EV5069-QV-00A

28V, Hot-Swap Protection Device with Current Monitoring Evaluation Board

DESCRIPTION

The EV5069-QV-00A is an evaluation board for MP/MPQ5069GQV.

MP/MPQ5069GQV is a hot-swap protection device designed to protect circuitry on its output from transients on its input. It also protects its input from undesired shorts and transients coming from its output.

An internal charge pump drives the gate of the power device, allowing for a power FET with a very low ON resistance of 7mΩ.

The MP/MPQ5069's fault protections include current-limit protection, thermal shutdown, and damaged-MOSFET detection. Both the current limit and thermal shutdown have user-settable auto-retry and latch-off mode. The device also features under-voltage protection.

The EV5069-QV-00A is a fully assembled and tested evaluation board.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	4.5 – 28	V
Output Voltage	V_{OUT}	4.5 – 28	V
Output Current	I_{OUT}	10	A

FEATURES

- Integrated 7mΩ Power FET
- Adjustable Current Limit (5A to 15A)
- Output Current Measurement
- ±5% Current Monitor Accuracy
- Fast Response (<200ns) for Short Protection
- PG Detector and FLTB Indication
- PG Assert Low at VIN=0
- Damaged MOSFET Detection
- External Soft-Start
- Under-Voltage Lockout
- Thermal Protection
- Available in a QFN-22 (3mmx5mm) Package

