EVM3650-QW-00A

17V Input, 5A, Step-Down Converter Module Evaluation Board

DESCRIPTION

The EVM3650-QW-00A evaluation board is designed to demonstrate the capabilities of MPS's MPM3650, a fully integrated, high-frequency, synchronous, rectified, step-down power module with an internal inductor. The MPM3650 offers a very compact solution to achieve 5A of continuous output current over a wide input voltage range with excellent load and line regulation. The MPM3650 offers synchronous mode operation for higher efficiency over the output current load range.

Constant-on-time (COT) control operation provides very fast transient response and easy loop design, as well as very tight output regulation. Full protection features include SCP, OCP, UVP, and thermal shutdown.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	2.75 to 17	V
Output voltage	V_{OUT}	1	V
Output current	I_{OUT}	5	A

FEATURES

- Wide 2.75V to 17V Operating Input Range
- 5A Output Current
- High Efficiency with DCM at Light Load
- Output Adjustable from 0.6V
- High-Efficiency Synchronous Mode Operation
- Supports Pre-Biased Start-Up
- Fixed 1200kHz Switching Frequency
- Externally Programmable Soft-Start Time
- EN and Power Good for Power Sequencing
- Over-Current Protection and Hiccup Mode
- Thermal Shutdown
- Available in a QFN-24 (4mmx6mmx1.6mm) Package

APPLICATIONS

- FPGA Power Systems
- Optical Modules
- Telecom
- Networking
- Industries Equipment

