

Service  
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# Service Manual

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# 1. Revision List

Manual xxxx xxx xxxx.0

- First release.

Manual xxxx xxx xxxx.1

- **Chapter 2:** Updated table [2.1 Technical Specifications](#).
- **Chapter 5:** Updated table [5-2 Factory mode overview](#).

- **Chapter 6:** Updated tables [6-2 White tone default settings](#) and [6-3 Display code overview](#).

Manual xxxx xxx xxxx.2

- **Chapter 2:** Updated table [2.1 Technical Specifications](#).
- **Chapter 6:** Updated tables [6-2 White tone default settings](#) and [6-3 Display code overview](#).

# 2. Technical Specs, Diversity, and Connections

Index of this chapter:

[2.1 Technical Specifications](#)

[2.2 Directions for Use](#)

[2.3 Connections](#)

[2.4 Chassis Overview](#)

Notes:

- Figures can deviate due to the different set executions.

- Specifications are indicative (subject to change).

## 2.1 Technical Specifications

For on-line product support please use the links in [Table 2-1](#). Here is product information available, as well as getting started, user manuals, frequently asked questions and software & drivers.

Table 2-1 Described Model Numbers and Diversity

CTN	2		4					9	10					11
	Connection Overview	Mechanics	Wire Dressing	Stand Removal	Rear Cover Removal	SSB Removal	IR/LED Board Removal		Block Diagram	Schematics				
Power Supply								SSB		J (IR/LED)	E (Keyboard/Leading Edge)	Styling		
<a href="#">43PUH4900/88</a>	<a href="#">2-1</a>	<a href="#">4-1</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.1</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.1</a>		
<a href="#">43PUT4900/12</a>	<a href="#">2-1</a>	<a href="#">4-1</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.1</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.1</a>		
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<a href="#">43PUT4900/60</a>	<a href="#">2-1</a>	<a href="#">4-1</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.1</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.1</a>		
<a href="#">49PUH4900/88</a>	<a href="#">2-1</a>	<a href="#">4-2</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.1</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.2</a>		
<a href="#">49PUT4900/12</a>	<a href="#">2-1</a>	<a href="#">4-2</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.1</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.2</a>		
<a href="#">49PUK4900/12</a>	<a href="#">2-1</a>	<a href="#">4-2</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.1</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.2</a>		
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<a href="#">55PUK4900/12</a>	<a href="#">2-1</a>	<a href="#">4-3</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.2</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.3</a>		
<a href="#">55PUT4900/60</a>	<a href="#">2-1</a>	<a href="#">4-3</a>	<a href="#">4-4</a>	<a href="#">4-5</a>	<a href="#">4-6</a>	<a href="#">4-7 &amp; 4-8</a>	<a href="#">9.1</a>	<a href="#">10.2</a>	<a href="#">10.3</a>	<a href="#">10.4</a>	<a href="#">10.5</a>	<a href="#">11.3</a>		

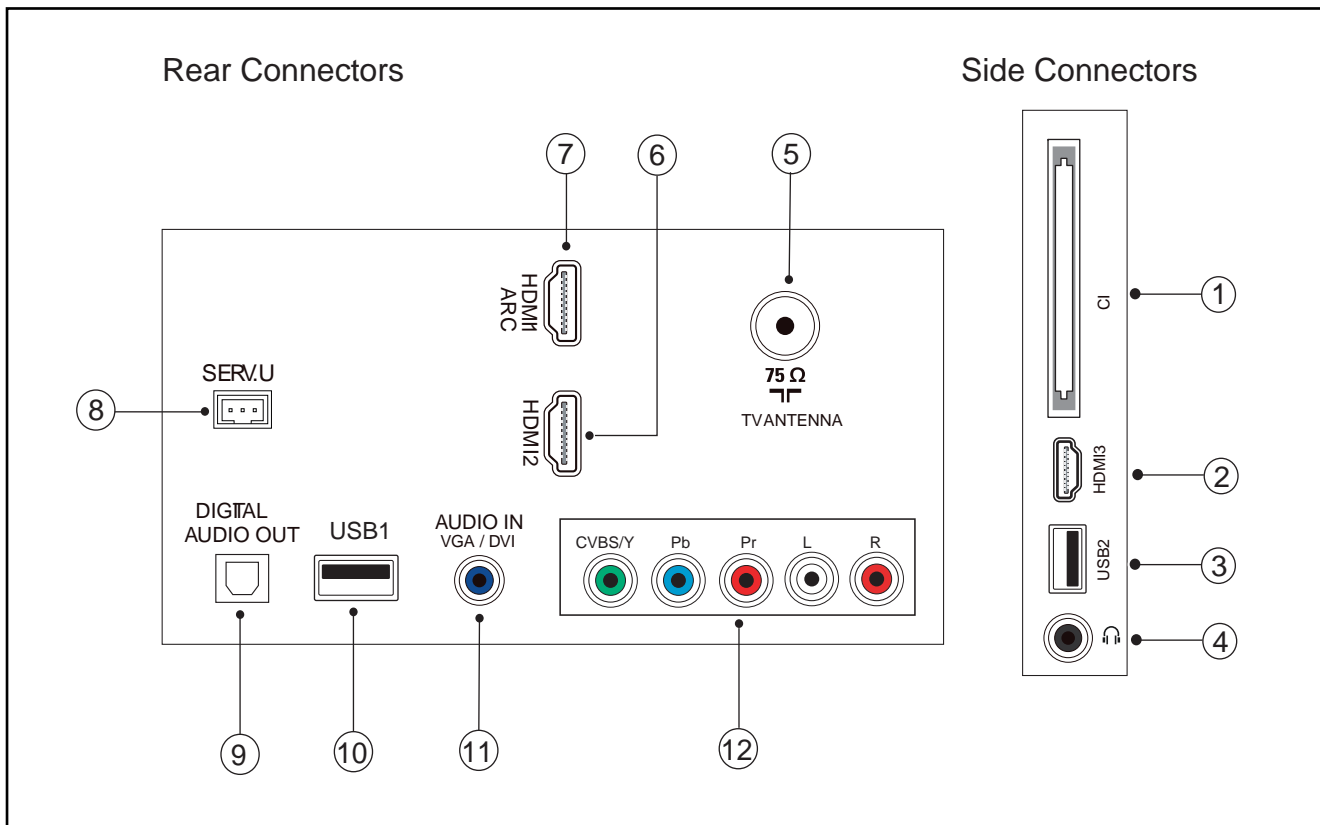
## 2.2 Directions for Use

Directions for use can be downloaded from the following websites:

<http://www.philips.com/support>

<http://www.p4c.philips.com>

2.3 Connections



19970\_001.eps

Figure 2-1 Connection overview

**Note:** The following connector colour abbreviations are used (acc. to DIN/IEC 757): Bk= Black, Bu= Blue, Gn= Green, Gy= Grey, Rd= Red, Wh= White, Ye= Yellow.

2.3.1 Side Connections

1 - Common Interface

68p - See figure 10-7-6



2 - HDMI 3: Digital Video - In, Digital Audio with ARC - In/Out

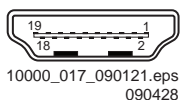


Figure 2-2 HDMI (type A) connector

- 1 - D2+ Data channel
- 2 - Shield Gnd
- 3 - D2- Data channel
- 4 - D1+ Data channel
- 5 - Shield Gnd
- 6 - D1- Data channel
- 7 - D0+ Data channel
- 8 - Shield Gnd
- 9 - D0- Data channel
- 10 - CLK+ Data channel
- 11 - Shield Gnd
- 12 - CLK- Data channel
- 13 - Easylink/CEC Control channel
- 14 - ARC Audio Return Channel
- 15 - DDC\_SCL DDC clock
- 16 - DDC\_SDA DDC data
- 17 - Ground Gnd
- 18 - +5V
- 19 - HPD Hot Plug Detect

20 - Ground

Gnd



3 - USB 2.0

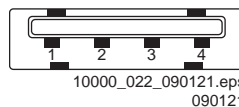
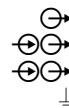


Figure 2-3 USB (type A)

- 1 - +5V
- 2 - Data (-)
- 3 - Data (+)
- 4 - Ground

Gnd



4 - Head phone (Output)

Bk - Head phone 80 - 600 Ω / 10 mW



2.3.2 Rear Connections

5 - TV ANTENNA - In

Signal input from an antenna, cable or satellite.

6 - HDMI 2: Digital Video - In, Digital Audio with ARC - In/Out

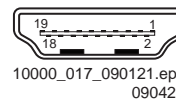


Figure 2-4 HDMI (type A) connector

- 1 - D2+ Data channel
- 2 - Shield Gnd



3	- D2-	Data channel	⊕
4	- D1+	Data channel	⊕
5	- Shield	Gnd	⊥
6	- D1-	Data channel	⊕
7	- D0+	Data channel	⊕
8	- Shield	Gnd	⊥
9	- D0-	Data channel	⊕
10	- CLK+	Data channel	⊕
11	- Shield	Gnd	⊥
12	- CLK-	Data channel	⊕
13	- Easylink/CEC	Control channel	⊕ ⊕
14	- ARC	Audio Return Channel	⊕
15	- DDC_SCL	DDC clock	⊕
16	- DDC_SDA	DDC data	⊕ ⊕
17	- Ground	Gnd	⊥
18	- +5V		⊕
19	- HPD	Hot Plug Detect	⊕
20	- Ground	Gnd	⊥

**7 - HDMI 1 ARC: Digital Video - In, Digital Audio with ARC - In/Out**

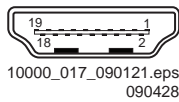


Figure 2-5 HDMI (type A) connector

1	- D2+	Data channel	⊕
2	- Shield	Gnd	⊥
3	- D2-	Data channel	⊕
4	- D1+	Data channel	⊕
5	- Shield	Gnd	⊥
6	- D1-	Data channel	⊕
7	- D0+	Data channel	⊕
8	- Shield	Gnd	⊥
9	- D0-	Data channel	⊕
10	- CLK+	Data channel	⊕
11	- Shield	Gnd	⊥
12	- CLK-	Data channel	⊕
13	- Easylink/CEC	Control channel	⊕ ⊕
14	- ARC	Audio Return Channel	⊕
15	- DDC_SCL	DDC clock	⊕
16	- DDC_SDA	DDC data	⊕ ⊕
17	- Ground	Gnd	⊥
18	- +5V		⊕
19	- HPD	Hot Plug Detect	⊕
20	- Ground	Gnd	⊥

**8 - Service / UART**

1	- Ground	Gnd	⊥
2	- UART_TX	Transmit	⊕
3	- UART_RX	Receive	⊕

**9 - Cinch: Digital Audio - Out**

BK	- Coaxial	0.4 - 0.6V <sub>PP</sub> / 75 W	⊕ ⊕
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**10 - USB 2.0**

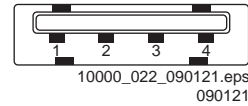


Figure 2-6 USB (type A)

1	- +5V		⊕
2	- Data (-)		⊕ ⊕
3	- Data (+)		⊕ ⊕
4	- Ground	Gnd	⊥

**11 - Audio - In: Left / Right, VGA**

Bu	- Audio L/R in	0.5 V <sub>RMS</sub> / 10 kW	jq
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**12 - EXT1: Video RGB/YC - In, CVBS - In/Out, Audio - In/Out**

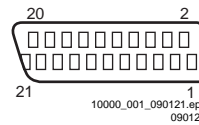


Figure 2-7 SCART connector

1	- Audio R	0.5 V <sub>RMS</sub> / 1 kΩ	⊕
2	- Audio R	0.5 V <sub>RMS</sub> / 10 kΩ	⊕
3	- Audio L	0.5 V <sub>RMS</sub> / 1 kΩ	⊕
4	- Ground Audio	Gnd	⊥
5	- Ground Blue	Gnd	⊥
6	- Audio L	0.5 V <sub>RMS</sub> / 10 kΩ	⊕
7	- Video Blue/C-out	0.7 V <sub>PP</sub> / 75 Ω	⊕ ⊕
8	- Function Select	0 - 2 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊕
9	- Ground Green	Gnd	⊥
10	- n.c.		
11	- Video Green	0.7 V <sub>PP</sub> / 75 Ω	⊕
12	- n.c.		
13	- Ground Red	Gnd	⊥
14	- Ground P50	Gnd	⊥
15	- Video Red/C	0.7 V <sub>PP</sub> / 75 Ω	⊕
16	- Status/FBL	0 - 0.4 V: INT 1 - 3 V: EXT / 75 Ω	⊕
17	- Ground Video	Gnd	⊥
18	- Ground FBL	Gnd	⊥
19	- Video CVBS	1 V <sub>PP</sub> / 75 Ω	⊕
20	- Video CVBS/Y	1 V <sub>PP</sub> / 75 Ω	⊕
21	- Shield	Gnd	⊥

**2.4 Chassis Overview**

Refer to [9. Block Diagrams](#) for PWB/CBA locations.

## 3. Precautions, Notes, and Abbreviation List

### Index of this chapter:

- [3.1 Safety Instructions](#)
- [3.2 Warnings](#)
- [3.3 Notes](#)
- [3.4 Abbreviation List](#)

### 3.1 Safety Instructions

Safety regulations require the following **during** a repair:

- Connect the set to the Mains/AC Power via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol ▲, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay in particular attention to the following points:

- Route the wire trees correctly and fix them with the mounted cable clamps.
- Check the insulation of the Mains/AC Power lead for external damage.
- Check the strain relief of the Mains/AC Power cord for proper function.
- Check the electrical DC resistance between the Mains/AC Power plug and the secondary side (only for sets that have a Mains/AC Power isolated power supply):
  1. Unplug the Mains/AC Power cord and connect a wire between the two pins of the Mains/AC Power plug.
  2. Set the Mains/AC Power switch to the "on" position (keep the Mains/AC Power cord unplugged!).
  3. Measure the resistance value between the pins of the Mains/AC Power plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 MΩ and 12 MΩ.
  4. Switch "off" the set, and remove the wire between the two pins of the Mains/AC Power plug.
- Check the cabinet for defects, to prevent touching of any inner parts by the customer.

### 3.2 Warnings

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD ▲). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

### 3.3 Notes

#### 3.3.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (⊥), or hot ground (↗), depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).
- Where necessary, measure the waveforms and voltages with (⏏) and without (⏏) aerial signal. Measure the voltages in the power supply section both in normal operation (Ⓜ) and in stand-by (Ⓜ). These values are indicated by means of the appropriate symbols.

#### 3.3.2 Schematic Notes

- All resistor values are in ohms, and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kΩ).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 Ω).
- All capacitor values are given in micro-farads ( $\mu = \times 10^{-6}$ ), nano-farads ( $n = \times 10^{-9}$ ), or pico-farads ( $p = \times 10^{-12}$ ).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (\*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed on the Philips Spare Parts Web Portal.

#### 3.3.3 Spare Parts

For the latest spare part overview, consult your Philips Spare Part web portal.

#### 3.3.4 BGA (Ball Grid Array) ICs

##### Introduction

For more information on how to handle BGA devices, visit this URL: <http://www.atyourservice-magazine.com>. Select "Magazine", then go to "Repair downloads". Here you will find information on how to deal with BGA-ICs.

##### BGA Temperature Profiles

For BGA-ICs, you **must** use the correct temperature-profile. Where applicable and available, this profile is added to the IC Data Sheet information section in this manual.

#### 3.3.5 Lead-free Soldering

Due to lead-free technology some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment. In general, use of solder paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free soldering tin. The solder tool must be able:
  - To reach a solder-tip temperature of at least 400°C.
  - To stabilize the adjusted temperature at the solder-tip.
  - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature of around 360°C - 380°C is reached and stabilized at the solder joint. Heating time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C, otherwise wear-out of tips will increase drastically and flux-fluid will be destroyed. To avoid wear-out of tips, switch "off" unused equipment or reduce heat.
- Mix of lead-free soldering tin/parts with leaded soldering tin/parts is possible but PHILIPS recommends strongly **to avoid** mixed regimes. If this cannot be avoided, carefully clear the solder-joint from old tin and re-solder with new tin.

#### 3.3.6 Alternative BOM identification

It should be noted that on the European Service website, "Alternative BOM" is referred to as "Design variant".

The **third digit** in the serial number (example: AG2B0335000001) indicates the number of the alternative B.O.M. (Bill Of Materials) that has been used for producing the specific TV set. In general, it is possible that the same TV model on the market is produced with e.g. two different types of displays, coming from two different suppliers. This will then

result in sets which have the same CTN (Commercial Type Number; e.g. 28PW9515/12) but which have a different B.O.M. number.

By looking at the third digit of the serial number, one can identify which B.O.M. is used for the TV set he is working with. If the third digit of the serial number contains the number "1" (example: AG1B033500001), then the TV set has been manufactured according to B.O.M. number 1. If the third digit is a "2" (example: AG2B033500001), then the set has been produced according to B.O.M. no. 2. This is important for ordering the correct spare parts!

For the third digit, the numbers 1...9 and the characters A...Z can be used, so in total: 9 plus 26= 35 different B.O.M.s can be indicated by the third digit of the serial number.

**Identification:** The bottom line of a type plate gives a 14-digit serial number. Digits 1 and 2 refer to the production centre (e.g. SN is Lysomice, RJ is Koberzyce), digit 3 refers to the B.O.M. code, digit 4 refers to the Service version change code, digits 5 and 6 refer to the production year, and digits 7 and 8 refer to production week (in example below it is 2010 week 10 / 2010 week 17). The 6 last digits contain the serial number.



Figure 3-1 Serial number (example)

### 3.3.7 Board Level Repair (BLR) or Component Level Repair (CLR)

If a board is defective, consult your repair procedure to decide if the board has to be exchanged or if it should be repaired on component level.

If your repair procedure says the board should be exchanged completely, do not solder on the defective board. Otherwise, it cannot be returned to the O.E.M. supplier for back charging!

### 3.3.8 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages.** While some may not be dangerous in themselves, they can cause unexpected reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

## 3.4 Abbreviation List

0/6/12

SCART switch control signal on A/V board. 0 = loop through (AUX to TV),

6 = play 16 : 9 format, 12 = play 4 : 3 format

AARA	Automatic Aspect Ratio Adaptation: algorithm that adapts aspect ratio to remove horizontal black bars; keeps the original aspect ratio
ACI	Automatic Channel Installation: algorithm that installs TV channels directly from a cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box
AM	Amplitude Modulation
AP	Asia Pacific
AR	Aspect Ratio: 4 by 3 or 16 by 9
ASF	Auto Screen Fit: algorithm that adapts aspect ratio to remove horizontal black bars without discarding video information
ATSC	Advanced Television Systems Committee, the digital TV standard in the USA
ATV	See Auto TV
Auto TV	A hardware and software control system that measures picture content, and adapts image parameters in a dynamic way
AV	External Audio Video
AVC	Audio Video Controller
AVIP	Audio Video Input Processor
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BDS	Business Display Solutions (iTV)
BLR	Board-Level Repair
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries
B-TXT	Blue TeleteXT
C	Centre channel (audio)
CEC	Consumer Electronics Control bus: remote control bus on HDMI connections
CL	Constant Level: audio output to connect with an external amplifier
CLR	Component Level Repair
ComPair	Computer aided rePair
CP	Connected Planet / Copy Protection
CSM	Customer Service Mode
CTI	Color Transient Improvement: manipulates steepness of chroma transients
CVBS	Composite Video Blanking and Synchronization
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DCM	Data Communication Module. Also referred to as System Card or Smartcard (for iTV).
DDC	See "E-DDC"
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz
DFI	Dynamic Frame Insertion
DFU	Directions For Use: owner's manual
DMR	Digital Media Reader: card reader
DMSD	Digital Multi Standard Decoding
DNM	Digital Natural Motion

DNR	Digital Noise Reduction: noise reduction feature of the set		The SDI signal is self-synchronizing, uses 8 bit or 10 bit data words, and has a maximum data rate of 270 Mbit/s, with a minimum bandwidth of 135 MHz.
DRAM	Dynamic RAM		
DRM	Digital Rights Management		
DSP	Digital Signal Processing		
DST	Dealer Service Tool: special remote control designed for service technicians	iTV	Institutional TeleVision; TV sets for hotels, hospitals etc.
DTCP	Digital Transmission Content Protection; A protocol for protecting digital audio/video content that is traversing a high speed serial bus, such as IEEE-1394	LS	Last Status; The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according to the customer's preferences
DVB-C	Digital Video Broadcast - Cable	LATAM	Latin America
DVB-T	Digital Video Broadcast - Terrestrial	LCD	Liquid Crystal Display
DVD	Digital Versatile Disc	LED	Light Emitting Diode
DVI(-d)	Digital Visual Interface (d= digital only)	L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
E-DDC	Enhanced Display Data Channel (VESA standard for communication channel and display). Using E-DDC, the video source can read the EDID information from the display.	LPL	LG.Philips LCD (supplier)
EDID	Extended Display Identification Data (VESA standard)	LS	Loudspeaker
EEPROM	Electrically Erasable and Programmable Read Only Memory	LVDS	Low Voltage Differential Signalling
EMI	Electro Magnetic Interference	Mbps	Mega bits per second
EPG	Electronic Program Guide	M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
EPLD	Erasable Programmable Logic Device	MHEG	Part of a set of international standards related to the presentation of multimedia information, standardised by the Multimedia and Hypermedia Experts Group. It is commonly used as a language to describe interactive television services
EU	Europe		
EXT	EXternal (source), entering the set by SCART or by cinches (jacks)		
FDS	Full Dual Screen (same as FDW)	MIPS	Microprocessor without Interlocked Pipeline-Stages; A RISC-based microprocessor
FDW	Full Dual Window (same as FDS)		
FLASH	FLASH memory	MOP	Matrix Output Processor
FM	Field Memory or Frequency Modulation	MOSFET	Metal Oxide Silicon Field Effect Transistor, switching device
FPGA	Field-Programmable Gate Array		
FTV	Flat TeleVision	MPEG	Motion Pictures Experts Group
Gb/s	Giga bits per second	MPIF	Multi Platform InterFace
G-TXT	Green TeleteXT	MUTE	MUTE Line
H	H_sync to the module	MTV	Mainstream TV: TV-mode with Consumer TV features enabled (iTV)
HD	High Definition		
HDD	Hard Disk Drive	NC	Not Connected
HDCP	High-bandwidth Digital Content Protection: A "key" encoded into the HDMI/DVI signal that prevents video data piracy. If a source is HDCP coded and connected via HDMI/DVI without the proper HDCP decoding, the picture is put into a "snow vision" mode or changed to a low resolution. For normal content distribution the source and the display device must be enabled for HDCP "software key" decoding.	NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
HDMI	High Definition Multimedia Interface	NTC	Negative Temperature Coefficient, non-linear resistor
HP	HeadPhone	NTSC	National Television Standard Committee. Color system mainly used in North America and Japan. Color carrier NTSC M/N= 3.579545 MHz, NTSC 4.43= 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
I	Monochrome TV system. Sound carrier distance is 6.0 MHz	NVM	Non-Volatile Memory: IC containing TV related data such as alignments
I <sup>2</sup> C	Inter IC bus	O/C	Open Circuit
I <sup>2</sup> D	Inter IC Data bus	OSD	On Screen Display
I <sup>2</sup> S	Inter IC Sound bus	OAD	Over the Air Download. Method of software upgrade via RF transmission.
IF	Intermediate Frequency		Upgrade software is broadcasted in TS with TV channels.
IR	Infra Red	OTC	On screen display Teletext and Control; also called Artistic (SAA5800)
IRQ	Interrupt Request	P50	Project 50: communication protocol between TV and peripherals
ITU-656	The ITU Radio communication Sector (ITU-R) is a standards body subcommittee of the International Telecommunication Union relating to radio communication. ITU-656 (a.k.a. SDI), is a digitized video format used for broadcast grade video.	PAL	Phase Alternating Line. Color system mainly used in West Europe (colour carrier = 4.433619 MHz) and South America (colour carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
	Uncompressed digital component or digital composite signals can be used.	PCB	Printed Circuit Board (same as "PWB")
		PCM	Pulse Code Modulation

PDP	Plasma Display Panel	SWAN	Spatial temporal Weighted Averaging
PFC	Power Factor Corrector (or Pre-conditioner)	SXGA	Noise reduction 1280 × 1024
PIP	Picture In Picture	TFT	Thin Film Transistor
PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency	THD	Total Harmonic Distortion
POD	Point Of Deployement: a removable CAM module, implementing the CA system for a host (e.g. a TV-set)	TMD5	Transmission Minimized Differential Signalling
POR	Power On Reset, signal to reset the uP	TS	Transport Stream
PSDL	Power Supply for Direct view LED backlight with 2D-dimming	TXT	TeleteXT
PSL	Power Supply with integrated LED drivers	TXT-DW	Dual Window with TeleteXT
PSLS	Power Supply with integrated LED drivers with added Scanning functionality	UI	User Interface
PTC	Positive Temperature Coefficient, non-linear resistor	uP	Microprocessor
PWB	Printed Wiring Board (same as "PCB")	UXGA	1600 × 1200 (4:3)
PWM	Pulse Width Modulation	V	V-sync to the module
QRC	Quasi Resonant Converter	VESA	Video Electronics Standards Association
QTNR	Quality Temporal Noise Reduction	VGA	640 × 480 (4:3)
QVCP	Quality Video Composition Processor	VL	Variable Level out: processed audio output toward external amplifier
RAM	Random Access Memory	VSB	Vestigial Side Band; modulation method
RGB	Red, Green, and Blue. The primary color signals for TV. By mixing levels of R, G, and B, all colors (Y/C) are reproduced.	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
RC	Remote Control	WXGA	1280 × 768 (15:9)
RC5 / RC6	Signal protocol from the remote control receiver	XTAL	Quartz crystal
RESET	RESET signal	XGA	1024 × 768 (4:3)
ROM	Read Only Memory	Y	Luminance signal
RSDS	Reduced Swing Differential Signalling data interface	Y/C	Luminance (Y) and Chrominance (C) signal
R-TXT	Red TeleteXT	YPbPr	Component video. Luminance and scaled color difference signals (B-Y and R-Y)
SAM	Service Alignment Mode	YUV	Component video
S/C	Short Circuit		
SCART	Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs		
SCL	Serial Clock I <sup>2</sup> C		
SCL-F	CLock Signal on Fast I <sup>2</sup> C bus		
SD	Standard Definition		
SDA	Serial Data I <sup>2</sup> C		
SDA-F	DAta Signal on Fast I <sup>2</sup> C bus		
SDI	Serial Digital Interface, see "ITU-656"		
SDRAM	Synchronous DRAM		
SECAM	SEequence Couleur Avec Mémoire. Colour system mainly used in France and East Europe. Colour carriers = 4.406250 MHz and 4.250000 MHz		
SIF	Sound Intermediate Frequency		
SMPS	Switched Mode Power Supply		
SoC	System on Chip		
SOG	Sync On Green		
SOPS	Self Oscillating Power Supply		
SPI	Serial Peripheral Interface bus; a 4-wire synchronous serial data link standard		
S/PDIF	Sony Philips Digital InterFace		
SRAM	Static RAM		
SRP	Service Reference Protocol		
SSB	Small Signal Board		
SSC	Spread Spectrum Clocking, used to reduce the effects of EMI		
STB	Set Top Box		
STBY	STand-BY		
SVGA	800 × 600 (4:3)		
SVHS	Super Video Home System		
SW	Software		



## 4. Mechanical Instructions

Index of this chapter:

[4.1 Cable Dressing](#)

[4.2 Service Positions](#)

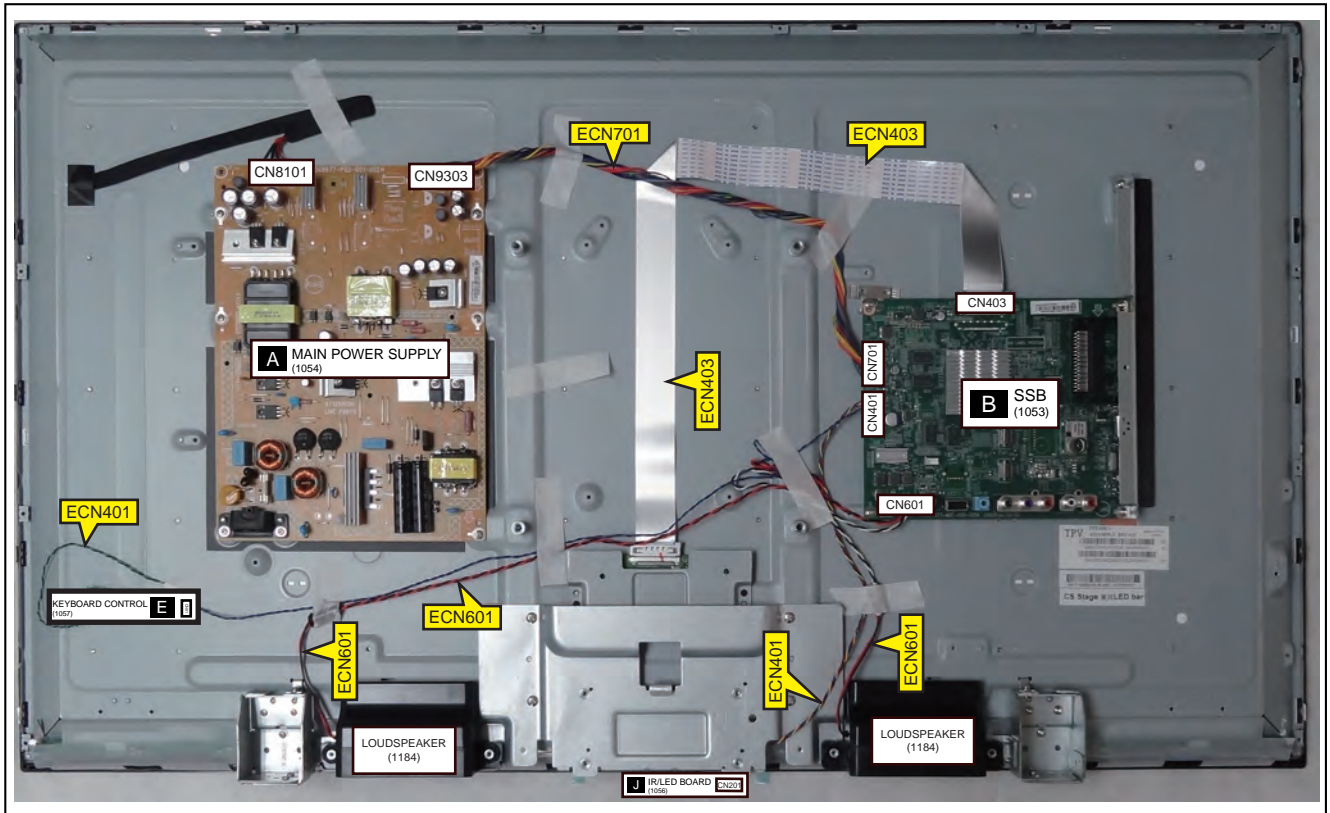
[4.3 Assembly/Panel Removal \(for 43"/49"/55"Pxx4x00\)](#)

[4.4 Set Re-assembly](#)

Notes:

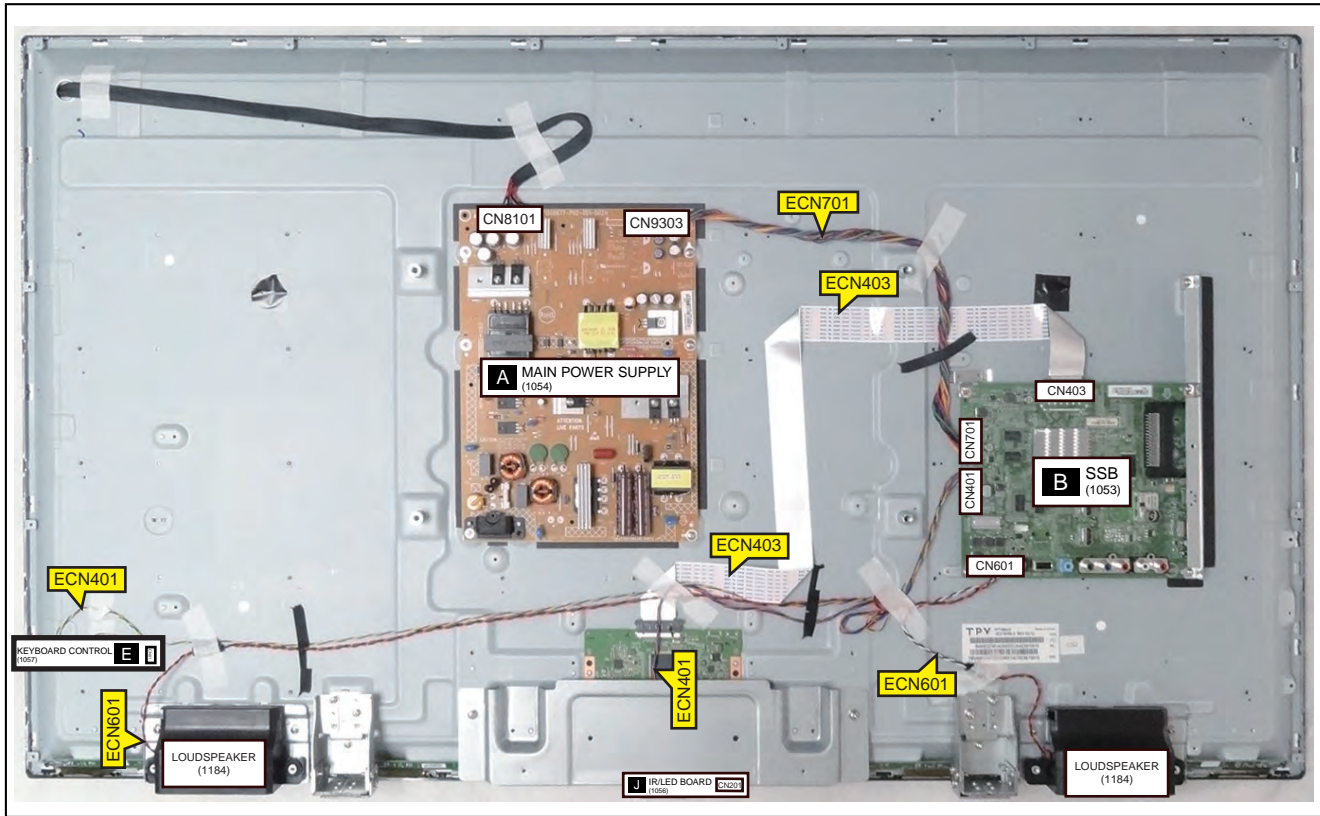
- Figures below can deviate slightly from the actual situation, due to the different set executions.

### 4.1 Cable Dressing



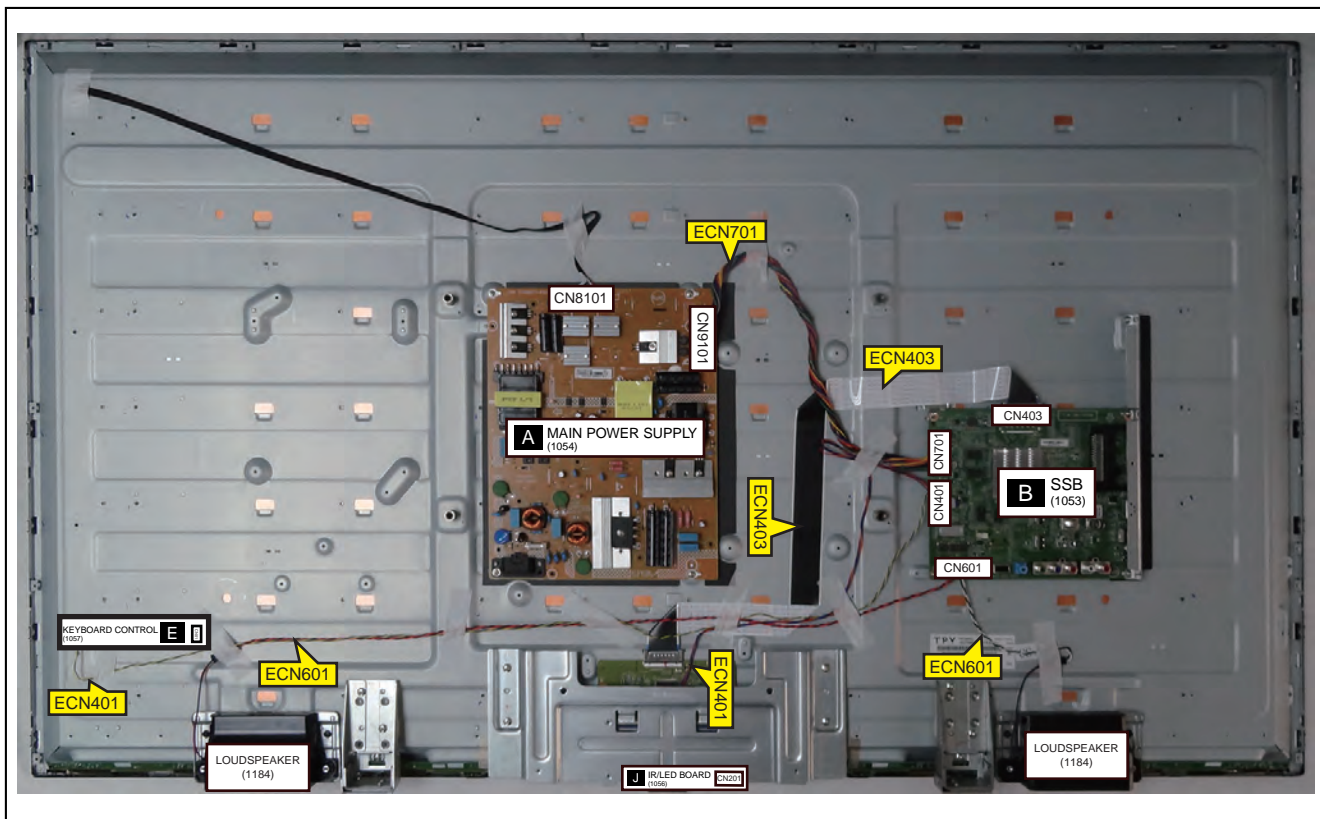
19970\_100.eps

Figure 4-1 Cable dressing (43" 4900 series)



19970\_101.eps

Figure 4-2 Cable dressing (49" 4900 series)



19970\_102.eps

Figure 4-3 Cable dressing (55" 4900 series)

#### 4.2 Service Positions

For easy servicing of a TV set, the set should be put face down on a soft flat surface, foam buffers or other specific workshop tools. Ensure that a stable situation is created to perform measurements and alignments. When using foam bars take care that these always support the cabinet and **never** only the display. **Caution:** Failure to follow these guidelines can seriously damage the display!  
Ensure that ESD safe measures are taken.

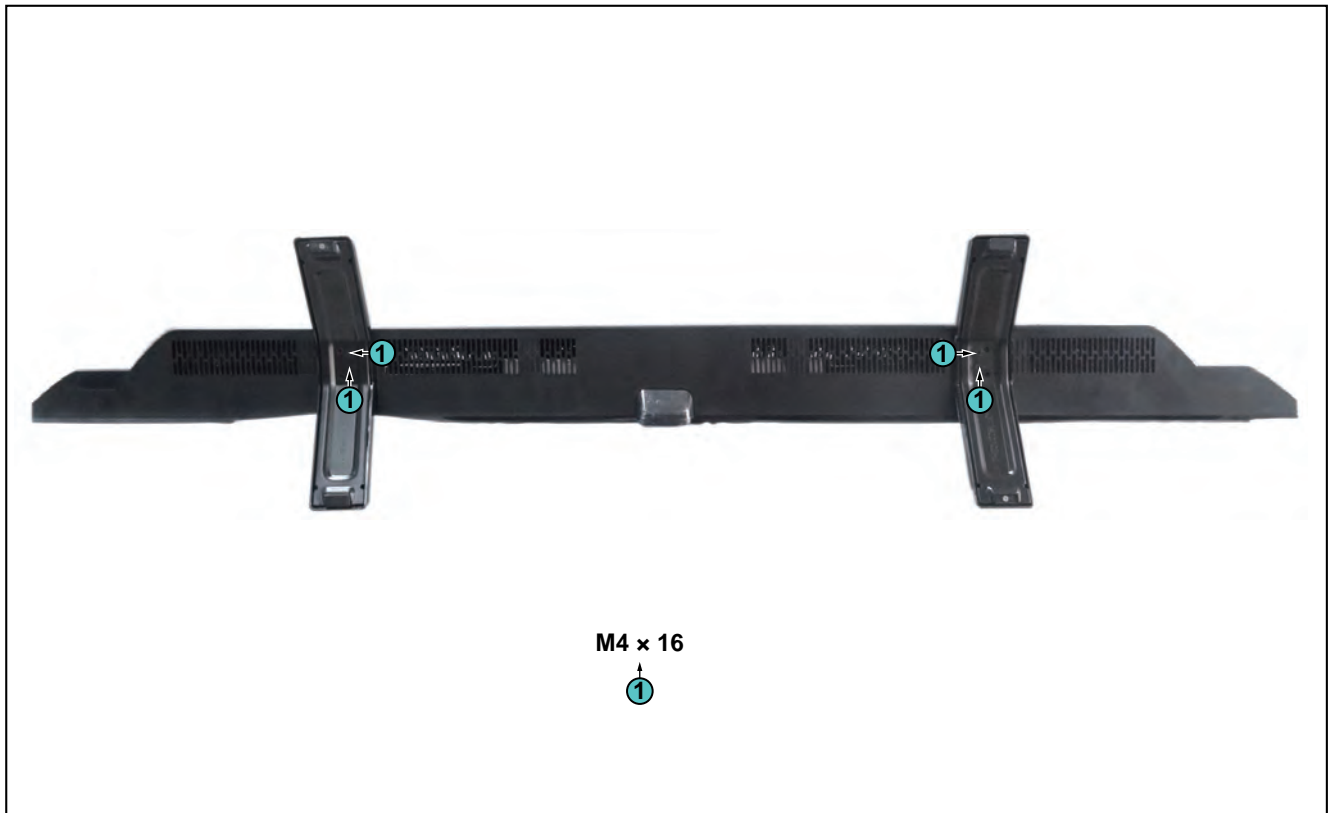
#### 4.3 Assembly/Panel Removal (for 43"/49"/55" Pxx4x00)

Instructions below apply to the 49PUH4900/88, but will be similar for other 43"/49"/55"PUx4900 series models.

