EV156-J-00A

Small, Energy-Efficient, Off-line Regulator EV Board

The Future of Analog IC Technology®

DESCRIPTION

MP156 is a primary-side regulator that provides accurate constant voltage (CV) regulation without opto-coupler, support buck, buck-boost, or flyback topologies. It has an integrated 500V MOSFET to simplify the structure and reduce costs. These features make it a competitive candidate for off-line low power applications, such as home appliances and standby power.

MP156 is a green-mode-operation regulator. Both its the peak current and the switching frequency decrease as the load decreases to provide excellent efficiency at light load, thus improving the overall average efficiency.

MP156 features various protections, including thermal shutdown (TSD), VCC under-voltage lockout (UVLO), overload protection (OLP), short-circuit protection (SCP), and open loop protection.

MP156 is available in the TSOT23-5 and SOIC8 package.

FEATURES

- Primary-Side Constant Voltage (CV) Control, Supporting buck, Buck-Boost and Flyback Topologies
- Integrated 500V/20Ω MOSFET
- <30mW No-Load Power Consumption
- Up to 3W Output Power
- Maximum DCM Output Current Less than 130mA
- Maximum CCM Output Current Less than 220mA
- Low VCC Operating Current
- Frequency Foldback
- Limited Maximum Frequency
- Peak-Current Compression
- Internal High-Voltage Current Source
- Internal 350ns Leading-Edge Blanking
- Thermal Shutdown (Auto Restart)
- VCC Under Voltage Lockout with Hysteresis
- Timer Based Over-Load Protection.
- Short-Circuit Protection
- Open-Loop Protection

