

Service
Service
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Service Manual

Contents	Page
1. Revision List	2
2. Technical Specs, Diversity, and Connections	2
3. Precautions, Notes, and Abbreviation List	11
4. Mechanical Instructions	15
5. Service Modes and Fault Finding	26
6. Alignments	34
7. Circuit Descriptions	36
8. IC Data Sheets	47
9. Block Diagrams	
Wiring diagram 3000 series 24"	59
Wiring diagram 3000 series 32"	60
Wiring diagram 3000 series 39"	61
Wiring diagram 31x8H/12 series 40"	62
Wiring diagram 31x8T/60 series 40"	63
Wiring diagram 31x8H/12 series 42"- 47"	64
Wiring diagram 31x8T/60 series 47"	65
Block diagram 3xx8 series	66
10. Circuit Diagrams and PWB Layouts	<i>Drawing PWB</i>
A 715G6163 PSU	67 71-72
A 715G6297 PSU	73 75-76
BA 715G6079 SSB+PSU combination panel	77 92-93
B 715G6092 SSB	94 107-108
B 715G6094 SSB	109 126-127
J 715G5772 IR/LED Panel	128 129
EJ 715G6167 Control Board IR/LED Panel	130 131
11. Styling Sheets	
3108 series 20"	132
3108 series 22"	133
3108 series 24"	134
3000 series 32"	135
3000 series 39"	136
3000 series 40"	137
3000 series 42"	138
3000 series 47"	139

Contents	Page
----------	------

1. Revision List

Manual xxxx xxx xxxx.0

- First release.

Manual xxxx xxx xxxx.1

- Chapter 2:** Updated table [2.1 Technical Specifications](#), and section [2.6 Connections \(for 20"/22"/24"PFL3108H\)](#).
- Chapter 4:** Added figure [4-1 Cable dressing \(24" 3000 series\)](#) and section [4.5 Assembly/Panel Removal \(for 20" & 22" & 24"\)](#).
- 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](#).
- Chapter 7:** Updated figures [7-7 Power Architecture \(for 20" & 22" & 24"\)](#) and [7-9 DC/DC converters \(for 20" & 22" & 24" & 40/42/47PFL3188H/12 & 47PFL3198H/12\)](#).
- Chapter 9:** Added wire diagram [9.1 Wiring diagram 3000 series 24"](#).
- Chapter 10:** Added circuit diagrams [10.2 A 715G6297 PSU](#) and [10.6 J 715G5772 IR/LED Panel](#).
- Chapter 11:** Added styling sheets [11.1 3108 series 20"](#), [11.2 3108 series 22"](#) and [11.3 3108 series 24"](#).

2. Technical Specs, Diversity, and Connections

Index of this chapter:

[2.1 Technical Specifications](#)

[2.2 Directions for Use](#)

[2.3 Connections \(for 32" & 39"\)](#)

[2.4 Connections \(for 40"/42"/47"PFL31x8H/12\)](#)

[2.5 Connections \(for 40"/47"PFL31x8T/60\)](#)

[2.6 Connections \(for 20"/22"/24"PFL3108H\)](#)

[2.7 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

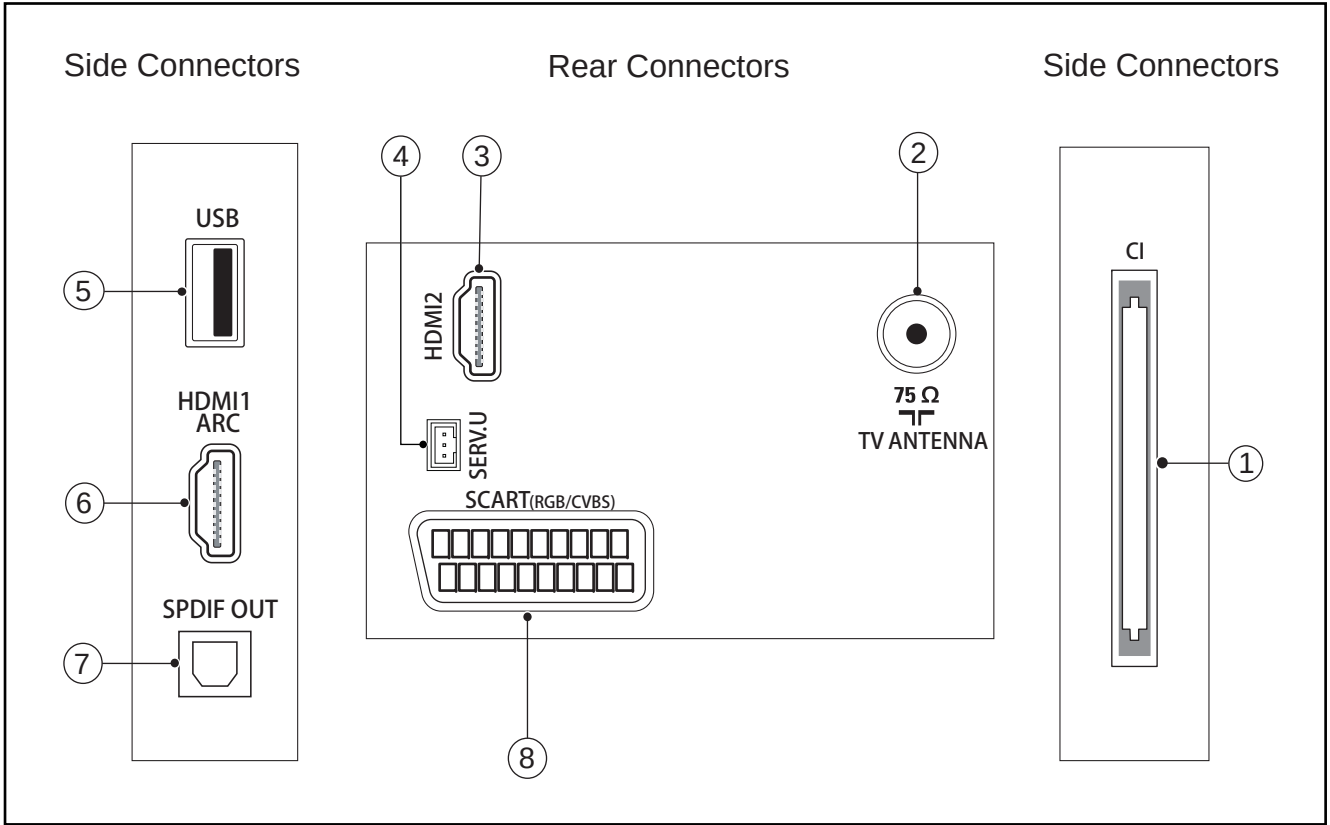
CTN	2	4				9		10						11
	Connection Overview	Mechanics				Block Diagrams		Schematics						Styling
		Wire Dressing	Rear Cover Removal	Speakers Removal	SSB Removal	Wiring Diagram	Block Diagram	Power Supply	SSB + PSU combination panel	SSB	J (IR/LED)	EJ (control board + IR/LED panel)		
20PFL3108H/12	2-18	4-1	4-15	-	4-16	9.1	9.8	10.2	-	10.4	10.6	-	11.1	
22PFL3108H/60	2-18	4-1	4-15	-	4-16	9.1	9.8	10.2	-	10.4	10.6	-	11.2	
24PFL3108H/12	2-18	4-1	4-15	-	4-16	9.1	9.8	10.2	-	10.4	10.6	-	11.3	
24PFL3108H/60	2-18	4-1	4-15	-	4-16	9.1	9.8	10.2	-	10.4	10.6	-	11.3	
32PFL3088H/12	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
32PFL3148H/12	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
32PFL3168H/12	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
32PFL3168T/60	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
32PFL3178T/60	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
32PFL3188H/12	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
32PFL3188K/12	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
32PFL3188T/60	2-1	4-2	4-8	4-10	4-11	9.2	9.8	-	10.3	-	-	10.7	11.4	
39PFL3088H/12	2-1	4-3	4-8	4-10	4-11	9.3	9.8	-	10.3	-	-	10.7	11.5	
39PFL3188H/12	2-1	4-3	4-8	4-10	4-11	9.3	9.8	-	10.3	-	-	10.7	11.5	
39PFL4398H/12	2-1	4-3	4-8	4-10	4-11	9.3	9.8	-	10.3	-	-	10.7	11.5	
39PFL4398T/60	2-1	4-3	4-8	4-10	4-11	9.3	9.8	-	10.3	-	-	10.7	11.5	
40PFL3088H/12	2-6	4-4	4-12	4-10	4-14	9.4	9.8	10.1	-	10.4	-	10.7	11.7	
40PFL3138H/12	2-6	4-4	4-12	4-10	4-14	9.4	9.8	10.1	-	10.4	-	10.7	11.7	
40PFL3148H/12	2-6	4-4	4-12	4-10	4-14	9.4	9.8	10.1	-	10.4	-	10.7	11.7	
40PFL3188H/12	2-6	4-4	4-12	4-10	4-14	9.4	9.8	10.1	-	10.4	-	10.7	11.7	
40PFL3188T/60	2-11	4-5	4-12	4-10	4-14	9.5	9.8	10.1	-	10.5	-	10.7	11.6	
40PFL3198T/60	2-11	4-5	4-12	4-10	4-14	9.5	9.8	10.1	-	10.5	-	10.7	11.6	
42PFL3188H/12	2-6	4-6	4-12	4-10	4-14	9.6	9.8	10.1	-	10.4	-	10.7	11.7	
42PFL4398H/12	2-6	4-6	4-12	4-10	4-14	9.6	9.8	10.1	-	10.4	-	10.7	11.7	
42PFL4398T/60	2-11	4-5	4-12	4-10	4-14	9.5	9.8	10.1	-	10.5	-	10.7	11.6	
47PFL3188H/12	2-6	4-6	4-12	4-10	4-14	9.6	9.8	10.1	-	10.4	-	10.7	11.7	
47PFL3188T/60	2-11	4-7	4-12	4-10	4-14	9.7	9.8	10.1	-	10.5	-	10.7	11.8	
47PFL3198H/12	2-6	4-6	4-12	4-10	4-14	9.6	9.8	10.1	-	10.4	-	10.7	11.7	
47PFL3198T/60	2-11	4-7	4-12	4-10	4-14	9.7	9.8	10.1	-	10.5	-	10.7	11.8	
47PFL4398H/12	2-6	4-6	4-12	4-10	4-14	9.6	9.8	10.1	-	10.4	-	10.7	11.7	
47PFL4398T/60	2-11	4-7	4-12	4-10	4-14	9.7	9.8	10.1	-	10.5	-	10.7	11.8	

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 (for 32" & 39")



19530_001_130730.eps
130730

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 10-3-12

5 - USB2.0

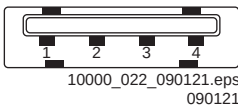
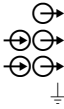


Figure 2-2 USB (type A)

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



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

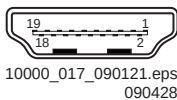


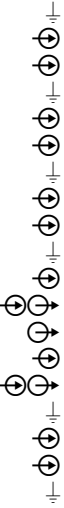
Figure 2-3 HDMI (type A) connector

- 1 - D2+
- Data channel



- 2 - Shield
- 3 - D2-
- 4 - D1+
- 5 - Shield
- 6 - D1-
- 7 - D0+
- 8 - Shield
- 9 - D0-
- 10 - CLK+
- 11 - Shield
- 12 - CLK-
- 13 - Easylink/CEC
- 14 - ARC
- 15 - DDC_SCL
- 16 - DDC_SDA
- 17 - Ground
- 18 - +5V
- 19 - HPD
- 20 - Ground

- Gnd
- Data channel
- Data channel
- Gnd
- Data channel
- Data channel
- Gnd
- Data channel
- Gnd
- Data channel
- Gnd
- Data channel
- Control channel
- Audio Return Channel
- DDC clock
- DDC data
- Gnd
- Gnd
- Hot Plug Detect
- Gnd



7 - Cinch: Digital Audio - Out

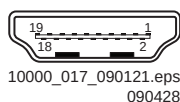
BK - Coaxial 0.4 - 0.6V_{PP} / 75 Ω



2.3.2 Rear Connections

2 - TV ANTENNA - In

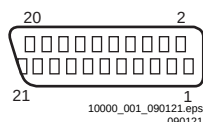
Signal input from an antenna, cable or satellite.

3 - HDMI2 : Digital Video - In, Digital Audio - 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	- n.c.		
15	- DDC_SCL	DDC clock	⊕
16	- DDC_SDA	DDC data	⊕→
17	- Ground	Gnd	⊥
18	- +5V		⊕
19	- HPD	Hot Plug Detect	⊕
20	- Ground	Gnd	⊥

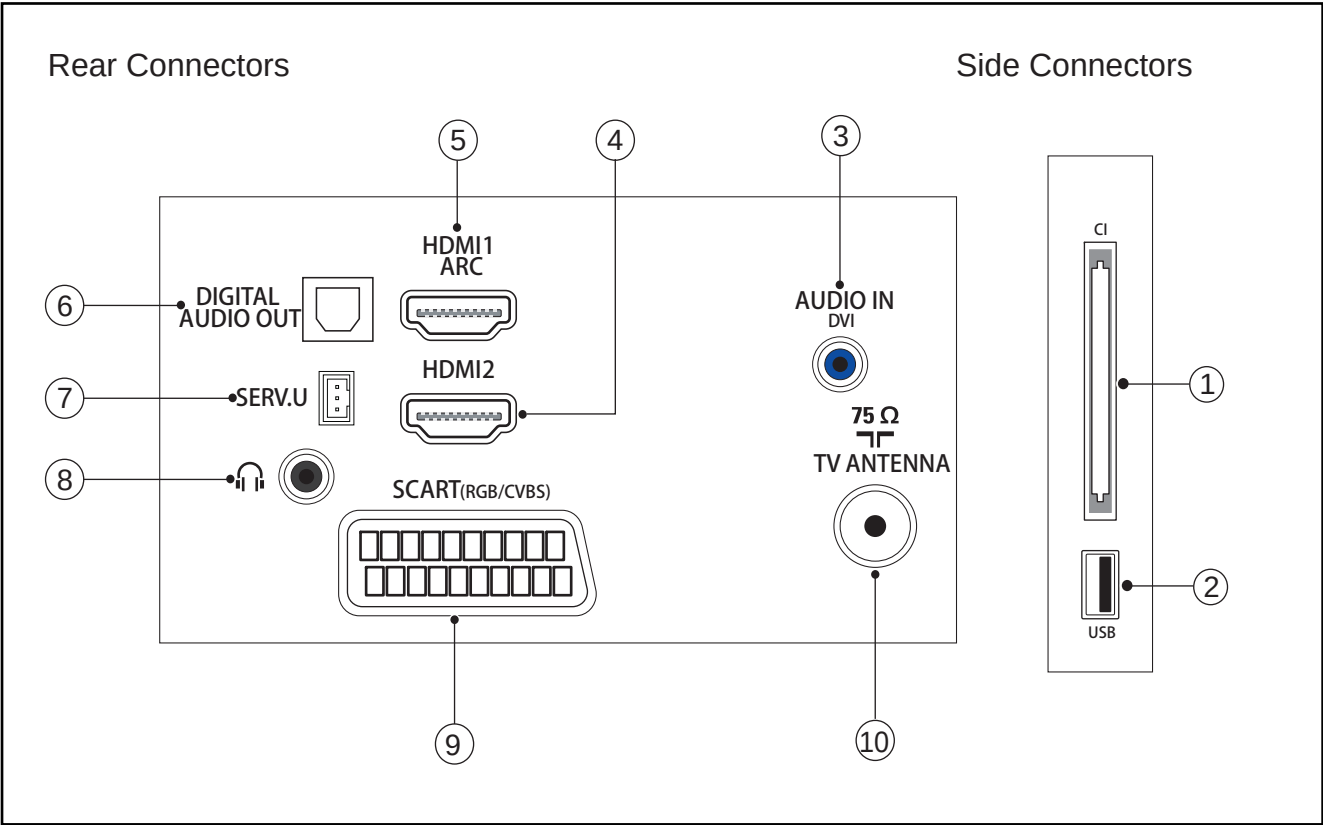
4 - Service / UART

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

8 - EXT1: Video RGB/YC - In, CVBS - In/Out, Audio - In/Out**Figure 2-5 SCART connector**

1	- Audio R	$0.5 V_{RMS} / 1 k\Omega$	→
2	- Audio R	$0.5 V_{RMS} / 10 k\Omega$	⊕
3	- Audio L	$0.5 V_{RMS} / 1 k\Omega$	→
4	- Ground Audio	Gnd	⊥
5	- Ground Blue	Gnd	⊥
6	- Audio L	$0.5 V_{RMS} / 10 k\Omega$	⊕
7	- Video Blue/C-out	$0.7 V_{PP} / 75 \Omega$	⊕→
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	$0.7 V_{PP} / 75 \Omega$	⊕
12	- n.c.		
13	- Ground Red	Gnd	⊥
14	- Ground P50	Gnd	⊥
15	- Video Red/C	$0.7 V_{PP} / 75 \Omega$	⊕
16	- Status/FBL	0 - 0.4 V: INT 1 - 3 V: EXT / 75Ω	⊕
17	- Ground Video	Gnd	⊥
18	- Ground FBL	Gnd	⊥
19	- Video CVBS	$1 V_{PP} / 75 \Omega$	→
20	- Video CVBS/Y	$1 V_{PP} / 75 \Omega$	⊕
21	- Shield	Gnd	⊥

2.4 Connections (for 40"/42"/47"PFL31x8H/12)



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130719

Figure 2-6 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.

2.4.1 Side Connections

1 - Common Interface

68p - See figure 10-3-12

2 - USB2 2.0

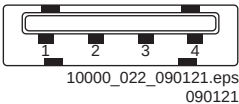


Figure 2-7 USB (type A)

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



2.4.2 Rear Connections

3 - Audio - In: Left / Right, VGA

Bu - Audio L/R in 0.5 V_{RMS} / 10 kW



4 - HDMI2 : Digital Video - In, Digital Audio - In/Out

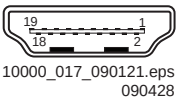


Figure 2-8 HDMI (type A) connector

- 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 - n.c.
- 15 - DDC_SCL DDC clock
- 16 - DDC_SDA DDC data
- 17 - Ground Gnd
- 18 - +5V
- 19 - HPD Hot Plug Detect
- 20 - Ground Gnd



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

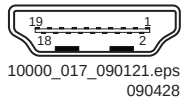


Figure 2-9 HDMI (type A) connector

- 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	

6 - Cinch: Digital Audio - Out

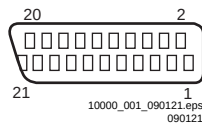
BK	- Coaxial	0.4 - 0.6V _{PP} / 75 W	
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7 - Service / UART

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

8 - Head phone (Output)

Bk	- Head phone	80 - 600 Ω / 10 mW	
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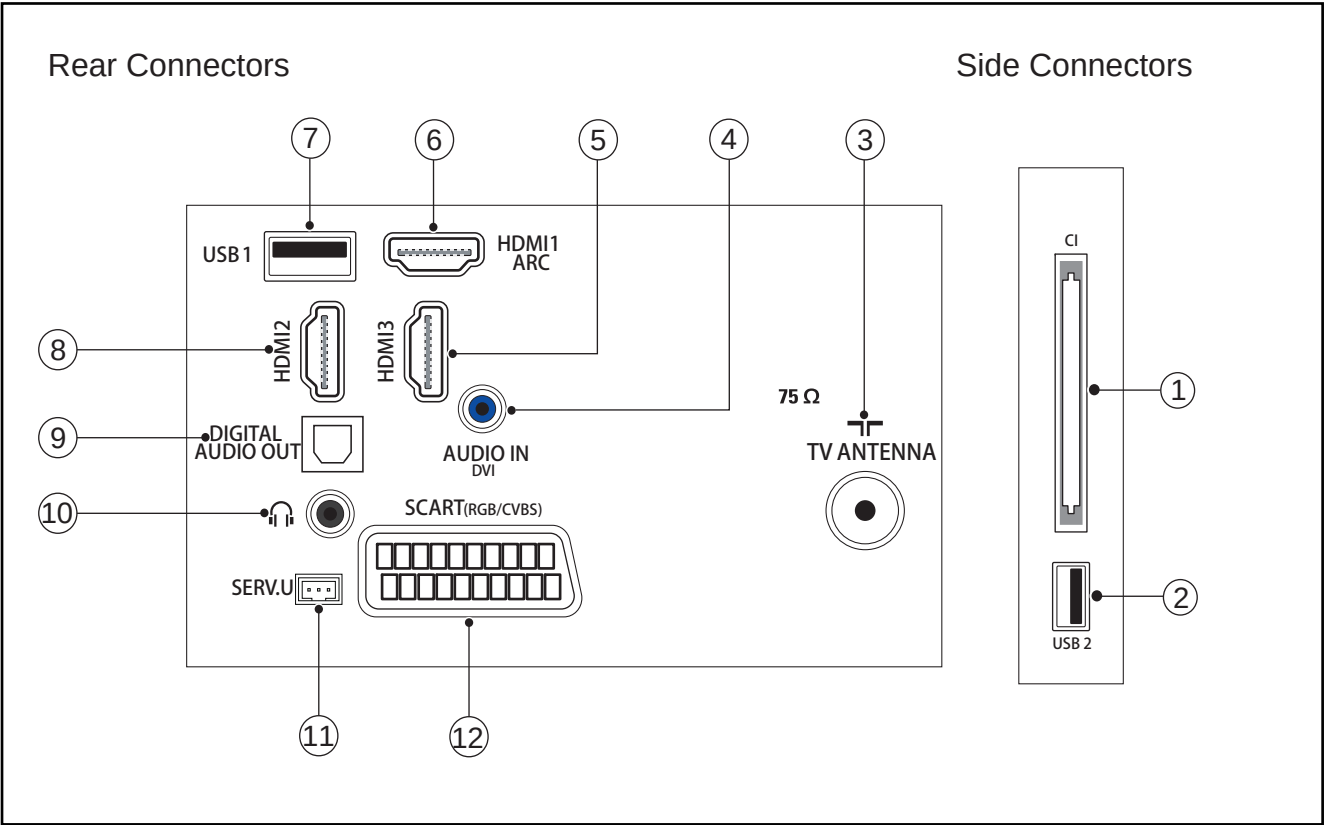
**9 - EXT1: Video RGB/YC - In, CVBS - In/Out, Audio - In/Out****Figure 2-10 SCART connector**

1	- Audio R	0.5 V _{RMS} / 1 kΩ	
2	- Audio R	0.5 V _{RMS} / 10 kΩ	
3	- Audio L	0.5 V _{RMS} / 1 kΩ	
4	- Ground Audio	Gnd	
5	- Ground Blue	Gnd	
6	- Audio L	0.5 V _{RMS} / 10 kΩ	
7	- Video Blue/C-out	0.7 V _{PP} / 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 _{PP} / 75 Ω	
12	- n.c.		
13	- Ground Red	Gnd	
14	- Ground P50	Gnd	
15	- Video Red/C	0.7 V _{PP} / 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 _{PP} / 75 Ω	
20	- Video CVBS/Y	1 V _{PP} / 75 Ω	
21	- Shield	Gnd	

10 - TV ANTENNA - In

Signal input from an antenna, cable or satellite.

2.5 Connections (for 40"/47"PFL31x8T/60)



19530_003_130722.eps
130722

Figure 2-11 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.

2.5.1 Side Connections

1 - Common Interface

68p- See figure [10-3-12](#)

2 - USB2 2.0

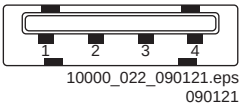


Figure 2-12 USB (type A)

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

2.5.2 Rear Connections

3 - TV ANTENNA - In

Signal input from an antenna, cable or satellite.

4 - Audio - In: Left / Right, VGA

Bu - Audio L/R in 0.5 V_{RMS} / 10 kW

5 - HDMI 3 : Digital Video - In, Digital Audio - In/Out

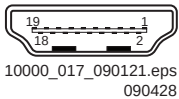


Figure 2-13 HDMI (type A) connector

- | | | |
|----|----------------|-----------------|
| 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 | - n.c. | |
| 15 | - DDC_SCL | DDC clock |
| 16 | - DDC_SDA | DDC data |
| 17 | - Ground | Gnd |
| 18 | - +5V | |
| 19 | - HPD | Hot Plug Detect |
| 20 | - Ground | Gnd |

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

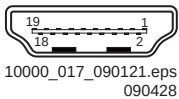
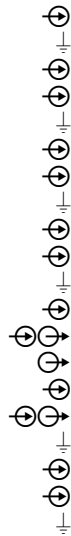
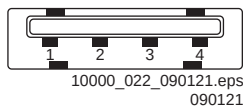
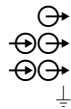
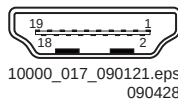


Figure 2-14 HDMI (type A) connector

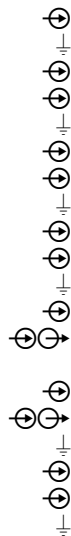
1	- D2+	Data channel
2	- Shield	Gnd
3	- D2-	Data channel
4	- D1+	Data channel
5	- Shield	Gnd
6	- D1-	Data channel
7	- D0+	Data channel
8	- Shield	Gnd
9	- D0-	Data channel
10	- CLK+	Data channel
11	- Shield	Gnd
12	- CLK-	Data channel
13	- Easylink/CEC	Control channel
14	- ARC	Audio Return Channel
15	-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

**7 - USB1 2.0****Figure 2-15 USB (type A)**

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

**8 - HDMI2 : Digital Video - In, Digital Audio - In/Out****Figure 2-16 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	- n.c.	
15	- DDC_SCL	DDC clock
16	- DDC_SDA	DDC data
17	- Ground	Gnd
18	- +5V	
19	- HPD	Hot Plug Detect
20	- Ground	Gnd

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

BK	- Coaxial	0.4 - 0.6V _{PP} / 75 W
----	-----------	---------------------------------

**10 - Head phone (Output)**

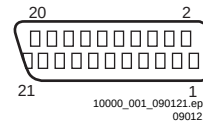
Bk	- Head phone	80 - 600 Ω / 10 mW
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**11 - Service / UART**

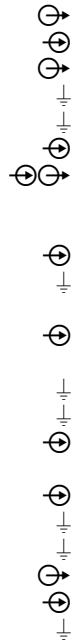
1	- Ground	Gnd
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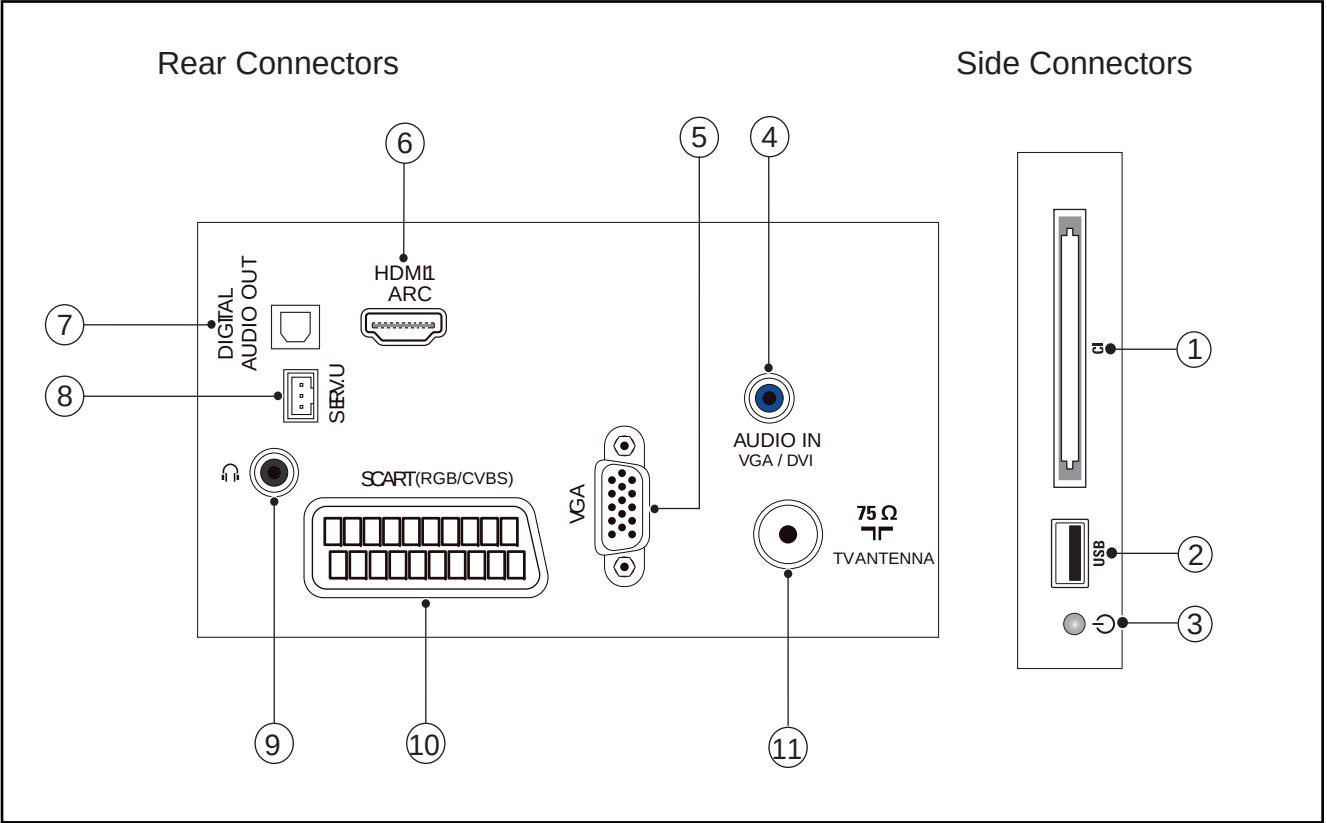
2	- UART_TX	Transmit
3	- UART_RX	Receive

**12 - EXT1: Video RGB/YC - In, CVBS - In/Out, Audio - In/Out****Figure 2-17 SCART connector**

1	- Audio R	0.5 V _{RMS} / 1 kΩ
2	- Audio R	0.5 V _{RMS} / 10 kΩ
3	- Audio L	0.5 V _{RMS} / 1 kΩ
4	- Ground Audio	Gnd
5	- Ground Blue	Gnd
6	- Audio L	0.5 V _{RMS} / 10 kΩ
7	- Video Blue/C-out	0.7 V _{PP} / 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 _{PP} / 75 Ω
12	- n.c.	
13	- Ground Red	Gnd
14	- Ground P50	Gnd
15	- Video Red/C	0.7 V _{PP} / 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 _{PP} / 75 Ω
20	- Video CVBS/Y	1 V _{PP} / 75 Ω
21	- Shield	Gnd



2.6 Connections (for 20"/22"/24"PFL3108H)



19531_001_130923.eps
130923

Figure 2-18 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.

2.6.1 Side Connections

1 - Common Interface

68p- See figure [10-3-12](#)

2 - USB 2.0

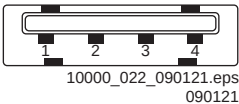


Figure 2-19 USB (type A)

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

3 - Power Button

Turn on/off the TV.

2.6.2 Rear Connections

4 - Audio - In: Left / Right, VGA

Bu - Audio L/R in 0.5 V_{RMS} / 10 kW

5 - PC IN:VGA

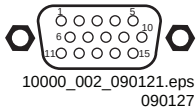


Figure 2-20 VGA connector

- 1 - Video Red 0.7 V_{PP} / 75 W
- 2 - Video Green 0.7 V_{PP} / 75 W
- 3 - Video Blue 0.7 V_{PP} / 75 W
- 4 - n.c.
- 5 - Ground Gnd
- 6 - Ground Red Gnd
- 7 - Ground Green Gnd
- 8 - Ground Blue Gnd
- 9 - +5V_{DC} +5 V
- 10 - Ground Sync Gnd
- 11 - Ground Red Gnd
- 12 - DDC_SDA DDC data
- 13 - H-sync 0 - 5 V
- 14 - V-sync 0 - 5 V
- 15 - DDC_SCL DDC clock

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

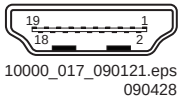


Figure 2-21 HDMI (type A) connector

- 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 - Cinch: Digital Audio - Out
BK - Coaxial 0.4 - 0.6V_{PP} / 75 W 

8 - Service / UART

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

9 - Head phone (Output)
Bk - Head phone 80 - 600 Ω / 10 mW



10 - EXT1: Video RGB/YC - In, CVBS - In/Out, Audio - In/Out

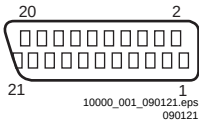


Figure 2-22 SCART connector

1	- Audio R	0.5 V _{RMS} / 1 kΩ	
2	- Audio R	0.5 V _{RMS} / 10 kΩ	
3	- Audio L	0.5 V _{RMS} / 1 kΩ	
4	- Ground Audio	Gnd	
5	- Ground Blue	Gnd	
6	- Audio L	0.5 V _{RMS} / 10 kΩ	
7	- Video Blue/C-out	0.7 V _{PP} / 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 _{PP} / 75 Ω	
12	- n.c.		
13	- Ground Red	Gnd	
14	- Ground P50	Gnd	
15	- Video Red/C	0.7 V _{PP} / 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 _{PP} / 75 Ω	
20	- Video CVBS/Y	1 V _{PP} / 75 Ω	
21	- Shield	Gnd	

11 - TV ANTENNA - In
Signal input from an antenna, cable or satellite.

2.7

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 Kobierzyce), 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
DSMD	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 form 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		
FM	Field Memory or Frequency Modulation	MOP	Matrix Output Processor
FPGA	Field-Programmable Gate Array	MOSFET	Metal Oxide Silicon Field Effect Transistor, switching device
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 ² C	Inter IC bus	O/C	Open Circuit
I ² D	Inter IC Data bus	OSD	On Screen Display
I ² 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 Deployment: 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 ² C		
SCL-F	CLock Signal on Fast I ² C bus		
SD	Standard Definition		
SDA	Serial Data I ² C		
SDA-F	DAta Signal on Fast I ² 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 \(for 32" & 39"\)](#)

[4.4 Assembly/Panel Removal \(for 40" & 42" & 47"\)](#)

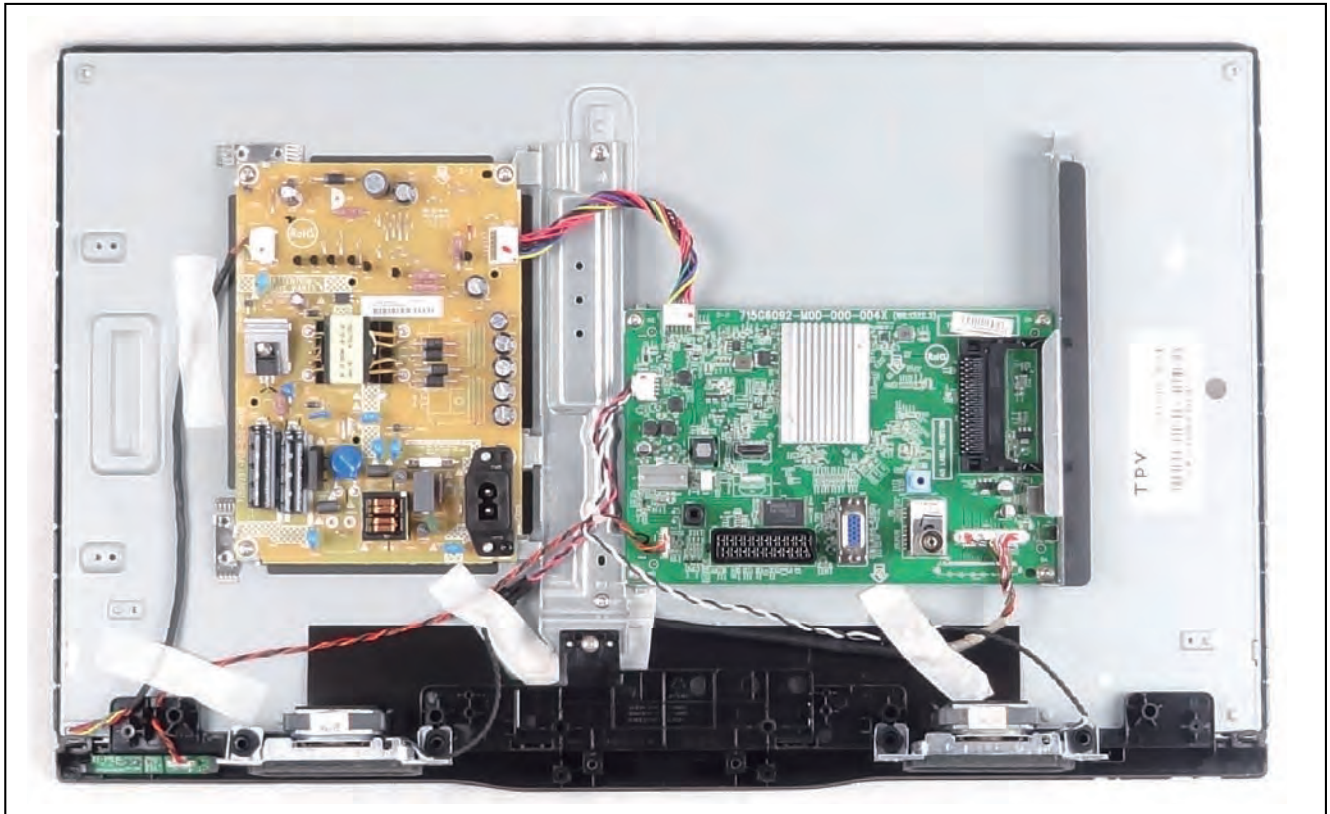
[4.5 Assembly/Panel Removal \(for 20" & 22" & 24"\)](#)

[4.6 Set Re-assembly](#)

Notes:

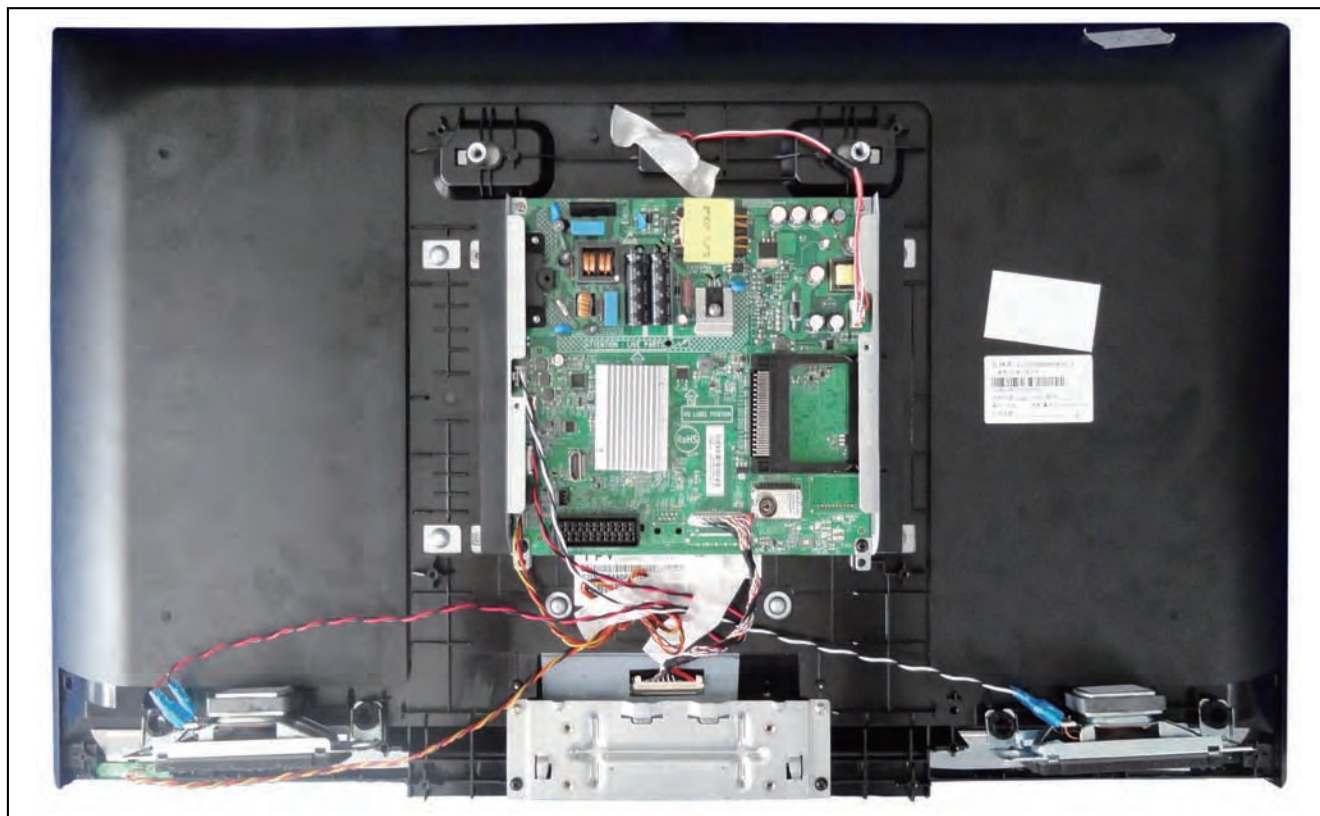
- Figures below can deviate slightly from the actual situation, due to the different set executions.

