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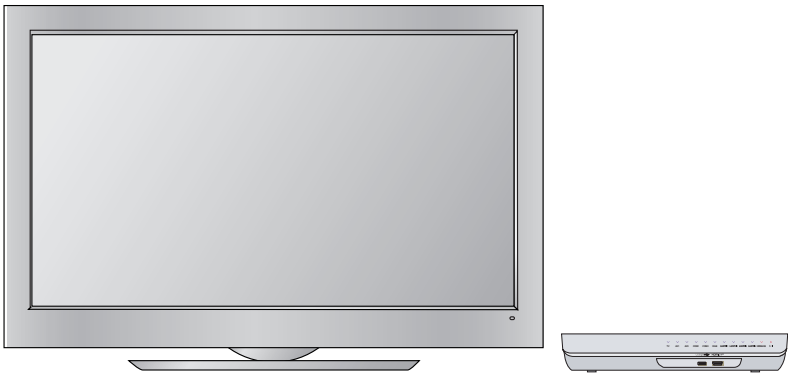
LCD TV
SERVICE MANUAL

CHASSIS : LC91E

MODEL : 55LH95QD 55LH95QD-CB

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



P/NO : MFL60021630 (0909-REV00)

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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 ⚠ 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 1W), keep the resistor 10mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

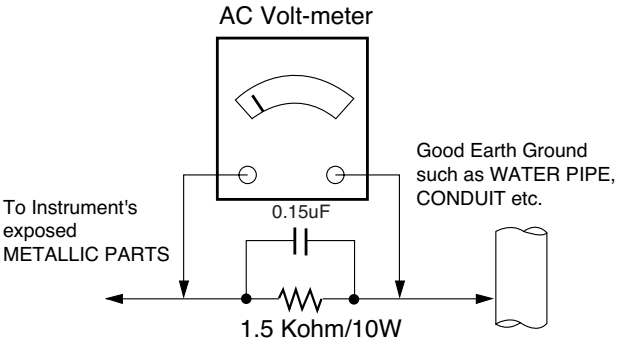
always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

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 1MΩ and 5.2MΩ.
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 1.5K/10watt resistor in parallel with a 0.15uF 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 0.5mA.
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



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 1.25cm) 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 sheet is applied to the LCD TV used LC91E chassis.

2. Specification

Each part is tested as below without special appointment

1) Temperature : 25 ± 5°C (77 ± 9°F), CST : 40 ± 5°C
2) Relative Humidity : 65 ±10%
3) Power Voltage : Standard input voltage
   (100-240V@ 50/60Hz)
   * 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 20 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 specification

4. General Specification(TV)

No.	Item	Specification	Remark
1.	Receiving System	Analog : Upper Heterodyne	
		Digital : COFDM, QAM	
2.	Input Voltage	100- 240V~, 50/60Hz	
3.	Market	China	
4.	Screen Size	55 inch Wide (1920 x 1080)	FHD
5.	Aspect Ratio	16:9	
6.	Broadcasting systme	1) PAL-DK	
		2) PAL-I	
		3) NTSC-M	
		4) DTMB	
		5) DVB-C	
7.	LCD Module	LC550WUL-SBT1	LGD
8.	Operating Environment	1) Temp : 0 ~ 40 deg	
		2) Humidity : ~ 80 %	
9.	Storage Environment	1) Temp : -20 ~ 60 deg	
		2) Humidity : 0 ~ 85 %	

5. Chroma & Brightness

No	Item			Min.	Typ.	Max.	Unit	Remark
1	Max Luminance (Center 1-point / Full White Pattern)			400	500		cd/m^2	
2	Luminance uniformity			77			%	Full white
3	Response Time	Gray-to-Gray			5	8	ms	Picture mode : Cinema
		MPRT			8	10	ms	
4	Color coordinate	RED	X		0.645			Typ. ± 0.03 Color Coordinate Measurement Mode : PC PSM : Standard CSM : Medium
			Y		0.330			
		GREEN	X		0.297			
			Y		0.629			
		BLUE	X		0.146			
			Y		0.054			
		WHITE	X		0.279			
			Y		0.292			
5	Contrast ratio			900:1	1300:1			Local Dimming ON (Except RGB/HDMI-PC)
				4,500,000	5,000,000			DCR(Except RGB/HDMI-PC)
6	Color Temperature	Cool	X	0.254	0.269	0.284		<Test Condition> 85% Full white pattern
			Y	0.258	0.273	0.288		
		Medium	X	0.270	0.285	0.300		
			Y	0.278	0.293	0.308		
		Warm	X	0.298	0.313	0.328		
			Y	0.314	0.329	0.344		
7	Color Distortion, DG					10	%	
8	Color Distortion, DP					10	deg	
9	Color S/N, AM/FM			43.0			dB	
10	Color Killer Sensitivity			-80			dBm	

6. Component Video Input (Y, C_B/P_B, C_R/P_R)

No.	Specification				Remark
	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock	
1.	720x480	15.73	60.00		SDTV, DVD 480i
2	720x480	15.63	59.94		SDTV, DVD 480i
3	720x480	31.47	59.94		480p
4	720x480	31.50	60.00		480p
5	720x576	15.625	50.00		SDTV, DVD 625 Line
6	720x576	31.25	50.00		HDTV 576p
7	1280x720	45.00	50.00		HDTV 720p
8	1280x720	44.96	59.94		HDTV 720p
9	1280x720	45.00	60.00		HDTV 720p
10.	1920x1080	31.25	50.00		HDTV 1080i
11.	1920x1080	33.75	60.00		HDTV 1080i
12.	1920x1080	33.72	59.94		HDTV 1080i
13.	1920x1080	56.250	50		HDTV 1080p
14.	1920x1080	67.43/67.5	59.94/60		HDTV 1080p

7. RGB input (PC)

No.	Specification				Proposed	Remark
	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock(MHz)		
	PC					
1.	720*400	31.468	70.08	28.321		HDCP
2.	640*480	31.469	59.94	25.17	VESA	HDCP
3	800*600	37.879	60.31	40.00	VESA	HDCP
4.	1024*768	48.363	60.00	65.00	VESA(XGA)	HDCP
5.	1280*768	47.78	59.87	79.5	WXGA	HDCP
6.	1360*768	47.72	59.8	84.75	WXGA	HDCP
7.	1280*1024	63981	60.0	108.875	SXGA	HDCP
8.	1920*1080	67.5	60	148.5	WUXGA	HDCP

8. HDMI input (PC/DTV)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock(MHz)	Proposed	Remark
	DTV					
1.	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	SDTV 480P	
2.	720*576	31.25	50	54	SDTV 576P	
3.	1280*720	37.500	50	74.25	HDTV 720P	
4.	1280*720	44.96 / 45	59.94 / 60	74.17/74.25	HDTV 720P	
5.	1920*1080	33.72 / 33.75	59.94 / 60	74.17/74.25	HDTV 1080I	
6.	1920*1080	28.125	50.00	74.25	HDTV 1080I	
7.	1920*1080	26.97 / 27	23.97 / 24	74.17/74.25	HDTV 1080P	
8.	1920*1080	33.716 / 33.75	29.976 / 30.00	74.25	HDTV 1080P	
9	1920*1080	56.250	50	148.5	HDTV 1080P	
10.	1920*1080	67.43 / 67.5	59.94 / 60	148.35/148.50	HDTV 1080P	
	PC					
1.	720*400	31.468	70.08	28.321		HDCP
2.	640*480	31.469	59.94	25.17	VESA	HDCP
3	800*600	37.879	60.31	40.00	VESA	HDCP
4.	1024*768	48.363	60.00	65.00	VESA(XGA)	HDCP
5.	1280*768	47.78	59.87	79.5	WXGA	HDCP
6.	1360*768	47.72	59.8	84.75	WXGA	HDCP
7.	1280*1024	63.981	60.0	108.875	SXGA	HDCP
8.	1920*1080	67.5	60	148.5	WUXGA	HDCP

ADJUSTMENT INSTRUCTION

1. Application Object

This specification sheet applied to LC91E Chassis applied LCD TV all models manufactured in TV factory.

2. Notes

(1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test equipment.
(2) Adjustments must be done in the correct order.
(3) The adjustments must be performed in the circumstance of 25±5°C of temperature and 65±10% of relative humidity if there is no specific designation.
(4) The input voltage of the receiver be must kept 100V-240V, 50/60Hz when adjusting.
(5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15ºC.
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,.
(6) The TV and the Media-box must be connected by Wireless or Wire. : Even if there is only the TV set, it is possible to adjust the White-balance

- Entry process of White Pattern
1) Press the POWER ON key on R/C for adjustment.
2) Press the ADJ key on R/C and enter EZ ADJUST.
3) Select '7. Test Pattern' by using CH +/- key and select "White" by using VOL +/-.

* Set is activated HEAT RUN without signal generator in this mode.
* Single color pattern (RED/BLUE/GREEN) of HEAT RUN mode uses to check panel.

Caution : If the still image is displayed more than 20 minutes(Especially digital, cross hatch pattern), an after-image in the black level area.

3. Adjustment items

- Check the TOOL OPTION prior to adjustment. If the TOOL OPTION is incorrect, correct it then execute the power off/on to apply the modification (refer to 7.3 TOOL OPTION)
- In case of this chassis,
Set the Media-box option in connection with Wireless or Wire.
Set the TV option in HDMI5 mode.(remove the wired HDMI cable)

3.1 Board-level adjustment

- ADC adjustment (Media-Box ONLY)
- EDID/DDC download
* Manual ADC Confirmation : [IN-START] -> [1.Adjust Check]
- After Board level adjustment, set volume setting value 0

3.2 Final assembly adjustment

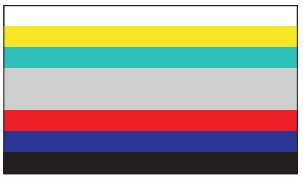
- White Balance adjustment
- RS-232C functionality check
- EYE-Q TEST
- Wireless Pairing (it is worked in the Wired status)
- Shipment mode setting (In-Stop)

4. Board-level adjustment

4.1. ADC(LGE3369) adjustment

(1) Overview
ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation.

(2) Equipment & Condition
1) Jig (RS-232C protocol)
2) External/Internal PATTERN
- Adjustment : ADC Comp Comp 480i
-> Using a Pattern Generator(MSPG-925FA - Model: 209 ,Pattern:65 or etc), enter component signals like below image into the Media-box.
- Adjustment : ADC Comp 1080p / RGB
-> use the Internal Pattern
* External input Image



(3) Adjustment

1) Method

- Using RS-232, adjust items listed in 3.1 in the other shown in “4.1.3.3”

2) Adj. protocol

Protocol	Command	Set ACK
Enter adj. mode	aa 00 00	a 00 OK00x
Source change	xb 00 40	b 00 OK40x (Adjust 480i Comp1)
	xb 00 60	b 00 OK60x (Adjust 1024*768 RGB)
Begin adj.	ad 00 10	
Return adj. result		OKx (Case of Success)
		NGx (Case of Fail)
Read adj. data	(main)	(main)
	ad 00 20	00000000000000000000000000007c007b006dx
	(sub)	(Sub)
	ad 00 21	00000007000000000000000000007c00830077x
Confirm adj.	ad 00 99	NG 03 00x (Fail)
		NG 03 01x (Fail)
		NG 03 02x (Fail)
		OK 03 03x (Success)
End adj.	aa 00 90	a 00 OK90x

Ref.) ADC Adj. RS232C Protocol_Ver1.0

3) Adj. order

- aa 00 00 [Enter ADC adj. mode]
- xb 00 40 [Change input source to Component1(480i)]
- ad 00 10 [Adjust 480i Comp1]
- xb 00 60 [Change input source to RGB(1024*768)]
- ad 00 10 [Adjust 1024*768 RGB]
- ad 00 90 End adj.

4.2. EDID(The Extended Display Identification Data)/DDC(Display Data Channel) download

(1) Overview

It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of “Plug and Play”.

(2) Equipment

- Adjust remote control
- Since embedded EDID data is used, EDID download JIG, HDMI cable and D-sub cable are not need.

(3)Download method

1) Press Adj. key on the Adj. R/C, then select “8.EDID D/L”, By pressing Enter key, enter EDID D/L menu.

2) Select [Start] button by pressing Enter key, HDMI1 / HDMI2 / HDMI3 / HDMI4 / RGB are Writing and display OK or NG.

* For HDMI5 EDID D/L, Change the TV input mode into HDMI5 mode then using Adj. R/C, download the HDMI5 EDID.

* HDMI5 / RGB can be downloaded by JIG and cable.

(4) EDID DATA

1) 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	ⓐ			ⓑ		
10	ⓒ		01	03	68	73	41	78	0A	CF	74	A3	57	4C	B0	23
20	09	48	4C	A1	08	00	81	80	61	40	45	40	31	40	01	01
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	7E	8A	42	00	00	1E	01	1D	00	72	51	D0	1E	20
50	6E	28	55	00	7E	8A	42	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	ⓓ			
70	ⓓ														00	ⓔ
80	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
90	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
A0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
B0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
C0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
D0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
E0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
F0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

2) HDMI 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	ⓐ			ⓑ		
10	ⓒ		01	03	80	73	41	78	0A	CF	74	A3	57	4C	B0	23
20	09	48	4C	A1	08	00	81	80	61	40	45	40	31	40	01	01
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	7E	8A	42	00	00	1E	01	1D	00	72	51	D0	1E	20
50	6E	28	55	00	7E	8A	42	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	ⓓ			
70	ⓓ														01	ⓔ
80	02	03	26	F1	4E	10	1F	84	13	05	14	03	02	12	20	21
90	22	15	01	26	15	07	50	09	57	07	ⓕ					
A0	ⓕ		E3	05	03	01	01	1D	80	18	71	1C	16	20	58	2C
B0	25	00	7E	8A	42	00	00	9E	01	1D	00	80	51	D0	0C	20
C0	40	80	35	00	7E	8A	42	00	00	1E	02	3A	80	18	71	38
D0	2D	40	58	2C	45	00	7E	8A	42	00	00	1E	66	21	50	B0
E0	51	00	1B	30	40	70	36	00	7E	8A	42	00	00	1E	00	00
F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	ⓔ

Item	Condition	Data(Hex)
Manufacturer ID	GSM	1E6D
Version	Digital : 1	01
Revision	Digital : 3	03

* Detail EDID Options are below

ⓐ Product ID

Model Name	HEX	EDID Table	DDC Function
FHD Model	0001	01 00	Analog/Digital

ⓑ Serial No: Controlled on production line.

ⓒ Week, Year: Fixed as S/W released day
Week 0x02(2), Year : 0x13(2009)

ⓓ Model Name(Hex):

MODEL	MODEL NAME(HEX)
all	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20

ⓔ Checksum: Changeable by total EDID data.
RGB 1D
HDMI1 04 F9
HDMI2 04 E9
HDMI3 04 D9
HDMI4 04 C9

ⓕ Vendor Specific(HDMI)

INPUT	MODEL NAME(HEX)
HDMI1	67 03 0C 00 10 00 B8 2D
HDMI2	67 03 0C 00 20 00 B8 2D
HDMI3	67 03 0C 00 30 00 B8 2D
HDMI4	67 03 0C 00 40 00 B8 2D
HDMI5	67 03 0C 00 50 00 B8 2D

* Reference
- HDMI1 ~ HDMI4 / RGB: Media-Box, HDMI5: TV
- In the data of EDID, bellows may be different by S/W or Input mode.
► VV: Week Manufacture
► WW: Year Manufacture
► XX: C/S
► YY: Physical address
(Generally, HDMI1 : 10 00, HDMI2 : 20 00 ¶)

5. Final assembly adjustment

5.1. White Balance Adjustment

5.1.1. Overview

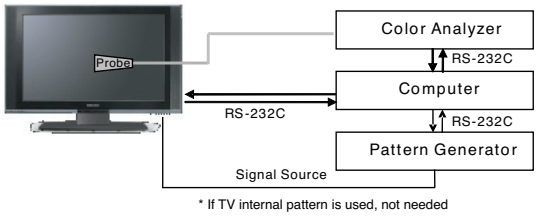
• W/B adj. Objective & How-it-works
- Objective: To reduce each Panel's W/B deviation
- How-it-works : When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.

5.1.2. Equipment

(1) Color Analyzer: CA-210 (NCG: CH 9 / WCG: CH12 / LED Module : CH14)
(2) Adj. Computer(During auto adj., RS-232C protocol is needed)
(3) Adjust Remote control
(4) Video Signal Generator MSPG-925F 720p/216-Gray (Model:217, Pattern:78)
-> Only when internal pattern is not available

• Color Analyzer Matrix should be calibrated using CS-1000

5.1.3. Equipment connection map



Connection Diagram of Automatic Adjustment

5.1.4. Adj. Command (Protocol)

(1) Protocol
<Command Format>

START | 6E | A | 50 | A | LEN | A | 03 | A | CMD | A | 00 | A | VAL | A | CS | A | STOP

- LEN: Number of Data Byte to be sent
- CMD: Command
- VAL: FOS Data value
- CS: Checksum of sent data
- A: Acknowledge
Ex) [Send: JA_00_DD] / [Ack: A_00_okDDX]

(2) RS-232C Command used during auto-adj.

RS-232C COMMAND [CMD	ID	DATA]	Meaning
wb	00	00	Begin White Balance adj.
wb	00	10	Gain adj.(internal white pattern)
wb	00	1f	Gain adj. completed
wb	00	20	Offset adj.(internal white pattern)
wb	00	2f	Offset adj. completed
wb	00	ff	End White Balance adj.(Internal pattern disappears)

Ex) wb 00 00 -> Begin white balance auto-adj.
wb 00 10 -> Gain adj.
ja 00 ff -> Adj. data
jb 00 c0
...
...
wb 00 1f -> Gain adj. completed
*(wb 00 20(Start), wb 00 2f(completed)) -> Off-set adj.
wb 00 ff -> End white balance auto-adj.

(3) Adjustment Map

	ITEM	Command		Data Range (Hex.)		Default (Decimal)
		Cmd 1	Cmd 2	Min	Max	
Cool	R-Gain	j	g	00	C0	
	G-Gain	j	h	00	C0	
	B-Gain	j	i	00	C0	
	R-Cut					
	G-Cut					
	B-Cut					
Medium	R-Gain	j	a	00	C0	
	G-Gain	j	b	00	C0	
	B-Gain	j	c	00	C0	
	R-Cut					
	G-Cut					
	B-Cut					
Warm	R-Gain	j	d	00	C0	
	G-Gain	j	e	00	C0	
	B-Gain	j	f	00	C0	
	R-Cut					
	G-Cut					

5.1.5. Adj. method

(1) Auto adj. method

1) Set TV in adj. mode using POWER ON key./
2) Zero calibrate probe then place it on the center of the Display.
3) Connect Cable(RS-232C)
4) Select mode in adj. Program and begin adjustment.
5) When adj. is complete (OK Sing), check adj. status pre mode. (Warm, Medium, Cool)
6) Remove probe and RS-232C cable to complete adj.

* Adjustment must be begun “wb 00 00”, and ended “wb 00 ff”. If it is needed, adjust the Offset value.

(2) Manual adj. method

1) Set TV in Adj. mode using POWER ON key.
2) Press ADJ key ‡ EZ ADJUST using adj. R/C.
3) Using CH +/- key, select [7.Test Pattern] then press ENTER to place in HEAT RUN mode and wait for 30 minutes.
4) Check a zero calibration for the probe of color analyzer, then place it on the center of LCD module within 10cm of the surface.
5) Press ADJ key -> [6.White Balance] then press the cursor to the right (►) key.
(When ► is pressed, Full White internal pattern will be displayed)
6) One of R Gain / G Gain / B Gain should be fixed at 192, and the rests will be lowered to meet the desired value.
7) Adj. is performed in COOL, MEDIUM, WARM 3 modes of color temperature.

* Adj. condition and cautionary items

1) Lighting condition in surrounding area
Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
2) Probe location
- LCD : Color Analyzer (CA-210) probe should be within 10cm and perpendicular of the module surface (80°~ 100°)
- In case of LCD, Back Light On should be checked using no signal or Full white pattern.

5.1.6. Reference (White Balance Adj. coordinate and color temperature)

- Luminance: 216 Gray
- Standard color coordinate and temperature using CS-1000

Mode	Color Coordination		Temp	ΔUV
	x	y		
COOL	0.269	0.273	13000K	0.0000
MEDIUM	0.285	0.293	9300K	0.0000
WARM	0.313	0.329	6500K	0.0000

- Standard color coordinate and temperature using CA-210(CH 9)

	H/R	Cool		Medium		Warm	
	Time(Min)	X	Y	X	Y	X	Y
		269	273	285	293	313	329
1	0-4	279	294	295	312	321	346
2	5-9	277	289	293	309	319	343
3	10-14	275	285	291	306	318	340
4	15-19	273	282	289	303	317	337
5	20-24	272	279	288	300	316	335
6	25-29	271	277	287	297	315	333
7	30-39	270	275	286	295	314	331
8	40-	269	273	285	293	313	329

5.2. EYE-Q function check

Step 1) Turn on TV
Step 2) Press EYE key of Adj. R/C
Step 3) Cover the Eye Q II sensor on the front of the using your hand and wait for 6 seconds
Step 4) Confirm that R/G/B value is lower than 10 of the “Raw Data (Sensor data, Back light)”. If after 6 seconds, R/G/B value is not lower than 10, replace Eye Q II sensor.
Step 5) Remove your hand from the Eye Q II sensor and wait for 6 seconds.
Step 6) Confirm that “ok” pop up. If change is not seen, replace Eye Q II sensor.

5.3. Wireless Pairing

(1) Overview
For the wireless connection between TV and Media-Box, Select the communication channel and fix the Mac address.
* The adjustment should be executed with being Wired. (HDMI cable connection)

(2) Method

1) Press IN-START key on adj. R/C then select [9.Wireless Check].
2) After Choosing the LRP Channel, Set OK in Paired Status.
3) Remove the HDMI cable and turn off/on TV and Media-box.
4) Check the Wireless status.

5.4. Shipment mode check(In-stop)

After final inspection, press IN-STOP key of the Adj. R/C and check that the unit goes to Stand-by mode.

6. GND and Internal Pressure check

6.1. Inspection Mmthod

1) GND & Internal Pressure auto-check preparation
   - Check that Power Cord is fully inserted to the SET. (If loose, re-insert)
2) Perform GND & Internal Pressure auto-check
   - Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
   - Connect D-terminal to AV JACK TESTER
   - Auto CONTROLLER(GWS103-4) ON
   - Perform GND TEST
   - If NG, Buzzer will sound to inform the operator.
   - If OK, changeover to I/P check automatically. (Remove CORD, A/V form AV JACK BOX)
   - Perform I/P test
   - If NG, Buzzer will sound to inform the operator.
   - If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

6.2. Checkpoint

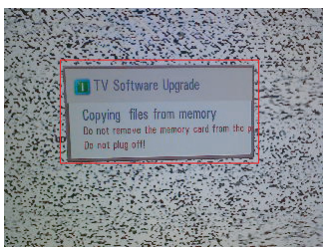
- TEST voltage
  - GND: 1.5KV/min at 100mA
  - SIGNAL: 3KV/min at 100mA
- TEST time: 1 second
- TEST POINT
  - GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
  - Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL
- LEAKAGE CURRENT: At 0.5mArms

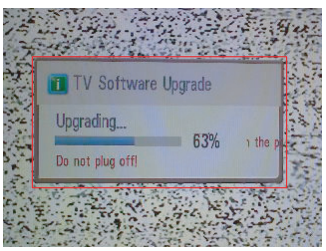
7. ETC.

7.1. USB S/W Download (option)

(1) Overview
USB download allows fast S/W upgrade in SVC areas or during Board-level production.

(2) Dowunload method
1) After Set on, confirm that image is displayed. (For updating Monitor, first input change to HDMI5)
2) Insert USB memory stick that contains the S/W and after a few seconds, Upgrade OSD is displayed.
(If the version of download file in USB is lower than the current version, Upgrade OSD is not displayed)
3) After download is finished, automatically Power off/on is executed.
(If auto power on/off is not executed, perform the power off/on manually)
4) S/W upgrade is completed and eject USB Memory Stick form USB jack.
5) By pressing IN-START key on the adj. R/C, check the S/W version.





7.2. TOOL OPTION

(1) Overview
- The model name and spec. will be confirmed and modified by adj. menu.
- No Modification at discretion

(2) Confirm/Modify method
1) By Pressing ADJ key, [EZ ADJUST] -> [0.Tool Option1].
2) In the Tool Option1, It is possible to modify the Inch/ Tool/ Module maker/ Module revision.
3) Contents of Tool Option 1~4 are like the section 7.2.(3)

* Entering into IN-START mode, [1.Adjust Check] shows Tool Options.

(3) Contents of Tool Option
1) Tool Option1
   - Inch
   - Tool
   - Maker
   - Module Rev.

2) Tool Option2
   - HDMI Count
   - HDMI Switch IC
   - Component Count
   - S-Video
   - RCA AV Count
   - Scart Count

3) Tool Option3
   - EMF(JPEG,MP3)
   - Divx
   - Bluetooth
   - Digital Eye.
   - Headphone
   - OPC
   - EPA
   - e-Manual
   - Audio Amp
   - LED Type
   - New E-Con

4) Tool Option4
   - Clear QAM
   - Local Dimming
   - THX
   - Digital Demod
   - Analog Demod
   - THX Media Director

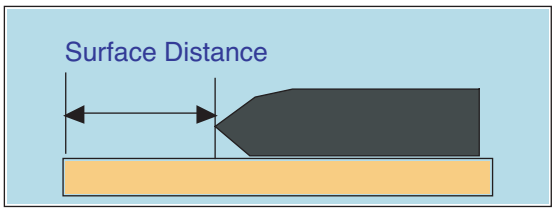
7.3. Tool Option Setting

MODEL	Display	Tool opt1	Tool opt2	Tool opt3	Tool opt4
55LH95QD-CB	TV	45955	4184	38	51840
	Media-Box	45955	4440	51366	51872

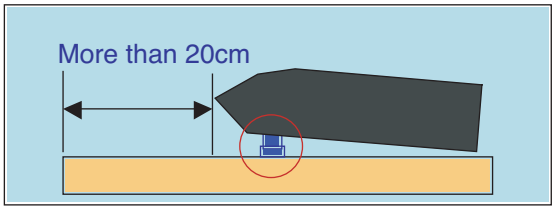
Tool Option4 should be set to TV ‘51840’, Media-Box ‘51872’ as a manufacturing default.
By ‘IN-STOP’ to make shipping condition, it will be set to TV ‘19072’, Media-Box ‘19104’ automatically.

MEDIA-BOX SETUP GUIDE

1. When setting up Media-Box at the cabinet and on th surface, etc

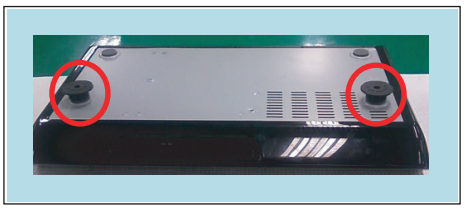


(1) If the surface distance becomes more than 20cm at [fig. 1], wireless connection difficulty could be happened.
(2) Set up Media-Box making the surface distance as less than 20cm as possible.



(3) If the surface distance becomes more than 20cm unavoidably at [fig. 2], a noise could be generated on the screen due to the drop of wireless connection sensitivity.
(4) Improve wireless connection sensitivity by raising a wireless emission angle using rubber (providing accessory).

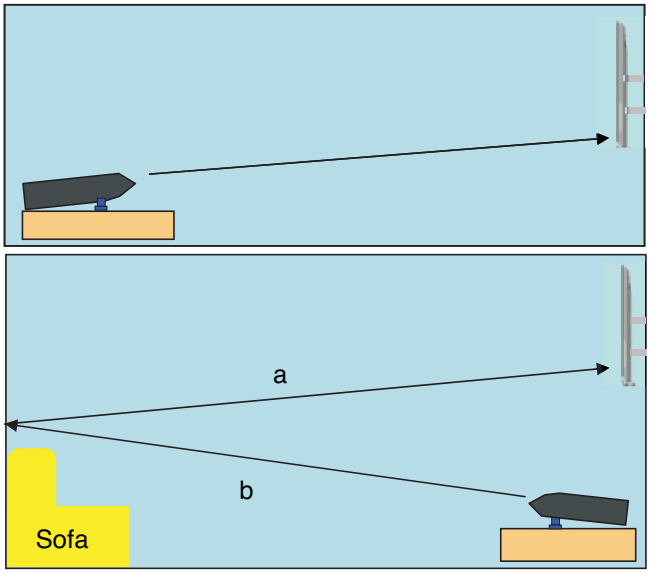
2. When setting up Media-Box and TV, facing each other



[Fig. 3] Attach rubber to the lower part of Media-Box.

If the surface distance on which Media-Box is placed becomes more than 20cm, wireless connection sensitivity could be dropped, and it is recommended to use rubber.

