EV3427-L-00A

17A, 600kHz, 8V Wide Input Range Synchronous Boost Converter EV Board

The Future of Analog IC Technology

DESCRIPTION

The EV3427-L-00A Evaluation Board is designed to demonstrate the performances of MPS' MP3427, which can provide 30W load from Li-on battery input.

The MP3427 is a 600 kHz fixed frequency, high efficiency, wide input range, current mode boost converter with optional internal or external current sensing configuration for high integration or high power application. It features internally a 10mΩ power switch and a synchronous gate driver for high conversion efficiency. The MP3427 is available in a low profile 22-pin 3mmx4mm QFN package.

This board is configured for 8V/30W application.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Supply Voltage	V_{IN}	3 – 5	V
Output Voltage	V_{OUT}	8	V
Output Power	P_{OUT}	0– 30(1)	W

Notes:

1) The output power may be lower if IC thermal is strictly restricted.

FEATURES

- 3V-to-8V Wide Input Range for MP3427
- Integrated 10mΩ Low-side Power FET
- SDR Driver for Synchronous Solution
- >17A Internal Switch Current Limit
- Optional Internal/External Current Sensing Configuration
- External Soft-Start and Compensation for Higher Flexibility
- Programmable UVLO and Hysteresis
- < 1μA Shutdown Current
- Thermal Shutdown at 150℃
- Available in 3x4mm QFN-22 Package

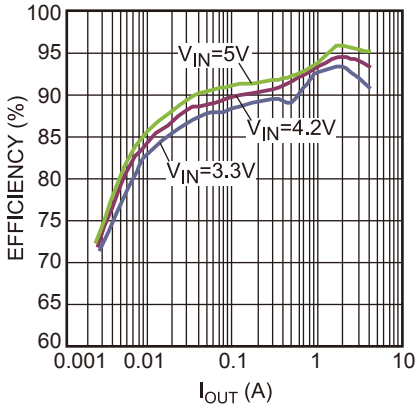
PACKAGE APPLICATIONS

- Tablet
- Power Banks
- Fuel Cells
- POS Systems
- Electronic Cigarette

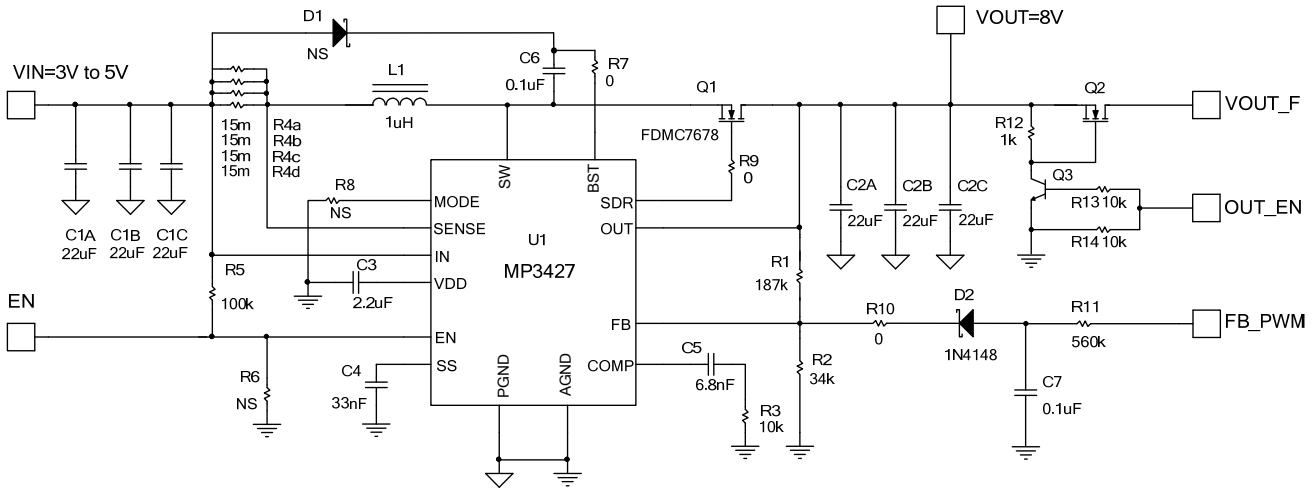
EV3427-L-00A EVALUATION BOARD

(L × W × H) 6.3cm × 6.3cm × 1.3cm	
Board Number	**MPS IC Number**
EV3427-L-00A	MP3427GL