4.1 Cable Dressing



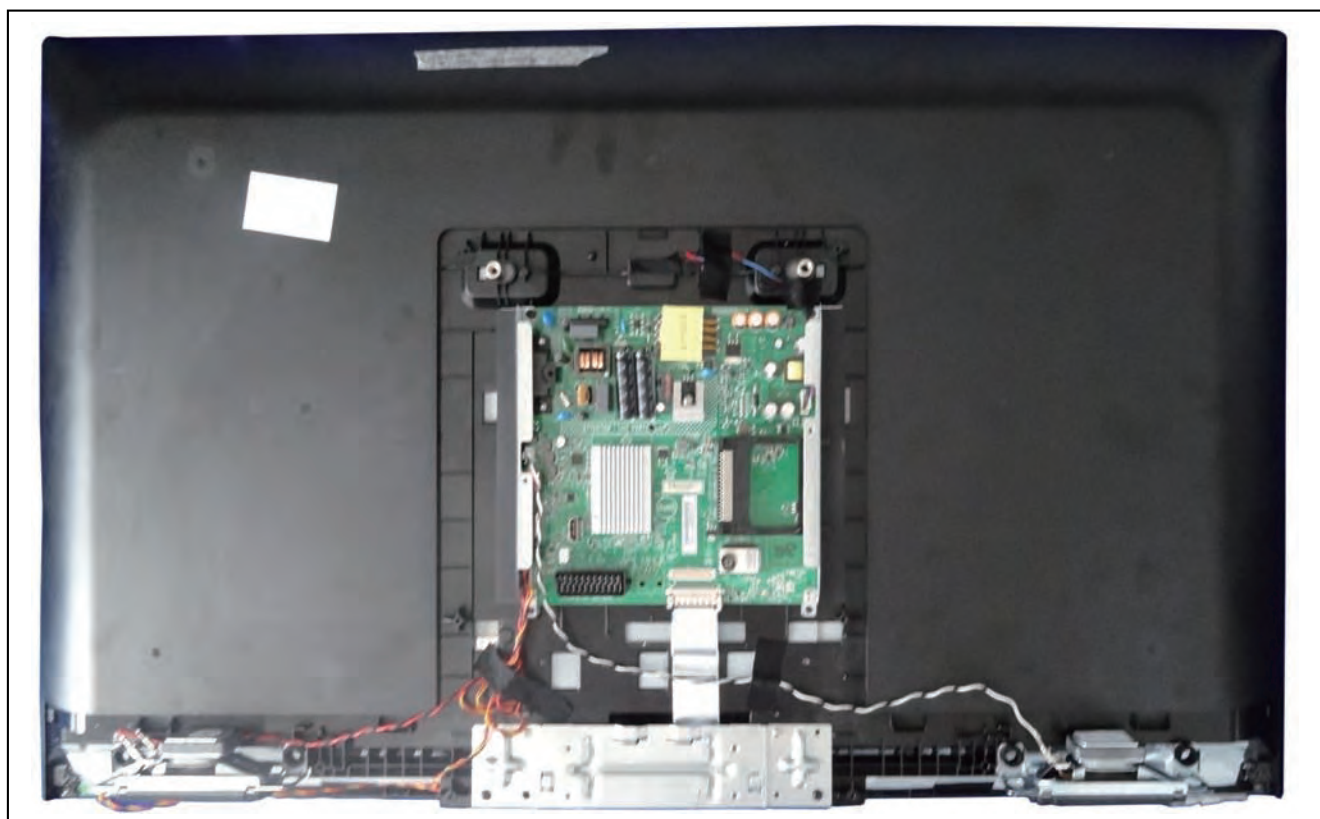
19531_100_130827.eps
130827

Figure 4-1 Cable dressing (24" 3000 series)



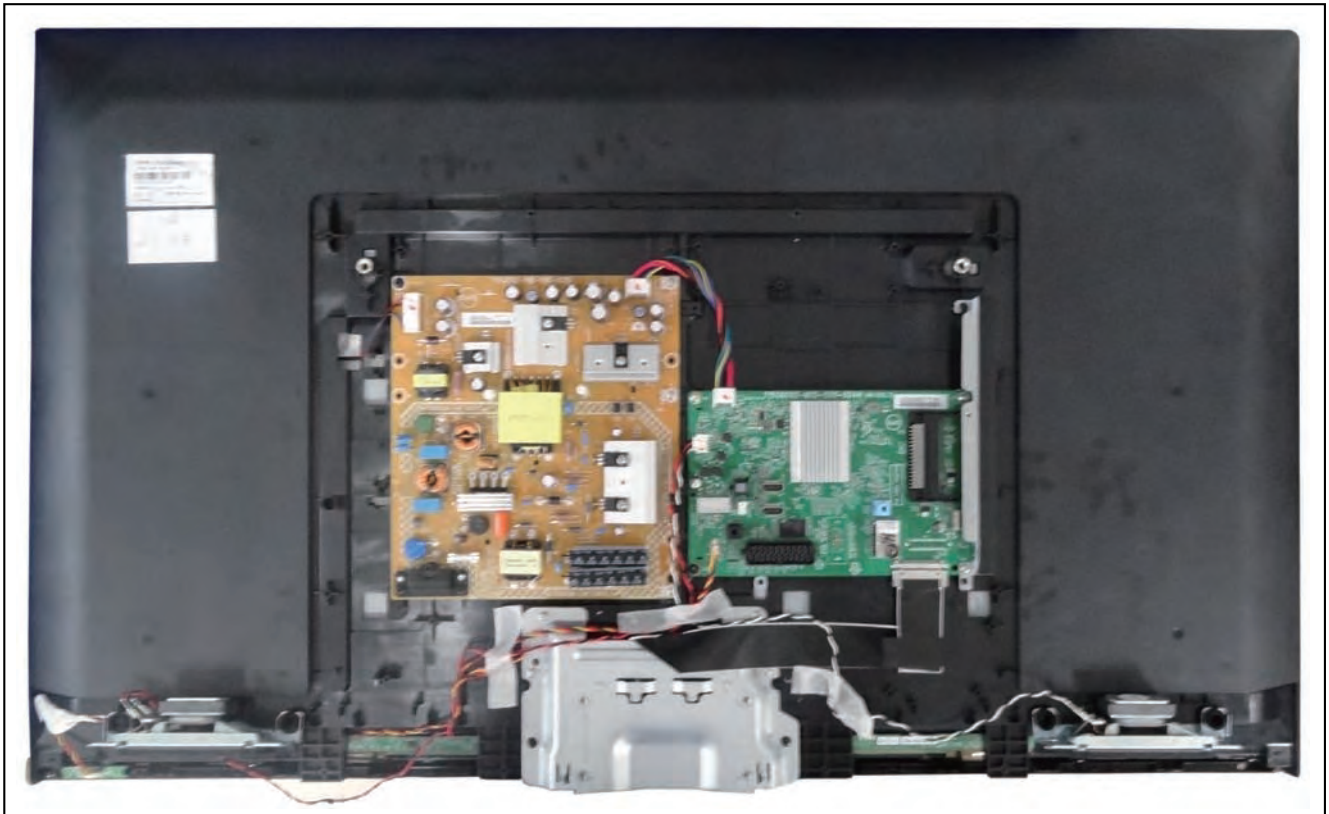
19530_100_130725.eps
130725

Figure 4-2 Cable dressing (32" 3000 series)



19530_101_130729.eps
130729

Figure 4-3 Cable dressing (39" 3000 series)



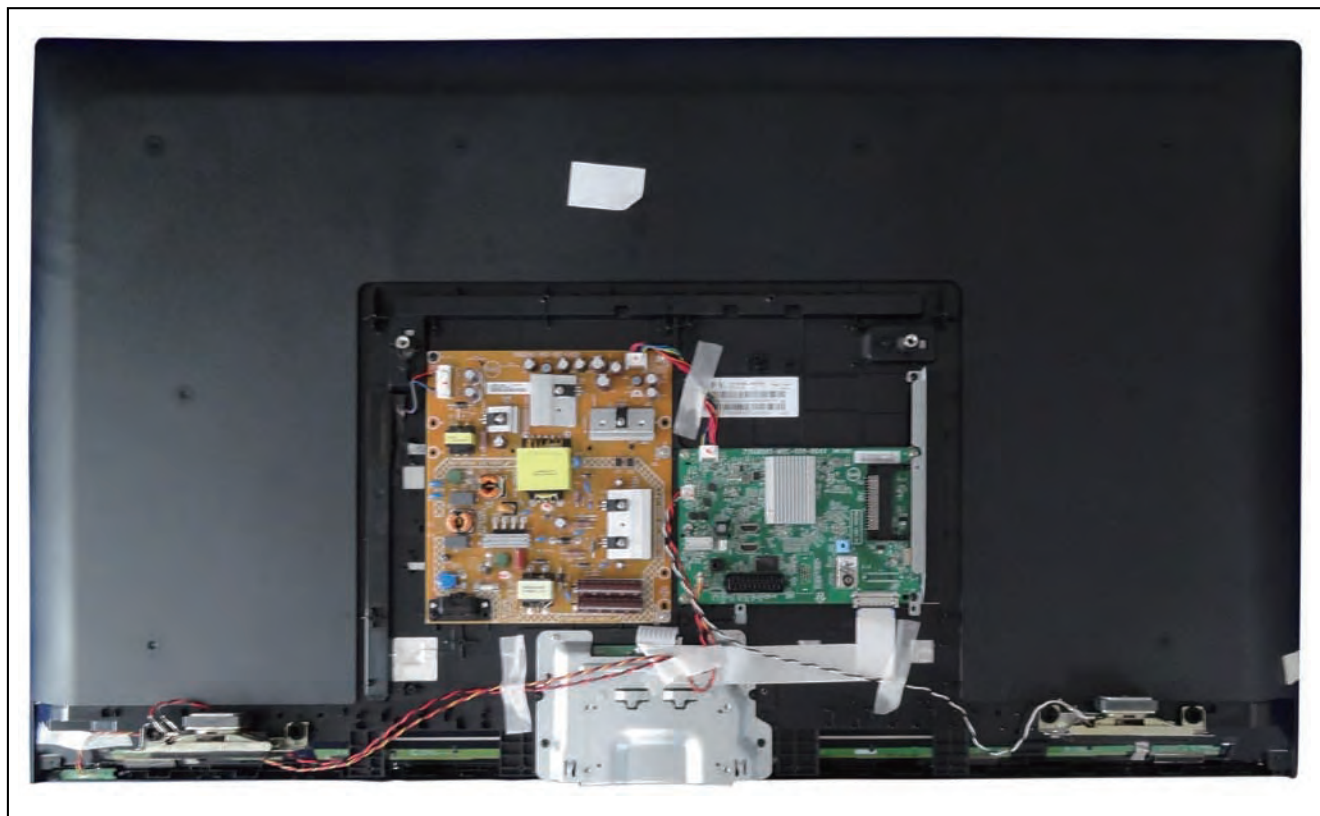
19530_102_130729.eps
130729

Figure 4-4 Cable dressing (40" 31x8H/12 series)



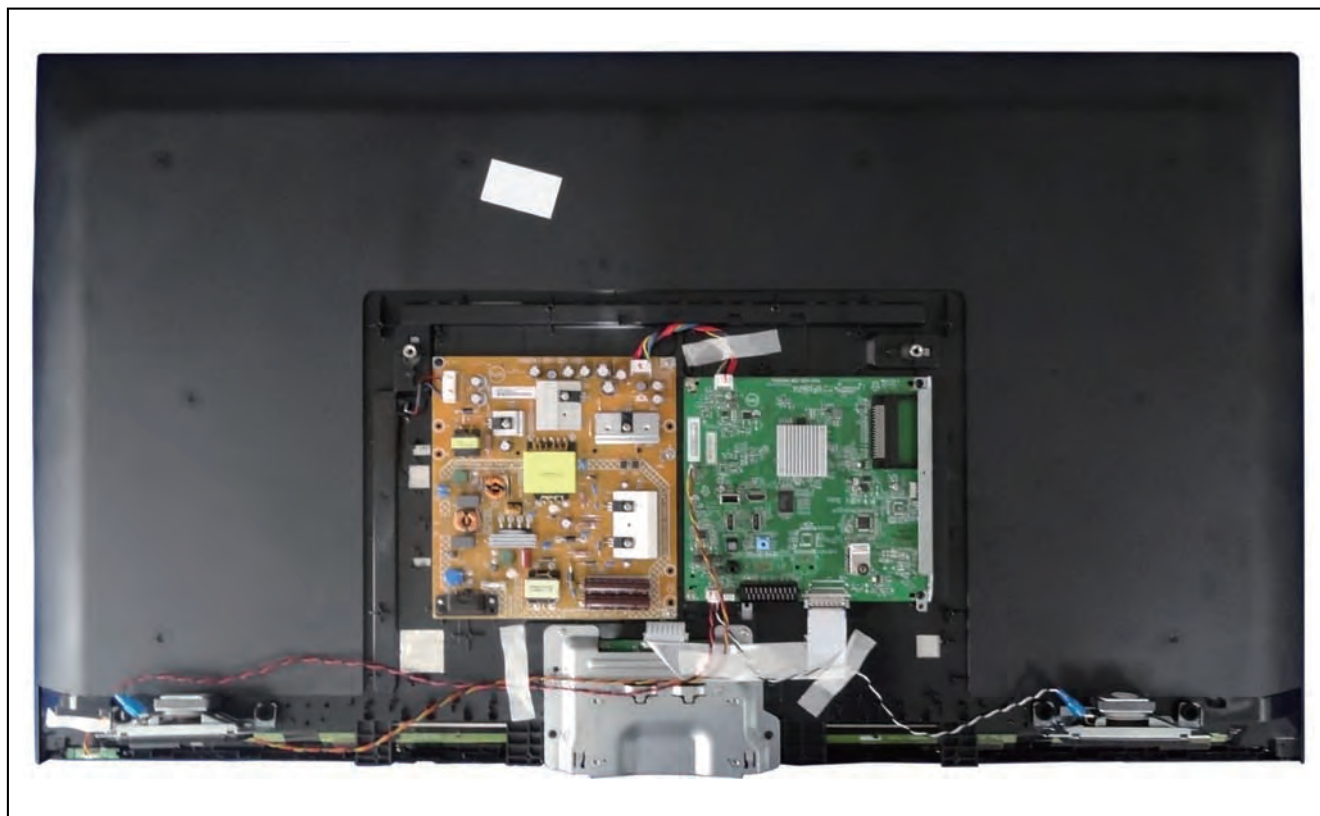
19530_103_130729.eps
130729

Figure 4-5 Cable dressing (40" 31x8T/60 series)



19530_104_130729.eps
130729

Figure 4-6 Cable dressing (47" 31x8H/12 series)



19530_105_130729.eps
130729

Figure 4-7 Cable dressing (47" 31x8T/60 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 32" & 39")

Instructions below apply to the 32PFL3168T/60, but will be similar for other series models.

4.3.1 Rear Cover

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

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

1. Remove fixation screws [1] that secure the base assy, pull out the base assy from the set. Then remove the fixation screws [2], [3] that secure the rear cover. Refer to [Figure 4-8](#) 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.



19530_106_130723.eps
130723

Figure 4-8 Rear cover removal [1]

19530_108_130723.eps
130723

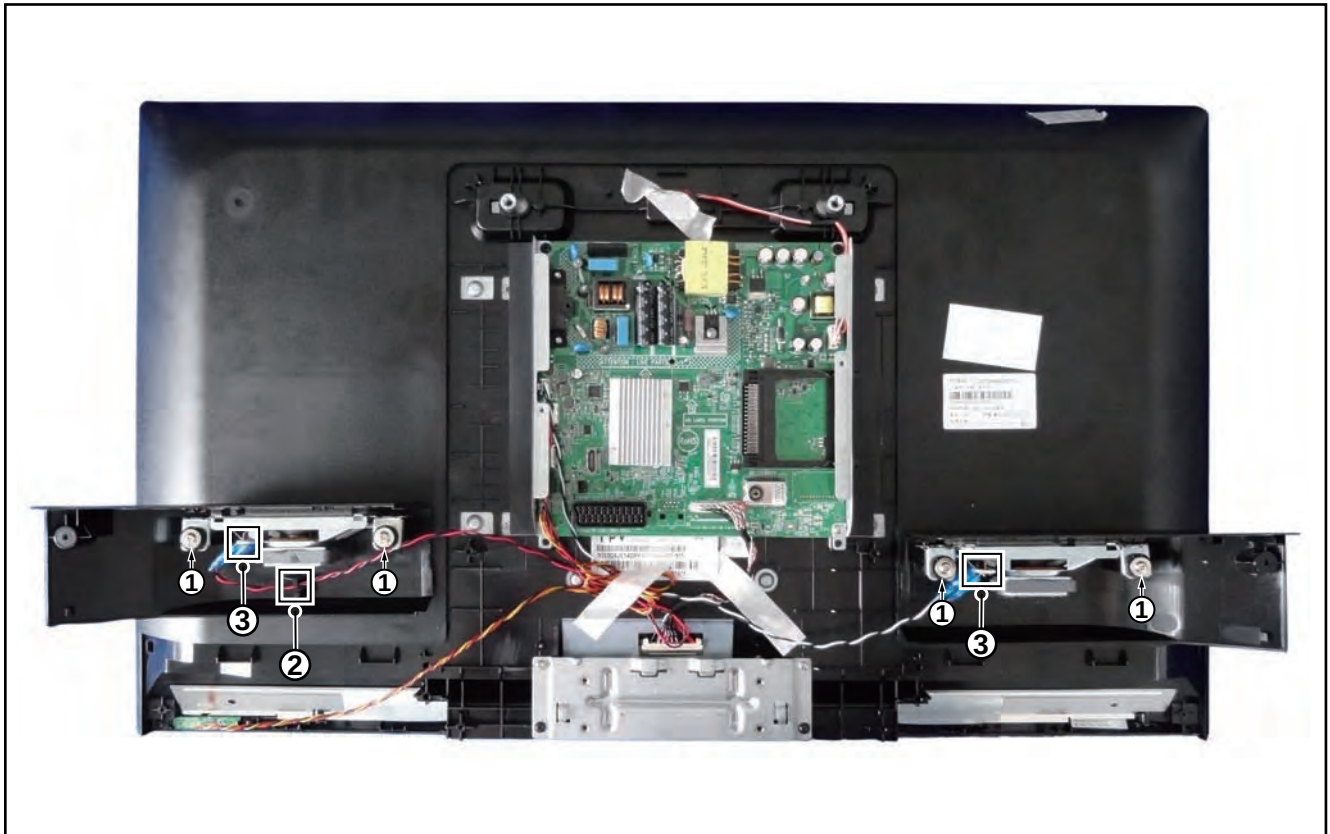
Figure 4-9 Rear cover removal [2]

4.3.2 Speakers

Refer to [Figure 4-9](#) and [Figure 4-10](#) for details.

1. Remove fixation screws [1] that secure the speakers cover, Refer to [Figure 4-9](#) for details.
2. Gently lift the speakers cover from the TV. Make sure that wires and cables are not damaged while lifting the rear cover from the set.
3. Remove the fixation screws [1] that secure the speakers. Refer to [Figure 4-10](#) for details.
4. Gently take the cable [2] out from the snap. Then gently unplug the connectors [3] from the SSB + PSU combination panel. Refer to [Figure 4-10](#) for details.
5. Gently take the speakers out.

When defective, replace the whole unit.



19530_110_130723.eps
130723

Figure 4-10 Speakers removal

4.3.3 Small Signal Board (SSB) + PSU combination panel

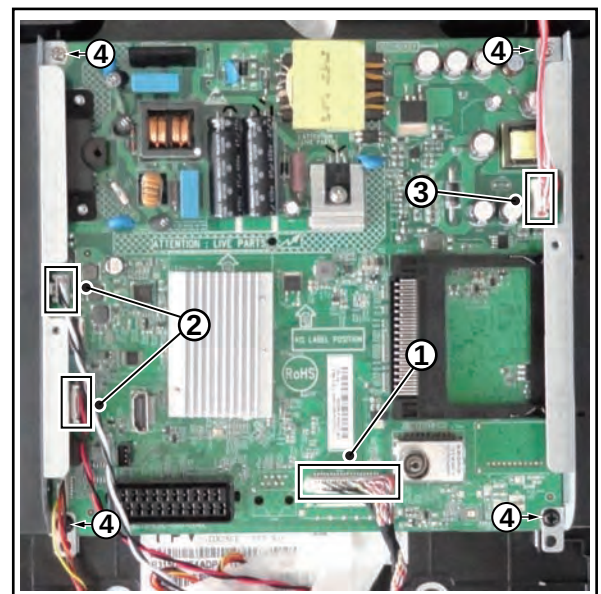
Refer to [Figure 4-11](#) for details.

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 + PSU combination panel.

1. Release the clips from the LVDS connector that connect with the SSB + PSU combination panel [1].

Caution: be careful, as these are very fragile connectors!

2. Unplug all other connectors [2] , [3].
3. Remove all the fixation screws from the SSB + PSU combination panel [4].
4. The SSB + PSU combination panel can now be shifted from side connector cover, then lifted and taken out of the I/O bracket. Refer to [Figure 4-11](#) for details.



19530_112_130723.eps
130723

Figure 4-11 SSB + PSU combination panel removal

4.3.4 Stand bracket

1. Remove all fixation screws of the bracket.
2. Lift the bracket from the set.

4.3.5 Control Board IR/LED Panel

1. Remove the stand bracket, as described earlier.

2. Unplug the connector from the Control Board IR/LED panel.
3. Gently release the clip that holds the panel and take it out from the bezel.

When defective, replace the whole unit.

4.3.6 LCD Panel

1. Unplug all the connector cables of the boards.
2. Gently take all the speakers out.
3. Lift the subframe with SSB + PSU combination panel, Control Board IR/LED panel from the LCD panel and put it aside.

Warning: Cause the panels of TPN10.1E series are bolt-on panels, the panel could not release from bezel. When defective, replace the whole unit.

4.4 Assembly/Panel Removal (for 40" & 42" & 47")

Instructions below apply to the 40PFL3188T/60, but will be similar for other series models.

4.4.1 Rear Cover

Refer to [Figure 4-12](#) for details.

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

1. Remove fixation screws [1] that secure the base assy, pull out the base assy from the set. Then remove the fixation screws [2], [3] that secure the rear cover. Refer to [Figure 4-12](#) 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.



19530_107_130724.eps
130724

Figure 4-12 Rear cover removal [1]

19530_109_130723.eps
130723

Figure 4-13 Rear cover removal [2]

4.4.2 Speakers

Refer to [Figure 4-10](#) and [Figure 4-13](#) for details.

1. Remove fixation screws [1] that secure the speakers cover, Refer to [Figure 4-13](#) for details.
2. Gently lift the speakers cover from the TV. Make sure that wires and cables are not damaged while lifting the rear cover from the set.
3. Remove the fixation screws [1] that secure the speakers. Refer to [Figure 4-10](#) for details.
4. Gently take the cable [2] out from the snap. Then gently unplug the connectors [3] from the SSB. Refer to [Figure 4-10](#) for details.
5. Gently take the speakers out.

When defective, replace the whole unit.

4.4.3 Small Signal Board (SSB)

Refer to [Figure 4-14](#) 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 4-14](#) for details.

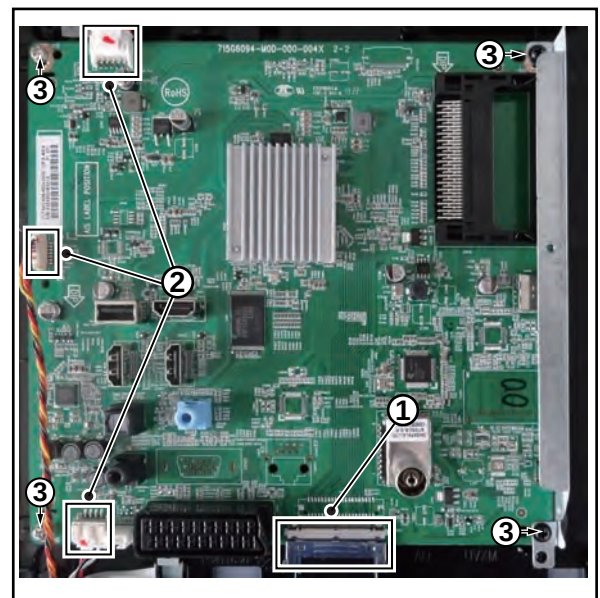
19530_113_130724.eps
130724

Figure 4-14 SSB removal

4.4.4 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.

4.4.5 Stand bracket

1. Remove all fixation screws of the bracket.
2. Lift the bracket from the set.

4.4.6 Control Board IR/LED Panel

1. Remove the stand bracket, as described earlier.
2. Unplug the connector from the Control Board IR/LED panel.
3. Gently release the clip that holds the panel and take it out from the bezel.

When defective, replace the whole unit.

4.4.7 LCD Panel

1. Unplug all the connector cables of the boards.
2. Gently take all the speakers out.
3. Lift the subframe with SSB, PSU, Control Board IR/LED panel from the LCD panel and put it aside.

Warning: Cause the panels of TPN10.1E series are bolt-on panels, the panel could not release from bezel.

When defective, replace the whole unit.

4.5 Assembly/Panel Removal (for 20" & 22" & 24")

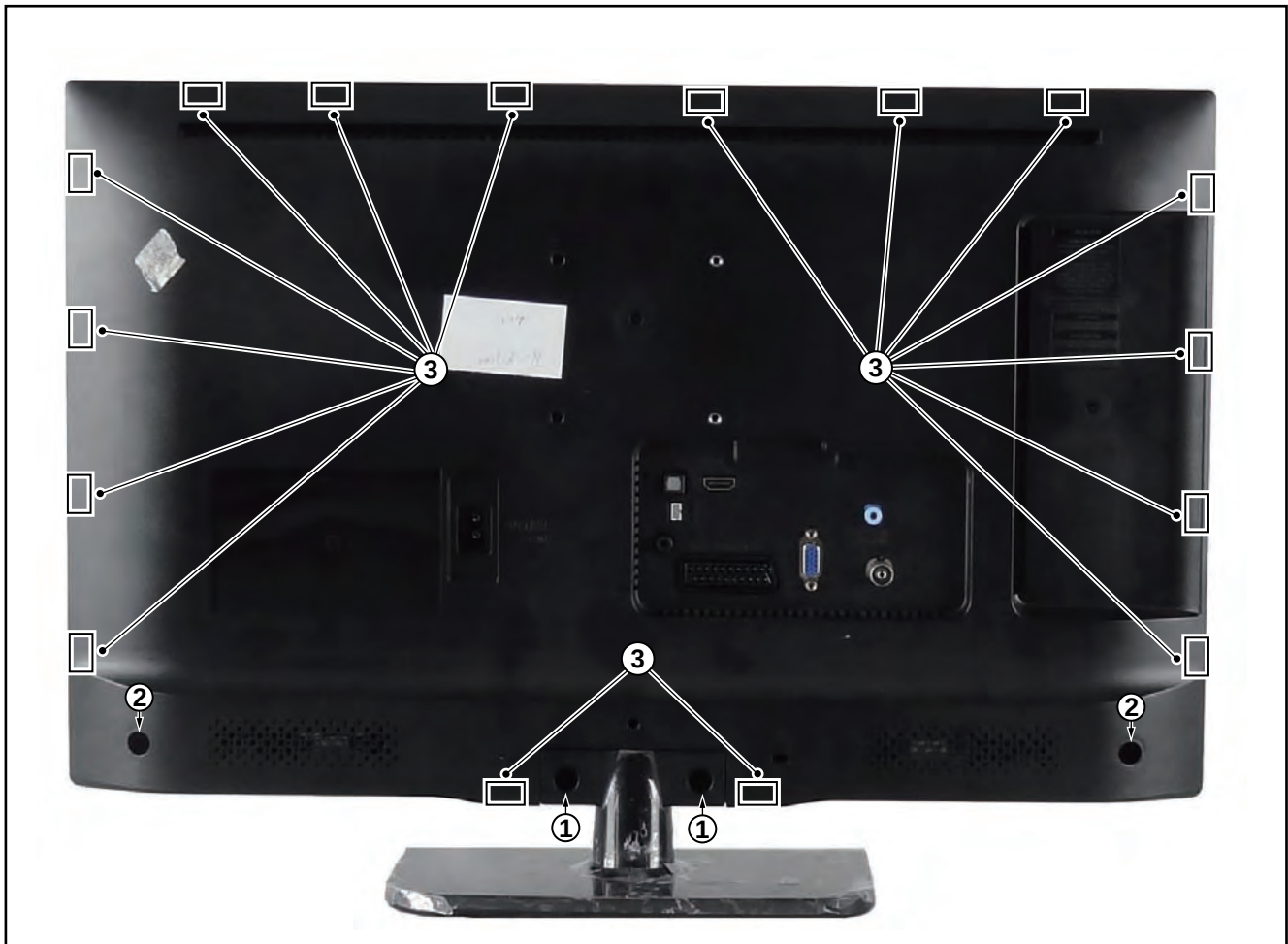
Instructions below apply to the 24PFL3108H/12, but will be similar for other series models.

4.5.1 Rear Cover

Refer to [Figure 4-15](#) for details.

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

1. Remove fixation screws [1] that secure the base assy, pull out the base assy from the set. Then remove the fixation screws [2] that secure the rear cover. Refer to [Figure 4-15](#) for details.
2. At the indicated areas [3] the cover is secured by clips. Be very careful with releasing those.
3. 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.



19531_101_130905.eps
130905

Figure 4-15 Rear cover removal

4.5.2 Small Signal Board (SSB)

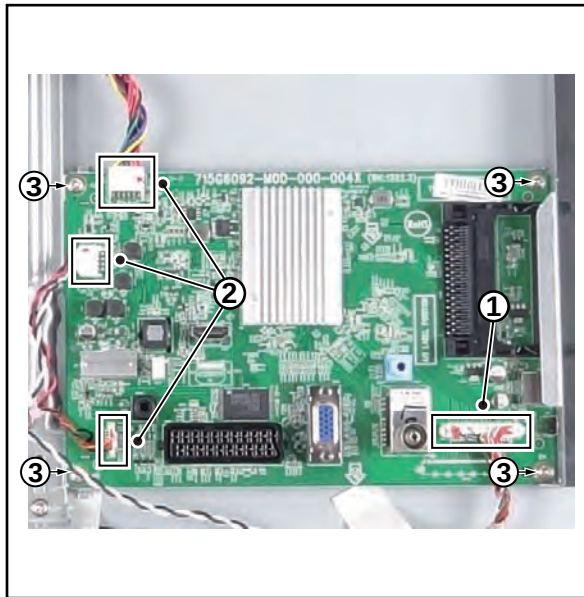
Refer to [Figure 4-14](#) for details.

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 [1] connector that connect with the SSB.

Caution: be careful, as these are very fragile connectors!

2. Unplug all other connectors [2].
3. Remove all the fixation screws [3] from the SSB.
4. The SSB can now be shifted from side connector cover, then lifted and taken out of the I/O bracket. Refer to [Figure 4-14](#) for details.



19531_102_130905.eps
130905

Figure 4-16 SSB removal

Notes:

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

4.5.3 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.

4.5.4 Speakers

1. Gently release the tapes that secures the speaker cables.
2. Unplug the speaker connectors from the SSB.
3. Take the speakers out.

When defective, replace the both units.

4.5.5 Stand bracket

1. Remove all fixation screws of the bracket.
2. Lift the bracket from the set.

4.5.6 IR/LED panel

1. Remove the stand bracket, as described earlier.
2. Unplug the connector from the IR/LED panel.
3. Gently release the clip that holds the panel and take it out from the bezel.

When defective, replace the whole unit.

4.5.7 LCD Panel

1. Unplug all the connector cables of the boards.
2. Gently take all the speakers out.
3. Lift the subframe with SSB, PSU, IR/LED panel from the LCD panel and put it aside.

Warning: Cause the panels of TPN10.1E series are bolt-on panels, the panel could not release from bezel. When defective, replace the whole unit.

4.6 Set Re-assembly

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

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 I²C /UART level and can be used by a Service engineer to quickly diagnose the TV set by reading out error codes, read 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 I²C 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.

- Automatic user menu time-out (menu switches

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: TPN10.1E 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.
- 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 display/clear the error code buffer.
- To perform alignments.

Specifications

- Operation hours counter (maximum five digits displayed).
- Software version, error codes, 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 6.3 Software Alignments 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		Store the RGB value
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.

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

- To perform extended alignments.

Specifications

- Displaying and or changing Panel ID information.
- 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,

Table 5-2 Factory mode overview

Item	Item value	Default value								Description
		20"	22"	24"	32"	39"	40"	42"	47"	
0	FW 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, the MTK, MCU and OAD software versions.
1	Board ID	715G6092	715G6092	715G6092	715G6079	715G6079	715G6092	715G6092	715G6094	Display the Board ID; be careful changing this, it can result in not correct displaying the screen!
2	PANEL_ID	17	18	19	6	8	9	11	11	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	68	68	68	128	128	118	128	128	Red colour temperature setting
6	CLR_TEMP_G	76	76	76	128	128	128	128	128	Green colour temperature setting
7	CLR_TEMP_B	128	128	128	128	128	126	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	off	off	off	off	on	off	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	0								Line-in audio gain
24	AUD_GAIN_HDMI	0								HDMI audio gain
25	AUD_GAIN_ATV	0	0	0	0	10	10	0	0	Analogue TV audio gain
26	AUD_GAIN_DTV	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	6	6	6	3	3	3	5	5	Audio Quality index
33	EDID UPDATE	Press OK								Used to enter a new EDID codes into the NVM
34	LVDS SSC Ratio	3%	3%	3%	2%	2%	2%	2%	2%	LVDS SSC ratio
35	LVDS SSC Freq	30KHz								LVDS SSC frequency
36	DDR SSC Ratio	2%								DDR SSC ratio

Item	Item value	Default value								Description
		20"	22"	24"	32"	39"	40"	42"	47"	
37	DDR SSC Freq	30KHz								DDR SSC frequency
38	Panel H.Flip	on	on	on	off	on	on	off	off	Flip panel
39	Panel V.Flip	on	on	on	off	on	on	off	off	Flip panel
40	Panel ABSwap	off	off	off	off	on	off	off	off	ABSwap panel
41	Watchdog	5sec								Watchdog
42	Backlight PWM freq.(Hz)	150	150	150	150	120	150	150	150	Backlight PWM frequency
43	Backlight PWM Limit	20								Backlight PWM Limit
44	VGA_TxRx_Mode	off								VGA_TxRx_Mode
45	LVDS Driving	3	3	3	3	1	1	5	5	LVDS Driving
46	LVDS Format	VESA 8bit	VESA 8bit	VESA 8bit	VESA 8bit	VESA 8bit	JEIDA 10bit	VESA 8bit	VESA 8bit	LVDS Format
47	Ziggo Aging	Press OK								Ziggo Aging
48	SPDIF	On								Enable/Disable SPDIF source
49	Standard PWM Gain	98	98	98	98	100	100	97	98	Standard PWM Gain
50	ECO PWM Gain	100								ECO PWM Gain
51	VGA port	on	on	on	off	off	off	off	off	Enable/Disable VGA port
52	Zero Detect Enable	on	on	on	off	off	off	off	off	Zero Detect Enable
53	Copy PQ table to TV	Press OK								Copy PQ table to TV
54	Headphone	on	on	on	off	on	on	on	on	Enable/Disable Headphone source
55	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 error codes and information on the TVs 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.
- **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

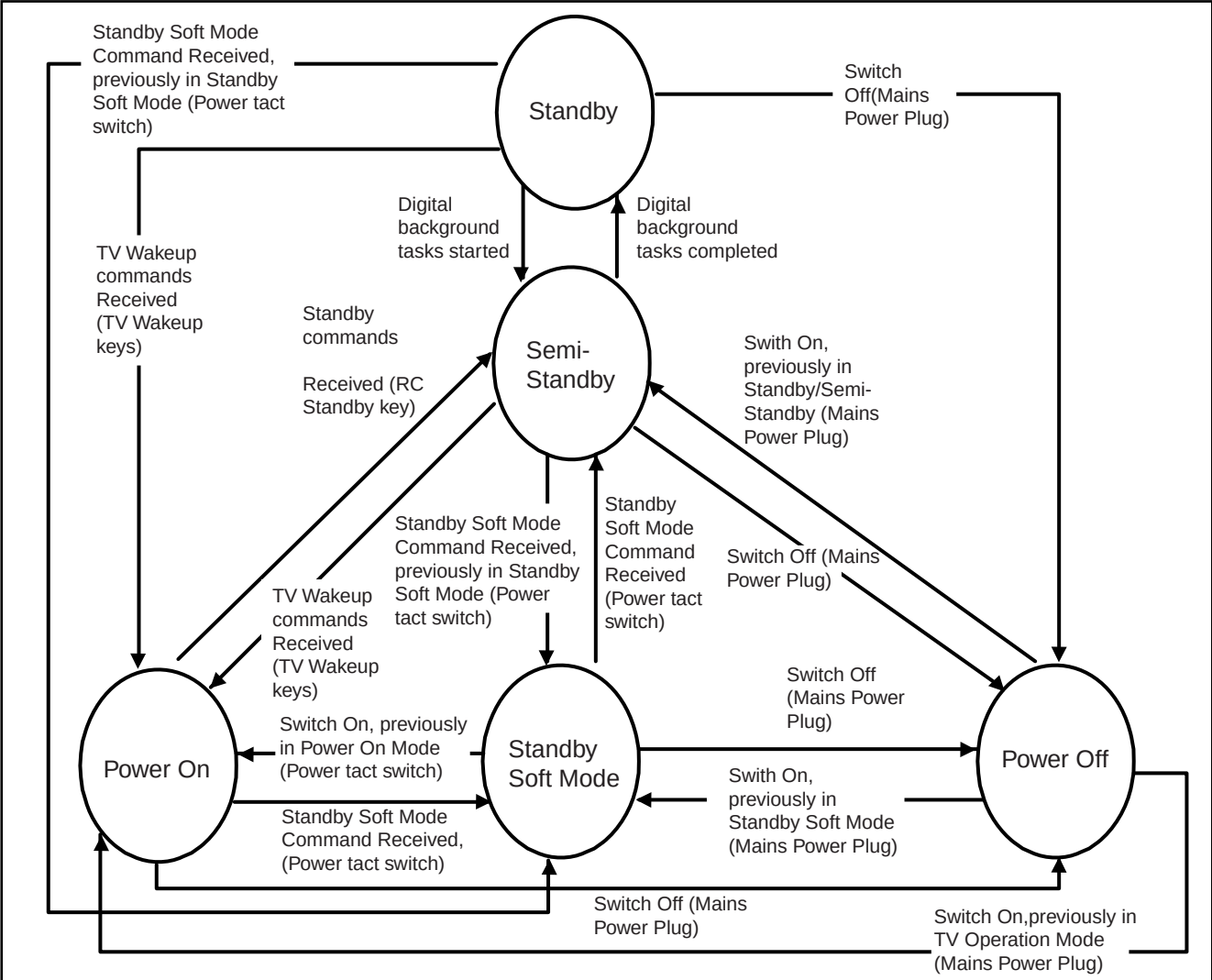
By means of the "CURSOR-DOWN/UP" knob (or the scroll wheel) on the RC-transmitter, can be navigated through the menus.

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



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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 I²C 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.

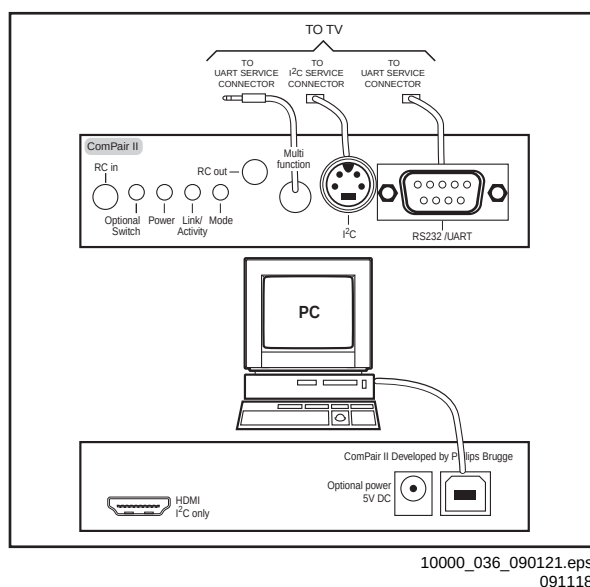


Figure 5-2 ComPair II interface connection

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](#).

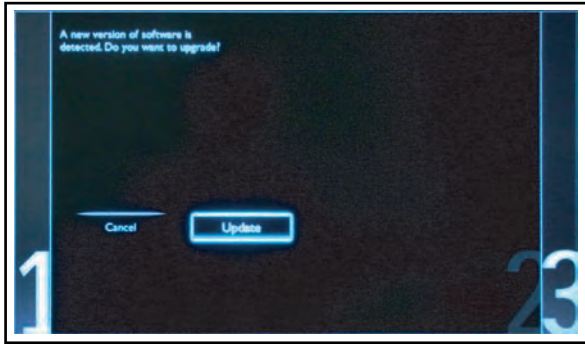
19080_207_110324.eps
110324

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

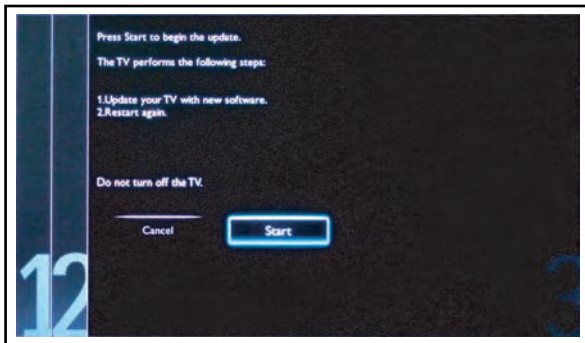
19080_208_110324.eps
110324

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

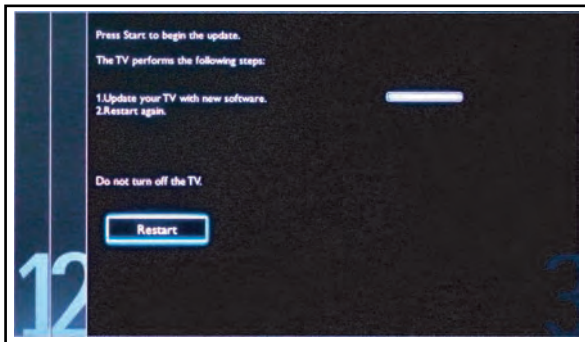
19080_209_110324.eps
110324

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.

- **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 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 platform 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. Because it is possible that more than one error can occur over time, an error buffer is available, which is capable of storing the last five errors that occurred. This is useful if the OSD is not working properly.

Errors can also be displayed by the blinking LED procedure. 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.

Example (2): the content of the error buffer is "12 9 6 0 0" After entering SDM, the following occurs.

- 1 long blink of 5 seconds to start the sequence.
- 12 short blinks followed by a pause of 1.5 seconds.
- 9 short blinks followed by a pause of 1.5 seconds.
- 6 short blinks followed by a pause of 1.5 seconds.
- 1 long blink of 1.5 seconds to finish the sequence.
- The sequence starts again with 12 short blinks.

5.6.2 Displaying the Entire Error Buffer

Additionally, the entire error buffer is displayed when Service Mode "SDM" is entered.

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.

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_{AC}, 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_i > 10 MW, C_i < 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)	20PFL3xx8	93	86	128
	22PFL3xx8	92	88	128
	24PFL3xx8	86	89	128
	32PFL3xx8	107	103	128
	39PFL3xx8	122	111	128
	40PFL3xx8	118	128	126
	42PFL3xx8	128	92	90
	47PFL3xx8	128	92	90
Cool (11000K)	20PFL3xx8	70	82	128
	22PFL3xx8	78	92	128
	24PFL3xx8	68	76	128
	32PFL3xx8	128	111	81
	39PFL3xx8	128	99	76
	40PFL3xx8	128	118	69
	42PFL3xx8	128	81	38
	47PFL3xx8	128	81	38
Warm (6500K)	20PFL3xx8	120	98	128
	22PFL3xx8	123	112	128
	24PFL3xx8	124	120	128
	32PFL3xx8	128	119	126
	39PFL3xx8	128	117	120
	40PFL3xx8	125	128	112
	42PFL3xx8	128	92	73
	47PFL3xx8	128	92	73

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 I²C 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
20PFL3xx8	TPM195WD1-RTN01	017
22PFL3xx8	TPM215HW01-HGJL02	018
24PFL3xx8	TPM236H3-BJ1L02	019
32PFL3xx8	TPT315B5-DXJSFE	006
39PFL3xx8	TPT420H2-HVN04	008
40PFL3xx8	LSC400HM06 SC1A	009
42PFL3xx8	TPT420H2-HVN04	011
47PFL3xx8	TPT470H1-DUJFFE	011

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-OOOO

- 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
- OOOO** Optional variation code

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

6.6 Cable position numbers

In this chassis, the cable position numbers can be defined via the rule that the number is always starting with an "E" followed by the connector number of the current sourcing board. The order is always seen from where the power initiates from. So from PSU to SSB, from SSB to IR/LED panel, from IR/LED panel to keyboard control panel. For example, a cable from the PSU connector CN902 to the SSB connector CN701, will have the position number ECN902.

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 - NT72567BG-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 TPN10.1E LA is a new chassis launched in Europe in 2013. The whole range is covered by NT72567.

The major deltas versus its predecessor support DVB-TC; DVB-TC/T2; DVB-TC/S2 with also multi-media, CEC, DLNA, ARC functionality.

The TPN10.1E LA chassis comes with the following stylings:

- series xxPFL30xx
- series xxPFL31xx

7.1.1 Implementation

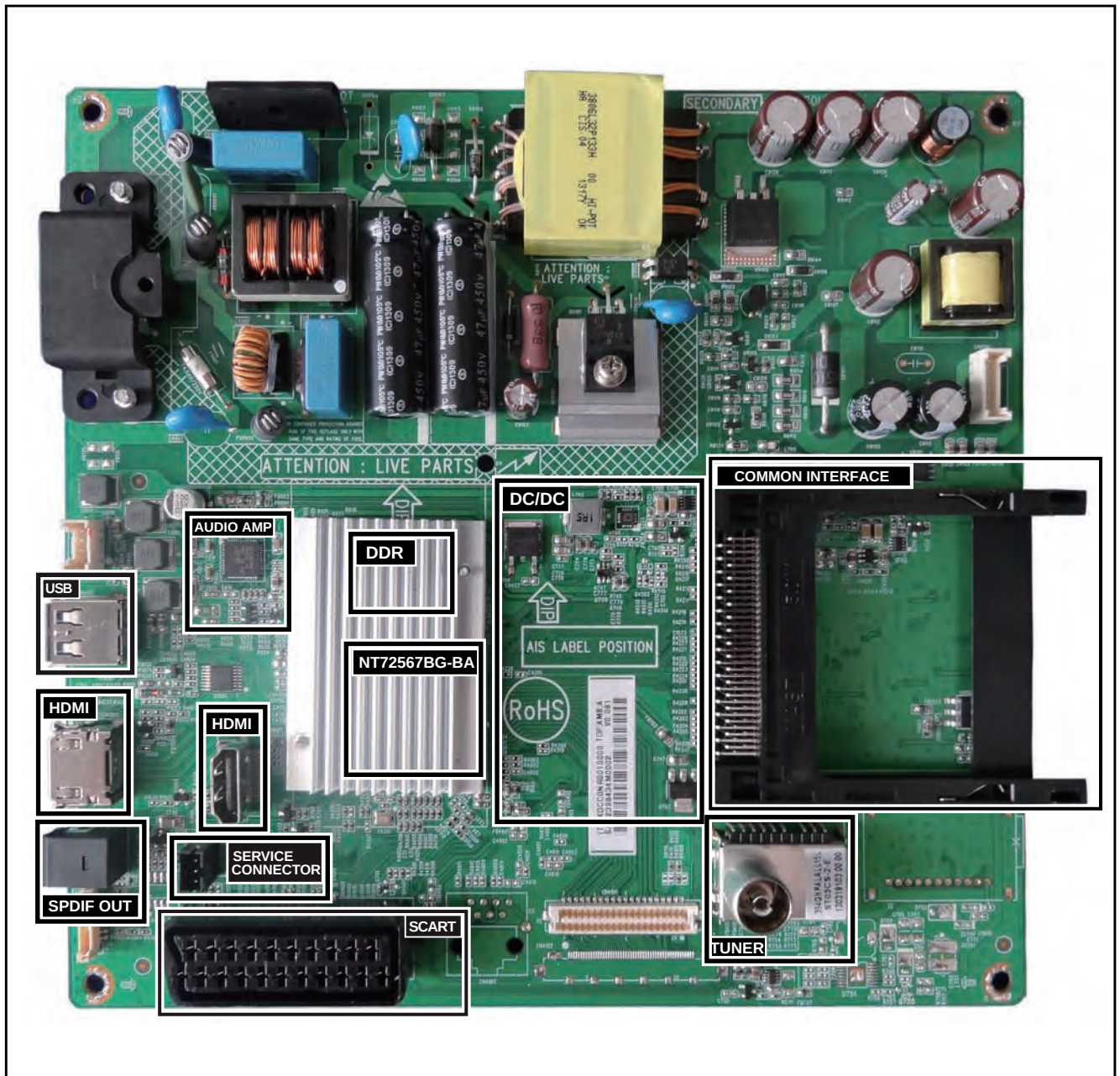
Key components of this chassis are:

- NT72567BG-BA LFBGA-576 TV Processor for 3188 series
- ST03CS-2-E Tuner for H/T series (DVB-T/C, T2 analogue)
- TDQS-A901F EUROP TUNER for K series (DVB-S2)
- NT78820 for T2 demond
- AVL6211LA LQFP-64 for S2 demond
- STA381BWTR 20W VQFN-48 for AUDIO Amplifier

7.1.2 TPN10.1E LA Architecture Overview

For details about the chassis block diagrams refer to [9. Block Diagrams](#). An overview architecture can be found in [Figure 9.8](#).

