



The Future of Analog IC Technology®

EV157-J-00A

Smallest Energy Off-line Regulator EV Board

DESCRIPTION

The EV157-J-00A Evaluation Board is designed to demonstrate the capabilities of MP157GJ. 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-J-00A Evaluation Board is designed as Buck application. The EV157-J-00A typically drives a 4.2W with a 12V_{TYP}, 350mA load from 85VAC to 265VAC, at 50Hz.

The EV157-J-00A has excellent efficiency and meets EN55022conducted EMI requirements. It has multiple protections, including open-circuit protection, short-circuit protection, over load protection and over-temperature protection, etc.

MP157GJ is available in the TSOT23-5 packages.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V _{IN}	85 to 265	VAC
Output Voltage	V _{OUT}	12	V
Output Current	I _{OUT}	350	mA
Output Power	P _{OUT}	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 Vcc Operating Current
- Frequency Foldback
- Limited maximum frequency
- Peak Current Compression
- Internal High Voltage Current Source
- Internal 400ns Leading Edge Blanking
- Thermal Shutdown (auto restart)
- VCC 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

All MPS parts are lead-free and adhere to the RoHS directive. For MPS green status, please visit MPS website under Products, Quality Assurance page.

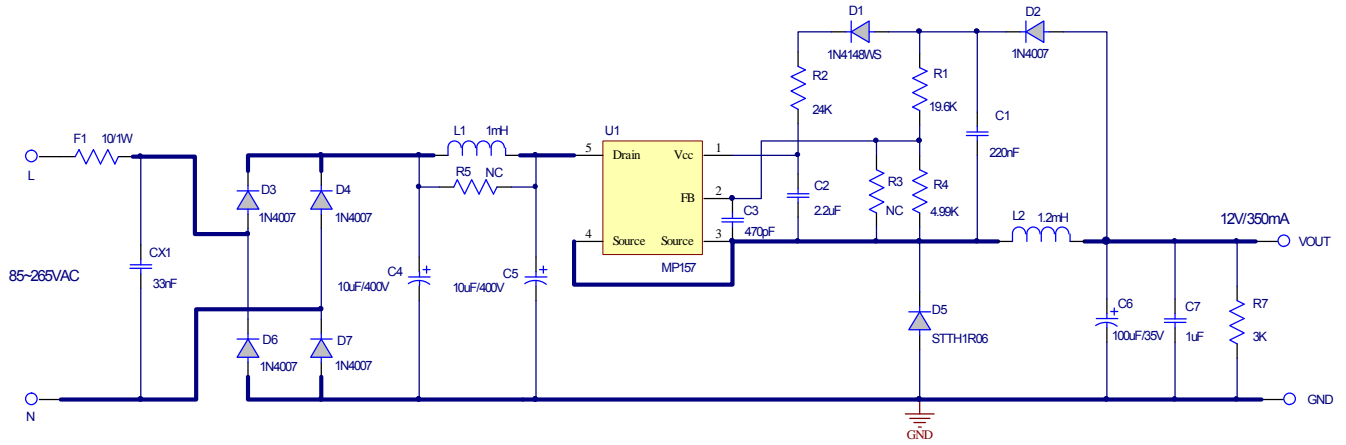
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EV157-J-00A EVALUATION BOARD

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

Board Number	MPS IC Number
EV157-J-00A	MP157GJ

EVALUATION BOARD SCHEMATIC



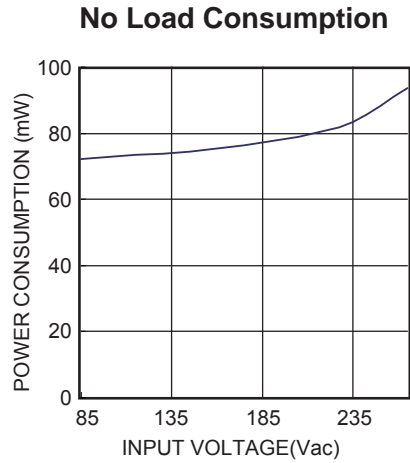
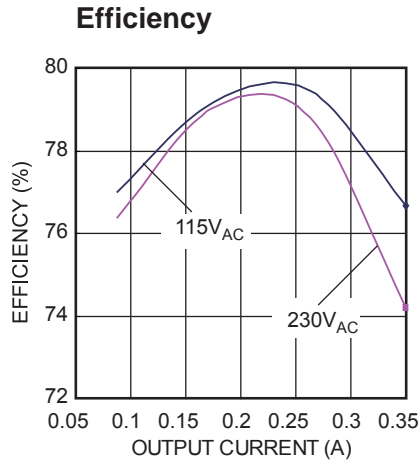
EV157-J-00A BILL OF MATERIALS