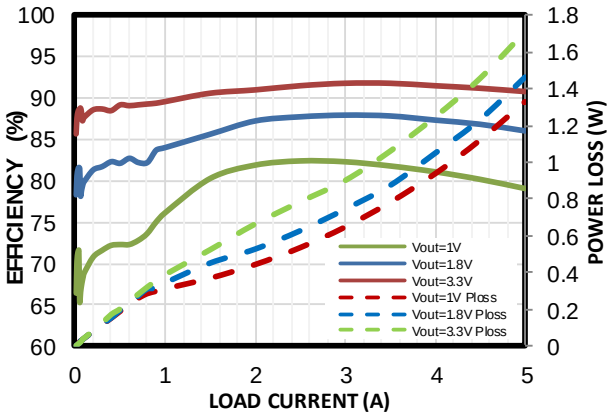
EVM3650-QW-00A EVALUATION BOARD

(LxWxH) 63.5mmx63.5mmx1.6mm

Board Number	MPS IC Number
EVM3650-QW-00A	MPM3650GQY

Efficiency VS. Load Current

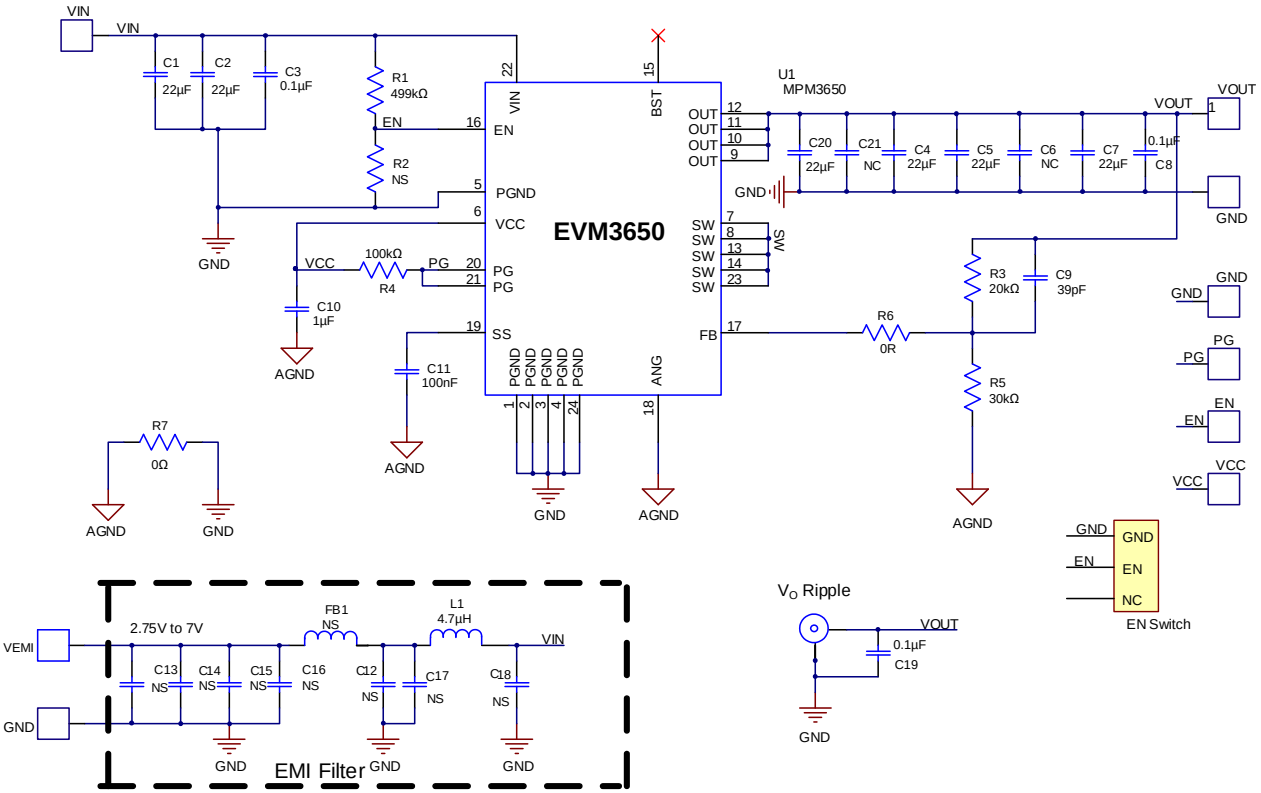
V_{IN} = 12V



QUICK START GUIDE

1. Preset the power supply to 2.75V ≤ V_{IN} ≤ 17V.
2. Turn the power supply off.
3. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (–): GND
4. Connect load (≤5A) to:
   a. Positive (+): VOUT
   b. Negative (–): GND
5. Turn the power supply on after connecting the terminals. The board should start up automatically.

EVALUATION BOARD SCHEMATIC



EVM3860-QW-00A BILL OF MATERIALS

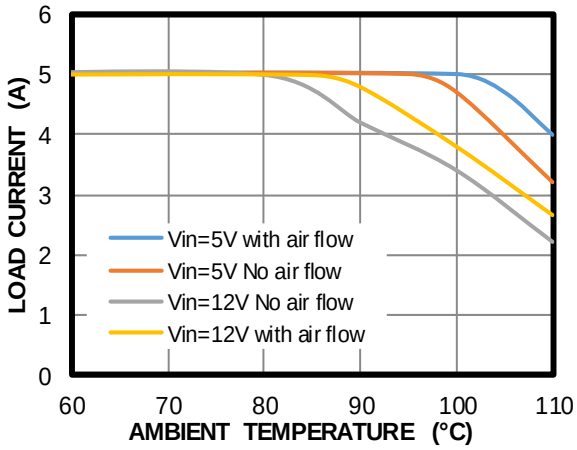
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
6	C1, C2, C4, C5, C20, C7	22µF	Ceramic capacitor, 25V, X5R	0805	Murata	GRM21BR61E226ME44L
4	C3, C8, C11, C19	0.1µF	Ceramic capacitor, 25V, X5R	0402	Wurth	885012105018
1	C10	1µF	Ceramic capacitor, 25V, X5R	0402	Murata	GRM155R61E105KA12D
1	C9	39pF	Ceramic capacitor, 50V, C0G	0402	Murata	GRM1555C1H390JA01D
1	R1	499kΩ	Film resistor, 1%, 0402, 499kΩ	0402	Yageo	RC0402FR-07499KL
1	R4	100kΩ	Film resistor, 1%, 0402, 100kΩ	0402	Yageo	RC0402FR-07100KL
2	R7, R6	0R	Film resistor, 1%, 0402, 0R	0402	Yageo	RC0402FR-070RL
1	R3	20kΩ	Film resistor, 1%, 0402, 20kΩ	0402	Yageo	RC0402FR-0720KL
1	R5	30kΩ	Film resistor, 1%, 0402, 30kΩ	0402	Yageo	RC0402FR-0730KL
1	EN	3 pins	3-pin, single-row, straight socket header	DIP	Wurth	61300311821
1	V_O Ripple	N/A	SMA mount straight jack, VOUT/AC test component	DIP	Wurth	60312002114503
5	VIN, VEMI, GND x 2, VOUT	φ2.0	φ2.0 copper pin	DIP	N/A	N/A
4	EN, GND, VCC, PG	φ1.0	φ1.0 copper pin	DIP	N/A	N/A
1	U1	N/A	Power module	QFN-24 (4mmx6mm)	MPS	MPM3650

EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board, V_{IN} = 5V, V_{OUT} = 1V, T_A = 25°C, unless otherwise noted.

