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PLASMA TV

SERVICE MANUAL

CHASSIS : PD23A

MODEL : 42PA4500/4510/4520

42PA4500-ZM/42PA4510-ZG/

42PA4520-ZJ

CAUTION

BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



P/NO : MFL67564701 (1204-REV00)

Printed in Korea

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SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by $\triangle$ in the Schematic Diagram and Exploded View.

It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.

Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.

If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 M Ω and 5.2 M Ω .

When the exposed metal has no return path to the chassis the reading must be infinite.

An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.

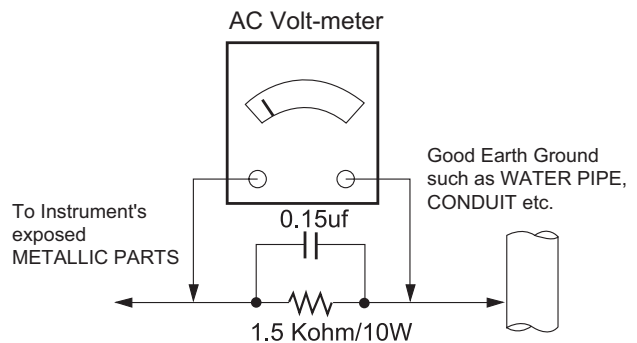
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.

Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5 mA.

In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1

*Base on Adjustment standard

SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

1. Application range

This spec sheet is applied all of the PDP TV with PD23A chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

- (1) Temperature: $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($77^{\circ}\text{F} \pm 9^{\circ}\text{F}$), CST: $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$
- (2) Relative Humidity: $65\% \pm 10\%$
- (3) Power Voltage
: Standard input voltage (AC 100-240 V~, 50/60 Hz)
* Standard Voltage of each products is marked by models.
- (4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
- (5) The receiver must be operated for about 5 minutes prior to the adjustment.

3. Test method

- (1) Performance: LGE TV test method followed
- (2) Demanded other specification
 - Safety : CE, IEC specification
 - EMC : CE, IEC

4. Module General Specification

- 42" 2D HD

No	Item	Specification	Remark
1	Display Screen Device	106 cm (42 inch) wide Color Display Module	PDP
2	Aspect Ratio	16:9	
3	PDP Module	PDP42T4####, RGB Closed (Well) Type, Glass Filter (38%) Pixel Format: 1024 horiz. By 768 ver.	
4	Operating Environment	1) Temp. : 0 deg ~ 40 deg 2) Humidity : 20 % ~ 80 %	LGE SPEC
5	Storage Environment	1) Temp. : -20 deg ~ 60 deg 2) Humidity : 10 % ~ 90 %	
6	Input Voltage	AC100 ~ 240V, 50/60Hz	Maker LG

5. Model General Specification

No	Item	Specification	Remark
1	Market	Albania, Austria, Belgium, Bosnia, Bulgaria, Croatia, Czech, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovenia, Spain, Sweden, Slovakia, Switzerland, Turkey, Ukraine, UK	36 Country
2	Broadcasting system	1) PAL/SECAM BG 2) PAL/SECAM DK 3) PAL I / II 4) SECAM L/L' 5) DVB T 6) DVB C	EU (PAL Market)
3	Receiving system	Analog : Upper Heterodyne Digital : COFDM	
4	Scart Jack (1EA)	PAL, SECAM	
5	Component Input (1EA)	Y/Cb/Cr, Y/ Pb/Pr	
6	RGB Input (1EA)	RGB-PC	Analog (D-Sub 15Pin)
7	RS232C (1EA)	SVC	
8	HDMI Input (2 or 3EA)	HDMI-PC HDMI-DTV	HDMI1/DVI, HDMI2, HDMI3
9	Audio Input (2EA)	RGB/DVI Audio, Component	L/R Input
10	SPDIF Out (1 EA)	SPDIF Out	
11	USB (1EA)	for SVC, S/W Download, DivX	
12	LAN	only DVB-T2 models	
13	PCMCIA (1EA)	DVB-T/C Decryption Interface, CI+	

ADJUSTMENT INSTRUCTION

1. Application Range

This spec. sheet applies to PD23A chassis applied PDP TV all models manufactured in TV factory.

2. Designation

- (1) The adjustment is according to the order which is designated and which must be followed, according to the plan which can be changed only on agreeing.
- (2) Power adjustment : Free Voltage.
- (3) Magnetic Field Condition: Nil.
- (4) Input signal Unit: Product Specification Standard.
- (5) Reserve after operation: Above 5 Minutes (Heat Run)
Temperature : at 25 °C ± 5 °C
Relative humidity : 65 % ± 10 %
Input voltage : 220V, 60Hz
- (6) Adjustment equipments : Color Analyzer (CA-210 or CA-110), DDC Adjustment Jig equipment, SVC remote controller.
- (7) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15

- In case of keeping module is in the circumstance of 0°C, it should be placed in the circumstance of above 15°C for 2 hours.
- In case of keeping module is in the circumstance of below -20°C, it should be placed in the circumstance of above 15°C for 3 hours.

- After RGB Full White in HEAT-RUN Mode, the receiver must be operated prior to the adjustment.
- Enter into HEAT-RUN MODE
 - 1) Press the POWER ON KEY on R/C for adjustment.
 - 2) OSD display and screen display PATTERN MODE.
- Set is activated HEAT run without signal generator in this mode.
- Single color pattern (WHITE) of HEAT RUN MODE uses to check panel.
- Caution : If you turn on a still screen more than 20 minutes (Especially digital pattern, cross hatch pattern), an after image may be occur in the black level part of the screen.
- (8) Push The "IN STOP KEY" – For memory initialization.

Case1 : Software version up

- 1) After downloading S/W by USB , Multi-vision set will reboot automatically
- 2) Push "In-stop" key
- 3) Push "Power on" key
- 4) Function inspection
- 5) After function inspection, Push "In-stop" key.

Case2 : Function check at the assembly line

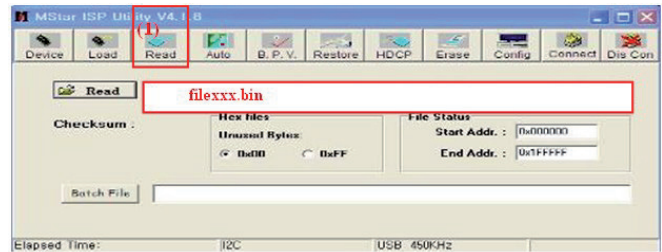
- 1) When TV set is entering on the assembly line, Push "In-stop" key at first.
- 2) Push "Power on" key for turning it on.
-> If you push "Power on" key, TV set will recover channel information by itself.
- 3) After function inspection, Push "In-stop" key.

3. Main PCB check process

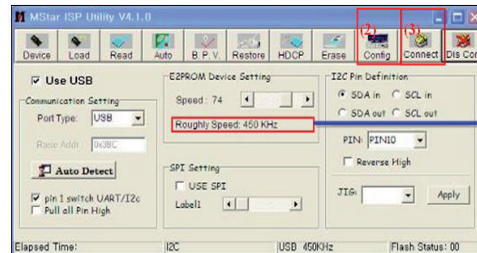
* APC - After Manual-Insult, executing APC

* Boot file Download

- (1) Execute ISP program "Mstar ISP Utility" and then click "Config" tab.
- (2) Set as below, and then click "Auto Detect" and check "OK" message
If "Error" is displayed, Check connection between computer, jig, and set.
- (3) Click "Read" tab, and then load download file (XXXX.bin) by clicking "Read"

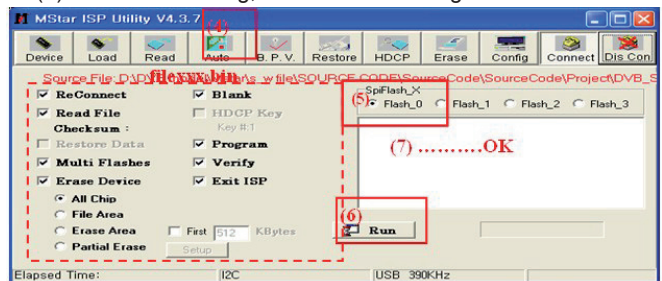


- (4) Click "Connect" tab. If "Can't" is displayed, Check connection between computer, jig, and set.



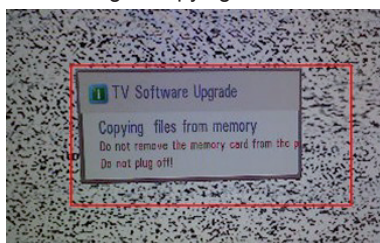
Please Check the Speed :
To use speed between
from 200KHz to 400KHz

- (5) Click "Auto" tab and set as below.
- (6) Click "Run".
- (7) After downloading, check "OK" message.

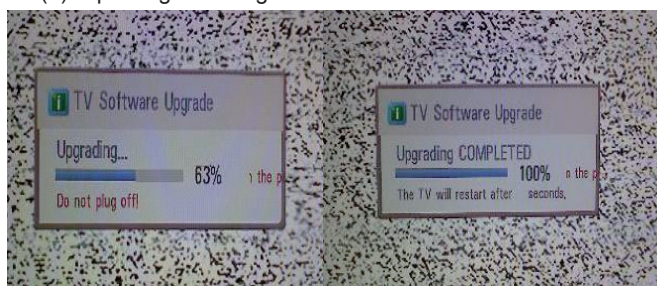


* USB DOWNLOAD(*.epk file download)

- (1) Put the USB Stick to the USB socket
- (2) Automatically detecting update file in USB Stick
 - If your downloaded program version in USB Stick is Low, it didn't work.
 - But your downloaded version is High, USB data is automatically detecting
- (3) Show the message "Copying files from memory"



- (4) Updating is starting.



- (5) Updating Completed, The Multi-vision will restart automatically.
- (6) If your Multi-vision is turned on, check your updated version and Tool option. (explain the Tool option, next stage)

* After downloading, have to adjust TOOL OPTION again.

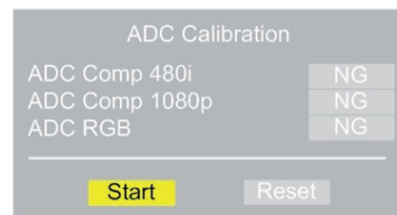
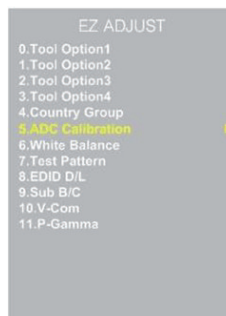
- 1) Push "IN-START" key in service remote controller.
- 2) Select "Tool Option 1" and Push "OK" button.
- 3) Punch in the number. (Each of models has their number.)
- 4) Completed selecting Tool option.

	42PA45*-Z*
Tool option 1	24576
Tool option 2	21802
Tool option 3	3697
Tool option 4	54726
Tool option 5	10

3.1. ADC Process

3.1.1. ADC

- Enter Service Mode by pushing "ADJ" key,
- Enter Internal ADC mode by pushing "▶" key at "5. ADC Calibration"



* Caution : Using 'power on' button of the Adjustment R/C , power on Multi-vision.

* ADC Calibration Protocol (RS232)

NO	Enter Adjust MODE	ADC adjust
Item	Adjust 'Mode In'	ADC Adjust
CMD 1	A	A
CMD 2	A	D
Data 0	0	0
	1	0
	When transfer the 'Mode In', Carry the command.	Automatically adjustment (The use of a internal pattern)

- Adjust Sequence

- aa 00 00 [Enter Adjust Mode]
- xb 00 40 [Component1 Input (480i)]
- ad 00 10 [Adjust 480i Comp1]
- xb 00 60 [RGB Input (1024*768)]
- ad 00 10 [Adjust 1024*768 RGB]
- aa 00 90 End Adjust mode

* Required equipment : Adjustment R/C.

3.2. Function Check

3.2.1. Check display and sound

- Check Input and Signal items. (cf. work instructions)
 - 1) COMPONENT (480i)
 - 2) RGB (PC : 1024 x 768 @ 60hz)
 - 3) HDMI
 - 4) DVI
 - 5) PC Audio In
- * Display and Sound check is executed by Remote controller.

* Caution : Not to push the INSTOP KEY after completion if the function inspection.

4. Total Assembly line process

4.1. POWER PCB Assy voltage adjustment

(Vs voltage adjustment)

- Required Equipment for adjustment
 - D.M.M
- Condition for adjustment
 - No signal with the snow noise in RF mode

4.2. Adjustment Preparation

- Required Equipment
 - Remote controller for adjustment
 - Color Analyzer (CS-1000, CA-100,100+,CA-210 or same product : CH 11 (PDP)
- * Please adjust CA-210, CA-100+ by CS-1000 before measuring
 - Auto W/B adjustment instrument(only for Auto adjustment)
 - 9 Pin D-Sub Jack(RS232C) is connected to the AUTO W/B EQUIPMENT.

Before Adjust of White Balance, Please press POWER ONLY key

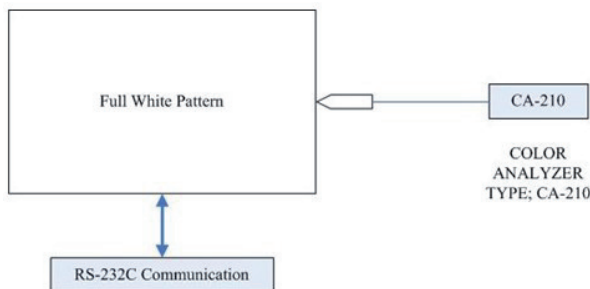
- Adjust Process will start by execute RS232C Command.
- Color temperature standards according to CSM and Module

CSM	PLASMA
Cool	11000K
Medium	9300K
Warm	6500K

- CS-1000/CA-100+/CA-210(CH 10) White balance adjustment coordinates and color temperature.

CSM	Color Coordination		Temp	± Color Coordination
	x	y		
COOL	0.276	0.283	11000K	0.002
MEDIUM	0.285	0.293	9300K	0.002
WARM	0.313	0.329	6500K	0.002

- * Connecting picture of the measuring instrument (On Automatic control)
 - Inside PATTERN is used when W/B is controlled. Connect to auto controller or push Adjustment R/C POWER-ON -> Enter the mode of White-Balance, the pattern will come out.



* Auto-control interface and directions

- 1) Adjust in the place where the influx of light like floodlight around is blocked. (Illumination is less than 100Lux).
- 2) Adhere closely the Color Analyzer (CA210) to the module less than 10cm distance, keep it with the surface of the Module and Color Analyzer's Probe vertically. (80~100°).
- 3) Aging time
 - After aging start, keep the power on (no suspension of power supply) and heat-run over 5 minutes.
 - Using 'no signal' or 'full white pattern' or the others, check the back light on.

■ Auto adjustment Map(RS-232C)

RS-232C COMMAND

[CMD ID DATA]

Wb 00 00 White Balance Start
Wb 00 ff White Balance End

	RS-232C COMMAND [CMD ID DATA]			M I N	CENTER (DEFAULT)			M A X
	Cool	Mid	Warm		Cool	Mid	Warm	
R Gain	jd	Ja	jd	00	172	192	192	192
G Gain	jh	Jb	je	00	172	192	192	192
B Gain	ji	Jc	jf	00	192	192	172	192
R Cut					64	64	64	128
G Cut					64	64	64	128
B Cut					64	64	64	128

* Caution

- Color Temperature : COOL, Medium, Warm.
- One of R Gain/G Gain/ B Gain should be kept on 0xC0, and adjust other two lower than C0. (when R/G/B Gain are all C0, it is the FULL Dynamic Range of Module)

* Manual W/B process using adjusts Remote control.

- After enter Service Mode by pushing "ADJ" key,
- Enter White Balance by pushing "►" key at "6. White Balance".
- Stick the sensor to the center of the screen and select each items(Red/Green/Blue Gain) using ▲/▼ (CH +/-) key on R/C.
- Adjust R/G/B Gain using ◀/▶ (VOL +/-) key on R/C.
- Adjust three modes all(Cool/Medium/Warm) : Fix the one of R/G/B Gain and Change the others.
- When the adjustment is completed, Enter "COPY ALL".
- Exit adjustment mode using EXIT key on R/C.

EZ ADJUST	
0.Tool Option1	
1.Tool Option2	
2.Tool Option3	
3.Tool Option4	
4.Country Group	
5.ADC Calibration	
6.White Balance	►
7.Test Pattern	
8.EDID D/L	
9.Sub B/C	
10.V-Com	
11.P-Gamma	

White Balance	
Color Temp.	Cool
R-Gain	172
G-Gain	172
B-Gain	192
R-Cut	64
G-Cut	64
B-Cut	64
Test-Pattern.	ON
Reset	To Set

- * After You finish all adjustments, Press “In-start” button and compare Tool option and Area option value with its BOM, if it is correctly same then unplug the AC cable.
If it is not same, then correct it same with BOM and unplug AC cable.
For correct it to the model’s module from factory JIG model.
- * Push The “IN STOP KEY” after completing the function inspection. And Mechanical Power Switch must be set “ON”
- * To check the coordinates of White Balance, you have to measure at the below conditions.
- Picture mode : Vivid, Energy Saving : Off, Below the Advanced control, Dynamic Contrast : Off, Dynamic Colour : Off Colour Temp.

Cool	30
Medium	0
Warm	30

-> Picture Mode change : Vivid -> Vivid(User)

4.3. DDC EDID Write (RGB 128Byte)

-> Not used any more, Use Auto D/L

- Connect D-sub Signal Cable to D-Sub Jack.
- Write EDID DATA to EEPROM (24C02) by using DDC2B protocol.
- Check whether written EDID data is correct or not.
- * For SVC main Ass’y, EDID have to be downloaded to Insert Process in advance.

4.4. DDC EDID Write (HDMI 256Byte)

-> Not used any more, Use Auto D/L

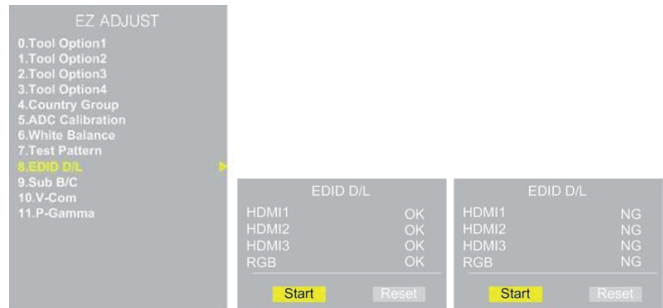
- Connect HDMI Signal Cable to HDMI Jack.
- Write EDID DATA to EEPROM(24C02) by using DDC2B protocol.
- Check whether written EDID data is correct or not.
- * For SVC main Ass’y, EDID have to be downloaded to Insert Process in advance.

4.5. EDID DATA

- (1) All Data : HEXA Value
- (2) Changeable Data :
 - * : Serial No : Controlled / Data:01
 - ** : Month : Controlled / Data:00
 - *** : Year : Controlled
 - **** : Check sum

4.6. EDID DATA Auto Download

- (1) Press Adj. key on the Adj. R/C,
- (2) Select EDID D/L menu.
- (3) By pressing Enter key, EDID download will begin
- (4) If Download is successful, OK is display, but If Download is failure, NG is displayed.
- (5) If Download is failure, Re-try downloads.

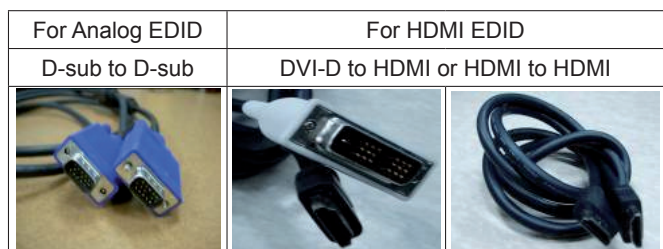


- * Caution : Never connect HDMI & D-sub Cable when EDID downloaded.