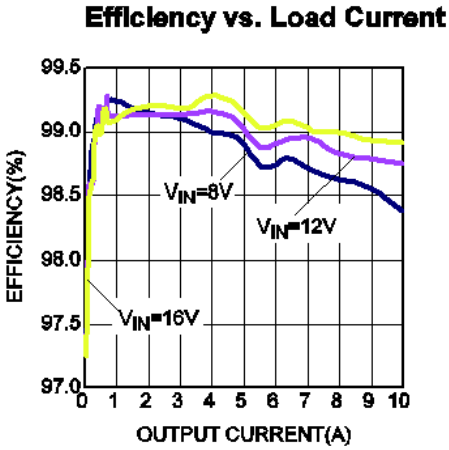
APPLICATIONS

- Hot Swappable:
  - o PC Cards
  - o Disk Drives
  - o Laptops

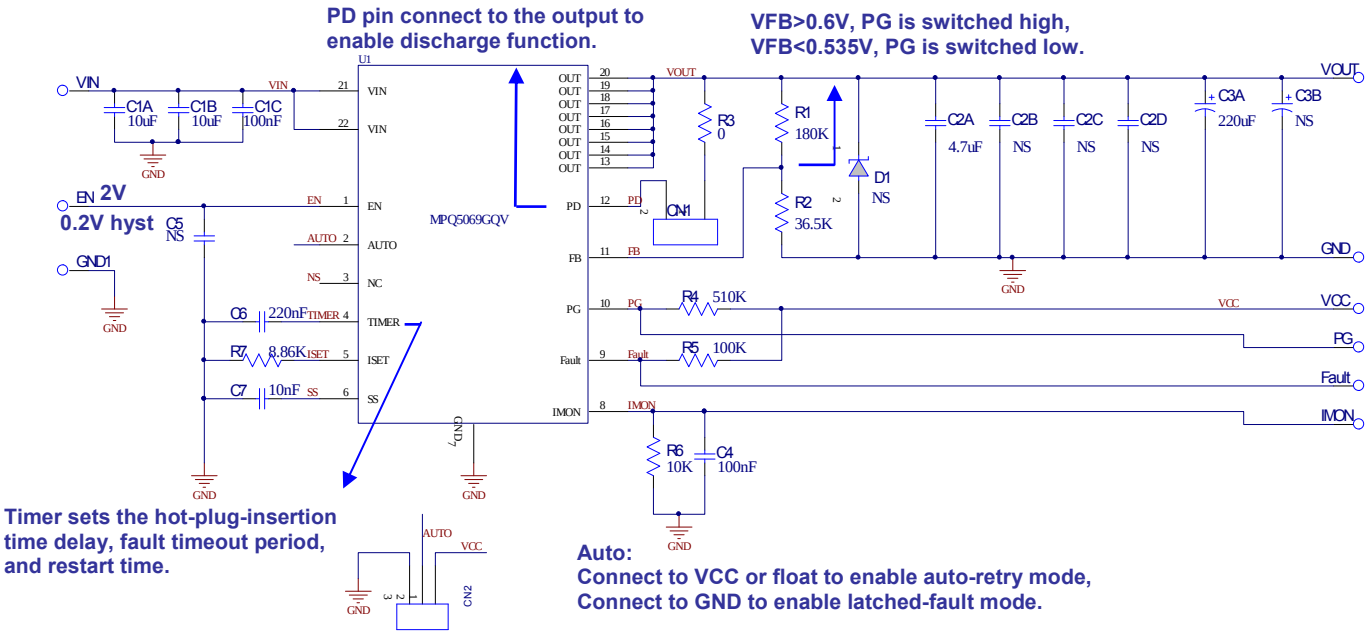
EVALUATION BOARD

(L x W x H) (8.55cm x 8.55cm x 1.6cm)

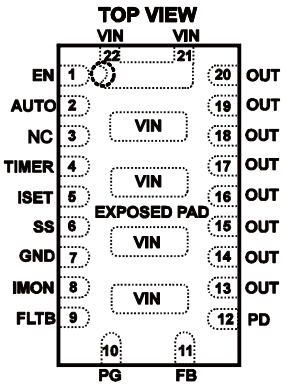
Board Number	MPS IC Number
EV5069-QV-00A	MP/MPQ5069GQV



EVALUATION BOARD SCHEMATIC



Package reference



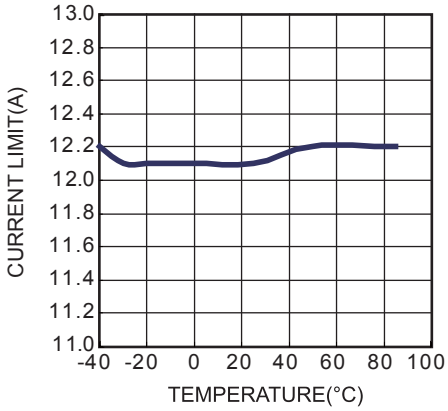
EV5069-QV-00A BILL OF MATERIALS

Qty	RefDes	Value	Description	Package	Manufacturer	Manufacturer P/N
2	C1A,C1B	10μF	Ceramic Cap.,50V, 10%, X7R	1210	muRata	GRM32ER71H106KA12L
1	C1C	100nF	Ceramic Cap.,100V, 10%, X7R	0805	muRata	GRM21BR72A104KAC4L
1	C3A	220μF	Electrolytic Cap., 35V	DIP	江海	CD110-35V220
1	C2A	4.7μF	Ceramic Cap.,50V, 10%, X7R	1206	muRata	GRM31CR71H475KA12L
