



EV172A-S-00A

Universal Input, Non-Isolated Offline Regulator with Improved EMI Performance Evaluation Board

DESCRIPTION

The EV172A-S-00A evaluation board is designed to demonstrate the capabilities of the MP172A. The MP172A is a primary-side constant voltage regulator that provides accurate constant voltage (CV) regulation without an optocoupler. It supports buck, buck-boost, boost, and flyback topologies.

The EV172A-S-00A evaluation board is designed for buck applications. It typically drives a 5V/120mA load from an 85VAC to 265VAC input.

The EV172A-S-00A has excellent efficiency and meets IEC 61000-4-5 Class 3 (2kV) surge immunity and EN 55022 conducted EMI requirements. The MP172A offers improved radiation emission performance when compared to the MP172. The MP172A features various protections such as thermal shutdown (TSD), VCC under-voltage lockout (UVLO), overload protection (OLP), short-circuit protection (SCP), and open loop detection.

The MP172A is available in TSOT23-5 and SOIC-8 packages.

ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|----------------|-----------|-----------|-------|
| Input voltage | V_{IN} | 85 to 265 | VAC |
| Output voltage | V_{OUT} | 5 | V |
| Output current | I_{OUT} | 120 | mA |

FEATURES

- Primary-Side, Non-Isolated CV Control
- Integrated 700V MOSFET
- <100mW No-Load Power Consumption
- Good EMI Performance
- Limited Maximum Frequency
- Multiple Protections: SCP, OLP, Open Loop Detection, TSD, and VCC UVLO
- Low Cost and Simple External Circuit

APPLICATIONS

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

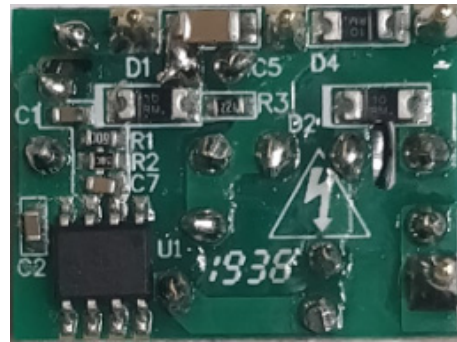
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High Voltage

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.

EV172A-S-00A EVALUATION BOARD



(LxWxH) 17mmx23mmx17mm

| Board Number | MPS IC Number |
|--------------|---------------|
| EV172A-S-00A | MP172AGS |

QUICK START GUIDE

1. Preset the power supply (V_{IN}) between 85VAC and 265VAC.
2. Turn the power supply off.
3. Connect the line and neutral terminals of the power supply to the L and N ports, respectively.
4. Connect the load's positive and negative terminals to the positive and negative outputs, respectively.
5. Turn on the power supply after making the connections.

