EV6005-K-00A

High Efficiency Flyback/Forward Controller
Primary-Side Regulate Fly-back EV Board

DESCRIPTION

EV6005-K-00A Evaluation Board is designed to demonstrate the capability of MP6005. The MP6005 is a high power, high efficiency flyback and forward controller. It is specifically designed for both low cost, small size isolated solution with primary-side regulate (PSR) flyback application, and high efficiency secondary-side regulate (SSR) active-clamped forward application. It also can be used in SSR flyback topology.

MP6005 senses the third winding waveform on primary side to regulate output in PSR mode, saves the traditional complex opto-isolator circuit. MP6005 can also be set as SSR mode, while the SYNC driver provides high efficiency solution for active-clamped forward topology.

The MP6005 also features with 2A GATE driver, frequency dithering, over load protection and over voltage protection.

The MP6005 is available in MSOP10 package.

Electrical Specification

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	36-57	V
Output Voltage	V_{OUT}	12	V
Output Current	I_{OUT}	2.5(1)	A

NOTE:

1) When Iout=2.5A, Board temperature is a little high, it is limited by board size, 2.1A continuous output current is recommended.

FEATURES

- 36V to 57V Input Voltage Range
- 12V Output Voltage and 2.5A Output Current
- Small Size PSR Fly-back Solution without Opto-Coupler Feedback
- 250kHz Fixed Switching Frequency
- Output Diode Compensation in PSR Mode
- EMI Reduction with Frequency Dithering
- Auxiliary Winding Supply VCC to Save IC Loss
- 2A GATE and 0.8A SYNC Drivers
- 160mV Switching Current Sense Limit
- Hiccup Protection for OLP, SCP, OVP and Thermal Shutdown
- Available in MSOP10 Package

APPLICATIONS

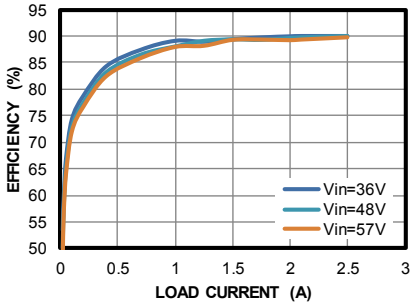
- Security Camera
- Video Telephone
- Wireless AP
- POS System
- Industrial Isolated Power Supply

EV6005-K-00A EVALUATION BOARD

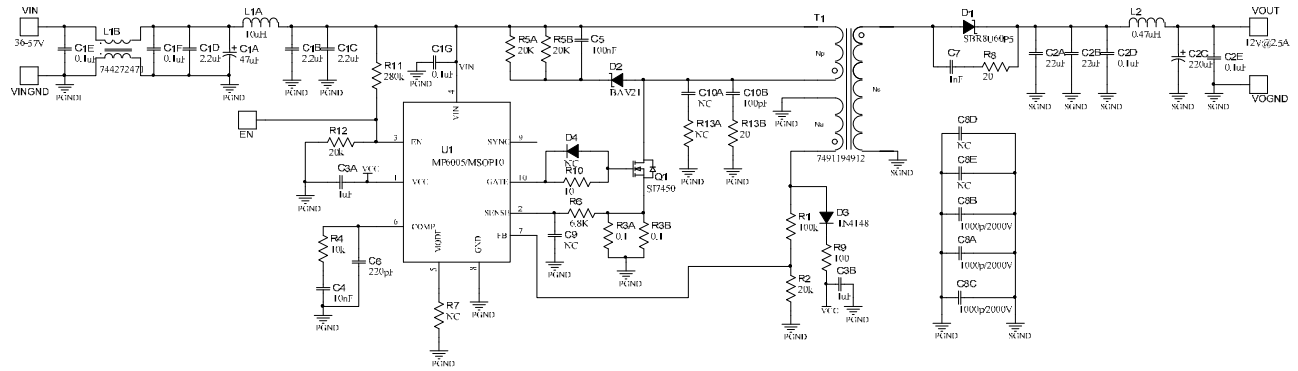
(L x W x H) 9.7cm x 3.7cm x 2cm

Board Number	MPS IC Number
EV6005-K-00A	MP6005GK

Efficiency



EVALUATION BOARD SCHEMATIC (2)



NOTE:

2) EV6005-K-00A is setting in frequency dither mode for better EMI performance and output diode compensation function. If stable switch is needed, please set R6 lower than 1.3k, then the load regulation will be a little worse, because the output diode compensation function is disabled at the same time.

