KAWA ELECTRONIC RESEARCH & DEVELOPMENT CENTRE

Service Manual

Reference No. : SM- LCT27ADADA1CS-001
Revision : 0
Date : 2006.Aug.
Page : P.1 of 138

In House Model No. : LCT27AD
Customer Model No. : LCT2721AD

BOM No : LCT27ADADA1CS –A02

Description : Service Manual for LCT27AD _CMO_USA

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0	Initial Release	2006-8-11

AKAI

SERVICE MANUAL

Model: LCT2721AD

This manual is the latest at the time of printing, and does not include the modification which may be made after the printing, by the constant improvement of product.

I. Safety Instructions

CAUTION

RISK OF ELECTRIC SHOCK DO NOT OPEN

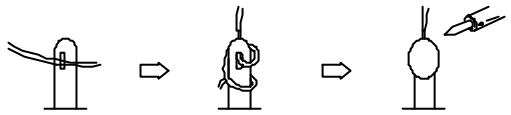
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL ONLY.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated " dangerous voltage" within the product' s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

PRECAUTIONS DURING SERVICING

1. In addition to safety, other parts and assemblies are specified for conformance with such regulations as those applying to spurious radiation. These must also be replaced only with specified replacements. Examples: RF converters, tuner units, antenna selection switches, RF cables, noise-blocking capacitors, noise-blocking filters, etc.
2. Use specified internal Wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads
3. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulating Tape
   2) PVC tubing
   3) Spacers (insulating barriers)
   4) Insulating sheets for transistors
   5) Plastic screws for fixing micro switches
4. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.), wrap ends of wires securely about the terminals before soldering.



5. Make sure that wires do not contact heat generating parts (heat sinks, oxide metal film resistors, fusible resistors, etc.)
6. Check if replaced wires do not contact sharply edged or pointed parts.
7. Make sure that foreign objects (screws, solder droplets, etc.) do not remain inside the set.

MAKE YOUR CONTRIBUTION TO PROTECT THE ENVIRONMENT

Used batteries with the ISO symbol for recycling as well as small accumulators (rechargeable batteries), mini-batteries (cells) and starter batteries should not be thrown into the garbage can.
Please leave them at an appropriate depot.

WARNING:

Before servicing this TV receiver, read the X-RAY RADIATION PRECAUTION, SAFETY INSTRUCTION and PRODUCT SAFETY NOTICE.

X-RAY RADIATION PRECAUTION

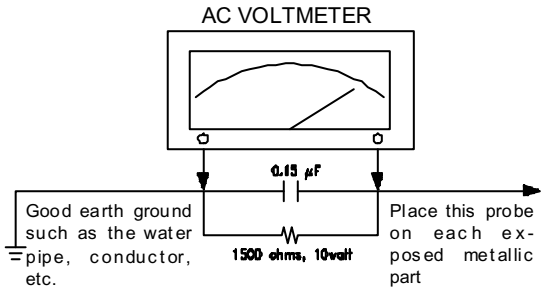
1. Excessively high can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not exceed the specified limit. The normal value of the high voltage of this TV receiver is 27 KV at zero bean current (minimum brightness). The high voltage must not exceed 30 KV under any circumstances. Each time when a receiver requires servicing, the high voltage should be checked. The reading of the high voltage is recommended to be recorded as a part of the service record, It is important to use an accurate and reliable high voltage meter.
2. The only source of X-RAY RADIATION in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type as specified in the parts list.
3. Some parts in this TV receiver have special safety related characteristics for X-RADIATION protection. For continued safety, the parts replacement should be under taken only after referring the PRODUCT SAFETY NOTICE.

SAFETY INSTRUCTION

The service should not be attempted by anyone unfamiliar with the necessary instructions on this TV receiver. The following are the necessary instructions to be observed before servicing.

1. An isolation transformer should be connected in the power line between the receiver and the AC line when a service is performed on the primary of the converter transformer of the set.
2. Comply with all caution and safety related provided on the back of the cabinet, inside the cabinet, on the chassis or picture tube.
3. To avoid a shock hazard, always discharge the picture tube's anode to the chassis ground before removing the anode cap.

4. Completely discharge the high potential voltage of the picture tube before handling. The picture tube is a vacuum and if broken, the glass will explode.
5. When replacing a MAIN PCB in the cabinet, always be certain that all protective are installed properly such as control knobs, adjustment covers or shields, barriers, isolation resistor networks etc.
6. When servicing is required, observe the original lead dressing. Extra precaution should be given to assure correct lead dressing in the high voltage area.
7. Keep wires away from high voltage or high tempera ture components.
8. Before returning the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as antennas, terminals, screwheads, metal overlay, control shafts, etc., to be sure the set is safe to operate without danger of electrical shock. Plug the AC line cord directly to the AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5K ohms volt sensitivity or more in the following manner.
   Connect a 1.5K ohm 10 watt resistor paralleled by a 0.15µF AC type capacitor, between a good earth ground (water pipe, conductor etc.,) and the exposed metallic parts, one at a time.
   Measure the AC voltage across the combination of the 1.5K ohm resistor and 0.15 uF capacitor. Reverse the AC plug at the AC outlet and repeat the AC voltage measurements for each exposed metallic part.
   The measured voltage must not exceed 0.3V RMS. This corresponds to 0.5mA AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.
   The resistance measurement should be done between accessible exposed metal parts and power cord plug prongs with the power switch "ON". The resistance should be more than 6M ohms.



AC Leakage Current Check

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this TV receiver have special safety-related characteristics. These characteristics are offer passed unnoticed by visual spection and the protection afforded by them cannot necessarily be obtained by using replacement components rates for a higher voltage, wattage, etc. The replacement parts which have these special safety characteristics are identified by ⚠ marks on the schematic diagram and on the parts list. Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock, fire, X-RAY RADIATION or other hazards.

Product Specification

1.1 VIDEO SECTION	CMO V270B1-L01 MK8202 USA
Display size	27”/16:9
Display Resolution	1366 X 768
Pixel Pitch	146.0μm (H) x 436.5μm (V)
Peak Brightness	500(nits)
Contract Ratio	1000:1, Typical (1/100 White Window, Dark Room)
View Angle	Hor. And Vert. ≥170 degree
Color Deeps	16.7M Color (R / G/ B each 256 Scales)
PC Resolution Supporting	VGA, SVGA, XGA,WXGA
HDTV Compatible	480p /720p /1080i
Progressive Scanning	Yes
Film Mode Pull Down	Yes
“GAMMA” Correction	Yes
Color Temperature Control	Yes
Comb Filter	Yes
Second De-interlace for Sub picture	No
Wide Mode	Full, 4:3 and Panoramic.
TV System	NTSC M, ATSC
Dual Tuner System	No
AV Input Color System	PAL /NTSC
PIP	No
1.2 AUDIO SECTION	
Audio Output Power	7W×2 (8 ohm)
Sound Effect	Spatial Effect and Surround
Tone Control	Yes
1.3 Input/Output Terminal	D-Sub 9 Pin Type (Analog-RGB Input) ×1 HDMI (Ver 1.1) Connector x 1 D-Sub 9 Pin (RS-232) RF (F-type Input) ×2 (ATV, DTV) Component Video-YPbPr × 1 RCA Terminals S-Video Input (Mini Din 4Pin) ×1 Video Input RCA Terminal x 1 Stereo Audio Input x 4 Audio Output (RCA ; L&R Type) ×1
1.4 Others	
Closed Caption / V-Chip	Yes
Teletext	No
OSD Language	English, Français, Español

Stereo Decode	MTS with SAP
Power Rating	AC 120V, 60Hz
Power Consumption	≤180W

1.5 Support the Signal Mode
This machine can support the different from VGA signal mode in 6 kinds

Resolution	Horizontal Frequency (kHz)	Vertical Frequency (kHz)
640 x 480	31.50	60.00
	37.86	72.81
800 x 600	35.16	56.25
	37.90	60.32
	48.08	72.19
1024 x 768	48.40	60.00

1.8 HDTV Mode (YPbPr)

Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)
480i	15.734	59.94
480p(720x480)	31.468	59.94
720p(1280x720)	45.00	60.00
1080i(1920x1080)	33.75	60.00

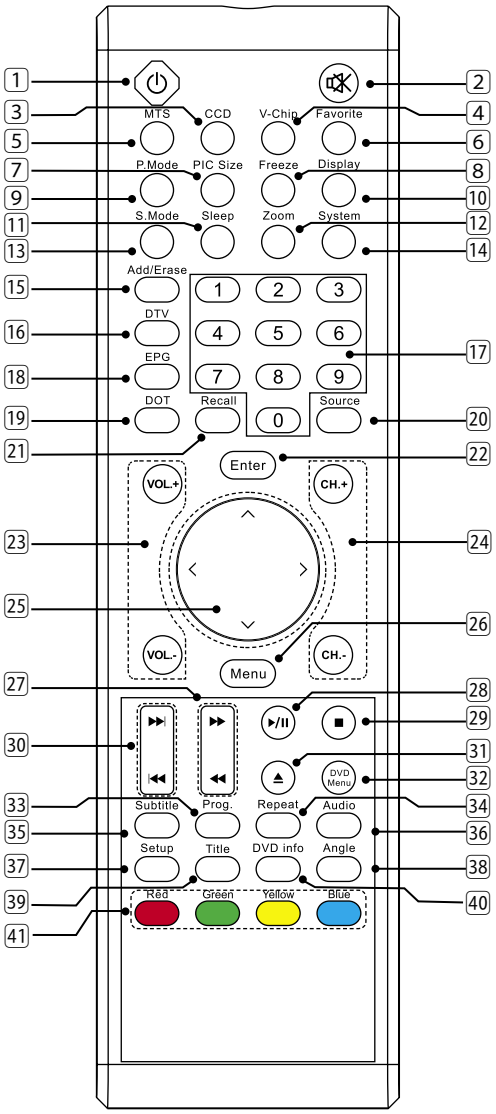
DVD player's spec. For LCD-TV Combo

Division	Section	Remarks
General	name	AKAI
	Marketing Area(setup default language)	USA
	Power supply	+5v,+3.3v
	Power Consumption	15W
	Manufactruer of Loader mechanism	Foryou DL06-LS
DVD Module	Opitical Pick UP	Sanyo HD-62/65
	Chipset used	MTK 1389FE
Playback Disc Type	Playable Media Type	Playable Disc Type: DVD, CD,
	Playable Disc Type	DVD(Single/ Dual layer, Double sided), CD
	Disc Size	8cm/12cm
	Regional code	Regional 1
	NTSC/ PAL Disc playback	O/O
Video	Video output signal	NTSC
	Video DAC	27MHz/ 10bit
Audio	Audio DAC	48Khz/ 96KHz/24-bit:selectable
	Dynamic range	Present
	Dolby digital decoder	Present
	DTS decoder	optional
	SRS + TruSurround for 2 channel	Not present
	3D Virtual surround for 2 channel	Not present
Playback Features	Fast forward/backward	x2,x4,x8,x16,x32
	Slow motion forward	x1/2,x1/4,x1/8,x1/16
	Slow motion backward	optional
	Still picture	Present
	Frame by frame forward/reverse	Forward only (Step function)
	Skip forward/reverse	Present
	Repeat function	Present
	DVD closed caption	Present
	Transition Effect for picture CD	Not present
	Rotation of picture for picture CDs	Present
	Last Memory	Present
Display user operation	Graphical user interface	Not present
	OSD Language	3 (ENG is base ,SPA and French)
	Subtitle	Present
	Screen saver	Present
	Resume play	Present
	Program function	Present
	PBC ON/OFF	Default on PCB
	Parental lock	Passward : 0000
	Picture mode selector	16:9, 4:3 LB, 4:3 PS(4:3 PS as default)
	Intro scan	Not present
	Digest in VCD	Present, only for PIC CD
	Time search	Present
	Multi angle	Present
	Selectable audio language streams	Present
Front Panel	kalaoke function	x
	VFD/ LED	x
	No. of keys	3(Open/Close, Play, Stop)
Rear Panel	Composite Video output	x
	Component Video output	x
	Progressive scan output (480P)	Present
	2 channel audio output	Present
	Coaxial audio output	Present

Technical Data

1. Power supply	TV	AC 120V, 60Hz	
	Remote control	Battery 3V (UM-3/R6P/AAA×2)	
2. TV system	TV System	NTSC M	ATSC
	Stereo Decode	MTS	MPEG-2
	Closed Caption/V-Chip	Yes	Yes
	Channel	181 CH	2-69 CH
3. Intermediate frequencies	Picture	45.75MHz	
4. Scanning	Horizontal (Hz)	15625/15750	
	Vertical (Hz)	50/60	
5. AC plug		UL Plug	
6. Panel		V270B1-L01	
7. Speaker	Internal	8 ohm 10W ×2	
8. Operating temperature	Fulfill all specifications	15°C ~ 30°C	
	Accept picture/sound reproduction	5°C ~ 33°C	
9. Operating relative humidity	Fulfill all specifications	45% ~ 75%	
	Accept picture/sound reproduction	20% ~ 80%	
10. Electrical & optical specification		See the attachment 1.	
11. Circuit diagram drawing No.			
12. Cabinet			
13. Cabinet color			
14. Packing		1 set per	
15. Container stuffing method		RD/05/P/LC26HAB/CSI/02 REV: 01	
16. Dimension (mm) (No packing)	LCD-TV	698(W)× 513 (H)×99(D)mm (w/o Stand)	
		698(W) × 554(H) × 250(D)mm (with Stand)	
	Remote control unit	183(L) × 53(W) ×28(T)mm	
17. Net weight	LCD-TV	13.9Kg (with Stand) approx.	
	Remote control	93g	
18. Cell Defect		Subject to Panel supplier specification	

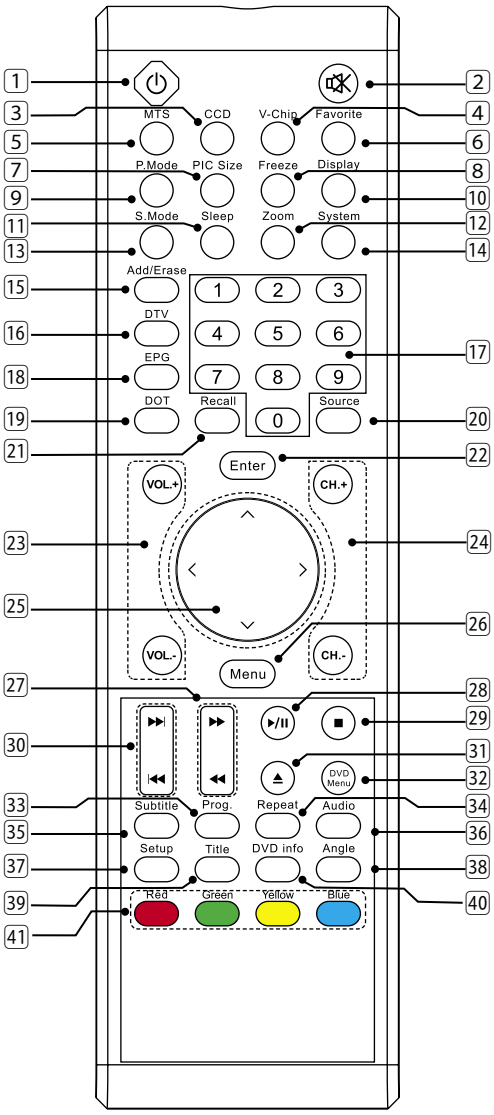
Remote Control



1. **Power** (⏻): Press to turn on and off.
2. **Mute** (🔇): Press to mute the sound. Press again or press VOL+/- to restore the sound.
3. **CCD**: Press to select the Closed Caption mode.
4. **V-Chip**: Press to select the child protect mode.
5. **MTS**: Press repeatedly to cycle through the Multi-channel TV sound (MTS) options: Mono, Stereo and SAP (Second Audio Program).
6. **Favorite**: Press repeatedly to cycle through the favorite channel list.
7. **PIC.Size**: Press to change the screen size, such as Full, 4:3, Panoramic. (Note: In VGA mode, it can select picture size is Full. While in DTV mode, it can select picture size is: Full and 4:3.)
8. **Freeze**: Press to freeze the picture, press again to restore the picture. (This button is not available for VGA mode.)
9. **P.Mode**: Press repeatedly to cycle through the picture mode: Hi-Bright, User, Cinema, Normal and Vivid.
10. **Display**: Press to display the channel information and it disappear after 3 seconds.
11. **Sleep**: Press repeatedly until it displays the time in minutes (15 Min, 30 Min, 60Min, 90 Min ,120 Min and, OFF) that you want the TV to remain on before shutting off. To cancel sleep time, press **Sleep** button repeatedly until sleep OFF appears.
12. **Zoom**: Press to zoom the image. (This button is not available for VGA mode.)
13. **S.Mode**: Press repeatedly to cycle through the sound mode: Normal, News, Cinema, Concert and User.
14. **System**: Press repeatedly to cycle through the system options: AUTO, NTSC3.58 and PAL. (This button is activate for AV, S-Video input source.)
15. **Add/Erase**: Press to add or delete favorite channel.
16. **DTV**: Press to select Digital TV mode.
17. **0~9 Number Buttons**: In TV mode, press 0~9 to select a channel; the channel changes after 2 seconds. In DVD mode, press 0~9 to input the items.
18. **EPG**: Press to display EPG (Electronic Program Guide) menu.
19. **DOT**: Press number buttons with it to select the channels directly in DTV.
20. **Source**: Press to select the signal source.
21. **Recall**: Press to return previous channel.
22. **Enter**: To select an item, press Enter to confirm.
23. **VOL +/-**: Press to adjust the volume.
24. **CH +/-**: Press to scan through channels. To scan quickly through channels, press and hold down either channels.
25. <,∧,∨,>: Press <,∧,∨,> to move the on-screen cursor.

(Continued on next page)

26 **Menu**: Press to enter on-screen setup menu, press again to exit.
27 ◀◀, ▶▶ : Press to search the backward or forward.
28 ▶/II : Press to play or pause the DVD disc.
29 ■ : Press to stop playing the disc.
30 |◀◀, ▶▶| : Press to skip the backward or forward.
31 ⏏ : Press to open or close the disc tray.
32 **DVD Menu**: Press to return DVD disc menu.
33 **Prog.**: Press to display the program menu. Press it again to exit.
34 **Repeat**: Press repeatedly to cycle through the options: CHAPTER, TITLE, ALL and nothing.
35 **Subtitle**: Press to select desired DVD subtitle.
36 **Audio**: Press to select desired audio track.
37 **Setup**: Press to display a menu. Press it again to exit menu.
38 **Angle**: Press to select desired viewing angle of the Video (disc feature).
39 **Title**: Press to display to DVD disc title.
40 **DVD Info**: Press to display DVD information.
41 **Color Buttons**:
(Only available in DTV EPG mode)
Red: Press this button to access the red item or page.
Blue: Press this button to access the blue item or page.
Green: Press this button to access the green item or page.
Yellow: Press this button to access the yellow item or page.



Note: Press CH+/- on the remote control can turn on TV set from last preview mode.

Optical Output

Flash 32mb

MT5351 MPEG Decoder

DDR 256M

DDR 256M

TD1336 Digital Tuner

X6965D SAW Filter

MT5111 DTV Demodulator

DTV BOARD

POWER BOARD

- 5V
- Standby 5V
- 12V
- 9V
- 24VA (For Class D)
- 24V (For LCD Panel)

MAIN BOARD

HDMI

MT8293 HDMI Receiver

74L VC245A X4 24 bit RGB Switch

Analog Tuner

YPbPr1

YPbPr2 (Option)

DVD YPbPr

QS3VH257 Switch(Option)

VGA

AV

S-Video

MT8202 ADC & Scaler & LVDS Transfer

To panel

Flash 8M/16M

NJRC4558 Audio Buffer

Audio Output

DDR 128M

DDR 128M

Audio X2

Audio X3

DVD Audio

HEF4052 Switch

WM8776 Audio ADC&DAC

R2S15102 Class D Amplifier

Relay

Speaker

Max232 Level Shift

RS232 Socket

Coaxial Output

COMB DVD

Am5888 SL/F Motor Driver

Loader &Optical Pick up

To HET-4052

4334KSZ Audio DAC

To QS3VH257

MT1389 MPEG decoder &Servo System

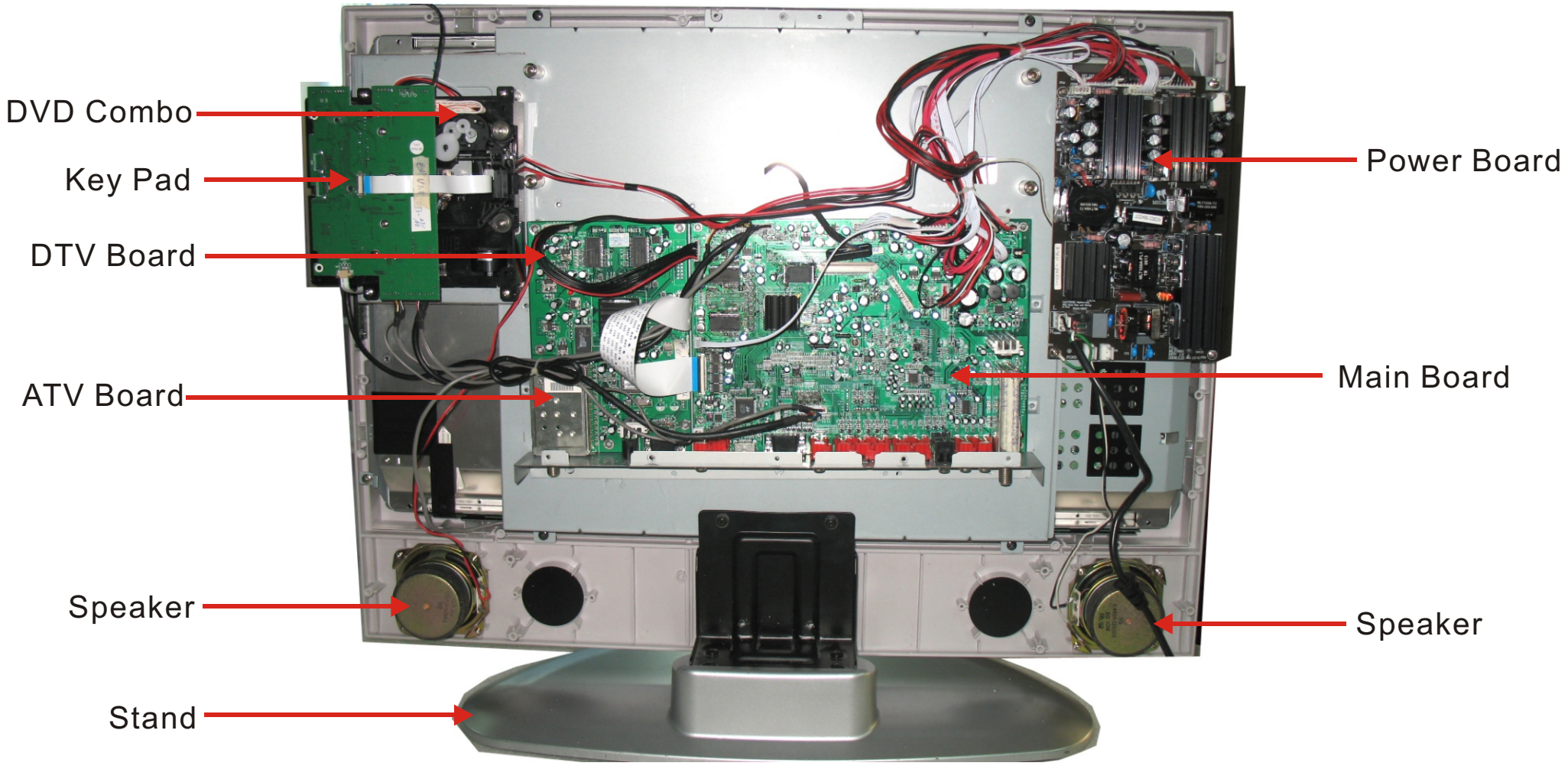
SDRAM 64M

EEPROM

Flash 16M

LCD panel

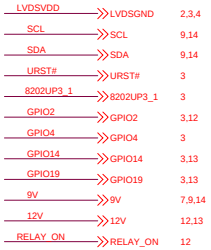
Parts Position

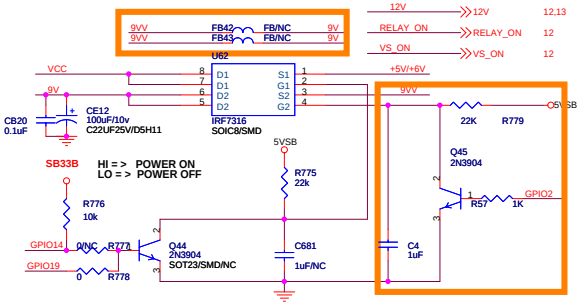


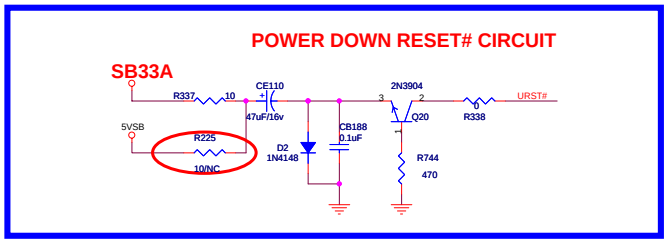
MT8202E (PBGA388) LCDTV BOARD 4 LAYERS FOR AKAI

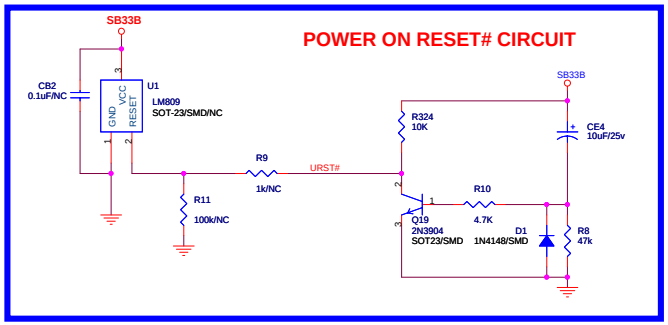
1. INDEX / POWER / RESET / EEPROM
2. LDO
3. MT8202E PBGA388
4. MT8202 DECOUPLING
5. DDR MEMORY & FLASH
6. MT5351 INTERFACE
7. HDMI MT8293
8. DAUGHTER BOARD IN
9. WM8776 & VIDEO BYPASS
10. AUDIO / VIDEO IN CIRCUIT
11 . VGA & PC AUDIO IN
12. LVDS OUT
13. BACK LIGHT / KEYPAD
14. TUNER IN
15. AV IN
16. AUDIO IN
17.AUDIO Amplifier

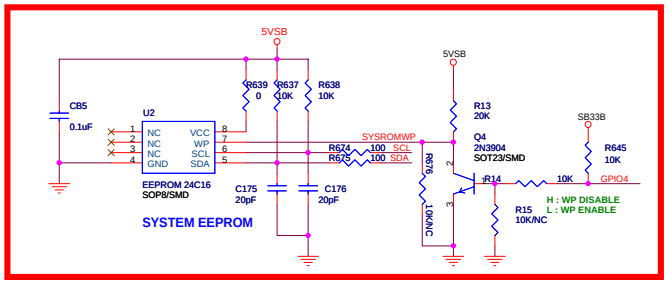
Rev	History	P#	Date
AKAI_MT8202_27US_LVDS_V0.0	New		2005/11/22
AKAI_MT8202_27US_HDMI_LVDS_V0.0	ADD HDMI / VIDEO /AUDIO CONNECTOR INPUT IN		

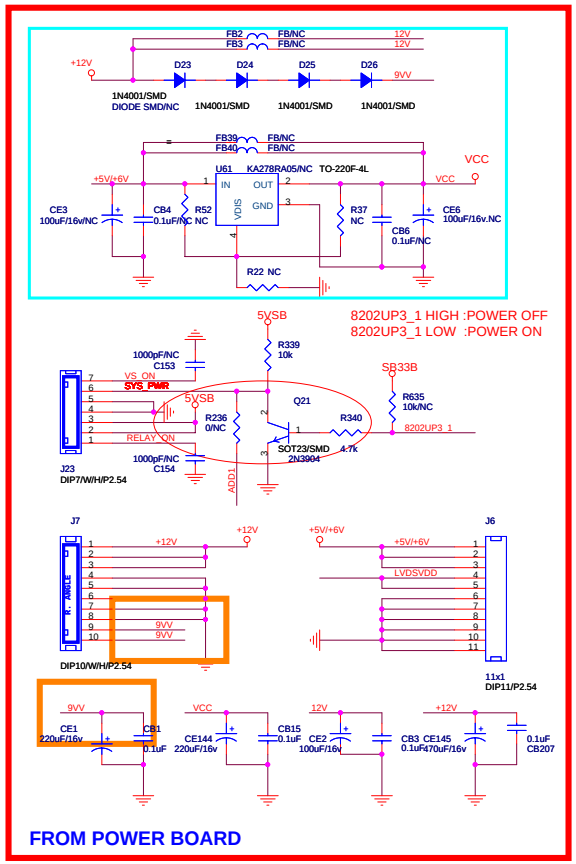


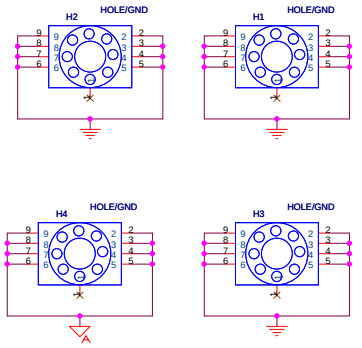












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Title: INDEX / POWER / RESET / EEPROM			
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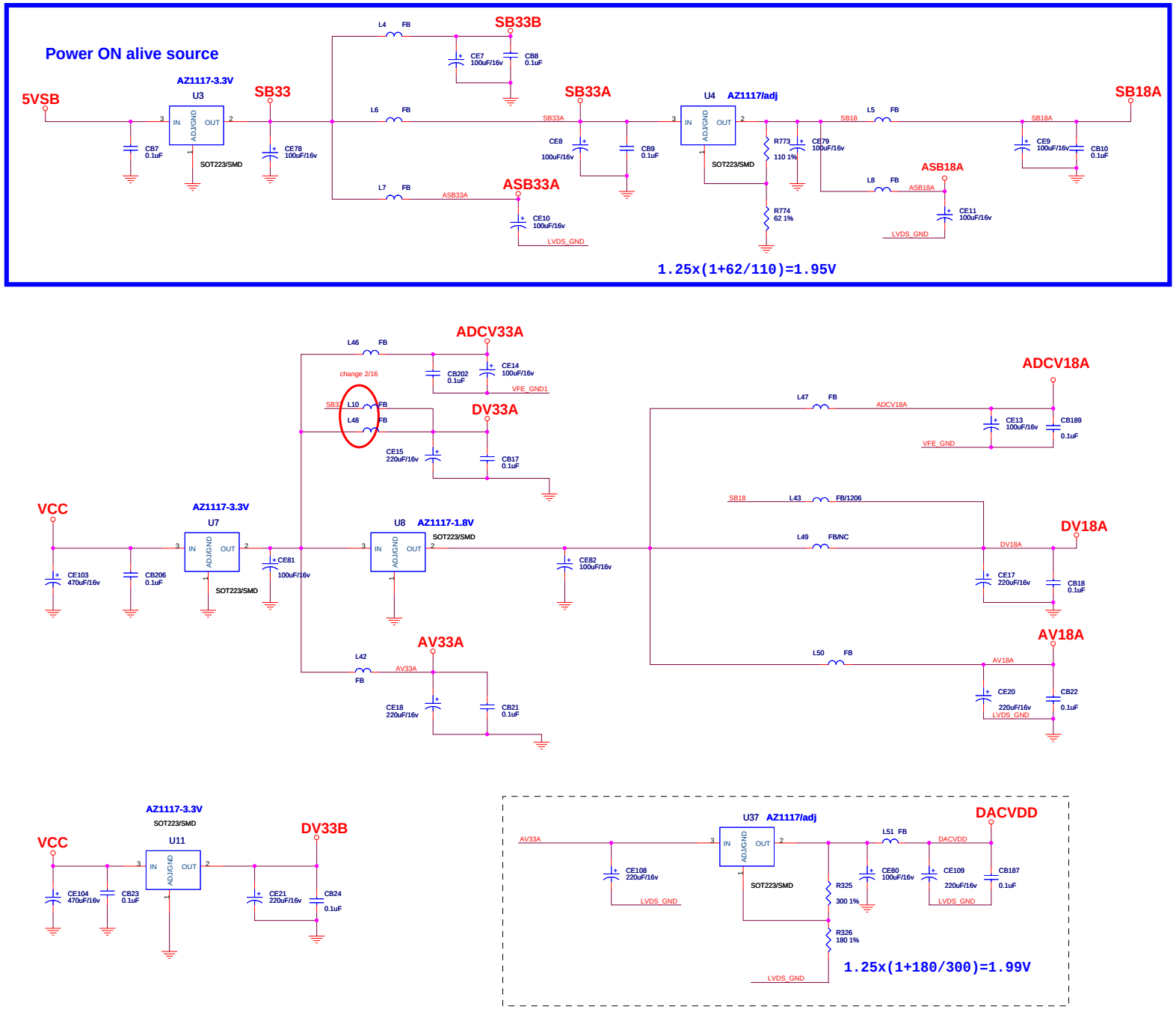
		Checked: <Checker>	
Date: Thursday, April 13, 2006		Sheet 1	17



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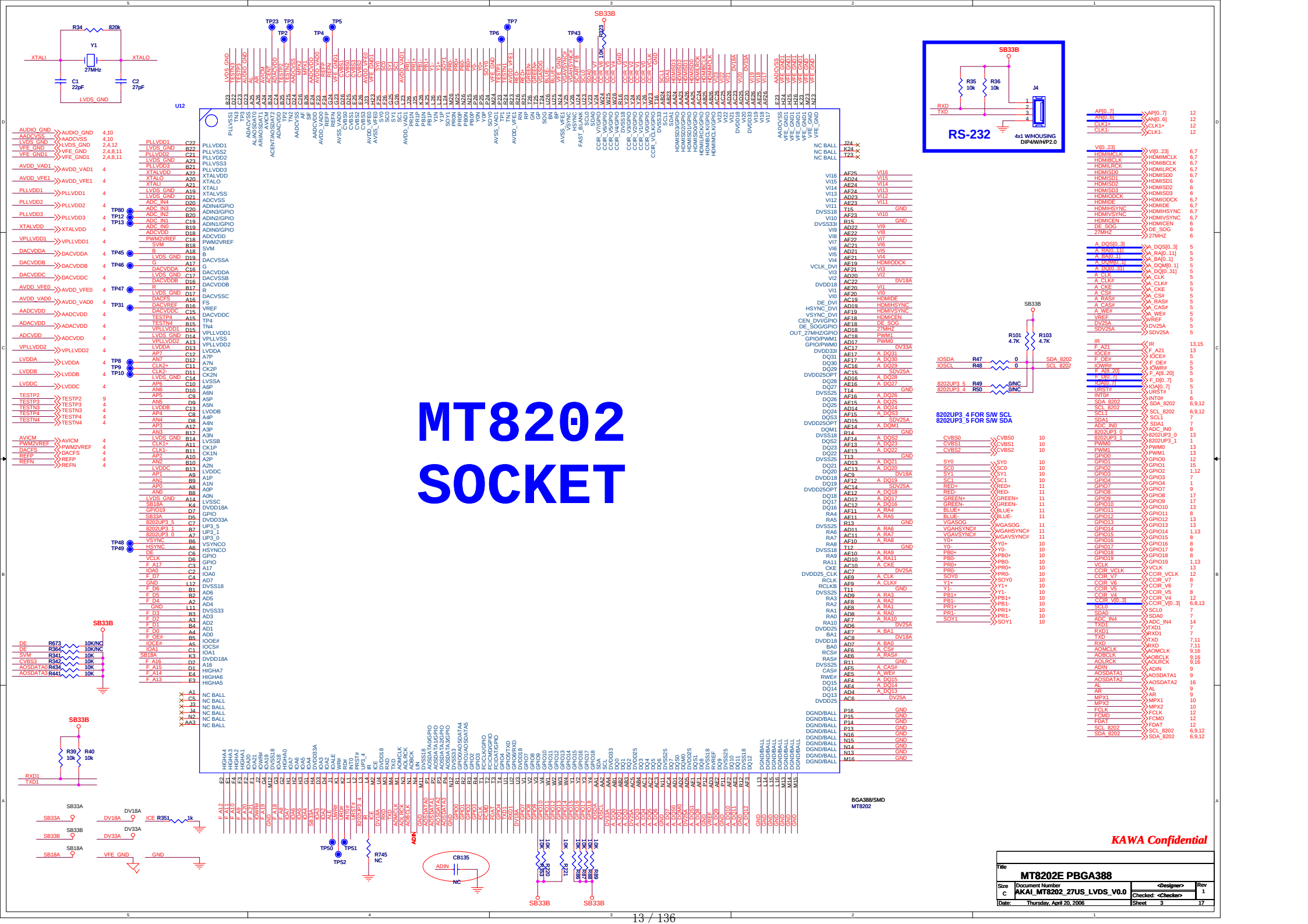
Size: C	Document Number: AKAI_MT8202_27US_LVDS_V0.0	<Designer> / Checked: <Checker>	Rev: 1
Date: Thursday, April 13, 2006		Sheet 2	17


MT8202
SOCKET
U12
SB33B
RS-232
4x1 W/HOUSING
DIP4/W/H/P2.0
8202UP3_4 FOR S/W SCL
8202UP3_5 FOR S/W SDA
BGA388/SMD
MT8202
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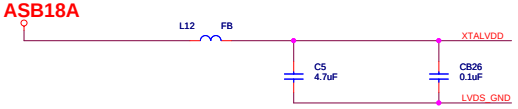
MT8202E PBGA388
AKAI_MT8202_27US_LVDS_V0.0
Thursday, April 20, 2006

STANDBY ANALOG POWER

ASB18A



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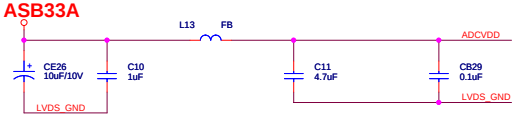
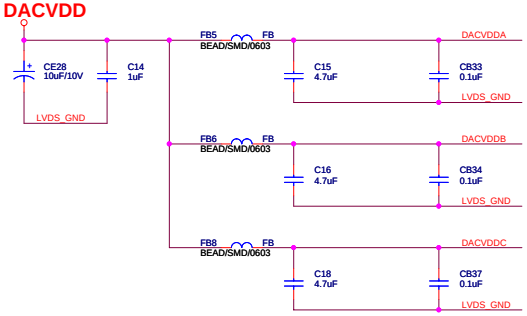


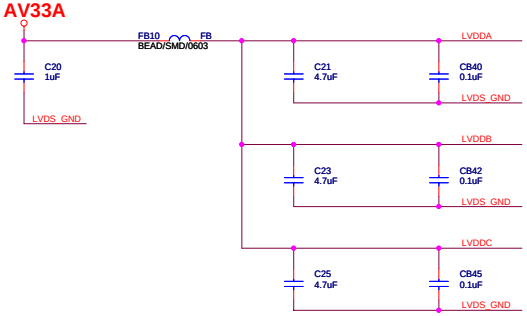
NORMAL VIDEO DAC POWER

DACVDD



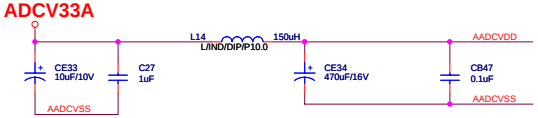
NORMAL VIDEO DAC POWER

AV33A

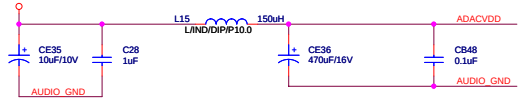


NORMAL AUDIO ADC / DAC POWER

ADCV33A

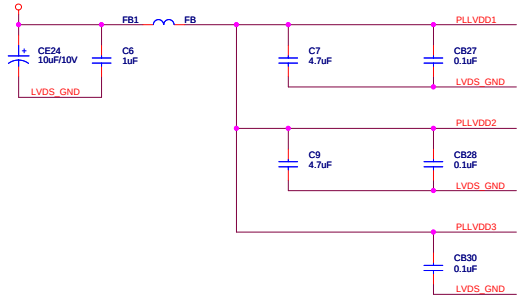


ADCV33A

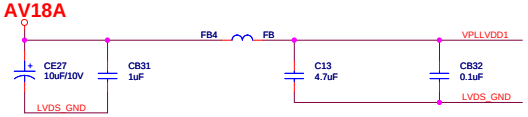


NORMAL ANALOG POWER

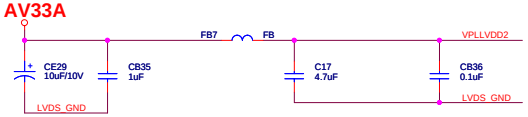
ASB18A



AV18A

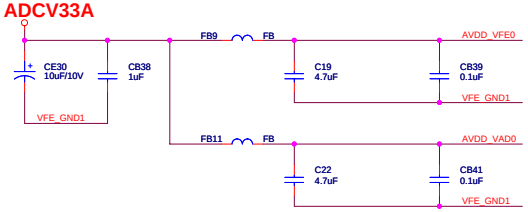


AV33A

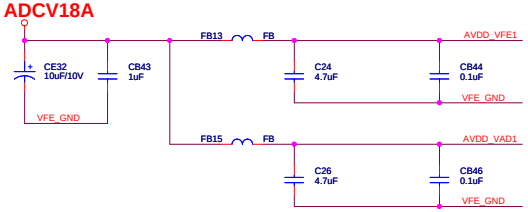


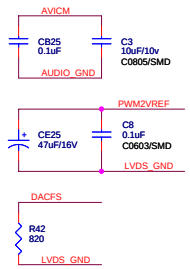
NORMAL VIDEO ADC POWER

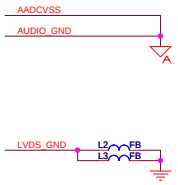
ADCV33A

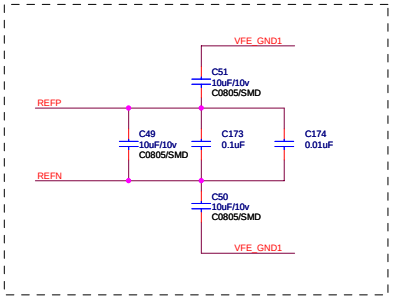


ADCV18A



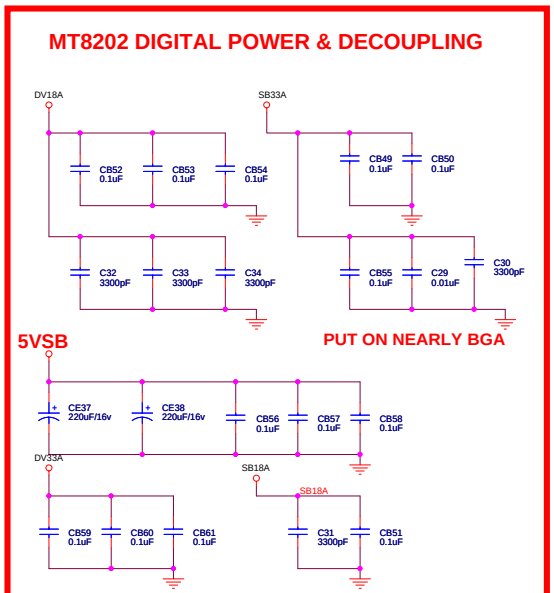






TESTP3	R43	49.9 1%	PLLVDD1
TESTN3	R44	49.9 1%	PLLVDD1
TESTP4	R45	49.9 1%	VPLLVDD1
TESTN4	R46	49.9 1%	VPLLVDD1

MT8202 DIGITAL POWER & DECOUPLING



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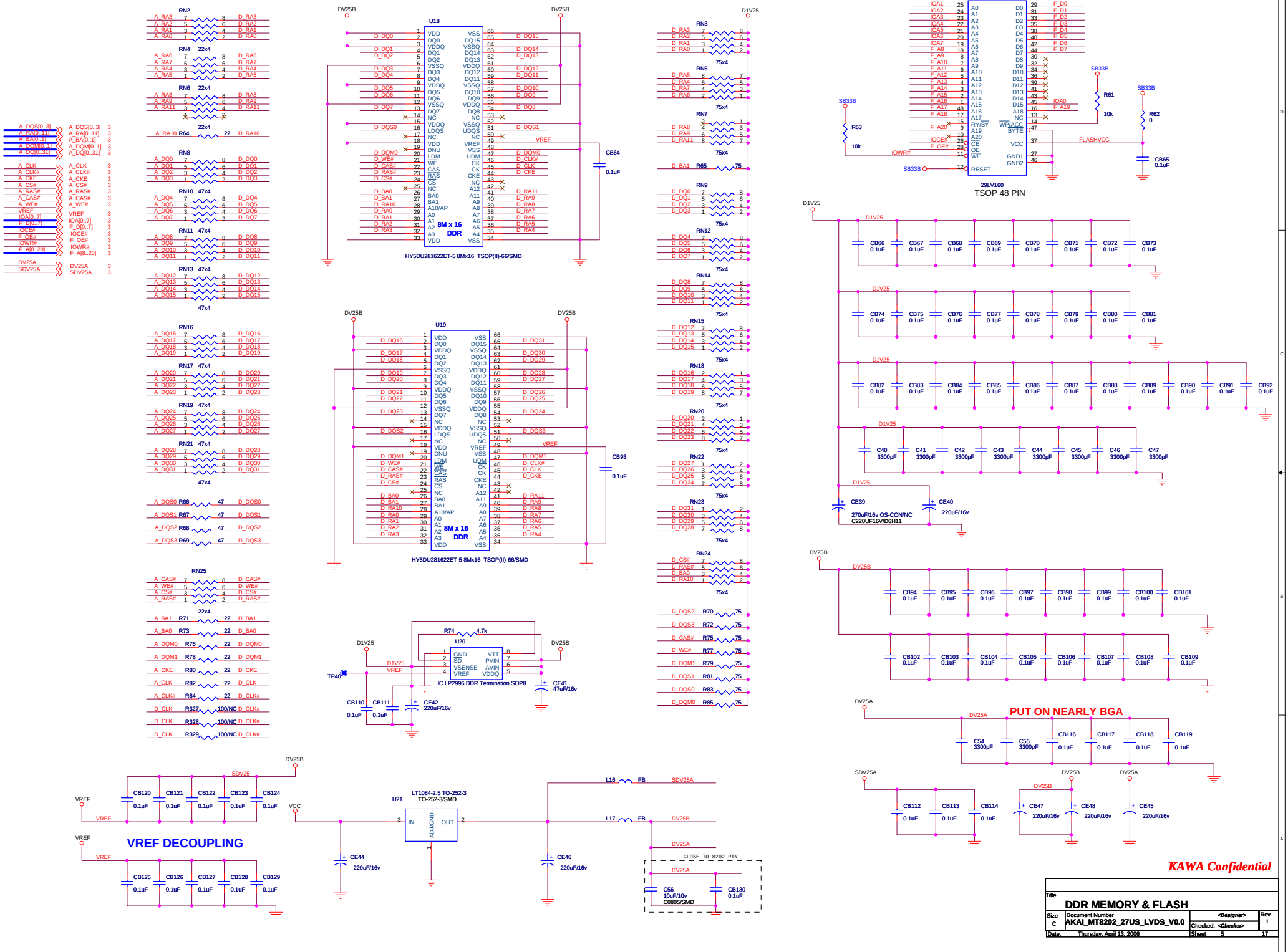
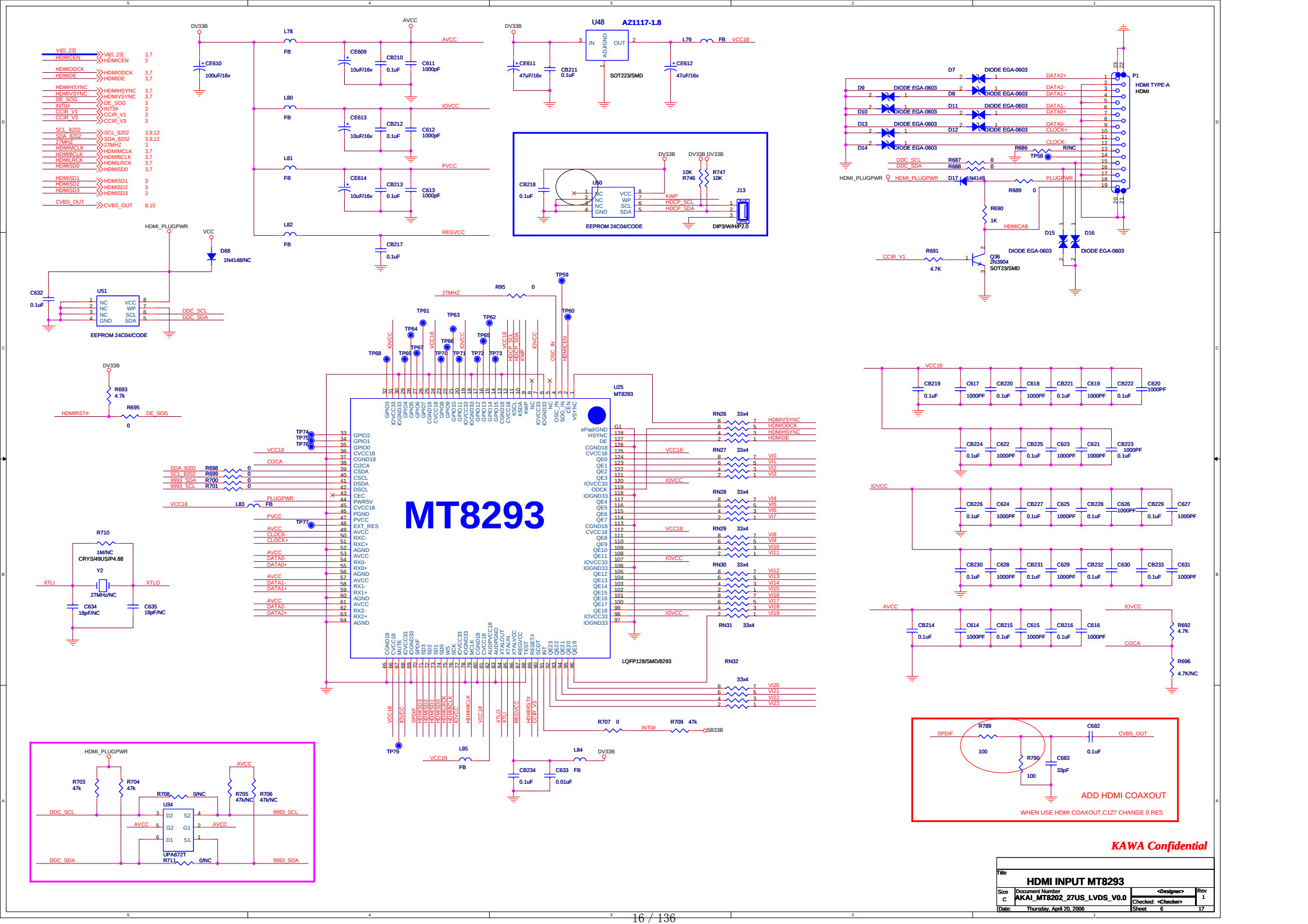
Title	MT8202 DECOUPLING		
Size C	Document Number AKAI_MT8202_27US_LVDS_V0.0	<Designer>	Rev 1
		Checked: <Checker>	
Date: Thursday, April 13, 2006		Sheet 4	17


