

# AKAI

# SERVICE MANUAL

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**Model:**

**LCT2016**

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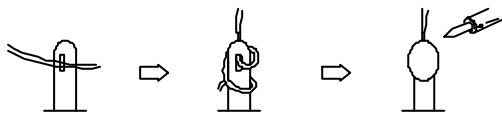
This manual is the latest at the time of printing, and does not include the modification which may be made after the printing, by the constant improvement of product.

# I. Safety Instructions

 <div style="border: 1px solid black; padding: 5px; text-align: center;"><b>CAUTION</b> <b>RISK OF ELECTRIC SHOCK</b> <b>DO NOT OPEN</b></div>  <p><b>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.</b></p>	 <p>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.</p>
	 <p>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.</p>

## 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 beam 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 temperature 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 0.15 $\mu$ F AC type capacitor, between a good earth ground (water pipe, conductor etc.) and the exposed metallic parts, one at a time.

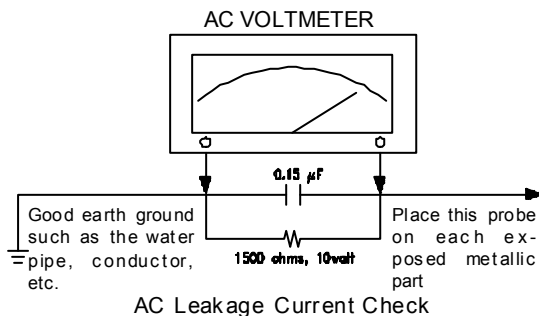
Measure the AC voltage across the combination of the 1.5K ohm resistor and 0.15  $\mu$ F capacitor. Reverse the AC plug at the AC outlet and repeat the AC voltage measurements for each exposed metallic part.

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.

## 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  $\triangle$  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.



## Technical Specification

Product Model:	LCT2016
Screen Size:	20" diagonal
Screen Area:	408mm(H) x 306mm(V)
Aspect Ratio:	4:3
External Size:	680mm(W) x 480mm(H) x 70mm(D) (w/o Stand)
Net Weight:	10kg
Resolution:	640 (H) x 480 (V) pixels (Each pixel has R/G/B 3 color cells)
Color:	16.7 millions of colors (R/G/B each 256 scales)
Gray Scale:	256 (R/G/B each 8-bit)
Brightness(Peak Value):	450cd/m <sup>2</sup> (Typical)
Contrast(Dark Room):	500:1 (Typical)
TV System:	NTSC M
Power Supply:	AC 100-240V, 50/60 Hz
Power Consumption:	≤ 60W
Input Terminals:	PC VGA 15 Pin (Analog RGB Input)
	Component Video - YPbPr/YCbCr x 1 RCA Terminals
	Video Input RCA Terminals
	S-Video Input Mini Din 4 Pin Terminal
	Audio Input for Video/S-Video
	Audio Input for YPbPr/YCbCr x 1
	Audio Input for PC (3.5mm)
Agent System:	UL, cUL, FCC

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## Support the Signal Mode

### A. D-Sub Mode (VGA)









NO.	Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)	Dot Clock Frequency (MHz)
1	640 x 480	31.50	60.00	25.18
2	640 x 480	35.00	67.00	30.24
3	640 x 480	37.50	75.00	31.50
4	640 x 480	37.86	72.81	31.50
5	720 x 400	31.47	70.08	28.32
6	800 x 600	35.16	56.25	36.00
7	800 x 600	37.90	60.32	40.00
8	800 x 600	46.90	75.00	49.50
9	800 x 600	48.08	72.19	50.00
10	832 x 624	49.00	75.00	57.27
11	1024 x 768	48.40	60.00	65.00
12	1024 x 768	56.50	70.00	75.00
13	1024 x 768	60.00	75.00	78.75
14	1152 x 864	63.86	70.02	94.51
15	1152 x 864	67.52	75.02	108.03
16	1280 x 960	60.02	60.02	108.04
17	1280 x 1024	64.00	60.01	108.00

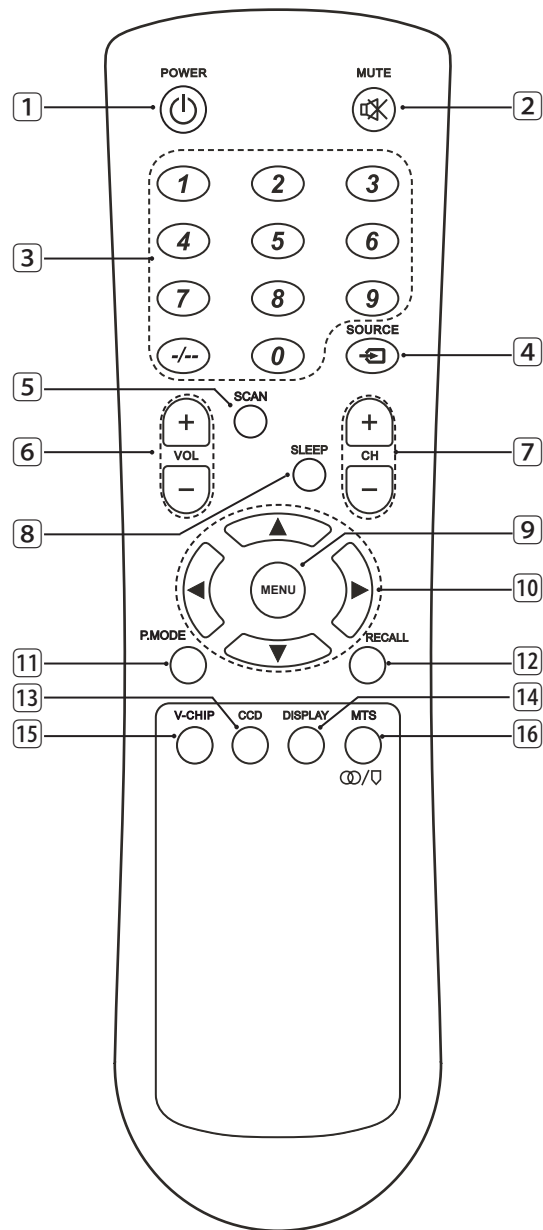
### B. HDTV Mode (YPbPr)

NO.	Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)	Dot Clock Frequency (MHz)
1	480i	15.734	59.94	13.50
2	480p(720x480)	31.468	59.94	27.00
3	720p(1280x720)	45.00	60.00	74.25
4	1080i(1920x1080)	33.75	60.00	74.25

- When the signal received by the Display exceeds the allowed range, a warning message "INPUT NOT SUPPORTED" shall appear on the screen.
- You can confirm the input signal format from the on-screen.

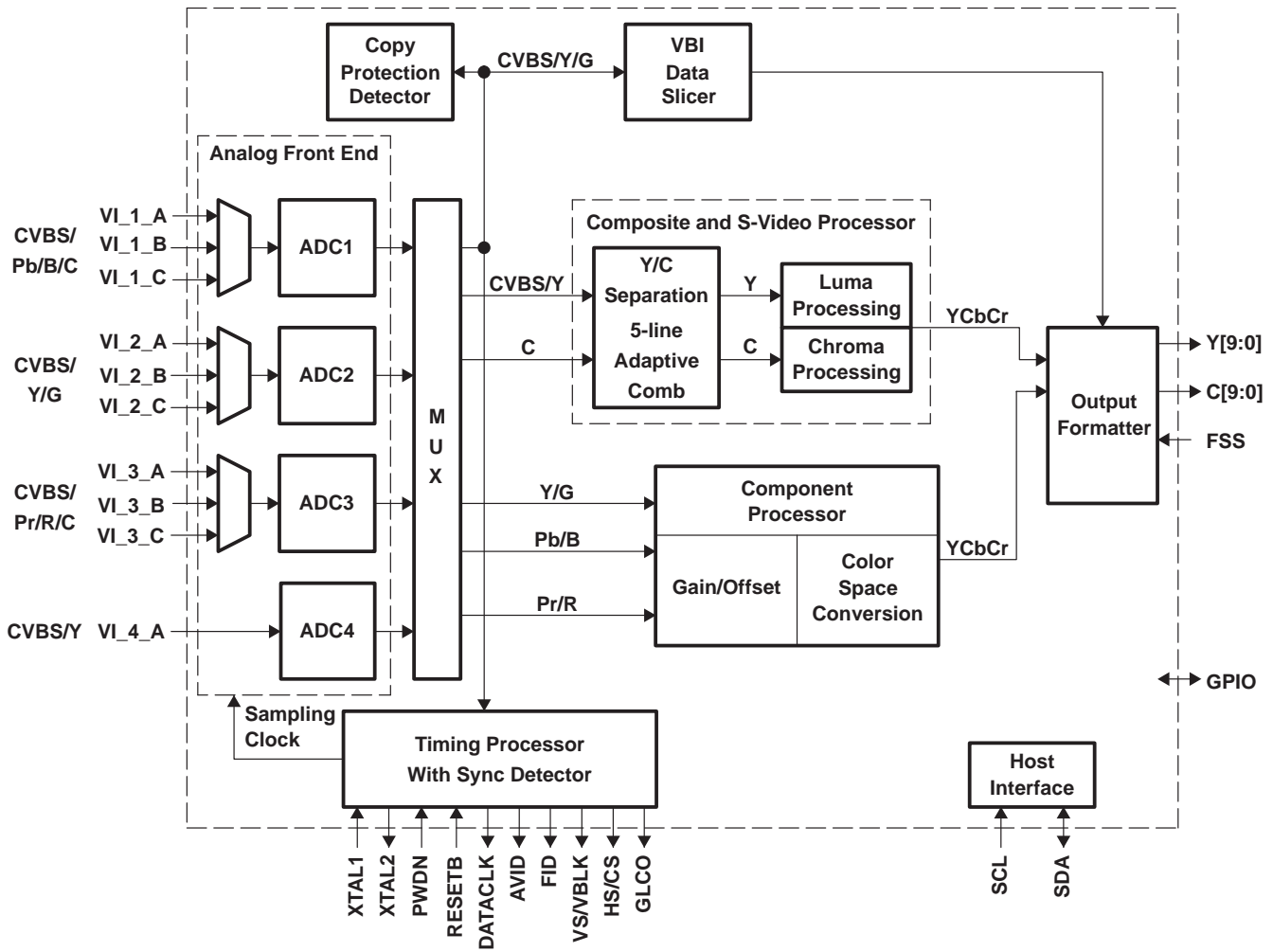
## 4.3 Remote Control

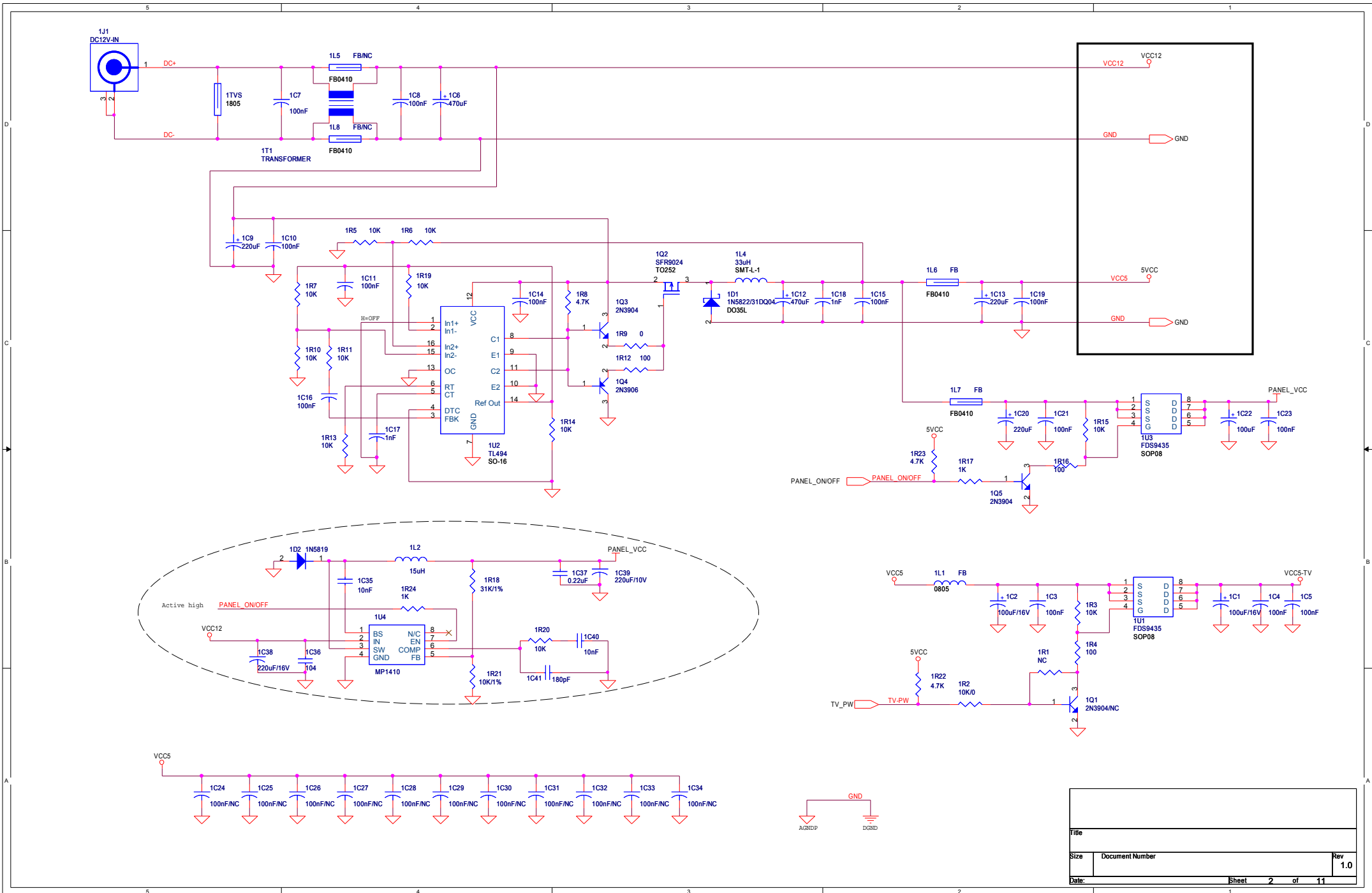
- 1 **Power** (  ): Press to turn on and off.
- 2 **Mute** (  ): Press to mute the sound. Press again or press ,  to restore the sound.
- 3 **-/--, 0~9 Number Buttons**: Press 0~9 to select a channel; If the channel more than 9, press -/-- button, then press other 0~9 number buttons; If the channel more than 100, press -/-- button twice, then press other 0~9 number buttons; the channel changes after 2 seconds.
- 4 **SOURCE**: Press to select the signal source, such as TV, VIDEO, S-VIDEO, COMPONENT or VGA.
- 5 **SCAN**: Press scan the channel.
- 6 **SLEEP**: Press repeatedly until it displays the time in minutes (30 Min, 60 Min, 90 Min, 120 Min and, OFF) that you want the TV to remain on before shutting off. To cancel sleep time, press SLEEP repeatedly until sleep OFF appears.
- 7 **VOL +/-**: Press to adjust the volume.
- 8 **CH +/-**: Press to scan through channels. To scan quickly through channels, press and hold down either channels.
- 9 **MENU**: Press to enter into the on-screen setup menu, press again to exit.
- 10 **◀,▲,▼,▶**: Press , , ,  to move the on-screen cursor.
- 11 **P.MODE**: Press repeatedly to cycle through the picture mode: STANDARD, BRIGHT, MOVIE, or USER.
- 12 **RECALL**: Press to return to previous channel.
- 13 **CCD**: Press to select the Closed Caption mode.
- 14 **DISPLAY**: Press to display the channel information and it disappear after 3 seconds.
- 15 **V-CHIP**: Press to select the child protect mode.
- 16 **MTS**: Press repeatedly to cycle through the Multi-channel TV sound (MTS) options: Mono, Stereo and SAP (Second Audio Program).



