harman kardon

Model DVD 38

DVD/CD/CD-R/CD-RW/VCD MP3 Player

Service Manual

- Contents -

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250 Crossways Park Dr.
Woodbury, New York 11797

Released 2007
Discontinued XXXX

Rev0 8/2007

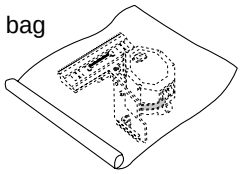
SERVICING PRECAUTIONS

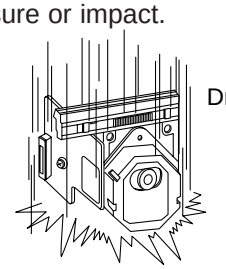
NOTES REGARDING HANDLING OF THE PICK-UP

1. Notes for transport and storage

1) The pick-up should always be left in its conductive bag until immediately prior to use.
2) The pick-up should never be subjected to external pressure or impact.

Storage in conductive bag

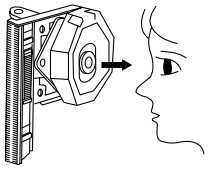




Drop impact

2. Repair notes

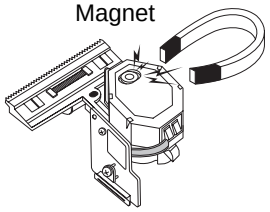
1) The pick-up incorporates a strong magnet, and so should never be brought close to magnetic materials.
2) The pick-up should always be handled correctly and carefully, taking care to avoid external pressure and impact. If it is subjected to strong pressure or impact, the result may be an operational malfunction and/or damage to the printed-circuit board.
3) Each and every pick-up is already individually adjusted to a high degree of precision, and for that reason the adjustment point and installation
screws should absolutely never be touched.
4) Laser beams may damage the eyes!
Absolutely never permit laser beams to enter the eyes!
Also NEVER switch ON the power to the laser output part (lens, etc.) of the pick-up if it is damaged.

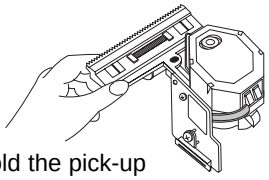


NEVER look directly at the laser beam, and don't let contact fingers or other exposed skin.

5) Cleaning the lens surface
If there is dust on the lens surface, the dust should be cleaned away by using an air bush (such as used for camera lens). The lens is held by a delicate spring. When cleaning the lens surface, therefore, a cotton swab should be used, taking care not to distort this.

Magnet

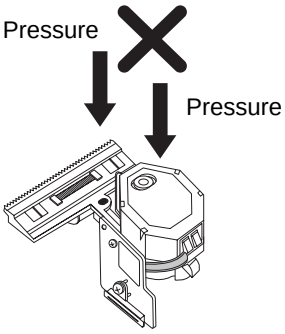


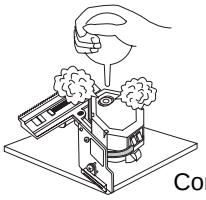


How to hold the pick-up

Pressure

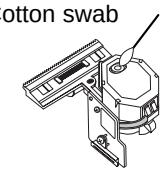
Pressure





Conductive Sheet

Cotton swab



6) Never attempt to disassemble the pick-up.
Spring by excess pressure. If the lens is extremely dirty, apply isopropyl alcohol to the cotton swab. (Do not use any other liquid cleaners, because they will damage the lens.) Take care not to use too much of this alcohol on the swab, and do not allow the alcohol to get inside the pick-up.

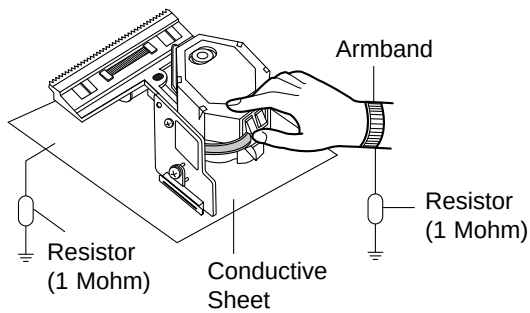
NOTES REGARDING COMPACT DISC PLAYER REPAIRS

1. Preparations

1) Compact disc players incorporate a great many ICs as well as the pick-up (laser diode). These components are sensitive to, and easily affected by, static electricity. If such static electricity is high voltage, components can be damaged, and for that reason components should be handled with care.
2) The pick-up is composed of many optical components and other high-precision components. Care must be taken, therefore, to avoid repair or storage where the temperature of humidity is high, where strong magnetism is present, or where there is excessive dust.

2. Notes for repair

1) Before replacing a component part, first disconnect the power supply lead wire from the unit
2) All equipment, measuring instruments and tools must be grounded.
3) The workbench should be covered with a conductive sheet and grounded.
   When removing the laser pick-up from its conductive bag, do not place the pick-up on the bag. (This is because there is the possibility of damage by static electricity.)
4) To prevent AC leakage, the metal part of the soldering iron should be grounded.
5) Workers should be grounded by an armband (1MΩ)
6) Care should be taken not to permit the laser pick-up to come in contact with clothing, in order to prevent static electricity changes in the clothing to escape from the armband.
7) The laser beam from the pick-up should NEVER be directly facing the eyes or bare skin.



ESD PRECAUTIONS

Electrostatically Sensitive Devices (ESD)

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive Devices (ESD). Examples of typical ESD devices are integrated circuits and some field-effect transistors and semiconductor chip components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ESD devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ESD devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ESD devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ESD devices.
6. Do not remove a replacement ESD device from its protective package until immediately before you are ready to install it. (Most replacement ESD devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive materials).
7. Immediately before removing the protective material from the leads of a replacement ESD device, touch the protective material to the chassis or circuit assembly into which the device will by installed.

CAUTION : BE SURE NO POWER IS APPLIED TO THE CHASSIS OR CIRCUIT, AND OBSERVE ALL OTHER SAFETY PRECAUTIONS.

8. Minimize bodily motions when handing unpackaged replacement ESD devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ESD device).

DVD 38 TECHNICAL SPECIFICATIONS

Applicable Disc:	
Disc formats:	5-inch (12cm) or 3-inch (8cm) DVD-Video, DVD-Audio, standard-conforming DVD-R, DVD+R, DVD-RW, DVD+RW, VCD, CD, CD-R, CD-RW or MP3 discs
Region code:	DVD video disc with Code 1 or 0 only
DVD layers:	Single side/single layer, single side/dual layer, dual side/dual layer
Audio formats:	DVD Audio MLP lossless, Linear PCM, MPEG, Windows Media® 9, Dolby® Digital or DTS® audio discs
Still-image format:	JPEG
Video Signal System:	NTSC
HDMI™ Output:	Video: 480p, 720p, 1080i HDMI Version 1.0-compliant HDCP Version 1.1-compliant
Composite Video Output:	1V p-p/75 ohms, sync negative polarity
S-Video Output:	
Y/luminance:	1V p-p/75 ohms, sync negative polarity
C/chrominance:	0.286V p-p
Component Video Output:	Y: 1V p-p/75 ohms, sync negative polarity
	Pr: 0.7V p-p/75 ohms
	Pb: 0.7V p-p/75 ohms
Analog Audio Output:	2V RMS (1kHz, 0dB)

Frequency Response:	
DVD (linear PCM):	2Hz – 22kHz +0/–0.5dB (48kHz sampling) 2Hz – 44kHz +0/–1.5dB (96kHz sampling) 2Hz – 88kHz +0/–0.5dB (192kHz sampling)
CD:	2Hz – 20kHz +0/–0.5dB
Signal/Noise Ratio (SNR):	105dB (A-weighted)
Dynamic Range:	
DVD:	100dB (18-bit)/105dB (20-bit)
CD/DVD:	96dB (16-bit)
THD/1kHz:	DVD/CD: 0.0025%
Wow & Flutter:	Below measurable limits
AC Power:	110–240V AC/50–60Hz
Power Consumption:	1 Watt (on/standby)/13 watts (max)
Dimensions (H x W x D):	2" x 17-3/10" x 11-1/4" (50mm x 440mm x 285mm)
Weight:	6 lb (2.7kg)
Shipping Dimensions (H x W x D):	5" x 14-3/8" x 20" (127mm x 365mmx 508mm)
Shipping Weight:	8.8 lb (4kg)

SimplayHD The DVD 38 is Simplay HD™-verified for compatibility via the HDMI connection with other Simplay HD-verified products.

Depth measurement includes knobs, buttons and terminal connections. Height measurement includes feet and chassis.

All features and specifications are subject to change without notice.

Please register your product on our Web site at www.harmankardon.com. Note: You'll need your serial number. At the same time, you can choose to be notified about our new products and/or special promotions.

MODEL NAME ：DVD 38

MP用

Description ： Characteristics Specification of Audio
Test Disc ： YEDS7 (SONY), TDV-540A (ABEX)
Test Conditions ： 10kΩ Load Terminated, AC100V 50/60Hz
Test Measuerment ： VP-7722A (Audio Analyzer) ,CASCADE SYS-2522(AP)

1.ANALOG AUDIO OUTPUT

Measurement Item			Limit	Result	TEST DISC
Output Level[Vrms]		L R	2.0 ± 0.2		YEDS7 (SONY) TRACK 1
Level difference [Vrms]			< 0.2		
F/ response [dB] Ref.1kHz 0dB	20 Hz	L R	0 ± 1.0		YEDS7 (SONY) TRACK 2
	100 Hz	L R	0 ± 1.0		YEDS7 (SONY) TRACK 4
	10 KHz	L R	0 ± 1.0		YEDS7 (SONY) TRACK 10
	20 KHz	L R	0 ± 1.5		YEDS7 (SONY) TRACK 13
	44 KHz	L R	0 ± 1.5		TDV-540A (ABEX) TITLE 4,CHAPTER 16 AUDIO STREAM 3
Emphasis Characteristic[dB] Ref.1kHz 0dB	5 KHz	L R	-4.53±1.0		YEDS7 (SONY) TRACK 40
	16 KHz	L R	-9.04 ± 1.0		YEDS7 (SONY) TRACK 41
S/N [dB]		L R	> 105		YEDS7 (SONY) TRACK 23
Channel Separation [dB]		L→R R→L	> 95		YEDS7 (SONY) TRACK 30,34
Linearity [dB] -90dB playback		L R	89.5±3		YEDS7 (SONY) TRACK 22
T.H.D [%]		L R	< 0.01		YEDS7 (SONY) TRACK 1
Dynamic Range [dB] -60dB playback		L R	> 93		YEDS7 (SONY) TRACK 20
全高調波歪率 [%] DVD 96k		L R	< 0.01		TDV-540A (ABEX) TITLE 3, CHAPTER 1
Dynamic Range [dB] DVD 96k		L R	> 95		TDV-540A (ABEX) TITLE 3, CHAPTER 2
全高調波歪率 [%] DVD 48k		L R	< 0.01		TDV-540A (ABEX) TITLE 2, CHAPTER 1 AUDIO STREAM 2
Dynamic Range [dB] DVD 48k		L R	> 95		TDV-540A (ABEX) TITLE 2, CHAPTER 2 AUDIO STREAM 2

2. DIGITAL OUTPUT

1) OPTICAL OUT

JITTER 44.1kHz (mUI)		< 50mUI		Normal 44.1kHz CD Playback
JITTER 96kHz (mUI)		< 50mUI		Normal 96kHz DVD Playback

2) COAXIAL OUT

OUTPUT Level [mV] Peak to Peak Level at 75ohm Lo		500±50 (mV)		Normal CD or DVD Playback

MODEL NAME : DVD 38
Description : Characteristics Specification of Video
Test Disc : TDV-540A (ABEX) , MDVD-111 (TEAC) Serial NO.:
Test Conditions : 75Ω Load Terminated
AC Input : For USA (120V/60Hz) , For Europe (230V/50Hz)
Test Measuerment : VM-700T

MP用

4. Video Frequency Respoens (75Ω Terminated)

Measurement Item		Limit	Result	Test Disc
Composite [dB]	0.5MHz 0dB Ref.	0		MDVD-111 TITLE2,CHAPTER9 100% Multi Brust
	1MHz	0dB ± 2dB		
	2MHz	0dB ± 2dB		
	3MHz	0dB ± 2dB		
	4MHz	0dB ± 2dB		
	5.8MHz	-3dB ± 2dB		

Measurement Item		Limit	Result	Test Disc
S-Video Y [dB]	0.5MHz 0dB Ref.	0		MDVD-111 TITLE2,CHAPTER9 100% Multi Brust
	1MHz	0dB ± 2dB		
	2MHz	0dB ± 2dB		
	3MHz	0dB ± 2dB		
	4MHz	0dB ± 2dB		
	5.8MHz	-3dB ± 2dB		

Measurement Item		Limit	Result	Test Disc
Component Y [dB] Interace Mode	0.5MHz 0dB Ref.	0		MDVD-111 TITLE2,CHAPTER9 100% Multi Brust
	1MHz	0dB ± 2dB		
	2MHz	0dB ± 2dB		
	3MHz	0dB ± 2dB		
	4MHz	0dB ± 2dB		
	5.8MHz	-3dB ± 2dB		

MODEL NAME : DVD 38
Description : Characteristics Specification of Video
Test Disc : TDV-540A (ABEX) , MDVD-111 (TEAC) Serial NO.:
Test Conditions : 75Ω Load Terminated
AC Input : For USA (120V/60Hz) , For Europe (230V/50Hz)
Test Measuerment : VM-700T

MP用

1. Video Level Test (75Ω Terminated)

Measurement Item		Limit	Result	Test Disc
Video output [V]	Composite	1.0V ± 0.1V		MDVD-111 TITLE2,CHAPTER1 100% COLOR BAR
	S-Video Y	1.0V ± 0.1V		
	S-Video C	286mV ± 30mV		
	Component Y	1.0V ± 0.1V		
	Component Pb	700mV ± 100mV		
	Component Pr	700mV ± 100mV		
	Scart CVBS	1.0V ± 0.15V		
	Scart Red	700mV ± 100mV		
	Scart Green	700mV ± 100mV		
	Scart Blue	700mV ± 100mV		

** Pb/Pr & RGB Video Level check before please setting the Black Level off in the set-up menu **

2. Video S/N Raito Test (75Ω Terminated)

Measurement Item		Limit	Result	Test Disc
Video SNR [dB] 100KHz~4.2MHz Use SC Trap	Composite	≥ 65.0 dB		MDVD-111 TITLE2,CHAPTER 4 50% Gray Color
	S-Video Y	≥ 65.0 dB		
	Component Y	≥ 65.0 dB		
	Component Pb	≥ 65.0 dB		
	Component Pr	≥ 65.0 dB		

3. Chroma Signal AM.PM Test (75Ω Terminated)

Measurement Item		Limit	Result	Test Disc
Chroma AM [dB] 10KHz~500KHz	Composite Chroma	≥ 65.0 dB		TDV-540A TITLE2,CHAPTER17 100% Magenta Color
	S-Video Chroma	≥ 65.0 dB		
Chroma PM [dB] 10KHz~500KHz	Composite Chroma	≥ 60.0 dB		
	S-Video Chroma	≥ 60.0 dB		

MP用

2. DVD-Audio Part (Test Disc V-612 , JVC)

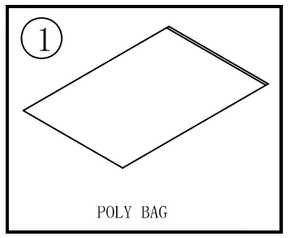
		Track Inform.	Limit	Downmix 2CH		Muiti 5 CH					SW
				LT	RT	FL	FR	SL	SR	C	
Output Level (V)		Tr.38 1KHz 0dB	2.1±0.2Vrms								
T.H.D (%) 20KHz LPF		Tr.38 1KHz 0dB	↓0.01%								
Frequency Respones (dB) Ref. : Tr. 38	48 / 24	Tr.59 17Hz	0±1.0dB								
		Tr.54 10KHz	0±1.0dB								
		Tr.53 20KHz	0±2.0dB								
	96 / 20	Tr.49 17Hz	0±1.0dB								
		Tr.45 10KHz	0±1.0dB								
		Tr.44 20KHz	0±2.0dB								
	192 / 24	Tr.22 17Hz	0±1.0dB								
		Tr.18 10KHz	0±1.0dB								
		Tr.17 20KHz	0±2.0dB								
S/N (dB) "A" Filter		Tr.40 Infinity Zero	↑90dB								
Dynamic Range (dB) 20KHz LPF		Tr.39 -60dB	↑85dB								

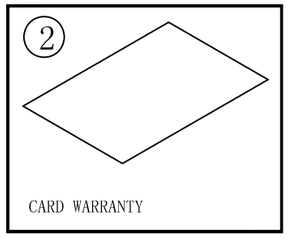
★ SW Level & THD --> Track 38 (30Hz) Play.

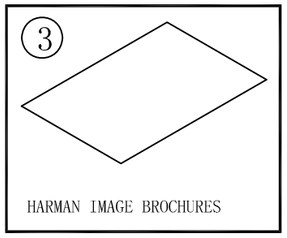
★ SW Frequency Respones -> Track 55(31Hz , 0dB) Reference

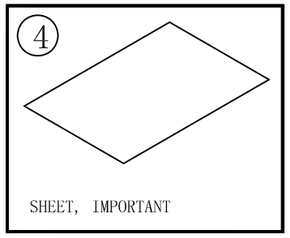
★ Track 54 (61Hz) , Track 53 (81Hz) , Track 51(127Hz) Play

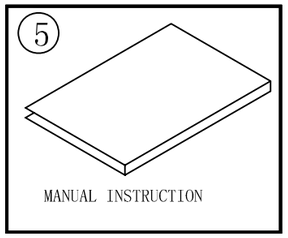
1. Instruction manual ass'y - Accessories

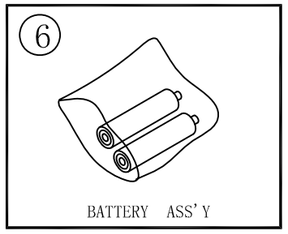


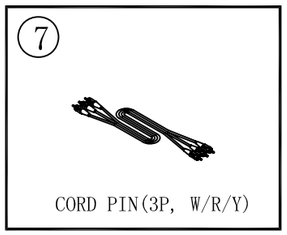


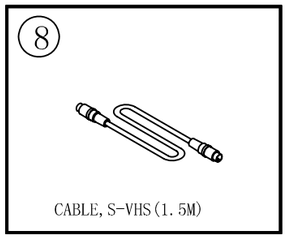


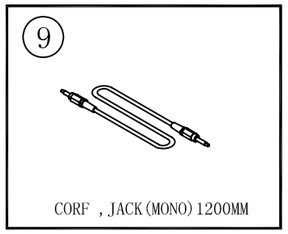


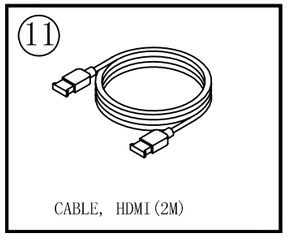


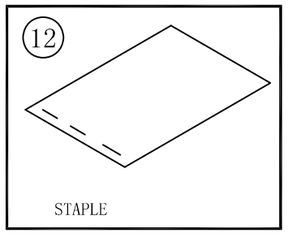






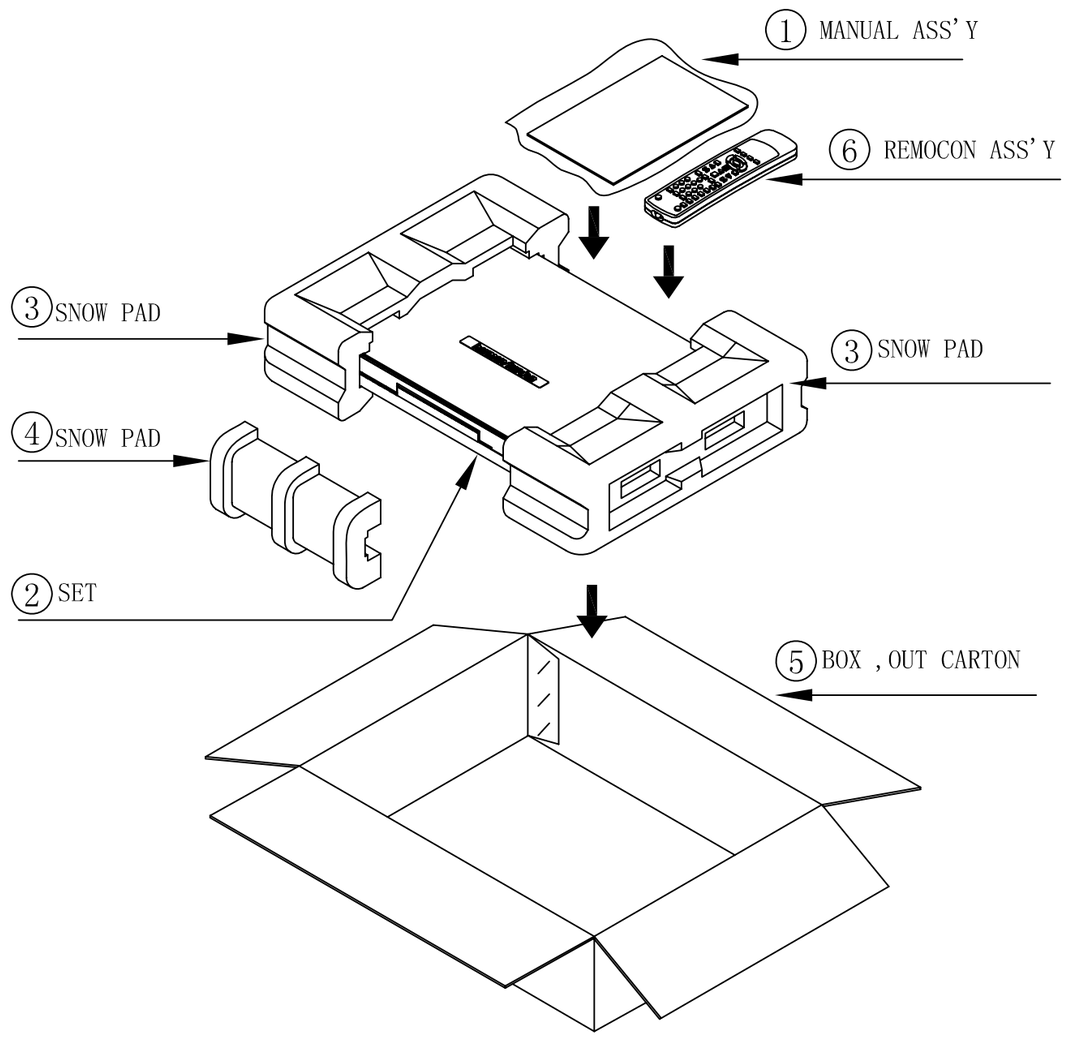






NO	DESCRIPTION	PARTS NO.	Q,ty
1	POLY BAG		1
2	CARD WARRANTY	CQE1A172X	1
3	HARMAN IMAGE BROCHURES		1
4	SHEET, IMPORTANT		1
5	INSTRUCTION MANUAL		1
6	BATTERY		2
7	CORD,PIN(3P,W/R/Y)	CJS4S004Z	1
8	CABLE,S-VHS(1.5M)	CJS0I006Z	1
9	CORD,JACK(MONO)1200MM	CJS9D002Z	1
10			
11	CABLE,HDMI(2M)	CJS8T001Z	1
12	STAPLE		3

2. Package Drawing



NO	DESCRIPTION	PARTS NO.	Q,ty
1	MANUAL ASS'Y		1
2	DVD 38	DVD 38	1
3	SNOW,PAD	CPS1A714	2
4	SNOW,PAD	CPS1A715	1
5	BOX,OUT CARTON	CPG1A798S	1
6	REMOCON ASS'Y	CARTDVD38	1
7			

FRONT-PANEL CONTROLS

Standby/On Switch: This electrical switch turns the DVD 38 on for playback, or leaves it in Standby mode for quick turn-on using this switch or the remote control.

Power Indicator: This LED is next to the Standby/On Switch. When the DVD 38 is plugged into AC power, the LED turns amber to indicate that the DVD 38 is in Standby mode (ready to be turned on). When the DVD 38 is turned on (by pressing the Standby/On Switch), the LED turns blue. If this LED ever turns red, immediately unplug the DVD 38. Check the wire connections. If the LED remains red, bring the DVD 38 to an authorized Harman Kardon service provider.

Open/Close: Press this button to open or close the disc drawer. When the DVD 38 is in Standby mode, press this button to turn it on and open the drawer. Before pressing this button, always make sure no objects are blocking the drawer. Remember to close the door or turn off the DVD 38 when you have finished. The door will close automatically after five minutes.

Message Display: Various messages appear in this display in response to commands. In addition, a variety of indicators will light at various times to display the current playback mode, video settings or other aspects of the DVD 38's status.

Disc Drawer: This drawer holds a disc that is played in the DVD 38. Press the Open/Close Button to access it. Be sure to carefully seat all discs in the recess in the drawer tray. To avoid damaging the drawer accidentally, do not press down on it when open. The drawer will close automatically after five minutes of inactivity to prevent dust or dirt from entering the DVD 38 and to prevent damage. If a disc is present, it will begin playing.

Play: Press to start playback of a loaded disc, or to resume play after the disc has been paused.

Pause: Press to pause play, or to resume after play has been momentarily paused. When a DVD is playing, a still image of the frozen action will appear on-screen. In Pause mode, you may access the Frame-by-Frame Advance and Slow Search functions by pressing the forward or reverse Step or Skip Buttons on the remote. The Disc Recognition function is not activated by Pause mode.

Stop: Press once to stop play and enter Resume mode, in which pressing Play resumes playback from the point at which it was stopped. Press this button twice to fully stop play of the disc. The Disc Recognition function is activated by Resume mode, enabling you to turn off the player or change discs, then resume play from the point at which it was stopped the next time the disc is loaded. Resume mode is not available for WMA files or VCDs without playback control.

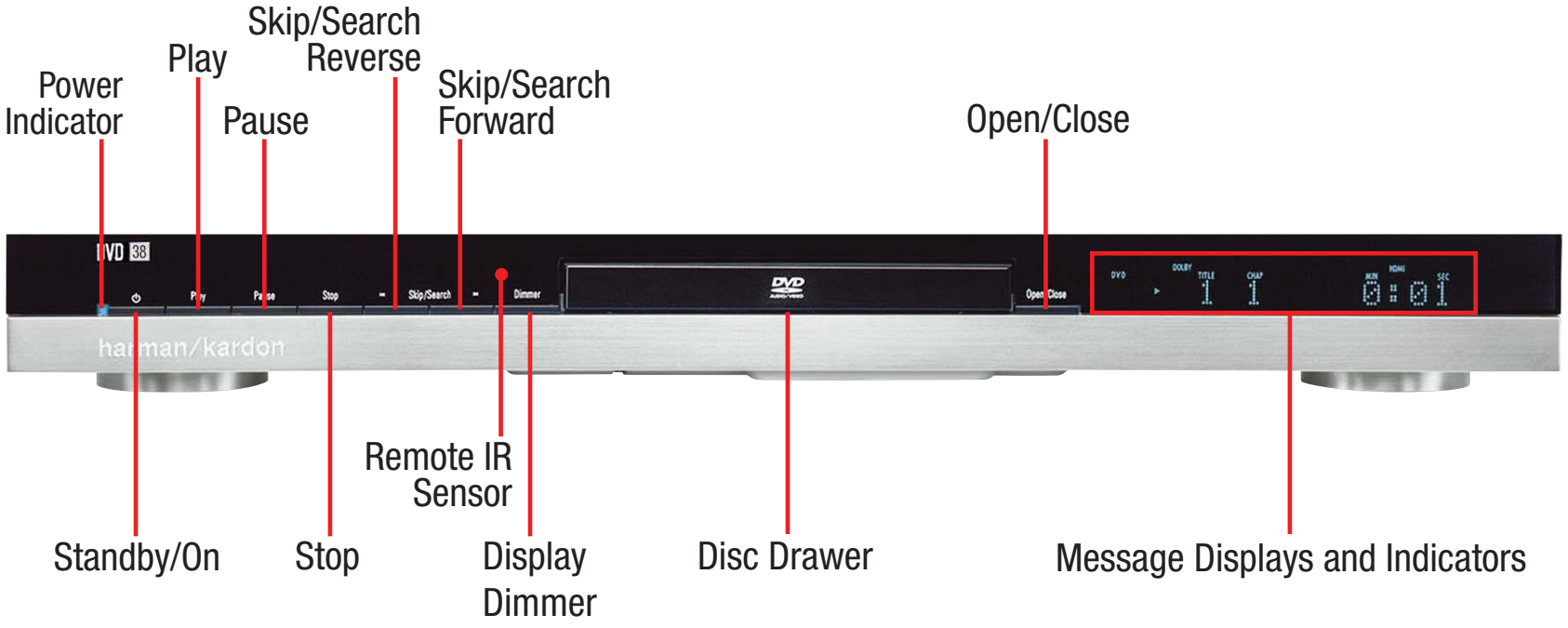
Skip/Search Reverse: Press once to return to the beginning of the current chapter or track. Quickly press again to skip to previous chapters or tracks. Press and hold for fast search reverse within the current chapter or track at the speed indicated on-screen.

Skip/Search Forward: Each press advances to the next chapter or track. Press and hold for fast search forward within the current chapter or track at the speed indicated on-screen.

Remote IR Sensor: This sensor receives infrared commands from the remote control. It is important to ensure that it is not blocked. If covering the sensor is unavoidable, such as when the DVD 38 is placed inside a cabinet, you may use an optional Harman Kardon HE 1000, or other infrared receiver, connecting it to the Remote IR Input on the DVD 38's rear panel. Alternatively, connect the Remote IR Output of another compatible component, such as a Harman Kardon AVR, to the DVD 38's Remote IR Input. Point the remote at the other device's remote sensor, and the command will be transmitted to the DVD 38. An external IR "blaster" may also be used, positioned to point at this area.

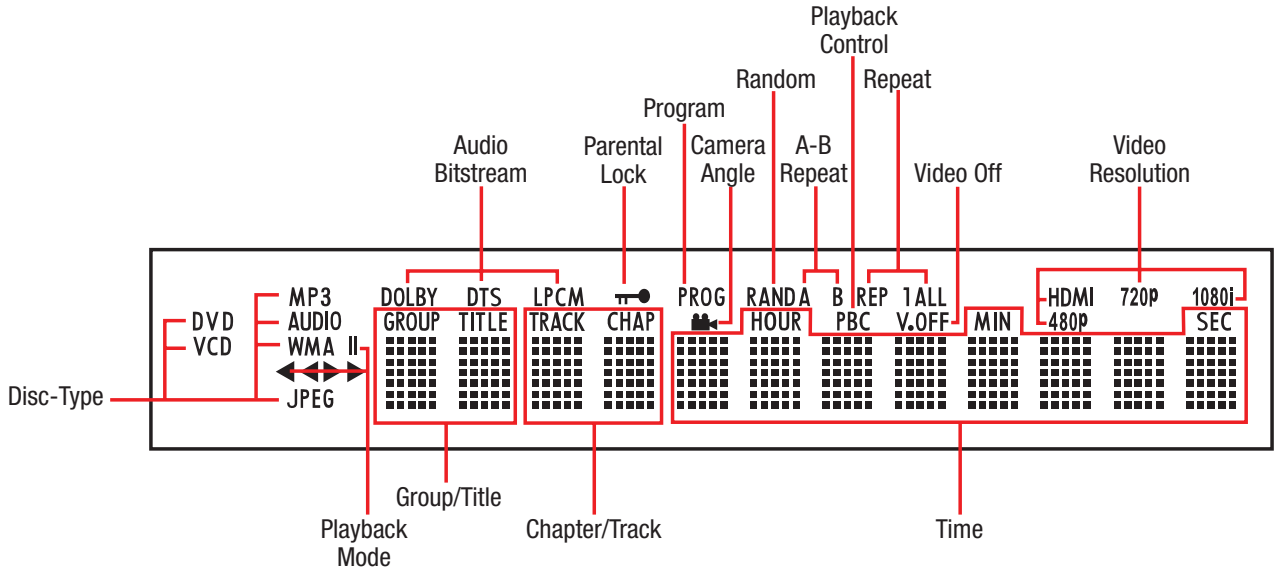
Dimmer: Some people find the front-panel display distracting, especially while watching a movie. Each press of this button cycles through the front-panel brightness options of Full Brightness, Half Brightness and Off. The Power Indicator always remains lit to remind you that the DVD 38 is turned on, but the display will remain dimmed or off, even when a command is entered.

Open/Close: Press this button to open or close the disc drawer.



NOTE: To make it easier to follow the instructions throughout the manual that refer to this illustration, a copy of this page may be downloaded from the Product Support section at www.harmankardon.com.

FRONT-PANEL INFORMATION DISPLAY



NOTE: To make it easier to follow the instructions that refer to the controls and connectors in this illustration, a larger copy may be downloaded from the Product Support section for this product at www.harmankardon.com.

Disc-Type Indicators: The **DVD**, **DVD-Audio**, **CD**, **VCD**, **MP3**, **WMA** or **JPEG** indicator will light to show the type of disc currently being played.

Audio Bitstream Indicators: When a Dolby Digital, DTS or Linear PCM digital audio signal is detected, one of these indicators will light. DVD-Audio, MP3 and WMA bitstreams will be indicated by the **Disc-Type Indicator**.

Parental-Lock Indicator: This indicator lights in red when the parental-lock system is engaged to prevent changing the rating level without a code.

Program Indicator: This indicator lights when a playlist has been programmed using the menu system (available for CDs only).

Angle Indicator: This indicator blinks when alternative viewing angles are available on the DVD currently playing.

Random Indicator: This indicator lights when the unit is in the Random Play mode.

A-B Repeat Indicator: This indicator lights when a specific passage for repeat playback has been selected.

VCD Playback Control Indicator: This indicator lights when the playback control function is turned on for VCDs.

Repeat Indicators: These indicators light when any of the Repeat functions are in use.

Video OFF Indicator: This indicator lights in red when the unit's video output has been turned off by pressing the **Video OFF Button** on the remote control.

Video Resolution Indicators: One of these indicators will light to indicate the video resolution of the source DVD, usually 480p. However, if your video display is capable of handling higher resolutions, the HDMI Output will upscale to the higher resolution, as indicated in the VIDEO SETUP menu (explained in the Initial Setup section). You may change the HDMI Mode setting to a lower resolution to improve picture quality using the VIDEO SETUP menu, or by pressing the HD Mode Button on the remote. This indicator does not reflect the HDMI Mode setting.

Time Indicators: These positions show the running time of a disc in play.

NOTE: These positions will also display text messages about the DVD's status, including Loading when a disc is loading, Power Off when the unit is turned off, and Disc Error when a disc not compatible with the DVD 38 is loaded.

Chapter/Track Number Indicators: When a DVD disc is playing, these two positions show the current chapter. When a DVD-Audio or CD disc is playing they will show the current track number.

Group/Title Indicators: These two positions show the current title number when a DVD disc is playing, or the current group for a DVD-Audio disc.

Playback-Mode Indicators: These indicators light to show the current playback mode:

▶ Lights when a disc is playing in the Normal mode. This indicator will flash when the disc is in Forward Slow Play mode. The on-screen banner display indicates the selected speed (1/2x, 1/4x, 1/8x or 1/16x).

▶▶ When the DVD 38 is in the Fast Search Play mode, two of these indicators will light to show that the unit is in a Fast Play mode. The on-screen banner display indicates the selected speed (2x, 4x, 8x, 20x or 100x). Fast Play mode is not available for WMA files.

❙❙ Lights when the disc is paused.

◀◀ Lights when the disc is in the Fast Search Reverse mode. The on-screen banner display indicates the selected speed (2x, 4x, 8x, 20x or 100x). Fast Search Reverse mode is not available for WMA files.

◀ Flashes when the disc is in Reverse Slow Play mode. The on-screen banner display indicates the selected speed (1/2x or 1/4x).

REAR-PANEL CONNECTIONS

Remote Infrared (IR) Input and Output: When the Remote IR sensor on the front panel is blocked, such as when the DVD 38 is placed inside a cabinet, connect the IR Output of your receiver/processor or an optional IR receiver to the Remote IR Input jack for use with the remote control. The Remote IR Output may be connected to the Remote IR Input of a compatible source device (or other product) to enable remote control through the DVD 38. When several devices are used, connect them in "daisy chain" fashion.

HDMI Output: If you have an HDMI-compatible receiver or video display device, connect this output to an HDMI input on the receiver or video display for high-quality digital audio and video. Even if your receiver is not capable of processing audio in the HDMI format, you will still experience the superb reproduction of HDMI video.

In all cases, the video display must be HDCP-compliant in order to use the HDMI output. For best results, we do not recommend HDMI connections in excess of ten feet without a repeater. If your video display has a DVI input, you may use an optional HDMI-to-DVI cable or adapter for the connection to the display.

The DVD 38 is Simplay HD-verified for compatibility via the HDMI connection with other Simplay HD-verified products.

The following audio formats may be output via the HDMI connection:
Audio CD – 2-Channel PCM or 5.1-channel DTS
DVD-Audio – 2-Channel PCM
DVD-Video – Up to 5.1-channel Dolby Digital or DTS

NOTE: To hear the high-resolution surround sound recorded on DVD-Audio discs, you also need to connect the **6-Channel Audio Outputs** to the corresponding input jacks on your receiver or processor. These formats are not output digitally.

To hear a two-channel analog downmix via the 2-Channel Analog Audio Outputs, select Stereo at the Bass Management setting in the AUDIO SETUP submenu, or press the Audio Mode Button on the remote repeatedly until the Stereo setting is selected.

Coaxial and Optical Digital Audio Outputs: If your receiver or processor has an available digital audio input, connect either of these digital audio outputs to the corresponding input on the receiver/processor to enjoy digital audio formats such as Dolby Digital, DTS or standard PCM (traditionally found on CDs and may be available on other discs). Never connect both of these outputs to the same device simultaneously. However, it is okay to connect one of the digital audio outputs plus the analog audio outputs to the same device.

NOTE: The Coaxial Digital Output should only be connected to a digital input. Even though it is the same RCA-type connector as standard analog audio connections, DO NOT connect it to a conventional analog input jack.

Component Video Outputs: If your television or video display and receiver are component video-capable, and your display does not have an HDMI input, connect these jacks to the corresponding inputs on the receiver or TV that are labeled "Y/Pr/Pb" or "Y/Cr/Cb." If your video display is capable of handling resolutions of 480p or better, connect these outputs to the HD (high-definition) component video inputs on your display. If the display is capable of displaying progressive-scan video, select Progressive at the Scan Type setting in the VIDEO SETUP submenu, or press the P/I Button on the remote repeatedly until the Progressive Scan setting is selected.

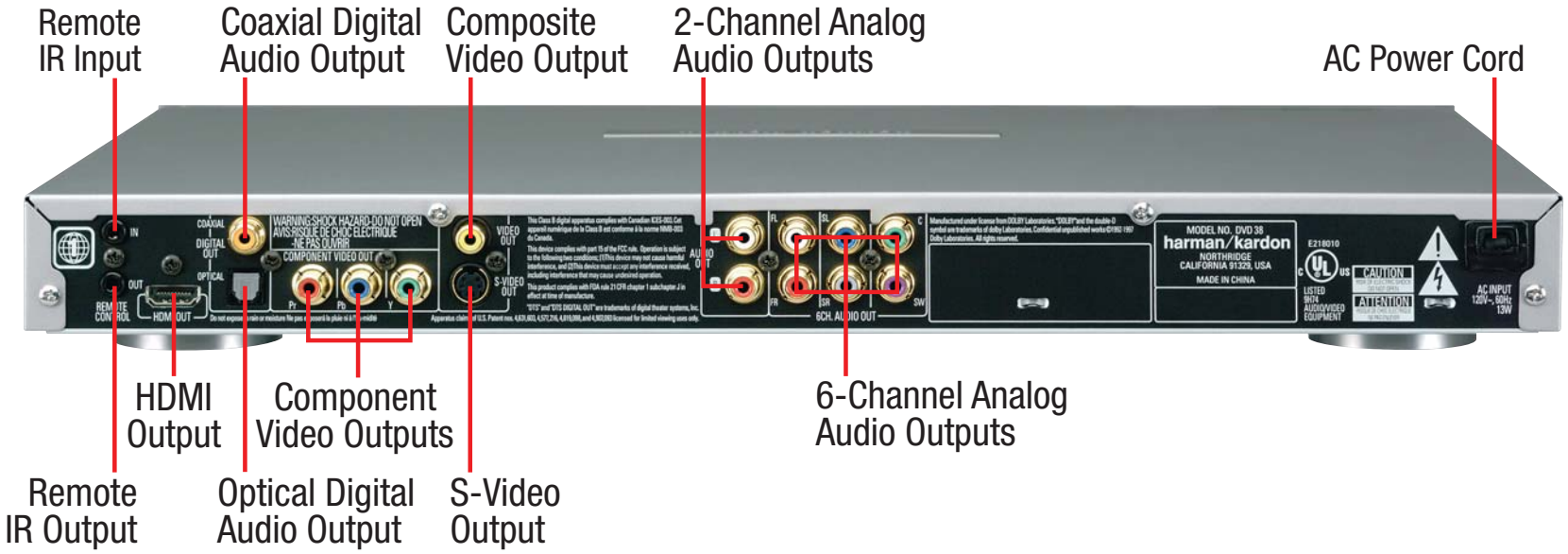
IMPORTANT NOTE: Do not connect the Component Video Output jacks to standard composite video inputs on any device.

Composite and S-Video Outputs: If your video display does not have HDMI or component video inputs, connect one of these two video outputs to your receiver/processor or directly to the display. If available, S-video is preferred. Do not connect more than one of the DVD 38's analog video outputs (component video, S-video, composite video) to any other device at the same time. You may connect both the HDMI Output and the Composite Video Output to your receiver if your receiver distributes composite video through a multiroom system.

2-Channel Analog Audio Outputs: Connect these outputs to the left and right analog audio inputs on your receiver/processor or TV. You may connect these jacks in addition to a digital audio connection, and it is recommended that you do so as a backup if you wish to use the DVD 38 as a source device for a multiroom system or if you wish to make analog recordings, as it is not possible to make digital recordings of most DVDs.

6-Channel Analog Audio Outputs: Connect these outputs to the matching 6-channel analog audio inputs on your receiver or surround sound processor. This connection is required to listen to the multichannel tracks on DVD-Audio discs. If the disc also contains a Linear PCM, Dolby Digital or DTS track, you may listen to it using the **HDMI Output**, the **Coaxial** or **Optical Digital Audio Output** or the **2-Channel Analog Audio Outputs**.

AC Power Cord: Connect the AC power cord to an AC outlet. If the outlet is controlled by a switch, make certain that it is in the ON position. If the cord somehow becomes damaged, contact your authorized Harman Kardon dealer for a replacement.



NOTE: To make it easier to follow the instructions throughout the manual that refer to this illustration, a copy of this page may be downloaded from the Product Support section at www.harmankardon.com.

REMOTE CONTROL FUNCTIONS

IR Transmitter Lens: As buttons are pressed on the remote, infrared codes are emitted through this lens. Make sure it is pointing toward the component being operated.

Power On: Press this button to turn on the DVD 38 when it is in Standby mode (plugged in with the Power Indicator lit up in amber).

Power Off: Press this button to turn off the DVD 38, placing it in Standby mode.

Open/Close: Press this button to open or close the disc drawer. If the DVD 38 is in Standby mode, pressing this button will turn it on.

Audio: Press this button while a DVD is playing to display the current audio track information and to select another audio format.

Clear: Press this button to clear a number you have started to enter. This button may also be used to clear the on-screen displays. Press and hold this button for five seconds while in Stop mode and with all on-screen displays cleared to reset the DVD 38 to its factory-default settings.

Title: This button allows you to select from the titles stored on the disc, which may include "making of" or other featurettes. Some DVD-Audio discs may allow you to select from the available audio formats using the Title Button.

Subtitle: Press this button while a DVD containing subtitle information is playing to turn subtitles off or select a subtitle language. This setting will only be in effect for the current disc.

> NOTE: Due to the variations in how DVD discs are authored, the subtitle languages displayed by the DVD 38 may not accurately reflect the actual languages available on the disc. It is recommended that subtitles be selected using the disc's menu.

Playlist: Press this button to display the Disc Information screen, which shows the order in which tracks are currently being played. You may navigate to the Program screen to program a playlist, in which the tracks may be played in a different order than they appear on the disc. See the Programming a Playlist section for more information.

Repeat: Press this button repeatedly to cycle through the Repeat modes available with the current disc. This button is not used to access A-B Repeat mode.

A-B Repeat: While a disc is playing, the A-B Repeat function allows you to repeatedly play a passage, which may include several tracks or chapters. Press the button once to select the starting point ("A"), and a second time to select the end of the passage ("B"). Press the button again to end repeat play.

Random: This button turns on or off Random Play mode, which plays the tracks on a CD in random order.

Numeric Keys: Use these buttons to directly enter a track or chapter number to skip to that section of the disc, or to enter a password for the parental control system.

Info: Press this button to display the Disc Information screen, which contains detailed information about the current disc. Press it again to clear the display. See the Operation section for more information.

System Setup: Press this button to access the SYSTEM SETUP menu. See the Initial Setup section for more information.

Disc Menu: Press this button while a DVD is playing to view the disc's menu.

Status: When a DVD or VCD is playing, press this button to view the Status Bar, which contains playback mode information.

Transport Controls: These buttons are used to operate the disc player. Use the controls to skip forward or reverse by track or chapter; to fast-search forward or reverse; and to play, pause or stop the disc. After pressing the Pause button, the Skip buttons may be used to step frame-by-frame through a video presentation, and the Fast-Search buttons may be used for slow play.

Angle: When a DVD encoded with multiple camera angles is playing and when the Angle Icon appears to indicate that the multiple-angle passage has been reached, press this button to cycle through the various available angles.

This button is also used to rotate still images. Each press rotates the image clockwise 90 degrees.

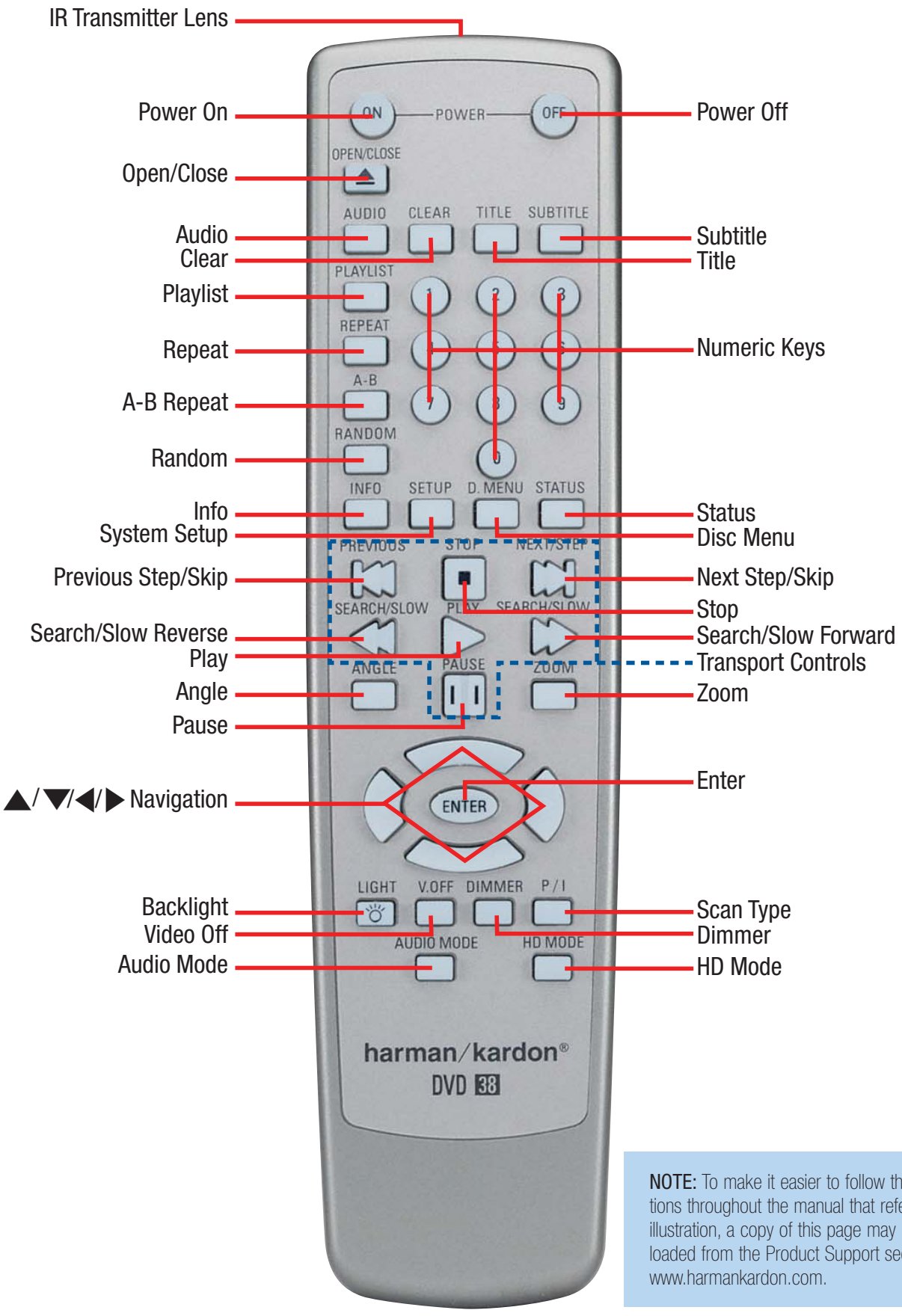
Zoom: When viewing a DVD, VCD or JPEG still image, press this button repeatedly to enlarge the on-screen image by 2x, 3x, 4x or 5x (2x or 3x only for VCDs) before returning to the original size. While enlarged, use the Navigation buttons to explore the image.

▲/▼/◀/▶ Navigation and **Enter Buttons:** These buttons are used together to make selections within the on-screen menu system.

Backlight: Press this button to turn on the backlight to make it easier to see the buttons in a darkened room. The backlight will remain on for a few seconds after your last button press before going out, or you may turn off the backlight by pressing this button again.

Video Off: Some people prefer to turn off the video display when listening to audio-only discs. Pressing this button deactivates the video circuitry, avoiding any possible interference with the audio. Moreover, plasma and CRT video displays are subject to "burn-in" when a still image, such as a menu, remains on-screen for more than a short time. Although the DVD 38 features a screen saver that appears automatically after a brief period of inactivity, we strongly recommend that plasma and CRT owners use the Video Off function liberally. Press the button a second time to reactivate the video displays.

REMOTE CONTROL FUNCTIONS



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REMOTE CONTROL FUNCTIONS

Dimmer: Some people find the front-panel displays distracting, especially while watching a movie in a darkened room. Each press of this button cycles through the Full Brightness, Half Brightness and Off settings. The Power Indicator will always remain lit to remind you that the DVD 38 is turned on.

> **NOTE:** Although you may enter commands and operate the DVD 38 normally even with the front-panel display fully dimmed, the display will not wake when a command is entered. To view the display messages, press the Dimmer Button to change the brightness setting.

Scan Type: Each press of this button toggles between the Progressive- and Interlaced Scan settings of the Component Video Outputs. It has no effect on the Composite, S-Video or HDMI Outputs. The button also has no effect while the SYSTEM SETUP menu is on-screen. Press the Clear or Setup Button to clear the on-screen displays. Use this button when your video display is not capable of handling progressive-scan component video signals, and you have inadvertently selected the progressive scan setting in the VIDEO SETUP menu.

Audio Mode: This button adjusts the Bass Management setting, which is also found in the AUDIO SETUP menu. Stop playback of the current disc in order to use this selector.

There are three available settings: Bypass (the default), On and Stereo. The first press displays the current setting, and each additional press cycles through the three settings.

Bypass: The analog audio information is passed through the Analog Audio Outputs as is, without applying any bass management adjustments. This mode is used with receivers and processors that are capable of applying bass management settings (speaker size, output levels and delay times) to their 6-channel analog inputs.

On: This setting is used with receivers and processors that pass the audio signals from their 6-channel analog inputs directly to the outputs without applying any bass management settings. With Bass Management on, use the AUDIO ADJUSTMENTS submenu to set the DVD 38's bass management settings.

Stereo: This mode is used when a 2-channel downmix of a multichannel audio signal is desired. For example, if you are playing a DVD-Audio disc, in which case the multichannel presentation is only available through the Analog Audio Outputs, and you would like to distribute the program to a multiroom system, select the Stereo mode.

