

### DESCRIPTION

The EV157-S-00A Evaluation Board is designed to demonstrate the capabilities of MP157GS. MP157 is a primary side regulator providing accurate constant voltage (CV) regulation without the Opto-coupler. It supports Buck, Buck-Boost, Boost and Flyback topologies.

The EV157-S-00A Evaluation Board is designed as Buck application. The EV157-S-00A typically drives a 4.2W with a 12V<sub>TYP</sub>, 350mA load from 85VAC to 265VAC, at 50Hz.

The EV157-S-00A has excellent efficiency and meets EN55022 conducted EMI requirements. It has multiple protections, including open-circuit protection, short-circuit protection, over load protection and over-temperature protection, etc.

MP157GS is available in the SOIC8 packages.

### ELECTRICAL SPECIFICATION

| Parameter          | Symbol           | Value     | Units |
|--------------------|------------------|-----------|-------|
| Input Voltage      | V <sub>IN</sub>  | 85 to 265 | VAC   |
| Output Voltage     | V <sub>OUT</sub> | 12        | V     |
| Output Current     | I <sub>out</sub> | 350       | mA    |
| Output Power       | P <sub>out</sub> | 4.2W      | W     |
| Average Efficiency | η                | >75.00    | %     |

### FEATURES

- Primary side constant voltage (CV) control
- Integrated 500V/10Ω MOSFET
- < 100mW No-load power consumption
- Up to 6W output power
- Maximum discontinuous conduction mode (DCM) output current less than 225mA, maximum continuous conduction mode (CCM) output current less than 360mA
- Low V<sub>cc</sub> Operating Current
- Frequency Foldback
- Limited maximum frequency
- Peak Current Compression
- Internal High Voltage Current Source
- Internal 400ns Leading Edge Blanking
- Thermal Shutdown (auto restart)
- V<sub>CC</sub> Under Voltage Lockout with Hysteresis (UVLO)
- Timer based Over Load Protection
- Short Circuit Protection
- Open Loop Protection

### APPLICATIONS

- Home Appliances, White Goods and Consumer Electronics
- Industrial Controls
- Standby Power

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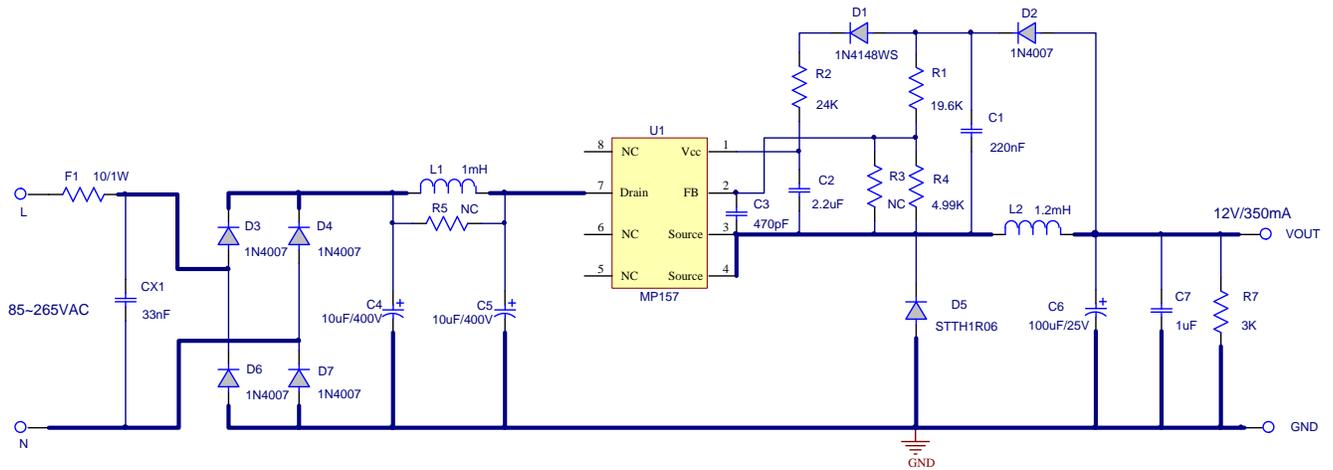
### EV157-S-00A EVALUATION BOARD