3. In case setting up by using a reflection

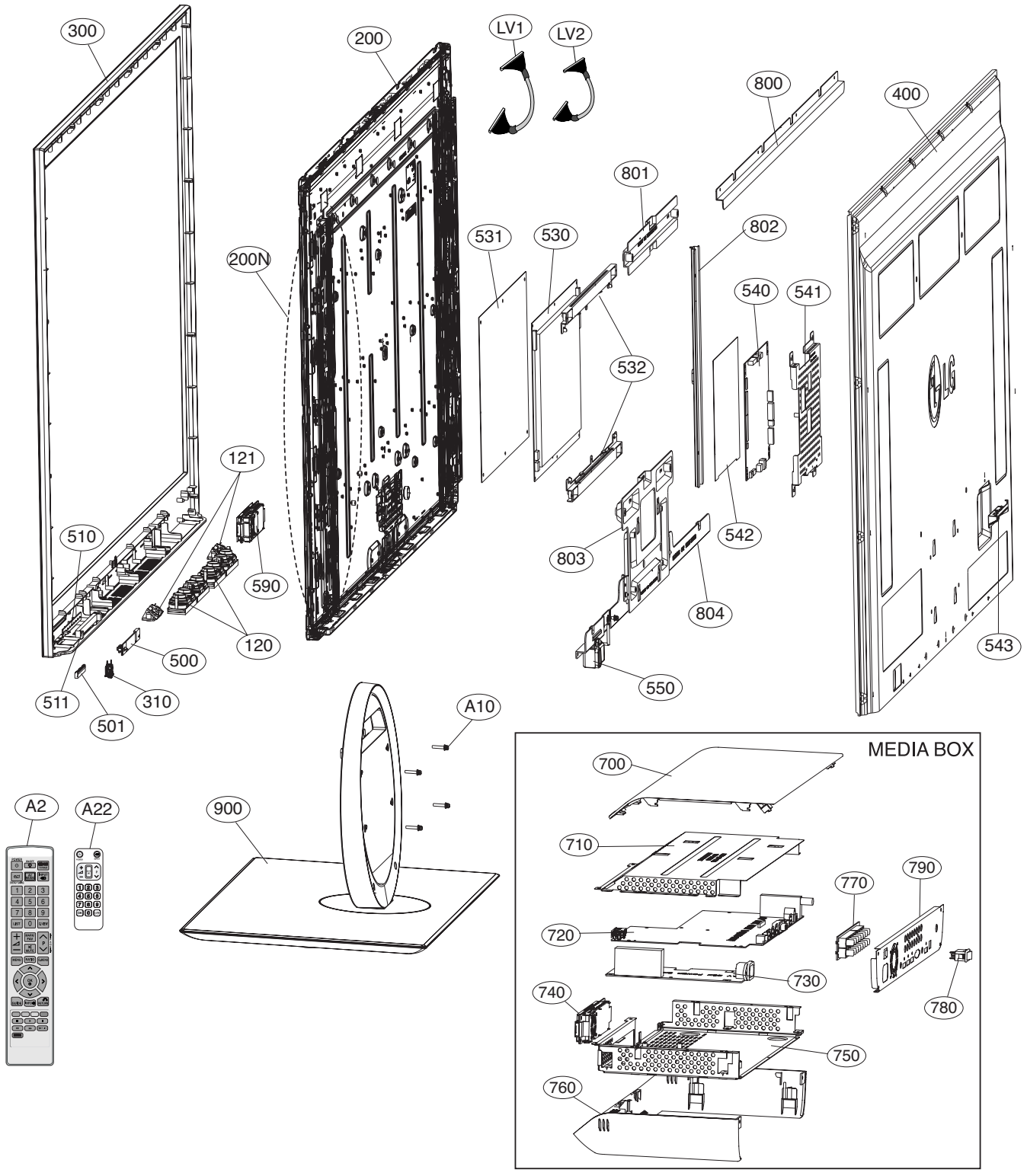


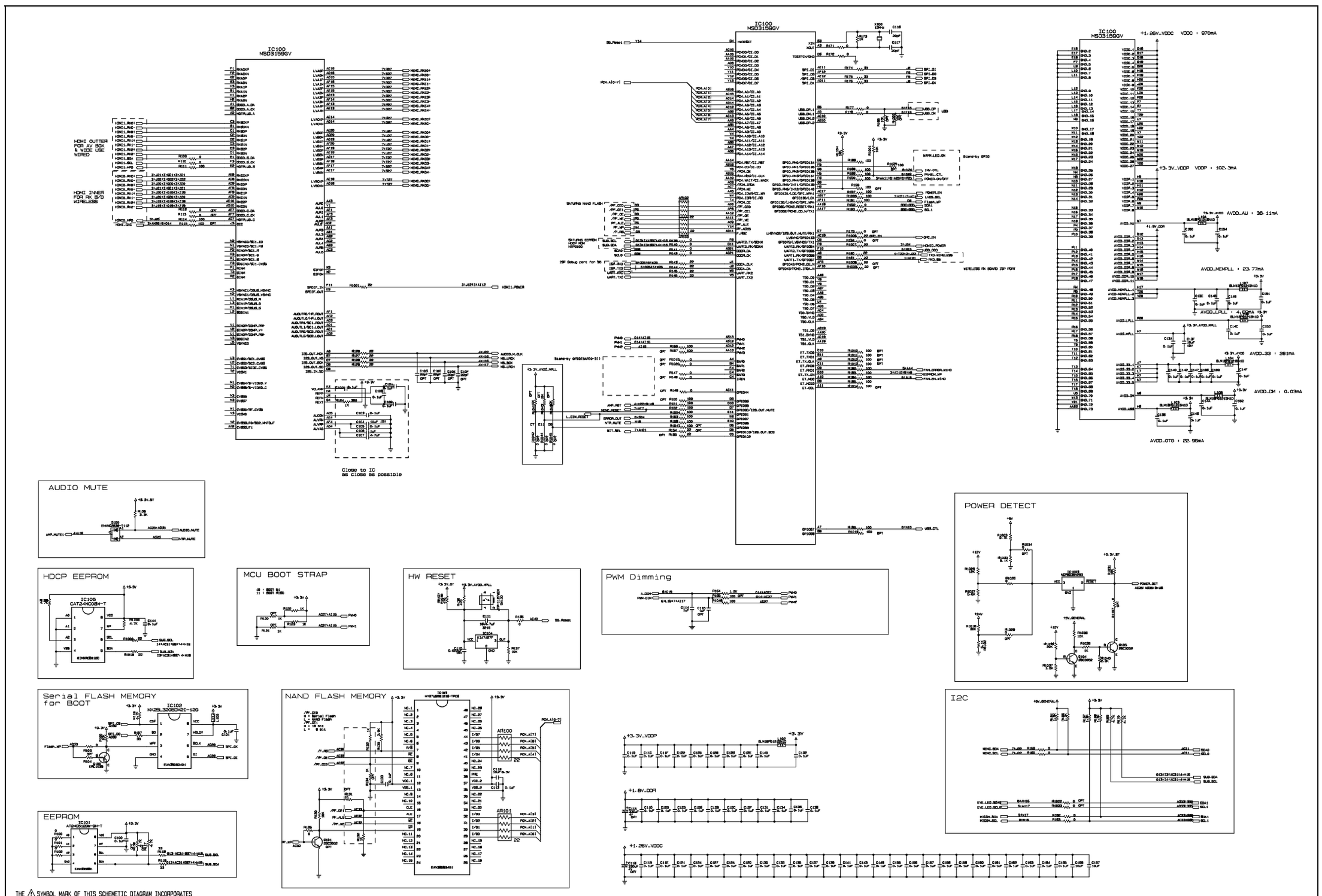
The whole reflected distance shouldn't be over 10m, and if using a rubber according to the condition how Media-Box is placed, wireless connection sensitivity improves. (a+b distance should be smaller than 10m.)

EXPLODED VIEW

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 X-RADIATION, Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.





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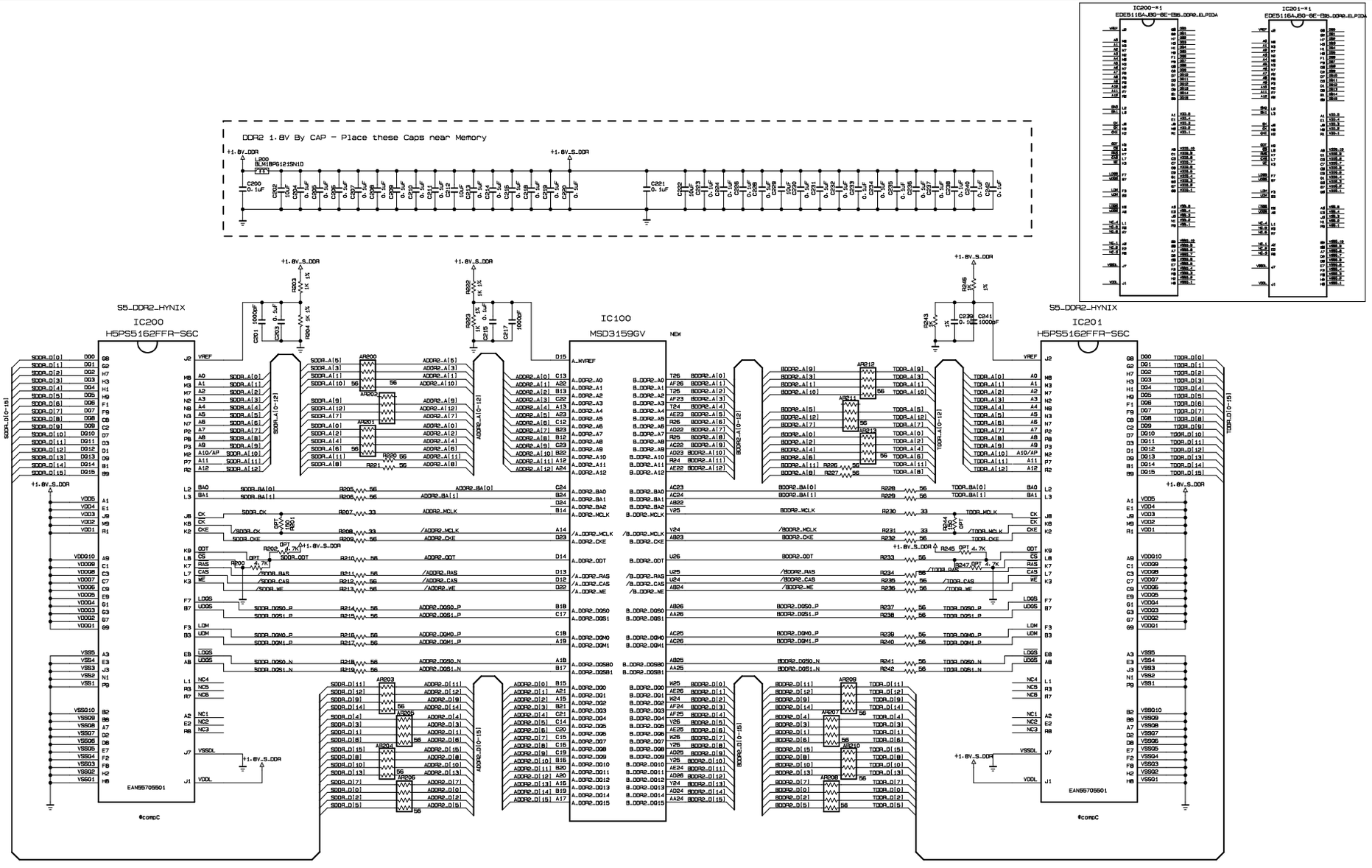
MODEL	JUPITER	DATE	
BLOCK	MAIN IC	SHEET	1 / 10



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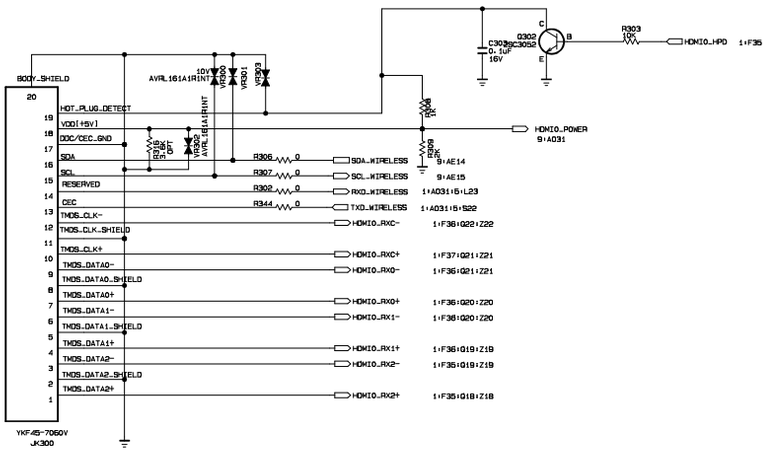
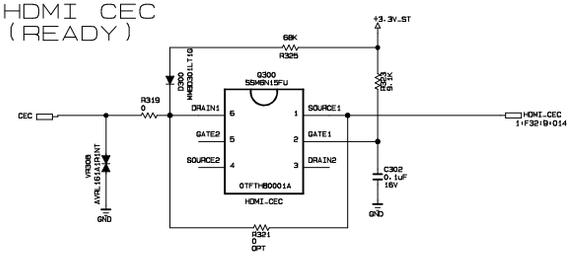
MODEL	JUNO/JUPITER	DATE	
BLOCK	MAIN DDR2	SHEET	2 / 8

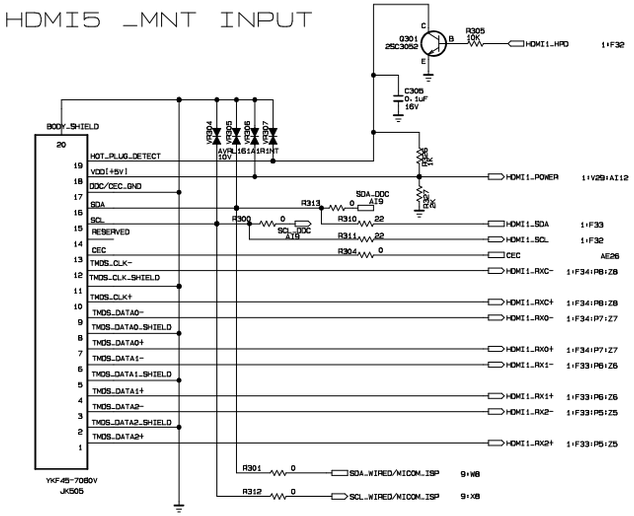
HDMI0 (ONLY FOR INNER RX BOARD)



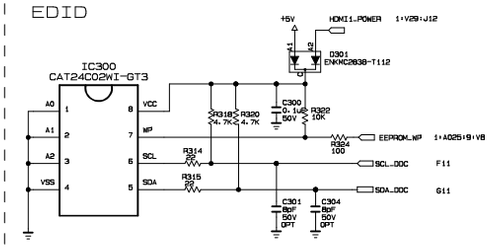
HDMI CEC (READY)



HDMI5 _MNT INPUT



EDID



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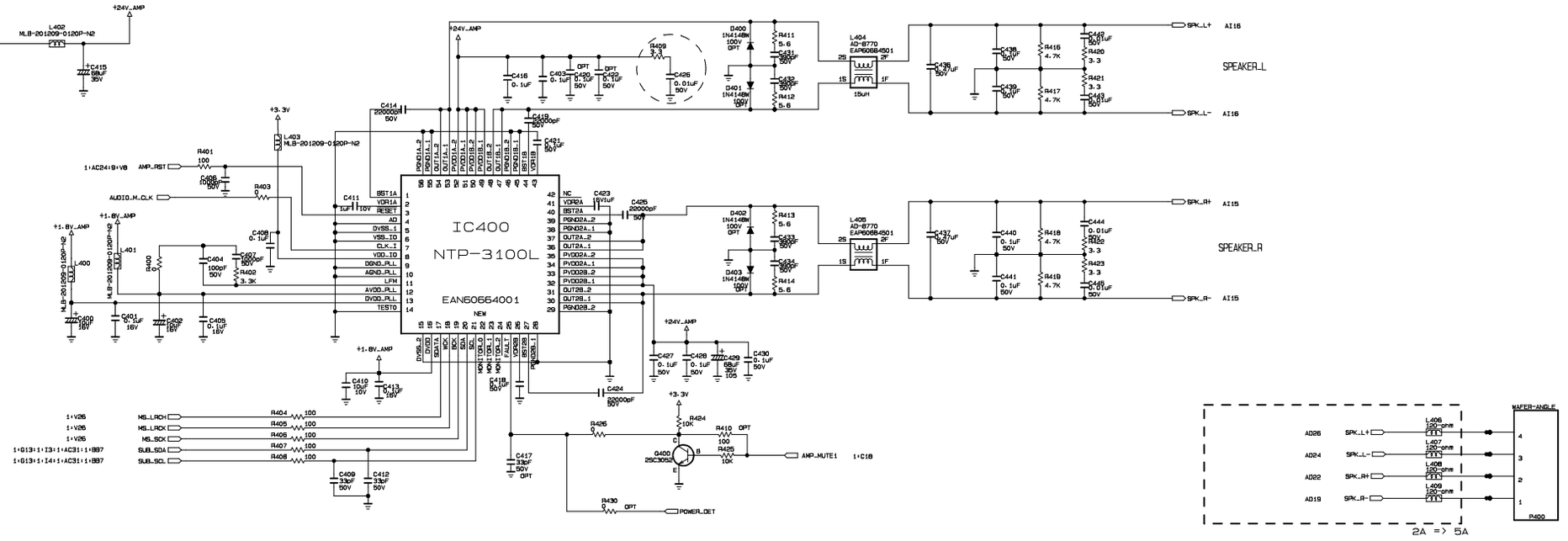
MODEL	JUPITER	DATE	
BLOCK	HDMI	SHEET	3 / 10

AUDIO AMP



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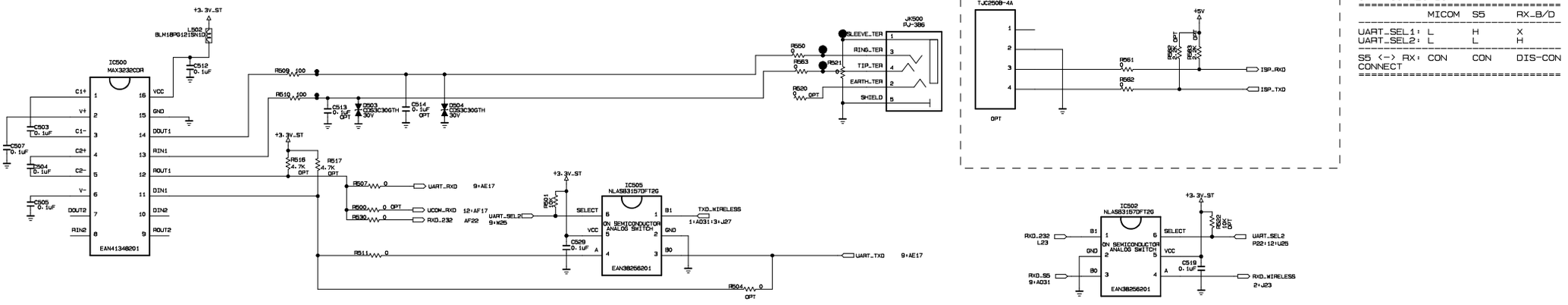
MODEL	JUPITER	DATE	
BLOCK	Audio Amp	SHEET	4 / 10

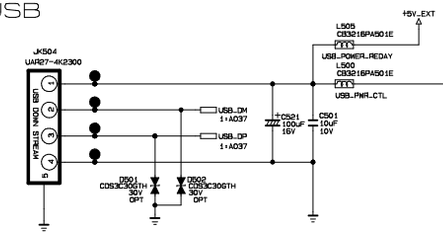
RS232C & ISP



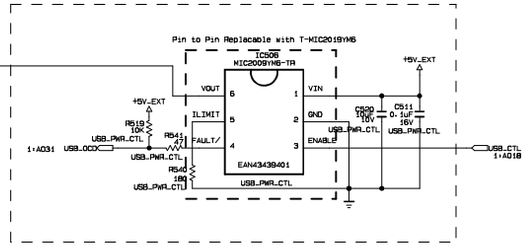
UART CONNECTION

	MICOM	S5	RX_B/D
UART_SEL1 :	L	H	X
UART_SEL2 :	L	L	H
S5 <-> RX : CONNECT	CON	CON	DIS-CON

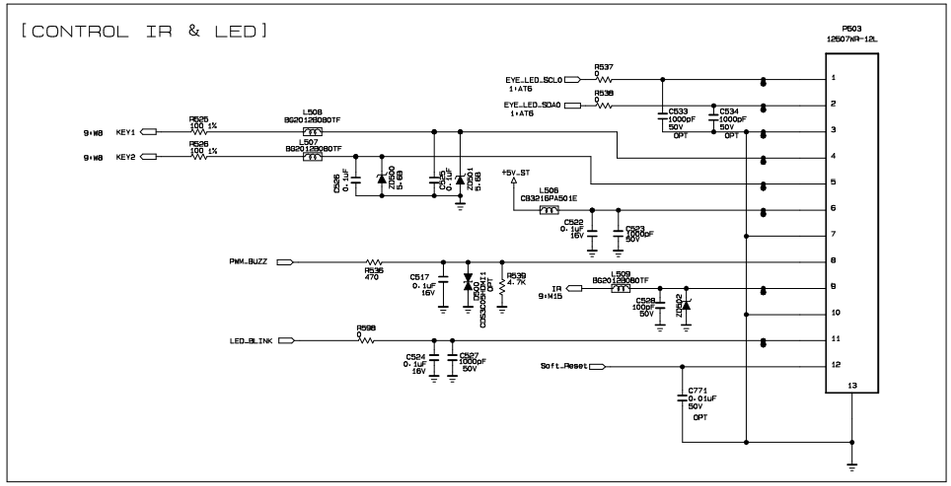
USB



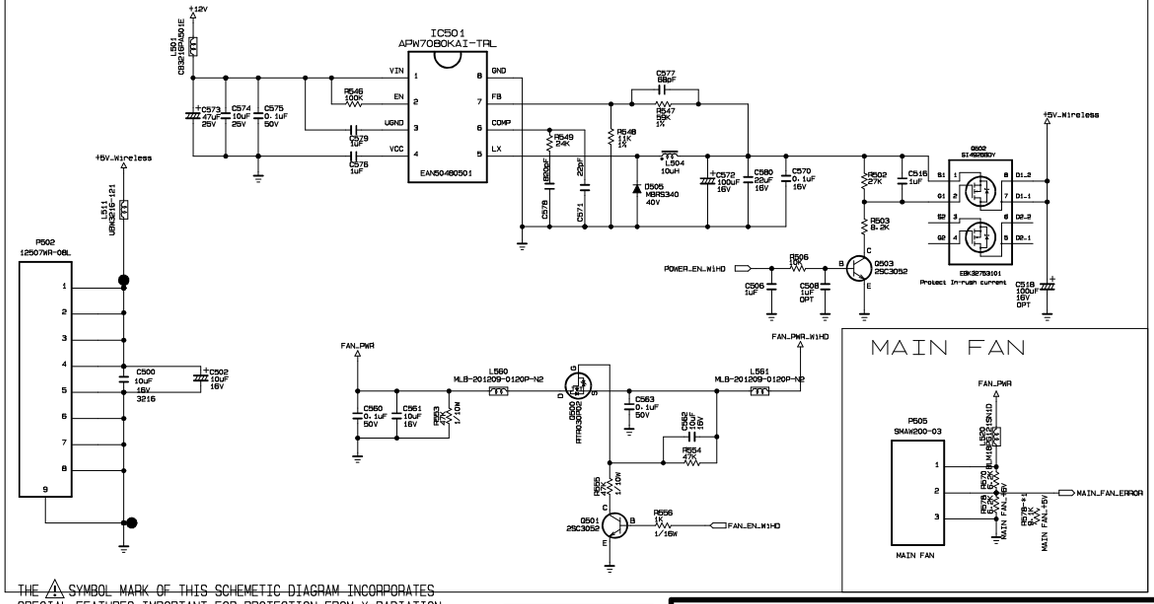
USB POWER CONTROL OPTION



[CONTROL IR & LED]

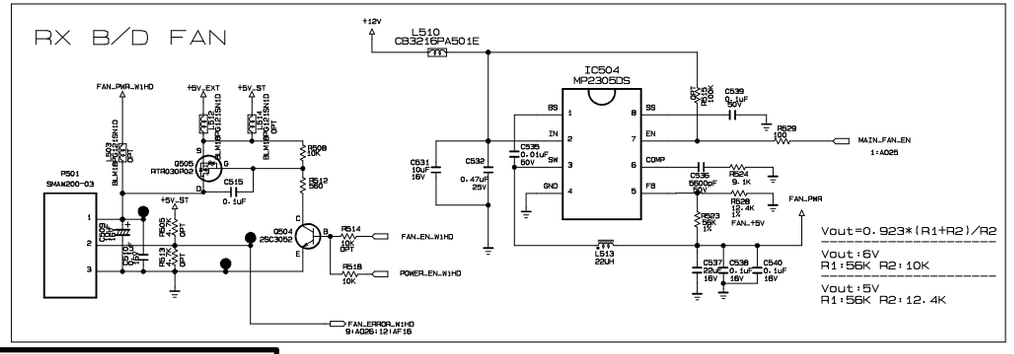


WIRELESS RX BOARD POWER



MAIN FAN

RX B/D FAN



Vout=0.923*(R1+R2)/R2

Vout:6V
R1:56K R2:10K

Vout:5V
R1:56K R2:12.4K

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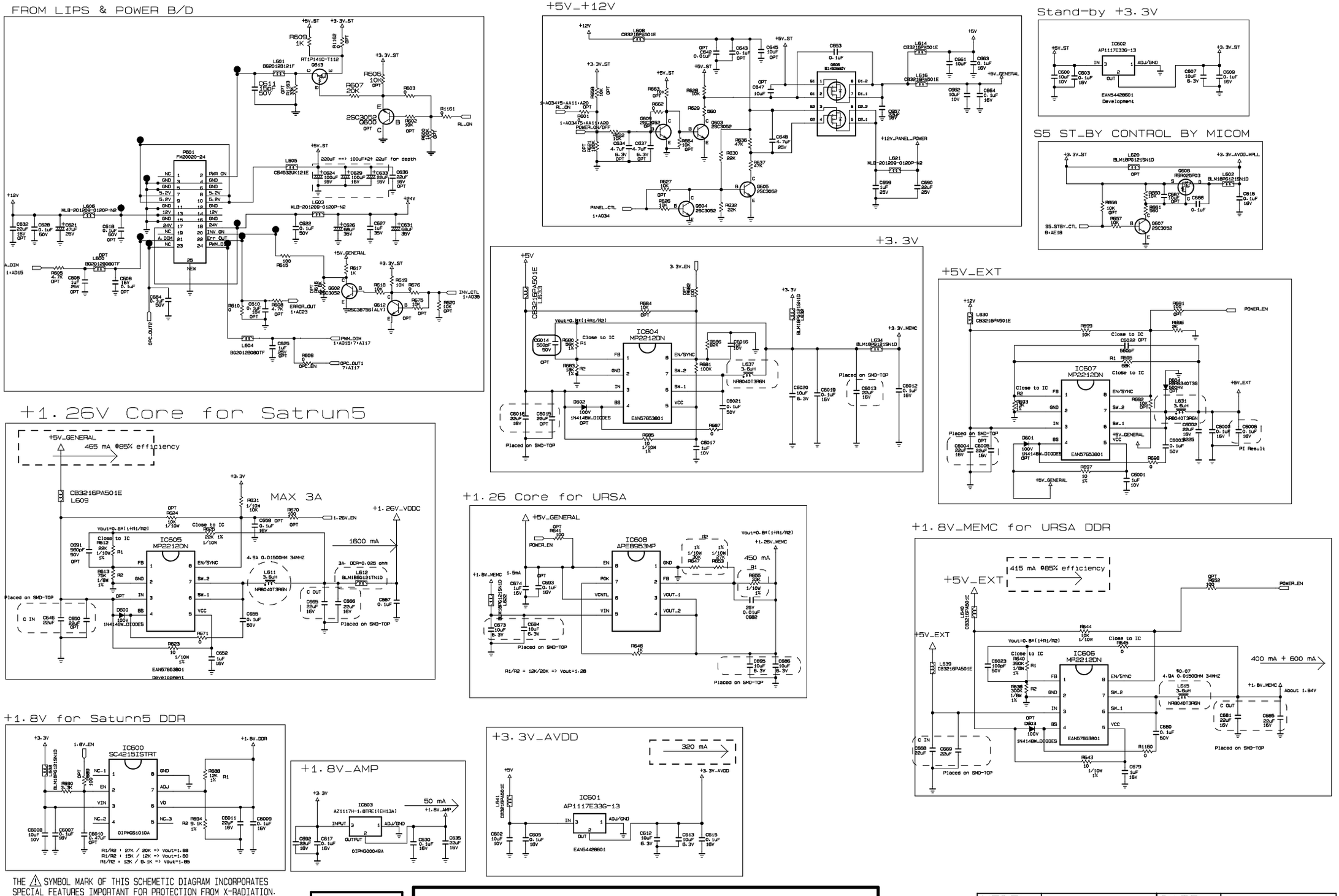
MODEL	JUPITER	DATE	
BLOCK	CONTROL	SHEET	5 / 10



