harman kardon
Model DVD 37

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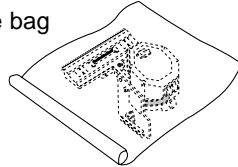
Service Manual

- Contents -

SERVICING PRECAUTIONS

NOTES REGARDING HANDLING OF THE PICK-UP

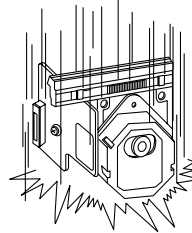### 1. Notes for transport and storage

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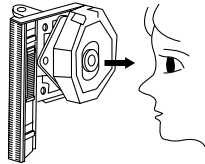
NEVER look directly at the laser beam, and don't let contact fingers or other exposed skin.

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

Cotton swab

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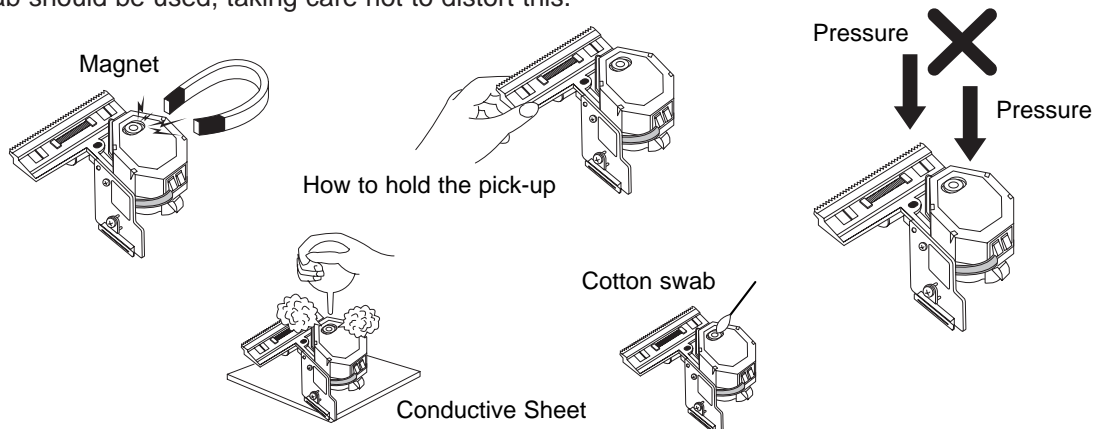
6) Never attempt to disassemble the pick-up.
   Spring by excess pressure. If the lens is extremely dirty, apply isopropyl alcohol to the cotton swab. (Do not use any other liquid cleaners, because they will damage the lens.) Take care not to use too much of this alcohol on the swab, and do not allow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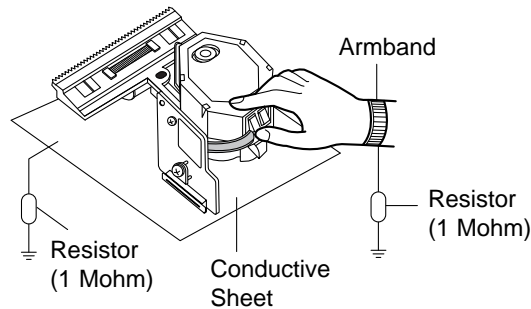
ESD PRECAUTIONS

Electrostatically Sensitive Devices (ESD)

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components com-monly are called Electrostatically Sensitive Devices (ESD). Examples of typical ESD devices are integrated cir-cuits 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 sur-face 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 gen-erate static electricity sufficient to damage an ESD device).

DVD 37 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)

Depth measurement includes knobs and connectors.

Height measurement includes feet and chassis.

All specifications subject to change without notice.

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MODEL NAME : DVD 37 & DVD 37/230

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	2.0 ± 0.2		YEDS7 (SONY) TRACK 1
		R			
Level difference [Vrms]			< 0.2		
F/ response [dB] Ref.1kHz 0dB	2 0 Hz	L	0 ± 1.0		YEDS7 (SONY) TRACK 2
		R			
	100 Hz	L	0 ± 1.0		YEDS7 (SONY) TRACK 4
		R			
	10 KHz	L	0 ± 1.0		YEDS7 (SONY) TRACK 10
		R			
	2 0 KHz	L	0 ± 1.5		YEDS7 (SONY) TRACK 13
		R			
	4 4 KHz	L	0 ± 1.5		TDV-540A (ABEX) TITLE 4,CHAPTER 16 AUDIO STREAM 3
		R			
Emphasis Characteristic[dB] Ref.1kHz 0dB	5 KHz	L	−4.53±1.0		YEDS7 (SONY) TRACK 40
		R			
	1 6 KHz	L	−9.04 ± 1.0		YEDS7 (SONY) TRACK 41
		R			
S/N [dB]		L	>105		YEDS7 (SONY) TRACK 23
		R			
Channel Separation [dB]		L→R	> 95		YEDS7 (SONY) TRACK 30,34
		R→L			
Linearity [dB] −90dB playback		L	89.5±3		YEDS7 (SONY) TRACK 22
		R			
T.H.D [%]		L	< 0.01		YEDS7 (SONY) TRACK 1
		R			
Dynamic Range [dB] −60dB playback		L	> 9 3		YEDS7 (SONY) TRACK 20
		R			
全高調波歪率 [%] ＤＶＤ ９６k		L	< 0.01		TDV-540A (ABEX) TITLE 3, CHAPTER 1
		R			
Dynamic Range [dB] ＤＶＤ ９６k		L	> 9 5		TDV-540A (ABEX) TITLE 3, CHAPTER 2
		R			
全高調波歪率 [%] ＤＶＤ 48k		L	< 0.01		TDV-540A (ABEX) TITLE 2, CHAPTER 1 AUDIO STREAM 2
		R			
Dynamic Range [dB] ＤＶＤ 48k		L	> 9 5		TDV-540A (ABEX) TITLE 2, CHAPTER 2 AUDIO STREAM 2
		R			

2. DIGITAL OUTPUT

1) OPTICAL OUT

		Limit	Result	TEST DISC
JITTER 44.1kHz (mUI)		< 50mUI		Normal 44.1kHz CD Playback
JITTER 96kHz (mUI)		< 50mUI		Normal 96kHz DVD Playback

2) COAXIAL OUT

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

MODEL NAME   : DVD 37& DVD 37/230
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

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 37& DVD 37/230
Description   : Characteristics Specification of **Video**
Test Disc   : TDV−540A (ABEX)   , MDVD−111 (TEAC)   <u>Serial NO.:</u>
Test Conditions   : 75Ω Load Terminated
AC Input   : For USA (120V/60Hz) , For Europe (230V/50Hz)
Test Measuerment : VM−700T

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		

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

Instruction manual ass'y - Accessories

Package Drawing

① POLY BAG

② CARD WARRANTY

③ HARMAN IMAGE BROCHURES

④ SHEET, IMPORTANT

⑤ MANUAL INSTRUCTION

⑥ BATTERY ASS'Y

⑦ CORD PIN (3P, W/R/Y)

⑧ CABLE, S-VHS (1.5M)

⑨ CORF , JACK (MONO) 1200MM

⑪ CABLE, HDMI (2M)

⑫ STAPLE

① MANUAL ASS'Y

⑥ REMOCON ASS'Y

③ SNOW PAD

③ SNOW PAD

④ SNOW PAD

② DVD37

⑤ BOX , OUT CARTON
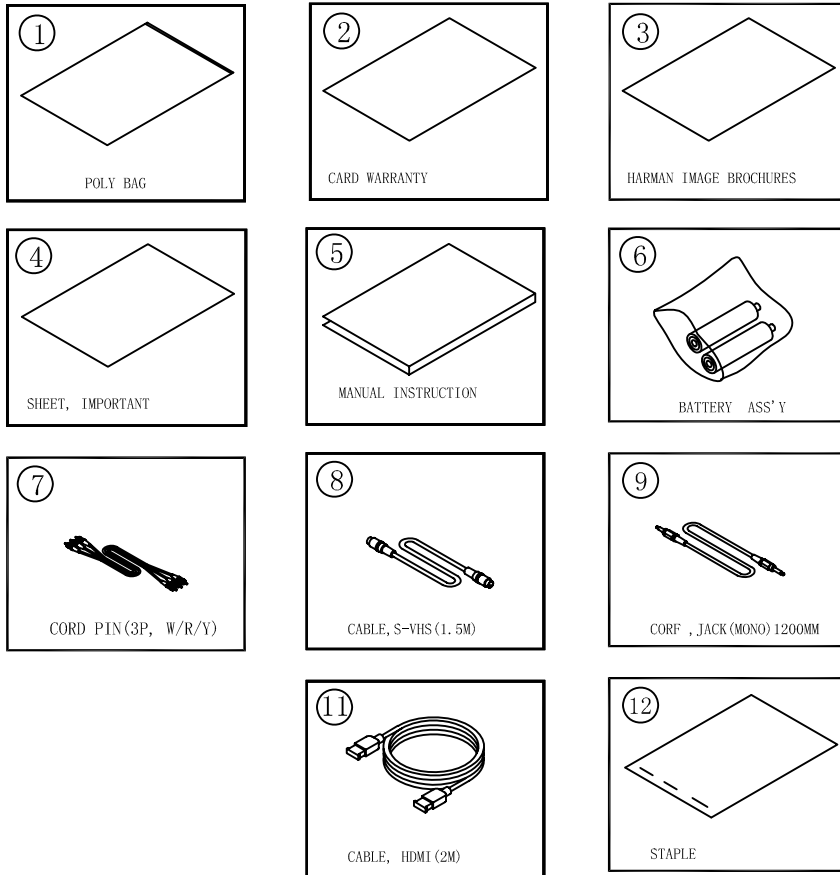
NO	DESCRIPTION	PARTS NO.	Q,ty
1	POLY BAG		1
2	CARD WARRANTY	CQE1A172X	1
3	HARMAN IMAGE BROCHURES		1
4	SHEET, IMPORTANT		1
5	INSTRUCTION MANUAL	CQX1A1049Z	1
6	BATTERY		2
7	CORD, PIN (3P, W/R/Y)	CJS4S004Z	1
8	CABLE, S-VHS (1.5M)	CJS0I006Z	1
9	CORD, JACK (MONO) 1200MM	CJS9D002Z	1
10			
11	CABLE, HDMI (2M)	CJS8T001Z	1
12	STAPLE		3
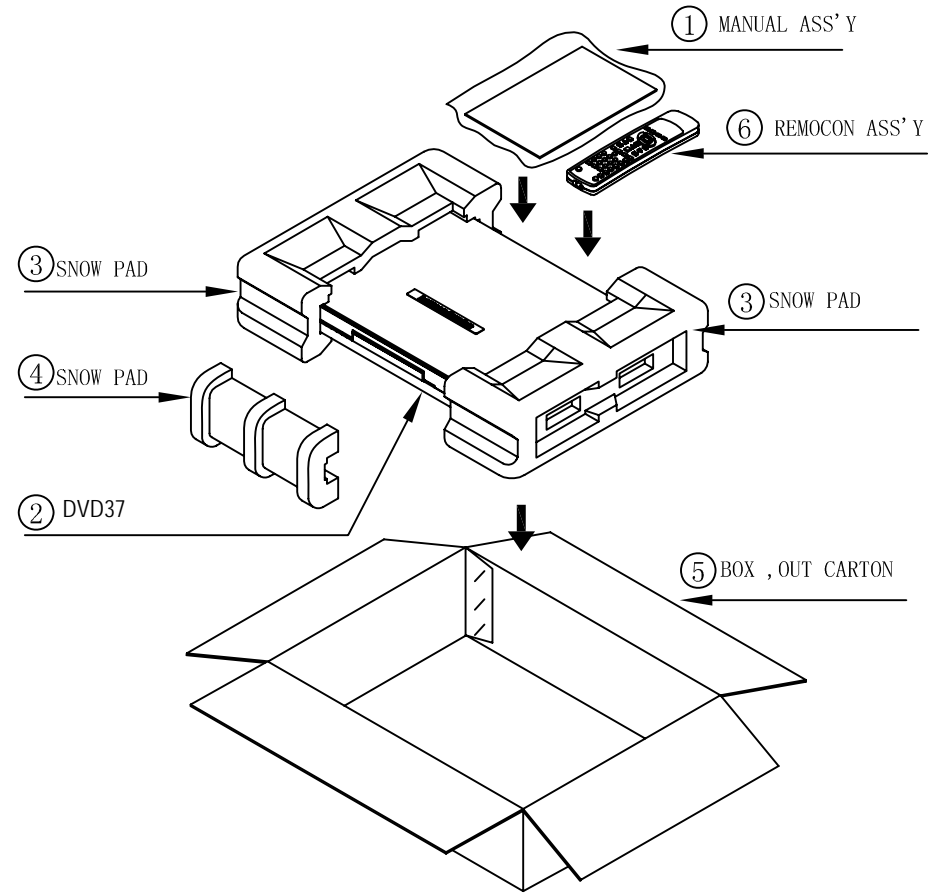
NO	DESCRIPTION	PARTS NO.	Q,ty
1	MANUAL ASS'Y		1
2	DVD 37	DVD 37	1
3	SNOW, PAD	CPS1A714	2
4	SNOW, PAD	CPS1A715	1
5	OUTER CARTON	CPG1A798Y	1
6	REMOCON ASS'Y	CARTDVD37A	1
7			

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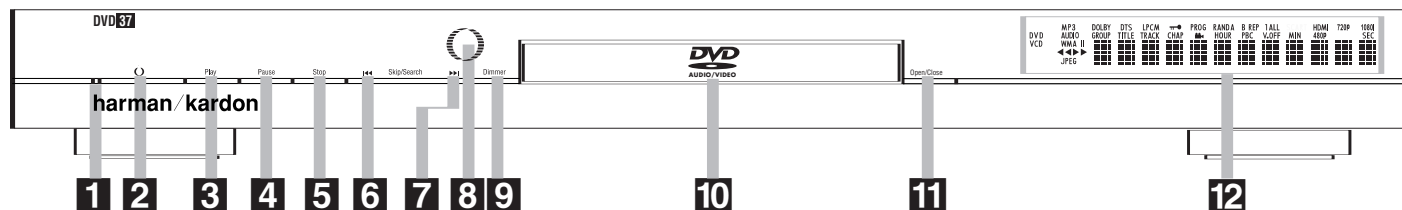
NOTE: To make it easier to follow the instructions that refer to the controls and connectors in this illustration, a larger copy may be downloaded from the Product Support section for this product at www.harmankardon.com.

⓵ Power Indicator
⓶ Power On/Off (Standby)
⓷ Play
⓸ Pause

⓹ Stop
⓺ Skip/Search Reverse
⓻ Skip/Search Forward
⓼ Remote Sensor

⓽ Display Dimmer
⑩ Disc Drawer
⑪ Open/Close
⑫ Information Display

⓵ **Power Indicator:** This indicator lights amber when the unit is connected to an AC power source, but is not turned on. When the unit is on, the indicator lights blue.

⓶ **Power On/Off (Standby):** Press the button once to turn the DVD 37 on. Press it again to put the unit in the Standby mode.

⓷ **Play:** Press to initiate playback or to resume playback after the **Pause Button** ⓸㉒ has been pressed.

⓸ **Pause:** Press this button to momentarily pause playback. To resume playback, press the button again. If a DVD is playing, action will freeze and a still picture will be displayed when the button is pressed.

⓹ **Stop:** Press this button once to place the disc in the Resume mode, which means that playback will stop, but as long as the tray is not opened or the disc changed, playback will continue from the same point on the disc when the **Play Button** ⓷㉔ is pressed again. Resume will also work if the unit was turned off. Resume will not operate for WMA files or VCDs that do not have playback control. To stop a disc and have play start from the beginning, press the button twice.

⓺ **Skip/Search Reverse:** Press this button once to return to the start of the current chapter for a DVD or track for a CD. Subsequent individual presses will skip backwards through the available chapters or tracks. Press and hold the button to play the disc in the fast reverse mode at the speed indicated in the on-screen display and by the **Playback Mode Indicators** ⓸.

⓻ **Skip/Search Forward:** Press this button once to move to the start of the next chapter for a DVD or track for a CD. Subsequent presses will skip forward through the available chapters or tracks. Press and hold the button to play the disc in the Fast Play mode at the speed indicated in the on-screen display and by the **Playback Mode Indicators** ⓸.

⓼ **Remote Sensor:** The sensor that receives commands from the remote control is behind the front panel in this area. To ensure proper operation of the player with the remote, it is important that this area not be covered. In the event that the player is enclosed in a cabinet or if the remote sensor is covered, you may extend the remote sensor by connecting an optional, external remote sensor to the **Remote Control Input** ❷ on the rear panel (see page 14). When optional, external IR "blasters" are used for system control, they should be positioned so that they point at this area.

⓽ **Display Dimmer:** Press this button to reduce the brightness of the **Information Display** ⑫ by 50% or to turn the display off completely in the following order: FULL BRIGHTNESS ➔ HALF BRIGHTNESS ➔ OFF ➔ FULL BRIGHTNESS.

⑩ **Disc Drawer:** This drawer is used to hold the discs played in the unit. Be certain to seat all discs carefully within the recess in the drawer. Do not press down on the drawer when it is open, to avoid damage to the player. When the drawer is left open with no activity for 5 minutes, it will automatically close to prevent dust or dirt from entering the component, and to prevent accidental damage. If a disc is present, the DVD 37 will immediately begin playback.

⑪ **Open/Close:** Press this button to open or close the disc tray.

⑫ **Information Display:** The Information Display provides status information on the player and the disc being played through a series of specific indicators and messages that appear in the display. See page 10 for more information on the display.

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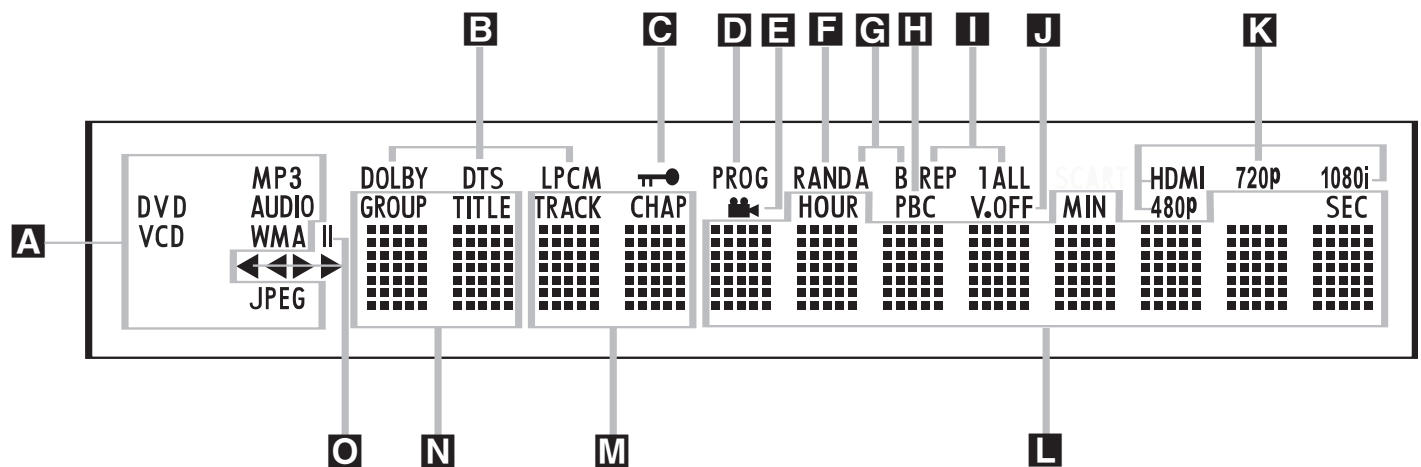
NOTE: To make it easier to follow the instructions that refer to the controls and connectors in this illustration, a larger copy may be downloaded from the Product Support section for this product at www.harmankardon.com.

A Disc-Type Indicators
B Audio Bitstream Indicators
C Parental Lock Indicator
D Program Indicator
E Angle Indicator

F Random Indicator
G A-B Repeat Indicator
H VCD Playback Control Indicator
I Repeat Indicators
J V-OFF Indicator

K Video Indicators
L Time Indicators
M Chapter/Track Number Indicators
N Group/Title Indicators
O Playback-Mode Indicator

A **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.

NOTE: The DVD 37 does not have an HDCD® (High Definition Compact Digital®) decoder. Therefore, to benefit from HDCD encoding, make sure to connect one of the DVD 37's **Digital Audio Outputs ❹❺** to your receiver or processor with HDCD encoding. If your receiver or processor does not have HDCD decoding, you may still enjoy conventional CD playback of the disc.

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

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

D **Program Indicator:** This indicator lights when a playlist has been programmed using the menu system (available for CDs only). See page 36 for more information on programming playlists.

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

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

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

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

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

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

K **Video Output Indicators:** When the DVD 37 is connected to a video display using the **HDMI Output ❸**, the display sends information to the DVD 37 indicating the highest video resolution it is capable of handling, and the DVD 37 automatically sets the video output to match it. That resolution is displayed here. You may use the **HD Mode Selector ⓲** to manually select a lower video output resolution.

L **Time Indicators:** These positions in the display will show the running time of a disc in play.

NOTE: The indicators **L M N** 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 is put into the play position.

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

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

O **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 (1/2, 1/4, 1/8 or 1/16).

▶▶ When the DVD 37 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 (x2, x4, x8, x20 or x100). Fast Play mode is not available for WMA files.
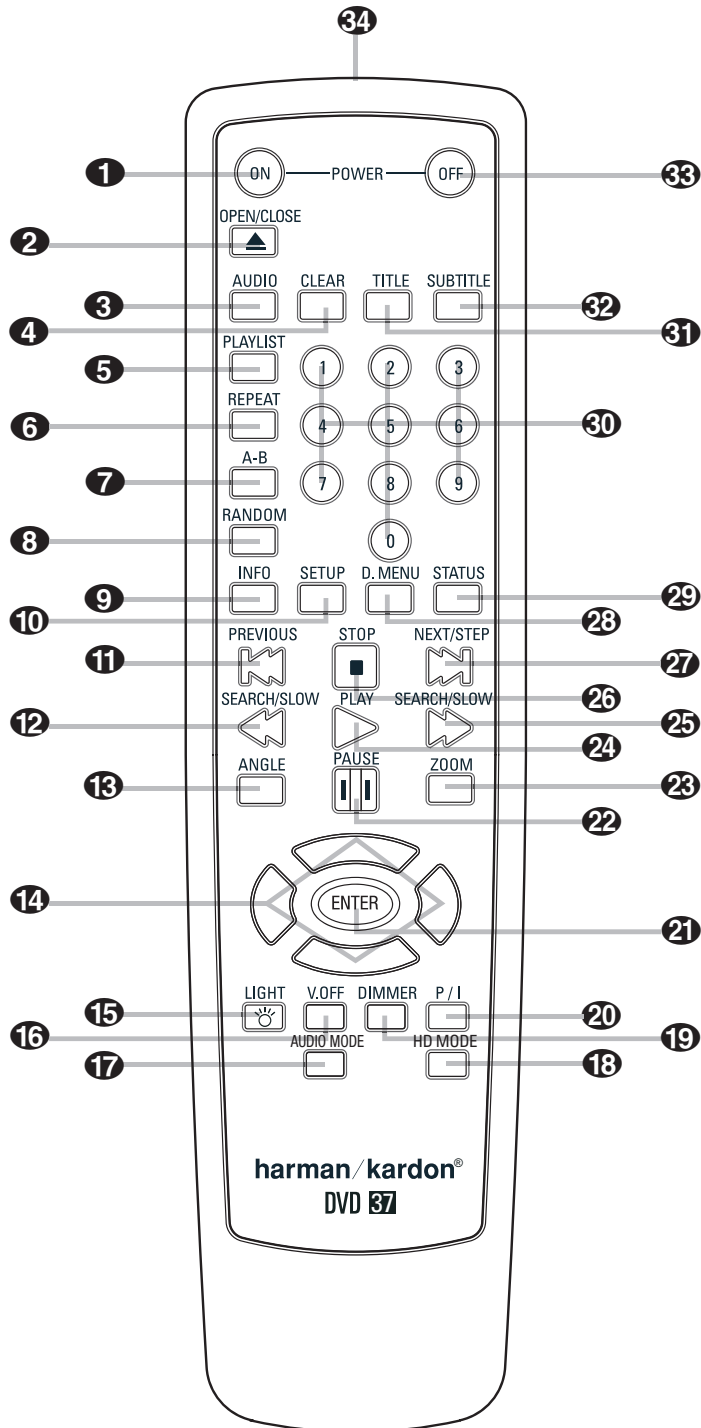
❚❚ Lights when the disc is paused.

◀◀ Lights when the disc is in the Fast Search Reverse mode. The on-screen banner display indicates the selected speed (x2, x4, x8, x20 or x100). 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 (1/2 or 1/4).

REMOTE CONTROL FUNCTIONS

❶ Power On
❷ Open/Close
❸ Audio Select
❹ Clear
❺ Playlist
❻ Repeat
❼ A-B Repeat
❽ Random
❾ Info
❿ Setup
⓫ Previous Step/Skip
⓬ Search/Slow Reverse
⓭ Angle
⓮ ▲/▼/◀/▶ Navigation Buttons
⓯ Light
⓰ Video Off
⓱ Audio Mode Selector
⓲ HD Mode Selector
⓳ Dimmer
⓴ Progressive Scan/Interlaced
㉑ Enter
㉒ Pause
㉓ Zoom
㉔ Play
㉕ Search/Slow Forward
㉖ Stop
㉗ Next Step/Skip
㉘ Disc Menu
㉙ Status
㉚ Numeric Keys
㉛ Title
㉜ Subtitle
㉝ Power Off
㉞ IR Emitter

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.

REMOTE CONTROL FUNCTIONS

❶ Power On: Turns on the player when it is in Standby mode (Harman Kardon logo appears on screen).

❷ Open/Close: Press to open or close the disc tray.

❸ Audio Select: Press to access various audio languages on a DVD (if the DVD contains multiple audio streams). This button may also allow you to access other audio formats on DVD discs, such as linear PCM or Dolby Digital 5.1 tracks (or other formats), if they've been recorded on the disc.

❹ Clear: Press this button to remove on-screen menus or banners from the display screen. Press this button to clear the current play order displayed next to a track while programming a playlist. In Stop mode and with all menus and banners removed from the display, press and hold this button for five seconds to reset all settings to their factory defaults.

❺ Playlist: Press this button to access the Playlist on-screen menu, which enables you to change the order in which tracks are played on a CD or DVD-Audio disc. (See page 36 for more information on creating and playing playlists.)

❻ Repeat: Each press of this button changes the playback mode to repeat a chapter or track or the entire disc. A repeat icon will appear in the upper right corner of the screen indicating the current repeat mode. If the Player Information Screen is active, the changes will be displayed on screen.

❼ A-B Repeat: Press this button to enter the starting point of a section on a disc you wish to repeat. The second press enters the end of the selection to be repeated. Once the "A" (start) and "B" (end) points have been entered the player will repeat the selection until the **Play Button ㉔❸** is pressed or the disc is stopped. If the Player Information Screen is active, the changes will be displayed on screen.

❽ Random: Each press of this button starts or stops playback in random order. The Random function is only available when playing CDs, but not when a Playlist is active (the Player Information screen indicates Programmed Order on the Playlist line).

❾ Info: Press once to access the Player Information menu for information on the current disc and the playback mode settings. Press again to remove information from screen. See page 28 for more information on the Player Information menu.

❿ Setup: Press this button to use the DVD 37's on-screen menu system to adjust the player's configuration settings. Note that the **Info Button ❾** must be pressed to access the DVD 37's Player Information menu to obtain detailed disc information, and to configure the playback mode of the disc.

⓫ Previous Step/Skip: Press this button once to skip back to the beginning of the current chapter on a DVD or track on a CD or DVD-Audio disc. Press it again to continue to skip back through the previous

chapters or tracks. After first pressing the **Pause Button ㉒**, press this button to step backwards through a DVD or VCD as a series of still-image frames.

⓬ Search/Slow Reverse: This button initiates fast or slow play in the reverse mode. For fast reverse play, each press of the button when playing DVD or VCD discs changes the speed as indicated by the number appearing in the upper right corner of the screen. For slow reverse play, first press the **Pause Button ㉒** and each subsequent press of this button will change the slow play speed as indicated by the number appearing in the upper right corner of the screen.

⓭ Angle: Press this button to change the camera angle on discs programmed for multiple-angle views. When a JPEG is being displayed, pressing the **Angle Button ⓭** repeatedly causes the on-screen image to rotate clockwise by 90 degrees each press. The current orientation in degrees will be displayed in the upper right corner of the screen.

