

### DESCRIPTION

EV3908+8002+6901-00A is designed as the Power over Ethernet (PoE) Powered Device (PD) module. An RJ-45 connector is provided to connect directly to an Ethernet cable having a Power Sourcing Equipment (PSE) driving it on the other end. It also accepts power applied using a stand-alone power supply.

According to the IEEE 802.3at specification, the PD module must provide the circuitry needed to be detected by the PSE as it polls the Ethernet links. The IEEE 802.3at specification also allows the option for the PD to provide classification as to the amount of power needed by the PD Module. EV3908+8002+6901-00A with the MP8002DN provides all the necessary hardware to provide detection and classification together with programmable inrush current limit, power good indicator, thermal protection and current limit. An external 30W Flyback converter is connected as the PWM part of the PD, which is controller by the PWM controller MP3908DK with soft-start, slope compensation and peak current limiting. MP6901DS is used for synchronous rectification on secondary side to boost the whole efficiency of the system.

### FEATURES

- Meets IEEE 802.3at Specifications
- 100V, 0.8Ω Integrate DMOS Device in MP8002DN
- 800mA, Temperature Compensated Current Limit
- Open Drain Power Good Output
- Synchronous Rectification with MP6901
- Current Mode Control
- Soft-Start
- 250kHz Constant Frequency Operation

### APPLICATIONS

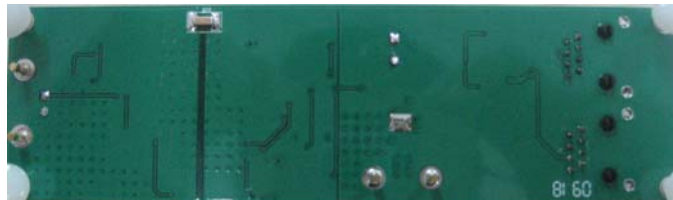
- VoIP Telephones
- Network Cards
- Security Camera Systems
- Safety Backup Power
- Remote Internet Power

### ELECTRICAL SPECIFICATIONS

| Parameter      | Symbol           | Value   | Units |
|----------------|------------------|---------|-------|
| Input Voltage  | V <sub>IN</sub>  | 40 – 57 | V     |
| Output Voltage | V <sub>OUT</sub> | 5       | V     |
| Output Current | I <sub>OUT</sub> | 0-6     | A     |