0	C2B,C2C, C2D	NS				
1	C4	100nF	Ceramic Cap., 25V, 10%,X7R	0603	muRata	GRM188R71C104KA01D
1	C5	NS	Not Stuffed			
1	C6	220nF	Ceramic Cap.,16V, 10%, X7R	0603	muRata	GRM188R71C224KA01D
1	C7	10nF	Ceramic Cap., 50V, 10%, X7R	0603	muRata	GRM188R71H103KA01D
1	R1	180k	Film Res., 1%	0603	Yageo	RC0603FR-07180KL
1	R2	36.5k	Film Res., 1%	0603	Yageo	RC0603FR-0736K5L
1	R3	0	Film Res., 5%	0603	Yageo	RC0603JR-070R0L
1	R4	510k	Film Res., 1%	0603	Yageo	RC0603FR-07510KL
1	R5	100k	Film Res., 1%	0603	Yageo	RC0603FR-07100KL
1	R6	10k	Film Res., 1%	0603	Yageo	RC0603FR-0710KL
1	R7	8.86k	Film Res., 1%	0603	Yageo	RC0603FR-078K86L
0	D1	NS				
1	CN1	2pin	Connector			
1	CN2	3pin	Connector			
1	CN4	NS	Not Stuffed			
1	U1	IC	Hot Swap Protection device	QFN22 (3*5mm)	MPS	MPQ5069GQV

