![LG Logo] **LG**

Life's Good

LED TV
SERVICE MANUAL

CHASSIS : LC31A / LD31T

MODEL : 22LN45 22LN45**-Z***

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

CONTENTS

LGE Internal Use Only

SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ 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 it's 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 MΩ and 5.2 MΩ.
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 is 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
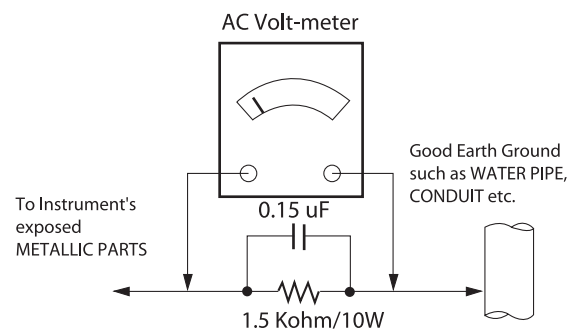
When 25A is impressed between Earth and 2nd Ground
for 1 second, Resistance must be less than 0.1 Ω
 *Base on Adjustment standard

SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the *SAFETY PRECAUTIONS* on page 3 of this publication.
NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions
1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
      CAUTION: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
   CAUTION: This is a flammable mixture.
   Unless specified otherwise in this service manual, lubrication of contacts in not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
   Always remove the test receiver ground lead last.
8. Use with this receiver only the test fixtures specified in this service manual.
   CAUTION: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices
Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.
1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.

2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines
1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500 °F to 600 °F.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle.
   Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
      CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
   a. Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
      CAUTION: Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

IC Remove/Replacement
Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal
1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement
1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete Transistor Removal/Replacement
1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device
Removal/Replacement
1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement
1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor
Removal/Replacement
1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.

3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair
Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections
To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections
Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.
   CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

SPECIFICATION

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

1. Application range

This specification is applied to the LED TV used LC31A / LD31T chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F), CST: 40 °C ± 5 °C
2) Relative Humidity: 65 % ± 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. Model General Specification

No.	Item	Specification	Remarks
1	Market	EU/CIS(PAL Market-37 Countries)	**DTV & Analog (Total 37 countries)** **DTV (MPEG2/4, DVB-T) :37 countries** UK/Italy/Germany/France/Spain/Sweden/Finland/Netherlands/ Belgium/Luxemburg/ Greece/Denmark/Czech/Austria/Hungary /Swiss/Croatia/Turkey/Norway/Slovenia/Poland/Ukraine/Portugal/Ireland/Morocco/Latvia/Estonia/Lithania/Rumania/Bulgaria/ Russia/SlovakiaBosnia/Serbia/Albania/Kazakhstan/Belarus *4 Country, Nordic option(EU model only) - Denmark , Finland, Norway, Sweden **DTV (MPEG2/4, DVB-T2): 8 countries** UK/Denmark/Sweden/Finland/Norway/Ireland/Ukraine/Kazakhstan **DTV (MPEG2/4, DVB-C): 37 countries** UK/Italy/Germany/France/Spain/Sweden/Finland/Netherlands/ Belgium/Luxemburg/ Greece/Denmark/Czech/Austria /Hungary/Swiss/Croatia/Turkey/Norway/Slovenia/Poland/Ukraine/ Portugal/Ireland/Morocco/Latvia/Estonia/Lithania/Rumania/ Bulgaria/Russia/Slovakia/Bosnia/Serbia/Albania/Kazakhstan/ Belarus **DTV (MPEG2/4,DVB-S): 29 countries** Italy/Germany/France/Spain/Netherlands/ Belgium/Luxemburg/ Greece/ Czech/Austria /Hungary/Swiss/Croatia/Turkey/Slovenia/Poland/Portugal/ Morocco/Latvia/Estonia/Lithuania/Rumania/Bulgaria/Russia/SlovakiaBosnia/Serbia/Albania/ Belarus **Supported satellite : 22 satellites** HISPASAT 1C/1D, ATLANTIC BIRD 2, NILESAT 101/102, ATLANTIC BIRD 3, AMOS 2/3, THOR 5/6, IRIUS 4, EUTELSAT-W3A, EUROBIRD 9A, EUTELSAT-W2A, HOTBIRD 6/8/9, EUTELSAT-SESAT, ASTRA 1L/H/M/KR, ASTRA 3A/3B, BADR 4/6, ASTRA 2D, EUROBIRD 3, EUTELSAT-W7, HELLASSAT 2, EXPRESS AM1, TURKSAT 2A/3A, INTERSAT10

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No.	Item	Specification	Remarks
2	Broadcasting system	Analogue TV 1) PAL-BG 2) PAL-DK 3) PAL-I/I' 4) SECAM-BG 5) SECAM-DK 6) SECAM L/L' Digital TV 1) DVB-T/C/T2 Satellite Digital TV 1) DVB-T/C/S/S2	Analogue TV : (RF) VHF: E2 to E12, UHF : E21 to E69 (CATV) S1 to S20, HYPER: S21 to S47 Digital TV : VHF, UHF Satellite TV : VHF, UHF, C-Band, Ku-Band * DVB-T2 (T2 model only support) * DVB-S/S2 (Satellite model only support)
3	Receiving system	Analog : Upper Heterodyne Digital : COFDM, QAM	► DVB-T - Guard Interval(Bitrate_Mbit/s)B : 1/4, 1/8, 1/16, 1/32 - Modulation : Code Rate QPSK : 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 ► DVB-T2 - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256, - Modulation : Code Rate QPSK : 1/2, 2/5, 2/3, 3/4, 5/6 16-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 64-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 256-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 ► DVB-C - Symbolrate : 4.0Msymbols/s to 7.2Msymbols/s - Modulation : 16QAM, 64-QAM, 128-QAM and 256-QAM ► DVB-S/S2 - symbolrate DVB-S2 (8PSK / QPSK) : 2 ~ 45 Msymbol/s DVB-S (QPSK) : 2 ~ 45 Msymbol/s - viterbi DVB-S mode : 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 mode : 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10
4	Scart Jack (1EA)	PAL, SECAM	Scart 1 Jack is Full scart and support RF-OUT(analog).
5	Component Input (1EA)	Y/Pb/Pr	
6	CVBS Input (1EA)	PAL, SECAM, NTSC	4 System(Rear) : PAL, SECAM, NTSC, PAL60 CVBS Video input is used by common port with Component.
7	RGB Input	RGB-PC	Analog(D-SUB 15PIN)
8	HDMI Input (1EA)	HDMI	Rear1EA / HDMI version 1.4/ support PC Support HDCP/HDMI : MHL Support
9	Audio Input (3EA)	RGB/DVI Audio Component & CVBS SCART	L/R Input CVBS Audio input is used by common port with Component.
10	Headphone out (1EA)	Antenna, AV, Component, RGB, HDMI	Side 1EA
11	USB (1EA)	Picture, Music, Movie, SVC	Software Update + Picture + Music + Movie
12	DVB	DVB-T	CI : UK, Finland, Denmark, Norway, Sweden, Russia, Spain, Ireland, Luxemburg, Belgium, Netherland CI+ : France(Canal+), Italy(DGTVi)
		DVB-C	CI : Switzerland, Austria, Slovenia, Hungary, Bulgaria CI+: Switzerland(UPC,Cablecom), Netherland(Ziggo), Germany(KDG,CWB), Finland(labwise)
13	Local Key (Touch)	⌄ ⌃ — + OK SETTINGS INPUT ⏻/I	
14	LAN JACK	Modular	Only UK model

5. Timing
5.1. RGB/HDMI (PC)

No.	Specification				Remark
	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	
1.	720*400	31.468	70.080	28.321	
2.	640*480	31.469	59.940	25.175	
3.	640*480	37.500	75.000	31.500	
4.	800*600	37.879	60.317	40.000	
5.	800*600	46.875	75.000	49.500	
6.	1024*768	48.363	60.004	65.000	
7.	1024*768	60.023	75.029	78.750	
8.	1280*720	45.000	60.000	74.250	
9.	1280*800	49.702	59.810	83.500	
10.	1366*768	47.717	59.79	85.5	

5.2. HDMI (DTV)

No.	Specification				Remark
	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	
1.	720*480	31.469 31.5000	59.940 60.000	27.000 27.030	SDTV 480P
2.	720*576	31.250	50.000	27.864	SDTV 576P
3.	1280*720	37.500	50.000	74.250	HDTV 720P
4.	1280*720	44.960 45.000	59.940 60.000	74.170 74.250	HDTV 720P
5.	1920*1080	33.720 33.750	59.940 60.000	74.170 74.250	HDTV 1080I
6.	1920*1080	28.125	50.000	74.250	HDTV 1080I
7.	1920*1080	27.000	24.000	74.250	HDTV 1080P
8.	1920*1080	33.750	30.000	74.250	HDTV 1080P
9.	1920*1080	56.250	50.000	148.500	HDTV 1080P
10.	1920*1080	67.430 67.500	59.940 60.000	148.350 148.500	HDTV 1080P

5.3. Component

No.	Specification				Remark
	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	
1.	720*480	15.730	59.940	13.500	SDTV, DVD 480I(525I)
2.	720*480	15.750	60.000	13.514	SDTV, DVD 480I(525I)
3.	720*576	15.625	50.000	13.500	SDTV, DVD 576I(625I) 50Hz
4.	720*480	31.470	59.940	27.000	SDTV 480P
5.	720*480	31.500	60.000	27.027	SDTV 480P
6.	720*576	31.250	50.000	27.000	SDTV 576P 50Hz
7.	1280*720	44.960	59.940	74.176	HDTV 720P
8.	1280*720	45.000	60.000	74.250	HDTV 720P
9.	1280*720	37.500	50.000	74.250	HDTV 720P 50Hz
10.	1920*1080	33.720	59.940	74.176	HDTV 1080I
11.	1920*1080	33.750	60.000	74.250	HDTV 1080I
12.	1920*1080	28.125	50.000	74.250	HDTV 1080I 50Hz,
13.	1920*1080	56.250	50.000	148.500	HDTV 1080P
14.	1920*1080	67.432	59.940	148.350	HDTV 1080P
15.	1920*1080	67.500	60.000	148.500	HDTV 1080P

ADJUSTMENT INSTRUCTION

1. Application Range

This document is applied to LC31A / LD31T chassis LED TV which is manufactured in TV(or Monitor) Factory or is produced on the basis of this data.

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 : 110-240 V, 50/60 Hz
6) Adjustment equipments: Color Analyzer(CA-210 or CA-110), DDC Adjustment Jig equipment, Service remote control.
7) Push The "IN STOP KEY" – For memory initialization

Case1 : Software version up
    1. After downloading S/W by USB , TV 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 display "Error", Check connect computer, jig, and set.
3) Click "Connect" tab. If display "Can't", Check connect computer, jig, and set.
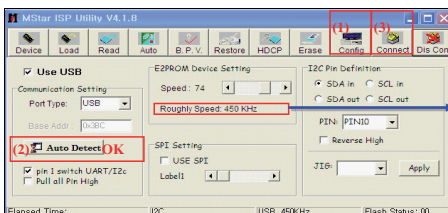
4) Click "Read" tab, and then load download file(XXXX.bin) by clicking "Read".
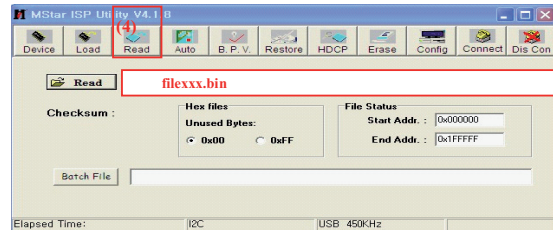
5) Click "Auto" tab and set as below
6) Click "Run".
7) After downloading, check "OK" message.
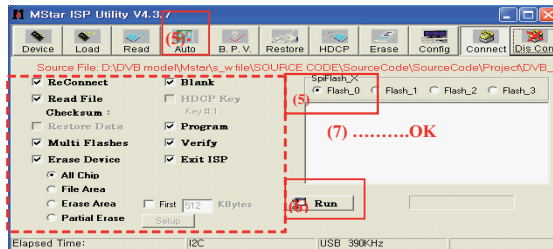
* USB DOWNLOAD(*.epk file download)

1) Make New folder named "LG_DTV" and put ISP file(*.epk) in the folder.
2) Put the USB Stick to the USB socket.
3) 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
4) Show the message "Copying files from memory"
5) Updating is starting.
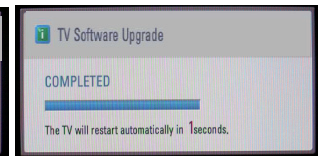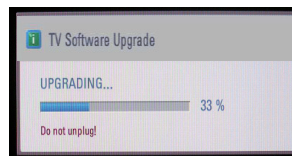
6) Updating Completed, The Multi-vision will restart automatically.
7) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
   * If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ATV test on production line.

* After downloading, have to adjust TOOL OPTION again.
    1. Push "ADJ" key in service remote control.
    2. Select "Tool Option 1" and push "OK" key.
    3. Punch in the number. (Each model has their number.)
    4. Completed selecting Tool option.

3.1. EDID Process
3.1.1. EDID download
(1) Press "Power only" key of service remote control.
(2) Press the ADJ KEY on R/C and enter EZ ADJUST
(3) Enter EDID D/L mode by pushing "►" key at "11. EDID D/L".
(4) EDID download is executed automatically.
(5) Press EXIT key on service remote control.

```
EZ ADJUST
0. Tool Option1
1. Tool Option2
2. Tool Option3
3. Tool Option4
4. Tool Option5
5. Tool Option6
6. Country Group
7. Area Option
8. ADC Calibration
9. White Balance
10. 10 Point WB
11. Test Pattern
12. EDID D/L              ►
14. Touch Sensitivity Setting
15. Ext. Input Adjust
16. SPK Lipsync Adjust
17.SPDIF Lipsync Adjust
```

```
EDID D/L
HDMI              OK
RGB               OK
   Start    Reset
```
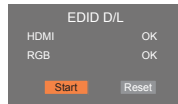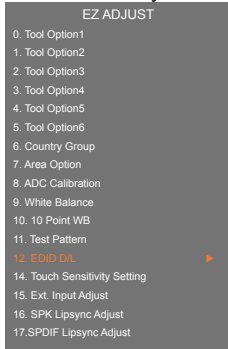
\<Caution\>
- Never connect HDMI & D-sub Cable when download EDID.
- Download HDMI

* Edid data and Model option download (USB)

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

3.1.2. RGB EDID Data
(1) All models without 29MN33D(Product ID: 22984/HEXA: 59C8)

128 B	Summary															
	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	C8	59	01	01	01	01
0x01	01	17	01	03	68	33	1D	78	EA	62	75	A3	55	4F	A0	27
0x02	12	50	54	A7	6A	00	31	4F	45	4F	61	4F	81	00	01	01
0x03	01	01	01	01	01	01	66	21	56	AA	51	00	1E	30	46	8F
0x04	33	00	FD	1E	11	00	00	1E	00	00	00	FD	00	38	4B	1E
0x05	3D	09	00	0A	20	20	20	20	20	20	00	00	FC	00	32	
0x06	44	20	48	44	20	4C	47	20	54	56	0A	20	00	00	00	FF
0x07	00	0A	20	20	20	20	20	20	20	20	20	20	20	00	B3	

*(week), **(year), ***(Check sum) : Adjustable Data
[ ] : Screen size, [ ] : Color Characteristics

3.1.3. HDMI EDID Data
(1) All models(Product ID: 22986/HEXA:59CA)

128 B	256 B	Summary														
	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	CA	59	01	01	01	01
0x01	01	17	01	03	80	33	1D	78	EA	62	75	A3	55	4F	A0	27
0x02	12	50	54	A7	6A	00	31	4F	45	4F	61	4F	81	00	01	01
0x03	01	01	01	01	01	01	66	21	56	AA	51	00	1E	30	46	8F
0x04	33	00	FD	1E	11	00	00	1E	00	00	00	FD	00	38	4B	1E
0x05	3D	09	00	0A	20	20	20	20	20	20	00	00	FC	00	32	
0x06	44	20	48	44	20	4C	47	20	54	56	0A	20	00	00	00	FF
0x07	00	0A	20	20	20	20	20	20	20	20	20	20	01	98		

128 B	256 B	Summary														
	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	02	03	21	F1	4E	84	05	03	02	20	22	10	11	13	12	14
0x01	1F	07	16	26	15	07	50	09	07	07	66	03	0C	00	10	00
0x02	80	01	1D	00	72	51	D0	1E	20	38	88	15	00	56	50	21
0x03	00	00	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00	56
0x04	50	21	00	00	9E	01	1D	80	D0	72	1C	16	20	10	2C	25
0x05	80	C4	8E	21	00	00	9E	02	3A	80	D0	72	38	2D	40	10
0x06	2C	45	20	06	44	21	00	00	1E	02	3A	80	18	71	38	2D
0x07	40	58	2C	45	00	56	50	21	00	00	1E	00	00	00	00	CE

*(week), **(year), ***(Check sum) : Adjustable Data
**** (physical address): (HDMI : 10), ****(Check sum): (HDMI : CE)
[ ] : Screen size, [ ] : Color Characteristics

3.2. Function Check
3.2.1. Check display and sound
*Check Input and Signal items. (cf. work instructions)
1) TV
2) AV (SCART/CVBS)
3) COMPONENT (480i)
4) RGB(PC : 1366 x 768 @ 60Hz)
5) HDMI(PC : 1366 x 768 @ 60Hz)
6) PC Audio In
* Display and Sound check is executed by Remote control

\<Caution\> Not to push the INSTOP key after completion if the function inspection.

