



EVL1604-TL-00A

5.5V, 4A, Synchronous Step-Down Converter in SOT583 Package Evaluation Board

DESCRIPTION

The EVL1604-TL-00A evaluation board is designed to demonstrate the capabilities of the MP1604, a monolithic, step-down switch-mode converter with built-in internal power MOSFETs.

The MP1604 can achieve up to 4A of continuous output current (I_{OUT}) from a 2.4V to 5.5V input voltage (V_{IN}) range, with excellent load and line regulation. The output voltage (V_{OUT}) can be regulated to as low as 0.4V.

Constant-on-time (COT) control provides fast transient response, easy loop design, and tight output regulation.

Full protection features include over-current protection (OCP), current limiting with hiccup mode, and thermal shutdown.

The MP1604 requires a minimal number of readily available, standard external components, and it is available in an ultra-small SOT583 package.

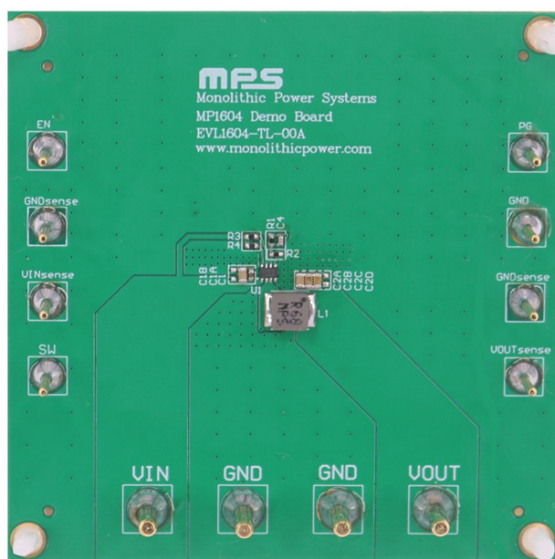
PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		2.4V to 5.5V
Output voltage (V_{OUT})	$V_{IN} = 2.4\text{V to } 5.5\text{V}$, $I_{OUT} = 0\text{A to } 4\text{A}$	1.2V
Maximum output current (I_{OUT})	$V_{IN} = 2.4\text{V to } 5.5\text{V}$	4A
Typical efficiency	$V_{IN} = 5\text{V}$, $V_{OUT} = 1.2\text{V}$, $I_{OUT} = 4\text{A}$	89.9%
Peak efficiency	$V_{IN} = 5\text{V}$, $V_{OUT} = 1.2\text{V}$, $I_{OUT} = 1.5\text{A}$	93.2%
Switching frequency (f_{SW})		1.2MHz

 Optimized Performance with MPS Inductor MPL-AL4020 Series

EVL1604-TL-00A EVALUATION BOARD



LxWxH (6.35cmx6.35cmx1.8cm)

Board Number	MPS IC Number
EVL1604-TL-00A	MP1604GTL

QUICK START GUIDE

The EVL1604-TL-00A evaluation board is easy to set up and use to evaluate the performance of the MP1604. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Preset the power supply to 5V, 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 5.5V.
- 2) When measuring the V_{OUT} or V_{IN} ripple, do not use the long ground lead on the oscilloscope probe.