RN2
RN4 22x4
RN6 22x4
RN8
RN10 47x4
RN11 47x4
RN13 47x4
RN16
RN17 47x4
RN19 47x4
RN21 47x4
RN25
R64 22
R66 47
R67 47
R68 47
R69 47
R71 22
R73 22
R76 22
R78 22
R80 22
R82 22
R84 22
R327 100/NC
R328 100/NC
R329 100/NC
U18
U19
8M x 16 DDR
HY5DU281622ET-5 8Mx16 TSOP(II)-66/SMD
RN3
RN5
RN7
RN9
RN12
RN14
RN15
RN18
RN20
RN22
RN23
RN24
75x4
R65 75
R70 75
R72 75
R75 75
R77 75
R79 75
R81 75
R83 75
R85 75
U17
29LV160
TSOP 48 PIN
R61 10k
R62 0
R63 10k
CB64 0.1uF
CB65 0.1uF
CB93 0.1uF
R74 4.7k
U20
IC LP2996 DDR Termination SOP8
TP40
CE41 47uF/16v
CB110 0.1uF
CB111 0.1uF
CE42 220uF/16v
CB66 0.1uF
CB67 0.1uF
CB68 0.1uF
CB69 0.1uF
CB70 0.1uF
CB71 0.1uF
CB72 0.1uF
CB73 0.1uF
CB74 0.1uF
CB75 0.1uF
CB76 0.1uF
CB77 0.1uF
CB78 0.1uF
CB79 0.1uF
CB80 0.1uF
CB81 0.1uF
CB82 0.1uF
CB83 0.1uF
CB84 0.1uF
CB85 0.1uF
CB86 0.1uF
CB87 0.1uF
CB88 0.1uF
CB89 0.1uF
CB90 0.1uF
CB91 0.1uF
CB92 0.1uF
C40 3300pF
C41 3300pF
C42 3300pF
C43 3300pF
C44 3300pF
C45 3300pF
C46 3300pF
C47 3300pF
CE39 270uF/16v OS-CON/NC C220UF16V/D6H11
CE40 220uF/16v
CB94 0.1uF
CB95 0.1uF
CB96 0.1uF
CB97 0.1uF
CB98 0.1uF
CB99 0.1uF
CB100 0.1uF
CB101 0.1uF
CB102 0.1uF
CB103 0.1uF
CB104 0.1uF
CB105 0.1uF
CB106 0.1uF
CB107 0.1uF
CB108 0.1uF
CB109 0.1uF
PUT ON NEARLY BGA
C54 3300pF
C55 3300pF
CB116 0.1uF
CB117 0.1uF
CB118 0.1uF
CB119 0.1uF
CB112 0.1uF
CB113 0.1uF
CB114 0.1uF
CE47 220uF/16v
CE48 220uF/16v
CE45 220uF/16v
CB120 0.1uF
CB121 0.1uF
CB122 0.1uF
CB123 0.1uF
CB124 0.1uF
CB125 0.1uF
CB126 0.1uF
CB127 0.1uF
CB128 0.1uF
CB129 0.1uF
VREF DECOUPLING
U21
LT1084-2.5 TO-252-3
TO-252-3/SMD
CE44 220uF/16v
CE46 220uF/16v
L16 FB
L17 FB
C56 10uF/10v C0805/SMD
CB130 0.1uF
CLOSE TO 8202 PIN
KAWA Confidential
DDR MEMORY & FLASH
AKAI_MT8202_27US_LVDS_V0.0
Thursday, April 13, 2006
Sheet 5 17


MT8293
U25
MT8293
LQFP128/SMD/8293
U48
AZ1117-1.8
SOT223/SMD
U50
EEPROM 24C04/CODE
DIP3/W/HP2.0
U51
EEPROM 24C04/CODE
U34
UPA672T
P1
HDMI TYPE-A
HDMI
Q36
2N3904
SOT23/SMD
ADD HDMI COAXOUT
WHEN USE HDMI COAXOUT,C127 CHANGE 0 RES
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HDMI INPUT MT8293
Document Number
AKAI_MT8202_27US_LVDS_V0.0
Rev
1
Date: Thursday, April 20, 2006
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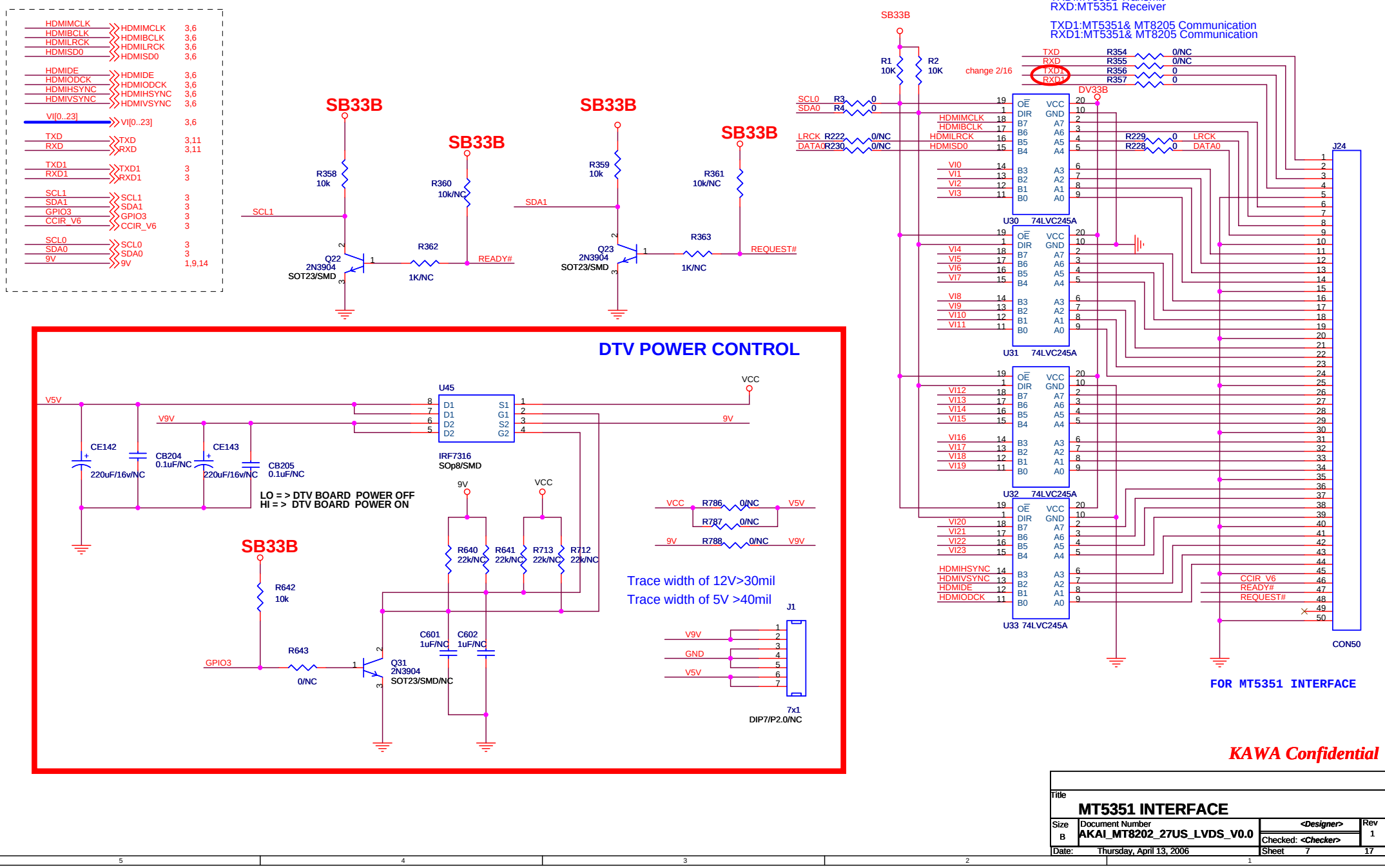
HDMIMCLK 3,6
HDMIBCLK 3,6
HDMILRCK 3,6
HDMISD0 3,6
HDMIDE 3,6
HDMIODCK 3,6
HDMIHSYNC 3,6
HDMIVSYNC 3,6
VI[0..23] 3,6
TXD 3,11
RXD 3,11
TXD1 3
RXD1 3
SCL1 3
SDA1 3
GPIO3 3
CCIR_V6 3
SCL0 3
SDA0 3
9V 1,9,14
SB33B
R358 10k
R360 10k/NC
SCL1
Q22 2N3904 SOT23/SMD
R362
1K/NC
READY#
R359 10k
SDA1
Q23 2N3904 SOT23/SMD
R363
1K/NC
R361 10k/NC
REQUEST#
TXD:MT5351 Transmit
RXD:MT5351 Receiver
TXD1:MT5351& MT8205 Communication
RXD1:MT5351& MT8205 Communication
R1 10K
R2 10K
change 2/16
R354 0/NC
R355 0/NC
R356 0
R357 0
DV33B
SCL0 R3 0
SDA0 R4 0
LRCK R222 0/NC
DATA0 R230 0/NC
R229 0 LRCK
R228 0 DATA0
U30 74LVC245A
U31 74LVC245A
U32 74LVC245A
U33 74LVC245A
J24
CON50
FOR MT5351 INTERFACE
DTV POWER CONTROL
V5V
V9V
CE142 220uF/16v/NC
CB204 0.1uF/NC
CE143 220uF/16v/NC
CB205 0.1uF/NC
U45
IRF7316 SOp8/SMD
VCC
9V
LO = > DTV BOARD POWER OFF
HI = > DTV BOARD POWER ON
R640 22k/NC
R641 22k/NC
R713 22k/NC
R712 22k/NC
R786 0/NC
R787 0/NC
R788 0/NC
Trace width of 12V>30mil
Trace width of 5V >40mil
R642 10k
GPIO3
R643 0/NC
Q31 2N3904 SOT23/SMD/NC
C601 1uF/NC
C602 1uF/NC
J1
7x1 DIP7/P2.0/NC
KAWA Confidential
Title
MT5351 INTERFACE
Size B
Document Number AKAI_MT8202_27US_LVDS_V0.0
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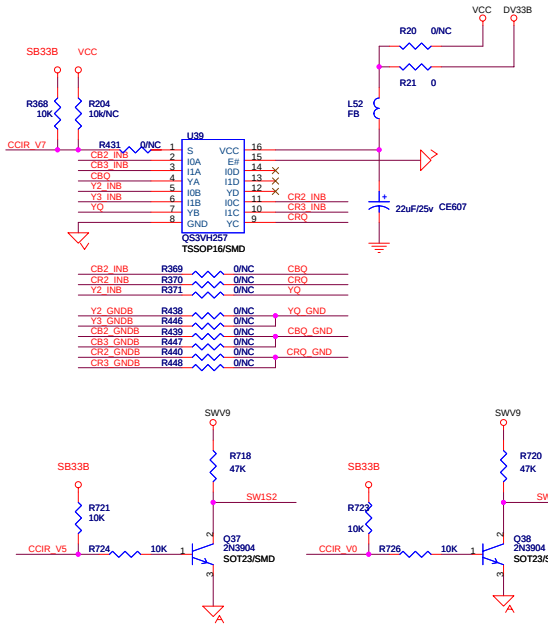
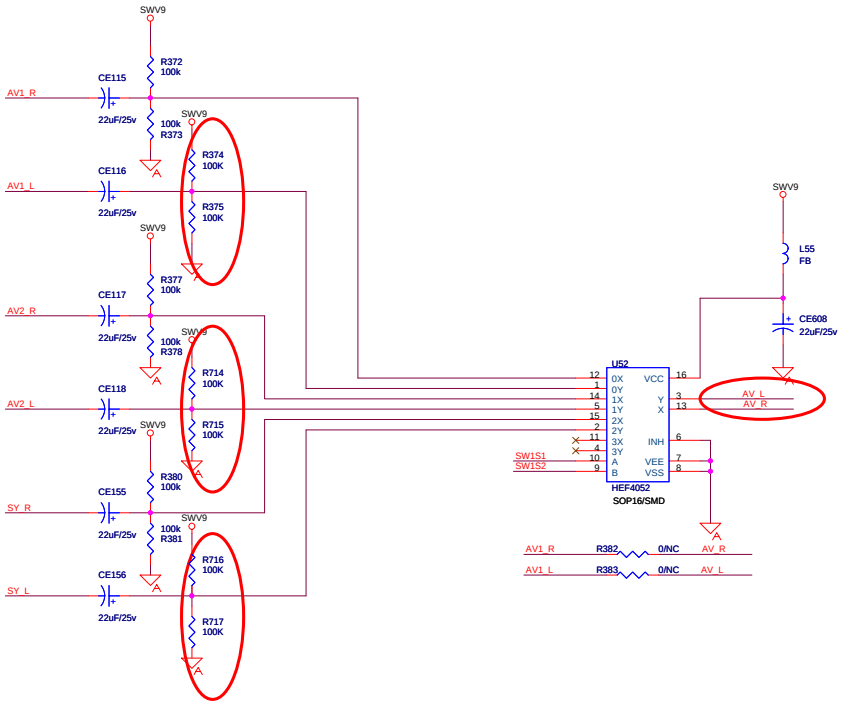
INPUT

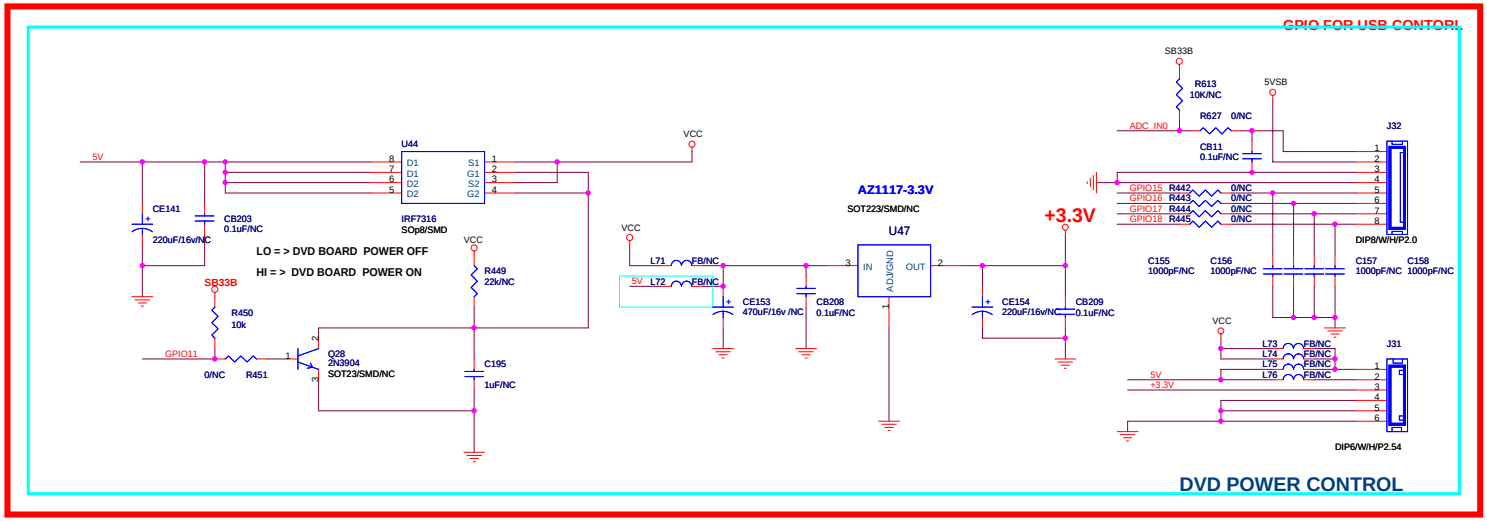
ADC_IN0	ADC_IN0	3
CCIR_V0	CCIR_V0	3
CCIR_V5	CCIR_V5	3
CCIR_V7	CCIR_V7	3
GPIO11	GPIO11	3
GPIO15	GPIO15	3
GPIO16	GPIO16	3
GPIO17	GPIO17	3
GPIO18	GPIO18	3
VFE_GND	VFE_GND	2,3,4,11
AADCVSS	AADCVSS	3,4,10
AV1_R	AV1_R	15
AV1_L	AV1_L	15
AV2_R	AV2_R	15
AV2_L	AV2_L	15
SY_R	SY_R	15
SY_L	SY_L	15
Y2_INB	Y2_INB	15
Y2_GNDB	Y2_GNDB	10,15
CB2_INB	CB2_INB	15
CB2_GNDB	CB2_GNDB	10,15
CR2_INB	CR2_INB	15
CR2_GNDB	CR2_GNDB	10,15
Y3_INB	Y3_INB	15
Y3_GNDB	Y3_GNDB	15
CB3_INB	CB3_INB	15
CB3_GNDB	CB3_GNDB	15
CR3_INB	CR3_INB	15
CR3_GNDB	CR3_GNDB	15
9V	9V	1,7,9,14

OUTPUT

AV_R	AV_R	9
AV_L	AV_L	9
YQ	YQ	10
CBQ	CBQ	10
CRQ	CRQ	10
YQ_GND	YQ_GND	10
CBQ_GND	CBQ_GND	10
CRQ_GND	CRQ_GND	10







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Title: DAUGHTER BOARD IN			
Size: C	Document Number: AKAI_MT8202_27US_LVDS_V0.0	<Designer>	Rev: 1
		Checked: <Checker>	
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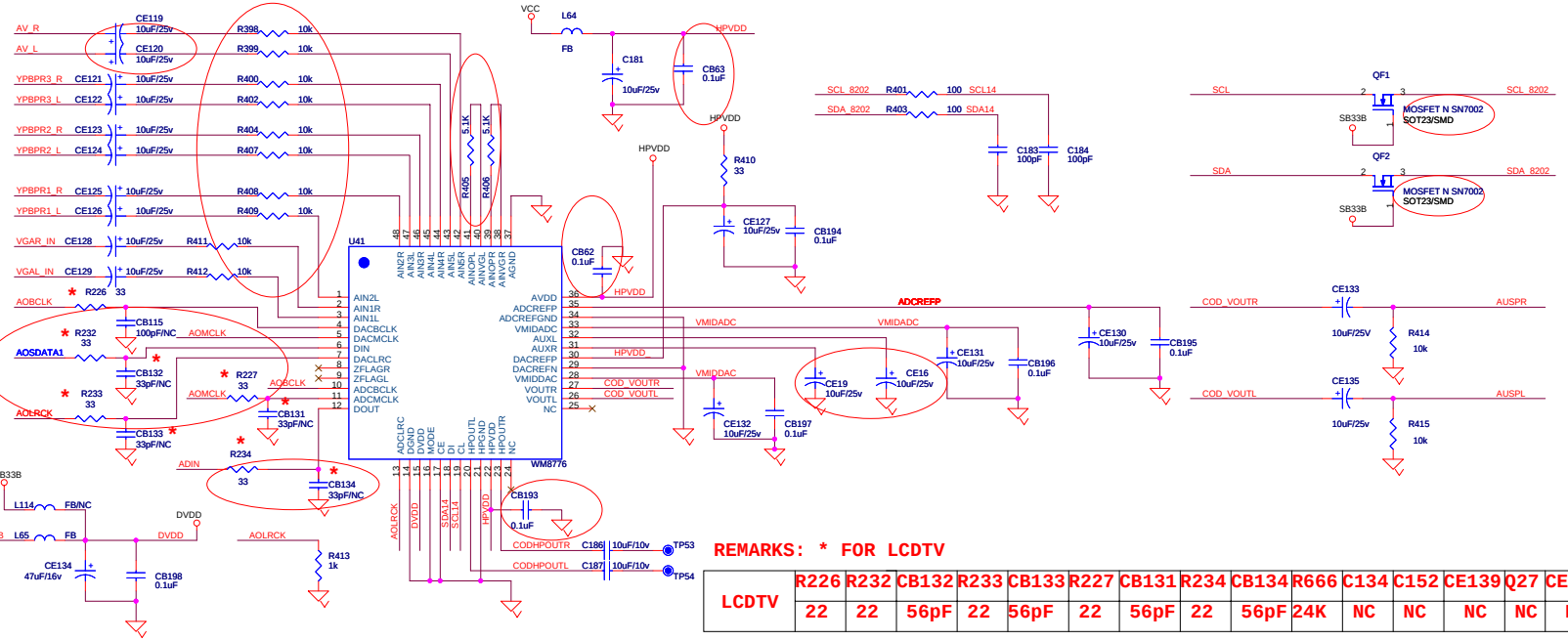
INPUT

GPIO7	GPIO7	3
SCL	SCL	1,14
SDA	SDA	1,14
SDA_8202	SDA_8202	3,6,12
SCL_8202	SCL_8202	3,6,12
AOSDATA1	AOSDATA1	3
AOMCLK	AOMCLK	3,16
AOBCLK	AOBCLK	3,16
AOLRCK	AOLRCK	3,16
ADIN	ADIN	3
AV_R	AV_R	8
AV_L	AV_L	8
YPBPR1_L	YPBPR1_L	15
YPBPR1_R	YPBPR1_R	15
YPBPR2_R	YPBPR2_R	15
YPBPR2_L	YPBPR2_L	15
YPBPR3_R	YPBPR3_R	15
YPBPR3_L	YPBPR3_L	15
VGAR_IN	VGAR_IN	11
VGAL_IN	VGAL_IN	11
TESTP2	TESTP2	3
AR	AR	3
AL	AL	3
MU	MU	16
A_MUTE	A_MUTE	17
9V	9V	1,7,14

OUTPUT

AUSPR	AUSPR	16
AUSPL	AUSPL	16
AVR_OUT	AVR_OUT	15
AVL_OUT	AVL_OUT	15
CVBS_OUT	CVBS_OUT	6,15



REMARKS: * FOR LCDTV

	R226	R232	CB132	R233	CB133	R227	CB131	R234	CB134	R666	C134	C152	CE139	Q27	CE140	CE138
LCDTV	22	22	56pF	22	56pF	22	56pF	22	56pF	24K	NC	NC	NC	NC	NC	NC

Title	M8776 & VIDEO BYPASS
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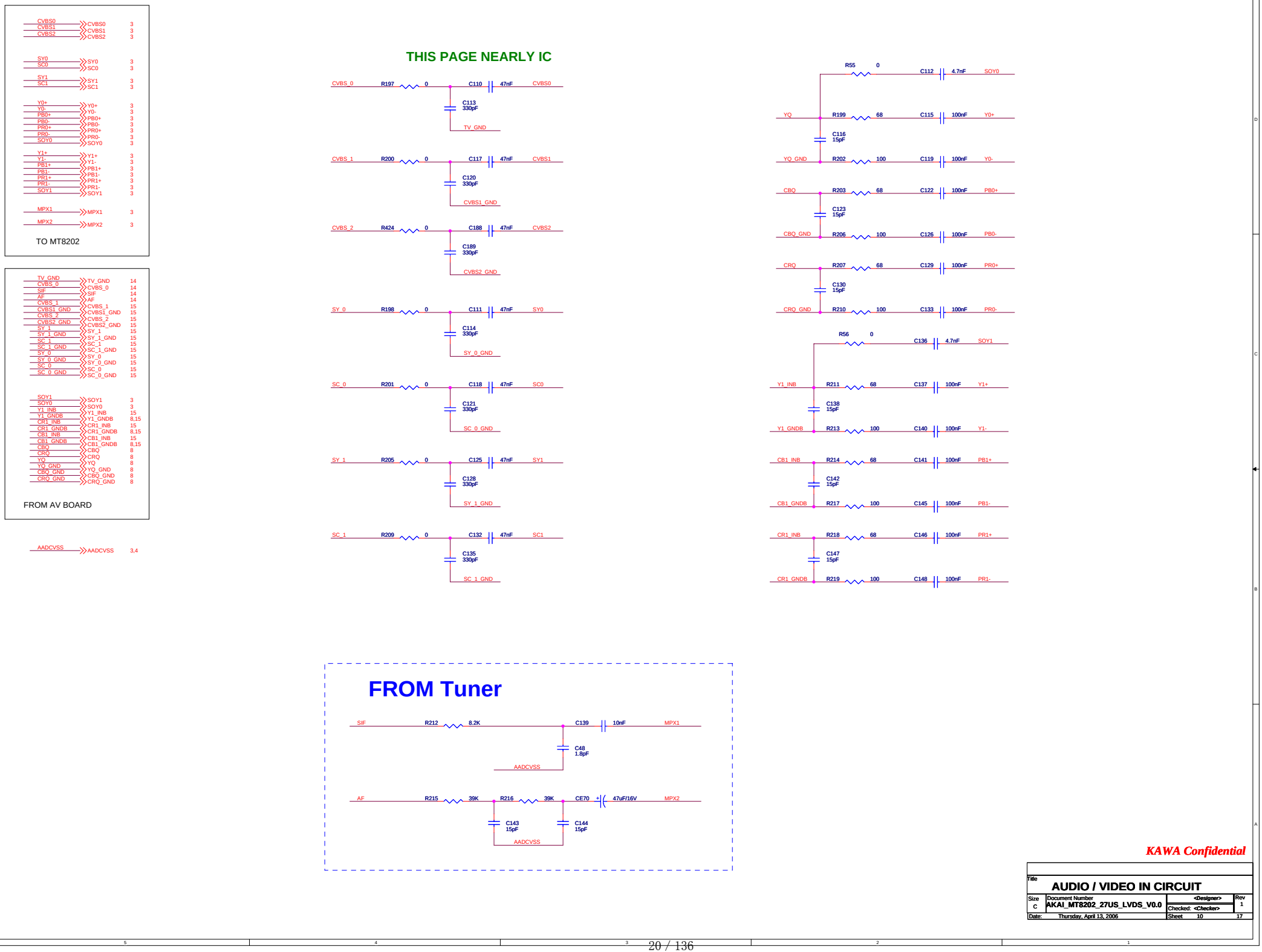

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Title	AUDIO / VIDEO IN CIRCUIT		
Size C	Document Number AKAI_MT8202_27US_LVDS_V0.0	<Designer> Checked: <Checker>	Rev 1
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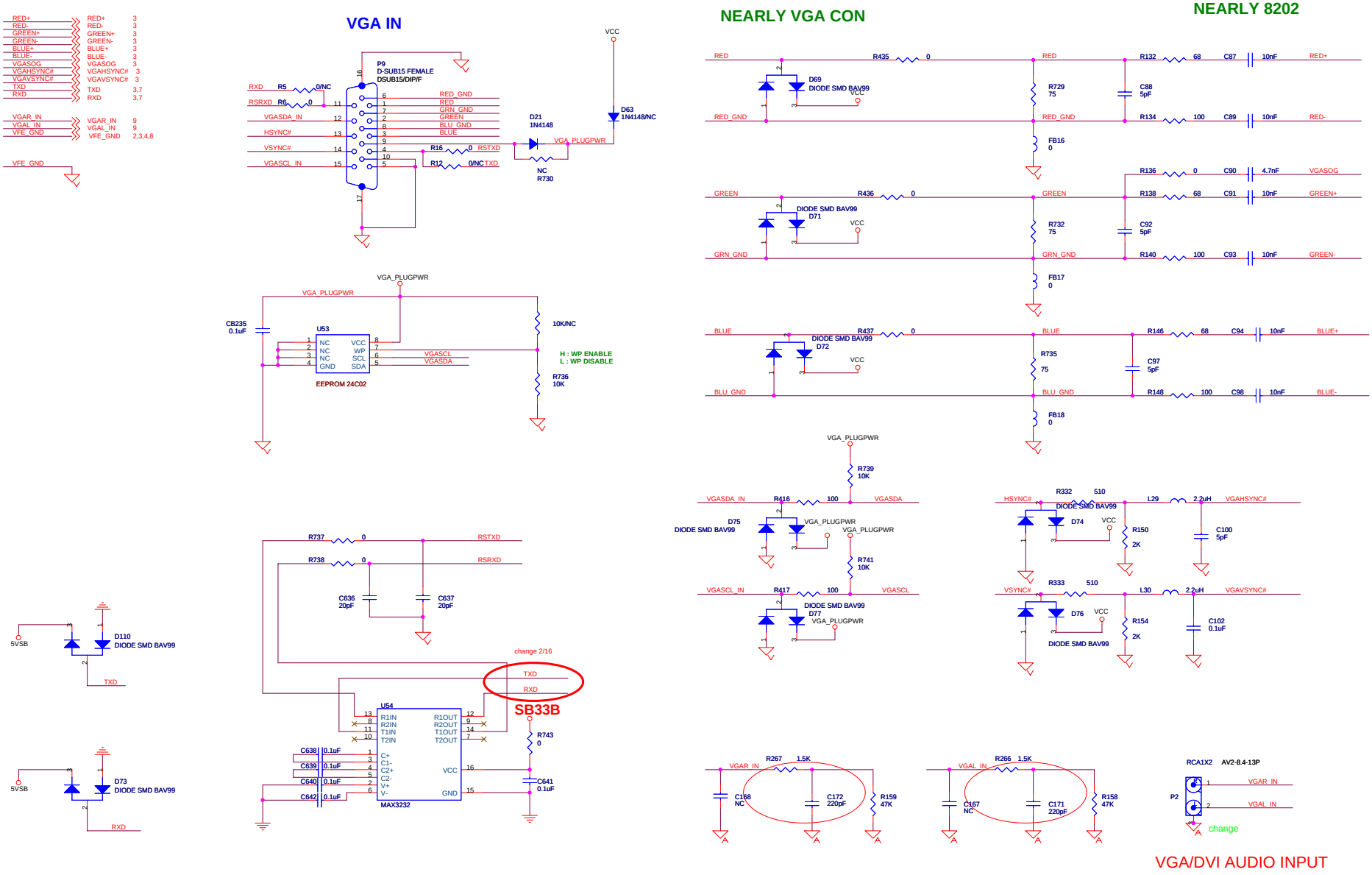

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Title: VGA IN & PC AUDIO IN			
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		Checked: <Checker>	
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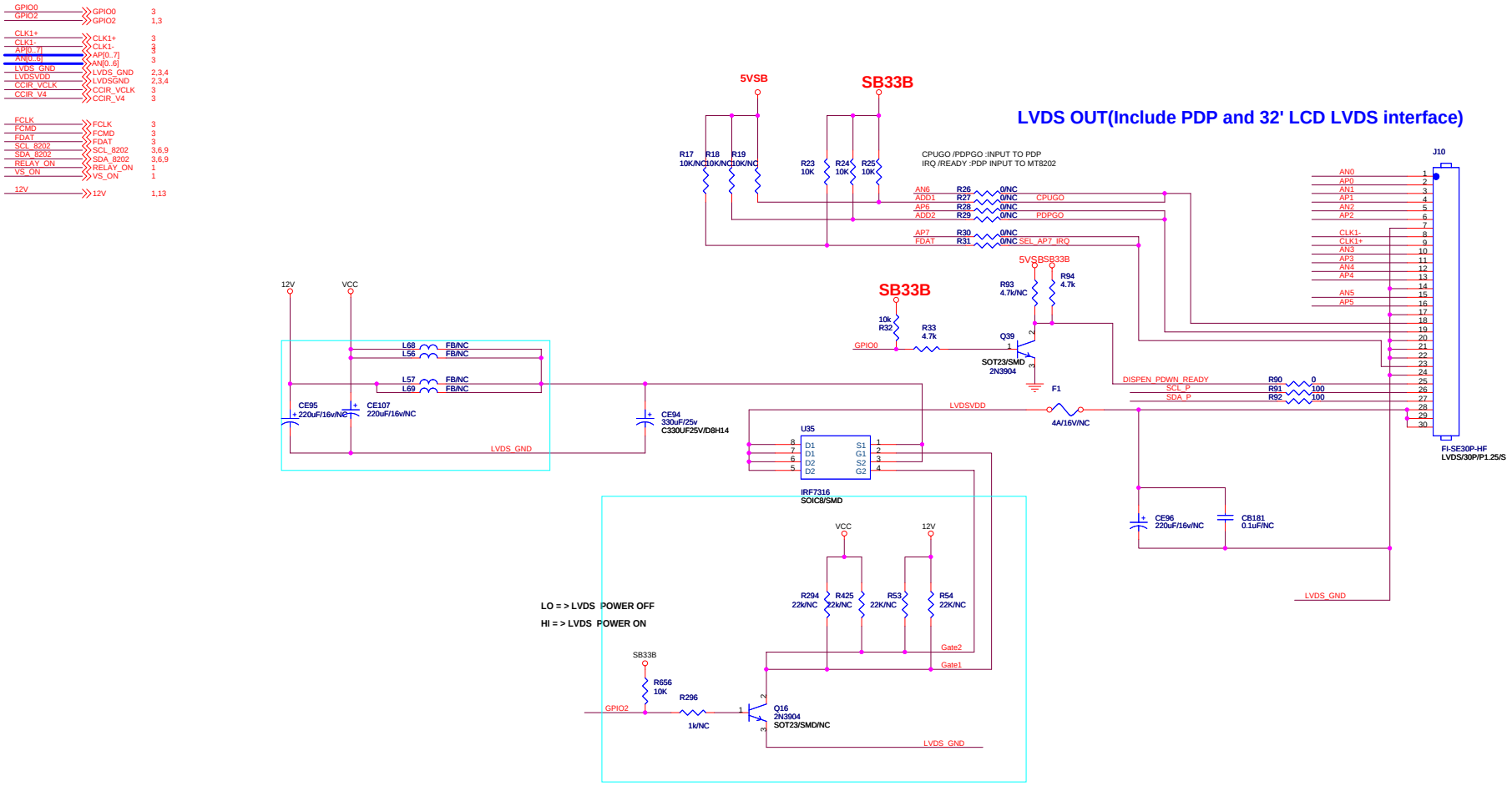

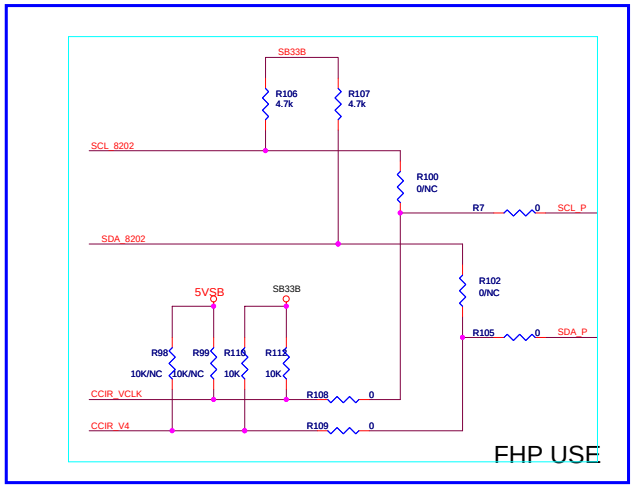

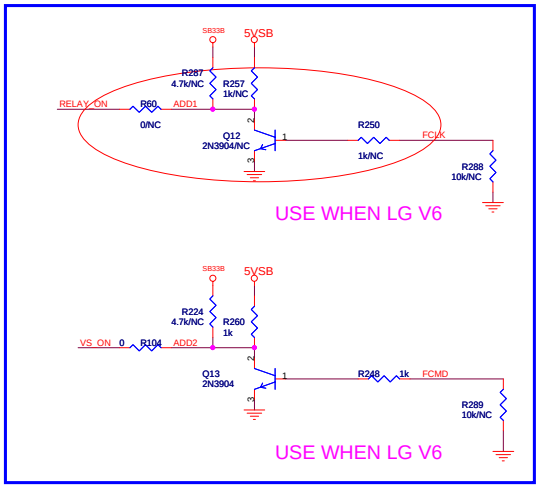

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Title: LVDS OUT			
Size: C	Document Number: AKAI_MT8202_27US_LVDS_V0.0	<Designer>	Rev: 1
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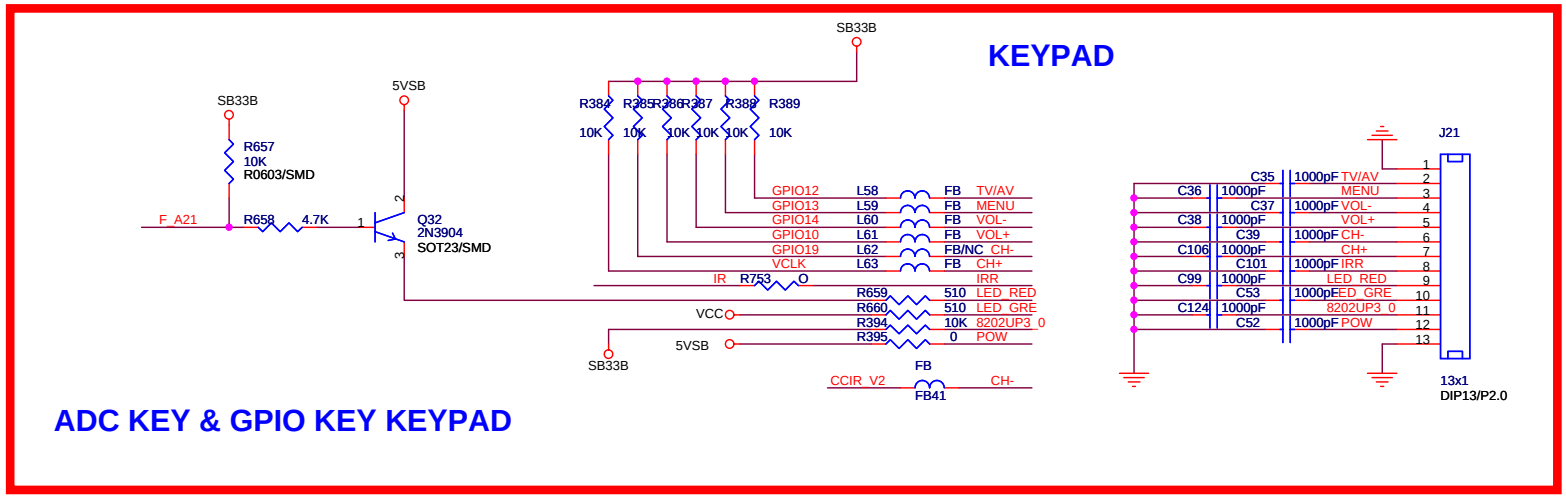
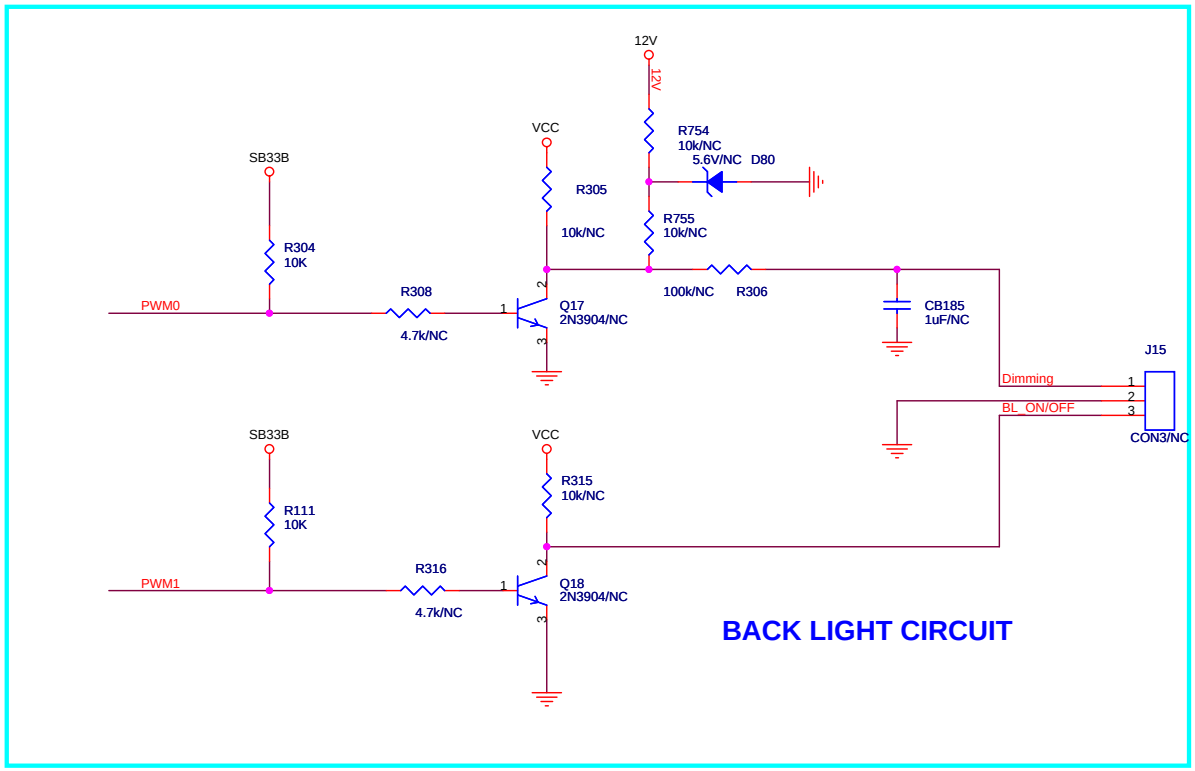
IR	IR	3,15
GPIO10	GPIO10	3
GPIO12	GPIO12	3
GPIO13	GPIO13	3
GPIO14	GPIO14	1,3
PWM0	PWM0	3
PWM1	PWM1	3
8202UP3_0	8202UP3_0	3
GPIO14	GPIO14	1,3
GPIO19	GPIO19	1,3
VCLK	VCLK	3
F_A21	F_A21	3
CCIR_V2	CCIR_V2	3
12V	12V	1,12





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Title: BACK LIGHT / KEYPAD			
Size: B	Document Number: AKAI_MT8202_27US_LVDS_V0.0	<Designer>	Rev: 1
		Checked: <Checker>	
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SCL
SDA
CVBS_0
TV_GND
AF
SIF
ADC_IN4
9V

SCL 1,9
SDA 1,9
CVBS_0 10
TV_GND 10
AF 10
SIF 10
ADC_IN4 3
9V 1,7,9

TUNER SIF1NTSC 4.5MHz BPF

SIF_9V
CE617 10uF/25v C10UF25V/D4H5
R423 1K
R422 1.8K
C645 10nF
SIF
SIF1_IN
C646 10nF
R418 0
1000pF/27pF C647
FB19 3.3uH/22uH
BEAD/SMD/1210
C648 10nF
Q40 2N3904 SOT23/SMD
C649 820pF 560pF
L87 1.5uH 1.2uH
C650 820pF 560pF
L88 1.5uH 1.2uH
2.2uH
R419 220
R420 10
R421 71.5
C651 NC

FQ1216 : PAL
FQ1236 : NTSC

ADDRESS
TUNER IF
C0 84

TU1
FQ1236-MK3
GND1 GND2 NC BT VS_TUNER SCL SDA AS AFC NC NC NC 2nd SIF OUT CVBS VS_IF AF/MPX GND3 GND4
21 22 1 2 3 4 5 6 7 8 9 10 11 12 13 14 23 24
VS_TUNER
VS_IF
SCL R231 100
SDA R208 100
TU_AV
C675 20pF
C676 20pF
AFC
SIF1_IN
AF1_IN

AF1_IN
CE626 33uF/16V AF
VCC
R178 R/NC
ADC_IN4
R180 0/NC AFC
R179 R/NC
C191 20pF

U59
ADD
9V
CE635 220uF/10V
CB247 0.1uF
IN ADJ/GND OUT
TO220/DIP
7805
加散热片，尺寸与atsc Board 相同

