

# UG405: Si3471 EVB User's Guide

## Si3471 Single 90 W Ethernet Port EVB

The Si3471 is a fully autonomous 802.3bt PSE capable of supplying 90 W on a single PoE Ethernet port. Three static I/O pins configure the maximum power the Si3471 will grant to a connected PD. The Si3471 includes a built-in LED driver to indicate the status of the PoE Ethernet port.

Configured as a single Ethernet port mid-span, the Si3471 EVB provides easy access to all Si3471 features. The compact design includes a two-layer daughtercard and a two-layer baseboard. Both are excellent starting points for new Si3471 designs.

### KEY FEATURES

- Adds 90 W PoE to a non-powered Ethernet cable
- Configurable max power output and access to Si3471 features
- Small, simple, two layer PCBs
- Only 1.8 x 3.25 inches, 46 x 83 mm
- IEEE 802.3bt compliant
- 54 V, 90 W power supply included



| Parameter               | Condition                | Specifications                  |
|-------------------------|--------------------------|---------------------------------|
| PSE Input Voltage Range | Connector J1             | 52 to 57 V                      |
| PoE Type/Class          | Type 4, Class 8          | IEEE 802.3bt                    |
| Daughtercard Size       |                          | 0.875 x 1.25 inches, 22 x 32 mm |
| Baseboard Size          |                          | 1.8 x 3.25 inches, 46 x 83 mm   |
| EVB Height              | Does not include headers | 1 inch, 25 mm                   |

# Table of Contents

- 1. Kit Description and Powering up the Si3471 EVB . . . . . 3
- 2. Si3471 Daughtercard and Baseboard Schematics . . . . . 7
- 3. Configuring Maximum Available Power . . . . . 9
- 4. Layout . . . . . 10
- 5. Bill of Materials . . . . .13
- 6. Design and Layout Checklist . . . . .15
- 7. Sifos Test Report . . . . . 16

## 1. Kit Description and Powering up the Si3471 EVB

The Si3471 EVB consists of a two-layer daughtercard and a two-layer baseboard. The daughtercard includes the Si3471, FETs, and a header for configuring the PWRAVL and MIDb pins on the Si3471.

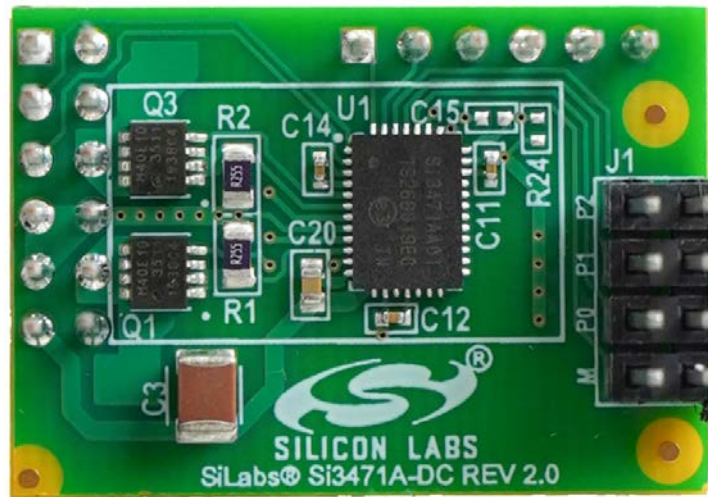


Figure 1.1. Si3471 EVB Daughtercard

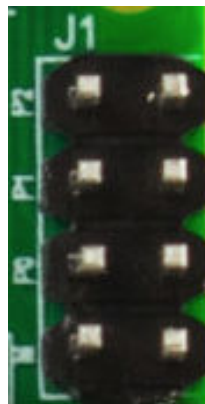


Figure 1.2. J1 Configuration Header

Adding a jumper to P0, P1, or P2 pulls the corresponding PWRAVL pin low. Adding a jumper to M pulls the MIDb pin low. The Si3471 EVB is shipped without any jumpers installed (Class 8 power). See [3. Configuring Maximum Available Power](#) for configuration details.

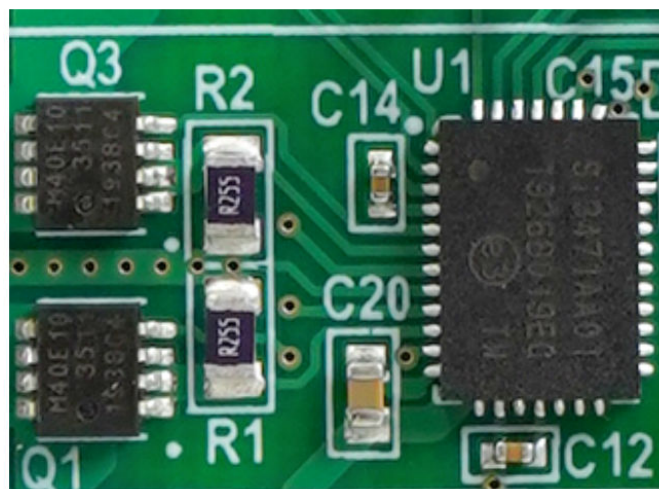


Figure 1.3. Si3471 and External FETs

The above figure shows the Si3471 and external FETs for powering the four twisted pairs in the Ethernet cable.

The Si3471 EVB baseboard includes the RJ45 Ethernet jacks, 802.3bt Ethernet magnetics, status LEDs, a reset button, and power jacks. The shrouded header, J5, is installed for EVB production use only and is not used for end user evaluation. The RJ45 connector, J1, accepts non-powered Ethernet, and the RJ45 connector, J2, outputs Power over Ethernet plus any Ethernet data from J1. Two LEDs indicate the status of the Si3471 EVB. The lower LED is connected to the LED2 driver on the Si3471, and the upper LED is connected to the LED1 driver on the Si3471. In the default Class 8 configuration of the Si3471, only the upper LED is used as the LED2 driver is only used when the Si3471 is configured for 802.3at operation. Finally, the push button is tied to RESETb and resets the Si3471.

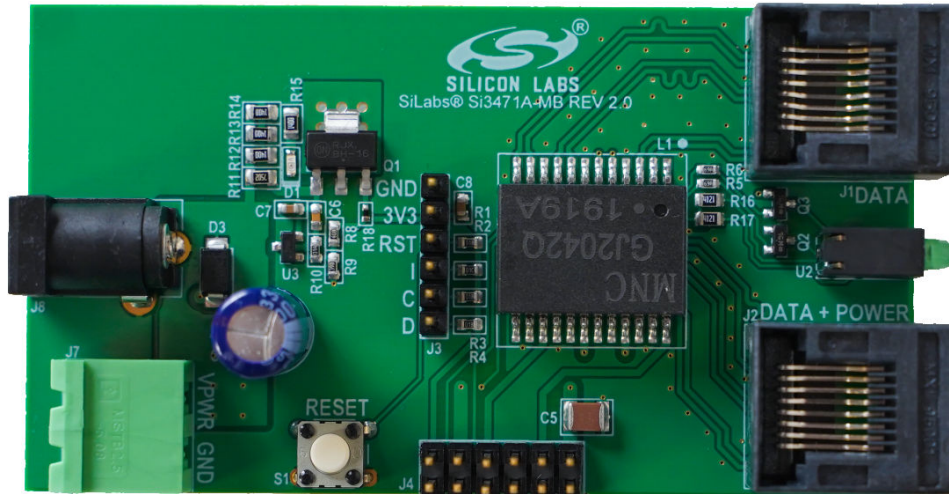


Figure 1.4. Si3471 EVB Baseboard

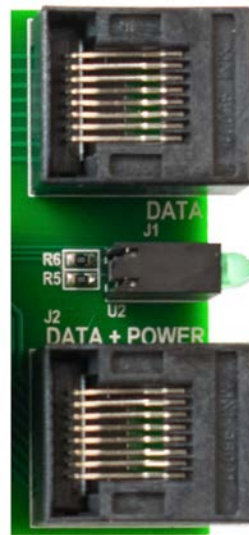
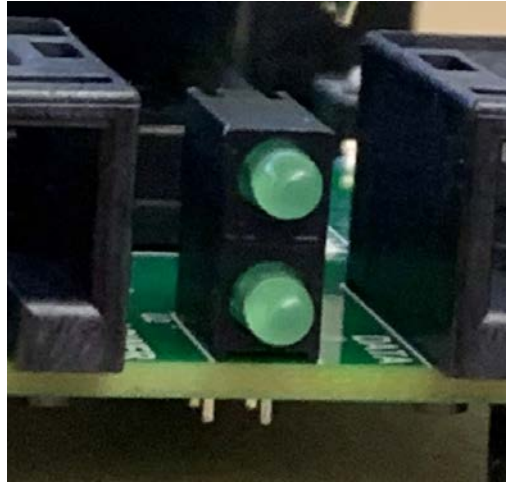


Figure 1.5. J1 and J2

J1 accepts non-PoE Ethernet, and J2 outputs 802.3bt PoE and adds any Ethernet data traffic from J1.