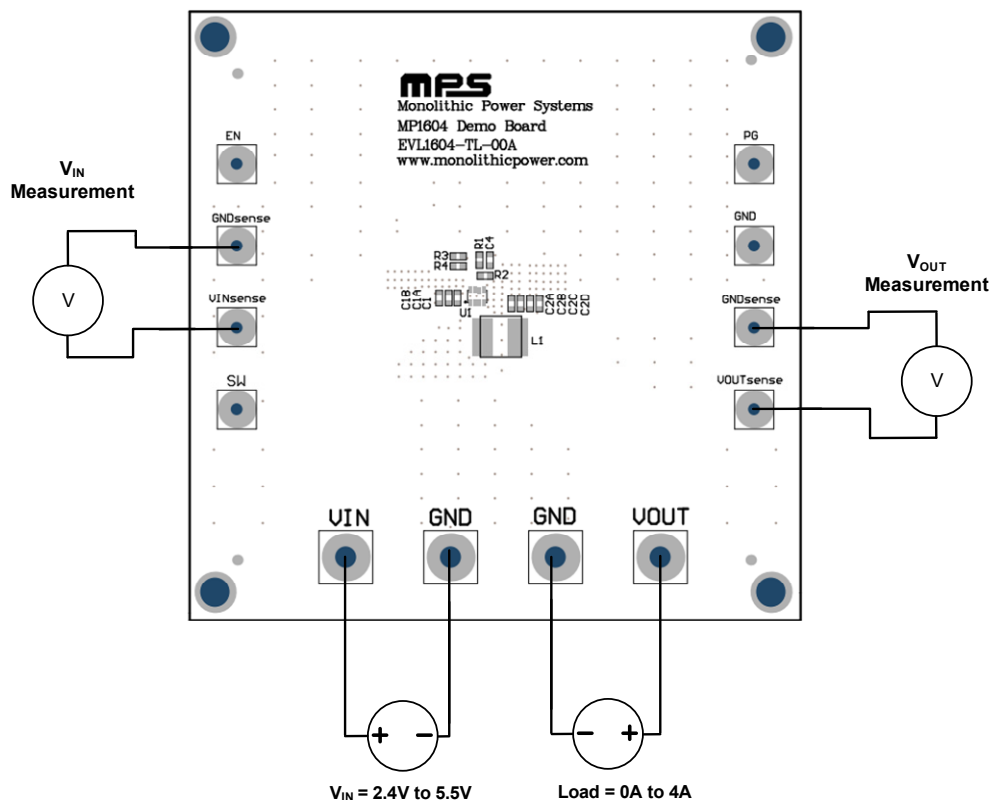


Figure 1: Proper Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

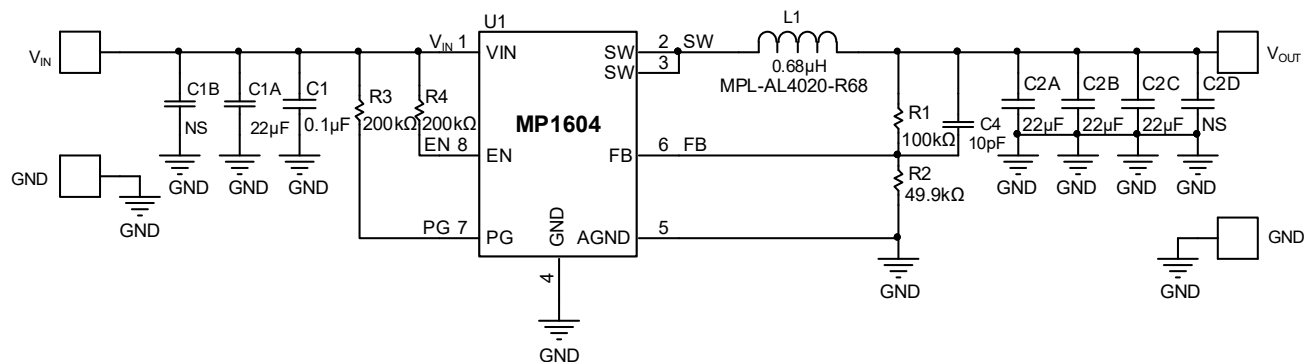


Figure 2: Evaluation Board Schematic

Note:

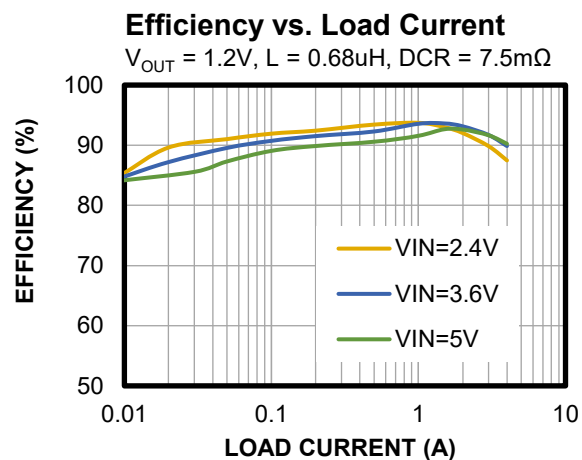
- 3) If $V_{IN} < 3.3V$, additional input capacitance may be required.