> **NOTE:** The 2-channel downmix (Stereo mode) and the 5.1-channel presentation of multichannel audio discs (Bypass or Bass Management On modes) are not available simultaneously. With Bass Management on, only the front left and right channel information will be available at both the 2-channel and 6-channel left and right Analog Audio Outputs. No surround or center channel information will be present in the signal output at the 2-channel Analog Audio Outputs. In Stereo mode, the down-mixed 2-channel signal will be available at both the 2-channel and 6-channel left and right Analog Audio Outputs, while none of the remaining 6-channel outputs will have any information.

> Use the Audio Mode Selector to conveniently select from the three available settings without having to enter the on-screen menu system.

HD Mode: Each time the DVD 38 is turned on while connected via HDMI to a video display or other device, the DVD 38 and the other device exchange information about the other device's video resolution capabilities. The DVD 38 sets the resolution of the HDMI Output to match the video display. If the original program materials were recorded at a much lower resolution, you may wish to change the video output resolution to improve the picture quality. Press this button to select from the resolution settings available with your display. You will not be able to select a resolution greater than your display's capabilities.

This button performs the same function as the HDMI Settings line in the VIDEO SETUP menu. The HDMI Mode setting will not be displayed on the front panel, which indicates the resolution of the source disc's video signal. The HDMI Mode setting may be viewed by accessing the VIDEO SETUP menu as described in the Initial Setup section.

CONNECTIONS

There are different types of audio and video connections used to connect the DVD 38 to your receiver or processor and video display. To make it easier to keep them all straight, the Consumer Electronics Association (CEA®) has established a color-coding standard. Table 1 may be helpful to you as a reference while you set up your system.

Table 1 – Connection Color Guide

Audio Connections		
	Left	Right
Front **(FL/FR)**		
Center **(C)**		
Surround **(SL/SR)**		
Subwoofer **(SUB)**		
Digital Audio Connections		
Coaxial		
Optical	Input	Output
Video Connections		
Component	Y	Pb / Pr
Composite		
S-Video		
HDMI™ Connections		
HDMI		

Types of Connections

This section will briefly review different types of cables and connections that you may use to set up your system.

Audio and video signals originate in what are known as "source devices," including a DVD/CD player such as the DVD 38.

Separate connections are required for the audio and video portions of the signal unless an HDMI connection is used (see below). The types of connections used depend upon what's available on your receiver, and for video signals, the capabilities of your video display.

Audio Connections

There are two formats for audio connections: digital and analog. Digital audio signals are required for listening to sources encoded with digital surround modes, such as Dolby Digital and DTS. There are two types of digital audio connections commonly used: coaxial and optical. Either type of digital audio connection may be used, but never both simultaneously. However, it's okay to make both analog and digital audio connections at the same time to the same source.

NOTE: The DVD 38 outputs digital audio signals through the HDMI connection. If your receiver/processor or video display is capable of *processing* the audio portion of the HDMI signal, then you will not need to make a separate digital audio connection. However, as explained in the Analog Audio section below, you may still need to make the analog audio connections. If your receiver/processor is only capable of *switching* HDMI signals, use HDMI for your video connection only and connect either the DVD 38's coaxial or optical digital audio output to the corresponding input on your receiver.

Digital Audio

Coaxial digital audio jacks are usually color-coded in orange. Although they look similar to analog jacks, they should not be confused, and you should not connect coaxial digital audio outputs to analog inputs or vice versa. See Figure 1.

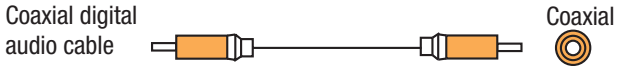

Figure 1 – Coaxial Digital Audio

Optical digital audio connectors are normally covered by a shutter to protect them from dust. The shutter opens as the cable is inserted. See Figure 2.

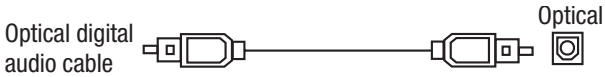

Figure 2 – Optical Digital Audio

Due to the nature of digital signals as binary bits, they aren't subject to signal degradation the way analog signals are. Therefore, the quality of coaxial and optical digital audio connections should be the same, although it is important to limit the length of the cable. Whichever type of connection you choose, Harman Kardon recommends that you always select the highest quality cables available within your budget.

Analog Audio

Analog connections require two cables, one for the left channel (white) and one for the right channel (red). See Figure 3. These two cables are often attached to each other for most of their length. Most devices that have digital audio jacks also have analog audio jacks. We recommend that you always connect the DVD 38's 2-Channel Analog Audio Outputs to your receiver/processor, or to your TV if you are not using a receiver. There are four reasons to use analog audio connections, even if you are using one of the digital audio connections:

1. To make recordings. Most DVDs are protected from digital copying and only analog copies are permitted. Please make sure to comply with all copyright laws when making recordings for personal use.
2. In a multiroom system. Many receivers and processors require sources used in multiroom systems to output analog audio signals.
3. When connecting the DVD 38 directly to a TV. The TV may not have digital audio inputs.
4. When playing high-resolution 96kHz PCM audio discs. If your receiver is not capable of processing 96kHz audio, you may need to use the analog audio connection.

NOTE: The DVD 38 is capable of downmixing multichannel materials and outputting a two-channel downmix. However, make sure to adjust the Bass Management setting in the Audio Setup menu to Stereo.

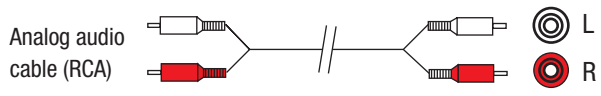

Figure 3 – Analog Audio

Multichannel analog connections are used with high-resolution DVD-Audio discs, where the copy-protected digital content is decoded inside the DVD 38. These connections are required for playing DVD-Audio discs, unless the disc also carries two-channel PCM and 5.1-channel

CONNECTIONS

Dolby Digital or DTS soundtracks for use with receivers/processors that are not equipped with 5.1-channel analog inputs. Check the disc's jacket for more information on alternate audio tracks. See Figure 4.

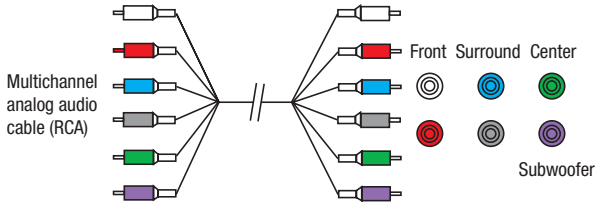

Figure 4 – Multichannel Analog Audio

NOTE: In order to enjoy the full benefit of lossless multichannel recordings, make sure the Bass Management setting in the AUDIO SETUP menu is set to On or Bypass, depending on the bass management capabilities of your receiver/processor. When the Stereo setting is selected, the center and surround channel information will be combined with the left and right channels, and will only be heard through the front channels. This setting may also be accessed by pressing the Audio Mode Button on the remote.

Video Connections

As mentioned above, the video signal is often transmitted separately from the audio signal. Even when the HDMI connection described below is used, sometimes the receiver is not capable of accessing the audio portion of the HDMI signal, and a separate audio connection is required.

Digital Video

The DVD 38 is equipped with an HDMI (High-Definition Multimedia Interface) output. HDMI is capable of carrying digital audio and video information using a single cable, delivering high-quality picture and sound.

The DVD 38 is capable of outputting up to 720p or 1080i video and 2-channel PCM or up to 5.1-channel Dolby Digital or DTS audio through its HDMI connection. The DVD 38 is in compliance with HDCP (High-Definition Copy Protection) and the video display must also be HDCP-compliant to be used with the DVD 38's HDMI output.

SimplayHD The DVD 38 is Simplay HD-verified for compatibility via the HDMI connection with other Simplay HD-verified products.

The physical HDMI connection is simple. The connector is shaped for easy plug-in (see Figure 5). If your video display has a DVI input, you may use an HDMI-to-DVI adapter (not included) to connect it to the HDMI Output.

Figure 5 – HDMI Connection

Analog Video

There are three types of analog video connections: composite video, S-video and component video.

Composite video is the basic connection most commonly available. The jack is usually color-coded yellow, and looks like an analog audio jack, although it is important never to confuse the two. Do not plug a composite video cable into an analog or coaxial digital audio jack, or vice versa. Both the chrominance (color) and luminance (intensity) components of the video signal are transmitted using a single cable. See Figure 6.

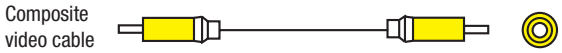

Figure 6 – Composite Video

S-video, or "separate" video, transmits the chrominance and luminance components using separate wires contained within a single cable. The plug on an S-video cable contains four metal pins, plus a plastic guide pin. Be careful to line up the plug correctly when you insert it into the jack on the receiver, source or video display. See Figure 7.

Figure 7 – S-Video

Component video separates the video signal into three components – one luminance ("Y") and two sub-sampled color signals ("Pb" and "Pr") – that are transmitted using three separate cables. The "Y" cable is color-coded green, the "Pb" cable is colored blue and the "Pr" cable is colored red. See Figure 8.

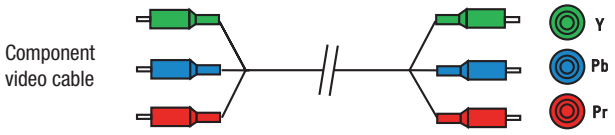

Figure 8 – Component Video

Do not confuse component video connections with composite video (described above). Although the plugs and jacks may look similar, they are not compatible and cross-connecting them will result in no picture or a very distorted picture. Remember that component video uses three connections, colored green, blue and red, while composite video uses a single connection, which is often color-coded yellow.

If your video display is capable of handling progressive-scan signals (480p or better), then connect the DVD 38's Component Video Outputs to the input jacks on your video display marked "HD Component". Make sure to configure your display for use with 480p video signals. Set the Scan Type setting in the DVD 38's Video Setup menu to Progressive; this setting may also be accessed by pressing the Scan Type Button on the remote (marked P/I).

NOTES:

- The DVD 38's component and S-video outputs are not available simultaneously. Adjust the Video Output setting in the VIDEO SETUP menu for the desired output. You may need to temporarily connect the DVD 38's Composite Video Output to your video display in order to view the menu.
- For simplified operation, connect one of the DVD 38's video outputs to your receiver or processor, and use the receiver/processor as a switching device for all of your sources, connecting only the receiver/processor to your video display. However, if your receiver is not capable of switching HDMI signals, connect the DVD 38's HDMI Output directly to an HDMI-capable video display for superior picture quality.

- If you are using the DVD 38 with a multiroom receiver/processor that is capable of distributing video, connect the DVD 38's Composite Video Output to the receiver in addition to the HDMI, Component Video or S-Video Output.

If it's available on your video display, HDMI is recommended as the best-quality connection, followed in preference by component video, S-video and then composite video. Except as indicated above for use in a multiroom system, do not connect more than one video output from the DVD 38 to another device.

Remote IR Input and Output

The DVD 38 is equipped with an infrared input and output to facilitate use of your system with a remote control in a variety of situations.

When the DVD 38 is placed in such a way that aiming the remote at the front-panel IR sensor is difficult, such as inside a cabinet or facing away from the listener, you may connect an external IR receiver, such as the optional Harman Kardon HE 1000, to the Remote IR Input jack.

If your receiver or any of your other components are equipped with a compatible remote IR input, you may use the included 1/8" mini-plug interconnect cable to connect the Remote IR Output to the device's remote IR input, which will pass any applicable remote signals transmitted through the DVD 38 to the other device. This enables you to control your devices even when the DVD 38 itself is controlled via an external IR receiver.

To control more than one device using the Remote IR Output, connect all devices in "daisy chain" fashion, with the receiver's remote IR output connected to the DVD 38's Remote IR input, then the DVD 38's Remote IR Output connected to the next device's remote IR input, that device's remote IR output connected to the next device's remote IR input, and so forth.

NOTE: Not all remote controllable devices are equipped with compatible IR inputs and outputs. Check with the manufacturer of the source device for more information on the type of IR signal expected. The DVD 38 will output a "stripped carrier" IR signal.

INSTALLATION

You are now ready to connect the DVD 38 to your system. Before beginning, make sure that all components, including the DVD 38, are turned completely off and their power cords are unplugged. **Don't plug any of the power cords back in until you have finished making all of your connections.**

Many components in a home theater system, such as a receiver or power amplifier, generate a great deal of heat that can interfere with the operation of the DVD 38. Therefore, it is best to place the DVD 38 on its own shelf instead of stacking it directly on top of another component. It is also a good idea to check the finish of your shelf. Some wood or other finishes can be affected over time by the DVD 38's rubber feet.

Step One – Connect the DVD 38 to Other Components

Select one of the following two sections, depending on whether you are connecting the DVD 38 directly to a television or video display, or if you are using an audio/video receiver or processor (this manual will use the term "receiver" to refer to either a receiver or a processor) that incorporates the DVD 38 as part of a home theater system.

Connecting the DVD 38 Directly to a Television

If your television is HDMI-capable and HDCP-compliant, then only one cable connection is required, and it will carry both audio and video signals. Use the included HDMI cable to connect the DVD 38's HDMI output to your television's HDMI input. See Figure 9. If your television has a DVI input rather than an HDMI input, purchase an HDMI-to-DVI cable or adapter.

SimplayHD The DVD 38 is Simplay HD™-verified for compatibility via the HDMI connection with other Simplay HD-verified products.

Figure 9 – HDMI Output

NOTE: When using the HDMI connection, turn on the television or video display *before* the DVD 38.

If your video display does not have an HDMI input, then separate audio and video connections are required. Select one of these types of video connections, in order of preference: component video, S-video, composite video. See Figure 10.

Figure 10 – Component, S- and Composite Video Outputs

Other than HDMI, most video displays are not equipped with coaxial or optical digital audio inputs. If your display is, then it would be preferable to connect one of the DVD 38's digital audio outputs to the corresponding input on your display. However, most likely you will use the 2-Channel Analog Audio Outputs. See Figure 11.

Figure 11 – 2-Channel Analog Audio Outputs

NOTE: The DVD 38 is capable of downmixing 5.1-channel materials to the two-channel format, but it is necessary to adjust the Bass Management setting in the AUDIO SETUP menu to Stereo. You may also access this setting by pressing the Audio Mode Button on the remote. If you leave the Bass Management setting at On or Bypass, the DVD 38 will only output content specific to the front left and right channels through the 2-Channel Analog Audio Outputs, losing the center and surround channel information.

After you have connected the DVD 38 to your television, skip to Step Two for more information.

Connecting the DVD 38 to an Audio/Video Receiver

One of the major advantages of the DVD format is its ability to use a variety of digital audio formats for the ultimate in sonic performance. In addition, the DVD 38 is capable of playing DVD-Audio discs, which contain high-resolution multichannel audio materials. In order to benefit from these audio formats, we strongly recommend that you connect the DVD 38 to a 5.1-, 6.1- or 7.1-channel audio/video receiver with the ability to decode digital audio such as Dolby Digital and DTS, and with 5.1-channel "direct" analog audio inputs. Harman Kardon AVR Series receivers are compatible with the DVD 38.

The DVD 38 may also be used with an analog A/V receiver by connecting the 2-Channel Analog Audio Outputs to any one of the receiver's inputs (in addition to a video connection).

If your receiver is HDMI-capable, connect the DVD 38's HDMI Output to one of the receiver's HDMI inputs. See Figure 9. If the receiver is equipped with a DVI port, purchase an HDMI-to-DVI cable or adapter.

SimplayHD The DVD 38 is Simplay HD™-verified for compatibility via the HDMI connection with other Simplay HD-verified products.

Figure 9 (repeated) – HDMI Output

Check your receiver's owner's manual to determine how it handles HDMI signals. It may simply switch the signal, it may process the audio portion of the signal but not the video portion, or it may be capable of processing both the audio and video portions of the signal. If the receiver only switches the signal, but is not capable of accessing and processing the audio or video data, then a separate audio connection is required, as explained below.

If the receiver is *not* HDMI-capable, then separate audio and video connections are required. Select *one* of these types of video connections, in order of preference: component video, S-video, composite video. See Figure 10.

Figure 10 (repeated) – Component, S- and Composite Video Outputs

If your receiver is equipped with digital audio inputs, then select *either* a coaxial or optical digital audio input, and connect it to the corresponding output on the DVD 38. See Figure 12. This step also applies to a receiver that is only capable of HDMI switching and cannot process the audio portion of the HDMI signal. If your HDMI-capable receiver processes the HDMI audio, then do not make another digital audio connection.

Figure 12 – Coaxial and Optical Digital Audio Outputs

If you wish to enjoy DVD-Audio discs in their native lossless format, connect the DVD 38's 6-Channel Analog Audio Outputs to the corresponding 6-channel analog audio inputs on the receiver. This connection is necessary because the digital content is copy-protected and decoded by the DVD 38, with only the analog audio output available. See Figure 13.

Figure 13 – 6-Channel Analog Audio Outputs

NOTE: When using the 6-Channel Analog Audio Outputs, remember to adjust the Bass Management setting in the AUDIO SETUP menu to On if the inputs on your receiver are "direct", meaning that the receiver does not perform any bass management on the signal; or to Bypass if the receiver does perform bass management on the 6-channel inputs, which may be indicated by calling them 6-channel DVD-Audio inputs. Consult your receiver's owner's manual for more information.

As explained in the Connections section, there may be several reasons for using the DVD 38's Analog Audio Outputs in addition to the Digital Audio Outputs. If you wish to make recordings, to use the DVD 38 as an audio source for a multiroom system, to play 96kHz discs when your receiver is not capable of processing 96kHz audio, or if your receiver is not equipped with digital audio inputs, then connect the DVD 38's 2-Channel Analog Audio Outputs to any pair of analog audio inputs on the receiver. See Figure 11.

Figure 11 (repeated) – 2-Channel Analog Audio Outputs

Even if you connected one of the DVD 38's digital audio outputs to your receiver, you may wish to connect the 2-Channel Analog Audio Outputs to your TV (if it isn't HDMI-capable) so that you may watch a DVD without turning on your complete home theater system. If you make this connection, remember to also connect one of the DVD 38's video outputs directly to the TV.

Step Two – Plug In AC Power

Having made all of your wiring connections, it is now time to power up the DVD 38. Plug the AC Power cord into a working, unswitched AC outlet. See Figure 14.

Figure 14 – AC Input for Power Cord

Step Three – Insert Batteries in Remote

The DVD 38 remote control uses two AAA batteries (included).

To remove the battery cover located on the back of the remote, firmly press the ridged area and slide the cover towards the bottom of the remote.

Insert the batteries as shown in Figure 15, making sure to observe the correct polarity.

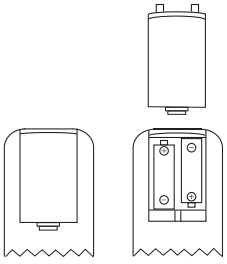

Figure 15 – Remote Battery Compartment

When using the remote, remember to point the lens toward the front panel of the DVD 38. Make sure no objects, such as furniture, are blocking the remote's path. Bright lights, fluorescent lights and plasma video displays may interfere with the remote's functioning. The remote has a range of about 20 feet, depending on the lighting conditions. It may be used at an angle of up to 30 degrees to either side of the DVD 38.

If the remote seems to operate intermittently, make sure the batteries have been inserted correctly, or replace all three batteries with fresh ones.

INSTALLATION

Step Four – Turn On the DVD 38

Plugging the DVD 38 into AC power places it in Standby mode, which is indicated by the Power Indicator (surrounding the Standby/On Switch) turning amber.

NOTE: When HDMI connections are used, turn on your television or video display before turning on the receiver and DVD 38.

There are several ways in which the DVD 38 may be turned on from Standby mode.

a) Press the Standby/On Switch on the front panel or remote. See Figure 16.

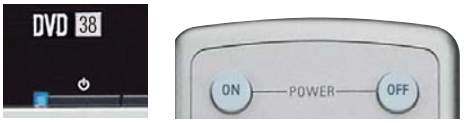

Figure 16 – Standby/On Switch

b) Press the Open/Close Button on the front panel or remote. See Figure 17.

Figure 17 – Open/Close Button

Pressing the Open/Close Button will also open the disc drawer.

c) Press the Play Button on the front panel or remote. If a disc is present, it will begin playing automatically. See Figure 18.

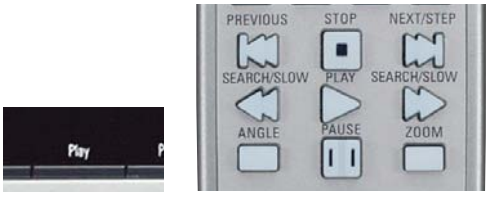

Figure 18 – Play Button

After customizing a few settings in the Initial Setup section, you may soon enjoy the finest in home entertainment.

OPERATION

Now that you have installed and configured your DVD 38, you are ready to begin enjoying your home theater system.

Turning On the DVD 38

When you have plugged in the DVD 38, the Power Indicator next to the power switch should light up in amber. This indicates that the DVD 38 is in Standby mode and is ready to be turned on. See Figure 16.

Figure 16 (repeated) – Standby/On Switch

There are several ways in which the DVD 38 may be turned on:

a) Press the Standby/On Switch. See Figure 16.

b) Press the Open/Close Button. See Figure 17.

c) Press the Play Button. See Figure 18.

Figure 17 (repeated) – Open/Close Button

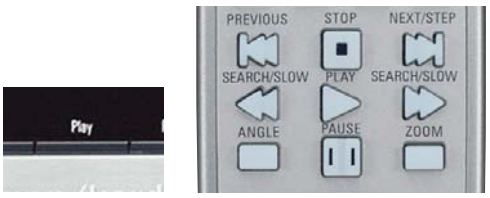

Figure 18 (repeated) – Play Button

To turn the DVD 38 off, press either the Standby/On Switch on the front panel, or press the Power Off Button on the remote. See Figure 16. When the DVD 38 is unplugged, any settings you have programmed will be preserved for up to four weeks.

Although you may previously have owned a CD or DVD player, we recommend you take a few minutes to learn the specifics of operating the DVD 38. You also may want to take a moment now to review the glossary terms in the back of the manual to familiarize yourself with the terminology used to describe DVD players.

Playback Basics

In some respects disc playback is the same for all types of discs. We suggest you read through the basic instructions, and then read the sections pertaining to the various disc types.

Disc Handling Precautions

- To keep the disc clean, handle the disc by its edge. Do not touch the surface. See Figure 29.

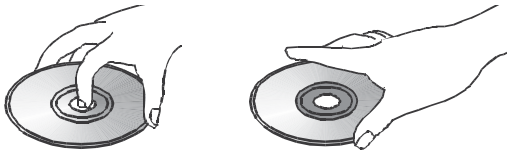

Figure 29 – How to Handle a Disc

- Do not stick paper or tape on the disc. If there is glue (or a similar substance) on the disc, remove the glue completely before using the disc.
- Do not expose the disc to direct sunlight or sources such as hot air ducts, or leave it in a car parked in direct sunlight, as there can be a considerable rise in temperature inside the car.
- After playing, store the disc in its case.
- Do not write on the label side with a ball-point pen or other sharp writing utensil.
- Be careful not to drop or bend the disc.

Disc Cleaning Precautions

- Before playing, clean the disc with a cleaning cloth. Wipe the disc from the center out.
- Do not use solvents such as benzene, thinner, commercially available cleaners or anti-static spray.

Disc Loading Precautions

- Do not load more than one disc on disc tray.
- Do not place a disc on the tray upside down.
- Do not try to close the disc tray when the disc is not positioned or centered properly.

Loading Discs

To load discs in the DVD 38, first turn it on by pressing the Standby/On Switch or the Open/Close Button on the front panel or the Power On Button on the remote. The Power Indicator is amber when the unit is connected to an AC power source, and it turns blue when the DVD 38 is turned on.

Next, if you have not already done so, press the Open/Close Button so that the disc tray opens.

Hold the disc by the edge, and gently place it into the disc drawer, making certain that the disc is properly seated in the tray's insert. If the disc is not correctly centered, you may damage both the disc and the player when the drawer closes. When loading discs, please note the following:

- The DVD 38 will play discs with the following logos as well as most DVD-RW or DVD+RW discs and most WMA and JPEG discs, including Kodak Picture CDs, but not Kodak Photo CDs. DO NOT attempt to play another type of disc.

- The DVD 38 will only play discs that are coded for Region 1 or discs that are open to being played in all regions (Region Code "0"). Discs that contain a Region Code of 2, 3, 4, 5 or 6 (as noted by a number inside a world map logo on the disc's jacket) will not play.
- The DVD 38 will only display video in the NTSC format. The PAL format is generally used in Europe and other regions of the world outside North America, and some music or other DVDs are available in PAL with a Region Code of "0". The DVD 38 will automatically detect the PAL format, and make the necessary conversions so that the video may be displayed on an NTSC TV. PAL discs bearing a Region Code other than "0" or "1" may not be played on the DVD 38.
- Playback capability for CD-RW, DVD-RW, DVD-R, DVD+RW or DVD+R discs will vary according to the quality of the disc. On some occasions it is possible that these discs may not play on the DVD 38.
- Both 5-inch (12cm) and 3-inch (8cm) discs may be used.
- Load CDs or DVD-Audio discs with the label side up.
- Load DVD-Video discs with printed labels label side up. If the disc contains both standard and high-definition (not HD-DVD or Blu-ray Disc) versions of the program, make sure the desired label faces up.
- Some DVD-Video discs are double-sided. The title information for these will be printed on the inner ring of the disc, very close to the center hole. The title for the side you wish to play should be facing up.

After a disc is properly loaded, press the Open/Close Button to close the disc drawer. After the drawer closes, the LOADING message will appear in the Main Information Display while the unit is determining the type of disc (DVD-Video, DVD-Audio, CD, VCD, JPEG, WMA or MP3) and is reading the data for track, chapter, title and other information about the disc.

Next, the applicable Disc-Type Indicator will light up in the front-panel display. If the disc is a DVD, CD or VCD2.0 disc, it will automatically begin playing. The disc's track and timing information and other relevant data will also appear in the Main Information Display.

Any time a control button is pressed, an icon will appear in the upper right corner of the screen to indicate the player's action. These icons include the standard transport modes (play, stop, pause, forward and reverse fast and slow search, track skip), the opening or closing of the disc drawer, or the prohibit icon (Ø) if the command action is not available at that time or for that disc. As explained in more detail below, pressing the Status Button displays the Status Banner for DVDs, and pressing the Info Button displays the Player Information submenu.

- When a DVD is detected, playback will automatically begin and the screen will show the program or the disc's menu, depending on how the disc was created.
- If a CD is detected, playback will begin automatically, and the Player Information screen will appear. See Figure 30.

Figure 30 – Player Information Screen (Audio CD)

- If the disc contains MP3, WMA or JPEG files, or if it is a VCD without playback control, the Player Information display will appear. See Figure 31. To play one of these files, use the Navigation Buttons to select a folder and press the Enter Button to open it. Use the Navigation Buttons to select a file for playback, and press the Enter Button to begin play.

Figure 31 – Player Information Screen (WMA Disc)

- VCD2.0 discs will begin play automatically, similar to a conventional audio CD. VCDs containing raw MPEG files may play, depending on how the disc was created.

If a disc is already in the drawer when the unit is turned on, it will begin playing. If the disc was stopped using the Resume function, playback will begin from the point where it was stopped. If the disc was stopped by pressing the Stop Button twice, the disc will begin playing from its beginning. If the Disc Recognition feature was turned on in the System Setup menu (see Figure 20), a screen will appear asking you whether to begin playback from the beginning of the disc, or from the point where playback was stopped during the last viewing session. See Figure 32.

Figure 32 – Disc-Recognition Resume Screen

OPERATION

Playback Control

See Figure 33 for reference to the transport controls described below.

Figure 33 – Transport Controls

- To momentarily pause playback and freeze the current picture frame on a DVD, press the Pause Button. To resume playback after pressing the Pause button, press the Play Button.
- To move forward or backward through the tracks on a DVD-Audio disc or CD, or the chapters on a DVD, press the Skip Forward/ Reverse Buttons on the front panel or the Previous/Next Buttons on the remote.
- To move forward or backward through the DVD or CD disc being played at fast speed, press the Search Forward/Reverse Buttons on the remote, or press and hold the front-panel Skip/Search Buttons briefly until fast play begins and then release them. Once one of these buttons is pressed, the fast search will continue until the Play Button is pressed. Each additional press of the Search Forward/Reverse Buttons will cycle through the five available fast-search speeds: 2X, 4x, 8x, 20x, 100x.

NOTE: Fast search is available when DVD-Audio and MP3 and discs are playing, but not for WMA discs. Search speeds available may vary for different types of discs.

- When a DVD or VCD is playing, you may move forward or backward through the disc in slow motion by first pressing the Pause Button and then pressing the Search/Slow Forward or Reverse Buttons. Each additional press of the buttons will cycle the player through one of the four forward slow-play speeds: 1/2x, 1/4x, 1/8x or 1/16x, or one of the two reverse slow-play speeds: 1/2x or 1/4x. Press the Play Button to resume normal playback.

NOTE: There is no audio playback during fast or slow-forward or -reverse play. This is normal for DVDs, as surround processors cannot process the digital audio streams during slow modes. Slow-play is available for VCDs, but not for audio CDs, MP3s or WMAs. Slow-play speeds may vary for different types of discs.

- To advance frame by frame while a DVD is playing, first press the Pause Button, then press the Skip/Step (Previous) or Skip/Step (Next) button repeatedly. Press the Pause or Play Button to resume normal play. Frame-by-frame movement in reverse is not available.

NOTE: Playback of a disc with 96kHz/24-bit audio requires the use of circuitry normally used for other features. Accordingly, the Slow Play Reverse and Step Advance features are not available with these discs.

- When a camera icon appears on screen, or the Angle Indicator appears on the front panel, it indicates that there is multiple-angle information on the disc being played. To change the angle, press the Angle Button repeatedly until the desired angle view appears. An on-screen banner message will indicate the current angle view.
- To illuminate the buttons on the remote control so that they may be seen in low-light conditions, press the Light Button.

The availability of the Zoom, Repeat, Repeat A-B and Random functions depends on the type of disc. In addition, the availability of the Player Information screens and Status Bar vary from one disc type to another. These features are described in the following sections describing playback of DVDs, CDs, MP3s, WMAs, JPEGs and VCDs. Programming playlists is explained after the section on VCDs.

Video Off Feature

The Video Off feature is available during playback of audio-only discs, such as CD, DVD-Audio, MP3 or WMA discs. Although the video circuitry is electrically isolated from the audio section, some users may prefer to turn the video displays off during audio playback to prevent any possibility of interference between audio and video. You may also wish to turn the video display off if you find the menu system distracting or unnecessary during audio playback.

IMPORTANT NOTE: It is strongly recommended that plasma and CRT video display owners use the Video Off feature to avoid burn-in, especially as some audio discs display still images continuously.

To turn the video displays off while an audio disc is playing, press the Video Off Button. Press the button again to restore the video output. The V-Off Indicator will light in red to remind you that the video displays have been turned off. The video output will automatically be restored each time the DVD 38 is turned on.

DVD Playback

Using a DVD's Menu

The DVD system offers a producer the opportunity to include a wide range of features on a disc, including multiple language tracks; subtitles in a variety of languages; special information such as movie trailers and cast information; and other customized information. In addition, producers may divide a movie or program into chapters that allow for quick access to specific parts of the program. These chapters may be accompanied by thumbnail pictures of a scene from the specific chapter to help you select the desired spot on the disc.

When a disc is playing, press the Disc Menu Button to pause playback and display the disc's menu. As there are no hard rules about style and contents for DVD menus, the way they appear on the screen and the information they contain will vary from one disc to another. However, the following general rules apply to most menus:

- You may move through the options on a menu using the Navigation Buttons, as the disc's programming allows. The option selected will typically be highlighted in a certain color or inside an outline box.
- To select a highlighted option, which may either play a portion of the disc or move to a submenu, press the Enter Button.
- On some discs, when you select the DVD menu during the playback of a movie, the disc will return to the point in the program where the menu was selected by offering a "Play Movie" option. Press the Enter Button or Play Button to resume play. However, not all discs offer this feature, and selecting the menu while playing a movie may mean that you will have to go back to either the beginning of the program or the start of a chapter. This feature is out of the control of the DVD 38, as it is set by the disc's internal programming.

NOTE ON PROHIBITED FUNCTIONS

The DVD 38 is capable of all the features and options covered by the DVD standards. However, not all discs will function identically, and some discs will not have many of the features of the DVD system. For example, most current DVD discs do not take advantage of the multiple-angle feature.

When you press a button and the player displays the "Function Prohibited" icon "Ø", this is an indication that the disc has not been programmed for that function. In addition, it is common for the producers of DVD discs to block the use of certain functions during only some parts of a disc. For example, many discs prohibit the use of fast-play buttons or prohibit access to the Chapter Menu display during the playback of copyright notices, studio logos, movie credits or trailers.

Zoom

The DVD 38's advanced digital video processing circuits include a Zoom feature that allows you to enlarge the image of a DVD, VCD or JPEG for closer examination of a particular part of the picture. Four steps of enlargement are available.

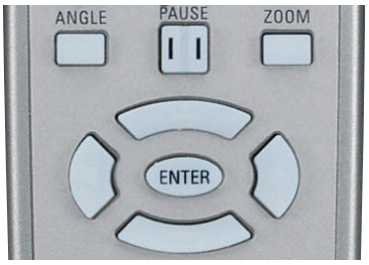

Figure 34 – Zoom and Navigation Buttons

- To use the Zoom feature, press the Zoom Button while a disc is playing or paused. See Figure 34. Each press of the button will increase the zoom-in effect. When you have cycled through all four steps (three steps of enlargement for VCDs), the picture will return to normal size.
- When the Zoom feature is activated, you may use the Navigation Buttons to explore the enlarged picture once the information box with the zoom ratio and playback time no longer appears on the screen.
- Some discs are created in a way that prevents the Zoom feature from operating. In addition, the Zoom feature will not operate on disc menus and may not operate on subtitles.

Playback Resume

The DVD 38 offers a "Resume" feature for DVD playback that is different from the conventional "Stop" function you may be used to on CD players. When the Stop Button is pressed once, the disc will stop and Resume will appear briefly in the upper right corner of the video screen and in the Main Information Display. While the Resume feature is active, the disc's position is entered into the unit's memory so that when the Play Button is pressed to resume playback, the program will continue from the point where the Stop Button was pressed. To completely stop playback, press the Stop Button twice.

You may resume a DVD (Audio or Video), CD, VCD with Playback Control, MP3 or JPEG disc after placing the DVD 38 in Standby mode. Resume will not operate for WMA files or for VCDs that do not have playback control.

Disc Recognition

When the Disc Recognition feature is turned on in the SYSTEM SETUP menu, you may press the Stop Button either once (to enter Resume mode) or twice (to enter Stop mode) and remove the DVD from the player. Even if you turn the DVD 38 off, the next time you insert that DVD, you will be presented with the option of either starting playback from the beginning, or resuming playback from the point at which you stopped previously. See Figure 32. The DVD 38 can recognize up to five discs total.

Player Information Menu

The DVD 38's PLAYER INFORMATION menu displays disc information and enables you to program playback modes. Press the Info Button to display the PLAYER INFORMATION menu. See Figure 35.

OPERATION

Figure 35 – Player Information Screen

The PLAYER INFORMATION menu has three submenus, which may be accessed by using the Navigation Buttons to highlight the submenu's icon, and pressing the Enter Button to select it. These submenus are different from the Setup menus in that many items are for display only and cannot be changed using the menu system.

PLAYBACK INFO Submenu: This submenu displays basic disc and playback mode information. See Figure 36. Access this submenu by highlighting the Info icon (top icon with a small "i") and pressing the Enter Button. See Figure 36.

Figure 36 – Playback Info Submenu

- **Disc:** This line displays the disc type, such as DVD-Video.
- **Disc ID:** If the disc is encoded with an identification label, such as a movie title, it will appear here.
- **Playlist:** This line indicates whether playback will occur in the disc's order, or following a programmed playlist. For DVDs this line will always indicate playback in the disc's order, as programmed play is not available for DVDs.
- **Repeat:** This line displays the current repeat mode, or Off if Repeat mode is not active.

PROGRAM submenu: The Program submenu is not available for DVDs.

DISC INFO Submenu: This submenu displays detailed information about the disc content (see Figure 35). You will not be able to make any changes to the items on this submenu. However, you may use the VIDEO SETUP submenu to change the DVD 38 player settings for video aspect ratio or scan type.

- **Disc:** This line displays the disc type.
- **Disc ID:** If the disc is encoded with an identification label, it will appear here.
- **Aspect Ratio:** This line displays the aspect ratio of the video content on the disc, and the format in which it is being played back according to the setting established in the VIDEO SETUP submenu. Some discs may contain two versions of the same program with a widescreen aspect ratio on one side of the disc, and a standard aspect ratio on the other.
- **Video Standard:** The disc's format is shown here. For Region 1 players, this will normally be NTSC, although some DVDs that are open region (playable in all regions) may be in the PAL format. The DVD 38 will convert the video to the NTSC format used by your television.
- **Scan Type:** This line displays whether the video program on the DVD was recorded with a progressive- or interlaced-scan rate. It also displays how the program is being played back, based on the setting established in the VIDEO SETUP submenu.
- **Audio Resolution:** This line displays the sample rate and bit rate for the current audio format.
- **Audio Format:** This line displays the current audio track, such as Dolby Digital 5.1 or Linear PCM.
- **Video Bit Rate:** This line displays the video bit rate up to the maximum of 10 Mbps. This indication will vary as a disc is played in response to changes in the amount of compression that was applied to the video signal when the disc was created. Thus, as shown in Figure 35, when the disc is stopped or paused, this line will remain blank.

When you have finished viewing the Player menus, press the Info or Clear Button to remove the displays from the screen and return to normal play.

On-Screen Status Display

When a DVD is playing, you may press the Status Button at any time to view a quick summary of the disc's playback status. The Status Bar not only gives you a snapshot of the unit's current state, it also provides an easy way to select a different group, title, chapter or track, or use the time search feature. See Figure 37.

Figure 37 – Status Bar

- **Group/Title:** For DVD-Video discs, this displays the current title number and the total number of titles on the disc. For DVD-Audio discs, the current group number and total number of groups are shown.
- **Chapter:** For DVD-Video discs, this shows the current chapter and the total number on the disc. For DVD-Audio discs, the current and total tracks are shown.
- **Play Mode Icon:** This displays the current play mode icon; i.e., Play ▶, Pause ❙❙, Stop ■.
- **Time Display:** This section of the display shows the time corresponding to the type of display indicated in the Time Display Type. The Time Search function enables you to start playback at any point in the program. Use the ◀/▶ Navigation Buttons to highlight this display. You may then use the Numeric Keys to enter the numbers corresponding to the time on the disc from which you wish play to commence. Press the Enter Button and play will begin at the selected time position.
- **Time Display Type:** This section identifies the type of information in the Time Display section of the display. Use the Navigation Buttons

to select this setting, and each subsequent press of the Enter Button will change the time display from Title Elapsed, to Title Remaining, to Chapter Elapsed to Chapter Remaining, and cycle back to Title Elapsed. The time displayed on screen and in the front-panel Information Display will change accordingly. For DVD-Audio discs, the time display options are Group Elapsed, Group Remaining, Track Elapsed and Track Remaining.

- **Time Bar:** This display is a graphic representation of the time elapsed for the title being played. As the disc plays, the number of bars will increase to reflect approximately what percentage of the title has been played thus far. It is not affected by changes to the Time Display Type.

Titles and Groups

To select a title or group, first press the Status Button so that the Status Display appears. Navigate so that the Current Title or Group is highlighted. Use the Numeric Keys to enter the desired title/group and it will begin playing immediately. See Figure 38.

Figure 38 – Selecting a Title

If a "ø" icon appears when you attempt to select a new title (group), this is an indication that the disc does not allow the title (group) to be changed in this manner, even though a list of numbers will appear. This is a function of the way the disc was created and is not a flaw in the DVD 38.

For some discs, you may press the Title or Audio Button during playback to change the current title or group. Other discs will switch to the disc menu, and some discs may simply restart play from the beginning of the current title or group. This is a function of how the disc was authored, and does not reflect a problem with the DVD 38.

Chapters and Tracks

To select a chapter for DVD-Video discs or a track for DVD-Audio discs, first press the Status Button so that the Status Display appears. The Current Chapter or Track Number will be highlighted. Use the Numeric Keys to enter the desired chapter/track, and it will begin playing immediately.

To select a specific chapter or track on a DVD at any time during playback, simply press the number corresponding to the chapter or track you wish to view using the Numeric Keys. You may also move one by one through the chapters or tracks at any time by pressing the Skip Reverse (Previous)/Skip Forward (Next) Buttons.

Audio Soundtracks

Many DVDs contain more than one audio soundtrack. On many discs, you will find multiple languages, while others offer a choice of different audio formats or mixes (e.g., Dolby Digital or DTS). Some will also contain commentary from the director or stars. The default audio language is set in the AUDIO SETUP menu.

To change the audio soundtrack, press the Audio Select Button to display the Audio banner and show the current audio soundtrack configuration. See Figure 39.

Figure 39 – Audio Status Bar

Each press of the Audio Select Button or the Enter Button will change the current audio soundtrack. Don't press any of the Numeric Keys to select an audio track; doing so will change the chapter or track.

When the desired selection appears, press the ◀/▶ Navigation Buttons so that Done is highlighted, and then press the Enter Button to remove the banner display and return to normal playback.

NOTES ON AUDIO TRACKS:

- Not all discs contain multiple audio soundtrack choices. Check the information on the disc jacket to see what audio languages or format options are available.
- Some DVDs do not allow direct selection of the audio track during playback. For these discs, you must change the audio soundtrack using the disc's menu system. Press the Disc Menu Button to display the disc's menu and then use the Navigation Buttons to make your selection following the navigation scheme of the individual disc.
- When you change the audio soundtrack or language with the Audio Select Button on the remote control as shown above, you only override the audio language setting established in the AUDIO SETUP menu for the disc currently being played. The unit will revert to its default setting with the next disc.

Subtitles (DVD-Video Discs Only)

Many DVDs contain one or more subtitle languages. The default subtitle language is set in the SYSTEM SETUP menu, but you may also turn the subtitles on or off, or change the language at any time during a disc's playback.

To change the subtitle language or turn the subtitles on or off, press the Subtitle Button to display the Subtitle banner and show the current configuration. See Figure 40. Each press of either the Subtitle Button or the Enter Button will change the current subtitle language, or turn subtitling off.

Figure 40 – Subtitle Banner

When your desired selection appears, press the ◀/▶ Navigation Buttons until Done is highlighted and then press the Enter Button to remove the banner display and return to normal playback.

NOTE: Due to the variations in how DVD discs are authored, subtitle languages displayed by the DVD 38 may not accurately reflect the actual languages available on the disc. It is recommended that subtitles be selected using the disc's menu.

Angles (DVD-Video Discs Only)

Some DVDs contain multiple-angle views, which allow the disc's creators to provide different camera views of the same scene. In many cases the disc will alert you to the presence of multiple angles by showing a camera icon or other indication, but in any case where multiple-angle

OPERATION

material is available, if the Show Angle Icon setting in the SYSTEM SETUP menu has been set to On, the Multiple Angle Icon will appear on screen briefly at the beginning of the passage where multiple camera angles are available, and the Angle Indicator will light in the front panel Information Display.

When multiple angle views are available, press the Angle Button to change the view. See Figures 41 and 42. The current angle number and total available angles will be displayed. Each press of the Angle Button will change the current camera angle. If you press the Angle Button during a section without multiple views, onlly one view will be available.

Figure 41 – Angle Button

Figure 42 – Angle Banner

When your desired selection appears, press the ◀/▶ Navigation Buttons until Done is highlighted and then press the Enter Button to remove the banner display and return to normal playback.

Repeat Play

The DVD 38 offers several repeat functions that allow you to take advantage of the capacity of the unit for unattended playback. Press the Repeat button once to display the Repeat Message on-screen. See Figure 43. Press the Repeat Button again to cycle through the options.

Figure 43 – Repeat Message

- **Repeat 1:** Repeats the DVD chapter or DVD-Audio track currently being played until the disc is manually stopped. The Repeat (“Rep.”) indicator will light in the front-panel display, and the Chapter or Track indicator will flash.
- **Repeat Title or Group:** This mode repeats the title or group currently being played until the disc is manually stopped. The Repeat (“Rep.”) indicator will light in the front-panel display, and the Title or Group indicator will flash.

A-B Repeat Play

The Repeat A-B function allows you to select any portion of a DVD-Video disc and have it repeat continuously until stopped.

To initiate a Repeat A-B playback sequence, follow these steps while a disc is playing:

Figure 44 – A-B Repeat Button

1. Press the A-B Repeat Button (see Figure 44) on the remote when you want to choose the beginning point; the “REPEAT A-” message will appear on screen. The “A” indicator will light in the front-panel display.
2. Press the A-B Repeat Button again to choose the end point. Repeat A-B has been set, and the A-B section will be played continuously. See Figure 45.

Figure 45 – Repeat A-B Message

3. Press the A-B Repeat Button on the remote again to cancel Repeat A-B mode.

CD Playback

Many functions of the DVD 38 operate the same way for CD playback as for DVD play; however, there are some important differences. When a CD is loaded, the DVD 38 will automatically display the Player Information menu. See Figure 46. Status banners are not available during CD play. Features unique to CD play are described in this section.

Player Information Menu

The DVD 38's Player Information menu displays disc information and enables you to program playback modes. If it is not already on screen, press the Info Button to display the Player Information menu. See Figure 46.

Figure 46 – CD Player Information Screen

The Player Information menu has three submenus, PLAYBACK INFO, PROGRAM and DISC INFORMATION, which may be accessed by using the Navigation Buttons to highlight the submenu's icon, and pressing the Enter Button to select.

PLAYBACK INFO Submenu: This submenu displays basic disc and playback mode information. See Figure 46.

- Disc: This line displays the disc type, such as CD-DA (Compact Disc Digital Audio).
- Playlist: You may choose to play the tracks in order as they appear on the disc, or you may program a playlist containing some or all of the tracks in the order in which you wish to hear them. This line indicates which of these two modes has been selected. To change this setting, use the PROGRAM submenu, as explained in the Programming Playlists section.
- Repeat: With this line highlighted, press the Enter Button or the Repeat Button to activate Repeat mode. Each press will change the repeat mode from Repeat 1 (repeat one track) to Repeat All (repeat all tracks on the disc) to Repeat Off. Repeat A-B is not selected using this setting.
- Random: With this line highlighted, press the Enter Button or the Random Button to activate Random play mode, in which the tracks on the disc are played in random order. Each press will toggle between turning Random play on or off.
- Track List: A list of tracks on the disc will appear. Use the Navigation Buttons to scroll through the list. Press the Enter Button or the Play Button while a track is highlighted to begin play.

Figure 47 – Program Submenu

PROGRAM Submenu: This submenu lets you program a playlist. The PROGRAM submenu is only accessible for CD's (see Figure 47).

- Disc: This line displays the disc type.
- Audio: This line displays the type of audio that was recorded on the disc, usually Stereo.
- Playlist: With this line highlighted, press the Enter Button to change the order in which the tracks are played from the order in which they appear on the disc (Disc's order) to a playlist order which you may program (Programmed order). If you select Programmed order, a list of program steps and the track programmed for each step will appear at the bottom of the screen (see Figure 54). You may enter a track number using the Numeric Keys and then use the Navigation Buttons to program another track. To remove a track from the playlist, press the Clear Button. You may not enter a track more than once in the playlist, if it appears in an earlier step. However, you may use the Repeat function while the playlist is playing. After you have finished programming the playlist, press the Play Button to begin play. See the Programming a Playlist section for more information.

DISC INFORMATION Submenu: This screen displays abbreviated track and playback information, and allows you to change the time display setting.

Figure 48 – Disc Information Submenu

The information at the top of the screen provides the same information on the disc type, audio format, playlist setting, Repeat play setting and Random play setting as on the other submenus. The following additional information appears next:

- Track: This line displays the current track on the left, and the total number of tracks on the disc to the right. When the current track number is highlighted, you may use the Numeric Keys to skip to a new track. The new track will begin playing immediately.
- Play Mode Icon: This icon appears to the right of the Track display and indicates the current playback mode.

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- **Time:** This section consists of three lines:
  - **Track Elapsed:** Displays the elapsed or remaining time of the current track.
  - **Disc Elapsed:** Displays the elapsed or remaining time of the disc.
  - **Elapsed Time Bar:** Displays a temperature bar reflecting the percentage of the disc that has been played.

  Use the Navigation Buttons to highlight either Track Elapsed or Disc Elapsed, and each press of the Enter Button will toggle between the elapsed and remaining settings. The time displayed to the right and in the front-panel Information Display will change accordingly.
- **Time Search:** The Time Search function enables you to start playback at any point in the track. Use the Navigation Buttons to highlight the track time display. Press the Numeric Keys to enter all six digits, including leading zeros if needed, to select the desired starting time, followed by the Enter Button.

When you have finished viewing the Player menus, press the Clear Button to remove the displays from the screen.

Tracks

To select a track, make sure the PLAYER INFORMATION menu is on screen. Press the Info Button to activate it if necessary. Next, press the Navigation Buttons so that the Track is highlighted. Use the Numeric Keys to enter the desired track, and press the Enter Button to begin playing the new track.

During playback, you may move one by one through the tracks at any time by pressing the Skip Reverse (Previous)/Skip Forward (Next) Buttons. When you press the Previous or Skip Reverse Button once, the player will return to the start of the current track. Additional presses of either button will step back through the available tracks, one at a time. See Figure 49.

Figure 49 – Skip Reverse (Previous) and Skip Forward (Next) Buttons

NOTE: When a JPEG, MP3 or Windows Media disc is playing, a special screen will appear. See the section describing those types of discs for more information.

Repeat Play

The DVD 38 offers several repeat functions for CDs that allow you to take advantage of the capacity of the unit for unattended playback:

- **Repeat Program:** Repeats the current playlist if Programmed Order has been selected at the Playlist setting.
- **Repeat 1 Track:** For CDs, VCDs, MP3s and WMAs, repeats the track or file currently playing until the disc is manually stopped. The Repeat and 1 indicators will light in the front-panel display.
- **Repeat Disc:** For CDs, VCDs, MP3s, WMAs and JPEGs, repeats the entire disc until play is manually stopped. The Repeat and All indicators will light in the front-panel display.
- **Repeat Folder:** For MP3s, WMAs and JPEGs, repeats all tracks within the current folder until play is manually stopped. The Repeat indicator will light in the front-panel display.

Each press of the Repeat Button (see Figure 50) cycles through the available Repeat options (except Repeat A-B). In addition, the Repeat setting in the Player Information menu will change.

Figure 50 – Repeat, A-B and Random Buttons

A-B Repeat Play

The Repeat A-B function allows you to select any portion of a CD and have it repeat continuously until the unit is manually stopped.

To initiate a Repeat A-B playback sequence, follow these steps while a disc is playing:

1. Press the A-B Repeat Button on the remote (see Figure 50) when you want to choose the beginning point; the Repeat A- icon appears on screen and on the front panel to indicate the beginning of the passage to be repeated.
2. Press the A-B Repeat Button again to choose the end point. Repeat A-B has been set, and the A-B section will be played continuously.
3. Press the A-B Repeat Button again to cancel Repeat A-B mode.

Random Play

The Random Play function will play all of the tracks on a CD in a random order, as selected by the DVD 38. Once the DVD 38 has played all of the tracks on the disc once, it will stop.

Select the random mode by pressing the Random Button on the remote. See Figure 50. Each press of the Random Button will toggle the setting between "Off" and "On", meaning that the remaining tracks on the disc will be played in random order.

The Random Indicator in the Front-Panel Information Display will light when the Random setting is on.

MP3, Windows Media and JPEG Playback

The DVD 38 will recognize data on CD-ROM discs recorded in the MP3, Windows Media 9 (WMA) or JPEG formats, including images stored on Kodak Picture CDs. You may also play discs with more than one of the three formats.

The specific file types that may be played on the DVD 38 are:

- **MP3 Files:** MP3 is a popular audio compression format that was developed by the Motion Picture Experts Group as part of the MPEG-1 video compression format. Depending on the specific MP3 encoder used, file size is greatly reduced so that you store many more songs on one compact disc than in the standard audio CD format. MP3 is also used to download audio files to computers for home use. In order to play an MP3 file on the DVD 38, the disc may not contain any encryption or coding that prevents playback. Always be certain that you have, or have purchased, the proper rights or authorization before creating a CD-ROM with MP3 or any other codec format.
- **WMA Files:** WMA (Windows Media Audio) is an audio compression format developed by the Microsoft® Corporation for use with its Windows Media Player. WMA files may be created with greater compression than MP3 without sacrificing audio quality so that even more songs may be recorded on a disc. There have been a number of versions of Windows Media, and the DVD 38 is compatible only with files that end in the "wma" extension and that were recorded using the Windows Media Series 9 encoding, but only up to 320kbps.
- **JPEG Files**: "JPEG" is the acronym used to identify image files recorded according to specifications established by Joint Photographic Experts Group for compressing still images. Identified by the file extension "jpg" when they are recorded on most computers, JPEG files may be created by a digital still camera and then edited and "burned" to a disc in your personal computer, recorded on a CD-ROM disc from film images by a photo processor, or scanned from printed photos into your personal computer and then burned onto a CD-ROM.