( L x W x H ) 4.5cm x 2.5cm x 1.7cm

| Board Number | MPS IC Number |
|--------------|---------------|
| EV157-S-00A  | MP157GS       |

### EVALUATION BOARD SCHEMATIC



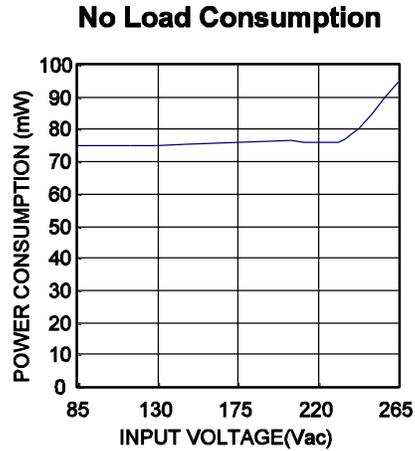
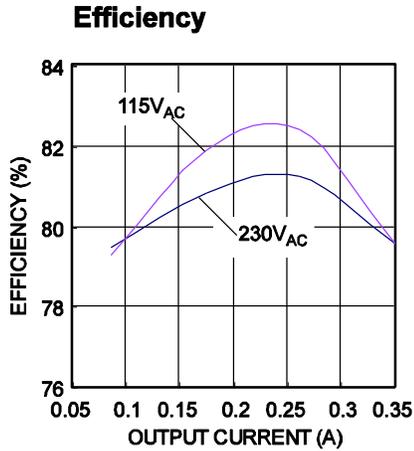
**EV157-S-00A BILL OF MATERIALS**

| Qty | Ref                            | Value     | Description                             | Package | Manufacture | Manufacture_PN     |
|-----|--------------------------------|-----------|---|---------|-------------|--------------------|
| 1   | C1                             | 220nF     | Ceramic Capacitor;16V;X7R;0603;         | 0603    | muRata      | GRM188R71C224KA01D |
| 1   | C2                             | 2.2μF     | Ceramic Capacitor;10V;X7R;0603;         | 0603    | muRata      | GRM188R71A225KE15D |
| 1   | C3                             | 470pF     | Ceramic Capacitor;50V;X7R;0603;         | 0603    | muRata      | GRM188R71H471KA01D |
| 2   | C4,<br>C5                      | 10μF/400V | Electrolytic Capacitor;400V;20%         | DIP     | Any         | Any                |
| 1   | C6                             | 100μF/35V | Electrolytic Capacitor;35V;Electrolytic | DIP     | Jianghai    | CD287-35V100       |
| 1   | C7                             | 1μF       | Ceramic Capacitor;16V;X7R;0603;         | 0603    | muRata      | GRM188R71C105KA12D |
| 1   | CX1                            | 33nF      | Capacitor;275V;10%                      | DIP     | Carli       | PX333K3IB29L270D9R |
| 1   | D1                             | 1N4148WS  | Diode;75V;0.15A;                        | SOD-323 | Diodes      | 1N4148WS-7-F       |
| 5   | D2,<br>D3,<br>D4,<br>D6,<br>D7 | 1N4007    | Diode;1000V;1A                          | DO-41   | Diodes      | 1N4007             |
| 1   | D5                             | STTH1R06  | Diode;600V;1A                           | DO-41   | ST          | STTH1R06           |
| 1   | F1                             | 10/1W     | Resistor;5%;1W                          | DIP     | Yageo       | FKN1WSJT-52-10R    |
| 1   | L1                             | 1mH       | Inductor;1000uH;8 Ohm;0.1A              | DIP     | Any         | Any                |
| 1   | L2                             | 1.2mH     | Inductor;1.2mH;1.8Ω;400 mA              | DIP     | Yimei       | DR9X12P2M1.2-00    |
| 1   | R1                             | 19.6k     | Film Resistor;1%;                       | 0603    | Yageo       | RC0603FR-0719K6L   |
| 1   | R2                             | 24k       | Film Resistor;1%;                       | 0603    | Yageo       | RC0603FR-0724KL    |
| 1   | R4                             | 4.99k     | Film Resistor;1%;                       | 0603    | Yageo       | RC0603FR-074K99L   |
| 1   | R7                             | 3k        | Film Resistor;1%                        | 1206    | Yageo       | RC1206FR-073KL     |
| 1   | U1                             | MP157GS   | Primary side regulator                  | SOIC8   | MPS         | MP157GS            |