⓮ ◀ ▶ ▲▼Navigation Buttons: Use to move the cursor in the on-screen menu system.

⓯ Light: Press to illuminate the buttons on the remote controller.

⓰ Video Off: Press this button to turn off the video output for improved audio performance when playing discs. Press it again to view the on-screen menus. It is highly recommended that you use this function to prevent "burn-in" of your plasma video display.

⓱ Audio Mode Selector: This button adjusts the Bass Management setting, which is also found in the **AUDIO SETUP** menu (see page 22). 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.

In Bypass mode, the analog audio information is passed through the **Analog Audio Outputs ❾❿** as is, without any bass management adjustments being applied. 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.

The On 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, it is recommended that you use the **AUDIO ADJUSTMENTS** submenu to set the DVD 37's bass management settings. See page 22.

The Stereo 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 ❾❿**, and you would like to have this signal available for 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, the same front left and right channel information will be available at both of the left and right **Analog Audio Outputs ❾❿**. No surround information will be present in the signal output at the 2-channel **Analog Audio Outputs ❾**. In Stereo mode only, the downmixed 2-channel signal will be available at both **Analog Audio Outputs ❾❿**. Use the **Audio Mode Selector ⓱** to toggle through the three available settings.

⓲ HD Mode Selector: When the DVD 37 is connected to a video display using the **HDMI Output ❸**, the display sends information to the DVD 37 indicating the highest video resolution it is capable of handling, and the DVD 37 automatically sets the video output to match it. Pressing this button allows you to manually change the output resolution, with your selection indicated by the **Video Output Indicators 🅚**. The DVD 37 will not allow you to select a resolution beyond the capabilities of your display, and if you try to do so, an on-screen error message will appear to alert you to the selection of an incompatible video format. Changes made with this button remain active until the DVD 37 or the display is turned off. When either is turned off, and then on again, the DVD 37 will revert to the default setting transmitted by the display.

⓳ Dimmer: Press to change the brightness of the front panel display or to turn the display off completely in the following order: **FULL BRIGHTNESS ➜ HALF BRIGHTNESS ➜ OFF ➜ FULL BRIGHTNESS**

⓴ Progressive Scan/Interlaced Button: Each press of this button selects between the progressive scan and interlaced modes for the **Component Video Outputs ❺**. This button has no effect while the Setup menu system is active, indicated by **–SETUP–** appearing in the **Information Display ⓬**. Press the Setup Button ❿ to clear the Setup menu, and then press this button to toggle between the progressive scan and interlaced component video settings.

㉑ Enter: Press this button to enter a setting in the DVD 37 menu system or to confirm a menu selection choice in a disc's on-screen menu.

㉒ Pause: Press this button to pause the disc and freeze the picture during DVD or VCD playback, or to pause the playback of a CD or DVD-Audio disc. To play a DVD or VCD in the slow-forward or -reverse mode, first press this button and then press either the **Search/Slow Forward ㉕** or **Reverse Button ⓬**.

㉓ Zoom: Press this button to zoom in on the image from a DVD, VCD or JPEG image. The image may be expanded by a factor of x2, x3, x4 or x5. Once the on-screen indication of the zoom ratio disappears from the screen you may use the **Navigation Buttons ⓮** to explore the picture.

REMOTE CONTROL FUNCTIONS

24 **Play:** Press this button to begin the playback of a disc, or to resume normal playback when a disc has been paused or scanned.

25 **Search/Slow Forward:** This button initiates fast or slow play in the forward mode. For fast forward play, each press of the button when playing DVD or VCD discs changes the speed as indicated by the number appearing in the upper right corner of the screen. For slow forward play, first press the **Pause Button** **21** and each subsequent press of this button will change the slow play speed as indicated by the number appearing in the upper right corner of the screen.

26 **Stop:** When a DVD is playing, press this button once to place the disc in the Resume mode, which means that playback will stop. However, as long as the disc drawer is not opened, playback will continue from the point where the disc was stopped when the **Play Button** **24** **3** is pressed again, as indicated by the **LAST SCENE** message (for DVDs) or the **RESUME** message (for CDs, MP3 files, JPEG files and VCDs with PBC) in the **Information Display** **12**. Resume will not operate for WMA files or VCDs that do not have playback control. Pressing the button twice will stop the disc and play will start from the beginning of the disc when the **Play Button** **24** **3** is pressed again.

27 **Next Step/Skip:** Press this button once to advance to the beginning of the next chapter on a DVD or track on a CD. Press it again to continue to advance through the remaining chapters or tracks. After first pressing the **Pause Button** **22**, press this button to step through a DVD-Video disc as a series of still-image frames.

28 **Disc Menu:** While a DVD is playing, press this button to view the disc's main menu.

29 **Status:** Press while a disc is playing to view the on-screen status banner display. The first press will display the current title and chapter, the play mode icon and the elapsed time, along with a "temperature bar" display of the time elapsed. You may use the ◀▶▲▼ **Navigation Buttons** **14** and the **Enter Button** **21** to select and change the current title or chapter, or the time display. The Status Banner is only available for DVDs and VCDs when PBC is turned off. Press the button one more time to remove the status displays from the screen. More detailed information about the disc is available by pressing the **Info Button** **9**.

30 **Numeric Keys:** Press these buttons to enter a number.

31 **Title:** When a DVD is playing, press this button to go back to the main title menu for the disc being played. If you are playing a DVD-Audio disc that contains other formats the DVD 37 is capable of playing, such as linear PCM or Dolby Digital 5.1, pressing this button may enable you to switch playback from one audio format to another.

32 **Subtitle:** When a DVD is playing, press to select a subtitle language or to turn subtitles off.

NOTE: Due to the variations in how DVD discs are authored, the subtitle languages displayed by the DVD 37 may not accurately reflect the actual languages available on the disc. It is recommended that subtitles be selected using the disc's menu.

33 **Power Off:** Puts the player in Standby mode.

34 **IR Emitter:** This small, clear button-like device sends the IR commands from the remote control to the DVD 37. To ensure proper performance of the remote control, be sure to point it toward the unit and do not cover it with your fingers when sending remote commands.

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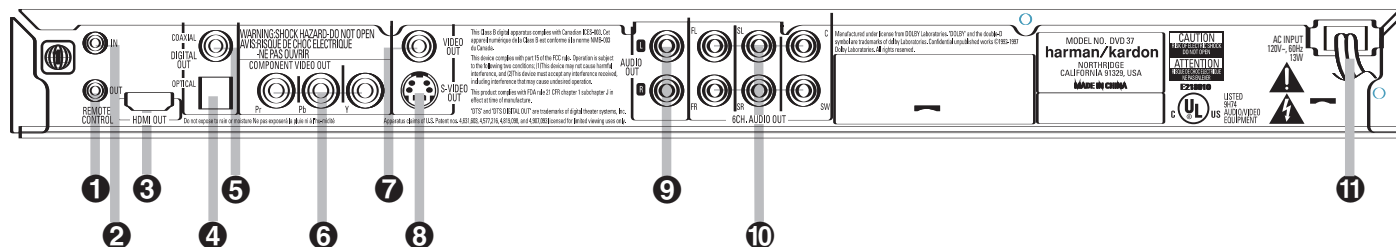
NOTE: To make it easier to follow the instructions that refer to the controls and connectors in this illustration, a larger copy may be downloaded from the Product Support section for this product at www.harmankardon.com.

❶ Remote Control Output
❷ Remote Control Input
❸ HDMI Output
❹ Optical Digital Audio Output

❺ Coaxial Digital Audio Output
❻ Component Video Outputs
❼ Composite Video Output
❽ S-Video Output

❾ Analog Audio Outputs
❿ 6-Channel Audio Outputs
⓫ AC Power Cord

❶ **Remote Control Output:** Connect this jack to the infrared (IR) input jack of another compatible remote-controlled product to have the built-in Remote Sensor on the DVD 37 provide IR signals to other compatible products.

❷ **Remote Control Input:** Connect the output of a remote infrared sensor, or the remote control output of another compatible product, to this jack. This will enable the remote control to operate even when the front-panel Remote Sensor on the DVD 37 is blocked. This jack may also be used with compatible IR remote control-based automation systems.

❸ **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 uncompressed 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.

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. 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.

The following audio formats may be output via the HDMI connection:
Audio CD – 2-Channel PCM or 5.1-channel DTS
DVD-Audio and SACD – 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 need to connect the **6-Channel Audio Outputs** ❿ to the corresponding input jacks on your receiver or processor. These formats are not output digitally.

❹ **Optical Digital Audio Output:** Connect this jack to the optical digital input of an A/V receiver or surround processor for Dolby Digital, DTS or PCM audio playback.

❺ **Coaxial Digital Audio Output:** Connect this jack to the coaxial digital input of an A/V receiver or surround processor for Dolby Digital, DTS or PCM audio playback.

NOTES:
• Connect either the **Optical Digital Audio Output** ❹ or the **Coaxial Digital Audio Output** ❺ to a corresponding digital audio input on your receiver or processor, but not both.

• 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.

❻ **Component Video Outputs:** These outputs carry the component video signals for connection to display monitors with component video inputs. For standard analog TVs or projectors with inputs marked Y/Pr/Pb or Y/Cr/Cb, connect these outputs to the corresponding inputs. If you have a high-definition television or projector that is compatible with high-scan-rate progressive video (480p or better), connect these jacks to the HD component inputs. If you are using a progressive scan display device, PROGRESSIVE must be selected in the Video menu in order to take advantage of the progressive scan circuitry. See the "Scan Type" section on page 23 for more information on progressive scan video.

IMPORTANT: These jacks should NOT be connected to standard composite video inputs.

❼ **Composite Video Output:** Connect this jack to the video input on a television or video projector, or to a video input on an A/V receiver or processor if you are using that type of device for video input switching.

❽ **S-Video Output:** Connect this jack to the S-video input on a television or video projector, or to an S-video input on an A/V receiver or processor if you are using that type of device for S-video input switching.

❾ **Analog Audio Outputs:** Connect these jacks to an audio input on an A/V receiver, surround processor or your television for analog audio playback.

❿ **6-Channel 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** ❸, **Optical Output** ❹ or **Coaxial Digital Audio Output** ❺ or the **Analog Audio Outputs** ❾.

⓫ **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: You'll find more details about all audio/video connections under Setup and Connections on the following pages.

SETUP AND CONNECTIONS

- Ensure that the power switch of this unit (and of other equipment to be connected) is set to "Off" before commencing connection. We also strongly recommend that you leave all system components unplugged from AC power until after you have completed the interconnections described in this section.
- Do not block the ventilation holes of any of the equipment and arrange them so that air can circulate freely.
- Read through the instructions before connecting other equipment.
- Ensure that you observe the color-coding when connecting audio and video cables.

VIDEO NOTES:

- For the best quality, if your receiver or processor and/or video display are HDMI-capable, we recommend using the HDMI output. With a single cable connection between components, HDMI is able to deliver uncompressed high-definition digital video and digital audio programming. Even without audio processing capability, your HDMI-ready receiver will be able to pass the uncompressed digital video signal to your video display.

  NOTE: 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. In all cases, the video display must be HDCP-compliant in order to use the HDMI output.

- If your equipment is not HDMI-ready, we recommend the use of component video for higher quality pictures. You may also use the standard S-video or composite video connection if your TV does not have component video inputs. The component and S-video outputs are not available simultaneously.

- The composite video output (yellow) sends the complete video signal to the TV (or to the A/V receiver) by one cable only. Use this video output when your TV set is equipped with a video input jack only.
- The S (separate) video output connector separates the color (C) and luminance (Y) signals before transmitting them to the TV set in order to achieve a sharper picture. Use the S-video cable when connecting the player to a TV equipped with an S-video input for improved picture clarity.
- The component video outputs further separate the color components of the video signal, optimizing the DVD 37's video performance. Component video connections are preferred, when available on your TV or receiver. If you are using a TV or video display that is compatible with high-resolution 480P video signals, use the input jacks on the video display marked "HD Component," if available. Also, be sure to configure the display's input settings for use with "480P" video signals. You will also need to change the scan type in the DVD 37's Video Setup menu from "Interlaced" to "Progressive." See page 23.
- Modern audio/video receivers are capable of connection to several video source devices, such as the DVD 37 and a VCR, cable television set-top box, HDTV tuner or other device. The receiver is equipped with video monitor outputs for connection to your television, projector or flat-panel display. As you select any input source device, the receiver selects the correct video input and routes it to the correct video monitor output to your television. It is recommended that you connect one of the video outputs from the DVD 37 to the corresponding input on your receiver to simplify operation of your home entertainment system. Refer to the owner's guide for your receiver for more information.
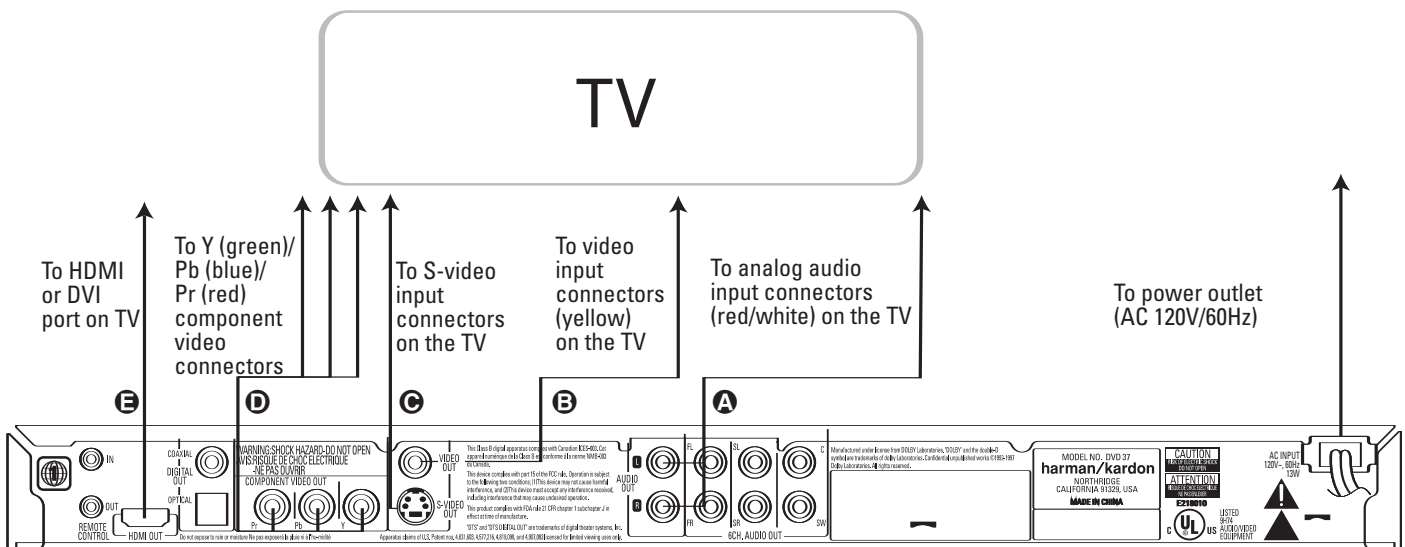
- If your receiver is capable of multiroom operation, it is recommended that you connect both the component (or HDMI) and composite video outputs of the DVD 37 to the receiver. This enables the highest-quality picture (component video) for viewing in the main listening room, while enabling the multiroom system, if it is video-capable, to distribute the composite video signal to the remote zone. Consult the owner's guide for your receiver to determine whether it has video multiroom capability.

IMPORTANT NOTE: The DVD 37 is not capable of displaying S-video and component video simultaneously. If you have used either of these video connections and have no picture, temporarily connect the **Composite Video Output** ❼ to your video display, and then press the **Setup Button** ❿ to access the menu system. Use the ▲▼ **Navigation Buttons** ⓮ to highlight the Video Setup submenu, and press the **Enter Button** ㉑ to select it. The 𝗩𝗜𝗗𝗘𝗢 𝗢𝗨𝗧𝗣𝗨𝗧 line indicates whether the DVD 37 is using the S-video or component video outputs. To change the setting, press the **Enter Button** ㉑ and use the ▲▼ **Navigation Buttons** ⓮ to highlight the desired setting on the dropdown menu. Press the **Enter Button** ㉑ to select it.

Connecting to a TV Only

When using the DVD 37 with a television but no audio receiver or processor, connect it as follows. Make the **Analog Audio Connection** Ⓐ and one of the **Video Connections** (**Composite Video** Ⓑ, **S-Video** Ⓒ, **Component Video** Ⓓ). If your television or video display is HDMI-capable, you only need to make the **HDMI** Ⓔ connection, as it handles both audio and video. Remember to plug in the power cord.

NOTE: When using the **HDMI** Ⓔ connection, turn on the television or video display *before* the DVD 37.

To HDMI or DVI port on TV — Ⓔ

To Y (green)/ Pb (blue)/ Pr (red) component video connectors — Ⓓ

To S-video input connectors on the TV — Ⓒ

To video input connectors (yellow) on the TV — Ⓑ

To analog audio input connectors (red/white) on the TV — Ⓐ

To power outlet (AC 120V/60Hz)

SETUP AND CONNECTIONS

Connecting to a Receiver/Amplifier With a Dolby Digital or DTS Decoder

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. However, in order to enjoy the benefits of digital audio, you must use a receiver or processor that has digital audio decoding capabilities and make an optical or coaxial digital audio connection between the DVD 37 and your home theater system. This simple connection is made as shown below with an optional coax or optical cable. Only one of these connections is required, and both should not be made at the same time.

In order to take advantage of the high-resolution DVD-Audio output of the DVD 37, you must connect the **6-Channel Audio Outputs** ❿ to the matching 6-channel inputs on your receiver or processor. Only compressed PCM, Dolby Digital or DTS tracks that may be present on the disc may be listened to using the digital audio outputs. Thus, the DVD 37 decodes the digital signal and outputs separate signals for each channel: front left, center, front right, surround right, surround left and low-frequency effects (LFE).

NOTES FOR ANALOG AUDIO:

- If you wish to use the DVD 37 as the input for a multiroom system, the **Analog Audio Outputs** ❾ should be connected to the standard analog left/right DVD or CD inputs on your digital receiver or processor.

- The connection from the **Analog Audio Outputs** ❾ to the TV is optional. If you plan on occasionally using your DVD 37 alone, without turning on your complete system, this connection must be made.

- When the audio signal is to be fed to an analog receiver rather than to the TV, connect the **Analog Audio Outputs** ❾ to any analog audio inputs on your receiver or processor. The DVD 37 will "down-mix" multichannel recordings to two channels.

- The analog audio connection should also be made if you wish to play high-resolution 96kHz PCM audio discs where your receiver does not support 96kHz processing.

- In each of these four cases in which the **Analog Audio Outputs** ❾ are used, set the bass management line of the ⱯⱯⱭⲒⲞ ⱾⲈⲦⲨⱣ menu to ⱾⲦⲈⱤⲈⲞ.

NOTES ON VIDEO:

- With multiple video sources, your audio/video receiver can be used for selecting the video signal and routing it to the TV. Connect the **HDMI** ❸, **Component** ❺, **Composite** ❻ or **S-Video** ❼ output of the DVD 37 to the correct video input on your receiver, and the video outputs of the receiver to your TV. For more details, see the manual for your audio/video receiver.

- If your receiver has only DVI inputs, you may use an optional HDMI-to-DVI cable or adapter for the connection to the receiver. In addition, the video display used with your system must be HDCP-compatible in order to take advantage of the HDMI output, whether it is used with HDMI or DVI connections.
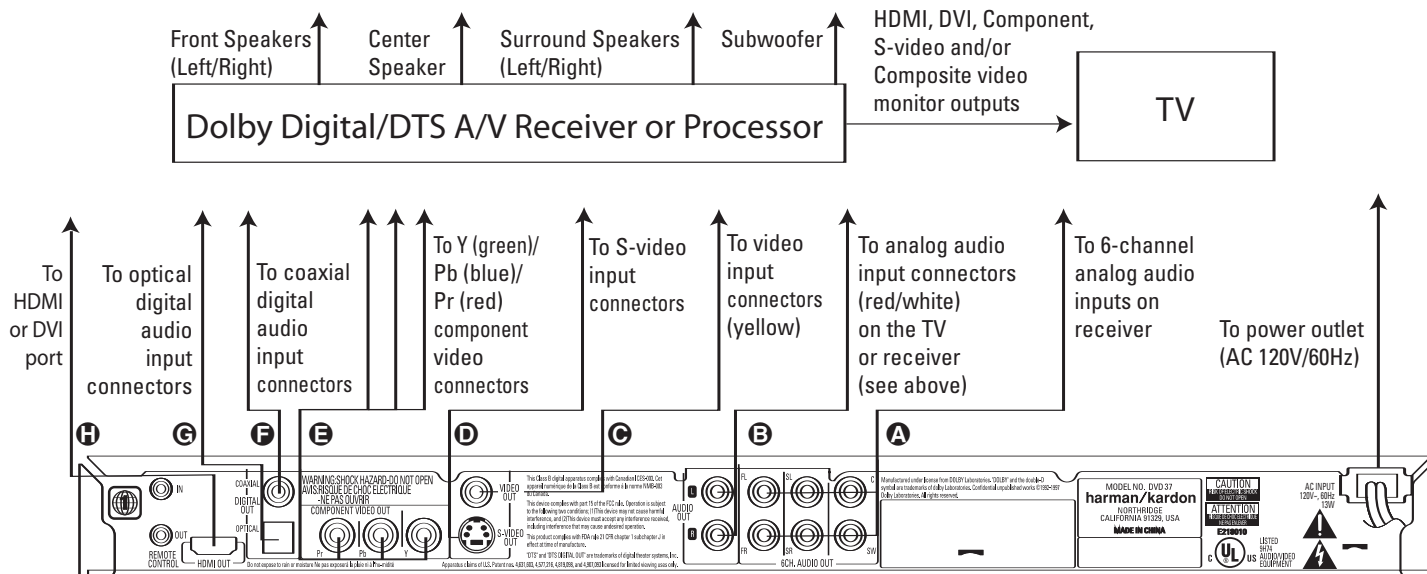
Connecting to a Receiver

When using the DVD 37 with an audio/video receiver or processor, connect it as follows. First, make one

of the video connections (**Composite Video** Ⓒ, **S-Video** Ⓓ, **Component Video** Ⓔ or **HDMI** Ⓗ) to the video input jacks on the A/V receiver, and then connect the receiver's video monitor output to the TV. If you will sometimes use the TV without the audio component, you may optionally make the **Analog Audio Connection** Ⓑ to the TV. In addition, to benefit from the high-resolution surround sound formats recorded on DVD-Audio discs, which are not output via the HDMI connection, you will need to make the **6-Channel Audio Connection** Ⓐ to your receiver or processor.

Second, if your receiver or processor is not HDMI-capable, make either the **Optical Digital Audio Connection** Ⓖ or the **Coaxial Digital Audio Connection** Ⓕ, to the receiver or processor. Remember that when the HDMI connection is used with a receiver or processor that is compliant with the HDMI format, a single connection suffices for both audio and video, except for DVD-Audio discs, as noted. If your receiver or processor is not capable of processing the HDMI audio signal, then a separate audio connection is required. If your receiver/processor has multiroom capability, you may also connect the DVD 37's analog audio outputs to the DVD analog audio inputs on the receiver.

IMPORTANT NOTE: Make certain that any device being connected, including the DVD 37, your receiver or processor and your TV or video display, is turned off whenever you make connections between products. When using the **HDMI** Ⓔ connection, turn on your system components in this order: 1) television or video display, 2) receiver or processor, and 3) DVD 37.

| Front Speakers (Left/Right) | Center Speaker | Surround Speakers (Left/Right) | Subwoofer | HDMI, DVI, Component, S-video and/or Composite video monitor outputs |

Dolby Digital/DTS A/V Receiver or Processor → **TV**

To HDMI or DVI port | To optical digital audio input connectors | To coaxial digital audio input connectors | To Y (green)/ Pb (blue)/ Pr (red) component video connectors | To S-video input connectors | To video input connectors (yellow) | To analog audio input connectors (red/white) on the TV or receiver (see above) | To 6-channel analog audio inputs on receiver | To power outlet (AC 120V/60Hz)

Ⓗ　Ⓖ　Ⓕ　Ⓔ　　Ⓓ　　Ⓒ　　Ⓑ　　Ⓐ

System Setup

The final step in the installation of the DVD 37 is to establish the system's configuration. Before proceeding further to make any adjustments, make certain that the DVD 37 is properly connected to a video display and an AC power source. Turn on the DVD 37 by pressing the **Power On/Off Switch 2** and the **Power Indicator 1** will change from amber to blue. You do not need to play a CD or DVD in the unit to make system setup adjustments.

In many cases, you will be able to accept the default settings. Of course, these settings may be changed at any time to reflect changes to the other equipment in your home theater system or to adjust the DVD 37's output or operation to your needs and preferences.

IMPORTANT NOTE: The DVD 37 is not capable of displaying S-video and component video simultaneously. If you have used either of these video connections and have no picture, temporarily connect the **Composite Video Output 7** to your video display, and then press the **Setup Button 10** to access the menu system. Use the ▲▼ **Navigation Buttons 14** to highlight the Video Setup submenu, and press the **Enter Button 21** to select it. The **VIDEO OUTPUT** line indicates whether the DVD 37 is using the S-video or component video outputs. To change the setting, press the **Enter Button 21** and use the ▲▼ **Navigation Buttons 14** to highlight the desired setting on the dropdown menu. Press the **Enter Button 21** to select it.

Menus and Navigation

The DVD 37 uses an elegant but simple on-screen menu system for all setup and control functions. There are two main menus that are navigated in a similar fashion:

• The **SETUP** menu is used to establish the basic configuration settings for all aspects of the DVD player's operation, including language and display settings, audio settings, video settings and adjustments, speaker bass management settings, parental control and other settings that you may customize. The **SETUP** menu is accessed by pressing the **Setup Button 10**.

• The **PLAYER INFORMATION** menu displays information about the current disc, allowing you to set the playback mode and create a playlist if desired. The **PLAYER INFORMATION** menu will appear on screen automatically for audio-only and JPEG discs, and for VCDs without PBC. For DVDs and VCDs with PBC, it may be accessed by pressing the **Info Button 9**.

The two main menus share a common layout, and are navigated in a similar manner. The menu screen is divided into four main areas:

Figure 1

A: Menu Title: The top line identifies which main menu is on screen.

B: The submenus listed in a vertical column at the left side of the screen access the specific groups of settings or controls. The submenu that is at the top of the list will be highlighted. As indicated on the **Instruction Line D**, press the **Enter Button 19** to select that submenu, which will move the cursor to the first **Control Setting C**.

On the Setup Main Menu, the Available Submenus Are:

• The **SYSTEM SETUP** menu, identified by a wrench icon and the word **SYSTEM**, is used to establish the general settings for the player.

• The **AUDIO SETUP** menu, identified by a speaker icon and the word **AUDIO**, is used to establish the settings for the player's audio output.

• The **SPEAKER SETUP** menu, identified by a loudspeaker cabinet icon, is used to establish the bass management settings for the audio output at the **6-Channel Audio Outputs 10** that are used when a DVD-Audio disc is playing.

• The **VIDEO SETUP** menu, identified by a TV icon and the word **VIDEO**, is used to establish the video formatting and configuration settings and to access the video adjustments screen for the picture settings.

On the Player Information Menu, the Available Submenus Are:

• The **PLAYBACK INFO** menu, identified by an "i" icon, includes the disc type and name (if available on the disc), and contains settings to control the playback mode.

• The **PROGRAM** menu, identified by an icon showing musical notes, is used to program a playlist, which lets you play back selected CD tracks in the order you choose. Playlists are only available for audio CDs.

• The **DISC INFO** menu, identified by a disc icon, provides detailed information about the video and audio content on the disc being played.

C Control Settings: The main area of each menu screen shows a list of the control settings available for the current submenu. On the left side of the main area is a listing of the settings available. To the right of each line is the current value for each setting. To adjust a specific setting, press the ▲▼ **Navigation Buttons 14** until the setting for the desired item is highlighted. Next, press the **Enter Button 21** and a dropdown menu will appear that contains the available options for that setting. Press the ▲▼ **Navigation Buttons 14** until the desired option is highlighted, then press the **Enter Button 21** to select that option. See Figure 2 for an example of a dropdown menu.
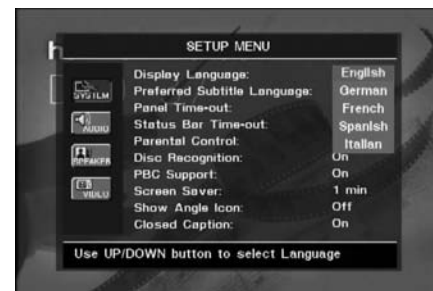
Figure 2

D Instruction Line: The DVD 37 will display the appropriate instructions in this area to assist you in navigating the menu system and making changes to the various settings.

