SDIS1_HW_ChangeDocument

SDIS1 HW Change Document

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Document History

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12.07.2016	0.1	V.Kill-Tollnek	Document created	Initial draft
21.07.2016	1.0	V.Kill-Tollnek	Document reviewed by Cetecom and approved	Approved
27.10.2016	2.0	Schuster Emil	Document updated with RGB LED change from Osram to Everlight	Approved
08.11.2017	2.1	Tobias Cremer	Re-work for single HWCD covering all HWIDs; Added HWID46	Changed Number of Ch 2 to Ch 1.2; Ch2.1 to Ch1.2 Added Chapter 2, HW46
09.11.2017	2.2	Tobias Cremer	Changed Title and ID of document to be generic; Added Table of Contents	
22.11.2017	2.3	Tobias Cremer	Adding Chapter 1, renaming the following chapters consequently	Chapter 1
07.12.2017	2.4	Tobias Cremer	Update of chapter 1 according to review of Meik Widmer/eso HW	Chapter 1

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1 Introduction of HW42

This chapter describes the changes between initial HW C101 used for certification testing, and the SOP HW 42. It also concludes the certification relevant tests which are to be performed with this new HW version before product certification can be issued.

1.1 Change Details for HW42

1.1.1 Description

#	Affected Area	Change description	Expert opinion	Cetecom review
1	Antenna tuning	The tuning was adapted to catch de-tuning caused by mechanical changes	No certification relevance	
2	Voltage undershoot correction	Increase value of capacitors to avoid damage of processor	No certification relevance	
3	Changes to VCM EMI-Shield	Added holes to avoid bubbles under foil after gluing	No certification relevance	
4	GPS Antenna flex design change	Cut-outs on flex for reliable gluing and performance	No certification relevance	
5	Test points for RGB LED	Added test points on PCB	No certification relevance	
6	Change in PMU Shielding geometry	Changed depth of cut-outs on shiedling flanks	No certification relevance	
7	System Crash Prevention	Added components to avoid that system crashes under certain conditions	No certification relevance	
8	Termination of RX-Line	Rx signal needs to be terminated to avoid false input signals.	No certification relevance	
9	EMC correction for radiated emissions at 750kHz	Added components to improve radiated emissions at 750kHz	No certification relevance	
10	Power-On-Key: HW de-bouncing	Improved user-experience by faster reaction of system on power-on-key event PMU_ONKEY_AP*	No certification relevance	
11	Stabilization of USB-Charging current	Corrects a potential malfunction in USB charging mode, to allow for reliable charging with 500mA	No certification relevance	
12	Remove ONE LCD Grounding Foam next to GPS side	Removal of one "LCD Grounding Foam", next to GPS Antenna.	No certification relevance	
13	Voltage undershoot correction for signal "CON_TEST_IN_SPEAKER"	Implementation of one additional capacitors on engine PWB.	No certification relevance	
14	PMIC HW-Shutdown for VSYS-Cut	In case of unexpected system-power-cut to PMIC, the component must be shutdown via HW trigger.	No certification relevance	
15	USB-Mux: Reassignment of power supply	Re-assignment of power supply for USB-Mux (I5000)	No certification relevance	

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16	Forced shut down for WiLink8	Wilink8 needs to be forced to shut-down (WL_EN and BT_EN pulled low by HW-Circuitry), in case of unexpected power-cut.	No certification relevance	
17	UART4 option on Syscon for PV	Added additiuonal components	No certification relevance	
18	PMIC deadlock prevention	Power sequence for LDO6 input needs to be modified, in order to prevent PMIC deadlock under rare condition.	No certification relevance	
19	EMI correction for emission at 156MHz, radiated by harness	Added a 2n2 50V 0603 capacitor to the V+ Supply	No certification relevance	
20	VCM Power sequence correction	Added components to correct power sequence	No certification relevance	
21	Correction for conducted emissions at 640kHz	low pass filter added for conducted emissions	No certification relevance	
22	Re-Configuration of Temperature Sensor	Added capacitor to DHS_WAKE*.	No certification relevance	

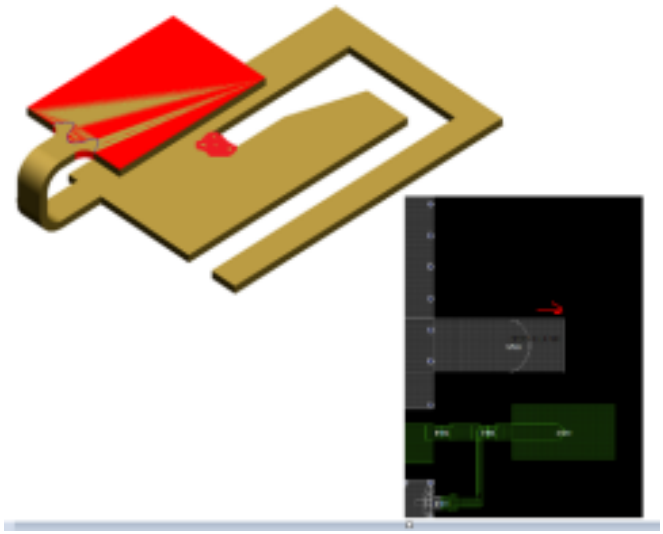
1.1.2 Details

1.1.2.1 Adaption of BT and WLAN antenna tunings

Due to mechanical changes, the antenna was de-tuned. The tuning was adapted accordingly.

1.1.2.1.1 WiFi antenna 5GHz

Pattern tuning + move C-Clip on PCB



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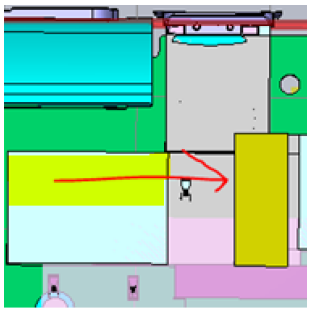
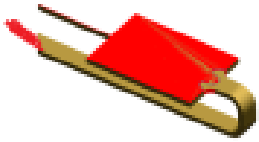
1.1.2.1.2 BT antenna

Pattern tuning + move grounding on audio shielding





1.1.2.2 Voltage undershoot correction for Volume-Keys

Description: Change to Engine PCB to avoid damage of processor

Changes: Increase value of capacitors C1170 and C1171 from 0u1 to 0u22 (1100254 Capacitor 0402 0u22 +/-10 % 16Vdc Murata GRM155R71C224KA12D)

Reason: Signal undershoot at falling edges of VOL_UP* and VOL_DOWN* exceeding absolute maximum ratings of -500mV according to NVIDIA datasheet.

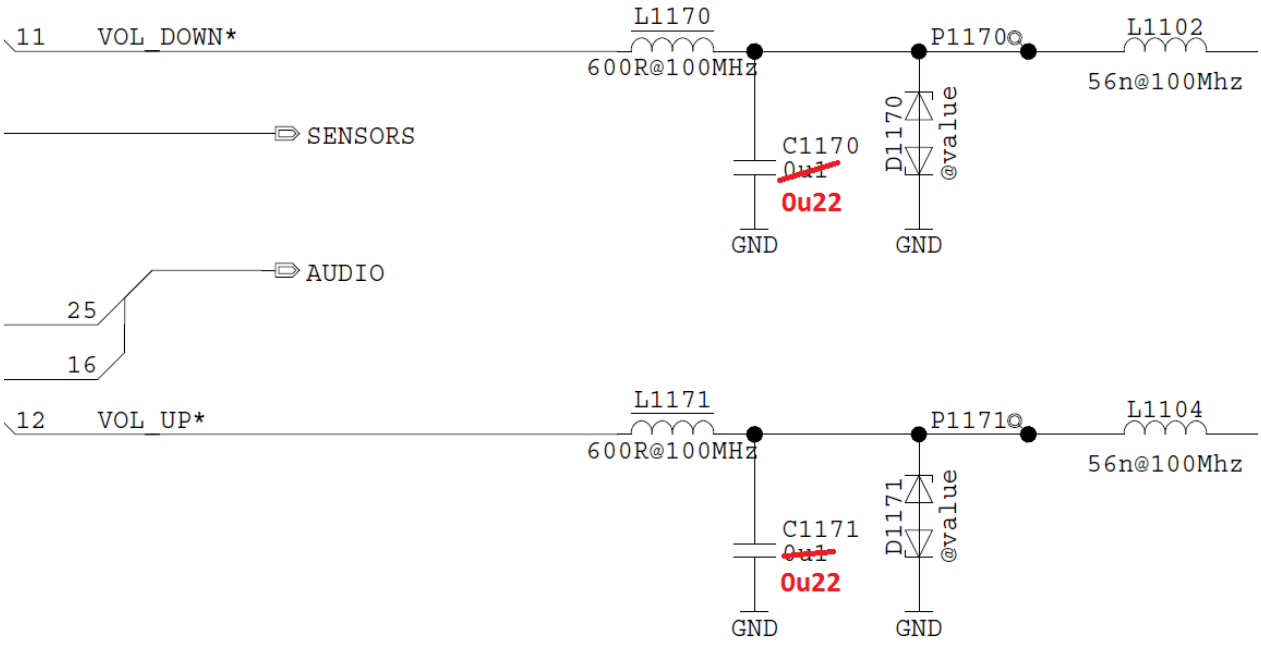


Figure 1 Schematic drawing of change for voltage undershoot correction

1.1.2.3 Changes to VCM EMI-Shield

Added holes to copper foil to avoid air trapped in under foil in gluing process.

Copper foil is still attached to entire metal surface of processor with electrically conductive glue, thus holes do not affect EMI performance.

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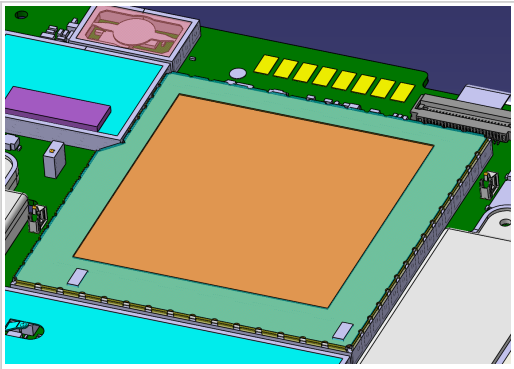


