UG425: Si3474 EVB User's Guide

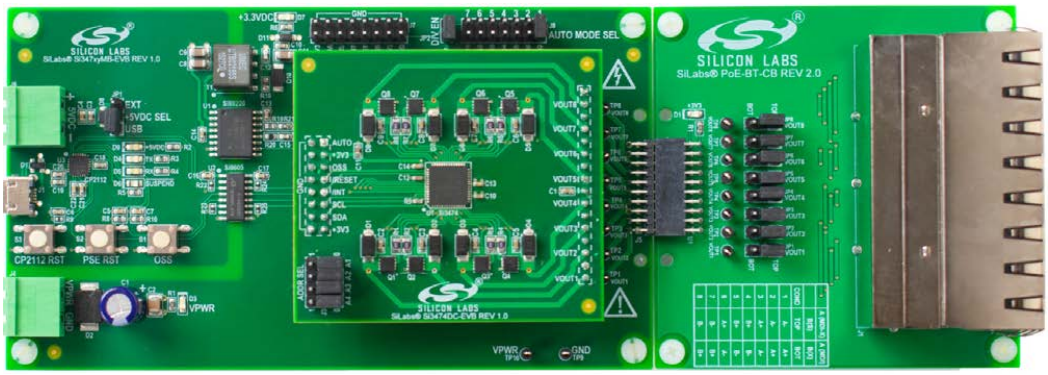
Si3474 Quad 90 W Ethernet Port EVB

The Si3474 is suitable for use in either a four-port 802.3bt PSE, eight-port 802.at PSE, or a mix of 802.3bt and 802.3at ports. The Si3474 achieves this by having two separate quads each powering four 2-pair ports. Each quad can either be configured for two 802.3bt 4-pair ports of for four 802.3at 2-pair ports. The Si3474-EVB includes an RJ45 interface board called the POE_BT_CB to allow evaluation of the Si3474 in a mixed 802.3bt and 802.3at system.

The Si3474-EVB can power up PDs without any software installation needed. The Si3474-EVB can be jumper-selected (J8) to automatically configure the Si3474 Port Power Allocation. Note that when using the Si3474 in AUTO mode, the ports must either all be in 802.3bt mode or 802.3at mode. To use the Si3474 in a mixed system, it will be necessary to access the Si3474 registers through I^{2}C. The Si3474-EVB allows access to the Si3474 registers through a Silicon Labs CP2112 USB to I^{2}C bridge. A Python interface is provided to allow evaluation through Windows PC, Linux or MacOS computers.

KEY FEATURES

- IEEE 802.3bt compliant
- Up to Four 802.3bt Ports or Eight 802.3at Ports
- AUTO Mode Jumpers
  - No software needed for basic operation
  - Configurable Max Port Power
- Available Direct I^{2}C Access to Si3474 Registers
  - USB Interface using Silicon Labs CP2112 USB to I^{2}C Bridge
  - Python interface to Windows, Linux or MacOS



Parameter	Condition	Specifications
PSE Input Voltage Range	Connector J4	52 to 57 V
PoE Type/Class	Type 4, Class 8	IEEE 802.3bt
Daughtercard Size		2.5 x 2.5 inches, 61 x 61 mm
Baseboard Size		3 x 5.35 inches, 76 x 136 mm
EVB Height	Does not include headers	1.2 inch, 30 mm

Table of Contents

1. Kit Description and Powering Up the Si3474 EVB

The Si3474 EVB consists of a four-layer daughter card, a four-layer baseboard and an RJ45 connector board.

The daughter card includes the Si3474, FETs and the J3 jumper. The purpose of the J3 jumper is to configure the I^2C Address for which the Si3474 responds to. Note that each Si3474 device responds to two I^2C Addresses because there are two quads in every Si3474 device.

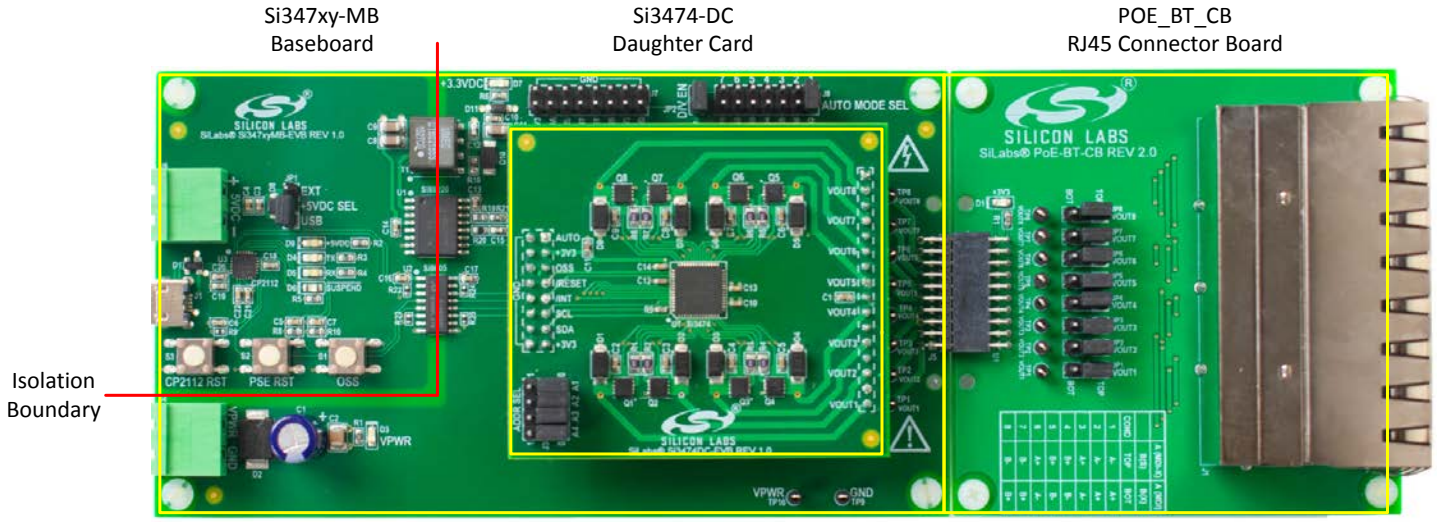


Figure 1.1. Si3474-EVB Baseboard, Daughter Card, and RJ45 Connector Board

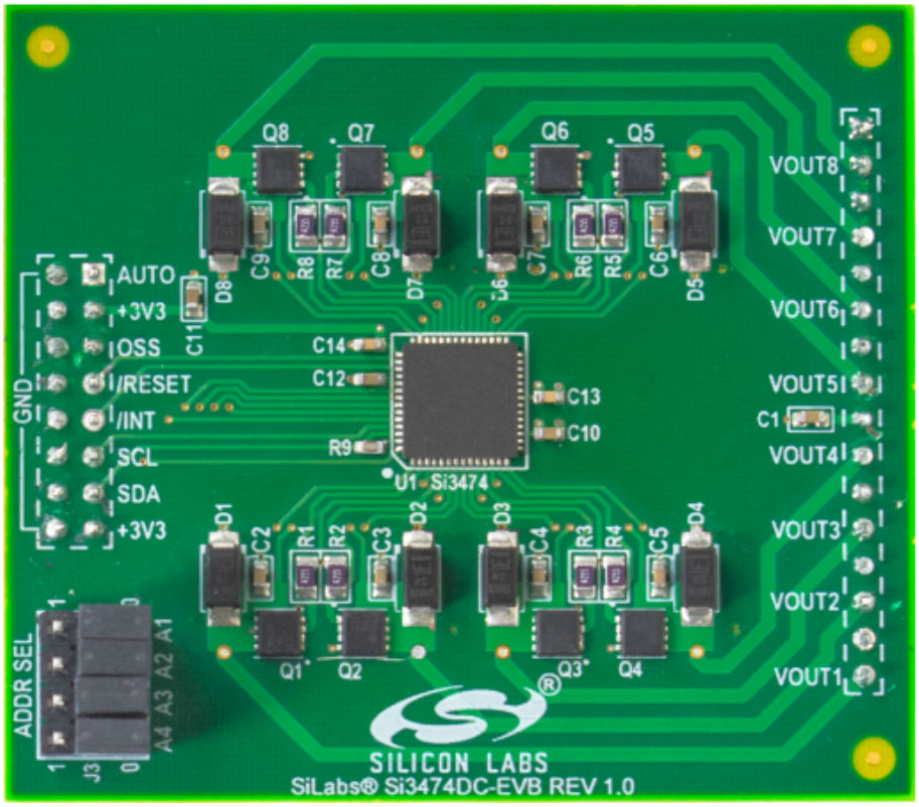


Figure 1.2. Si3474-EVB Daughter Card

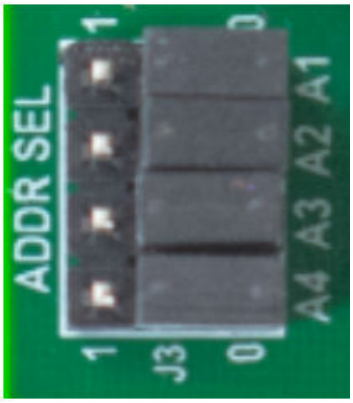


Figure 1.3. J3 Configuration Header

Table 1.1. J3 I²C Address Selection Table

A4	A3	A2	A1	Quad 0 I²C Address	Quad 1 I²C Address
0	0	0	0	0x20	0x21
0	0	0	1	0x22	0x23
0	0	1	0	0x24	0x25
0	0	1	1	0x26	0x27
0	1	0	0	0x28	0x29
0	1	0	1	0x2A	0x2B
0	1	1	0	0x2C	0x2D
0	1	1	1	0x2E	0x2F
1	0	0	0	0x30	0x31
1	0	0	1	0x32	0x33
1	0	1	0	0x34	0x35
1	0	1	1	0x36	0x37
1	1	0	0	0x38	0x39
1	1	0	1	0x3A	0x3B
1	1	1	0	0x3C	0x3D
1	1	1	1	0x3E	0x3F

The Si3474 EVB base board consists of:

- Status LEDs
- Terminal Blocks for Power
- USB Connector
- AUTO Mode Selection Jumpers

The RJ45 connectors are on a separate board called the POE_BT_CB. The POE_BT_CB also has some jumpers in order to allow configuration of the RJ45 for either 802.3bt 4-pair port usage or for 802.3at 2-pair port usage.