EVL1604-TL-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1	0.1 μ F	Ceramic capacitor, 16V, X7R	0402	Murata	GRM155R71C104KA88D
4	C1A, C2A, C2B, C2C	22 μ F	Ceramic capacitor, 16V, X7R	0603	Samsung	GRM188R61C226ME01D
0	C2D	NS				
1	C4	10pF	Ceramic capacitor, 50V, X7R	0402	Wurth	885012005040
1	R1	100k Ω	Film resistor, 1%	0402	Yageo	RC0402FR-07100KL
1	R2	49.9k Ω	Film resistor, 1%	0402	Yageo	RC0402FR-0749K9L
2	R3, R4	200k Ω	Film resistor, 1%	0402	Yageo	RC0402FR-07200KL
1	L1	0.68 μ H	Inductor, $D_{CR} = 7.5\text{m}\Omega$, $I_{SAT} = 11\text{A}$	4.1mmx 4.1mmx 1.9mm	MPS	MPL-AL4020-R68
1	U1	MP1604	5.5V, 4A, synchronous step- down converter	SOT583 (1.6mmx 2.1mm)	MPS	MP1604GTL

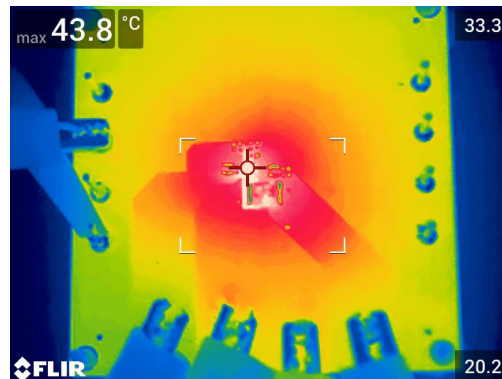
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 5V$, $V_{OUT} = 1.2V$, $T_A = 25^{\circ}C$, unless otherwise noted.



Thermal Performance

$I_{OUT} = 4A$, no forced airflow, $T_{CASE} = 43.8^{\circ}C$

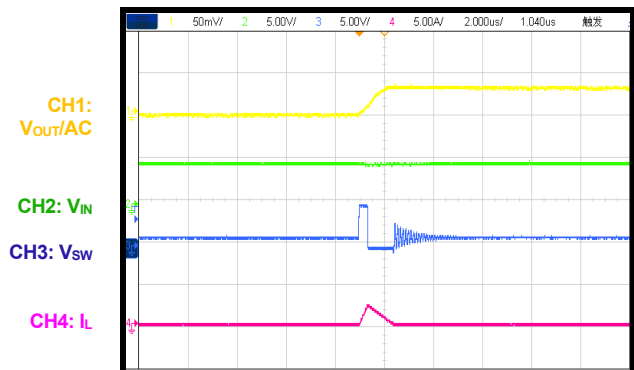


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 5V$, $V_{OUT} = 1.2V$, $T_A = 25^{\circ}C$, unless otherwise noted.

