EV2454-H-00A

36V, 0.6A

Step Down Converter Evaluation Board

The Future of Analog IC Technology

DESCRIPTION

The EV2454-H-00A is an evaluation board for the MP2454/MPQ2454, a frequency-programmable (350kHz to 2.3MHz) step-down switching regulator with integrated internal high-side high voltage power MOSFET. It efficiently outputs up to 0.6A, and has current-mode control for fast loop response.

The wide 3.3V-to-36V input range accommodates a variety of step-down applications in automotive-input environments. A 3.5μA shutdown-mode quiescent current allows for use in battery-powered applications. The device also has a high-duty cycle and low drop-out mode for automotive cold-crank conditions.

The MPQ2454 also achieves high power conversion efficiency over a wide load range by scaling down the switching frequency at light load conditions to reduce both switching and gate driving losses.

Frequency fold-back prevents inductor current runaway during start-up and short circuit. Thermal shutdown provides reliable, fault-tolerant operation. An open-drain power-good signal indicates the output is within its nominal voltage.

The EV2454-H-00A is assembled and tested with MSOP-10 package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	3.3-36	V
Output Voltage	V_{OUT}	3.3	V
Output Current	I_{OUT}	0.6	A

FEATURES

- 60μA Operating Quiescent Current
- Wide 3.3V-to-36V Operating Input Range
- 200mΩ Internal Power MOSFET
- Up to 2.3MHz Programmable Switching Frequency
- Stable with Ceramic Output Capacitors
- Internal Compensation
- External Soft-Start
- > 90% Efficiency
- Low Dropout Operation for Cold-crank
- 3.5μA Low Shutdown Supply Current
- Synchronize to External Clock
- Power Good Output
- Programmable Power Good Delay Time
- Available in AEC-Q100 Grade 1
- Fully Assembled and Tested

APPLICATIONS

- High Voltage Power Conversion
- Automotive Systems
- Industrial Power Systems
- Distributed Power Systems
- Battery Powered Systems

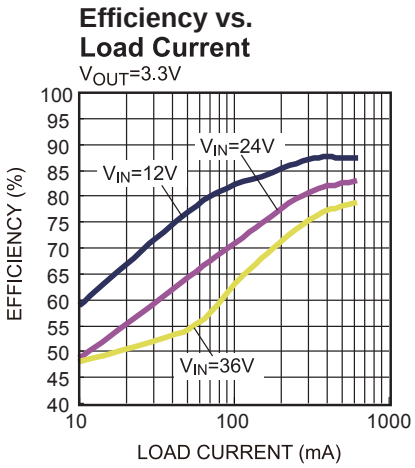
All MPS parts are lead-free and adhere to the RoHS directive. For MPS green status, please visit MPS website under Quality Assurance. “MPS” and “The Future of Analog IC Technology” are Registered Trademarks of Monolithic Power Systems, Inc.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2015 MPS. All Rights Reserved.