APPLICATIONS

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

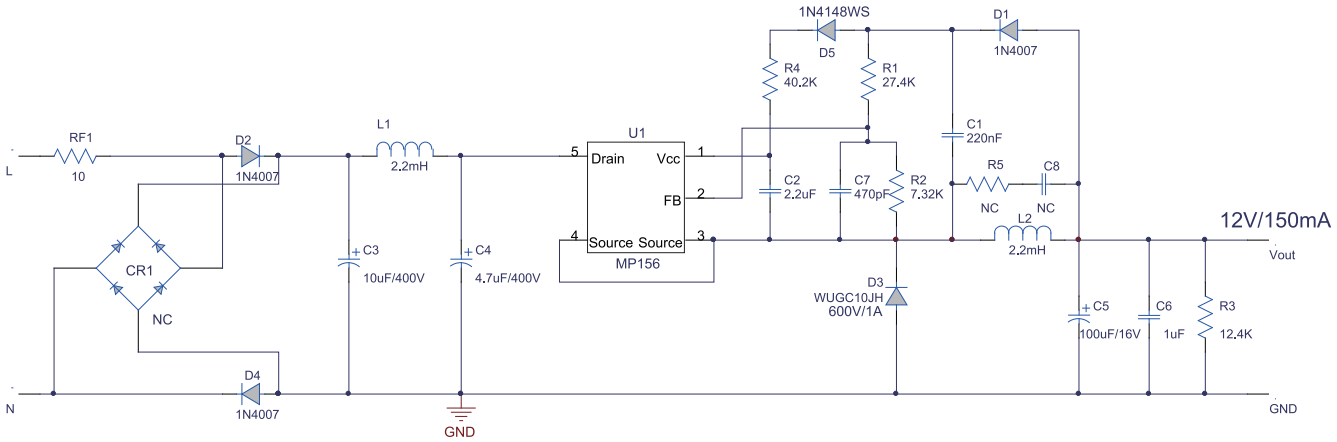
EV156-J-00A EVALUATION BOARD

(L x W x H) 3.4cm x 2.2cm x 1.6cm

Board Number	MPS IC Number
EV156-J-00A	MP156GJ

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

EVALUATION BOARD SCHEMATIC



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

EV156-J-00A BILL OF MATERIALS

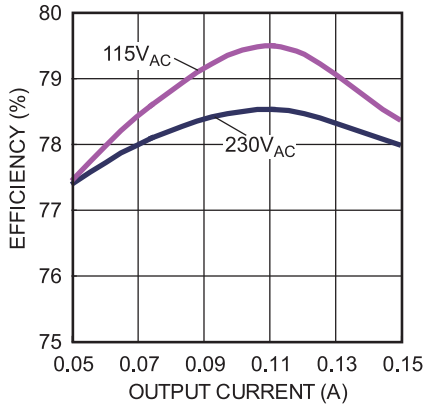
Qty	RefDes	Value	Description	Package	Manufacture	Manufacture_PN
1	C1	220nF	Ceramic Capacitor;16V;X7R ;0603;	0603	muRata	GRM188R71C224KA01D
1	C2	2.2uF	Ceramic Capacitor;10V;X7R ;0603	0603	muRata	GRM188R71A225KE15D
1	C3	10uF/400V	Electrolytic Capacitor;400V;20 %	DIP	Any	Any
1	C4	4.7uF/400V	Electrolytic Capacitor;400V;Ele ctrolytic;DIP	DIP	Jianghai	CD263-400V4.7
1	C5	100uF/16V	Electrolytic Capacitor;16V;Elec trolytic;DIP	DIP	Jianghai	CD11C-16V100
1	C6	1uF	Ceramic Capacitor;50V;X7R ;0805;	0805	muRata	GRM21BR71H105KA12L
1	C7	470pF	Ceramic Capacitor;50V;CO G	0603	TDK	C1608COG1H471J
3	D1, D2, D4	1N4007	Diode;1000V;1A	DO-41	Diodes	1N4007
1	D3	WUGC10JH	Diode;600V;1A	SMA	ZOWIE	WUGC10JH
1	D5	1N4148WS	Diode;75V;0.15A;	SOD-323	Diodes	1N4148WS-7-F
1	L1	2.2mH	Inductor;2.2mH;11; 210mA	DIP	Wurth	744741222
1	L2	2.2mH	Inductor;2.2mH;4.7 3;300mA	DIP	Wurth	7447720222
1	R1	27.4K	Film Resistor;1%	0603	Yageo	RC0603FR-0727K4L
1	R2	7.32K	Film Resistor;1%	0603	Yageo	RC0603FR-077K32L
1	R3	12.4K	Film Resistor;1%;	0603	Yageo	RC0603FR-0712K4L
1	R4	40.2K	Film Resistor;1%;	0603	Yageo	RC0603FR-0740K2L
1	RF1	10	Fuse Resistor;5%;1W	DIP	Any	Any
1	U1	MP156GJ	Primary side regulator	TSOT23-5	MPS	MP156GJ

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

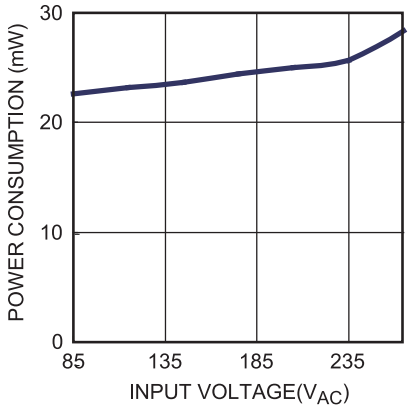
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN} = 85V to 265V_{AC}, V_{OUT} = 12V, I_{OUT} = 150mA, T_A = 25ºC, unless otherwise noted.