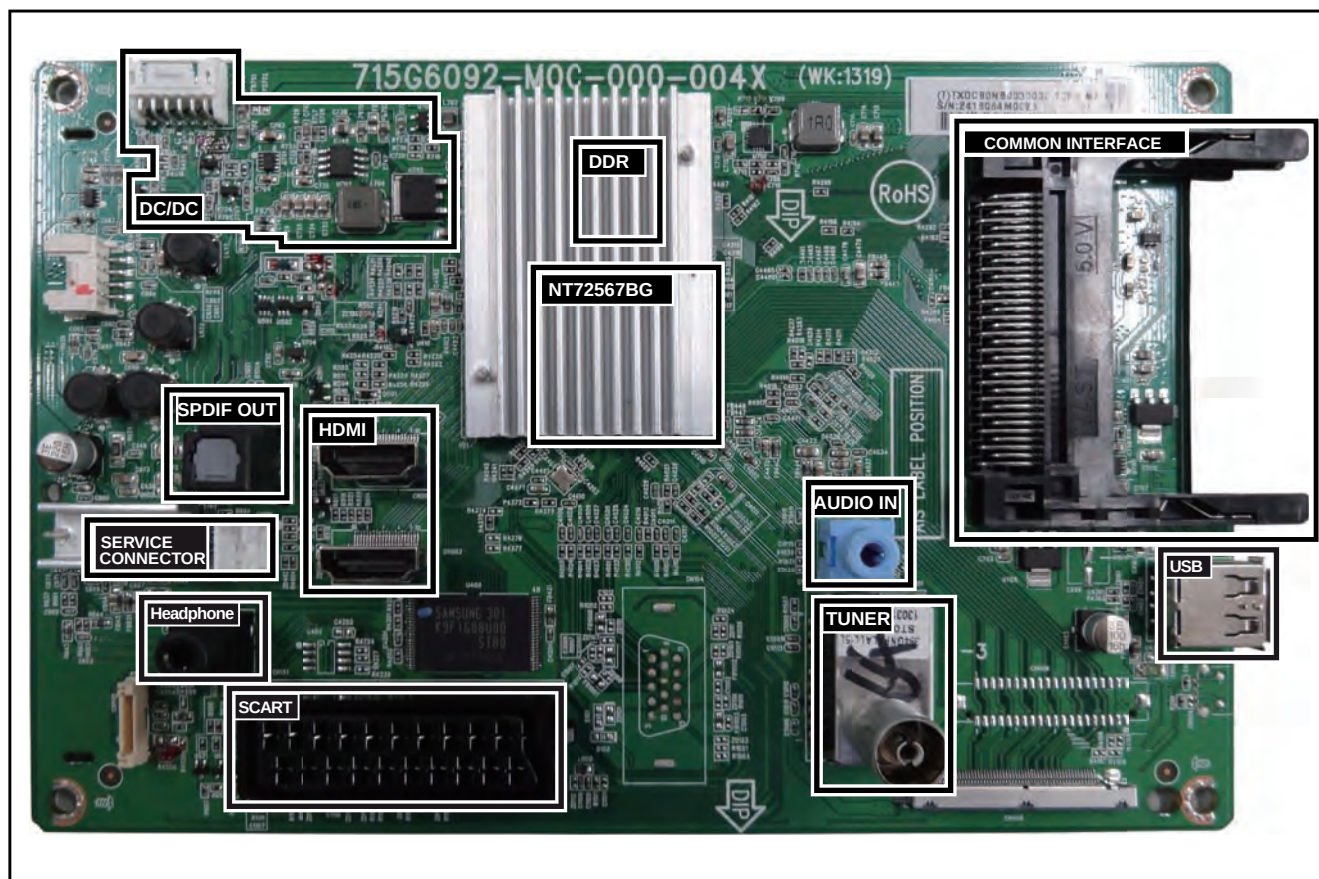
7.1.3 SSB Cell Layout



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130807

Figure 7-1 SSB layout cells (top view) (for 32" & 39")

7.1.4 SSB Cell Layout



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Figure 7-2 SSB layout cells (top view) (for 40" & 42" & 47"PFL31x8H/12)

7.1.5 SSB Cell Layout

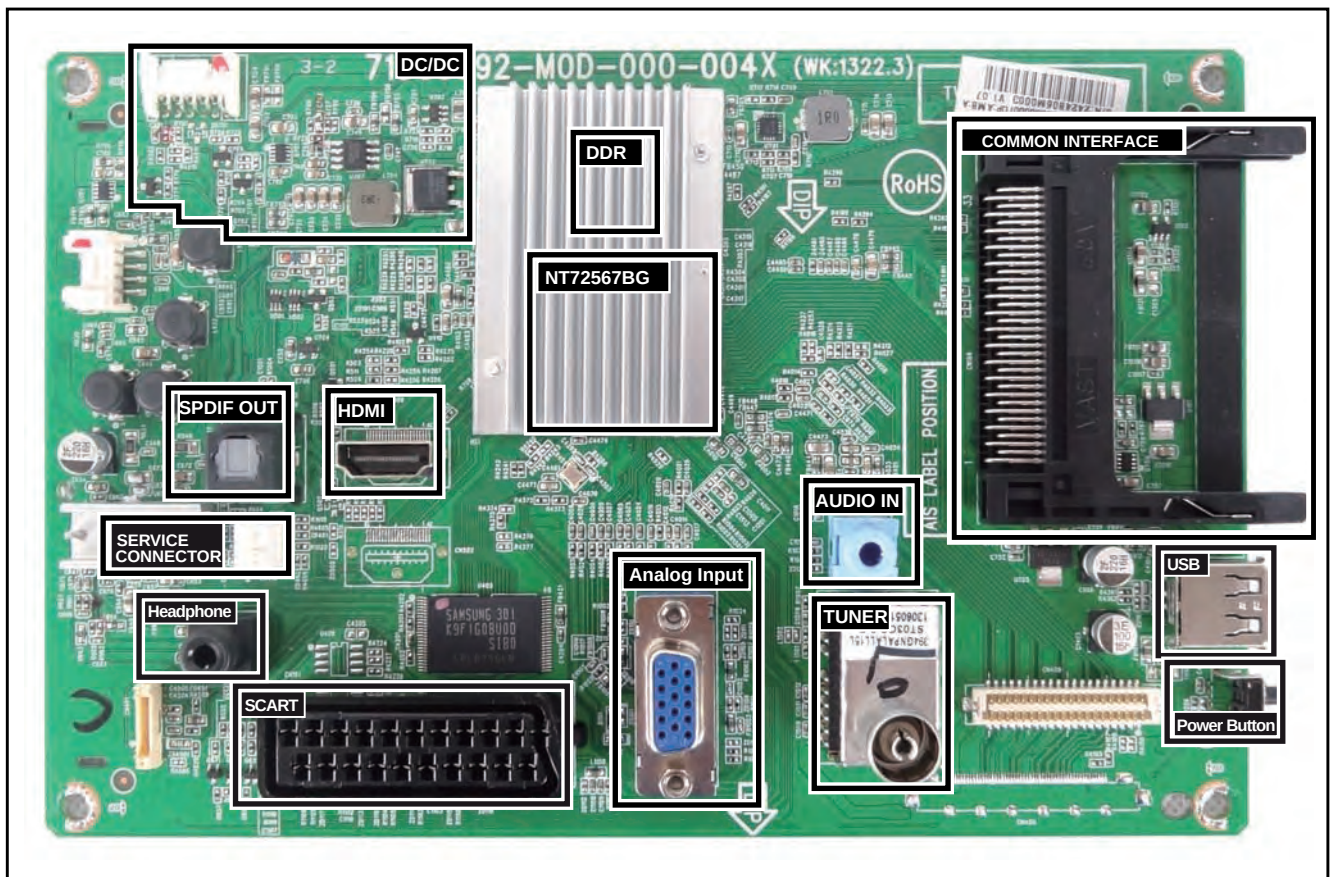
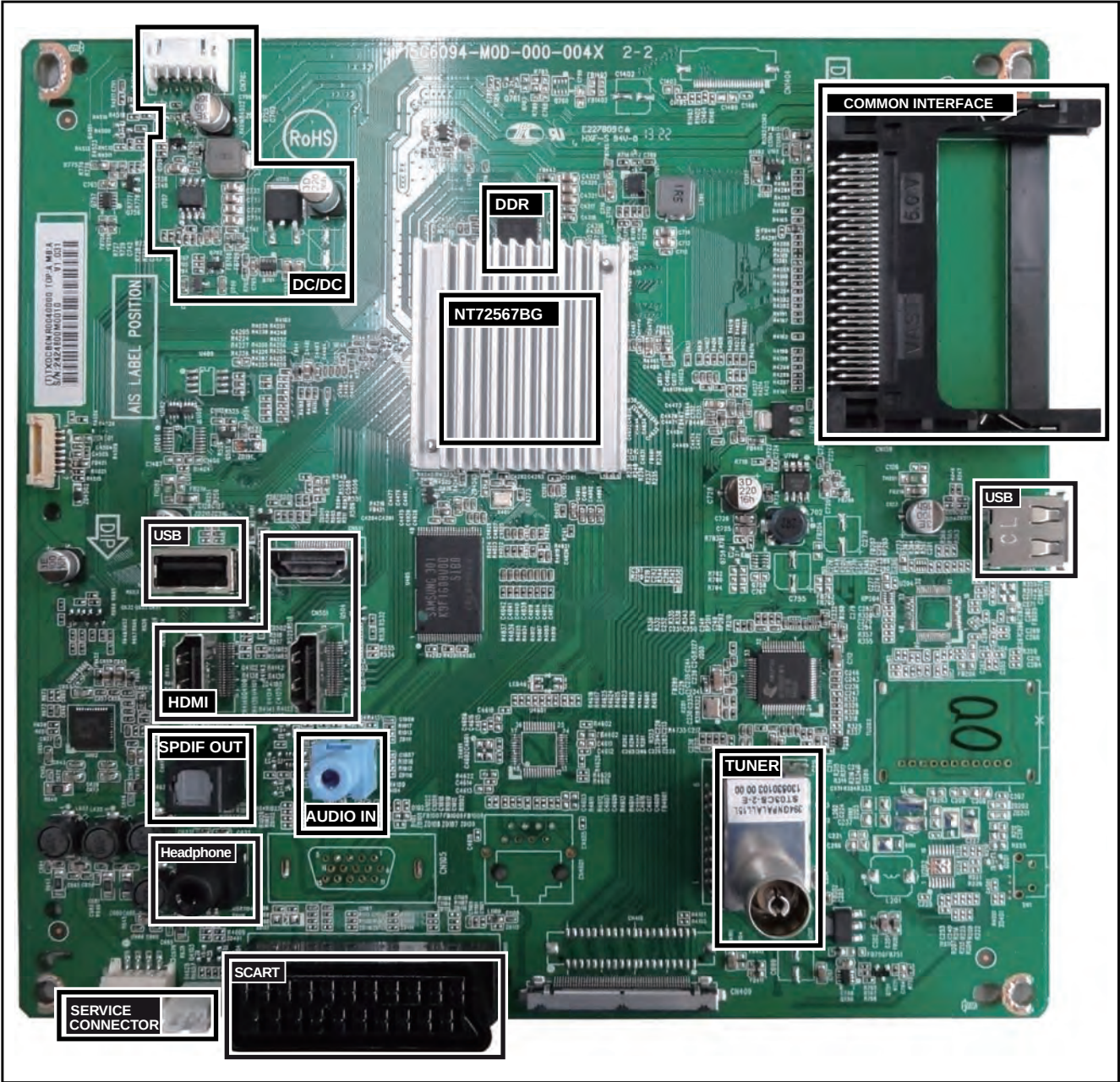
19531_200_130923.eps
130923

Figure 7-3 SSB layout cells (top view) (for 20" & 22" & 24")

7.1.6 SSB Cell Layout

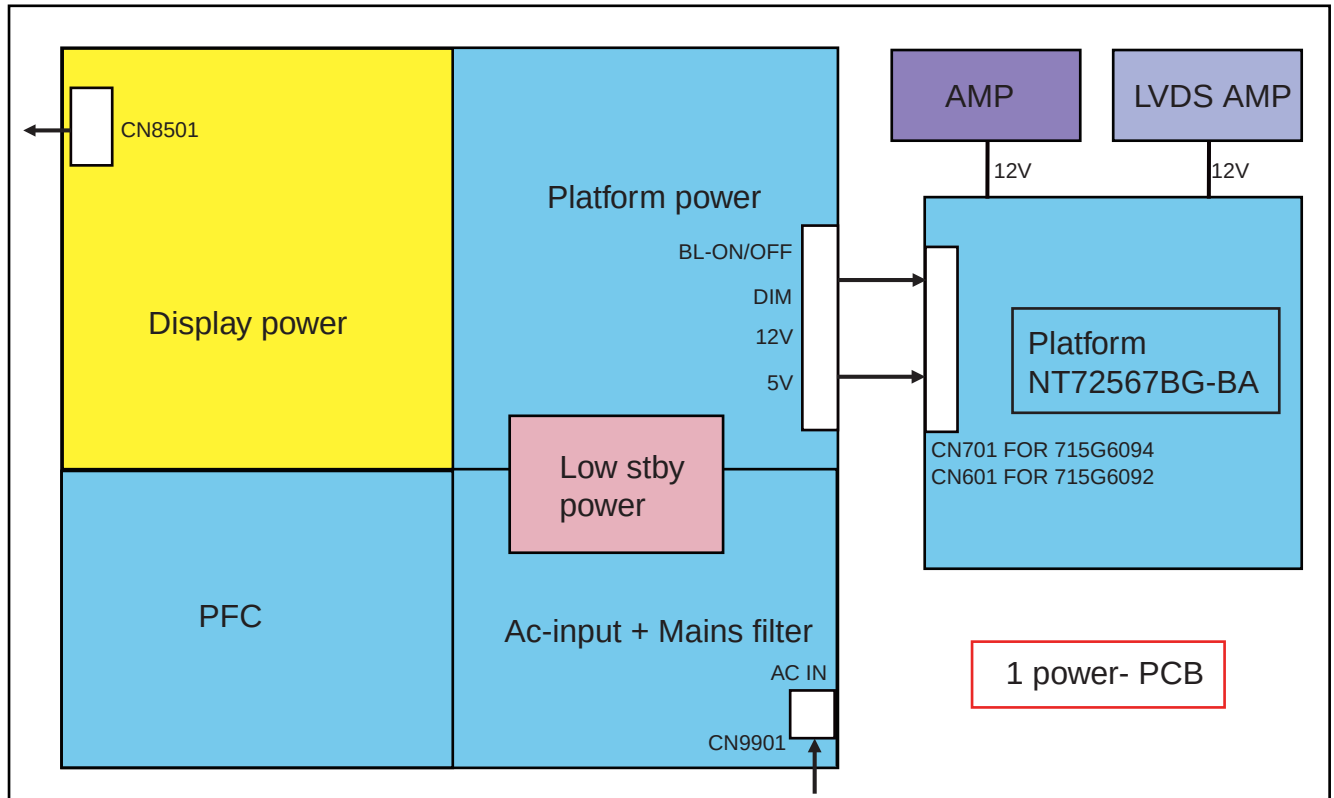


19530_202_130808.eps
130808

Figure 7-4 SSB layout cells (top view) (for 40" & 47"PFL31x8T/60)

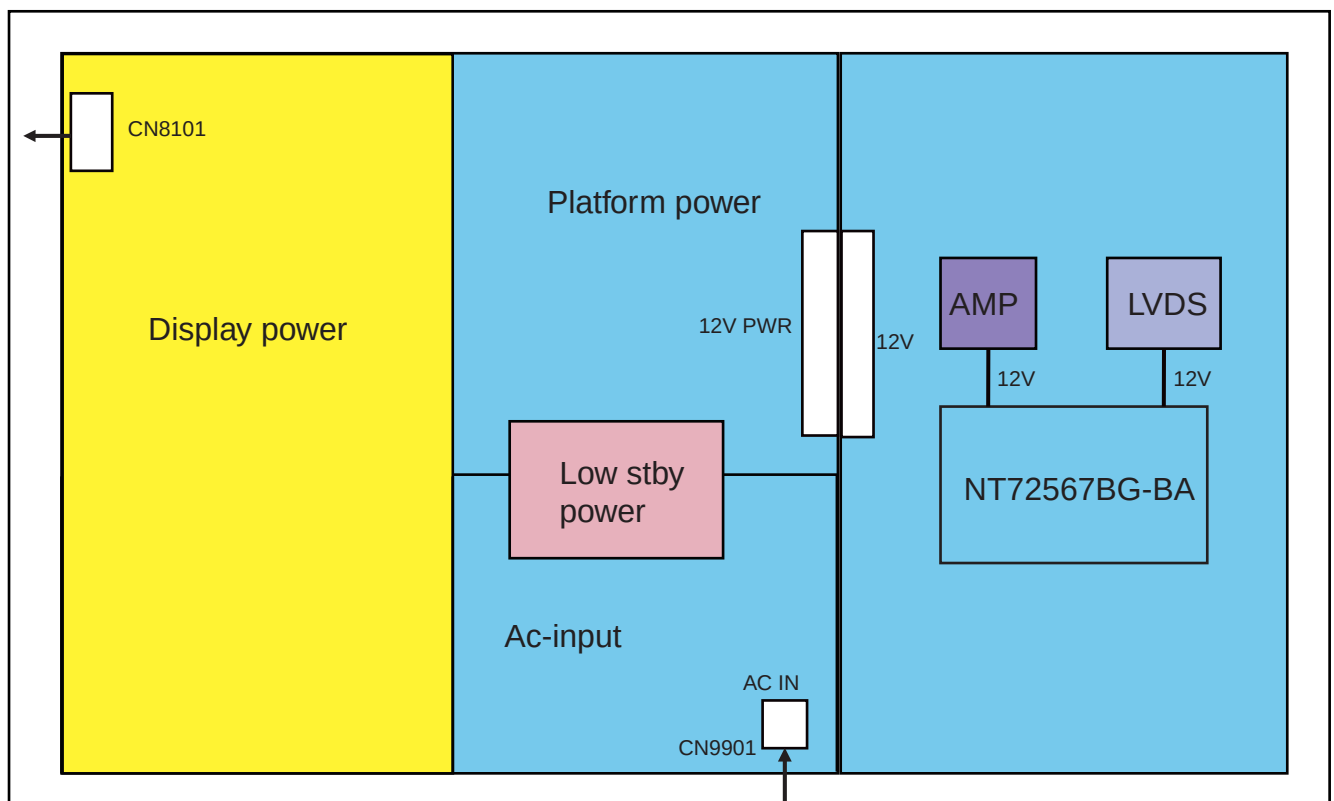
7.2 Power Supply

Refer to figure [Figure 7-5](#) and [Figure 7-6](#) for the power architecture of this platform.



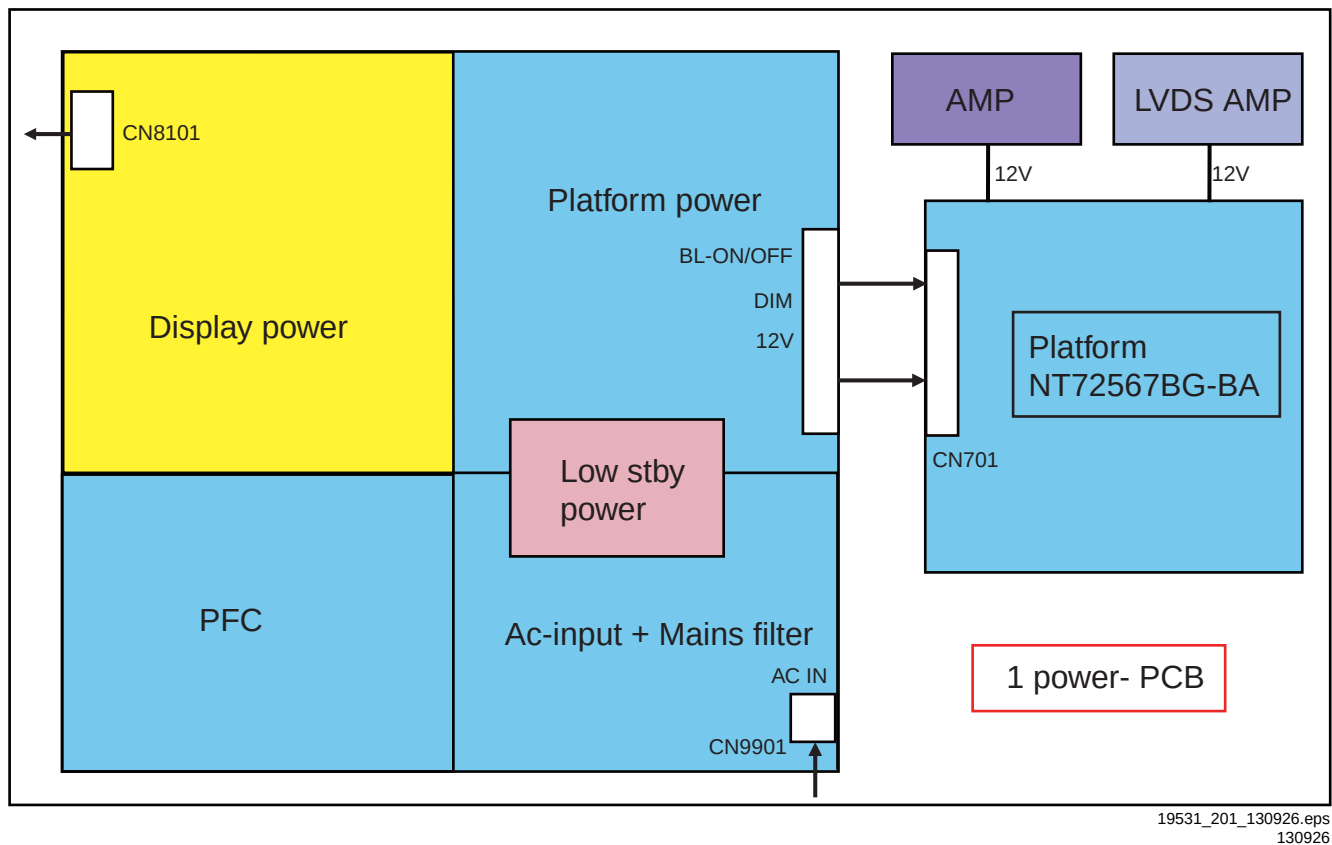
19530_203_130810.eps
130810

Figure 7-5 Power Architecture (for 40" & 42" & 47")



19530_204_130810.eps
130810

Figure 7-6 Power Architecture (for 32" & 39")



19531_201_130926.eps
130926

Figure 7-7 Power Architecture (for 20" & 22" & 24")

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 TPN10.1E LA classis platform are:
- New power architecture for LED backlight
 - "Boost"-signal is now a PWM-signal + continuous variable.

- The control signals are:
- Stand-by
 - 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:
- +4V7-STANDBY (Stand-by mode only)
 - +12V (on-mode)
 - +Vsnd (+12V) (audio power) (on-mode)
 - +12V (bolt-on power) (on-mode)
 - 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 **P**ower **S**upply with integrated **L**ED-drivers.
PSLS stands for a **P**ower **S**upply with integrated **L**ED-drivers with added **S**canning functionality (added microcontroller).
PSDL stands for a **P**ower **S**upply for **D**irect-view LED backlight with 2D-dimming.

7.2.3 Connector overview

Table 7-1 Connector overview

	Connector		
Number	CN9101	CN8501	CN9904
Description	to SSB	to panel	to SSB
Pin	14	12	14
1	DIM	LED1+	DIM
2	On/off	n.c.	ON/OFF
3	PS_ON	LED1-	n.c.
4	n.c.	LED1-	n.c.
5	GND	n.c.	GND
6	GND	n.c.	GND
7	GND	n.c.	GND
8	GND	n.c.	GND
9	+12V-AUDIO	LED1-	+12V-AUDIO
10	+12V-AUDIO	LED1-	+12V-AUDIO
11	+12V_AL	n.c.	+12V
12	+12V_AL	LED1+	+12V
13	+12_AL	-	+12_AL
14	+12_AL	-	+12_AL

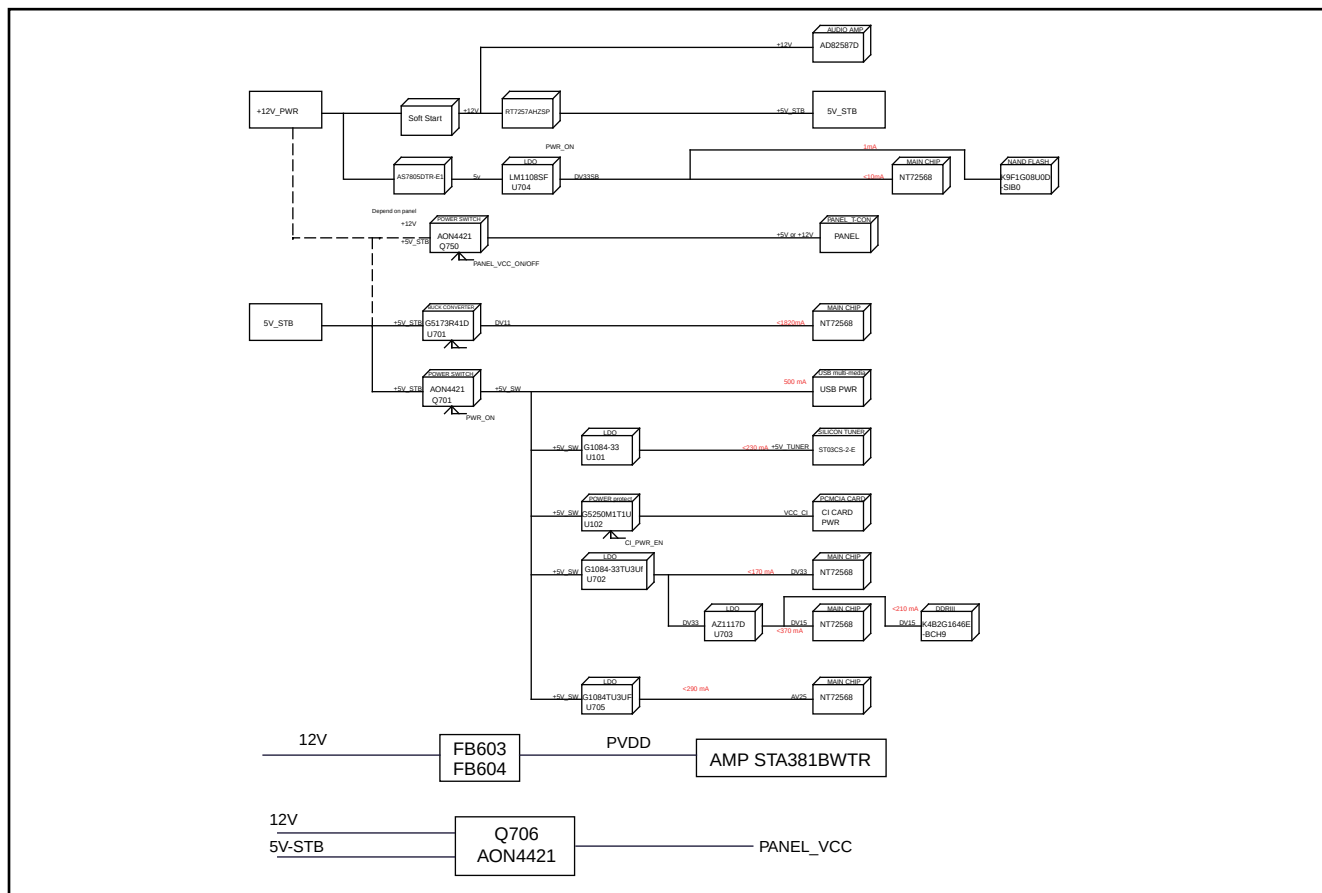
7.3 DC/DC Converters

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

- +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 AMP
- +1V5, from the power supply for the scaler IC NT72567
- +1V1, from the power supply for the scaler IC NT72567
- +1V5, supply voltage for DDR2 (diagram B03B)

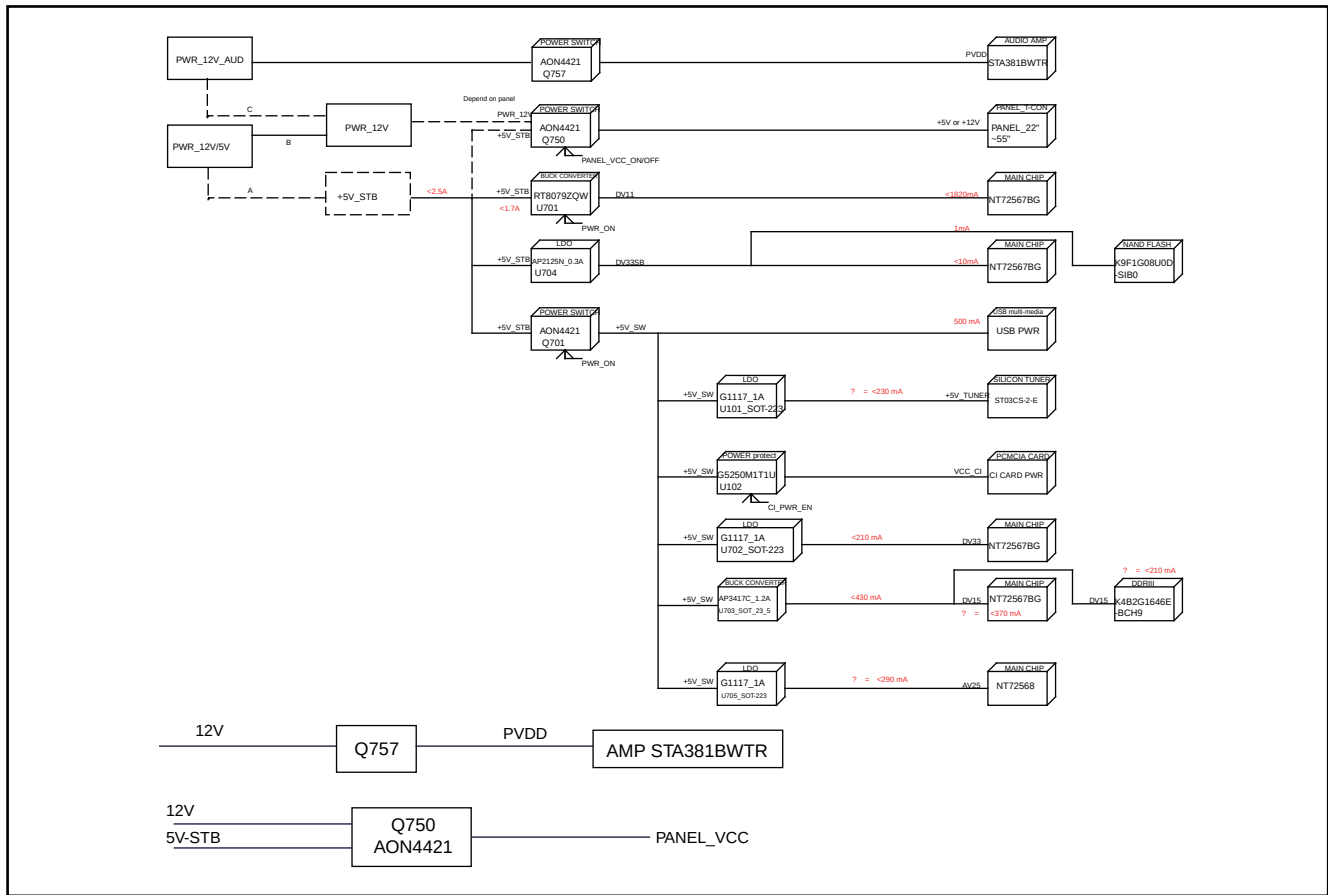
- +3V3, genenal supply voltage
- +3V3-TUN, supply voltage for tuner
- +3V3 from the power supply for the scaler IC NT72567
- +3V3-DVBS, clean voltage for DVB-S2 channel decoder
- +1V2-DVBS, core voltage for DVB-S2 channel decoder

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



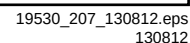
19530_205_130807.eps
130807

Figure 7-8 DC/DC converters (for 32" & 39")



19530_206_130812.eps
130812

Figure 7-9 DC/DC converters (for 20" & 22" & 24" & 40/42/47PFL3188H/12 & 47PFL3198H/12)

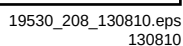


7.4 Front-End Analogue and DVB-T, DVB-C; ISDB-T reception

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

- TUNER EUROPE system ST03CS-2-E
- SCALER NT72567BG-BA LFBGA-576

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

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130810

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

- TUNER EUROPE system ST03CS-2-E
- SCALER NT72567BG-BA LFBGA-576
- DEMODULATOR NT78820TLMFG/B LQFP-64

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

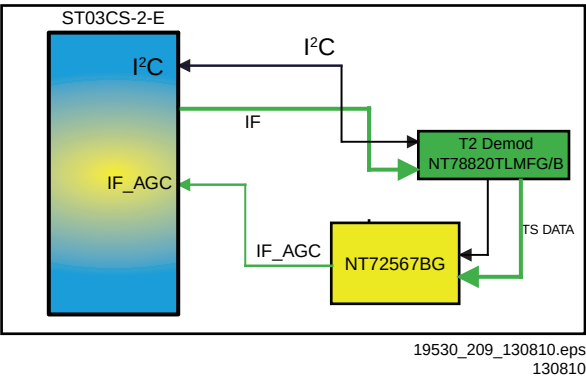


Figure 7-13 Front-End DVB-T2 DTV block diagram

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-A801F
- SCALER NT72567BG-BA LFBGA-576
- AVL6211LA LQFP-64

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

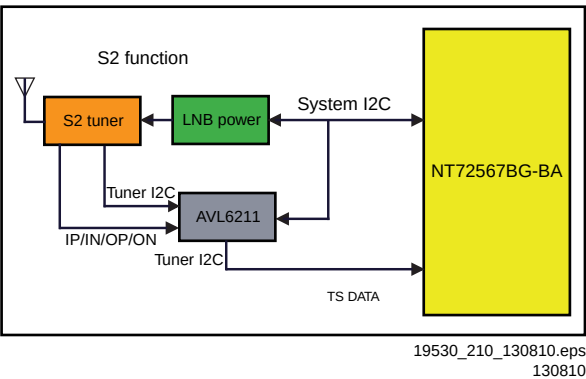


Figure 7-14 Front-End DVB-T2 DTV block diagram

The application supports the following protocols:

- Polarization selection via supply voltage (18V = horizontal, 13V = vertical)
- Band selection via "toneburst" (22kHz): tone "on" = "high" band, tone "off" = "low" band
- Satellite (LNB) selection via DiSEqC 1.0 protocol
- Reception of DVB-S (supporting QPSK encoded signals) and DVB-S2 (supporting QPSK, 8PSK, 16APSK and 32APSK encoded signals), introducing LDPC low-density parity check techniques

7.6 HDMI

Refer to figure [7-15 HDMI input configuration](#) for the application.

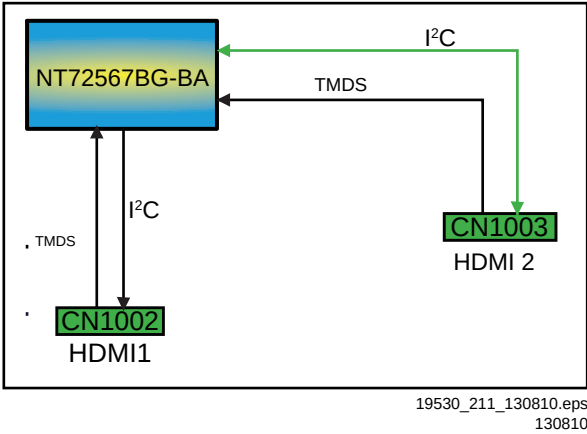


Figure 7-15 HDMI input configuration

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
- HDMI 3: HDMI input (TV digital interface support HDCP) with digital audio/PC DVI input
- +5V detection mechanism
- Stable clock detection mechanism
- Integrated EDID
- HPD control
- Sync detection
- TMDS output control
- CEC control

7.7 Video and Audio Processing - NT72567BG-BA

The NT72567BG-BA is the main audio and video processor (or System-on-Chip) for this platform. It has the following features:

- Multi-standard digital video decoder (MPEG-2, H.264, MPEG-4)
- Integrated DVB-T/DVB-C/DVB-S channel decoder
- Integrated CI+
- Integrated motion accurate picture processing
- High definition ME/MC
- Extended colour gamut and colour booster
- Integrated USB2.0 host controller
- Improved MPEG artefact reduction compared
- Security for customers own code/settings (secure flash)

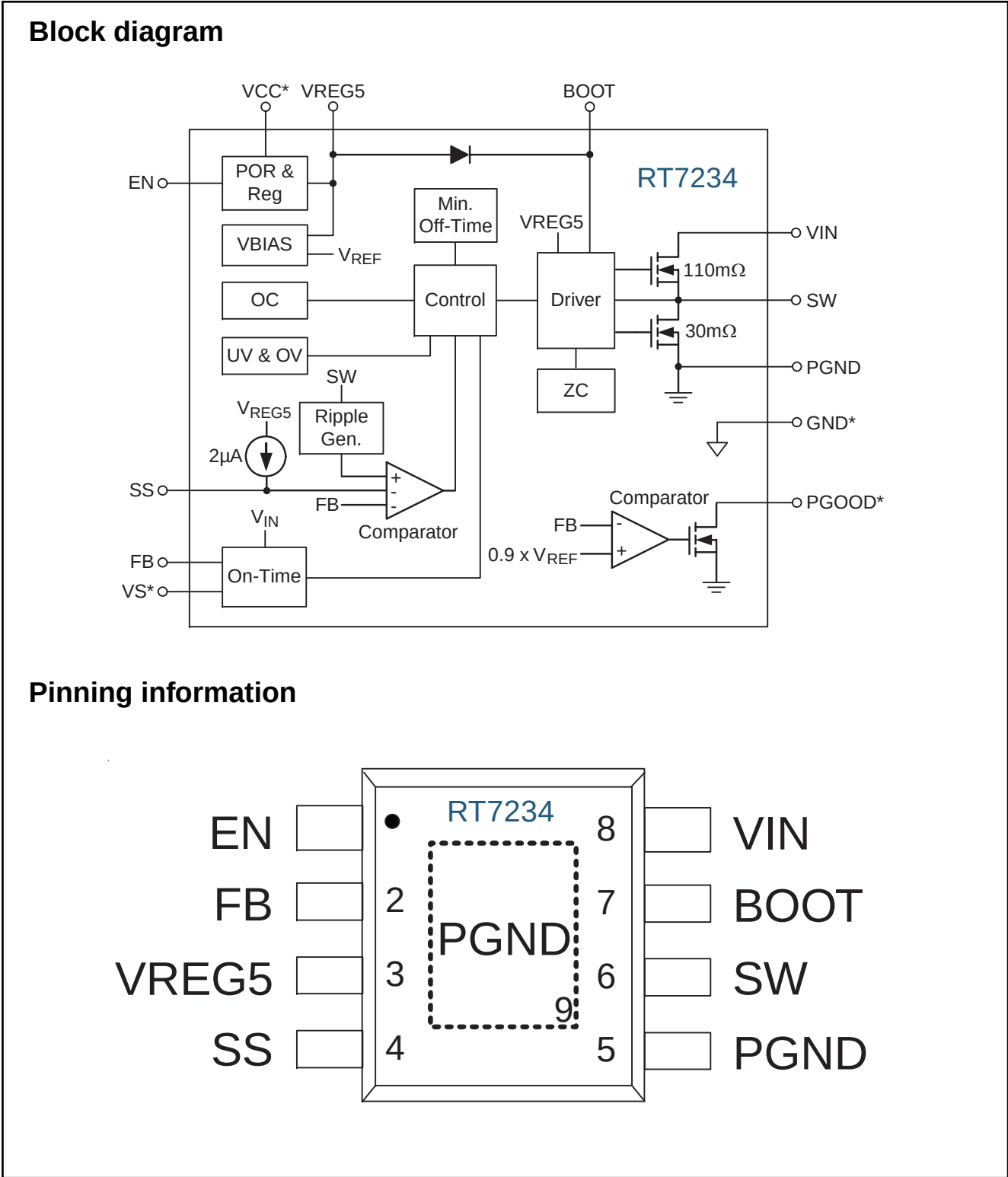
The NT72567BG-BA/D is an integrated TV system-on-chip which complaints with variety ATV as NTSC,PAL and SECAM,and DTV standards as ISDB-T,DVB-T/C, integrates DTV and multi-media AV decoder,SIF demodulator,and support A/V post-processing. It also includes next generation Motion Accurate Picture Processing High flat panel screen resolutions and refresh rates are supported with formats including 1366 × 768 @ 60Hz and 1920 x 1080 @ 60Hz.The combination of Ethernet, CI+ and H.264 supports new TV experiences with IPTV and VOD. On top of that, optional support is available for 2D dimming in combination roptimum contrast and power savings up to 50%.

For a functional diagram of the NT72567BG-BA, refer to [Figure 8-3](#).

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 Power, B01, RT7234GSP (IC U701)



19530_300_130724.eps
130724

Figure 8-1 Internal block diagram and pin configuration

8.2
 Diagram
 [10-3-1 Power](#),
 B01,
 TPS54519RTE (IC U701)

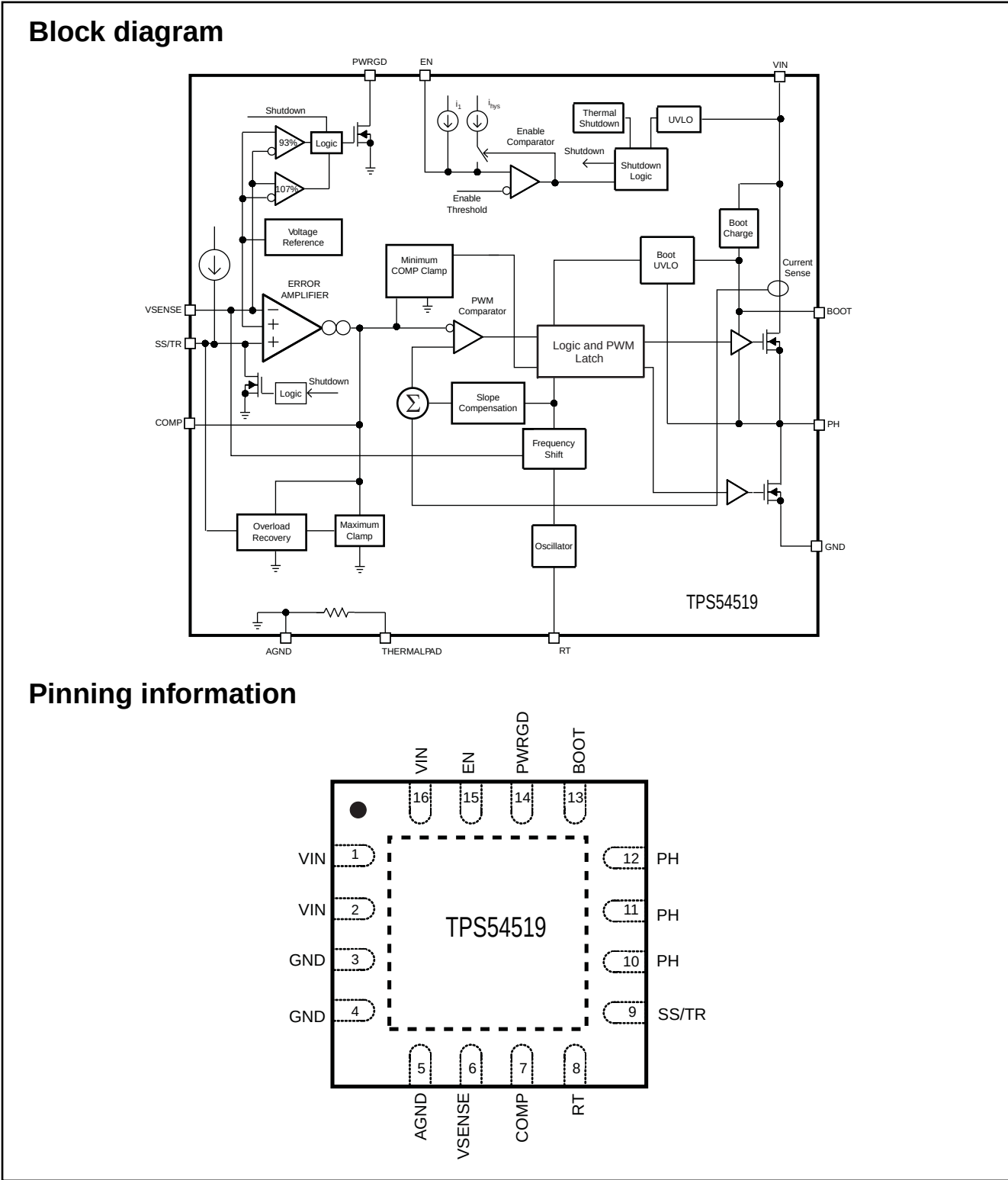


Figure 8-2 Internal block diagram and pin configuration

8.3 Diagram [10-3-3 NT72567 ADC/DAC/AUDIO/SIF](#), B03, NT72567BG-BA (IC U4001D)

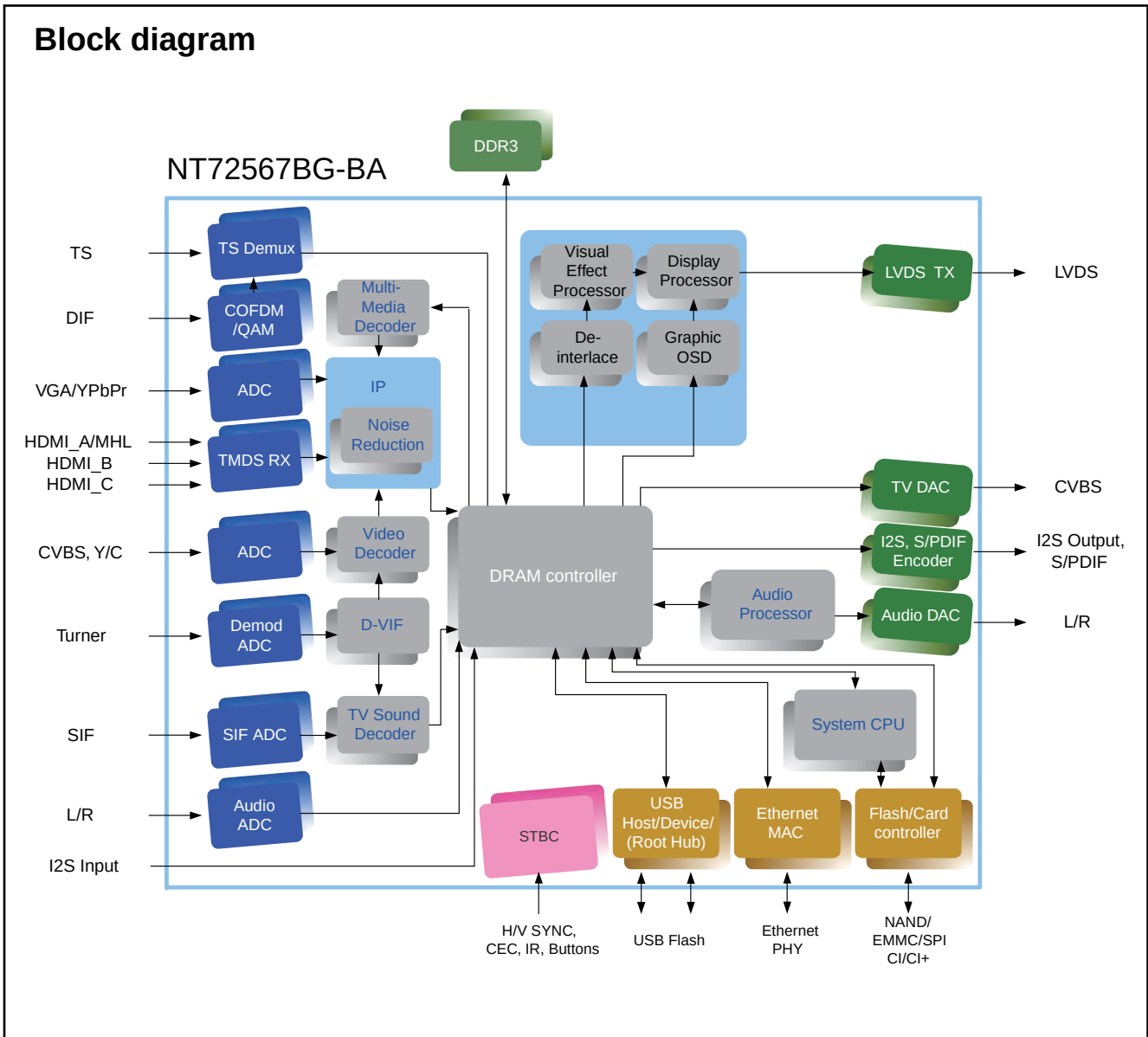


Figure 8-3 Internal block diagram

NT72567BG-BA

[illegible]