TU_VCC
CE618 220uF/10V
L89 470uH
L/IND/SMD/SLF7032
VS_TUNER
FB12 BEAD/SMD/1206 NC
CE620 470uF/16V
CB236 0.1uF

TU_VCC
L91 470uH
L/IND/SMD/SLF7032
VS_IF
FB14 BEAD/SMD/1206 NC
CE625 470uF/16V
CB239 0.1uF

9V
FB21 47
SWV9
CE629 47uF/16V
CE630 220uF/16V
CB242 0.1uF
FB22 FB
SIF_9V
CE634
CB243 0.1uF

TU_AV
L93 2.2uH
L/IND/SMD/0805
TU_CVBS
R317 18
R58 0 CVBS_0
R318 56
TV_GND
FB20 0
C656 330pF
C657 330pF

J9
TU_VCC 1
TU_AV 2
TV_GND 3
SIF1_IN 4
AF1_IN 5
6
7
SCL 8
SDA 9
AFC 10
11
DIP11/W/H/P2.0

J16
SIF 1
AF 2
3
4
CVBS_0 5
TV_GND 6
SCL 7
SDA 8
8x1
DIP8/P2.0

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Title	<Title>		
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Title	TUNER IN		
Size Custom	Document Number AKAI_MT8202_27US_LVDS_V0.0	<Designer> Checked: <Checker>	Rev 1
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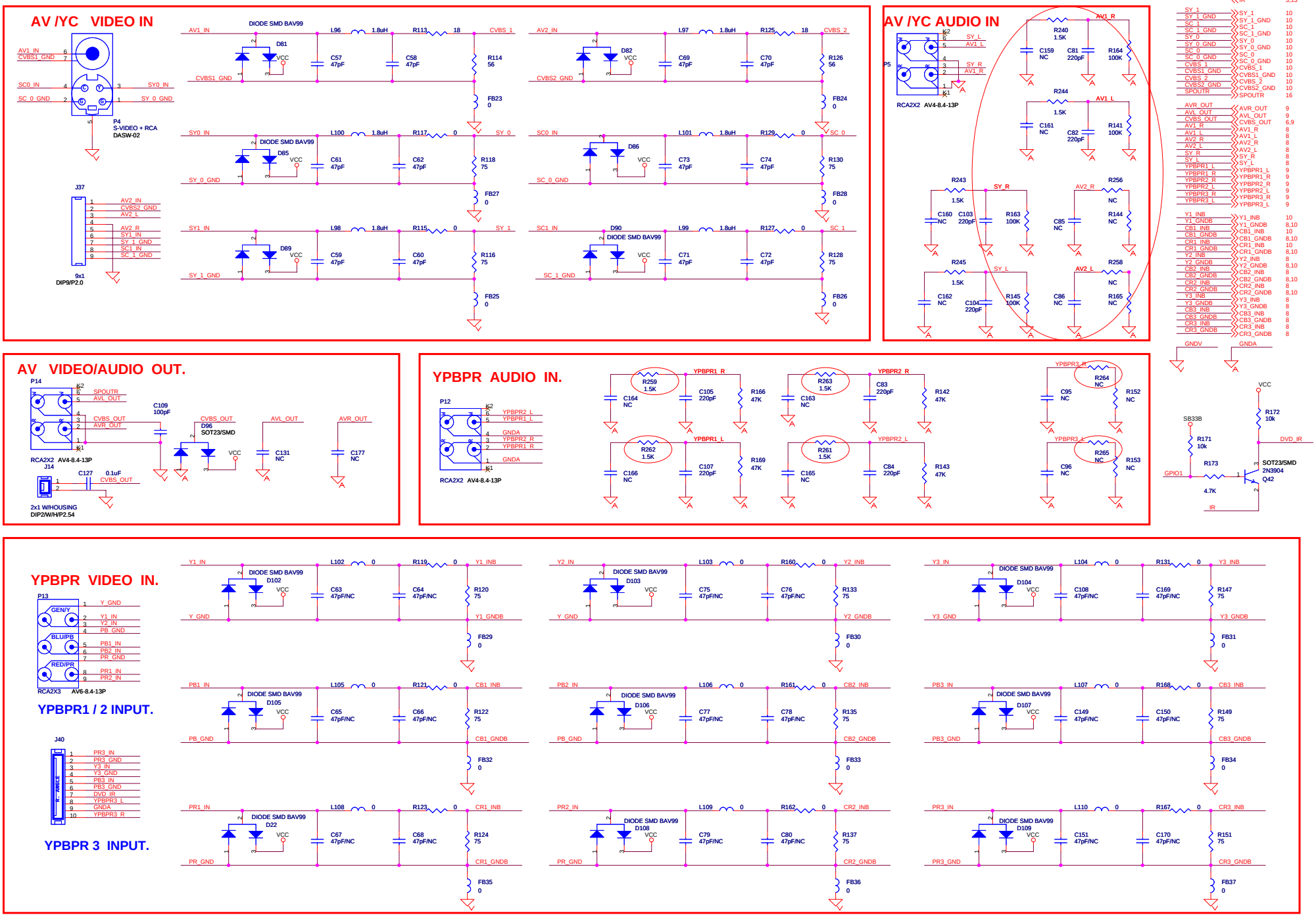
AV /YC VIDEO IN
AV1_IN
CVBS1_GND
SC0_IN
SC_0_GND
SY0_IN
SY_0_GND
P4
S-VIDEO + RCA
DASW-02
J37
AV2_IN
CVBS2_GND
AV2_L
AV2_R
SY1_IN
SY_1_GND
SC1_IN
SC_1_GND
9x1
DIP9/P2.0
DIODE SMD BAV99
D81
D82
D85
D86
D89
D90
L96
L97
L100
L101
L98
L99
1.8uH
R113
R125
R117
R129
R115
R127
18
0
CVBS_1
CVBS_2
SY_0
SC_0
SY_1
SC_1
R114
R126
R118
R130
R116
R128
56
75
C57
C69
C61
C73
C59
C71
C58
C70
C62
C74
C60
C72
47pF
FB23
FB24
FB27
FB28
FB25
FB26
VCC
AV /YC AUDIO IN
P5
RCA2X2 AV4-8.4-13P
SY_L
AV1_L
SY_R
AV1_R
R240
1.5K
R244
R243
R256
R245
R258
C159
C81
R164
C161
C82
R141
C160
C103
R163
C85
R144
C162
C104
R145
C86
R165
NC
220pF
100K
AV /YC VIDEO/AUDIO OUT.
P14
SPOUTR
AVL_OUT
CVBS_OUT
AVR_OUT
RCA2X2 AV4-8.4-13P
J14
C109
100pF
D96
SOT23/SMD
C131
C177
C127
0.1uF
2x1 W/HOUSING
DIP2/W/H/P2.54
YPBPR AUDIO IN.
P12
YPBPR2_L
YPBPR1_L
GNDA
YPBPR2_R
YPBPR1_R
RCA2X2 AV4-8.4-13P
R259
R262
R263
R261
R264
R265
C164
C166
C163
C165
C95
C96
C105
C107
C83
C84
R166
R169
R142
R143
R152
R153
47K
YPBPR1_R
YPBPR1_L
YPBPR2_R
YPBPR2_L
YPBPR3_R
YPBPR3_L
YPBPR VIDEO IN.
P13
GEN/Y
BLU/PB
RED/PR
Y_GND
Y1_IN
Y2_IN
PB_GND
PB1_IN
PB2_IN
PR_GND
PR1_IN
PR2_IN
RCA2X3 AV6-8.4-13P
YPBPR1 / 2 INPUT.
J40
PR3_IN
PR3_GND
Y3_IN
Y3_GND
PB3_IN
PB3_GND
DVD_IR
YPBPR3_L
GNDA
YPBPR3_R
YPBPR 3 INPUT.
D102
D103
D104
D105
D106
D107
D108
D109
C63
C75
C108
C65
C77
C149
C67
C79
C151
C64
C76
C169
C66
C78
C150
C68
C80
C170
47pF/NC
R119
R160
R131
R121
R161
R168
R123
R162
R167
Y1_INB
Y2_INB
Y3_INB
CB1_INB
CB2_INB
CB3_INB
CR1_INB
CR2_INB
CR3_INB
R120
R133
R147
R122
R135
R149
R124
R137
R151
Y1_GNDB
Y2_GNDB
Y3_GNDB
CB1_GNDB
CB2_GNDB
CB3_GNDB
CR1_GNDB
CR2_GNDB
CR3_GNDB
FB29
FB30
FB31
FB32
FB33
FB34
FB35
FB36
FB37
GPIO1
IR
SY_1
SY_1_GND
SC_1
SC_1_GND
SY_0
SY_0_GND
SC_0
SC_0_GND
CVBS_1
CVBS1_GND
CVBS_2
CVBS2_GND
SPOUTR
AVR_OUT
AVL_OUT
CVBS_OUT
AV1_R
AV1_L
AV2_R
AV2_L
SY_R
SY_L
YPBPR1_L
YPBPR1_R
YPBPR2_R
YPBPR2_L
YPBPR3_R
YPBPR3_L
Y1_INB
Y1_GNDB
CB1_INB
CB1_GNDB
CR1_INB
CR1_GNDB
Y2_INB
Y2_GNDB
CB2_INB
CB2_GNDB
CR2_INB
CR2_GNDB
Y3_INB
Y3_GNDB
CB3_INB
CB3_GNDB
CR3_INB
CR3_GNDB
GNDV
GNDA
VCC
R172
10k
SB33B
R171
10k
DVD_IR
R173
SOT23/SMD
2N3904
Q42
4.7K
IR
KAWA Confidential
Title
AV IN
Size
C
Document Number
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Rev
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<Designer>
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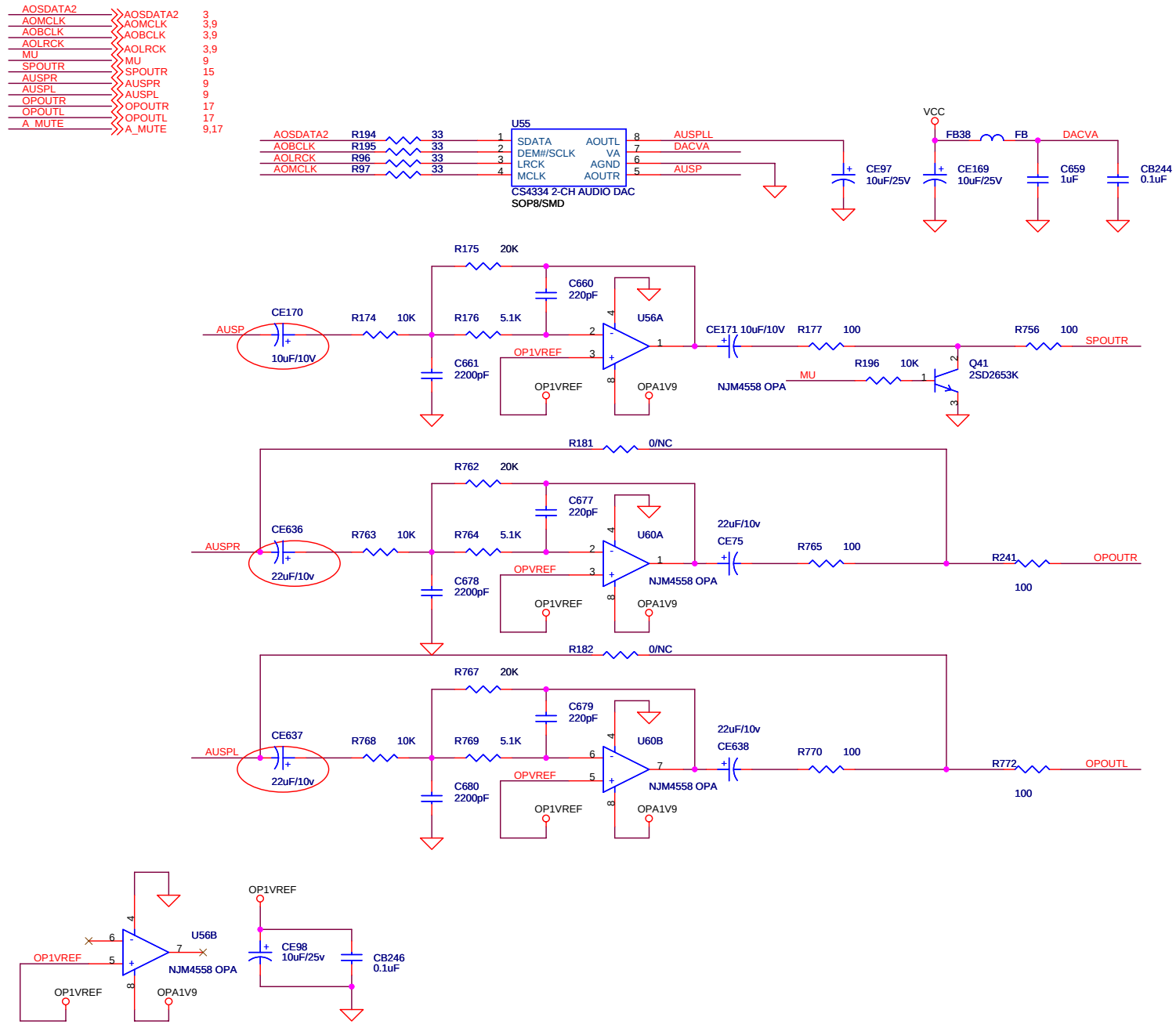

GPIO DECRIPTION

UP3_4 : SW SCL
UP3_5 : SW SDA
ERO0/UP3_0 :KEYPAD POWER
ERO1/UP3_1 : MAIN POWER SWITCH
VCLK : KEPAD CH+
GPIO19 : KEPAD CH-
DE/GPIO : DVD IR
CCIR_CLK : PDP USE
CCIR_V4 : PDP USE
GPIO0 : PDP USE
GPIO1 : NO USE
GPIO2 : LVDS POWER SW
GPIO3 : DTV POWER CONTROL
GPIO4 : EEPROM WRITE PROTECT
GPIO5/TXD : 2nd UART FOR MT5351
GPIO6/RXD : 2nd UART FOR MT5351
GPIO7 : AUDIO BYPASS MUTE CONTROL
GPIO8 : SPEAKER SWITCH
GPIO9 : AUDIO MUTE
GPIO10 : Indicates active video at HDMI port
GPIO11 : DVD POWER CONTROL
GPIO12 : AV SWITCH
GPIO13 : HDMI Hot Plug Detect
GPIO14 : NO USE
GPIO[15..18] : FOR DVD CONTROL
GPIO/PWM0 : DIMMING
GPIO/PWM1 : BACKLIGHT ON/OFF
OUT_27Mhz/GPIO : HDMI CRYSTAL
SDA1 : TO MT5351 I/F REQUEST
SCL1 : TO MT5351 I/F READY
F_A21 : KEYPAD(LED RED)
ADCIN0 : KEYPAD
ADCIN3:PDP 5VD DETECT
ADCIN4:FOR TUNER AFC

CCIR_V[0-3] : KEYPAD
CCIR_V5 : AUDIO SWITCH
CCIR_V6 : RESET DTV
CCIR_V7 : YPBPR VIDEO SWITCH

Title: SUB WOOFER			
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		Checked: <Checker>	
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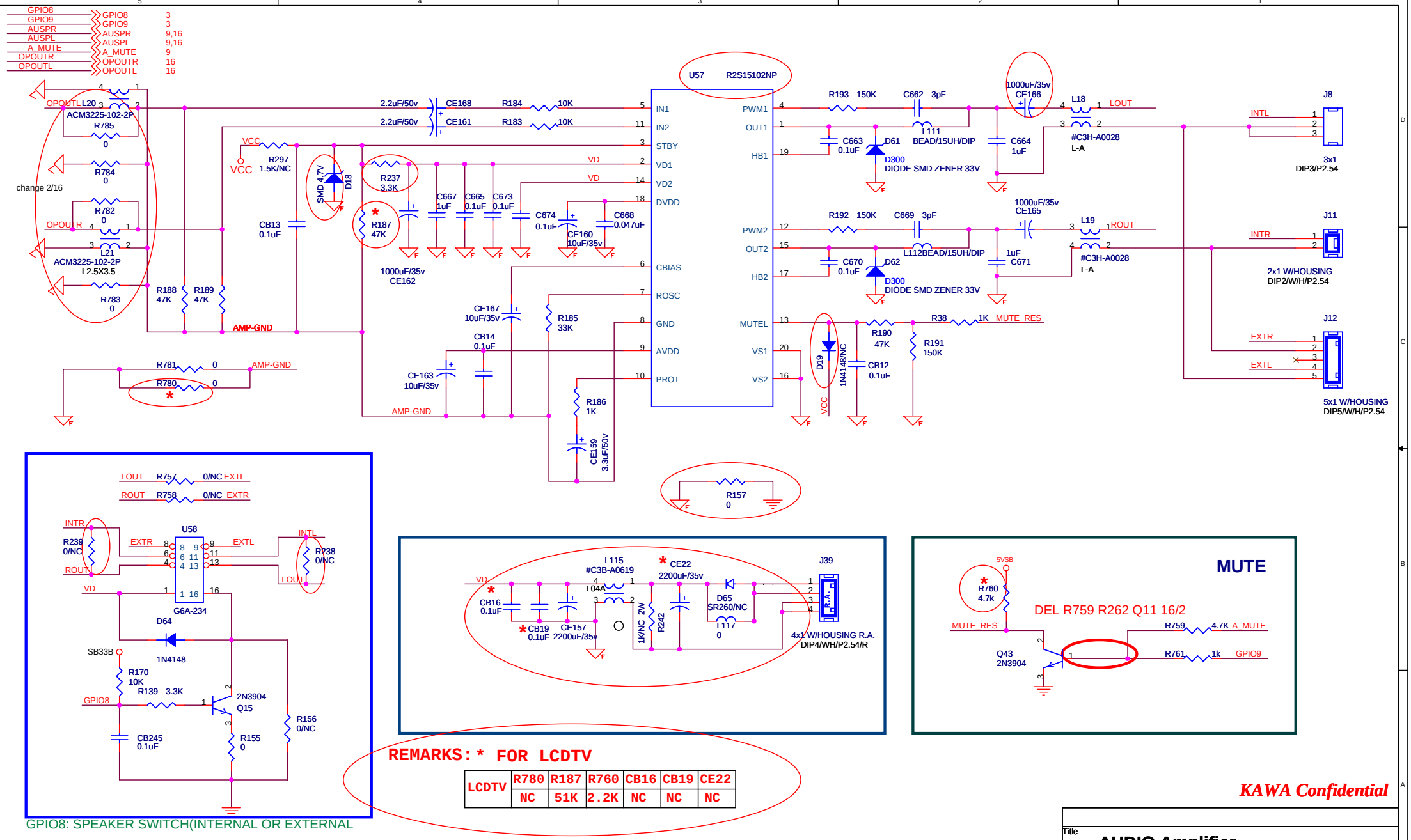
GPIO8 3
GPIO9 3
AUSPR 9,16
AUSPL 9,16
A_MUTE 9
OPOUTR 16
OPOUTL 16
U57 R2S15102NP
ACM3225-102-2P
R785 0
R784 0
R782 0
R783 0
ACM3225-102-2P
L2.5X3.5
change 2/16
VCC
R297 1.5K/NC
SMD 4.7V
D18
R237 3.3K
R187 47K
CB13 0.1uF
R188 47K
R189 47K
AMP-GND
R781 0
R780 0
2.2uF/50v
CE168
CE161
R184 10K
R183 10K
C667 1uF
C665 0.1uF
C673 0.1uF
C674 0.1uF
CE160 10uF/35v
C668 0.047uF
1000uF/35v CE162
CE167 10uF/35v
CB14 0.1uF
CE163 10uF/35v
R185 33K
R186 1K
CE159 3.3uF/50v
IN1
IN2
STBY
VD1
VD2
DVDD
CBIAS
ROSC
GND
AVDD
PROT
PWM1
OUT1
HB1
PWM2
OUT2
HB2
MUTEL
VS1
VS2
R193 150K
C662 3pF
C663 0.1uF
D61
L111 BEAD/15UH/DIP
D300 DIODE SMD ZENER 33V
1000uF/35v CE166
C664 1uF
L18
LOUT
#C3H-A0028 L-A
R192 150K
C669 3pF
C670 0.1uF
D62
L112BEAD/15UH/DIP
D300 DIODE SMD ZENER 33V
1000uF/35v CE165
1uF C671
L19
ROUT
#C3H-A0028 L-A
R38 1K MUTE_RES
R190 47K
R191 150K
D19 1N4148/NC
CB12 0.1uF
R157 0
J8
INTL
3x1 DIP3/P2.54
J11
INTR
2x1 W/HOUSING DIP2/W/H/P2.54
J12
EXTR
EXTL
5x1 W/HOUSING DIP5/W/H/P2.54
LOUT R757 0/NC EXTL
ROUT R758 0/NC EXTR
U58
INTR
EXTR
EXTL
INTL
R239 0/NC
R238 0/NC
ROUT
LOUT
VD
G6A-234
D64
1N4148
SB33B
R170 10K
R139 3.3K
GPIO8
2N3904 Q15
R156 0/NC
R155 0
CB245 0.1uF
L115 #C3B-A0619
L04A
CE22 2200uF/35v
CB16 0.1uF
CB19 0.1uF
CE157 2200uF/35v
1K/NC 2W
R242
D65 SR260/NC
L117 0
J39
R.A.
4x1 W/HOUSING R.A. DIP4/WH/P2.54/R
5VSB
R760 4.7k
MUTE_RES
MUTE
DEL R759 R262 Q11 16/2
Q43 2N3904
R759 4.7K A_MUTE
R761 1k GPIO9
GPIO8: SPEAKER SWITCH(INTERNAL OR EXTERNAL
REMARKS: * FOR LCDTV
LCDTV | R780 | R187 | R760 | CB16 | CB19 | CE22
NC | 51K | 2.2K | NC | NC | NC
KAWA Confidential
Title AUDIO Amplifier
Size B
Document Number AKAI_MT8202_27US_LVDS_V0.0
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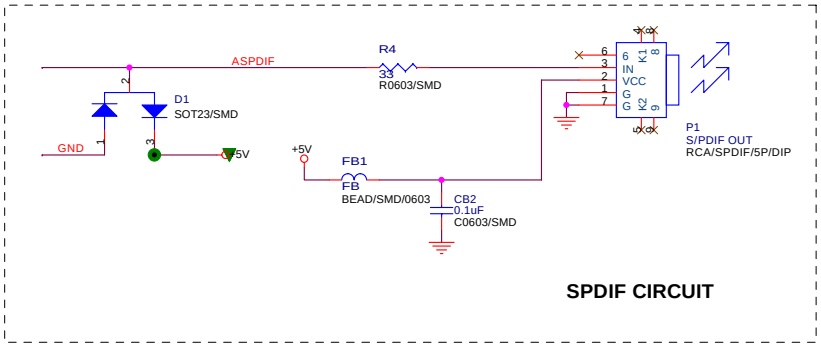
MT5111 / MT5351 REFERENCE DESIGN - 4 LAYERS

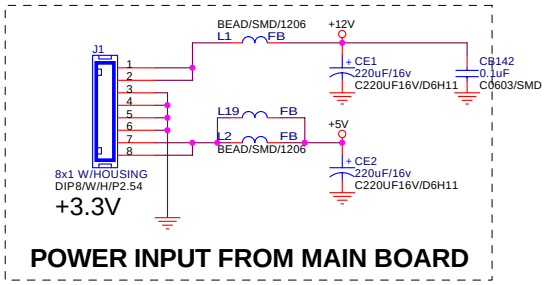
Rev	History	P#	DATE
RA-V1	INITIAL VERSION		2005/06/15
RA-V2	ADDED AUDIO SWITCH / REFINE POWER CIRCUIT		2005/07/14

NS : NON-STUFF

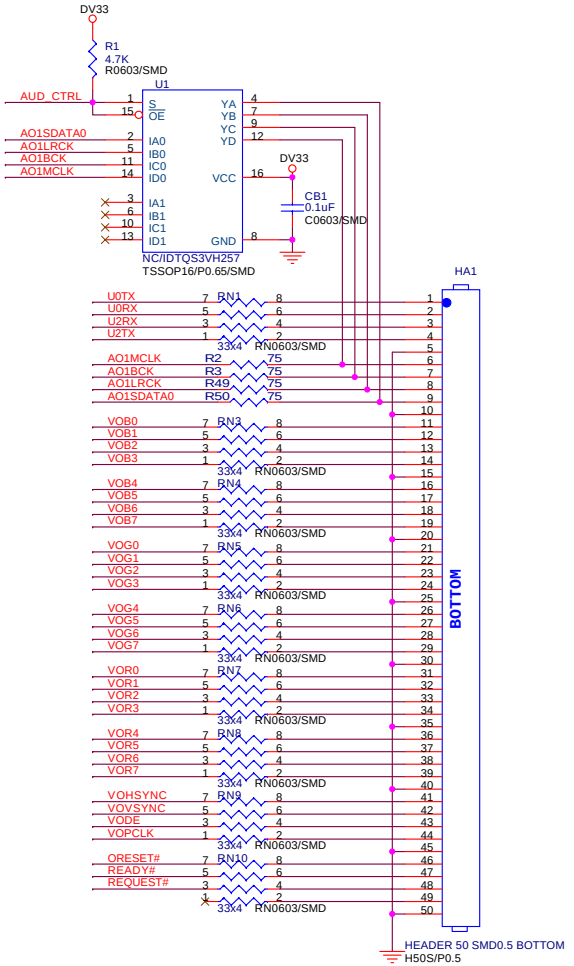
NAME	TYPE	DEVICE
+12V	POWER +12V	POWER SUPPLY
+5V	POWER +5V	POWER SUPPLY
+5V_tuner	POWER +5V	TUNER POWER
DV33_DM	POWER +3V3	MT5111 POWER
DV18	POWER +1V8	MT5111 POWER
DV33	POWER +3V3	MT5351 POWER
AV33	POWER +3V3	MT5351 ANALOG POWER
DV25	POWER +2V5	MT5351 DDR POWER
DV12	POWER +1V2	MT5351 POWER
GND	GROUND	GROUND



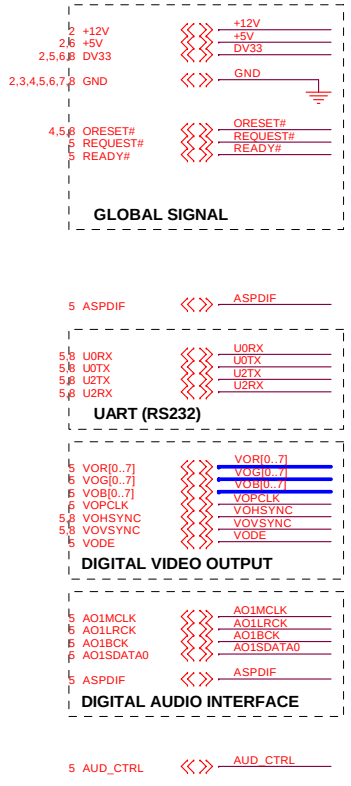
SPDIF CIRCUIT



POWER INPUT FROM MAIN BOARD



DIGITAL OUTPUT



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Size: Custom	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
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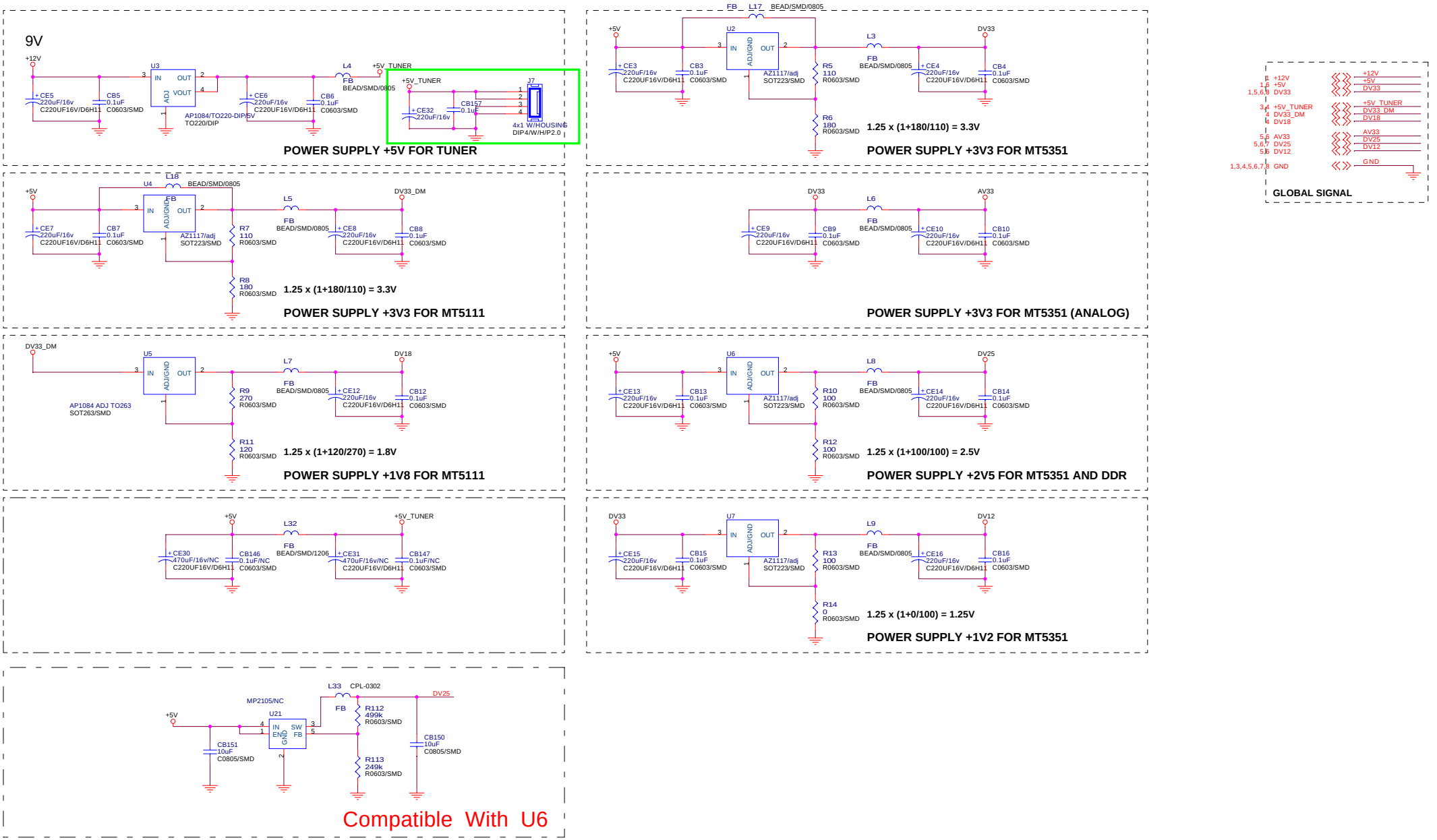

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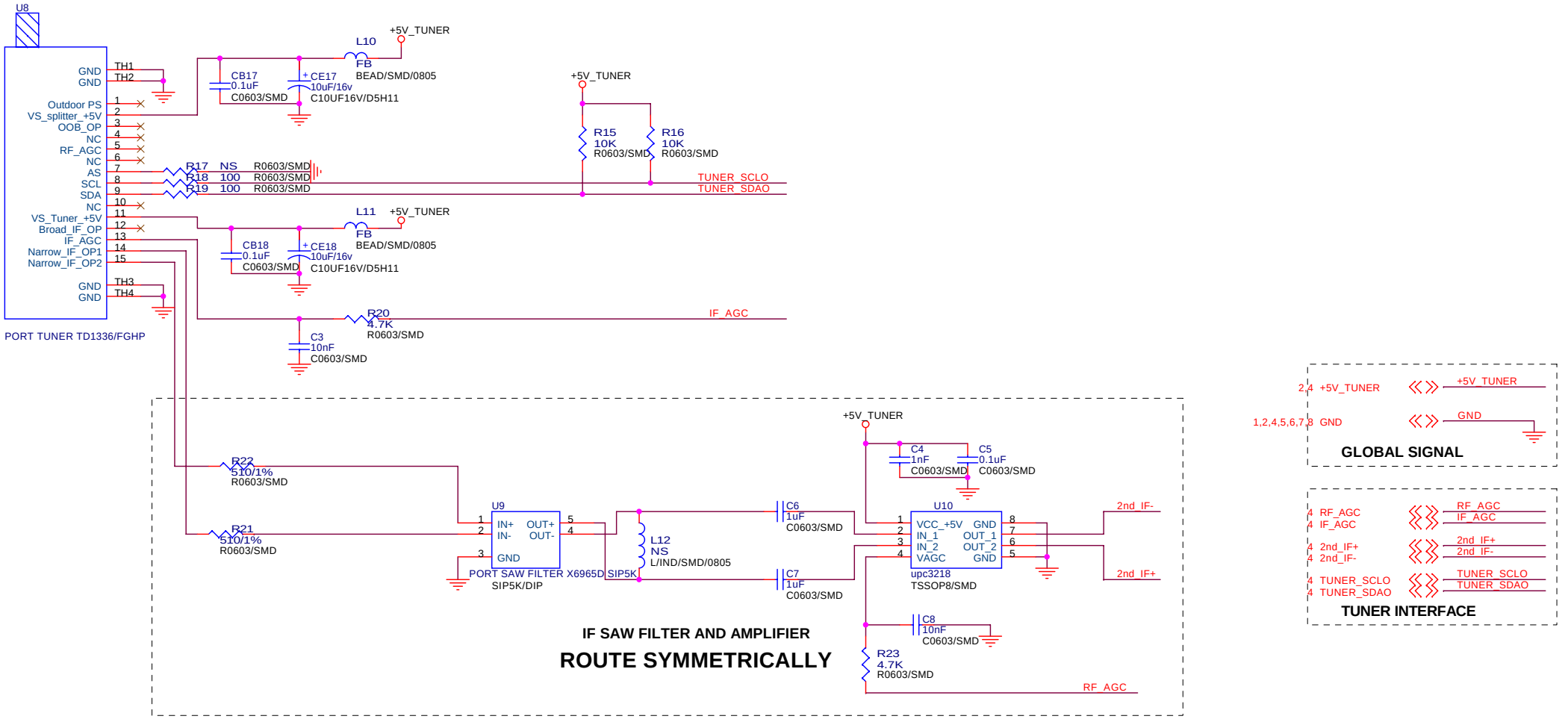

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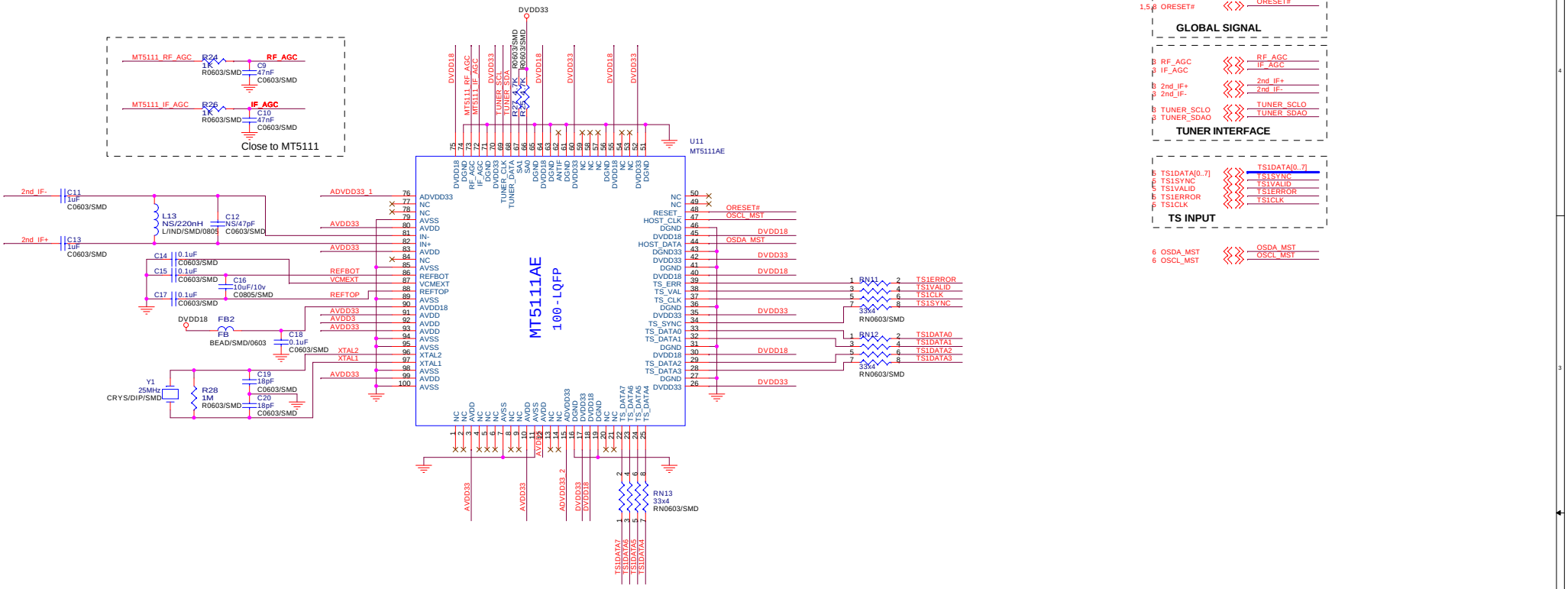

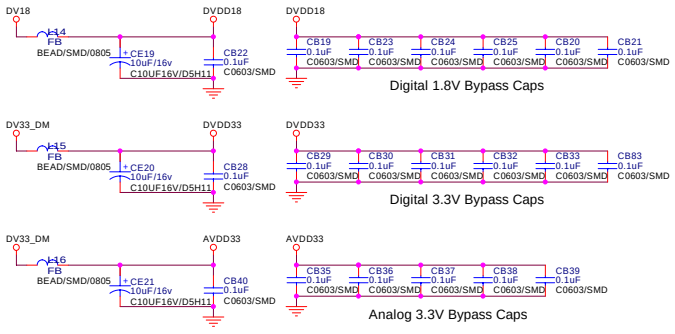

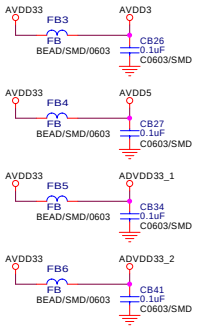

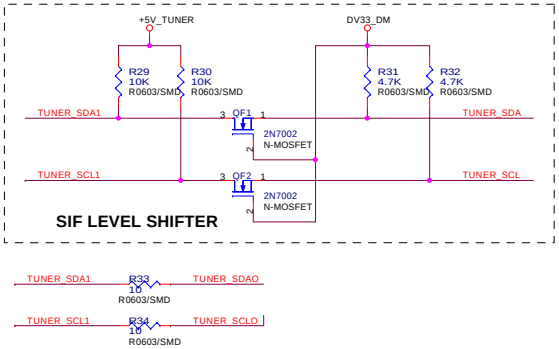

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Size: C	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
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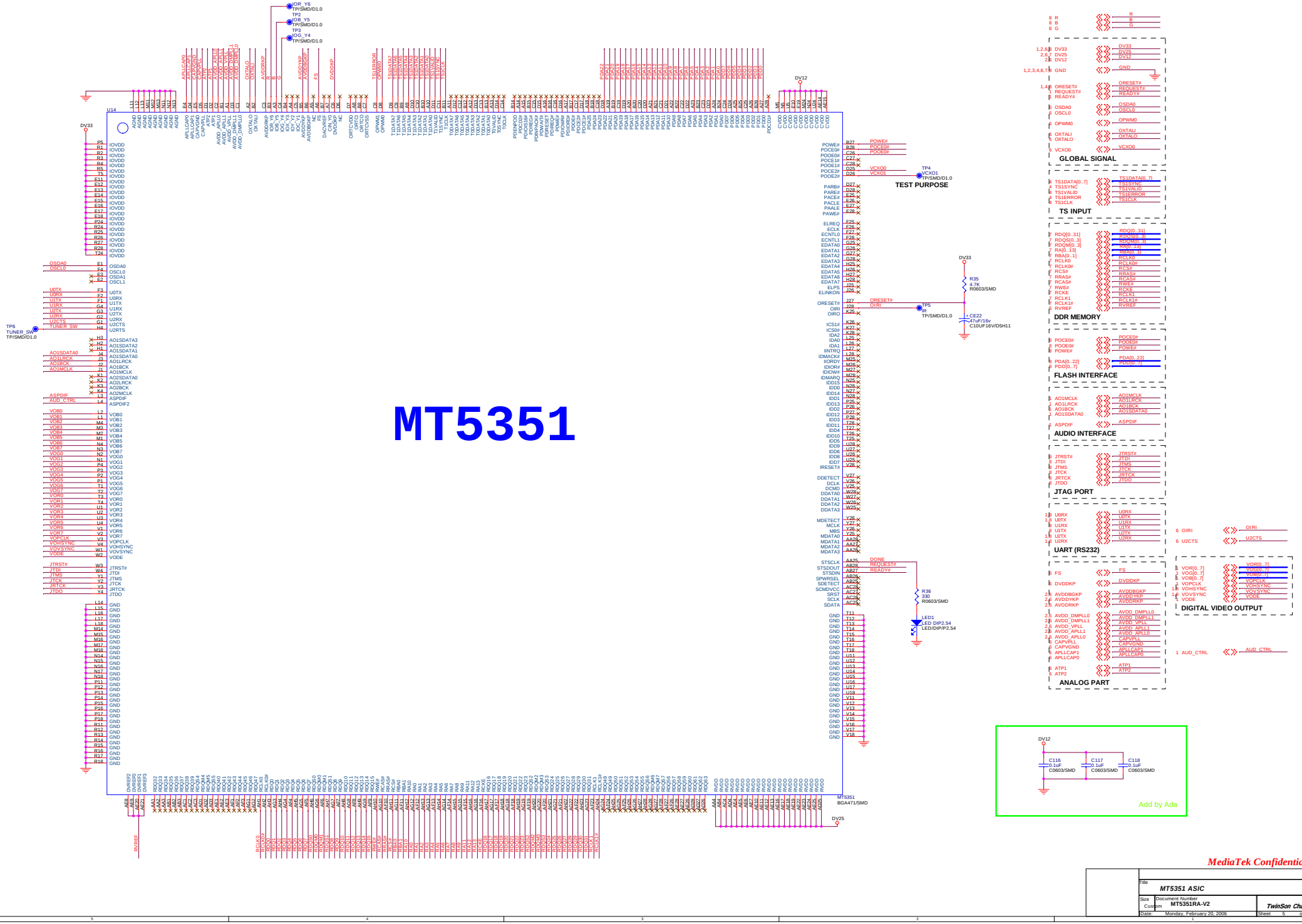

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Title	MT5351 ASIC		
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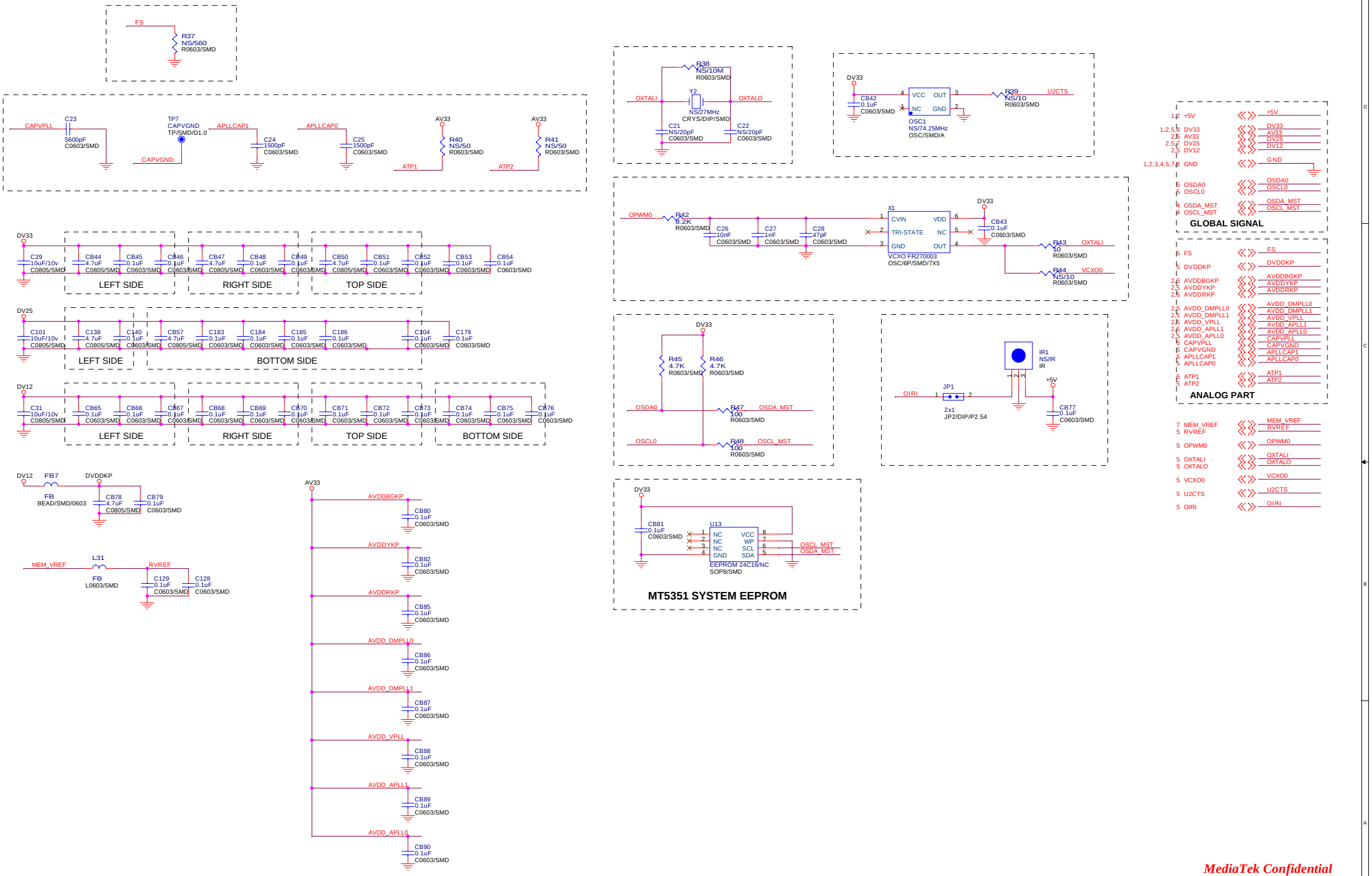

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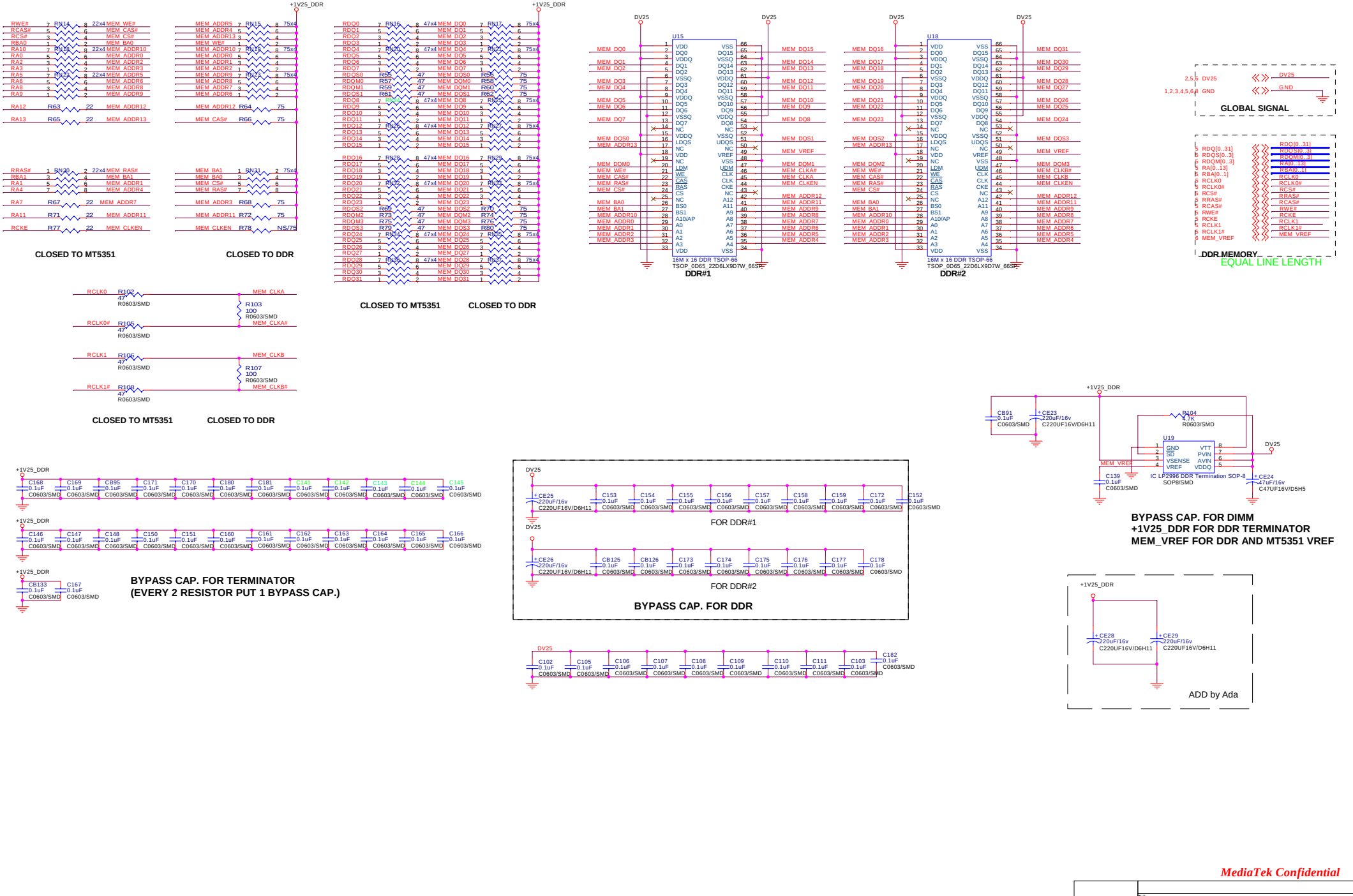

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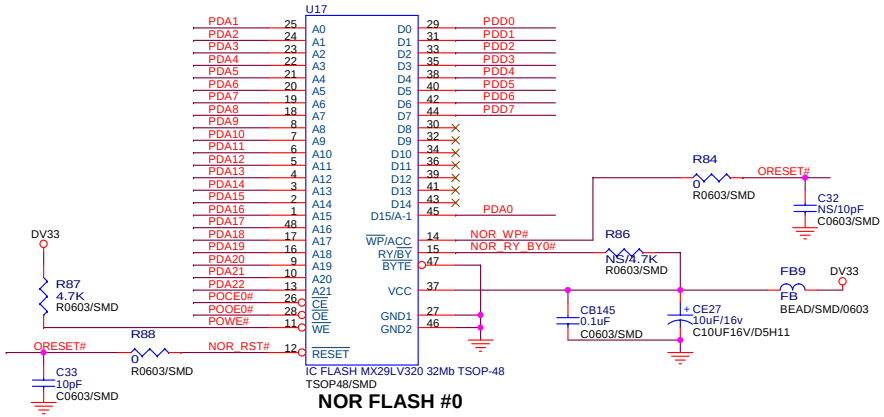