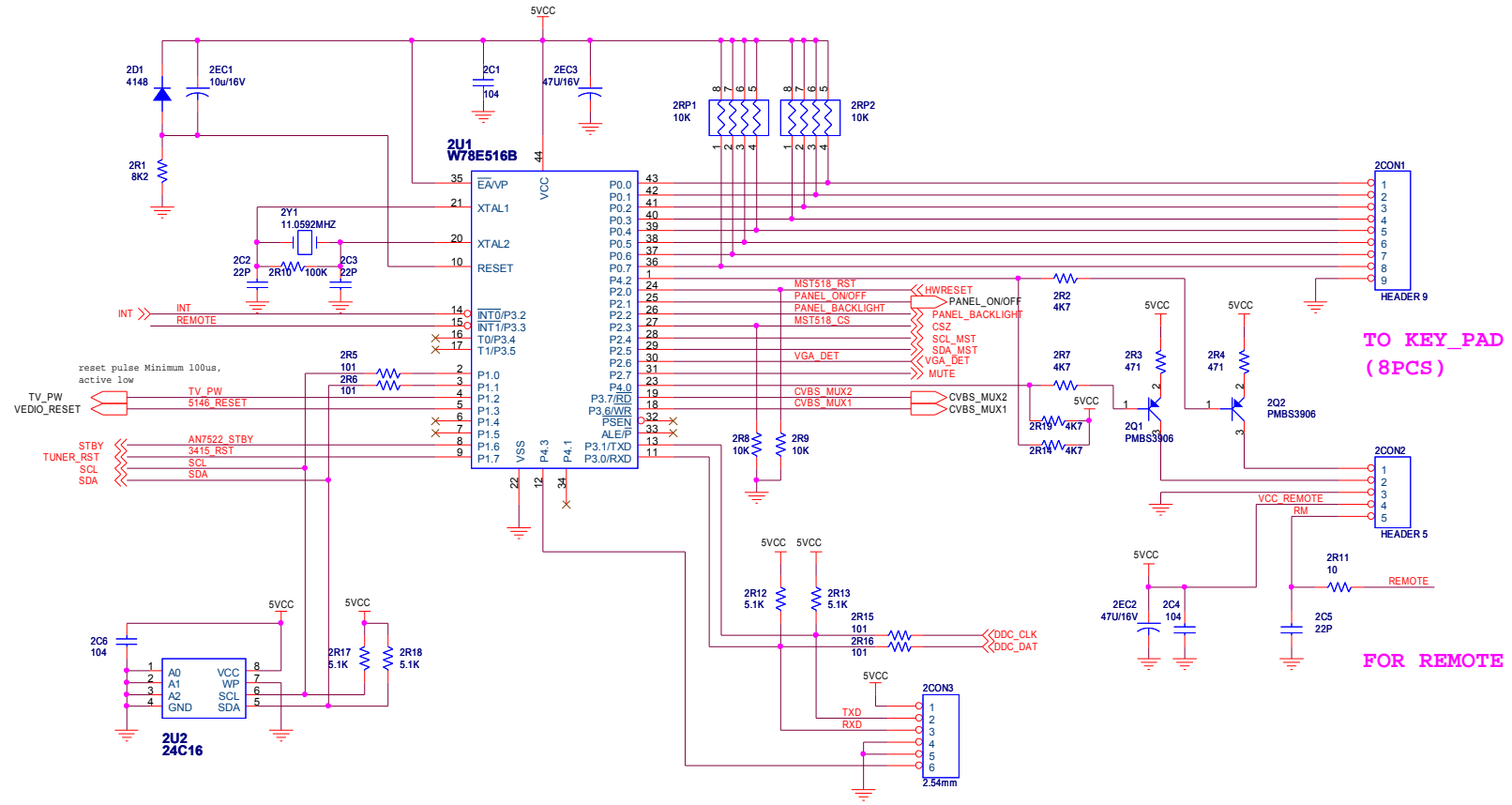
*Note: Press **CH+/CH-** on the remote control can turn on TV set from last preview mode.*

# Functional Block Diagram





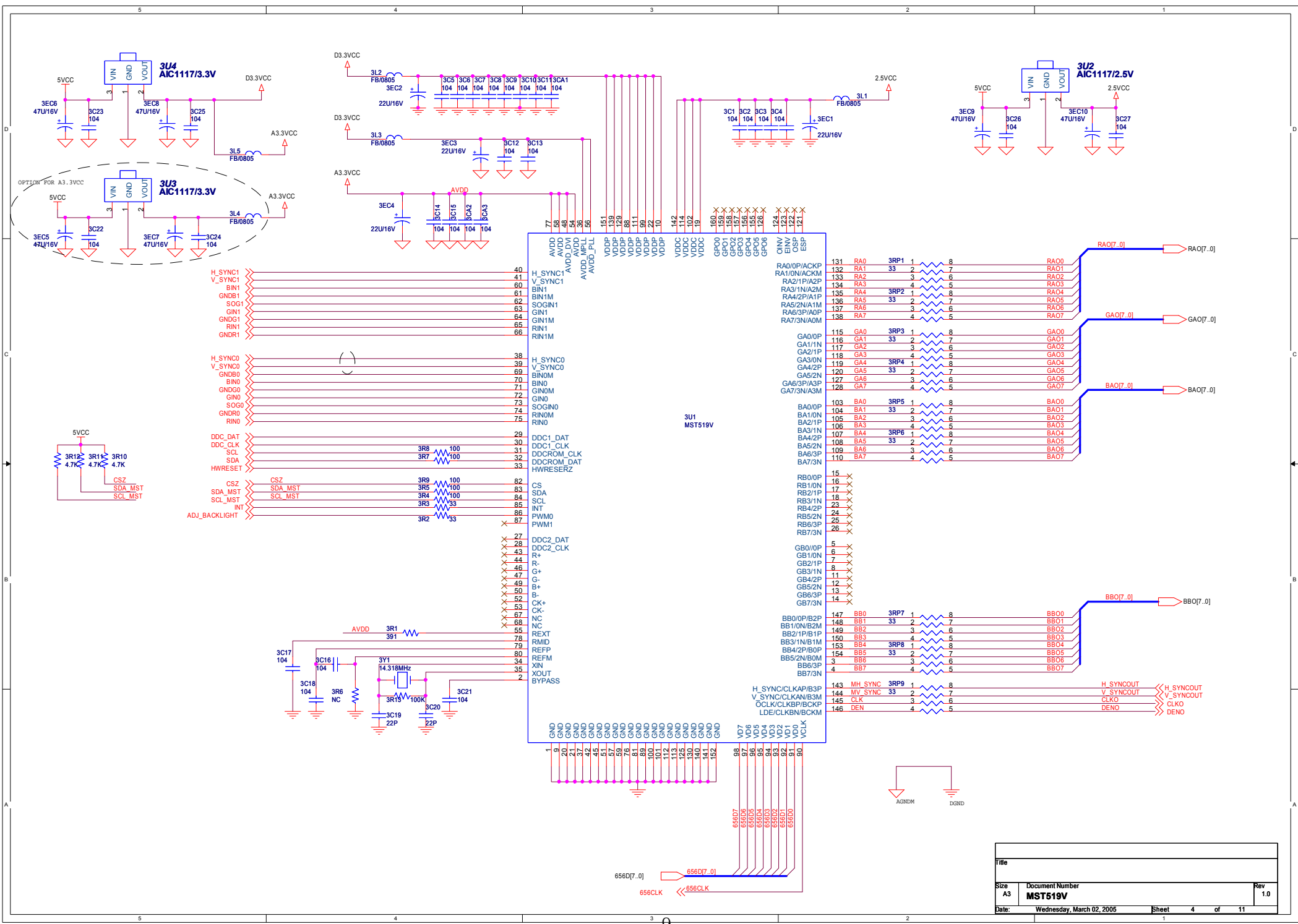




TO KEY\_PAD  
(8PCS)

FOR REMOTE

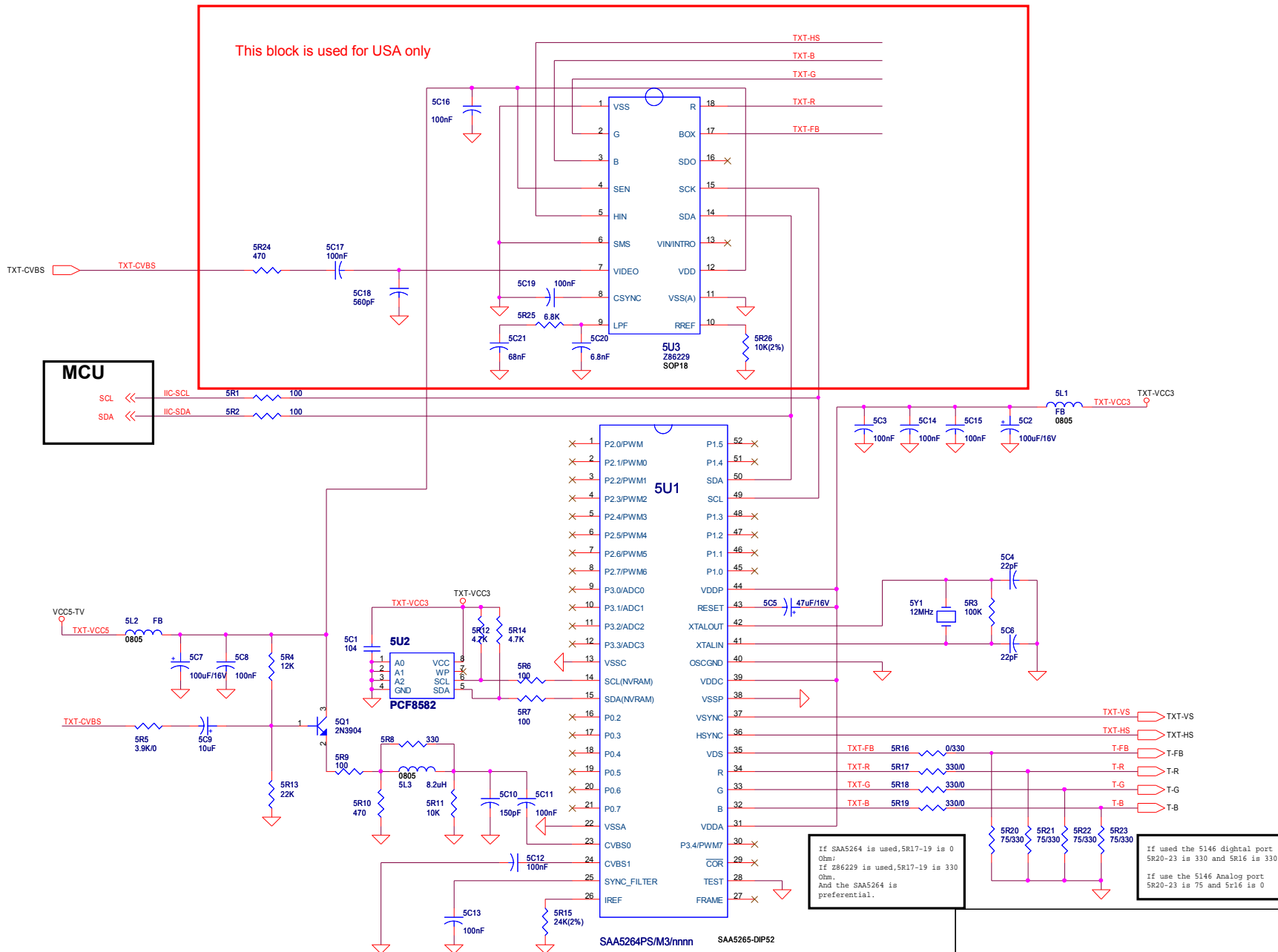
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Size A3	Document Number <b>MCU</b>	Rev 1.0
Date: Wednesday, March 02, 2005	Sheet 3	of 11