It is easier to describe the use cases for the USB Connector, Terminal Blocks, AUTO Mode Selection Jumpers and the POE_BT_CB jumper connections together.

Please refer to the appendix if you have PoE-BT-CB Rev 1.0 or are not sure which revision you have. The following figure for PoE-BT-CB Rev 2.0 shows the use case where the Si3474 is used as an 802.3at PSE, without an I2C Host. The JP2 AUTO MODE SEL in this case can be set to either Position 7 or Position 6. The corresponding selection jumpers on the POE_BT_CB will need to be set in an alternating fashion so that the eight 802.3at ports can drive the RJ45 jacks as shown. Note that the VPWR polarity of the top-row RJ45 jacks have an opposite polarity relative to the ports on the bottom-row RJ45. Two power supplies are needed for this configuration. The +54 V provides power to PDs as well as to the Si3474 VPWR. The +5 V supply is used to supply power to the Si3474 VDD (albeit indirectly through isolation)

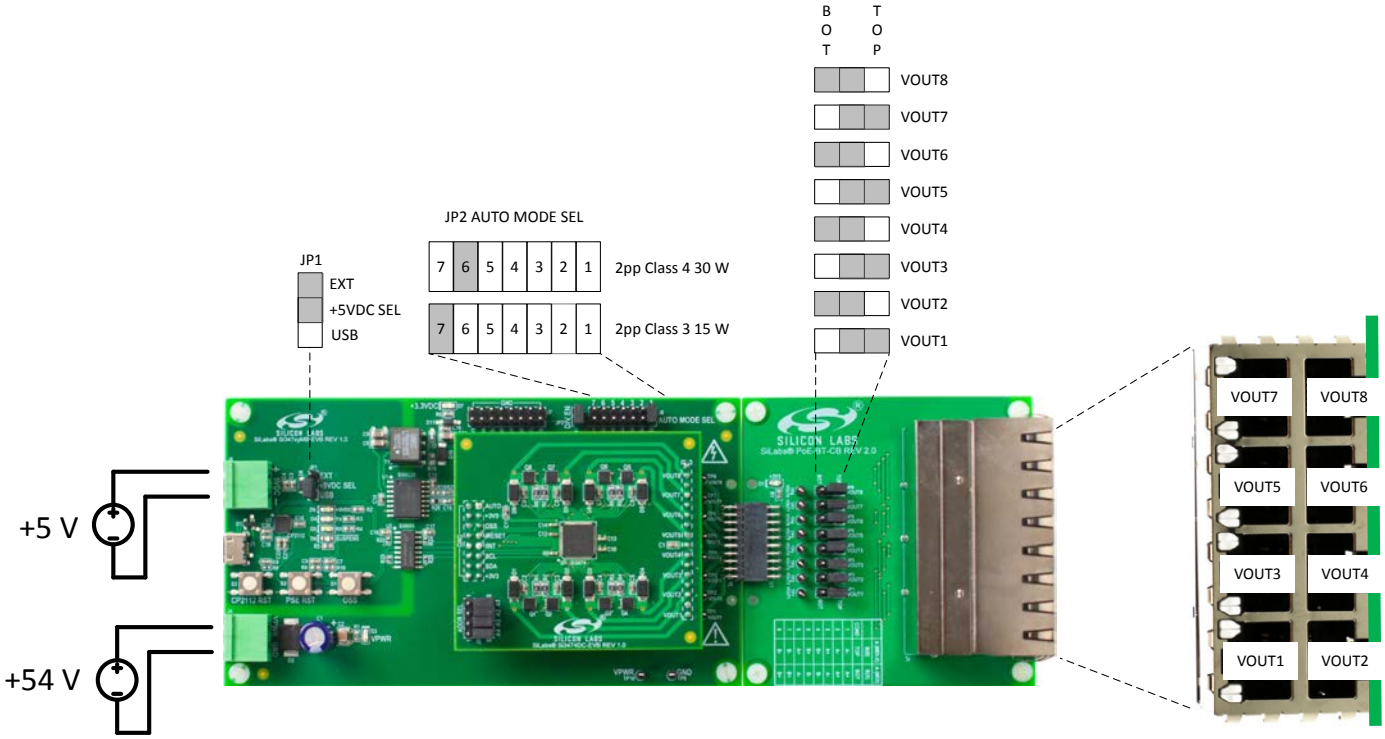


Figure 1.4. No I2C Host, Eight 802.3at 2-Pair Ports

The figure below shows the use case where the Si3474 is used as an 802.3bt PSE without an I2C Host. The JP2 AUTO MODE SEL in this case can be set to either Position 1, 2, 3, 4, or Position 5. The corresponding selection jumpers on the POE_BT_CB will need to be set to all "Top" positions. Four of the RJ45 jacks will be active while the other four RJ45 jacks are not connected.

Note that it is also possible to configure the jumpers to all "BOT" instead of all "TOP" (then use the bottom RJ45 jacks). When using the bottom RJ45s, the VPWR polarity will be inverted relative to when using the top RJ45 jacks. Two power supplies are needed for this configuration. The +54 V provides power to PDs as well as to the Si3474 VPWR. The +5 V supply is used to supply power to the Si3474 VDD (albeit indirectly through isolation).

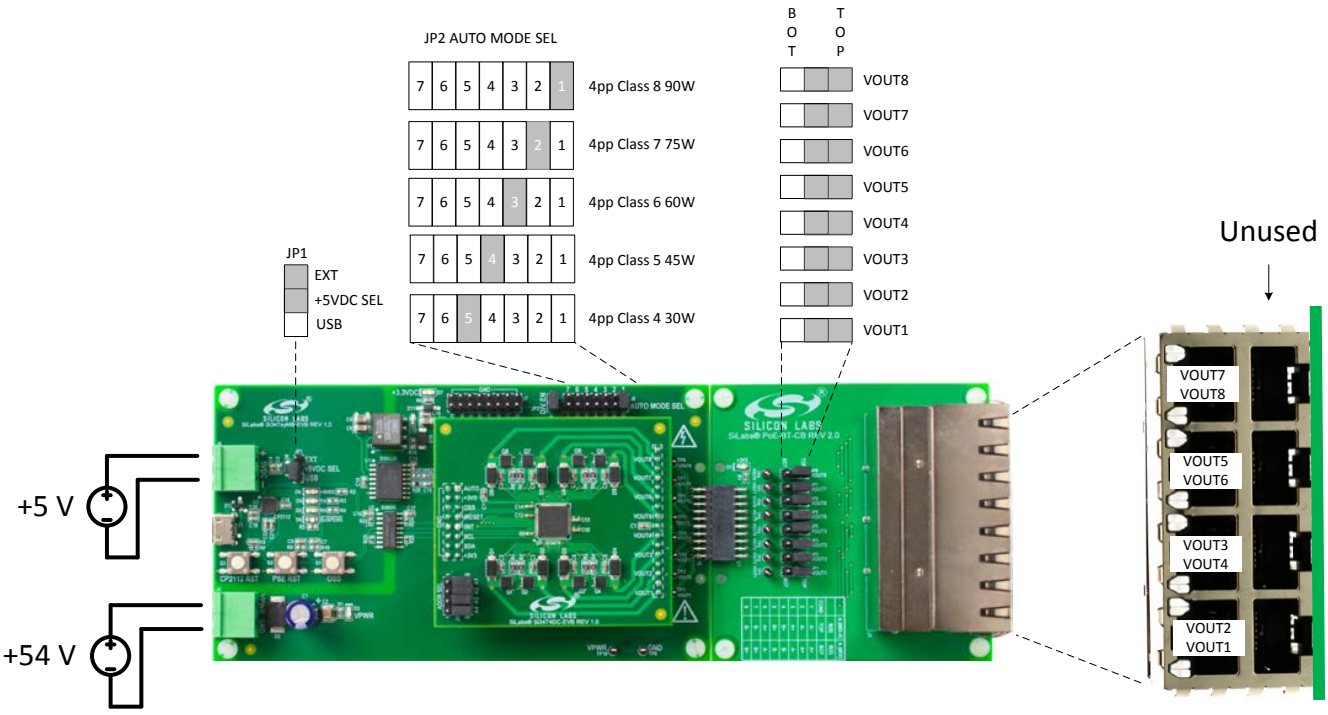


Figure 1.5. No I²C Host, Four 802.3bt 4-Pair Ports

The following figure shows the use case where the Si3474 is with an I²C Host. In this case, all JP2 AUTO MODE SEL jumpers are removed to indicate a Hosted I²C operation mode. The selection jumpers on the POE_BT_CB will need to be set up, depending on the expected programming of bits 4 and 7 of Register 0x29 on both quads. One power supply is needed for this configuration. The +54 V provides power to PDs as well as to the Si3474 VPWR. The JP1 jumper is placed so that the +5 V supply is derived from USB. The 5 V USB rail supplies power to the Si3474 VDD (albeit indirectly through isolation).