- Edid data and Model option download (RS232)
- Manual Download

NO	Enter download MODE	EDID data Model option download
Item	download 'Mode In'	download
CMD 1	A	A
CMD 2	A	E
Data 0	0	00
	0	10
	When transfer the 'Mode In', Carry the command.	Automatically download (The use of a internal pattern)

- * Caution
 - Use the proper signal cable for EDID Download
 - Analog EDID : Pin3 exists
 - Digital EDID : Pin3 exists
- * Caution
 - Never connect HDMI & D-sub Cable at the same time.
 - Use the proper cables below for EDID Writing.
 - Download HDMI1, HDMI2 separately because HDMI1 is different from HDMI2.



For Analog EDID		For HDMI EDID	
D-sub to D-sub		DVI-D to HDMI or HDMI to HDMI	
No.	Item	Condition	Hex Data
1	Manufacturer ID	GSM	1E6D
2	Version	Digital : 1	01
3	Revision	Digital : 3	03

* 2D HD EDID data
- 2D HD RGB EDID data

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	16	01	03	68	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	01	01	01	01
30	01	01	01	01	01	01	64	19	00	40	41	00	26	30	18	88
40	36	00	B0	84	43	00	00	18	A0	0F	20	00	31	58	1C	20
50	28	80	14	00	B0	84	43	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	00	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	00	58

- 2D HD HDMI1 EDID data

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	16	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	01	01	01	01
30	01	01	01	01	01	01	64	19	00	40	41	00	26	30	18	88
40	36	00	B0	84	43	00	00	18	A0	0F	20	00	31	58	1C	20
50	28	80	14	00	B0	84	43	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	00	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	3F

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	25	F1	4D	10	1F	04	93	05	14	03	02	12	20	22
10	15	01	26	15	07	50	09	57	07	67	03	0C	00	10	00	80
20	2D	E3	05	03	01	01	1D	00	72	51	D0	1E	20	6E	28	55
30	00	40	84	63	00	00	1E	02	3A	80	18	71	38	2D	40	58
40	2C	45	00	40	84	63	00	00	1E	01	1D	80	18	71	1C	16
50	20	58	2C	25	00	40	84	63	00	00	9E	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	34

- 2D HD HDMI2 EDID data

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	16	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	01	01	01	01
30	01	01	01	01	01	01	64	19	00	40	41	00	26	30	18	88
40	36	00	B0	84	43	00	00	18	A0	0F	20	00	31	58	1C	20
50	28	80	14	00	B0	84	43	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	00	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	3F

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	25	F1	4D	10	1F	04	93	05	14	03	02	12	20	22
10	15	01	26	15	07	50	09	57	07	67	03	0C	00	10	00	80
20	2D	E3	05	03	01	01	1D	00	72	51	D0	1E	20	6E	28	55
30	00	40	84	63	00	00	1E	02	3A	80	18	71	38	2D	40	58
40	2C	45	00	40	84	63	00	00	1E	01	1D	80	18	71	1C	16
50	20	58	2C	25	00	40	84	63	00	00	9E	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	24

- 2D HD HDMI3 EDID data

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	16	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	01	01	01	01
30	01	01	01	01	01	01	64	19	00	40	41	00	26	30	18	88
40	36	00	B0	84	43	00	00	18	A0	0F	20	00	31	58	1C	20
50	28	80	14	00	B0	84	43	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	00	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	3F

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	25	F1	4D	10	1F	04	93	05	14	03	02	12	20	22
10	15	01	26	15	07	50	09	57	07	67	03	0C	00	10	00	80
20	2D	E3	05	03	01	01	1D	00	72	51	D0	1E	20	6E	28	55
30	00	40	84	63	00	00	1E	02	3A	80	18	71	38	2D	40	58
40	2C	45	00	40	84	63	00	00	1E	01	1D	80	18	71	1C	16
50	20	58	2C	25	00	40	84	63	00	00	9E	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	14

* Vender ID

Input	HEX
HDMI1	10
HDMI2	20
HDMI3	30

* Checksum: Changeable by total EDID data.

EDID C/S data		2D-HD	
		HDMI	RGB
check sum (Hex)	Block 0	0x3F	0x58
	Block 1	0x34(HDMI1)	
		0x24(HDMI2)	
		0x14(HDMI3)	

4.7. Checking the EYE-Q Operation.

- (1) Press the EYE Key on the adjustment remote controller.
- (2) Check the Sensor DATA (It must be under 10) and keep the data longer than 1.5s
- (3) Check 'OK'

Green Eye-Check(Factory Mode)	
Sensor Data	9
Power saving mode	1
	OK

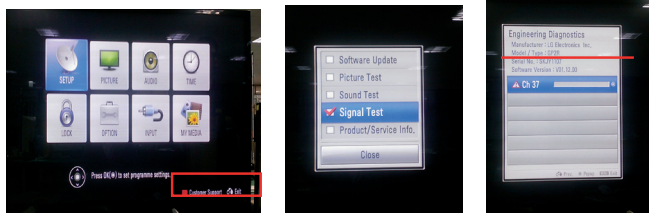
(Sensor DATA 0 ~ 4095, Power Saving Mode 0 ~ 12)

* IF you press IN-STAP Button, change Green Eye-check OSD.

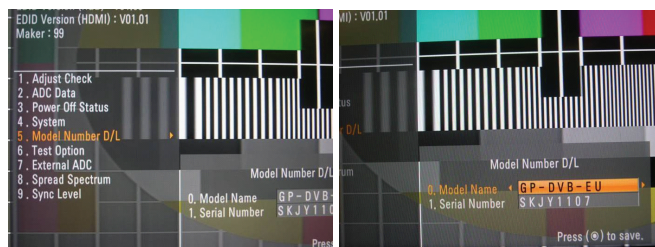
5. Model name & Serial number Download

5.1. Model name & Serial number D/L

- Press "Power on" key of service remocon.(Baud rate : 115200 bps)
- Connect RS232 Signal Cable to RS-232 Jack.
- Write Serial number by use RS-232.
- Must check the serial number at signal test of customer support. (Refer to below).



- 1) Press the 'instart' key of ADJ remote controller.
- 2) Go to the menu '5.Model Number D/L' like below photo.
- 3) Input the Factory model name or Serial number like photo.



- 4) Check the model name Instart menu -> Factory name displayed.
- 5) Check the Diagnostics (DTV country only) -> Buyer model displayed

5.2. Signal TABLE

CMD	LENGTH	ADH	ADL	DATA_1	...	Data_n	CS	DELAY
-----	--------	-----	-----	--------	-----	--------	----	-------

CMD: A0h

LENGTH : 85~94h (1~16 bytes)

ADH : EEPROM Sub Address high (00~1F)

ADL : EEPROM Sub Address low (00~FF)

Data : Write data

CS : CMD + LENGTH + ADH + ADL + Data_1 + ... + Data_n

Delay : 20ms

5.3. Command Set

* Description

No.	1
Adjust mode	EEPROM WRITE
CMD(hex)	A0h
LENGTH(hex)	84h+n
Description	n-bytes Write (n = 1~16)

FOS Default write : <7mode data> write

Vtotal, V_Frequency, Sync_Polarity, Htotal, Hstart, Vstart, 0, Phase

Data write : Model Name and Serial Number write in EEPROM,.

5.4. Method & Notice

- (1) Serial number D/L is using of scan equipment.
- (2) Setting of scan equipment operated by Manufacturing Technology Group.
- (3) Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0

* Manual Download (Model Name and Serial Number)

If the TV set is downloaded By OTA or Service man, Sometimes model name or serial number is initialized.(Not always)

There is impossible to download by bar code scan, so It need Manual download.



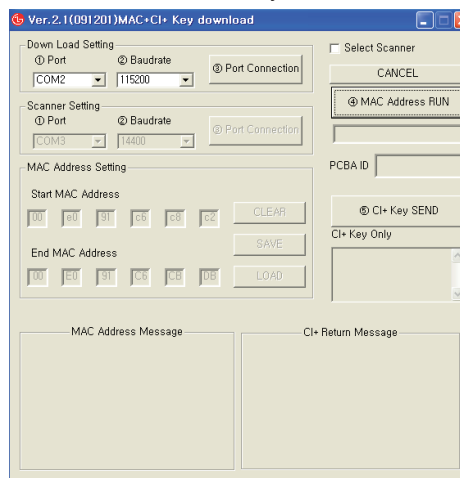
6. Download CI+ Key (EU model only)

* Connect TV SET and PC which download keys Writing program by RS232C-Cable

- (1) Start "CIKeyl.exe"Program and Click (3) Button to connect TV and PC.

- (2) Click (5) to download CI+ Key.

43 When download succeed, you can see "OK" on (6)



■ Check the method of RS232C Command

(1) into the main ass'y mode (RS232 : aa 00 00)

CMD1	CMD2	Data 0	
A	A	0	0

(2) check the key download for transmitted command (RS232 : ci 00 10)

CMD1	CMD2	Data 0	
C	1	1	0

(3) result value

- normally status for download : OKx
- abnormally status for download : NGx

■ Check the method of CI+ Key value (RS232)

(1) into the main ass'y mode (RS232 : aa 00 00)

CMD1	CMD2	Data 0	
A	A	0	0

(2) check the mothod of CI+ key by command (RS232 : ci 00 20)

CMD1	CMD2	Data 0	
C	1	1	0

(3) result value

i 01 OK 1d1852d21c1ed5dcx
 └─> CI+ Key Value

(3) result value

- normally status for download : OKx
- abnormally status for download : NGx

8. SW Download Guide.

* Put a *.bin to USB Stick and Turn on TV

(1) Put the USB Stick to the USB socket

(2) Automatically detecting update file in USB Stick

* If your downloaded program version in USB Stick is Low, it didn't work.

But your downloaded version is High, USB data is automatically detecting.

(3) Show the message "Copying files from memory"

(4) Updating is starring.

(5) Updating Completed, The TV will restart automatically.

After turn on TV, Please press 'IN-STOP' button on ADJ Remote-control.

* IF you don't have ADJ R/C, enter 'Factory Reset' in OP-TION MENU.

(6) When TV turn on, check the Updated version on Diagnostics MENU.

7. Download MAC Address, CI+ Key and widevine Key.

- Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).

-> MAC Address need only DVB-T2 Model (ex.50PA650T-ZA).

* Connect TV SET and PC which download keys Writing program by RS232C-Cable

1) Start "MAC+CIKey.exe"Program and Click (3) Button to connect TV and PC.

2) Click (4) to download MAC Address.

3) Click (5) to download CI+ Key.

4) When download succeed, you can see "OK" on (6)

* Each Chassis has it's own MAC Address. Please be careful of download.

■ Check the method of RS232C Command

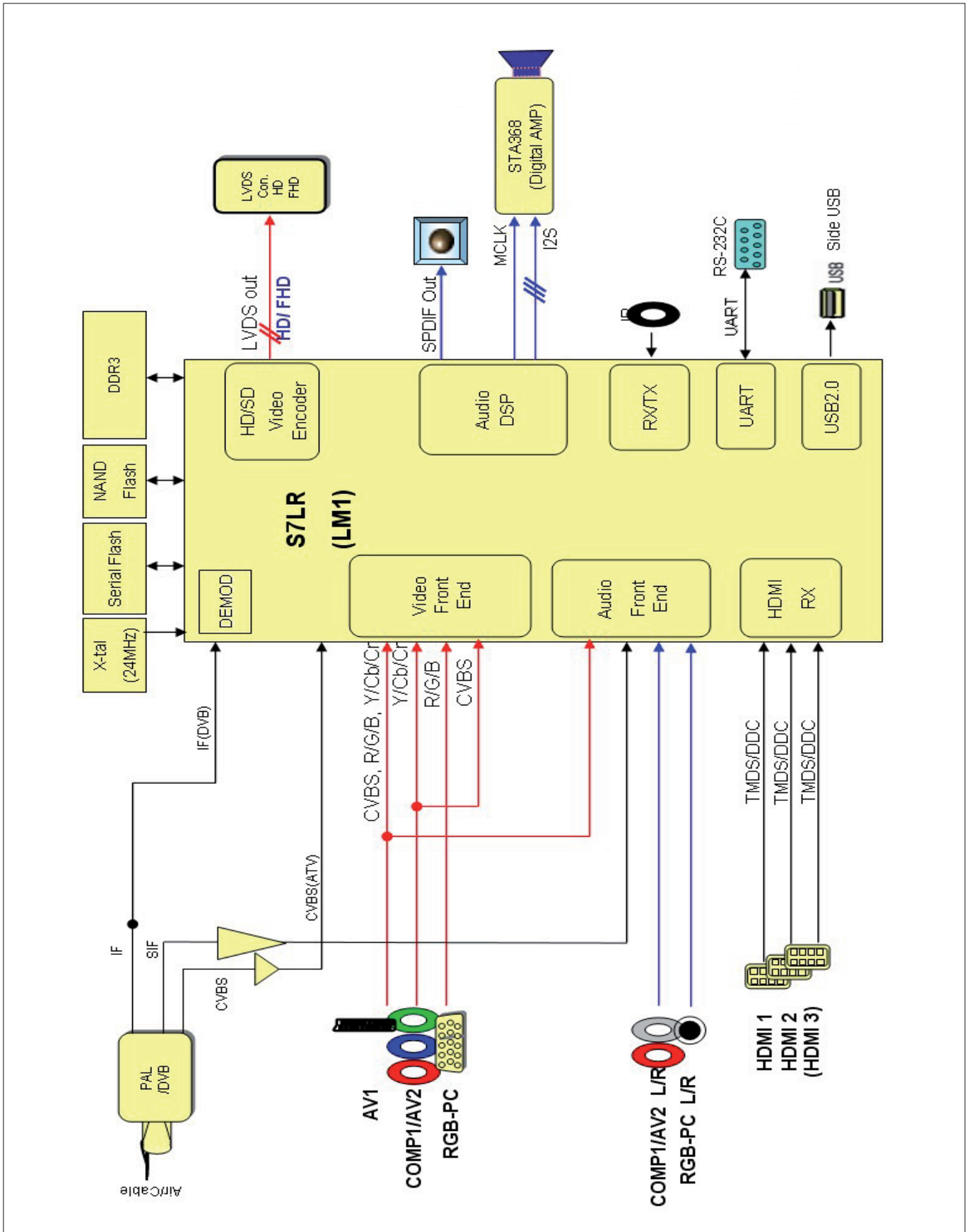
(1) into the main ass'y mode (RS232 : aa 00 00)

CMD1	CMD2	Data 0	
A	A	0	0

(2) check the key download for transmitted command (RS232 : ci 00 10)

CMD1	CMD2	Data 0	
C	1	1	0

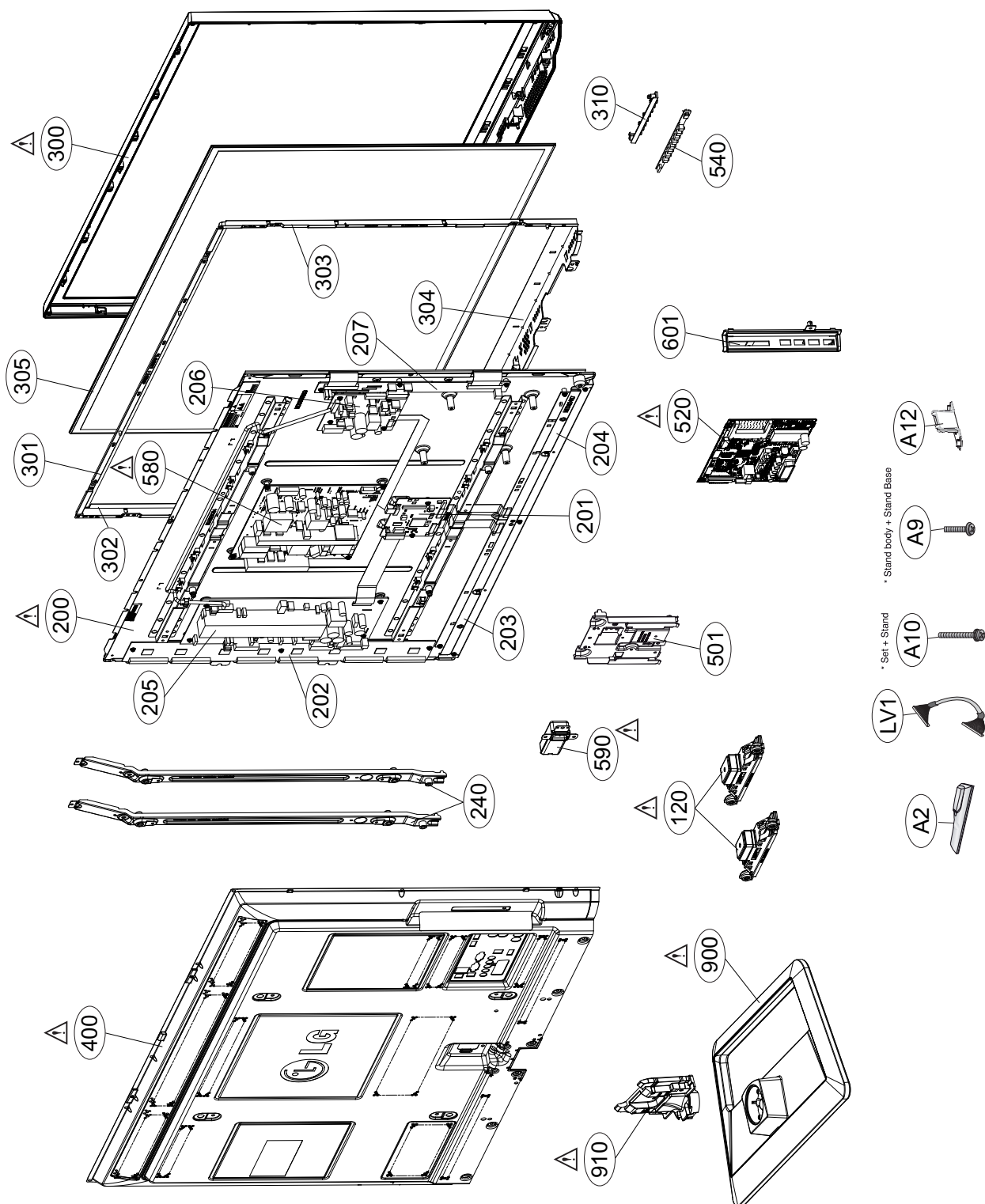
BLOCK DIAGRAM



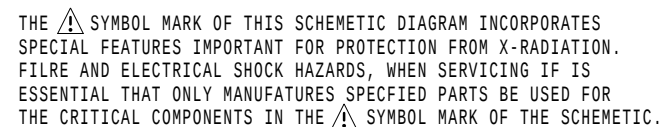
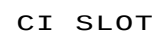
EXPLODED VIEW

IMPORTANT SAFETY NOTICE

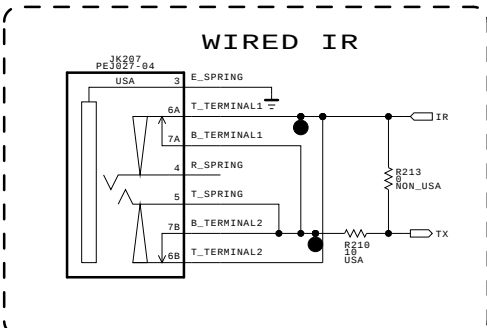
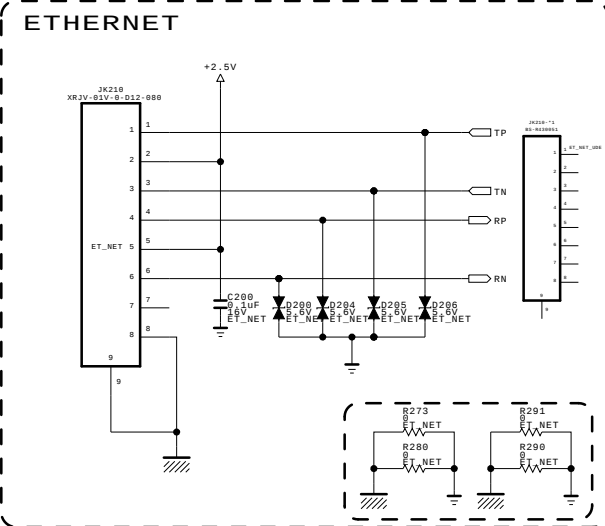
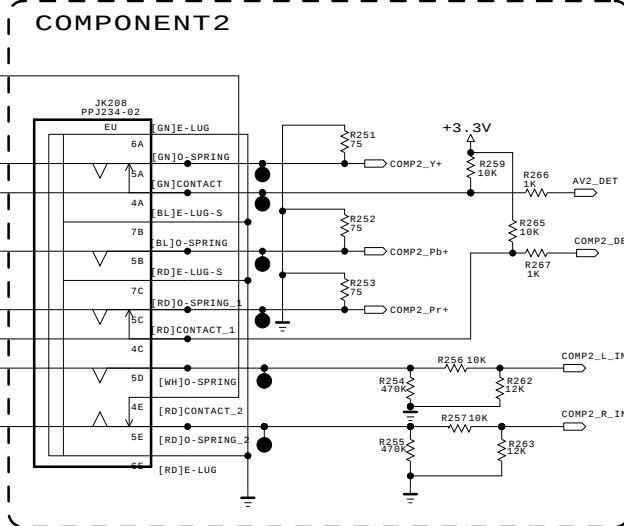
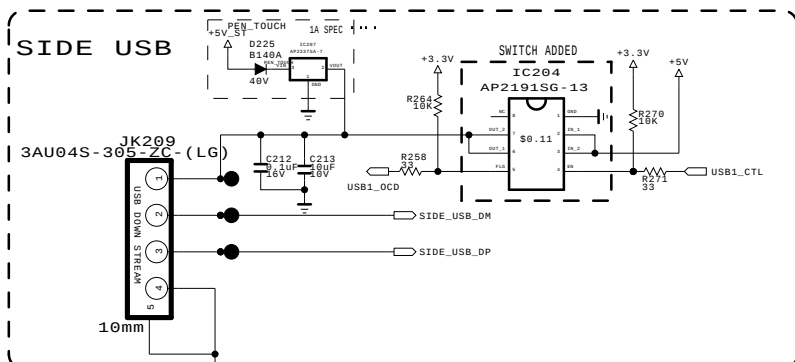
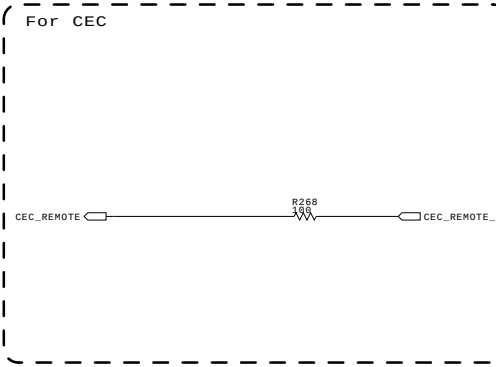
Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by Δ in the Schematic Diagram and EXPLODED VIEW. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.