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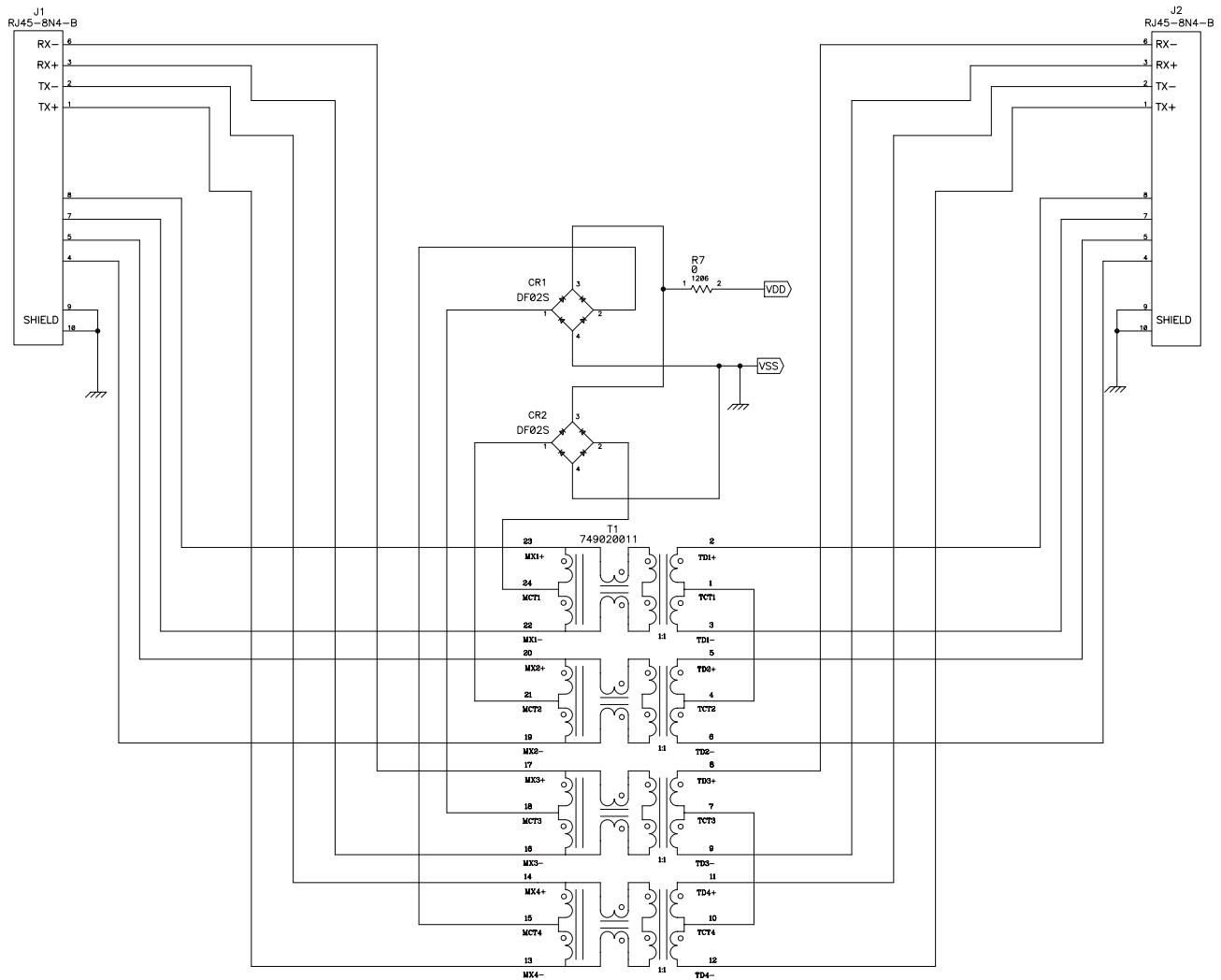
### EV3908+8002+6901-00A EVALUATION BOARD