##### 4.3.1 Stand

Refer to [Figure 4-4](#) for details.

1. Remove the fixation screws [1] that secure the stand bracket. Refer to [Figure 4-4](#) for details.
2. Take the stand bracket out from the set.



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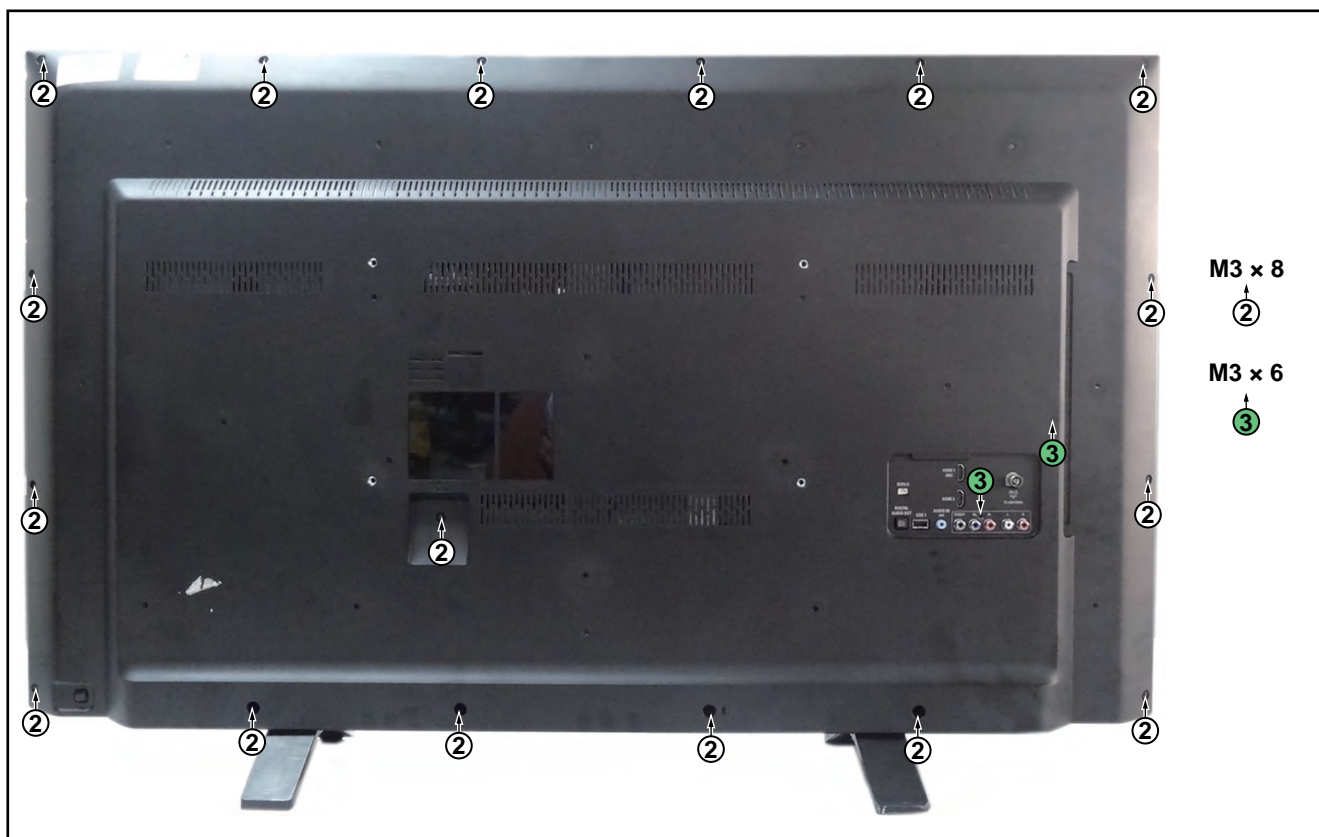
Figure 4-4 Stand removal

#### 4.3.2 Rear Cover

Refer to [Figure 4-5](#) for details.

**Warning:** Disconnect the mains power cord before removing the rear cover.

1. Remove the fixation screws [2] and [3] that secure the rear cover. Refer to [Figure 4-5](#) for details.
2. Gently lift the rear cover from the TV. Make sure that wires and cables are not damaged while lifting the rear cover from the set.



19970\_104.eps

Figure 4-5 Rear cover removal

#### 4.3.3 Keyboard Control unit

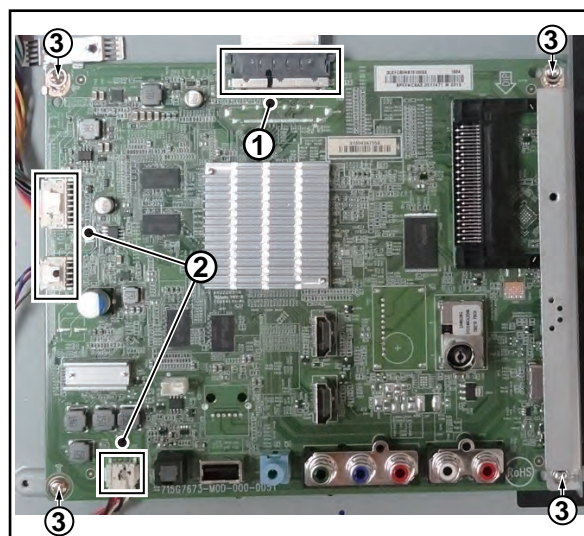
1. Unplug the connector from the keyboard control panel.
  2. Remove the fixation screw that secure the keyboard
  3. Gently take the keyboard out.
- When defective, replace the whole unit.

#### 4.3.4 Small Signal Board (SSB)

Refer to [Figure 4-6](#) for details.

**Caution:** it is mandatory to remount all different screws at their original position during re-assembly. Failure to do so may result in damaging the SSB.

1. Release the clips from the LVDS connector that connect with the SSB[1].
- Caution:** be careful, as these are very fragile connectors!
2. Unplug all other connectors [2].
3. Remove all the fixation screws from the SSB [3].
4. The SSB can now be shifted from side connector cover, then lifted and taken out of the I/O bracket. Refer to [Figure 4-6](#) for details.



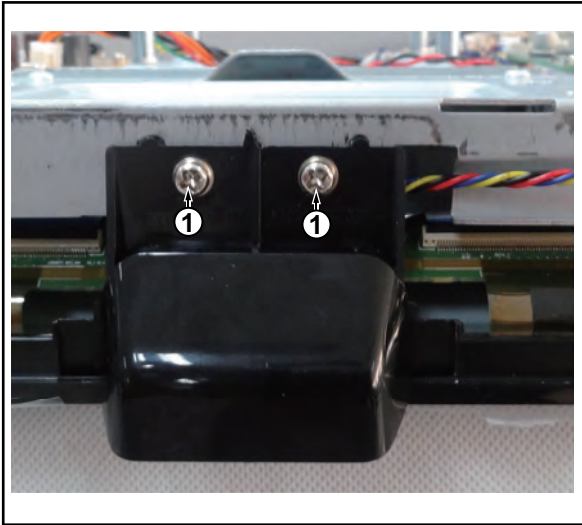
19970\_105.eps

Figure 4-6 SSB removal

#### 4.3.5 IR/LED Board

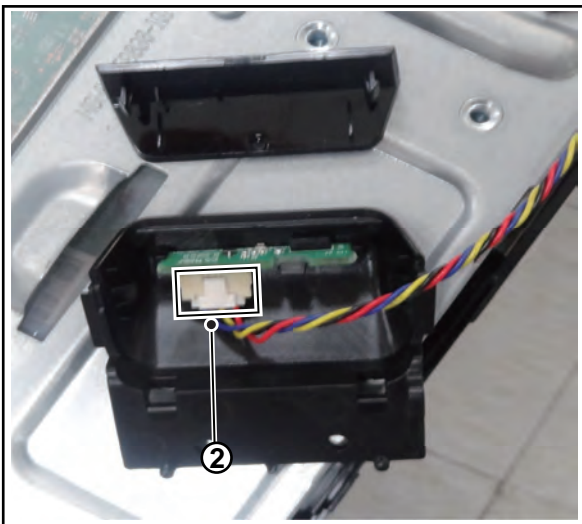
Refer to [Figure 4-7](#) and [Figure 4-8](#) for details.

1. Remove the fixation screws [1] from the stand bracket, pull out the assy from the set. Refer to [Figure 4-7](#) for details.
2. Carefully Releases the cover secured by clips, then unplug the connector [2] from the IR/LED board. The IR/LED Board can now be lifted and taken out from the cover. Refer to [Figure 4-8](#) for details.



19791\_107.eps

Figure 4-7 IR/LED Board removal[1]



19791\_109.eps

Figure 4-8 IR/LED Board removal[2]

#### 4.3.6 Power Supply Unit (PSU)

**Caution:** it is mandatory to remount all different screws at their original position during re-assembly. Failure to do so may result in damaging the PSU.

1. Gently unplug all connectors from the PSU.
2. Remove all fixation screws from the PSU.
3. The PSU can be taken out of the set now.

#### 4.3.7 Speakers

1. Gently release the tapes that secure the speaker cables.
2. Unplug the speaker connector from the SSB.

3. Take the speakers out.  
When defective, replace the both units.

#### 4.3.8 LCD Panel

1. Remove the SSB as described earlier.
2. Remove the PSU as described earlier.
3. Remove the keyboard control panel as described earlier.
4. Remove the stand bracket as described earlier.
5. Remove the IR/LED as described earlier.
6. Remove the fixations screws that fix the metal clamps to the front bezel. Take out those clamps.
7. Remove all other metal parts not belonging to the panel.
8. Lift the LCD Panel from the bezel.  
When defective, replace the whole unit.

#### 4.4 Set Re-assembly

To re-assemble the whole set, execute all processes in reverse order.

##### Notes:

- While re-assembling, make sure that all cables are placed and connected in their original position. See [Figure 4-1](#) to [Figure 4-3](#).
- Pay special attention not to damage the EMC foams on the SSB shields. Ensure that EMC foams are mounted correctly.

## 5. Service Modes and Fault Finding

Index of this chapter:

- [5.1 Test Points](#)
- [5.2 Service Modes](#)
- [5.3 Stepwise Start-up](#)
- [5.4 Service Tools](#)
- [5.5 Software Upgrading](#)
- [5.6 The Blinking LED Procedure](#)
- [5.7 Fault Finding and Repair Tips](#)

### 5.1 Test Points

As most signals are digital, it will be difficult to measure waveforms with a standard oscilloscope. However, several key ICs are capable of generating test patterns, which can be controlled via ComPair. In this way it is possible to determine which part is defective.

Perform measurements under the following conditions:

- Service Default Mode.
- Video: Colour bar signal.
- Audio: 3 kHz left, 1 kHz right.

### 5.2 Service Modes

The Service Mode feature is split into five parts:

- Service Default Mode (SDM).
- Service Alignment Mode (SAM).
- Factory Mode.
- Customer Service Mode (CSM).
- Computer Aided Repair Mode (ComPair).

SDM, SAM and the Factory mode offer features, which can be used by the Service engineer to repair/align a TV set. Some features are:

- A pre-defined situation to ensure measurements can be made under uniform conditions (SDM).
- Activates the blinking LED procedure for error identification when no picture is available (SDM).
- Make alignments (e.g. White Tone), reset the error buffer (SAM and Factory Mode).
- Display information ("SDM" or "SAM" indication in upper right corner of screen, error buffer, software version, operating hours, options and option codes, sub menus).

The CSM is a Service Mode that can be enabled by the consumer. The CSM displays diagnosis information, which the customer can forward to the dealer or call centre. In CSM mode, "CSM", is displayed in the top right corner of the screen. The information provided in CSM and the purpose of CSM is to:

- Increase the home repair hit rate.
- Decrease the number of nuisance calls.
- Solved customers' problem without home visit.

ComPair Mode is used for communication between a computer and a TV on I<sup>2</sup>C /UART level and can be used by a Service engineer to quickly diagnose the TV set by reading and write in NVMs, communicate with ICs and the micro processor (PWM, registers, etc.), and by making use of a fault finding database. It will also be possible to up and download the software of the TV set via I<sup>2</sup>C with help of ComPair. To do this, ComPair has to be connected to the TV set via the ComPair connector, which will be accessible through the rear of the set (without removing the rear cover).

**Note:** For the new model range, a new remote control (RC) is used with some renamed buttons. This has an impact on the activation of the Service modes. For instance the old "MENU" button is now called "HOME" (or is indicated by a "house" icon).

#### 5.2.1 General

Next items are applicable to all Service Modes or are general.

#### Life Timer

During the life time cycle of the TV set, a timer is kept (called "Op. Hour"). It counts the normal operation hours (not the Stand-by hours). The actual value of the timer is displayed in SDM and SAM in a decimal value. Every two soft-resets increase the hour by + 1. Stand-by hours are not counted.

#### Software Identification, Version, and Cluster

The software ID, version, and cluster will be shown in the main menu display of SDM, SAM and CSM.

The screen will show: "AAAAB-X.YYY", where:

- AAAA is the chassis name: TPN152E x.yy.
- B is the region indication: E = Europe, A = AP/China, U = NAFTA, L = LATAM.
- X is the main version number: this is updated with a major change of specification (incompatible with the previous software version). Numbering will go from 1 - 99 and AA - ZZ.
  - If the main version number changes, the new version number is written in the NVM.
  - If the main version number changes, the default settings are loaded.
- YYY is the sub version number: this is updated with a minor change (backwards compatible with the previous versions). Numbering will go from 000 - 999.
  - If the sub version number changes, the new version number is written in the NVM.
  - If the NVM is refreshed, the software identification, version, and cluster will also be written to NVM.

#### Display Option Code Selection

When after an SSB or display exchange, the display option code is not set properly, it will result in a TV with "no display". Therefore, it is required to set this display option code after such a repair.

To do so, press the following key sequence on a standard RC transmitter: "062598" directly followed by MENU and "xxx", where "xxx" is a 3 digit decimal value of the panel type: see column "Display Code" in [Table 6-3](#). When the value is accepted and stored in NVM, the set will switch to Stand-by, to indicate that the process has been completed.

During this algorithm, the NVM-content must be filtered, because several items in the NVM are TV-related and not SSB related (e.g. Model and Prod. S/N). Therefore, "Model" and "Prod. S/N" data is changed into "See Type Plate". In case a call centre or consumer reads "See Type Plate" in CSM mode.

#### 5.2.2 Service Default Mode (SDM)

##### Purpose

Set the TV in SDM mode in order to be able to create a predefined setting for measurements to be made. In this platform, a simplified SDM is introduced (without protection override and without tuning to a predefined frequency).

##### Specifications

- Set linear video and audio settings to 50%, but volume to 25%. Stored user settings are not affected.
- All service-unfriendly modes (if present) are disabled, since they interfere with diagnosing/repairing a set. These service unfriendly modes are:
  - (Sleep) timer.
  - Blue mute/Wall paper.
  - Auto switch "off" (when there is no "ident" signal).
  - Hotel or hospital mode.
  - Child lock or parental lock (manual or via V-chip).
  - Skipping, blanking of "Not favourite", "Skipped" or "Locked" presets/channels.
  - Automatic storing of Personal Preset or Last Status settings.

- Automatic user menu time-out (menu switches back/OFF automatically).
- Auto Volume levelling (AVL).

### How to Activate SDM

To activate SDM, use the following methods:

- Press the following key sequence on the RC transmitter: “062596”, directly followed by the “Home/Menu” button.

After activating this mode, “SDM” will appear in the upper left corner of the screen.

### On Screen Menu

After activating SDM, the following items are displayed, with SDM in the upper right corner of the screen to indicate that the television is in Service Default Mode. Menu items and explanation:

- **xxxxx** Operating hours (in decimal).
- **AAAAB-X.YYY** See [Software Identification, Version, and Cluster](#) for the software name definition.
- **ERR** Shows all errors detected since the last time the buffer was erased in format <xxx> <xxx> <xxx> <xxx> <xxx> (five errors possible).
- **OP** Used to read-out the option bytes. In this chassis two times eight option codes are used.

### How to Navigate

As this mode is read only, there is nothing to navigate. To switch to other modes, use one of the following methods:

- Command MENU from the user remote will exit SDM.
- To prevent the OSD from interfering with measurements in SDM, use the command “Adjust” or “Options” (“STATUS” or “INFO” for NAFTA and LATAM) from the user remote. This will switch the OSD “off” while remaining in the SDM mode. The “SDM” OSD is remains visible in the upper right corner of the screen. To exit SDM switch to “Stand-by” mode.
- Press the following key sequence on the remote control transmitter: “062596” directly followed by the OK button to switch to SAM (do not allow the display to time out between entries while keying the sequence). Remarks: new remote

controls will not have I+ button, but an “INFO” button instead.

### How to Exit SDM

- Switch the set to Stand-by, by pressing the standby button on the remote control transmitter or on the television set.
- Via a standard customer RC-transmitter: key in “00”-sequence.

**Note:** If the TV is switched “off” by a power interrupt while in SDM, the TV will show up in the last status of SDM menu as soon as the power is supplied again. The error buffer will not be cleared.

## 5.2.3 Service Alignment Mode (SAM)

### Purpose

- To modify the NVM.
- To perform alignments.

### Specifications

- Operation hours counter (maximum five digits displayed).
- Software version and option settings display.
- Error buffer clearing.
- Option settings.
- Software alignments (White Tone).
- NVM Editor.
- Set screen mode to full screen (all content is visible).

### How to Activate SAM

To activate SAM, use one of the following methods:

- Press the following key sequence on the remote control transmitter: “062596”, directly followed by the “INFO/OK” button. Do not allow the display to time out between entries while keying the sequence.
- Or via ComPair.

After entering SAM, the following items are displayed, with “SAM” in the upper right corner of the screen to indicate that the television is in Service Alignment Mode.

Table 5-1 SAM mode overview

Main Menu	Sub-menu 1	Sub-menu 2	Description
System Information	Op Hour	e.g. 00082	This represents the life timer. The timer counts normal operation hours, but does not count Stand-by hours.
Clear	Press [OK] to clean the Error Codes immediately		Erases the contents of the error buffer. Select this menu item and press the MENU RIGHT key on the remote control. The content of the error buffer is cleared.
RGB Align	Warm	R Gain	To align the White Tone. See paragraph <a href="#">6.3 Software Alignments</a> in the Alignments section for a detailed description
		G Gain	
		B Gain	
	Normal	R Gain	
		G Gain	
		B Gain	
	Cool	R Gain	
		G Gain	
		B Gain	
	Store		
Upload to USB	Copy Channel List to USB		To upload several settings from the TV to an USB stick
Download from USB	Copy Channel List from USB		To download several settings from the USB stick to the TV

### How to Navigate

- In the SAM menu, select menu items with the UP/DOWN keys on the remote control transmitter. The selected item will be indicated. When not all menu items fit on the screen, use the UP/DOWN keys to display the next/previous menu items.
- With the “LEFT/RIGHT” keys, it is possible to:
  - (De) activate the selected menu item.
  - (De) activate the selected sub menu.
  - Change the value of the selected menu item.
- When you press the MENU button once while in top level SAM, the set will switch to the normal user menu (with the SAM mode still active in the background).

- Press the following key sequence on the remote control transmitter: “062596” directly followed by the “Home/Menu” button to switch to SDM (do not allow the display to time out between entries while keying the sequence).

### How to Store SAM Settings

To store the settings changed in SAM mode (except the RGB Align settings), leave the top level SAM menu by using the POWER button on the remote control transmitter or the television set. The mentioned exceptions must be stored separately via the STORE button.

**How to Exit SAM**

Use one of the following methods:

- Switch the set to STANDBY by pressing the mains button on the remote control transmitter or the television set.
- Via a standard RC-transmitter, key in "00" sequence.

**Note:** When the TV is switched "off" by a power interrupt while in SAM, the TV will show up in "normal operation mode" as soon as the power is supplied again. The error buffer will not be cleared.

- Displaying and or changing Tuner ID information.
- Error buffer clearing.
- Various software alignment settings.
- Testpattern displaying.
- Public Broadcasting Service password Reset.
- etc.

**How to Activate the Factory mode**

To activate the Factory mode, use the following method:

- Press the following key sequence on the remote control transmitter: from the "menu/home" press "1999", directly followed by the "Back/Return" button. Do not allow the display to time out between entries while keying the sequence.

After entering the Factory mode, the following items are displayed,

**5.2.4 Contents of the Factory mode:****Purpose**

- To perform extended alignments.

**Specifications**

- Displaying and or changing Panel ID information.

**Table 5-2 Factory mode overview**

Item	Item value	Default value			Description
		43"	49"	55"	
0	F/W VERSION	Press OK			Displays the software versions of the supplier, Flash PQ, Smart Picture, BL Dimming, Source Meter, the Picture Quality checksum, the Dimming library, the Source meter library, the Flash AQ, MCU and OAD software versions.
1	Board ID	715G6079-3in1			Display the Board ID; be careful changing this, it can result in not correct displaying the screen!
2	PANEL_ID	5	4	2	Displays and changes the Panel ID with the left and right cursor; be careful changing this, it can result in not correct displaying the screen!
3	DB COPY TV to USB	Press OK			DB COPY TV to USB
4	DB READ USB to TV	Press OK			DB READ USB to TV
5	CLR_TEMP_R	115	128	73	Red colour temperature setting
6	CLR_TEMP_G	114	128	89	Green colour temperature setting
7	CLR_TEMP_B	128	128	128	Blue colour temperature setting
8	AUTO_COLOR	Press OK			PC: any pattern that has black and white, YPbPr: SMPTE bar (colour bar), any timing.
9	ADC_GAIN_R	0			Red ADC gain
10	ADC_GAIN_G	0			Green ADC gain
11	ADC_GAIN_B	0			Blue ADC gain
12	ADC_OFFSET_R	0			Red ADC offset
13	ADC_OFFSET_G	0			Green ADC offset
14	ADC_OFFSET_B	0			Blue ADC offset
15	VIRGING_MODE	off			Use this to return the set to virgin mode. Depends whether the set has been used already.
16	E_Fuse	on			E-fuse mode
17	ORT_MODE	off			ORT mode
18	AGEING_MODE	off			Use this for aging a new LCD panel
19	AUD_LIMITE_MODE	1			Three modes,0: off, 1: adaptive mode, 2: fixed mode
20	AUD_THRESHOLD_BYTE1	100			Limit threshold
21	AUD_THRESHOLD_BYTE2	200			Limit threshold
22	AUD_THRESHOLD_BYTE3	100			Limit threshold
23	AUD_GAIN_LINEIN	-9	-10	0	Line-in audio gain
24	AUD_GAIN_HDMI	-10	-10	0	HDMI audio gain
25	AUD_GAIN_ATV	-10	-10	10	Analogue TV audio gain
26	AUD_GAIN_DTV	-10	-10	10	Digital TV audio gain
27	AUD_GAIN_USB	0			USB audio gain
28	TUNER_ID	0			Displays and changes the Tuner ID with the left and right cursor. Not to be changed when the tuner is replaced with the correct service part.
29	CIPLUS QUERY	Press OK			Shows the Validity of the CI+ key and the supplier information
30	CIPLUS UPDATE	Press OK			Used to enter a new CI+ code into the NVM. This can only be used when no CI+ code exists in the NVM
31	CI Key Type Selection	ProductKey			CI Key Type Selection
32	AQ_TABLE_INDEX	1	2	1	Audio Quality index
33	EDID UPDATE	Press OK			Used to enter a new EDID codes into the NVM
34	Vx1 SSC Ratio	0.4%			LVDS SSC ratio
35	Vx1 SSC Freq	30KHz	30KHz	off SSC	LVDS SSC frequency
36	DDR MIU0 SSC Ratio	2%	2%	0%	DDR MIU0 SSC ratio
37	DDR MIU0 SSC Freq	30KHz	30KHz	off SSC	DDR MIU0 SSC frequency
38	DDR MIU1 SSC Ratio	2%	2%	0%	DDR MIU1 SSC ratio
39	DDR MIU1 SSC Freq	30KHz	30KHz	off SSC	DDR MIU1 SSC frequency
40	Panel H.Flip	off	off	off	Flip panel
41	Panel V.Flip	off	off	off	Flip panel
42	Panel ABSwap	off	off	off	ABSwap panel
43	Watchdog	5sec	5sec	off	Watchdog
44	Backlight PWM freq.(Hz)	150	150	150	Backlight PWM frequency
45	Backlight PWM Limit	2	2	20	Backlight PWM Limit
46	VGA_TxRx_Mode	off	off	off	VGA_TxRx_Mode
47	LVDS Driving	3	3	1	LVDS Driving



Item	Item value	Default value			Description
		43"	49"	55"	
48	LVDS Format	VESA 8bit			LVDS Format
49	Ziggo Aging	Press OK			Ziggo Aging
50	SPDIF	On			Enable/Disable SPDIF source
51	Standard PWM Gain	100	100	100	Standard PWM Gain
52	ECO PWM Gain	108	108	100	ECO PWM Gain
53	VGA port	off	off	on	Enable/Disable VGA port
54	Zero Detect Enable	on	on	off	Zero Detect Enable
55	Copy PQ table to TV	Press OK			Copy PQ table to TV
56	Copy AQ table to TV	Press OK			Copy AQ table to TV
57	Headphone	on	on	on	Enable/Disable Headphone source
58	EnhancedH/88	on	on	On	EnhancedH/88
59	Joystick Enable	On	On	Off	Joystick Enable
60	Ambilight Enable	Off	Off	Off	Ambilight Enable
61	Lounge Light Enable	Off	Off	Off	Lounge Light Enable
62	FRC F/W Upgrade	Press OK			FRC F/W Upgrade
63	Satellite Tuner Slave Address	Auto	Auto	0xC6	TUNER Address
64	912_SSC_LVDS_PERCENT	0			Percent of 912_SSC_LVDS
65	912_SSC_LVDS_FREQ	0			912_SSC_LVDS_FREQ
66	912_LVDS_DRIVING	0			912_LVDS_DRIVING
67	912_LVDS_FORMAT	JEDIA 8bit			The format for 912_LVDS
68	EXIF_FACTORY	Press OK			Exits the Factory mode

### How to Exit the Factory mode

Use one of the following methods:

- Select EXIT\_FACTORY from the menu and press the "OK" button.

**Note:** When the TV is switched "off" by a power interrupt, or normal switch to "stand-by" while in the factory mode, the TV will show up in "normal operation mode" as soon as the power is supplied again. The error buffer will not be cleared.

### 5.2.5 Customer Service Mode (CSM)

#### Purpose

The Customer Service Mode shows information on the TV's operation settings. The call centre can instruct the customer (by telephone) to enter CSM in order to identify the status of the set. This helps the call centre to diagnose problems and failures in the TV set before making a service call.

The CSM is a read-only mode; therefore, modifications are not possible in this mode.

#### Specifications

- Ignore "Service unfriendly modes".
- Line number for every line (to make CSM language independent).
- Set the screen mode to full screen (all contents on screen is visible).
- After leaving the Customer Service Mode, the original settings are restored.
- Possibility to use "CH+" or "CH-" for channel surfing, or enter the specific channel number on the RC.

#### How to Activate CSM

To activate CSM, press the following key sequence on a standard remote control transmitter: "123654" (do not allow the display to time out between entries while keying the sequence). After entering the Customer Service Mode, the following items are displayed.

**Note:** Activation of the CSM is only possible if there is no (user) menu on the screen!

#### Contents of CSM

- **1.1 Set Type** This information is very helpful for a helpdesk/workshop as reference for further diagnosis. In this way, it is not necessary for the customer to look at the rear of the TV-set. Note that if an NVM is replaced or is initialized after corruption, this set type has to be re-written to NVM.

- **1.2 Production code** Displays the production code (the serial number) of the TV. Note that if an NVM is replaced or is initialized after corruption, this production code has to be re-written to NVM.
- **1.3 Installation date** Indicates the date of the first installation of the TV. This date is acquired via time extraction.
- **1.4 SSB** Gives an identification of the SSB as stored in NVM. Note that if an NVM is replaced or is initialized after corruption, this identification number has to be re-written to NVM. This identification number is the 12NC number of the SSB.
- **1.5 Display** 12NC NVM read/write.
- **1.6 PSU** 12NC NVM read/write.
- **2.1 Current Main SW** Displays the built-in main software version. In case of field problems related to software, software can be upgraded. As this software is consumer upgradeable, it will also be published on the internet.
- **2.2 Standby SW** Displays the built-in stand-by processor software version. Upgrading this software will be possible via USB.
- **2.3 Panel Code** Displays the Display Code number.
- **2.4 NVM version** Detects and displays NVM version.
- **3.1 Signal Quality** Analog/digital signal strength.
- **3.2 Child lock** Not active / active. This is a combined item for locks. If any lock (channel lock, parental lock) is active, it is indicated as "active".
- **3.3 HDCP keys** Indicates the validity of the HDMI keys (or HDCP keys). In case these keys are not valid and the customer wants to make use of the HDMI functionality, the SSB has to be replaced.

#### How to Navigate

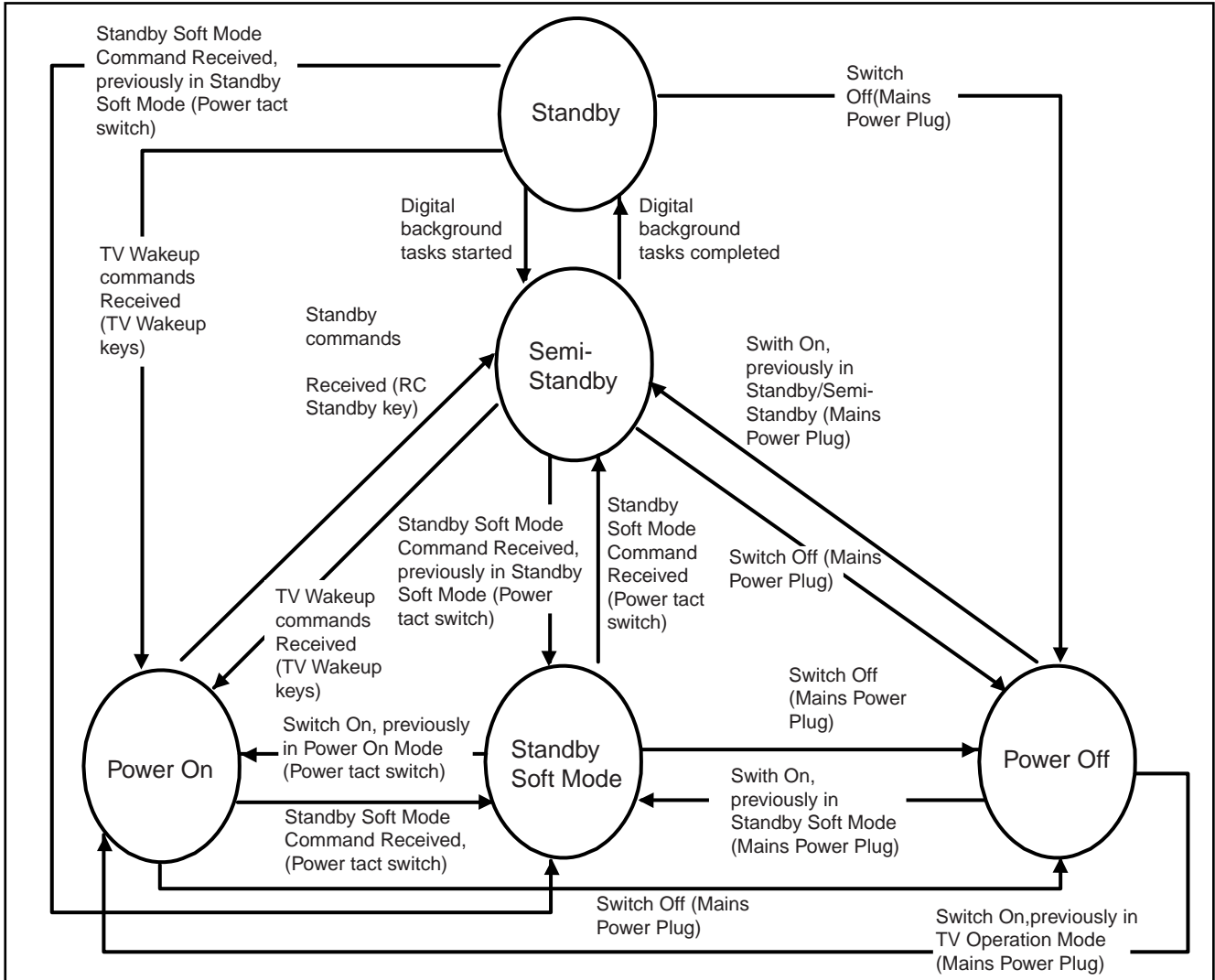
By means of the "CURSOR-DOWN/UP" knob (or the scroll wheel) on the RC-transmitter, can be navigated through the menus.

#### How to Exit CSM

To exit CSM, use one of the following methods.

- Press the MENU/HOME button on the remote control transmitter.
- Press the POWER button on the remote control transmitter.
- Press the POWER button on the television set.

5.3 Stepwise Start-up



19080\_206\_110323.eps  
120224

Figure 5-1 Stepwise Start-up

## 5.4 Service Tools

### 5.4.1 ComPair

#### Introduction

ComPair (Computer Aided Repair) is a Service tool for Philips Consumer Electronics products, and offers the following:

1. ComPair helps to quickly get an understanding on how to repair the chassis in a short and effective way.
2. ComPair allows very detailed diagnostics and is therefore capable of accurately indicating problem areas. No knowledge on I<sup>2</sup>C or UART commands is necessary, because ComPair takes care of this.
3. ComPair speeds up the repair time since it can automatically communicate with the chassis (when the micro processor is working) and all repair information is directly available.
4. ComPair features TV software up possibilities.

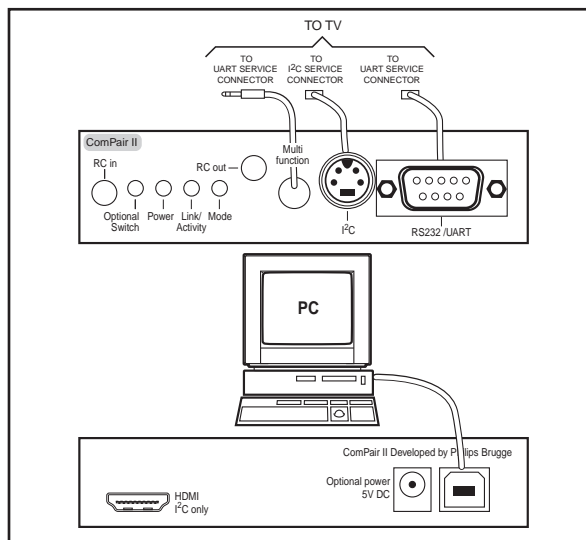
#### Specifications

ComPair consists of a Windows based fault finding program and an interface box between PC and the (defective) product. The ComPair II interface box is connected to the PC via an USB cable. For the TV chassis, the ComPair interface box and the TV communicate via a bi-directional cable via the service connector(s).

The ComPair fault finding program is able to determine the problem of the defective television, by a combination of automatic diagnostics and an interactive question/answer procedure.

#### How to Connect

This is described in the chassis fault finding database in ComPair.



10000\_036\_090121.eps  
091118

Figure 5-2 ComPair II interface connection

**Caution:** It is compulsory to connect the TV to the PC as shown in the picture above (with the ComPair interface in between), as the ComPair interface acts as a level shifter. If one connects the TV directly to the PC (via UART), ICs can be blown!

#### How to Order

ComPair II order codes:

- ComPair II interface: 3122 785 91020.
- Software is available via the Philips Service web portal.
- ComPair UART interface cable for TPM10.1x xx.  
(using DB9 to 2mm pitch JST connector): 3122 785 90630.

**Note:** When you encounter problems, contact your local support desk.

## 5.5 Software Upgrading

### 5.5.1 Description

It is possible for the user to upgrade the main software via the USB port. This allows replacement of a software image in a stand alone set. A description on how to upgrade the main software can be found in the DFU or on the Philips website.

### 5.5.2 Introduction

Philips continuously tries to improve its products, and it's recommend that the TV software is updated when updates are available. Software update files can be obtained from the dealer or can be downloaded from the following websites:  
<http://www.philips.com/support>

#### Preparing a portable memory for software upgrade

The following requirements have to be met:

1. A personal computer connected to the internet.
2. An archive utility that supports the ZIP-format (e.g. WinZip for Windows or Stuffit for Mac OS).
3. A FAT formatted USB memory stick (preferably empty).

#### Note:

1. Only FAT/DOS-formatted memory sticks are supported.
2. Only use software update files that can be found on the <http://www.philips.com/support> web site.

### 5.5.3 Check the current TV software version

Before starting the software upgrade procedure, it is advised to check that what the current TV software:

1. Press the "1 2 3 6 5 4" button on the remote control to enter the CSM mode.
2. Use the up/down cursor keys to select "Current Main Software".

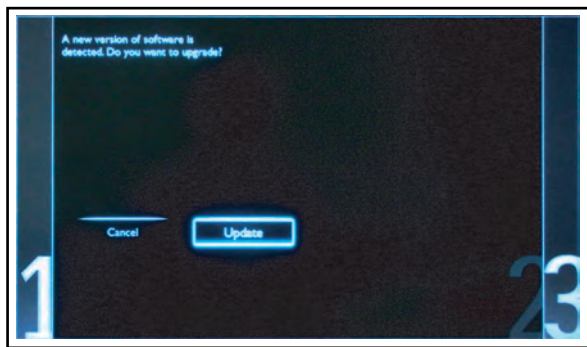
If the current software version of the TV is the same as the latest update file found on <http://www.philips.com/support>, it is not necessary to update the TV software.

### 5.5.4 Download the latest software

1. Open the internet page <http://www.philips.com/support>.
2. Find information and software related to the TV.
3. Select the latest software update file and download it to the PC.
4. Insert the USB memory stick into one of the USB ports of the PC.
5. Decompress the downloaded ZIP file and copy it to the root directory of the USB flash drive.

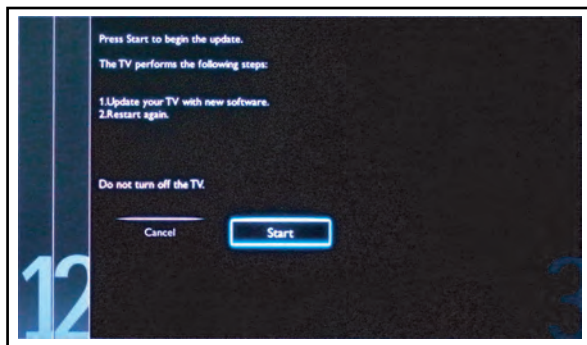
### 5.5.5 Update the TV software

1. Turn the TV on and wait for it to boot completely.
2. Insert the USB memory stick that contains the software update files in one of the TV's USB ports.
3. The TV will detect the USB memory stick automatically. Then a window jumps out as [Figure 5-3](#).  
**Note:** If the USB flash drive is not detected after power up, disconnect it and re-insert it.
4. Select [Update] and press OK. See [Figure 5-3](#).
5. To proceed, In next menu select [Start] and press OK to start software updates. See [Figure 5-4](#).
6. Upgrading will now begins and the status of the updating progress will be displayed.
7. When the TV software is updated. Remove your USB flash drive, then select [Restart] and press OK to restart the TV. See [Figure 5-5](#).



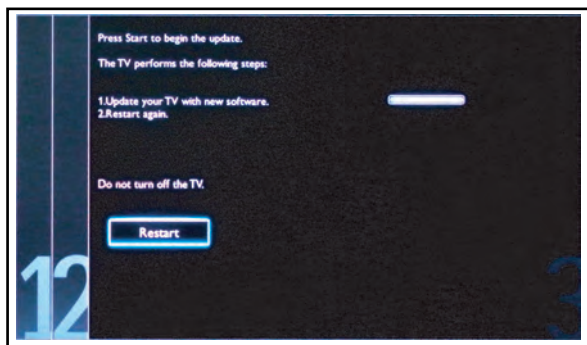
19080\_207\_110324.eps  
110324

Figure 5-3 Update the TV software [1/3]



19080\_208\_110324.eps  
110324

Figure 5-4 Update the TV software [2/3]



19080\_209\_110324.eps  
110324

Figure 5-5 Update the TV software [3/3]

#### Note:

- Do not remove the USB flash drive during the software update.
- If a power failure occurs during the update, do not remove the USB flash drive from the TV. The TV will continue the software update as soon as the power comes up again.
- If an error occurs during the update retry the procedure or contact the dealer.
- We do not recommend downgrading to an older version.
- Once the upgrade is finished, use the PC to remove the TV software from the USB portable memory.

#### 5.5.6 Content and Usage of the One-Zip Software File

Below you find a content explanation of the One-Zip file, and instructions on how and when to use it. Only files that are relevant for Service are mentioned here.

- **EDID\_clustername.zip:** Contains the EDID content of the different EDID NVMs. See ComPair for further instructions.

- **FUS\_clustername\_version.zip:** Contains the file downloaded which is needed to upgrade the TV main software and the software download application.
- **NVM\_clustername\_version.zip:** Default NVM content. Must be programmed via ComPair.