TYPICAL CHARACTERISTICS

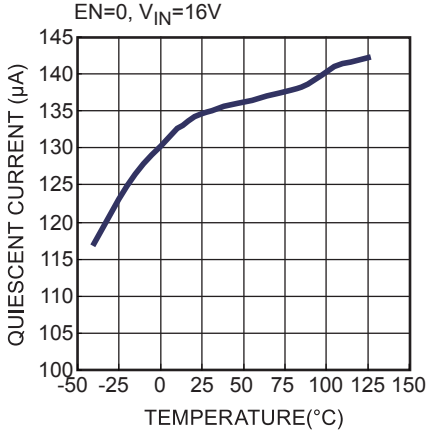
V_{IN}=12V, C_{OUT}=220µF, C_T=220nF, C_{SS}=10nF, R_{SET}=10kΩ, T_A=+25°C, unless otherwise noted.

Current Limit vs. Temperature



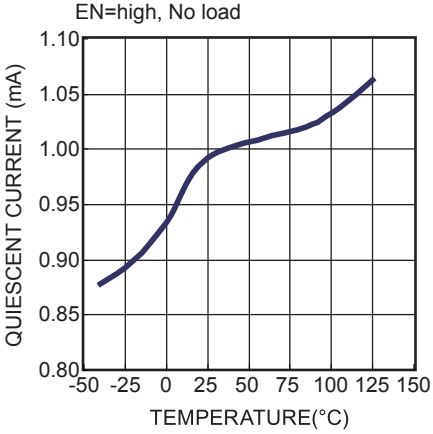
Quiescent Current vs. Temperature

EN=0, V_{IN}=16V

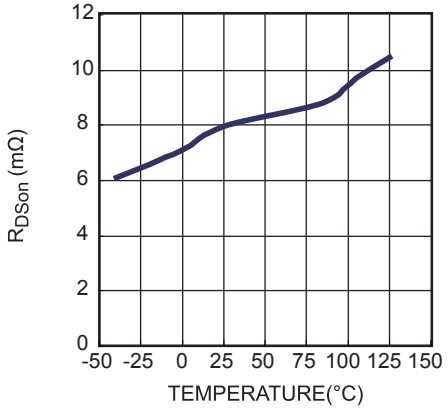


Quiescent Current vs. Temperature

EN=high, No load

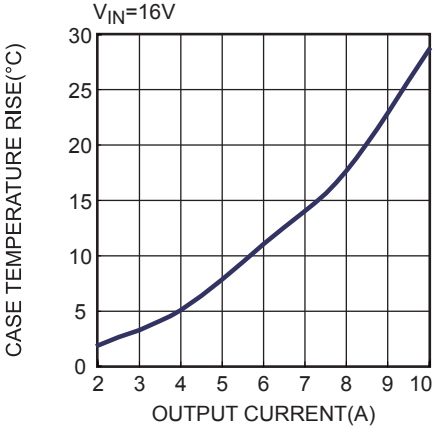


R_{DSon} vs.Temperature



Case Temperature Rise vs. Output Current

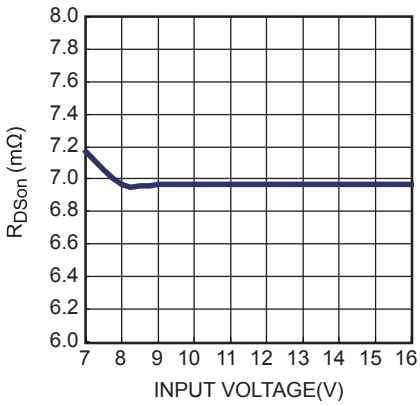
V_{IN}=16V



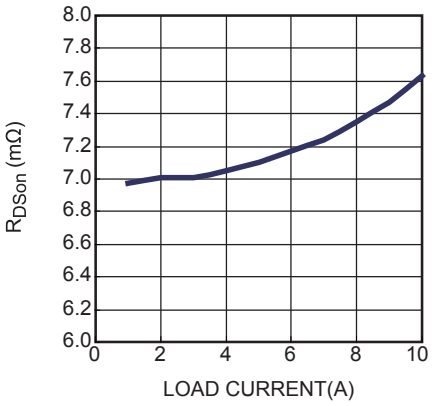
TYPICAL PERFORMANCE CHARACTERISTICS