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, 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, D3, D4, D6, 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	MP157GJ	Primary side regulator	TSOT23-5	MPS	MP157GJ

EVB TEST RESULTS

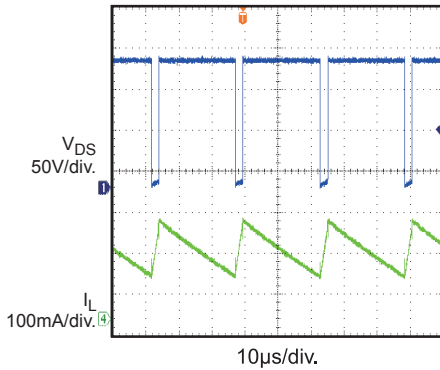
Performance waveforms are tested on the evaluation board.

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



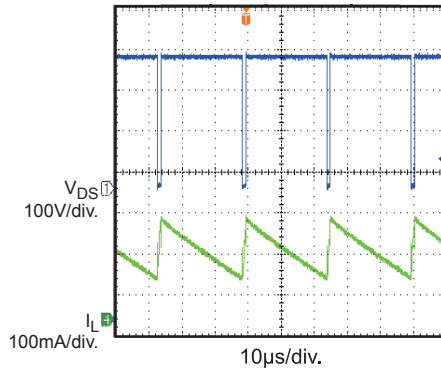
Normal Operation

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



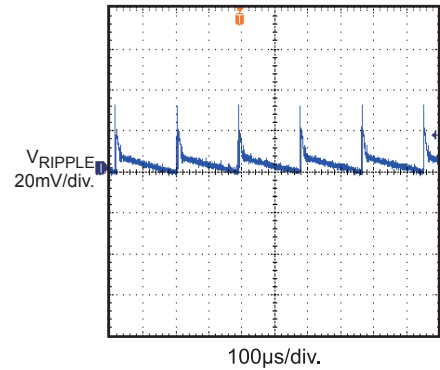
Normal Operation

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



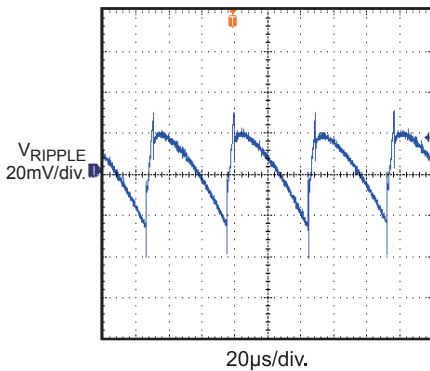
Output Ripple