EVALUATION BOARD SCHEMATIC

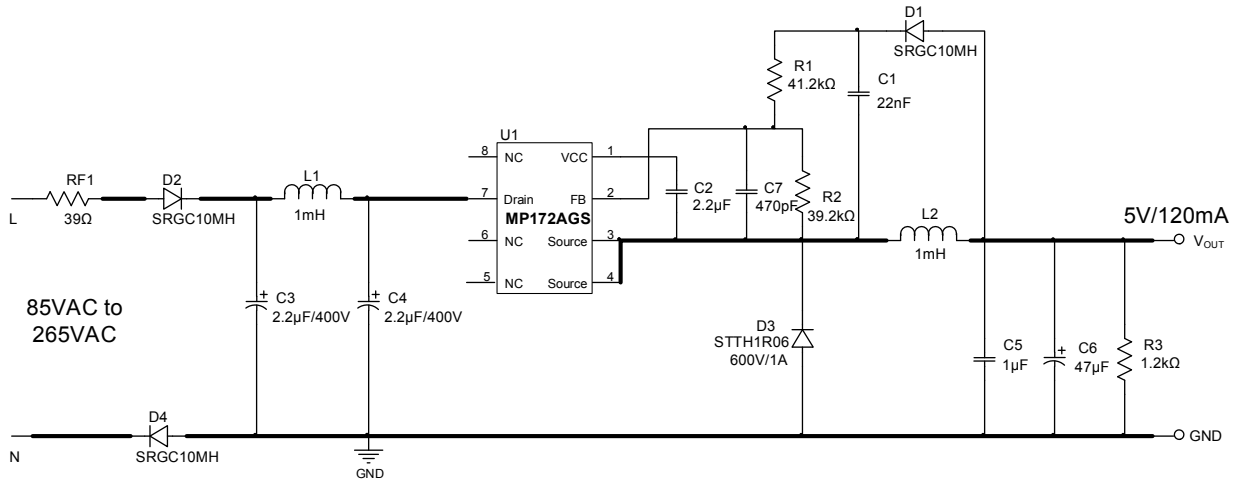


Figure 1: Evaluation Board Schematic

CIRCUIT DESCRIPTION

The EV172A-S-00A is configured in a buck topology to demonstrate the performance of the MP172A. The MP172A is a primary-side regulator that provides accurate constant voltage. It simplifies the schematic and minimizes BOM cost.

RF1 protects the circuit from component failure and excessive short events. It also restrains the inrush current.

C3, L1, and C4 are part of the CLC filter, which meets EN 55022 conducted EMI standards. C3 and C4 provide energy storage and protect against line surges.

With RF1, C3, and C4, the EV172A-J-00A meets standard IEC 61000-4-5 Class 3 (2kV) surge immunity.

C1 is the sample-hold capacitor that reflects output voltage. R1 and R2 are resistor dividers that detect the output voltage by sampling the voltage on C1.

D3 is the freewheeling diode. For universal voltage applications, use a diode with a 600V reverse block voltage. It is recommended to use fast-recovery diodes or ultrafast diodes for improved efficiency and reliable operation.

C6 is the output capacitor for a 5V output. R3 is a dummy load that lowers the output voltage under a no-load condition.

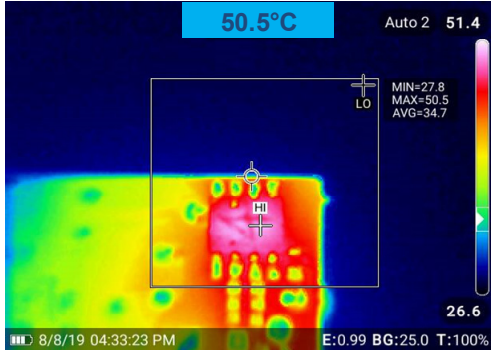
BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacture | Manufacturer PN |
|-----|------------|----------|------------------------------|---------|-------------|--------------------|
| 1 | C1 | 22nF | Ceramic capacitor, 16V, X7R | 0603 | muRata | GRM188R71C223KA01D |
| 1 | C2 | 2.2μF | Ceramic capacitor, 10V, X7R | 0603 | muRata | GRM188R71A225KE15D |
| 2 | C3, C4 | 2.2μF | Electrolytic capacitor, 400V | DIP | Rubycon | 400LLE2R2MEFC |
| 1 | C5 | 1μF | Ceramic capacitor, 25V, X7R | 1206 | muRata | GRM31MR71E105KA01 |
| 1 | C6 | 47μF | Electrolytic capacitor, 25V | DIP | Jianghai | CD28L-25V47 |
| 1 | C7 | 470pF | Ceramic capacitor, 50V, X7R | 0603 | muRata | GRM188R71H471KA01D |
| 3 | D1, D2, D4 | SRGC10MH | Diode, 1000V, 1A | 1206 | Maxmega | SRGC10MH |
| 1 | D3 | STTH1R06 | Diode, 600V, 1A | DO-41 | ST | STTH1R06 |
| 1 | L1 | 1mH | Inductor, 17.4Ω, 100mA | DIP | Any | CKL0410-102 |
| 1 | L2 | 1mH | Inductor, 6Ω, 250mA | DIP | Würth | 7447462102 |
| 1 | R1 | 41.2kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0741K2L |
| 1 | R2 | 39.2kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0739K2L |
| 1 | R3 | 1.2kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-071K2L |
| 1 | RF1 | 39Ω | Fuse resistor, 5%, 1W | DIP | Yageo | FKN1WSJT-52-39R |
| 1 | U1 | MP172A | Buck regulator | SOIC-8 | MPS | MP172AGS |

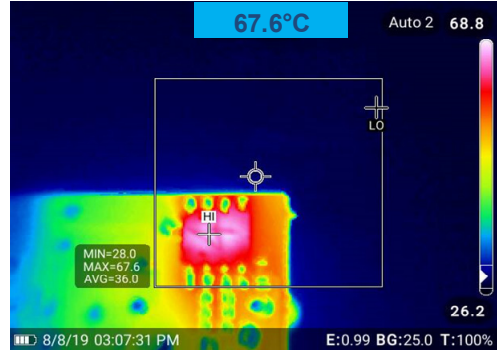
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. $V_{IN} = 230VAC$, $V_{OUT} = 5V$, $I_{OUT} = 120mA$, $T_A = 26^{\circ}C$, unless otherwise noted.