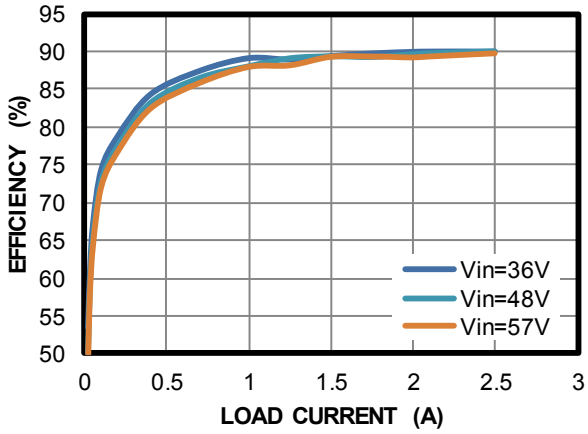
BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	C1A	47μF	47uF E-cap CD284	DIP	Jianghai	47μF/100V
3	C1B, C1C, C1D	2.2μF	Ceramic Cap.,100V,X7R	1210	muRata	GRM32ER72A225KA88L
3	C1E, C1F, C1G	0.1μF	Ceramic Cap.,100V,X7R	0603	muRata	GRM188R72A104KA01D
2	C2A, C2B	22μF	Ceramic Cap.,25V,X7R	1210	muRata	GRM32ER71E226KA88L
1	C2C	220μF	220uF/25V E-cap	DIP	wurth	86008047010
2	C2D, C2E	0.1μF	Ceramic Cap.,25V,X7R	0603	muRata	GRM188R71E104KA01D
2	C3A, C3B	1μF	Ceramic Cap.,25V,X7R	0603	muRata	GRM188R71E105KA01D
1	C4	10nF	Ceramic Cap.,16V,X7R	0603	muRata	GRM188R71C103KA01D
1	C5	100nF	Ceramic Cap.,100V,X7R	0805	muRata	GRM21BR72A104KA01D
1	C6	220pF	Ceramic Cap.,50V,X7R	0603	muRata	GRM188R71H221KA01D
1	C7	1nF	Ceramic Cap.,50V,X7R	0603	muRata	GRM188R71H102KA01D
3	C8A, C8B, C8C	1000pF	Ceramic Cap.,2000V X7R	1808	muRata	GR442QR73D102KW01L
0	C8D, C8E, C9, D4, R7, R13A, C10A	NC				
1	C10B	100pF	Ceramic Cap.,250V,X7R	0805	muRata	GRM21BR72E101KA01D
1	D1	SBR8U60P5	Switching Diode 8A 60V	POWERDI5	Diode.Inc	SBR8U60P5
1	D2	BAV21	Switching Diode 200V	SOD-123	Diode.Inc	BAV21W-7-F
1	D3	1N4148	Diode Switch, 75V, 400mW	SOD-323	Diodes Inc.	1N4148W-7
1	L1A	10μH	Isat=4.9A, Rdc=40.9mΩ	SMD	Coilcraft	XAL5050-103MEC
1	L1B	2x470uH	Common filter, Rdc=2X65mΩ	SMD	Wurth	744272471
1	L2	0.47μH	Isat=6.8A, Rdc=11.2mΩ	SMD	Wurth	744 373 240 047
1	Q1	SI7450	80mΩ 200V N-MOSFET	PowerPak SO-8	Vishy	SI7450DP
1	R1	100k	Film Res.,1%	0603	ROYAL	RC0603FR-07100KL
2	R2, R12	20k	Film Res.,1%	0603	ROYAL	RC0603FR-0720KL
2	R3A, R3B	0.1	Film Res.,1%	1206	ROYAL	RC1206FR-070R1L
1	R4	10k	Film Res.,1%	0603	ROYAL	RC0603FR-0710KL
2	R5A, R5B	20K	Current sense resistor	1206	ROYAL	RC1206JR-0720KL
1	R6	6.8K	Film Res.,1%	0603	ROYAL	RC0603FR-076K8L
2	R8, R13B	20	Film Res.,1%	0805	ROYAL	RC0805FR-0720RL
1	R9	100	Film Res.,1%	0603	ROYAL	RC0603FR-07100RL
1	R10	10	Film Res.,1%	0603	ROYAL	RC0603FR-0710RL
1	R11	280k	Film Res.,1%	0603	ROYAL	RC0603FR-07280KL
1	T1	7491194912	Power Transformer	SMD	Wurth	7491194912
1	U1	MP6005GK	Fly-back/Forward controller	MSOP10	MPS	MP6005GK