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



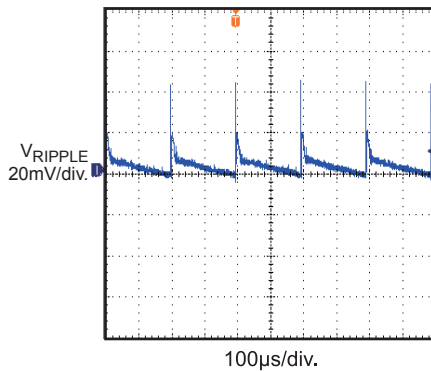
Output Ripple

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



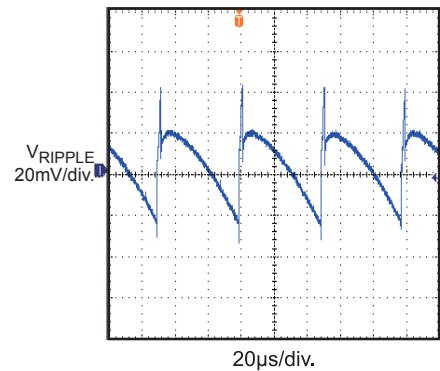
Output Ripple

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



Output Ripple

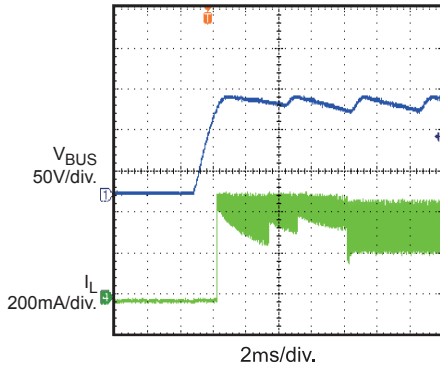
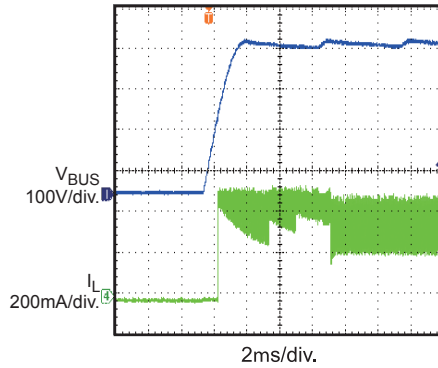
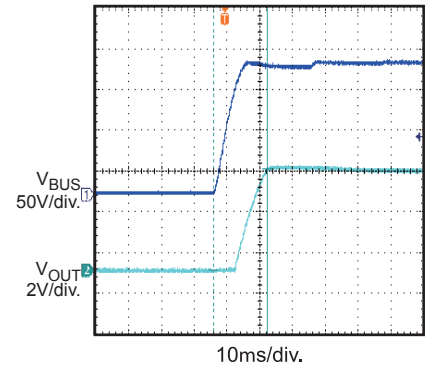
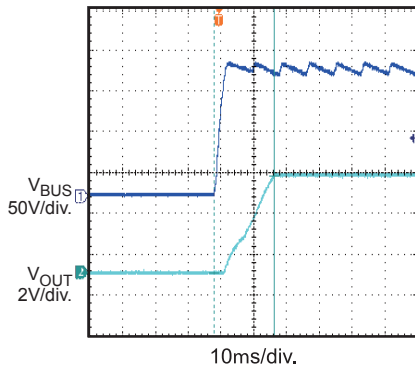
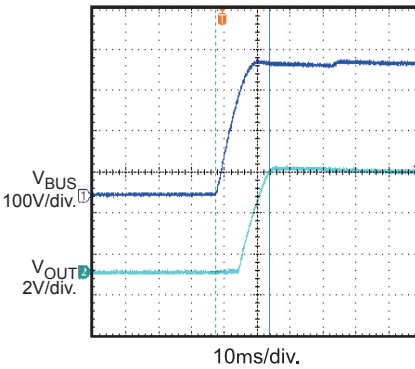
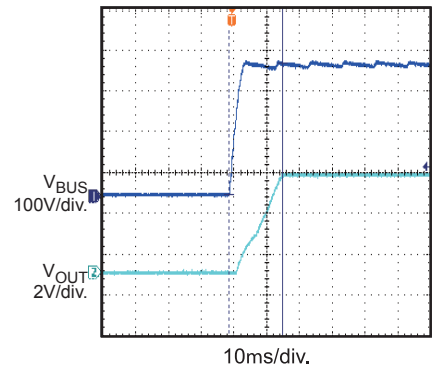
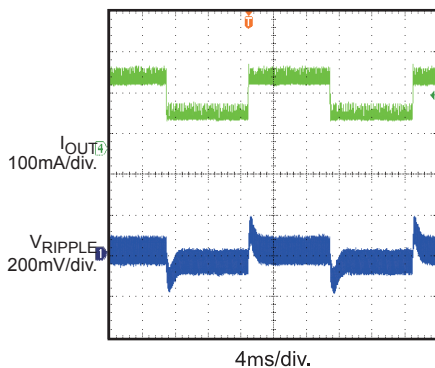
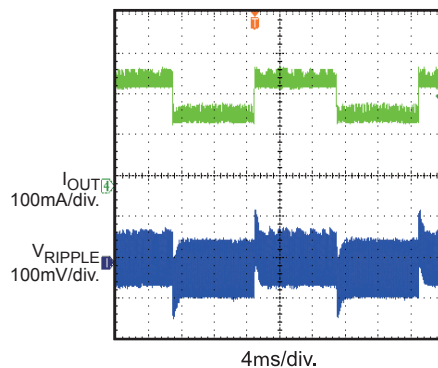
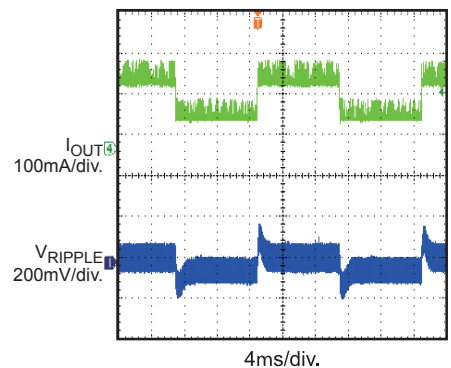
$V_{IN} = 230\text{VAC}$, Full Load



