EV163-SE-00A

Universal Input, Dual Output Non-Isolated Off-Line Regulator Evaluation Board

The Future of Analog IC Technology

DESCRIPTION

The EV163-SE-00A Evaluation Board is designed to demonstrate the capabilities of MP163. The MP163 is a primary-side constant voltage regulator providing accurate constant voltage (CV) regulation without Opto-coupler. It supports Buck, Buck-Boost, Boost and Flyback topologies.

The EV163-SE-00A Evaluation Board is designed as Buck application. EV163-SE-00A typically drives a 12V/70mA, 3.3V/50mA output from 85VAC to 265VAC, at 60/50Hz.

The EV163-SE-00A has an excellent efficiency and meets 1kV IEC61000-4-5 surge immunity and EN55022 conducted EMI requirements. MP163 features various protections, including thermal shutdown (TSD), VCC under-voltage lockout (UVLO), over-load protection (OLP), short- circuit protection (SCP), and open loop protection.

MP163AGSE-33 is used in this evaluation board, it is in SOIC16 package. This board can be used for MP163B and MP163C evaluation, please refer to the last page for advice.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	85 to 265	VAC
Output Voltage1	V_{OUT1}	12	V
Output Current1	I_{OUT1}	70	mA
Output Voltage2	V_{OUT2}	3.3	V
Output Current2	I_{OUT2}	50	mA

FEATURES

- Primary-side non-isolated constant voltage (CV) Control
- Integrated 700V MOSFET
- < 30mW no-load power consumption
- Peak-current control with peak current Compression
- Low VCC operating current
- Limited maximum frequency
- Frequency foldback
- Multiple protections: SCP, OCP, TSD, and VCC UVLO
- Low cost and simple external circuit
- Internal high-voltage current source
- Built in LDO

APPLICATIONS

- Home appliance, white goods and consumer electronics
- Industrial controls
- Standby power

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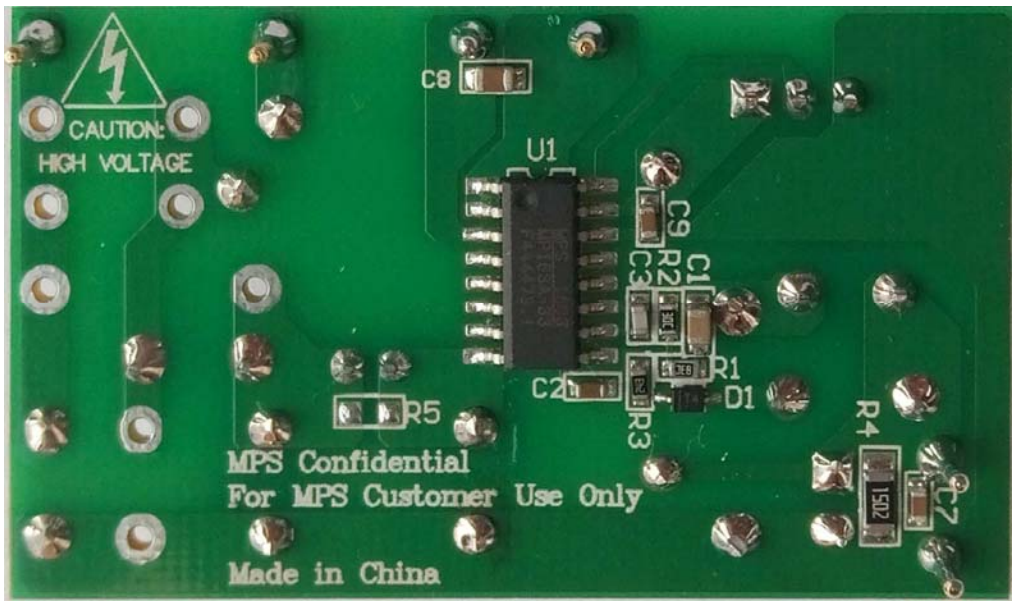
Warning: Although this board is designed to satisfy safety requirements, the engineering prototype has not been agency approved. Therefore, all testing should be performed using an isolation transformer to provide the AC input to the prototype board.

