KAWA ELECTRONIC RESEARCH & DEVELOPMENT CENTRE

Service Manual

Reference No. : SM-LCD27AD-002
Revision : 0
Date : 2006.5.18
Page : P.1 of 84

In House Model No. : LCT27AD
Customer Model No. : LCT2701AD

BOM No. : LCT27ADNDA1CS-C01

Description : Service Manual for LCT27AD _CMO_USA

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0	Initial Release	2006-5-16

AKAI

SERVICE MANUAL

Model:

LCT2701AD

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

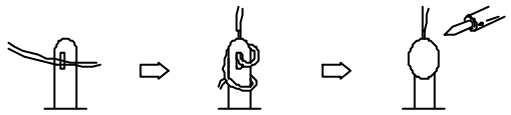
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL ONLY.

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

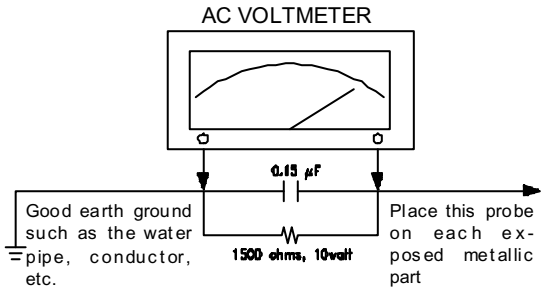
1. Excessively high can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not exceed the specified limit. The normal value of the high voltage of this TV receiver is 27 KV at zero bean current (minimum brightness). The high voltage must not exceed 30 KV under 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.

Reference No : LCT2701AD

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	550(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
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 Terminals	D-Sub 15 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
1.4 Output Terminals	Audio Output (RCA ; L&R Type) ×1
1.5 Others	
Closed Caption / V-Chip	Yes
Teletext	No
OSD Language	English, Français, Español

Reference No : LCT2701AD

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

1.6 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

1.7 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

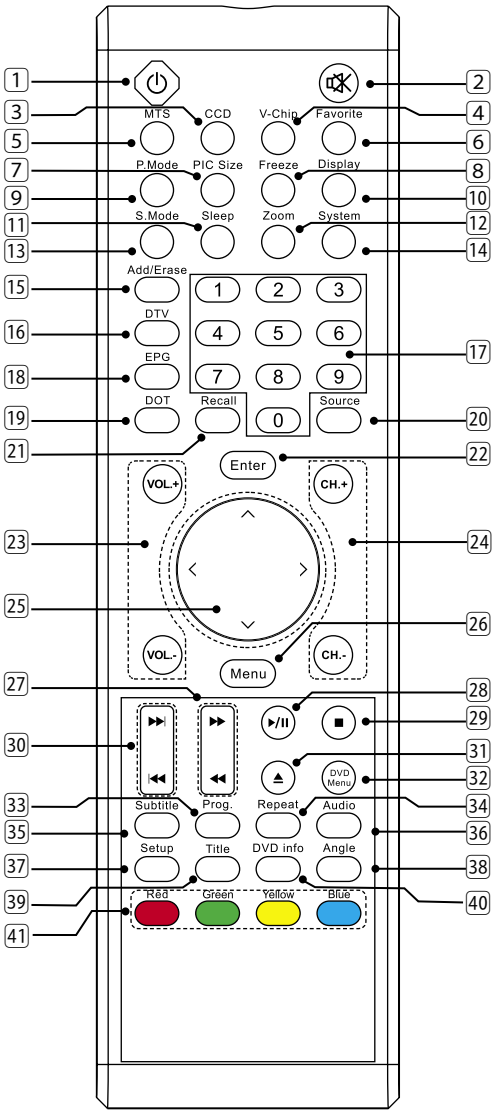
KAWA ELECTRONIC RESEARCH & DEVELOPMENT CENTRE

Reference No : LCT2701AD

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		**V**270B1-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	

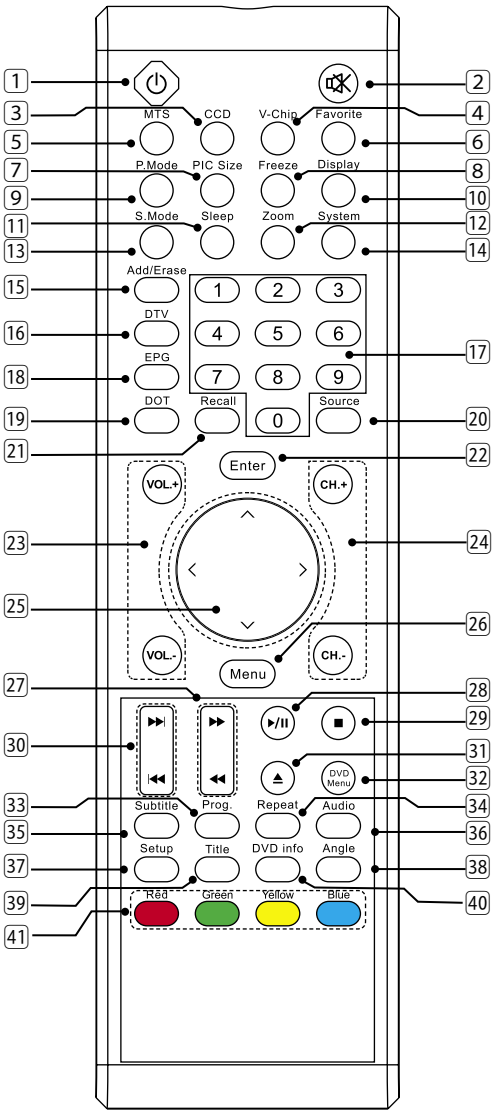
Remote Control



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.

Reference No : LCT2701AD

Attachment 1： Electrical & Optical Specification

No.	*Items*	*Instruction*	*Typical*	*Limit*	*Unit*
1	Video sensitivity	For 30dB S/N	44	≤51	dBuV
2	FM sound sensitivity	For 30dB S/N	21	≤35	dBuV
3	Color sensitivity	For RF transmission	37	≤40	dBuV
4	CCD sensitivity	TV screen refreshes 40 times number of mistakes≤8	43	≤50	dBuV
5	Minimum NICAM threshold	Without crackline noise	N/A	N/A	dBuV
6	Stereo Channel Separation	BTSC.	18	≥15	dB
7	AGC static characteristic	Accept. Picture/Sound repr.	90	≥90	dBuV
8	Selectivity	Adjacent sound carrier	30	≥28	dB
		Below adjacent sound carrier	30	≥30	
		Adjacent picture carrier	45	≥40	
		Up adjacent picture carrier	40	≥30	
9	IF rejection		55	≥45	dB
10	Image rejection	VHF	57	≥45	dB
		UHF	55	≥40	
11	AFT pull-in range		±1.0	≥|±1.0|	MHz
12	Chroma sync pull-in range		±500	≥|±200|	Hz
13	Color killer function		-11	≤-10	dB

14	Resolution	RF	Horizontal	PAL	300	≥300	Lines
				NTSC	260	≥240	Lines
			Vertical	PAL	410	≥400	Lines
				NTSC	320	≥300	Lines
		Video	Horizontal		450	≥450	Lines
			Vertical		400	≥400	Lines

15	Color Coordination	White	Xw	Full Pattern	0.285	0.285±0.02	
			Yw		0.293	0.293±0.02	
16	View Angle(Lo/3)	Horizontal			170	≥170	Degree
		Vertical					
17	Overscan			Cross hatch signal	96	94~98	%
18	Picture position			In all direction	±2	≤|±3|	mm
19	H sync pull-in range				±400	≥|±200|	Hz
20	V sync pull-in range				6	≥6	Hz
21	Audio frequency response			±3dB ref. to 1KHz	0.15~12	0.2~12	KHz

22	Max Audio Output Power		7×2	≥5.0×2	W
23	Audio output power 10% THD	1KHz 10% THD	6×2	≥4.0×2	W
24	THD	Po=0.5W	0.5	≤3	%
25	Signal to buzz ratio	coeighting	50	≥30	dB
26	Minimum volume hum	coeighting	6	≤10	mVrms
27	Maximum woofer output power		N/A	N/A	W
28	Woofer audio frequency response	?3dB ref. to 15Hz AV mode	N/A	N/A	Hz
29	Tone low frequency	100Hz ref. to 1KHz AV mode	±8	≥|±3|	dB
30	Tone high frequency	10KHz ref. to 1KHz AV mode	±8	≥|±3|	dB
31	Balance	Center	0	≤|±2|	dB
		Max.	3	>2	
		Min.	-35	≤-30	

32	Video input level		1.0	1±0.3	Vpp
33	Audio input level*（1）		1.0 *	0.5±0.3	Vrms
34	Video output level		N/A	N/A	Vrms
35	Audio output level*（2）		0.3 *	0.5±0.3	Vrms
36	AV Audio input max. level		2	≤2	Vrms
37	AV Audio output L/R Separation		35	≥30	dB
38	Power consumption	Operating	200	≤200	W
		Stand by	3	≤5	W
39	IR receiving distance	0 Degree	7	≥6	m
40	IR receiving angle left/right	5m	60	≥45	Degree
	IR receiving angle Up/down		20	≥15	Degree
41	Dielectric strength	DC 3KV 1min.	5	≤10	mArms
42	The vibration noise from electromagnetic devices in LCD-TV set	The distance between the tester and the LCD-TV set is four times as many as the screen height	No obvious vibration noise can be heard		

Reference No : LCT2701AD

Test Condition

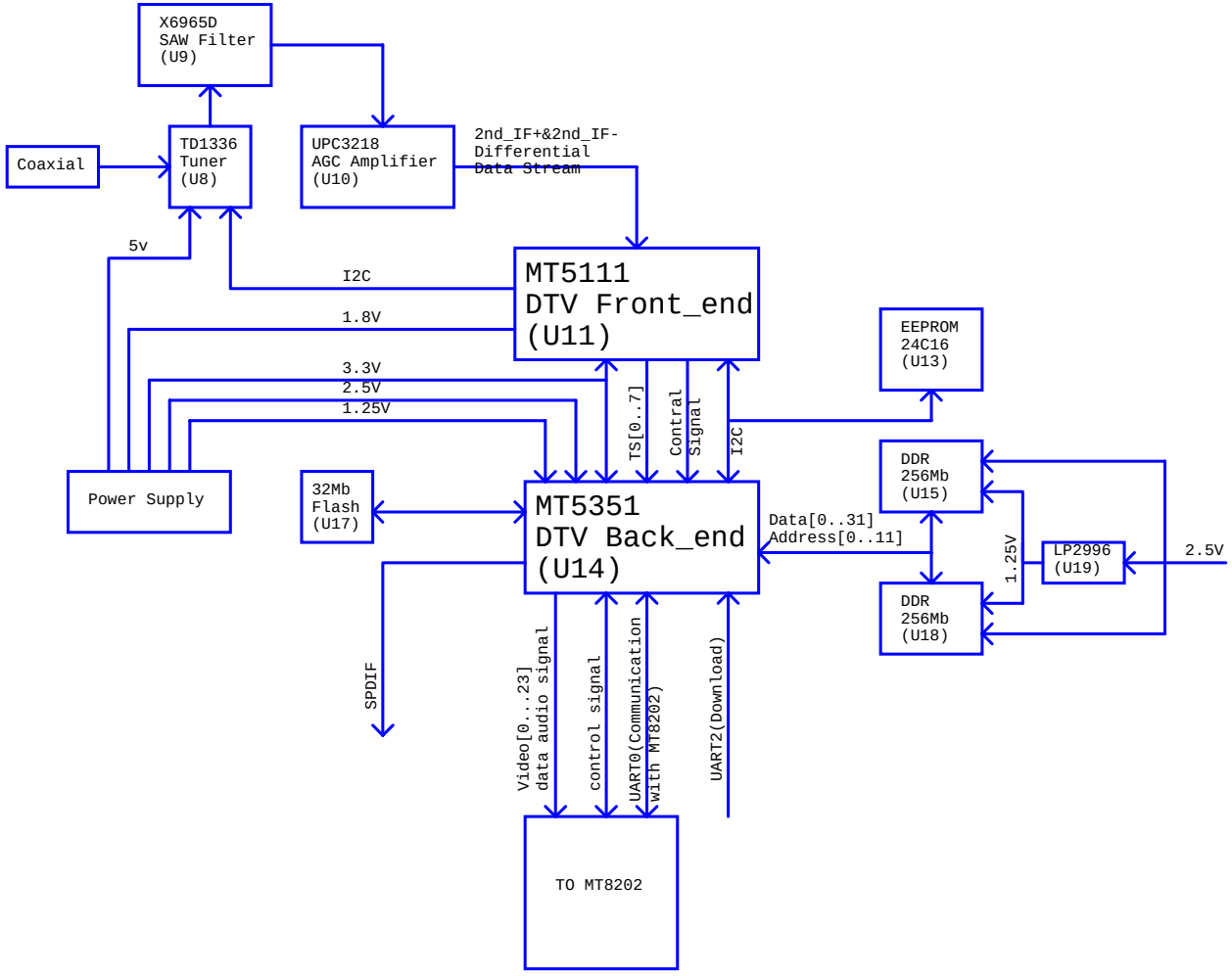
All tests shall be performed under the following conditions unless otherwise specified

1	**Picture Modulation**	**87.5%**
2	**Sound Modulation**	**27KHz Dev. For DK/I/BG** **15KHz Dev. For M/N**
3	**Picture to Sound Ratio**	**10dB**
4	**Sound Artificial Load Resistor**	**8 ohm**
5	**Video signal**	**Stair and Special**
6	**Audio signal**	**1KHz sine wave 0.5Vrms**
7	**Other conditions:** **A. Switch LCD-TV on and let it warm up for more than 30 minutes.** **Viewing distance: 3H (H: Panel High) in front of LCD, about 2M.** **B. Brightness, Contrast, Saturation, Tint, sharpness set at normal.** **C. RF test point: Video output.**	
8	**Note:** ***(1) Now this project cannot fit the limited spec. the typical audio input level is 1.0 Vrms,** ***(2) The audio out level is controlled by the volume level, the range is from 0 to 0.5Vrms.**	

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

ATSC SYSTEM



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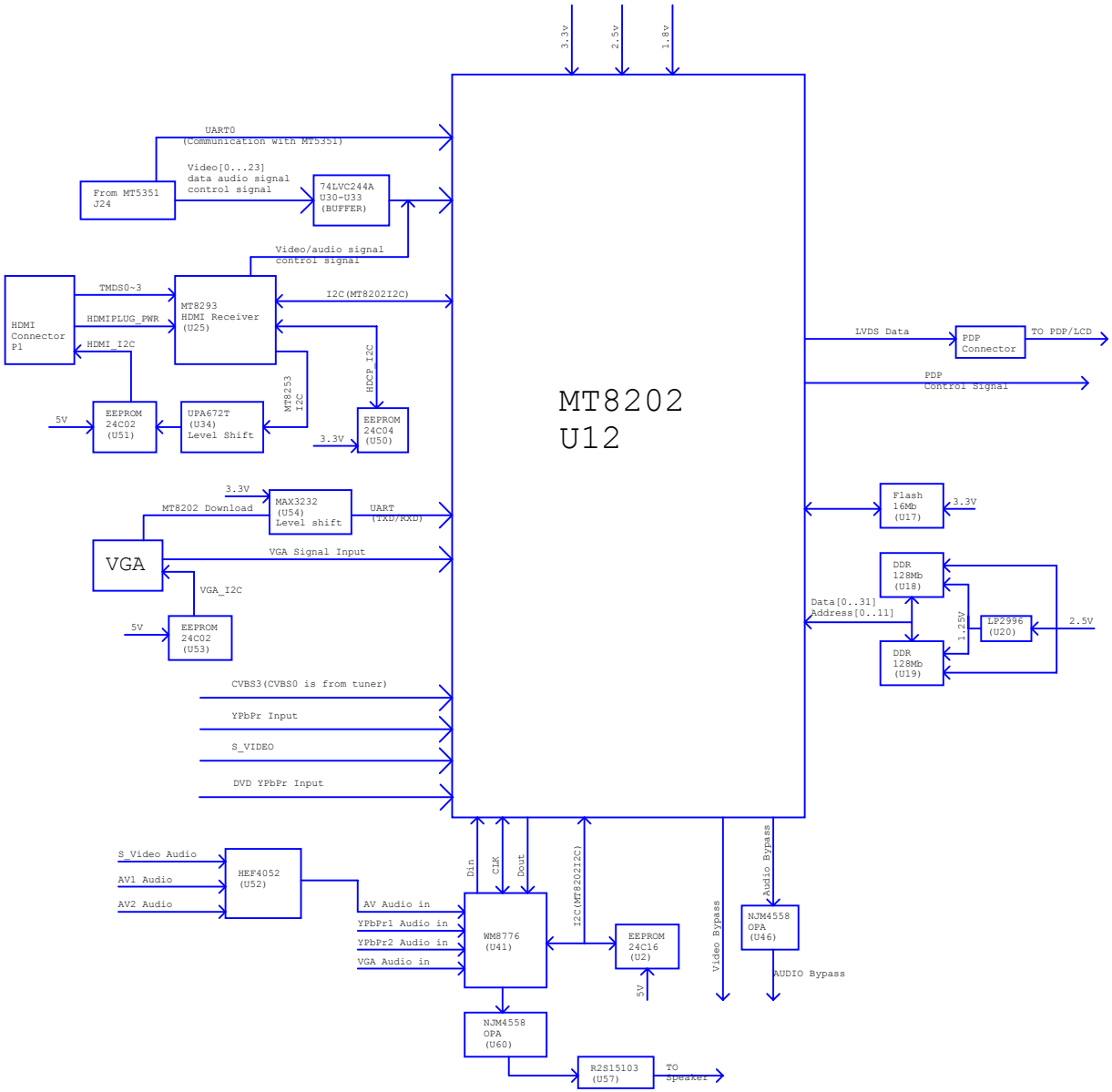
Date: Friday, March 17, 2006		Sheet 1 of 2	



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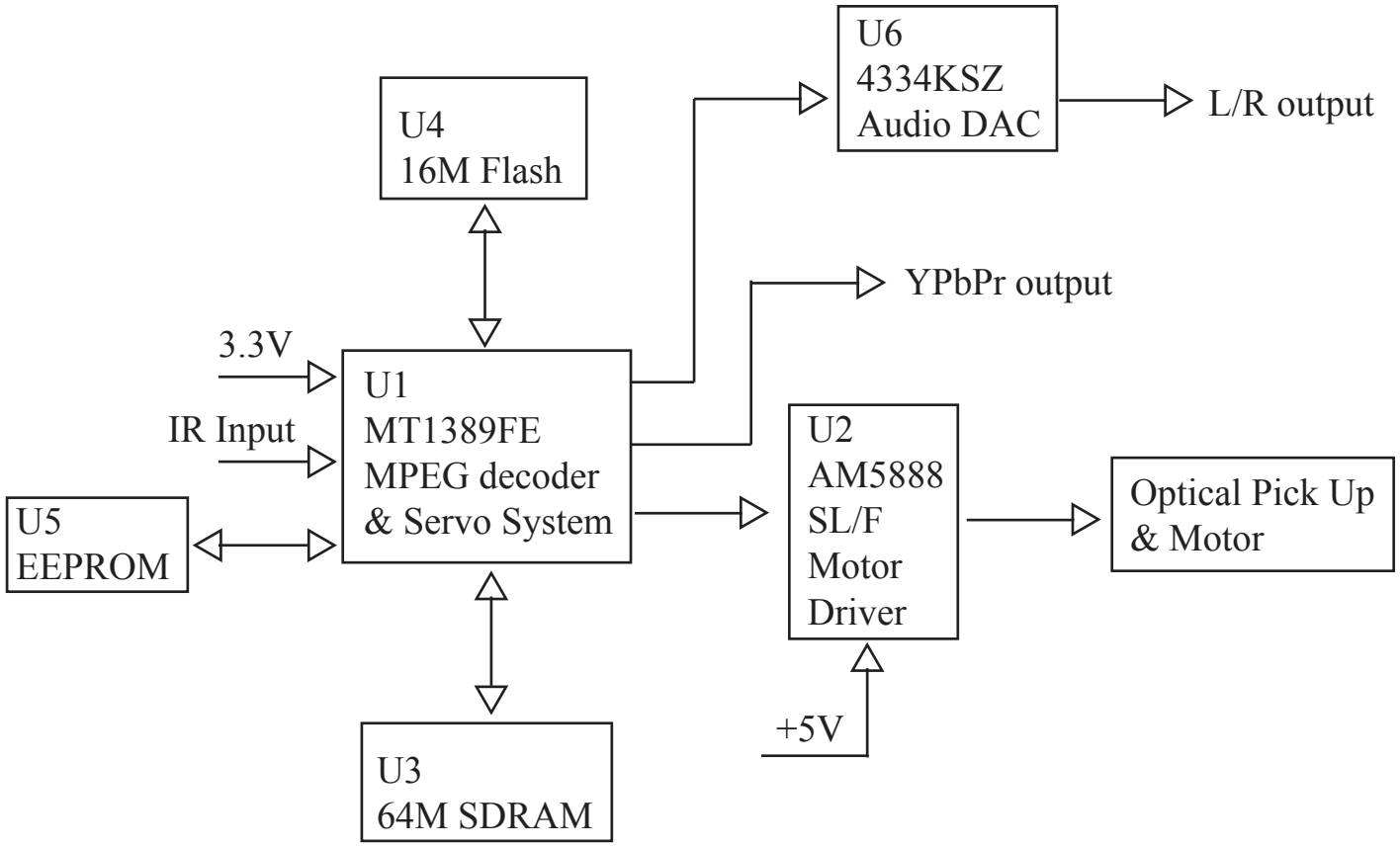
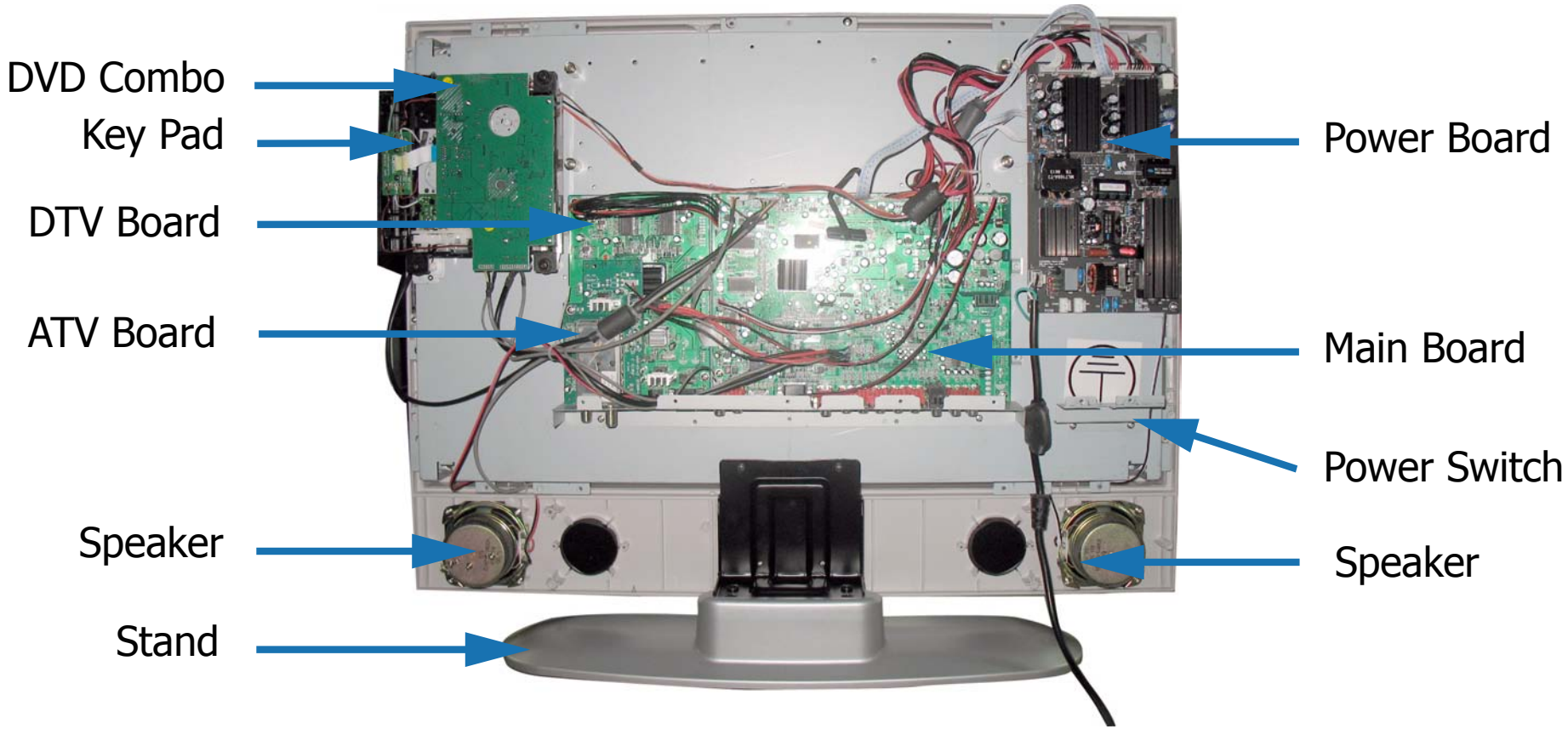
		Checked: <Checker>	
Date: Friday, March 17, 2006		Sheet 2 of 2	

Combo DVD


U6
4334KSZ
Audio DAC
L/R output
U4
16M Flash
YPbPr output
3.3V
U1
MT1389FE
MPEG decoder
& Servo System
IR Input
U2
AM5888
SL/F
Motor
Driver
Optical Pick Up
& Motor
U5
EEPROM
+5V
U3
64M SDRAM

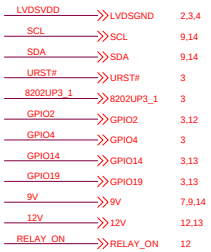
Parts Position

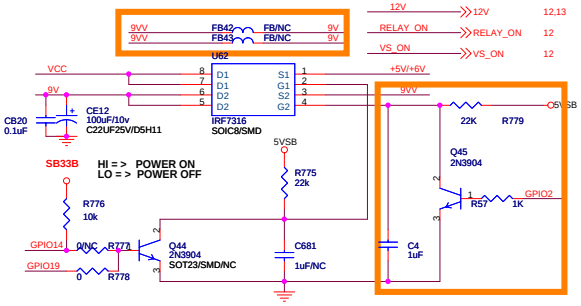


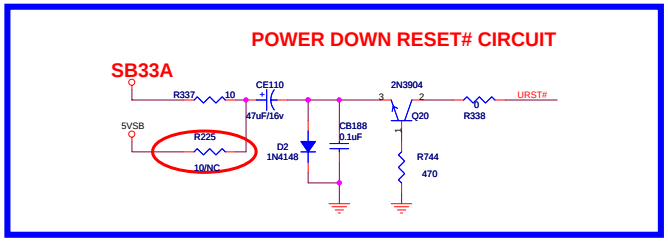
MT8202E (PBGA388) LCDTV BOARD 4 LAYERS FOR AKAI

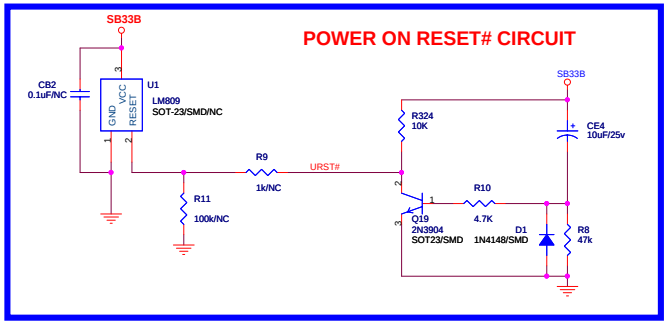
1. INDEX / POWER / RESET / EEPROM
2. LDO
3. MT8202E PBGA388
4. MT8202 DECOUPLING
5. DDR MEMORY & FLASH
6. MT5351 INTERFACE
7. HDMI MT8293
8. DAUGHTER BOARD IN
9. WM8776 & VIDEO BYPASS
10. AUDIO / VIDEO IN CIRCUIT
11 . VGA & PC AUDIO IN
12. LVDS OUT
13. BACK LIGHT / KEYPAD
14. TUNER IN
15. AV IN
16. AUDIO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

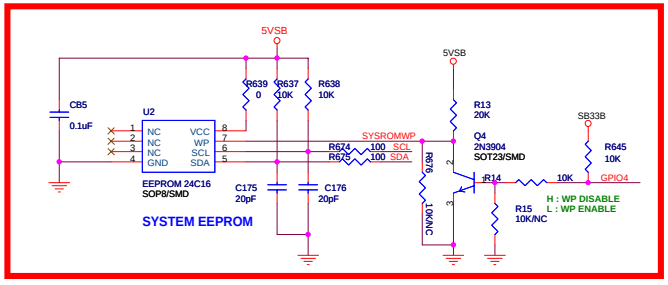
Rev	History	P#	Date
AKAI_MT8202_27US_LVDS_V0.0	New		2005/11/22
AKAI_MT8202_27US_HDMI_LVDS_V0.0	ADD HDMI / VIDEO /AUDIO CONNECTOR INPUT IN		