Title		
Size	Document Number	Rev
A3	<b>MST519V</b>	1.0
Date:	Wednesday, March 02, 2005	Sheet 4 of 11



This block is used for USA only



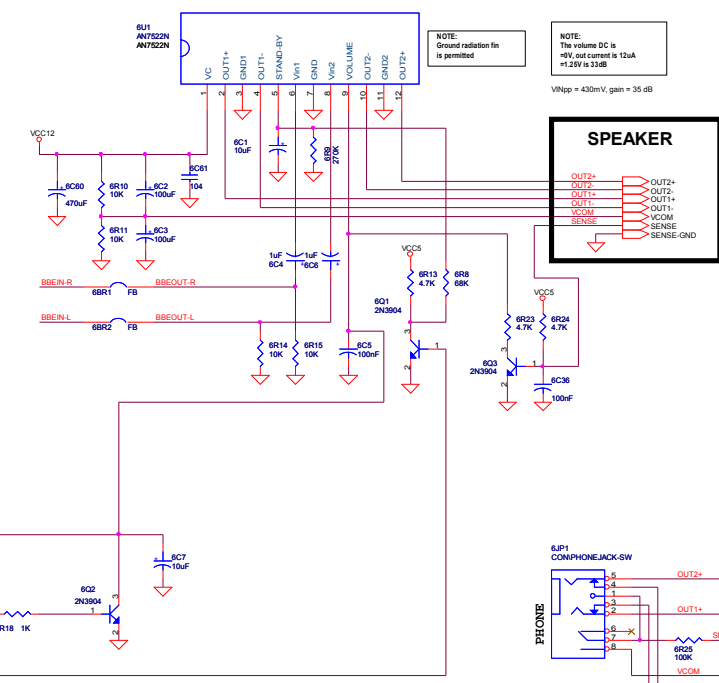
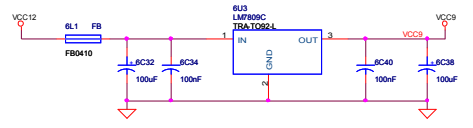
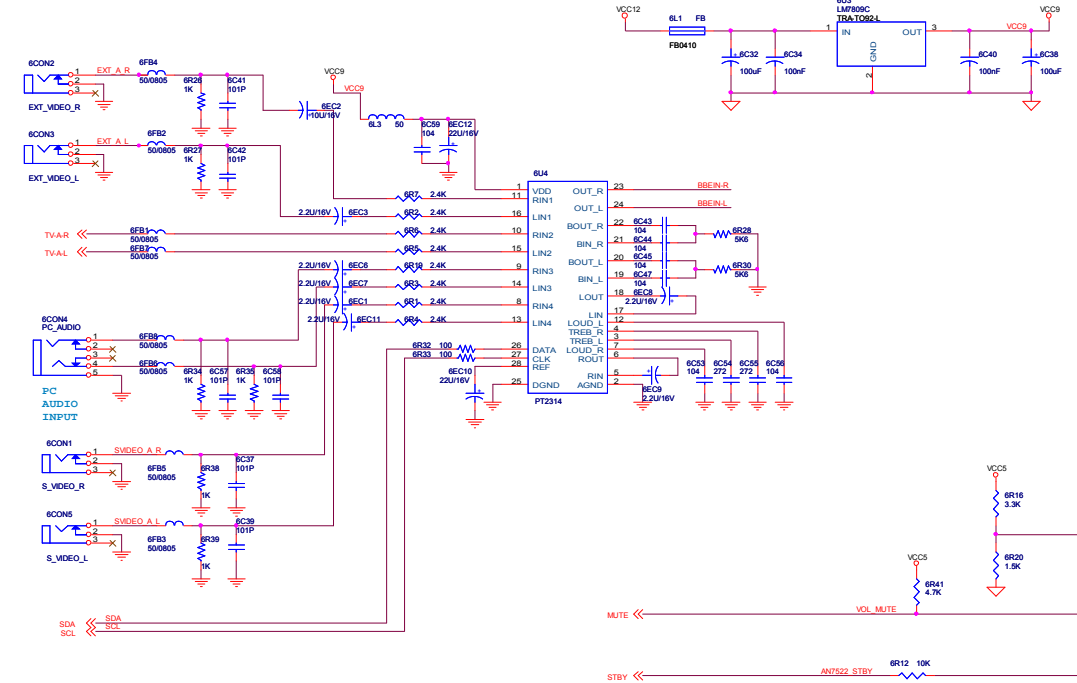
**MCU**  
 SCL << IIC-SCL  
 SDA << IIC-SDA

If SAA5264 is used, 5R17-19 is 0 Ohm.  
 If 286229 is used, 5R17-19 is 330 Ohm.  
 And the SAA5264 is preferential.

If used the 5146 digital port  
 5R20-23 is 330 and 5R16 is 330  
 If use the 5146 Analog port  
 5R20-23 is 75 and 5R16 is 0

Title		
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Date:	Sheet 6 of 11	

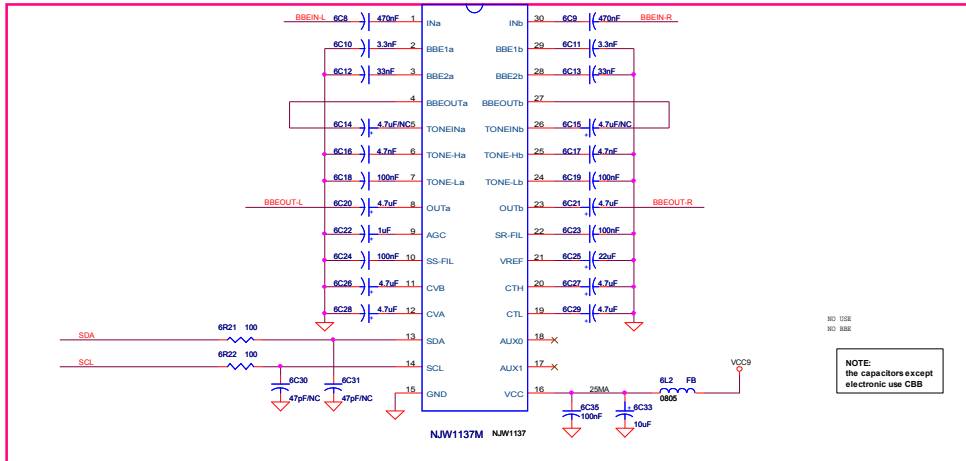
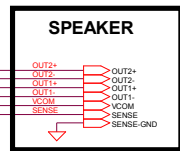
EXT\_A.L >> EXT\_A.L  
EXT\_A.R >> EXT\_A.R