EVB TEST RESULTS (continued)

Performance waveforms are tested on the evaluation board.

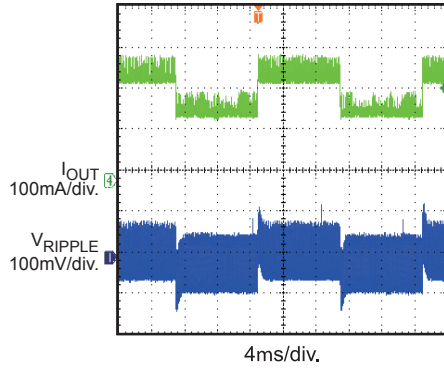
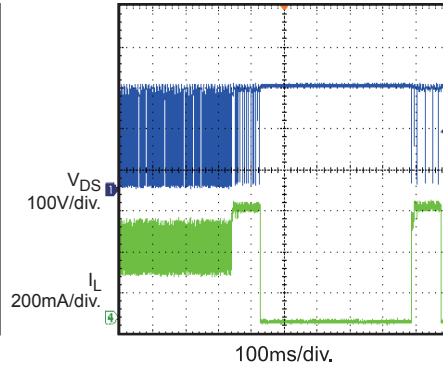
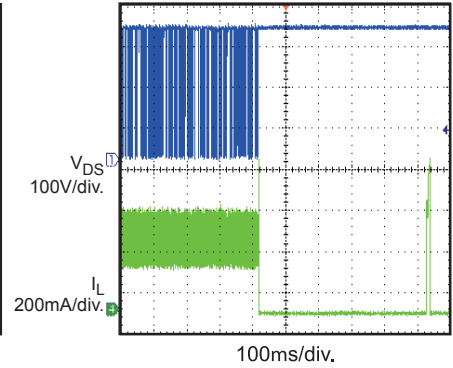
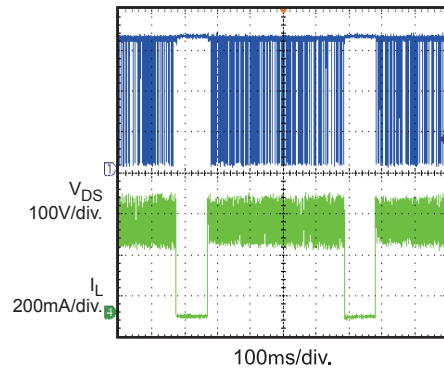
 $V_{IN} = 85\sim 265V_{AC}$, $V_{OUT} = 12V$, $I_{OUT} = 350mA$, $T_A = 25^{\circ}C$, unless otherwise noted.

