EV5021GQV-00A

12V, 7mΩ (Rds_on) Hot Swap Protection
DEVICE WITH CURRENT MONITORING

The Future of Analog IC Technology

DESCRIPTION

The MP5021 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 MP5021 includes an optional discharge function that provides a discharge path for the external output capacitor when the part is disabled. Fault protection includes current limit, thermal shutdown and damaged MOSFET detection. Both of the current limit and thermal shutdown have user settable auto retry and latch off mode. The device also features over-voltage protection and under-voltage protection

The MP5021 is available in 3mmx5mm QFN package.

FEATURES

- Integrated 7mΩ Power FET
- Adjustable Current Limit (5A to 15A)
- Output Current Measurement
- +/-5% Current Limit and 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
- Programmable EN Blanking Time
- Under/Over Voltage Lockout
- Thermal Protection
- Small 3mmx5mm QFN Package

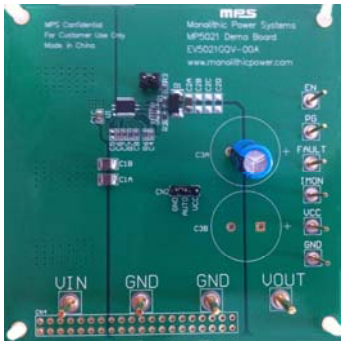
APPLICATIONS

- Hot Swap
- PC Cards
- Disk Drives
- Laptops

ELECTRICAL SPECIFICATIONS

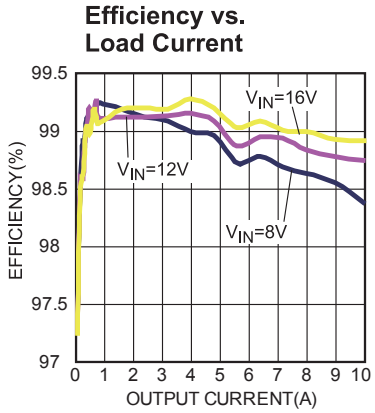
Parameter	Symbol	Value	Units
Input Voltage Range	V_{IN}	8-16	V
Output Voltage	V_{OUT}	8-16	V
Load Max	I_{OUT}	10	A

