EVL1654F-TF-00A

16V, 4A, Synchronous Step-Down Converter with FCCM Evaluation Board

DESCRIPTION

The EVL1654F-TF-00A evaluation board is designed to demonstrate the capabilities of the MP1654F, a synchronous, rectified, step-down switch-mode converter with built-in internal power MOSFETs.

The MP1654F can achieve up to 4A of continuous output current (I_{OUT}) from a 4.5V to 16V input voltage (V_{IN}) range, with excellent load and line regulation. The output voltage (V_{OUT}) can be regulated to as low as 0.6V.

Constant-on-time (COT) control provides fast transient response, easy loop design, and tight output regulation. Full protection features include short-circuit protection (SCP), over-current protection (OCP), under-voltage protection (UVP), and thermal shutdown.

The MP1654F requires a minimal number of readily available, standard external components, and is available in an ultra-small SOT563 package.

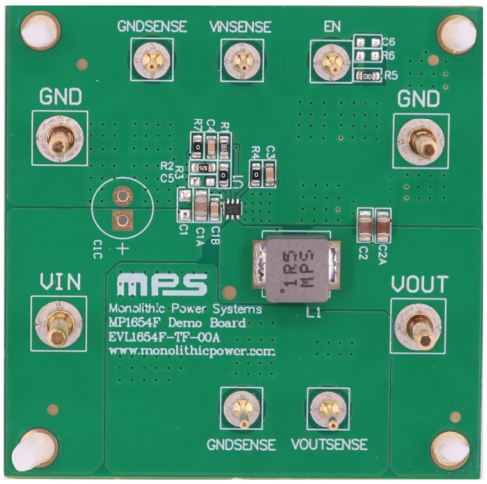
PERFORMANCE SUMMARY

Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		4.5V to 16V
Output voltage (V_{OUT})	V_{IN} = 4.5V to 16V, I_{OUT} = 0A to 4A	3.3V
Maximum output current (I_{OUT})	V_{IN} = 4.5V to 16V	4A
Full load efficiency	V_{IN} = 12V, V_{OUT} = 3.3V, I_{OUT} = 4A	89.6%
Peak efficiency	V_{IN} = 12V, V_{OUT} = 3.3V, I_{OUT} = 1A	94.0%
Switching frequency (f_{SW})		1100kHz

MPL Optimized Performance with MPS Inductor MPL-AL6050 Series

EVL1654F-TF-00A EVALUATION BOARD



LxWxH (50mmx50mmx1.6mm)

2-Layers, 2oz/2oz

Board Number	MPS IC Number
EVL1654F-TF-00A	MP1654FGTF

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QUICK START GUIDE

The EVL1654F-TF-00A evaluation board is easy to set up and use to evaluate the performance of the MP1654F. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Preset the power supply to 12V, then turn off the power supply. (1)
2. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
3. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
4. After making the connections, turn on the power supply. The board should automatically start up.
5. Check for the proper output voltage (V_{OUT}) between the VOUTSENSE and GNDSENSE terminals.
6. Once the proper V_{OUT} is established, adjust the load within the operating range and measure the efficiency, V_{OUT} ripple, and other parameters. (2)
7. After completing all tests, adjust the load to 0A, then turn off the input power supply.

Notes:

1) Ensure that V_{IN} does not exceed 16V.
2) When measuring the V_{OUT} or V_{IN} ripple, do not use the long ground lead on the oscilloscope probe.