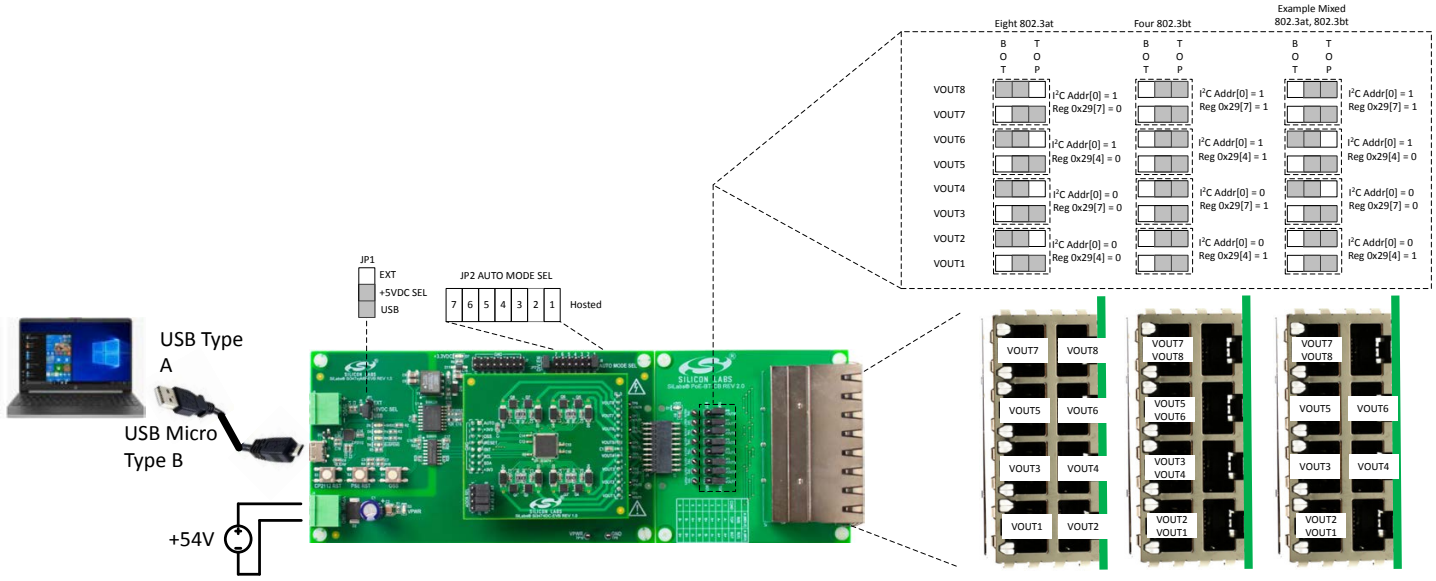


Figure 1.6. I²C Hosted

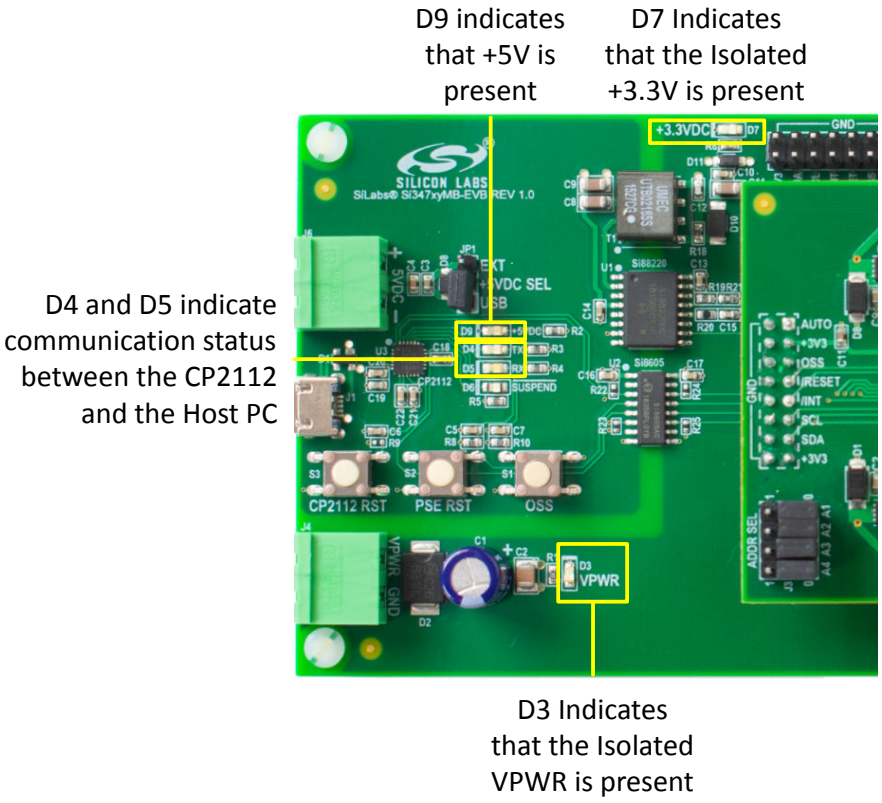


Figure 1.7. Status LEDs

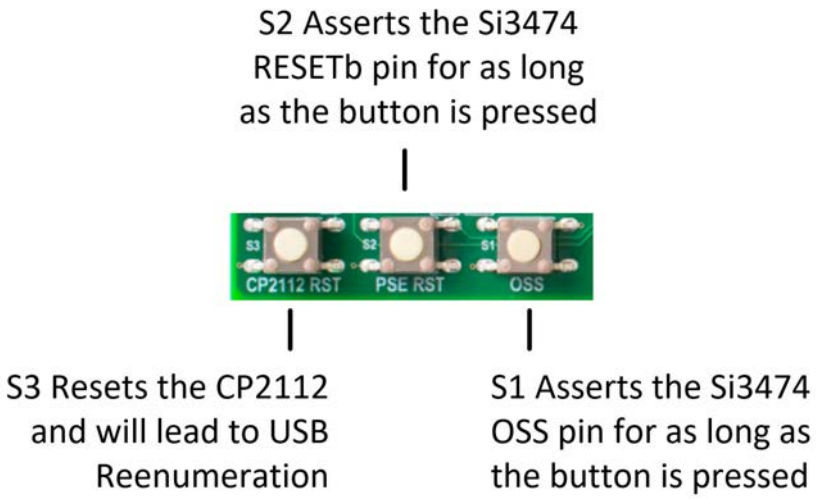


Figure 1.8. Buttons

2. Software Drivers

The Si3474-EVB has a USB port, allowing it to communicate with computer host running Windows, Linux or MacOS. The installation guide, documentation and software are available through the following download site.

Please go to www.silabs.com/start-poe and select the Si3474-KIT link.

3. Si3474 Baseboard, Daughter Board and POE_BT_CB Board Schematics

Silicon Labs will provide a free schematic and PCB layout review. Visit www.siliconlabs.com/support to submit a support request for the review.