EV5021GQV-00A EVALUATION BOARD

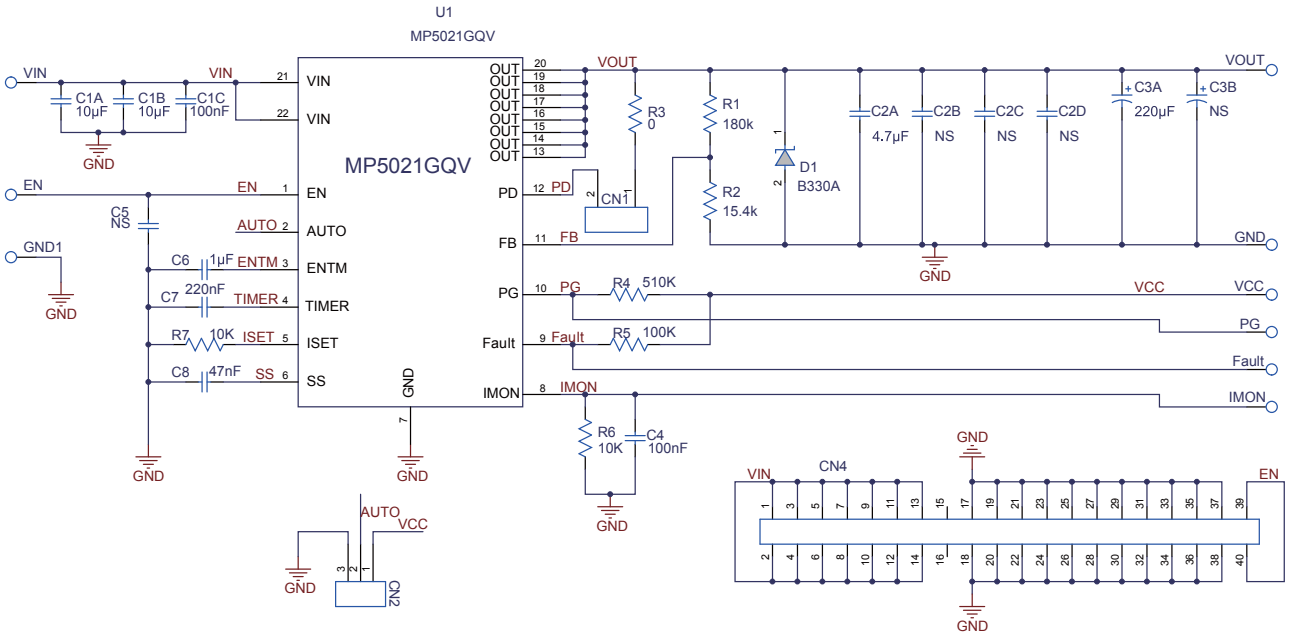


(L × W × H) 8.55cm × 8.55cm × 1.6mm

Board Number	MPS IC Number
EV5021GQV-00A	MP5021GQV



EVALUATION BOARD SCHEMATIC



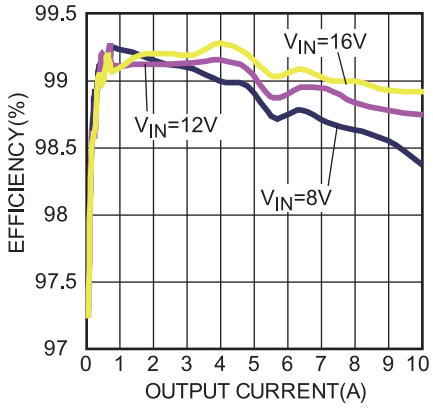
EV5021GQV-00A BILL OF MATERIALS

Qty	RefDes	Value	Description	Package	Manufacture	Manufature 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
1	C4	100nF	Ceramic Cap., 25V, 10%,X7R	0603	muRata	GRM188R71C104KA01D
1	C5	NS	Not Stuffed			
1	C6	1μF	Ceramic Cap., 6.3V, 10%, X7R	0603	muRata	GRM188R70J105KA01
1	C7	220nF	Ceramic Cap.,16V, 10%, X7R	0603	muRata	GRM188R71C224KA01D
1	C8	47nF	Ceramic Cap., 50V, 10%, X7R	0603	muRata	GRM188R71H473KA61D
1	D1	B330A	Schottky Diodes, 30V, 3A	SMA	Diodes	B330A
1	R1	180k	Film Res., 1%	0603	Yageo	RC0603FR-07180KL
1	R2	15.4k	Film Res., 1%	0603	Yageo	RC0603FR-0715K4L
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
2	R6,R7	10k	Film Res., 1%	0603	Yageo	RC0603FR-0710KL
1	U1	IC	Hot Swap Protection device	QFN22(3*5mm)	MPS	MP5021GQV

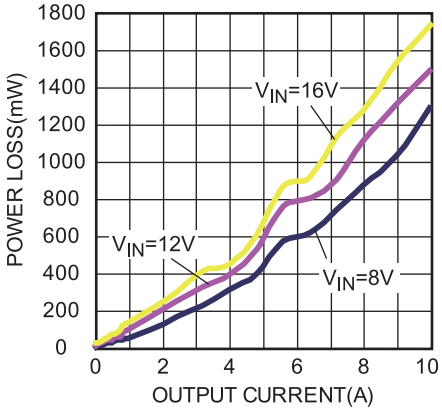
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN}=12V, C_{OUT}=220µF, C_6=1µF, C_7=220nF,C_8=47nF, R_7=10kΩ, T_A=+25°C, unless otherwise noted.