PDP GP4 S7LR3
EAX64696601



MODEL	GP4_S7LR3	DATE	2011-12-01
BIOS PK	SCART, CI Slot	54FEET	1 / 7

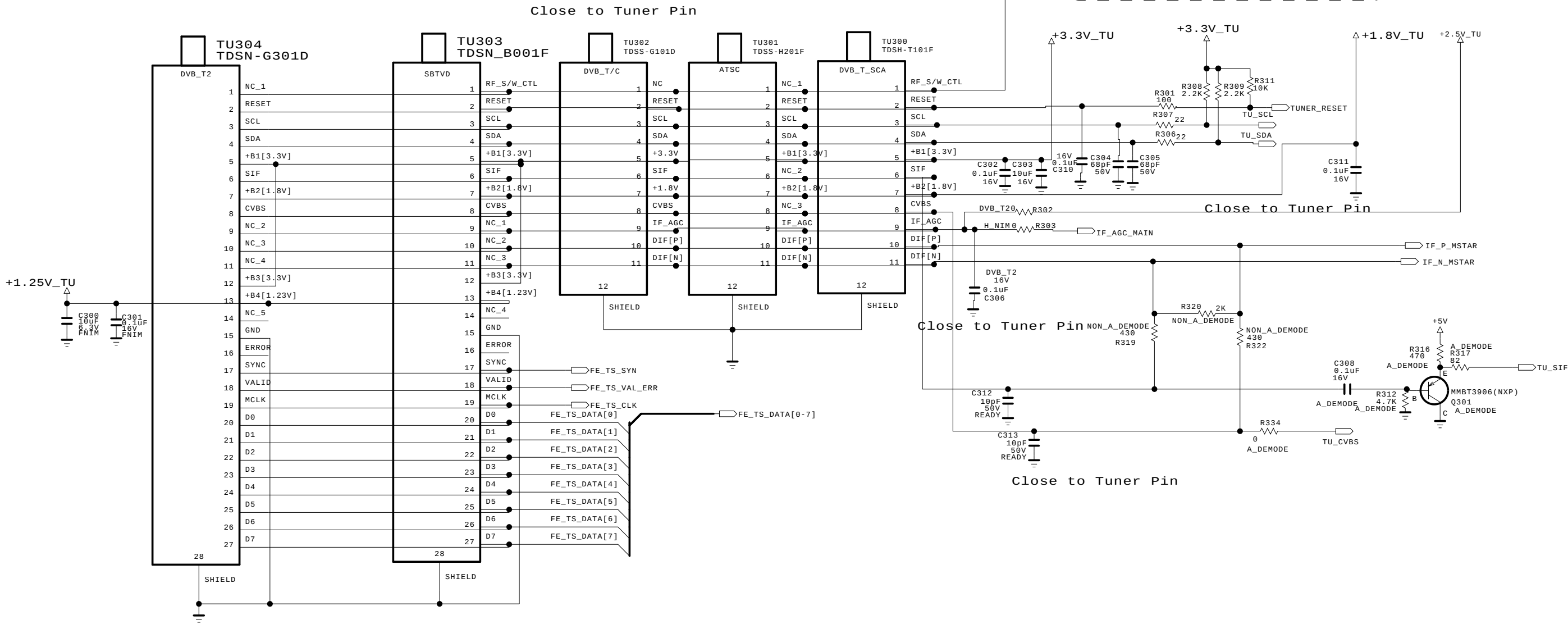
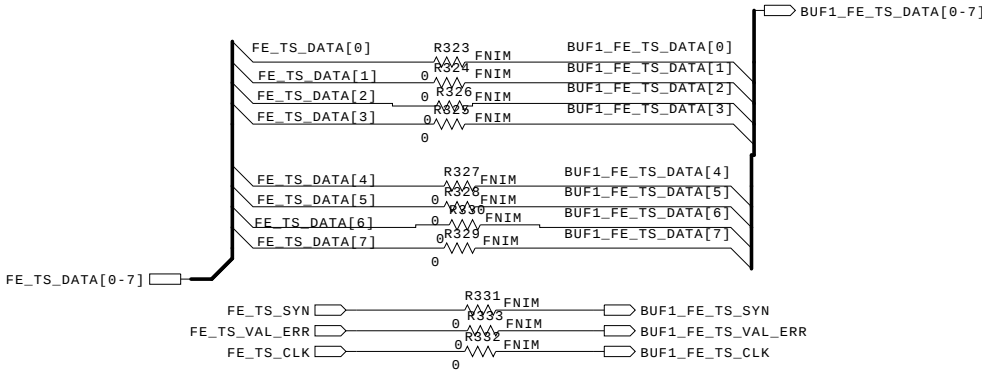
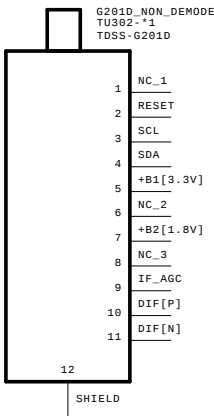


SECRET
LGElectronics



TUNER

TUNER	OPT1	OPT2	OPT3
TDSS-G201D	DVB-T/C	HNIM	X
TDSS-H201F	ATSC	HNIM	X
TDSH-T101F	DVB-T_SCA	HNIM	RF_SW
TDSN_B001F	SBTVD	FNIM	RF_SW
TDSN_G301D	DVB_T2	FNIM	X



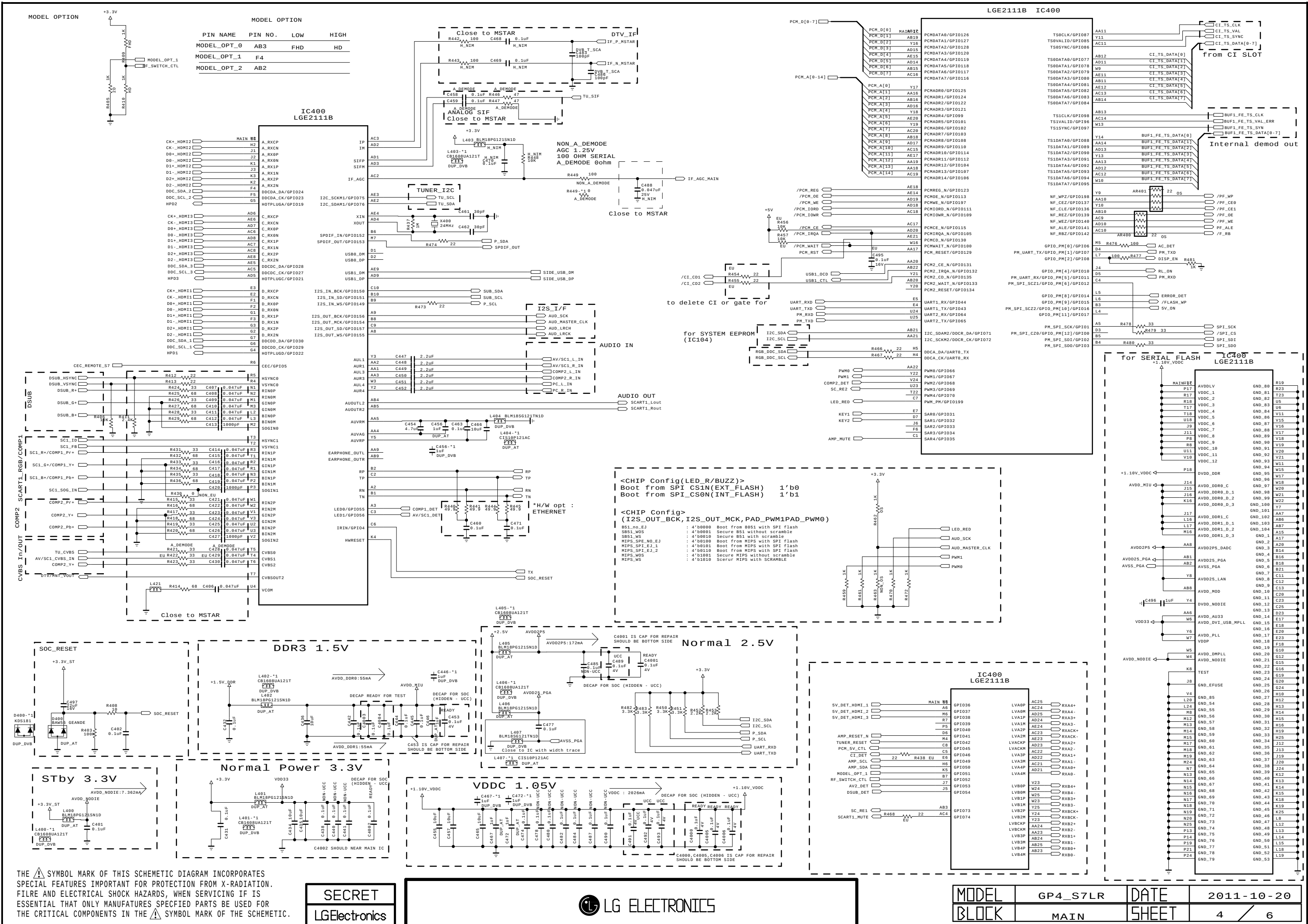
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

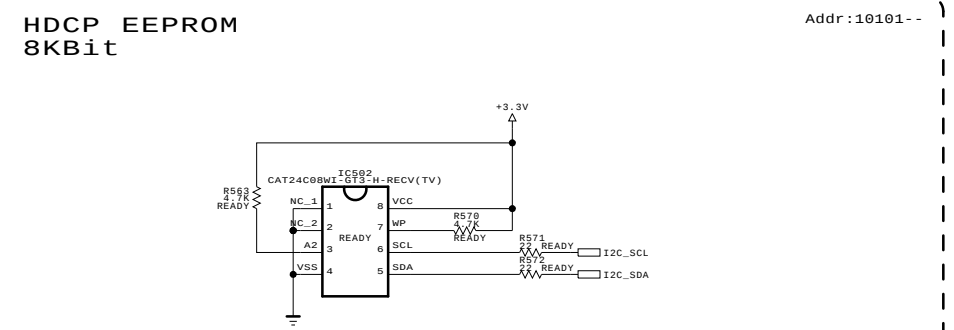
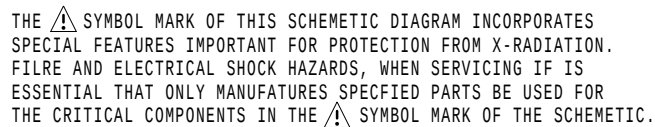
SECRET

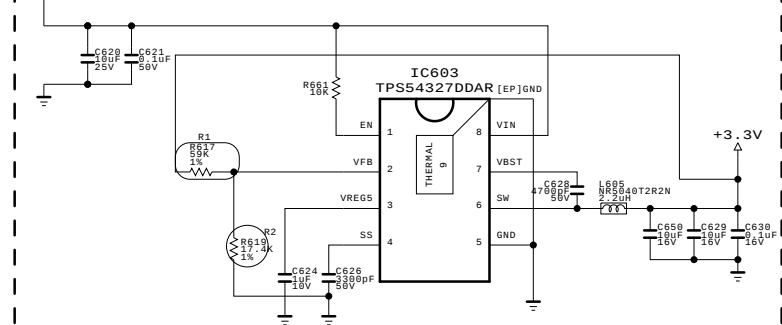
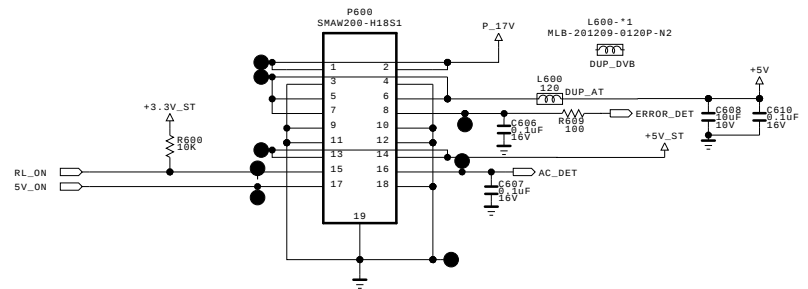
LGElectronics

 LG ELECTRONICS

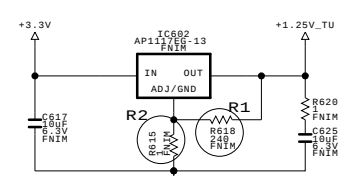
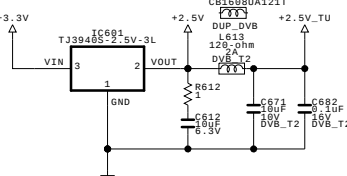
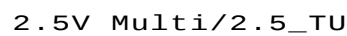
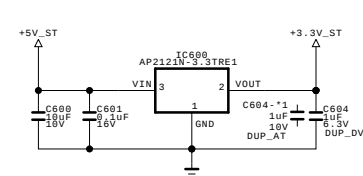
MODEL		DATE	
BLOCK	Tuner block	SHEET	3 / 6



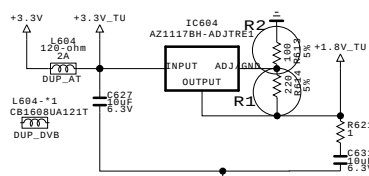
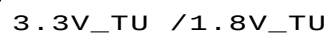




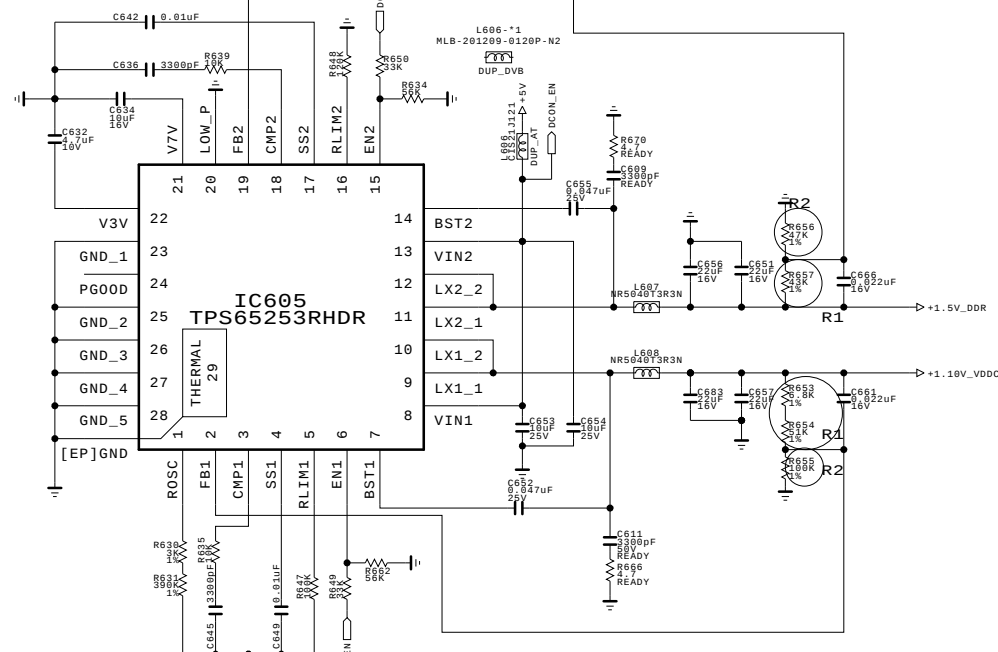
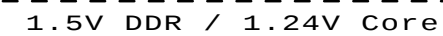
$$V_{out} = 0.765 * (1 + R1/R2)$$