Figure 8-4 Internal pin configuration [1/6]

Pinning Information

NT72567BG-BA

	1	2	3	4	5	6	7	8
A		GPC_6 / PTSIN1_D7 / CCIR_IN_D7	GPC_5 / PTSIN1_D6 / CCIR_IN_D6	GPC_4 / PTSIN1_D5 / CCIR_IN_D5		GPC_3 / PTSIN1_D4 / CCIR_IN_D4	mini1_D0-	
B	GPC_11 / PTSOUT_D0 / PTSIN2_D0 / DEMODOOUT_D0 / STSOUT_DATA	GPC_10 / PTSOUT_START / PTSIN2_START / DEMODOOUT_START / STSOUT_START	GPC_9 / PTSOUT_VALID / PTSIN2_VALID / DEMODOOUT_VALID / STSOUT_VALID	GPC_8 / PTSOUT_CLK / PTSIN2_CLK / DEMODOOUT_CLK / STSOUT_CLK	GPC_7 / PTSIN2_ERROR / DEMODOOUT_ERROR	GPC_2 / PTSIN1_D3 / CCIR_IN_D3	mini1_D0+	LVO_0+ / mini1_D1+
C	GPC_17 / PTSOUT_D6 / PTSIN2_D6 / DEMODOOUT_D6	GPC_16 / PTSOUT_D5 / PTSIN2_D5 / DEMODOOUT_D5	GPC_15 / PTSOUT_D4 / PTSIN2_D4 / DEMODOOUT_D4	GPC_14 / PTSOUT_D3 / PTSIN2_D3 / DEMODOOUT_D3	GPC_13 / PTSOUT_D2 / PTSIN2_D2 / DEMODOOUT_D2	GPC_12 / PTSOUT_D1 / PTSIN2_D1 / DEMODOOUT_D1	LVO_0- / mini1_D1-	LVO_1- / mini1_D2-
D	GPD_16 / CI_HAD4 / I2S_OUT_C_MCLK	GPD_15 / CI_HAD3 / I2S_OUT_B_DATA	GPD_14 / CI_HAD2 / I2S_OUT_B_WS	GPD_13 / CI_HAD1 / I2S_OUT_B_BCLK	GPD_12 / CI_HAD0 / I2S_OUT_B_MCLK	GPC_18 / PTSOUT_D7 / PTSIN2_D7 / DEMODOOUT_D7	GPC_1 / PTSIN1_D2 / CCIR_IN_D2	
E	GPC_21 / CI_CE	GPC_20 / CI_CD	GPC_19 / CI_RST	GPD_19 / CI_HAD7 / I2S_OUT_C_DATA	GPD_18 / CI_HAD6 / I2S_OUT_C_WS	GPD_17 / CI_HAD5 / I2S_OUT_C_BCLK	GPC_0 / PTSIN1_D1 / CCIR_IN_D1	GPB_22 / PTSIN1_START / STSIN1_START
F	GPC_27 / CI_REG	GPC_26 / CI_HWR	GPC_25 / CI_HRD	GPC_24 / CI_IOWR	GPC_23 / CI_IORD	GPC_22 / CI_IJINT	GPB_23 / PTSIN1_D0 / CCIR_IN_D0 / STSIN1_DATA	GPB_21 / PTSIN1_VALID / STSIN1_VALID
G		GPD_0 / CI_HA3	GPC_31 / CI_HA2	GPC_30 / CI_HA1 / CI_ALE8	GPC_29 / CI_HA0 / CI_ALE0	GPC_28 / CI_HWAIT	VDD_CORE	VDD_CORE
H	GND	GPD_5 / CI_HA8	GPD_4 / CI_HA7	GPD_3 / CI_HA6	GPD_2 / CI_HA5	GPD_1 / CI_HA4	VDD_CORE	VDD_CORE
J	DQL_6	GND	DQL_4	GND	GPD_8 / CI_HA11 / Tensilica_TMS	GPD_7 / CI_HA10 / Tensilica_TCK	VDD_CORE	VDD_CORE
K		DQL_0	DQL_2	GPD_9 / CI_HA12 / Tensilica_TDO	GPD_10 / CI_HA13 / Tensilica_TDI	GPD_11 / CI_HA14 / Tensilica_TRST	VDD_CORE	VDD_CORE
L	DQU_3	DM_U	GND	GPD_6 / CI_HA9	GND	GND	GND	VDD10_DDR
M	DQU_5	DQU_7	DQU_1	GND	GND	GND	VDD_MMU	VDD_MMU

19530_303_130724.eps
130724

Figure 8-5 Internal pin configuration [2/6]

Pinning Information

NT72567BG-BA

	9	10	11	12	13	14	15	16
A	LVO_2- / mini1_CLK-	LVO_CLK- / mini1_D3-		LVE_0- / mini2_D0-	LVE_1- / mini2_D1-		LVE_3- / mini2_D3-	LVE_4- / mini2_D4-
B	LVO_1+ / mini1_D2+	LVO_CLK+ / mini1_D3+	LVO_3+ / mini1_D4+	LVO_4+ / mini1_D5+	LVE_1+ / mini2_D1+	LVE_2+ / mini2_D2+	LVE_CLK+ / mini2_CLK+	LVE_4+ / mini2_D4+
C	LVO_2+ / mini1_CLK+	LVO_3- / mini1_D4-	LVO_4- / mini1_D5-	LVE_0+ / mini2_D0+	LVE_2- / mini2_D2-	LVE_CLK- / mini2_CLK-	LVE_3+ / mini2_D3+	mini2_D5-
D	GPB_20 / PTSIN1_CLK / CCIR_IN_CLK / STSIN1_CLK	GPB_17 / STSINO_START		GPB_11 / I2S_OUT_A_DATA / (BS_0)	GPB_9 / LR0_DELAY		GPB_4 / LED_PWM_4 / LED_SPI_CLK / YDIO /	GPB_3 / LED_PWM_3 / LED_SPI_EN / VSYNC
E	GPB_19 / PTSIN1_ERROR / STSINO_ERROR	GPB_16 / STSINO_VALID	GPB_13 / I2S_OUT_A_BCLK / (BS_2)	GPB_10 / LR1_DELAY	GPB_8 / H-OUT / LED_PWM_7 / VSYNC	GPB_5 / LED_PWM_5 / LED_SPI_DI / HSC_SDA	GPB_1 / LED_PWM_1	GPH_8 / H-OUT / VSYNC / LED_PWM_7
F	GPB_18 / STSINO_DATA	GPB_15 / STSINO_CLK	GPB_12 / I2S_OUT_A_WS / (BS_1)	GPB_7 / 3D_IR / 3D_BT / 3D_Active	GPB_6 / LED_PWM_6 / LED_SPI_DO / HSC_SCL	GPH_1 / LED_PWM_1	GPH_6 / LED_PWM_6 / LED_SPI_DO / HSC_SCL	GPH_9 / LR0_DELAY
G	VDD_CORE	VDD_CORE	GND_LVDS	GPB_14 / I2S_OUT_A_MCLK	GPB_2 / LED_PWM_2	GPB_0 / LED_PWM_0	GPA_9 / I2S_IN_MCLK / DEMODO_Debug_LED	GPA_7 / I2S_IN_WS / INT4
H	VDD_CORE	VDD_CORE	GND_LVDS	GND	GND	GND_TVDAC	GPA_8 / I2S_IN_BCLK / INT5	GPA_6 / I2S_IN_DATA / INT3
J	VDD_CORE	VDD_CORE	GND	GND	GND	GND	GND	GND
K	VDD_CORE	VDD_CORE	GND	GND	GND	GND	GND	GND
L	GND	GND	GND	GND	GND	GND	GND	GND
M	VDD_MMU	GND	GND	GND	GND	GND	GND	GND

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130724

Figure 8-6 Internal pin configuration [3/6]

Pinning Information

NT72567BG-BA

	9	10	11	12	13	14	15	16
N	VDD_MMU	GND	GND	GND	GND	GND	GND	GND
P	VDD_MMU	GND	GND	GND	GND	GND	GND	GND
R	VDD_MMU	VDD25_DLL	GND	GND	GND	GND	GND	GND
T	VDD_MMU	GND	GND	GND	GND	GND	GND	GND
U	GPE_3 / I2C_MD_SCL	MIPS_UART_C_RX / GPE_28 / INT2	GND	GND	GND	GND	GND	GND
V	MIPS_UART_C_TX / GPE_27 / INT1	GPE_26 / USB1_PWEN	GND	GND	GND	GND_HDMI	GND	GND
W	MIPS_UART_B_RX / GPE_7 / INT7	MIPS_UART_B_TX / GPE_6 / INT6	GND_USB	GND	VDD33_HDMI	GND_HDMI	TEST_EN	TEST_BYPASS
Y	MIPS_TDI / GPE_12	GPE_25 / USB0_PWEN	VDD33_USB	VDD33_IO	VDD33_HDMI	MHL_CD_SENSE / STBC_GPG_24	PADPWR5V_A	PADPWR5V_B
AA	MIPS_TRST / GPE_13	HDMI_A_SCL / STBC_GPF_0	VDD33_USB	VDD33_IO	EXT_RES	HDMI_ARC	HDMI_B_SCL / STBC_GPF_2	HDMI_B_SDA / STBC_GPF_3
AB		HDMI_A_SDA / STBC_GPF_1	HDMI_CEC		MHL_CBUS	MHL_VBUS / STBC_GPG_25		HDMI_C_SCL / STBC_GPF_4
AC	USB0_D-	RXA_CLK-	RXA_0+	RXA_2-	RXB_CLK-	RXB_0+	RXB_2-	RXC_CLK-
AD	USB0_D+	RXA_CLK+	RXA_1+	RXA_2+	RXB_CLK+	RXB_1+	RXB_2+	RXC_CLK+
AE		RXA_0-	RXA_1-		RXB_0-	RXB_1-		RXC_0-

19530_306_130724.eps
130724

Figure 8-7 Internal pin configuration [4/6]

Pinning Information

NT72567BG-BA

	17	18	19	20	21	22	23	24	25
A		FSADJ	GPH_7 / 3D_IR / 3D_BT / 3D_Active		DACOUT_L1	AUD_VCM_I	AUD_VRP	ADIN_R0	
B	mini2_D5+	VCOMP	GPH_5 / LED_PWM_5 / LED_SPI_DI / HSC_SDA	DACOUT_R0	DACOUT_R1	AUD_VRM	ADIN_L0	ADIN_L1	ADIN_R1
C	GPH_10 / LR1_DELAY	TVDAC_OUT	GPH_2 / LED_PWM_2	DACOUT_L0	AUD_VCM	GPA_18 / RMII_RX_D1	GND_AUD	ADIN_L2	ADIN_R2
D		GPH_11 / I2S_OUT_A_MCLK	GPH_0 / LED_PWM_0	GPA_19 / RMII_REF_CLK	GPA_21 / RMII_TX_D1	GPA_17 / RMII_RX_D0	GND_AUD	ADIN_R3	ADIN_L3
E	GPH_3 / LED_PWM_3 / LED_SPI_EN / VSYNC	GPH_4 / LED_PWM_4 / LED_SPI_CLK / YDIO	GPA_25 / RMII_CRCS	GPA_20 / RMII_TX_D0	GPA_22 / RMII_TX_EN	GPA_10 / I2S_OUT_A_DATA	GPA_13 / I2S_OUT_A_MCLK	GND	
F	GPA_26 / RMII_RXERR / SPDIF_OUT / RFAGC_VSYNC	GPA_24 / RMII_MDIO	GPA_23 / RMII_MDC	VDD25_TVADC	VDD25_AUDAC	VDD25_AUADC	GPA_12 / I2S_OUT_A_BCLK	GPA_11 / I2S_OUT_A_WS	GPA_14 / DEMODO_Emergency / RFAGC_VSYNC
G	GPA_5 / I2C_ME_SCL	GPA_4 / I2C_ME_SDA	VDD25_TVADC 1	VDD25_TVADC 0	VDD25_TVADC 0	VDD11_DEMOD	DEMOD-	DEMOD+	GND_DEMOD
H	VDD25_LVDS	VDD25_LVDS	VDD25_TVADC 1	VDD33_TVADC 0		GPA_16 / Tuner RF AGC / RF_AGC_PWM	SIF+	SIF-	
J	VDD25_MPLL	VDD25_BIAS	VDD25_TVADC 1				GPA_15 / Tuner IF AGC / IF_AGC_PWM	GPA_1 / I2C_MA_SCL	GPA_0 / I2C_MA_SDA
K	EFUSE_EN	GND	GND	GND_TVADC0	GND_TVADC0	SCART0_FB	CVBS_OUT	TUNER_CVBSIN	CVBS0
L	GND	GND	GND		ADC1VMID	S_Y	SCART0_Y	ADC0M	
M	GND	GND	GND	GND_TVADC1	GND_BIAS		SOG_1	VGA_R	VGA_G

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130724

Figure 8-8 Internal pin configuration [5/6]

Pinning Information

NT72567BG-BA

	17	18	19	20	21	22	23	24	25
N	GND	GND	GND	GND_TVADC1	GND_TVADC1	SCART1_B	YPbPr0_Pr	ADC1M	VGA_B
P	GND	GND	I2C_M1_SCL / STBC_GPG_17	ADC3VMID	SCART1_G	SCART1_R	YPbPr0_Y	ADC2M	
R	GND	GND	I2C_M1_SDA / STBC_GPG_16	GPA_2 / I2C_MB_SDA	SOG_2		SOG_0	ADC3M	YPbPr0_Pb
T	GND	GND	STBC_UART_0_RX	GPA_3 / I2C_MB_SCL	VGA_VS	VGA_HS	VGA_SCL / STBC_GPG_21		
U	GND	GND	STBC_UART_0_TX	I2C_M0_SDA / STBC_GPG_14	I2C_M0_SCL / STBC_GPG_15	VGA_SDA / STBC_GPG_20	STBC_UART_1_TX	STBC_UART_1_RX	
V	GND	GND	GND	VDD10_STBC			SAR_ADC_7 / STBC_GPG_23 / SD_PWEN#	GND_XTAL	XTAL_IN
W	POR_EN	LDO_BYPASS	VDD_NAND	VDD33_STBC	VDD33_STBC		SAR_ADC_8 / STBC_GPG_26 / eMMC_CMD / SD_CMD	SAR_ADC_5 / STBC_GPG_13 / SD_CD#	XTAL_OUT
Y	STBC_GPIO_2 / (BS_8)	PW_EN	STBC_GPIO_3 / (BS_9)	SPI_HOLD(DIO3) / STBC_GPF_19 (BS_5)	NAND_D7 / STBC_GPF_27 / CPE_A7 / eMMC_D7	NAND_D6 / STBC_GPF_26 / CPE_A6 / eMMC_D6	SAR_ADC_6 / STBC_GPG_22 / SD_WP	SAR_ADC_4 / STBC_GPG_12 / eMMC_CLK / SD_CLK	
AA	PADPWR5V_C	STBC_GPIO_1 / (BS_7)	STBC_RSTn	SPI_DQ(DIO1) / STBC_GPF_17 (BS_4)	NAND_D5 / STBC_GPF_25 / CPE_A5 / eMMC_D5	NAND_D4 / STBC_GPF_24 / CPE_A4 / eMMC_D4	STBC_GPIO_8 / (BS_13)	SAR_ADC_2 / STBC_GPG_10	SAR_ADC_3 / STBC_GPG_11
AB	HDMIC_SDA / STBC_GPF_5		STBC_IR / STBC_GPF_12	SPI_CLK / STBC_GPF_15	NAND_D3 / STBC_GPF_23 / CPE_A3 / eMMC_D3 / SD_DAT3	NAND_D2 / STBC_GPF_22 / CPE_A2 / eMMC_D2 / SD_DAT2	NAND_CE_0H / STBC_GPG_2 / PGENB / eMMC_RSTn	SAR_ADC_0 / STBC_GPG_8	SAR_ADC_1 / STBC_GPG_9
AC	RXC_0+	RXC_2-	STBC_GPIO_5	SPI_CS / STBC_GPF_14 (BS_3)	NAND_D1 / STBC_GPF_21 / CPE_A1 / eMMC_D1 / SD_DAT1	NAND_D0 / STBC_GPF_20 / CPE_A0 / eMMC_D0 / SD_DAT0	NAND_WPH / STBC_GPG_0 / CPE_PROGRAM	STBC_GPIO_6 / (BS_11)	STBC_GPIO_9 / (BS_14)
AD	RXC_1+	RXC_2+	STBC_GPIO_4 / (BS_15)	SPI_WP(DIO2) / STBC_GPF_18	SPI_DIO(DIO0) / STBC_GPF_16	NAND_RVB# / STBC_GPF_28 / CPE_B0	NAND_WE# / STBC_GPF_30 / CPE_B2	NAND_CE_1H / STBC_GPG_3 / CSB	STBC_GPIO_7 / (BS_12)
AE	RXC_1-		STBC_GPIO_0 / (BS_6)	STBC_RSTout / STBC_GPF_13 (BS_10)		NAND_CLE / STBC_GPF_29 / CPE_B1	NAND_ALE / STBC_GPF_31 / CPE_B3	NAND_RE# / STBC_GPG_1 / LOAD	

19530_308_130724.eps
130724

Figure 8-9 Internal pin configuration [6/6]

8.4 Diagram [10-3-11 SPEAKER AMPLIFER/HEADPHONE OUT, B11, STA381BWTR \(IC U601\)](#)

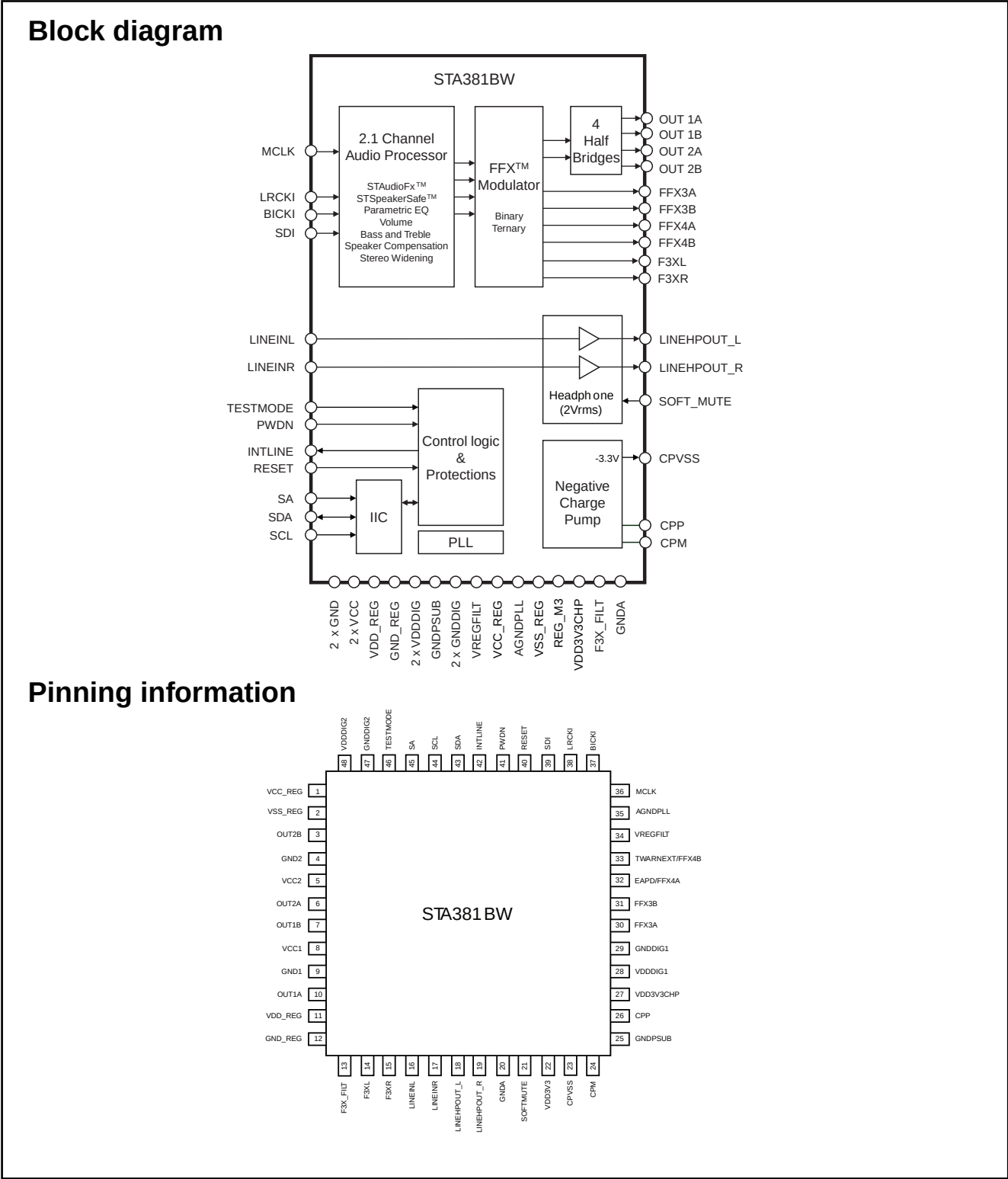
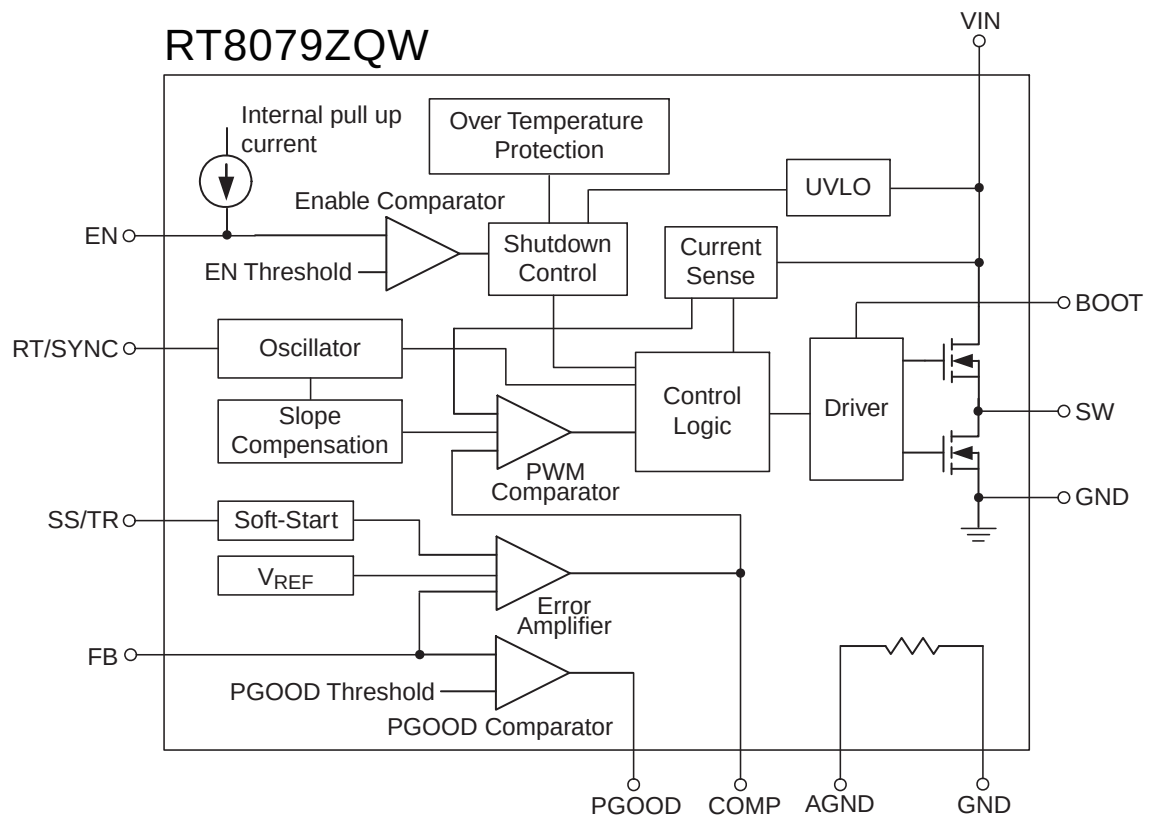


Figure 8-10 Internal block diagram and pin configuration

8.5 Diagram [10-4-1 Power-1](#), B01, RT8079ZQW (IC U701)

Block diagram



Pinning information

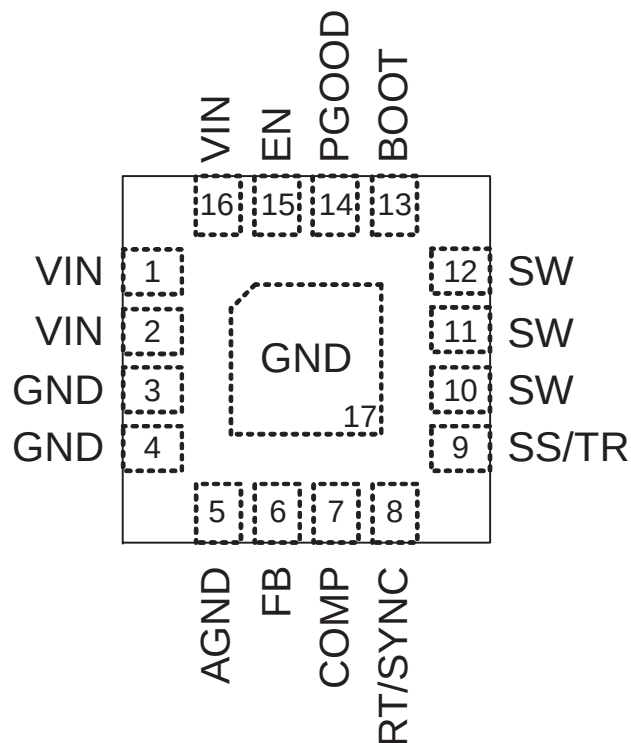
19530_309_130724.eps
130724

Figure 8-11 Internal block diagram and pin configuration

8.6
Diagram
10-5-14 T2/S2 Tuner/Demodulator, B14, NT78820TL (IC U203)

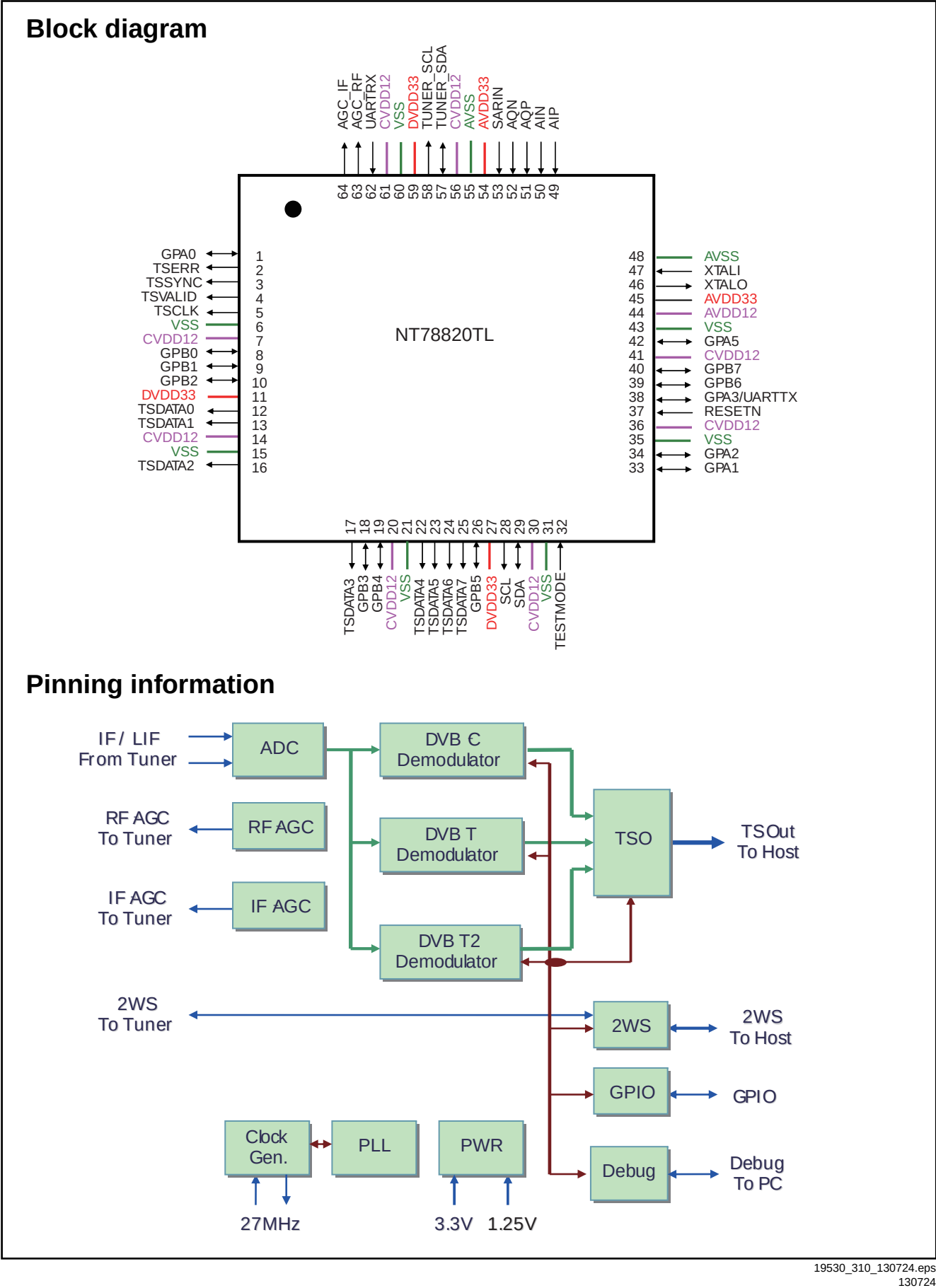
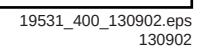


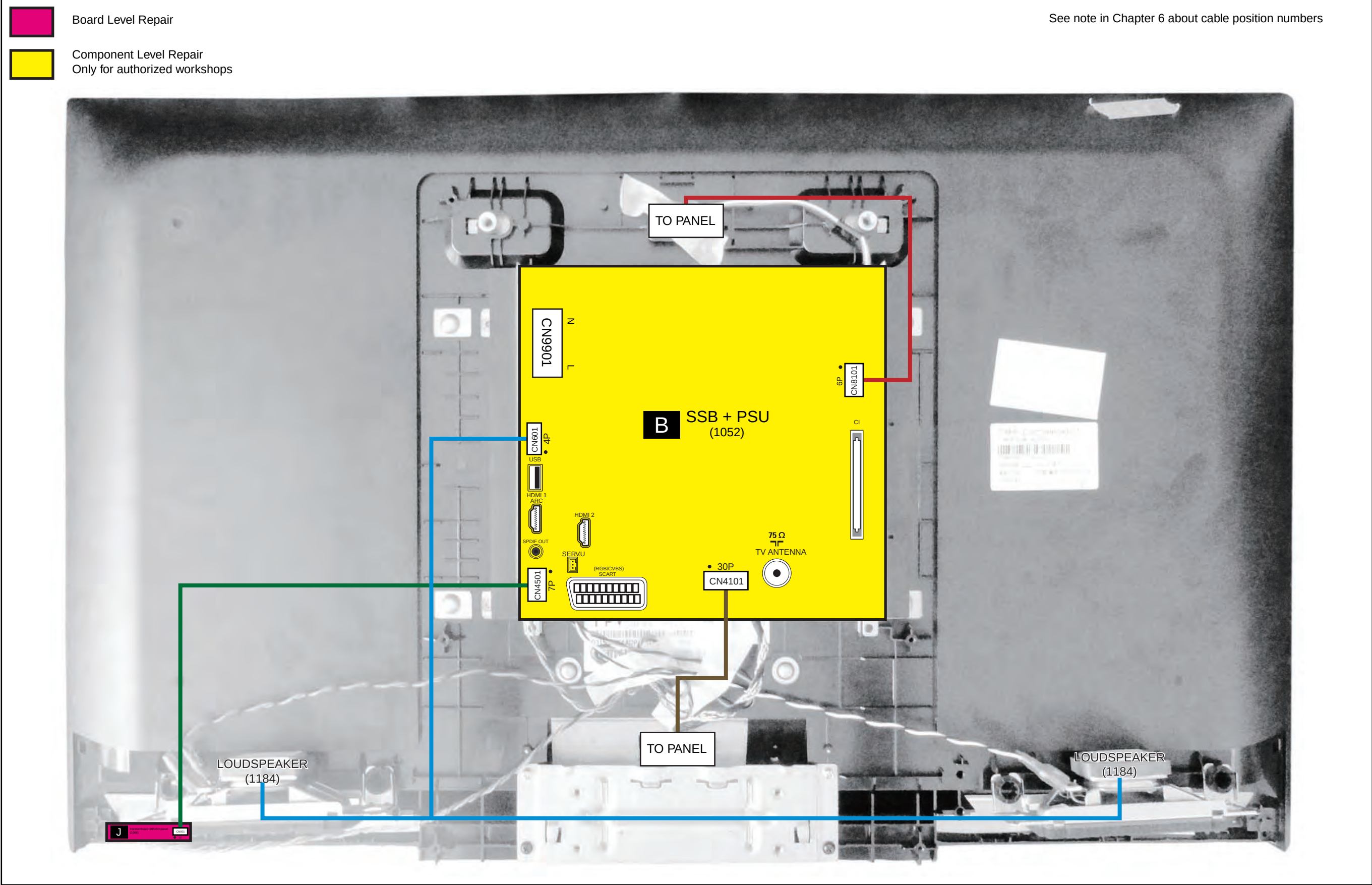
Figure 8-12 Internal block diagram and pin configuration

WIRING DIAGRAM 24" (3000 series)

See note in Chapter 6 about cable position numbers

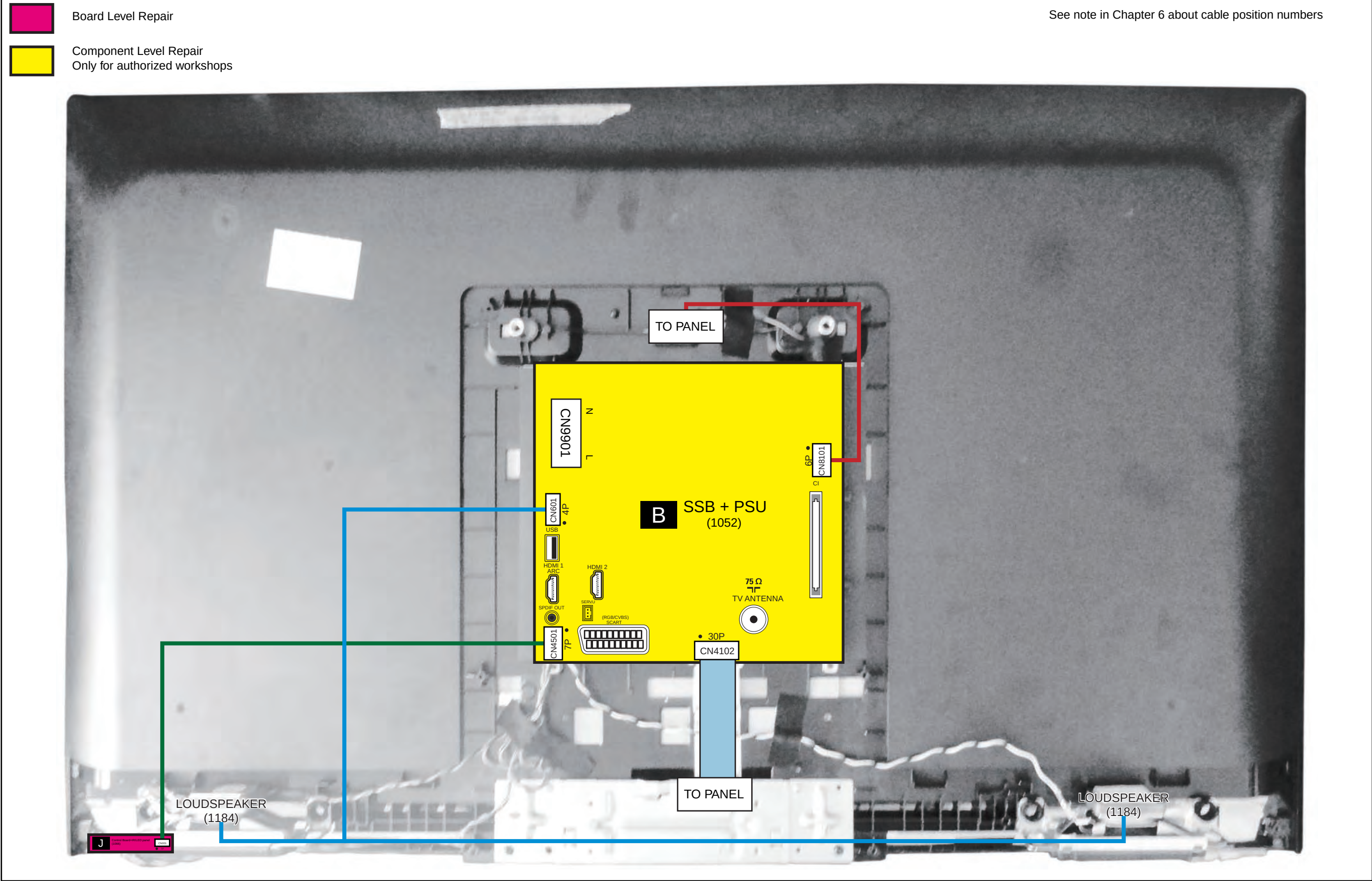


9.2 Wiring diagram 3000 series 32"
WIRING DIAGRAM 32" (3000 series)



9.3 Wiring diagram 3000 series 39"
WIRING DIAGRAM 39" (3000 series)

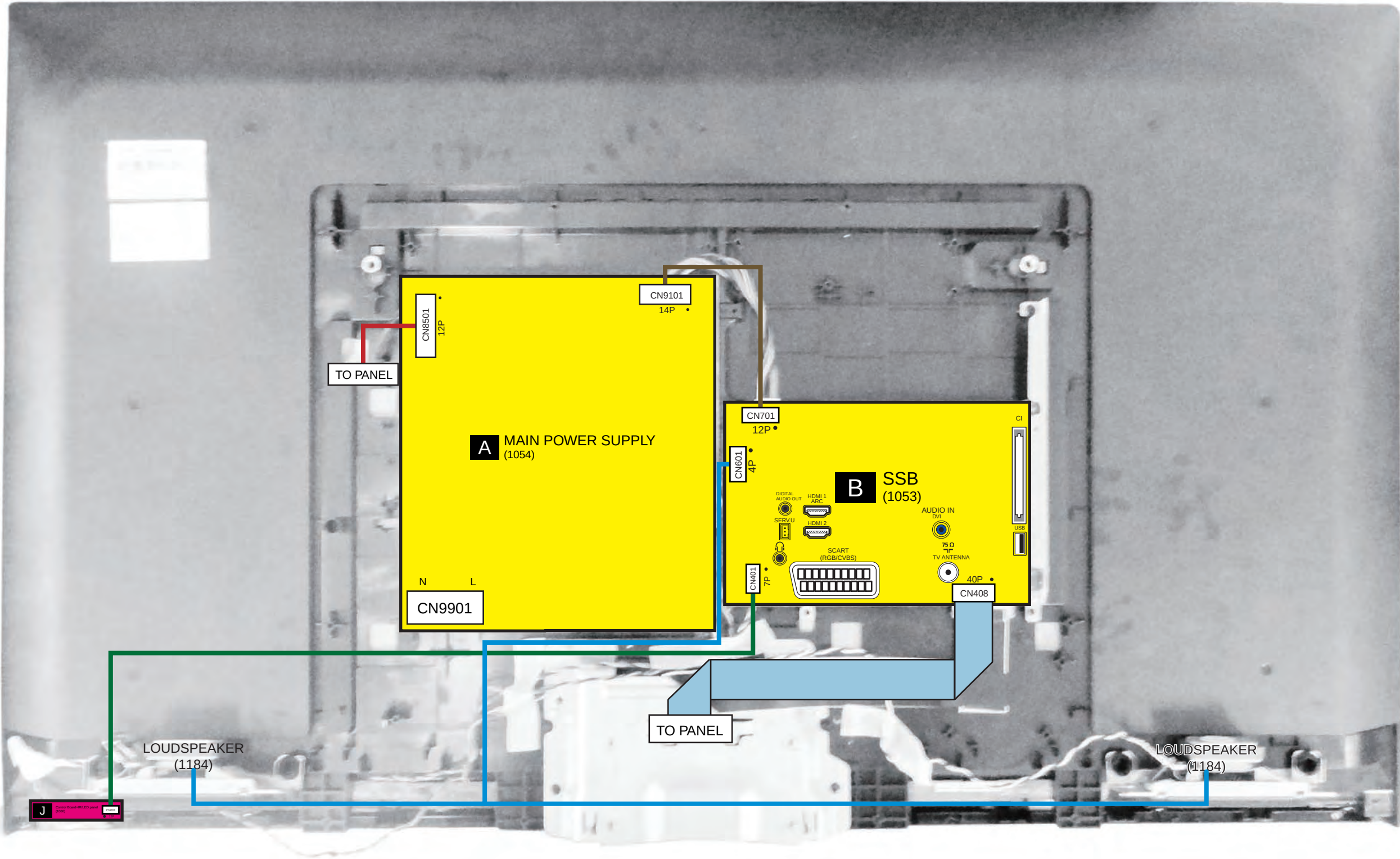
See note in Chapter 6 about cable position numbers



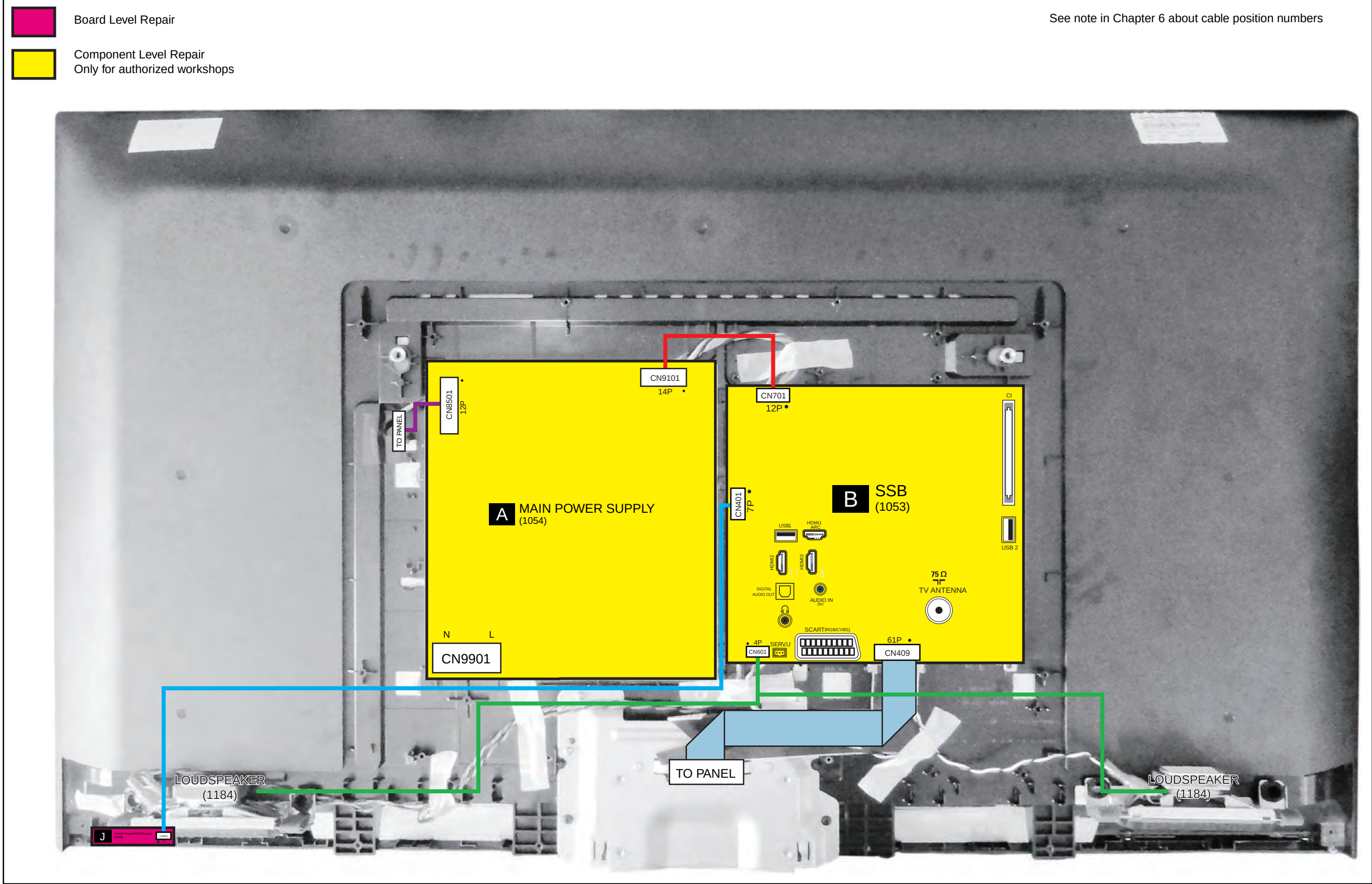
9.4 Wiring diagram 31x8H/12 series 40"
WIRING DIAGRAM 40" (31x8H/12 series)