Efficiency vs. Output Current



EVALUATION BOARD SCHEMATIC



EV3427-L-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
6	C1A, C1B, C1C, C2A, C2B, C2C	22µF	16V, ceramic Capacitor	1210	muRata	GRM32ER71C226KEA8L
1	C3	2.2µF	25V, ceramic Capacitor	0805	muRata	GRM21AR71E225KL
1	C4	33nF	50V ceramic capacitor	0603	muRata	GRM188R71H333KL
1	C5	6.8nF	50V ceramic capacitor	0603	muRata	GRM188R71H682KL
2	C6, C7	0.1µF	50V, ceramic Capacitor	0603	muRata	GRM188R71H104KL
1	R1	187k	Film resistor, 1%	0603	YAGEO	RC0603FR-07187KL
1	R2	34k	Film resistor, 1%	0603	YAGEO	RC0603FR-0734KL
3	R3, R13, R14	10k	Film resistor, 1%	0603	YAGEO	RC0603FR-0710KL
4	R4a, R4b, R4c, R4d	15m	low ohmic Film resistor, 1%	0805	YAGEO	RL0805FR-070R015L
1	R5	100k	Film resistor, 5%	0603	YAGEO	RC0603JR-07100KL
0	R6, R8	NS		0603		
3	R7, R9, R10	0	Film resistor, 5%	0603	YAGEO	RC0603JR-070RL
1	R11	560k	Film resistor, 1%	0603	YAGEO	RC0603FR-07560KL
1	R12	1k	Film resistor, 1%	0603	YAGEO	RC0603FR-071KL

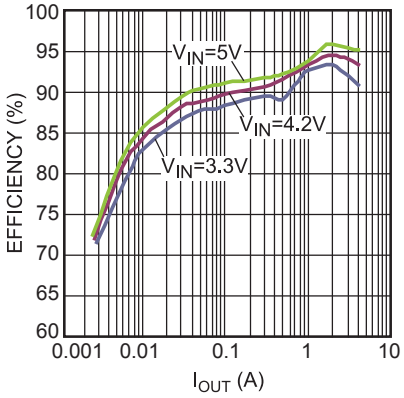
EV3427-L-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
0	D1	NS		SOD-323		
1	D2	1N4148	DIODE	SOD-123		1N4148
1	L1	1μH	4.6mOhm, Isat=19A, inductor	SMD	Wurth	744311100
1	Q1	FDMC7678	30V, 6.8mOhm 15A, N-Channel MOS	MLP3.3x3.3	FAIRCHILD	FDMC7678
1	Q2	AON7423	20V, P-Channel MOS	QFN3.3x3.3	ALPHA&OMEGA	AON7423
1	Q3	MMBT3904	NPN	SOT23	NXP	MMBT3904
1	U1	MP3427	3~8V, 17A, 600kHz boost converter	QFN22-3*4	MPS	MP3427GL

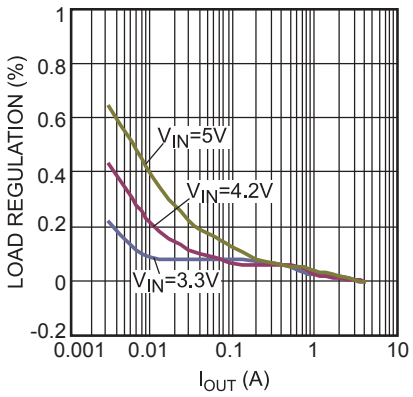
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN} = 3.3V, V_{OUT} = 8V, P_{OUT}=30W, L = 1μH, T_A = 25°C, MODE=float, R_{SENSE}=3.75mΩ, unless otherwise noted.