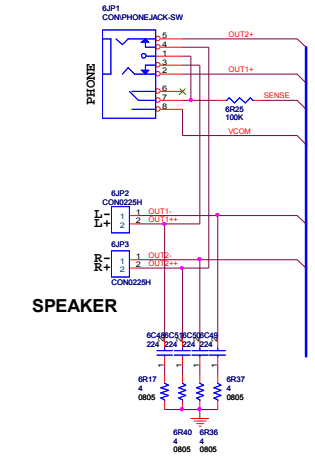
NOTE: Ground radiation fin is permitted

NOTE: The volume DC is +9V, out current is 12mA +1.2V is 33dB

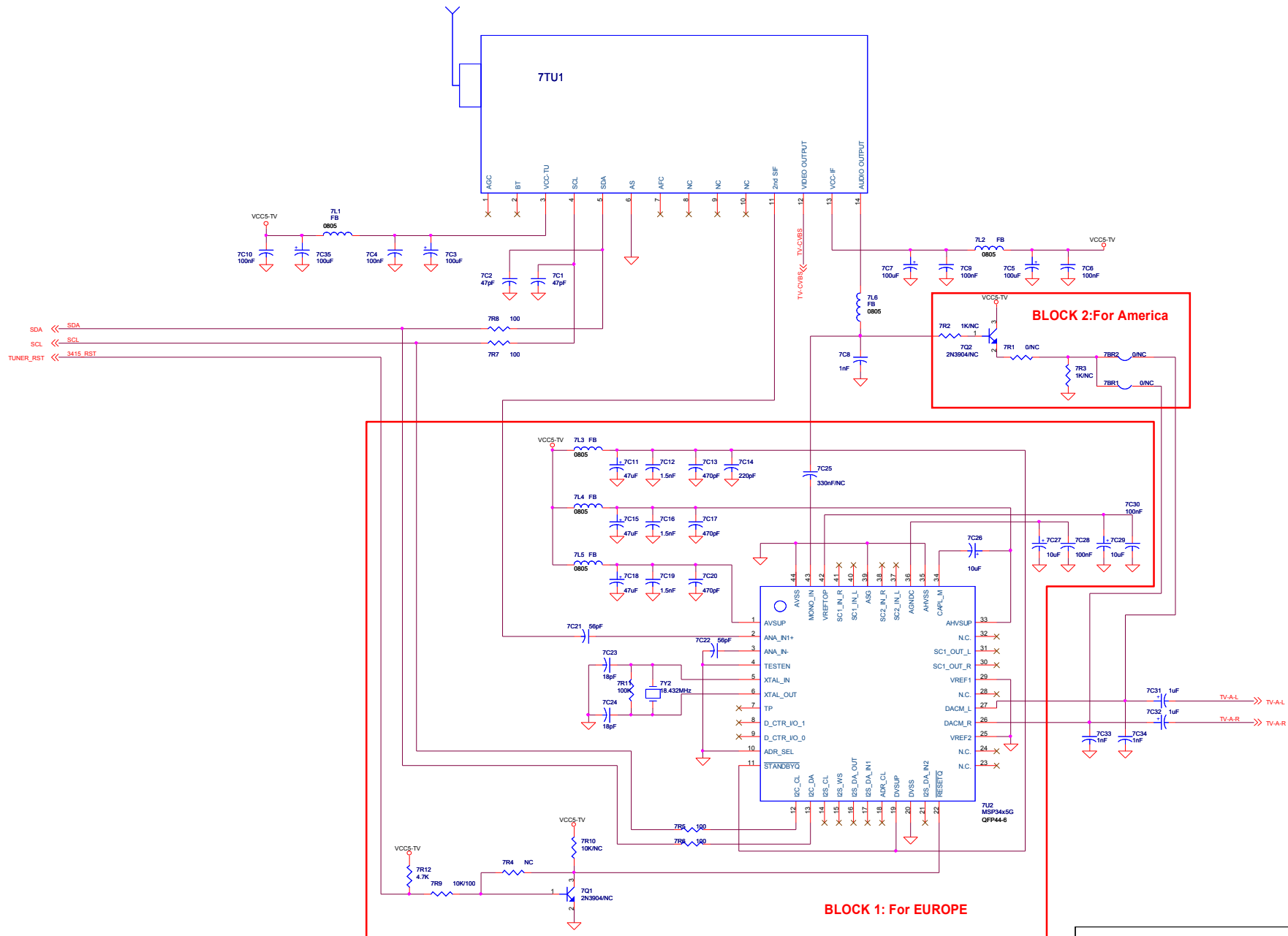
V<sub>DDP</sub> = 430mV, gain = 35 dB



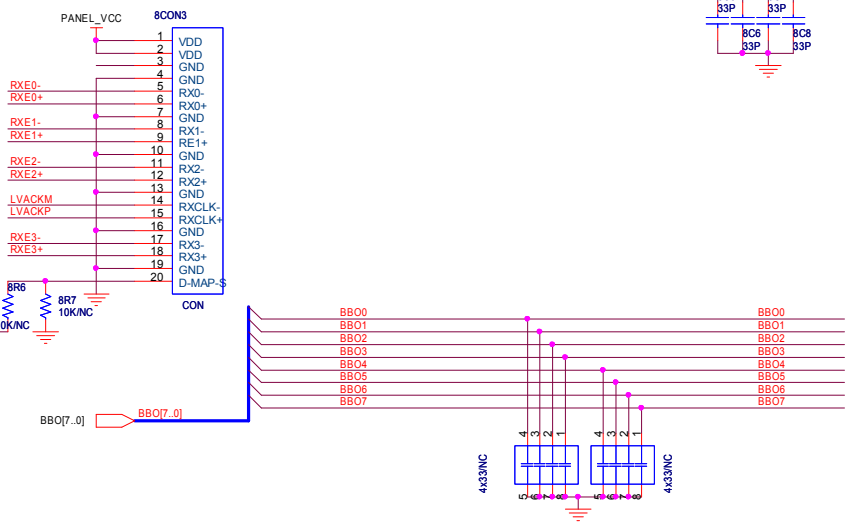
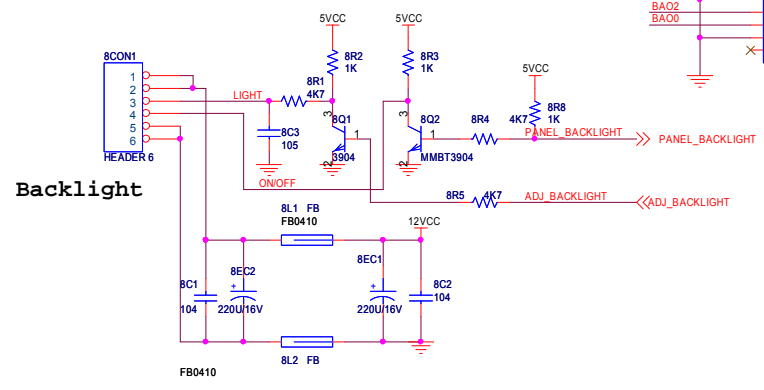
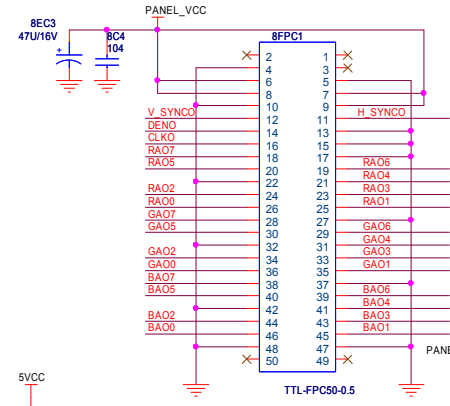
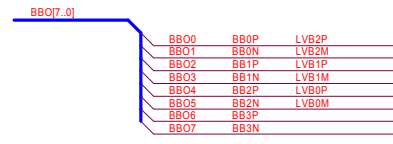
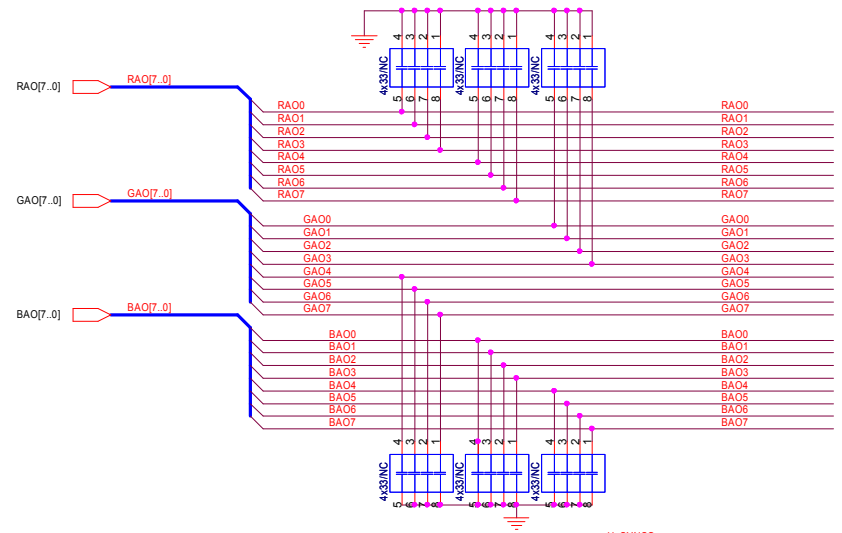
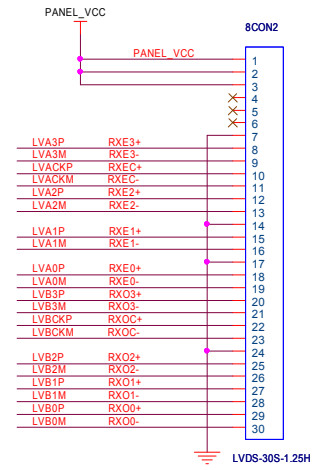
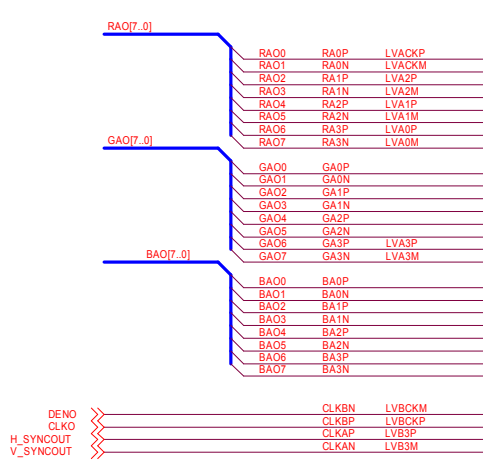
NOTE: the capacitors except electronic use CBB



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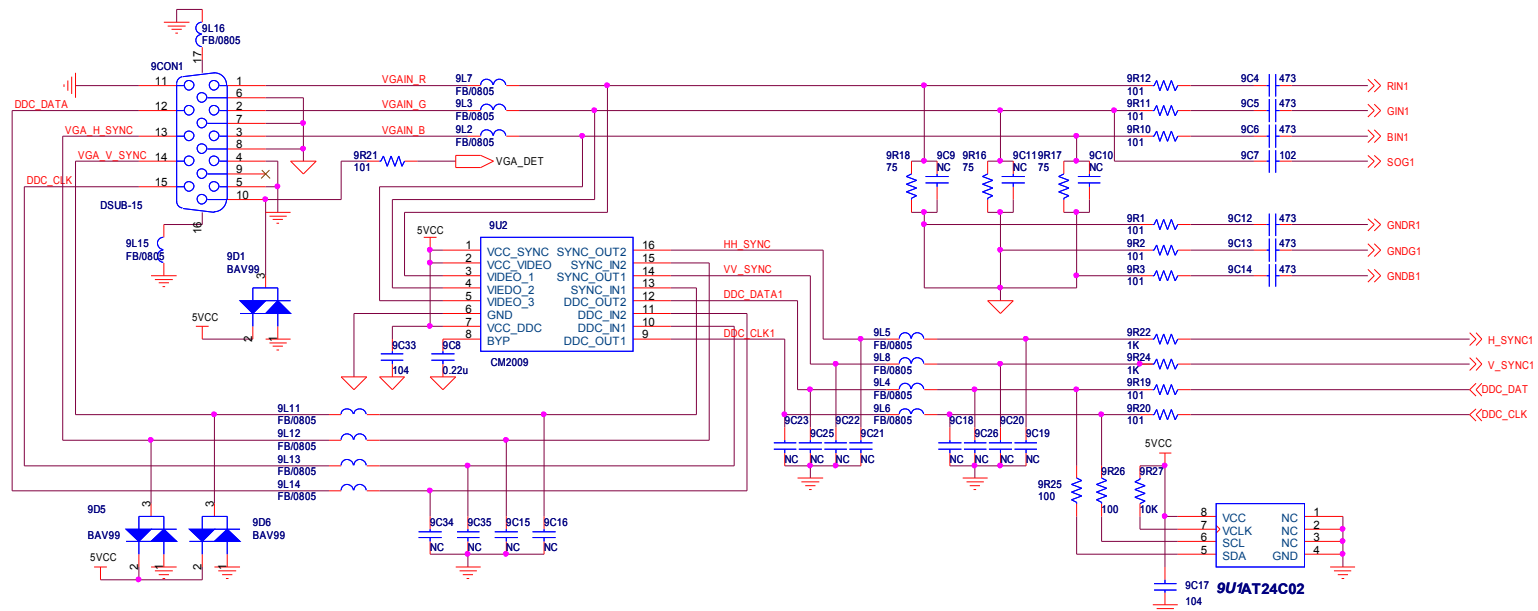
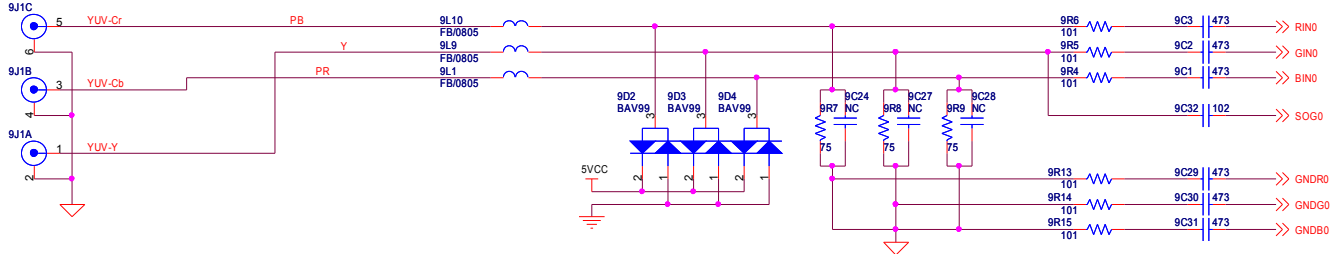


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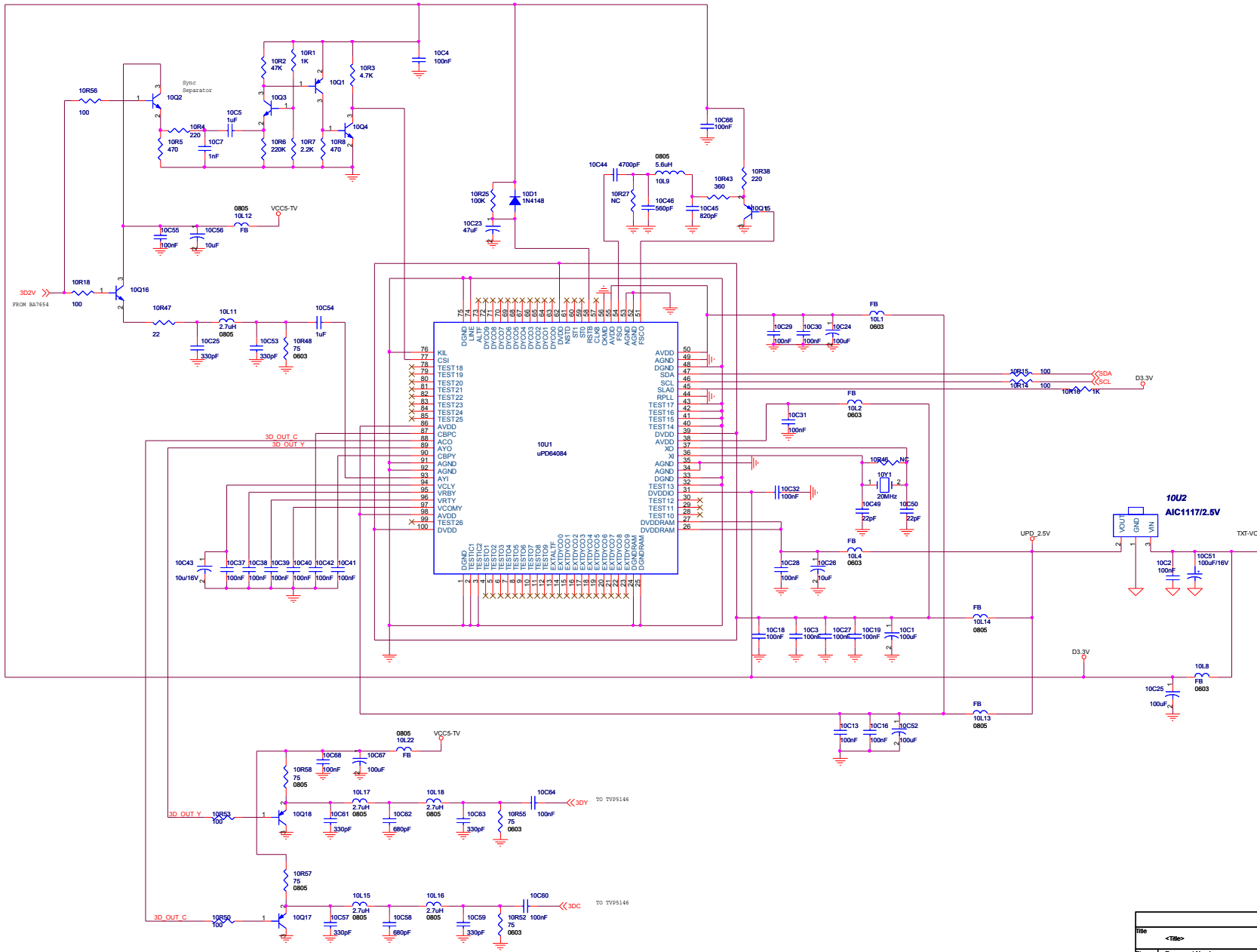
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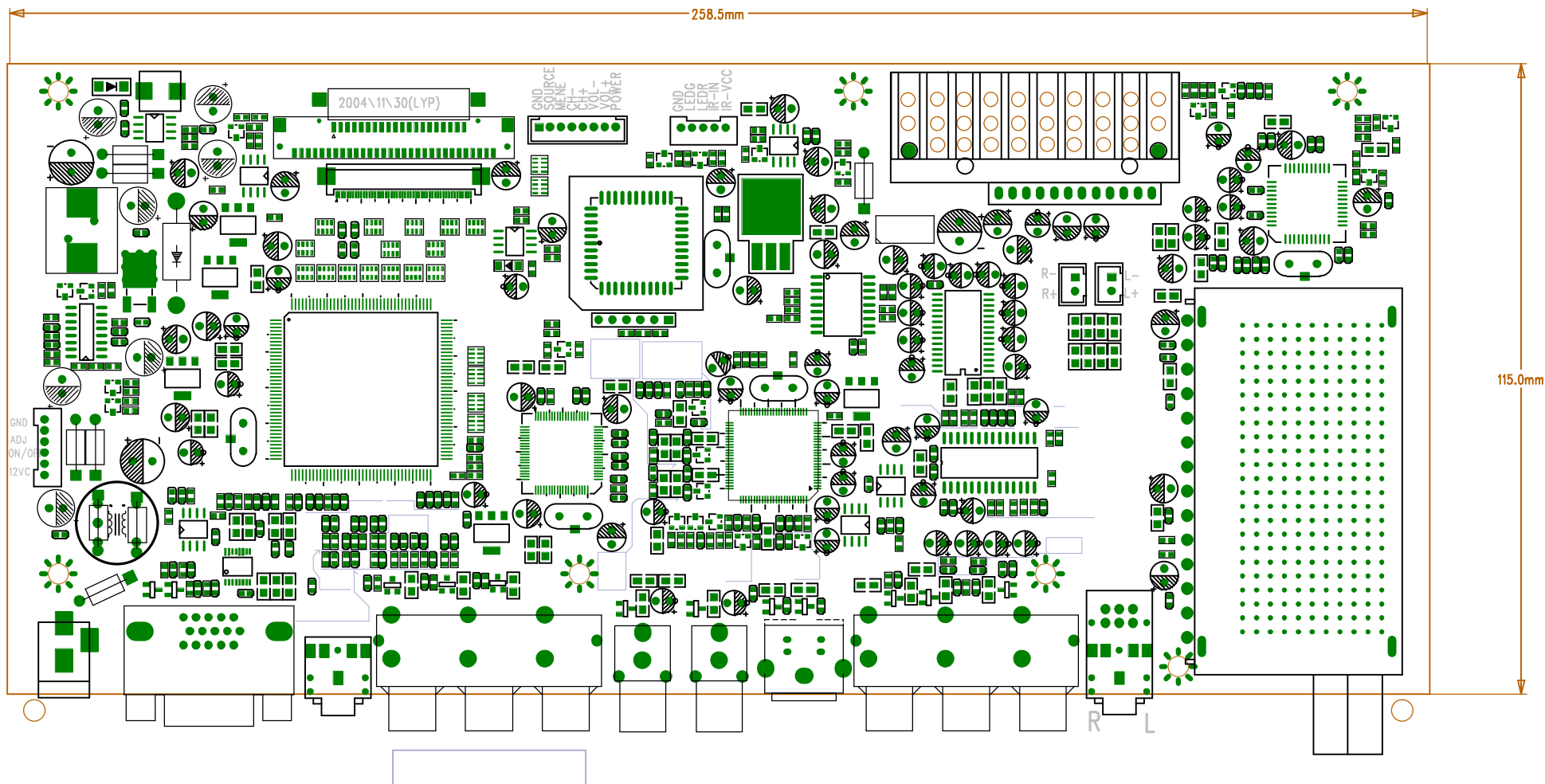