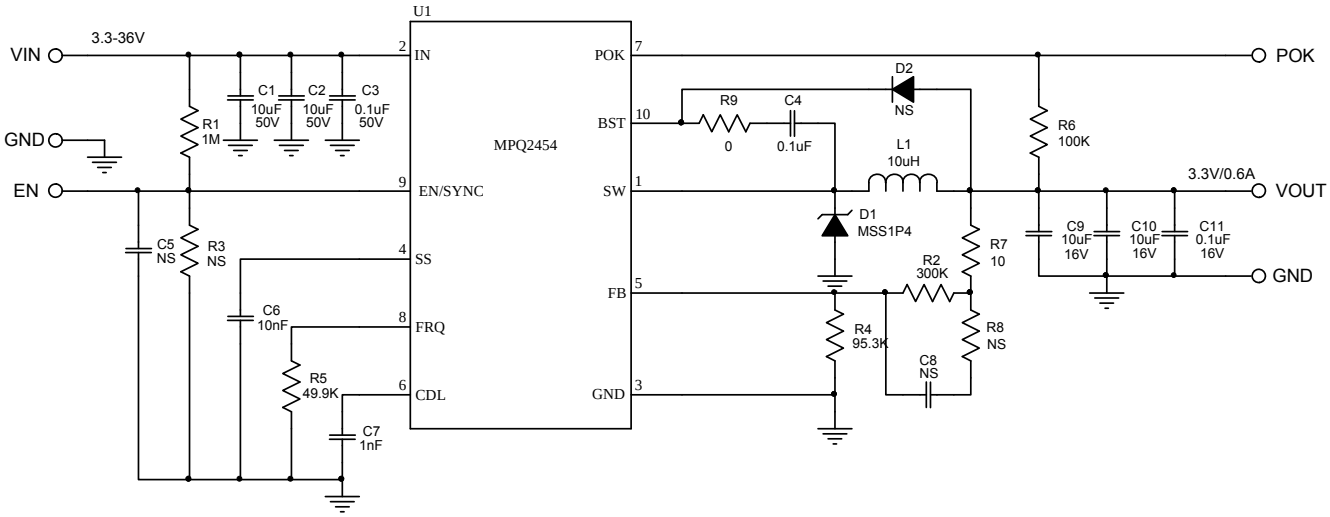
EV2454-H-00A EVALUATION BOARD

(L x W x H) 2.5” x 2.5” x 0.2”
(6.35cm x 6.35cm x0.5cm)

Board Number	MPS IC Number
EV2454-H-00A	MPQ2454GH



EVALUATION BOARD SCHEMETIC



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2015 MPS. All Rights Reserved.

EV2454-H-00A BILL OF MATERIALS

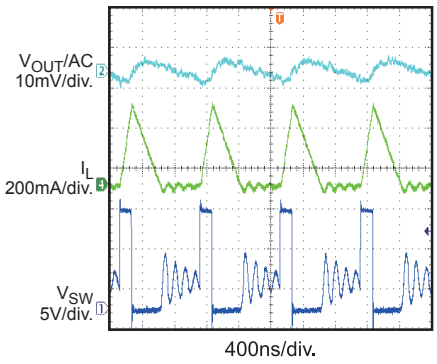
Qty	RefDes	Value	Description	Package	Manufacture	Manufacture_PN
2	C1, C2	10μF	Ceramic Capacitor; 50V;X7R; 1210;	1210	muRata	GRM32ER71H106KA12L
3	C3, C4, C11	0.1μF	Ceramic Capacitor; 50V;X7R; 0603;	0603	muRata	GRM188R71H104KA93D
1	C6	10nF	Ceramic Capacitor; 50V;X7R; 0603;	0603	muRata	GRM188R71H103KA01D
1	C7	1nF	Ceramic Capacitor; 50V;C0G 0603;	0603	muRata	GRM1885C1H102JA01D
2	C9, C10	10μF	Ceramic Capacitor; 16V;X7R; 1210	1210	muRata	GRM32DR71C106KA01L
2	C5, C8	NS		0603		
1	D1	MSS1P4	Schottky Diode; 40V;1A;	MicroSMP	Vishay	MSS1P4
1	D2	1N4148WS	Diode; 75V; 0.15A;	SOD-323	Diodes	1N4148WS
1	L1	10μH	Inductor;10μH; 53mΩ; 2.3 A	SMD	ABC	DM5028100ML
			Inductor;10uH; 52.8mΩ;1.5A	SMD	SUMIDA	CDRH6D26NP-100NC
1	R1	1M	Film Resistor;5%;	0603	Yageo	RC0603JR-071ML
1	R2	300k	Film Resistor;1%;	0603	Yageo	RC0603FR-07300KL
1	R4	95.3k	Film Resistor;1%;	0603	Yageo	RC0603FR-0795K3L
1	R5	49.9k	Film Resistor;1%;	0603	Yageo	RC0603FR-0749K9L
1	R6	100k	Film Resistor;1%;	0603	Yageo	RC0603FR-07100KL
1	R7	10	Film Resistor;1%;	0603	Yageo	RC0603FR-0710RL
1	R9	0	Film Resistor;5%;	0603	Yageo	RC0603JR-070RL
2	R3, R8	NS		0603		
1	U1		Step-Down Regulator	MSOP-10	MPS	MPQ2454GH
4	VIN, GND VOUT, GND		2.0 Golden Pin		HZ	
3	EN,POK, GND		1.0 Golden Pin		HZ	

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2015 MPS. All Rights Reserved.