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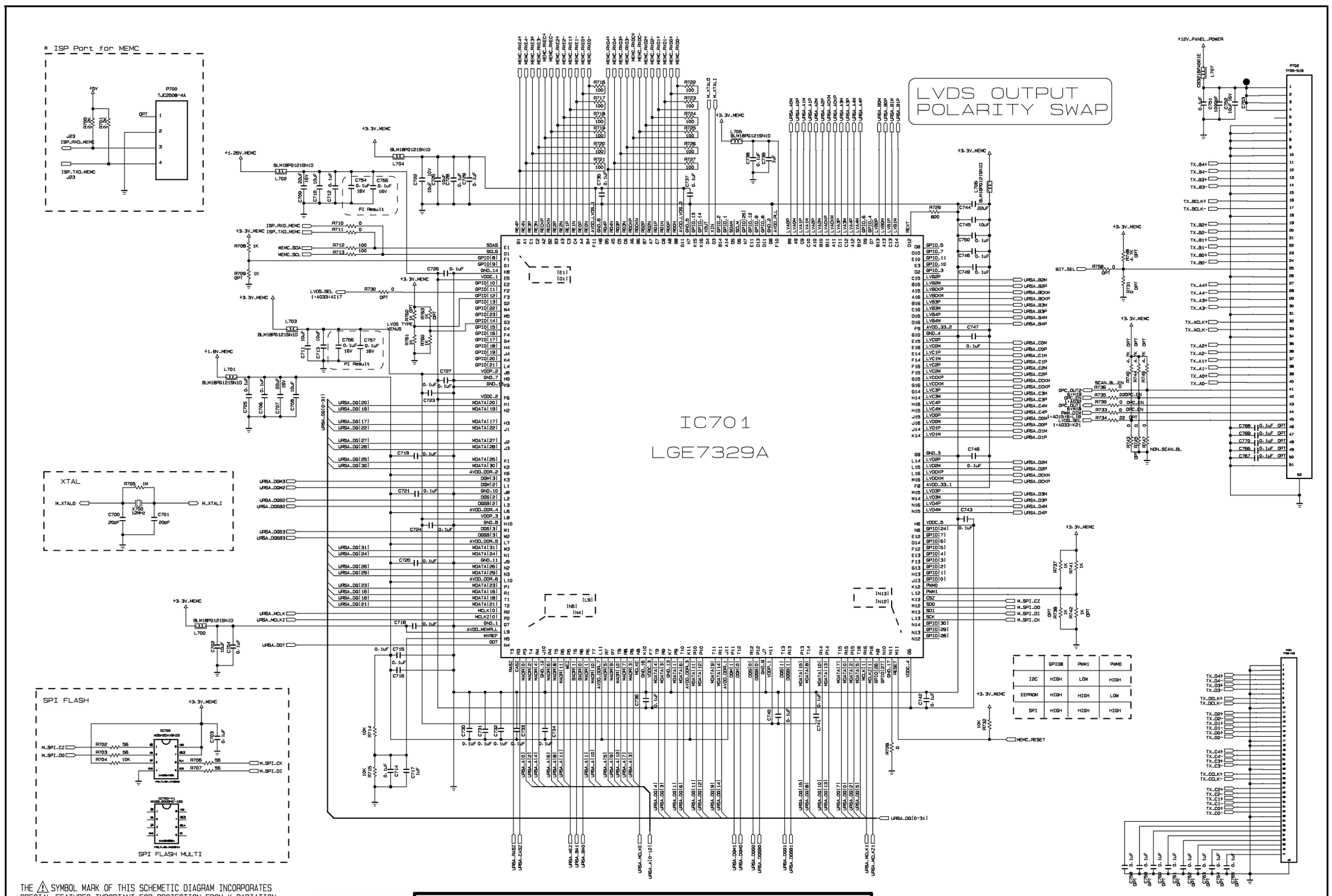
LG ELECTRONICS

MODEL	JUPITER	DATE	
BLOCK	Power	SHEET	6 / 10



	GPIO8	PWM1	PWM0
I2C	HIGH	LOW	HIGH
EEPROM	HIGH	HIGH	LOW
SPI	HIGH	HIGH	HIGH

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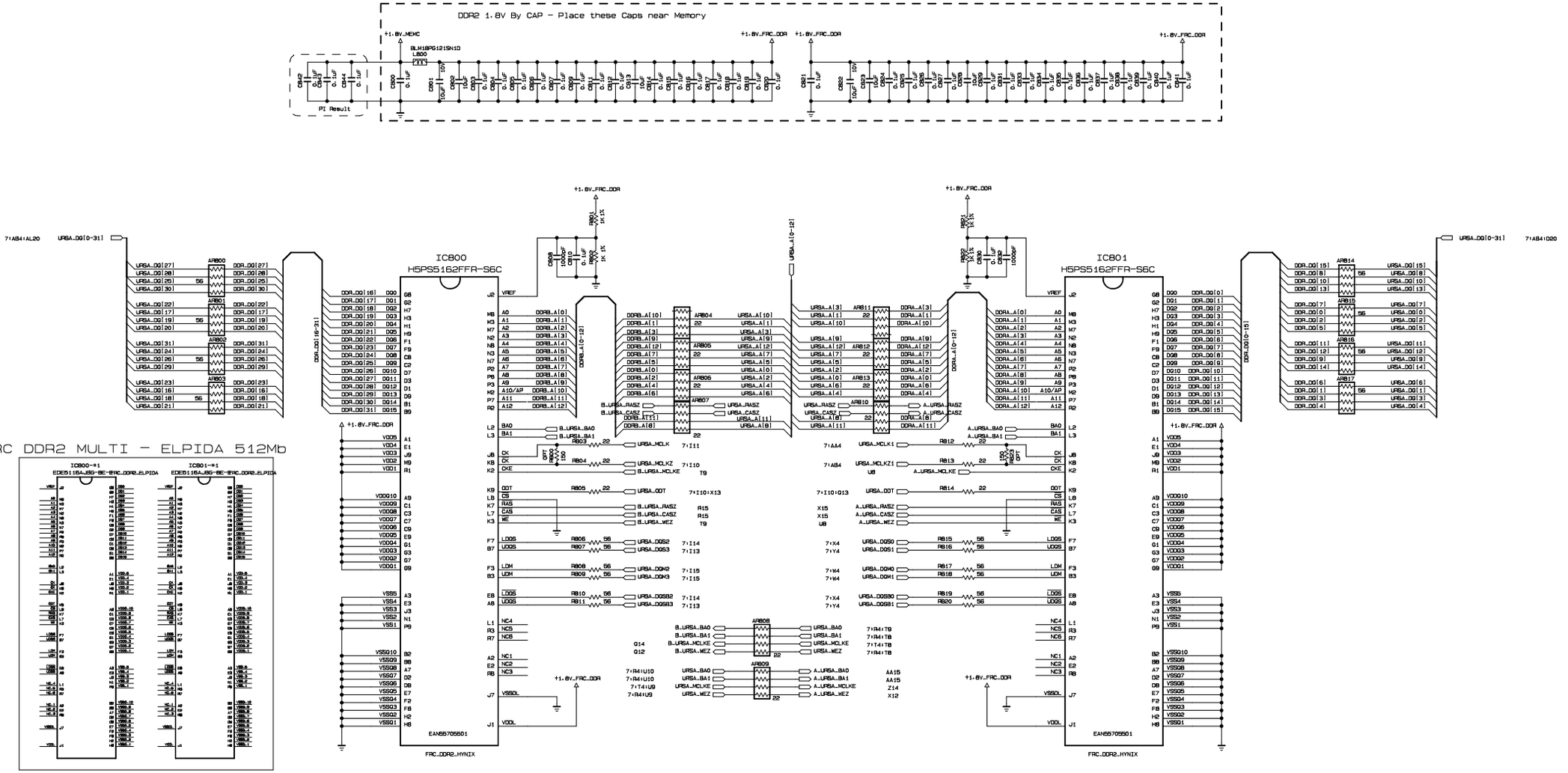
FRC DDR2



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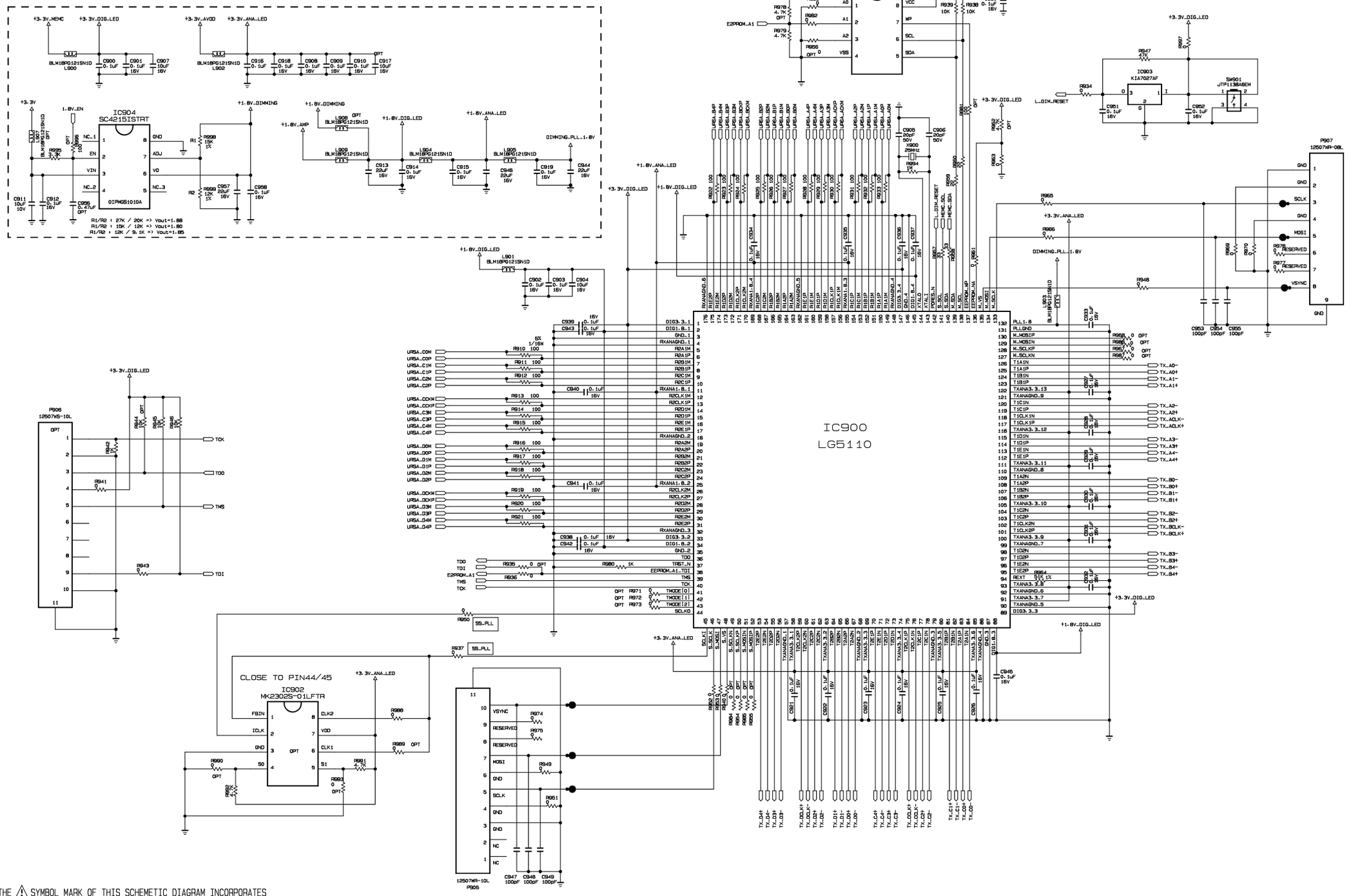
MODEL	JUPITER	DATE	
BLOCK	MST7323S DDR2	SHEET	8 / 10

Local Dim



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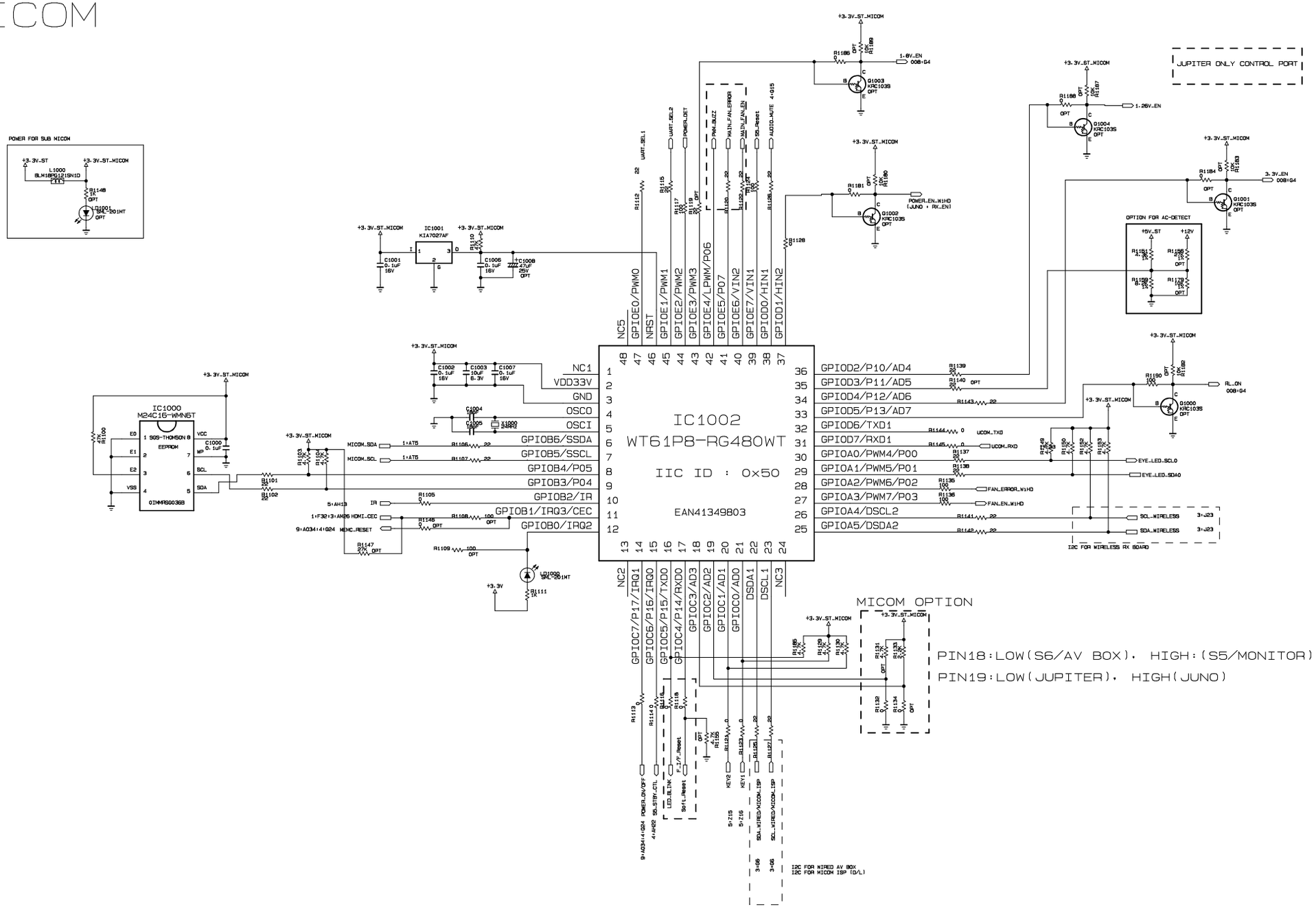
MODEL	JUPITER	DATE	
BLOCK	Local Dimming	SHEET	9 / 10

MICOM



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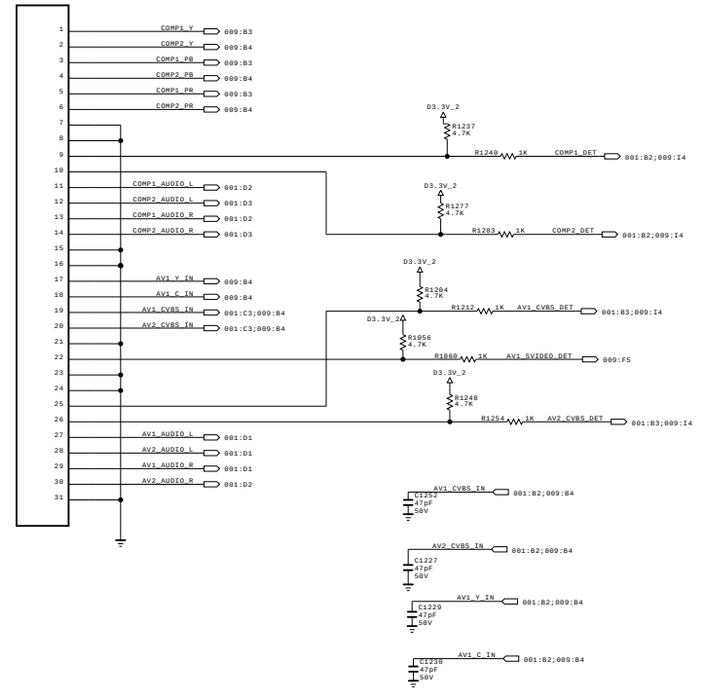
MODEL	JUPITER	DATE	
BLOCK	MICOM	SHEET	9 / 9

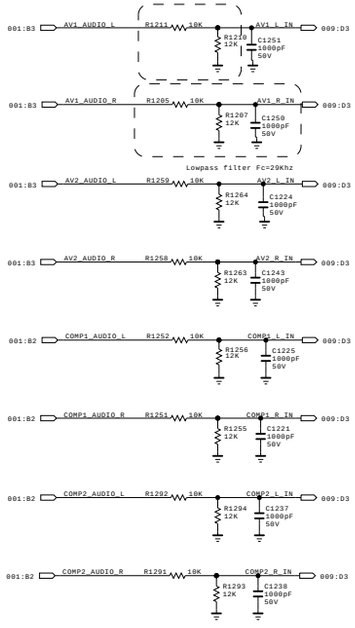
ANALOG IN/OUT

In case of 2Vrms INPUT, Voltage divider for Mstar(3.3Vp-p ADC) * PC sound input & AV audio input voltage divider value is different so we need cordinate it in next model

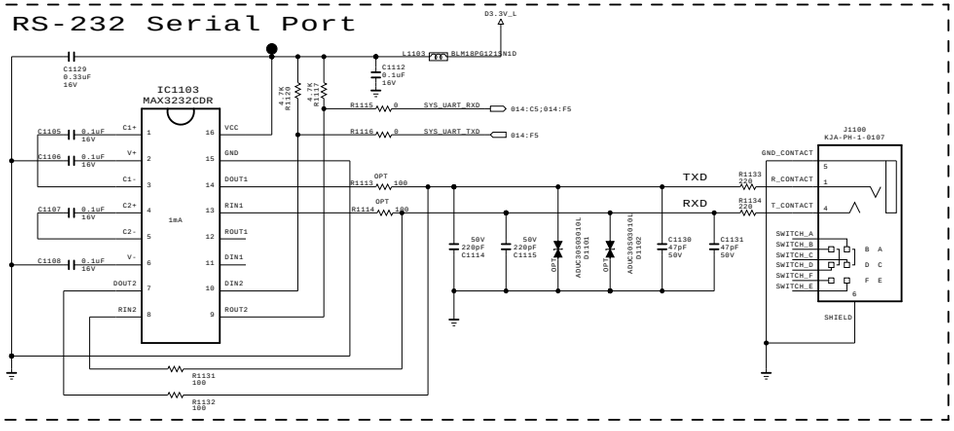
JACK TO MAIN WAFER

P1200
10022HS-31A02

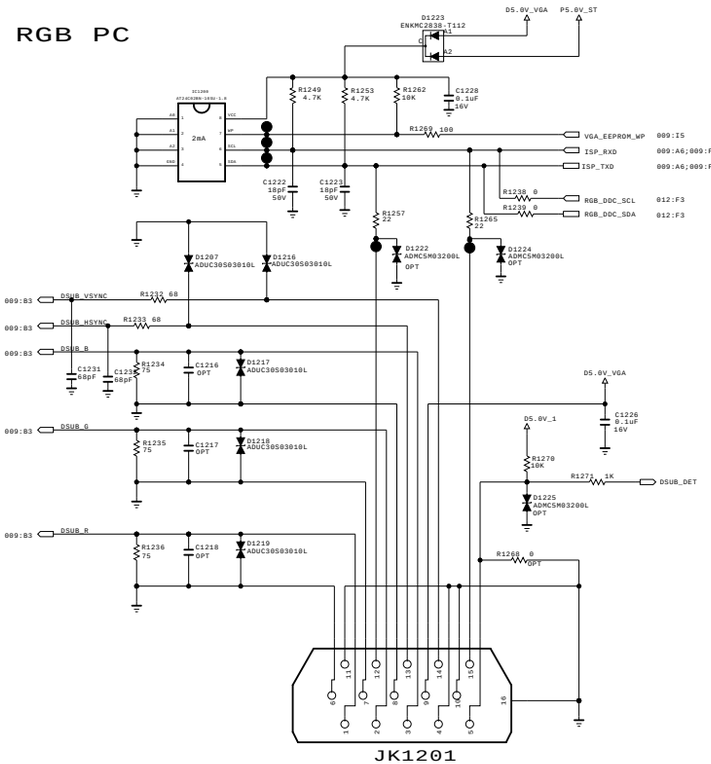




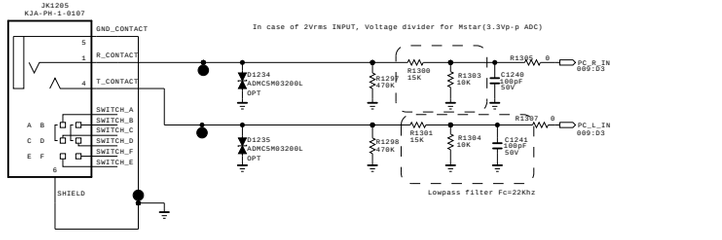
RS-232 Serial Port



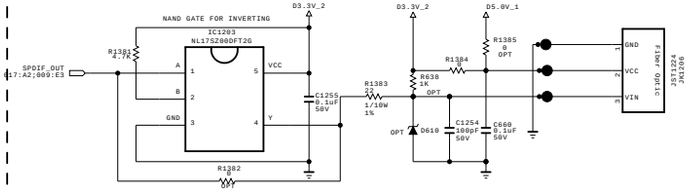
RGB PC



PC AUDIO



SPDIF OPTIC JACK



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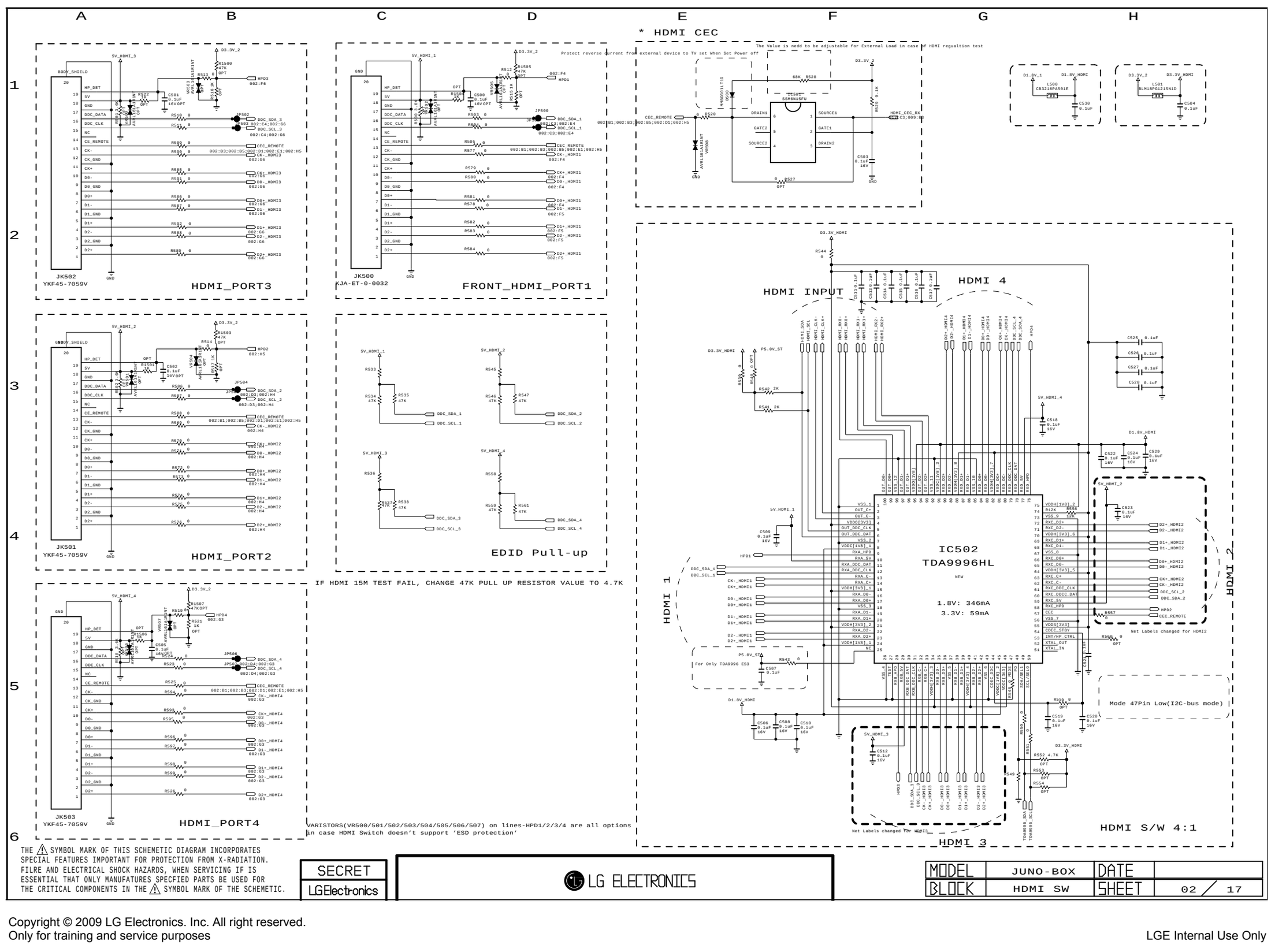
MODEL	JUNO-BOX	DATE	09.02.16
BLOCK	IN/OUT	SHEET	01 / 17



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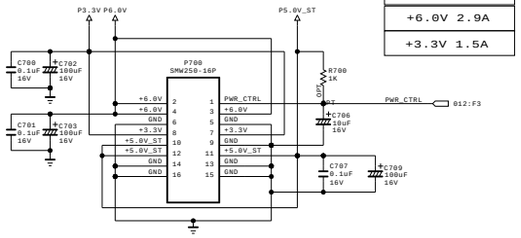
MODEL	JUNO-BOX	DATE	
BLOCK	HDMI SW	SHEET	02 / 17