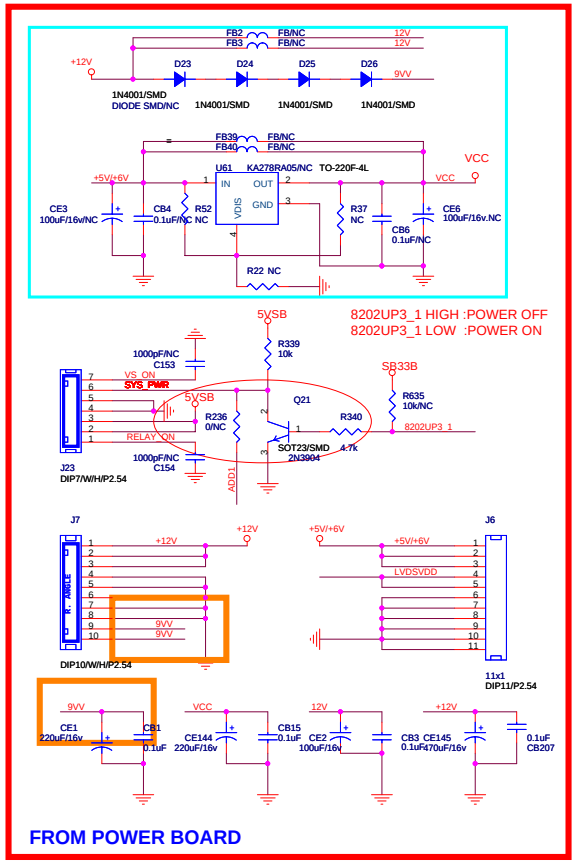


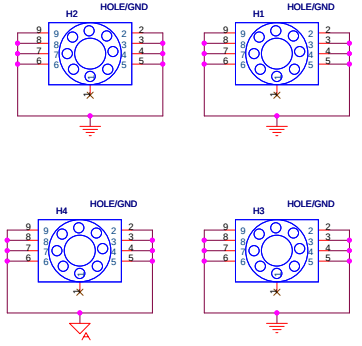












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Title: INDEX / POWER / RESET / EEPROM			
Size: C	Document Number: AKAI_MT8202_27US_LVDS_V0.0	<Designer>	Rev: 1
		Checked: <Checker>	
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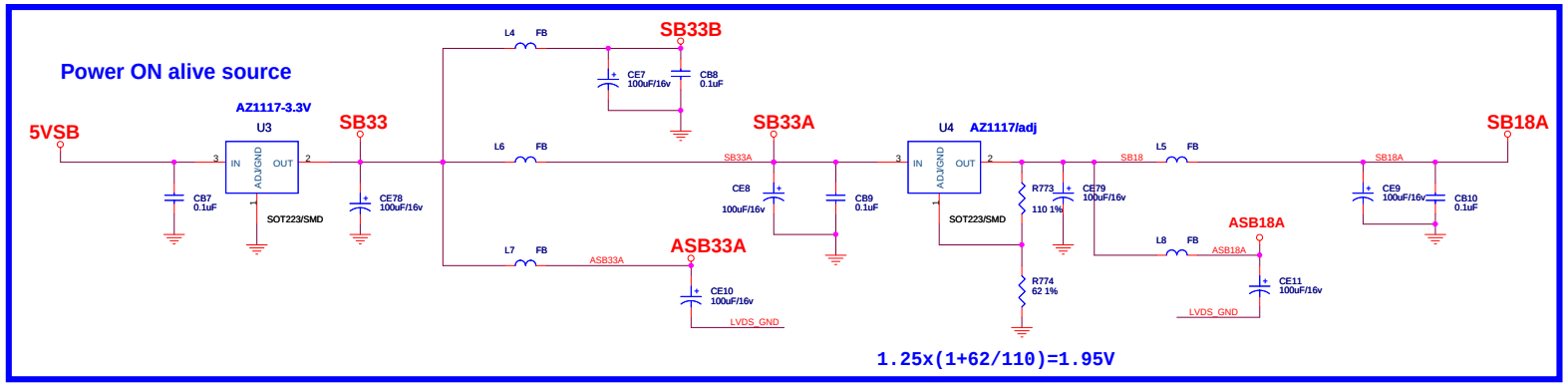

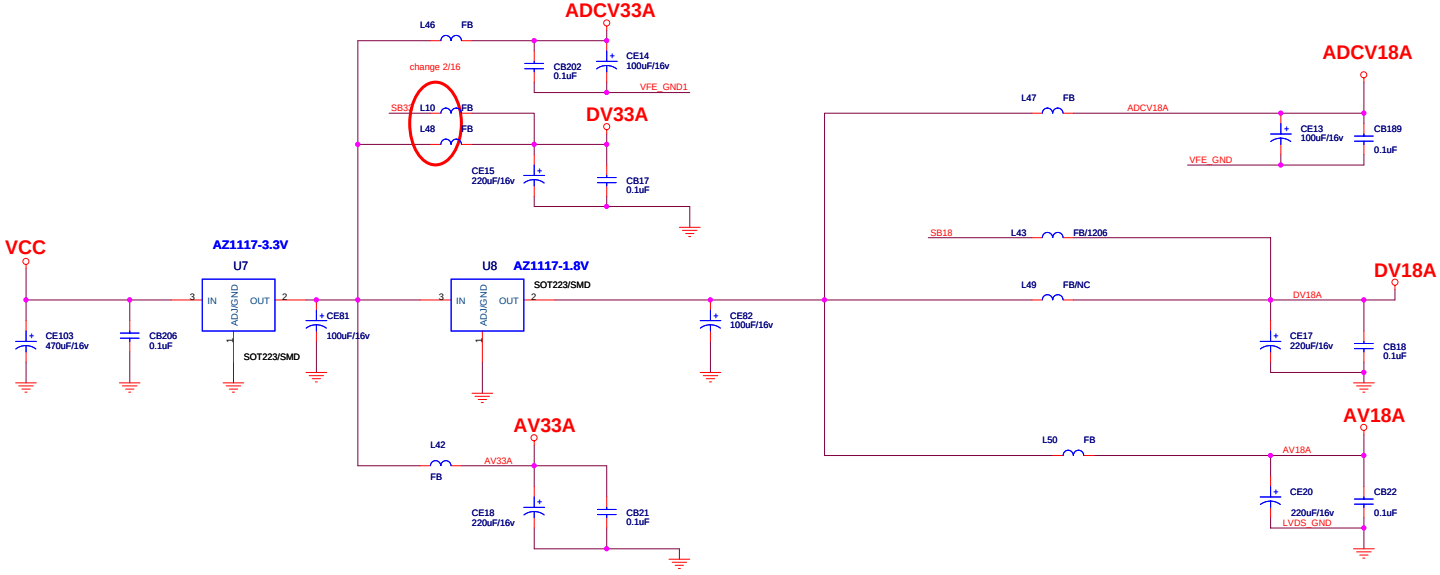

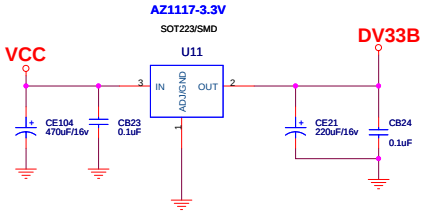

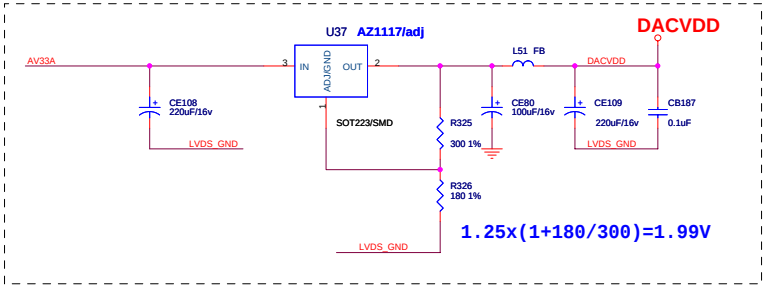

LVDS_GND >> LVDS_GND 3,4,12

VFE_GND >> VFE_GND 3,4,8,11

VFE_GND1 >> VFE_GND1 3,4,8,11

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Title: LDO			
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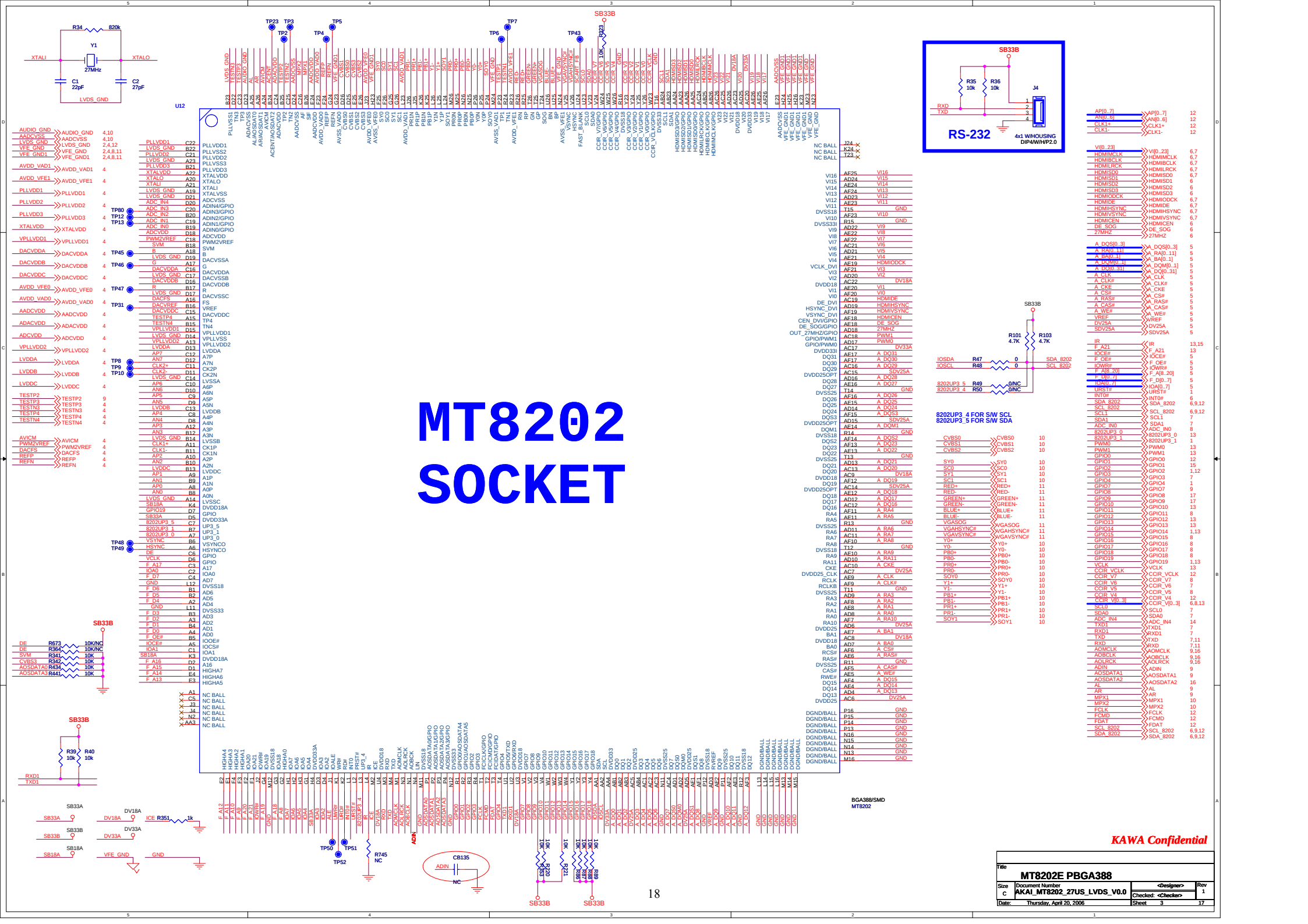
MT8202
SOCKET
U12
SB33B
RS-232
4x1 W/HOUSING
DIP4/W/H/P2.0
J4
R35 10k
R36 10k
RXD
TXD
R101 4.7K
R103 4.7K
R47 0
R48 0
SDA_8202
SCL_8202
R49 0/NC
R50 0/NC
8202UP3_4 FOR S/W SCL
8202UP3_5 FOR S/W SDA
Y1
27MHz
C1 22pF
C2 27pF
R34 820k
LVDS_GND
XTALI
XTALO
BGA388/SMD
MT8202
KAWA Confidential
MT8202E PBGA388
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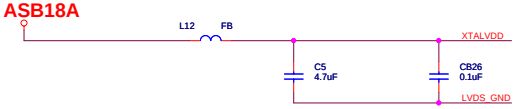
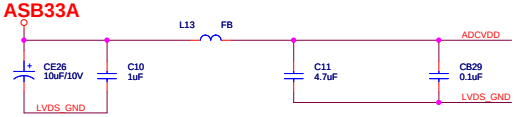
18

STANDBY ANALOG POWER

ASB18A

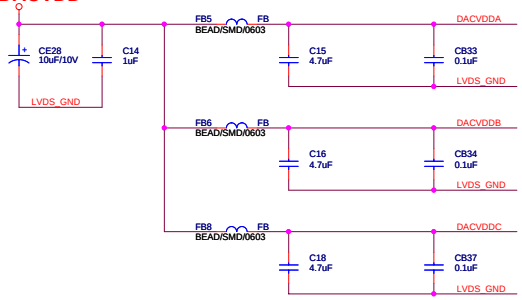


ASB33A



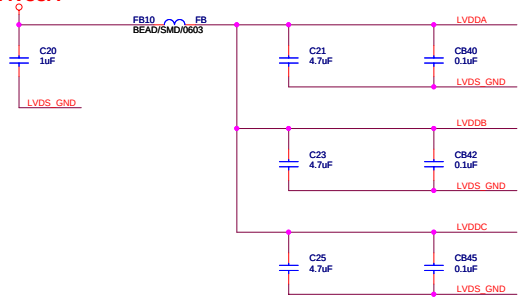
NORMAL VIDEO DAC POWER

DACVDD



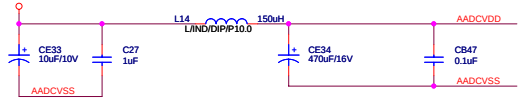
NORMAL VIDEO DAC POWER

AV33A

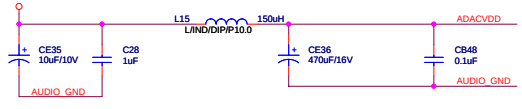


NORMAL AUDIO ADC / DAC POWER

ADCV33A

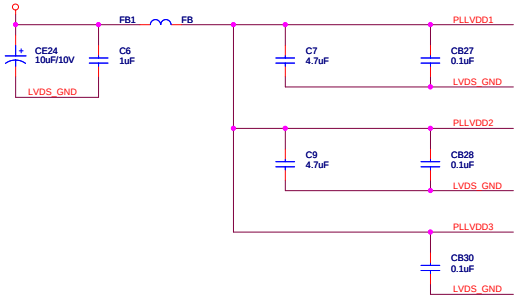


ADCV33A

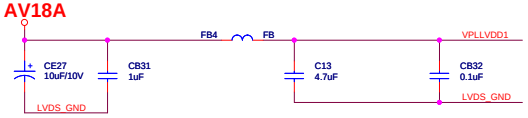


NORMAL ANALOG POWER

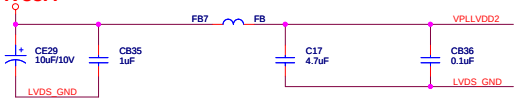
ASB18A



AV18A

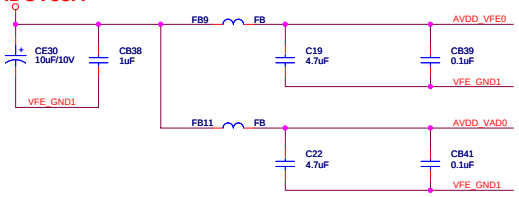


AV33A

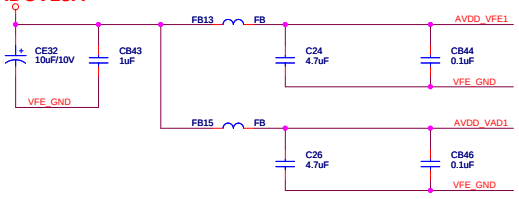


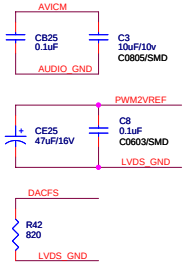
NORMAL VIDEO ADC POWER

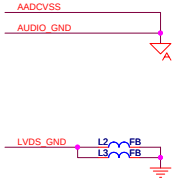
ADCV33A

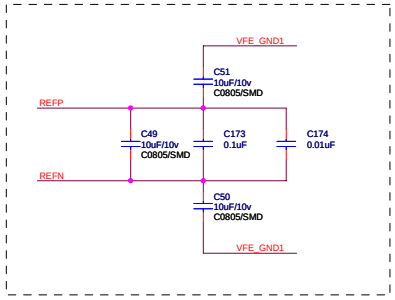


ADCV18A



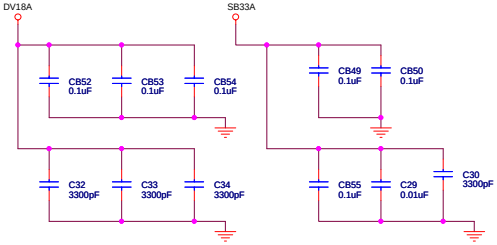




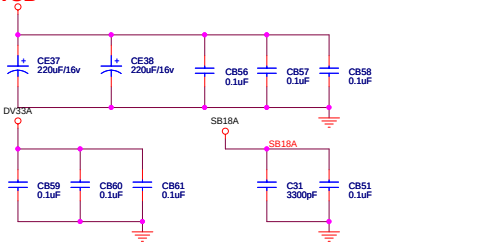


TESTP3	R43	49.9 1%	PLLVDD1
TESTN3	R44	49.9 1%	PLLVDD1
TESTP4	R45	49.9 1%	VPLLVDD1
TESTN4	R46	49.9 1%	VPLLVDD1

MT8202 DIGITAL POWER & DECOUPLING



PUT ON NEARLY BGA



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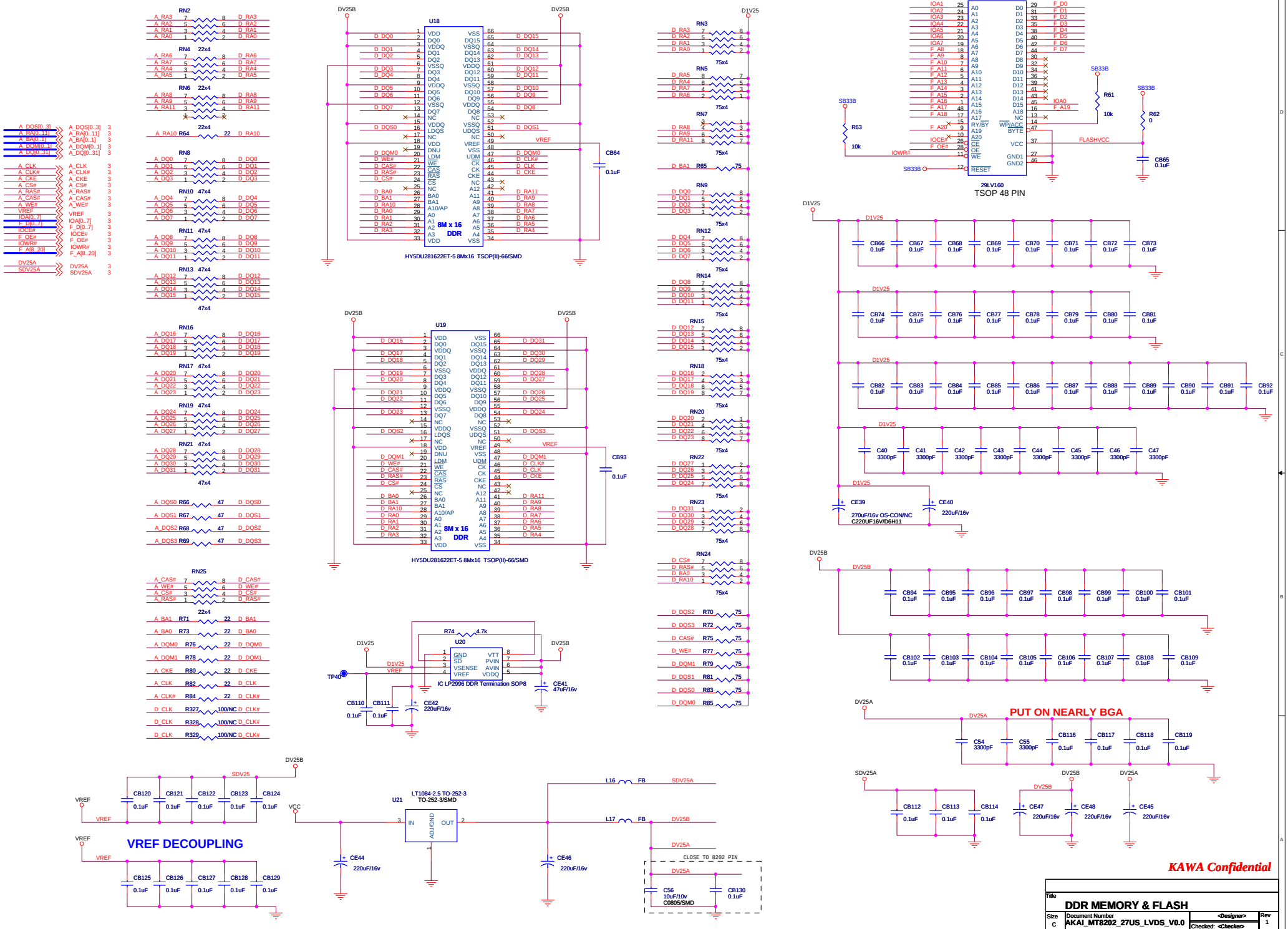
RN2
RN4 22x4
RN6 22x4
RN8
RN10 47x4
RN11 47x4
RN13 47x4
RN16
RN17 47x4
RN19 47x4
RN21 47x4
RN25
R64 22
R66 47
R67 47
R68 47
R69 47
R71 22
R73 22
R76 22
R78 22
R80 22
R82 22
R84 22
R327 100/NC
R328 100/NC
R329 100/NC
U18
U19
8M x 16 DDR
HY5DU281622ET-5 8Mx16 TSOP(II)-66/SMD
RN3
RN5 75x4
RN7 75x4
RN9 75x4
RN12 75x4
RN14 75x4
RN15 75x4
RN18 75x4
RN20 75x4
RN22 75x4
RN23 75x4
RN24 75x4
R65 75
R70 75
R72 75
R75 75
R77 75
R79 75
R81 75
R83 75
R85 75
U20
R74 4.7k
IC LP2996 DDR Termination SOP8
U21
LT1084-2.5 TO-252-3
TO-252-3/SMD
U17
29LV160
TSOP 48 PIN
R61 10k
R62 0
R63 10k
CB64 0.1uF
CB93 0.1uF
CE41 47uF/16v
CE42 220uF/16v
CE44 220uF/16v
CE46 220uF/16v
CB65 0.1uF
CE39 270uF/16v OS-CON/NC C220UF16V/D6H11
CE40 220uF/16v
C40 3300pF
C41 3300pF
C42 3300pF
C43 3300pF
C44 3300pF
C45 3300pF
C46 3300pF
C47 3300pF
CB54 3300pF
CB55 3300pF
CB112 0.1uF
CB113 0.1uF
CB114 0.1uF
CE47 220uF/16v
CE48 220uF/16v
CE45 220uF/16v
CB56 10uF/10v C0805/SMD
CB130 0.1uF
CLOSE TO 8202 PIN
PUT ON NEARLY BGA
VREF DECOUPLING
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DDR MEMORY & FLASH
AKAI_MT8202_27US_LVDS_V0.0
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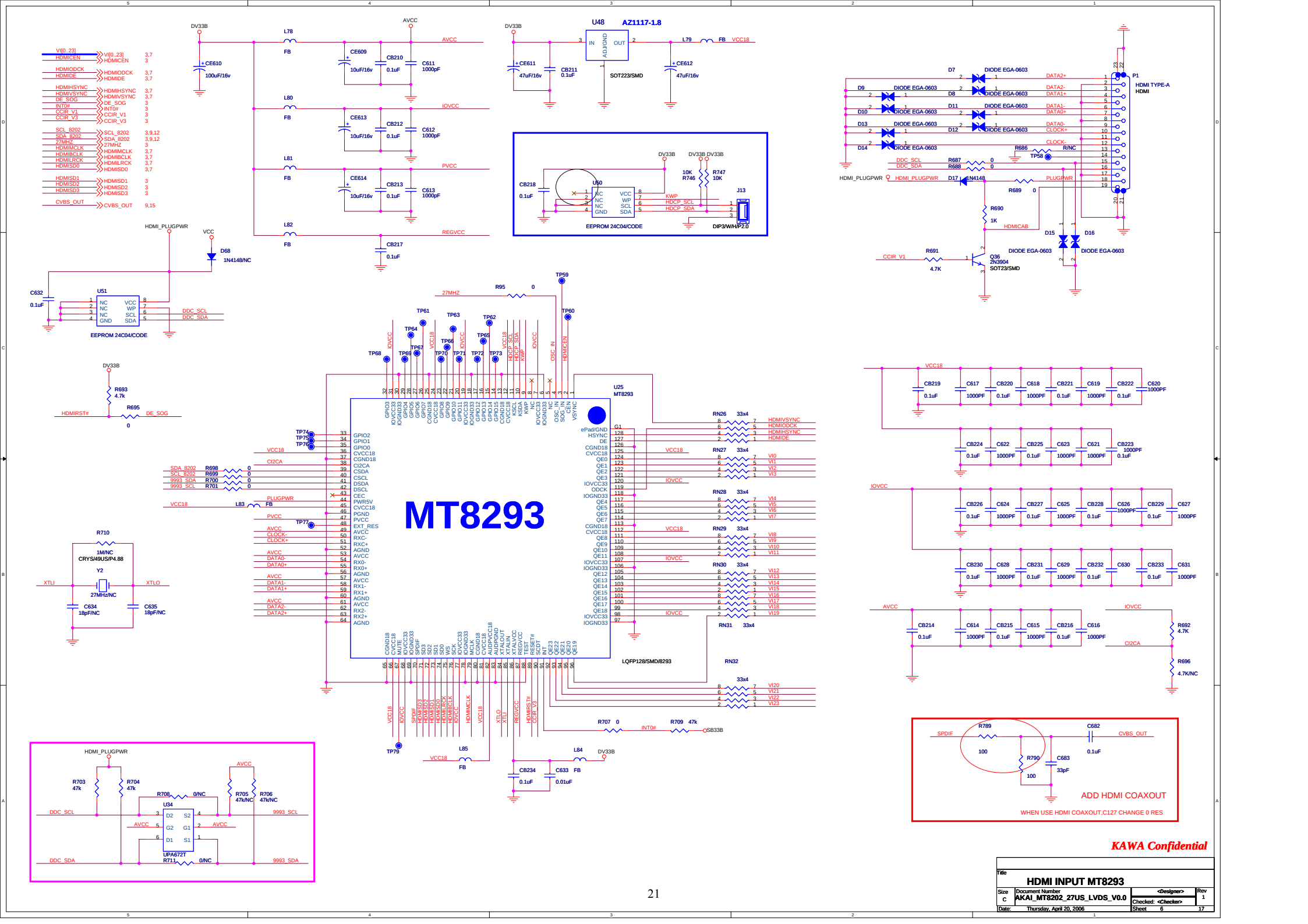
MT8293
U48 AZ1117-1.8
SOT223/SMD
EEPROM 24C04/CODE
DIP3/W/HP2.0
HDMI TYPE-A
HDMI
LQFP128/SMD/8293
ADD HDMI COAXOUT
WHEN USE HDMI COAXOUT,C127 CHANGE 0 RES
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HDMI INPUT MT8293
Document Number
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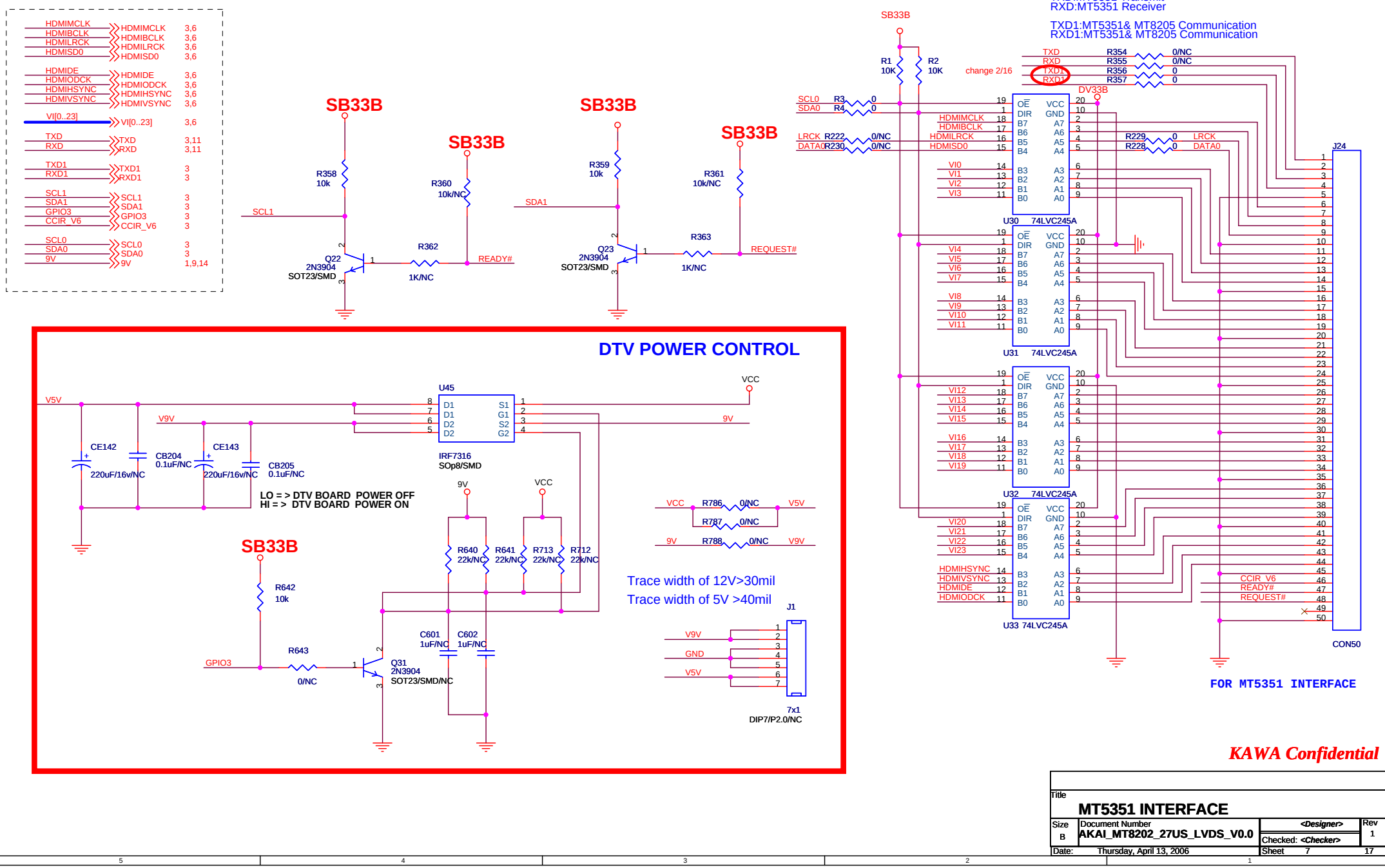
HDMIMCLK 3,6
HDMIBCLK 3,6
HDMILRCK 3,6
HDMISD0 3,6
HDMIDE 3,6
HDMIODCK 3,6
HDMIHSYNC 3,6
HDMIVSYNC 3,6
VI[0..23] 3,6
TXD 3,11
RXD 3,11
TXD1 3
RXD1 3
SCL1 3
SDA1 3
GPIO3 3
CCIR_V6 3
SCL0 3
SDA0 3
9V 1,9,14
SB33B
R358 10k
R360 10k/NC
SCL1
Q22 2N3904 SOT23/SMD
R362
1K/NC
READY#
R359 10k
SDA1
Q23 2N3904 SOT23/SMD
R363
1K/NC
R361 10k/NC
REQUEST#
DTV POWER CONTROL
V5V
V9V
CE142 220uF/16v/NC
CB204 0.1uF/NC
CE143 220uF/16v/NC
CB205 0.1uF/NC
LO = > DTV BOARD POWER OFF
HI = > DTV BOARD POWER ON
U45
IRF7316 SOp8/SMD
VCC
9V
R640 22k/NC
R641 22k/NC
R713 22k/NC
R712 22k/NC
R642 10k
R643 0/NC
GPIO3
Q31 2N3904 SOT23/SMD/NC
C601 1uF/NC
C602 1uF/NC
R786 0/NC
R787 0/NC
R788 0/NC
Trace width of 12V>30mil
Trace width of 5V >40mil
J1
7x1 DIP7/P2.0/NC
TXD:MT5351 Transmit
RXD:MT5351 Receiver
TXD1:MT5351& MT8205 Communication
RXD1:MT5351& MT8205 Communication
change 2/16
R1 10K
R2 10K
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
CCIR_V6
READY#
REQUEST#
FOR MT5351 INTERFACE
KAWA Confidential
Title
MT5351 INTERFACE
Size B
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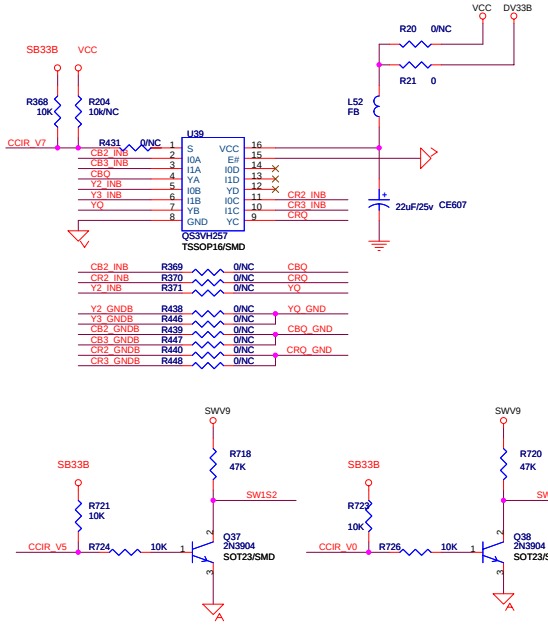
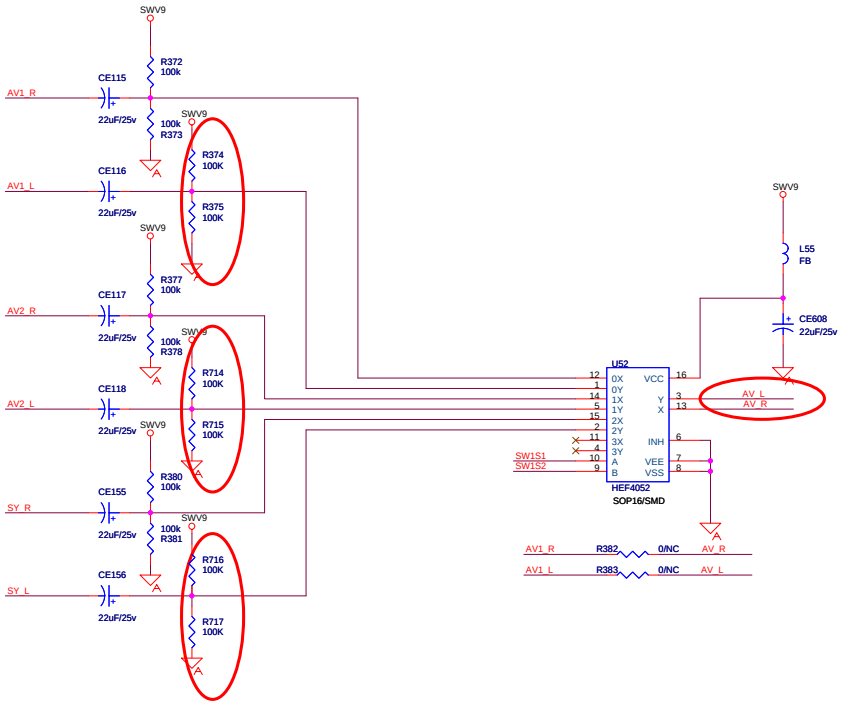
INPUT