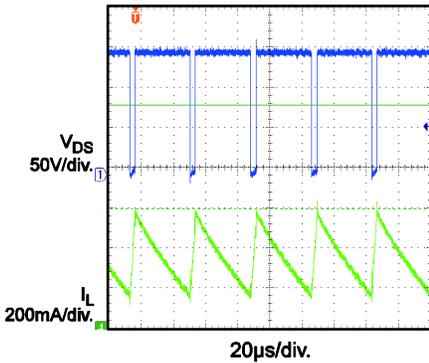
## EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

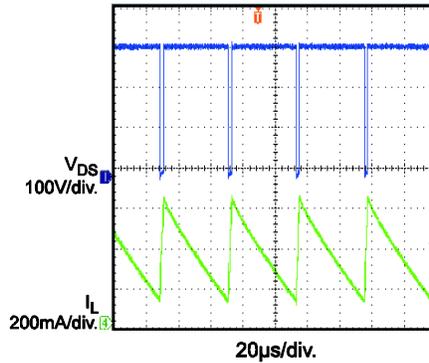
$V_{IN} = 85\text{--}265\text{VAC}$ ,  $V_{OUT} = 12\text{V}$ ,  $I_{OUT} = 350\text{mA}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted.



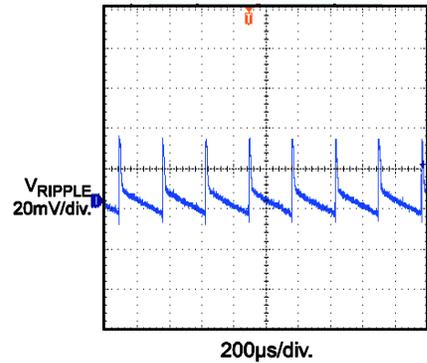
**Normal Operation**  
 $V_{IN} = 115\text{VAC}$ , Full Load



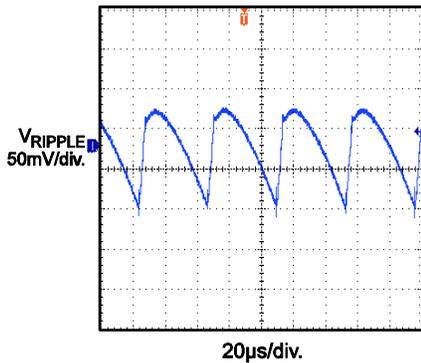
**Normal Operation**  
 $V_{IN} = 230\text{VAC}$ , Full Load



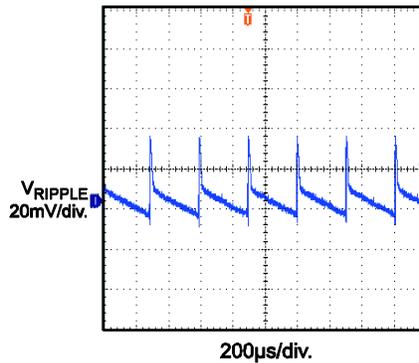
**Output Ripple**  
 $V_{IN} = 115\text{VAC}$ , No Load



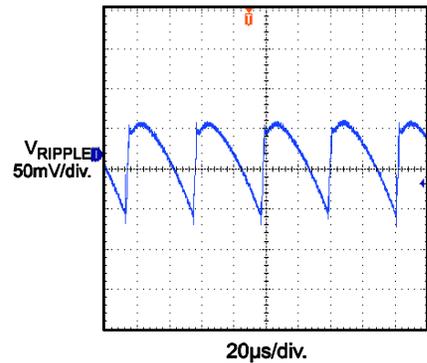
**Output Ripple**  
 $V_{IN} = 115\text{VAC}$ , Full Load