3.1 Motherboard Schematics

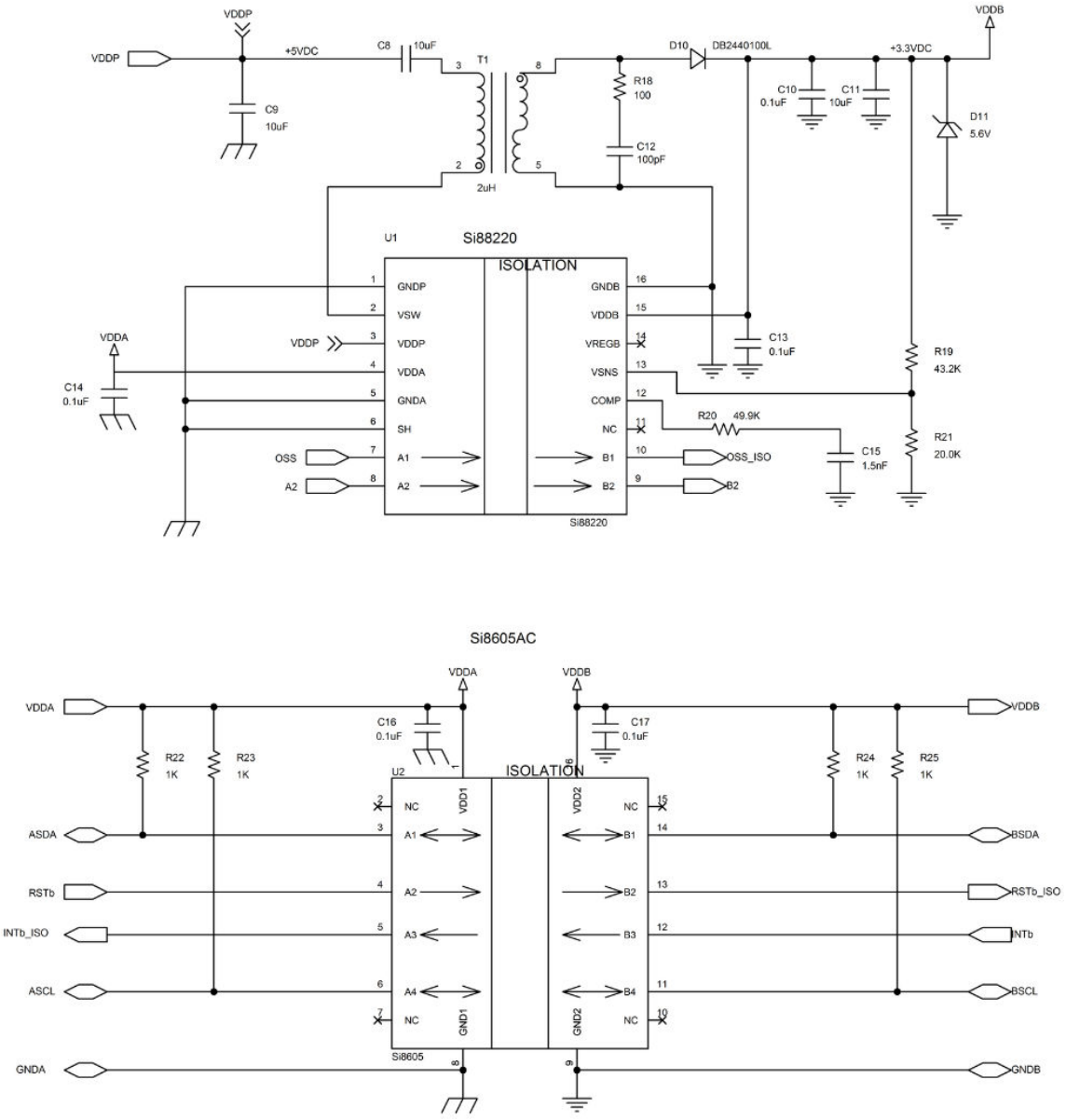


Figure 3.1. Motherboard Isolations

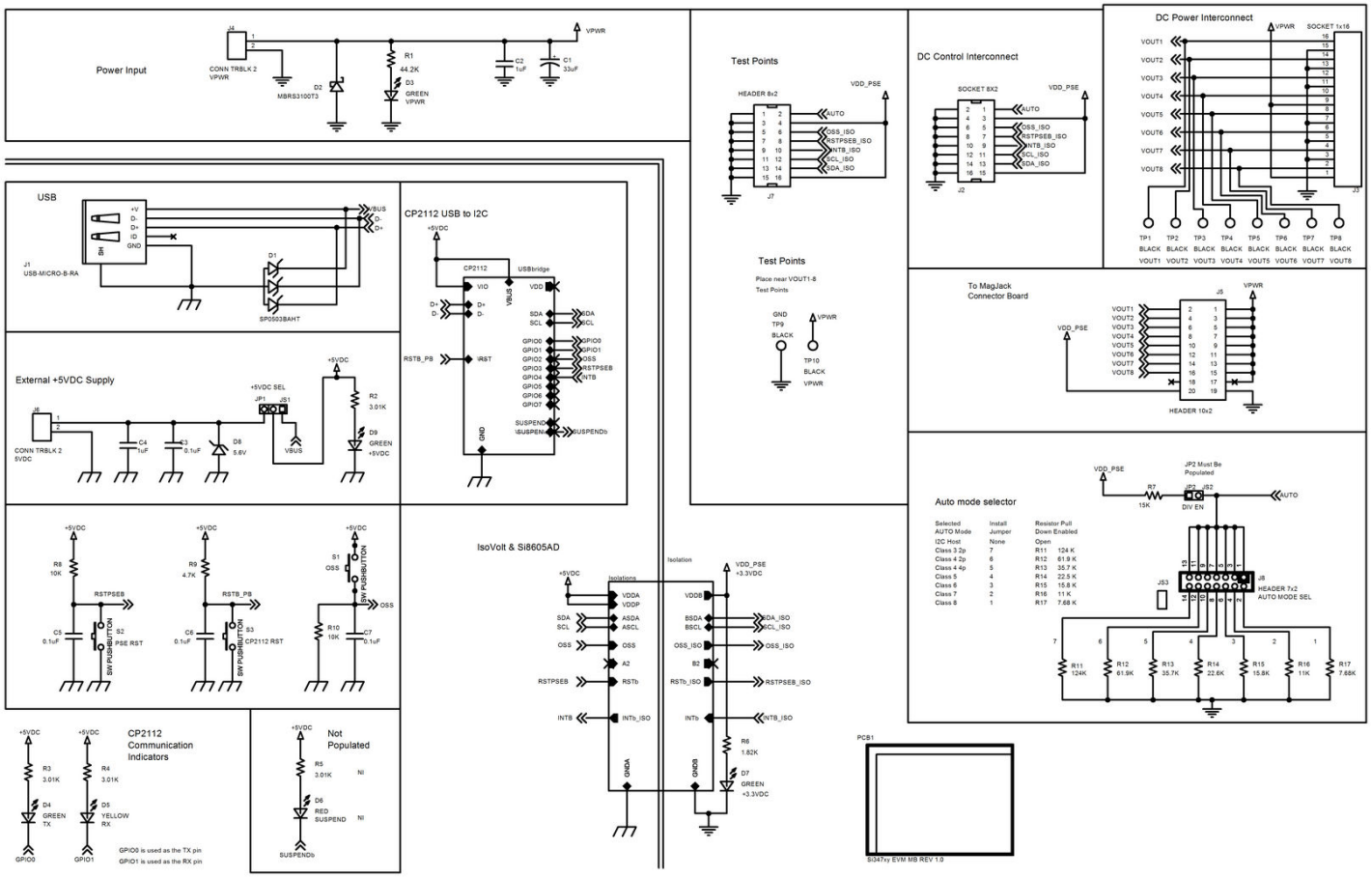


Figure 3.2. Motherboard Top

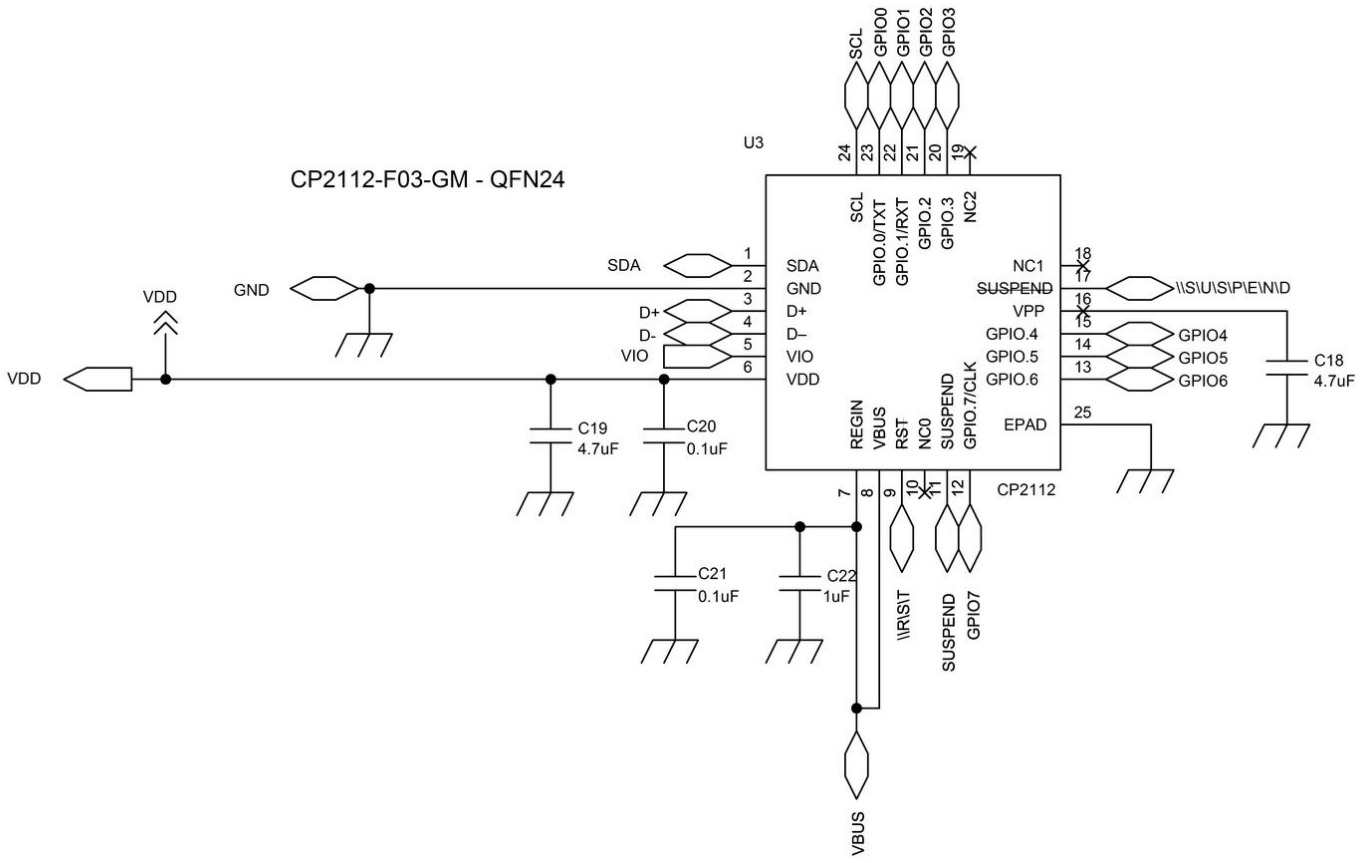


Figure 3.3. Motherboard USB Bridge

3.2 Daughtercard Schematics

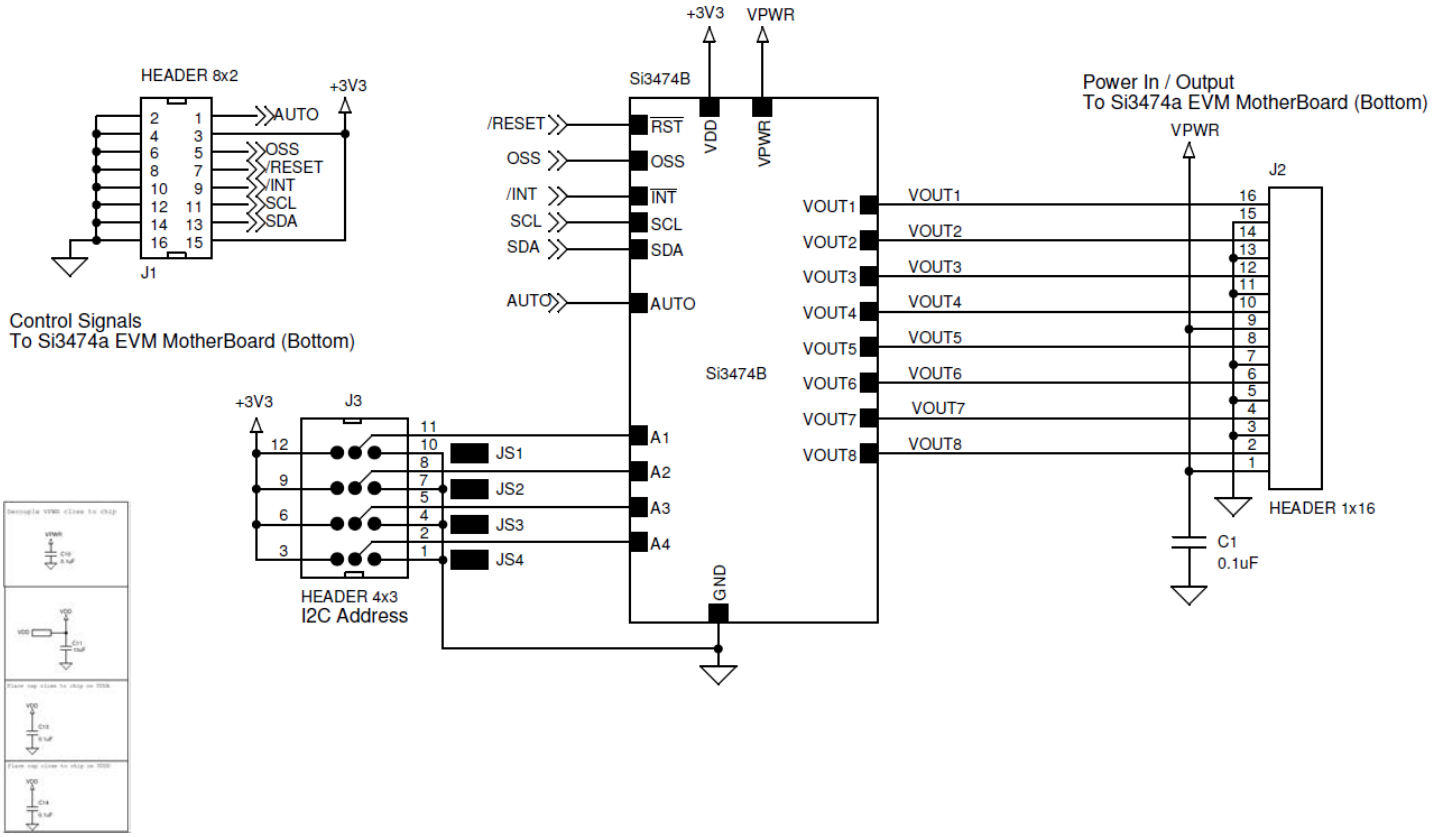


Figure 3.4. DC Schematic 1

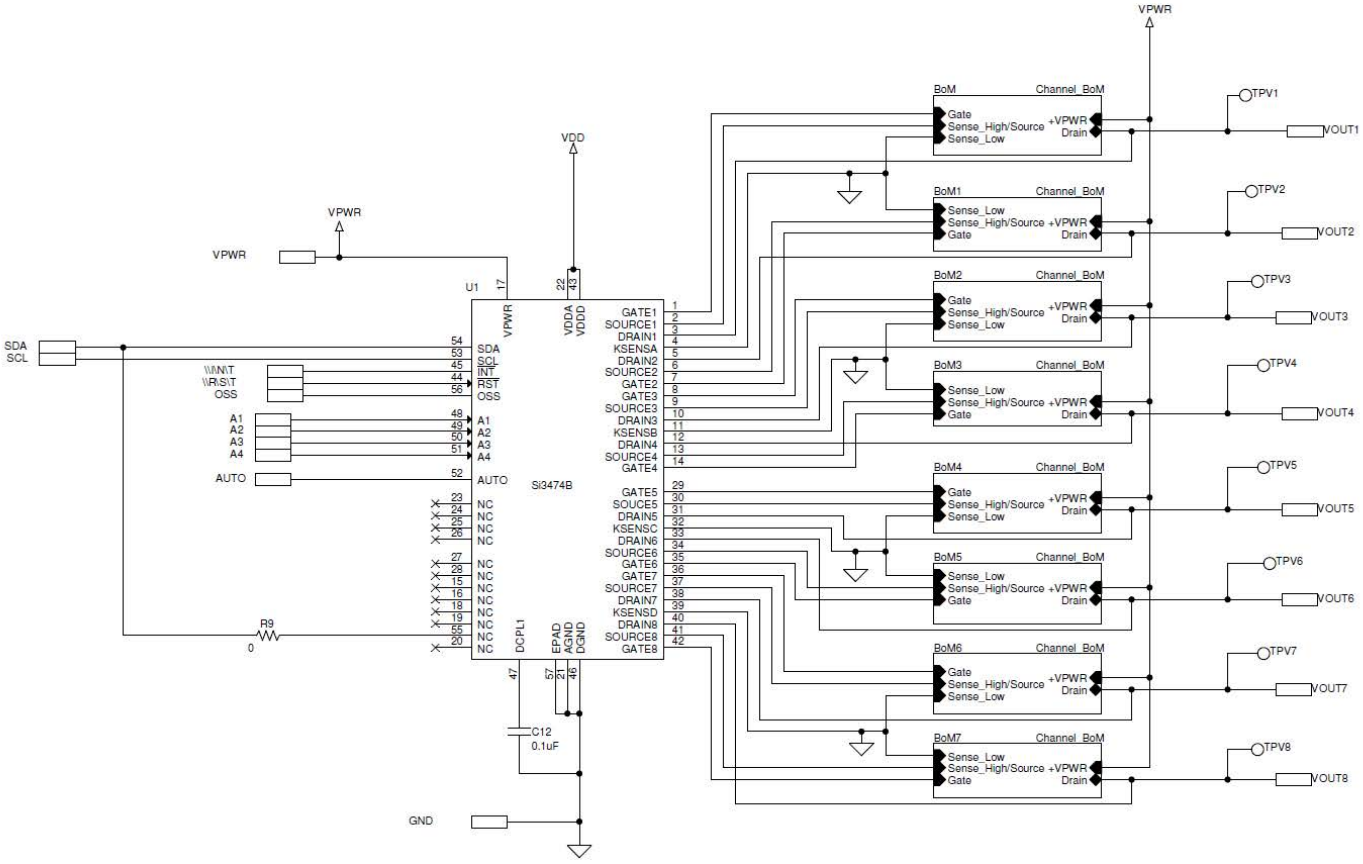


Figure 3.5. DC Schematic 2

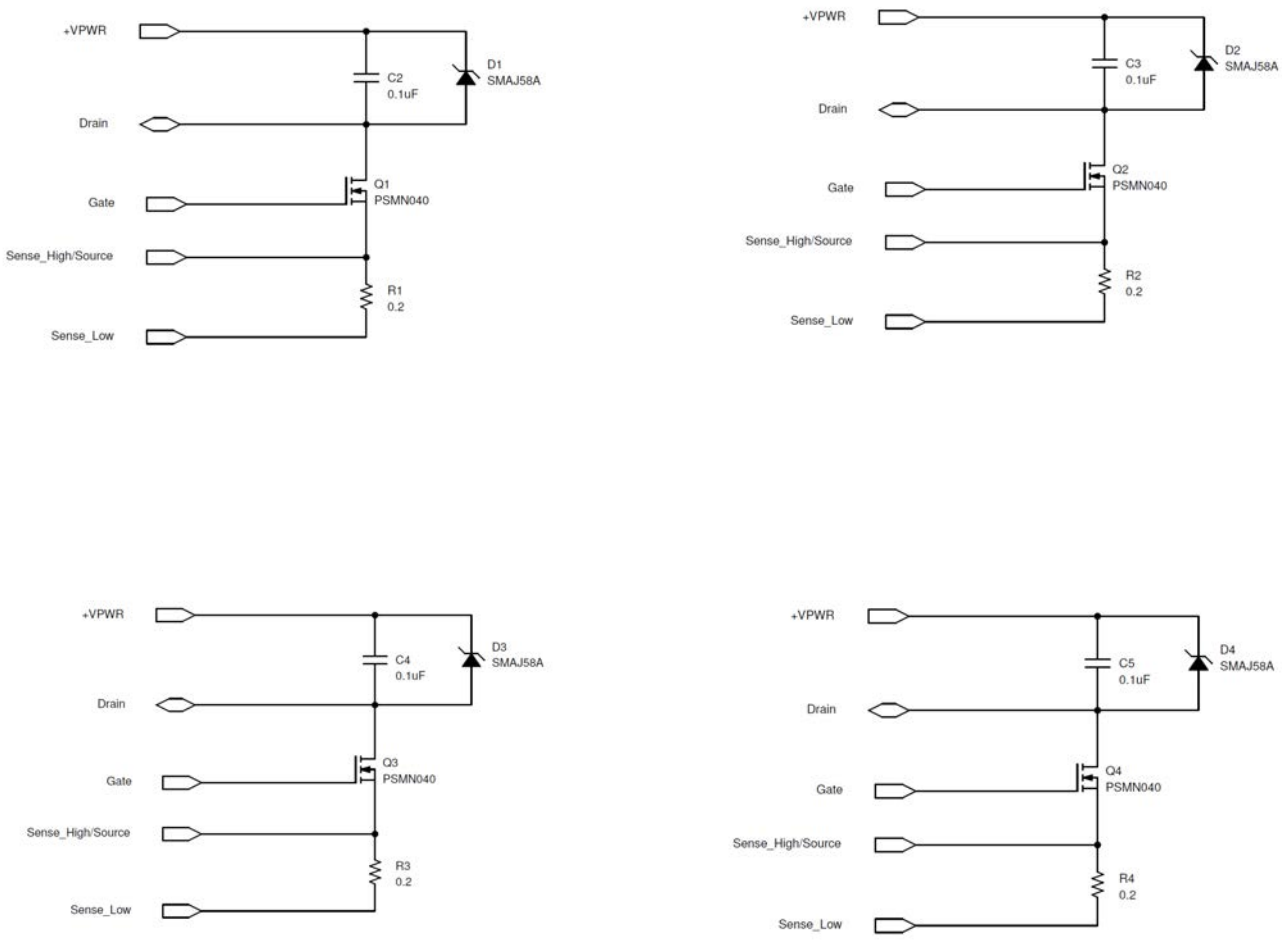


Figure 3.6. DC Schematic 3

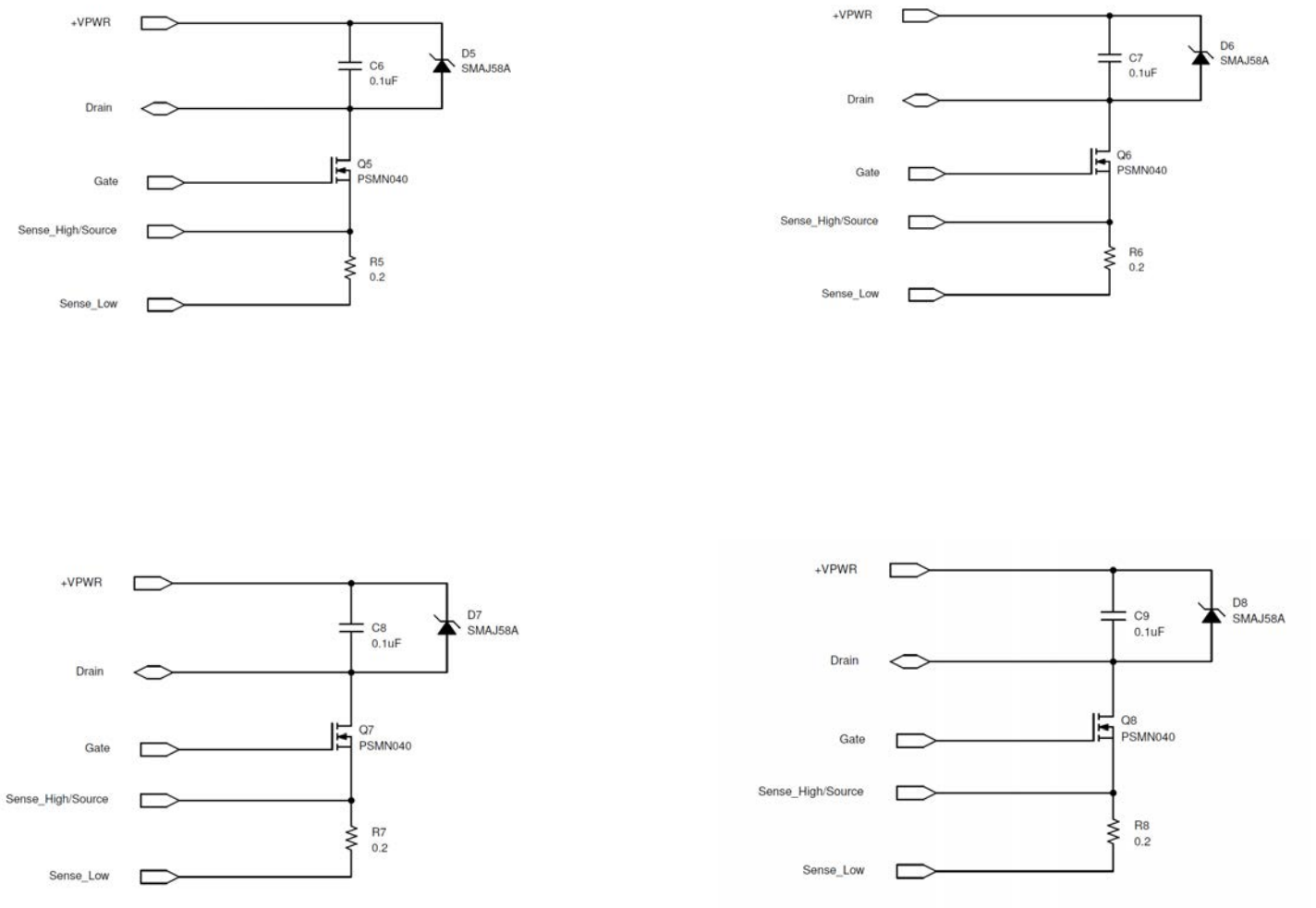


Figure 3.7. DC Schematic 4

3.3 Connector Board Schematic

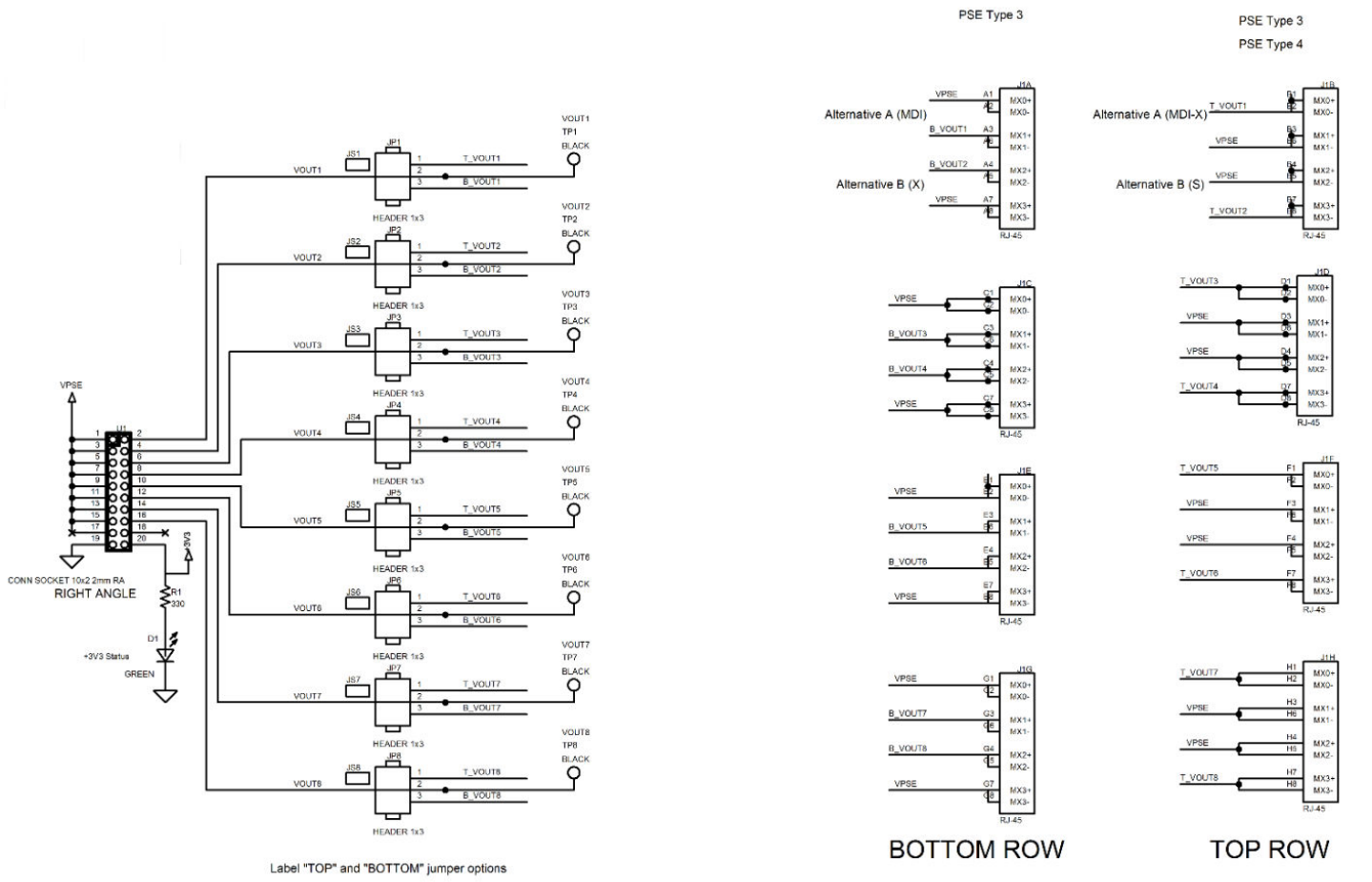


Figure 3.8. Connector Board Schematic

4. Si3474 Bills of Materials

4.1 Motherboard BOM

Designator	Qty	Value	PCB Footprint	Mfr	Mfr Part Number
C12	1	100 pF	C0603	Venkel	C0603X7R500-101K
C15	1	1.5 nF	C0603	Venkel	C0603X7R160-152K
C3, C5, C6, C7, C10, C13, C14, C16, C17, C20, C21	11	0.1 µF	C0603	Venkel	C0603X7R100-104K
C4, C22	2	1 µF	C0603	Murata	GRM188R71A105KA61D
C2	1	1 µF	C1210	Venkel	C1210X7R101-105K
C18, C19	2	4.7 µF	C0603	Venkel	C0603X5R100-475K
C8, C9, C11	3	10 µF	C1206	Venkel	C1206X7R100-106K
C1	1	33 µF	C3.5X8MM-RAD	Panasonic	ECA2AM330
D1	1	SP0503BAHT	SOT143-AKKK	Littlefuse	SP0503BAHTG
D2	1	MBRS3100T3	DO-214AB	On Semi	MBRS3100T3
D3, D4, D7, D9	4	Green	LED-0805-K	Lite On, Inc.	LTST-C170GKT
D5	1	Yellow	LED-0805-K	Rohm Semiconductor	SML-212WTT86A