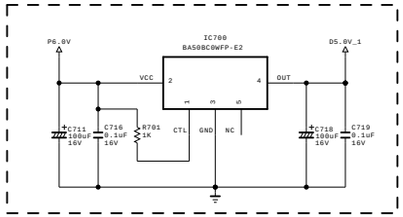
POWER SUPPLY

POWER CONNECTOR

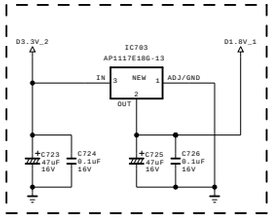
+5.0V_ST 2A
+6.0V 2.9A
+3.3V 1.5A



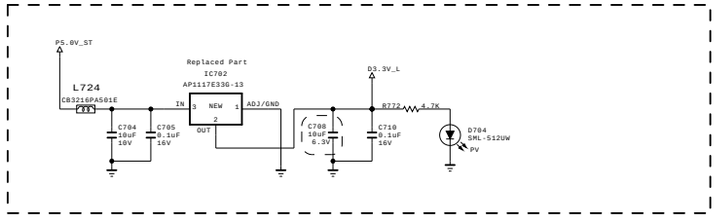
+5.0V For USB & Etc



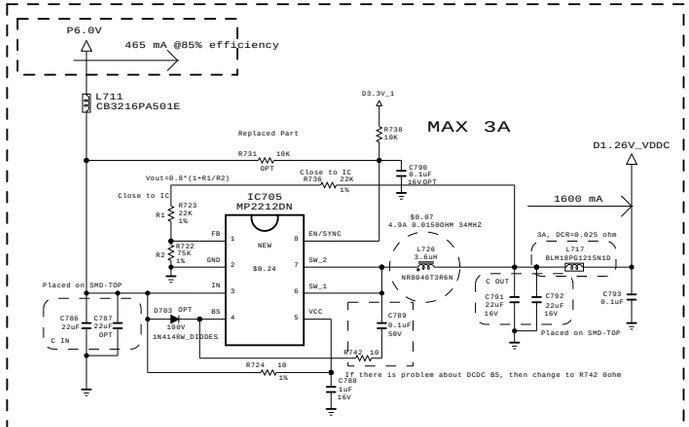
+1.8V For HDMI TX



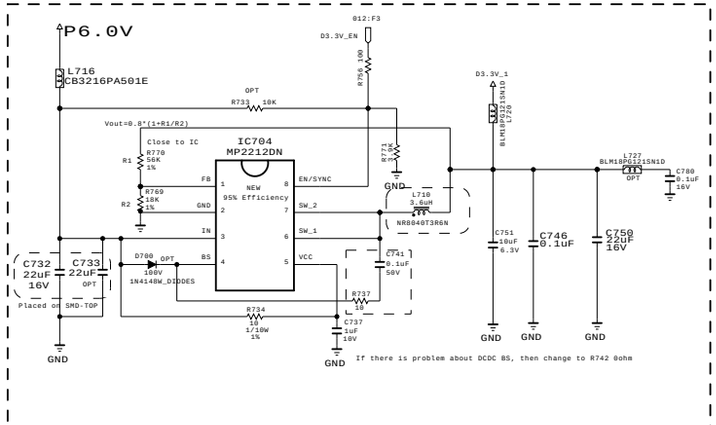
Stand-by +3.3V

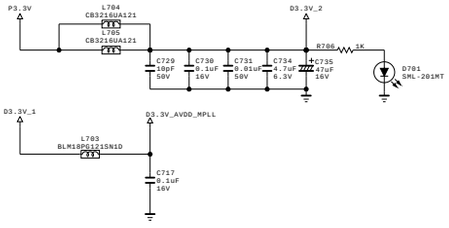


+1.26 Core for Saturn6

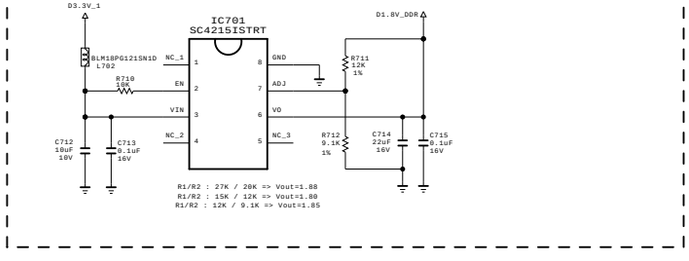


+3.3V

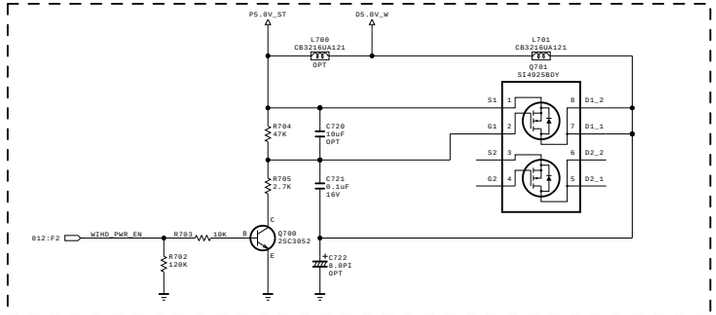




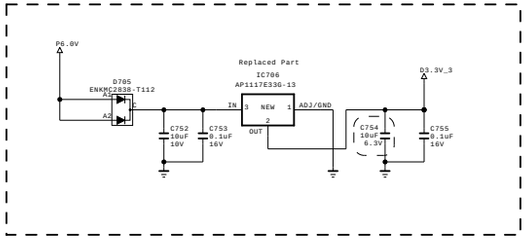
+1.8V for Saturn6 DDR



Switch for +5.0V (WIRELESS)



+3.3V For TMDS Switch



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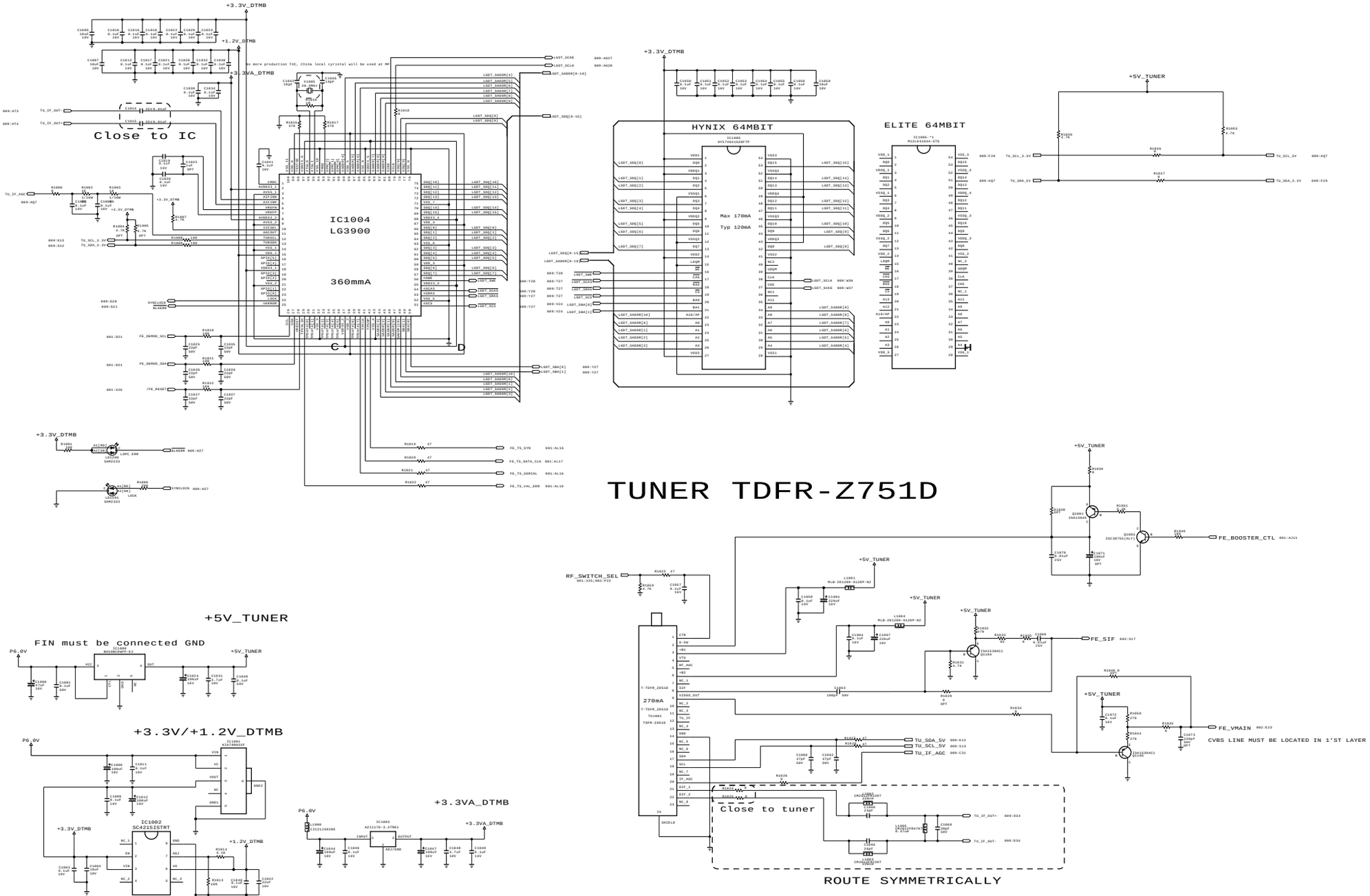
MODEL	JUNO-BOX	DATE	
BLOCK	POWER	SHEET	04 / 17

DEMODULATOR LGDT3900



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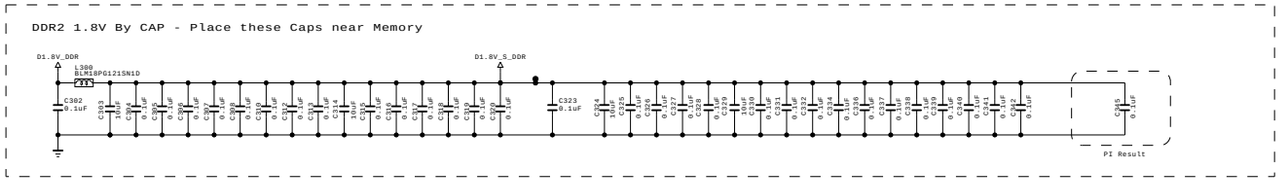
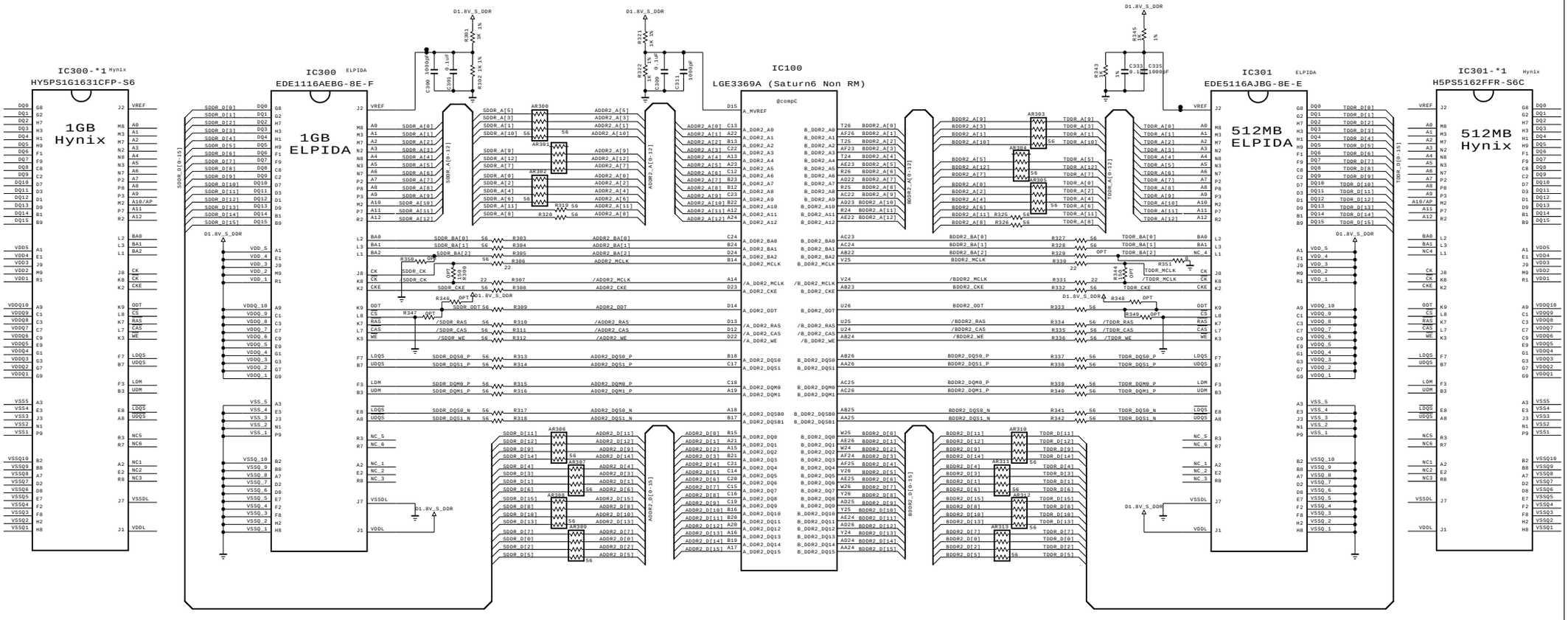
MODEL		DATE	
BLOCK	TUNER	SHEET	/

DDR2





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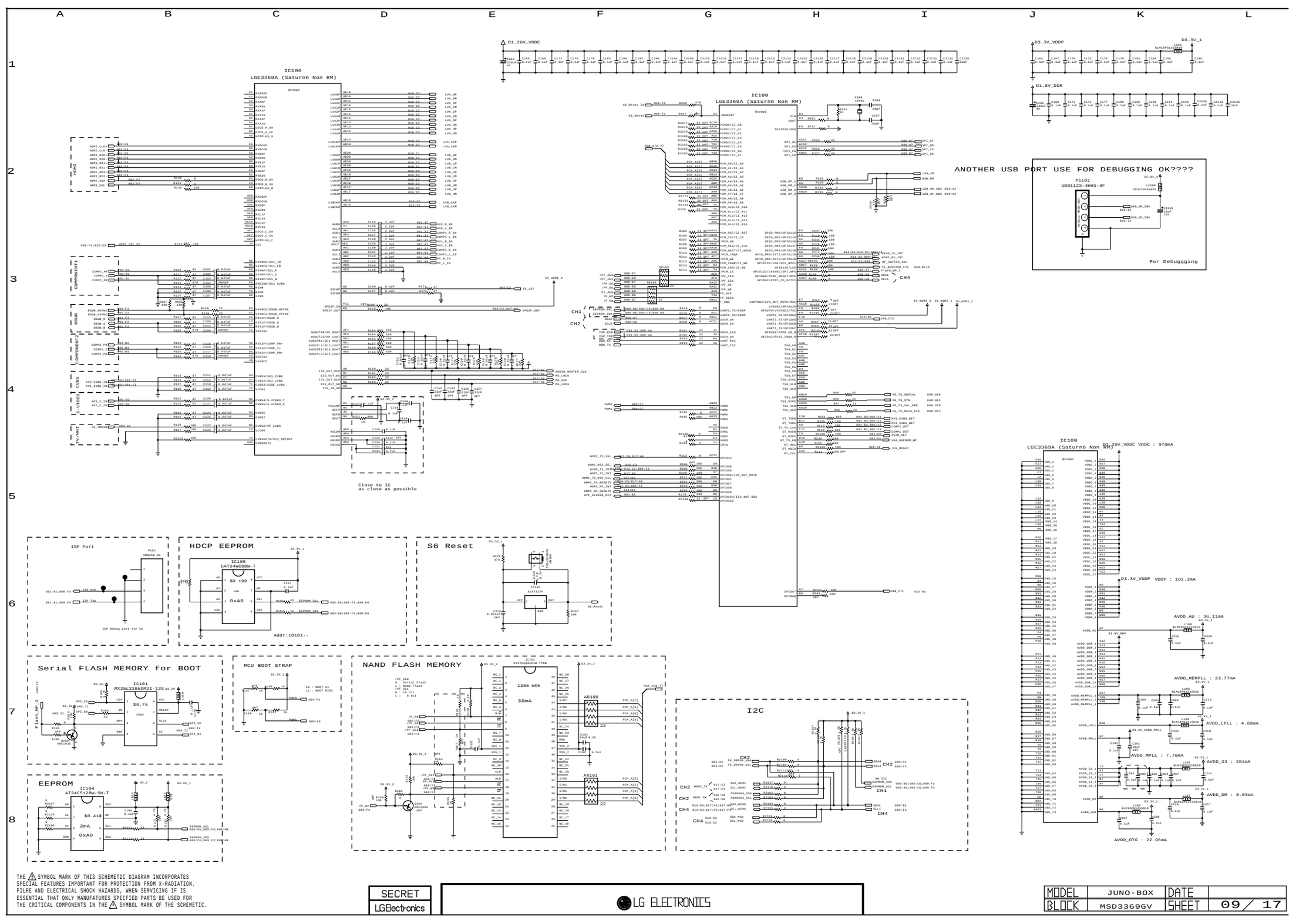
MODEL	JUNO-BOX	DATE	
BLOCK	DDR2	SHEET	06 / 17



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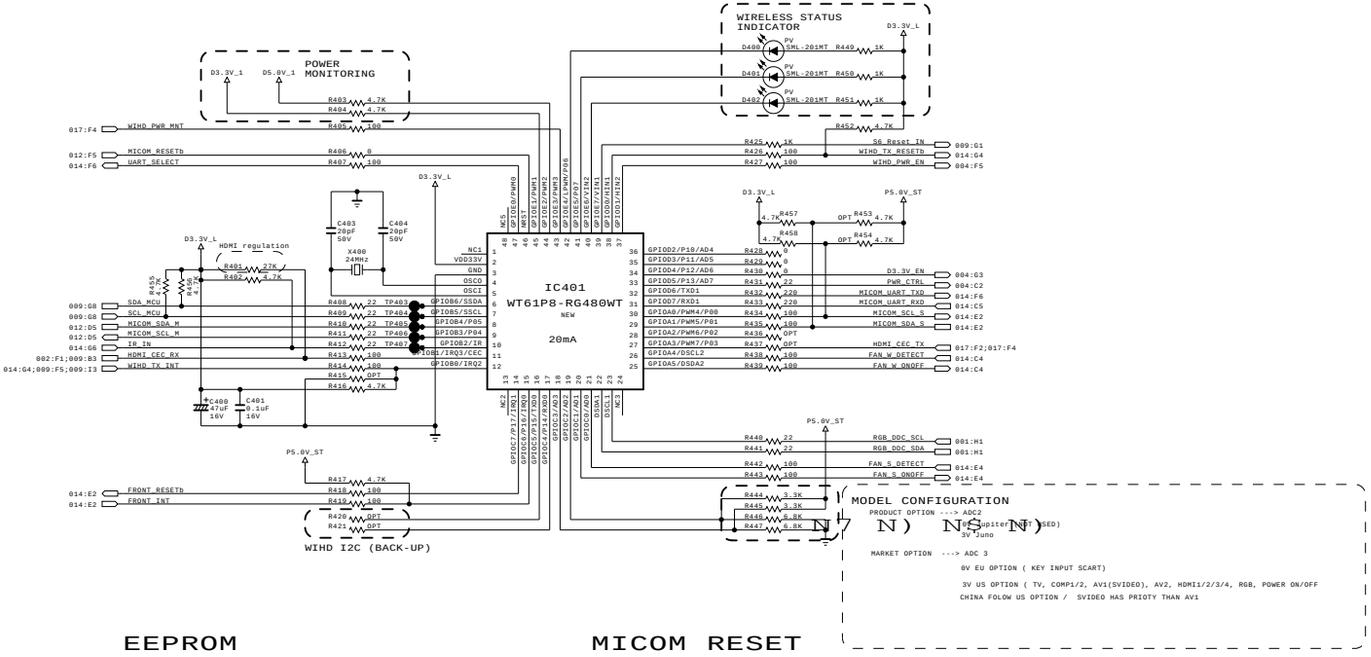
MODEL	JUNO-BOX	DATE	
BLOCK	MSD3369GV	SHEET	09 / 17

MICRO-CONTROLLER



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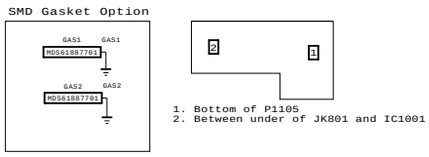
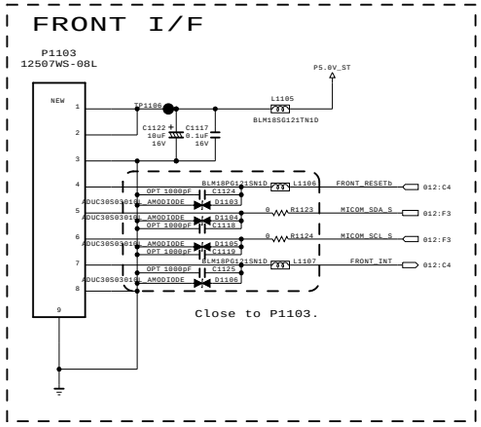
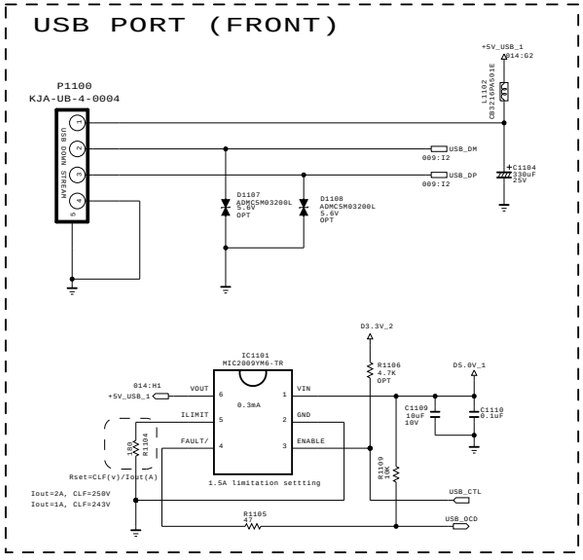
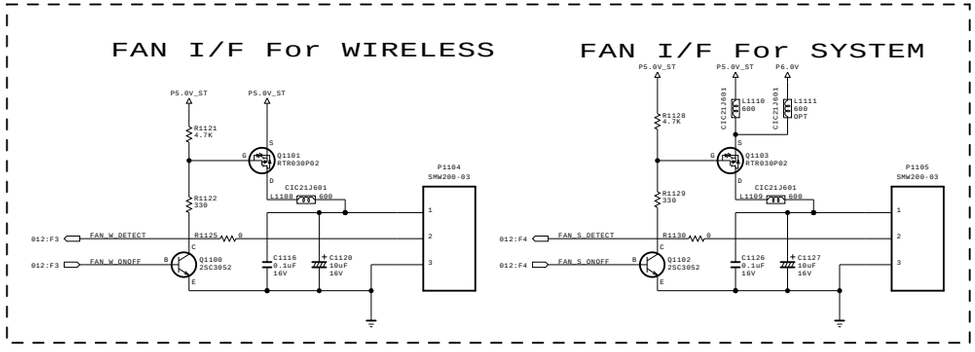
LG ELECTRONICS

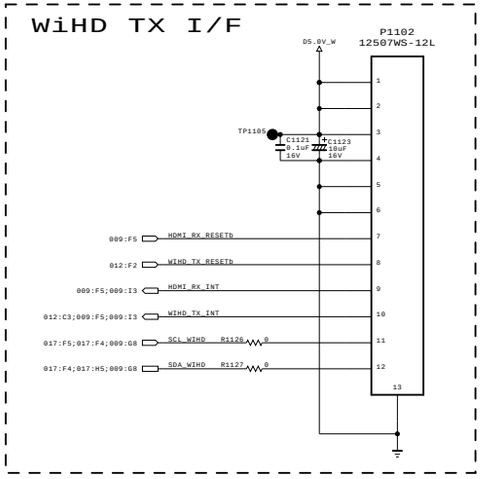
MODEL	JUNO-BOX	DATE	
BLOCK	MICOM	SHEET	12 / 17

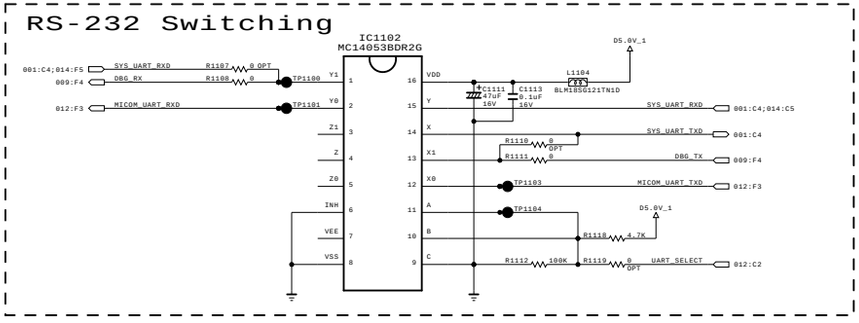


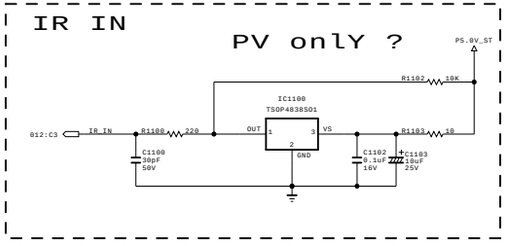












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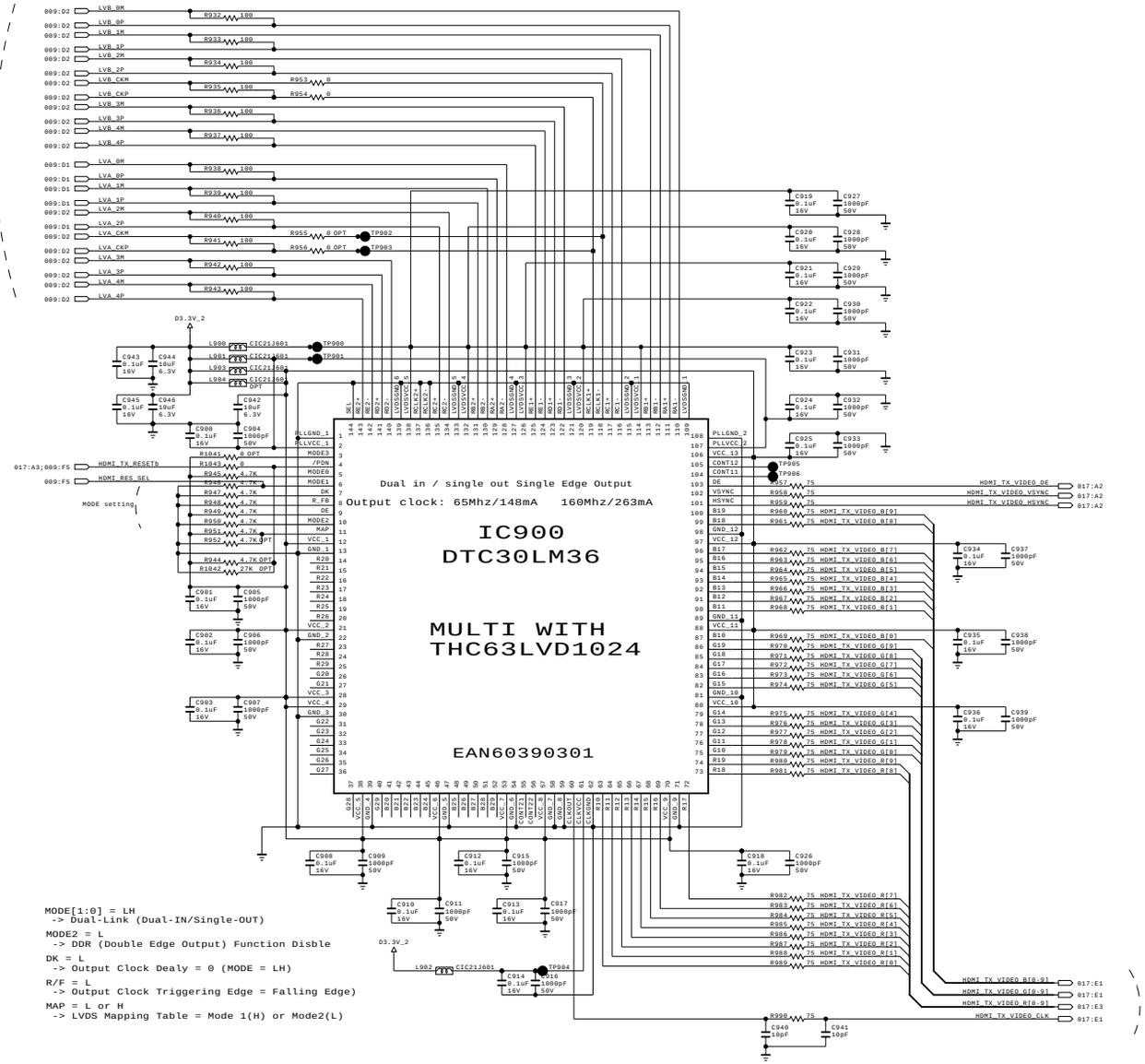
MODEL	JUNO-BOX	DATE	
BLOCK	SUB	SHEET	14 / 17