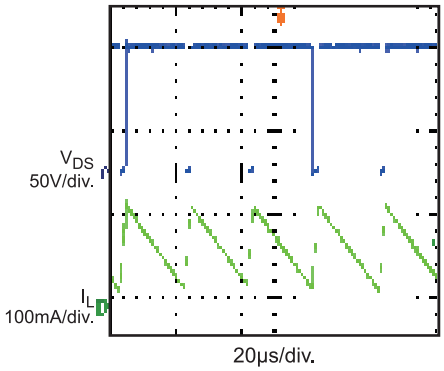
Efficiency



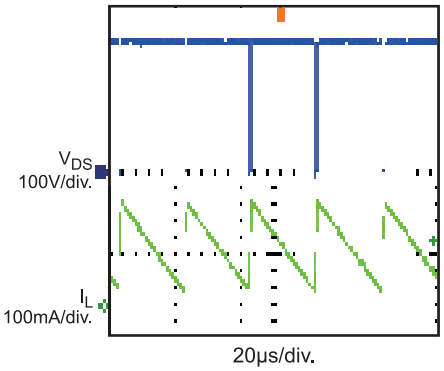
No Load Consumption



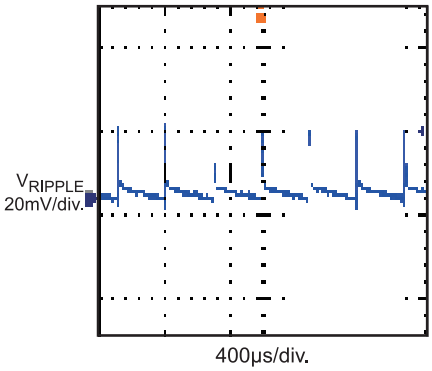
Normal Operation
V_{IN} = 115V_{AC}, Full Load



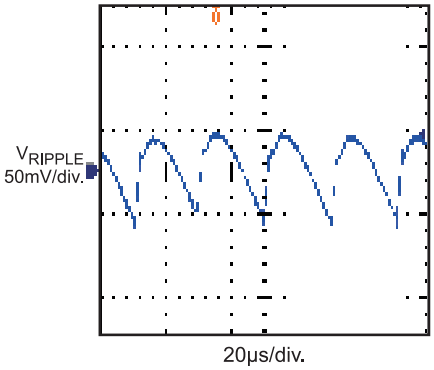
Normal Operation
V_{IN} = 230V_{AC}, Full Load



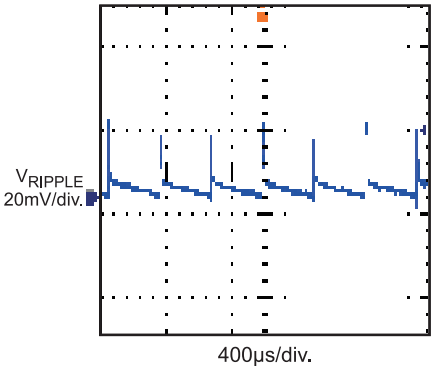
Output Ripple
V_{IN} = 115V_{AC}, No Load



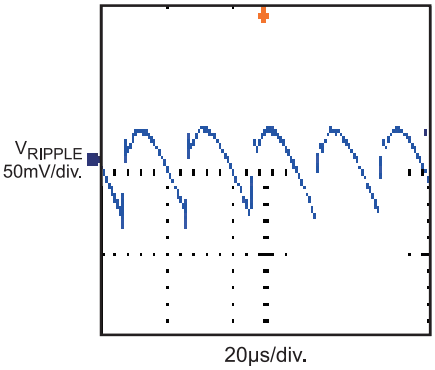
Output Ripple
V_{IN} = 115V_{AC}, Full Load