#### 5.5.7 How to Copy NVM Data to/from USB

When copying data to and from a USB memory stick, the folder "repair" is used. When inserting an empty USB memory stick, and downloading data to the stick, the TV will create this folder. When sending data from a USB memory stick to a TV, the intended data must be available in the "repair" folder. Note that when copying EDID data to the TV, all necessary EDID files must be in this folder. Service mode overview for your reference.

Table 5-3 Service mode overview

Service Modes	Description
SAM	Service alignment mode
Factory Mode	Used for extended alignments
SDM	Service default Mode
CSM	3-page compact CSM pages. There will be CSM dump to USB-stick upon entering CSM-mode
USB SW upgradeable	SW-upgrading of flash memories NT72666 can be done via USB. The main SW can be upgraded via the ZIP file downloaded.
NVM-Editor in SAM	NVM-editor will function as in the past: Address and Value field is a decimal value via digit entry
Service Data	New Service data in SAM for CTN, Prod. no., 12NC programming with virtual keyboard
USB copy/paste in SAM	Channel list, NVM data, Readable info, EDID
UART logging	There will be printout available in UART. No specifications of the printout, per MTK provision/definition.
Blind SAM	RC sequence "062598" + "Menu" + "Panel code"
Clear Buffer	RC sequence "062599" + "OK" or via SAM

## 5.6 The Blinking LED Procedure

### 5.6.1 Introduction

The software is capable of identifying different kinds of errors. These errors can be displayed by the blinking LED procedure. It is a useful function if the OSD is not working properly. The method is to repeatedly let the front LED pulse with as many pulses as the error code number, followed by a period of 1.5 seconds in which the LED is "off". Then this sequence is repeated.

**Example (1):** error code 4 will result in four times the sequence LED "on" for 0.25 seconds / LED "off" for 0.25 seconds. After this sequence, the LED will be "off" for 1.5 seconds. Any RC command terminates the sequence. Error code LED blinking is in red color.

## 5.7 Fault Finding and Repair Tips

### Note:

- It is assumed that the components are mounted correctly with correct values and no bad solder joints.
- Before any fault finding actions, check if the correct options are set.

### 5.7.1 NVM Editor

In some cases, it can be convenient if one directly can change the NVM contents. This can be done with the "NVM Editor" in SAM mode. With this option, single bytes can be changed.

### Caution:

- Do not change these, without understanding the function of each setting, because incorrect NVM settings may seriously hamper the correct functioning of the TV set!
- Always write down the existing NVM settings, before changing the settings. This will enable you to return to the original settings, if the new settings turn out to be incorrect.

### 5.7.2 Load Default NVM Values

It is possible to upload the default values to the NVM with ComPair in case the SW is changed, the NVM is replaced with a new (empty) one, or when the NVM content is corrupted. After replacing an EEPROM (or with a defective/no EEPROM), default settings should be used to enable the set to start-up and allow the Service Default Mode and Service Alignment Mode to be accessed.

### 5.7.3 No Picture

When you have no picture, first make sure you have entered the correct display code. See paragraph [6.4 Option Settings](#) for the instructions. See also [Table 6-3](#).

### 5.7.4 Unstable Picture via HDMI input

Check (via ComPair or factory mode) if HDMI EDID data is properly programmed.

### 5.7.5 No Picture via HDMI input

Check if HDCP key is valid. This can be done in CSM.

### 5.7.6 TV Will Not Start-up from Stand-by

Possible Stand-by Controller failure. Re-flash the software.

### 5.7.7 Audio Amplifier

The Class D-IC U606 has a powerpad for cooling. When the IC is replaced it must be ensured that the powerpad is very well pushed to the PWB while the solder is still liquid. This is needed to insure that the cooling is guaranteed, otherwise the Class D-IC could break down in short time.

### 5.7.8 CSM

When CSM is activated and there is a USB memory stick connected to the TV, the software will dump the complete CSM content to the USB memory stick. The file (Csm.txt) will be saved in the root of the USB memory stick.

### 5.7.9 Loudspeakers

Make sure that the volume is set to minimum during disconnecting the speakers in the ON-state of the TV. The audio amplifier can be damaged by disconnecting the speakers during ON-state of the set!

### 5.7.10 Display option code

Attention: In case the SSB is replaced, always check the Panel Code in CSM, even when picture is available. Performance with the incorrect display option code can lead to unwanted side-effects for certain conditions.

## 6. Alignments

### Index of this chapter:

- [6.1 General Alignment Conditions](#)
- [6.2 Hardware Alignments](#)
- [6.3 Software Alignments](#)
- [6.4 Option Settings](#)
- [6.5 Reset of Repaired SSB](#)

### 6.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- Power supply voltage: 90 - 264 V<sub>AC</sub>, 50/ 60 ± 3 Hz.
- Connect the set to the mains via an isolation transformer with low internal resistance.
- Allow the set to warm up for approximately 15 minutes.
- Measure voltages and waveforms in relation to correct ground (e.g. measure audio signals in relation to AUDIO\_GND).

**Caution:** It is not allowed to use heat sinks as ground.

- Test probe: R<sub>i</sub> > 10 MW, C<sub>i</sub> < 20 pF.
- Use an isolated trimmer/screwdriver to perform alignments.

### 6.2 Hardware Alignments

Not applicable.

### 6.3 Software Alignments

Put the set in SAM mode (see Chapter [5. Service Modes and Fault Finding](#)). The SAM menu will now appear on the screen. Select RGB Align and go to one of the sub menus. The alignments are explained below.

The following items can be aligned:

- White point.

To store the data:

- Press OK on the RC **before the cursor is moved to the left.**
- Select "Store" and press OK on the RC.
- Switch the set to stand-by mode.

For the next alignments, supply the following test signals via a video generator to the RF input:

- **EU/AP-PAL models:** a PAL B/G TV-signal with a signal strength of at least 1 mV and a frequency of 475.25 MHz
- **US/AP-NTSC models:** an NTSC M/N TV-signal with a signal strength of at least 1 mV and a frequency of 61.25 MHz (channel 3).
- **LATAM models:** an NTSC M TV-signal with a signal strength of at least 1 mV and a frequency of 61.25 MHz (channel 3).

#### 6.3.1 RGB Alignment

Before alignment, set the picture as follows:

Picture Setting	
Dynamic backlight	Off
Dynamic Contrast	Off
Color Enhancement	Off
Picture Format	Unscaled
Light Sensor	Off
Brightness	50
Color	0
Contrast	100

#### White Tone Alignment:

- Activate SAM.
- Select "RGB Align." and choose a color temperature.
- Use a 100% white screen as input signal and set the following values:
  - "Red BL Offset" and "Green BL Offset" to "7" (if present).
  - All "White point" values initial to "128".

In case you have a colour analyser:

- Measure with a calibrated (phosphor- independent) color analyser (e.g. Minolta CA-210) in the centre of the screen. Consequently, the measurement needs to be done in a dark environment.
- Adjust the correct x, y coordinates (while holding one of the White point registers R, G or B on max. value) by means of decreasing the value of one or two other white points to the correct x, y coordinates (see Table [6-1 White D alignment values](#)). Tolerance: dx: ± 0.003, dy: ± 0.003.
- Repeat this step for the other colour Temperatures that need to be aligned.
- When finished return to the SAM root menu and press STANDBY on the RC to store the aligned values to the NVM.

Table 6-1 White D alignment values

Value	Cool (11000 K)	Normal (9000 K)	Warm (6500 K)
x	0.276	0.287	0.313
y	0.282	0.296	0.329

If you do **not** have a colour analyser, you can use the default values. This is the next best solution. The default values are average values coming from production (statistics).

#### 6.3.2 Display Adjustment

You can use the default values. The default values are average values coming from production.

- Enter SAM mode.
- Select a colour temperature (e.g. COOL, NORMAL, or WARM).
- Set the RED, GREEN and BLUE default values according to the values in [Table 6-2](#).
- When finished press OK on the RC, then press STORE to store the aligned values to the NVM.
- Restore the initial picture settings after the alignments.

Table 6-2 White tone default settings

Picture mode	Screen size	Colour temperature		
		Red	Green	Blue
Normal (9000K)	43PUH4900/88	128	122	124
	43PUT4900/12	127	122	123
	43PUK4900/12	128	121	122
	43PUT4900/60	126	121	121
	49PUH4900/88	128	113	115
	49PUT4900/12	128	112	116
	49PUK4900/12	126	111	116
	49PUT4900/60	127	110	116
	55PUH4900/88	91	99	128
	55PUT4900/12	90	98	128
	55PUK4900/12	92	97	125
	55PUT4900/60	93	95	124
Cool (11000K)	43PUH4900/88	115	114	128
	43PUT4900/12	116	115	127
	43PUK4900/12	115	116	128
	43PUT4900/60	116	116	127
	49PUH4900/88	119	108	127
	49PUT4900/12	118	106	125
	49PUK4900/12	119	110	126
	49PUT4900/60	117	110	127
	55PUH4900/88	73	89	128
	55PUT4900/12	74	90	127
	55PUK4900/12	75	89	128
	55PUT4900/60	76	90	126

Picture mode	Screen size	Colour temperature		
		Red	Green	Blue
Warm (6500K)	43PUH4900/88	128	107	84
	43PUT4900/12	127	106	85
	43PUK4900/12	126	108	86
	43PUT4900/60	127	106	85
	49PUH4900/88	128	102	73
	49PUT4900/12	126	101	72
	49PUK4900/12	128	100	75
	49PUT4900/60	127	100	75
	55PUH4900/88	127	121	120
	55PUT4900/12	127	120	119
	55PUK4900/12	125	122	120
	55PUT4900/60	126	121	118

This group setting of colour temperature will be applied automatically to the TV / VGA / HDMI / AV sources.

## 6.4 Option Settings

### 6.4.1 Introduction

The microprocessor communicates with a large number of I<sup>2</sup>C ICs in the set. To ensure good communication and to make digital diagnosis possible, the microprocessor has to know which ICs to address. The presence / absence of these NT72567 ICs is made known by the option codes.

#### Notes:

- After changing the option(s), save them by pressing the OK button on the RC before the cursor is moved to the left, select STORE and press OK on the RC.
- The new option setting is only active after the TV is switched "off" / "stand-by" and "on" again with the mains switch (the NVM is then read again).

### 6.4.2 Option Code Overview

Enter SAM mode to check the option codes. they could not be edited in the NVM.

### 6.4.3 Display Code Overview

Press the following key sequence on a standard RC transmitter: "062598" directly followed by MENU and "xxx", where "xxx" is a 3 digit decimal value of the panel type: see column "Display Code" in [Table 6-3](#). After resetting the Display Code, restart the set immediately.

**Table 6-3 Display code overview**

CTN_ALT BOM#	Panel Type	Display Code
43PUH4900/88	TPT430U3-EQYSHM.G S1C NH	005
43PUT4900/12	TPT430U3-EQYSHM.G S1C NH	005
43PUK4900/12	TPT430U3-EQYSHM.G S1C NH	005
43PUT4900/60	TPT430U3-EQYSHM.G S1C NH	005
49PUH4900/88	TPT490U2-EQYSHM.G SC1C XM	004
49PUT4900/12	TPT490U2-EQYSHM.G SC1C XM	004
49PUK4900/12	TPT490U2-EQYSHM.G SC1C XM	004
49PUT4900/60	TPT490U2-EQYSHM.G SC1C XM	004
55PUH4900/88	TPT550U2-EQYSHM.G S1E XM	002
55PUT4900/12	TPT550U2-EQYSHM.G S1E XM	002
55PUK4900/12	TPT550U2-EQYSHM.G S1E XM	002
55PUT4900/60	TPT550U2-EQYSHM.G S1E XM	002

## 6.5 Reset of Repaired SSB

A very important issue towards a repaired SSB from a Service repair shop (SSB repair on component level) implies the reset of the NVM on the SSB.

A repaired SSB in Service should get the service Set type "00PF0000000000" and Production code "00000000000000".

Also the virgin bit is to be set. To set all this, you can use the ComPair tool or use the "NVM editor" and "Dealer options" items in SAM (do not forget to "store").

After a repaired SSB has been mounted in the set (set repair on board level), the type number (CTN) and production code of the TV has to be set according to the type plate of the set. For this, you can use the NVM editor in SAM. The loading of the CTN and production code can also be done via ComPair (Model number programming).

In case of a display replacement, reset the "Operation hours display" to "0", or to the operation hours of the replacement display.

#### Remark:

- After the NVM has been replaced, go to SAM and scroll to the <Reload MAC address> (see figure 1\*).
- Select the item and press <OK> on the RC.

### 6.5.1 Reset of Repaired SSB

#### Instruction

After NVM replacement, reload MAC address via SAM menu. This ensures the correct MAC address to be available in CSM for future repair actions.

#### Way of working:

- After the NVM has been replaced, go to SAM and scroll to the <Reload MAC address> .
- Select the item and press <OK> on the RC.

#### Notes:

- Only applicable to all related models that are "Smart TV level 0" enabled (only YouTube access). For models without internet connection feature, **no action** is needed.
- HDCP keys are located in the NVM. If you are loading NVM with the ComPair tool, there is warning message displayed.

New NVM EEPROMs are shipped with pre-loaded HDCP keys.

### 6.5.2 SSB Identification

SSB's of this chassis are identified by a "715" code on the SSB. 715Axxxx-Nnn-MMM-O000

- **715** main category, Printed Wiring Board
- **Axxxx** sub category, sequential coding number
- **Nnn** Version code
  - **N** Development number
  - **nn** Production number
- **MMM** Mounting variation code
- **O000** Optional variation code

Make sure when replacing an SSB the SSB identification codes match the replacement panel.

## 7. Circuit Descriptions

### Index of this chapter:

- [7.1 Introduction](#)
- [7.2 Power Supply](#)
- [7.3 DC/DC Converters](#)
- [7.4 Front-End Analogue and DVB-T, DVB-C: ISDB-T reception](#)
- [7.5 Front-End DVB-S\(2\) reception](#)
- [7.6 HDMI](#)
- [7.7 Video and Audio Processing - NT72666MBG-BA](#)

### Notes:

- Only **new** circuits (circuits that are not published recently) are described.
- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the wiring, block (see chapter [9. Block Diagrams](#)) and circuit diagrams (see chapter [10. Circuit Diagrams and PWB Layouts](#)). Where necessary, you will find a separate drawing for clarification.

### 7.1 Introduction

The TPN15.2E LA is a new chassis launched in Europe in 2015. The whole range is covered by NT72666 platform. The major deltas versus its predecessor support DVB-TC; DVB-TC/T2; DVB-TC/S2 with also 4K, multi-media, USB3.0, ARC, CEC function.

The TPN15.2E LA chassis comes with the following stylings:

- series xxPxx4900

#### 7.1.1 Implementation

Key components of this chassis are:

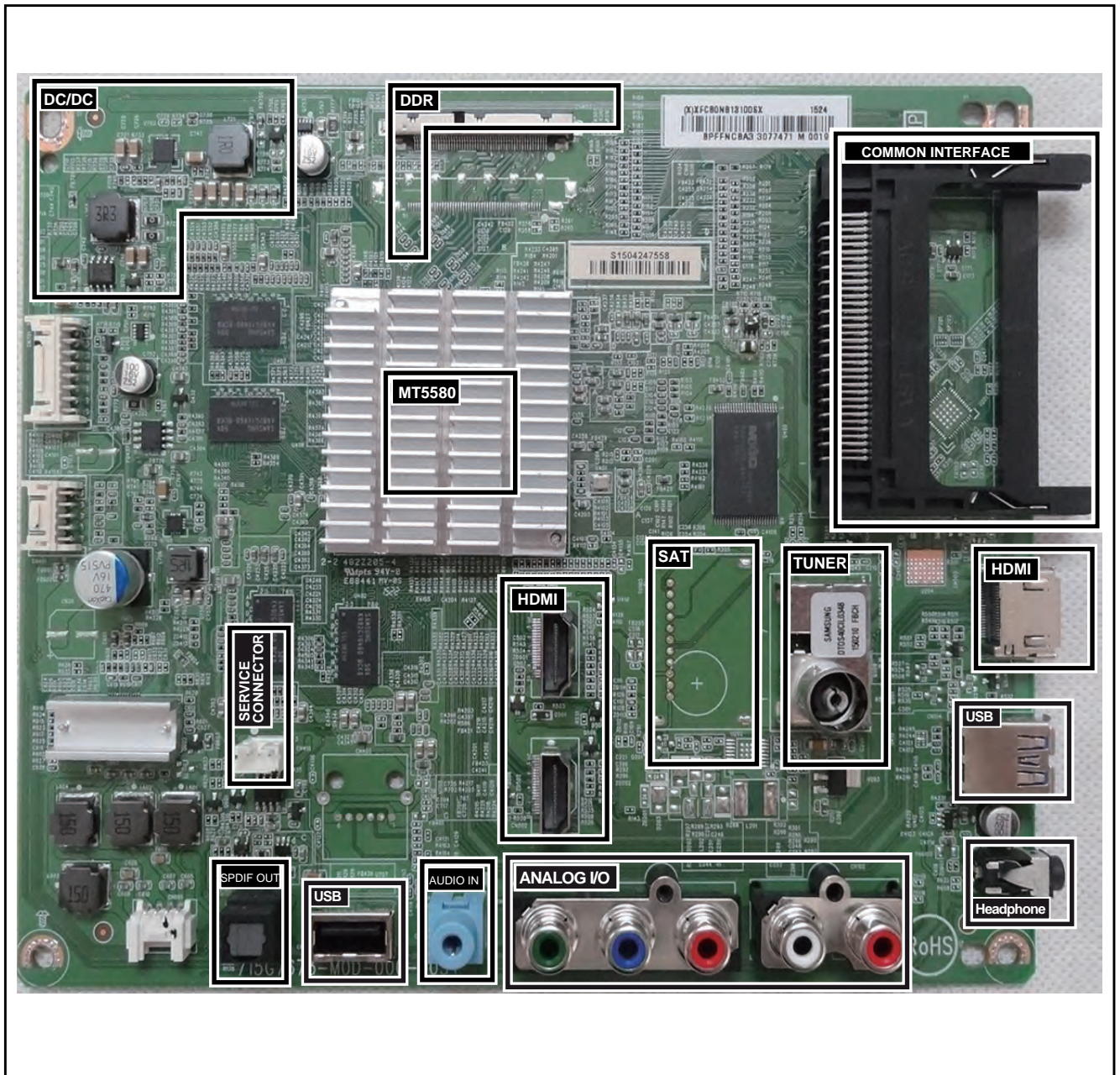
- Scaler NT72666BG-BA/D HS-PBGA-1135
- TUNER EU DTOS40CIL034B for T&H&K
- TUNER EUROPE TDQS-A751F for K
- DEMODULATOR NT78822QG/A QFN-48)
- NAND FLASH MX30LF2G18AC-TI 2Gb TSOP-48
- DRAM K4B2G1646Q-BCK0 2Gb FBGA-96
- AUDIO AD87588-LG48NAY 20W E-LQFP-48 150

#### 7.1.2 TPN15.2E LA Architecture Overview

For details about the chassis block diagrams refer to [9. Block Diagrams](#). An overview architecture can be found in [Figure 9.1](#).



## 7.1.3 SSB Cell Layout

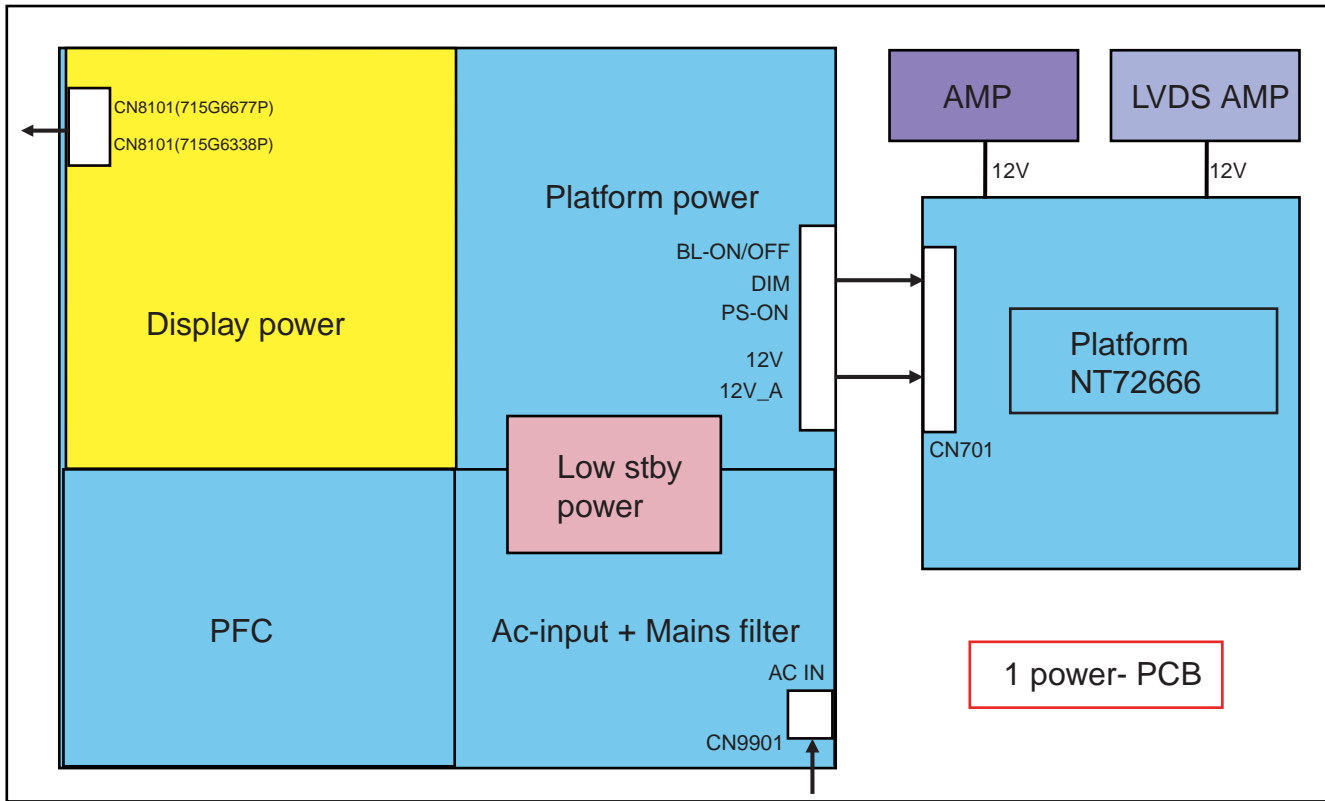


19970\_200.eps

Figure 7-1 SSB layout cells (top view)

## 7.2 Power Supply

Refer to figure [Figure 7-2](#) for the power architecture of this platform.



19970\_201.eps

Figure 7-2 Power Architecture

### 7.2.1 Power Supply Unit

All power supplies are a black box for Service. When defective, a new board must be ordered and the defective one must be returned, unless the main fuse of the board is broken. Always replace a defective fuse with one with the correct specifications! This part is available in the regular market. Consult the Philips Service web portal for the order codes of the boards.

Important delta's with the TPN15.2E LA classis platform are:

- New power architecture for LED backlight
- "Boost"-signal is now a PWM-signal + continuous variable.

The control signals are:

- PS\_ON
- Lamp "on/off"
- DIM (PWM) (not for PSDL)

In this manual, no detailed information is available because of design protection issues.

The output voltages to the chassis are:

- 8.5V(Stand-by mode for 715G6677)
- 3.5V(Stand-by mode for 715G6973)
- +12V (on-mode)
- +12V\_audio (audio power)
- +35V VLED output(on-mode for 715G6677)
- +37.4V VLED output(on-mode for 715G6973)
- Output to the display; in case of
  - IPB: High voltage to the LCD panel
  - PSL and PSLs (LED-driver outputs)
  - PSDL (high frequent) AC-current.

### 7.2.2 Diversity

The diversity in power supply units is mainly determined by the diversity in displays.

The following displays can be distinguished:

- CCFL/EEFL backlight: power panel is conventional IPB
- LED backlight:
  - side-view LED without scanning: PSL power panel
  - side-view LED with scanning: PSLs power panel
  - direct-view LED without 2D-dimming: PSL power panel
  - direct-view LED with 2D-dimming: PSDL power panel.

**PSL** stands for **Power Supply** with integrated LED-drivers. **PSLS** stands for a **Power Supply** with integrated LED-drivers with added **Scanning** functionality (added microcontroller). **PSDL** stands for a **Power Supply** for **Direct-view LED** backlight with 2D-dimming.

### 7.2.3 Connector overview

Table 7-1 Connector overview

Number	Connector			
	43" & 49"		55"	
	CN9303	CN8101	CN9101	CN8601
Descriptor	to SSB	to panel	to SSB	to panel
Pin	16	12	16	12
1	DIM	+VLED	DIM	VLED
2	On/off	n.c.	On/off	n.c.
3	PS_ON	-VLED1	PS_ON	LED1
4	3D_ON	-VLED1	3D_ON	LED1
5	GND	-VLED1	GND	LED1

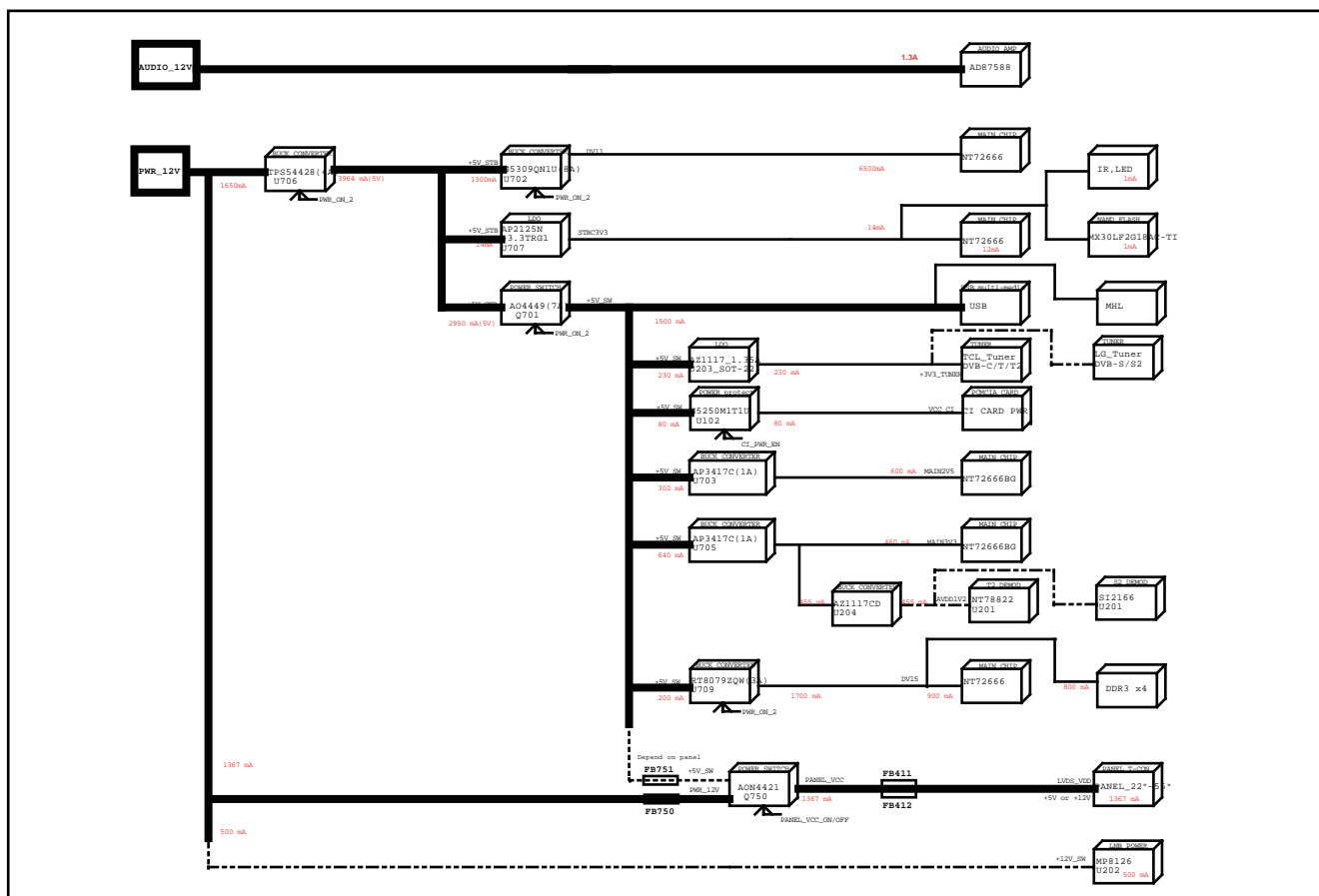
Number	Connector			
	43" & 49"		55"	
	CN9303	CN8101	CN9101	CN8601
Description	to SSB	to panel	to SSB	to panel
Pin	16	12	16	12
6	GND	n.c.	GND	n.c.
7	GND	n.c.	GND	n.c.
8	GND	-VLED2	GND	LED2
9	+12V-A	-VLED2	+12V-A	LED2
10	+12V-A	-VLED2	+12V-A	LED2
11	+12V	n.c.	+12V	n.c.
12	+12V	+VLED	+12V	VLED
13	+12V	-	+12V	-
14	+12V	-	+12V	-
15	+3.5V/5V	-	+3.5V	-
16	+3.5V/5V	-	+3.5V	-

- +5V-STANDBY, permanent voltage for the Stand-by controller, LED/IR receiver and controls.
- +12V, input from the power supply for the panel common(active mode)
- +12V, input from the power supply for the audio amplifier
- +1V5, from the power supply for the scaler IC NT72666
- +1V1, from the power supply for the scaler IC NT72666
- +3V3, from the power supply for the scaler IC NT72666
- +2V5, from the power supply for the scaler IC NT72666
- +1V5, supply voltage for DDR2 (diagram B03B)
- +5V, supply voltage for USB and CAM
- +3V3-TUN, supply voltage for tuner
- +5V\_SW, input intermediate supply voltage for USB
- +1V2\_T2, voltage for Tuner T2\_Decoder

Figures gives a graphical representation of the DC/DC converters with its current consumptions :

### 7.3 DC/DC Converters

The on-board DC/DC converters deliver the following voltages (depending on set execution):



19970\_202.eps

Figure 7-3 DC/DC converters

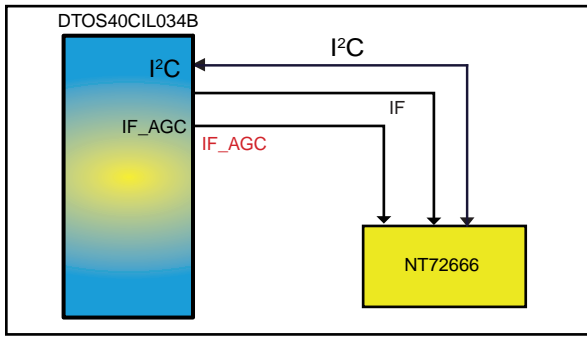
### 7.4 Front-End Analogue and DVB-T, DVB-C; ISDB-T reception

#### 7.4.1 Front-End Analogue and DVB-T/C part

The Front-End for DVB-T/C DTV part consist of the following key components:

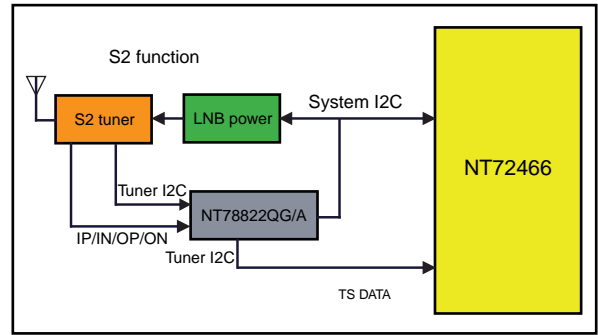
- TUNER EU DTOS40CIL034B
- SCALER NT72666BG-BA/D HS-PBGA-1135

Below find a block diagram of the front-end application for DVB-T/C DTV part.



19970\_203.eps

Figure 7-4 Front-End DVB-T/C DTV block diagram



19970\_205.eps

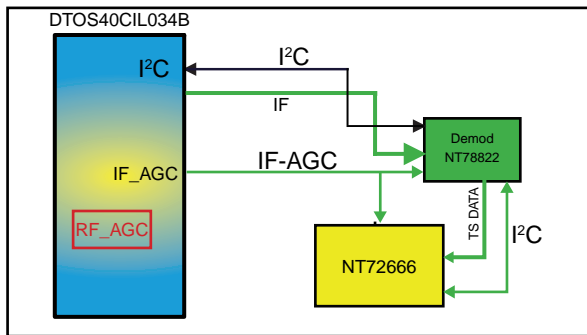
Figure 7-6 Front-End DVB-S2 DTV block diagram

7.4.2 DVB-T2 reception

The Front-End for DVB-T2 DTV part consist of the following key components:

- TUNER EUROPE DTOS40CIL034B
- SCALER NT72666BG-BA/D HS-PBGA-1135
- DEMODULATOR NT78822QG/A QFN-48 for DVB-T2 DTV part

Below find a block diagram of the front-end application for DVB-T2 DTV part.



19970\_204.eps

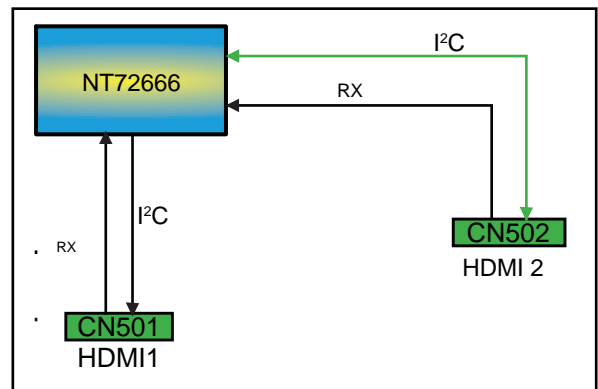
Figure 7-5 Front-End DVB-T2 DTV block diagram

7.5 Front-End DVB-S(2) reception

The Front-End for the DVB-S(2) application consist of the following key components:

- TUNER EUROPE TDQS-A751F for K
- SCALER NT78822QG/A QFN-48
- SCALER NT72666BG-BA/D HS-PBGA-1135

Below find a block diagram of the front-end application for DVB-S(2) reception.



19970\_206.eps

Figure 7-7 HDMI input configuration

The following HDMI connector can be used:

- HDMI 1: HDMI input ( TV digital interface support HDCP) with digital audio/PC DVI input/ARC
- HDMI 2: HDMI input ( TV digital interface support HDCP) with digital audio/PC DVI input
- +5V detection mechanism
- Stable clock detection mechanism
- HPD control
- Sync detection
- TMDS output control
- CEC control

7.7 Video and Audio Processing - NT72666MBG-BA

The NT72666 is the main audio and video processor (or System-on-Chip) for this platform. It has the following features:

- Support pixel format YUV420 only for all video codec except JPEG
- H.264 Constrained Baseline/Main/High Profiles @ 4K2Kp30(Level 5.0 and Level 5.1 under limited bit-rate)
- MVC Stereo High Profile @ 1080p60

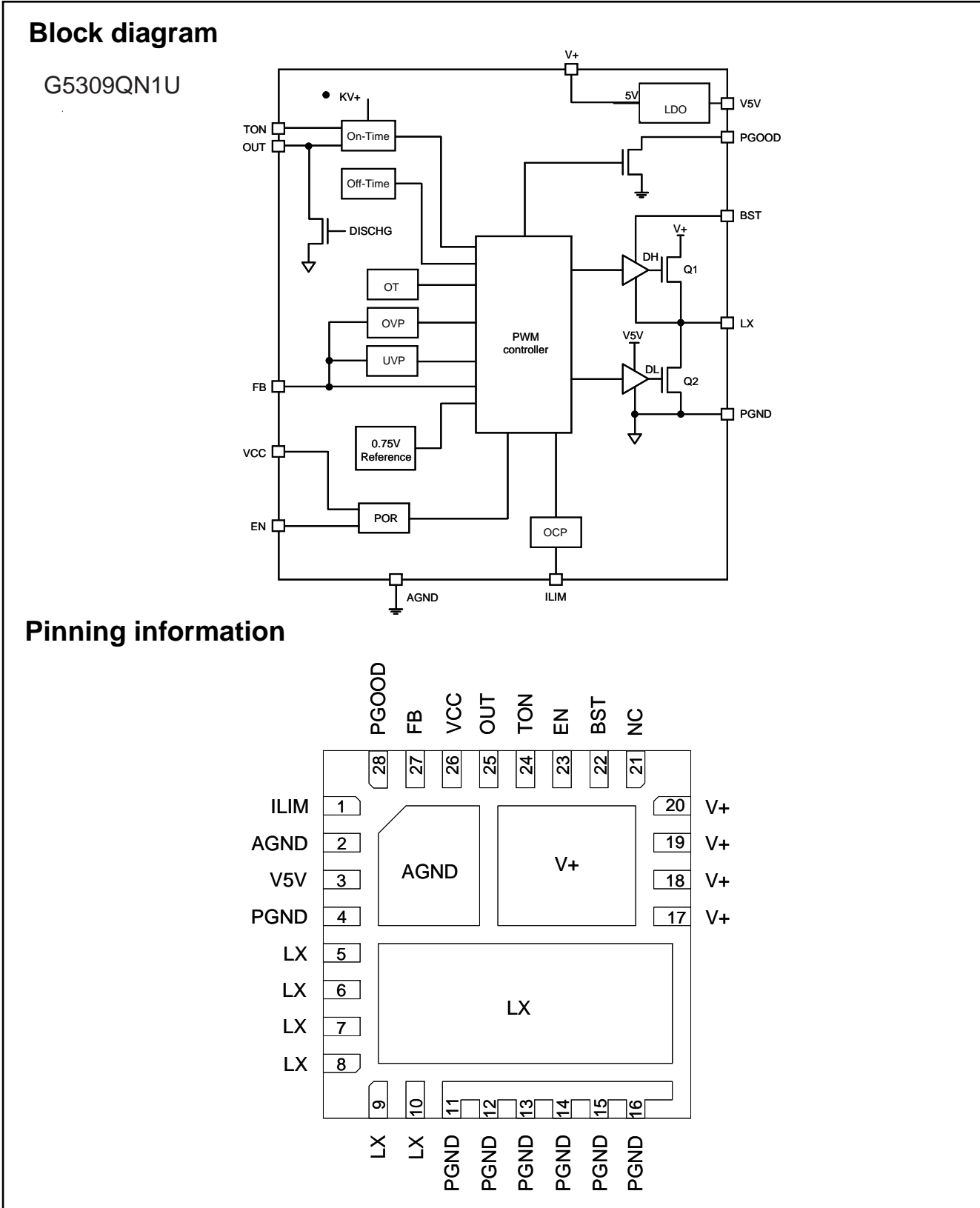
- VP8 All Profiles @ 1080p30
- AVS (Optional)Jizhun Profile @ 1080p30 (Level 6.0)
- VC-1 (Optional)Simple/Main/Advanced Profiles @ 1080p30 (Level 3.0)
- RealVideo (Optional)8/9/10 @ 1080p30
- MPEG-4 Simple/Advanced Simple Profiles @1080p30
- DivX1 3/4/5/6(Optional) @ 1080p30
- Support GMC with 1 warp point
- H.263 Profile 0 @ 1080p30
- Dedicated DSP to decode compressed audio
- 16KB instruction, 48KB data cache
- Supports digital audio format decoding
- MPEG-1/2 (Layer I/ II/ III), Dolby2.Digital (AC3) (Optional) , Dolby Digital Plus (EAC3) (Optional), AAC-LC, HE-AAC, WMA3 (Optional), WMA Pro(Optional), DTS4 (Optional), DTS-LBR(Optional)
- Supports Dolby Digital Plus(Optional) and MS10(Optional) multistream decoder, including Dolby Digital Encoder for transcoding streams to Dolby Digital 5.1
- Supports DTS Neo 2:5(Optional) to transcoding streams to DTS 5.1
- Advance sound processing: Automatic Volume Control, 5-band EQ, Automatic Gain Control, Virtual Surround
- Advance sound processing options available, for example: SRS5 (Optional)

The NT72666 is an smart TV system-on-chip which compliants with variety ATV as NTSC, PAL and SECAM, and DTV standards as ISDB-T, DVB-T/-C, ITU-T J.83B, 8VSB integrates DTV and multi-media AV decoder, SIF demodulator, and support A/V post-processing. The integrated video ADC and video decoder support PC VGA port, YPbPr, SCART, CVBS and S-Video Input. The video decoder supports universal TV video format. The integrated audio ADC supports stereo audio input corresponding to video input sources. The integrated TV sound decoder supports universal TV sound format. The advanced picture quality and color engine create more vivid image impression than ever. The HDMI receiver v1.4a, supports deep color, CEC features. The USB high speed host supports updating firmware code, multi-media playback from the external USB flash devices. The standby controller can operate sololy from the main system, powered by the standby power source from power module, consumes as low current as possible. It meets the requirement of Green appliance.

## 8. IC Data Sheets

This chapter shows the internal block diagrams and pin configurations of ICs that are drawn as “black boxes” in the electrical diagrams (with the exception of “memory” and “logic” ICs).