Performance waveforms are tested on the evaluation board of the Design Example section. V_{IN}=12V, C_{OUT}=220µF, C_T=220nF, C_{SS}=47nF, R_{SET}=10kΩ, T_A=+25°C, unless otherwise noted.

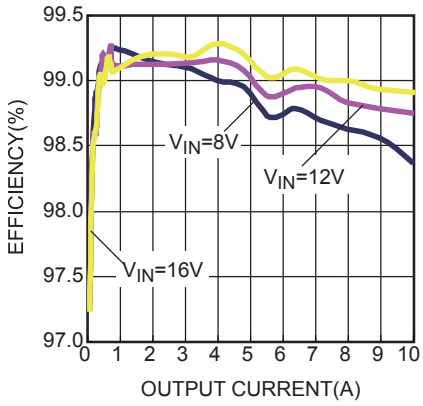
R_{DSon} vs. Input Voltage



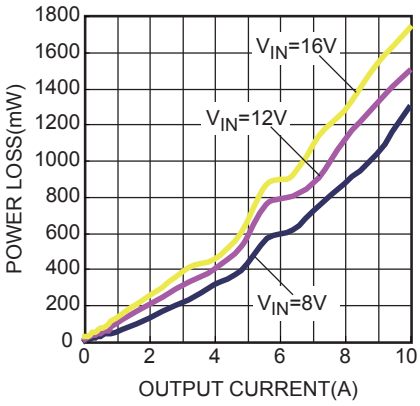
R_{DSon} vs. Load Current



Efficiency vs. Load Current



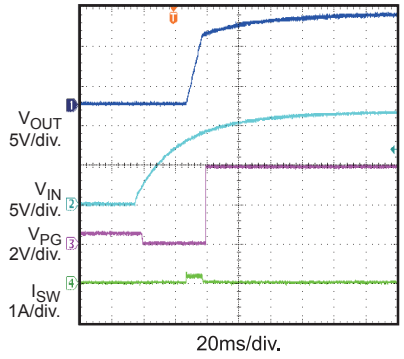
Power Loss vs. Load Current



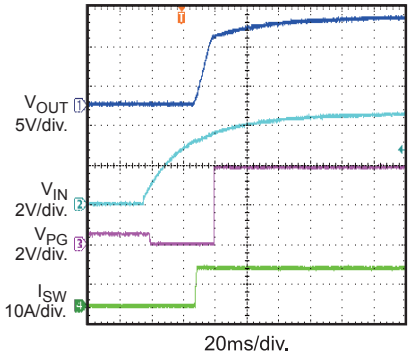
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board of the Design Example section.
V_{IN}=12V, C_{OUT}=220µF, C_T=220nF, C_{SS}=10nF, R_{SET}=10kΩ, T_A=+25°C, unless otherwise noted.