Output Ripple
V_{IN} = 230V_{AC}, No Load



Output Ripple
V_{IN} = 230V_{AC}, Full Load

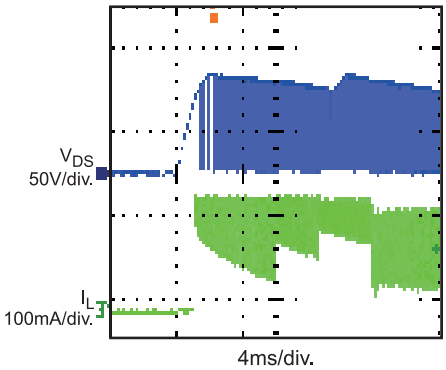


MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

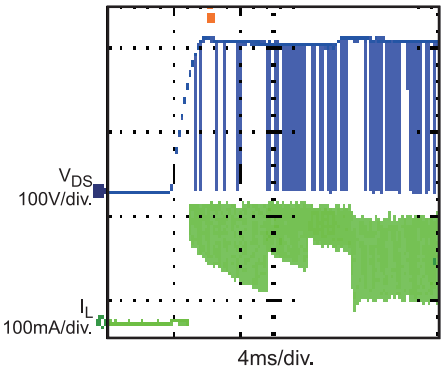
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 85V to 265V_{AC}, V_{OUT} = 12V, I_{OUT} = 150mA, T_A = 25ºC, unless otherwise noted.

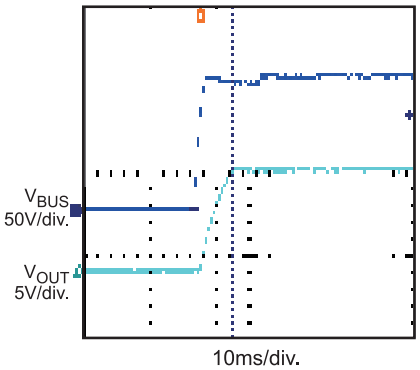
Soft Start
V_{IN} = 85V_{AC}, Full Load



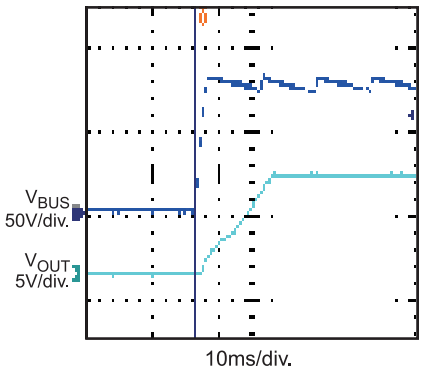
Soft Start
V_{IN} = 265V_{AC}, Full Load



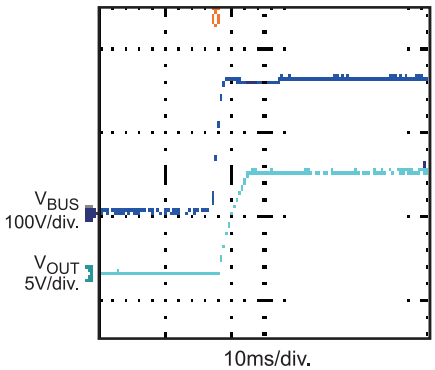
Turn-on Delay
V_{IN} = 115V_{AC}, No Load



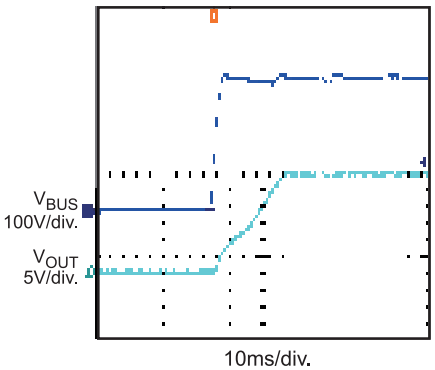
Turn-on Delay
V_{IN} = 115V_{AC}, Full Load



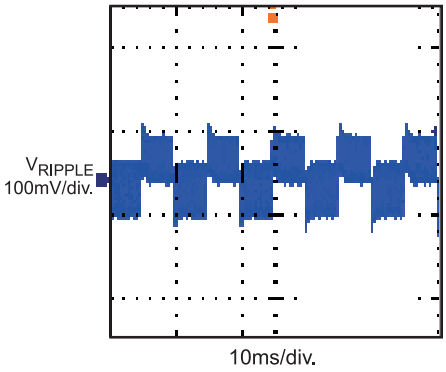
Turn-on Delay
V_{IN} = 230V_{AC}, No Load