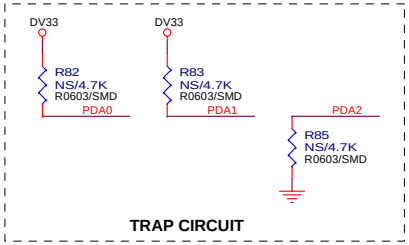

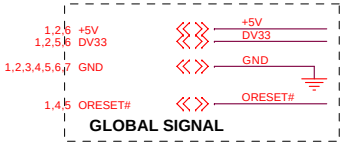

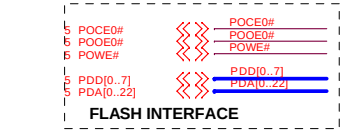

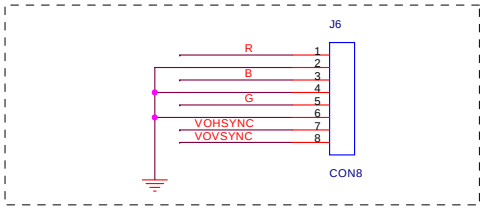

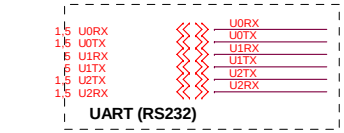

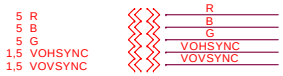

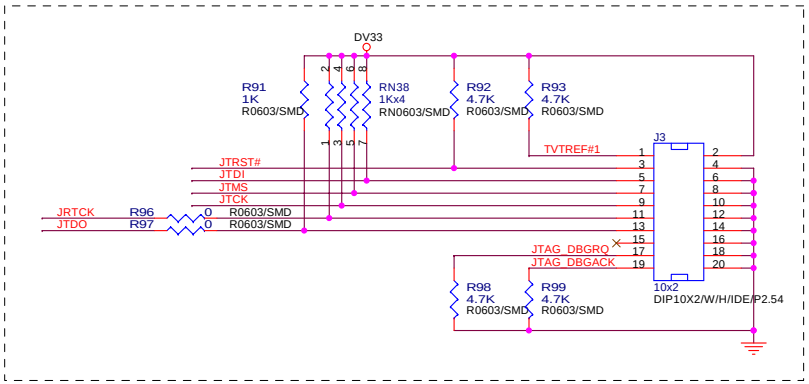

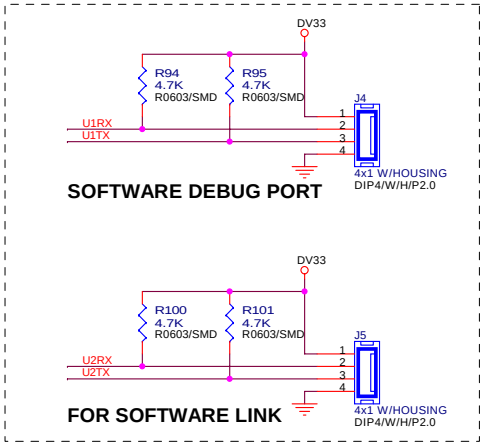

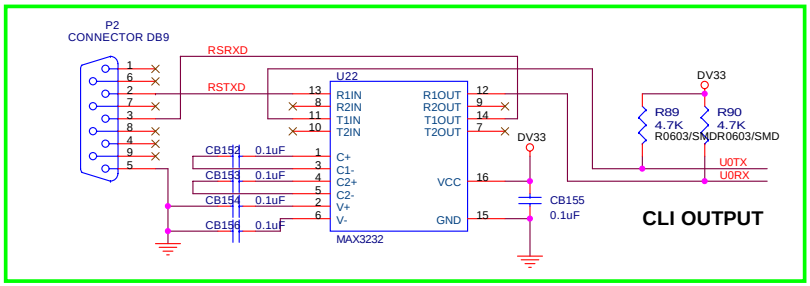

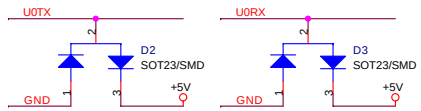

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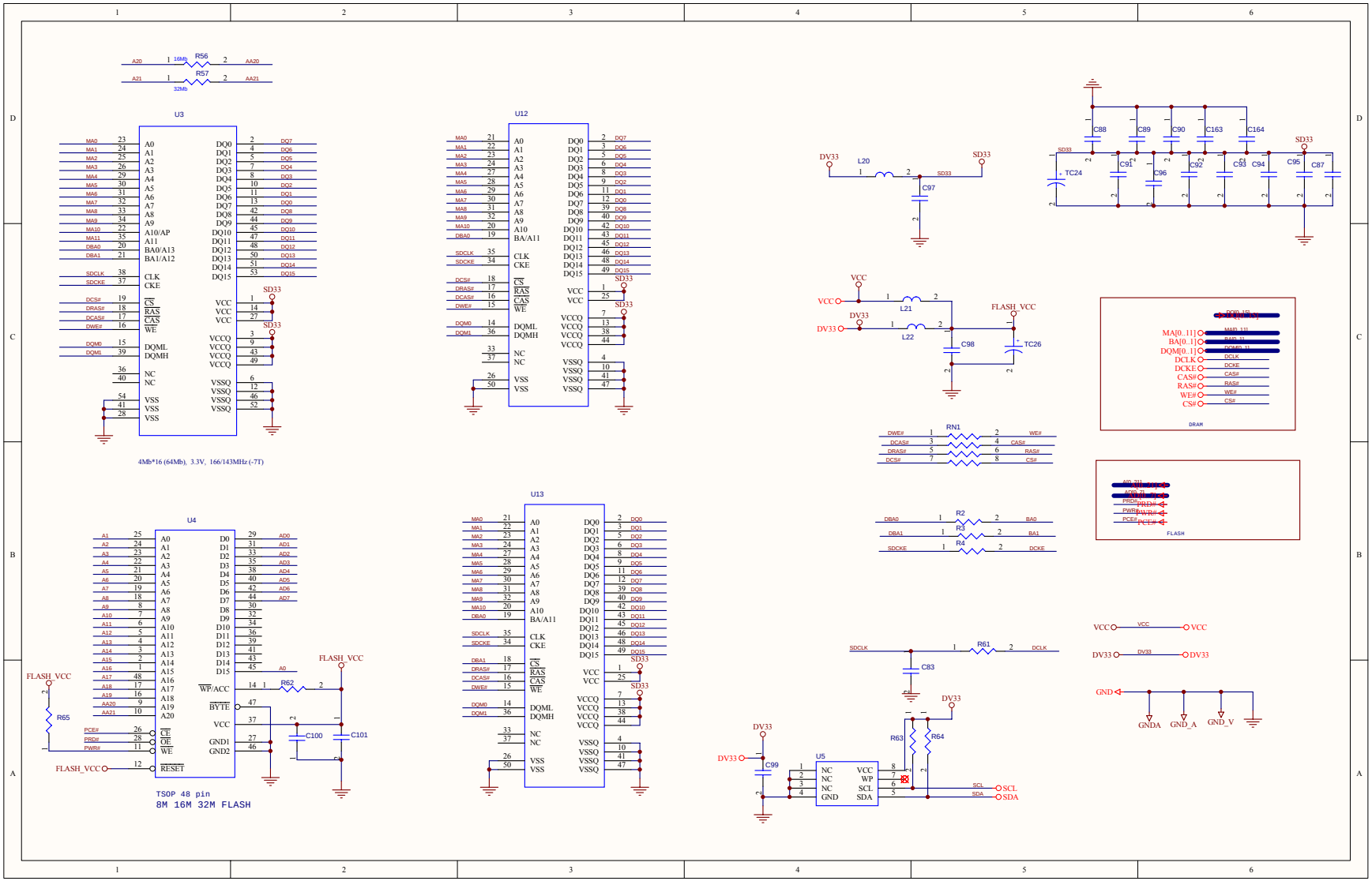
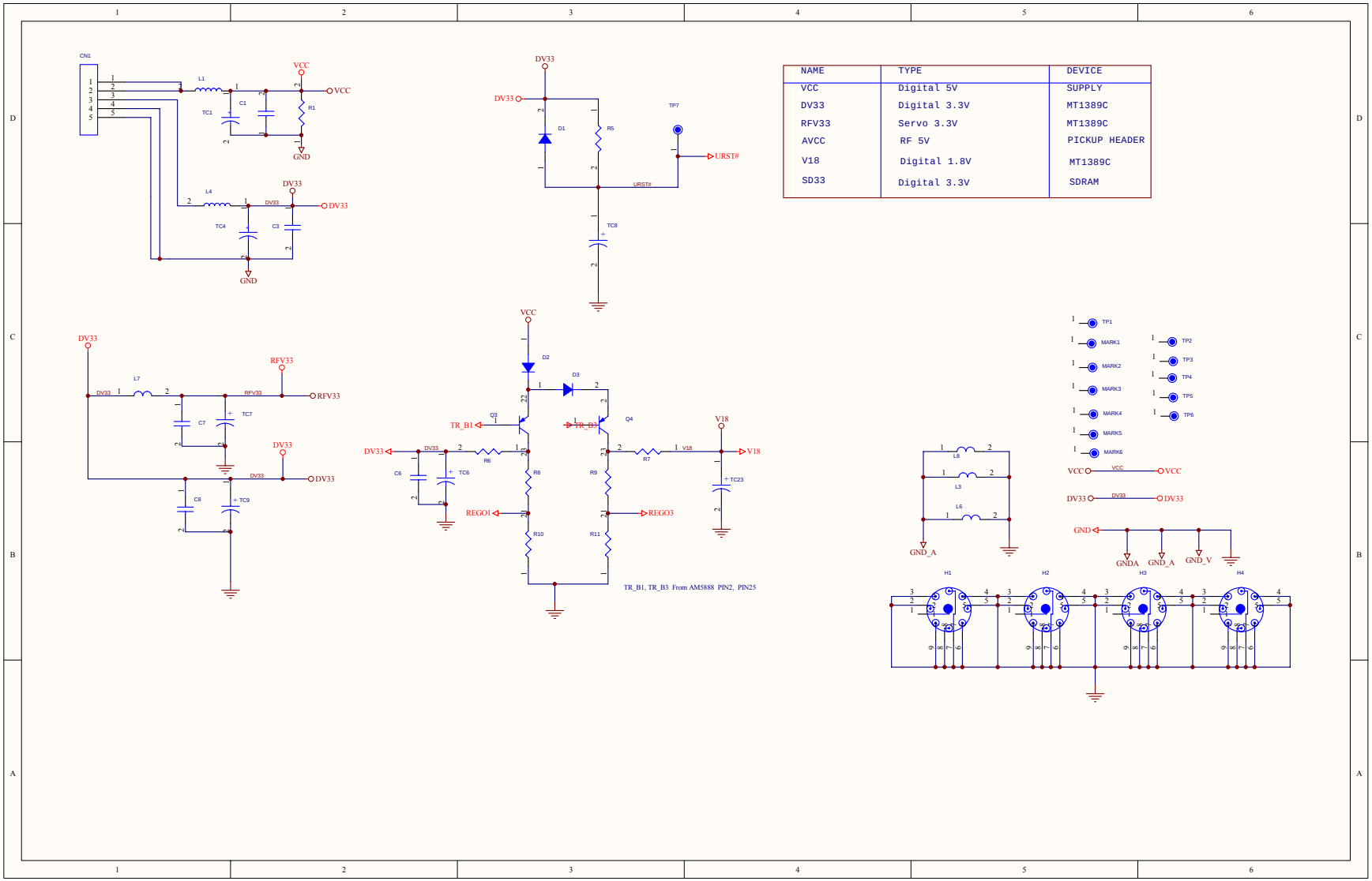
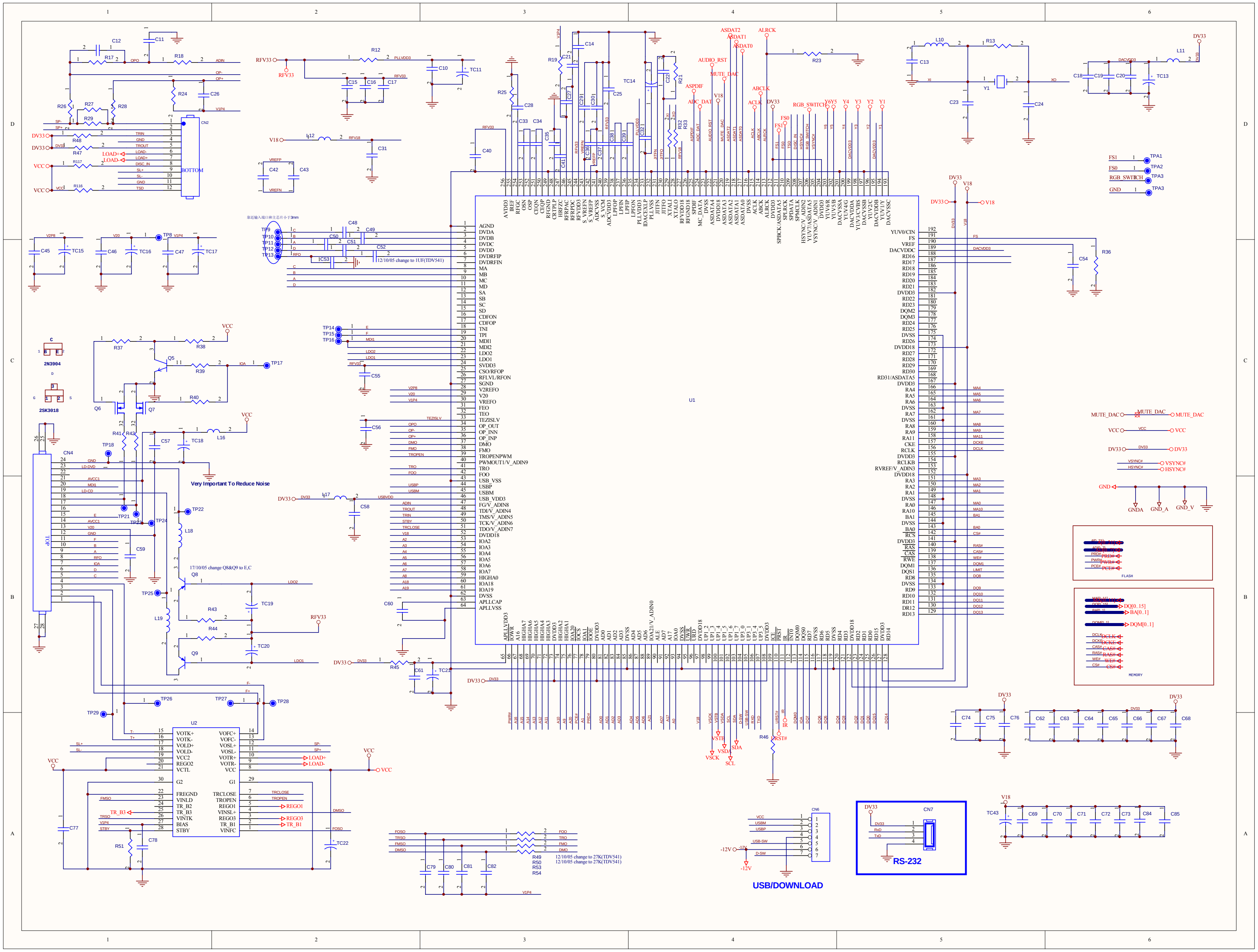
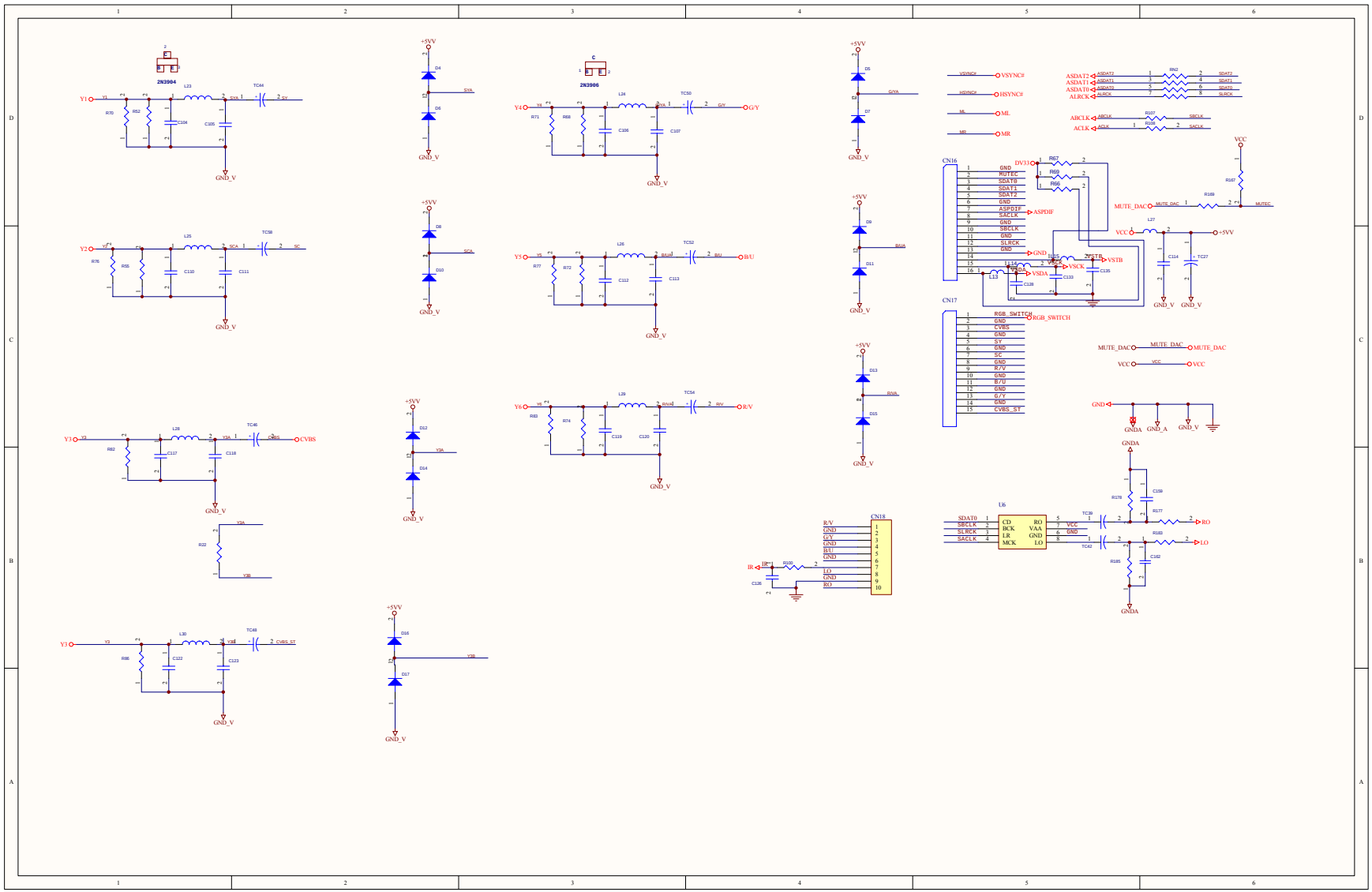

R56
16Mb
R57
32Mb
U3
4Mb*16 (64Mb), 3.3V, 166/143MHz (-7T)
U12
U4
TSOP 48 pin
8M 16M 32M FLASH
U13
U5
RN1
R2
R3
R4
R61
R62
R63
R64
R65
C83
C88
C89
C90
C163
C164
C91
C96
C92
C93
C94
C95
C87
C97
C98
C99
C100
C101
TC24
TC26
L20
L21
L22
SD33
VCC
DV33
FLASH_VCC
GND
GNDA
GND_A
GND_V
SCL
SDA
DRAM
FLASH



NAME	TYPE	DEVICE
VCC	Digital 5V	SUPPLY
DV33	Digital 3.3V	MT1389C
RFV33	Servo 3.3V	MT1389C
AVCC	RF 5V	PICKUP HEADER
V18	Digital 1.8V	MT1389C
SD33	Digital 3.3V	SDRAM





Basic Operations & Circuit Description

MODULE

There are 1 pcs panel and 5 pcs PCB including 3 pcs Extension PCB, 1 pcs Timming controller board and 1 pcs Back Light board in the Module.

SET

There are 6 pcs PCBs including 1 pcs ATV Tuner board, 1 pcs keypad board, 1 pcs Remote Control Receiver board, 2 pcs L/R Speakers and 1 pcs Main(Video)board, 1 pcs ATSC board in the SET.

PCB funtion

1. Power :

   (1). Input voltage: AC 120V, 60Hz.

   (2). To provide power for PCBs.

2. Main board : To converter TV signals, S signals, AV signals, Y Pb/Cb Pr/Cr signals, DVI/HDMI signals and D-SUB signals to digital ones and to transmit to Control board.

3. Control board : Dealing with the digital signal for output to panel.

4. Extension board : Output addressing signals.

5. ATV Tuner Board : To convert TV RF signal to video and SIF audio signal to Main board.

6. ATSC Board : Receiver and converter ATSC TV signal to transmit to main board.

PCB failure analysis

1. CONTROL : a. Abnormal noise on screen. b. No picture.
2. MAIN : a. Lacking color, Bad color scale.
   b. No voice. (Make sure status: Mute / Internal, External speaker)
   c. No picture but with signals output, OSD and back light.
   d. Abnormal noise on screen.
3. POWER : NO picture, no power output.
4. Back Light : a. No picture.
   b. Flash on screen.
   c. Darker picture with signals.
5. ATV Tuner : a. No ATV Noise
   b. No ATV signals
6. ATSC: a No ATSC TV signal

Main IC Specifications

- M13S128168A (ESMT)
  2M x 16 Bit x 4 Banks Double Data Rate SDRAW

- MT5111CE
  Single-Chip HDTV/CATV Demodulator

- MT5351
  MT5351 is a DTV Backend Decoder SOC which support flexible transport demux, HD MPEG-2 video decoder, MPEG1,2, MP3, AC3 audio decoder, HDTV encoder. MT5351 is powered by ARM 926EJ with 16K I-Cache and 16K D-Cache. It can support 64Mb to 1Gb DDR DRAM devices with configurable 32/64 bit data bus interface.

- MT8202
  MT8202G is a highly integrated Single-Chip for LCD TV supporting video input and output format up to HDTV. It includes 3D comb filter TV decoder to retrieve the best image from popular composite signals.

- MT8293
  HDMI PanelLink Cinema Receiver

- R2S15102NP
  Digital Power Amplifier R2S15102NP

- WM8776
  24-bit, 192kHz Stereo CODEC with 5 Channel I/P Multiplexer

MT5111CE
Single-Chip HDTV/CATV Demodulator

Key Features

- Compliant with ATSC digital television standard
- Supports SCTE DVS-031 and ITU J.83 Annex B digital CATV standard
- Accepts direct IF (44 MHz or 43.75MHz) and low IF (5.38MHz)
- Differential IF input with programmable input signal level: 0.5Vpp to 2Vpp
- NTSC interference rejection capability
- Compensate echo up to -5 to +47*us* range for terrestrial HDTV reception
- On-chip 10-bit ADC for HDTV/CATV demodulator
- On-chip programmable gain amplifier
- 25MHz crystal for clock generation
- On-chip PLL clock generation
- Full-digital timing recovery, no VCXO is required
- Full-digital frequency offset recovery with wide acquisition range ±1MHz for ATSC and ±250kHz for CATV reception
- Dual digital AGC controls for IF and RF respectively
- MPEG-2 transport stream output in parallel or serial format
- On-chip error rate estimators for TS packets, TCM decoder, and equalizer
- EIA/CEA-909 antenna interface
- Controlled by I^2C interface
- Supports sleep mode to save power consumption
- Core power supply: 1.8V, peripheral power supply: 3.3V
- 100-LQFP package
- Lead Free

Functional Block Diagram

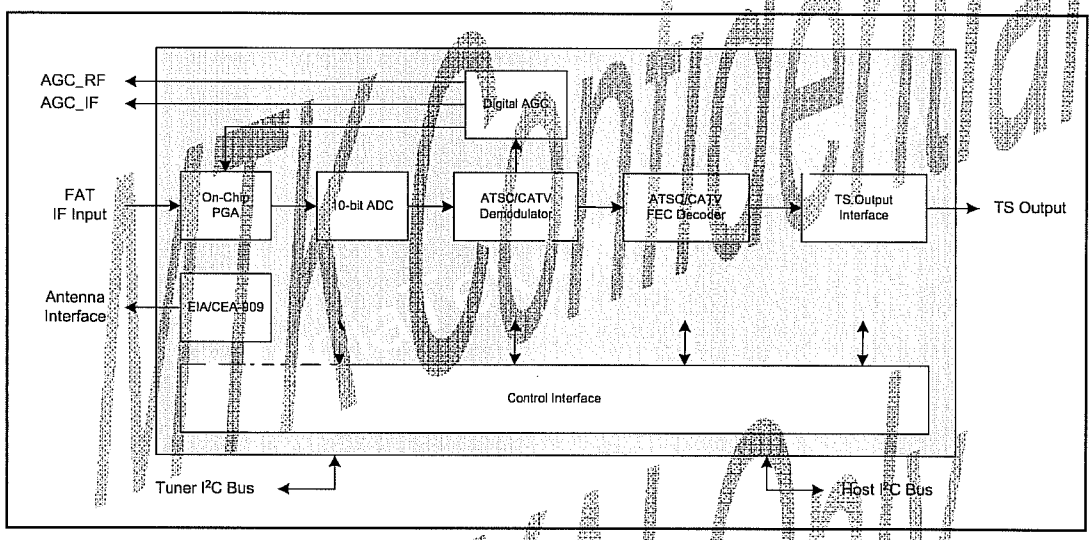


Figure 1: MT5111CE Functional Block Diagram

General Description

MT5111CE is a fully integrated single-chip 8-VSB and 64/256-QAM demodulator. The chip is designed specifically for the digital terrestrial HDTV and CATV receivers, and is fully compliant with ATSC A/53, SCTE DVS-031, and ITU J.83 Annex B standards.

MT5111CE includes a 10-bit A/D converter, 8-VSB/QAM demodulator, TCM (Trellis-Coded Modulation) decoder, and Reed-Solomon Forward Error Correction decoder. Moreover, an internal controller handles the acquisition and tracking to ensure the best receiving performance. The internal controller communicates with the external host controller via the I2C-compatible interface, and also provides direct control to the RF tuner via the second I2C-compatible

interface.

MT5111CE accepts either the direct IF signals centered at 44MHz or 43.75MHz, or the low IF signals centered at 5.38MHz. The center frequency of the incoming IF signal can also be programmed to other frequencies for various applications. An On-chip programmable gain-controlled amplifier is designed to provide sufficient signal amplitude when the received RF signal is weak. The IF signal is first sampled by a 10-bit A/D converter. Afterward, the digitized samples are further processed for adjacent channel interference rejection.

MT5111CE measures the power level of the digitized sequence, and feeds the control voltages back to the RF tuner and the IF amplifier respectively. The control voltages are converted to analog signals through the on-chip 1-bit sigma-delta D/A converters plus the off-chip R-C low-pass filters. The automatic gain control keeps the received power level at a desired level and maximizes the received SNR.

The carrier frequency offset and symbol timing offset are both estimated and compensated by a fully digital synchronizer. The synchronizer also controls the rate conversion in the digital re-sampling device by estimating the sampling frequency offset. All synchronization in MT5111CE are integrated in digital circuits, no external VCXO is required.

The equalizer is adopted to cancel the effect of multi-path fading channel during signal propagation in the air or over cable networks. The equalizer is not only capable of acquiring correct coefficients combination by specified adaptive algorithms, but also programmable to different configurations for various channel conditions.

The following FEC decoder corrects most of the errors by the concatenation

of TCM and Reed-Solomon decoders. For CATV reception, MT5111CE detects and aligns de-puncturing timing of the received sequence. The timing synchronization is also automatically performed to lock the FEC frames. The on-chip error rate estimator can simultaneously monitor the receiving qualities at the three stages: equalizer output, TCM decoder, and transport stream packets. The chip finally outputs the decoded MPEG-2 packets in either the serial or parallel transport stream format.

In addition to the demodulation of HDTV signal, MT5111CE also provides the capability to remove the NTSC co-channel interference. To achieve the best reception condition, an antenna interface compliant with EIA/CEA-909 is designed to control the antenna parameters.

MT5111CE is designed with efficient mechanisms of power saving. When configured to enter the sleep mode by the system host, it can immediately turn off almost all embedded hardware except the on-chip controller to reduce the power consumption. Resuming from sleep mode is also triggered by the system host. Upon returning to the operation mode, the chip will try to re-acquire the DTV signal automatically.

Pin Out

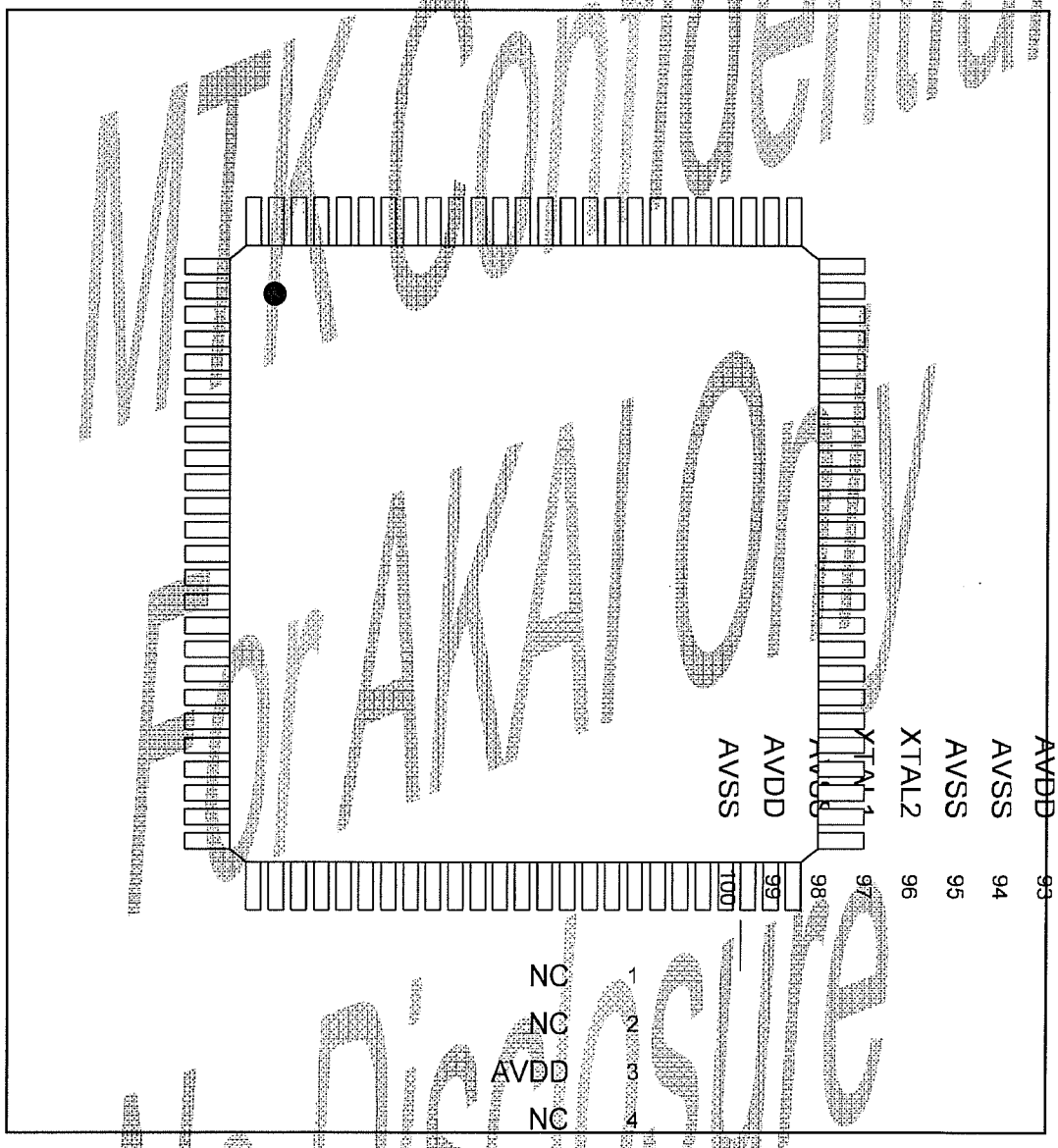


Figure 2: MT5111CE Pin Out

Pin Description

Signal Name	Pin No	I/O	Description
Transport Stream			
TSDATA[7:0]	22,23,24,25,28, 29,32,33,	O	TS data output
TSSYNC	34	O	TS packet start signal
TSVAL	38	O	TS output valid signal
TSCLK	37	O	TS output clock
TSERR	39	O	TS packet error indicator
Analog Signal			
IN+	82	I	Analog differential IF input
IN-	81	I	
REFTOP	88	O	ADC reference top voltage. Decouple with a capacitor to AVSS
REFBOT	86	O	ADC reference bottom voltage. Decouple with a capacitor to AVSS
VCMEXT	87	O	ADC common mode voltage
Antenna Interface			
ANTIF	62	O	CEA-909 Antenna Control Interface
Clock Generation			
XTAL1	97	I	25MHz crystal input
XTAL2	96	I	
Control Signals			
HOST_CLK	47	I	Host processor serial clock input, 5 volt compatible
HOST_DATA	44	I/O	Host processor serial data pin, 5 volt compatible
TUNER_CLK	69	O	Tuner serial clock output, 5 volt compatible
TUNER_DATA	68	I/O	Tuner serial data pin, 5 volt compatible
IF_AGC	72	O	IF AGC output
RF_AGC	73	O	RF AGC output
RESET	48	I	Power reset pin, low active
SA0	66	I	Chip slave address selection pin, tie to VDD3.3 or DGND
SA1	67	I	Chip slave address selection pin, tie to VDD3.3 or DGND
Power Supply			
VDD3.3	17,26,35,42, 52,60,70	P	Digital power supply, tie to 3.3V
VDD1.8	18,30,40,45, 55,64,75	P	Digital power supply, tie to 1.8V
DGND	16,19,27,31, 36,41,43,46,51,56, 61,63,65,71,74	P	Digital ground, tie to digital ground plane
AVDD	3,10,12,80,83,91, 92,93,99	P	Analog power supply, tie to 3.3V
AVSS	7,11,79,85,89,94, 95,98,100		Analog ground, tie to analog ground plane
ADVDD3.3	15,76	P	Digital power supply for analog component, tie to 3.3V
AVDD1.8	90	P	Digital power supply for analog component, tie to 1.8V
Others			
NC	1,2,4,5,6,8,9,13,14, 20,21,49,50,53,54, 57,58,59,77,78,84		Not Connected

Table 1: Pin Description

Electrical Characteristic

Recommended Operating Condition

Symbol	Description	Min	Typical	Max	Unit
Tj	Chip Junction Temperature	-	-	125	°C
VDD1.8	1.8V Digital Core Power Supply Voltage	1.62	1.8	1.98	Volt
AVDD	3.3V Analog Power Supply Voltage	3.15	3.3	3.45	Volt
VDD3.3	3.3V Digital IO Power Supply Voltage	3	3.3	3.6	Volt
AVDD1.8	1.8V Analog Power Supply Voltage	1.7	1.8	1.9	Volt
VIH	Digital Input High Voltage	3	3.3	3.6	Volt
VIL	Digital Input Low Voltage	-	0	-	Volt

Table 2: Recommend Operating Condition

Typical Current and Power Dissipation (ASTC Mode)

Symbol	Description	Typical	Unit
I_VDD1.8	1.8V Digital Core Power Supply Current	350	mA
I_AVDD	3.3V Analog Power Supply Current	70	mA
I_VDD3.3	3.3V Digital I/O Power Supply Current	16	mA
I_AVDD1.8	1.8V Analog Power Supply Current	2	mA
P_VDD1.8	1.8V Digital Core Power Dissipation	630	mW
P_AVDD	3.3V Analog Power Dissipation	231	mW
P_VDD3.3	3.3V Digital IO Power Dissipation	52.8	mW
P_AVDD1.8	1.8V Analog Power Dissipation	3.6	mW
P_Total	Total Power Dissipation	917.4	mW
P_Sleep	Total Power Dissipation (Sleep Mode)	130	mW

Table 3: Typical Current and Power Dissipation (ATSC Mode)

Typical Current and Power Dissipation (QAM Mode)

Symbol	Description	Typical	Unit
I_VDD1.8	1.8V Digital Core Power Supply Current	175	mA
I_AVDD	3.3V Analog Power Supply Current	70	mA
I_VDD3.3	3.3V Digital I/O Power Supply Current	19	mA
I_AVDD1.8	1.8V Analog Power Supply Current	2	mA
P_VDD1.8	1.8V Digital Core Power Dissipation	315	mW
P_AVDD	3.3V Analog Power Dissipation	231	mW
P_VDD3.3	3.3V Digital IO Power Dissipation	62.7	mW
P_AVDD1.8	1.8V Analog Power Dissipation	3.6	mW
P_Total	Total Power Dissipation	612.3	mW
P_Sleep	Total Power Dissipation (Sleep Mode)	130	mW

Table 4: Typical Current and Power Dissipation (QAM Mode)

MEDIATEK

MT8293

Specifications are subject to change without notice

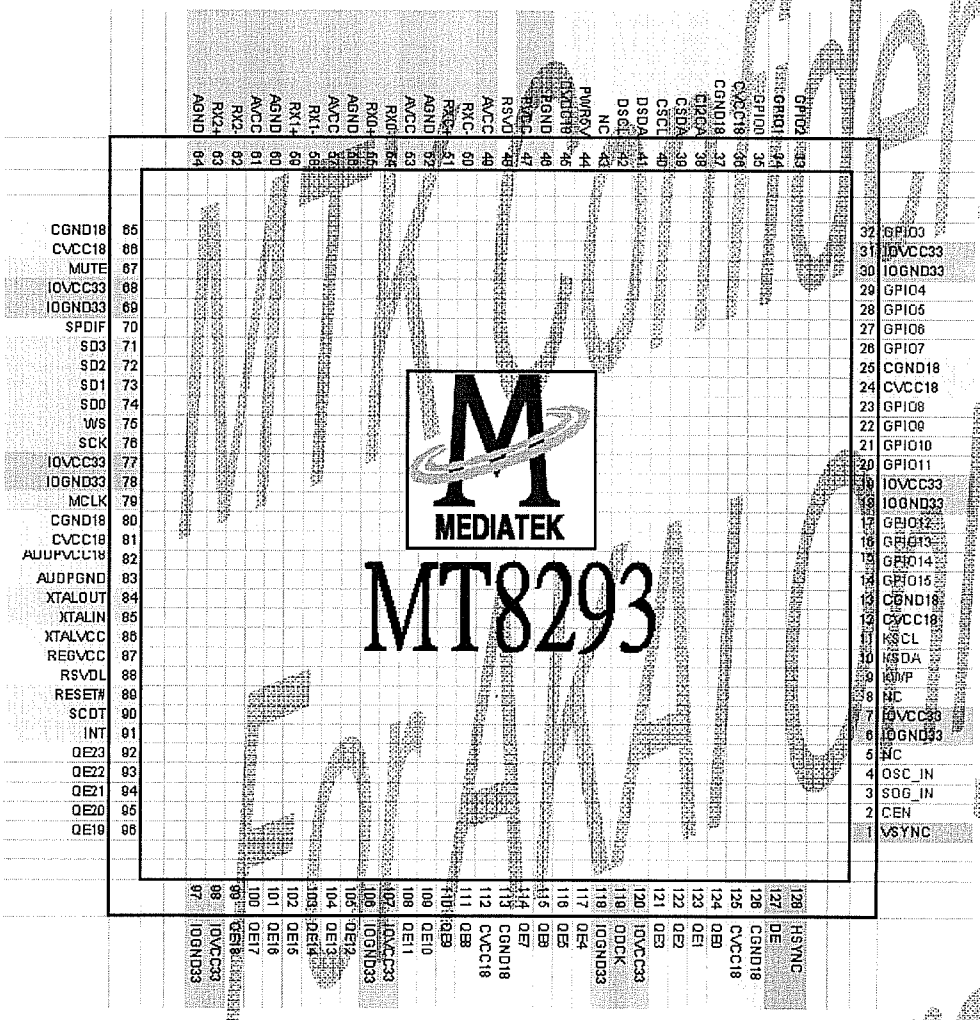
HDMI PanelLink Cinema Receiver

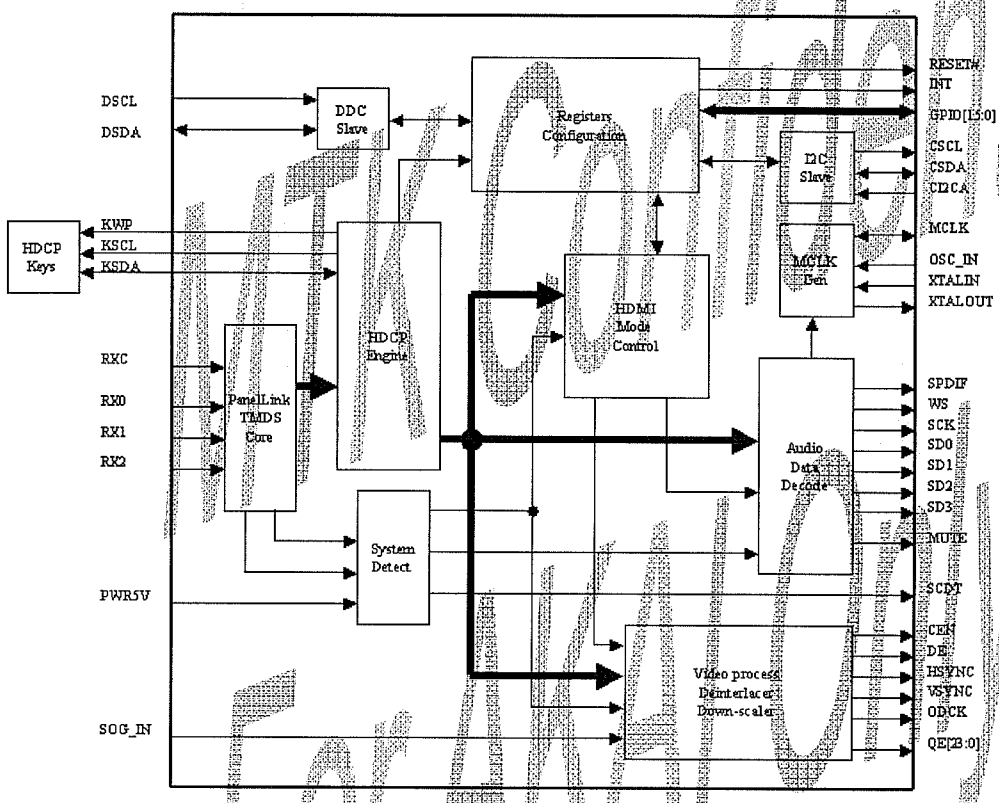
MT8293 is a low-cost, fully HDMI-compliant receiver that fits directly into home theater products such as LCD TVs, plasma TVs and HDTVs. The receiver is capable of supporting bandwidths up to 165MHz and video resolutions up to 1080p and UXGA. The MT8293 supports the DVD-Audio standard, including 7.1- surround audio at 96kHz and stereo audio at 192kHz.

The built-in High-bandwidth Digital Content Protection (HDCP) decryption engine secures the digital link for transmission of valuable high-definition video and audio.Built-in HDCP self-test engine simplifies manufacturing testing.

FEATHRES

- Industry-Standard
  - HDMI 1.1
  - DVI 1.0
  - EIA/CEA-861B
  - HDCP 1.1
- Digital Video Output
  - Integrated PanelLink Core
  - Supports DTV (480i/576i/480p/576p/720p/1080i/1080p) and PC (VGA/XGA/SXGA/UXGA) resolution up to 165MHz (using dual edge to transmit video data for pixel clock over 112MHz)
  - Flexible digital video interface
    - 24-bit RGB/YCbCr 4:4:4
    - 16-bit YCbCr 4:2:2
    - 8-bit YCbCr 4:2:2 (ITU-R BT.656)
  - Integrated RGB <-> YCbCr color space conversion (both 601 and 709)
  - 4:2:2 <-> 4:4:4 converter
  - Integrated Deinterlacer for 480i/576i (SDTV only)
  - Integrated Down-Scaler (with CEN)
- Digital Audio Output
  - Industry-standard S/PDIF and 3-wire output
  - Supports high-end audio including DVD-Audio
    - 2-ch. 32-192kHz or
    - 8-ch. 32-96kHz
  - Programmable 3-wire output supports numerous low-cost I2S audio DACs
  - Supports IEC60958 2-channel PCM
  - Capable of carrying IEC61937 compressed audio (Dolby Digital, DTS, etc.)
- Content Protection
  - Integrated HDCP cipher engine
  - External EEPROM for encrypt HDCP keys
  - Built-in HDCP self-test
  - Decrypts both video and audio
- System Operation
  - Register-programmable via slave I2C interface
  - Auto video mode
  - Auto audio mode
  - Flexible interrupt registers with interrupt pin
- Power Management
  - 1.8V core provides low-power operation
  - Flexible power-down modes
- Outline
  - 128-pin QFP package





Item	Symbol	Pin #	Type	Description
DIGITAL				
Power/Ground (45)				
1	CVCC18	12,24,36,45,66,81,112,125	I	Digital Logic 1.8V power
2	CGND18	13,25,37,65,80,113,126	I	Digital Logic ground
3	IOVCC33	7,19,31,68,77,98,107,120	I	Input/Output Pin 3.3V power
4	IOGND33	6,18,30,69,78,97,106,118	I	Input/Output Pin ground
5	AVCC	49,53,57,61	I	TMDS Analog 3.3V power
6	AGND	52,56,60,64	I	TMDS Analog ground
7	PVCC	47	I	TMDS PLL 3.3V power
8	PGND	46	I	TMDS PLL ground
9	AUDPVCC18	82	I	ACR PLL 1.8V power
10	AUDPGND	83	I	ACR PLL ground
11	XTALVCC	86	I	ACR PLL crystal input 3.3V power
12	REGVCC	87	I	ACR PLL regulator 3.3V power
Configuration/Programming (20)				
1	INT	91	O	Interrupt output
2	RESET#	89	I	Reset Pin. Active low
3	DSCL	42	I	DDC I2C clock, 5V tolerance
4	DSDA	41	I/O	DDC I2C data, 5V tolerance
5	CSCL	40	I	Configuration I2C clock
6	CSDA	39	I/O	Configuration I2C data
7	KSCL	11	O	KEYS EEPROM I2C clock
8	KSDA	10	I/O	KEYS EEPROM I2C data
9	KWP	9	O	KEYS EEPROM write protect
10	SCDT	90	O	Indicates active video at HDMI input port
11	CISCA	38	I	I2C device address select

Item	Symbol	Pin #	Type	Description
12	PWR5V	44	I	TMDS port transmitter detect (hot plug), 5V tolerance
13	RSVDL	88	I	Must be tied low
14	RSVD	48	O	
15	NC	43	-	No connect
16	NC	8,5	-	No connect
17	OSC_IN	4	I	Oscillator input, External in
18	SOG_IN	3	I	SOG input, External AD in
19	CEN	2	O	Clock enable, for 8202 CEN input
Digital Audio Interface (9)				
1	MCLK	79	I/O	Audio master clock input reference
2	SCK	76	O	I2S serial clock output
3	WS	75	O	I2S word select output
4	SD0	74	O	I2S serial data output
5	SD1	73	O	I2S serial data output
6	SD2	72	O	I2S serial data output
7	SD3	71	O	I2S serial data output
8	SPDIF	70	O	S/PDIF audio output
9	MUTE	67	O	Mute audio output
GPIO Interface (16)				
1	GPIO0	35	I/O	GPIO
2	GPIO1	34	I/O	GPIO
3	GPIO2	33	I/O	GPIO

Item	Symbol	Pin #	Type	Description
4	GPIO3	32	I/O	GPIO
5	GPIO4	29	I/O	GPIO
6	GPIO5	28	I/O	GPIO
7	GPIO6	27	I/O	GPIO
8	GPIO7	26	I/O	GPIO
9	GPIO8	23	I/O	GPIO
10	GPIO9	22	I/O	GPIO
11	GPIO10	21	I/O	GPIO
12	GPIO11	20	I/O	GPIO
13	GPIO12	17	I/O	GPIO
14	GPIO13	16	I/O	GPIO
15	GPIO14	15	I/O	GPIO
16	GPIO15	14	I/O	GPIO
TTL Interface (28)				
1	DE	127	O	Data enable
2	VSYNC	1	O	Vertical sync
3	HSYNC	128	O	Horizontal sync
4	ODCK	119	O	Output data clock
5	QE0	124	O	24-bit Even pixel
6	QE1	123	O	24-bit Even pixel
7	QE2	122	O	24-bit Even pixel

Item	Symbol	Pin #	Type	Description
8	QE3	121	O	24-bit Even pixel
9	QE4	117	O	24-bit Even pixel
10	QE5	116	O	24-bit Even pixel
11	QE6	115	O	24-bit Even pixel
12	QE7	114	O	24-bit Even pixel
13	QE8	111	O	24-bit Even pixel
14	QE9	110	O	24-bit Even pixel
15	QE10	109	O	24-bit Even pixel
16	QE11	108	O	24-bit Even pixel
17	QE12	105	O	24-bit Even pixel
18	QE13	104	O	24-bit Even pixel
19	QE14	103	O	24-bit Even pixel
20	QE15	102	O	24-bit Even pixel
21	QE16	101	O	24-bit Even pixel
22	QE17	100	O	24-bit Even pixel
23	QE18	99	O	24-bit Even pixel
24	QE19	96	O	24-bit Even pixel
25	QE20	95	O	24-bit Even pixel
26	QE21	9	O	24-bit Even pixel
27	QE22	93	O	24-bit Even pixel
28	QE23	92	O	24-bit Even pixel

Item	Symbol	Pin #	Type	Description
ANALOG (8)				
Differential signal				
1	RXC+	51	I	TMDS input clock pair
1	RXC-	50	I	TMDS input clock pair
1	RX0	55	I	TMDS input data pair
1	RX0	54	I	TMDS input data pair
1	RX1	59	I	TMDS input data pair
1	RX1	58	I	TMDS input data pair
1	RX2	63	I	TMDS input data pair
1	RX2	62	I	TMDS input data pair
PLL group(2)				
68	XTALIN	85	I	Crystal input PAD
69	XTALOUT	84	O	Crystal output PAD

MEDIATEK

MT8202

HDTV-Ready LCD TV Chip

Specifications are subject to change without notice.

MT8202 is a highly integrated single chip for LCD TV supporting video input and output format up to HDTV. It includes 3D comb filter TV decoder to retrieve the best image from popular composite signals. Embedded HDTV/VGA decoders let the high bandwidth input signals perfectly reproduced. 24/16/8 bits digital port may accept all kinds of external digital input video source. New 2nd generation advanced motion adaptive de-interlacer converts accordingly the interlace video into progressive one with overlay of a 2D Graphic processor. Advanced full function color processing with fully 10-bit path provides high quality video contents. Independent two Flexible scalers provide wide adoption to various LCD panels for two of different video sources at the same time. Its on-chip audio processor decodes analog signals from tuner with lip sync control, delivering high quality post-processed sound effect to customers. On-chip microprocessor reduces the system BOM and shortens the schedule of UI design by high level C program. MT8202 is a cost-effective and high performance HDTV-ready solution to LCD TV manufactures.