Within a given menu, adjustments are made using the following steps and commands on the remote control:

• Press the ▲▼ **Navigation Buttons 14** to select an item to be adjusted.

• When the current setting for the item to be adjusted is highlighted, press the **Enter Button 21**.

• Press the ▲▼ **Navigation Buttons 14** to select one of the options shown. When a series of underscore lines (_ _ _ _) is shown, enter the desired setting using the **Numeric Keys 30**.

• When the desired setting is highlighted or the numeric entry made, press the **Enter Button 21**.

• Press the ▲▼ **Navigation Buttons 14** to select another item for adjustment, if required.

• When all required adjustments on this submenu have been made, press the ◀▶ **Navigation Buttons 14** to move to the **Submenu Selection Area B** and then press the ▲▼ **Navigation Buttons 14** to select another submenu.

• If all adjustments are complete, press the **Setup Button 10** to exit the **SETUP** menu, or press the **Info Button 9** to exit the **PLAYER INFORMATION** menu.

Most DVDs are created to allow setup menus to be displayed while the disc is playing, superimposed over the video playback. However, some discs are authored

SYSTEM SETUP

in a way that does not allow this. If you see the ø icon displayed on the screen after pressing the **Setup Button** ❿ or the **Info Button** ❾, press the **Stop Button** ㉖ and then press the **Setup** or **Info Button** ❿ ❾ again.

This method of navigation, option selection and adjustment applies to all menus except for the Video Adjustments menu, which accommodates the need to view the on-screen video or the DVD 37's internal test signal while the settings are being made. See page 24 for information on changing the Video Adjustments.

The **SPEAKER SETUP** menu uses the same navigation method, but with a slightly different arrangement. Since adjustments are made to accommodate the speaker used for each channel, the settings for each speaker are displayed according to their placement in the listening room.

Setup Menu

The four submenus within the **SETUP** menu are where you establish the basic system settings for the DVD 37. Most of these settings need to be adjusted only once, and in many cases you will find that the system defaults are the correct option for your combination of components. However, it is worth a few minutes to briefly scan through each of the Submenus to confirm that the settings are correct and to familiarize yourself with the available options so that you are aware of the flexibility of the DVD 37.

System Setup Submenu

The **SYSTEM SETUP** submenu is where you establish the control options, languages and displays. In most cases, the system default options are sufficient for normal operation, but you may wish to change them to tailor the unit's operation to your preferences.

Access the **SYSTEM SETUP** submenu by pressing the **Setup Button** ❿ to display the main **SETUP** menu. The System icon should be highlighted. If it isn't, use the ▲▼ **Navigation Buttons** ⑭ to highlight the icon. As indicated on the **Instruction Line** Ⓓ, press the **Enter Button** ㉑ to access the settings in **SYSTEM SETUP**.

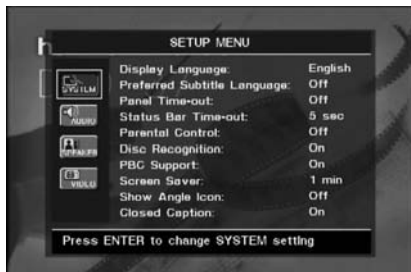The following adjustments may be made on the **SYSTEM SETUP** menu.

Figure 3

Display Language: This setting selects the language that will be used for the DVD 37's OSD menus and other system messages. The default is English, but you may also select French, Spanish, German or Italian.

Preferred Subtitle Language: This setting selects the language used for the display of subtitles. The default setting is **OFF**, to play discs without subtitles. To set the player so that subtitles will always play in a specific language when they are available, select from the choices shown in the drop down menu.

If you do not find your preferred language in the list of options, you may select a preferred language by first pressing the ▲▼ **Navigation Buttons** ⑭ so that **OTHER** is highlighted in the dropdown menu. Press the **Enter Button** ㉑ and then use the ▲▼◀▶ **Navigation Buttons** ⑭ to select a subtitle language (see Figure 4). When the desired language is highlighted, press the **Enter Button** ㉑ to set it as the preferred subtitle language.

If you wish to exit this screen without selecting a language, use the ▲▼◀▶ **Navigation Buttons** ⑭ until the word **RETURN** at the bottom of the screen is highlighted, and press the **Enter Button** ㉑ to return to the **SYSTEM SETUP** screen.

This procedure selects a preferred subtitle language, but it will only be available when the disc being played contains that language. The list of subtitles available on any given disc is always shown on the disc jacket, usually at the bottom of the back cover. Note that the subtitles may also be switched on or off, or a new language selected during playback using the **Subtitle Button** ㉜, as described on page 30.

If you have selected a subtitle language and subtitles do not appear on screen, press the **Subtitle Button** ㉜ to display the Subtitle banner. Each press of the **Enter Button** ㉑ will cycle through the subtitle languages available on the disc. If subtitles still do not appear, press the **Disc Menu Button** ㉘ to make sure that subtitling has been selected in the disc's menu system.

NOTE: Due to the variations in how DVD discs are authored, the subtitle languages displayed by the DVD 37 may not accurately reflect the actual languages available on the disc. It is recommended that subtitles be selected using the disc's menu.

Figure 4

Panel Time-Out: This setting allows you to select the length of time the **Front-Panel Display** ⑫ remains illuminated during disc playback (as some people find the front-panel display to be distracting while a movie is playing). You may program the DVD 37 to refresh the front-panel display only when a button is pressed on the remote or front panel, and to turn the display off again after either five or 20 seconds. When the display is off, the blue **Power Indicator** ❶ will remain lit to remind you that the unit is turned on. When the Panel Time-Out setting is set to "Off," the display remains lit at all times. This feature is only in effect when a DVD or VCD is playing. However, you may always press the **Dimmer Button** ⑲ to dim the front-panel display either by half or fully.

Status Bar Time-Out: This setting selects the time-out interval for the on-screen Status Bar that appears at the top of your video screen when the **Status Button** ㉙ is pressed while a disc is playing. During DVD playback, the status bar shows the current title and chapter, the elapsed or remaining time in the current chapter or title, a setting to adjust the time display, and a temperature bar for the time display.

You may program the status bar to remain on screen for either five or 20 seconds after the **Status Button** ㉙ is pressed. When **OFF** is selected, the time-out is disabled, and the status bar will remain on the screen until the **Status Button** ㉙ or **Clear Button** ❹ is pressed.

Parental Control: The DVD 37's password system allows you to restrict viewing of certain materials that may not be suitable for younger members of the household by requiring the viewer to enter a password before viewing those materials. The system is based on rating information encoded in the DVD that classifies materials into eight levels, roughly corresponding to the Motion Picture Association of America (MPAA) voluntary ratings system:

Level 1: Corresponds to the MPAA's "G" (General Audiences) rating, and is considered suitable for all viewers.

Level 2: Intermediate level between the "PG" and "G" ratings.

Level 3: Corresponds to the MPAA's "PG" (Parental Guidance) rating.

Level 4: Corresponds to the MPAA's "PG-13" (Parental Guidance and 13 years old) rating.

Level 5: Intermediate level between the "R" and "PG-13" ratings.

Level 6: Corresponds to the MPAA's "R" (Restricted) rating.

Level 7: Corresponds to the MPAA's "NC-17" (17 years and older) rating.

SYSTEM SETUP

Level 8: All DVDs, including adult materials, can be played.

Unlocked: Any DVD may be viewed without entering the password.

The DVD 37 is shipped from the factory with the parental control system unlocked (no password is required to view any DVD), and with the password set to the four-digit code "1234." To activate the system, use the ▲▼ **Navigation Buttons** ⓲ to highlight the Parental Control Setting on the 𝗦𝗬𝗦𝗧𝗘𝗠 𝗦𝗘𝗧𝗨𝗣 submenu, and press the **Enter Button** ㉑. Select the "On" setting from the dropdown menu, and the password screen will appear (see Figure 5.) Make sure the dashes on the Password line are highlighted, then enter the password code using the **Numeric Keys** ㉚ and press the ▼ Navigation Button ⓲.

If you have entered the password correctly, the current setting of the Rating line will be highlighted. You may press the **Enter Button** ㉑ to display the ratings dropdown menu. Select a new rating using the ▲▼ **Navigation Buttons** ⓲ and the **Enter Button** ㉑.

Figure 5

The first time you use the DVD 37, it is recommended that you scroll down to the Change Password line and press the **Enter Button** ㉑ to display the Change Password screen. Use the **Numeric Keys** ㉚ to enter your new password once at the New Password line, and a second time at the Confirm Password line. The DVD 37 will return to the screen shown in Figure 5, where you may then change the Ratings Setting. Since you had previously entered a valid password, you will not be required to enter a password again before changing the rating. However, once you press the ◀▶ **Navigation Button** ⓲ and return to the 𝗦𝗬𝗦𝗧𝗘𝗠 𝗦𝗘𝗧𝗨𝗣 submenu, the new password will take effect.

Disc Recognition: The setting for the Disc Recognition feature, when turned on, allows you to pause or stop a DVD-Video disc, remove it from the player, play another disc, and then resume playback of the original disc at a later time from the point at which you paused. When a previously played disc is reinserted in the DVD 37, you will be presented with an on-screen status message asking whether you wish to start play-

back from the beginning of the disc or resume at the point where you left off. Note that even when the setting is activated, you must press the **Stop Button** ❺ ㉖ either once (Resume mode) or twice (Stop mode), but not the **Pause Button** ❹ ㉒. The unit may be turned off between discs. The DVD 37 can store the information for up to five DVDs at a time.

PBC Support: This setting controls the activation of PBC (Play Back Control) Support for VCD discs. If you plan to play VCD discs, which are a CD-ROM-based format that predates DVD, we recommend that the setting be turned 𝗢𝗡. However, with PBC enabled, the Repeat Track, Repeat Disc and Random functions will not be available for VCDs.

Screen Saver: The DVD 37 offers a Screen Saver option to protect your TV or video display from damage that may occur if the player is left turned on with the same still image for a period of time, as there is a possibility that the image may be "burned" into some display devices. This is particularly important for plasma displays and some CRT devices. Set Screen Saver to 𝗢𝗡 so that the DVD 37 will run the screen saver when no action has been detected for either one or five minutes. Press a desired command key on the front panel or remote to "wake" the DVD 37 and resume normal operation.

Show Angle Icon: Some DVDs are programmed with multiple-angle capability, allowing you to view the same scene from a different camera angle. Normally, the angle icon will be displayed on screen during those scenes to inform you that you may press the **Angle Button** ⓭ to change to a different view. If you would find the appearance of the icon on-screen distracting, select the Show Angle Icon setting in the System submenu, and set it to 𝗢𝗙𝗙. The **Angle Indicator** 🄴 will appear in the front-panel display whenever multiple angles are available, regardless of whether the on-screen icon appears.

Closed Caption: This setting enables viewing of closed caption messages, if they have been encoded in the video material. Closed captions – text displays of the program's dialogue which are normally hidden from view – are made available for the hearing-impaired or others. Select the 𝗢𝗡 setting to activate the DVD 37's closed captioning decoder so that these messages may be viewed.

Audio Setup Submenu

This submenu establishes the DVD's configuration for general audio settings, such as preferred language and digital audio settings.

As with all setup menus, press the **Setup Button** ❿ to activate the main menu screen, and then press the ▲▼ **Navigation Buttons** ⓲ until the 𝗔𝗨𝗗𝗜𝗢 𝗦𝗘𝗧𝗨𝗣 icon is highlighted, and press the **Enter Button** ㉑ again.

Figure 6

The following adjustments are available on the Audio Setup menu:

Preferred Audio Language: This setting is used to select the default language that will be used for program playback. The factory default setting is English, but you may choose French, Spanish, German or Italian by making a selection from the dropdown menu. To select a language other than those shown, select 𝗢𝗧𝗛𝗘𝗥 from the dropdown menu and press the **Enter Button** ㉑. A screen will appear with a list of language choices (see Figure 4). Use the ▲▼◀▶ **Navigation Buttons** ⓲ to select a language. When the desired language is highlighted, press the **Enter Button** ㉑ to set it as the preferred audio language. If you wish to exit this screen without selecting a language, use the ▲▼◀▶ Navigation Buttons ⓲ until the word 𝗥𝗘𝗧𝗨𝗥𝗡 at the bottom of the screen is highlighted, and press the Enter Button ㉑ to return to the 𝗔𝗨𝗗𝗜𝗢 𝗦𝗘𝗧𝗨𝗣 screen.

This procedure selects a preferred audio program language, but it will only be available when the disc being played contains that language. The list of languages available on any given disc is always shown on the disc jacket, usually at the bottom of the back cover. Note that the audio playback language may also be changed at any time during playback using the **Audio Select Button** ❸, as described on page 30, but any changes made will only be effective during playback of that disc.

Digital Output: This setting selects the digital audio data stream that is routed to the **Optical Digital Output** ❹ or the **Coaxial Digital Output** ❺. Two choices are available:

• 𝗕𝗶𝘁𝘀𝘁𝗿𝗲𝗮𝗺, the default setting, outputs the Dolby Digital or DTS signal, as selected from the disc's menu or by using the **Audio Select Button** ❸, as explained on page 30. This setting should be used when your receiver or processor is capable of decoding signals in the Dolby Digital or DTS format.

• 𝗣𝗖𝗠 outputs a standard PCM signal for decoding by receivers or processors that are not capable of decoding a Dolby Digital or DTS bitstream. This setting enables 2-channel audio playback or matrix decoding where available.

SYSTEM SETUP

NOTE: Any changes made to the Digital Output setting during playback will not take effect until after play has been stopped and restarted.

PCM Limit: This setting determines whether the digital audio output of the DVD 37 will be sent to your receiver or processor at its original sampling rate, or whether high-resolution (96kHz or greater) materials will be downsampled to 48kHz. Select the **96kHz** setting if your receiver is capable of resolving digital signals greater than 48kHz and does not require downsampling. If you select the **96kHz** setting when your receiver is not capable of processing signals with a sampling rate greater than 48kHz, then you will not hear any audio when high-resolution materials are played. If you are uncertain of your receiver's capabilities, select the **48kHz** setting to limit the sampling rate to 48kHz.

NOTE: Due to copyright restrictions, the DVD 37 will not output an uncompressed signal in the PCM format from a disc recorded with 96kHz/24-bit resolution, such as some DTS audio CDs. If the Digital Output setting in the **Audio Setup** submenu is set to **PCM**, and the PCM Limit setting is set to **96kHz**, no audio will be outputted, and the message **CGMS MUTE** will appear in the **Main Information Display 12**. "CGMS" stands for "Copy General Management System." Should this message appear, change the PCM Limit setting to **48kHz** to hear the audio at a lower resolution.

Dynamic Range: This setting allows you to take advantage of the Night-mode encoding present on some Dolby Digital recordings to reduce the volume of louder passages while maintaining intelligibility of quieter passages. This means that you may listen to programs at a level that allows the full impact of a soundtrack to be heard at a volume that is lower than you might otherwise use to avoid disturbing others. The DVD 37 accomplishes this by compressing the audio to a greater or lesser degree, depending on which setting you choose. Three options are available:

- **MAXIMUM** does not make any changes to the original playback, and should be used when the volume setting in the listening room may be as loud as you desire.

- **MEDIUM** applies a moderate amount of compression so that louder passages are a little bit quieter.

- **MINIMUM** applies more compression so that louder passages are much softer.

Feel free to experiment with the settings at any time. Note that if your receiver or processor also allows you to program the dynamic range setting, also known as the "Night Mode," you do not need to make any adjustments on the DVD 37 and should leave the setting at **MAXIMUM**.

Delay Unit: This setting selects the unit of distance used for calculating delay times when the **AUDIO ADJUSTMENTS** menu is activated. The default unit is feet, but you may select meters.

Bass Management: This setting activates the **AUDIO ADJUSTMENTS** menu's bass management settings, to optimize playback of DVD-Audio discs through the **Analog Audio Outputs 9 10**. Three settings are available:

- **On:** If your receiver or processor is equipped with "direct" 6-channel inputs and the receiver is not capable of performing bass management on these inputs, then change this setting on the DVD 37 to **On**, and proceed to the **AUDIO ADJUSTMENTS** menu to program the bass management settings.

- **Bypass:** This is the default setting. If your receiver or processor is equipped with 6-channel inputs and is capable of adjusting the bass management settings (speaker size, output levels and delay times) for its 6-channel analog inputs, then we recommend that you leave this setting at the default **Bypass**, and adjust the bass management settings on your receiver.

- **Stereo:** If your receiver or processor is not equipped with 6-channel inputs at all, then change this setting to **Stereo**, which will send a downmixed 2-channel signal to the **Analog Audio Outputs 9**, for use with any 2-channel analog input on your receiver. You may then select an analog surround mode available on your receiver.

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, the same front left and right channel information will be available at both of the left and right **Analog Audio Outputs 9 10**. No surround information will be present in the signal output at the 2-channel **Analog Audio Outputs 9**. In Stereo mode only, the downmixed 2-channel signal will be available at both **Analog Audio Outputs 9 10**. If it is more convenient to use the remote than to change this setting in the on-screen menu system, use the **Audio Mode Selector 17** to toggle through the three available settings. Either method achieves the same result.

Audio Adjustments Submenu

This menu allows you to adjust bass management settings that control the audio output of the **6-Channel Audio Outputs 10** for speaker size, output level and delay times. The proper adjustment of these settings is key to optimal reproduction of DVD-Audio discs, when the DVD 37 is used with a receiver or processor that does not have audio adjustment capabilities for the direct inputs.

IMPORTANT NOTE: In order to avoid audio problems, when the DVD 37 is connected to a receiver or processor that *does* have the capability to adjust bass management parameters for its multichannel inputs, you have the option to either use that capability or adjust the settings in the DVD 37. The preferred method of operation is to use the receiver for these adjustments. In that case, remember to set the **Bass Management** setting in the **AUDIO SETUP** menu to **Bypass**. If you make the adjustments using the DVD 37's settings, it is important that the receiver's settings for the multichannel direct inputs be disabled, or set to "Large" for the speaker sizes and "0" for the level adjustments and delay times, unless these settings are also used for the receiver's other source inputs, in which case they should be left the way you set them when you configured your receiver. If you have any questions about the capabilities of your receiver or processor, we recommend that you consult its owner's manual or the manufacturer's Web site for further information.

If your receiver or processor does not have 6-channel analog inputs, make sure to select **Stereo** for the **Bass Management** setting in the **AUDIO SETUP** menu. Then connect the **Analog Audio Outputs 9** to any 2-channel analog inputs on your receiver.

Before proceeding with the DVD 37's audio setup adjustments, we recommend that you first use the menu system in your receiver or processor to ascertain the settings already established for "Speaker Size," "Output Level" and "Delay Time," which may be set as a distance. Write these settings down to refer to during the configuration process.

Press the **Setup Button 10** to activate the Setup menu; then use the ▲▼ **Navigation Buttons 14** until the **AUDIO ADJUSTMENTS** submenu is highlighted within a white outline box, and press the **Enter Button 21**.

Figure 7

The following adjustments are available on the **AUDIO ADJUSTMENTS** menu for each speaker position. It is recommended that you cycle through the adjustments for each speaker position using the ▲▼◀▶ **Navigation Buttons 14** to enter the settings that are appropriate for your system.

Pressing the **Enter Button** ㉑ displays a dropdown menu with the selections available for that setting. Use the ▲▼ **Navigation Buttons** ⑭ to highlight the appropriate setting, and then press the **Enter Button** ㉑ to select it.

You will notice that the adjustments for speaker size and distance (used to calculate delay times) are set in tandem for the front left and right speaker pair, and for the surround left and right speaker pair. Changing the settings for either speaker in these pairs also affects that setting for the other speaker in that pair. For this reason, it is important to select the same brand and model for both speakers in each pair, and also to place them at about the same distance from the listening position.

Speaker Size: Speaker size is part of the bass man-agement system which determines which frequencies are sent to the specific speaker position, and which are sent to the subwoofer. The designation of "size" does not refer to the speaker's physical size, but rather to the lowest frequency a speaker can handle. For this purpose, "full-range" speakers are considered "large," while those not capable of reproduction below 100Hz are considered "small." In general, if you are using a packaged speaker system with smaller satellite-type speakers and a subwoofer, you should select 𝚂𝚖𝚊𝚕𝚕 for all five speakers. 𝙻𝚊𝚛𝚐𝚎 should only be selected if you are certain that your speakers are capable of handling extreme low-frequency sounds.

Delay Time: This setting is used to compensate for the time it takes for sound to reach you from each speaker position, as some speakers may be placed further from the listening position than others. Select the distance from the speaker to your listening position by choosing one of the distance settings shown. This setting is not available for the subwoofer.

Output Level: This setting is used to maintain bal-anced reproduction and sound field presentation. The goal is to make certain that the sound is heard from each speaker position with equal loudness. You may simply enter the same speaker level output settings already used for your receiver or processor. Alter-natively, you may use a test disc that outputs a fixed tone to all speakers at the same time and adjust the settings here so that the tone is heard at the same level (loudness) from all speakers.

For the subwoofer, the settings are slightly different. Select 𝙾𝚗 when a subwoofer is connected, or 𝙾𝚏𝚏 if one is not used. The second setting for the sub-woofer is the crossover. This determines which sounds will be sent to the subwoofer, and which to the main speakers when 𝚂𝚖𝚊𝚕𝚕 is selected as the speaker size for any of the speakers. Select the frequency from those shown that is closest to the lowest frequency your main (left/center/right/surround left/surround

right) speakers are able to reproduce. If you are not familiar with that information, it may be found in the owner's manual for your speakers. The output level should be set the same way as for the other speakers.

When you have finished entering all settings on this menu, use the ▲▼◄► **Navigation Buttons** ⑭ to highlight the word 𝙳𝚘𝚗𝚎 at the bottom of the screen, and then press the **Enter Button** ㉑ to enter your settings into the DVD 37's memory.

Video Setup Submenu

This menu establishes the DVD's configuration for video format settings such as aspect ratio and output scan. It also allows access to the Video Adjustments banner (see next section).

As with all setup menus, press the **Setup Button** ⑩ to activate the main menu screen, and then press the ▲▼ **Navigation Buttons** ⑭ until the 𝚅𝙸𝙳𝙴𝙾 𝚂𝙴𝚃𝚄𝙿 icon is highlighted, and then press the **Enter Button** ㉑.

Figure 8

The following adjustments are available on the Video Setup menu:

Aspect Ratio: This setting selects the aspect ratio of video programming. Your choice should be made according to the shape of your video display and your personal preferences. When the **HDMI Output** ❸ is used, the aspect ratio will automatically be set appro-priately for the specific display. However, you may select an alternate view. For most other video displays, make sure the Aspect Ratio setting is correct for your display. Two choices are available:

• **16:9:** If you have a widescreen (16:9) display, or a display that has a widescreen mode, choose this setting. With this setting, the DVD 37 will adjust the output for widescreen movies so that they fill the entire screen in the proper aspect ratio. However, in this setting a disc recorded in the 4:3 aspect ratio will appear in the widescreen as a boxed image in the center, with black columns on the left and right side of the screen. If the widescreen option is chosen and a widescreen movie is played on a conventional 4:3 aspect-ratio set, the image will be distorted due to vertical compression.

• **4:3:** If you have a standard, 4:3 aspect ratio video display, choose this setting. You will see the entire frame of the movie as it is recorded on the disc without any image cutoff at the left and right sides. While this allows widescreen movies to be shown in their entirety, they will occupy a smaller portion of the screen and black "letterbox" bars may appear at the top and bottom of the screen.

Video Output: This setting selects between the S-Video Output ❽ and Component Video Outputs ❻, which are not available simultaneously If you have connected one of these outputs to your video display and the screen is blank, you will need to temporarily connect the **Composite Video Output** ❼ to your TV in order to view the on-screen menus and change this setting.

Scan Type: This setting allows you to select between progressive and interlaced scanning for the **Component Video Outputs** ❻ to maximize the image resolution for the type of video display in use. The output at the **S-Video** ❽ and **Composite Video** ❼ outputs will always be standard-rate video that is compatible with any television set or video dis-play. Two choices are available:

• **Progressive:** Select this option if you have a video display that is compatible with input sources of 480P or greater. Displays labeled as "HDTV Ready," including virtually all large-screen LCD and plasma displays, are compatible with progressive scan.

• **Interlaced:** Select this option when you are using an older video display that has Y/Pr/Pb component inputs, but which is not capable of displaying high scan rate, or "HD" signals.

NOTES:

1. The Scan Type may only be changed when the Video Output setting has been set to Component.

2. If you have connected the DVD 37 to a video dis-play that is not capable of displaying progressive scan video using the **Component (Y/Pr/Pb) Video Outputs** ❻, and you have inadvertently changed the Video Output Setting to Component *and* the Scan Type setting to Progressive, you may reset the scan type to interlaced by pressing the **Setup Button** ⑩ to deactivate the Setup menu system. Then press the **Progressive Scan/Interlaced Button** ⑳. The display will blink, indicating that the scan type has been reset to interlaced mode.

Alternatively, as a last-resort measure, you may completely reset all of the DVD 37's settings, including the scan type, by exiting the on-screen menu system and pressing and holding the **Clear Button** ❹ for five seconds. The display will blink, and all settings will return to the factory defaults.

Video Adjustment: Use this setting to access the Video Adjustments banner by changing the setting

SYSTEM SETUP

from **0 f f** to **0 n**. See below for more information on using the Video Adjustments banner to optimize your picture settings.

HDMI Settings: This setting displays the characteristics of the video output signal at the **HDMI Output ❸**. When the DVD 37 is connected to a video display using the **HDMI Output ❸**, the display sends information to the DVD 37 that indicates the highest video resolution it is capable of handling, and the DVD 37 automatically sets the video output to match it. That resolution is displayed here. You may use this setting to manually select a lower video output resolution. Changes made here remain active until the DVD 37 or the display is turned off. When either is turned off, and then on again, the DVD 37 will revert to the default setting transmitted by the display. Make sure your video display or other video switching equipment (such as an HDMI-capable receiver) is capable of handling the DVD 37's HDMI output signal.

Video Adjustments Banner

This banner menu allows you to adjust the brightness, sharpness and black level of the video signal to compensate for differences between your DVD player and other video sources. You may use either the DVD 37's built-in color bar test signal or a test disc as the standard for the adjustments. To ensure that your system is properly optimized, we strongly recommend that you adjust your video display using the display's own controls before making any changes to the DVD 37's output. Once the display is properly calibrated with all settings on the DVD 37 set to their midpoint, use the controls on this menu to fine-tune the DVD 37's output.

Due to the nature of these settings, the navigation is somewhat different from the DVD 37's other menus and controls. The banner is accessed from the Video Setup submenu. Press the **Setup Button ❿** to display the Setup menu, and then press the ▲▼ **Navigation Buttons ⓴** until the Video Setup submenu icon is highlighted. Press the **Enter Button ㉑** to access the Video Setup submenu, then scroll down to the Video Adjustment line and press the **Enter Button ㉑** again. Select **0 n** to display the Video Adjustments banner. The Setup screen will disappear from view.

To change any of the video adjustments shown, first press the ▲▼ **Navigation Buttons ⓴** so that the parameter's setting bar is highlighted. Use the ▶ **Navigation Button ⓴** to increase the setting or the ◀ **Navigation Button ⓴** to decrease the setting.

Changes to any of the settings may be made while a test disc is playing, or you may use the internal test signal by pressing the ▲▼ **Navigation Buttons ⓴** until the word **0 f f** is highlighted next to the **Test Screen** line. To activate the test signal, press the **Enter Button ㉑** and note that a special combination test signal, including both color bars and gray scale along with 100% black and white fields, will be displayed behind the video adjustments banner.

See the Test Screen section on page 25 for more guidance in making picture adjustments.

To adjust the Brightness setting, use the ▲▼ **Navigation Buttons ⓴** until the area between the "−" and "+" signs is highlighted, then use the ◀▶ **Navigation Buttons ⓴** to increase or decrease the setting.

When adjusting the Black Level setting, only two adjustments are available: either the complete bar will appear, which provides a full "0 to 100" black level setting, or "full", which complies with standards for video with what is called "setup"; or only a thin line will appear, which represents a "7.5 to 100" black level setting.