3.3. CI+ key writing process. (Device CN)
3.3.1. Communication Port Connection

```
PCBA            USB to Serial Adapter    RS-232C cable   Personal Computer
PCBA (USB Port)    (UC-232A)              RS-232C Cable   PC (RS-232C Port)
```

Connection : PCBA (USB Port) → USB to Serial Adapter (UC-232A) → RS-232C cable → PC(RS-232C port)
* Caution: LD31Q/LD31A chassis support only UC-232A driver. (only use this one)

3.3.2. CI+ Key Download
(1) Set CI+ Key path Directory at Start Mac & CI+ Download Programme.
(2) Set COM 1,2,3,4 / 115200(Baudrate) (1)/(2)
(3) Click port connection button(1)
(4) Start CI+ Key Download, Push the button(4)
(5) Check OK or NG

```
Ver.2.1(091201)MAC+CI+ Key download
Down Load Setting
① Port    ② Baudrate
COM2      115200      ③ Port Connection
Scanner Setting
① Port    ② Baudrate
COM3      14400        Port Connection
MAC Address Setting
Start MAC Address
00 e0 91 c6 c8 c2        CLEAR
End MAC Address
00 E0 91 C6 CB DB        SAVE
                          LOAD
Select Scanner
CANCEL
④ MAC Address RUN
PCBA ID
⑥ CI+ Key SEND
CI+ Key Only
MAC Address Message    CI+ Return Message
```

(6) After completing download, CI + key values are increase by one automatically. To write CI+ key next SET, click CI+ key writing button(5) directly.
(7) Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).

LGE Internal Use Only
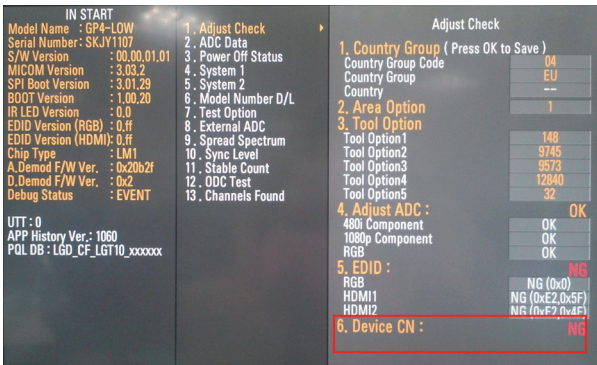
=> Check the Download to CI+ Key value in LG set.
(1) Check the method of CI+ Key value
  1) Check the method on Instart menu
  2) Check the method of RS232C Command
    a. Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
A	A	0	0

    b. Check the key download for transmitted command
      (RS232: ci 00 10)

CMD 1	CMD 2	Data 0	
C	I	1	0

    c. Result value
      - Normally status for download : OKx
      - Abnormally status for download : NGx
(2) Check the method of CI+ key value(RS232)
  1) Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
A	A	0	0

  2) Check the mothed of CI+ key by command
    (RS232: ci 00 20)

CMD 1	CMD 2	Data 0	
C	I	2	0

  3) Result value
    i 01 OK 1d1852d21c1ed5dcx
           └───→ CI+ Key Value

4. Total Assembly line process
4.1. Tool option & ADC Check
(1) Press "Power on" key of service remote control.
(2) Connect USB Port → USB to Serial Adapter (UC-232A) → RS-232C cable → PC(RS-232C port)
(3) Check the 'Tool Option'(Refer to the BOM Comments or Adjustment spec)
(4) Check the 'ADC' is ok.

4.2. Model name & Serial number download
4.2.1. Model name & Serial number D/L
1) Press "Power on" key of service remote control.
2) Connect RS232 Signal Cable to RS-232 Jack.
3) Write Model Name & Serial Number by use RS-232.
4) Must check the serial number at the Diagnostics of SET UP menu. (Refer to below.)
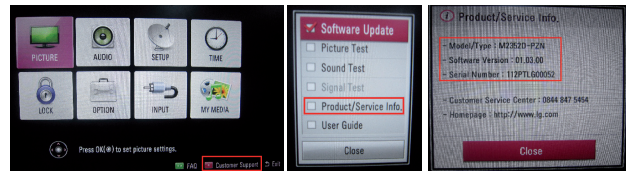
4.2.2. Method & notice
(1) Model Name & Serial Number D/L is using of scan equipment.
(2) Setting of scan equipment operated by Manufacturing Technology Group.
(3) Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

*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.
1) Press the 'Instart' key of ADJ remote control.
2) Go to the menu '6.Model Number D/L' like below photo.
3) Input the Factory model name(ex 24LN4500) or Serial number like photo.
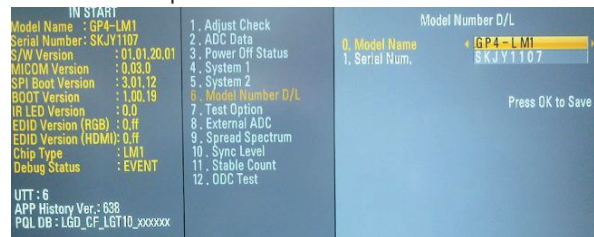
4) Check the model name Instart menu → Factory name displayed (ex 24LN4500)
5) Check the Diagnostics (DTV country only) → Buyer model displayed (ex 24LN4500)

4.3. Function Check

4.3.1. Check display and sound
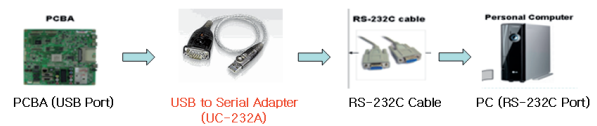
■ Check Input and Signal items. (cf. work instructions)
1) TV
2) AV (SCART/CVBS)
3) COMPONENT (480i)
4) RGB(PC : 1366 x 768 @ 60Hz)
5) HDMI(PC : 1366 x 768 @ 60Hz)
6) PC Audio In
* Display and Sound check is executed by Remote control
* Caution : Not to push the INSTOP KEY after completion if the function inspection.

4.3.2. PCMCIA CARD Check

You must adjust DTV 29 Channel and insert PCMCIA CARD to socket.
- If PCMCIA CARD works normally, video signals will appear on screen. But it works abnormally, "No CA module" will appear on screen.
* Caution: Set up "RF mode" before launching products.

4.3.3. PIP Check

(1) Press "Power on" key of service remote control.
(2) Input RGB & TV(ATV or DTV) signal.
(3) Set Input mode to RGB.
(4) Press 'PIP" key of ADJ remote control
(5) Check TV Video & Audio signal of Sub picture.

4.3.4 HDMI MHL Function Inspection(HDMI2 Port only)

(1) Insert HDMI cable for MHL function JIG connected to HDMI2 port of the SET.
(2) Check that LED of JIG is green light and check that set screen is correctly worked.
(3) If NG situation or other HDMI jack connection, LED of JIG is red light and screen is not displayed.
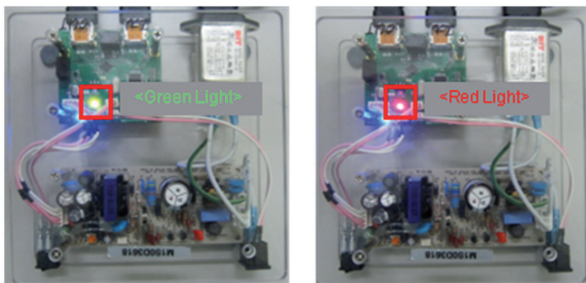
4.4. White balance adjustment

- Equipment
  (1) Color Analyzer: CA-210 (LED Module : CH 14)
  (2) Adj. Computer(During auto adj., RS-232C protocol is needed)
  (3) Adjust Remote control

RGB Gains are fixed data for each model.
Insert RS-232C Jack which is connected with PC for White Balance or equivalent device.
→ Total Assembly line should be check whether the color coordinate(x,y) data refer to below table were meet or not.

- Cool Panel

Color Temperature	Cool	13,000	K	X=0.276 (±0.03) Y=0.275 (±0.03)	<Test Signal> Inner pattern (204gray,80IRE)
	Medium	9,300	K	X=0.290 (±0.03) Y=0.298 (±0.03)	
	Warm	6,500	K	X=0.318 (±0.03) Y=0.334 (±0.03)	
Luminance (cd/m²)	Cool	Min : 80	K	Typ : 110	<Test Signal> Inner pattern (204gray,80IRE)
	Medium	Min : 80	K	Typ : 110	
	Warm	Min : 70	K	Typ : 110	

* Note : x,y coordinates are drifted about 0.007 after 30 mins heat-run. So checking color coordinate within 5-min at total assembly line, consider x,y coordinates might be up to 0.007 than x,y target of each color temperature.

* Note : Manual W/B process using adjusts Remote control.
1) After enter Service Mode by pushing "ADJ" key,
2) Enter "White Balance" by pushing "►" key at "White Balance".
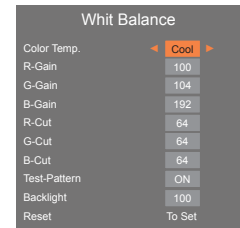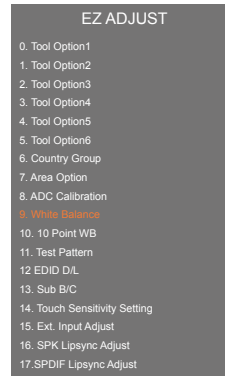
* When doing Adjustment, Please make circumstance as below.
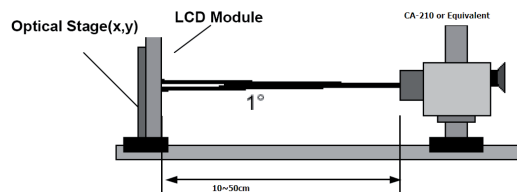
4.5. DPM Operation check

■ Measurement Condition: 100~240V@ 50/60Hz

(1) Set Input to RGB-PC and connect D-sub cable to set - RGB Mode.

Set Input to HDMI(with Input Label set to PC) and connect HDMI cable to set - HDMI Mode

(2) Cut off H sync or V sync of signal.

(3) Check DPM operation refer to the below table.

Operating Condition		Sync(H/V)	Video	LED(SET)	Wattage(W)
Power S/W On	Sleep mode - RGB, HDMI	Off/Off	Off	Amber	1

■ HDMI DPM Operating condition
- Input Label: HDMI (PC&DVI Mode)

	MHL Cable	HDMI & HDMI to DVI Cable
DPM	X	O

4.6. Model name & SW version & Adjust check

* Press the 'Instart' key of ADJ remote control.

4.6.1. Model Name& SW Version Check

1) Check 'Model Name'.
2) Check 'S/W Version' (Refer to the IC Ver. in the BOM)

4.6.2. Adjust Check

1) Check 'Country Group'
2) Check 'Area Option'
3) Check 'Tool Option' (Refer to the BOM Comments)
4) Check 'Adjust ADC[Comp&RGB]' is OK.
5) Check 'EDID[RGB&HDMI]' is OK.
* After check all, Press the 'EXIT' key of ADJ remote control to go out SVC menu.

4.7. Outgoing condition Configuration

* After all function test., press IN-STOP key by SVC Remote control. And make Outgoing Condition.

TROUBLE SHOOTING

1. No Power

```
┌──────────────────────┐   N   ┌──────────────────────┐   N   ┌──────────────────────┐
│   Check  C820 All    │ ────► │  Check Power connector│ ────► │   Replace Adapter    │
│  Voltage Level (19V) │       │        OK ?           │       │                      │
└──────────┬───────────┘       └──────────────────────┘       └──────────────────────┘
           │ Y
┌──────────▼───────────┐   N   ┌──────────────────────┐
│  Check  IC809 Output │ ────► │    Replace  IC809     │
│ Voltage Level (3.3V_ST)│     │                      │
└──────────┬───────────┘       └──────────────────────┘
           │ Y
┌──────────▼───────────┐   N   ┌──────────────────────┐
│  Check IC802 output  │ ────► │    Replace IC802 &    │
│  Voltage Level (12V) │       │       Recheck         │
└──────────┬───────────┘       └──────────────────────┘
           │ Y
┌──────────▼───────────┐   N   ┌──────────────────────┐
│  Check  IC810 Output │ ────► │    Replace  IC810     │
│ Voltage Level (2.5V) │       │                      │
└──────────┬───────────┘       └──────────────────────┘
           │ Y
┌──────────▼───────────┐   N   ┌──────────────────────┐
│  Check  IC807 Output │ ────► │    Replace  IC807     │
│ Voltage Level (1.5V) │       │                      │
└──────────┬───────────┘       └──────────────────────┘
           │ Y
┌──────────▼───────────┐   N   ┌──────────────────────┐
│  Check  IC806 Output │ ────► │    Replace  IC806     │
│ Voltage Level (1.15V)│       │                      │
└──────────┬───────────┘       └──────────────────────┘
           │ Y
┌──────────▼───────────┐   N   ┌──────────────────────┐
│   Check X201 Clock   │ ────► │    Replace X201       │
│       24MHz          │       │                      │
└──────────┬───────────┘       └──────────────────────┘
           │ Y
┌──────────▼───────────┐
│ Replace IC100 Flash  │
│      Memory          │
└──────────────────────┘
```

2. No Picture

```
┌─────────────────────┐  N   ┌─────────────────────┐  N   ┌─────────────────────┐
│      Module         │─────▶│ Check WLED_ENABLE   │─────▶│    Check IC101      │
│   Back Light On ?   │      │ high R131           │      │ Replace Main Scaler │
└─────────────────────┘      └─────────────────────┘      │        IC           │
          │ Y                          │ Y                 └─────────────────────┘
          │                 ┌─────────────────────┐  N   ┌─────────────────────┐
          │                 │ Check LED Driver    │─────▶│ Check LED Driver    │
          │                 │ output (LED Driver  │      │ IC1100 Replace LED  │
          │                 │ B'd P1101           │      │ Driver IC           │
          │                 │ #1,2,3,4,9,10,11,12)│      └─────────────────────┘
          │                 └─────────────────────┘
          ▼
┌─────────────────────┐  N   ┌─────────────────────┐
│  Check Panel power  │─────▶│   Replace IC804     │
│ P601(#27,28,29,30)  │      └─────────────────────┘
│ 12V IC804Output 12V │
└─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐  N   ┌─────────────────────┐
│  Check Panel clock  │─────▶│    Check IC101      │
│    P601(#9,10)      │      │  Repair Main B/D    │
└─────────────────────┘      └─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐  N   ┌─────────────────────┐
│ Check FFC Cable for │─────▶│   Replace Cable     │
│ damage or open      │      └─────────────────────┘
│ conductors.         │
└─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐
│   Replace T-con     │
│  Board or module    │
└─────────────────────┘
```