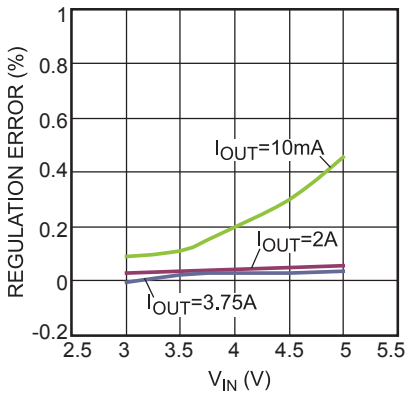
Efficiency vs. Output Current



Load Regulation

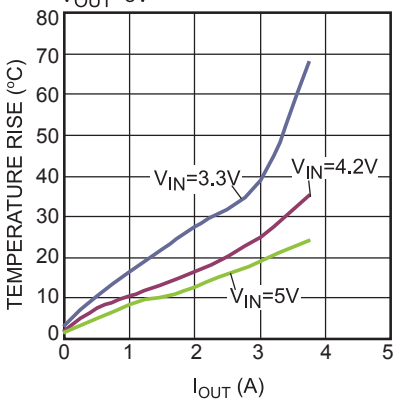


Line Regulation



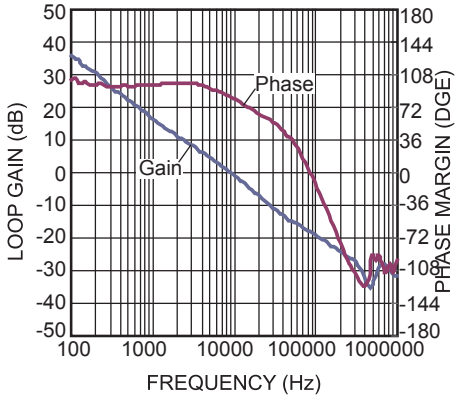
Case Temperature Rise vs. Output Current

V_{OUT}=8V



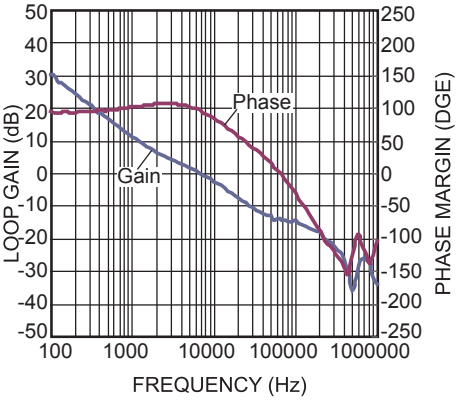
Bode Plot

V_{IN}=3.3V, I_{OUT}=2A



Bode Plot

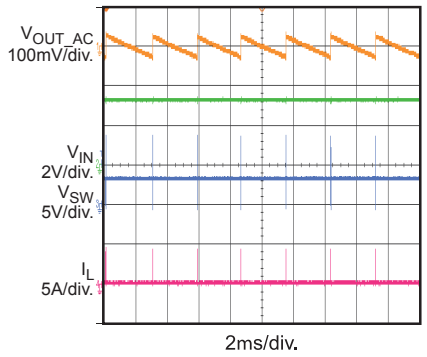
V_{IN}=3.3V, I_{OUT}=3.75A



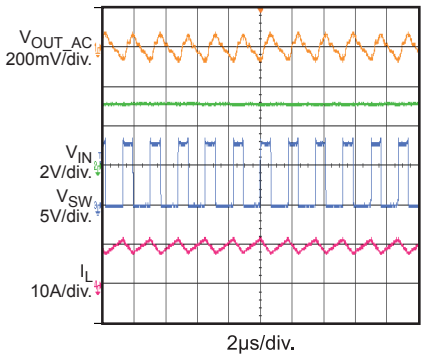
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 3.3V, V_{OUT} = 8V, P_{OUT}=30W, L = 1µH, T_A = 25°C, MODE=float, R_{SENSE}=3.75mΩ, unless otherwise noted.