**Figure 1.6. Upper and Lower LEDs**

The upper LED is tied to the LED1 driver, and the lower LED is tied to the LED2 driver on the Si3471.



**Figure 1.7. S1 Reset Button**

S1 resets the Si3471.

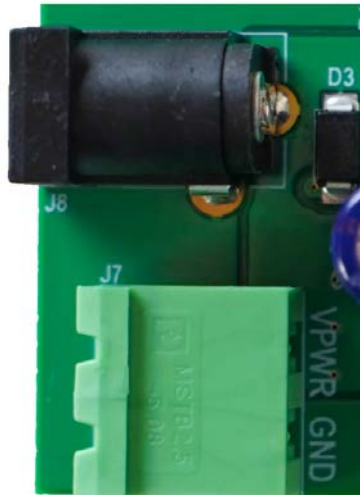
**Table 1.1. LED Status Indicators<sup>1</sup>**

| LED Indicator        | Status                                              |
|----------------------|-----------------------------------------------------|
| LED on, no blinking  | Port successfully powered at requested power level. |
| LED blinking slowly  | Looking for a valid detection signature.            |
| LED blinking quickly | Error condition, such as port overload.             |

**Note:**

1. See the Si3471 Data Sheet for more information.

The Si3471 EVB can be powered using either a standard barrel jack (J8) or two-wire connection (J7) using standard PoE voltages of 52 to 57 V. The barrel jack accepts either 2.1 or 2.5 mm adapters. The barrel jack is rated only for 24 V operation and must only be used with human supervision in an air-conditioned, nominal-room-temperature and low-humidity environment. When using a commercially available dc power supply, the dc power jack should already be connected to the EVB before plugging the supply into the ac mains. As such, DO NOT plug/unplug power at the dc jack. If there is a need to reset the board, use the supplied pushbutton reset.



**Figure 1.8. Barrel Jack with Two Terminal Power Connectors**

## 2. Si3471 Daughtercard and Baseboard Schematics

Silicon Labs will provide a free schematic and PCB layout review. To submit a support request for the review, visit [www.siliconlabs.com/support](http://www.siliconlabs.com/support).