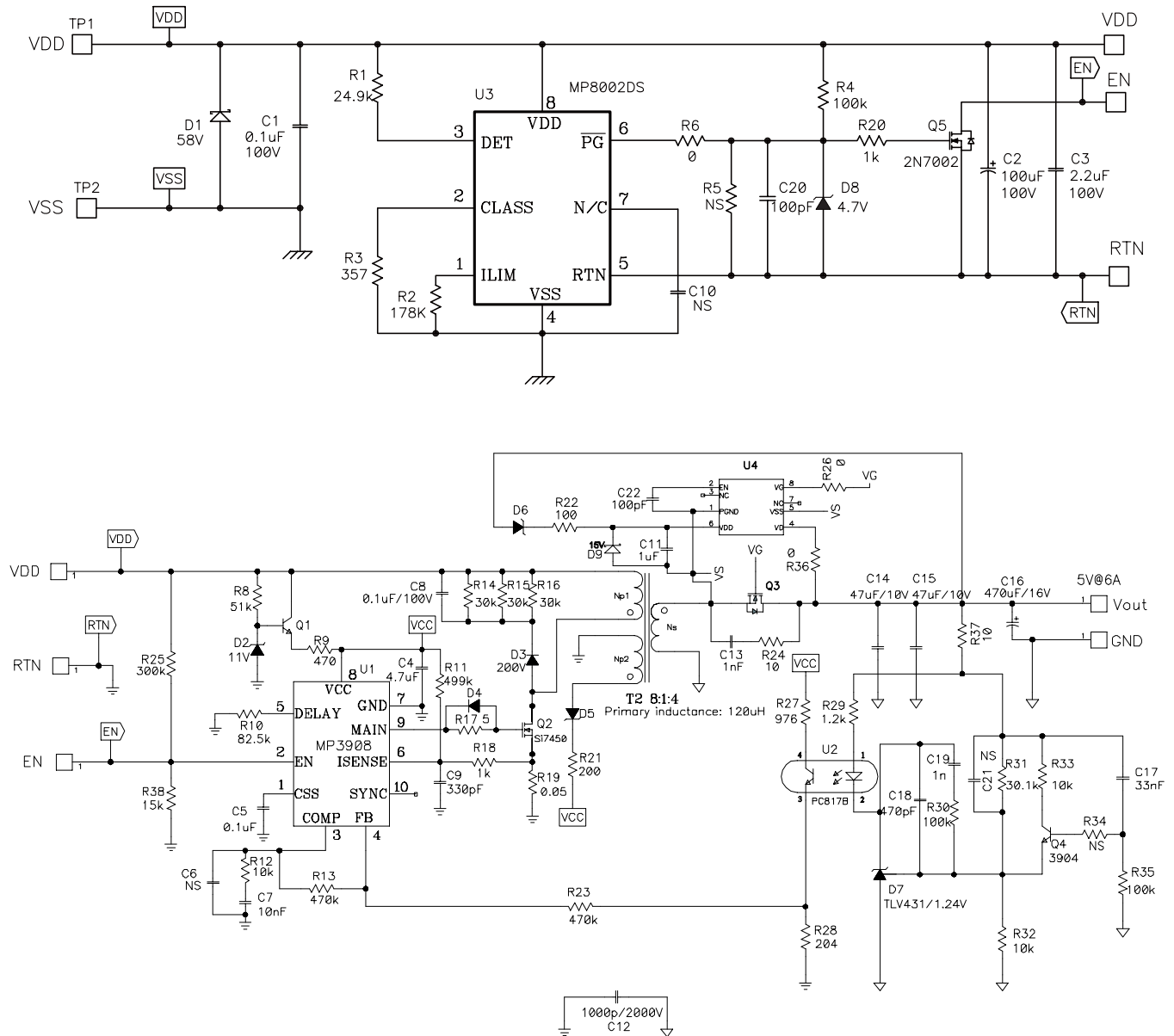


(L x W x H) 5.4" x 1.7" x 0.8"  
(13.8cm x 4.3cm x 2.0cm)

| Board Number         | MPS IC Number                |
|----------------------|------------------------------|
| EV3908+8002+6901-00A | MP3908DK, MP8002DN, MP6901DS |