Figure 2 Copper foil before change

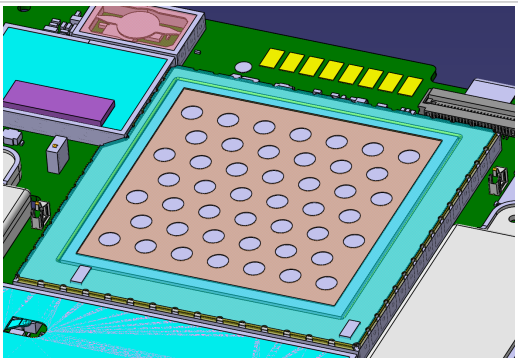
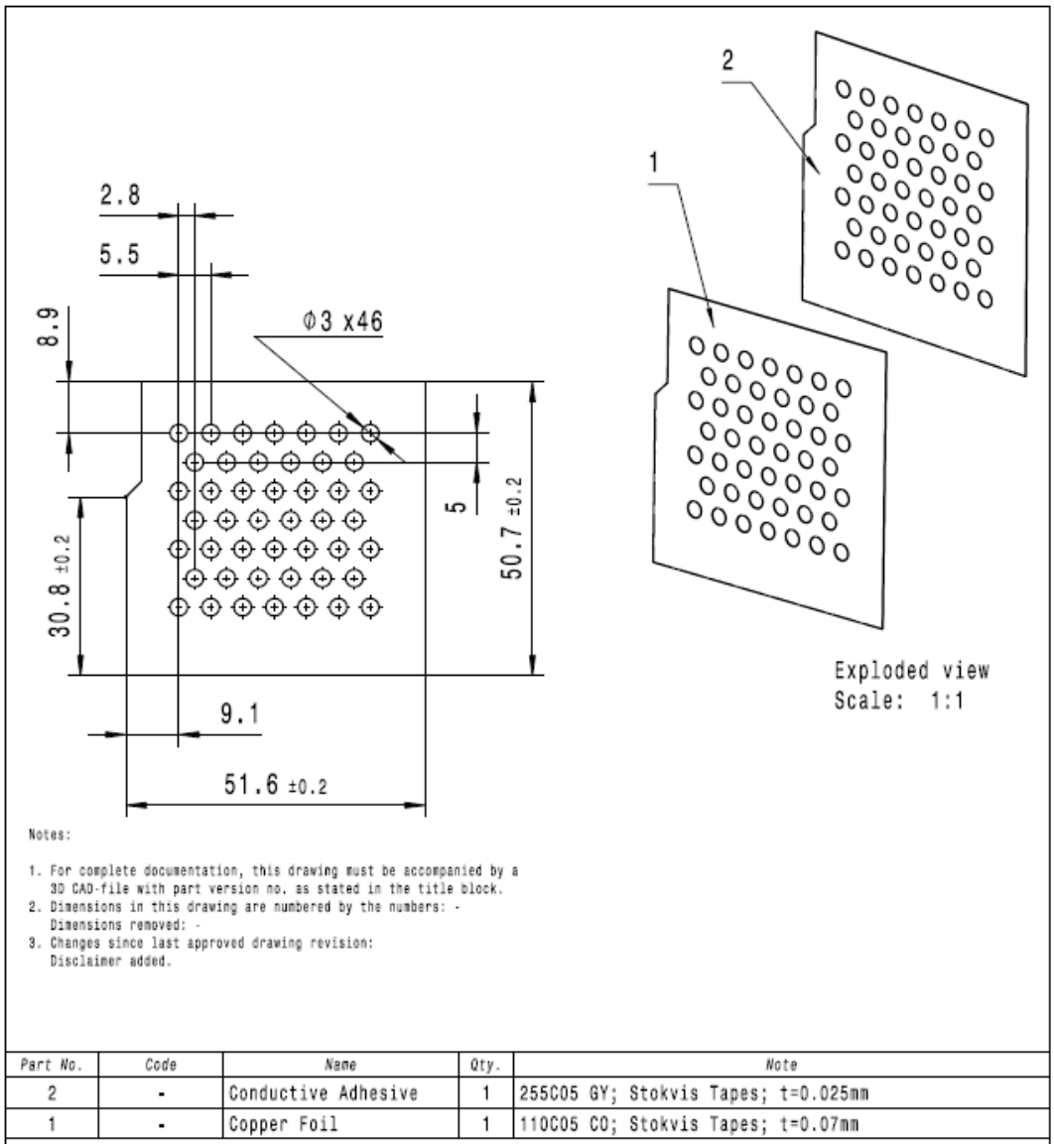


Figure 3 Copper foil after change



Part No.	Code	Name	Qty.	Note
2	-	Conductive Adhesive	1	255C05 GY; Stokvis Tapes; t=0.025mm
1	-	Copper Foil	1	110C05 CO; Stokvis Tapes; t=0.07mm

F

Figure 4 Drawing of change

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1.1.2.4 GPS Antenna flex design change

Radius of GPS antenna flex is too tight, added cutting lines to improve reliability and keep performance.

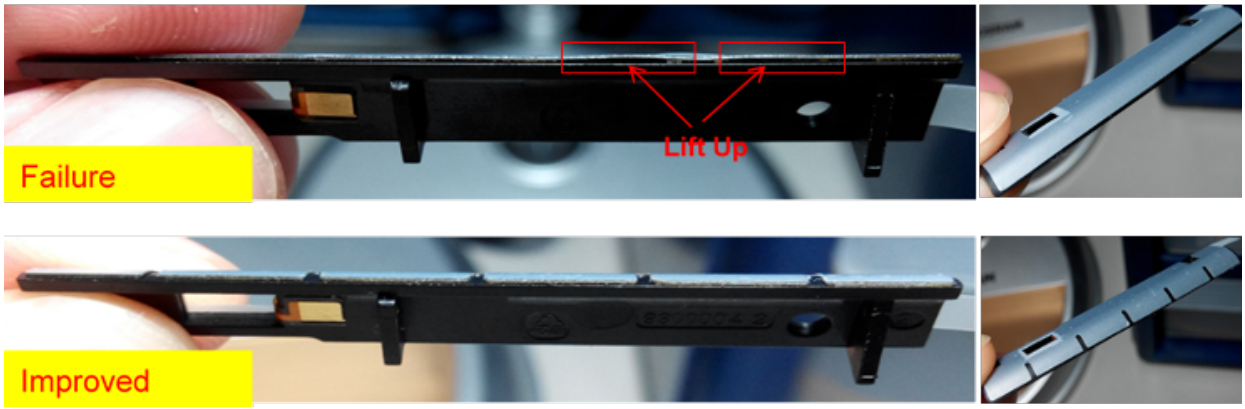

Figure 5 Image of antenna flex change, before and after

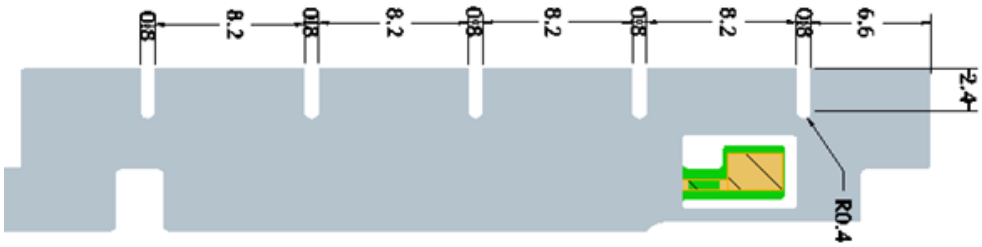

Figure 6 Drawing of GPS antenna flex change

1.1.2.5 Test points for RGB LED

For production testing, test points on the PCB were introduced.

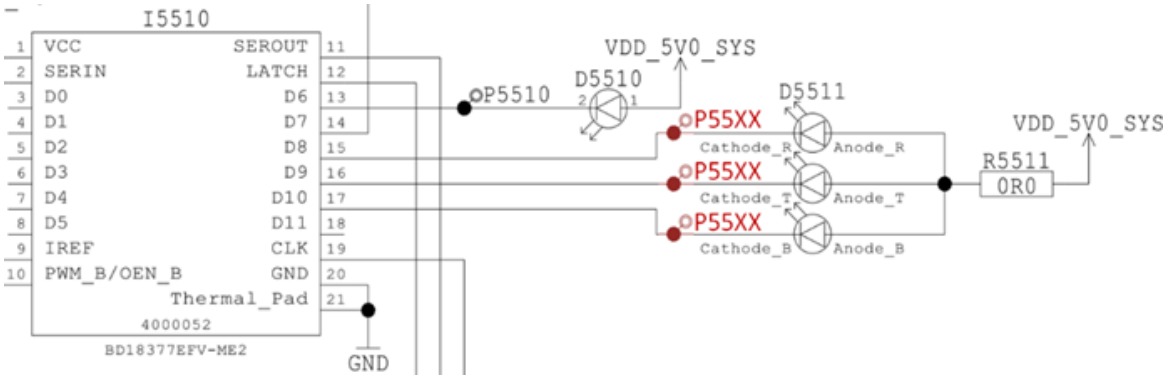

Figure 7 Schematics of RGB LED test points

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1.1.2.6 Change in PMU Shielding geometry

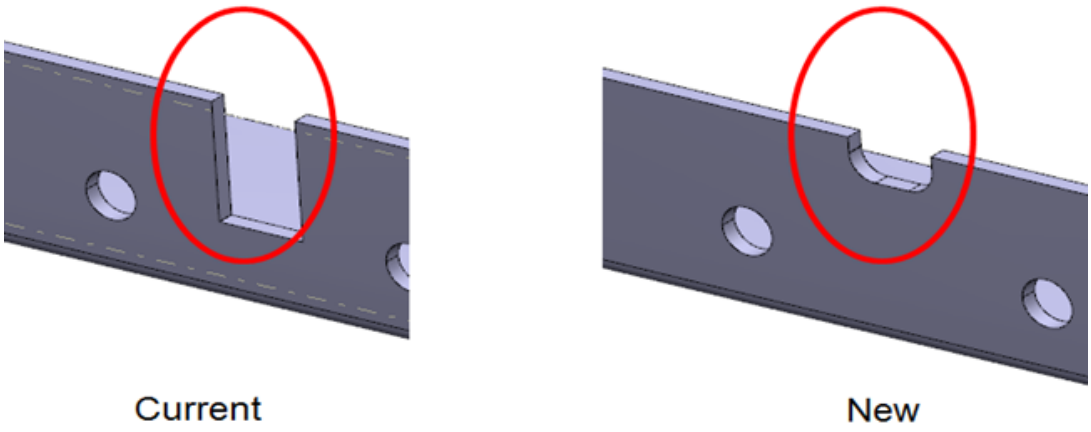

Figure 8 Drawing of change of geometry of PMU Shieldings

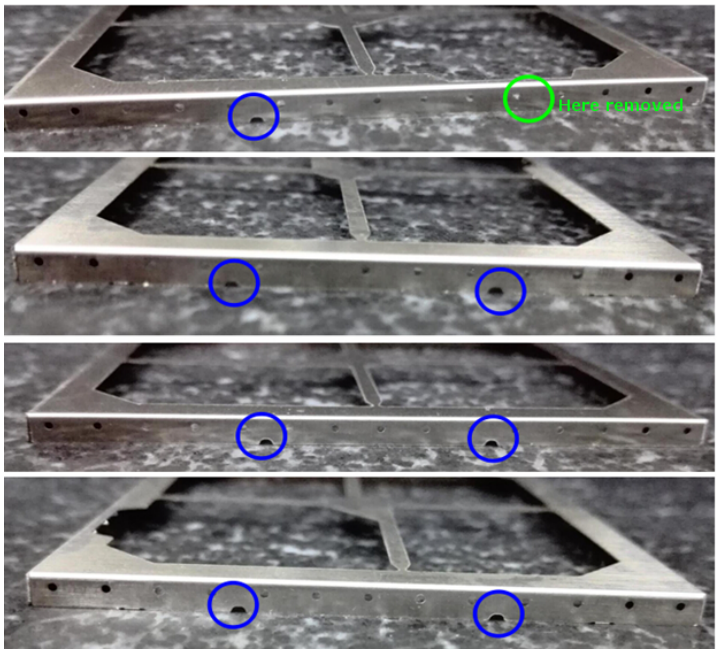

Figure 9 Pictures of change in PMU shielding geometry

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1.1.2.7 System-Crash-Prevention

Added Schottky-diode and leakage compensation to avoid that system crashes under certain conditions.

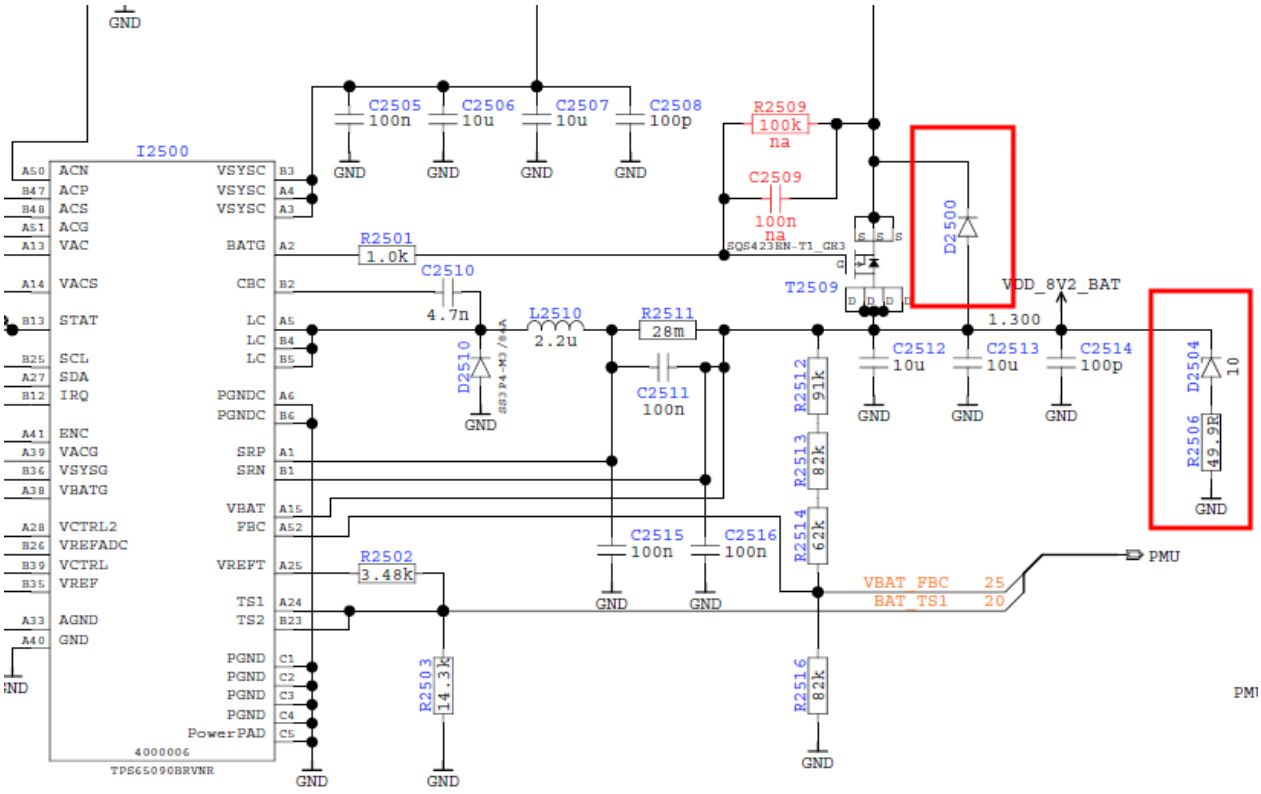

Figure 10 Components added for system crash prevention

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1.1.2.8 Termination of RX-Line

Rx (signal to VCM) line of internal debug connector is currently floating and needs to be terminated to avoid false input signals.