LVDS RECEIVER



pAY ATTEMTION ABOUT TTL LINE BOARD DESIGNE TO DEDUCE EMI

1. LINE MUST BE LOACATED IN 1'ST LAYER
2. USE GROUND VIA NEAR BY TTL LINE

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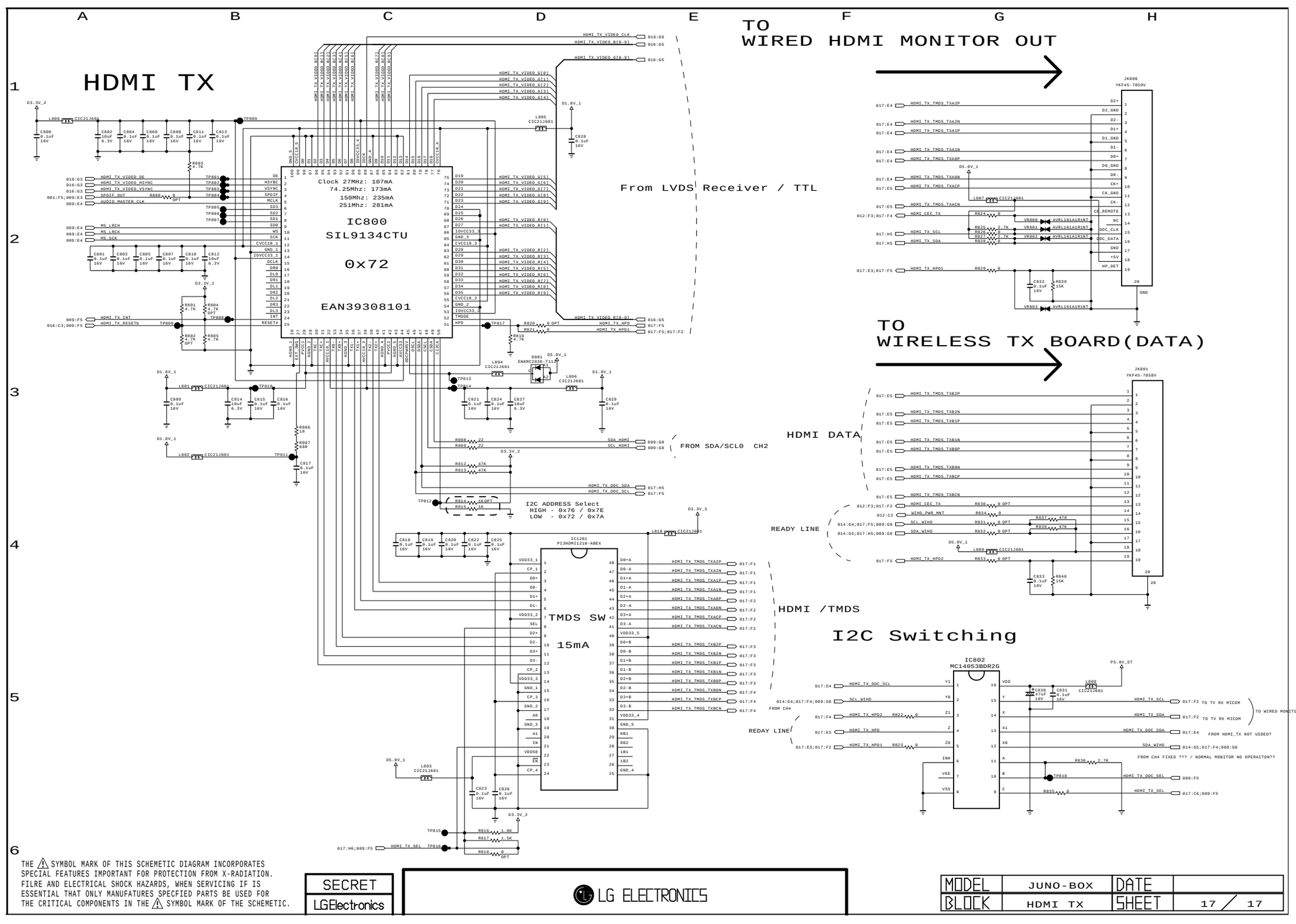
MODEL	JUNO-BOX	DATE	
BLOCK	LVDS RX	SHEET	16 / 17



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MODEL	JUNO-BOX	DATE	
BLOCK	HDMI TX	SHEET	17 / 17

Wireless TV Transmitter Board

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SECRET
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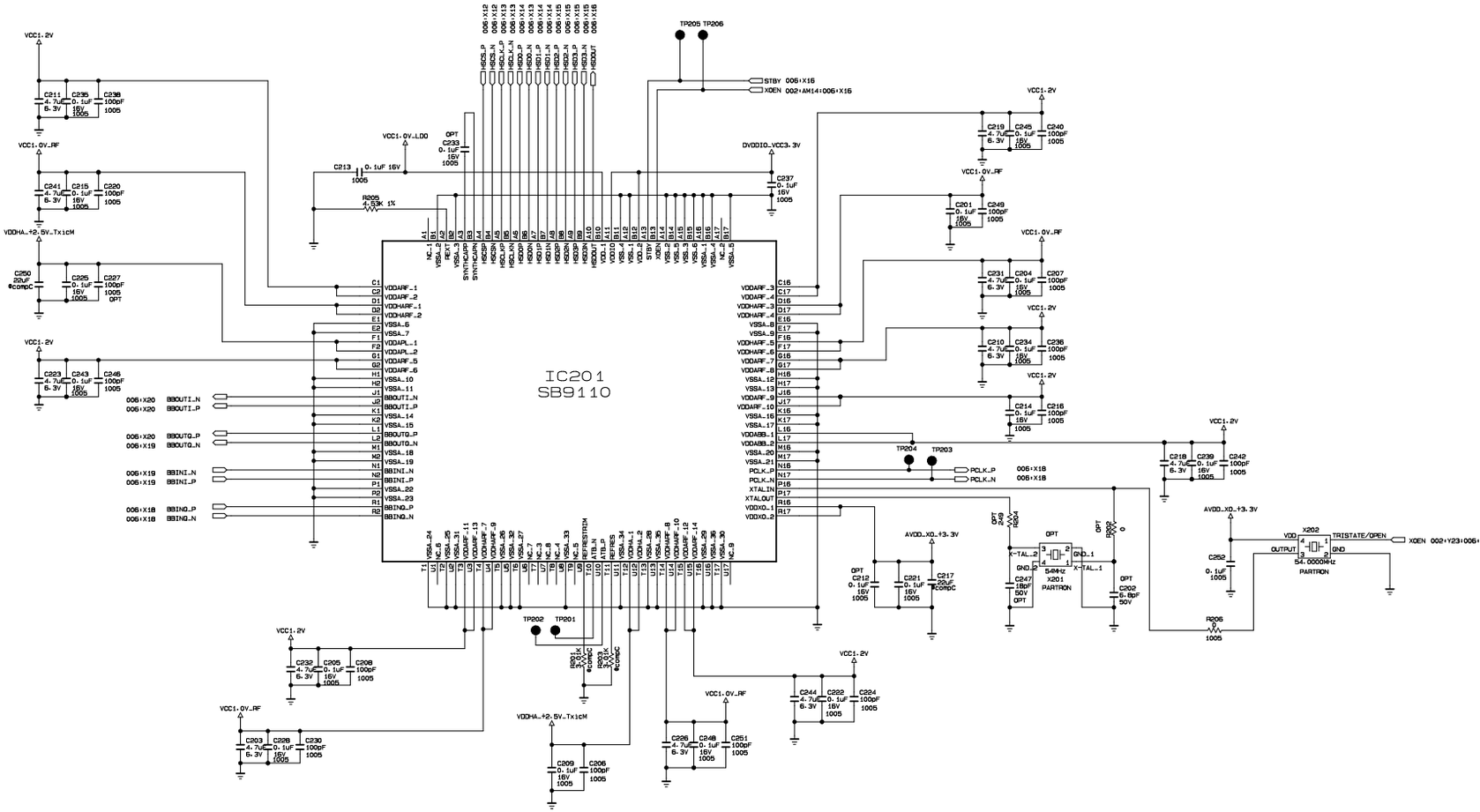
CHOI SEONG WOOK LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	Title Sheet	SHEET	1 / 12



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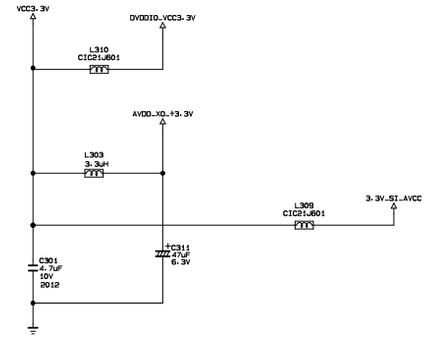
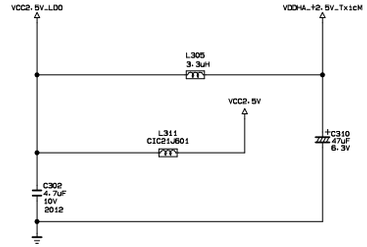
CHOI SEONG WOOK

LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	RFIC	SHEET	2 / 12





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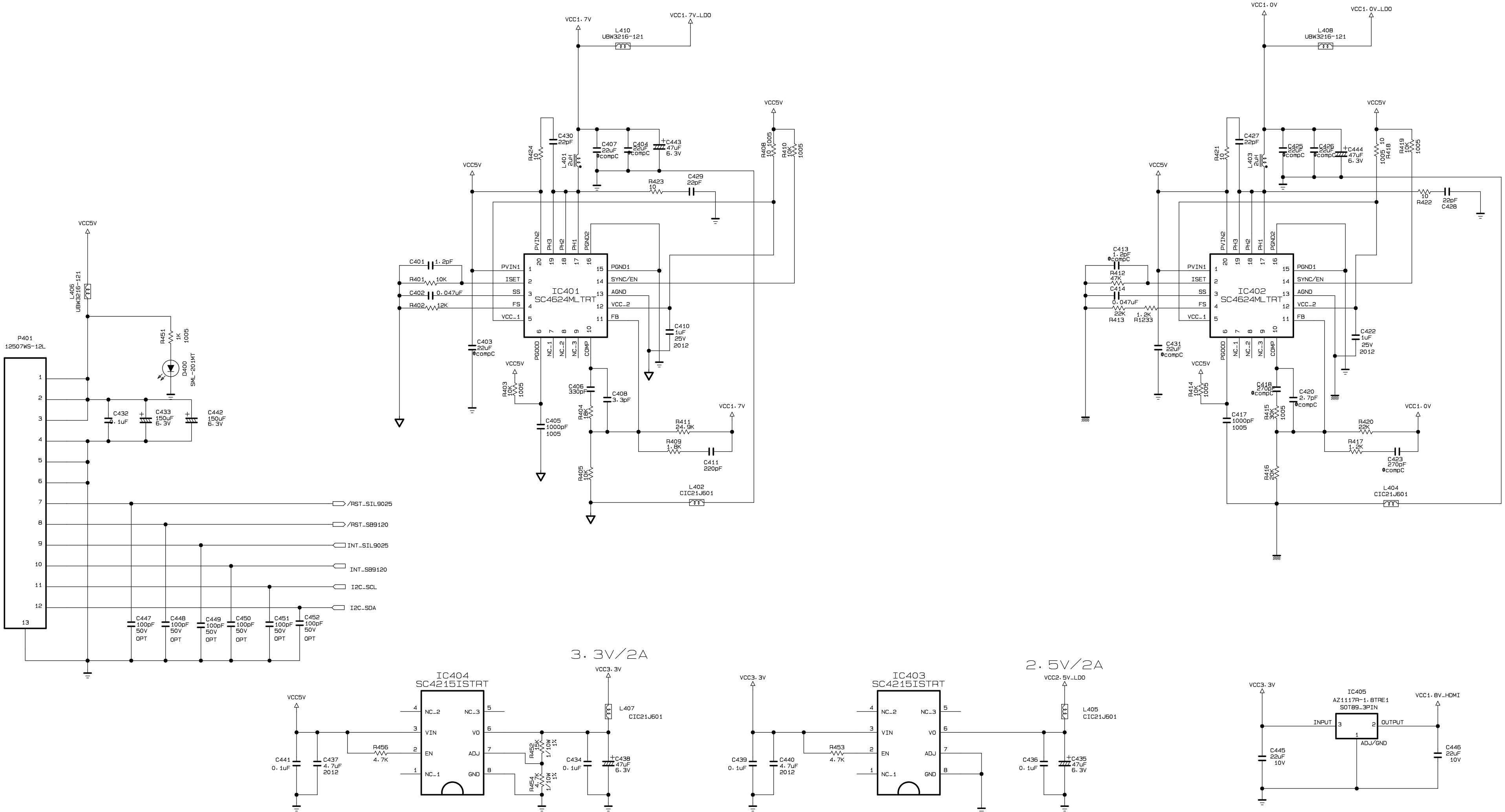
CHOI SEONG WOOK LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	Power	SHEET	3 /12



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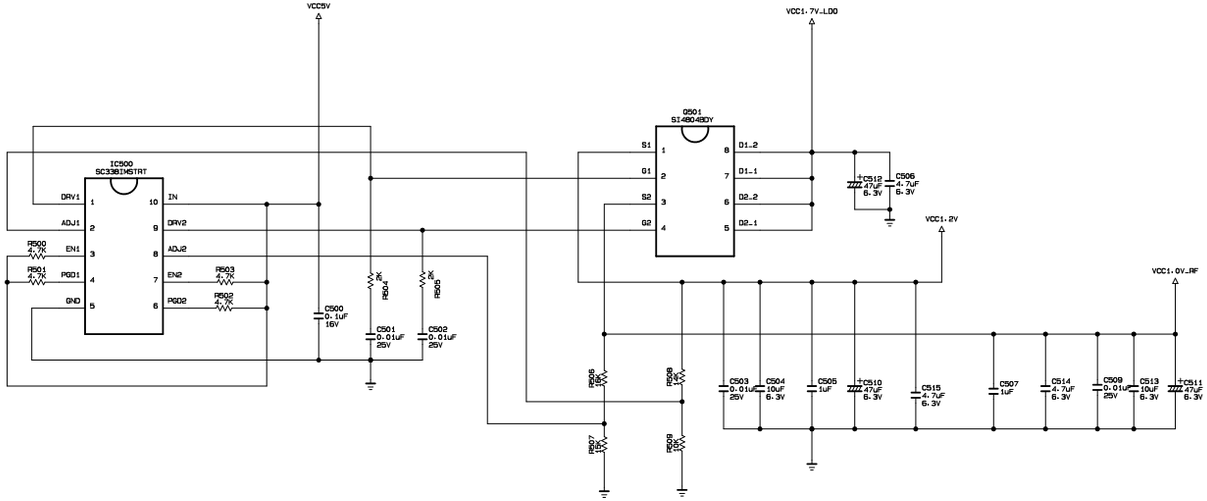
SECRET
LGElectronics

CHOI SEONG WOOK
LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	Power Supply1	SHEET	4 / 12



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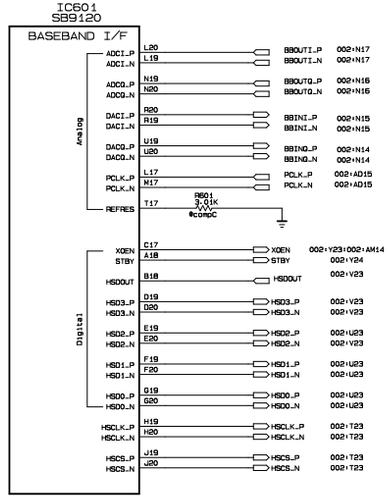
SECRET
LGElectronics

CHOI SEONG WOOK LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	Power Supply2	SHEET	5 / 12



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CHOI SEONG WOOK

LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	BBIC IF	SHEET	6 / 12

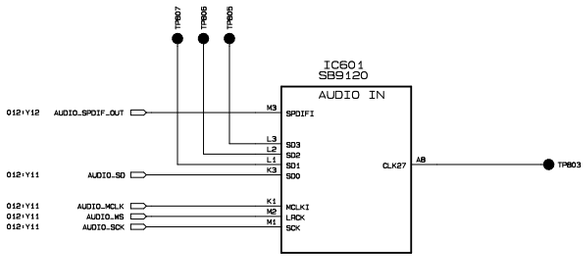
BACK CHANNEL AUDIO CIRCUIT REMOVED

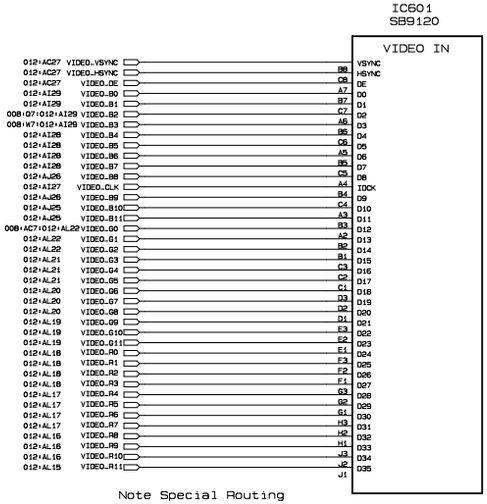
THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

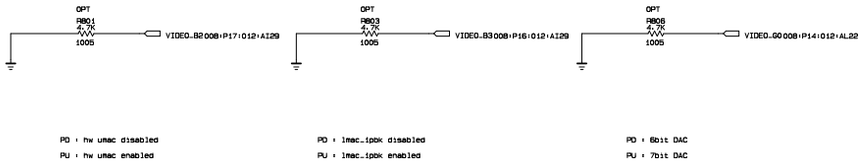
CHOI SEONG WOOK LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	BBIC Clock Recovery	SHEET	7 / 12





Note Special Routing



PD : hw umac disabled
PU : hw umac enabled

PD : lmac_ipdk disabled
PU : lmac_ipdk enabled

PD : 6bit DAC
PU : 7bit DAC

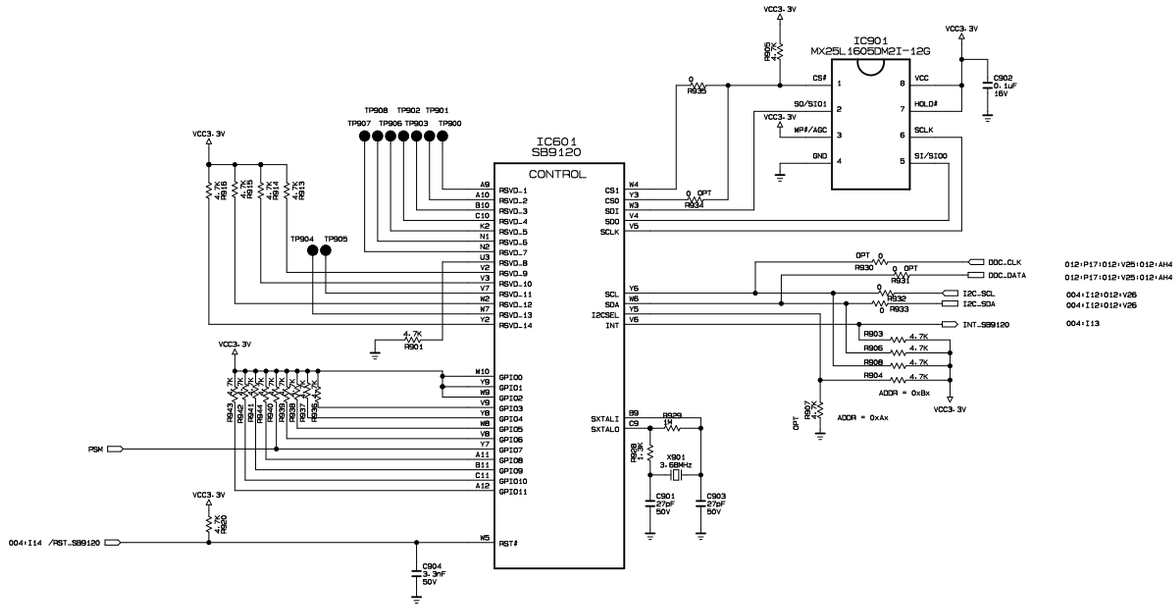
THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

CHOI SEONG WOOK

LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	BBIC Audio/Video Output	SHEET	8 / 12



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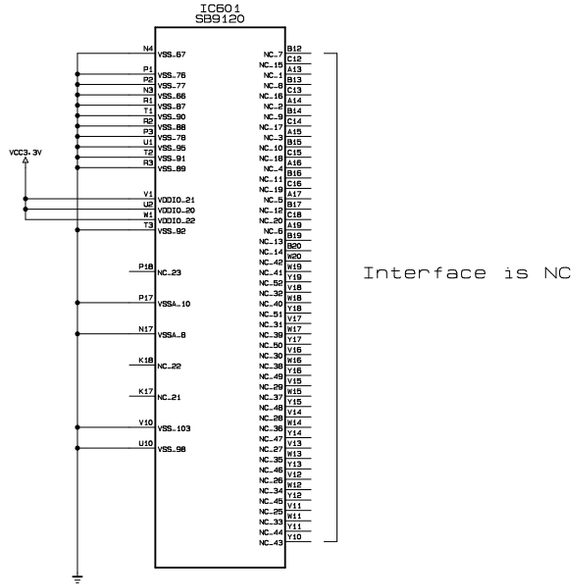
SECRET
LGElectronics

CHOI SEONG WOOK LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	BBIC Control	SHEET	9 / 12



Interface is NC

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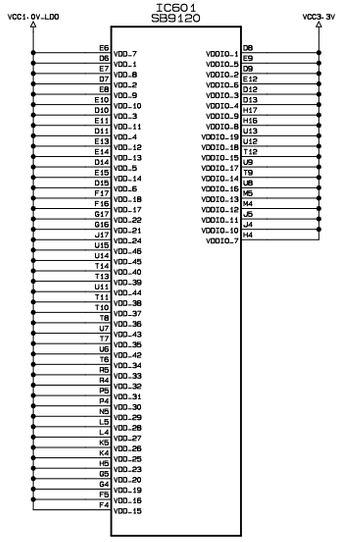
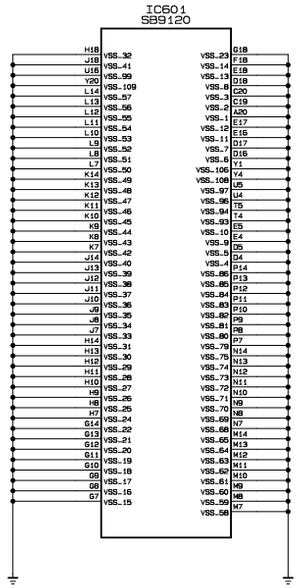
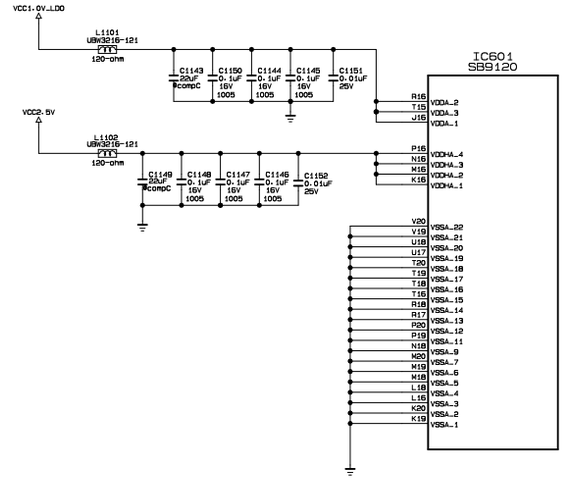
SECRET
LGElectronics

CHOI SEONG WOOK LG ELECTRONICS

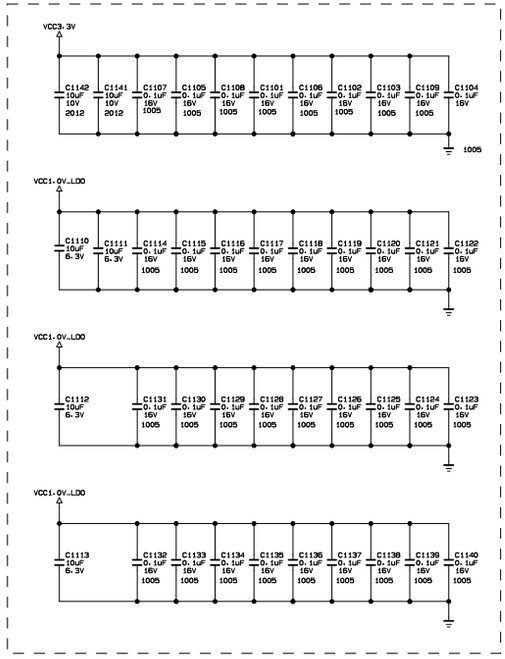
MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	BBIC Misc	SHEET	10 / 12







SB9120 Bypass Caps



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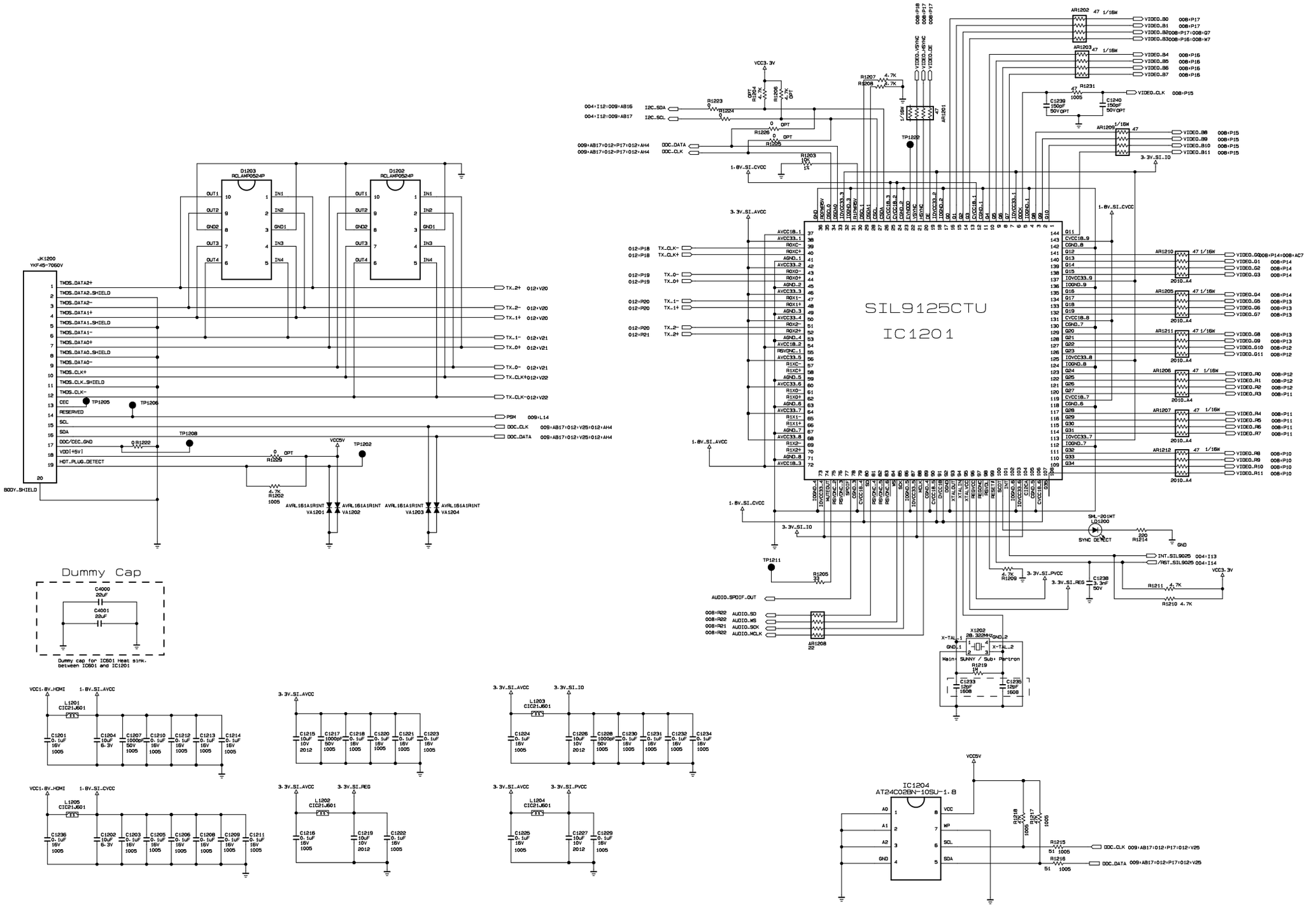
SECRET
LGElectronics

CHOI SEONG WOOK LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	BBIC Power/Ground	SHEET	11 / 12