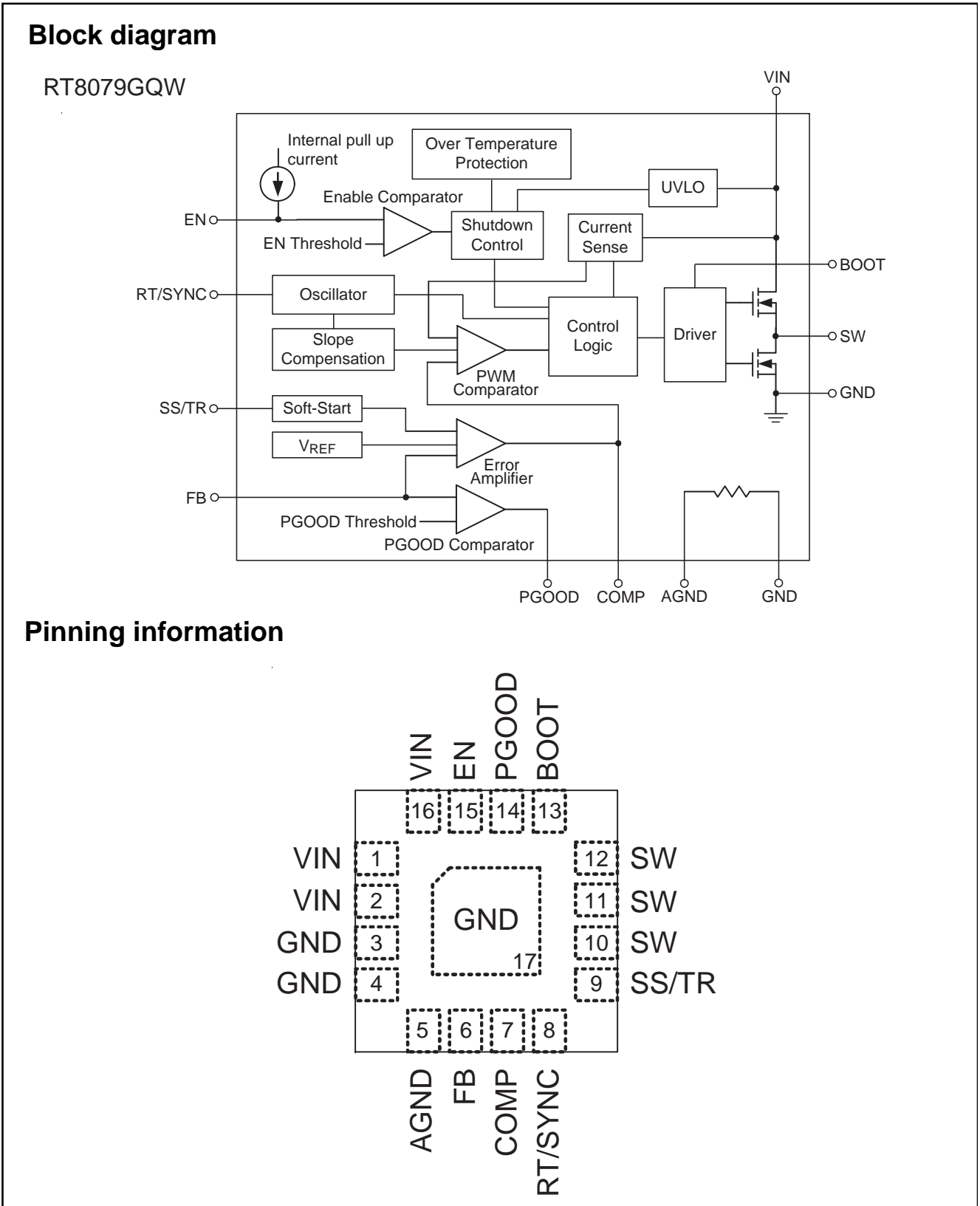
### 8.1 Diagram 10-3-1 System Power 1, B01, G5309QN1U (IC U702)



19970\_300.eps

Figure 8-1 Internal block diagram and pin configuration

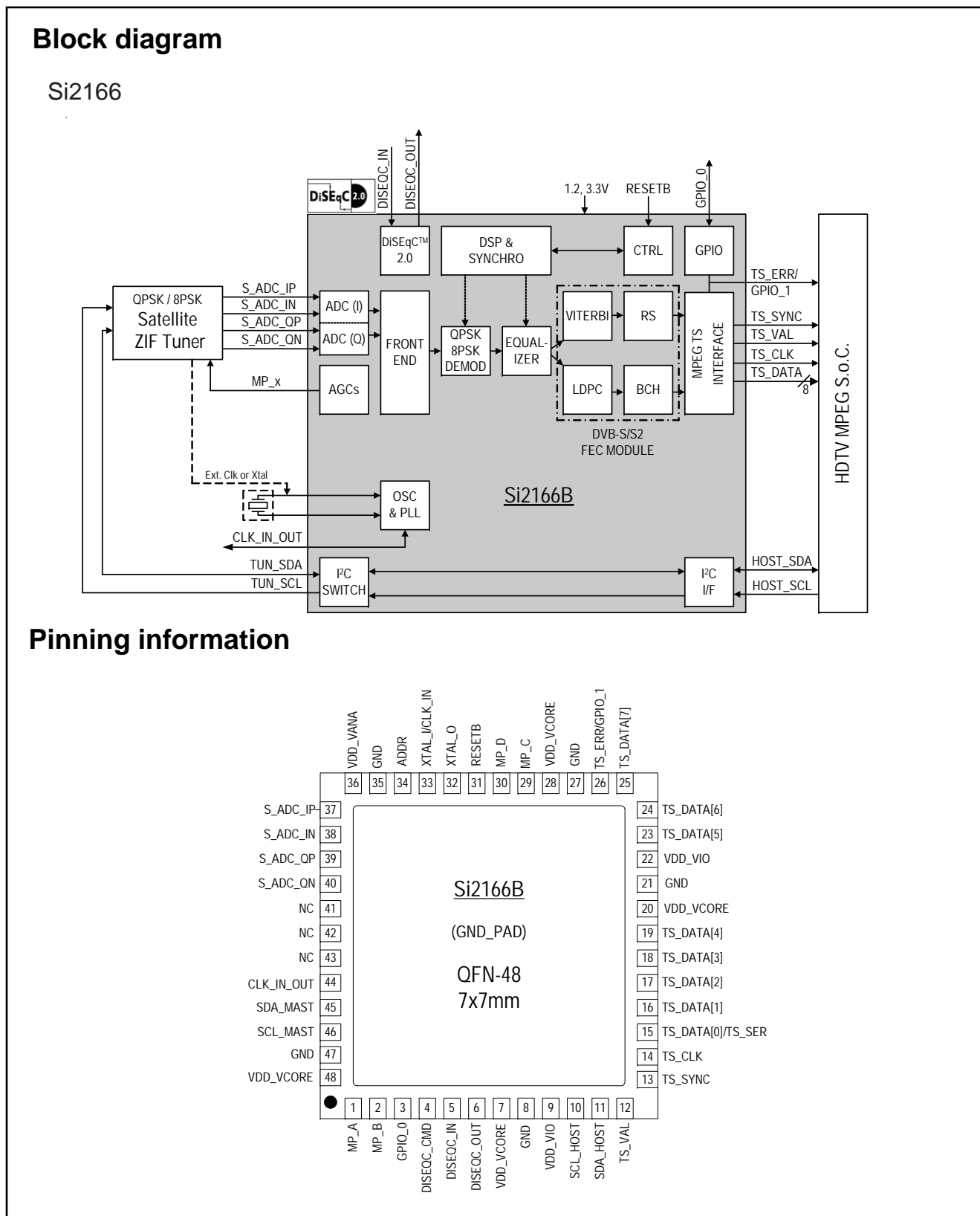
8.2 Diagram 10-3-2 System Power 2, B02, RT8079GQW (IC U709)



19970\_301.eps

Figure 8-2 Internal block diagram and pin configuration

8.3 Diagram [10-3-10 Tuner/Demodulator, B10, Si2166 \(IC U201\)](#)

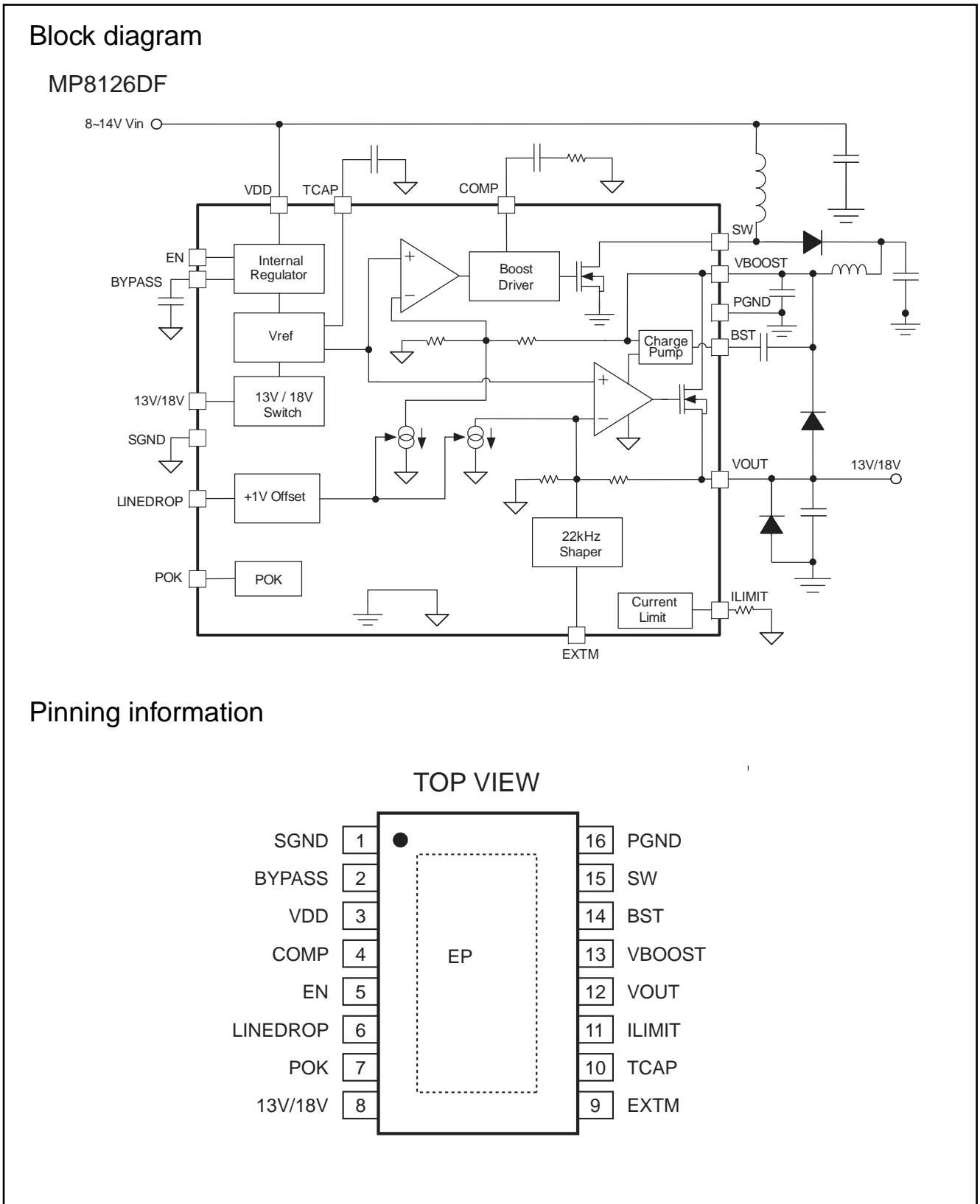


19970\_302.eps

Figure 8-3 Internal block diagram and pin configuration



8.4 Diagram [10-3-10 Tuner/Demodulator](#), B10, MP8126DF (IC U202)



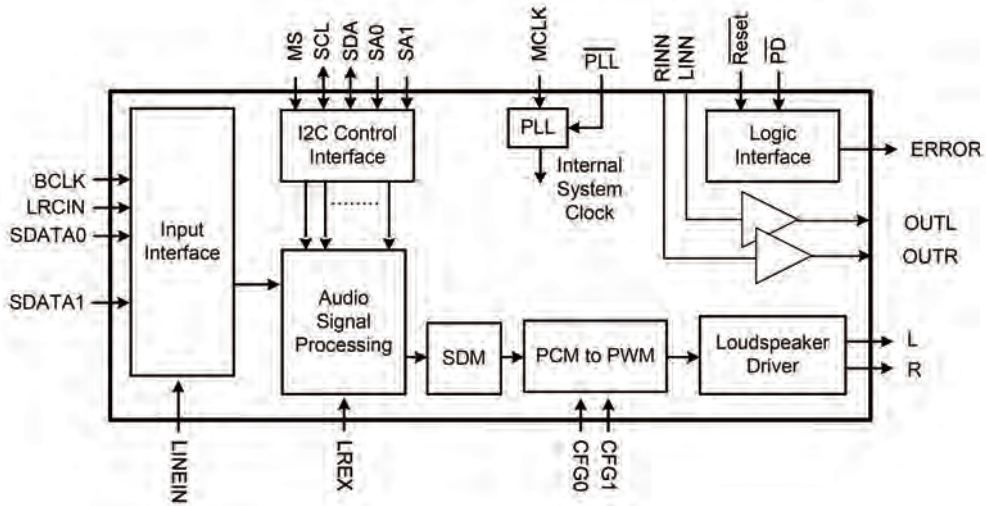
19790\_304.eps

Figure 8-4 Internal block diagram and pin configuration

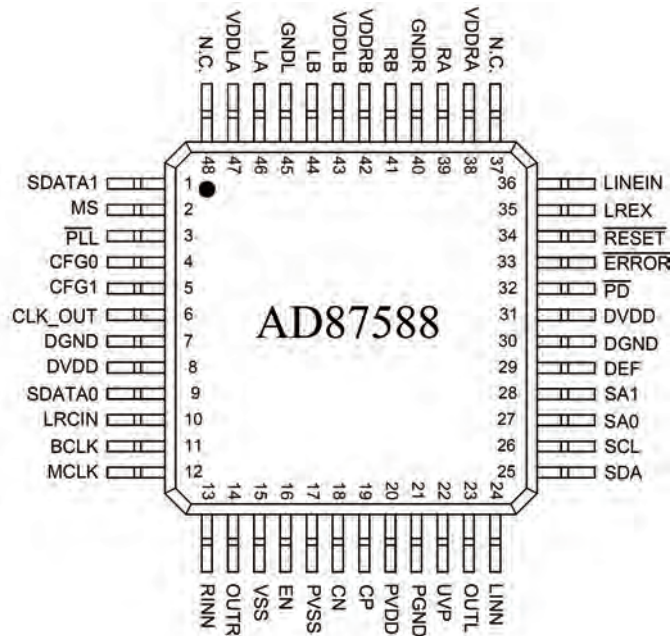
8.5 Diagram [10-3-11 SPK AMP/HP OUT, B11, AD87588 \(IC U601\)](#)

**Block diagram**

AD87588



**Pinning information**

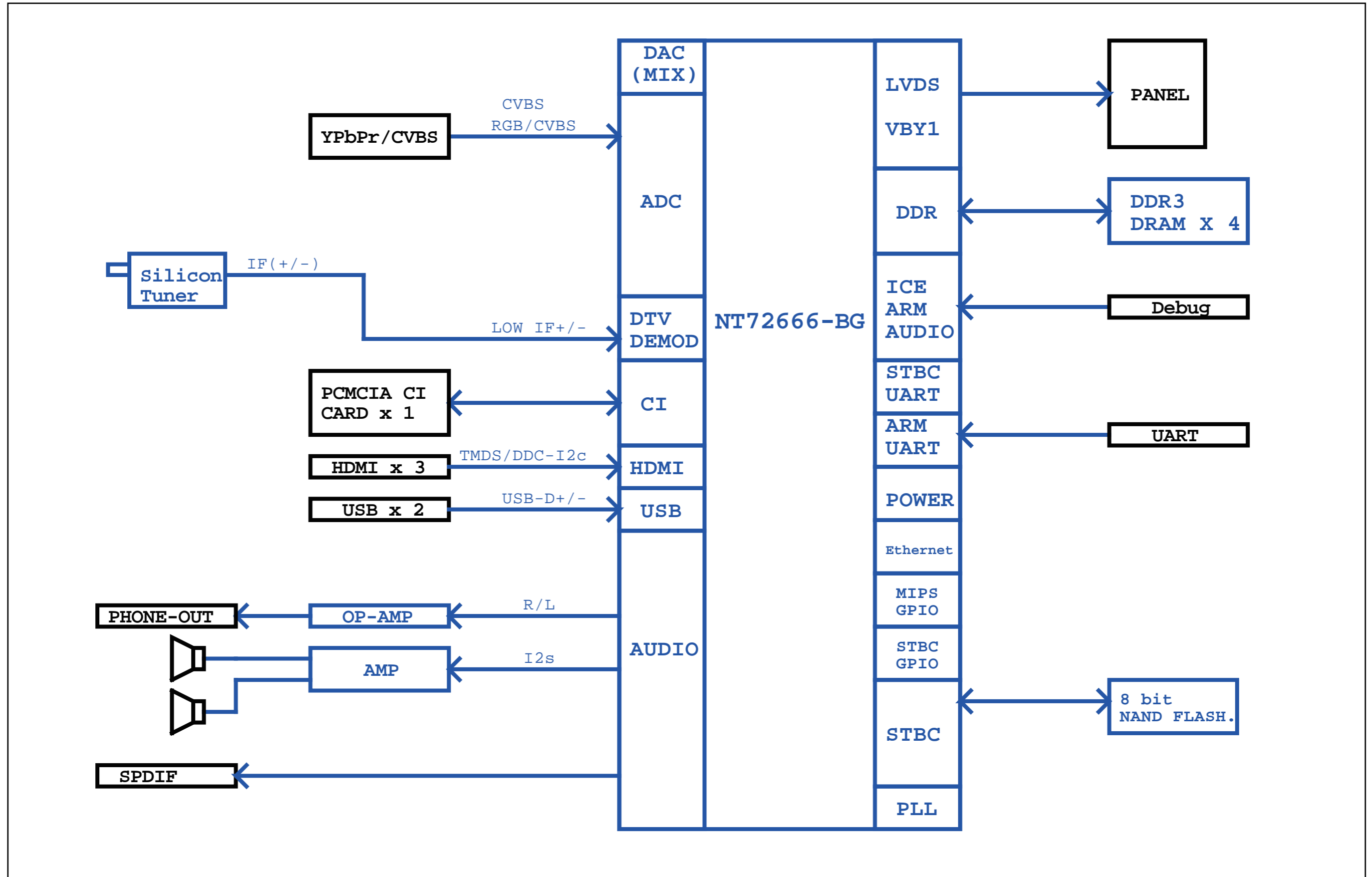


19790\_301.eps

Figure 8-5 Internal block diagram and pin configuration

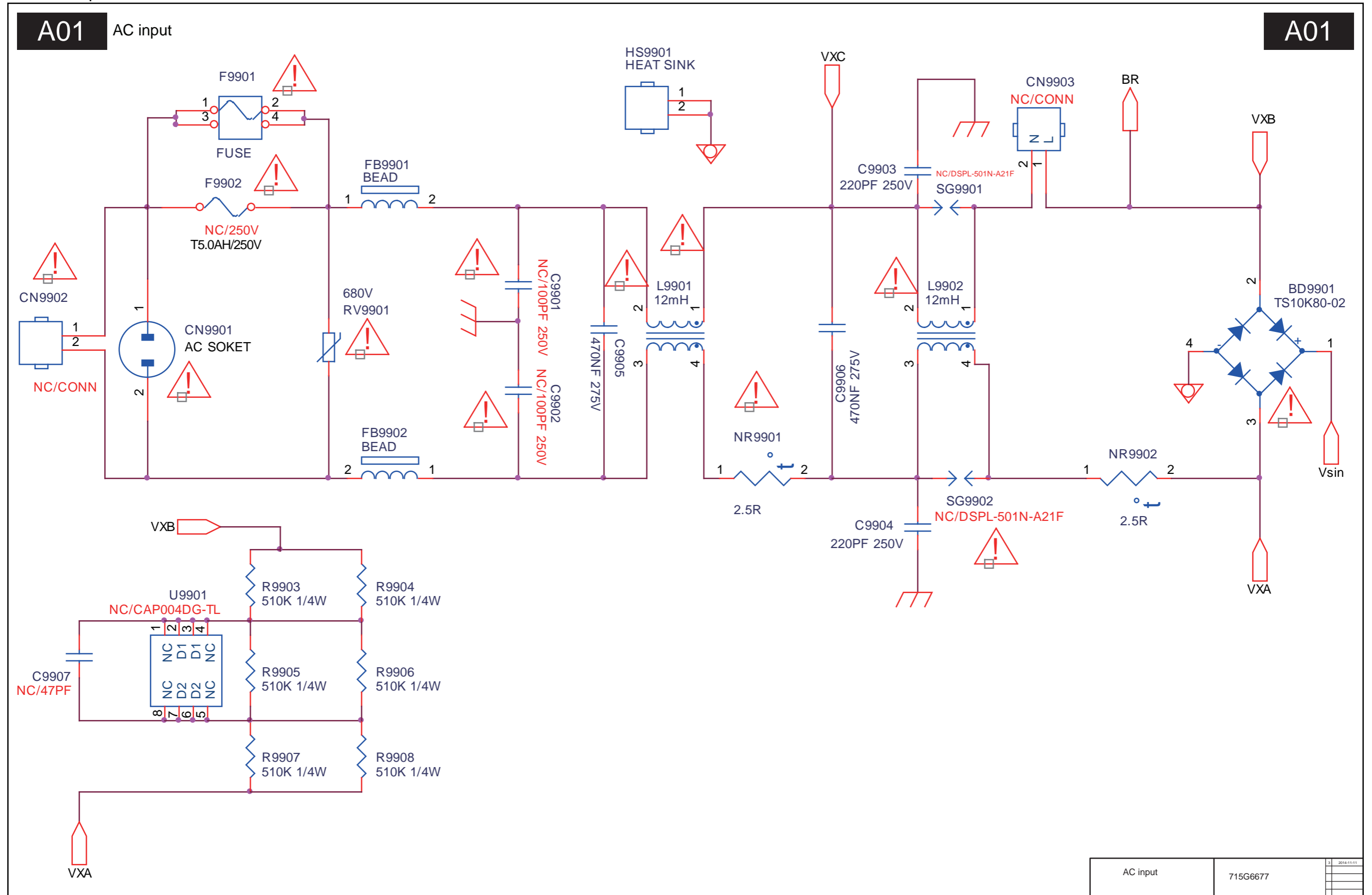
## 9. Block Diagrams

### 9.1 Block diagram 4900 series



# 10. Circuit Diagrams and PWB Layouts

## 10.1 A 715G6677 PSU 10-1-1 AC input



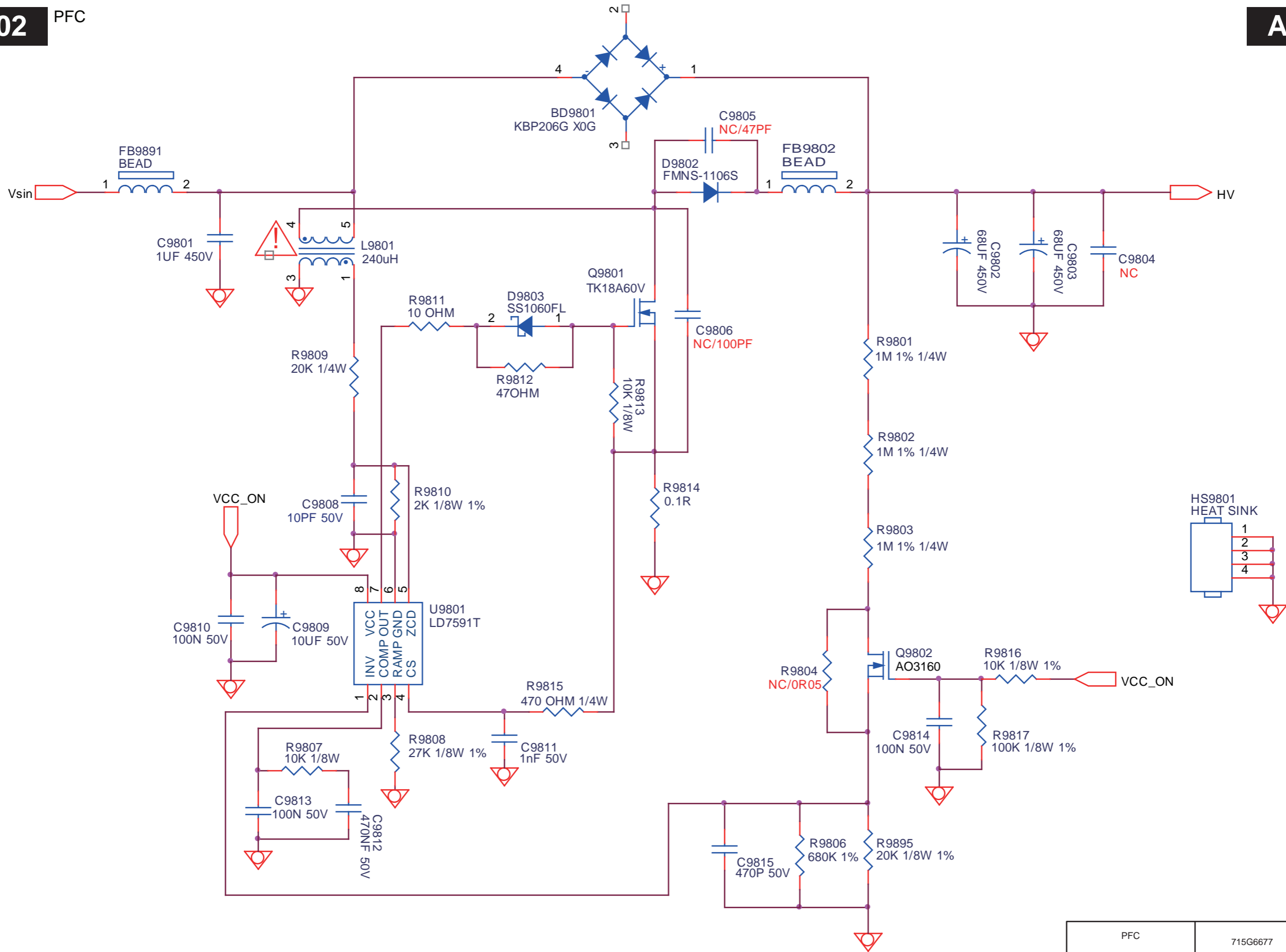
AC input	715G6677	3	2014-11-11

10-1-2 PFC

A02

PFC

A02



PFC	715G6677	2014-11-11

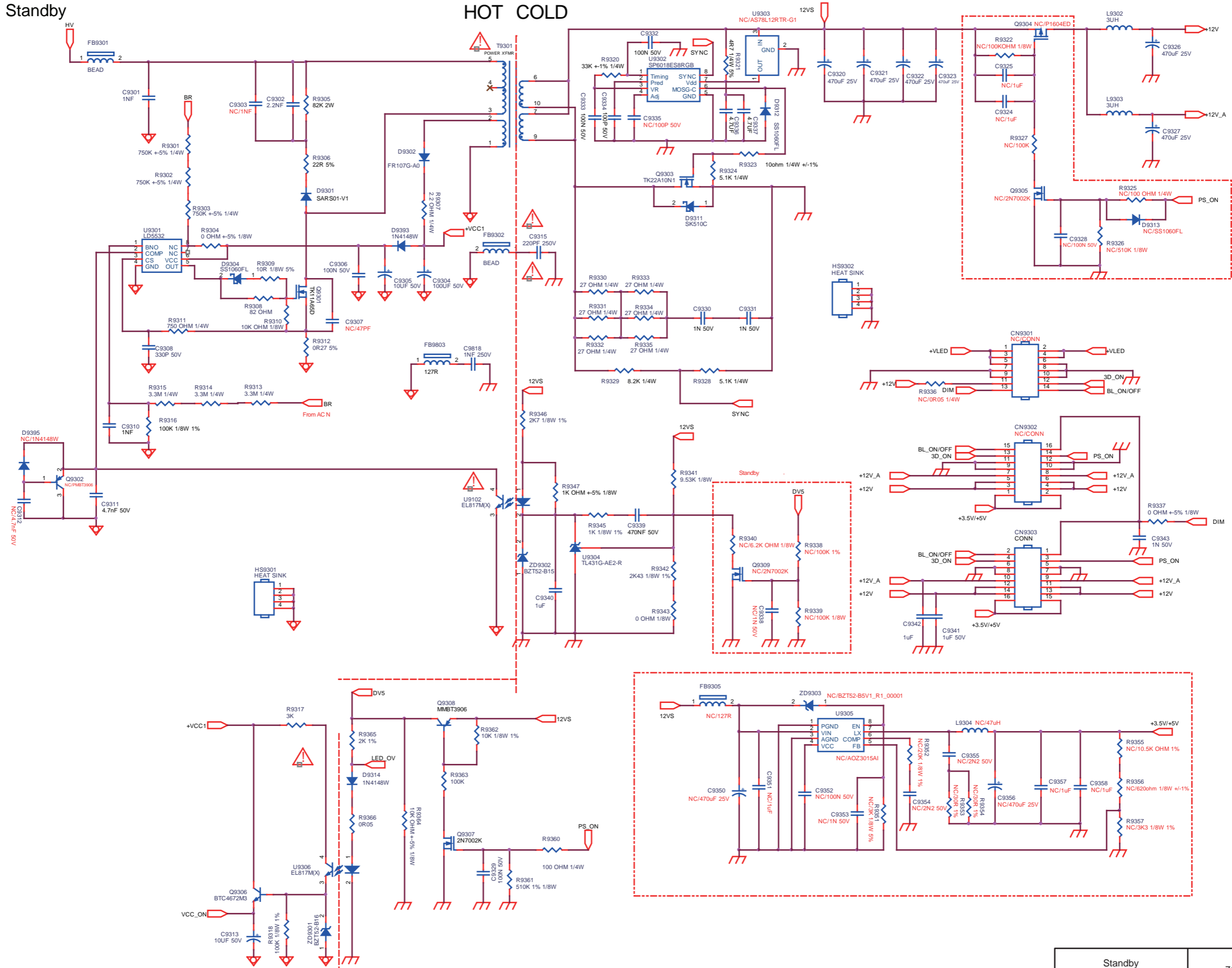
10-1-3 Standby

A03

Standby

HOT COLD

A03



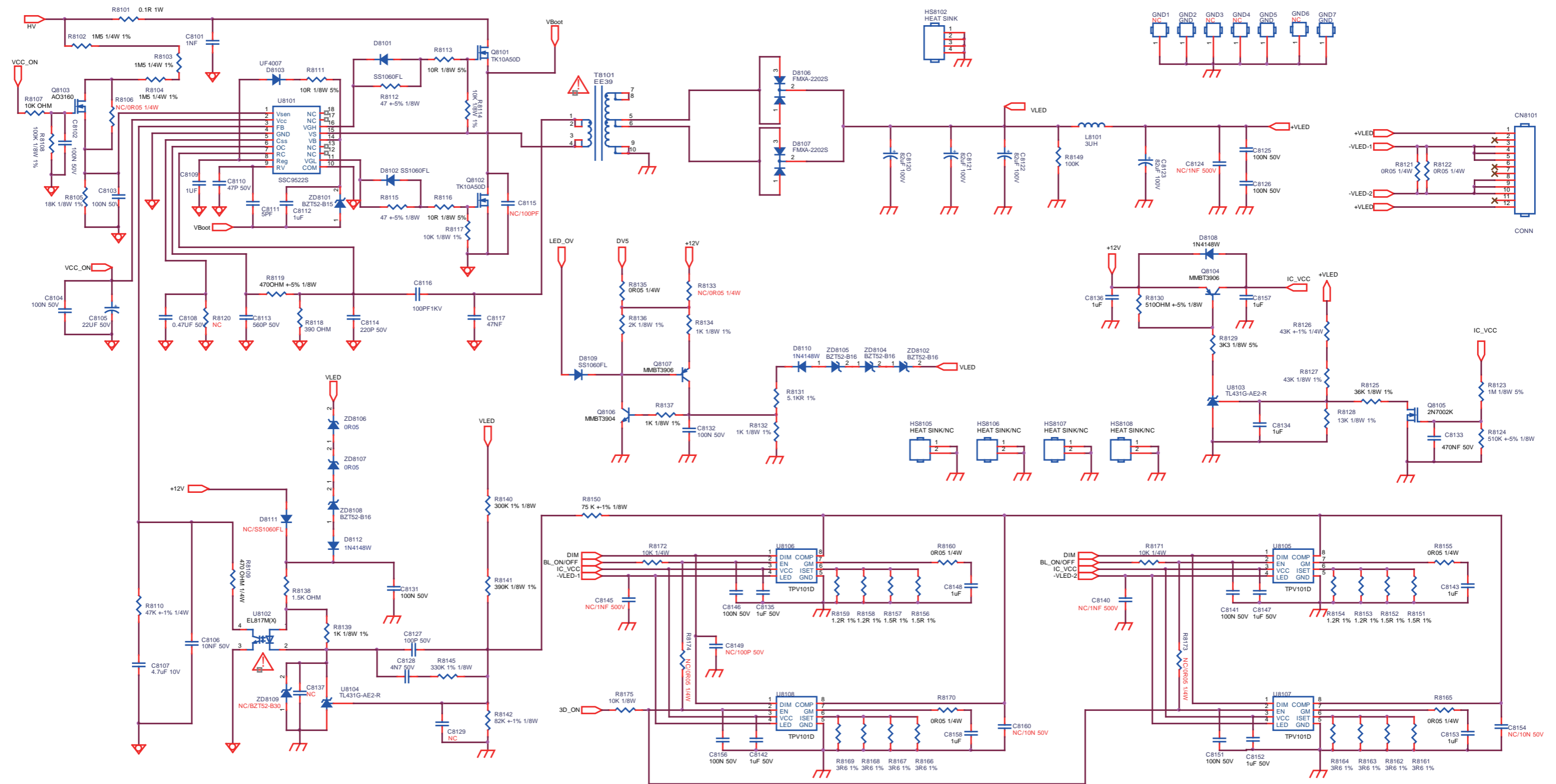
Standby	715G6677	2014-11-11
---------	----------	------------

10-1-4 LED

A04

LED

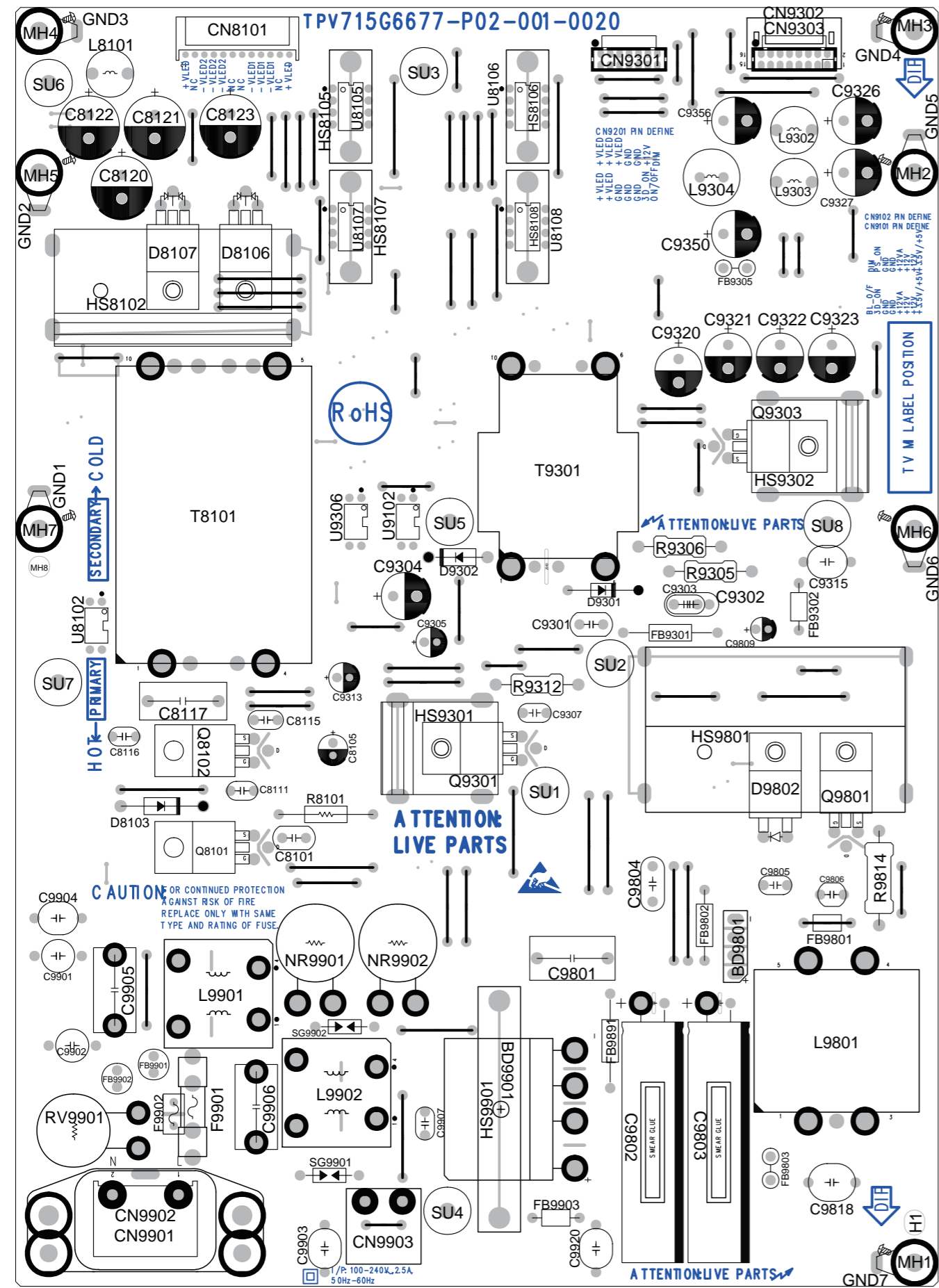
A04



LED	715G6677	2014-11-11

19820\_543.eps

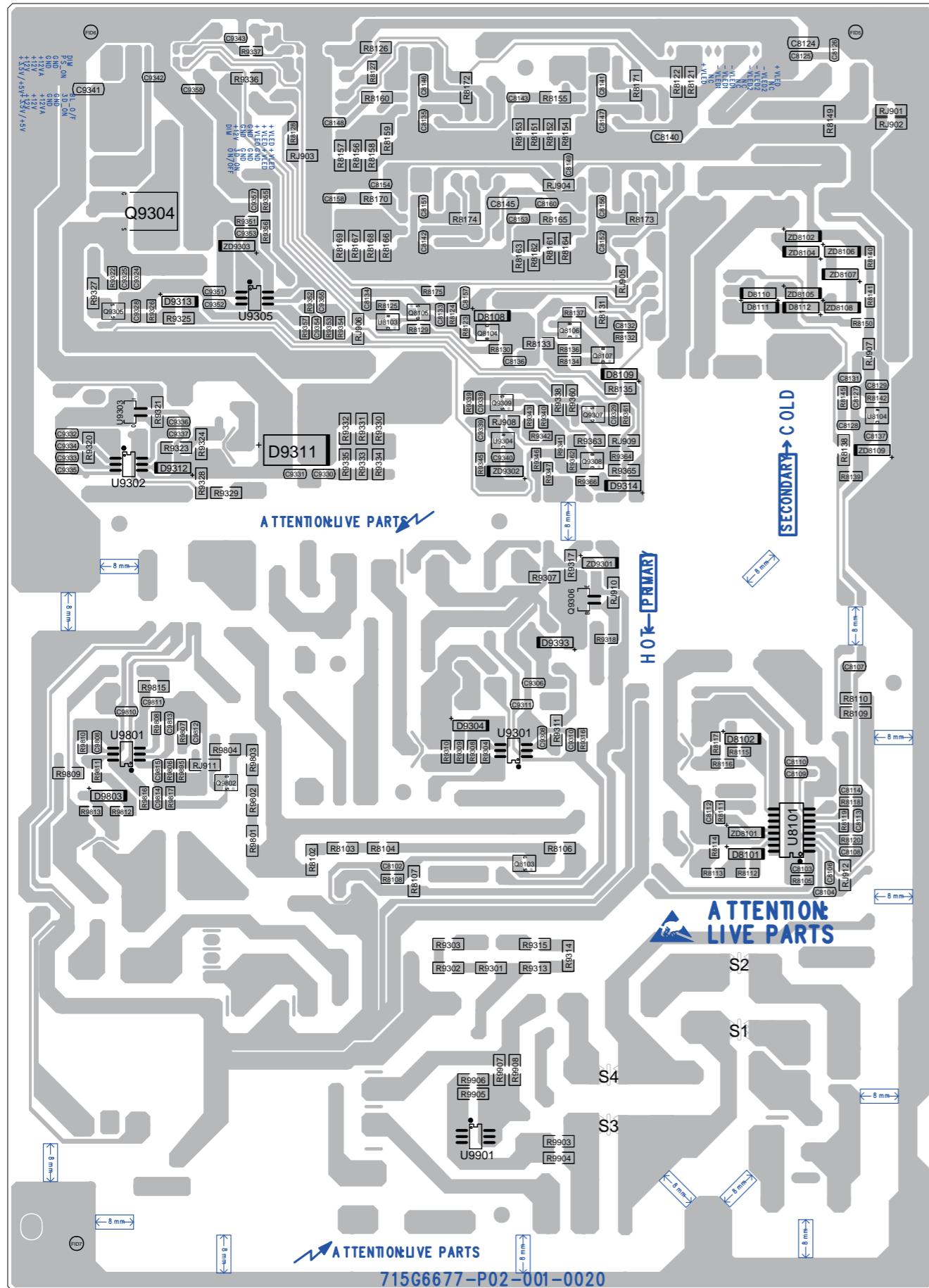
10-1-5 Power layout top



LAYOUT TOP	715G6677	2014-11-05



10-1-6 Power layout bottom



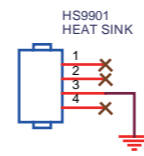
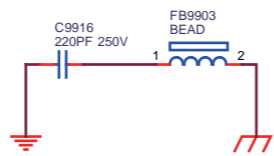
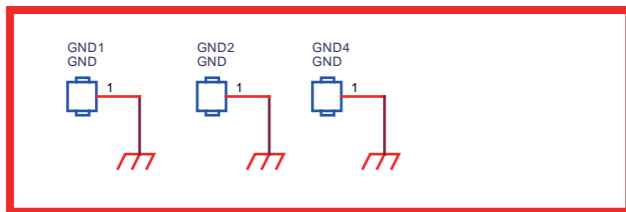
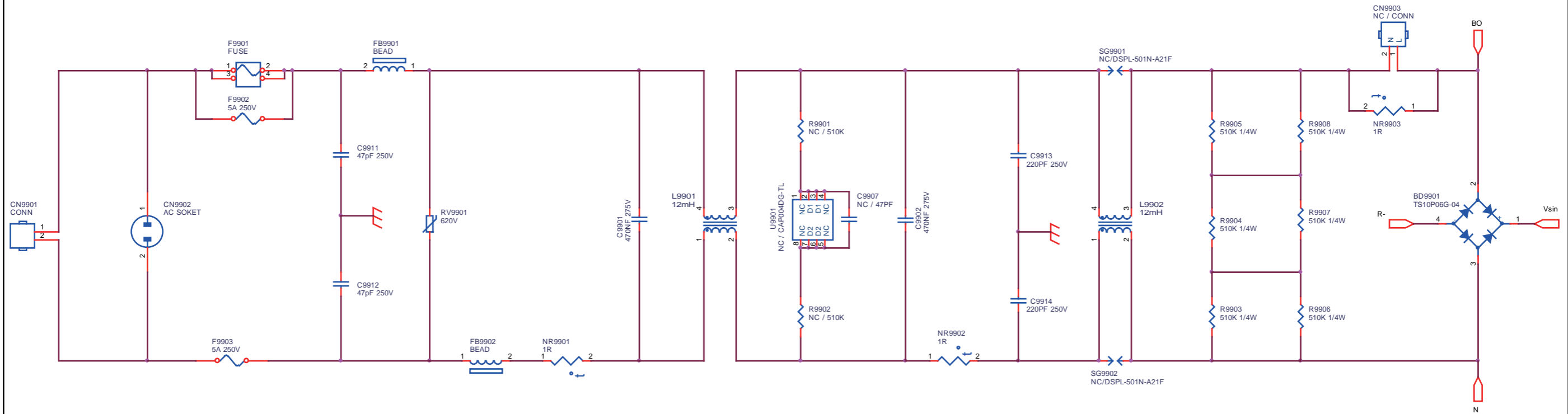
715G6677-P02-001-0020