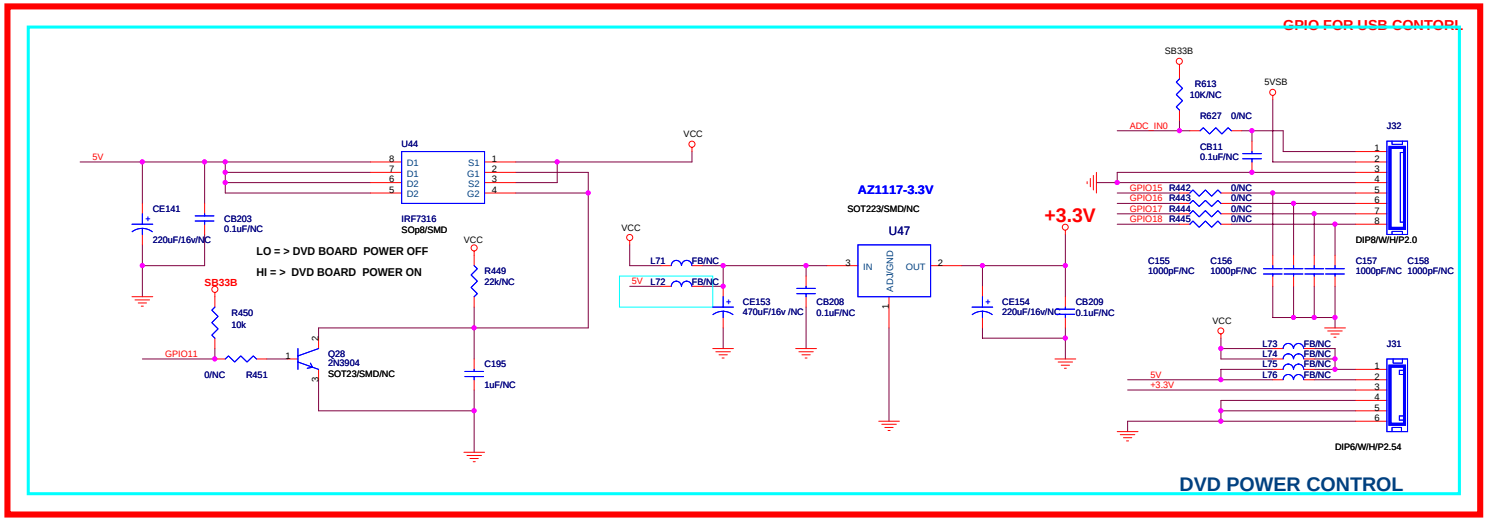
ADC_IN0	ADC_IN0	3
CCIR_V0	CCIR_V0	3
CCIR_V5	CCIR_V5	3
CCIR_V7	CCIR_V7	3
GPIO11	GPIO11	3
GPIO15	GPIO15	3
GPIO16	GPIO16	3
GPIO17	GPIO17	3
GPIO18	GPIO18	3
VFE_GND	VFE_GND	2,3,4,11
AADCVSS	AADCVSS	3,4,10
AV1_R	AV1_R	15
AV1_L	AV1_L	15
AV2_R	AV2_R	15
AV2_L	AV2_L	15
SY_R	SY_R	15
SY_L	SY_L	15
Y2_INB	Y2_INB	15
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
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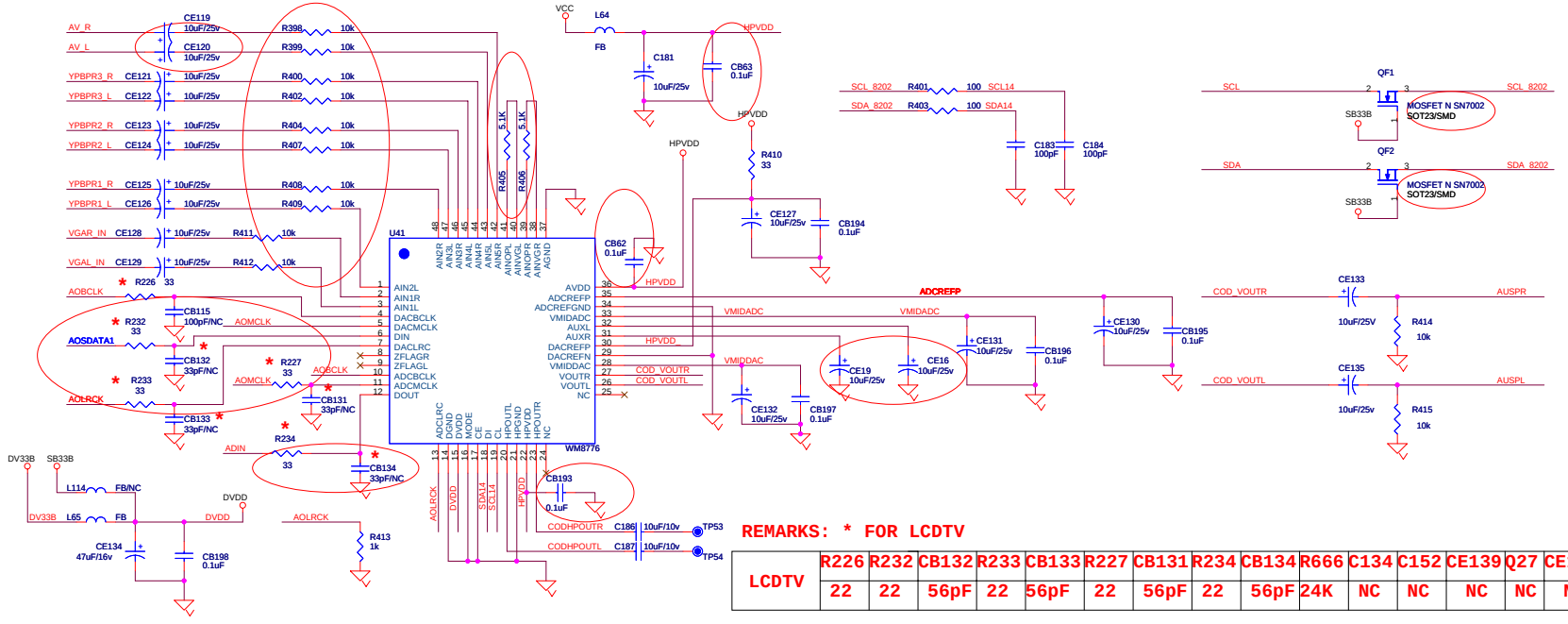
INPUT

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

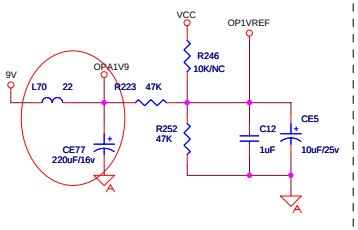
OUTPUT

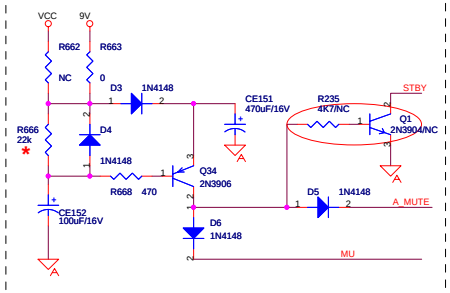
AUSPR	AUSPR	16
AUSPL	AUSPL	16
AVR_OUT	AVR_OUT	15
AVL_OUT	AVL_OUT	15
CVBS_OUT	CVBS_OUT	6,15

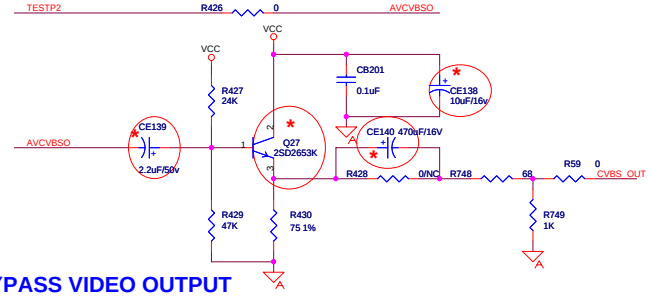


REMARKS: * FOR LCDTV

	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

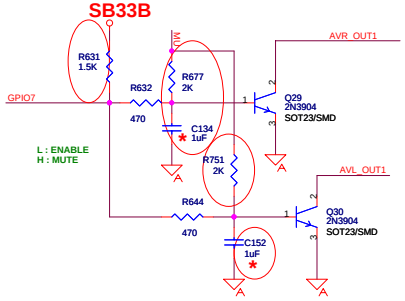




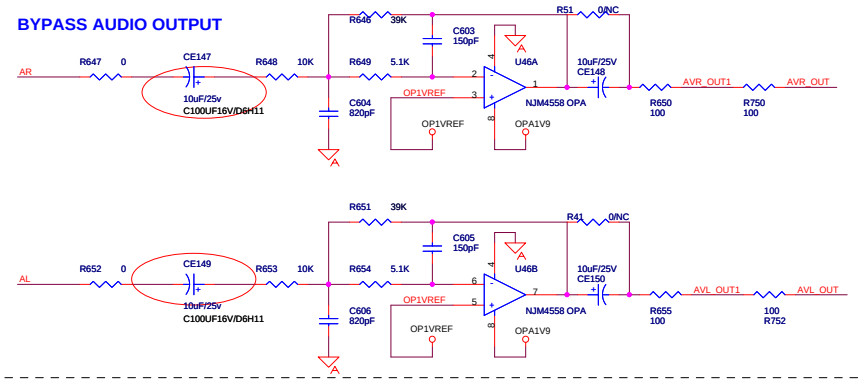


BYPASS VIDEO OUTPUT

AUDIO BYPASS MUTE



BYPASS AUDIO OUTPUT



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Title	M8776 & VIDEO BYPASS		
Size C	Document Number AKAI_MT8202_27US_LVDS_V0.0	<Designer> Checked: <Checker>	Rev 1
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CVBS0 CVBS0 3
CVBS1 CVBS1 3
CVBS2 CVBS2 3

SY0 SY0 3
SC0 SC0 3

SY1 SY1 3
SC1 SC1 3

Y0+ Y0+ 3
Y0- Y0- 3
PB0+ PB0+ 3
PB0- PB0- 3
PR0+ PR0+ 3
PR0- PR0- 3
SOY0 SOY0 3

Y1+ Y1+ 3
Y1- Y1- 3
PB1+ PB1+ 3
PB1- PB1- 3
PR1+ PR1+ 3
PR1- PR1- 3
SOY1 SOY1 3

MPX1 MPX1 3

MPX2 MPX2 3

TO MT8202

TV_GND TV_GND 14
CVBS_0 CVBS_0 14
SIF SIF 14
AF AF 14
CVBS_1 CVBS_1 15
CVBS1_GND CVBS1_GND 15
CVBS_2 CVBS_2 15
CVBS2_GND CVBS2_GND 15
SY_1 SY_1 15
SY_1_GND SY_1_GND 15
SC_1 SC_1 15
SC_1_GND SC_1_GND 15
SY_0 SY_0 15
SY_0_GND SY_0_GND 15
SC_0 SC_0 15
SC_0_GND SC_0_GND 15

SOY1 SOY1 3
SOY0 SOY0 3
Y1_INB Y1_INB 15
Y1_GNDB Y1_GNDB 8,15
CR1_INB CR1_INB 15
CR1_GNDB CR1_GNDB 8,15
CB1_INB CB1_INB 15
CB1_GNDB CB1_GNDB 8,15
CBQ CBQ 8
CRQ CRQ 8
YQ YQ 8
YQ_GND YQ_GND 8
CBQ_GND CBQ_GND 8
CRQ_GND CRQ_GND 8

FROM AV BOARD

AADCVSS AADCVSS 3,4

THIS PAGE NEARLY IC

CVBS_0 R197 0 C110 47nF CVBS0
C113 330pF TV_GND

CVBS_1 R200 0 C117 47nF CVBS1
C120 330pF CVBS1_GND

CVBS_2 R424 0 C188 47nF CVBS2
C189 330pF CVBS2_GND

SY_0 R198 0 C111 47nF SY0
C114 330pF SY_0_GND

SC_0 R201 0 C118 47nF SC0
C121 330pF SC_0_GND

SY_1 R205 0 C125 47nF SY1
C128 330pF SY_1_GND

SC_1 R209 0 C132 47nF SC1
C135 330pF SC_1_GND

R55 0 C112 4.7nF SOY0

YQ R199 68 C115 100nF Y0+
C116 15pF
YQ_GND R202 100 C119 100nF Y0-

CBQ R203 68 C122 100nF PB0+
C123 15pF
CBQ_GND R206 100 C126 100nF PB0-

CRQ R207 68 C129 100nF PR0+
C130 15pF
CRQ_GND R210 100 C133 100nF PR0-

R56 0 C136 4.7nF SOY1

Y1_INB R211 68 C137 100nF Y1+
C138 15pF
Y1_GNDB R213 100 C140 100nF Y1-

CB1_INB R214 68 C141 100nF PB1+
C142 15pF
CB1_GNDB R217 100 C145 100nF PB1-

CR1_INB R218 68 C146 100nF PR1+
C147 15pF
CR1_GNDB R219 100 C148 100nF PR1-

FROM Tuner

SIF R212 8.2K C139 10nF MPX1
C48 1.8pF AADCVSS

AF R215 39K R216 39K CE70 + 47uF/16V MPX2
C143 15pF C144 15pF AADCVSS

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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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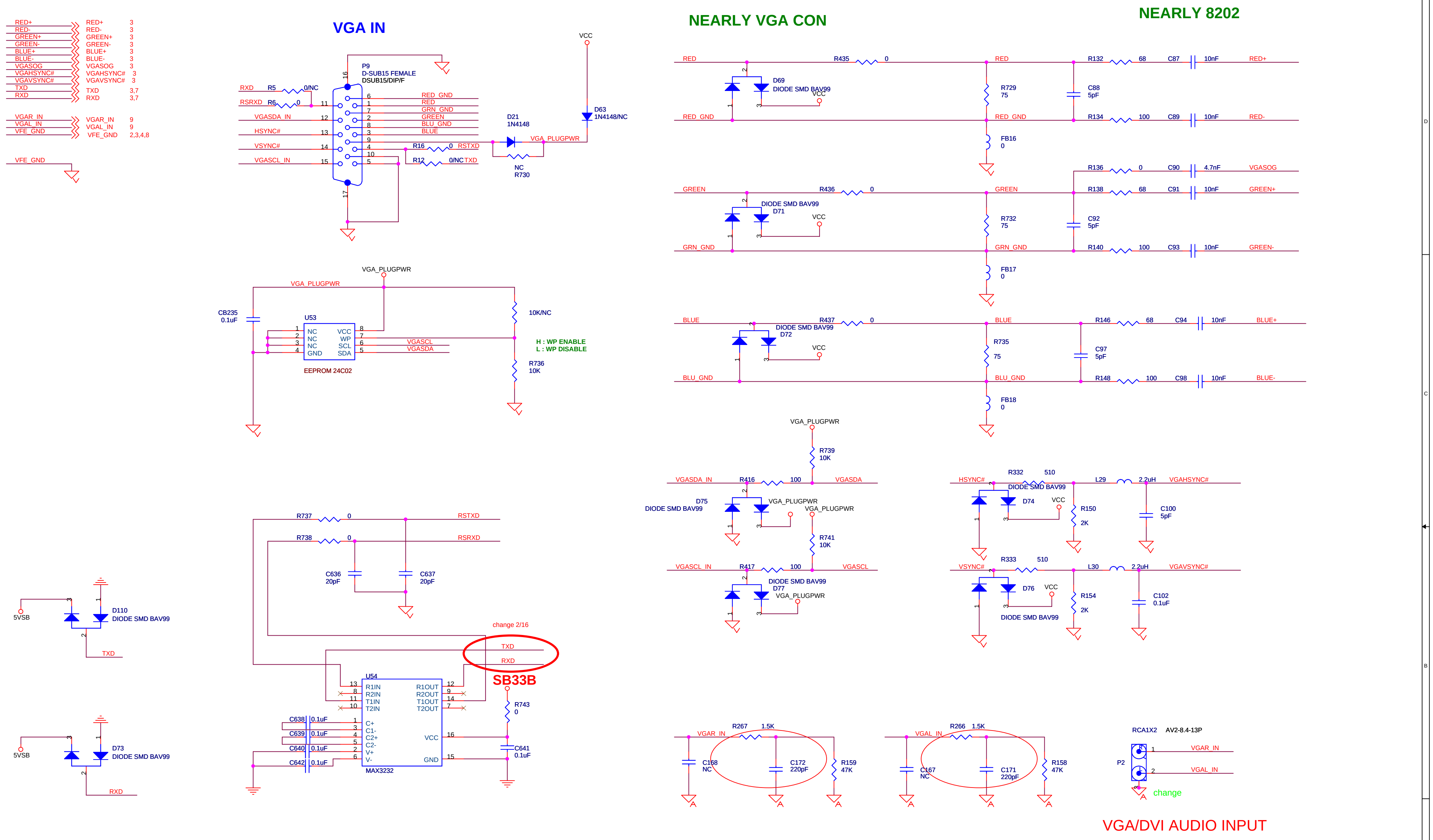

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Title	VGA IN & PC AUDIO IN	
Size C	Document Number AKAI_MT8202_27US_LVDS_V0.0	<Designer> Rev 1
		Checked: <Checker>
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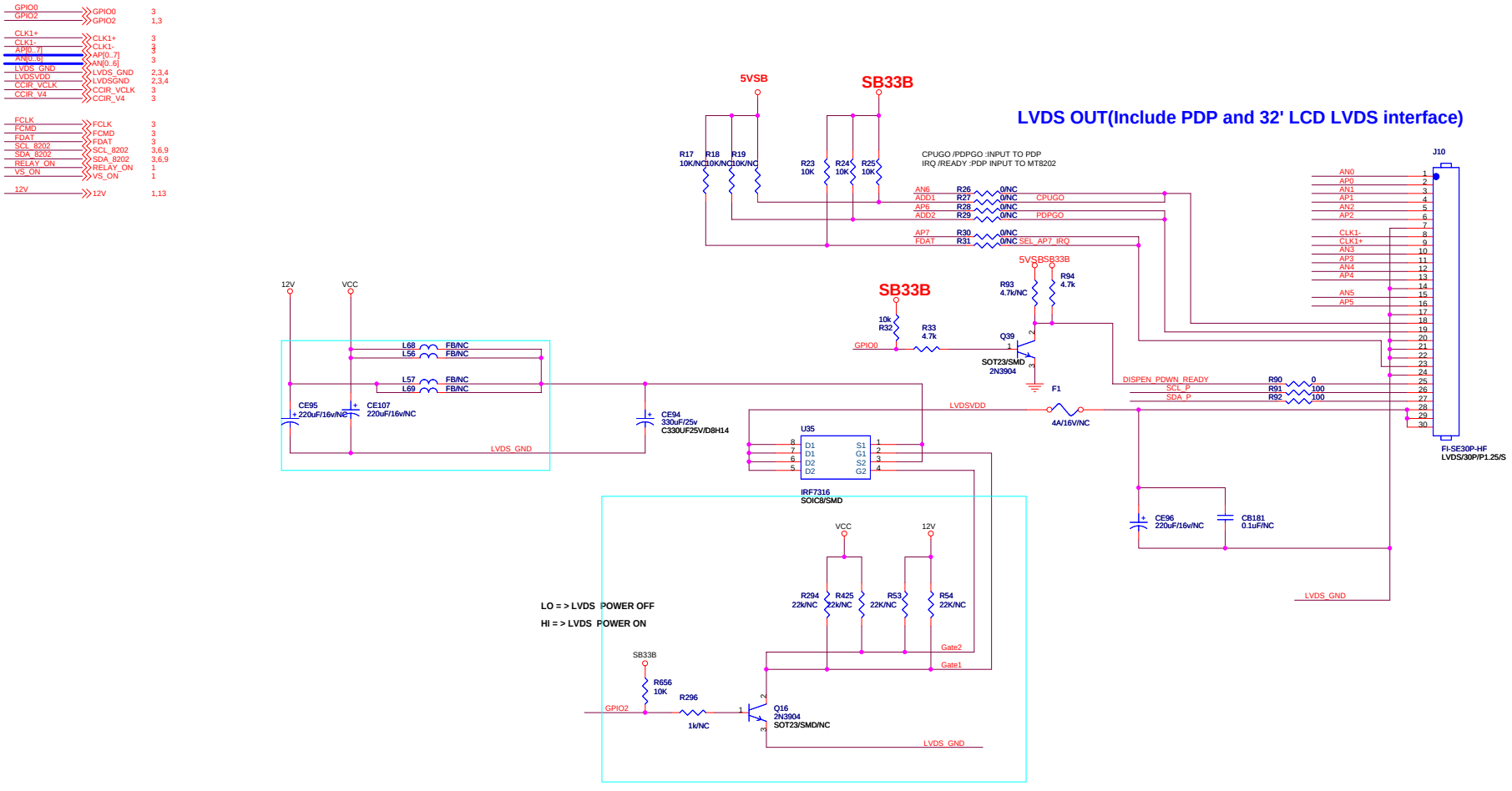

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Title: LVDS OUT			
Size: C	Document Number: AKAI_MT8202_27US_LVDS_V0.0	<Designer>	Rev: 1
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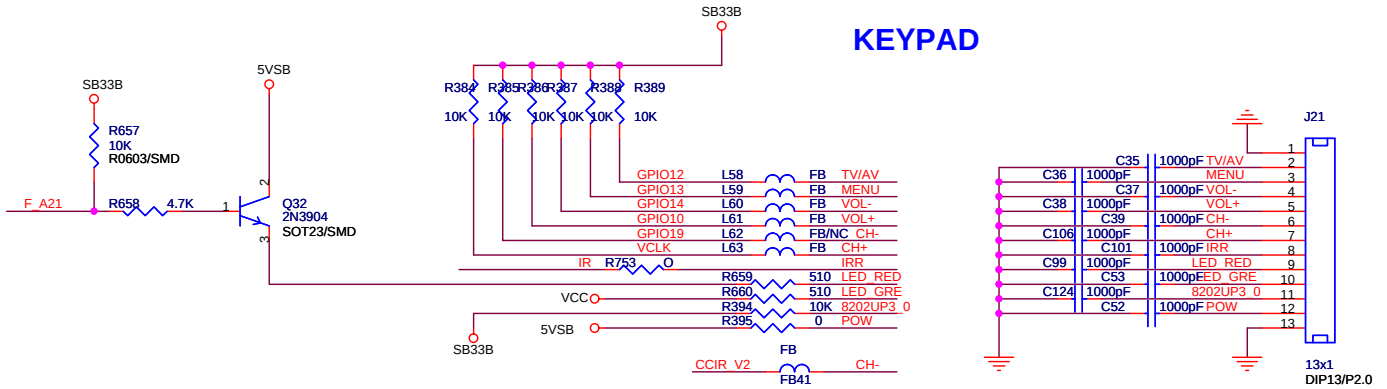
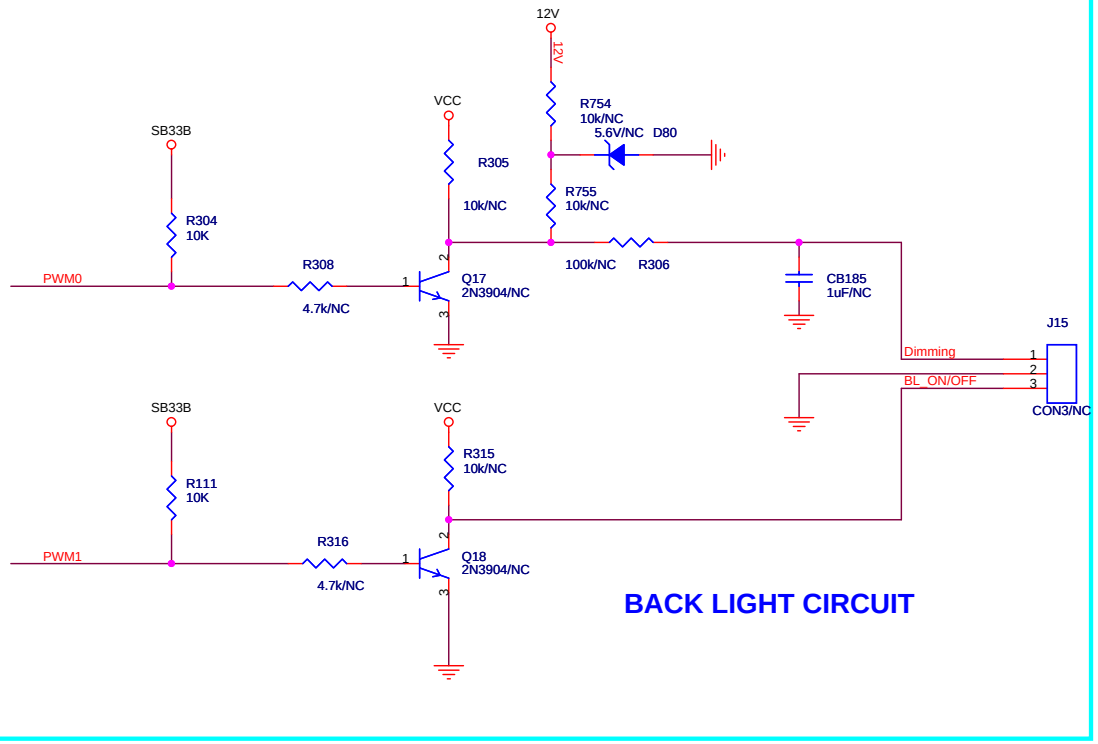
IR	IR	3,15
GPIO10	GPIO10	3
GPIO12	GPIO12	3
GPIO13	GPIO13	3
GPIO14	GPIO14	1,3
PWM0	PWM0	3
PWM1	PWM1	3
8202UP3_0	8202UP3_0	3
GPIO14	GPIO14	1,3
GPIO19	GPIO19	1,3
VCLK	VCLK	3
F_A21	F_A21	3
CCIR_V2	CCIR_V2	3
12V	12V	1,12