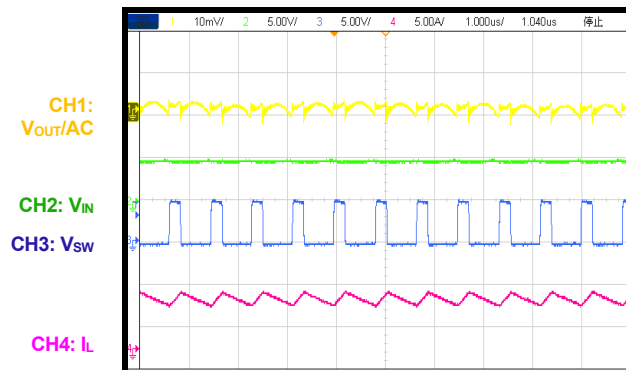
Output Voltage Ripple

$V_{IN} = 5V$, $V_{OUT} = 1.2V$, $I_{OUT} = 0A$



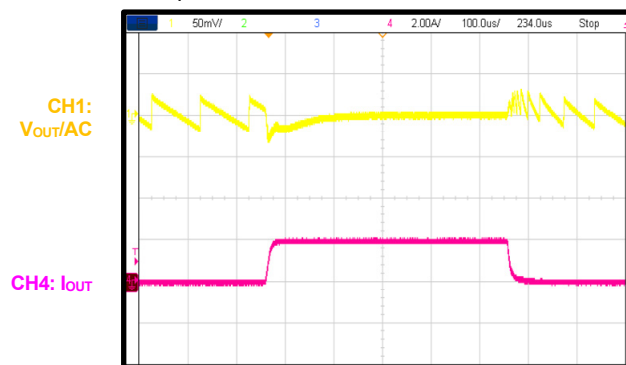
Output Voltage Ripple

$V_{IN} = 5V$, $V_{OUT} = 1.2V$, $I_{OUT} = 4A$



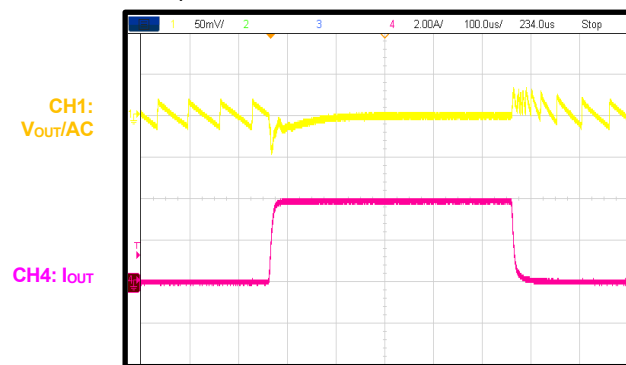
Load Transient Response

$V_{IN} = 5V$, $V_{OUT} = 1.2V$, $I_{OUT} = 0A$ to $2A$,
 $2.5A/\mu s$ with e-load



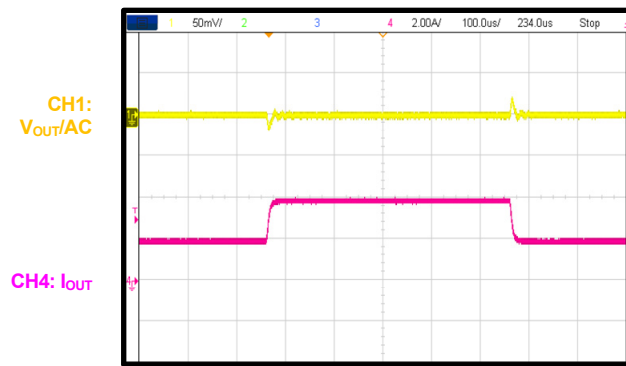
Load Transient Response

$V_{IN} = 5V$, $V_{OUT} = 1.2V$, $I_{OUT} = 0A$ to $4A$,
 $2.5A/\mu s$ with e-load



Load Transient Response

$V_{IN} = 5V$, $V_{OUT} = 1.2V$, $I_{OUT} = 2A$ to $4A$,
 $2.5A/\mu s$ with e-load