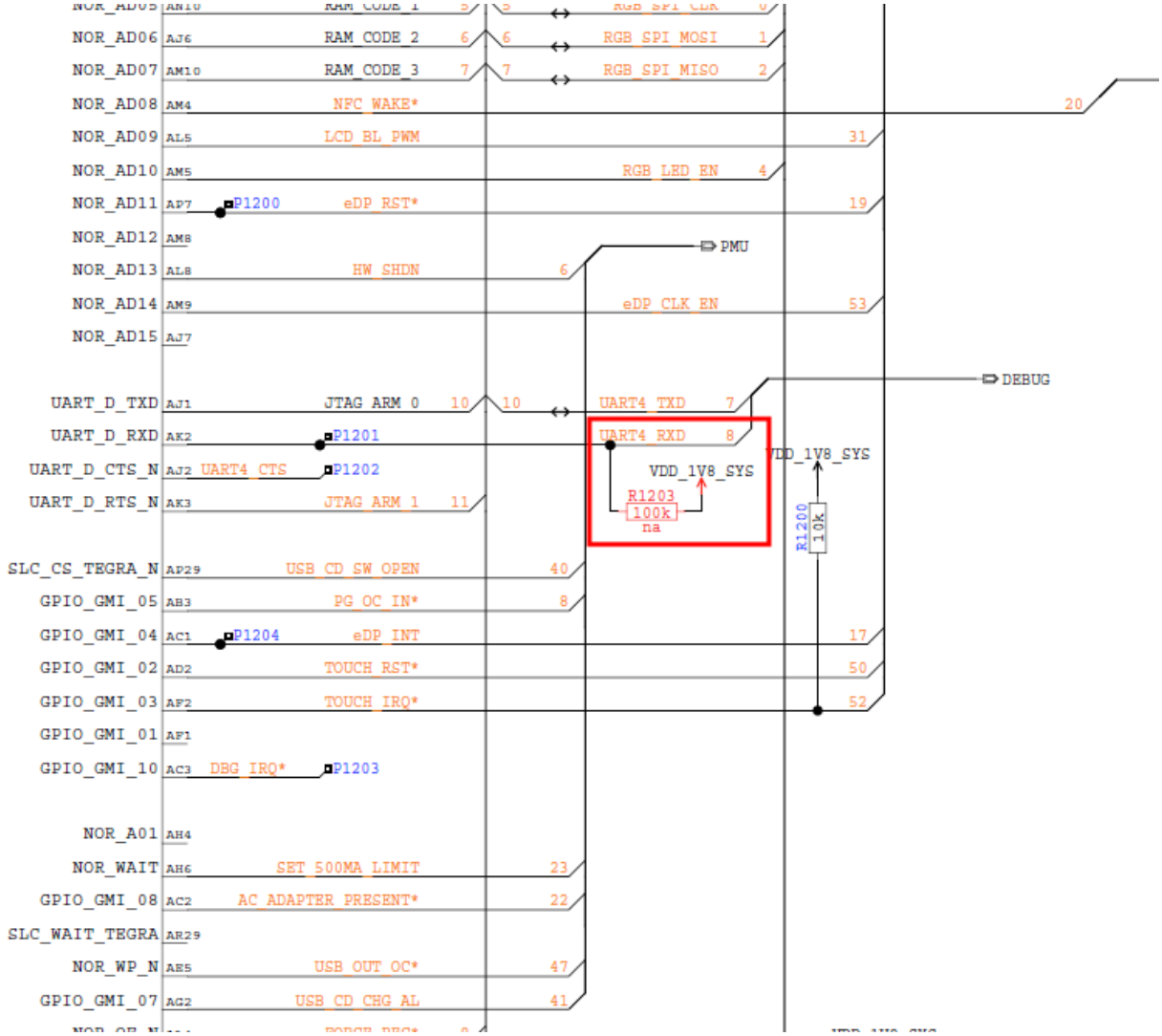

Figure 11 Component added for RX line termination

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1.1.2.9 EMC correction for radiated emissions at 750kHz

Added one capacitor to ground at each audio output line of the audio codec I6300. Capacitors to be placed after ferrites L6002, L6003, L6032, L6033 to ground. Parts to be set to not assembled.

Description of the capacitor: Capacitor 0402 470p +/-5 % 50Vdc AEC-Q200

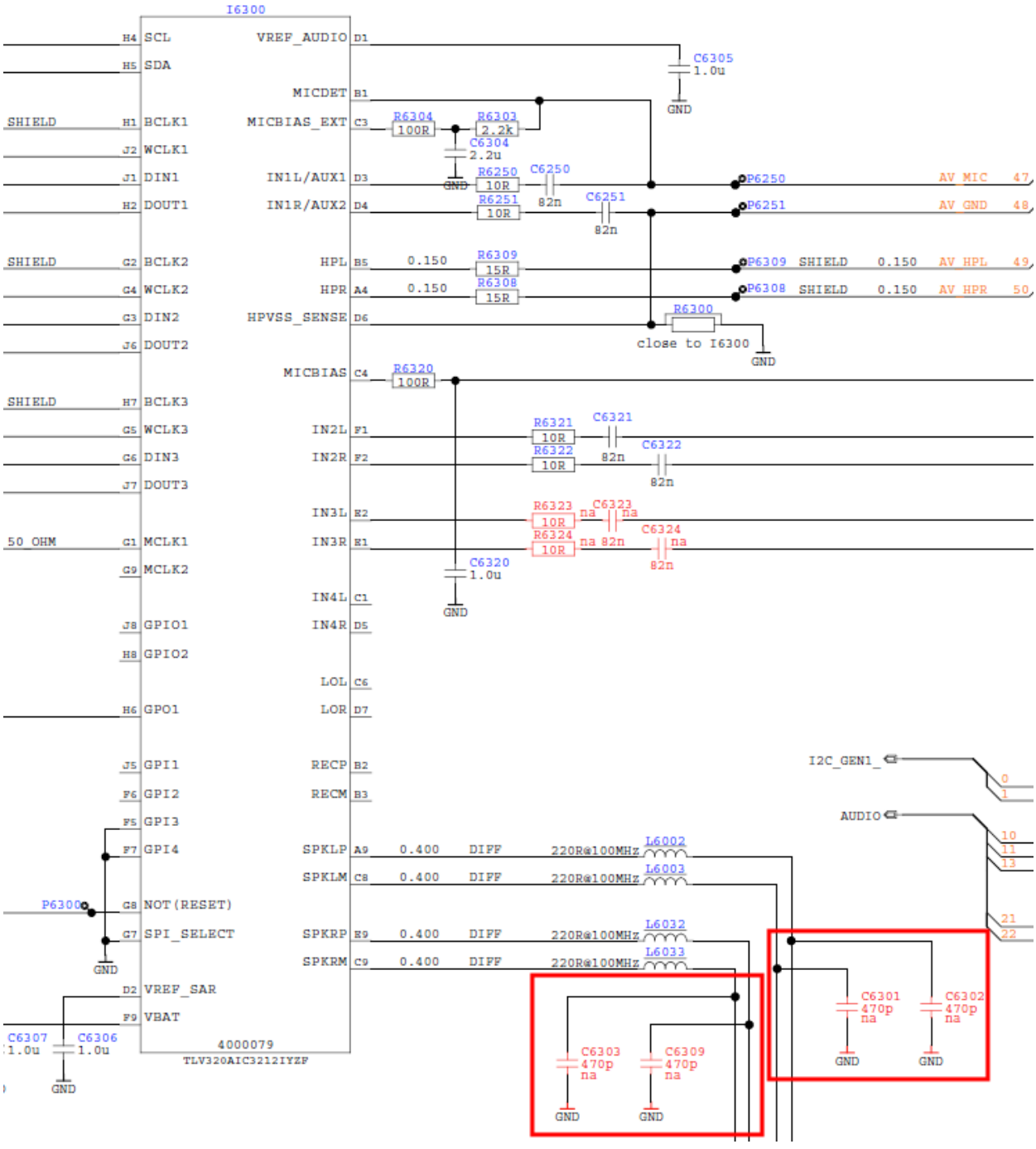

Figure 12 Components added for EMC correction at 750kHz

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1.1.2.10 Power-On-Key: HW de-bouncing for PMIC signal

Debouncing circuit to improve user experience by decreasing response time of power button press while device is being started in charger/hidden mode.

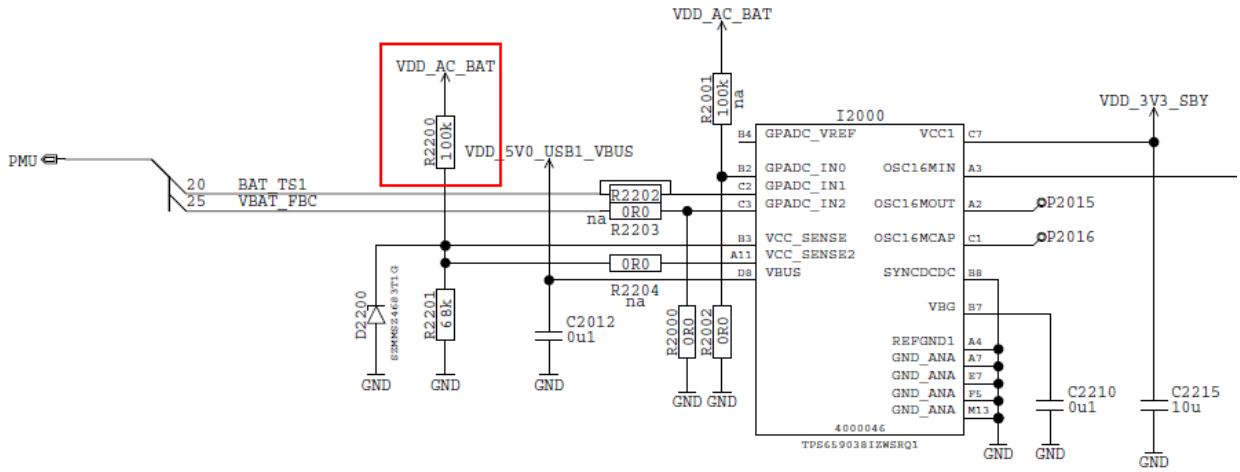

Figure 13 Schematics before change

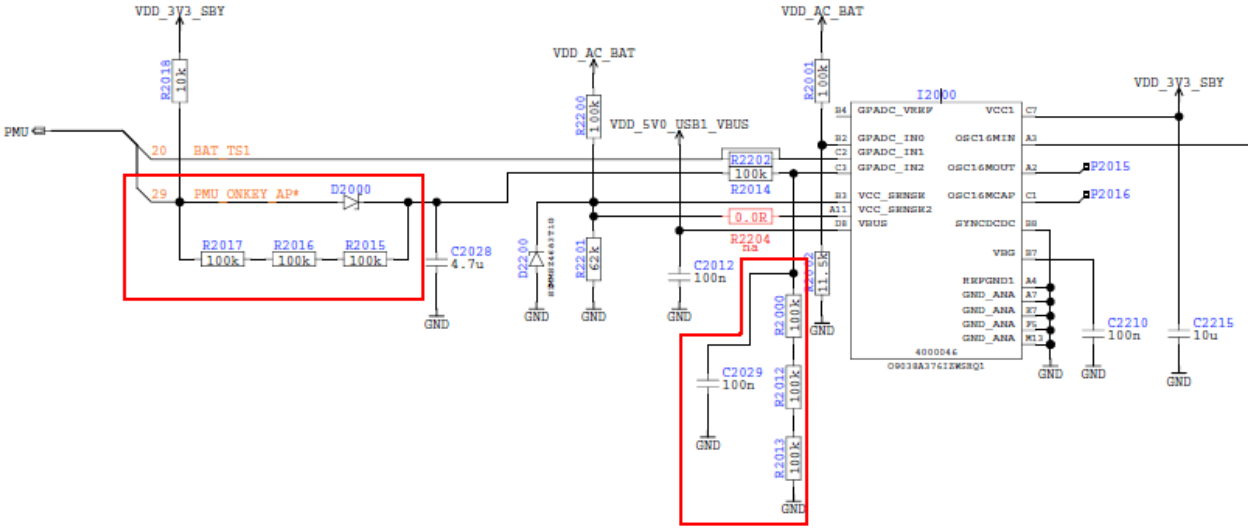

Figure 14 Schematics after change

1.1.2.11 Stabilization of USB-Charging current to 500mA

Stabilization of USB-Charging current to 500mA

Reason: Corrects a potential malfunction in USB charging mode, to allow for reliable charging with 500mA

Technical solution: One additional ground connection (via) on engine PCB.

