

**PD70211EVB50FW-3**  
**3.3V/50W Isolated Active Clamp Forward Converter PD**  
**Evaluation Board User Guide**  
Revision 1.0



## 1 About this guide

This user guide provides both description and operation procedures for Microsemi's PD70211EVB50FW-3 evaluating board. This board is used for evaluating the performance of PD70211A PD controller with integrated switching regulator, and PD70224 Dual MOSFET – Based Active Bridge Rectifier.

PD70211ILQ device supports both the standard IEEE802.3at PD application interface, and a PWM controller that is used to provide the PD operational voltage.

The evaluation board supports a 50 Watt, 3.3V output in its existing configuration, with no heat sink.

### 1.1 Audience

This user guide is intended for qualified personnel, meaning operators and technicians who have a background in basic concepts of electronics.

### 1.2 Organization

This guide is divided into several sections as follows:

|                                                                                                     |                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Chapter <b>Error! Reference source not found.</b></li> </ul> | <p><b>Error! Reference source not found.:</b> Describes the objectives, audience, and organization.</p>                                                |
| <ul style="list-style-type: none"> <li>Chapter 2</li> </ul>                                         | <p><b>Introduction:</b> Provides an overview about evaluation board's main functions, features, physical characteristics and ordering information.</p> |
| <ul style="list-style-type: none"> <li>Chapter 3</li> </ul>                                         | <p><b>Physical Description:</b> Provides explanation related to the physical description (switches, jumpers, connectors).</p>                          |
| <ul style="list-style-type: none"> <li>Chapter 4</li> </ul>                                         | <p><b>Electrical Characteristics:</b> Provides electrical characteristics of the evaluation board.</p>                                                 |
| <ul style="list-style-type: none"> <li>Chapter 5</li> </ul>                                         | <p><b>Installation:</b> Provides description of the installation process.</p>                                                                          |
| <ul style="list-style-type: none"> <li>Chapter 6</li> </ul>                                         | <p><b>Test Data:</b> Provides board test data information</p>                                                                                          |
| <ul style="list-style-type: none"> <li>Chapter 7</li> </ul>                                         | <p><b>Schematic:</b> Provides board schematic diagram</p>                                                                                              |
| <ul style="list-style-type: none"> <li>Chapter 8</li> </ul>                                         | <p><b>List of Material:</b> Provides board's list of materials.</p>                                                                                    |
| <ul style="list-style-type: none"> <li>Chapter 9</li> </ul>                                         | <p><b>Board Layout:</b> Provides board Gerber files description for all layers.</p>                                                                    |

### 1.3 Reference Documents

PD70211 datasheet, catalogue number DS\_PD70211

PD70224 datasheet, catalogue number DS\_PD70224

## 2 Introduction

Microsemi's PD70211ILQ device is part of a family of devices which are targeted for realizing the 802.3at standard PD interface.

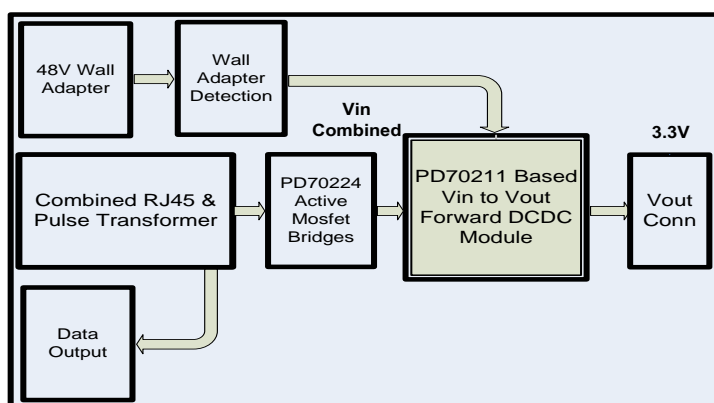
The PD interface family of devices includes the following:

| Device type | Power capability                                 | Integrates PWM controller |
|-------------|--------------------------------------------------|---------------------------|
| PD70100     | IEEE802.3at Type 1<br>(IEEE802.3 af level)       | No                        |
| PD70101     | IEEE802.3at Type 1<br>(IEEE802.3 af level)       | Yes                       |
| PD70200     | IEEE802.3at Type 2                               | No                        |
| PD70201     | IEEE802.3at Type 2                               | Yes                       |
| PD70210(A)  | 2 x IEEE802.3at Type 2 (4 pair)<br>HDBaseT (95W) | No                        |
| PD70211     | 2 x IEEE802.3at Type 2 (4 pair)<br>HDBaseT (95W) | Yes                       |

Microsemi's PD70211EVB50FW-3 Evaluation Board (see Figure 2) provides designers with an environment needed for evaluating the performance and implementation of PD applications based on PD70211 controller.

The board is using a single PD controller, PD70211ILQ, to support the Detection, Class, and Power Supplying phases on the 4 Pairs of the Cat5 cable. The board supports sync detection of the 4 pairs. PD70211ILQ supports the current of the HDBaseT over 4 Pairs, which is more than twice the power of a standard IEEE802.3AT Type 2 interface.

All necessary steps and connection instructions required to install and operate this board are provided within this document.



**Figure 1: PD70211EVB50FW-3 Block Diagram**



**Figure 2: PD70211EVB50FW-3 Evaluation Board – General View**

### Evaluation Boards Ordering Information

Microsemi supplies the following Evaluation Board as shown below:

| Ordering Number  | Description                                                                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PD70211EVB50FW-3 | 2 x IEEE802.3at Type 2 (4 pair) PD based on PD70211 device having 4 pair supply, controlling an <b>isolated Forward converter</b> , having a <b>3.3V 15A</b> output. |

## 2.1 Evaluation Board Features

- Designed to support Data and Spare current by a single PD70211A device
- Power is supplied through the 4-pairs of the Cat5 cable
- Wall Adapter input – Standard Barrel Jack available for connecting to an external 42-54V Wall Adapter.
- Data pass-through connector
- On board PSE class type LED indicators
- On board AT detected LED indicator
- On board 4P\_AT detected LED indicator
- On board HD detected LED indicator
- On board 4P\_HD detected LED indicator
- On board Power Good LED indicator which may be configured to monitor PD Front End or VPP UVLO.
- $T_A = -40^\circ$  to  $+70^\circ\text{C}$
- RoHS compliant

## 2.2 Physical Characteristics

Table 1 lists evaluation board's physical characteristics.

**Table 1: Physical Characteristics**

| Parameter                   | Value                        |
|-----------------------------|------------------------------|
| Mechanical dimensions in mm | 165 x 57 x 20 mm (L x W x H) |



### 3 Physical Description

#### 3.1 Package Contents

Upon opening the Evaluation Board package, verify the following part is included.

If it seems damaged, contact local representative or Microsemi's headquarters.

Package content for standard shipments is:

- PD70211EVB50FW-3 Evaluation Board.
- Wall Adapter Input Cable

#### 3.2 Connectors

The following sections provide both general and detailed information regarding unit's connectors.

##### 3.2.1 Connectors Table

Table 2 lists the Evaluation Board's connectors.

**Table 2: Connectors List**

| # | Connector | Name               | Description                                                                                                                                           |
|---|-----------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | J1        | RJ45 Connector     | RJ45 port for Data + Power In for PSE connection                                                                                                      |
| 2 | J2        | Wall Adapter Input | Standard Barrel Jack used for 48V Wall Adapter. Wall adapter connection will be automatically sensed and will override the PSE power connected to J1. |
| 3 | J3        | Converter Output   | Screw terminals for easy connecting a load to 3.3V output.                                                                                            |
| 4 | J4        | RJ45 Connector     | A port for Data pass – through output                                                                                                                 |

##### 3.2.2 Connectors Detailed Explanation

(The numbering is in reference to the numbers listed in Table 2.)