## EVALUATION BOARD SCHEMATIC





## EV3908+8002+6901-00A BILL OF MATERIALS

| Qty | Ref            | Value        | Description            | Package | Manufacturer | Manufacturer P/N    |
|-----|----------------|--------------|------------------------|---------|--------------|---------------------|
| 1   | C1             | 0.1uF        | Ceramic Cap. 100V X7R  | 1206    | muRata       | GRM319R72A104KA01 L |
| 1   | C2             | 100uF        | 100V Electrolytic      | DIP     | JiangHai     | CD287-100V100       |
| 1   | C3             | 2.2uF        | Ceramic Cap. 100V X7R  | 1210    | muRata       | GRM32ER72A224KA3 5L |
| 1   | C4             | 4.7uF        | Ceramic Cap. 25V X7R   | 1206    | TDK          | C3216X7R1E475K      |
| 1   | C5             | 0.1uF        | Ceramic Cap. 50V X7R   | 0603    | TDK          | C1608X7R1H104K      |
| 3   | C6,C10, C21    | NS           |                        |         |              |                     |
| 1   | C7             | 10nF         | Ceramic Cap. 50V X7R   | 0603    | TDK          | C1608X7R1H103K      |
| 1   | C8             | 0.1uF        | Ceramic Cap. 100V X7R  | 0805    | TDK          | C2012X7R2A104K      |
| 1   | C9             | 330pF        | Ceramic Cap. 50V X7R   | 0603    | TDK          | C1608X7R1H331K      |
| 1   | C11            | 1uF          | Ceramic Cap. 25V X7R   | 1206    | muRata       | GRM31MR71E105KA0 1  |
| 1   | C12            | 1nF          | Ceramic Cap. 2000V X7R | 1812    | TDK          | C4520X7R3D102K      |
| 2   | C13,C19        | 1nF          | Ceramic Cap. 50V X7R   | 0603    | TDK          | C1608X7R1H102K      |
| 2   | C14,C15        | 47uF         | Ceramic Cap. 10V X5R   | 1210    | TDK          | C3225X5R1C475K      |
| 1   | C16            | 470uF        | 16V Electrolytic       | DIP     | Rubycon      | 470uF/16V           |
| 1   | C17            | 33nF         | Ceramic Cap. 50V X7R   | 0603    | TDK          | C1608X7R1H333K      |
| 1   | C18            | 470pF        | Ceramic Cap. 50V X7R   | 0603    | TDK          | C1608X7R1H471K      |
| 2   | C20,C22        | 100pF        | Ceramic Cap. 50V COG   | 0603    | muRata       | GRM1885C1H101JA01 D |
| 1   | R1             | 24.9k        | Film Resistor 1%       | 0603    | Yageo        | RC0603FR-0724K9L    |
| 1   | R2             | 178k         | Film Resistor 1%       | 0603    | Yageo        | RC0603FR-07178KL    |
| 1   | R3             | 357          | Film Resistor 1%       | 1206    | Yageo        | RC1206FR-07357RL    |
| 2   | R5,R34         | NS           |                        |         |              |                     |
| 3   | R4,R30, R35    | 100k         | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-07100KL    |
| 4   | R6,R7,R 26,R36 | 0            | Film Resistor 5%       | 1206    | Yageo        | RC1206JR-070RL      |
| 1   | R8             | 51k          | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-0751KL     |
| 1   | R9             | 470          | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-07470RL    |
| 1   | R10            | 82.5k        | Film Resistor 1%       | 0603    | Yageo        | RC0603FR-0782K5L    |
| 1   | R11            | 499k         | Film Resistor 1%       | 0603    | Yageo        | RC0603FR-07499KL    |
| 3   | R12,R32, R33   | 10k          | Film Resistor 1%       | 0603    | Yageo        | RC0603FR-0710KL     |
| 3   | R14,R15, R16   | 30k          | Film Resistor 5%       | 0805    | Yageo        | RC0805JR-0730KL     |
| 1   | R17            | 5.1          | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-075R1L     |
| 3   | R18,R20, R29   | 1k           | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-071KL      |
| 1   | R19            | 50m $\Omega$ | Strip Resistor 1%      | 1206    | CYNTEC       | RL1632H-R050-FN     |
| 1   | R21            | 200          | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-07200RL    |
| 1   | R22            | 100          | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-07100RL    |
| 2   | R13,R23        | 470k         | Film Resistor 5%       | 0603    | Yageo        | RC0603JR-07470KL    |