- Board Level Repair
- Component Level Repair
Only for authorized workshops

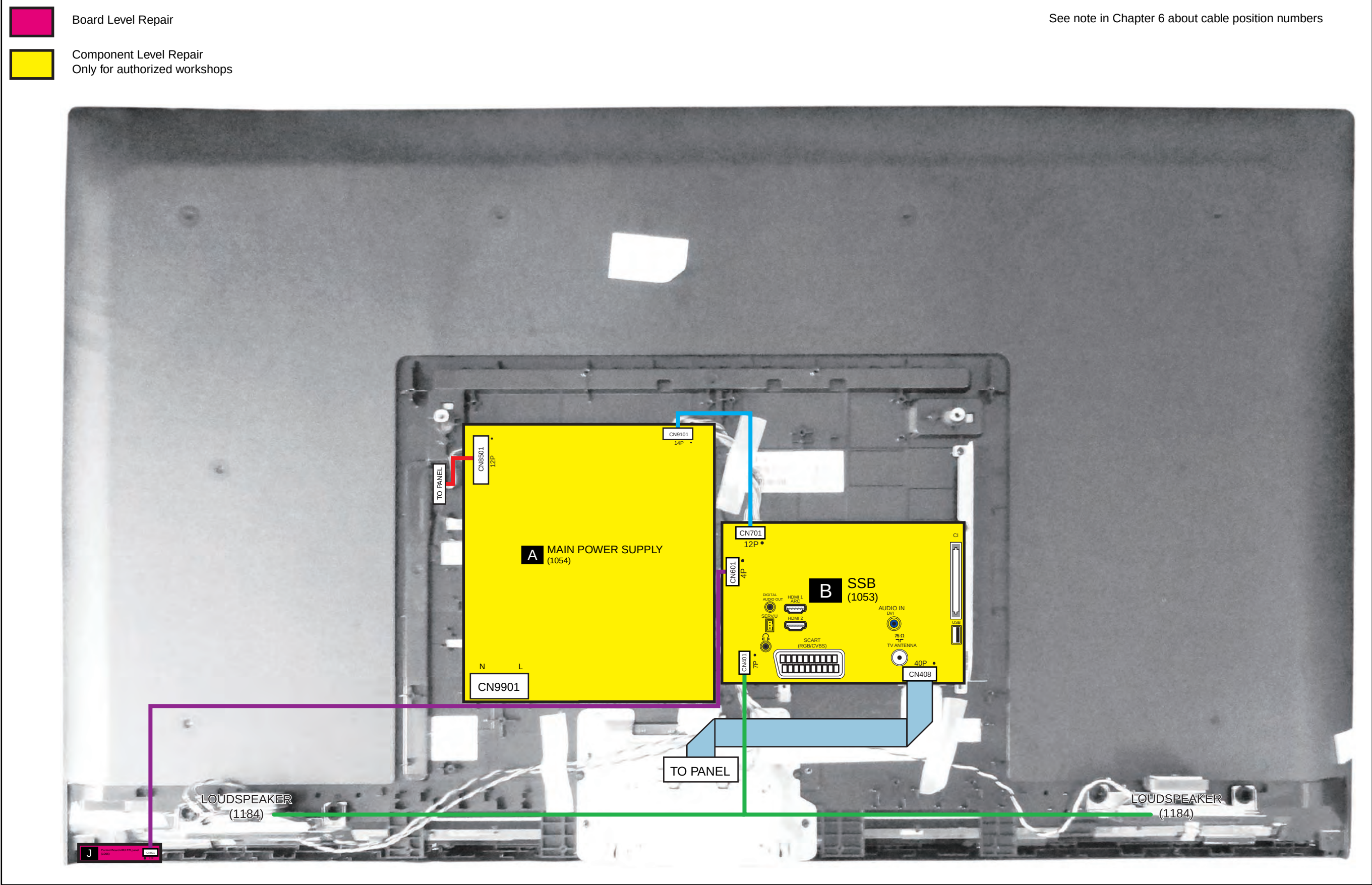
See note in Chapter 6 about cable position numbers



9.5 Wiring diagram 31x8T/60 series 40"
WIRING DIAGRAM 40" (31x8T/60 series)



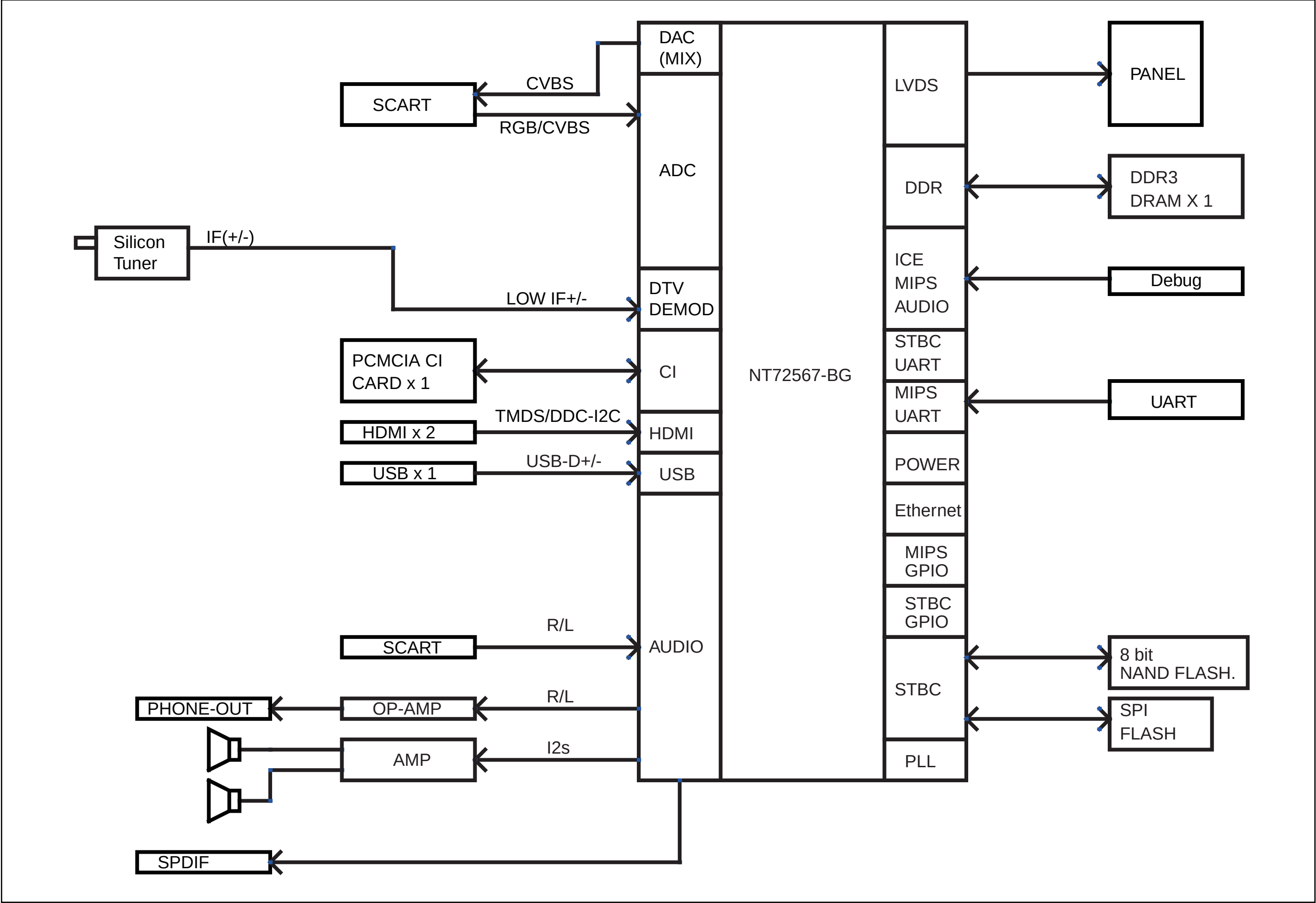
9.6 Wiring diagram 31x8H/12 series 42"- 47"
WIRING DIAGRAM 42"- 47" (31x8H/12 series)



9.7 **Wiring diagram 31x8T/60 series 47"**
WIRING DIAGRAM 47" (31x8T/60 series)

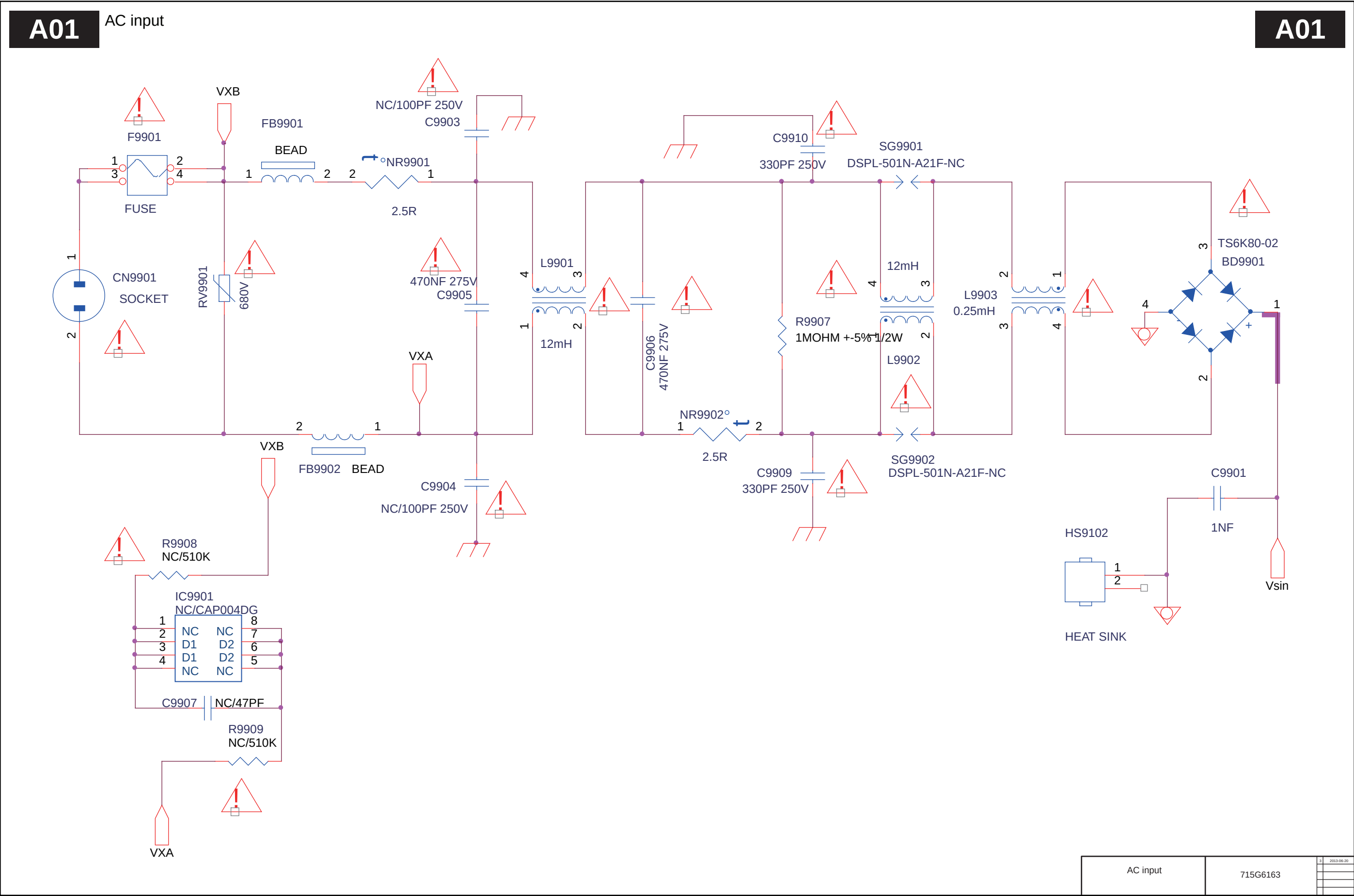


9.8 Block diagram 3xx8 series



10. Circuit Diagrams and PWB Layouts

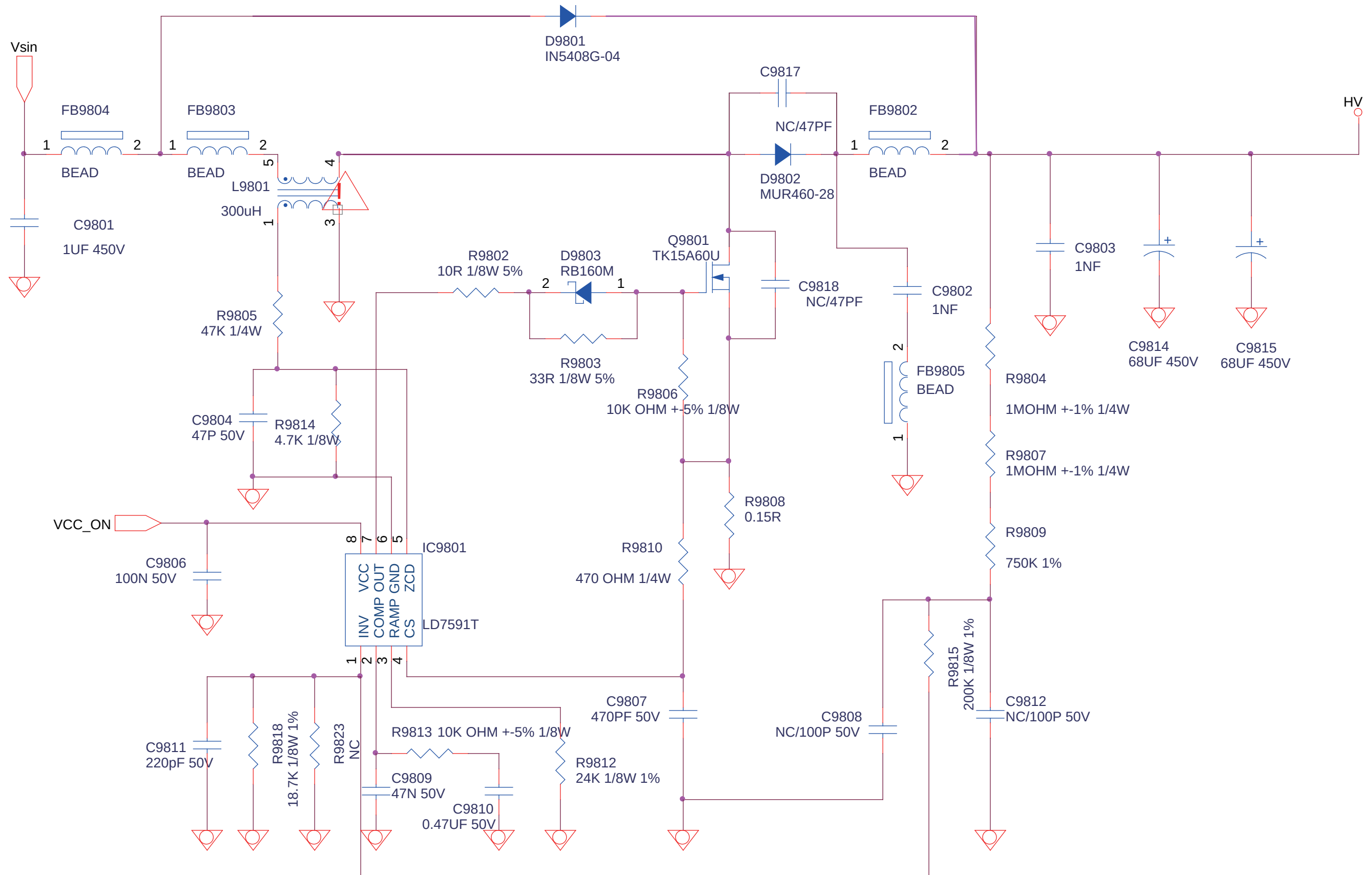
10.1 A 715G6163 PSU
10-1-1 AC input



PFC

PFC

A02

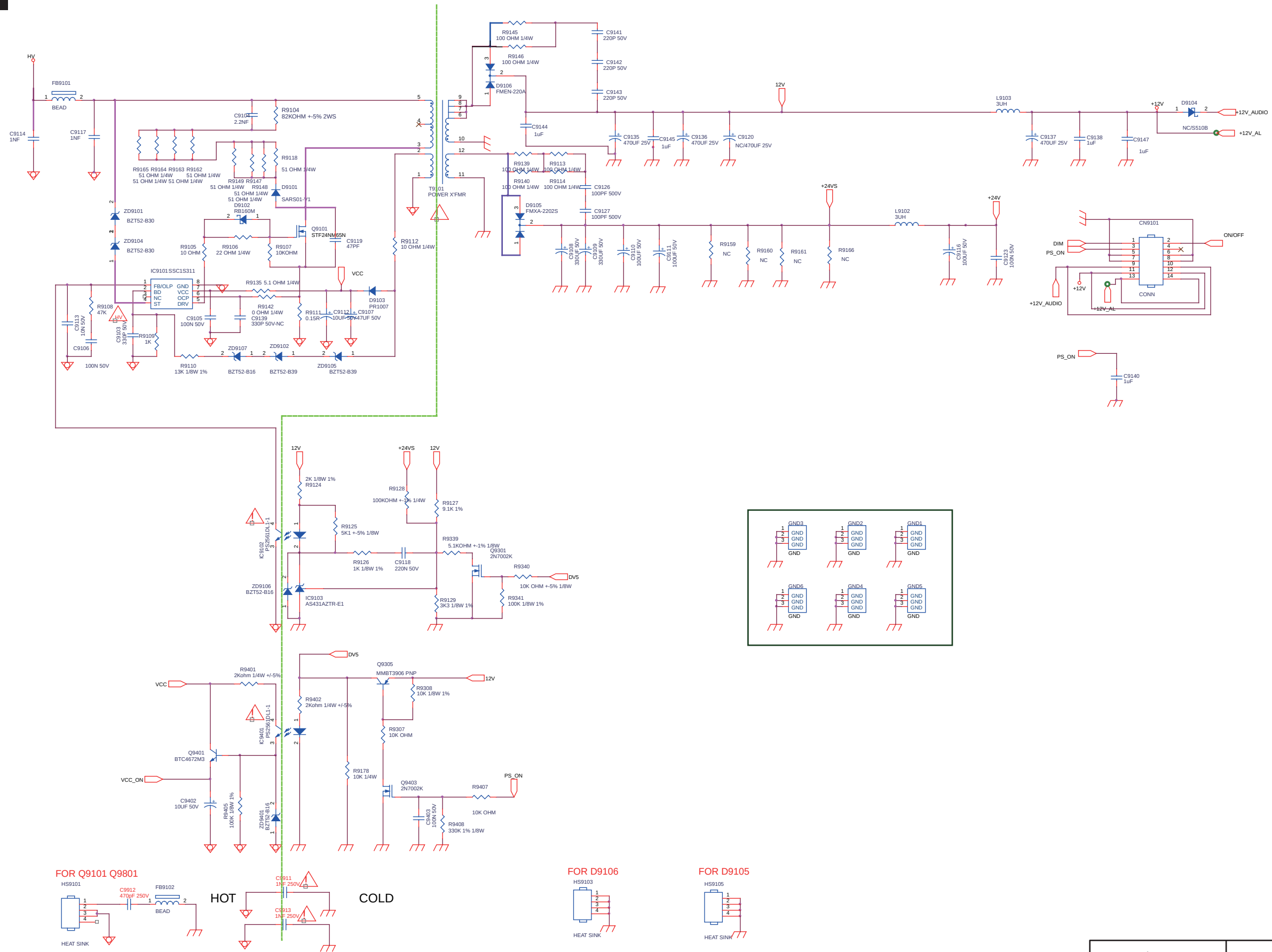


PFC	715G6163	3	2013-06-20

A03

Main Power

A03

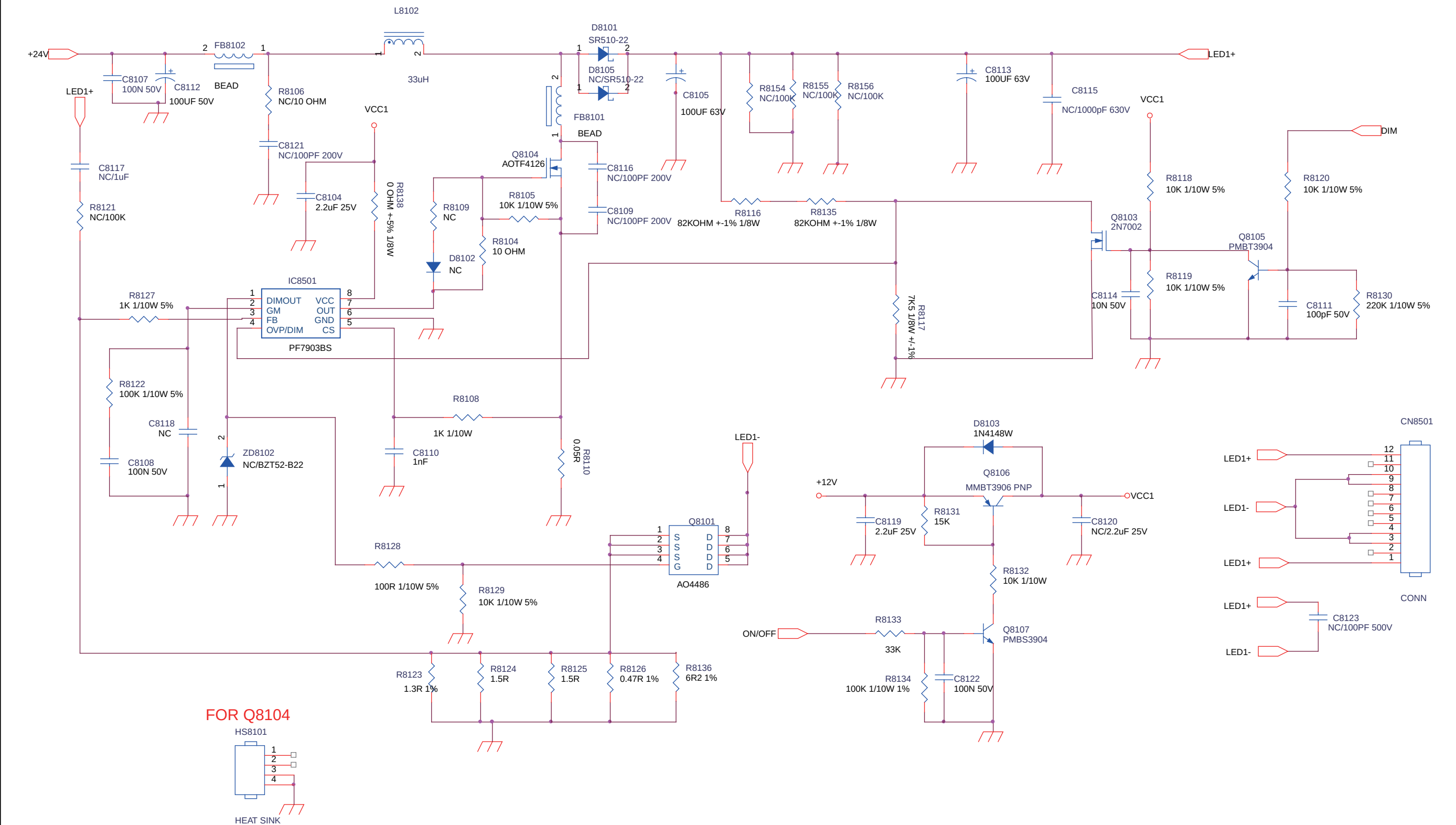


Main Power	715G6163	3	2013-08-20

A04

LED Driver

A04

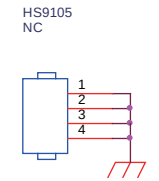


LED Driver	715G6163	3	2013-08-20

10-2-1 POWER

POWER

A01

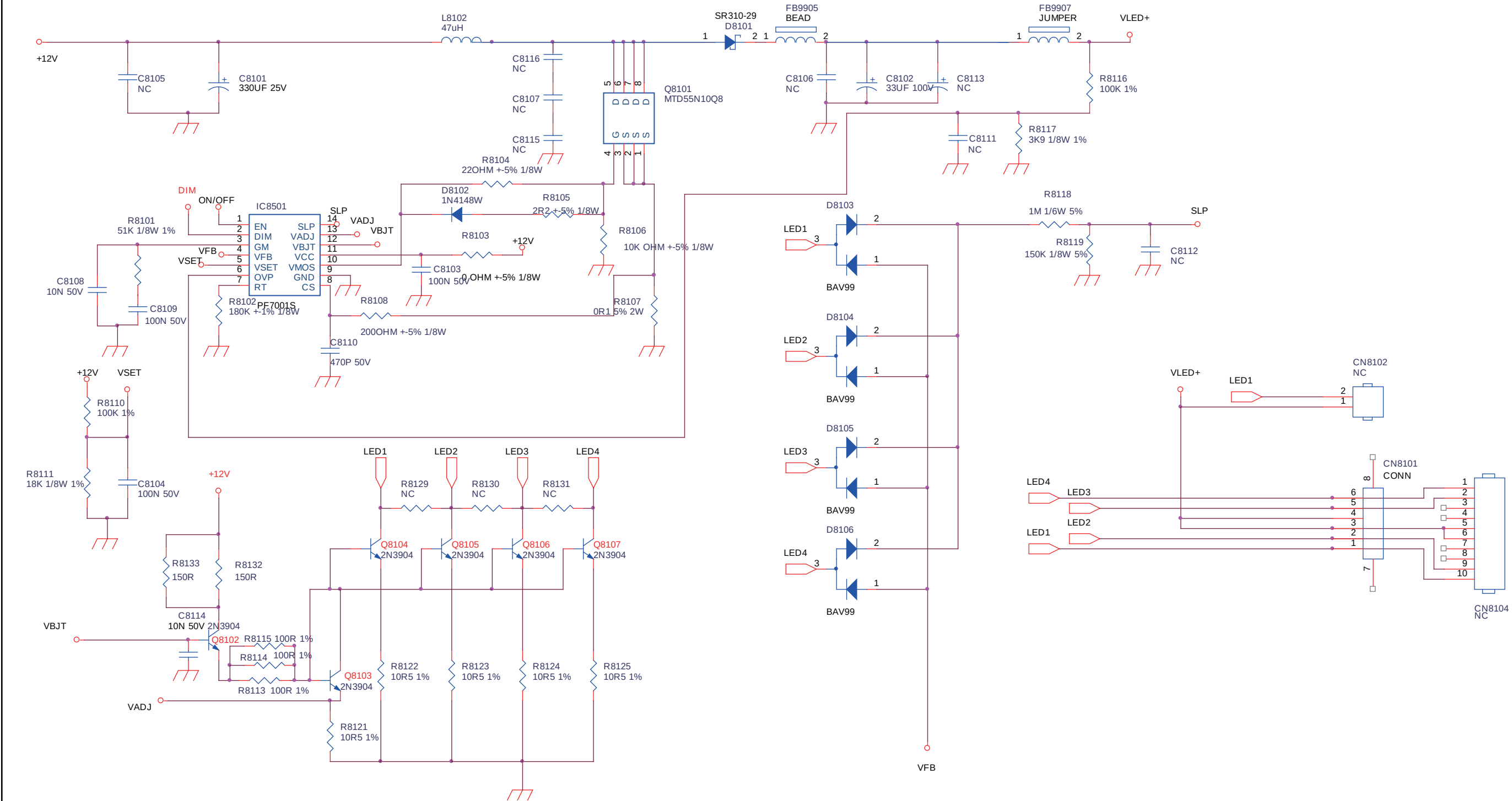
715G6297

10-2-2 LED DRIVER

A02

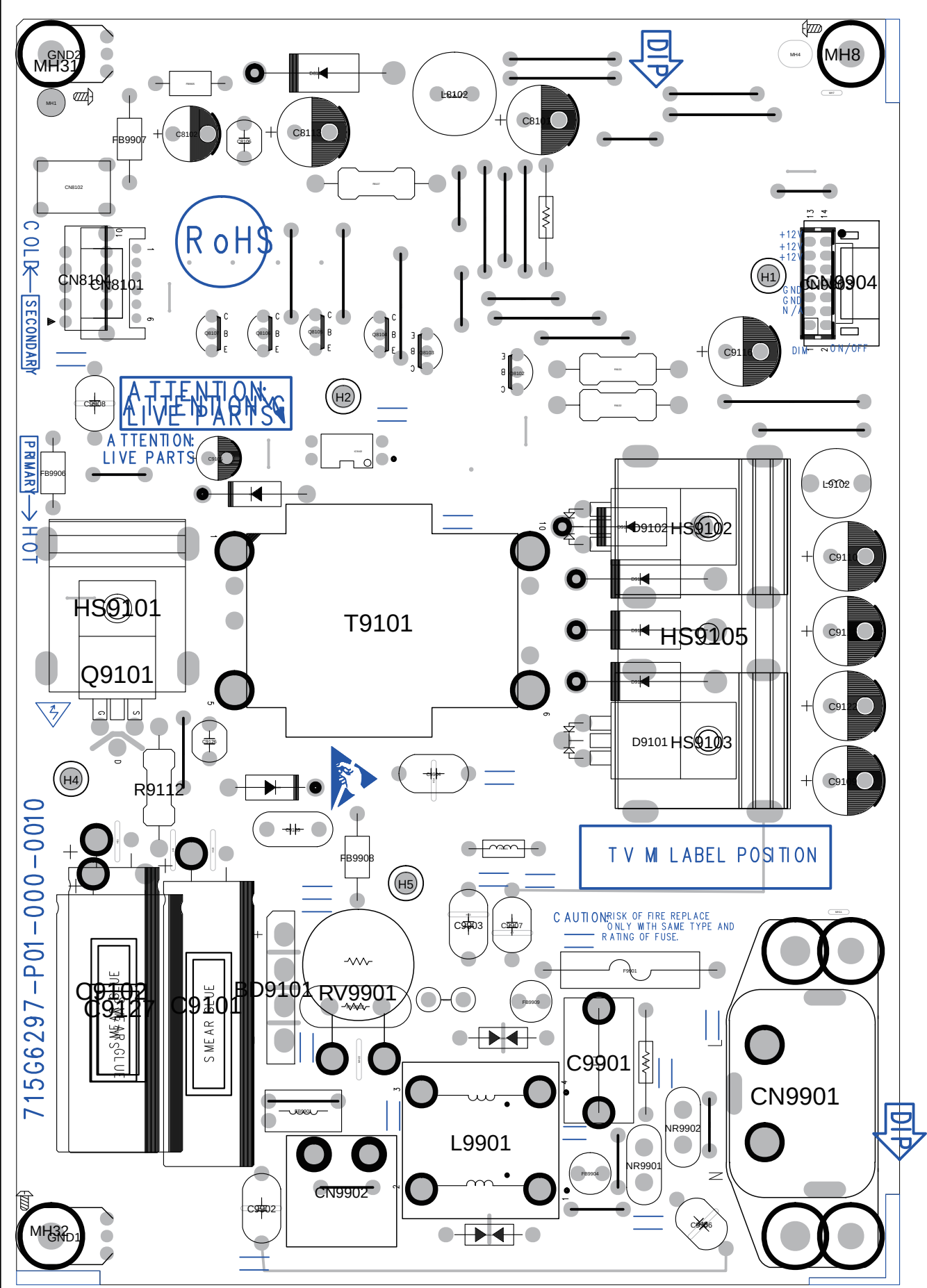
LED DRIVER

A02



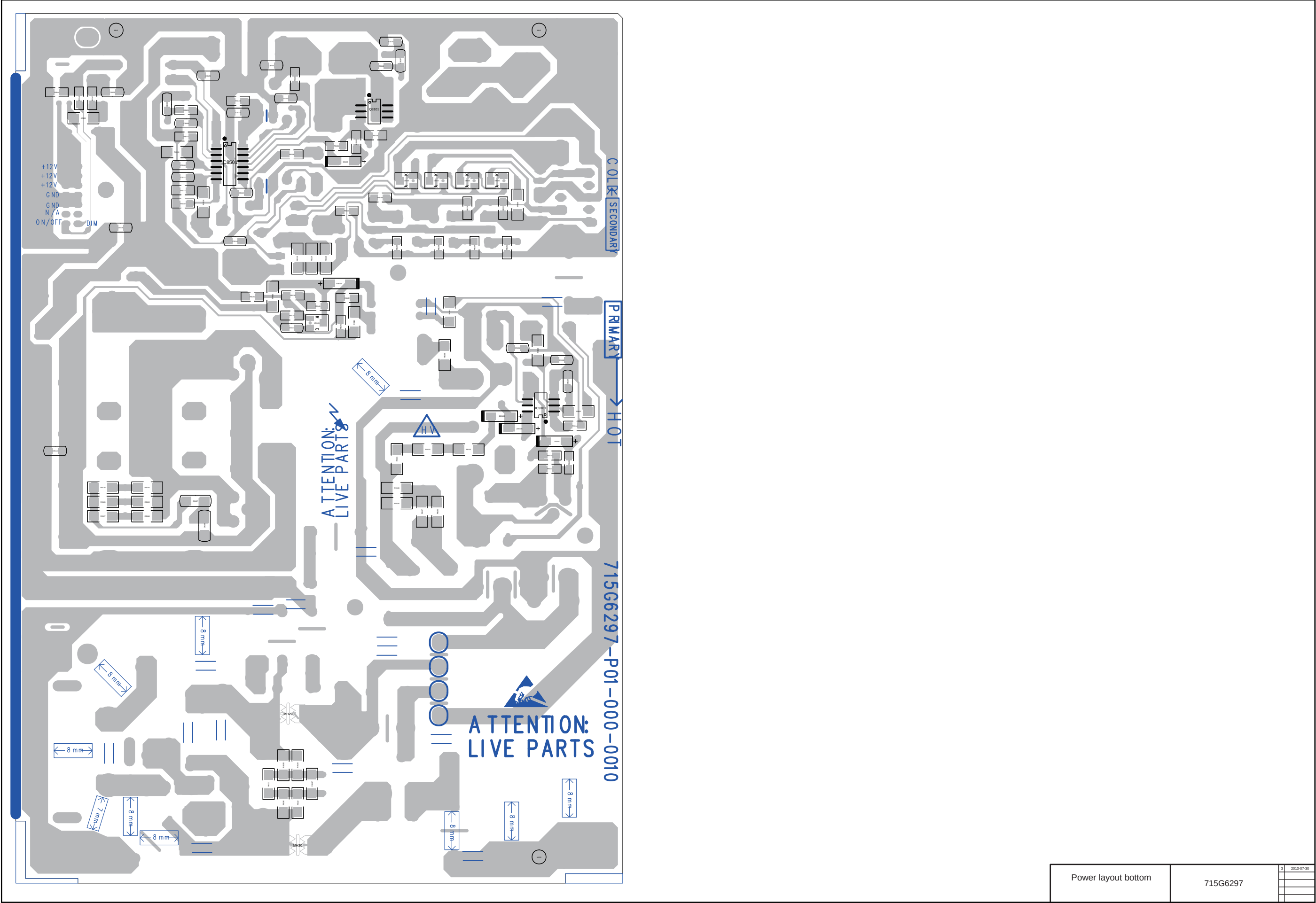
LED DRIVER	715G6297	3	2013-08-01

10-2-3 Power layout top



Power layout top	715G6297	3	2013-07-30

10-2-4 Power layout bottom

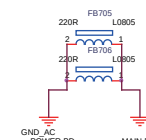
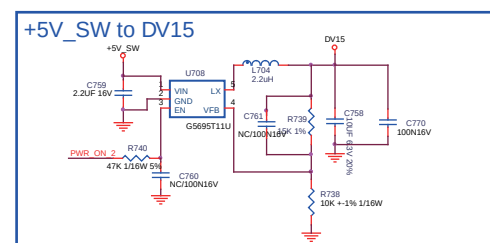
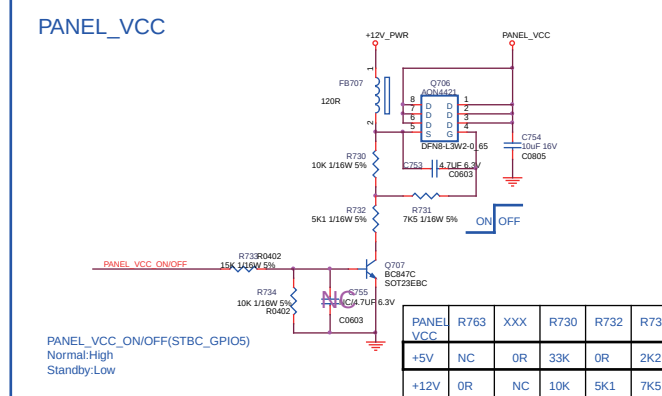
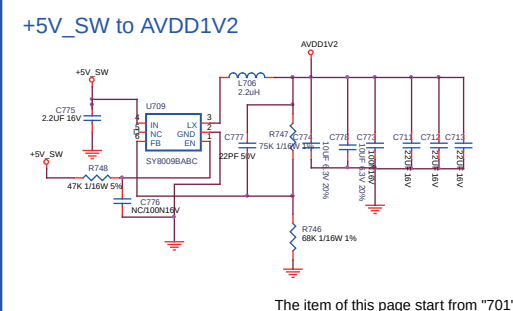
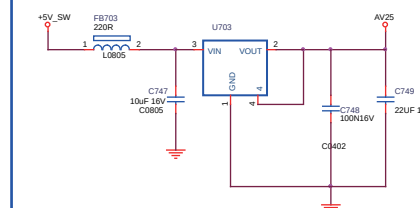
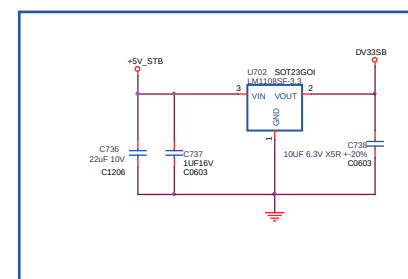
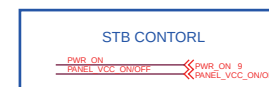
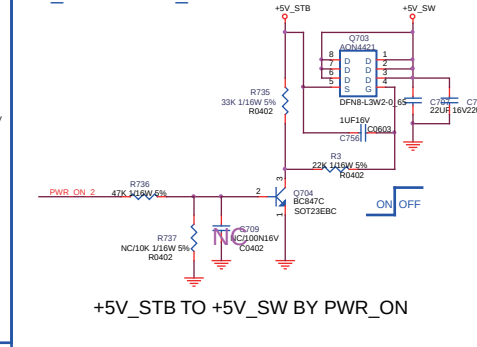


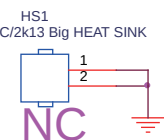
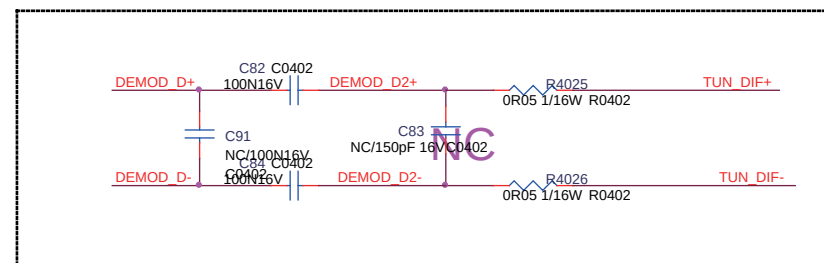
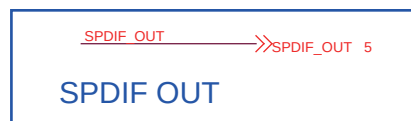
Power layout bottom	715G6297	3	2013-07-30

10-3-1 Power

BA01

+5V STB to +5V SW

715G6079

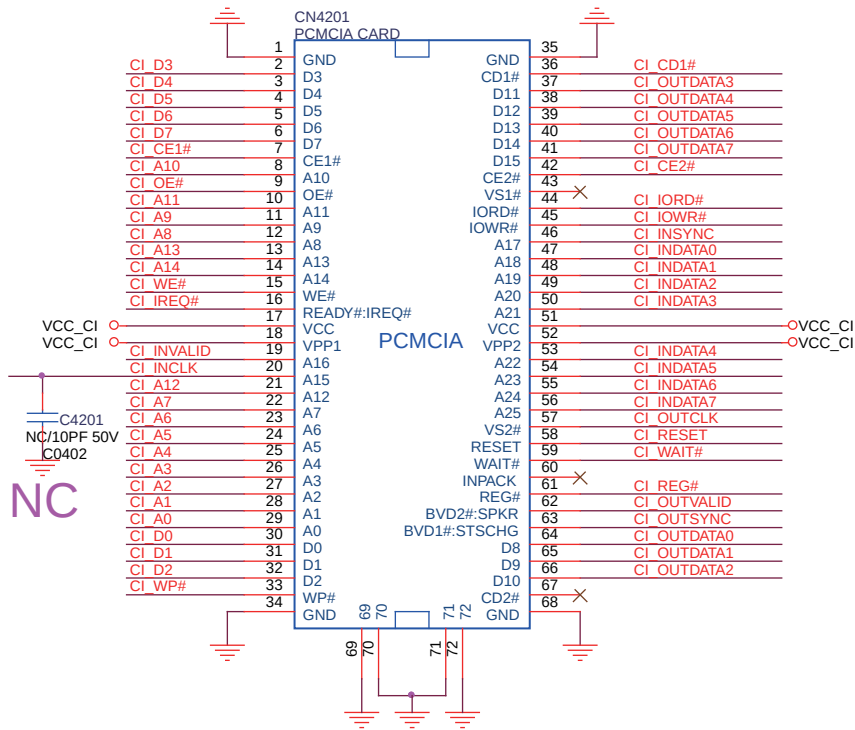


BA05

NT72567_CI

BA05

PCMCIA Slot



CI A13 CI A 13
CI INDATA0 R4201 0R05 OHM CI INDATA_0
CI A8 CI A 8
CI A9 CI A 9

CI A11 CI A 11
CI A10 CI A 10
CI OUTDATA7 CI OUTDATA_7
CI OUTDATA6 CI OUTDATA_6

CI D7 R4202 22R 1/16W 5%R0402 CI D 7
CI D6 R4203 22R 1/16W 5%R0402 CI D 6
CI OUTDATA5 CI OUTDATA_5
CI D5 R4204 22R 1/16W 5%R0402 CI D 5

CI D4 R4205 22R 1/16W 5%R0402 CI D 4
CI OUTDATA4 CI OUTDATA_4
CI D3 R4206 22R 1/16W 5%R0402 CI D 3
CI OUTDATA3 CI OUTDATA_3

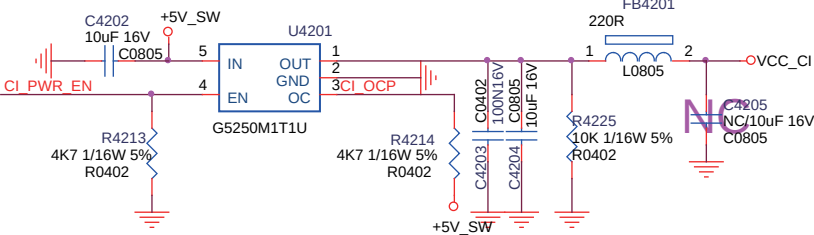
VCC_CI
R4207 10K 1/16W 5% CI CD1#
R4208 10K 1/16W 5% CI CE2#
R4209 10K 1/16W 5% CI WP#
R0402
R4210 10K 1/16W 5% CI IREQ#
R4211 10K 1/16W 5% CI RESET
R4212 10K 1/16W 5% CI WAIT#
R0402
R0402

+5V_STB >>> +5V_STB 4,5,19
+5V_SW >>> +5V_SW 4,11,16,19
DV33 >>> DV33 4,5,6,7,9,11,12,13,14,16
DV15 >>> DV15 4,10
DV11 >>> DV11 4,12
DV33SB >>> DV33SB 4,5,9,12,13
<<<>>> GND 4,5,6,7,9,10,11,12,13,14,16,19

GPIO

CI PWR_EN <<< CI_PWR_EN 11
CI INCLK <<< CI_INCLK 16
CI INVALID <<< CI_INVALID 16
CI INSYNC <<< CI_INSYNC 16
CI INDATA7 <<< CI_INDATA7 16
CI INDATA6 <<< CI_INDATA6 16
CI INDATA5 <<< CI_INDATA5 16
CI INDATA4 <<< CI_INDATA4 16
CI INDATA3 <<< CI_INDATA3 16
CI INDATA2 <<< CI_INDATA2 16
CI INDATA1 <<< CI_INDATA1 16
CI INDATA0 <<< CI_INDATA0 16

CI Bus Power Control



CI OUTDATA2 CI OUTDATA_2
CI D2 R4215 22R 1/16W 5%R0402 CI D 2
CI D1 R4216 22R 1/16W 5%R0402 CI D 1

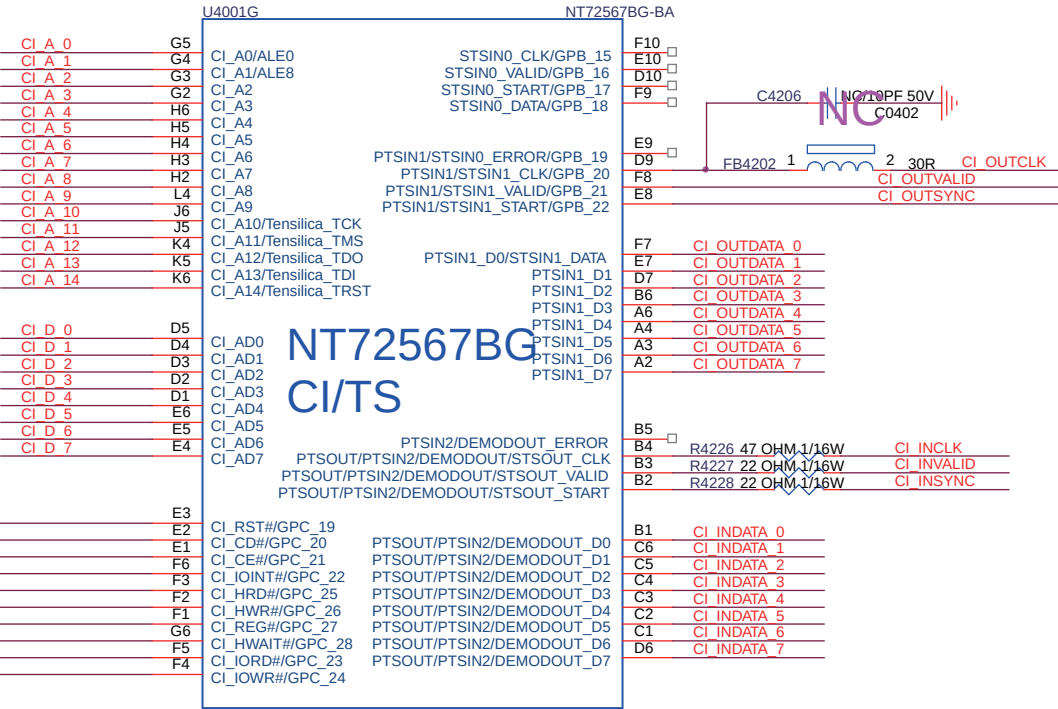
CI OUTDATA1 CI OUTDATA_1
CI D0 R4217 22R 1/16W 5%R0402 CI D 0
CI A0 CI A 0
CI OUTDATA0 CI OUTDATA_0

CI A1 CI A 1
CI A2 CI A 2
CI A3 CI A 3
CI A4 CI A 4

CI A5 CI A 5
CI INDATA7 R4218 0R05 OHM CI INDATA_7
CI A6 CI A 6
CI A7 CI A 7

CI INDATA6 R4219 0R05 OHM CI INDATA_6
CI A12 CI A 12
CI INDATA5 R4220 0R05 OHM CI INDATA_5
CI INDATA4 R4221 0R05 OHM CI INDATA_4