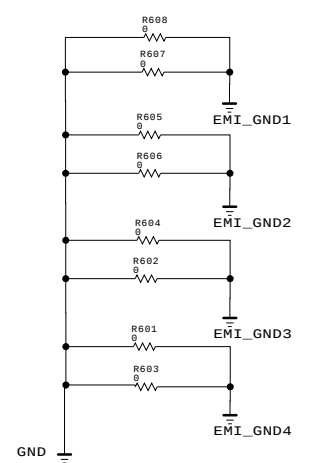
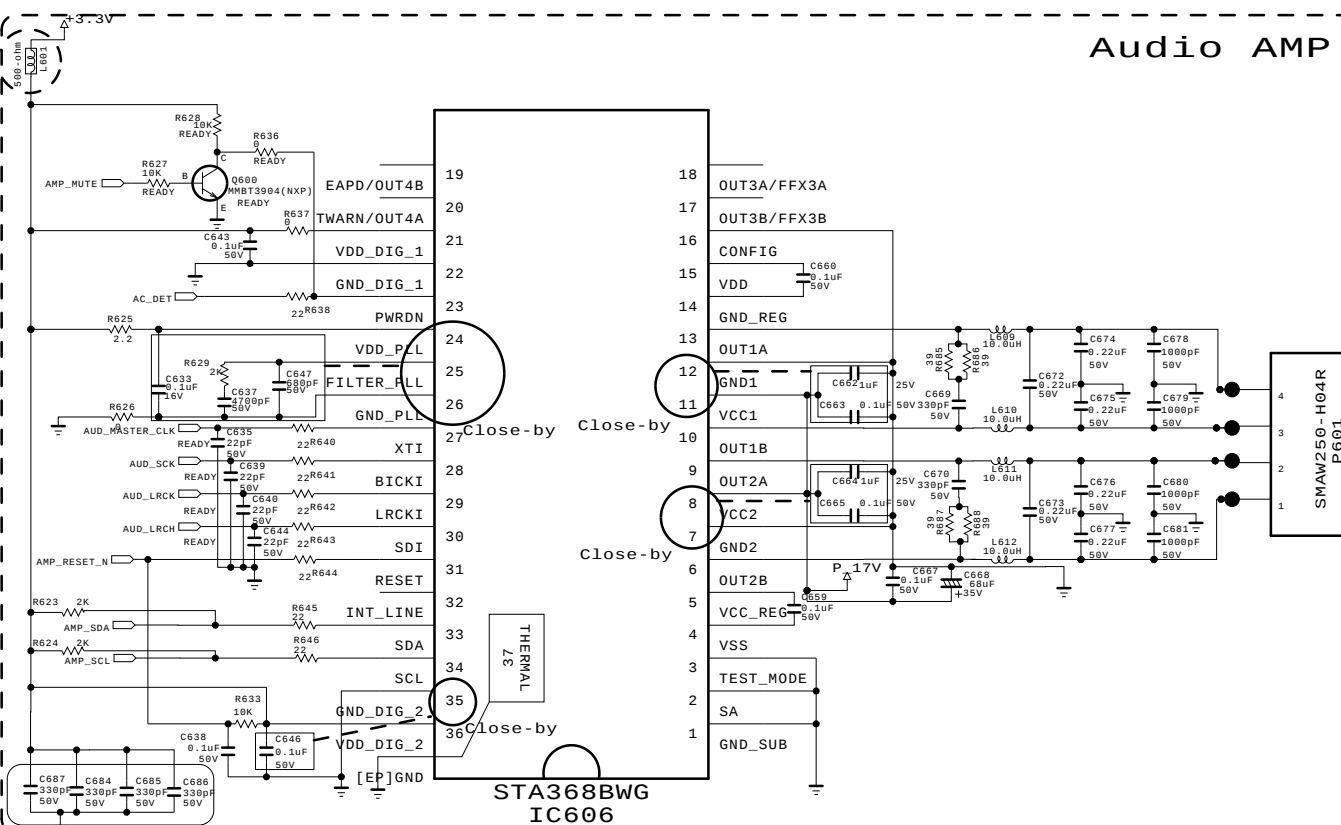
$$V_{out} = 1.25 * (1 + R2/R1)$$



$$V_{out} = 1.25 * (1 + R2/R1)$$



$$V_{out} = 0.8 * (1 + R1/R2)$$

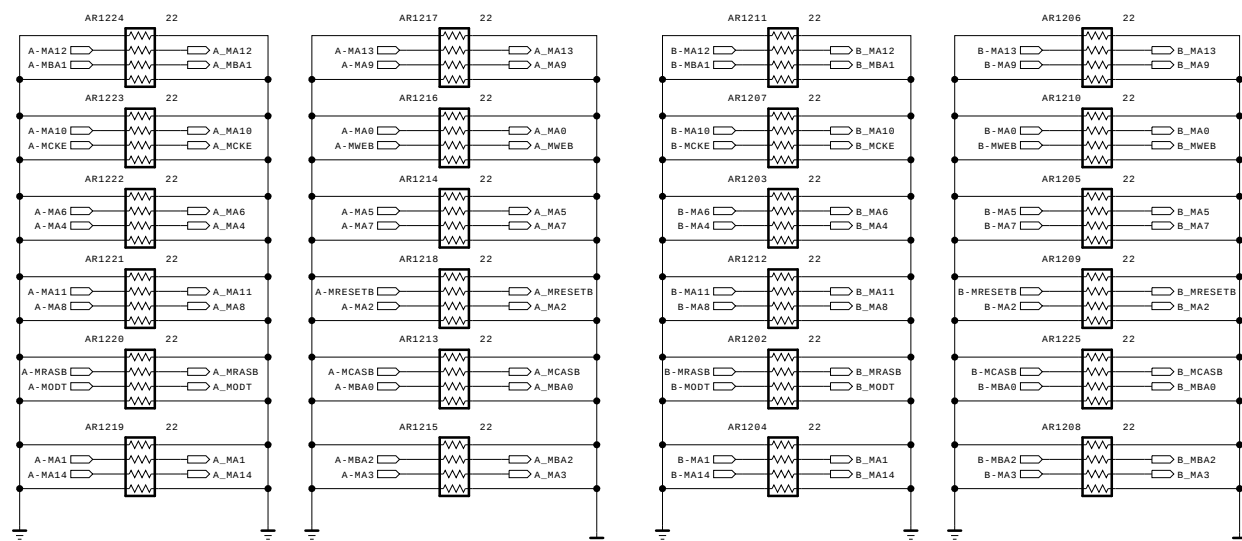
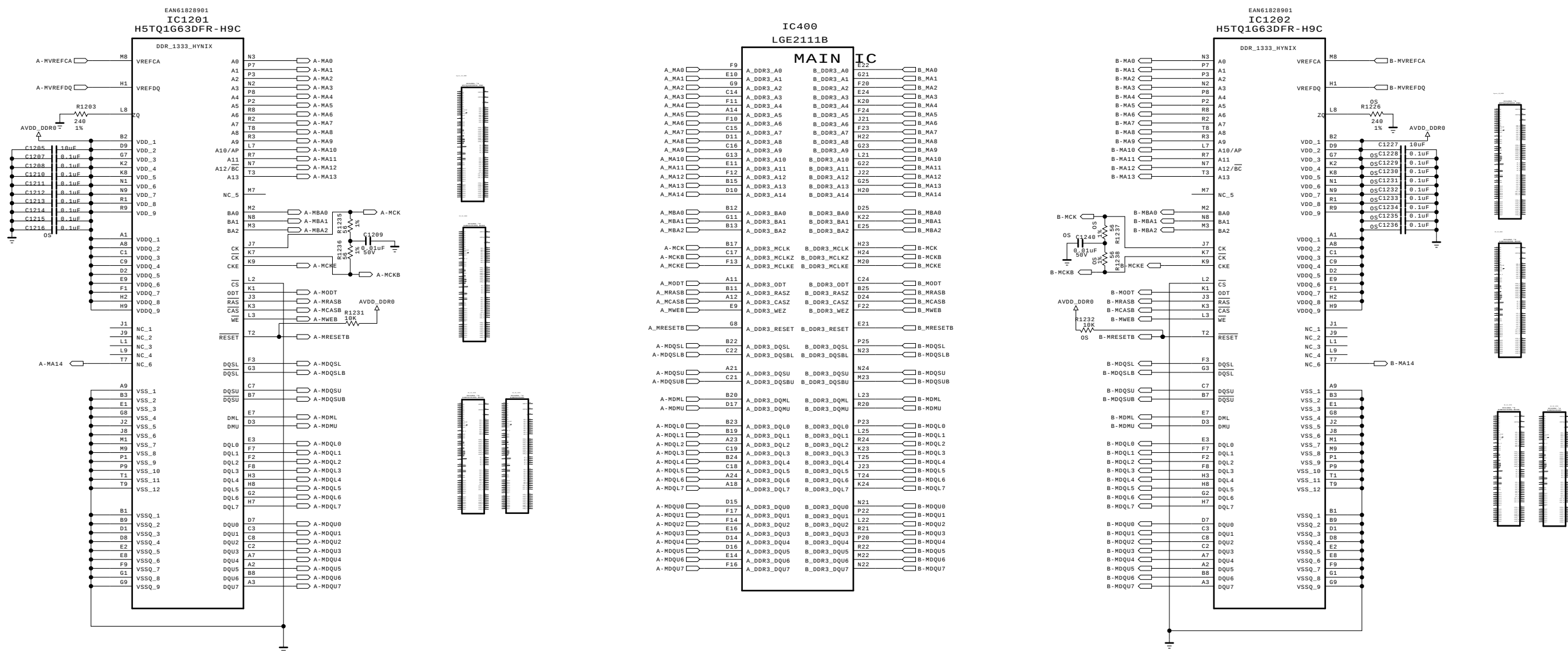


THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET
LG Electronics



MODEL	GP4_S7LR	DATE	2011-04-01
BLK	Power, AMP	SHEET	6 /



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILTRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET
G Electronics

MODEL	GP4L_S7LR2	DATE	2011/06/03
BLOCK	DDR_256	SHEET	12 /

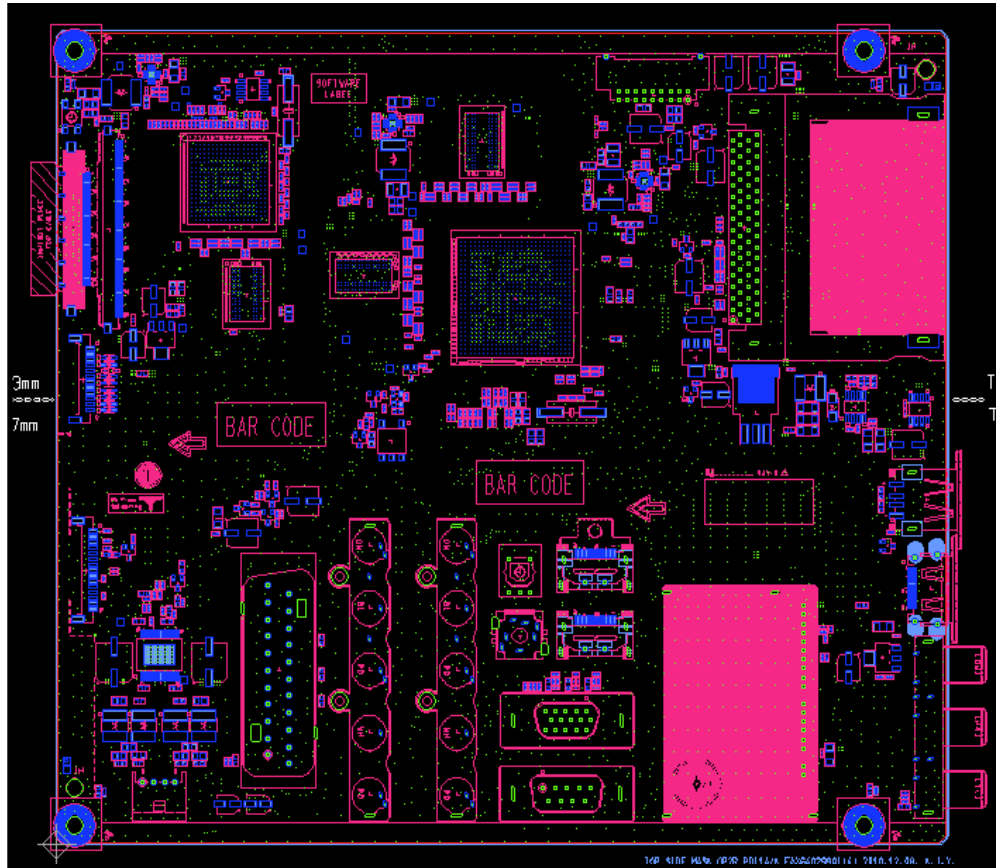


GP2R, LM1 Training Manual

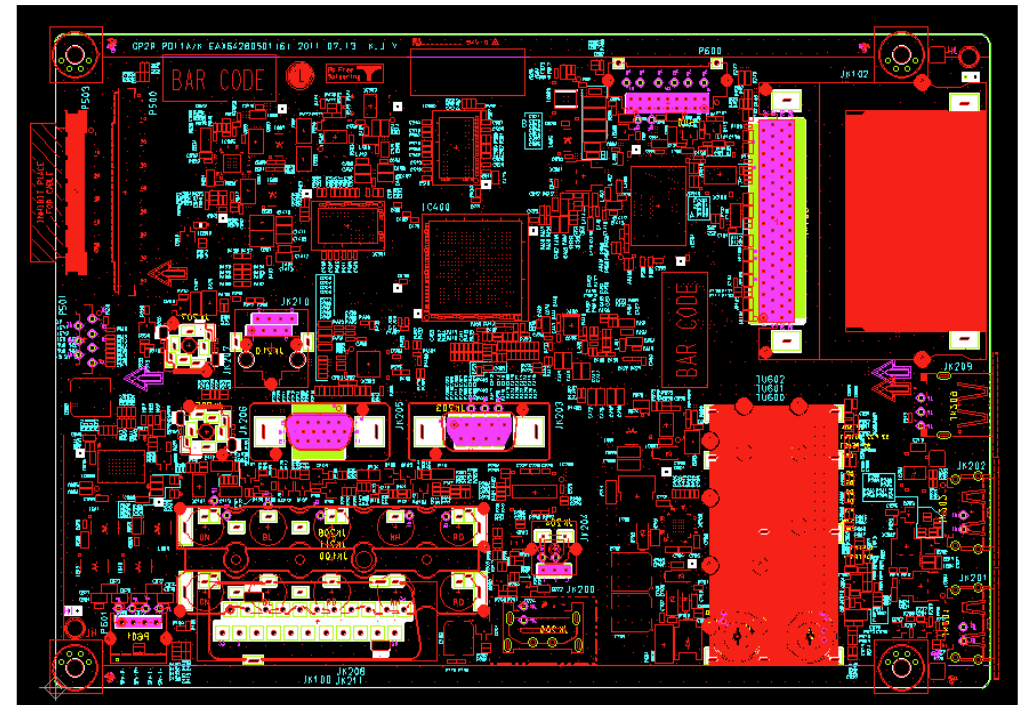
Table of contents

- 1. PCB layout.**
- 2. GP2R vs LM1**
- 3. GP2R. (Block, Power, I2C)**
- 4. LM1. (Block, Power, I2C)**
- 5. LM1 SOC Power sequence.**
- 6. Memory test.**
- 7. Pen touch overview.**

1. PCB Layout.



GP2R (206 x 183)



LM1 (206 x 141.5)

- ※ LM1 use internal EDID&HDCP. (LM1 is Removing the EEPROM for EDID&HDCP)
- LM1 is optimizing Power block. (LM1 is reducing DC/DC, LDO, power application)

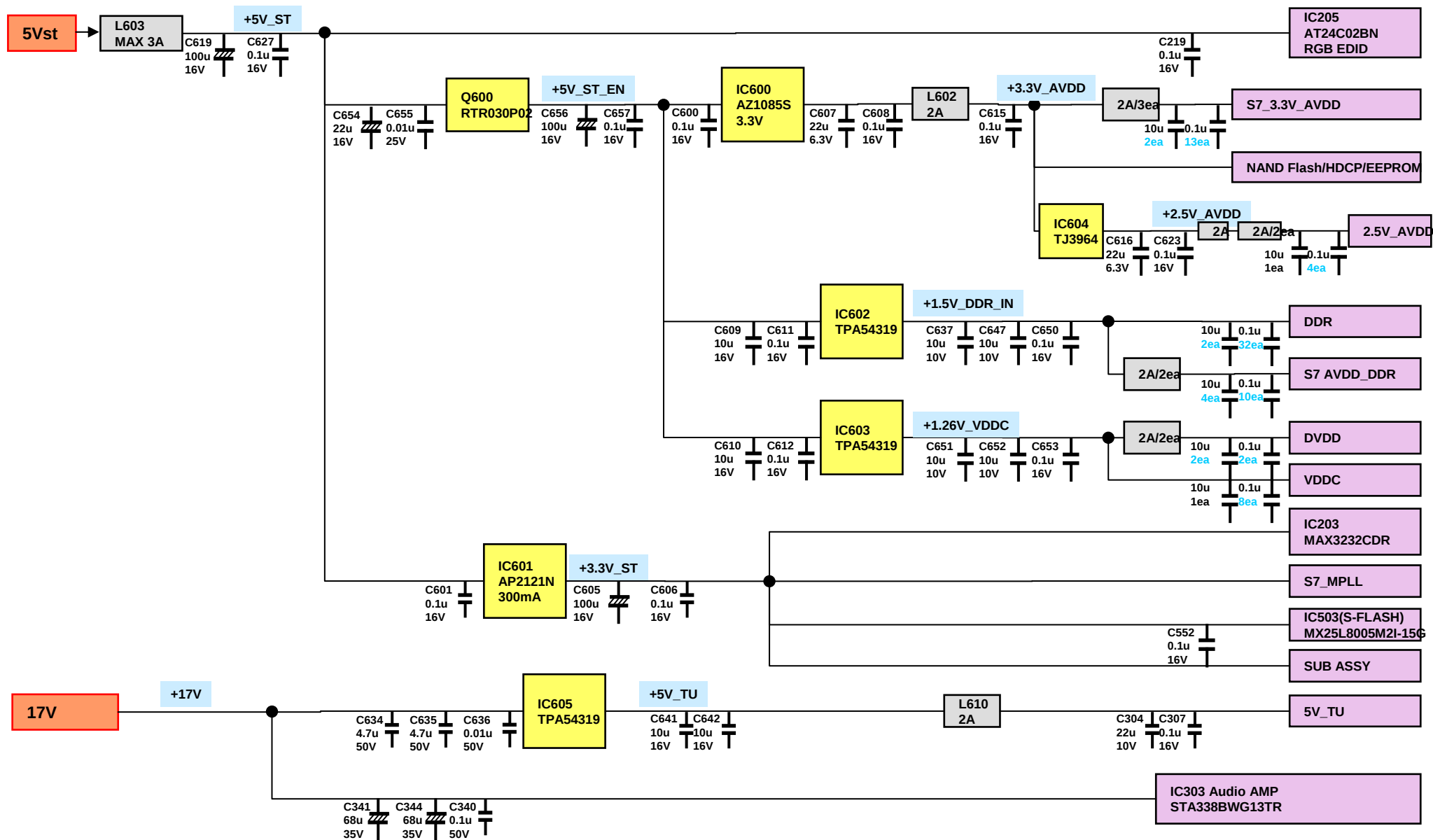
2. GP2R vs GP4 LM1.