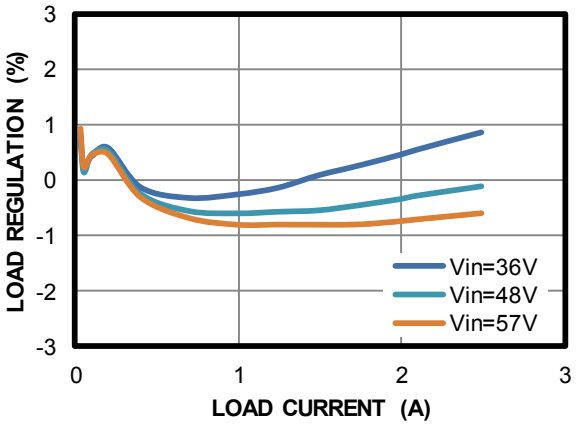
EVB TEST RESULTS

V_{IN} = 48V, V_{OUT}= 12V, I_{OUT}= 2.5A, T_A = 25°C, unless otherwise noted.

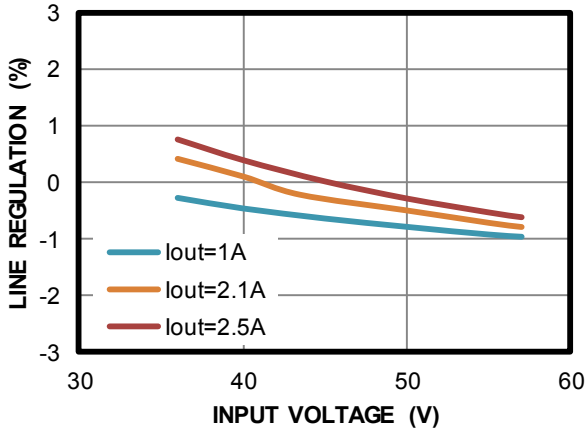
Efficiency



Load Regulation

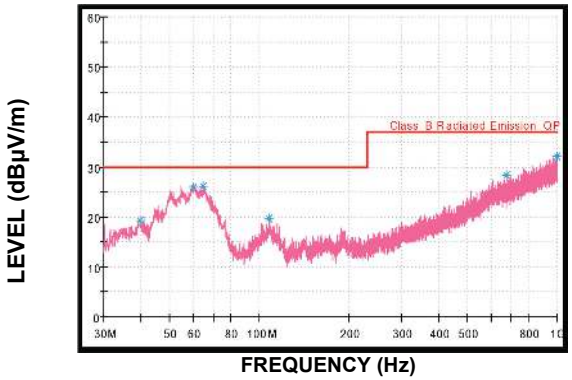


Line Regulation



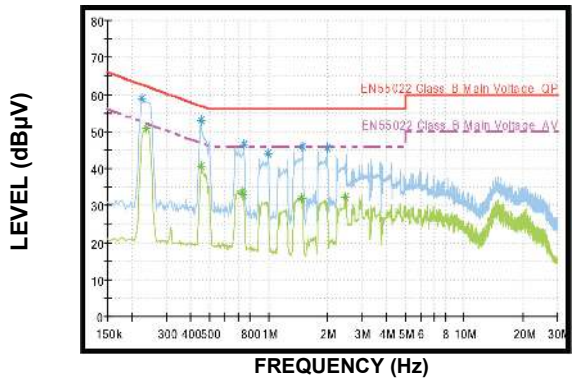
Radlated Emission Results (3)

I_{OUT}=2.1A



Conducted Emission Results (3)

I_{OUT}=2.1A



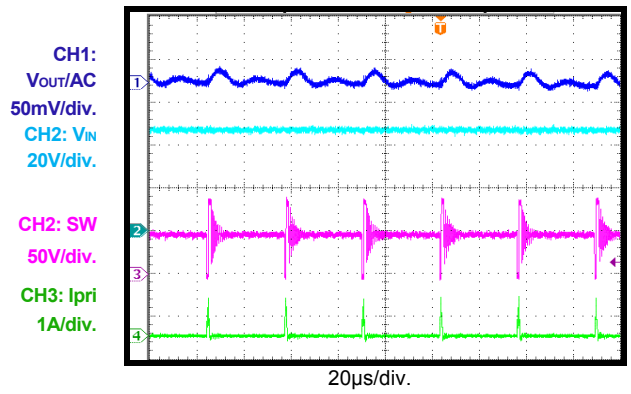
Note:

3) It is tested with peak mode (PK mode). Quasi-peak mode (QP mode) test result should have more margin.