Discs containing MP3, WMA or JPEG files are navigated and controlled a little differently than standard DVDs and CDs. When a disc containing one or more of these types of files is loaded in the DVD 38, the PLAYER INFORMATION menu screen will appear. See Figure 51.

Figure 51 – Player Information Screen For WMA Disc

This screen will display a list of the main folders contained on the disc The elapsed time will appear in the upper right corner of the screen. It isn't possible to change the time display, and the Time Search function is not available.

MP3 or WMA Disc Playback

MP3 and WMA discs may contain 200 or more tracks. To get the best view of all tracks on the disc, including their names, and to select them comfortably, use the on-screen display rather than the front-panel display. The front-panel display will only show the number and the elapsed time of the track being played.

The supported bit rate for WMA files is between 64kbps and 320kbps. The supported bit rate for MP3 files is between 32kbps and 320kbps.

- To expand a folder (if any), press the Navigation Buttons until the desired folder name is highlighted, then press the Enter Button.
- To collapse a folder (so that you can select another folder on the disc), use the Navigation Buttons to highlight the folder icon at the top of the track list and press the Enter Button.
- To select a track, press the Navigation Buttons until the desired track name is highlighted. To start play of the selected track, press the Enter or Play Button.

During MP3/WMA playback, some of the standard CD/DVD playback controls operate in their normal fashion (refer to Figure 33):

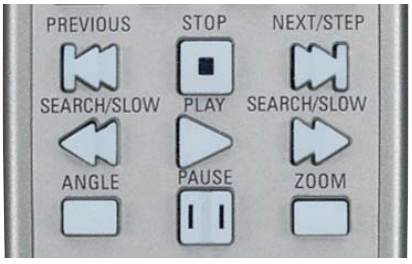

Figure 33 (repeated) – Transport Controls

- You may skip forward to the next track on the disc by pressing the Skip/Next Button.
- You may skip back to the previous track on the disc by pressing the Skip/Prev Button *twice*.
- Press the Pause Button to momentarily stop playback. Press the Play Button to resume play. Press the Stop Button to enter stop mode.
- Press the Search Forward or Search Reverse buttons for fast search of a track. Press the Play ▶, Pause ❙❙ or Stop Button ■ to end fast play.
- Slow-play is not available during MP3/WMA playback.
- You may play an MP3 or WMA disc in random mode by pressing the Random Button. See Figure 50.
- The Repeat function may be accessed during playback of an MP3 or WMA disc by pressing the Repeat Button on the remote. See Figure 50. Repeatedly press the Repeat Button to scroll through the options of Repeat 1 (repeat one file), Repeat All (repeat all files) or Repeat Folder (repeat all files within the current folder). The next press will turn the repeat function off. Repeat A-B is not available during MP3/WMA playback.

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NOTES ON MP3 AND WMA PLAYBACK:

- During playback, the front-panel display and the time indicator on the screen above the list will show the elapsed time of the track being played. Other time display options are not available with MP3/WMA playback.
- The DVD 38 is only compatible with standard MP3- and WMA-encoded discs. Other compressed audio formats used for Internet audio downloads will not play on the DVD 38.
- Due to the differences in various versions of the MP3 and WMA formats, and the many differences between the CD-R machines used to record discs on a computer, it is possible that some discs may not play on the DVD 38 even though they will work on a computer. This is normal and does not indicate a fault with the unit.
- When a multisession disc with both standard CD audio and MP3 or WMA content is in use, the DVD 38 will play only the CD audio sections of the disc. Track numbers will be visible in the display, but the files will not be decoded.
- If a disc containing MP3, WMA and/or JPEG files is created in more than one session, the DVD 38 may not recognize files added during the later sessions, especially if the disc was finalized after the first session.
- When a disc with multiple folders is playing, only tracks from one folder can be displayed and played at a time. Select the desired folder and press the Play Button or Enter Button to start the first track. To see and play tracks from other folders, you must first collapse the current folder as appropriate and use the Navigation Buttons until the desired folder is selected. Press the Enter Button to expand the folder, navigate to the desired track, and press the Enter or Play Button to begin play.
- Only stereo-audio playback is available for MP3 and WMA discs.
- Programmed playlists are not available for MP3/WMA discs.
- Use the Navigation Buttons to select the DISC INFO Submenu icon on the left side of the screen, and press the Enter Button to view it. If the disc contains ID3 tag information, then the current MP3 track information – song title, artist, album, year, genre, and any comments will be displayed. For WMA and JPEG files, only the file name will appear.

JPEG Playback

The DVD 38 is capable of recognizing JPEG still-image files and displaying them. When a disc or folder containing JPEG files is loaded, the JPEG Disc-Type Indicator will light in the Main Information Display. The disc will immediately begin displaying the images on the disc in order.

When viewing JPEG images, the Angle Button may be used to rotate the image. With the image onscreen, press the Angle Button once to display the current orientation of the image, usually +0. Press the Angle Button again to rotate the image clockwise 90 degrees. Each additional press of the Angle Button will continue to rotate the image clockwise by 90 degrees.

You may use the Zoom Button to enlarge a JPEG image, and the Navigation Buttons to explore the enlarged image.

You may view thumbnails of the images in an expanded folder by pressing the Disc Menu Button. When the images appear on screen, you may use the Navigation Buttons to move the picture frame until the desired image is selected. Press the Enter Button to display a full-size view of that image. See Figure 52.

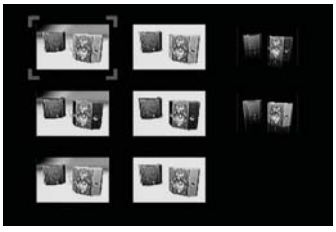

Figure 52 – Thumbnail Image Menu

VCD Playback

VCD, a video-playback format that predates DVD, is based on a different compression format than DVD and uses a recording method that is similar to CD. Although the DVD has, for the most part, replaced VCD as a format, the DVD 38 offers VCD playback so that you may play your existing library of VCD discs, or home movies that you have recorded as VCDs on your computer.

There are two versions of the VCD format: an early version which is simply called "VCD" and a later version with Playback Control that's called "Version 2.0" or "PBC." The DVD 38 is compatible with both forms of VCD, although playback will vary according to which version is used and the specific way in which the disc was created.

Even though VCD discs provide video, because the format is based on CD technology, the playback functions for a VCD disc are similar to CD. To play a VCD disc, place it in the DVD 38 as you would do with any other CD or DVD disc. The unit takes a few seconds to read the disc's contents; the VCD Disc-Type Indicator in the front-panel display will light and the disc will begin playing.

Keep in mind that the exact level of functionality for any VCD will vary widely and it is ultimately determined by the way the disc was created, not by the DVD 38, particularly if the disc has been created under VCD Version 2.0 with Playback Control (see "Playback Control").

When playing VCD discs, most standard DVD/CD playback controls are used, including Play, Stop, Pause, Resume, Track Skip Forward and Reverse, Slow Forward, Step Forward and Fast Forward. The Reverse Search and Step Reverse functions are not available with VCDs.

You may access information on the disc by pressing the Info Button on the remote. The availability of the Repeat and Random functions will depend on whether PBC Support has been activated using the SYSTEM SETUP submenu. With PBC Support on, Repeat and Random will not be available.

Repeat A-B is always available. Simply press the Repeat A-B Button once at the beginning of the passage to be repeated, again at the end of the passage, and a third time to cancel Repeat A-B mode.

NOTE: Discs containing raw MPEG files, without playback control, are not technically Video CDs, and are played in a different manner. When such a disc is loaded, the Player Information menu will appear, with a list of folders or files, similar to an MP3 disc. The disc directory is navigated using the Navigation Buttons. Press the Enter Button to expand or collapse a folder. Select the desired track, and press the Play Button or the Enter Button to begin play. You will find that the Stop, Pause, Track Skip Forward and Reverse, Slow Forward and Reverse, Step Forward and Reverse, and Fast Forward and Reverse Search functions are all available, depending on how the disc was encoded. However, the Status Banner is not available for these types of VCDs.

Status Bar

When playing VCD discs, it is possible to access the disc's features using the Status Bar. Press the Status Button to view it.

The Status Bar will appear the same as for DVDs (see Figure 53), except that the current and total track numbers will be shown, rather than the title, and there is no chapter display. If PBC is off, you may select the track number and change it to skip to another track. You may also use the Time Search function to begin play at a desired place. You may change the time display from Track Elapsed, to Track Remaining, to Disc Elapsed, to Disc Remaining, and back to Track Elapsed, just as with DVDs. The elapsed time will appear as a graphic temperature bar, with additional lines added as more of the track or disc is played.

Figure 53 – VCD Status Bar

Zoom

The Zoom function is available for VCDs by pressing the Zoom Button. Repeatedly pressing this button will cycle through the possible settings of 1x, 2x and 3x zoom, as indicated on screen. After the enlargement indication disappears from view, you may explore the image using the Navigation Buttons.

Playback Control

VCD discs made under the Revision 2.0 specification will usually offer PBC playback control. The PBC Indicator in the front display will turn on automatically with any VCD when the disc is played. With PBC, you can select titles and navigate the disc as with DVDs. However, the access to some functions may be prohibited by PBC playback control; in that case, the prohibit icon will appear on screen.

When a VCD is made without PBC, the disc can be controlled the same as an audio CD, but direct track access by entering a number is not possible without opening the Status Bar. With PBC, many discs include chapter selection menus that are similar to those found on DVDs. However, on VCD discs, the disc menu (if any) is accessed and controlled differently than on DVDs.

- Play will start with the first track (which may be an intro), then proceed to the VCD menu (if any) automatically.
- The Next (Skip Forward) command will skip to the VCD menu from the intro (Track 1) directly.
- Once the menu options appear on the screen, make your selection by pressing the Numeric Keys that correspond to your desired choice. The desired selection will begin playing automatically.
- Direct number entry without any VCD menu shown on-screen has no effect – even when the Status Bar is on.

The Disc Menu Button used during DVD playback is not used for VCD playback. Use of functions when PBC is on will vary according to the disc type.

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Programming a Playlist

Programmed play allows you to select tracks on a CD for playback in a specific order, skipping tracks you don't wish to hear and reordering other tracks to suit your tastes.

To program a disc for playback, follow these steps:

1. Load the desired disc, but stop play if it begins automatically. Playlists may only be programmed in Stop mode.
2. Press the Info Button to display the PLAYER INFORMATION menu. Use the Navigation Buttons to highlight the icon for the PROGRAM submenu, and press the Enter Button to display it.
3. Use the ▲/▼ Navigation Buttons to highlight the Playlist setting. Press the Enter Button so that the setting changes to Programmed Order and a grid of program steps appears on the bottom of the screen (see Figure 54).

Figure 54 – Programmed Play Screen

4. At this time the playlist will simply contain the tracks in the disc's order. Thus, Step P01 will display track 1 from the disc, Step P02 will display track 2 from the disc, and so forth. The track assigned to Step P01 will be highlighted. Use the Numeric Keys to enter the number of the track on the disc which you wish to hear first in your playlist. When you have finished entering it, press the ▶ Navigation Button to move to Step P02.
5. Continue entering the disc track numbers into the desired program step positions. You need not do so in step order; you may use the Navigation Buttons to navigate to any step in the list.
6. Press the Clear Button to remove a track from the playlist.
7. Although you may enter fewer programmed steps in your list than the number of tracks on the disc, you may not repeat tracks within the list. However, while the playlist is playing, the normal Repeat functions will be available.
8. When you have finished entering all of the tracks in your playlist, press the Play Button to begin playback of your programmed list.

During programmed play the track number shown in the front-panel display will reflect its normal order on the disc. However, the Program Indicator will light to remind you that the disc's tracks are playing in programmed order.

To cancel programmed play, stop play and perform one of these steps:

1. Open the Disc Drawer.
2. Press the Playlist Button. The Playlist Banner will appear on screen. Each press of the Playlist Button will toggle the mode between programmed order and disc order.
3. Press the Info Button and navigate to the PROGRAM submenu, as described above in Step 2 of the instructions for programming a playlist. With the Playlist setting highlighted, press the Enter Button until the setting reads Disc's Order.

TROUBLESHOOTING GUIDE

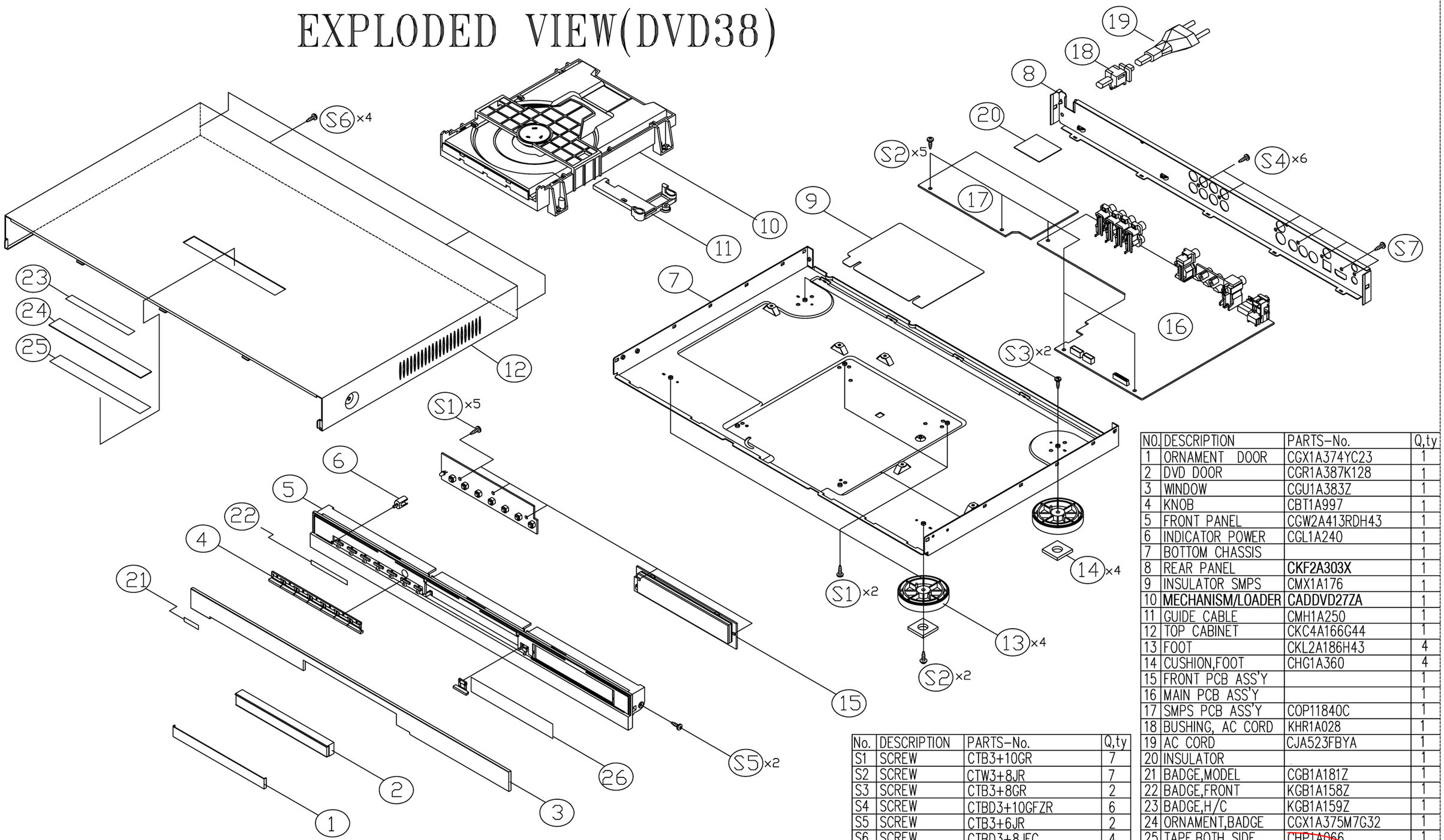
SYMPTOM	CAUSE	SOLUTION
Unit does not turn on	• No AC power	• Make certain AC power cord is plugged into a live outlet. • Check to see whether outlet is switch-controlled.
Unit does not respond to remote commands	• Weak batteries in remote • Remote sensor is obscured	• Change remote batteries and insert with correct polarity. • Make certain front panel sensor is in line of sight of remote or connect an optional remote sensor.
No picture	• Intermittent connections • Wrong input • Progressive Scan output selected • HDMI Output is connected to a video display that is not HDCP-compliant • Video Off feature active • Wrong video output setting in VIDEO SETUP menu	• Check all video connections. • Check input selection of TV or receiver. • Use Progressive Scan mode only with compatible TV. Press Scan Type Button to toggle to the correct resolution. • The HDMI Output may not be used with video displays that are not HDCP-compliant. Unplug the cable and select another audio and video connection. • Press Video Off Button to reactivate video circuitry. • S- and component video are not available simultaneously. Temporarily connect composite video to access Video Setup menu and change Video Output setting to desired type.
Disc does not play	• Disc loaded improperly • Incorrect disc type • Invalid Region Code • Rating is above parental control setting	• Load disc label-side up; align the disc with the guides and place it in its proper position. • Check to see that the disc is CD, CD-R, CD-RW, VCD, MP3, WMA, JPEG, DVD-R/RW, DVD+R/RW (standard-conforming), DVD-Audio or DVD-Video; other types will not play. • Use Region 1 or Open Region (0) disc only. • Enter password to override or change rating settings.
No sound	• Intermittent connections • Incorrect digital audio input selection • DVD disc is in fast or slow mode • Surround receiver not compatible with 96kHz PCM audio • DVD-Audio disc is loaded without using analog audio connection • Wrong bass management setting in AUDIO SETUP	• Check all audio connections. • Check digital audio settings on DVD 38 and on receiver. • There is no audio playback on DVD discs during fast or slow modes. • Change PCM Limit setting in Audio Setup menu to 48kHz. • Use 6-Channel Audio Outputs or Analog Audio Outputs. • In order to hear a downmixed 2-channel signal at the Analog Audio Outputs, make sure to change the Bass Management setting to Stereo.
Picture is distorted or jumps during fast forward or reverse play	• MPEG-2 decoding	• It is a normal artifact of DVD playback for pictures to jump or show some distortion during rapid play.

TROUBLESHOOTING GUIDE

SYMPTOM	CAUSE	SOLUTION
Some remote buttons do not operate during DVD play; prohibited symbol Ø appears	• Function not permitted at this time	• With most discs, some functions are not permitted at certain times (e.g., Track Skip) or at all (e.g., direct audio track selection).
The OSD menu is in a foreign language	• Incorrect OSD language	• Change the display language selection in the SYSTEM SETUP menu.
The Ø symbol appears	• Requested function not available at this time	• Certain functions may be disabled by the DVD itself during some passages of a disc.
Picture is displayed in the wrong aspect ratio	• Incorrect match of aspect-ratio settings to disc	• Change aspect-ratio settings.
Disc will not copy to VCR	• Copy protection	• Many DVDs are encoded with copy protection to prevent copying to VCR.
Password not accepted	• Incorrect password being used or password has been forgotten	• Stop play of disc and clear all displays from screen. Press and hold Clear Button until the display blinks. This resets the password and all settings to their defaults. You will need to reenter all audio, video and system settings.
Screen Saver not activated	• Screen saver will not activate when cursor is in column of icons on left side of screen	• Move cursor to main disc information or playlist area to avoid burn-in on plasma and CRT displays.
Cannot program playlist	• Programmed play is not available for all disc types • DVD 38 must be in Stop mode to program a playlist	• Programmed play is available only for CDs. • Stop play of disc before programming a playlist.

In addition to the items shown above, additional information on troubleshooting possible problems with your DVD 38, or installation-related issues, may be found in the list of "Frequently Asked Questions" which is located in the Product Support section of our Web site at www.harmankardon.com.

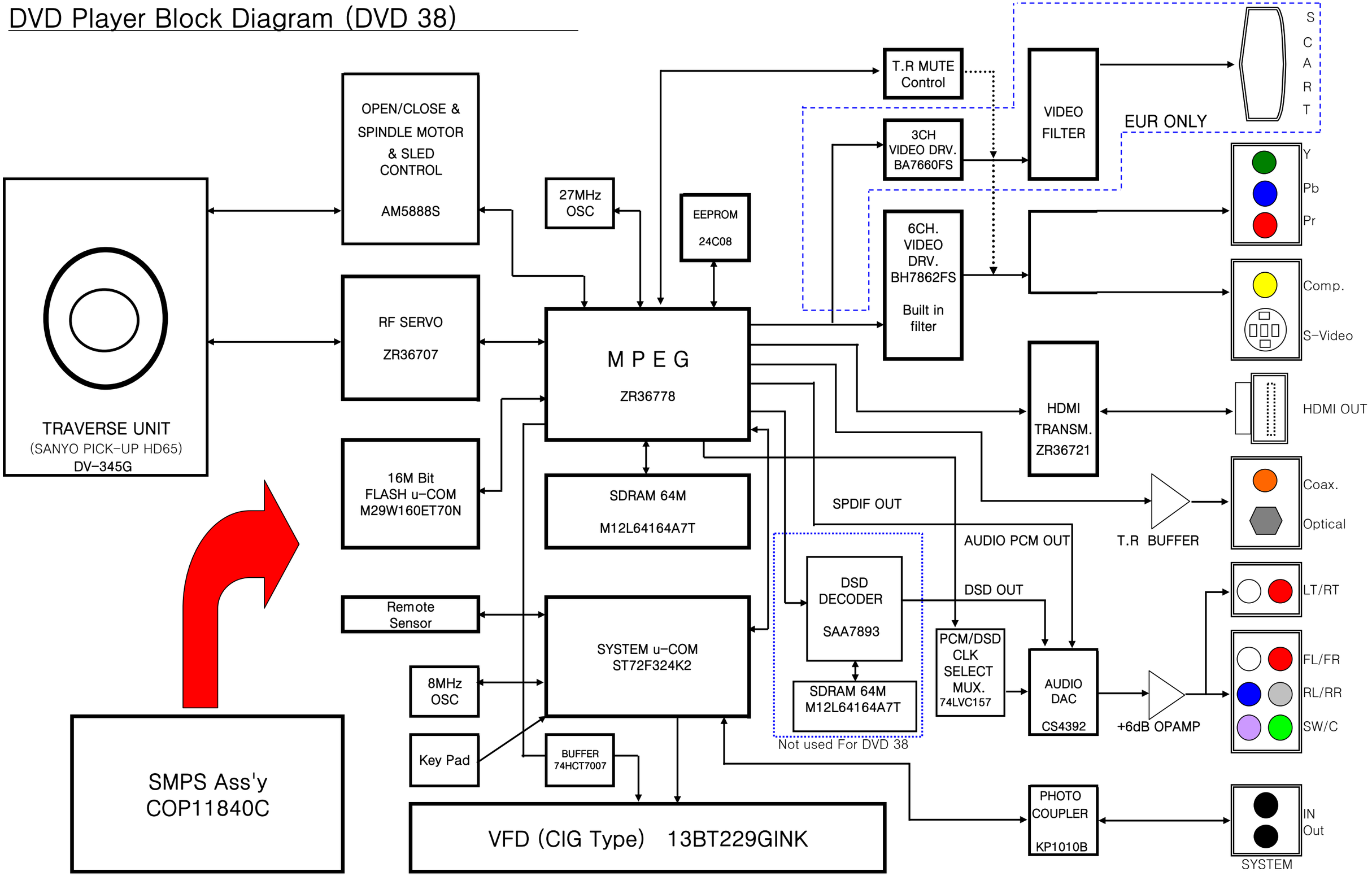
EXPLODED VIEW(DVD38)



NO.	DESCRIPTION	PARTS-No.	Q,ty
1	ORNAMENT DOOR	CGX1A374YC23	1
2	DVD DOOR	CGR1A387K128	1
3	WINDOW	CGU1A383Z	1
4	KNOB	CBT1A997	1
5	FRONT PANEL	CGW2A413RDH43	1
6	INDICATOR POWER	CGL1A240	1
7	BOTTOM CHASSIS		1
8	REAR PANEL	**CKF2A303X**	1
9	INSULATOR SMPS	CMX1A176	1
10	**MECHANISM/LOADER**	**CADDVD27ZA**	1
11	GUIDE CABLE	CMH1A250	1
12	TOP CABINET	CKC4A166G44	1
13	FOOT	CKL2A186H43	4
14	CUSHION,FOOT	CHG1A360	4
15	FRONT PCB ASS'Y		1
16	MAIN PCB ASS'Y		1
17	SMPS PCB ASS'Y	COP11840C	1
18	BUSHING, AC CORD	KHR1A028	1
19	AC CORD	CJA523FBYA	1
20	INSULATOR		1
21	BADGE,MODEL	CGB1A181Z	1
22	BADGE,FRONT	KGB1A158Z	1
23	BADGE,H/C	KGB1A159Z	1
24	ORNAMENT,BADGE	CGX1A375M7G32	1
25	TAPE,BOTH SIDE	~~CHP1A066~~	1
26	FILTER , FIP	CMZ1A105Z	1

No.	DESCRIPTION	PARTS-No.	Q,ty
S1	SCREW	CTB3+10GR	7
S2	SCREW	CTW3+8JR	7
S3	SCREW	CTB3+8GR	2
S4	SCREW	CTBD3+10GFZR	6
S5	SCREW	CTB3+6JR	2
S6	SCREW	CTBD3+8JFC	4
S7	SCREW	CTBD3+6FFZR	1

DVD Player Block Diagram (DVD 38)



DVD38 Electrical Parts List					
Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
Capacitors					
C100	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C101	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C102	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C103	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C104	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C106	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C107	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C110	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C112	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C113	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C115	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C117	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C120	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C122	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C124	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C126	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C127	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C129	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C146	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C156	CCUS1H180JA	CAP , CHIP(18PF/50V)	18PF JA 1608	1	EA
C156	CCUS1H180JA	CAP , CHIP(18PF/50V)	18PF JA 1608	1	EA
C157	CCUS1H330JA	CAP , CHIP	33PF JA 1608	1	EA
C158	CCUS1H330JA	CAP , CHIP	33PF JA 1608	1	EA
C159	CCUS1H562KC	CAP , CHIP CERAMIC(1608, 5600p	5600PF KC 1608	1	EA
C160	CCUS1H562KC	CAP , CHIP CERAMIC(1608, 5600p	5600PF KC 1608	1	EA
C161	CCUS1H562KC	CAP , CHIP CERAMIC(1608, 5600p	5600PF KC 1608	1	EA
C163	CCUS1H471JA	CAP , CHIP	470PF JA 1608	1	EA
C164	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C165	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C166	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C167	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C168	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C169	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C170	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C172	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C173	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C174	CCUS1H333KC	CAP , CHIP	0.033PF KC 1608 SIZE	1	EA
C175	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C176	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C178	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C179	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C180	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C181	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C183	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C185	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C186	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C187	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C188	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C189	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C190	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C191	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C192	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C193	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C194	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C195	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C196	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C197	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
C199	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C200	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C201	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C204	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C205	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C207	CCUS1H272KC	CAP , CHIP	2700PF KC 1608	1	EA
C208	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C209	CCUS1H273KC	CAP , CHIP	0.027UF KC 1608	1	EA
C210	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C214	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C215	CCUS1H561JA	CAP , CHIP	560PF JA 1608	1	EA
C217	CCUS1H273KC	CAP , CHIP	0.027UF KC 1608	1	EA
C218	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C220	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C222	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C225	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C227	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C228	CCUS1H222KC	CAP , CHIP	2200PF KC 1608	1	EA
C229	CCUS1H222KC	CAP , CHIP	2200PF KC 1608	1	EA
C230	CCUS1H222KC	CAP , CHIP	2200PF KC 1608	1	EA
C231	CCUS1H222KC	CAP , CHIP	2200PF KC 1608	1	EA
C232	CCUS1H330JA	CAP , CHIP	33PF JA 1608	1	EA
C240	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C242	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C244	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C245	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C247	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C249	CCUS1H150JA	CAP , CHIP(15PF/50V)	15PF JA 1608	1	EA
C250	CCUS1H150JA	CAP , CHIP(15PF/50V)	15PF JA 1608	1	EA
C252	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C253	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C254	CCUS1H272KC	CAP , CHIP	2700PF KC 1608	1	EA
C255	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C256	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C257	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C260	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C261	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C262	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C263	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C266	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C267	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C276	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C277	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C279	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C280	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C281	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C282	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C283	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C284	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C285	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C286	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C287	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C295	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C304	HCSHB21A220B	CAP , TANTAL B2 SIZE	22UF/50V	1	EA
C306	HCSHB21A220B	CAP , TANTAL B2 SIZE	22UF/50V	1	EA
C307	HCSHB21A220B	CAP , TANTAL B2 SIZE	22UF/50V	1	EA
C308	HCSHB21A220B	CAP , TANTAL B2 SIZE	22UF/50V	1	EA
C310	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C311	CCUS1H560JA	CAP , CHIP	56PF JA 1608	1	EA
C312	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C313	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
C336	CCUS1H682KC	CAP , CHIP	6800PF KB 1608	1	EA
C337	CCUS1H223KC	CAP , CHIP	0.022UF KC 1608	1	EA
C338	CCUS1H221JA	CAP , CHIP	220PF JA 1608	1	EA
C339	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C346	CCUS1H070DA	CAP , CHIP	7PF D 1608	1	EA
C380	CCUS1H150JA	CAP , CHIP(15PF/50V)	15PF JA 1608	1	EA
C401	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C402	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C403	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
C405	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C406	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C408	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C429	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C430	CRJ10DJ0R0T	RES , CHIP	0 ohm 1608	1	EA
C431	CCUS1H221JA	CAP , CHIP	220PF JA 1608	1	EA
C432	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C511	CCUS1H151JA	CAP , CHIP	150PF JA 1608	1	EA
C531	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C533	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C552	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C553	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C555	CCUS1H150JA	CAP , CHIP(15PF/50V)	15PF JA 1608	1	EA
C556	CCUS1H150JA	CAP , CHIP(15PF/50V)	15PF JA 1608	1	EA
C578	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C580	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C581	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C584	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C585	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C593	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C594	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C615	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C617	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C620	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C630	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C631	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C636	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C638	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C639	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C641	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C644	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C646	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C650	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C657	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C659	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C660	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C662	CCUS1H391JA	CAP , CHIP	390PF JA 1608	1	EA
C664	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C665	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C668	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C672	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C674	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C677	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C678	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C679	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C809	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C810	CCUS1H560JA	CAP , CHIP	56PF JA 1608	1	EA
C822	CCUS1H560JA	CAP , CHIP	56PF JA 1608	1	EA
C823	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C828	CCUS1H220JA	CAP , CHIP	22PF JA 1608	1	EA
C830	CCUS1H150JA	CAP , CHIP(15PF/50V)	15PF JA 1608	1	EA
C831	CCUS1H150JA	CAP , CHIP(15PF/50V)	15PF JA 1608	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
C834	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
C105	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C108	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C109	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C111	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C114	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C116	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C118	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C119	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C121	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C123	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C125	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C128	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C130	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C137	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C155	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C177	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C182	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C184	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C198	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C202	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C203	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C206	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C213	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C219	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C221	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C223	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C224	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C226	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C233	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C241	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C243	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C251	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C258	CCEA1HH4R7T	CAP , ELECT	4.7UF 50V	1	EA
C301	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C404	CCEA1CKS470T	CAP , ELECT	47UF 16V	1	EA
C504	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C508	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C510	CCEA1HH4R7T	CAP , ELECT	4.7UF 50V	1	EA
C530	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C532	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C548	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C549	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C561	CCEA1CH100T	CAP , ELECT	10UF 16V	1	EA
C562	CCEA1HH1R0T	CAP , ELECT	1UF 50V	1	EA
C574	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C579	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C582	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C583	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C586	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C616	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA
C618	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C628	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C629	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C637	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C640	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C642	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA
C643	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA
C645	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C648	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C653	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
C658	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C661	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C666	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C667	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C669	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C673	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C675	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C676	CCEA1HH1R0T	CAP , ELECT	1UF 50V	1	EA
C680	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C681	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C685	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C687	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C688	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C689	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C690	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C692	HCQI1H222JZT	CAP , MYLAR	2200PF 50V J	1	EA
C733	CCEA1HH3R3T	CAP , ELECT	3.3UF 50V	1	EA
C751	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA
C752	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA
C795	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C801	CCEA1AH331T	CAP , ELECT	330UF 10V	1	EA
C802	CCEA1AH331T	CAP , ELECT	330UF 10V	1	EA
C803	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA
C804	CCEA1CH101T	CAP , ELECT	100UF 16V	1	EA
C824	CCEA1HH1R0T	CAP , ELECT	1UF 50V	1	EA
C825	CCEA1HH1R0T	CAP , ELECT	1UF 50V	1	EA
C826	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C827	CCEA1CH470T	CAP , ELECT	47UF 16V	1	EA
C829	CCEA1AH471T	CAP , ELECT	470UF 10V	1	EA
C835	CCEA1CH221T	CAP , ELECT	220UF 16V	1	EA
C891	CCEA1AH471T	CAP , ELECT	470UF 10V	1	EA
Semiconductors					
D101	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
D102	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
D501	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
D502	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
D511	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
D601	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
D602	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
D603	HVDRLS4148SR	DIODE, SWITCHING, SMD TYPE	RLS4148 TE-11	1	EA
IC10	HVIZR36778	IC,MPEG (ZORAN)	ZR36778	1	EA
IC11	HVILM1117S-3V3	I.C , REGULATOR (3.3V)	1117S-3.3V	1	EA
IC12	HVILM1117S-1V8	I.C , REGULATOR (1.8V)	LM1117-1V8	1	EA
IC13	HVILM1117S-3V3	I.C , REGULATOR (3.3V)	1117S-3.3V	1	EA
IC14	HVILM1117S-1V8	I.C , REGULATOR (1.8V)	LM1117-1V8	1	EA
IC15	HVIAT24C08N10SC	I.C. EEPROM	AT24C08N10SC2.7	1	EA
IC17	HVI74VHC04MX	I.C , INVERTER	74VHC04M	1	EA
IC19	HVIZR36721	IC,HDMI TRANSMITTER(ZORAN)	ZR36721	1	EA
IC20	HVITL3472IDR	IC,DUAL OP AMP 8-SOIC (TI)	TL3472	1	EA
IC21	HVIM29W160ET70N	IC,16M FLASH (ST)	M29W160ET-70N6	1	EA
IC22	HVIM12L64164A7T	IC, 64M SDRAM (4X16)	M12L64164A7T	1	EA
IC23	HVIAM5888SLF	I. C , Motor Driver AMtek	AM5888S L/F	1	EA
IC24	HVIZR36707	IC,RF (ZORAN)	ZR36707	1	EA
IC40	HVICS4382-KQ	I.C , DAC	CS4382-KQ	1	EA
IC41	BVIBH7862FS	IC , 6CH VIDEO DRIVER	ROHM (BH7862FS)	1	EA
IC43	HVI74LVC157ADBR	I.C , MULTIPLEXER	SN74LVC157A	1	EA
IC45	HVIST72F324K2	IC,FLASH (ST)	ST72F324K2	1	EA
IC47	HVITC74HCT7007F	I.C. HEX BUFFER	TC74HC7007AFEL	1	EA
IC51	HVILM1117S-5.0	IC REGULATOR/SOT-223	LM1117-1V8 (1.8V)	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
IC52	HVINJM2068MDTE1	I.C , DUAL OP AMP	NJM2068MD-TE1	1	EA
IC53	HVILM1117S-3V3	I.C , REGULATOR (3.3V)	1117S-3.3V	1	EA
IC54	HVINJM2068MDTE1	I.C , DUAL OP AMP	NJM2068MD-TE1	1	EA
IC55	HVINJM2068MDTE1	I.C , DUAL OP AMP	NJM2068MD-TE1	1	EA
IC56	HVILM1117S-5.0	IC REGULATOR/SOT-223	LM1117-5V0 (5V)	1	EA
IC57	HVTHN1K05FU	MOS FET ARRAY	HN1K05FU	1	EA
IC50	HVIKA79L08AZT	REGULATOR, -8V	KA79L08	1	EA
Q605	HVTKSA916YT	TRANSISTOR PNP	KSA916Y	1	EA
Q105	HVTKTA1664YP	TRANSISTOR , CHIP	KTA1664	1	EA
Q106	HVTKTA1664YP	TRANSISTOR , CHIP	KTA1664	1	EA
Q108	HVT2N3904SP	TRANSISTOR, CHIP (KEC)	2N3904S-RTK/PS	1	EA
Q109	HVT2N3904SP	TRANSISTOR, CHIP (KEC)	2N3904S-RTK/PS	1	EA
Q110	HVT2N3904SP	TRANSISTOR, CHIP (KEC)	2N3904S-RTK/PS	1	EA
Q307	HVT2SA1955B	TRANSISTOR, TE85L,F, SSM Type	TE85L,F SSM TYPE HFE	1	EA
Q308	HVT2N3904SP	TRANSISTOR, CHIP (KEC)	2N3904S-RTK/PS	1	EA
Q315	HVTKRC107S	TRANSISTOR , CHIP	KRC107S	1	EA
Q404	HVT2N3904SP	TRANSISTOR, CHIP (KEC)	2N3904S-RTK/PS	1	EA
Q407	HVTKRC107S	TRANSISTOR , CHIP	KRC107S	1	EA
Q408	HVTKRA107ST	TRANSISTOR , CHIP	KRA107S	1	EA
Q501	HVTKTA1504SYRTK	TRANSISTOR , CHIP	KTA1504S Y RTK	1	EA
Q502	HVTKTC3875SYRTK	TRANSISTOR , CHIP	KTC3875S Y RTK	1	EA
Q604	HVTKRA107ST	TRANSISTOR , CHIP	KRA107S	1	EA
Q606	HVTKRA107ST	TRANSISTOR , CHIP	KRA107S	1	EA
Q607	HVTKRA107ST	TRANSISTOR , CHIP	KRA107S	1	EA
Q608	HVTKRC107S	TRANSISTOR , CHIP	KRC107S	1	EA
Q609	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q610	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q611	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q612	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q613	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q614	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q615	HVTKRA107ST	TRANSISTOR , CHIP	KRA107S	1	EA
Q616	HVTKRC107S	TRANSISTOR , CHIP	KRC107S	1	EA
Q617	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q618	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q619	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q620	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q621	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q622	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q804	HVTKTA1504SYRTK	TRANSISTOR , CHIP	KTA1504S Y RTK	1	EA
Q805	HVTKTD1304T	TRANSISTOR , CHIP (MUTE)	KTD1304	1	EA
Q806	HVTKRA107ST	TRANSISTOR , CHIP	KRA107S	1	EA
Q821	HVTKTA1504SYRTK	TRANSISTOR , CHIP	KTA1504S Y RTK	1	EA
D103	CVD1N4003ST	DIODE , RECT	1N4003	1	EA
D104	CVD1N4003ST	DIODE , RECT	1N4003	1	EA
D105	CVD1N4003ST	DIODE , RECT	1N4003	1	EA
D107	CVD1N4003ST	DIODE , RECT	1N4003	1	EA
D109	CVD1N4003ST	DIODE , RECT	1N4003	1	EA
D110	CVD1N4003ST	DIODE , RECT	1N4003	1	EA
D401	CVD50BOBBWGA	L.E.D , 2 COLOR (ORG , BLUE)	TOL-50BOBBWGA	1	EA
IC46	BVIKP1010B	IC, PHOTO COUPLER	KP1010B	1	EA
IC49	HVIKIA7808API	I.C , REGULATOR +8V	7808 (KEC)	1	EA
IC61	HRVKSM603TH2	SENSOR , REMOCON	KSM-603TH2	1	EA
Resistors					
R100	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R101	CRJ10DF4700T	RES, CHIP 470 OHM/1608/1%	470 OHM(1%) 1608 SIZE	1	EA
R102	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R103	CRJ10DF4300T	RES , CHIP	430 OHM(1%) 1608 SIZE	1	EA
R104	CRJ10DF3920T	RES. CHIP (392R 1%)	3.9K OHM(1%) 1608 SIZE	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
R105	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R109	CRJ10DJ472T	RES , CHIP	100 OHM 1608 SIZE	1	EA
R112	CRJ10DJ202T	RES , CHIP	2K OHM 1608 SIZE	1	EA
R113	CRJ10DJ202T	RES , CHIP	2K OHM 1608 SIZE	1	EA
R114	CRJ10DJ121T	RES , CHIP	120 OHM 1608 SIZE	1	EA
R115	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R116	CRJ10DJ121T	RES , CHIP	120 OHM 1608 SIZE	1	EA
R117	CRJ10DJ121T	RES , CHIP	120 OHM 1608 SIZE	1	EA
R118	CRJ10DJ103T	RES , CHIP	10K OHM1608 SIZE	1	EA
R123	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R124	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R125	CRJ10DJ113T	RES , CHIP	11K OHM 1608 SIZE	1	EA
R126	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R127	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R128	CRJ10DJ121T	RES , CHIP	120 OHM 1608 SIZE	1	EA
R133	CRJ10DF3920T	RES. CHIP (392R 1%)	3.9K OHM(1%) 1608 SIZE	1	EA
R134	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R135	CRJ10DJ100T	RES , CHIP	10 OHM 1608 SIZE	1	EA
R136	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R137	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R138	CRJ10DJ100T	RES , CHIP	10 OHM 1608 SIZE	1	EA
R139	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R140	CRJ10DJ133T	RES , CHIP	13K OHM 1608 SIZE	1	EA
R141	CRJ10DJ474T	RES , CHIP	470K OHM 1608 SIZE	1	EA
R142	CRJ10DJ474T	RES , CHIP	470K OHM 1608 SIZE	1	EA
R144	CRJ10DJ330T	RES , CHIP	33 OHM 1608 SIZE	1	EA
R145	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R146	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R147	CRJ10DJ104T	RES , CHIP	100K OHM 1608 SIZE	1	EA
R148	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R149	CRJ104DJ470T	RES , 4ARRAY (1608*4)	47 OHM/1608X4	1	EA
R150	CRJ104DJ470T	RES , 4ARRAY (1608*4)	47 OHM/1608X4	1	EA
R151	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R152	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R153	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R154	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R155	CRJ10DJ101T	RES , CHIP	100 OHM 1608 SIZE	1	EA
R157	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R158	CRJ104DJ101T	RES , CHIP NETWORK(1/16W, 100)	100 OHM/1608X4	1	EA
R159	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R160	CRJ10DJ330T	RES , CHIP	33 OHM 1608 SIZE	1	EA
R162	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R163	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R164	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R165	CRJ10DJ330T	RES , CHIP	33 OHM/1608*4	1	EA
R166	CRJ10DJ330T	RES , CHIP	33 OHM/1608*4	1	EA
R167	CRJ10DJ330T	RES , CHIP	33 OHM/1608*4	1	EA
R168	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R169	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R170	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R171	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R172	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R173	CRJ104DJ330T	RES , 4ARRAY (1608*4)	33 OHM/1608*4	1	EA
R174	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R175	CRJ10DJ912T	RES , CHIP	9.1K OHM/1608	1	EA
R176	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R177	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R178	CRJ10DJ272T	RES , CHIP	2.7K OHM 1608 SIZE	1	EA
R180	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R181	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R182	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
R183	CRJ10DF1202T	RES , CHIP 1%	1.2K OHM(1%) 1608 SIZE	1	EA
R184	CRJ10DJ471T	RES , CHIP	470 OHM 1608 SIZE	1	EA
R185	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R186	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R187	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R188	CRJ10DJ113T	RES , CHIP	11K OHM 1608 SIZE	1	EA
R189	CRJ10DJ105T	RES , CHIP	1M OHM 1608 SIZE	1	EA
R190	CRJ10DJ223T	RES , CHIP	22K OHM 1608 SIZE	1	EA
R191	CRJ10DJ223T	RES , CHIP	22K OHM 1608 SIZE	1	EA
R192	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R193	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R194	CRJ10DJ750T	RES , CHIP	33 OHM 1608 SIZE	1	EA
R195	CRJ10DJ101T	RES , CHIP	100 OHM 1608 SIZE	1	EA
R196	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R197	CRJ10DJ753T	RES , CHIP	75K OHM 1608 SIZE	1	EA
R199	CRJ10DJ330T	RES , CHIP	33 OHM 1608 SIZE	1	EA
R200	CRJ10DJ330T	RES , CHIP	33 OHM 1608 SIZE	1	EA
R201	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R202	CRJ10DJ622T	RES , CHIP	6.2K OHM 1608 SIZE	1	EA
R203	CRJ10DJ562T	RES , CHIP	5.6K OHM 1608 SIZE	1	EA
R204	CRJ10DJ562T	RES , CHIP	5.6K OHM 1608 SIZE	1	EA
R205	CRJ10DJ562T	RES , CHIP	5.6K OHM 1608 SIZE	1	EA
R206	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R207	CRJ10DF4700T	RES, CHIP 470 OHM/1608/1%	470 OHM(1%) 1608 SIZE	1	EA
R209	CRJ10DF1002T	RES , CHIP 1%	10K OHM(1%) 1608 SIZE	1	EA
R210	CRJ10DF1002T	RES , CHIP 1%	10K OHM(1%) 1608 SIZE	1	EA
R211	CRJ10DF1002T	RES , CHIP 1%	10K OHM(1%) 1608 SIZE	1	EA
R219	CRJ10DJ273T	RES , CHIP	27K OHM 1608 SIZE	1	EA
R220	CRJ10DJ562T	RES , CHIP	5.6K OHM 1608 SIZE	1	EA
R221	CRJ10DJ562T	RES , CHIP	5.6K OHM 1608 SIZE	1	EA
R222	CRJ10DJ562T	RES , CHIP	5.6K OHM 1608 SIZE	1	EA
R230	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R241	CRJ10DF75R0T	RES, CHIP 1% 75 OHM	75 OHM(1%) 1608 SIZE	1	EA
R243	CRJ10DF75R0T	RES, CHIP 1% 75 OHM	75 OHM(1%) 1608 SIZE	1	EA
R244	CRJ10DF75R0T	RES, CHIP 1% 75 OHM	75 OHM, 1% 1608 SIZE	1	EA
R265	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R284	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R285	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R287	CRJ10DJ113T	RES , CHIP	11K OHM 1608 SIZE	1	EA
R297	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R298	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R299	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R301	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R302	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R303	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R305	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R306	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R307	CRJ10DJ272T	RES , CHIP	2.7K OHM 1608 SIZE	1	EA
R308	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R309	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R377	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R404	CRJ10DJ333T	RES , CHIP	33K OHM 1608 SIZE	1	EA
R409	CRJ10DJ100T	RES , CHIP	10 OHM 1608 SIZE	1	EA
R410	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R412	CRJ10DJ681T	RES , CHIP	680 OHM 1608 SIZE	1	EA
R413	CRJ10DJ821T	RES , CHIP	820 OHM 1608 SIZE	1	EA
R414	CRJ10DJ122T	RES , CHIP	1.2K OHM 1608 SIZE	1	EA
R415	CRJ10DJ152T	RES , CHIP	1.5K OHM 1608 SIZE	1	EA
R416	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R417	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R418	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
R419	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R420	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R421	CRJ10DJ680T	RES , CHIP	68 OHM 1608 SIZE	1	EA
R422	CRJ10DJ121T	RES , CHIP	120 OHM 1608 SIZE	1	EA
R423	CRJ10DJ820T	RES , CHIP	82 OHM 1608 SIZE	1	EA
R424	CRJ10DJ4R7T	RES , CHIP	4.7 OHM 1608 SIZE	1	EA
R425	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R501	CRJ10DJ182T	RES , CHIP	1.8K OHM 1608 SIZE	1	EA
R502	CRJ10DJ182T	RES , CHIP	1.8K OHM 1608 SIZE	1	EA
R503	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R504	CRJ10DJ473T	RES , CHIP	47K OHM 1608 SIZE	1	EA
R505	CRJ10DJ470T	RES , CHIP	47 OHM 1608 SIZE	1	EA
R506	CRJ10DJ271T	RES , CHIP	270 OHM 1608 SIZE	1	EA
R511	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R512	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R513	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R514	CRJ10DJ100T	RES , CHIP	10 OHM 1608 SIZE	1	EA
R515	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R516	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R517	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R518	CRJ10DJ103T	RES , CHIP	10K OHM 1608 SIZE	1	EA
R519	CRJ10DJ473T	RES , CHIP	47K OHM 1608 SIZE	1	EA
R522	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R533	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R544	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R549	CRJ10DJ105T	RES , CHIP	1M OHM 1608 SIZE	1	EA
R552	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R553	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R564	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
R593	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R600	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R601	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R602	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R603	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R604	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R605	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R606	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R607	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R608	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R609	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R611	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R612	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R618	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R619	CRJ10DJ101T	RES , CHIP	100 OHM 1608 SIZE	1	EA
R620	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R621	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R622	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R623	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R624	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R625	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R626	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R627	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R628	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R629	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R630	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R631	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R632	CRJ10DJ104T	RES , CHIP	1M OHM 1608 SIZE	1	EA
R633	CRJ10DJ104T	RES , CHIP	1M OHM 1608 SIZE	1	EA
R641	CRJ10DJ224T	RES , CHIP	220K OHM 1608 SIZE	1	EA
R642	CRJ10DJ224T	RES , CHIP	220K OHM 1608 SIZE	1	EA
R650	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
R651	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R652	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R653	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R654	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R655	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R656	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R657	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R658	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R659	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R660	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R661	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R662	CRJ10DJ104T	RES , CHIP	100K OHM 1608 SIZE	1	EA
R663	CRJ10DJ104T	RES , CHIP	100K OHM 1608 SIZE	1	EA
R664	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R665	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R666	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R667	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R668	CRJ10DJ104T	RES , CHIP	100K OHM 1608 SIZE	1	EA
R669	CRJ10DJ104T	RES , CHIP	100K OHM 1608 SIZE	1	EA
R670	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R671	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R672	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R673	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R674	CRJ10DJ332T	RES , CHIP	3.3K OHM 1608 SIZE	1	EA
R675	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R676	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R677	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R678	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R679	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R680	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R681	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R685	CRJ10DJ101T	RES , CHIP	100 OHM 1608 SIZE	1	EA
R686	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R687	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R688	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R694	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R695	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R698	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R699	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
R726	CRJ10DJ474T	RES , CHIP	470K OHM 1608 SIZE	1	EA
R727	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R728	CRJ10DJ223T	RES , CHIP	22K OHM 1608 SIZE	1	EA
R729	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R730	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R731	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R732	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R733	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R734	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R735	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R736	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R737	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R738	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R739	CRJ10DJ224T	RES , CHIP	220K OHM 1608 SIZE	1	EA
R744	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R745	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R746	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R747	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R748	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R749	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R801	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R802	CRJ10DJ820T	RES , CHIP	82 OHM 1608 SIZE	1	EA