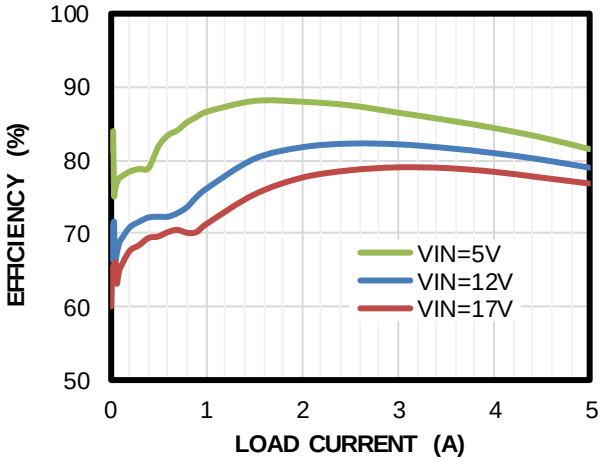
Thermal Derating

V_{OUT} = 1V



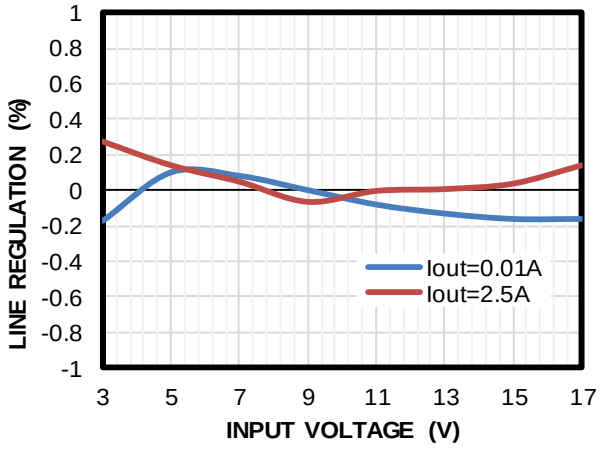
Efficiency vs. Load Current

V_{OUT} = 1V



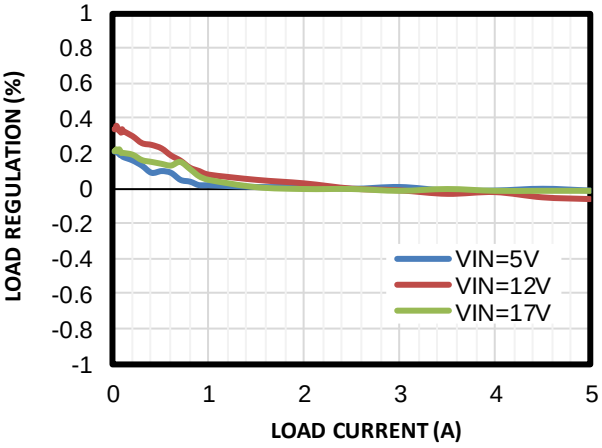
Line Regulation

V_{OUT} = 1V



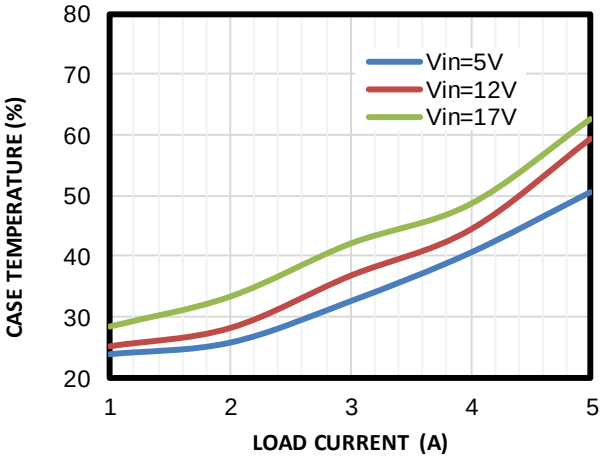
Load Regulation

V_{OUT} = 1V



Temperature vs. I_{OUT}

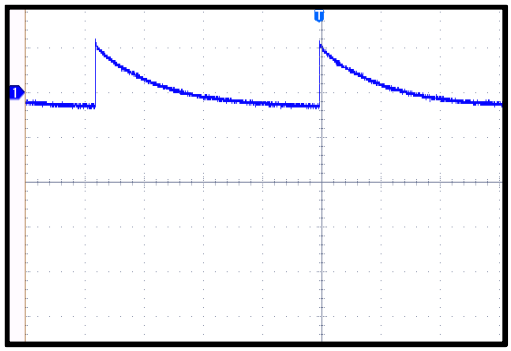
V_{OUT} = 1V, T_A = 15°C



EVB TEST RESULTS *(continued)*