**Output Ripple**  
 $V_{IN} = 230\text{VAC}$ , No Load



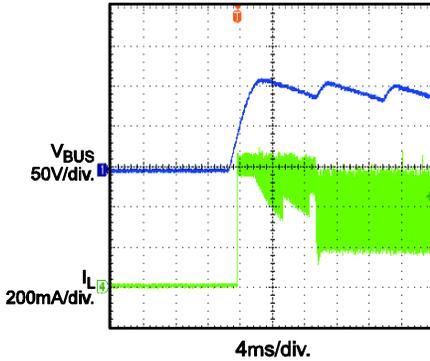
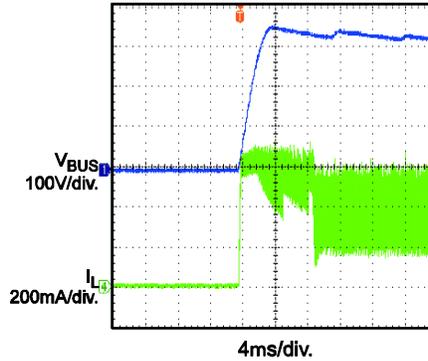
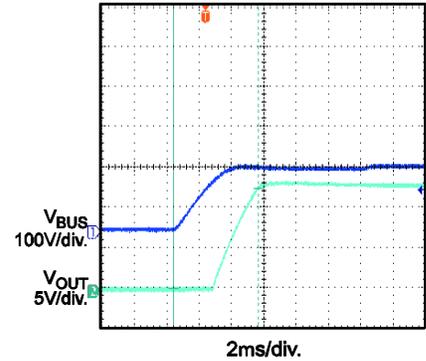
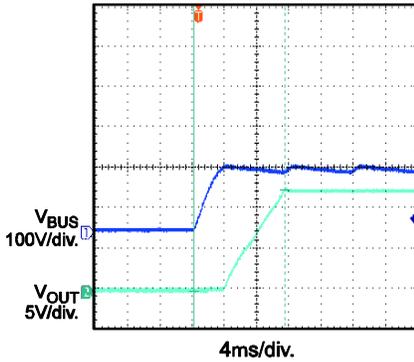
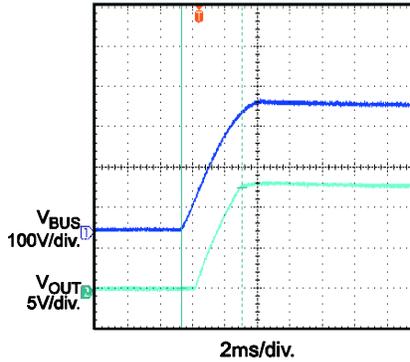
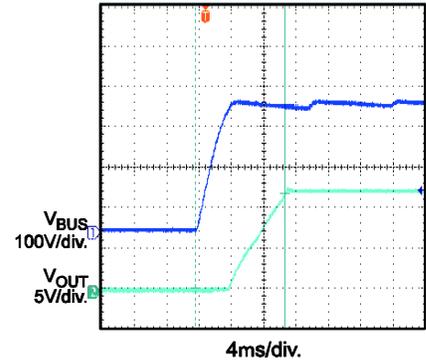
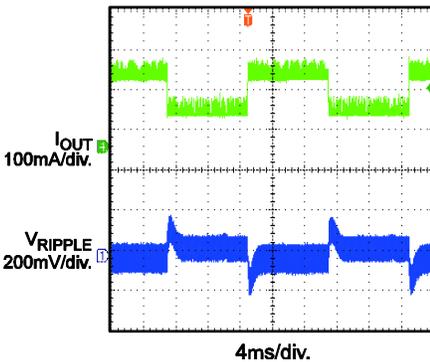
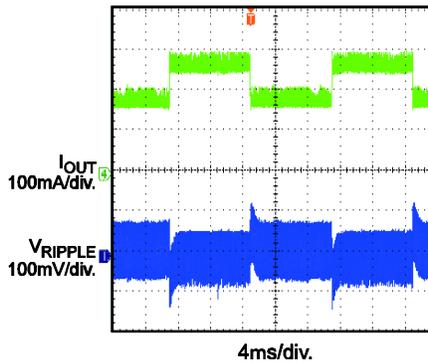
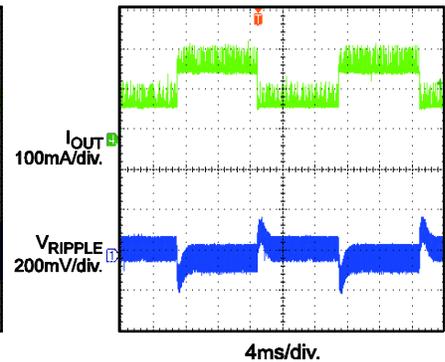
**Output Ripple**  
 $V_{IN} = 230\text{VAC}$ , Full Load



**EVB TEST RESULTS** *(continued)*

Performance waveforms are tested on the evaluation board.