To remove the banner from the screen so that only the test screen appears, simply wait a few seconds, and the banner will disappear. Press any button on the remote to restore the banner to view.

When you have finished making your video adjustments, press the ▲▼ **Navigation Buttons ⓴** until the word Done is highlighted, and press the **Enter Button ㉑**. The DVD 37 will return to the Video Setup submenu.

In order to recall the video adjustments menu, you will need to press the **Setup Button ❿** and navigate through the menu system as described above.

When you have finished using the Setup menus, press the **Setup Button ❿** to clear the screen. If a DVD is loaded, the splash screen will appear. If any other type of disc is loaded, the Player Information menu will appear. You may now proceed to page 26 to learn the basics of operating the DVD 37.

TEST SCREEN

DVD is one of the highest quality sources ever made available for in-home playback of prerecorded pictures and sound. In order to make certain that your home theater system is fully optimized to take advantage of DVD's superb picture quality, the DVD 37 offers a built-in video test signal that makes it easy to calibrate your TV or video display for proper playback.

Test Screen

With the test screen showing on your video display, the following adjustments may be made:

• The proper color intensity setting on your TV.

• Proper color adjustments using the color bars, which should be (left to right) black, white, yellow, cyan (turquoise), green, magenta, red, blue, black.

• The proper color transition, seen as sharp separation of the bars.

• The performance of the color circuits in your TV (with "Video" signals); bar edges should show no vertical crawling dots.

With the gray scale and the black/white fields below the color bars, the brightness and contrast of your screen can be adjusted.

NOTE: Most of the video adjustments using the DVD 37's test screen should be made using the controls on your video display, with the DVD 37's controls set at their factory default position in the center. If necessary, you may tweak the brightness and sharpness using the controls found in the DVD 37's video adjustments menu.
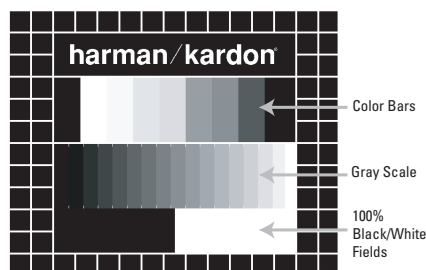

Figure 10

TV Picture Adjustment With Test Screen
Brightness Adjustment:
1. Turn down the color control on your TV until the color bars are visible in black and white.

2. Adjust the contrast on your TV to the lowest level where you still can see all bars within the gray scale in the test picture separately and clearly.

3. Adjust the brightness using the DVD 37 video adjustments control so that the bars in the gray scale are all visible. The bar furthest to the left has to be as black as possible rather than gray, but the next gradation must clearly be distinct from it.

All the bars in the gray scale should be gradually and evenly changing from black to white, going from left to right.

Contrast Adjustment:
1. Adjust the contrast on your TV until you see a bright white bar in the lower right corner of the screen and a deep-dark-black bar to the left. The optimal contrast setting will depend on your preference and the surrounding light in the TV room.

2. If the brightness of the white bar no longer increases when the contrast is turned up or the borders of the white "harman/kardon" letters on top bloom (over-light) into the black areas (drastically decreasing the sharpness of the type), the contrast has been turned up too much. Reduce the contrast until these effects disappear and the video still looks realistic.

3. If you are watching TV with customary surrounding daylight, adjust the contrast so that a normal video picture has about the same look as the surroundings in your room. That way the eye is relaxed when watching the TV picture. This contrast setting may be reduced when the surrounding light is dimmed, thereby usually improving the sharpness of a video significantly.

4. The gray scale in the middle line needs to have the same clear difference between each bar as before the contrast adjustment. If not, go back to "Brightness Adjustment" and repeat Step 3 and then "Contrast Adjustment," making only minor adjustments each time for optimization.

Color Adjustment
1. When the brightness and contrast are set optimally, turn up the color control to the level of your preference. Adjust to the level where the colors look strong but still natural, not overdone. If the color level is too high, depending on the TV, some of the bars will seem wider or the color intensity will not increase while the control is turned up. Then the color control must be reduced again. Ultimately, you also should test the color intensity with a video — e.g., pictures of natural faces, flowers, fruit and vegetables, and other common natural articles for an optimal setting of the color intensity.

2. Use the large white bar below the gray scale to tweak the warmth of the picture. Every viewer has a preference as to how the glow of the picture should be. Some prefer a little colder picture, some a warmer glow. The Tint function on your TV and the white bar can be used to control this. Adjust the Tint to the level where you feel the white color has the tone you prefer.

Sharpness Adjustment

Contrary to intuition, the picture will appear sharper and clearer with the sharpness, or Edges, setting backed off from the maximum setting. Reduce the sharpness setting on your television, and the Edges setting on the DVD 37 video adjustments menu if necessary, to minimize the appearance of any white lines between the bars in the gray scale portion of the test screen.

Convergence and Edge Focus

The crosshatch pattern that surrounds the test screen may be used to evaluate edge focus and convergence in front- or rear-projection video displays. However, the controls used to adjust these parameters are often not user-accessible. In any event, these adjustments are extremely complex, and require proper training and experience to avoid worsening the situation. Therefore, it is recommended that if you are unable to improve the picture using the available controls, contact the video display manufacturer's authorized service representative for assistance.

When all desired setup and configuration entries have been made, use the ▲▼ Navigation Buttons ⑭ until "Done" is highlighted at the bottom of the Video Adjustments submenu. Press the Enter Button ㉑ to select it to return to the on-screen menu system. Then, press the Setup Button ⑩ to remove the menu displays from the screen. The unit will return to normal operation and you are ready to enjoy the finest in DVD or CD playback!

TROUBLESHOOTING GUIDE

TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Unit does not turn on	• No AC power	• Check AC power plug and make certain any switched outlet is turned on.
Disc does not play	• Disc loaded improperly	• Load disc label-side up; align the disc with the guides and place it in its proper position.
	• Incorrect disc type	• Check to see that the disc is CD, CD-R, CD-RW, VCD, MP3, WMA, JPEG, DVD-R, DVD-RW, DVD+R, DVD+RW (standard-conforming), DVD-Audio or DVD-Video; other types will not play.
	• Invalid Region Code	• Use Region 1 or Open Region (0) disc only.
	• Rating is above parental preset	• Enter password to override or change rating settings (see page 20).
No picture	• Intermittent connections	• Check all video connections.
	• Wrong input	• Check input selection of TV or receiver.
	• Progressive Scan output selected	• Use Progressive Scan mode only with compatible TV. Press **Progressive Scan/ Interlaced Button** ⓮ to toggle to the correct mode (see page 23).
	• Video Off feature active	• Press **Video Off Button** ⓰ to reactivate video circuitry.
	• **HDMI Output** ❸ is connected to a video display that is not HDCP-compliant.	• The **HDMI Output** ❸ may not be used with video displays that are not HDCP-compliant. Unplug the cable and select another audio and video connection (see pages 14 through 16).
	• Wrong video output setting in **VIDEO SETUP** menu	• 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 (see page 23).
No sound	• Intermittent connections	• Check all audio connections.
	• Incorrect digital audio selection	• Check digital audio settings on DVD 37 and on receiver.
	• DVD disc is in fast or slow mode	• There is no audio playback on DVD discs during fast or slow modes.
	• Surround receiver not compatible with 96kHz PCM audio	• Change **PCM LIMIT** setting in **AUDIO SETUP** menu to **48kHz** (see page 22).
	• DVD-Audio disc is loaded without using analog audio connection	• Use **6-Channel Audio Outputs** ❿ or **Analog Audio Outputs** ❾.
	• Wrong bass management setting in **AUDIO SETUP**	• In order to hear a downmixed 2-channel signal at the **Analog Audio Outputs** ❾, make sure to change the **BASS MANAGEMENT** setting to **STEREO** (see pages 12 and 22).
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.
Some remote buttons do not operate during DVD play; prohibited symbol ⊘ appears (see below)	• 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 (see page 23).
The ⊘ symbol appears	• Requested function not available at this time	• Certain functions may be disabled by the DVD itself during passages of a disc.
Picture is displayed in the wrong aspect ratio	• Incorrect match of aspect ratio settings to disc	• Change aspect ratio settings (see page 23).
Remote control inoperative	• Weak batteries	• Change both batteries.
	• Sensor is blocked	• Clear path to sensor or use optional outboard remote sensor.
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. Press and hold **Clear Button** ❹ until the display blinks. This resets the password and all settings to their defaults.

1. Removing the Top Cabinet
   Remove the Screws ①~④
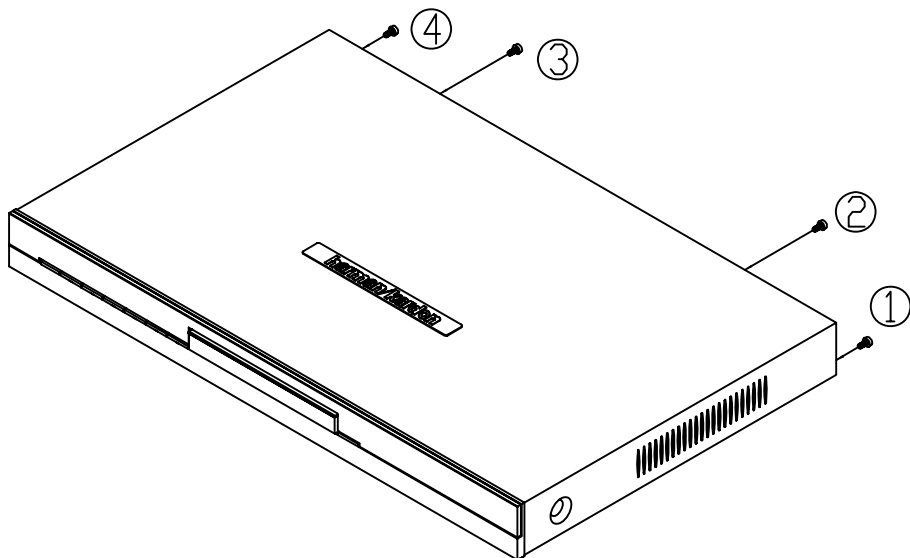
2. Removing the Bottom Chassis
   Remove the Screws ①~②
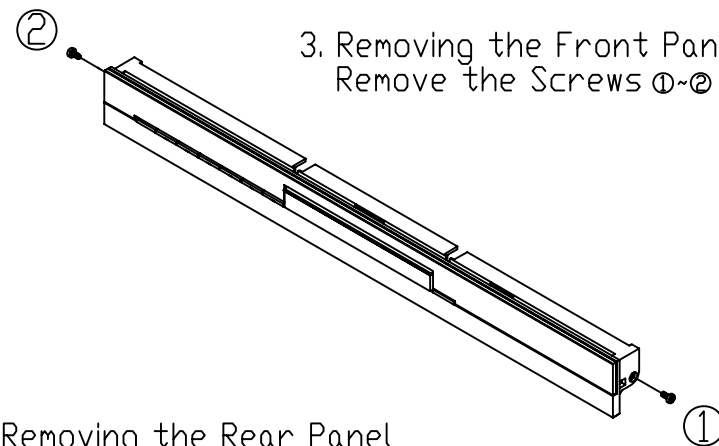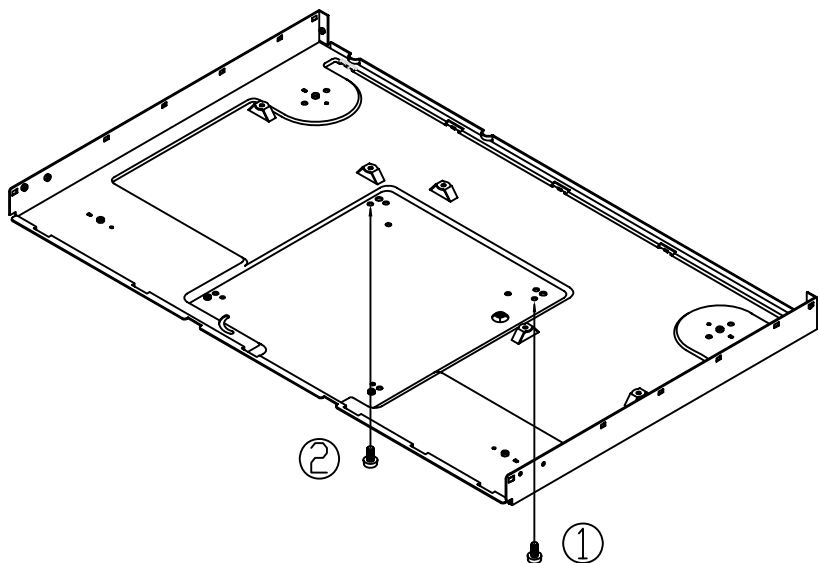
3. Removing the Front Panel
   Remove the Screws ①~②

3. Removing the Rear Panel
   Remove the Screws ①~⑧
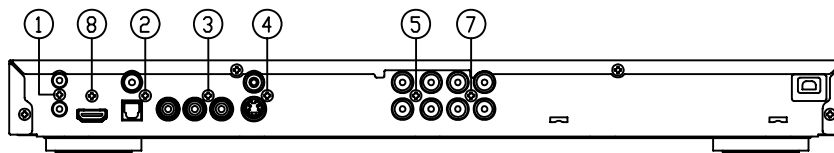
4. Removing the Main PCB
   Remove the Screws ①~⑧
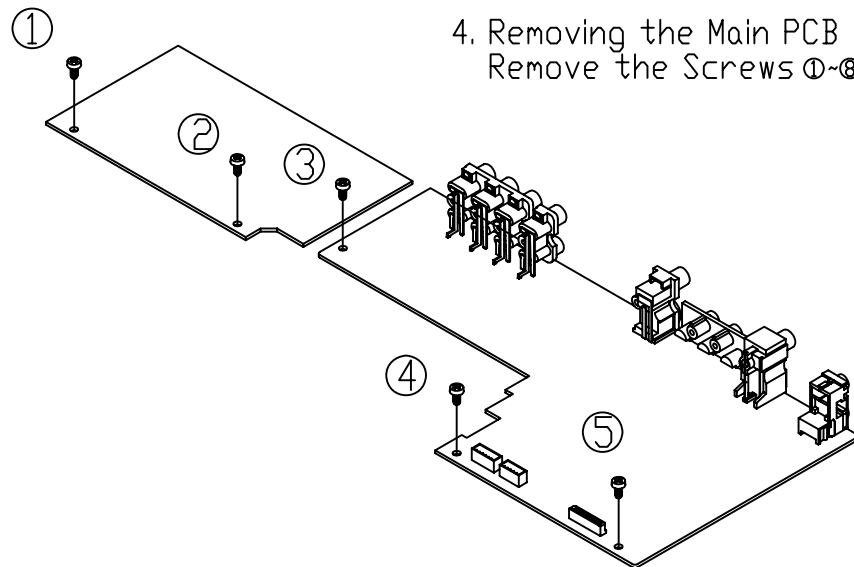
EXPLODED VIEW(DVD37)
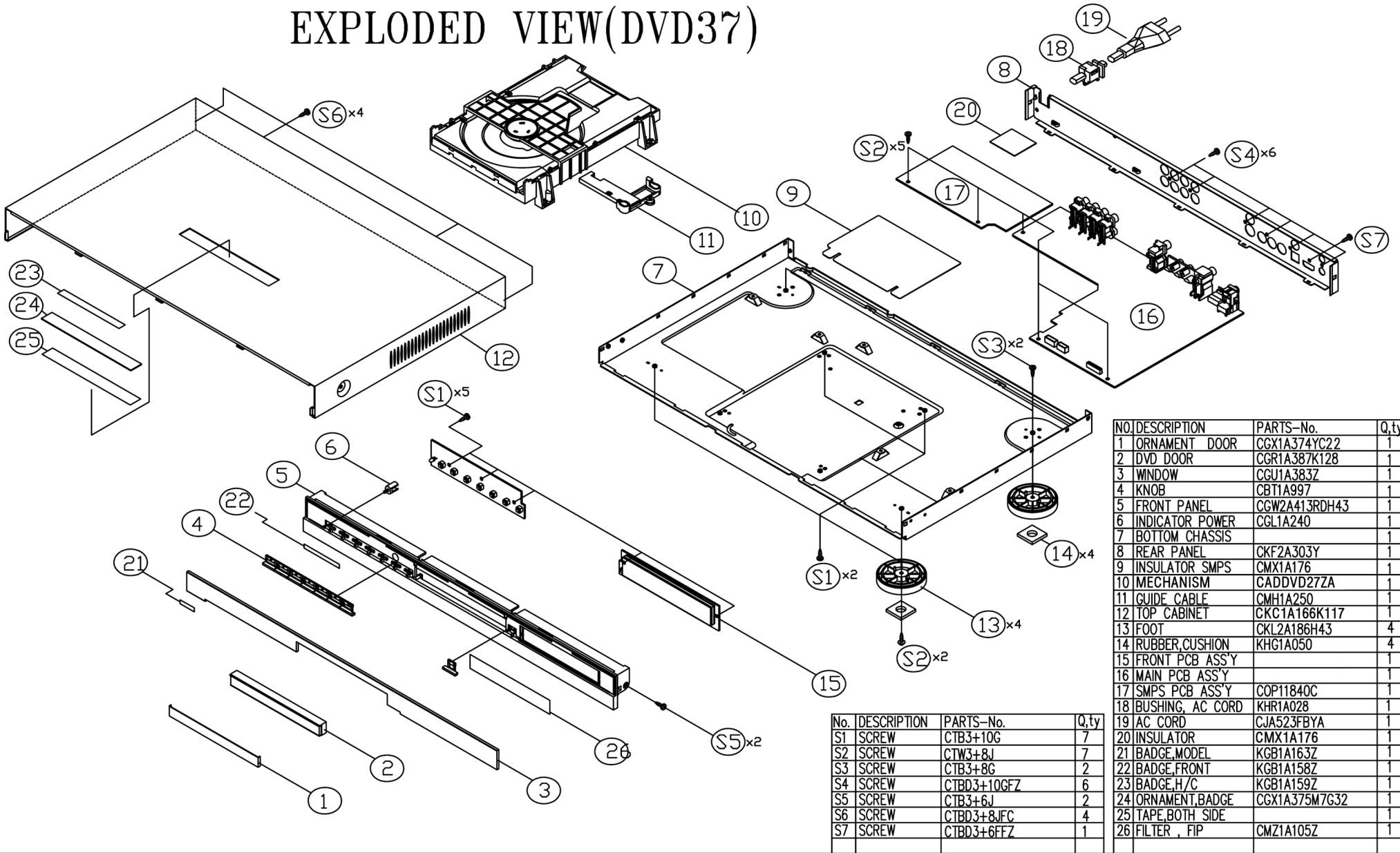
NO.	DESCRIPTION	PARTS-No.	Q,ty
1	ORNAMENT DOOR	CGX1A374YC22	1
2	DVD DOOR	CGR1A387K128	1
3	WINDOW	CGU1A383Z	1
4	KNOB	CBT1A997	1
5	FRONT PANEL	CGW2A413RDH43	1
6	INDICATOR POWER	CGL1A240	1
7	BOTTOM CHASSIS		1
8	REAR PANEL	CKF2A303Y	1
9	INSULATOR SMPS	CMX1A176	1
10	MECHANISM	CADDVD27ZA	1
11	GUIDE CABLE	CMH1A250	1
12	TOP CABINET	CKC1A166K117	1
13	FOOT	CKL2A186H43	4
14	RUBBER,CUSHION	KHG1A050	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	CMX1A176	1
21	BADGE,MODEL	KGB1A163Z	1
22	BADGE,FRONT	KGB1A158Z	1
23	BADGE,H/C	KGB1A159Z	1
24	ORNAMENT,BADGE	CGX1A375M7G32	1
25	TAPE,BOTH SIDE		1
26	FILTER , FIP	CMZ1A105Z	1

No.	DESCRIPTION	PARTS-No.	Q,ty
S1	SCREW	CTB3+10G	7
S2	SCREW	CTW3+8J	7
S3	SCREW	CTB3+8G	2
S4	SCREW	CTBD3+10GFZ	6
S5	SCREW	CTB3+6J	2
S6	SCREW	CTBD3+8JFC	4
S7	SCREW	CTBD3+6FFZ	1

DVD Player Block Diagram (DVD 37 & 37/230)

SCART

OPEN/CLOSE &
SPINDLE MOTOR
& SLED
CONTROL

AM5888S

27MHz
OSC

EEPROM
24C08

T.R MUTE
Control

VIDEO
FILTER

EUR ONLY

3CH
VIDEO DRV.
BA7660FS

6CH.
VIDEO
DRV.
BH7862FS

Built in
filter

Y
Pb
Pr

Comp.

S-Video

RF SERVO

ZR36707

M P E G

ZR36778

HDMI
TRANSM.
ZR36721

HDMI OUT

TRAVERSE UNIT
(SANYO PICK-UP HD62)
DV-342FV

16M Bit
FLASH u-COM
M29W160ET70N

SDRAM 64M

M12L64164A7T

SPDIF OUT

AUDIO PCM OUT

T.R BUFFER

Coax.

Optical

Remote
Sensor

DSD
DECODER

SAA7893

DSD OUT

LT/RT

SYSTEM u-COM
ST72F324K2

PCM/DSD
CLK
SELECT
MUX.
74LVC157

AUDIO
DAC

CS4392

+6dB OPAMP

FL/FR

RL/RR

SW/C

8MHz
OSC

SDRAM 64M
M12L64164A7T

Not used For DVD 37

Key Pad

BUFFER
74HCT7007

SMPS Ass'y
COP11840C

VFD (CIG Type)   13BT229GINK

PHOTO
COUPLER

KP1010B

IN
Out

SYSTEM

DVD37 Electrical Parts List					
Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
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	CHIP, CAP 18PF/50V/1608	18PF JA 1608	1	EA
C156	CCUS1H180JA	CHIP, CAP 18PF/50V/1608	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	CHIP CERAMIC CAP. 1608 (5600p)	5600PF KC 1608	1	EA
C160	CCUS1H562KC	CHIP CERAMIC CAP. 1608 (5600p)	5600PF KC 1608	1	EA
C161	CCUS1H562KC	CHIP CERAMIC CAP. 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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
C197	CCUS1H104KC	CAP , CHIP	0.1UF ZF 1608	1	EA
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	CHIP, CAP 15PF/50V/1608	15PF JA 1608	1	EA
C250	CCUS1H150JA	CHIP, CAP 15PF/50V/1608	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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
C313	CCUS1H102KC	CAP , CHIP	1000PF KC 1608	1	EA
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	CHIP, CAP 15PF/50V/1608	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	CHIP, CAP 15PF/50V/1608	15PF JA 1608	1	EA
C556	CCUS1H150JA	CHIP, CAP 15PF/50V/1608	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	CHIP, CAP 15PF/50V/1608	15PF JA 1608	1	EA

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
C831	CCUS1H150JA	CHIP, CAP 15PF/50V/1608	15PF JA 1608	1	EA
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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
C653	CCEA1CH220T	CAP , ELECT	22UF 16V	1	EA
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,Pb f	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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
IC51	HVILM1117S-5.0	IC REGULATOR/SOT-223	LM1117-1V8 (1.8V)	1	EA
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	HN1K05FU	1	EA
Q105	HVTKTA1664YP	TRANSISTOR PNP	KTA1664	1	EA
Q106	HVTKTA1664YP	TRANSISTOR PNP	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, PNP	2SA1955B	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	RECT , DIODE	1N4003	1	EA
D104	CVD1N4003ST	RECT , DIODE	1N4003	1	EA
D105	CVD1N4003ST	RECT , DIODE	1N4003	1	EA
D107	CVD1N4003ST	RECT , DIODE	1N4003	1	EA
D109	CVD1N4003ST	RECT , DIODE	1N4003	1	EA
D110	CVD1N4003ST	RECT , DIODE	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	REGULATOR, +8v	7808 (KEC)	1	EA
IC61	HRVKSM603TH2	SENSOR IR	KSM-603TH2	1	EA
IC50	HVIKA79L08AZT	REGULATOR, -8V	KA79L08	1	EA
Q605	HVTKSA916YT	TRANSISTOR PNP	KSA916Y	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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
R104	CRJ10DF3920T	RES. CHIP (392R 1%)	392 OHM 1608 SIZE	1	EA
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%)	392 OHM 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, ARRAY, 100R (1608)	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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
R182	CRJ10DJ0R0T	RES , CHIP	0 OHM 1608 SIZE	1	EA
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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
R418	CRJ10DJ472T	RES , CHIP	4.7K OHM 1608 SIZE	1	EA
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	0 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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
R650	CRJ10DJ132T	RES , CHIP	1.3K OHM 1608 SIZE	1	EA
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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
R802	CRJ10DJ820T	RES , CHIP	82 OHM 1608 SIZE	1	EA
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					
CN11	CJP24GA195ZM	SMT FFC/FPC WAFER(0.5MM PITCH)	52559-2472 (PB FREE)	1	EA
X101	HOX27000E180S	CRYSTAL , CHIP(27MHZ,SMD)	HC-49/US	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, 6PIN	6Pin connector	1	EA
CN12	CJP05GA19ZY	WAFER, STRAIGHT, 5PIN	5Pin connector	1	EA
CN13	CJP06GA19ZY	WAFER, STRAIGHT, 6PIN	6Pin connector	1	EA
ET01	CMC1A111	PLATE , EARTH		1	EA
ET02	CMC1A111	PLATE , EARTH		1	EA
F401	HFL13BT229GINK	F.I.P	13-BT-229GINK (FUTAB	1	EA
JK01	CJJ4R041Z	6P JACK, BOARD	RCA-601DAG-11	1	EA
JK02	CJJ4N067Z	2P, JACK	RCA-201DAG-01	1	EA
JK03	CJJ4S043Z	JACK , BOARD		1	EA
JK04	CJJ9N003Z	JACK , (S-VIDEO)		1	EA
JK06	HJS9U008Z	Optical Jack	YKC22-0732N	1	EA
JK08	HJJ1D002Z	JACK, HOSIDEN	SR7400	1	EA
X501	HOX08000E160C	CRYSTAL 8MHz		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

Ref. Designator	Part Number	Description		Qty	
MAIN/FRONT PCB ASS'YS					
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
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
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

Ref. Designator	Part Number	Description		Qty	
SMPS PCB ASS'Y					
C935	CCFT1H104ZF	CAP , SEMICONDUCTOR	0.1UF 50V ZF	1	EA
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	0.027UF KC 1608	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 NORMAL PNP/TO-92L	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	CEF04N6	1	EA
Q903	HVTKSB1151Y	TRANSISTOR PNP	KSB1151Y	1	EA
Resistors					
R901	KROS1TJ105V	RES , METAL FILM (1/2W , 1M OH	(1/2W , 1M OHM)	1	EA
R903	CRD25TJ754T	RES,CF	750K OHM 1/4W J	1	EA
R904	CRD25TJ754T	RES,CF	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

Ref. Designator	Part Number	Description		Qty	
SMPS PCB ASS'Y					
R920	CRD20TJ101T	RES , CARBON	100 OHM 1/5W J	1	EA
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 1.5(J) NON-INDUCT	1	EA
R927	KRDS1TJ681V	RES , CARBON	680OHM 1/2W J	1	EA
Miscellaneous					
	CVICEF04N6YA	FET. HEAT SINK ASS`Y	FOR Q901	1	EA
CN91	KJP02KA060ZY	WAFER	7.92MM(YUNHO)	1	EA
CN92	CJP12GA19ZY	WAFER	12Pin connector	1	EA
LF91	CLZ9Z060Y	LINE FILTER	CLZ9Z060Y	1	EA
T901	CLT9Z018ZE	TRANS (DVD 27)	EER2828H	1	EA
F901	KBA2C2000TLEY	FUSE	(2A/250V)	1	EA
FH91	KJCFC5S	HOLDER , FUSE	FOR F901	1	EA
FH92	KJCFC5S	HOLDER , FUSE	FOR F901	1	EA
L903	CLZ9Z040Z	COIL , CHOKE(6.8UH)	DR 6.5*7.5	1	EA
L905	CLZ9Z040Z	COIL , CHOKE(6.8UH)	DR 6.5*7.5	1	EA
NT91	KRT10D9MSFT	THERMISTER	10D9M	1	EA
	CMY2A223	HEAT SINK		1	EA
	CTB3+8JR	SCREW		1	EA

DVD 27-50629.pcb - Mon Dec 26 16:44:38 2005
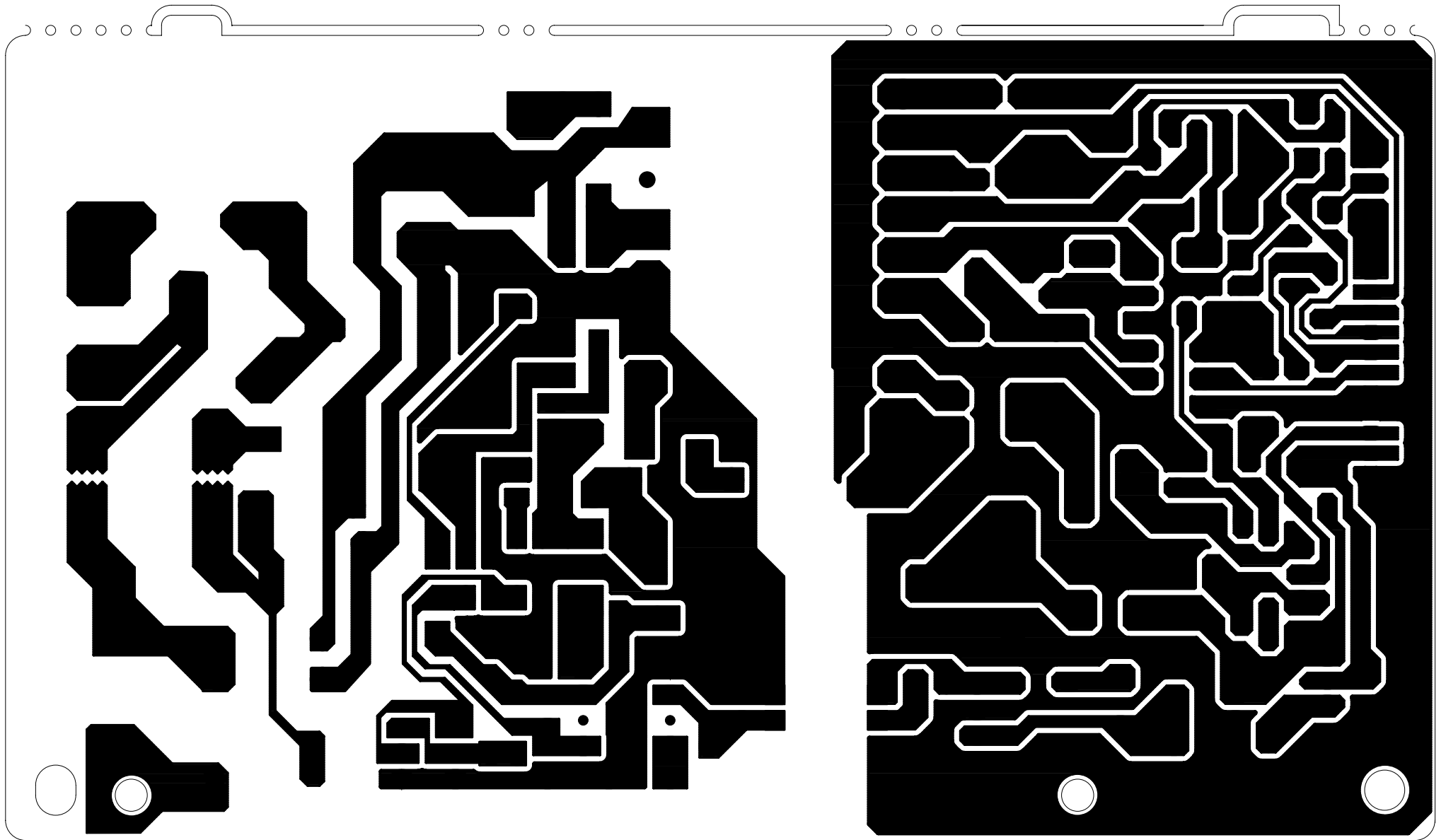
FOR CONTINUED PROTECTION AGAINST RISK OF FIRE.   REPLACE ONLY WITH SAME TYPE AND RATING OF FUSE(S).