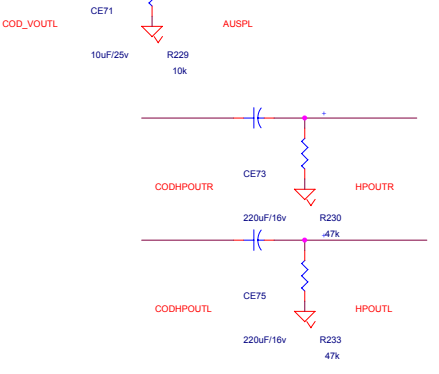
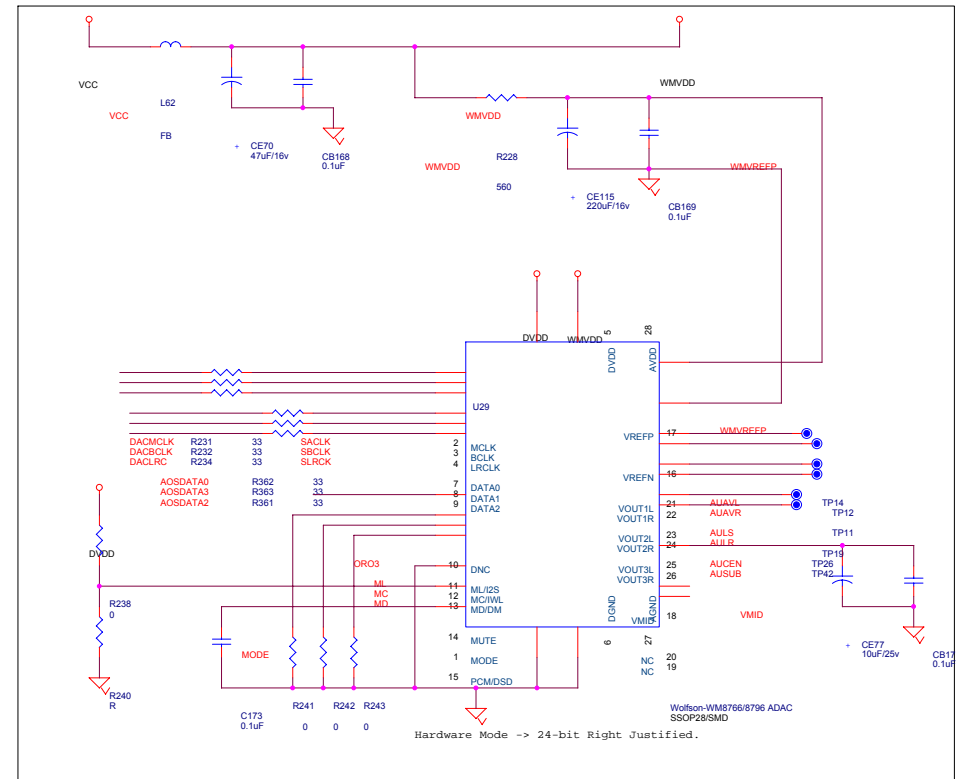
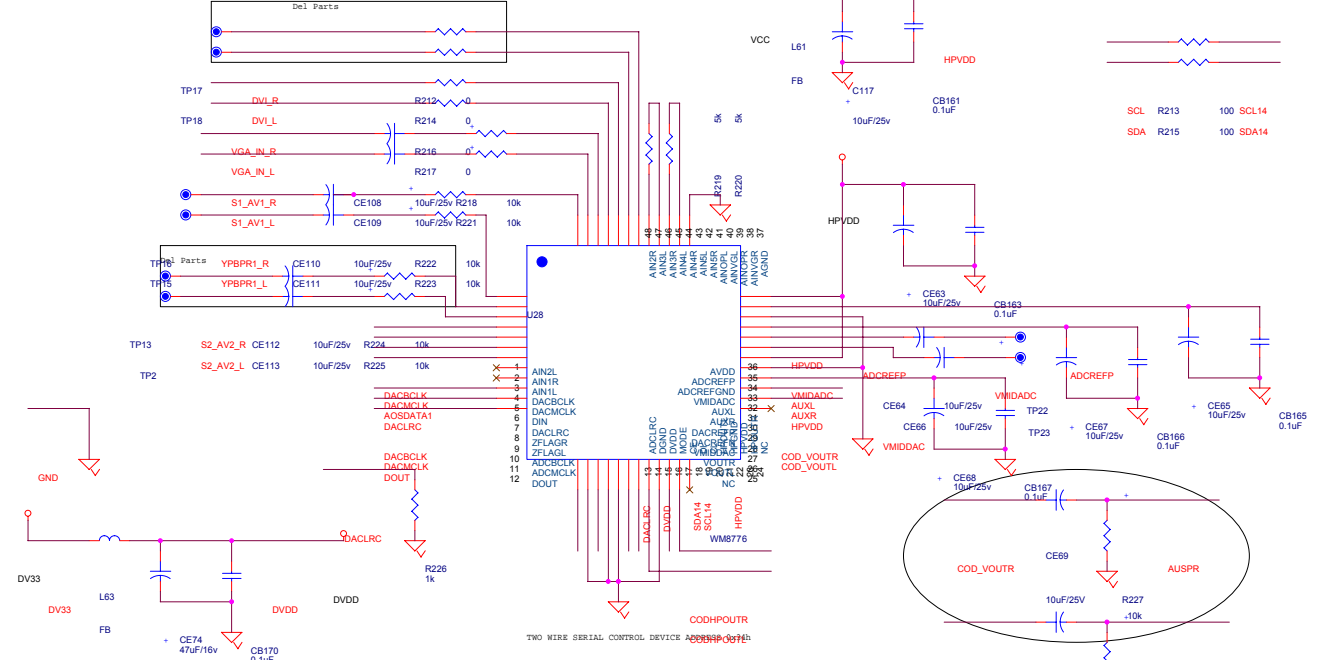
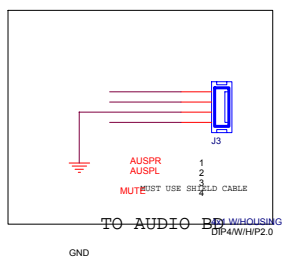
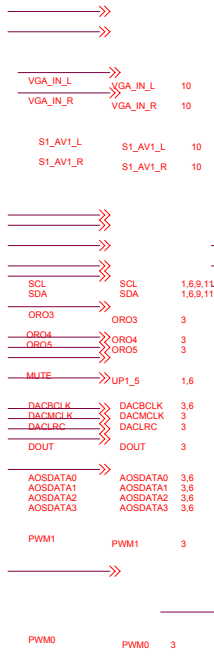
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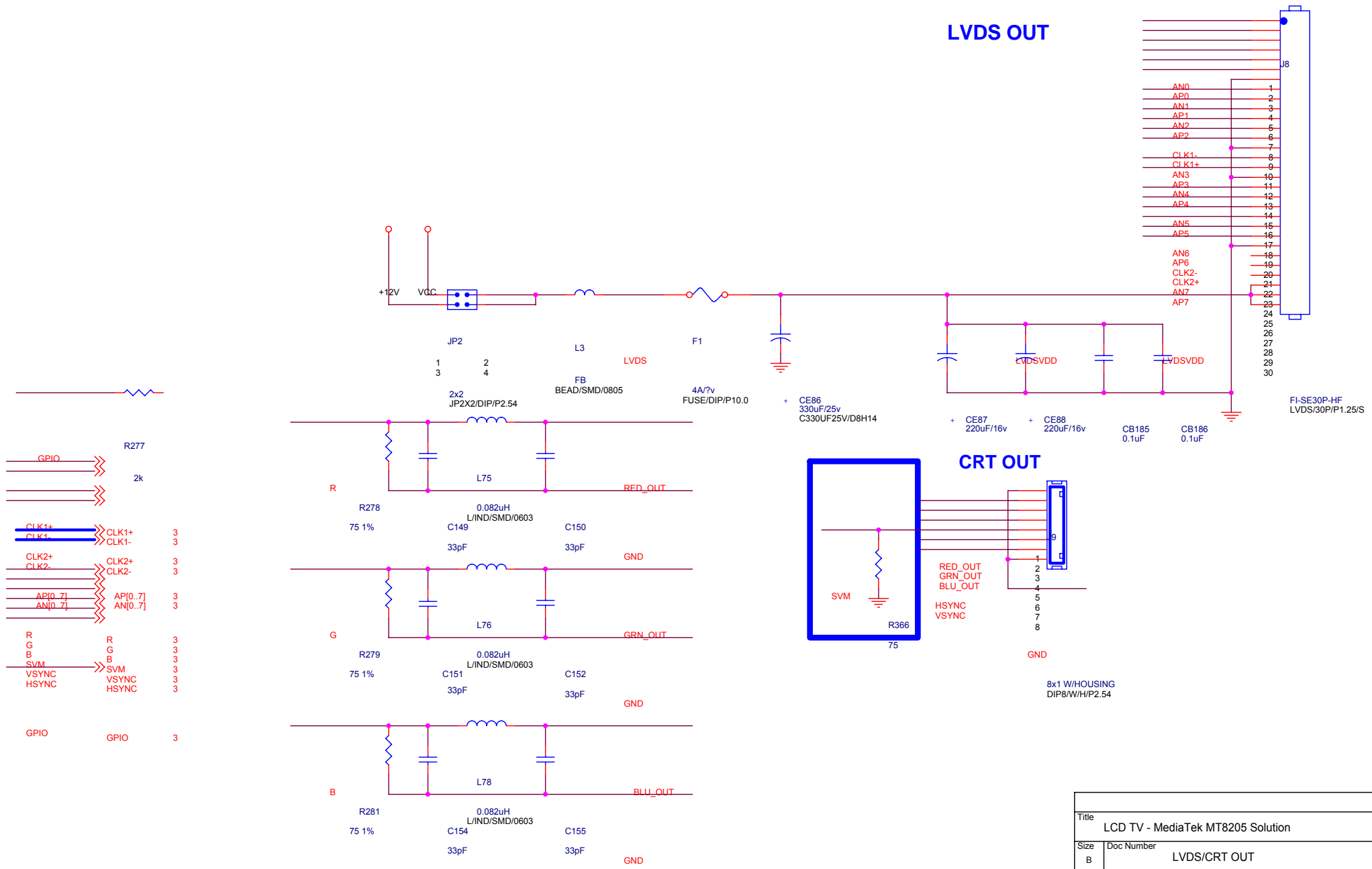