Difference		GP2R 50PZ550	LM1 50PA6500	Changes
PDP Module		R3(FHD)	R4(FHD)	New module. 50R4 Initial model.
Tool		PZ Tool	PA Tool	12' years New tool.
VSC	PCB	206x183	206x141.5	change PCB Size. (smaller than GP2R.)
	Main IC	S7R	S7LR	Internal sub-Micom .(PM block)
	Jack Layout	Slim Depth	Slim Depth	Same.
Sub Assy		PZ Tool	PA Tool	GP2R 15pin, LM1 8pin
PSU		50R3 XP5 B'd	50R4 UP1 B'd	Reduce power on time.
SW		GP2R	LM1	PDP only code.
JIG		GP2R	LM1	Support DFT JIG.
-		.	.	Develop new WAFER and CABLE. (12 years)
Power Wafer		18P	18P	Stand by 0.3W ↓
Stand by 3.5V		O	O	Stand by 3.5V .
12V_secondary		X	X	Not use 12V.
IR Wafer		15P	8P	LM1 not support 3D.
USB		O	O	SIDE USB.
Memory		DDR3	DDR3	DDR3 1Gbit . 2ea

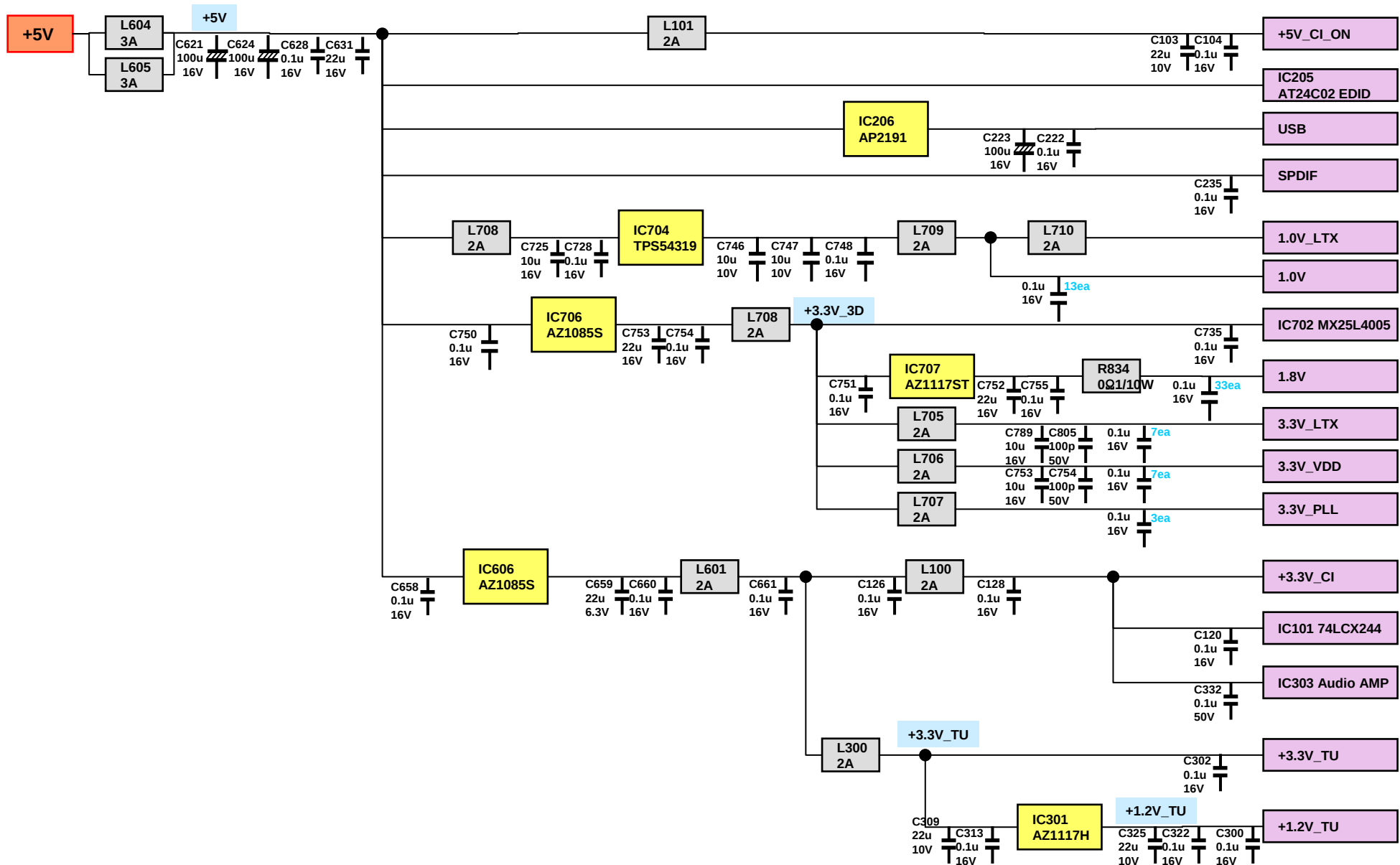
3. GP2R Power measure Summary

Power Line	Voltage Spec [V]	Voltage [V]	Ripple spec [Vpp]	Ripple [mV]	Current [A]	Remark
+5V_ST	4.845~5.355	5.01		86	0.009	
+5V_ST_EN	4.845~5.355	5.00		17	0.710	
+3.3V_AVDD	3.14~3.6	3.31	0.5	15	0.285	
+2.5V_AVDD	2.38~2.62	2.53		20	0.200	
+1.5V_DDR_IN	1.425~1.575	1.57	1.5V +/-5%	20	0.310	
+1.26V_VDDC	1.2~1.32	1.27		30	0.770	
+3.3V_ST	3.234~3.366	3.30	0.5	19	0.024	
+17V	16.15~17.85	17.03		1.09A	1.420	
+5V_TU	4.75~5.25	4.99	None	20	0.170	
+5V	4.845~5.355	5.03		57	2.600	
+3.3V_TU	3.15~3.46	3.26	None	26	0.320	
+1.2V_TU	1.20~1.32	1.27	None	21	0.300	

3-1. GP2R Power Block Diagram



3-2. GP2R Power Block Diagram

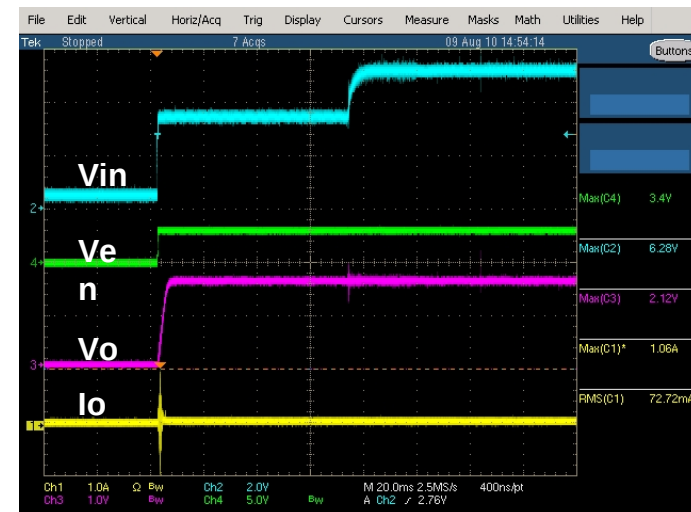


3-3. LDO/DC-DC Start up

IC600 (+3.3V_AVDD/AZ1085S)



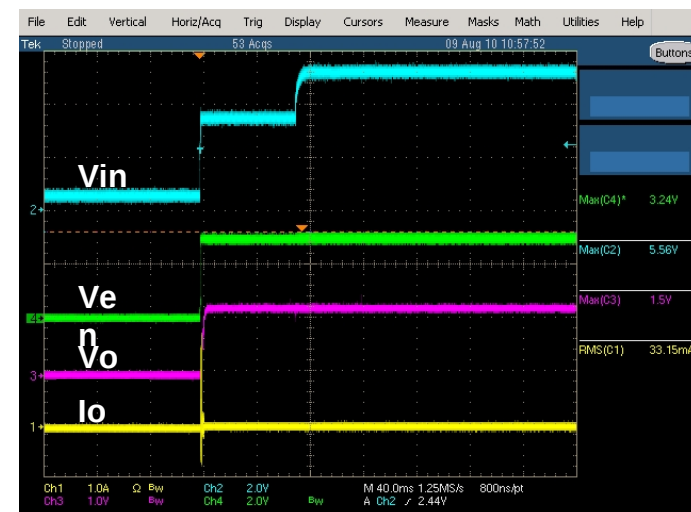
IC602 (+1.5V_DDR_IN/TPS54319)



IC604(+2.5V_AVDD/TJ3964S)



IC603 (+1.26V_VDDC/TPS54319)

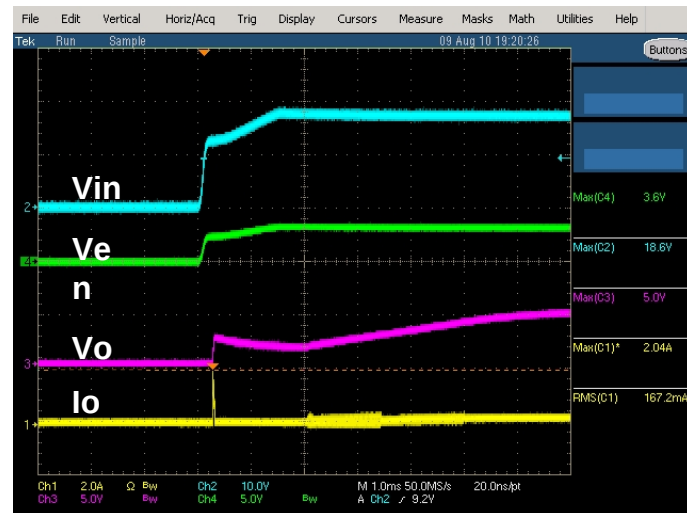


3-4. LDO/DC-DC Start up

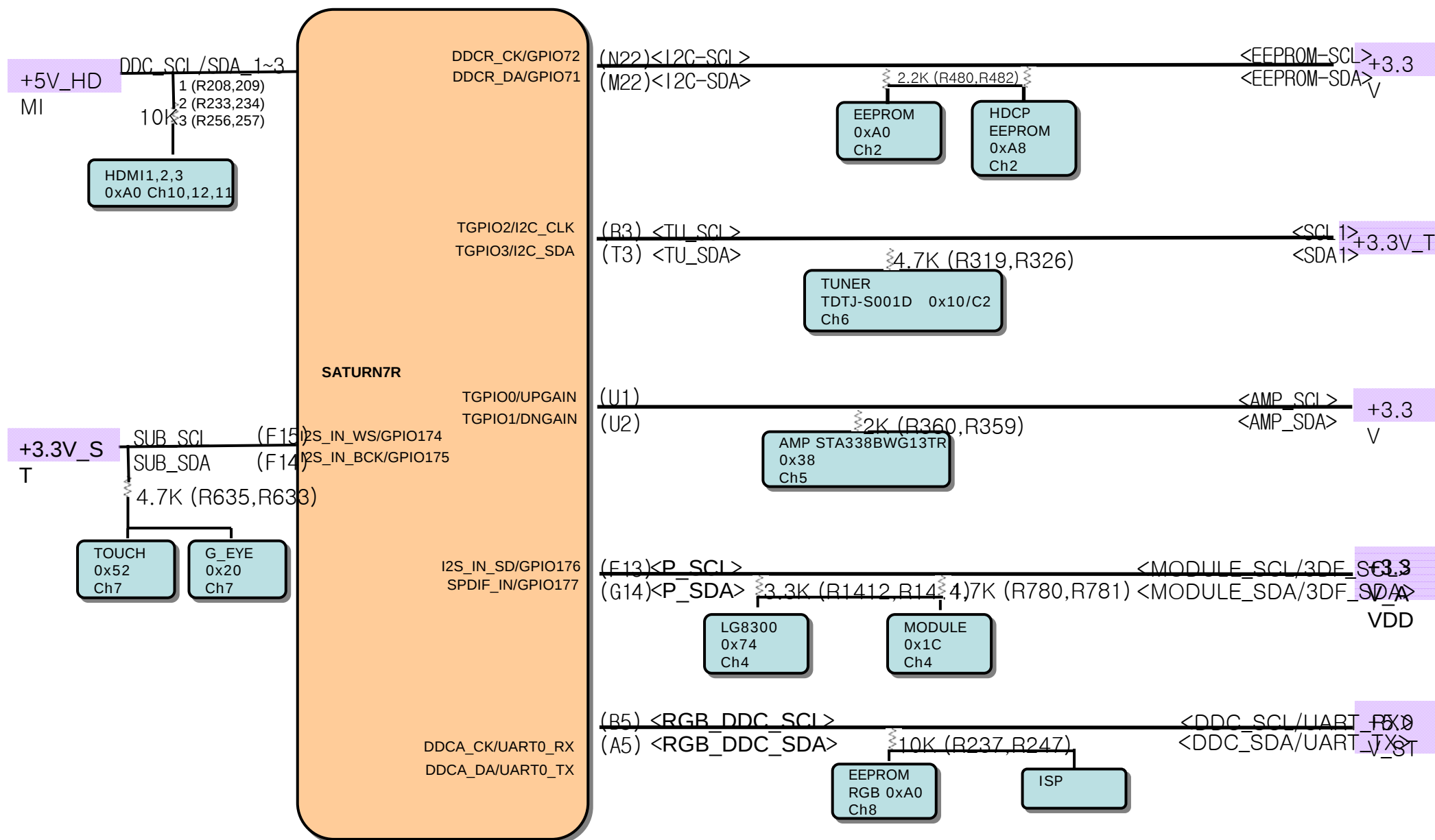
■ IC606 (+3.3V/AZ1085S)



■ IC605 (+5V_TU/TPS54231)

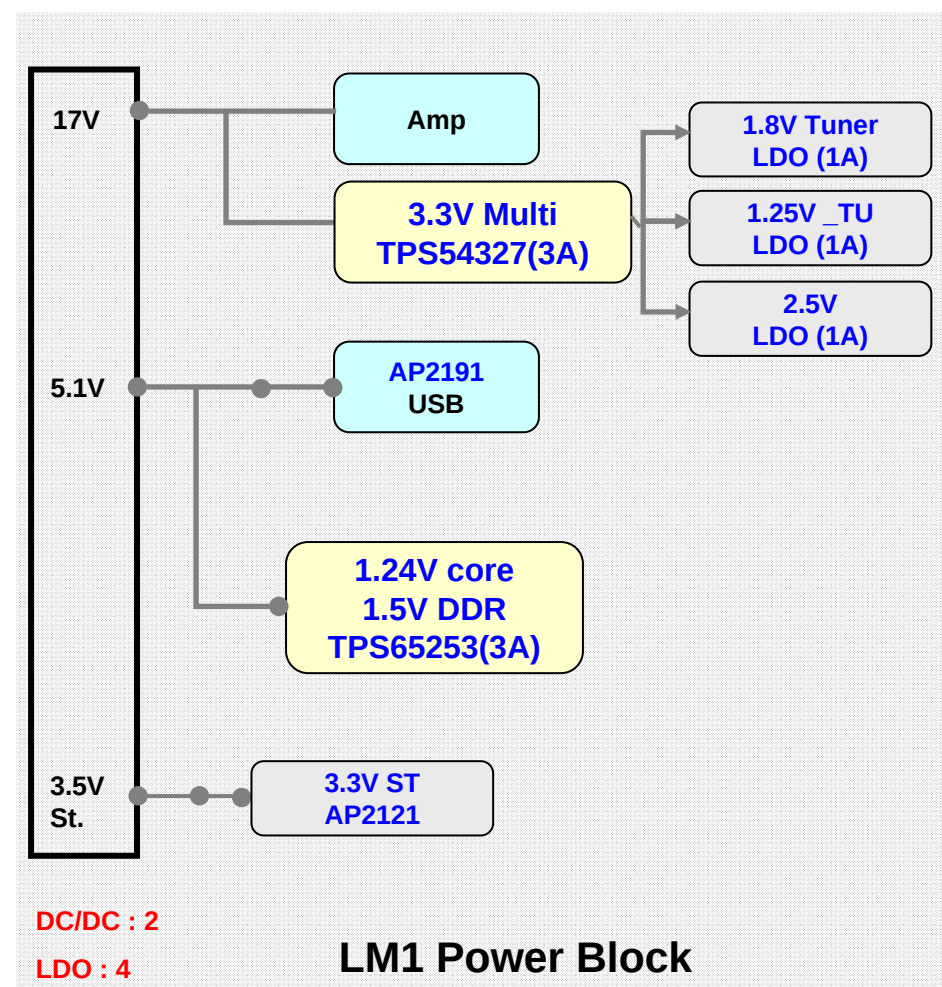
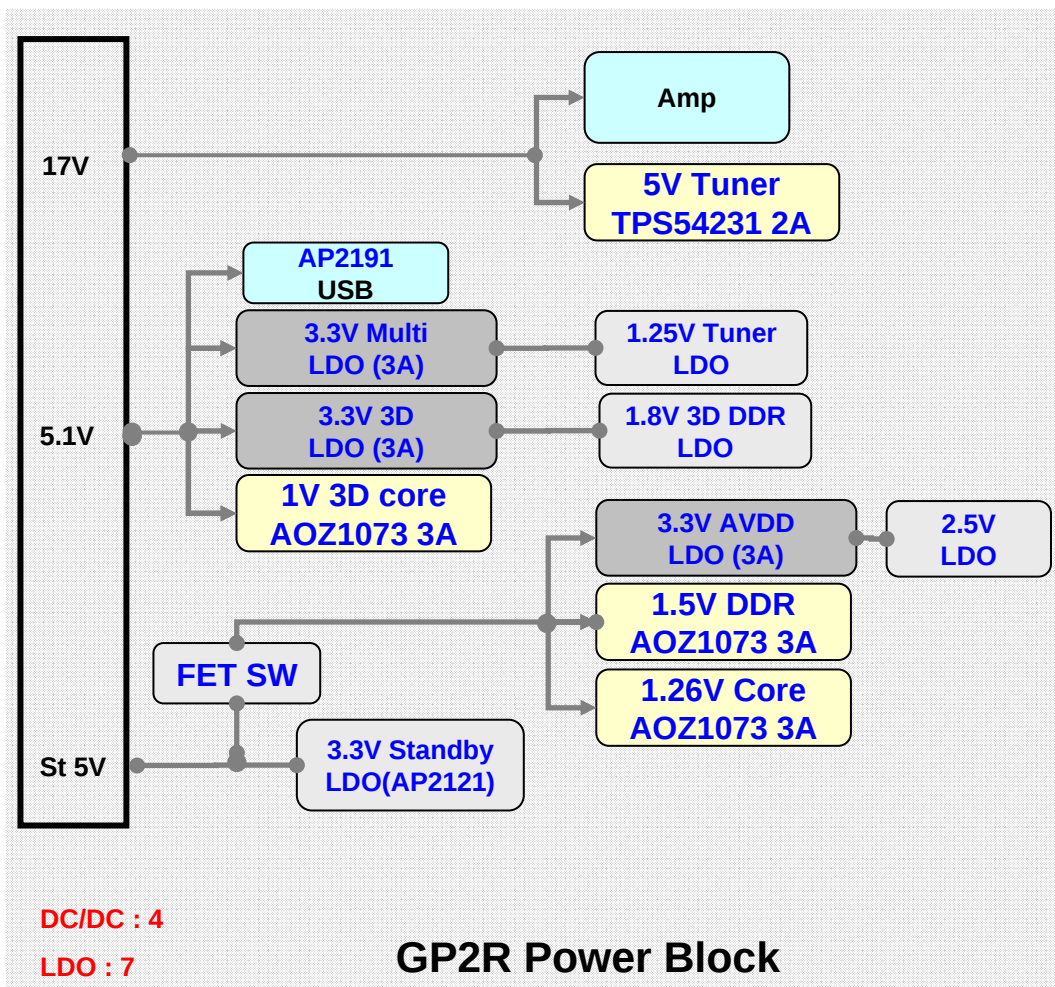


3-5. GP2R I2C MAP

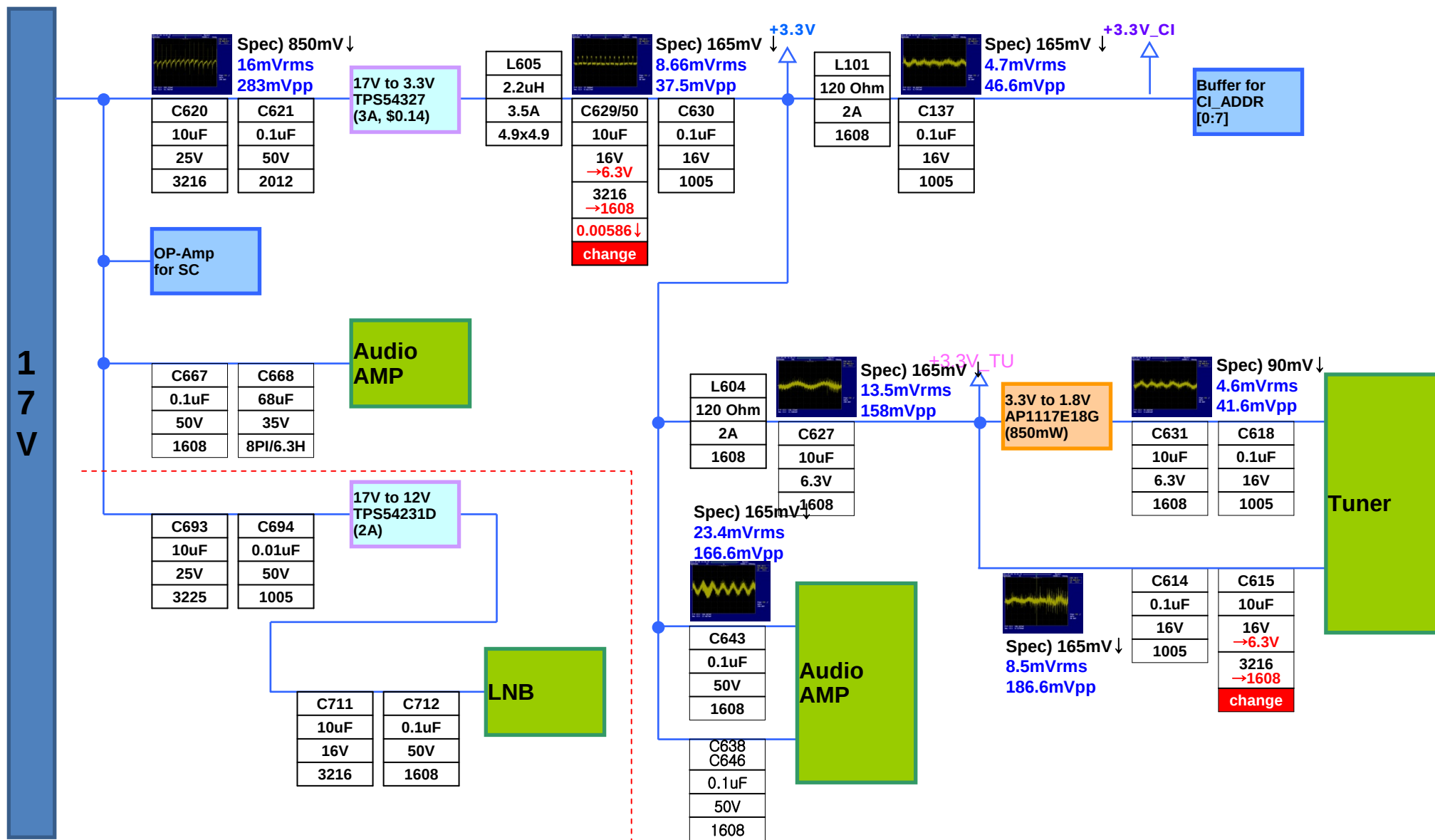


4. LM1 Power Block optimization.

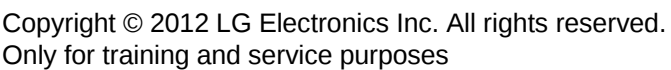
1. GP2R vs LM1 Power Block.