Efficiency vs. Load Current



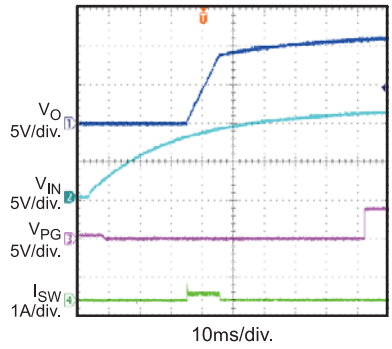
Power Loss vs. Load Current



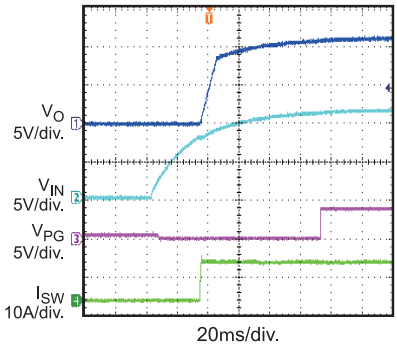
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN}=12V, C_{OUT}=220µF, C_6=1µF, C_7=220nF,C_8=47nF, R_7=10kΩ, T_A=+25°C, unless otherwise noted.

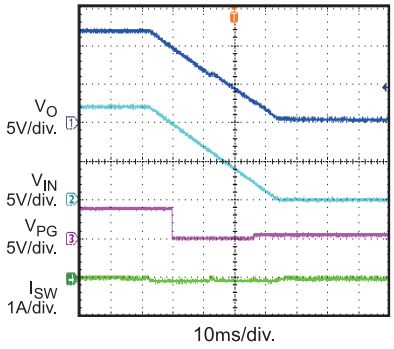
Start Up through Vin
I_O = 0A



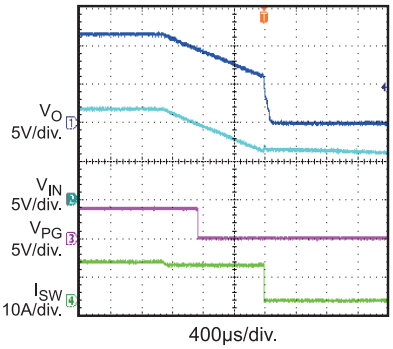
Start Up through Vin
I_O = 10A



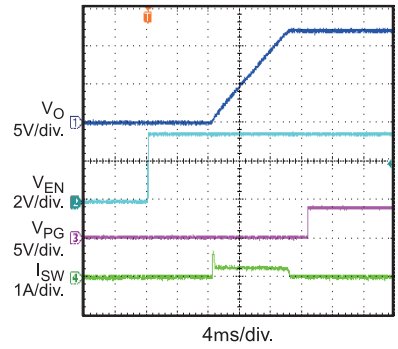
Shut Down through Vin
I_O = 0A



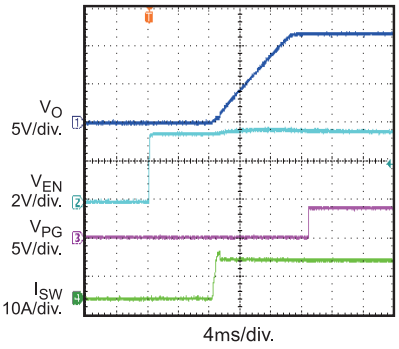
Shut Down through Vin
I_O = 10A



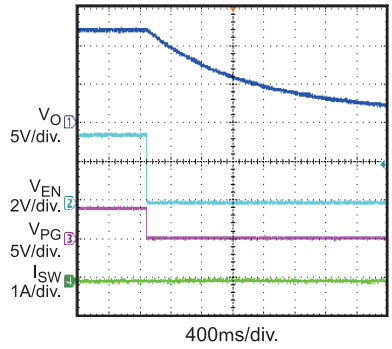
Start Up through EN
I_O = 0A



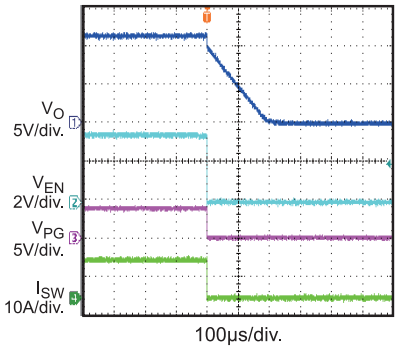
Start Up through EN
I_O = 10A



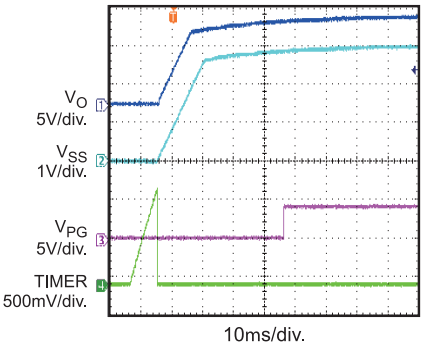
Shut Down through EN
I_O = 0A



Shut Down through EN
I_O = 10A



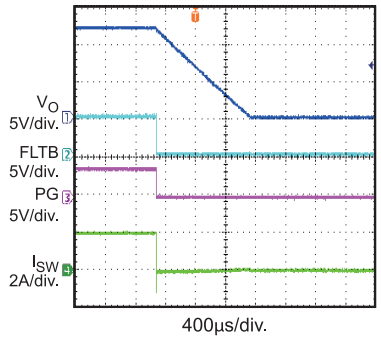
Start-Up Sequence



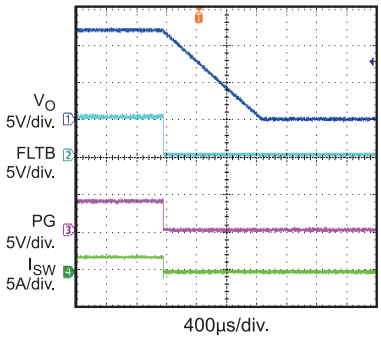
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN}=12V, C_{OUT}=220µF, C_6=1µF, C_7=220nF,C_8=47nF, R_7=10kΩ, T_A=+25°C, unless otherwise noted.