FEATURES

- Video Input
  - Support fully programmable 8 Composite/SV input pins
  - Support 2 Component inputs with SDTV format & HDTV 480p/720p/1080i format
  - Support 1 VGA input up to SXGA (1280x1024x75Hz) including SOG signals
  - Support DVI 24-bit RGB digital input
  - Support CCIR-656/601 digital input
- TV decoder
  - Full 10-bit data path to enhance the video resolution and reduce digital truncation errors
  - Support PAL(B,G,D,H,M,N,I,Nc), PAL(Nc), PAL, NTSC, NTSC-4.43, SECAM
  - Automatic Luma/Chroma gain control
  - Automatic TV standard detection
  - 2nd generation NTSC/PAL Motion Adaptive 3D comb filter with huge improvement
  - Motion Adaptive 3D Noise Reduction
  - VBI decoder for Closed-Caption/XDS/ Teletext/WSS/VPS
  - High speed advanced Teletext/Closed-Caption drawing engine directly on OSD plane
  - Macrovision detection
  - Adjustable horizontal delay for combination of SCART Composite/RGB input
- Video Processor
  - Fully 10-bit processing to enhance the video quality
  - Advanced flesh tone and color processing
  - Gamma/anti-Gamma correction
  - Advanced Color Transient Improvement (CTI)
  - 2D Peaking
  - Advanced horizontal/vertical sharpness
  - Saturation/hue adjustment
  - Brightness and contrast adjustment
  - Black level extender
  - White peak level limiter
  - Adaptive Luma/Chroma management
  - Automatic detect film or video source
  - 3:2/2:2 pull down source detection
  - 2nd generation Advanced Motion adaptive de-interlacing
  - Arbitrary ratio vertical/horizontal scaling of video, from 1/32X to 32X
  - Advanced linear and non-linear Panorama scaling
  - Programmable Zoom viewer
  - Progressive scan output
  - Picture-in-Picture (PIP)
  - Picture-Out-Picture (POP)
  - Advanced dithering processing for LCD display with 6/8/10 bit output
  - Frame rate conversion, 50Hz to 75Hz
- Audio DSP
  - Support BTSC/EIAJ/A2/NICAM decode
  - Stereo demodulation, SAP demodulation

- Noise reduction
- Mode selection (Main/SAP/Stereo)
- Pink noise and white noise generator
- Equalizer
- Sub-woofer/Bass enhancement
- Noise auto mute
- 3D surround processing include virtual surround
- Audio and video lip synchronization
- Support Reverberation

Audio Input/Output

- Decode audio AF from Tuner
- 2 channel audio L/R digital line in
- 7.1-channel slave digital line in
- Including full 7.1-channels digital output, 2-channel bypass and 2-channel headphone output
- Embedded 3 internal DAC output

DRAM Controller

- Supports up to 32M-byte SDR/DDR DRAM
- Supports 2x16 bit SDR/DDR bus interfaces
- Build in a DRAM interface programmable clock to optimize the DRAM performance
- Programmable DRAM access cycle and refresh cycle timings
- Support 3.3/2.5-Volt SDR/DDR Interface

Video Output

- TV pattern generator for testing
- Interlaced 50Hz to 120Hz
- Support up to 1366 horizontal points
- 6/8/10-bit single channel or 6/8/10-bit dual channel LVDS output
- Support video output mirror and upside down

2D-Graphic/3 OSD processor

- Embedded Two backend RGB domain OSD planes and one YUV domain OSD
- Support Text/Bitmap decoder
- Support line/rectangle/gradient fill
- Support bitblt
- Support color Key function
- Support Clip Mask
- Support Alpha blending with video output
- 65535/256/16/4/2-color bitmap format OSD,
- Automatic vertical scrolling of OSD image
- Support OSD mirror and upside down

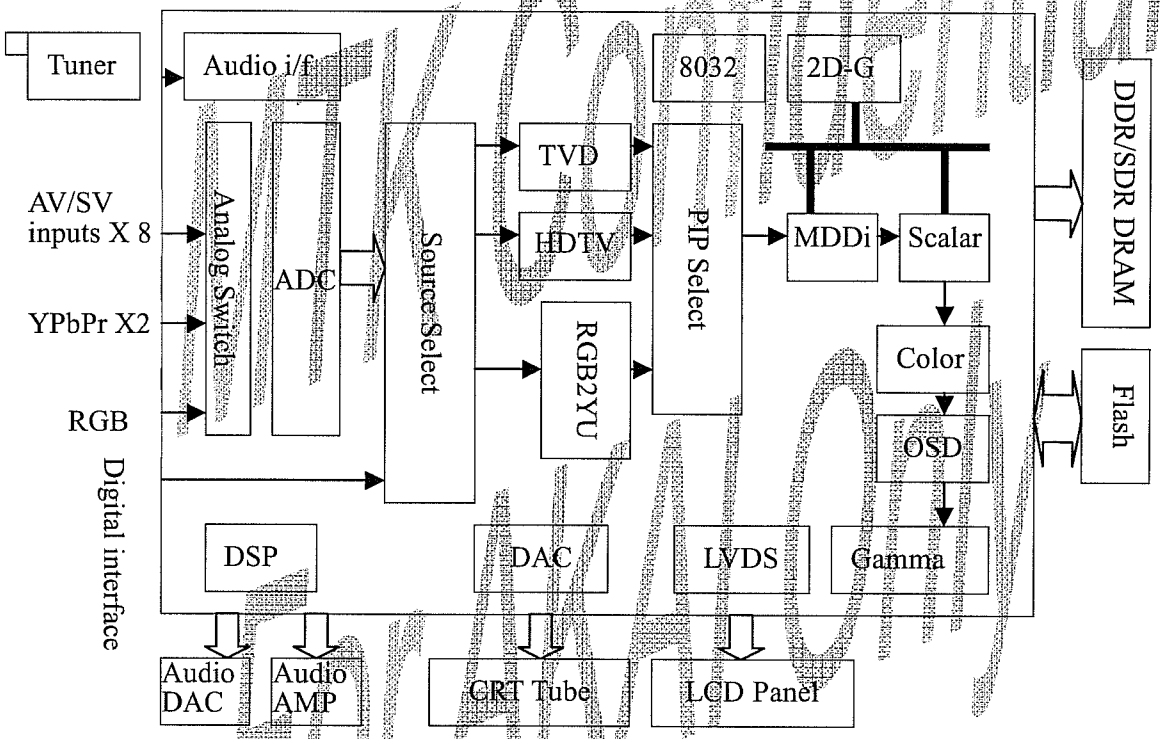
Host Micro controller

- Turbo 8032 micro controller
- Built-in internal 373 and 8-bit programmable lower address port
- 2048-bytes on-chip RAM
- Up to 4M bytes FLASH-programming interface
- Supports 5/3.3-Volt FLASH interface
- Supports power-down mode
- Supports additional serial port
- IR control serial input
- Support 2 RS232 interface for external source communication
- Support 2 PWM output
- Support DDC2Bi/DDC2B/DDC1/DDCCI
- Programmable GPIO setting for complex external device control

Outline

- 388-pin BGA package
- Lead Free
- 3.3/2.5/1.8-Volt operating voltages
- 0.18um process

BLOCK DIGRAM



Analog Switch

Analog switches are built in MT8202 to connect to 17 input signals and there is need to add external components to add analog video multiplexes on board.

There are 9 high-speed differential input pairs for 3 sets of YPRPB/VGA input signals.

The 8 Composite/S signal input pins can be fully programmed to connect to any AV/SV inputs.

ADC/ Source Select

The video ADC sample analog input signals. After ADC, all signal processing is digital domain. The source select multiplex all inputs from digital and analog video ports and route them into data path.

Audio Interface

Audio interface accept analog audio signal from Tuner, e.g. AF. It also includes preprocessing circuit to filter the noisy audio signals. Audio decoder will decode the BTSC or NICAM, and output best sound with enhanced 3D surround post-processing.

Embedded 7.1 channel digital audio input (slave) and 2 channels (master) digital audio inputs.

Embedded 3 high performance audio DACs.

DSP

DSP handle audio decoding as well as computing intensive jobs. The downloadable micro code enables fast function convergence for various audio standards in the world.

Advanced DSP engine supports full functions of sound effects.

MDDi/Scaler

MDDi is MTK proprietary de-interlacing technology, 2nd generation MDDi solution provides improved low angle processing and more accurate motion detection for all interlace sources. The techniques reduce jagged edges and broken images. The MDDi engine supports both Main and Sub channel SDTV inputs or one channel 1080i high quality de-interlacing.

Two totally independent scaler support full functions of PIP/POP and frame rate conversion.

With MDDi and high quality scaler, MT8202 guarantee all input format could be translated to output format with best video quality for motion and still pictures.

Color/Gamma

MT8202 includes advanced color management function to allow user to improve video quality with fully flexibility. With contrast/hue/saturation/Gamma/anti-Gamma/flesh tone function, MT8202 deliver the best video quality with vivid color.

Advanced dither function support 6/8/10-bit video output for any kinds of display unit (LCD, PDP, CRT).

8032

On-chip Turbo8032 provide the most cost effective development environment for system house. Well-proven F/W could speed up the system design significantly.

2D-G/OSD

On-chip graphic engine draw bitmap OSD and store them into DRAM. OSD read data from DRAM and display on screen. With 2D-G and OSD. The computing power requirement of μP will be minimized.

One YUV space OSD added to support Main/PIP Teletext/Close-caption functions.

MT5351

DTV Backend Decoder SOC

MEDIATEK

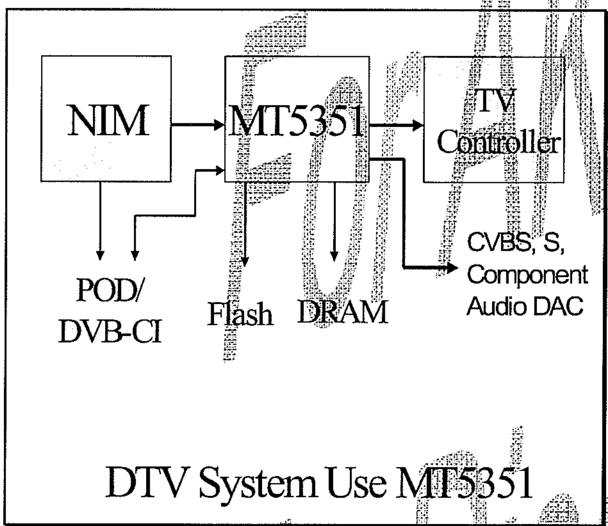
Specifications are subject to change without notice.

MediaTek MT5351 is a DTV Backend Decoder SOC which support flexible transport demux, HD MPEG-2 video decoder, JPEG decoder, MPEG1,2, MP3, AC3 audio decoder, HD TV encoder. The MT5351 enables consumer electronics manufactures to build high quality, feature-rich DTV, STB or other home entertainment audio/video device.

World-Leading Technology: HW support worldwide major broadcast network and CA standards, include ATSC, DVB, OpenCable, DirectTV, MHP.

Rich Feature for high value product: To enrich the feature of DTV, the MT5351 support 1394-5C component to external DVHS. Dual display, PIP/POP and quad pictures provide user a whole new viewing experience.

Credible Audio/Video Quality: The MT5351 use advanced motion-adaptive de-interlace algorithm to achieve the best movie/video playback. The embedded 4X over-sample video DAC could generate very fine display quality. Also, the audio 3D surround and equalizer provide professional entertainment



Key Features:

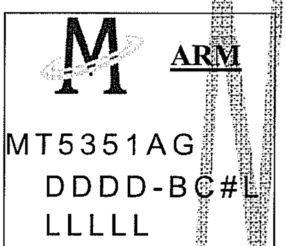
1. Flexible Demuxer
2. Dual HD MPEG2 Video Decoder
3. Dual MPEG1,2, MP3, AC3 Audio decode
4. Dual Display
5. PIP/POP/Quad Mode
6. IEEE1394-5C
7. POD/DVB-CI

Application:

1. DTV
2. Set-top Box
3. DTV Recorder
4. Home Media Center

Order Information:

MT5351AG → one HD decoder
MT5351CG → two HD decoder
All Package are Lead Free



IC Top View:

DDDD: Date Code
#: Subcontractor Code
LLLLL: Lot Number

General Feature List

- Host CPU
  - ARM 926EJ
  - 16K I-Cache and 16K D-Cache
  - 8K Data TCM and 8K Instruction TCM
  - JTAG ICE interface
  - Watch Dog timers
- Transport Demuxer
  - Support 3 independent transport stream inputs.
  - Support serial / parallel interface for each transport stream input.
  - Support ATSC, DVB, and MPEG2 transport stream inputs.
  - Programmable sync detection.
  - Support DES/3-DES de-scramble
  - 96 PID filter and128 section filters.
  - Support TS recording via IEEE1394 interface
- MPEG2 Decoder
  - Support dual MPEG-2 HD decoder or up to 8 SD decoder
  - Complaint to MP@ML, MP@HL and MPEG-1 video standards
- JPEG Decoder
  - Decode Base-line or progressive JPEG file
- 2D Graphics
  - Support multiple color modes
  - Point, horizontal/vertical line primitive drawing
  - Rectangle fill and gradient fill functions
  - BitBlt with transparent, alpha blending, alpha composition and stretch
  - Font rendering by color expansion
  - Support clip masks
  - YCbCr to RGB color space transfer
- OSD Display
  - 3 linking list OSDs with multiple color mode
  - OSD scaling with arbitrary ratio from 1/2x to 2x
  - Square size, 32x32 or 64x64 pixel, hardware cursor
- Video Processing
  - Advanced Motion adaptive de-interlace on SDTV resolution
  - Support clip
  - 3:2/2:2 pull down source detection
  - Arbitrary ratio vertical/horizontal scaling of video, from 1/15X to 16X
  - Support Edge preserve
  - Support horizontal edge enhancement
  - Support Quad-Picture
- Main Display
  - Mixing two video and three OSD and hardware cursor
  - Contrast/Brightness adjustment
  - Gamma correction
  - Picture-in-Picture (PIP)
  - Picture-Out-Picture (POP)
  - 480i/576i/480p/576p/720p/1080i output
- Auxiliary Display
  - Mixing one video and one OSD
  - 480i/576i output
- TV Encoder
  - Support NTSC M/N, PAL M/N/B/D/G/H/I
  - Macrovision Rev 7.1.L1
  - CGMS/WSS
  - Closed Captioning
  - Six12-bit video DACs for CVBS, S-video or RGB/YPbPr output
- Digital Video Interface
  - Support SAV/EAV
  - Support 8/16 for SD/HD digital video input
  - Support 8/16/24 bits digital output for main display
  - Support 8 bits digital output for aux display
- DRAM Controller
  - Supports 64Mb to 1Gb DDR DRAM devices
  - Configurable 32/64 bit data bus interface
  - Support DDR266, DDR333, DDR400 JEDEC specification compliant SDRAM
- Peripheral Bus Interface
  - Support NOR/NAND flash
  - Support CableCard host control bus
- Audio

- Support Dolby Digital AC-3 decoding
- MPEG-1 layer I/II, MP3 decoding
- Dolby prologic II
- Main audio output: 5.1ch + 2ch (down mix)
- Auxiliary audio output: 2ch
- Pink noise and white noise generator
- Equalizer
- Bass management
- 3D surround processing include virtual surround
- Audio and video lip synchronization
- Support reverberation
- SPDIF out
- I2S I/F

Peripherals

- Three UARTs with Tx and Rx FIFO, two of them have hardware flow control
- Two serial interfaces, one is master only; the other can be set to master mode or slave mode
- Two PWMs
- IR blaster and receiver
- IEEE 1394 link controller
- IDE bus: ATA/ATAPI7 UDMA mode 5, 100 MB/s
- Real-time clock and watchdog controller
- Memory card I/F: MS/MS-Pro, SD, CF, and MMC
- PCMCIA/POD/CI interface

IC Outline

- 471 Pin BGA Package
- 3.3V/1.2V dual Voltage

Electrical Characteristics

Absolute Maximum Rating

Symbol	Parameters	Value	Unit
IOVDD	3.3V supply voltage	-0.5 to 4.6	V
CVDD	1.2V supply voltage	-0.5 to 1.8	V
AVDD	Analog supply voltage	-0.5 to 4.6	V
RVDD	DDR supply voltage	-0.5 to 3.5	V
VIN(3.3V)	Input Voltage(3.3V IO)	VSS-1.0 to 3.63	V
VIN(5V tolerance)	Input Voltage(5V tolerance IO)	VSS-1.0 to 5.5	V
Vout	Output Voltage	-0.3 to VDD3+0.3	V
Ts	Storage Temperature	-40 to 150	C
Ta	Ambient Temperature	0 to 70	C

DC Characteristics

Symbol	Parameters	Min	Typ	Max	Unit
IOVDD	3.3V supply voltage	2.97	3.3	3.63	V
CVDD	1.2V supply voltage	1.08	1.2	1.32	V
AVDD	Analog supply voltage	2.97	3.3	3.63	V
VIH(3.3V)	3.3V input voltage high	2.0			V
VIL(3.3V)	3.3V input voltage low			0.8	V
VOH(3.3V)	3.3V output voltage high	2.4			
VOL(3.3V)	3.3V output voltage low			0.4	
VIH(3/5V)	3/5V tolerance input voltage high	2.0			V
VIL(3/5V)	3/5V tolerance input voltage low			0.8	V
VOH(3/5V)	3/5V tolerance output voltage high	2.4			V
VOL(3/5V)	3/5V tolerance output voltage low			0.4	V
Tj	Junction operation temperature	-40	25	125	C
PD(estimate)	Power dissapation		1.5		W
Pdown	Power down mode		2		mW

DDR ELECTRICAL Characteristics and DC Operating Condiction

Symbol	Parameters	Min	Typ	Max	Unit
RVDD(DDR333)	DDR I/O supply voltage for DDR266 or DDR333	2.3	2.5	2.7	V
RVDD(DDR400)	DDR I/O supply voltage for DDR400	2.5	2.6	2.7	V
DVREF	DDR I/O reference voltage	0.49*RVDD	0.5*RVDD	0.51*RVDD	V
VTT	DDR I/O termination voltage	VREF-0.04	VREF	VREF+0.04	V
VIH	DDR input voltage high	VREF+0.15		RVDD+0.3	V
VIL	DDR input voltage low	-0.3		VREF-0.15	V

DDR AC Operating Condiction

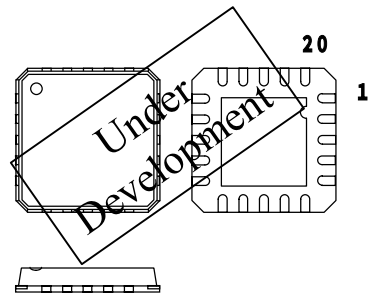
Symbol	Parameters	Min	Typ	Max	Unit
VIH	Input high voltage, DQ, DQS	DVREF+0.31			V
VIL	Input low voltage, DQ, DQS			DVREF-0.31	V
Vslew	Input minimum slew rate	1.0			V/ns
Vswing	Input maximum swing			1.5	V

10Wx2ch(SE)/20Wx1ch(BTL) Digital Audio Power Amplifier

1.Outline

R2S15102NP is a Digital Power Amplifier IC developed for TV.
R2S15102NP can realize maximum Power 10W × 2ch
(VD = 24V,THD = 10%, SE) at 8 Ω load.
It is possible to replace from the conventional analog amplifier system to the digital amplifier system easily.

Fig. 1 Package



20pin QFN
Body : 6 x 6 mm
Lead pitch : 0.8 mm

2.Feature

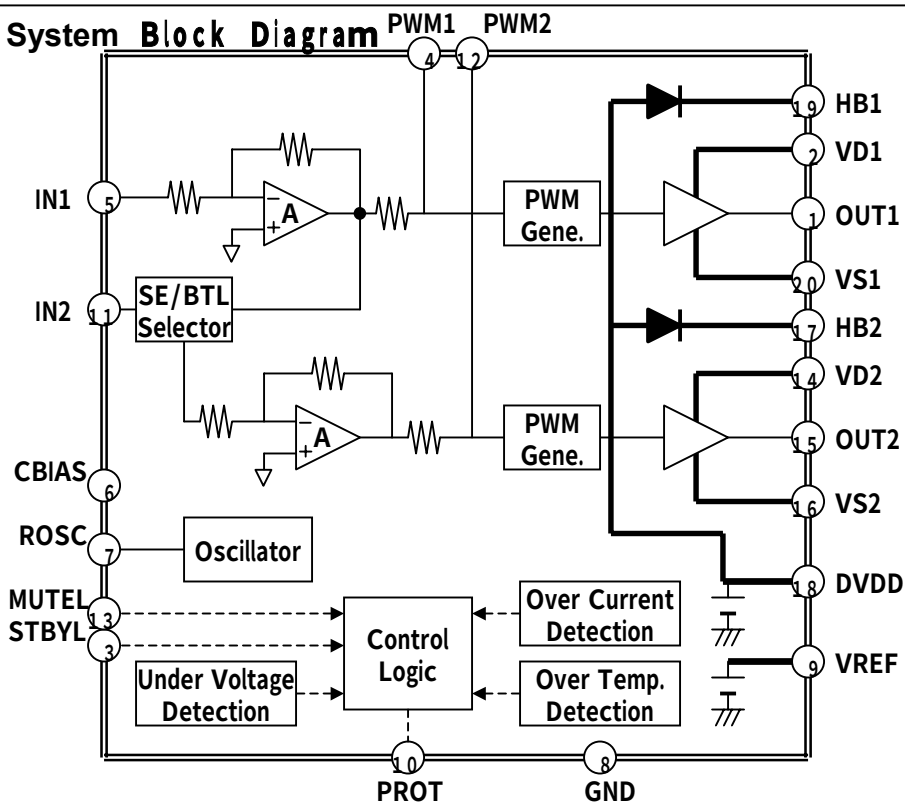
- **High** Output Power(THD=10%)**without external Heat Sink**
  (note) the thermal pad is soldered the thermal pad with the printed-circuit board directly.
  Recommanded Power Condition
  SE operation mode :10Wx2ch(VD=24V) at 8 Ω
  BTL operation mode: 20Wx1ch(VD=18V) at 8 Ω
- The RENESAS original circuits realize high power efficiency, low noise and low distortion characteristics.
- **Pop sound Less**
- **Built-in protection function**
  (Over Current, Over Temperature and Under Voltage)
- **Built-in Mute and Stand-by function**

3.Operating Condition

- **Recommanded** Power supply voltage : **from 11V to 25V**
- **Recommanded** Speaker Impedance : from 4 to 8Ω

4.Block Diagram

Fig. 2 System Block Diagram



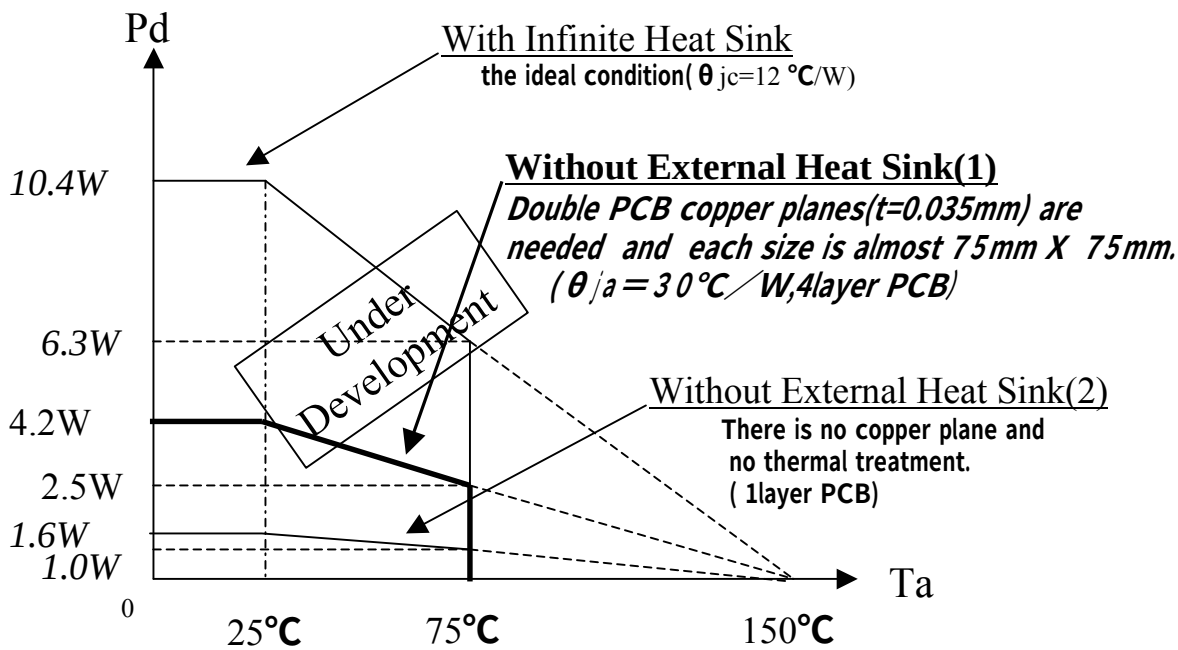
5. Pin Configuration(Table.1)

No.	NAME	I/O	Description	
1	OUT1	O	Power Output pin #1	
2	VD1	—	Power supply pin for power output stage #2	
3	STBYL	I	Stand-by control pin. When this is “L”, circuit current is reduced.There is the pull-down resistor:50Kohm(typ.).	
4	PWM1	I	PWM input pin #1 (for phase compensation)	
5	IN1	I	Analog input #1. The gain is depended on the external resistance .	
6	CBIAS	I/O	A capacitor is connected so that it may not be influenced of power supply change(Ripple Filter).	
7	ROSC	I	Control pin for PWM carrier frequency	
8	GND	—	GND pin for analog block	
9	VREF	I/O	Capacitor connection pin for analog block reference voltage source	
10	PROT	O	Protection Timer pin. At protection mode,the output becomes “L”-level. (The timing capacitor is connected)	
11	IN2	I	SE operation	Analog input #2(as same as IN1)
		I	BTL operation	When this is connected to DVDD pin via the resister, Reversed signal of OUT1 is output to OUT2.
12	PWM2	I	PWM input pin#2 (for phase compensation)	
13	MUTEL	I	Mute control pin. When this is “L”, it becomes mute status.	
14	VD2	—	Power supply pin for power output stage #2	
15	OUT2	O	Power Output pin #2	
16	VS2	—	Ground pin for power output stage #2	
17	HB2	I/O	Capacitor connection pin for bootstrap	
18	DVDD	O	Built-in power supply pin for internal digital block.	
19	HB1	I/O	Capacitor connection pin for bootstrap #1	
20	VS1	—	Ground pin for power output stage #1	

6. Absolute Maximum Rating(Table.2)

Symbol	Parameter	Condition	Value	Unit
VD max	Maximum VD Voltage	VD1,VD2 pin voltage	27	V
HB max	Maximum HB Voltage	HB1、HB2 pin voltage	40	V
Pd	Power dispassion	Ta = 25°C :See Fig.3	4.2	W
θja	Thermal Resistance	See Fig.3	30	℃/W
Tj	Junction temperature	Maximum Temperature	150	℃
Ta	Operating ambient temperature	Temperature range	-20～75	℃
Tstg	Storage temperature	Temperature range	-40～150	℃

Fig.3 Thermal De-rating(on PCB: printed-circuit board):Size 75mm x 75mm

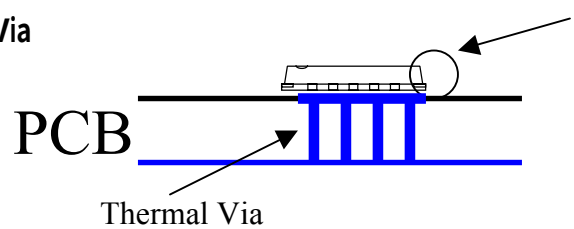


(NOTE)

PCB pattern design for high effective thermal conductivity

(1)The exposed die pad is directly soldered with the printed-circuit board pattern .

(2)Thermal Via



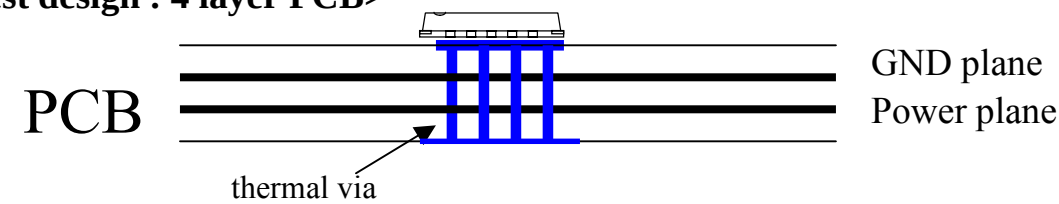
(caution)
There are side expositions of the die pad at corners of the package.
(The die pad is grounded.)

Consideration about the PCB design

The Power dispassion at 10Wx2ch(SE) or 20Wx1ch(BTL) is estimated almost 2W. It has enough margin, designing the PCB at θja=30℃/W.

(1)PCB basic design (copper plane)

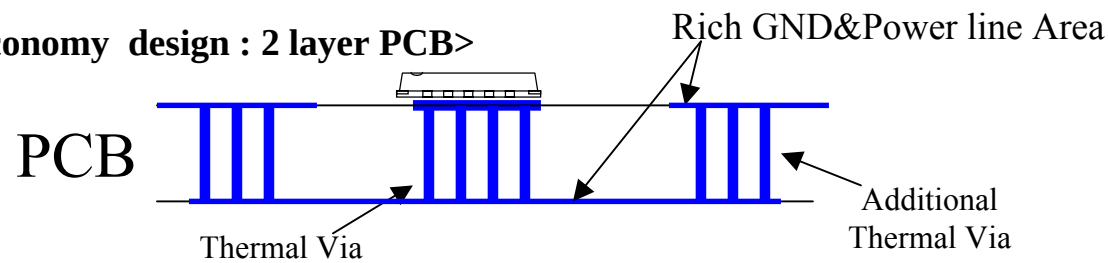
<the best design : 4 layer PCB>



<PCB size estimation >

10Wx2ch: 75mm x 75mm

<the economy design : 2 layer PCB>



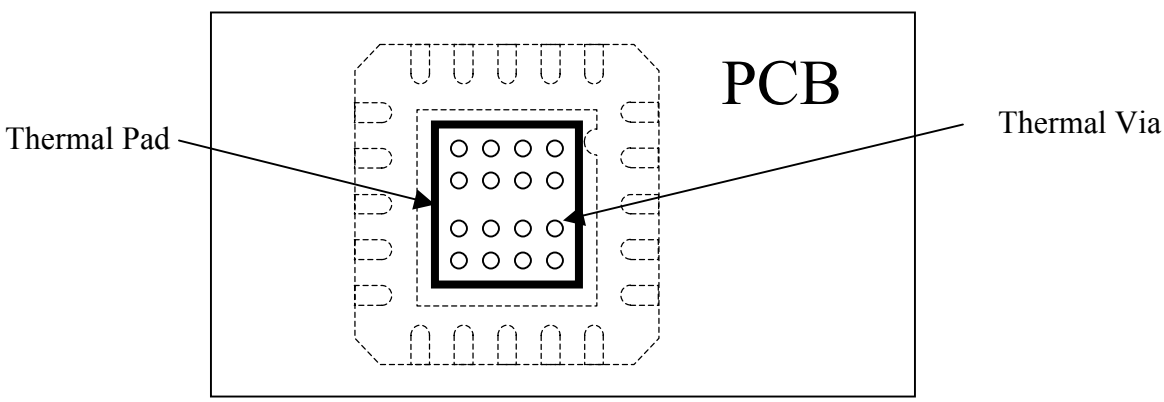
The GND&Power line total area size is also equal to the above GND&Power line total area size of the 4layer PCB.

<PCB size estimation >

10Wx2ch: (75+α)mm x (75+α) mm

(2)PCB Thermal Pad

The exposed die pad is directly soldered with the printed-circuit board pattern .



7. Recommended Operating condition(Table.3)

Symbol	Parameter	Condition	MIN	TYP	MAX	Unit
VD	Supply Voltage	VD1,VD2 pin voltage	11	-	25	V
VH	Control voltage of high level	STBYL、MUTEL	2	-	5	V
VL	Control voltage of low level	STBYL、MUTEL	0	-	0.8	V
fosc	Carrier Frequency	R= 33kΩ	300	400	600	kHz

(note) ・STBYL: High level:normal operation Low level:Stand-by
・MUTEL:High level:normal operation Low level:Mute
・The carrier frequency can be changed by the resistance at Pin#.7 .

8. Electronic Characteristics(Table.4)

(Unless otherwise noted, Ta=25°C, VD=24V, Carrier Frequency=400kHz, f=1kHz,SE operation)

Symbol	Parameter		Condition	MIN	TYP	MAX	Unit
IVD	Circuit Current		No Signal	TBD	28	TBD	mA
			MUTE	TBD	-	TBD	mA
			Stand-by	-	-	10	uA
VDPR	Detection Voltage		VD under-voltage	TBD	9.8	TBD	V
TPR	Protection Temperature		Thermal Shut-dawn	-	150	-	℃
TRL	Release Temperature		Thermal Shut-dawn	-	120	-	℃
IPR	Protection Current		Output over-current	-	6	-	A
Pomax	Maximum output power	at SE	THD=10%、VD=24V、RL=8Ω	TBD	10	-	W/ch
		at BTL	THD=10%、VD=18V、RL=8Ω	TBD	20	-	W
THD	Total Harmonic Distortion		Po=1W	-	0.1	TBD	%
No	Output Noise level		A-Weighted filter	-	(100)	TBD	uVrms
Eff	Power Efficiency	at SE	Po=10+10W	TBD	93	-	%
		at BTL	Po=20W	TBD	89	-	%
Mute	Mute Attenuation			TBD	80	-	dB
PSRR	Ripple Rejection Ratio		dVD=100mVrms,f=100Hz	TBD	50	-	dB

9. Application Examples

(note)
"R for GND" 's are for the evaluation only and not needed actually.

Fig.4 SE operation mode(10Wx2ch)

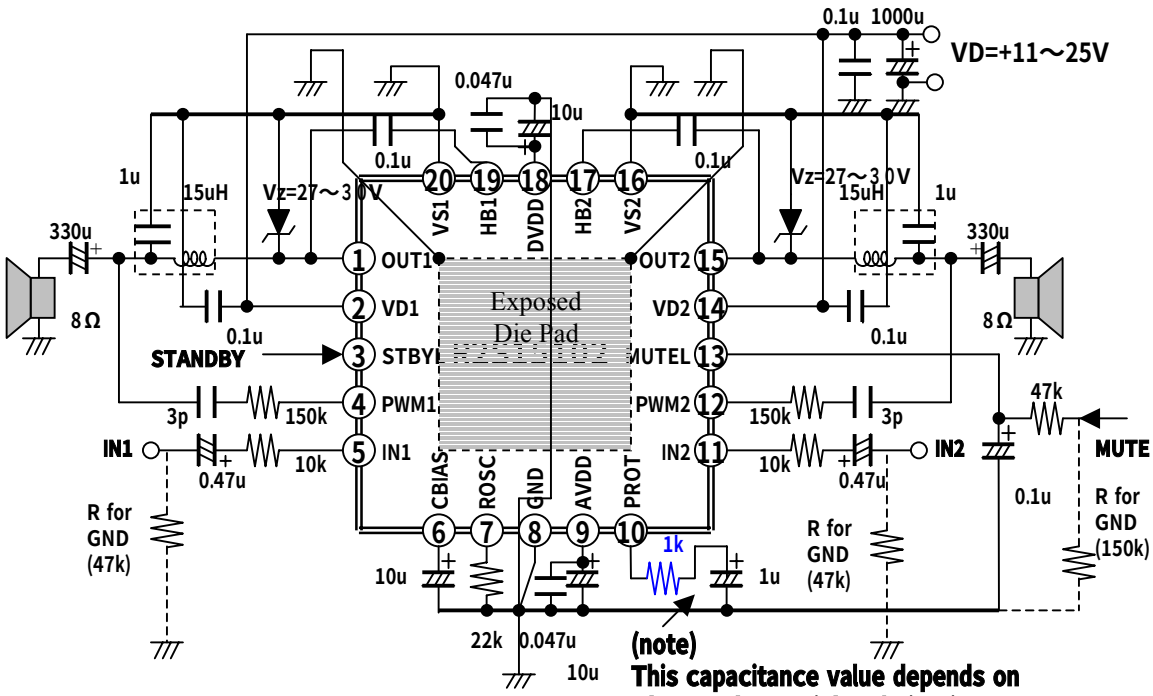


Fig.5 BTL operation mode (20W)

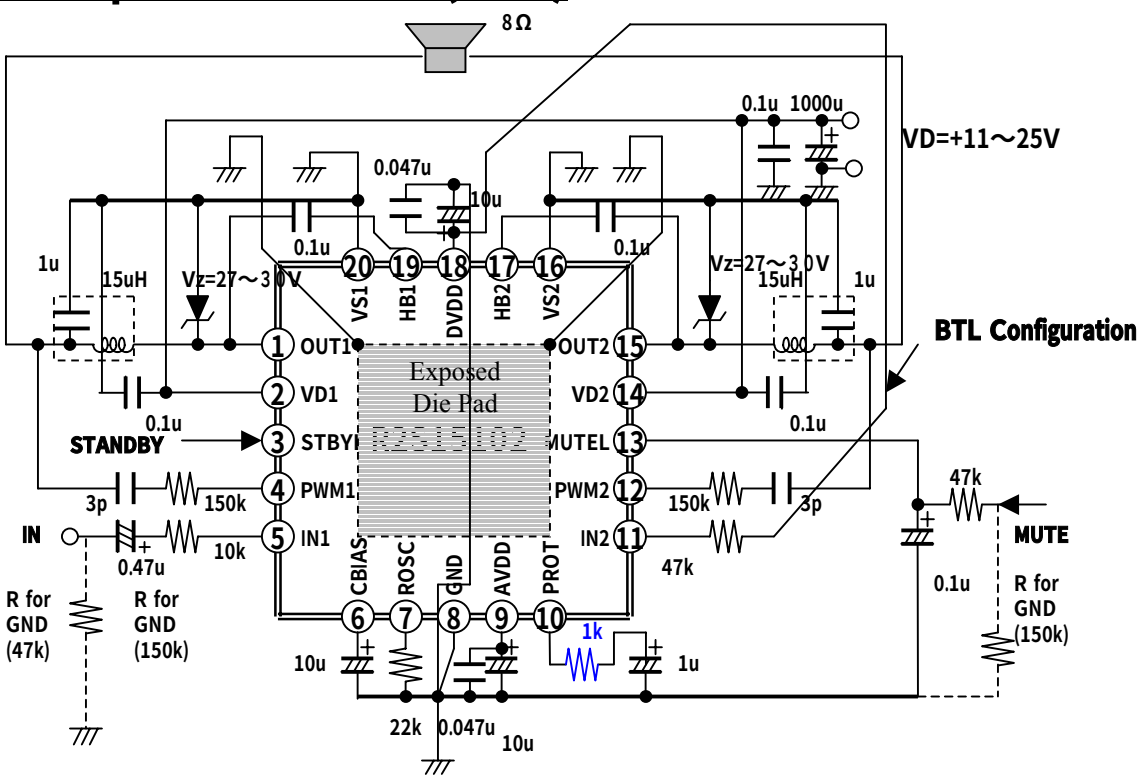


Fig.6 BTL operation mode(20W) with PWM direct input

(note)
"R for GND" 's are for the evaluation only and not needed actually.

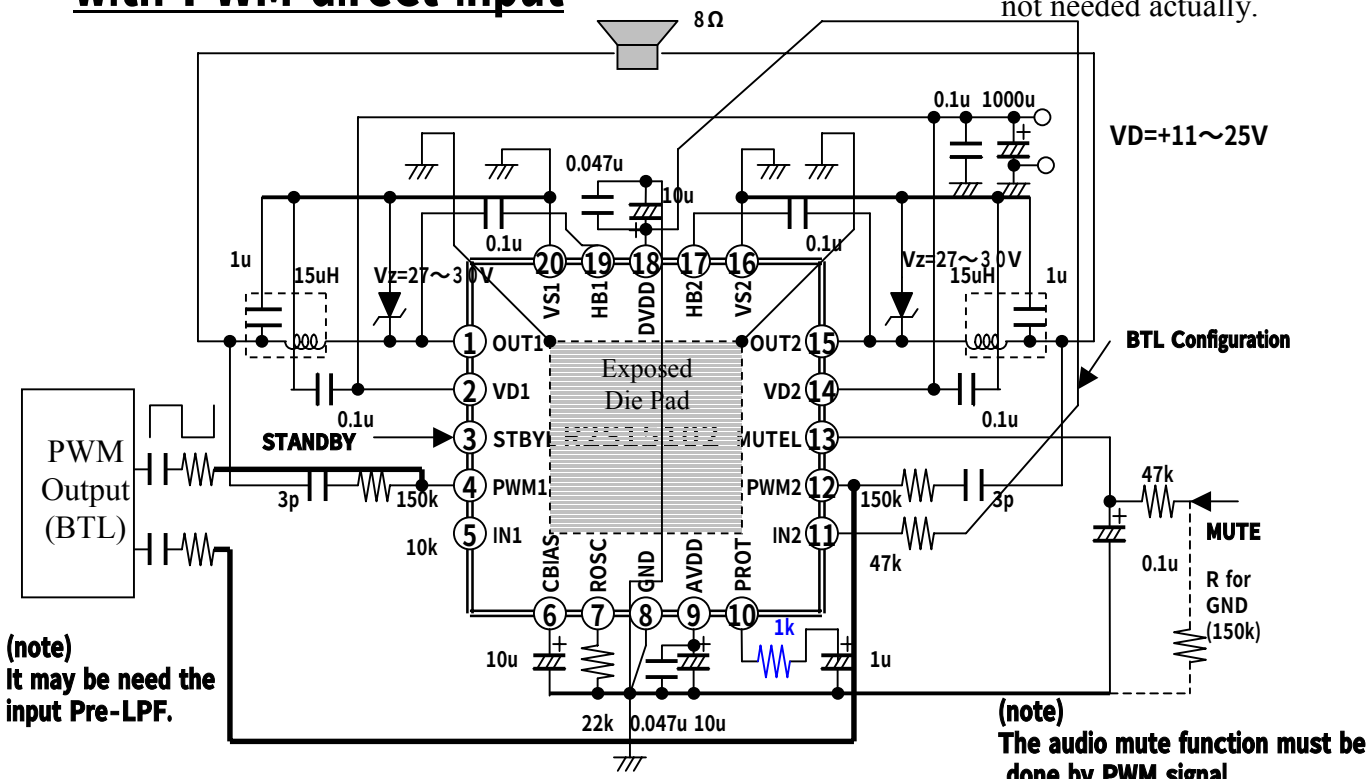
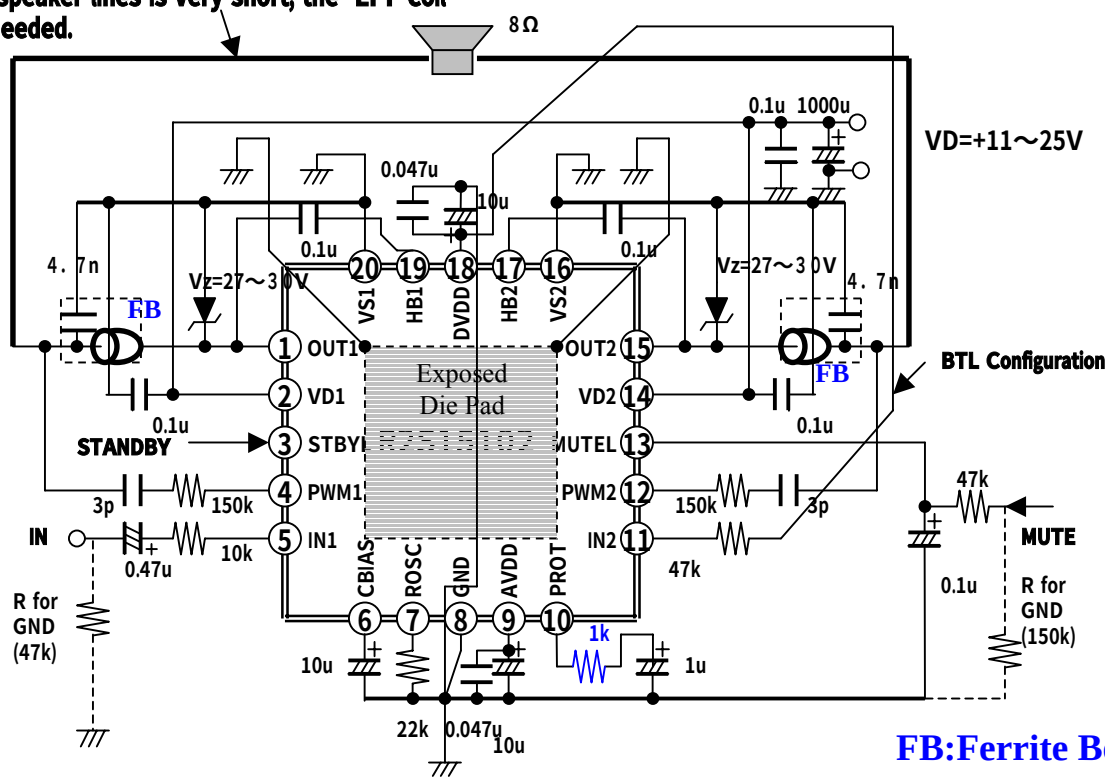


Fig.7 BTL operation mode without output LPF coil

If this speaker lines is very short, the LPF coil is not needed.



WM8776

24-bit, 192kHz Stereo Codec with 5 Channel I/P Multiplexer

DESCRIPTION

The WM8776 is a high performance, stereo audio codec with five channel input selector. The WM8776 is ideal for surround sound processing applications for home hi-fi, DVD-RW and other audio visual equipment.

A stereo 24-bit multi-bit sigma delta ADC is used with a five stereo channel input mixer. Each ADC channel has programmable gain control with automatic level control. Digital audio output word lengths from 16-32 bits and sampling rates from 32kHz to 96kHz are supported.

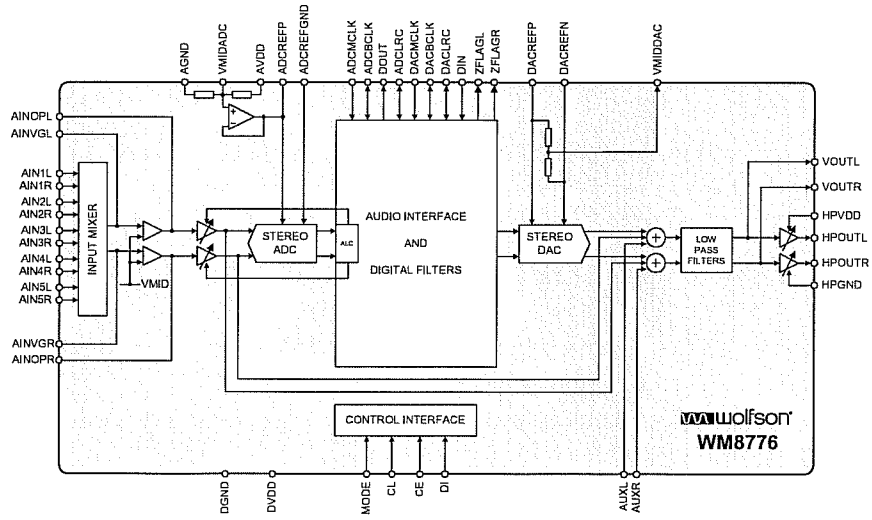
A stereo 24-bit multi-bit sigma delta DAC is used with digital audio input word lengths from 16-32 bits and sampling rates from 32kHz to 192kHz. The DAC has an input mixer allowing an external analogue signal to be mixed with the DAC signal. There are also Headphone and line outputs, with volume controls for the headphones.

The WM8776 supports fully independent sample rates for the ADC and DAC. The audio data interface supports I^2S, left justified, right justified and DSP formats.

The device is controlled in software via a 2 or 3 wire serial interface, selected by the MODE pin, which provides access to all features including channel selection, volume controls, mutes, and de-emphasis facilities.

The device is available in a 48-pin TQFP package.

