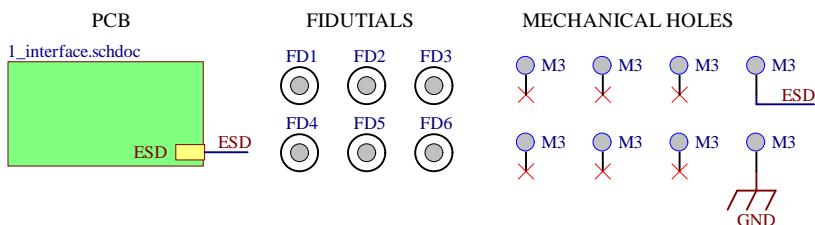


Rev	Description	Date	Author
0.5	- Updated templates. - Added missing schematic to layout elements. - Updated PC-104 interface. - Reviewed circuits and architecture.	26-Aug-2020	Andre M. P. Mattos
0.7	- Updated SpaceLab logo, added FRAM memory, updated resistor values for system leds, fixing non-connected CS memory pin and added test point to RTCCLK MCU pin.	04-Jun-2021	Andre M. P. Mattos

### Revision History

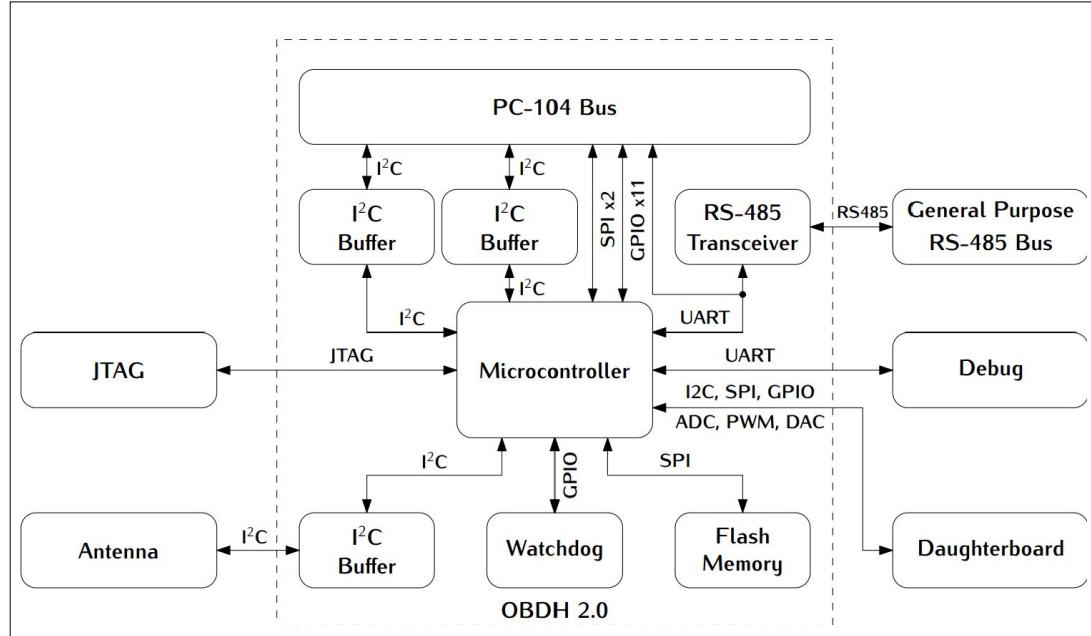


### PCB Elements

OBDH2 Hardware:

- Drawn by: André M. P. Mattos
- Reviewers: Cezar A. Rigo, Kleber Gouveia and Yan C. Azeredo
- Based on FloripaSat-I OBDH designed by: Sara V. Martinez
- Support: Gabriel M. Marcelino

### Project Contributions



### Block Diagram

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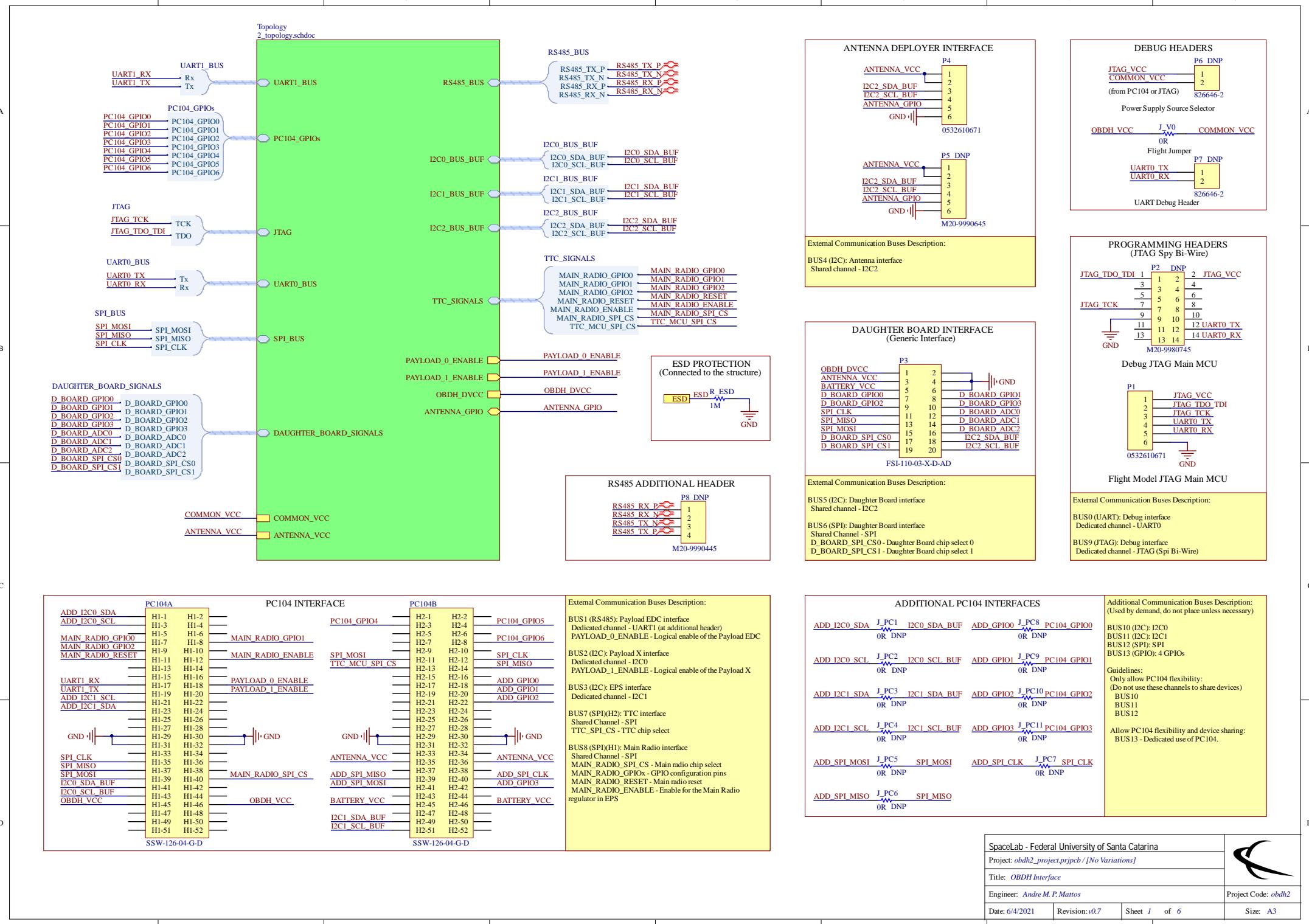
OBDH2 Hardware  
Based on the FloripaSat-I OBDH 2.0

This work is licensed under the CERN-OHL-S Open Hardware License version 2.  
To view a copy of this license, visit <https://ohwr.org/project/cernohl/wikis/Documents/CERN-OHL-version-2>.