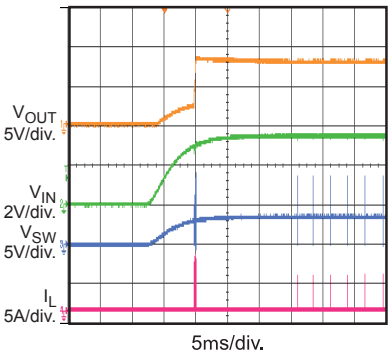
Steady State
I_{OUT} = 0A



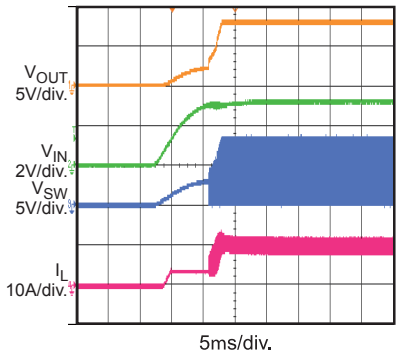
Steady State
I_{OUT} = 3.75A



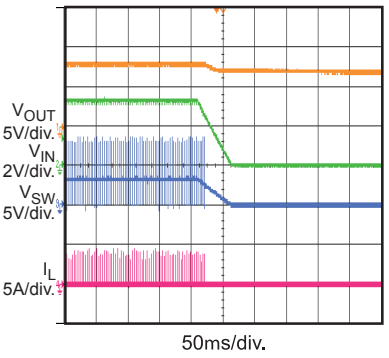
V_{IN} Start Up
I_{OUT} = 0A



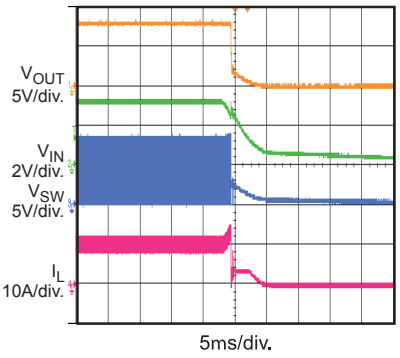
V_{IN} Start Up
I_{OUT} = 3.75A



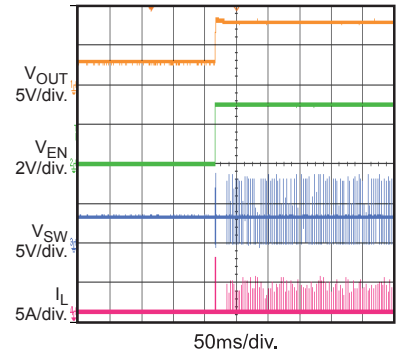
V_{IN} Shutdown
I_{OUT} = 0A



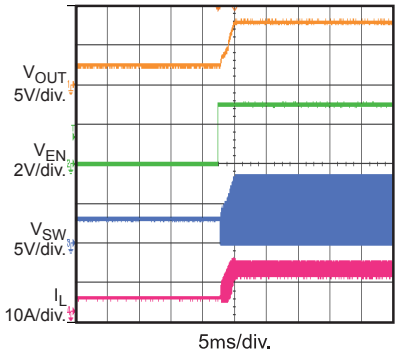
V_{IN} Shutdown
I_{OUT} = 3.75A



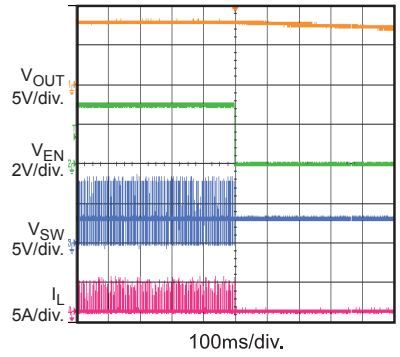
EN Start Up
I_{OUT} = 0A



EN Start Up
I_{OUT} = 3.75A



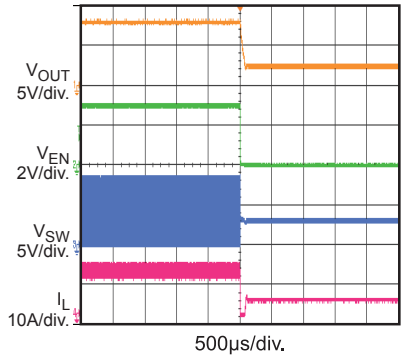
EN Shutdown
I_{OUT} = 0A