D8, D11	2	5.6 V	SOD-123	On Semi	MMSZ5232BT1G
D10	1	DB2440100L	SOD-128	Panasonic	DB2440100L
JP1	1	Header 1x3	CONN-1X3	Samtec	TSW-103-07-T-S
JP2	1	Header 1x2	CONN1X2	Samtec	TSW-102-07-T-S
JS1, JS2, JS3	3	Jumper Shunt	N/A	Samtec	SNT-100-BK-T
J1	1	USB-MICRO-B-RA	MICRO-USB-PTH-WURTH	Wurth	6.29105E+11
J2	1	Socket 8 x 2	CONN2X8-SSW	Samtec	SSW-108-01-T-D
J3	1	Socket 1 x 16	CONN-1X16	Samtec	SSW-116-01-T-S
J4, J6	2	Conn TRBLK 2	CONN-TB-1757242	Poenix Contact	1757242
J5	1	Header 10 x 2	CONN2X10-RA-2MM	Samtec	TMM-110-01-T-D-RA
J7	1	Header 8 x 2	CONN2X8	Samtec	TSW-108-07-S-D
J8	1	Header 7 x 2	CONN-2X7-TSW	Samtec	TSW-107-07-T-D
MH1, MH2, MH3, MH4, MH5	5	4-40	MH-125NP	Richco Plastic Co.	NSS-4-4-01
PCB1	1	Si347xy EVM MB REV 1.0	N/A	Silicon Labs	Si347xy EVM MB REV 1.0
R18	1	100 Ω	R0603	Venkel	CR0603-16W-1000F
R22, R23, R24, R25	4	1 kΩ	R0402	Venkel	CR0402-16W-1001F
R6	1	1.82 kΩ	R0603	Venkel	CR0603-10W-1821F
R2, R3, R4	3	3.01 kΩ	R0603	Venkel	CR0603-16W-3011F
R9	1	4.7 kΩ	R0402	Venkel	CR0402-16W-472JT

Designator	Qty	Value	PCB Footprint	Mfr	Mfr Part Number
R17	1	7.68 kΩ	R0603	Venkel	CR0603-16W-7681F
R8, R10	2	10 kΩ	R0603	Venkel	CR0603-10W-103J
R16	1	11 kΩ	R0603	Venkel	CR0603-16W-1102F
R7	1	15 kΩ	R0603	Venkel	CR0603-10W-1502F
R15	1	15.8 kΩ	R0603	Venkel	CR0603-16W-1582F
R21	1	20.0 kΩ	R0603	Venkel	CR0603-16W-2002F
R14	1	22.6 kΩ	R0603	Venkel	CR0603-16W-2262F