Soft Start
 $V_{IN} = 85V_{AC}$

Soft Start
 $V_{IN} = 265V_{AC}$

Turn-on Delay
 $V_{IN} = 115V_{AC}$, No Load

Turn-on Delay
 $V_{IN} = 115V_{AC}$, Full Load

Turn-on Delay
 $V_{IN} = 230V_{AC}$, No Load

Turn-on Delay
 $V_{IN} = 230V_{AC}$, Full Load

Load Transient
 $V_{IN} = 115V_{AC}$,
25% Load to 50% Load

Load Transient
 $V_{IN} = 115V_{AC}$,
50% Load to 75% Load

Load Transient
 $V_{IN} = 230V_{AC}$,
25% Load to 50% Load


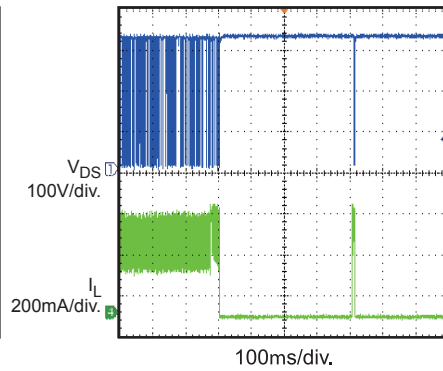
EVB TEST RESULTS (continued)

Performance waveforms are tested on the evaluation board.

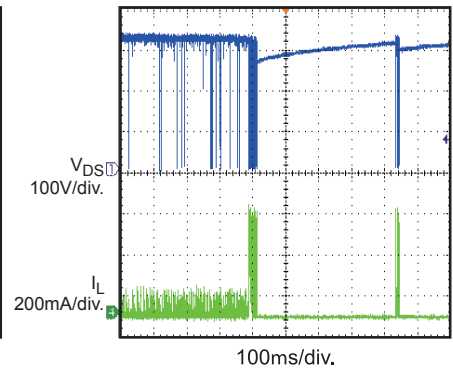
 $V_{IN} = 85\text{--}265\text{VAC}$, $V_{OUT} = 12\text{V}$, $I_{OUT} = 350\text{mA}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

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

OLP Protection
 $V_{IN} = 230\text{VAC}$

SCP Protection
 $V_{IN} = 230\text{VAC}$

Thermal Down

Open Loop

Full Load

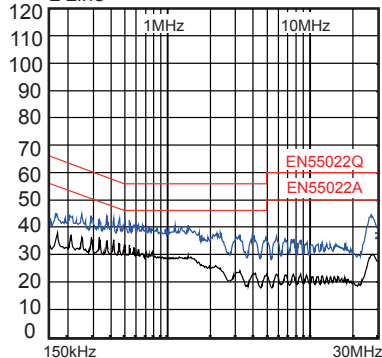

Open Loop

No Load


Conducted EMI

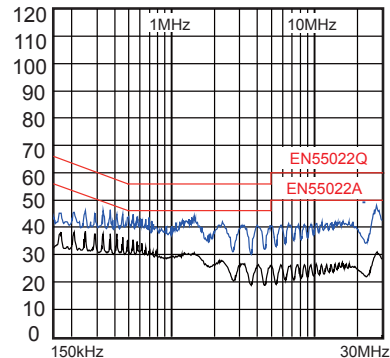
 Two-Wire Input, $V_{IN} = 230\text{VAC}$