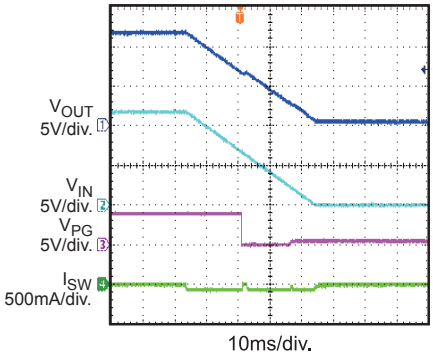
Start Up through VIN
I_{OUT}=0A



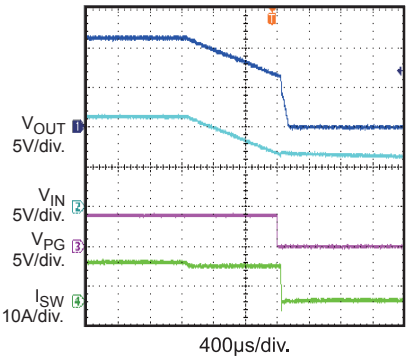
Start Up through VIN
I_{OUT}=10A



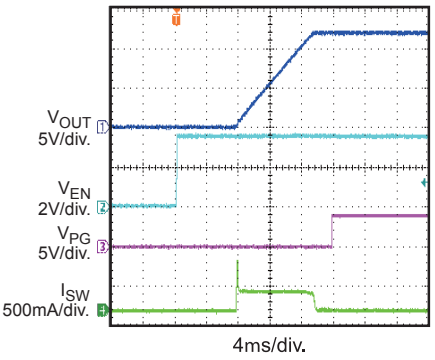
Shut Down through VIN
I_{OUT}=0A



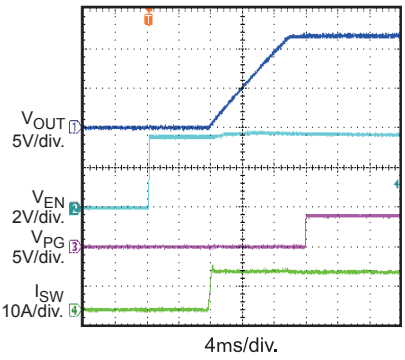
Shut Down through VIN
I_{OUT}=10A



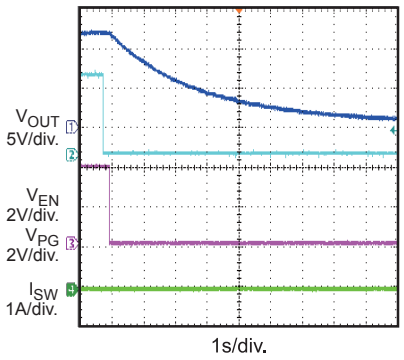
Start Up through EN
I_{OUT}=0A



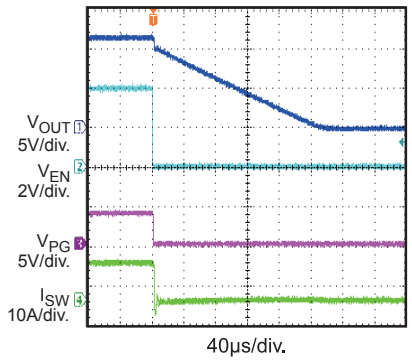
Start Up through EN
I_{OUT}=10A



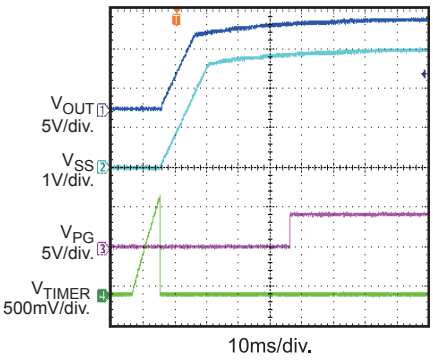
Shut Down through EN
I_{OUT}=0A



Shut Down through EN
I_{OUT}=10A



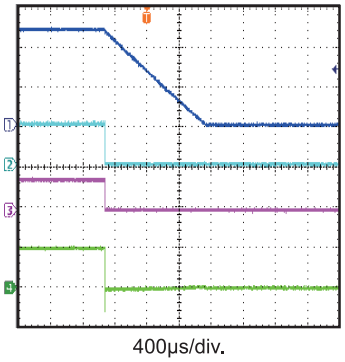
Start-Up Sequence



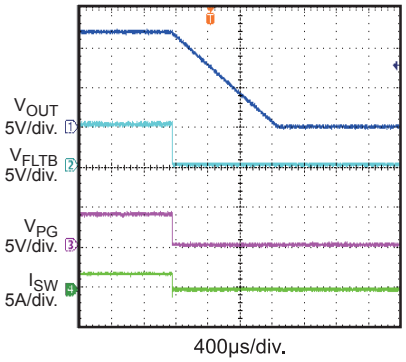
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board of the Design Example section.
V_{IN}=12V, C_{OUT}=220µF, C_T=220nF, C_{SS}=10nF, R_{SET}=10kΩ, T_A=+25°C, unless otherwise noted.