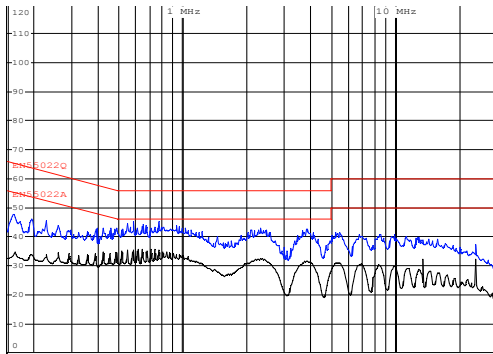
Thermal
 $V_{IN} = 85VAC$



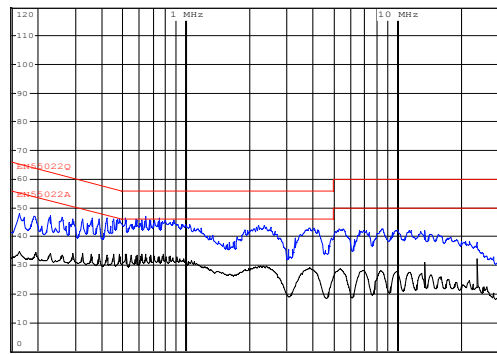
Thermal
 $V_{IN} = 265VAC$



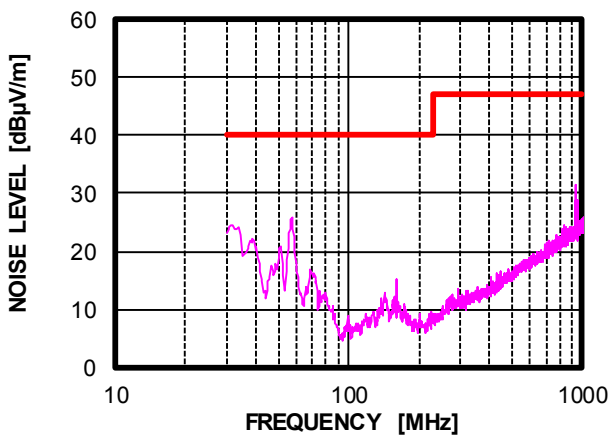
CE Performance
L-line



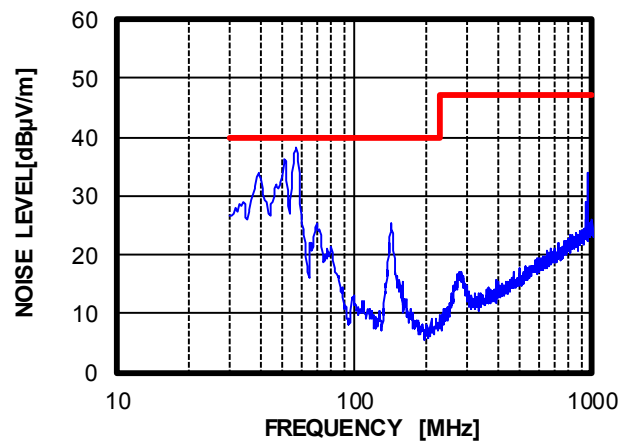
CE Performance
N-line



RE Performance
Horizontal (peak)



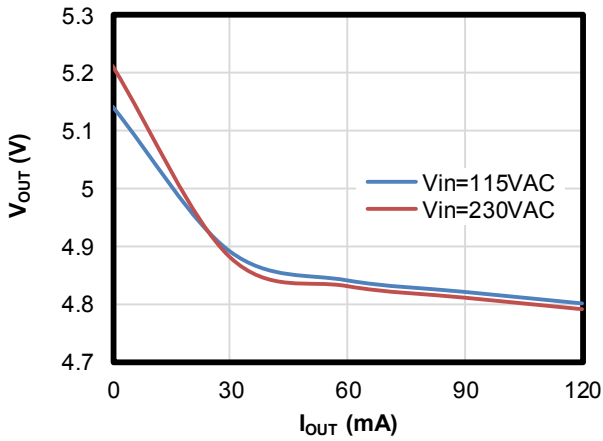
RE Performance
Vertical (peak)