CAUTION

F901
250V T2AL

FH91   FH92

CN91

L   L

N   N

R901

C901

NT91

LF91

D902

D904

C902

D901

D903

C933

C932

Q912   C910   C906

R910

C904 R902 D905

T901

D924   D928

D923   C927

C925   C926

J923   Q906

C928   C935 C929
R934   Q911   J921
Q910

Q909   J924

J922   Q907   R930

Q908

D922   D925 D926   R935 R933   J915   D930
R929

D921   J916   J925   R928

C903

R903

J901

R908

Q901

R909   D908   C930

D909

R904   R905 R912 R913 R907 R906

D907 D910

C908

R914

C907

D912

IC91

C905

D906
R911

PC91

IC92

R920

CUP11840Z

C923

D920
R921

R932   C924

C920   L905

R940

C922

L903
Q904
D913

C921

R922
R923
R931

R924   Q903

R925

C931

R926
R927
D911
Q905

FL−
FL+
CON
VP
+5VS
−12V
GNDD
GNDD
+12V
+5V
GNDA
GNDA

CN92

<A30C5/C5>

CUP11842Z_mpё.pcb — Wed Apr 19 12:00:03 2006

CUP11842Z_mpë.pcb – Wed Apr 19 13:57:35 2006

< A30C5/C5 >   **harman/kardon®**

CUP11842Z

DIPPING

CUP11842-1

< A30C5/C5 >   CUP11842-2

< A30C5/C5 >   CUP11842-3

ZORAN

Data Sheet

ZR36778HQCG

Vaddis® 778 Advanced Featured DVD SoC

Version 0.9
19 Sep 2004

ZORAN Proprietary

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

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).

1.3 Typical Applications

Stand- alone DVD and CD disc players. See example block diagram in the figure below.
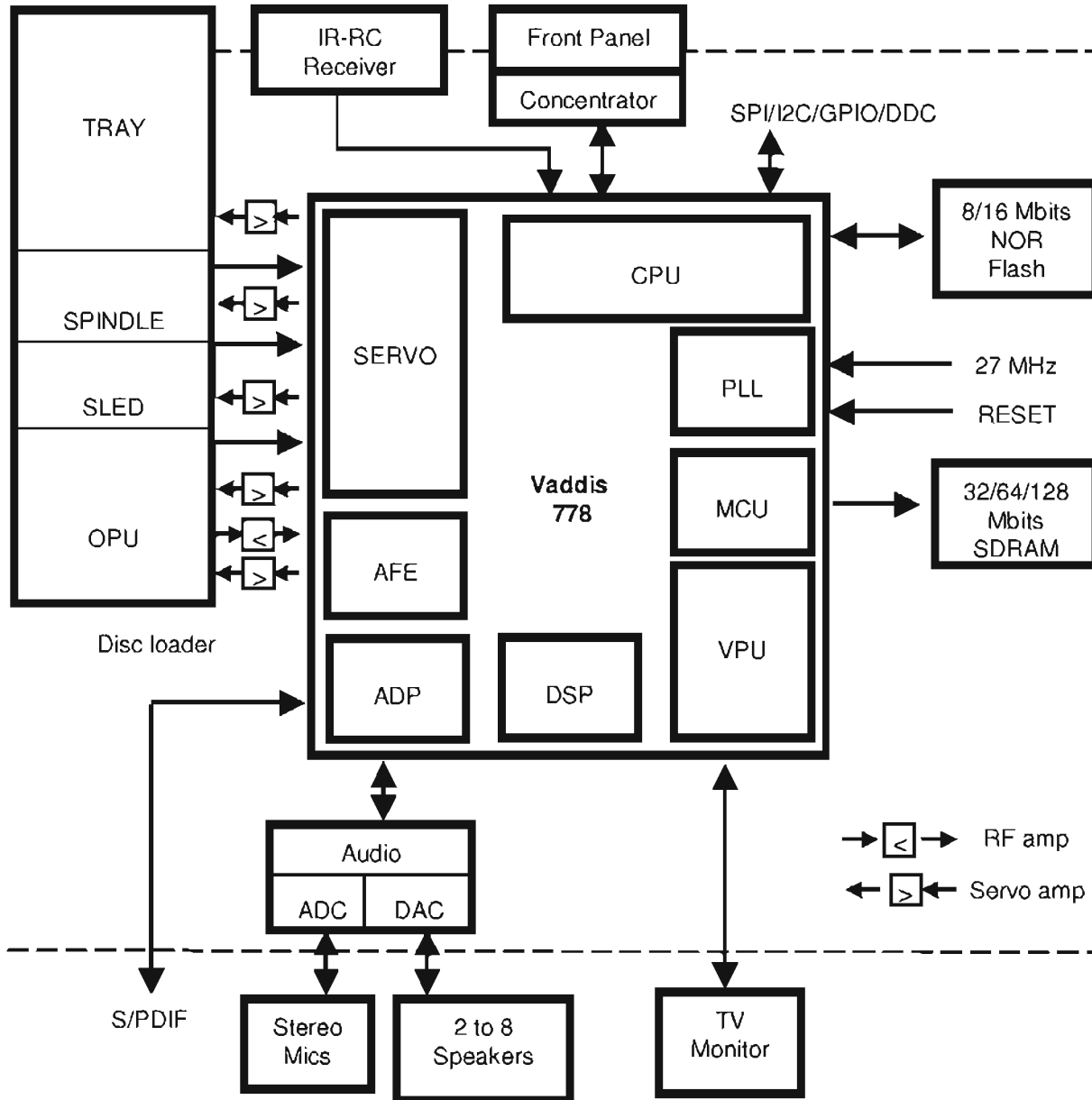
Figure 1 – DVD Player Block Diagram

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.

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).
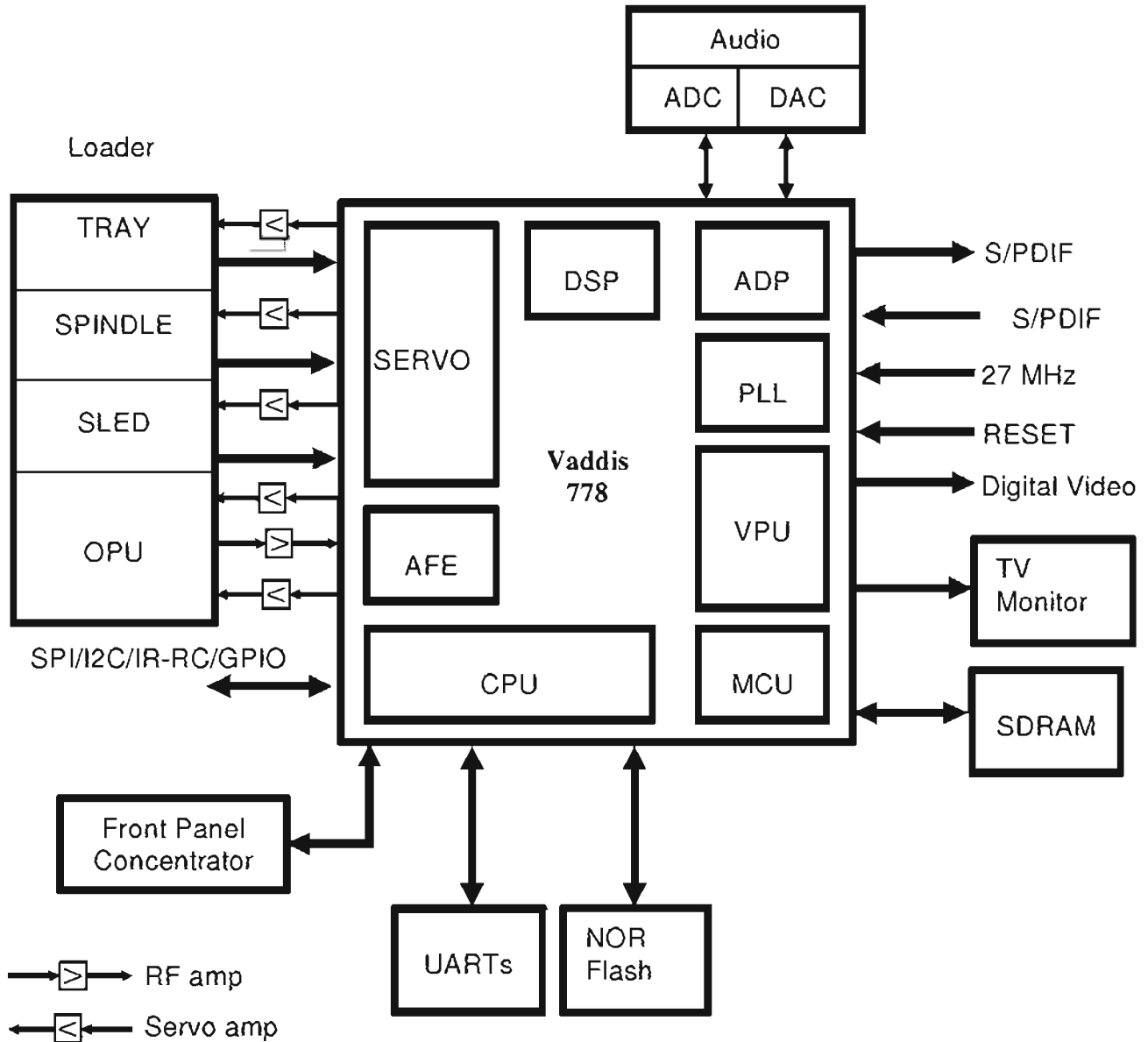
Figure 2 – Vaddis 778 Main External Interfaces

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 [15,16]	O	PNVM/SRAM address bus outputs
	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

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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

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

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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

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

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

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

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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

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

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

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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Data Sheet

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

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.

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

ZORAN Proprietary

9 Package information

ZR36778HQCG is a green package

ZR36778HQCG

Vaddis 778

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ZORAN

Data Sheet

ZR36721

HD*Xtreme*®

HD up-scaling and HDMI transmitter processor

Version 1.2
25 July 2004

ZORAN Proprietary

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

2

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3 PIN DIAGRAM

HDXtreme

(TOP VIEW)

Left side (top to bottom):
- VDDDAC — 65
- GY — 66
- RPR — 67
- BPB — 68
- GNDDAC — 69
- GNDC — 70
- H_SYNC — 71
- VDDC — 72
- V_SYNC — 73
- GNDP — 74
- GPIO14 — 75
- VDDP — 76
- GPIO13 — 77
- GPIO12 — 78
- GPIO11 — 79
- GPIO10 — 80

Top side (left to right, pins 64–41):
- 64 RSET
- 63 GNDDACP
- 62 GNDDACB
- 61 AVDDT33
- 60 AVDDT18
- 59 AGNDT1B
- 58 CSET
- 57 AGNDT33
- 56 TXD2P
- 55 TXD2N
- 54 AVDDT33
- 53 TXD1P
- 52 TXD1N
- 51 AGNDT33
- 50 TXD0P
- 49 TXD0N
- 48 AVDDT33
- 47 TXCP
- 46 TXCN
- 45 AGNDT33
- 44 GNDPLL
- 43 REFCLK
- 42 VDDPLL
- 41 RESET

Right side (top to bottom):
- 40 — VDDP
- 39 — RESERVED
- 38 — GPIO17
- 37 — GPIO16
- 36 — SDA
- 35 — SCL
- 34 — GNDP
- 33 — GNDC
- 32 — HOTPLUG
- 31 — VDDC
- 30 — GPIO0
- 29 — GPIO1
- 28 — GPIO2
- 27 — GPIO3
- 26 — VDDP
- 25 — GPIO4

Bottom side (left to right, pins 1–24):
- 1 VIN7
- 2 VIN6
- 3 VIN5
- 4 VIN4
- 5 VIN3
- 6 VIN2
- 7 VIN1
- 8 VIN0
- 9 VDDIP
- 10 VDDC
- 11 VCLKX2
- 12 GNDC
- 13 GNDP
- 14 HSYNC
- 15 FIELD
- 16 VDDP
- 17 GPIO9
- 18 GPIO8
- 19 GPIO7
- 20 GPIO6
- 21 GPIO5
- 22 SPDIF
- 23 GPIO15
- 24 GNDP

2

HD*Xtreme*
Data Sheet

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.

3

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.

2

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
	PAGE 5 OF 44	

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
- $\pm$ 20% Fc accuracy (Fc = 1 to 12 MHz)
- $\pm$ 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	DOCUMENT NO.	REV.
ZR36707TQCG Electrical Specification		1.0
	PAGE **6** OF **44**	

1.1.2 Block Diagram (Figure 1)
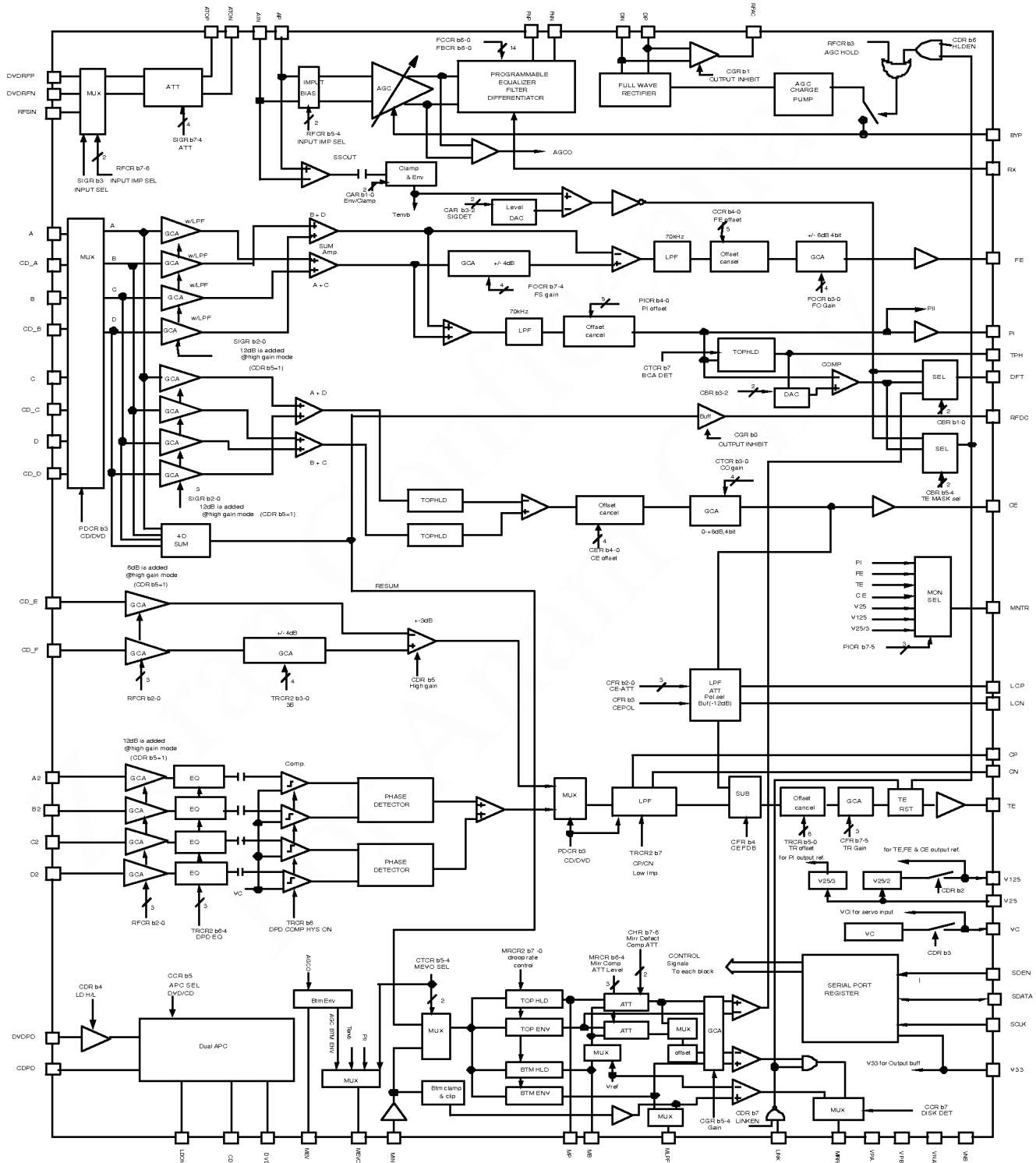
TITLE	DOCUMENT NO.	REV.
ZR36707TQCG Electrical Specification		1.0
	PAGE **44** OF **44**	

PACKAGE PIN DESIGNATIONS
(Top view)

Top pins (left to right): SDEN (48), SDATA (47), SCLK (46), V33 (45), LCP (44), LCN (43), MNTR (42), CE (41), FE (40), TE (39), PI (38), V25 (37), V125 (36), TPH (35), DFT (34), LINK (33)

Left pins (top to bottom): RX (49), MEV (50), VNA (51), FNN (52), FNP (53), DIP (54), DIN (55), BYP (56), RFAC (57), VPA (58), AIP (59), AIN (60), ATON (61), ATOP (62), RFSIN (63), RFDC (64)

Right pins (top to bottom): MEVO (32), MIN (31), MLPF (30), MB (29), MP (28), MIRR (27), LDON (26), VNB (25), CDPD (24), DVDPD (23), CDLD (22), DVDLD (21), VC (20), VPB (19), CD_E (18), CD_F (17)

Bottom pins (left to right): DVDRFP (1), DVDRFN (2), A2 (3), B2 (4), C2 (5), D2 (6), CP (7), CN (8), D (9), C (10), B (11), A (12), CD_D (13), CD_C (14), CD_B (15), CD_A (16)

ZR36707TQCG

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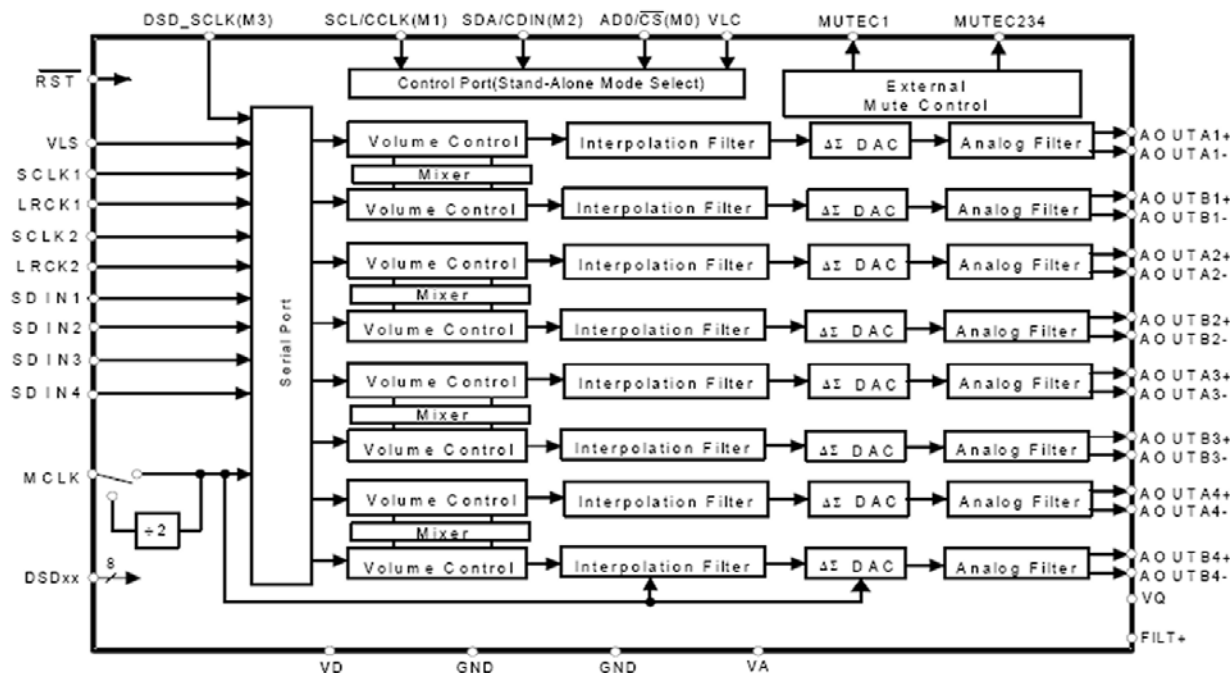
Preliminary Product Information | This document contains information for a new product. Cirrus Logic reserves the right to modify this product without notice.

CS4382

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.
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.

CS4382

CIRRUS LOGIC®

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^{2}C 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^{2}C 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/$\overline{\text{CS}}$	17	**Address Bit 0 (I^{2}C) / Control Port Chip Select (SPI)** (*Input*) - AD0 is a chip address pin in I^{2}C mode; $\overline{\text{CS}}$ 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

V_{DD}	1	54	V_{SS}
DQ0	2	53	DQ15
V_{DDQ}	3	52	V_{SSQ}
DQ1	4	51	DQ14
DQ2	5	50	DQ13
V_{SSQ}	6	49	V_{DDQ}
DQ3	7	48	DQ12
DQ4	8	47	DQ11
V_{DDQ}	9	46	V_{SSQ}
DQ5	10	45	DQ10
DQ6	11	44	DQ9
V_{SSQ}	12	43	V_{DDQ}
DQ7	13	42	DQ8
V_{DD}	14	41	V_{SS}
LDQM	15	40	N C
$\overline{WE}$	16	39	UDQM
$\overline{CAS}$	17	38	CLK
$\overline{RAS}$	18	37	CKE
$\overline{CS}$	19	36	N C
A_{13}	20	35	A_{11}
A_{12}	21	34	A_9
A_{10}/AP	22	33	A_8
A_0	23	32	A_7
A_1	24	31	A_6
A_2	25	30	A_5
A_3	26	29	A_4
V_{DD}	27	28	V_{SS}

Elite Semiconductor Memory Technology Inc.
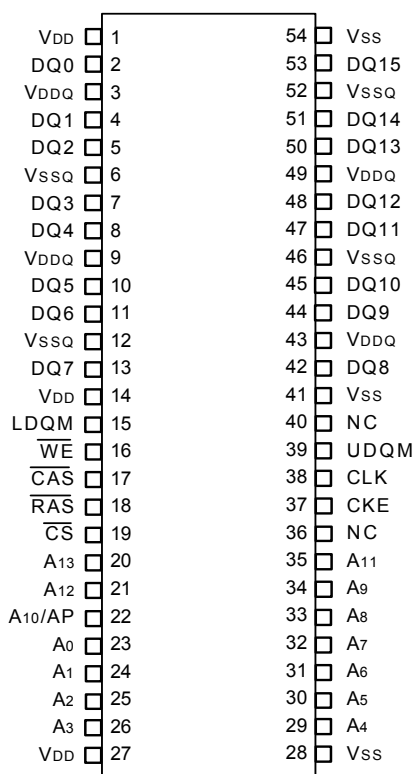
ESMT

FUNCTIONAL BLOCK DIAGRAM
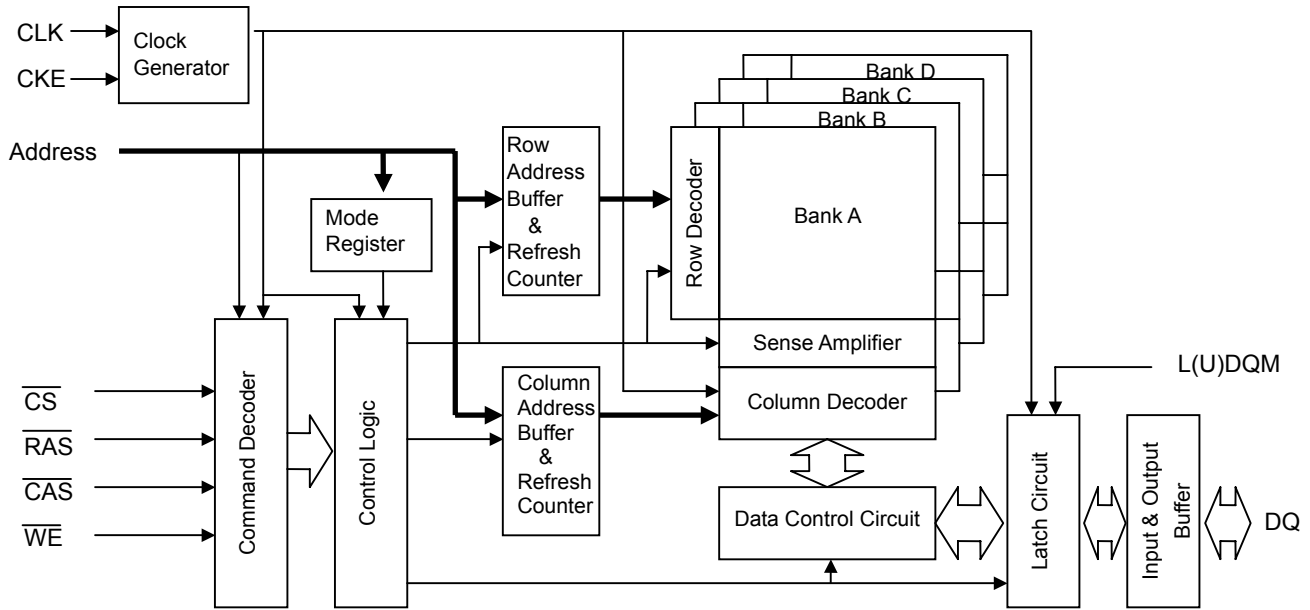
PIN FUNCTION DESCRIPTION

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.