BLOCK DIAGRAM



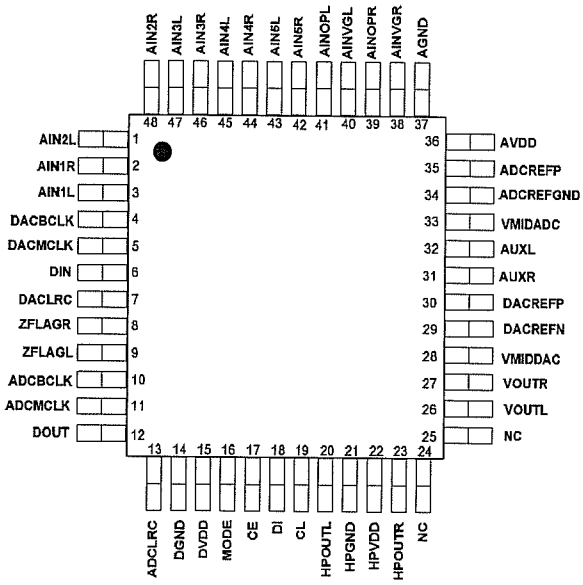
FEATURES

- Audio Performance
  - 108dB SNR ('A' weighted @ 48kHz) DAC
  - 102dB SNR ('A' weighted @ 48kHz) ADC
- DAC Sampling Frequency: 32kHz – 192kHz
- ADC Sampling Frequency: 32kHz – 96kHz
- Five stereo ADC inputs with analogue gain adjust from +24dB to –21dB in 0.5dB steps
- Programmable Limiter or Automatic Level Control (ALC)
- Stereo DAC with independent analogue and digital volume controls
- Stereo Headphone and Line Output
- 3-Wire SPI Compatible or 2-Wire Software Serial Control Interface
- Master or Slave Clocking Mode
- Programmable Audio Data Interface Modes
  - I^2S, Left, Right Justified or DSP
  - 16/20/24/32 bit Word Lengths
- Analogue Bypass Path Feature
- Selectable AUX input to the volume controls
- 2.7V to 5.5V Analogue, 2.7V to 3.6V Digital supply Operation

APPLICATIONS

- Surround Sound AV Processors and Hi-Fi systems
- DVD-RW

PIN CONFIGURATION



ORDERING INFORMATION

DEVICE	TEMPERATURE RANGE	PACKAGE	MOISTURE SENSITIVITY LEVEL	PEAK SOLDERING TEMPERATURE
WM8776EFT/V	-25 to +85°C	48-pin TQFP	MSL2	240°C
WM8776EFT/RV	-25 to +85°C	48-pin TQFP (tape and reel)	MSL2	240°C
WM8776SEFT/V	-25 to +85°C	48-pin TQFP (lead free)	MSL2	260°C
WM8776SEFT/RV	-25 to +85°C	48-pin TQFP (lead free, tape and reel)	MSL2	260°C

Note:

Reel quantity = 2,200

PIN DESCRIPTION

PIN	NAME	TYPE	DESCRIPTION
1	AIN2L	Analogue Input	Channel 2 left input multiplexor virtual ground
2	AIN1R	Analogue Input	Channel 1 right input multiplexor virtual ground
3	AIN1L	Analogue Input	Channel 1 left input multiplexor virtual ground
4	DACBCLK	Digital input/output	DAC audio interface bit clock
5	DACMCLK	Digital input	Master DAC clock; 256, 384, 512 or 768fs (fs = word clock frequency)
6	DIN	Digital Input	DAC data input
7	DACLRC	Digital input/output	DAC left/right word clock
8	ZFLAGR	Open Drain output	DAC Right Zero Flag output (external pull-up resistor required)
9	ZFLAGL	Open Drain output	DAC Left Zero Flag output (external pull-up resistor required)
10	ADCBCLK	Digital input/output	ADC audio interface bit clock
11	ADCMCLK	Digital input	ADC audio interface master clock
12	DOUT	Digital output	ADC data output
13	ADCLRC	Digital input/output	ADC left/right word clock
14	DGND	Supply	Digital negative supply
15	DVDD	Supply	Digital positive supply
16	MODE	Digital input	Control interface mode select (5V tolerant)
17	CE	Digital input	Serial interface Latch signal (5V tolerant)
18	DI	Digital input	Serial interface data (5V tolerant)
19	CL	Digital input	Serial interface clock (5V tolerant)
20	HPOUTL	Analogue Output	Headphone left channel output
21	HPGND	Supply	Headphone negative supply
22	HPVDD	Supply	Headphone positive supply
23	HPOUTR	Analogue Output	Headphone right channel output
24	NC	Not bonded	
25	NC	Not bonded	
26	VOUTL	Analogue output	DAC channel left output
27	VOUTR	Analogue output	DAC channel right output
28	VMIDDAC	Analogue output	DAC midrail decoupling pin ; 10uF external decoupling
29	DACREFN	Analogue input	DAC negative reference input
30	DACREFP	Analogue input	DAC positive reference input
31	AUXR	Analogue input	DAC mixer right channel input
32	AUXL	Analogue input	DAC mixer left channel input
33	VMIDADC	Analogue Output	ADC midrail divider decoupling pin; 10uF external decoupling
34	ADCREFGND	Supply	ADC negative supply and substrate connection
35	ADCREFP	Analogue Output	ADC positive reference decoupling pin; 10uF external decoupling
36	AVDD	Supply	Analogue positive supply
37	AGND	Supply	Analogue negative supply and subVstrate connection
38	AINVGR	Analogue Input	Right channel multiplexor virtual ground
39	AINOPR	Analogue Output	Right channel multiplexor output
40	AINVGL	Analogue Input	Left channel multiplexor virtual ground
41	AINOPL	Analogue Output	Left channel multiplexor output
42	AIN5R	Analogue Input	Channel 5 right input multiplexor virtual ground
43	AIN5L	Analogue Input	Channel 5 left input multiplexor virtual ground
44	AIN4R	Analogue Input	Channel 4 right input multiplexor virtual ground
45	AIN4L	Analogue Input	Channel 4 left input multiplexor virtual ground
46	AIN3R	Analogue Input	Channel 3 right input multiplexor virtual ground
47	AIN3L	Analogue Input	Channel 3 left input multiplexor virtual ground
48	AIN2R	Analogue Input	Channel 2 right input multiplexor virtual ground

Note : Digital input pins have Schmitt trigger input buffers and pins 16, 17, 18 and 19 are 5V tolerant.

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings are stress ratings only. Permanent damage to the device may be caused by continuously operating at or beyond these limits. Device functional operating limits and guaranteed performance specifications are given under Electrical Characteristics at the test conditions specified.

ESD Sensitive Device. This device is manufactured on a CMOS process. It is therefore generically susceptible to damage from excessive static voltages. Proper ESD precautions must be taken during handling and storage of this device.

Wolfson tests its package types according to IPC/JEDEC J-STD-020B for Moisture Sensitivity to determine acceptable storage conditions prior to surface mount assembly. These levels are:

MSL1 = unlimited floor life at <30°C / 85% Relative Humidity. Not normally stored in moisture barrier bag.
MSL2 = out of bag storage for 1 year at <30°C / 60% Relative Humidity. Supplied in moisture barrier bag.
MSL3 = out of bag storage for 168 hours at <30°C / 60% Relative Humidity. Supplied in moisture barrier bag.

CONDITION	MIN	MAX
Digital supply voltage	-0.3V	+3.63V
Analogue supply voltage	-0.3V	+7V
Voltage range digital inputs (DI, CL, CE and MODE)	DGND -0.3V	+7V
Voltage range digital inputs (MCLK, DIN, ADCLRC, DACLRC, ADCBCLK and DACBCLK)	DGND -0.3V	DVDD + 0.3V
Voltage range analogue inputs	AGND -0.3V	AVDD +0.3V
Master Clock Frequency		37MHz
Operating temperature range, T_A	-25°C	+85°C
Storage temperature	-65°C	+150°C

Notes:

1. Analogue and digital grounds must always be within 0.3V of each other.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Digital supply range	DVDD		2.7		3.6	V
Analogue supply range	AVDD, HPVDD, DACREFP		2.7		5.5	V
Ground	AGND, DGND, DACREFN, ADCREFGND			0		V
Difference DGND to AGND			-0.3	0	+0.3	V

Note: digital supply DVDD must never be more than 0.3V greater than AVDD.

ELECTRICAL CHARACTERISTICS

Test Conditions

AVDD = 5V, DVDD = 3.3V, AGND = 0V, DGND = 0V, T_A = +25°C, fs = 48kHz, MCLK = 256fs unless otherwise stated.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Digital Logic Levels (TTL Levels)						
Input LOW level	V_{IL}				0.8	V
Input HIGH level	V_{IH}		2.0			V
Output LOW	V_{OL}	I_{OL}=1mA			0.1 x DVDD	V
Output HIGH	V_{OH}	I_{OH}=1mA	0.9 x DVDD			V
Analogue Reference Levels						
Reference voltage	V_{VMID}			AVDD/2		V
Potential divider resistance	R_{VMID}			50k		Ω
DAC Performance (Load = 10k Ω, 50pF)						
0dBFs Full scale output voltage				1.0 x AVDD/5		Vrms
SNR (Note 1,2)		A-weighted, @ fs = 48kHz		108		dB
SNR (Note 1,2)		A-weighted @ fs = 96kHz		108		dB
Dynamic Range (Note 2)	DNR	A-weighted, -60dB full scale input		108		dB
Total Harmonic Distortion (THD)		1kHz, 0dBFs		-97	-90	dB
DAC channel separation				100		dB
Power Supply Rejection Ratio	PSRR	1kHz 100mVpp		50		dB
		20Hz to 20kHz 100mVpp		45		dB
Headphone Buffer						
Maximum Output voltage				0.9		Vrms
Max Output Power (Note 4)	P_o	R_L = 32 Ω		25		mW
		R_L = 16 Ω		50		mW
SNR (Note 1,2)		A-weighted	85	92		dB
Headphone analogue Volume Gain Step Size			0.5	1	1.5	dB
Headphone analogue Volume Gain Range		1kHz Input	-73		+6	dB
Headphone analogue Volume Mute Attenuation		1kHz Input, 0dB gain		100		dB
Total Harmonic Distortion +Noise	THD+N	1kHz, R_L = 32Ω @ P_o = 10mW rms		-80 0.01	-60 0.1	dB %
		1kHz, R_L = 32Ω @ P_o = 20mW rms		-77 0.014	-40 1.0	dB %
Power Supply Rejection Ratio	PSRR	20Hz to 20kHz, without supply decoupling		-40		dB
ADC Performance						
Input Signal Level (0dB)				1.0 x AVDD/5		Vrms
SNR (Note 1,2)		A-weighted, 0dB gain @ fs = 48kHz		102		dB
SNR (Note 1,2)		A-weighted, 0dB gain @ fs = 96kHz 64 x OSR		100		dB
Dynamic Range (note 2)		A-weighted, -60dB full scale input		102		dB
Total Harmonic Distortion (THD)		1kHz, 0dBFs		-90	-80	DB

Test Conditions

AVDD = 5V, DVDD = 3.3V, AGND = 0V, DGND = 0V, T_A = +25°C, fs = 48kHz, MCLK = 256fs unless otherwise stated.

		1kHz, -3dBFs		-95	-85	dB
ADC Channel Separation		1kHz Input		90		dB
Programmable Gain Step Size			0.25	0.5	0.75	dB
Programmable Gain Range (Analogue)		1kHz Input	-21		+24	dB
Programmable Gain Range (Digital)		1kHz Input	-103		-21.5	dB
Mute Attenuation (Note 6)		1kHz Input, 0dB gain		76		dB
Power Supply Rejection Ratio	PSRR	1kHz 100mVpp		50		dB
		20Hz to 20kHz 100mVpp		45		dB
Analogue input (AIN) to Analogue output (VOUT) (Load=10k Ω, 50pF, gain = 0dB) Bypass Mode						
0dB Full scale output voltage				1.0 x AVDD/5		Vrms
SNR (Note 1)			90	100		dB
THD		1kHz, 0dB		-90		dB
		1kHz, -3dB		-95		dB
Power Supply Rejection Ratio	PSRR	1kHz 100mVpp		50		dB
		20Hz to 20kHz 100mVpp		45		dB
Mute Attenuation		1kHz, 0dB		100		dB
Supply Current						
Analogue supply current		AVDD = 5V		48		mA
Digital supply current		DVDD = 3.3V		8		mA

Notes:

1. Ratio of output level with 1kHz full scale input, to the output level with all zeros into the digital input, measured 'A' weighted.
2. All performance measurements done with 20kHz low pass filter, and where noted an A-weight filter. Failure to use such a filter will result in higher THD+N and lower SNR and Dynamic Range readings than are found in the Electrical Characteristics. The low pass filter removes out of band noise; although it is not audible it may affect dynamic specification values.
3. VMID decoupled with 10uF and 0.1uF capacitors (smaller values may result in reduced performance).
4. Harmonic distortion on the headphone output decreases with output power.
5. All performance measurement done using certain timings conditions (Please refer to section 'Digital Audio Interface').
6. A better MUTE Attenuation can be achieved if the ADC gain is set to minimum.

TERMINOLOGY

1. Signal-to-noise ratio (dB) - SNR is a measure of the difference in level between the full scale output and the output with no signal applied. (No Auto-zero or Automute function is employed in achieving these results).
2. Dynamic range (dB) - DNR is a measure of the difference between the highest and lowest portions of a signal. Normally a THD+N measurement at 60dB below full scale. The measured signal is then corrected by adding the 60dB to it. (e.g. THD+N @ -60dB= -32dB, DR= 92dB).
3. THD+N (dB) - THD+N is a ratio, of the rms values, of (Noise + Distortion)/Signal.
4. Stop band attenuation (dB) - Is the degree to which the frequency spectrum is attenuated (outside audio band).
5. Channel Separation (dB) - Also known as Cross-Talk. This is a measure of the amount one channel is isolated from the other. Normally measured by sending a full scale signal down one channel and measuring the other.
6. Pass-Band Ripple - Any variation of the frequency response in the pass-band region.

TFT LCD Preliminary Specification

MODEL NO.: V270B1 - L01

LCD TV Head Division	

QRA Dept.	TVHD / PDD		
	DDIII	DDII	DDI
Approval	Approval	Approval	Approval

LCD TV Marketing and Product Management Division	
Product Manager	

- CONTENTS -

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 1.0	Jun. 15,'05	All	All	Preliminary Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V270B1- L01 is a TFT Liquid Crystal Display module with 14-CCFL Backlight unit and 1ch-LVDS interface. The display diagonal is 27”. This module supports 1366 x 768 WXGA format and can display true 16.7M colors(8-bits colors). The inverter module for backlight is built-in.

1.2 FEATURES

- Excellent brightness (550 nits)
- Ultra high contrast ratio (1000:1)
- Fast response time (8ms)
- High color saturation NTSC 75%
- WXGA (1366 x 768 pixels) resolution
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Optimized response time for both 50/60 Hz frame rate
- Ultra wide viewing angle: 176(H)/176(V) (CR>20) Super MVA technology
- 180 degree rotation display option
- Low color shift function option
- Color reproduction (Nature color)

1.3 APPLICATION

- TFT LCD TVs
- High brightness, multi-media displays
-

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	596.259 (H) x 335.232 (V) (27” diagonal)	mm	(1)
Bezel Opening Area	603.22 (H) x 341.98 (V)	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1366 x R.G.B. x 768	pixel	
Pixel Pitch (Sub Pixel)	0.1460 (H) x 0.4365 (V)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	16.7M	color	
Display Operation Mode	Transmissive mode / Normally black	-	
Surface Treatment	Hardness : 3H, Haze : 40% Anti-reflective coating < 2% reflection	-	

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	636.85	637.55	638.25	mm	
	Vertical(V)	379.1	379.8	380.5	mm	
	Depth(D)	33.9	35.4	36.9	mm	To PCB cover
	Depth(D)	39.2	40.7	42.2	mm	To inverter cover
Weight		3700	4000	4300	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

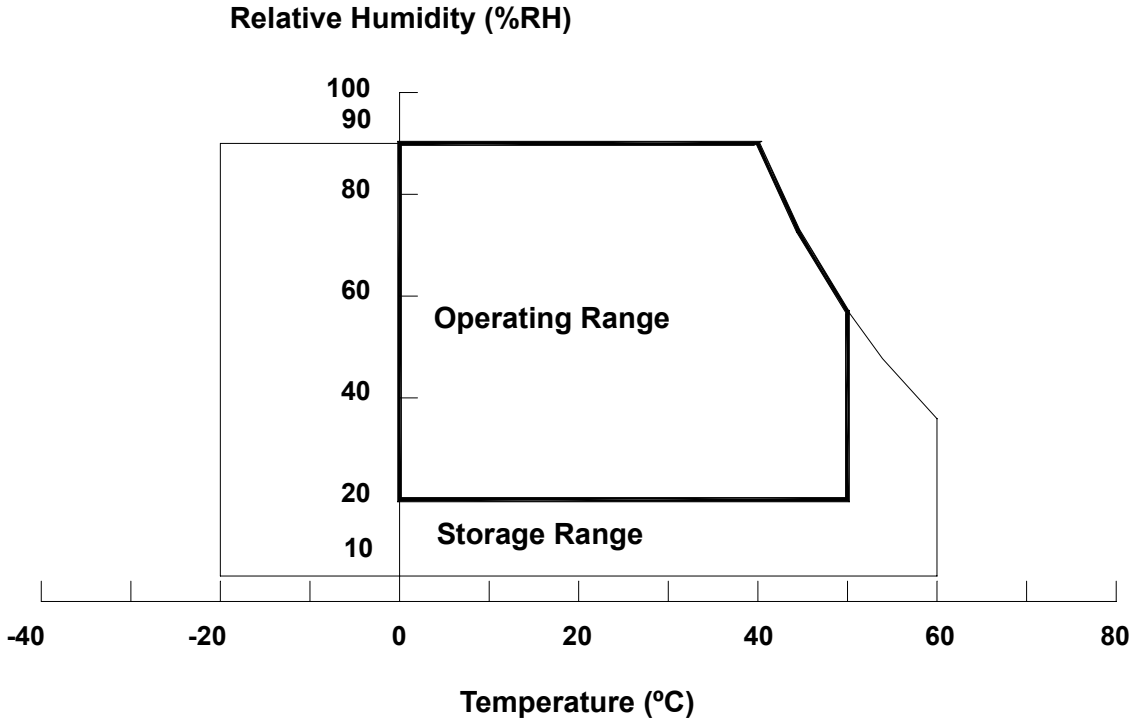
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 60 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 60 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 500 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	6.0	V	(1)
Input Signal Voltage	V_{IN}	-0.3	3.6	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Test Condition	Min.	Type	Max.	Unit	Note
Lamp Voltage	V_W	Ta = 25 ℃	—	—	3000	V_{RMS}	
Power Supply Voltage	V_{BL}	—	0	—	30	V	(1)
Control Signal Level	—	—	-0.3	—	7	V	(1), (3)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals includes Backlight On/Off Control, Internal PWM Control, External PWM Control and Internal/External PWM Selection.

3. ELECTRICAL CHARACTERISTICS

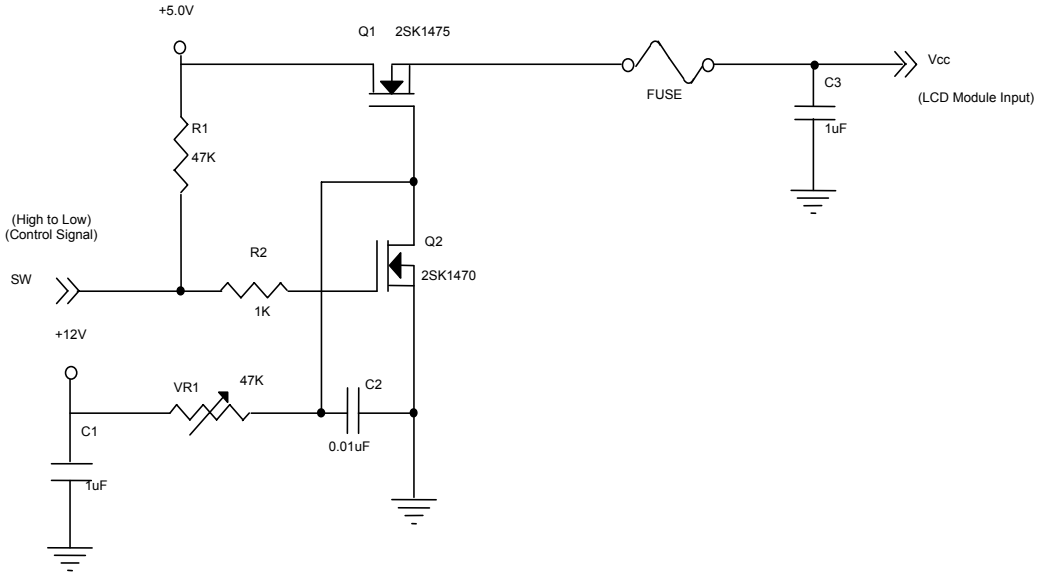
3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

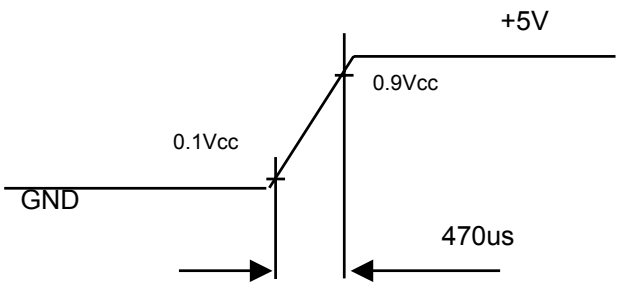
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	4.5	5.0	5.5	V	(1)
Power Supply Ripple Voltage		V_{RP}	-	-	150	mV	
Rush Current		I_{RUSH}	-	-	3.0	A	(2)
Power Supply Current	White	I_{CC}	-	1.8	-	A	(3)
	Black		-	1.2	-	A	
	Vertical Stripe		-	1.65	-	A	
LVDS Interface	Differential Input High Threshold Voltage	V_{LVTH}	-	-	+100	mV	
	Differential Input Low Threshold Voltage	V_{LVTL}	-100	-	-	mV	
	Common Input Voltage	V_{LVC}	1.125	1.25	1.375	V	
	Terminating Resistor	R_T		100		ohm	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:



Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at Vcc = 5 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

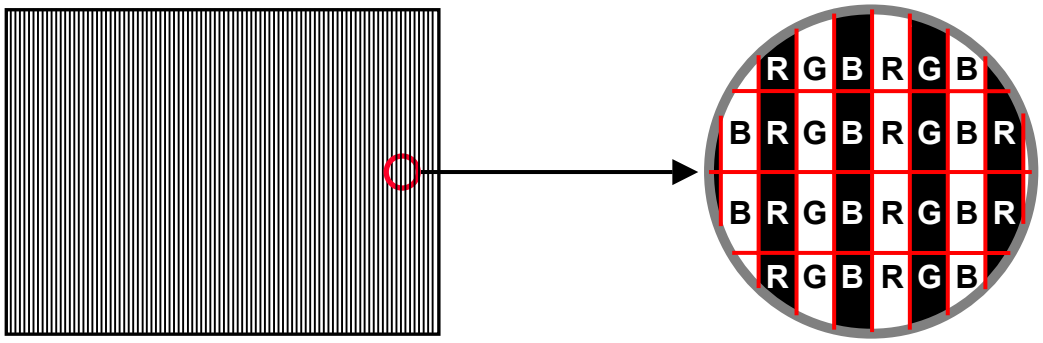
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern



Active Area

3.2 BACKLIGHT INVERTER UNIT

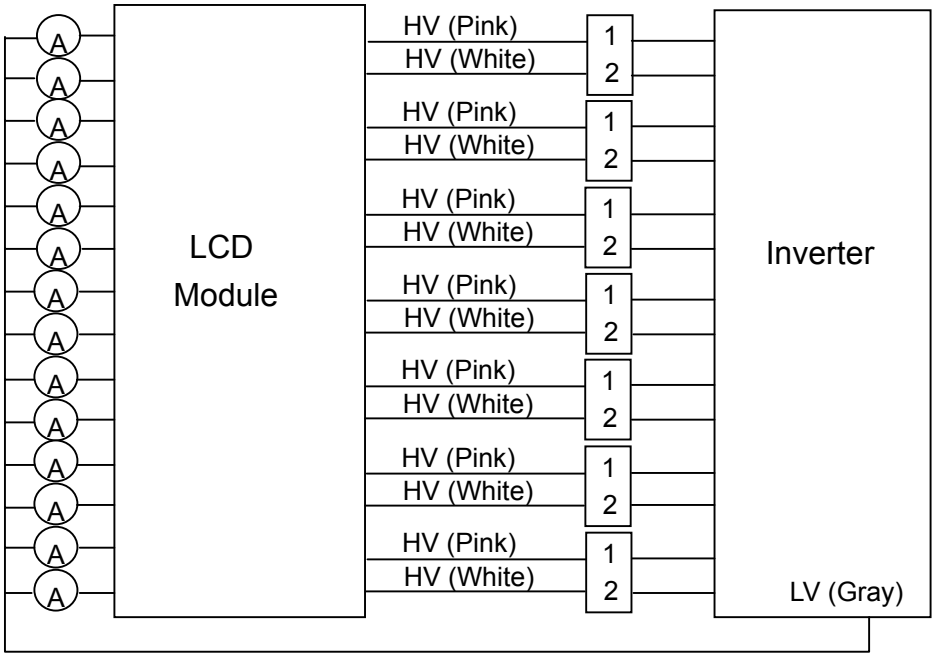
3.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Voltage	V_W	-	1120	-	V_{RMS}	I_L = 4.7mA
Lamp Current	I_L	4.2	4.7	5.2	mA_{RMS}	(1)
Lamp Starting Voltage	V_S	-	-	1650	V_{RMS}	(2), Ta = 0 ºC
		-	-	1500	V_{RMS}	(2), Ta = 25 ºC
Operating Frequency	F_O	50	-	70	KHz	(3)
Lamp Life Time	L_{BL}	50,000	60,000	-	Hrs	(4)

3.2.2 INVERTER CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P_{BL}	-	92	-	W	(5), I_L = 4.7mA
Power Supply Voltage	V_{BL}	22.8	24	25.2	V_{DC}	
Power Supply Current	I_{BL}	-	3.8	-	A	Non Dimming
Input Ripple Noise	-	-	-	500	mV_{P-P}	V_{BL} =22.8V
Backlight Turn on Voltage	V_{BS}	1790	-	-	V_{RMS}	Ta = 0 ºC
		1200	-	-	V_{RMS}	Ta = 25 ºC
Oscillating Frequency	F_W	53	56	59	kHz	
Dimming Frequency	F_B	150	160	170	Hz	
Minimum Duty Ratio	D_{MIN}	-	10	-	%	

Note (1) Lamp current is measured by utilizing high frequency current meters as shown below:



Note (2) The lamp starting voltage V_S should be applied to the lamp for more than 1 second under starting up duration. Otherwise the lamp could not be lighted on completed.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point.) as the time in which it continues to operate under the condition Ta = 25 ±2°C and I_L = 4.2 ~ 5.2 mA_{RMS}.

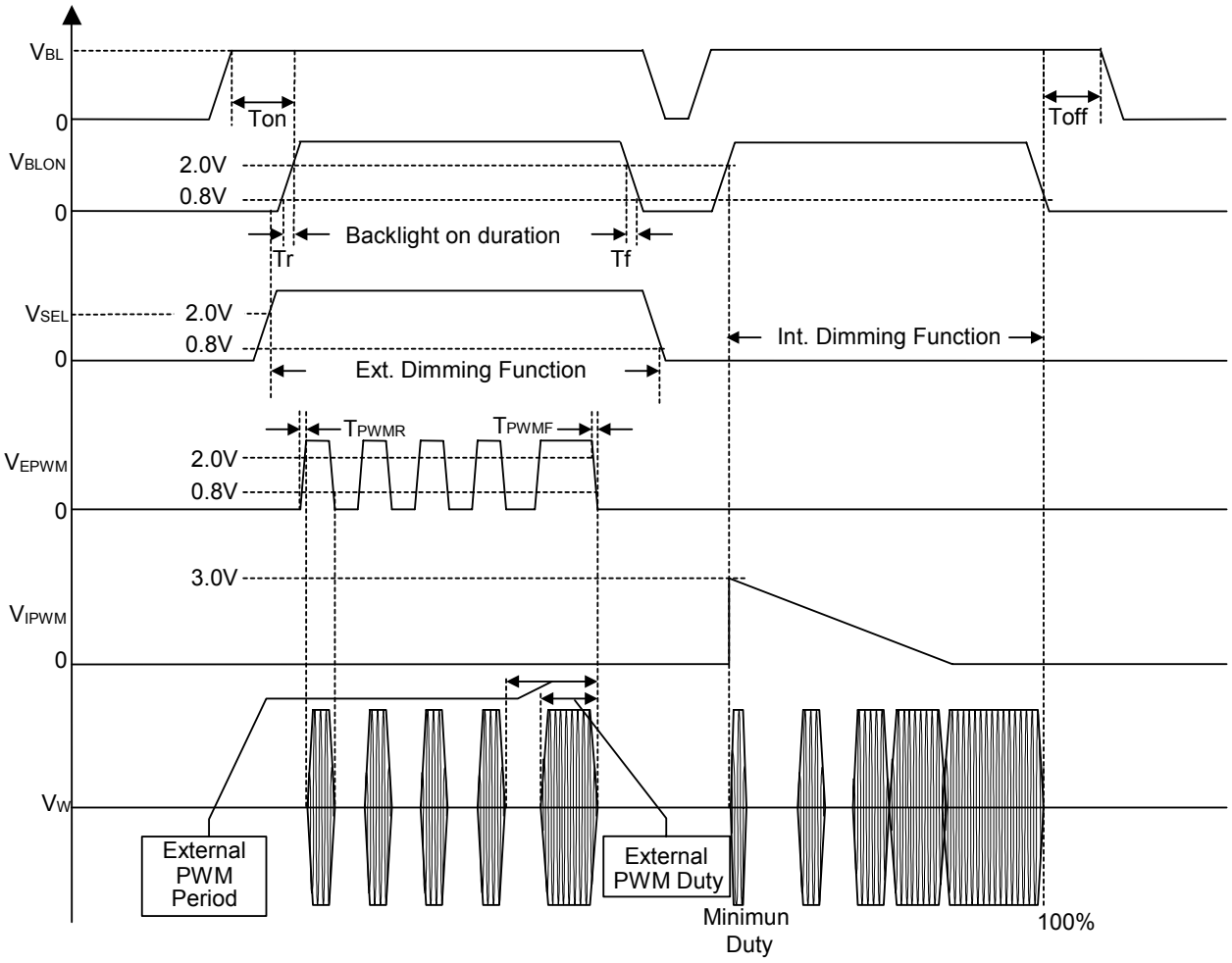
Note (5) The power supply capacity should be higher than the total inverter power consumption P_{BL}. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when inverter dimming.

3.2.3 INVERTER INTERTFACE CHARACTERISTICS

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit	Note
On/Off Control Voltage	ON	V_{BLON}	—	2.0	—	5.0	V	
	OFF		—	0	—	0.8	V	
Internal/External PWM Select Voltage	HI	V_{SEL}	—	2.0	—	5.0	V	
	LO		—	0	—	0.8	V	
Internal PWM Control Voltage	MAX	V_{IPWM}	V_{SEL} = L	—	—	3.0	V	minimum duty ratio
	MIN			—	0	—	V	maximum duty ratio
External PWM Control Voltage	HI	V_{EPWM}	V_{SEL} = H	2.0	—	5.0	V	duty on
	LO			0	—	0.8	V	duty off
Control Signal Rising Time		T_r	—	—	—	100	ms	
Control Signal Falling Time		T_f	—	—	—	100	ms	
PWM Signal Rising Time		T_{PWMR}	—	—	—	50	us	
PWM Signal Falling Time		T_{PWMF}	—	—	—	50	us	
Input impedance		R_{IN}	—	1	—	—	MΩ	
BLON Delay Time		T_{on}	—	1	—	—	ms	
BLON Off Time		T_{off}	—	1	—	—	ms	

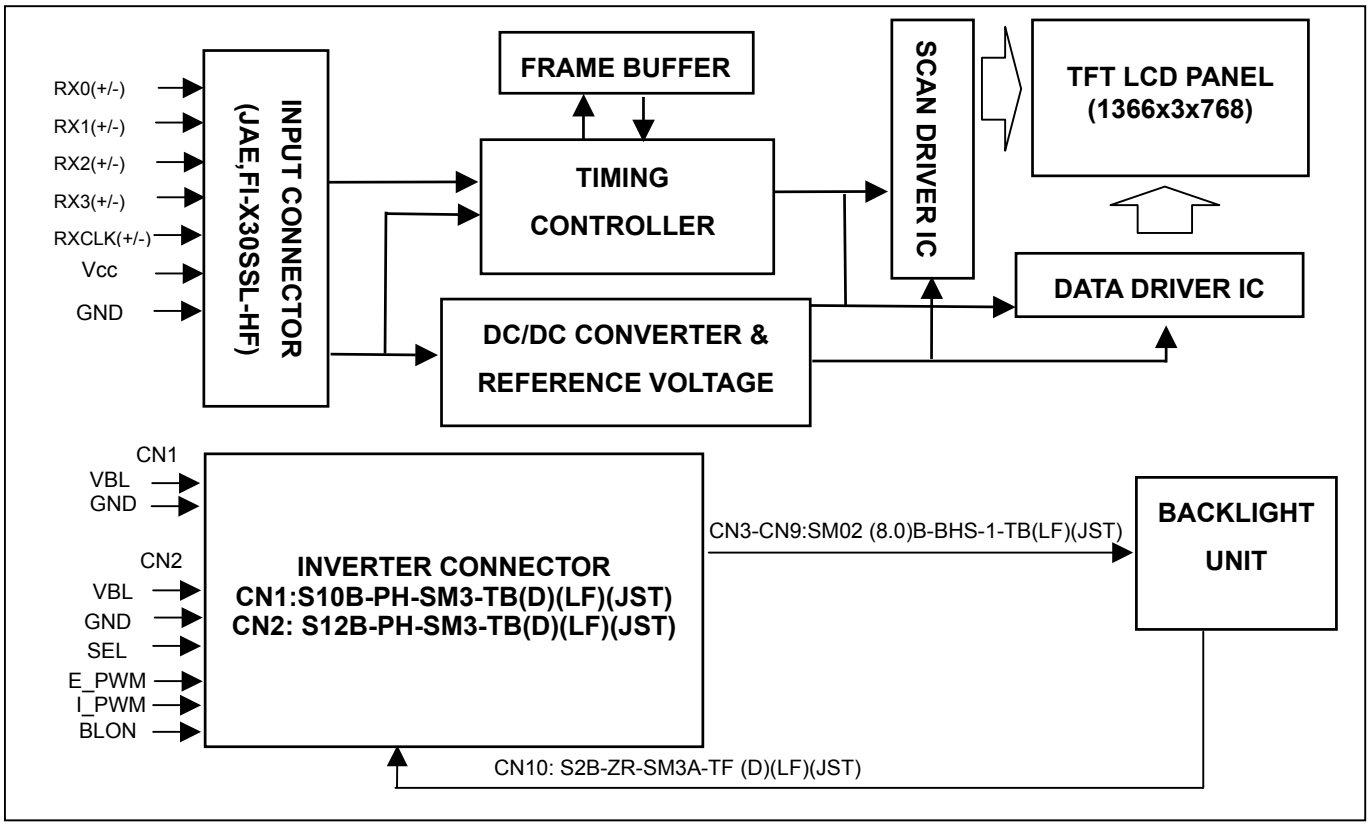
Note (1) The SEL signal should be valid before backlight turns on by BLON signal. It is inhibited to change the internal/external PWM selection (SEL) during backlight turn on period.

Note (2) The power sequence and control signal timing are shown as the following figure.



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INTERFACE PIN CONNECTION

5.1 TFT LCD MODULE

CNF1 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	GND	Ground	
2	RPF	Display Rotation	(3)
3	SELLVDS	Select LVDS data format	(5)
4	NC	No Connection	(2)
5	NC	No Connection	
6	ODSEL	Overdrive Lookup Table Selection	(4)
7	EN_LCS	Low Color Shift	(6)
8	GND	Ground	
9	RX0-	Negative transmission data of pixel 0	
10	RX0+	Positive transmission data of pixel 0	
11	RX1-	Negative transmission data of pixel 1	
12	RX1+	Positive transmission data of pixel 1	
13	RX2-	Negative transmission data of pixel 2	
14	RX2+	Positive transmission data of pixel 2	
15	RXCLK-	Negative of clock	
16	RXCLK+	Positive of clock	
17	RX3-	Negative transmission data of pixel 3	
18	RX3+	Positive transmission data of pixel 3	
19	GND	Ground	
20	GND	Ground	
21	GND	Ground	
22	GND	Ground	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	
26	VCC	Power supply: +5V	
27	VCC	Power supply: +5V	
28	VCC	Power supply: +5V	
29	VCC	Power supply: +5V	
30	VCC	Power supply: +5V	

Note (1) Connector Part No.: FI-X30SSL-HF(JAE) or compatible

Note (2) Reserved for internal use. Left it open.

Note (3) Low : normal display (default), High : display with 180 degree rotation

Note (4) Overdrive lookup table selection. The Overdrive lookup table should be selected in accordance to the frame rate to optimize image quality.

ODSEL	Note
L	Lookup table was optimized for 60 Hz frame rate.
H	Lookup table was optimized for 50 Hz frame rate.

Note (5) Please refer to 5.5 LVDS INTERFACE (Page 17)

Note (6) Enable Low color shift function.

EN_LCS	Note
L	Low color shift off
H	Low color shift on

5.2 BACKLIGHT UNIT

The pin configuration for the housing and leader wire is shown in the table below.

CN3-CN9 (Housing): BHR-03VS-1 (JST)

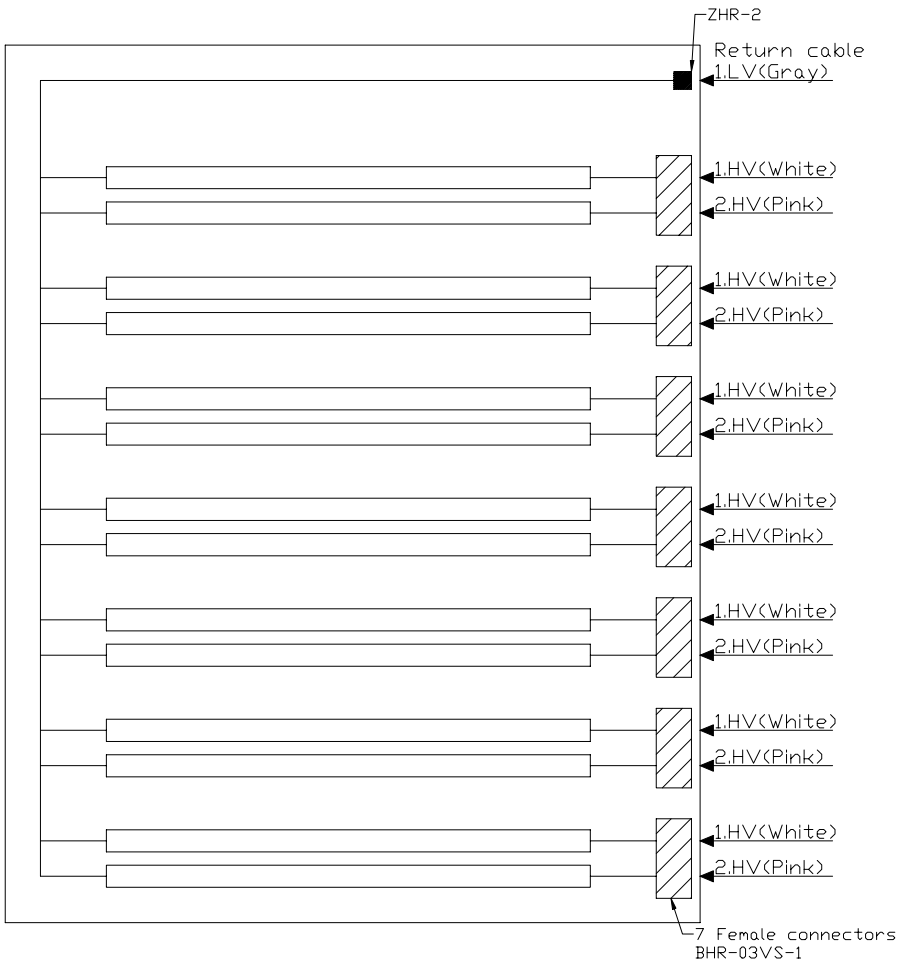
Pin No.	Symbol	Description	Wire Color
1	HV	High Voltage	Pink
2	HV	High Voltage	White

Note (1) The backlight interface housing for high voltage side is a model BHR-03VS-1, manufactured by JST. The mating header on inverter part number is SM02(8.0)B-BHS-1-TB(LF) or equivalent.

CN10 (Housing): ZHR-2 (JST) or equivalent

Pin No.	Symbol	Description	Wire Color
1	LV	Low Voltage (+)	Gray
2	NC	No Connection	-

Note (2) The backlight interface housing and return cable for low voltage side is a model ZHR-2 , manufactured by JST or equivalent. The mating header on inverter part number is S2B-ZR-SM3A-TF(D)(LF) or equivalent.



5.3 INVERTER UNIT

CN1(Header):S10B-PH-SM3-TB(D)(LF)(JST) or equivalent.

Pin	Name	Description
1	VBL	+24V Power input
2		
3		
4		
5		
6	GND	Ground
7		
8		
9		
10		

CN2(Header): S12B-PH-SM3-TB(D)(LF)(JST) or equivalent.

Pin	Name	Description
1	VBL	+24V Power input
2		
3		
4		
5		
6	GND	Ground
7		
8		
9	SEL	Internal/external PWM selection High : external dimming Low : internal dimming
10	E_PWM	External PWM control signal E_PWM should be connected to low when internal PWM was selected (SEL = low).
11	I_PWM	Internal PWM control signal I_PWM should be connected to ground when external PWM was selected (SEL = high).
12	BLON	Backlight on/off control

CN3-CN9(Header): SM02(8.0)B-BHS-1-TB(LF)(JST) or equivalent

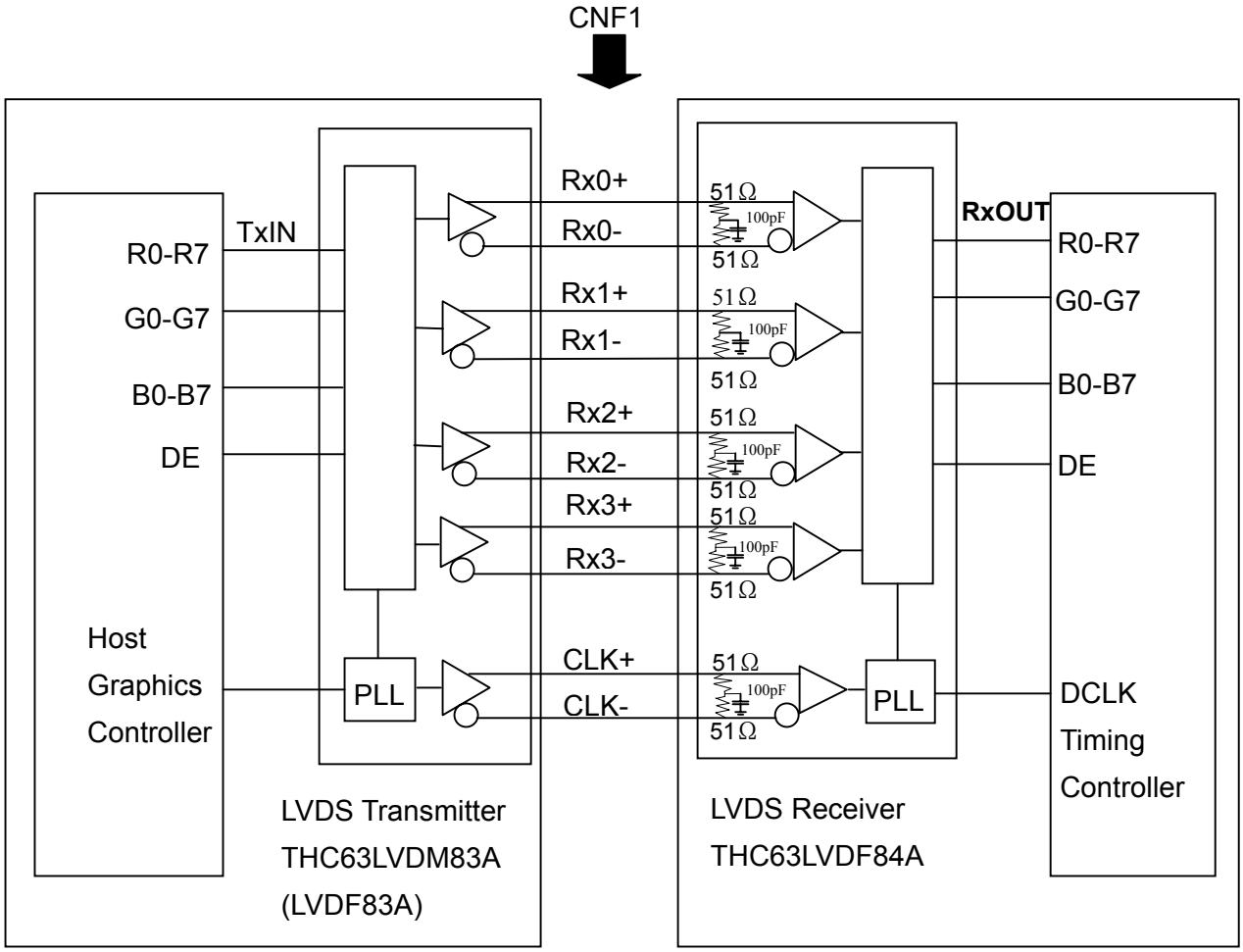
Pin	Name	Description
1	CCFL HOT	CCFL high voltage
2	CCFL HOT	CCFL high voltage

CN10(Header): S2B-ZR-SM3A-TF(D)(LF)(JST) or equivalent

Pin	Name	Description
1	CCFL COLD	CCFL low voltage
2	NC	-

Note (1) Floating of any control signal is not allowed.

5.4 BLOCK DIAGRAM OF INTERFACE



R0~R7 : Pixel R Data ,

G0~G7 : Pixel G Data ,

B0~B7 : Pixel B Data ,

DE : Data enable signal

Note (1) The system must have the transmitter to drive the module.

Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

5.5 LVDS INTERFACE

	SIGNAL		TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER THC63LVDF84A		TFT CONTROL INPUT	
	SELLVDS =L	SELLVDS =H	PIN	INPUT	Host	TFT-LCD	PIN	OUTPUT	SELLVDS =L	SELLVDS =H
	R0	R2	51	TxIN0			27	Rx OUT0	R0	R2
	R1	R3	52	TxIN1			29	Rx OUT1	R1	R3
	R2	R4	54	TxIN2	TA OUT0+	Rx 0+	30	Rx OUT2	R2	R4
	R3	R5	55	TxIN3			32	Rx OUT3	R3	R5
	R4	R6	56	TxIN4			33	Rx OUT4	R4	R6
	R5	R7	3	TxIN6	TA OUT0-	Rx 0-	35	Rx OUT6	R5	R7
	G0	G2	4	TxIN7			37	Rx OUT7	G0	G2
	G1	G3	6	TxIN8			38	Rx OUT8	G1	G3
	G2	G4	7	TxIN9			39	Rx OUT9	G2	G4
	G3	G5	11	TxIN12	TA OUT1+	Rx 1+	43	Rx OUT12	G3	G5
	G4	G6	12	TxIN13			45	Rx OUT13	G4	G6
	G5	G7	14	TxIN14			46	Rx OUT14	G5	G7
	B0	B2	15	TxIN15	TA OUT1-	Rx 1-	47	Rx OUT15	B0	B2
	B1	B3	19	TxIN18			51	Rx OUT18	B1	B3
24	B2	B4	20	TxIN19			53	Rx OUT19	B2	B4
bit	B3	B5	22	TxIN20			54	Rx OUT20	B3	B5
	B4	B6	23	TxIN21	TA OUT2+	Rx 2+	55	Rx OUT21	B4	B6
	B5	B7	24	TxIN22			1	Rx OUT22	B5	B7
	DE	DE	30	TxIN26			6	Rx OUT26	DE	DE
	R6	R0	50	TxIN27	TA OUT2-	Rx 2-	7	Rx OUT27	R6	R0
	R7	R1	2	TxIN5			34	Rx OUT5	R7	R1
	G6	G0	8	TxIN10			41	Rx OUT10	G6	G0
	G7	G1	10	TxIN11			42	Rx OUT11	G7	G1
	B6	B0	16	TxIN16	TA OUT3+	Rx 3+	49	Rx OUT16	B6	B0
	B7	B1	18	TxIN17			50	Rx OUT17	B7	B1
	RSVD 1	RSVD 1	25	TxIN23			2	Rx OUT23	NC	NC
	RSVD 2	RSVD 2	27	TxIN24	TA OUT3-	Rx 3-	3	Rx OUT24	NC	NC
	RSVD 3	RSVD 3	28	TxIN25			5	Rx OUT25	NC	NC
		DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	RxCLK IN+ RxCLK IN-	26	RxCLK OUT	DCLK	

R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE: Data enable signal

Notes(1) RSVD(reserved)pins on the transmitter shall be “H” or “L”.