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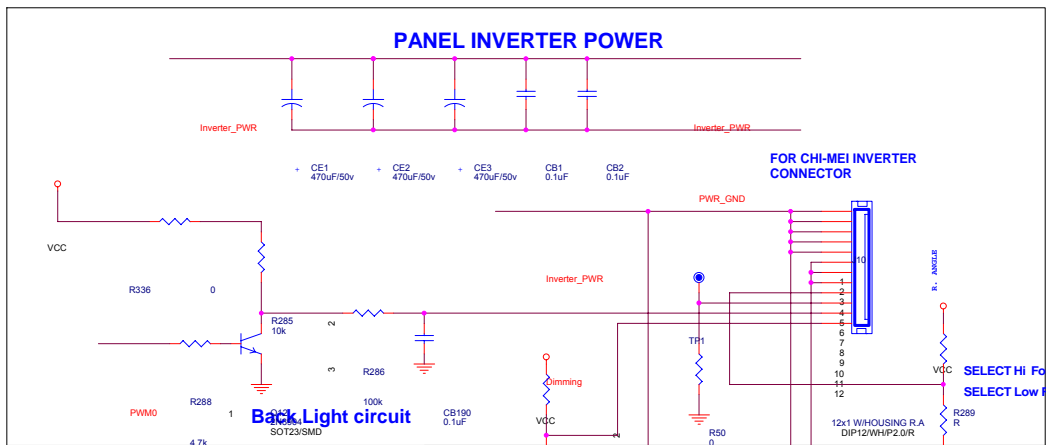
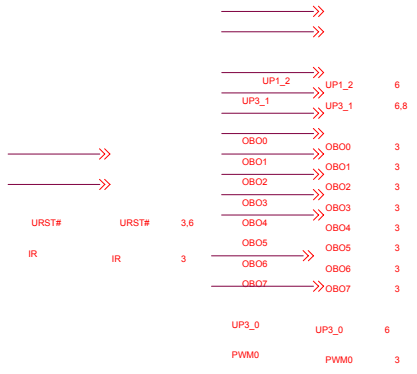




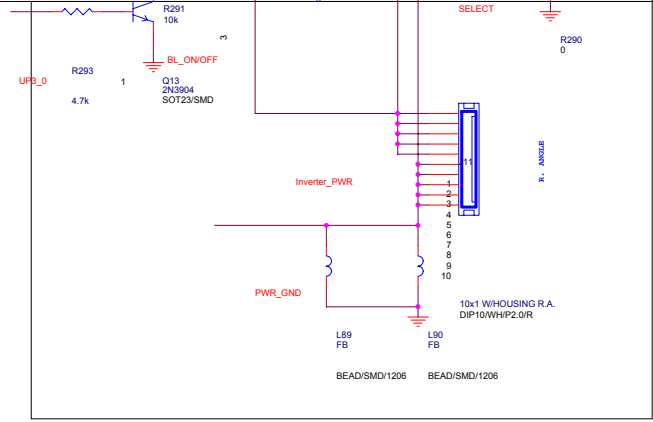
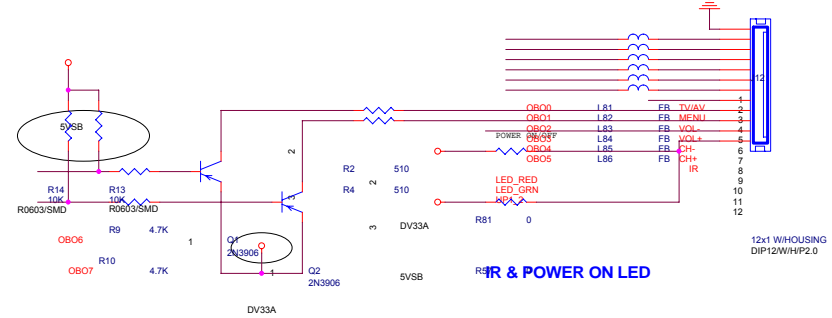
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Size	Doc Number	WM8776/WM8766/AUDIO CODEC	Rev
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Date:	Tuesday, May 10, 2005	Sheet	13 of 16



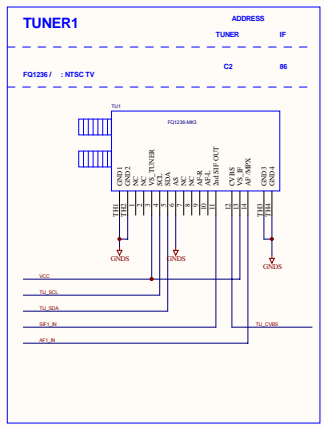
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Date:	Tuesday, May 10, 2005	Sheet 14 of 16

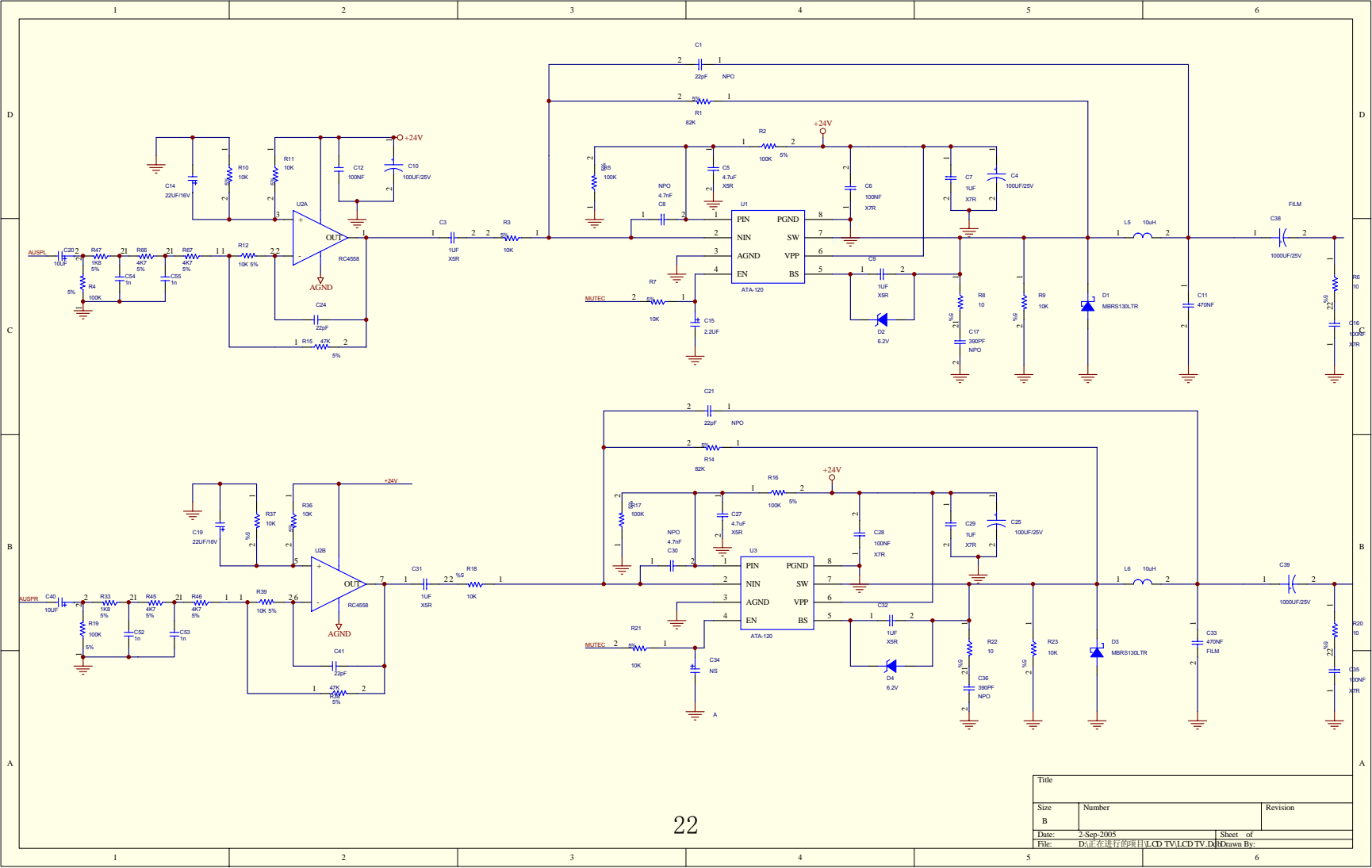


### KEYPAD - MAX 8-KEYS

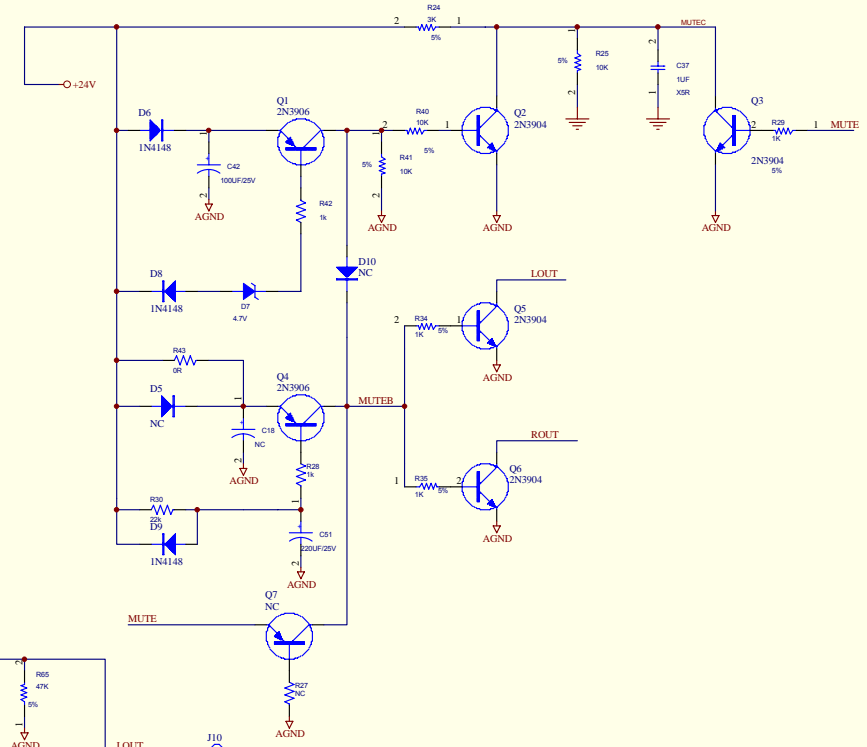
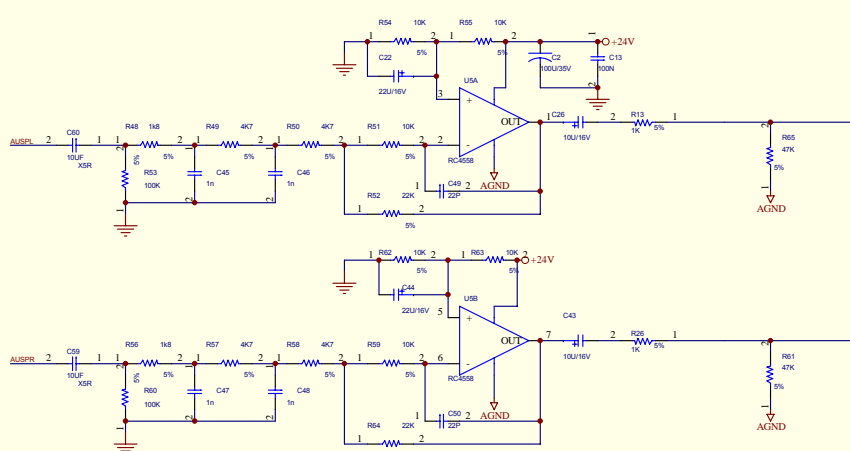


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LCD TV - MediaTek MT8205 Solution		
Size	Doc Number	Rev
C	BACK_LIGHT/KEYPAD	V0.1
Date:	Tuesday, May 10, 2005	Sheet 15 of 16