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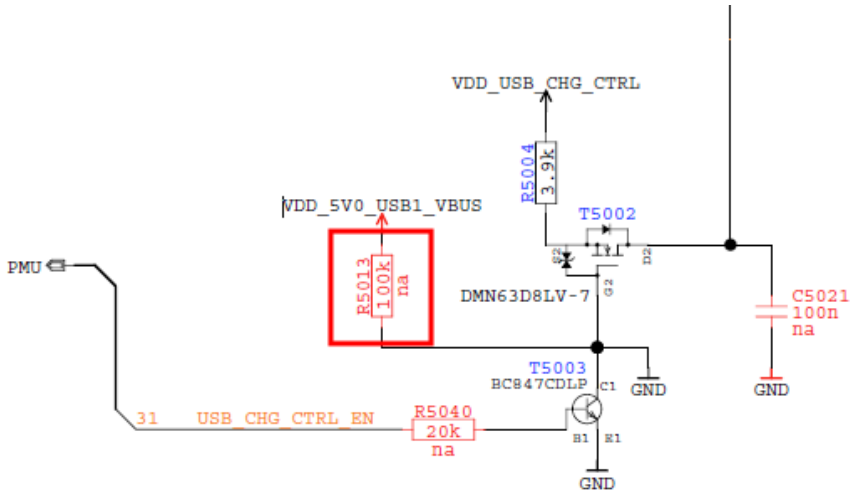

Figure 15 Schematic drawing of component added for USB-charging stabilisation

1.1.2.12 Remove one LCD Grounding Foam next to GPS side

Removal of one "LCD Grounding Foam", next to GPS Antenna. Only one Grounding Foam next to GPS side remains and is sufficient.

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1.1.2.13 Voltage undershoot correction for signal "CON_TEST_IN_SPEAKER"

Current circuitry creates unwanted voltage-undershoot, which is not allowed (could harm application processor)
Solution: Implementation of one additional capacitors on engine PWB.

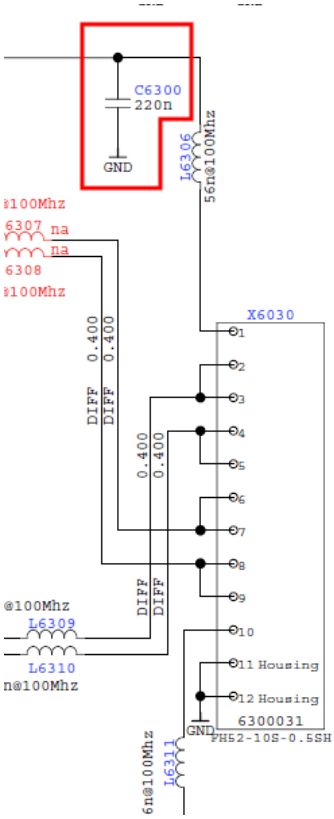

Figure 16 Voltage undershoot correction: change in schematics

Figure 17 Voltage undershoot correction: Changes on PCB

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1.1.2.14 PMIC HW-Shutdown for VSYS-Cut / component damage protection

In case of unexpected system-power-cut to PMIC, the component must be shutdown via HW trigger (NSLEEP), to prevent potential damage of the component.

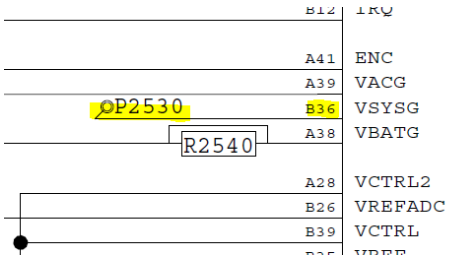

Figure 18 Schematic before change

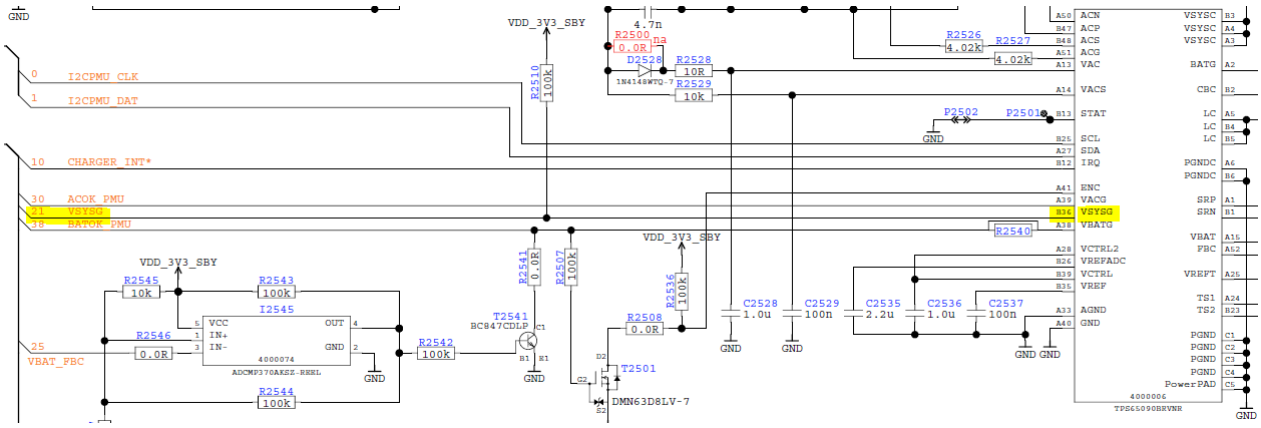

Figure 19 changed schematics for PMIC HW shutdown

1.1.2.15 USB-Mux: Reassignment of power supply

Power supply for USB-Mux (I5000) needs to be re-assigned from VDD_3V3_SBY to VDD_5V_USB1_VBUS, correct supply voltage needs to be set by resistive voltage-divider and one zener-diode.

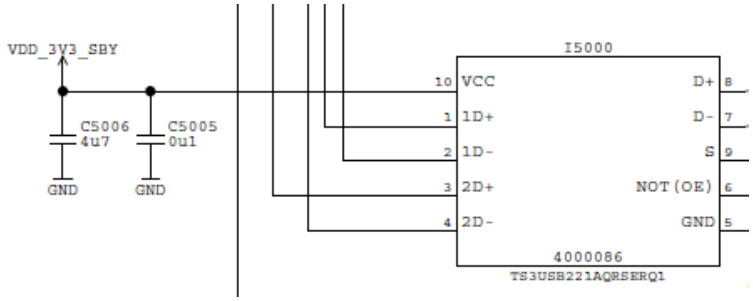

Figure 20 Schematics before change

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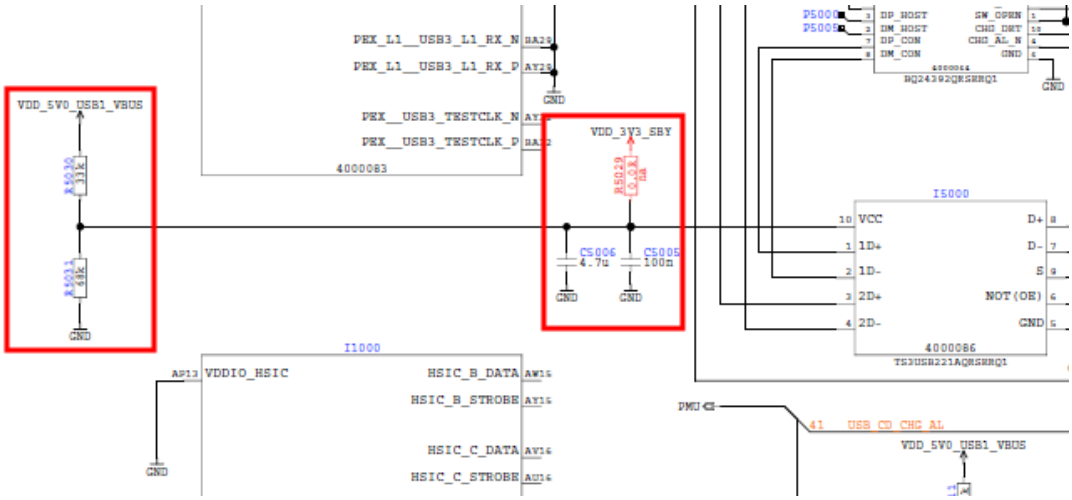

Figure 21 Schematics after change

1.1.2.16 Forced shut down for WiLink8 in case of unexpected power-cut

Wilink8 needs to be forced to shut-down (WL_EN and BT_EN pulled low by HW-Circuitry), in case of unexpected power-cut.

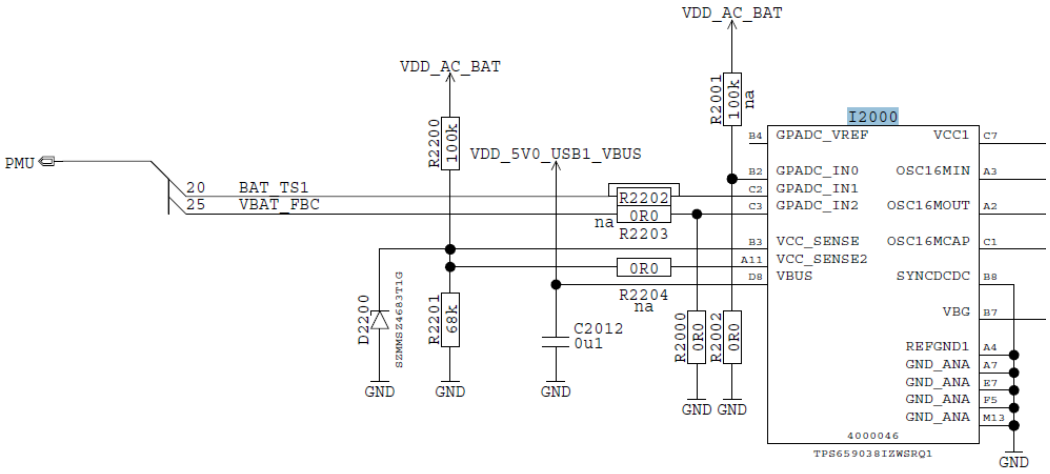

Figure 22 Schematics before change

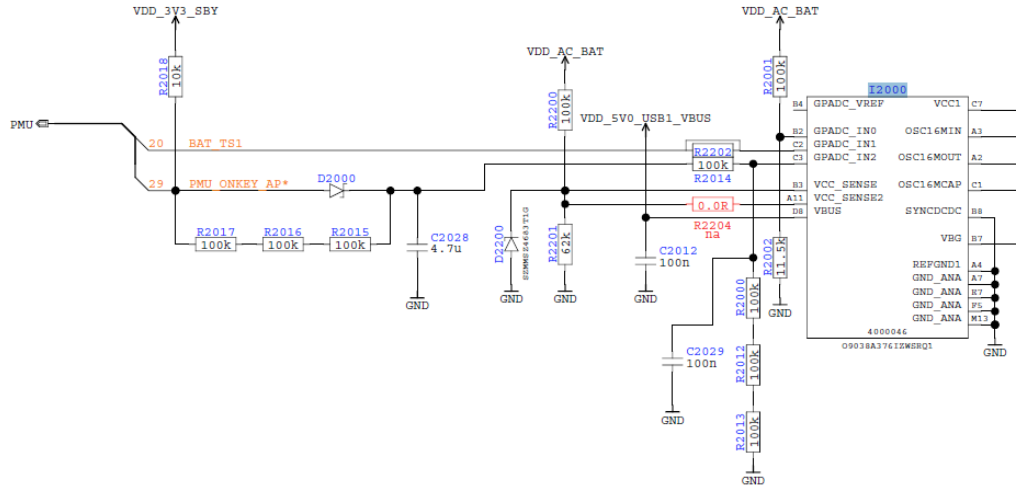

Figure 23 Schematics after change

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1.1.2.17 UART4 option on Syscon for PV