KEYPAD



ADC KEY & GPIO KEY KEYPAD



BACK LIGHT CIRCUIT

KAWA Confidential

Title: BACK LIGHT / KEYPAD			
Size: B	Document Number: AKAI_MT8202_27US_LVDS_V0.0	<Designer>	Rev: 1
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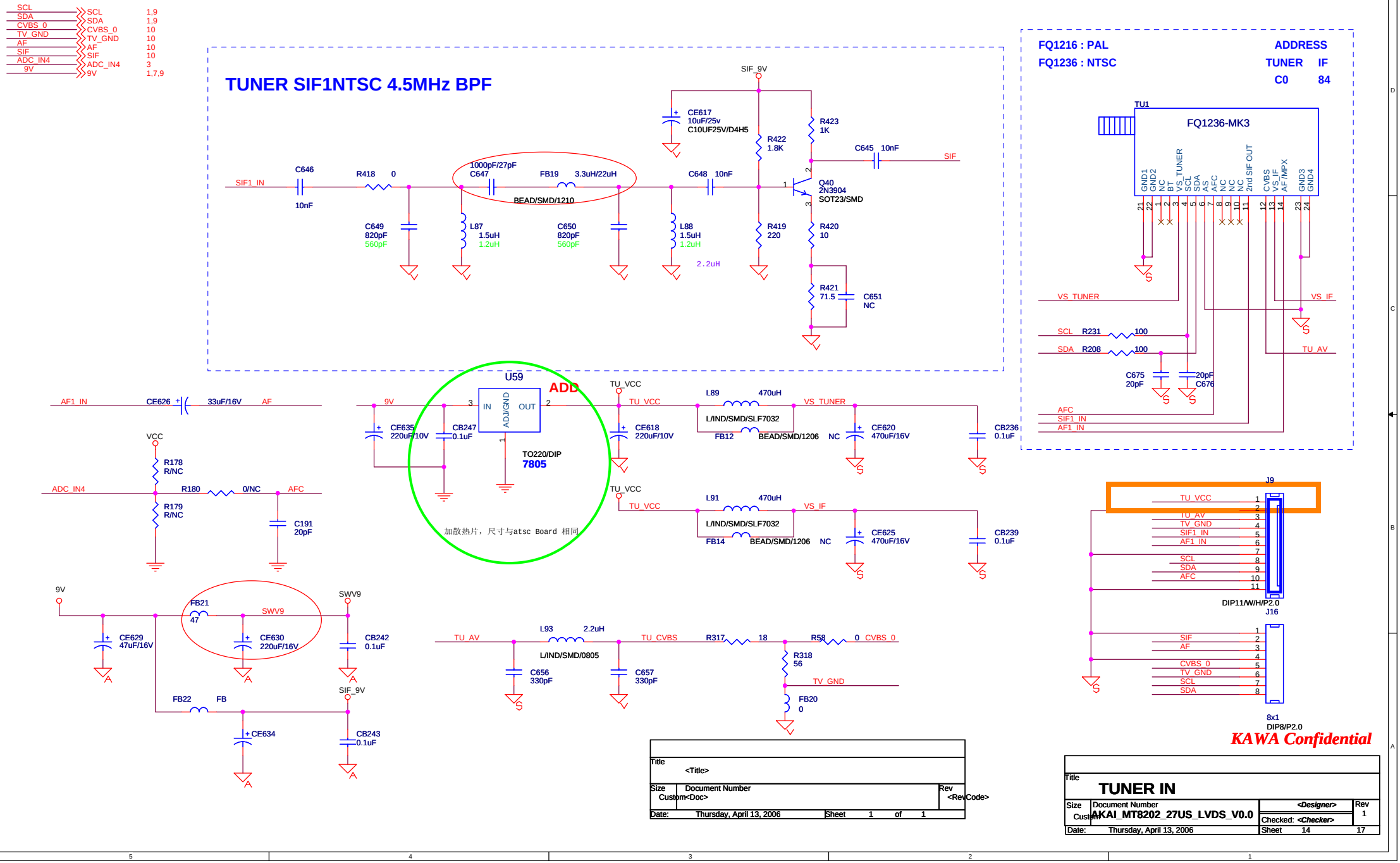
SCL 1,9
SDA 1,9
CVBS_0 10
TV_GND 10
AF 10
SIF 10
ADC_IN4 3
9V 1,7,9
TUNER SIF1NTSC 4.5MHz BPF
SIF_9V
CE617 10uF/25v C10UF25V/D4H5
R423 1K
R422 1.8K
C645 10nF
SIF
SIF1_IN
C646 10nF
R418 0
1000pF/27pF C647
FB19 3.3uH/22uH
BEAD/SMD/1210
C648 10nF
Q40 2N3904 SOT23/SMD
C649 820pF 560pF
L87 1.5uH 1.2uH
C650 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
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
IN ADJ/GND OUT
CE635 220uF/10V
CB247 0.1uF
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
L91 470uH
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
C656 330pF
C657 330pF
R318 56
TV_GND
FB20 0
J9
TU_VCC
TU_AV
TV_GND
SIF1_IN
AF1_IN
SCL
SDA
AFC
DIP11/W/H/P2.0
J16
SIF
AF
CVBS_0
TV_GND
SCL
SDA
8x1
DIP8/P2.0
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Title
<Title>
Size Custom
Document Number <Doc>
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TUNER IN
Size Custom
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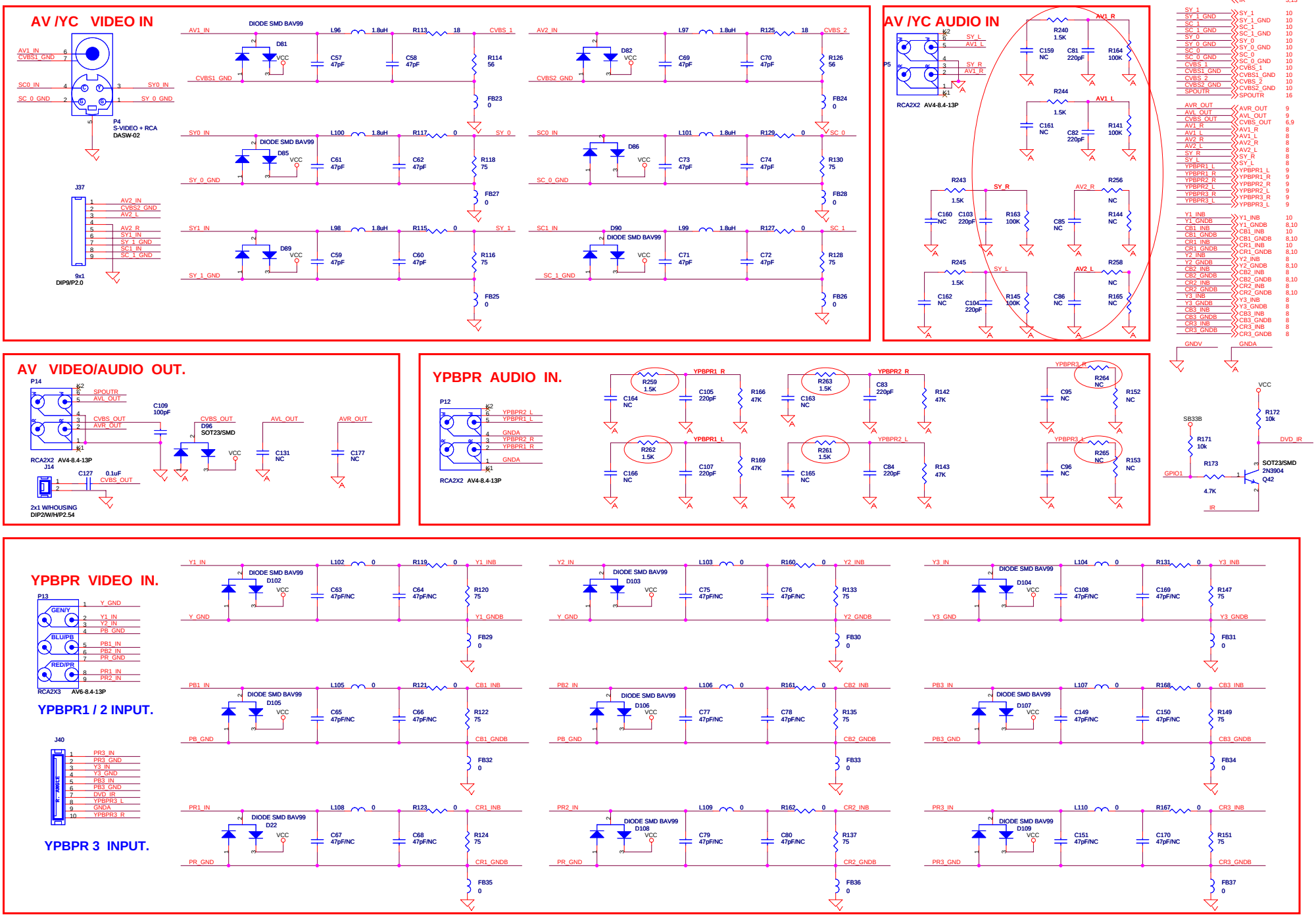

Title	AV IN		
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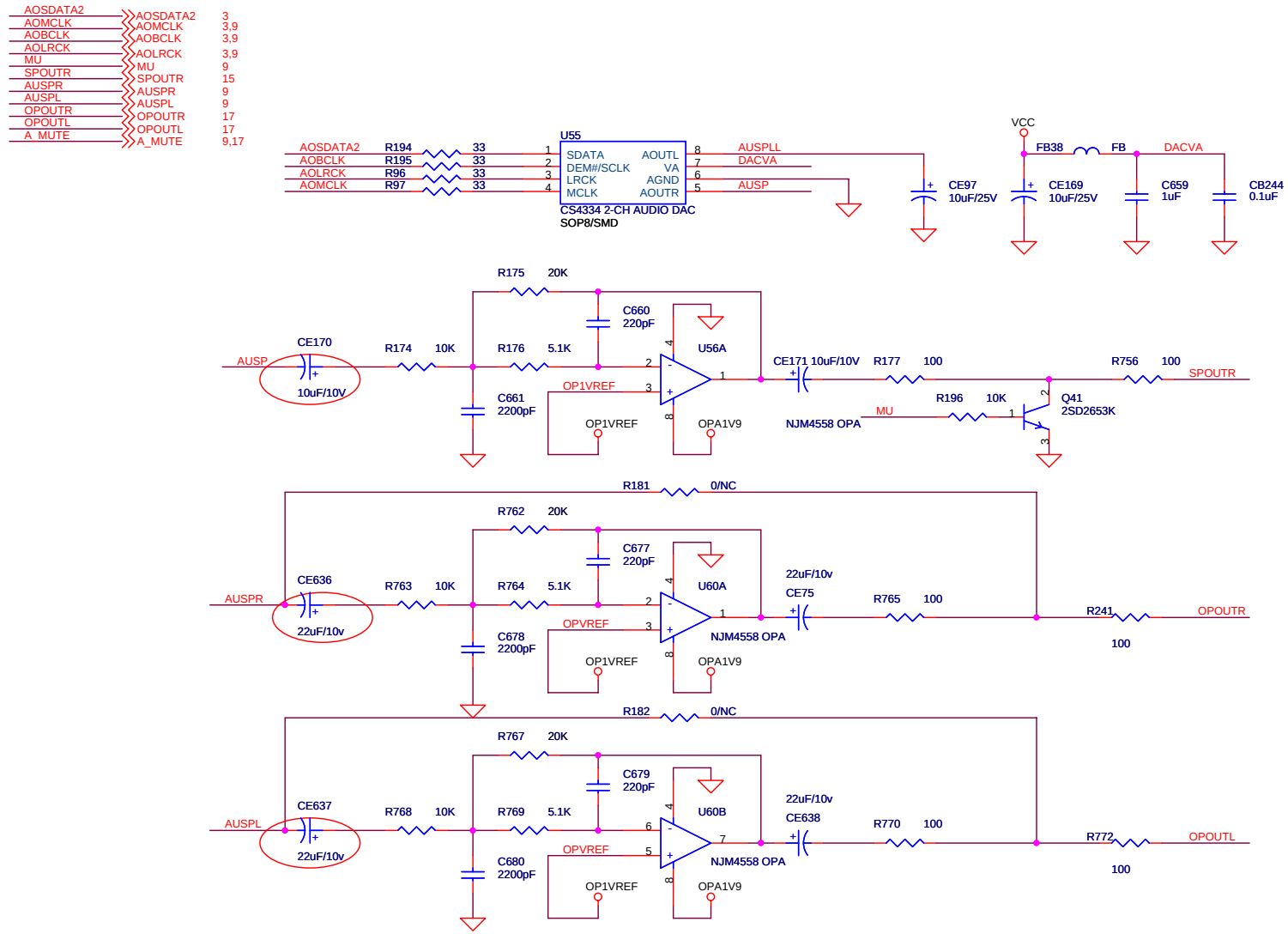

GPIO DECRIPTION

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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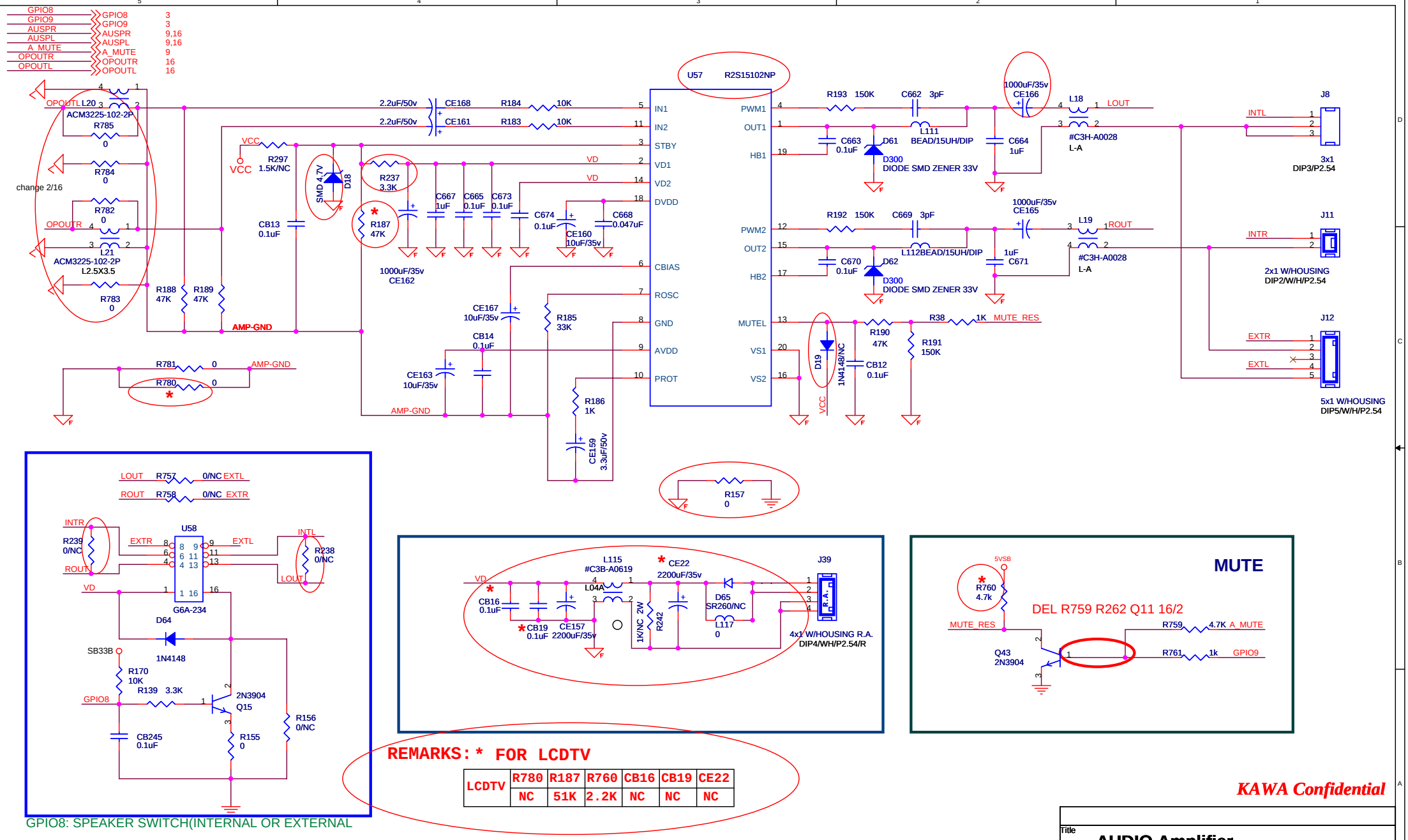

GPIO8: SPEAKER SWITCH(INTERNAL OR EXTERNAL

REMARKS: * FOR LCDTV

LCDTV	R780	R187	R760	CB16	CB19	CE22
	NC	51K	2.2K	NC	NC	NC

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Title: AUDIO Amplifier			
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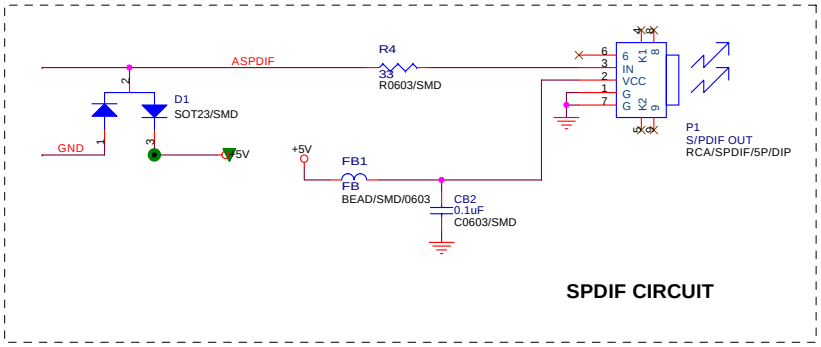
MT5111 / MT5351 REFERENCE DESIGN - 4 LAYERS

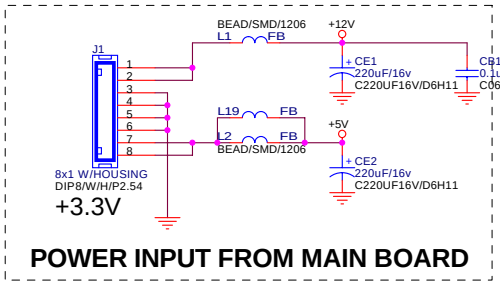
Rev	History	P#	DATE
RA-V1	INITIAL VERSION		2005/06/15
RA-V2	ADDED AUDIO SWITCH / REFINE POWER CIRCUIT		2005/07/14

NS : NON-STUFF

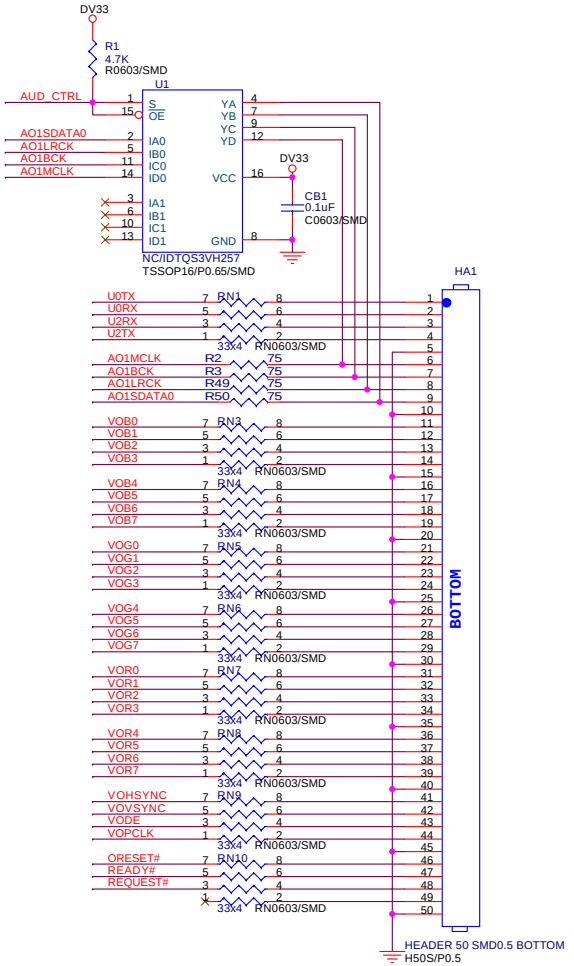
NAME	TYPE	DEVICE
+12V	POWER +12V	POWER SUPPLY
+5V	POWER +5V	POWER SUPPLY
+5V_tuner	POWER +5V	TUNER POWER
DV33_DM	POWER +3V3	MT5111 POWER
DV18	POWER +1V8	MT5111 POWER
DV33	POWER +3V3	MT5351 POWER
AV33	POWER +3V3	MT5351 ANALOG POWER
DV25	POWER +2V5	MT5351 DDR POWER
DV12	POWER +1V2	MT5351 POWER
GND	GROUND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



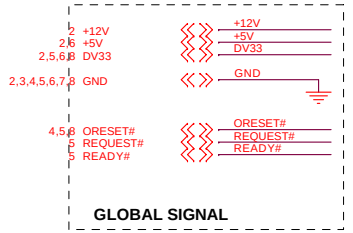
SPDIF CIRCUIT



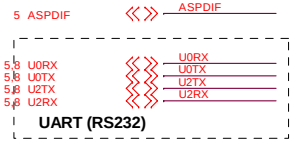
POWER INPUT FROM MAIN BOARD



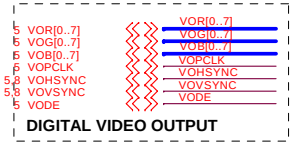
DIGITAL OUTPUT



GLOBAL SIGNAL



UART (RS232)



DIGITAL VIDEO OUTPUT

DIGITAL AUDIO INTERFACE

Title: INDEX
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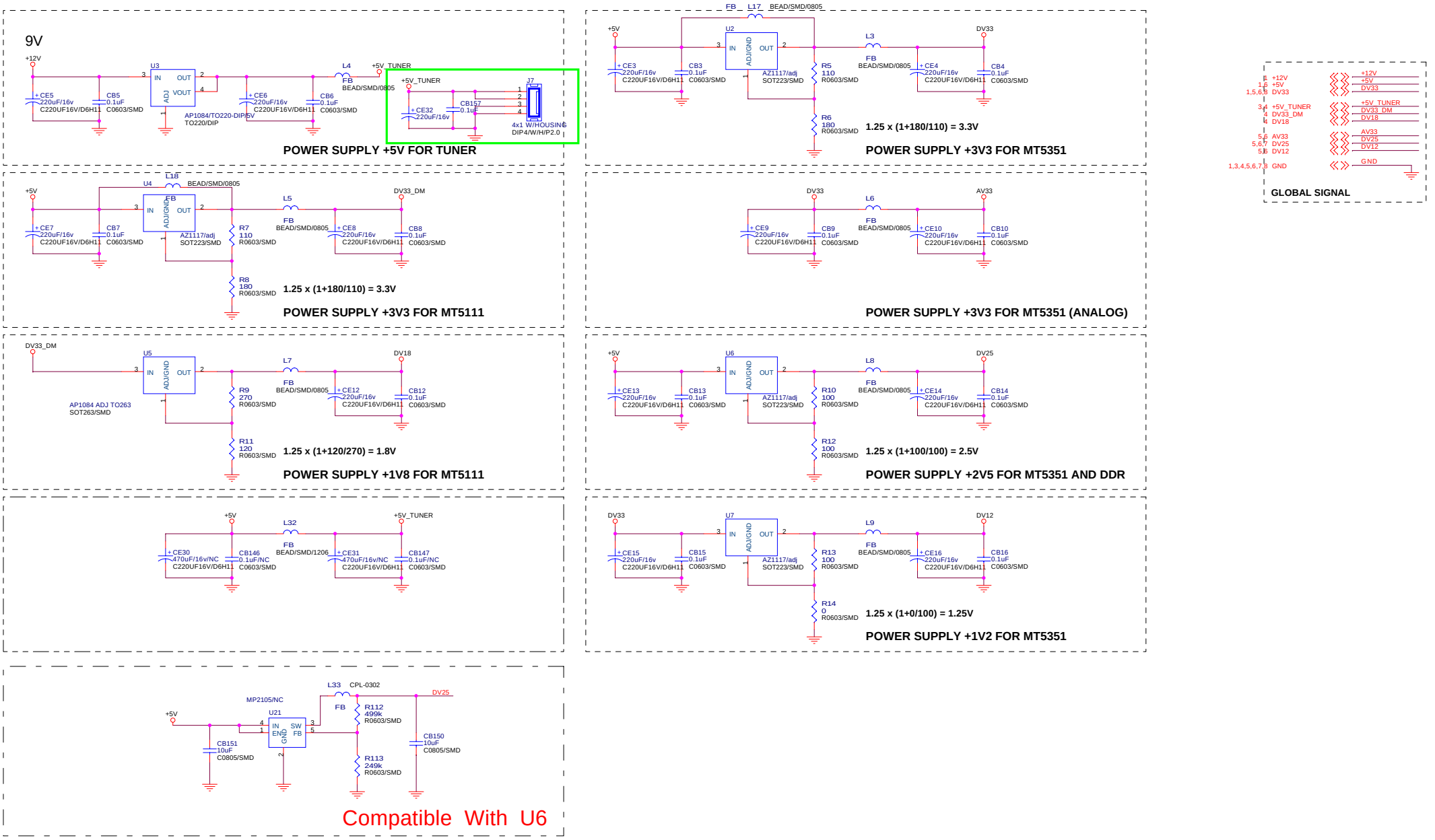

Title: POWER			
Size: Custom	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
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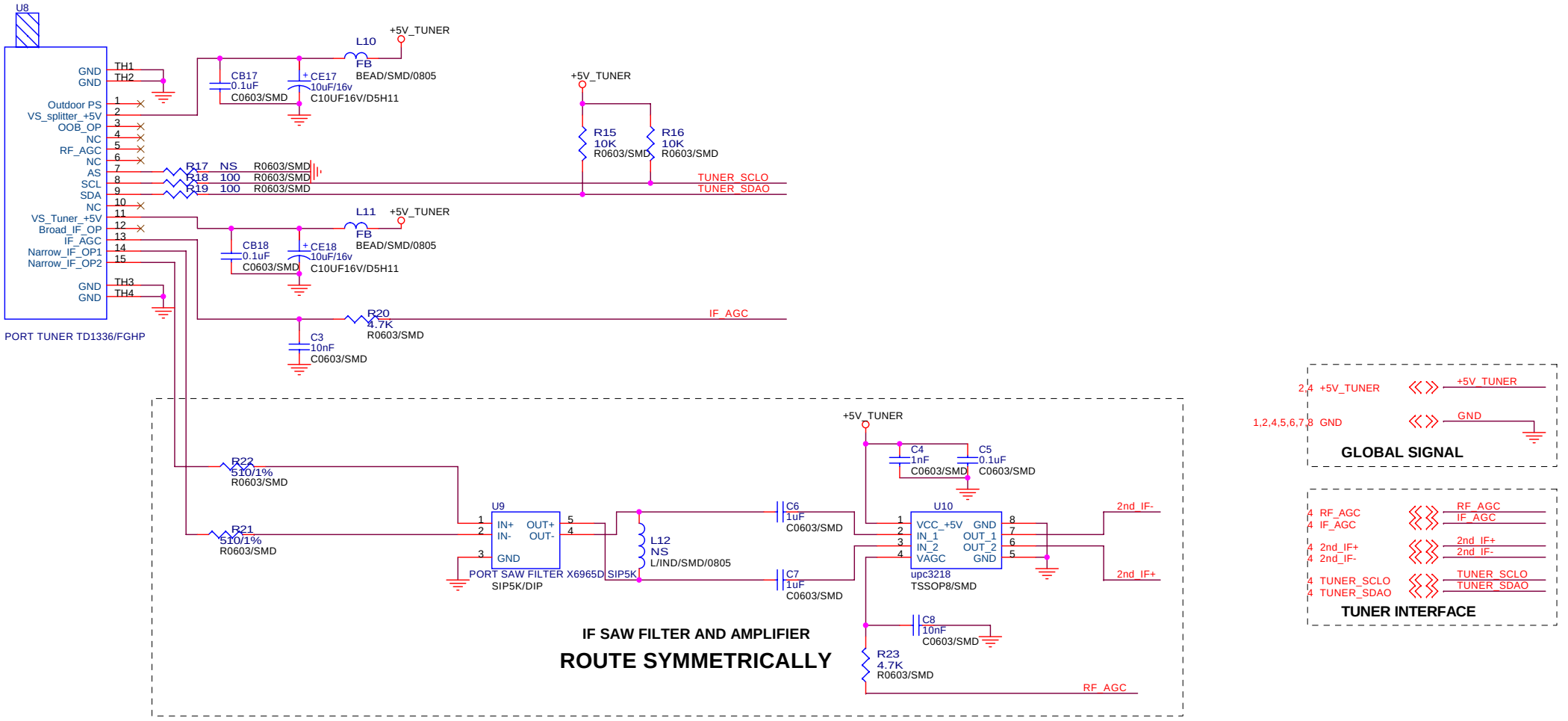