R13	1	35.7 kΩ	R0603	Venkel	CR0603-16W-3572F
R19	1	43.2 kΩ	R0603	Yageo	RC0603FR-0743K2L
R1	1	44.2 kΩ	R0603	Venkel	CR0603-10W-4422F
R20	1	49.9 kΩ	R0603	Venkel	CR0603-10W-4992F
R12	1	61.9 kΩ	R0603	Venkel	CR0603-16W-6192F
R11	1	124 kΩ	R0603	Venkel	CR0603-16W-1243FT
SO1, SO2, SO3, SO4, SO5	5	STANDOFF		SPC Technology	2397
S1, S2, S3	3	SW Pushbutton	SW4N10P4.5	Tyco Electronics	2-1437565-8
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10	10	Black	Testpoint	Kobiconn	151-203-RC
T1	1	2 µH	IND-UTB00569S	UMEC	UTB02185s
U1	1	Si88220	SO16N10.3P1.27	Silicon Labs	Si88220EC-IS
U2	1	Si8605	SO16N6.0P1.27	Silicon Labs	Si8605AC-B-IS1
U3	1	CP2112	QFN24N4X4P0.5	Silicon Labs	CP2112-F03-GM
Not Installed Components					
D6	1	Red	LED-0805-K	Rohm Semiconductor	SML-212U2TT86A
R5	1	3.01 kΩ	R0603	Venkel	CR0603-16W-3011F

4.2 Daughtercard BOM

Designator	Qty	Value	PCB Footprint	Mfr	Mfr Part Number
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C12	11	0.1 µF	C0603	Venkel	C0603X7R101-104K
C13, C14	2	0.1 µF	C0603	Venkel	C0603X7R160-104M
C11	1	10 µF	C0603	Venkel	C0603X5R100-106K
D1, D2, D3, D4, D5, D6, D7, D8	8	SMAJ58A	DO-214AC	Littelfuse	SMAJ58A
JS1, JS2, JS3, JS4	4	Jumper Shunt	Shunt	Samtec	SNT-100-BK-T
J1	1	Header 8 x 2	CONN2X8	Samtec	TSW-108-07-S-D
J2	1	Header 1 x 16	CONN-1X16	Samtec	TSW-116-07-T-S
J3	1	Header 4 x 3	CONN3X4	Samtec	TSW-104-07-G-T
PCB1	1	Si3474A DC REV 1.0	N/A	Silicon Labs	Si3474A DC REV 1.0
Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8	8	PSMN040	LFPAK33	Nexperia	PSMN040-100MSE
R1, R2, R3, R4, R5, R6, R7, R8	8	0.2	R0805	Venkel	LCR0805-R200F
R9	1	0	R0603	Panasonic	ERJ-3GEY0R00V
TPV1, TPV2, TPV3, TPV4, TPV5, TPV6, TPV7, TPV8	8	TPV	TP-VIA	N/A	N/A
U1	1	Si3474B	QFN56M8X8P0.5E6.7	Silicon Labs	Si3474B-A01-IMR

4.3 Connector Board BOM

Designator	Qty	Value	PCB Footprint	Mfr	Mfr Part Number
D1	1	Green	LED-0805-K	Lite On, Inc.	LTST-C170GKT
JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8	8	Header 1 x 3	CONN-1X3	Samtec	TSW-103-07-T-S
JS1, JS2, JS3, JS4, JS5, JS6, JS7, JS8	8	Jumper Shunt	Shunt	Samtec	SNT-100-BK-T
J1	1	RJ-45	RJ45-8PORT	Molex	44170-0001
PCB1	1	PoE-BT-CB Rev 2.0	N/A	Silicon Labs	PoE-BT-CB REV 2.0
R1	1	330 Ω	R0603	Venkel	CR0603-16W-3300F
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	8	Black	Testpoint	Kobiconn	151-203-RC
U1	1	Conn Socket 10x2 2 mm RA	CONN2X10-2MM-SKT-RA	Samtec	SQT-110-01-F-D-RA

5. Appendix

Earlier Si3474-KITs were shipped with PoE-BT-CB Rev 1.0 instead of PoE-BT-CB Rev 2.0. If the Si3474-KIT is shipped with PoE-BT-CB Rev 1.0, this section describes how to use the PoE-BT-CB Rev 1.0.

PoE-BT-CB Rev 1.0 has a schematic error. However, it is possible to work-around this error by ignoring the printed silk screen then using the PoE-BT-CB Rev 1.0 as shown in the following figures.