3. No Video - Digital TV

```
┌─────────────────────┐
│   Check RF Cable    │
└─────────────────────┘
          │ Y
          ▼
┌─────────────────────────────┐  N   ┌─────────────────────┐
│ 1. Check Tuner(TU2603 #5)   │─────▶│   Replace IC803     │
│    Power (3.3V)             │      └─────────────────────┘
│ 2. Check IC803 Output       │
│    voltage(3.3V)            │
└─────────────────────────────┘
          │ Y
          ▼
┌─────────────────────────────┐  N   ┌─────────────────────┐
│ 1. Check Tuner(TU2602 #7)   │─────▶│   Replace IC805     │
│    Power (1.8V)             │      └─────────────────────┘
│ 2. Check IC805 Output       │
│    voltage(1.8V)            │
└─────────────────────────────┘
          │ Y
          ▼
┌─────────────────────────────┐  N   ┌─────────────────────┐
│ Check Tuner(TU2602) I2C     │─────▶│    Check IC101      │
│ Signal SCL(R3735), SDA(R3736)│     └─────────────────────┘
└─────────────────────────────┘
          │ Y
          ▼
┌─────────────────────────────┐  N   ┌─────────────────────┐
│ Check Tuner(TU2603)         │─────▶│ Replace Tuner(TU2603)│
│ Data, CLK, SYN, VAL         │      │      Recheck        │
└─────────────────────────────┘      └─────────────────────┘
```

4. No Video - Component

```
┌─────────────────────────┐
│ Check input signal format │
│    Is it supported?       │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│  Check Component Cable   │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐      N    ┌─────────────────────────┐
│     Check JK2800         │─────────▶│   Replace JK2800 or     │
└─────────────────────────┘           │     Check Device        │
           │ Y                         └─────────────────────────┘
           ▼
┌─────────────────────────┐      N    ┌─────────────────────────┐
│    Check signal          │─────────▶│  Replace R239,R237,R241 │
│   R239,R237,R241         │           │    C220,C218,C222       │
│   C220,C218,C222         │           └─────────────────────────┘
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│   IC101 has problem      │
└─────────────────────────┘
```


Wave form of Comp Y

Wave form of Comp Pb

Wave form of Comp Pr

Wave form of C220

Wave form of C218

Wave form of C222

5. No Video - RGB

```
┌─────────────────────────┐
│ Check input signal format │
│    Is it supported?       │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│    Check RGB Cable       │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐      N    ┌─────────────────────────┐
│     Check JK400          │─────────▶│   Replace JK400 or      │
└─────────────────────────┘           │     Check Device        │
           │ Y                         └─────────────────────────┘
           ▼
┌─────────────────────────┐      N    ┌─────────────────────────┐
│   Check Hsync, Vsync     │─────────▶│  Replace R4024, R4025   │
│    R4024, R4025          │           └─────────────────────────┘
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐      N    ┌─────────────────────────┐
│   Check signal RGB       │─────────▶│ Replace R228,R230,R232  │
│   R228,R230,R232         │           │    C204,C206,C208       │
│   C204,C206,C208         │           └─────────────────────────┘
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│   IC101 has problem      │
└─────────────────────────┘
```


Wave form of R4025(Vsync)

Wave form of R4024(Hsync)

Wave form of R228/C204

Wave form of R230/C206

Wave form of R232/C208

LGE Internal Use Only

6. No Video - HDMI

```
┌─────────────────────────────┐
│  Check  input signal format │
│       Is it supported?      │
└─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐
│   Check HDMI Cable for damage│
│      or open connector      │
└─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐        N    ┌─────────────────────────────┐
│      Check JK500,501        │ ──────────▶ │     Replace connector       │
│ for proper connection or damage│          └─────────────────────────────┘
└─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐        N    ┌─────────────────────────────┐
│   Check I2C Signal (JK500,501)│ ────────▶ │    Re download EDID data    │
│        (#15, #16)           │             └─────────────────────────────┘
└─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐        N    ┌─────────────────────────────┐
│     Check HDCP Key (IC101)  │ ──────────▶ │    Replace Scaler(IC101)    │
└─────────────────────────────┘             └─────────────────────────────┘
```

7. No Audio

```
┌─────────────────────────────┐
│ Make sure you can't hear any audio and│
│ Device support the audio signal normally.│
└─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐        N    ┌─────────────────────────────┐
│      Check Speaker and      │ ──────────▶ │  Replace connector or Speaker│
│   its wire connection (P700)│             └─────────────────────────────┘
│      and the resistance     │
└─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐        N    ┌─────────────────────────────┐
│ Check R4045 Voltage Level (3.3V)│ ──────▶ │     Replace IC807(3.3V)     │
└─────────────────────────────┘             └─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐        N    ┌─────────────────────────────┐
│    Check Signal from IC700  │ ──────────▶ │       Replace IC700         │
│     L700,L701, L706, L709   │             └─────────────────────────────┘
└─────────────────────────────┘
              │ Y
              ▼
┌─────────────────────────────┐        N    ┌─────────────────────────────┐
│    Check Signal from IC101  │ ──────────▶ │       Replace IC101         │
│         SDA/SCL             │             └─────────────────────────────┘
│   (R703/R214, R707/R213)    │
└─────────────────────────────┘
```

BLOCK DIAGRAM

EXPLODED VIEW

NAND FLASH MEMORY

IC102
H27U1G8F2CTR-BC
NAND_1G_HYNIX_9103(DEV)
EAN35669103

<CHIP Config(LED_R/BUZZ)>
Boot from SPI CS1N(EXT_FLASH)   1'b0
Boot from SPI_CS0N(INT_FLASH)   1'b1

<CHIP Config>
(I2S_OUT_BCK,I2S_OUT_MCK,PAD_PWM1PAD_PWM0)

B51_no_EJ   : 4'b0000 Boot from 8051 with SPI flash
SB51_WOS   : 4'b0001 Secure B51 without scramble
SB51_WS   : 4'b0010 Secure B51 with scramble
MIPS_SPE_NO_EJ   : 4'b0100 Boot from MIPS with SPI flash
MIPS_SPI_EJ_1   : 4'b1100 Boot from MIPS with SPI flash
MIPS_SPI_EJ_2   : 4'b1010 Secure MIPS with SPI flash
MIPS_WOS   : 4'b1001 Boot MIPS without scramble
MIPS_WS   : 4'b1010 Scrur MIPS with SCRAMBLE

IC101
MSD804KKX
S7LR-M_NON_MS10

NAND_1G_SS
EAN61857001
IC102-*1
K9F1G08U0D-SCB0

NAND_1G_NUMONYX(DEV)
EAN60762401
IC102-*2
NAND01GW3B2CN6E

LGE2121-NonMS10 (MSD804KKX)
: EAN62651201 (KR/US REGION)

LGE2121-MS10 (MSD804KKX)
: EAN62674101 (NON_KR/US REGION)

DIMMING

I2C

PM MODEL OPTION

EEPROM

IC103
AT24C256C-SSHL-T
NVRAM_ATMEL
A0'h
EAN61133501

NVRAM_ST
IC103-*1
M24256-BRMN6TP
EAN61548301

NVRAM_RENESAS
IC103-*2
R1EX24256BSAS0A
EAN62389501

for SYSTEM EEPROM
(IC104)

SERIAL FLASH MEMORY

S_FLASH_MAIN_WINBOND
IC100
W25Q80BVSSIG

S_FLASH_MAIN_MACRONIX
IC100-*1
MX25L8006EM2I-12G

for SERIAL FLASH

from CI SLOT

Internal demod out

IC101
MSD804KKX
S7LR-M_NON_MS10

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THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

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EAX65077401

| MODEL | NC4_S7LRM | DATE | 2012.09.15 |
| BLOCK | MAIN1_EU | SHEET | 1 / 12 |

MODEL OPTION

PIN NAME	PIN NO	LOW	HIGH
MODEL_OPT_0	AB3	FHD	HD
MODEL_OPT_1	F4	PHM_OFF	PHM_ON
MODEL_OPT_2	AB2	NON_DVB_T2	DVB_T2
MODEL_OPT_3	T25	NON_3D	3D
MODEL_OPT_4	U23	MIU-128M	MIU0-256M
MODEL_OPT_5	T24	NON_DVB_S	DVB_S
MODEL_OPT_6	B8	MIU1-NO_DDR	MIU1-128M
MODEL_OPT_7	A8	NON_DualStream	DualStream

* Dual Stream is only Korea 3D spec
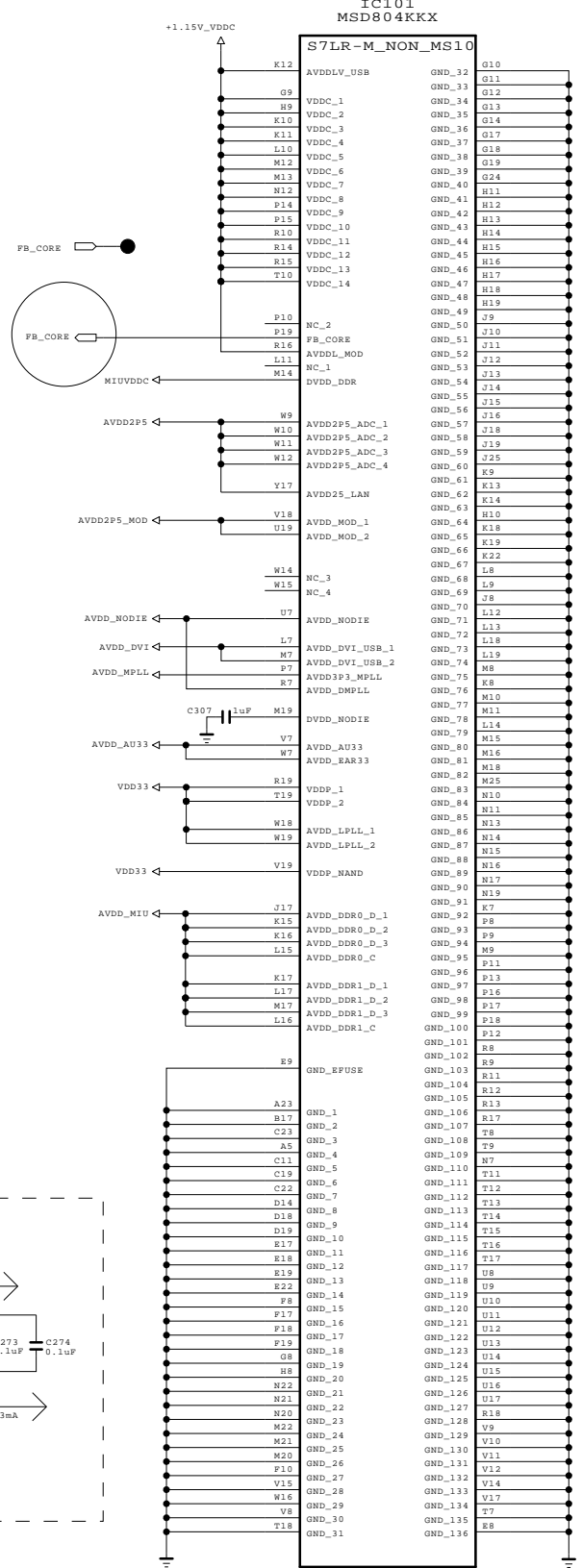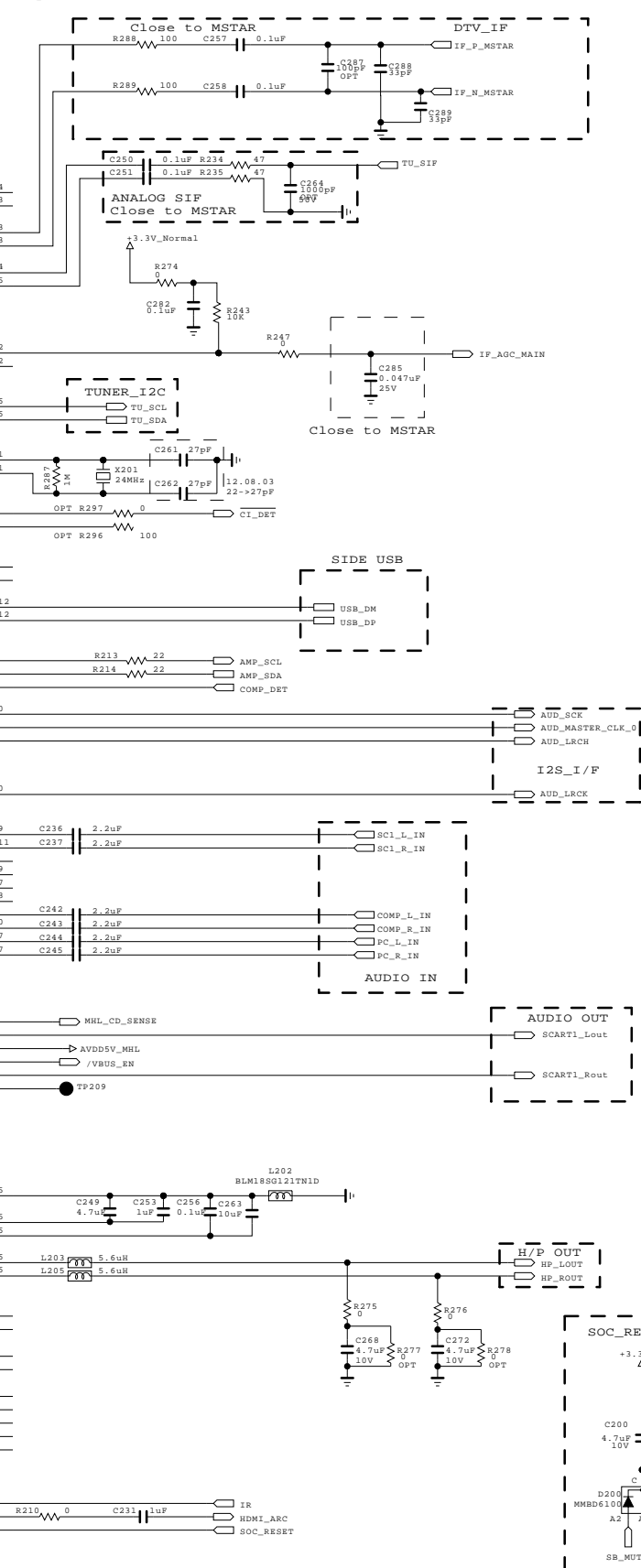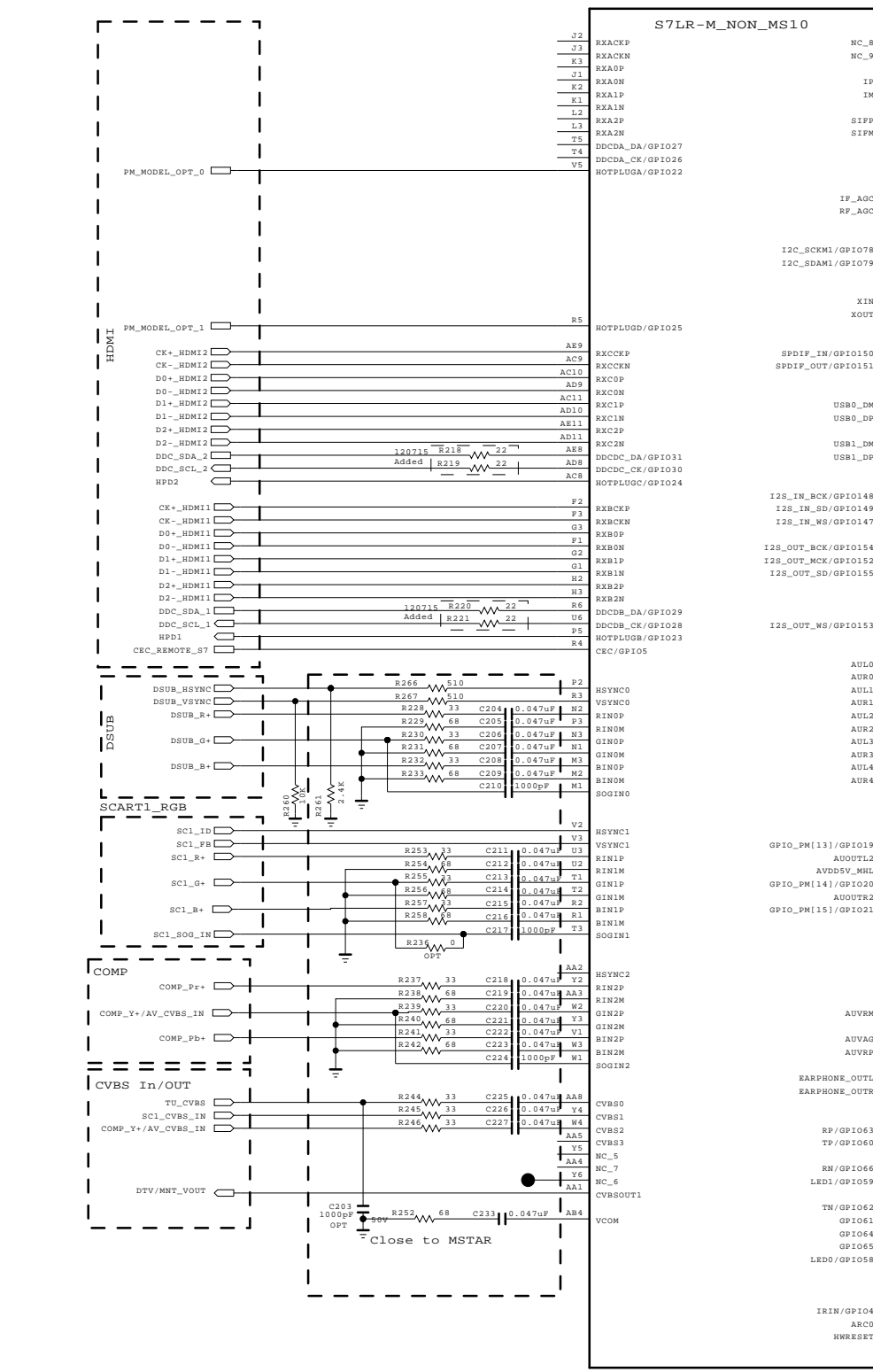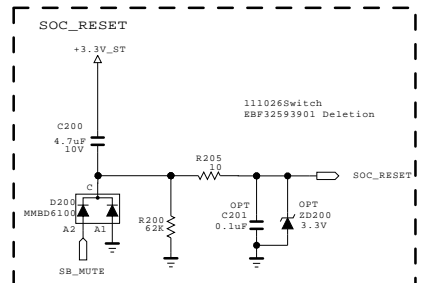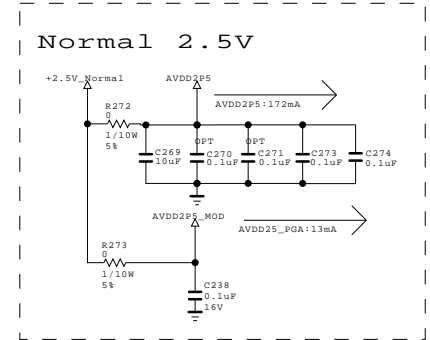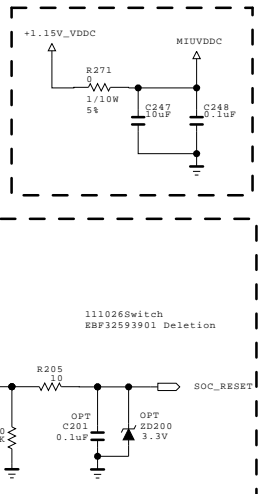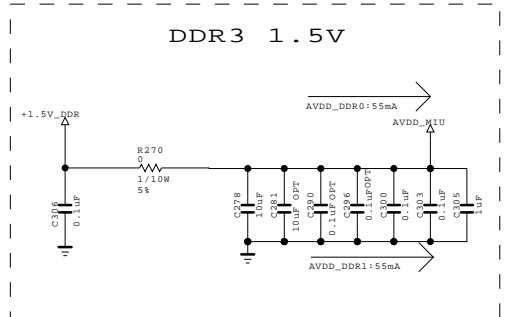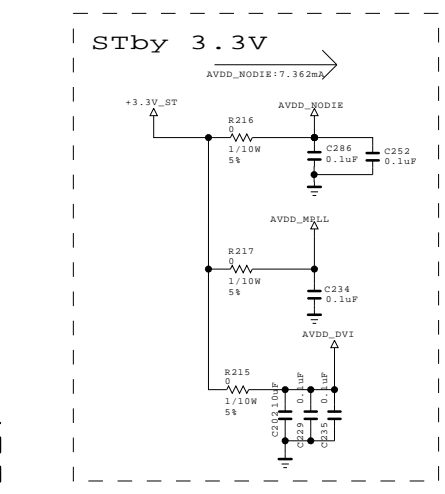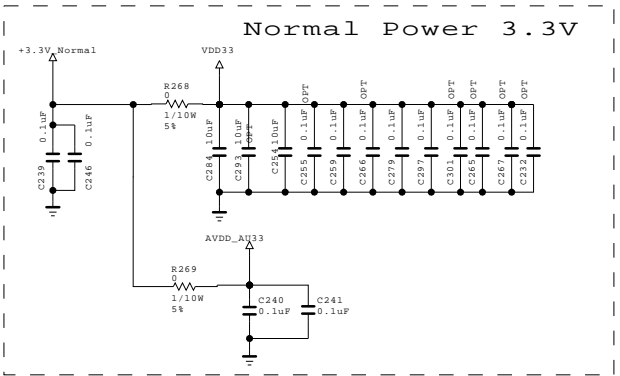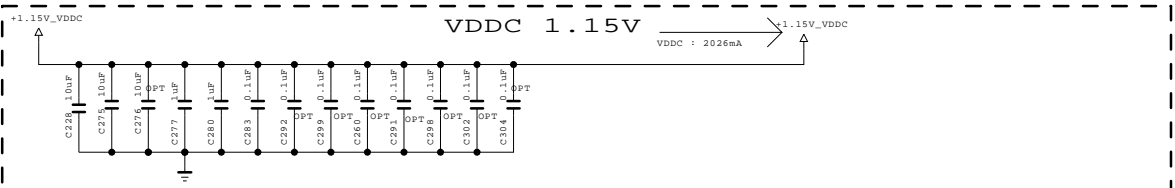
MEMORY OPTION