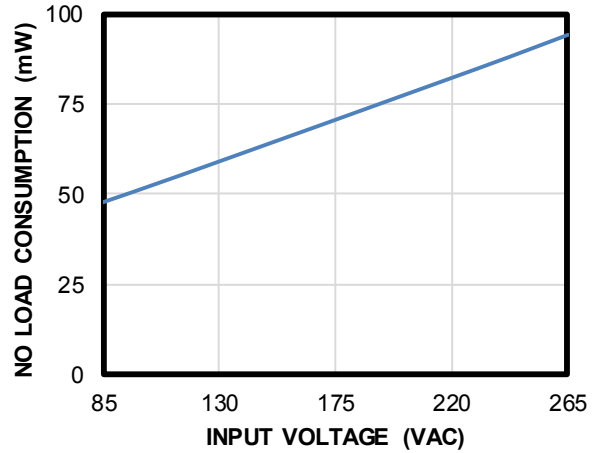
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. $V_{IN} = 230VAC$, $V_{OUT} = 5V$, $I_{OUT} = 120mA$, $T_A = 26^{\circ}C$, unless otherwise noted.

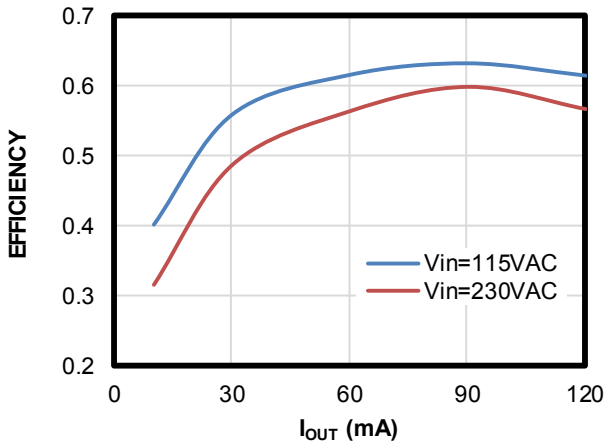
Load Regulation



No-Load Consumption



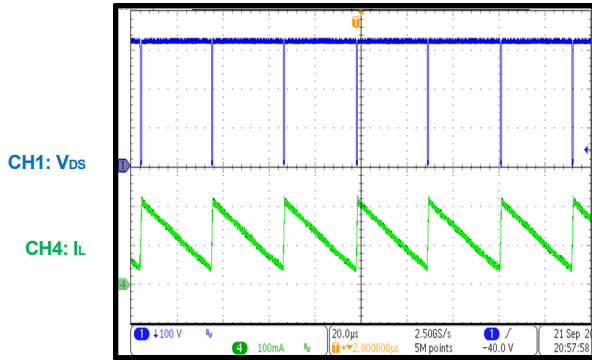
Efficiency



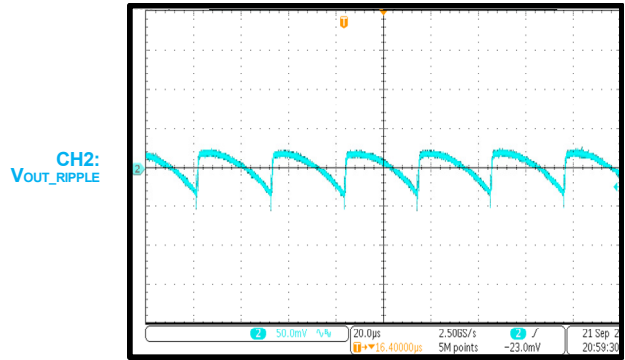
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. $V_{IN} = 230VAC$, $V_{OUT} = 5V$, $I_{OUT} = 120mA$, $T_A = 26^{\circ}C$, unless otherwise noted.