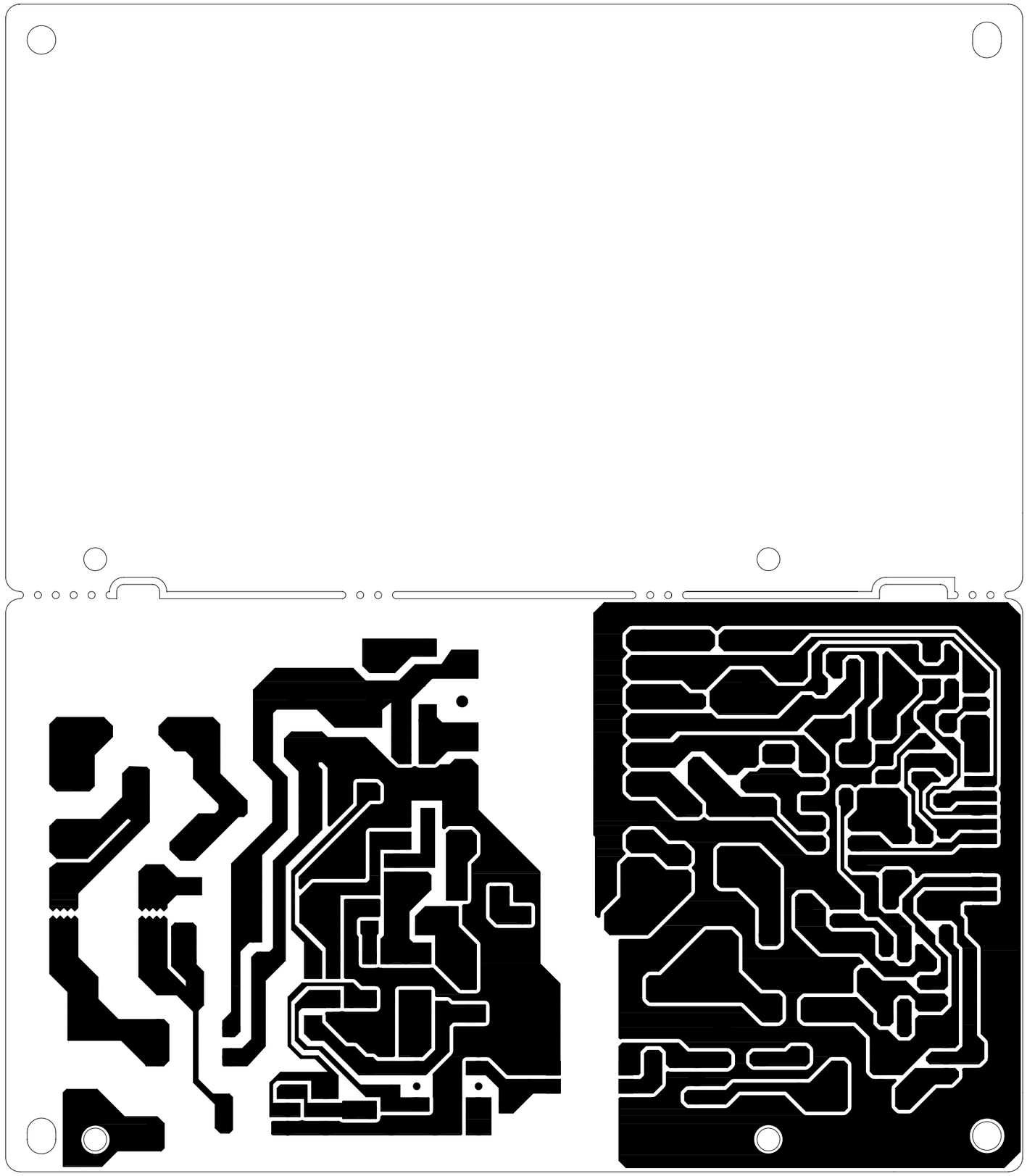
Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
R803	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R806	CRJ10DJ820T	RES , CHIP	82 OHM 1608 SIZE	1	EA
R816	CRJ10DJ390T	RES , CHIP	39 OHM 1608 SIZE	1	EA
R817	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R818	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R821	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R823	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
R824	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R825	CRJ10DJ101T	RES , CHIP	100 OHM 1608 SIZE	1	EA
R826	CRJ10DJ222T	RES , CHIP	2.2K OHM 1608 SIZE	1	EA
R827	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R828	CRJ18AJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R829	CRJ10DJ104T	RES , CHIP	100K OHM 1608 SIZE	1	EA
R830	CRJ10DJ390T	RES , CHIP	39 OHM 1608 SIZE	1	EA
R832	CRJ10DJ102T	RES , CHIP	1K OHM 1608 SIZE	1	EA
R833	CRJ10DJ750T	RES , CHIP	75 OHM 1608 SIZE	1	EA
R834	CRJ10DJ820T	RES , CHIP	82 OHM 1608 SIZE	1	EA
R878	CRJ10DJ104T	RES , CHIP	100K OHM 1608 SIZE	1	EA
R879	CRJ10DJ101T	RES , CHIP	100 OHM 1608 SIZE	1	EA
R895	CRJ10DJ221T	RES , CHIP	220 OHM 1608 SIZE	1	EA
R896	CRJ10DJ680T	RES , CHIP	68 OHM 1608 SIZE	1	EA
Miscellaneous					
X101	HOX27000E180S	CRYSTAL , CHIP(27MHZ,SMD)	HC-49/US	1	EA
CN11	CJP24GA195ZM	SMT FFC/FPC WAFER(0.5MM PITCH)	52559-2472 (PB FREE)	1	EA
JK07	HJJ9H003Z	JACK , HDMI(JALCO)	YKF45-7009	1	EA
L101	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L102	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L103	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L104	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L105	HLQ06E100KRZ	INDUCTOR , CHIP	3225 SIZE	1	EA
L106	HLQ06E100KRZ	INDUCTOR , CHIP	3225 SIZE	1	EA
L107	HLQ06E100KRZ	INDUCTOR , CHIP	3225 SIZE	1	EA
L109	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L110	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L111	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L112	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L113	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L114	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L115	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L116	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L117	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L120	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L121	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L123	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L124	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L125	HLZ9R006Z	BEAD , CHIP	221E, 1.5A	1	EA
L126	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L127	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L128	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L518	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L519	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L520	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L521	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L522	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L601	BLZ9R004Z	BEAD CHIP 90 OHM (2012 SIZE)	ACM2012H-900	1	EA
L602	BLZ9R004Z	BEAD CHIP 90 OHM (2012 SIZE)	ACM2012H-900	1	EA
L603	BLZ9R004Z	BEAD CHIP 90 OHM (2012 SIZE)	ACM2012H-900	1	EA
L604	BLZ9R004Z	BEAD CHIP 90 OHM (2012 SIZE)	ACM2012H-900	1	EA
L610	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB					
L611	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L612	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L613	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L614	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L615	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L617	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L696	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L801	HLQ08ER68KRZ	CHIP FERRITE INDUCTOR	2012-R68UH	1	EA
L804	HLQ09E8R2KRZ	CHIP , COIL	8.2UH 2012 SIZE	1	EA
L805	HLQ08ER68KRZ	CHIP FERRITE INDUCTOR	2012-R68UH	1	EA
L806	HLQ08ER39KRZ	CHIP FERRITE INDUCTOR	2012-R39UH	1	EA
L808	HLZ9R001Z	FB, 2012(0805)600E, 1.5A,POWER	600E, 1.5A	1	EA
L809	HLQ09E8R2KRZ	CHIP , COIL	8.2UH	1	EA
S401	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
S402	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
S403	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
S404	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
S405	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
S406	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
S407	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
S408	HST1A020ZT	SW , TACT	switch, Front panel	1	EA
	CMD1A504	BRACKET , FIP		2	EA
BN01	CWB1C912060EN	WIRE ASS'Y	12Pin, 60mm	1	EA
BN07	CWB1A906190EN	WIRE ASS'Y	6Pin, 190mm	1	EA
CN01	CJP15GA117ZY	WAFER , CARD CABLE	15Pin connector	1	EA
CN03	CJP07GA01ZY	WAFER, STRAIGHT, 7PIN	7Pin connector	1	EA
CN05	CJP15GB113ZY	WAFER	15Pin connector	1	EA
CN07	CJP06GA19ZY	WAFER , STRAIGHT DVD LOADER	6Pin connector	1	EA
CN12	CJP05GA19ZY	WAFER, STRAIGHT, 5PIN	5Pin connector	1	EA
CN13	CJP06GA19ZY	WAFER , STRAIGHT DVD LOADER	6Pin connector	1	EA
ET01	CMC1A111	PLATE , EARTH		1	EA
ET02	CMC1A111	PLATE , EARTH		1	EA
F401	HFL13BT229GINK	F.I.P	13-BT-229GINK (FUTABA)	1	EA
JK01	CJJ4R041Z	6P JACK, BOARD	RCA-601DAG-11	1	EA
JK02	CJJ4N067Z	JACK , 2P	RCA-201DAG-01	1	EA
JK03	CJJ4S043Z	JACK , BOARD	RCA-215A-02	1	EA
JK04	CJJ9N003Z	JACK , (S-VIDEO+VHS)	R102-D04KG-01	1	EA
JK06	CJS9U011Z	JACK, OPTICAL+COXIAL(GOLD PLAT	YCK22-0872V	1	EA
JK08	HJJ1D002Z	JACK , STEREO(2P 3.5PIE)	SR7400	1	EA
X501	HOX08000E160C	CRYSTAL 8MHz	HC-49/US	1	EA
SMPS PCB ASS'Y					
Capacitors					
C905	CCFT1H104ZF	CAP , SEMICONDUCTOR	0.1UF 50V ZF	1	EA
C906	CCKT1H391KB	CAP , CERAMIC	330PF 50V KB	1	EA
C907	CCEA1HH100T	CAP , ELECT	10UF 50V	1	EA
C908	CCEA1HH470T	CAP , ELECT	47UF 50V	1	EA
C910	CCEA1HH1R0T	CAP , ELECT	1UF 50V	1	EA
C921	CCEA1EH331T	CAP , ELECT	33OUF 25V	1	EA
C922	CCEA1HH0R1T	CAP , ELECT	0.1UF 50V	1	EA
C923	CCEA1EH331T	CAP , ELECT	33OUF 25V	1	EA
C924	CCEA1VH101T	CAP , ELECT	100UF 35V	1	EA
C925	CCEA1EH331T	CAP , ELECT	33OUF 25V	1	EA
C926	HCQI1H102JZT	CAP , MYLAR	1000PF 50V J	1	EA
C927	CCEA1HH470T	CAP , ELECT	47UF 50V	1	EA
C928	CCEA1HH470T	CAP , ELECT	47UF 50V	1	EA
C929	CCFT1H104ZF	CAP , SEMICONDUCTOR	0.1UF 50V ZF	1	EA
C931	CCFT1H104ZF	CAP , SEMICONDUCTOR	0.1UF 50V ZF	1	EA
C935	CCFT1H104ZF	CAP , SEMICONDUCTOR	0.1UF 50V ZF	1	EA

Ref. Designator	Part Number	Description		Qty	
SMPS PCB ASS'Y					
C901	HCQF2E104KZE	CAP , POLYPROPYLENE FILM	0.1UF	1	EA
C902	HCQF2E104KZE	CAP , POLYPROPYLENE FILM	0.1UF	1	EA
C903	CCET400VKRH470K	CAP , ELECT(400V/47uF)	400V/47uF	1	EA
C904	CCKT3A222KBL	CAP , CERAMIC	2200pF (1KV)	1	EA
C920	CCEA1EH102T	CAP , ELECT	1000UF 25V	1	EA
C930	CCKDHS222ME	CAP , CERAMIC (400V Y-CAP)	2200pF (400V)	1	EA
C932	CCKDHS102ME	CAP , CERAMIC (400V Y-CAP)	1000pF (400V)	1	EA
C933	CCKDHS102ME	CAP , CERAMIC (400V Y-CAP)	1000pF (400V)	1	EA
Semiconductors					
D906	HVDMTZJ12BT	DIODE , ZENER	MTZJ12B 1/2W	1	EA
D907	HVD1N4148T	DIODE	1N4148	1	EA
D909	HVDMTZJ24BT	DIODE , ZENER	MTZJ24BT 1/2W	1	EA
D910	HVD1N4148T	DIODE	1N4148	1	EA
D911	HVD1N4148T	DIODE	1N4148	1	EA
D912	HVDMTZJ5.1BT	DIODE , ZENER	MTZJ5.1B 1/2W	1	EA
D925	HVD1N4148T	DIODE	1N4148	1	EA
D926	HVDMTZJ12BT	DIODE , ZENER	MTZJ12B 1/2W	1	EA
D928	HVDMTZJ2.7BT	DIODE , ZENER	MTZJ2.7B 1/2W	1	EA
IC92	HVIKIA431BAT	I.C , REGULATOR	KIA431B	1	EA
Q904	HVTKTC3198YT	TRANSISTOR NPN	KTC3198Y	1	EA
Q905	HVTKTA1273YT	TRANSISTOR PNP	KTA1273Y	1	EA
Q906	HVTKSC1008YT	TRANSISTOR NPN	KSC1008Y	1	EA
Q907	HVTKRC102MT	TRANSISTOR NPN	KRC102M	1	EA
Q908	HVTKRA102MT	TRANSISTOR PNP	KRA102M	1	EA
Q910	HVTKSC1008YT	TRANSISTOR NPN	KSC1008Y	1	EA
Q911	HVTKSA708YT	TRANSISTOR PNP	KSA708Y	1	EA
Q912	HVDMCR100-6ZL1G	SCR (ON SEMI)	DMCR100-6ZL1G	1	EA
D901	HVD1N4007T	DIODE	1N4007 (1000V/1A)	1	EA
D902	HVD1N4007T	DIODE	1N4007 (1000V/1A)	1	EA
D903	HVD1N4007T	DIODE	1N4007 (1000V/1A)	1	EA
D904	HVD1N4007T	DIODE	1N4007 (1000V/1A)	1	EA
D905	HVDUF4007T	DIODE , SCHOTTKY	UF4007	1	EA
D908	HVD1N4007T	DIODE	1N4007 (1000V/1A)	1	EA
D913	HVD1N4148T	DIODE	1N4148	1	EA
D920	HVD31DQ06H	DIODE	31DQ06-FC5	1	EA
D921	HVDUF4007T	DIODE , SCHOTTKY	UF4007	1	EA
D922	HVD1N4937T	DIODE , RECTIFIERS	1N4937(600V/1A)	1	EA
D923	HVD1N4937T	DIODE , RECTIFIERS	1N4937(600V/1A)	1	EA
D924	HVDSF26T	DIODE , SUPER FAST	SF26 (400V/2A)	1	EA
IC91	BVISG6848DZ	IC,PWM	SG6848DZ	1	EA
PC91	HVIPC17L1CB	I.C , PHOTO COUPLER	PC17L1C	1	EA
Q901	BVICEF04N6	FET , CEF04N6		1	EA
Q903	HVTKSB1151Y	TRANSISTOR PNP TO-126	KSB1151Y	1	EA
Resistors					
R901	KROS1TJ105V	RES , METAL FILM (1/2W , 1M OH	(1/2W , 1M OHM)	1	EA
R903	CRD25TJ754T	RES	750K OHM 1/4W J	1	EA
R904	CRD25TJ754T	RES	750K OHM 1/4W J	1	EA
R905	CRD20TJ222T	RES , CARBON	2.2K OHM 1/5W J	1	EA
R906	CRD20TJ101T	RES , CARBON	100 OHM 1/5W J	1	EA
R907	CRD20TJ103T	RES , CARBON	10K OHM 1/5W J	1	EA
R909	CRD20TJ100T	RES , CARBON	10 OHM 1/5W J	1	EA
R910	CRD20TJ103T	RES , CARBON	10K OHM 1/5W J	1	EA
R911	CRD20TJ104T	RES , CARBON	100K OHM 1/5W J	1	EA
R912	CRD20TJ102T	RES , CARBON	1K OHM 1/5W J	1	EA
R913	CRD20TJ102T	RES , CARBON	1K OHM 1/5W J	1	EA
R914	CRD20TJ333T	RES , CARBON	33K OHM 1/5W J	1	EA
R920	CRD20TJ101T	RES , CARBON	100 OHM 1/5W J	1	EA

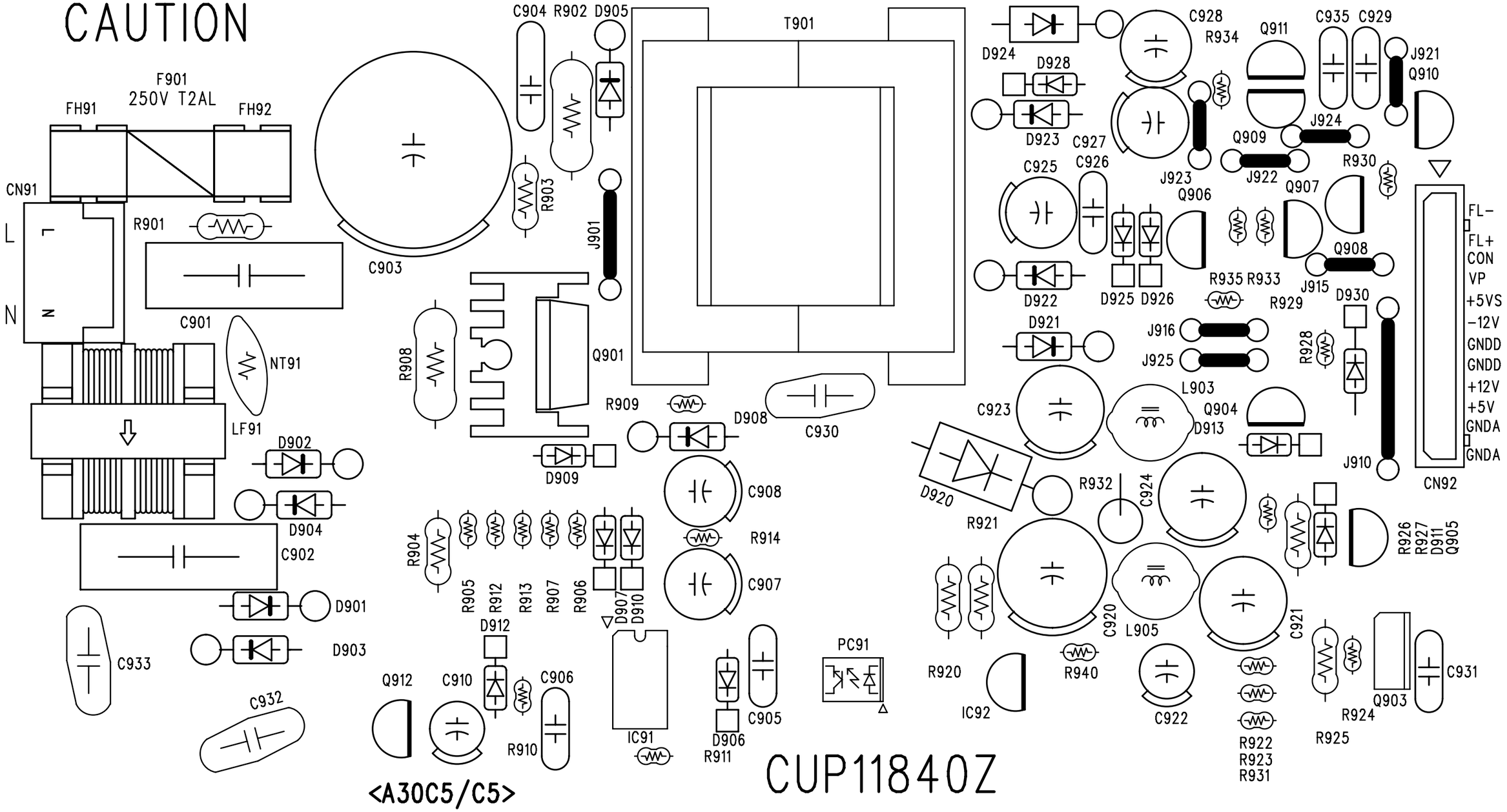
Ref. Designator	Part Number	Description		Qty	
SMPS PCB ASS'Y					
R921	CRD20TJ222T	RES , CARBON	2.2K OHM 1/5W J	1	EA
R922	CRD20TF3481T	RES , CARBON	3.48K OHM 1/5W J	1	EA
R923	CRD20TF3001T	RES , CARBON	3K 1/5W F	1	EA
R924	CRD20TJ101T	RES , CARBON	100 OHM 1/5W J	1	EA
R925	CRD25TJ101T	RES , CARBON	100 OHM 1/4W J	1	EA
R926	CRD20TJ101T	RES , CARBON	100 OHM 1/5W J	1	EA
R928	CRD20TJ102T	RES , CARBON	1K OHM 1/5W J	1	EA
R929	CRD20TJ102T	RES , CARBON	1K OHM 1/5W J	1	EA
R930	CRD20TJ101T	RES , CARBON	100 OHM 1/5W J	1	EA
R934	CRD20TJ102T	RES , CARBON	1K OHM 1/5W J	1	EA
R935	CRD20TJ153T	RES , CARBON	15K OHM 1/5W J	1	EA
R940	CRD20TJ472T	RES , CARBON	4.7K OHM 1/5W J	1	EA
R902	KRG1SANJ104H	RES,METAL OXIDE FILM	100K OHM	1	EA
R908	KRW1PJ1R5V	RES , WIRE WOUND(1W, 1.5ohm)	1W 1.5(J) NON-INDUCT	1	EA
R927	KRDS1TJ681V	RES , CARBON	680OHM 1/2W J	1	EA
Miscellaneous					
FH91	KJCFC5S	HOLDER , FUSE	for F901	1	EA
FH92	KJCFC5S	HOLDER , FUSE	for F901	1	EA
F901	KBA2C2000TLEY	FUSE	EUR (2A/250V)	1	EA
CN91	CJP02KA060ZY	WAFER	7.92MM(YUNHO)	1	EA
CN92	CJP12GA19ZY	WAFER	12Pin connector	1	EA
NT91	KRT10D9MSFT	THERMISTER	10D9M	1	EA
LF91	CLZ9Z060Y	LINE FILTER	CLZ9Z060Y	1	EA
L903	CLZ9Z040Y	COIL , CHOCK(6.8uH)	DR 6.5*7.5	1	EA
L905	CLZ9Z040Y	COIL , CHOCK(6.8uH)	DR 6.5*7.5	1	EA
	CMY2A223	HEAT SINK		1	EA
	CTB3+8JR	SCREW		1	EA
T901	CLT9Z018ZE	TRANS (DVD 27)	EER2828H	1	EA
MECHANICAL					
	CHE154	CLAMPER , ARM		0.12	M
	CGWDVD38	FRONT PANEL ASS'Y	DVD38	1	EA
	CBT1A997	KNOB, FUNCTION		1	EA
	CGL1A240	INDICATOR, POWER		1	EA
	CGR1A387K128	DOOR, DVD		1	EA
	CGUDVD38	WINDOW ASS'Y	DVD38	1	EA
	CGB1A181Z	BADGE , HARMAN(DVD38)	DVD38	1	EA
	CGU1A383Z	WINDOW, FIP		1	EA
	CGW2A413RDH43	PANEL,FRONT		1	EA
	CGX1A374YC23	ORNAMENT, DOOR		1	EA
	CMZ1A105Z	FILTER , FIP		1	EA
	CTB3+10GR	SCREW		5	EA
	CTB3+6JR	SCREW		2	EA
	CWC1B2A15A120B	CABLE , CARD		1	EA
	KGB1A158Z	BADGE , HARMAN/KARDON(FRONT)		1	EA
ET03	CMC1A214	PLATE , EARTH		1	EA
	CGX1A375ZA	BADGE ASS'Y		1	EA
	CGX1A375M7G32	ORNAMENT , BADGE		1	EA
	KGB1A159Z	BADGE , HARMAN/KARDON(TOP)		1	EA
	CKC4A166G44	CABINET , TOP DVD38		1	EA
	CTBD3+10GFZR	SCREW		6	EA
	CTBD3+8JFC	SCREW , DOT		4	EA
	CTB3+6FFZR	SCREW		1	EA
		BOTTOM CHASSIS ASS'Y	DVD38	1	EA
	CADDVD27ZA	DVD MECHANISM ASS'Y(KOMI)		1	EA
	CMH1A250	GUIDE, CABLE		1	EA
	CWB1B905150EE	WIRE ASS'Y		1	EA
	CWB5A906150SE	WIRE ASS'Y		1	EA

Ref. Designator	Part Number	Description		Qty	
MECHANICAL					
	CWC1G2A24G250B	CABLE , CARD		1	EA
	CHG1A360	CUSHION , FOOT		4	EA
	CHR301	CLAMPER		3	EA
	CJA523FBYA	CORD , POWER		1	EA
	CKF2A303X	PANEL , REAR(DVD38)	DVD38	1	EA
	CKL2A186H43	FOOT		4	EA
	CMX1A176	INSULATOR, SMPS		1	EA



FOR CONTINUED PROTECTION AGAINST RISK OF FIRE. REPLACE ONLY WITH SAME TYPE AND RATING OF FUSE(S).

CAUTION



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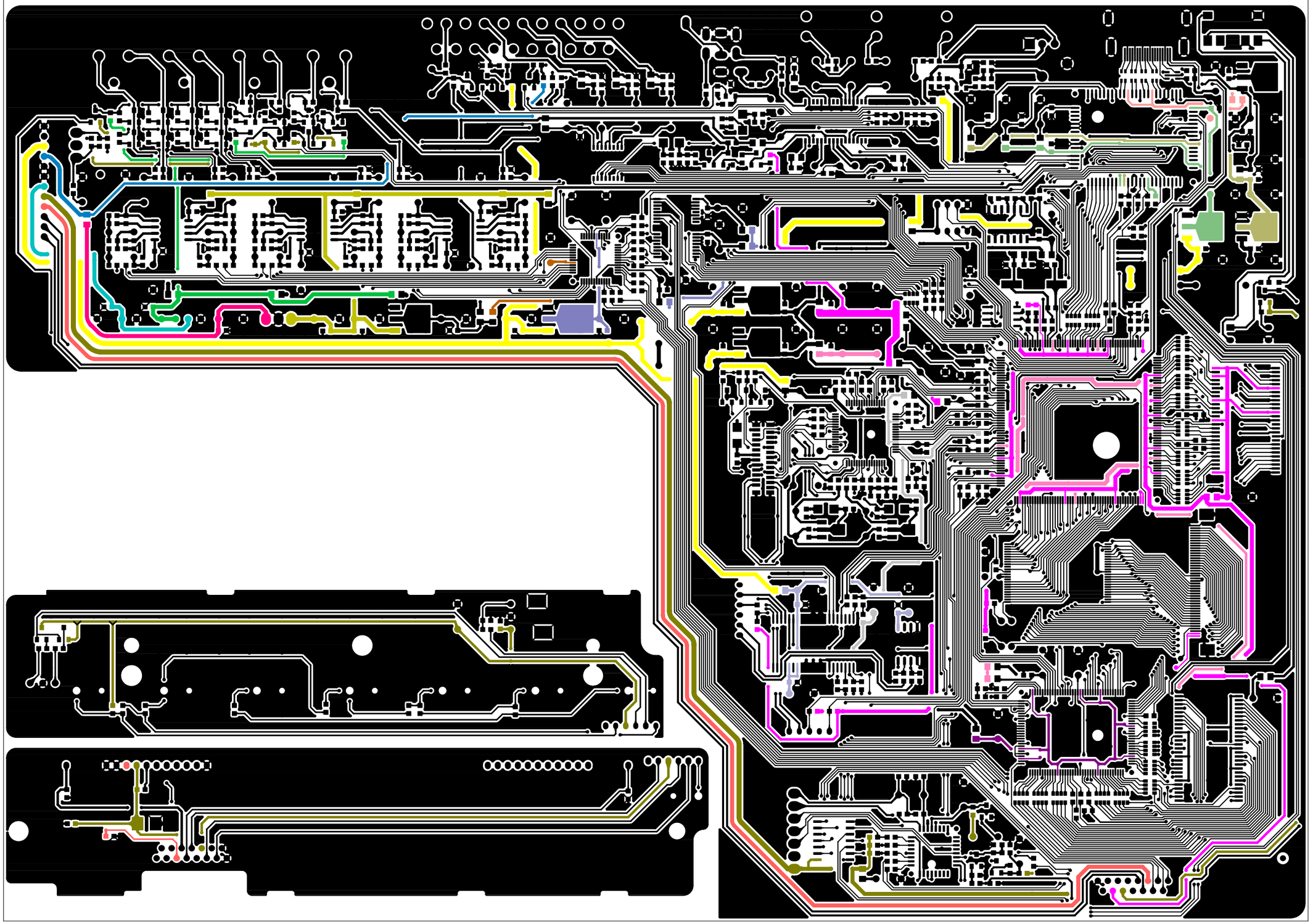

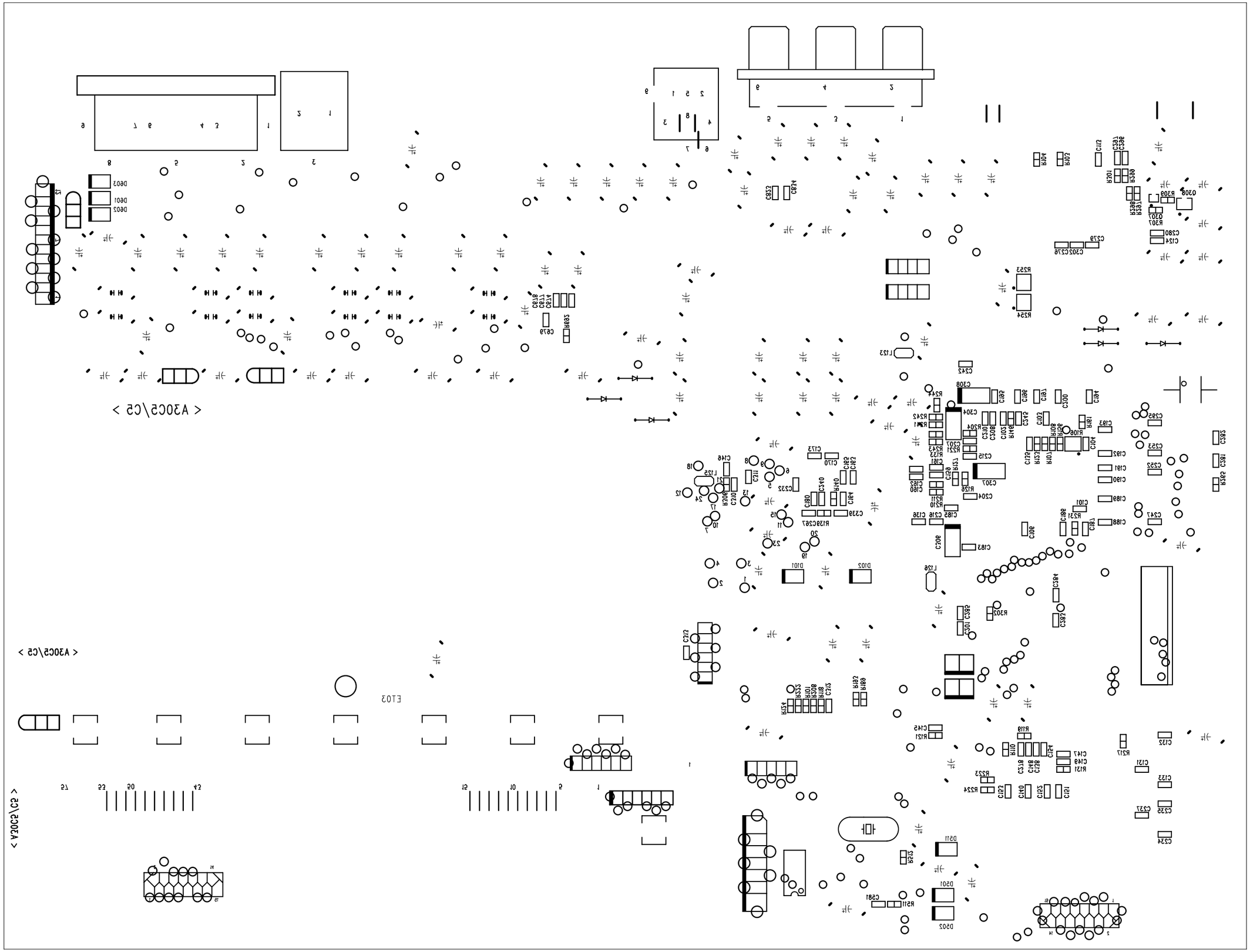

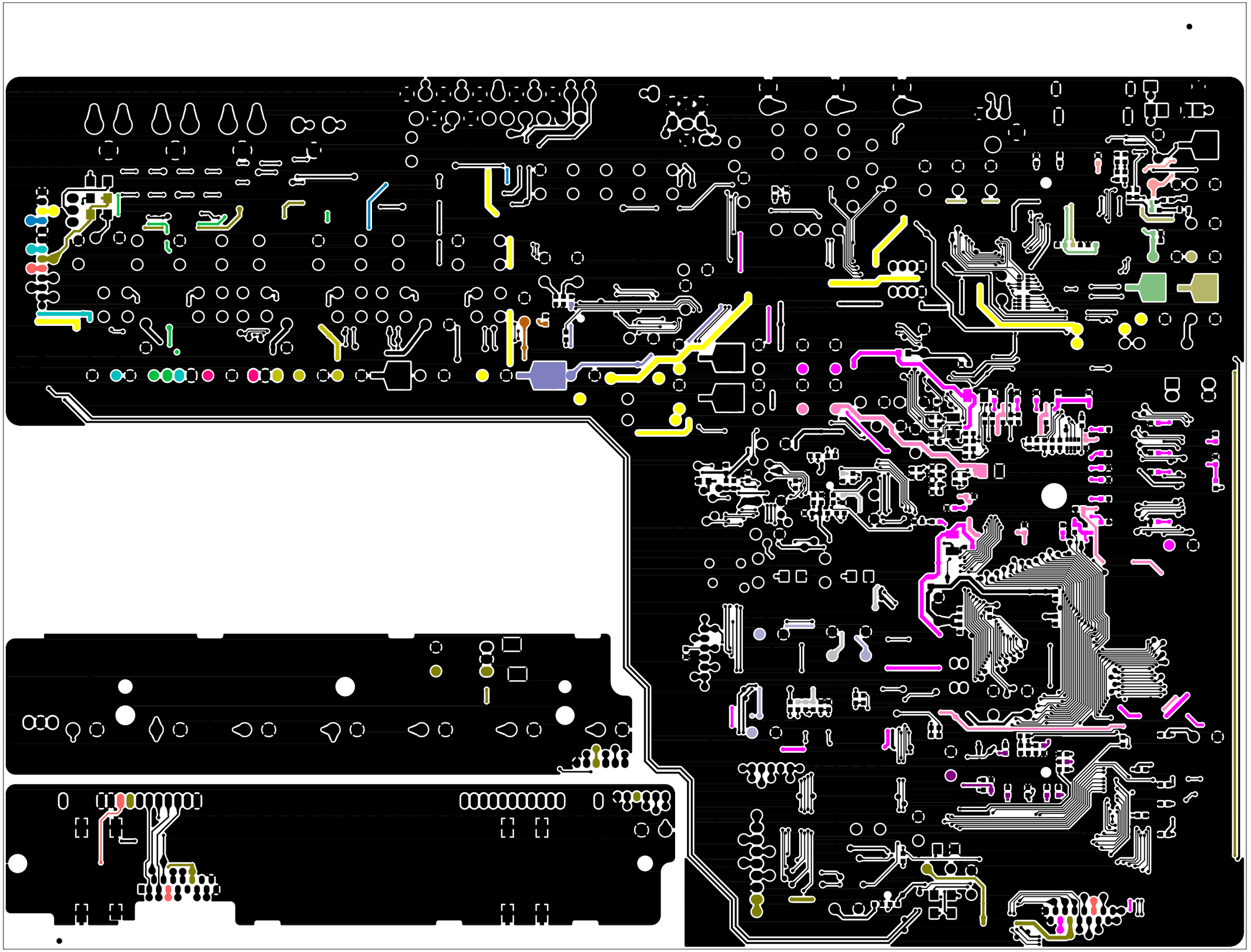

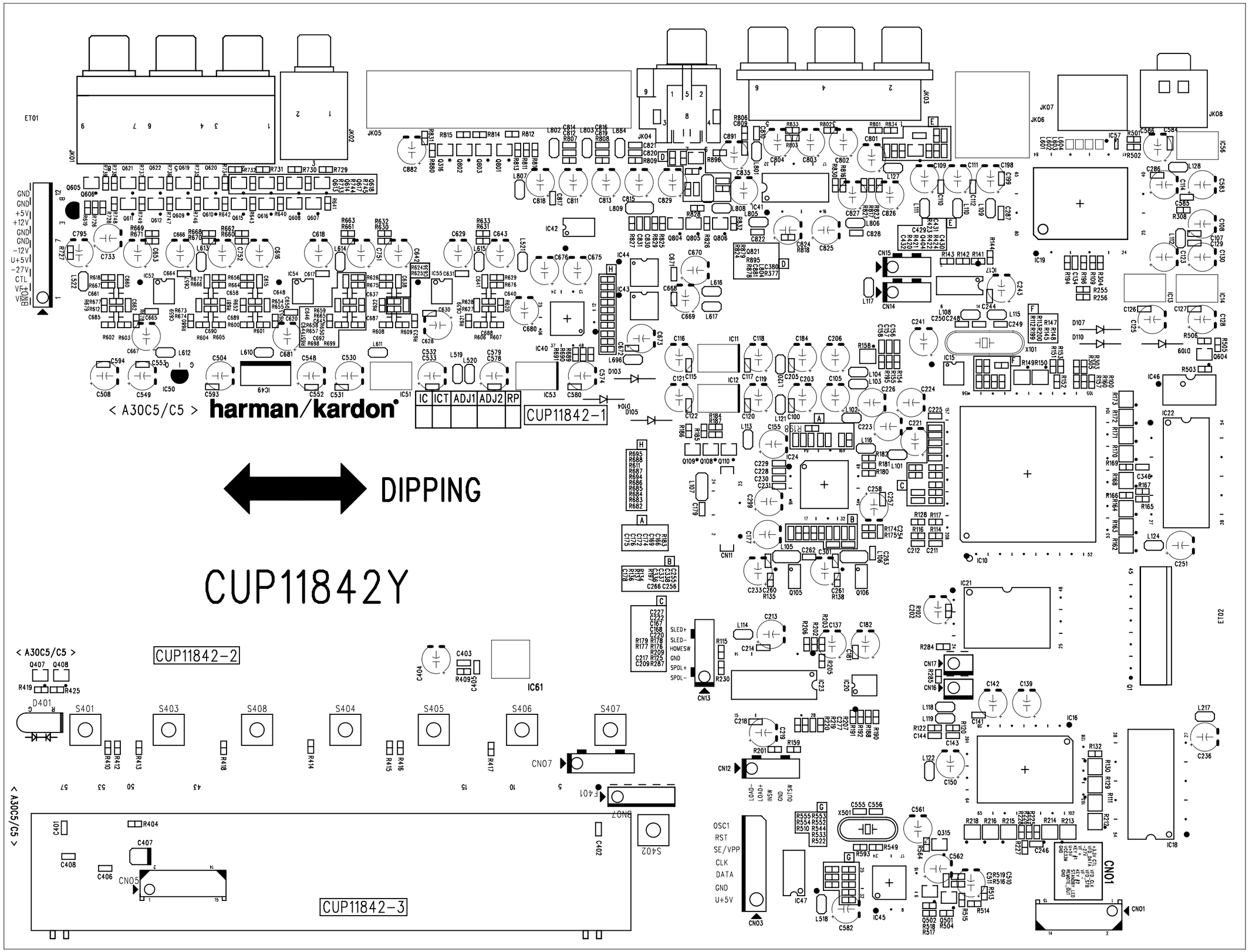

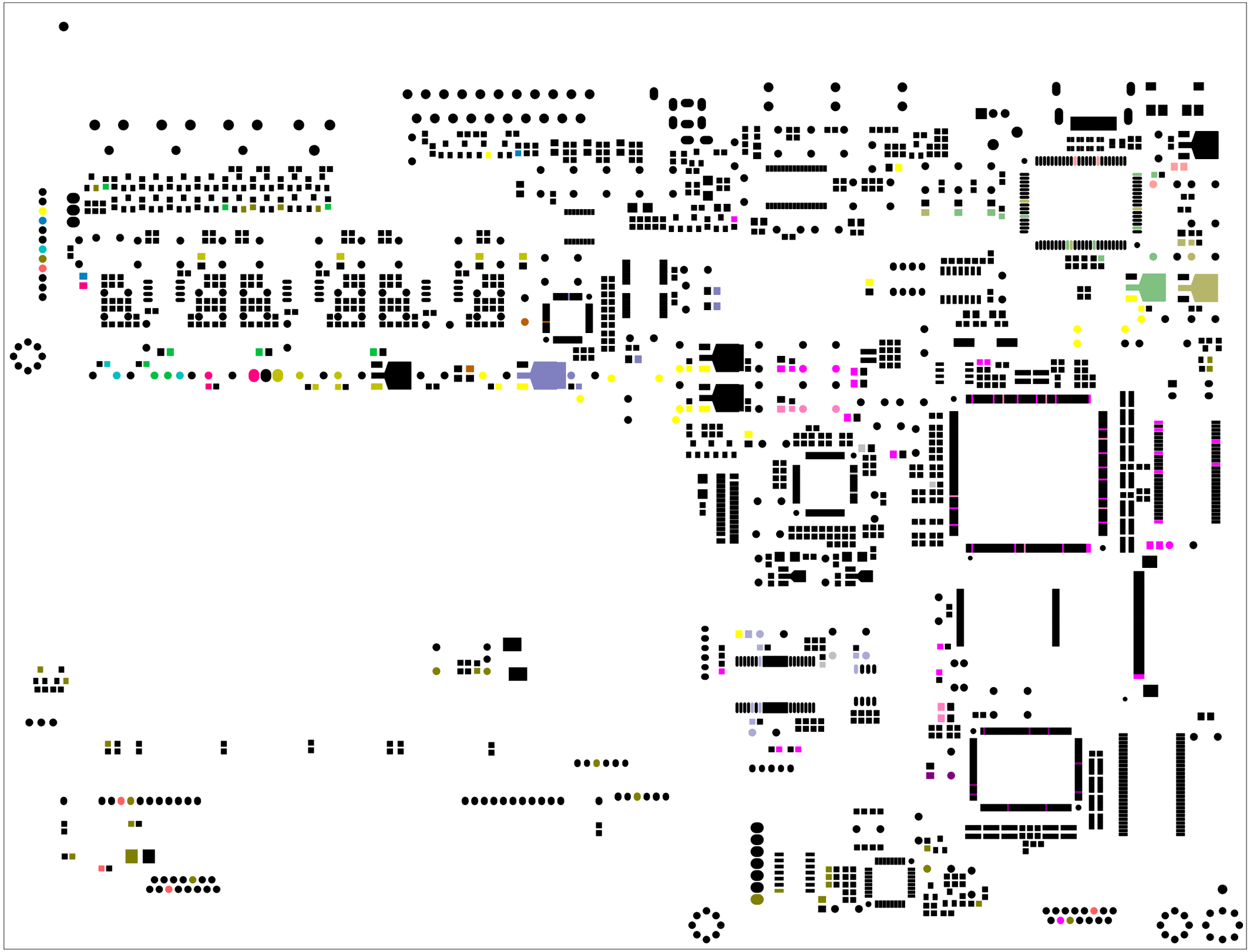

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Data Sheet

ZR36778HQCG

Vaddis® 778 Advanced Featured DVD SoC

Version 0.9
19 Sep 2004

ZORAN Proprietary

ZORAN Corporation, 1390 Kifer Road, Sunnyvale, CA 94086-5305
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1 Introduction

1.1 General

This document describes the technical specification of the **Vaddis 778** disc loader controller, flash memory card reader and decoder device.

The **Vaddis 778** can control disc loaders and read bitstreams using the following media: DVD-ROM, DVD-R, DVD+R, DVD-RW, DVD+RW, CD-DA, CD-ROM, CD-ROM (XA), CD-R and CD-RW discs.

The **Vaddis 778** can read the following types of serial and parallel flash memory cards: Secure Digital (SD), Memory Stick (MS and MS Pro), Compact Flash (CF) and Smart Media (SM) and XD.

The **Vaddis 778** can playback all discs conforming to the above standards (including support of sub-pictures, highlights and closed captions) with the exception of DVD-Audio ASV transition effects. The **Vaddis 778** can playback MP3 (MPEG 1 Layer 3), MPEG 2, Layer 3 (including low sampling rates) DTS, AAC or WMA type audio files from CD-ROM, CD-R and CD-R/W discs. The **Vaddis 778** can playback various types of JPEG, MPEG 4 and DivX bitstreams from files on DVD-ROM, DVD-R, DVD-RW, CD-ROM, CD-R and CD-RW, or on flash cards, or SACD with external SACD decoder chip.

Vaddis 778 is pin compatible with Vaddis 770.

It is assumed that the reader is familiar with the various discs, JPEG, MPEG 4, MPEG 2 and MPEG 1 international standards and the industrial standards for DivX, DVD-Video, DVD-Audio and the various types of CD and flash card formats. Note: This document contains information from industrial standards that were obtained by Zoran from other corporations under a Non Disclosure Agreement.

The **Vaddis 778** receives data from the disc loader optical pick-up unit OPU through an external RF amplifier, limit switches and other sensors and control the disc loader focus and tracking coils, sled, spindle and tray motors through a servo amplifier external device(s). The **Vaddis 778** implements all the signal processing, multi-pass ECC, EDC, track buffer management and servo functions that result in a (error corrected) bitstream.

The **Vaddis 778** can perform the decryption processes for bitstreams originating from a DVD-Video or DVD-Audio discs or from DivX bitstreams.

The max data read rate for all types of CD discs is 8x (8*1.411 Mbits/Sec). The max data read rate for DVD discs is 2x (2*10.08 Mbits/Sec).

The **Vaddis 778** outputs interlaced or progressive CCIR size (also called SD or D1 size), 4:2:2, Y, U and V digital video. The representation of each component sample is 8 bits. Suitable post-processing, to transform the original decoded size and format (e.g., SIF size or CCIR size MPEG 1 format, SIF size, "half D1" size, "2/3 D1" size or CCIR size MPEG 2 format) to the interlaced CCIR size, 4:2:2, Y, U and V format, is performed by the **Vaddis 778.**

The interlaced video display frame rate is either 25 or 29.97 frames per second. Frame rate conversion is performed from coded MPEG frame rates of 23.976, 25, or 29.97 per second, to one of the two display frame rates mentioned above. For example, for display frame rate of 29.97 and coded frame rate of 23.976, "3/2 pull down" is performed.

The progressive video display frame rate is either 50 or 59.94 frames per second. Frame rate

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conversion is performed from coded MPEG frame rates of 23.976, 25, or 29.97 per second, to one of the two display frame rates mentioned above by a de-interlacing unit using 2 fields edge adaptive interpolation.

The interlaced or progressive 8 bits digital video output is synchronous with an output video clock and sync signals, and contiguous along each video line.

Image display "location" relative to the sync signals, and size (up to the max specified above), are specified by **Vaddis 778** SW. The size of the displayed part of the decoded image can be less than or equal to the size of the decoded image

Format conversion between PAL, NTSC, 16:9 or 4:3 is supported, with pixel aspect ratio conservation, using (e.g.) either the "Pan-scan" or the "Letterbox" methods.

When the digital video output is interlaced, the **Vaddis 778** output analog interlaced video through a video encoder and four 10 bits DACs that are included in the **Vaddis 778.** Analog outputs can be either composite (CVBS and Y, C of "S-video") or component (R, G and B, or Y, U and V). When the digital video output is progressive, the **Vaddis 778** output analog progressive video in components format only, through the three components DACs or compatible interlaced video. The video encoder and DACs operate with a 54 MHz clock.

The audio output is 16, 18, 20 or 24 bits, two to eight channels, PCM samples at 16, 22.05, 24, 32, 44.1, 48, 96 or 192 KHz with each pair of (e.g., left and right) samples interleaved on a serial bus according to several flavours of the I2S standard. Post processing of the decoded audio and one stereo digital audio input, suitable for Karaoke and similar applications is supported. Audio coded data or reconstructed data can be output on a single line using an internal S/PDIF transmitter. PCM or coded audio data can be also input through one of two S/PDIF (TTL) inputs using a S/PDIF receiver to recover the input bit clock.

The Vaddis 778 can also output 8 bits, Y, U and V, 4:2:2, digital ("still") video to the HDXtreme companion chip, in various formats, compatible with the HDXtreme, as long as the sample rate is less than 135 MHz and the width of the Y component is less than 2047. In this mode, no other digital or analog video is output.

The **Vaddis 778** uses Synchronous DRAMs (SDRAM) for external buffers and generates all address and control signals for this external buffer. The required Synchronous DRAMs are of -7 type (max clock rate of 147 MHz). The required size is 64 Mbits using one 4M*16 bit device. The internal structure of the devices has to be four banks of 2048 rows by 256 cells each. Some limited applications can be supported by a single or dual 16 Mbits device(s). A single 128 Mbits device with four banks of 2048 rows by 512 cells each is also supported.

The **Vaddis 778** interfaces directly (through external buffers only) to several types of serial and parallel flash cards connectors. The interface is sharing some of the pins also used for disc loader control, so that the disc loader can not be operational while reading a card. For parallel flash cards, the interface is sharing some of the flash memory pins, so that the flash memory can not be accessed while reading a sector from a card.

The **Vaddis 778** interfaces to the other devices of a player (e.g., IR remote control receiver, front panel controller, audio DACs and ADCs) mainly through GPIO functions controlled by SW to implement protocols like SPI and I2C. There are on-chip HW aids to interface to a master SSC type device (e.g., a front panel concentrator).

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1.3 Typical Applications

Stand- alone DVD and CD disc players. See example block diagram in the figure below.

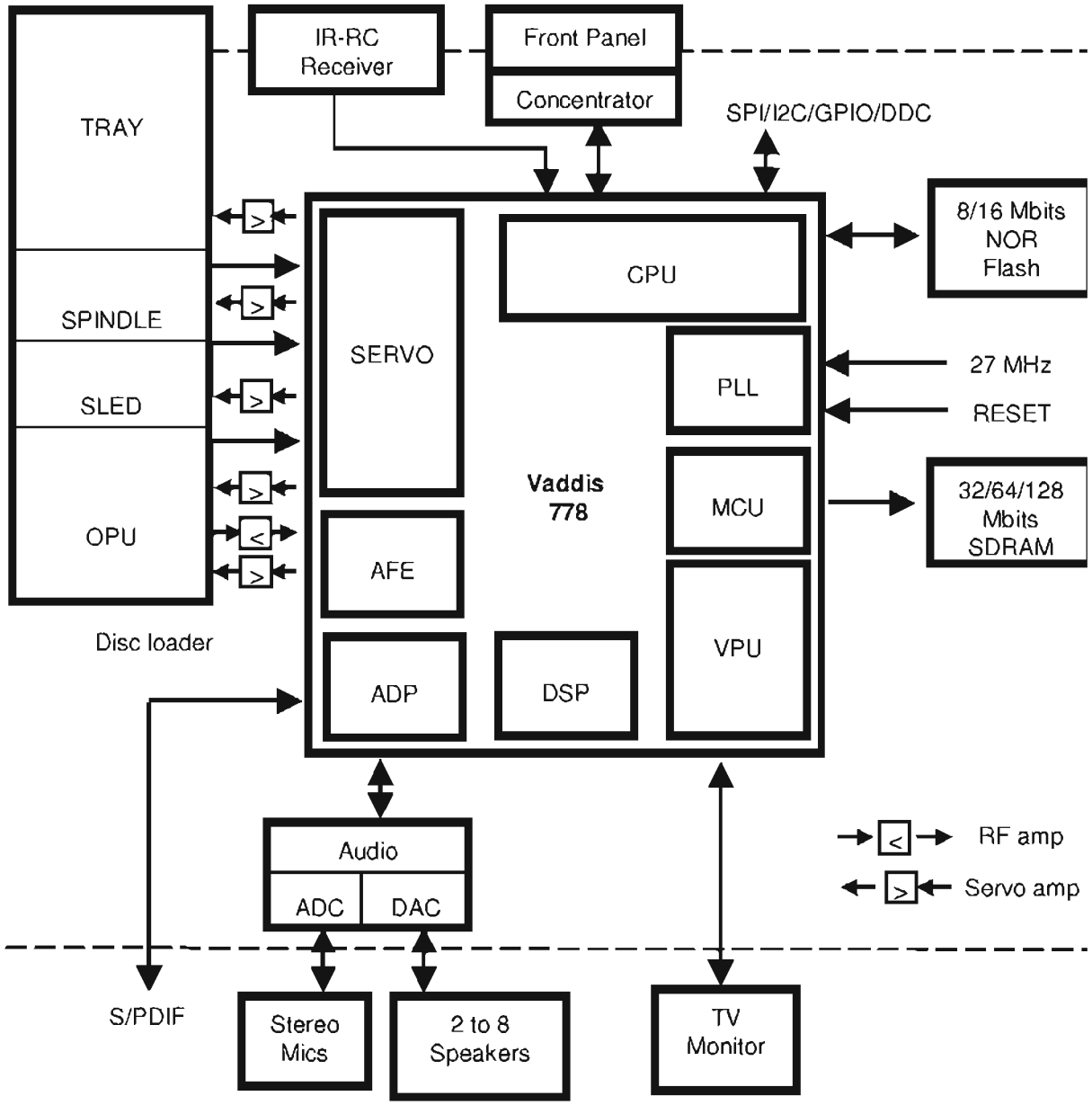

Figure 1 – DVD Player Block Diagram

The pins used for disc loader and NOR flash interface have a second function for direct flash card reading (not shown). Interface to an HD TV monitor is through an HDXtreme companion chip (not shown). When needed, the 64 Mbits SDRAM can be replaced by a 128 Mbits SDRAM.