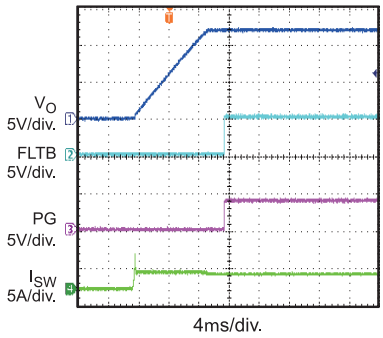
Thermal Shutdown
I_O = 2A,Latch mode



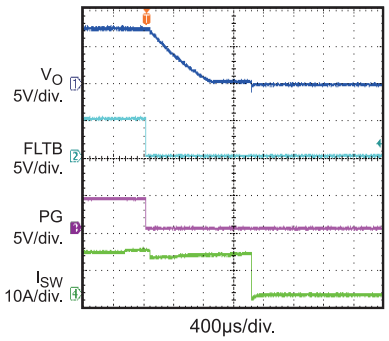
Thermal Shutdown
I_O = 2A,Retry mode



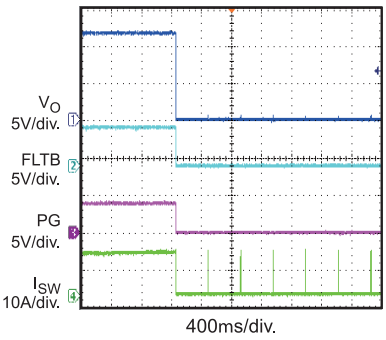
Thermal Recovery
I_O = 2A,Retry mode



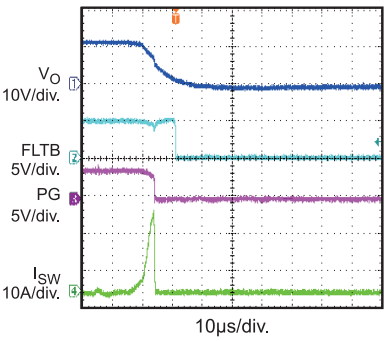
OCP
V_{IN} = 12V,Latch mode



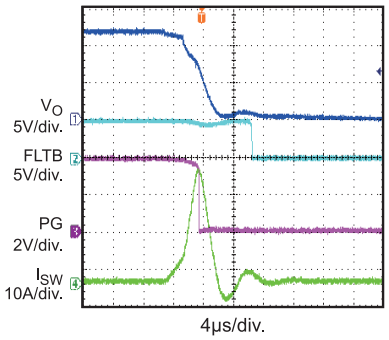
OCP
V_{IN} = 12V,Retry mode



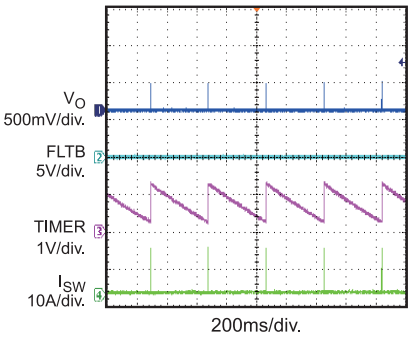
SCP Entry
V_{IN} = 12V,Latch mode



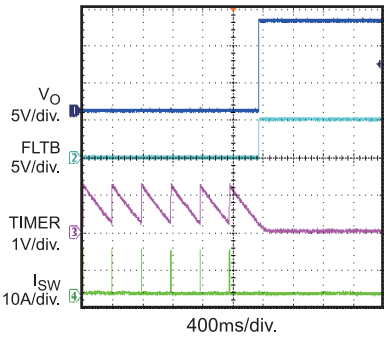
SCP Entry
V_{IN} = 12V,Retry mode



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



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



PRINTED CIRCUIT BOARD LAYOUT

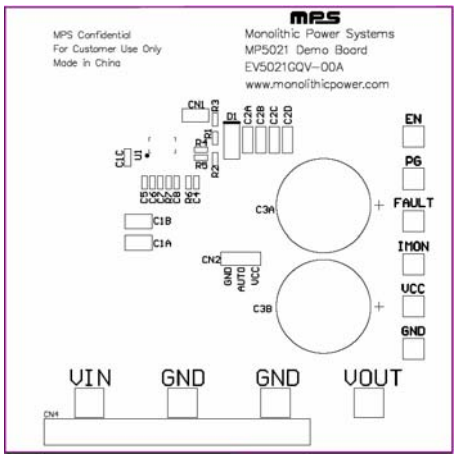


Figure 1—Top Silk Layer

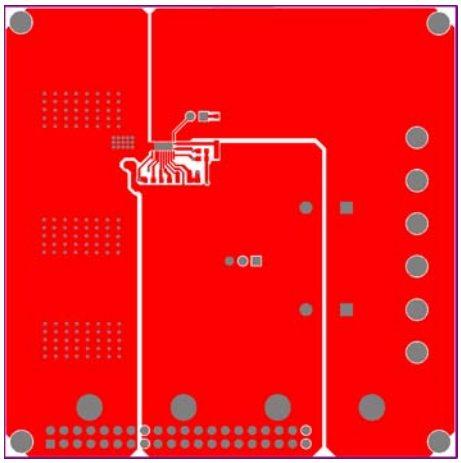


Figure 2—Top Layer