Github repository: <https://github.com/spacelab-ufsc/obdh2>  
More info about SpaceLab: <https://spacelab.ufsc.br/>

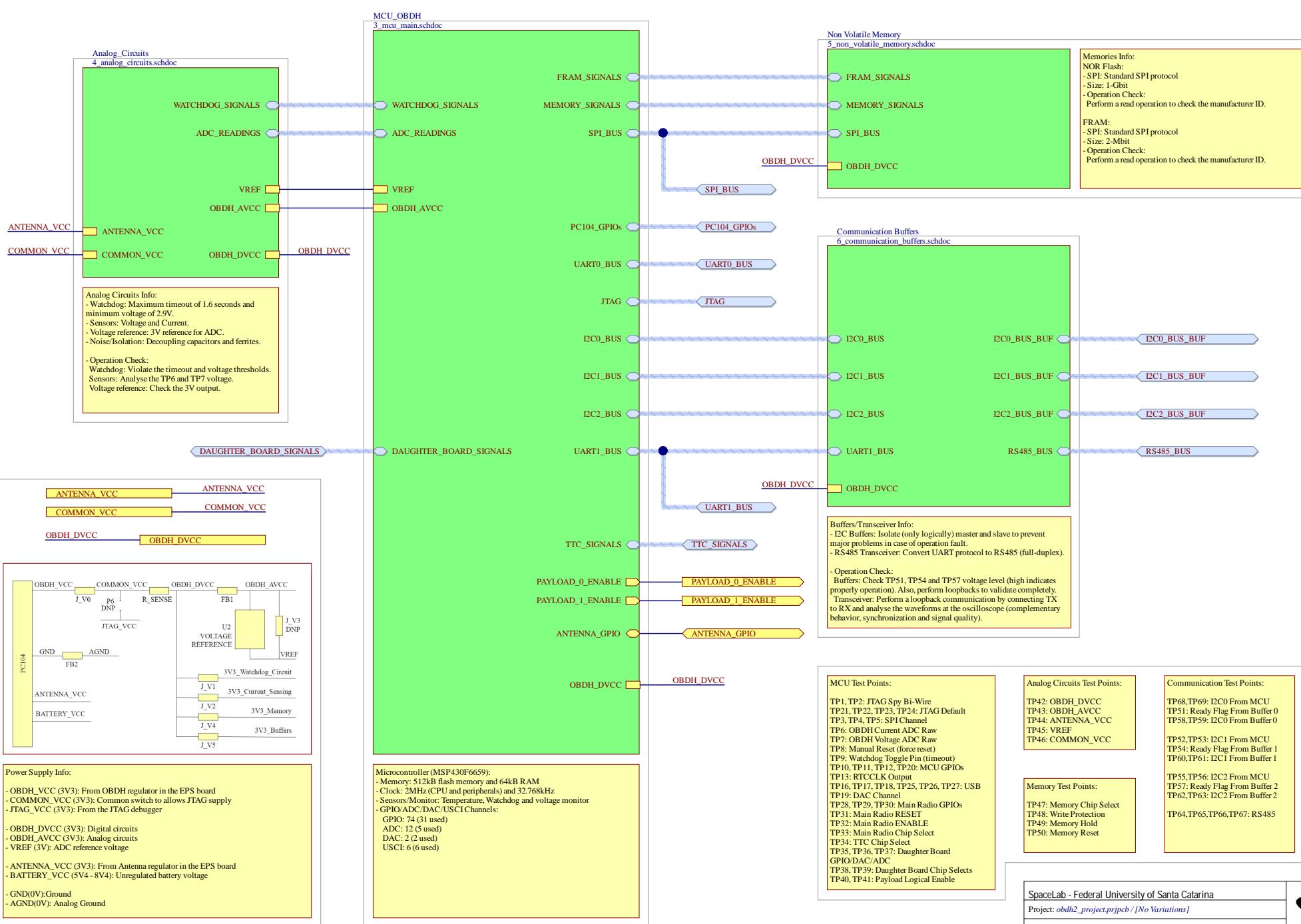
### Project Information

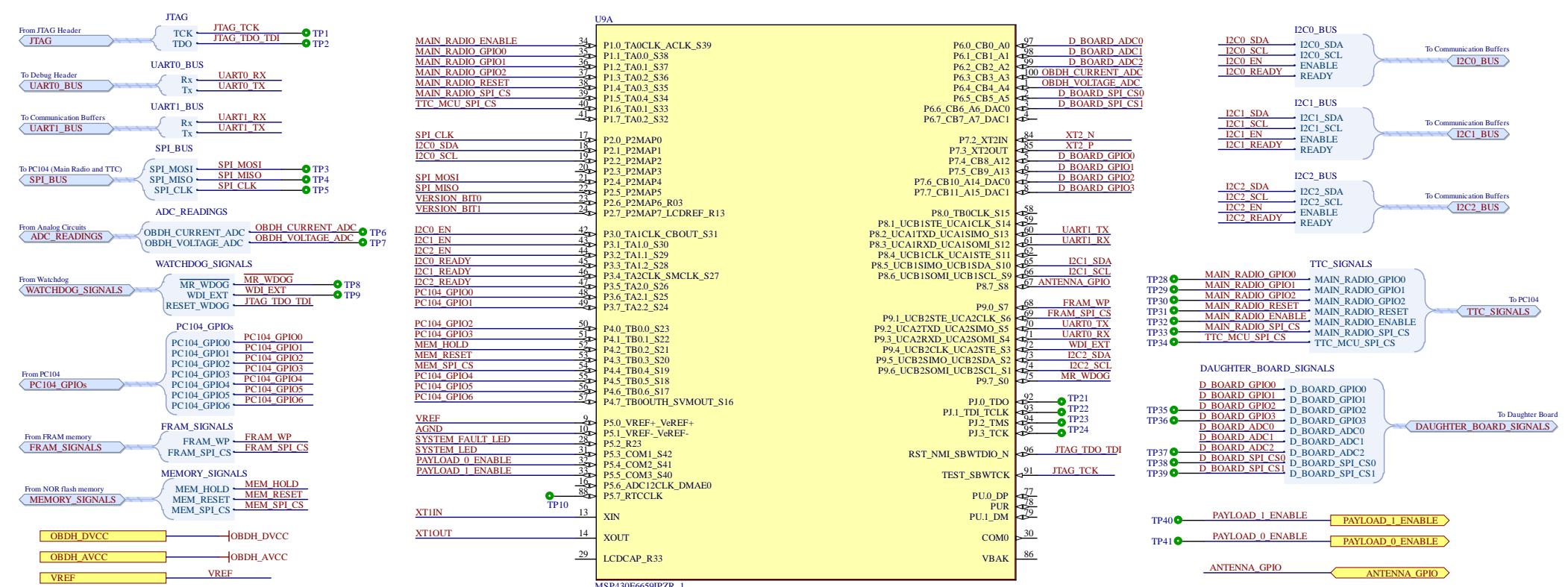
SpaceLab - Federal University of Santa Catarina	
Project: <a href="#">obdh2_project.prjpcb</a> / [No Variations]	
Title: <a href="#">OBDH Hardware Architecture</a>	
Designed by: Andre M. P. Mattos	
Date: 6/4/2021	Revision: v0.7
Sheet 0 of 6	Size: A4