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2 Functional Description

2.1 External interface

The main external interfaces of the **Vaddis 778** are shown in the next figure. The pins used for disc loader and NOR flash interface have a second function for direct flash card reading (not shown). Interface to an HD TV monitor is through an **HDXtreme** companion chip (not shown).

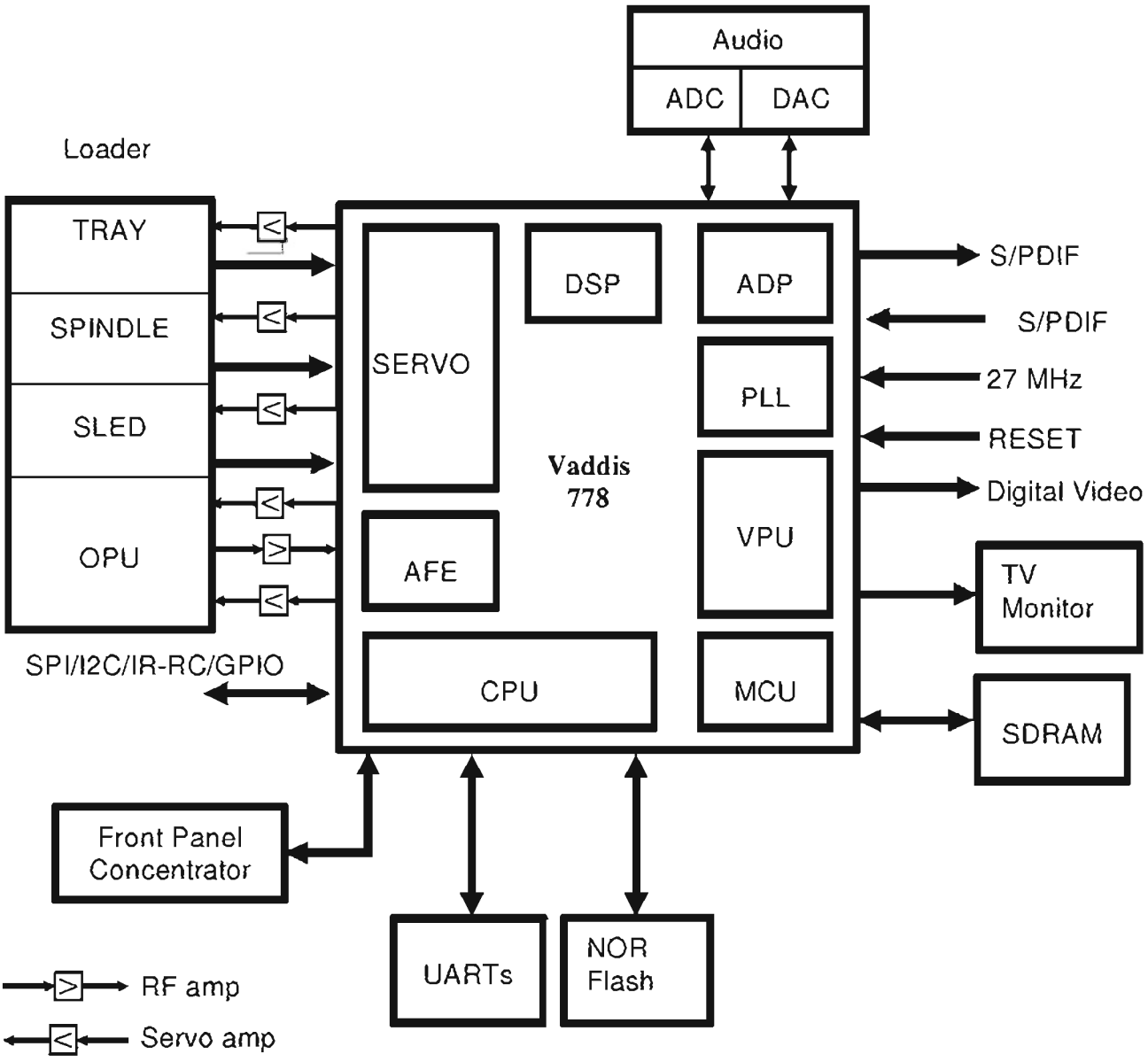

Figure 2 – Vaddis 778 Main External Interfaces

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3 Pin Description

3.1 Pin List

The **Vaddis 778** has 208 pins. The table below lists the pins, their functions, the direction or nature of each function (according to the legend below). Note that some of the functional pins may have additional function(s) dedicated for testing which are not described here. Following is the table legend:

I - standard input-only. O - standard active driver, with a 3-state option. I/O - bi-directional I/O pin, with a 3-state option. AI - Analog input signal. AO - Analog output signal. AI/O - Analog connection. ID - input, not sampled by PCLK. S - Power supply or ground.

If different functions have different direction, the **Vaddis 778** I/O supports all of them. Directions needed at RESET or for testing, when are different, are not shown in the table. All I and I/O pins have a level retaining HW.

Pins that are designated AI, S or ID should not be left not connected or floating.

Table 1 – Vaddis 778 Pinouts

Pin Number	Pin Functions	Direction	Description
1	*SSCRXD*	I	SSC data input.
	GPCI/O[17]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP or FCU SW
	PM[15]	O	Probe mux data output
2	*MEMCS[1]#*	O	PNVM/SRAM chip select (active low) output
	GPCI/O[18]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
3	*VDDP*	S	3.3 V Digital periphery power supply
4,5	*MEMAD*	O	PNVM/SRAM address bus outputs
	[15,16]		
	SYSIND[1,0]	I	General purpose system configuration Indication input. Level sampled during RESET
6	*MEMAD[14]*	O	PNVM/SRAM address bus output
	GCLKSEL	I	*GCLKPOUT* or *GCLKA* function selection. Level sampled during RESET
7	*MEMAD[13]*	O	PNVM/SRAM address bus output
	FCUIF[29]	O	Flash card interface unit output signal

Pin Number	Pin Functions	Direction	Description
8	*MEMAD[12]*	O	PNVM/ SRAM address bus output
	PLLCFGA	I	Audio PLL configuration input. Level sampled during RESET. In normal operation the pin must be low during RESET
9	*MEMDA[15]*	I/ O	PNVM/ SRAM bi- directional data bus
	FCUIF[28]	I/ O	Flash card interface unit input/ output signal
10	*MEMAD[11]*	O	PNVM/ SRAM address bus output
	PLLCFGP	I	Process PLL configuration input. Level sampled during RESET. In normal operation the pin must be low during RESET
11	*MEMDA[7]*	I/ O	PNVM/ SRAM bi- directional data bus
	FCUIF[9]	I/ O	Flash card interface unit input/ output signals
12	*GNDP*	S	Digital periphery ground of 3.3 V supply
13	*MEMAD[10]*	O	PNVM/ SRAM address bus output
	FCUIF[20]	O	Flash card interface unit output signal
14	*MEMDA[14]*	I/ O	PNVM/ SRAM bi- directional data bus
	FCUIF[27]	I/ O	Flash card interface unit input/ output signal
15	*MEMAD[9]*	O	PNVM/ SRAM address bus outputs
	FCUIF[19]	O	Flash card interface unit output signal
16	*MEMDA[6]*	I/ O	PNVM/ SRAM bi- directional data bus
	FCUIF[8]	I/ O	Flash card interface unit input/ output signals
17	*MEMAD[8]*	O	PNVM/ SRAM address bus outputs
	FCUIF[18]	O	Flash card interface unit output signal
18- 19	*MEMDA[13,5]*	I/ O	PNVM/ SRAM bi- directional data bus
	FCUIF[26.7]	I/ O	Flash card interface unit input/ output signals
20	*MEMAD[20]*	O	PNVM/ SRAM address bus outputs
	MEMCS[2]#	O	PNVM/ SRAM chip select (active low) output
	GPCI/ O[19]	I/ O	General purpose input/ output, monitored/ controlled by the CPU or DSP SW
21	*VDDP*	S	3.3 V Digital periphery power supply
22	*MEMDA[12]*	I/ O	PNVM/ SRAM bi- directional data bus

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Pin Number	Pin Functions	Direction	Description
	FCUIF[25]	I/O	Flash card interface unit input/output signal
23	*MEMWR#*	O	PNVM/SRAM write enable (active low) output
	FCUIF[0]	O	Flash card interface unit output signal
24	*MEMDA[4]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[6]	O	Flash card interface unit output signal
25	*VDDC*	S	1.8 V Digital core power supply
26	*MEMDA[11]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[24]	I/O	Flash card interface unit input/output signal
27	*MEMDA[3]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[5]	I/O	Flash card interface unit input/output signals
28	*MEMAD[19]*	O	PNVM/SRAM address bus outputs
	PLLSEL	I	PLL frequency selection - 108 MHz (low) or 135 MHz (high). Level sampled during RESET
29	*GNDC*	S	Digital core ground of 1.8 V supply
30	*MEMDA[10]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[23]	I/O	Flash card interface unit input/output signal
31	*MEMAD[18]*	O	PNVM/SRAM address bus output
32	*GNDP*	S	Digital periphery ground of 3.3 V supply
33	*MEMDA[2]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[4]	I/O	Flash card interface unit input/output signals
34	*MEMAD[17]*	O	PNVM/SRAM address bus output
35	*MEMDA[9]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[22]	I/O	Flash card interface unit input/output signal
36	*MEMAD[7]*	O	PNVM/SRAM address bus outputs
	FCUIF[17]	O	Flash card interface unit output signal
37	*MEMDA[1]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[3]	I/O	Flash card interface unit input/output signals
38	*MEMAD[6]*	O	PNVM/SRAM address bus outputs
	FCUIF[16]	O	Flash card interface unit output signal
39	*MEMDA[8]*	I/O	PNVM/SRAM bi-directional data bus

Pin Number	Pin Functions	Direction	Description
	FCUIF[21]	I/O	Flash card interface unit input/output signal
40	*MEMAD[5]*	O	PNVM/SRAM address bus outputs
	FCUIF[15]	O	Flash card interface unit output signal
41	*VDDP*	S	3.3 V Digital periphery power supply
42	*MEMDA[0]*	I/O	PNVM/SRAM bi-directional data bus
	FCUIF[2]	O	Flash card interface unit output signal
43	*MEMAD[4]*	I/O	PNVM/SRAM address bus outputs
	FCUIF[14]	O	Flash card interface unit output signal
44	*MEMRD#*	O	PNVM/SRAM read enable (active low) output
	FCUIF[1]	I/O	Flash card interface unit input/output signal
45-46	*MEMAD[3,2]*	O	PNVM/SRAM address bus outputs
	FCUIF[13,12]	O	Flash card interface unit output signal
47	*MEMCS[0]#*	O	PNVM/SRAM chip select (active low) output
48	*MEMAD[1]*	O	PNVM/SRAM address bus outputs
	FCUIF[11]	O	Flash card interface unit output signals
	BOOTSEL[2]	I	CPU SW boot (and execute) source selection: (high, high) - For production testing; (high, low) - Flash+SRAM (for debug monitor); (low, high) - First debug UART (low, low) - Flash (low) or Level sampled during RESET
49	*MEMAD[0]*	O	PNVM/SRAM address bus outputs
	FCUIF[10]	O	Flash card interface unit output signals
	BOOTSEL[1]	I	CPU SW boot (and execute) source selection: (high, high) - For production testing; (high, low) - Flash+SRAM (for debug monitor); (low, high) - First debug UART (low, low) - Flash (low) or Level sampled during RESET
50	*GNDP*	S	Digital periphery ground of 3.3 V supply

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Pin Number	Pin Functions	Direction	Description
51	*VDD-IP*	S	3.3 V periphery reference voltage
52	*VDDP*	S	3.3 V Digital periphery power supply
53-57	*RAMADD [4,3,5,2,6]*	O	SDRAM address bus output
58	*VDDP*	S	3.3 V Digital periphery power supply
59-61	*RAMADD [1,7,0]*	O	SDRAM address bus output
62	*GNDP*	S	Digital periphery ground of 3.3 V supply
63	*RAMADD[8]*	O	SDRAM address bus output
64	*VDDC*	S	1.8 V Digital core power supply
65	*RAMADD[10]*	O	SDRAM address bus output
66	*GNDC*	S	Digital core ground of 1.8 V supply
67	*RAMADD[9]*	O	SDRAM address bus output
68	*VDDP*	S	3.3 V Digital periphery power supply
69	*RAMADD[11]*	O	SDRAM address bus output
70	*RAMCS[0]#*	O	SDRAM chip select (active low)
	RAMBA[1]	O	SDRAM bank select output
71	*RAMBA[0]*	O	SDRAM bank select output
72	*GNDP*	S	Digital periphery ground of 3.3 V supply
73	*RAMCS[1]#*	O	SDRAM chip select (active low) output
74	*RAMRAS#*	O	SDRAM row select (active low) output
75	*RAMCAS#*	O	SDRAM column select (active low) output
76	*VDDP*	S	3.3 V Digital periphery power supply
77	*RAMWE#*	O	SDRAM write enable (active low) output
78	*RAMDQM*	O	SDRAM data masking (active high) output
79	*GNDPCLK*	S	Digital ground of filtered 3.3 V supply for PCLK
80	*PCLK*	O	SDRAM clock output (same as internal processing clock)
81	*VDDPCLK*	S	3.3 V filtered digital power supply for PCLK
82	*RAMDAT[8]*	I/O	SDRAM bi-directional data bus

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Pin Number	Pin Functions	Direction	Description
83	*GNDP*	S	Digital periphery ground of 3.3 V supply
84-86	*RAMDAT [7,9,6]*	I/O	SDRAM bi-directional data bus
87	*VDDP*	S	3.3 V Digital periphery power supply
88-90	*RAMDAT [10,5,11]*	I/O	SDRAM bi-directional data bus
91	*GNDP*	S	Digital periphery ground of 3.3 V supply
92	*RAMDAT[4]*	I/O	SDRAM bi-directional data bus
93	*VDDC*	S	1.8 V Digital core power supply
94	*RAMDAT[12]*	I/O	SDRAM bi-directional data bus
95	*GNDC*	S	Digital core ground of 1.8 V supply
96	*RAMDAT[3]*	I/O	SDRAM bi-directional data bus
97	*VDDP*	S	3.3 V Digital periphery power supply
98-100	*RAMDAT [13,2,14]*	I/O	SDRAM bi-directional data bus
101	*GNDP*	S	Digital periphery ground of 3.3 V supply
102-104	*RAMDAT [1,15,0]*	I/O	SDRAM bi-directional data bus
105	*VDDP*	S	3.3 V Digital periphery power supply
106	*GPCI/O[20]*	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	CPUNMI	I	CPU non-maskable interrupt input
	SDATA[0]	I	SERVO channel sample data input for AFE by-pass
	PM[0]	O	Probe mux data output
107	*GNDP*	S	Digital periphery ground of 3.3 V supply
108	*ICGPCI/O[0]*	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the CPU
	AOUT[3]	O	Serial output of digital stereo audio

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Pin Number	Pin Functions	Direction	Description
	SDATA[1]	I	SERVO channel sample data input for AFE by-pass
	PM[1]	O	Probe mux data output
109	*IDGPCI/O[0]*	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	RAMCKE	O	Clock enable signal to the SDRAM (for power down)
	SDATA[2]	I	SERVO channel sample data input for AFE by-pass
	PM[2]	O	Probe mux data output
110	*S/PDIFOUT*	O	S/PDIF transmitter output for digital coded or reconstructed audio data
	SDATA[3]	I	SERVO channel sample data input for AFE by-pass
	PM[3]	O	Probe mux data output
111	*AOUT[2]*	O	Serial outputs of digital stereo audio
	GPCI/O[21]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	SDATA[4]	I	SERVO channel sample data inputs for AFE by-pass
	PM[4]	O	Probe mux data outputs
112	*AOUT[1]*	O	Serial outputs of digital stereo audio
	GPCI/O[22]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	PM[5]	O	Probe mux data outputs
113	*AOUT[0]*	O	Serial output of digital stereo audio
	SDATA[6]	I	SERVO channel sample data input for AFE by-pass
	PM[6]	O	Probe mux data outputs

Pin Number	Pin Functions	Direction	Description
114	*GPAI/O*	I/O	General purpose input/output, monitored/controlled by the ADP SW
	AOUT[3]	O	Serial output of digital stereo audio
	IDGPCI/O[0]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	PM[7]	O	Probe mux data output
115	*ALRCLK*	O	Digital audio left/right select output for the audio port. Square wave, at the sampling frequency. Programmable polarity
116	*ABCLK*	O	Digital audio bit-clock output. Data on AOUT and AIN is output or latched, respectively, with the rising or falling (programmable) edge of this clock
117	*GNDP-A2*	S	Digital ground of filtered 3.3 V supply for AMCLK
118	*AMCLK*	I/O	Audio Master Clock input/output. 128, 192, 256 or 384 times the sampling frequency (programmable).
119	*VDDP-A2*	S	3.3 V filtered digital power supply for AMCLK
120	*AIN*	I	Serial input of digital stereo audio
	GPCI/O[23]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	PM[8]	O	Probe mux data output
121	*GNDC*	S	Digital core ground of 1.8 V supply
122	*VSYNC#*	O	SD digital video vertical sync output signal
	HDFI	I	HD digital video field index input signal
	GPCI/O[24]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	DACTEST[9]	I	DACs test input
	PM[9]	O	Probe mux data output
123	*VDDC*	S	1.8 V Digital core power supply
124	*HSYNC#*	O	SD digital video horizontal sync output signal

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Pin Number	Pin Functions	Direction	Description
	HDHS	I	HD digital video horizontal sync input signal
	GPCI/O[25]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
125	*GNDP*	S	Digital periphery ground of 3.3 V supply
126	*VCLKx2*	O	Digital video clock output. 27.000 (for SD interlaced), 54.000 (SD progressive) or 135.000 (for HD) MHz
	COSYNC	O	Composite sync output. Active only when component analog output is selected
	ICGPCI/O[1]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the CPU
127	*VDDP*	S	3.3 V Digital periphery power supply
128	*VID[7]*	O	Digital 4:2:2 video luma/chroma output, interleaved U, Y V Y
	GPCI/O[26]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
129	*VID[6]*	O	Digital 4:2:2 video luma/chroma output, interleaved U, Y V Y
	ICGPCI/O[2]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the CPU
130	*VID[5]*	O	Digital4:2:2 video luma/chroma output, interleaved U, Y V Y
	IDGPCI/O[1]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
131	*GNDP*	S	Digital periphery ground of 3.3 V supply
132	*VID[4]*	O	Digital 4:2:2 video luma/chroma output, interleaved U, Y V Y
	GPCI/O[27]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW

Pin Number	Pin Functions	Direction	Description
133	*VID[3]*	O	Digital 4:2:2 video luma/ chroma output, interleaved U, Y V Y
	GPCI/ O[28]	I/ O	General purpose input/ output, monitored/ controlled by the CPU or DSP SW
	SERVOCLK	O	SERVO channel clock output for AFE by-pass
134	*VID[2]*	O	Digital 4:2:2 video luma/ chroma output, interleaved U, Y V Y
	GPCI/ O[29]	I/ O	General purpose input/ output, monitored/ controlled by the CPU or DSP SW
	SSEL[0]	O	SERVO channel select output for AFE by-pass
135	*VDDP*	S	3.3 V Digital periphery power supply
136	*VID[1]*	O	Digital 4:2:2 video luma/ chroma output, interleaved U, Y V Y
	GPCI/ O[30]	I/ O	General purpose input/ output, monitored/ controlled by the CPU or DSP SW
	SSEL[1]	O	SERVO channel select output for AFE by-pass
137	*VID[0]*	O	Digital 4:2:2 video luma/ chroma output, interleaved U, Y V Y
	ICGPCI/ O[3]	I/ O	General purpose input/ output, monitored/ controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the CPU
138	*GNDP*	S	Digital periphery ground of 3.3 V supply
139	*GNDA*	S	Ground plane of internal PLL circuit
140	*RESET#*	ID	Reset input (active low)
141	*VDDA*	S	1.8 V Power supply for internal PLL circuit
142	*XO*	AO	Output to a crystal that is connected to *GCLKP*. If a crystal is not used at *GCLKP*, *XO* must be left not connected
143	*GCLKP*	ID	27.000MHz clock or crystal input for main processing clock generation.
144	*GCLKA*	ID	27.000MHz clock input for audio master clock generation.
	GPCI/ O[31]	I/ O	General purpose input/ output, monitored/ controlled by the CPU or DSP SW

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Pin Number	Pin Functions	Direction	Description
	GCLKPOUT	O	*GCLKP* output
145	*VDDP*	S	3.3 V Digital periphery power supply
146	*ICGPCI/O[4]*	I/O	General purpose input/output monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the CPU
147	*S/PDIFIN[0]*	I	S/PDIF receiver inputs for digital coded or reconstructed audio data
	GPCI/O[33]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW.
148	*ICGPCI/O[4]*	I/O	General purpose input/output monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the CPU
149	*S/PDIFIN[1]*	I	S/PDIF receiver inputs for digital coded or reconstructed audio data
	GPCI/O[34]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW.
150	*IDGPCI/O[3]*	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	FCUIF[33]	I	Flash card interface unit input signal
151	*GNDP*	S	Digital periphery ground of 3.3 V supply
152	*DUPRD0*	I	First debug UART data input
	GPCI/O[35]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
153	*DUPTD0*	O	First debug UART data output
	GPCI/O[36]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
154	*VDD-IP*	S	3.3 V periphery reference voltage
155	*DUPRD1*	I	Second debug UART data output
	GPCI/O[37]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
156	*DUPTD1*	O	Second debug UART data output

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Pin Number	Pin Functions	Direction	Description
	GPCI/O[38]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
157	*GNDDACD*	S	Ground for the video DACs 3.3 V analog power supply
158	*CVBS/G/Y* (DAC A)	AO	When the Vaddis 778 outputs composite (SCART or non-SCART) video, this line is CVBS output When the Vaddis 778 outputs RGB, this line is the Green output When the Vaddis 778 outputs YUV, this line is the Y output
159	*CVBS/C/Y* (DAC D)	AO	When the other Vaddis 778 outputs are not SCART video, the output on this line can be either CVBS or C. The selection is independent of the specific selection of the other three DACs. When the Vaddis 778 outputs composite SCART video, this line is the Y output
160	*VDDDAC*	S	3.3 V Analog power supply for the video DACs
161	*Y/R/V/C* (DAC B)	AO	When the Vaddis 778 outputs composite non-SCART video, this line is Y output When the Vaddis 778 outputs RGB, this line is the Red output When the Vaddis 778 outputs YUV, this line is the V output When the Vaddis 778 outputs composite SCART video, this line is the C output
162	*C/B/U* (DAC C)	AO	When the Vaddis 778 outputs composite (SCART or non-SCART) video, this line is C output When the Vaddis 778 outputs RGB, this line is the Blue output When the Vaddis 778 outputs YUV, this line is the U output
163	*RSET*	AI	Resistive load for gain adjustment of the DACs

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Pin Number	Pin Functions	Direction	Description
164	*GNDDACP*	S	Ground for the video DACs 3.3 V analog power supply
165	*GNDDABS2*	S	Common Ground for the video and SERVO DACs
166	*GNDDACPS*	S	Grounds for the SERVO DAC 3.3 V analog power
167	*DACDRIVE[0]*	AO	Drive DACs output signal
168	*VDDDACS*	S	3.3 V SERVO DACs power supply
169	*DACDRIVE[1]*	AO	Drive DACs output signal
170	*GNDDACDS*	S	Grounds for the SERVO DAC 3.3 V analog power supply
171	*VDDAFERF*	S	3.3 V Analog RF (AFE) power supply
172	*RFINP*	AI	RF positive input signal (differential input) / / RF input signal (single ended)
173	*RFINN*	AI	RF negative input signal (differential input) / / RF reference input signal
174	*GNDAFERF*	S	Analog RF (AFE) ground of 3.3 V supply
175	*VDDAFES*	S	3.3 V Analog SERVO (AFE) power supply
176	*ADCIN[7]*	AI	SERVO ADC input signal (e.g. from RF amplifier)
177	*ADCIN[6]*	AI	SERVO ADC input signal from RF amplifier
178-183	*ADCIN[5-0]*	AI	SERVO ADC input signals (e.g. from RF amplifier)
184,185	*VBIASS[0,1]*	AI	Servo analog signal reference voltage inputs
186	*GNDAFES*	S	Analog SERVO (AFE) ground of 3.3 V supply
187	*PWMACT[0]*	O	PWM0 output signal
	GPCI/O[39]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP or FCU SW
	DVDDAT[0]	I	AV data input for FE by-pass
	NRZDATA	I	NRZ data input for AFE and DRC by-pass
188	*PWMACT[1]*	O	PWM1 output signal

Pin Number	Pin Functions	Direction	Description
	GPCI/O[40]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP or FCU SW
	DVDDAT[1]	I	AV data input for FE by-pass
	NRZCLK	I	NRZ clock input for AFE and DRC by-pass
189	*PWMCO[0]*	O	PWM2 output signal
	GPCI/O[41]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	DVDDAT[2]	I	AV data input for FE by-pass
	NRZLOCK	I	NRZ lock input for AFE and DRC by-pass
190	*GNDC*	S	Digital core ground of 1.8 V supply
191	*PWMCO[1]*	O	PWM3 output signal
	GPCI/O[42]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	DVDDAT[3]	I	AV data input for FE by-pass
	NRZDFCT	I	NRZ defect input for AFE and DRC by-pass
192	*VDDC*	S	1.8 V Digital core power supply
193	*PWMCO[2]*	O	PWM4 output signal
	GPCI/O[43]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	FCUIF[34]	O	Flash card interface unit input signal
	DVDDAT[4]	I	AV data inputs for FE by-pass
194	*PWMCO[3]*	O	PWM5 output signal
	GPCI/O[44]]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	FCUIF[35]	I/O	Flash card interface unit input/output signal
	IDGPCI/O[2]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	DVDDAT[5]	I	AV data inputs for FE by-pass
195	*GNDPWMS*	S	SERVO PWMs ground of 3.3 V supply
196	*PWMCO[4]*	O	PWM6 output signal

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Pin Number	Pin Functions	Direction	Description
	GPCI/O[45]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	DVDDAT[6]	I	AV data input for FE by-pass
197	*VDDPWMS*	S	3.3 V SERVO PWM power supply
198	*PWMCO[5]*	O	PWM7 output signal
	GPCI/O[46]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW
	FCUIF[36]	I/O	Flash card interface unit input/output signal
	DVDDAT[7]	I	AV data inputs for FE by-pass
199	*PWMCO[6]*	O	PWM8 output signal
	IDGPCI/O[4]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	FCUIF[32]	I/O	Flash card interface unit input/output signal
	DVDSTRB	I	AV data input for FE by-pass
	RFDAT[4]	I	RF channel sample data inputs for AFE by-pass
200	*DEFECT*	I/O	Disc defect input or output signal
	IDGPCI/O[5]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	FCUIF[37]	I/O	Flash card interface unit input/output signal
	DVDREQ	O	AV data request output for FE by-pass. Programmable polarity
201	*ICGPCI/O[6]*	I/O	General purpose input/output, monitored/controlled by the CPU or DSP or FCU SW. When input, the pin can be used as general purpose external interrupt to the CPU
	DVDVALID	I	AV data valid input for FE by-pass. Programmable polarity
202	*GNDP*	S	Digital periphery ground of 3.3 V supply

Pin Number	Pin Functions	Direction	Description
203	*ICGPCI/O[7]*	I/O	General purpose input/output, monitored/controlled by the CPU or DSP or FCU SW. When input, the pin can be used as general purpose external interrupt to the CPU
	DVDERR	I	AV error input for FE by-pass. Programmable polarity
204	*VDDP*	S	3.3 V Digital periphery power supply
205	*SLEDPULSE*	I	Sled optical encoder input
	IDGPCI/O[6]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	FCUIF[30]	I	Flash card interface unit output signal
	DVDSOS	I	AV start of sector indication input for FE by-pass. Programmable polarity
206	*SPINDLE-PULSE*	I	Spindle optical encoder input
	IDGPCI/O[7]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW. When input, the pin can be used as general purpose external interrupt to the DSP
	FCUIF[31]	I/O	Flash card interface unit input/output signal
207	*SSCCLK*	I/O	SSC clock input signal
	GPCI/O[47]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP or FCU SW
208	*SSCTXD*	O	SSC data output signal
	GPCI/O[16]	I/O	General purpose input/output, monitored/controlled by the CPU or DSP SW

3.2 Signal Status During RESET and After RESET

Only I, I/O and O type pins are mentioned in this section.

In the following table, the status of the pins signals during RESET and just after RESET are specified.

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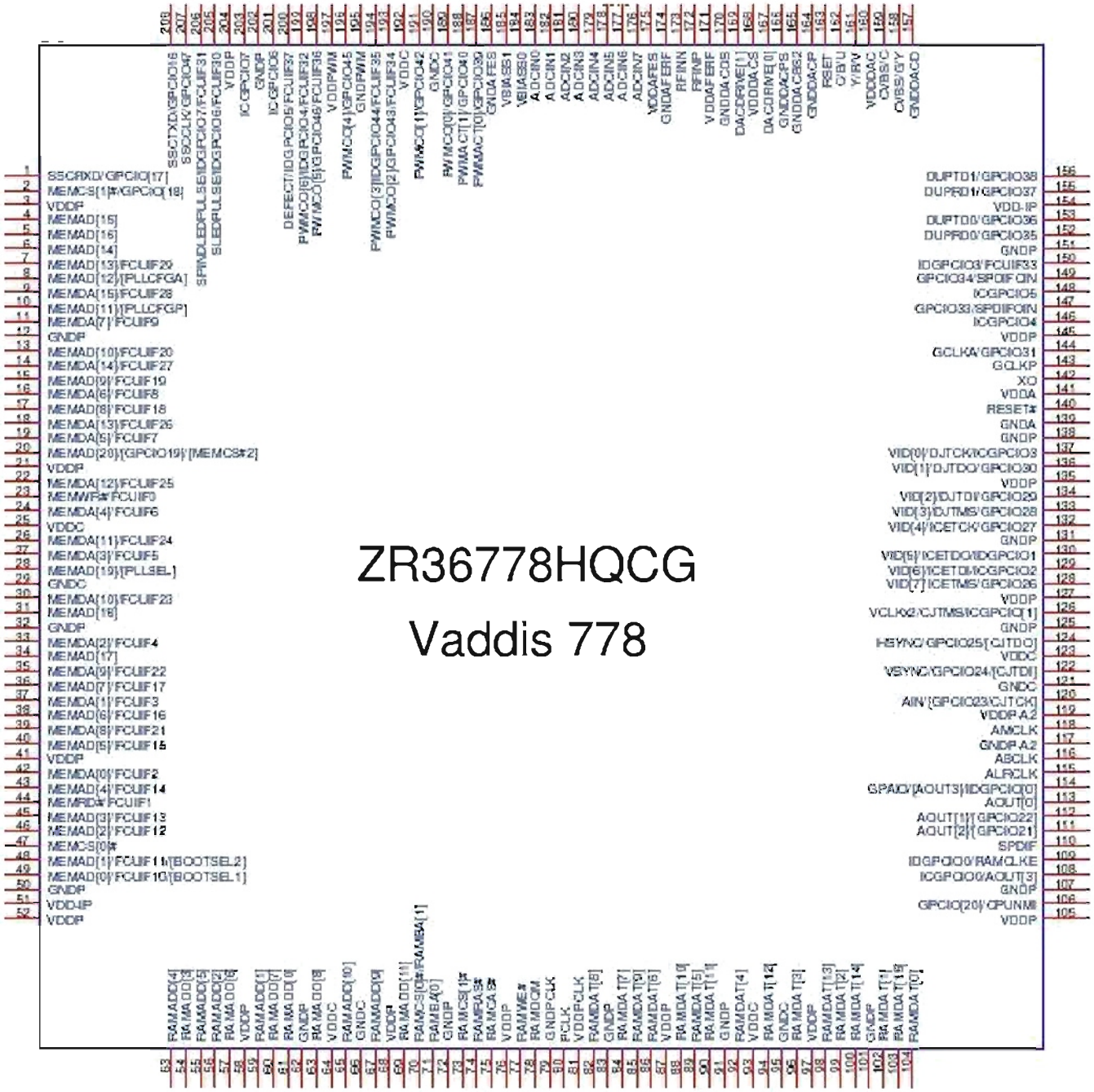
9 Package information

ZR36778HQCG is a green package



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Data Sheet

ZR36721

HD*Xtreme*®

HD up-scaling and HDMI transmitter processor

Version 1.2
25 July 2004

ZORAN Proprietary

ZORAN Corporation, 1390 Kifer Road, Sunnyvale, CA 94086-5305
Phone (408) 523-6500 Fax (408) 523-6501

1 Product brief

1.1 Introduction

HDMI is the emerging digital interface for audio and video consumer products. It enables the next generation of DVD players to digitally transfer the highest quality video and audio to HDMI equipped high definition televisions. As a companion to the high-performance Vaddis 7 DVD solution, Zoran's HDXtreme processor upscales standard definition digital video and digital images to high definition resolution, which can then be displayed on HDTV / VGA monitors using the built-in HDMI/ DVI interface or the analog video output. The HDXtreme, when used with the Vaddis 778, enables decoded JPEG images to be shown at the display's native high definition resolution. The output can be digital via HDMI or analog via the DACs. Digital video or digital images are received from the Vaddis V778, in YUV, 4:2:2, 8 bits, progressive 480p and 576p, with embedded sync signals in a CCIR656-like protocol. HDXtreme introduces upscaling that adapts to all HDTV modes, including 720p (1280 pixels X 720 lines, progressive) and 1080i (1920 pixels X 1080 lines, interlaced). HDXtreme supports the progressive frame rate and the interlaced field rate: 59.94Hz, 50Hz, and color space conversion from standard definition YUV to high definition YUV and RGB.

1.2 Features

- Enables cost optimized Vaddis DVD system with HDMI/DVI interface
- No external SDRAM or CPU required
- Zoran proprietary adaptive high definition upscaler for 1080i, 720p and other resolutions
- JPEGXtreme™ feature displays JPEG at native resolution
- HDMI v1.0 standard compliant
- High-bandwidth Digital Content Protection (HDCP) r1.1 encryption support
- RGB or YPbPr component analog output via three High Definition video DACs
- Supports sidebars, wide-screen or anamorphic scaling from 4:3 inputs to 16:9 outputs
- Supports DDC and CEC via Vaddis IC
- Simultaneous HDMI digital and analog outputs
- Simultaneous Progressive HD video out from HDXtreme™ and SD interlaced video out from Vaddis
- 0.7W typical power consumption
- Power management for optimum system power consumption
- 80-pin PQFP Package

2.1 Block Diagram

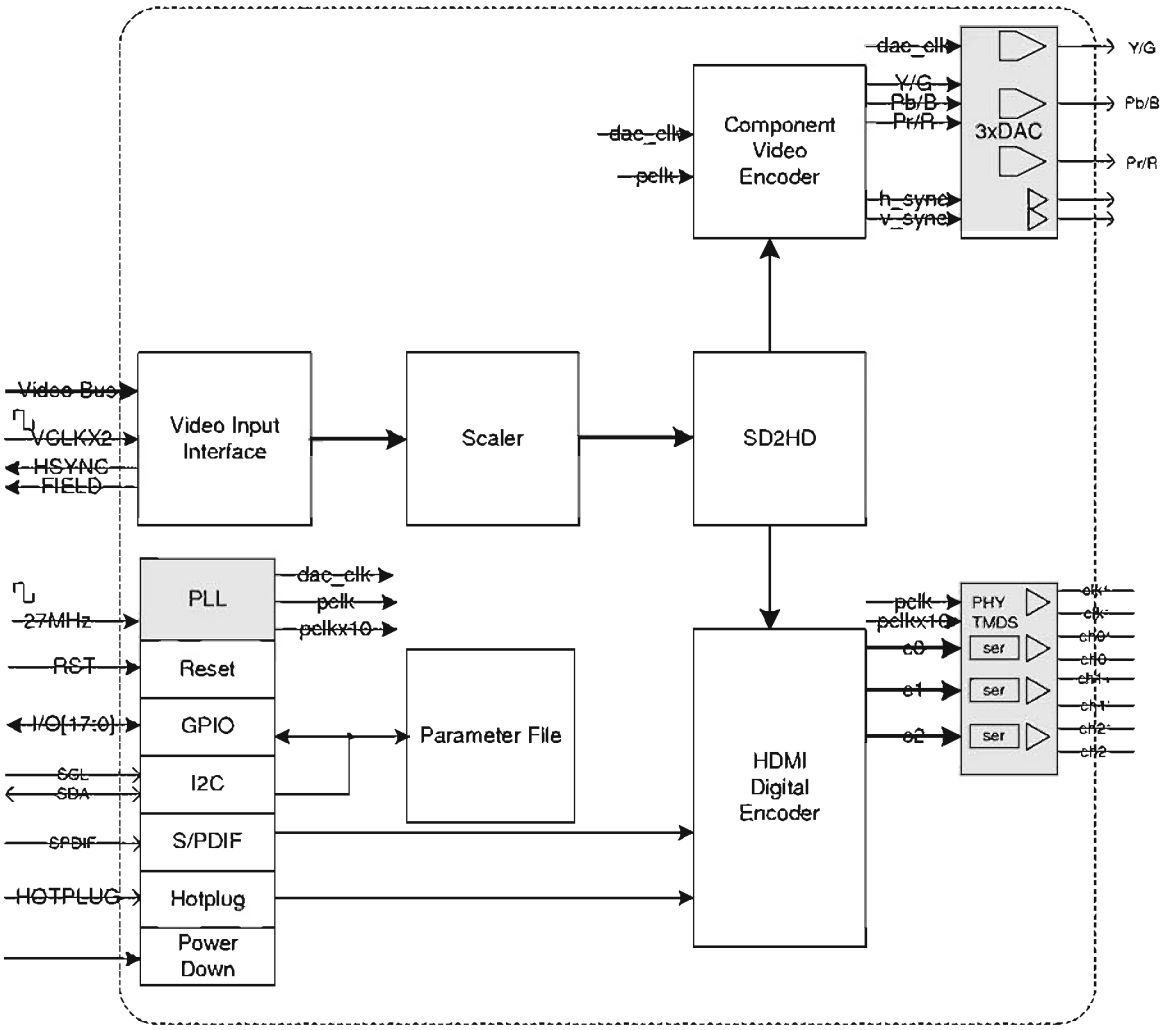
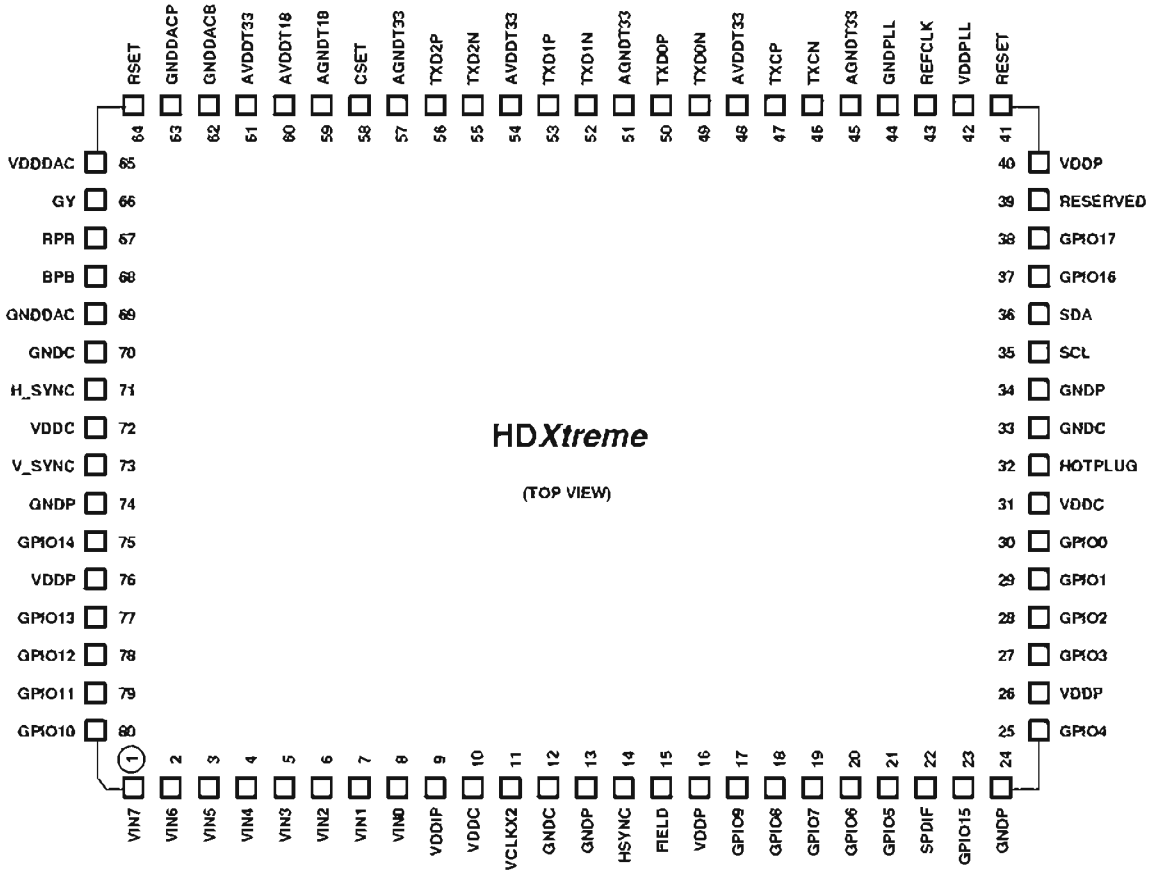


Figure 1 . Block Diagram

3 PIN DIAGRAM



4 PIN DESCRIPTION

Table 7. Pin Description

Pin Name	Pin #	Type	Description
			Digital Pins
VIN[7:0]	8-1	I	Video data bus. Video and control data are multiplexed on this bus in accordance to the c656 format.
VCLKX2	11	I	Video data bus clock (54MHz or 135MHz).
HSYNC/ I2CCFG2/ PD	14	I/O	1. Horizontal sync output control while in master mode. 2. I2C address select (bit 6) input. The value read on this pin is latched in during RESET# active. 3. Power down control input. While in ready for power down (see programming reference), a high value driven on this pin will activate the power down mode (see functional description).
FIELD/ I2CCFG1	15	I/O	1. Vertical sync output control while in master mode. 2. I2C address select (bit 4) input. The value read on this pin is latched in during RESET# active.
GPIO[17:0]	38,37,23 75,77-80 17-21,25 27-30	I/O	General-purpose input/output pins.
SPDIF/ I2CCFG0	22	I	1. Audio input serial interface – SPDIF format 2. I2C address select (bit 4) input. The value read on this pin is latched in during RESET# active.
HOTPLUG	32	I	Input used to monitor the "Hotplug" detect signal. This input is 5V tolerant.
SCL	35	I	I2C compatible clock input. This pin requires a pullup resistor connected to VDDP.
SDA	36	I/O	I2C compatible bidirectional data line. This pin requires a pullup resistor connected to VDDP.
RESERVED	39	I	This pin is reserved and must be left unconnected.
RESET#	41	I	General asynchronous reset, active low.
REFCLK	43	I	27MHz reference clock input.

H_SYNC	71	O	Horizontal sync output control that drive the display monitor (see VESA Standard)
V_SYNC	73	O	Vertical sync output control that drive the display monitor (see VESA Standard)
Differential Signal Pins			
TXCP	47	O	Differential driver output clock
TXCN	46		
TXD0P	50	O	Channel – 0 differential driver output data
TXD0N	49		
TXD1P	53	O	Channel – 1 differential driver output data
TXD1N	52		
TXD2P	56	O	Channel – 2 differential driver output data
TXD2N	55		
CSET	58	I	Current setting. This pin requires a pull down resistor connected to AGNDT33. The value of this resistor will control the amplitude of the differential output voltage swing. Typical 390 Ohms.

Pin Name	Pin #	Type	Description
Analog Video Pins			
G/Y	66	O	Analog green or Y output. Capable of driving 37 Ohms load.
R/PR	67	O	Analog red or PR output. Capable of driving 37 Ohms load.
B/PB	68	O	Analog blue or PB output. Capable of driving 37 Ohms load.
AVDDT33	61	I	Differential drivers power supply (3.3V – nominal). See HD*Xtreme* Design Considerations Application Note.
RSET	64	I	Full-scale adjust. This pin requires a pull down resistor connected to GNDDAC. The value of this resistor will control the full-scale current drive on each of the analog outputs.
Power and Ground Pins			
VDDIP	9		Digital high-speed I/O power supply (3.3V – nominal).
VDDP	16,26,40,76		Digital I/O power supply (3.3V – nominal).
GNDP	13,24,34,74		Digital I/O ground.

VDDC	10,31,72		Digital core power supply (1.8V – nominal).
GNDC	12,33,70		Digital core ground.
VDDPLL	42		PLL power supply (3.3V – nominal).
GNDPLL	44		PLL ground.
AVDDT33	48,54		Differential drivers power supply (3.3V – nominal).
AGNDT33	45,51,57		Differential drivers ground.
AVDDT18	60		High-speed serialize power supply (1.8V – nominal).
AGNDT18	59		High-speed serialize ground.
GNDDACB	62		Internal bandgap ground
GNDDACP	63		Current control ground
AVDDDAC	65		DAC power supply (3.3V – nominal)
GNDDAC	69		DAC ground (3.3V – nominal)

5 ELECTRICAL SPECIFICATIONS

5.1 ABSOLUTE MAXIMUM RATINGS

Storage Temperature	-65^0 to 150^0	C
VDDP, VDDIP, AVDDT33, VDDDAC Supply Voltage to Ground	-0.5 to 4.6	V
VDDC, VDDPLL, AVDDT18 Supply Voltage to Ground	-0.5 to 3.6	V
DC Voltage Applied to Outputs in High Impedance Output State at all pins but VIN[7:0]	-0.5 to 5.5	V
DC Voltage Applied to Outputs in High Impedance Output State at VIN[7:0]	-0.5 to 5.5	V
DC Voltage Applied to Digital Inputs at all pins but the VIN[7:0]	-0.5 to 5.5	V
DC Voltage Applied to Digital Inputs at all pins but the VIN[7:0]	-0.5 to 3.6	V
DC Input Current, any single input	-10 to 3.0	mA
DC Output Current, any single output apart form DACs	20	mA
Total Power Dissipation (P_{TOT})	2	W
ESD Voltage	2.0	kV

TITLE	DOCUMENT NO.	REV.
ZR36707TQCG Electrical Specification		1.0
	PAGE 1 OF 44	

ZORAN CORPORATION

ZR36707TQCG

DVD 16x Analog Front-end IC

Electrical Specification

Revision 1.0 June 29, 2004

Print Date: September 15, 2004

TITLE	DOCUMENT NO.	REV.
ZR36707TQCG Electrical Specification		1.0
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1.1.1 Features (continued)

Channel
- 100MHz bandwidth
- Supports individual RF inputs for DVD(differential or single_ended) and CD(single_ended)
- Supports internal summing mode for RF signal for DVD and CD respectively
- Programmable attenuator (min:-24dB, 4bit resolution)
- Fast attack mode for rapid AGC recovery
- Low drift AGC hold circuitry
- Signal Swing qualification circuit
- Temperature compensated, exponential control AGC
- Supports internal AGC HOLD control function
- Supports four ranges of Programmable cutoff frequency : 1 to 4.0MHz, 3.5 to 12MHz, 11 to 36MHz, 30 to 72MHz
- Programmable boost/equalization of 0 to 11dB
- Single-ended normal outputs for pulse qualification
- Differential normal signal outputs
- ± 20% Fc accuracy (Fc = 1 to 12 MHz)
- ± 15% Fc accuracy (Fc = 11 to 72 MHz)
- Less than 2% total harmonic distortion
- No external filter components required

Auto Laser Power Control
- Supports power mode selection
- Provides dual APC circuits for twin laser

VC reference voltage
- Supports VC (VPB/2) reference voltage output for internal and external circuits
- Supports V125(V25/2, reference voltage output) for internal servo output reference voltage

TITLE
ZR36707TQCG Electrical Specification

DOCUMENT NO. REV. 1.0

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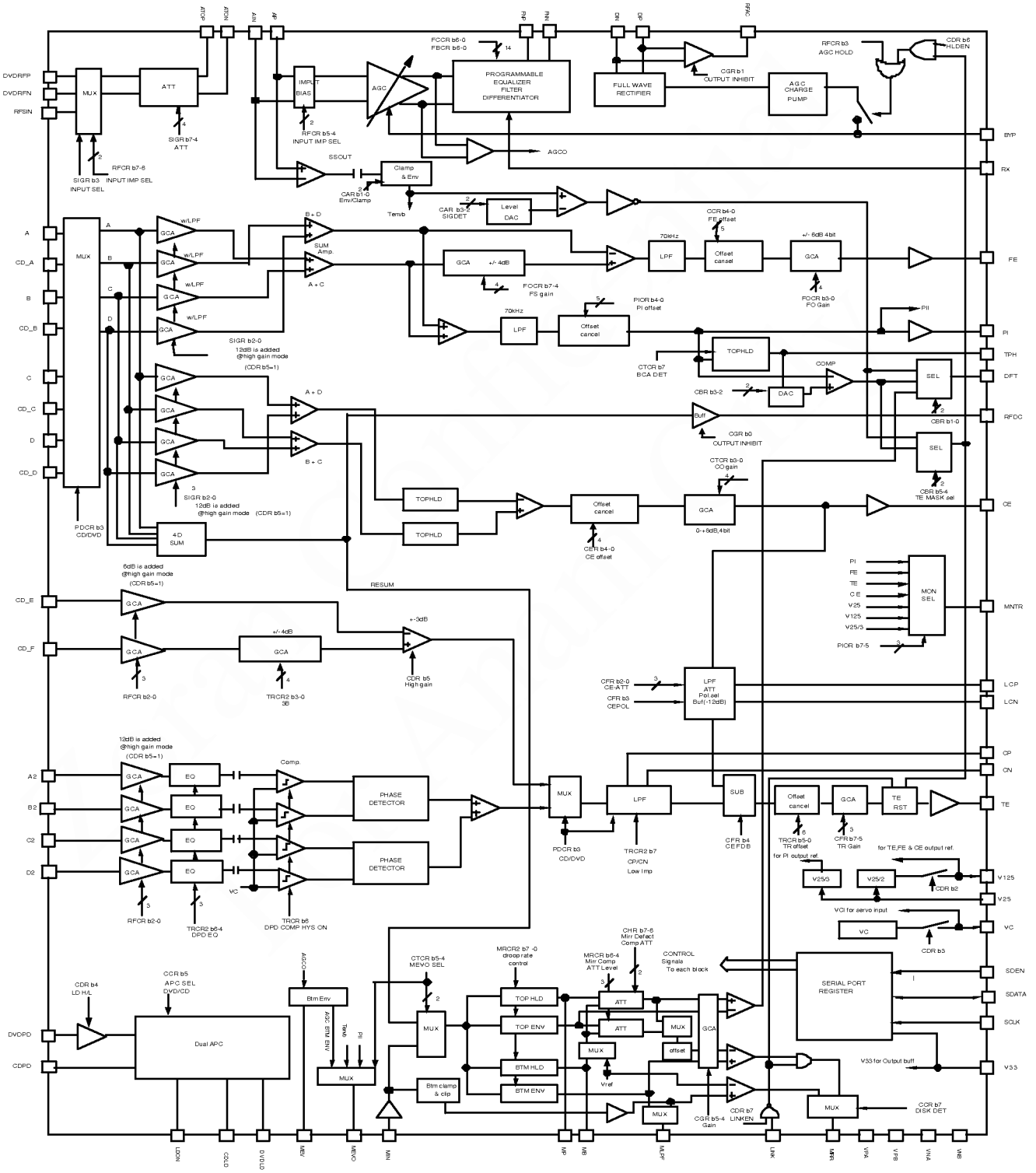
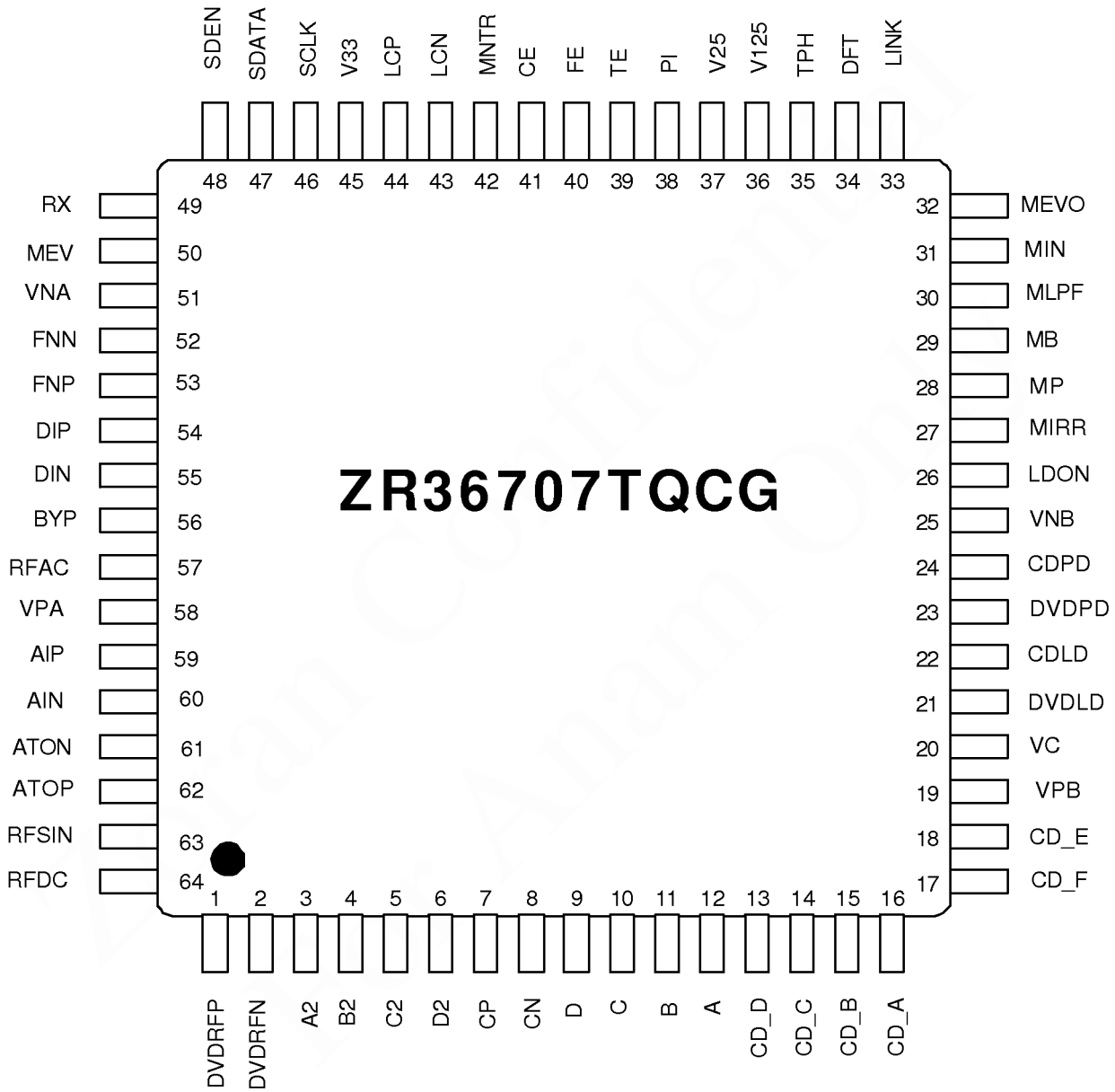
1.1.2 Block Diagram(Figure 1)



TITLE	DOCUMENT NO.	REV.
ZR36707TQCG Electrical Specification		1.0
	PAGE 44 OF 44	

PACKAGE PIN DESIGNATIONS
(Top view)



CIRRUS LOGIC®

CS4382

114 dB, 192 kHz 8-Channel D/A Converter

Features

- 24-Bit Conversion
- Up to 192 kHz Sample Rates
- 114 dB Dynamic Range
- -100 dB THD+N
- Supports PCM and DSD Data Formats
- Selectable Digital Filters
- Volume Control with Soft Ramp
  - 1 dB Step Size
  - Zero Crossing Click-Free Transitions
- Dedicated DSD inputs
- Low Clock Jitter Sensitivity
- Simultaneous Support for Two Synchronous Sample Rates for DVD Audio
- µC or Stand-Alone Operation

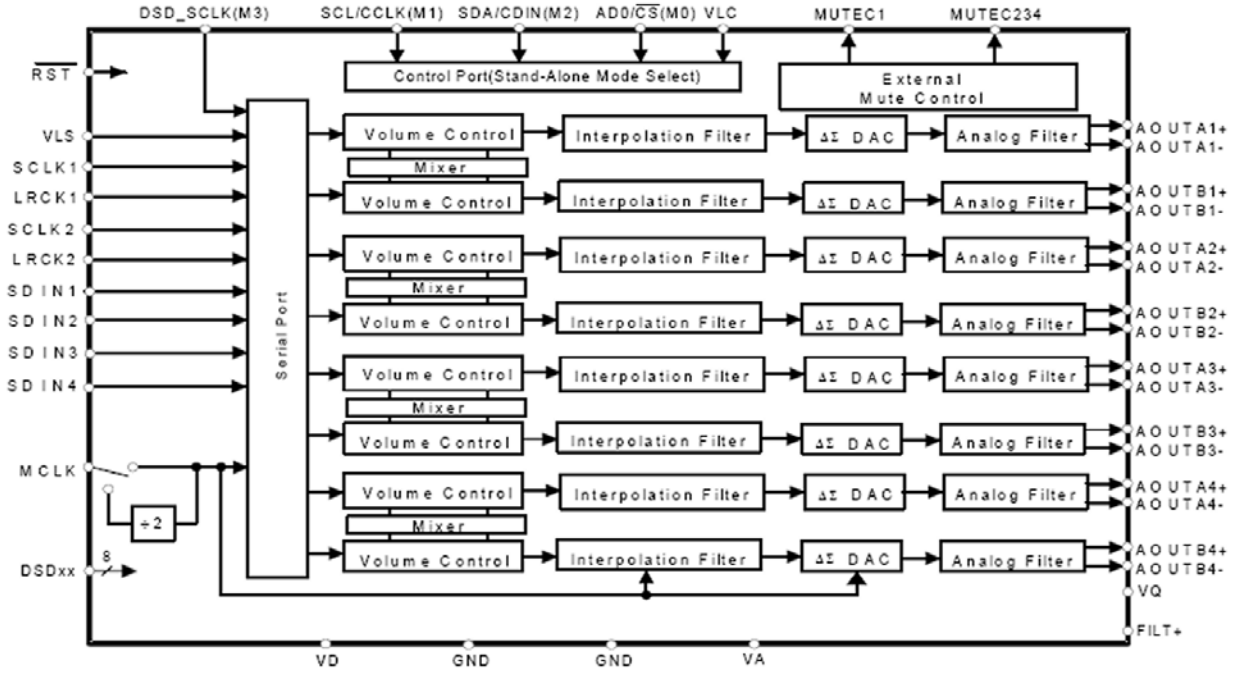
Description

The CS4382 is a complete 8-channel digital-to-analog system including digital interpolation, fifth-order delta-sigma digital-to-analog conversion, digital de-emphasis, volume control and analog filtering. The advantages of this architecture include: ideal differential linearity, no distortion mechanisms due to resistor matching errors, no linearity drift over time and temperature and a high tolerance to clock jitter.