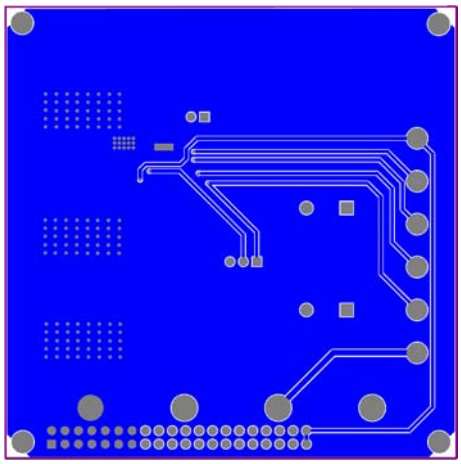


Figure 5—Bottom Layer

QUICK START GUIDE

The default output voltage of this board is set to 12V.
The board layout accommodates most commonly used schottky and output capacitors.

1. Attach the positive and negative ends of the load to the VOUT and GND pins, respectively.
2. Attach the input voltage (8V≤VIN≤16V) and input ground to the VIN and GND pins, respectively. Then the board is powered up.
3. The EV5021GQV-00A is enabled ON in default. It's turned on once the input voltage is applied. To enable the board externally, apply a voltage, VEN≥2V, to the EN pin. To disable the board, apply a voltage, VEN≤0.4V, to the EN pin.
4. The board is retry mode when OCP in default, users can select retry mode or latch mode by apply the auto pin to VCC or GND.