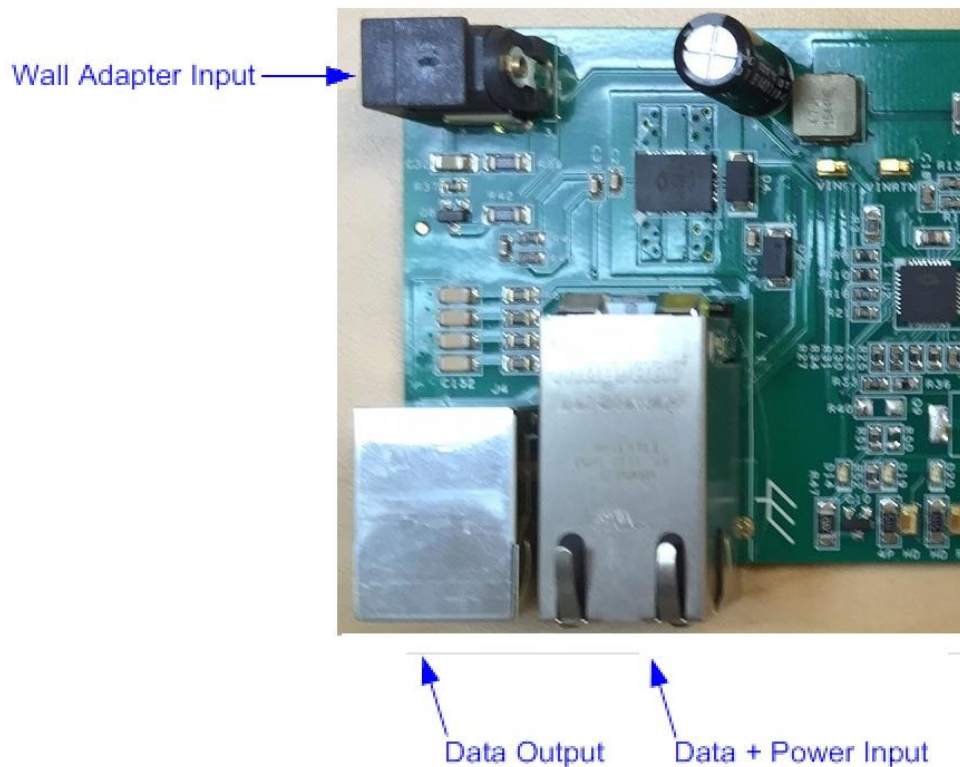
###### 1. RJ45 Connectors.

See Figure 3.

**Table 3: RJ45 Connectors**

| J1 & J4 Pin No | Signal Name       | Description                                                            |
|----------------|-------------------|------------------------------------------------------------------------|
| J1 - 1, 2      | Data and Power In | Data and power input to powered device (PoE Master Negative data port) |
| J1 - 3, 6      | Data and Power In | Data and power input to powered device (PoE Master Positive data port) |
| J1 - 4, 5      | Data and Power In | Data and power input to powered device (PoE Master Positive data port) |
| J1 - 7, 8      | Data and Power In | Data and power input to powered device (PoE Master Negative data port) |

| J1 & J4 Pin No | Signal Name | Description                                               |
|----------------|-------------|-----------------------------------------------------------|
| J4 - 1, 2      | Data Output | Isolated data pass-through to external monitoring device. |
| J4 - 3, 6      | Data Output | Isolated data pass-through to external monitoring device. |
| J4 - 4, 5      | Data Output | Isolated data pass-through to external monitoring device. |
| J4 - 7, 8      | Data Output | Isolated data pass-through to external monitoring device. |



**Figure 3: Front RJ45 and Auxiliary 48V Wall Adapter Connectors**

**2. Wall Adapter Connections**

See Figure 3.

| J2 Pin No    | Signal Name | Description                         |
|--------------|-------------|-------------------------------------|
| Center Pin   | VIN (+)     | 42V to 57V input from wall adapter. |
| Outer Barrel | VIN (-)     | Wall Adapter Return                 |

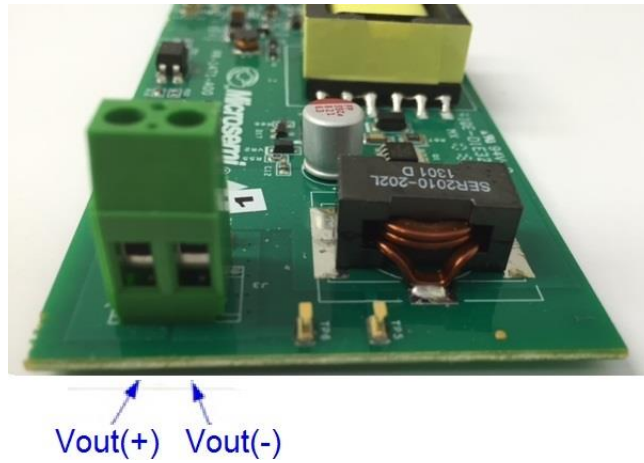
**3. V<sub>out</sub> Connections**



See Figure 4.

**Table 4: Output Load Connections**

| Pin No. | Signal Name | Description                    |
|---------|-------------|--------------------------------|
| J3 - 2  | Vout (-)    | Return of DC-DC output voltage |
| J3 - 1  | Vout (+)    | Positive DC-DC output voltage  |



**Figure 4: Output Connections**





### 3.3 Indications

The following sections provide general information regarding unit's indications.

#### 3.3.1 LED Indication

See Figure 5.

D16 is the AT\_FLAG indication LED, a PD70211 device output signal indicating the device has detected a 2 finger class event from the PSE side in the class stage. The flag will be operative at 3, 4, and 6 fingers detection as well.

D15 is the 4P\_AT indication LED, a PD70211 device output signal indicating the device has detected a 4 finger class event from the PSE side in the class stage, or a 2 finger class event from the PSE side in the class stage, and SUPP\_SA and SUPP\_SB are both High.

The flag will be operative at 6 fingers detection as well.

D20 is the HD\_FLAG indication LED, a PD70211 device output signal indicating the device has detected a 3 finger class event from the PSE side in the class stage.

The flag will be operative at 6 fingers detection as well.

D19 is the 4P\_HD indication LED, a PD70211 device output signal indicating the device has detected a 6 finger class event from the PSE side in the class stage.

D14 is the Power Good indication. This LED indicates the presence of power. This indicator may be configured to monitor PD Front End VAUX (Asserts when VPP = 36V min.; de-asserts when VPP = 31V min.), or it may be configured to monitor the VPP UVLO, which is user selectable by the resistor values at VINS and HYST pins (R13, R19, and R25). See the PD70211 datasheet for further details regarding setting VPP UVLO limits. EVB default for Power Good EVB is monitoring VPP UVLO, and will track the operation of the DC-DC converter. To change Power Good to monitor PD Front End VAUX:

- 1) Remove R51, 100 Ohm Resistor (located on PCB bottom under D10).
- 2) Add R50 Zero Ohm Jumper (Also located on PCB bottom under D10).
- 3) Insure that only R51 or R50 are installed; do not operate with both resistors installed.

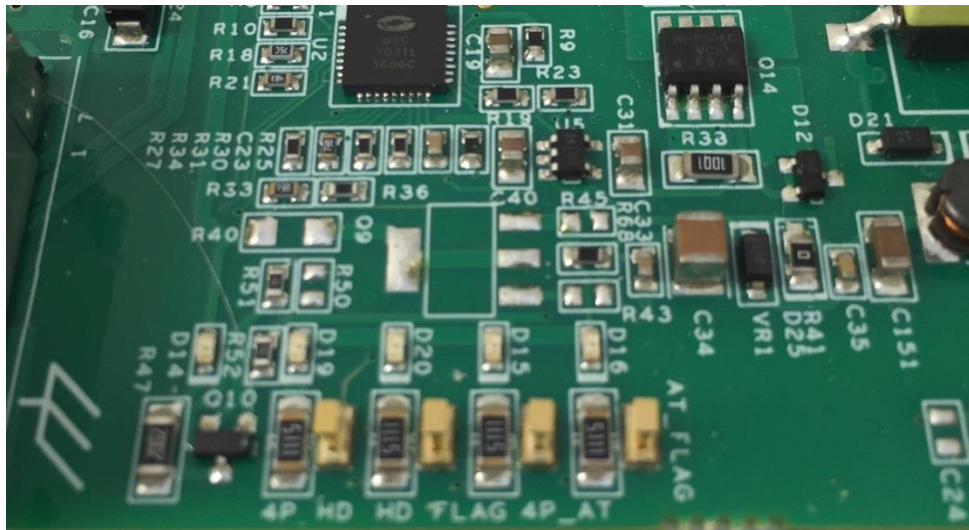


Figure 5: LED Indications

## 4 Electrical Characteristics

Evaluation board's electrical characteristics are described below:

**Table 5: Electrical Characteristics**

| Parameter                              |  | Min  | Max  |       |
|----------------------------------------|--|------|------|-------|
| Main DC Supply – J1, VIN+, VINRTN      |  | 42*  | 57   | V     |
| Wall Adapter Supply – J2, VIN+, VINRTN |  | 42   | 57   | V     |
| Output voltage                         |  | 3.25 | 3.40 | V     |
| Maximum Output Current                 |  |      | 15   | A     |
| Port Isolation to Chassis              |  | -    | 1.5  | kVrms |

\*After start-up, the minimum voltage is 36V with load  $\leq$  13W per IEEE specification.