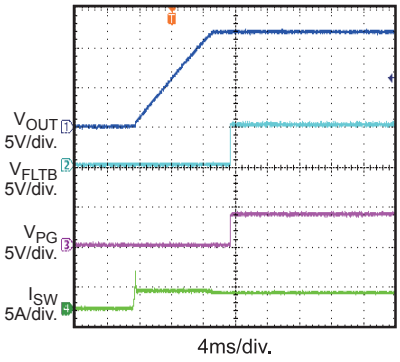
Thermal Shutdown
I_{OUT}=2A, Latch mode



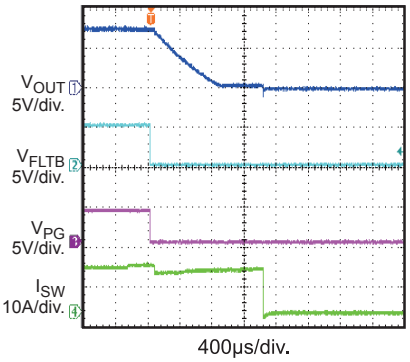
Thermal Shutdown
I_{OUT}=2A, Retry mode



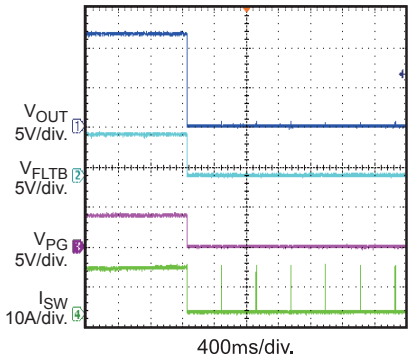
Thermal Recovery
I_{OUT}=2A, Retry mode



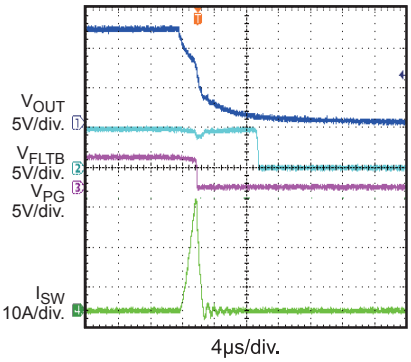
OCP
V_{IN}=12V, Latch mode



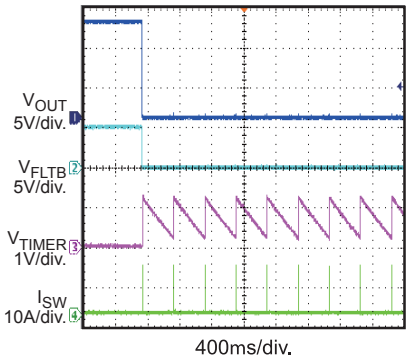
OCP
V_{IN}=12V, Retry mode



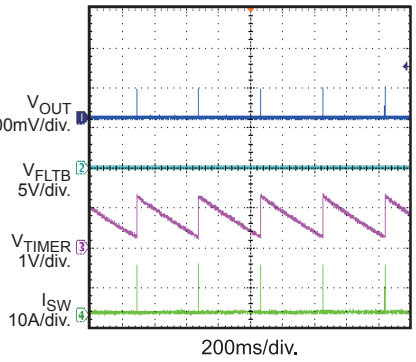
SCP Entry
V_{IN}=12V, Latch mode



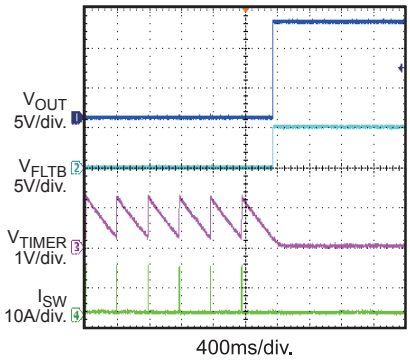
SCP Entry
V_{IN}=12V, Retry mode



SCP Steady State
V_{IN}=12V, Retry mode



SCP Recovery
V_{IN}=12V, Retry mode



PRINTED CIRCUIT BOARD LAYOUT

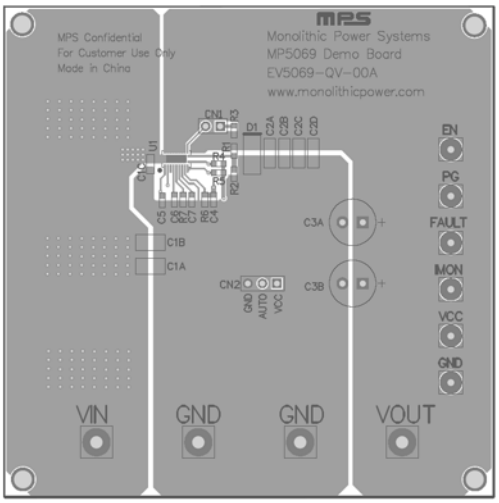


Figure 1—Top Layer

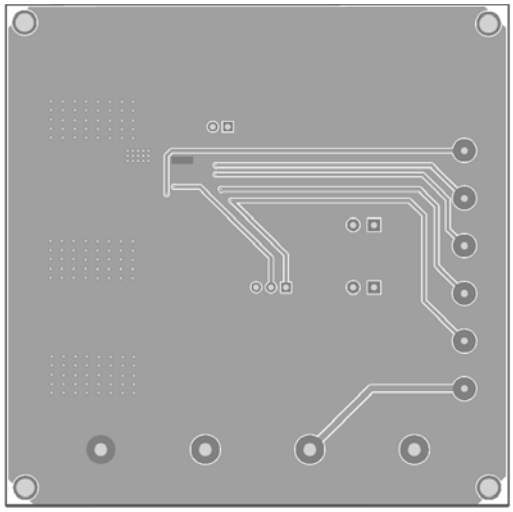


Figure 2—Bottom Layer

QUICK START GUIDE

1. Attach the positive and negative ends of the load to the VOUT and GND pins, respectively. Set the load current between 0A to 10A.
2. Preset the power supply output between 4.5V to 28V, and then turn off the power supply.
3. Connect the positive and negative terminals of the power supply output to Vin and GND pins, respectively.
4. Give a digital input to the EN pin. Drive EN higher than 2V to turn on the regulator, drive EN less than 1.8V to turn it off.
5. Turn the power supply on, the board will automatically startup.
4. Applying the AUTO pin to VCC or float can select auto-retry mode and applying the AUTO pin to GND can select latched-fault mode.