EVB TEST RESULTS *(continued)*

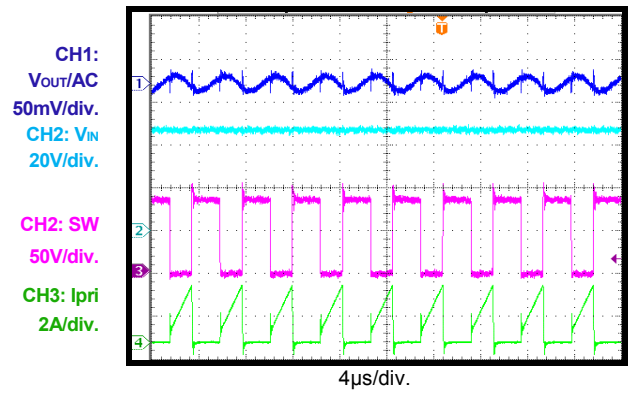
V_{IN} = 48V, V_{OUT}= 12V, I_{OUT}= 2.5A, T_A = 25°C, unless otherwise noted.

Steady State
I_{OUT}=30mA



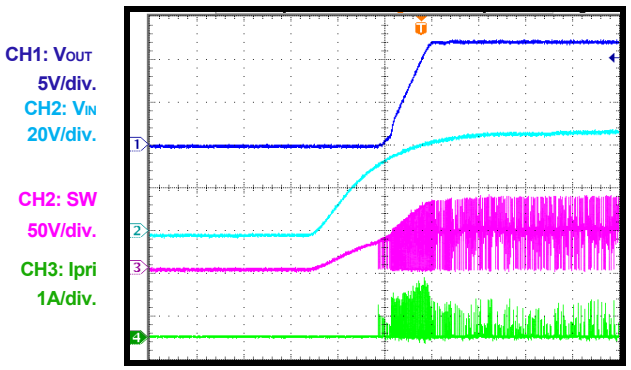
20µs/div.

Steady State
I_{OUT}=2.5A



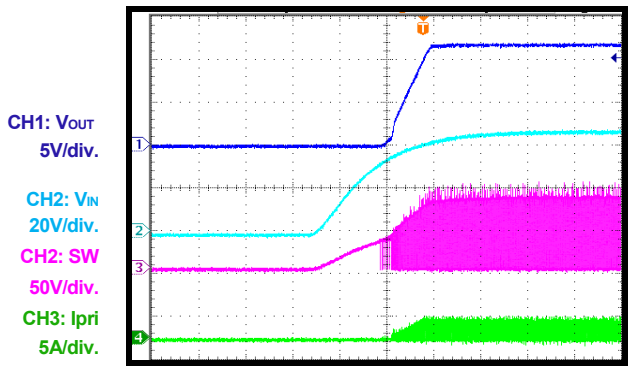
4µs/div.

VIN Startup
I_{OUT}=30mA



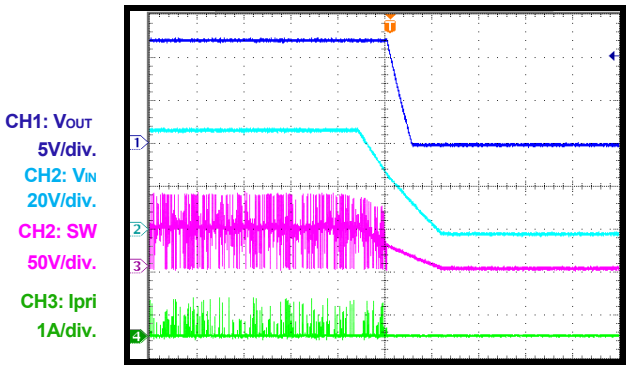
4ms/div.