Memory	Model OPT 4	Model OPT 6	Note
128M	0	0	
128M+128M	0	1	
256M	1	0	
256M+128M	1	1	Ginga

VDDC 1.15V   VDDC : 2026mA

Normal Power 3.3V

STby 3.3V

DDR3 1.5V

Normal 2.5V

VDD 1.15V_VDDC

SOC_RESET

IC101
MSD804KKX
S7LR-M_NON_MS10

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EAX65077401

MODEL	NC4_S7LRM	DATE	2012.09.15
BLOCK	MAIN2_EU	SHEET	2 / 12
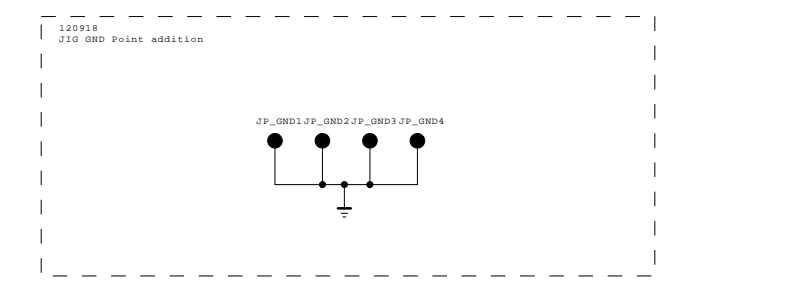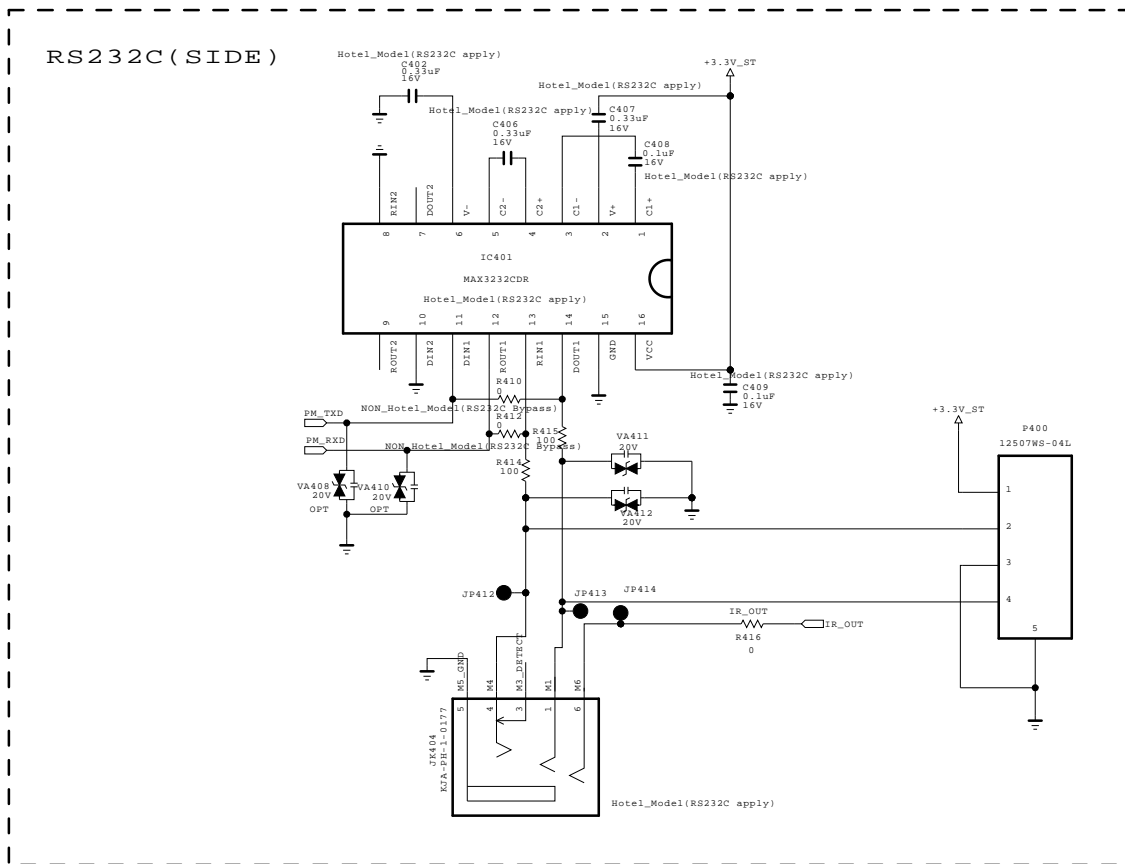
DSUB RGB

PC AUDIO(SIDE)

USB(SIDE)

Jack Shield (HDMI1, HDMI2, RGB)

JackShield(for NonCKD)
M1
MGJ63348201

JackShield(for CKD)
M1-*1
MGJ63348202

120918
JIG GND Point addition

JP_GND1 JP_GND2 JP_GND3 JP_GND4

RS232C(SIDE)

IC401
MAX3232CDR
Hotel_Model(RS232C apply)

P400
12507WS-04L

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EAX65077401

| MODEL | NC4_S7LRM | DATE | 2012.09.15 |
| BLOCK | INTERFACE | SHEET | 4 / 12 |

HDMI

HDMI_1
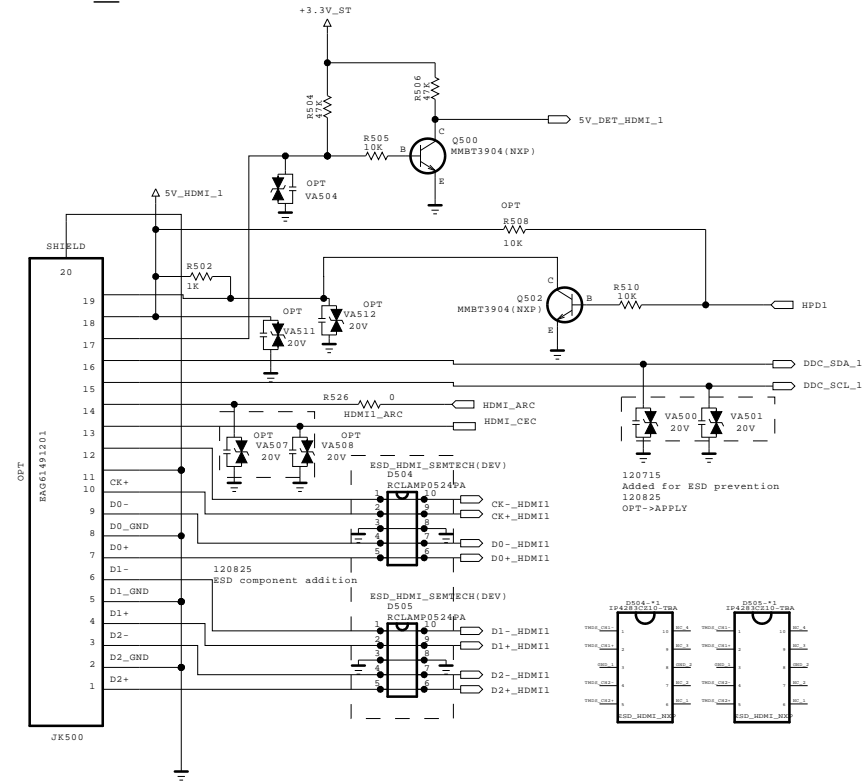
CEC
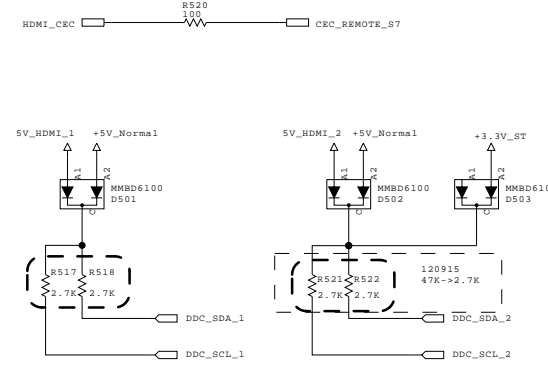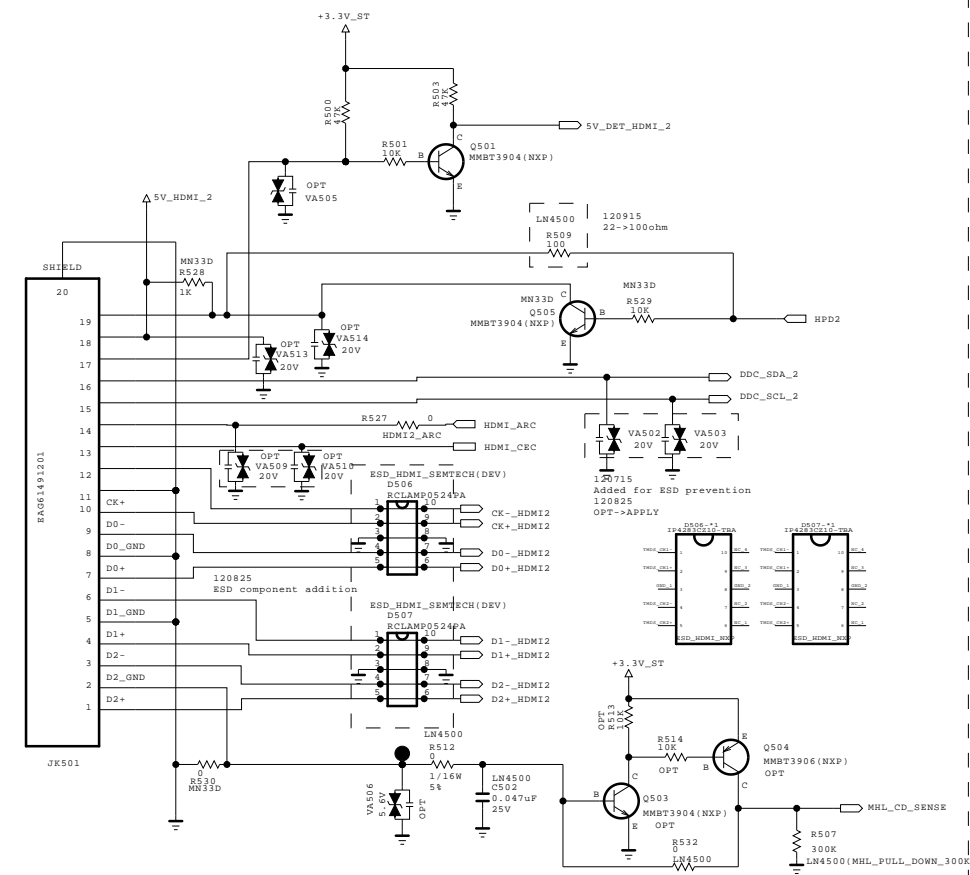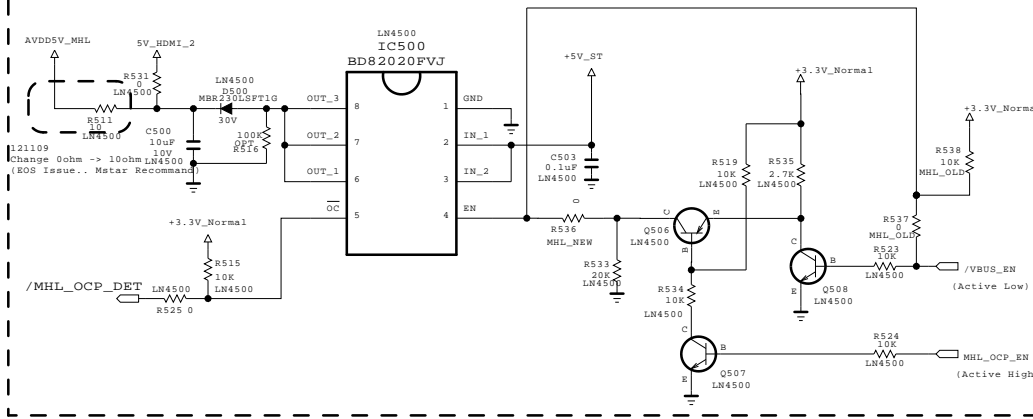
MHL OCP