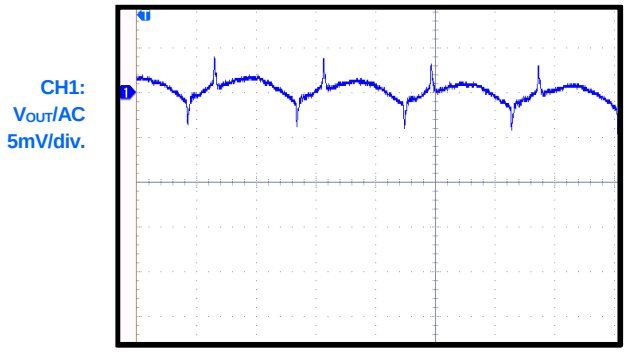
Performance curves and waveforms are tested on the evaluation board, V_{IN} = 5V, V_{OUT} = 1V, T_A = 25°C, unless otherwise noted.

V_{OUT} Ripple
I_{OUT} = 0A



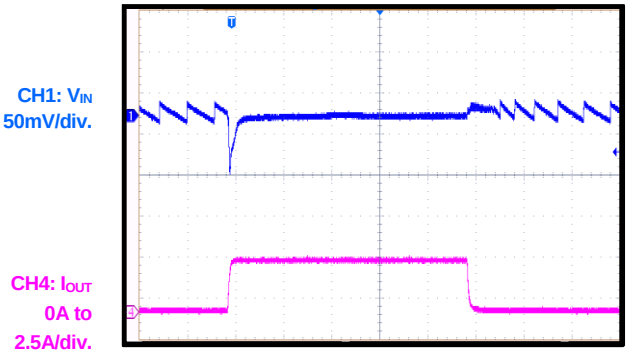
20ms/div.

V_{OUT} Ripple
I_{OUT} = 5A



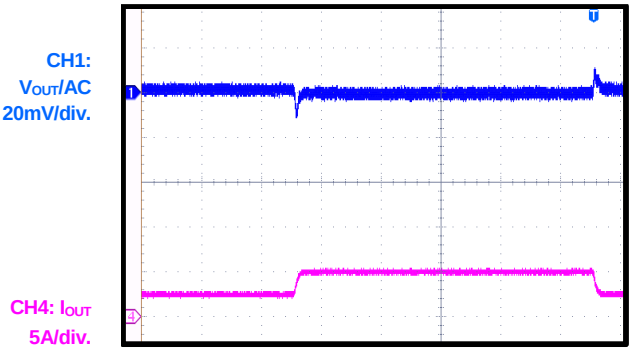
400ns/div.

Load Transient
I_{OUT} = 0A to 2.5A



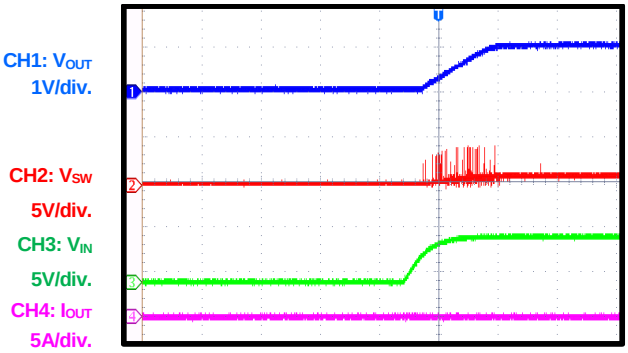
100µs/div.