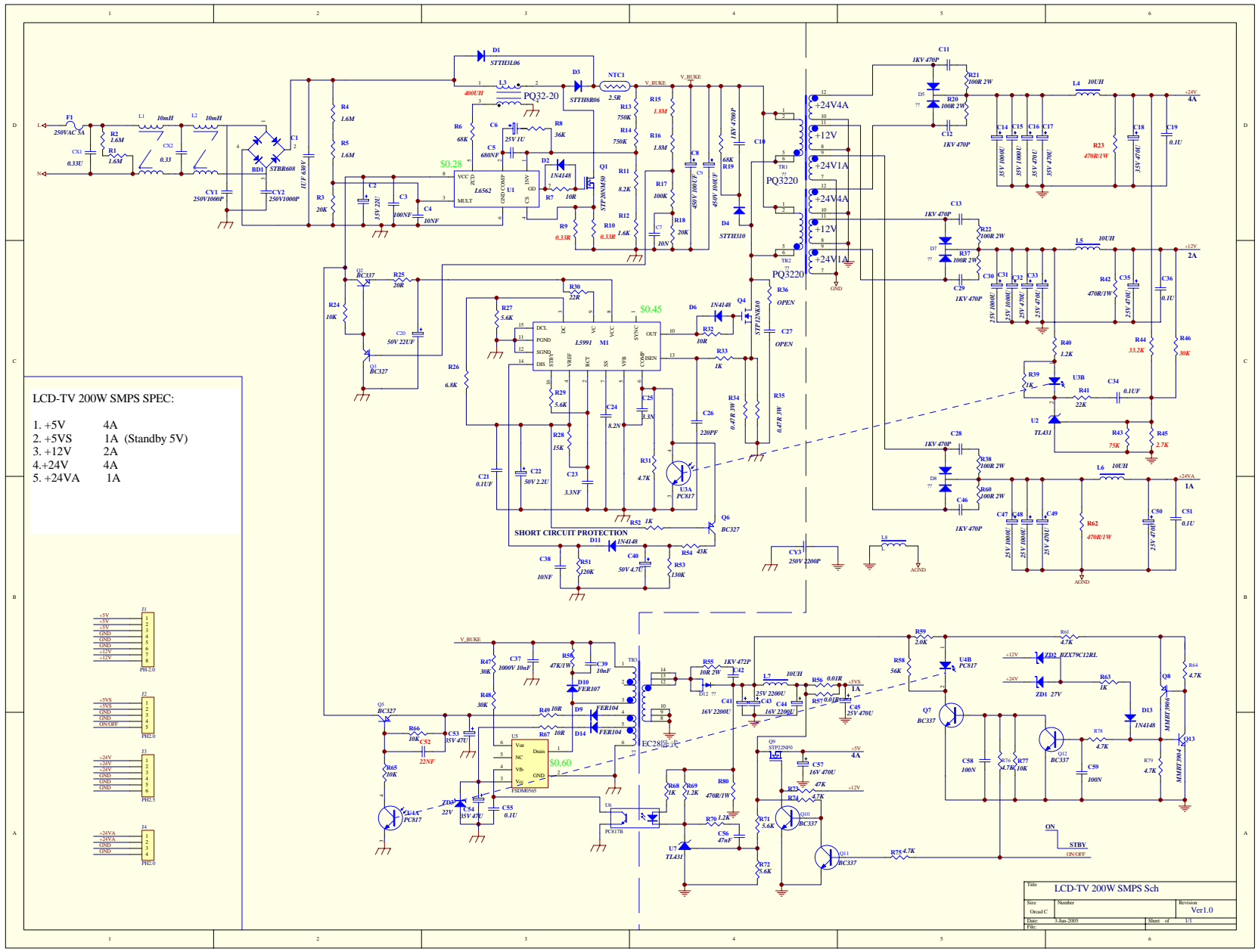


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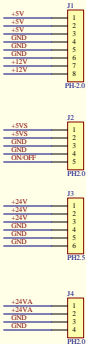
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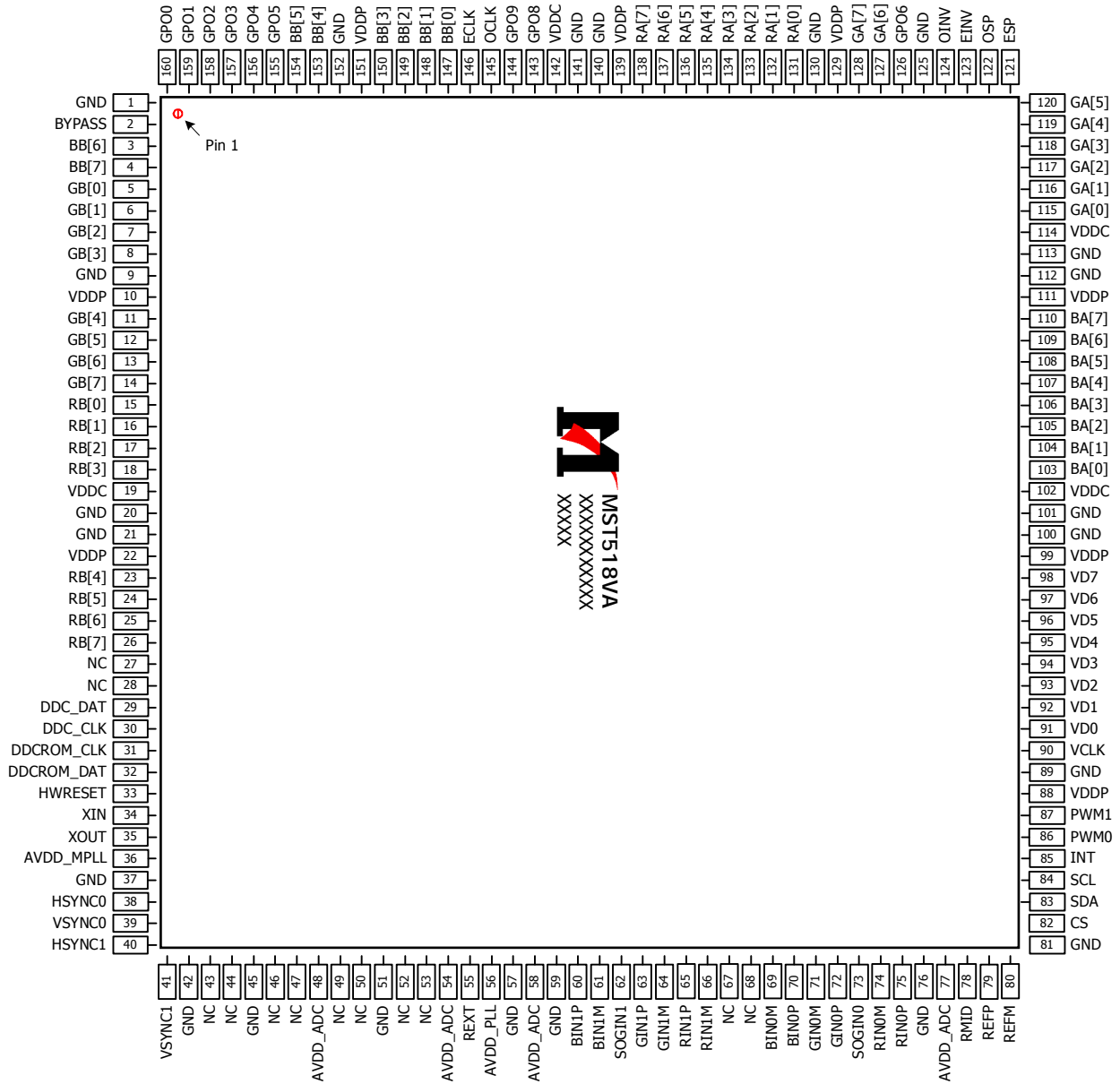
LCD-TV 200W SMPS SPEC:

- 1. +5V 4A
- 2. +5VS 1A (Standby 5V)
- 3. +12V 2A
- 4. +24V 4A
- 5. +24VA 1A



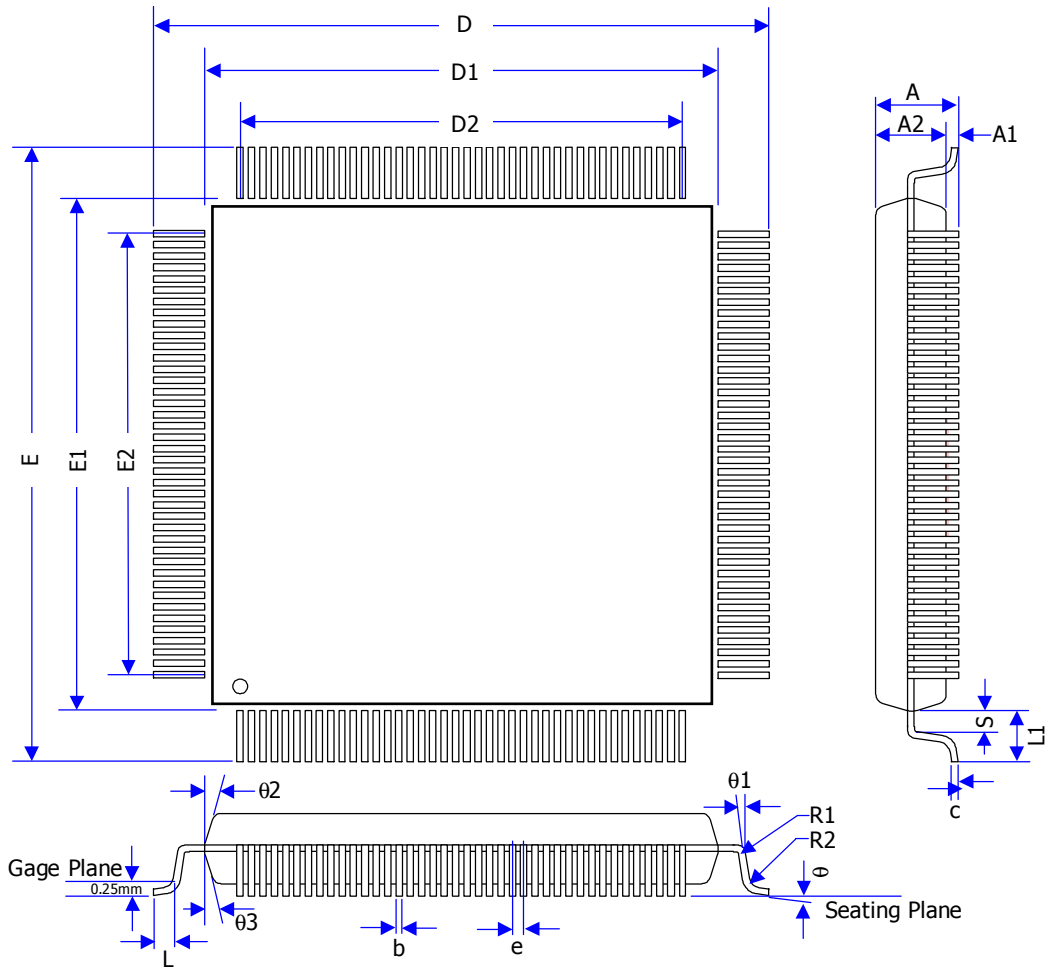
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Sheet C		Ver1.0
Date	3Jan2005	Sheet of 1/1
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# Main IC Specification



Note: This pin diagram is based on TTL output with TCON. For details, please see the Output Type vs. Configuration at the end of Pin Description section.

# MECHANICAL DIMENSIONS



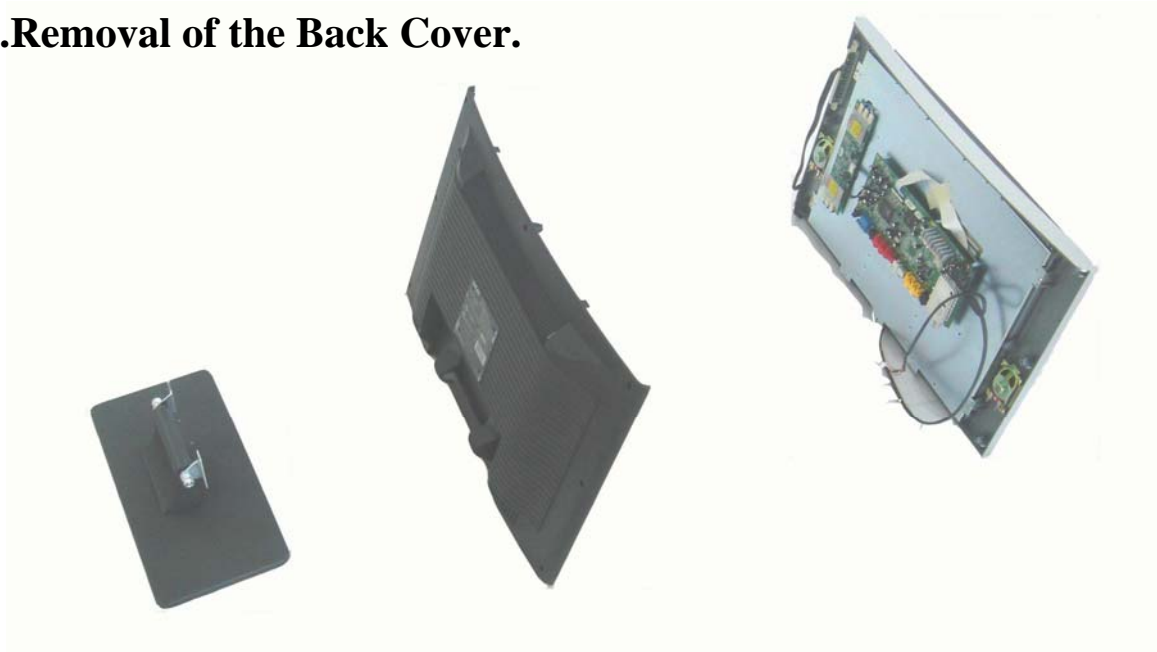
Symbol	Millimeter			Inch		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	3.40	-	-	0.134
A1	0.25	-	-	0.010	-	-
A2	2.50	2.72	2.90	0.098	0.107	0.114
D	31.20			1.228		
D1	28.00			1.102		
D2	25.35			0.998		
E	31.20			1.228		
E1	28.00			1.102		
E2	25.35			0.998		
R1	0.13	-	-	0.005	-	-
R2	0.13	-	0.30	0.005	-	0.012

Symbol	Millimeter			Inch		
	Min.	Nom.	Max.	Min.	Nom.	Max.
$\theta$	0°	-	7°	0°	-	7°
$\theta 1$	0°	-	-	0°	-	-
$\theta 2$	8° Ref			8° Ref		
$\theta 3$	8° Ref			8° Ref		
b	0.22	0.30	0.38	0.009	0.012	0.015
c	0.11	0.15	0.23	0.004	0.006	0.009
e	0.65 BSC.			0.026 BSC.		
L	0.73	0.88	1.03	0.029	0.035	0.041
L1	1.60 Ref			0.063 Ref		
S	0.20	-	-	0.008	-	-

# Disassembly

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in the illustrations.