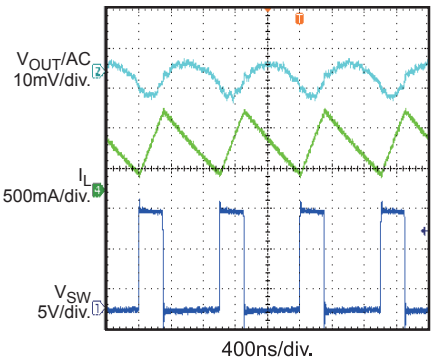
EVB TEST RESULTS

V_{IN} = 12V, V_{OUT} =3.3V, C_{OUT} = 2x10µF, L = 10µH, T_A = +25°C, unless otherwise noted.

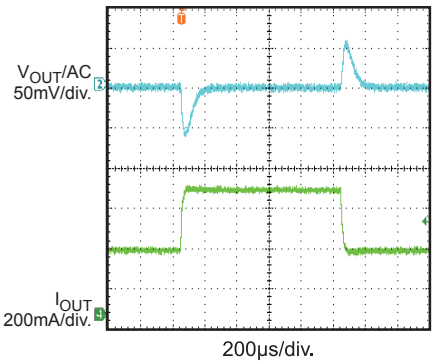
Steady State
I_{OUT}=0.1A



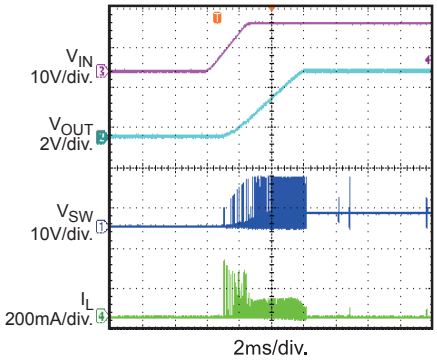
Steady State
I_{OUT}=0.6A



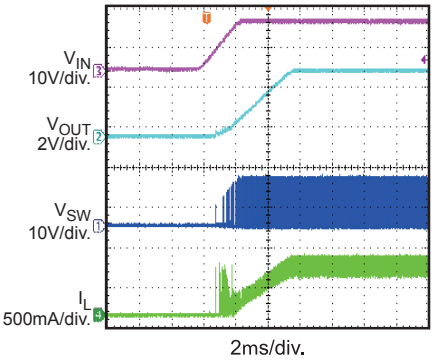
Load Transient
I_{OUT} = 0.3A-0.6A, 1.6A/µs