Load Transient
I_{OUT} = 2.5A to 5A



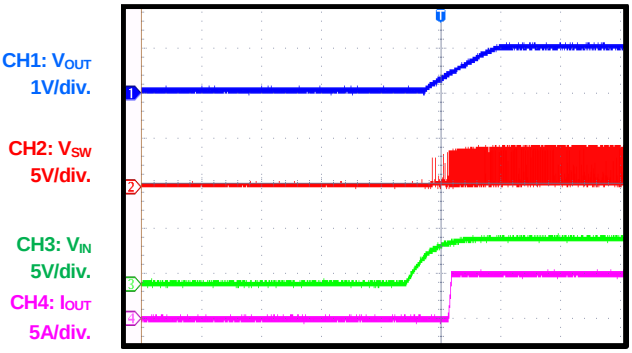
100µs/div.

VIN On
I_{OUT} = 0A



10ms/div.

VIN On
I_{OUT} = 5A

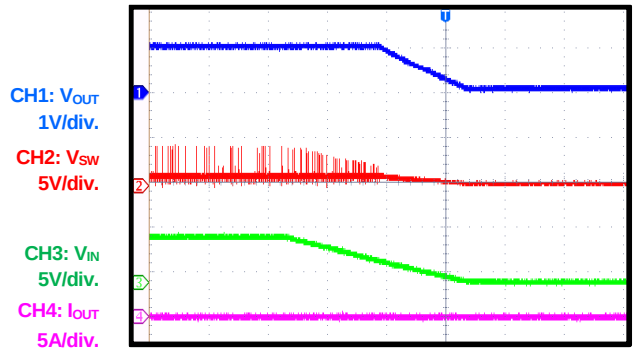


10ms/div.

EVB TEST RESULTS *(continued)*

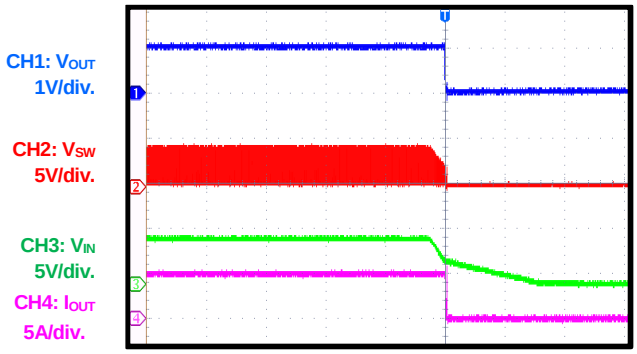
Performance curves and waveforms are tested on the evaluation board, V_{IN} = 5V, V_{OUT} = 1V, T_A = 25°C, unless otherwise noted.

VIN Off
I_{OUT} = 0A



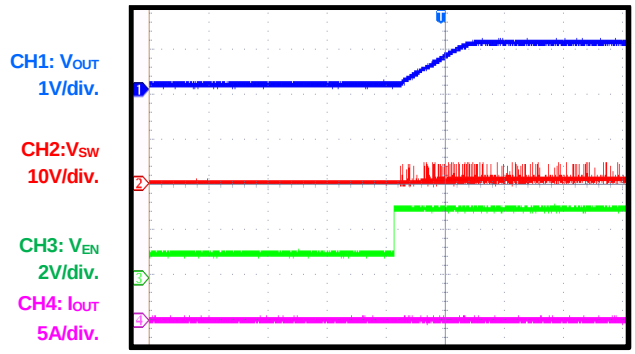
10ms/div.

VIN Off
I_{OUT} = 5A



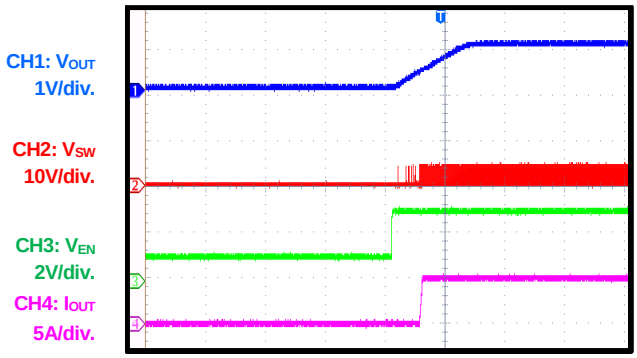
10ms/div.