## 5 Installation

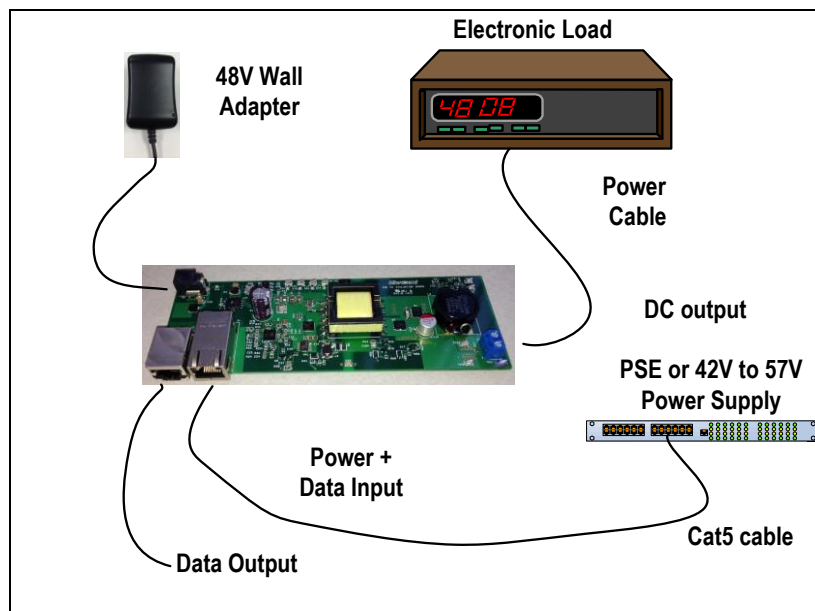
### 5.1 Preliminary Considerations and Safety Precautions

- If using an external supply in place of a PSE, verify the external power supply is turned “off” before all peripheral devices are connected. Insure the external supply is connected to the RJ45 input (J1) per Table 3.

### 5.2 Initial Configuration

**Note:** It is important to verify evaluation board is setup as shown in Figure 6 prior to starting any operation.

1. Connect load to evaluation board (J3 -1 (+) & J3 - 2 (-), or TP17 (+) & TP16 (-)).
2. Connect a Cat5 cable from PSE to Evaluation Board (J1), or a 48V Wall Adapter to Evaluation Board (J2).  
 Note: Wall Adapter will override power from PSE.



**Figure 6: Test Setup**

## 6 Test Data

This chapter describes typical EVB test data under various loads and POE input voltage levels.

The efficiency is indicated up to 15A output load current.

Overall efficiency is measured at the input to the bridge. It does not include system-level components (input/output connectors, data transformer, and EMI filter).

$$Eff = \frac{V_{out} * I_{out}}{V_{in} * I_{in}}$$

DC-DC efficiency is measured after the PD chip.

### 6.1 Efficiency vs. Input Voltage to the bridge at full load (15A)

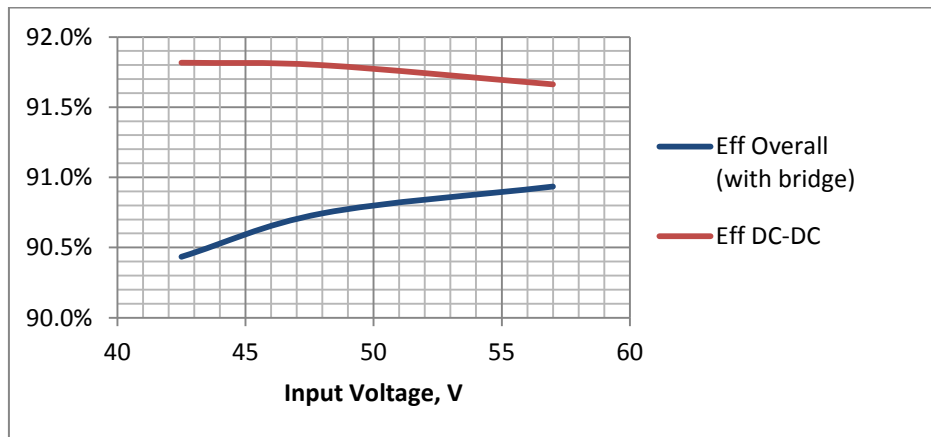


Figure 7: Efficiency vs. Input Voltage

### 6.2 Efficiency vs. Load Current at 48V Input to the bridge

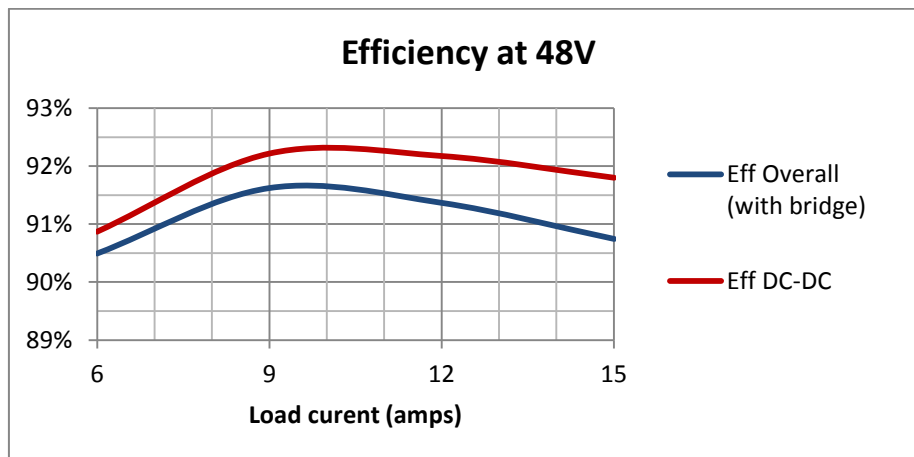
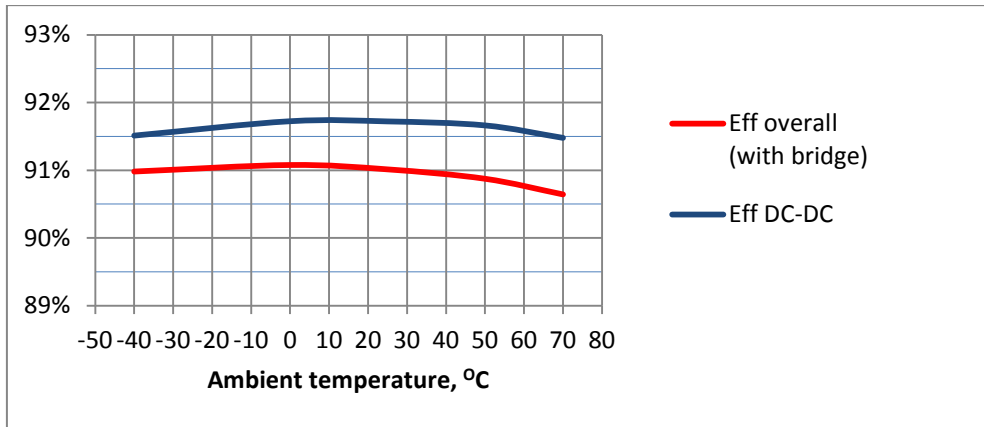