LAYOUT BOTTOM	715G6677	2014.11.08

**10.2 A 715G6973 PSU**  
10-2-1 AC input

**A01** AC input

**A01**

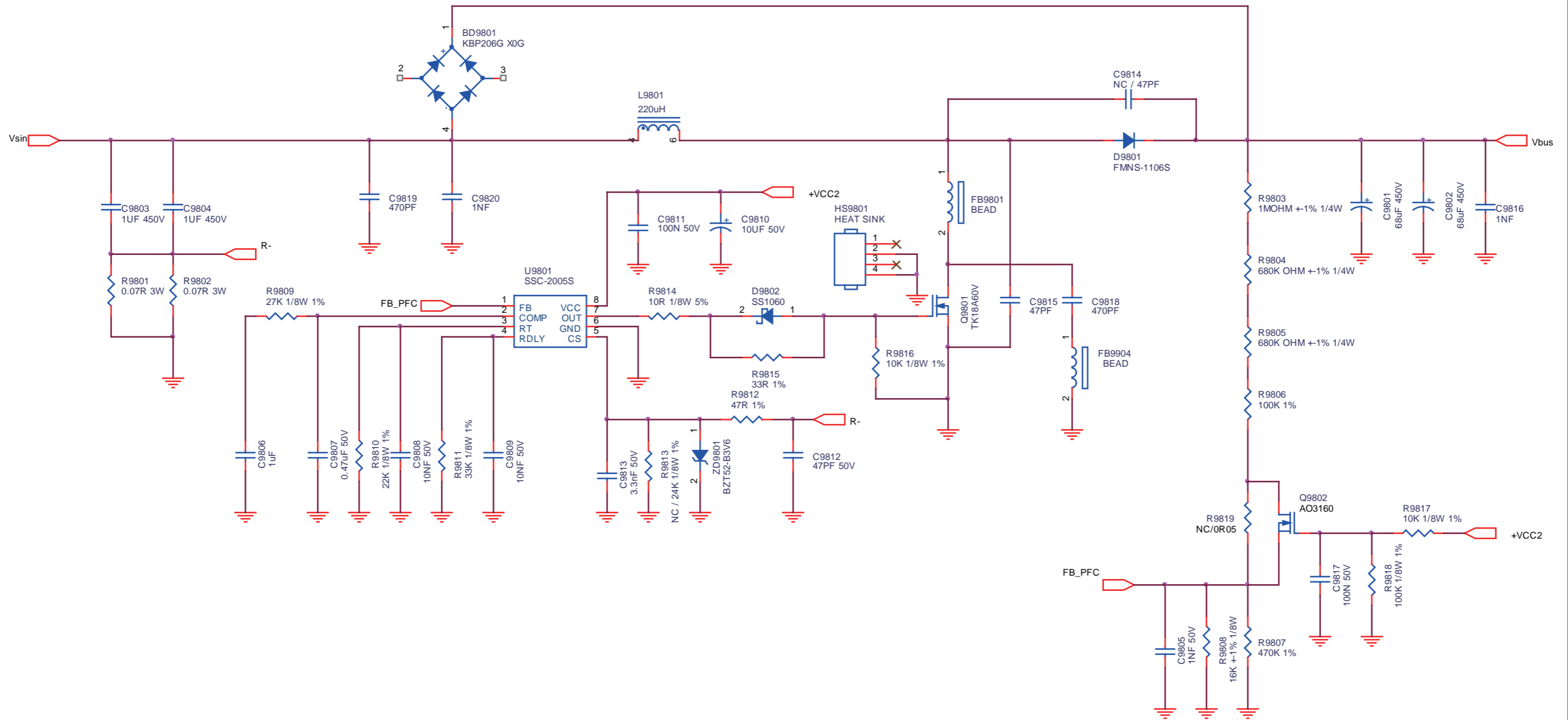


AC input	715G6973	2014-12-08

10-2-2 PFC

A02 PFC

A02

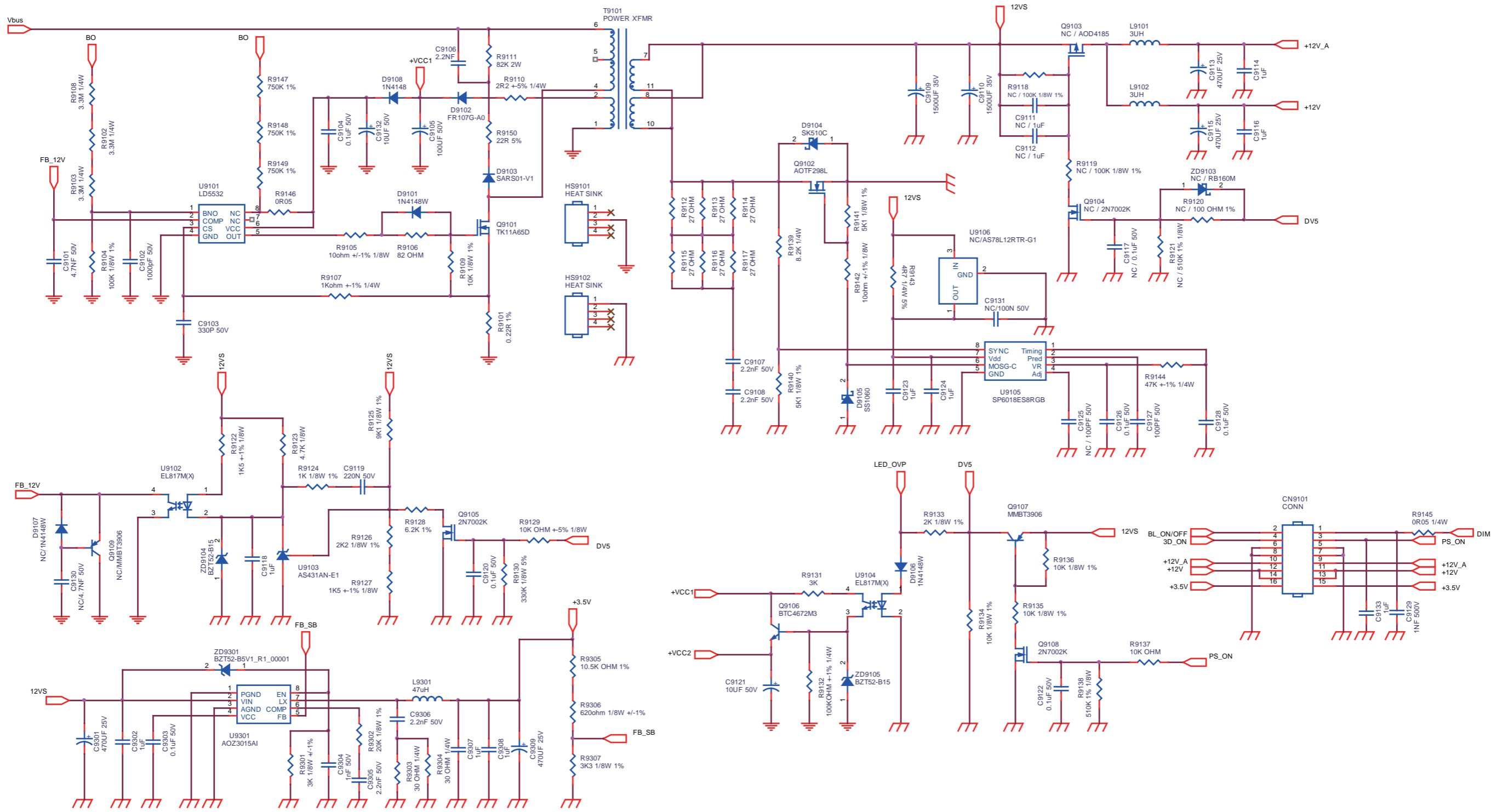


PFC	715G6973	2014-12-08

10-2-3 Main power

**A03** Main power

**A03**



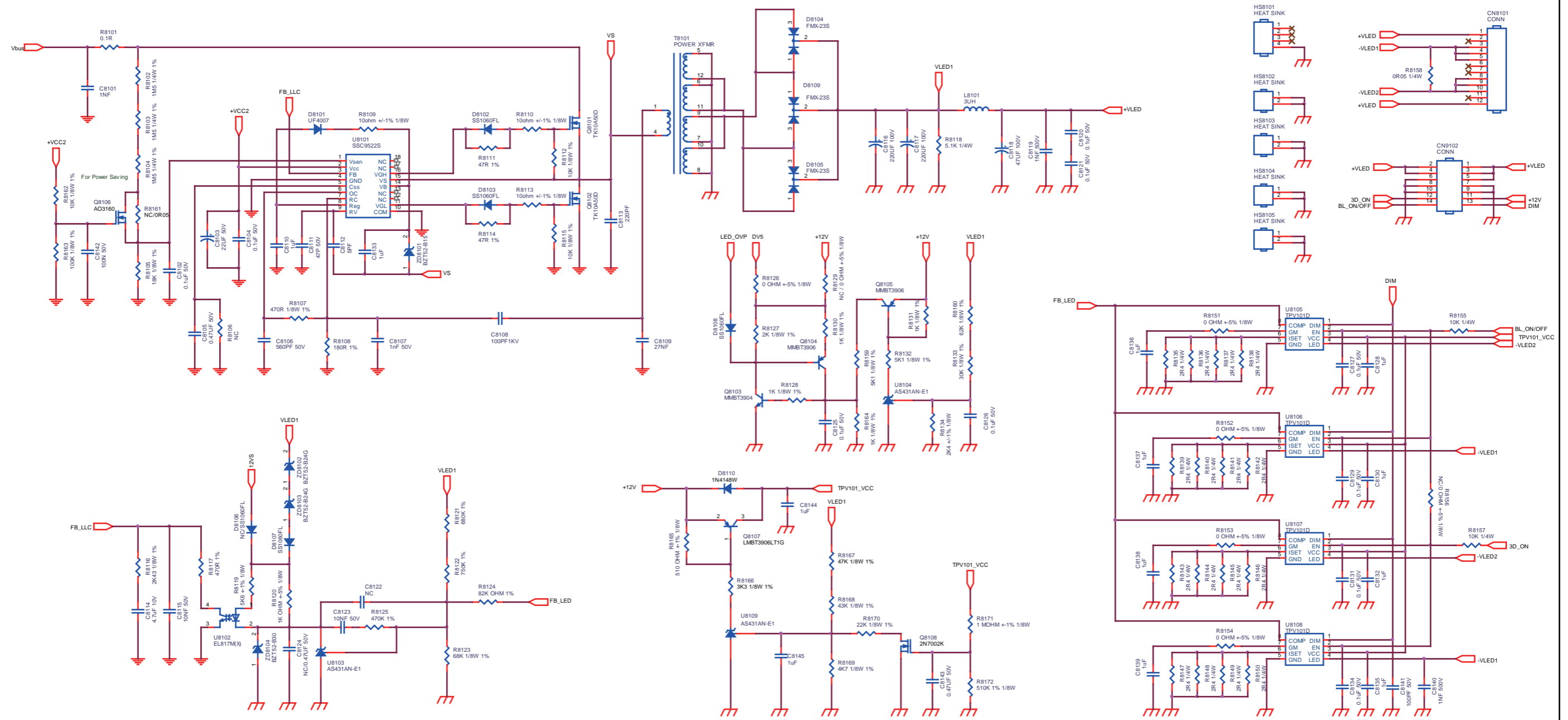
Main power	715G6973	2014-12-08

10-2-4 LED Driver

A04

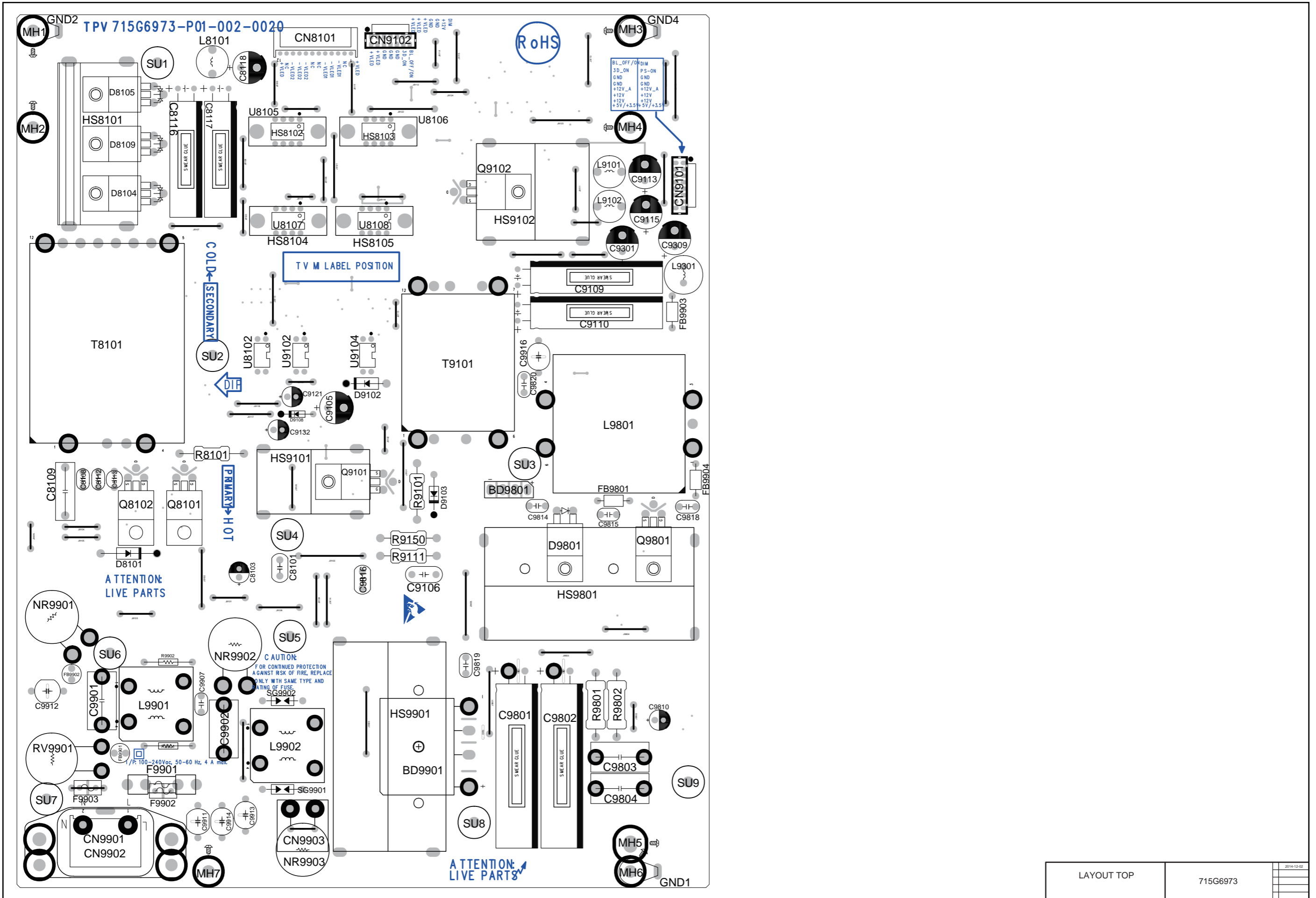
LED Driver

A04

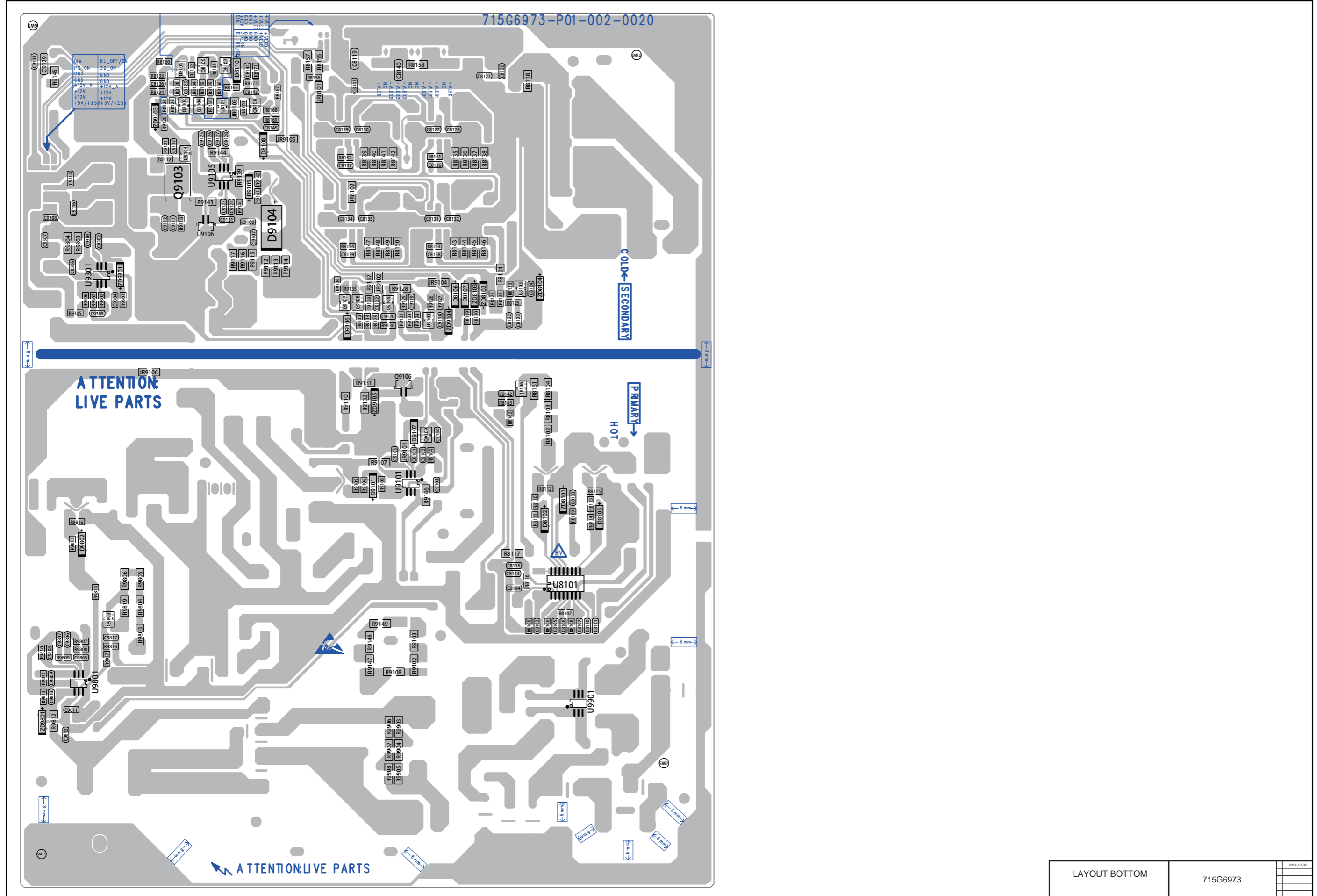


LED Driver	715G6973	2014-12-08

10-2-5 Power layout top



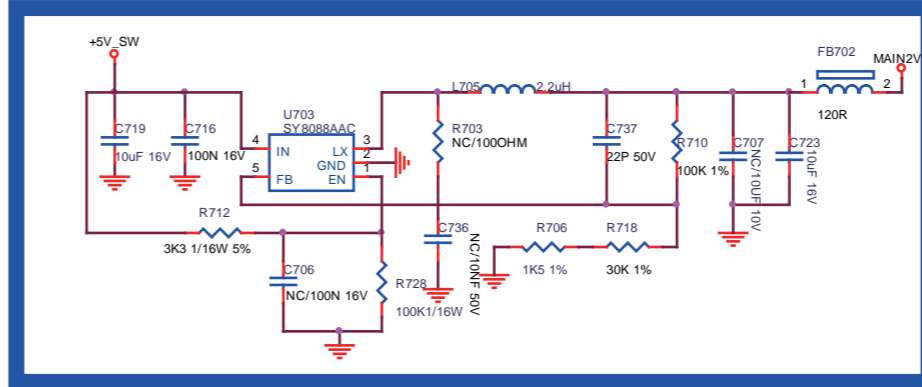
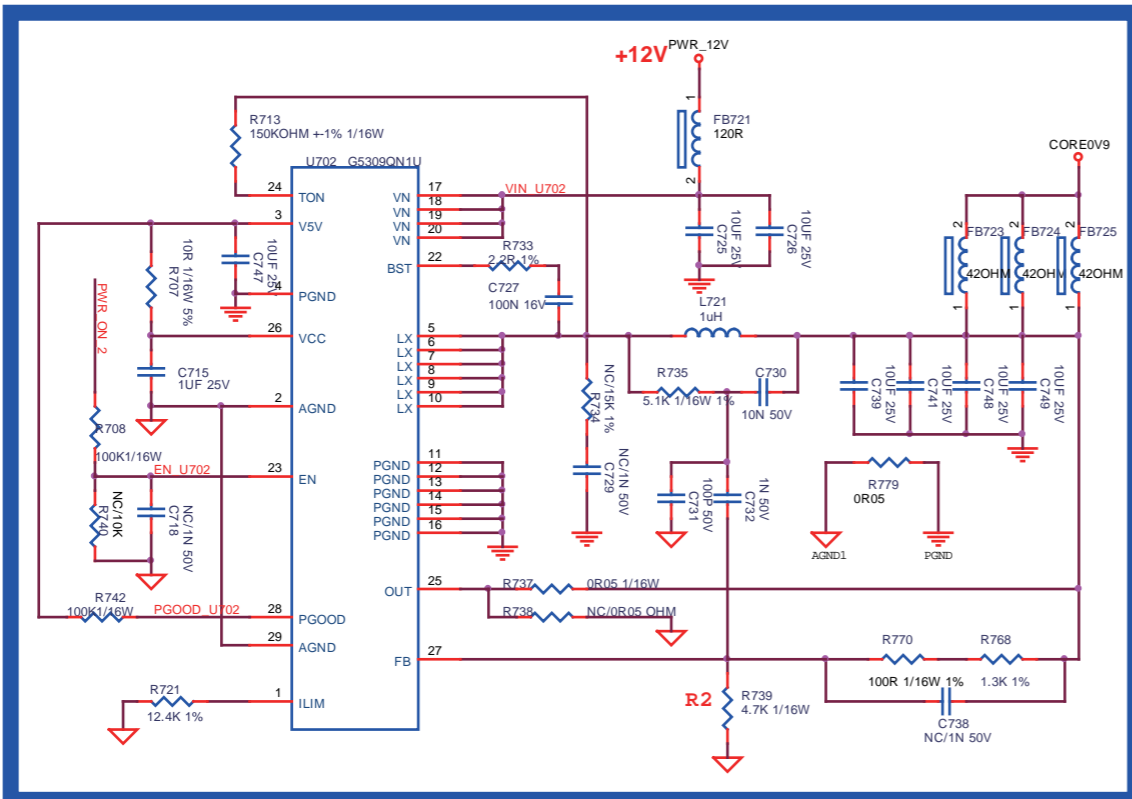
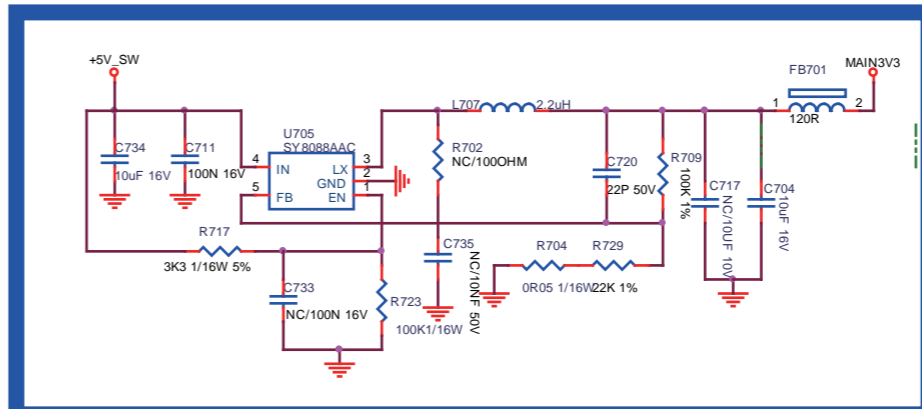
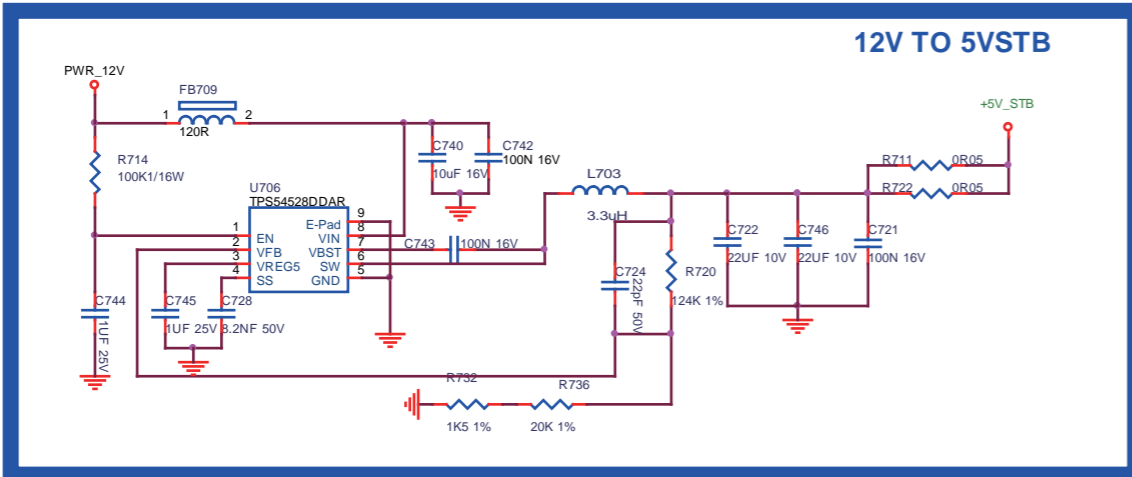
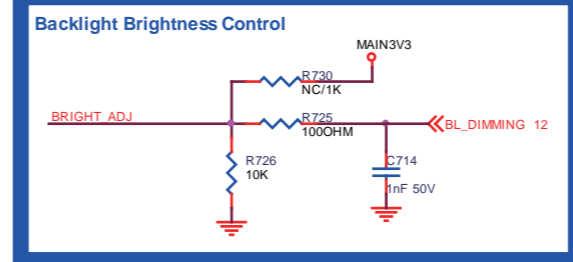
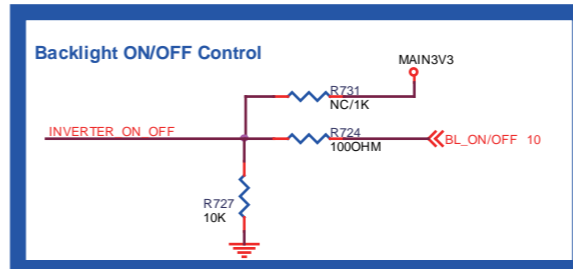
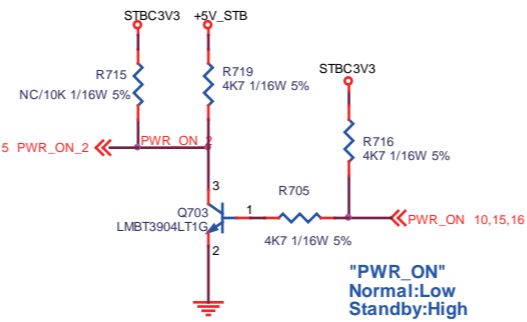
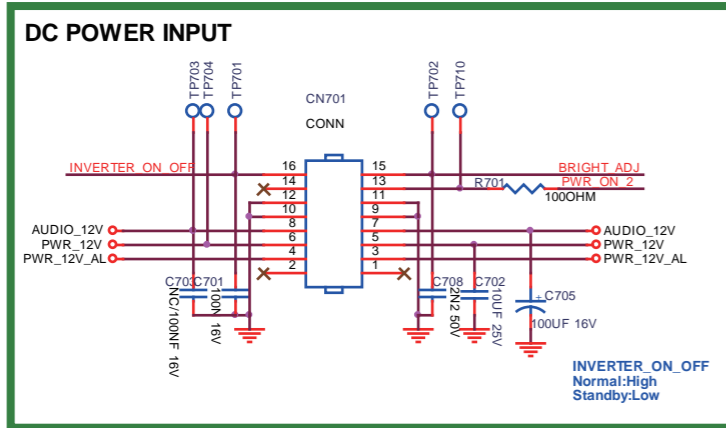
10-2-6 Power layout bottom



**10.3 B 715G7673 SSB**  
10-3-1 System Power 1

**B01** System POWER-1

**B01**



System POWER-1	715G7673	3	2015-06-25
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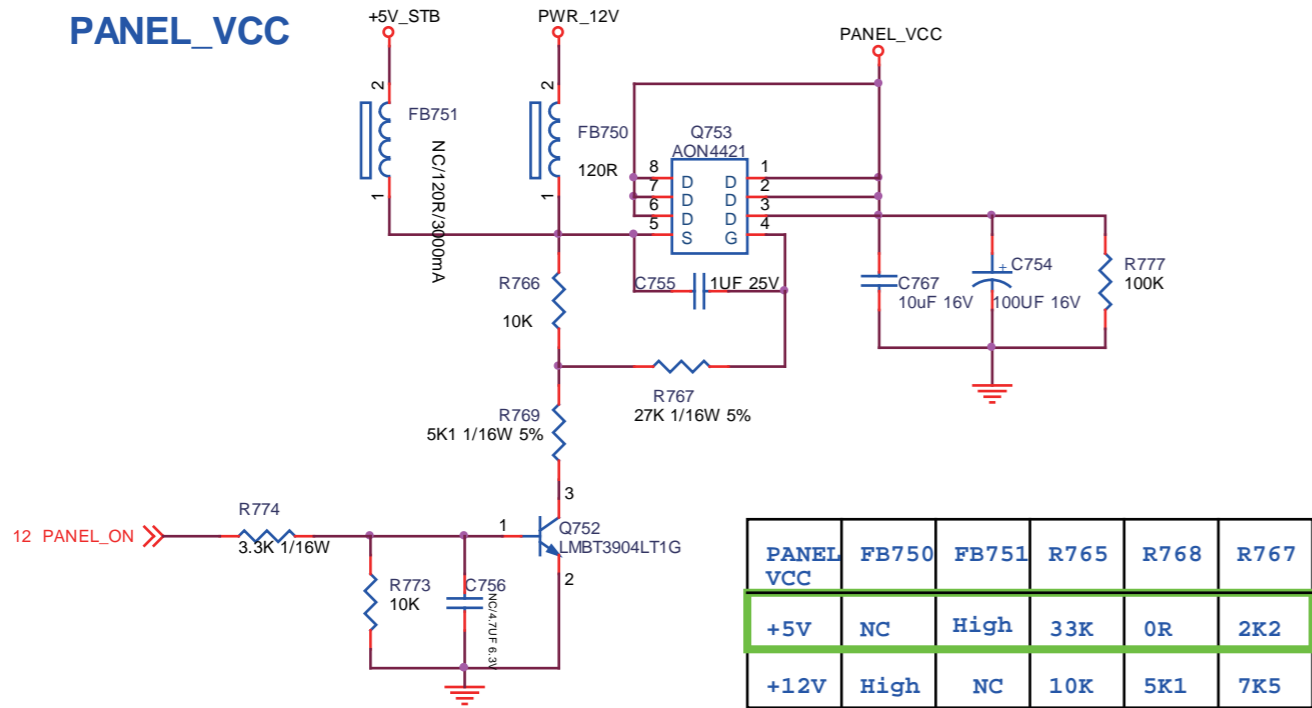


**B02**

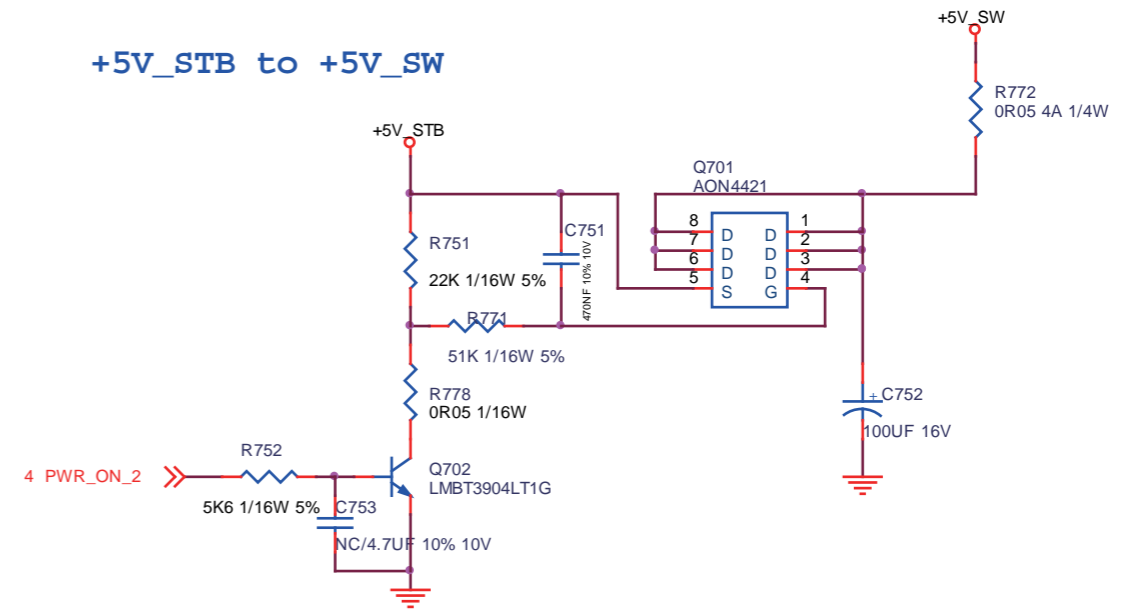
System POWER-2

**B02**

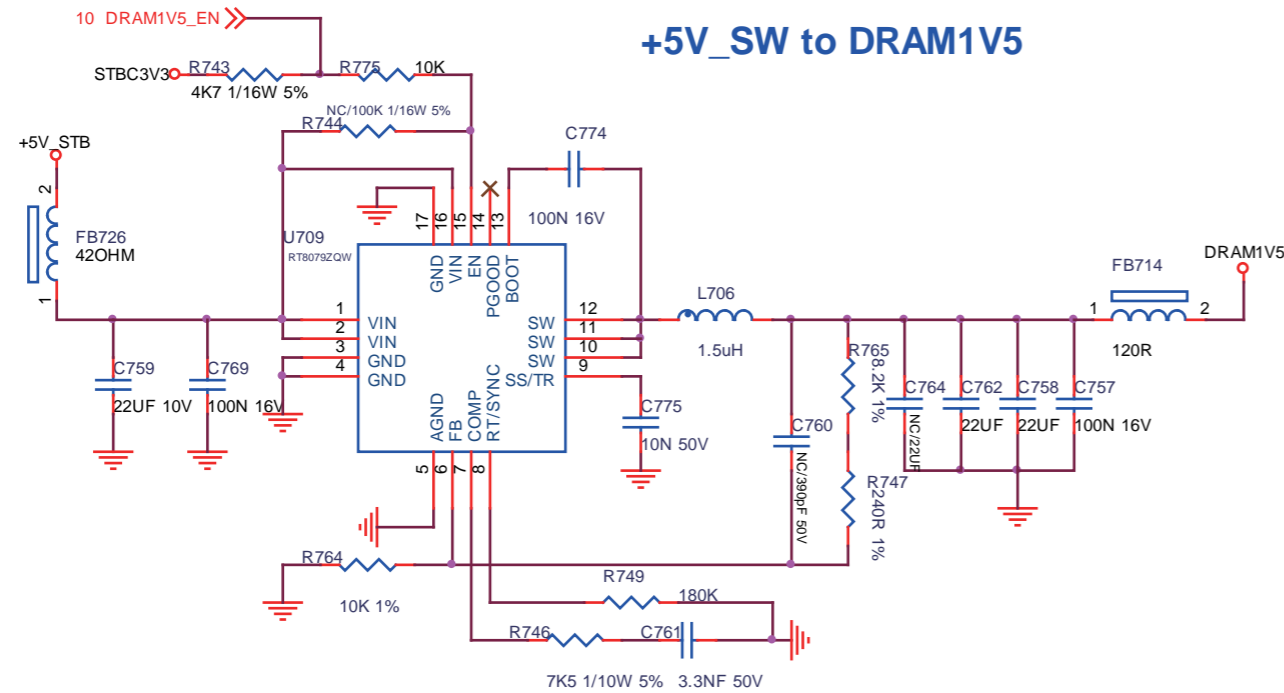
**PANEL\_VCC**



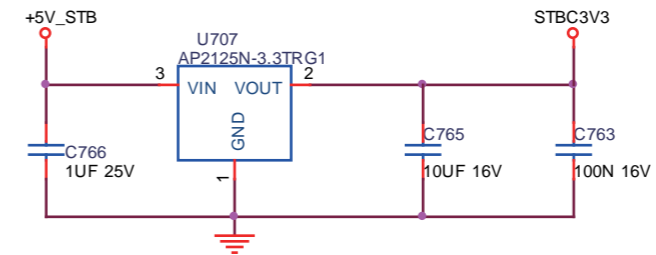
**+5V\_STB to +5V\_SW**



**+5V\_SW to DRAM1V5**



**+5V\_STB to DV33SB**

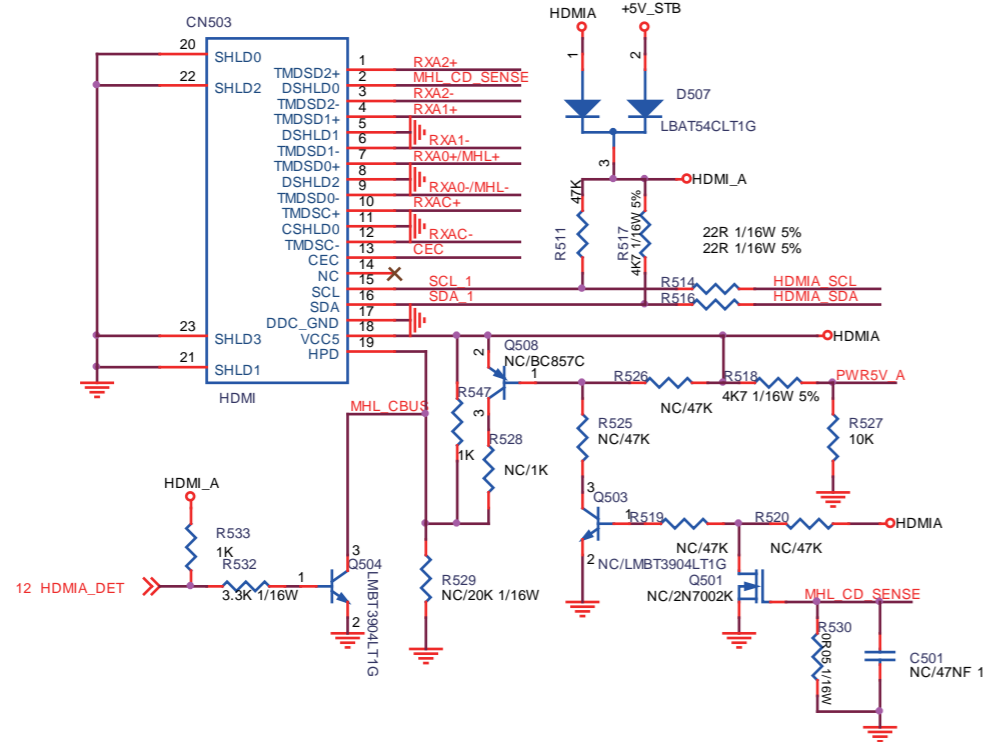


10-3-3 NT72866 HDMI

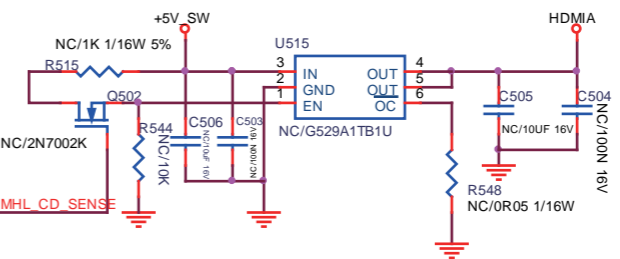
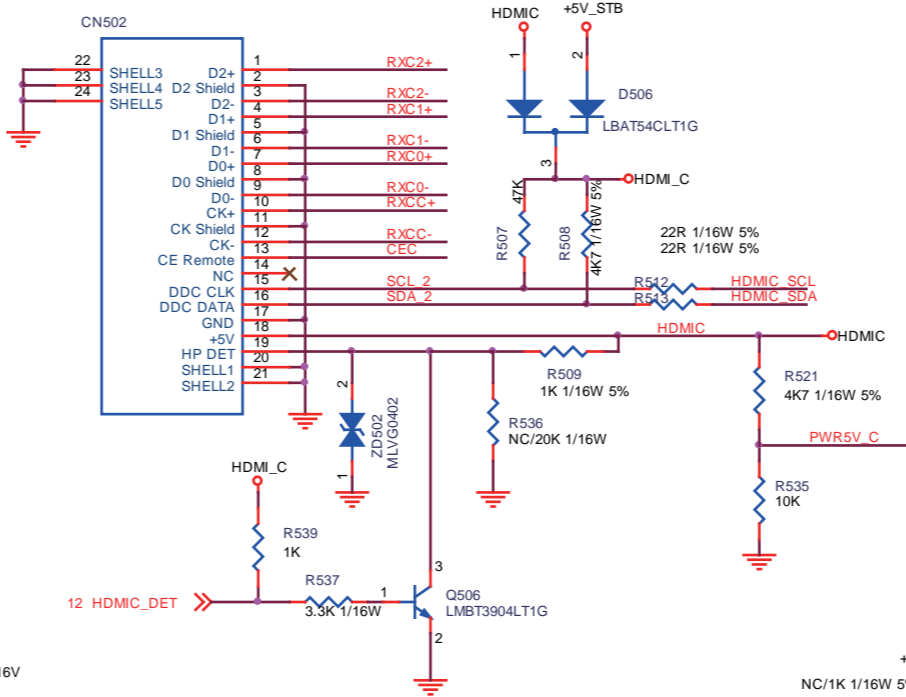
B03