2 additional resistors 0201 0R0 Ohm Rohm MCR006YZPJ000

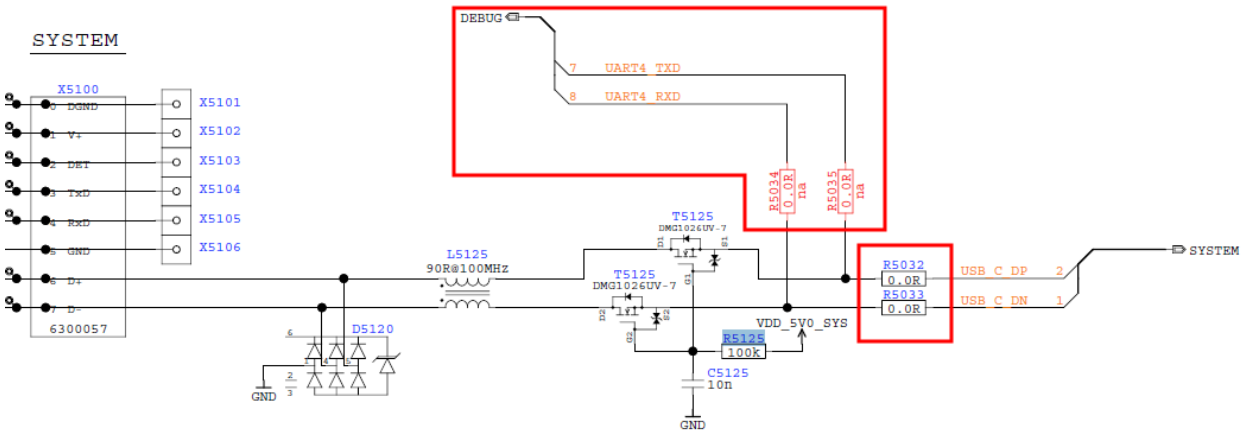

Figure 24 Changed schematics for UART4 option

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1.1.2.18 PMIC deadlock prevention

Power sequence for LDO6 input needs to be modified, in order to prevent PMIC deadlock under rare condition.

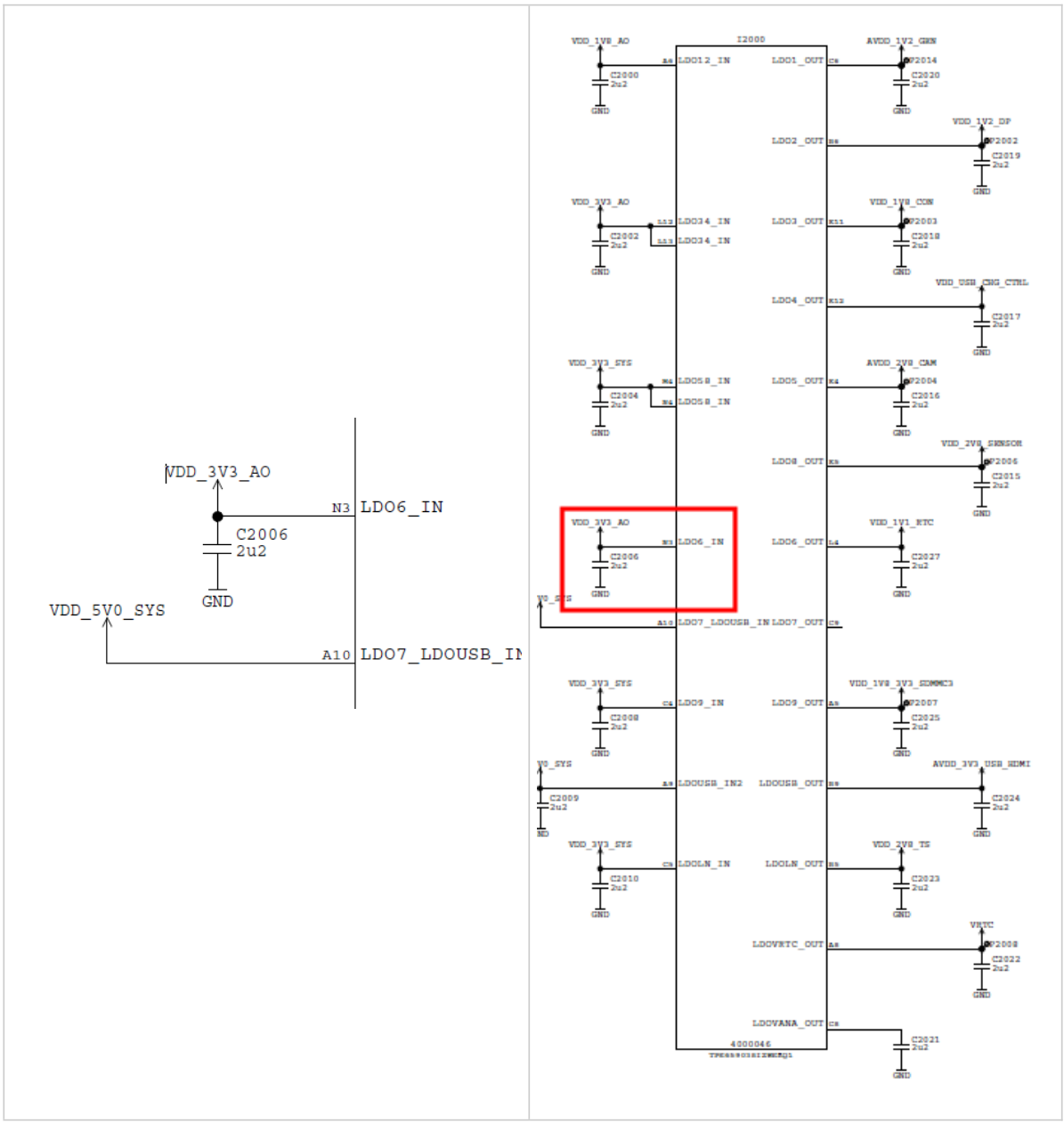

Figure 25 Detailed schematics before change

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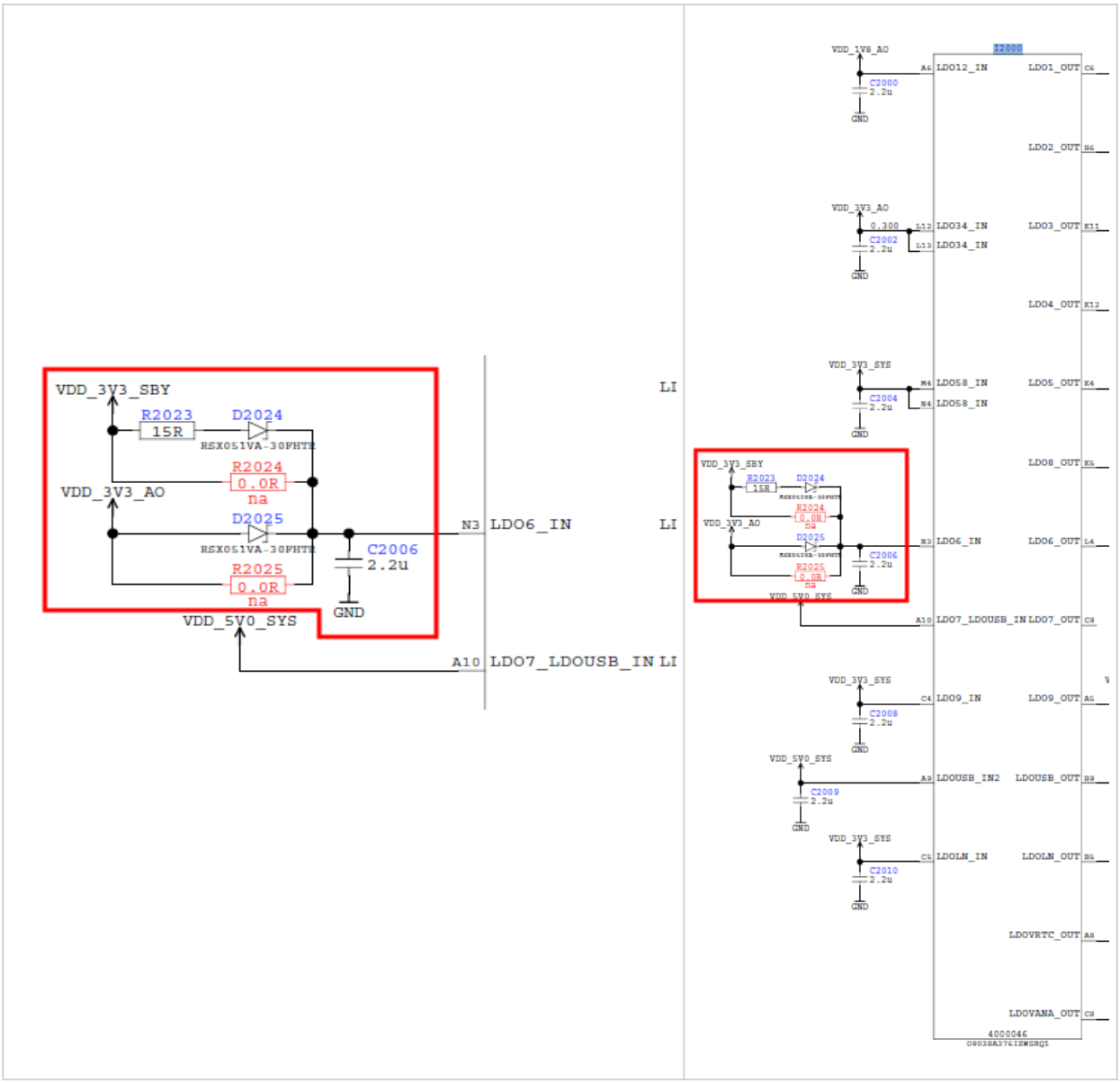

Figure 26 Detailed schematics after change

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1.1.2.19 EMI correction for emission at 156MHz, radiated by harness

Changes to Engine PCB required to add a 2n2 50V 0603 capacitor to the V+ Supply close to the system connector. Removal of 0 Ohm Resistors in Supply Lines.