5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

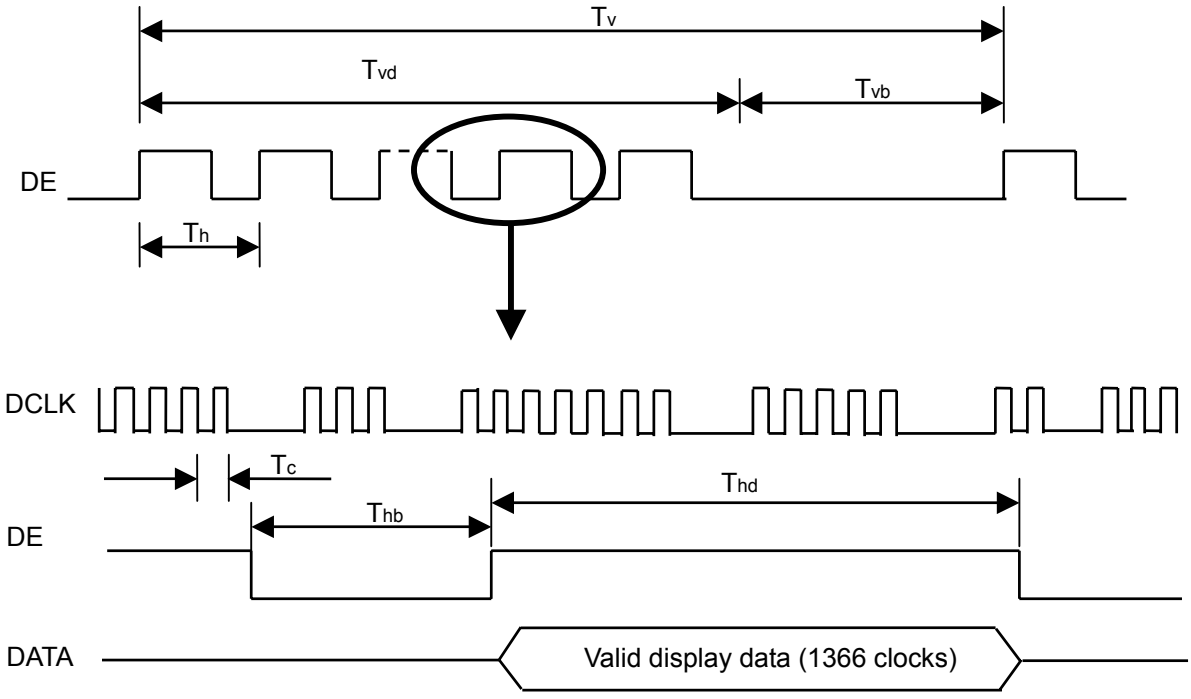
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	60	86	88	MHz	
	Input cycle to cycle jitter	Trcl	-	-	200	ps	
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	
	Hold Time	Tlvhd	600	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr_5	47	50	53	Hz	(2)
		Fr_6	57	60	63	Hz	
	Total	Tv	770	795	888	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768	Th	-
	Blank	Tvb	2	27	120	Th	-
Horizontal Active Display Term	Total	Th	1436	1798	1936	Tc	Th=Thd+Thb
	Display	Thd	1366	1366	1366	Tc	-
	Blank	Thb	70	432	570	Tc	-

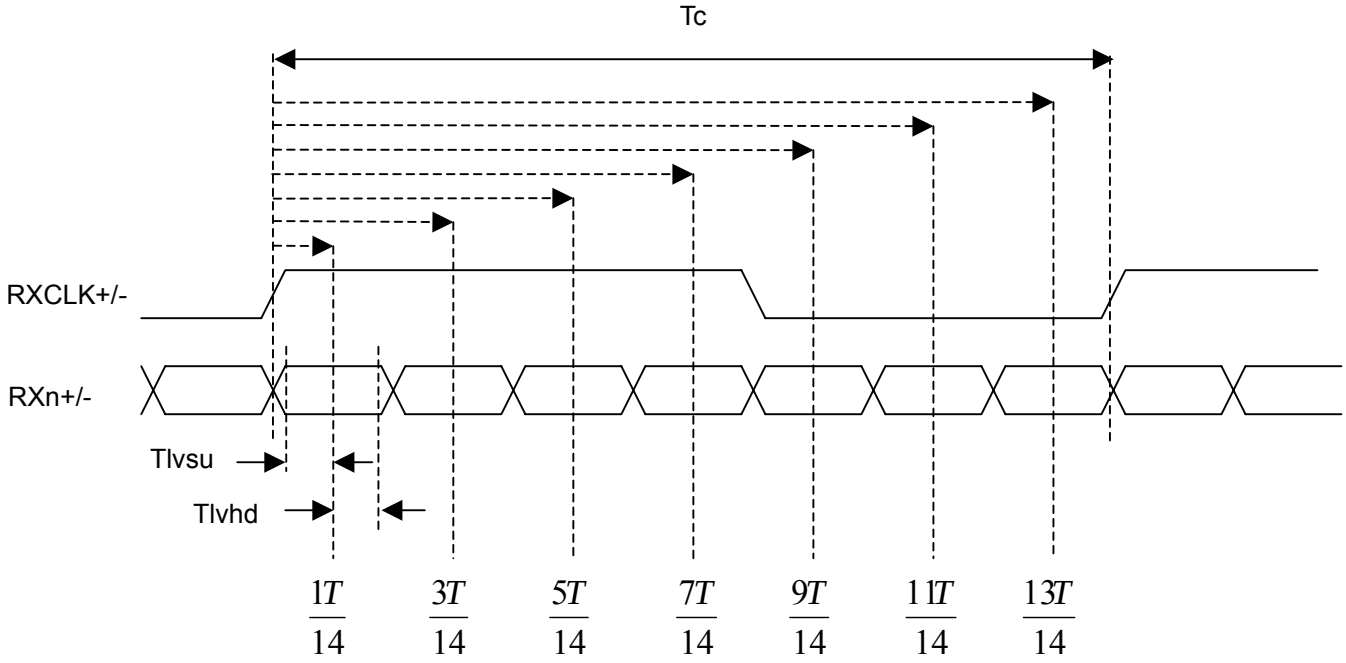
Note (1) Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

(2) Please refer to 5.1 for detail information.

INPUT SIGNAL TIMING DIAGRAM

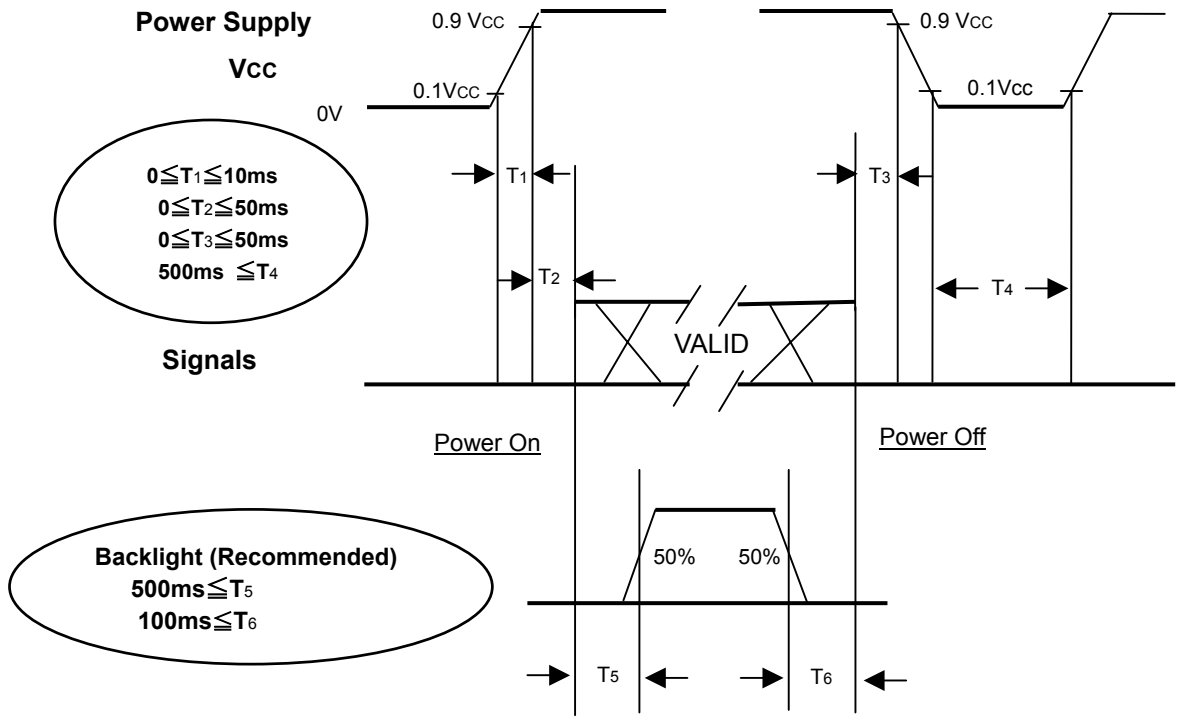


LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	4.7 ± 0.5	mA
Oscillating Frequency (Inverter)	F_W	56 ± 3	KHz

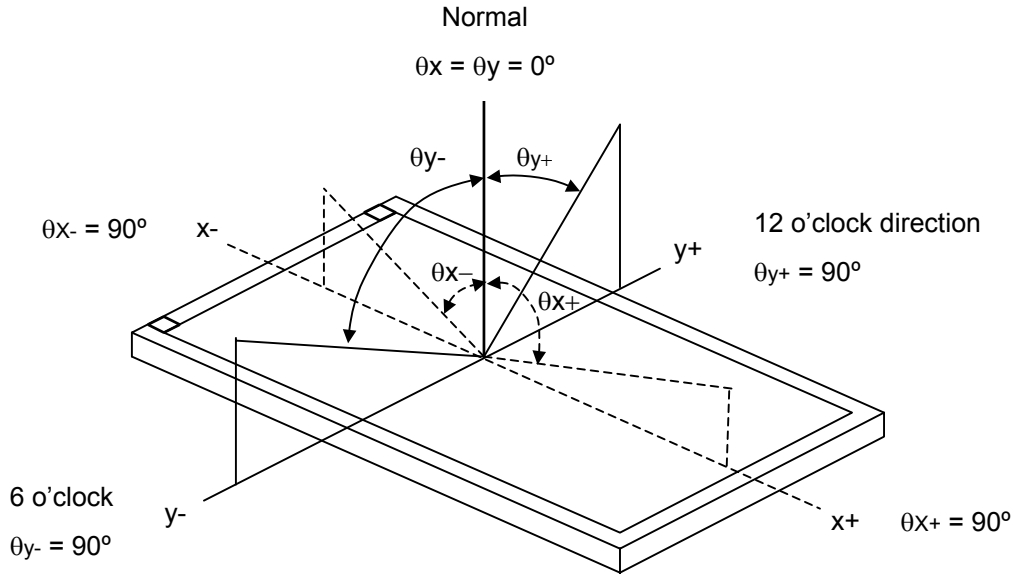
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle		(1000)		-	(2)
Response Time		Gray to gray average			(8)		ms	(3)
Center Luminance of White		L_C			(550)		cd/m^2	(4)
White Variation		δW				(1.3)	-	(7)
Cross Talk		CT				(4)	%	(5)
Color Chromaticity	Red	Rx			(0.652)		-	(6)
		Ry			(0.331)		-	
	Green	Gx			(0.275)		-	
		Gy			(0.597)		-	
	Blue	Bx			(0.143)		-	
		By			(0.063)		-	
	White	Wx			(0.285)		Target	
		Wy			(0.293)			
	Color Gamut	CG			(75)		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥20		(88)		Deg.	(1)
		θ_x-			(88)			
	Vertical	θ_Y+			(88)			
		θ_Y-			(88)			

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by EZ-Contrast 160R (Eldim)



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

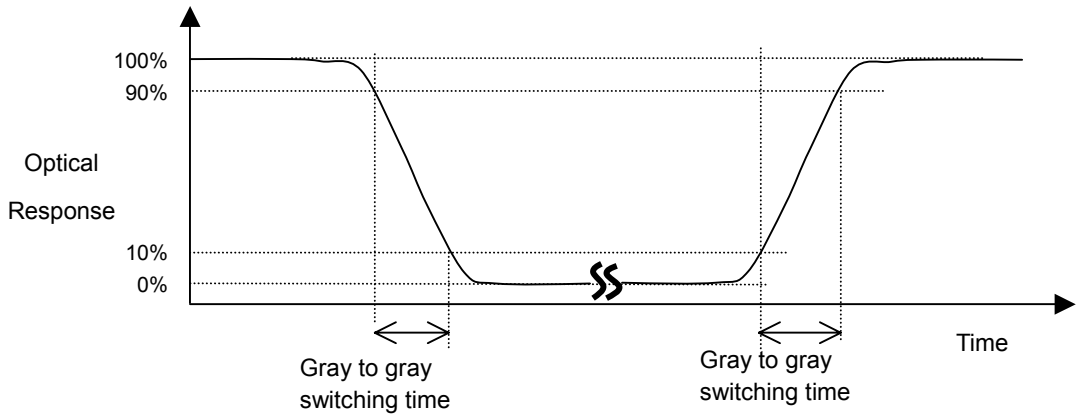
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (3) Definition of Gray to Gray Switching Time :



The driving signal means the signal of gray level 0, 63, 127, 191, 255.

Gray to gray average time means the average switching time of gray level 0 ,63,127,191,255 to each other .

Note (4) Definition of Luminance of White (L_C, L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L(5)$

$L_{AVE} = [L(1)+ L(2)+ L(3)+ L(4)+ L(5)] / 5$

L (x) is corresponding to the luminance of the point X at the figure in Note (7).

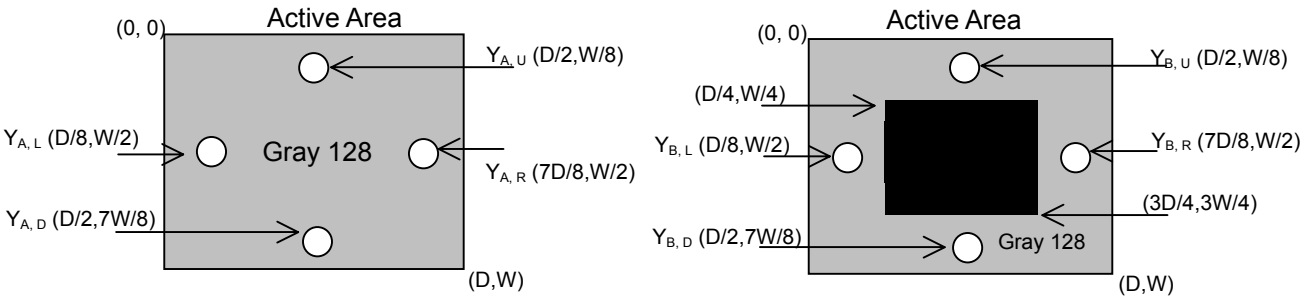
Note (5) Definition of Cross Talk (CT):

$CT = | Y_B – Y_A | / Y_A \times 100$ (%)

Where:

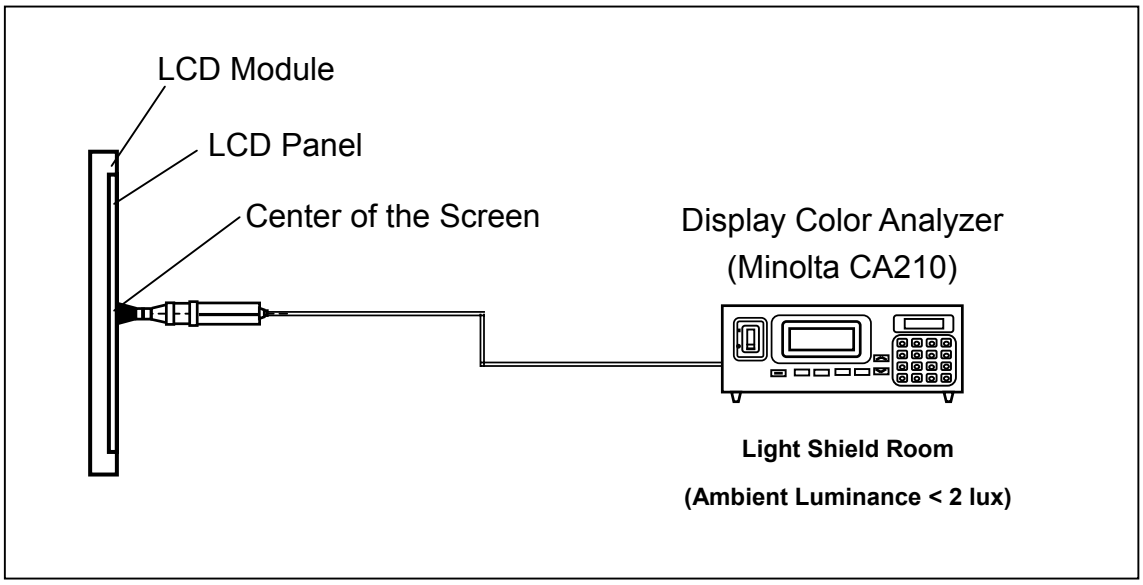
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)



Note (6) Measurement Setup:

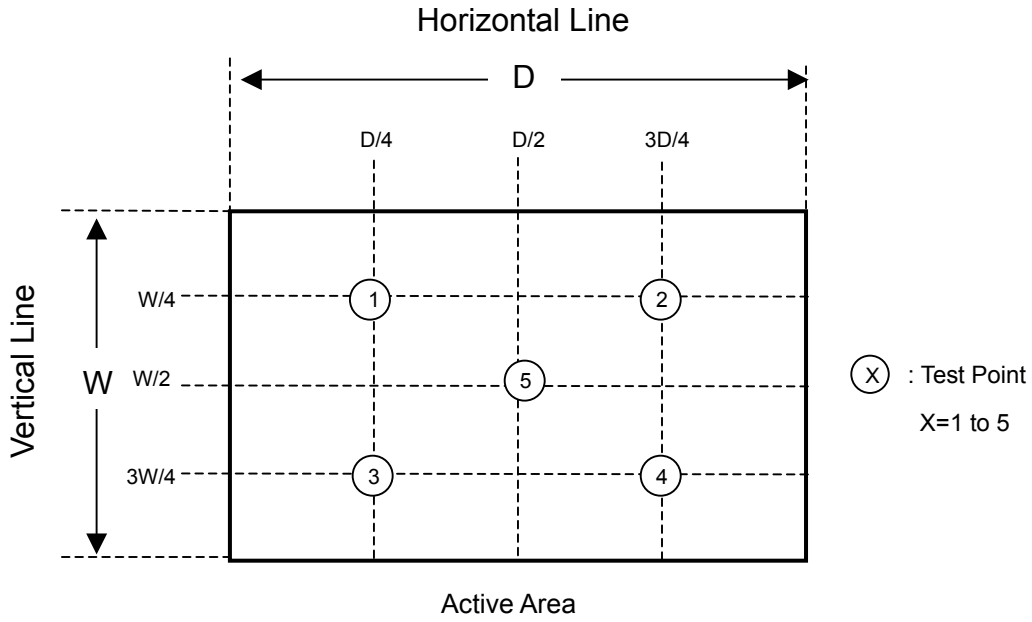
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

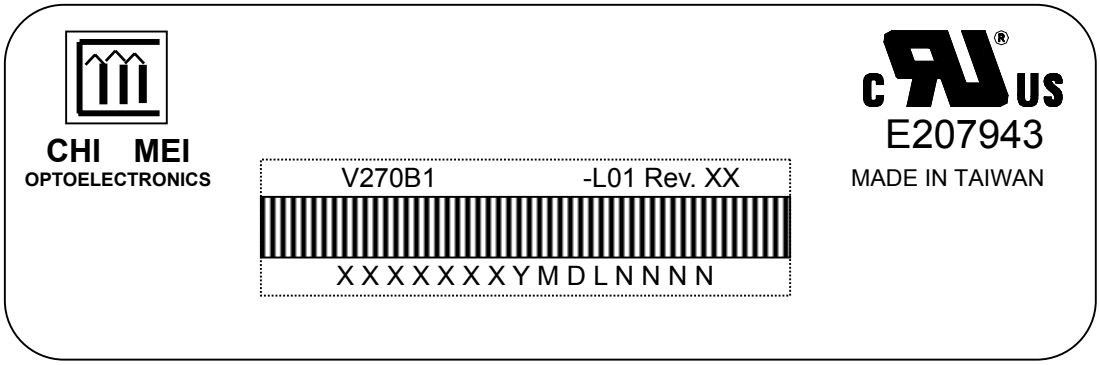
δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

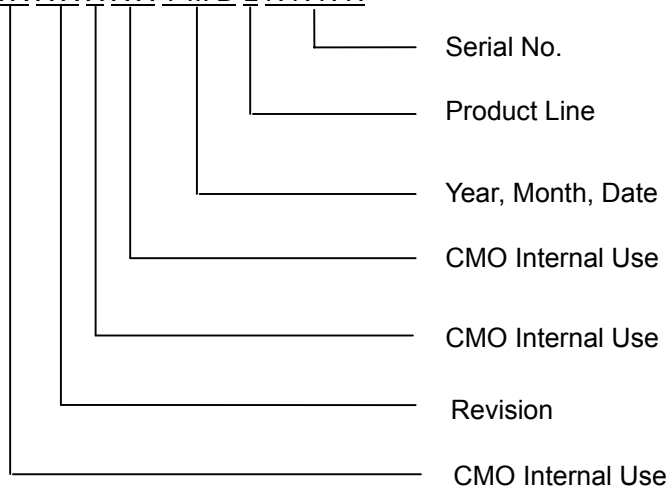
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: V270B1-L01

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) Serial ID: X X X X X X X Y M D L N N N N



Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

(b) Revision Code: Cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 4 LCD TV modules / 1 Box

(2) Box dimensions : 742(L) X 327 (W) X 510 (H)

(3) Weight : approximately 19Kg (4 modules per box)

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

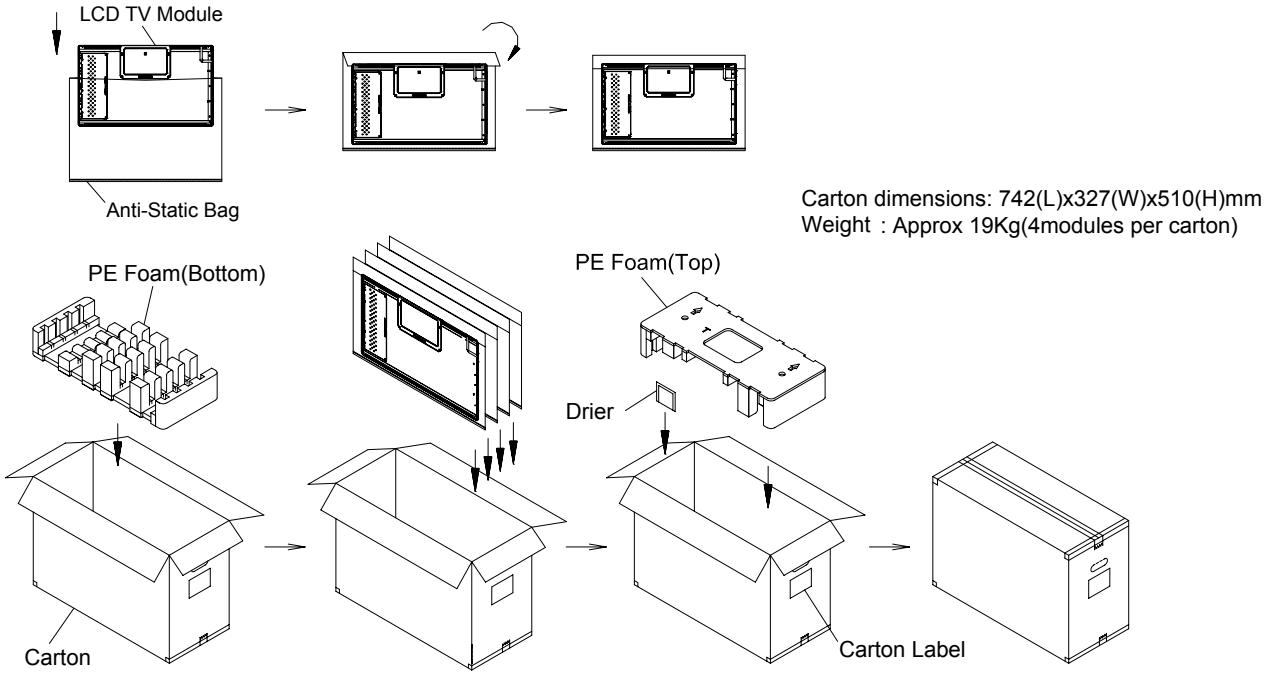


Figure.9-1 packing method

Corner Protector:L1020*50mm*50mm
Pallet:L1100*W1100*H135mm
Corrugated Fiberboard:L1100*W1100mm
Pallet Stack:L1100*W1100*H1160mm
Gross:168kg

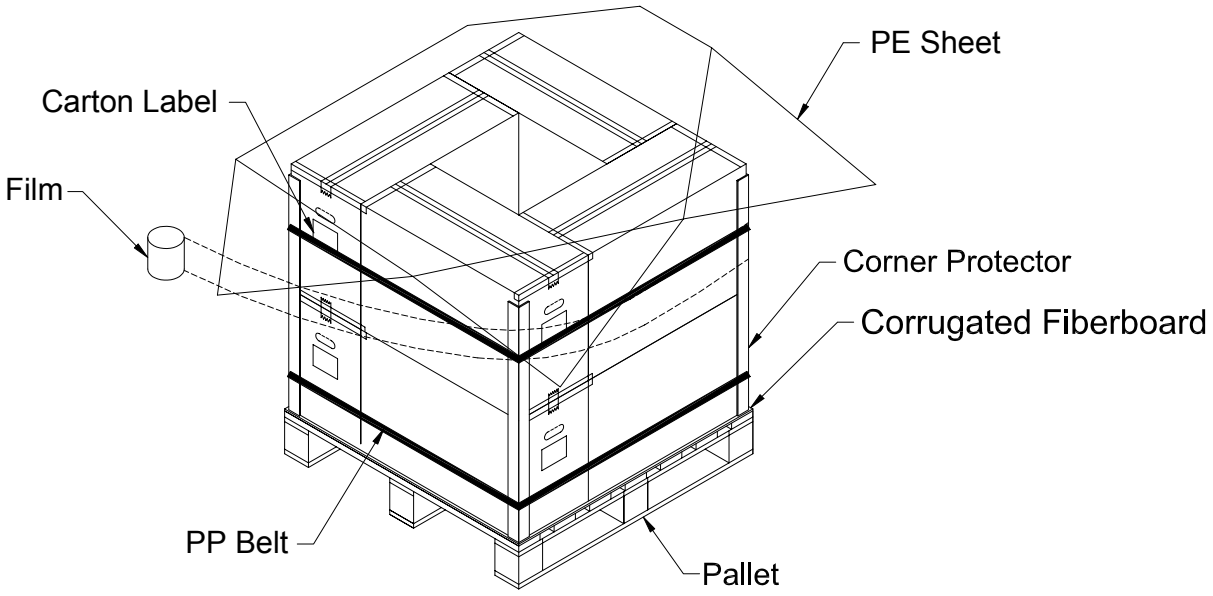


Figure. 9-2 packing method

10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

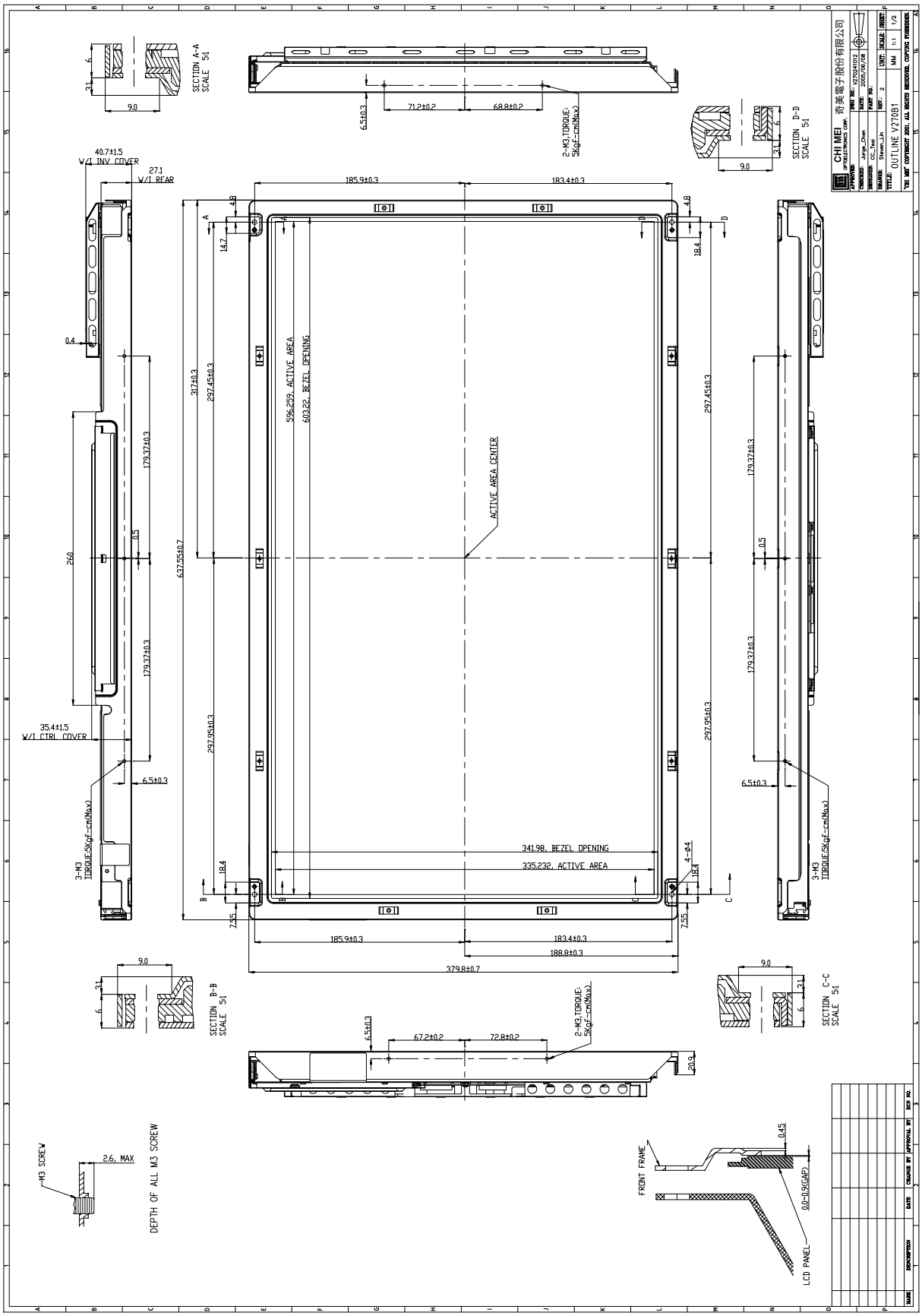
10.2 SAFETY PRECAUTIONS

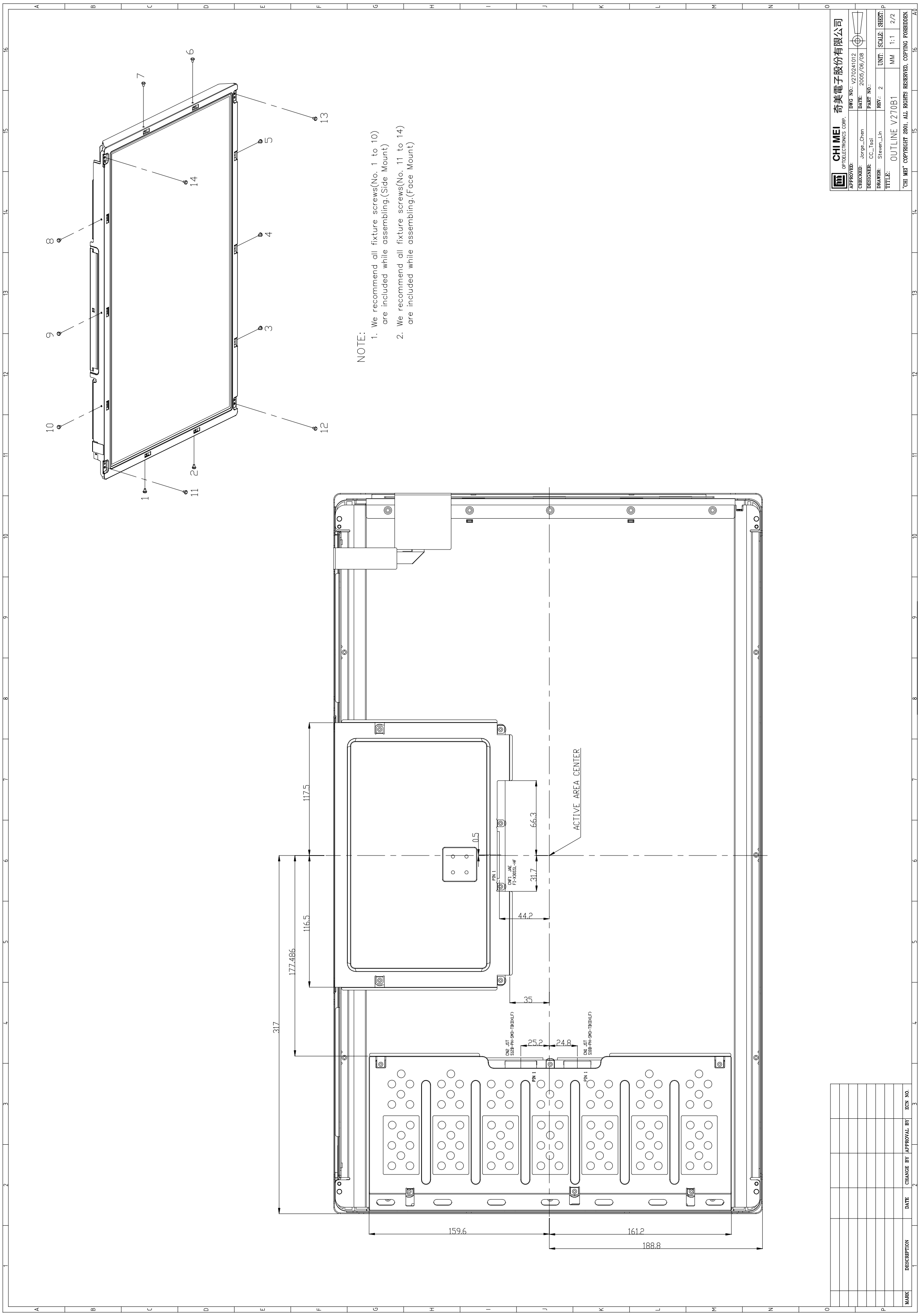
(1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.

11. MECHANICAL CHARACTERISTICS

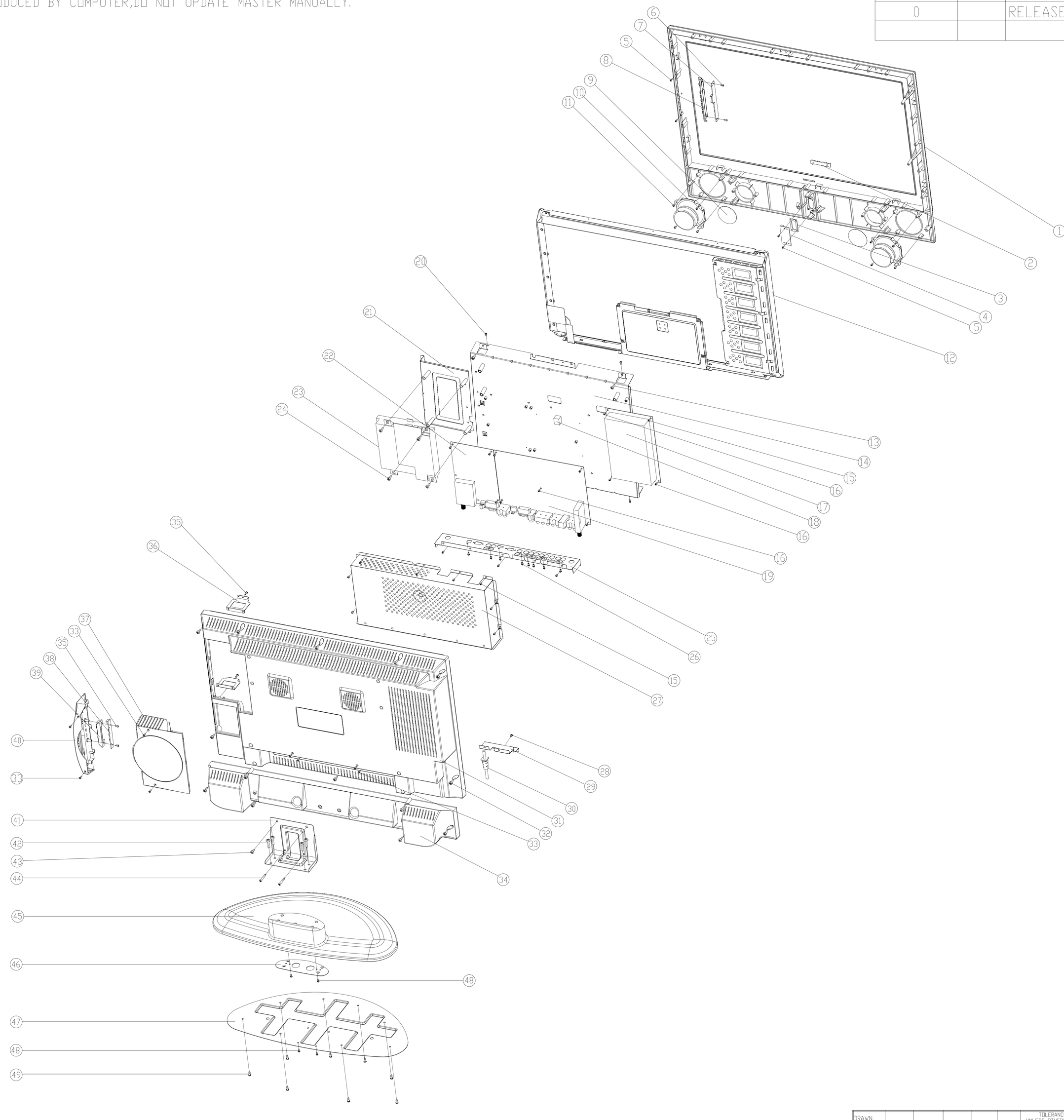




NOTE:
1. We recommend all fixture screws(No. 1 to 10) are included while assembling.(Side Mount)
2. We recommend all fixture screws(No. 11 to 14) are included while assembling.(Face Mount)
ACTIVE AREA CENTER
117.5
116.5
177.486
317
66.3
31.7
44.2
0.5
35
25.2
24.8
159.6
161.2
188.8
CHI MEI
OPTOELECTRONICS CORP.
奇美電子股份有限公司
OUTLINE V270B1
MM
1:1
2/2
"CHI MEI" COPYRIGHT 2001, ALL RIGHTS RESERVED, COPYING FORBIDDEN.
MARK
DESCRIPTION
DATE
CHANGE BY
APPROVAL BY
ECN NO.

NOTE : THIS RELEASED DRAWING WAS PRODUCED BY COMPUTER,DO NOT UPDATE MASTER MANUALLY.

DWG.Rev.	ZONE	DESCRIPTION	DATE	REVISOR
0		RELEASE	21-Jul-06	tzl



BOM NO: LCT27ADADAICS-A02

ITEM	PART No.	DESCRIPTION	QTY
49	614-400412-10	S-TAP. SCREW BID 4X12	6
48	614-300108-10	S-TAP. SCREW BID 3X8	4
47	449-27LA11-01	METAL PLATE FOR STAND BASE	1
46	423-27LA08-01	MIDDLE PLATE	1
45	230-26LA11-02RV	STAND COVER	1
44	614-400440-00	S-TAP. SCREW BID 4X40	2
43	604-407010-00	MACH. SCREW BID M4X10	2
42	604-508022-00	MACH. SCREW BID M5X22	4
41	423-27LA0A-01	STAND SUPPORT PLATE	1
40	258-L27AD21-01RV	DVD FUNCTION KNOB COVER	1
39	277-L27AD11-01S	DVD FUNCTION KNOB	1
38	771KL27AD02-01	DVD KEY PCB ASSY	1
37	236-L27AD11-01RV	DVD COVER	1
36	429-L27AD02-01S	DVD COVER BRACKET	2
35	614-300108-10	S-TAP. SCREW BID 3X8	4
34	206-L27AD11-01RV	SPEAKER BACK CABINET	1
33	601-3005008-00	MACH. SCREW CTS M3X8	10
32	614-400416-00	S-TAP. SCREW BID 4X16	12
31	202-L27AD31-01AV	BACK CABINET	1
30	E3461-064039	POWER CABLE	1
29	426-L27AD05-01S	POWER BRACKET	1
28	614-300210-10	S-TAP. SCREW BID 3X10	1
27	483-L27AD11-01S	SHIELD COVER -MAIN PCB	1
26	610-300210-10	S-TAP. SCREW BID 3X10	8
25	436-L27AD0D-01S	TERMINAL SHEET S-MT8202 W/DVD	1
24	604-305008-00	MACH. SCREW M3X8	1
23	E7801-DD2001	DVD PCB ASSY NEON FOR MT8202 NEW	2
22	771S42D102-0	ATSC TUNER PCB ASS'Y	1
21	481-L27AD01-01S	DVD BOTTOM PLATE FOR NEON	1
20	602-305004-10	MACH. SCREW PAN-WASHER M3X4	4
19	771EL27AD04-05	MAIN PCB ASS'Y S-MT8202	1
18	370-42D102-01	PAD	1
17	E7801-PQ2001	PCB ASSY PSU BOARD MEGMEET MT168	1
16	604-305005-10	MACH. SCREW BID M3X5	25
15	614-300210-10	S-TAP. SCREW BID 3X10	2
14	428-L27AD01-01S	PANEL BRACKET FOR MT8202	1
13	614-400412-10	S-TAP. SCREW BID 4X12	10
12	E6203-27CD02	LCD PANEL CMO	1
11	614-300210-10	S-TAP. SCREW BID 3X10	8
10	E4801-124001	SPEAKER	2
9	389-L32AB01-01	PVC PLATE	2
8	277-L32AD11-01S	FUNCTION KEY LCT32AD SILVER	1
7	771KL37AD01-01	KEY PCB ASSY	1
6	614-220206-10	S-TAP. SCREW BID 2.2X6	2
5	614-260208-10	S-TAP. SCREW BID 2.6X8	4
4	771BL37AD01-01	IR RECEIVE PCB ASSY	1
3	269-42SD01-01L	REMOTE RECEIVE LENS	1
2	486-M32111-01	NAME PLATE	1
1	200-L27AD21-STD01A	FRONT CABINET	1

DRAWN.							TOLERANCE UNLESS OTHERWISE SPECIFIED	KAWA ELECTRONIC R & D CENTRE	TITLE EXPLODE VIEW
CHECKED							0 ~ 30 ± 0.10		MODEL NO. LCT2721AD
APPRD.							>30~100 ± 0.20	MATL.	A3 PART NO. / DWG. NO.
3rd ANGLE PROJECTION							>100 ± 0.30	FINISH	SCALE 1:1 / SHEET 1 OF 1
							ANGULAR: ± 0.3°		
							UNIT : mm		

Spare Parts List

Item	Part Number	Part Description	Usage / unit	Unit	Key/Spare
	LCT27ADADA1CS-A02	AKAI LCT27"(LCT2721AD) (II) S-MT8202 +DVD(NEON)/CMO AC120V/60HZ USA SILVER			
1>	510-L27AD03-09AK	CARTON BOX AKAI LCT2721AD	1.000000	Piece	K
2>	580-L27AD2B-03AP	IB E FOR AKAI LCT2721AD DTV +DVD S-MT8202 CMO USA	1.000000	Piece	K
3>	E7501-061001	REMOTE CONTROL K002 AKAI FOR MT8202 COMBO 60KEYS SIL/BLK	1.000000	SET	K
4>	E7801-P02001	PCB ASSY PSU BOARD MEGMEET MLT168 FOR 27LCD AC110-240V OUTPUT 12V/8V/24V 200W	1.000000	SET	K
5>	771EL27AD04-05	MAIN PCB ASS'Y S-MT8202 DVD (NEON) USA CMO	1.000000	SET	K
6>	771S42D102-02	ATSC TUNER PCB ASS'Y (MT5111CE) W/O MAX3232	1.000000	SET	K
7>	200-L27AD21-STD01A	CABINET FRONT SILVER/BLACK A	1.000000	Piece	S
8>	202-L27AD51-01A	BACK CABINET BLACK LCT27AD	1.000000	Piece	S
9>	206-L27AD11-01R	SPEAKER CABINET AKAI LCT2701TD(MT8205) R	1.000000	Piece	S
10>	236-L27AD11-01RV	DVD COVER BLACK LCT2701TD R	1.000000	Piece	S
11>	258-L27AD21-01R	DVD FUNCTION KNOB COVER KNOB BLACK R	1.000000	Piece	S
12>	269-42SD01-01L	REMOTE RECEIVE LENS	1.000000	Piece	S
13>	277-L27AD11-01S	DVD FUNCTION KNOB BLK LCT2701TD S	1.000000	Piece	S
14>	277-L32AD11-01S	FUNCTION KEY SIL(MATERIAL: BLACK) LCT32SD	1.000000	Piece	S
15>	300-L27AD05-02C	POLYFOAM BOTTOM	1.000000	Piece	S
16>	300-L27AD06-02C	POLYFOAM TOP	1.000000	Piece	S
17>	310-030404-01	POLYBAG 110MMX80MMX0.04MM	1.000000	Piece	S
18>	310-041204-01V	POLYBAG 4"X12"X0.04 AV	1.000000	Piece	S

Spare Parts List

19>	310-111404-07V	POLYBAG 11"X14"X0.04 FV	1.000000	Piece	S
20>	310-383550-07V	POLYBAG LAMIFILM 38"X35"X0.5MM	1.000000	Piece	S
21>	370-42D102-01	PAD CORD SPONG FOR SPK	1.000000	Piece	S
22>	387-L27AD01-07AH	MODEL PLATE AKAI LCT2721AD	1.000000	Piece	S
23>	389-L32AB01-01	PVC SHEET L32AB	2.000000	Piece	S
24>	426-L27AD05-01S	POWER BRACKET THROUGH WITHOUT SWITCH LCT27AD	1.000000	Piece	S
25>	428-L27AD01-01S	PANEL BRACKET	1.000000	Piece	S
26>	436-L27AD0D-01S	TERMINAL SHEET S-MT8202 W/DVD	1.000000	Piece	S
27>	481-L27AD01-01S	DVD BOTTOM PLATE FOR NEON	1.000000	Piece	S
28>	483-L27AD11-01S	SHIELD COVER-MAIN PCB	1.000000	Piece	S
29>	486-M32111-01	NAME PLATE M AKAI	1.000000	Piece	S
30>	522-421D01-01	MASKING PAPER	1.000000	Piece	S
31>	530-080032-10	FBP WHR 3.2X8.0X1.0	1.000000	Piece	S
32>	563-119-	SERIAL NO. LABEL	1.000000	Piece	S
33>	568-P46T02-02	WARNING LB ENG 42SF NIL	1.000000	Piece	S
34>	578-L32AD01-02AP	FUNCTION SHEET FOR S-MT8202 W/DVD P	1.000000	Piece	S
35>	579-42D102-09	SERIAL NO/BAR CODE LABEL 42D1	1.000000	Piece	S
36>	579-42D105-01	PROTECTIVE EARTH LABEL FOR ESA 42TD1	1.000000	Piece	S
37>	579-L27AD02-05AP	UPC LABEL OF C/B AKAI LCT2721AD	2.000000	Piece	S
38>	579-L27AD09-01	CAUTION LABEL ENG AKAI	1.000000	Piece	S

39>	579-L32AD03-02	CLASS I LASER PRODUCT LOGO	1.000000	Piece	S
40>	590-L27AD01-12AP	WARRANTY CARD AKAI LCT2721AD	1.000000	Piece	S
41>	E3404-157010	AC CORD UL 1.88M FOR MT8202 (W/O FILTER)	1.000000	Piece	S
42>	E3407-081001	CORD FFC P0.5 50P L=110 B-0.5-50X110-4(8)X4(8)-0.3X0.035	1.000000	Piece	S
43>	E3421-925118	WIRE ASSY 8P2.5/7P2.0 L170MM 5V 12V SIGNAL POWER MT8202	1.000000	Piece	S
44>	E3421-925119	WIRE ASSY P2.5 11P/11P L400MM 5V SIGNAL POWER MT8202	1.000000	Piece	S
45>	E3421-925127	WIRE ASSY TJC3-2Y L860 SPK-R MT8202	1.000000	Piece	S
46>	E3421-925133	WIRE ASSY TJC3-3Y L650 SPK-L MT8202	1.000000	Piece	S
47>	E3421-925145	WIRE ASSY 10P/10P 2.5/2.5 L400MM 12V/9V MT8202	1.000000	Piece	S
48>	E3421-926125	WIRE ASSY P2.5 4P/4P L400MM AMP24V EMI MT8202	1.000000	Piece	S
49>	E3461-064036	WIRE ASSY INVERTER 12P2.0+8P2.5 +3P2.0 L450MM L650MM MT8202	1.000000	Piece	S
50>	E3461-064038	WIRE ASSY P2.5 7P/7P L400MM 5V STANBY POWER MT8202 FOR 27"/32" LCD	1.000000	Piece	S
51>	E3461-064039	WIRE ASSY 5P2.5 L560MM 5V 3.3V SIGNAL WIRE EMI MT8202	1.000000	Piece	S
52>	E3471-000048	WIRE WS SHIELD WIRE FOR 32LCD TV+COMBO KEY WIRE FOR DVD	1.000000	Piece	S
53>	E3471-000057	WIRE WS SHIELD WIRE 27" L300MM MICO CMO MT8202 LVDS NEW	1.000000	Piece	S
54>	E3471-000072	WIRE WS SHIELD FOR MT8202 MICO KEY 13P/8P+5P L650/L750MM W/O EMI	1.000000	Piece	S
55>	E3471-002005	WIRE WS SHIELD 6P2.0/+2P2.5 +8P2.0 COMBO DVD SIGNAL WIRE MT8202	1.000000	Piece	S
56>	E3471-002006	WIRE WS SHIELD WIRE 27LCD TV +COMBO DVD SIGNAL WIRE MT8202	1.000000	Piece	S
57>	E4801-124001	SPEAKER 8 OHM 10W D3" YD78-1	2.000000	Piece	S

Spare Parts List

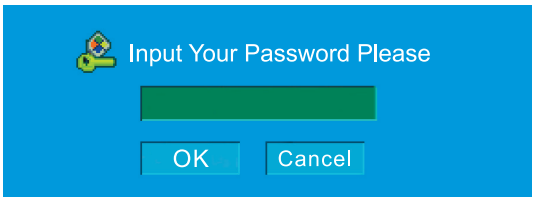
58>	E6203-27CD02	DISPLAY LCD 27" CMO V270B1-L01 1366X768 1000:1 HIGH CONTRAST	1.000000	Piece	S
59>	E7301-010002	BATTERY AAA R03P1.5V <2>	2.000000	Piece	S
60>	E7801-D02001	DVD PCB ASSY NEON FOR MT8202 NEW	1.000000	SET	S
61>	734-L27AD03-01	ELLIPSE PLASTIC BASE ASSY W/O LOGO W/O PACKING SILVER	1.000000	SET	S
62>	771BL37AD01-01	IR RECEIVE PCB ASSY FOR LCT37AD	1.000000	SET	S
63>	771KL27AD02-01	KEY PCB ASSY FOR DVD LCT27AD ATSC & DVD S-MT8202G	1.000000	SET	S
64>	771KL37AD01-01	KEY PCB ASSY FOR LCT37AD	1.000000	SET	S

If you forget your V-Chip Password

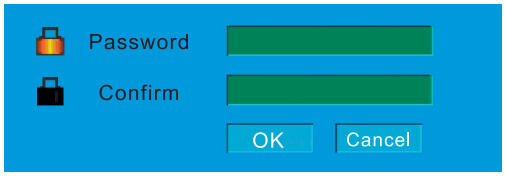
- Omnipotence V-Chip Password: 8202.