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SECRET
LGElectronics

CHOI SEONG WOOK

LG ELECTRONICS

MODEL	W-TV Tx	DATE	2009.02.05
BLOCK	HDMI Rx	SHEET	12 / 12

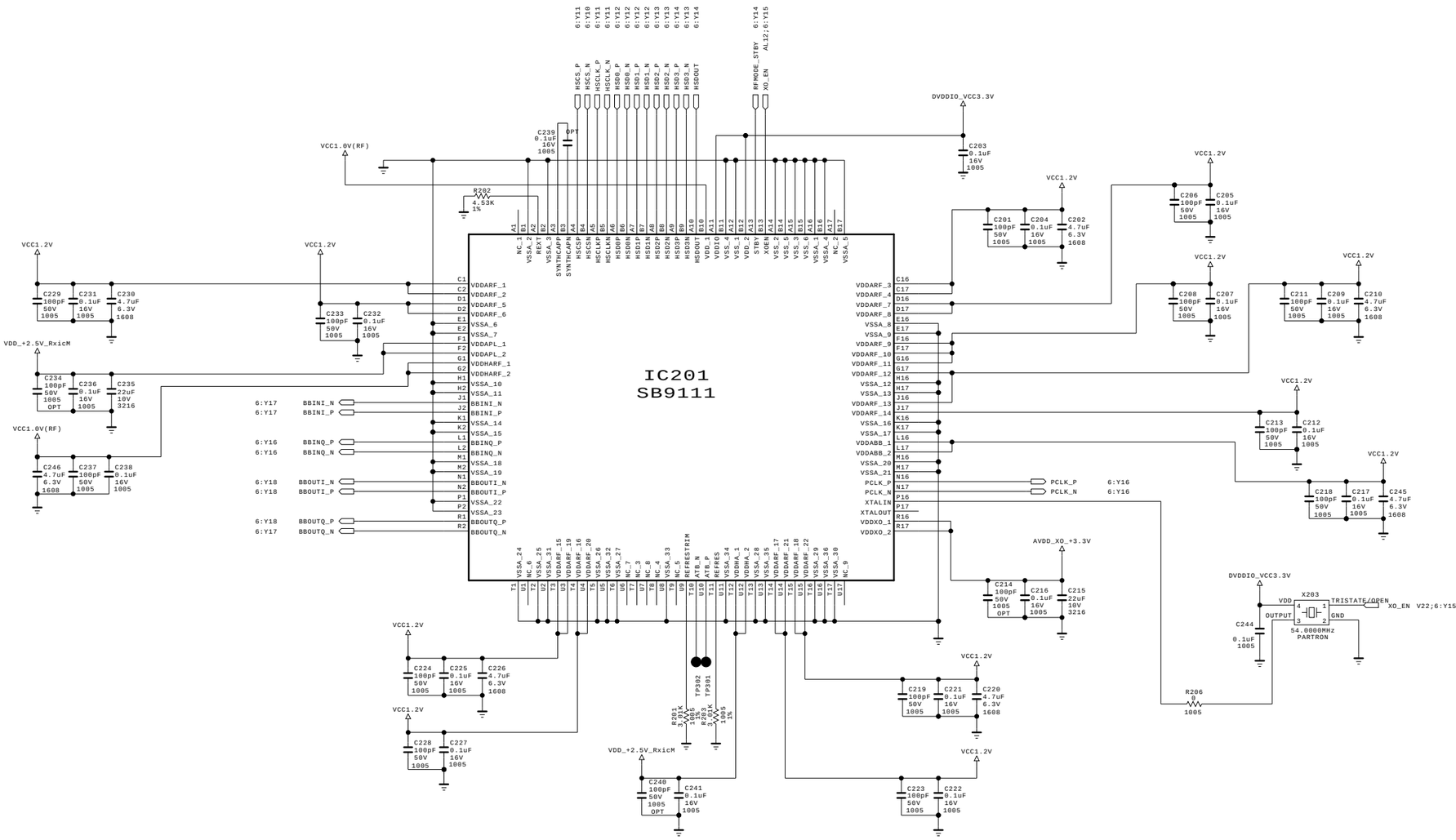
Wireless TV Receiver Board

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

SECRET
LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	Title Sheet	SHEET	1 / 13



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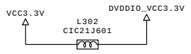
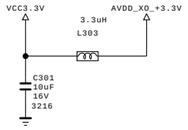
SECRET

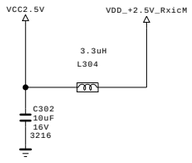
LGElectronics

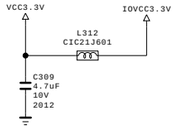
LG ELECTRONICS

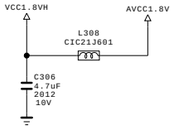
MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	RFIC	SHEET	2 /13

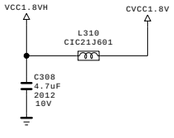


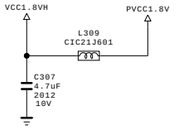


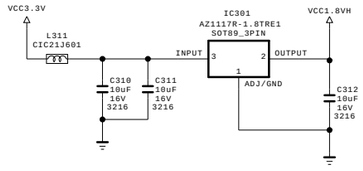












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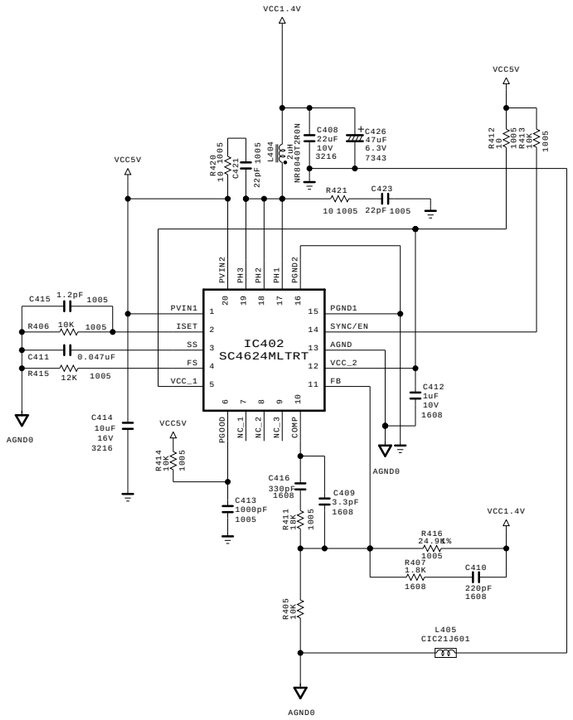
SECRET

LGElectronics

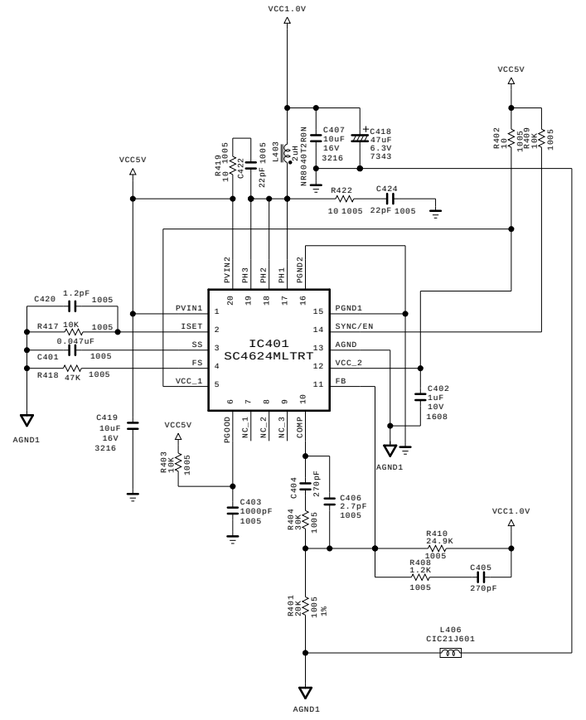
LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	Power	SHEET	3 / 13

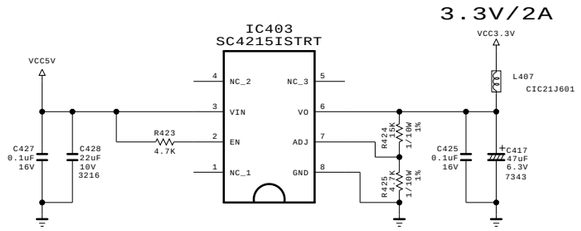
1.4V/3.5A



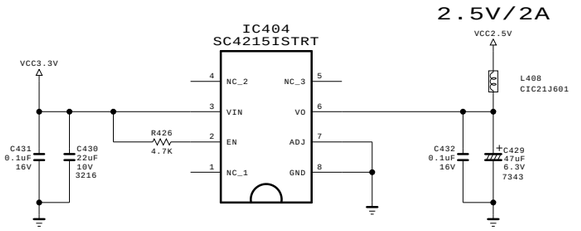
1.0V/3A



3.3V/2A



2.5V/2A



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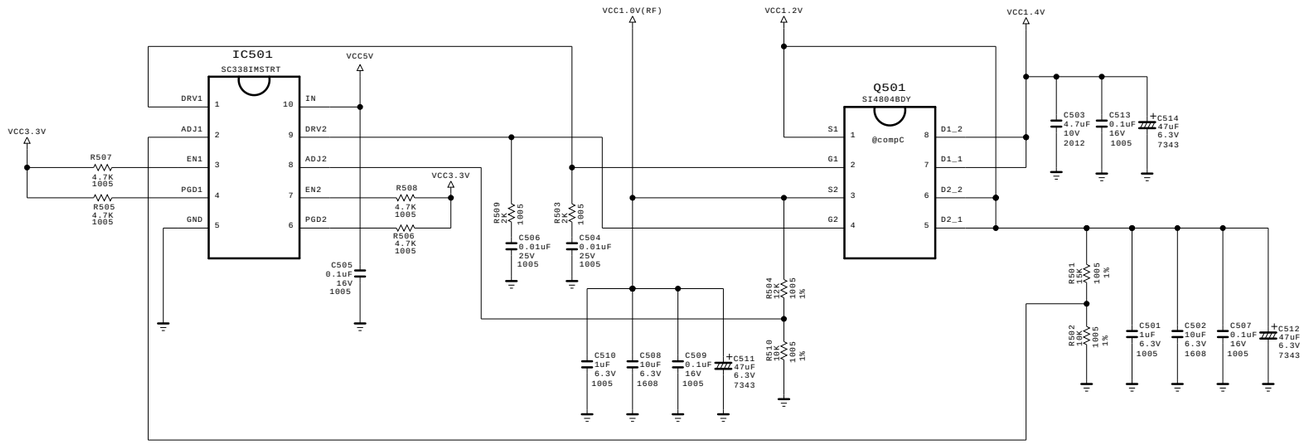
SECRET

LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	Power Supply1	SHEET	4 / 13



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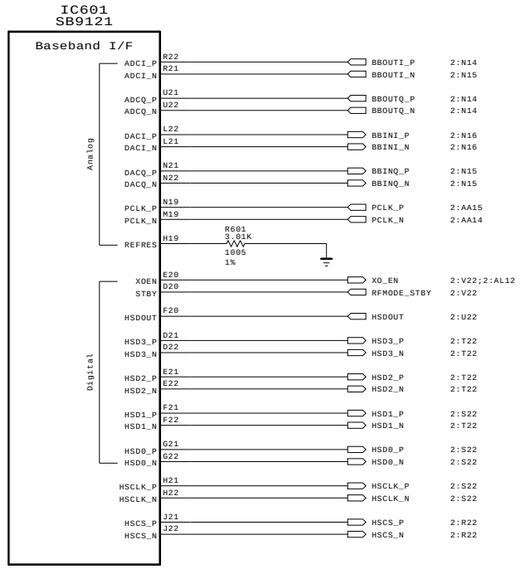
SECRET

LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	Power Supply2	SHEET	5 / 13



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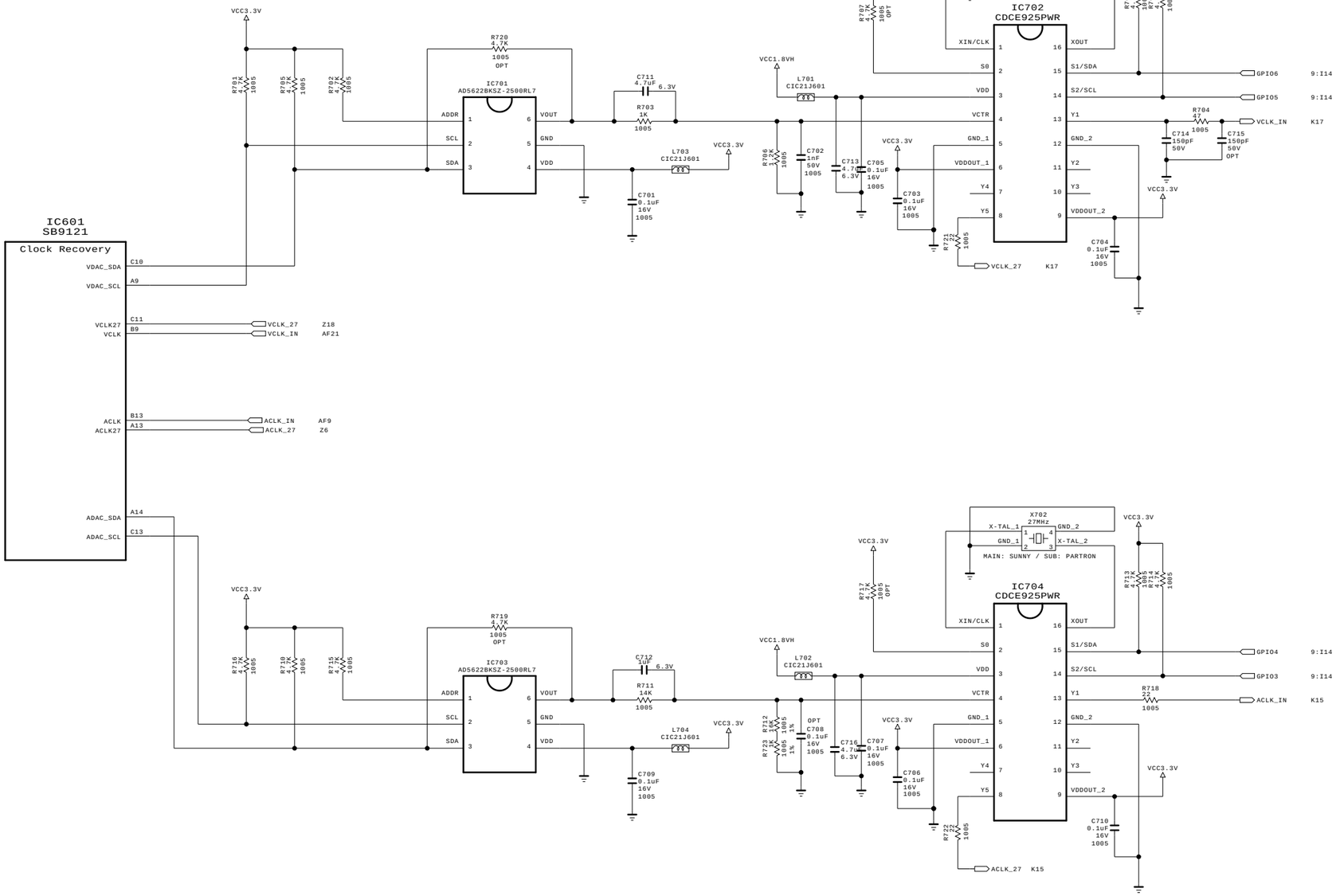
SECRET
LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	BBIC IF	SHEET	6 /13



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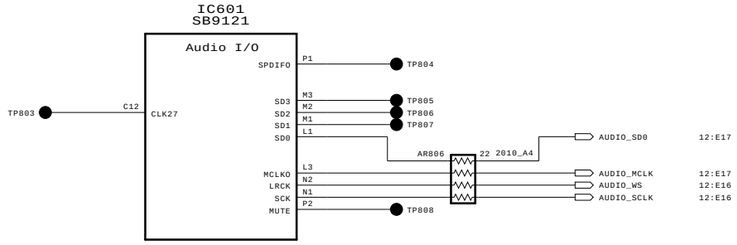
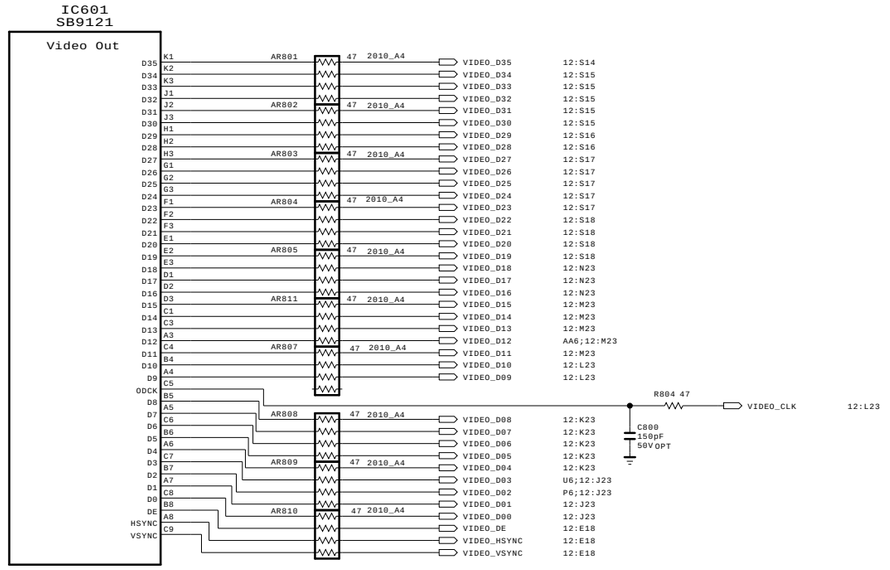
SECRET
LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	BBIC Clock Recovery	SHEET	7 /13





Note Special Routing

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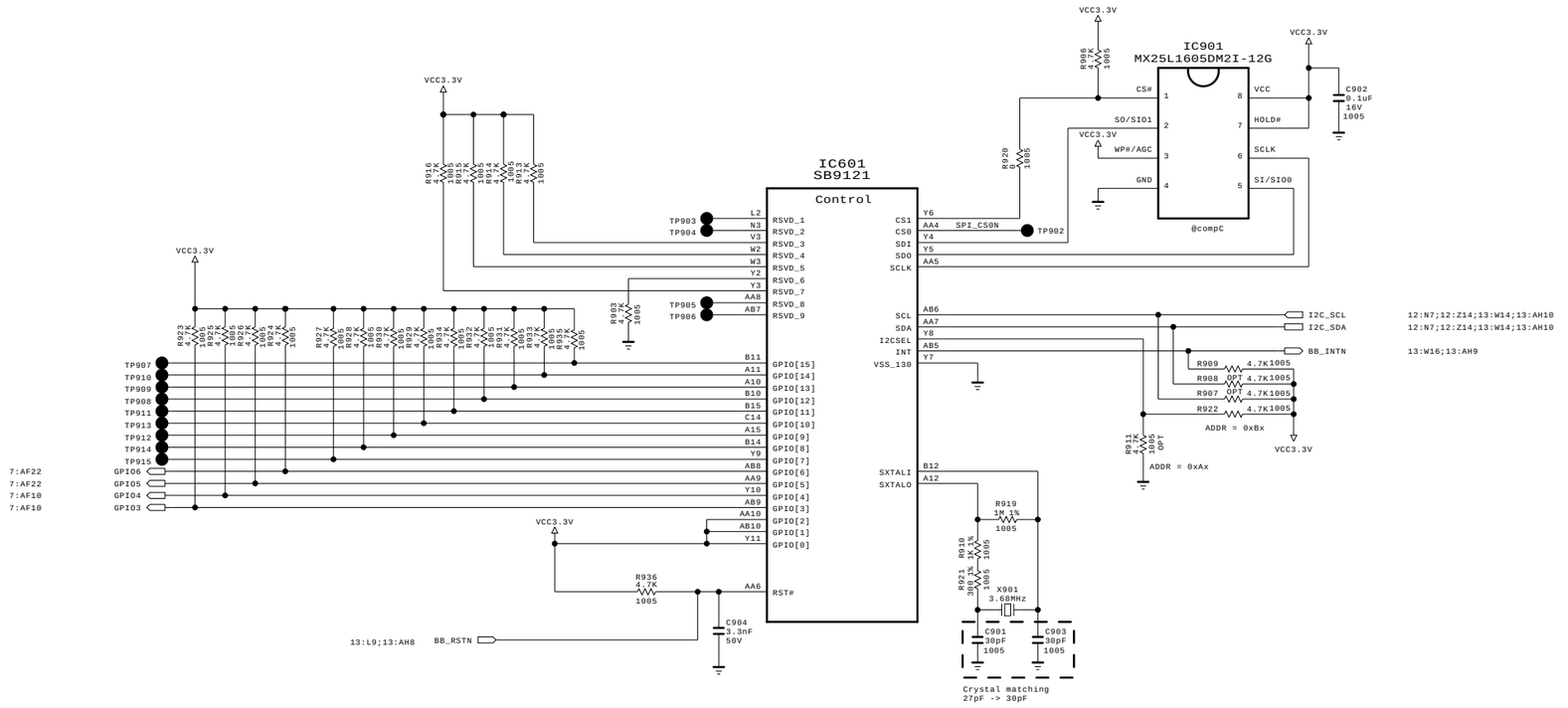
SECRET
LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	BBIC Audio/Video Output	SHEET	8 /13



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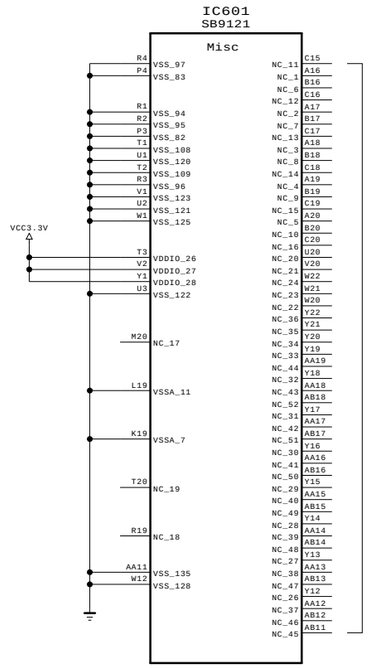
SECRET

LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	BBIC Control	SHEET	9 /13



Interface is NC

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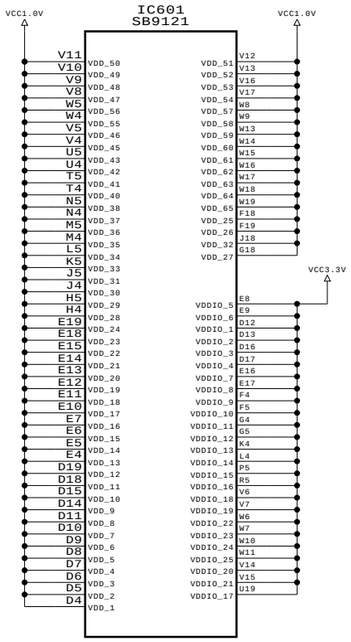
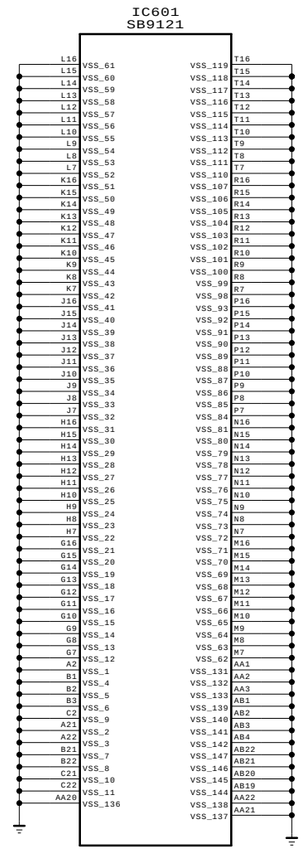
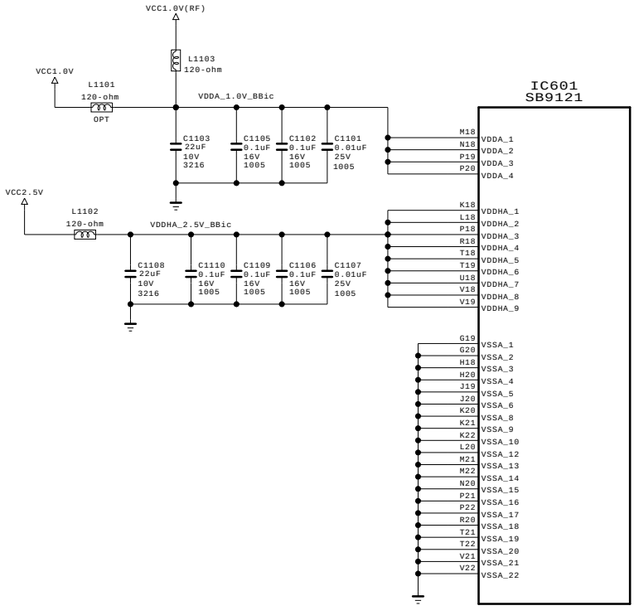
SECRET
LGElectronics

LG ELECTRONICS

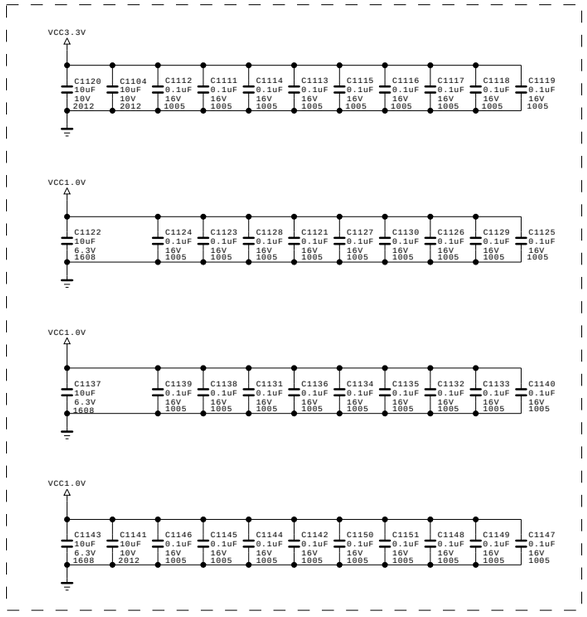
MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	BBIC Misc	SHEET	10 / 13







SB9121 Bypass Caps



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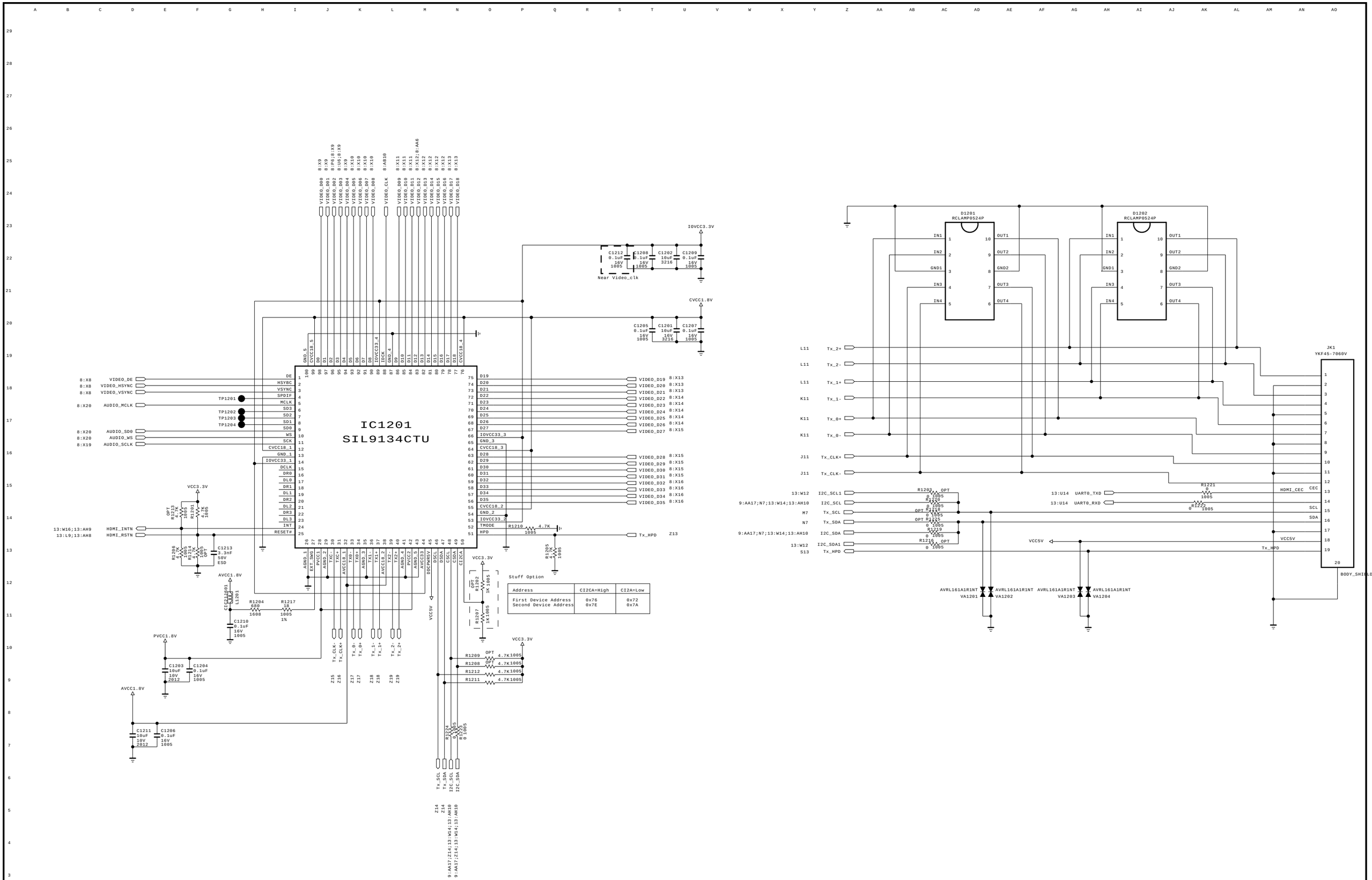
SECRET

LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	BBIC Power/Ground	SHEET	11 / 13