The CS4382 accepts PCM data at sample rates from 4 kHz to 192 kHz, DSD audio data, and operates over a wide power supply range. These features are ideal for multi-channel audio systems including DVD players, SACD players, A/V receivers, digital TV's and VCR's, mixing consoles, effects processors, set-top boxes, and automotive audio systems.

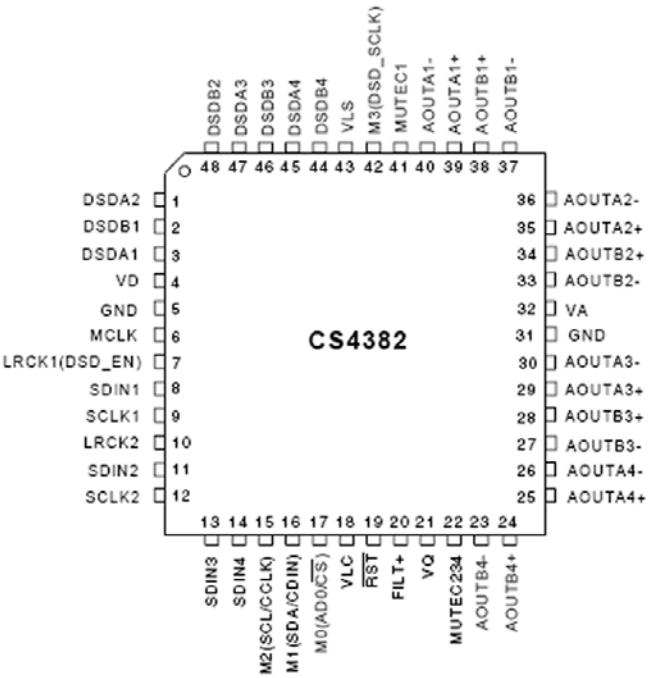
ORDERING INFORMATION

CS4382-KQZ, Lead Free	-10 to 70 °C	48-pin LQFP
CS4382-BQ	-40 to 85 °C	48-pin LQFP
CDB4382		Evaluation Board



Preliminary Product Information | This document contains information for a new product. Cirrus Logic reserves the right to modify this product without notice.

4. PIN DESCRIPTION



Pin Name	#	Pin Description
VD	4	**Digital Power** (*Input*) - Positive power supply for the digital section. Refer to the Recommended Operating Conditions for appropriate voltages.
GND	5 31	**Ground** (*Input*) - Ground reference. Should be connected to analog ground.
MCLK	6	**Master Clock** (*Input*) - Clock source for the delta-sigma modulator and digital filters. Table 5 illustrates several standard audio sample rates and the required master clock frequency.
LRCK1 LRCK2	7 10	**Left Right Clock** (*Input*) - Determines which channel, Left or Right, is currently active on the serial audio data line. The frequency of the left/right clock must be at the audio sample rate, Fs.
SDIN1 SDIN2 SDIN3 SDIN4	8 11 13 14	**Serial Audio Data Input** (*Input*) - Input for two's complement serial audio data.
SCLK1 SCLK2	9 12	**Serial Clock** (*Input*) - Serial clock for the serial audio interface.
VLC	18	**Control Port Power** (*Input*) - Determines the required signal level for the control port. Refer to the Recommended Operating Conditions for appropriate voltages.
$\overline{\text{RST}}$	19	**Reset** (*Input*) - The device enters a low power mode and all internal registers are reset to their default settings when low.
FILT+	20	**Positive Voltage Reference** (*Output*) - Positive reference voltage for the internal sampling circuits. Requires the capacitive decoupling to analog ground, as shown in the Typical Connection Diagram.
VQ	21	**Quiescent Voltage** (*Output*) - Filter connection for internal quiescent voltage. VQ must be capacitively coupled to analog ground, as shown in the Typical Connection Diagram. The nominal voltage level is specified in the Analog Characteristics and Specifications section. VQ presents an appreciable source impedance and any current drawn from this pin will alter device performance. However, VQ can be used to bias the analog circuitry assuming there is no AC signal component and the DC current is less than the maximum specified in the Analog Characteristics and Specifications section.

Pin Name	#	Pin Description
MUTEC1 **MUTEC234**	41 22	**Mute Control** (*Output*) - The Mute Control pins go high during power-up initialization, reset, muting, power-down or if the master clock to left/right clock frequency ratio is incorrect. These pins are intended to be used as a control for external mute circuits to prevent the clicks and pops that can occur in any single supply system. The use of external mute circuits are not mandatory but may be desired for designs requiring the absolute minimum in extraneous clicks and pops.
AOUTA1 +,- **AOUTB1 +,-** **AOUTA2 +,-** **AOUTB2 +,-** **AOUTA3 +,-** **AOUTB3 +,-** **AOUTA4 +,-** **AOUTB4 +,-**	39, 40 38, 37 35, 36 34, 33 29, 30 28, 27 25, 26 24, 23	**Differential Analog Output** (*Output*) - The full scale differential analog output level is specified in the Analog Characteristics specification table.
VA	32	**Analog Power** (*Input*) **-** Positive power supply for the analog section. Refer to the Recommended Operating Conditions for appropriate voltages.
VLS	43	**Serial Audio Interface Power** (*Input*) **-** Determines the required signal level for the serial audio interface. Refer to the Recommended Operating Conditions for appropriate voltages.
Control Port Definitions		
SCL/CCLK	15	**Serial Control Port Clock** (*Input*) - Serial clock for the serial control port. Requires an external pull-up resistor to the logic interface voltage in I^2C mode as shown in the Typical Connection Diagram.
SDA/CDIN	16	**Serial Control Data** (*Input/Output*) - SDA is a data I/O line in I^2C mode and requires an external pull-up resistor to the logic interface voltage, as shown in the Typical Connection Diagram. CDIN is the input data line for the control port interface in SPI mode.
AD0/$\overline{CS}$	17	**Address Bit 0 (I^2C) / Control Port Chip Select (SPI)** (*Input*) - AD0 is a chip address pin in I^2C mode; $\overline{CS}$ is the chip select signal for SPI format.
Stand-Alone Definitions		
M0 **M1** **M2** **M3**	17 16 15 42	**Mode Selection** (*Input*) - Determines the operational mode of the device as detailed in Tables 6 and 7.
DSD Definitions		
DSD_SCLK	42	**DSD Serial Clock** (*Input*) - Serial clock for the Direct Stream Digital audio interface.
DSD_EN	7	**DSD-Enable** *(Input)* - When held at logic '1' the device will enter DSD mode (Stand-Alone mode only).
DSDA1 **DSDB1** **DSDA2** **DSDB2** **DSDA3** **DSDB3** **DSDA4** **DSDB4**	3 2 1 48 47 46 45 44	**Direct Stream Digital Input** (*Input*) - Input for Direct Stream Digital serial audio data.

ESMT **M12L64164A**

SDRAM 1M x 16 Bit x 4 Banks Synchronous DRAM

FEATURES

- JEDEC standard 3.3V power supply
- LVTTL compatible with multiplexed address
- Four banks operation
- MRS cycle with address key programs
  - CAS Latency (2 & 3)
  - Burst Length (1, 2, 4, 8 & full page)
  - Burst Type (Sequential & Interleave)
- All inputs are sampled at the positive going edge of the system clock
- DQM for masking
- Auto & self refresh
- 64ms refresh period (4K cycle)

ORDERING INFORMATION

54 Pin TSOP (Type II)
(400mil x 875mil)

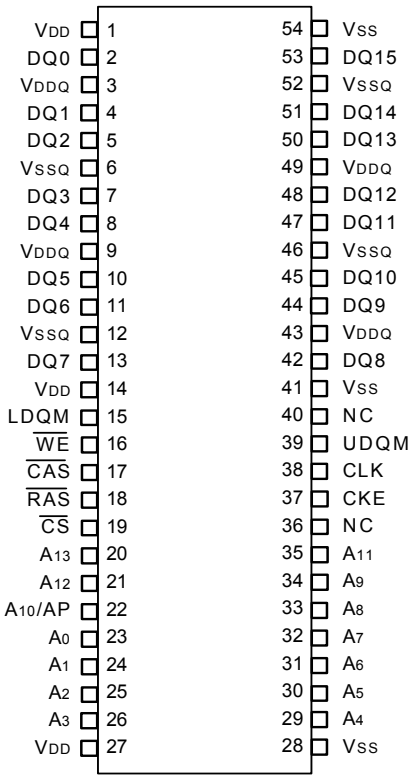
PRODUCT NO.	MAX FREQ.	PACKAGE
M12L64164A-6T	166MHz	TSOP II
M12L64164A-7T	143MHz	

GENERAL DESCRIPTION

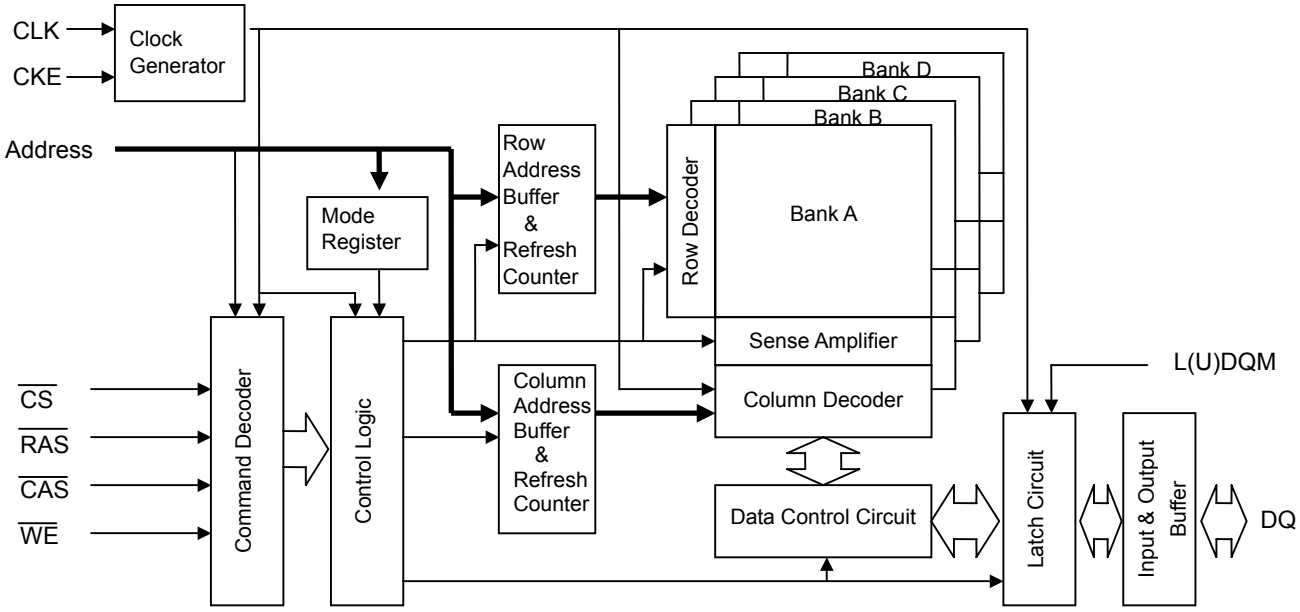
The M12L64164A is 67,108,864 bits synchronous high data rate Dynamic RAM organized as 4 x 1,048,576 words by 16 bits. Synchronous design allows precise cycle controls with the use of system clock I/O transactions are possible on every clock cycle. Range of operating frequencies, programmable burst length and programmable latencies allow the same device to be useful for a variety of high bandwidth, high performance memory system applications.

PIN ASSIGNMENT

Top View



FUNCTIONAL BLOCK DIAGRAM



PIN FUNCTION DESCRIPTION

PIN	NAME	INPUT FUNCTION
CLK	System Clock	Active on the positive going edge to sample all inputs
$\overline{CS}$	Chip Select	Disables or enables device operation by masking or enabling all inputs except CLK , CKE and L(U)DQM
CKE	Clock Enable	Masks system clock to freeze operation from the next clock cycle. CKE should be enabled at least one cycle prior new command. Disable input buffers for power down in standby.
A0 ~ A11	Address	Row / column address are multiplexed on the same pins. Row address : RA0~RA11, column address : CA0~CA7
A12 , A13	Bank Select Address	Selects bank to be activated during row address latch time. Selects bank for read / write during column address latch time.
$\overline{RAS}$	Row Address Strobe	Latches row addresses on the positive going edge of the CLK with $\overline{RAS}$ low. Enables row access & precharge.
$\overline{CAS}$	Column Address Strobe	Latches column address on the positive going edge of the CLK with $\overline{CAS}$ low. Enables column access.
$\overline{WE}$	Write Enable	Enables write operation and row precharge. Latches data in starting from $\overline{CAS}$, $\overline{WE}$ active.
L(U)DQM	Data Input / Output Mask	Makes data output Hi-Z, t_{SHZ} after the clock and masks the output. Blocks data input when L(U)DQM active.
DQ0 ~ DQ15	Data Input / Output	Data inputs / outputs are multiplexed on the same pins.
VDD / VSS	Power Supply / Ground	Power and ground for the input buffers and the core logic.
VDDQ / VSSQ	Data Output Power / Ground	Isolated power supply and ground for the output buffers to provide improved noise immunity.
NC	No Connection	This pin is recommended to be left No Connection on the device.

DEVICE OPERATIONS

CLOCK (CLK)

The clock input is used as the reference for all SDRAM operations. All operations are synchronized to the positive going edge of the clock. The clock transitions must be monotonic between V_{IL} and V_{IH}. During operation with CKE high all inputs are assumed to be in valid state (low or high) for the duration of setup and hold time around positive edge of the clock for proper functionality and Icc specifications.

CLOCK ENABLE(CKE)

The clock enable (CKE) gates the clock onto SDRAM. If CKE goes low synchronously with clock (set-up and hold time same as other inputs), the internal clock suspended from the next clock cycle and the state of output and burst address is frozen as long as the CKE remains low. All other inputs are ignored from the next clock cycle after CKE goes low. When all banks are in the idle state and CKE goes low synchronously with clock, the SDRAM enters the power down mode from the next clock cycle. The SDRAM remains in the power down mode ignoring the other inputs as long as CKE remains low. The power down exit is synchronous as the internal clock is suspended. When CKE goes high at least "1CLK + t_{SS}" before the high going edge of the clock, then the SDRAM becomes active from the same clock edge accepting all the input commands.

BANK ADDRESSES (A13~A12)

This SDRAM is organized as four independent banks of 1,048,576 words x 16 bits memory arrays. The A13~A12 inputs are latched at the time of assertion of $\overline{RAS}$ and $\overline{CAS}$ to select the bank to be used for the operation. The banks addressed A13~A12 are latched at bank active, read, write, mode register set and precharge operations.

ADDRESS INPUTS (A0~A11)

The 20 address bits are required to decode the 1,048,576 word locations are multiplexed into 12 address input pins (A0~A11). The 12 row addresses are latched along with $\overline{RAS}$ and A13~A12 during bank active command. The 8 bit column addresses are latched along with $\overline{CAS}$, $\overline{WE}$ and A13~A12 during read or with command.

NOP and DEVICE DESELECT

When $\overline{RAS}$, $\overline{CAS}$ and $\overline{WE}$ are high, The SDRAM performs no operation (NOP). NOP does not initiate any new operation, but is needed to complete operations which require more than single clock cycle like bank activate, burst read, auto refresh, etc. The device deselect is also a NOP and is entered by asserting $\overline{CS}$ high. $\overline{CS}$ high disables the command decoder so that $\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$ and all the address inputs are ignored.

POWER-UP

1. Apply power and start clock, Attempt to maintain CKE = "H", DQM = "H" and the other pins are NOP condition at the inputs.
2. Maintain stable power, stable clock and NOP input condition for minimum of 200us.
3. Issue precharge commands for both banks of the devices.
4. Issue 2 or more auto-refresh commands.
5. Issue a mode register set command to initialize the mode register.
   cf.) Sequence of 4 & 5 is regardless of the order.

   The device is now ready for normal operation.

MODE REGISTER SET (MRS)

The mode register stores the data for controlling the various operating modes of SDRAM. It programs the CAS latency, burst type, burst length, test mode and various vendor specific options to make SDRAM useful for variety of different applications. The default value of the mode register is not defined, therefore the mode register must be written after power up to operate the SDRAM. The mode register is written by asserting low on $\overline{CS}$, $\overline{RAS}$, $\overline{CAS}$ and $\overline{WE}$ (The SDRAM should be in active mode with CKE already high prior to writing the mode register). The state of address pins A0~A11 and A13~A12 in the same cycle as $\overline{CS}$, $\overline{RAS}$, $\overline{CAS}$ and $\overline{WE}$ going low is the data written in the mode register. Two clock cycles is required to complete the write in the mode register. The mode register contents can be changed using the same command and clock cycle requirements during operation as long as all banks are in the idle state. The mode register is divided into various fields into depending on functionality. The burst length field uses A0~A2, burst type uses A3, CAS latency (read latency from column address) use A4~A6, vendor specific options or test mode use A7~A8, A10/AP~A11 and A13~A12. The write burst length is programmed using A9. A7~A8, A10/AP~A11 and A13~A12 must be set to low for normal SDRAM operation. Refer to the table for specific codes for various burst length, burst type and CAS latencies.

DEVICE OPERATIONS (Continued)

BANK ACTIVATE

The bank activate command is used to select a random row in an idle bank. By asserting low on $\overline{RAS}$ and $\overline{CS}$ with desired row and bank address, a row access is initiated. The read or write operation can occur after a time delay of $t_{RCD\ (min)}$ from the time of bank activation. t_{RCD} is the internal timing parameter of SDRAM, therefore it is dependent on operating clock frequency. The minimum number of clock cycles required between bank activate and read or write command should be calculated by dividing $t_{RCD\ (min)}$ with cycle time of the clock and then rounding of the result to the next higher integer. The SDRAM has four internal banks in the same chip and shares part of the internal circuitry to reduce chip area, therefore it restricts the activation of four banks simultaneously. Also the noise generated during sensing of each bank of SDRAM is high requiring some time for power supplies to recover before another bank can be sensed reliably. $t_{RRD\ (min)}$ specifies the minimum time required between activating different bank. The number of clock cycles required between different bank activation must be calculated similar to t_{RCD} specification. The minimum time required for the bank to be active to initiate sensing and restoring the complete row of dynamic cells is determined by $t_{RAS\ (min)}$. Every SDRAM bank activate command must satisfy $t_{RAS\ (min)}$ specification before a precharge command to that active bank can be asserted. The maximum time any bank can be in the active state is determined by $t_{RAS\ (max)}$ and $t_{RAS\ (max)}$ can be calculated similar to t_{RCD} specification.

BURST READ

The burst read command is used to access burst of data on consecutive clock cycles from an active row in an active bank. The burst read command is issued by asserting low on $\overline{CS}$ and $\overline{RAS}$ with $\overline{WE}$ being high on the positive edge of the clock. The bank must be active for at least $t_{RCD\ (min)}$ before the burst read command is issued. The first output appears in CAS latency number of clock cycles after the issue of burst read command. The burst length, burst sequence and latency from the burst read command is determined by the mode register which is already programmed. The burst read can be initiated on any column address of the active row. The address wraps around if the initial address does not start from a boundary such that number of outputs from each I/O are equal to the burst length programmed in the mode register. The output goes into high-impedance at the end of burst, unless a new burst read was initiated to keep the data output gapless. The burst read can be terminated by issuing another burst read or burst write in the same bank or the other active bank or a precharge command to the same bank. The burst stop command is valid at every page burst length.

BURST WRITE

The burst write command is similar to burst read command and is used to write data into the SDRAM on consecutive clock cycles in adjacent addresses depending on burst length and burst sequence. By asserting low on $\overline{CS}$, $\overline{CAS}$ and $\overline{WE}$ with valid column address, a write burst is initiated. The data inputs are provided for the initial address in the same clock cycle as the burst write command. The input buffer is deselected at the end of the burst length, even though the internal writing can be completed yet. The writing can be complete by issuing a burst read and DQM for blocking data inputs or burst write in the same or another active bank. The burst stop command is valid at every burst length. The write burst can also be terminated by using DQM for blocking data and procreating the bank t_{RDL} after the last data input to be written into the active row. See DQM OPERATION also.

DQM OPERATION

The DQM is used mask input and output operations. It works similar to $\overline{OE}$ during operation and inhibits writing during write operation. The read latency is two cycles from DQM and zero cycle for write, which means DQM masking occurs two cycles later in read cycle and occurs in the same cycle during write cycle. DQM operation is synchronous with the clock. The DQM signal is important during burst interrupts of write with read or precharge in the SDRAM. Due to asynchronous nature of the internal write, the DQM operation is critical to avoid unwanted or incomplete writes when the complete burst write is required. Please refer to DQM timing diagram also.

PRECHARGE

The precharge is performed on an active bank by asserting low on clock cycles required between bank activate and clock cycles required between bank activate and $\overline{CS}$, $\overline{RAS}$, $\overline{WE}$ and A10/AP with valid A13~A12 of the bank to be procharged. The precharge command can be asserted anytime after $t_{RAS\ (min)}$ is satisfy from the bank active command in the desired bank. t_{RP} is defined as the minimum number of clock cycles required to complete row precharge is calculated by dividing tRP with clock cycle time and rounding up to the next higher integer. Care should be taken to make sure that burst write is completed or DQM is used to inhibit writing before precharge command is asserted. The maximum time any bank can be active is specified by $t_{RAS\ (max)}$. Therefore, each bank activate command. At the end of precharge, the bank enters the idle state and is ready to be activated again. Entry to power-down, Auto refresh, Self refresh and Mode register set etc. is possible only when all banks are in idle state.

DEVICE OPERATIONS (Continued)

AUTO PRECHARGE

The precharge operation can also be performed by using auto precharge. The SDRAM internally generates the timing to satisfy $t_{RAS\ (min)}$ and "t_{RP}" for the programmed burst length and CAS latency. The auto precharge command is issued at the same time as burst write by asserting high on A10/AP, the bank is precharge command is asserted. Once auto precharge command is given, no new commands are possible to that particular bank until the bank achieves idle state.

BOTH BANKS PRECHARGE

Both banks can be precharged at the same time by using Precharge all command. Asserting low on $\overline{CS}$, $\overline{RAS}$, and $\overline{WE}$ with high on A10/AP after all banks have satisfied $t_{RAS\ (min)}$ requirement, performs precharge on all banks. At the end of t_{RP} after performing precharge all, all banks are in idle state.

AUTO REFRESH

The storage cells of SDRAM need to be refreshed every 64ms to maintain data. An auto refresh cycle accomplishes refresh of a single row of storage cells. The internal counter increments automatically on every auto refresh cycle to refresh all the rows. An auto refresh command is issued by asserting low on $\overline{CS}$, $\overline{RAS}$ and $\overline{CAS}$ with high on CKE and $\overline{WE}$. The auto refresh command can only be asserted with both banks being in idle state and the device is not in power down mode (CKE is high in the previous cycle). The time required to complete the auto refresh operation is specified by $t_{RFC\ (min)}$. The minimum number of clock cycles required can be calculated by driving t_{RFC} with clock cycle time and them rounding up to the next higher integer. The auto refresh command must be followed by NOP's until the auto refresh operation is completed. The auto refresh is the preferred refresh mode when the SDRAM is being used for normal data transactions. The auto refresh cycle can be performed once in 15.6us or the burst of 4096 auto refresh cycles in 64ms.

SELF REFRESH

The self refresh is another refresh mode available in the SDRAM. The self refresh is the preferred refresh mode for data retention and low power operation of SDRAM. In self refresh mode, the SDRAM disables the internal clock and all the input buffers except CKE. The refresh addressing and timing is internally generated to reduce power consumption. The self refresh mode is entered from all banks idle state by asserting low on $\overline{CS}$, $\overline{RAS}$, $\overline{CAS}$ and CKE with high on $\overline{WE}$. Once the self refresh mode is entered, only CKE state being low matters, all the other inputs including clock are ignored to remain in the refresh.
The self refresh is exited by restarting the external clock and then asserting high on CKE. This must be followed by NOP's for a minimum time of t_{RFC} before the SDRAM reaches idle state to begin normal operation. If the system uses burst auto refresh during normal operation, it is recommended to use burst 4096 auto refresh cycles immediately after exiting self refresh.

TOSHIBA TC74HCT7007AP/AF

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

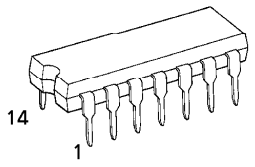
TC74HCT7007AP, TC74HCT7007AF

HEX BUFFER

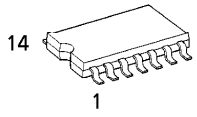
The TC74HCT7007A is a high speed CMOS BUFFER fabricated with silicon gate C^2MOS technology.
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.
The internal circuit is composed of 4 stages including a buffer output, which provides high noise immunity and stable output.
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES:

- High Speed ..... t_{pd} = 11ns(typ.) at V_{CC} = 5V
- Low Power Dissipation ..... I_{CC} = 1μA(Max.) at Ta = 25°C
- Compatible with TTL outputs .... V_{IH} = 2V (Min.)
  V_{IL} = 0.8V (Max.)
- Wide Interfacing ability ..... LSTTL, NMOS, CMOS
- Output Drive Capability ..... 10 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL}$ = 4mA(Min.)
- Balanced Propagation Delays ..... $t_{pLH} \simeq t_{pHL}$
- Pin and Function Compatible with 74LS07

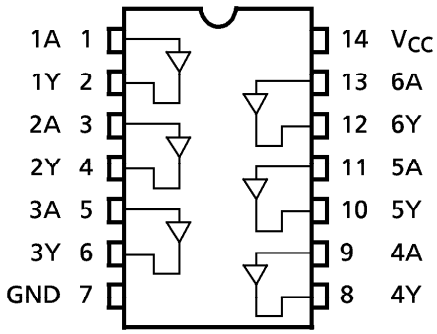


P (DIP14-P-300-2.54)
Weight : 0.96g (Typ.)



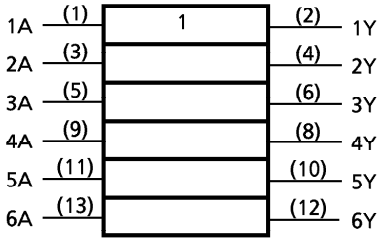
F (SOP14-P-300-1.27)
Weight : 0.18g (Typ.)

PIN ASSIGNMENT



(TOP VIEW)

IEC LOGIC SYMBOL



PIN ASSIGNMENT

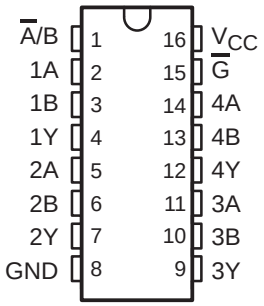
A	Y
L	L
H	H

SN74LVC157A
QUADRUPLE 2-LINE TO 1-LINE DATA SELECTOR/MULTIPLEXER

SCAS292G – JANUARY 1993 – REVISED OCTOBER 1998

- ***EPIC***™ **(Enhanced-Performance Implanted CMOS) Submicron Process**
- **Typical V_{OLP} (Output Ground Bounce) < 0.8 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Typical V_{OHV} (Output V_{OH} Undershoot) > 2 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Inputs Accept Voltages to 5.5 V**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages**

D, DB, OR PW PACKAGE
(TOP VIEW)



description

This quadruple 2-line to 1-line data selector/multiplexer is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74LVC157A features a common strobe ($\overline{G}$) input. When the strobe is high, all outputs are low. When the strobe is low, a 4-bit word is selected from one of two sources and is routed to the four outputs. The device provides true data.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

The SN74LVC157A is characterized for operation from –40°C to 85°C.

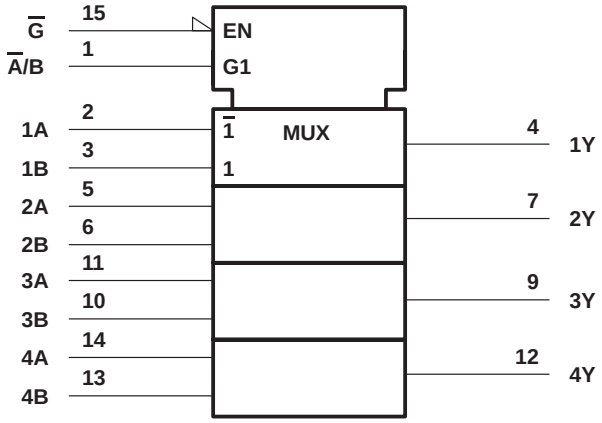
FUNCTION TABLE

INPUTS				OUTPUT
$\overline{G}$	$\overline{A}$/B	A	B	Y
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

SN74LVC157A
QUADRUPLE 2-LINE TO 1-LINE DATA SELECTOR/MULTIPLEXER

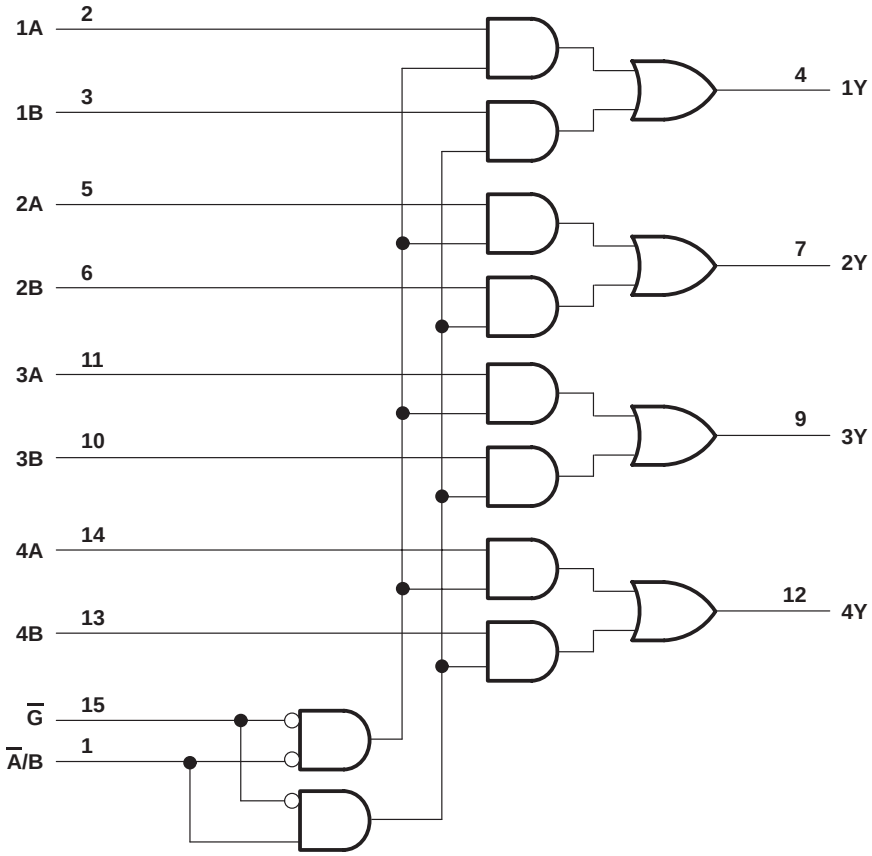
SCAS292G – JANUARY 1993 – REVISED OCTOBER 1998

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



FAIRCHILD SEMICONDUCTOR®

November 1992
Revised February 2005

74VHC04
Hex Inverter

General Description

The VHC04 is an advanced high speed CMOS Inverter fabricated with silicon gate CMOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output. An input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Features

- High Speed: t_{PD} = 3.8 ns (typ) at V_{CC} = 5V
- High noise immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min)
- Power down protection is provided on all inputs
- Low Noise: V_{OLP} = 0.4V (typ)
- Low power dissipation: I_{CC} = 2 μA (Max) @ T_A = 25°C
- Pin and function compatible with 74HC04

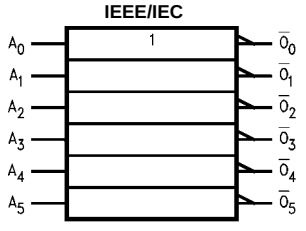
Ordering Code:

Order Number	Package Number	Package Description
74VHC04M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC04MX_NL (Note 1)	M14A	Pb-Free 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC04SJ	M14D	Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHC04MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC04MTCX_NL (Note 1)	MTC14	Pb-Free 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC04N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

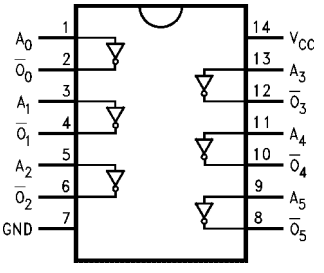
Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.
Pb-Free package per JEDEC J-STD-020B.

Note 1: "_NL" indicates Pb-Free package (per JEDEC J-STD-020B). Device available in Tape and Reel only.

Logic Symbol



Connection Diagram



Pin Descriptions

Pin Names	Description
A_n	Inputs
$\overline{O}_n$	Outputs

Truth Table

A	$\overline{O}$
L	H
H	L

5-channel BTL Driver for DVD player AM5888S

The AM5888S is a five-channel BTL driver IC for driving the motors and actuators such as used in DVD player and consists of two independent precision voltage regulators with adjustable range from 1.5V to 4 V. It supports a variety of applications. Also, Pb free package is selectable (Please refer to Marking Identification).

● Applications

BTL driver for CD, CD-ROM and DVD.

● Features

1) Two channels are voltage-type BTL drivers for actuators of tracking and focus. Two channels are voltage-type BTL driver for sled and spindle motors. It is also built-in one channel bi-direction DC motor driver for tray.
2) Wide dynamic range [9.0V (*typ.*) when Vcc1= Vcc2= 12V, at R_L= 20Ω load].
3) Separating power of Vcc1 and Vcc2 is to improve power efficiency by a low supply voltage for tracking, focus, and spindle.
4) Level shift circuit built-in.
5) Thermal shut down circuit built-in.
6) Mute mode built-in.
7) **Dual actuator drivers:**
   A general purpose input OP provides differential input for signal addition. The output structure is two power OPAMPS in bridge configuration.
8) **Sled motor driver:**
   A general purpose input OP provides differential input for signal addition. The output structure is one power OPAMP in bridge configuration.
9) **Spindle driver:**
   Single input linear BTL driver. The output structure are two power OPAMPS in bridge configuration.
10) **Tray in-out driver:**
    The DC motor driver supports forward/reverse control for tray motor.
11) 2 **Built-in regulator controllers**
    Adjustable range 1.5V ~ 4V

● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	Vcc1 Vcc2	13.5	V
Power dissipation	P_d	*1.7	W
Operate Temp range	T_{opr}	-35 ~ +85	℃
Storage Temp range	T_{stg}	**-55 ~ +150	℃

*When mounted on a 70mm×70mm×1.6mm glass epoxy board.

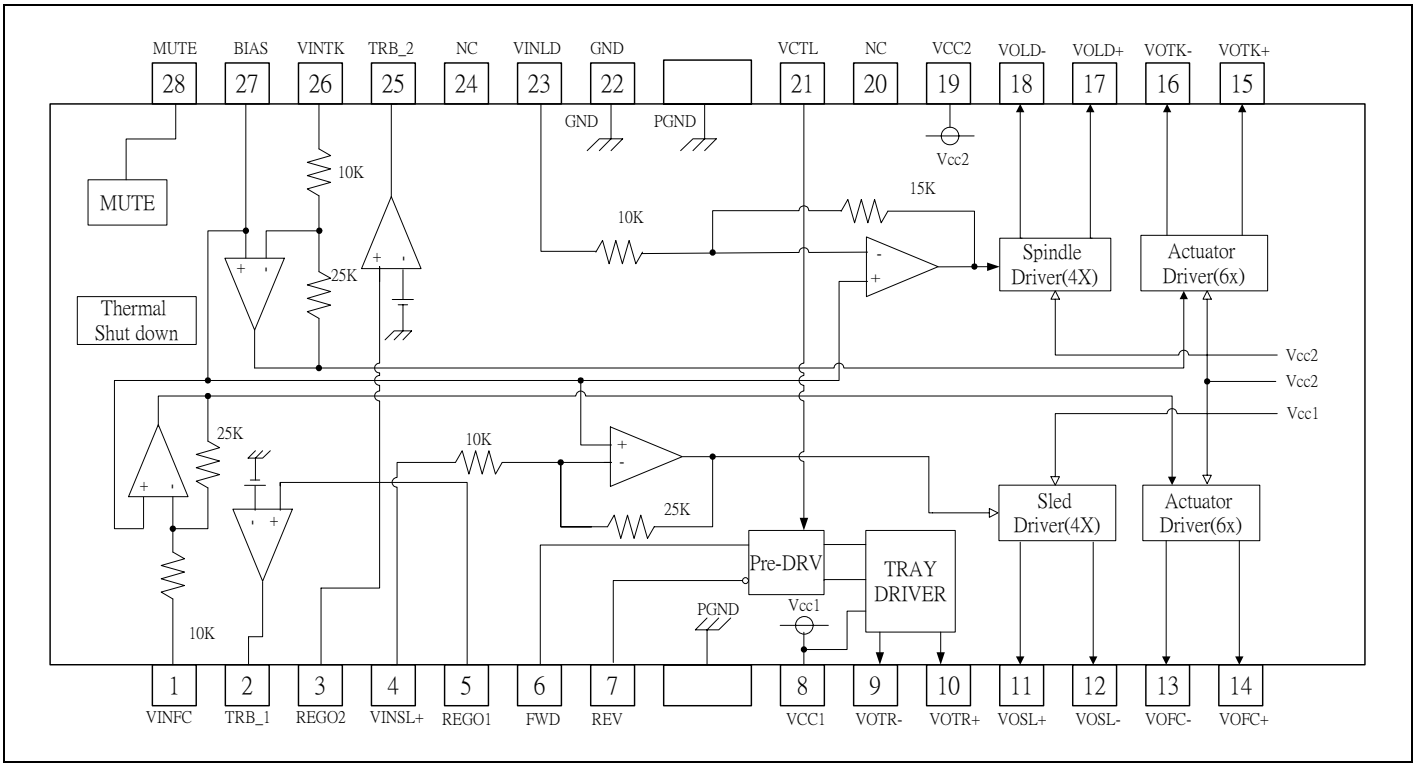
*Reduced by 13.6mW for each increase in T_a of 1℃ over 25℃.

**Should not exceed Pd or ASO and T_j=150℃ values

● Guaranteed operating conditions (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	Vcc1	4.3 ~ 13.2	V
	Vcc2	4.3 ~ Vcc1	V

● Block diagram



● Pin description

PIN No	Pin Name	Function
1	VINFC	Input for focus driver
2	TRB_1	Connect to external transistor base
3	REGO2	Regulator voltage output, connect to external transistor collector
4	VINSL+	Input for the sled driver
5	REGO1	Regulator voltage output, connect to external transistor collector
6	FWD	Tray driver forward input
7	REV	Tray driver reverse input
8	Vcc1	Vcc for pre-drive block and power block of sled and tray
9	VOTR-	Tray driver output (-)
10	VOTR+	Tray driver output (+)
11	VOSL+	Sled driver output (+)
12	VOSL-	Sled driver output (-)
13	VOFC-	Focus driver output (-)
14	VOFC+	Focus driver output (+)
15	VOTK+	Tracking driver output (+)
16	VOTK-	Tracking driver output (-)
17	VOLD+	Spindle driver output (+)
18	VOLD-	Spindle driver output (-)
19	Vcc2	Vcc for power block of spindle, tracking and focus
20	NC	No Connection
21	VCTL	Speed control input of tray driver
22	GND	Ground
23	VINLD	Input for spindle driver
24	NC	No Connection
25	TRB_2	Connect to external transistor base
26	VINTK	Input for tracking driver
27	BIAS	Input for reference voltage
28	MUTE	Input for mute control

Notes) Symbol of + and – (output of drivers) means polarity to input pin.
(For example, if voltage of pin1 is high, pin14 is high.)

Features

- **Medium-voltage and Standard-voltage Operation**
  - **5.0 (V_{CC} = 4.5V to 5.5V)**
  - **2.7 (V_{CC} = 2.7V to 5.5V)**
- **Automotive Temperature Range –40°C to 125°C**
- **Internally Organized 128 x 8 (1K), 256 x 8 (2K), 512 x 8 (4K), 1024 x 8 (8K) or 2048 x 8 (16K)**
- **Two-wire Serial Interface**
- **Schmitt Trigger, Filtered Inputs for Noise Suppression**
- **Bidirectional Data Transfer Protocol**
- **400 kHz (2.7V) Compatibility**
- **Write Protect Pin for Hardware Data Protection**
- **8-byte Page (1K, 2K), 16-byte Page (4K, 8K, 16K) Write Modes**
- **Partial Page Writes are Allowed**
- **Self-timed Write Cycle (5 ms max)**
- **High-reliability**
  - **Endurance: 1 Million Write Cycles**
  - **Data Retention: 100 Years**
- **8-lead PDIP, 8-lead JEDEC SOIC, and 8-lead TSSOP Packages**

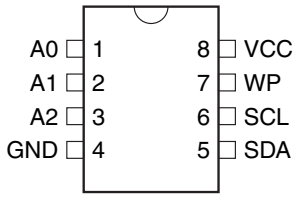
Description

The AT24C01A/02/04/08A/16A provides 1024/2048/4096/8192/16384 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 128/256/512/1024/2048 words of 8 bits each. The device is optimized for use in many automotive applications where low-power and low-voltage operation are essential. The AT24C01A/02/04/08A/16A is available in space-saving 8-lead PDIP, 8-lead JEDEC SOIC, and 8-lead TSSOP packages and is accessed via a two-wire serial interface. In addition, the entire family is available in 2.7V (2.7V to 5.5V) versions.

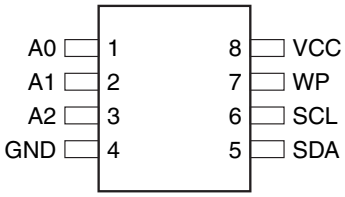
Table 1. Pin Configurations

Pin Name	Function
A0 – A2	Address Inputs
SDA	Serial Data
SCL	Serial Clock Input
WP	Write Protect
NC	No Connect

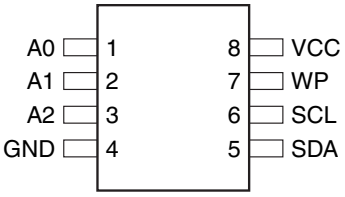
8-lead PDIP



8-lead SOIC



8-lead TSSOP



Two-wire Automotive Temperature Serial EEPROM

1K (128 x 8)

2K (256 x 8)

4K (512 x 8)

8K (1024 x 8)

16K (2048 x 8)

AT24C01A
AT24C02
AT24C04
AT24C08A
AT24C16A

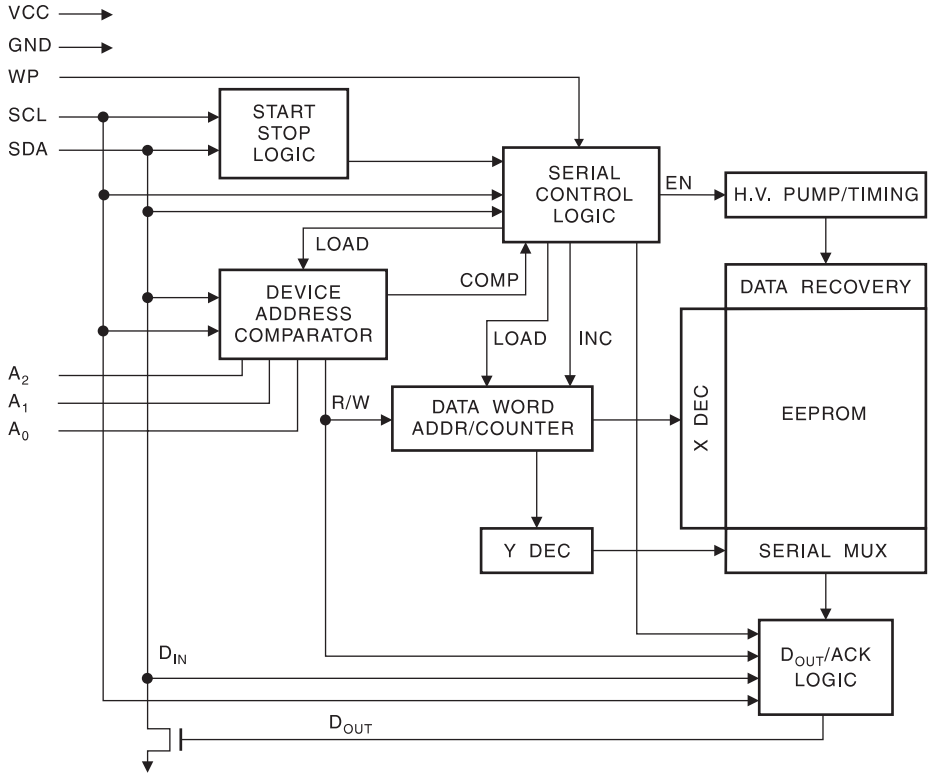
5092B–SEEPR–9/05

Absolute Maximum Ratings

Operating Temperature	–55°C to +125°C
Storage Temperature	–65°C to +150°C
Voltage on Any Pin with Respect to Ground	–1.0V to +7.0V
Maximum Operating Voltage	6.25V
DC Output Current	5.0 mA

*NOTICE: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Figure 1. Block Diagram



Pin Description

SERIAL CLOCK (SCL): The SCL input is used to positive edge clock data into each EEPROM device and negative edge clock data out of each device.

SERIAL DATA (SDA): The SDA pin is bi-directional for serial data transfer. This pin is open-drain driven and may be wire-ORed with any number of other open-drain or open-collector devices.

DEVICE/PAGE ADDRESSES (A2, A1, A0): The A2, A1 and A0 pins are device address inputs that are hard wired for the AT24C01A and the AT24C02. As many as eight 1K/2K devices may be addressed on a single bus system (device addressing is discussed in detail under the Device Addressing section).