A

A





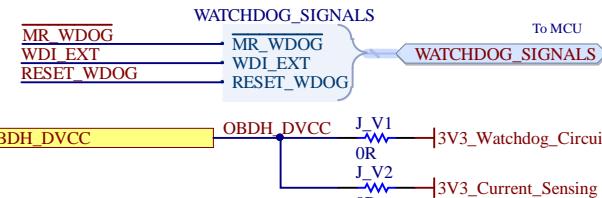
1

2

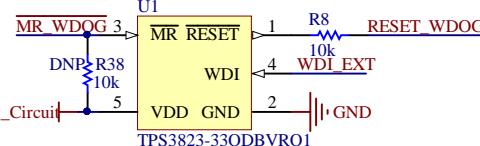
3

4

A



#### EXTERNAL VOLTAGE MONITOR WITH WATCHDOG TIMER

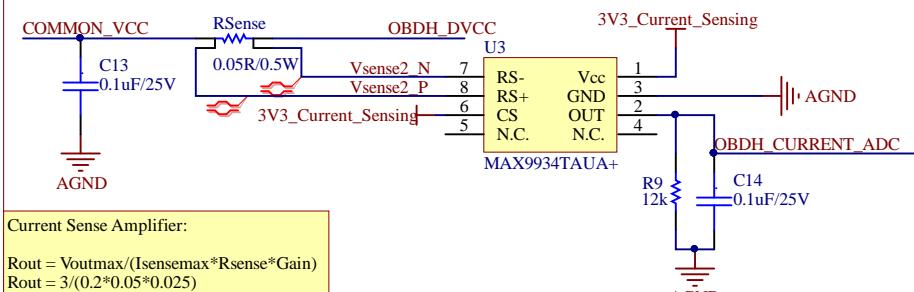


**Watchdog Operation:**

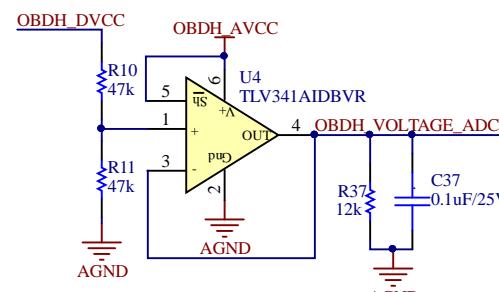
- MR (Manual Reset): Resets MCU. (Active low)
- RESET: Used by the JTAG interface.
- WDI (Timeout Counter): Resets case any change within 1.6 seconds (typically), both falling and rising edges.
- Resets case the voltage supply drops below 2.9V(typically).

#### INTERNAL MEASUREMENT CIRCUITS

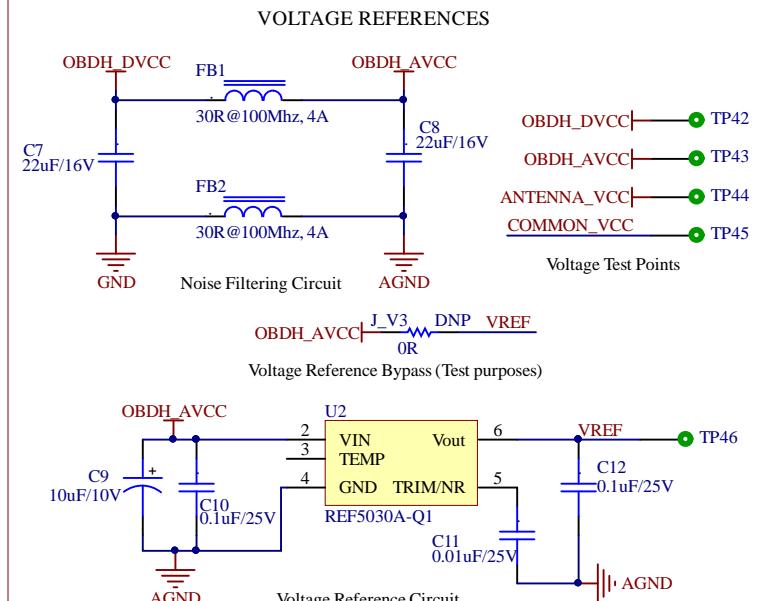
##### Current Sensing Circuit



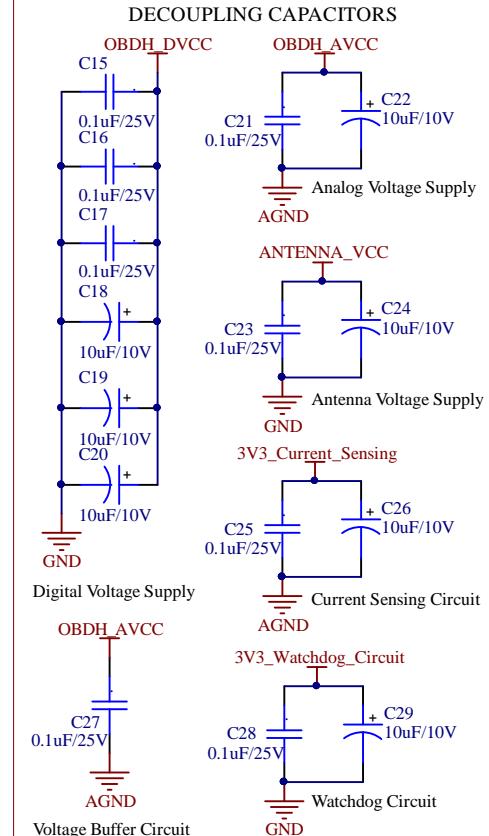
##### Voltage Buffer Circuit



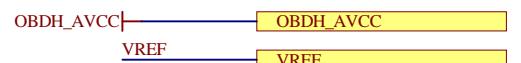
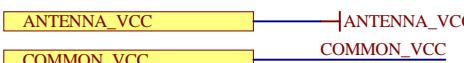
B