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Title: TUNER			
Size: Custom	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
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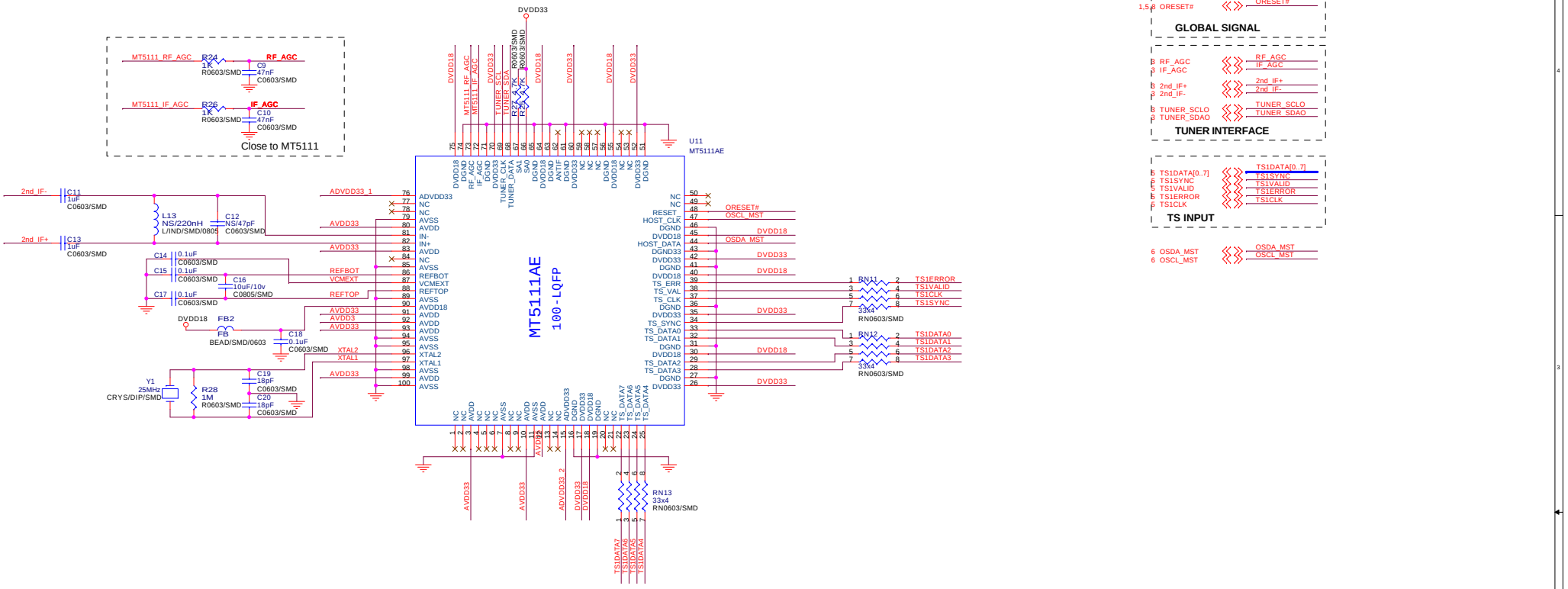

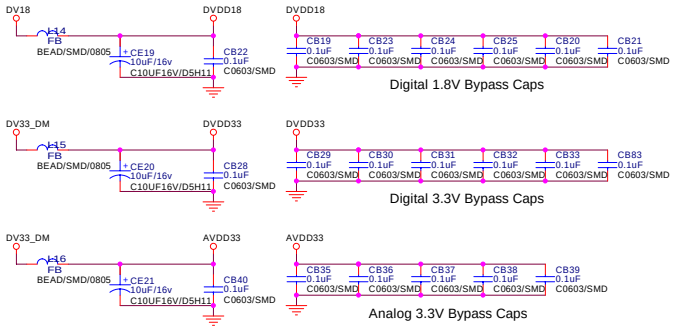

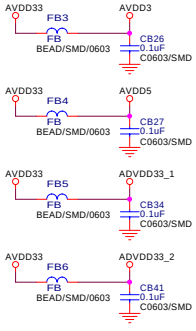

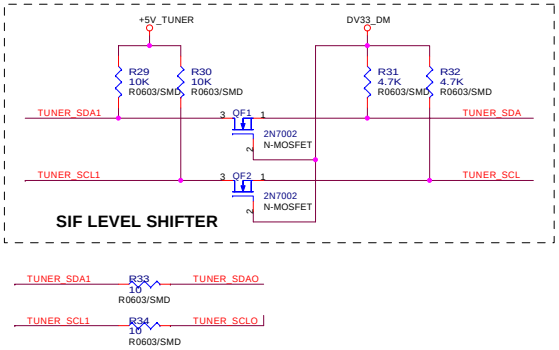

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Size: C	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
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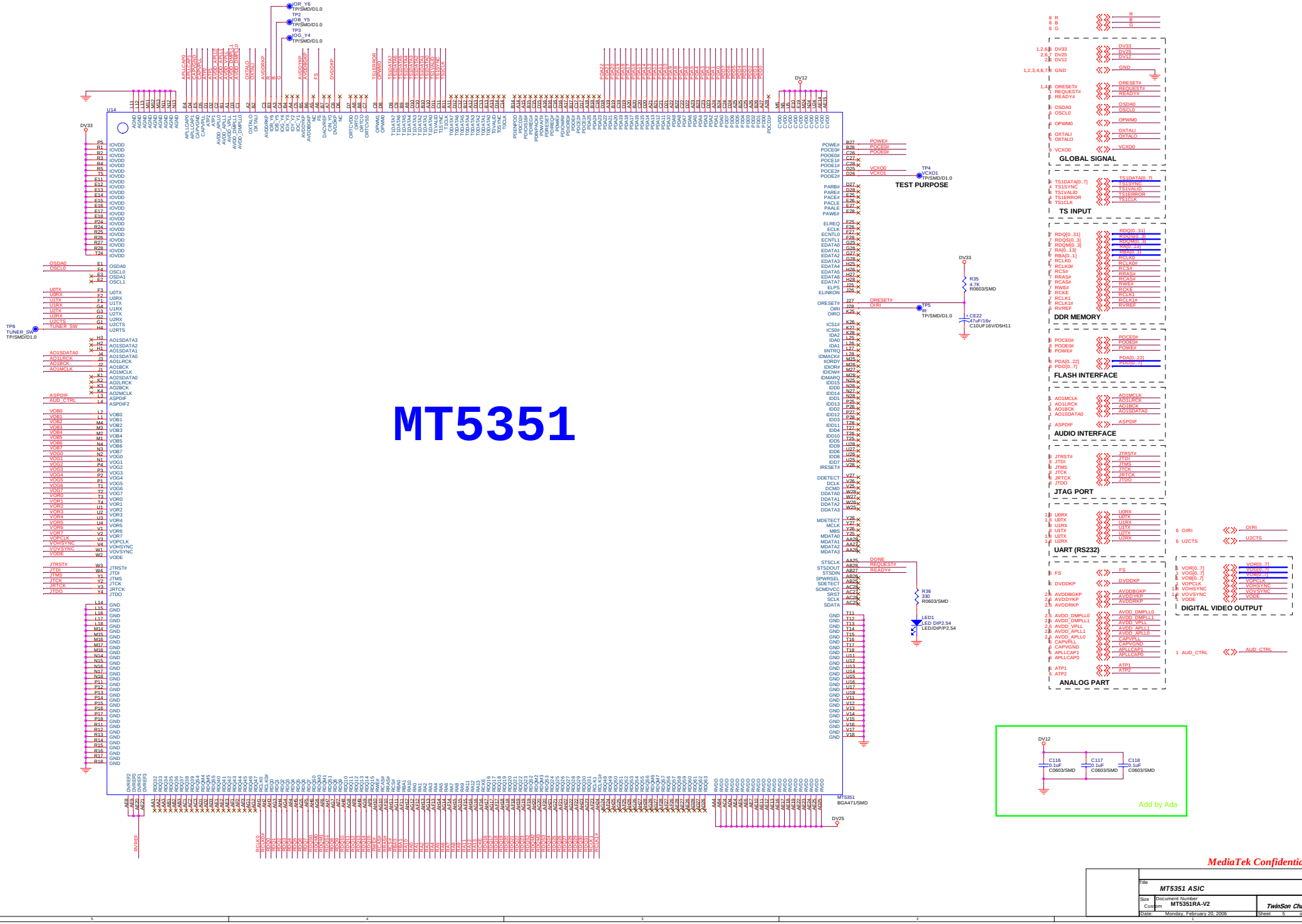

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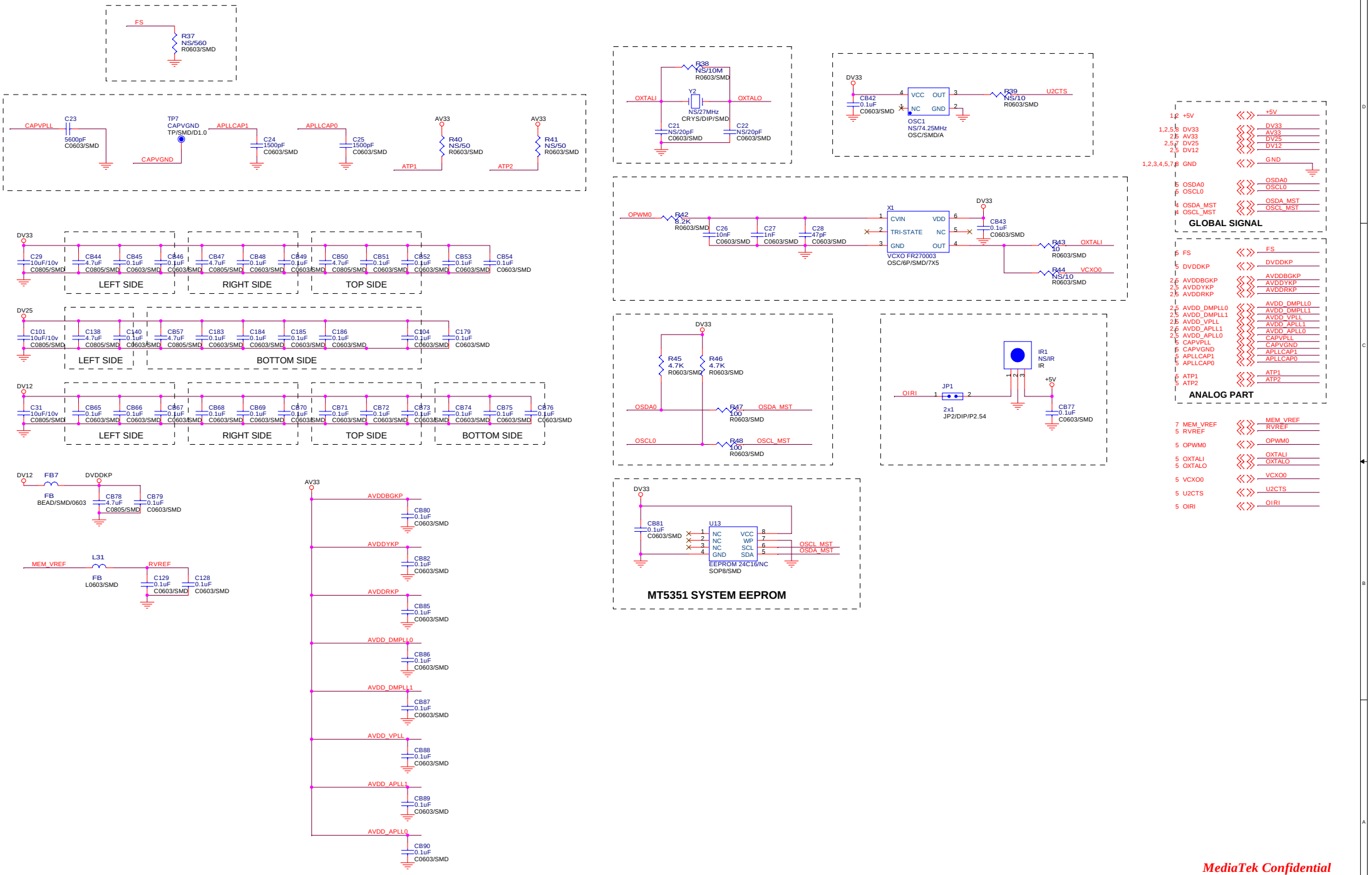
Title: MT5351 ASIC			
Size: Custom	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
Date: Monday, February 20, 2006	Sheet 5 of 8		



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Title: MT5351 PERIPHERAL			
Size: Custom	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
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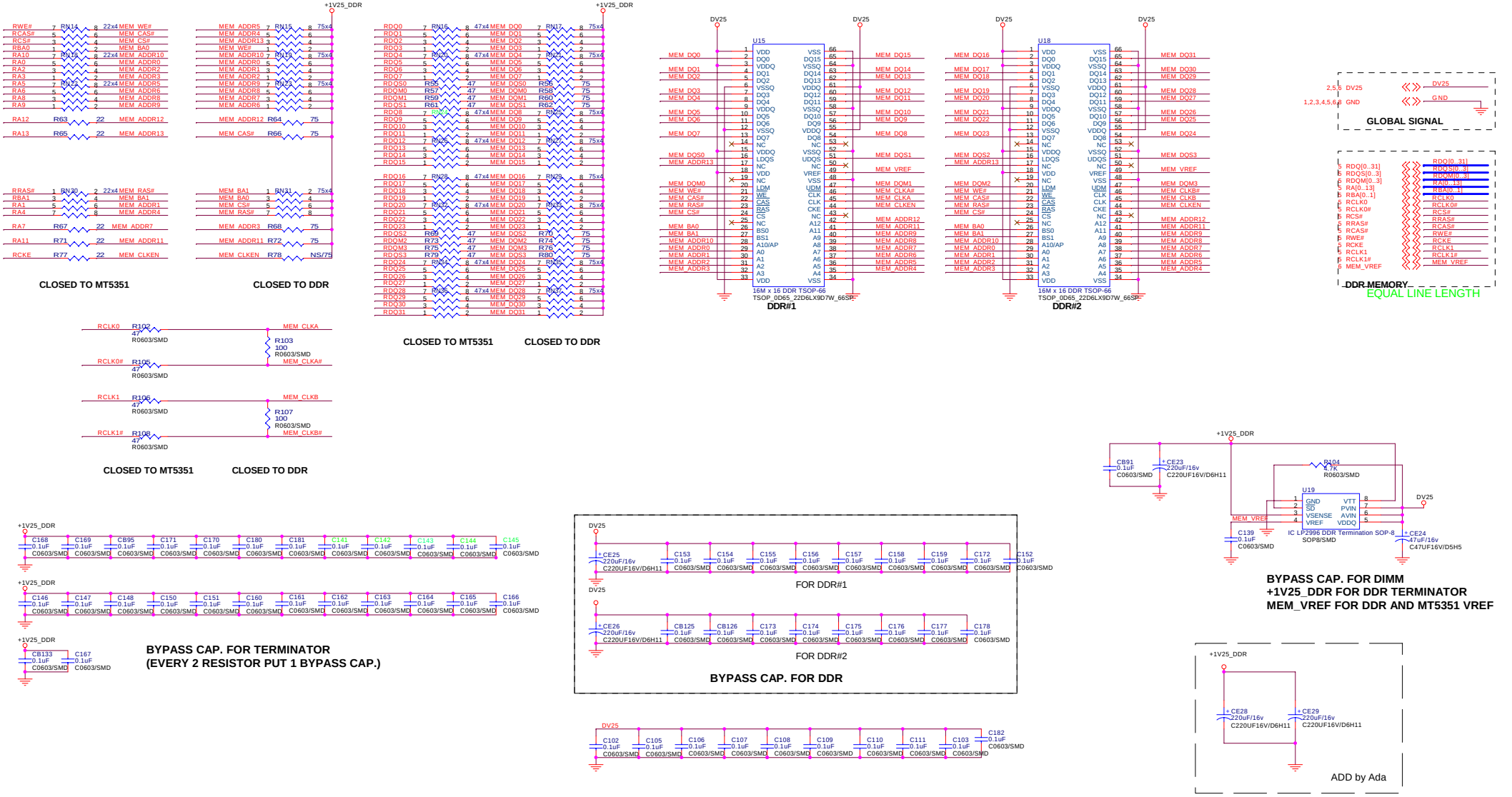

Title: DDR MEMORY			
Size: Custom	Document Number: MT5351RA-V2	TwinSon Chan	Rev: 1
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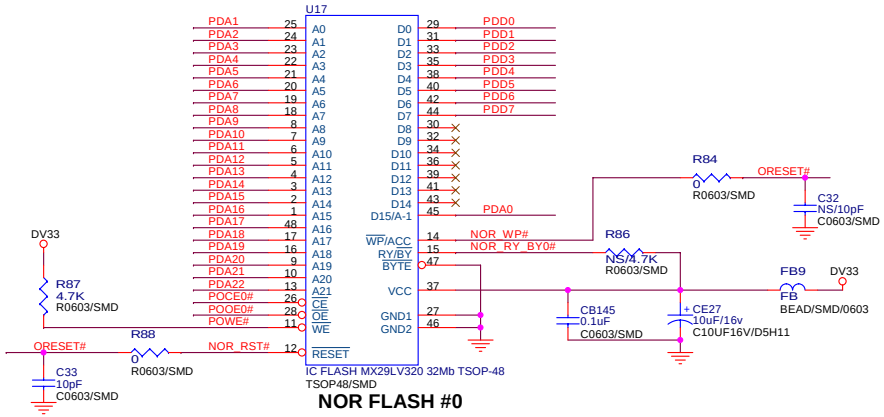
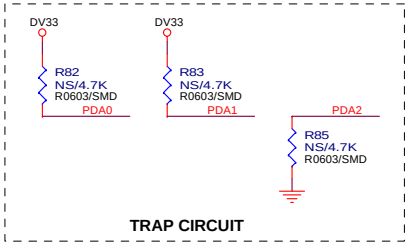
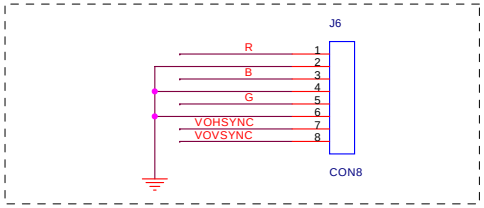
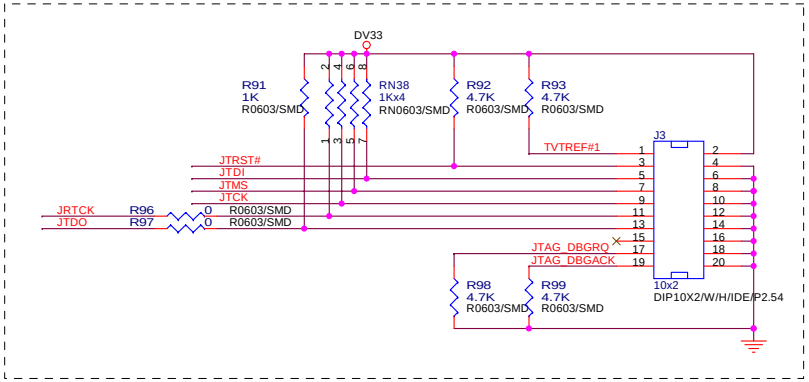
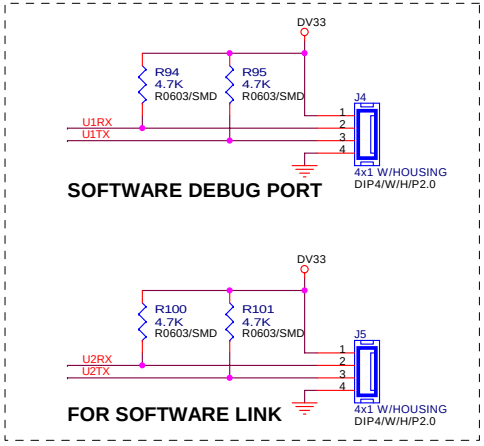
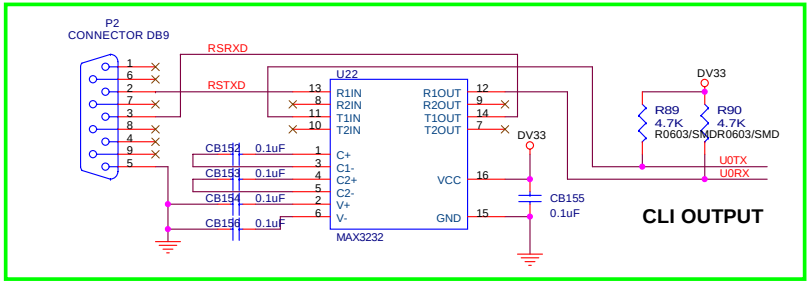


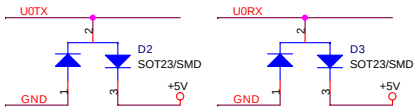


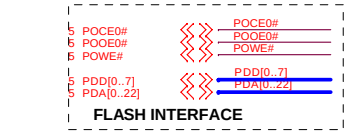


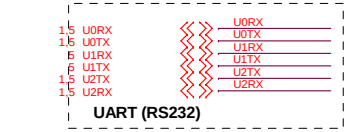












Title	NOR FLASH / JTAG / UART	
Size: Custom	Document Number: MT5351RA-V2	Rev: 1
Date: Monday, February 20, 2006	TwinSon Chan	Sheet 8 of 8

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

TFT LCD Preliminary Specification

MODEL NO.: V270B1 - L01

LCD TV Head Division	
AVP	郭振隆

QRA Dept.	TVHD / PDD		
	DDIII	DDII	DDI
Approval	Approval	Approval	Approval
陳永一	李汪洋	藍文錦	林文聰

LCD TV Marketing and Product Management Division	
Product Manager	陳立宜　　謝芳宜

- 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).

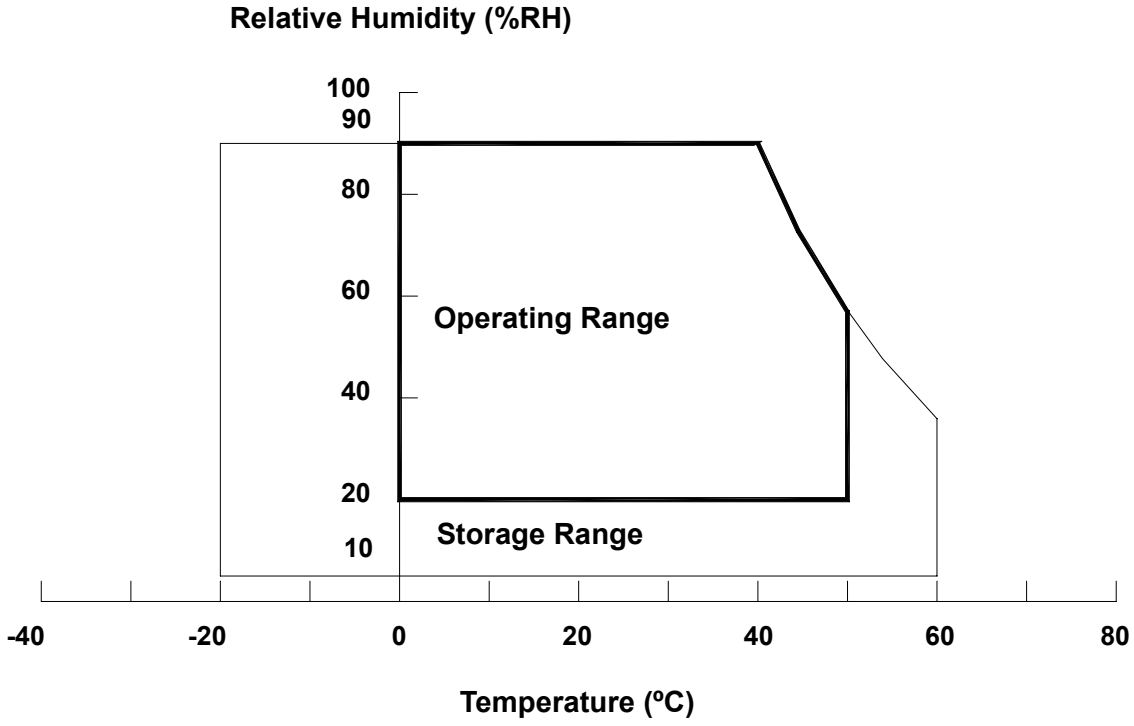
(c) No condensation.

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

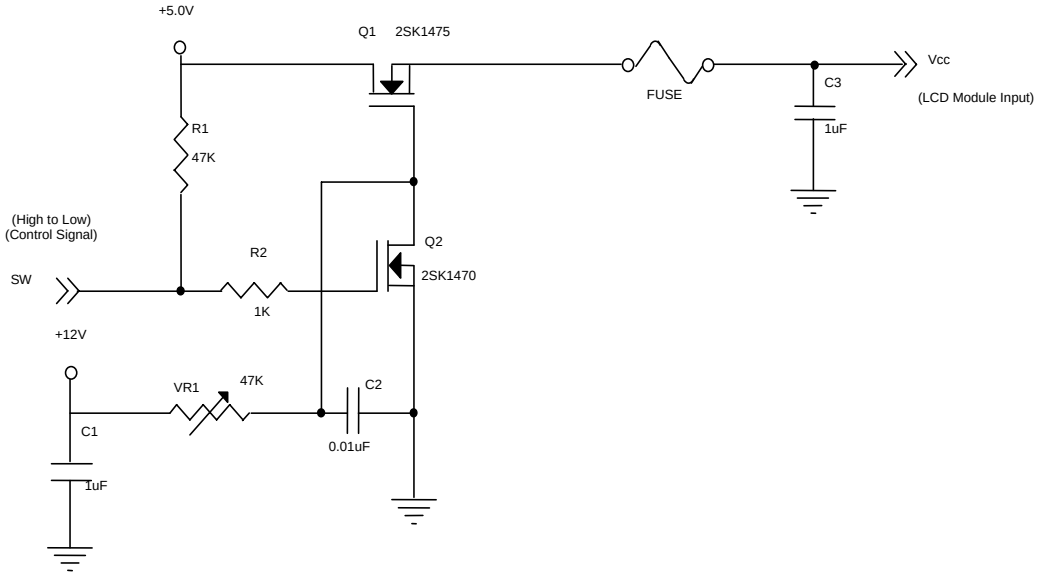
3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

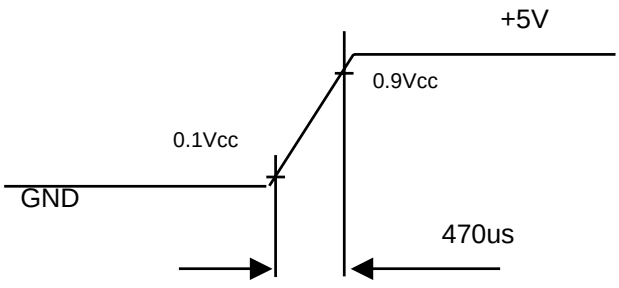
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	4.5	5.0	5.5	V	(1)
Power Supply Ripple Voltage		V_{RP}	-	-	150	mV	
Rush Current		I_{RUSH}	-	-	3.0	A	(2)
Power Supply Current	White	I_{CC}	-	1.8	-	A	(3)
	Black		-	1.2	-	A	
	Vertical Stripe		-	1.65	-	A	
LVDS Interface	Differential 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.

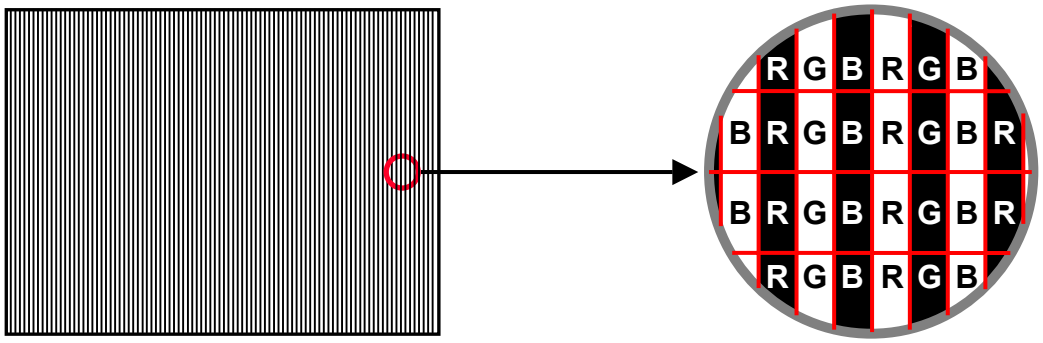
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern



Active Area

3.2 BACKLIGHT INVERTER UNIT

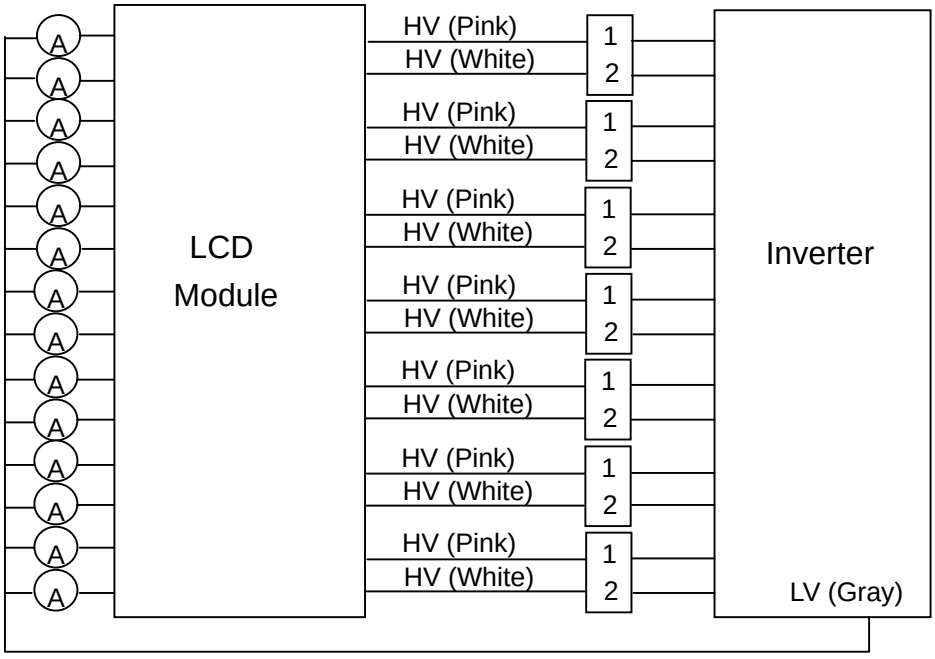
3.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 ºC)

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}.