ESMT

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.

ESMT

M12L64164A

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.

ESMT   M12L64164A

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
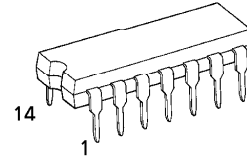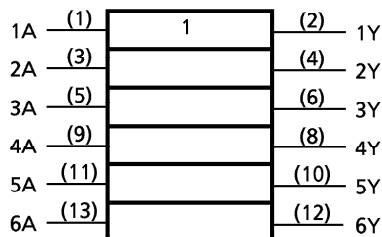
P (DIP14-P-300-2.54)
Weight : 0.96g (Typ.)
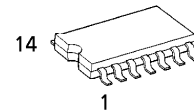
F (SOP14-P-300-1.27)
Weight : 0.18g (Typ.)

PIN ASSIGNMENT

1A	1	14 V_{CC}
1Y	2	13 6A
2A	3	12 6Y
2Y	4	11 5A
3A	5	10 5Y
3Y	6	9 4A
GND	7	8 4Y

(TOP VIEW)

IEC LOGIC SYMBOL

1A	(1)	1	(2)	1Y
2A	(3)		(4)	2Y
3A	(5)		(6)	3Y
4A	(9)		(8)	4Y
5A	(11)		(10)	5Y
6A	(13)		(12)	6Y
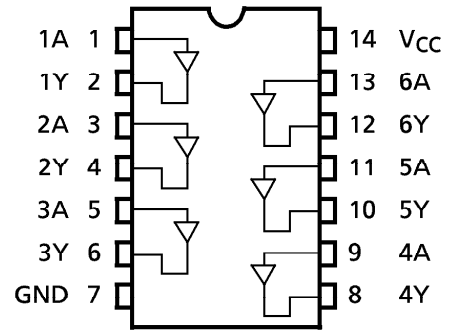
PIN ASSIGNMENT

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)

```
           _____
 A̅/B  [ 1   U   16 ] V_CC
  1A  [ 2       15 ] G̅
  1B  [ 3       14 ] 4A
  1Y  [ 4       13 ] 4B
  2A  [ 5       12 ] 4Y
  2B  [ 6       11 ] 3A
  2Y  [ 7       10 ] 3B
 GND  [ 8        9 ] 3Y
           _____
```
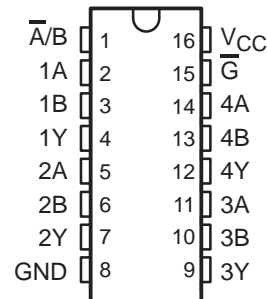
description

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

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SN74LVC157A
QUADRUPLE 2-LINE TO 1-LINE DATA SELECTOR/MULTIPLEXER
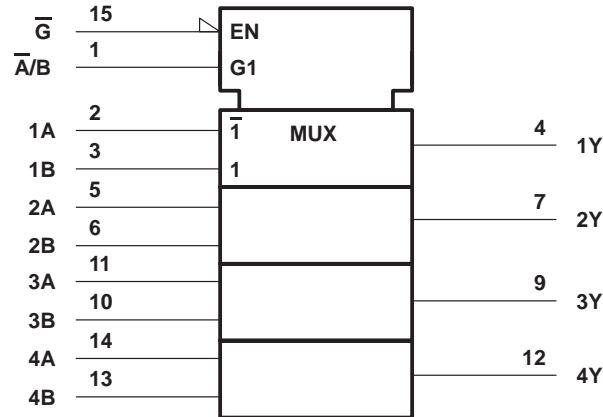
logic symbol†

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

logic diagram (positive logic)

FAIRCHILD

SEMICONDUCTOR®
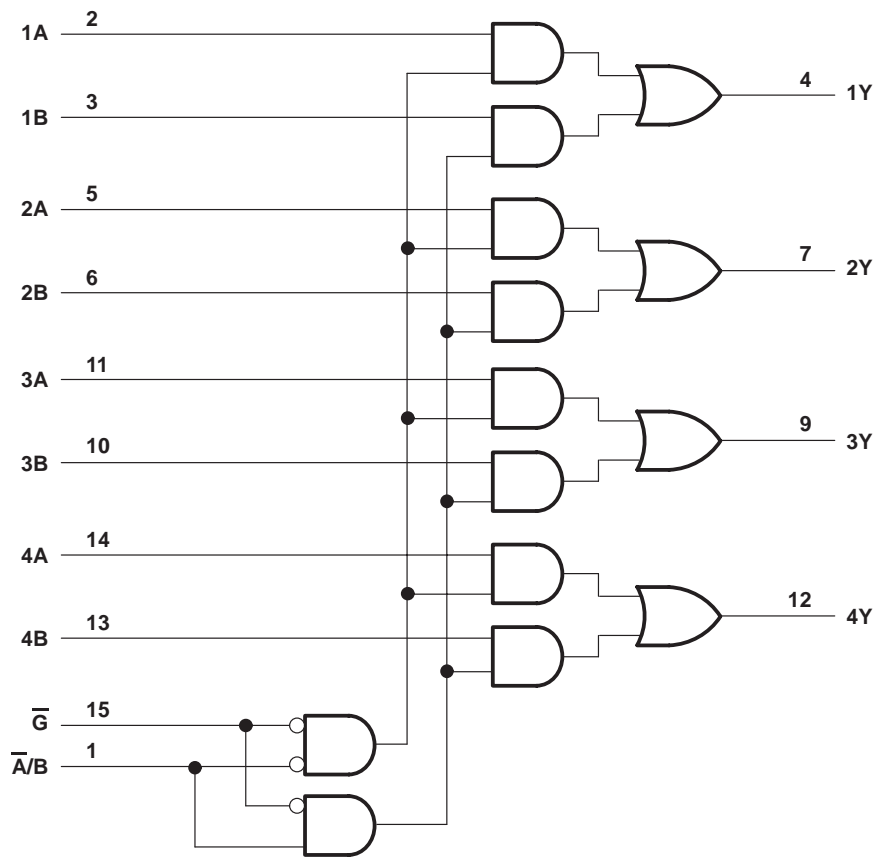
74VHC04 Hex Inverter

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.

74VHC04

Logic Symbol

IEEE/IEC
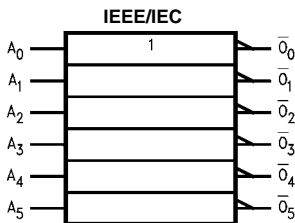
Connection Diagram
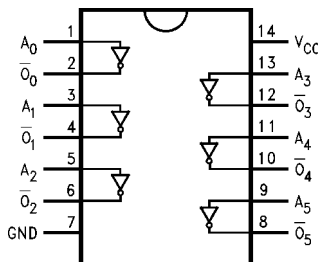
Pin Descriptions

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

Truth Table

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

AM5888S
Motor Driver ICs

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

AM5888S
Motor Driver ICs

- ● **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**
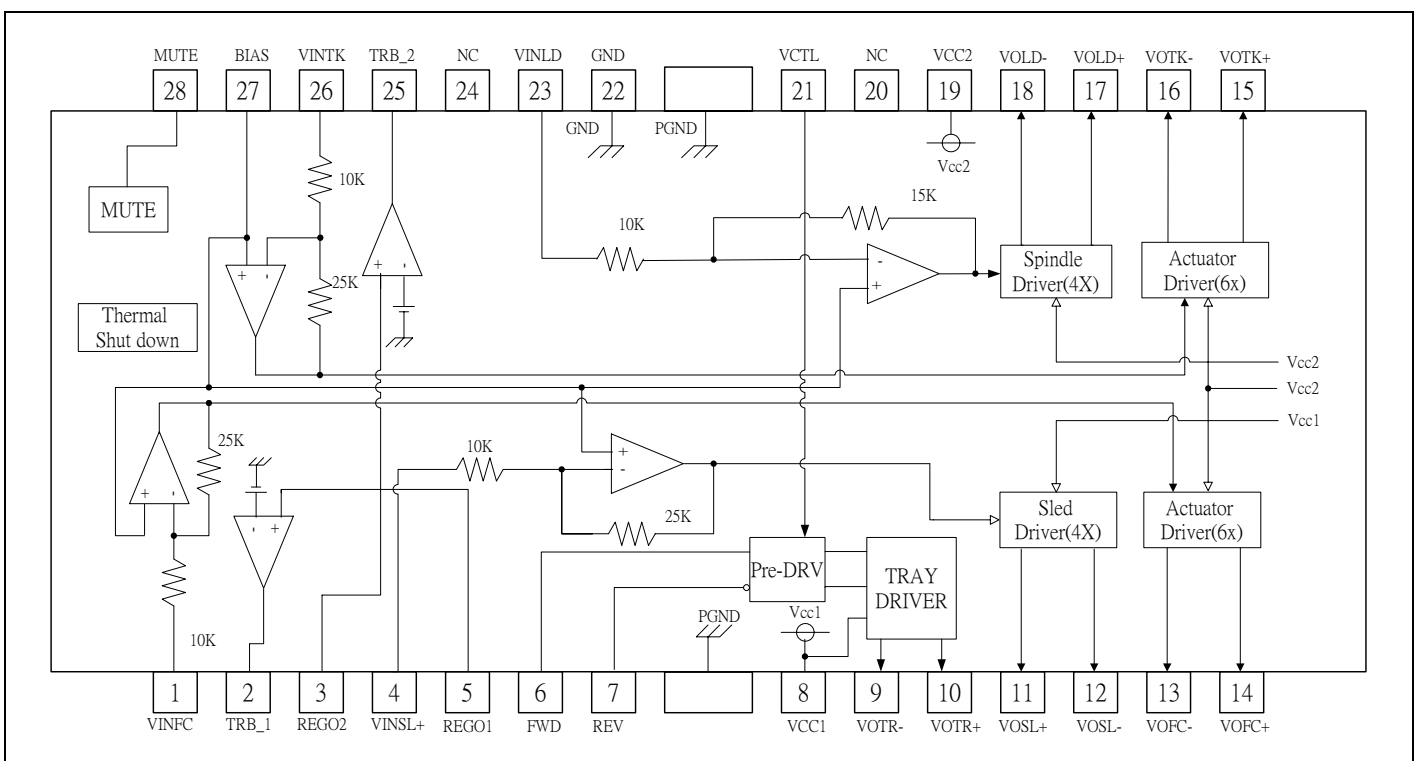
AM5888S
Motor Driver ICs

● **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.

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

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

```
        ┌───∪───┐
A0  □ │ 1     8 │ □ VCC
A1  □ │ 2     7 │ □ WP
A2  □ │ 3     6 │ □ SCL
GND □ │ 4     5 │ □ SDA
        └───────┘
```

8-lead SOIC

```
         ┌────────┐
A0  ⊐─│ 1     8 │─⊏ VCC
A1  ⊐─│ 2     7 │─⊏ WP
A2  ⊐─│ 3     6 │─⊏ SCL
GND ⊐─│ 4     5 │─⊏ SDA
         └────────┘
```

8-lead TSSOP

```
         ┌────────┐
A0  ⊐─│ 1     8 │─⊏ VCC
A1  ⊐─│ 2     7 │─⊏ WP
A2  ⊐─│ 3     6 │─⊏ SCL
GND ⊐─│ 4     5 │─⊏ SDA
         └────────┘
```

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
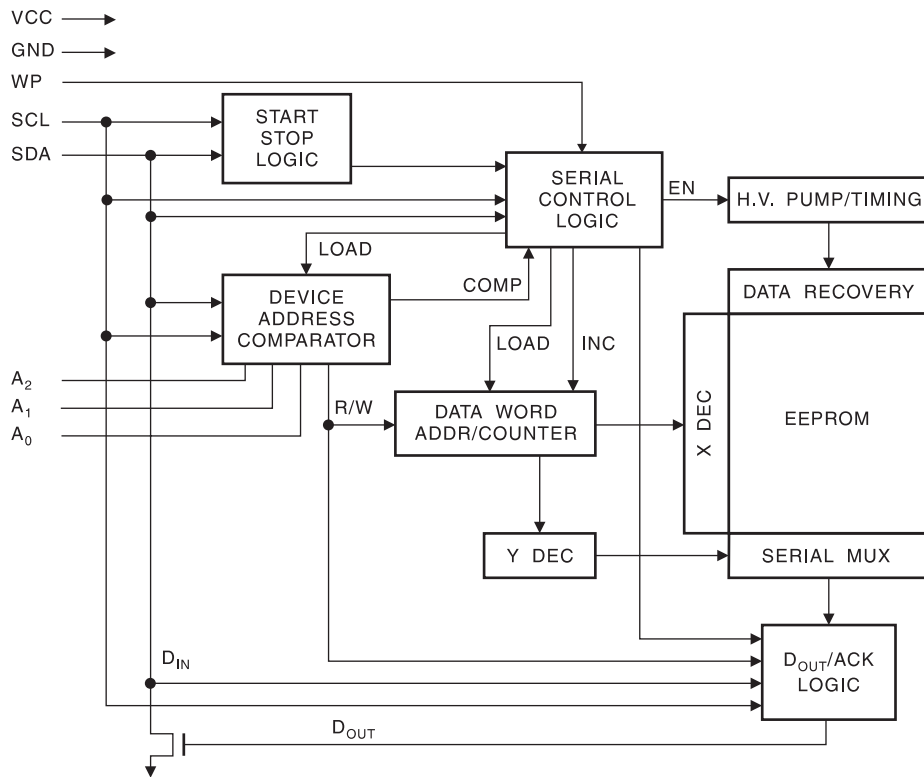
Pin Description

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

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.

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	Vcc 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	Vcc	4.5	–	5.5	V

◎Radiation resistance is not included in the design.

BH7862FS

Multimedia ICs

●**Block diagram**

KEC
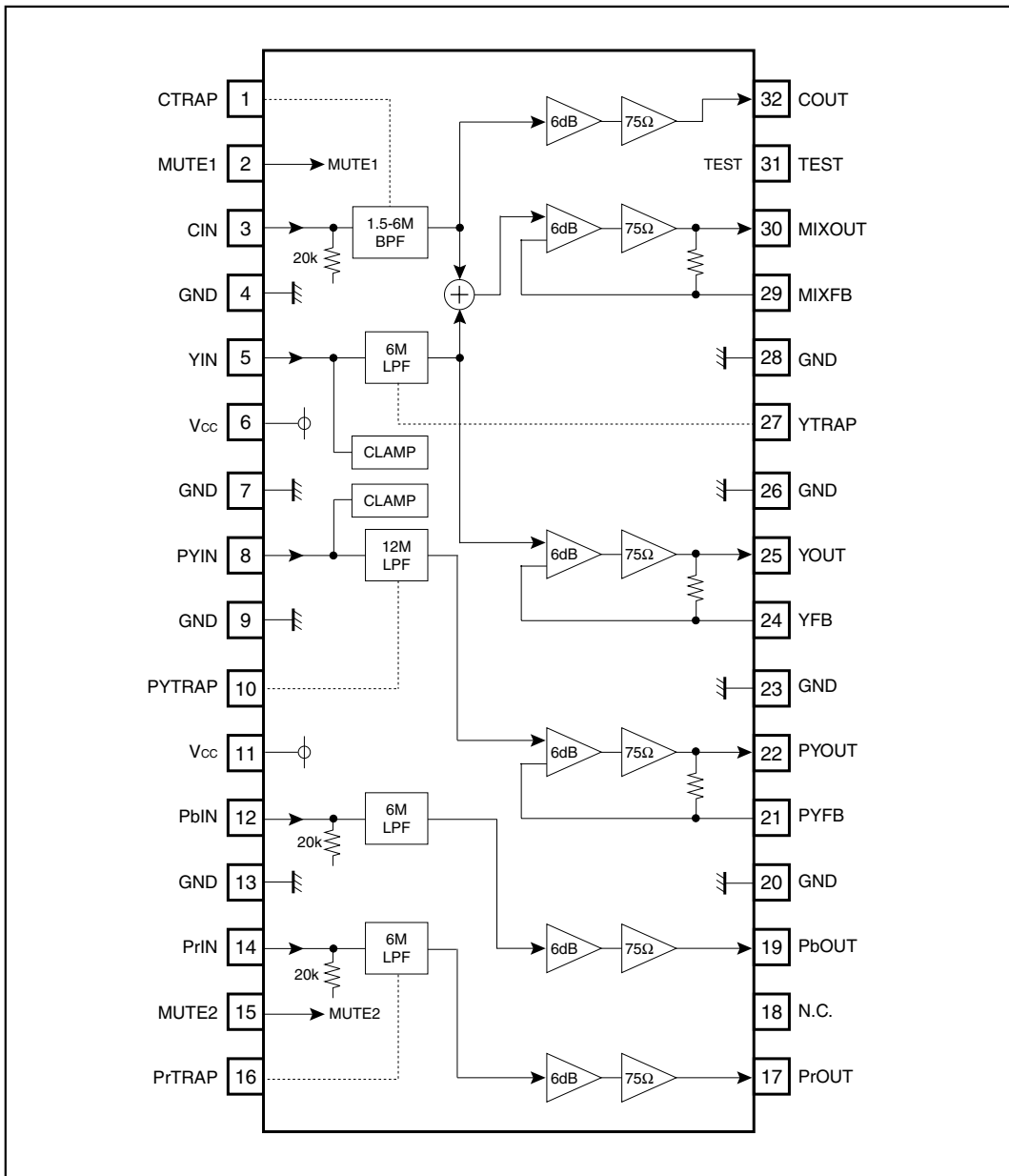
SEMICONDUCTOR TECHNICAL DATA	KIA7805API~ KIA7824API
	BIPOLAR LINEAR INTEGRATED CIRCUIT

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

1. INPUT
2. COMMON
3. OUTPUT

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
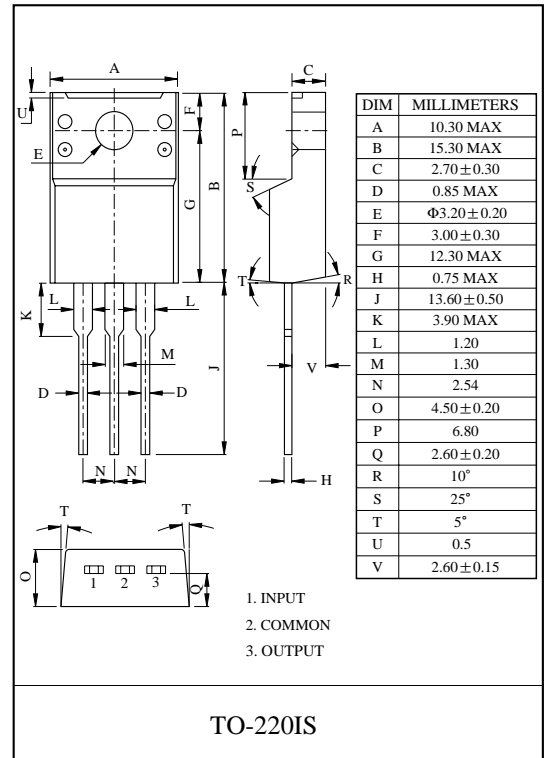
SEMICONDUCTOR TECHNICAL DATA	KIA79L05BP~ KIA79L24BP
	BIPOLAR LINEAR INTEGRATED CIRCUIT

THREE TERMINAL POSITIVE VOLTAGE REGULATORS

5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V.

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	℃

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

1. COMMON
2. INPUT
3. OUTPUT

TO-92L
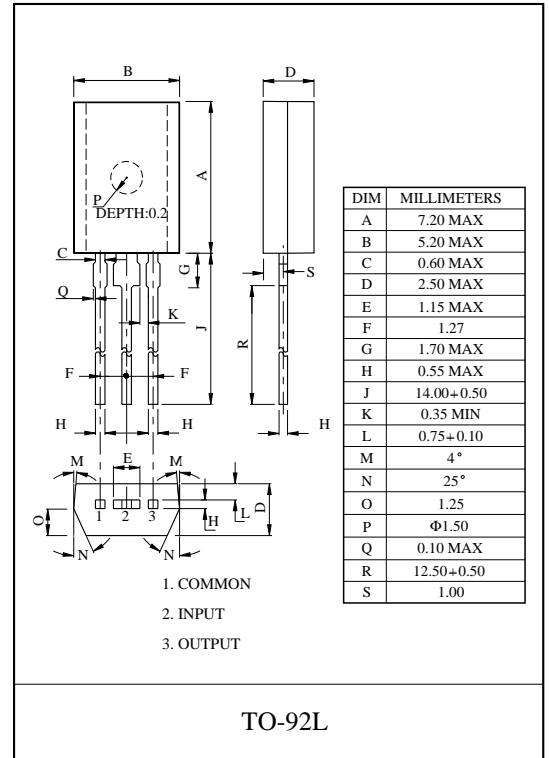
EQUIVALENT CIRCUIT
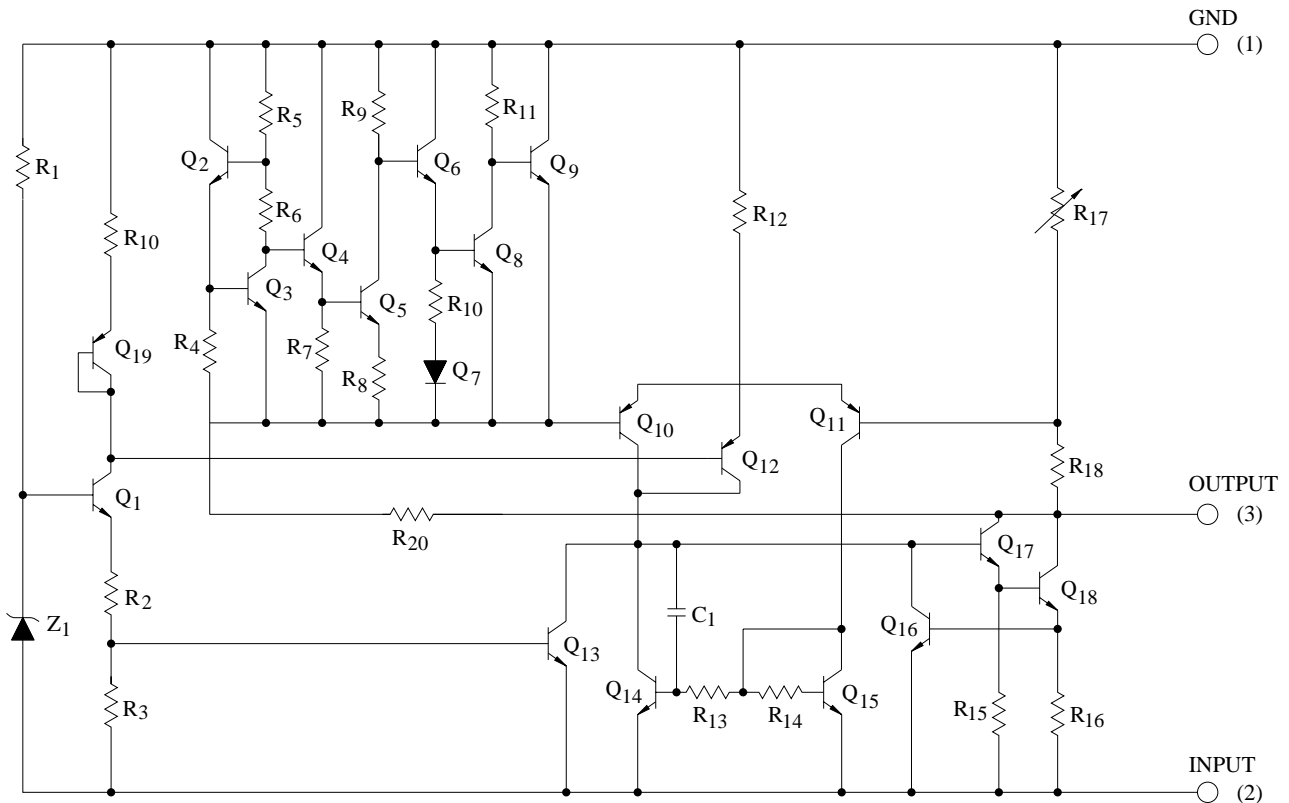
Optic receiver modules

KSM- 60 TH2· KSM- 70 TH2

The KSM- 60 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)
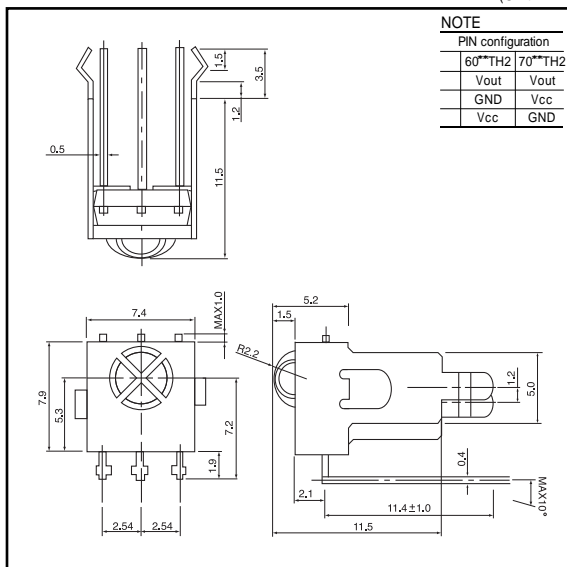
NOTE

PIN configuration

	60 TH2	70 TH2
	Vout	Vout
	GND	Vcc
	Vcc	GND

MAXIMUM RATINGS

(Ta= 25 Unless otherwise noted)

Parameter	Symbol	Rating	Unit
Supply Voltage	Vcc	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	Vcc			4.5	5.0	5.5	V
Current Consumption	Icc	Input Signal= 0		-	1.2	2.5	mA
Peak Wavelength *1	p			-	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	Voh	30cm over the ray	4.5	5.0	-	V
L Level Output Voltage *1	Vol	axis	-	0.1	0.5	V
H Level Output Pulse Width *1	Twh	Burst Wave= 600μ s	500	600	700	μ s
L Level Output Pulse Width *1	Twl	Period= 1.2	500	600	700	μ s
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.

■ **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

■ **PACKAGE OUTLINE**

NJM2068D   **NJM2068M**
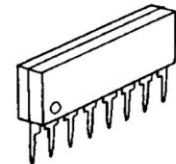
NJM2068V   **NJM2068L**

■ **PIN CONFIGURATION**
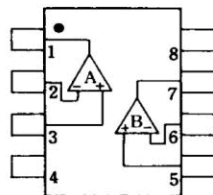
NJM2068D
NJM2068M
NJM2068V
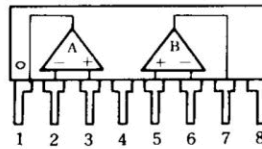
NJM2068L

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)

LM1117/LM1117I 800mA Low-Dropout Linear Regulator

N *National*
Semiconductor
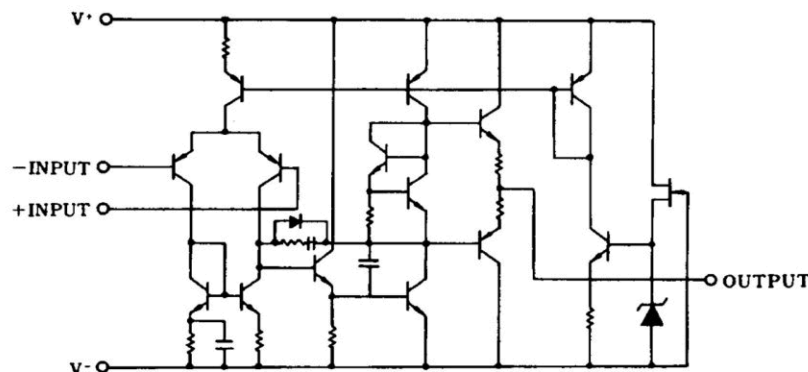
October 2002

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
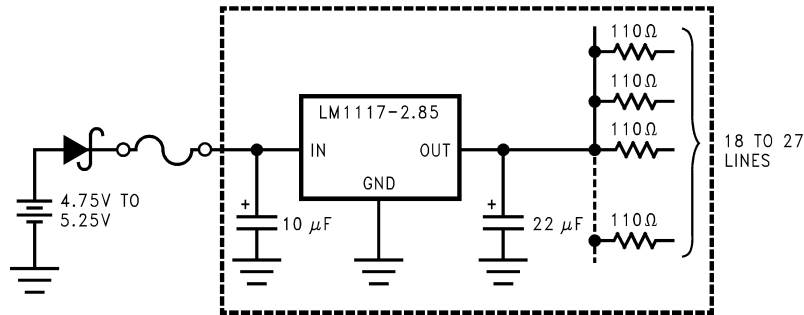
10091905

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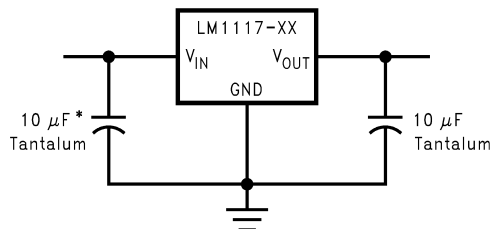
*Required if the regulator is located far from the power supply filter.