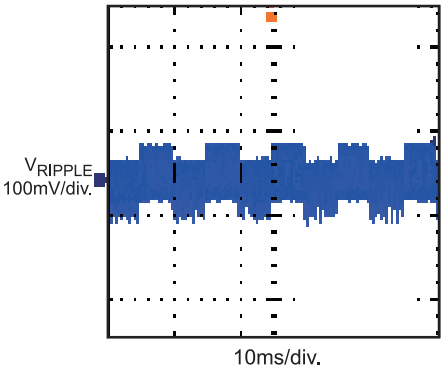
Turn-on Delay
V_{IN} = 230V_{AC}, Full Load



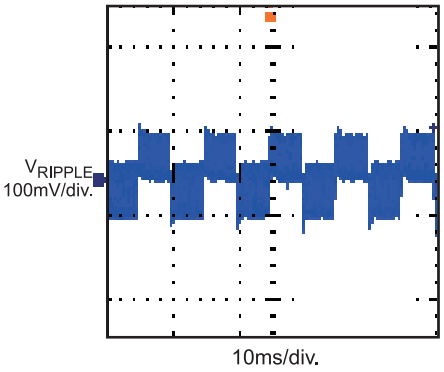
Load Transient
V_{IN} = 115V_{AC},
25% Load to 50% Load



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



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



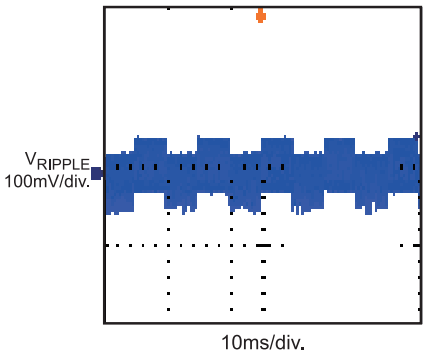
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 85V to 265V_{AC}, V_{OUT} = 12V, I_{OUT} = 150mA, T_A = 25ºC, unless otherwise noted.