CI INDATA3 R4222 0R05 OHM CI INDATA_3
CI INDATA2 R4223 0R05 OHM CI INDATA_2
CI INDATA1 R4224 0R05 OHM CI INDATA_1
CI A14 CI A 14



NT72567_CI

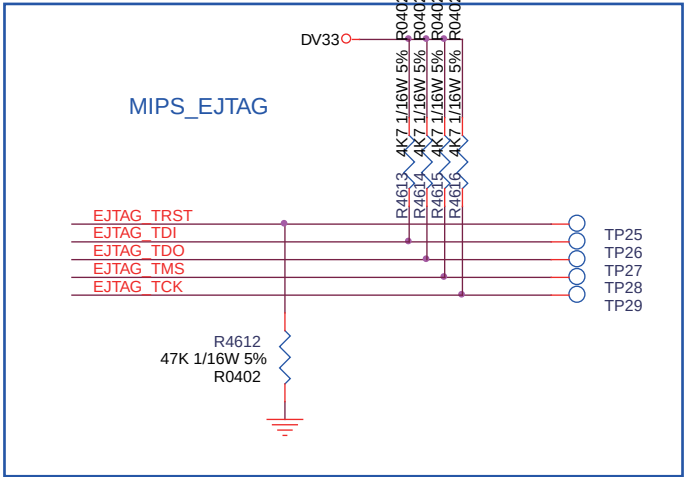
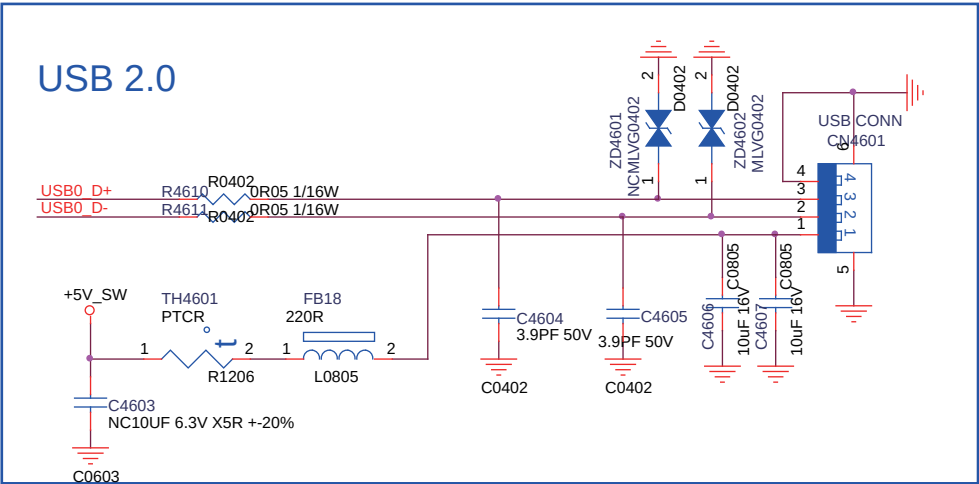
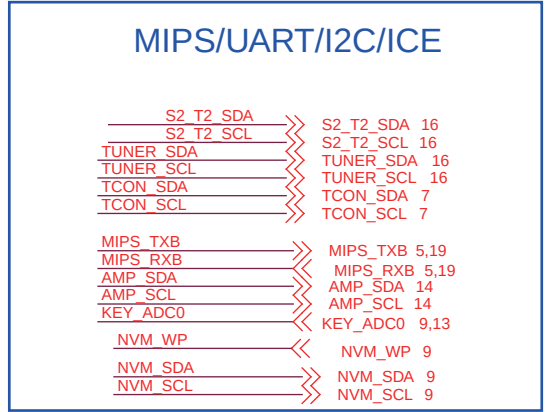
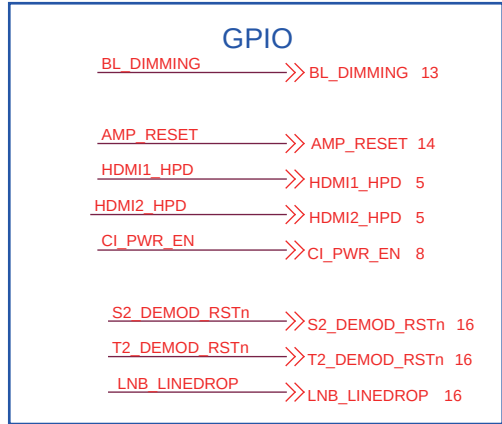
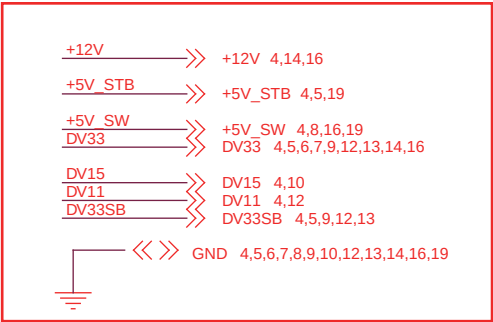
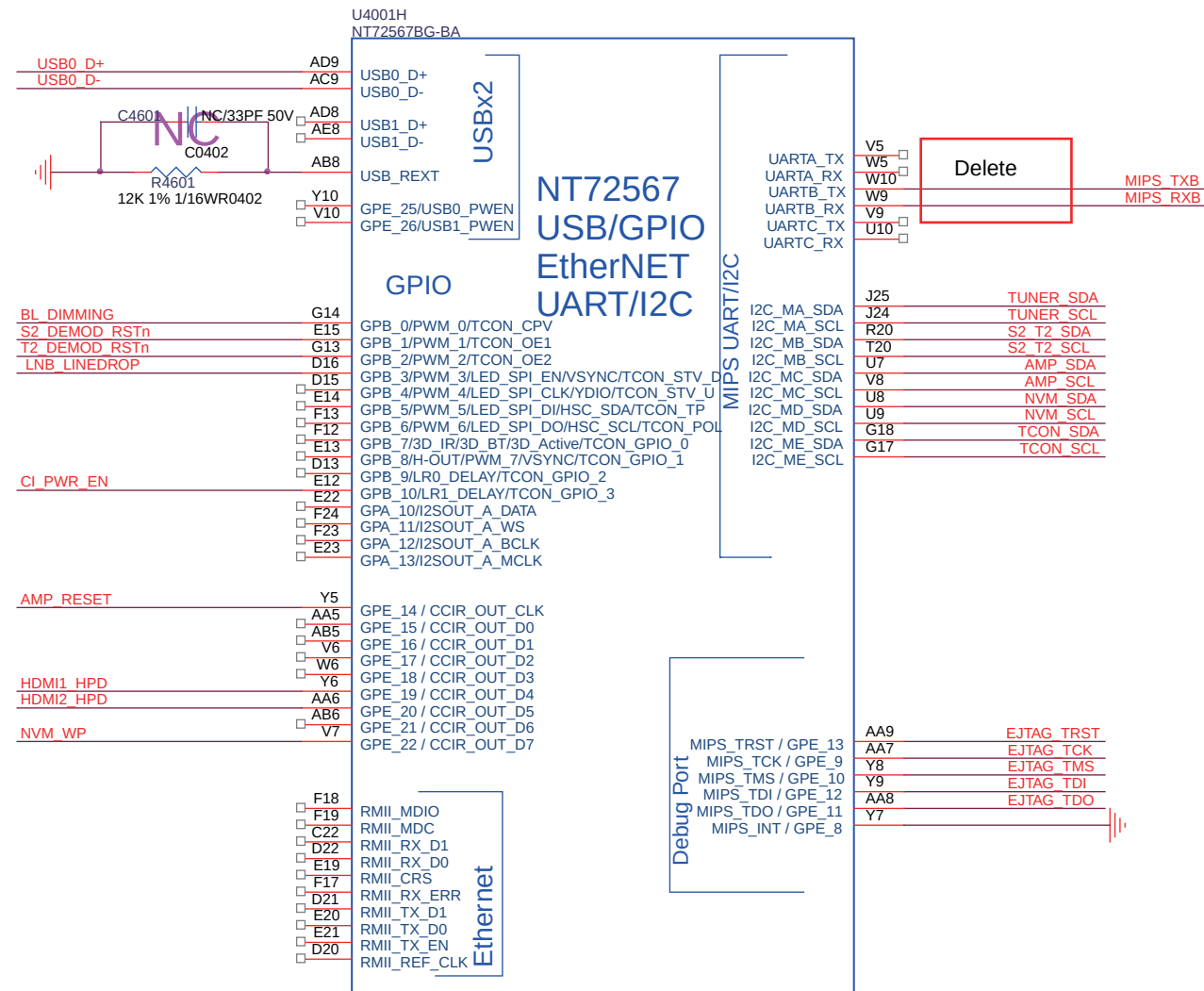
715G6079

C 2013-08-04

BA08

NT72567_USB/GPIO

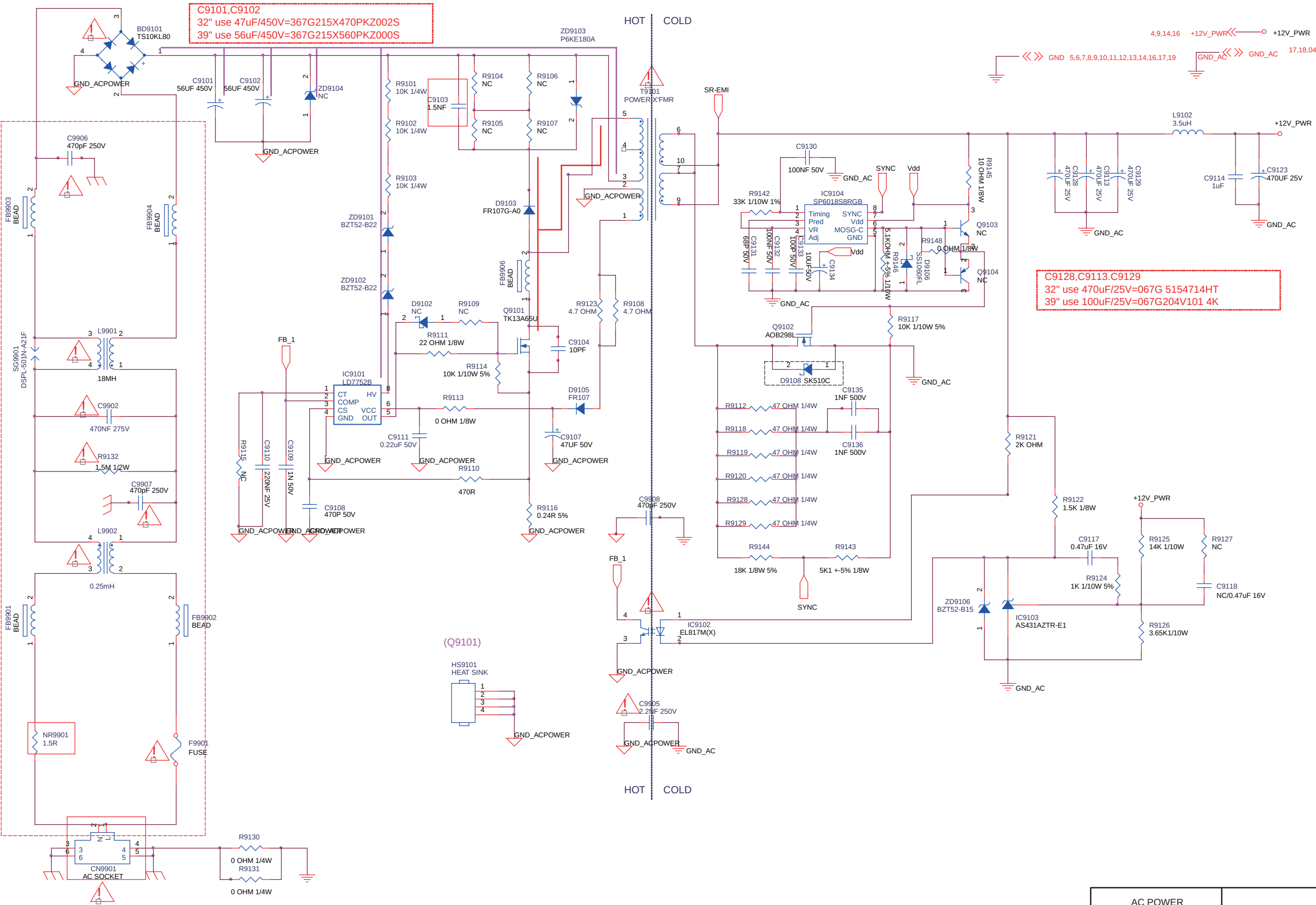
BA08



BA13

AC POWER

BA13



AC POWER	715G6079	C	2013-08-04

10-3-16 SSB+PSU combination panel layout top

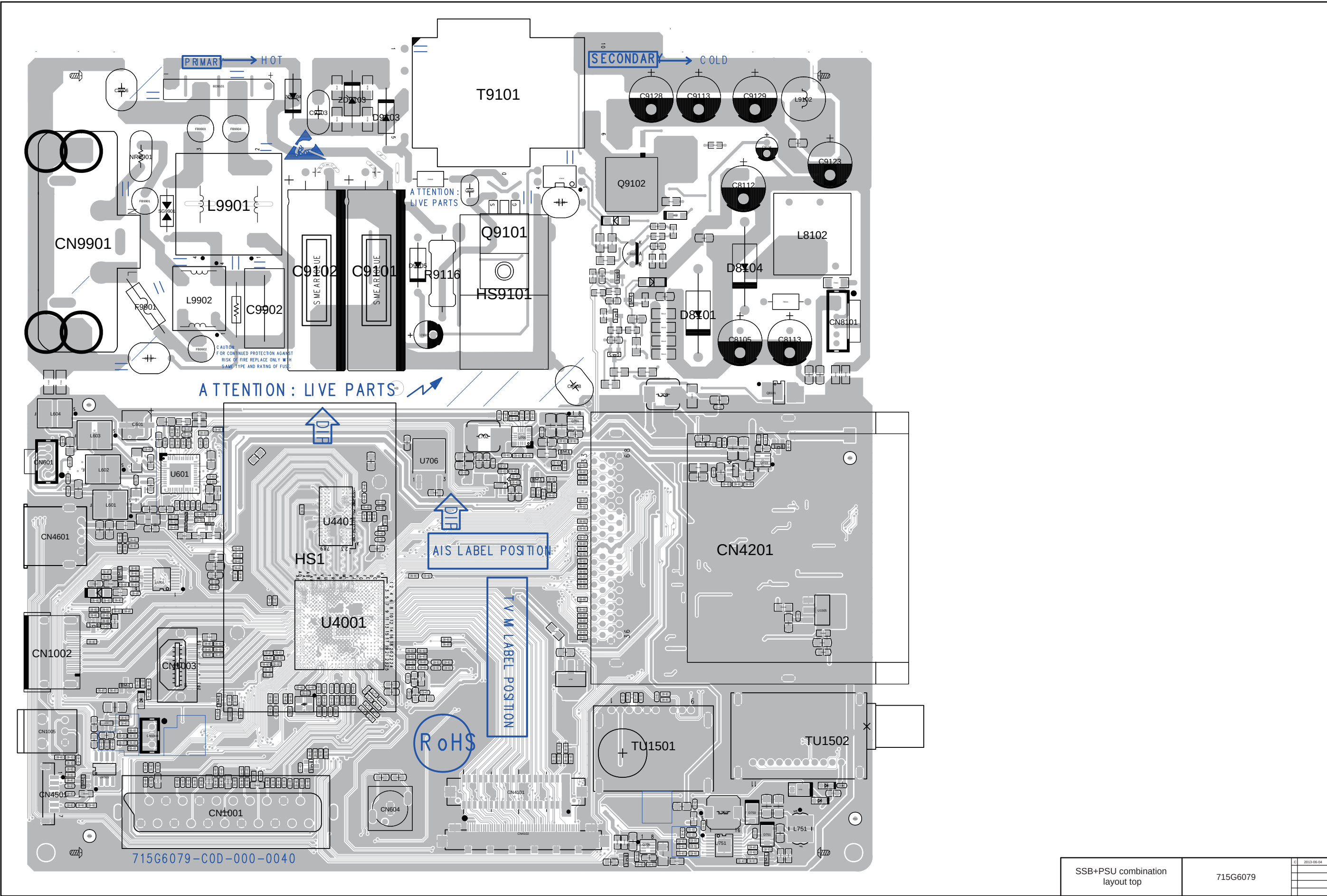


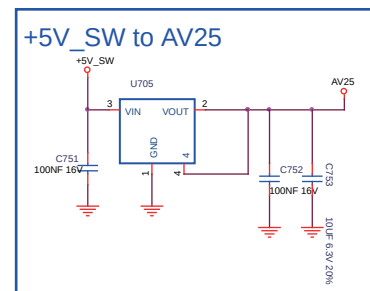
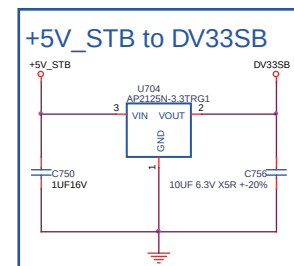
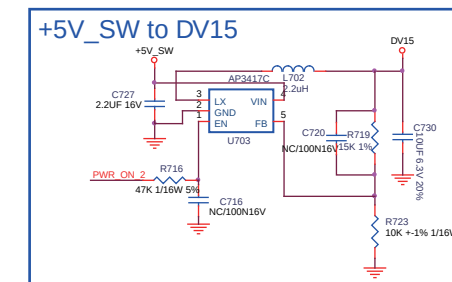
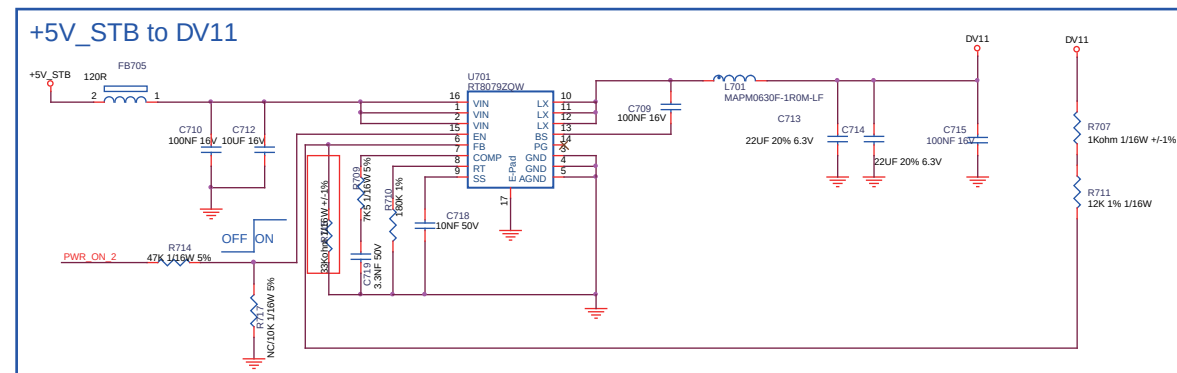
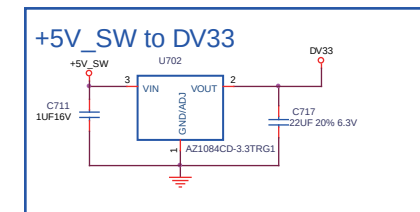
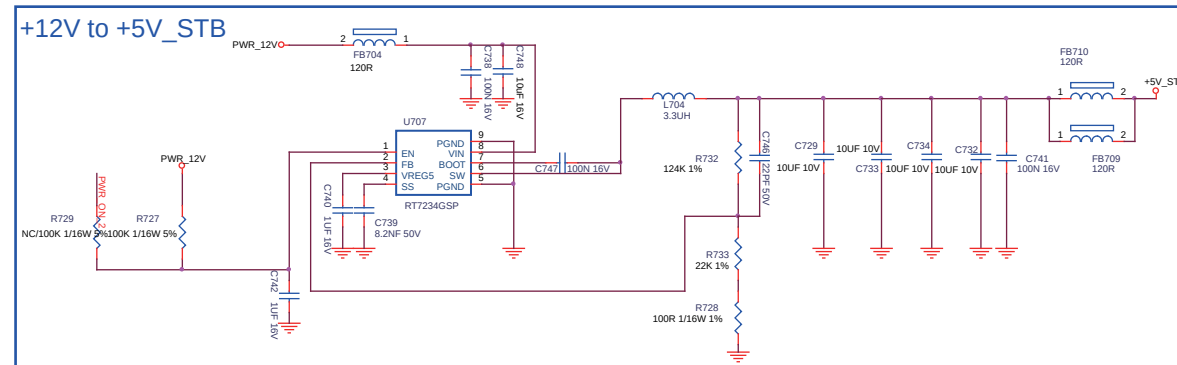
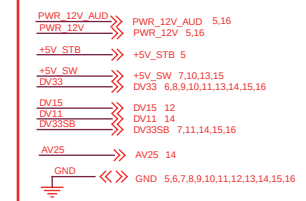
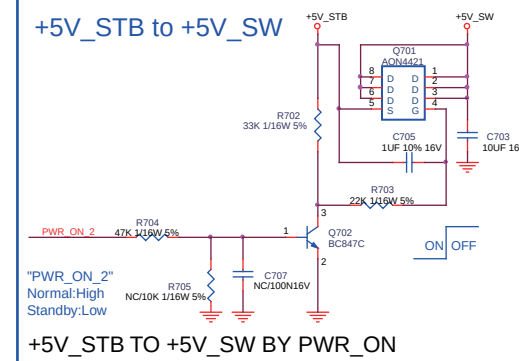
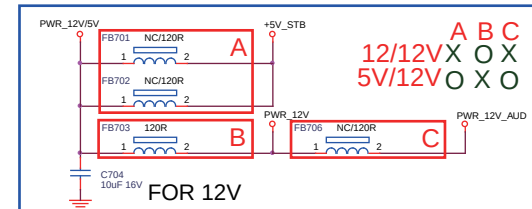
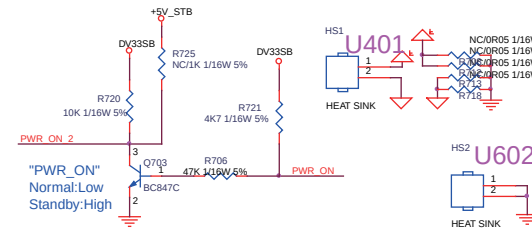
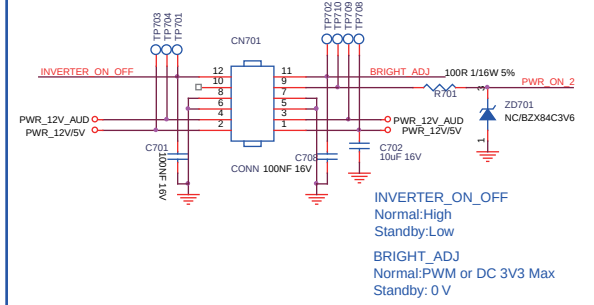
Diagram of the SSB+PSU combination layout bottom. The layout shows various components and their positions, including:

- Secondary Section:** Labeled "SECONDARY" with a "C OLD" indicator. Components include Q8104, Q8105, Q8106, Q8107, Q8108, Q8109, Q8110, Q8111, Q8112, Q8113, Q8114, Q8115, Q8116, Q8117, Q8118, Q8119, Q8120, Q8121, Q8122, Q8123, Q8124, Q8125, Q8126, Q8127, Q8128, Q8129, Q8130, Q8131, Q8132, Q8133, Q8134, Q8135, Q8136, Q8137, Q8138, Q8139, Q8140, Q8141, Q8142, Q8143, Q8144, Q8145, Q8146, Q8147, Q8148, Q8149, Q8150, Q8151, Q8152, Q8153, Q8154, Q8155, Q8156, Q8157, Q8158, Q8159, Q8160, Q8161, Q8162, Q8163, Q8164, Q8165, Q8166, Q8167, Q8168, Q8169, Q8170, Q8171, Q8172, Q8173, Q8174, Q8175, Q8176, Q8177, Q8178, Q8179, Q8180, Q8181, Q8182, Q8183, Q8184, Q8185, Q8186, Q8187, Q8188, Q8189, Q8190, Q8191, Q8192, Q8193, Q8194, Q8195, Q8196, Q8197, Q8198, Q8199, Q8200, Q8201, Q8202, Q8203, Q8204, Q8205, Q8206, Q8207, Q8208, Q8209, Q8210, Q8211, Q8212, Q8213, Q8214, Q8215, Q8216, Q8217, Q8218, Q8219, Q8220, Q8221, Q8222, Q8223, Q8224, Q8225, Q8226, Q8227, Q8228, Q8229, Q8230, Q8231, Q8232, Q8233, Q8234, Q8235, Q8236, Q8237, Q8238, Q8239, Q8240, Q8241, Q8242, Q8243, Q8244, Q8245, Q8246, Q8247, Q8248, Q8249, Q8250, Q8251, Q8252, Q8253, Q8254, Q8255, Q8256, Q8257, Q8258, Q8259, Q8260, Q8261, Q8262, Q8263, Q8264, Q8265, Q8266, Q8267, Q8268, Q8269, Q8270, Q8271, Q8272, Q8273, Q8274, Q8275, Q8276, Q8277, Q8278, Q8279, Q8280, Q8281, Q8282, Q8283, Q8284, Q8285, Q8286, Q8287, Q8288, Q8289, Q8290, Q8291, Q8292, Q8293, Q8294, Q8295, Q8296, Q8297, Q8298, Q8299, Q8300, Q8301, Q8302, Q8303, Q8304, Q8305, Q8306, Q8307, Q8308, Q8309, Q8310, Q8311, Q8312, Q8313, Q8314, Q8315, Q8316, Q8317, Q8318, Q8319, Q8320, Q8321, Q8322, Q8323, Q8324, Q8325, Q8326, Q8327, Q8328, Q8329, Q8330, Q8331, Q8332, Q8333, Q8334, Q8335, Q8336, Q8337, Q8338, Q8339, Q8340, Q8341, Q8342, Q8343, Q8344, Q8345, Q8346, Q8347, Q8348, Q8349, Q8350, Q8351, Q8352, Q8353, Q8354, Q8355, Q8356, Q8357, Q8358, Q8359, Q8360, Q8361, Q8362, Q8363, Q8364, Q8365, Q8366, Q8367, Q8368, Q8369, Q8370, Q8371, Q8372, Q8373, Q8374, Q8375, Q8376, Q8377, Q8378, Q8379, Q8380, Q8381, Q8382, Q8383, Q8384, Q8385, Q8386, Q8387, Q8388, Q8389, Q8390, Q8391, Q8392, Q8393, Q8394, Q8395, Q8396, Q8397, Q8398, Q8399, Q8400, Q8401, Q8402, Q8403, Q8404, Q8405, Q8406, Q8407, Q8408, Q8409, Q8410, Q8411, Q8412, Q8413, Q8414, Q8415, Q8416, Q8417, Q8418, Q8419, Q8420, Q8421, Q8422, Q8423, Q8424, Q8425, Q8426, Q8427, Q8428, Q8429, Q8430, Q8431, Q8432, Q8433, Q8434, Q8435, Q8436, Q8437, Q8438, Q8439, Q8440, Q8441, Q8442, Q8443, Q8444, Q8445, Q8446, Q8447, Q8448, Q8449, Q8450, Q8451, Q8452, Q8453, Q8454, Q8455, Q8456, Q8457, Q8458, Q8459, Q8460, Q8461, Q8462, Q8463, Q8464, Q8465, Q8466, Q8467, Q8468, Q8469, Q8470, Q8471, Q8472, Q8473, Q8474, Q8475, Q8476, Q8477, Q8478, Q8479, Q8480, Q8481, Q8482, Q8483, Q8484, Q8485, Q8486, Q8487, Q8488, Q8489, Q8490, Q8491, Q8492, Q8493, Q8494, Q8495, Q8496, Q8497, Q8498, Q8499, Q8500, Q8501, Q8502, Q8503, Q8504, Q8505, Q8506, Q8507, Q8508, Q8509, Q8510, Q8511, Q8512, Q8513, Q8514, Q8515, Q8516, Q8517, Q8518, Q8519, Q8520, Q8521, Q8522, Q8523, Q8524, Q8525, Q8526, Q8527, Q8528, Q8529, Q8530, Q8531, Q8532, Q8533, Q8534, Q8535, Q8536, Q8537, Q8538, Q8539, Q8540, Q8541, Q8542, Q8543, Q8544, Q8545, Q8546, Q8547, Q8548, Q8549, Q8550, Q8551, Q8552, Q8553, Q8554, Q8555, Q8556, Q8557, Q8558, Q8559, Q8560, Q8561, Q8562, Q8563, Q8564, Q8565, Q8566, Q8567, Q8568, Q8569, Q8570, Q8571, Q8572, Q8573, Q8574, Q8575, Q8576, Q8577, Q8578, Q8579, Q8580, Q8581, Q8582, Q8583, Q8584, Q8585, Q8586, Q8587, Q8588, Q8589, Q8590, Q8591, Q8592, Q8593, Q8594, Q8595, Q8596, Q8597, Q8598, Q8599, Q8600, Q8601, Q8602, Q8603, Q8604, Q8605, Q8606, Q8607, Q8608, Q8609, Q8610, Q8611, Q8612, Q8613, Q8614, Q8615, Q8616, Q8617, Q8618, Q8619, Q8620, Q8621, Q8622, Q8623, Q8624, Q8625, Q8626, Q8627, Q8628, Q8629, Q8630, Q8631, Q8632, Q8633, Q8634, Q8635, Q8636, Q8637, Q8638, Q8639, Q8640, Q8641, Q8642, Q8643, Q8644, Q8645, Q8646, Q8647, Q8648, Q8649, Q8650, Q8651, Q8652, Q8653, Q8654, Q8655, Q8656, Q8657, Q8658, Q8659, Q8660, Q8661, Q8662, Q8663, Q8664, Q8665, Q8666, Q8667, Q8668, Q8669, Q8670, Q8671, Q8672, Q8673, Q8674, Q8675, Q8676, Q8677, Q8678, Q8679, Q8680, Q8681, Q8682, Q8683, Q8684, Q8685, Q8686, Q8687, Q8688, Q8689, Q8690, Q8691, Q8692, Q8693, Q8694, Q8695, Q8696, Q8697, Q8698, Q8699, Q8700, Q8701, Q8702, Q8703, Q8704, Q8705, Q8706, Q8707, Q8708, Q8709, Q8710, Q8711, Q8712, Q8713, Q8714, Q8715, Q8716, Q8717, Q8718, Q8719, Q8720, Q8721, Q8722, Q8723, Q8724, Q8725, Q8726, Q8727, Q8728, Q8729, Q8730, Q8731, Q8732, Q8733, Q8734, Q8735, Q8736, Q8737, Q8738, Q8739, Q8740, Q8741, Q8742, Q8743, Q8744, Q8745, Q8746, Q8747, Q8748, Q8749, Q8750, Q8751, Q8752, Q8753, Q8754, Q8755, Q8756, Q8757, Q8758, Q8759, Q8760, Q8761, Q8762, Q8763, Q8764, Q8765, Q8766, Q8767, Q8768, Q8769, Q8770, Q8771, Q8772, Q8773, Q8774, Q

POWER-1

B01

DC POWER INPUT

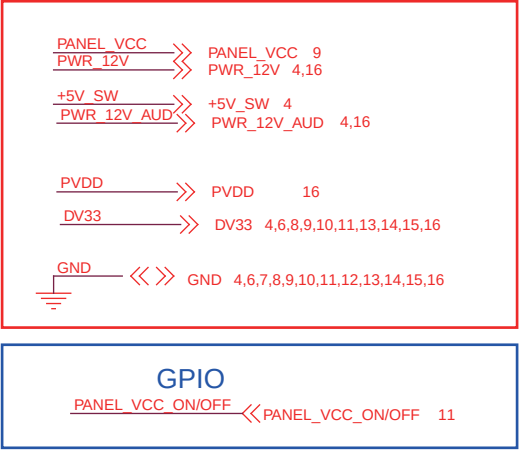
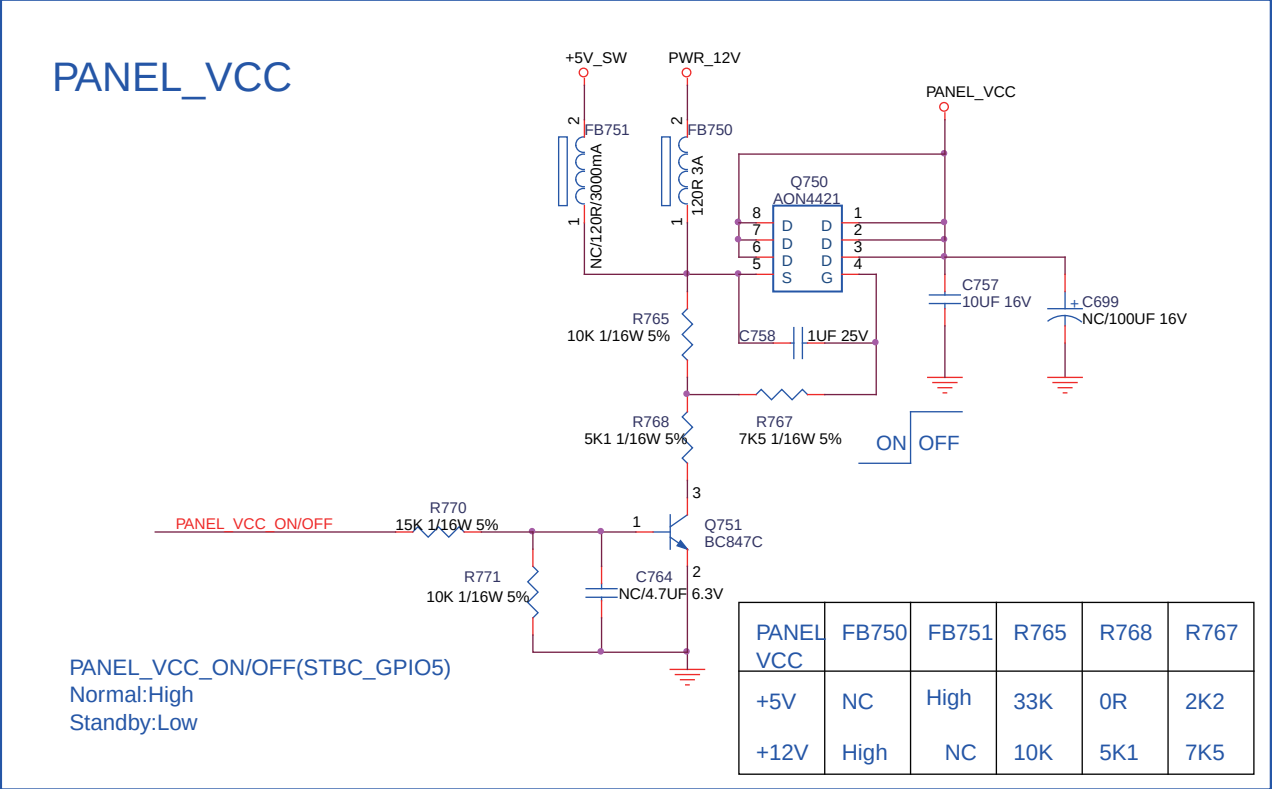
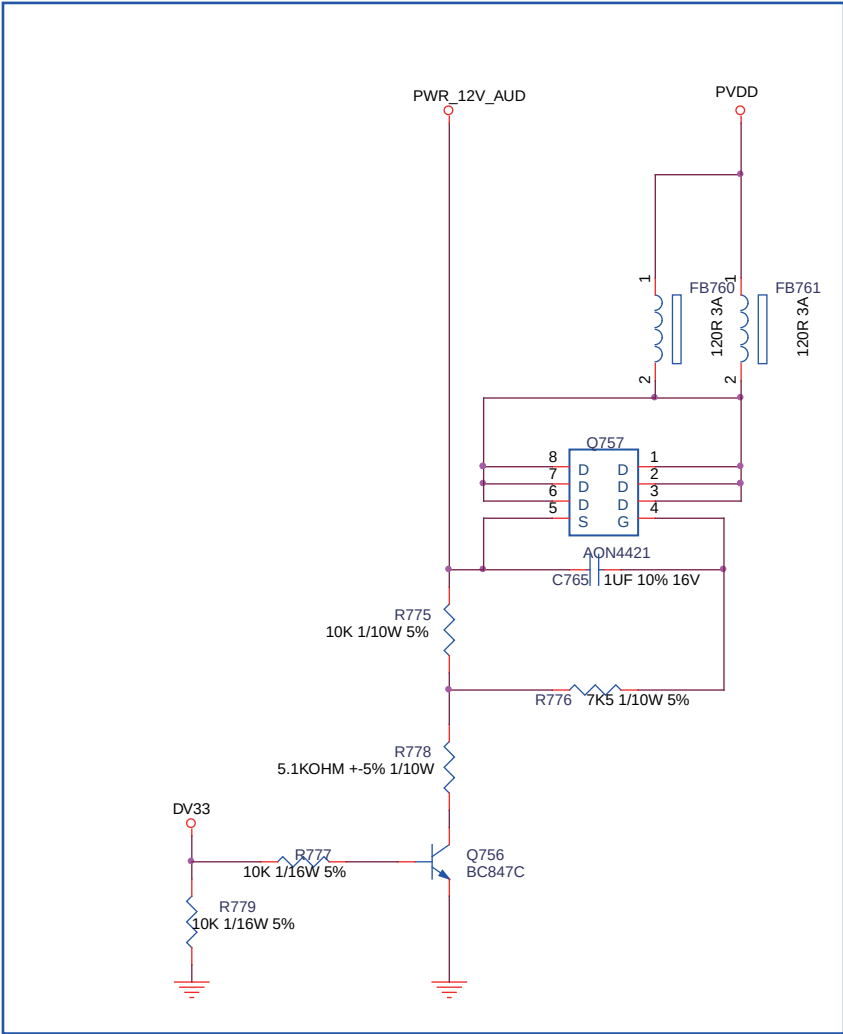


POWER-1	715G6092	1	2013-06-11

B02

POWER-2

B02

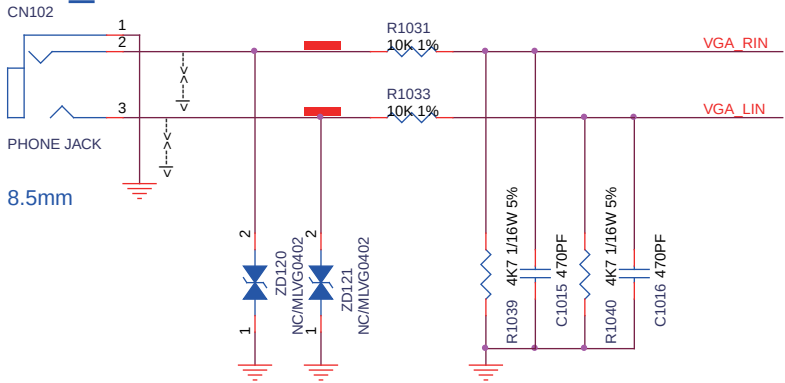


B03

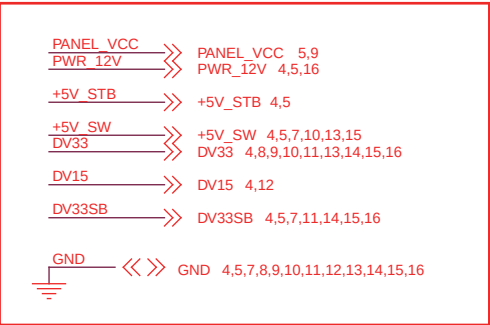
SPDIF/UART INPUT

B03

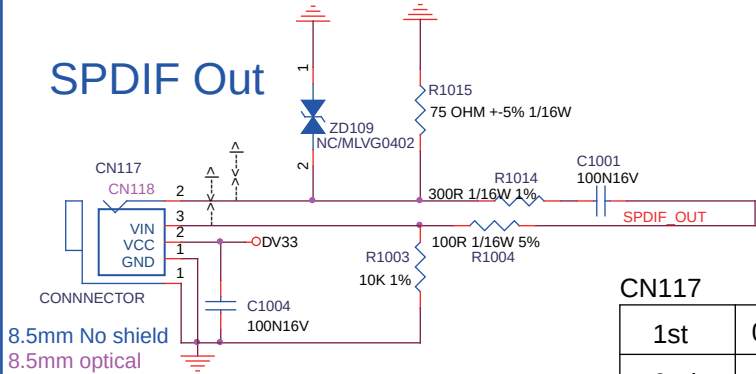
PC_side Audio in



1st	088G302F311VCL
2nd	088G302F311VQS



SPDIF Out

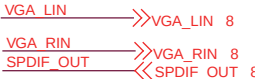


1st	088G 78F112VCL
2nd	388G078F118VQS

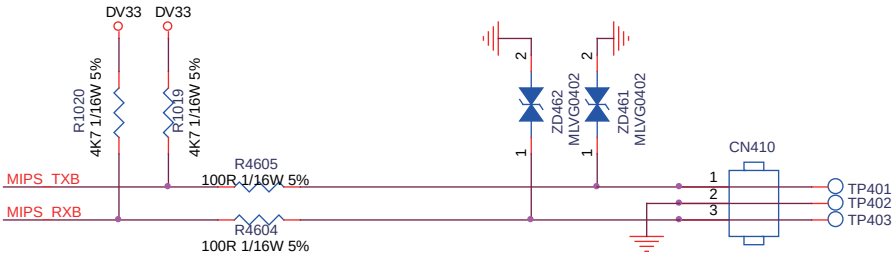
MIPS/UART/I2C/ICE



AUDIO /IF



U-ART



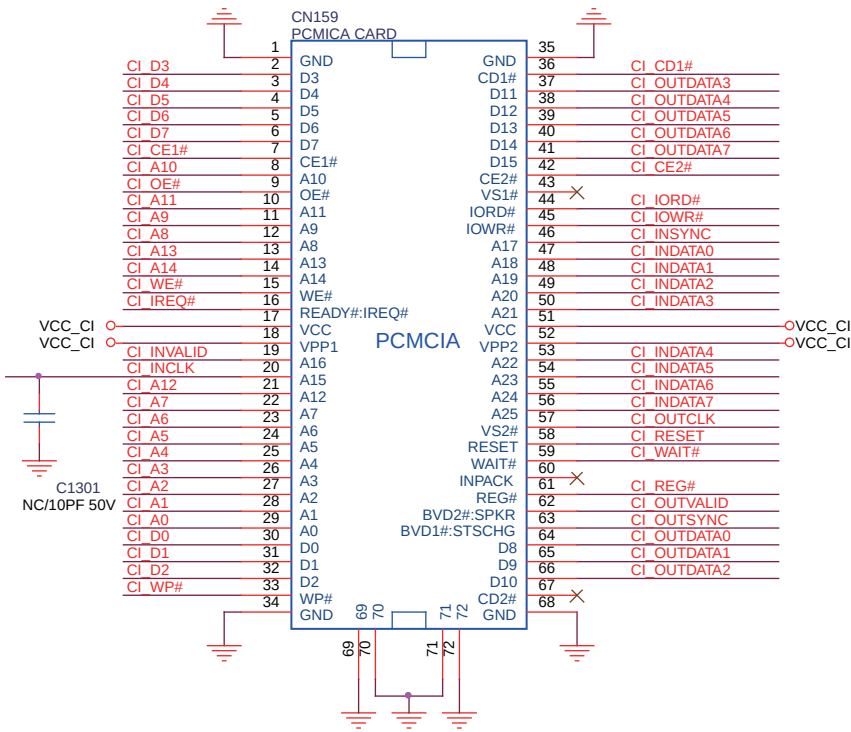
SPDIF/UART INPUT	715G6092	1	2013-05-08

B07

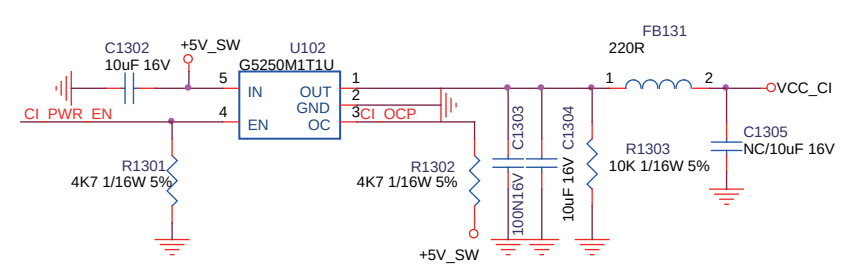
NT72567_CI

B07

PCMCIA Slot



CI Bus Power Control



CI_OUTDATA2
CI D2
CI D1

CI A5
CI_INDATA7
CI A6
CI A7

CI_OUTDATA1
CI D0
CI A0
CI_OUTDATA0

CI_INDATA6
CI A12
CI_INDATA5
CI_INDATA4

CI A1
CI A2
CI A3
CI A4

CI_INDATA3
CI_INDATA2
CI_INDATA1
CI A14

CI A13
CI_INDATA0
CI A8
CI A9

CI A11
CI A10
CI_OUTDATA7
CI_OUTDATA6

CI D7
CI D6
CI_OUTDATA5
CI D5

CI D4
CI_OUTDATA4
CI D3
CI_OUTDATA3

VCC_CI
R4161 10K 1/16W 5% CI_CD1#
R4162 10K 1/16W 5% CI_CE2#
R4163 10K 1/16W 5% CI_WP#
R4164 10K 1/16W 5% CI_IREQ#
R4165 10K 1/16W 5% CI_RESET#
R4166 10K 1/16W 5% CI_WAIT#

PWR_12V >>> PWR_12V 4,5,16
+5V_STB >>> +5V_STB 4,5
+5V_SW >>> +5V_SW 4,5,7,13,15
DV15 >>> DV15 4,12
DV11 >>> DV11 4,14
DV33SB >>> DV33SB 4,5,7,11,14,15,16
GND <<< GND 4,5,6,7,8,9,11,12,13,14,15,16