VIN Startup
I_{OUT}=2.5A



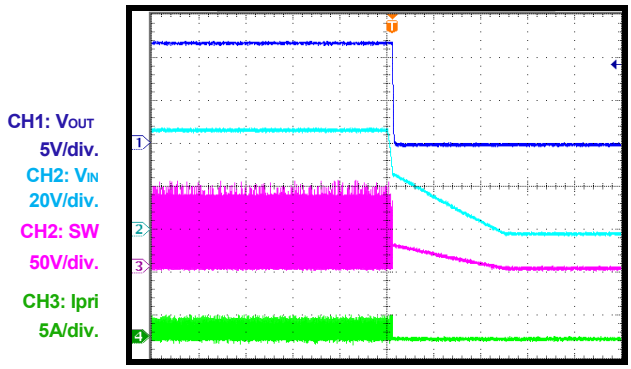
4ms/div.

VIN Shutdown
I_{OUT}=30mA



200ms/div.

VIN Shutdown
I_{OUT}=2.5A



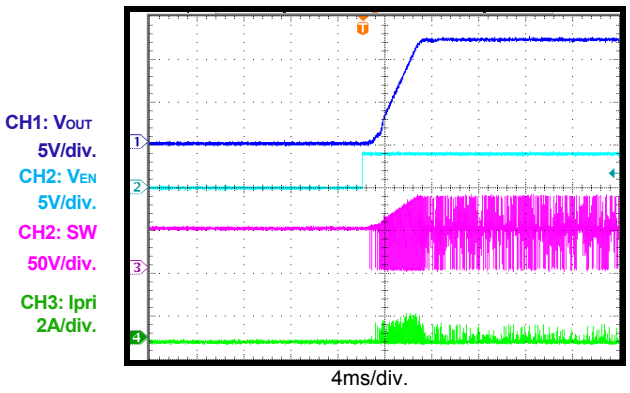
100ms/div.

EVB TEST RESULTS *(continued)*

V_{IN} = 48V, V_{OUT}= 12V, I_{OUT}= 2.5A, T_A = 25°C, unless otherwise noted.