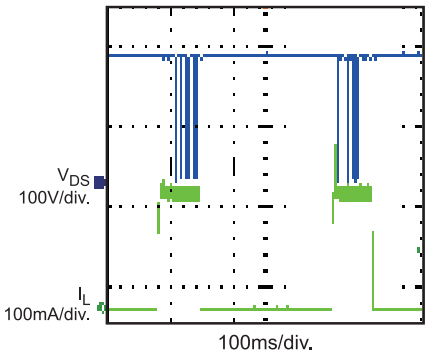
Load Transient

V_{IN} = 230V_{AC},
50% Load to 75% Load



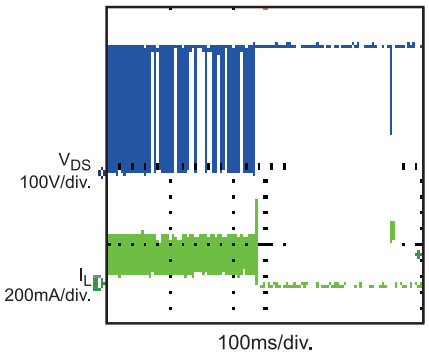
OLP Protection

V_{IN} = 230V_{AC}

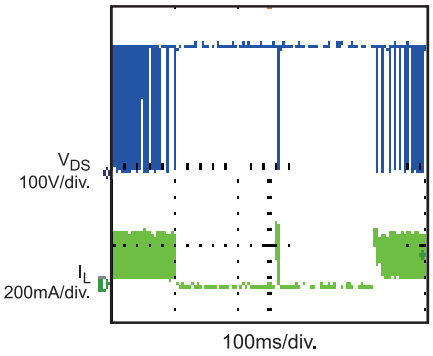


SCP Protection

V_{IN} = 230V_{AC}

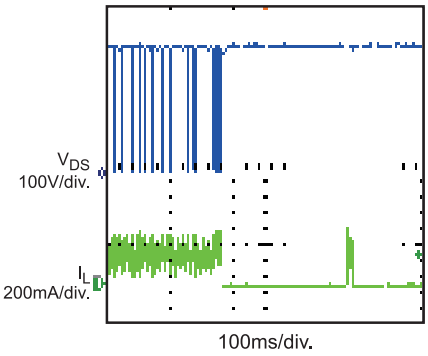


Thermal Down



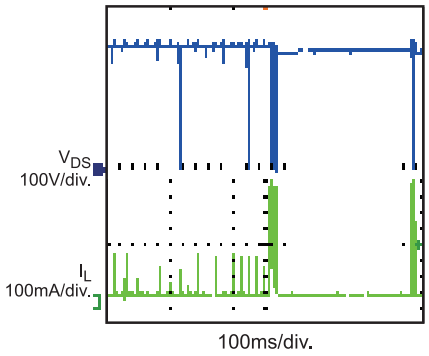
Open Loop

Full Load



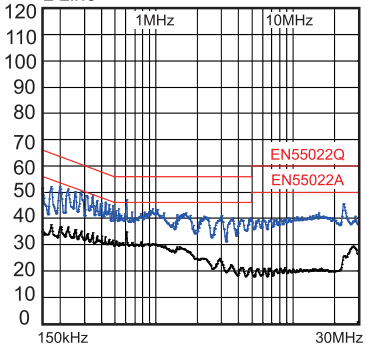
Open Loop

No Load



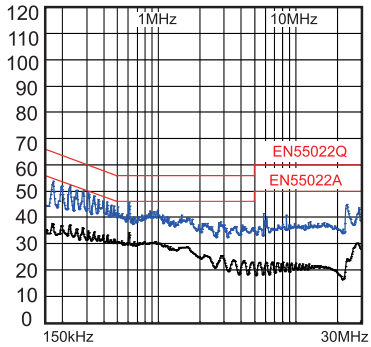
Conducted EMI

Two-Wire Input, V_{IN} =230V_{AC}
L Line



Conducted EMI

Two-Wire Input, V_{IN} =230V_{AC}
N Line



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

SURGE PERFORMANCE

With the input capacitors C3 (10µF) and C4 (4.7µF), the board can pass 1kV 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
C3	1µF	10µF	22µF
C4	1µF	4.7µF	10µF