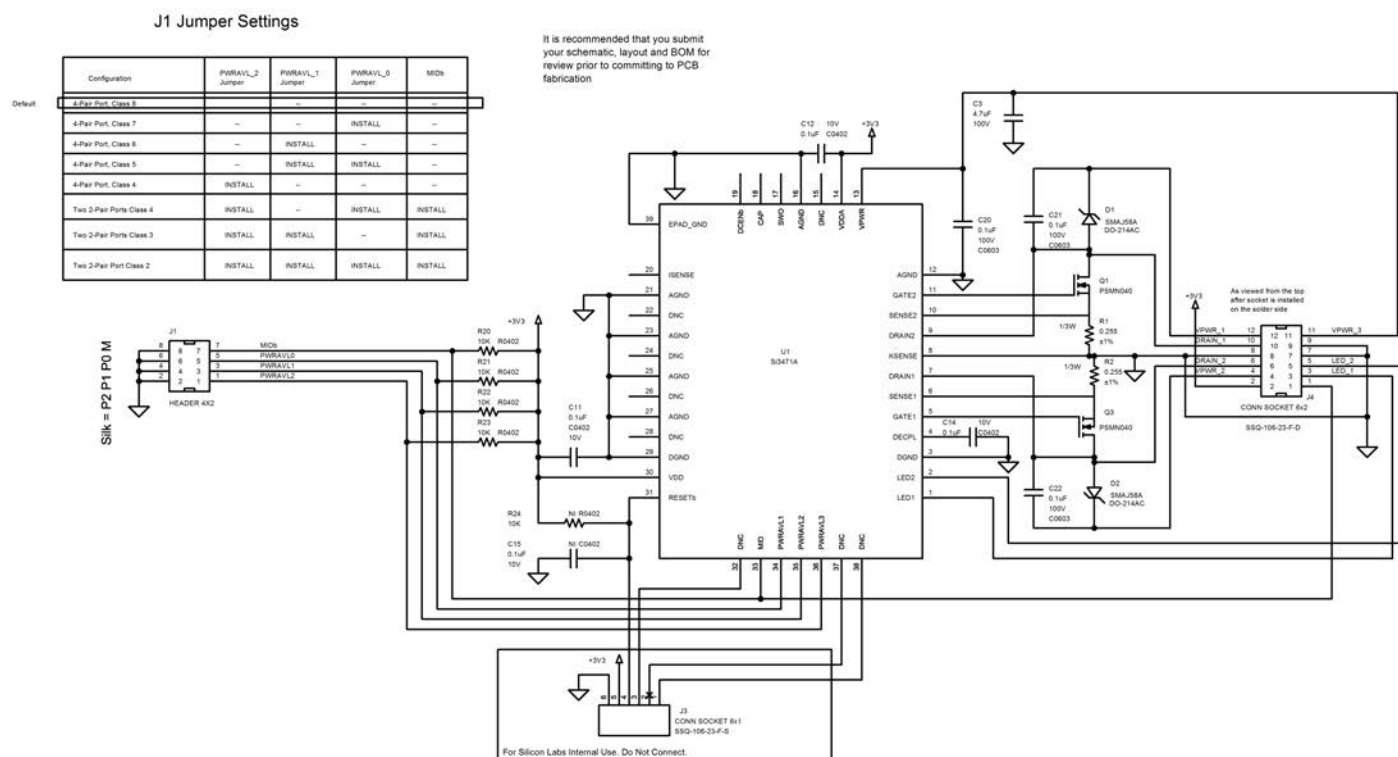


Figure 2.1. Daughtercard Schematic

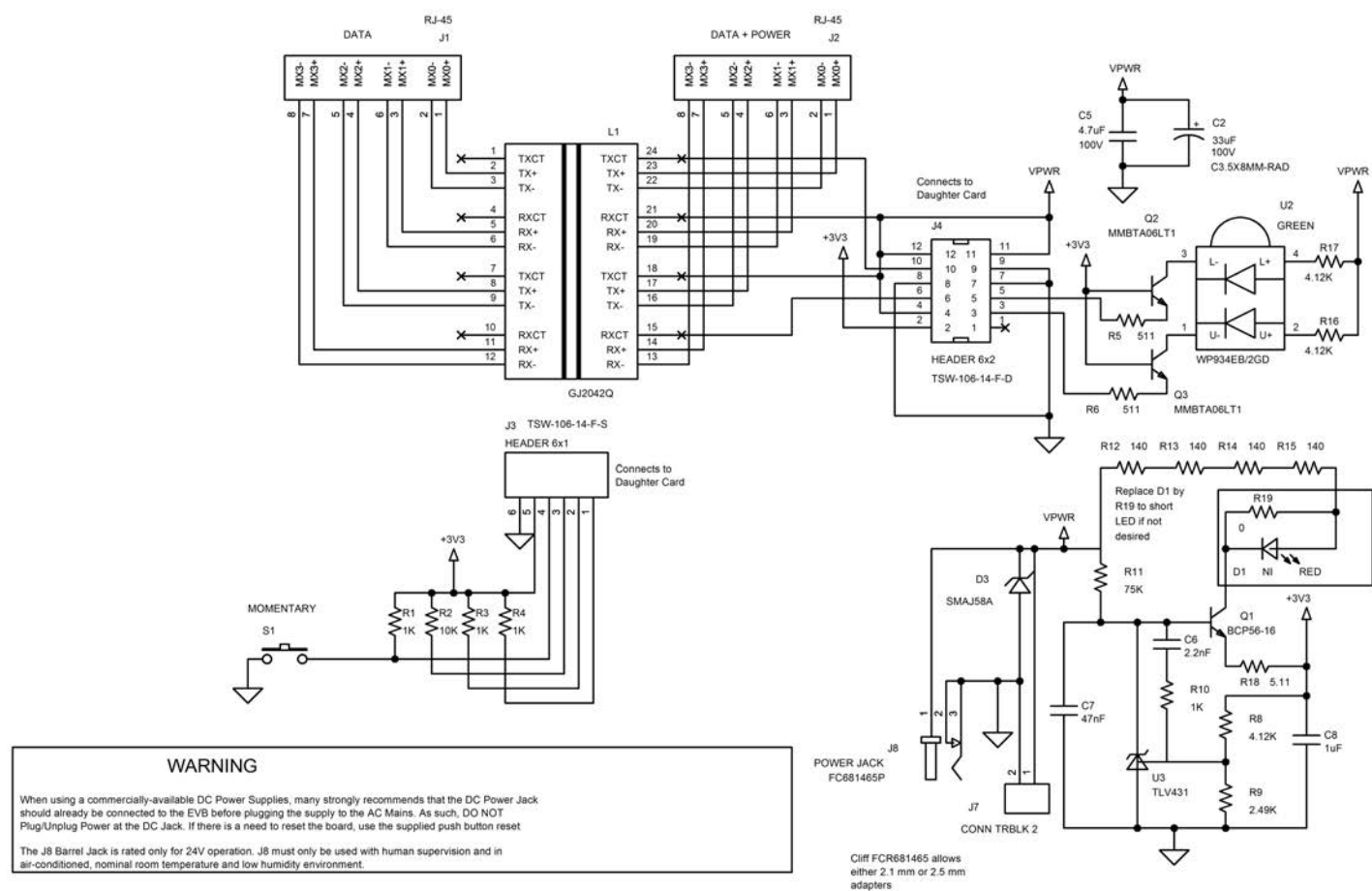


Figure 2.2. Baseboard Schematic

### 3. Configuring Maximum Available Power

The PWRAVL pins on the Si3471 configure the maximum power the Si3471 will grant to a connected PD. J1 on the daughtercard allows the PWRAVL pins to be configured when using the Si3471 EVB. The following table shows the jumper settings and their corresponding maximum power.

**Table 3.1. Jumper Settings and Maximum PD Power**

| Configuration                                                 | Maximum Power Granted to PD | M Jumper MIDb | P0 Jumper PWRAVL0 | P1 Jumper PWRAVL1 | P2 Jumper PWRAVL2 |
|---------------------------------------------------------------|-----------------------------|---------------|-------------------|-------------------|-------------------|
| Single 4-pair port, Class 8 (Default Configuration)           | 90 W                        | —             | —                 | —                 | —                 |
| Single 4-pair port, Class 7                                   | 75 W                        | —             | Install           | —                 | —                 |
| Single 4-pair port, Class 6                                   | 60 W                        | —             | —                 | Install           | —                 |
| Single 4-pair port, Class 5                                   | 45 W                        | —             | Install           | Install           | —                 |
| Single 4-pair port, Class 4                                   | 30 W                        | —             | —                 | —                 | Install           |
| Two 2-pair ports, Class 4 <sup>1</sup>                        | 60 W                        | —             | Install           | —                 | Install           |
| Two 2-pair ports, Class 3 <sup>1</sup>                        | 30.8 W                      | —             | —                 | Install           | Install           |
| Two 2-pair ports, Class 2 <sup>1</sup>                        | 15 W                        | —             | Install           | Install           | Install           |
| <b>Note:</b><br>1. Si3471 EVB only supports one Ethernet port |                             |               |                   |                   |                   |

