EV4001-S-00A

350mA, Universal-Input, WLED Driver with Passive PFC Evalvation Board

DESCRIPTION

The EV4001-S-00A is an evaluation board for the MP4001. The MP4001 is a high-efficiency step-down converter designed to drive high-brightness light-emitting diodes (LEDs).

The EV4001-S-00A can supply a maximum output current of 350mA to drive 10V-to-30V LED strings from an input voltage of 90VAC to 265VAC at 50Hz/60Hz.

Applying a pulse width modulated square wave signal between the DIM and GND pins implements PWM dimming.

The EV4001-S-00A meets EN55015 EMI standards. The EVB fits in PAR-22 lighting fixtures.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	VAC	90 – 265	V
Output Voltage	V_{OUT}	10 – 30	V
Output Current	I_{OUT}	350	mA
Power Factor	PF	>0.65	

FEATURES

- Constant-Current LED Driver
- Universal AC Input
- Power MOSFET Zero-Current Turn-On
- High Efficiency Boundary-Mode Operation
- High-Voltage Smart LDO integrated
- Low 1mA Operation Current
- PWM or DC-Input Burst-Dimming Control
- Hiccup Short-Circuit Protection
- Maximum Frequency of 110kHz
- Thermal Shutdown
- Available in an SOIC8 Package

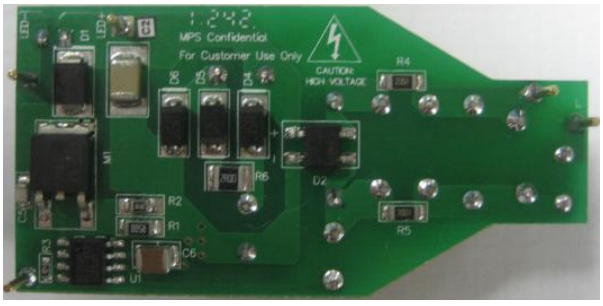
APPLICATIONS

- DC/DC or AC/DC LED Drivers
- General Illumination
- Industrial LED Lighting
- LED Light

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

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.