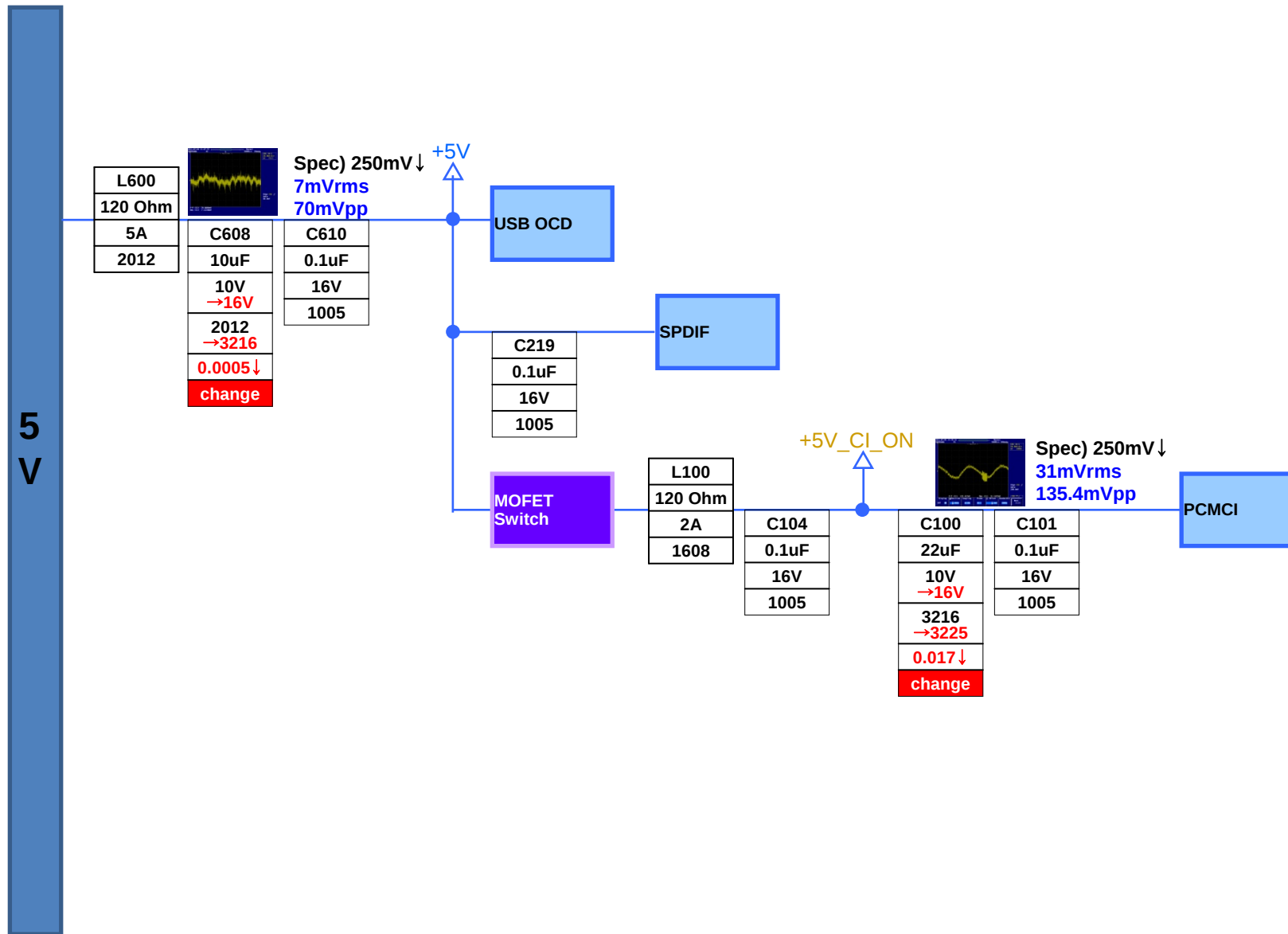
4-1. P_17V



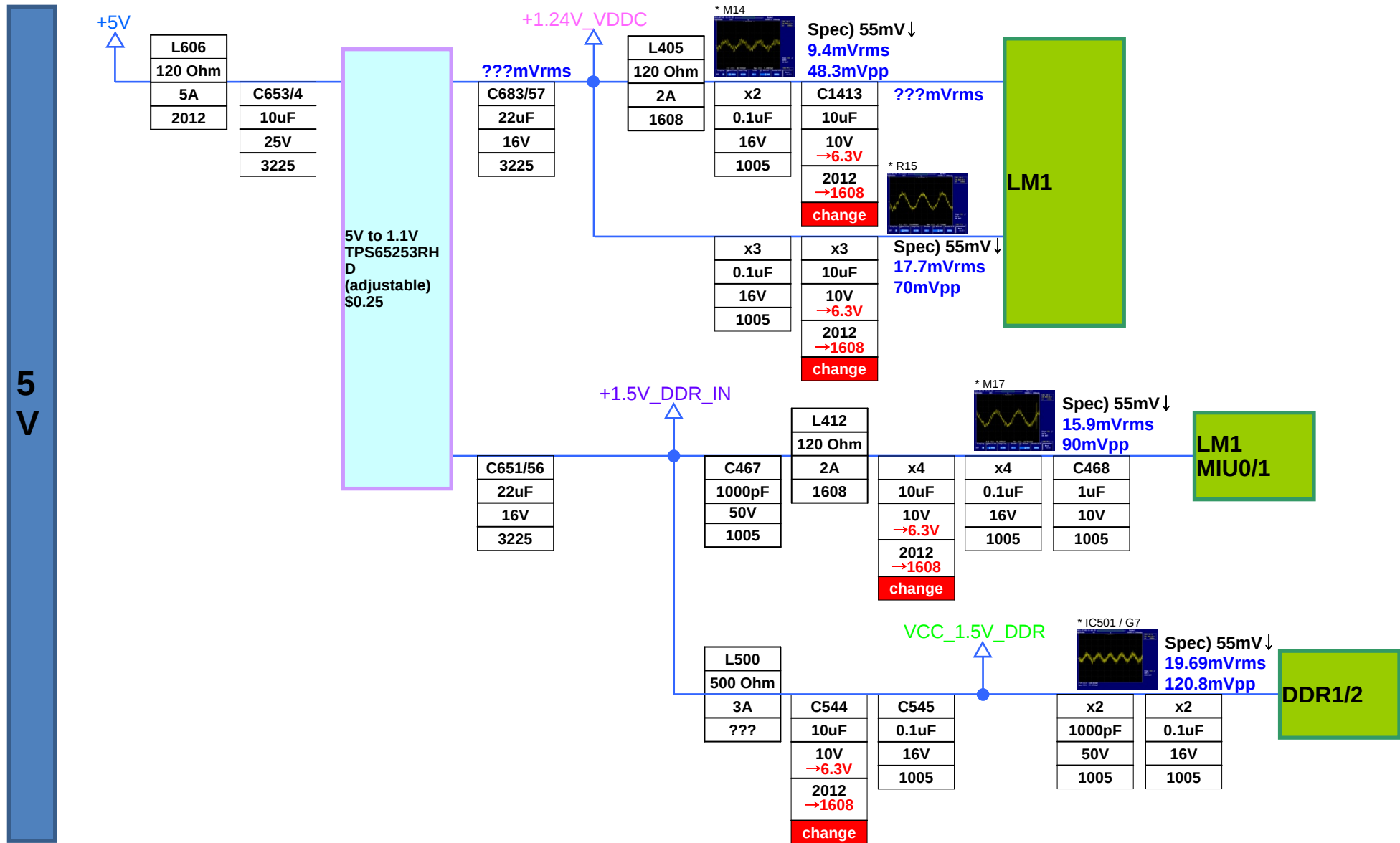
17V



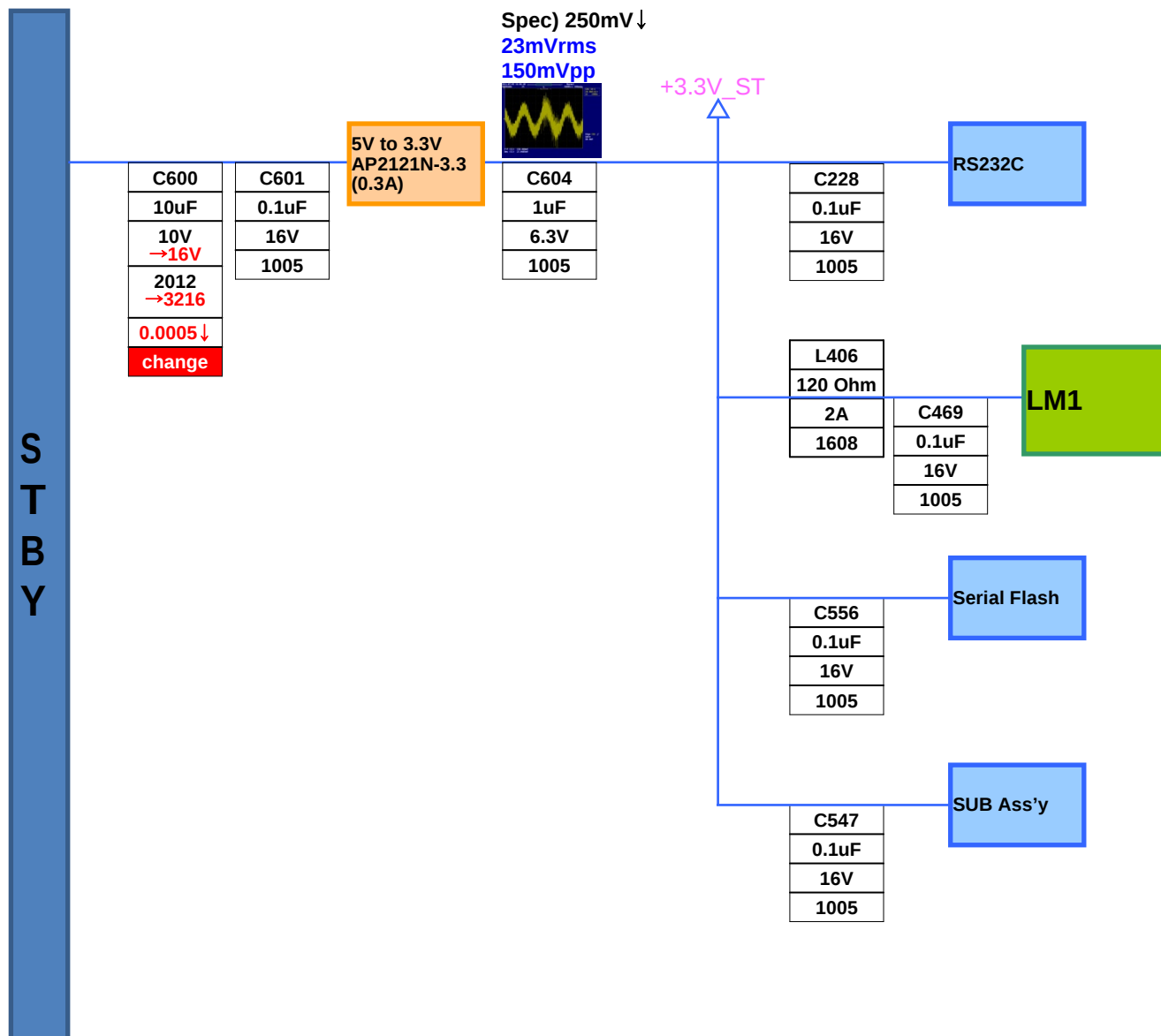
4-3. P_5V



4-4. P_5V

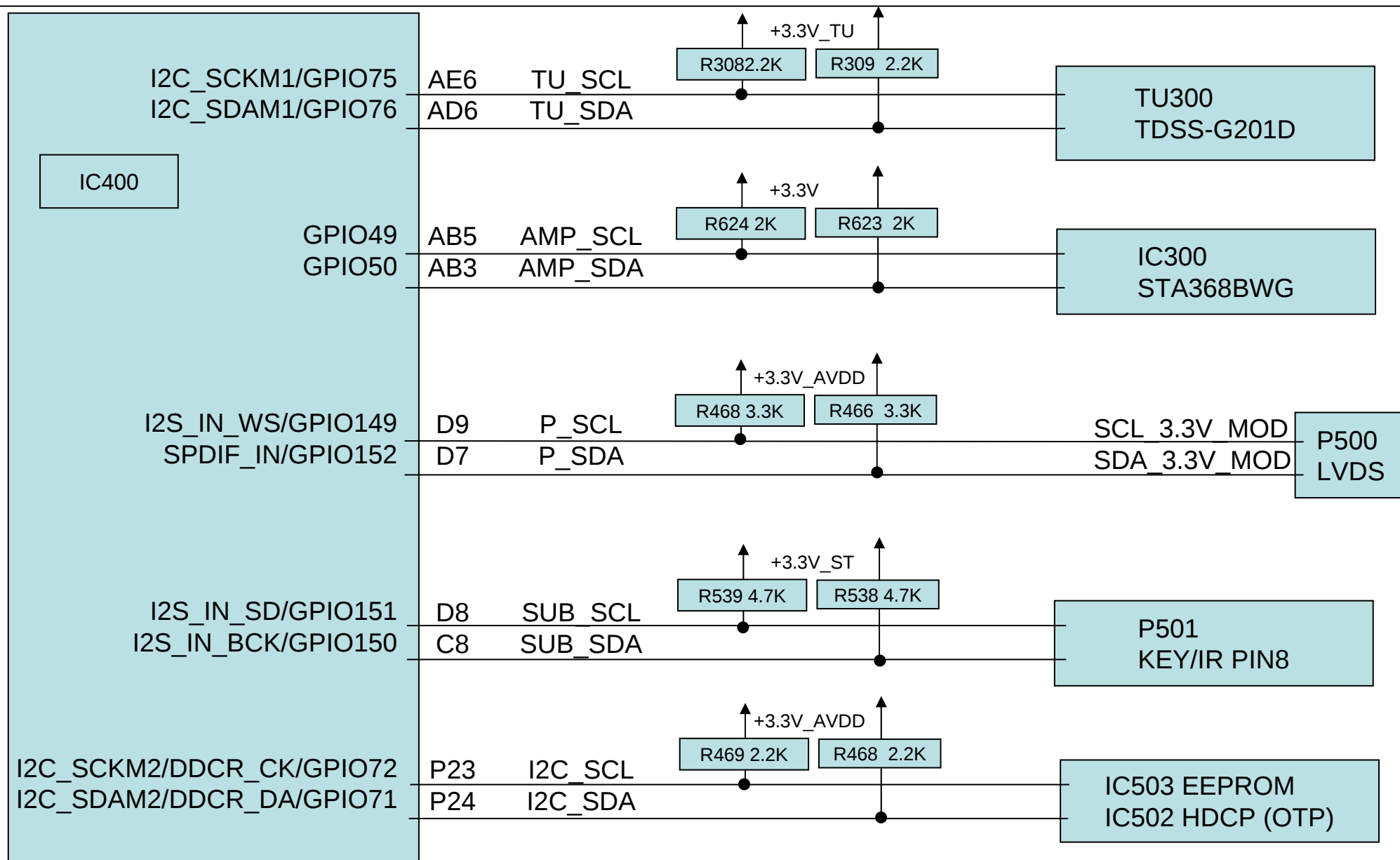


4-5. STBY

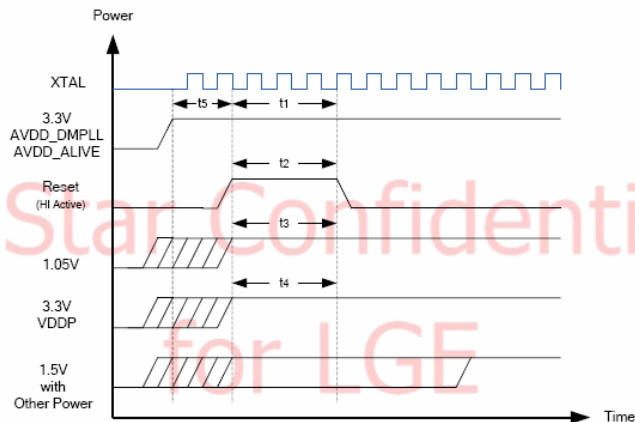


4-6. GP4 LM1 I2C MAP

EAX64337201_0



5. GP4 LM1 SOC Power Sequence Procedure



Note:
 3.3V standby power (AVDD_DMPLL, AVDD_ALIVE, AVDD_DVI, AVDD_CVBS33)
 1.05V (VDDC)
 2.5V (AVDD_ADC25, AVDD_AU25, AVDD_REF25, AVDD_MOD25, AVDD_PGA25)
 1.5V (AVDD_DDR)
 Other Powers (AVDD_AU33, AVDD_LPLL, AVDD_MEMPLL, VDDP, VDD33_DDR)

Figure-1 Power on Sequence

Table-1 Power Requirements

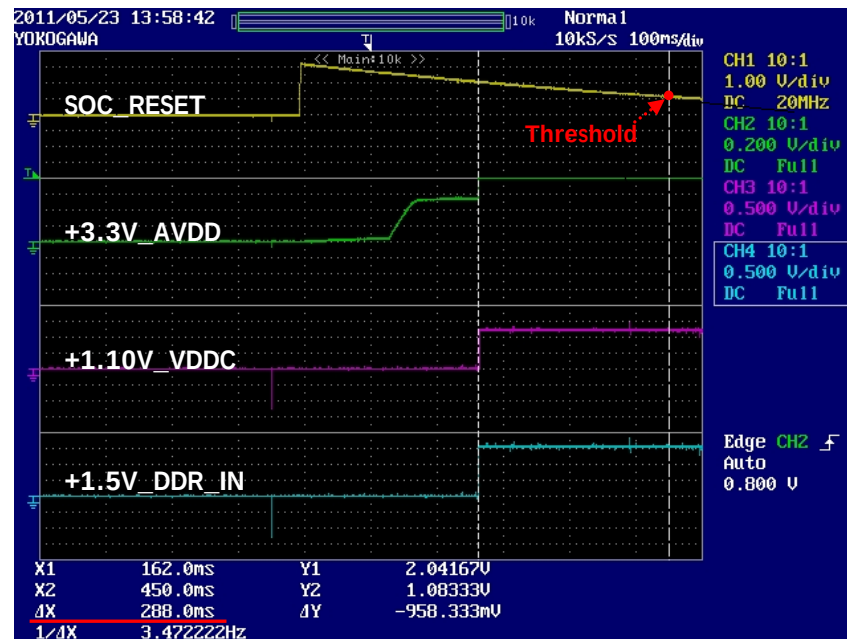
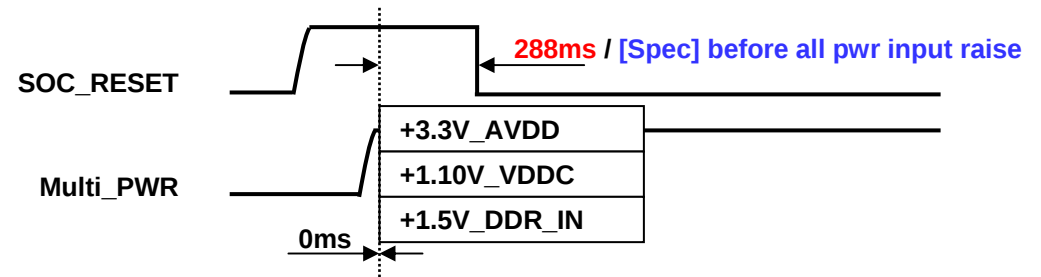
time	Description	Min	Typ.	Max	Unit
t ₁	XTAL stable to Reset falling	5	—	—	ms
t ₂	Reset pulse width	5	—	—	ms
t ₃	1.05V to Reset falling	5	—	—	ms
t ₄	2.5V to Reset falling	5	—	—	ms
t ₅	AVDD_DMPLL/AVDD_ALIVE to Reset rising	0*	—	—	ms

Note: 3.3V power ready ($\geq 3.14V$) must lead Reset rising edge.