PRINTED CIRCUIT BOARD LAYOUT

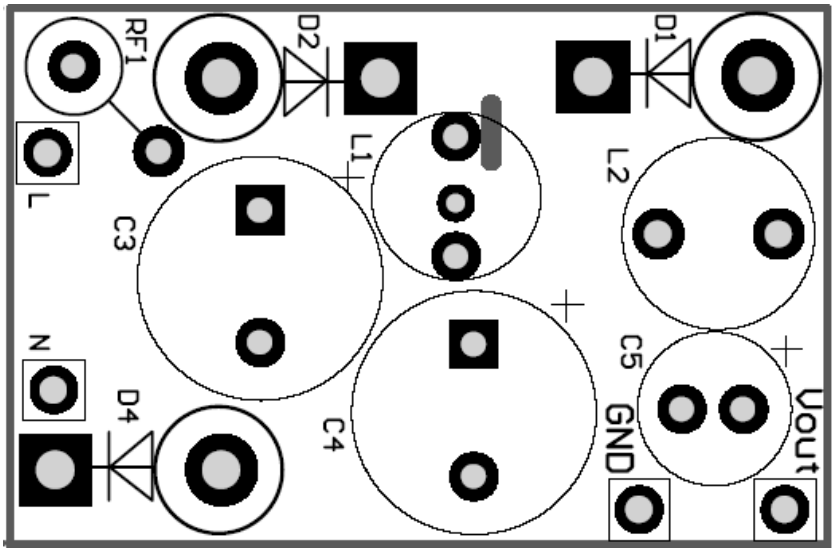


Figure 1 — Top Silk Layer

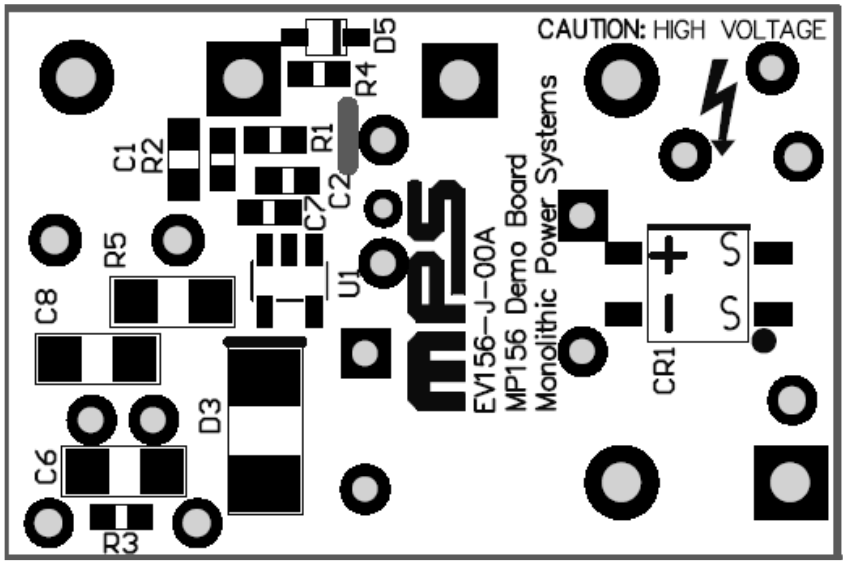


Figure 2 — Bottom Silk Layer

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

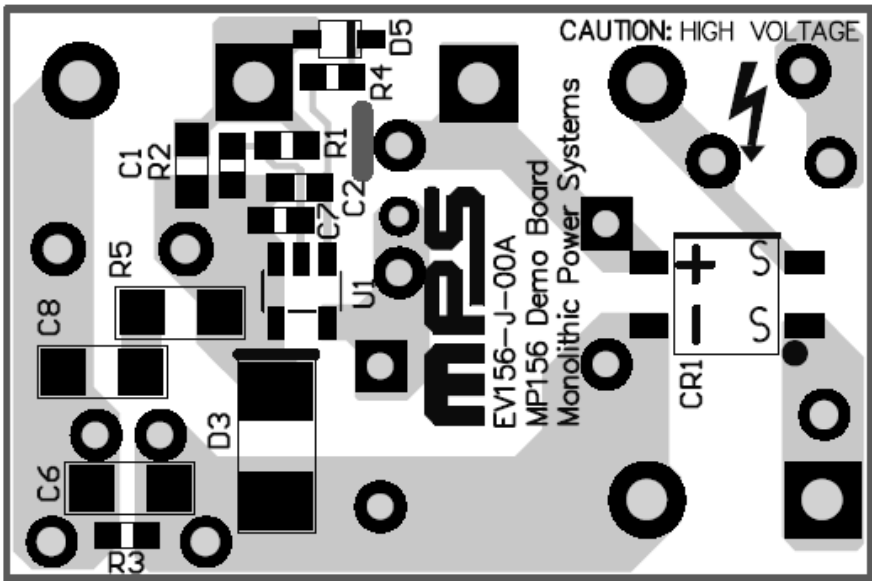


Figure 3 — Bottom Layer

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.

QUICK START GUIDE

1. Preset Power Supply to 85V ≤ V_{IN} ≤ 265V.
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 V_{OUT} port, and connect the negative terminal of the load to GND port.
5. Turn Power Supply on after making connections.

NOTICE: The information in this document is subject to change without notice. Please contact MPS for current specifications. Users should warrant and guarantee that third party Intellectual Property rights are not infringed upon when integrating MPS products into any application. MPS will not assume any legal responsibility for any said applications.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2013 MPS. All Rights Reserved.