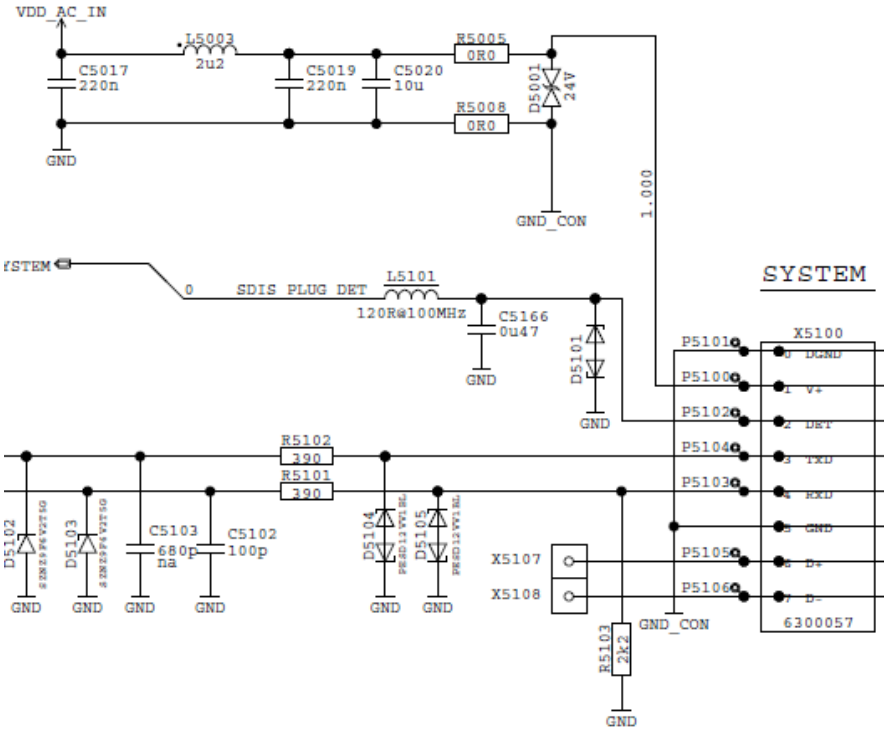

Figure 27 Schematics before change

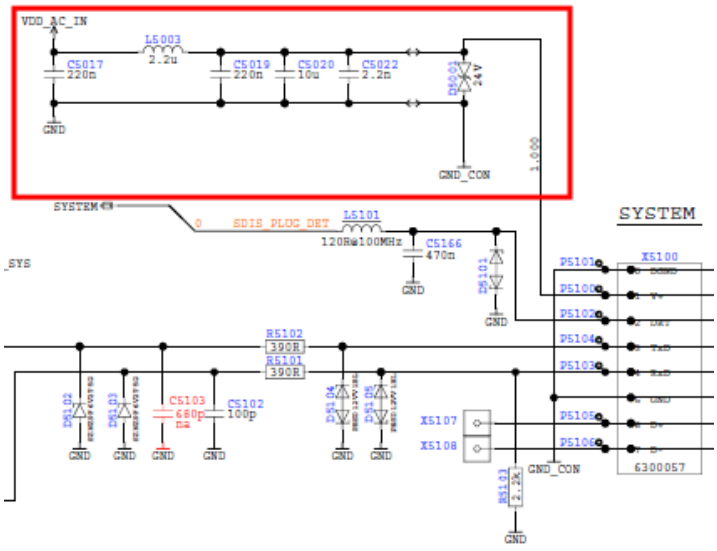

Figure 28 Schematics after change

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1.1.2.20 VCM Power sequence correction

Update for PCB and components. in order to avoid non-deterministic behavios of GPIOs after boot up and damage of of VCM after ~60k boot cycles.

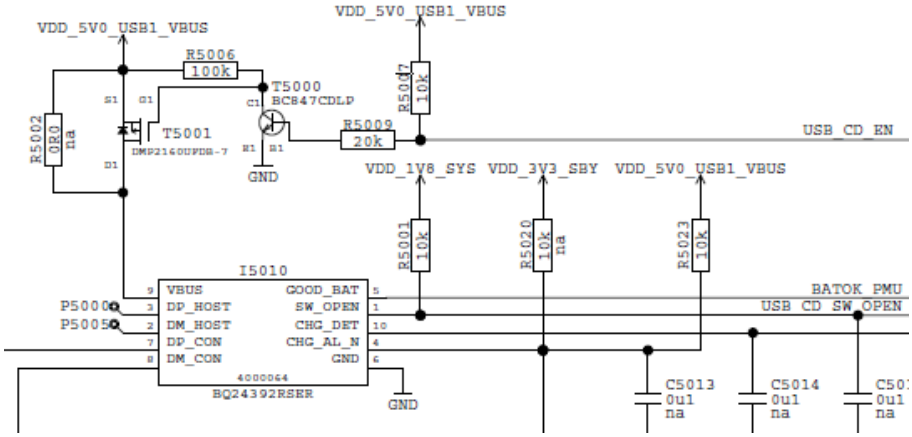

Figure 29 Schematics before change

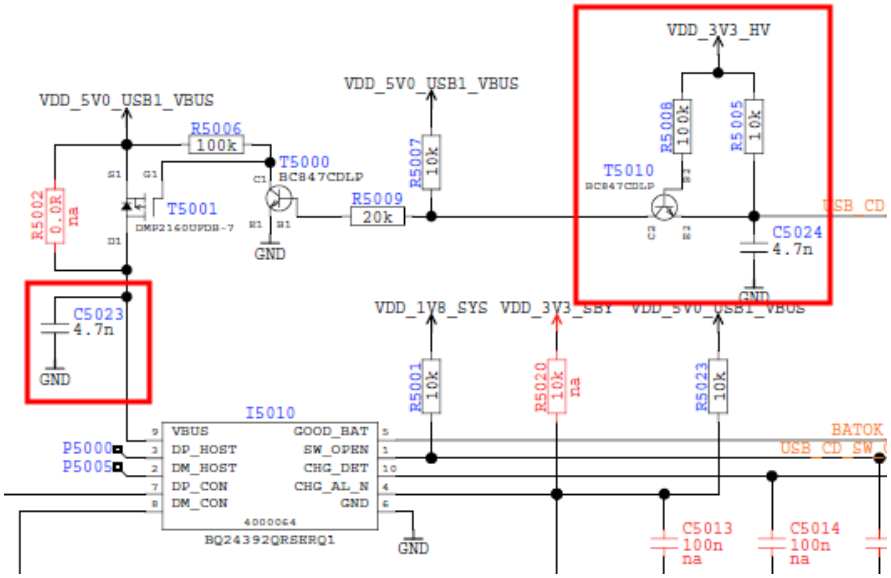

Figure 30 Schematics after change

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1.1.2.21 EMV correction for conducted emissions at 640kHz

1. The modifications shown in “M1” are incorporating a low-pass-filter, in order to optimize the conducted emissions behavior at 640 kHz
2. The low pass filter is comprising
   a. Shielded power inductor: Coilcraft XAL4020-222ME 2.2.uH
   b. Capacitor: Murata GCM188R71E224KA55D 220nF
   c. Capacitor: Murata GRM21BC81E106KE11 10uF
3. The SDIS1 passed official testing at CETECOM including this low-pass-filter

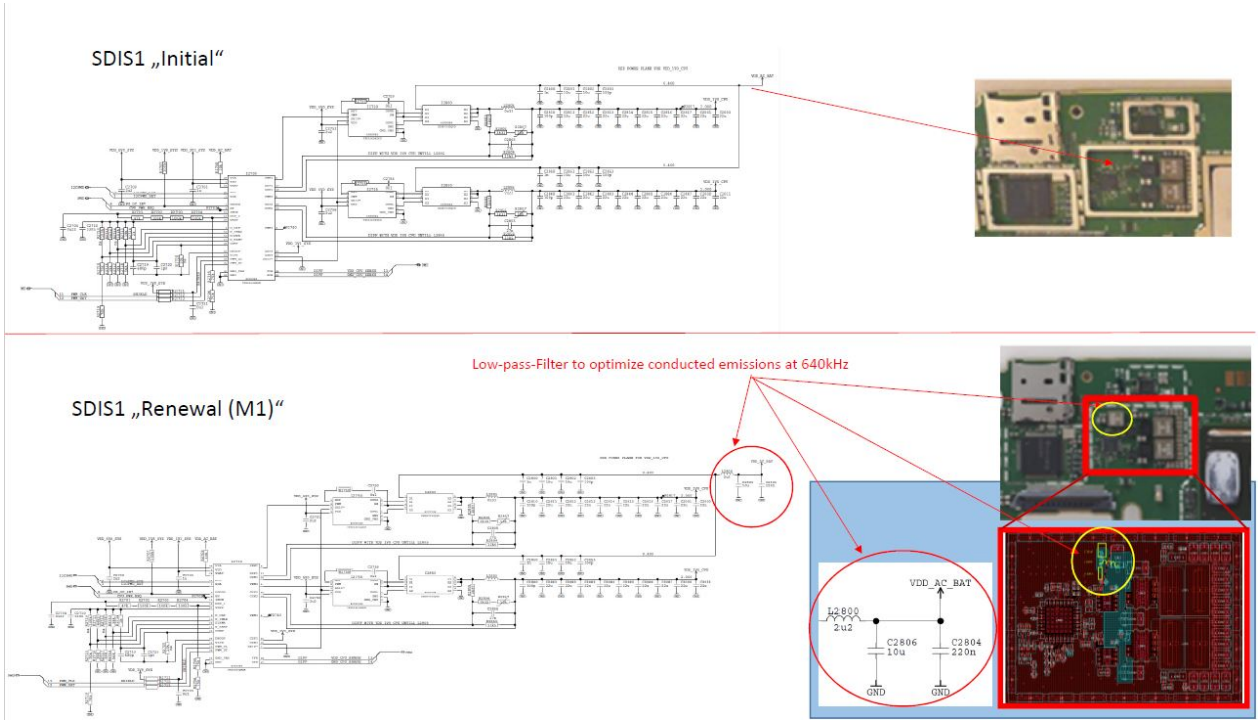

Figure 31 Comparison of schematics

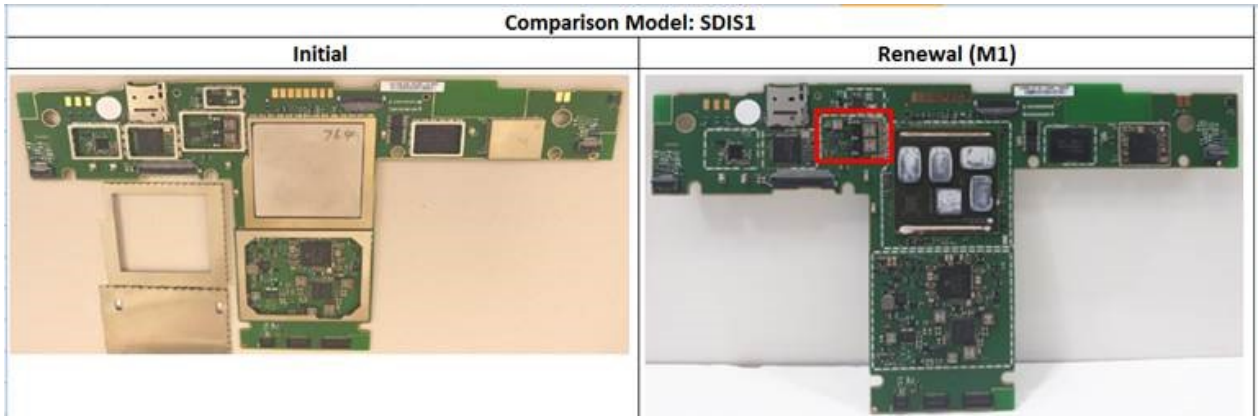

Figure 32 Pictures of PCB before and after the change

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1.1.2.22 Re-Configuration of Temperature Sensor

Added a capacitor on the DHS_WAKE*.

Component: Capacitor 0603 10u +/-20 % 10Vdc, Murata, GRM188C81A106MA73

Reason: Wake-up the system when battery power comes back with temperature decreasing after interruption at 80°C, so that TMP102 can be reconfigured via software after POR.