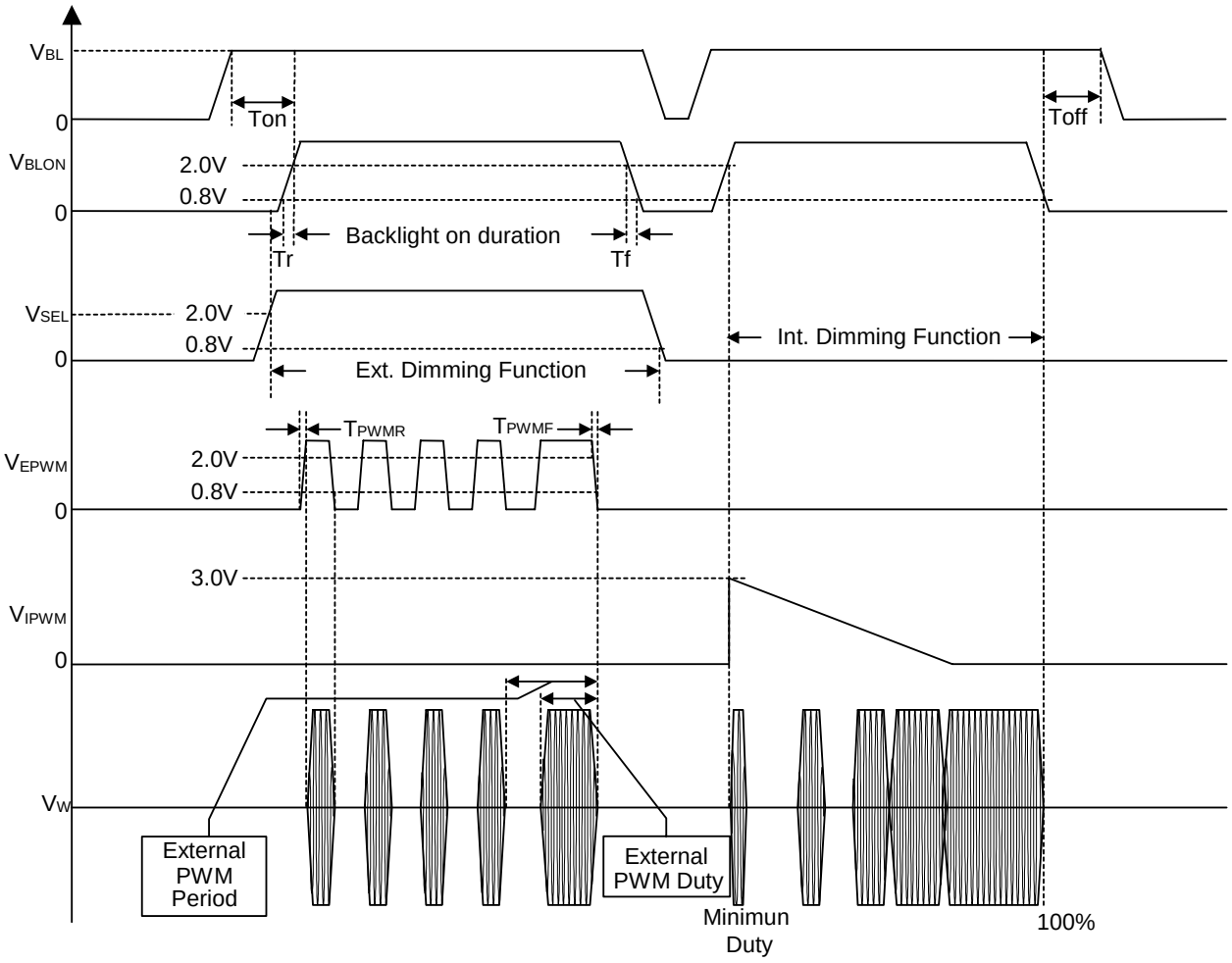
Note (5) The power supply capacity should be higher than the total inverter power consumption P_{BL}. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the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

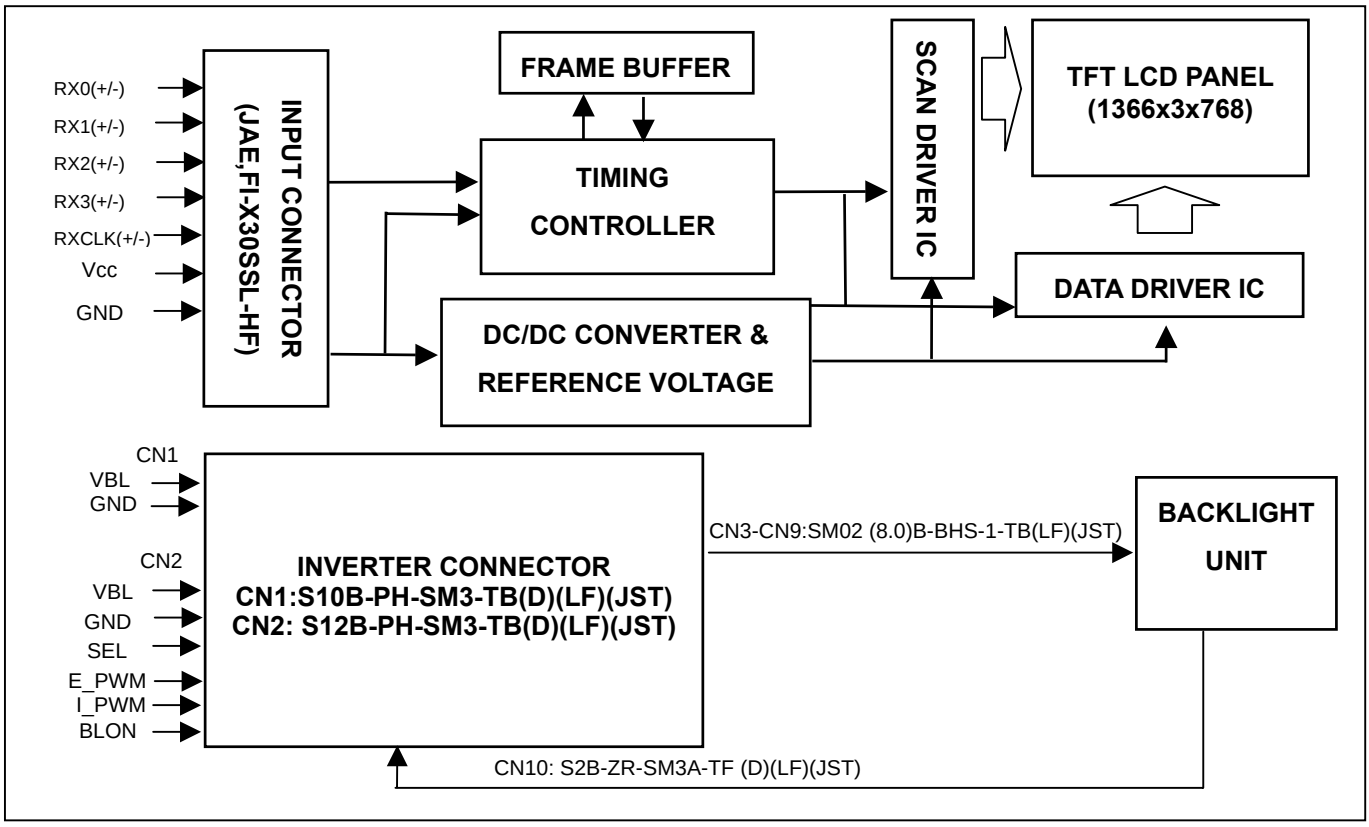
Note (1) The SEL signal should be valid before backlight turns on by BLON signal. It is inhibited to change the internal/external PWM selection (SEL) during backlight turn on period.

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)

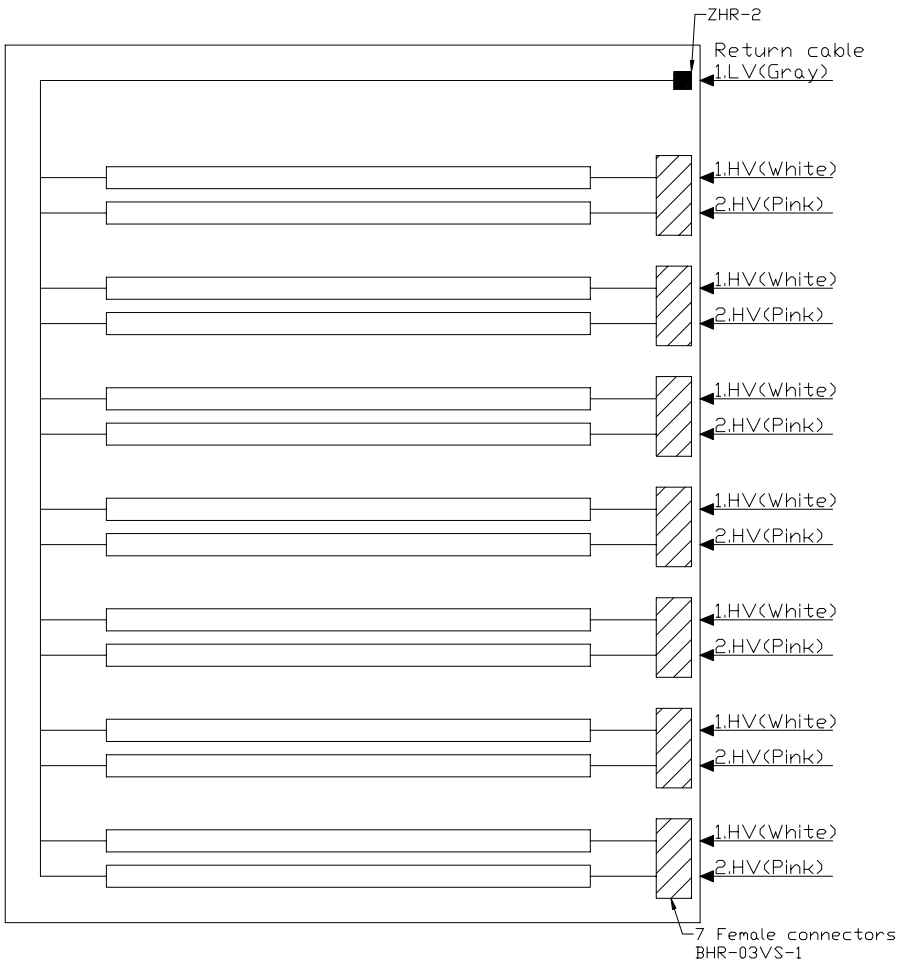
Pin No.	Symbol	Description	Wire Color
1	HV	High Voltage	Pink
2	HV	High Voltage	White

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

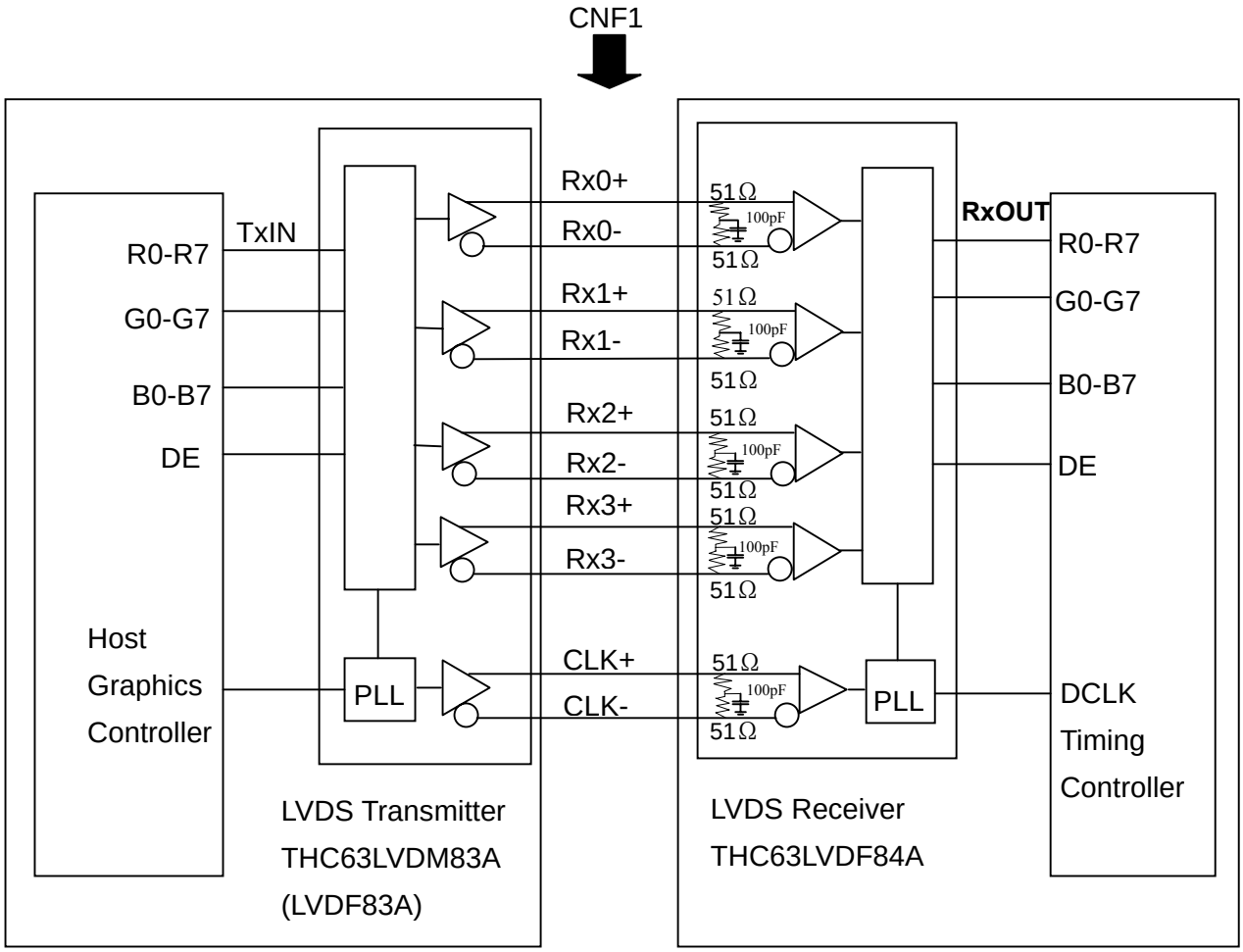
Pin	Name	Description
1	CCFL HOT	CCFL high voltage
2	CCFL HOT	CCFL high voltage

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
24 bit	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
	B2	B4	20	TxIN19			53	Rx OUT19	B2	B4
	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

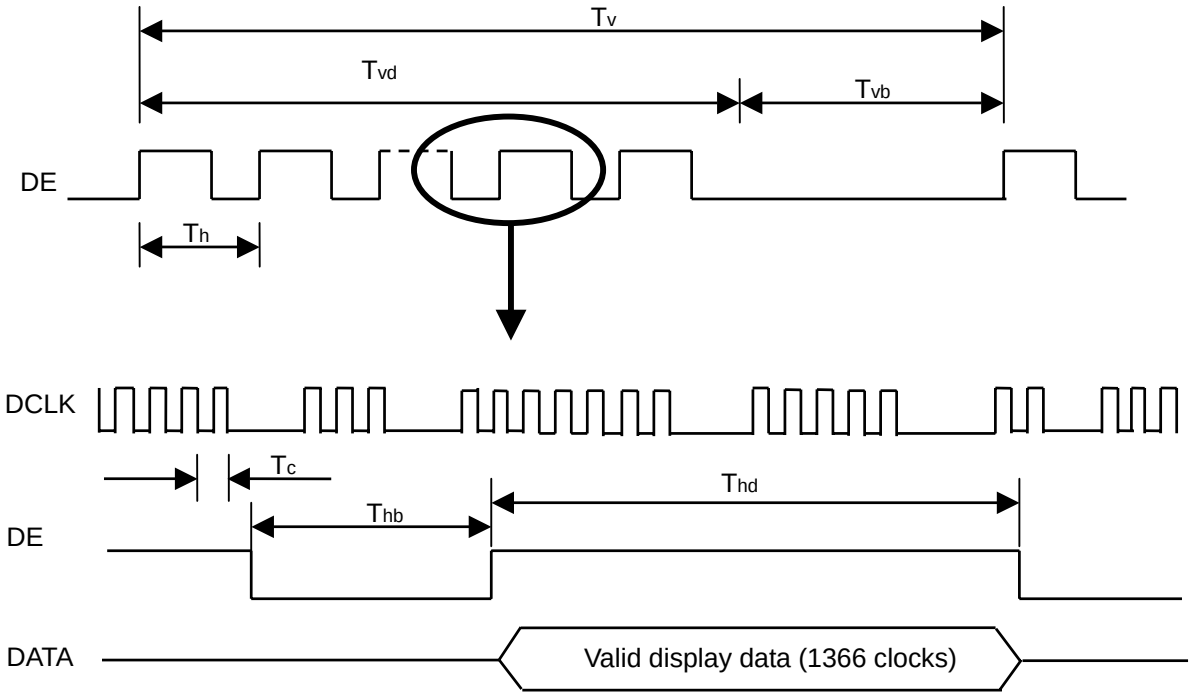
The input signal timing specifications are shown as the following table and timing diagram**.**

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	-

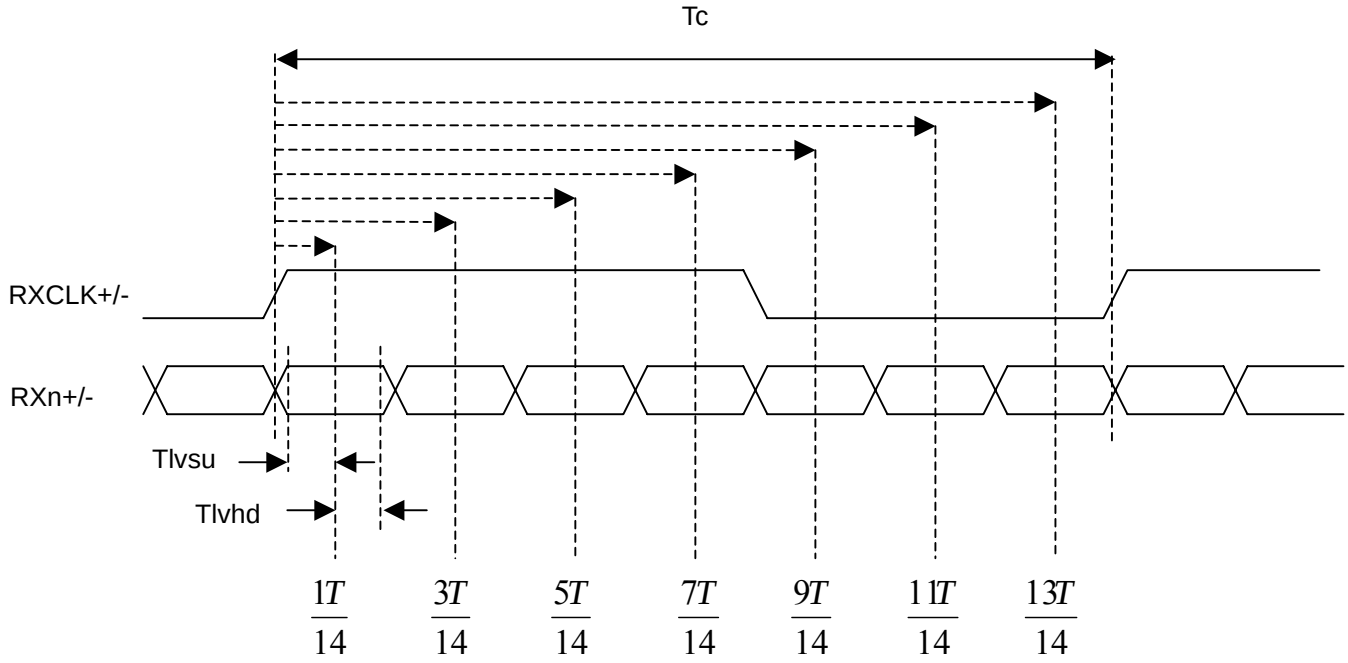
Note (1) Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

(2) Please refer to 5.1 for detail information.

INPUT SIGNAL TIMING DIAGRAM

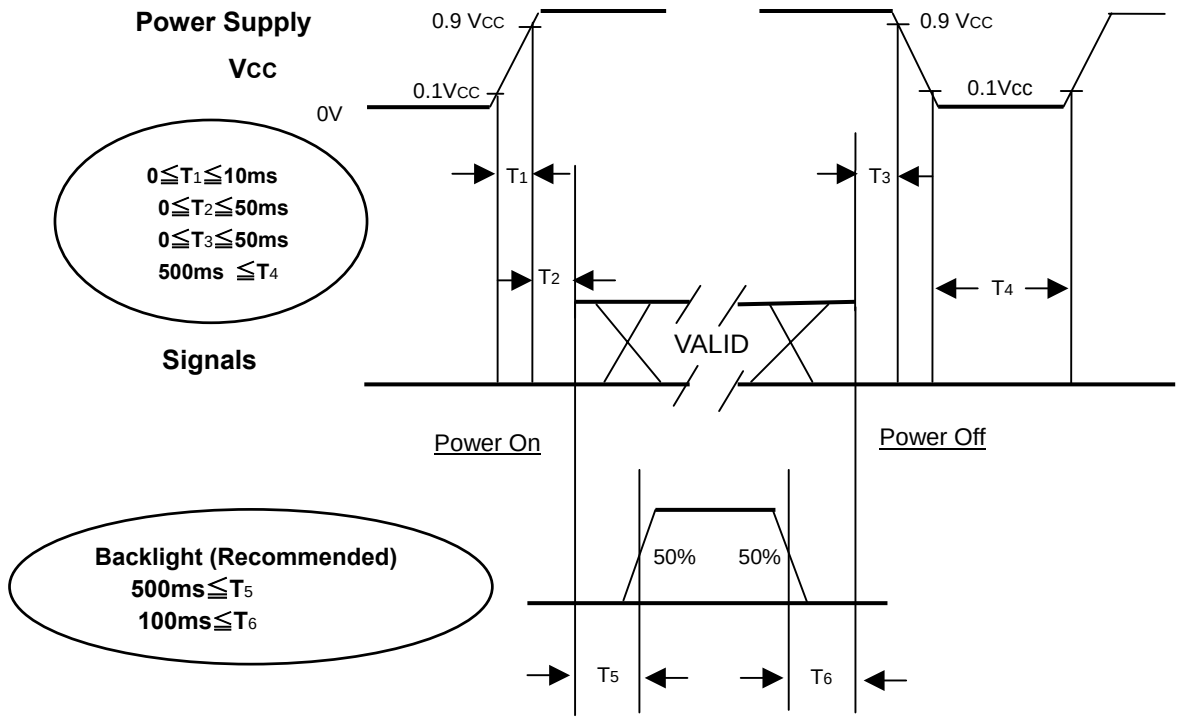


LVDS RECEIVER INTERFACE TIMING DIAGRAM



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

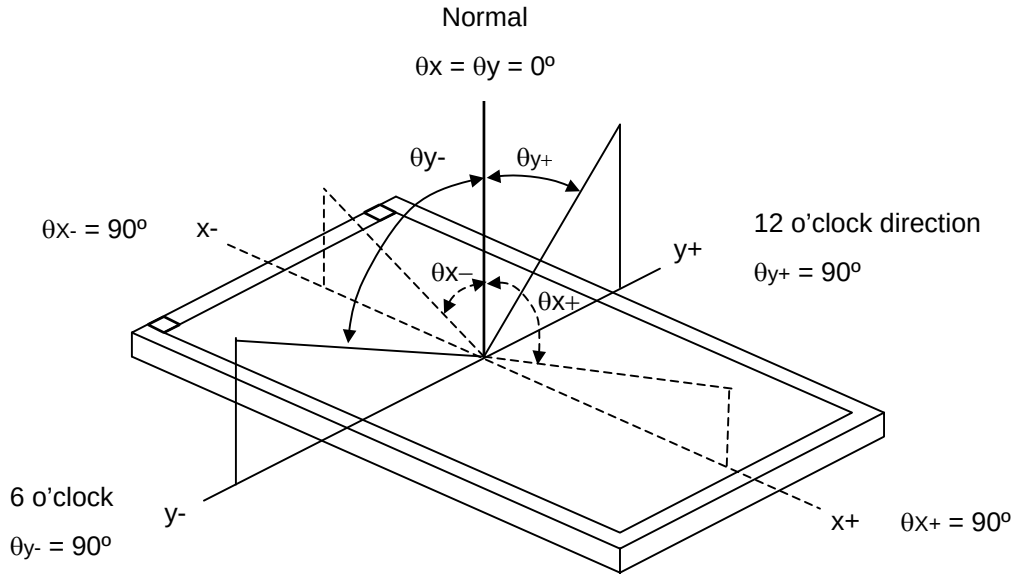
7.2 OPTICAL SPECIFICATIONS

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

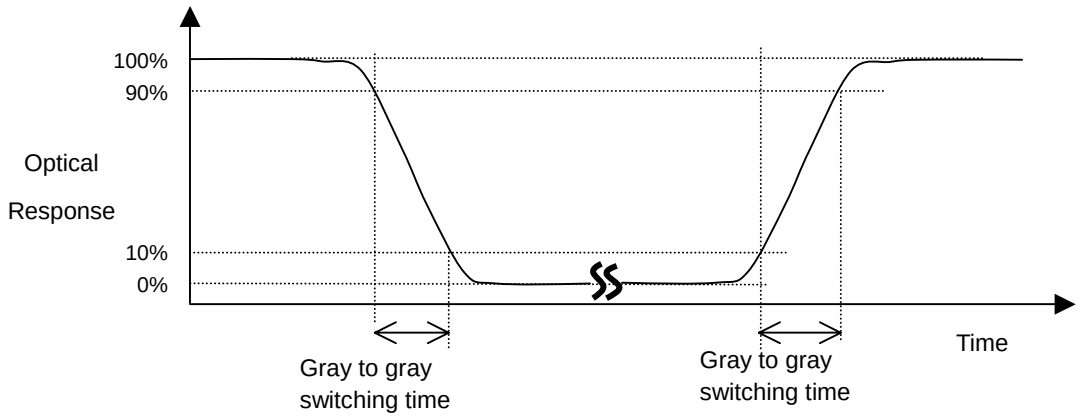
L255: Luminance of gray level 255

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).