## EV3908+8002+6901-00A BILL OF MATERIALS (continued)

| Qty | Ref       | Value      | Description                                                                     | Package        | Manufacturer     | Manufacturer P/N |
|-----|-----------|------------|---------------------------------------------------------------------------------|----------------|------------------|------------------|
| 1   | R24       | 10         | Film Resistor 5%                                                                | 0805           | Yageo            | RC0805JR-0710RL  |
| 1   | R25       | 300k       | Film Resistor 5%                                                                | 0603           | Yageo            | RC0603JR-07300KL |
| 1   | R27       | 976        | Film Resistor 1%                                                                | 0603           | Yageo            | RC0603FR-07976RL |
| 1   | R28       | 205        | Film Resistor 1%                                                                | 0603           | Yageo            | RC0603FR-07204RL |
| 1   | R31       | 30.1k      | Film Resistor 1%                                                                | 0603           | Yageo            | RC0603FR-0730K1L |
| 1   | R37       | 10         | Film Resistor 5%                                                                | 0603           | Yageo            | RC0805JR-0710RL  |
| 1   | R38       | 15k        | Film Resistor 5%                                                                | 0603           | Yageo            | RC0603JR-0715KL  |
| 1   | D1        | 58V        | DIODE ZENER 58V                                                                 | SMA            | Diodes Inc       | SMAJ58A          |
| 1   | D2        | 10V        | DIODE ZENER 10V                                                                 | SOD-123        | Diodes Inc       | BZT52C10         |
| 1   | D3        | BAV21      | Switching Diode 200V 200mW                                                      | SOD-123        | Diodes Inc       | BAV21W-7-F       |
| 3   | D4,D5, D6 | 1N4148     | Switching Diode 75V 250mW                                                       | SOD323         | Diodes Inc       | 1N4148WS-7       |
| 1   | D7        | TLV431A    | REG VLT ADJ 1.24V                                                               | SOT-23-5       | Zetex Inc        | TLV431A          |
| 1   | D8        | 4.7V       | DIODE ZENER 4.7V                                                                | SOD-123        | Diodes Inc       | BZT52C4V7        |
| 1   | D9        | 15V        | DIODE ZENER 15V                                                                 | SOD-123        | Diodes Inc       | BZT52C15         |
| 2   | Q1,Q4     | NPN        | Transistor NPN 40V 350mA                                                        | SOT-23         | Fairchild        | MMBT3904FSCT     |
| 1   | Q2        | MOSFET     | N-CH 200V 3.9A                                                                  | POWER PAK SO-8 | Vishay Siliconix | Si7450           |
| 1   | Q3        | MOSFET     | N-CH 40V 14A                                                                    | SO-8           | Vishay Siliconix | Si4840           |
| 1   | Q5        | MOSFET     | N-CH 60V                                                                        | SOT-23         |                  | 2N7002           |
| 2   | CR1,C R2  | DF02S      | 1.0A Surface Mount Glass Passivated Bridge Rectifier                            | SDIP-4         | Diodes Inc       | DF02S            |
| 1   | U1        | MP3908 DK  | BOOST                                                                           | MSOP10         | MPS              | MP3908DK         |
| 1   | U2        | PC817B     | PHOTOCOUP                                                                       | SMD            | SHARP            | PC817B           |
| 1   | U3        | MP8002 DN  | IEEE 802.3af Powered Device Controller                                          | SO-8           | MPS              | MP8002DN         |
| 1   | U4        | MP6901 DS  | Rectifier Controller                                                            | SO-8           | MPS              | MP6901DS         |
| 1   | T1        |            | LAN-TRANSFORMER WE-LAN                                                          | SMD            | WURTH            | 749020011        |
| 1   | T2        |            | POWER STAGE TRANSFORMER                                                         | SMD            | Cooper           | CTX01-18290      |
| 2   | J1,J2     | RJ45-8N4-B | RJ Jack / Signal Line EMI/RFI Filters 6 TRMN BRD/CBLE GRND 8 PIN BLOCK INDUCTOR | RJ45-TAB DOWN  | Würth Elektronik | WE-615008137121  |