Using the “Change Password” item

1. When enter the “V-Chip” menu, select “Change Password”.
2. Press ▲ or ▼ button to highlight the “Change Password” item.
3. Press **Enter** button to confirm and pop up a menu.



4. Use 0~9 buttons input the omnipotence password(8202), then Press **Enter** button to enter and pop up a menu.



5. Use 0~9 buttons input your new password.
6. Press ▼ button to move to confirm blank.
7. Use 0~9 buttons input your new password again.
8. Press **Enter** button to confirm

-Suggest: Change to your familiar Password again.

Software Upgrade

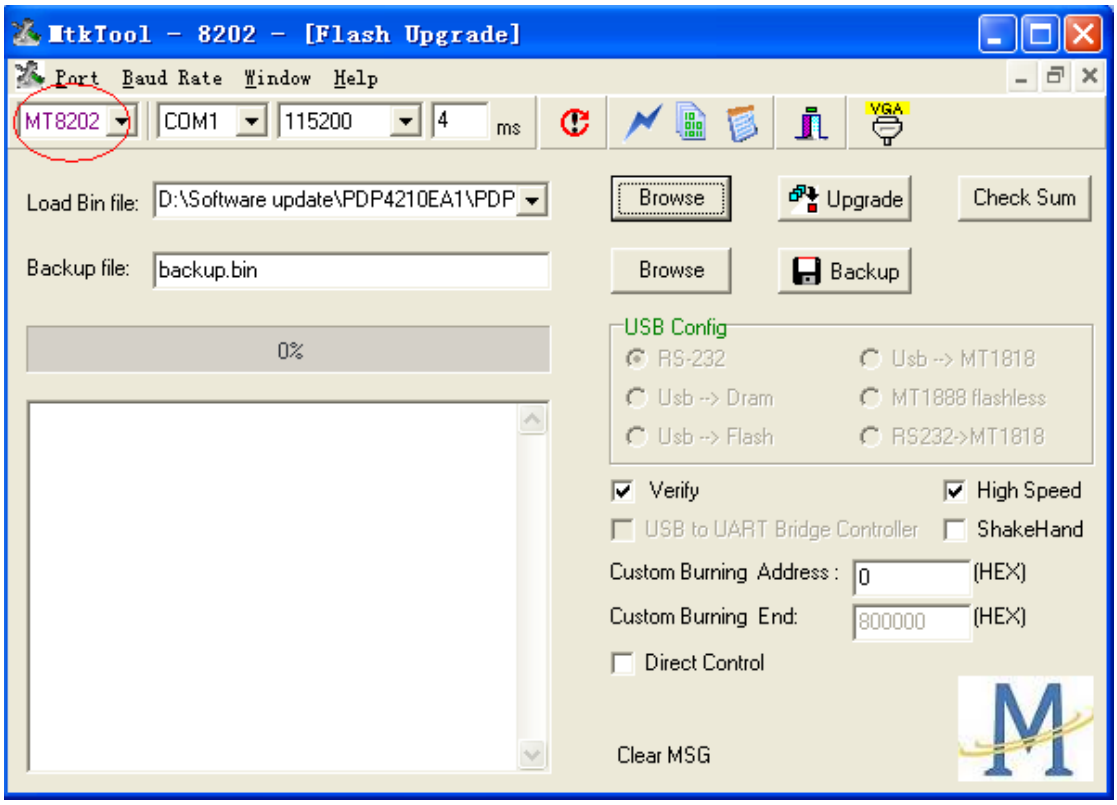
Process of update MT8202

Preparing :

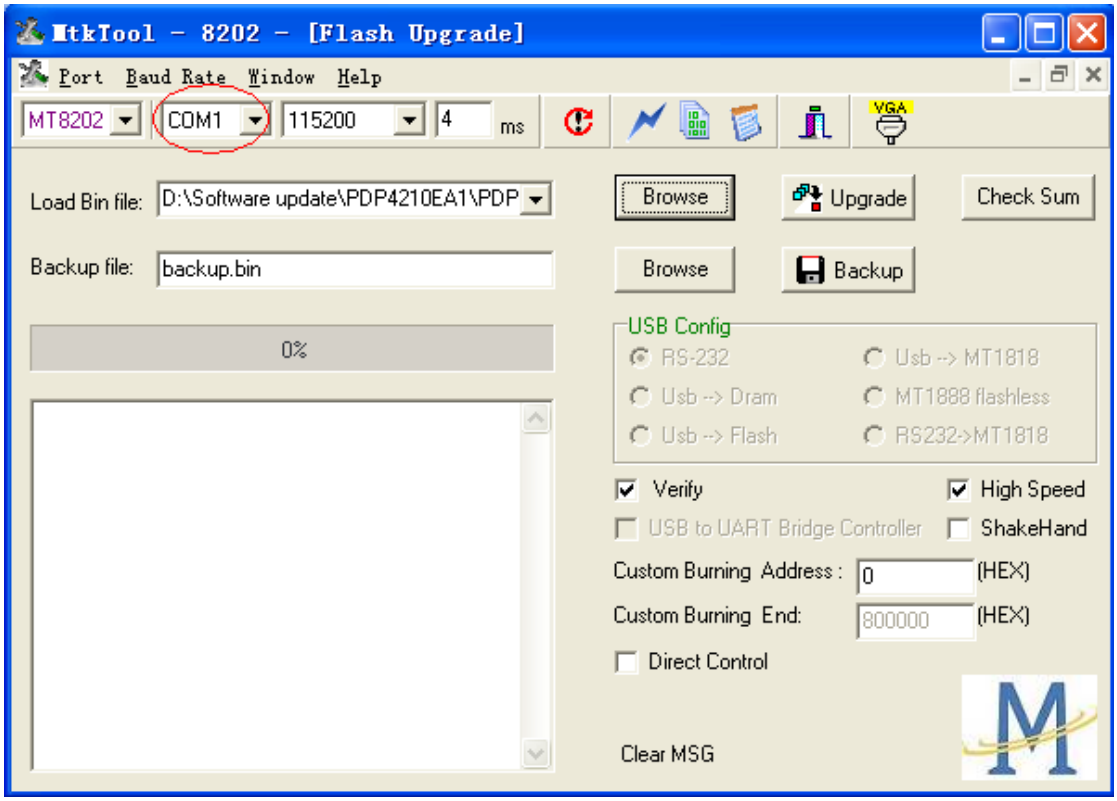
1. Connect the Plasma/LCD TV and PC with the **Software Upgrade Board**.Please find the details for connecting **refering to the appendix at the end of this file.**
2. Store the MtkTool into the PC .

Downloading :

3. Turn on AC power of the TV and then press the button “standby” of the remote control . The image could be found on the screen of the Plasma TV while the color of the power indicator is green . (the mode of the TV will be standby mode if after turn on the main power only .)
4. Execute MTKtool and select the chipset as MT8202. (the software of MTKtool will be sent to your side)

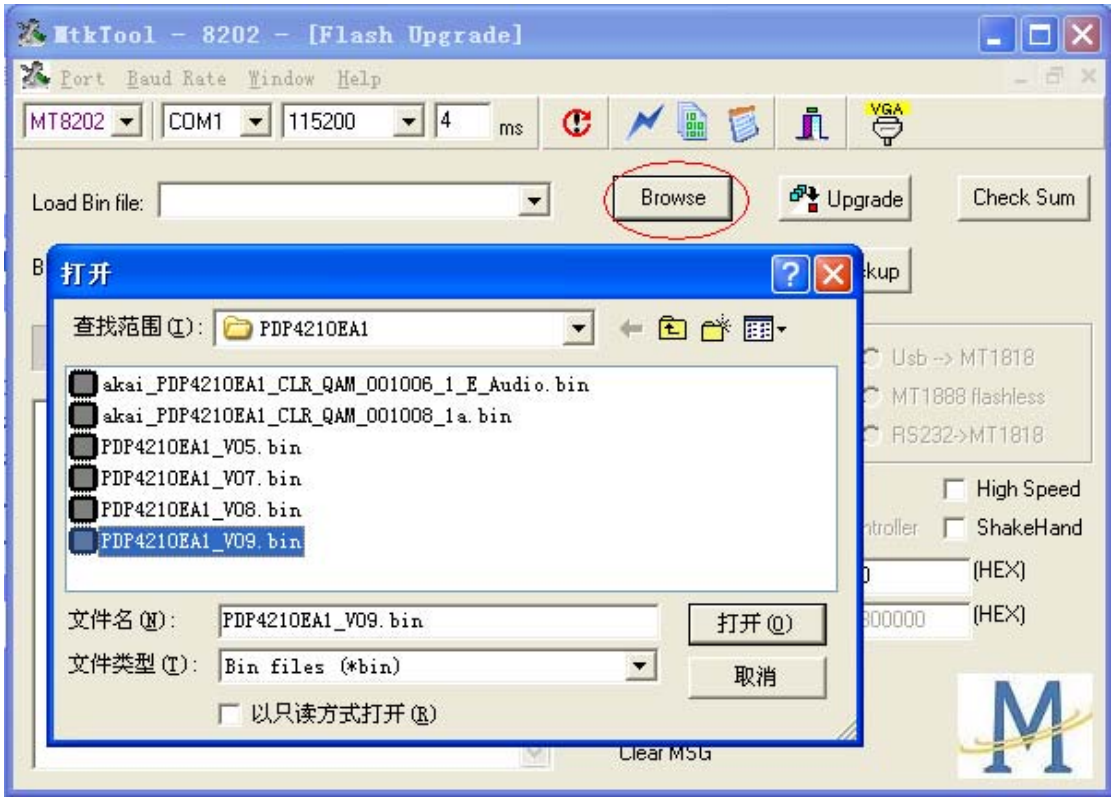


5. Select current COM port. (please try to check the COM port of your PC).

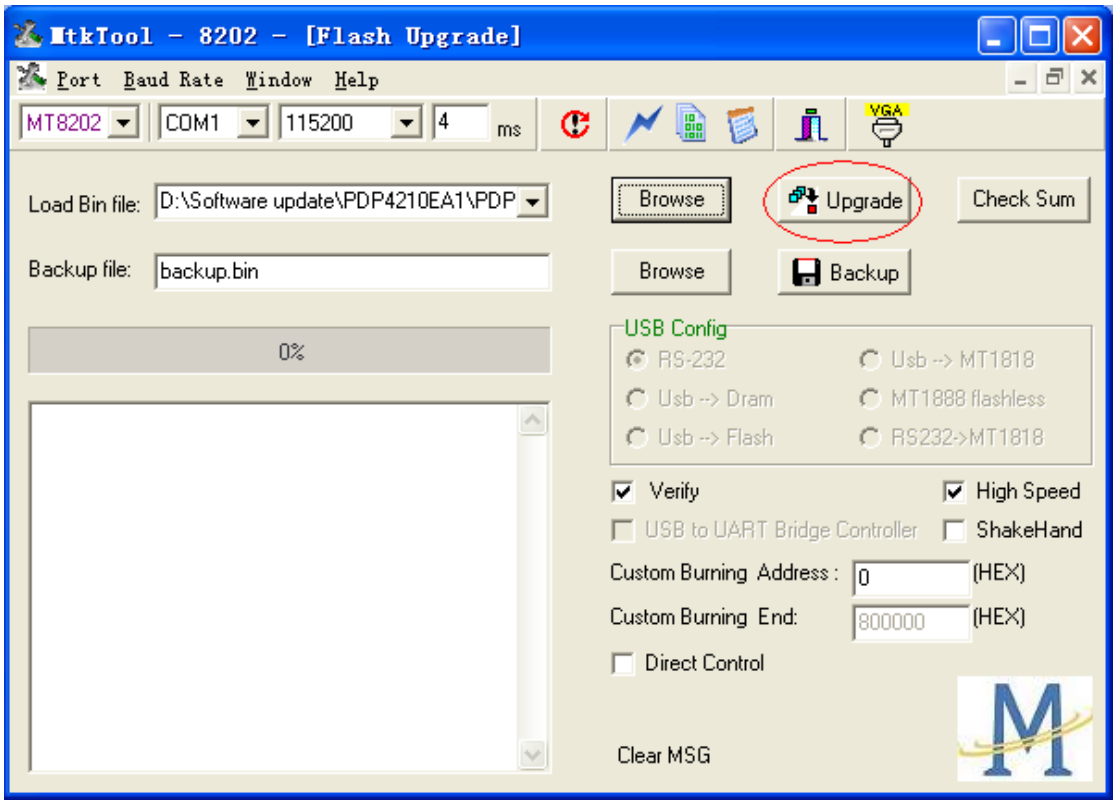


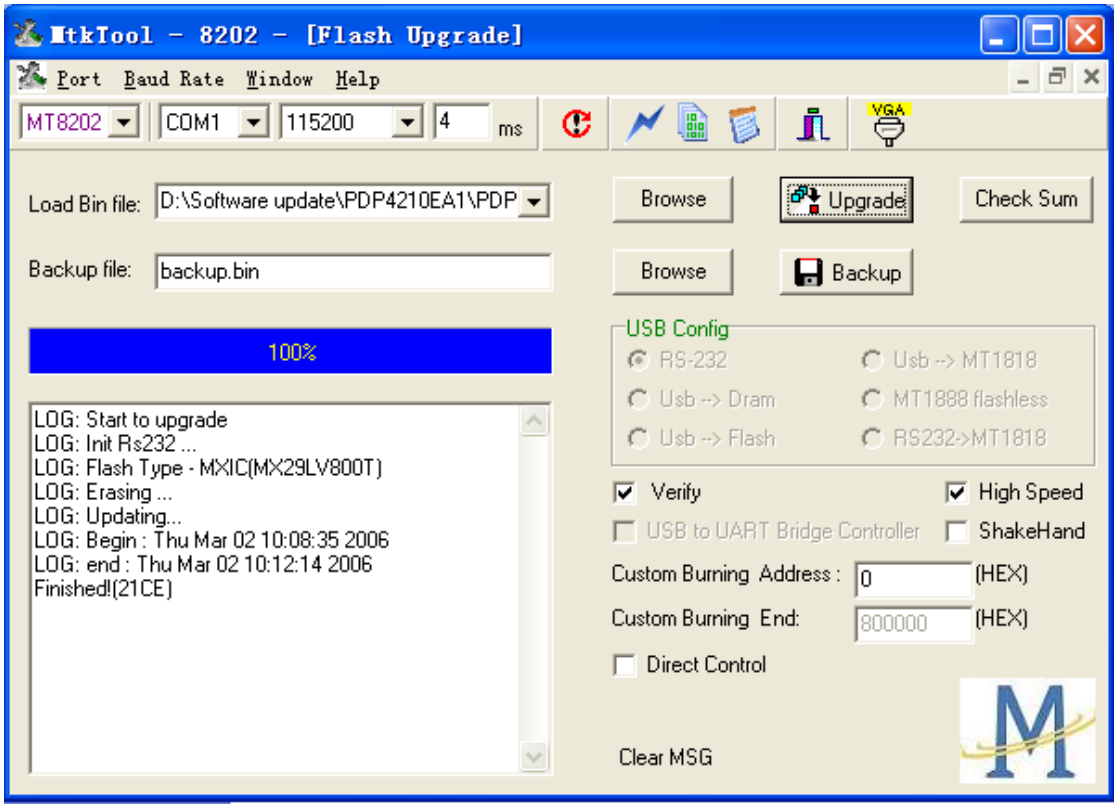
6. Choose the bit rate as 115200.

7. Select the update binary by pressing browse button. For example,the binary file name is PDP4210EA1_V09.bin. (this update firmware will be sent to your side)



8. Press Upgrade button and start update process.





9. The update process is successful as the progress bar is 100%. After the update process is ok,

turn off power and wait indicator light is off. Turn on power and TV can work.

Checking

It is needed to check the version of the firmware for MT8202 which has been download into the Plasma TV .

Press Menu button of the remote control，following input “8202”of the remote control and OSD menu for Factory Setting is appeared on the screen .

Use the remote control and select the mode of Firmware Version and then enter the mode of Firmware Version . It is easy to be found the version of the current firmware for MT8202 is as the following : “Factory ID : PDP4210EA1_VXX ”

Appendix:

Quick Installation Guide

For

Software Upgrade Board

1. Parts List

- Software upgrade board x 1 (#1)
- RS232 null cable x 1 for PC (#2)
- RS232 – VGA cable (#4)
- USB cable x 1 (#5)

2. Installation for ATV upgrade

2.1 Connect RS232 cable (#2) to PC serial port

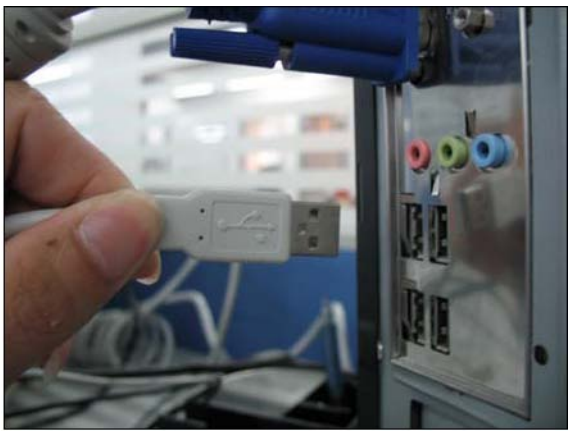
Connect another side of RS232 cable (#2) to the board (#1)

2.2 Connect RS232-VGA cable (#4) (RS232 side) to the board (#1)

Connect RS232-VGA cable (#4) (VGA side) to the TV

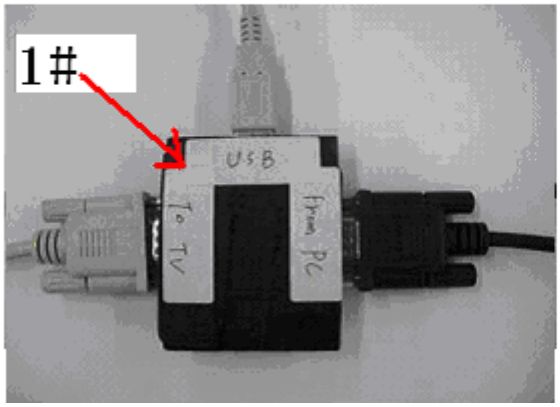
2.3 Connect USB cable (#5) to the board (#1)

Connect another side of USB cable (#5) to PC

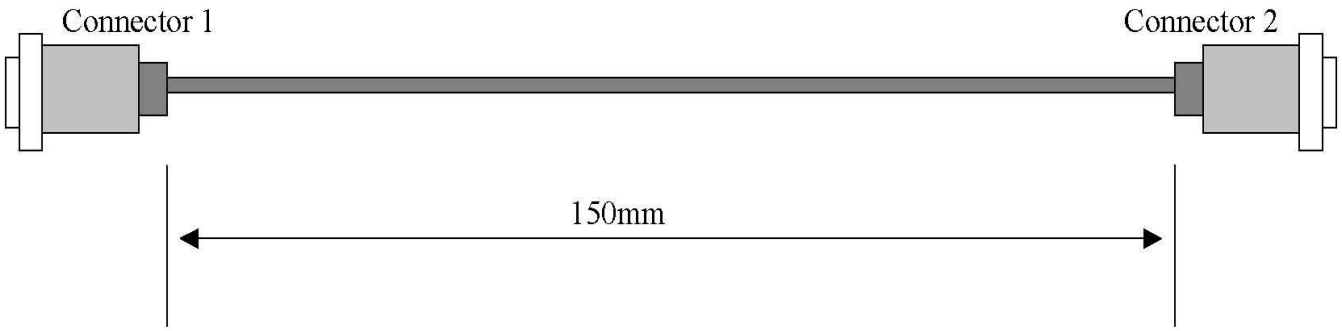


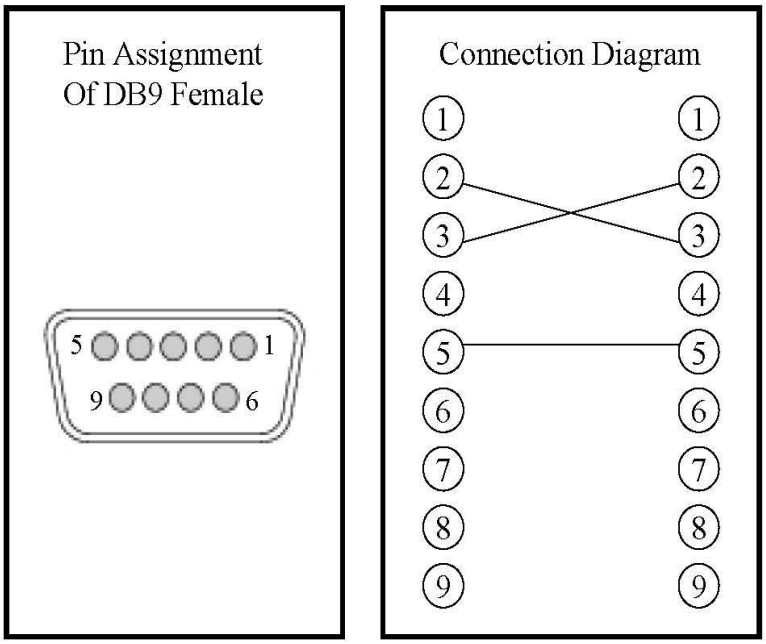
3. Cables Standard for Upgrade Board

Software upgrade board x 1 (#1)



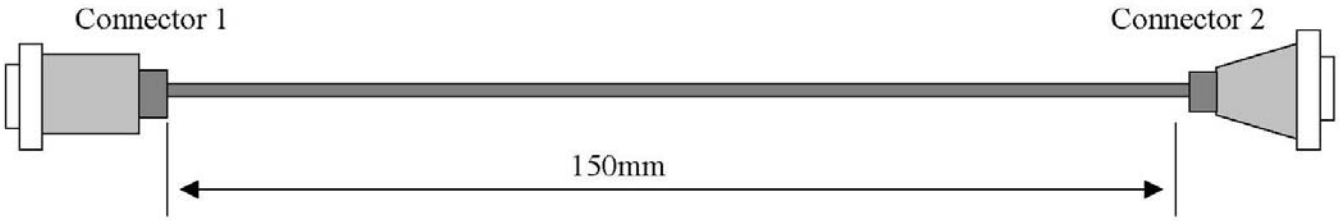
RS232 Null Cable for PC (#2)

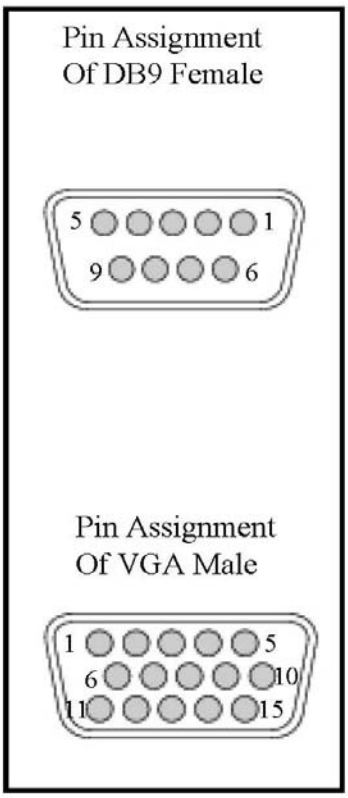


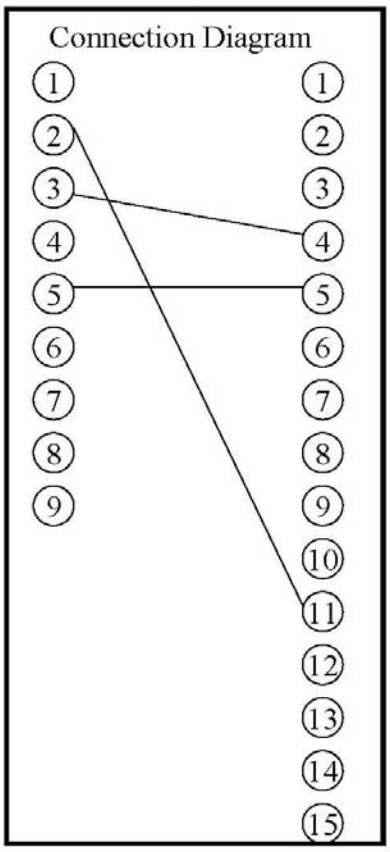


Connector 1: DB9 Female
Connector 2: DB9 Female

RS232 - VGA Cable (#4)

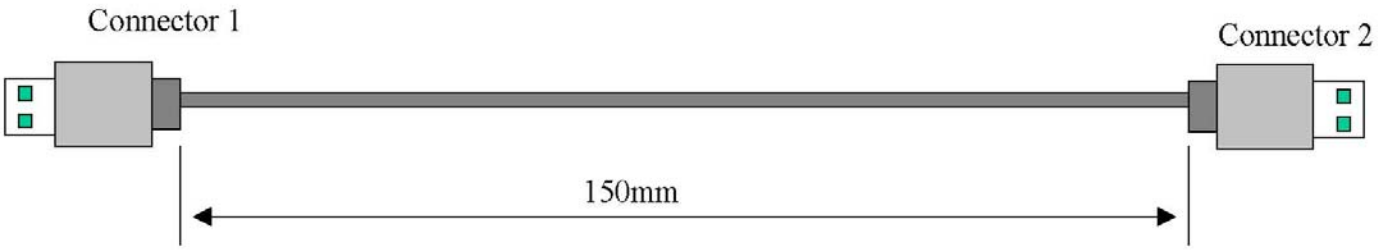






Connector 1: DB9 Female
Connector 2: VGA Male

USB Cable (#5)



Connector 1: Standard USB Male
Connector 2: Standard USB Male

Software Upgrade

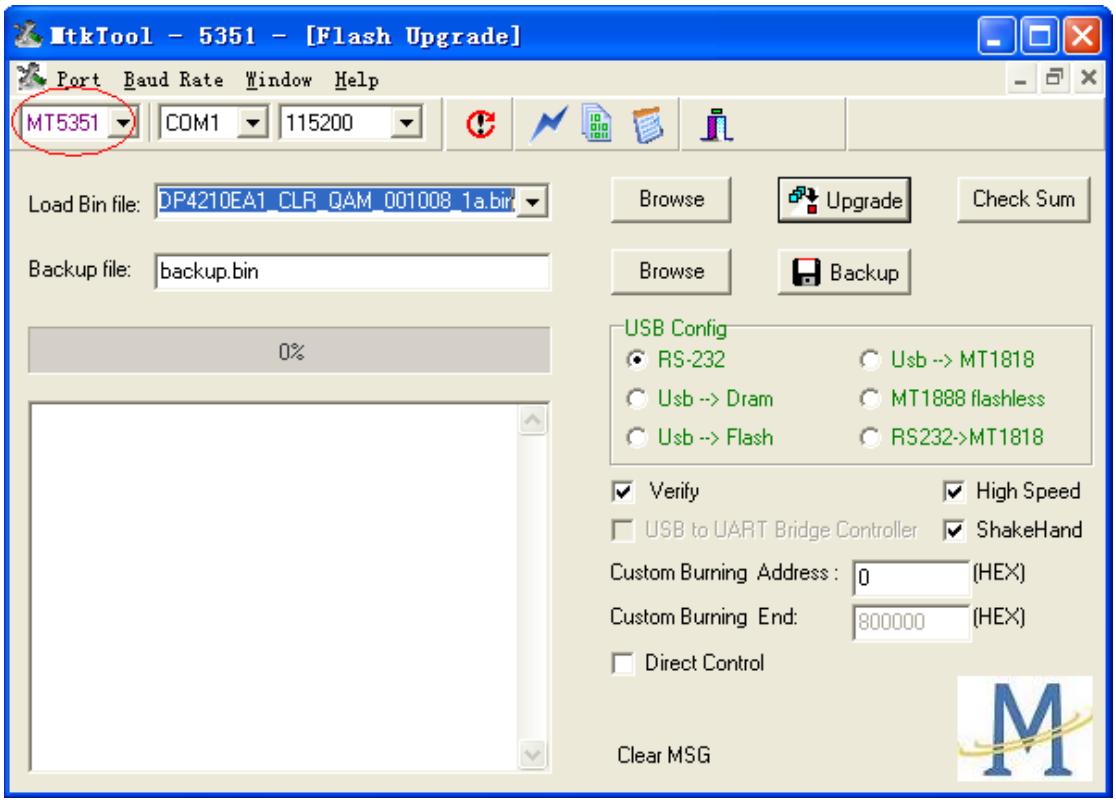
Process of update MT5351AG

Preparing :

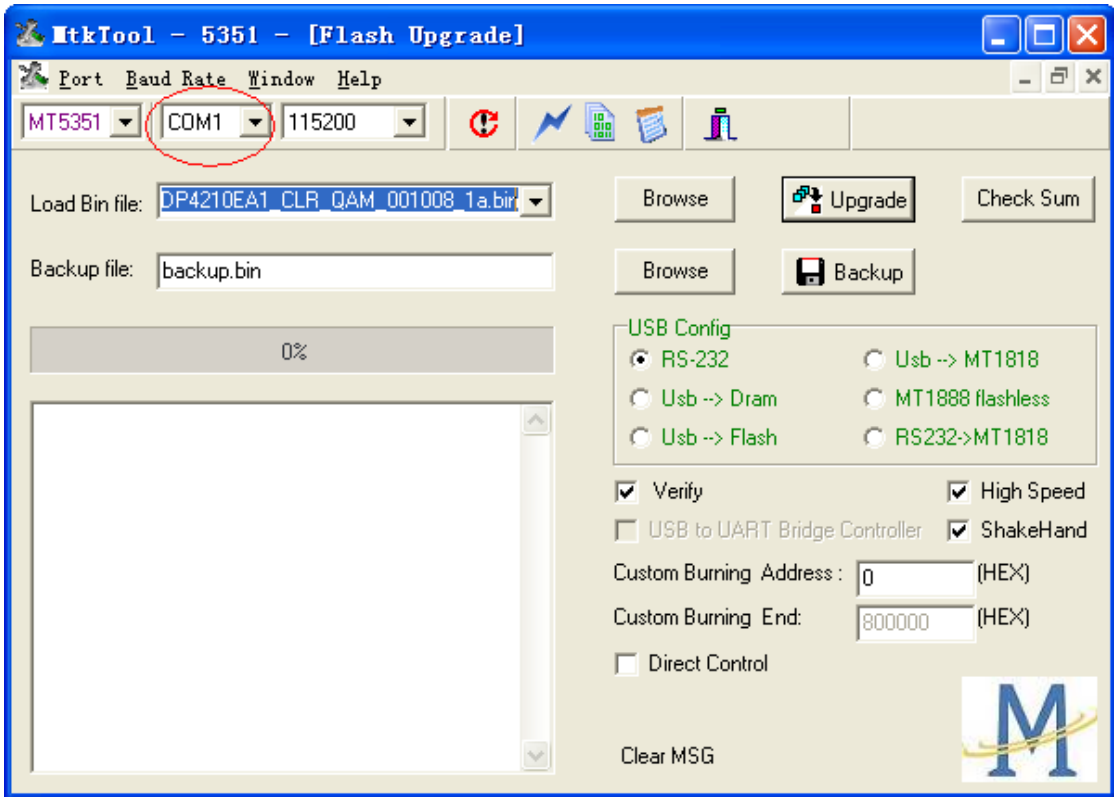
1. Connect the Plasma/LCD TV and PC with the **Software Upgrade Board**.Please find the details for connecting **refering to the appendix at the end of this file.**
2. Store the MtkTool into the PC

Downloading :

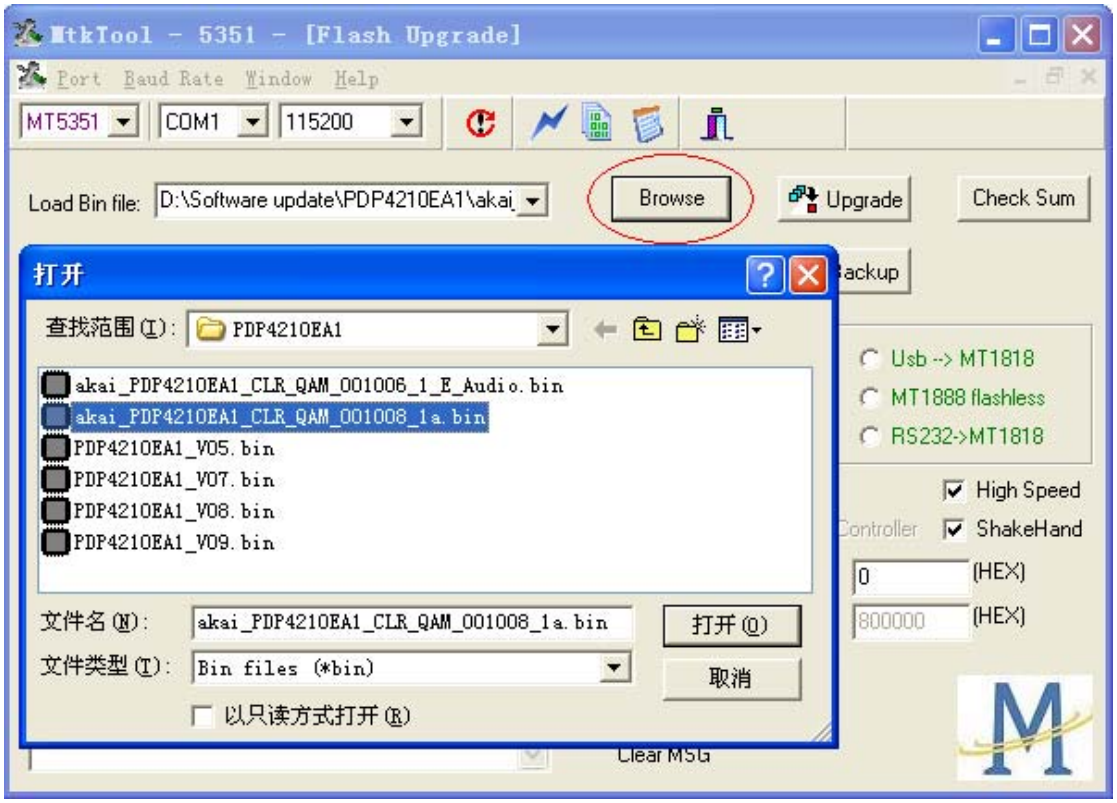
3. Turn on AC power of the TV and then press the button “standby” of the remote control . The image could be found on the screen of the Plasma TV while the color of the power indicator is green . (the mode of the TV will be standby mode if after turn on the main power only .)
4. Execute MTKtool and select the chipset as MT5351. (the software of MTKtool will be sent to your side)



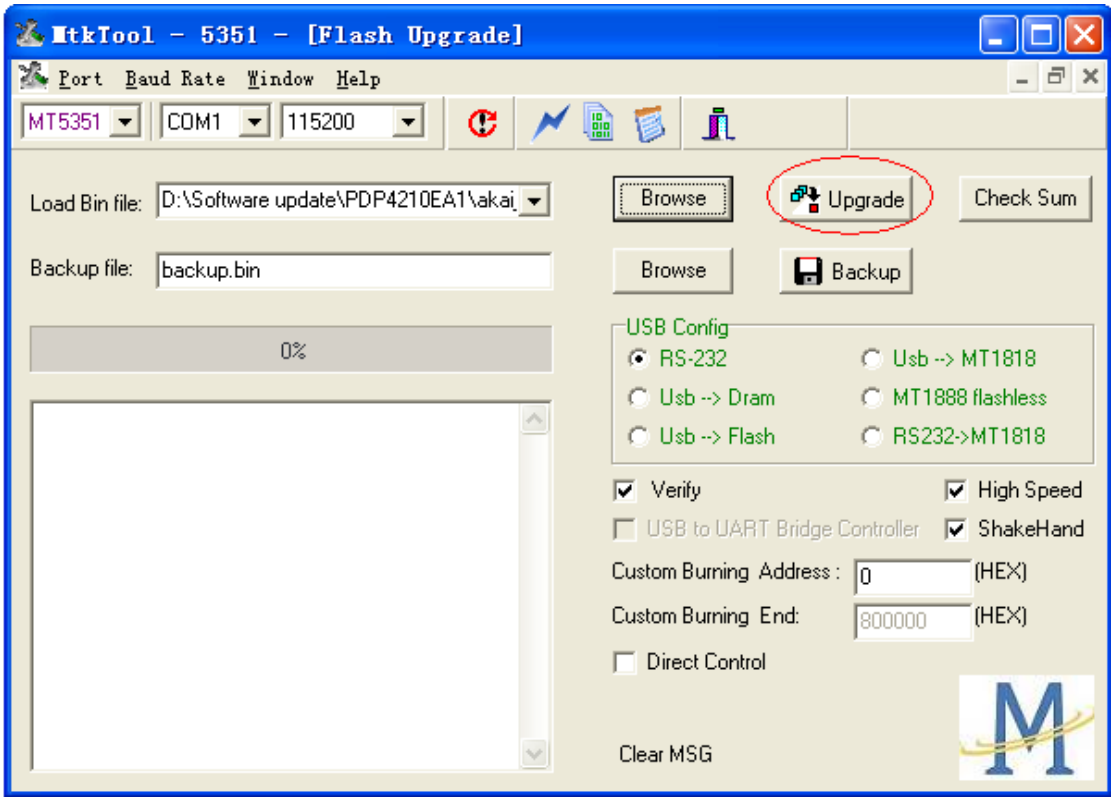
5. Select current COM port. (please try to check the COM port of your PC).



6. Choose the bit rate as 115200.
7. Select the update binary by pressing browse button. For example,the binary file name is XXXX_PDP4210EA1_000000XX_X_P.bin. (this update firmware will be sent to your side)



8. Press Upgrade button and start update process.



9. The update process is successful as the progress bar is 100%. After the update process is ok, turn off power and wait indicator light is off. Turn on power and TV can work.

Checking :

It is needed to check the version of the firmware for MT5351AG which has been download into the Plasma TV .

Press Menu button of the remote control and the main OSD menu is appeared on the screen .

Use the remote control and select the DTV menu . following input “0000” (zero , zero , zero , zero) of the remote control .Then enter the mode of factory after input the digits .

It is easy to be found the version of the current firmware for MT5351AG is “PDP4210EA1 CLA_QAM_XXXXXX_XX”under the mode of factory .

Appendix:

Quick Installation Guide

For

Software Upgrade Board

1. Parts List

- Software upgrade board x 1 (#1)
- RS232 null cable x 1 for PC (#2)
- RS232 null cable x 1 for DTV (#3)
- USB cable x 1 (#5)

2. Installation for DTV upgrade

2.1 Connect RS232 cable (#2) to PC serial port

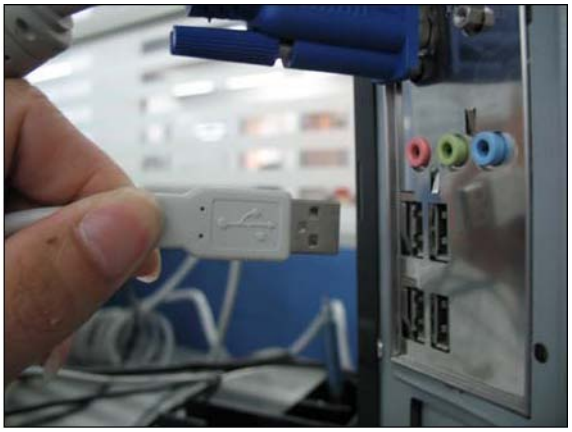
Connect another side of RS232 cable (#2) to the board (#1)

2.2 Connect RS232 cable for DTV (#3) to the board (#1)

Connect another side of RS232 cable for DTV (#3) to the TV

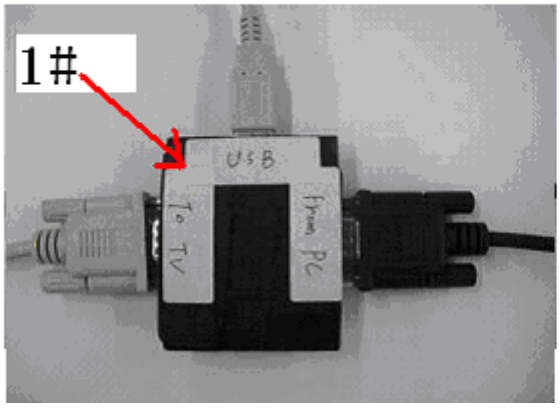
2.3 Connect USB cable (#5) to the board (#1)

Connect another side of USB cable (#5) to PC

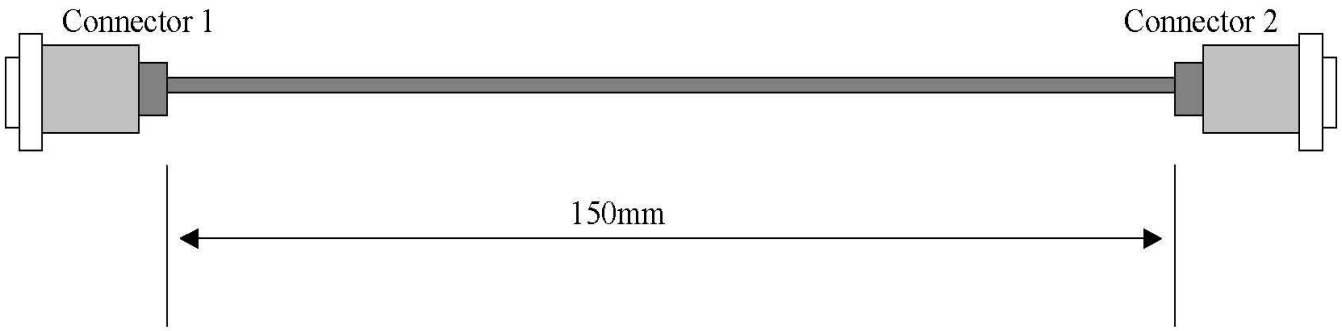


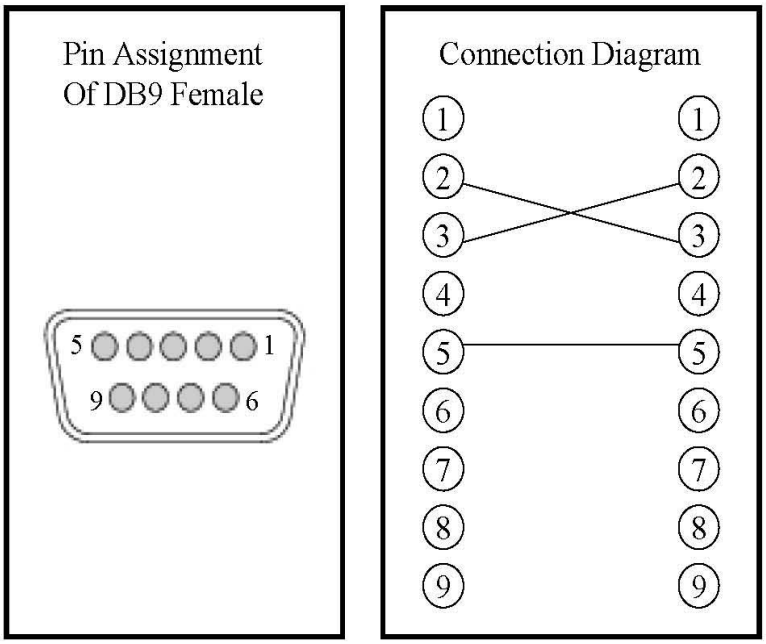
3. Cables Standard for Upgrade Board

Software upgrade board x 1 (#1)



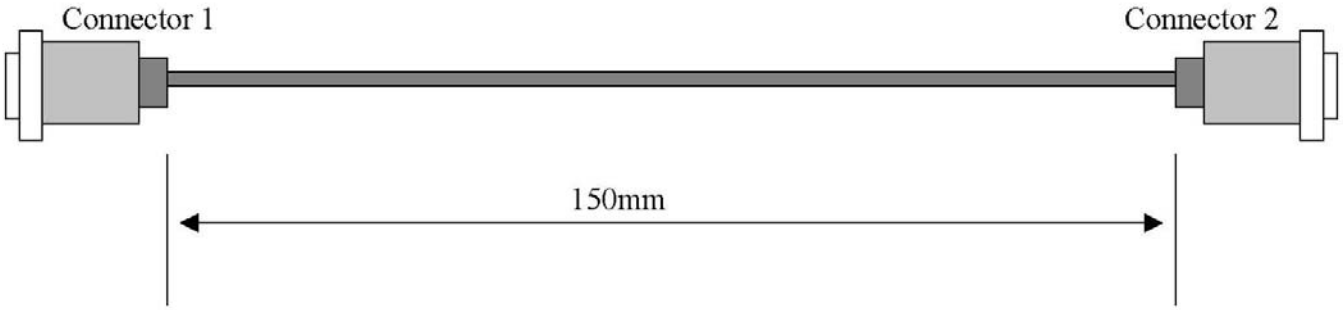
RS232 Null Cable for PC (#2)

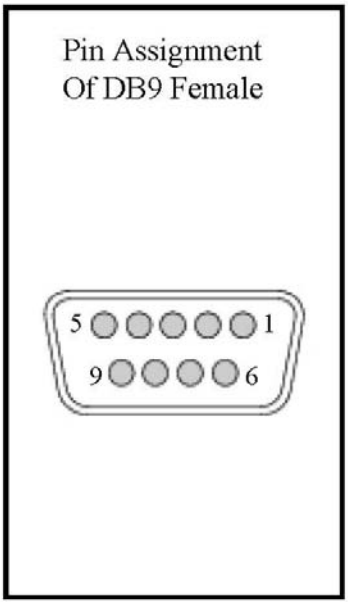


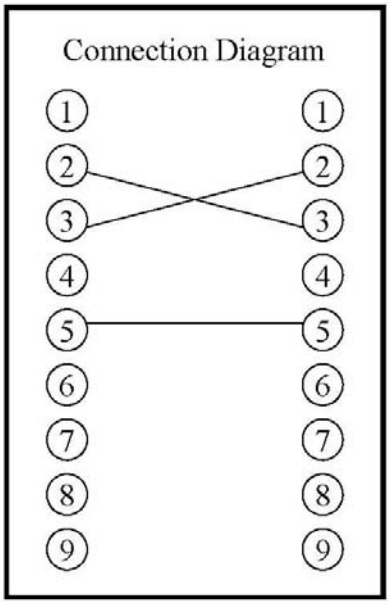


Connector 1: DB9 Female
Connector 2: DB9 Female

RS232 Null Cable for DTV (#3)

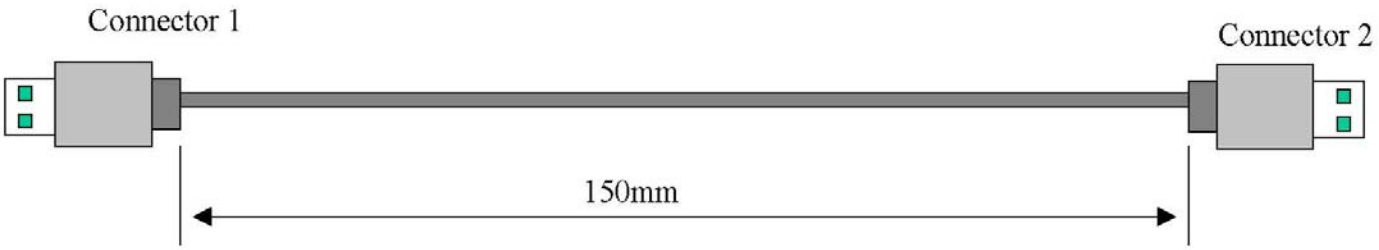






Connector 1: DB9 Female
Connector 2: DB9 Female

USB Cable (#5)



Connector 1: Standard USB Male
Connector 2: Standard USB Male