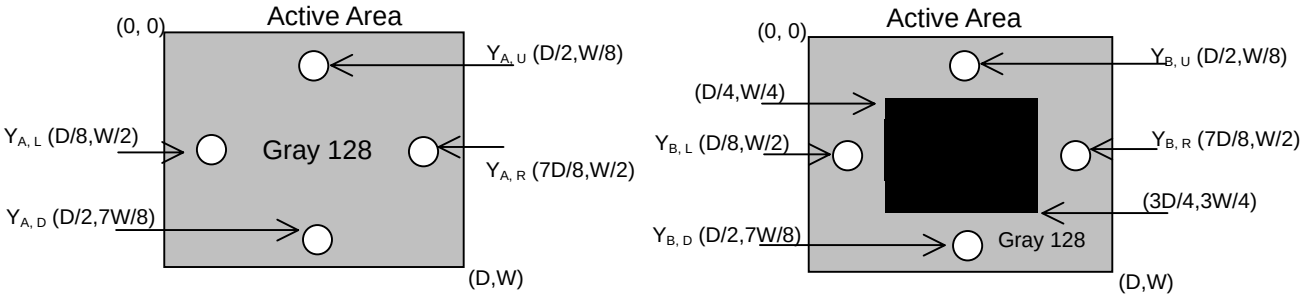
Note (5) Definition of Cross Talk (CT):

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

Where:

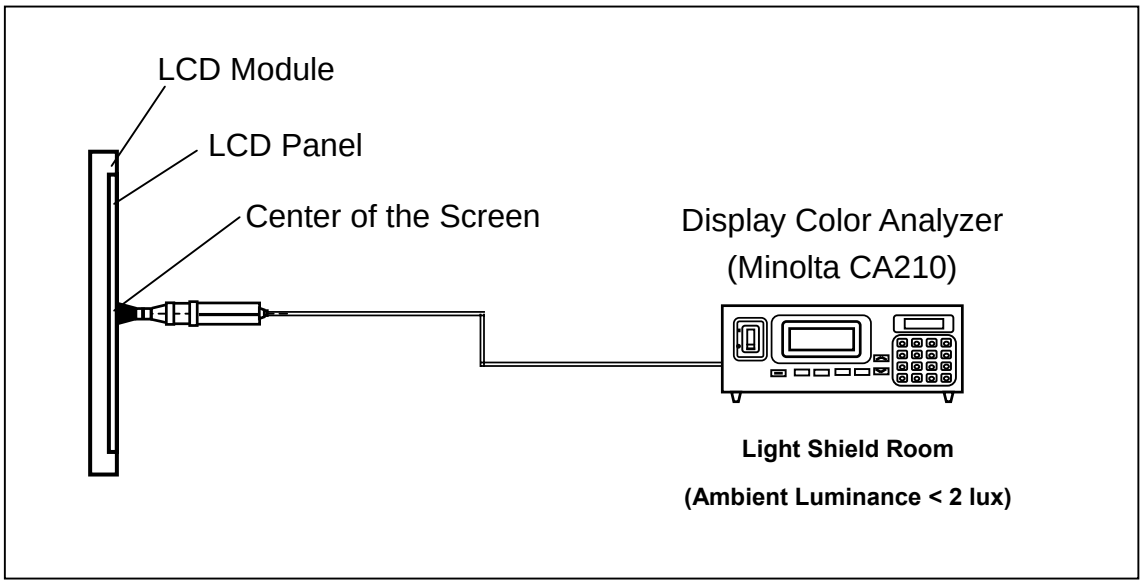
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

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



Note (6) Measurement Setup:

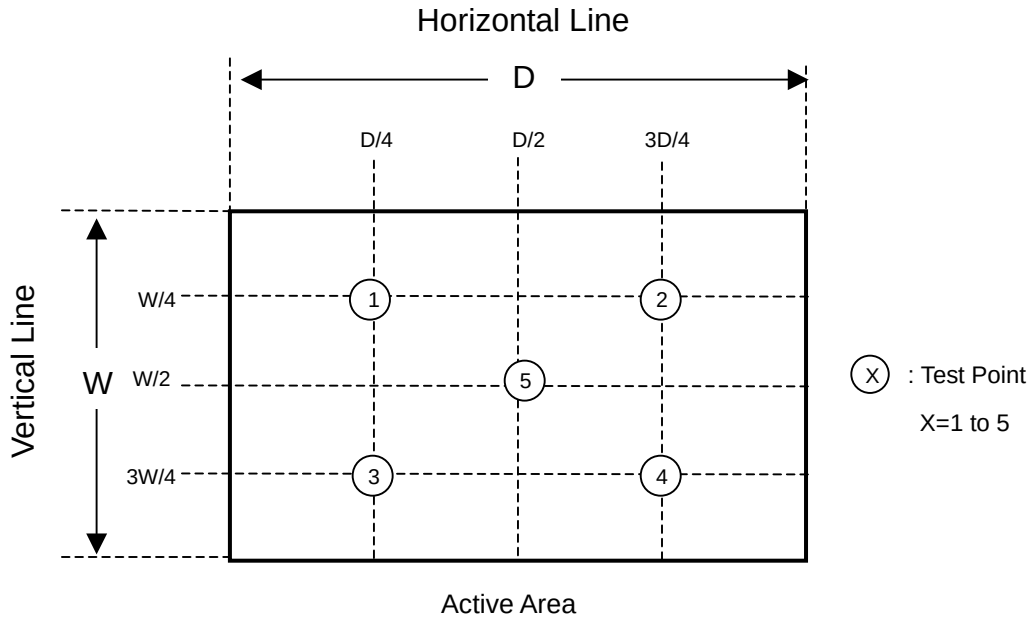
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



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

Measure the luminance of gray level 255 at 5 points

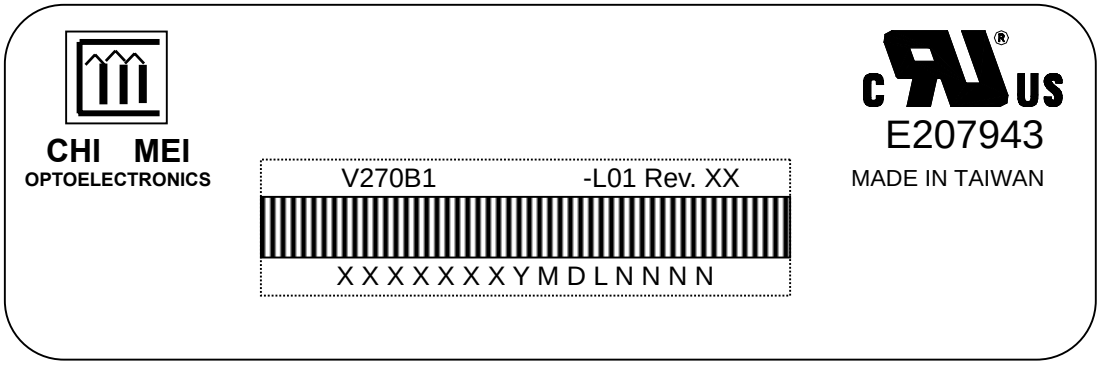
δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

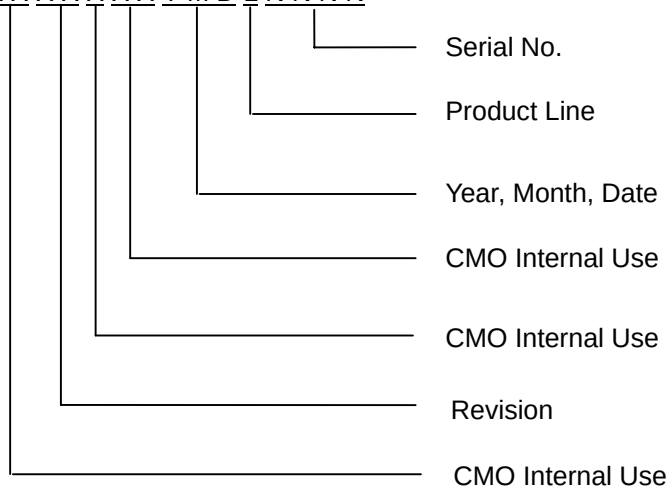
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(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

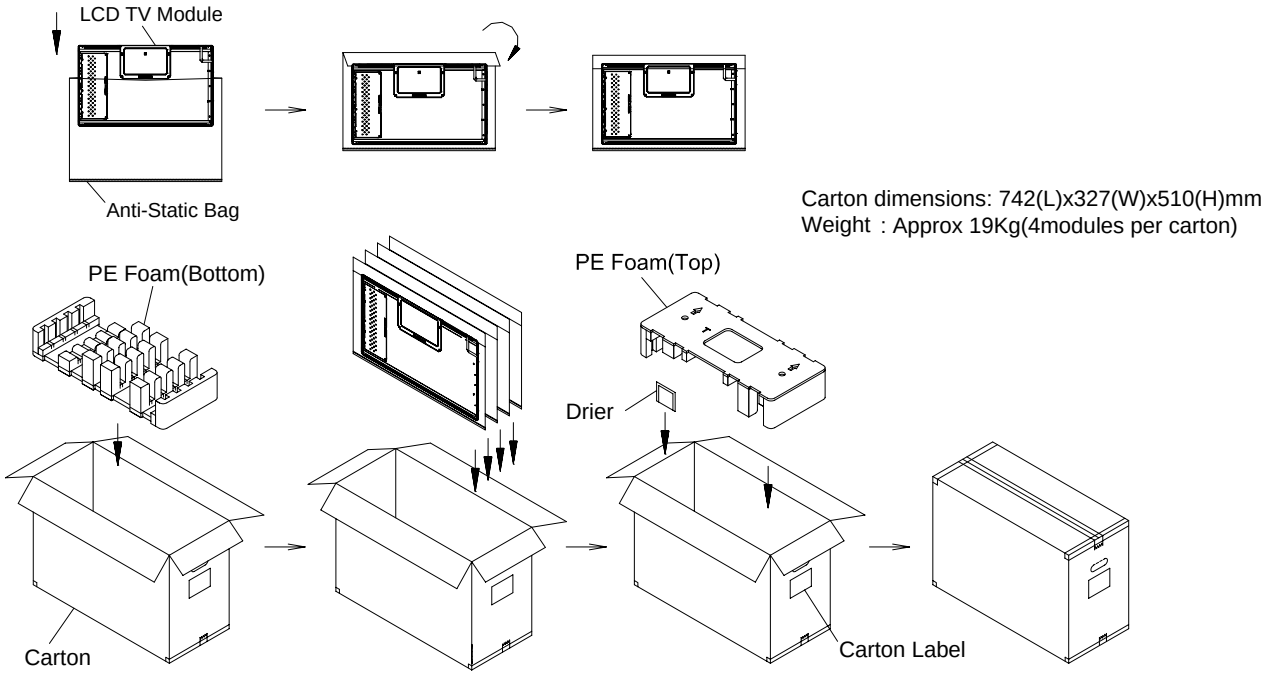


Figure.9-1 packing method

Corner Protector:L1020*50mm*50mm

Pallet:L1100*W1100*H135mm

Corrugated Fiberboard:L1100*W1100mm

Pallet Stack:L1100*W1100*H1160mm

Gross:168kg

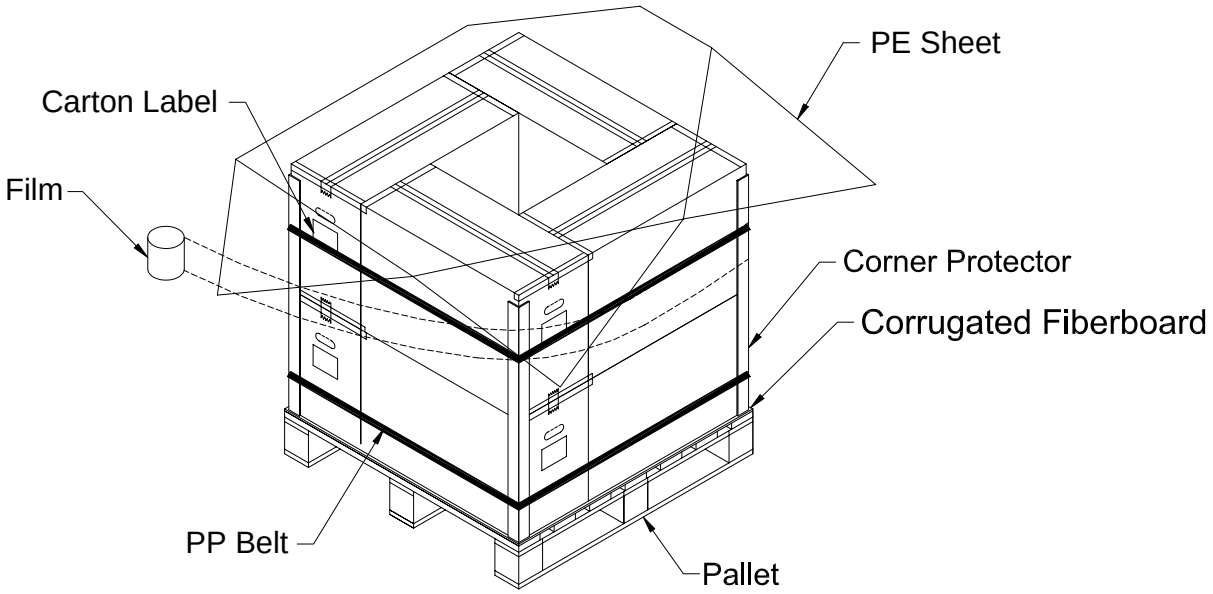


Figure. 9-2 packing method

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.

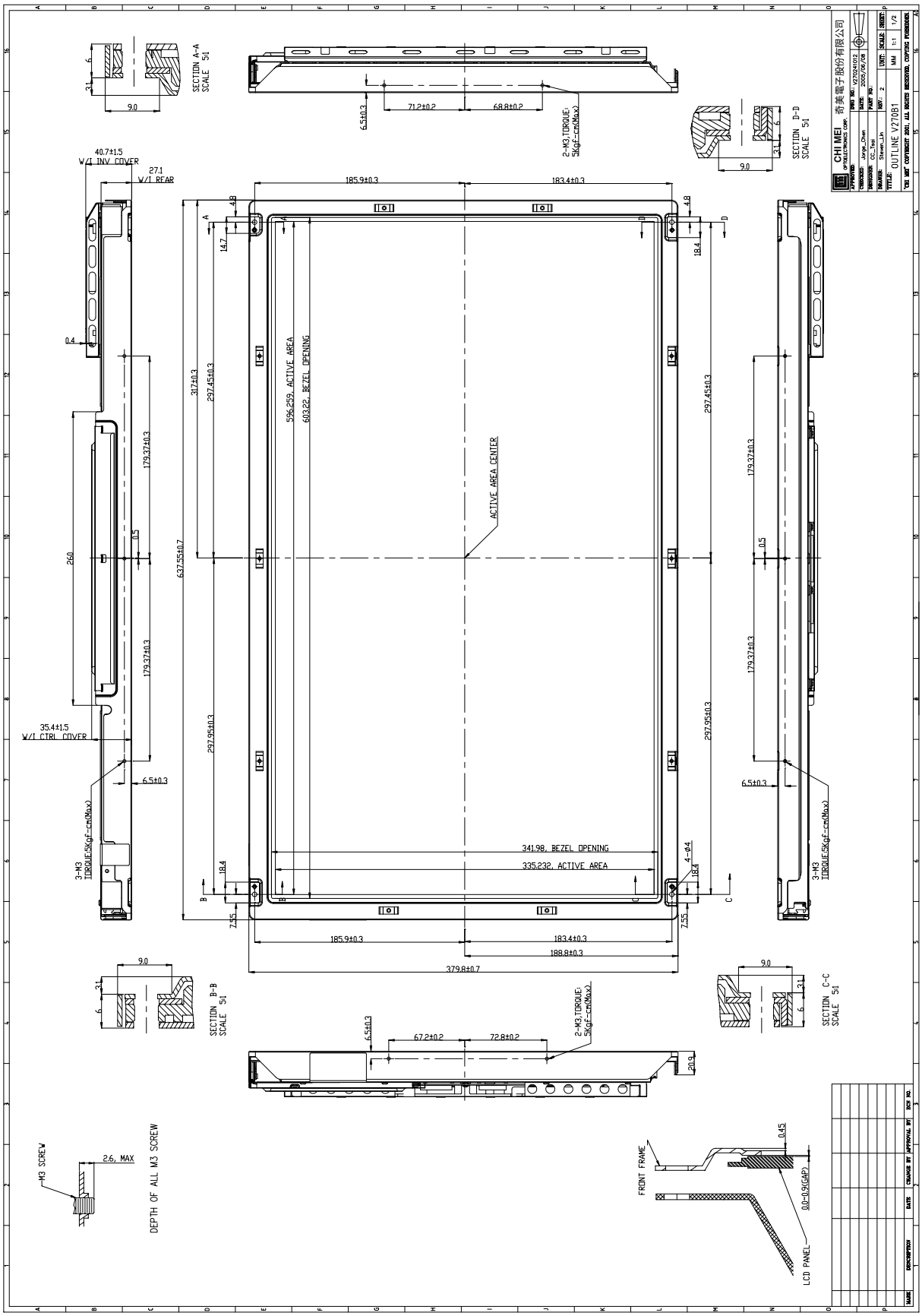
10.2 SAFETY PRECAUTIONS

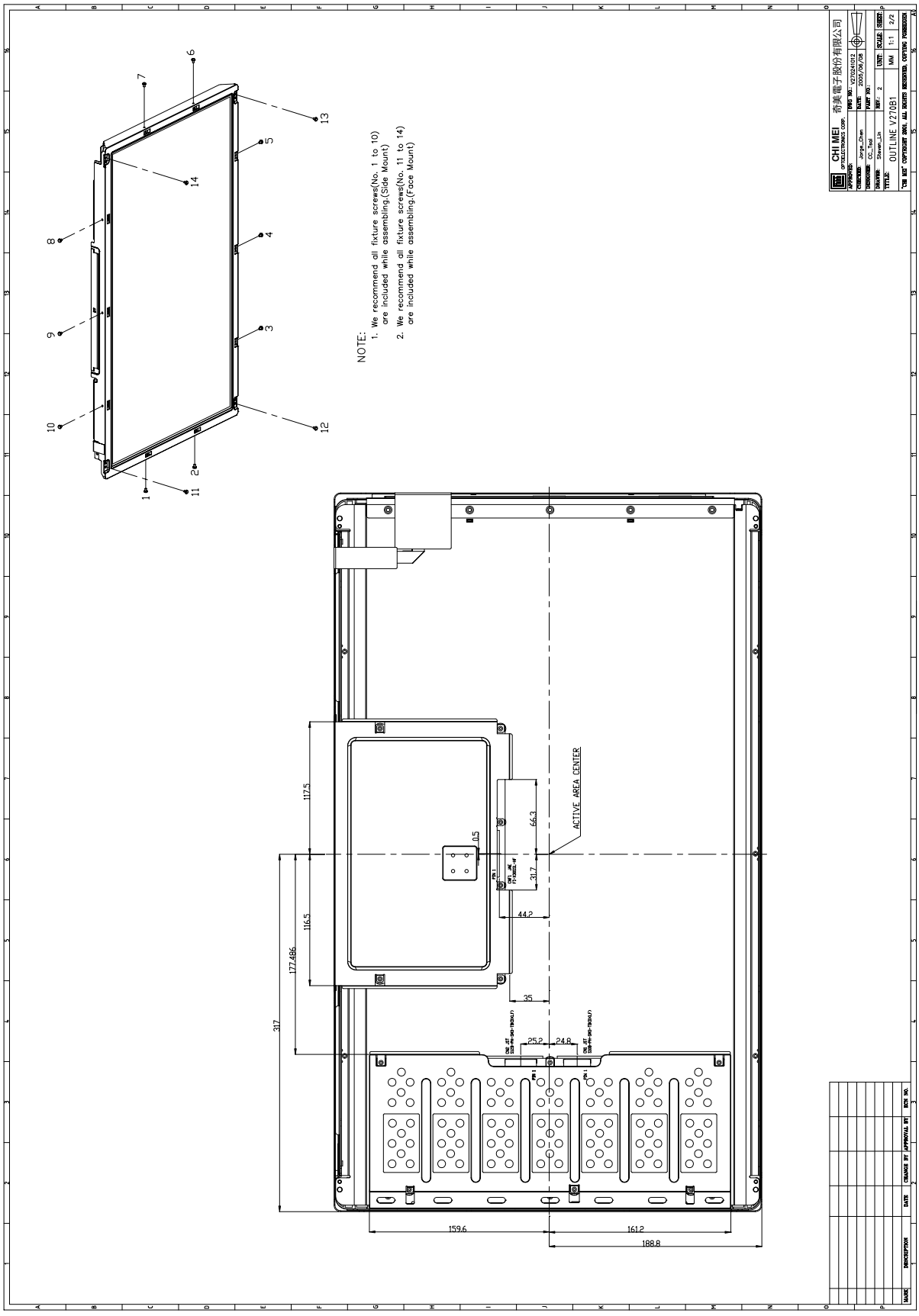
(1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.

(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.

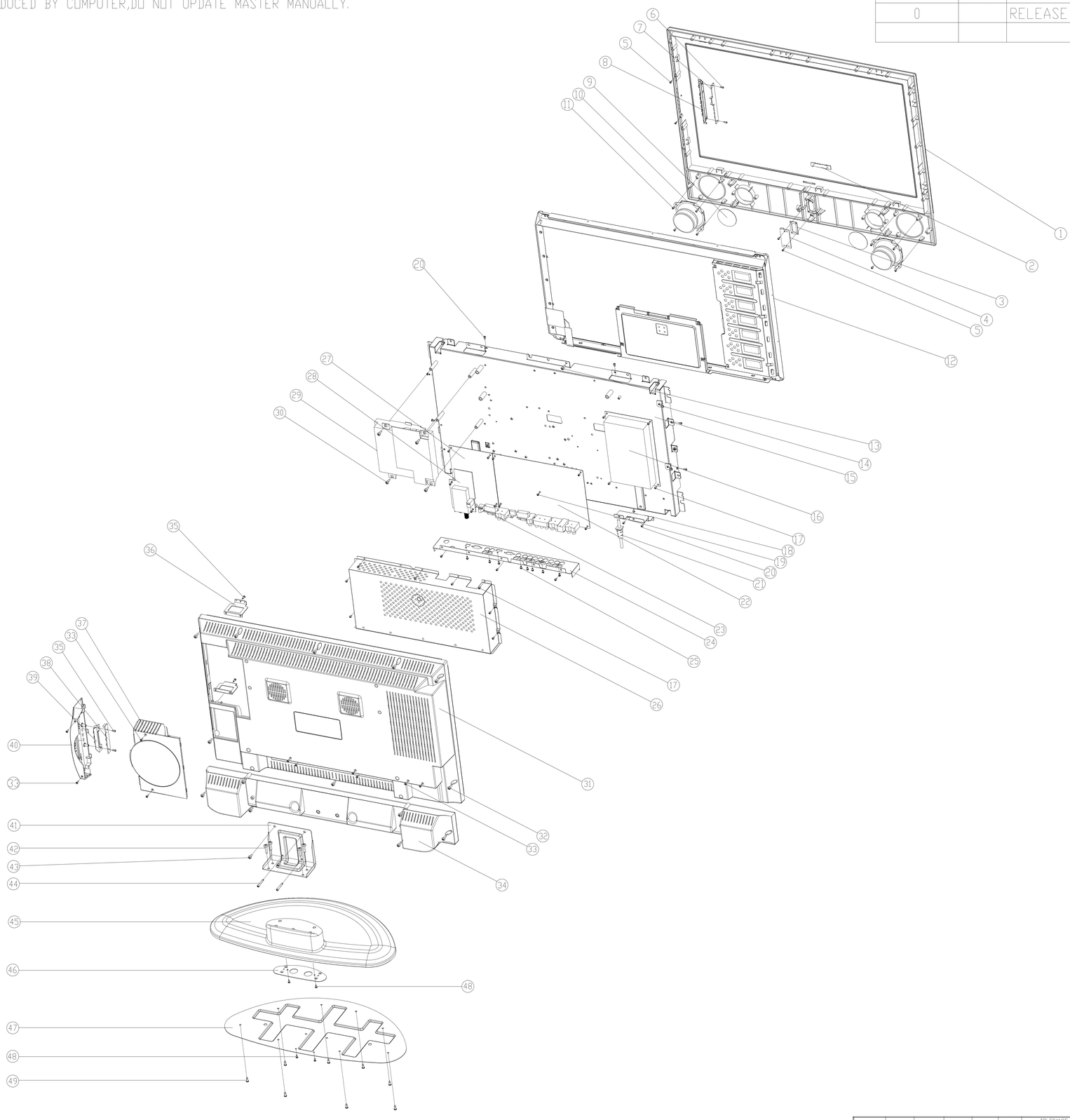
11. MECHANICAL CHARACTERISTICS




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
159.6
161.2
188.8

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

DWG.Rev.	ZONE	DESCRIPTION	DATE	REVISOR
0		RELEASE	15-May-06	tzl



BOM NO: LCT27ADNDAICS-C01

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	449-27LA01-01	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-L27AD11-01RV	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	609-L32AD01-01	SPECIAL MACH. SCREW M4X15	4
29	E7802-005006	DVD ASSY	1
28	771L37AD01-01	NTSC TUNER PCB ASSY	1
27	771S42D102-01	ATSC TUNER PCB ASSY	1
26	483-L27AD01-01S	SHIELD COVER -MAIN PCB	1
25	610-300210-10	S-TAP. SCREW BID 3X10	8
24	436-L27AD08-01S	TERMINAL SHEET	1
23	649-42AA02-01	CONNECTION BOSS	2
22	771EL27AD04-01	MAIN PCB ASSY	1
21	E3404-157009	POWER CABLE	1
20	602-305004-10	MACH. SCREW BID M3X4	8
19	604-305005-10	MACH. SCREW BID M3X5	8
18	426-L27AD03-01S	POWER CABLE BRACKET	1
17	604-305005-10	MACH. SCREW BID M3X5	17
16	E7801-P02001	PCB ASSY PSU BOARD MEGMEET MT168	1
15	428-27LA0C-01S	PANEL BRACKET FOR MT8202 W DVD	1
14	424-L27AD01-01S	POWER PCB BRACKET	2
13	614-400412-10	S-TAP. SCREW BID 4X12	7
12	E6203-27CD02	LCD PANEL CMO	1
11	614-300210-10	S-TAP. SCREW BID 3X10	8
10	E4901-124001	SPEAKER	2
9	389-L32AB01-01	PVC PLATE	2
8	277-L32AD11-01S	FUNCTION KEY LCT32AD SILVER	1
7	771KL27AD01-01	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	771BL27AD01-01	IR RECEIVE PCB ASSY	1
3	269-42SD01-01L	REMOTE RECEIVE LENS	1
2	486-M32111-01	NAME PLATE	1
1	200-L27AD11-STD01AV	FRONT CABINET	1

DRAWN				TOLERANCE UNLESS OTHERWISE SPECIFIED	KAWA ELECTRONIC R & D CENTRE
CHECKED				0 ~ 30 ± 0.10 30~100 ± 0.20 >100 ± 0.30 ANGULAR: ± 0.5° UNIT : mm	MATL.
APPRD.					FINISH
3rd ANGLE PROJECTION					

TITLE EXPLODE VIEW
MODEL NO. LCT2701AD
A3 PART NO. EXP-L27AD05-01 DWG. NO. L27ADEXP5
SCALE 1:1 SHEET 1 OF 1

Item	Part Number	Part Description	Usage / unit	Unit	Key/Spare
	LCT27ADNDA1CS-C01	AKAI LCD 27" COMBO (LCT2701AD) S-MT8202G CMO(V270B1-L01) AC120V USA BLACK			
1>	510-L27AD03-02AKA	CARTON BOX AKAI LCT2701AD (MTK-8202+CMO PANEL) K	1	Piece	K
2>	580-L27ADHS-TU14L	IB E FOR AKAI LCT2701AD USA CM DTV+DVD S-MT8202 (w/o power switch)	1	Piece	K
	580-L27ADHS-TU04L	IB E FOR AKAI LCT2701AD USA CM DTV+DVD S-MT8202 (w power switch)	1	Piece	K
3>	E7501-061001	REMOTE CONTROL K002 AKAI FOR MT8202 COMBO 60KEYS SIL/BLK	1	SET	K
4>	771EL27AD04-01	MAIN PCB ASSY S-MT8202G ATSC & DVD FOR 27LCD CMO	1	SET	K
5>	771L37AD01-01	NTSC TUNER PCB ASSY FOR LCD37	1	SET	K
6>	771S42D102-01	ATSC TUNER PCB ASSY (MT5111CE)	1	SET	K
7>	200-L27AD11-STD01AV	CABINET FRONT SILVER/BLACK AKAI LCT2701TD MT8205 A	1	Piece	S
8>	202-L27AD41-01AV	BACK CABINET W/DVD W/O CARD READER LCT27AD	1	Piece	S
9>	206-L27AD11-01RV	SPEAKER CABINET AKAI LCT2701TD(MT8205) R	1	Piece	S
10>	236-L27AD11-01RV	DVD COVER BLACK LCT2701TD R	1	Piece	S
11>	258-L27AD11-01RV	DVD FUNCTION KNOB BLACK COVER LCT2701TD R	1	Piece	S
12>	269-42SD01-01L	REMOTE RECEIVE LENS	1	Piece	S
13>	277-L27AD11-01S	DVD FUNCTION KNOB BLK LCT2701TD S	1	Piece	S
14>	277-L32AD11-01S	FUNCTION KEY SIL(MATERIAL:BLACK) LCT32SD	1	Piece	S
15>	300-L27AD05-02C	POLYFOAM BOTTOM	1	Piece	S
16>	300-L27AD06-02C	POLYFOAM TOP	1	Piece	S
17>	310-041204-01V	POLYBAG 4"X12"X0.04 AV	1	Piece	S
18>	310-111404-07V	POLYBAG 11"X14"X0.04 FV	1	Piece	S
19>	310-383550-07V	POLYBAG LAMIFILM 38"X35"X0.5MM	1	Piece	S
20>	370-42D102-01	PAD CORD SPONG FOR SPK	1	Piece	S
21>	384-L32AB01-04AHA	PVC SHEET FOR TERMINAL (MTK-8202) W/DVD	1	Piece	S
22>	387-L27AD01-02AHA	MODEL PLATE AKAI LCT2701AD (MTK8202+CMO PANEL) H	1	Piece	S
23>	389-L32AB01-01	PVC SHEET L32AB	2	Piece	S
24>	426-L27AD03-01S	POWER CABLE BRACKET W/O SWITCH LCT27AD	1	Piece	S
25>	436-L27AD08-01S	TERMINAL SHEET MT8202 W/DVD ONLY COMPONET 1	1	Piece	S
26>	483-L27AD01-01S	SHIELD COVER-MAIN PCB	1	Piece	S
27>	486-M32111-01	NAME PLATE M AKAI	1	Piece	S
28>	522-421D01-01	MASKING PAPER	1	Piece	S

Item	Part Number	Part Description	Usage / unit	Unit	Key/Spare
29>	530-080032-10	FBP WHR 3.2X8.0X1.0	1	Piece	S
30>	530-120045-05	FIBER WASHER 12X4.5X0.5MM	4	Piece	S
31>	563-119-	SERIAL NO. LABEL	1	Piece	S
32>	568-P46T02-02	WARNING LB ENG 42SF NIL	1	Piece	S
33>	579-42D102-09	SERIAL NO/BAR CODE LABEL 42D1	1	Piece	S
34>	579-42D105-01	PROTECTIVE EARTH LABEL FOR ESA 42TD1	1	Piece	S
35>	579-L27AD02-03APA	UPC LABEL OF C/B AKAI LCT2701AD P	2	Piece	S
36>	579-L27AD09-01	CAUTION LABEL ENG AKAI	1	Piece	S
37>	579-L32AD03-02	CLASS I LASER PRODUCT LOGO	1	Piece	S
38>	579-L32AD04-01	LASER WARNING LABEL AKAI LC32AD	1	Piece	S
39>	590-L27AD01-05	WARRANTY CARD AKAI LCT2701AD	1	Piece	S
40>	593-L27AD01-06	INSERTION CARD AKAI LCT2701AD	1	Piece	S
41>	E3404-157009	AC CORD UL 1.88M FOR LCD32 MT8202	1	Piece	S
42>	E3421-925118	WIRE ASSY 8P2.5/7P2.0 L170MM 5V 12V SIGNAL POWER MT8202	1	Piece	S
43>	E3421-925119	WIRE ASSY P2.5 11P/11P L400MM 5V SIGNAL POWER MT8202	1	Piece	S
44>	E3421-925127	WIRE ASSY TJC3-2Y L860 SPK-R MT8202	1	Piece	S
45>	E3421-925133	WIRE ASSY TJC3-3Y L650 SPK-L MT8202	1	Piece	S
46>	E3421-926119	WIRE ASSY P2.0 8P L=215 TV/SIF	1	Piece	S
47>	E3421-926125	WIRE ASSY P2.5 4P/4P L400MM AMP24V EMI MT8202	1	Piece	S
48>	E3461-064036	WIRE ASSY INVERTER 12P2.0+8P2.5+3P2.0 L450MM L650MM MT8202	1	Piece	S
49>	E3461-064037	WIRE ASSY P2.5 10P/10P+4P/2.0 L400MM L680MM 12V 9V MT8202	1	Piece	S
50>	E3461-064038	WIRE ASSY P2.5 7P/7P L400MM 5V STANBY POWER MT8202 FOR 27"/32" LCD	1	Piece	S
51>	E3461-064039	WIRE ASSY 5P2.5 L560MM 5V 3.3V SIGNAL WIRE EMI MT8202	1	Piece	S
52>	E3471-000044	WIRE WS SHIELD WIRE FOR 32LCD COMBO MICO KEY 13P/8P+5P	1	Piece	S
53>	E3471-000048	WIRE WS SHIELD WIRE FOR 32LCD TV+COMBO KEY WIRE FOR DVD	1	Piece	S
54>	E3471-000057	WIRE WS SHIELD WIRE 27" L300MM MICO CMO MT8202 LVDS NEW	1	Piece	S
55>	E3471-002005	WIRE WS SHIELD 6P2.0/+2P2.5+8P2.0 COMBO DVD SIGNAL WIRE MT8202	1	Piece	S
56>	E3471-002006	WIRE WS SHIELD WIRE 27LCD TV+COMBO DVD SIGNAL WIRE MT8202	1	Piece	S
57>	E4801-124001	SPEAKER 8 OHM 10W D3" YD78-1	2	Piece	S
58>	E6203-27CD02	DISPLAY LCD 27" CMO V270B1-L01 1366X768 1000:1 HIGH CONTRAST	1	Piece	S

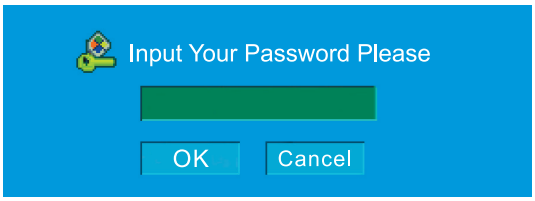
Item	Part Number	Part Description	Usage / unit	Unit	Key/Spare
59>	E7301-010002	BATTERY AAA R03P1.5V <2>	2	Piece	S
60>	E7801-D01001	DVD PCB ASSY MICO FOR MT8202	1	SET	S
61>	E7801-P02001	PCB ASSY PSU BOARD MEGMEET MT168 FOR 27LCD AC110-240V OUTPUT 12V/8V/24V 200W	1	SET	S
62>	734-L27AD03-01	ELLIPSE PLASTIC BASE ASSY W/O LOGO W/O PACKING SILVER	1	SET	S
63>	771BL27AD01-01	IR RECEIVE PCB ASSY FOR LCT27AD ATSC & DVD S-MT8202G	1	SET	S
64>	771KL27AD01-01	KEY PCB ASSY FOR TV S-MT8202G ATSC & DVD	1	SET	S
65>	771KL27AD02-01	KEY PCB ASSY FOR DVD LCT27AD ATSC & DVD S-MT8202G	1	SET	S

If you forget your V-Chip Password

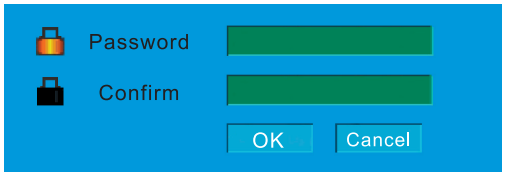
- Omnipotence V-Chip Password: 8202.