NT72666 HDMI

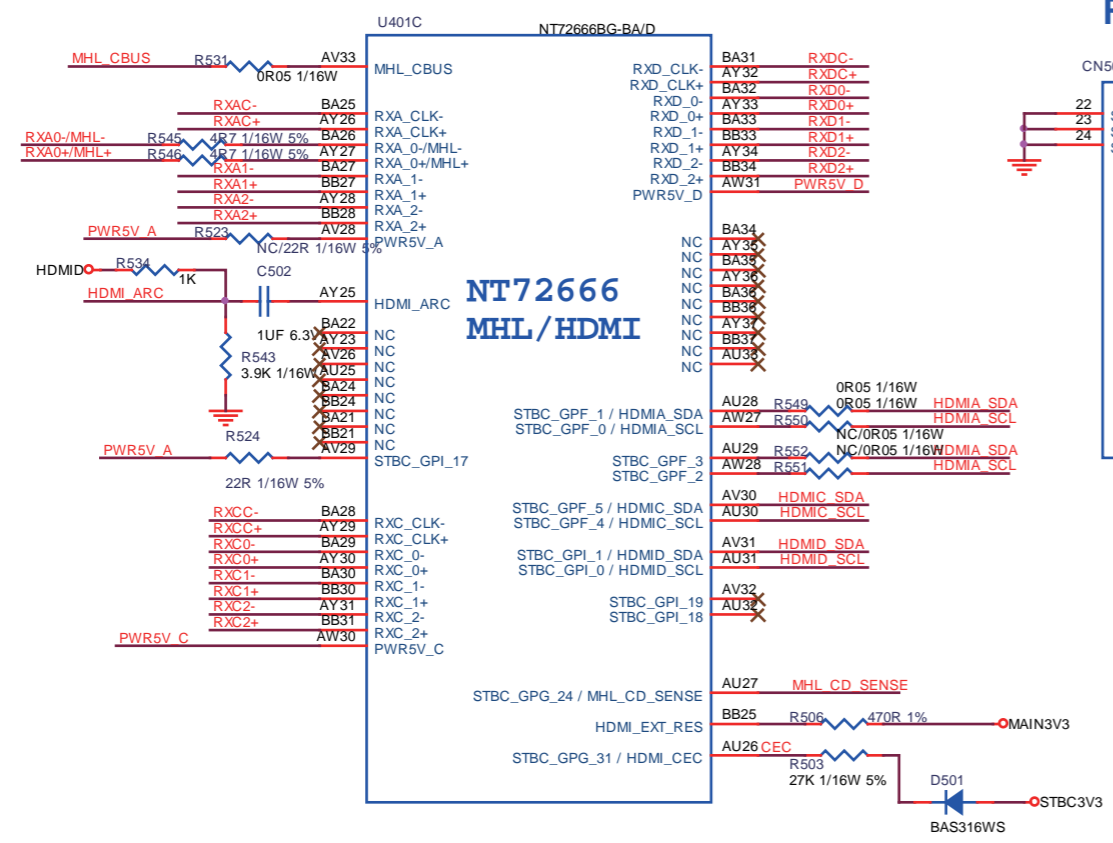
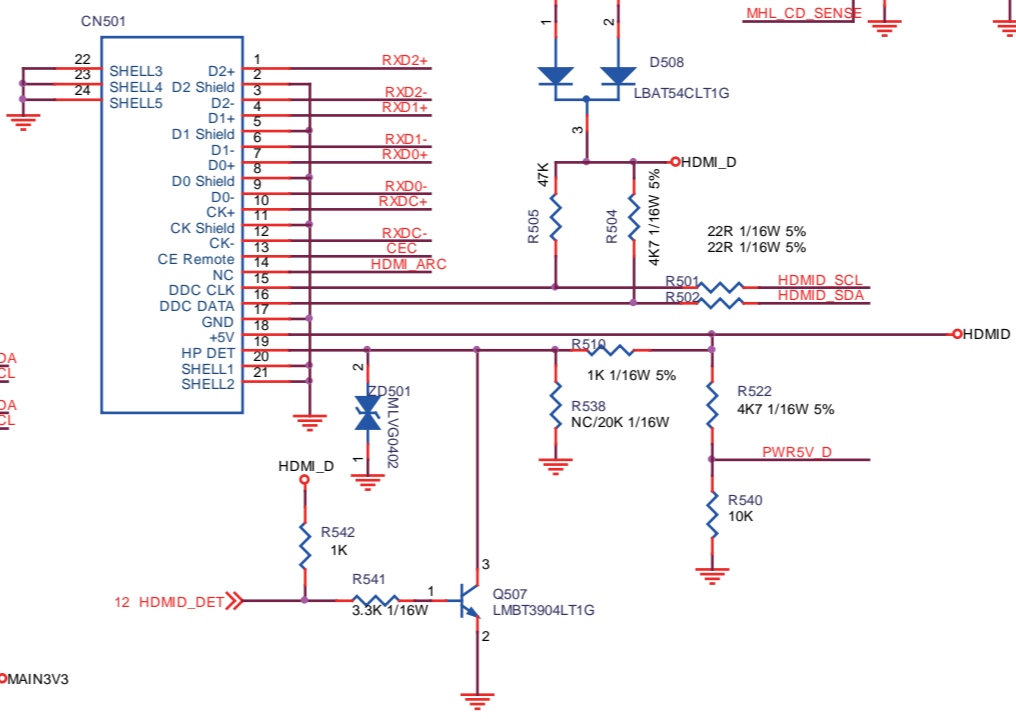
B03



Rear HDMI 2



Rear HDMI 3

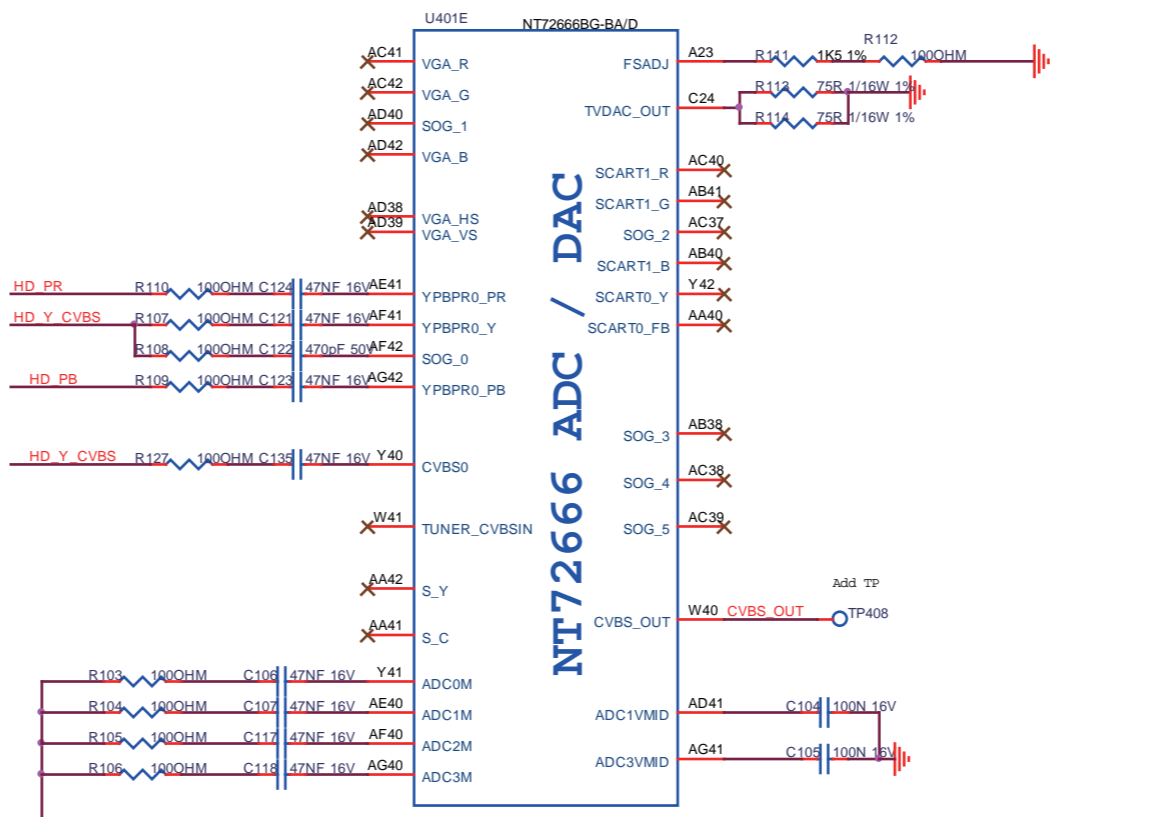
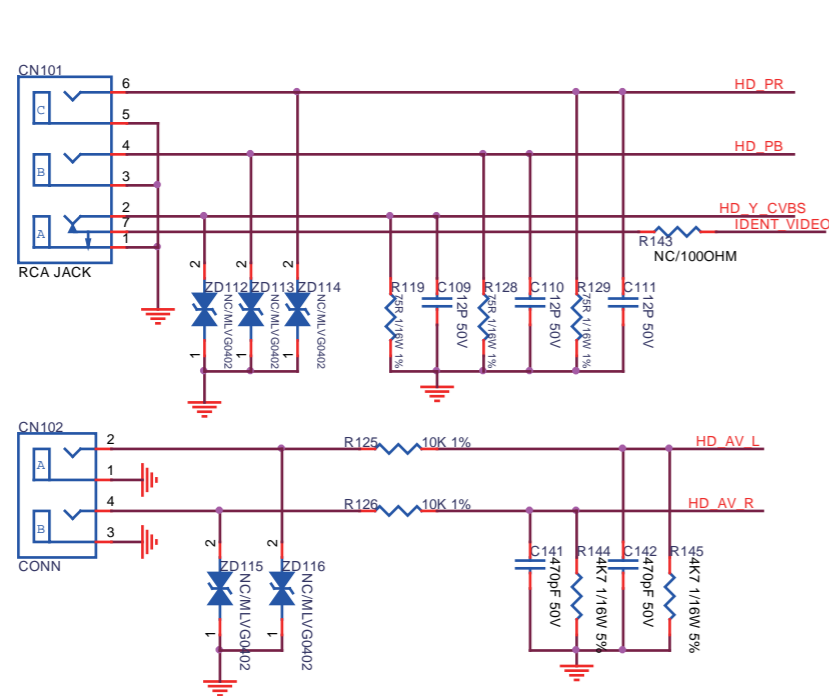


NT72666 HDMI	715G7673	4	2015-08-25

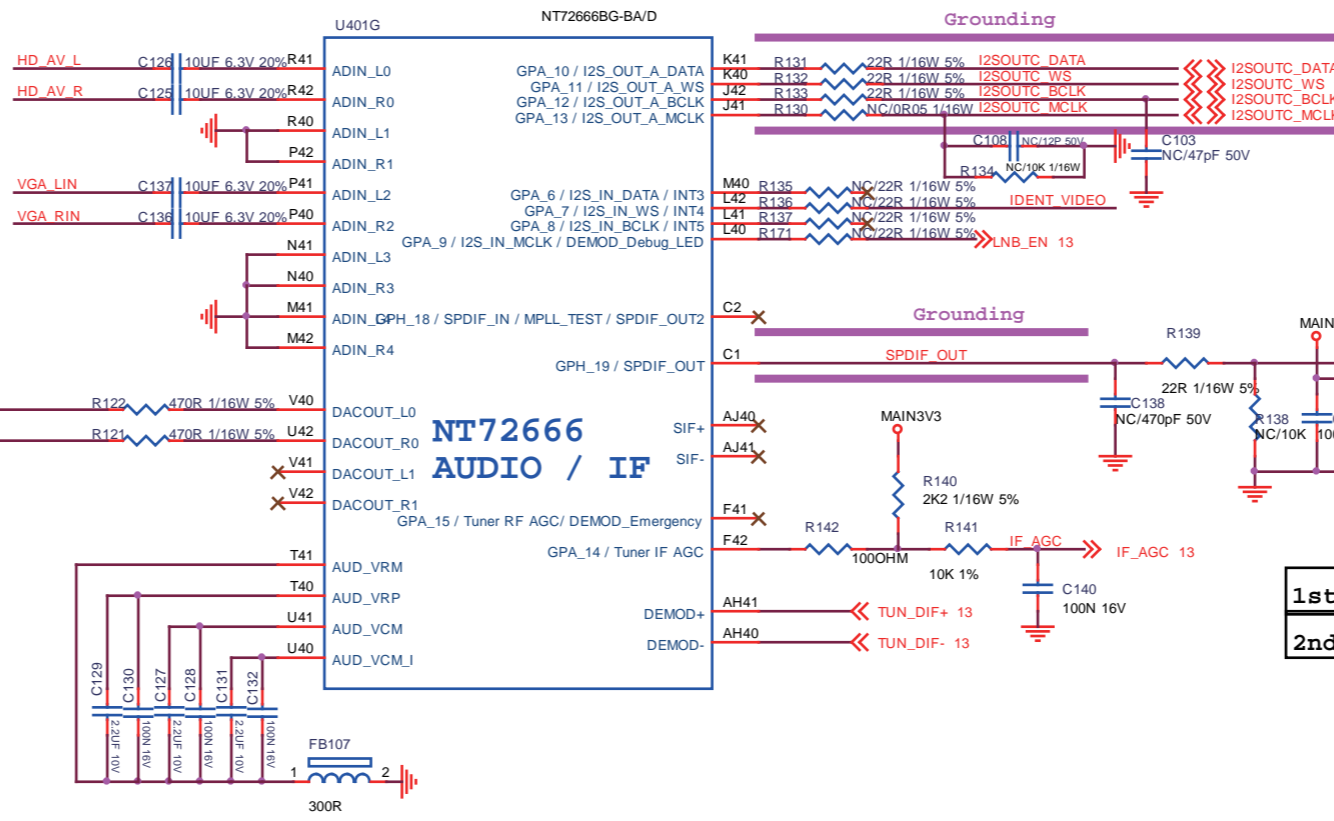
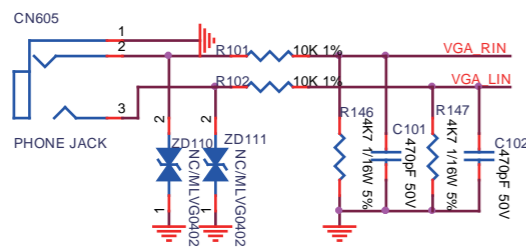
B04

ADC/DAC/AUDIO/SIF

B04



PC / DVI Audio in



SPDIF Out

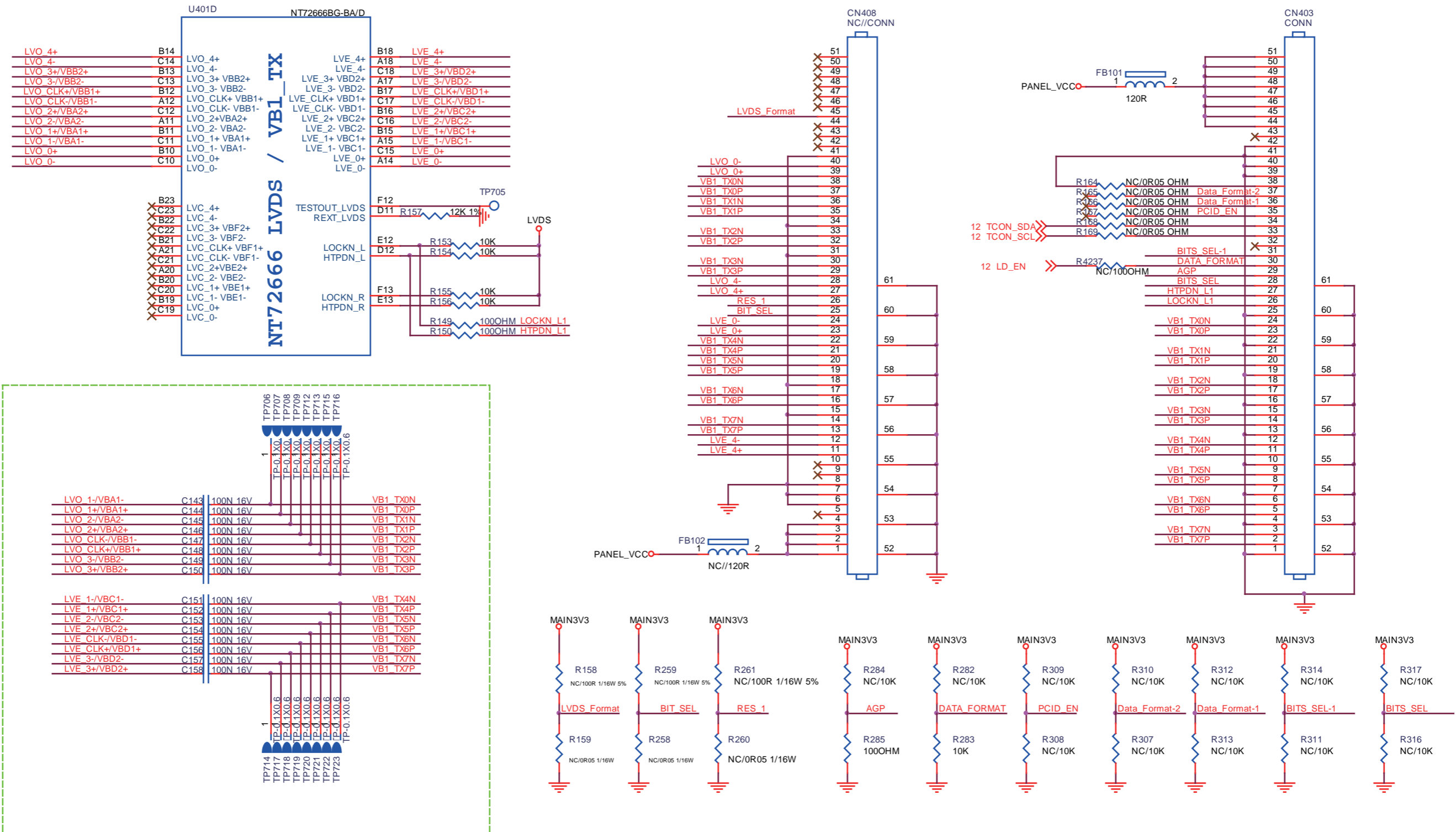
1st	088G 78F112VCL
2nd	388G078F118VQs

10-3-5 NT7266\_VB1 OUT

B05

NT72666\_VB1 OUT

B05

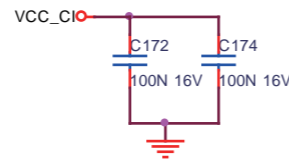
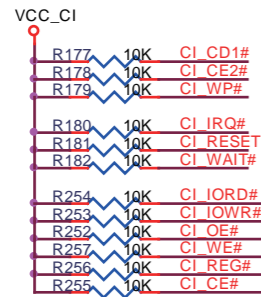


NT72666_VB1 OUT	715G7673	4	2015-08-25

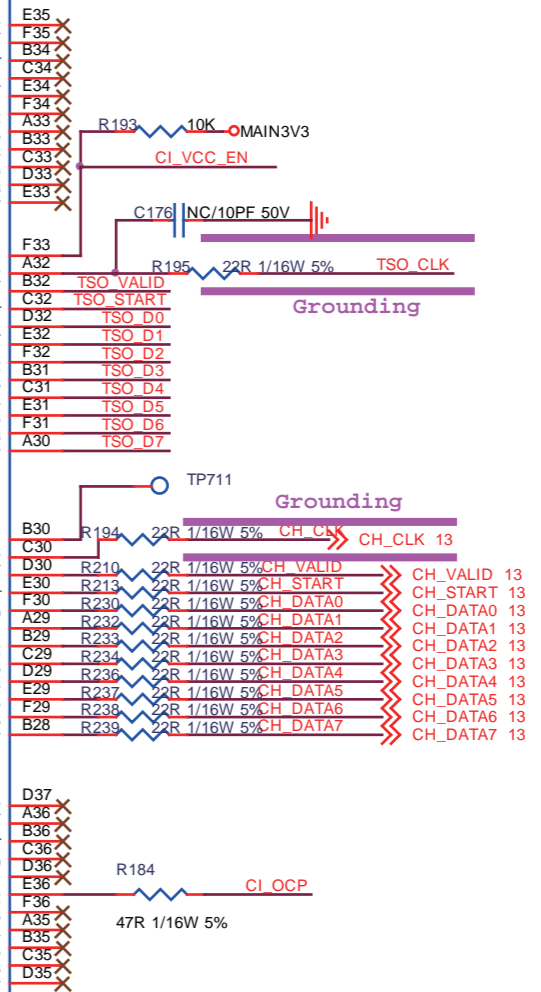
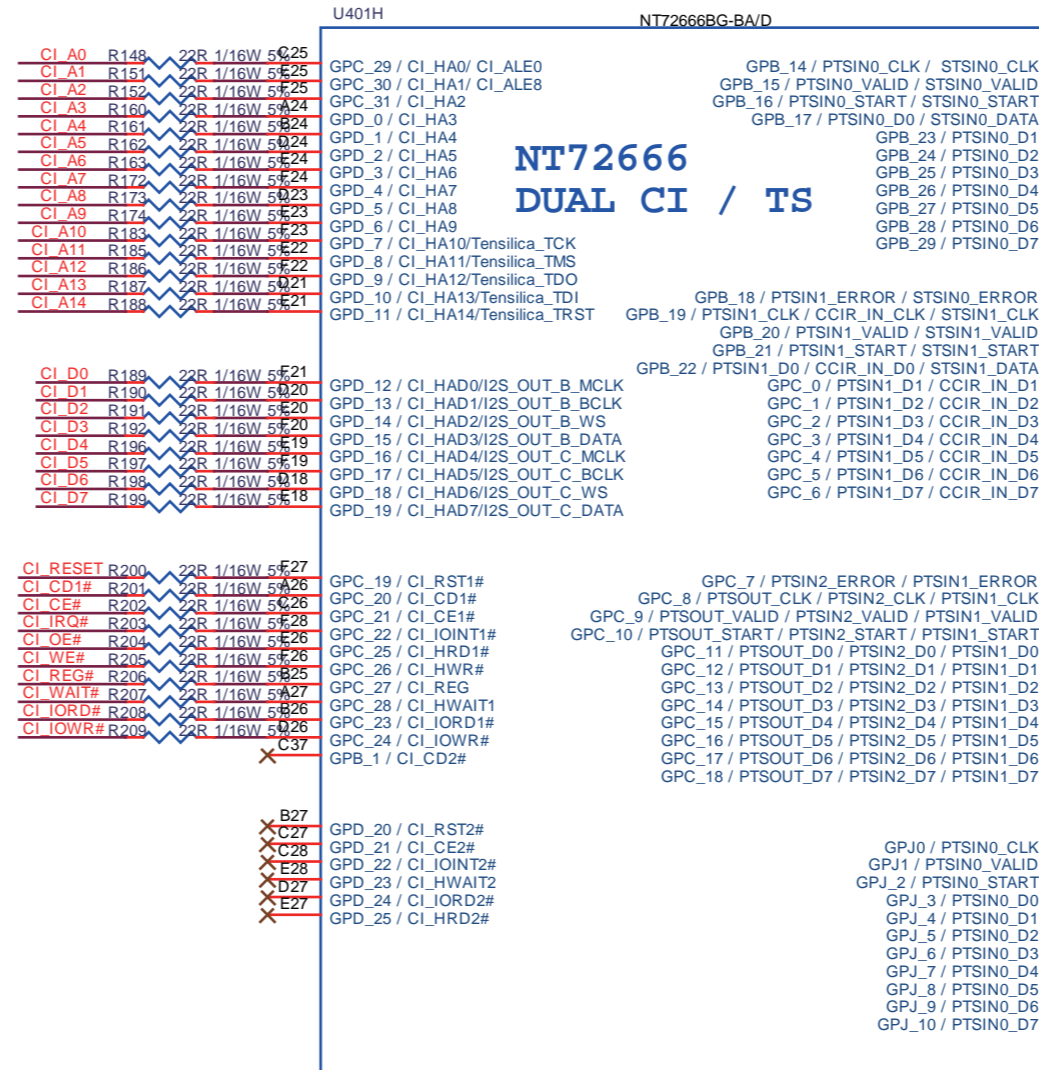
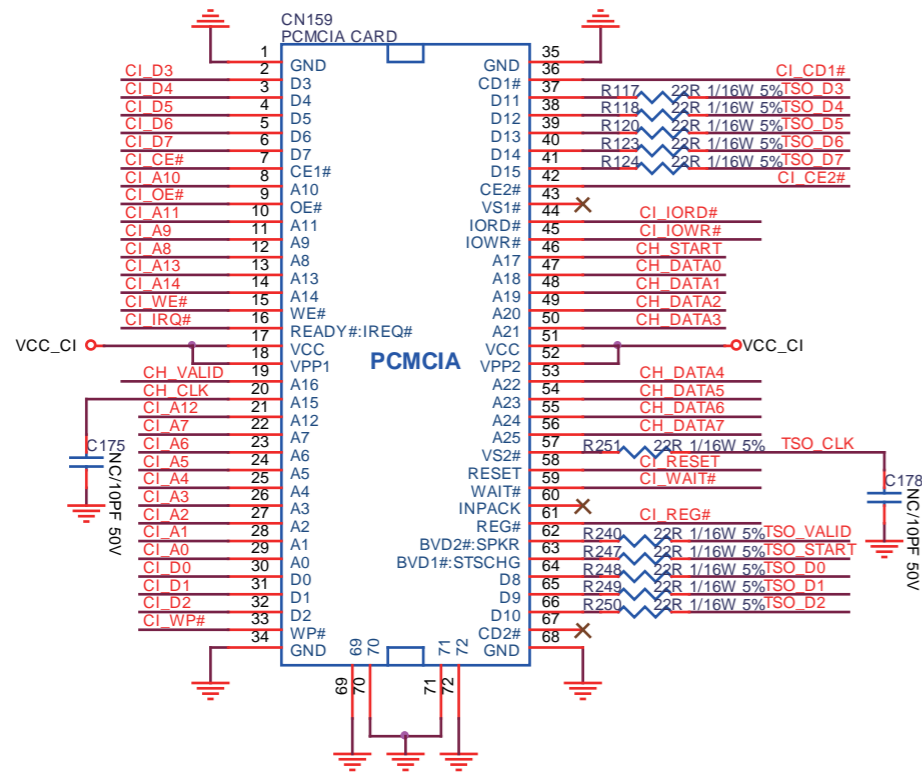
B06

NT72666\_CI

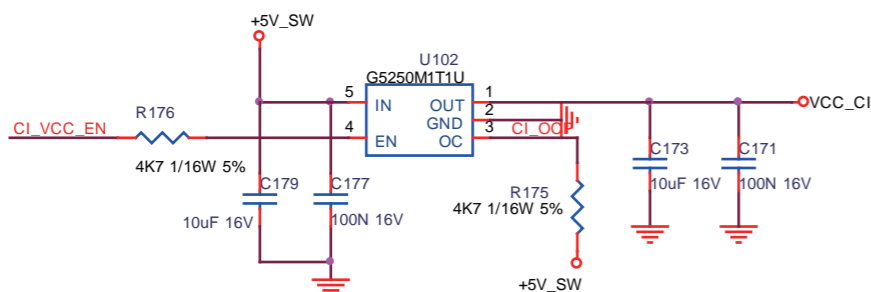
B06



PCMCIA Slot

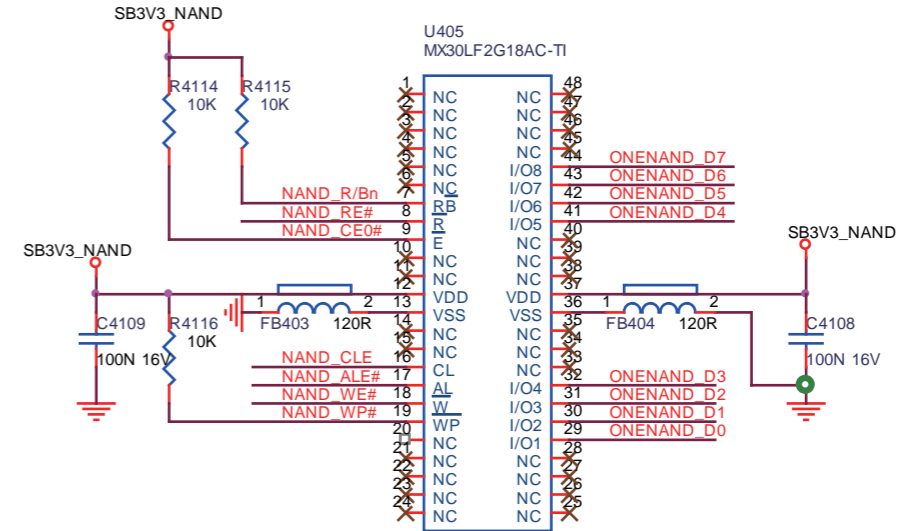
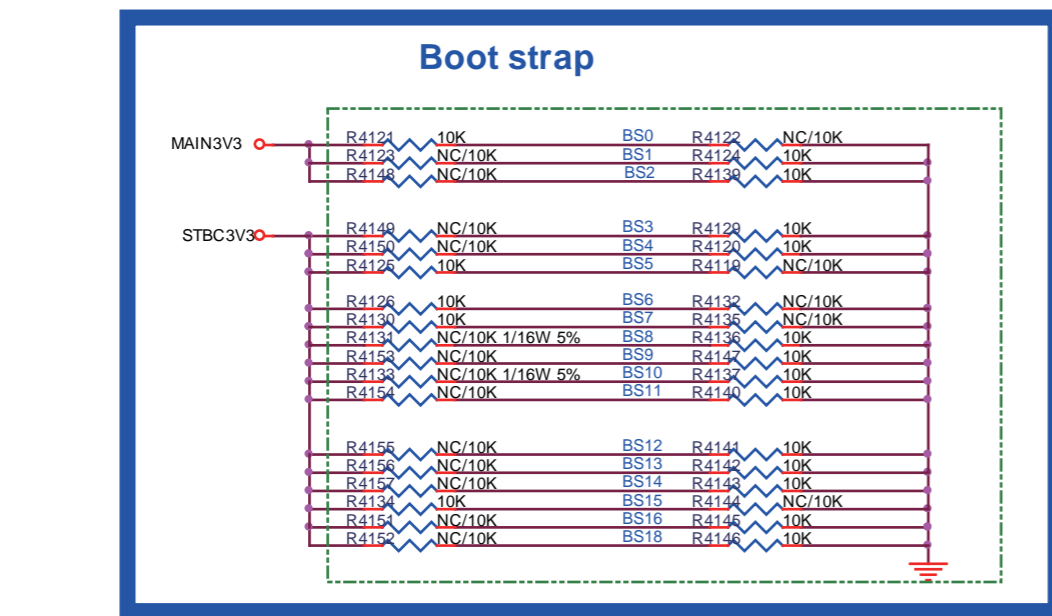
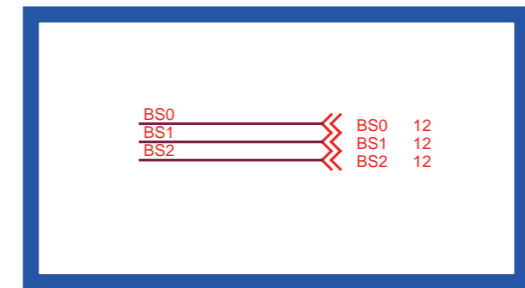
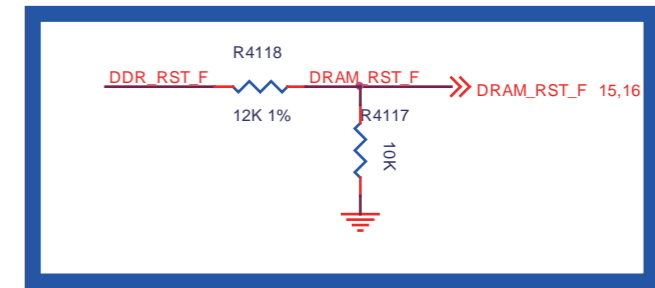
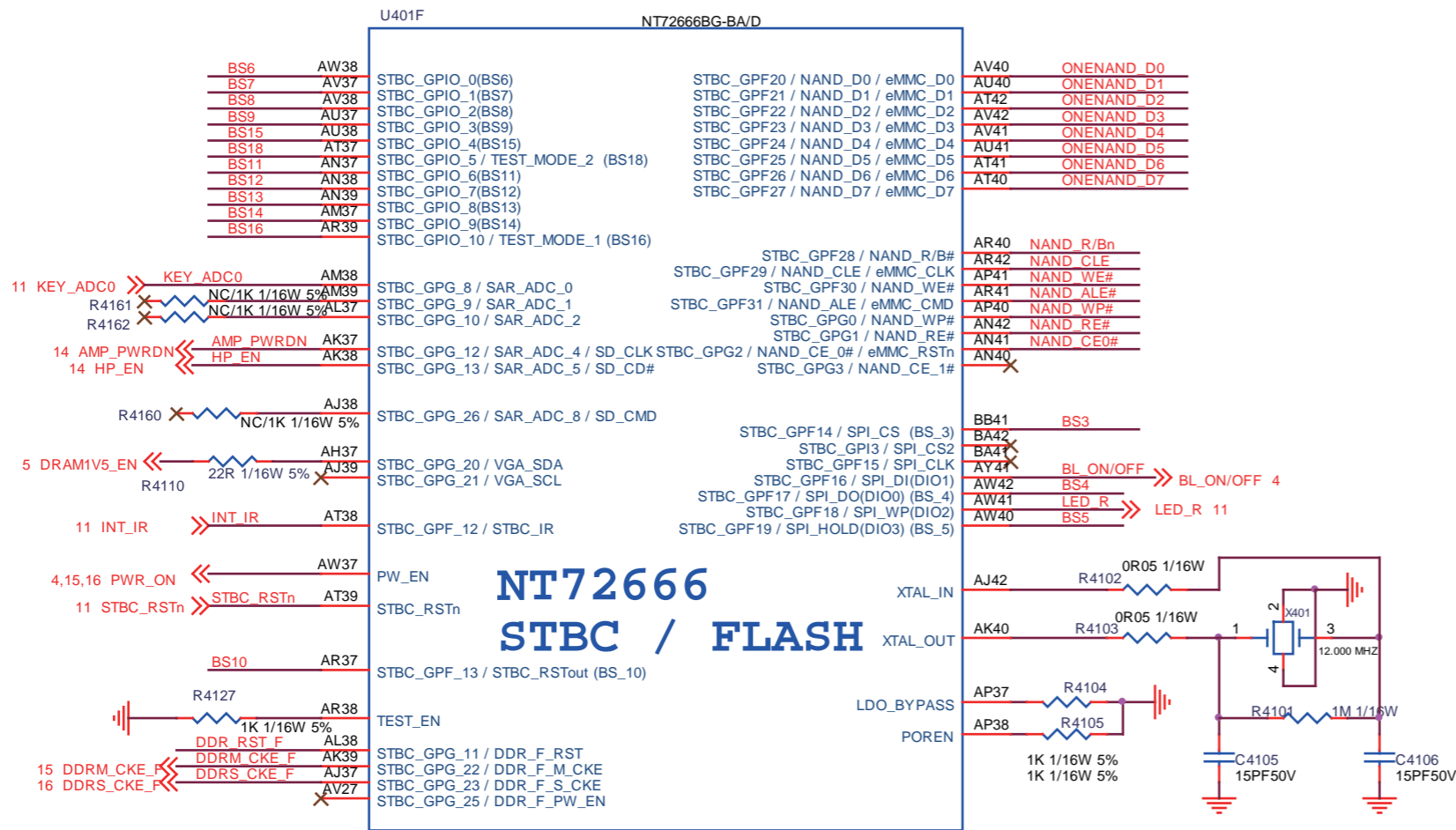


CI Bus Power Control



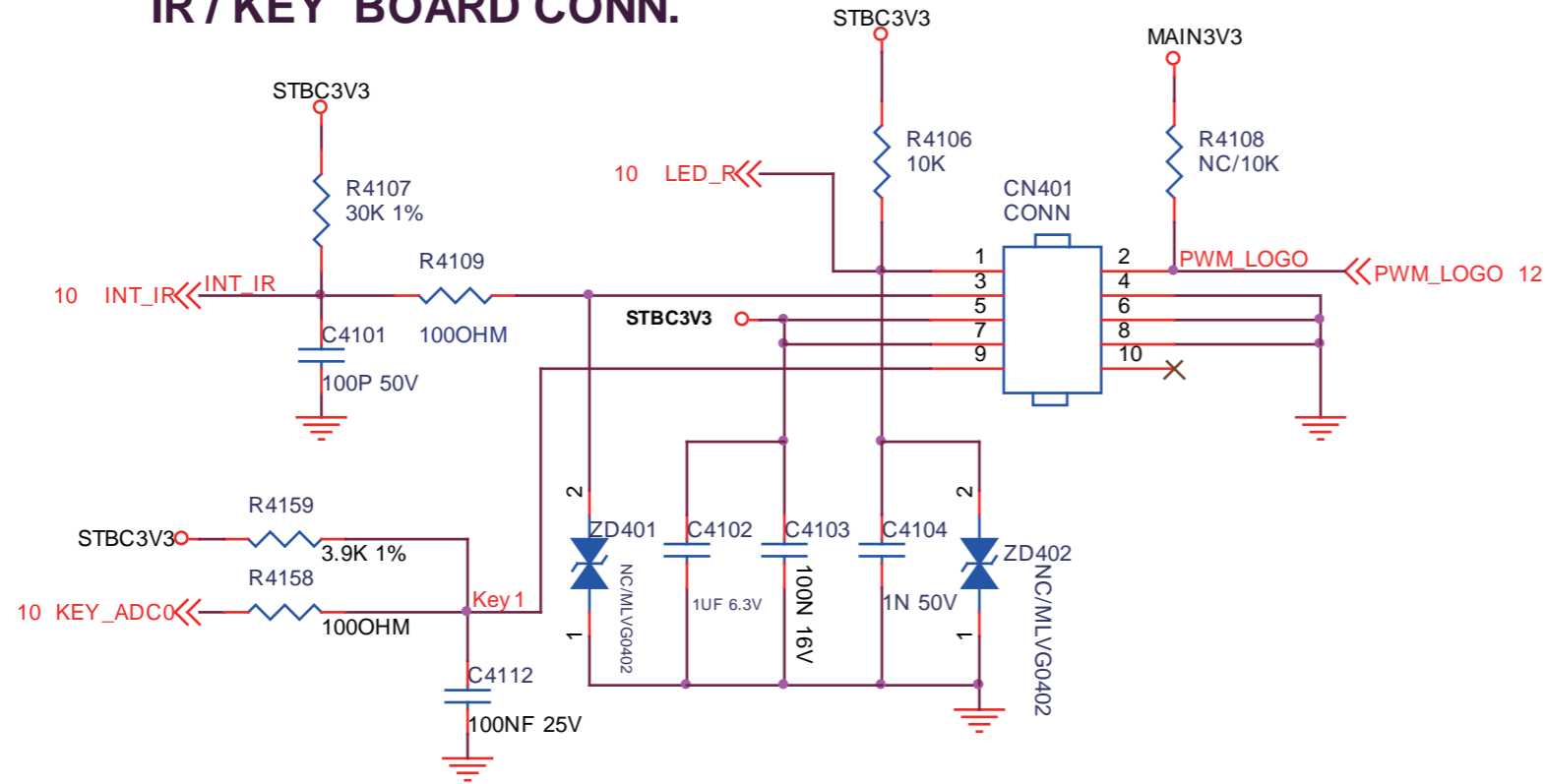
**B07** STBC/FLASH

**B07**

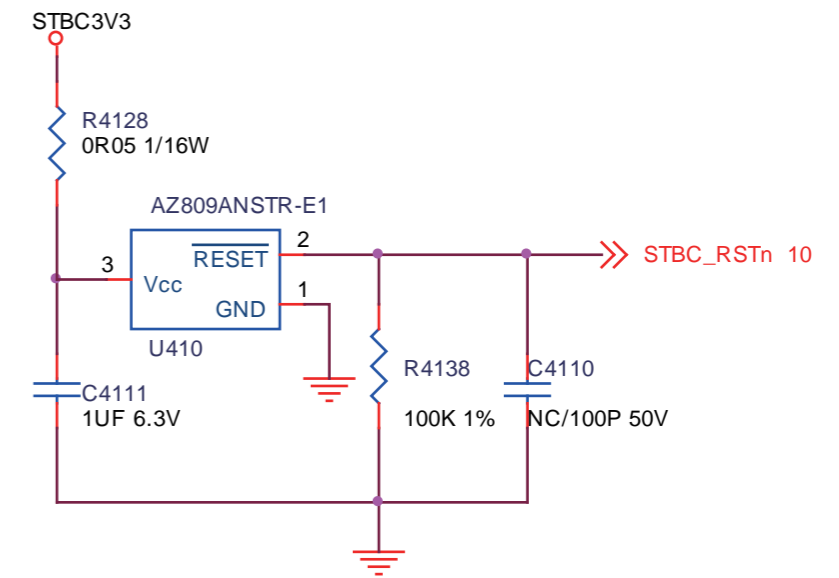


STBC/FLASH	715G7673	4	2015-08-25
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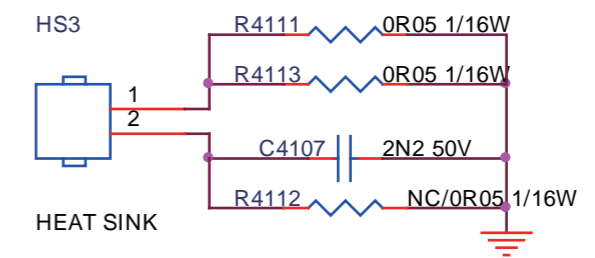
### IR / KEY BOARD CONN.