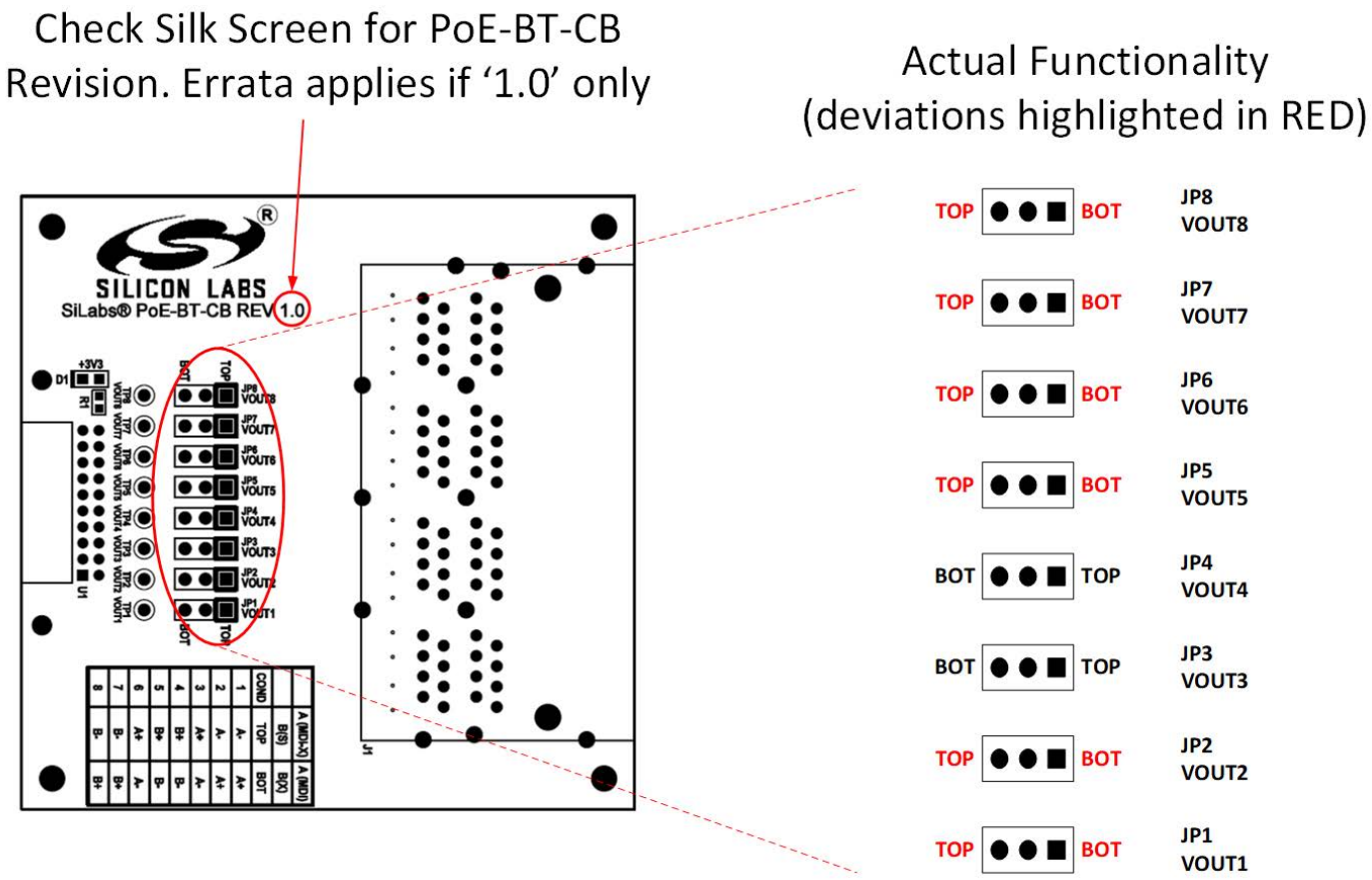


Figure 5.1. PoE-BT-CB Rev 1.0

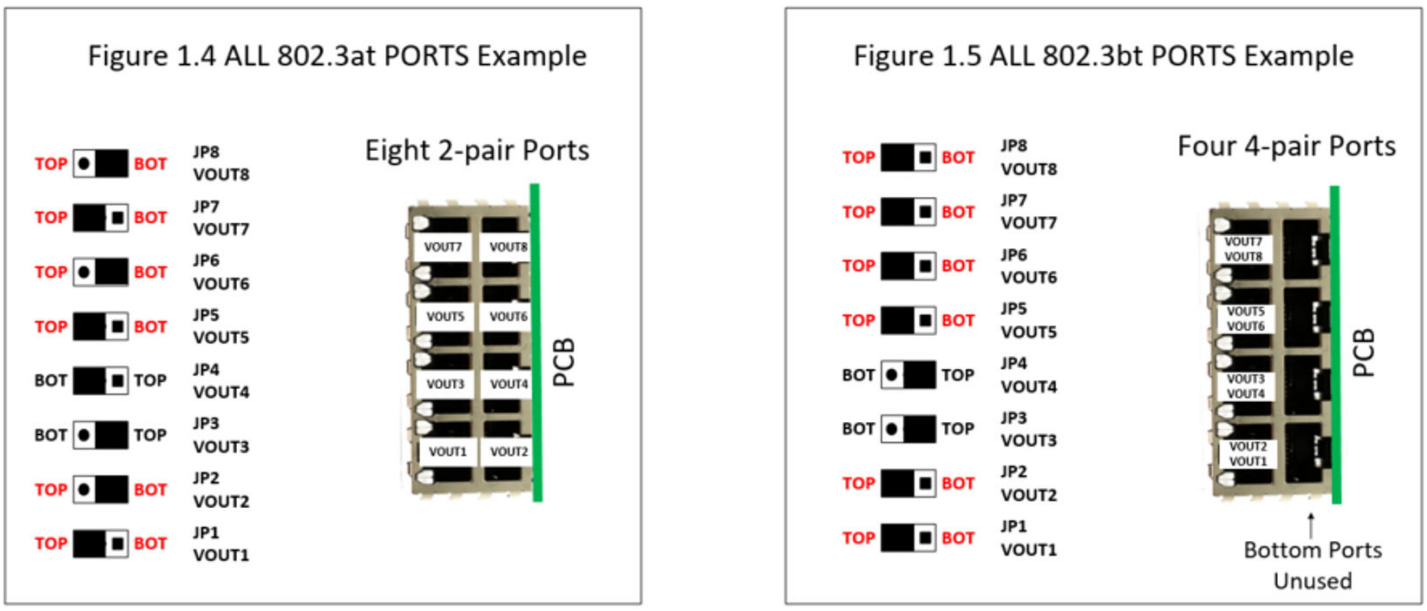
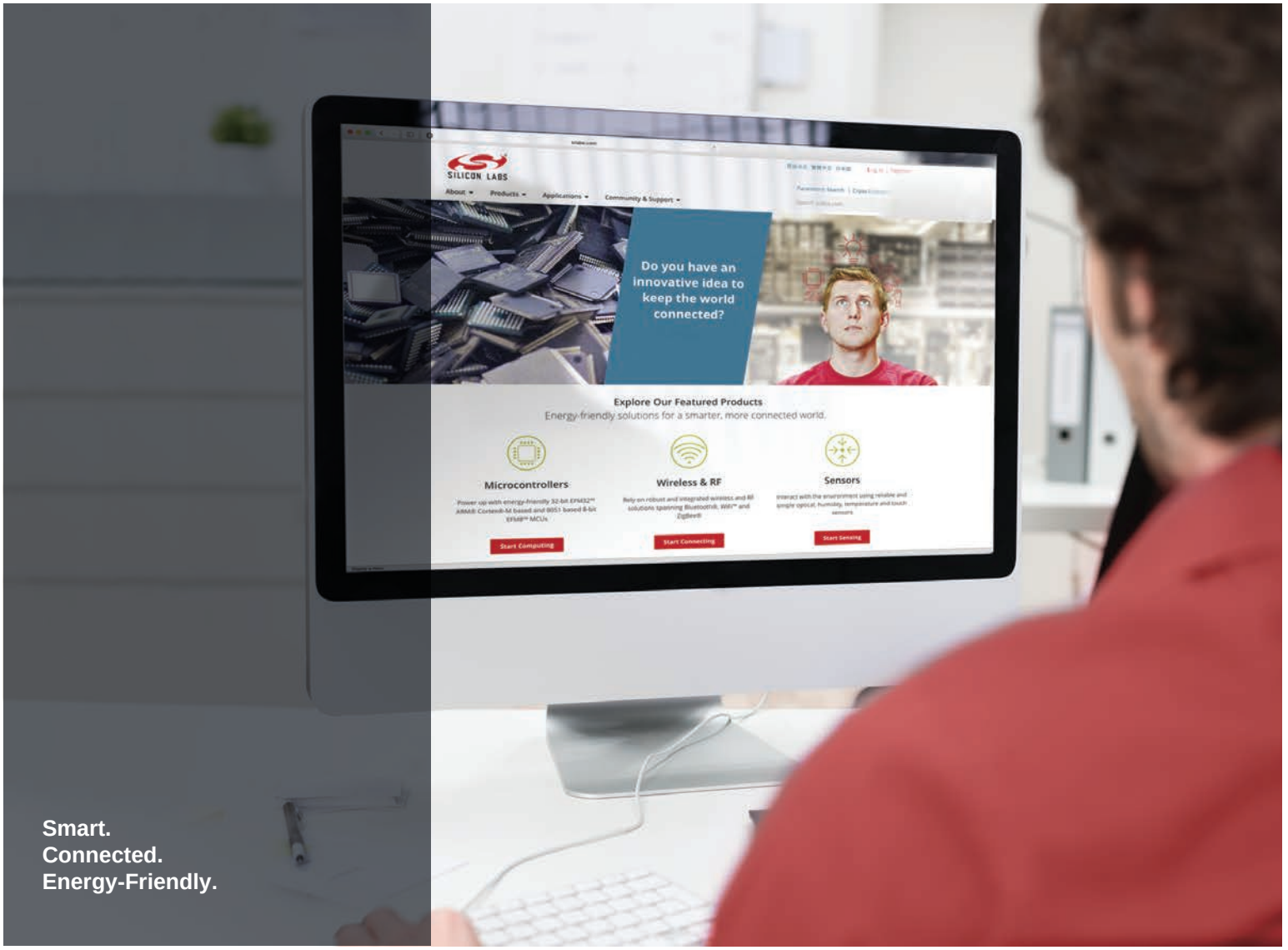


Figure 5.2. Replacement Figures for PoE-BT-CB Rev 1.0



Products
www.silabs.com/products

Quality
www.silabs.com/quality

Support and Community
community.silabs.com

SILICON LABS

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
USA

http://www.silabs.com

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Skyworks:
Si3474-KIT