The AT24C04 uses the A2 and A1 inputs for hard wire addressing and a total of four 4K devices may be addressed on a single bus system. The A0 pin is a no connect.

AT24C01A/02/04/08A/16A

The AT24C08A only uses the A2 input for hardwire addressing and a total of two 8K devices may be addressed on a single bus system. The A0 and A1 pins are no connects.

The AT24C16A does not use the device address pins, which limits the number of devices on a single bus to one. The A0, A1 and A2 pins are no connects.

WRITE PROTECT (WP): The AT24C01A/02/04/08A/16A has a Write Protect pin that provides hardware data protection. The Write Protect pin allows normal read/write operations when connected to ground (GND). When the Write Protect pin is connected to V_{CC}, the write protection feature is enabled and operates as shown in the following table.

Table 2. Write Protect

WP Pin Status	Part of the Array Protected				
	24C01A	24C02	24C04	24C08A	24C16A
At V_{CC}	Full (1K) Array	Full (2K) Array	Full (4K) Array	Full (8K) Array	Full (16K) Array
At GND	Normal Read/Write Operations				

Memory Organization

AT24C01A, 1K SERIAL EEPROM: Internally organized with 16 pages of 8 bytes each, the 1K requires a 7-bit data word address for random word addressing.

AT24C02, 2K SERIAL EEPROM: Internally organized with 32 pages of 8 bytes each, the 2K requires an 8-bit data word address for random word addressing.

AT24C04, 4K SERIAL EEPROM: Internally organized with 32 pages of 16 bytes each, the 4K requires a 9-bit data word address for random word addressing.

AT24C08A, 8K SERIAL EEPROM: Internally organized with 64 pages of 16 bytes each, the 8K requires a 10-bit data word address for random word addressing.

AT24C16A, 16K SERIAL EEPROM: Internally organized with 128 pages of 16 bytes each, the 16K requires an 11-bit data word address for random word addressing.

AT24C01A/02/04/08A/16A

Table 5. AC Characteristics

Applicable over recommended operating range from T_A = –40°C to +125°C, V_{CC} = +2.7V to +5.5V, CL = 1 TTL Gate and 100 pF (unless otherwise noted)

Symbol	Parameter	AT24C01A/02/04/08A/16A		Units
		Min	Max	
f_{SCL}	Clock Frequency, SCL		400	kHz
t_{LOW}	Clock Pulse Width Low	1.2		µs
t_{HIGH}	Clock Pulse Width High	0.6		µs
t_I	Noise Suppression Time(1)		50	ns
t_{AA}	Clock Low to Data Out Valid	0.1	0.9	µs
t_{BUF}	Time the bus must be free before a new transmission can start(2)	1.2		µs
$t_{HD.STA}$	Start Hold Time	0.6		µs
$t_{SU.STA}$	Start Set-up Time	0.6		µs
$t_{HD.DAT}$	Data In Hold Time	0		µs
$t_{SU.DAT}$	Data In Set-up Time	100		ns
t_R	Inputs Rise Time(2)		300	ns
t_F	Inputs Fall Time(2)		300	ns
$t_{SU.STO}$	Stop Set-up Time	0.6		µs
t_{DH}	Data Out Hold Time	50		ns
t_{WR}	Write Cycle Time		5	ms
Endurance(2)	5.0V, 25°C, Page Mode	1M		Write Cycles

Note: 1. This parameter is characterized and is not 100% tested (T_A = 25°C).
2. This parameter is characterized.

Device Operation

CLOCK and DATA TRANSITIONS: The SDA pin is normally pulled high with an external device. Data on the SDA pin may change only during SCL low time periods (see to Figure 4 on page 7). Data changes during SCL high periods will indicate a start or stop condition as defined below.

START CONDITION: A high-to-low transition of SDA with SCL high is a start condition which must precede any other command (see to Figure 5 on page 7).

STOP CONDITION: A low-to-high transition of SDA with SCL high is a stop condition. After a read sequence, the stop command will place the EEPROM in a standby power mode (see Figure 5 on page 7).

ACKNOWLEDGE: All addresses and data words are serially transmitted to and from the EEPROM in 8-bit words. The EEPROM sends a “0” to acknowledge that it has received each word. This happens during the ninth clock cycle.

STANDBY MODE: The AT24C01A/02/04/08A/16A features a low-power standby mode which is enabled: (a) upon power-up and (b) after the receipt of the STOP bit and the completion of any internal operations.

BH7862FS

Multimedia ICs

High-performance 6-channel video driver IC for progressive DVD

BH7862FS

BH7862FS is a 6-channel video driver IC developed for progressive DVD player/recorder. Special filters adjusted to each band of various video signals are incorporated into a single chip. Extended definition, size reduction, and high cost performance can be achieved in DVD players.

●Application

DVD players, DVD recorders

●Features

1) Each high-performance filter, 6dB amplifier, and 75Ω driver for DVD are incorporated into a single chip.
2) Driver 6ch (Y, C, MIX, and PY, Pb, Pr for progressive)
3) Group delay difference between chroma signal and luminance signal is a small number of nsec.
4) Drive 2 lines of each signal
5) Operating by 5V single power supply
6) Built-in mute circuit

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Impressed voltage	V_{CC} max	6.0	V
Power dissipation	Pd	0.95*	W
Operating temperature range	Topr	−10~+70	°C
Storage temperature range	Tstg	−55~+150	°C

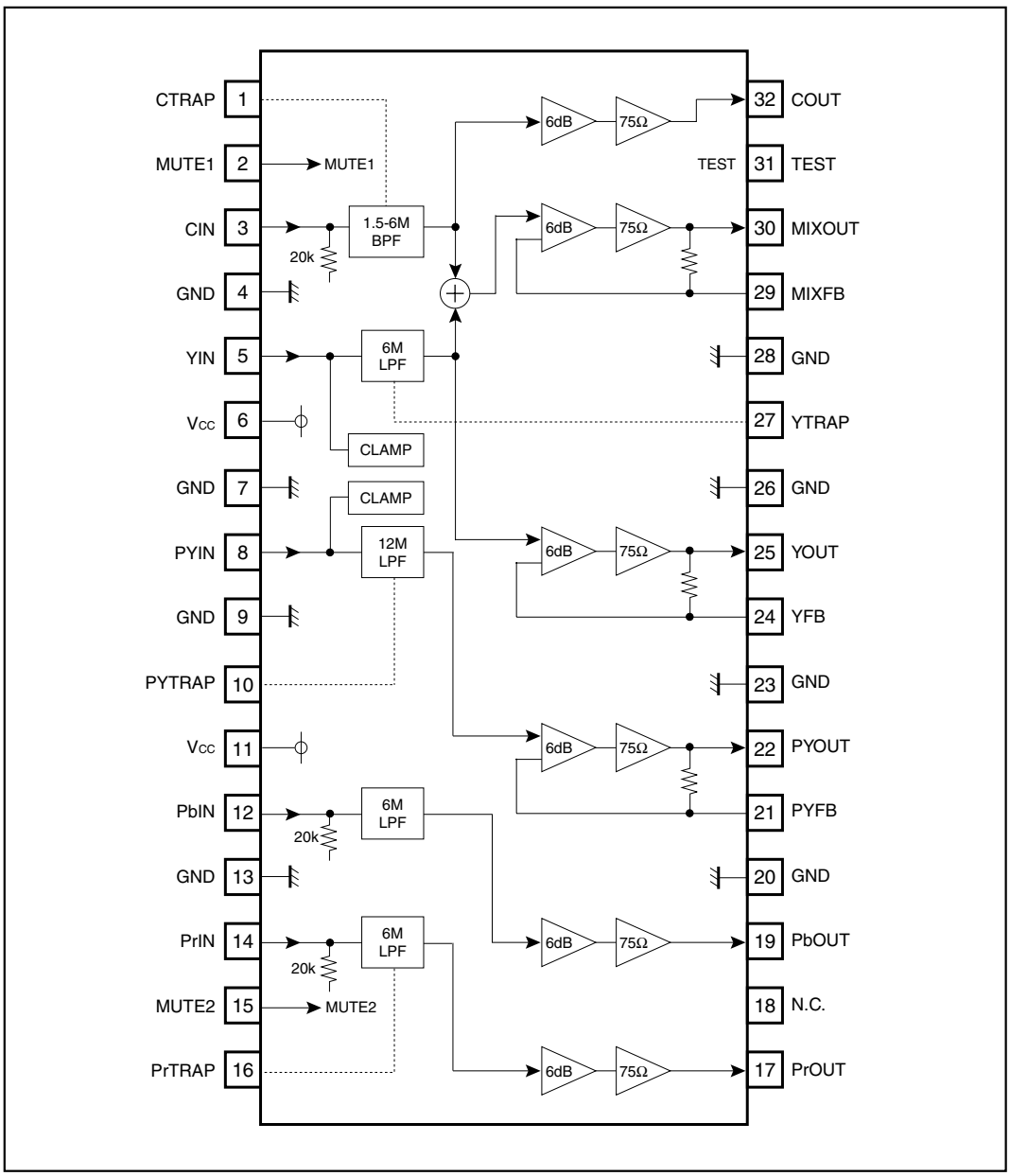
* Reduced by −7.6mW for each increase in Ta of 1°C over 25°C.
PCB (70mm×70mm, t=1.6mm) glass epoxy mounting.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	4.5	−	5.5	V

◎Radiation resistance is not included in the design.

●**Block diagram**



KEC

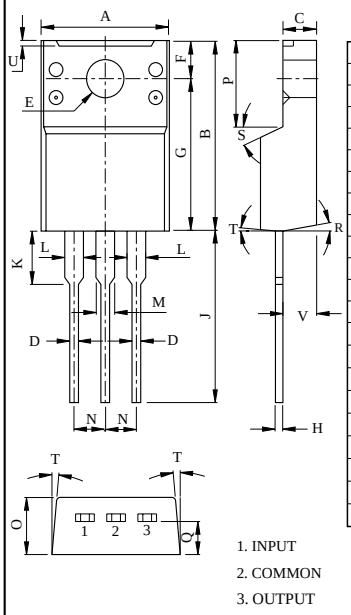
SEMICONDUCTOR
TECHNICAL DATA

KIA7805API~ KIA7824API
BIPOLAR LINEAR INTEGRATED CIRCUIT

THREE TERMINAL POSITIVE VOLTAGE REGULATORS
5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V.

FEATURES

- Suitable for C-MOS, TTL, the Other Digital IC's Power Supply.
- Internal Thermal Overload Protection.
- Internal Short Circuit Current Limiting.
- Output Current in Excess of 1A.
- Satisfies IEC-65 Specification. (International Electronical Commission)



DIM	MILLIMETERS
A	10.30 MAX
B	15.30 MAX
C	2.70±0.30
D	0.85 MAX
E	Φ3.20±0.20
F	3.00±0.30
G	12.30 MAX
H	0.75 MAX
J	13.60±0.50
K	3.90 MAX
L	1.20
M	1.30
N	2.54
O	4.50±0.20
P	6.80
Q	2.60±0.20
R	10°
S	25°
T	5°
U	0.5
V	2.60±0.15

TO-220IS

MAXIMUM RATINGS (Ta=25℃)

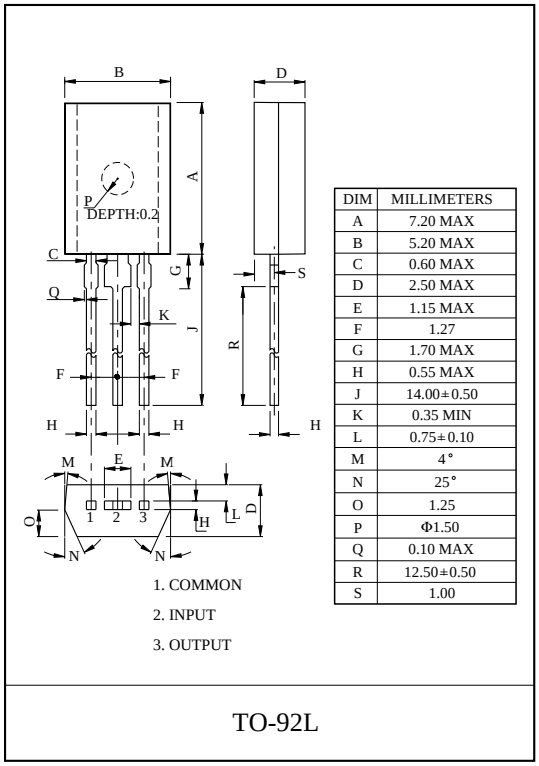
CHARACTERISTIC		SYMBOL	RATING	UNIT
Input Voltage	KIA7805API ~ KIA7815API	V_{IN}	35	V
	KIA7818API ~ KIA7824API		40	
Power Dissipation (Tc=25℃)		P_D	20.8	W
Power Dissipation (Without Heatsink)	KIA7805API ~ KIA7824API	P_D	2.0	W
Operating Junction Temperature		T_j	-30 ~150	℃
Storage Temperature		T_{stg}	-55 ~150	℃

KEC

SEMICONDUCTOR
TECHNICAL DATA

KIA79L05BP~ KIA79L24BP
BIPOLAR LINEAR INTEGRATED CIRCUIT

THREE TERMINAL POSITIVE VOLTAGE REGULATORS
5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V.



DIM	MILLIMETERS
A	7.20 MAX
B	5.20 MAX
C	0.60 MAX
D	2.50 MAX
E	1.15 MAX
F	1.27
G	1.70 MAX
H	0.55 MAX
J	14.00±0.50
K	0.35 MIN
L	0.75±0.10
M	4°
N	25°
O	1.25
P	Φ1.50
Q	0.10 MAX
R	12.50±0.50
S	1.00

TO-92L

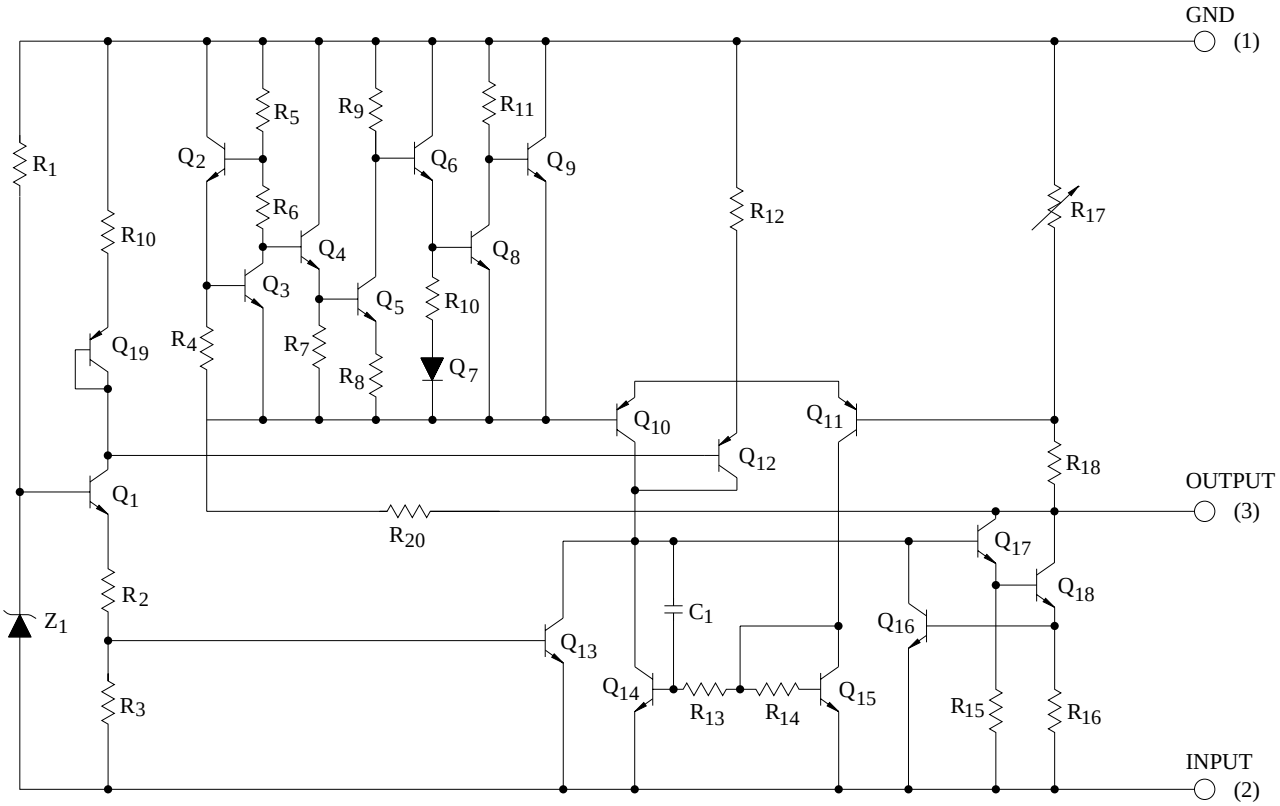
FEATURES

- Best Suited to a Power Supply for TTL and CMOS.
- Built-in Overcurrent Protective Circuit.
- Built-in Thermal Protective Circuit.
- Max. Output Current 150mA (T_j=25 ℃).
- Packaged in TO-92L.

MAXIMUM RATINGS (Ta=25 ℃)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Input Voltage	KIA79L05BP ~ KIA79L15BP	V_{IN}	-35	V
	KIA79L18BP ~ KIA79L24BP		-40	
Power Dissipation (Tc=25℃)		P_D	800	mW
Operating Junction Temperature		T_j	-30 ~ 150	℃
Operating Temperature		T_{opr}	-30 ~ 75	℃
Storage temperature		T_{stg}	-55 ~ 150	℃

EQUIVALENT CIRCUIT



Optic receiver modules

KODENSHI

KSM - 60 钡 TH2 · KSM - 70 钡 TH2

The KSM - 60钡TH2 consist of a PIN Photodiode of high speed and a preamplifier IC in the package as an receiver for Infrared remote control systems

FEATURES

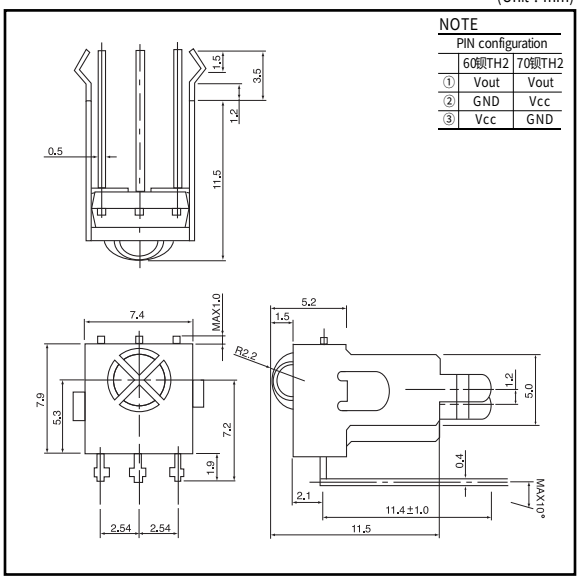
- One mold small package
- 5 Volt supply voltage, low power consumption
- Shielded against electrical field disturbance
- High immunity against ambient light
- Easy interface with the main board
- TTL and CMOS compatibility

APPLICATIONS

- TV, VTR, Acoustic Devices, Air Conditioners, Car Stereo Units, Computers, Interior controlling appliances, and all appliances that require remote controlling

DIMENSIONS

(Unit : mm)



MAXIMUM RATINGS

(Ta=25℃ Unless otherwise noted)

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{CC}	5.5	V
Operating Temperature	Topr.	- 10~+60	℃
Storage Temperature	Tstg.	- 20~+75	℃
Soldering Temperature	Tsol.	260(Max 5 sec)	℃

B.P.F CENTER FREQUENCY

Model NO.	B.P.F Center Frequency(kHz)
KSM - ◯◯1 TH2	40.0
KSM - ◯◯2 TH2	36.7
KSM - ◯◯3 TH2	37.9
KSM - ◯◯4 TH2	32.7
KSM - ◯◯5 TH2	56.9

ELECTRO-OPTICAL CHARACTERISTICS

(Ta=25℃), Vcc=5.0V

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit.
Supply Voltage	V_{CC}			4.5	5.0	5.5	V
Current Consumption	I_{CC}	Input Signal=0		-	1.2	2.5	mA
Peak Wavelength *1	λp			-	940	-	nm
B.P.F Center Frequency	fo			-	37.9	-	kHz
Transmission Distance *1	L	200±50lx	0°	10	-	-	m
			±30°	7	-	-	m
H Level Output Voltage *1	V_{OH}	30cm over the ray axis		4.5	5.0	-	V
L Level Output Voltage *1	V_{OL}			-	0.1	0.5	V
H Level Output Pulse Width *1	T_{WH}	Burst Wave=600μs Period=1.2ms		500	600	700	μs
L Level Output Pulse Width *1	T_{WL}			500	600	700	μs
Output Form				Active Low Output			

Note : *1. It specifies the maximum distance between emitter and detector that the output waveform satisfies the standard under the conditions below against the standard transmitter

1) Measuring place : Indoor without extreme reflection of light
2) Ambient light source : Detecting surface illumination shall be irradiate 200±50lx under ordinary white fluorescence lamp without high frequency lightning
3) Standard transmitter : Burst wave of standard transmitter shall be arranged to 50mVp - p under the measuring circuit

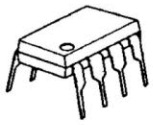
NJM2068

LOW-NOISE DUAL OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

The NJM2068 is a high performance, low noise dual operational amplifier. This amplifier features popular pin-out, superior noise performance, and superior total harmonic distortion. This amplifier also features guaranteed noise performance with substantially higher gain-bandwidth product and slew rate, which far exceeds that of the 4558 type amplifier. The specially designed low noise input transistors allow the NJM2068 to be used in very low noise signal processing applications such as audio preamplifiers and servo error amplifier.

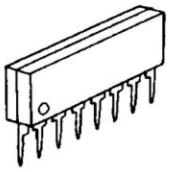
■ PACKAGE OUTLINE



NJM2068D

NJM2068M

NJM2068V

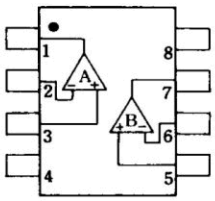


NJM2068L

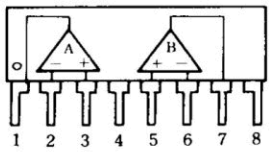
■ FEATURES

- Operating Voltage (±4V~±18V)
- Low Total Harmonic Distortion (0.001% typ.)
- Low Noise Voltage (FLAT+JISA,0.56μV typ.)
- High Slew Rate (6V/μs typ.)
- Unity Gain Bandwidth (27MHz @ f=10kHz)
- Package Outline DIP8,DMP8,SIP8,SSOP8
- Bipolar Technology

■ PIN CONFIGURATION



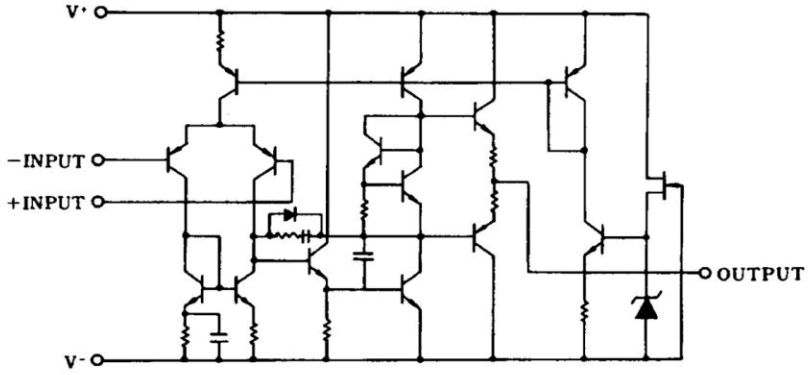
NJM2068D
NJM2068M
NJM2068V



NJM2068L

PIN FUNCTION
1.A OUTPUT
2.A –INPUT
3.A +INPUT
4.V^-
5.B +INPUT
6.B –INPUT
7.B OUTPUT
8.V^+

■ EQUIVALENT CIRCUIT (1/2 Shown)



National Semiconductor

October 2002

LM1117/LM1117I
800mA Low-Dropout Linear Regulator

General Description

The LM1117 is a series of low dropout voltage regulators with a dropout of 1.2V at 800mA of load current. It has the same pin-out as National Semiconductor's industry standard LM317.

The LM1117 is available in an adjustable version, which can set the output voltage from 1.25V to 13.8V with only two external resistors. In addition, it is also available in five fixed voltages, 1.8V, 2.5V, 2.85V, 3.3V, and 5V.

The LM1117 offers current limiting and thermal shutdown. Its circuit includes a zener trimmed bandgap reference to assure output voltage accuracy to within ±1%.

The LM1117 series is available in LLP, TO-263, SOT-223, TO-220, and TO-252 D-PAK packages. A minimum of 10µF tantalum capacitor is required at the output to improve the transient response and stability.

Features

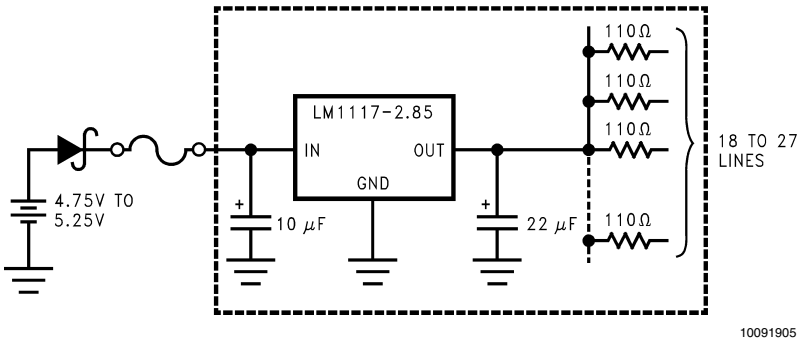
- Available in 1.8V, 2.5V, 2.85V, 3.3V, 5V, and Adjustable Versions
- Space Saving SOT-223 and LLP Packages
- Current Limiting and Thermal Protection
- Output Current 800mA
- Line Regulation 0.2% (Max)
- Load Regulation 0.4% (Max)
- Temperature Range
  - — LM1117 0˚C to 125˚C
  - — LM1117I –40˚C to 125˚C

Applications

- 2.85V Model for SCSI-2 Active Termination
- Post Regulator for Switching DC/DC Converter
- High Efficiency Linear Regulators
- Battery Charger
- Battery Powered Instrumentation

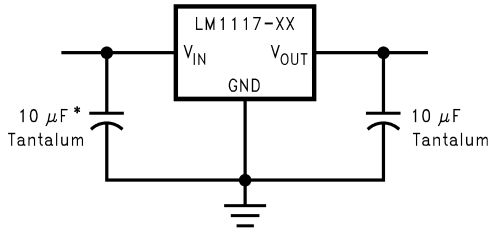
Typical Application

Active Terminator for SCSI-2 Bus



10091905

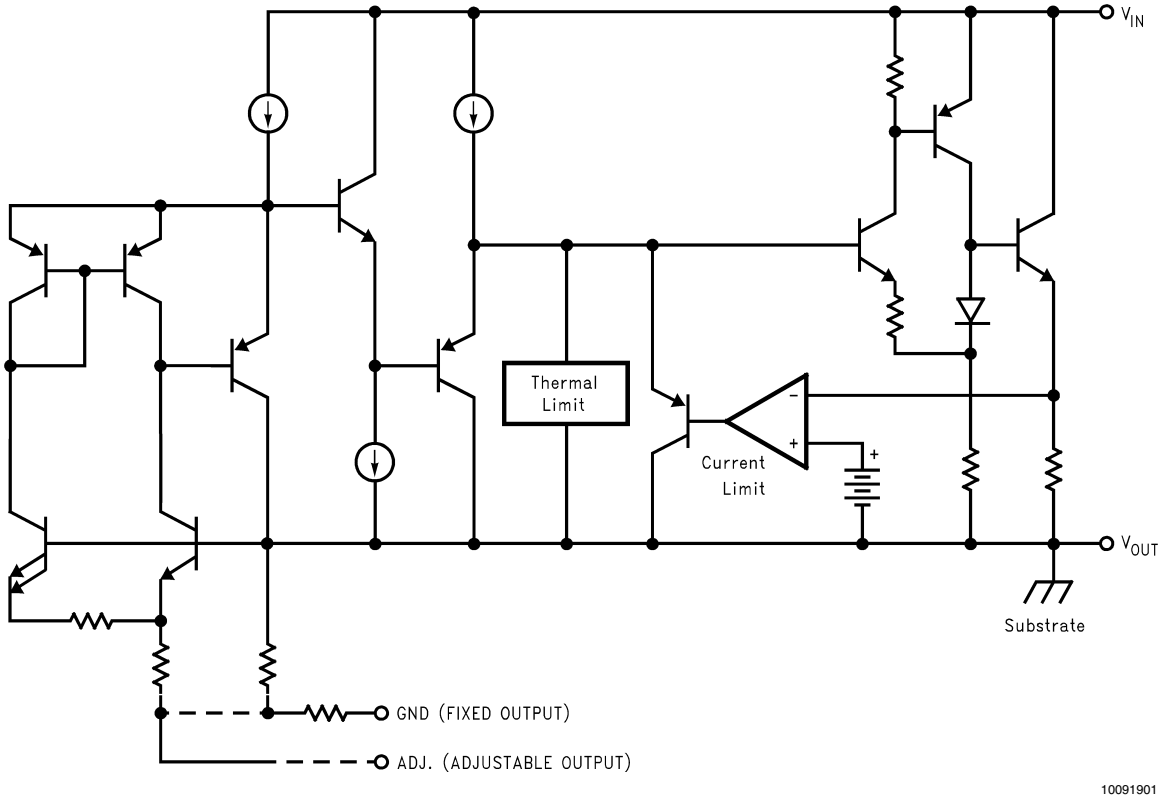
Fixed Output Regulator



* Required if the regulator is located far from the power supply filter.

10091928

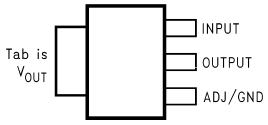
Block Diagram



10091901

Connection Diagrams

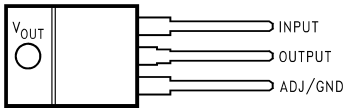
SOT-223



10091904

Top View

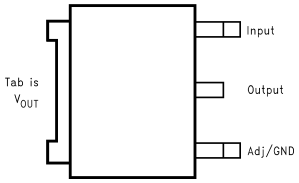
TO-220



10091902

Top View

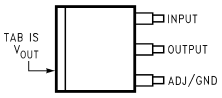
TO-252



10091938

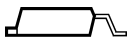
Top View

TO-263



10091944

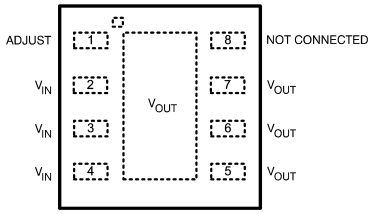
Top View



10091945

Side View

LLP



10091946

When using the LLP package
Pins 2, 3 & 4 must be connected together and
Pins 5, 6 & 7 must be connected together

Top View

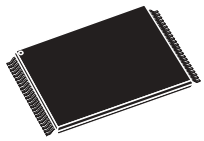
M29W160ET
M29W160EB

16 Mbit (2Mb x8 or 1Mb x16, Boot Block) 3V Supply Flash Memory

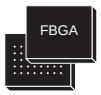
FEATURES SUMMARY

- SUPPLY VOLTAGE
  - V_{CC} = 2.7V to 3.6V for Program, Erase and Read
- ACCESS TIMES: 70, 90ns
- PROGRAMMING TIME
  - 10µs per Byte/Word typical
- 35 MEMORY BLOCKS
  - 1 Boot Block (Top or Bottom Location)
  - 2 Parameter and 32 Main Blocks
- PROGRAM/ERASE CONTROLLER
  - Embedded Byte/Word Program algorithms
- ERASE SUSPEND and RESUME MODES
  - Read and Program another Block during Erase Suspend
- UNLOCK BYPASS PROGRAM COMMAND
  - Faster Production/Batch Programming
- TEMPORARY BLOCK UNPROTECTION MODE
- COMMON FLASH INTERFACE
  - 64 bit Security Code
- LOW POWER CONSUMPTION
  - Standby and Automatic Standby
- 100,000 PROGRAM/ERASE CYCLES per BLOCK
- ELECTRONIC SIGNATURE
  - Manufacturer Code: 0020h
  - Top Device Code M29W160ET: 22C4h
  - Bottom Device Code M29W160EB: 2249h

Figure 1. Packages



TSOP48 (N)
12 x 20mm



TFBGA48 (ZA)
6 x 8mm

SUMMARY DESCRIPTION

The M29W160E is a 16 Mbit (2Mb x8 or 1Mb x16) non-volatile memory that can be read, erased and reprogrammed. These operations can be performed using a single low voltage (2.7 to 3.6V) supply. On power-up the memory defaults to its Read mode where it can be read in the same way as a ROM or EPROM.

The memory is divided into blocks that can be erased independently so it is possible to preserve valid data while old data is erased. Each block can be protected independently to prevent accidental Program or Erase commands from modifying the memory. Program and Erase commands are written to the Command Interface of the memory. An on-chip Program/Erase Controller simplifies the process of programming or erasing the memory by taking care of all of the special operations that are required to update the memory contents.

The end of a program or erase operation can be detected and any error conditions identified. The command set required to control the memory is consistent with JEDEC standards.

The blocks in the memory are asymmetrically arranged, see Figures 5 and 6, Block Addresses. The first or last 64 KBytes have been divided into four additional blocks. The 16 KByte Boot Block can be used for small initialization code to start the microprocessor, the two 8 KByte Parameter Blocks can be used for parameter storage and the remaining 32K is a small Main Block where the application may be stored.

Chip Enable, Output Enable and Write Enable signals control the bus operation of the memory. They allow simple connection to most microprocessors, often without additional logic.

The memory is offered TSOP48 (12 x 20mm) and TFBGA48 (0.8mm pitch) packages. The memory is supplied with all the bits erased (set to '1').

Figure 2. Logic Diagram

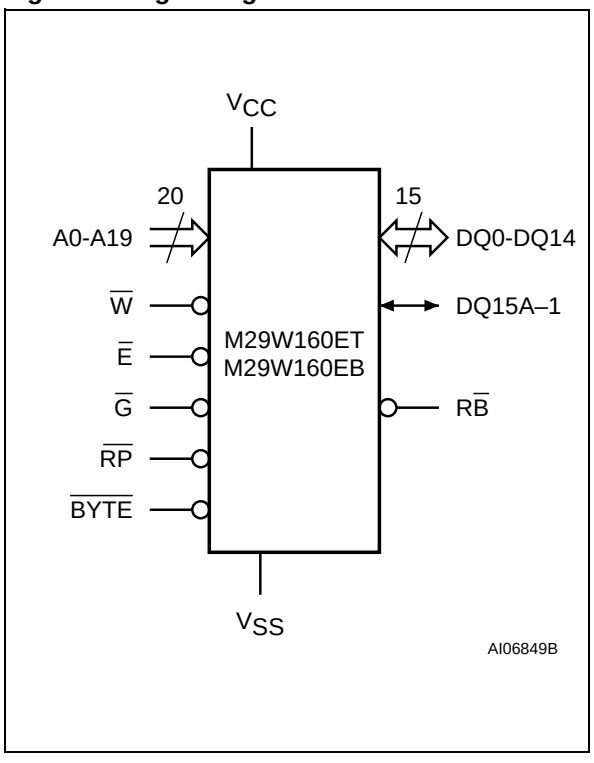
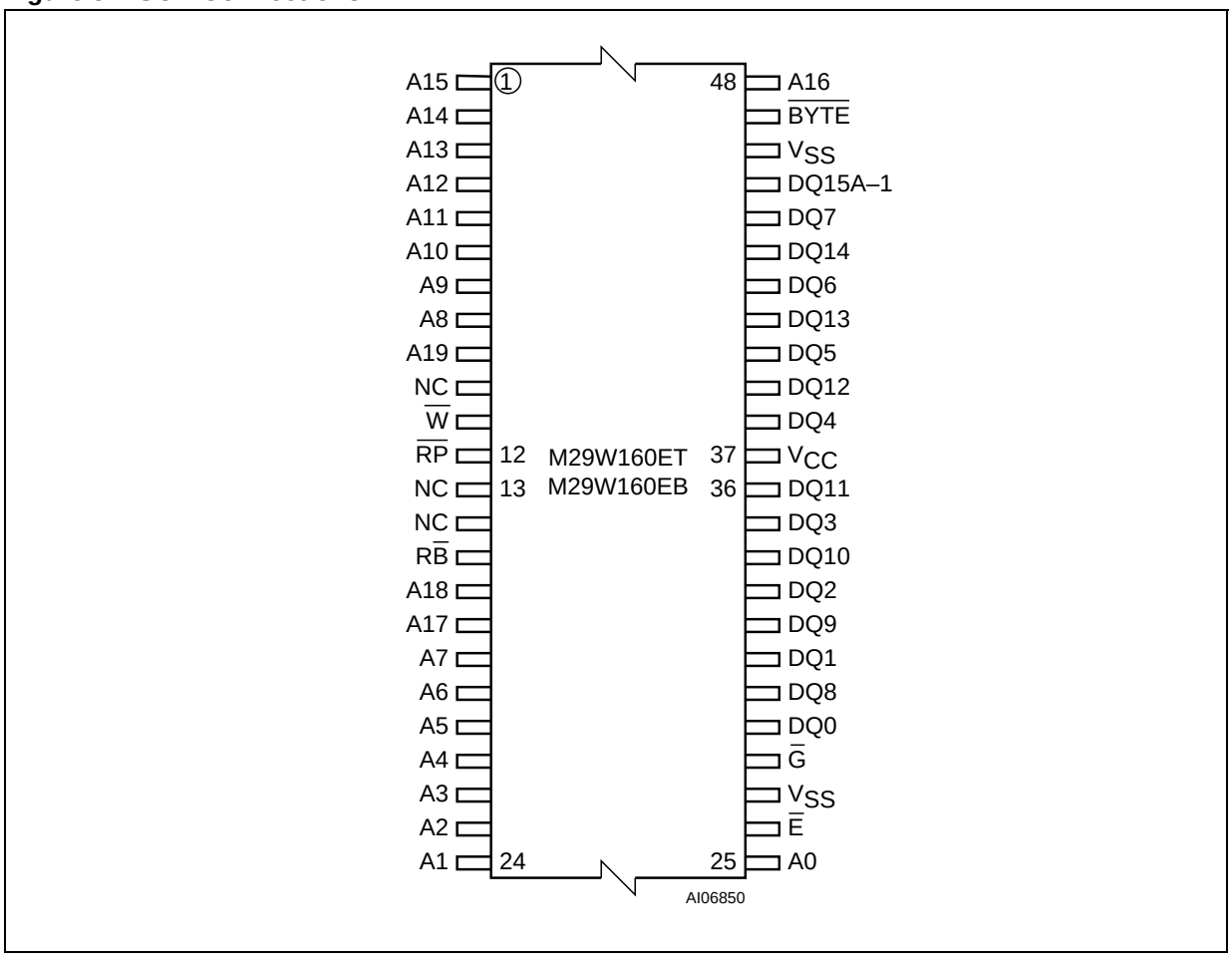


Table 1. Signal Names

A0-A19	Address Inputs
DQ0-DQ7	Data Inputs/Outputs
DQ8-DQ14	Data Inputs/Outputs
DQ15A–1	Data Input/Output or Address Input
$\overline{E}$	Chip Enable
$\overline{G}$	Output Enable
$\overline{W}$	Write Enable
$\overline{RP}$	Reset/Block Temporary Unprotect
$R\overline{B}$	Ready/Busy Output
$\overline{BYTE}$	Byte/Word Organization Select
V_{CC}	Supply Voltage
V_{SS}	Ground
NC	Not Connected Internally

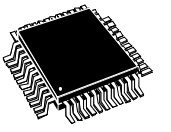
Figure 3. TSOP Connections



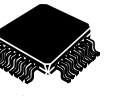
ST72F324L, ST72324BL

3V RANGE 8-BIT MCU WITH 8 TO 32K FLASH/ROM, 10-BIT ADC, 4 TIMERS, SPI, SCI INTERFACE

- **Memories**
  - 8 to 32K dual voltage High Density Flash (HDFlash) or ROM with read-out protection capability. In-Application Programming and In-Circuit Programming for HDFlash devices
  - 384 to 1K bytes RAM
  - HDFlash endurance: 100 cycles, data retention: 20 years at 55°C
- **Clock, Reset And Supply Management**
  - Clock sources: crystal/ceramic resonator oscillators, internal RC oscillator, and bypass for external clock
  - PLL for 2x frequency multiplication
  - Four Power Saving Modes: Halt, Active-Halt, Wait and Slow
- **Interrupt Management**
  - Nested interrupt controller
  - 10 interrupt vectors plus TRAP and RESET
  - 9/6 external interrupt lines (on 4 vectors)
- **Up to 32 I/O Ports**
  - 32/24 multifunctional bidirectional I/O lines
  - 22/17 alternate function lines
  - 12/10 high sink outputs
- **4 Timers**
  - Main Clock Controller with: Real time base, Beep and Clock-out capabilities
  - Configurable watchdog timer
  - 16-bit Timer A with: 1 input capture, 1 output compare, external clock input, PWM and pulse generator modes
  - 16-bit Timer B with: 2 input captures, 2 output compares, PWM and pulse generator modes



TQFP44
10 x 10



TQFP32
7 x 7

SDIP32
400 mil

- **2 Communication Interfaces**
  - SPI synchronous serial interface
  - SCI asynchronous serial interface
- **1 Analog Peripheral**
  - 10-bit ADC with up to 12 input ports
- **Instruction Set**
  - 8-bit Data Manipulation
  - 63 Basic Instructions
  - 17 main Addressing Modes
  - 8 x 8 Unsigned Multiply Instruction
- **Development Tools**
  - Full hardware/software development package
  - In-Circuit Testing capability

Device Summary

Features	ST72F324L(J/K)6	ST72F324L(J/K)4	ST72F324L(J/K)2	ST72324BL(J/K)4	ST72324BL(J/K)2
Program memory - bytes	Flash 32K	Flash 16K	Flash 8K	ROM 16K	ROM 8K
RAM (stack) - bytes	1024 (256)	512 (256)	384 (256)	512 (256)	384 (256)
Voltage Range	2.85 to 3.6V				
Temp. Range	up to -40°C to +85°C				
Packages	TQFP44 10x10, SDIP32, TQFP32 7x7				

Rev. 3

1 INTRODUCTION

The ST72F324L and ST72324BL devices are members of the ST7 microcontroller family designed for the 3V operating range. They can be grouped as follows:

– The 32-pin devices are designed for mid-range applications

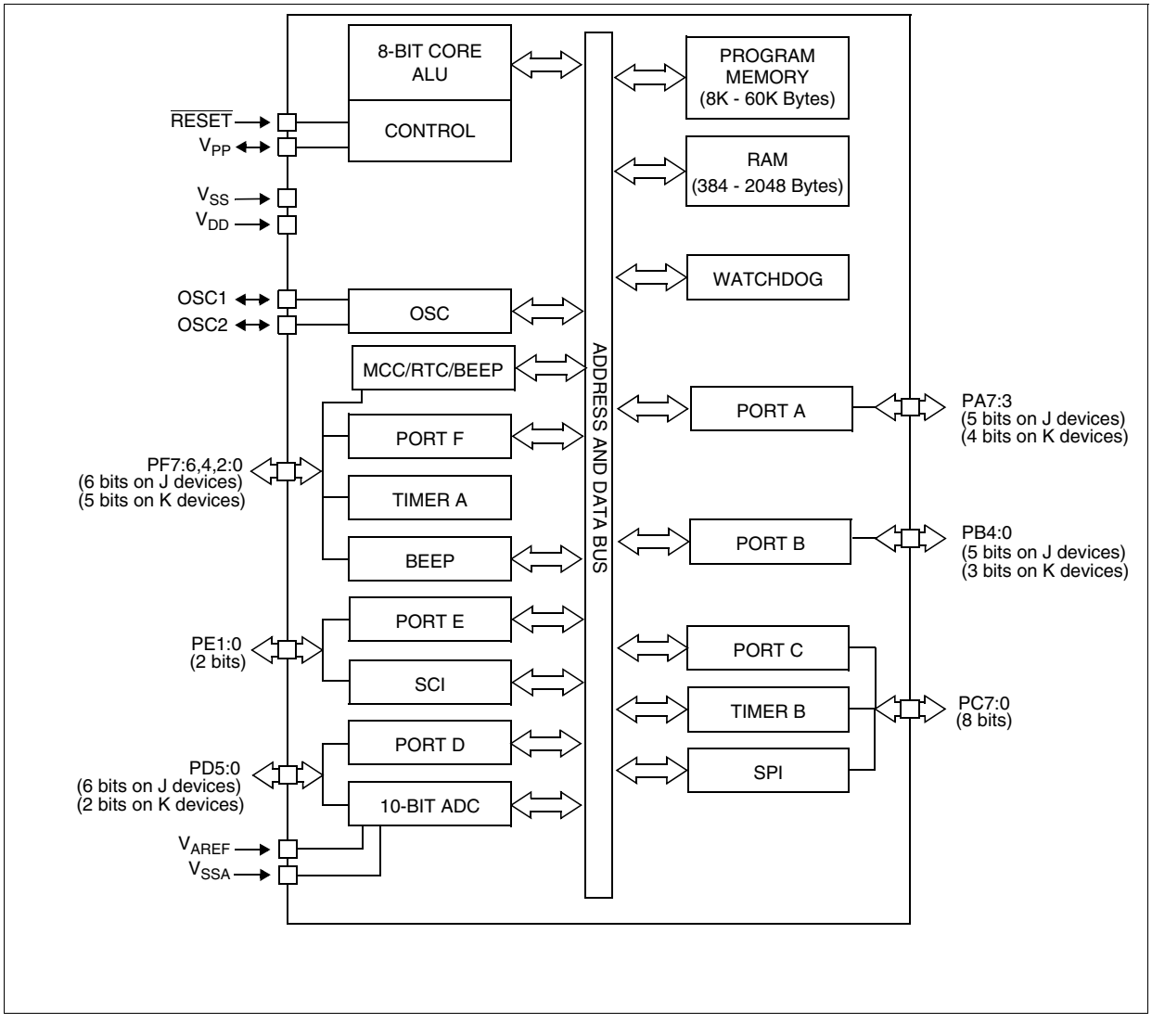
– The 44-pin devices target the same range of applications requiring more than 24 I/O ports.

All devices are based on a common industry-standard 8-bit core, featuring an enhanced instruction set and are available with FLASH or ROM program memory.

Under software control, all devices can be placed in WAIT, SLOW, ACTIVE-HALT or HALT mode, reducing power consumption when the application is in idle or stand-by state.

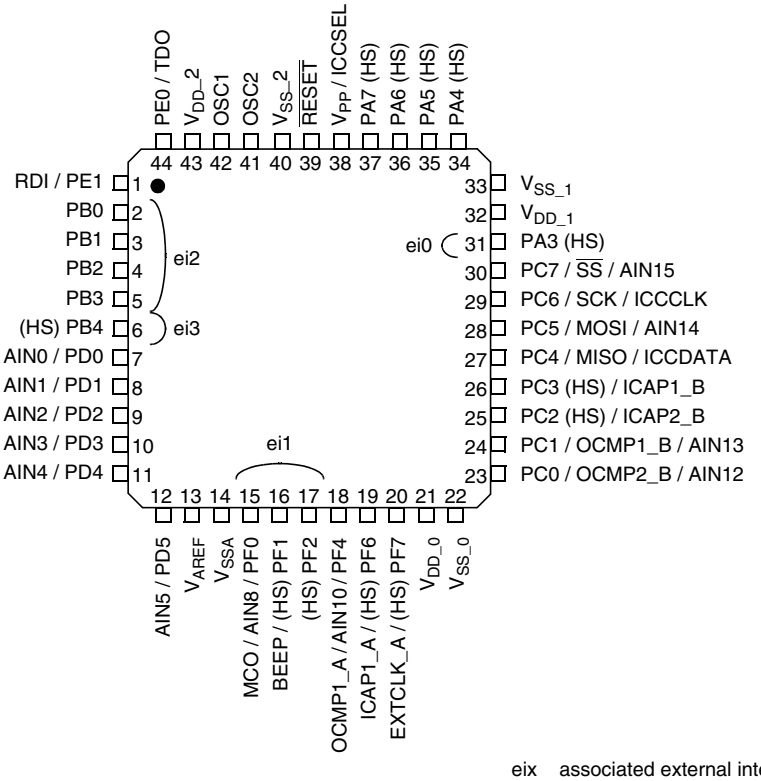
The enhanced instruction set and addressing modes of the ST7 offer both power and flexibility to software developers, enabling the design of highly efficient and compact application code. In addition to standard 8-bit data management, all ST7 microcontrollers feature true bit manipulation, 8x8 unsigned multiplication and indirect addressing modes.

Figure 1. Device Block Diagram



2 PIN DESCRIPTION

Figure 2. 44-Pin TQFP Package Pinouts



PIN DESCRIPTION (Cont'd)

Figure 3. 32-Pin SDIP Package Pinout

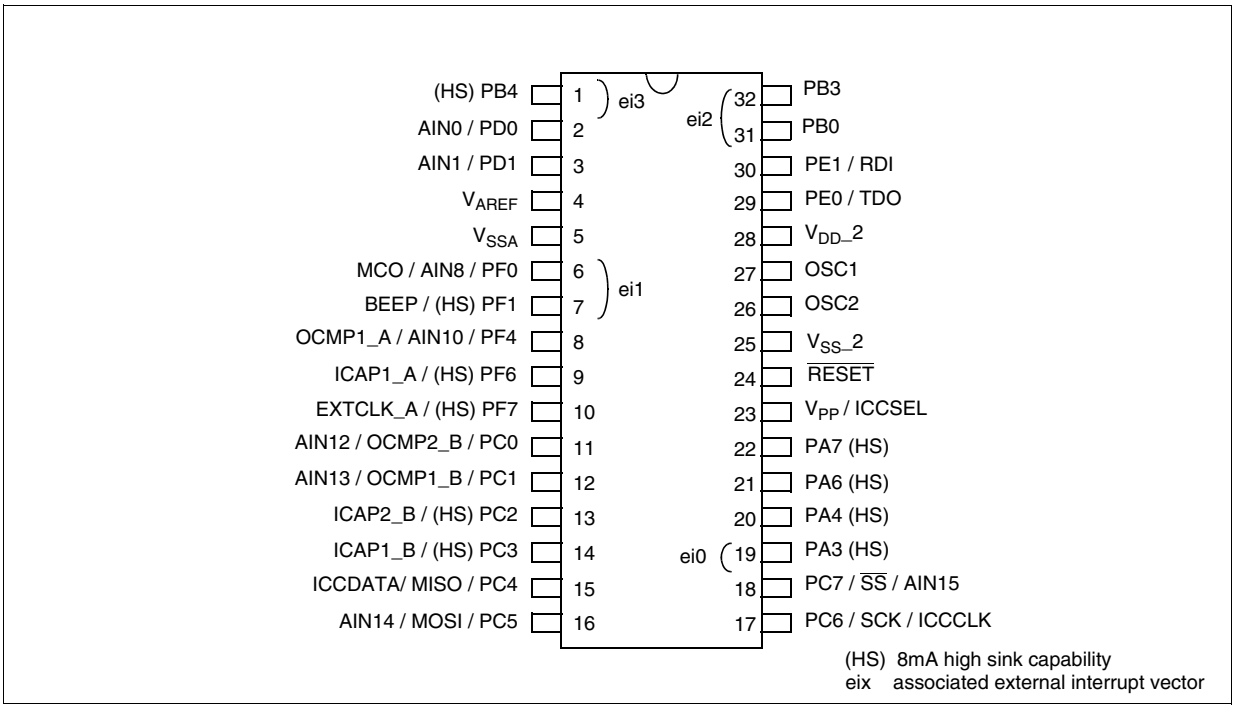
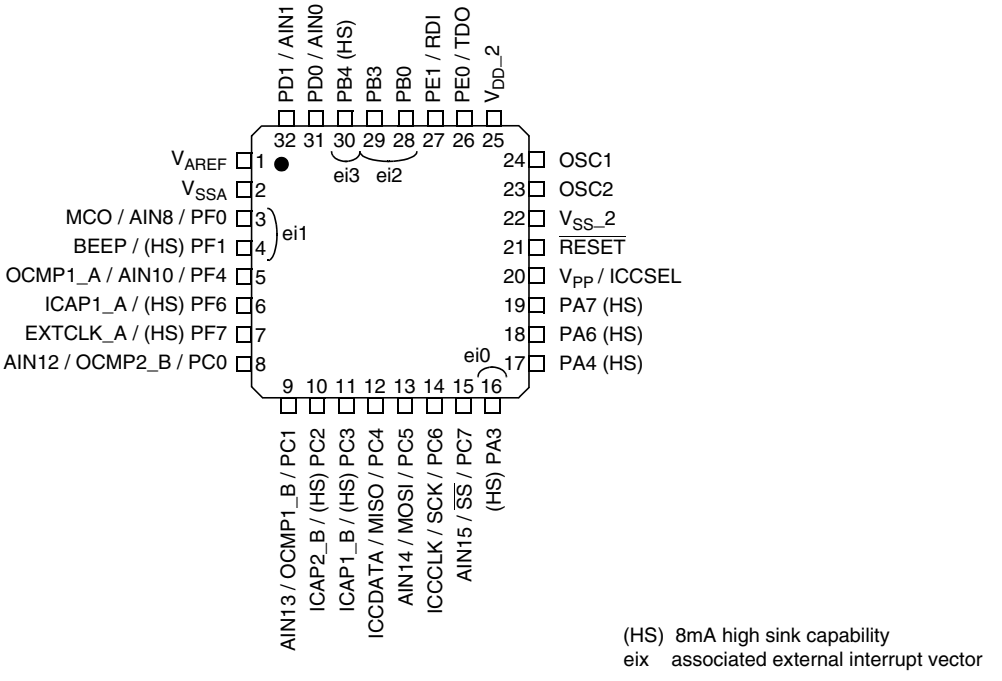


Figure 4. 32-Pin TQFP 7x7 Package Pinout



PIN DESCRIPTION (Cont'd)

For more details, refer to "ELECTRICAL CHARACTERISTICS" on page 110

Legend / Abbreviations for Table 1:

Type: I = input, O = output, S = supply

In/Output level: C = CMOS
C_T= CMOS with input trigger

Output level: HS = high sink (on N-buffer only)

Port and control configuration:

- Input: float = floating, wpu = weak pull-up, int = interrupt [1], ana = analog ports
- Output: OD = open drain [2], PP = push-pull

Refer to "I/O PORTS" on page 39 for more details on the software configuration of the I/O ports.