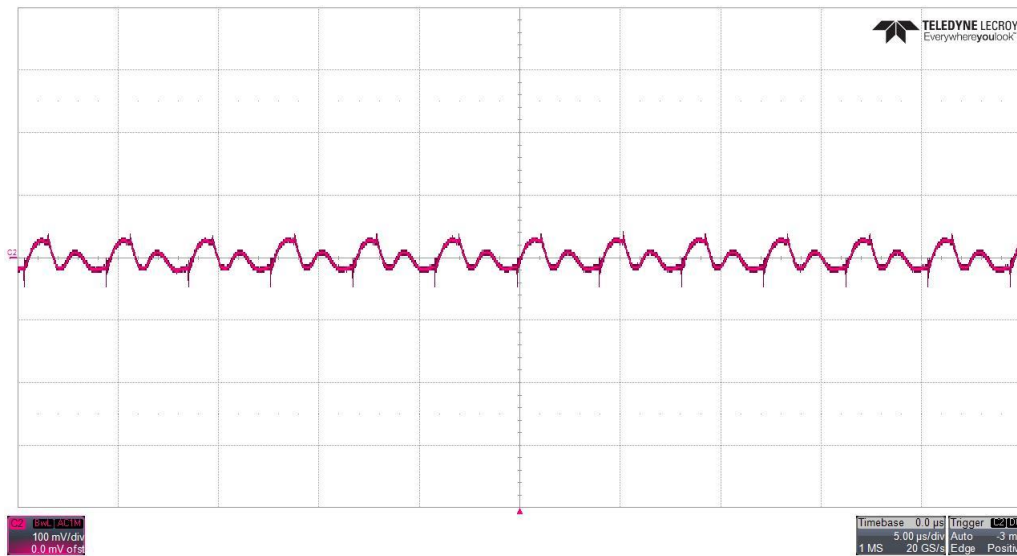
Figure 8: Efficiency at 48V Input

**6.3 Efficiency vs. ambient temperature at 48V input**



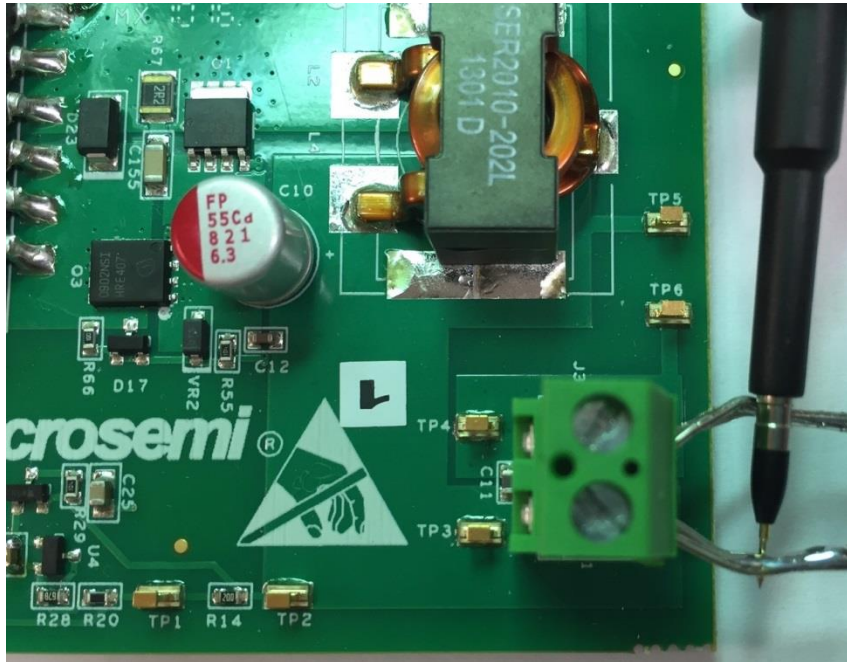
**Figure 9: Efficiency vs. temperature at 48V Input**

**6.4 Output Ripple and Noise at 48V input full load (20 MHz bandwidth)**



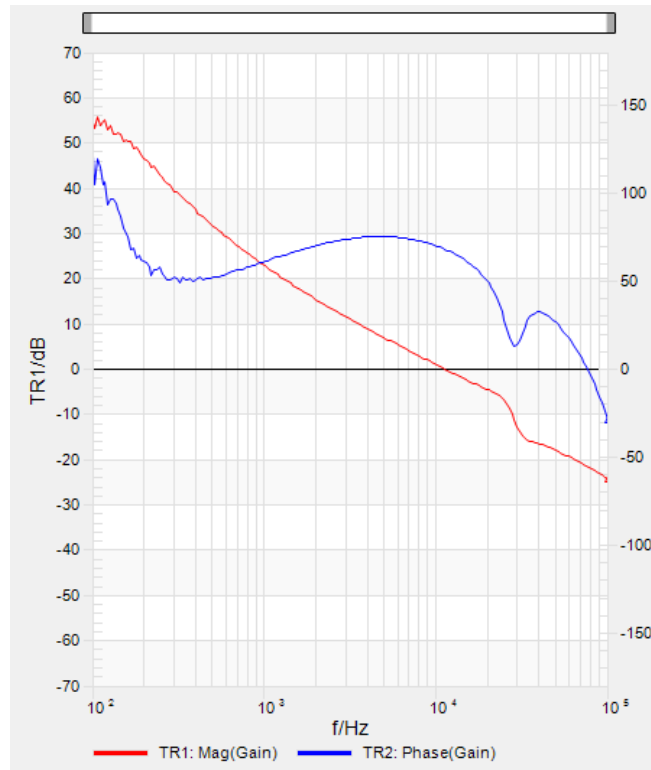
**Figure 10: Full Load Voltage Ripple and Noise (100mV/div)**





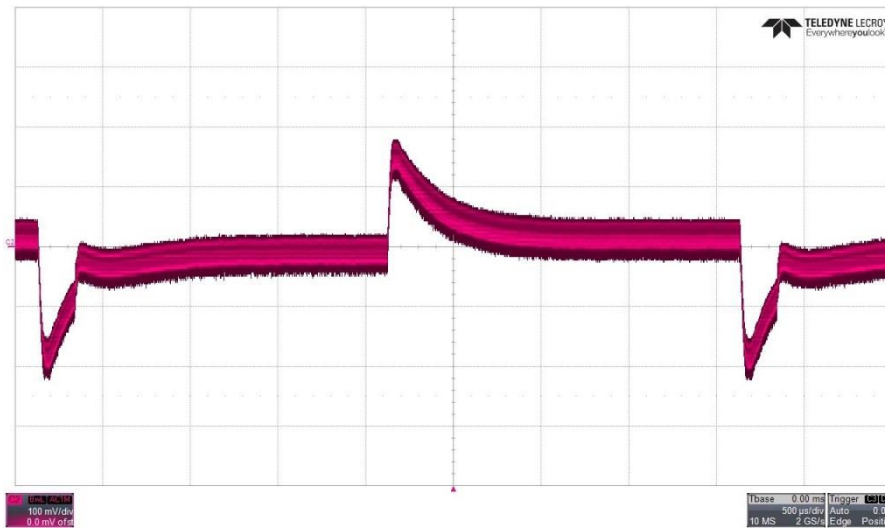
**Figure 11. Proper ripple measurement**

**6.5 Bode Plots at full load at 48V input**



**Figure 12. Bode plots (gain and phase)**  
 Phase margin:  $66^\circ$ , gain margin: -22dB.

**6.6 Step Load Response for transitions between 20% and 100% load at 48V input**



**Figure 13: Load Step Response (100mV/div)**



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50W Isolated Forward Converter PD