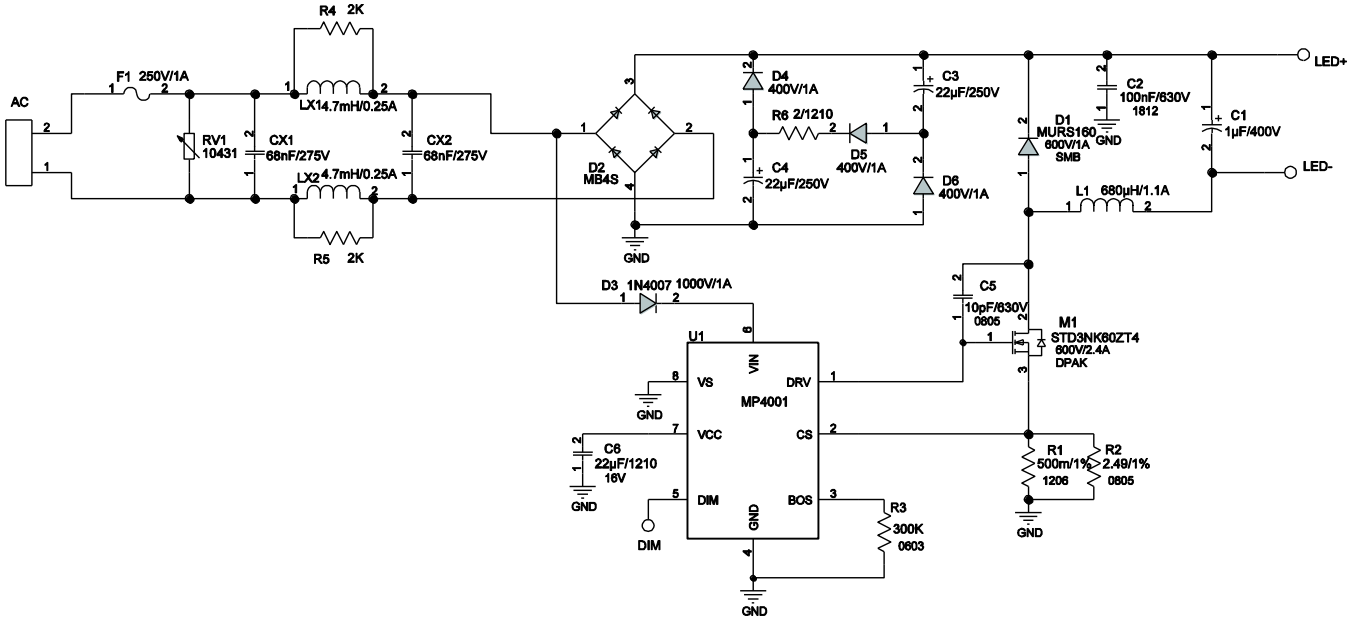
EV4001-S-00A EVALUATION BOARD



(L x W x H) 2.4" x 1.2" x 0.5"

Board Number	MPS IC Number
EV4001-S-00A	MP4001DS

EVALUATION BOARD SCHEMATIC



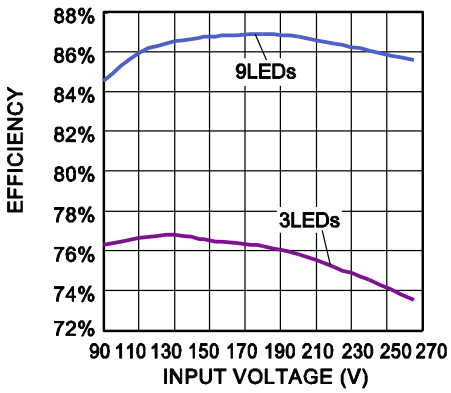
EV4001-S-00A BILL OF MATERIALS

Designator	Value	Description	Package	Manufacture	Manufacture_PN
C1	1μF/400V	Capacitor;400V	DIP	Rubycon	400LLE1MRFC6.3X
C2	100nF/630V	Ceramic Capacitor;630V;X7R	1812	Murata	GRM43DR72J104K
C3, C4	22μF/250V	Capacitor;250V;20%	DIP	Rubycon	250BXC22MEFC10
C5	10pF/630V	Capacitor;630V;X7R	0805	HQ	C0805C100KBRAC
C6	22μF/1210	Ceramic Capacitor;16V;X7R;1210;	1210	TDK	C3225X7R1C226M
CX1, CX2	68nF/275V	Capacitor;275V;10%	DIP	Carli	PX683K3IC39L270
D1	MURS160-E3/52T	Diode;600V;1A;	SMB	Vishay	MURS160-E3/52T
D2	MB4S	Diode;400V;0.5A;	SOIC	Taiwan Semi	MB4S
D3	1N4007	Diode;1000V;1A	DO-41	Diodes	1N4007
D4, D5, D6	ES1G	Diode;400V;1A;	SMA	PREMIER	ES1G
F1	SS-5-1A	Fuse;250V;1A	DIP	COOPER BUSSMANN	SS-5-1A
L1	680μH/1.1A	Inductor;680uH;825m;1.1A	SMD	Wurth	7447709681
LX1, LX2	4.7mH/0.25A	Inductor;4.7mH;9.5;250mA	DIP	Wurth	744772472
M1	STD3NK60ZT4	Mosfet;600V;3.6/10V;11.8;2.4A	TO-252	ST	STD3NK60ZT4
R1	500m/1%	Film Resistor;1%	1206	Yageo	RL1206FR-070R5L
R2	2.49/1%	Film Resistor;1%	0805	Yageo	RC0805FR-072R49
R3	300K	Film Resistor;1%;	0603	Yageo	RC0603FR-07300K
R4, R5	2K	Resistor;1%	1206	Royalohm	1206F2001T5E
R6	2	Film Resistor;1%;	1210	Yageo	RC1210FR-072RL
RV1	TVR10431KSY	Variable Resistor	DIP	TKS	TVR10431KSY
U1	MP4001	WLED Driver	SO-8	MPS	MP4001DS