EN On
I_{OUT} = 0A



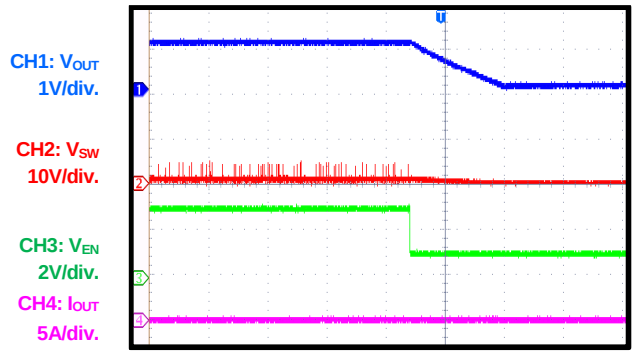
10ms/div.

EN On
I_{OUT} = 5A



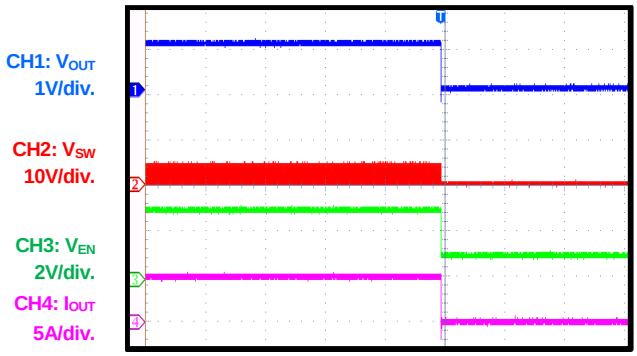
10ms/div.

EN Off
I_{OUT} = 0A



10ms/div.

EN Off
I_{OUT} = 5A

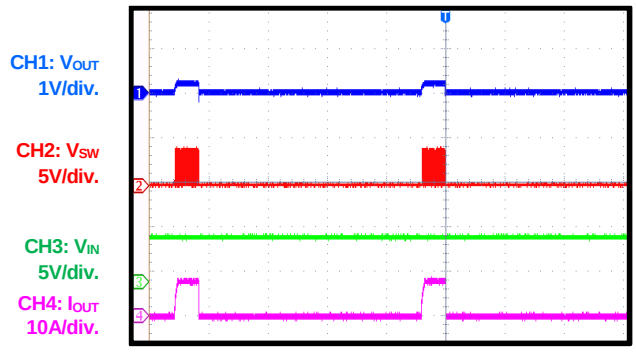


10ms/div.

EVB TEST RESULTS *(continued)*

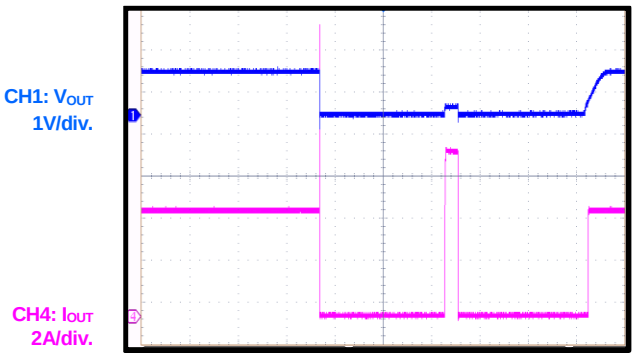
Performance curves and waveforms are tested on the evaluation board, V_{IN} = 5V, V_{OUT} = 1V, T_A = 25°C, unless otherwise noted.

SCP Steady State



20ms/div.

SCP Entry and Recovery



200ms/div.