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EV163-SE-00A EVALUATION BOARD



TOP VIEW



BOTTOM VIEW

(L x W x H) 53mm x 31mm x 17mm

Board Number	MPS IC Number
EV163-SE-00A	MP163AGSE-33

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EVALUATION BOARD SCHEMATIC

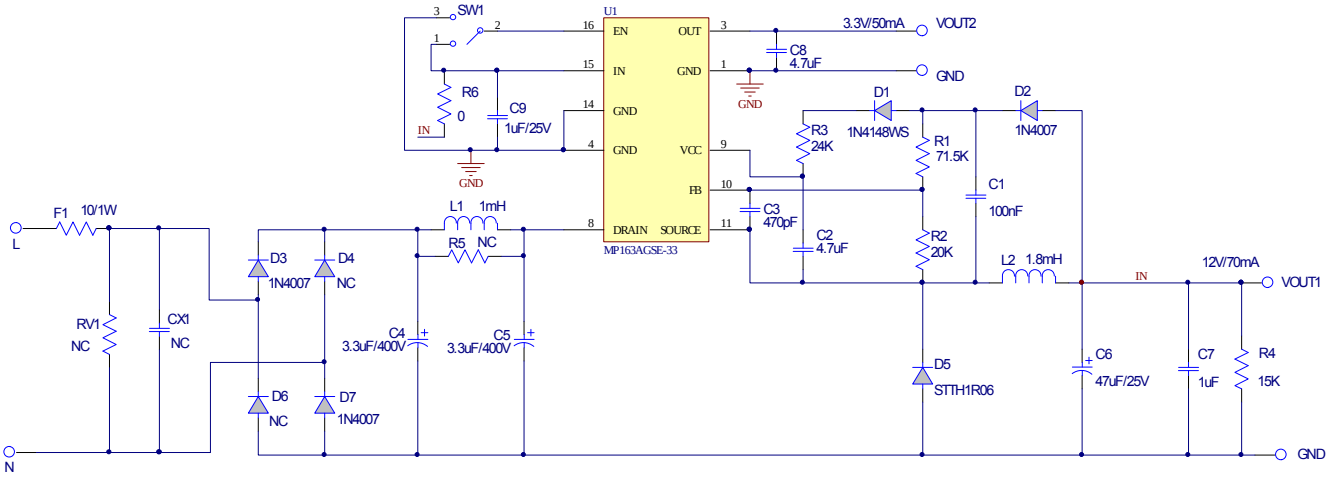


Figure 1—Schematic

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PCB LAYOUT (SINGLE-SIDED)