Evaluation Board

## 7 Schematic

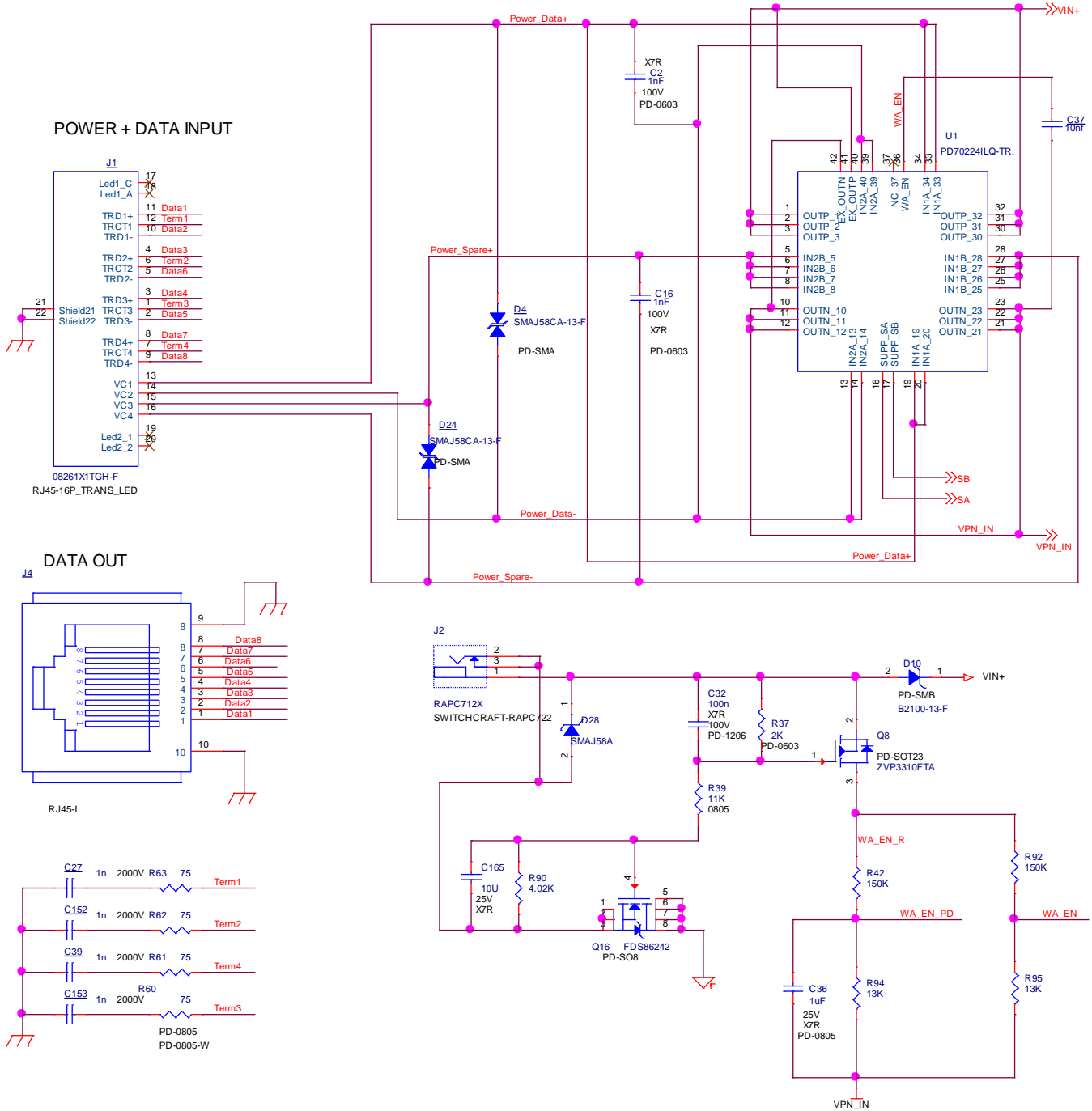


Figure 14: Evaluation Board Schematic (1 of 2)

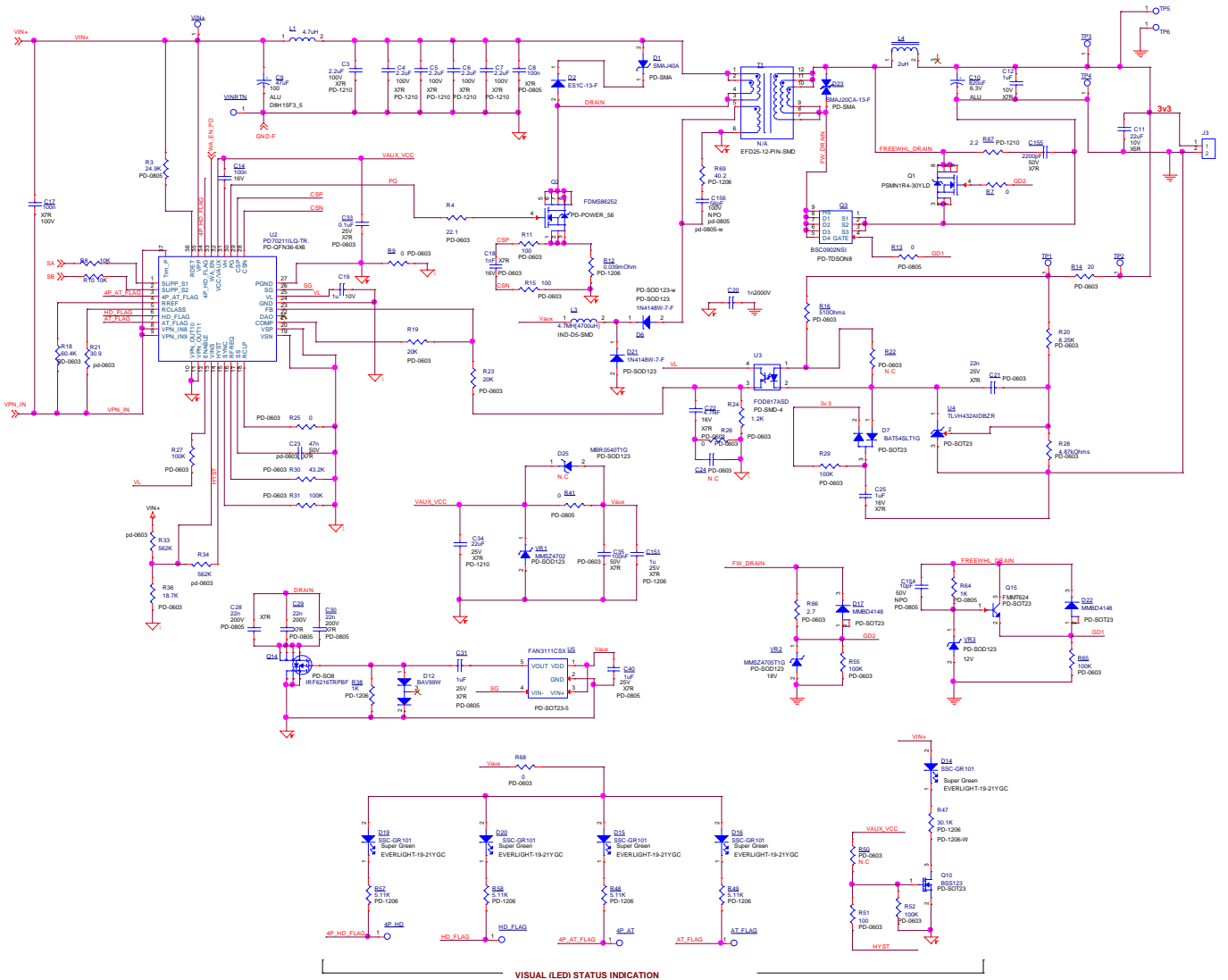


Figure 15: Evaluation Board Schematic (2 of 2)



## 8 List of Materials

| QTY | Reference Designation         | Value  | Description                             | Mfr. Name | Mfr. Part Number    |
|-----|-------------------------------|--------|-----------------------------------------|-----------|---------------------|
| 2   | C2,C16                        | 1nF    | Cap 1nF 100V 10% X7R 0603 SMT           | Samsung   | CL10B102KC8NNNC     |
| 5   | C3,C4,C5,<br>C6,C7            | 2.2uF  | CAP CER 2.2uF 100V 10% X7R 1210 SMT     | Kemet     | C1210C225K1RACTU    |
| 1   | C8                            | 100n   | Capacitor, X7R, 100nF 100V 10% 0805     | TDK       | C2012X7R2A104K      |
| 1   | C9                            | 47uF   | CAP ALUM 47uF 100V 20% 105C RADIAL 8X15 | Samsung   | CL10B223KA8NNNC     |
| 1   | C10                           | 820uF  | CAP ALUM 820UF 6.3V 20% RADIAL TH       | Nichicon  | RL80J821MDN1KX      |
| 1   | C11                           | 22uF   | CAP CER 22uF 10V 20% X5R 0603 SMT       | TDK       | C1608X5R1A226M080AC |
| 1   | C12                           | 1uF    | Capacitor, X7R, 1uF, 10V, 10% 0603      | Kemet     | C0603C105K8RACTU    |
| 1   | C14                           | 100n   | Capacitor, X7R, 100nF, 16V, 20% 0805    | Kemet     | C0805C104M4RACTU    |
| 2   | C17,C32                       | 100n   | CAP CRM 100nF 100V 10%X7R 1206 SMT      | Kemet     | C1206C104K1RACTU    |
| 1   | C18                           | 1nF    | Capacitor, X7R, 1nF, 16V, 10% 0603      | Samsung   | CL10B102KANNNC      |
| 1   | C19                           | 1u     | CAP CRM 1uF 10V 10%X7R 0805 SMT         | TDK       | C2012X7R1C105K      |
| 5   | C20,C27,<br>C39,<br>C152,C153 | 1n     | CAP CRM 1nF/2000V 10%++X7R 1206 SMT     | AVX       | 1206GC102KAT1A      |
| 1   | C21                           | 22n    | Capacitor, 22nF, X7R, 25V, 10% 0603     | Vishay    | VJ0603Y223KXXT      |
| 1   | C22                           | 4.7nF  | CAP CRM 4.7nF 16V 10% X7R 0603 SMT      | Samsung   | CL10B472KB8NNNC     |
| 1   | C23                           | 47n    | Capacitor, X7R, 47nF, 50V, 10% 0603     | TDK       | C1608X7R1H473K      |
| 1   | C24                           | 0.1 uF | Capacitor,0.1uF, X7R, 10V, 10% 0603     | Kemet     | C0603C104K8RACTU    |
| 1   | C25                           | 1uF    | CAP CRM 1uF 16V 10%0805 X7R SMT         | Murata    | GRM21BR71C105KA01   |
| 1   | C28                           | 22n    | CAP CRM 22nF 200V 10%X7R 0805 SMT       | Novacap   | 0805B223K201NT      |
| 1   | C29                           | 22n    | CAP CRM 22nF 200V 2%NPO 0805 SMT        | Novacap   | 0805B223K201NT      |
| 1   | C30                           | 22n    | CAP CRM 470pF 100V 2%NPO 0805 SMT       | Novacap   | 0805B223K201NT      |
| 2   | C31,C40                       | 1uF    | CAP CRM 1uF 25V 10% X7R 0805 SMT        | AVX       | 08053C105KAT2A      |
| 2   | C33,C36                       | 0.1uF  | CAP 100NF 25V X7R 10% 0603              | Murata    | GRM188R71E104KA01D  |
| 1   | C34                           | 22uF   | CAP CRM 22uF 25V 20% 1210 X7R SMT       | Murata    | GRM32ER71E226ME15L  |
| 1   | C35                           | 100nF  | CAP CRM 100nF 50v 10% X7R 0603          | Meritek   | MA0603XR104K500     |
| 2   | C36, C151                     | 1u     | CAP CRM 1uF 25V 10% X7R1206             | Murata    | GRM31MR71E105KA01B  |