## 4. Layout

### Daughtercard PCB Layout

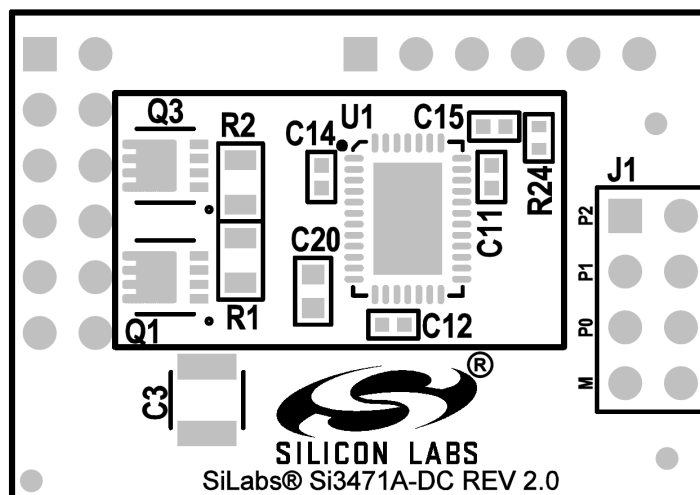


Figure 4.1. Top Silkscreen

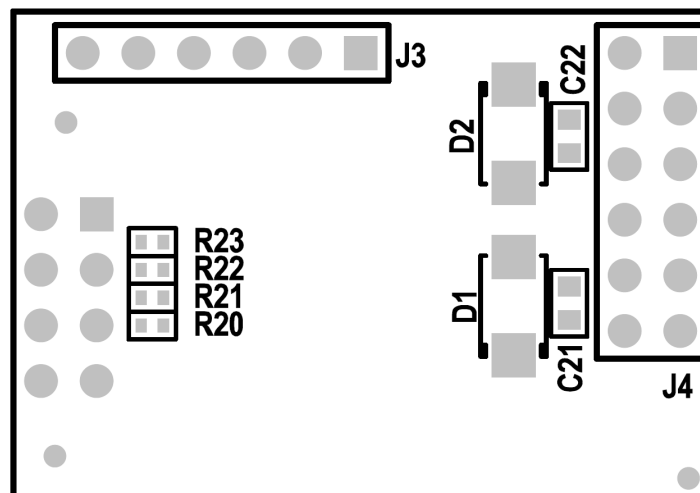


Figure 4.2. Bottom Silkscreen

### PRIMARY SIDE

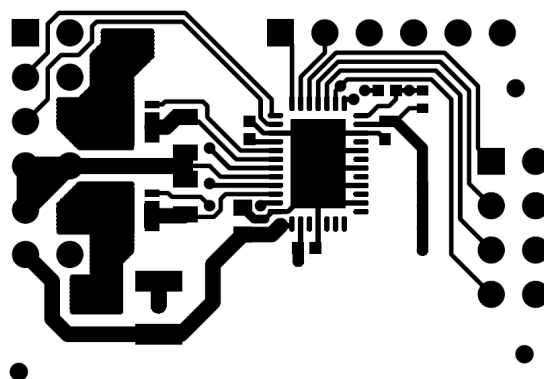


Figure 4.3. Top Layer

## SECONDARY SIDE

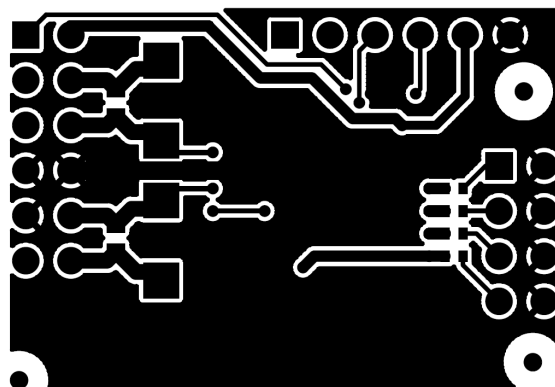


Figure 4.4. Bottom Layer

### Baseboard Layout

#### PRIMARY SILKSCREEN

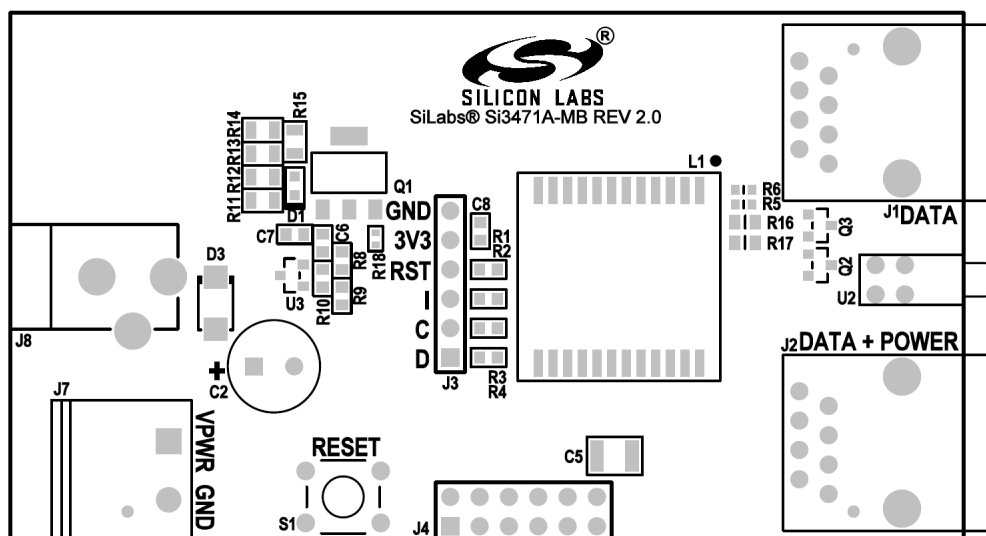


Figure 4.5. Top Silkscreen

## PRIMARY SIDE

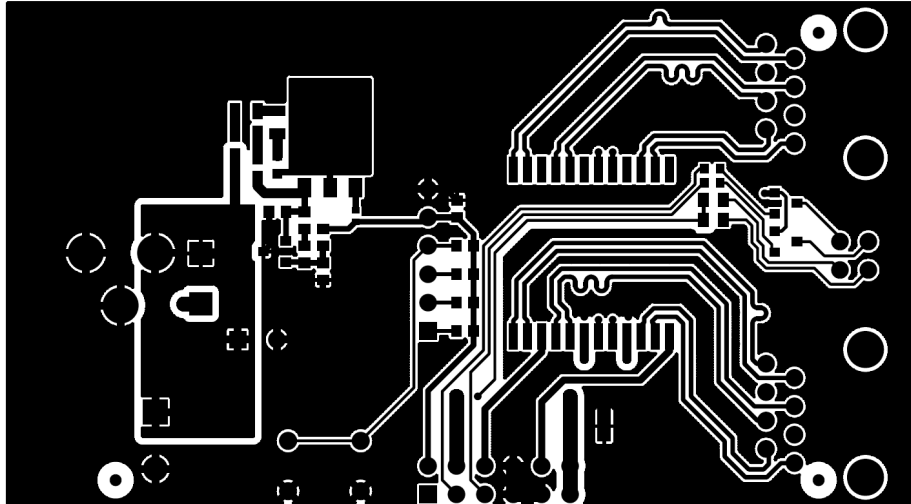


Figure 4.6. Top Layer

## SECONDARY SIDE

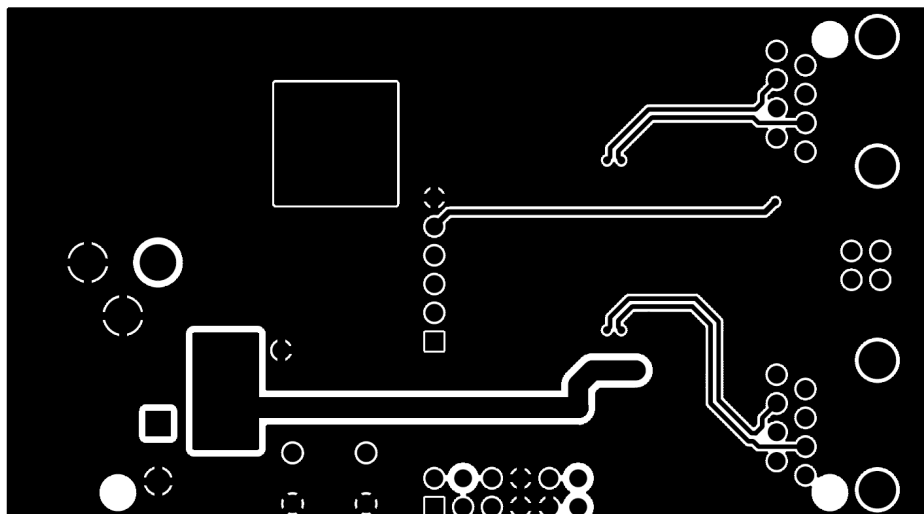


Figure 4.7. Bottom Layer

## 5. Bill of Materials

Table 5.1. Si3471 Daughtercard Bill of Materials

| Ref  | Qty | Value                 | PCB Footprint | Mfr                   | Mfr Part Number       |
|------|-----|-----------------------|---------------|-----------------------|-----------------------|
| C3   | 1   | 4.7 $\mu$ F           | C1210         | TDK                   | C3225X7S2A475M200AB   |
| C11  | 1   | 0.1 $\mu$ F           | C0402         | Venkel                | C0402X7R100-104K      |
| C12  | 1   | 0.1 $\mu$ F           | C0402         | Venkel                | C0402X7R100-104K      |
| C14  | 1   | 0.1 $\mu$ F           | C0402         | Venkel                | C0402X7R100-104K      |
| C15  | 1   | 0.1 $\mu$ F           | C0402         | Venkel                | C0402X7R100-104K      |
| C20  | 1   | 0.1 $\mu$ F           | C0603         | Venkel                | C0603X7R101-104K      |
| C21  | 1   | 0.1 $\mu$ F           | C0603         | Venkel                | C0603X7R101-104K      |
| C22  | 1   | 0.1 $\mu$ F           | C0603         | Venkel                | C0603X7R101-104K      |
| D1   | 1   | SMAJ58A               | DO-214AC      | Littelfuse            | SMAJ58A               |
| D2   | 1   | SMAJ58A               | DO-214AC      | Littelfuse            | SMAJ58A               |
| J1   | 1   | HEADER 4X2            | CONN-2X4      | Samtec                | TSW-104-08-T-D        |
| J3   | 1   | CONN SOCKET 6x1       | CONN-1X6      | Samtec                | SSQ-106-23-F-S        |
| J4   | 1   | CONN SOCKET 6x2       | CONN2X6-SKT   | Samtec                | SSQ-106-23-F-D        |
| PCB1 | 1   | Si3471A-DC-EVB-Rev2.0 | N/A           | Silicon Labs          | Si3471A-DC-EVB-Rev2.0 |
| Q1   | 1   | PSMN040               | LFPK33        | Nexperia              | PSMN040-100MSE        |
| Q3   | 1   | PSMN040               | LFPK33        | Nexperia              | PSMN040-100MSE        |
| R1   | 1   | 0.255                 | R0805         | KOA Speer Electronics | SR732ATTDR255F        |
| R2   | 1   | 0.255                 | R0805         | KOA Speer Electronics | SR732ATTDR255F        |
| R20  | 1   | 10 k $\Omega$         | R0402         | Venkel                | CR0402-16W-103J       |
| R21  | 1   | 10 k $\Omega$         | R0402         | Venkel                | CR0402-16W-103J       |
| R22  | 1   | 10 k $\Omega$         | R0402         | Venkel                | CR0402-16W-103J       |
| R23  | 1   | 10 k $\Omega$         | R0402         | Venkel                | CR0402-16W-103J       |
| R24  | 1   | 10 k $\Omega$         | R0402         | Venkel                | CR0402-16W-103J       |
| U1   | 1   | Si3471A               | QFN38N5X7P0.5 | Silicon Labs          | Si3471-A-A01-IM       |

Table 5.2. Si3471 Motherboard Bill of Materials

| Ref                   | Qty | Value                 | PCB Footprint          | Mfr                     | Mfr Part Number  |
|-----------------------|-----|-----------------------|------------------------|-------------------------|------------------|
| C2                    | 1   | 33 $\mu$ F            | C3.5X8MM-RAD           | ECA2AM330               | Panasonic        |
| C5                    | 1   | 4.7 $\mu$ F           | C1210                  | C3225X7S2A475M200A<br>B | TDK              |
| C6                    | 1   | 2.2 nF                | C0603                  | C0603X7R160-222K        | Venkel           |
| C7                    | 1   | 47 nF                 | C0603                  | C0603X7R160-473M        | Venkel           |
| C8                    | 1   | 1 $\mu$ F             | C0603                  | C0603X7R160-105K        | Venkel           |
| R19                   | 1   | 0                     | R0603                  | CR0603-16W-000          | Venkel           |
| D3                    | 1   | SMAJ58A               | DO-214AC               | SMAJ58A                 | Littelfuse       |
| JP1                   | 1   | PLUG                  |                        | 1757019                 | Phoenix Contact  |
| J1,J2                 | 2   | RJ-45                 | RJ45-95001             | 095501-2881             | MOLEX            |
| J3                    | 1   | HEADER 6x1            | CONN-1X6               | TSW-106-14-F-S          | Samtec           |
| J4                    | 1   | HEADER 6x2            | CONN-2X6               | TSW-106-14-F-D          | Samtec           |
| J7                    | 1   | CONN TRBLK 2          | CONN-TB-1757242        | 1757242                 | Phoenix Contact  |
| J8                    | 1   | POWER JACK            | CONN-3-PWR-CLIFF       | FC681465P               | Cliff Electronic |
| L1                    | 1   | GJ2042Q               | ETH1-460L              | GJ2042Q                 | Mentech          |
|                       |     | WA8704-ALD            |                        | WA8704-ALD              | Coilcraft        |
| PCB1                  | 1   | Si3471A-MB-EVB-Rev2.0 | N/A                    | Si3471A-MB-EVB-Rev2.0   | Silicon Labs     |
| Q1                    | 1   | BCP56-16              | SOT223-BCE             | BCP56-16                | On Semiconductor |
| Q2,Q3                 | 2   | MMBTA06LT1            | SOT23-BEC              | MMBTA06LT1              | On Semi          |
| R1, R3, R4            | 3   | 1 k $\Omega$          | R0603                  | CR0603-10W-1001F        | Venkel           |
| R2                    | 1   | 10 k $\Omega$         | R0603                  | CR0603-10W-1002F        | Venkel           |
| R5, R6                | 2   | 511 $\Omega$          | R0603                  | CR0603-10W-5110F        | Venkel           |
| R8                    | 1   | 4.12 k $\Omega$       | R0603                  | CR0603-10W-4121F        | Venkel           |
| R9                    | 1   | 2.49 k $\Omega$       | R0603                  | CR0603-16W-2491F        | Venkel           |
| R10                   | 1   | 1 k $\Omega$          | R0603                  | CR0603-16W-1001F        | Venkel           |
| R11                   | 1   | 75 k $\Omega$         | R0805                  | CR0805-8W-7502F         | Venkel           |
| R12, R13,<br>R14, R15 | 4   | 140 $\Omega$          | R0805                  | CR0805-8W-1400F         | Venkel           |
| R16, R17              | 2   | 4.12 k $\Omega$       | R0805                  | CR0805-8W-4121F         | Venkel           |
| R18                   | 1   | 5.11 $\Omega$         | R0402                  | CR0402-16W-5R11F        | Venkel           |
| SF1, SF2,<br>SF3, SF4 | 4   | BUMPER                | RUB-<br>BER_FOOT_SMALL | SJ61A6                  | 3M               |
| S1                    | 1   | MOMENTARY             | SW4N6.5X4.5-PB         | EVQ-PAC04M              | PANASONIC CORP   |
| U2                    | 1   | GREEN                 | LED-DUAL-RT            | WP934EB/2GD             | Kingbright       |
| U3                    | 1   | TLV431                | TLV431-DBZ             | TLV431BCDBZR            | TI               |