## 1. Removal of the Back Cover.



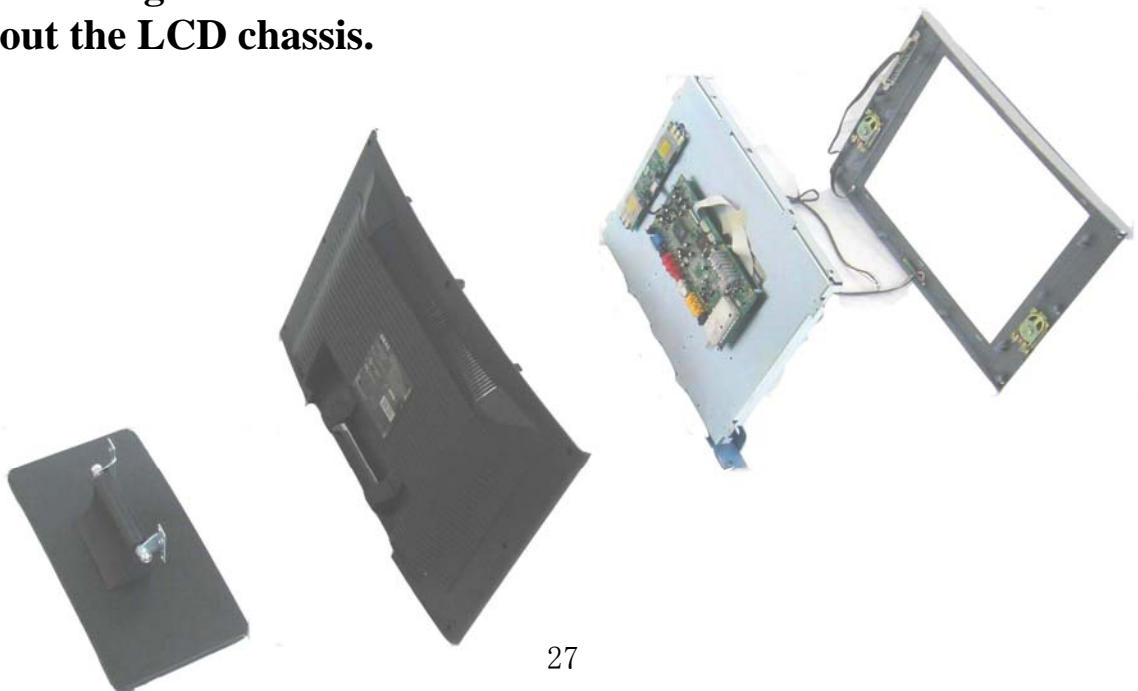
## 2. Removal of the MAIN PCB.

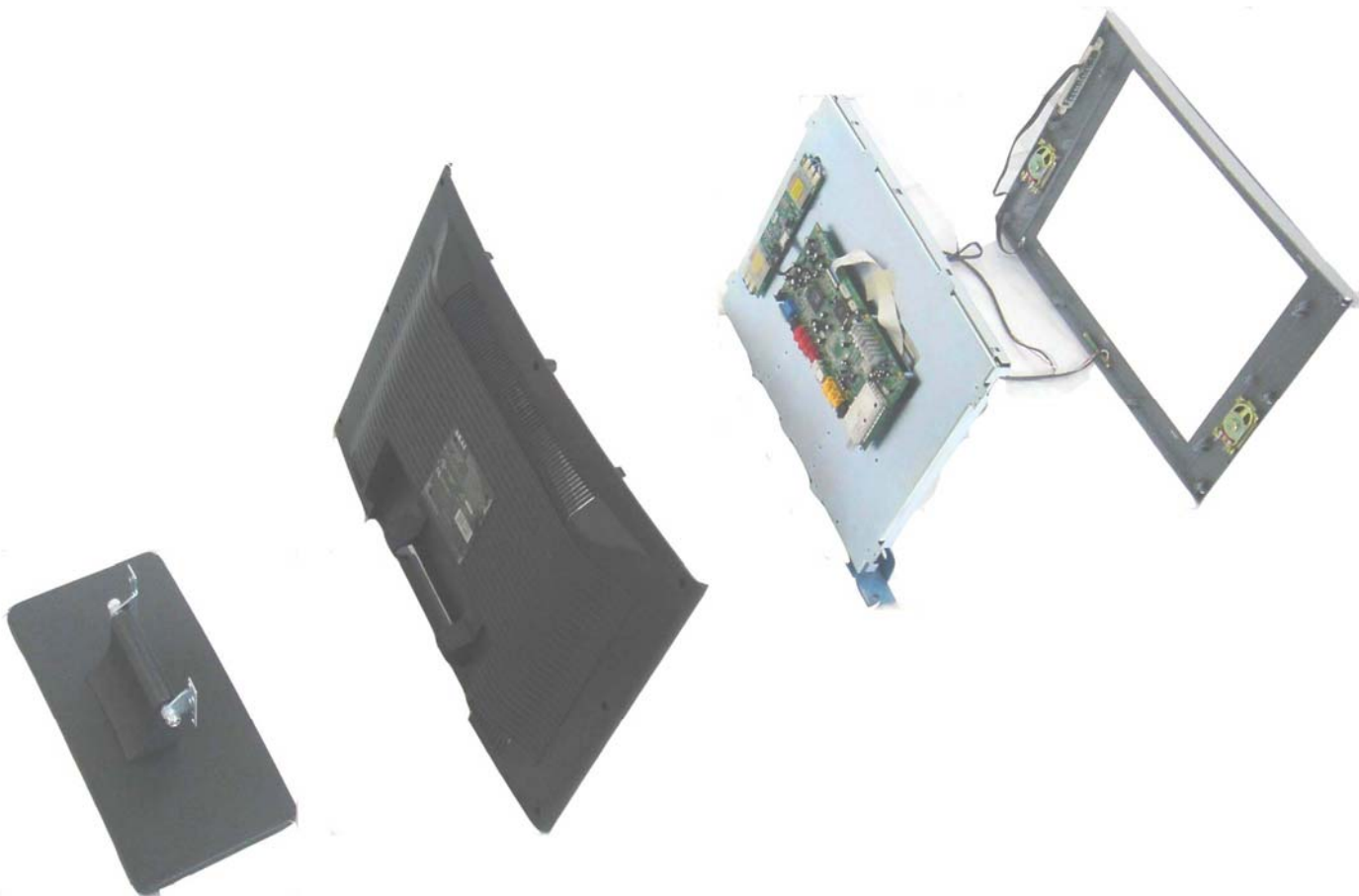
a. Remove the screws.

b. slide out the LCD chassis slightly; pull up the connector of AC cord from PCB; pull up the LCD PCB from LCD.

c. Remove the A node cap from The picture tube. To avoid a shock hazard, be sure to discharge.

d. Take out the LCD chassis.





ITEM	DESCRIPTION	PART NO	QTY	TYPE	REMARK
1	FRONT_CAB_ASS_LCD2016		1	ASSEMBLY	
2	KEY_PCB_ASS_LCD2016		1	PART	
3	F_KEY_L2016		1	PART	
4	SELF TAPPING SCREW		2	PART	
5	20PANEL_ASS		1	ASSEMBLY	
6	BKT_2016		1	PART	
7	MACH SCREW		6	PART	
8	SOCKET_PVC_PLATE		1	PART	
9	SEAT_ASS		1	ASSEMBLY	
10	MACH SCREW		2	PART	

## Spare Part List for LCT2016

Item	Part Number	Part Description	Usage / unit	Unit
1	TI-L20160001-01	20.1" LCD Panel	1	piece
2	TI-L20160002-01	Front Plastic Cabinet with Remote Lens	1	piece
3	TI-L20160003-01	Plastic Back Cover with wall mount bracket	1	piece
4	TI-L20160004-01	Plastic Base Cover	1	piece
5	TI-L20160005-01	Rubber Foot	6	piece
6	TI-L20160006-01	Main PCBA	1	piece
7	TI-L20160007-01	Inverter PCBA	1	piece
8	TI-L20160008-01	Control PCBA with 8 pin connector	1	piece
9	TI-L20160009-01	AC Adaptor with AC Cord	1	piece
10	TI-L20160010-01	5 pin connector	1	piece
11	TI-L20160011-01	6 pin connector	1	piece
12	TI-L20160012-01	LVDB signal cable	1	piece
13	TI-L20160013-01	Remote Control	1	piece
14	TI-L20160014-01	Speaker	2	piece
15	TI-L20160015-01	Model Plate	1	piece
16	TI-L20160016-01	Polyfilm Bag for Main Unit	1	piece
17	TI-L20160017-01	Top Cushion	1	set
18	TI-L20160018-01	Bottom Cushion	1	set
19	TI-L20160019-01	Carton Box	1	piece
20	TI-L20160020-01	Instruction Manual	1	piece

## If you forget your V-Chip Password

- Omnipotence V-Chip Password: **3308**.
- Press **MENU** button.
- Press **MENU** buttons to highlight "CCDV-CHIP" Menu.
- Press **Up, Down** buttons to highlight "SET V-CHIP".
- Press **Up, Down** buttons to highlight "CHANGE PASSWORD".
- Use the **Number buttons** (0~9) to enter an omnipotence Password.
- Press **MENU** button to confirm and your can select "CHANGE PASSWORD".
- Suggest: Change to your familiar Password again.

## Software upgrade

- Connect the RS-232C input jack to an external control device (such as a computer) and software upgrade.

### Type of connector; D-Sub 9-pin male connector male

No. Pin name

1 No connection

2 RXD (Receive data)

3 TXD (Transmit data)

4 DTR (DTE side ready)

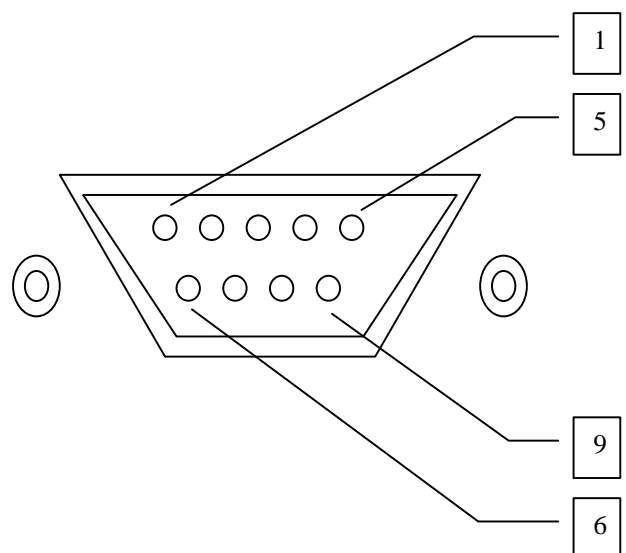
5 GND

6 DSR (DCE side ready)

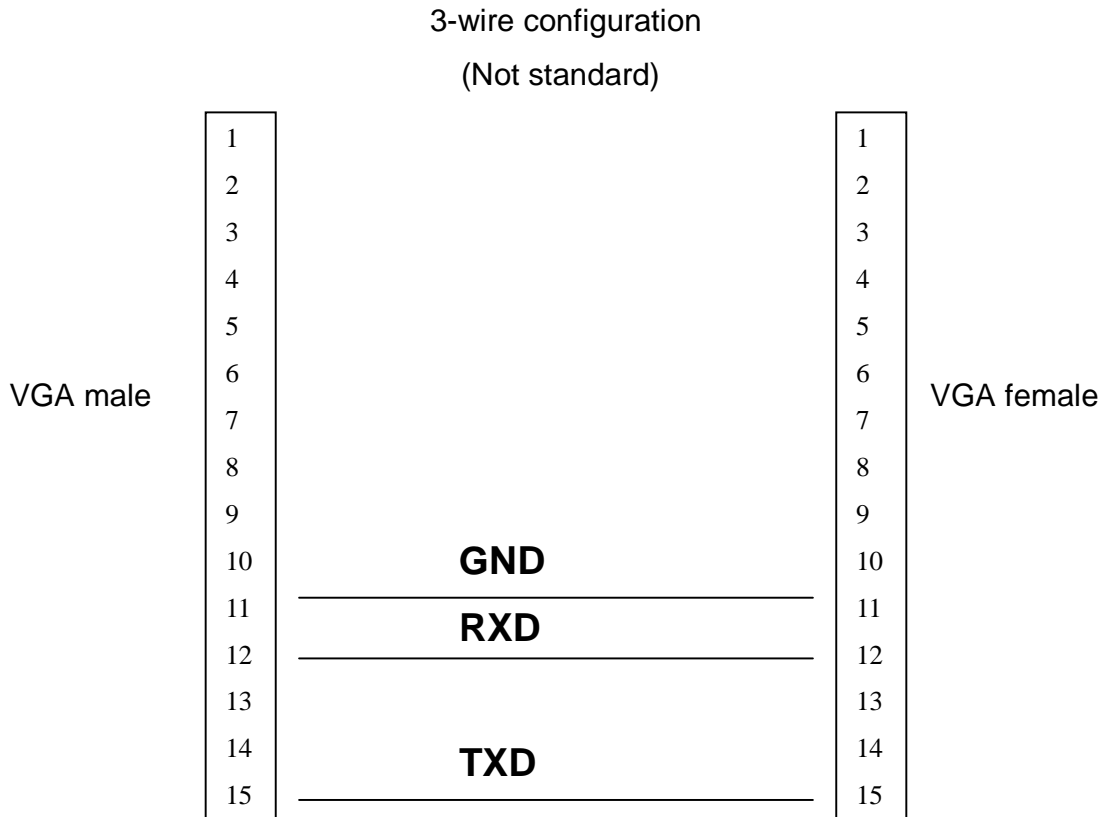
7 RTS (Ready to send)

8 CTS (Clear to send)

9 No Connection



## VGA configurations



## Software upgrade Process

- Power Switch OFF.
- Connect the serial port of the control device to the VGA jack on the LCD-TV back panel.
- VGA connection cables are not supplied with the LCD-TV.
- Power Switch ON. The power indicator on the front of the panel should now display green.
  
- Press **V+** and **V-** button, the panel should now display “ISP”.
  
- Copy the software to the computer.
- Open the 8051ISPwriter ,Load the software to the 8051ISPwriter.



- Select the file which will be update.
- Press "ConNect" button
- Waiting for the upgrader programing, when it is finished, the bar will display "program OK".
- After the upgrader is finished, shut down the power switch, take out the VGA connection