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|   |                             |               |                                             |               |                    |
|---|-----------------------------|---------------|---------------------------------------------|---------------|--------------------|
| 1 | C37                         | 10nf          | Capacitor, , 10nF, 100V, 10% 0603 X7R       | Samsung       | CL10B103KC8NNNC    |
| 1 | C154                        | 10pF          | CAP CRM 10pF 50V 5%NPO 0805 SMT             | Samsung       | CL21C100JBANNNC    |
| 1 | C155                        | 2200pF        | CAP CER 2200PF 50V 10% X7R 1206 SMT         | AVX           | 12065C222KAT2A     |
| 1 | C156                        | 56pF          | CAP CRM 56pF 100V 5% NPO 0805 SMT           | AVX           | 08051A560JAT2A     |
| 1 | C165                        | 10uF          | Capacitor, X7R, 10uF, 25V, 20% 1210         | Murata        | GRM32DR71E106MA12L |
| 1 | D1                          | SMAJ40A       | DIODE TVS 40V 400W 5uA 6.2 Amps Uni-Dir SMT | Bourns        | SMAJ40A            |
| 1 | D2                          | ES1C-13-F     | DIODE SUPER FAST 150V 1A SMA SMT            | Diodes Inc.   | ES1C-13-F          |
| 2 | D4,D24                      | SMAJ58CA      | TVS DIODE 58VWM 93.6VC SMA                  | Diodes Inc.   | SMAJ58CA-13-F      |
| 2 | D6,D21                      | 1N4148W       | DIODE SW 100V 0.15A SOD123 SMT              | Diodes Inc.   | 1N4148W-7-F        |
| 1 | D7                          | BAT54S        | Diode Schottky Dual 200mA 30V 230 mW SOT23  | ON Semi       | BAT54SLT1G         |
| 1 | D10                         | B2100-13-F    | DIODE SCHOTTKY 100V 2A SMB                  | Diodes Inc.   | B2100-13-F         |
| 1 | D12                         | BAV99W        | Diode, Dual Switching BAV99W SOT323         | NXP           | BAV99W             |
| 5 | D14,D15,<br>D16,D19,<br>D20 | SSC-GR101     | LED SuperGreen 16mcd h=0.8 0603 SMD         | SEOUL         | SSC-GR101          |
| 2 | D17,D22                     | MMBD4148      | DIODE SML SIG 100V 0.2A SOT23-3             | Fairchild     | MMBD4148           |
| 1 | D23                         | SMAJ20CA      | DIODE TVS 20VWM 32.4VC SMT                  | Diodes Inc.   | SMAJ20CA-13-F      |
| 1 | D25                         | MBR0540       | DIO SCHOTTKY 40V 500mASOD123 REC. SMT       | ON Semi       | MBR0540T1G         |
| 1 | J1                          | Magjack       | CONN MAGJACK 1PORT 1000 BASE-T              | Bel Stewart   | 08261X1TGH-F       |
| 1 | J2                          | RAPC712X      | DC Power Jack 16V 5A TH Pin dia 2.5mm       | Switchcraft   | RAPC712X           |
| 1 | J3                          | ED700/2       | TERMINAL BLOCK 5MM 2POS PCB                 | On Shore Tech | ED700/2            |
| 1 | J4                          | RJ45          | CON RJ45 SINGLE 8 POS. SHIELDED             | Bel Stewart   | SS71800-007F       |
| 2 | L1,L5                       | 4.7uH         | FIXED IND 4.7uH 5.5A 40mOHM SMD             | Vishay        | IHLP2525CZER4R7M01 |
| 1 | L2                          | 4.7uH         | FIXED IND 4.7uH 16.8A 4.5mOHM               | Pulse         | PB2020.472NL       |
| 1 | L3                          | 4.7mH         | FIXED IND 4700uH 40mA 48OHM SMD             | Bourns        | SDR0503-472JL      |
| 1 | L4                          | 2uH           | Fixed Inductors 2 uH 20% 45A                | Coilcraft     | SER2010-202MLB     |
| 1 | Q1                          | PSMN1R4-30YLD | MOSFET N-CH with Schottky 30V 1.4mOhm 30V   | NXP           | PSMN1R4-30YLD      |
| 1 | Q2                          | FDMS86252     | N-CH POWER MOSFET 150v 16A POWER56          | Fairchild     | FDMS86252          |
| 1 | Q3                          | BSC0902NSI    | MOSFET N-Ch 30V 100A TDSO8                  | Infineon      | BSC0902NSI         |
| 1 | Q8                          | ZVP3310FTA    | MOSFET P-CH 100V 75MA SOT23-3               | Diodes Inc.   | ZVP3310FTA         |
| 1 | Q9                          | PZTA06        | TRANSISTOR GP NPN 80V SOT-223               | Fairchild     | PZTA06             |