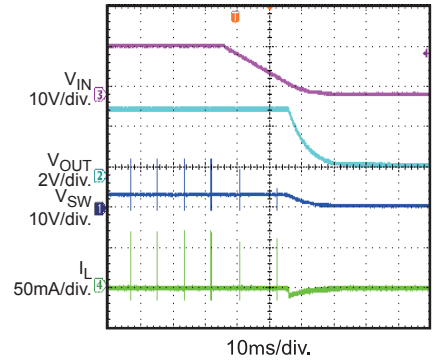
Startup through V_{IN}
I_{OUT} = 0A



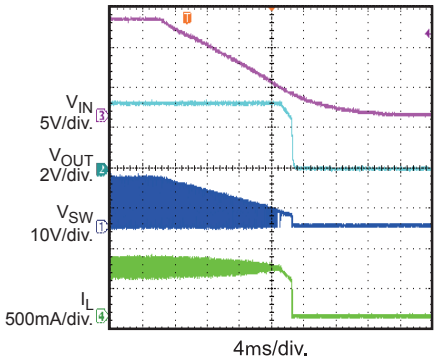
Startup through V_{IN}
I_{OUT} = 0.6A



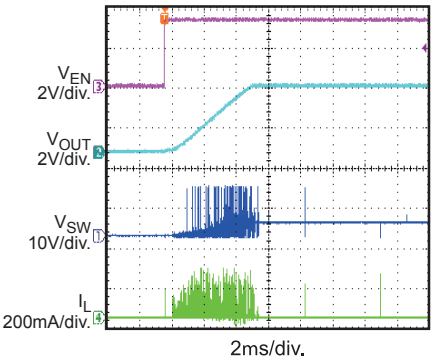
Shutdown through V_{IN}
I_{OUT} = 0A



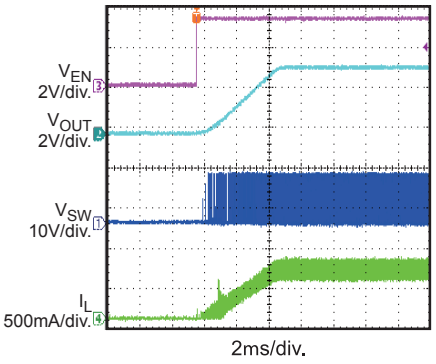
Shutdonw through V_{IN}
I_{OUT} = 0.6A



Startup through EN
I_{OUT} = 0A



Startup through EN
I_{OUT} = 0.6A

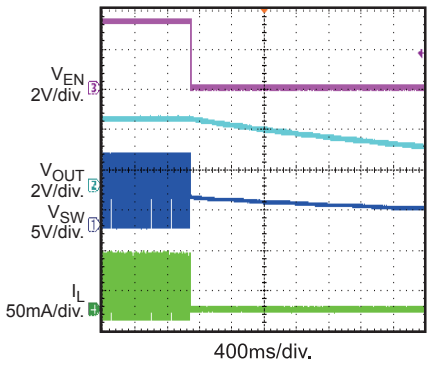


MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2015 MPS. All Rights Reserved.

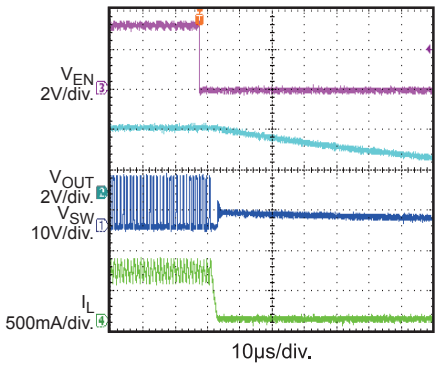
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT} =3.3V, C_{OUT} = 2x10µF, L = 10µH, T_A = +25°C, unless otherwise noted.