The RESET configuration of each pin is shown in bold. This configuration is valid as long as the device is in reset state.

Table 1. Device Pin Description

Pin n°			Pin Name	Type	Level		Port						Main function (after reset)	Alternate Function	
							Input				Output				
TQFP44	TQFP32	SDIP32			Input	Output	float	wpu	int	ana	OD	PP			
6	30	1	PB4 (HS)	I/O	C_T	HS	**X**	ei3			X	X	Port B4		
7	31	2	PD0/AIN0	I/O	C_T		**X**	X		X	X	X	Port D0	ADC Analog Input 0	
8	32	3	PD1/AIN1	I/O	C_T		**X**	X		X	X	X	Port D1	ADC Analog Input 1	
9			PD2/AIN2	I/O	C_T		**X**	X		X	X	X	Port D2	ADC Analog Input 2	
10			PD3/AIN3	I/O	C_T		**X**	X		X	X	X	Port D3	ADC Analog Input 3	
11			PD4/AIN4	I/O	C_T		**X**	X		X	X	X	Port D4	ADC Analog Input 4	
12			PD5/AIN5	I/O	C_T		**X**	X		X	X	X	Port D5	ADC Analog Input 5	
13	1	4	V_{AREF}	S									Analog Reference Voltage for ADC		
14	2	5	V_{SSA}	S									Analog Ground Voltage		
15	3	6	PF0/MCO/AIN8	I/O	C_T		**X**	ei1		X	X	X	Port F0	Main clock out (f_{OSC}/2)	ADC Analog Input 8
16	4	7	PF1 (HS)/BEEP	I/O	C_T	HS	**X**	ei1			X	X	Port F1	Beep signal output	
17			PF2 (HS)	I/O	C_T	HS	**X**		ei1		X	X	Port F2		
18	5	8	PF4/OCMP1_A/ AIN10	I/O	C_T		**X**	X		X	X	X	Port F4	Timer A Output Compare 1	ADC Analog Input 10
19	6	9	PF6 (HS)/ICAP1_A	I/O	C_T	HS	**X**	X			X	X	Port F6	Timer A Input Capture 1	
20	7	10	PF7 (HS)/ EXTCLK_A	I/O	C_T	HS	**X**	X			X	X	Port F7	Timer A External Clock Source	
21			V_{DD_0}	S									Digital Main Supply Voltage		
22			V_{SS_0}	S									Digital Ground Voltage		
23	8	11	PC0/OCMP2_B/ AIN12	I/O	C_T		**X**	X		X	X	X	Port C0	Timer B Output Compare 2	ADC Analog Input 12
24	9	12	PC1/OCMP1_B/ AIN13	I/O	C_T		**X**	X		X	X	X	Port C1	Timer B Output Compare 1	ADC Analog Input 13

Pin n°			Pin Name	Type	Level		Port						Main function (after reset)	Alternate Function	
							Input				Output				
TQFP44	TQFP32	SDIP32			Input	Output	float	wpu	int	ana	OD	PP			
25	10	13	PC2 (HS)/ICAP2_B	I/O	C_T	HS	X	X			X	X	Port C2	Timer B Input Capture 2	
26	11	14	PC3 (HS)/ICAP1_B	I/O	C_T	HS	X	X			X	X	Port C3	Timer B Input Capture 1	
27	12	15	PC4/MISO/ICCDATA	I/O	C_T		X	X			X	X	Port C4	SPI Master In / Slave Out Data	ICC Data Input
28	13	16	PC5/MOSI/AIN14	I/O	C_T		X	X		X	X	X	Port C5	SPI Master Out / Slave In Data	ADC Analog Input 14
29	14	17	PC6/SCK/ICCCLK	I/O	C_T		X	X			X	X	Port C6	SPI Serial Clock	ICC Clock Output
30	15	18	PC7/$\overline{SS}$/AIN15	I/O	C_T		X	X		X	X	X	Port C7	SPI Slave Select (active low)	ADC Analog Input 15
31	16	19	PA3 (HS)	I/O	C_T	HS	X		ei0		X	X	Port A3		
32			V_{DD_1}	S									Digital Main Supply Voltage		
33			V_{SS_1}	S									Digital Ground Voltage		
34	17	20	PA4 (HS)	I/O	C_T	HS	X	X			X	X	Port A4		
35			PA5 (HS)	I/O	C_T	HS	X	X			X	X	Port A5		
36	18	21	PA6 (HS)	I/O	C_T	HS	X				T		Port A6 [1)]		
37	19	22	PA7 (HS)	I/O	C_T	HS	X				T		Port A7 [1)]		
38	20	23	V_{PP} /ICCSEL	I									Must be tied low. In the flash programming mode, this pin acts as the programming voltage input V_{PP}. See Section 12.9.2 for more details. High voltage must not be applied to ROM devices.		
39	21	24	$\overline{RESET}$	I/O	C_T								Top priority non maskable interrupt.		
40	22	25	V_{SS_2}	S									Digital Ground Voltage		
41	23	26	OSC2	O									Resonator oscillator inverter output		
42	24	27	OSC1	I									External clock input or Resonator oscillator inverter input		
43	25	28	V_{DD_2}	S									Digital Main Supply Voltage		
44	26	29	PE0/TDO	I/O	C_T		X	X			X	X	Port E0	SCI Transmit Data Out	
1	27	30	PE1/RDI	I/O	C_T		X	X			X	X	Port E1	SCI Receive Data In	
2	28	31	PB0	I/O	C_T		X	ei2			X	X	Port B0		
3			PB1	I/O	C_T		X	ei2			X	X	Port B1		
4			PB2	I/O	C_T		X	ei2			X	X	Port B2		
5	29	32	PB3	I/O	C_T		X		ei2		X	X	Port B3		

Notes:

1. In the interrupt input column, “eiX” defines the associated external interrupt vector. If the weak pull-up column (wpu) is merged with the interrupt column (int), then the I/O configuration is pull-up interrupt input, else the configuration is floating interrupt input.

2. In the open drain output column, “T” defines a true open drain I/O (P-Buffer and protection diode to V_{DD}

are not implemented). See See “I/O PORTS” on page 39. and Section 12.8 I/O PORT PIN CHARACTERISTICS for more details.

3. OSC1 and OSC2 pins connect a crystal/ceramic resonator, or an external source to the on-chip oscillator; see Section 1 INTRODUCTION and Section 12.5 CLOCK AND TIMING CHARACTERISTICS for more details.

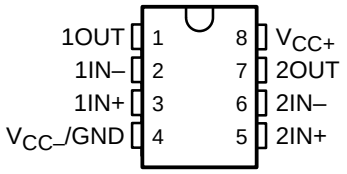
4. On the chip, each I/O port has 8 pads. Pads that are not bonded to external pins are in input pull-up configuration after reset. The configuration of these pads must be kept at reset state to avoid added current consumption.

TL3472
HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIER

SLOS200G – OCTOBER 1997 – REVISED JULY 2003

- **Wide Gain-Bandwidth Product . . . 4 MHz**
- **High Slew Rate . . . 13 V/μs**
- **Fast Settling Time . . . 1.1 μs to 0.1%**
- **Wide-Range Single-Supply Operation . . . 4 V to 36 V**
- **Wide Input Common-Mode Range Includes Ground ($V_{CC–}$)**
- **Low Total Harmonic Distortion . . . 0.02%**
- **Large-Capacitance Drive Capability . . . 10,000 pF**
- **Output Short-Circuit Protection**

D OR P PACKAGE
(TOP VIEW)



description/ordering information

Quality, low-cost, bipolar fabrication with innovative design concepts is employed for the TL3472 operational amplifier. This device offers 4 MHz of gain-bandwidth product, 13-V/μs slew rate, and fast settling time, without the use of JFET device technology. Although the TL3472 can be operated from split supplies, it is particularly suited for single-supply operation because the common-mode input voltage range includes ground potential ($V_{CC–}$). With a Darlington transistor input stage, this device exhibits high input resistance, low input offset voltage, and high gain. The all-npn output stage, characterized by no dead-band crossover distortion and large output voltage swing, provides high-capacitance drive capability, excellent phase and gain margins, low open-loop high-frequency output impedance, and symmetrical source/sink ac frequency response. This low-cost amplifier is an alternative to the MC33072 and the MC34072 operational amplifiers.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP (P)	Tube of 25	TL3472CP	TL3472CP
	SOIC (D)	Tube of 50	TL3472CD	3472C
		Reel of 2500	TL3472CDR	
–40°C to 105°C	PDIP (P)	Tube of 25	TL3472IP	TL3472IP
	SOIC (D)	Tube of 50	TL3472ID	Z3472
		Reel of 2500	TL3472IDR	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type HN1K05FU

TOSHIBA HN1K05FU

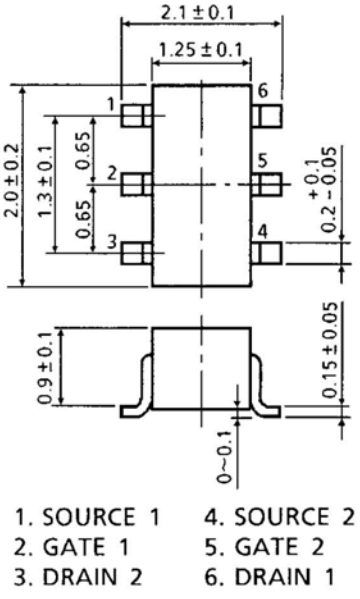
Unit: mm

For Portable Devices

High Speed Switching Applications

Interface Applications

- High input impedance and extremely low drive current.
- V_{th} is low and it is possible to drive directly at low-voltage CMOS.
  : V_{th} = 0.5 to 1.0 V
- Suitable for high-density mounting because of a compact package.



US6

JEDEC	—
JEITA	—
TOSHIBA	2-2J1C

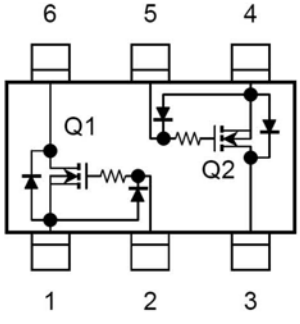
Weight: 6.8 mg

Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DS}	20	V
Gate-source voltage	V_{GSS}	10	V
DC drain current	I_D	100	mA
Drain power dissipation	P_D (Note)	200	mW
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	−55 to 150	°C

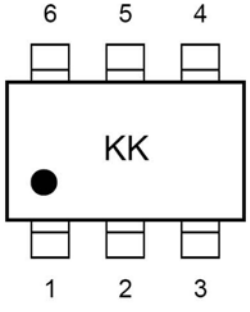
Note: TOTAL rating

Equivalent Circuit (top view)



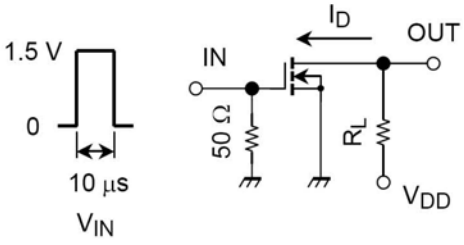
(Q1, Q2 common)

Marking



Switching Time Test Circuit

(a) Test circuit



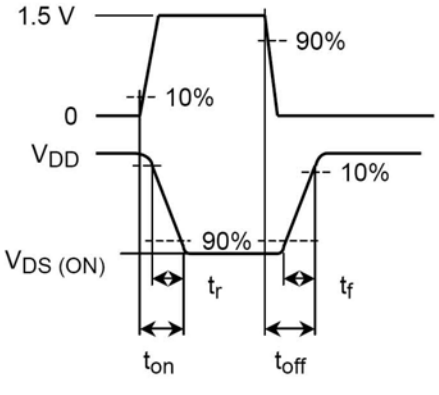
V_{DD} = 1.5 V
D.U. ≦ 1%
V_{IN}: t_r, t_f < 5 ns
(Z_{out} = 50 Ω)
Common Source
Ta = 25°C

(b) V_{IN}

V_{GS}

(c) V_{OUT}

V_{DS}



SYSTEM GENERAL

Product Specification

Low Cost Green-Mode PWM Controller for Flyback Converters **SG6848**

FEATURES

- Green-Mode PWM
- Supports the “Blue Angel” Standard
- Low Start-up Current (5uA)
- Low Operating Current (2mA)
- Leading-Edge Blanking
- Constant Output Power Limit
- Universal Input
- Built-in Synchronized Slope Compensation
- Current Mode Operation
- Cycle-by-cycle Current Limiting
- Under Voltage Lockout (UVLO)
- Programmable PWM Frequency
- Gate Output Voltage Clamped at 15V
- Low Cost
- Few External Components Required
- Small SOT-26 Package

APPLICATIONS

General-purpose switching mode power supplies and flyback power converters, such as

- Battery chargers for cellular phones, cordless phones, PDAs, digital cameras, and power tools
- Power adapters for ink jet printers, video game consoles, and portable audio players
- Open-frame SMPS for TV/DVD standby and other auxiliary supplies, home appliances, and consumer electronics
- Replacements for linear transformers and RCC SMPS
- PC 5V standby power.

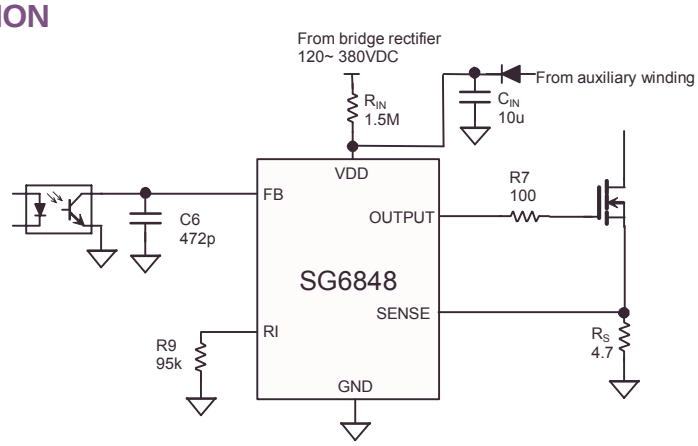
DESCRIPTION

This highly-integrated PWM controller provides several special enhancements designed to meet the low standby-power needs of low-power SMPS. To minimize standby power consumption, the proprietary green-mode function provides off-time modulation to linearly decrease the switching frequency under light-load conditions. This green-mode function enables the power supply to easily meet even the strictest power conservation requirements.

The BiCMOS fabrication process enables reducing the start-up current to 5uA, and the operating current to 2mA. To further improve power conservation, a large start-up resistance can be used. Built-in synchronized slope compensation ensures the stability of peak current mode control. Proprietary internal compensation provides a constant output power limit over a universal AC input range (90VAC to 264VAC). Pulse-by-pulse current limiting ensures safe operation even during short-circuits.

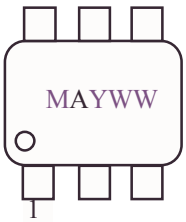
To protect the external power MOSFET from being damaged by supply over voltage, the SG6848’s output driver is clamped at 15V. SG6848 controllers can be used to improve the performance and reduce the production cost of power supplies. The SG6848 is the best choice for replacing linear and RCC-mode power adapters. It is available in 8-pin DIP and 6-pin SOT-26 packages.

TYPICAL APPLICATION

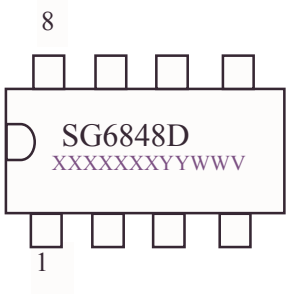


Low Cost Green-Mode PWM Controller for Flyback Converters **SG6848**

MARKING DIAGRAMS

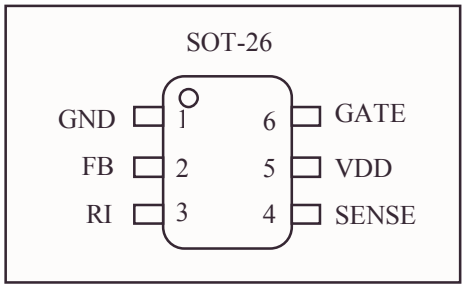


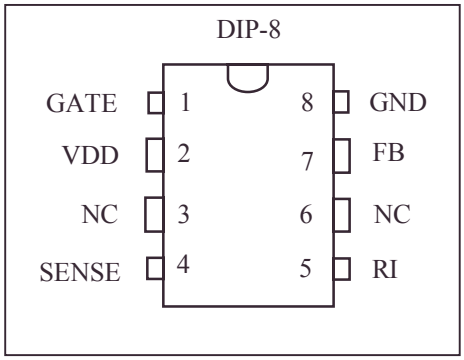
M: Mask Version
Y: Year; WW: Work Week



XXXXXXX: Wafer Lot
YY: Year; WW: Week
V: Assembly Location

PIN CONFIGURATION





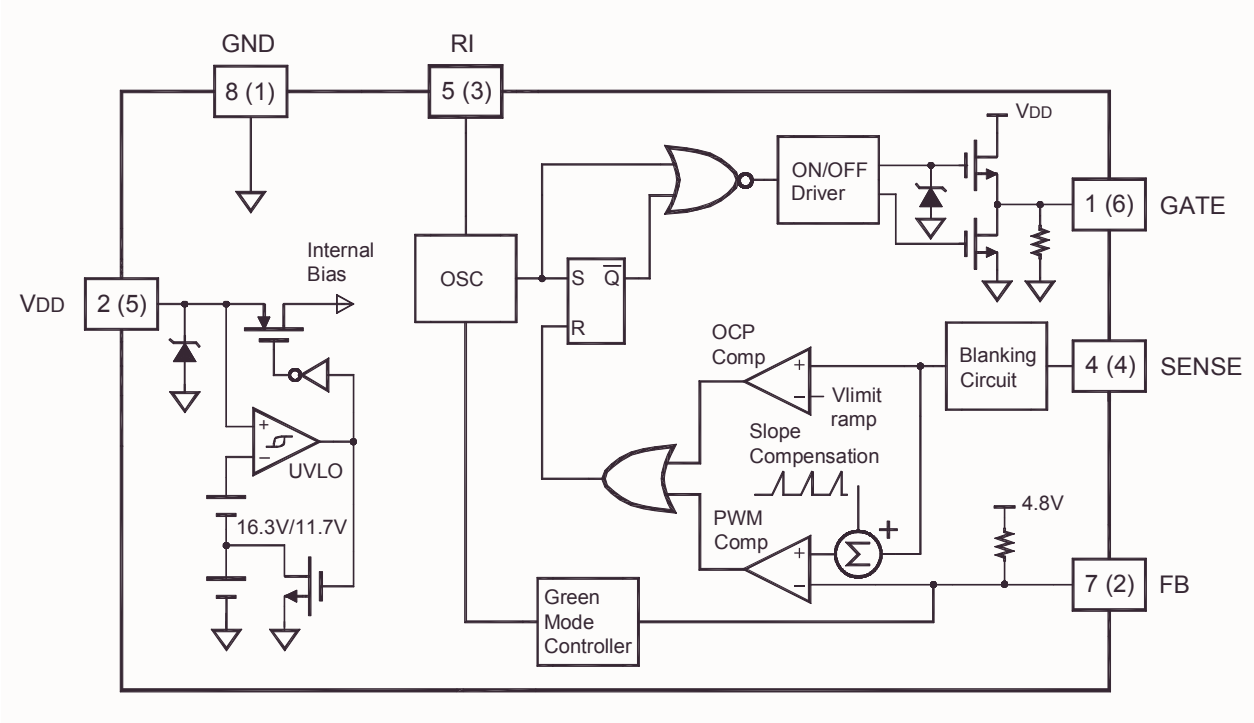
ORDERING INFORMATION

Part Number	PWM Frequency	Package
SG6848T	70kHz	6-Pin SOT-26
SG6848D	70kHz	8-pin DIP-8

PIN DESCRIPTIONS

Name	Pin No. DIP-8 / (SOT-26)	Type	Function
GATE	1 / (6)	Driver Output	The totem-pole output driver for driving the power MOSFET.
VDD	2 / (5)	Supply	Power supply.
NC	3		NC pin.
SENSE	4 / (4)	Analog Input	Current sense. This pin senses the voltage across a resistor. When the voltage reaches the internal threshold, PWM output is disabled. This activates over-current protection. This pin also provides current amplitude information for current-mode control.
RI	5 / (3)	Analog Input/Output	A resistor connected from the RI pin to ground will generate a constant current source for the SG6848. This current is used to charge an internal capacitor, to determine the switching frequency. Increasing the resistance will reduce the amplitude of the current source and reduce the switching frequency. A 95kΩ resistor R_i results in a 50uA constant current I_i and a 70kHz switching frequency.
NC	6		NC pin.
FB	7 / (2)	Analog Input	Feedback. The FB pin provides the output voltage regulation signal. It provides feedback to the internal PWM comparator, so that the PWM comparator can control the duty cycle.
GND	8 / (1)	Supply	Ground.

BLOCK DIAGRAM



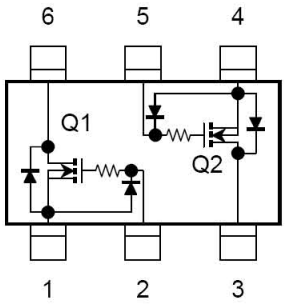
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter			Value	Unit
V_{DD}	DC Supply Voltage *			25	V
	Zener Clamp			26	V
	Zener Current			10	mA
V_{FB}	Input Voltage to FB Pin			-0.3 to 6 V	V
V_{Sense}	Input Voltage to Sense Pin			-0.3 to 6V	V
P_d	Power Dissipation			300	mW
T_J	Operating Junction Temperature			150	℃
$R_{\theta JA}$	Thermal Resistance (Junction to Air)	SOT-26		208.4	°C/W
		DIP-8		82.5	°C/W
T_{stg}	Storage Temperature Range			-55 to +150	℃
T_L	Lead Temperature (Soldering)	20 sec	SOT-26	220	°C
		10 sec	DIP-8	260	
	ESD Capability, HBM Model			3.0	kV
	ESD Capability, Model			300	V

* All voltage values, except differential voltages, are given with respect to the network ground terminal.

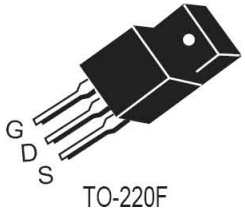
Semiconductors

HN1K05FU N Channel IC57



1. Source 1
2, Gate 1
3. Drain 2
4. Source 2
5. Gate 2
6. Drain 1

CEF04N6 N Channel Q901

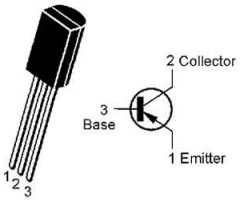


TO-220F

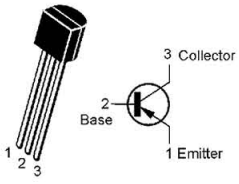
(SCR) MCR100 Q912

PIN ASSIGNMENT	
1	Cathode
2	Gate
3	Anode

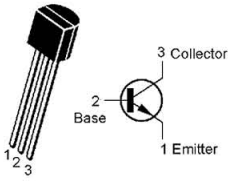
KTA1273Y Q905
KSA916Y Q605



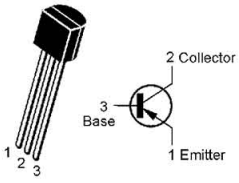
KSA708 Q911



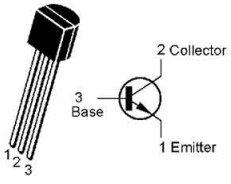
KSC1008 Q906,910



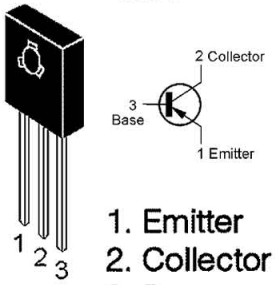
KRA102M Q908



KRC102M Q907
KTC3198Y Q904

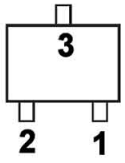


KSB1151Y PNP Q903



1. Emitter
2. Collector
3. Base

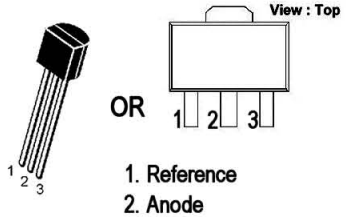
KTC3875S NPN Q502
KTA1504S PNP Q501,804,821
KRA107S PNP Q604,606,607,615,806
KTD1304 NPN Q609-614,Q617-622,Q805
2N3904S NPN Q108-110,Q308,404
KRC 107S NPN Q315,407,408,608,616
2SA1955 PNP Q307



1) Emitter
2) Base
3) Collector

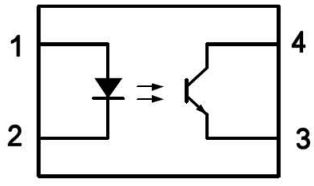
KIA431B IC92

TO-92 SOT-89



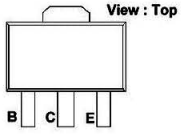
1. Reference
2. Anode
3. Cathode

PC17L PC91



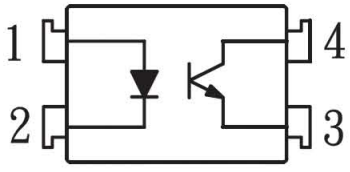
Pin Connections
1. Anode
2. Cathode
3. Emitter
4. Collector

KTA1664 PNP Q105,106

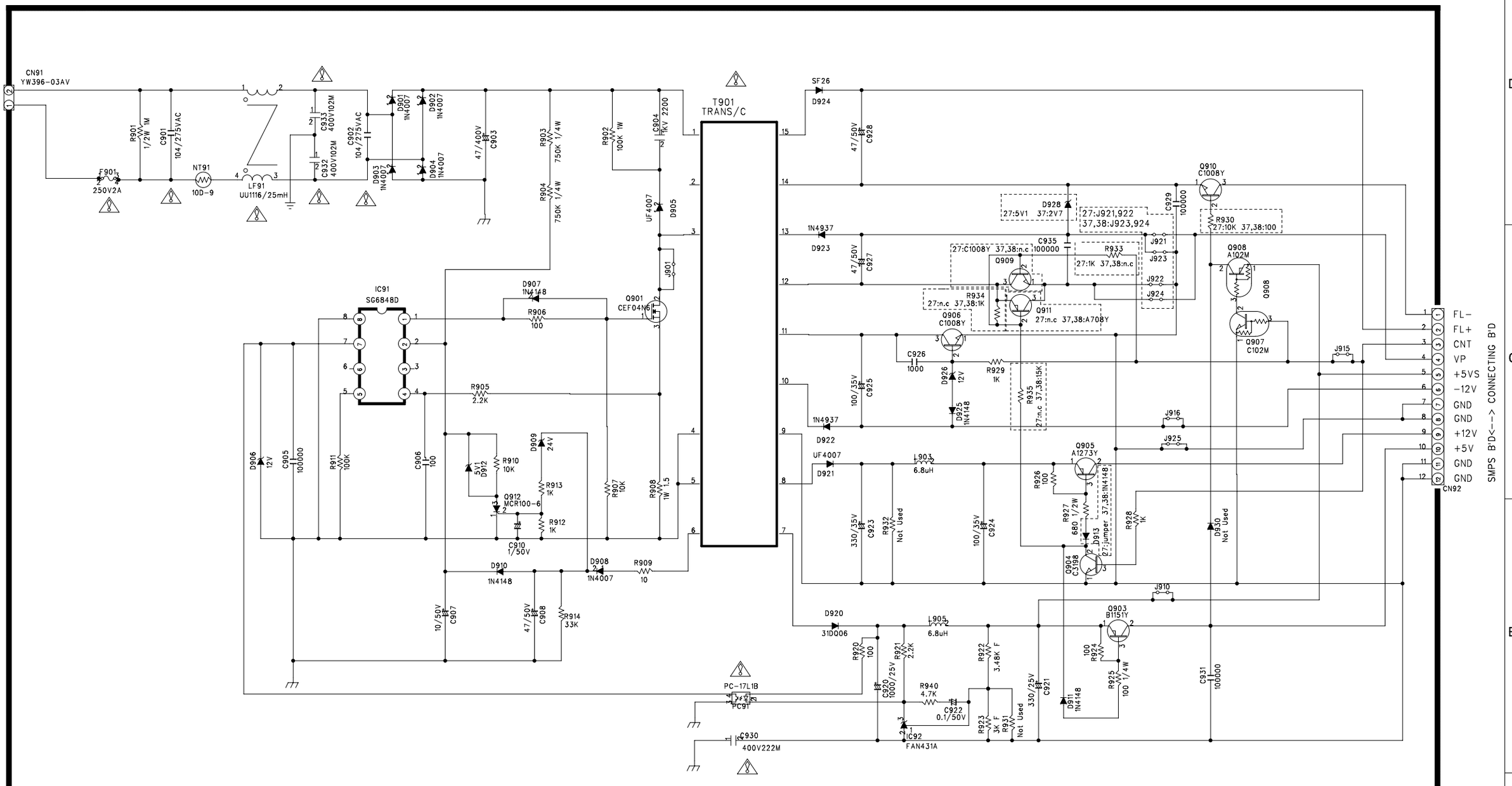


1 Base
2 Collector
3 Emitter

Photo Coupler K1010 IC46



1. Anode
2. Cathode
3. Emitter
4. Collector



DVD 27			
D913 : JUMPER	R935 : N.C	R934 : N.C	
Q909 : C1008Y	R933 : 1K	Q911 : N.C	
D928 : 5V1	R930 : 10K	J923, J924 : N.C	
J921, J922 : CONNECTION			

DVD 37/38		
D913 : 1N4148	R935 : 15K	R934 : 1K
Q911 A708Y	Q909 : N.C	R933 : N.C
D928 : 2V7	R930 : 100	
J921, J922 : N.C	J923, J924 : CONNECTION	

**IMPORTANT SAFETY NOTICE.
COMPONENTS IDENTIFIED BY ⚠ MARK HAVE SPECIAL CHARACTERISTICS. IMPORTANT FOR SAFETY. WHEN REPLACING ANY OF THESE COMPONENTS. USE ONLY MANUFACTUREY'S SPECIFIED PARTS.

**THE UNIT OF RESISTANCE IS OHM.
K=1000 OHM, M=1000 KOHM

**THE UNIT OF CAPACITANCE IS MICROFARAD (uF)
1pF = 10^{-6} uF

**THIS SCHEMATIC DIAGRAM MAY MODIFIED AT ANYTIME WITH THE IMPROVEMENT OF PERFORMANCE

2007.04.04

REVISION	2		4		6	
1		3		5		7

SCHEMATIC DIAGRAM			SHEET
MODEL	DVD 27/37/38		
DESIGN	CHECK	APPROVE	DRAWING NO
S.H.LEE	J.H.PARK		1840SCLZ
07.04.04	07.04.04		(SMPS) 1/1

6 5 4 3 2 1

TO MECHANISM PICK-UP PART

GND-LD
DVD-LD
NC
HFM
MD
CD-LD
VR-DVD
VR-CD
NC
E
VCC
VC(VREF)
GND/PD
F
B
A
RF
CD-DVD/SW
D
T-
T+
F+
F-

TACT-
TACT+
TACT+
TACT-

5CH. MOTOR DRIVER

AM5888S

IN_SW
GND
OUT_SW
LOAD+
LOAD-

SLED+
SLED-
HOME_SW
GND
MOT_SPDL+
MOT_SPDL-

SLED & SPINDLE

TL3472

ZR36707
RF_AMP

74VHC04

24C08

ZR36778
MPEG Decoder

16M FLASH MEMORY

64M_SDRAM

BOOTSEL2
BOOTSEL1

* DVD47 : R143 (33 ohm)
* DVD37/38 : R143 (N.C)

for Γ
DVD47 ONLY

* DVD47 : R194 (33 ohm)
* DVD37/38 : R194 (75 ohm)

ZR36721
HDMI
Transmitter

TO HDMI CONNECTOR

Near to ZR36721

LM1117-3V3
LM1117-1V8

TO AUDIO DAC (DSD OUT)

SAA7893
DSD Decoder

64M_SDRAM

* DVD37/38 only use

REVISION	2		4		6	
1		3		5		7

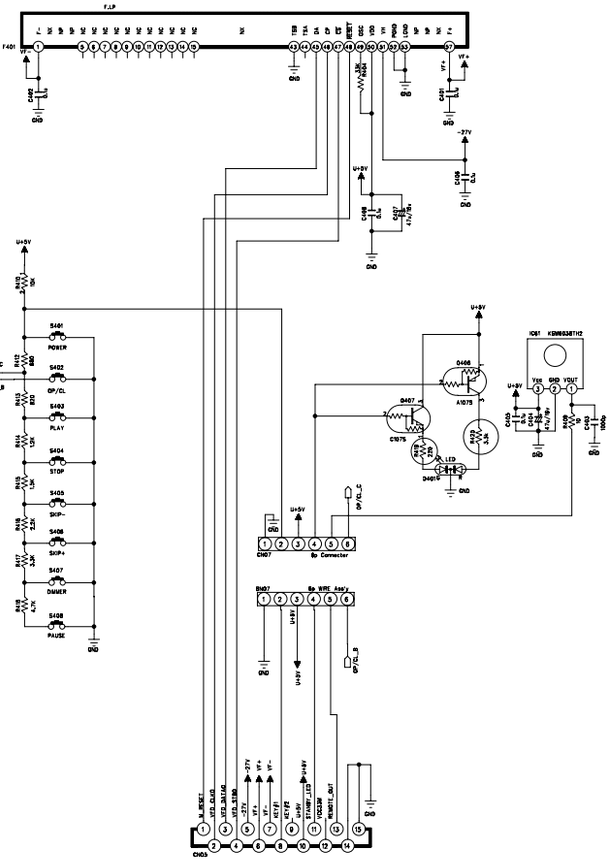
M.P

ISSUE

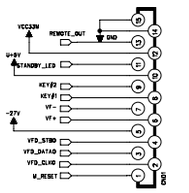
`4

SCHEMATIC DIAGRAM — SHEET 1/3

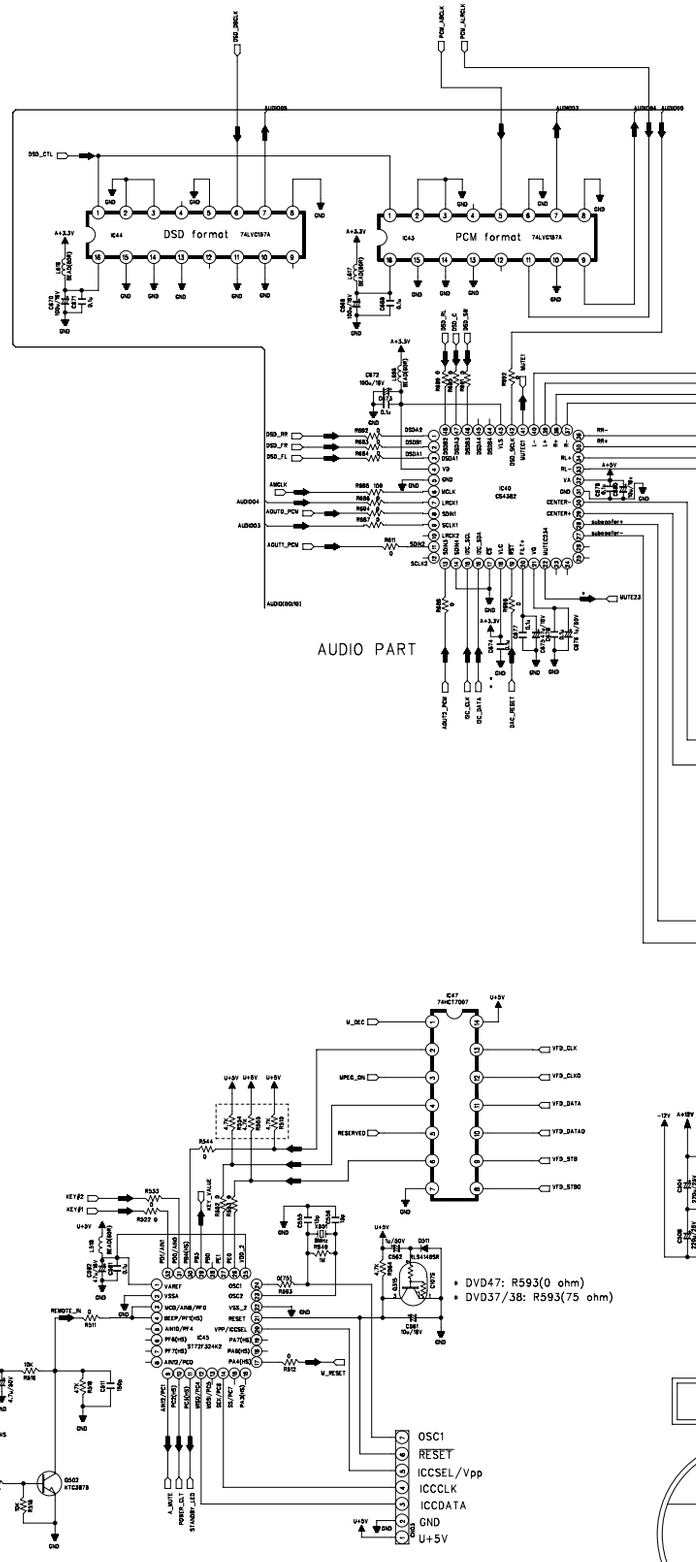
MODEL	DVD 37/38/47 (Harman DVD)		
DESIGN	CHECK	APPROVE	DRAWING NO
S.H LEE	J.H PARK		11842SCMY 1/3
2007.04.04	2007.04.04		



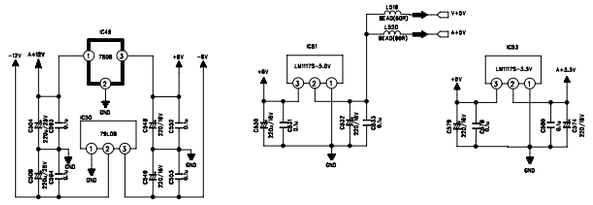
FRONT part



VFD PORT
MAIN-->FRONT



MCU PART

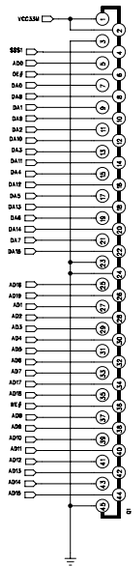


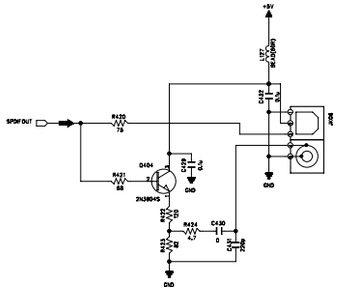
POWER PART

M
MULTI. LAB.

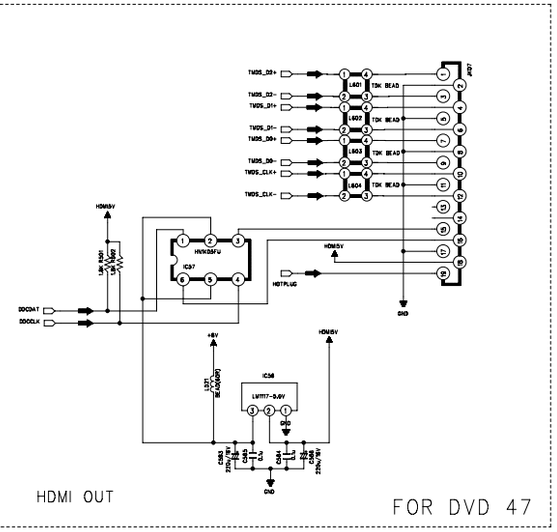
REVISION	2	4	6	
1	3	5	7	

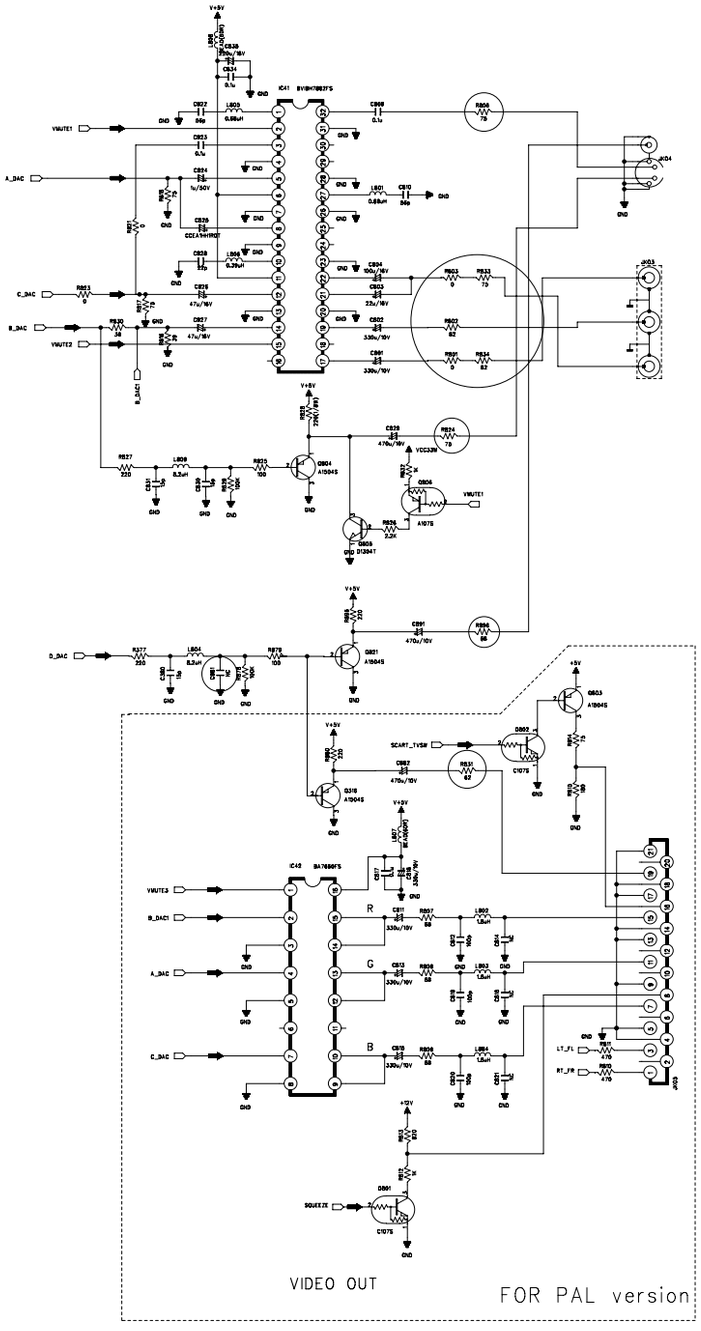
SCHEMATIC DIAGRAM			SHEET
MODEL	DVD 37/38/47 (Harman DVD)		2/3
DESIGN	CHECK	APPROVE	DRAWING NO
S.H.LEE	J.H.PAR		11842SCMY
2007.04.04	2007.04.04		2/3

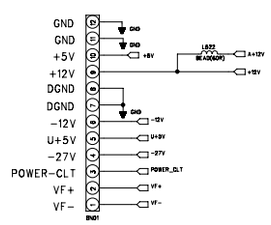




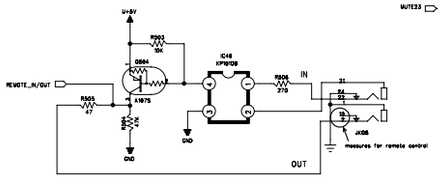
SPDIF OUT



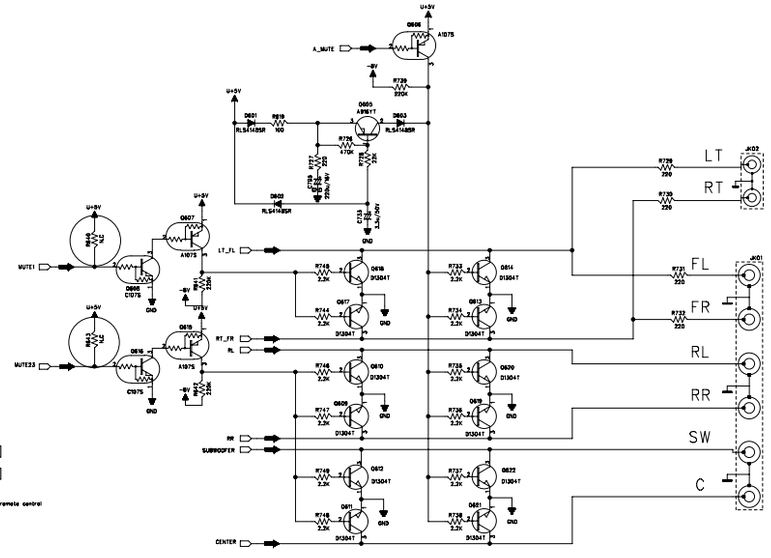




POWER PORT



REMOTE_IN/OUT



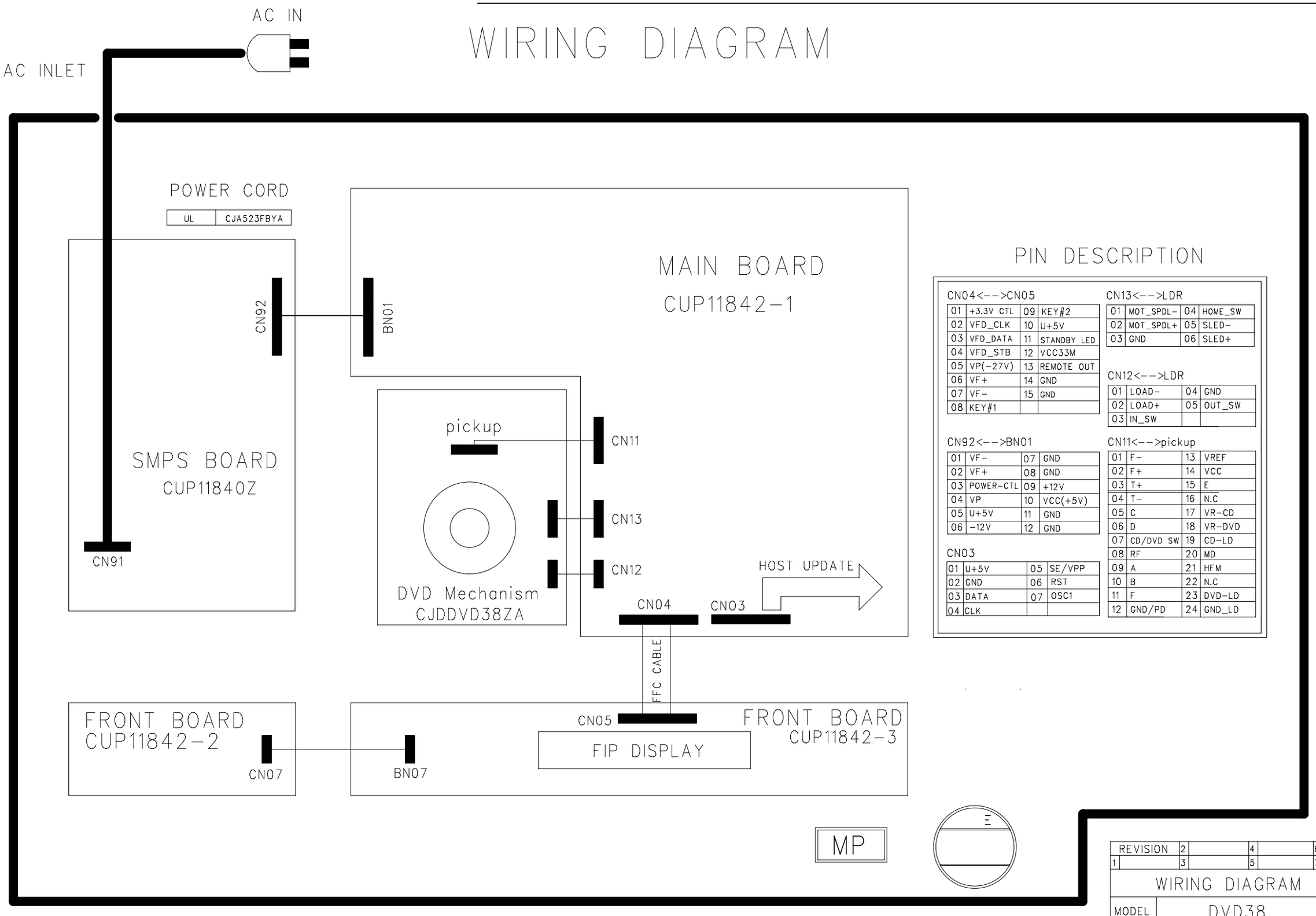
AUDIO OUT

REVISION	2		4		6	
1		3		5		7	

SCHEMATIC DIAGRAM — SHEET 3/3

MODEL	DVD 37/38/47 (Harman DVD)		3/3
DESIGN	CHECK	APPROVE	DRAWING NO
S.H.LEE	J.H.PARK	H.W.LEE	11842SCMY
2007.04.04	2007.04.04		3/3

WIRING DIAGRAM



PIN DESCRIPTION

CN04<-->CN05

01	+3.3V CTL	09	KEY#2
02	VFD_CLK	10	U+5V
03	VFD_DATA	11	STANDBY LED
04	VFD_STB	12	VCC33M
05	VP(-27V)	13	REMOTE OUT
06	VF+	14	GND
07	VF-	15	GND
08	KEY#1		

CN13<-->LDR

01	MOT_SPDL-	04	HOME_SW
02	MOT_SPDL+	05	SLED-
03	GND	06	SLED+

CN12<-->LDR

01	LOAD-	04	GND
02	LOAD+	05	OUT_SW
03	IN_SW		

CN92<-->BN01

01	VF-	07	GND
02	VF+	08	GND
03	POWER-CTL	09	+12V
04	VP	10	VCC(+5V)
05	U+5V	11	GND
06	-12V	12	GND

CN11<-->pickup

01	F-	13	VREF
02	F+	14	VCC
03	T+	15	E
04	T-	16	N.C
05	C	17	VR-CD
06	D	18	VR-DVD
07	CD/DVD SW	19	CD-LD
08	RF	20	MD
09	A	21	HFM
10	B	22	N.C
11	F	23	DVD-LD
12	GND/PD	24	GND_LD

CN03

01	U+5V	05	SE/VPP
02	GND	06	RST
03	DATA	07	OSC1
04	CLK		

REVISION	2	4	6
1	3	5	7

WIRING DIAGRAM				SHEET 1/1
MODEL	DVD38			
DESIGN	CHECK	APPROVE	DRAWING NO	
L.S.H	P.J.H			1/1
07.04.04	07.04.04			