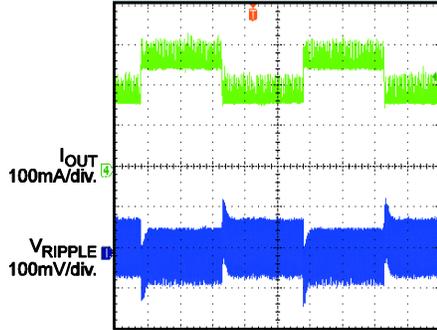
 $V_{IN} = 85\text{--}265\text{VAC}$ ,  $V_{OUT} = 12\text{V}$ ,  $I_{OUT} = 350\text{mA}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted.

**Soft Start**
 $V_{IN} = 85\text{VAC}$ 

**Soft Start**
 $V_{IN} = 265\text{VAC}$ 

**Turn-on Delay**
 $V_{IN} = 115\text{VAC}$ , No Load

**Turn-on Delay**
 $V_{IN} = 115\text{VAC}$ , Full Load

**Turn-on Delay**
 $V_{IN} = 230\text{VAC}$ , No Load

**Turn-on Delay**
 $V_{IN} = 230\text{VAC}$ , Full Load

**Load Transient**
 $V_{IN} = 115\text{VAC}$ ,  
25% Load to 50% Load

**Load Transient**
 $V_{IN} = 230\text{VAC}$ ,  
25% Load to 50% Load

**Load Transient**
 $V_{IN} = 115\text{VAC}$ ,  
50% Load to 75% Load


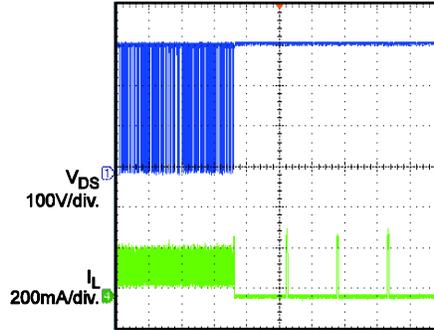
**EVB TEST RESULTS** *(continued)*

Performance waveforms are tested on the evaluation board.

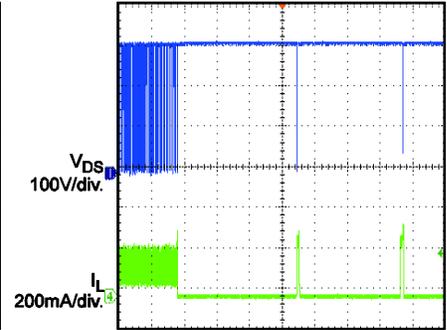
 $V_{IN} = 85\sim 265VAC$ ,  $V_{OUT} = 12V$ ,  $I_{OUT} = 350mA$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

**Load Transient**
 $V_{IN} = 230VAC$ ,  
50% Load to 75% Load


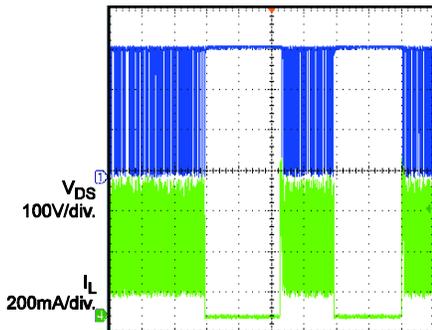
4ms/div.

**OLP Protection**
 $V_{IN} = 230VAC$ 


100ms/div.

**SCP Protection**
 $V_{IN} = 230VAC$ 


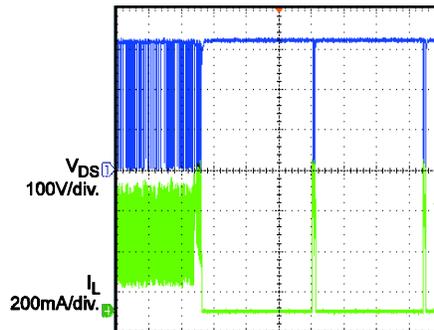
100ms/div.