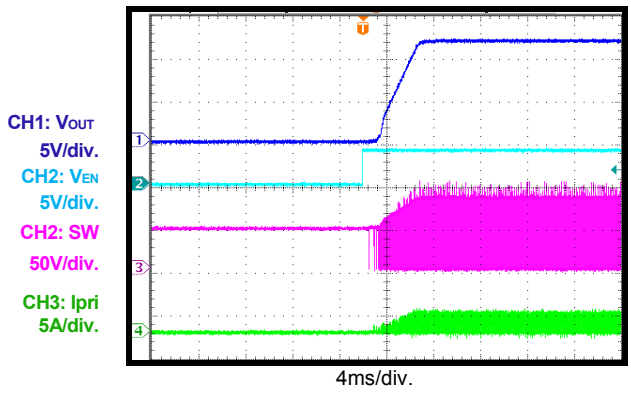
EN Startup

I_{OUT}=30mA



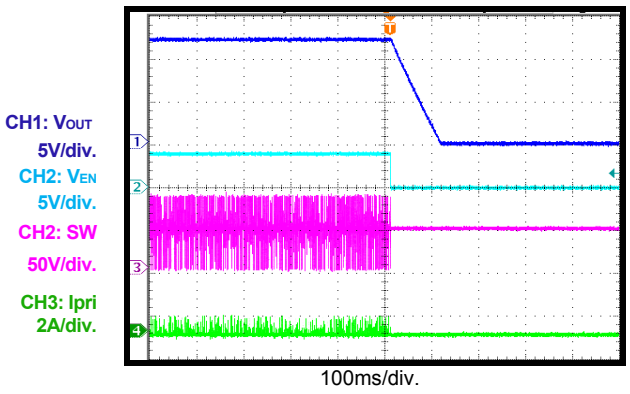
EN Startup

I_{OUT}=2.5A



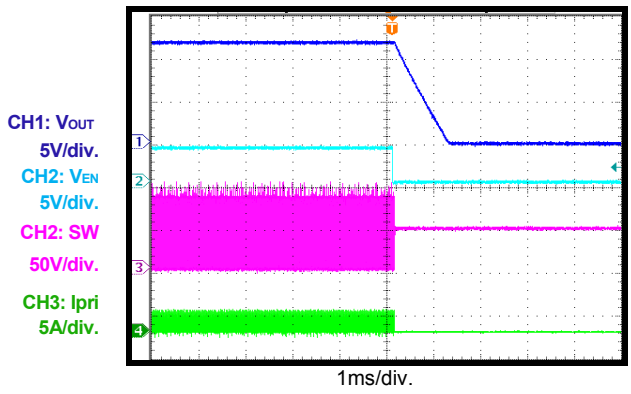
EN Shutdown

I_{OUT}=30mA



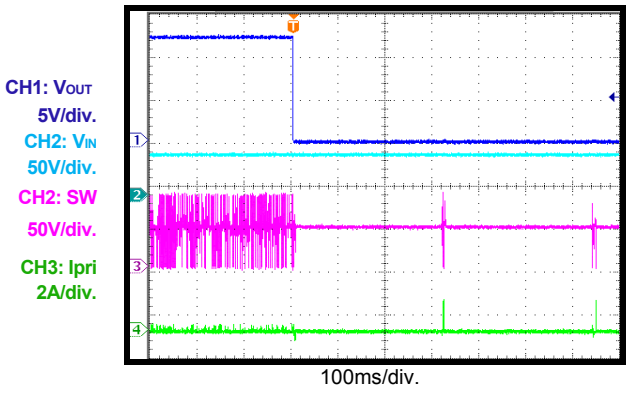
EN Shutdown

I_{OUT}=2.5A



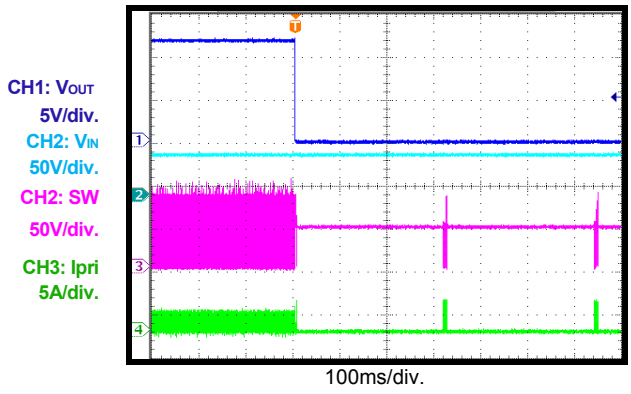
SCP Entry

I_{OUT}=30mA to Short



SCP Entry

I_{OUT}=2.5A to Short

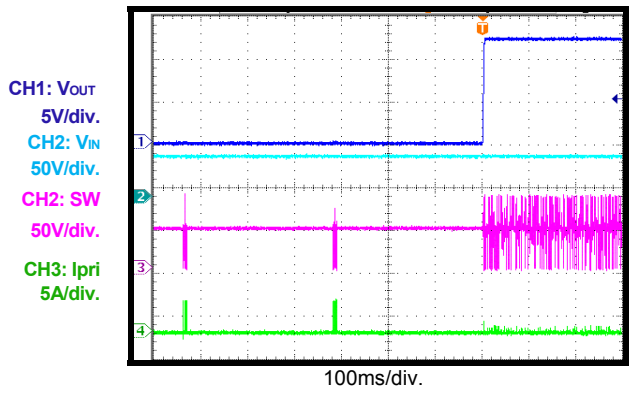


EVB TEST RESULTS *(continued)*

V_{IN} = 48V, V_{OUT}= 12V, I_{OUT}= 2.5A, T_A = 25°C, unless otherwise noted.