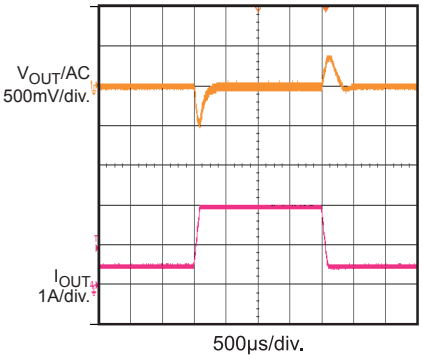
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 3.3V, V_{OUT} = 8V, P_{OUT}=30W, L = 1µH, T_A = 25°C, MODE=float, R_{SENSE}=3.75mΩ, unless otherwise noted.

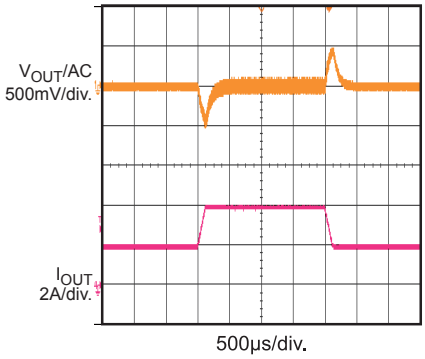
EN Shutdown
I_{OUT} = 3.75A



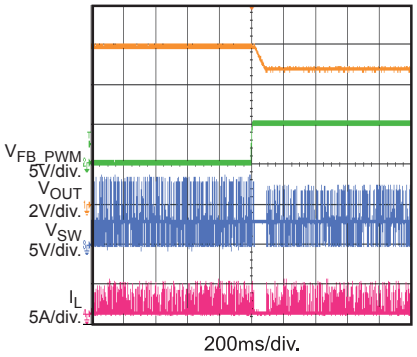
Load Transient
I_{OUT} = 0.5A to 2A, 15mA/µs



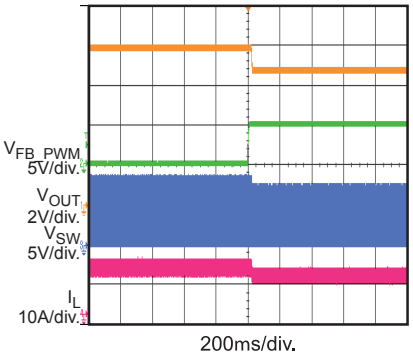
Load Transient
I_{OUT} = 2A to 3.75A, 15mA/µs



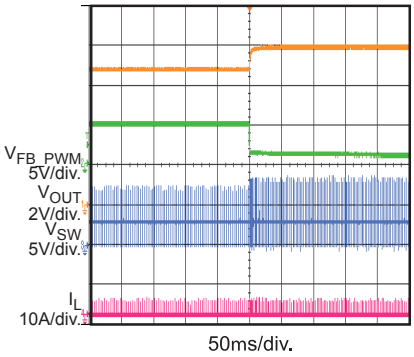
FB Regulate On
FB_PWM=5V, I_{OUT} = 0A



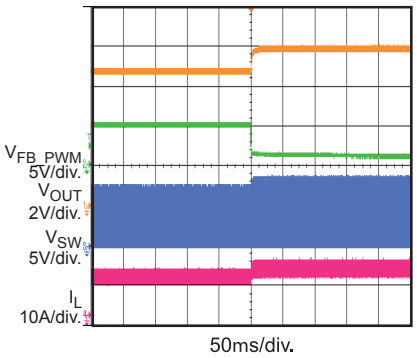
FB Regulate On
FB_PWM=5V, I_{OUT} = 3.75A