C

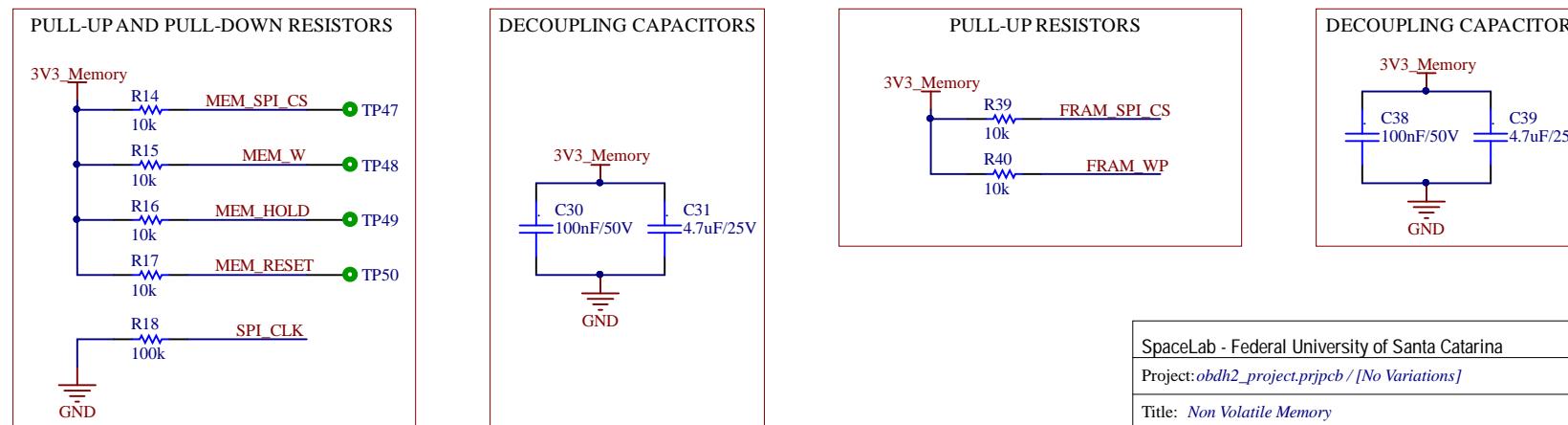
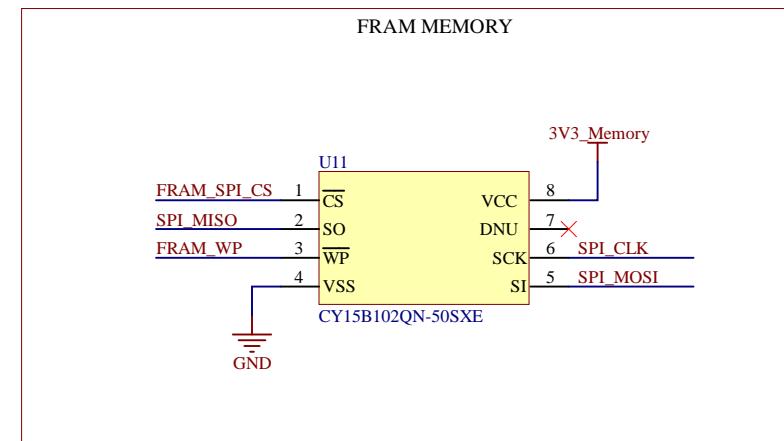
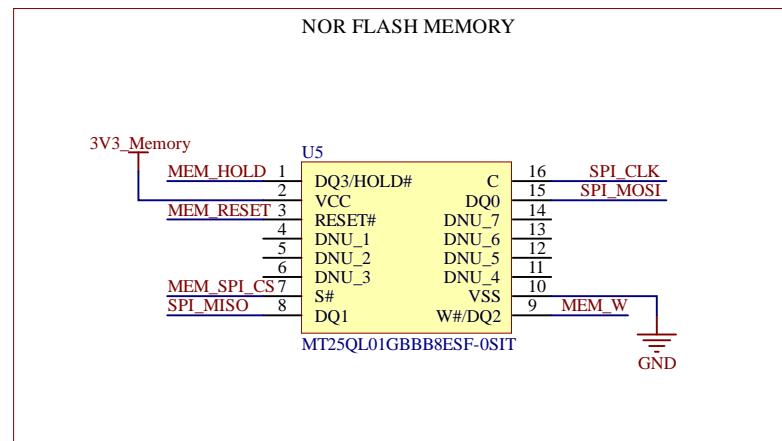
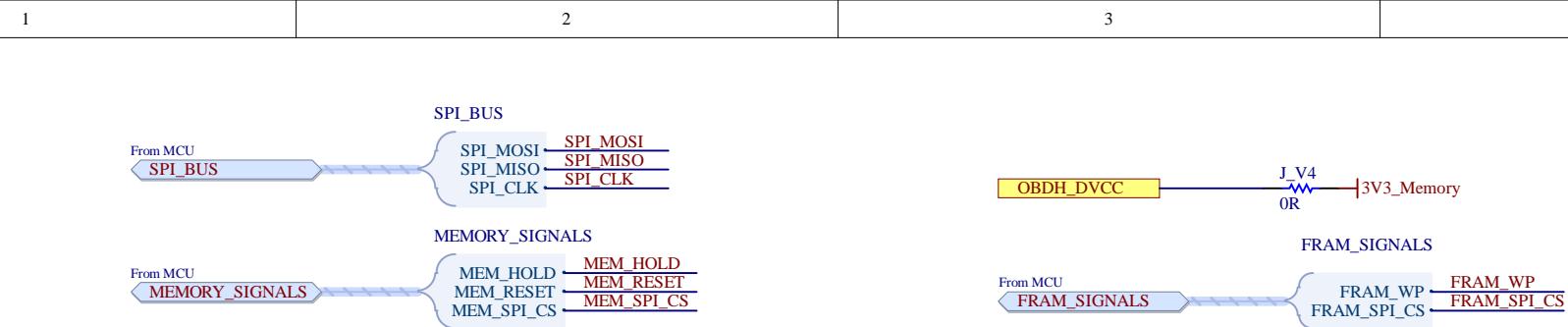


D



SpaceLab - Federal University of Santa Catarina

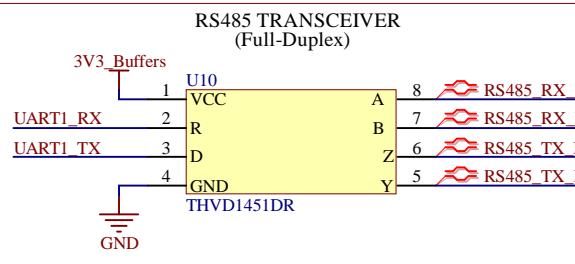
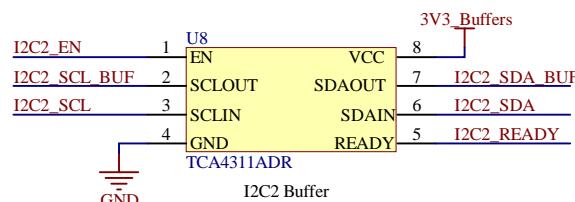
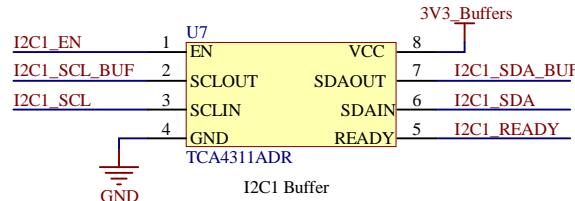
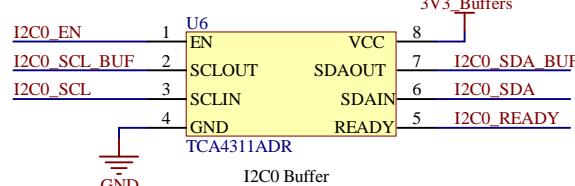
Project: *obdh2\_project.prjpcb / [No Variations]*Title: *Analog Circuits*Designed by: *Andre M. P. Mattos*Date: *6/4/2021*Revision: *v0.7*Sheet *4* of *6*Size: *A4*