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

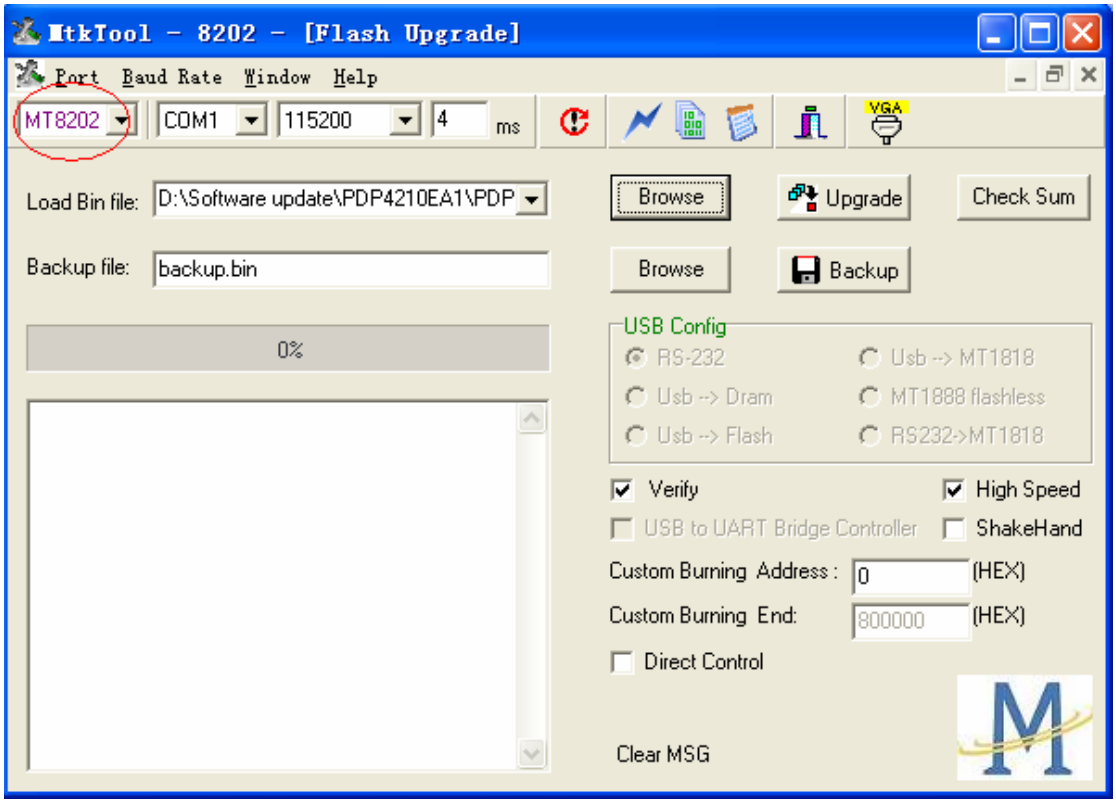
Process of update MT8202

Preparing :

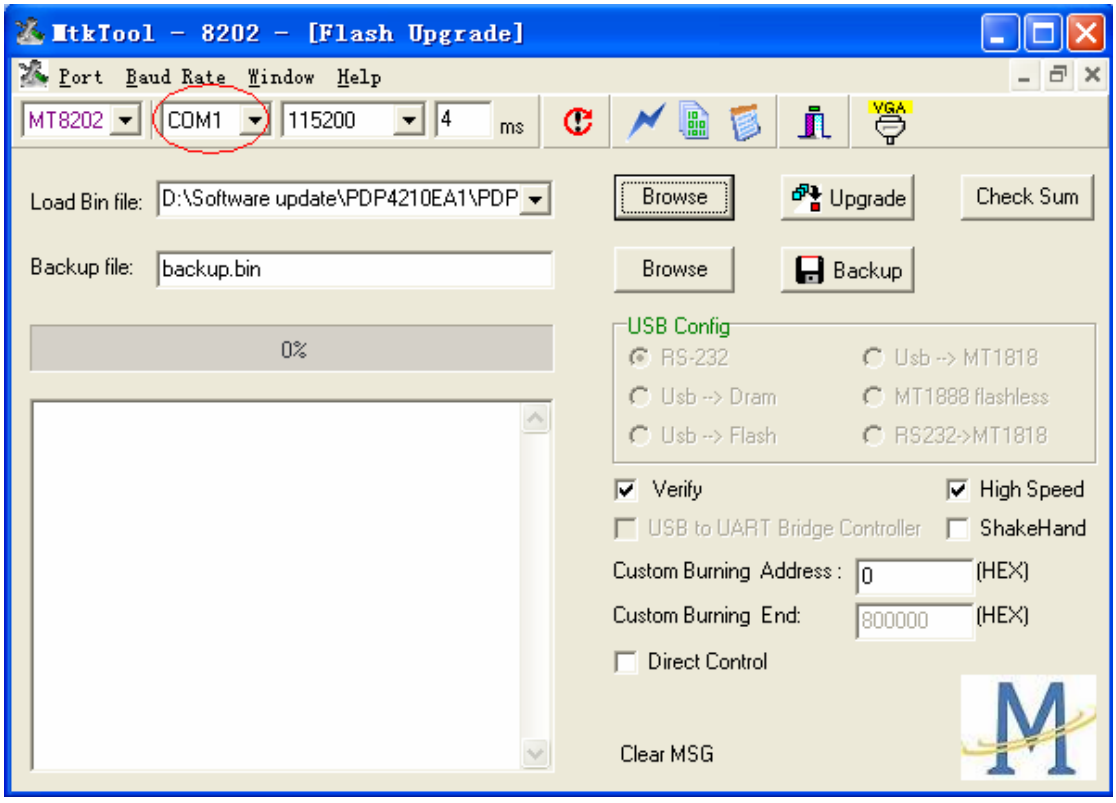
1. Connect **RS232-VGA download line**, One connector is connected to **VGA connect port of Plasma TV** ,while another side is connected to PC COM port.
2. Store the MtkTool into the PC .

Downloading :

3. Turn on AC power switch of the Plasma 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 Plasma TV will be standby mode if after turn on the main power switch only .)
4. Execute MTKtool and select the chipset as MT8202. (the software of MTKtool will be sent to your side)

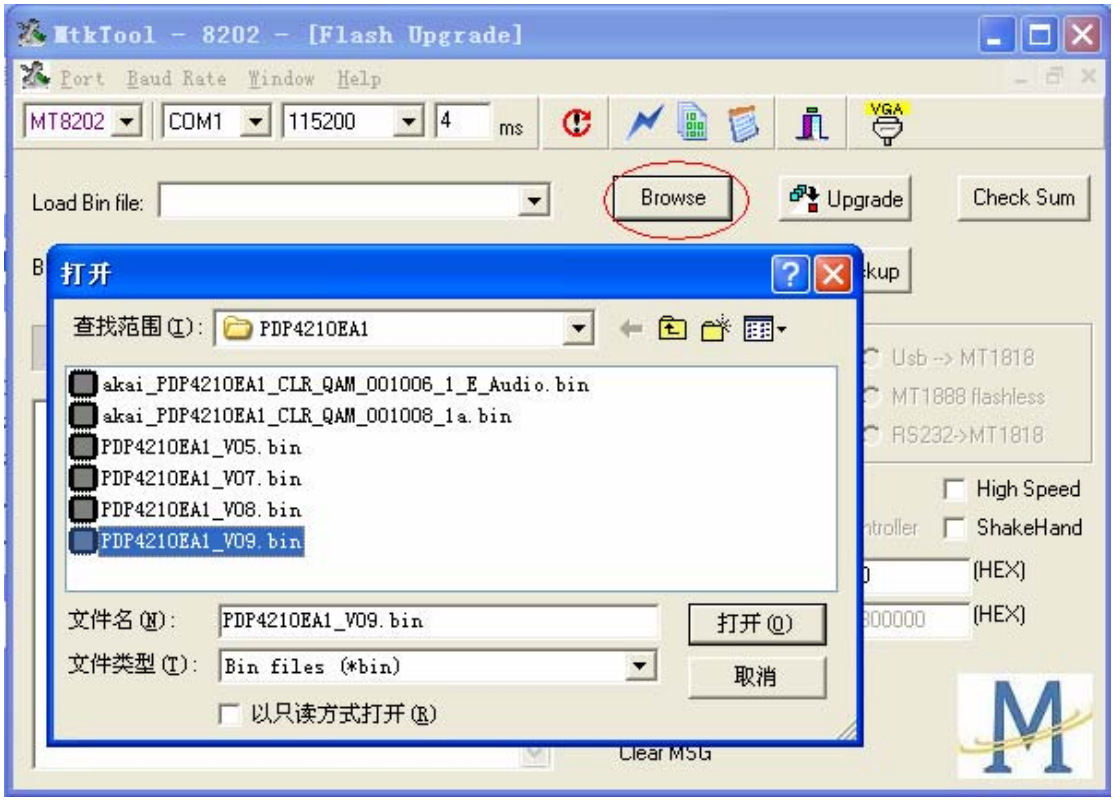


5. Select current COM port. (please try to check the COM port of your PC).

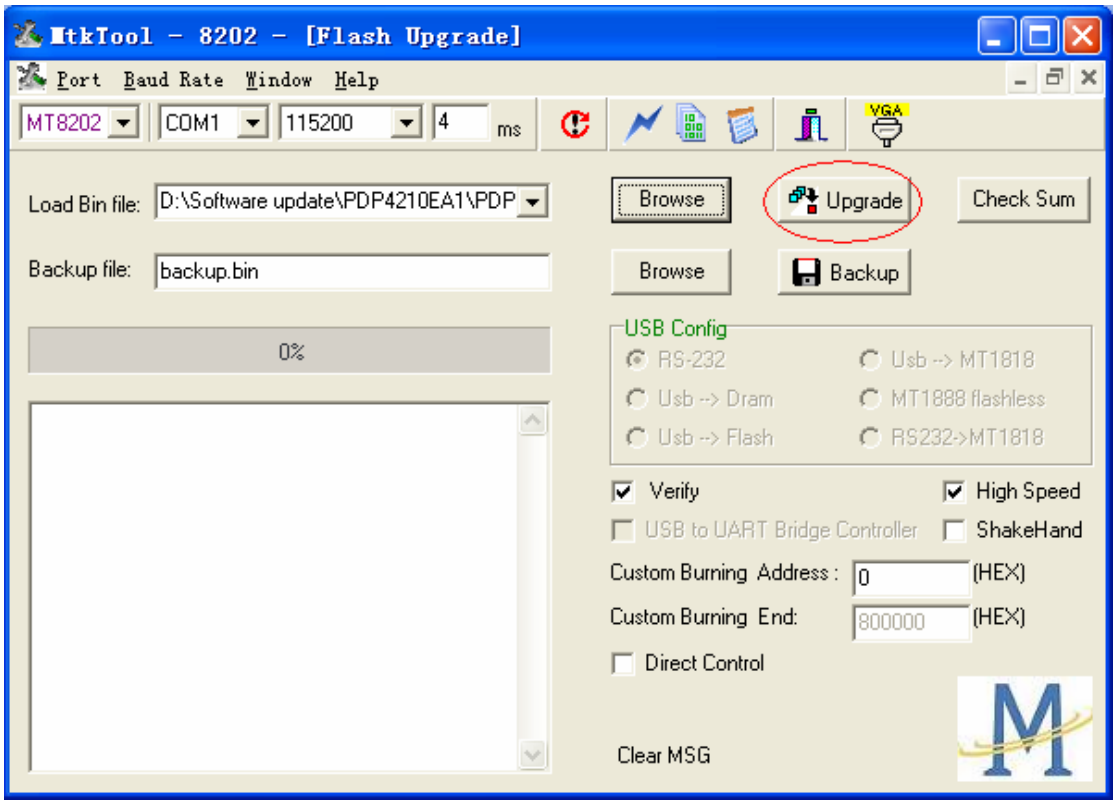


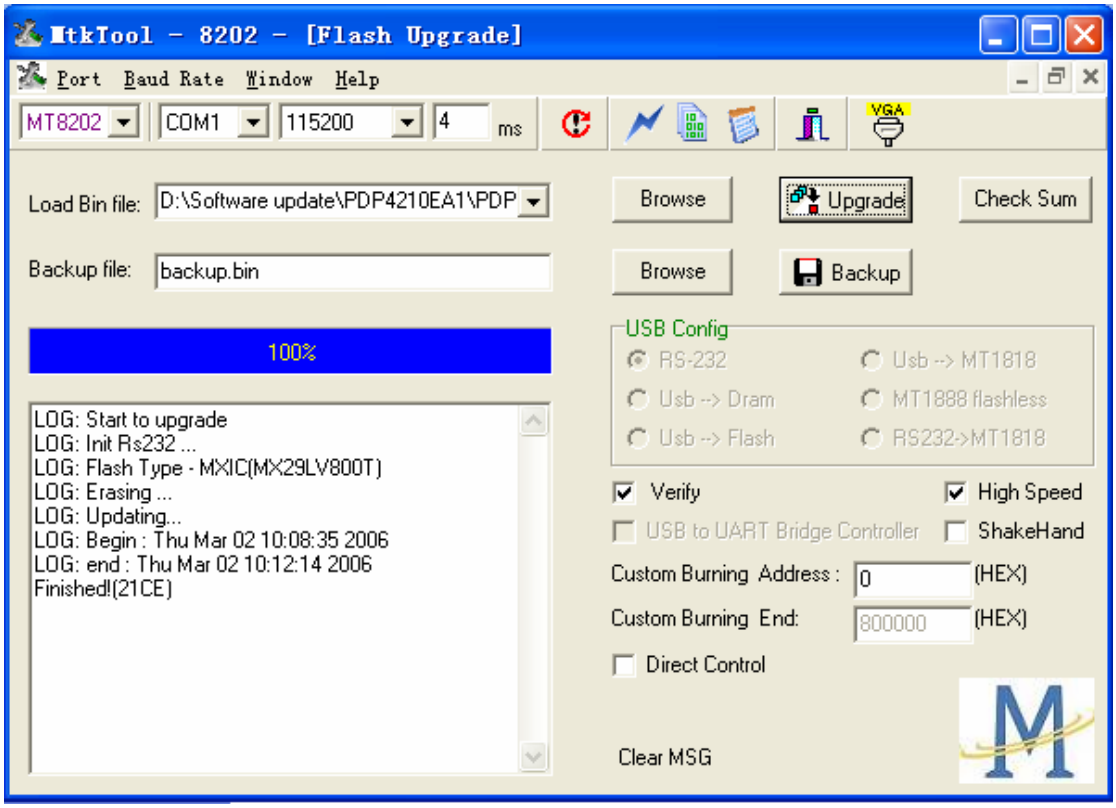
6. Choose the bit rate as 115200.

7. Select the update binary by pressing browse button. For exemple,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 ”

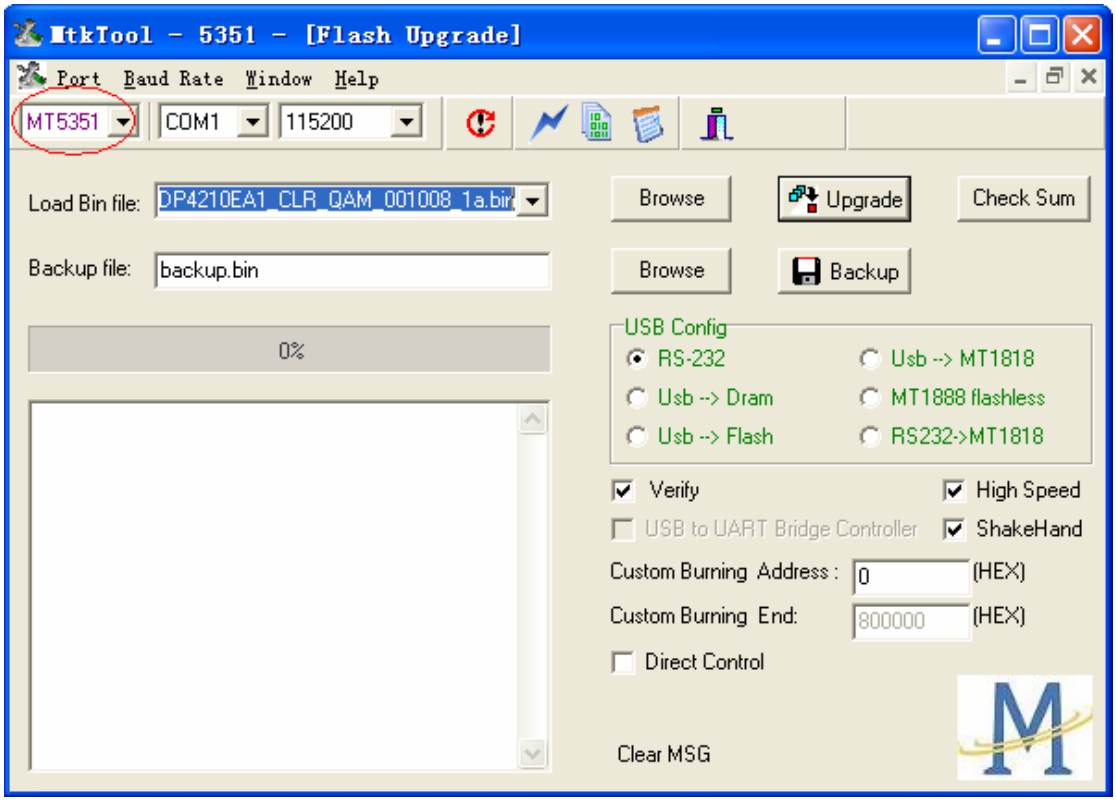
Process of update MT5351AG

Preparing :

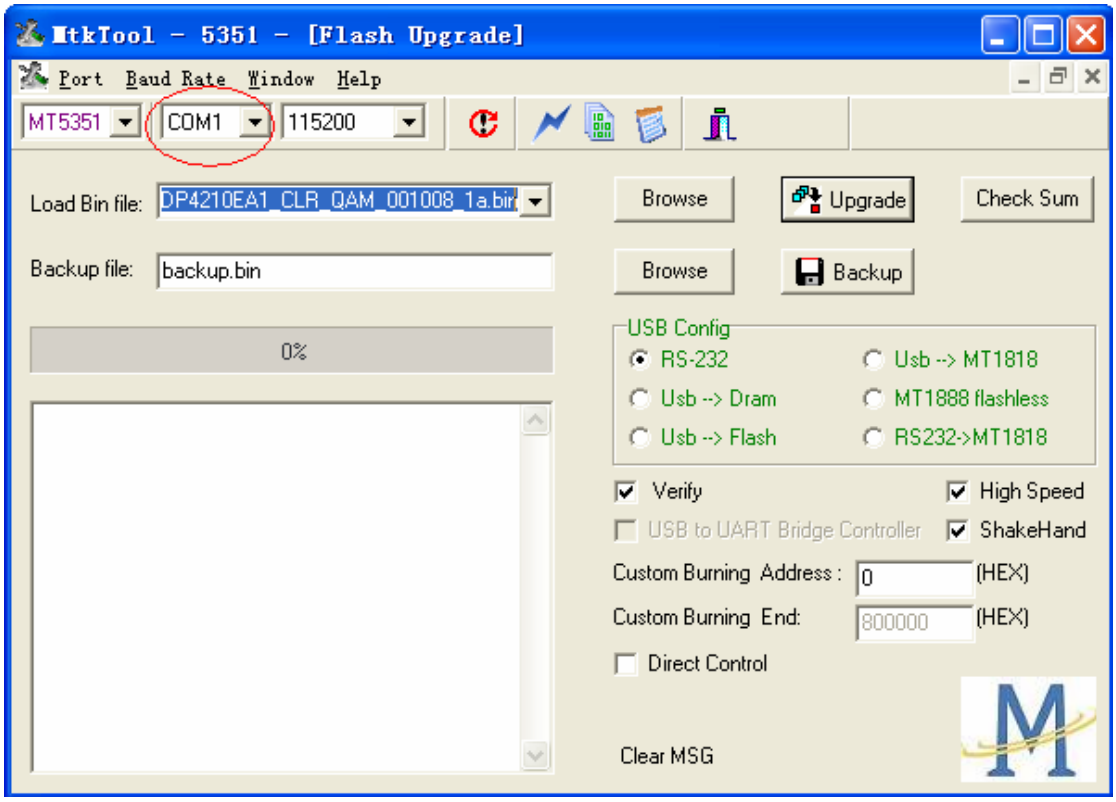
1. Connect **RS232 download line**, One connector is connected to **RS232 connect port of Plasma TV** ， while another side is connected to PC COM port.
2. Store the MtkTool into the PC

Downloading :

3. Turn on AC power switch of the Plasma 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 Plasma TV will be standby mode if after turn on the main power switch only .)
4. Execute MTKtool and select the chipset as MT5351AG. (the software of MTKtool will be sent to your side)



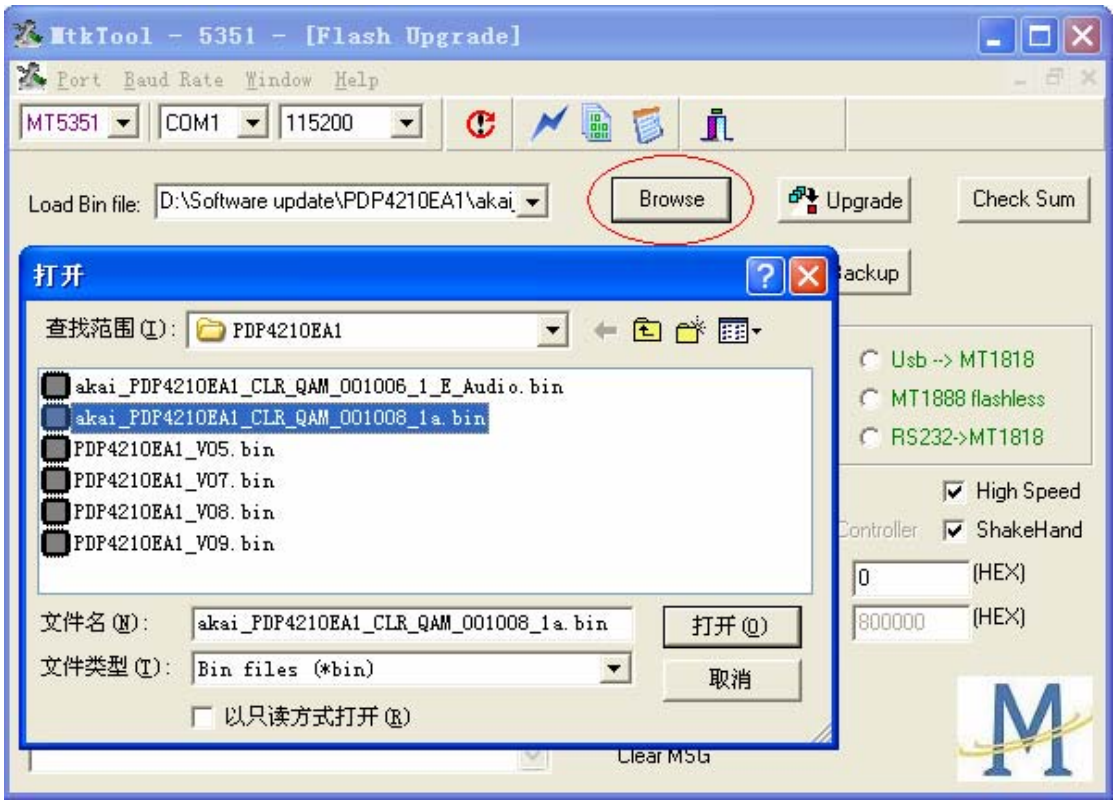
5. Select current COM port. (please try to check the COM port of your PC).



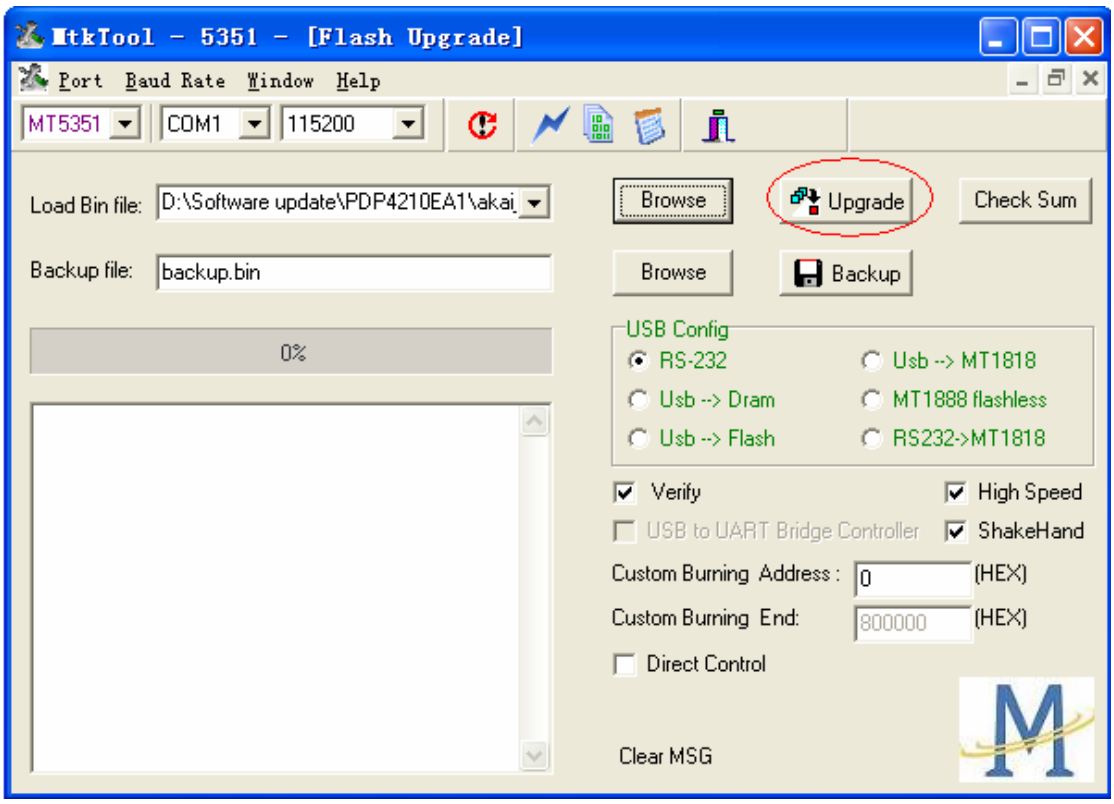
6. Choose the bit rate as 115200.

7. Select the update binary by pressing browse button. For exemple,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 .