L Line


Conducted EMI

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

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

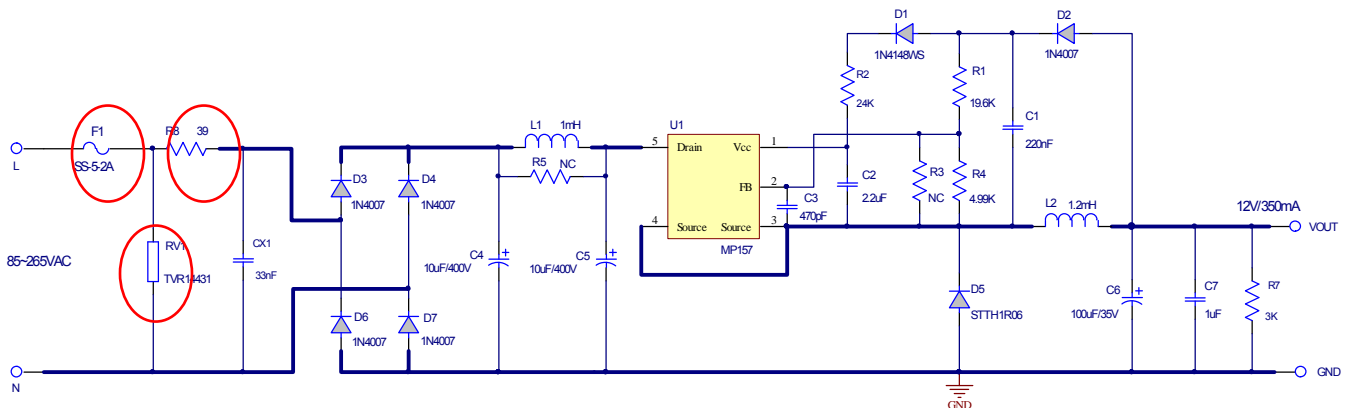
With the input capacitors C4 (10 μ F) and C5 (10 μ F), the board can pass 1000V surge test. Table 1 shows the capacitance required under normal condition for different surge voltage.

Table 1: Recommended Capacitor Values

Surge Voltage	500V	1000V	2000V
C1	3.3 μ F	10 μ F	Shown in Fig
C2	3.3 μ F	10 μ 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 (39ohm)



PRINTED CIRCUIT BOARD LAYOUT

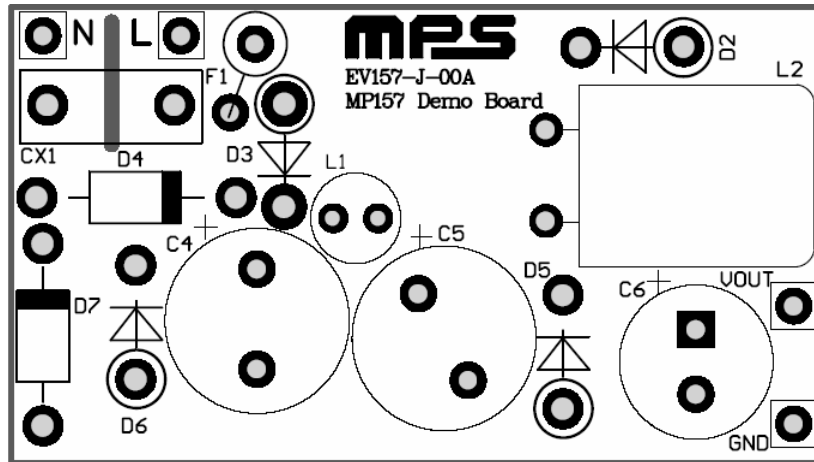


Figure 1 — Top Silk Layer

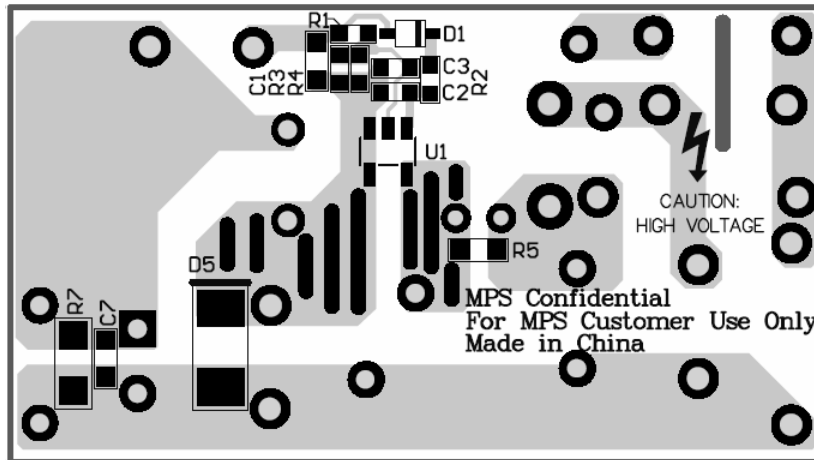


Figure 2 — Bottom Layer

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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