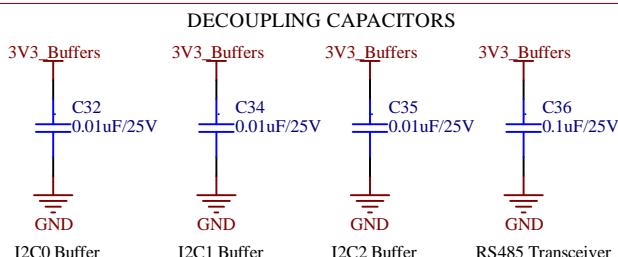
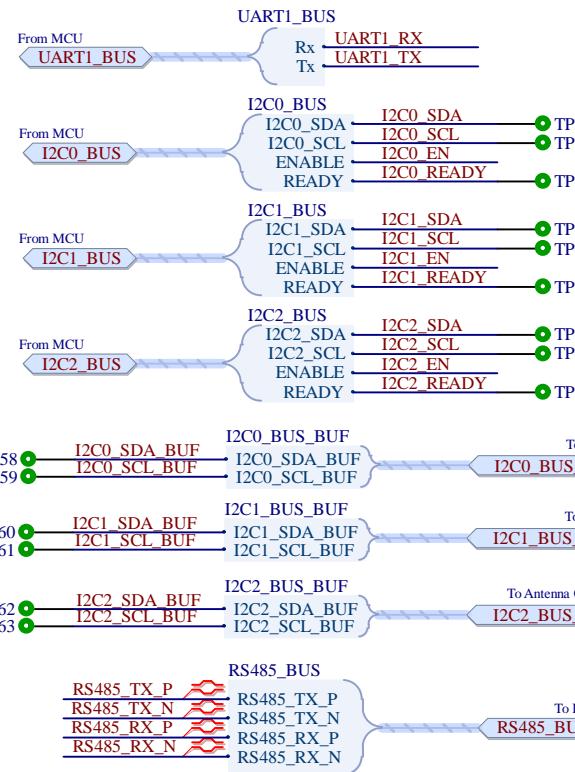
SpaceLab - Federal University of Santa Catarina	
Project: <i>obdh2_project.prjpcb</i> / [No Variations]	
Title: <i>Non Volatile Memory</i>	
Designed by: Andre M. P. Mattos	
Date: 6/4/2021	Revision: v0.7
Sheet 5 of 6	Size: A4

A

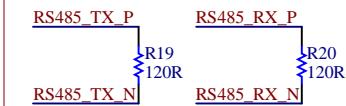
## I2C BUFFERS



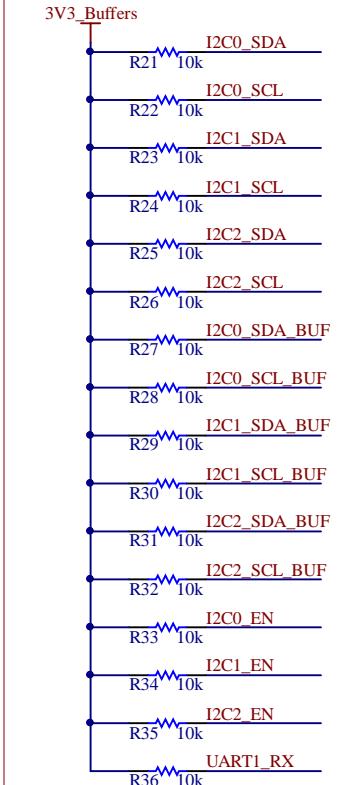
OBDH\_DVCC ————— J\_V5  
OR  
————— 3V3\_Buffers



## TERMINATION RESISTORS

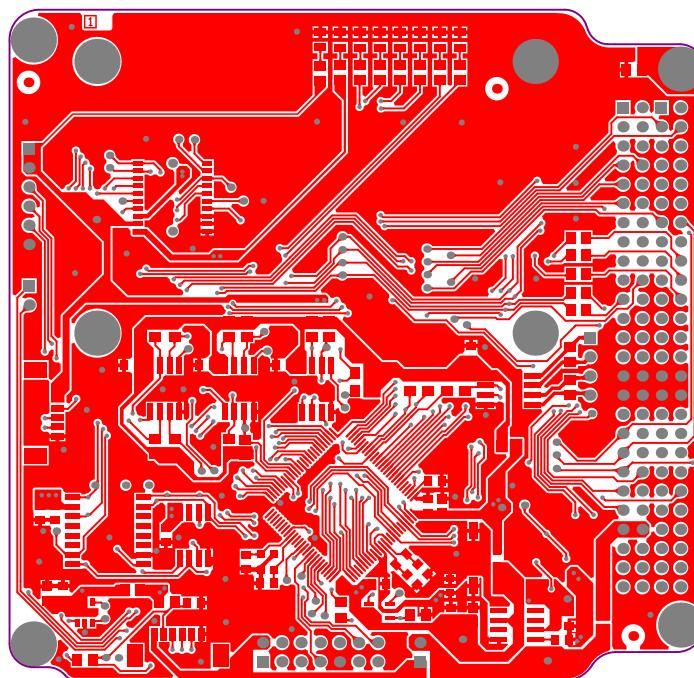


## PULL-UP RESISTORS



A

A



B

B

C

C

D

D

Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	0.010mm	3.5	
3	Top Layer	Copper	0.035mm		
4	Dielectric Core	FR-4	1.500mm	4.8	
5	Bottom Layer	Copper	0.035mm		
6	Bottom Solder	Solder Resist	0.010mm	3.5	
7	Bottom Overlay				

### Fabrication specifications:

- Copper base 10Z
- PCB Material: Prepeg FR4—Standard
- PCB Thickness: 1.6mm
- PCB Surface: HASL (with lead)
- Silkscreen Color: White (top and bottom)
- Soldermask Color: Green
- Vias: Force Complete Tenting
- Special: Stack-up (herein included)

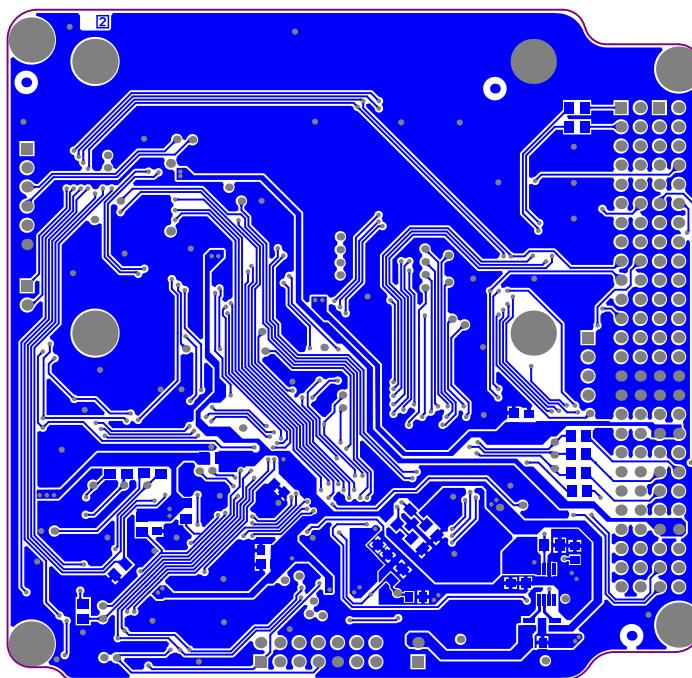
### Assembly specifications:

- Solder composition: Include lead
- Fiducials: 3 top and 3 bottom available
- Check BOM for not placed components

SpaceLab - Federal University of Santa Catarina	
Project: OBDH2	
Layer: Top Layer	
Designed by: Andre M. P. Mattos	
Date: 6/4/2021	Project Code: OBDH2
Version: v0.7	Size: A4

A

A



B

B

Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	0.010mm	3.5	
3	Top Layer	Copper	0.035mm		
4	Dielectric Core	FR-4	1.500mm	4.8	
5	Bottom Layer	Copper	0.035mm		
6	Bottom Solder	Solder Resist	0.010mm	3.5	
7	Bottom Overlay				

C

C

### Fabrication specifications:

- Copper base 10Z
- PCB Material: Prepeg FR4—Standard
- PCB Thickness: 1.6mm
- PCB Surface: HASL (with lead)
- Silkscreen Color: White (top and bottom)
- Soldermask Color: Green
- Vias: Force Complete Tenting
- Special: Stack-up (herein included)

D

D

### Assembly specifications:

- Solder composition: Include lead
- Fiducials: 3 top and 3 bottom available
- Check BOM for not placed components

SpaceLab - Federal University of Santa Catarina	
Project: OBDH2	
Layer: Bottom Layer	
Designed by: Andre M. P. Mattos	
Date: 6/4/2021	Project Code: OBDH2
Version: v0.7	Size: A4

A

1

B

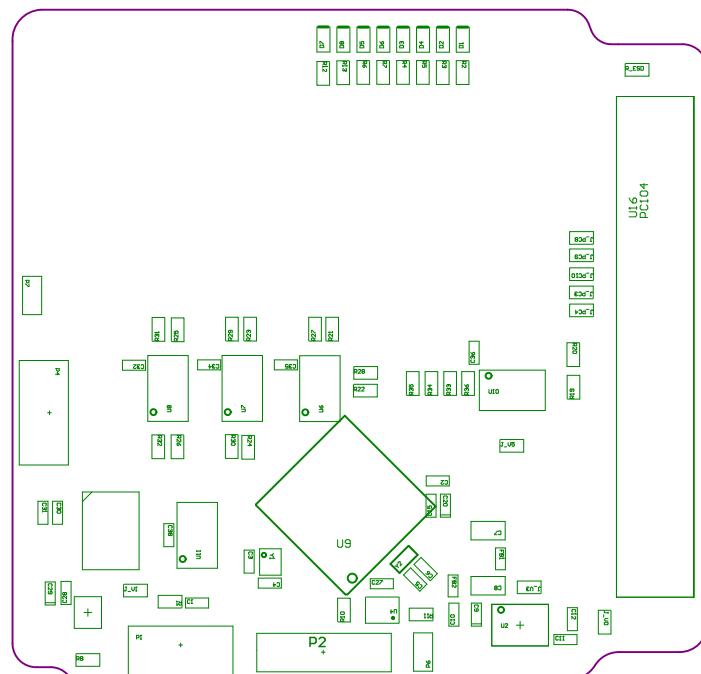
8

6

9

D

1



Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	0.010mm	3.5	
3	Top Layer	Copper	0.035mm		
4	Dielectric Core	FR-4	1.500mm	4.8	
5	Bottom Layer	Copper	0.035mm		
6	Bottom Solder	Solder Resist	0.010mm	3.5	
7	Bottom Overlay				

Fabrication specifications:

- Copper base 1OZ:
  - PCB Material: Prepeg FR4—Standard
  - PCB Thickness: 1.6mm
  - PCB Surface: HASL (with lead)
  - Silkscreen Color: White (top and bottom)
  - Soldermask Color: Green
  - Vias: Force Complete Tenting
  - Special: Stack-up (herein included)

Assembly specifications:

- Solder composition: Include lead
  - Fiducials: 3 top and 3 bottom available
  - Check BOM for not placed components

A

A

B

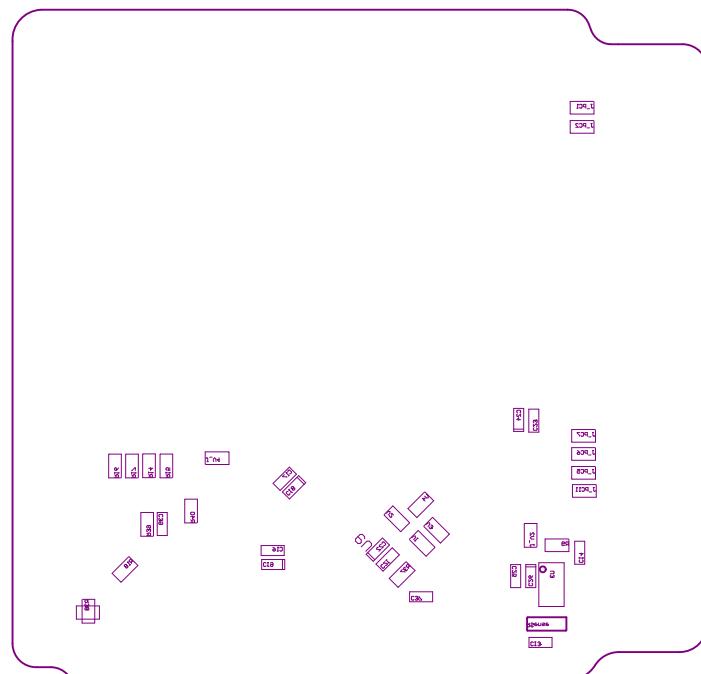
B

C

C

D

D



Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	0.010mm	3.5	
3	Top Layer	Copper	0.035mm		
4	Dielectric Core	FR-4	1.500mm	4.8	
5	Bottom Layer	Copper	0.035mm		
6	Bottom Solder	Solder Resist	0.010mm	3.5	
7	Bottom Overlay				

### Fabrication specifications:

- Copper base 10Z
- PCB Material: Prepeg FR4—Standard
- PCB Thickness: 1.6mm
- PCB Surface: HASL (with lead)
- Silkscreen Color: White (top and bottom)
- Soldermask Color: Green
- Vias: Force Complete Tenting
- Special: Stack-up (herein included)

### Assembly specifications:

- Solder composition: Include lead
- Fiducials: 3 top and 3 bottom available
- Check BOM for not placed components