**Thermal Down**


100ms/div.

**Open Loop**

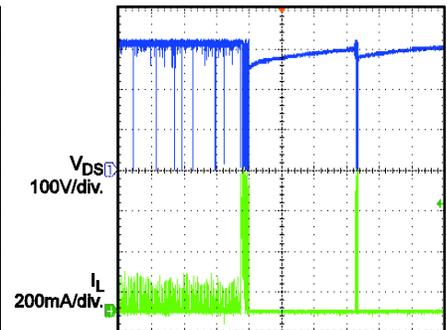
Full Load



100ms/div.

**Open Loop**

No Load

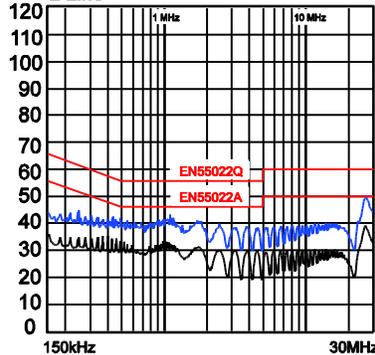


100ms/div.

**Conducted EMI**

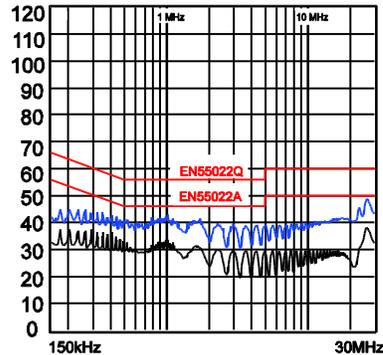
 Two-Wire Input,  $V_{IN} = 230VAC$ 

L Line


**Conducted EMI**

 Two-Wire Input,  $V_{IN} = 230VAC$ 

N Line



## SURGE PERFORMANCE

The circuit pass the 1000V surge.

| Surge Level (V) | Input Voltage (VAC) | Injection Location | Injection Phase(o) | Number of Surges | Test Result |
|-----------------|---------------------|--------------------|--------------------|------------------|-------------|
| 1000            | 220                 | L-N                | 0                  | 5                | PASS        |
| 1000            | 220                 | L-N                | 90                 | 5                | PASS        |
| 1000            | 220                 | L-N                | 180                | 5                | PASS        |
| 1000            | 220                 | L-N                | 270                | 5                | PASS        |
| -1000           | 220                 | L-N                | 0                  | 5                | PASS        |
| -1000           | 220                 | L-N                | 90                 | 5                | PASS        |
| -1000           | 220                 | L-N                | 180                | 5                | PASS        |
| -1000           | 220                 | L-N                | 270                | 5                | PASS        |

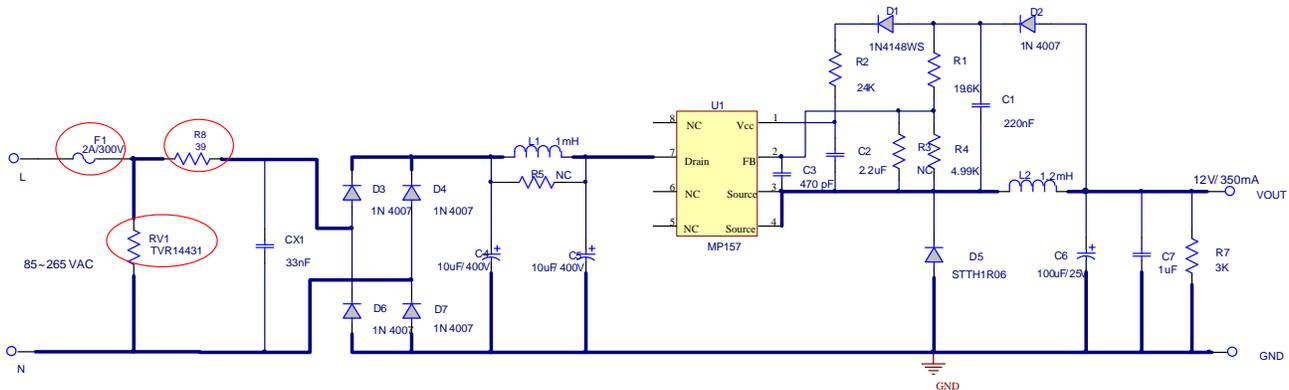
With the input capacitors C4 (10 $\mu$ F) and C5 (10 $\mu$ F), the board can pass 1000V surge test. Table 1 shows the capacitance required under normal condition for different surge voltage.