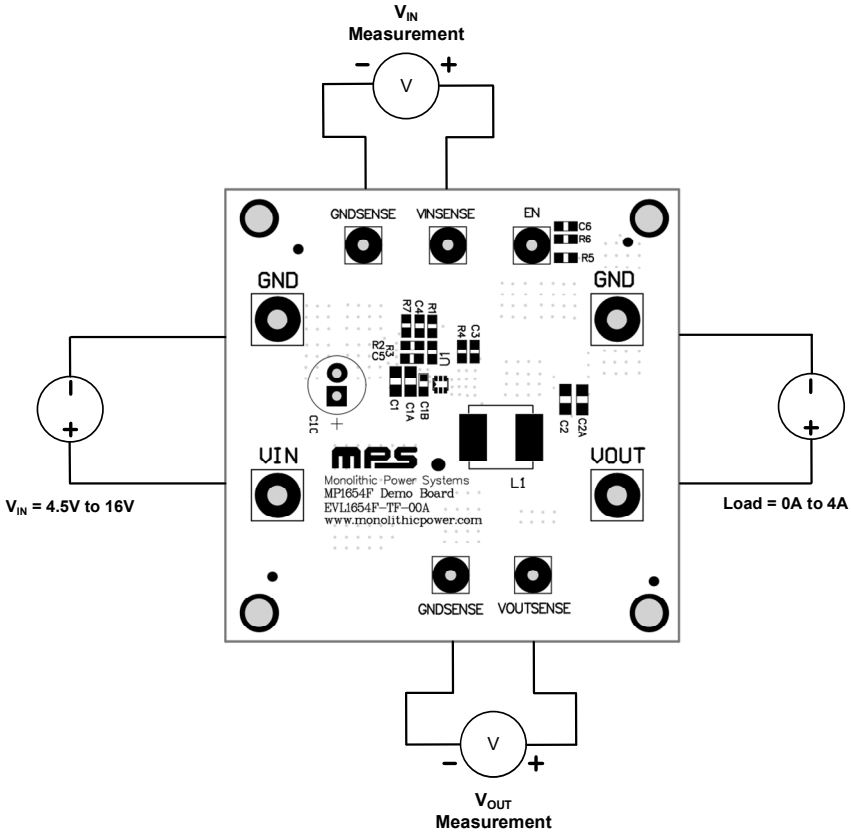

Figure 1: Proper Measurement Equipment Set-Up

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EVALUATION BOARD SCHEMATIC

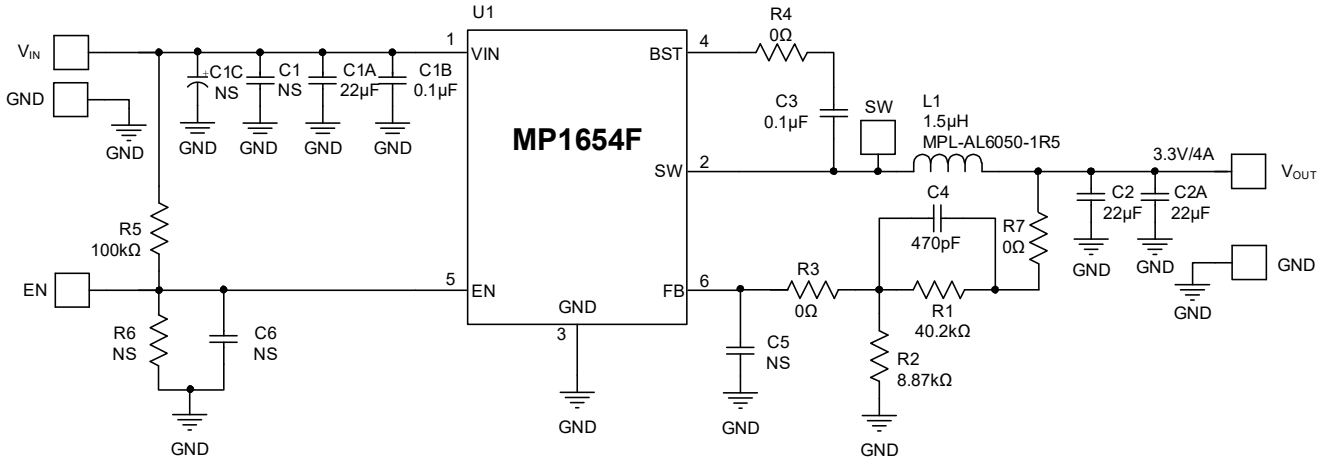

Figure 2: Evaluation Board Schematic

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EVL1654F-TF-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1A	22µF	Ceramic capacitor, 25V, X5R	0805	Murata	GRM21BR61E226ME44L
0	C1, C1C, C5, C6	NS				
2	C2, C2A	22µF	Ceramic capacitor, 16V, X5R	0805	Murata	GRM21BR61C226ME44L
2	C1B, C3	0.1µF	Ceramic capacitor, 25V, X7R	0603	Wurth	885012206071
1	C4	470pF	Ceramic capacitor, 50V, X7R	0603	Wurth	885012206081
1	R1	40.2kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-0740K2L
1	R2	8.87kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-078K87L
3	R3, R4, R7	0Ω	Thick film resistor, 1%	0603	Yageo	RC0603FR-070RL
1	R5	100kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-07100KL
0	R6	NS				
1	L1	1.5µH	Inductor, D_{CR} = 6mΩ, I_{SAT} = 18A	6.6mmx 6.4mmx 4.8mm	MPS	MPL-AL6050-1R5
1	U1	MP1654F	16V, 4A, synchronous step-down converter	SOT563 (1.6mmx 1.6mm)	MPS	MP1654FGTF