HDMI_2 With MHL

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| MODEL | NC4_S7LRM | DATE | 2012.09.15 |
| BLOCK | HDMI | SHEET | 5 / 12 |

EAX65077401

IR/LED and Control

```
                                    +3.3V_ST
                                       |
                              R616    R617   L600
                              3.3K    3.3K   BLM18PG121SN1D
KEY2                          R614                    JP600
KEY1                          100                     JP601
KEY_SCL                       R615                    JP602
KEY_SDA                       100                     JP605
                                                      JP604
  +3.3V_ST                    +3.3V_ST                JP603
   R604   270                  R610   330             JP607
                              120915                  JP606
                              RED LED setting         JP608
                              : 9.6->7.9mA            JP609
                                                      JP610
Amber LED setting : 9.6mA                             JP611

                         P600
                         12507WR-12L
                          1
                          2
                          3
                          4
                          5
                          6
                          7
                          8
                          9
                          10
                          11
                          12
                          13
```

```
           R600          C
           10K       B  Q600
LED_RED              E  MMBT3904(NXP)
           R601
           10K
```

```
(IR Port protection against ESD)
121018                      R630
100ohm->200ohm              200
IR

+3.3V_ST

C600  D602   C601   D604   OPT  OPT   OPT D602 OPT D603
0.1uF 20V    100PF  20V    C602 C603  20V      20V
50V          50V          100PF 100PF
                          50V   50V
                                          12.07.17
                                          Change D601-3
```

```
           R602          C
           10K       B  Q601
LED_AMBER            E  MMBT3904(NXP)
           R603
           10K
```

IR_OUT(Ready)

```
        +3.3V_ST
           |
         IR_OUT
         R619
         10K          +3.3V_ST
   R618     OPT
   22       R620       R622
IR_OUT     0           10K
        C              IR_OUT
    B  Q602    IR_OUT
    E          R621
MMBT3904(NXP)  10K
IR_OUT         C604
               1000pF
               IR_OUT
                        C
                    B  Q603        R623
                    E              47K       IR
               MMBT3904(NXP)       IR_OUT
               IR_OUT
```

Module

```
                                    P601
                                    10031HR-30
                                     1
                                     2
                                     3
                                     4
                                     5
RXA3+                                6
RXA3-                                7
                                     8
RXACK+                               9
RXACK-                               10
                                     11
RXA2+                                12
RXA2-                                13
                                     14
RXA1+                                15
RXA1-                                16
                                     17
RXA0+                                18
RXA0-                                19
                                     20
                                     21
PIN22                R628            22
  0~0.7V  | VESA     0               23
  2.7~3.3V| JEDIA    R629
PIN23                0     LGD       24
  GND  | LGD                         25
  NC   | NC                          26
                                     27
                                     28
+12V_PANEL_POWER                     29
                                     30
                  2012.04.13         31
                  1K/10W -> 4.7K/10W
111116
100uF Ecap   C605   C606  C607  4.7K  4.7K  4.7K  4.7K
Deletion     0.1uF  10uF  1000pF R624 R625 R626 R627
EAE38362801  50V    25V   50V

             2012.04.13
             10uF/10V -> 10uF/25V    JP612
```
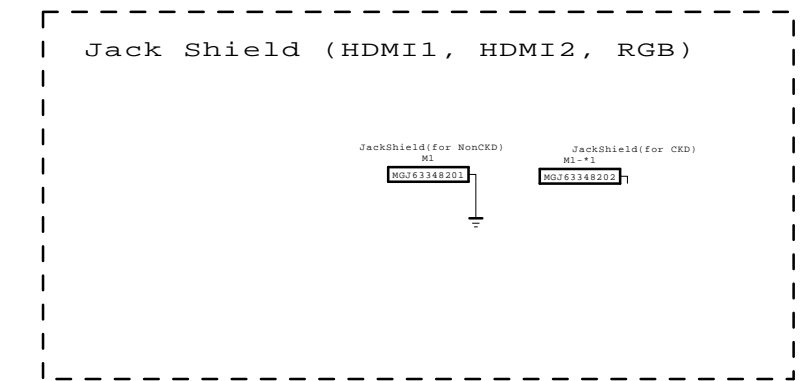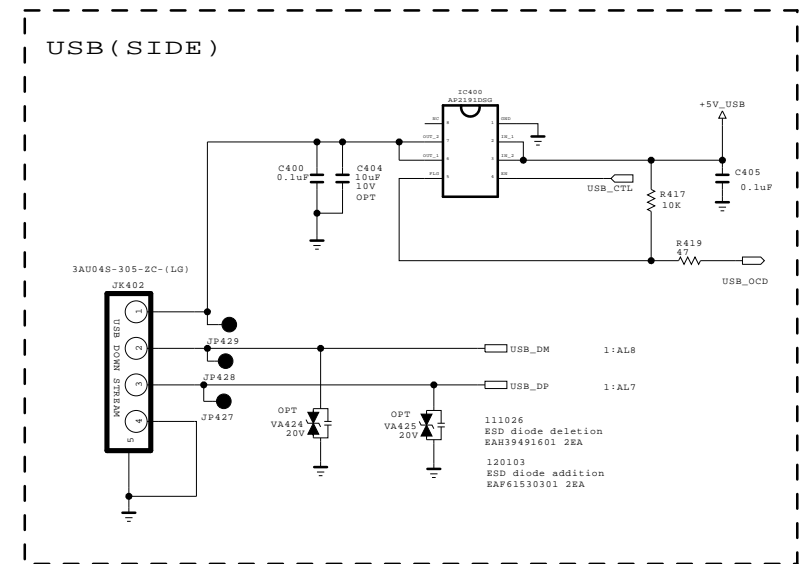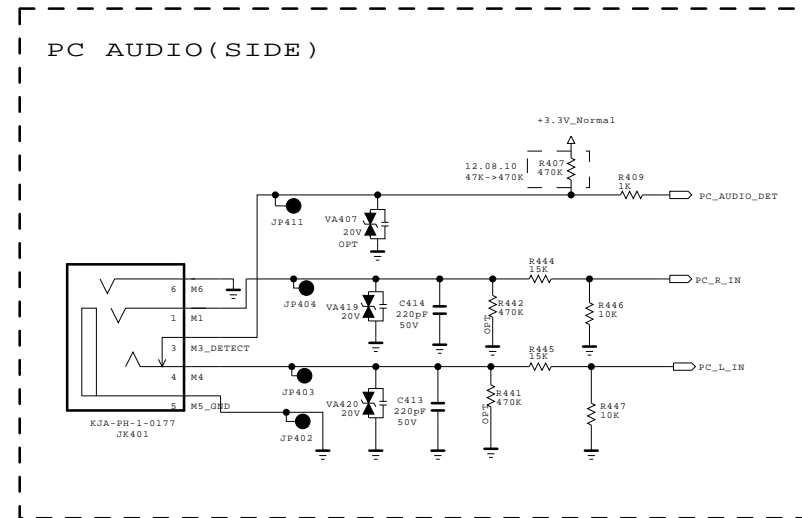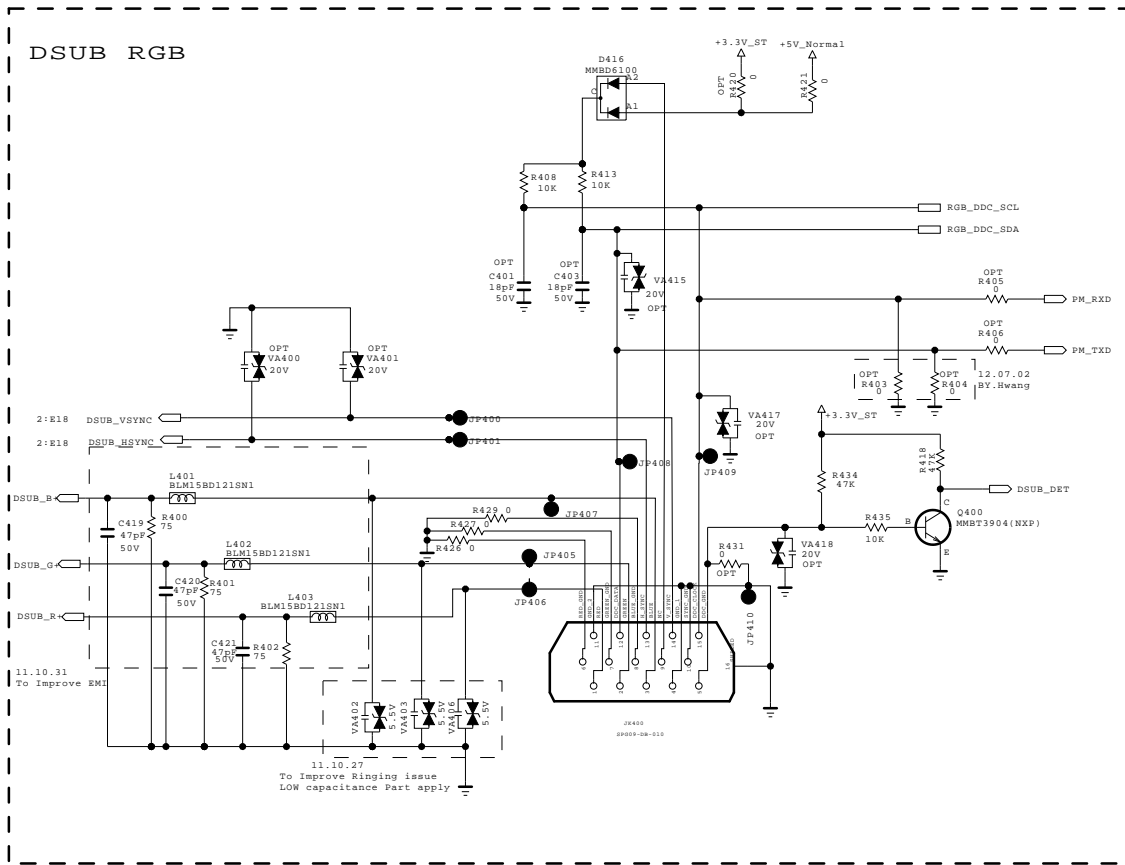

THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES
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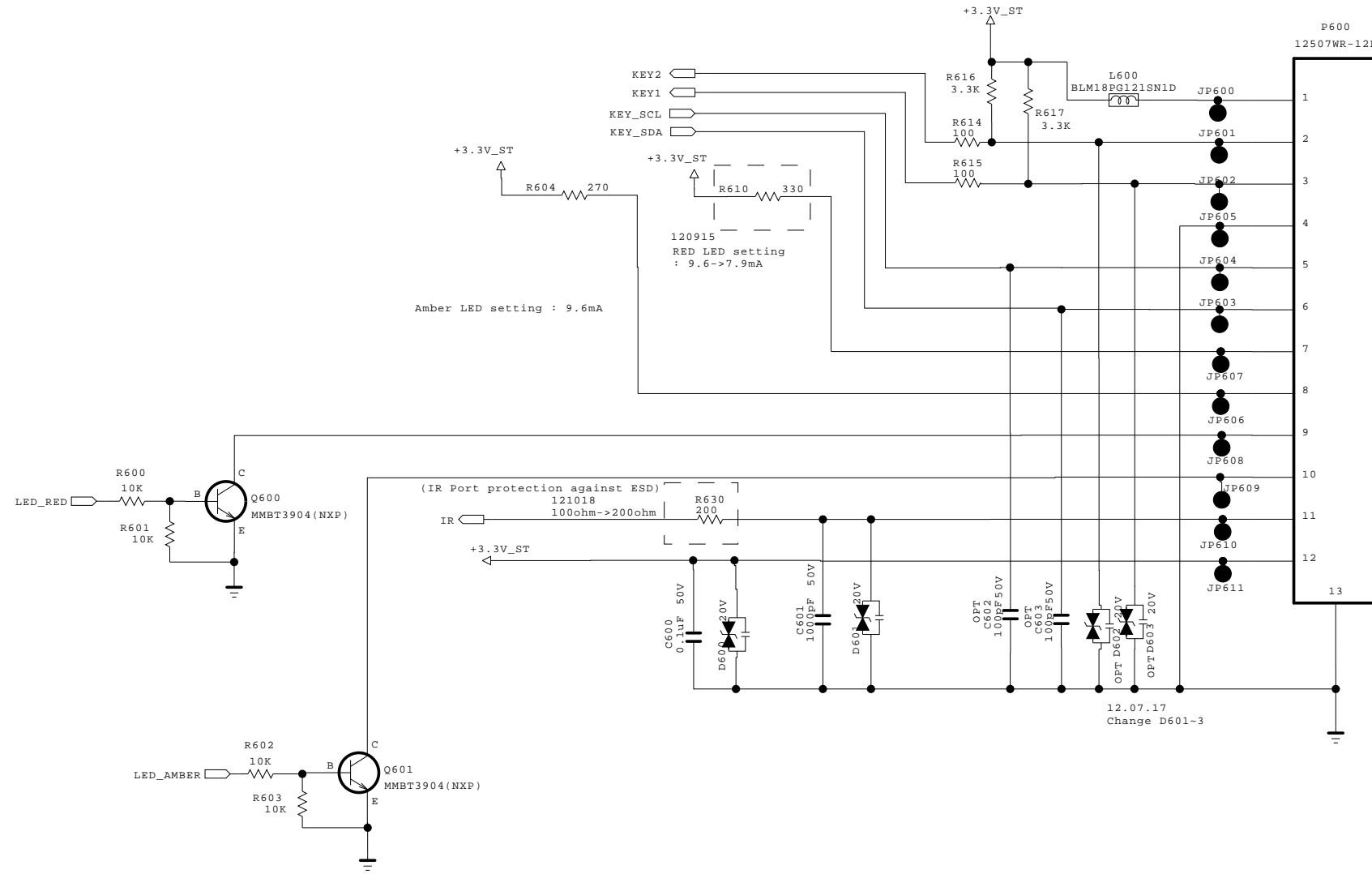| SECRET |
|--------|
| LGElectronics |