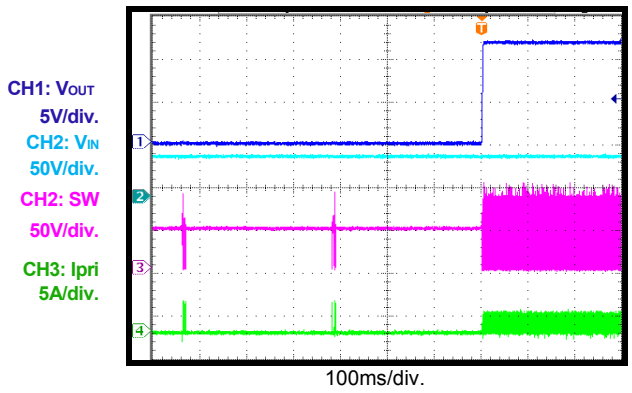
SCP Recovery

I_{OUT}=Short to 30mA



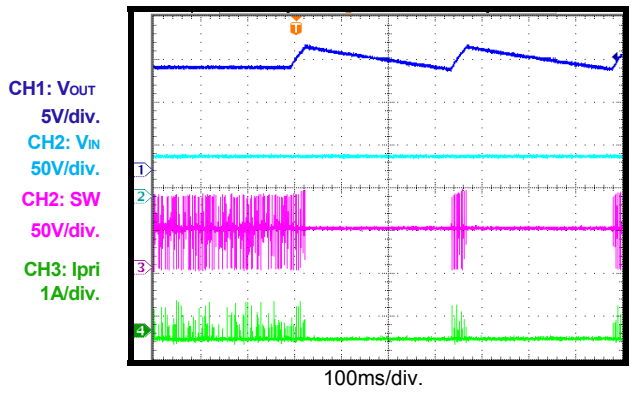
SCP Recovery

I_{OUT}=Short to 2.5A



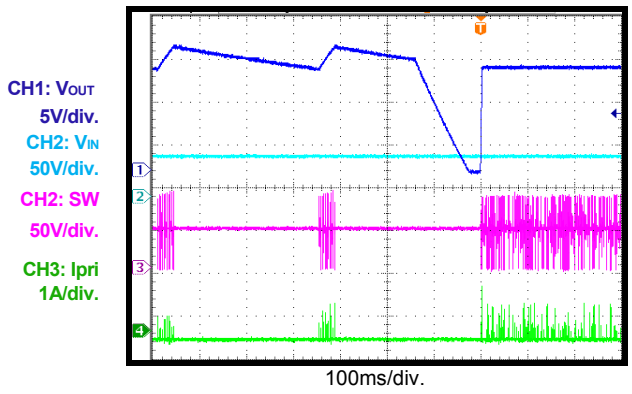
OVP Entry

I_{OUT}=30mA to 2mA



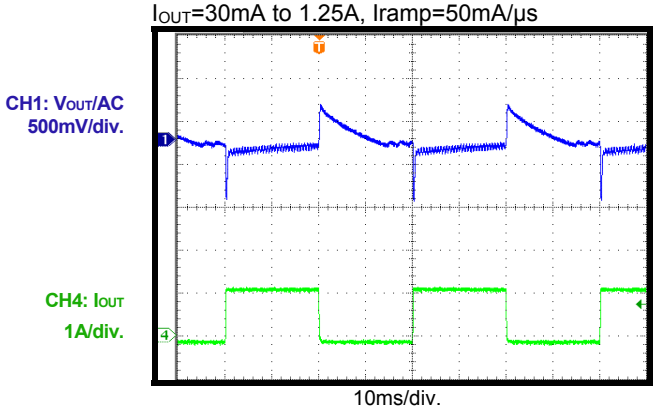
OVP Recovery

I_{OUT}=2mA to 30mA



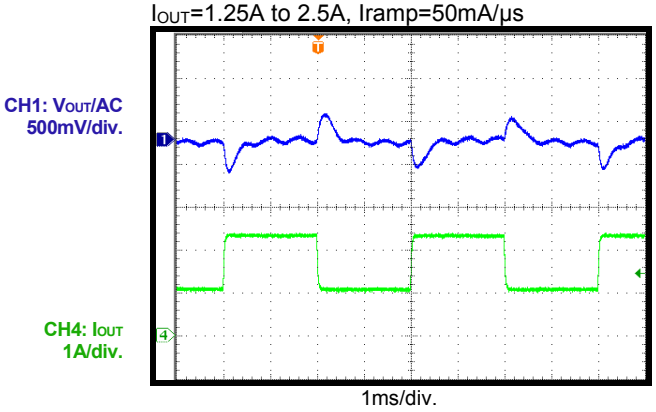
Load transient

I_{OUT}=30mA to 1.25A, Iramp=50mA/µs



Load transient

I_{OUT}=1.25A to 2.5A, Iramp=50mA/µs



PRINTED CIRCUIT BOARD LAYOUT

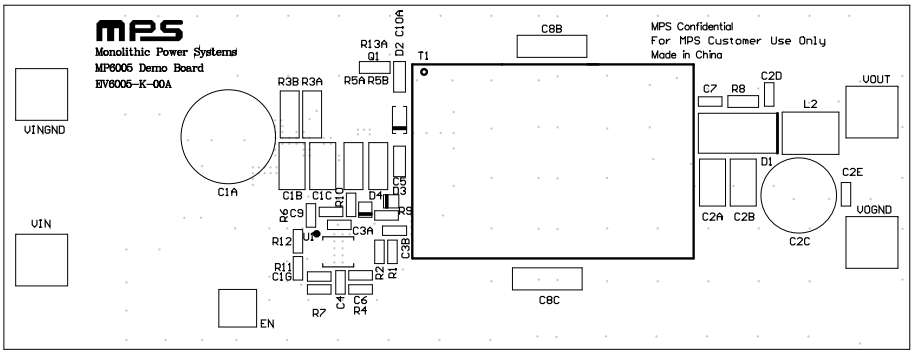


Figure 1—Top Silk Layer

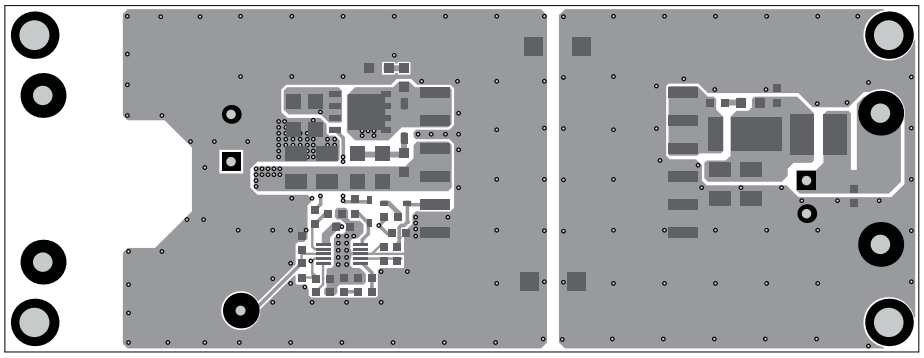


Figure 2—Top Layer