**Table 1 — Recommended Capacitor Values**

| Surge Voltage | 500V        | 1000V      | 2000V        |
|---------------|-------------|------------|--------------|
| C1            | 3.3 $\mu$ F | 10 $\mu$ F | Shown in Fig |
| C2            | 3.3 $\mu$ F | 10 $\mu$ F |              |

The board can pass 2kV surge test by using the circuit below.

- 1) Change the fuse resistor F1 (10ohm/1W) to SS-5-2A
- 2) Add a MOV RV1 (TVR14431)
- 3) Add a resistor R8 (39 $\Omega$ )



PRINTED CIRCUIT BOARD LAYOUT

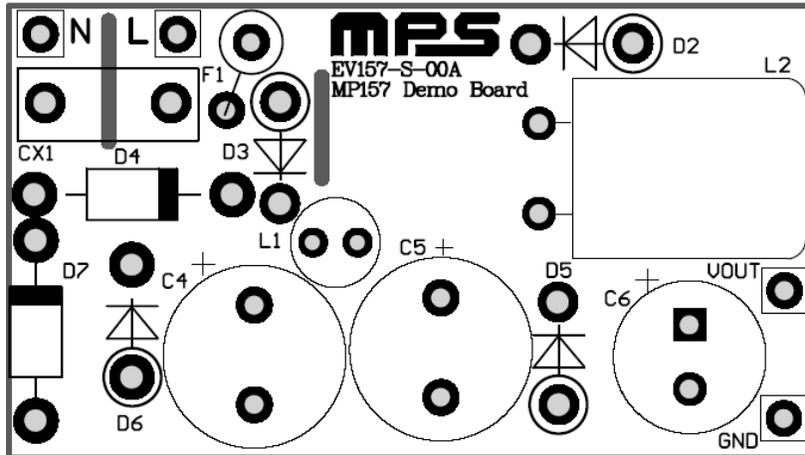


Figure 1 — Top Silk Layer

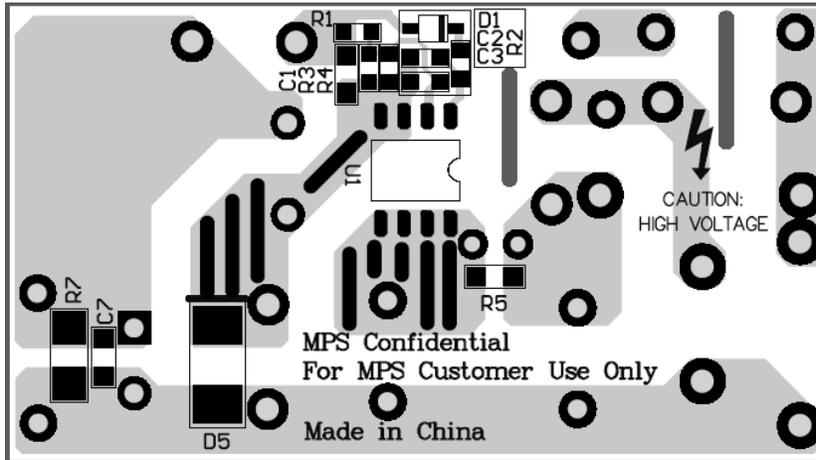


Figure 2 — Bottom Layer

## **QUICK START GUIDE**

1. Preset Power Supply to  $85\text{VAC} \leq V_{\text{IN}} \leq 265\text{VAC}$ .
2. Turn Power Supply off.
3. Connect the Line and Neutral terminals of the power supply output to L and N port.
4. Connect the positive terminal of the load to “+” port, and connect the negative terminal of the load to “-” port.
5. Turn Power Supply on after making connections.

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