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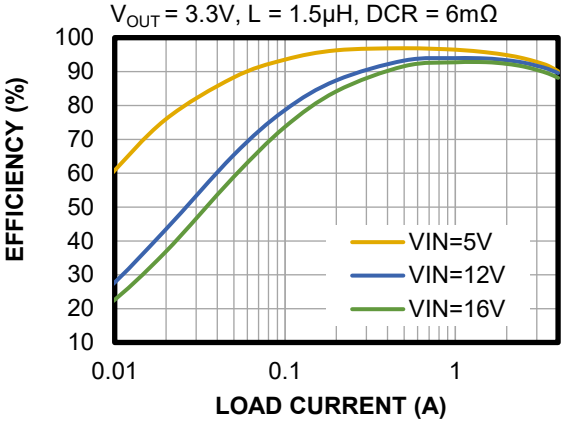
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 3.3V, T_A = 25°C, unless otherwise noted.

Efficiency vs. Load Current

V_{OUT} = 3.3V, L = 1.5µH, DCR = 6mΩ



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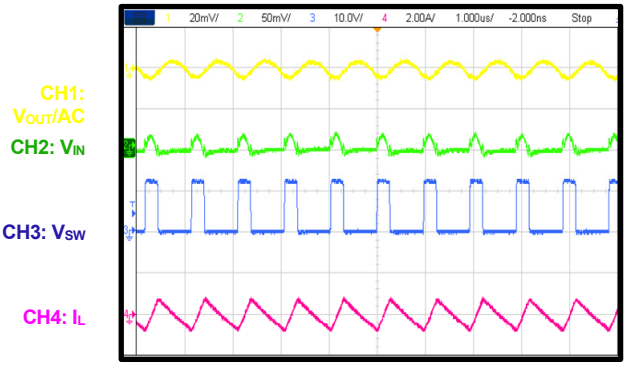
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 3.3V, T_A = 25°C, unless otherwise noted.

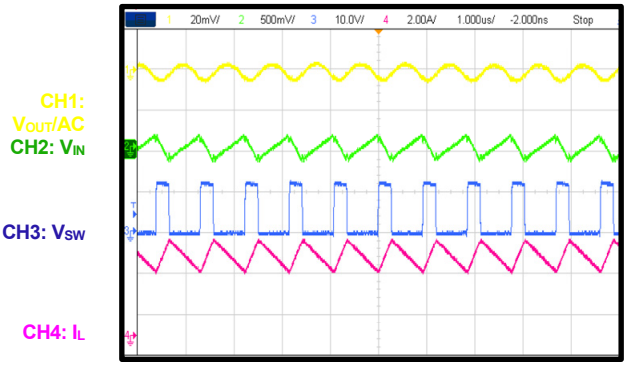
Steady State and Output Ripple

I_{OUT} = 0A



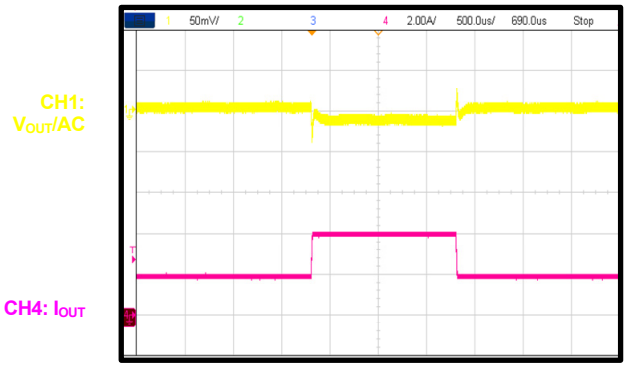
Steady State and Output Ripple

I_{OUT} = 4A



Load Transient Output Ripple

I_{OUT} = 2A to 4A, slew rate = 2.5A/µs (e-load)