## PRINTED CIRCUIT BOARD LAYOUT

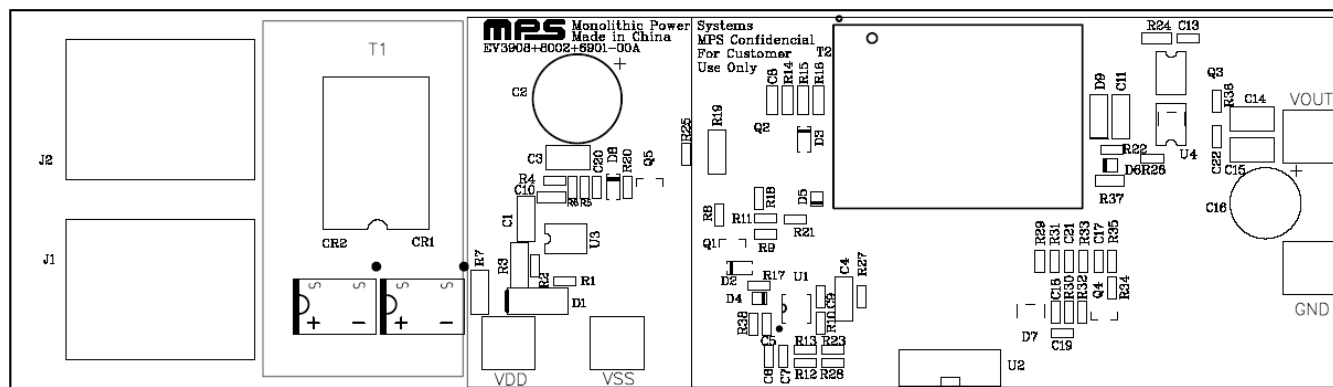


Figure 1—Top Silk Layer

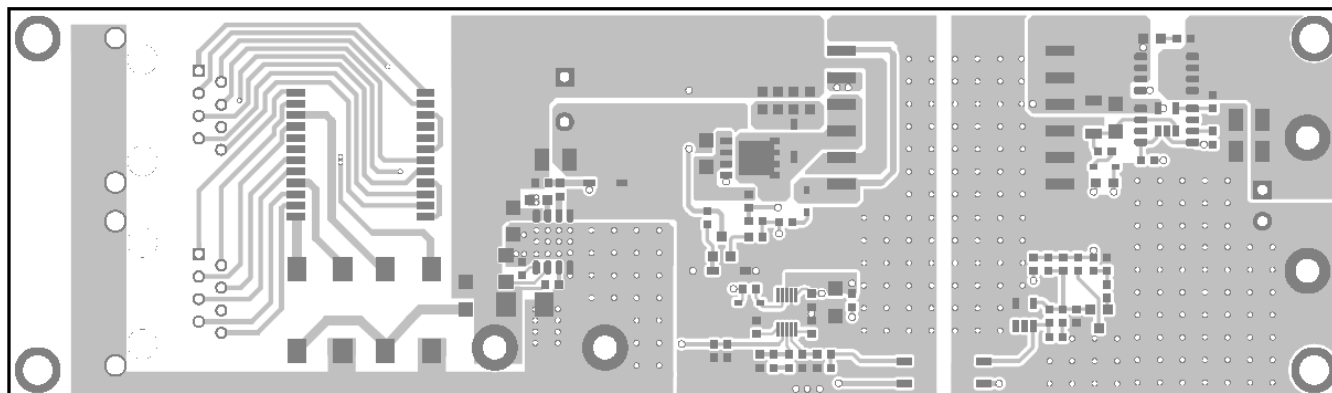


Figure 2—Top Layer

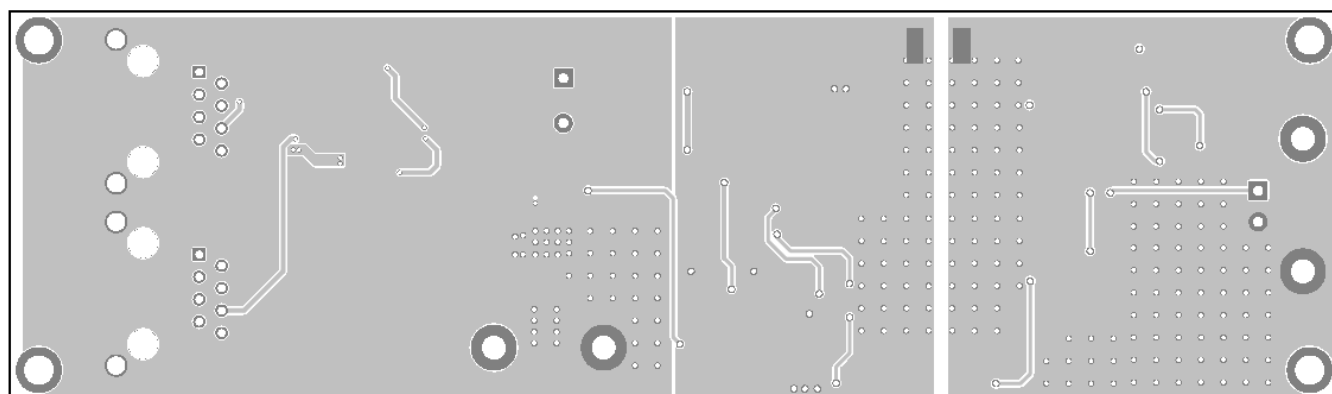


Figure 3—Bottom Layer

## QUICK START GUIDE

1. Connect the load between VOUT (positive) and GND (negative) terminals.
2. Plug the cable coming from the PSE, carrying the input voltage for the PD, into the Ethernet Jack J1. The board will automatically startup.
3. External DC supply can also be used. Preset the power supply output to 40V – 57V and turn off the power supply. Connect the positive terminal of the power supply output to the VDD pin and the negative terminal of the power supply output to the VSS pin. Turn the power supply on. The board will automatically startup.

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