PCB LAYOUT

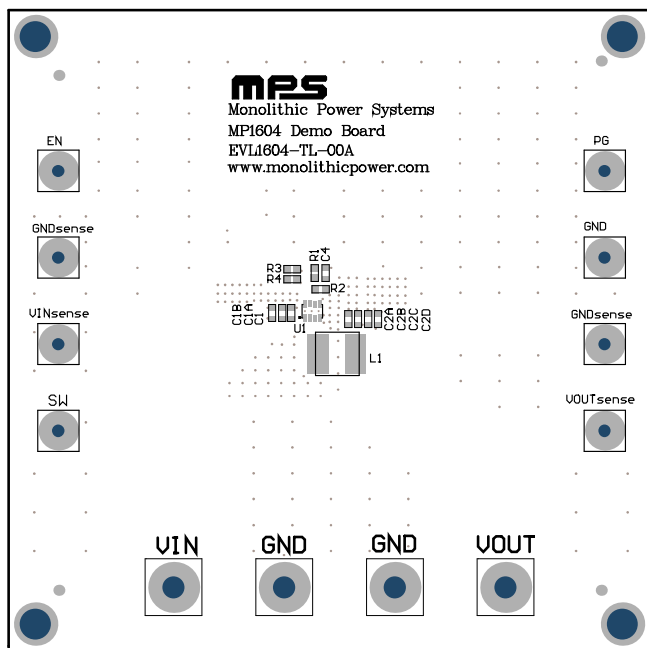


Figure 3: Top Silk

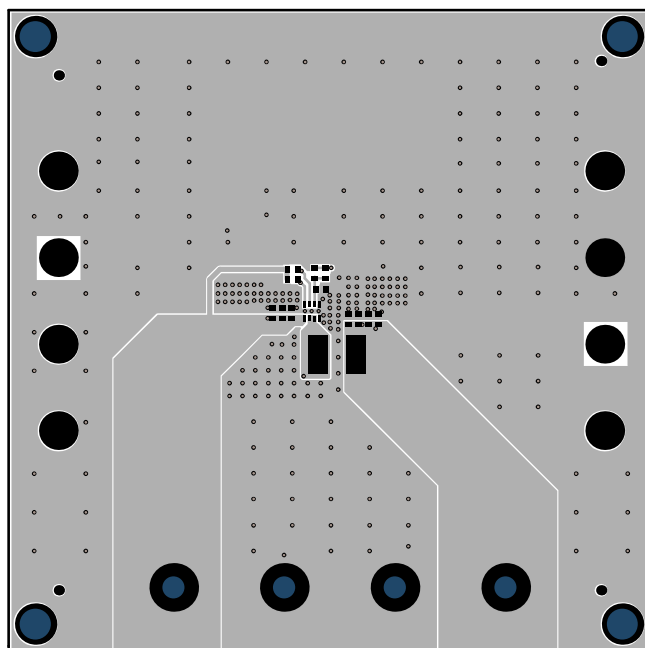


Figure 4: Top Layer

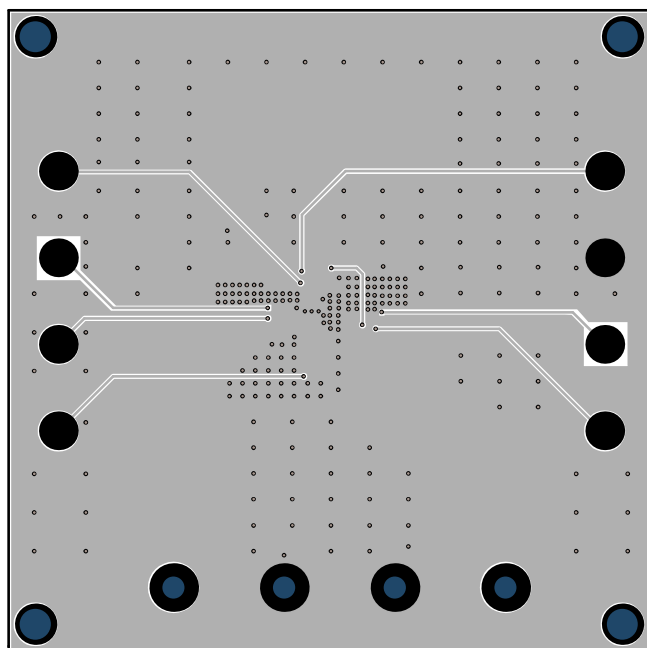


Figure 5: Bottom Layer



REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	5/30/2024	Initial Release	-

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