Table-2 Power and Reset Operation Requirements

Parameter	Conditions	Min	Typ.	Max	Unit
3.3V Supply Voltages	3.3V $\pm$ 5%	3.14	—	3.46	V
1.05V Supply Voltages	1.05V $\pm$ 5%	1.0	—	1.1	V
1.5V Supply Voltages	1.5V $\pm$ 5%	1.43	—	1.58	V
2.5V Supply Voltages	2.5V $\pm$ 5%	2.38	—	2.62	V
Reset signal VIH	2V $\pm$ 10%	1.8	—	2.2	V
Reset signal VIL	1.2V $\pm$ 10%	1.08	—	1.32	V

Hot Point



◆ SOC_RESET timing and Power sequence are ok.

5. GP4 LM1 SOC Power Sequence Procedure

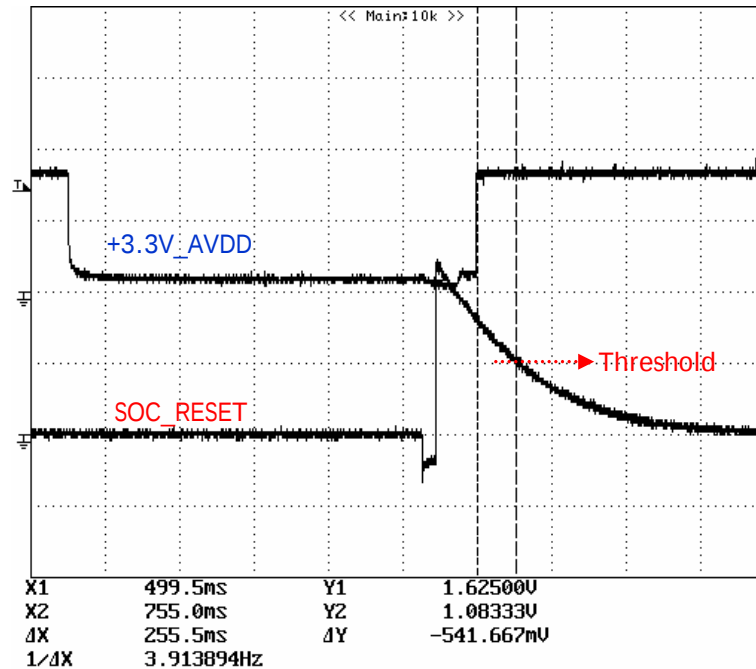
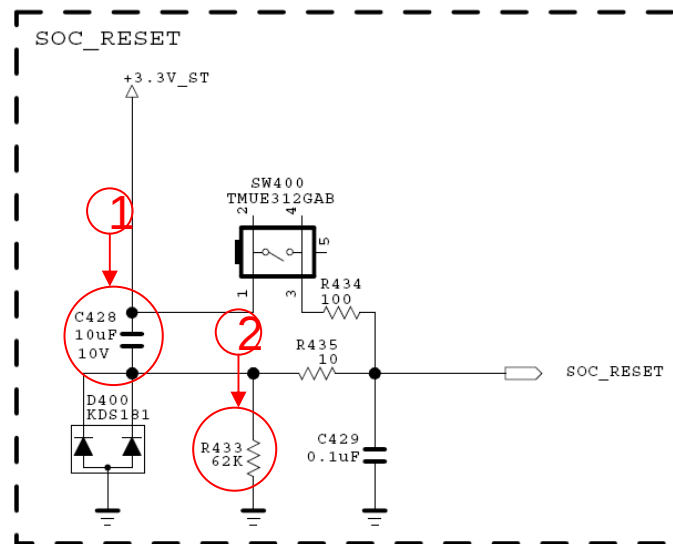
◆ Solution

■ Value of Capacitor and resistor.

① Cap → 22uF.

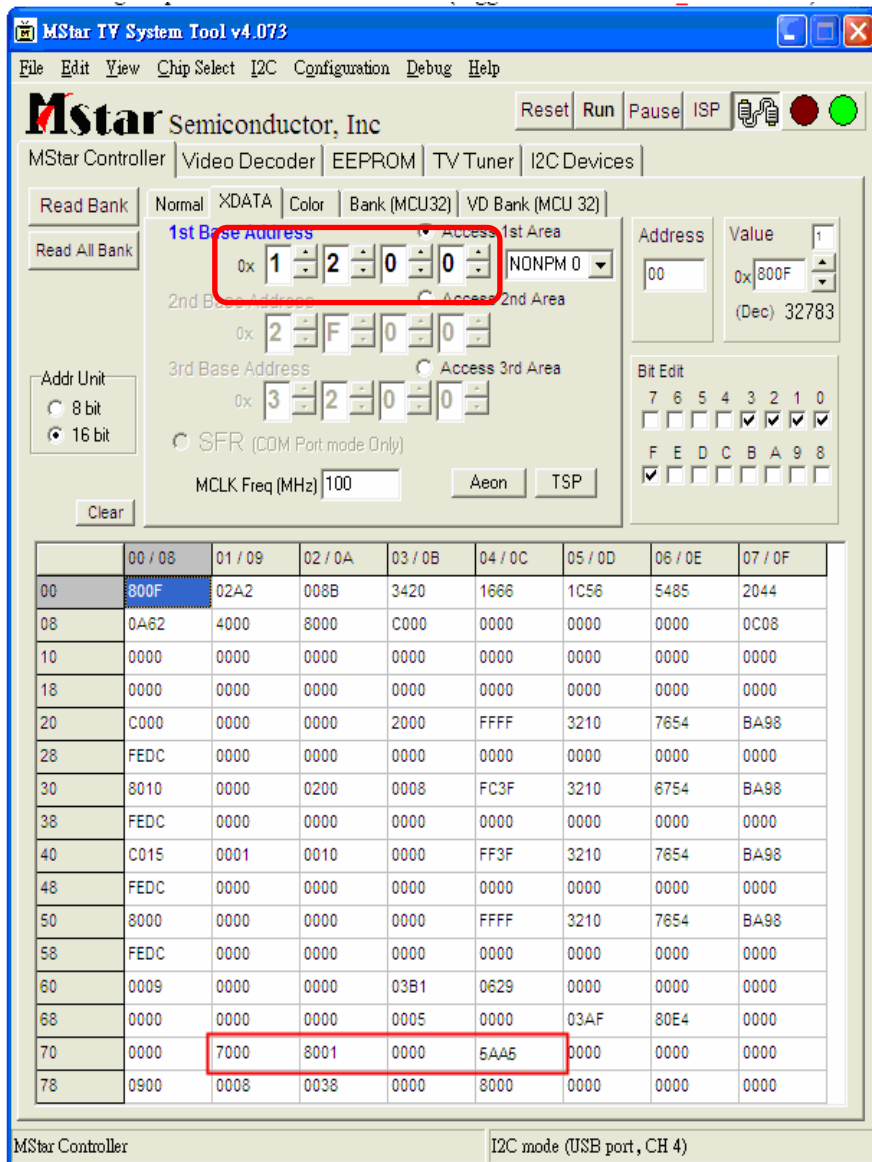
0CK226DC67A 22uF 6.3V \$0.0117

② Resister → 100k Ω .

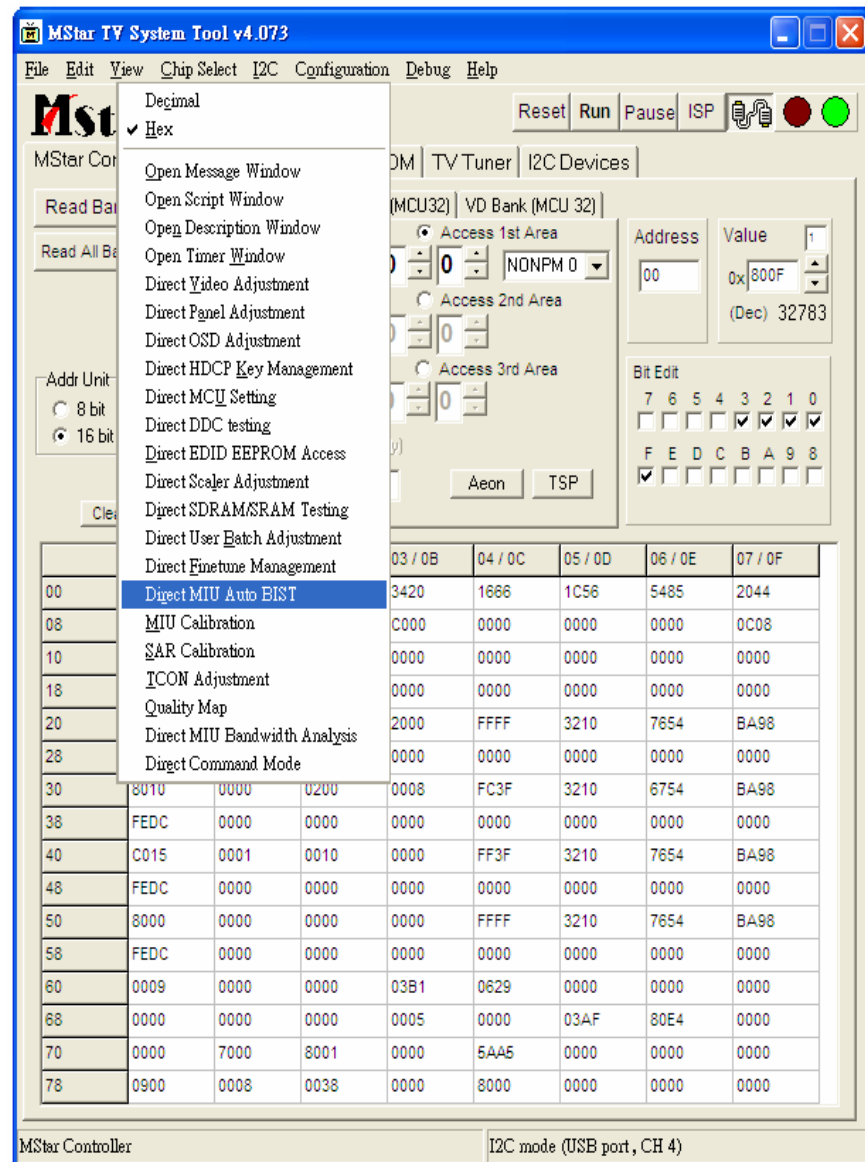


6. Memory margin test. (DDR)

STEP1. Setting like below. (Red box)

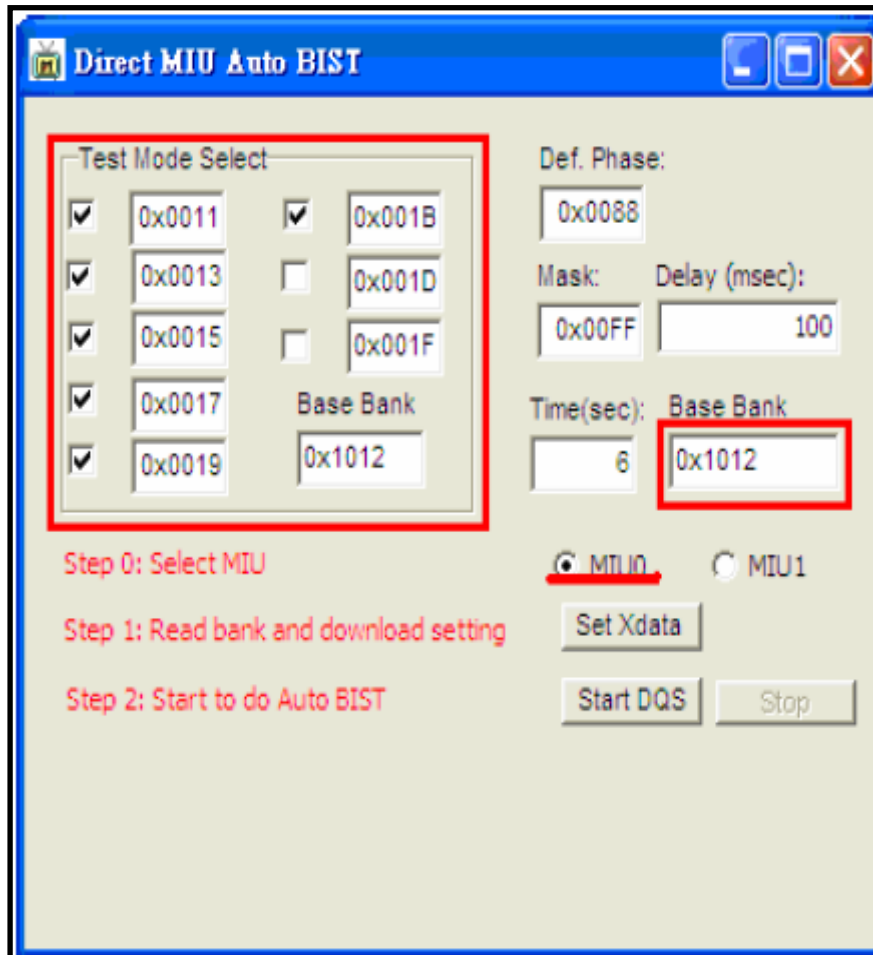


STEP2. Call "direct MIU Auto BIST" function from Menu.

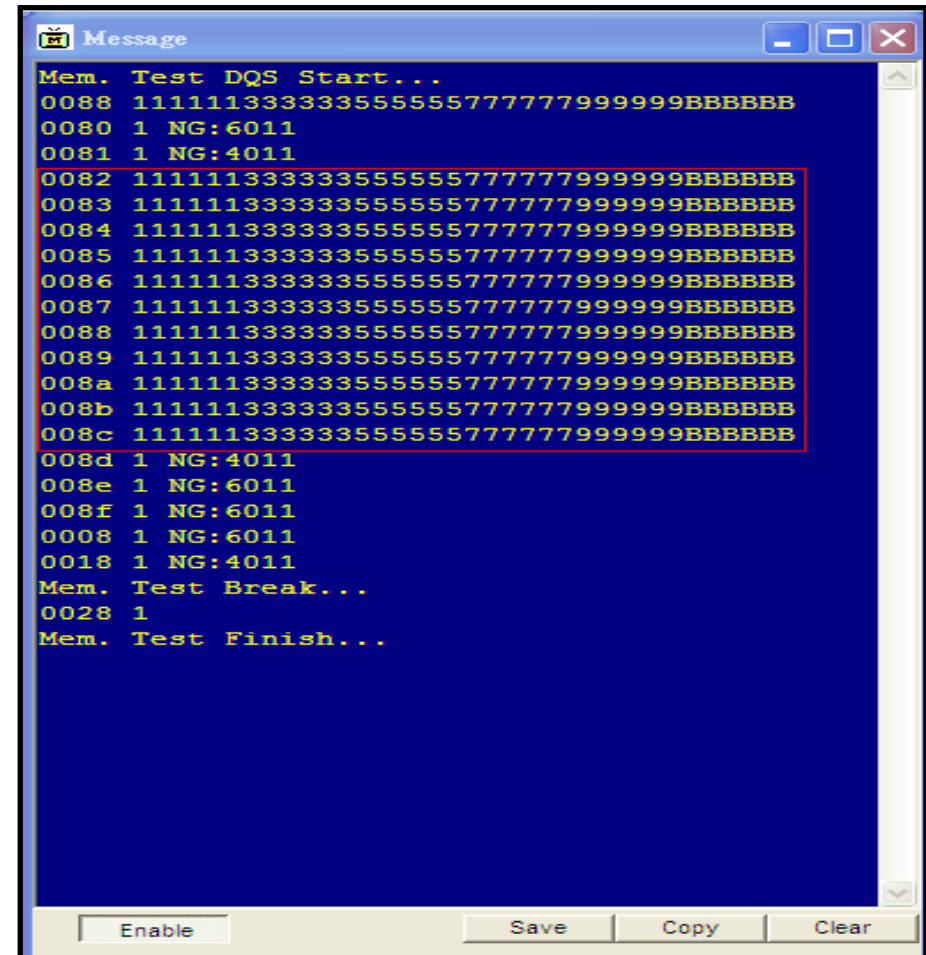


6. Memory margin test. (DDR)

STEP3. Setting like below and push "Start DQS". (Red box)



STEP4. below picture is test result. Red box is timing margin.



※ Normal operating board has timing margin 7~9. If timing margin under 7 ,it's some problem DDR or Main MIU.

7. Pen touch overview. (Installation_Pentouch Program.)

Install the Pentouch program on your computer to use its various functions.

Follow the steps described in this manual to install the program.

! NOTE

- Disconnect the USB dongle first to install the program.
- You must log in as an administrator to install or remove the included software.
- Make sure to install the program found on the CD provided.
- Make sure to close all running applications before installing the program.

- 1 Prepare your computer and start it.
- 2 After the computer starts, Insert the supplied CD . The installation screen appears automatically.

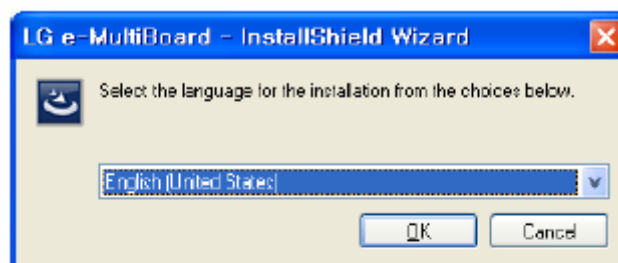
(If the installation screen is not displayed automatically, access My computer and then click installation CD driver and index.htm to view the installation screen.)

- 3 Click [Install the Pentouch Program] on the web page. Selects a language to display, and then Install the Pentouch program.

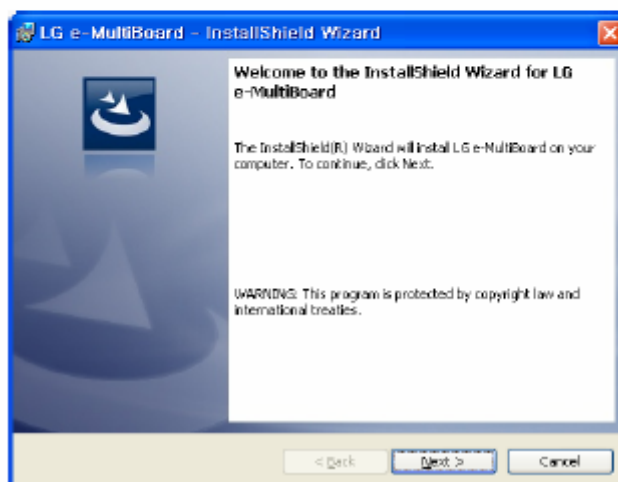
The default folder is used for installation.