## 6. Design and Layout Checklist

Silicon Labs strongly recommends using these EVB schematics and layout files as a starting point to ensure robust performance and avoid common mistakes in the schematic capture and PCB layout processes.

## 7. Sifos Test Report

The table below shows the test results of the Sifos Technologies 802.3bt 4Pr Conformance Test Suite version 5.1.0n. All tests pass. However, Sifos had not yet added weighting to each test, leaving the calculated Sifos Interop Index to report "#DIV/0!".

**Table 7.1. PSE Conformance Test Suite**

| Chassis ID: 10.11.13.80<br>TestLoop: 1 | PSA-3000 Ports |       | Min    | Max    | Average | LowLi-<br>mit | P/F  | HighLi-<br>mit | P/F  |
|----------------------------------------|----------------|-------|--------|--------|---------|---------------|------|----------------|------|
|                                        | 1-1            | Units |        |        |         |               |      |                |      |
| Test: det_v                            |                |       |        |        |         |               |      |                |      |
| Open_Circuit_Voc_A=                    | 8.7            | V     | 8.7    | 8.7    | 8.7     | 0             | Pass | 30             | Pass |
| Open_Circuit_Voc_B=                    | 8.6            | V     | 8.6    | 8.6    | 8.6     | 0             | Pass | 30             | Pass |
| Backoff_Voltage_A=                     | 0.1            | V     | 0.1    | 0.1    | 0.1     | 0             | Pass | 2.8            | Pass |
| Backoff_Voltage_B=                     | 0.1            | V     | 0.1    | 0.1    | 0.1     | 0             | Pass | 2.8            | Pass |
| Backoff_Voltage_Ss=                    | 0.1            | V     | 0.1    | 0.1    | 0.1     | 0             | Pass | 2.8            | Pass |
| Max_Det_Step_V_A=                      | 8.16           | V     | 8.16   | 8.16   | 8.16    | 3.8           | Pass | 10             | Pass |
| Max_Det_Step_V_B=                      | 8.14           | V     | 8.14   | 8.14   | 8.14    | 3.8           | Pass | 10             | Pass |
| Min_Det_Step_V_A=                      | 4.07           | V     | 4.07   | 4.07   | 4.07    | 2.8           | Pass | 9              | Pass |
| Min_Det_Step_V_B=                      | 4.05           | V     | 4.05   | 4.05   | 4.05    | 2.8           | Pass | 9              | Pass |
| Det_Step_Changes_A=                    | 2              | ****  | 2      | 2      | 2       | 1             | Pass | 9              | Pass |
| Det_Step_Changes_B=                    | 2              | ****  | 2      | 2      | 2       | 1             | Pass | 9              | Pass |
| Min_Step_DV_A=                         | 4.02           | V     | 4.02   | 4.02   | 4.02    | 1             | Pass | 7.2            | Pass |
| Min_Step_DV_B=                         | 4.01           | V     | 4.01   | 4.01   | 4.01    | 1             | Pass | 7.2            | Pass |
| Pre-Det_CC_Step_V_A=                   | 0              | V     | 0      | 0      | 0       | 0             | Pass | 10             | Pass |
| Pre-Det_CC_Step_V_B=                   | 0              | V     | 0      | 0      | 0       | 0             | Pass | 10             | Pass |
| Test: det_cc                           |                |       |        |        |         |               |      |                |      |
| Presumed_CC_DET_SEQ=                   | 1              | ****  | 1      | 1      | 1       | 0             | Pass | 3              | Pass |
| Conn_Chk_SS_V_A=                       | 7.47           | V     | 7.47   | 7.47   | 7.47    | 2.8           | Pass | 10             | Pass |
| Conn_Chk_SS_V_B=                       | 4.37           | V     | 4.37   | 4.37   | 4.37    | 2.8           | Pass | 10             | Pass |
| Conn_Chk_DS_V_A=                       | 7.52           | V     | 7.52   | 7.52   | 7.52    | 2.8           | Pass | 10             | Pass |
| Conn_Chk_DS_V_B=                       | 4.08           | V     | 4.08   | 4.08   | 4.08    | 2.8           | Pass | 10             | Pass |
| High_Signature_CC_A=                   | 1              | ****  | 1      | 1      | 1       | 1             | Pass | 1              | Pass |
| High_Signature_CC_B=                   | 1              | ****  | 1      | 1      | 1       | 1             | Pass | 1              | Pass |
| 4Pair_Start_Fail=                      | 0              | ****  | 0      | 0      | 0       | 0             | Pass | 0              | Pass |
| Test: det_i                            |                |       |        |        |         |               |      |                |      |
| Isc_Init_A=                            | 2.62           | mA    | 2.62   | 2.62   | 2.62    | 0             | Pass | 5              | Pass |
| Isc_Init_B=                            | 3.28           | mA    | 3.28   | 3.28   | 3.28    | 0             | Pass | 5              | Pass |
| Isc_Det_A=                             | 2.62           | mA    | 2.62   | 2.62   | 2.62    | 0             | Pass | 5              | Pass |
| Isc_Det_B=                             | 3.28           | mA    | 3.28   | 3.28   | 3.28    | 0             | Pass | 5              | Pass |
| Det_Slew_A=                            | 0.0524         | V/μs  | 0.0524 | 0.0524 | 0.0524  | 0             | Pass | 0.1            | Pass |