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|   |                             |           |                                        |           |                    |
|---|-----------------------------|-----------|----------------------------------------|-----------|--------------------|
| 1 | Q10                         | BSS123    | FET NCH 100V 0.15A 6RLogic Level SOT23 | Infineon  | BSS123             |
| 1 | Q14                         | IRF6216   | MOSFET P-CH 150V 2.2A 8-SOIC           | I.R.      | IRF6216TRPBF       |
| 1 | Q15                         | FMMT624   | Transistor NPN 125V 1A sot23           | Fairchild | FMMT624            |
| 1 | R3                          | 24.9K     | RES TK FLM 24.9K 100 mW1% 0805         | Bourns    | CR0805-FX-2492-ELF |
| 1 | Q16                         | FDS86242  | N-CH POWER MOSFET 150v 4.1A SO8        | Fairchild | FDS86242           |
| 1 | R4                          | 22.1      | RES TCK FLM 22.1R 62.5 mW 1% 0603 SMT  | Yageo     | RC0603FRF0722R1    |
| 2 | R7,R13                      | 0         | RES TCK FLM 0R 125 mW 5% 0805 SMT      | Bourns    | CR0805-J/-000-ELF  |
| 2 | R8,R10                      | 10K       | RES 10K 62.5 mW 1% 0603 SMT MTL FLM    | Rohm      | MCR03EZPFX1002     |
| 2 | R9,R68                      | 0         | RES TCK FLM 0R 62.5 mW 5% 0603 SMT     | Panasonic | ERJ3GEY0R00V       |
| 2 | R11,R15                     | 100       | RES TCK FLM 100R 62.5 mW 1% 0603 SMT   | Yageo     | RC0603FR-07100RL   |
| 1 | R12                         | 0.039     | RES TCK FLM 0.039R 1% 0.5W 1206 SMT    | Panasonic | ERJ8BWF0R39V       |
| 1 | R14                         | 20        | Resistor, 20 OHM 5% 1/10W 0603         | Rohm      | MCR03EZPJ200       |
| 1 | R16                         | 510       | RES 510R 1% 1/10W 0603 SMD             | Stackpole | RMCF0603FT510R     |
| 1 | R18                         | 60.4K     | RES TCK FLM 60.4K 62.5 mW 1% 0603 SMT  | ASJ       | CR16-6042FL        |
| 2 | R19,R23                     | 20K       | RES 20K 62.5 mW 1% 0603 SMT MTL FLM    | Panasonic | ERJ3EKF2002V       |
| 1 | R20                         | 8.25K     | RES 8.25K 62.5 mW 1% 0603 SMT          | Yageo     | RC0603FR-078K25-L  |
| 1 | R21                         | 30.9      | Resistor, 30.9R 1%, 1/10W 0603         | Panasonic | ERJ3EKF30R9V       |
| 2 | R22,R50                     | 2.94K     | Resistor, 2.94K, 1%, 1/16W             | Rohm      | MCR03EZPF2941      |
| 1 | R24                         | 1.2K      | Resistor, SMT 1.2K, 5%, 1/10W 0603     | Panasonic | ERJ3GEYJ122V       |
| 2 | R25,R26                     | 0         | RES TCK FLM 0R 62.5 mW 5% 0603 SMT     | Rohm      | MCR03EZPJ000       |
| 2 | R27,R31                     | 100K      | RES 100K 62.5 mW 1% 0603 SMT MTL FLM   | Samsung   | RC1608F1003CS      |
| 1 | R28                         | 4.87kOhms | Resistor, 4.87K 1% 1/10W 0603          | Yageo     | RC0603FR-074K87L   |
| 5 | R29,R45,<br>R52,R55,<br>R65 | 100K      | Resistor, 100K, 5%, 1/16W              | ASJ       | CR16-104JL         |
| 1 | R30                         | 43.2K     | RES 43.2K 100 mW 0603SMT 1%            | ASJ       | CR16-4322FL        |
| 2 | R33,R34                     | 562K      | RES 562K, 1%, 1/16W, 0603              | Vishay    | CRCW0603562KFKEA   |
| 1 | R36                         | 18.7K     | Resistor, 18.7K, 1%, 1/16W             | Rohm      | MCR03EZPFX1872     |
| 1 | R37                         | 2K        | RES 2K 62.5 mW 1% 0603 SMT MTL FLM     | Vishay    | CRCW06032KFKEA     |
| 1 | R38                         | 1K        | RES 1K 250 mW 1% 1206 SMT MTL FLM      | Samsung   | RC3216F1001CS      |
| 1 | R39                         | 11K       | RES 11K 250 mW 1% 1206 SMT MTL FLM     | Yageo     | RC0805FR-0711KL    |



**Microsemi**

# PD70211EVB50FW-3

50W Isolated Forward Converter PD

Evaluation Board

|   |                  |            |                                                  |                   |                  |
|---|------------------|------------|--------------------------------------------------|-------------------|------------------|
| 1 | R40              | 2.21K      | RES TK FLM 2.21K 250 mW1% 1206                   | Rohm              | MCR18EZPF2211    |
| 1 | R41              | 0          | RES TCK FLM 0R 125 mW 5% 0805 SMT                | Yageo             | RC0805JR-070RL   |
| 2 | R42, R92         | 150K       | RES 150K 250 mW 1% 1206 SMT MTL FLM              | Panasonic         | ERJ6ENF1503V     |
| 1 | R43              | 1K         | Resistor, 1K, 5%, 1/16W 0603                     | Vishay            | CRCW06031K00JNEA |
| 1 | R44              | 820        | Resistor, 820 Ohm, 1%, 1/16W 0603                | Panasonic         | ERJ3EKF8200V     |
| 1 | R46              | 620        | RES 620 OHM 1/10W 1% 0603 SMT                    | KOA               | RK73H1JTDD6200F  |
| 1 | R47              | 30.1K      | RES 30.1K 250 mW 1% 1206 SMT MTL FLM             | Yageo             | RC1206FR-0730K1L |
| 4 | R48,R49, R57,R58 | 5.11K      | RES TCK FLM 5.11K 250 mW1% 1206 SMT              | Samsung           | RC3216F5111CS    |
| 1 | R51              | 100        | Resistor, 100 Ohm, 5%, 1/16W 0603                | Samsung           | RC1608J101CS     |
| 4 | R60,R61, R62,R63 | 75         | RES 75R 125 mW 1% 0805SMT                        | Yageo             | RC0805FK-0775RL  |
| 1 | R64              | 1K         | RES TCK FLM 1K 125 mW 1%0805 SMT                 | Rohm              | MCR10EZPF1001    |
| 1 | R66              | 2.7        | Resistor, SMT 2.7 Ohm, 5%, 1/16W 0603            | Panasonic         | ERJ3GEYJ2R7V     |
| 1 | R67              | 2.2        | RES TCK FLM 2.2R 0.5W 5% 1210 SMT                | KOA               | RK73B2ETTD2R2J   |
| 1 | R69              | 40.2       | RES THK FLM 40.2R 250 mW1% 1206 SMT              | Rohm              | MCR18 EZHEF 40R2 |
| 1 | R90              | 4.02k      | Resistor, 4.02K, 1%, 1/16W 0603                  | Panasonic         | ERJ3EKF4021V     |
| 2 | R94, R95         | 13k        | Resistor, 13K, 1%, 1/16W 0603                    | ASJ               | CR16-1302FL      |
| 1 | T1               | N/A        | Transformer 3.3V 15A forward                     | ICE Components    | TX15072          |
|   |                  |            | Alternate part                                   | Shinhom           | STEFD25-006-1    |
| 1 | U1               | PD70224ILQ | Ideal Diode Bridge dual bridge 6x8 SMT PD70224   | Microsemi         | PD70224ILQ-TR.   |
| 1 | U2               | PD70211ILQ | IEEE 802.3 AF/AT, HDbaseT Powered Device PD70211 | Microsemi         | PD70211ILQ-TR.   |
| 1 | U3               | FOD817ASD  | OPTOISOLATOR 5KV TRANSISTOR 4 SMD                | Fairchild         | FOD817ASD        |
| 1 | U4               | TLVH432A   | IC VREF SHUNT ADJ 1.25V SOT23-3                  | Texas Instruments | TLVH432AIDBZR    |
| 1 | U5               | FAN3111CSX | IC GATE DVR 1CH 1A LOW SOT23-5                   | Fairchild         | FAN3111CSX       |
| 1 | VR1              | MMSZ4702   | DIODE ZENER 15V 500 mW SOD123_MMSZ4702           | Fairchild         | MMSZ4702         |
| 1 | VR2              | MMSZ4705   | DIODE ZENER 18V 500 mW SOD-123                   | ON-Semiconductor  | MMSZ4705T1G      |
| 1 | VR3              | 12V        | DIO ZENER 12V 500 mW SOD123 SMT                  | Diodes Inc.       | BZT52C12-7-F     |



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50W Isolated Forward Converter PD

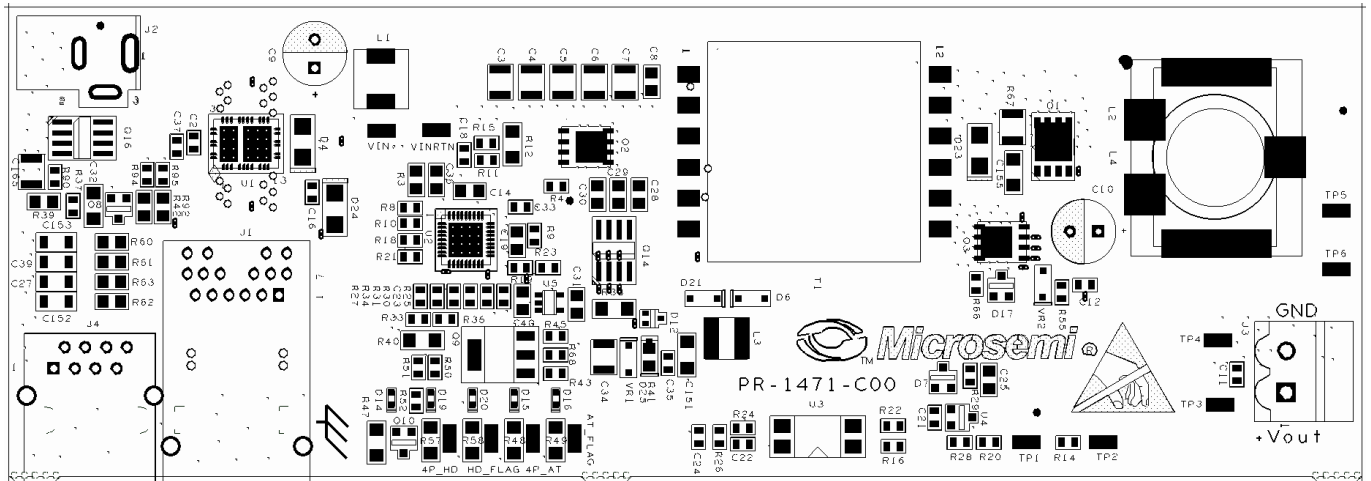
Evaluation Board

|    |                                                                                                 |            |                            |       |            |
|----|-------------------------------------------------------------------------------------------------|------------|----------------------------|-------|------------|
| 12 | TP1,TP2,<br>TP3,TP4,<br>4P_HD,<br>4P_AT,<br>TP5,TP6,<br>VINRTN,<br>VIN+,<br>HD_FLAG,<br>AT_FLAG | HK-2-G-S05 | TEST POINT TIN PLATED HEAD | MAC-8 | HK-2-G-S05 |
|----|-------------------------------------------------------------------------------------------------|------------|----------------------------|-------|------------|