### Reset IC

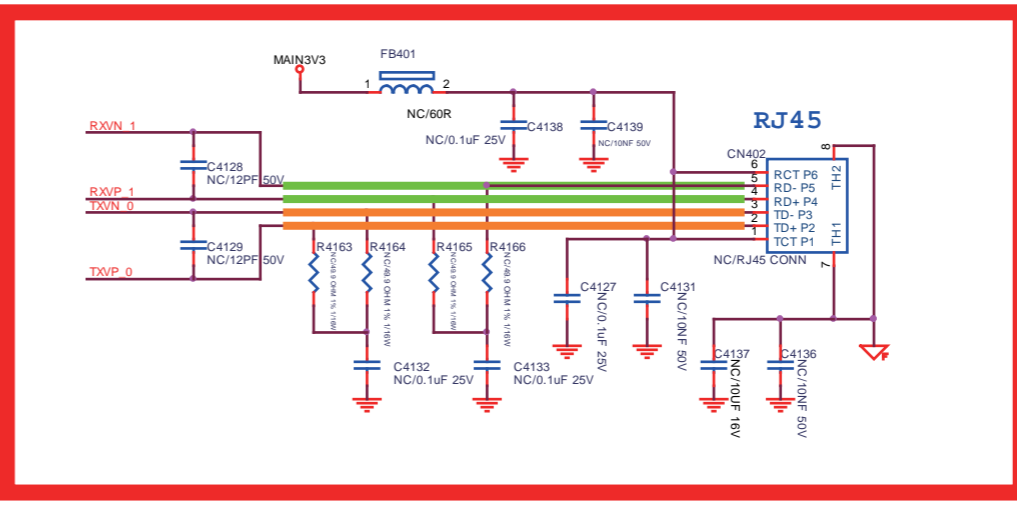
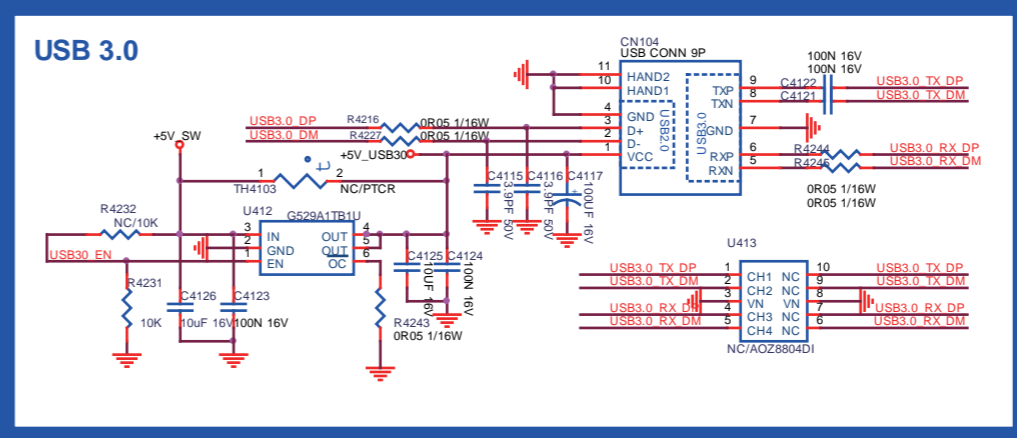
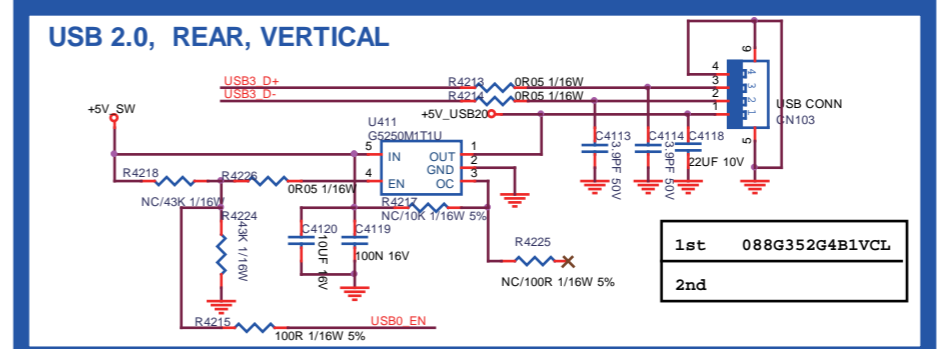
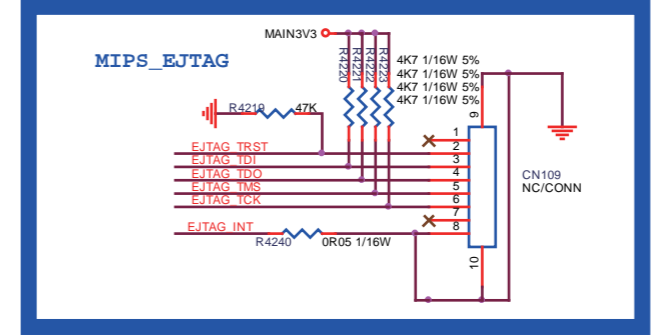
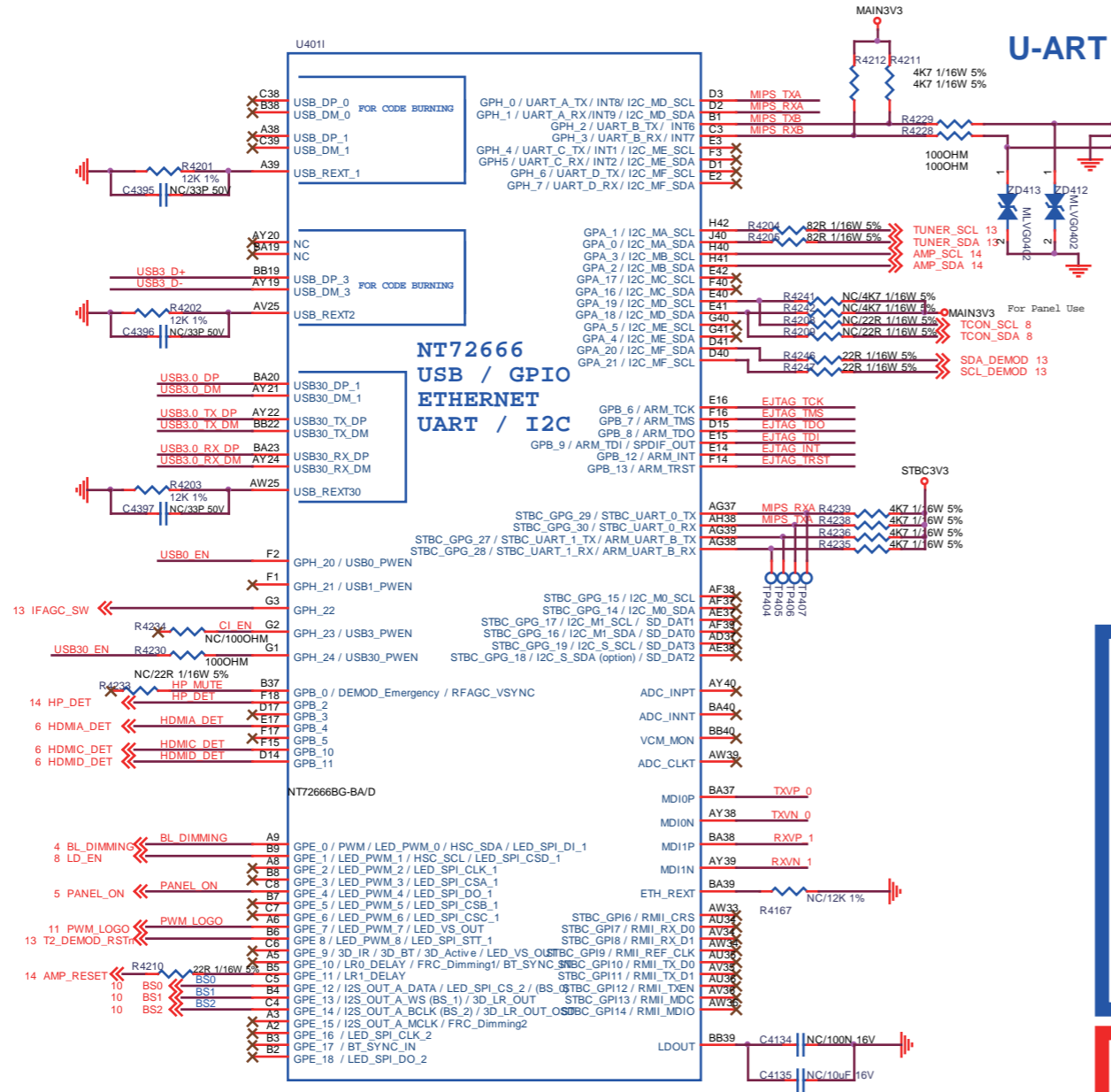


### U401



**B09** USB/GPIO/Ethernet

**B09**



USB/GPIO/Ethernet	715G7679

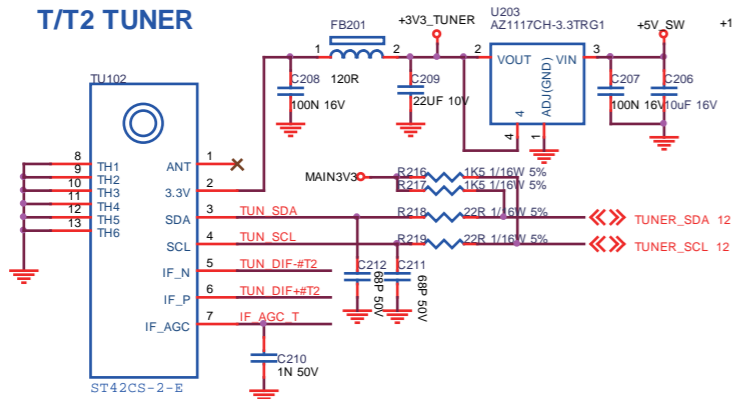


10-3-10 Tuner/Demodulator

**B10** Tuner/Demod

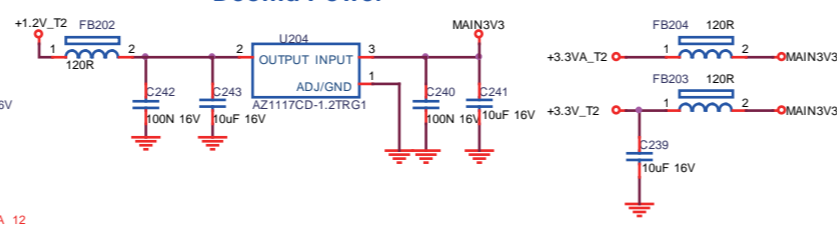
**B10**

**T/T2 TUNER**

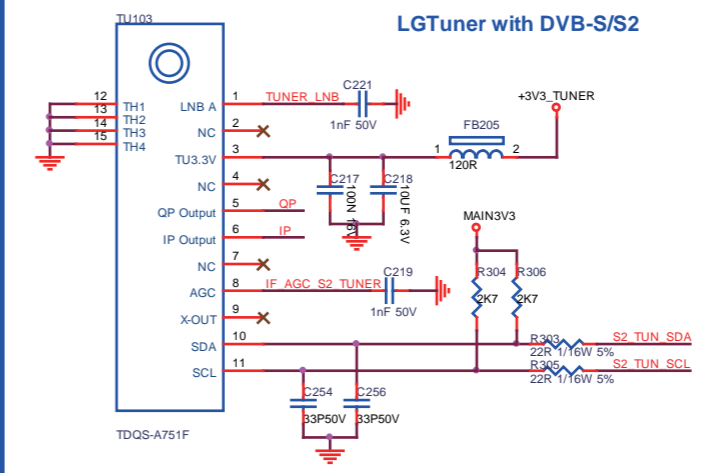


H/T	394GPASEBIL02G	LG TDSY-G430D
K	394GNPALALL35A	SAMSUNG DTOS40CIL034B

**Deomd Power**

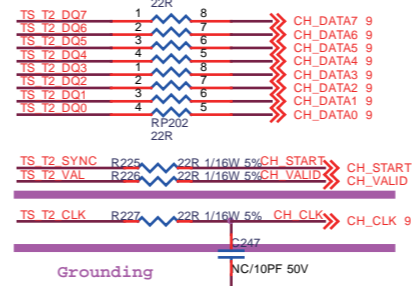
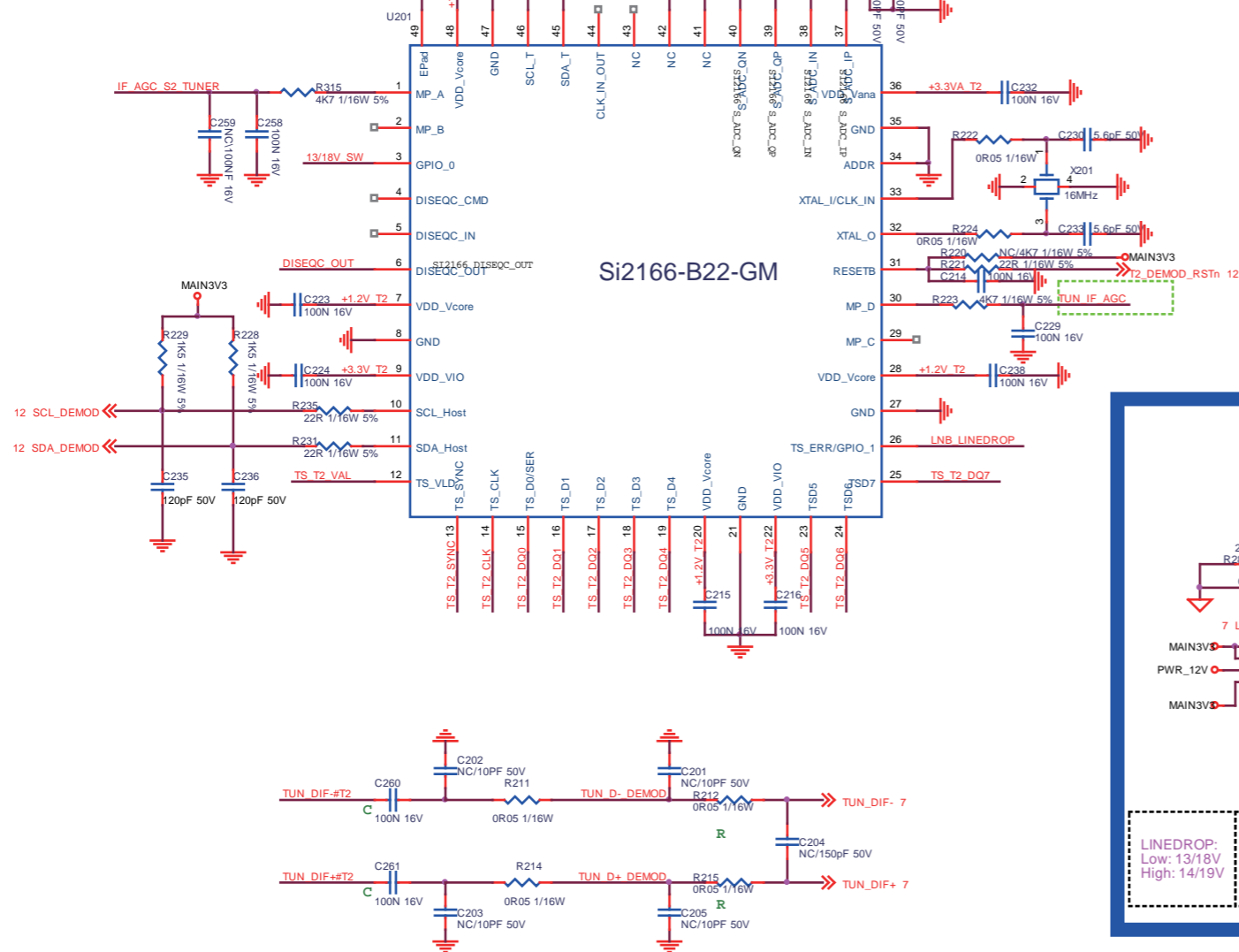


**S2 TUNER**

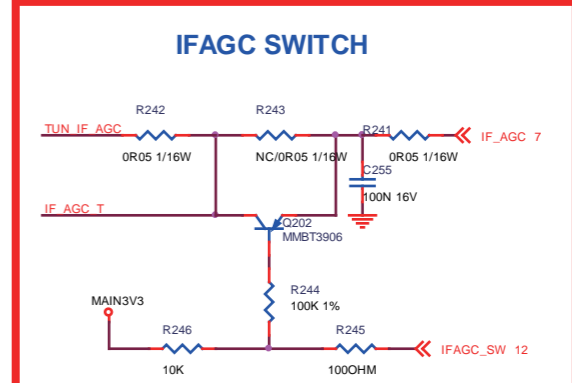


1st	394GPASEBIL05G	LG TDQS-A751F
2nd	394GDVBSALL01A	Samsung DNB02112IH2

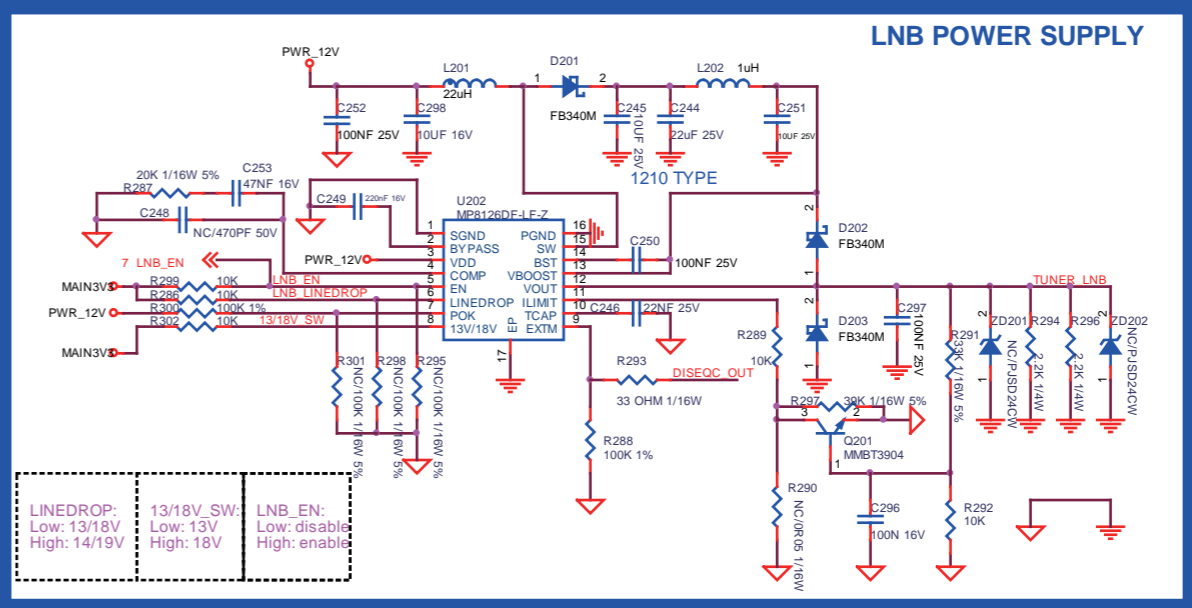
**DVB/T2 Demodulator**



**IFAGC SWITCH**



**LNB POWER SUPPLY**

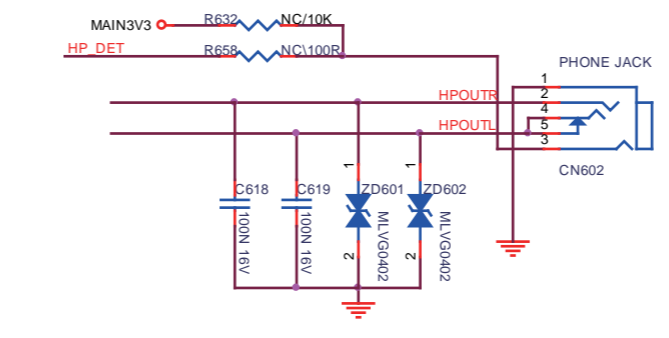
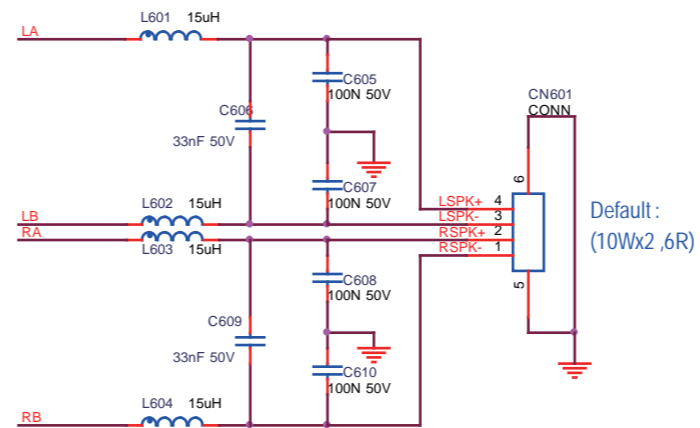
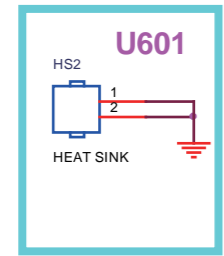
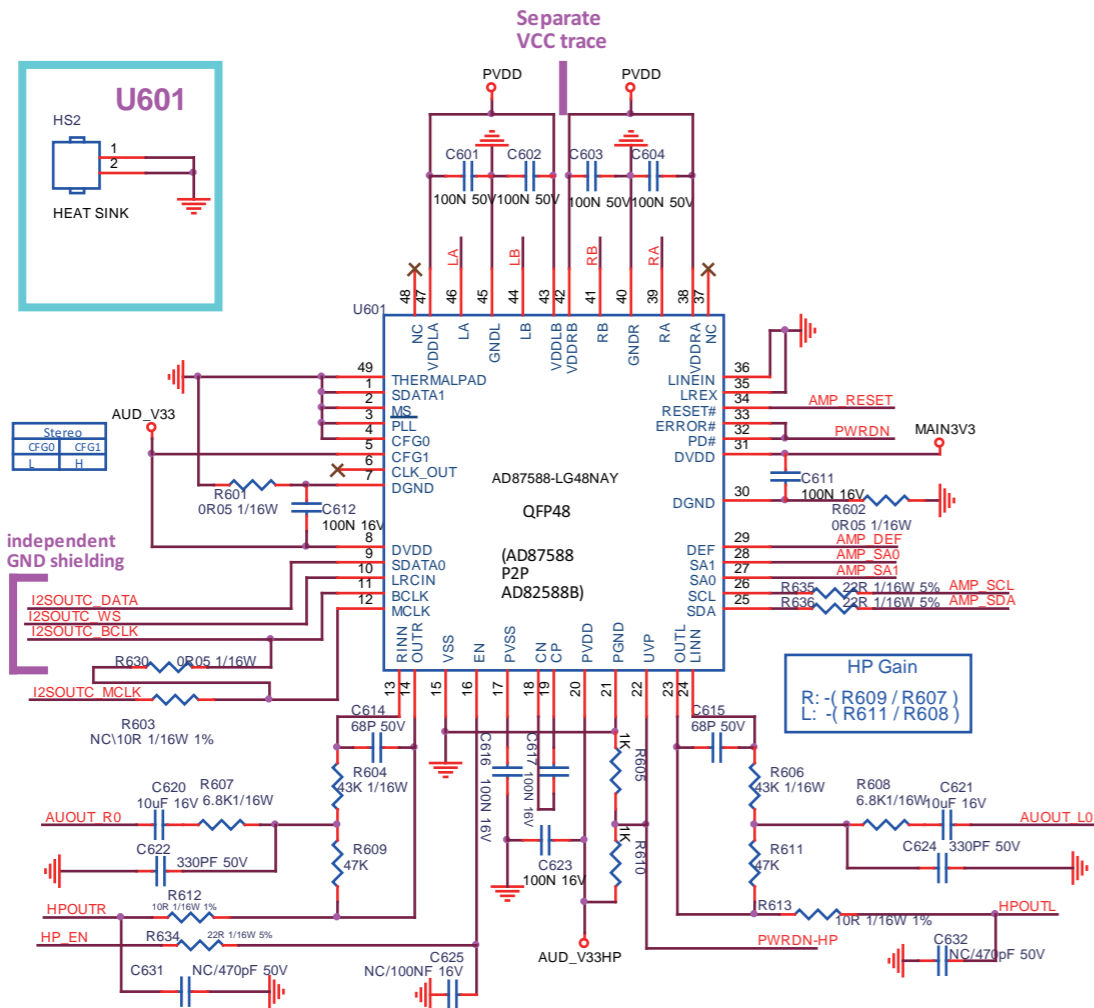


LINEDROP: Low: 13/18V, High: 14/19V  
 13/18V\_SW: Low: 13V, High: 18V  
 LNB\_EN: Low: disable, High: enable

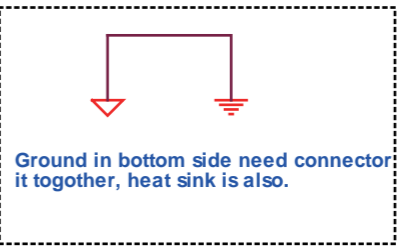
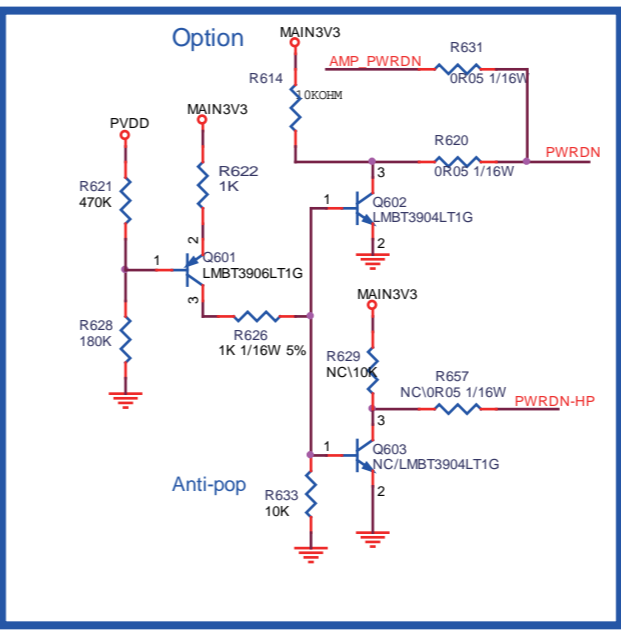
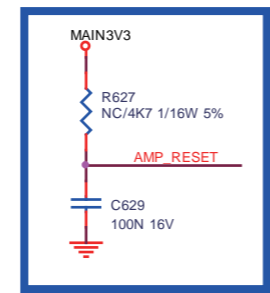
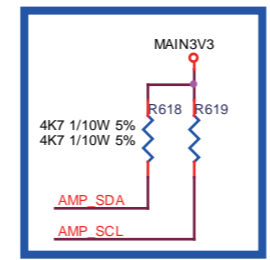
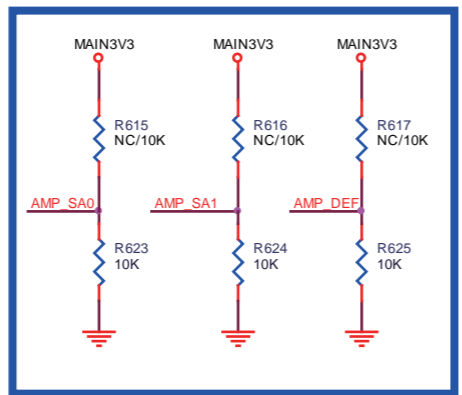
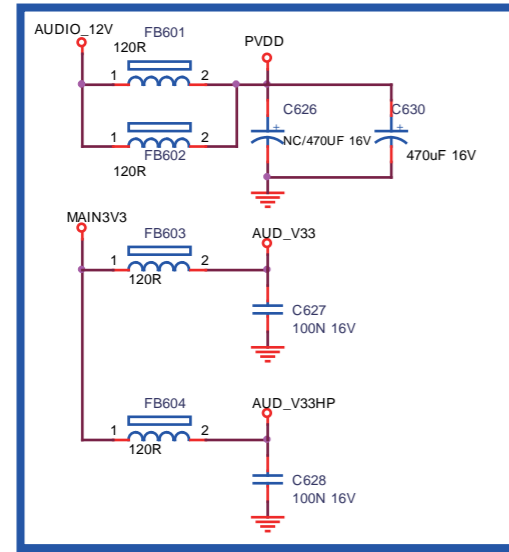
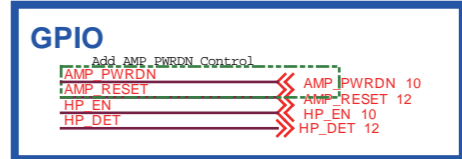
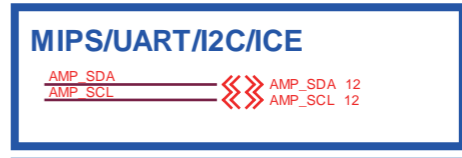
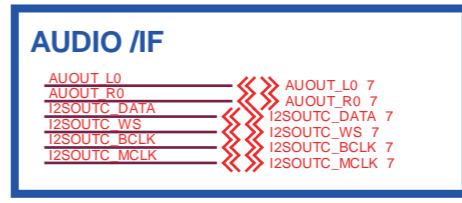
Tuner/Demod	715G7673
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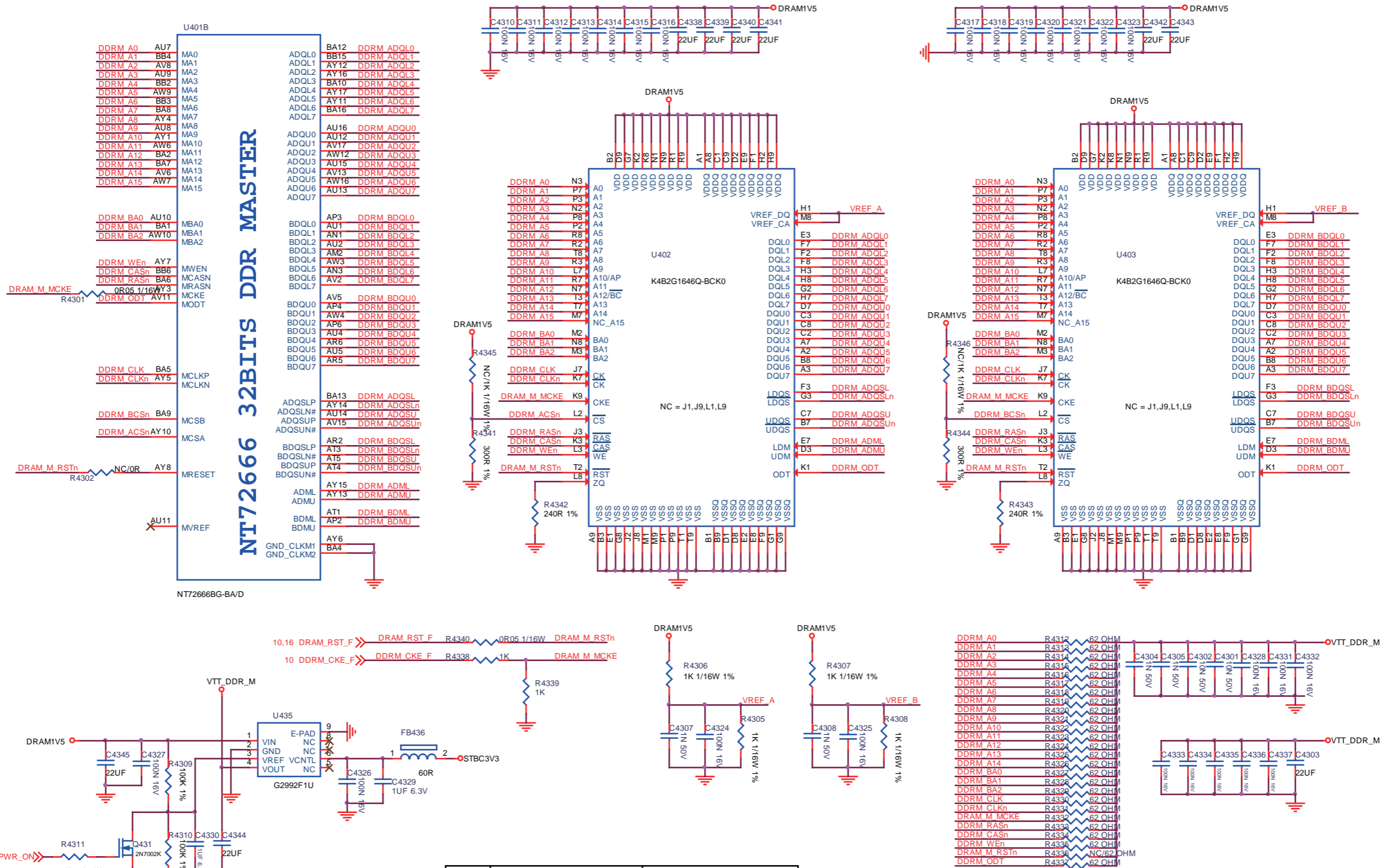
B11 SPK AMP/HP OUT

B11



HP Gain  
R: -(R609/R607)  
L: -(R611/R608)



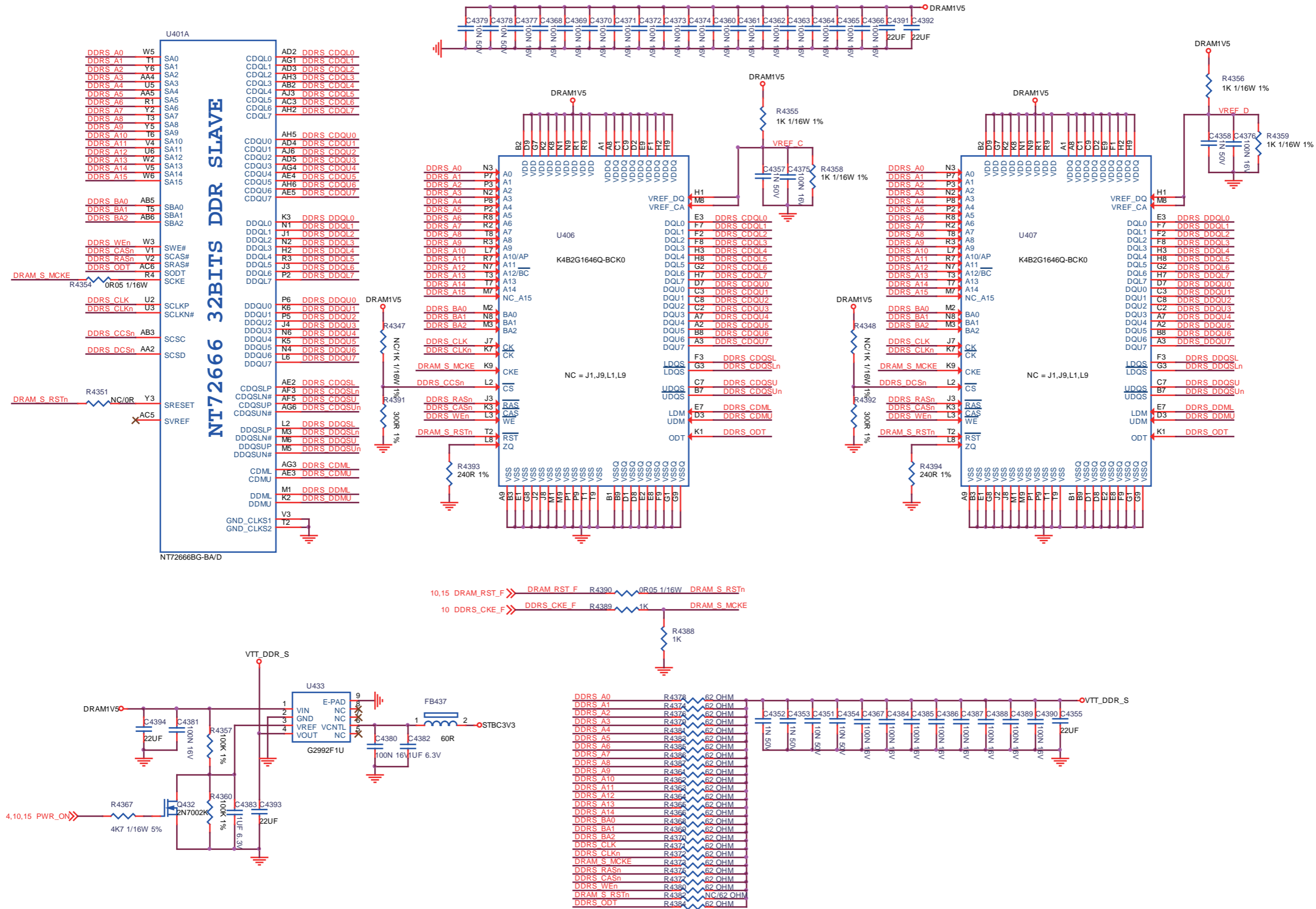


1st	356G0615002600	K4B2G1646Q-BCK0
2nd	356G0615002686	NT5CC128M16IP-DI

B13

DDR3-S

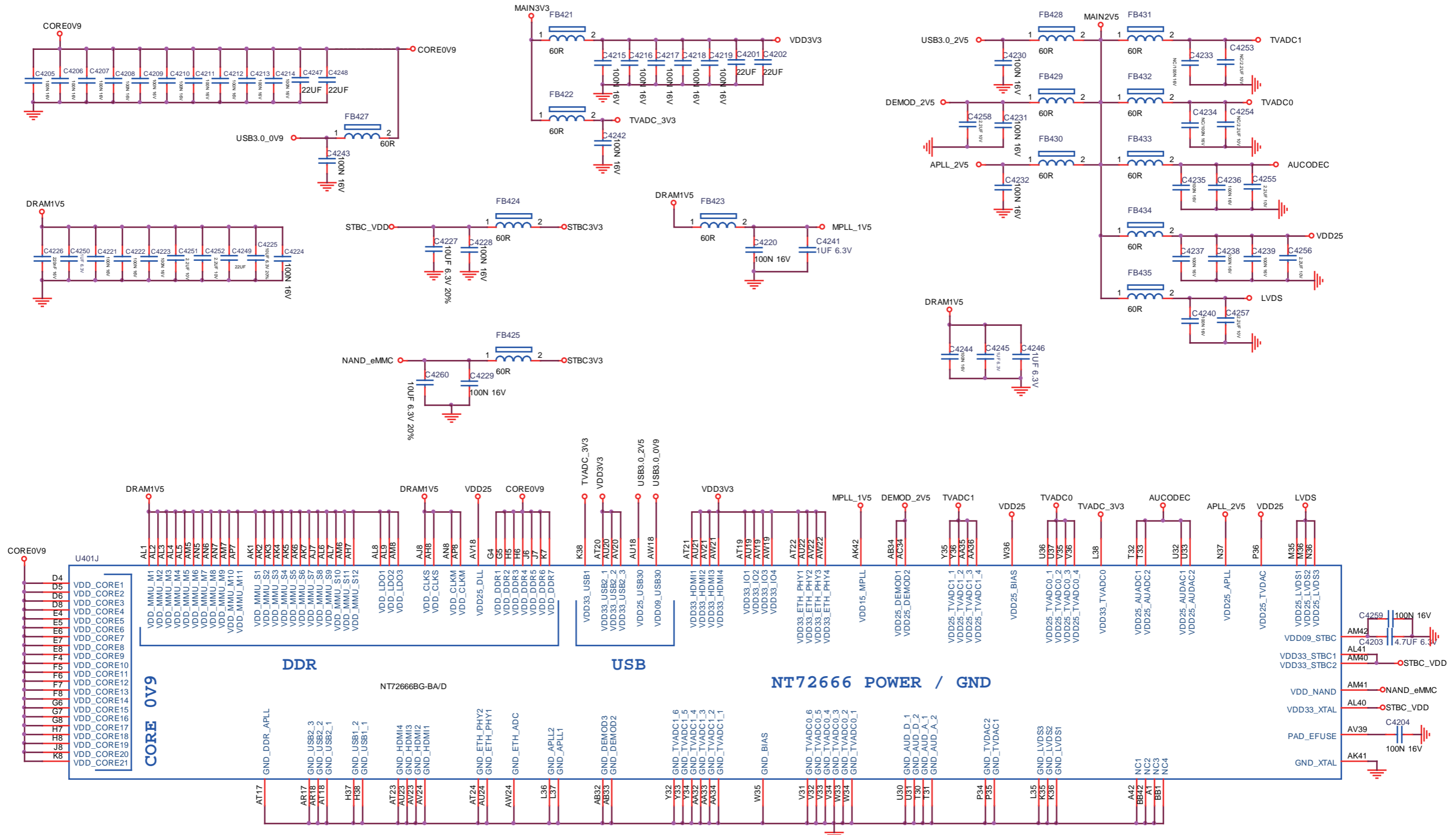
B13



DDR3-S	715G7673	4	2015-08-25
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**B14** NT72666 POWER