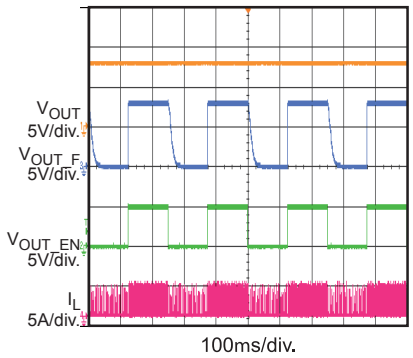
FB Regulate Off
FB_PWM=5V, I_{OUT} = 0A



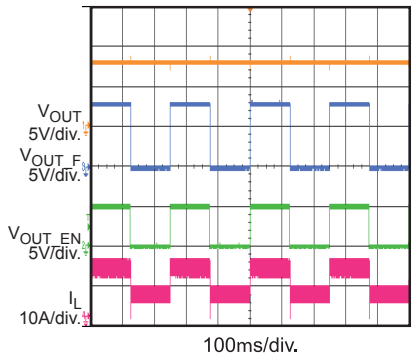
FB Regulate Off
FB_PWM=5V, I_{OUT} = 3.75A



OUT_EN On/Off
I_{OUT} = 0A, I_{OUT_F} = 0A,



OUT_EN On/Off
I_{OUT} = 2A, I_{OUT_F} = 2A,



PRINTED CIRCUIT BOARD LAYOUT

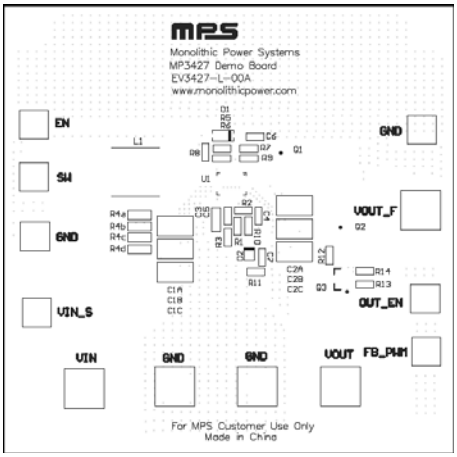


Figure 1: Top Silkscreen Layer

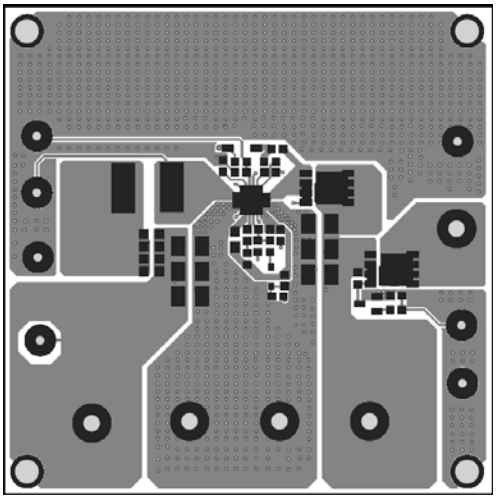


Figure 2: Top Layer

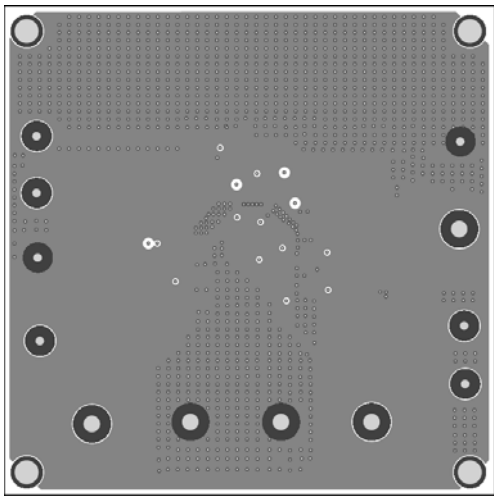


Figure 3: Middle Layer 1

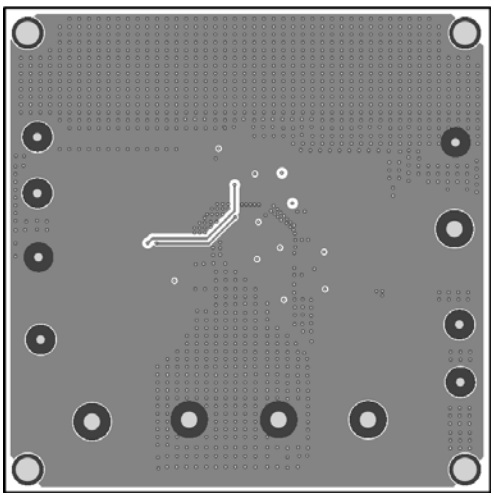


Figure 4: Middle Layer 2

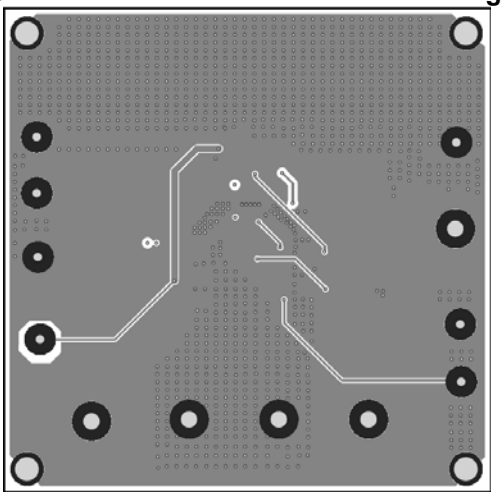


Figure 5: Bottom Layer

QUICK START GUIDE

The output voltage of this board is set to 8V. The board layout accommodates most commonly used inductors and output capacitors. With an input ranging from 3V to 5V, this board can provide load up to 30W. To use this EVB for evaluation, you can do as below:

1. Preset Power Supply to between 3V and 5V.
2. Turn Power Supply off.
3. Preset Load to a value, for example, 1.5A.
4. Connect Power Supply terminals to:
   a. Positive (+): VIN
   b. Negative (–): GND
   c. Connect Load to:
   d. Positive (+): VOUT
   e. Negative (–): GND
5. Turn Power Supply on after making connections. The MP3427 will automatically startup to work.

The output voltage VOUT can be programmed by changing R2. And the value of R2 can be calculated by the following formula:

$$R2 = R1 \times \frac{V_{FB}}{V_{OUT} - V_{FB}}$$

Where R1=187kΩ, and V_{FB}=1.225V.

If EN function is preferred, apply a high level (>1.39V) turns on MP3427, low level (<0.4V) turns off MP3427. After being turned off, output voltage will be discharged to equal to Vin.

If FB_PWM function is use to regulate the output voltage, FB_PWM value and R11 for expected V_{OUT} can be calculated by the below formula:

$$V_{FB\_PWM} = (\frac{V_{FB}}{R2} - \frac{V_{OUT} - V_{FB}}{R1}) \times R11 + V_{FB} + V_F$$

Where, V_F is the DIODE forward voltage. The V_{FB-PWM} control voltage can be provided by a DC voltage source or a PWM voltage source.

If OUT_EN function is used, different OUT_EN signal duty cycle can get different average power on the resistive load.

The default configuration of this board is using external sensing resistor. To use the internal sensing block, first shut off power supply, then connect MODE pin (find it by looking for R8 on the board) to GND through R8 of which the value should be 0Ω. After power-on, MP3427 automatically uses internal sensing resistor.