PCB LAYOUT

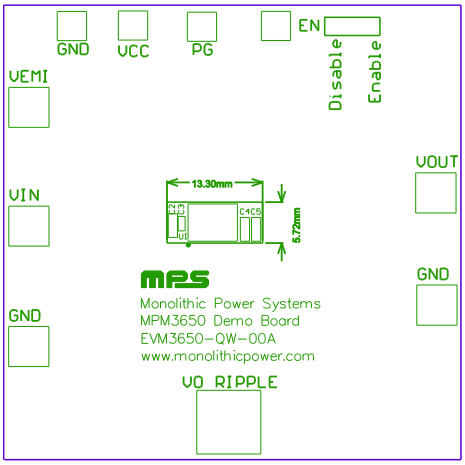


Figure 1: Top Silk Layer

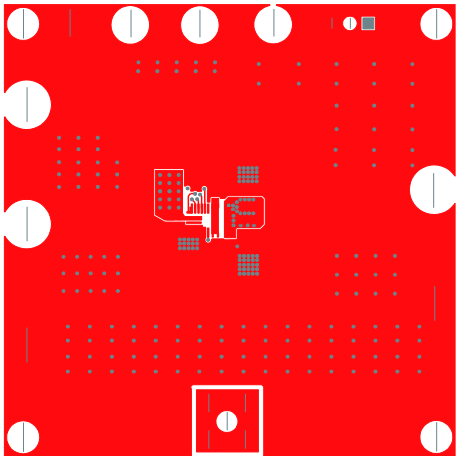


Figure 2: Top Layer

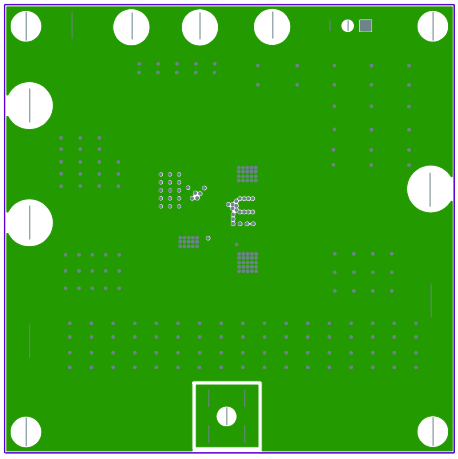


Figure 3: Mid-Layer 1

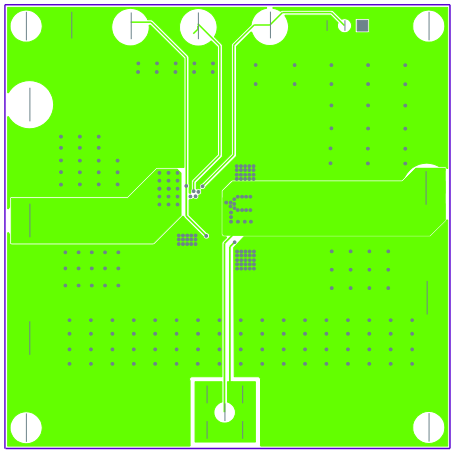


Figure 4: Mid-Layer 2

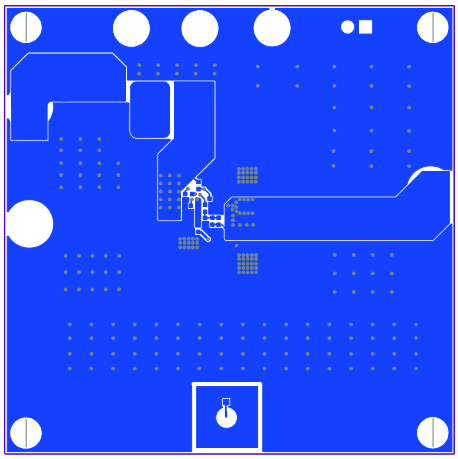


Figure 5: Bottom Layer

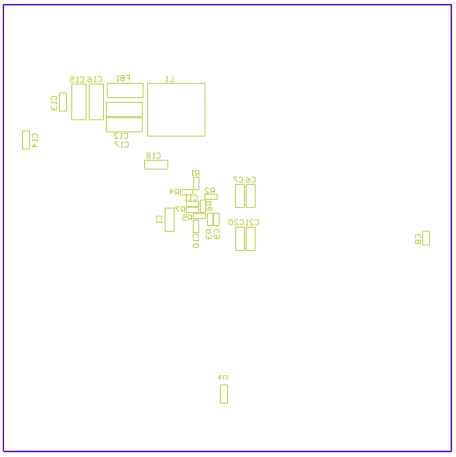


Figure 6: Bottom Silk Layer

Revision History

Revision #	Revision Date	Description	Pages Updated
1.0	7/8/2020	Initial Release	-