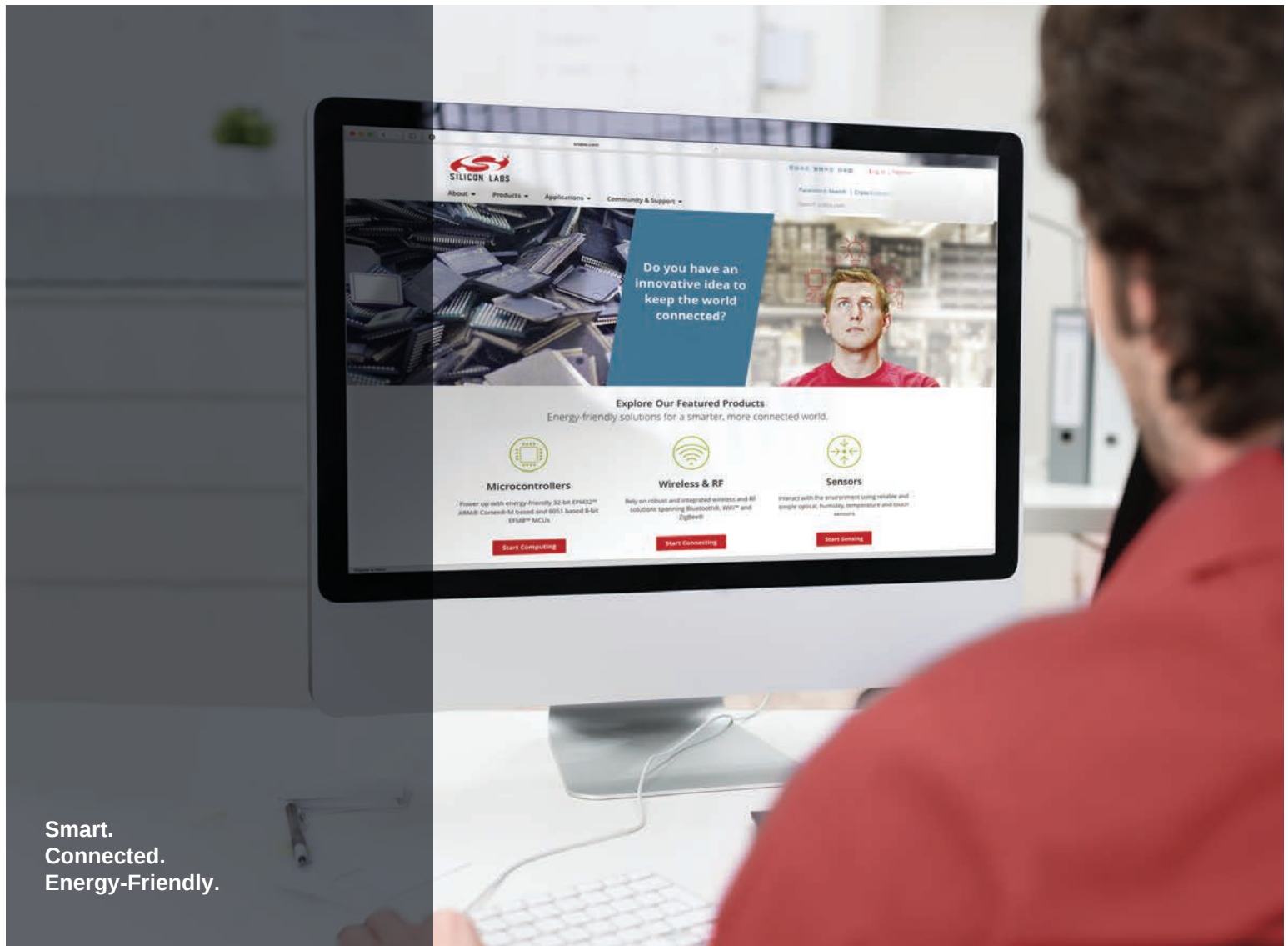
| Chassis ID: 10.11.13.80<br>TestLoop: 1 | PSA-3000 Ports |       | Min    | Max    | Average | LowLi-<br>mit | P/F  | HighLi-<br>mit | P/F  |
|----------------------------------------|----------------|-------|--------|--------|---------|---------------|------|----------------|------|
|                                        | 1-1            | Units |        |        |         |               |      |                |      |
| Det_Slew_B=                            | 0.0656         | V/μs  | 0.0656 | 0.0656 | 0.0656  | 0             | Pass | 0.1            | Pass |
| <b>Test: det_range</b>                 |                |       |        |        |         |               |      |                |      |
| Rgood_Max_Single=                      | 28             | kΩ    | 28     | 28     | 28      | 27            | Pass | 32             | Pass |
| Rgood_Min_Single=                      | 17             | kΩ    | 17     | 17     | 17      | 16            | Pass | 19             | Pass |
| Cgood_Max_Single=                      | 0.1            | μF    | 0.1    | 0.1    | 0.1     | 0             | Pass | 10             | Pass |
| Rgood_Max_Dual_A=                      | 28             | kΩ    | 28     | 28     | 28      | 27            | Pass | 32             | Pass |
| Rgood_Max_Dual_B=                      | 28             | kΩ    | 28     | 28     | 28      | 27            | Pass | 32             | Pass |
| Rgood_Min_Dual_A=                      | 17             | kΩ    | 17     | 17     | 17      | 16            | Pass | 19             | Pass |
| Rgood_Min_Dual_B=                      | 17             | kΩ    | 17     | 17     | 17      | 16            | Pass | 19             | Pass |
| Cgood_Max_Dual_A=                      | 0.1            | μF    | 0.1    | 0.1    | 0.1     | 0             | Pass | 10             | Pass |
| Cgood_Max_Dual_B=                      | 0.1            | μF    | 0.1    | 0.1    | 0.1     | 0             | Pass | 10             | Pass |
| <b>Test: det_time</b>                  |                |       |        |        |         |               |      |                |      |
| Detect_Time_Tdet_A=                    | 134.8          | msec  | 134.8  | 134.8  | 134.8   | 0             | Pass | 500            | Pass |
| Detect_Time_Tdet_B=                    | 136.7          | msec  | 136.7  | 136.7  | 136.7   | 0             | Pass | 500            | Pass |
| Backoff_Time_SS=                       | 390.6          | msec  | 390.6  | 390.6  | 390.6   | 0             | Pass | 9999           | Pass |
| Det2Det_Time=                          | 41             | msec  | 41     | 41     | 41      | 0             | Pass | 400            | Pass |
| <b>Test: det_rsource</b>               |                |       |        |        |         |               |      |                |      |
| PSE_Detect_Source=                     | 0              | ****  | 0      | 0      | 0       | 0             | Pass | 1              | Pass |
| PSE_Source_Zout_A=                     | 0              | kΩ    | 0      | 0      | 0       | 45            | Pass | 300            | Pass |
| PSE_Source_Zout_B=                     | 0              | kΩ    | 0      | 0      | 0       | 45            | Pass | 300            | Pass |
| <b>Test: cc_response</b>               |                |       |        |        |         |               |      |                |      |
| Single_Sig_Response=                   | 1              | ****  | 1      | 1      | 1       | 1             | Pass | 1              | Pass |
| Dual_Sig_Response=                     | 1              | ****  | 1      | 1      | 1       | 1             | Pass | 1              | Pass |
| 2Pair_PD_A=                            | 1              | ****  | 1      | 1      | 1       | 0             | Pass | 2              | Pass |
| 2Pair_PD_B=                            | 0              | ****  | 0      | 0      | 0       | 0             | Pass | 2              | Pass |
| <b>Test: class_v</b>                   |                |       |        |        |         |               |      |                |      |
| Vclass_max_SS=                         | 18.8           | V     | 18.8   | 18.8   | 18.8    | 15.5          | Pass | 20.5           | Pass |
| Vclass_min_SS=                         | 17.6           | V     | 17.6   | 17.6   | 17.6    | 15.5          | Pass | 20.5           | Pass |
| Vmark_SS=                              | 9.4            | V     | 9.4    | 9.4    | 9.4     | 7             | Pass | 10             | Pass |
| Vreset_SS=                             | 0              | V     | 0      | 0      | 0       | 0             | Pass | 2.8            | Pass |
| Vclass_max_DSA=                        | 18.8           | V     | 18.8   | 18.8   | 18.8    | 15.5          | Pass | 20.5           | Pass |
| Vclass_max_DSB=                        | 18.8           | V     | 18.8   | 18.8   | 18.8    | 15.5          | Pass | 20.5           | Pass |
| Vclass_min_DSA=                        | 17.7           | V     | 17.7   | 17.7   | 17.7    | 15.5          | Pass | 20.5           | Pass |
| Vclass_min_DSB=                        | 17.7           | V     | 17.7   | 17.7   | 17.7    | 15.5          | Pass | 20.5           | Pass |
| Vmark_DSA=                             | 9.4            | V     | 9.4    | 9.4    | 9.4     | 7             | Pass | 10             | Pass |
| Vmark_DSB=                             | 9.4            | V     | 9.4    | 9.4    | 9.4     | 7             | Pass | 10             | Pass |