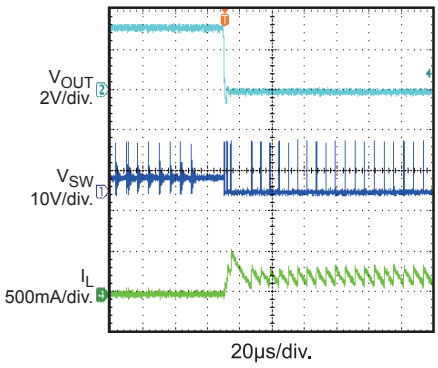
Shutdown through EN
I_{OUT}=0A



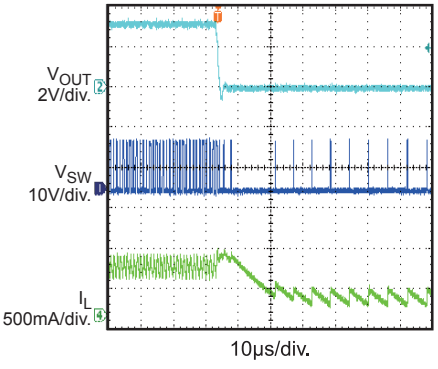
Shutdown through EN
I_{OUT}=0.6A



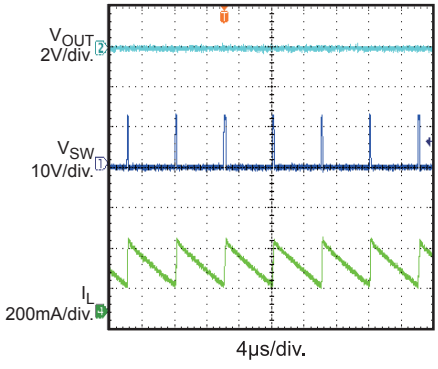
SCP Entry
I_{OUT}=0A to Short Circuit



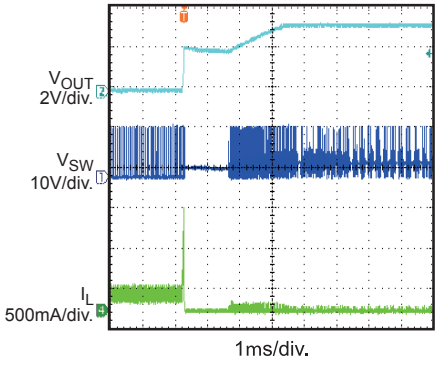
SCP Entry
I_{OUT}=0.6A to Short Circuit



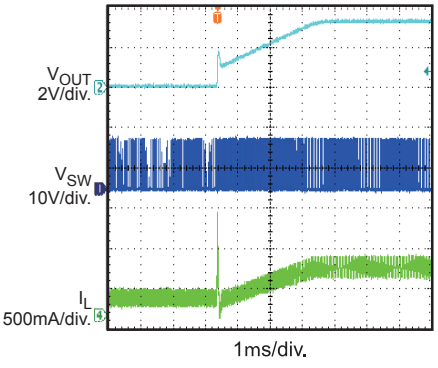
SCP Steady State



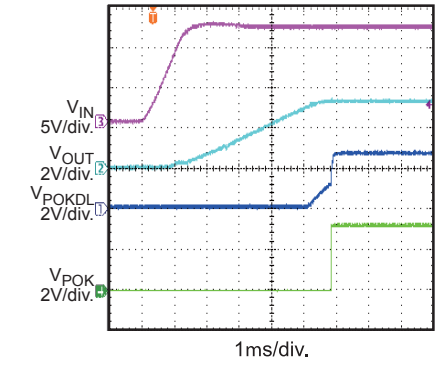
SCP Recovery
Short Circuit to I_{OUT}=0A



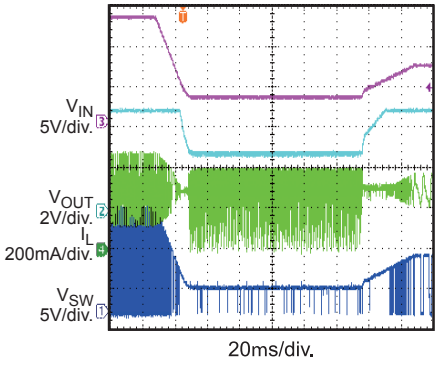
SCP Recovery
Short Circuit to I_{OUT}=0.6A



POK through Power On



Cold-Crank
V_{OUT} = 5V, I_{OUT} = 0.3A



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2015 MPS. All Rights Reserved.