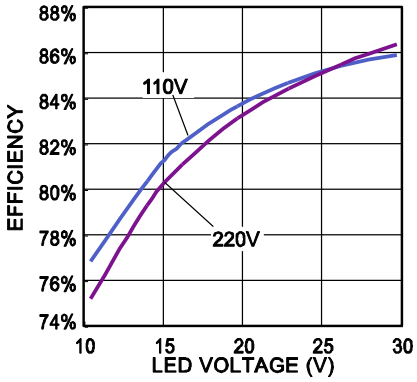
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN} = 90V_{AC} to 265V_{AC}, V_{OUT} = 10V to 30V, L = 680µH, T_A = 25ºC, unless otherwise noted.

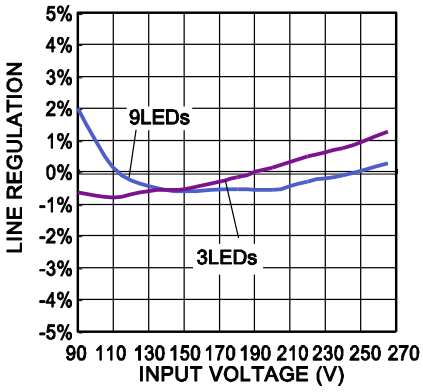
Efficiency Vs. Input Voltage



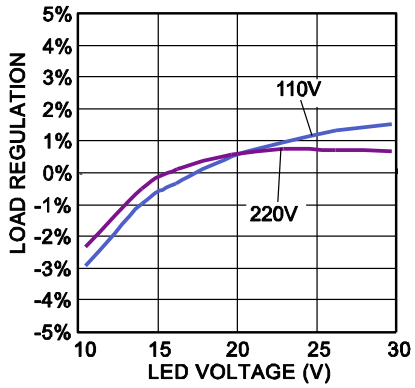
Efficiency Vs. LED Voltage



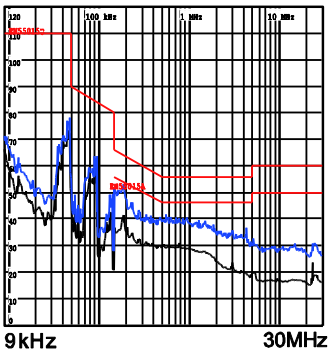
Line Regulation



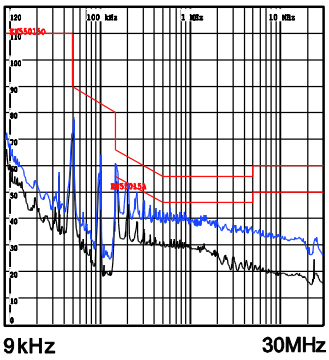
Load Regulation



EMI VIN=120VAC, VLED=30V



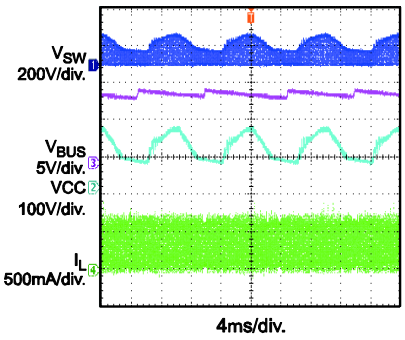
EMI VIN=230VAC, VLED=30V



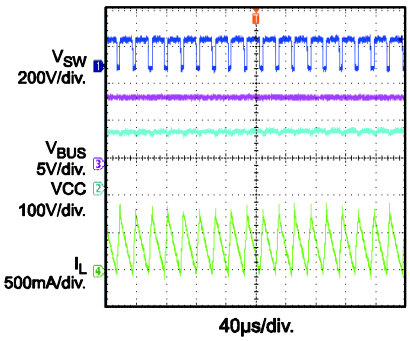
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 90V_{AC} to 265V_{AC}, V_{OUT} = 10V to 30V, L = 680µH, T_A = 25ºC, unless otherwise noted.