| Chassis ID: 10.11.13.80<br>TestLoop: 1 | PSA-3000 Ports |        | Min  | Max  | Average | LowLi-mit | P/F  | HighLi-mit | P/F  |
|----------------------------------------|----------------|--------|------|------|---------|-----------|------|------------|------|
|                                        | 1-1            | Units  |      |      |         |           |      |            |      |
| Vreset_DSA=                            | 0              | V      | 0    | 0    | 0       | -1        | Pass | 2.8        | Pass |
| Vreset_DSB=                            | 0              | V      | 0    | 0    | 0       | -1        | Pass | 2.8        | Pass |
| <b>Test: class_time</b>                |                |        |      |      |         |           |      |            |      |
| Class_Probe_SS=                        | 1              | ****   | 1    | 1    | 1       | 0         | Pass | 1          | Pass |
| EV_Count_7_SS=                         | 5              | Events | 5    | 5    | 5       | 1         | Pass | 5          | Pass |
| Long_EV1_Time_SS=                      | 99.6           | msec   | 99.6 | 99.6 | 99.6    | 88        | Pass | 105        | Pass |
| Min_Class_EV_Time_SS=                  | 7.8            | msec   | 7.8  | 7.8  | 7.8     | 6         | Pass | 20         | Pass |
| Max_Class_EV_Time_SS=                  | 13.7           | msec   | 13.7 | 13.7 | 13.7    | 6         | Pass | 20         | Pass |
| Min_Mark_EV_Time_SS=                   | 7.8            | msec   | 7.8  | 7.8  | 7.8     | 6         | Pass | 12         | Pass |
| Max_Mark_EV_Time_SS=                   | 9.8            | msec   | 9.8  | 9.8  | 9.8     | 6         | Pass | 12         | Pass |
| Final_Mark_EV_Time_SS=                 | 11.7           | msec   | 11.7 | 11.7 | 11.7    | 6         | Pass | 256        | Pass |
| CI_Prb_Reset_Time_SS=                  | 23.4           | msec   | 23.4 | 23.4 | 23.4    | 15        | Pass | 10000      | Pass |
| Class_Probe_DA=                        | 1              | ****   | 1    | 1    | 1       | 0         | Pass | 1          | Pass |
| EV_Count_5D_DA=                        | 4              | Events | 4    | 4    | 4       | 1         | Pass | 4          | Pass |
| Long_EV1_Time_DA=                      | 97.7           | msec   | 97.7 | 97.7 | 97.7    | 88        | Pass | 105        | Pass |
| Min_Class_EV_Time_DA=                  | 7.8            | msec   | 7.8  | 7.8  | 7.8     | 6         | Pass | 20         | Pass |
| Max_Class_EV_Time_DA=                  | 15.6           | msec   | 15.6 | 15.6 | 15.6    | 6         | Pass | 20         | Pass |
| Min_Mark_EV_Time_DA=                   | 7.8            | msec   | 7.8  | 7.8  | 7.8     | 6         | Pass | 12         | Pass |
| Max_Mark_EV_Time_DA=                   | 9.8            | msec   | 9.8  | 9.8  | 9.8     | 6         | Pass | 12         | Pass |
| Final_Mark_EV_Time_DA=                 | 9.7            | msec   | 9.7  | 9.7  | 9.7     | 6         | Pass | 256        | Pass |
| CI_Prb_Reset_Time_DA=                  | 25.4           | msec   | 25.4 | 25.4 | 25.4    | 15        | Pass | 10000      | Pass |
| Class_Probe_DB=                        | 1              | ****   | 1    | 1    | 1       | 0         | Pass | 1          | Pass |
| EV_Count_5D_DB=                        | 4              | Events | 4    | 4    | 4       | 1         | Pass | 4          | Pass |
| Long_EV1_Time_DB=                      | 99.6           | msec   | 99.6 | 99.6 | 99.6    | 88        | Pass | 105        | Pass |
| Min_Class_EV_Time_DB=                  | 7.8            | msec   | 7.8  | 7.8  | 7.8     | 6         | Pass | 20         | Pass |
| Max_Class_EV_Time_DB=                  | 13.7           | msec   | 13.7 | 13.7 | 13.7    | 6         | Pass | 20         | Pass |
| Min_Mark_EV_Time_DB=                   | 7.8            | msec   | 7.8  | 7.8  | 7.8     | 6         | Pass | 12         | Pass |
| Max_Mark_EV_Time_DB=                   | 9.8            | msec   | 9.8  | 9.8  | 9.8     | 6         | Pass | 12         | Pass |
| Final_Mark_EV_Time_DB=                 | 9.7            | msec   | 9.7  | 9.7  | 9.7     | 6         | Pass | 256        | Pass |
| CI_Prb_Reset_Time_DB=                  | 25.4           | msec   | 25.4 | 25.4 | 25.4    | 15        | Pass | 10000      | Pass |
| <b>Test: class_response</b>            |                |        |      |      |         |           |      |            |      |
| Class_3_Count=                         | 1              | ****   | 1    | 1    | 1       | 1         | Pass | 1          | Pass |
| Class_4_Count=                         | 3              | ****   | 3    | 3    | 3       | 1         | Pass | 3          | Pass |
| Class_5_Count=                         | 4              | ****   | 4    | 4    | 4       | 1         | Pass | 4          | Pass |
| Class_6_Count=                         | 4              | ****   | 4    | 4    | 4       | 1         | Pass | 4          | Pass |
| Class_7_Count=                         | 5              | ****   | 5    | 5    | 5       | 1         | Pass | 5          | Pass |

| Chassis ID: 10.11.13.80<br>TestLoop: 1 | PSA-3000 Ports |       | Min   | Max   | Average | LowLi-<br>mit | P/F  | HighLi-<br>mit | P/F  |
|----------------------------------------|----------------|-------|-------|-------|---------|---------------|------|----------------|------|
|                                        | 1-1            | Units |       |       |         |               |      |                |      |
| Class_8_Count=                         | 5              | ****  | 5     | 5     | 5       | 1             | Pass | 5              | Pass |
| Class_2D_Count_A=                      | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 3              | Pass |
| Class_2D_Count_B=                      | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 3              | Pass |
| Class_3D_Count_A=                      | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 3              | Pass |
| Class_3D_Count_B=                      | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 3              | Pass |
| Class_4D_Count_A=                      | 3              | ****  | 3     | 3     | 3       | 1             | Pass | 3              | Pass |
| Class_4D_Count_B=                      | 3              | ****  | 3     | 3     | 3       | 1             | Pass | 3              | Pass |
| Class_5D_Count_A=                      | 4              | ****  | 4     | 4     | 4       | 1             | Pass | 4              | Pass |
| Class_5D_Count_B=                      | 4              | ****  | 4     | 4     | 4       | 1             | Pass | 4              | Pass |
| Max_SS_Class=                          | 8              | ****  | 8     | 8     | 8       | 3             | Pass | 8              | Pass |
| Max_DS_Class=                          | 5              | ****  | 5     | 5     | 5       | 1             | Pass | 5              | Pass |
| Init_Grant_Match=                      | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 1              | Pass |
| 2-Pair_Pairset=                        | 1              | ****  | 1     | 1     | 1       | 0             | Pass | 2              | Pass |
| PRI_4pr_Pairset=                       | 12             | ****  | 12    | 12    | 12      | 1             | Pass | 12             | Pass |
| <b>Test: class_err</b>                 |                |       |       |       |         |               |      |                |      |
| Class_Ilim_A=                          | 84             | mA    | 84    | 84    | 84      | 51            | Pass | 100            | Pass |
| Class_Ilim_B=                          | 84.3           | mA    | 84.3  | 84.3  | 84.3    | 51            | Pass | 100            | Pass |
| Pwr_CI_52_SS=                          | 0              | ****  | 0     | 0     | 0       | 0             | Pass | 0              | Pass |
| Pwr_CI_52_DSA=                         | 0              | ****  | 0     | 0     | 0       | 0             | Pass | 0              | Pass |
| Pwr_CI_52_DSB=                         | 0              | ****  | 0     | 0     | 0       | 0             | Pass | 0              | Pass |
| Mark_Ilim_A=                           | 86             | mA    | 86    | 86    | 86      | 0             | Pass | 105            | Pass |
| Mark_Ilim_B=                           | 84             | mA    | 84    | 84    | 84      | 0             | Pass | 105            | Pass |
| Inval_Sig_EV2_SS=                      | 1              | ****  | 1     | 1     | 1       | 0             | Pass | 1              | Pass |
| Inval_Sig_EV4_SS=                      | 0              | ****  | 0     | 0     | 0       | 0             | Pass | 1              | Pass |
| Inval_Sig_EV5_SS=                      | 0              | ****  | 0     | 0     | 0       | 0             | Pass | 1              | Pass |
| Inval_Sig_EV2_DSA=                     | 1              | ****  | 1     | 1     | 1       | 0             | Pass | 1              | Pass |
| Inval_Sig_EV2_DSB=                     | 1              | ****  | 1     | 1     | 1       | 0             | Pass | 1              | Pass |
| Inval_Sig_EV4_DSA=                     | 1              | ****  | 1     | 1     | 1       | 0             | Pass | 1              | Pass |
| Inval_Sig_EV4_DSB=                     | 1              | ****  | 1     | 1     | 1       | 0             | Pass | 1              | Pass |
| <b>Test: pwrup_time</b>                |                |       |       |       |         |               |      |                |      |
| Pwr_On_Time_Tpon_SS=                   | 331.2          | msec  | 331.2 | 331.2 | 331.2   | 0             | Pass | 400            | Pass |
| Pwr_On_Time_Tpon_DSA=                  | 311.7          | msec  | 311.7 | 311.7 | 311.7   | 0             | Pass | 400            | Pass |
| Pwr_On_Time_Tpon_DSB=                  | 311.7          | msec  | 311.7 | 311.7 | 311.7   | 0             | Pass | 400            | Pass |
| Pwrup_Rise_Time_A=                     | 327            | µs    | 327   | 327   | 327     | 15            | Pass | 50000          | Pass |
| Pwrup_Rise_Time_B=                     | 328            | µs    | 328   | 328   | 328     | 15            | Pass | 50000          | Pass |
| Pwr_Stagger_Time_SS4=                  | 69.5           | msec  | 69.5  | 69.5  | 69.5    | -1            | Pass | 75             | Pass |