**B14**

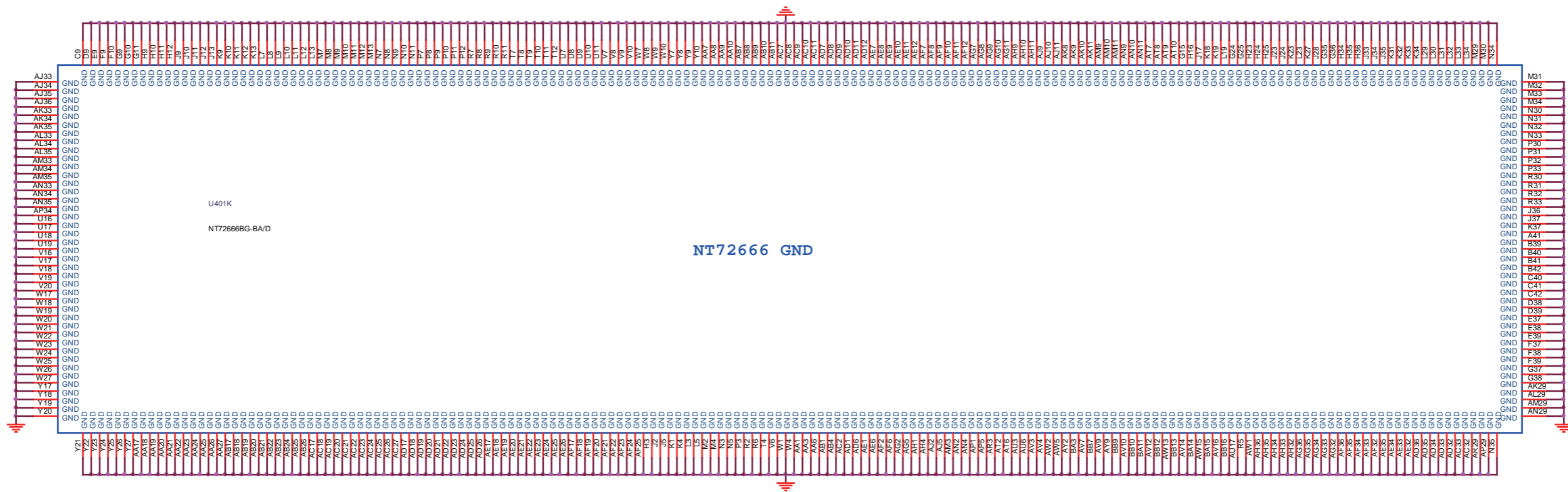


NT72666 POWER	715G7673
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10-3-15 GROUND

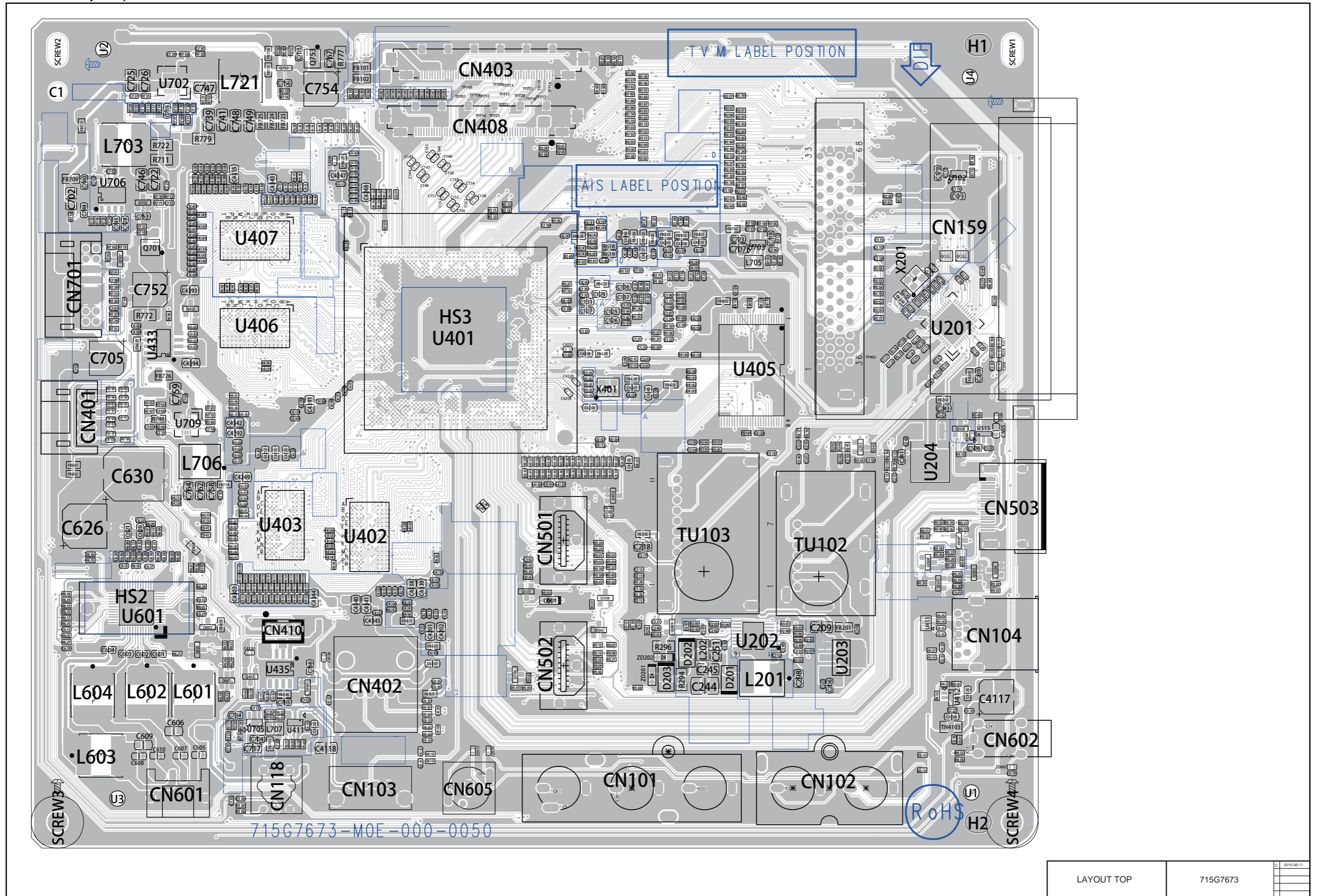
B15 GROUND

B15



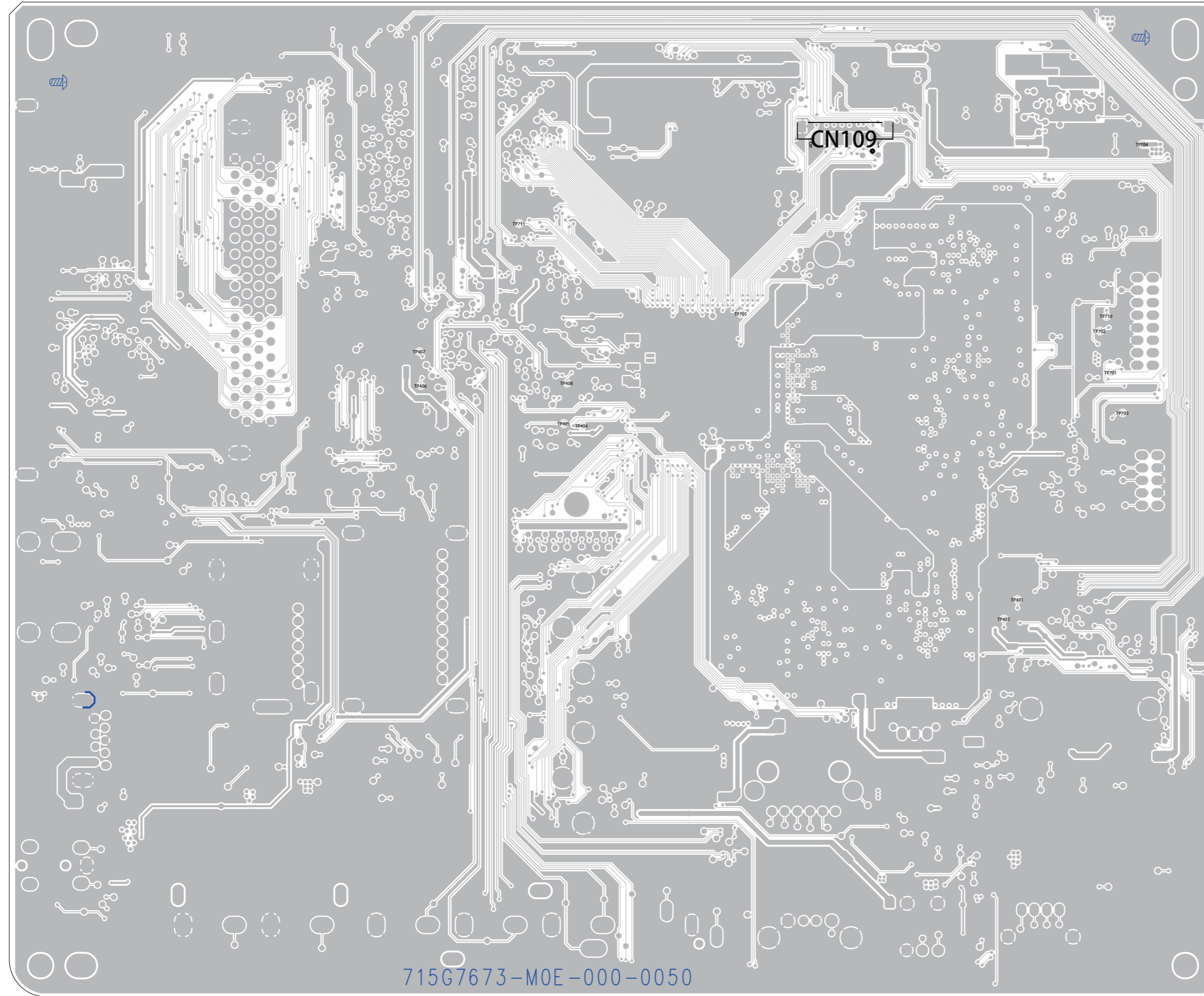
GROUND	715G7673	4	2015-08-25

10-3-16 SSB layout top



LAYOUT TOP	715G7673	C 2015-06-11

10-3-17 SSB layout bottom



715G7673-M0E-000-0050

Power layout bottom	715G7673	3	2015-06-11

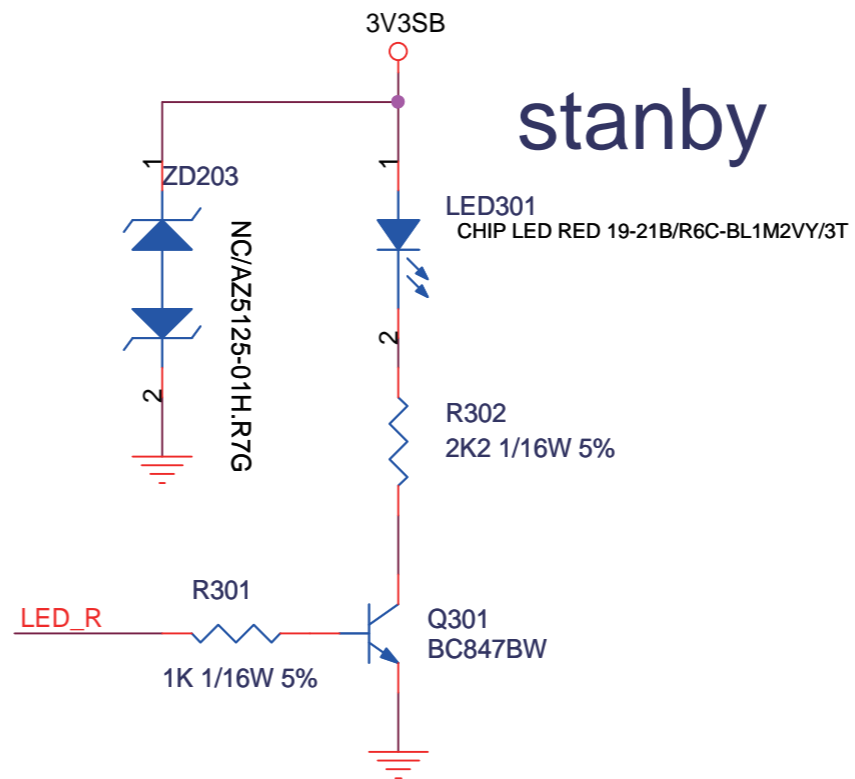
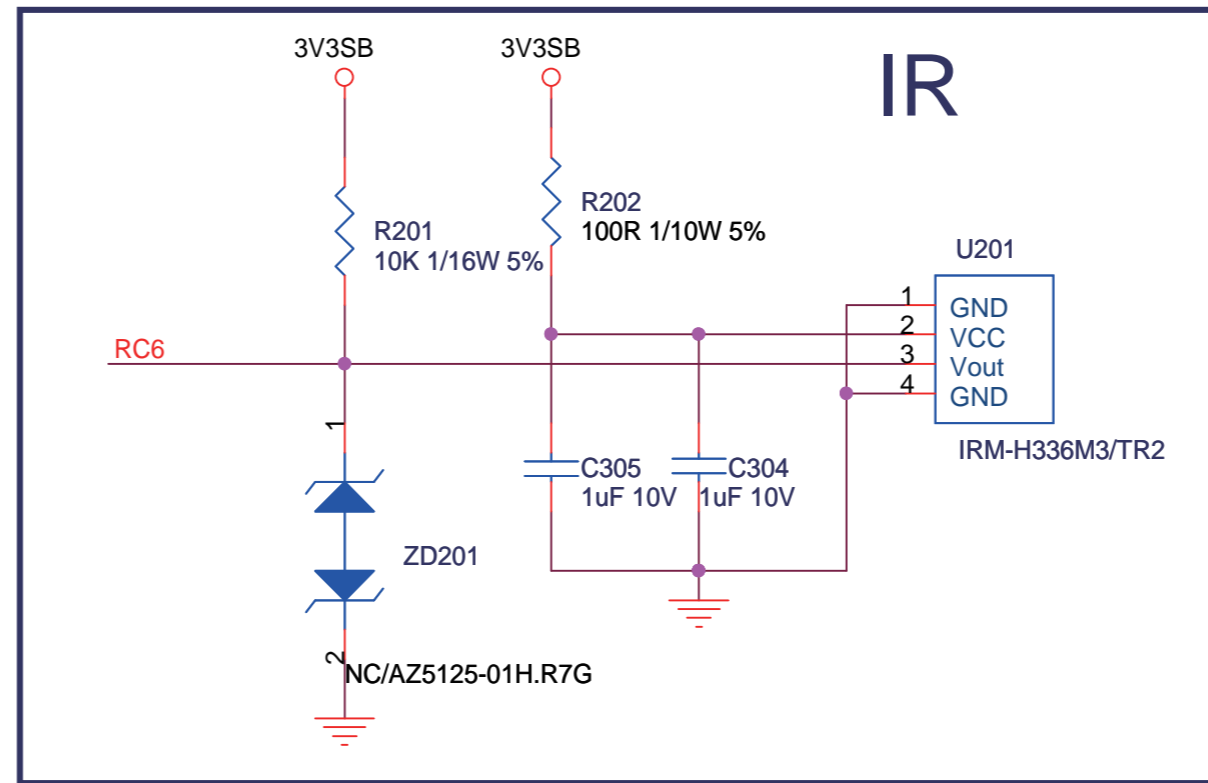
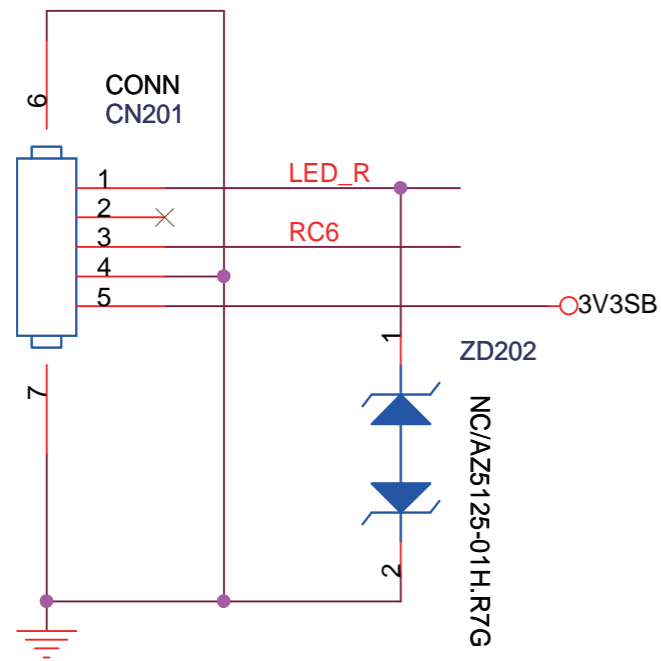


10.4 J 715G7459 IR/LED Panel  
10-4-1 LED & IR & 3D & Light sensor

J

LED & IR & 3D & Light sensor

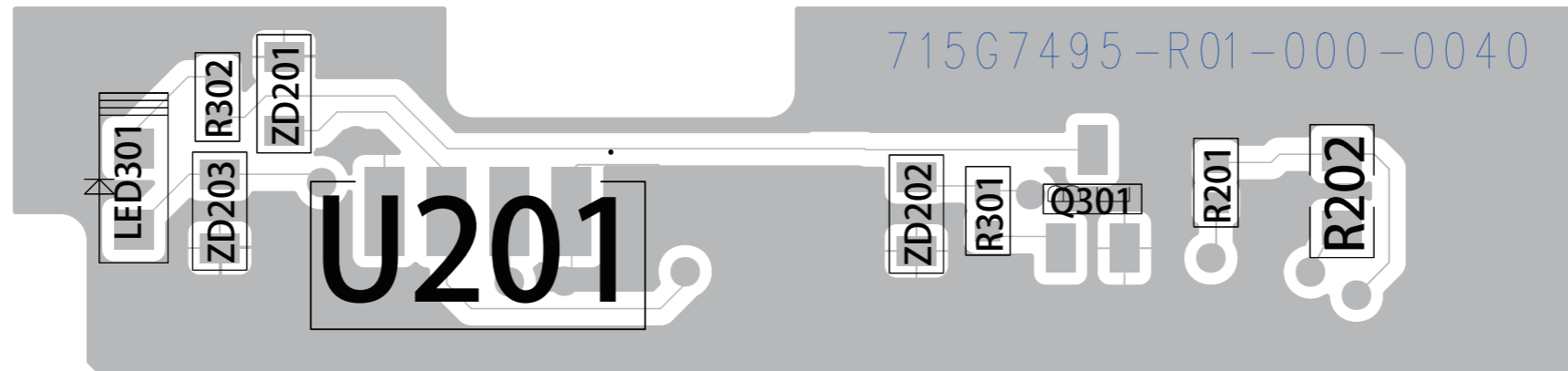
J



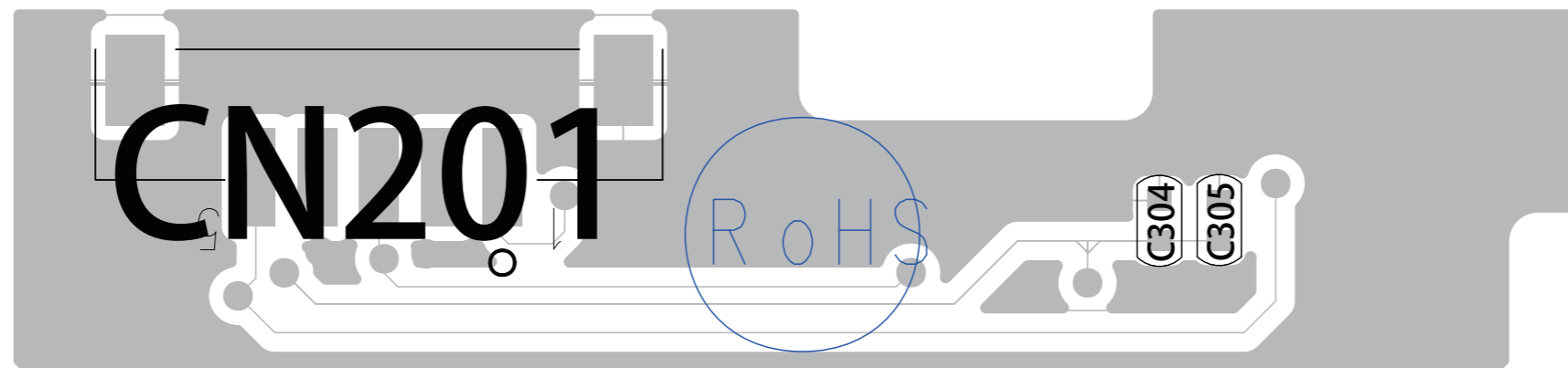
LED&IR &3D&Light sensor	715G7495	C1	2014-11-28

10-4-2 IR/LED board layout

Layout IR/LED panel (top side)



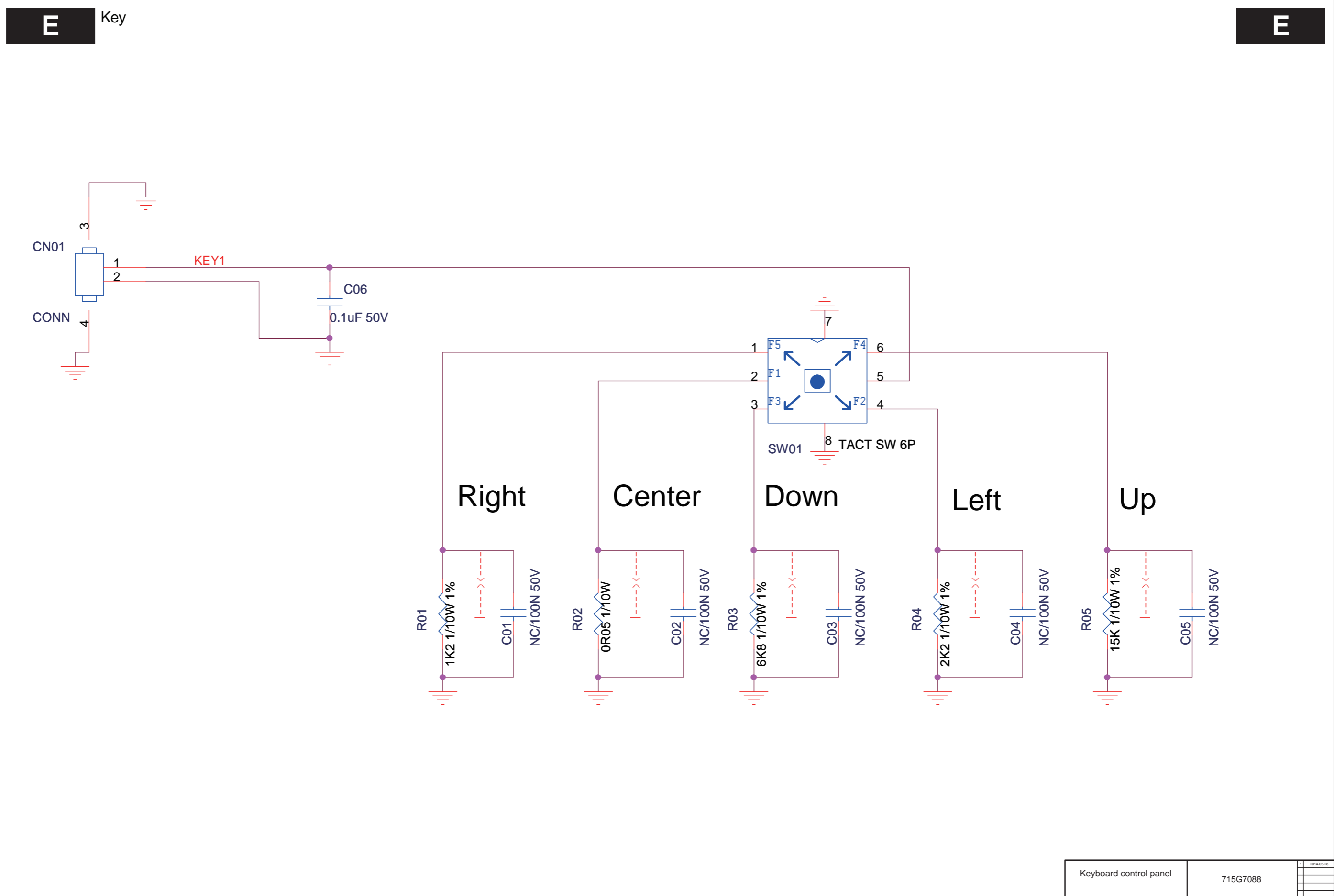
Layout IR/LED panel (bottom side)



IR/LED panel layout top/bottom	715G7495	
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10.5 E 715G7088 Keyboard control panel

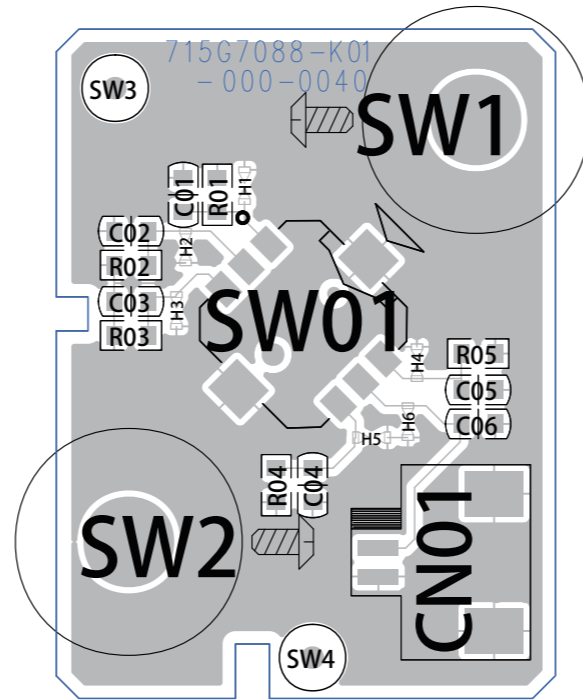
10-5-1 Key



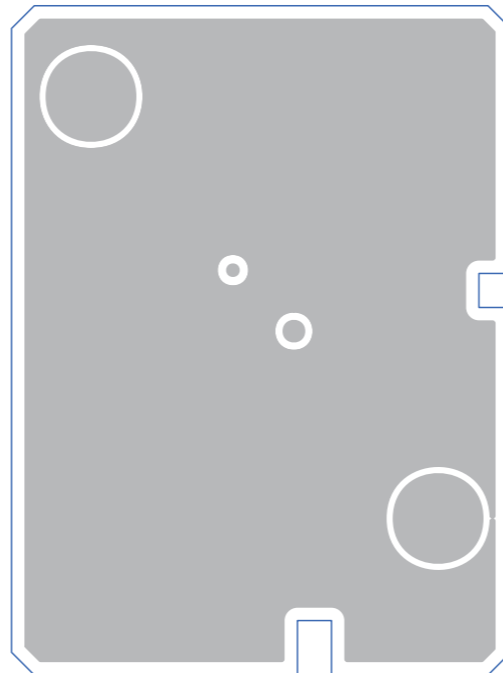
Keyboard control panel	715G7088	1	2014-05-28

10-5-2 Key board layout

Layout Keyboard control panel (top side)



Layout Keyboard control panel (bottom side)

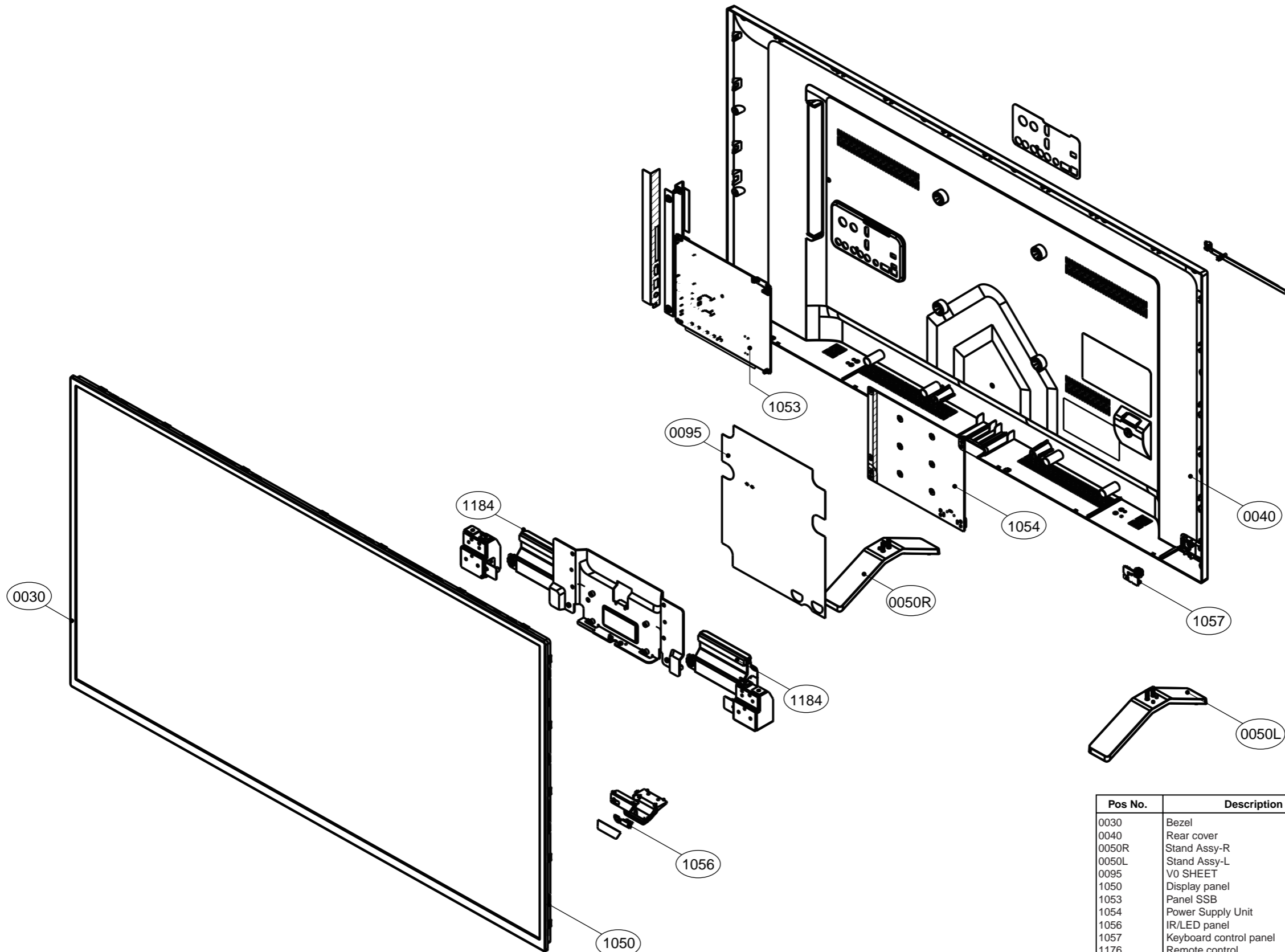


Keyboard control panel layout top/bottom	715G7088	1	2014-06-08

# 11. Styling Sheets

11.1 4900 series 43"

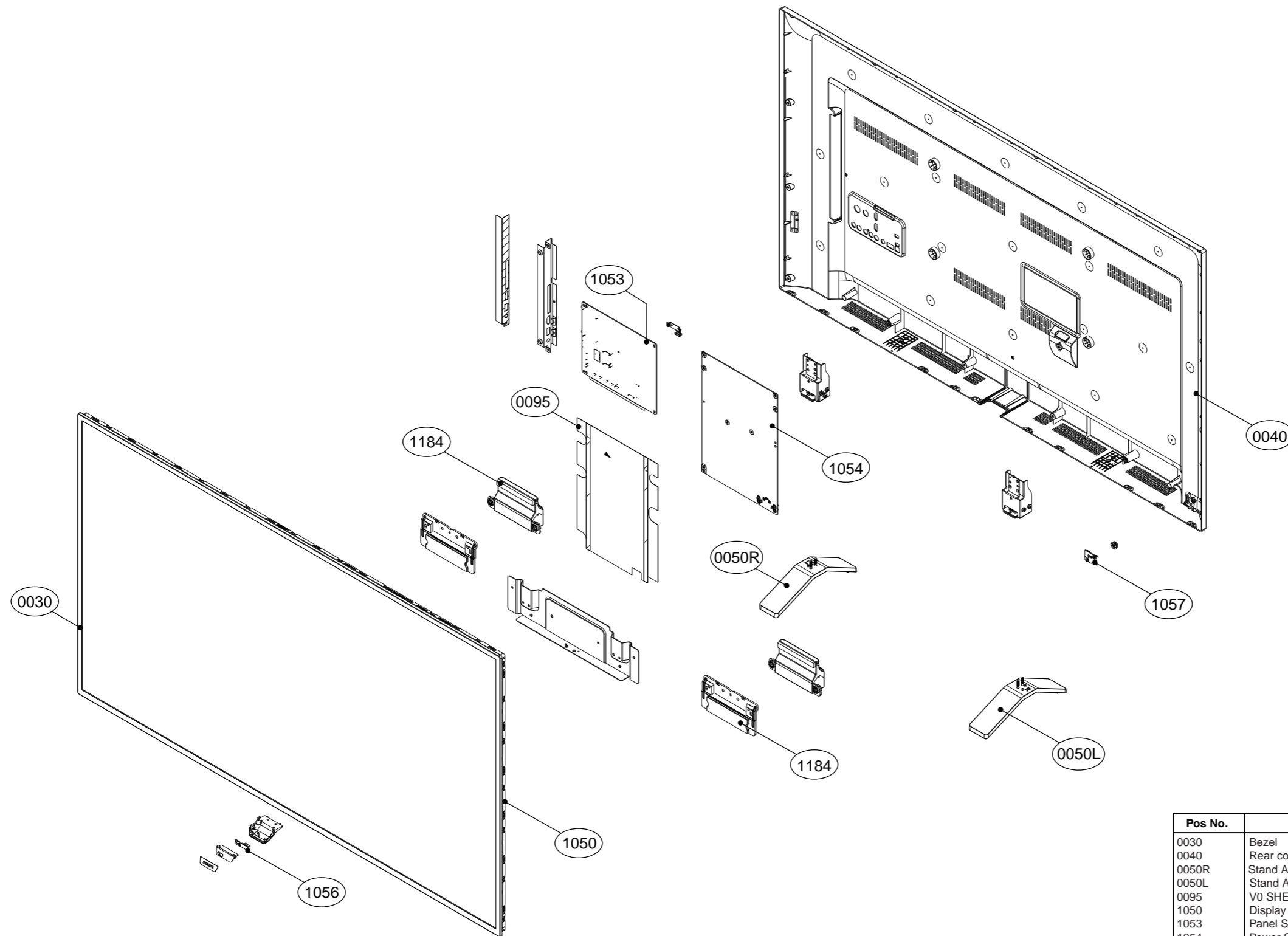
4900 series 43"



Pos No.	Description	Remarks
0030	Bezel	
0040	Rear cover	
0050R	Stand Assy-R	
0050L	Stand Assy-L	
0095	V0 SHEET	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1056	IR/LED panel	
1057	Keyboard control panel	
1176	Remote control	Not displayed
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

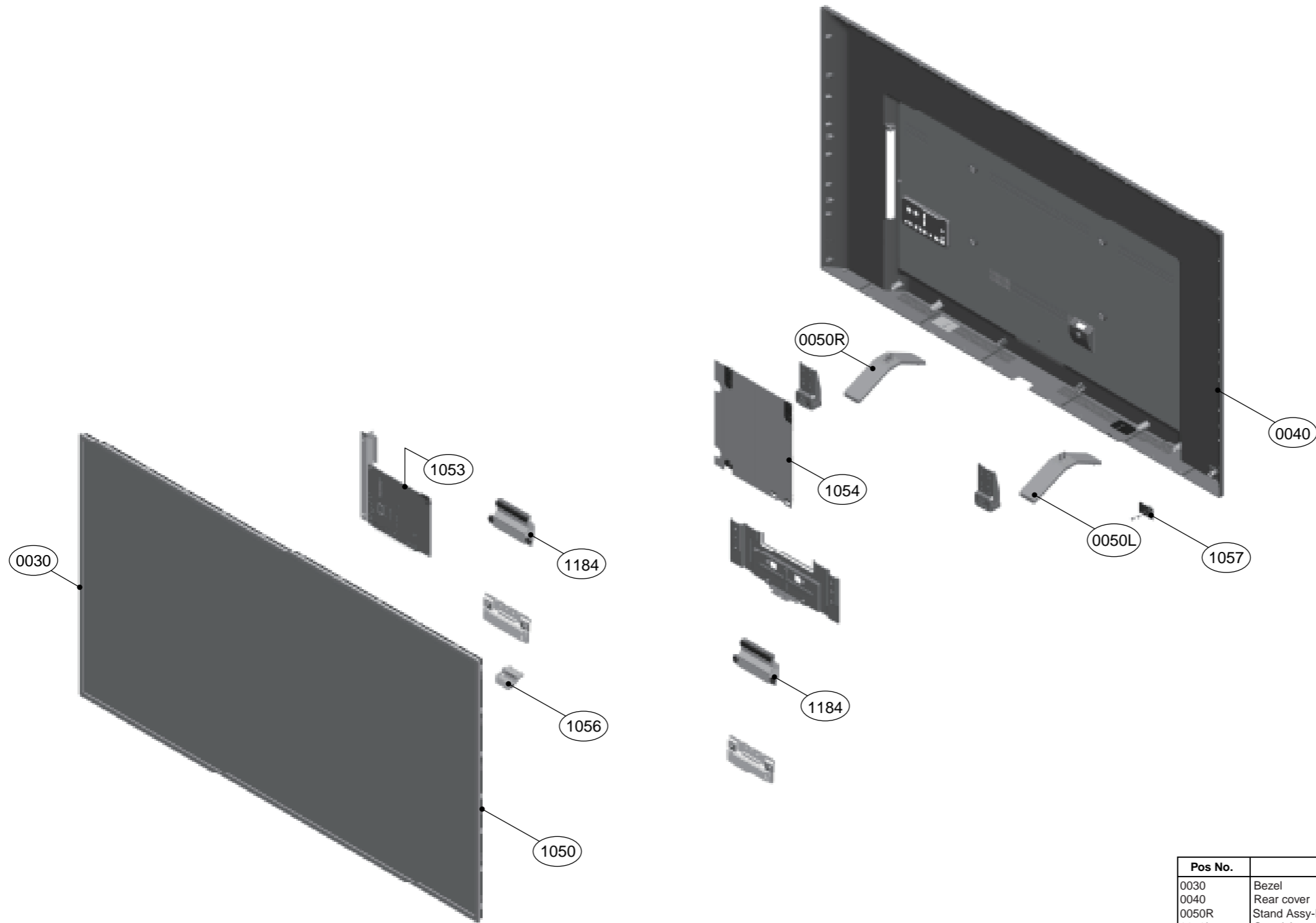
**4900 series 49"**



Pos No.	Description	Remarks
0030	Bezel	
0040	Rear cover	
0050R	Stand Assy-R	
0050L	Stand Assy-L	
0095	V0 SHEET	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1056	IR/LED panel	
1057	Keyboard control panel	
1176	Remote control	Not displayed
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

**4900 series 55"**



Pos No.	Description	Remarks
0030	Bezel	
0040	Rear cover	
0050R	Stand Assy-R	
0050L	Stand Assy-L	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1056	IR/LED panel	
1057	Keyboard control panel	
1176	Remote control	Not displayed
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9