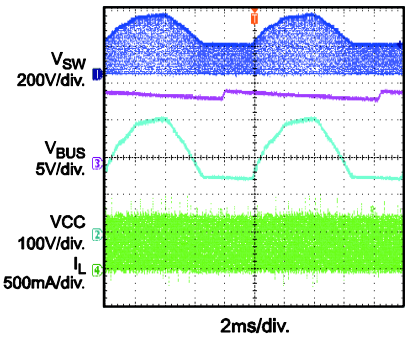
Steady State@110VAC



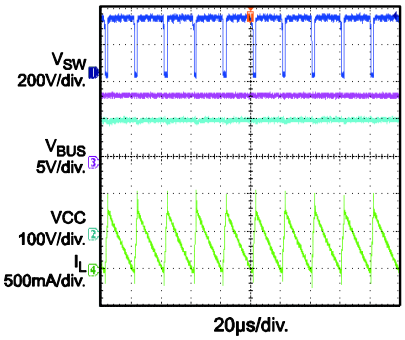
Steady State@110VAC



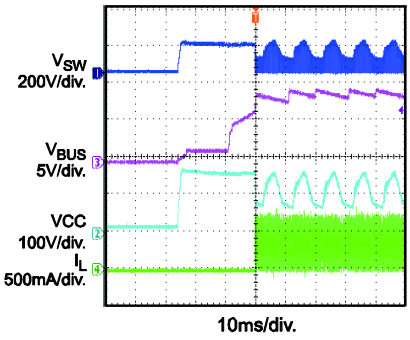
Steady State@220VAC



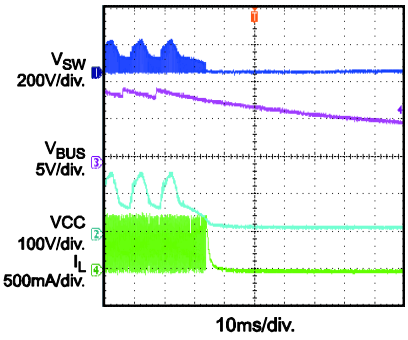
Steady State@220VAC



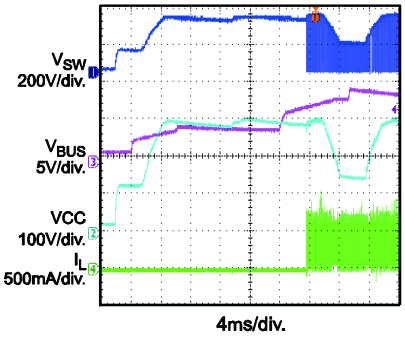
Power Up@110VAC



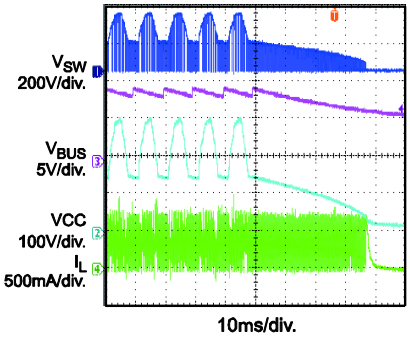
Power Down@110VAC



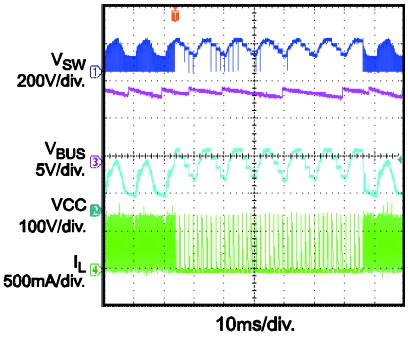
Power Up@220VAC



Power Down@220VAC



Short Load and Recover @110VAC



PRINTED CIRCUIT BOARD LAYOUT

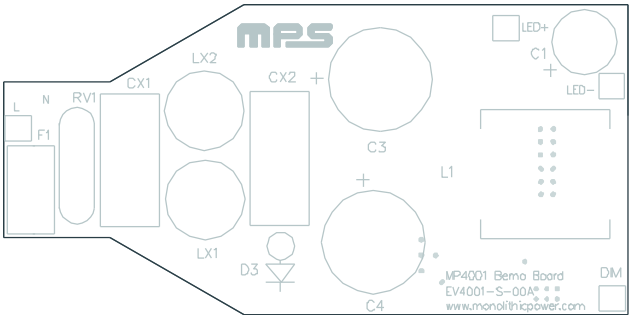


Figure 1—Top Silk Layer

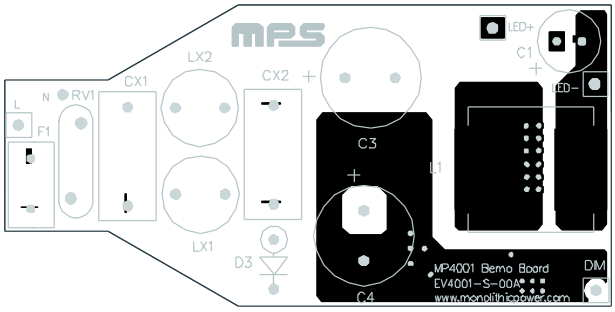


Figure 2—Top Layer

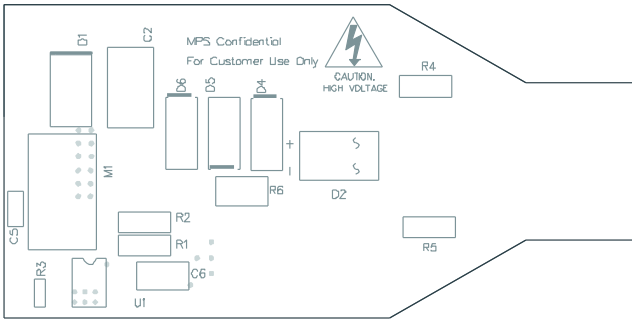


Figure 3—Bottom Silk Layer