GPIO

CI_PWR_EN <<< CI_PWR_EN 13



CI_RESET
CI_CD1#
CI_CE1#
CI_IREQ#
CI_OE#
CI_WE#
CI_REG#
CI_WAIT#
CI_IORD#
CI_IOWR#

NT72567BG
CI/TS

B1 CI_INDATA_0
C6 CI_INDATA_1
C5 CI_INDATA_2
C4 CI_INDATA_3
C3 CI_INDATA_4
C2 CI_INDATA_5
C1 CI_INDATA_6
D6 CI_INDATA_7

NT72567_CI

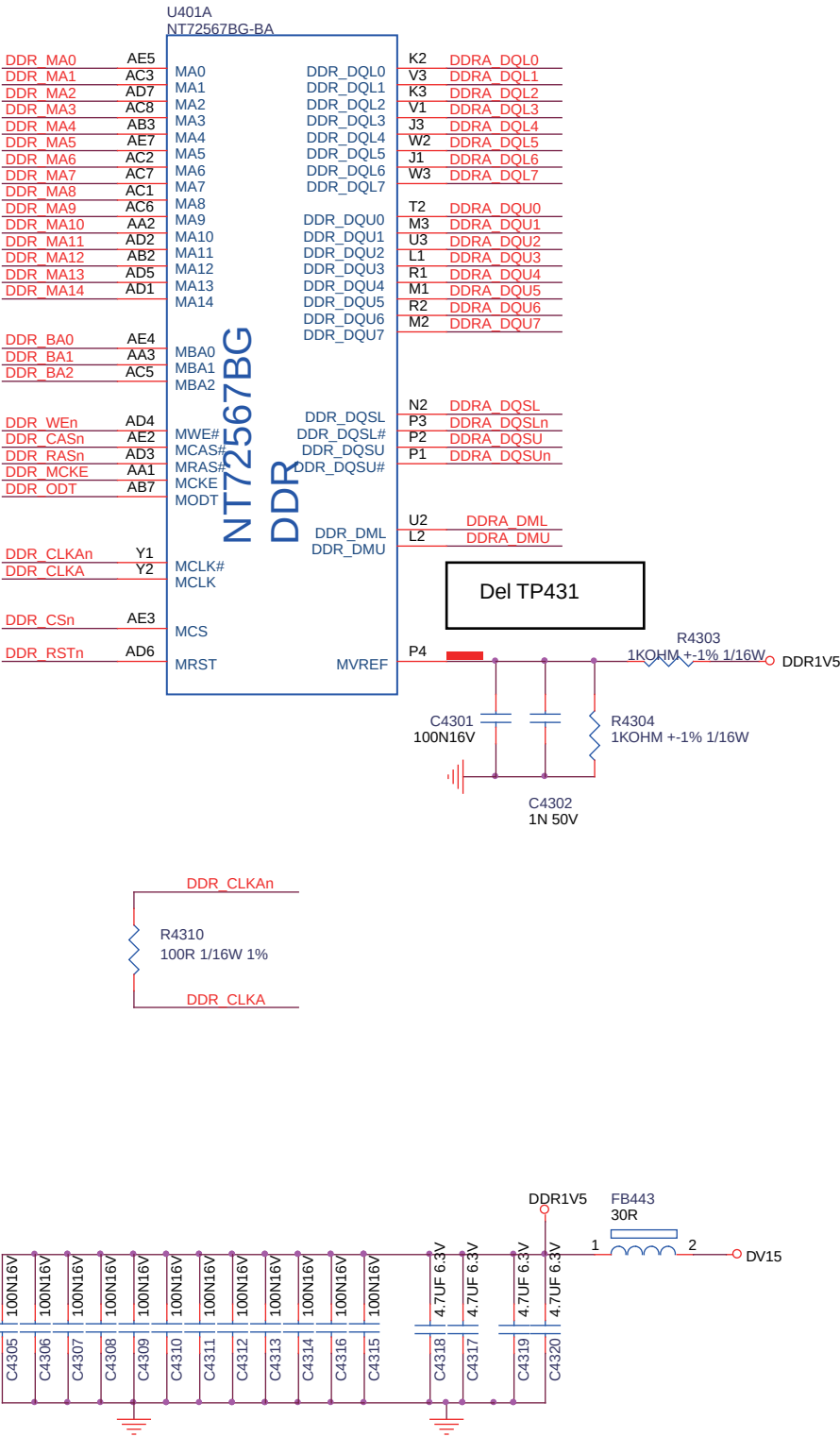
715G6092

1 2013-09-29

B09

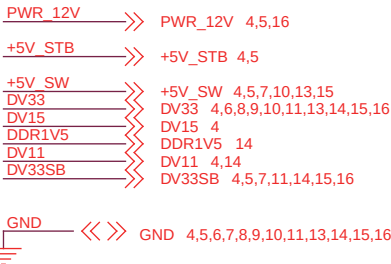
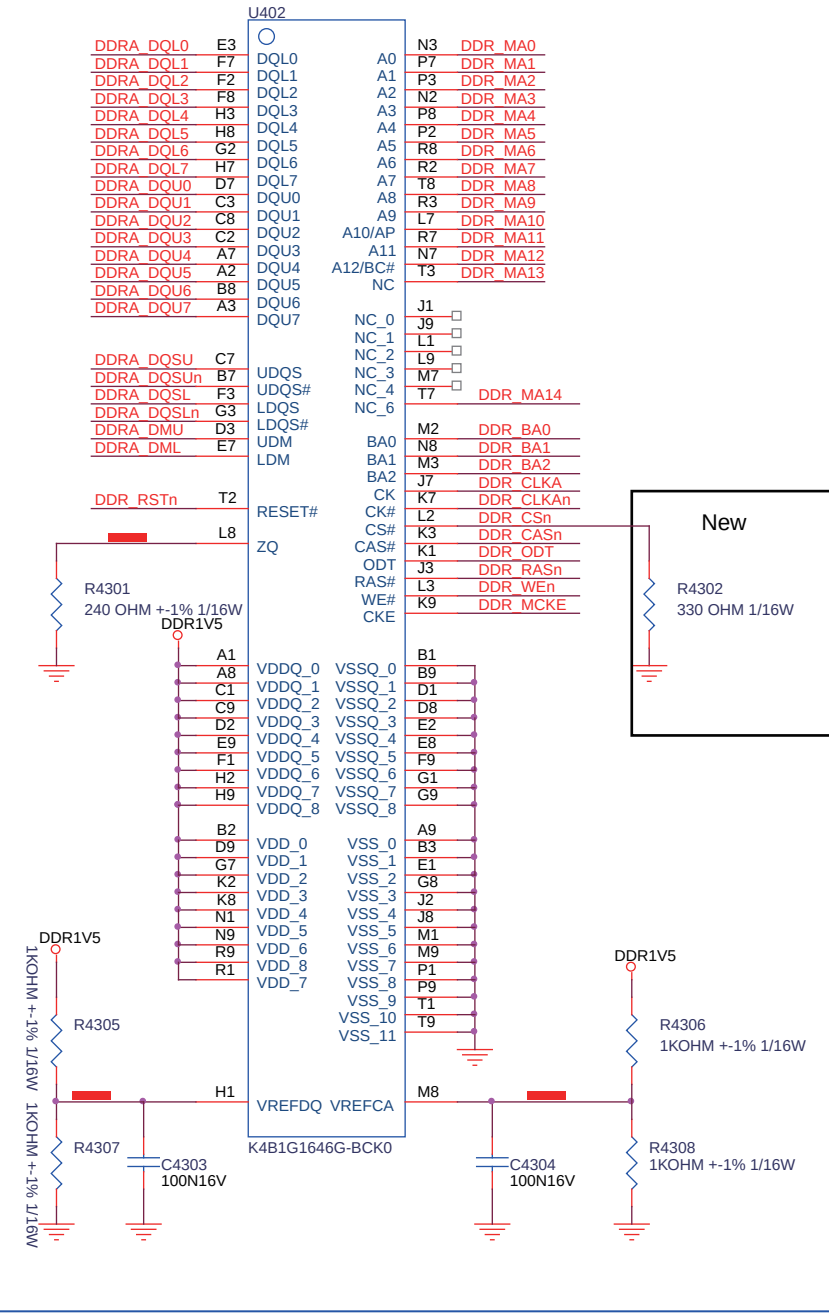
NT72567_DDR

B09



DDR3#1

DDR3 128MBx16Bits /1.6GHz



1st	56G 615151	k4B1G1646E-BCH9 1Gb fbga-96
2nd	56G 615145	H5TQ1G63DFR--H9C 1Gb wbga-96

Samsung

Hynix

NT72567_DDR

715G6092

1 2013-09-29

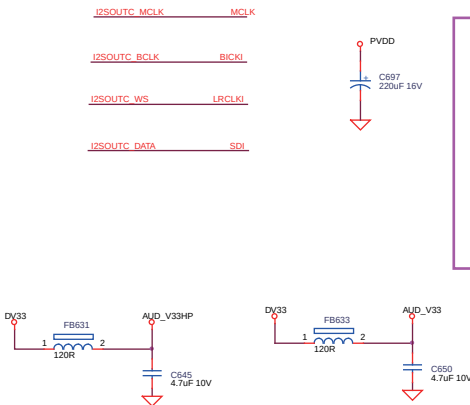
10-4-13 SPEAKER AMPLIFIER/HEADPHONE OUT

B13

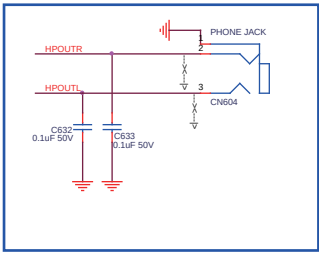
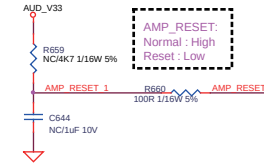
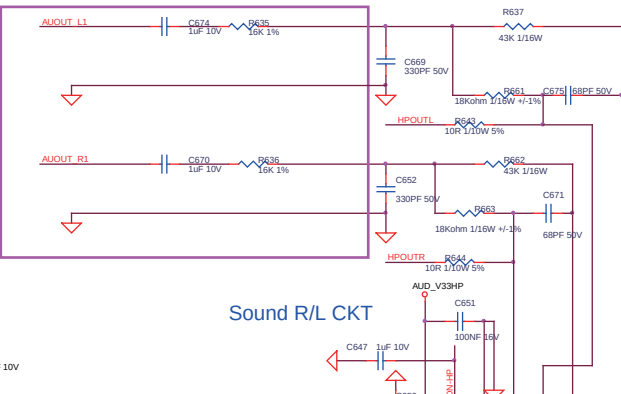
SPEAKER AMPLIFIER/HEADPHONE OUT

B13

Main Speak CKT



Sound R/L CKT



1st	088G302F3B2VCL
2nd	088G302F3B2VQS

PWR_12V	PWR_12V 4.5
PVD0	PVD0 4.5
+5V_STB	+5V_STB 4.5
+5V_SW	+5V_SW 4.5,7,10,13,15
DV33	DV33 4.5,6,8,9,10,11,12,13,14,15
DV15	DV15 4.12
DV11	DV11 4.14
DV33SB	DV33SB 4.5,7,11,14,15
GND	GND 4,5,6,7,8,9,10,11,12,13,14,15

MIPS/UART/I2C/ICE	
AMP_SDA	AMP_SDA 13
AMP_SCL	AMP_SCL 13

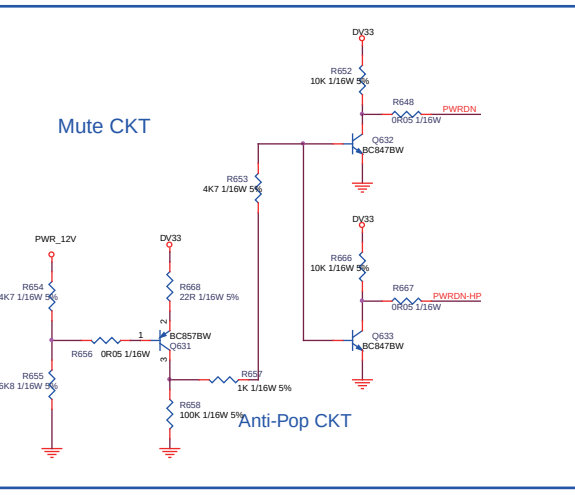
GPIO

AMP_RESET

AMP_RESET 13

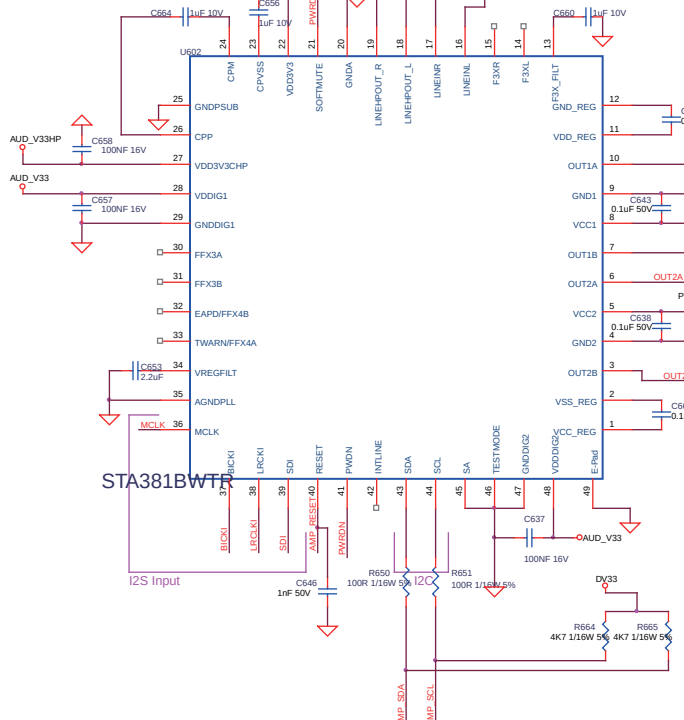
STB CONTORL	
AMP_PD	AMP_PD 11

Mute CKT

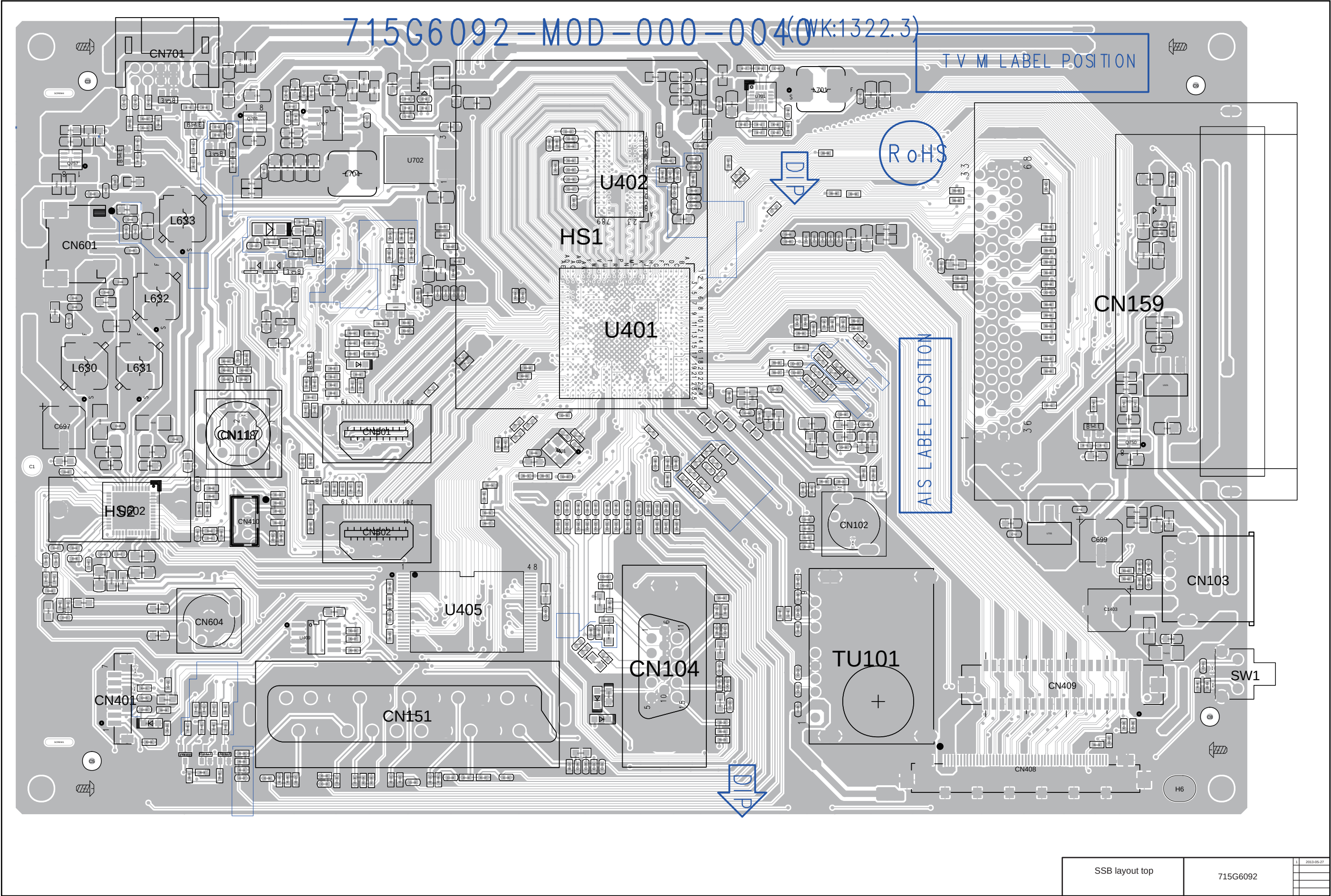


Anti-Pop CKT

STA381BWT

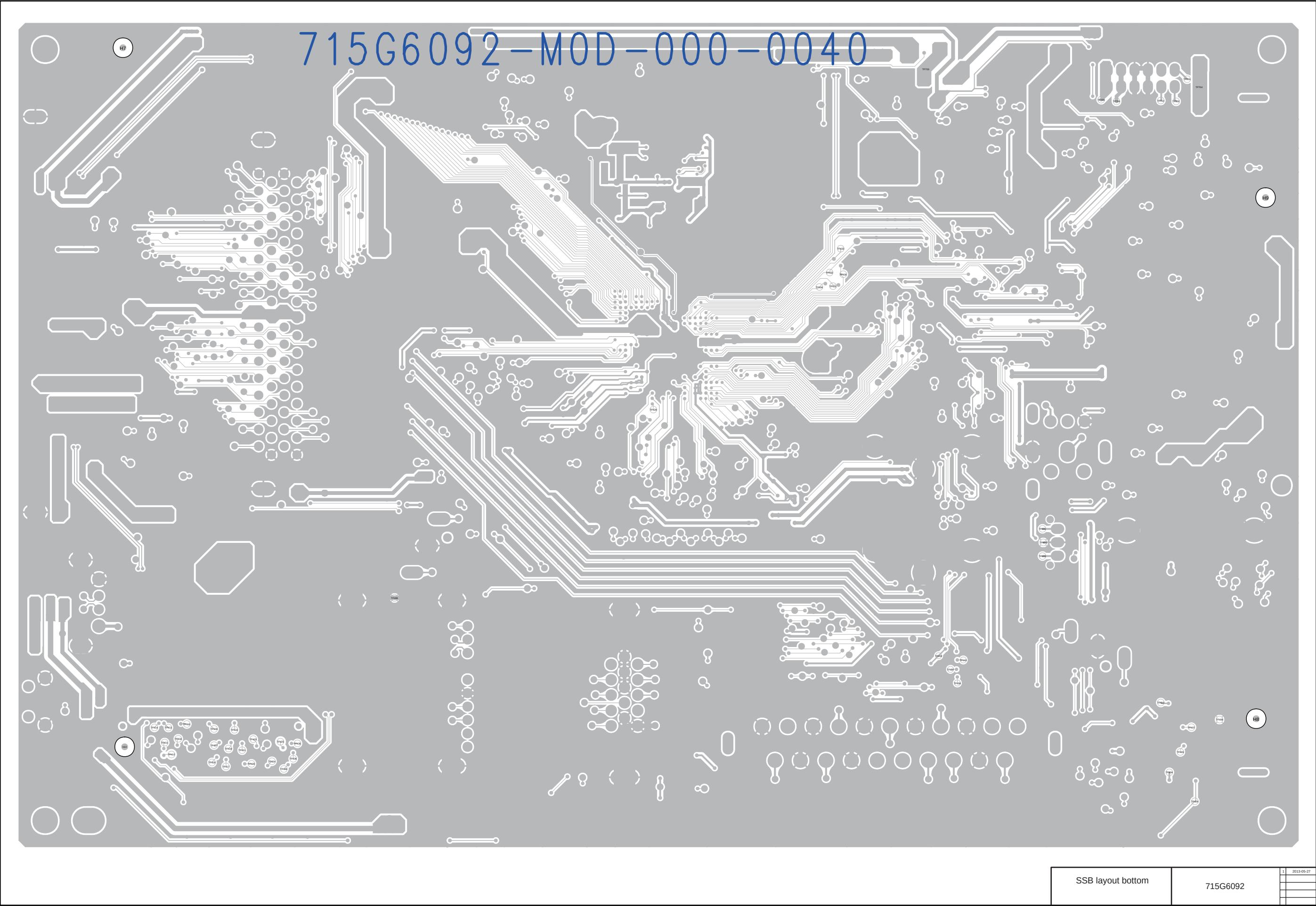


10-4-14 SSB layout top



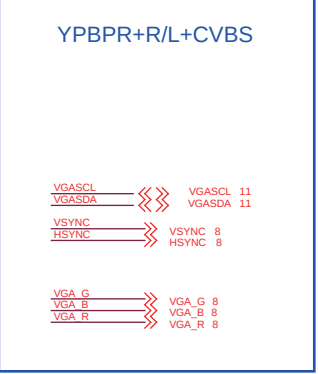
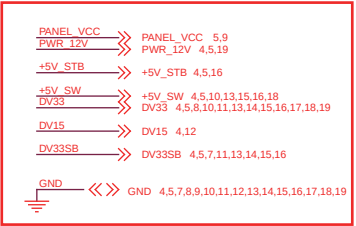
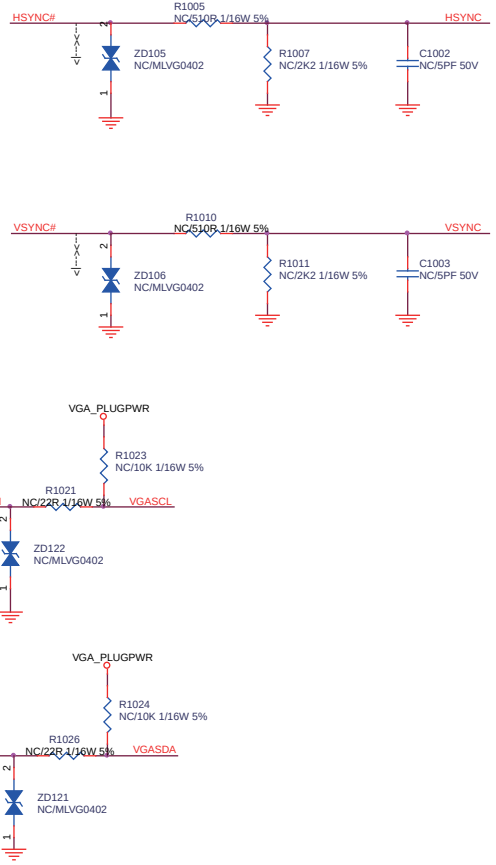
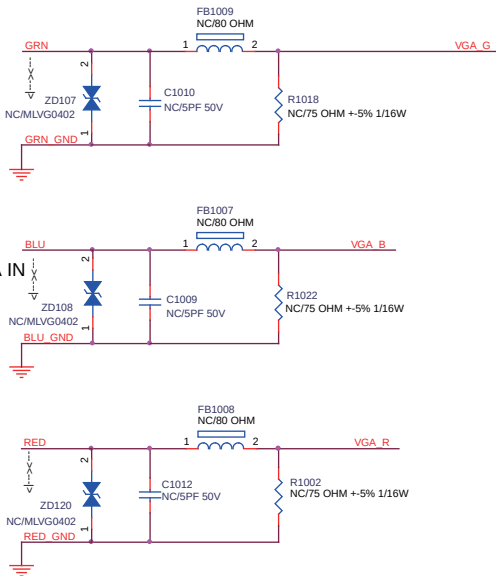
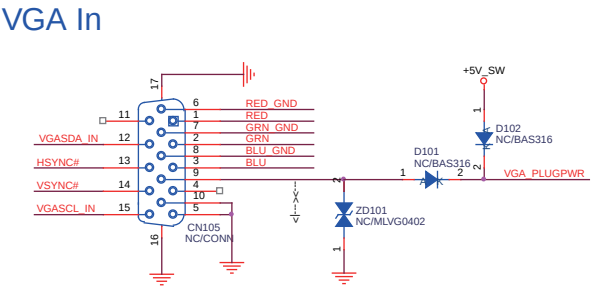
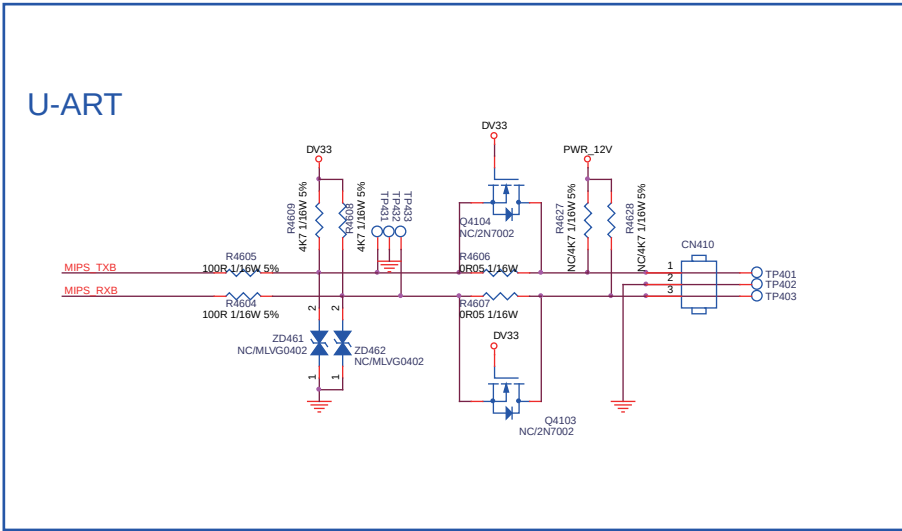
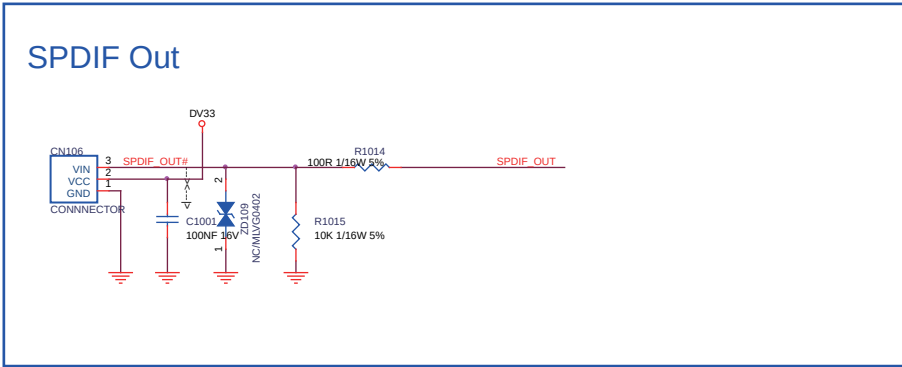
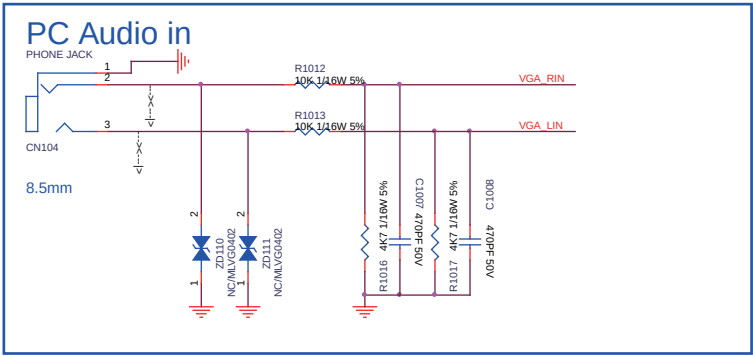
SSB layout top	715G6092	1	2013-05-27

10-4-15 SSB layout bottom



B03 VGA/SPDIF/UART INPUT

B03

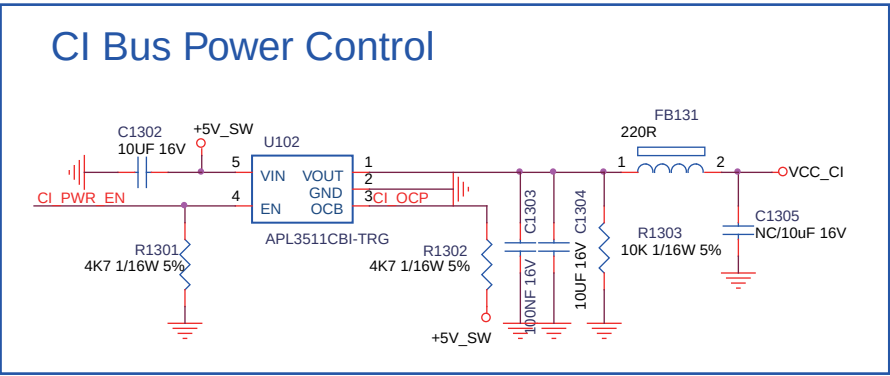
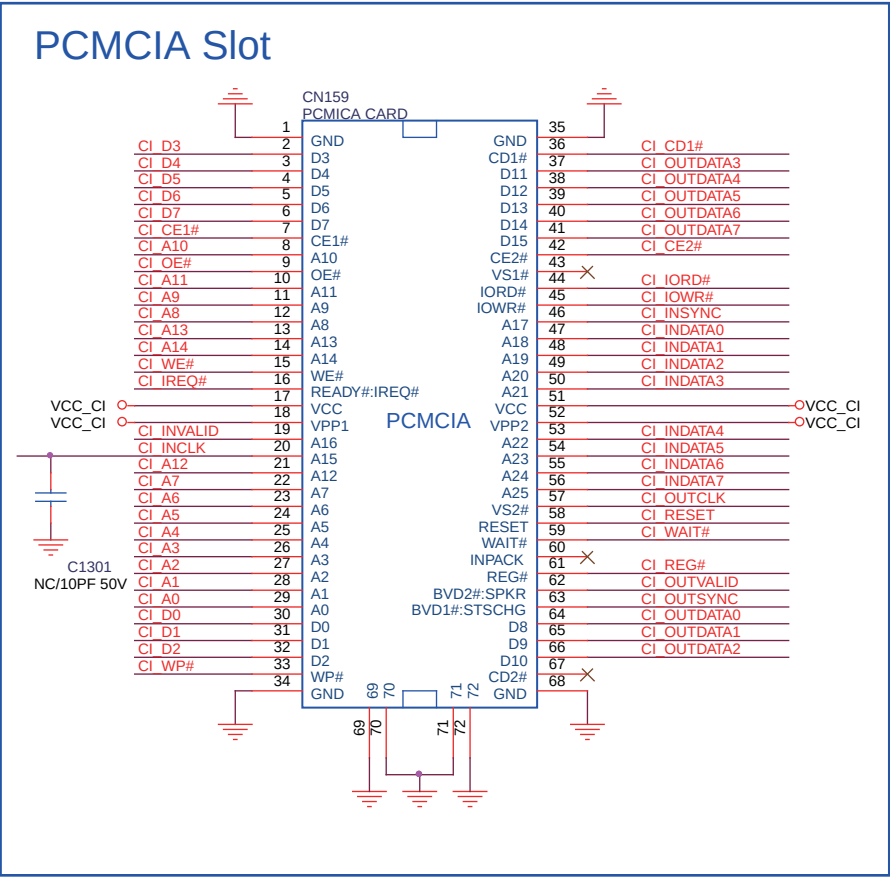


VGA/SPDIF/UART INPUT	715G6094	1	2013-06-05

B07

NT72567_CI

B07



CI_OUTDATA2	R4294	22R 1/16W 5%	CI_OUTDATA_2
CI_D2	R4293	22R 1/16W 5%	CI_D_2
CI_D1			CI_D_1

CI_OUTDATA1	R4183	22R 1/16W 5%	CI_OUTDATA_1
CI_D0			CI_D_0
CI_A0			CI_A_0
CI_OUTDATA0			CI_OUTDATA_0

CI_A1			CI_A_1
CI_A2			CI_A_2
CI_A3			CI_A_3
CI_A4			CI_A_4

CI_A5			CI_A_5
CI_INDATA7	R4291	0R05 1/16W	CI_INDATA_7
CI_A6			CI_A_6
CI_A7			CI_A_7

CI_INDATA6	R4288	0R05 1/16W	CI_INDATA_6
CI_A12			CI_A_12
CI_INDATA5	R4286	0R05 1/16W	CI_INDATA_5
CI_INDATA4	R4285	0R05 1/16W	CI_INDATA_4

CI_INDATA3	R4284	0R05 1/16W	CI_INDATA_3
CI_INDATA2	R4283	0R05 1/16W	CI_INDATA_2
CI_INDATA1	R4282	0R05 1/16W	CI_INDATA_1
CI_A14			CI_A_14

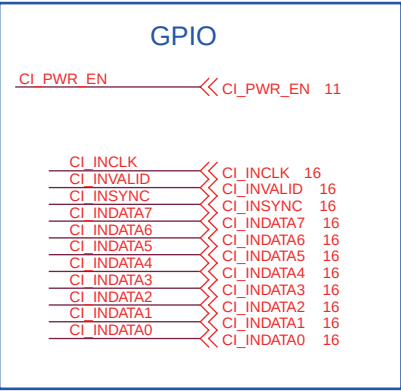
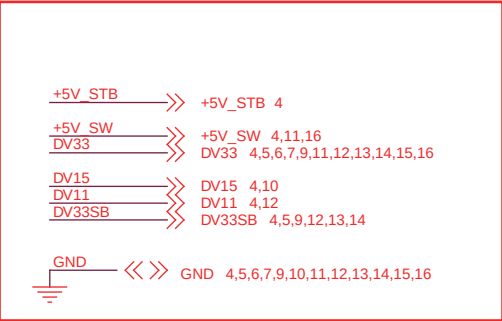
CI_A13			CI_A_13
CI_INDATA0	R4191	0R05 1/16W	CI_INDATA_0
CI_A8			CI_A_8
CI_A9			CI_A_9

CI_A11			CI_A_11
CI_A10			CI_A_10
CI_OUTDATA7			CI_OUTDATA_7
CI_OUTDATA6			CI_OUTDATA_6

CI_D7	R4198	22R 1/16W 5%	CI_D_7
CI_D6	R4199	22R 1/16W 5%	CI_D_6
CI_OUTDATA5			CI_OUTDATA_5
CI_D5	R4300	22R 1/16W 5%	CI_D_5

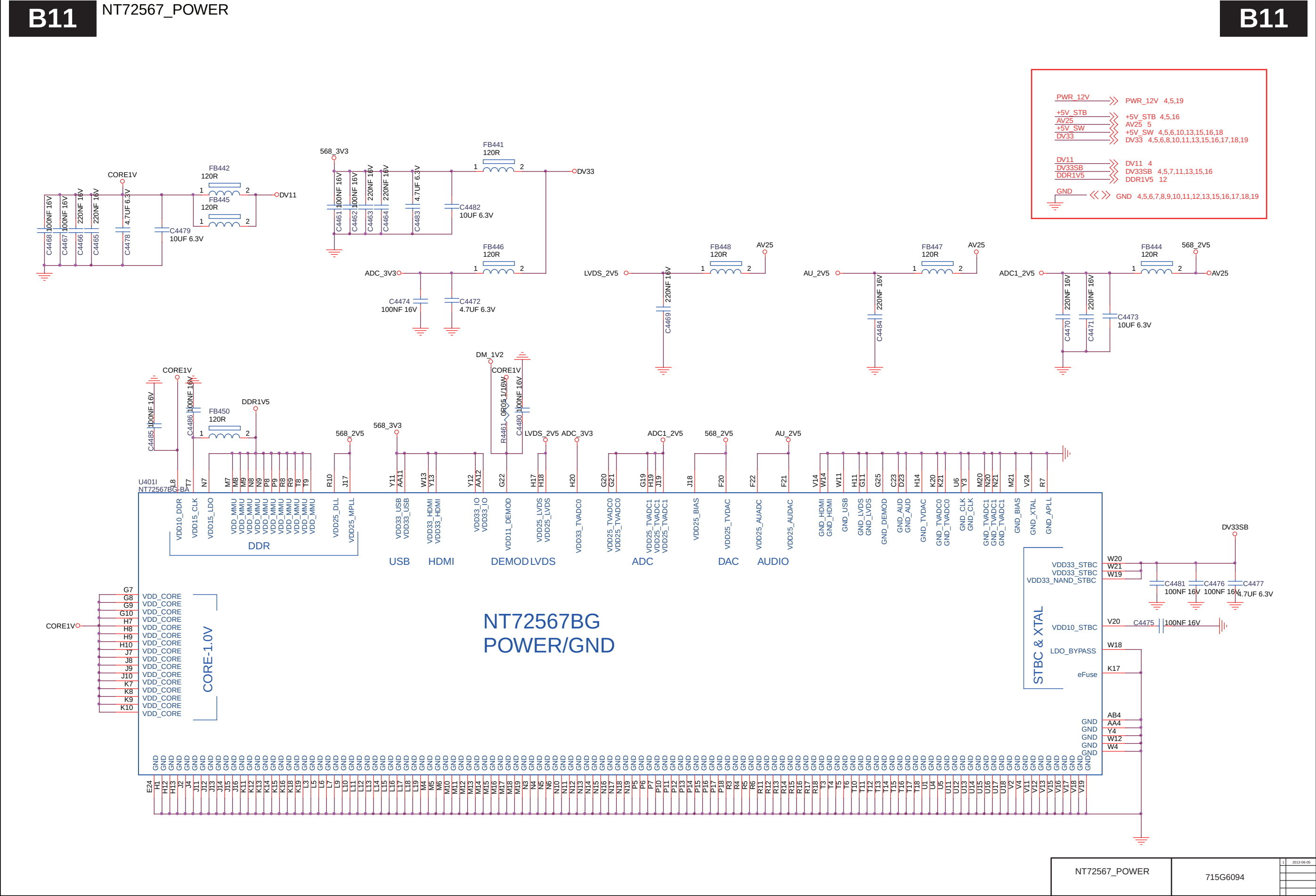
CI_D4	R4299	22R 1/16W 5%	CI_D_4
CI_OUTDATA4			CI_OUTDATA_4
CI_D3	R4297	22R 1/16W 5%	CI_D_3
CI_OUTDATA3			CI_OUTDATA_3

VCC_CI	R4161	10K 1/16W 5%	CI_CD1#
	R4162	10K 1/16W 5%	CI_CE2#
	R4163	10K 1/16W 5%	CI_WP#
	R4164	10K 1/16W 5%	CI_IREQ#
	R4165	10K 1/16W 5%	CI_RESET
	R4166	10K 1/16W 5%	CI_WAIT#



NT72567_CI	715G6094	1	2013-08-05
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10-5-11 NT72567_POWER

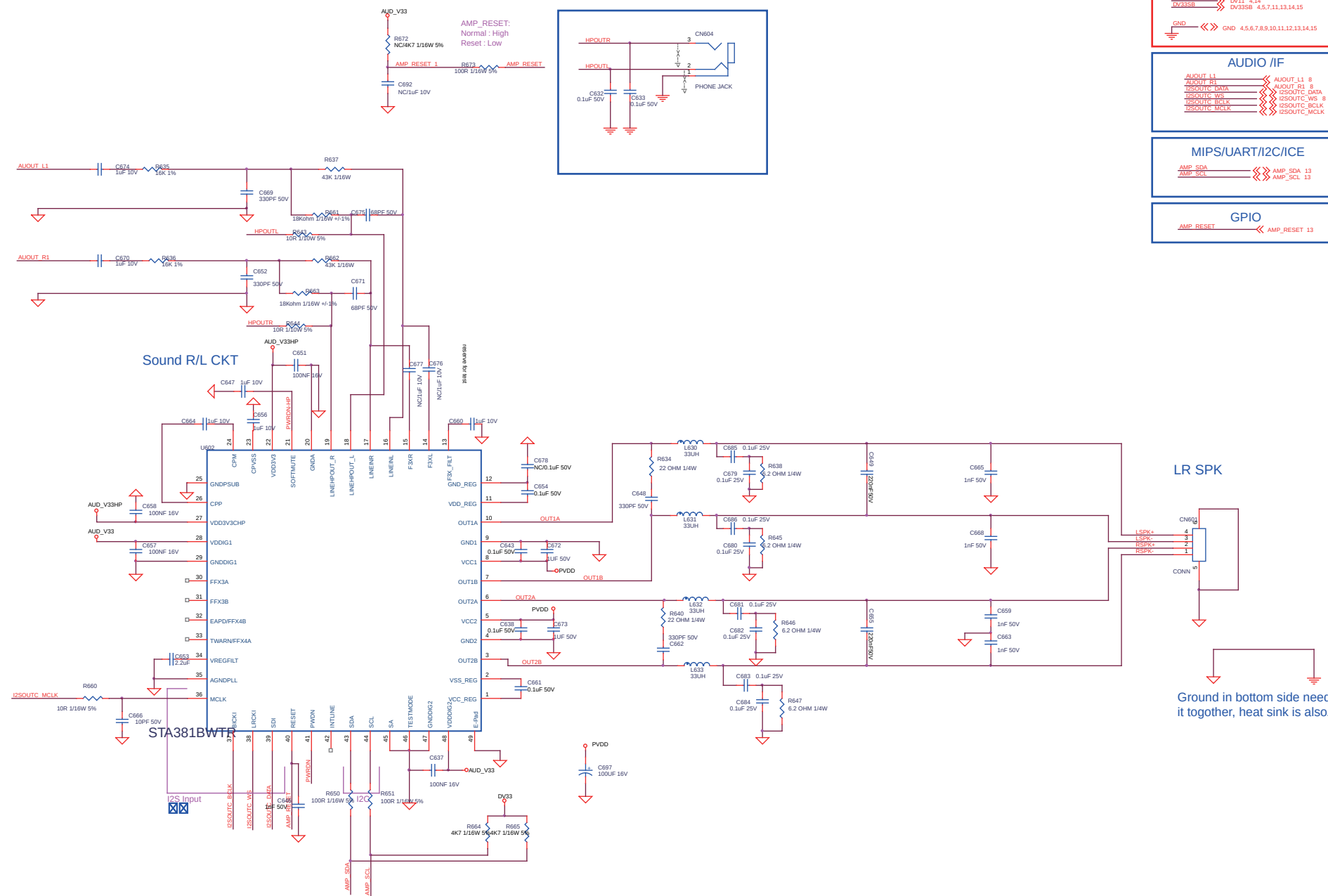
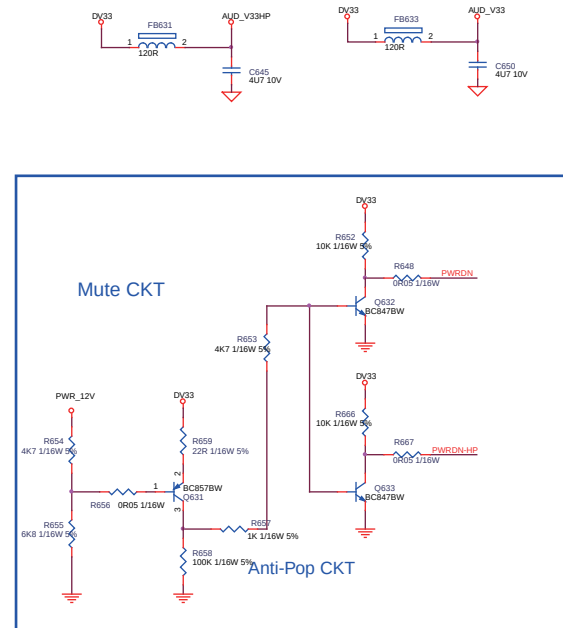


10-5-13 SPEAKER AMPLIFIER/HEADPHONE OUT

B13

SPEAKER AMPLIFIER/HEADPHONE OUT

B13



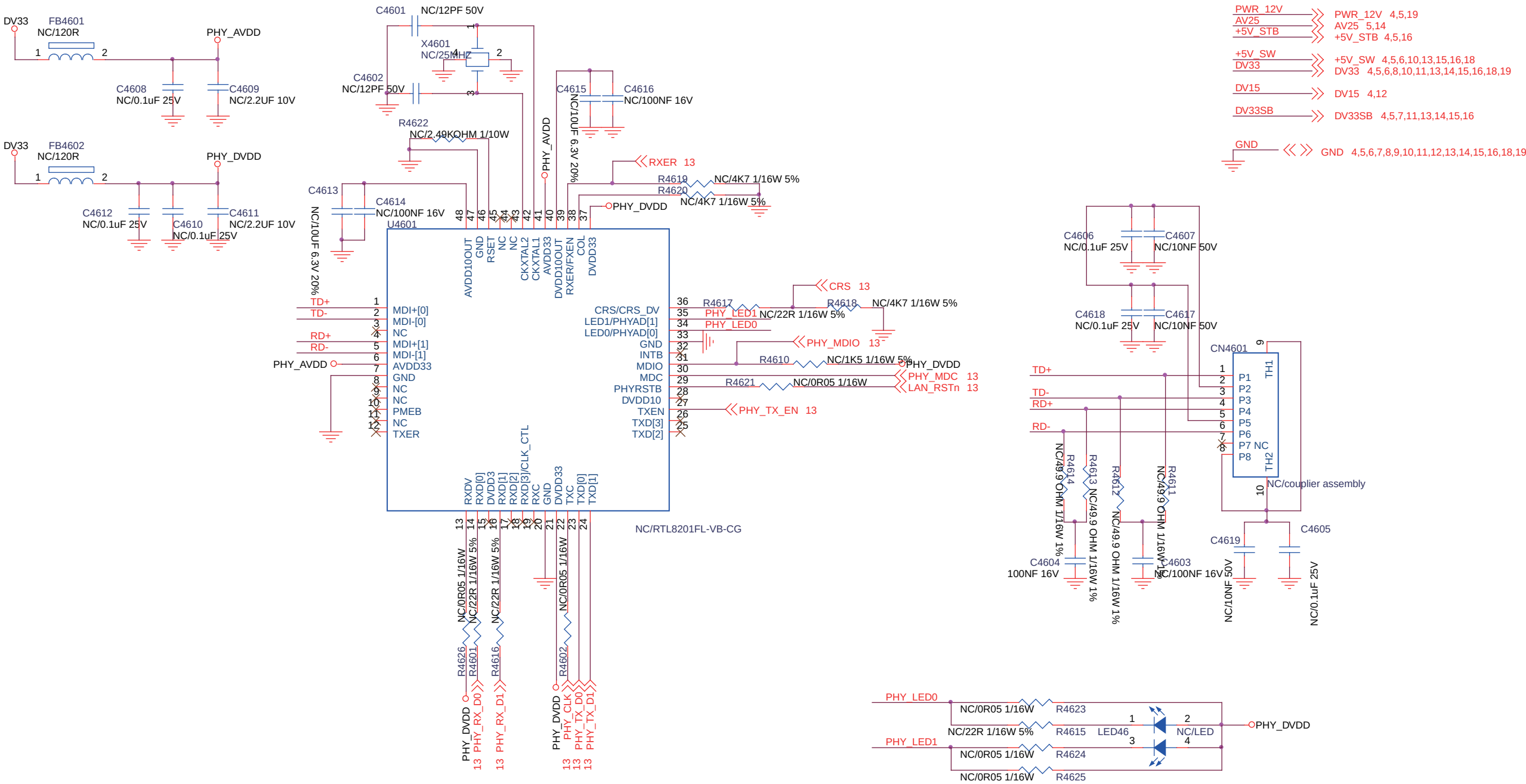
Ground in bottom side need connector
it together, heat sink is also.