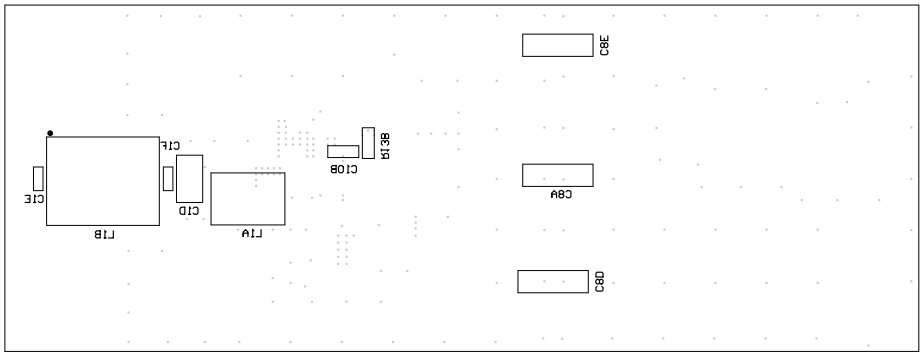


Figure 3—Bottom Silk Layer

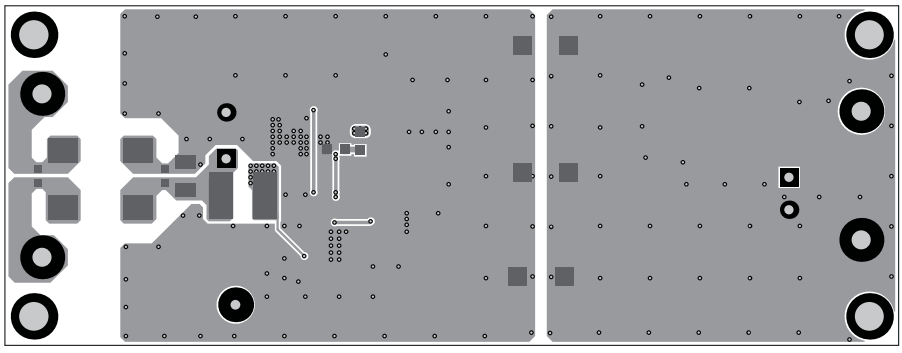


Figure 4—Bottom Layer

QUICK START GUIDE

The output voltage of this board is set to 12V. The board layout accommodates most commonly used components. Following blew steps to quick start EV6005-K-00A.

1. Preset Power Supply to 36V ≤ VIN ≤ 57V.
2. Turn Power Supply off.
3. Connect Power Supply terminals to:
   a. Positive (+): VIN
   b. Negative (–): VINGND
4. Connect Load to:
   a. Positive (+): VOUT
   b. Negative (–): VOGND
5. Turn Power Supply on after making connections. The MP6005 will automatically startup.