10091928

Block Diagram
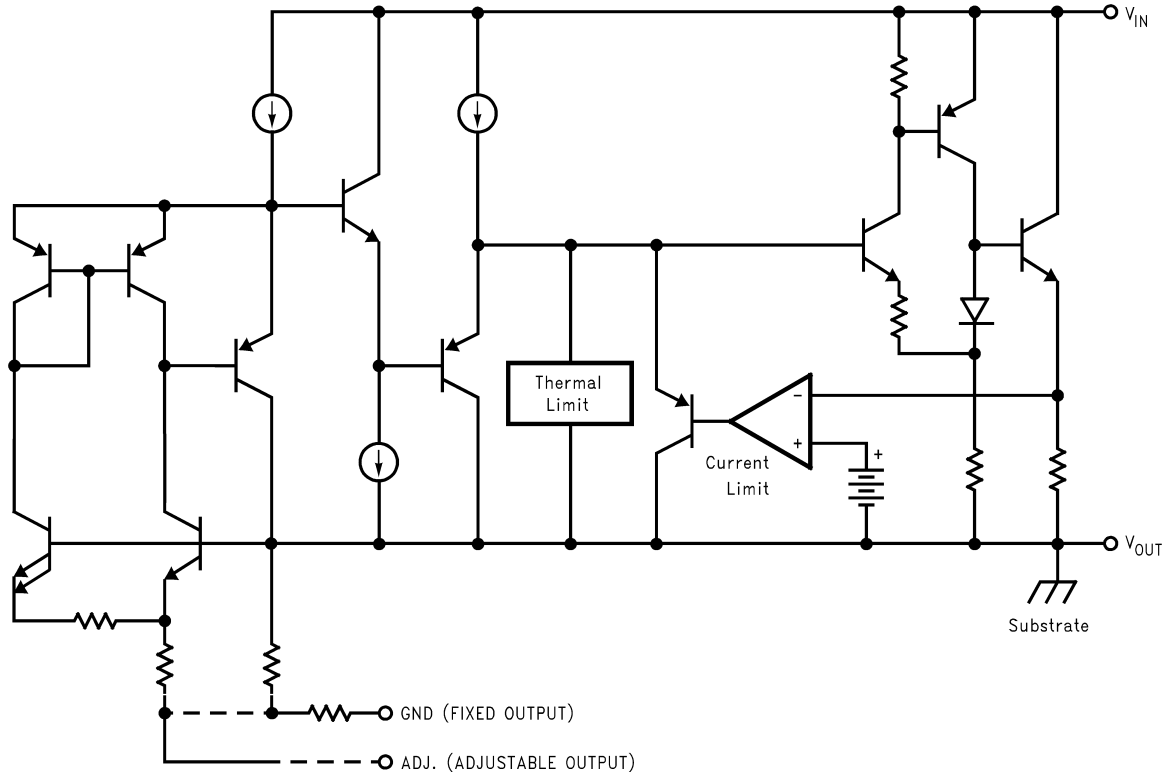
10091901

Connection Diagrams

SOT-223

Tab is
V$_{OUT}$

INPUT
OUTPUT
ADJ/GND

10091904

Top View

TO-220

V$_{OUT}$

INPUT
OUTPUT
ADJ/GND

10091902

Top View

TO-252

Tab is
V$_{OUT}$

Input
Output
Adj/GND

10091938

Top View

TO-263

TAB IS
V$_{OUT}$

INPUT
OUTPUT
ADJ/GND

10091944

Top View

10091945

Side View

LLP

ADJUST   1   8   NOT CONNECTED
V$_{IN}$ 2   V$_{OUT}$ 7   V$_{OUT}$
V$_{IN}$ 3   6   V$_{OUT}$
V$_{IN}$ 4   5   V$_{OUT}$
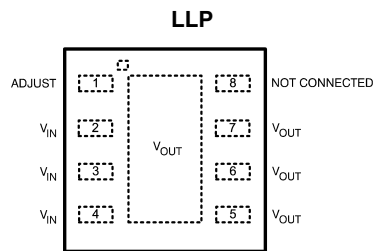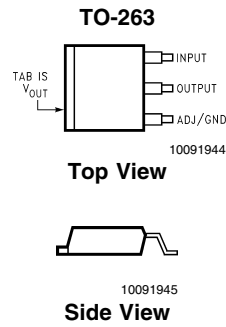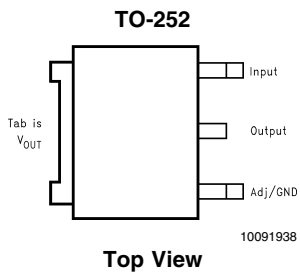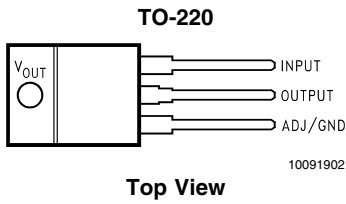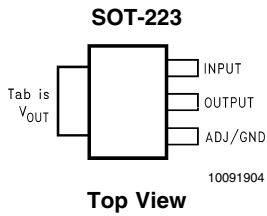
10091946

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

FBGA

TFBGA48 (ZA)
6 x 8mm
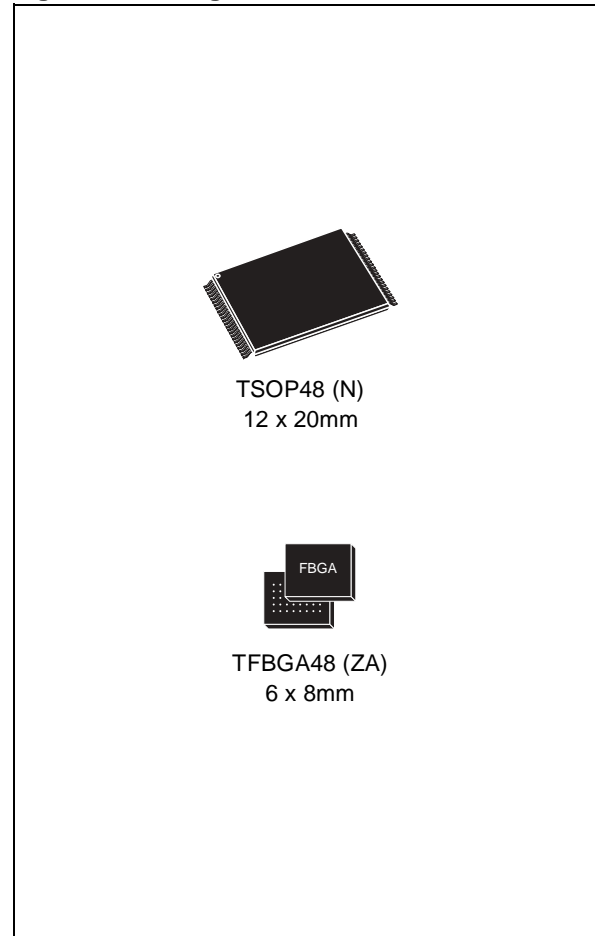
SUMMARY DESCRIPTION

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
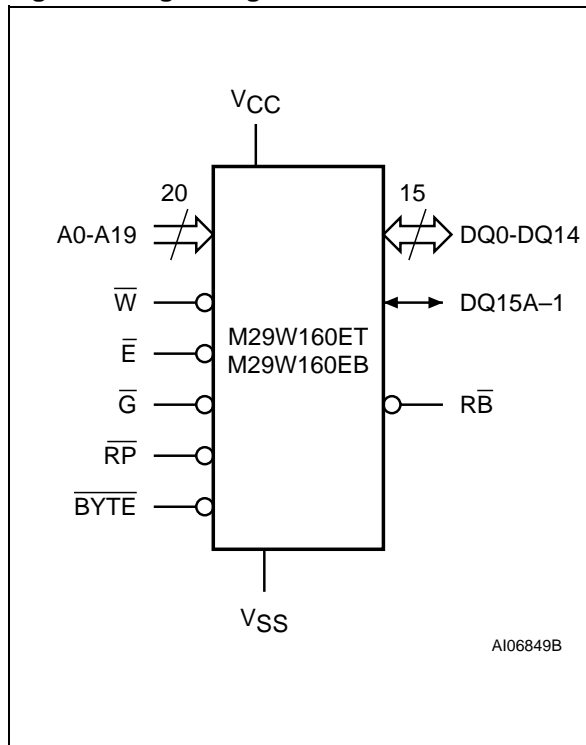
Table 1. Signal Names

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

M29W160ET, M29W160EB

Figure 3. TSOP Connections

Left pins			Right pins
A15	①	48	A16
A14			$\overline{BYTE}$
A13			V_{SS}
A12			DQ15A–1
A11			DQ7
A10			DQ14
A9			DQ6
A8			DQ13
A19			DQ5
NC			DQ12
$\overline{W}$			DQ4
$\overline{RP}$	12 M29W160ET	37	V_{CC}
NC	13 M29W160EB	36	DQ11
NC			DQ3
$R\overline{B}$			DQ10
A18			DQ2
A17			DQ9
A7			DQ1
A6			DQ8
A5			DQ0
A4			$\overline{G}$
A3			V_{SS}
A2			$\overline{E}$
A1	24	25	A0

AI06850
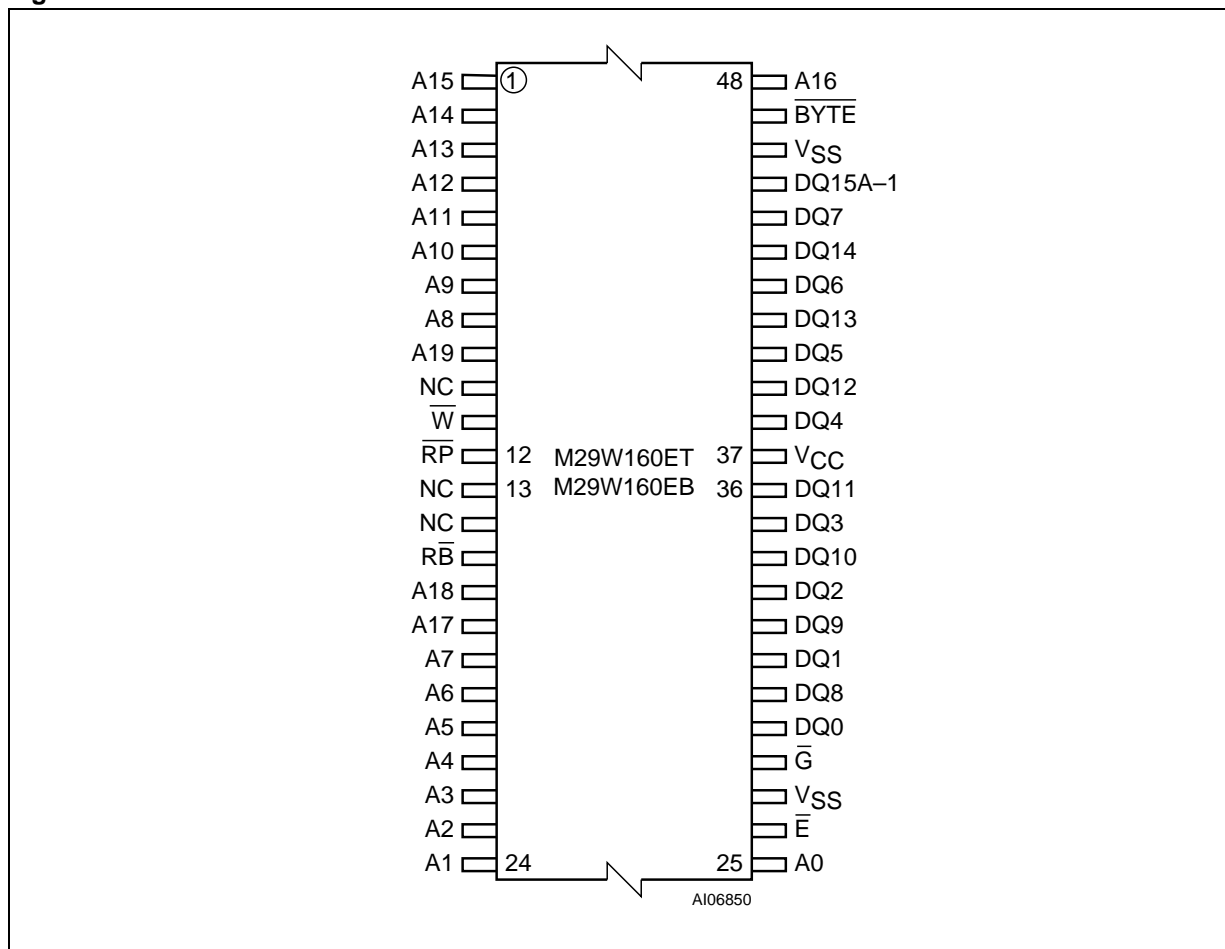
ST72F324L, ST72324BL

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 (HD-Flash) 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
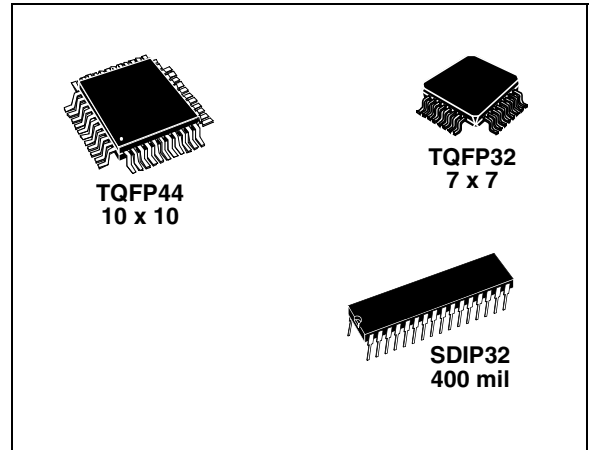
■ **2 Communication Interfaces**
- SPI synchronous serial interface
- SCI asynchronous serial interface

■ **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
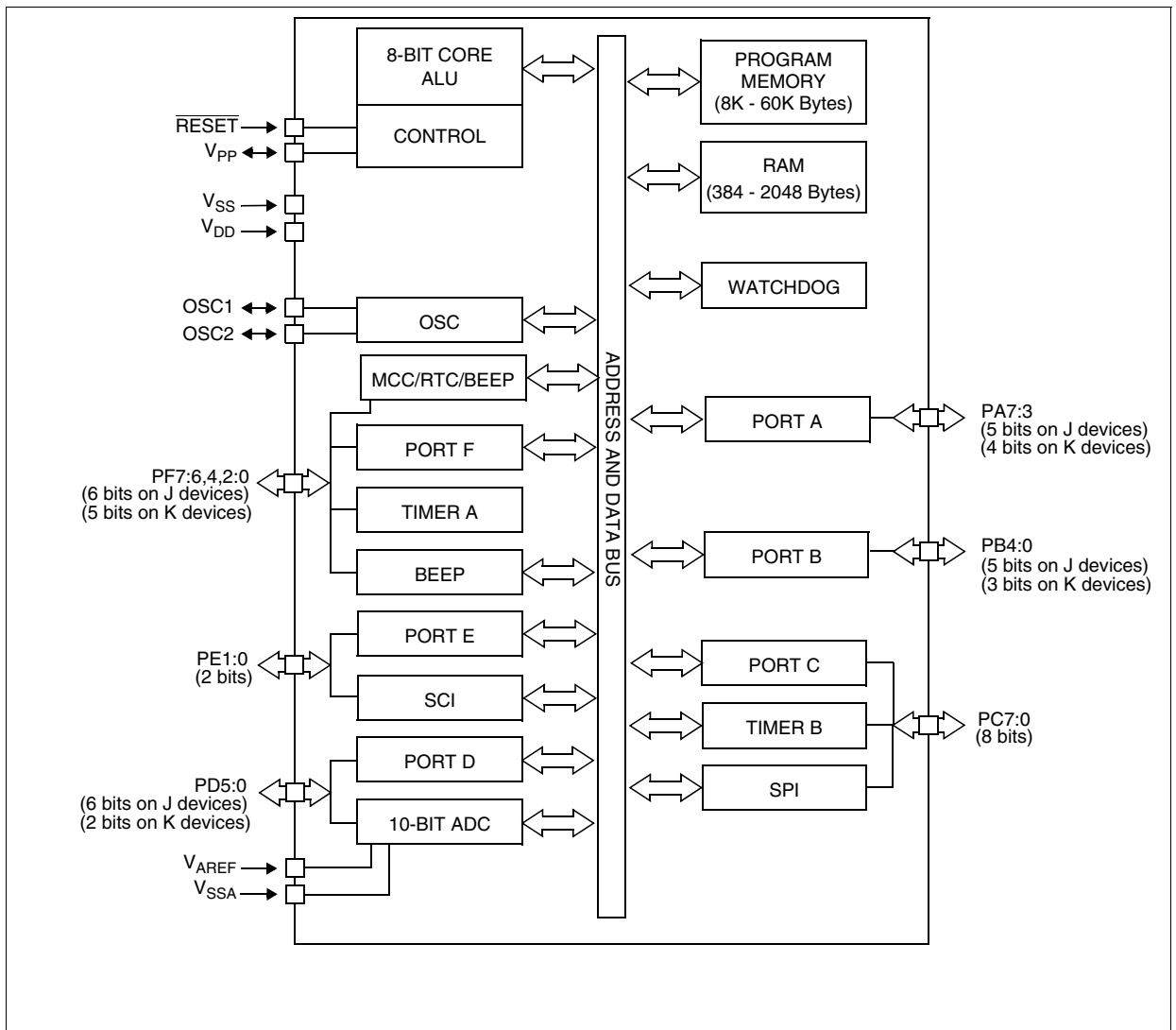
2 PIN DESCRIPTION

Figure 2. 44-Pin TQFP Package Pinouts

eix   associated external interrupt vector
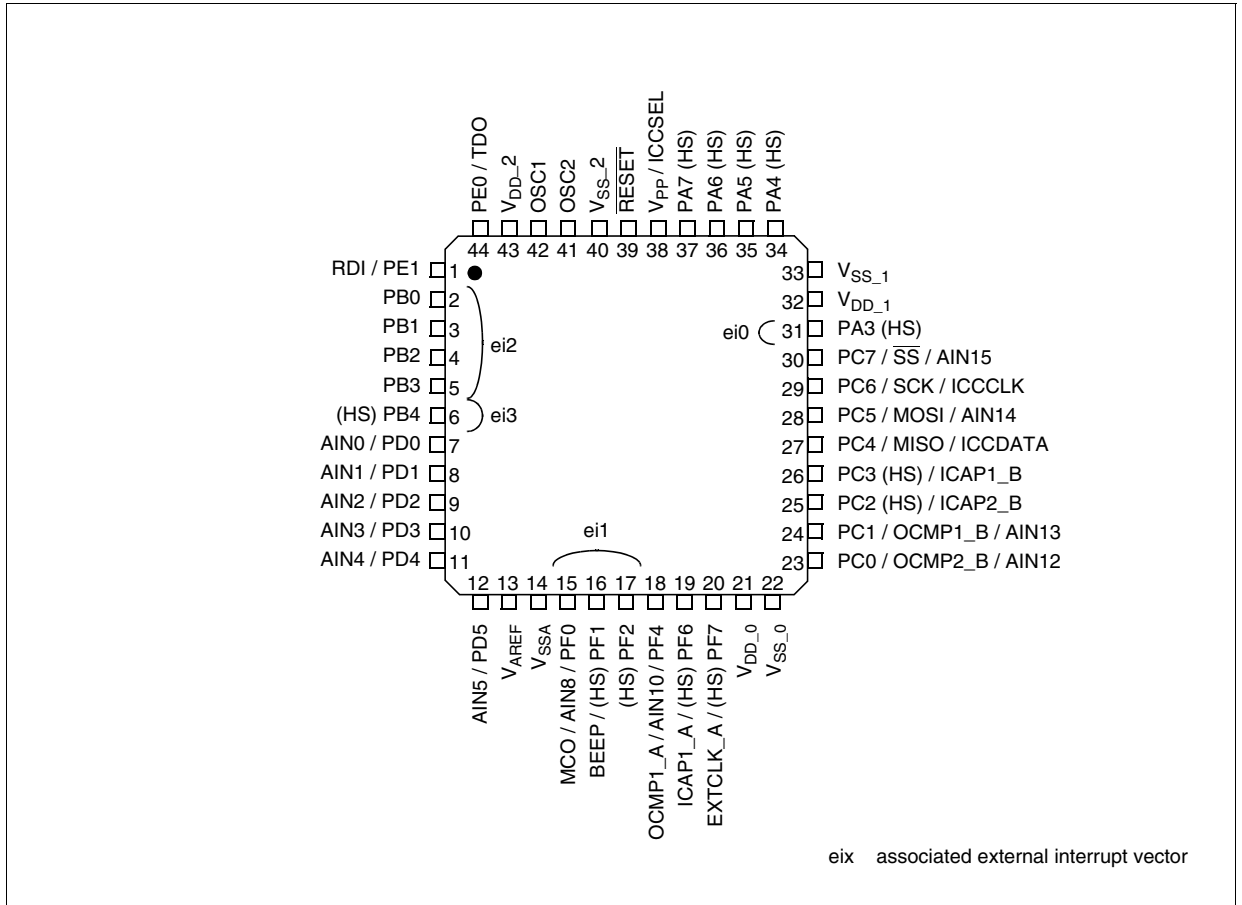
PIN DESCRIPTION (Cont'd)

Figure 3. 32-Pin SDIP Package Pinout

(HS) 8mA high sink capability
eix   associated external interrupt vector
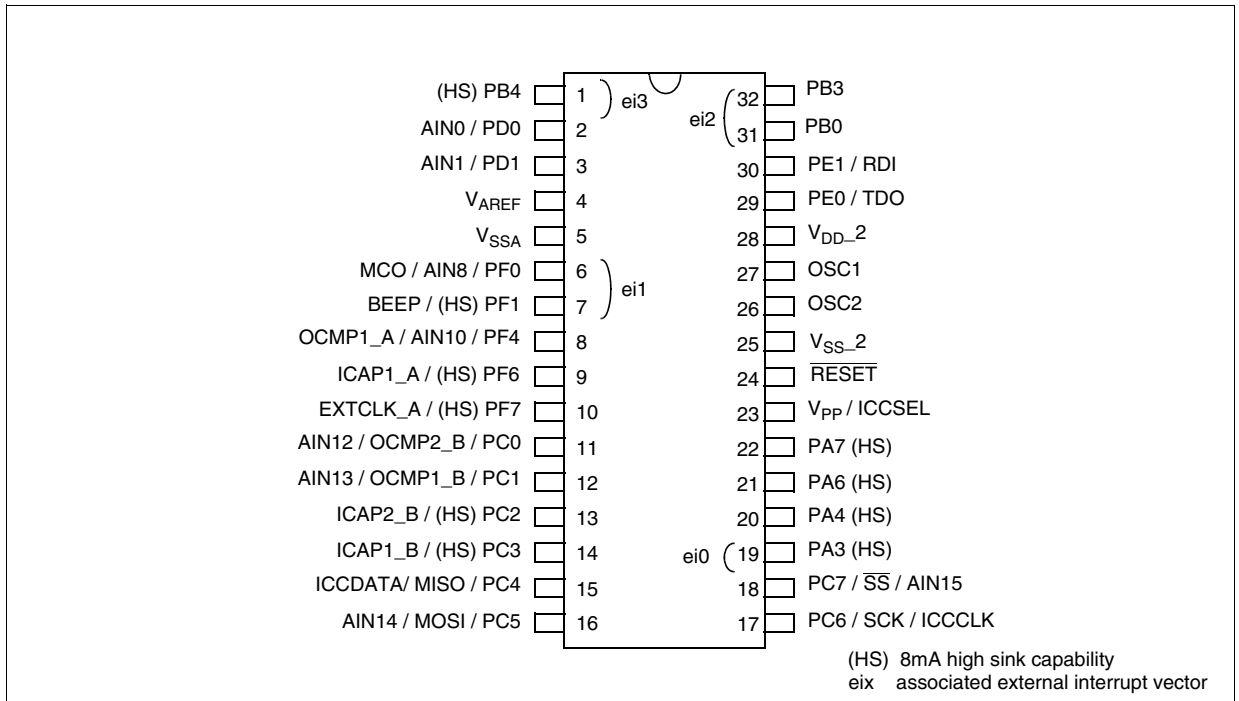
Figure 4. 32-Pin TQFP 7x7 Package Pinout

(HS) 8mA high sink capability
eix   associated external interrupt vector
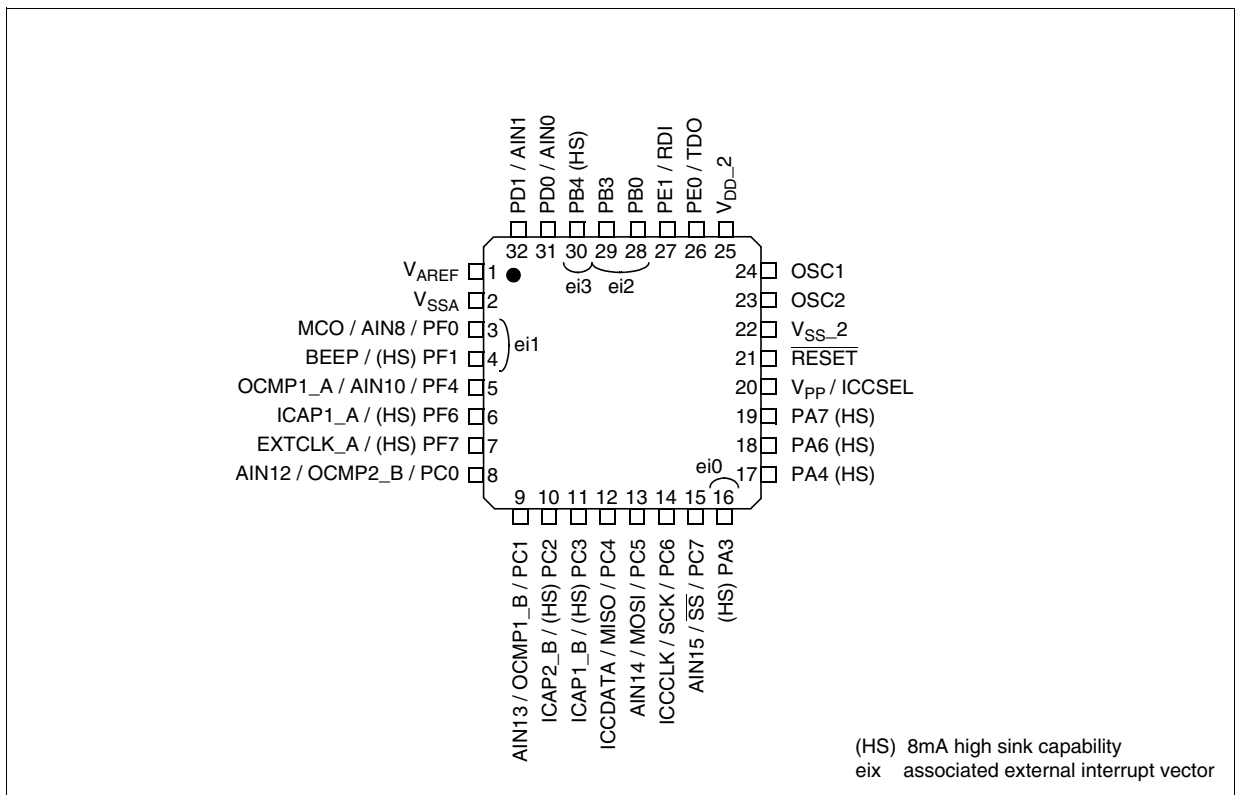
PIN DESCRIPTION (Cont'd)

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	
TQFP44	TQFP32	SDIP32			Input	Output	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

ST72F324L, ST72324BL

TQFP44	TQFP32	SDIP32	Pin Name	Type	Input	Output	float	wpu	int	ana	OD	PP	Main function (after reset)	Alternate Function	
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/ICCDA-TA	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 CHARACTER-ISTICS 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

- **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)

1OUT	1	8	V$_{CC+}$
1IN–	2	7	2OUT
1IN+	3	6	2IN–
V$_{CC-}$/GND	4	5	2IN+
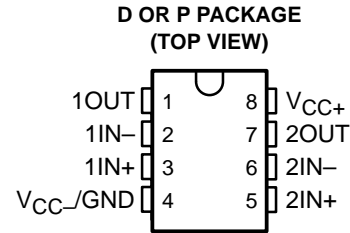
description/ordering information

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.