SpaceLab - Federal University of Santa Catarina



Project: OBDH2

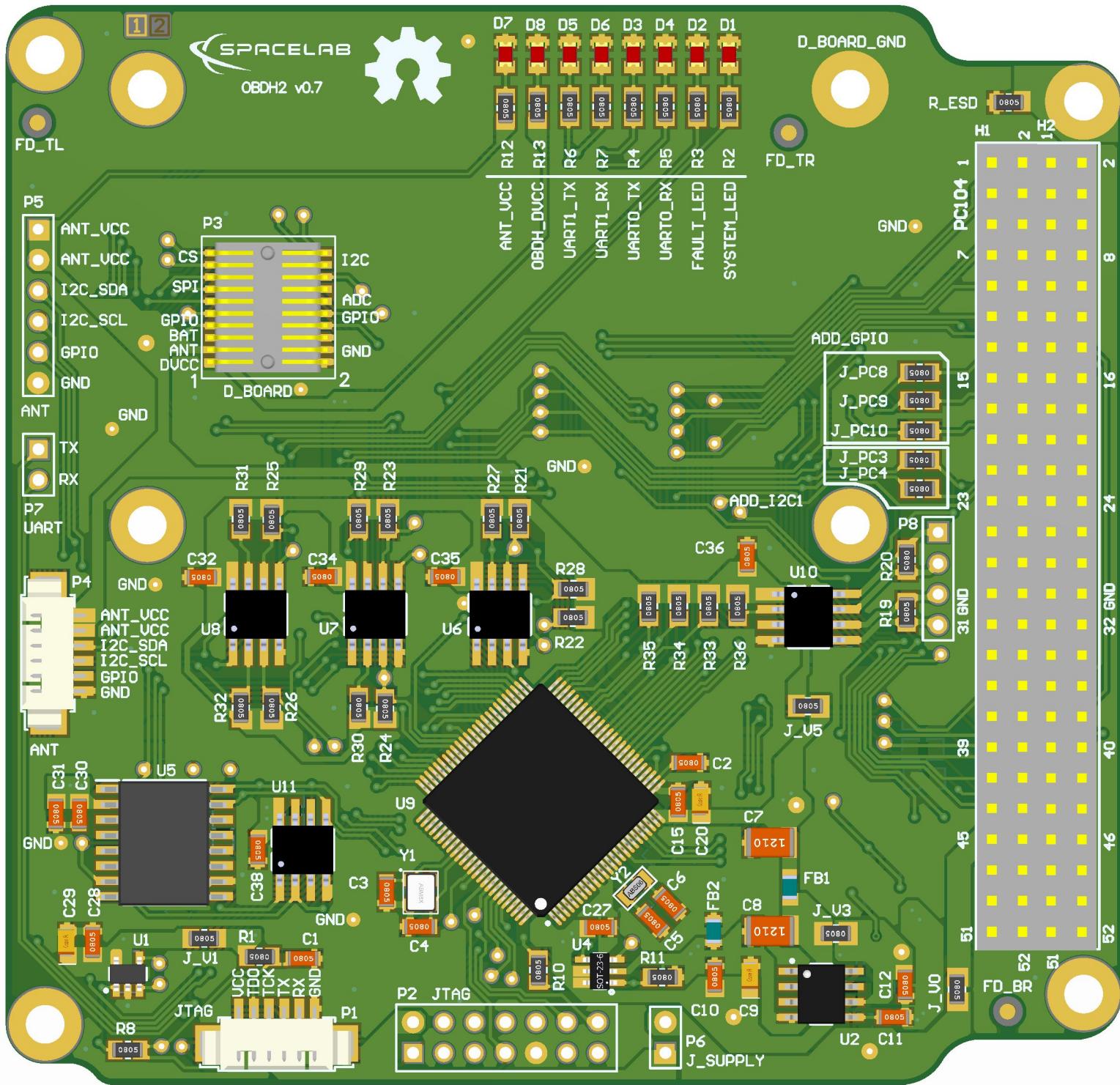
Layer: ASM Bottom

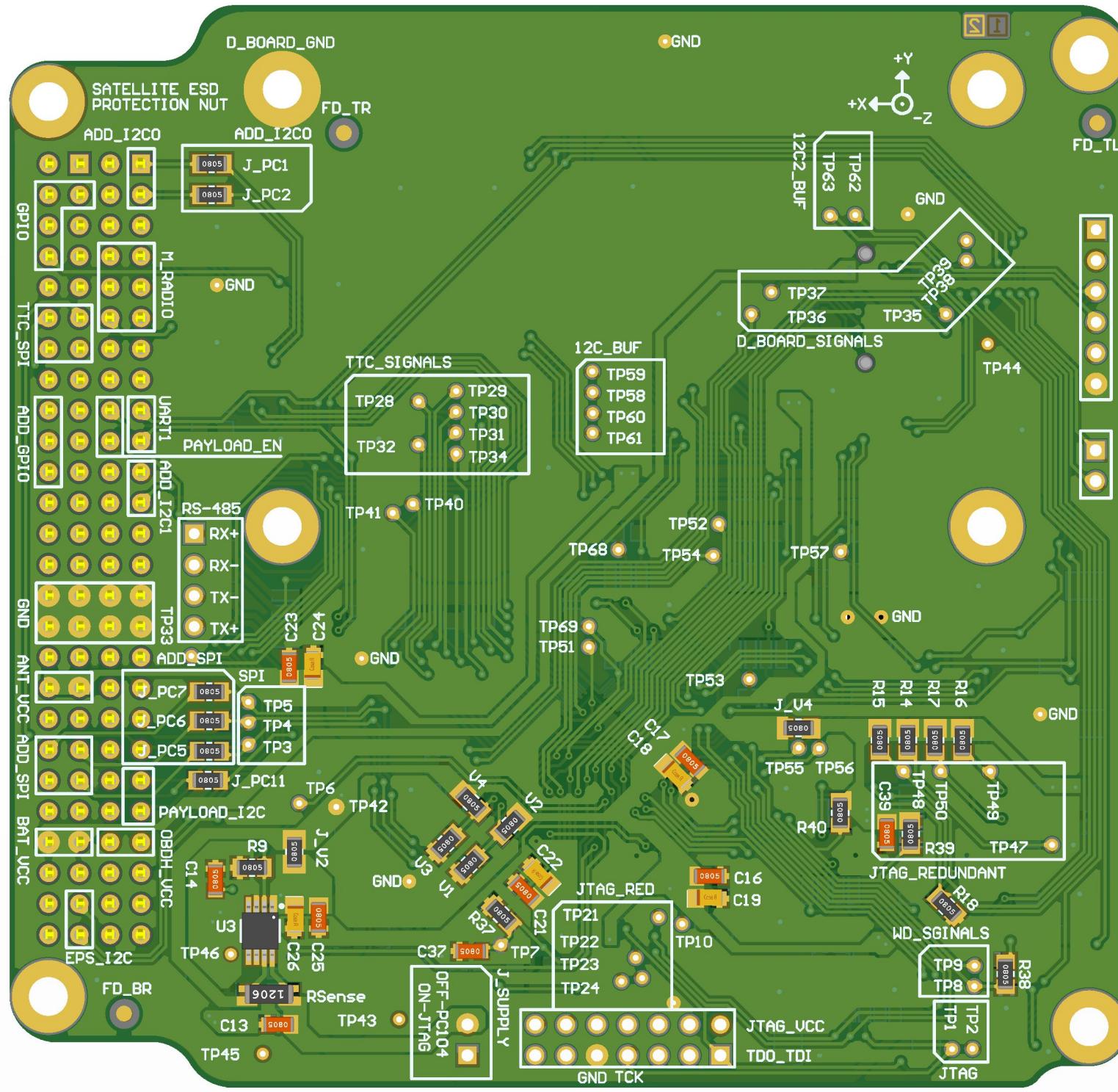
Project Code: OBDH2

Designed by: Andre M. P. Mattos

Date: 6/4/2021 Version: v0.7

Size: A4







## Bill of Materials

Source Data From: obdh2\_project.prjpcb

Project: obdh2\_project.prjpcb

Variant: None

Project Code: obdh2

Report Date: 6/4/2021

5:00:18 PM

Print Date: 04/06/2021

17:00:38

#	Designator	Quantity	Manufacturer	Manufacturer Part Number	Partnumber	Description	Column Name Error-Pa	Footprint	Mount	Fitted
1	R8, R14, R15, R16, R17, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R38, R39, R40	24			CRCW080510K0FKEA	RES 10K OHM 1/8W 1% 0805		0805		Fitted
2	J,PC1, J,PC2, J,PC3, J,PC4, J,PC5, J,PC6, J,PC7, J,PC8, J,PC9, J,PC10, J,PC11, J,V0, J,V1, J,V2, J,V3, J,V4, J,V5	17			CRCW08050000Z0EA	RES 0R OHM 1/8W JUMPER 0805		0805		Fitted
3	C10, C12, C13, C14, C15, C16, C17, C21, C23, C25, C27, C28, C36, C37	14			CC0805KRX7R8BB104	CAP CER 0.1uF 25V 10% X7R 0805		CC0805		Fitted
4	R2, R3, R4, R5, R6, R7, R12, R13	8			RC0805FR-071KL	RES 1.0K OHM 1/8W 1% 0805		0805		Fitted
5	R1, R10, R11, V1, V2, V3, V4	7			RC0805FR-074TKL	RES 47K OHM 1/8W 1% 0805		0805		Fitted
6	D1, D2, D3, D4, D5, D6	6			LTST-C170KFKT	SMD Orange LED		0805-LED		Fitted
7	C11, C32, C34, C35	4			CL21B103KAANINN	CAP CER 0.01uF 25V 10% X7R 0805		CC0805		Fitted
8	C9, C18, C19, C20	4			TPS106K006R1000	CAP Tantalum 10uF 6.3V 10% 0805		CC0805_Tantalum		Fitted
9	C22, C24, C26, C29	4			TPSP106M010R2000	CAP Tantalum 10uF 10V 20% 0805		CC0805_Tantalum		Fitted
10	U6, U7, U8	3			TCA4311ADR	IC SIGNAL BUFFER I2C 8SOIC		SOIC8		Fitted
11	C31, C39	2			C0805C475K3RACAUTO	CAP CER 4.7uF 25V 10% X7R 0805		CC0805		Fitted
12	C3, C4	2			08051A100FAT2A	CAP CER 10pF 100V 0805		CC0805		Fitted
13	R9, R37	2			RC0805FR-0712KL	RES 12K OHM 1/8W 1% 0805		0805		Fitted
14	C5, C6	2			CL21C120FBANNINC	CAP CER 12pF 50V 0805		CC0805		Fitted
15	C7, C8	2			C3225XTR1C226K250AC	CAP CER 22uF 16V 10% X7R 1210		CC1210		Fitted
16	FB1, FB2	2			BLM21PG300SN1D	Ferrite Bead 30 OHM 4A 100MHz		IND0805		Fitted