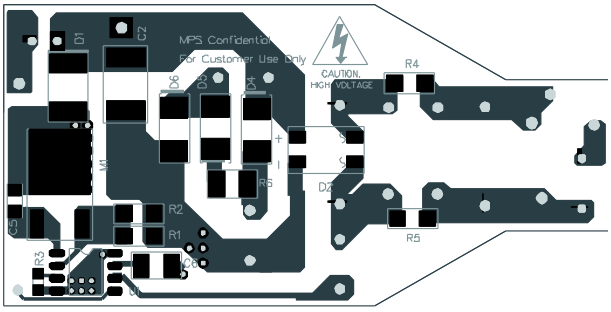


Figure 4—Bottom Layer

QUICK START GUIDE

1. Connect the LED string between “LED_P” (anode of LED string) and “LED_N“ (cathode of LED string).
2. Connect the AC input voltage between “N” and “L” the AC input terminals as shown on the board.
3. Turn Power Supply off.
4. Preset AC Power Supply to 90V ≤ AC input ≤ 265V.
5. Turn Power Supply on after making connections.

PWM Dimming

The EV4001-S-00A can use PWM dimmed by applying a square TTL-compatible signal between DIM and GND terminals. Since there is no galvanic isolation on the board, care must be taken to prevent damage to the PWM dimming source.

Suggested use of an opto-isolation to drive the DIM pin. Reference figure shown below.