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

2.1 ± 0.1
1.25 ± 0.1
2.0 ± 0.2
1.3 ± 0.1
0.65
0.65
0.2 +0.1 −0.05
0.9 ± 0.1
0.15 ± 0.05
0~0.1

1. SOURCE 1   4. SOURCE 2
2. GATE 1   5. GATE 2
3. DRAIN 2   6. DRAIN 1

US6

JEDEC	—
JEITA	—
TOSHIBA	2-2J1C
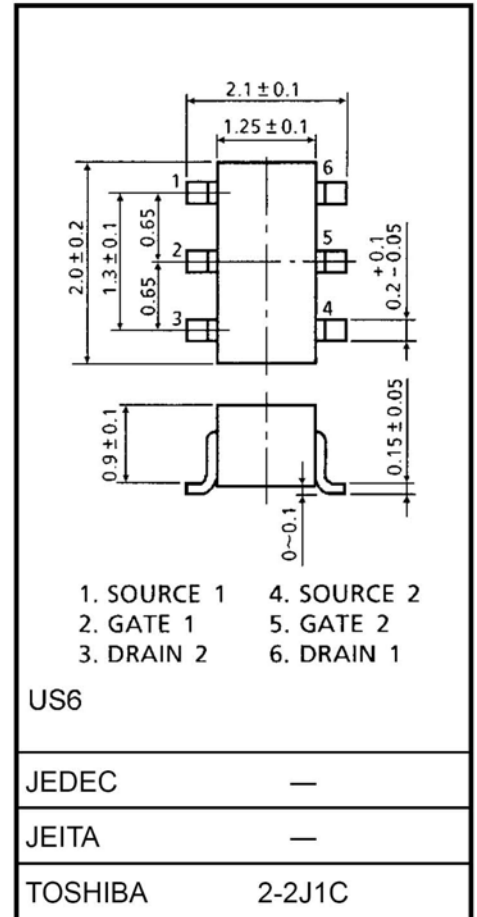
Weight: 6.8 mg

Equivalent Circuit (top view)

6   5   4

Q1
Q2

(Q1, Q2 common)

1   2   3

Marking

6   5   4

KK

1   2   3
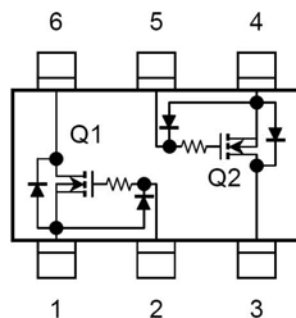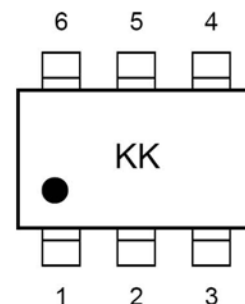
Switching Time Test Circuit

(a) Test circuit

1.5 V
0
10 μs
V_{IN}

IN
I_D
OUT
50 Ω
R_L
V_{DD}

$V_{DD} = 1.5$ V
D.U. $\leq$ 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}

1.5 V
90%
10%
0
V_{DD}
10%
90%
$V_{DS\ (ON)}$
t_r
t_f
t_{on}
t_{off}

SYSTEM GENERAL

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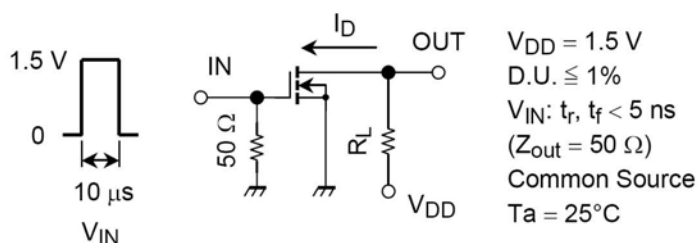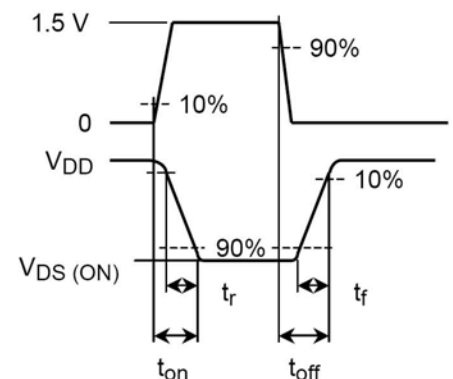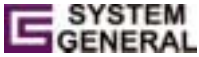
FEATURES

- 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

**⌐ SYSTEM
   GENERAL**

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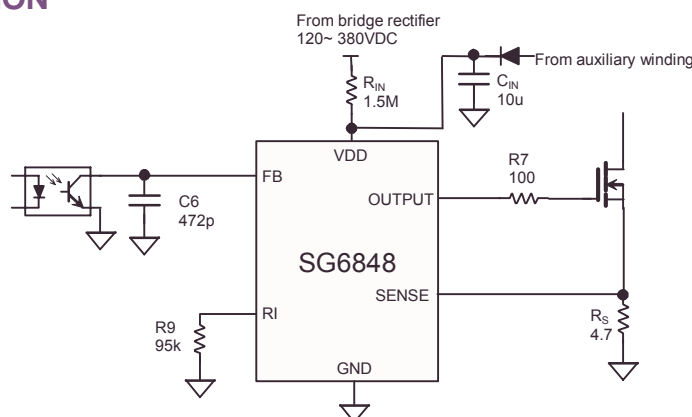
MARKING DIAGRAMS

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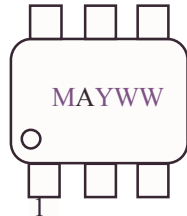
M: Mask Version
Y: Year; WW: Work Week

8

SG6848D
XXXXXXXYYWWV
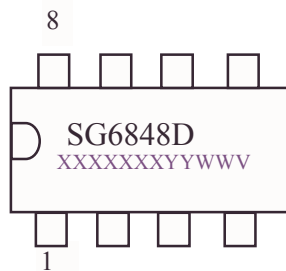
XXXXXXX: Wafer Lot
YY: Year; WW: Week
V: Assembly Location

1

PIN CONFIGURATION

SOT-26

GND	1	6	GATE
FB	2	5	VDD
RI	3	4	SENSE

DIP-8

GATE	1	8	GND
VDD	2	7	FB
NC	3	6	NC
SENSE	4	5	RI
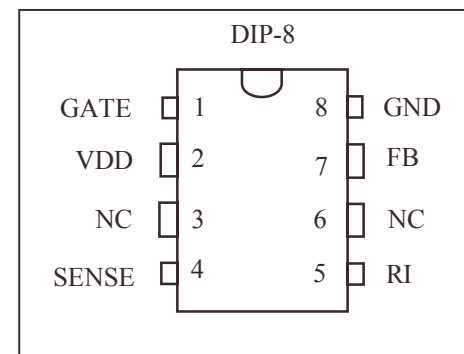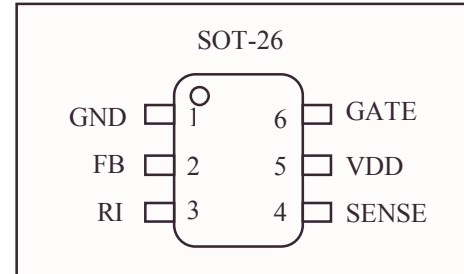
ORDERING INFORMATION

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.

SYSTEM GENERAL

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

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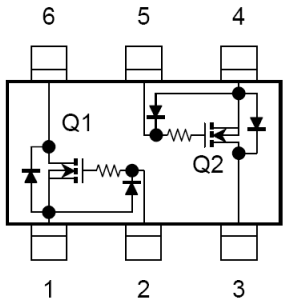
1. Source 1
2, Gate 1
3. Drain 2
4. Source 2
5. Gate 2
6. Drain 1

CEF04N6 N Channel

G
D
S

TO-220F
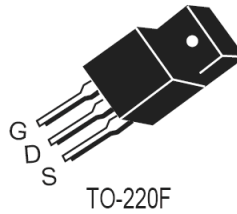
(SCR) MCR100

PIN ASSIGNMENT	
1	Cathode
2	Gate
3	Anode

KTA1273Y
KSA916Y

2 Collector
3 Base
1 Emitter

KTC3206

Collector 2
3 Base
1 Emitter
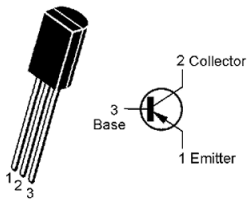
KRA102M
KTA708
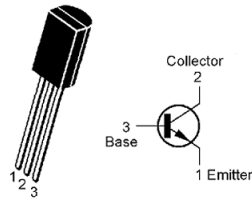
2 Collector
3 Base
1 Emitter
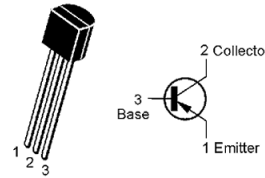
KRC102M
KTC1008
KTC3198Y

2 Collector
3 Base
1 Emitter

KSB1151Y PNP
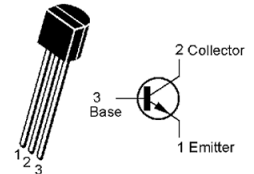
2 Collector
3 Base
1 Emitter
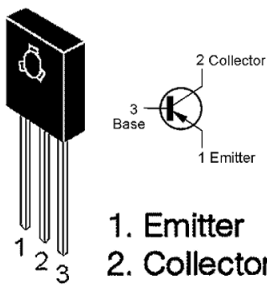
1. Emitter
2. Collector
3. Base

KRC107 PNP
KTC3875S NPN
KTA1504S PNP
KRA107S PNP
KTD1304 NPN
2N3904S NPN
KRC 107S NPN
2SA1955 PNP

3
2   1

1) Emitter
2) Base
3) Collector

KTA1664 PNP

View : Top

B   C   E

1 Base
2 Collector
3 Emitter
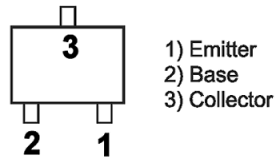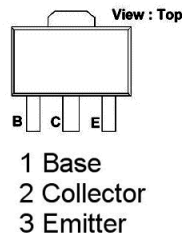
KIA431B

TO-92   SOT-89

View : Top

1   2   3

OR

1. Reference
2. Anode
3. Cathode

PC17L

1   4

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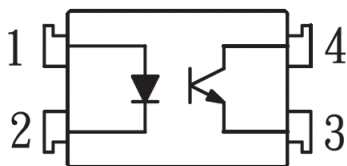
Pin Connections
1. Anode
2. Cathode
3. Emitter
4. Collector

Photo Coupler   K1010

1   4

2   3

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

DVD37

harman/kardon
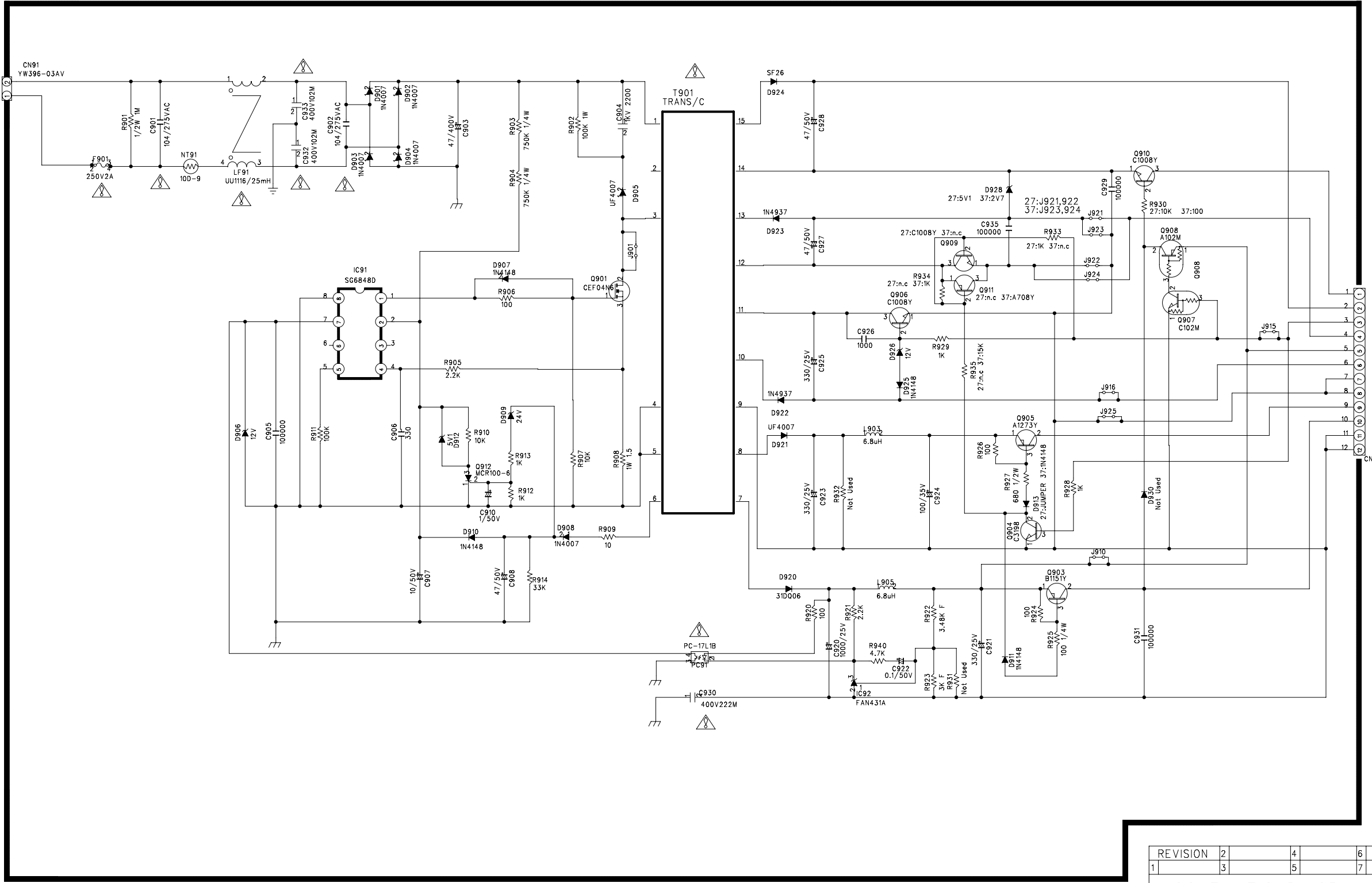
SCHEMATIC DIAGRAM of DVD 27/37/47 power supply (SMPS). Page contains electronic schematic with components including IC91 SG6848D, T901 TRANS/C, Q901 CEF04N6, and connector CN92.

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

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

M.P
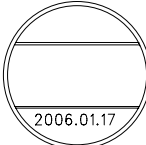
2006.01.17

REVISION	2		4		6	
1		3		5		7

SCHEMATIC DIAGRAM   SHEET

MODEL	DVD 27/37/47	
DESIGN	CHECK	APPROVE	DRAWING NO
S.M.KIM	J.H.PARK		11840SCMZ
06.01.17	06.01.17		(SMPS) 1/1

ZR36707
RF_AMP

ZR36721
HDMI
Transmitter

74VHC04

24C08

SAA7893
DSD Decoder

ZR36778

MPEG Decoder

16M FLASH MEMORY

TL3472

64M_SDRAM

64M SDRAM

Not used for DVD 37

REVISION		2		4		6	
	1		3		5		7

SCHEMATIC DIAGRAM

			SHEET
MODEL	DVD 37 (Harman DVD)		
DESIGN	CHECK	APPROVE	DRAWING NO
J.S CHAE	J.H PARK	H.W LEE	11842SCMZ
2006.01.17	2006.01.17		

M.P

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2006.01.17

1/3

SPDIF OUT

HDMI OUT　　　　　　　　　　　　FOR DVD 47

POWER PORT

REMOTE_IN/OUT

AUDIO OUT

VIDEO OUT　　　　　FOR PAL version

LT
RT
FL
FR
RL
RR
SW
C

M.P

REVISION	2		4		6	
1		3		5		7

SCHEMATIC DIAGRAM　　SHEET

MODEL	DVD 37 (Harman DVD)	3/3

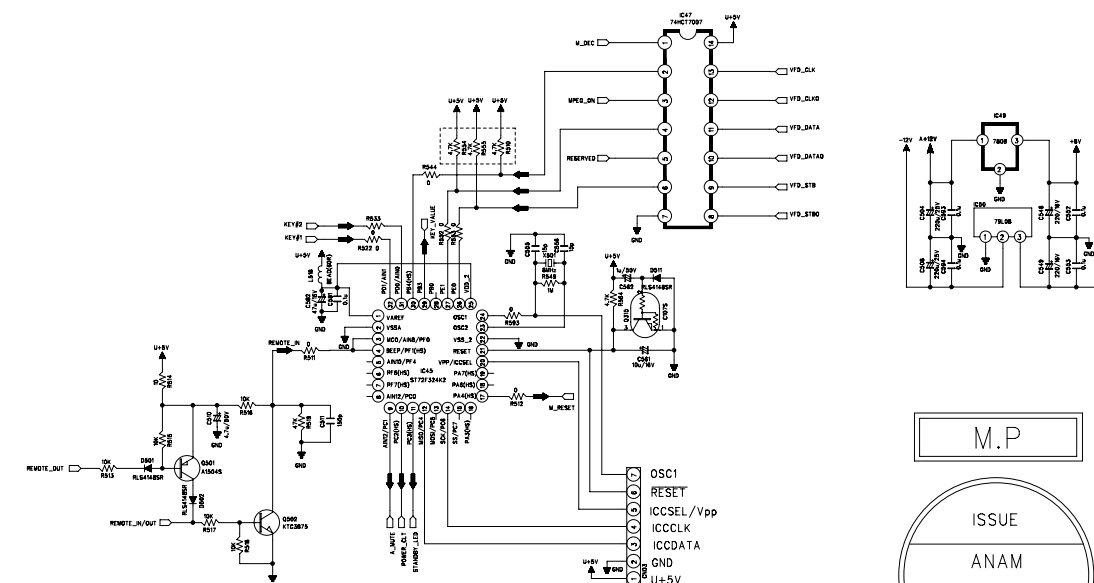| DESIGN	CHECK	APPROVE	DRAWING NO
J.S.CHAE	J.H.PARK	H.W.LEE	11842SCMZ
2006.01.17	2006.01.17		

ISSUE
ANAM
MULTI. LAB.
2006.01.17

FRONT part

VFD PORT

MAIN-->FRONT

AUDIO PART

MCU PART

POWER PART

M.P
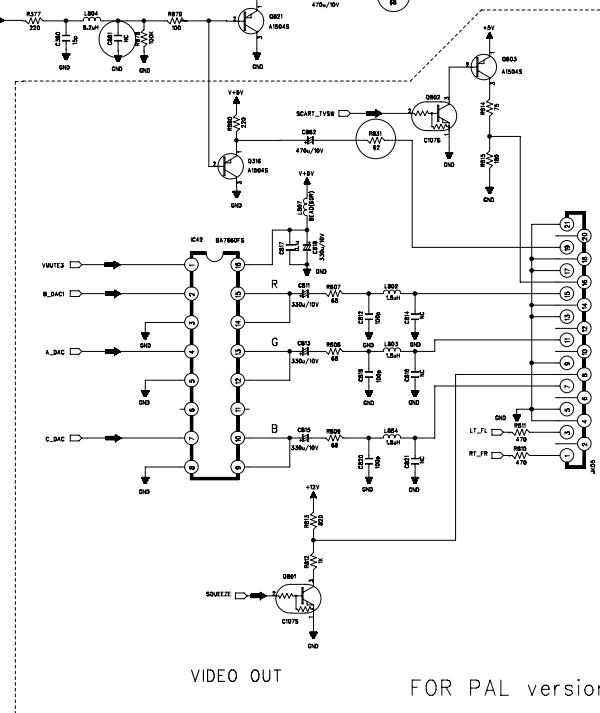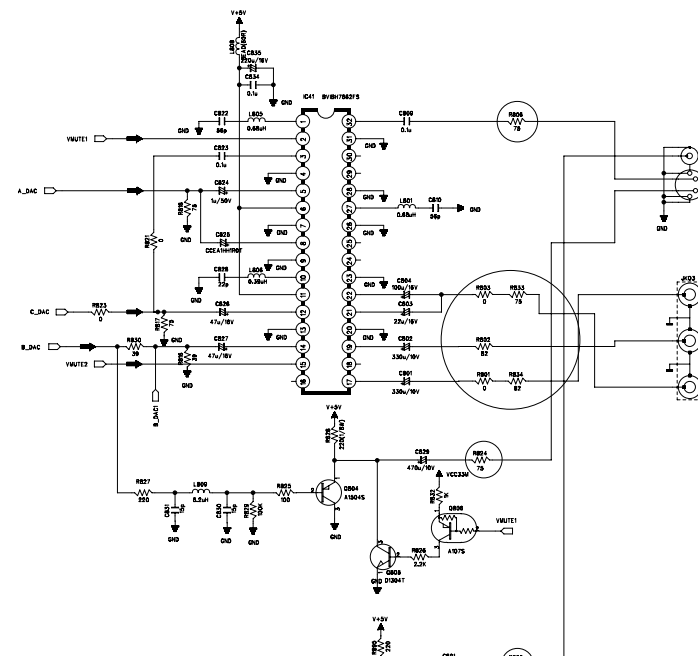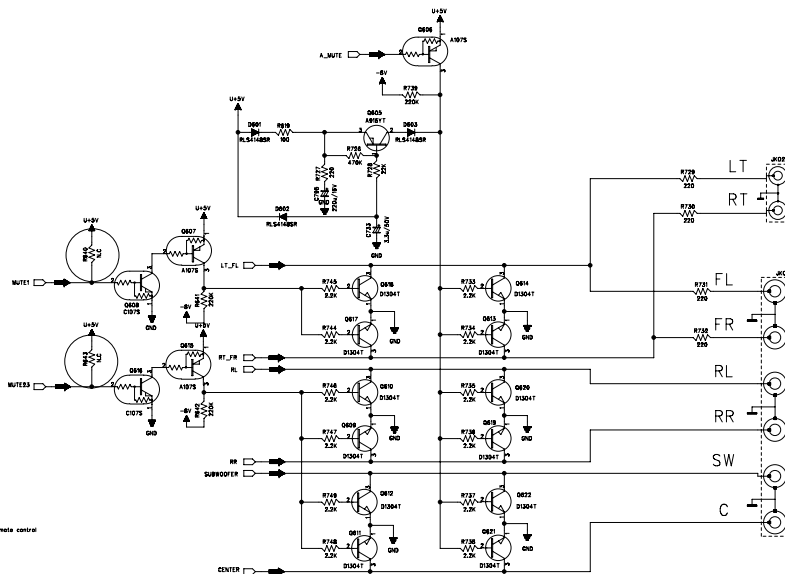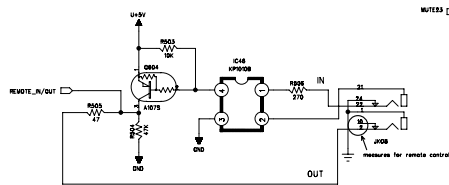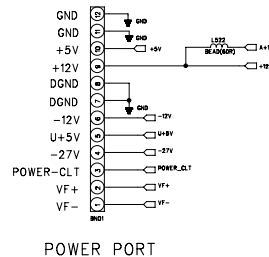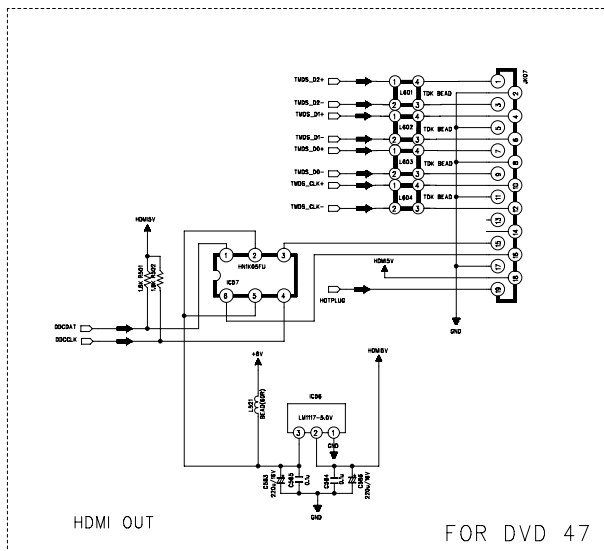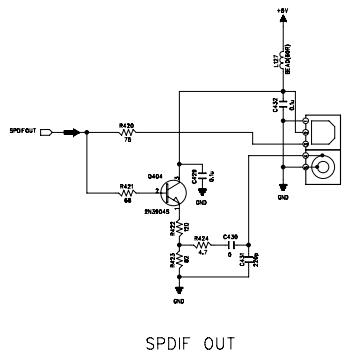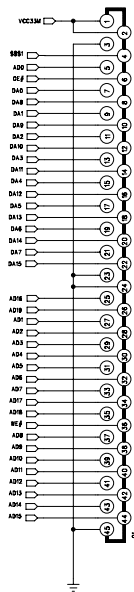
ISSUE

ANAM
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2006.01.17

REVISION	2		4		6	
1		3		5		7

SCHEMATIC DIAGRAM

SHEET

MODEL	DVD 37 (Harman DVD)	2/3
DESIGN	CHECK	APPROVE	DRAWING NO
J.S.CHAE	J.H.PARK	H.W.LEE	11842SCMZ
2006.01.17	2006.01.17		2/3

PIN DISCRIPTION

D

SMPS BOARD CUP11840Z

CN92

BN01

MAIN BOARD
CUP11842-1

MECHANISM ASS'Y
CJDDVD27ZA

CN11

CN03
UPDATE

C

CN91

CN13 CN12 CN04

D.P.P

B

AC100~230V
50/60Hz

CN05

A

CUP11842-2
FRONT BOARD-1 (KEY PARTS)

CN07   BN07

CUP11842-3
FRONT BOARD-2 (VFD PARTS)

CN92<--->BN01

1	VF(-)
2	VF(+)
3	PWR_CTL
4	Vp
5	U+5V
6	-12V
7	GND
8	GND
9	+12V
10	VCC(+5V)
11	GND
12	GND

CN04<--->CN05

1	+3.3V CTL
2	VFD_CLK
3	VFD_DATA
4	VFD_STB
5	Vp(-27V)
6	VF+
7	VF-
8	KEY#1
9	KEY#2
10	U+5V
11	STANDBY LED
12	VCC33M
13	REMOTE OUT
14	GND
15	GND

CN03

1	U+5V
2	GND
3	DATA
4	CLK
5	SE/VPP
6	RST
7	OSC1

CN11

1	F-
2	F+
3	T+
4	T-
5	C
6	D
7	CD-DVD/SW
8	RF
9	A
10	B
11	F
12	GND/PD
13	VC(VREF)
14	VCC
15	E
16	NC
17	VR-CD
18	VR-DVD
19	CD-LD
20	MD
21	HFM
22	NC
23	DVD-LD
24	GND-LD

CN12

1	LOAD-
2	LOAD+
3	IN SW
4	GND
5	OUT SW

CN13

1	SPDL-
2	SPDL+
3	GND
4	HOME SW
5	SLED-
6	SLED+

WIRING DIAGRAM   SHEET

REVISION	2		4		6	
1		3		5		7

DESIGN	DVD 37 & 37/230

DESIGN	CHECK	APPROVE	
J.S.CHAE	J.H PARK	H.W LEE	11842WCDZ
2005.07.01			

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