LG ELECTRONICS

EAX65077401

MODEL	NC4_S7LRM	DATE	2012.09.15
BLOCK	MODULE&CONTROL	SHEET	6 / 12

AUDIO AMP

Headphone block
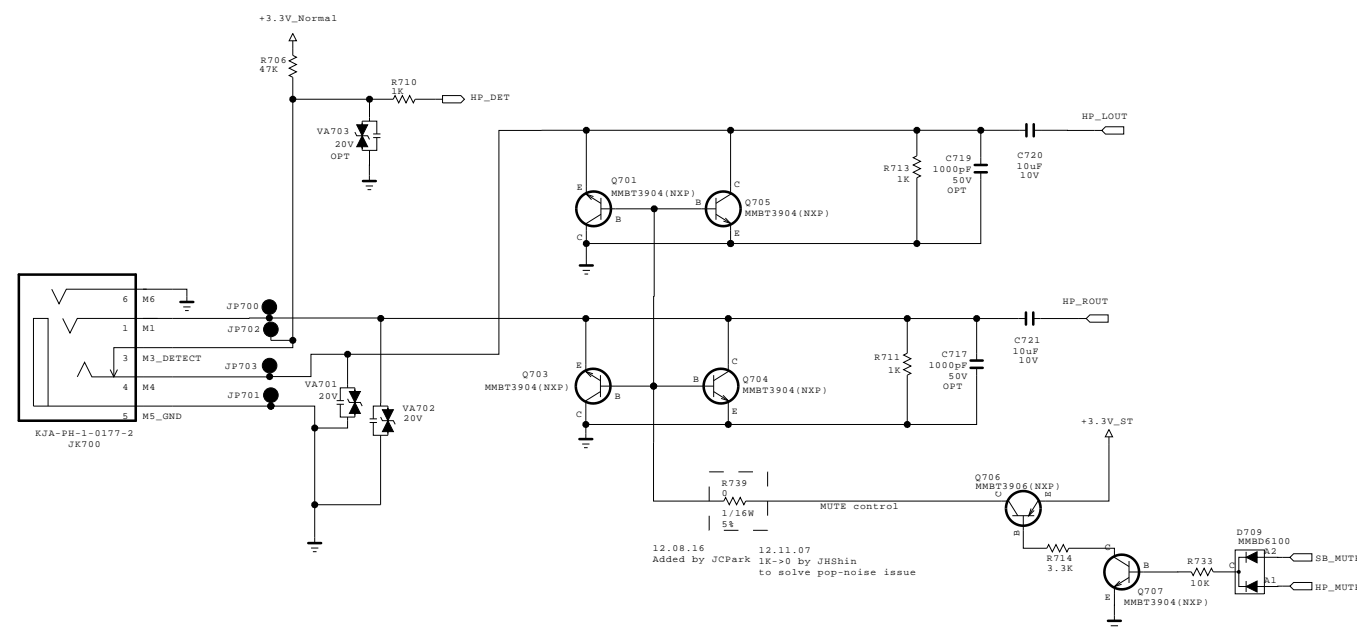
Pop-up noise killer
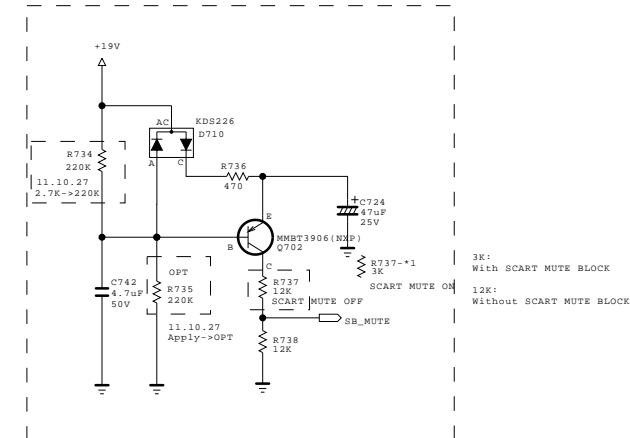
SECRET
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EAX65077401

MODEL	NC4_S7LRM	DATE	2012.09.15
BLOCK	AUDIO AMP	SHEET	7 / 12

PANEL POWER CONTROL

19V TO 5V DCDC CONVERTER

5V TO 1.15V DCDC CONVERTER
M1 Core

19V TO 12V DCDC CONVERTER

3.3 TO 1.5V LDO

Not used :
only for small(ready)

AMP_VCC Control

AO3407A Vgs : 10.8V(24V input)
AO3407A Vgs : 10.36V(19V input)

AMP_VCC

19V TO 5V DCDC FOR MHL

120915
MP1584->MP1472

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LG ELECTRONICS

EAX65077401

| MODEL | NC4_S7LRM | DATE | 2012.08.25 |
| BLOCK | POWER | SHEET | 8 / 12 |

LED DRIVER

+19V

11.11.15
1K->100ohm
1000pF->100pF

R1127
100

WLED_ENABLE

R1129
100K
1%

C1116
100pF
50V

11.12.02
22uF 2EA->47uF 1EA
EAK60365101->EAK61423901

C1118
47uF
25V

C1121
4.7uF
50V

L1101
33uH

11.11.29
0DSKE00048A Diode DEL

11.11.29
Diode change canceled(111202)
EAH61112701->EAH61533501

D1103
BR210
100V

12.01.10
Main AOD478
Sub AP18T10GH

Q1103
AOD478

12.08.11
270K-270K
->510K 2012size

R1100
510K
1/8W
1%

VOUT

R1121
100

WLED_DIM_ADJ

R1128
22K
1%

C1114
1000pF
50V

R1122
100K

C1111
100pF
50V

12.08.11
24K->22K

11.11.15
1000pF->100pF

IC1100
DT1641AS

1 EN
2 OVP
3 NC_1
22 CS
21 HDRV
20 RSS
19 COMP
18 RT
8 LS8
7 RISET
17 LS1
16 LS2
15 LS3
14 LS4
13 LGND
9 LS7
10 LS6
11 LS5
12 NC_2

24 [EP]GND
23 VIN
VREF

TERMAL
25

C1122
1uF
25V

R1136 0

R1137
0.1
1%
1W

11.10.27
Parallel 0ohm DEL

C1123
4700pF
500V

C1125
0.047uF
25V

R1112
220K 1%

R1134
30K 1%

R1131
39K 1%

R1133
1.5K 1%

R1135
1.5K 1%

BLU_CURRENT_CTL

R1123
100K
1%

R1124
1.5K
1%

R1125
24K
1%

JP1100

JP1101

JP1105

JP1106

JP1102

JP1104

JP1103

JP1107

JP1108

12.10.16
EAN62407801->EAN62656301

VOUT

VOUT

MC1124
2.2uF
100V

C1127
1uF
100V

C1128
1uF
100V

OPT
C1129
1uF
100V

OPT
C1130
1uF
100V

12.03.08
EAK61103401 2.2uF MLCC 1ea(3225)
->EAK61381601 1uF MLCC 2ea(3216)

05002HR-H12J05
P1100

13
12
11
10
9
8
7
6
5
4
3
2
1

+19V

L1100
10uH

12.05.17
C1110 EAK62721801 33uF,
C1111 0CH810C2691 10uF
-> EAK60171701 68uF 2EA

D1101
BR210
100V

+24V_BLU

C1112
47uF
25V

C1113
10uF
25V

C1115
0.1uF
50V

C1119
100pF
50V
OPT

R1107
220E

R1109
30E
1/16W

C1135
68uF
35V

C1136
68uF
35V

C1137
1uF
50V

C1138
1uF
50V

OPT
C1139
1uF
50V

+3.3V_ST

R1103
10K
1/16W

R1101
4.7K

R1102
10K

Q1102
MMBT3904(NXP)

MULTI_ON

R1105
100K
1/16W

C1126
0.1uF
16V

IC1101
TPS40210DQR

RC
SS
DIS/EN
COMP
FB

VDD
BP
GDRV
ISNS
GND

[EP]