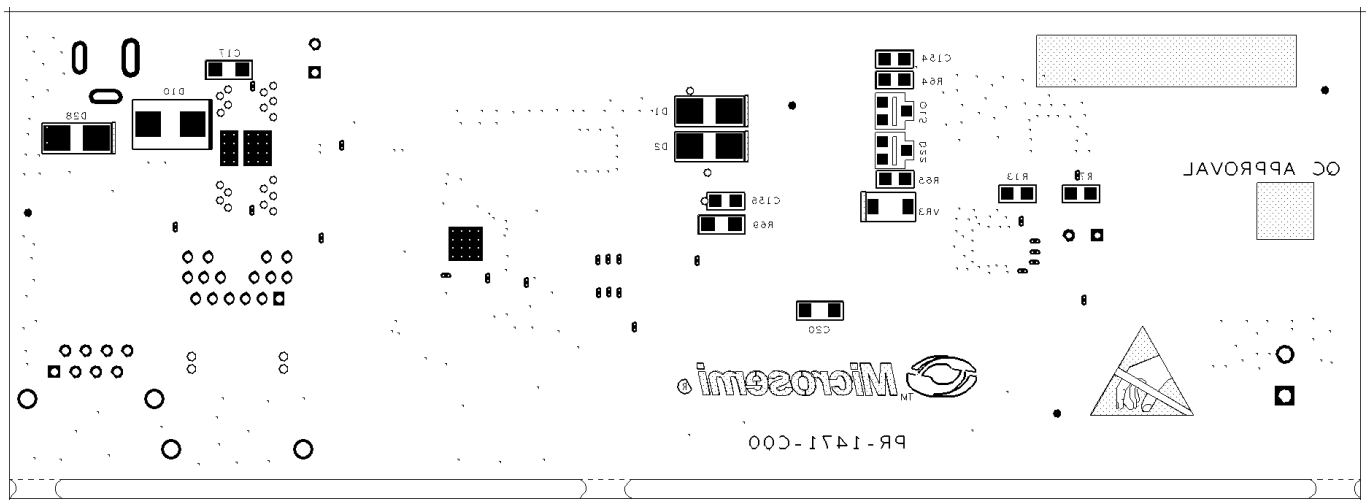
Note: Parts may be replaced by approved equivalents

## 9 Board Layout

This section presents the layout of the evaluation board. The board is a 2 layer board. All layers are 2 Oz layers. Below figures present the 2 copper layers and the silk of the board for tracking devices placements.



**Figure 14: Top Silk and Solder Mask**



**Figure 15: Bottom Silk and Solder Mask**



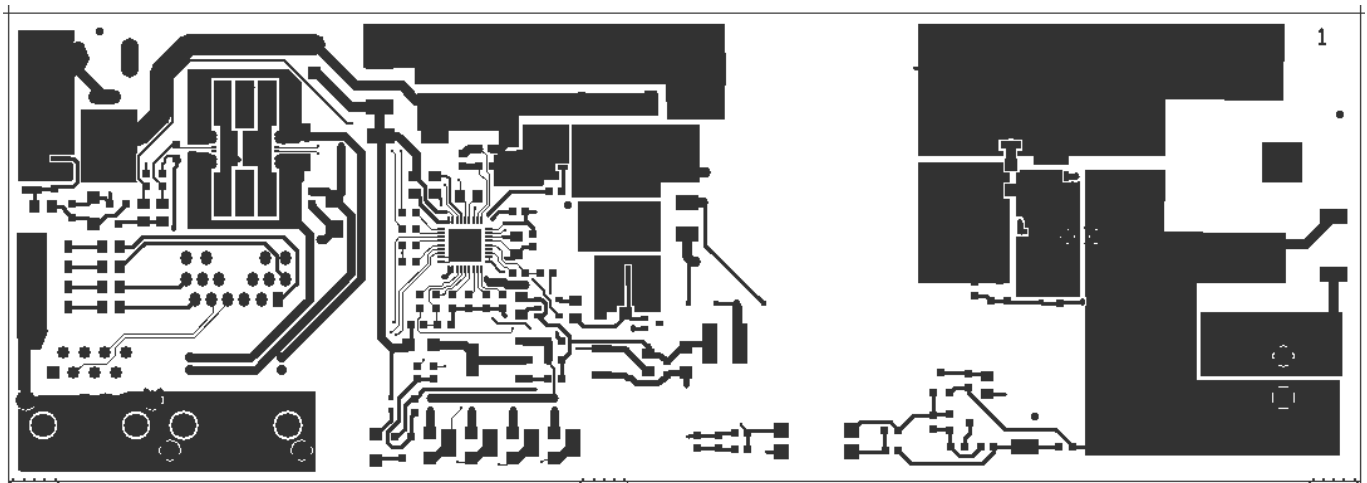


Figure 16: Top Layer

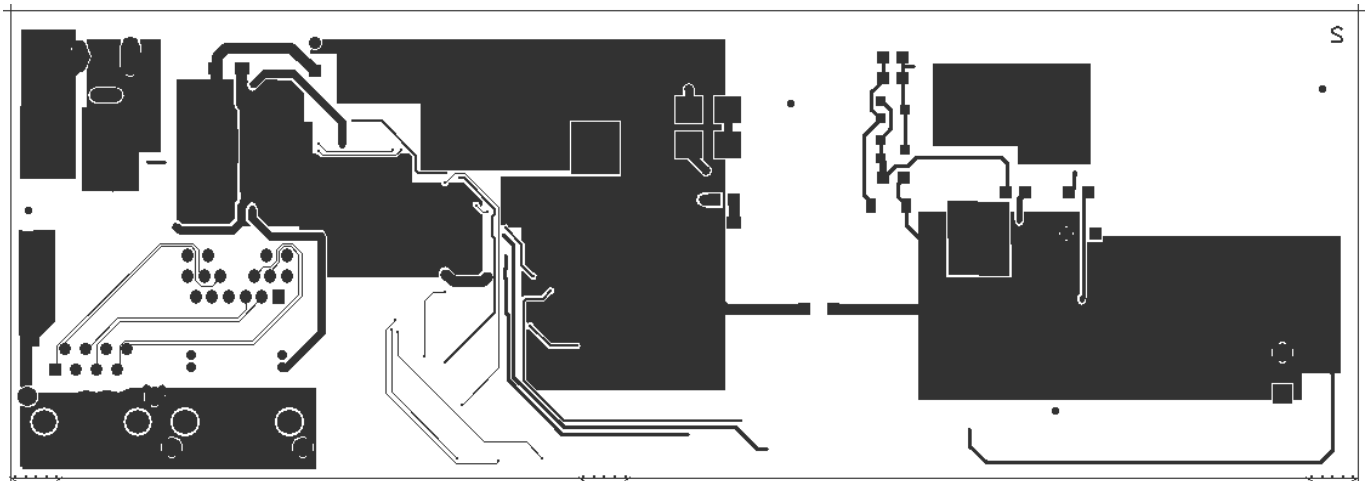


Figure 17: Bottom Layer

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**Revision History**

| Revision Level / Date | Paragraph Affected/Page | Description     |
|-----------------------|-------------------------|-----------------|
| 1.0 / 28-June-16      |                         | Initial release |
|                       |                         |                 |
|                       |                         |                 |
|                       |                         |                 |

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