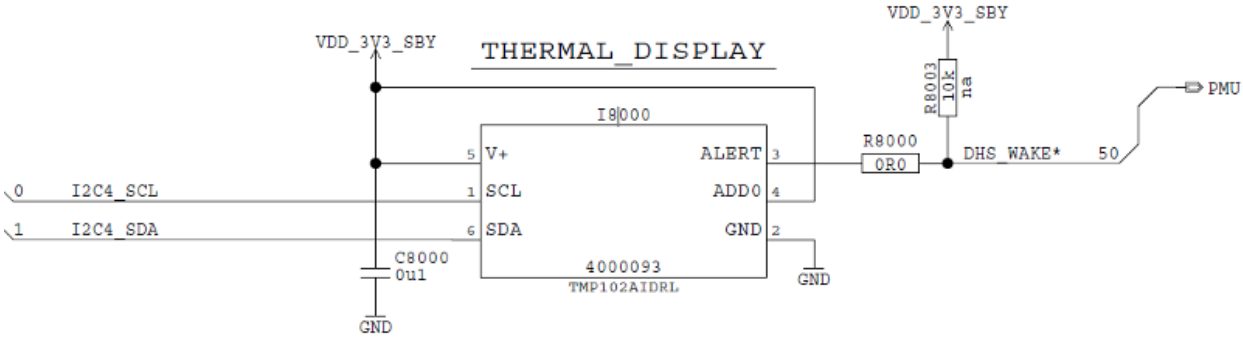

Figure 33 Schematics of Thermal Display before change

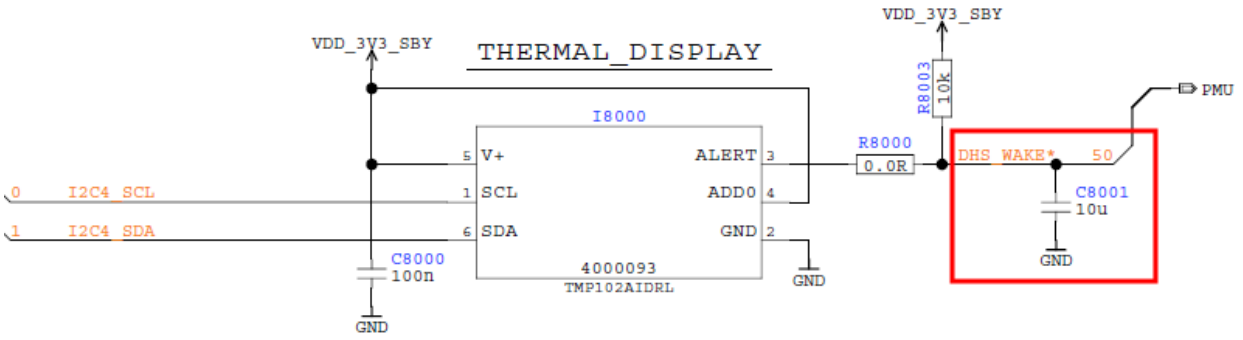

Figure 34 Schematics of Thermal Display after change

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2 Introduction of HW44

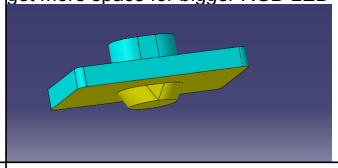
This document describes the SDIS1 Hardware changes to the previous HW version. It also concludes the certification relevant tests which are to be performed with this new HW version before product certification can be issued.

2.1 Conclusion

The information and data available by the references listed in chapter 3 have been reviewed for the HW change in question and it has been concluded that the test cases listed in the following tables are needed to assume full compliance after the change.

Certifications		Standard or Test Spec.	Test Cases to be re-tested
R&TTE	BT/WLAN	EN 300 328	No testing
	WLAN	EN 301 893 EN 300 440	No testing
	RFID (NFC)	EN 300 330	No testing
	GPS	EN 300 440	No testing
	Safety, LVD	EN 60950	No testing
	Health, SAR	EN 60209	No testing
EMC	BT/WLAN	EN 301 489-1 EN 301 489-17	No testing
	RFID	EN 301 489-1 EN 301 489-3	No testing
	GPS	EN 301 489-1	No testing
FCC/IC		CFR 47 Part 2	No testing
		CFR 47 Part 15B/C	No testing
		RSS-Gen/-102/-210	No testing
Japan	Business Law	-	No testing
	Radio Law	-	No testing
China	SRRC, CCC	-	No testing
Other countries		-	No testing
BT Qualification		BT SIG Profiles	reuse of QDID B019990 and testing as defined by BQE
		BT SIG Protocol and core	covered by QDID B019990 and 58354
		BT SIG RF	No testing
WLAN		WiFi Alliance	No testing
USB		USB.org	No testing
NFC		NFC Forum	No testing

2.2 Change details for new HWID 44

#	Affected Area	Change description	Expert opinion	Cetecom review
1	RGB light-guide: Update	Changed thickens of RGB lightguide to get more space for bigger RGB-LED 	Uncritical, only change in plastic part	12.05. 16, Cetecom, No testing
2	RGB LED: Changed from Osram to Everlight	The new RGB-LED has a chan-ged Footprint and therefore the PWB has been adjusted.	Uncritical, no influence to EMC behavior. The expert opinion is that the	25.10.16, Cetecom, No testing

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			layout changes are marginal and therefore the EMC behavior is the same.	
3	Nvidia VCM	Solder ball supplierchange from SPIL to TSMC	Uncritical, Solder balls identical from mechanical and electrical point of view. No influence on EMC behaviour.	12.05. 16, Cetecom, No testing
4	Loudspeaker	Replacement for Grand Speaker (supplier / part not finally decided yet)	Uncritical: Loudspeaker has same performance and is identical to the Grand Speaker currently in use. R&D Antenna performance measurements of one supplier showed small improvements of the Antenna.	12.05. 16, Cetecom, No testing in case no influence of Antenna performance
5	Volume Key PCB cut out removal	SDIS_HW44_V2_ChangeDocument.pptx	R&D Anntenna measurements are done and no changes in antenna performance seen	12.05. 16, Cetecom, No testing
6	Display	Changed ESR80 reflector foil inside the Innolux Display near the Aluminium backside		12.05. 16, Cetecom, No testing
7	Nvidia VCM	Nvidia VCM (DRAM, Automotive-Resistors, Bump-Site). 7_1.pdf 7_2.pdf 7_3.pdf	Uncritical, no influence to EMC behaviour: • DRAM: Is part of VCM and below EMC shielding. • Automotive-Resistors: not certification relevant identical component values Bump Site: not certification relevant, only relocation of the processes for application of solder balls on the Processor-Die	20.07.16, Cetecom, No testing
8	Mass storage system	eMMC changed from Hynix 4.5 to Samsung 5.0	Uncritical, no influence to EMC behaviour: - Influence improbable because mass storage under own EMC-Shield - supply conductors are completely burrowed routed	04.11.2015, Cetecom, No testing

Mass storage system

	Old				NEW			
Ref-Des	**PartName**	**Description**	**Supplier**	**Supplier code**	**PartName**	**Description**	**Supplier**	**Supplier code**
I3000	4000174	32GB eMMC 5.0	Hynix	H26M64103EMRA	4000208	Automotive eMMC 5.0 32GB	Samsung	KLMBG4GESD-B03P017

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3 Introduction of HW46

The information and data available by the references listed in chapter 2 have been reviewed for the HW change in question and it has been concluded that the test cases listed in the following tables are needed to assume full compliance after the change.

3.1 Conclusion

Certifications		Standard or Test Spec.	Test Cases to be re-tested
R&TTE	BT/WLAN	EN 300 328	No testing
	WLAN	EN 301 893 EN 300 440	No testing
	RFID (NFC)	EN 300 330	No testing
	GPS	EN 300 440	No testing
	Safety, LVD	EN 60950	No testing
	Health, SAR	EN 60209	No testing
EMC	BT/WLAN	EN 301 489-1 EN 301 489-17	No testing
	RFID	EN 301 489-1 EN 301 489-3	No testing
	GPS	EN 301 489-1	No testing
FCC/IC		CFR 47 Part 2	
		CFR 47 Part 15B/C	
		RSS-Gen/-102/-210	
Japan	Business Law	-	No testing
	Radio Law	-	No testing
China	SRRC, CCC	-	
Other countries		-	
BT Qualification		BT SIG Profiles	reuse of QDID B019990 and testing as defined by BQE
		BT SIG Protocol and core	covered by QDID B019990 and 58354
		BT SIG RF	
WLAN		WiFi Alliance	No testing
USB		USB.org	No testing
NFC		NFC Forum	No testing

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3.2 Change Details for new HW46

3.2.1 Description

#	Affected Area	Change description	Expert opinion	Cetecom review
1	NFC	Removal of NFC functionality: Remove of NFC chip I9500 and related components; remove of NFC Antenna in Window Carrier Assy	no impact	

3.2.2 Details

3.2.2.1 Parts List

The following components are set to not assembled

I9500	NFC controller BCM20792M QFN32
I9510	Crystal Unit XTAL 26 MHz
C9500	Capacitor 0201 0u1 +/-10 % 6,3Vdc
C9502	Capacitor 0402 1u +/-10 % 16Vdc
C9503	Capacitor 0201 1n +/-10 % 25Vdc
C9504	Capacitor 0201 10n +/-10 % 10Vdc
C9505	Capacitor 0201 1n +/-10 % 25Vdc
C9506	Capacitor 0402 4u7 +/-20 % 6,3Vdc
C9507	Capacitor 0402 4u7 +/-20 % 6,3Vdc
C9508	Capacitor 0402 4u7 +/-20 % 6,3Vdc
C9510	Capacitor 0201 12p +/-5 % 25Vdc
C9511	Capacitor 0201 12p +/-5 % 25Vdc
C9515	Capacitor 0402 1u +/-10 % 16Vdc
C9550	Capacitor 0402 180p +/-2 % 50Vdc
C9551	Capacitor 0402 68p +/-2 % 50Vdc
C9552	Capacitor 0402 100p +/-1 % 50Vdc
C9553	Capacitor 0402 33p +/-2 % 50Vdc
C9554	Capacitor 0402 2p0 +/-0.1p % 50Vdc
C9560	Capacitor 0402 180p +/-2 % 50Vdc
C9561	Capacitor 0402 68p +/-2 % 50Vdc
C9562	Capacitor 0402 100p +/-1 % 50Vdc
C9563	Capacitor 0402 33p +/-2 % 50Vdc
C9564	Capacitor 0402 2p0 +/-0.1p % 50Vdc
L9550	Wire Wound Magnetic Type for Choke–LQW18C 330nH@10MHz Henry +/-5
L9560	Wire Wound Magnetic Type for Choke–LQW18C 330nH@10MHz Henry +/-5
R9515	Resistor 0201 4k7 Ohm +/-5 %
R9516	Resistor 0201 4k7 Ohm +/-5 %
R9553	Resistor 0603 1R5 Ohm +/-5 %
R9563	Resistor 0603 1R5 Ohm +/-5 %
X9500	Shielding Frame 9.46 x 15.40
X9553	C-Clip uncompressed 1.6mm height
X9563	C-Clip uncompressed 1.6mm height