SPEAKER AMPLIFIER/ HEADPHONE OUT	715G6094	1	2013-06-05

B15

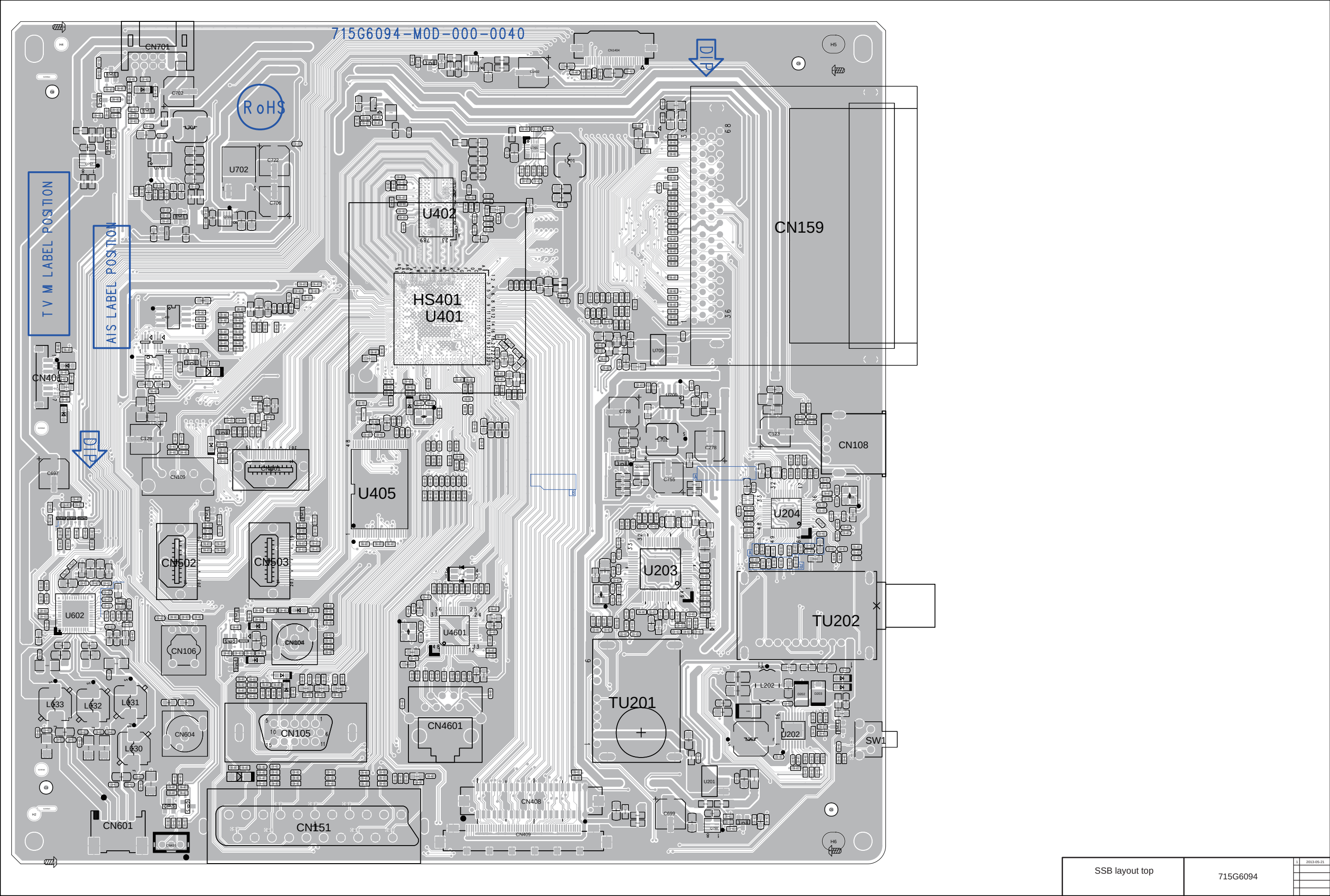
Ethernet

B15



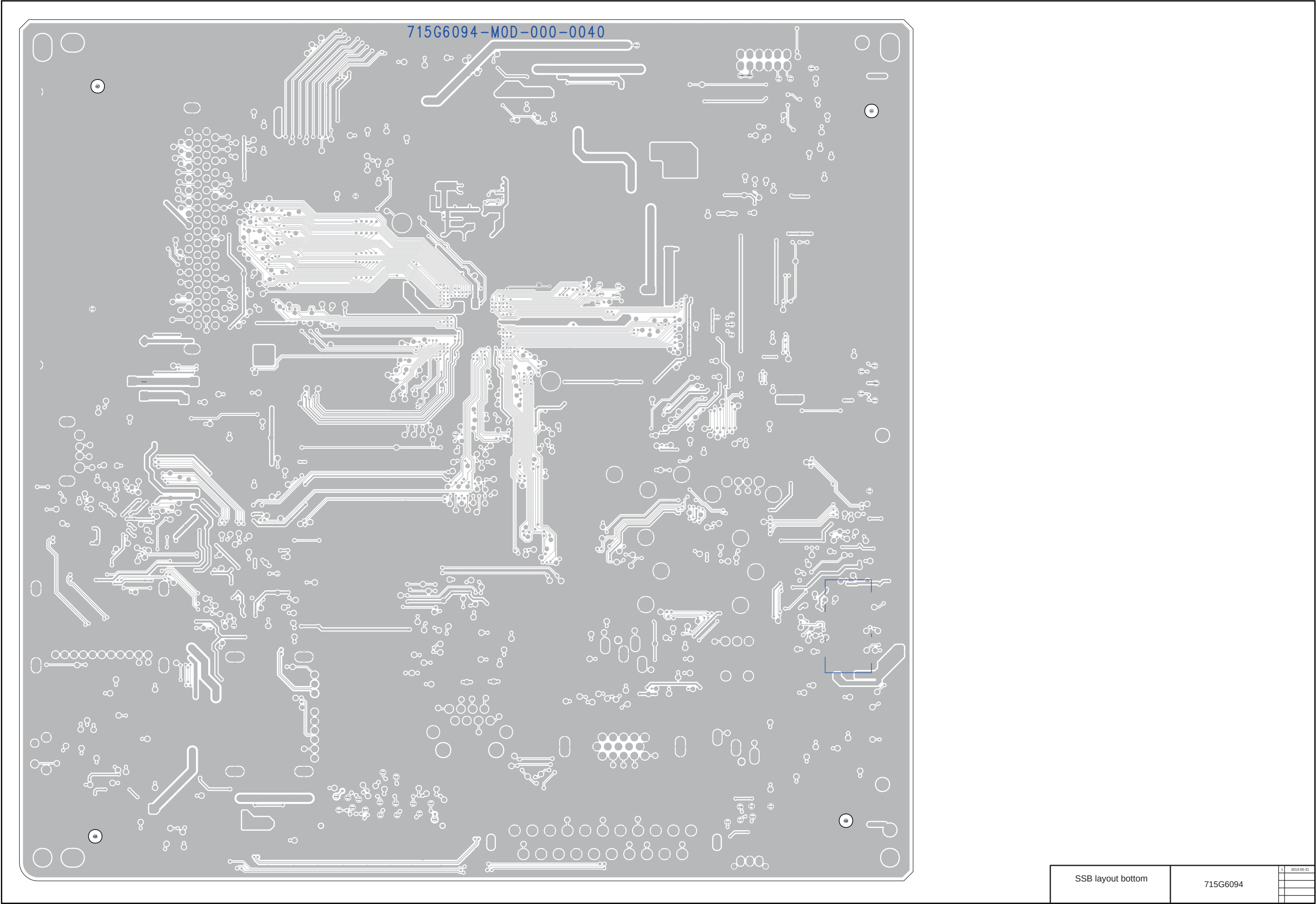
Ethernet	715G6094	1	2013-08-05

10-5-18 SSB layout top



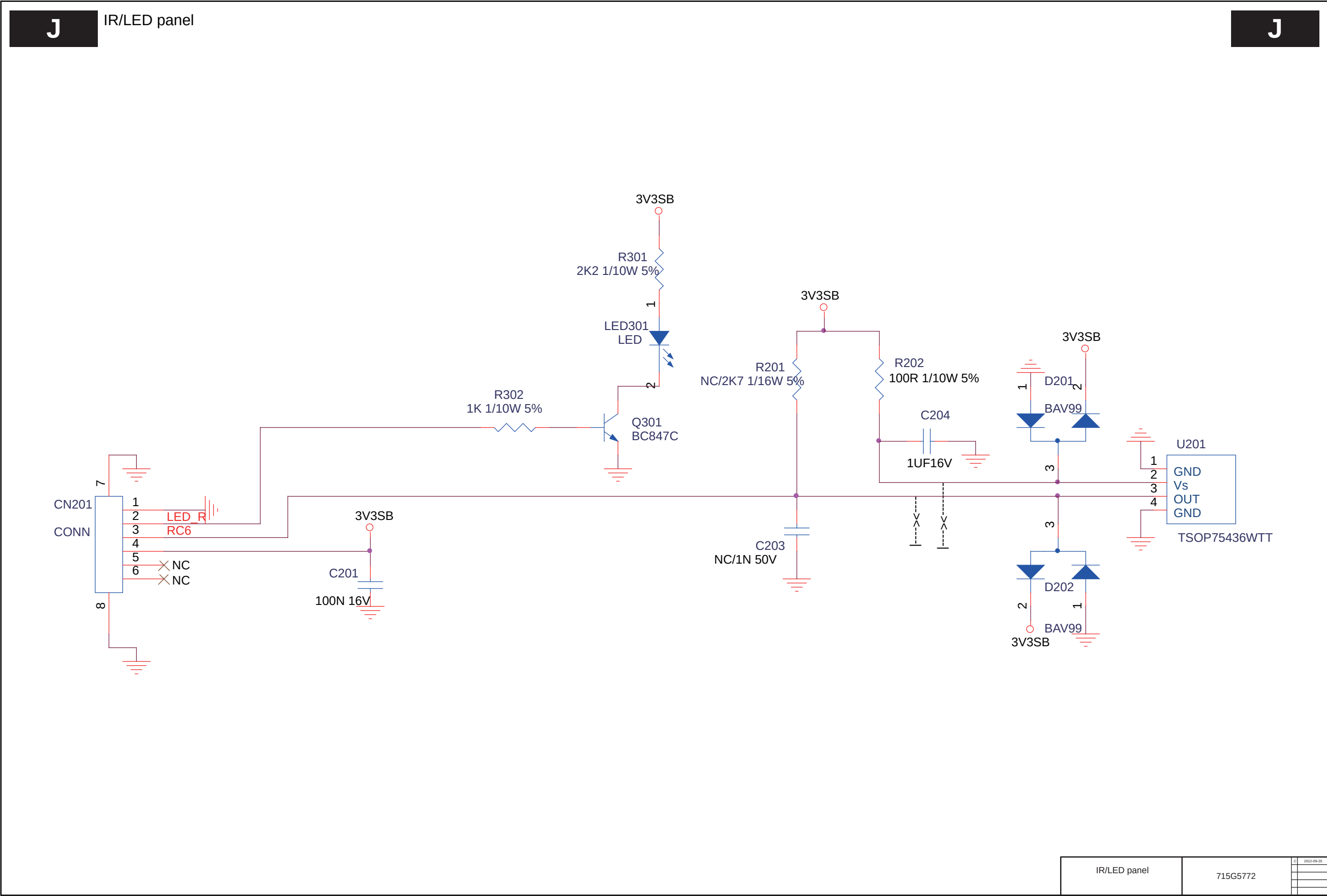
SSB layout top	715G6094	1	2013-05-21

10-5-19 SSB layout bottom



10.6 J 715G5772 IR/LED Panel

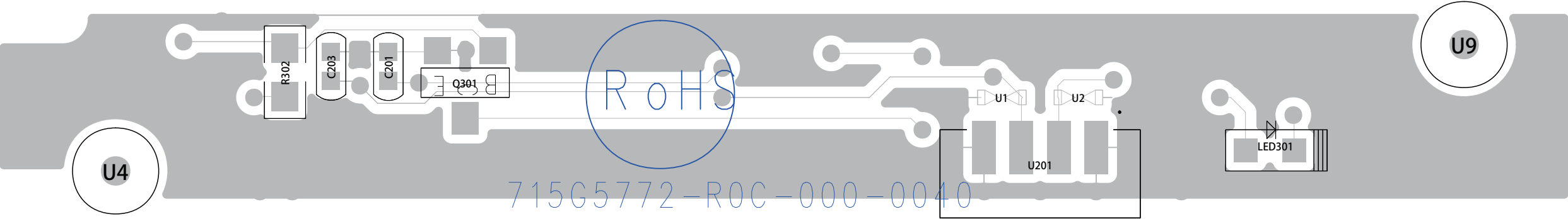
10-6-1 IR/LED Panel



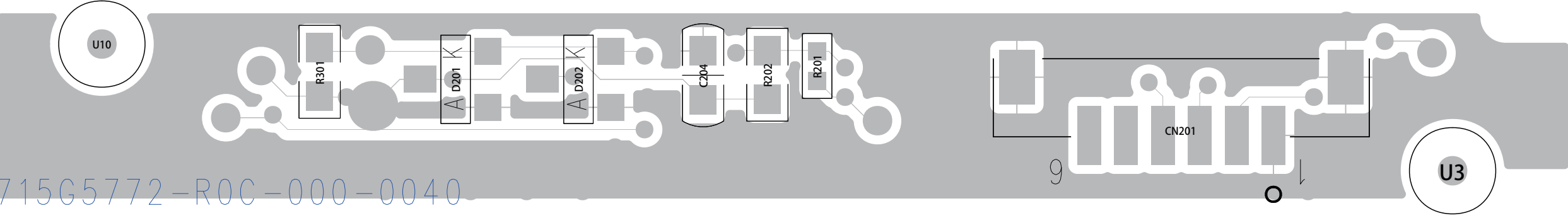
IR/LED panel	715G5772	C	2012-09-20

10-6-2 IR/LED board layout

Layout IR/LED panel (top side)



Layout IR/LED panel (bottom side)



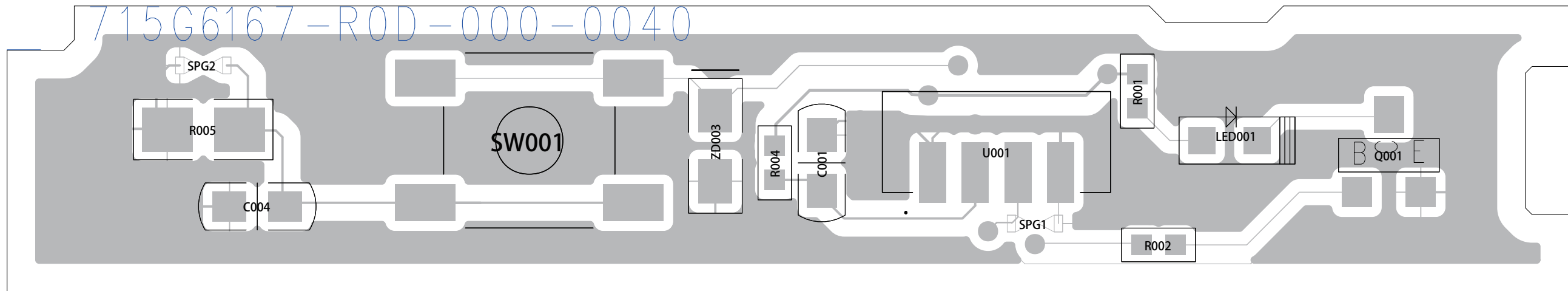
IR/LED panel layout top/bottom	715G5772	C	2012-09-20

10-7-1 Control Board IR/LED Panel

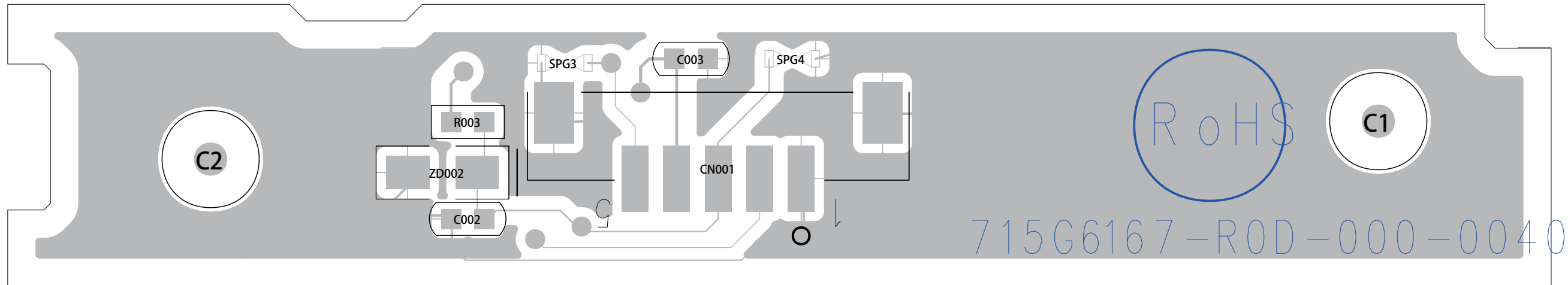


10-7-2 Control Board IR/LED board layout

Layout Control Board IR/LED panel (top side)



Layout Control Board IR/LED panel (bottom side)



11. Styling Sheets

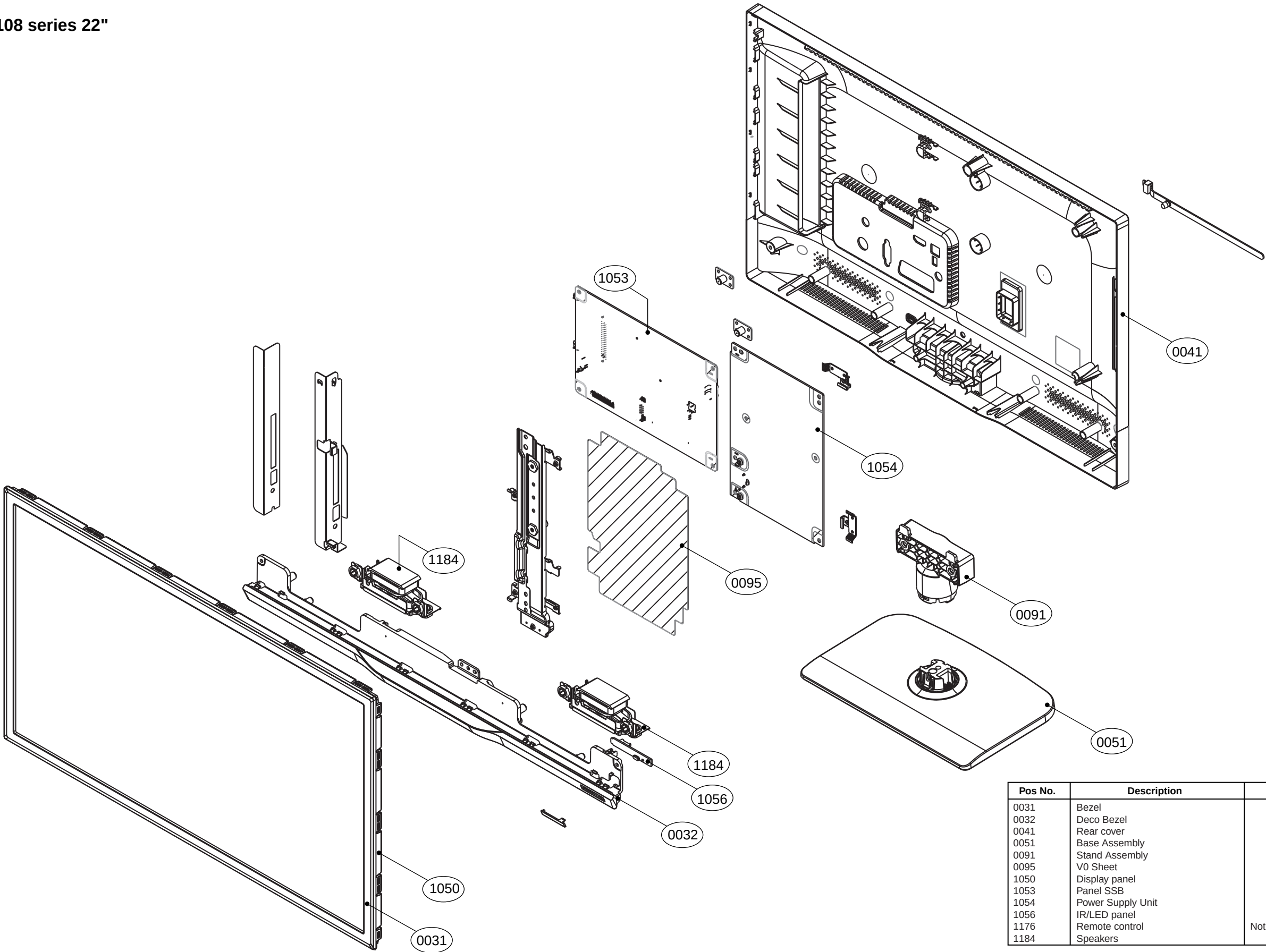
11.1 3108 series 20"

3108 series 20"

Pos No.	Description	Remarks
0031	Bezel	
0032	Deco Bezel	
0041	Rear cover	
0051	Base Assembly	
0091	Stand Assembly	
0095	V0 SHEET	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1056	IR/LED panel	
1176	Remote control	Not displayed
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

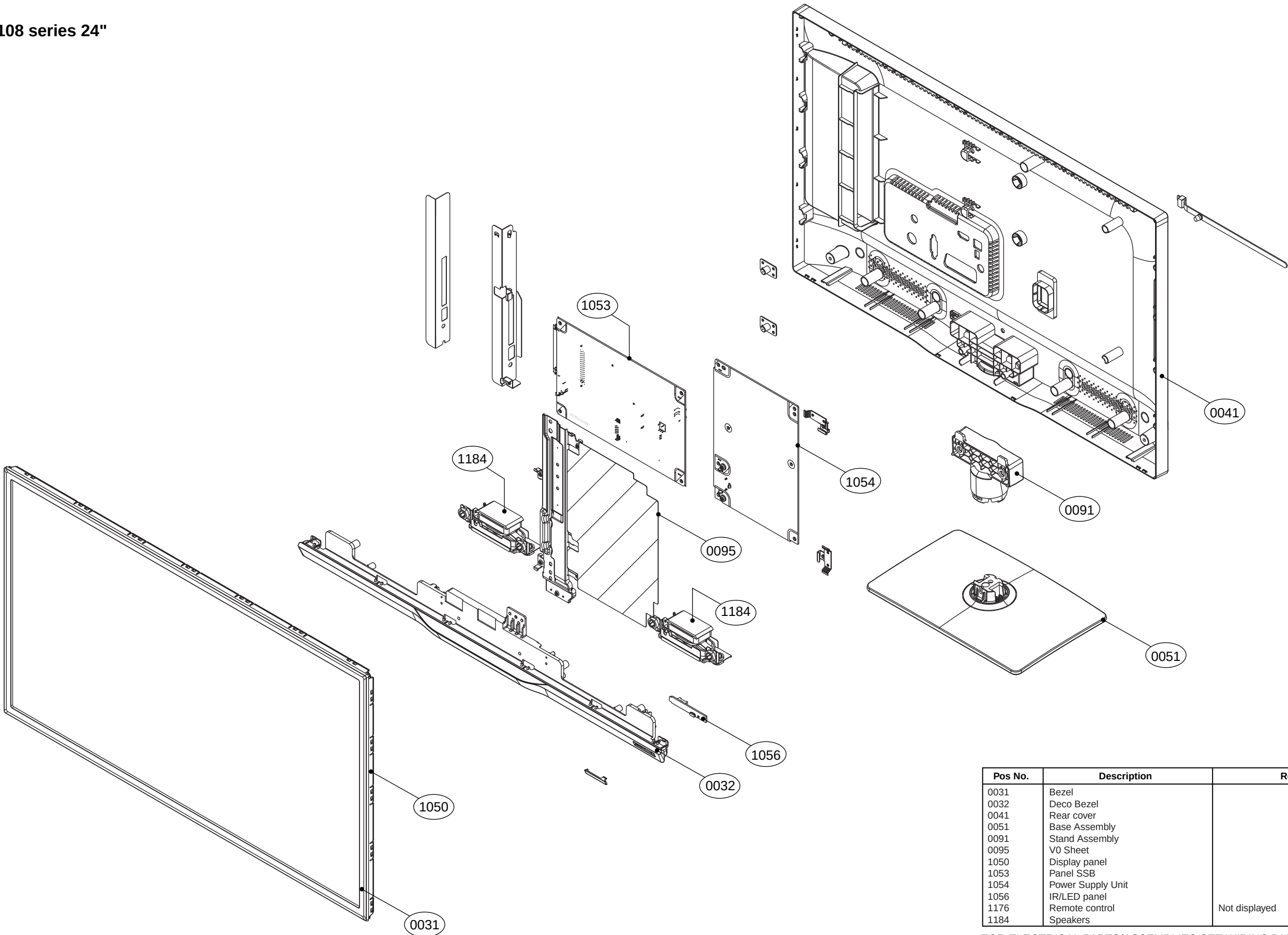
3108 series 22"



Pos No.	Description	Remarks
0031	Bezel	Not displayed
0032	Deco Bezel	
0041	Rear cover	
0051	Base Assembly	
0091	Stand Assembly	
0095	V0 Sheet	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1056	IR/LED panel	
1176	Remote control	
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

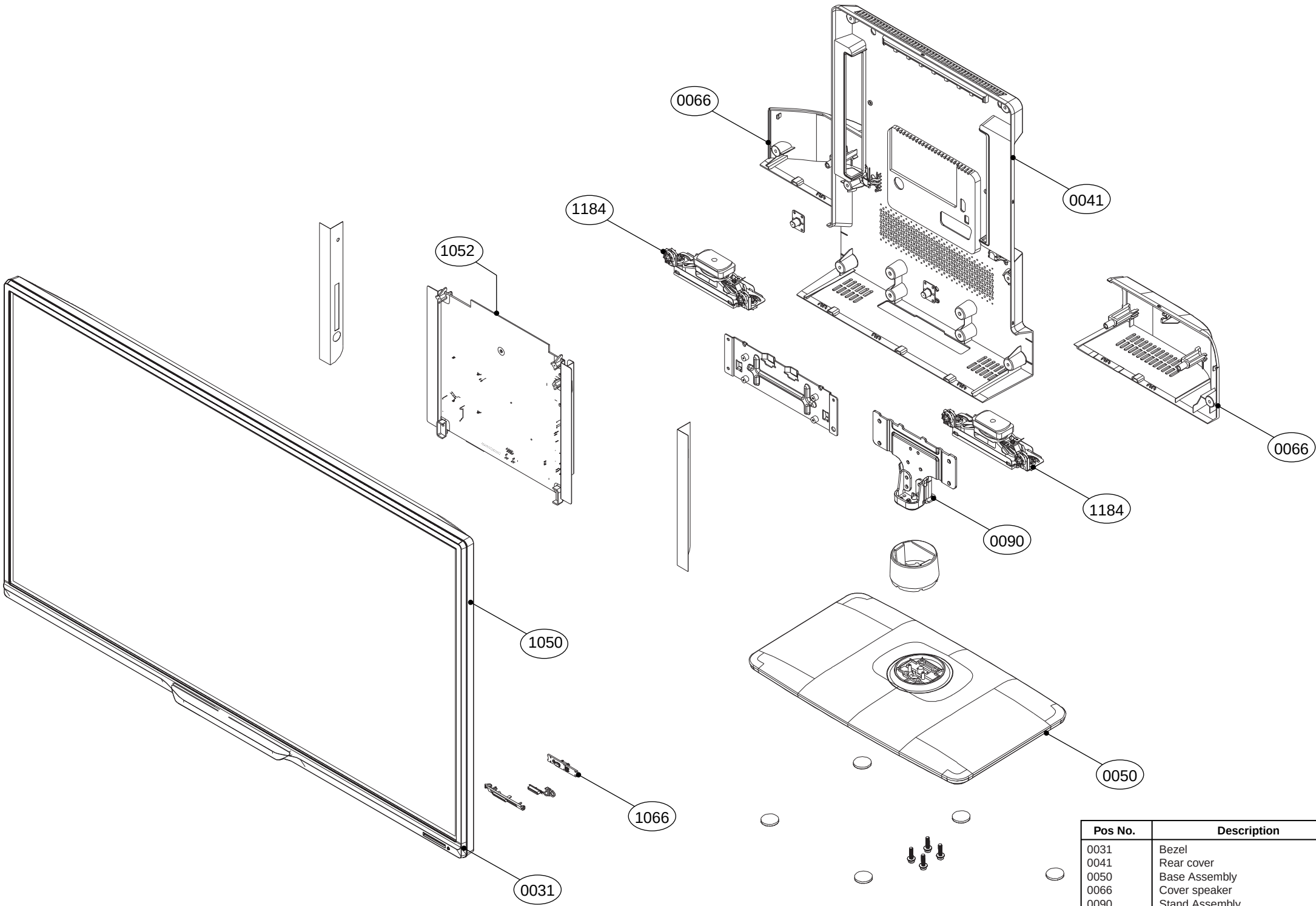
3108 series 24"



Pos No.	Description	Remarks
0031	Bezel	
0032	Deco Bezel	
0041	Rear cover	
0051	Base Assembly	
0091	Stand Assembly	
0095	V0 Sheet	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1056	IR/LED panel	
1176	Remote control	Not displayed
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

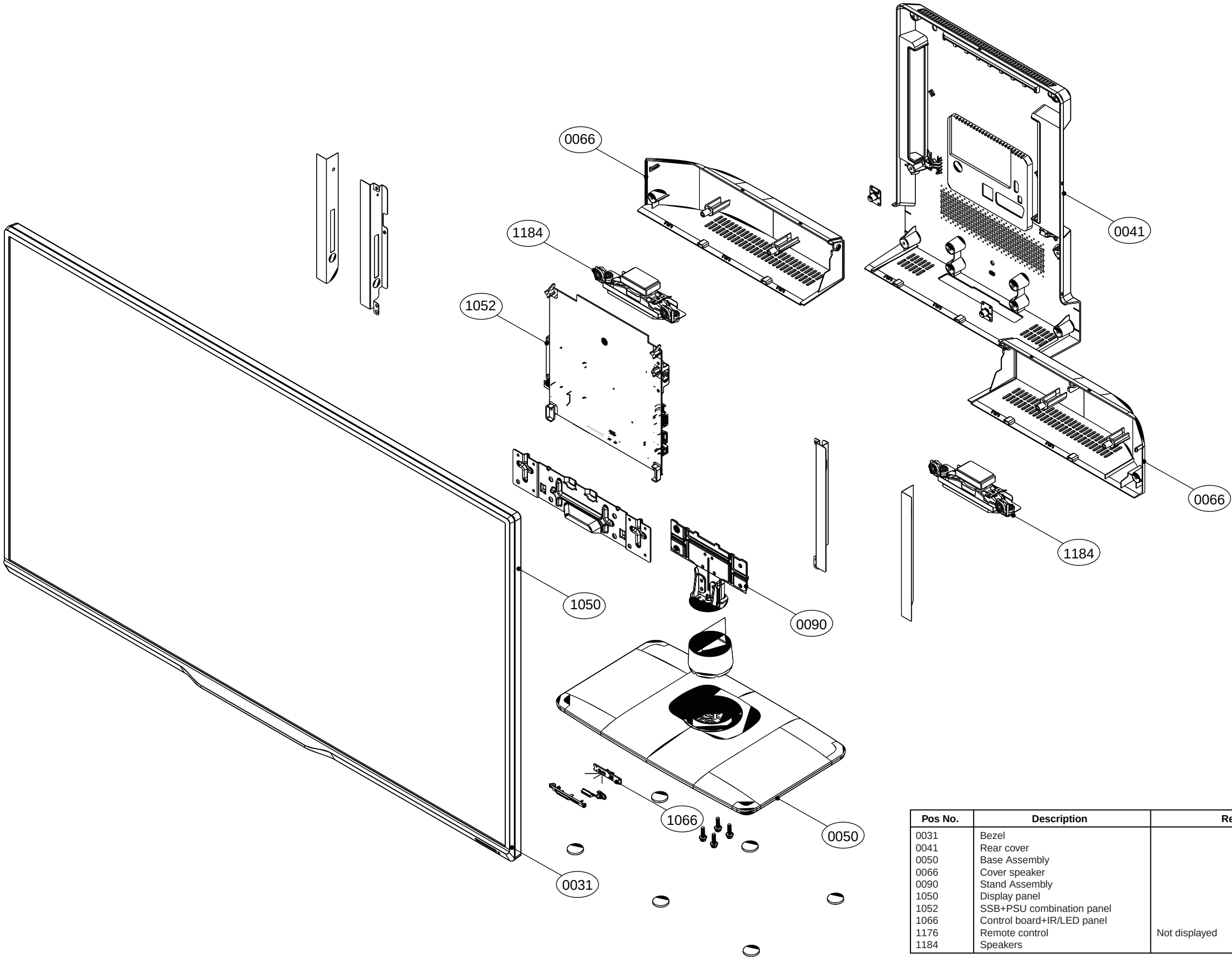
3000 series 32"



Pos No.	Description	Remarks
0031	Bezel	Not displayed
0041	Rear cover	
0050	Base Assembly	
0066	Cover speaker	
0090	Stand Assembly	
1050	Display panel	
1052	SSB+PSU combination panel	
1066	Control board+IR/LED panel	
1176	Remote control	
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

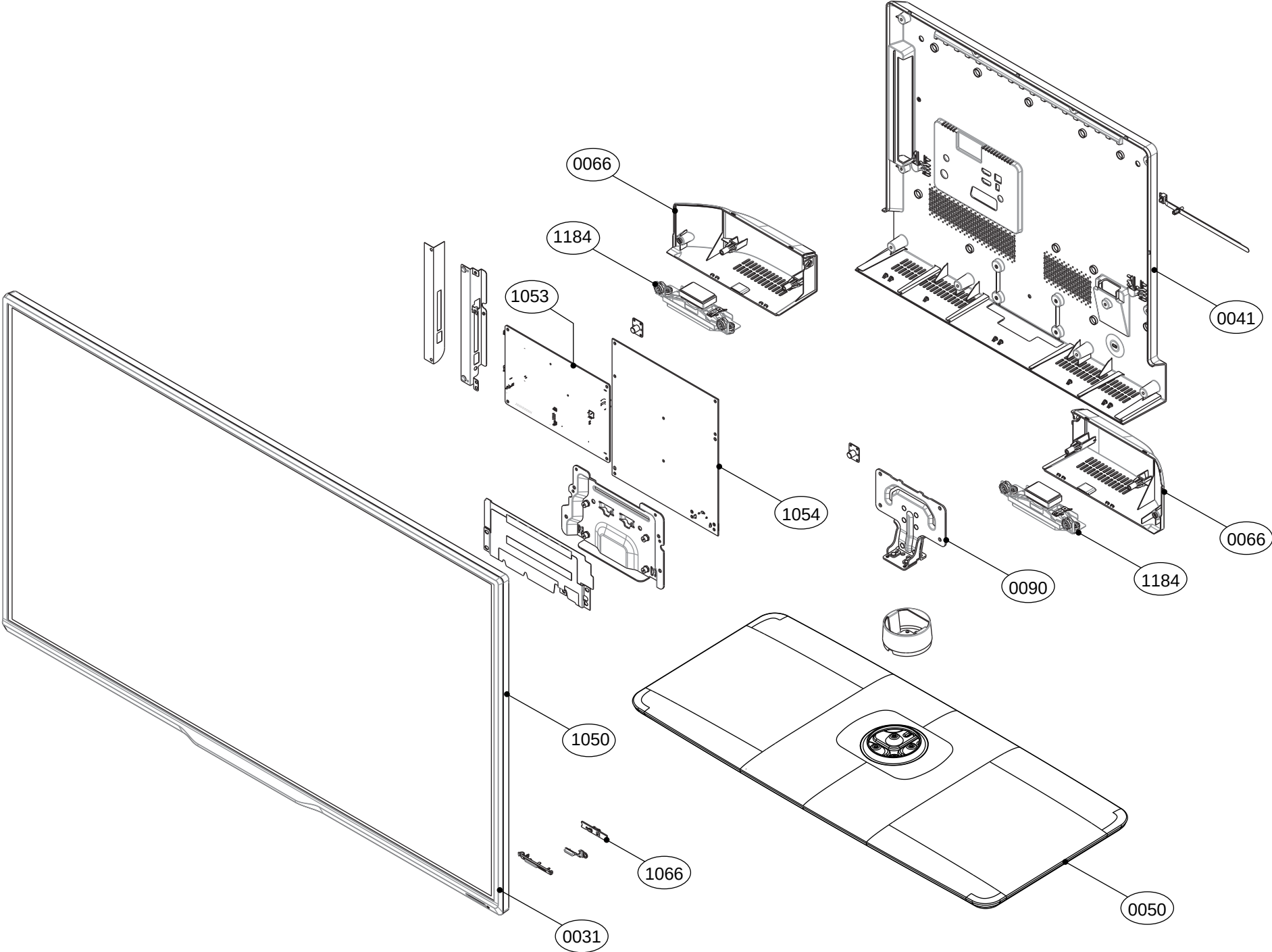
3000 series 39"



Pos No.	Description	Remarks
0031	Bezel	Not displayed
0041	Rear cover	
0050	Base Assembly	
0066	Cover speaker	
0090	Stand Assembly	
1050	Display panel	
1052	SSB+PSU combination panel	
1066	Control board+IR/LED panel	
1176	Remote control	
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

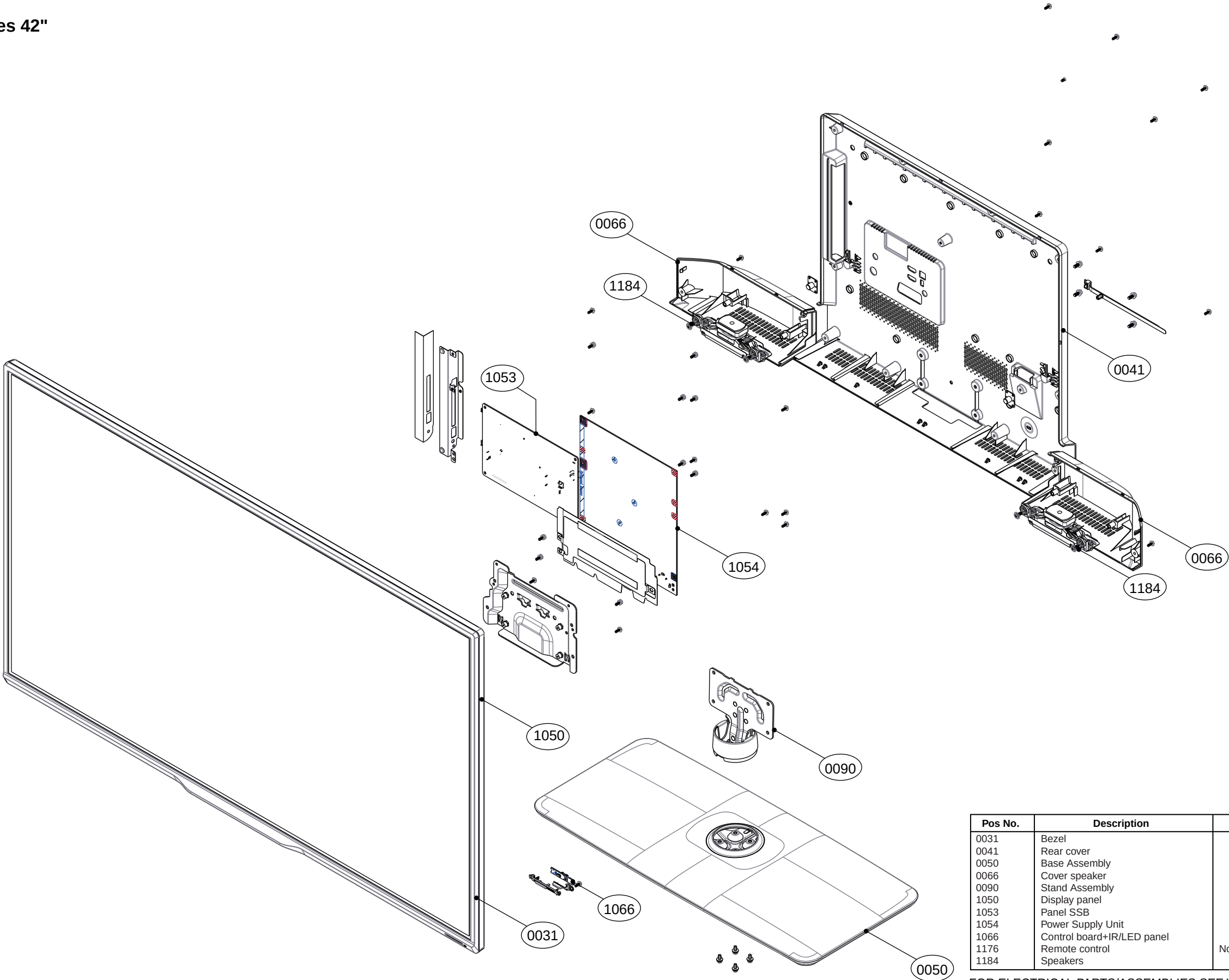
3000 series 40"



Pos No.	Description	Remarks
0031	Bezel	
0041	Rear cover	
0050	Base Assembly	
0066	Cover speaker	
0090	Stand Assembly	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1066	Control board+IR/LED panel	
1176	Remote control	Not displayed
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

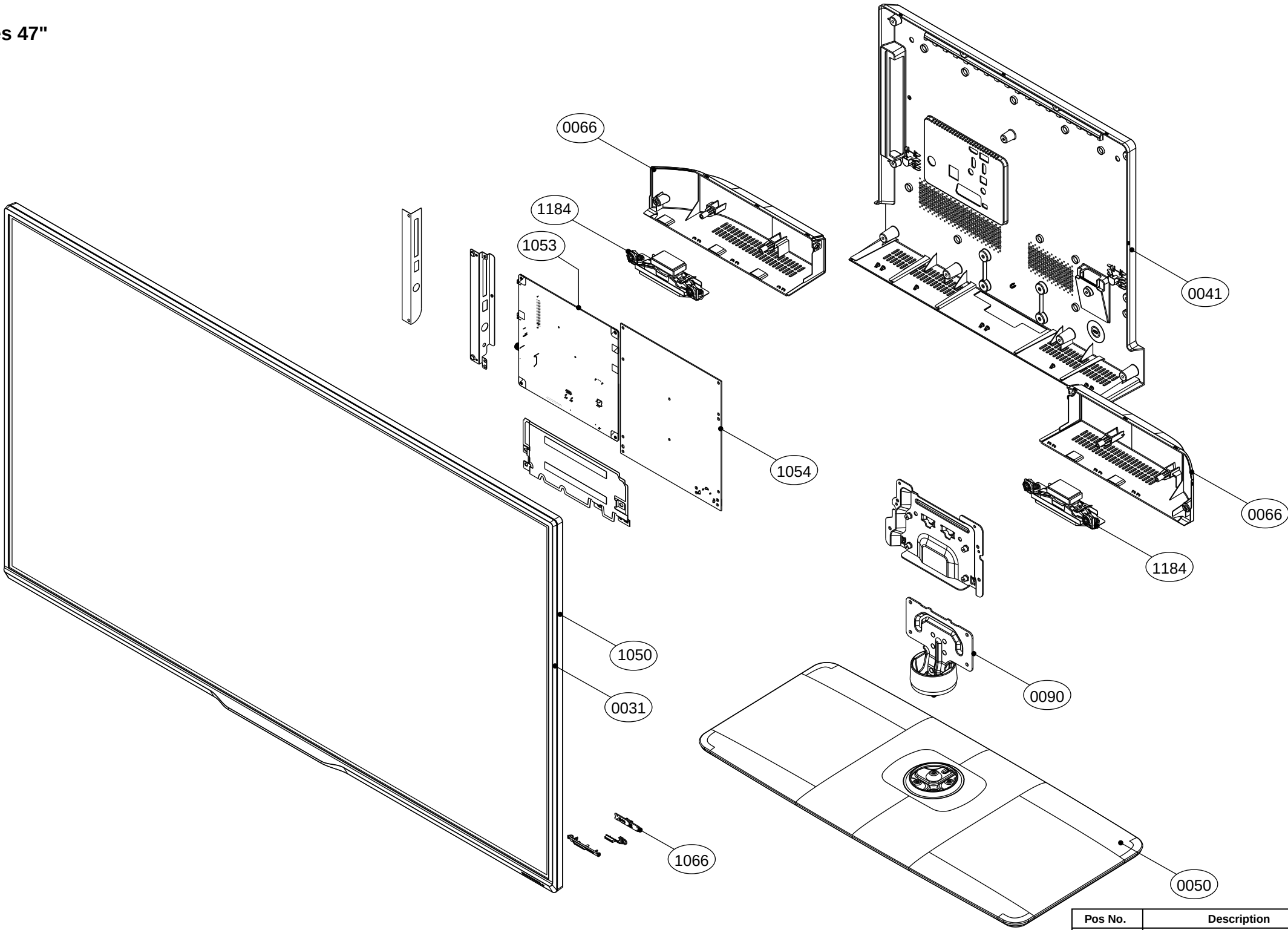
3000 series 42"



Pos No.	Description	Remarks
0031	Bezel	
0041	Rear cover	
0050	Base Assembly	
0066	Cover speaker	
0090	Stand Assembly	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1066	Control board+IR/LED panel	
1176	Remote control	Not displayed
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9

3000 series 47"



Pos No.	Description	Remarks
0031	Bezel	Not displayed
0041	Rear cover	
0050	Base Assembly	
0066	Cover speaker	
0090	Stand Assembly	
1050	Display panel	
1053	Panel SSB	
1054	Power Supply Unit	
1066	Control board+IR/LED panel	
1176	Remote control	
1184	Speakers	

FOR ELECTRICAL PARTS/ASSEMBLIES SEE WIRING DIAGRAM CHAPTER 9