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PCB LAYOUT

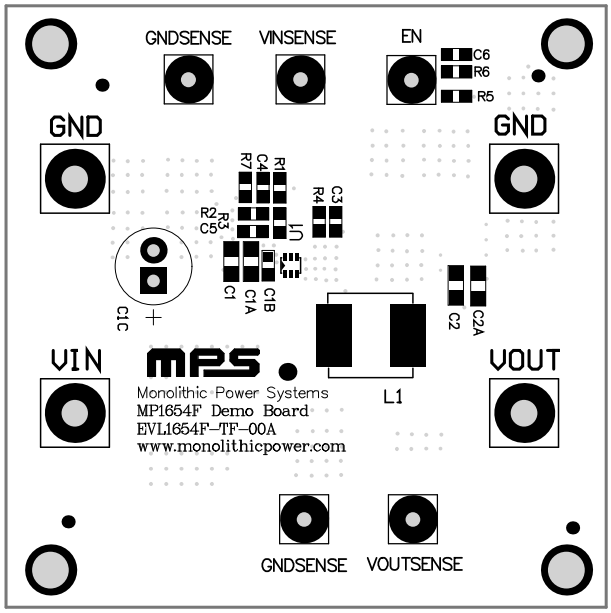

Figure 3: Top Silk

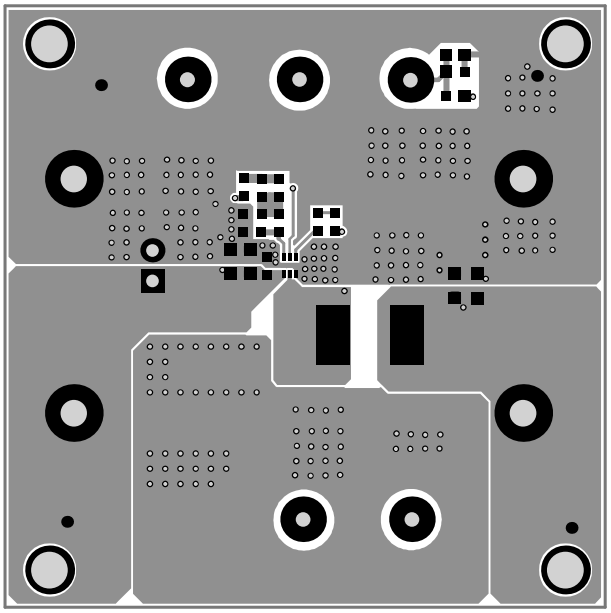

Figure 4: Top Layer

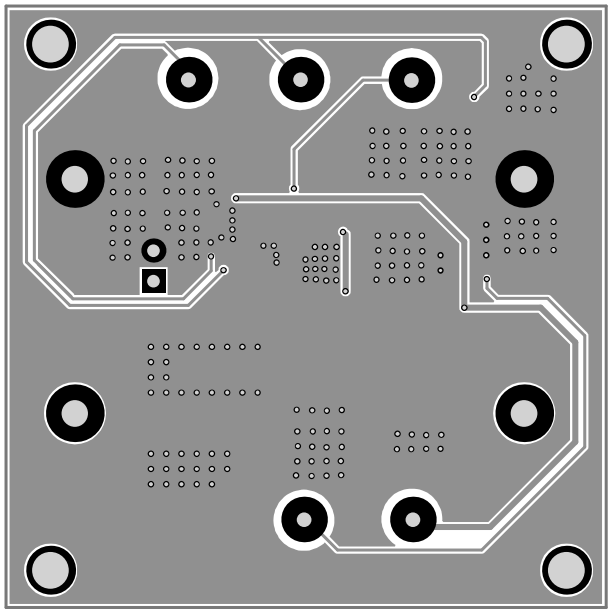

Figure 5: Bottom Layer

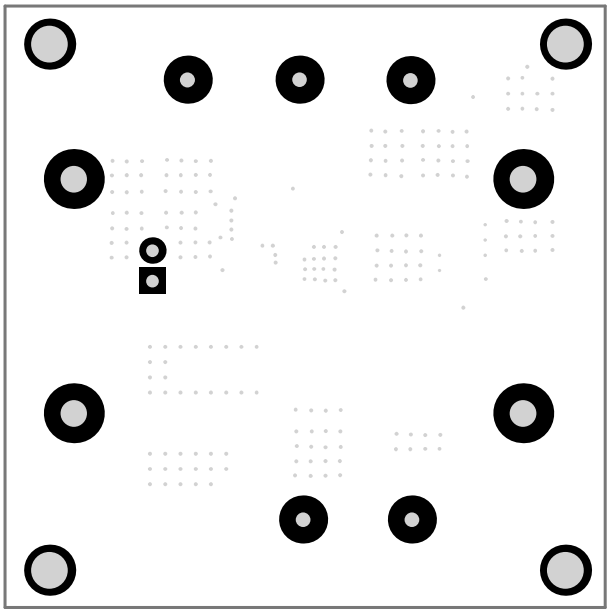

Figure 6: Bottom Silk

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REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	9/18/2025	Initial Release	-

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