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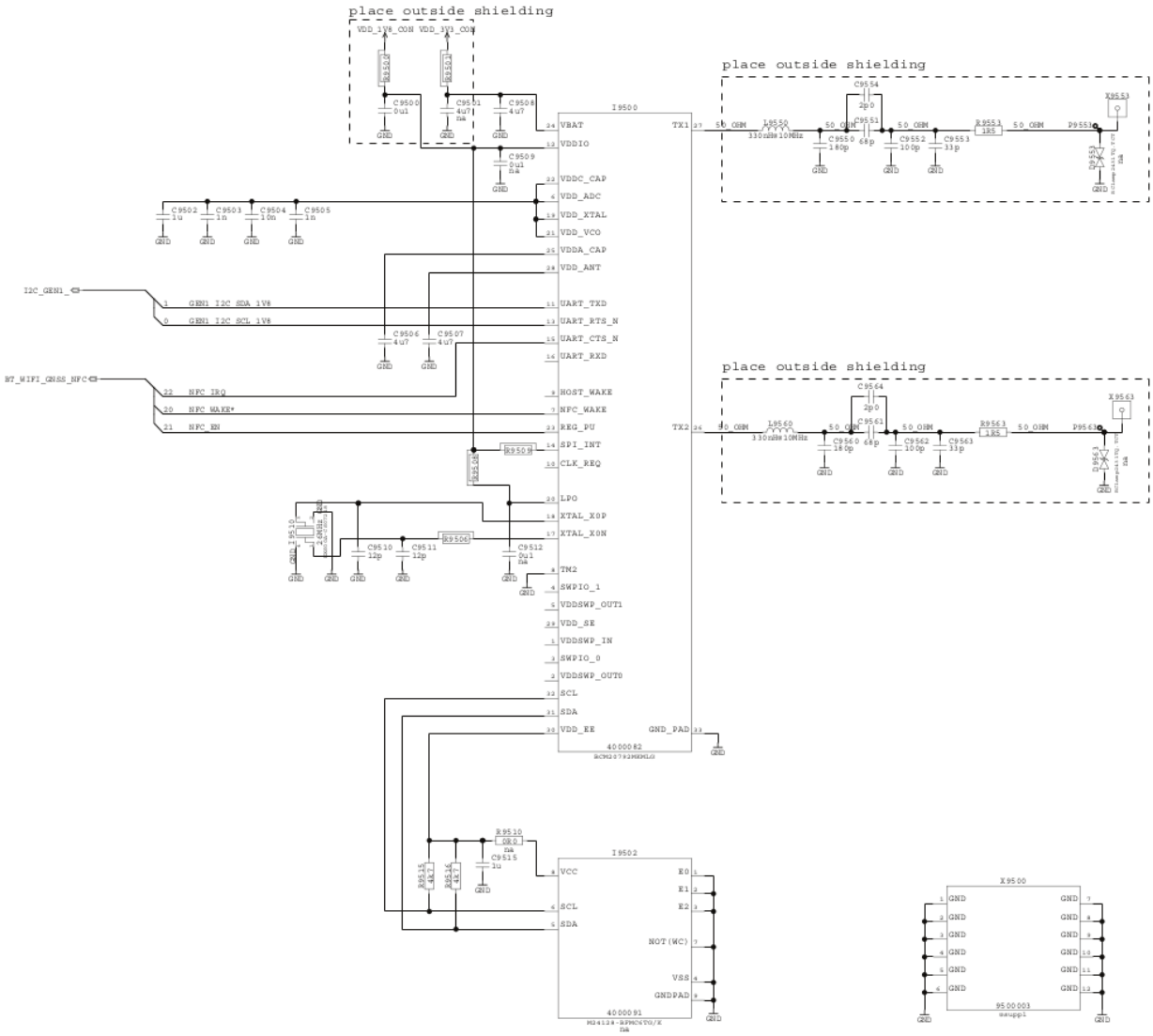
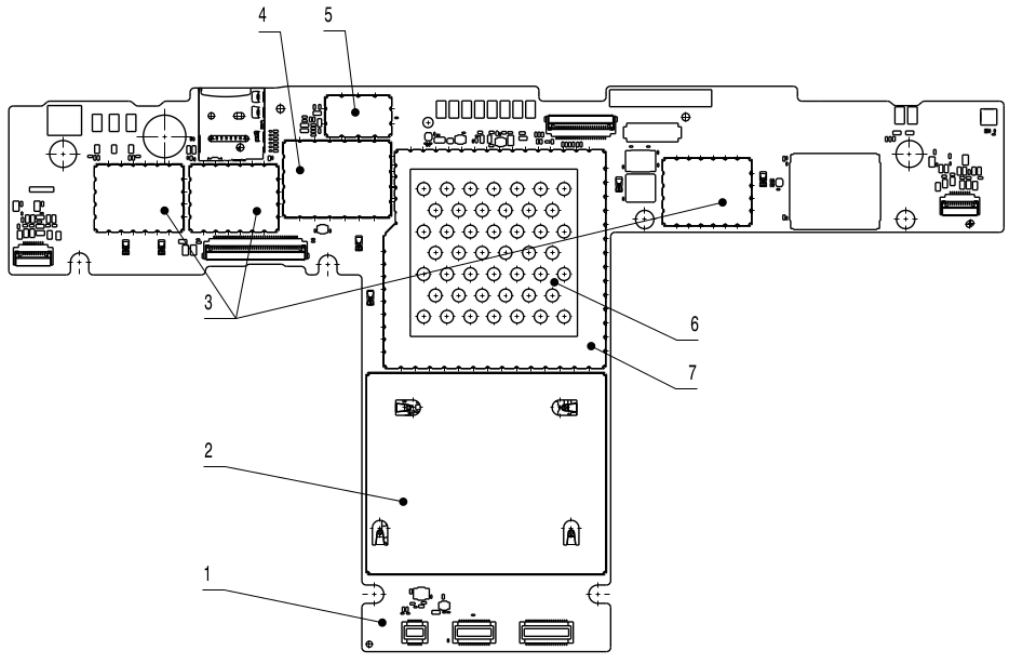
3.2.2.2 Schematics

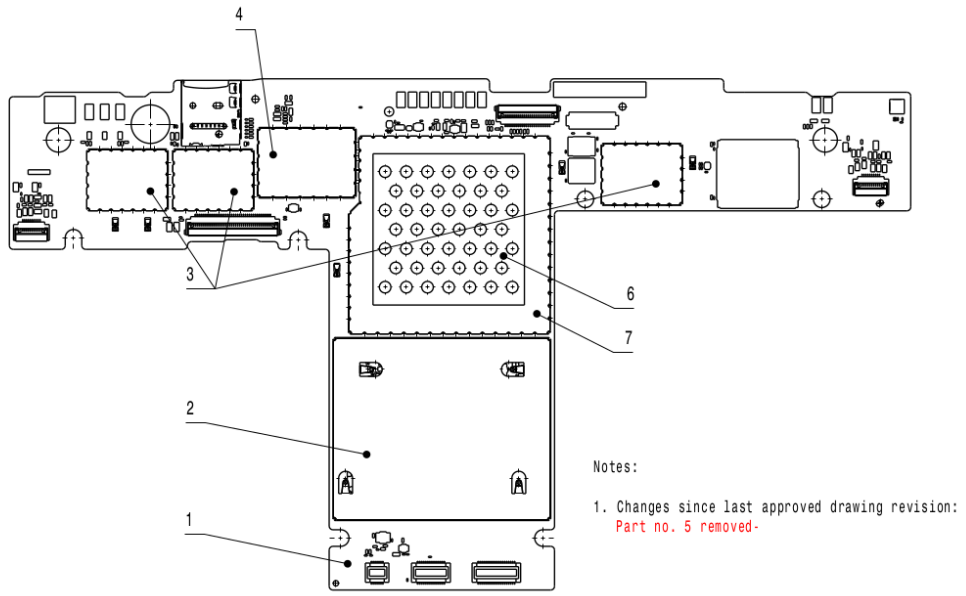


3.2.2.3 PCB Placement



Part No.	Code	Name	Qty.	Note
7	9500010	Shielding Lid 52 x 51.1	1	
6	9400059	Copper Foil VCM	1	
5	9500007	Shielding Lid 9.5 x 15.4	1	
4	9500006	Shielding Lid 17.9 x 25.2	1	
3	9500012	Shielding Lid 20.7 x 15.65	3	
2	9500005	Shielding Lid 47.1 x 56.1	1	
1	8800001	SDIS1 Engine PCB Module assembled	1	

Figure 35 : PCB Placement HW44



Part No.	Code	Name	Qty.	Note
7	9500010	Shielding Lid 52 x 51.1	1	
6	9400059	Copper Foil VCM	1	
5	-	-	-	
4	9500006	Shielding Lid 17.9 x 25.2	1	
3	9500012	Shielding Lid 20.7 x 15.65	3	
2	9500005	Shielding Lid 47.1 x 56.1	1	
1	8800001	SDIS1 Engine PCB Module assembled	1	

Figure 36 : PCB Placement HW46

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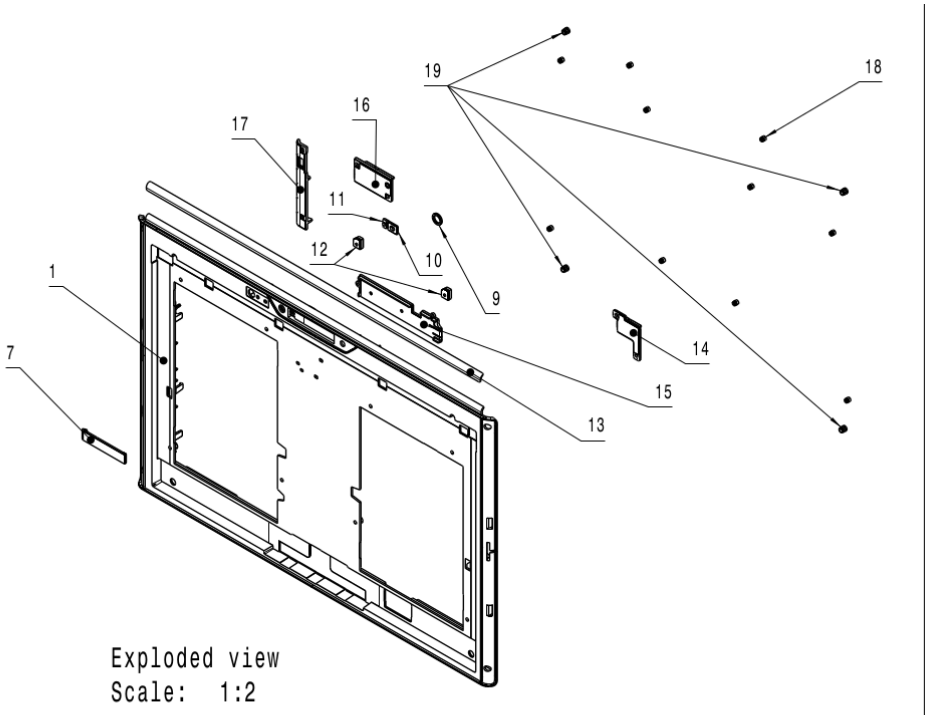
3.2.2.4 Window Carrier Assy



Part No.	Code	Name	Qty.	Note
20	-	-	-	
19	9800002	Insert M2X3	4	
18	9800010	Insert M1.4	10	
17	9300004	GPS Antenna Subassy	1	
16	9300002	WIFI1 Antenna Subassy	1	
15	9300001	NFC Antenna Subassy	1	
14	9300003	WIFI2 Antenna Subassy	1	
13	9400030	Dust Foam	1	see note 2.
12	9400018	Mic Foam middle	2	see note 2.
11	9100054	LED Lightguide Subassy	1	
10	9100053	RGB Lightguide Subassy	1	
9	9400009	Camera Gasket	1	see note 2.
8	-	-	-	
7	9100007	Logo Lightguide Subassy	1	
6	-	-	-	
5	-	-	-	
4	-	-	-	
3	-	-	-	
2	-	-	-	
1	9100005	Window Carrier	1	

Figure 37 : Window Assy HW44

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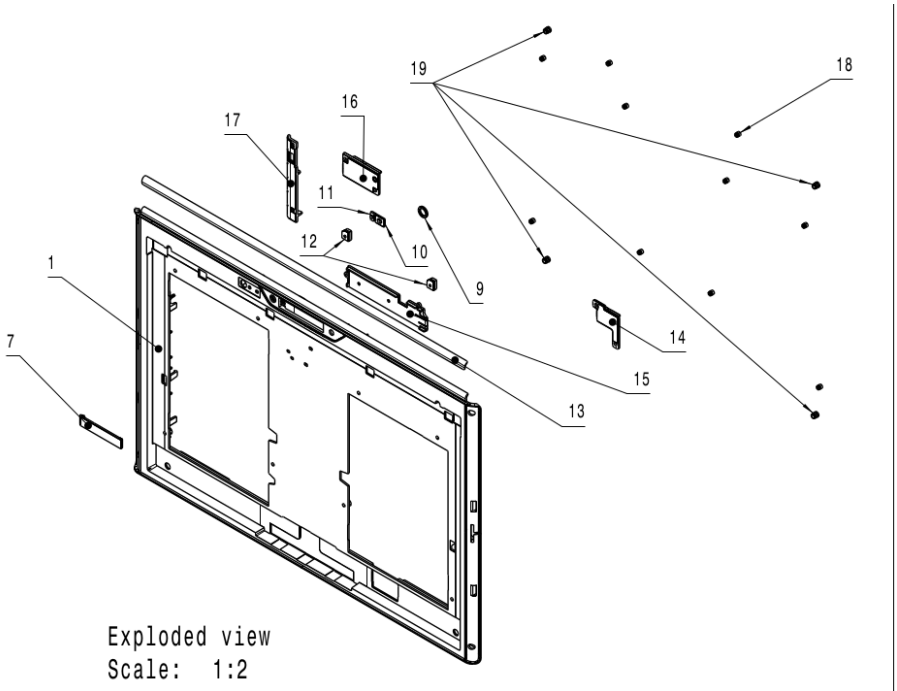

Part No.	Code	Name	Qty.	Note
20	-	-	-	
19	9800002	Insert M2X3	4	
18	9800010	Insert M1.4	10	
17	9300004	GPS Antenna Subassy	1	
16	9300002	WIFI1 Antenna Subassy	1	
15	9300001	NFC Antenna Subassy	1	
14	9300003	WIFI2 Antenna Subassy	1	
13	9400030	Dust Foam	1	see note 2.
12	9400018	Mic Foam middle	2	see note 2.
11	9100054	LED Lightguide Subassy	1	
10	9100053	RGB Lightguide Subassy	1	
9	9400009	Camera Gasket	1	see note 2.
8	-	-	-	
7	9100007	Logo Lightguide Subassy	1	
6	-	-	-	
5	-	-	-	
4	-	-	-	
3	-	-	-	
2	-	-	-	
1	9100005	Window Carrier	1	

Figure 38 : Window Assy HW46

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