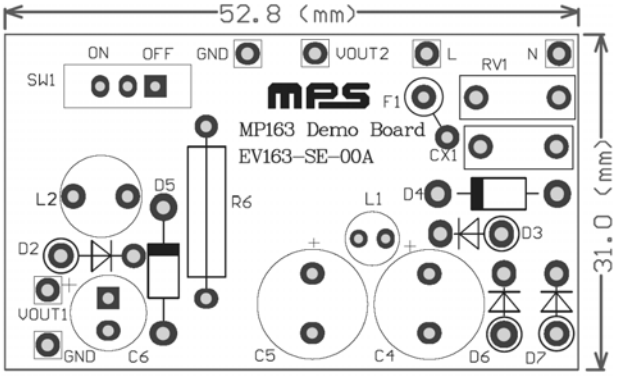


Figure 2—Top Layer

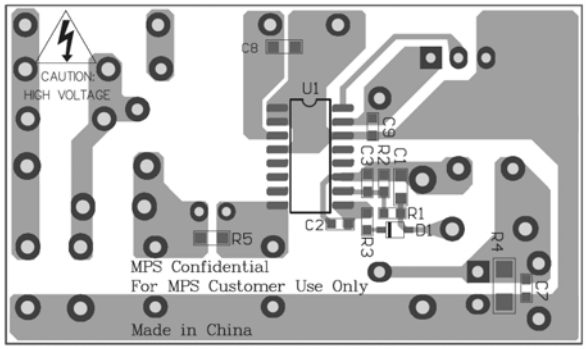


Figure 3—Bottom Layer

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EV163-SE-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	C1	100nF	Ceramic Capacitor; 50V;X7R	0805	muRata	GRM21BR71H104KA01L
1	C2	2.2μF	Ceramic Capacitor; 10V;X7R	0603	muRata	GRM188R71A225KE15D
1	C3	1nF	Ceramic Capacitor; 50V;X7R	0603	muRata	GRM188R71H102KA01D
2	C4, C5	3.3μF	Electrolytic Capacitor; 400V;20%	DIP	Rubycon	400LLE3R3MEFC8X11.5
1	C6	47μF	Electrolytic Capacitor; 25V	DIP	Lelon	RXW221M1EBK0811P
2	C7, C9	1μF	Ceramic Capacitor; 25V;X7R	0603	muRata	GRM188R71E105KA12D
1	C8	4.7μF	Ceramic Capacitor; 10V;X5R	0805	TDK	C2012X5R1A475K
0	CX1	NC				
1	D1	1N4148WS	Diode;75V;0.15A	SOD-323	Diodes	1N4148WS-7-F
3	D2, D3, D7	1N4007	Diode;1000V;1A	DO-41	Diodes	1N4007
0	D4, D6,	NC				
1	D5	STTH1R06	Diode;600V;1A	DO-41	ST	STTH1R06
1	F1	10	Resistor;5%;1W	DIP	Yageo	FKN1WSJT-52-10R
1	L1	1mH	Inductor;1000μH; 17.4Ω;100mA	DIP	Any	CKL0410-102
1	L2	1.8mH	Inductor;1.8mH; 3.3Ω;350mA	DIP	Wurth	768772182
1	R1	71.5k	Film Resistor;1%	0603	Yageo	RC0603FR-0771K5L
1	R2	20k	Film Resistor;1%	0603	Yageo	RC0603FR-0720KL
1	R3	24k	Film Resistor;5%	0603	LIZ	CR0603JA0243G
1	R4	15k	Film Resistor;1%	1206	Yageo	RC1206FR-0715KL
0	R5	NC				
1	R6	Jumper	16mm wire			
0	RV1	NC				
1	SW1	450301014042	Switch	DIP	Wurth	450310104042
1	U1	MP163	Primary side regulator	SOIC16	MPS	MP163AGSE-33

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CIRCUIT DESCRIPTION

The EV163-SE-00A is configured in a buck regulator topology, it uses primary-side-control which can mostly simplify the schematic and get a cost effective BOM. It can also achieve accurate constant voltage and acceptable cross regulation.

F1 is used to protect circuit from component failure or some excessive short events; also it can restrain the inrush current.

C4, L1 and C5 compose π filter to guarantee the conducted EMI meet standard EN55022. C2 and C3 are also used for energy storage and protecting against line surge.

R3, C2, and D1 are used as VCC power supply. Though MP163 is equipped with an internal high voltage current source, using this circuit can achieve better efficiency.

C1 is the sample-hold capacitor, used for reflecting output voltage. R1 and R2 are resistor divider for detecting output voltage by sampling voltage on C1.

D5 is the freewheeling diode. For universal voltage applications, use a diode with a 600V reverse block voltage. Ultra-fast recovery diode is recommended for better efficiency.

C6 and C7 are output capacitors for 12V output. C6 should be low ESR electrolytic capacitor for better output ripple. C7 is ceramic capacitor to reduce high frequency voltage ripple. R4 is dummy load to lower the output voltage of 12V rail at no load condition.

C9 is the input capacitor of built in LDO. And C8 is the output capacitor of LDO.

SW1 controls the EN of LDO. When the handle is moved to ON position, EN is connected to 12V output, which enables the LDO output. When the handle is moved to OFF position, EN is connected to GND and LDO output is disabled.

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QUICK START GUIDE

1. Preset power supply to 85VAC ≤ V_{IN} ≤ 265VAC.
2. Turn power supply off.
3. Connect the Line and Neutral terminals of the power supply output to L and N port.
4. Connect different loads to corresponding outputs :
    a. Positive (+): VOUT1, VOUT2
    b. Negative (–): GND
5. Turn power supply on after making connections.
6. When MP163B or MP163C is dropped in for evaluation, power inductor (L2) should be replaced with larger current rating ones to prevent inductor saturation. The recommended inductance is around 1mH and can be varied according to the output power. And output capacitor (C6) should also be enlarged to get acceptable output ripple. If the output power is much larger than original, please also enlarge the input capacitor to avoid very low bus voltage under low line input.

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