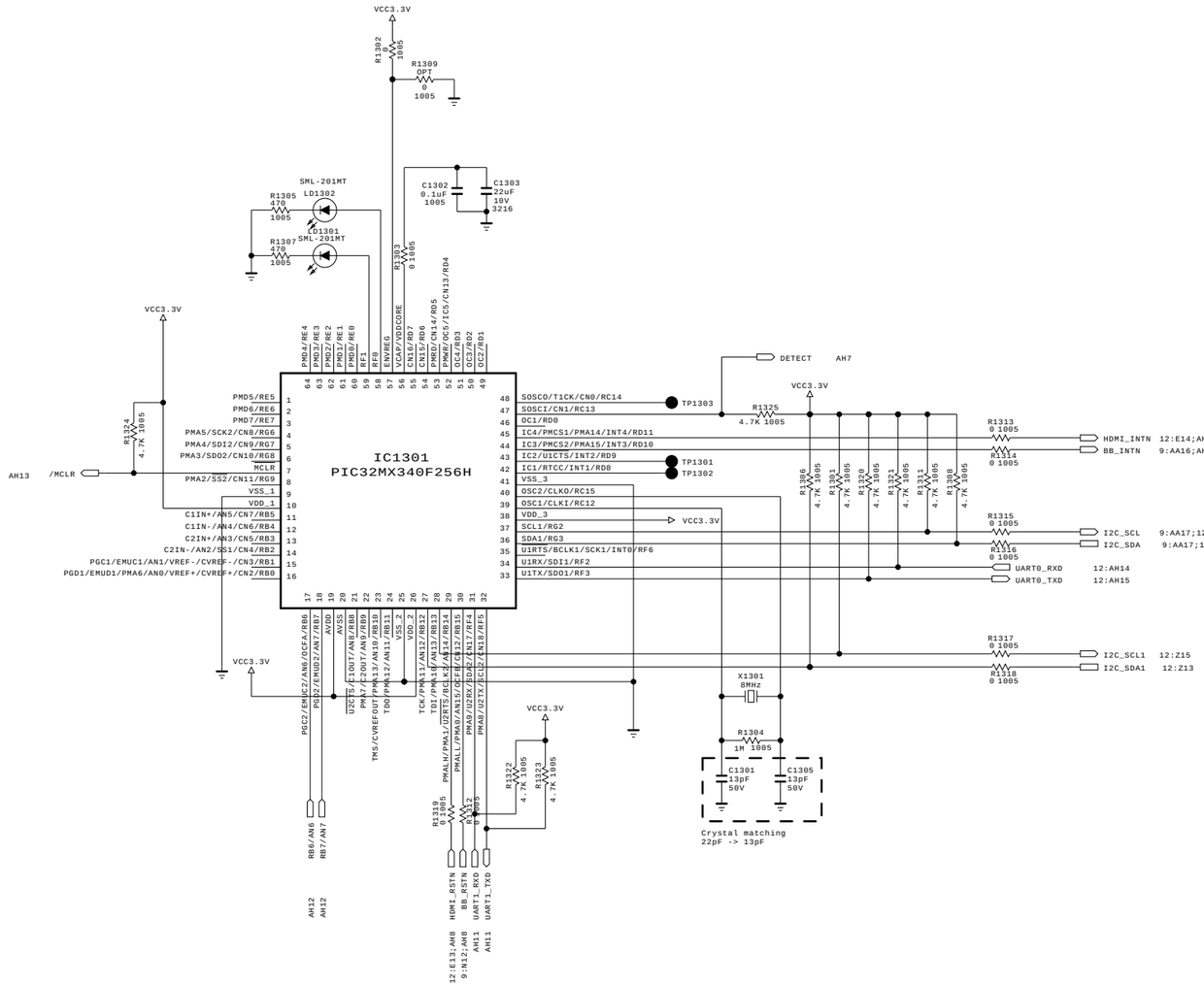


THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

MODEL	W-TV Rx	DATE	2009.02.03
BLOCK	HTMI Tx	SHEET	12 / 13



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

SECRET

LGElectronics

LG ELECTRONICS

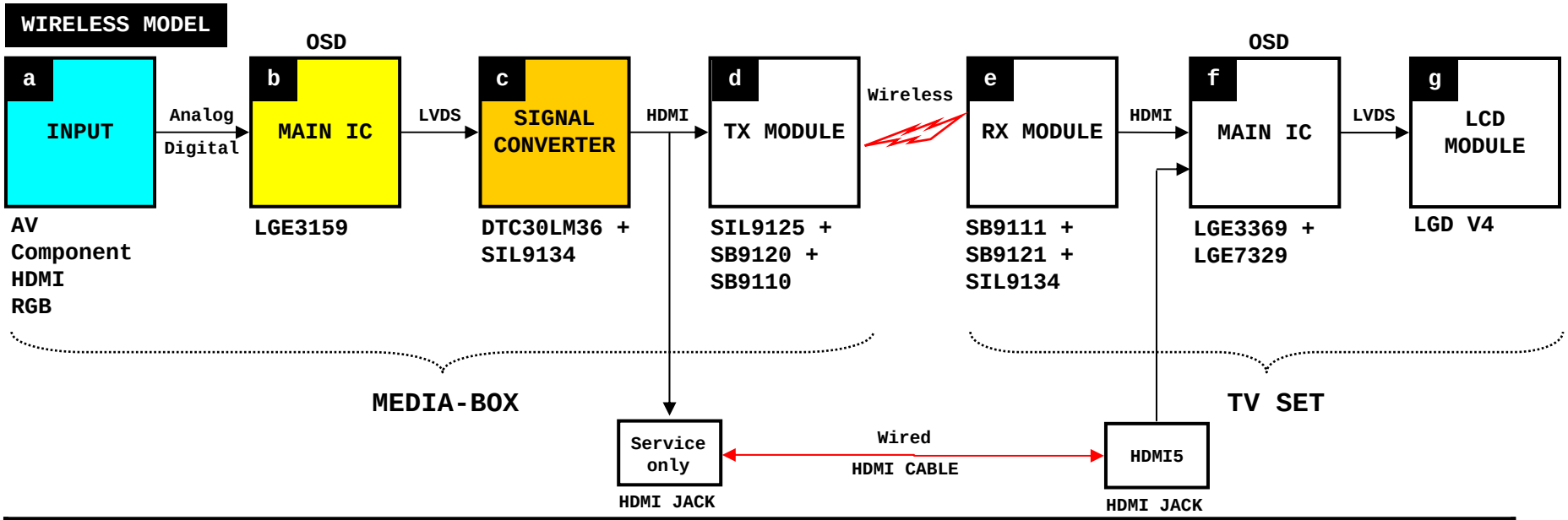
MODEL	W-TV Rx	DATE	2009.03.21
BLOCK	uController	SHEET	13 / 13


LG Electronics Inc.

Trouble shooting Guide

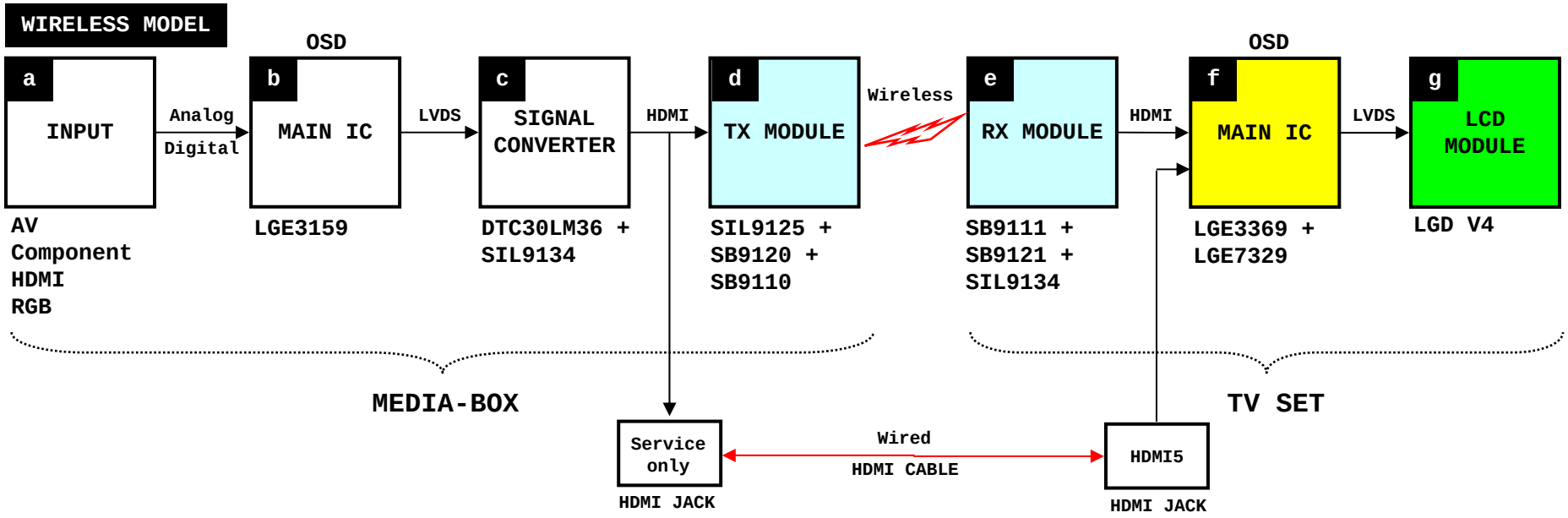
LCD TV Research Lab
R&D 3 Dept / AJ Gr.

LG ELECTRONICS INC.



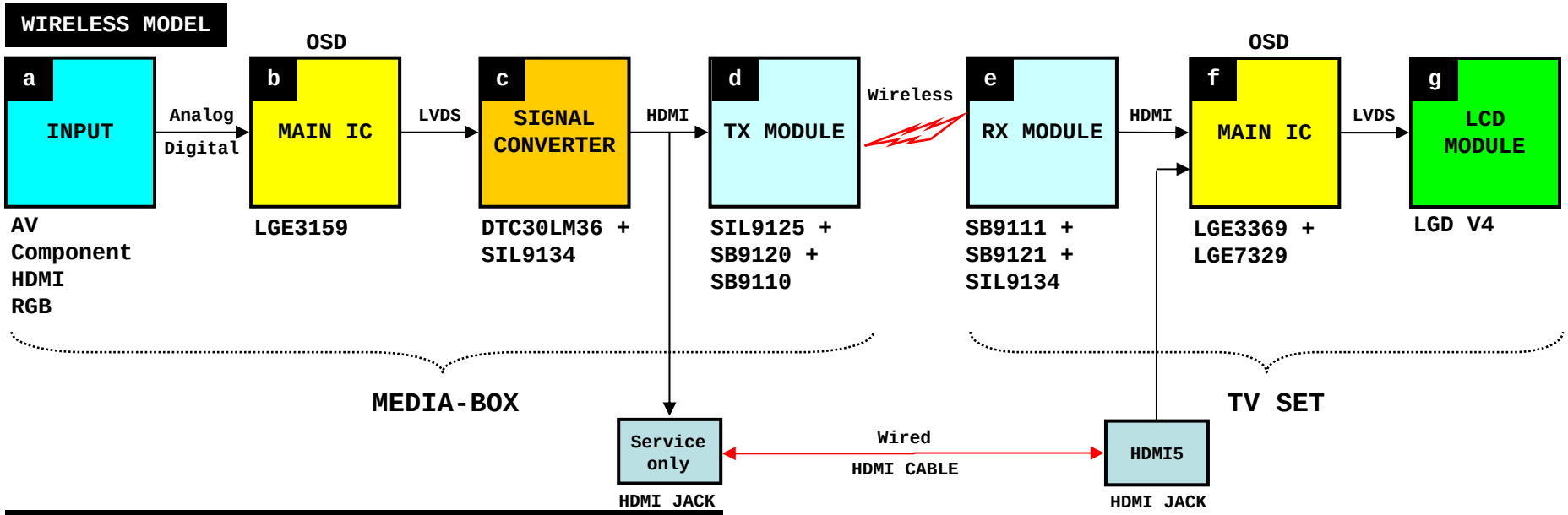
Defect block	Symptoms	Wireless connection	Check
a	▪Bad (noise) image / No image – osd is good ▪Bad sound / No sound	No effect directly	▶ Check the EDID of HDMI & RGB ▶ Check cable & contact error
b	▪Bad image – IC's cold soldering or memory defect accompanied noise on osd ▪Bad sound / No sound ▪Wireless connecting osd is displayed continually – There is no video signal from Rx module to TV main ic, so TV understand this time like disconnection state and display connecting osd continually. And then, if TV is not activated rightly within 15min, it will go to st-by mode.	No effect directly No effect directly No connection	▶ Check main ic basic power & power sequence ▶ Control line check (I2C & etc) ▶ Check input/output video & audio signal
C	▪Bad image / Bad or No sound ▪Wireless connecting osd is displayed continually – No image	No effect directly No connection	▶ Check power & control line ▶ Check input/output signal ▶ Check inner HDMI cable connection status (There can be cable's defect.)

*Focused on Wireless connection



Defect block	Symptoms	Wireless connection	Check
d e	▪Wireless connection osd is displayed continually – That osd can be appeared by HDMI cable or Jack defect even though wireless connection is completed. (only Rx module)	No connection connection	▶ Check Wireless connecting osd ▶ Check inner HDMI cable connection status (There can be cable's defect.)
F	▪Bad image / No image – IC's cold soldering or memory defect accompanied noise on osd ▪Bad sound / No sound	No effect directly	▶ Check main ic basic power & power sequence ▶ Check control line (I2C & etc) ▶ Check input/output video & audio signal ▶ Check LVDS cable & wafer locking (There can be cable's defect.)
g	▪Bad image or No image	No effect directly	▶ Ticon b/d or Inverter check ▶ Check power

* Defect block means from itself to ahead of next part.
* Wireless TV is similar with the model using LGE3159 or LGE3369 except for wireless parts.



※ Check first when Wireless connection is disable!

- Pairing
- S/W version check
- Fan defect
  - ▷ TV Rx module fan defect: Check Fan error of TV In-start menu
  - ▷ Media-Box fan defect: Check the red led's blinking of Media-Box front
- Wireless interference check
  - ▷ Refer to the installation method guide
- Inner HDMI cable's connection status (From Rx/Tx module to Main)

※ Check Tip

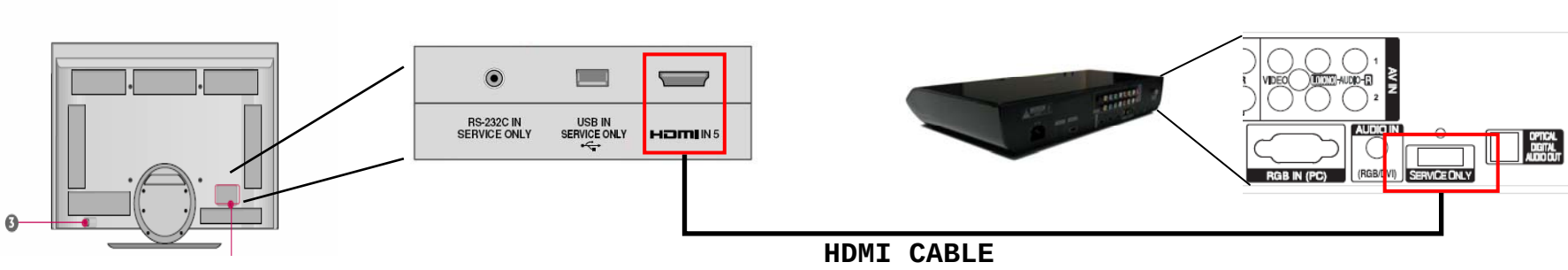
- In some cases, TV only or Wired mode make easy to check.

※ Caution & Information

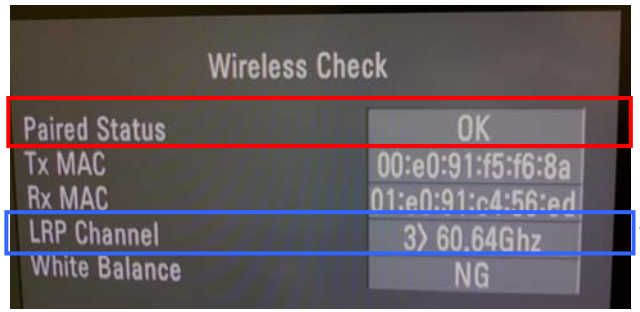
- TV set & Media-Box is just 1:1 connection. (No multiple device connection)
- In order to download TV set, you must change the mode to HDMI5 or turn off Media-Box.
- Rx/Tx module's performance is very sensitive to temperature. So, When you repair the defect, should keep up with the original assembly state.

Pairing for SVC

1. Turn on the TV SET & Media-Box
2. Connect TV HDMI5 Jack & Media-Box rear [Service only] Jack with HDMI cable



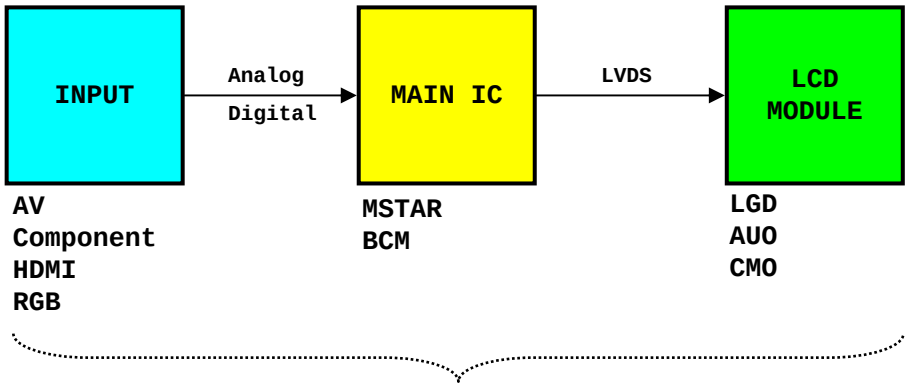
3. Enter the [IN START(Media Box)] menu and go to sub-title [9.Wireless check]
   Enter menu and Push the left or right remote-controller button.
   Check the Paired Status if changed from NG to OK
   ※ If s/w version of Tx/Rx module & TV/Media-box main isn't matched, Wireless can't be connected, So at that time check the version and upgrade by usb



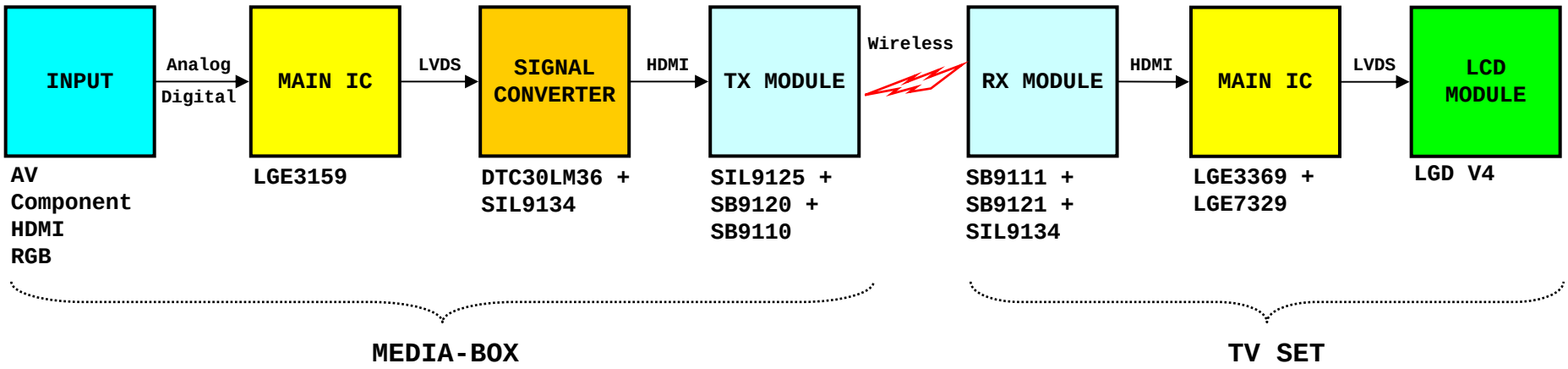
→ If there are 2 or more wireless tv set, it's need to be set channel respectively. (Must separate them more than 10m)

4. Remove HDMI cable & check wireless connection.
   If connection is not completed, power off and on the TV & Media-Box.

NORMAL MODEL



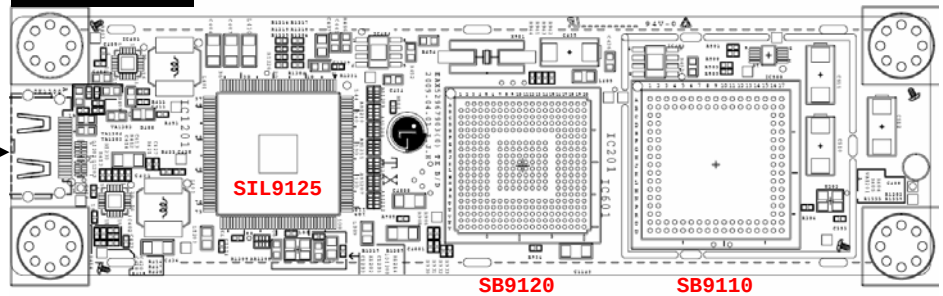
WIRELESS MODEL



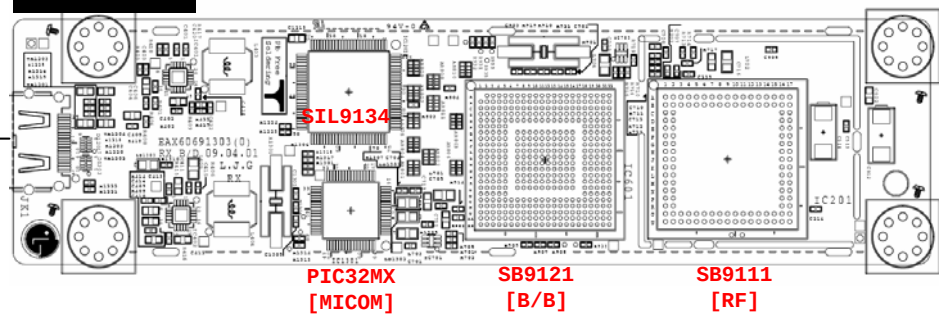
From Media-Box Main b/d

HDMI Cable

TX Module



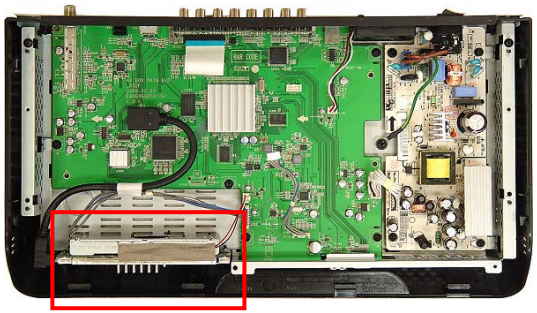
RX Module



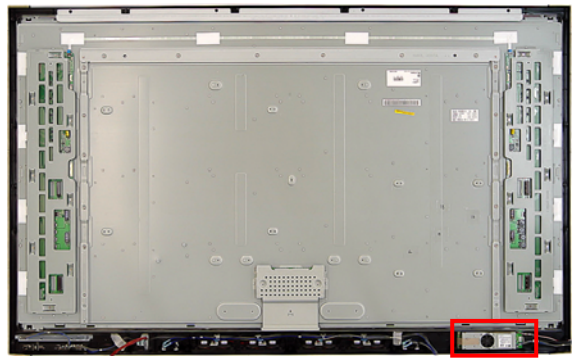
HDMI Cable

To TV Main b/d

Media-Box

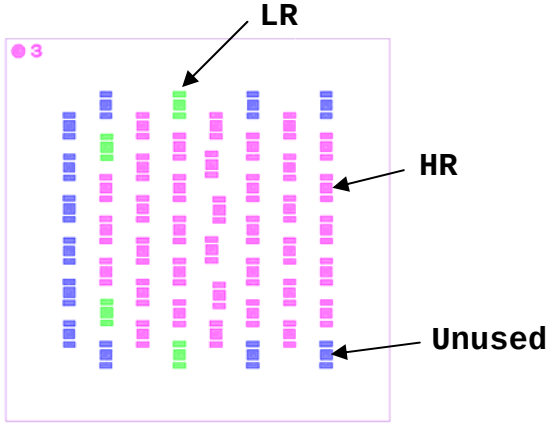


TV SET

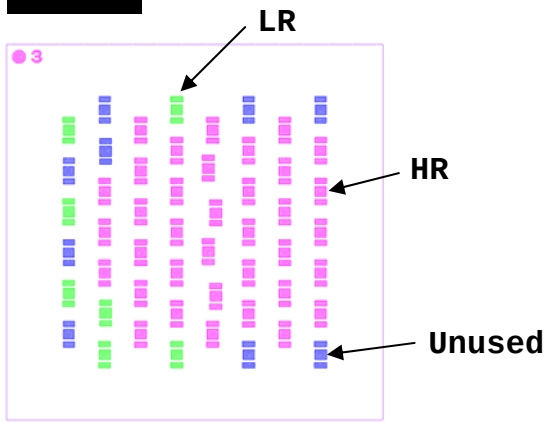


Top view of RF IC (Antenna)

SB9110

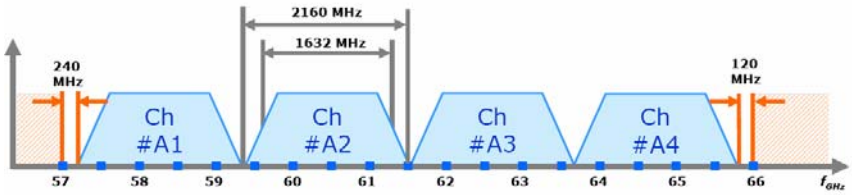


SB9111



HRP Channel

Channel Number	Low Freq. (GHz)	Center Freq. (GHz)	High Freq. (GHz)	Nyquist BW (MHz)	Roll-Off Factor
A1	57.240	58.320	59.400	1632	0.3235
A2	59.400	60.480	61.560	1632	0.3235
A3	61.560	62.640	63.720	1632	0.3235
A4	63.720	64.800	65.880	1632	0.3235

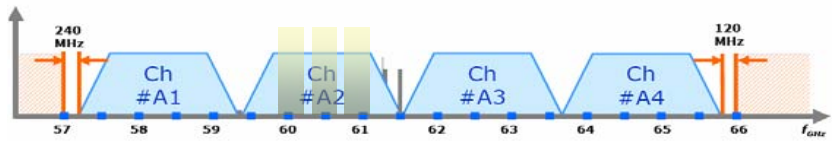


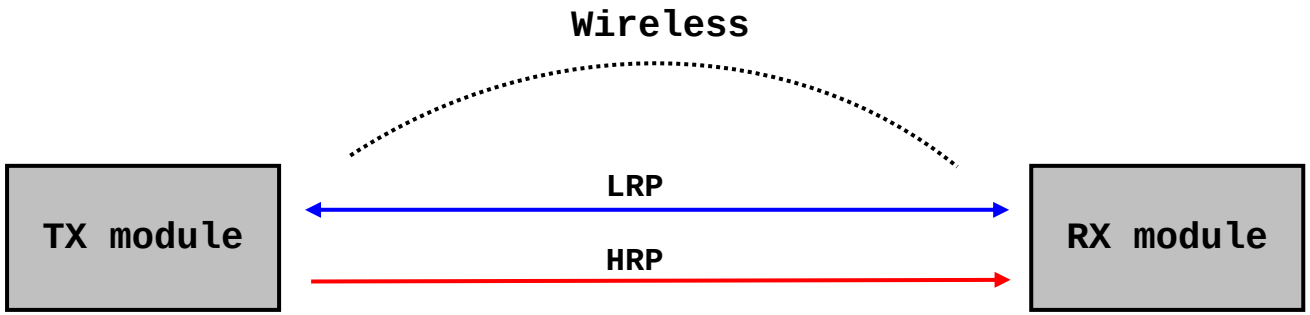
LRP Channel

$F_{c(HRP)}$= 60.48GHz

LRP channel index	Start frequency[a]	Center frequency	Stop frequency[a]
1	$f_{c(HRP)}$ – 207.625 MHz	$f_{c(HRP)}$ – 158.625 MHz	$f_{c(HRP)}$ – 109.625 MHz
2	$f_{c(HRP)}$ – 49 MHz	$f_{c(HRP)}$	$f_{c(HRP)}$ + 49 MHz
3	$f_{c(HRP)}$ + 109.625 MHz	$f_{c(HRP)}$ + 158.625 MHz	$f_{c(HRP)}$ + 207.625 MHz