TERMAL
11

R1113
1/16W

Q1101
AOD478

R1111
1/16W

R1114

R1115
1

C1117
2200pF
50V

C1120
47pF
50V

R1108
51K
1/16W

C1131
1uF
10V

C1132
1uF
16V

C1134
100pF
50V

R1104
470K
1/16W

12.05.17 To improve audible noise
C1103 2200pF->47pF
C1105 47pF->OPT

12.07.03 To improve backlight blinking
C1103 47pF->2200pF
C1105 47pF->Apply
R1103 18K->470K

+24V_BLU

JP1088

P1101
SM14B-SRSS-TB

1 24V
2 24V
3 24V
4 24V
5 24V
6 GND
7 GND
8 GND
9 GND
10 GND
11 ERROR_OUT
12 INV_ON
13 NC
14 PWM_DIM
15 GND

JP1109
OPT
R1110
1/16W

ERROR_OUT

JP1110
WLED_ENABLE

R1112
1/16W OPT

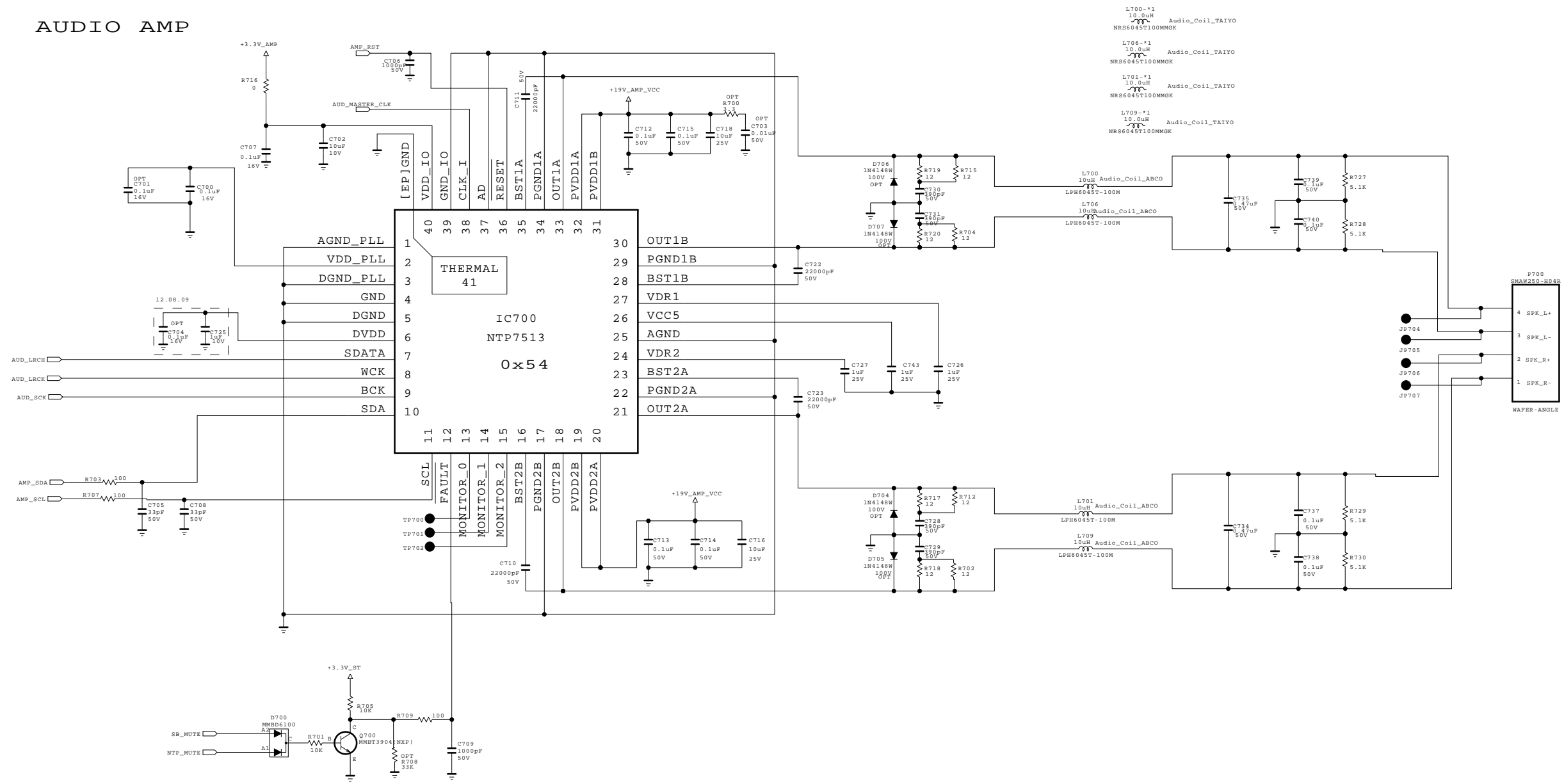JP1111
WLED_DIM_ADJ
OPT
C1133
1uF
10V

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LG ELECTRONICS

EAX65077401

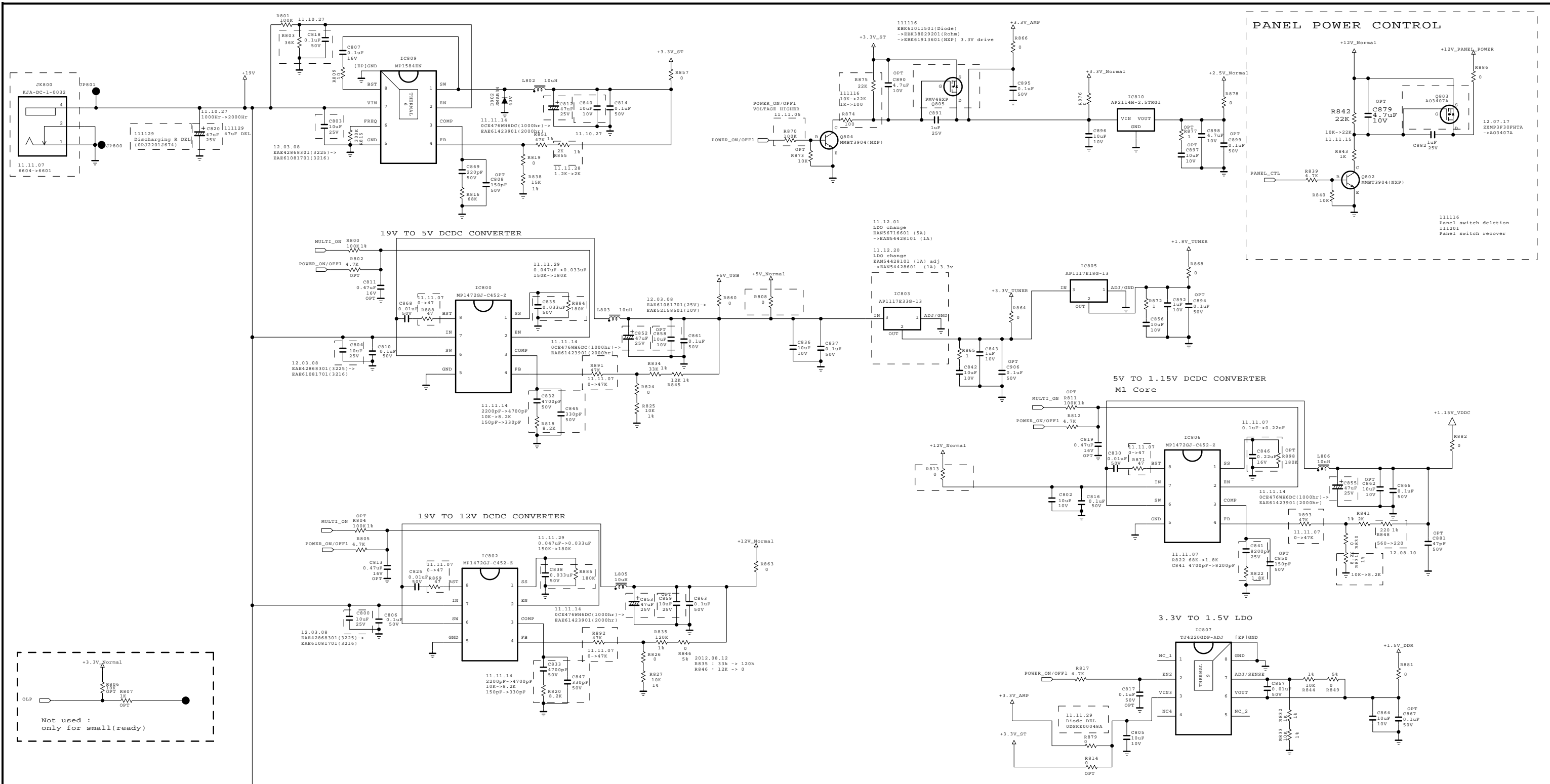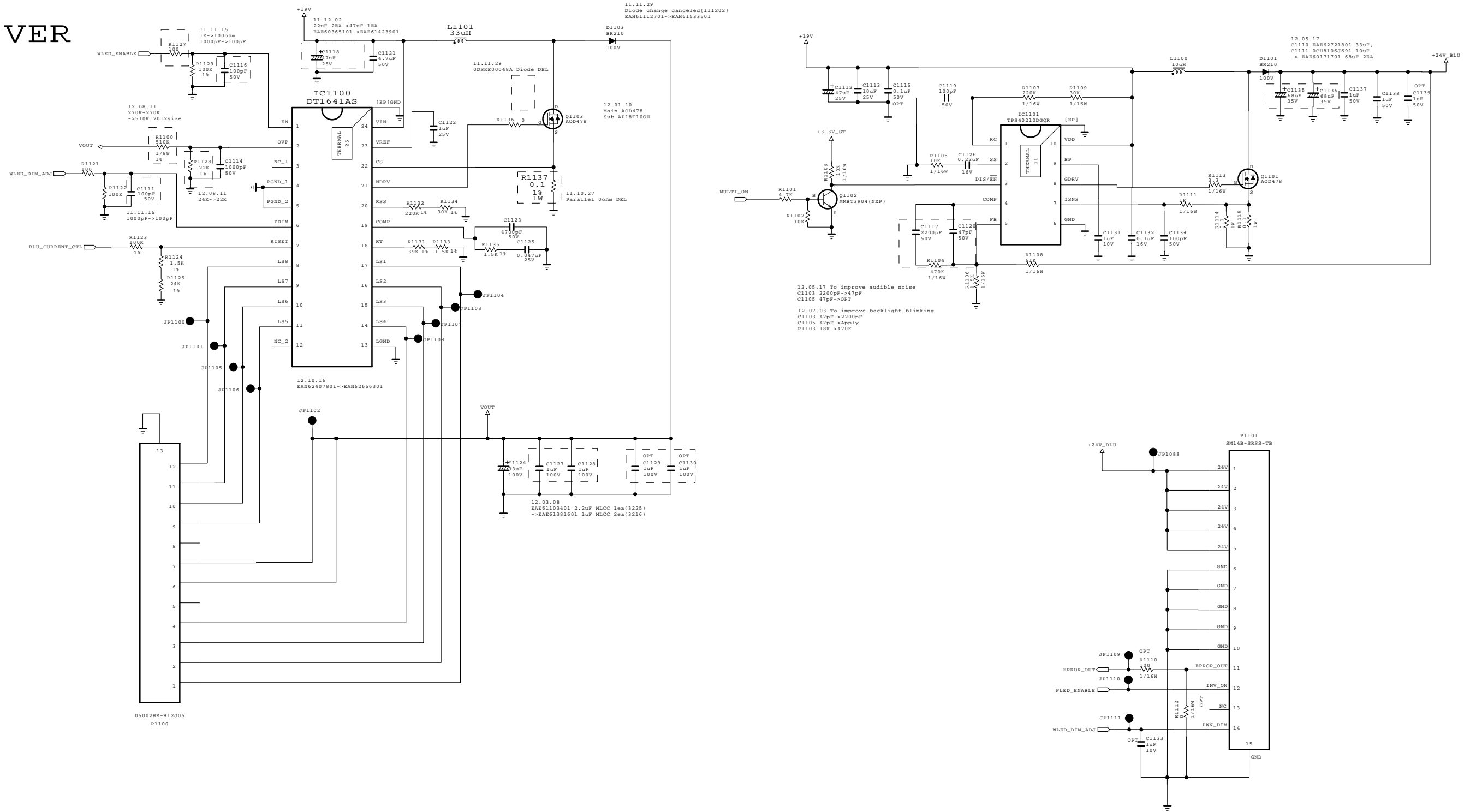| MODEL	NC4_S7LRM	DATE	2012.08.25
BLOCK	LED DRIVER	SHEET	11 / 12
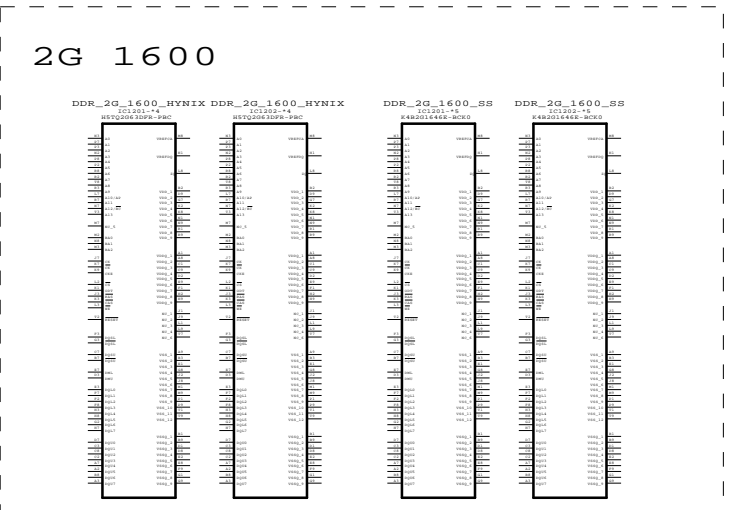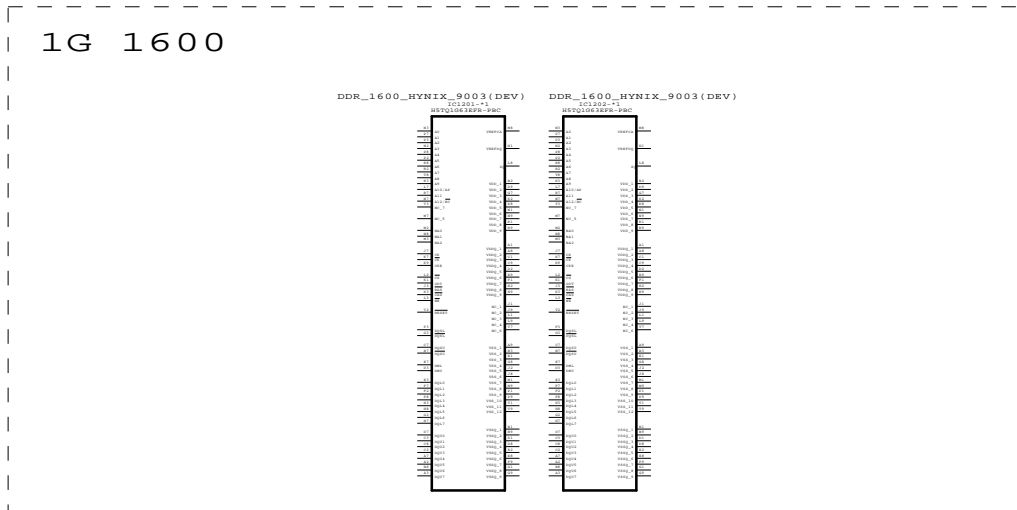
CLose to DDR3
CLose to Saturn7M IC
CLose to Saturn7M IC
CLose to DDR3

EAN61836301
IC1201
K4B1G1646G-BCK0
DDR_1600_SS

IC101
MSD804KKX
S7LR-M_NON_MS10

EAN61836301
IC1202
K4B1G1646G-BCK0
DDR_1600_SS

1G 1600
DDR_1600_HYNIX_9003(DEV) DDR_1600_HYNIX_9003(DEV)

2G 1600
DDR_2G_1600_HYNIX DDR_2G_1600_HYNIX DDR_2G_1600_SS DDR_2G_1600_SS

SECRET
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LG ELECTRONICS

MODEL	NC4_S7LRM	DATE	2012.09.15
BLOCK	DDR	SHEET	12 / 12

EAX65077401

* Option name of this page : CI_SLOT
(because of Hong Kong)

CI Region
CI SLOT

CI TS INPUT

+5V_CI_ON
CI_DATA[0-7]

+5V_Normal
C1906 10uF 10V
R1903 10K
/CI_CD1
C1903 0.1uF 16V
R1908 100
P1900 EAX41860102 10067972-000LF

AR1901 33
CI_TS_DATA[4]
CI_TS_DATA[5]
CI_TS_DATA[6]
CI_TS_DATA[7]

R1902 10K

CI_IORD
CI_IOWR
CI_MDI[0]
CI_MDI[1]
CI_MDI[2]
CI_MDI[3]

+5V_Normal
R1928 10K
120915 ADDED
CLOSE TO MSTAR

CI_MDI[4]
CI_MDI[5]
CI_MDI[6]
CI_MDI[7]

C1905 0.1uF
GND
OPT R1910 0

R1906 10K

PCM_RST
/PCM_WAIT
REQ
CI_TS_CLK
CI_TS_VAL
CI_TS_SYNC

R1903 47
R1903 47
R1925 100
R1926 33
R1927 33

AR1903 33
CI_TS_DATA[0]
CI_TS_DATA[1]
CI_TS_DATA[2]
CI_TS_DATA[3]

/CI_CD2
R1907 100
+5V_Normal

C1914 2pF 50V
CLOSE TO MSTAR
R1904 10K
C1904 0.1uF 16V

CI_MISTRT
CI_MIVAL_ERR
CI_MCLKI

CI_DATA[3]
CI_DATA[4]
CI_DATA[5]
CI_DATA[6]
CI_DATA[7]

R1921 10K
/PCM_CE
CI_OE

CI_ADDR[10]
CI_ADDR[11]
CI_ADDR[8]
CI_ADDR[9]
CI_ADDR[13]
CI_ADDR[14]

+5V_Normal
R1911 10K 120915 ADDED
/PCM_IRQA

R1920 100
CI_WE

OPT R1918 0
C1909 0.1uF
GND
C1915 0.1uF 16V 120915 ADDED
GND
CLOSE TO MSTAR

CI_ADDR[12]
CI_ADDR[7]
CI_ADDR[6]
CI_ADDR[5]
CI_ADDR[4]
CI_ADDR[3]
CI_ADDR[2]
CI_ADDR[1]
CI_ADDR[0]

CI_DATA[0]
CI_DATA[1]
CI_DATA[2]
CI_ADDR[0-14]

OPT R1909 0
GND
GND
GND

CI_MDI[7]
CI_MDI[6]
CI_MDI[5]
CI_MDI[4]
AR1905 33
FE_TS_DATA[7]
FE_TS_DATA[6]
FE_TS_DATA[5]
FE_TS_DATA[4]

CI_MDI[3]
CI_MDI[2]
CI_MDI[1]
CI_MDI[0]
AR1906 33
FE_TS_DATA[3]
FE_TS_DATA[2]
FE_TS_DATA[1]
FE_TS_DATA[0]
FE_TS_DATA[0-7]

CI_MISTRT
CI_MIVAL_ERR
CI_MCLKI
R1929 33
R1930 33
R1931 100
FE_TS_SYNC
FE_TS_VAL_ERR
FE_TS_CLK

120915 Array->normal resistor

120915 BufferIC change
0ITO742440D ->0ISTLPH048A

CI HOST I/F

OE	DIR	CI ADDRESS	NAND ADDRESS
L	L	OUTPUT	INPUT
L	H	INPUT	OUTPUT
H	X	HIGH-Z	HIGH-Z

+3.3V_CI
IC1902 74LVC245A
C1913 0.1uF

NAND_EN R1932 22 DIR
CI_ADDR[0] A0
CI_ADDR[1] A1
CI_ADDR[2] A2
CI_ADDR[3] A3
CI_ADDR[4] A4
CI_ADDR[5] A5
CI_ADDR[6] A6
CI_ADDR[7] A7
GND

VCC
OE R1933 22 CI_DET
B0 PCM_A[0]
B1 PCM_A[1]
B2 PCM_A[2]
B3 PCM_A[3]
B4 PCM_A[4]
B5 PCM_A[5]
B6 PCM_A[6]
B7 PCM_A[7]

CI_DATA[0]
CI_DATA[1]
CI_DATA[2]
CI_DATA[3]
AR1907 33
PCM_D[0]
PCM_D[1]
PCM_D[2]
PCM_D[3]

CI_DATA[4]
CI_DATA[5]
CI_DATA[6]
CI_DATA[7]
AR1908 33
PCM_D[4]
PCM_D[5]
PCM_D[6]
PCM_D[7]
PCM_D[0-7]

CI_DATA[0-7]
PCM_D[0-7]

CI_ADDR[8]
CI_ADDR[9]
CI_ADDR[10]
CI_ADDR[11]
AR1912 33
PCM_A[8]
PCM_A[9]
PCM_A[10]
PCM_A[11]