Steady State

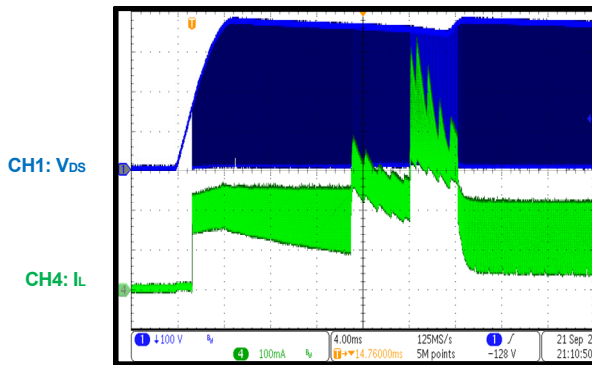


Output Ripple

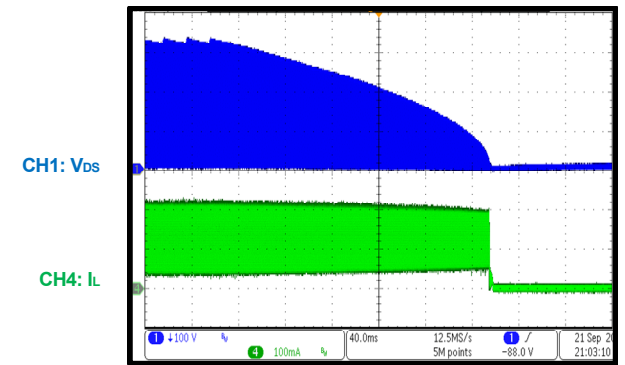


Start-Up

$V_{IN} = 265VAC$, $C_{OUT} = 470\mu F$

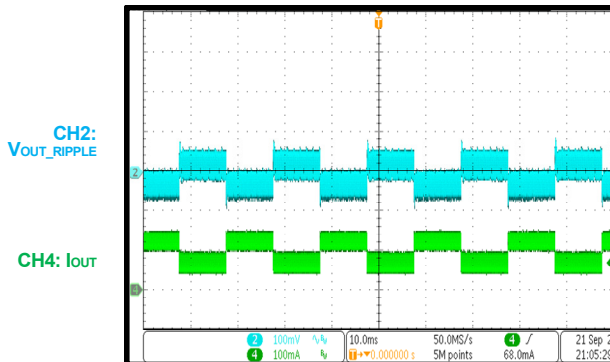


Shutdown

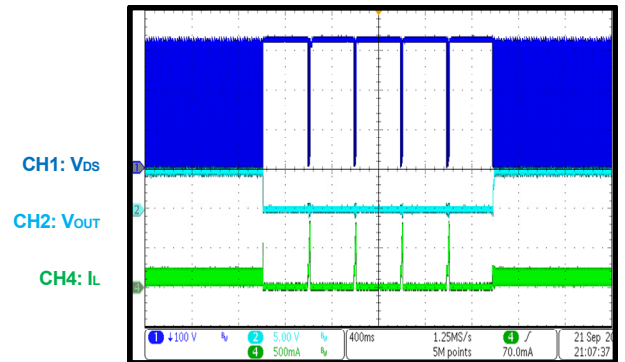


Load Transient

Half-load to full load



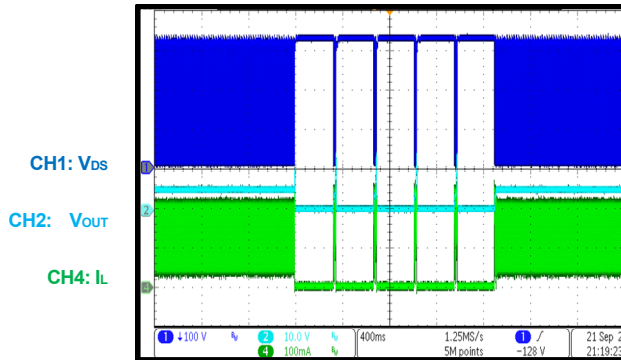
Short-Circuit Protection (SCP) Entry and Recovery



EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. $V_{IN} = 230VAC$, $V_{OUT} = 5V$, $I_{OUT} = 120mA$, $T_A = 26^{\circ}C$, unless otherwise noted.

Open Loop Entry and Recovery



Over-Temperature Protection (OTP) Entry and Recovery