PRINTED CIRCUIT LAYOUT

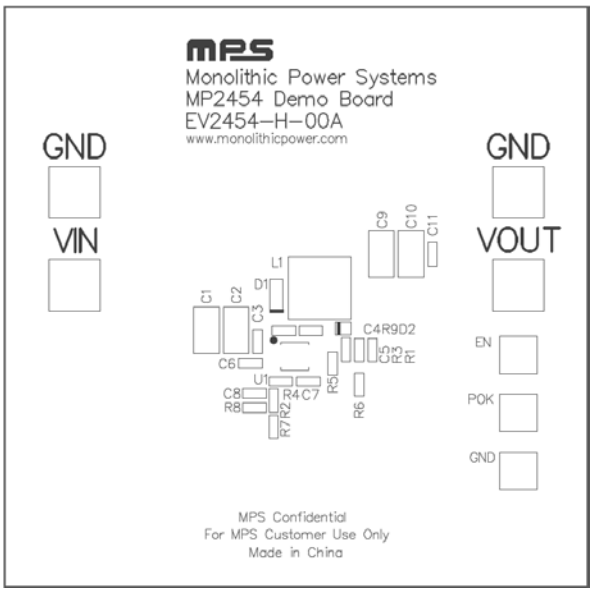


Figure1 – Top Silk Layer

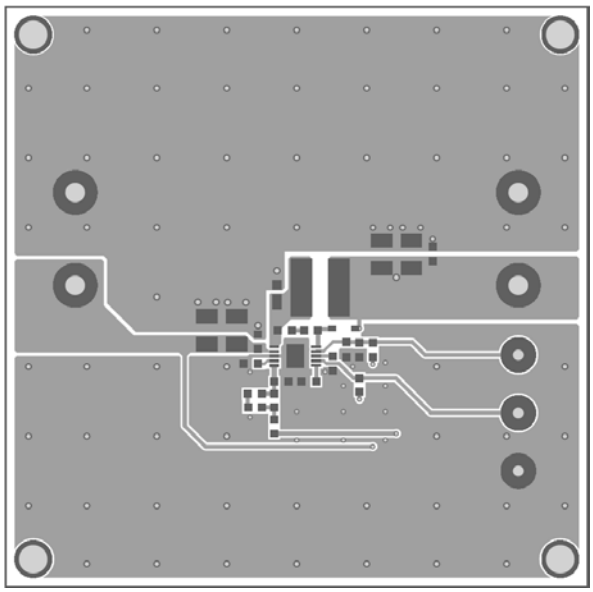


Figure 2 – Top Layer

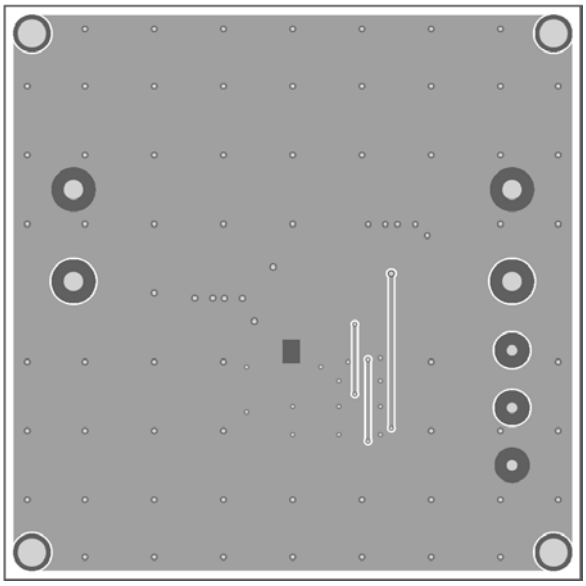


Figure3 – Bottom Layer

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2015 MPS. All Rights Reserved.

QUICK START GUIDE

1. Connect the positive and negative terminals of the load to the VOUT and GND pins respectively.
2. Preset the power supply output to between 3.3V to 36V, and then turn it off.
3. Connect the positive and negative terminals of the power supply output to the VIN and GND pins respectively.
4. Turn the power supply on. The MP2454/MPQ2454 will automatically startup.
5. To use the Enable function, apply a digital input to the EN pin. Drive EN higher than 1.8V for longer than 200ns to turn on the regulator, drive EN less than 1 V for longer than 2μs to turn it off. There is an internal 1.2MΩ resister between EN and GND, so floating this pin shuts chip down.
6. Connect the EN input pin through a pull-up resistor to any voltage connected to the V_{IN} pin—the pull-up resistor is selected to limit the EN input current to less than 150μA to prevent damaging internal Zener diode. For example, with 12V connected to V_{IN}, R_{PULLUP} ≥ (12V – 7.5V) ÷ (150+7.5/1.2)μA = 28.8kΩ.
7. Connect the EN pin directly to a voltage source without any pull-up resistor requires limiting voltage amplitude to ≤7.5V to prevent damage to the internal Zener diode.
8. Connect the EN input pin with an external clock with a range of 350kHz to 2.3MHz after output voltage is set to synchronize the internal clock rising edge to the external clock rising edge.

NOTICE: The information in this document is subject to change without notice. Users should warrant and guarantee that third party Intellectual Property rights are not infringed upon when integrating MPS products into any application. MPS will not assume any legal responsibility for any said applications.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2015 MPS. All Rights Reserved.