CI_ADDR[12]
CI_ADDR[13]
CI_ADDR[14]
REG
AR1913 33
PCM_A[12]
PCM_A[13]
PCM_A[14]
/PCM_REG

CI_OE
CI_WE
CI_IORD
CI_IOWR
AR1909 33
PCM_OE
PCM_WE
PCM_IORD
PCM_IOWR

CI DETECT
/CI_CD2
/CI_CD1
+3.3V_CI +3.3V_CI
C1908 0.1uF 16V
GND
R1917 10K
R1915 47
R1918 47
CI_DET
/PCM_CD

+3.3V_Normal +3.3V_CI
L1901 BLM18PG121SN1D
OPT C1901 0.1uF
C1902 0.1uF

CI POWER ENABLE CONTROL
+5V_Normal
Q1902 AO3407A
L1902 BLM18PG121SN1D
+5V_CI_ON
C1907 0.1uF 16V
OPT R1912 10K
R1914 22K
C1911 4.7uF 10V
C1910 0.1uF 16V
OPT R1923 10K
OPT C1912 0.1uF 16V
R1922 2.2K
PCM_5V_CTL
R1913 10K
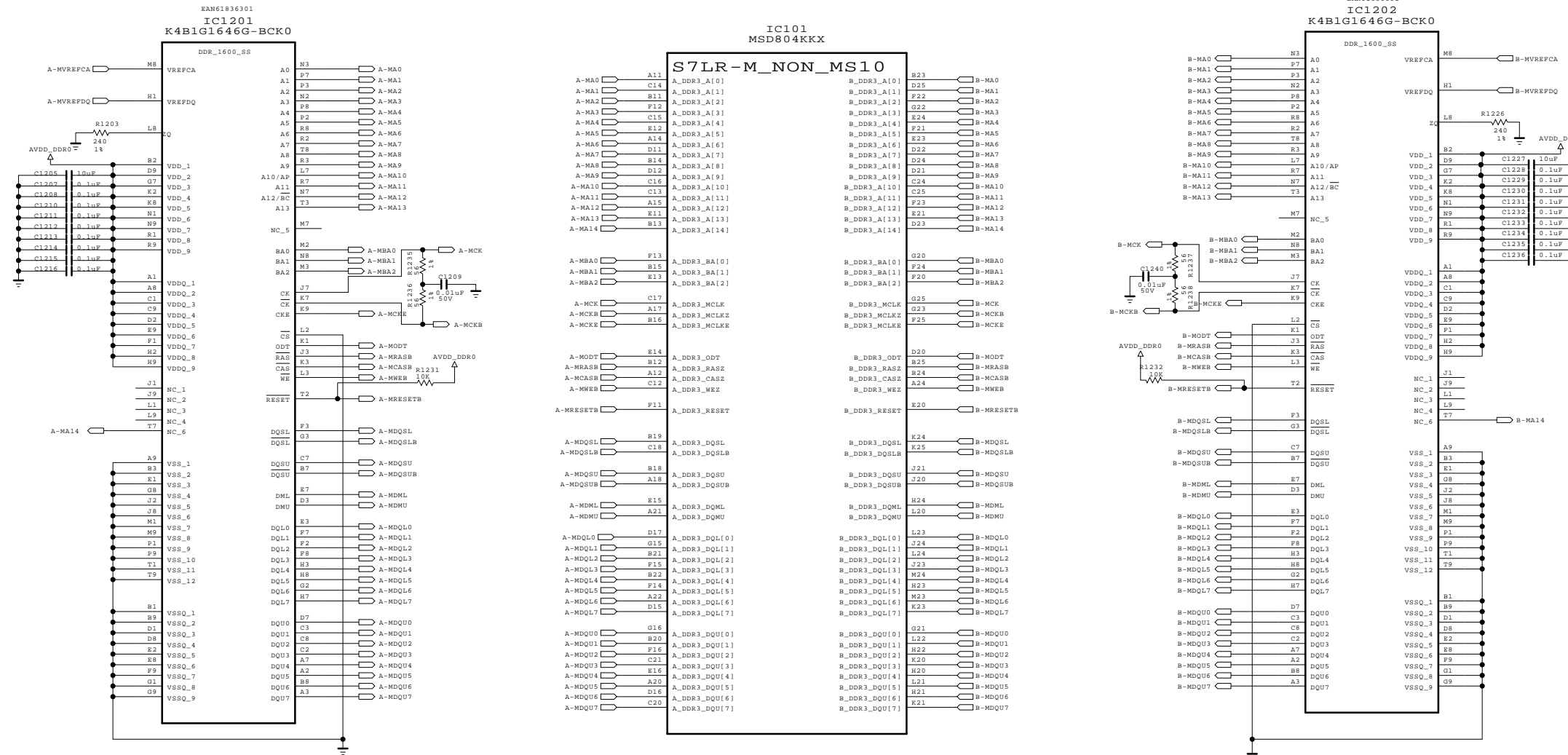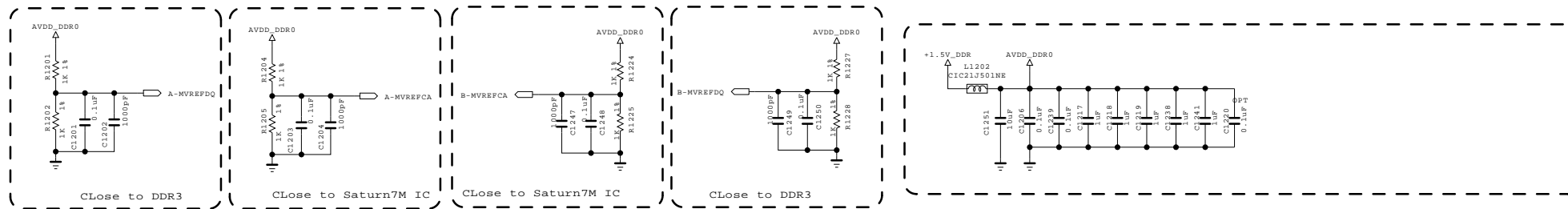R1924 10K
Q1901 MMBT3904(NXP)

EAX65077401

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 MANUFATURES SPECIFED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.
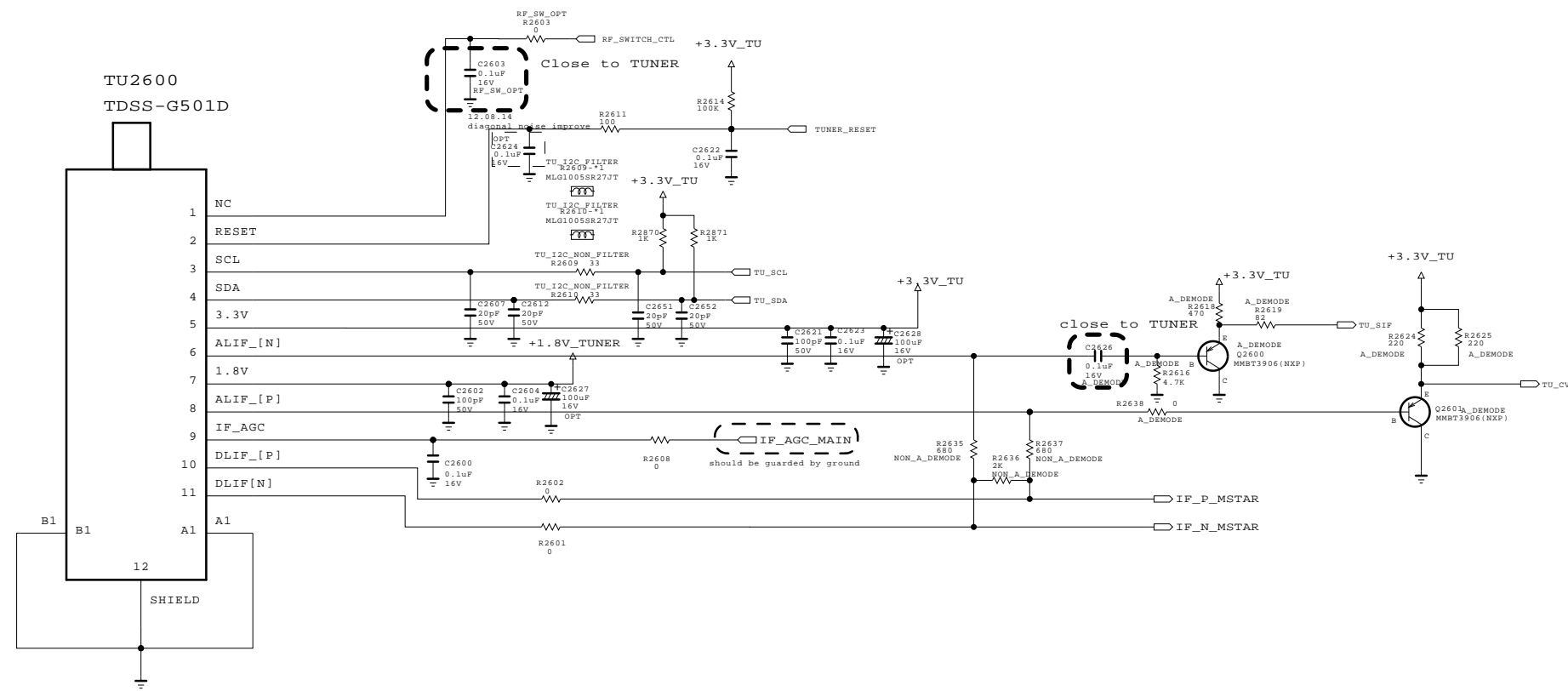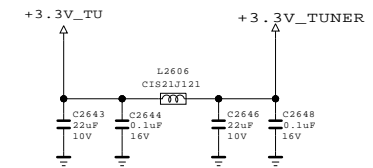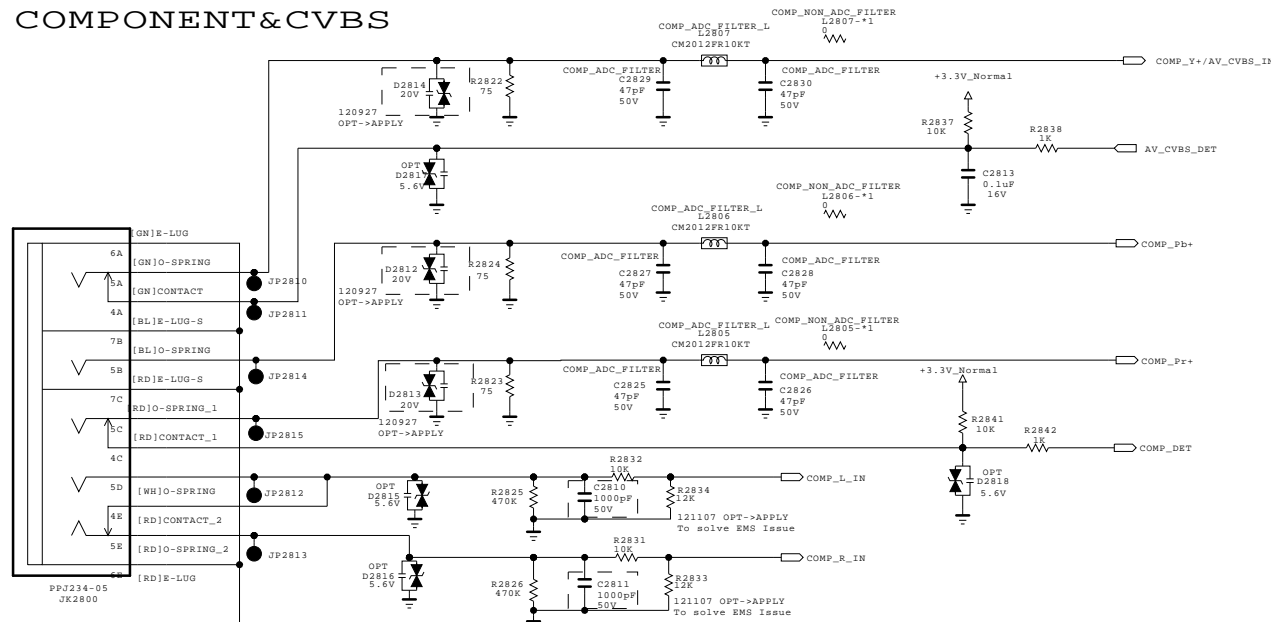
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LGElectronics

LG ELECTRONICS

MODEL	NC4_S7LRM	DATE	2012.09.15
BLOCK	PCMCI	SHEET	19 / 12

NETCAST4.0 EU(DVB-T/C)_TUNER_BLOCK

SECRET
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LG ELECTRONICS

EAX65077401

| MODEL | NC4_S7LRM | DATE | 2012.09.15 |
| BLOCK | TUNER_EU | SHEET | 26 / 12 |

SCART / COMPONENT&CVBS

COMPONENT&CVBS

SCART AMP
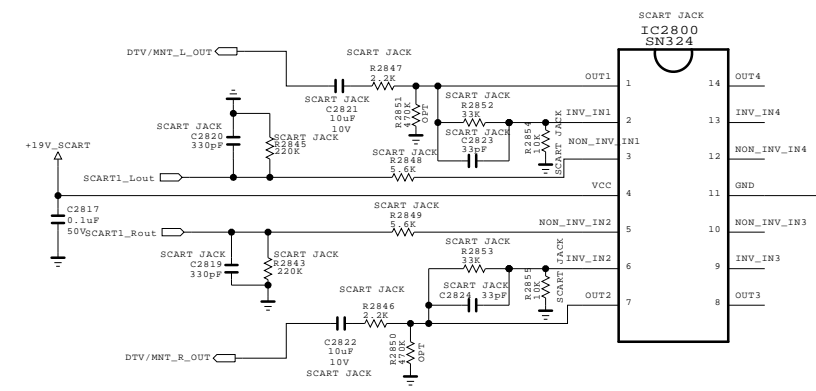
FULL SCART
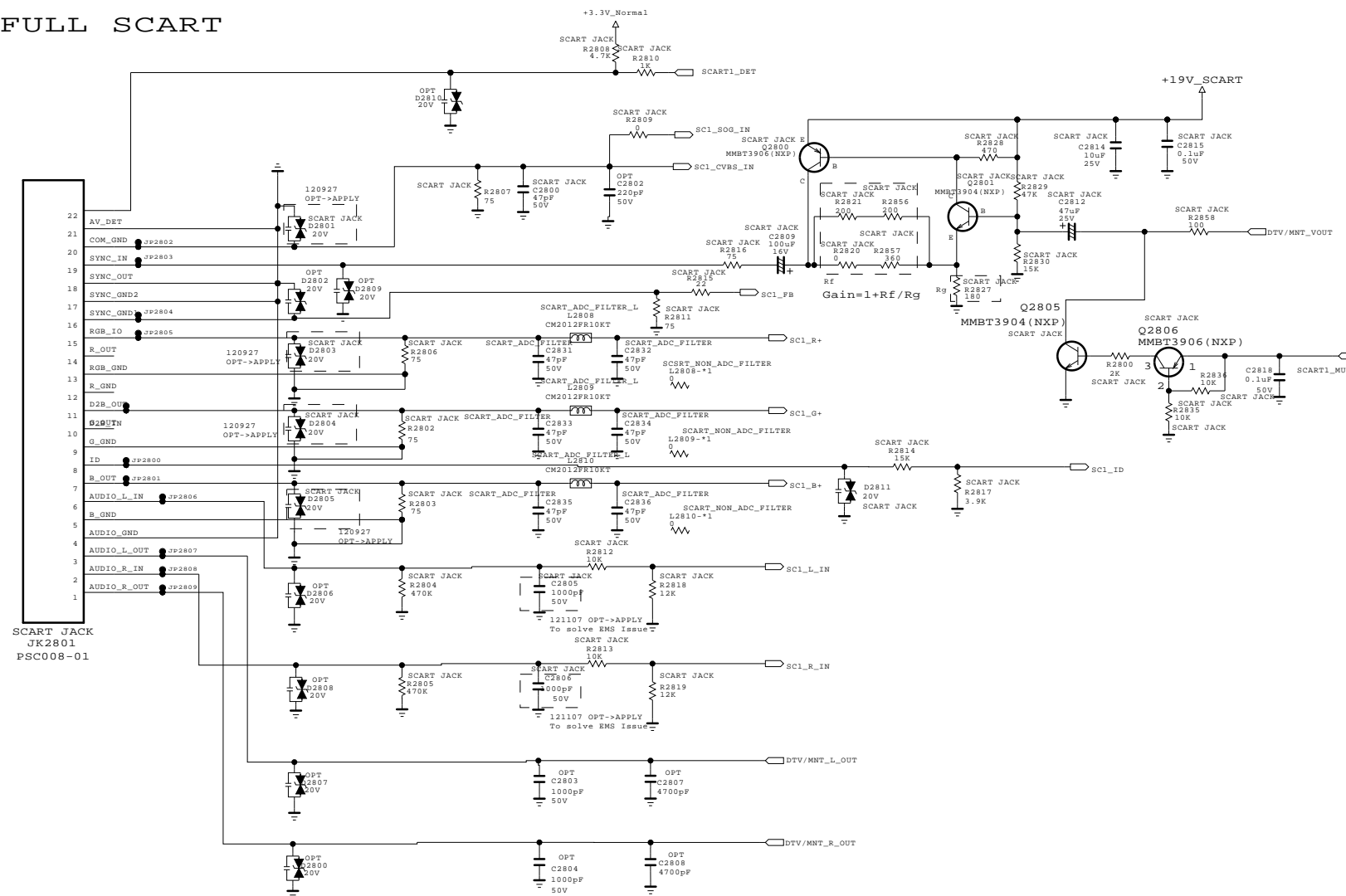
[SCART AUDIO MUTE]
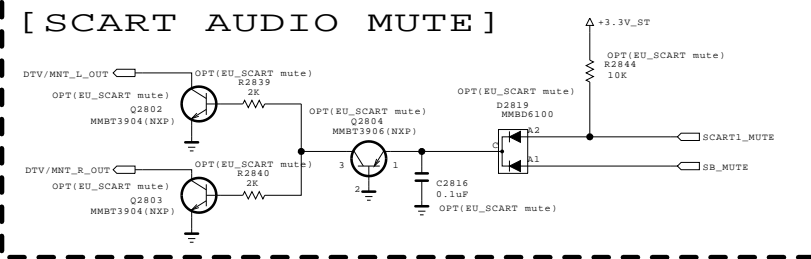
Gain=1+Rf/Rg

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LG ELECTRONICS

MODEL	GP4L_S7LR2	DATE	2012.09.15
BLOCK	SCART&COMP	SHEET	28 / 12

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