17	C30, C38	2			C0603C104K5RAC3121	CAP CER 100nF 50V 0603 10%		CC0805		Fitted
18	R19, R20	2			CRGCQ0805F120R	RES 120R OHM 1/8W 1% 0805		0805		Fitted
19	P6, P7	2			826646-2	Connector Header Through Hole 2 position 0.100" (2.54mm)		HDR 1X2		Fitted
20	P1, P4	2			0532610671	PicoBlade 6 Position Right Angle Connector Header Surface Mount 0.049" (1.25mm)		PICOBLADE 6PIN Right Angle		Fitted
21	D7, D8	2			LTST-C171GKT	SMD Green LED		0805-LED		Fitted
22	RSense	1			LVK12R050DER	Current Sense Resistors - SMD 0.05ohm, 5% 4 Terminal		1206 - ohmite		Fitted
23	C2	1			C0805C474K5RACTU	CAP CER 0.47uF 50V 10% X7R 0805		CC0805		Fitted
24	R_ESD	1			RMCF0805FG1M00	RES 100K OHM 1/8W 1% 0805		0805		Fitted
25	C1	1			C0603X102J4RECAUTO	CAP CER 1nF 16V 0603 5%		CC0805		Fitted
26	Y1	1			ABM8X-102-32.000MHZ-T	32MHz ±10ppm Crystal 10pF 6.0 Ohm -40°C - 125°C		Xtal_ABM8X		Fitted
27	Y2	1			ECS-327-12.5-34S-TR	32.768MHz ±20ppm Crystal 12.5pF 70 KOhm -40°C ~ 125°C		AB506 0805		Fitted
28	R18	1			AC0805FR-13100KL	RES 100K OHM 1/8W 1% 0805		0805		Fitted
29	U11	1			CY15B102QN-50SX	FRAM (Ferroelectric RAM) Memory IC 2MB (256x 8) SPI 50 MHz 8-SOIC		SOIC8		Fitted
30	P3	1			FSI-110-03-G-AD	Contact Connector		FSI-110-03-X-D-AD		Fitted
31	P2	1	Harwin	M20-9980745		Connector Header Through Hole 14 position 0.100" (2.54mm)		CONN HEADER VERT 14POS 2.54MM	Through Hole	Fitted
32	P8	1			M20-9990445	Connector Header Through Hole 4 position 0.100" (2.54mm)		HDR1X4		Fitted
33	P5	1			M20-9990645	Connector Header Through Hole 6 position 0.100" (2.54mm)		HDR1X6		Fitted
34	U3	1			MAX9934TAUA+	MAX9934TAUA+		MSOP-8		Fitted
35	U9	1	Texas Instruments		MSP430F6659IPZ	Imported		PZ0100A_N		Fitted
36	U5	1			MT25QL01GBBB8ESF-0SIT	IC FLASH 1GBIT 108MHz 16SOIC		SOIC127P1032K265-16N		Fitted
37	U2	1			REF5030A-Q1	REF5030A-Q1		SOIC-8		Fitted
38	PC104	1			SSW-126-04-G-D	PC104		PC104		Fitted
39	U10	1			THVD1451DR	IC INTERFACE RS422_RS485 8SOIC		SOIC8		Fitted
40	U4	1			TLV341AIDBVR	TLV341AIDBVR		SOT-23 6L		Fitted
41	U1	1	Texas Instruments		TPS3823-3QDBVR01	Processor Supervisory Circuit, 1 Supply Monitored, .40 to 85 deg., 5-Pin SOT-23 (DBV), Green (RoHS & no St/Br)		DBV0005A_N		Fitted