A window appears to indicate that the installation was completed successfully.

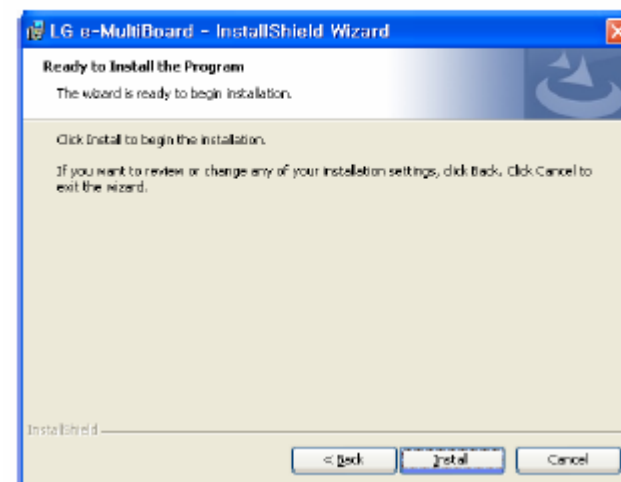
- 4 Select the language for the installation.



- 5 Select Next.

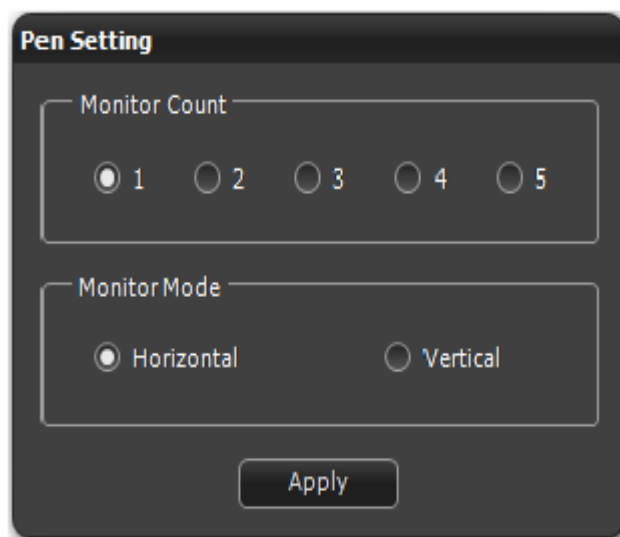


- 6 Select Install.



7. Pen touch overview. (Installation_Pentouch Program.)

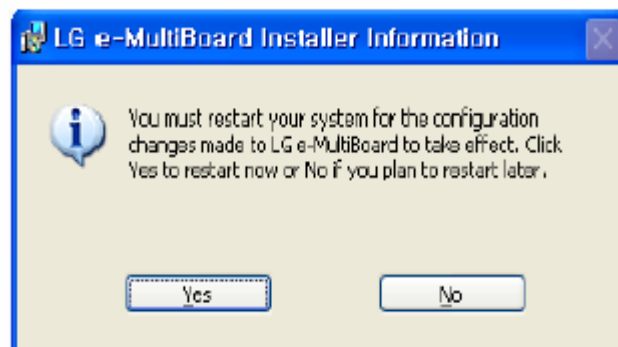
- 7 Check the appropriate items based on the number of monitors installed and the installation method, then click Apply.



NOTE

- Check the appropriate number under Monitor Count based on the number of monitors.
- Check Horizontal for installation in landscape mode and Vertical for installation in portrait mode.

- 8 Please reboot your PC after removing the program.



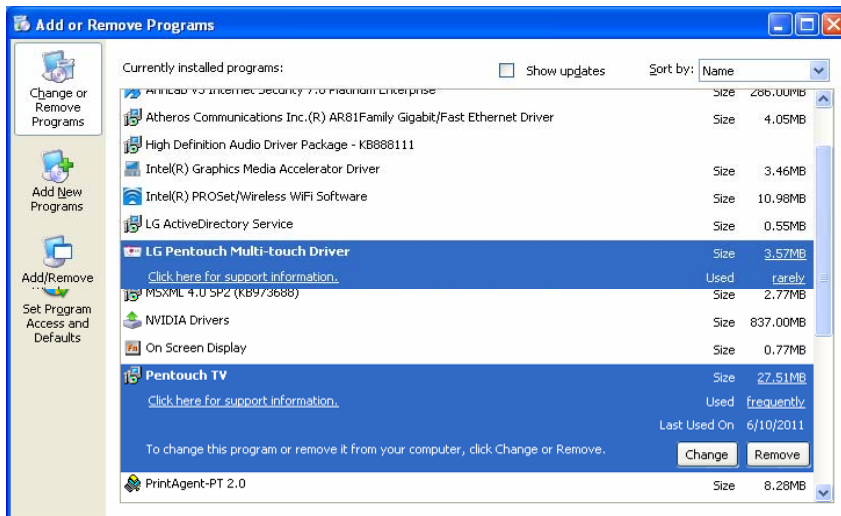
Removing the pentouch program

If there is a problem with the Pentouch program installation or if an error occurs while using the program, follow the steps below to remove the program or driver, and then reinstall them.

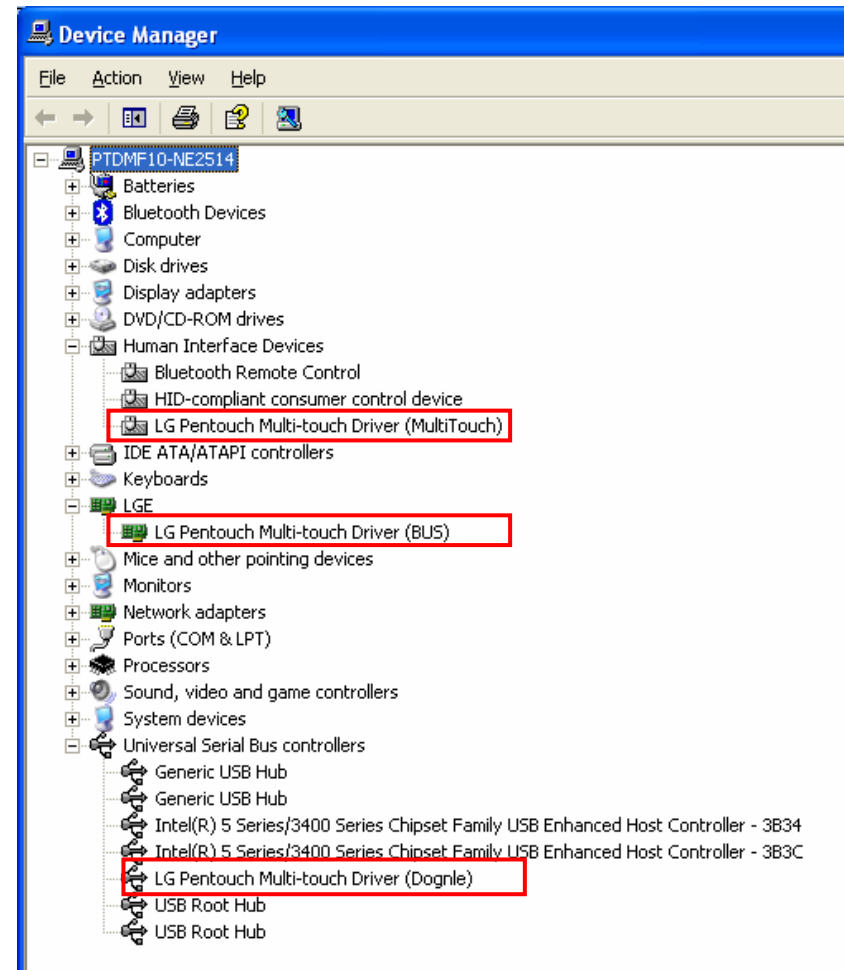
- 1 On your computer, select [Start] → [Control Panel] → [Add/Remove Programs] to remove the Pentouch program.
 - The installed Pentouch program: LG e-MultiBoard
- 2 Click [Yes]. A window appears telling you that the program/driver has been removed.
- 3 Please reboot your PC after removing the program.

7-1. Pen touch overview. (Check the installation status.)

- 1 Currently installed programs
Check the LG Pentouch Multi-touch Driver or Pentouch TV



- 2 Check USB Dongle Driver in Device Manager
-LG Pentouch Multi-touch Driver(MultiTouch)
-LG Pentouch Multi-touch Driver(BUS)
-LG Pentouch Multi-touch Driver(Dongle)
the Dongle Driver should be displayed when connected USB Dongle



7-2. Pen touch overview. (Pairing between Touch Pen and Dongle)

What is Pairing?

You need to pair the touch pen and the dongle before using the touch pen.

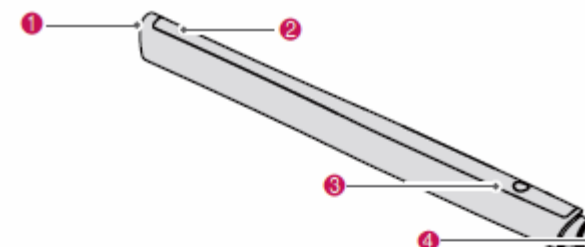
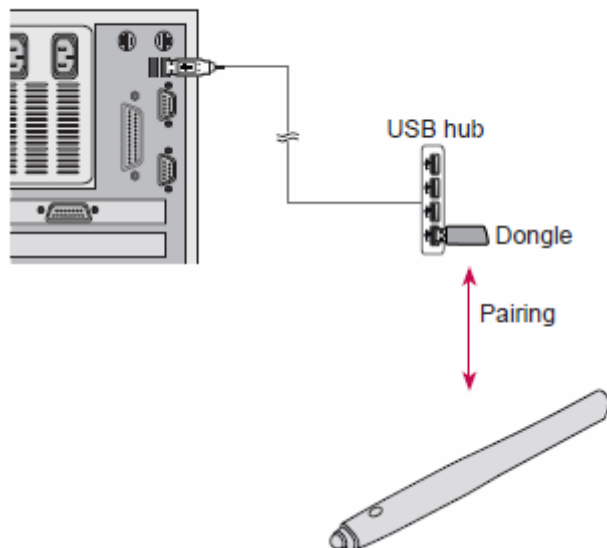
Once paired, you do not need to pair them again unless you:

- Bought a new pen
- Replaced the old pen with a new one

Things to Know Before Pairing

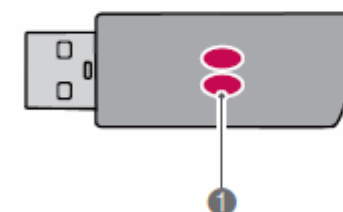
- You will need a dongle for each pen that you use.
- You can use up to 4 pens.
- Pairing of pen and dongle should be done in sequence for each set.
- If they are paired when two or more dongles are inserted at the same time, pairing may fail. Therefore, make sure to remove the dongle currently paired before you pair another pen and dongle set.
- When connecting four dongles to the PC after pairing four pens and four dongles, you can use all four pens.

<Computer Rear Panel>



No.	Description
①	USB charging port
②	LED indicator
③	Power / Home button
④	Touch pen tip switch

Dongle



Indicator LED

! NOTE

- When you leave your touch pen unused for a certain period of time (10 minutes), the pen automatically powers off.

7-3. Pen touch overview. (Pairing between Touch Pen and Dongle)

Pairing for the First Time

- 1 Insert the Pentouch dongle into the USB port. Windows will then display a message in the taskbar, indicating that drivers are being searched and installation is in progress. When the installation is complete, the two LED indicators on the USB dongle will turn red. When you can see a message indicating that the new device has been installed, prepare the touch pen provided as an accessory.
- 2 Keep the touch pen within 30 cm of the dongle. Press the  /Home button on the touch pen once. The LED indicator on the touch pen will turn red for 2 seconds and blink green 3 times when pairing is complete.
- 3 After pairing, when you press the touch pen POWER/HOME button, the LED indicator of the pen turns green.

NOTE

- After pairing, when you press the touch pen POWER/HOME button, the LED indicator of the pen turns green. A touch pen only needs to be paired once. To use a touch pen, make sure that the pen is switched on by pressing the pen POWER/HOME button, alongside a properly working dongle.

Unpairing (Resetting touch pen)

- 1 Check if the LED indicator turns green by the touch pen POWER/HOME button.
- 2 Press and hold the  /Home button on the touch pen for 9 to 10 seconds.
- 3 When the green light blinks once, release the button. The red light blinks 3 times and the pen is then in its initial state (unpaired).

Caution When Unpairing

- 1 Be careful not to unpair the pen by mistake. If unpaired, try pairing it again.
- 2 To pair one or more pens, you need to initialize all pens by following the procedures described above, i.e. pairing each set of pens and dongles one by one.
- 3 Make sure to remove the dongle currently paired before pairing another pen and dongle set.

NOTE

- After 3 hours of a continuous charge, you can use the touch pen for about 8 hours.
- Pentouch operation may not be normal while charging.
- Green LED will be turned on during using. If a touch pen is not in use, the green LED switches off automatically after one minute and the power also switches off after nine minutes.
- Touch pen LED indicator for battery status
 - Charging: Red LED
 - Charging complete: Green LED
 - Battery level 20% or less: Red LED blinks every 3 seconds
 - No battery power: Red LED blinks every second and powers off automatically.

Touch pen Operation

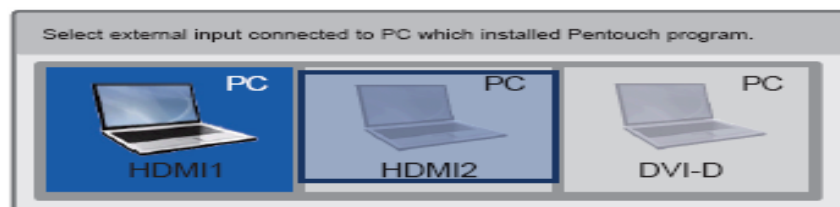
Once paired, you can use the touch pen in the following ways.

- 1 Powering on
 - Press the  /Home button once. The red and green LEDs will remain lit to indicate that the power is on.
- 2 Powering off
 - Press and hold the  /Home button. When the red LED turns on once briefly and once again, release the button. The red LED blinks 3 times and the pen is then powered off.
 - Touch pen power is automatically switched off if you do not use it for ten minutes, so you do not have to switch it off manually.
- 3 Pressing the  /Home button while using the touch pen
 - It makes menu appear or disappear when running the pen touch program.
 - In Windows: Works in the same way as the right-click function. Touch an object on which you want the touch pen to right-click, then press the button.
- 4 The touch pen works in the same way as the mouse in Windows.

7-4. Pen touch overview. (Using the Pentouch Function)

■ Image shown may differ from your monitor. You need the following items to use the Pentouch functions:

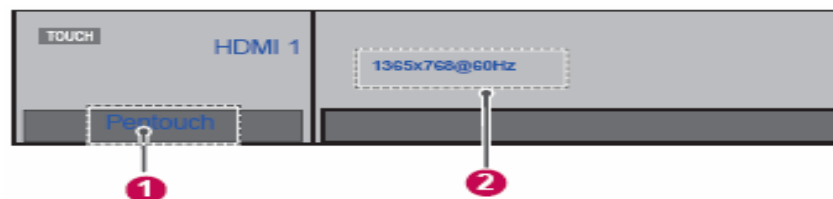
- 1 Enter the Pentouch mode on your monitor. - Press TOUCH button on the remote control or MENU to access the main menus. Then choose Pentouch function.
- 2 Select the correct computer input connection to enter the Pentouch mode.



- 3 Use the touch pen or the mouse to start the Pentouch program. Pressing the /Home button on the touch pen works in the same way as right-clicking the mouse.

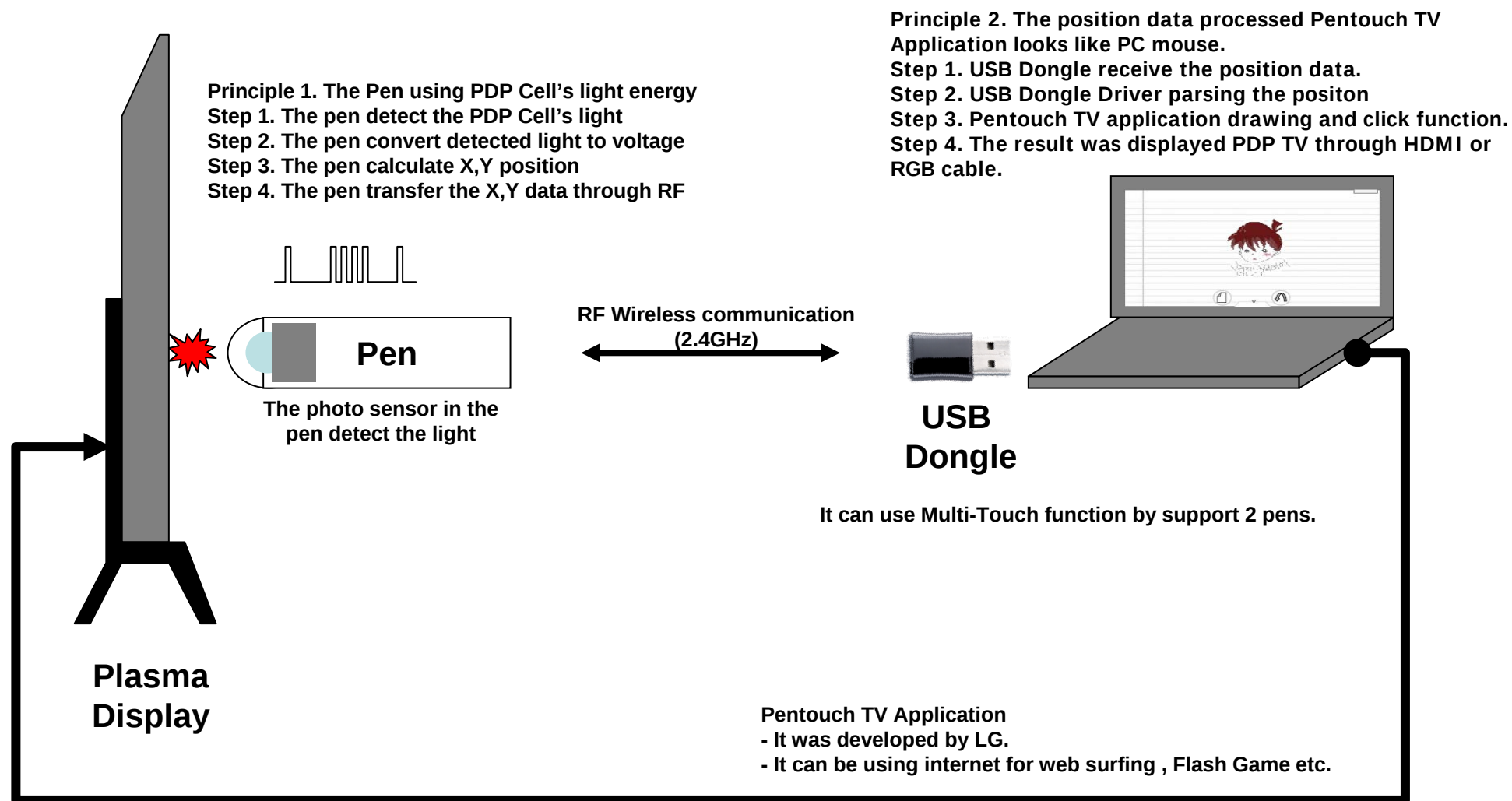
■ Viewing the Screen Settings

Image shown may differ from your monitor. If you press the OK button on the remote control, the screen shown below appears to indicate that the screen settings have been updated successfully.



- ① The text "Pentouch" should be displayed to indicate that the Pentouch mode is activated. If not, restart the Pentouch mode.
- ② "1365x768 " should be displayed to indicate that the resolution has been set successfully. If not, set the monitor resolution again.(See p.38)

7-5. Pen touch overview. (PDP Pen Touch Concept)



The HDMI or RGB signal is PC's output that configuration set by clone mode.