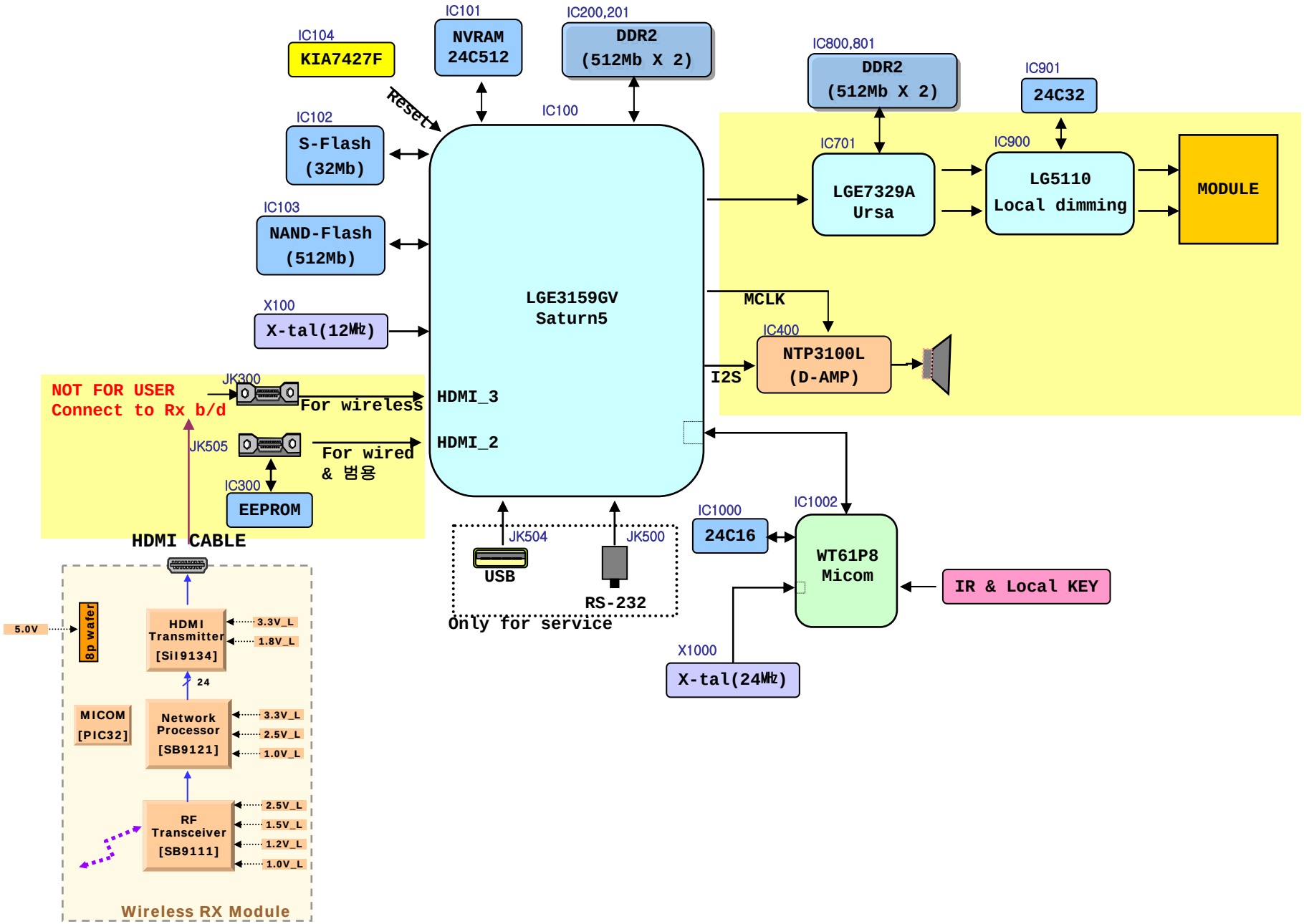
a. The start and stop frequencies are the nominal values. The LRP TX mask requirements are defined in 5.4.1.1





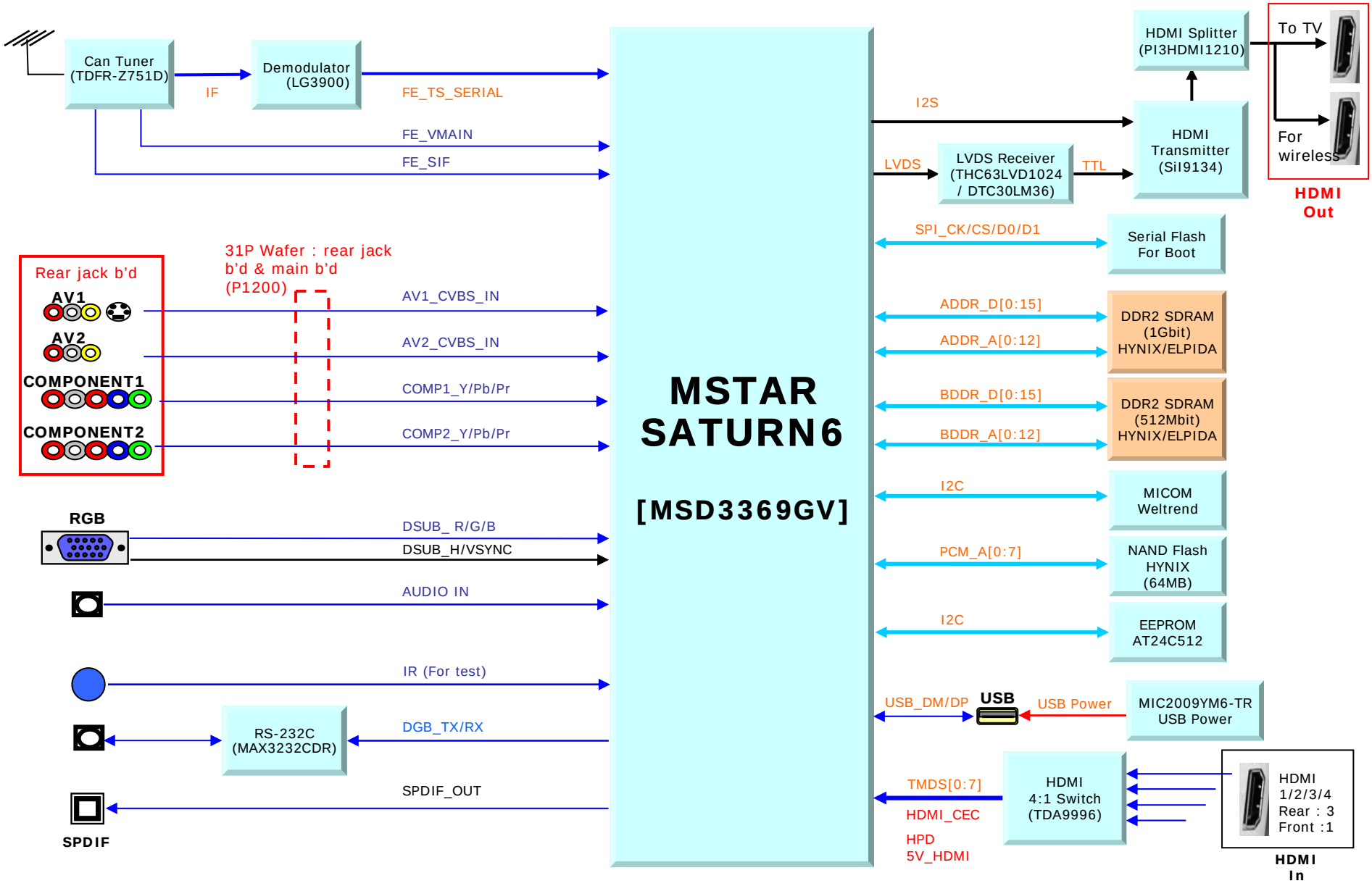
LRP: Control data
HRP: Video & Audio data

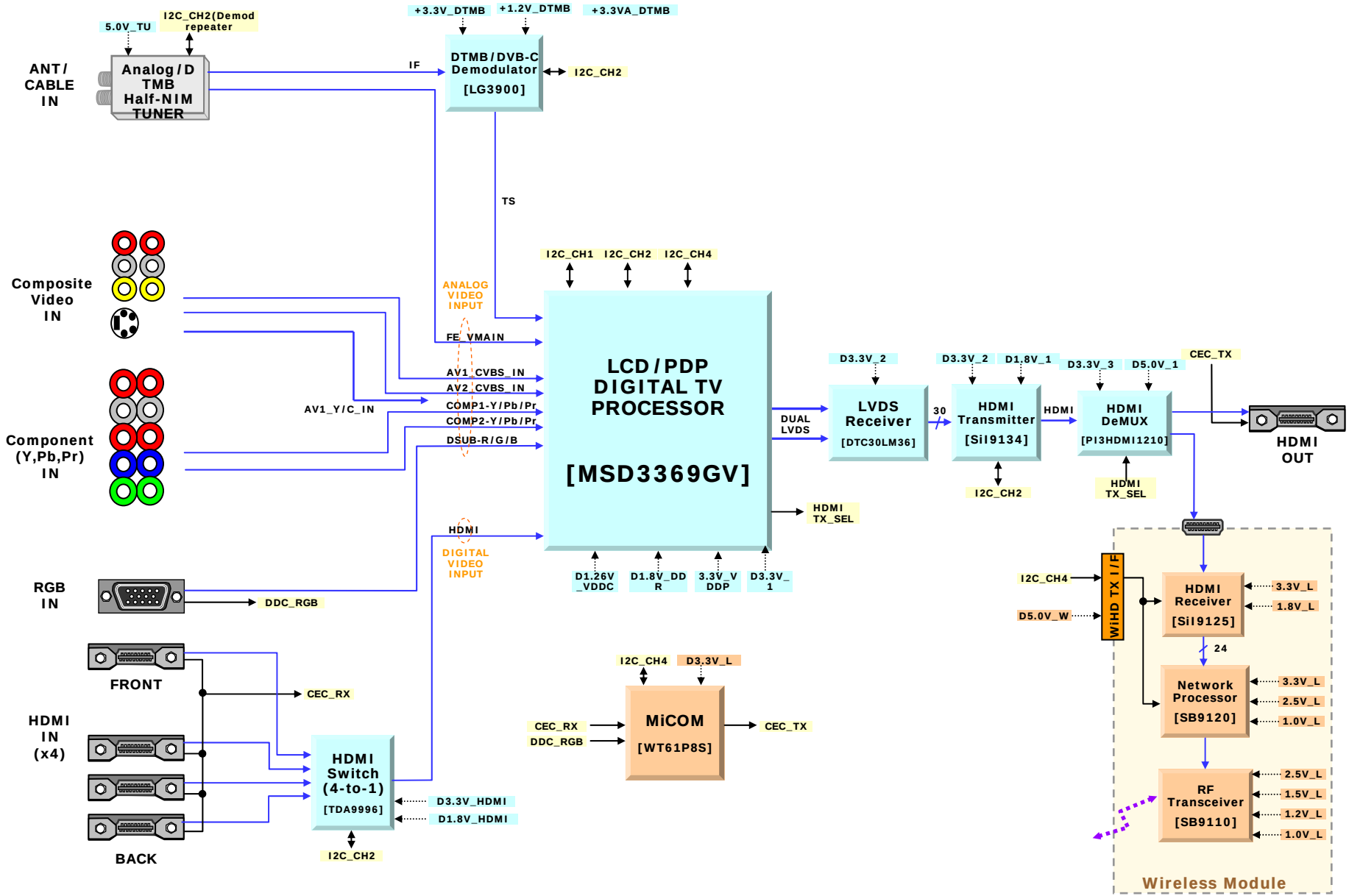
Wireless TV is similar to the walkie-talkie. We must match the channel of Tx & Rx module.
There are 4 HRP channel(A1~A4). We use only A2 channel and 3 LRP channel like this [60.32㎓], [60.48㎓],[60.64㎓].
First thing, the LRP channel setting has to be matched in wired mode. There are not only channel but also mac address that Tx/Rx modules have it’s own for preventing wireless interference.
Set the LRP channel and share the mac address each other, that’s called pairing.
After pairing, Antenna search and set the wireless path by LRP and then send video & audio data to HRP channel.

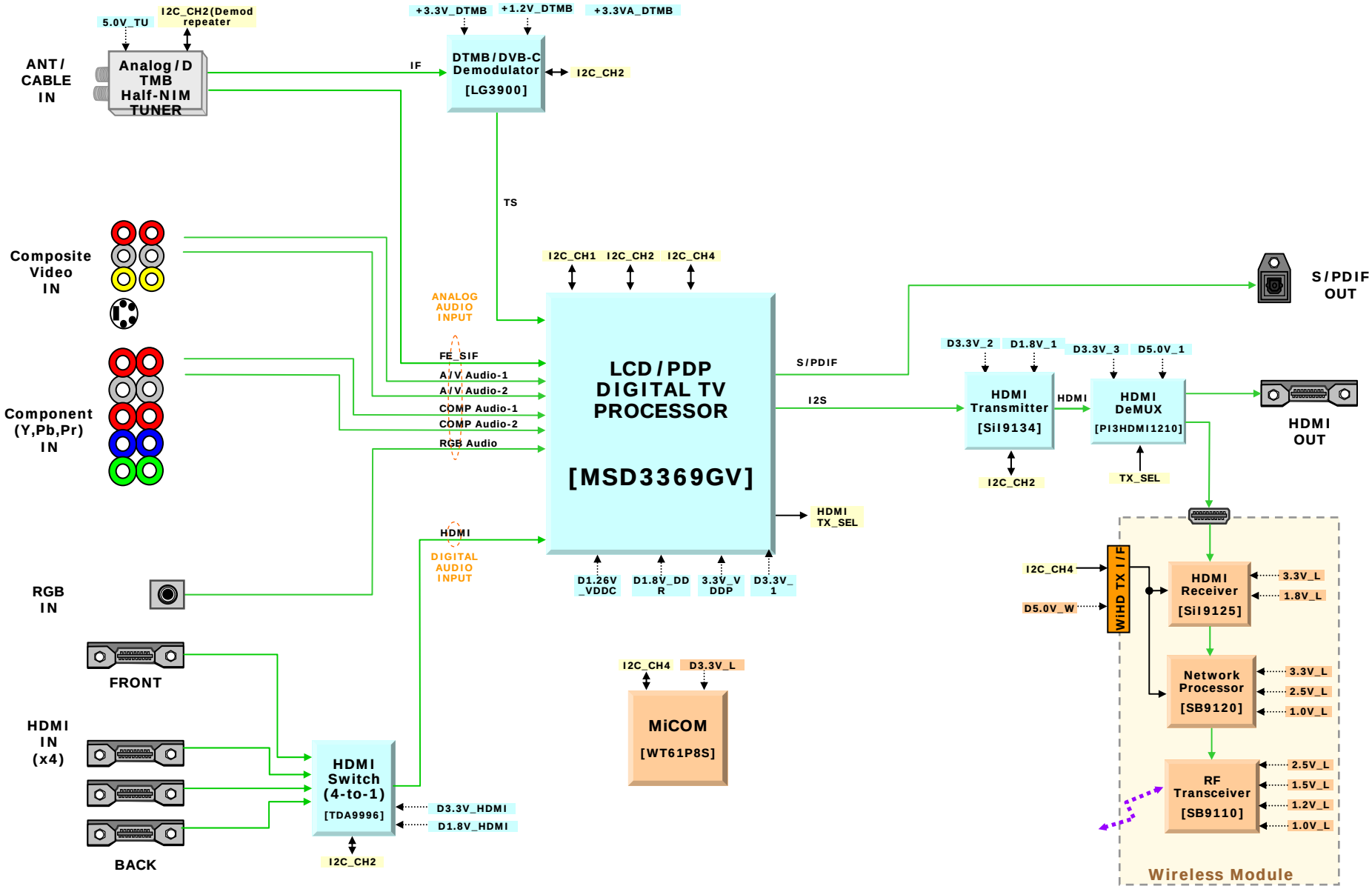

IC104
KIA7427F
IC101
NVRAM
24C512
IC200,201
DDR2
(512Mb X 2)
Reset
IC102
S-Flash
(32Mb)
IC100
IC103
NAND-Flash
(512Mb)
X100
X-tal(12㎒)
LGE3159GV
Saturn5
HDMI_3
HDMI_2
IC800,801
DDR2
(512Mb X 2)
IC901
24C32
IC701
LGE7329A
Ursa
IC900
LG5110
Local dimming
MODULE
MCLK
IC400
NTP3100L
(D-AMP)
I2S
NOT FOR USER
Connect to Rx b/d
JK300
For wireless
JK505
For wired
& 범용
IC300
EEPROM
HDMI CABLE
JK504
USB
JK500
RS-232
Only for service
IC1000
24C16
IC1002
WT61P8
Micom
IR & Local KEY
X1000
X-tal(24㎒)
5.0V
8p wafer
HDMI
Transmitter
[Sil9134]
3.3V_L
1.8V_L
24
MICOM
[PIC32]
Network
Processor
[SB9121]
3.3V_L
2.5V_L
1.0V_L
RF
Transceiver
[SB9111]
2.5V_L
1.5V_L
1.2V_L
1.0V_L
Wireless RX Module

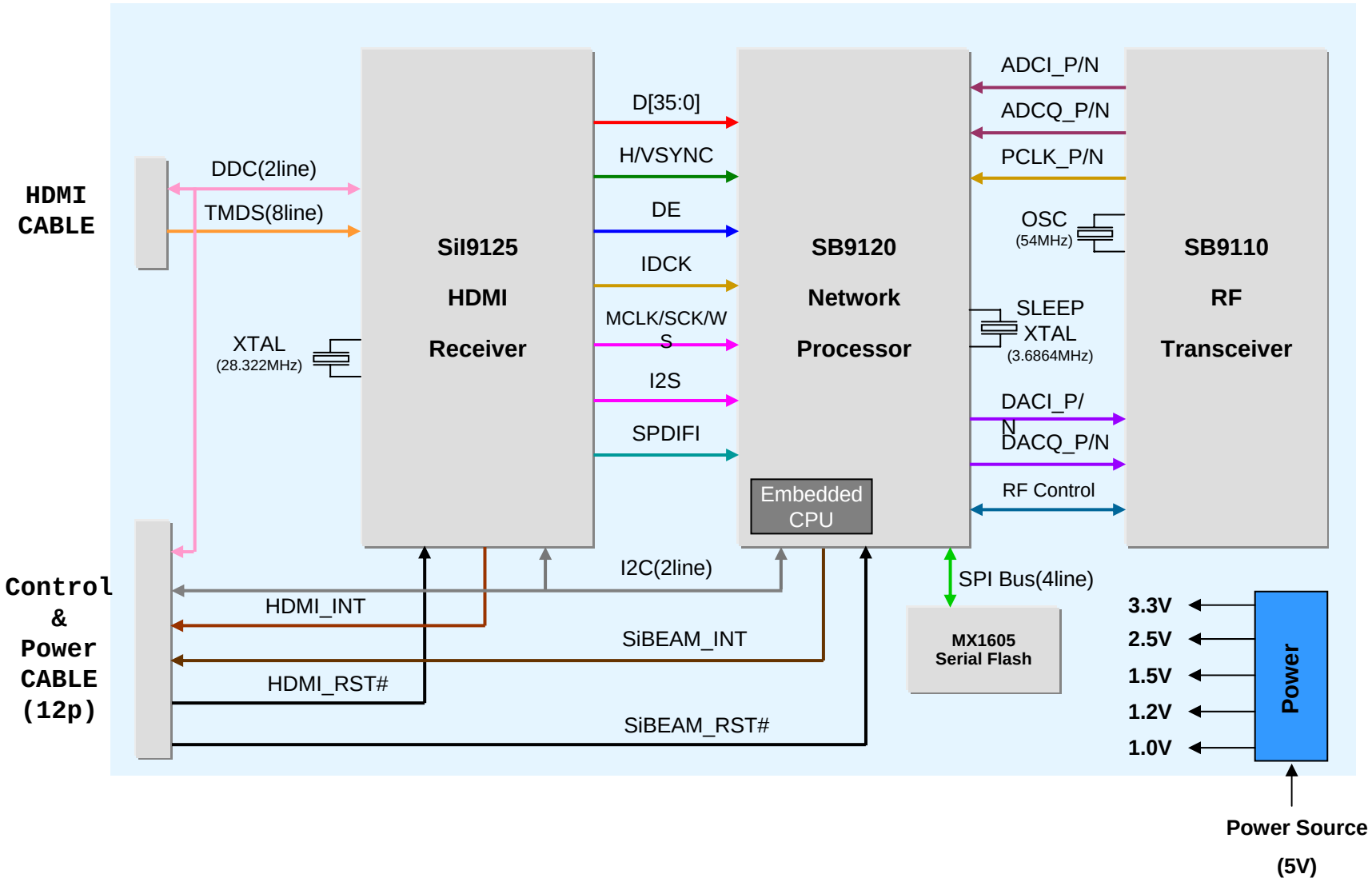
Block Diagram

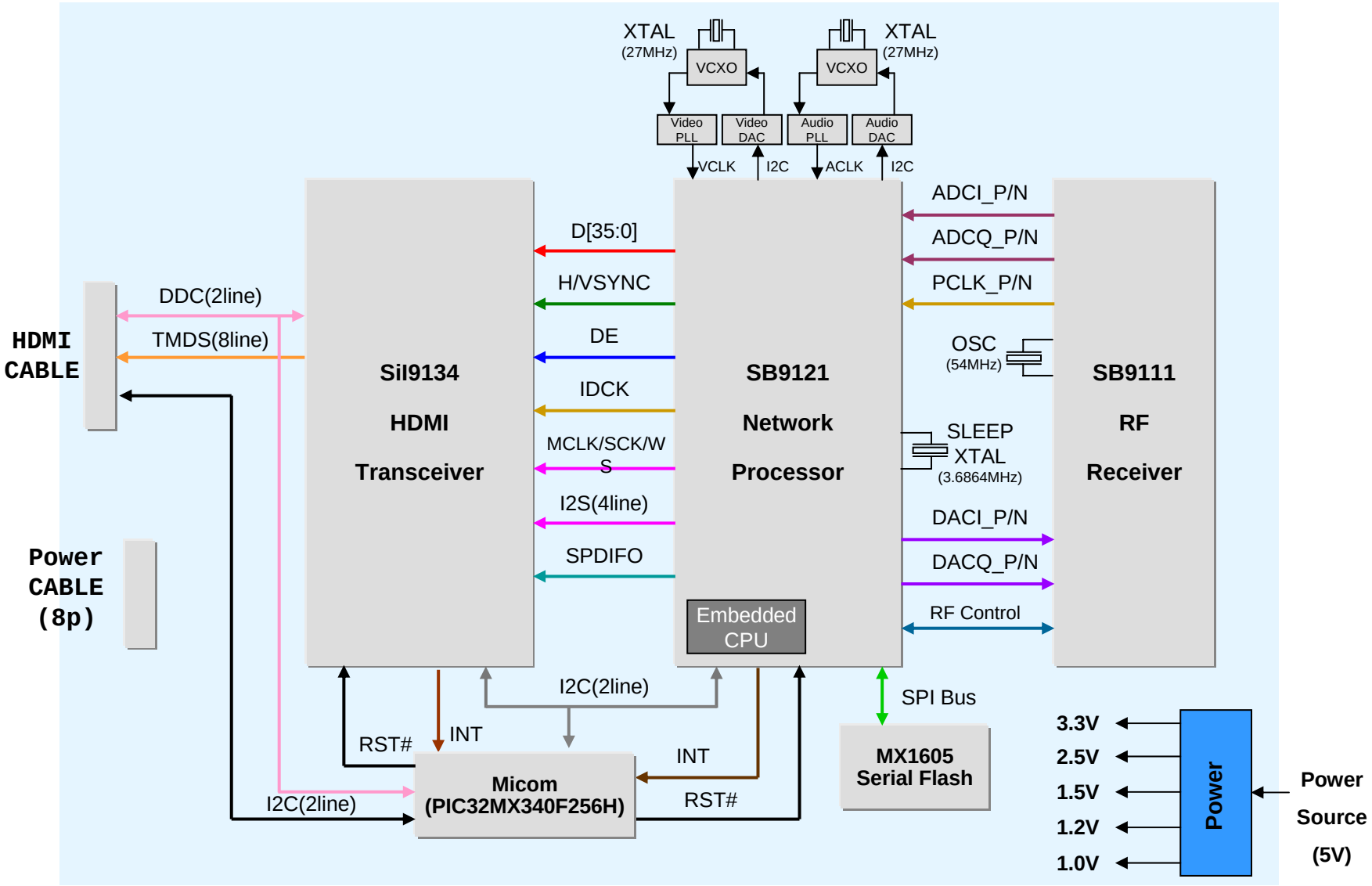
MEDIA-BOX(SIMPLE)




ANT/
CABLE
IN
5.0V_TU
I2C_CH2(Demod repeater
Analog/D
TMB
Half-NIM
TUNER
IF
+3.3V_DTMB
+1.2V_DTMB
+3.3VA_DTMB
DTMB/DVB-C
Demodulator
[LG3900]
I2C_CH2
TS
Composite
Video
IN
Component
(Y,Pb,Pr)
IN
AV1_Y/C_IN
I2C_CH1
I2C_CH2
I2C_CH4
ANALOG
VIDEO
INPUT
FE_VMAIN
AV1_CVBS_IN
AV2_CVBS_IN
COMP1-Y/Pb/Pr
COMP2-Y/Pb/Pr
DSUB-R/G/B
HDMI
DIGITAL
VIDEO
INPUT
LCD/PDP
DIGITAL TV
PROCESSOR
[MSD3369GV]
D1.26V
_VDDC
D1.8V_DD
R
3.3V_V
DDP
D3.3V_
1
DUAL
LVDS
HDMI
TX_SEL
D3.3V_2
LVDS
Receiver
[DTC30LM36]
30
D3.3V_2
D1.8V_1
HDMI
Transmitter
[SiI9134]
I2C_CH2
HDMI
D3.3V_3
D5.0V_1
HDMI
DeMUX
[PI3HDMI1210]
HDMI
TX_SEL
CEC_TX
HDMI
OUT
RGB
IN
DDC_RGB
FRONT
HDMI
IN
(x4)
BACK
CEC_RX
HDMI
Switch
(4-to-1)
[TDA9996]
D3.3V_HDMI
D1.8V_HDMI
I2C_CH2
I2C_CH4
D3.3V_L
CEC_RX
DDC_RGB
MiCOM
[WT61P8S]
CEC_TX
I2C_CH4
D5.0V_W
WiHD TX I/F
HDMI
Receiver
[SiI9125]
3.3V_L
1.8V_L
24
Network
Processor
[SB9120]
3.3V_L
2.5V_L
1.0V_L
RF
Transceiver
[SB9110]
2.5V_L
1.5V_L
1.2V_L
1.0V_L
Wireless Module


5.0V_TU
I2C_CH2(Demod repeater
ANT/ CABLE IN
Analog/D TMB Half-NIM TUNER
IF
+3.3V_DTMB
+1.2V_DTMB
+3.3VA_DTMB
DTMB/DVB-C Demodulator [LG3900]
I2C_CH2
TS
Composite Video IN
Component (Y,Pb,Pr) IN
RGB IN
FRONT
HDMI IN (x4)
BACK
I2C_CH1
I2C_CH2
I2C_CH4
ANALOG AUDIO INPUT
FE_SIF
A/V Audio-1
A/V Audio-2
COMP Audio-1
COMP Audio-2
RGB Audio
HDMI
DIGITAL AUDIO INPUT
LCD/PDP DIGITAL TV PROCESSOR
[MSD3369GV]
D1.26V_VDDC
D1.8V_DDR
3.3V_VDDP
D3.3V_1
S/PDIF
I2S
HDMI TX_SEL
S/PDIF OUT
D3.3V_2
D1.8V_1
D3.3V_3
D5.0V_1
HDMI Transmitter [Sil9134]
HDMI
HDMI DeMUX [PI3HDMI1210]
HDMI OUT
I2C_CH2
TX_SEL
HDMI Switch (4-to-1) [TDA9996]
D3.3V_HDMI
D1.8V_HDMI
I2C_CH2
I2C_CH4
D3.3V_L
MiCOM [WT61P8S]
I2C_CH4
D5.0V_W
WiHD TX I/F
HDMI Receiver [Sil9125]
3.3V_L
1.8V_L
Network Processor [SB9120]
3.3V_L
2.5V_L
1.0V_L
RF Transceiver [SB9110]
2.5V_L
1.5V_L
1.2V_L
1.0V_L
Wireless Module


HDMI CABLE
DDC(2line)
TMDS(8line)
XTAL
(28.322MHz)
Sil9125
HDMI
Receiver
D[35:0]
H/VSYNC
DE
IDCK
MCLK/SCK/WS
I2S
SPDIFI
SB9120
Network
Processor
Embedded CPU
ADCI_P/N
ADCQ_P/N
PCLK_P/N
OSC
(54MHz)
SLEEP
XTAL
(3.6864MHz)
DACI_P/N
DACQ_P/N
RF Control
SB9110
RF
Transceiver
Control & Power CABLE (12p)
I2C(2line)
HDMI_INT
SiBEAM_INT
HDMI_RST#
SiBEAM_RST#
SPI Bus(4line)
MX1605
Serial Flash
3.3V
2.5V
1.5V
1.2V
1.0V
Power
Power Source
(5V)


XTAL
(27MHz)
VCXO
XTAL
(27MHz)
VCXO
Video PLL
Video DAC
Audio PLL
Audio DAC
VCLK
I2C
ACLK
I2C
HDMI CABLE
DDC(2line)
TMDS(8line)
Sil9134
HDMI
Transceiver
D[35:0]
H/VSYNC
DE
IDCK
MCLK/SCK/WS
I2S(4line)
SPDIFO
SB9121
Network
Processor
ADCI_P/N
ADCQ_P/N
PCLK_P/N
OSC
(54MHz)
SLEEP
XTAL
(3.6864MHz)
DACI_P/N
DACQ_P/N
RF Control
SB9111
RF
Receiver
Power CABLE (8p)
Embedded CPU
I2C(2line)
SPI Bus
RST#
INT
INT
RST#
I2C(2line)
Micom
(PIC32MX340F256H)
MX1605
Serial Flash
3.3V
2.5V
1.5V
1.2V
1.0V
Power
Power Source (5V)