| Chassis ID: 10.11.13.80<br>TestLoop: 1 | PSA-3000 Ports |       | Min   | Max   | Average | LowLi-<br>mit | P/F  | HighLi-<br>mit | P/F  |
|----------------------------------------|----------------|-------|-------|-------|---------|---------------|------|----------------|------|
|                                        | 1-1            | Units |       |       |         |               |      |                |      |
| Pwr_Stagger_Time_SS5=                  | 0              | msec  | 0     | 0     | 0       | 0             | Pass | 75             | Pass |
| Pwr_Stagger_Time_DS=                   | 349.5          | msec  | 349.5 | 349.5 | 349.5   | 0             | Pass | 1000           | Pass |
| <b>Test: pwrup_inrush</b>              |                |       |       |       |         |               |      |                |      |
| linrush_min_Class_3=                   | 417            | mA    | 417   | 417   | 417     | 400           | Pass | 9999           | Pass |
| linrush_min_Class_5=                   | 836.5          | mA    | 836.5 | 836.5 | 836.5   | 400           | Pass | 9999           | Pass |
| linrush_min_Class_7=                   | 836.6          | mA    | 836.6 | 836.6 | 836.6   | 800           | Pass | 9999           | Pass |
| linrush_min_Class_1D_A=                | 417.4          | mA    | 417.4 | 417.4 | 417.4   | 400           | Pass | 9999           | Pass |
| linrush_min_Class_1D_B=                | 417            | mA    | 417   | 417   | 417     | 400           | Pass | 9999           | Pass |
| linrush_4P_max_Class_3=                | 417.7          | mA    | 417.7 | 417.7 | 417.7   | 0             | Pass | 450            | Pass |
| linrush_4P_max2_Class_5=               | 837.3          | mA    | 837.3 | 837.3 | 837.3   | 0             | Pass | 900            | Pass |
| linrush_4P_max2_Class_7=               | 837.5          | mA    | 837.5 | 837.5 | 837.5   | 0             | Pass | 900            | Pass |
| linrush_2P_max_Class_3=                | 417.4          | mA    | 417.4 | 417.4 | 417.4   | 0             | Pass | 450            | Pass |
| linrush_2P_max2_Class_7=               | 418.8          | mA    | 418.8 | 418.8 | 418.8   | 0             | Pass | 600            | Pass |
| linrush_2p_max_CI_1D_A=                | 418            | mA    | 418   | 418   | 418     | 0             | Pass | 450            | Pass |
| linrush_2p_max_CI_1D_B=                | 417.7          | mA    | 417.7 | 417.7 | 417.7   | 0             | Pass | 450            | Pass |
| Tinrush_minPr_Class_3=                 | 69.34          | msec  | 69.34 | 69.34 | 69.3    | 50            | Pass | 75             | Pass |
| Tinrush_maxPr_Class_3=                 | 69.34          | msec  | 69.34 | 69.34 | 69.3    | 50            | Pass | 75             | Pass |
| Tinrush_minPr_Class_7=                 | 69.34          | msec  | 69.34 | 69.34 | 69.3    | 50            | Pass | 75             | Pass |
| Tinrush_maxPr_Class_7=                 | 69.34          | msec  | 69.34 | 69.34 | 69.3    | 50            | Pass | 75             | Pass |
| Tinrush_Class_1D_A=                    | 72.47          | msec  | 72.47 | 72.47 | 72.5    | 50            | Pass | 75             | Pass |
| Tinrush_Class_1D_B=                    | 72.07          | msec  | 72.07 | 72.07 | 72.1    | 50            | Pass | 75             | Pass |
| Delay_Inrush_Class_7=                  | 69.34          | msec  | 69.34 | 69.34 | 69.3    | 50            | Pass | 75             | Pass |
| Delay_Inrush_Class_2D_A=               | 72.07          | msec  | 72.07 | 72.07 | 72.1    | 50            | Pass | 75             | Pass |
| Delay_Inrush_Class_2D_B=               | 72.47          | msec  | 72.47 | 72.47 | 72.5    | 50            | Pass | 75             | Pass |
| 45ms_Pwr_Stat_Class_7=                 | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 1              | Pass |
| 45ms_Pwr_Stat_Class_2D_A=              | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 1              | Pass |
| 45ms_Pwr_Stat_Class_2D_B=              | 1              | ****  | 1     | 1     | 1       | 1             | Pass | 1              | Pass |
| Vinrush_Class_2D_A=                    | 31.2           | V     | 31.2  | 31.2  | 31.2    | 30            | Pass | 60             | Pass |
| Vinrush_Class_2D_B=                    | 31.1           | V     | 31.1  | 31.1  | 31.1    | 30            | Pass | 60             | Pass |
| <b>Test: pwr_on_v</b>                  |                |       |       |       |         |               |      |                |      |
| Vpse_Max_Alt_A=                        | 56.05          | V     | 56.05 | 56.05 | 56.05   | 52            | Pass | 57             | Pass |
| Vpse_Max_Alt_B=                        | 56.1           | V     | 56.1  | 56.1  | 56.1    | 52            | Pass | 57             | Pass |
| Vpse_Min_Alt_A=                        | 54.9           | V     | 54.9  | 54.9  | 54.9    | 52            | Pass | 57             | Pass |
| Vpse_Min_Alt_B=                        | 54.88          | V     | 54.88 | 54.88 | 54.88   | 52            | Pass | 57             | Pass |
| Vport_PSE_diff=                        | 50             | mV    | 50    | 50    | 50      | 0             | Pass | 150            | Pass |
| V_ripple_A=                            | 7              | mVp-p | 7     | 7     | 7       | 0             | Pass | 500            | Pass |

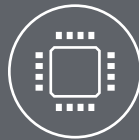
| Chassis ID: 10.11.13.80<br>TestLoop: 1 | PSA-3000 Ports |       | Min    | Max    | Average | LowLi-<br>mit | P/F  | HighLi-<br>mit | P/F  |
|----------------------------------------|----------------|-------|--------|--------|---------|---------------|------|----------------|------|
|                                        | 1-1            | Units |        |        |         |               |      |                |      |
| V_ripple_B=                            | 5              | mVp-p | 5      | 5      | 5       | 0             | Pass | 500            | Pass |
| V_noise_A=                             | 6              | mVp-p | 6      | 6      | 6       | 0             | Pass | 200            | Pass |
| V_noise_B=                             | 14             | mVp-p | 14     | 14     | 14      | 0             | Pass | 200            | Pass |
| V_trans_A=                             | 54.832         | V     | 54.832 | 54.832 | 54.832  | 52            | Pass | 57             | Pass |
| V_trans_B=                             | 54.784         | V     | 54.784 | 54.784 | 54.784  | 52            | Pass | 57             | Pass |
| <b>Test: pwrn_pwrcap</b>               |                |       |        |        |         |               |      |                |      |
| pwrn_pwrcap=                           | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| <b>Test: pwrn_maxi</b>                 |                |       |        |        |         |               |      |                |      |
| pwrn_maxi=                             | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| <b>Test: pwrn_overld</b>               |                |       |        |        |         |               |      |                |      |
| pwrn_overld=                           | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| <b>Test: mps_dc_valid</b>              |                |       |        |        |         |               |      |                |      |
| mps_dc_valid=                          | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| <b>Test: mps_dc_pwrnd</b>              |                |       |        |        |         |               |      |                |      |
| mps_dc_pwrnd=                          | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| <b>Test: pwrnd_overld</b>              |                |       |        |        |         |               |      |                |      |
| pwrnd_overld=                          | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| <b>Test: pwrnd_time</b>                |                |       |        |        |         |               |      |                |      |
| pwrnd_time=                            | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| <b>Test: pwrnd_v</b>                   |                |       |        |        |         |               |      |                |      |
| pwrnd_v=                               | -1             | ****  | -1     | -1     | -1      | 0             | Pass | 1              | Pass |
| Test Port Model Number:                | 3202           |       |        |        |         |               |      |                |      |
| Test Port Hardware Version:            | 8              |       |        |        |         |               |      |                |      |
| Test Port Firmware Version:            | 4.14           |       |        |        |         |               |      |                |      |



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