EV9151-D-00A

20V, 4A 800kHz Synchronous Step-down Converter EV Board

DESCRIPTION

The EV9151-D-00A is for demonstrating MPS's MP9151, a high-frequency, synchronous, rectified, step-down, switch-mode converter with internal power MOSFETs. MP9151 offers a very compact solution to achieve 4A continuous output current over a wide input supply range with excellent load and line regulation. The MP9151 operates at high efficiency over a wide output current load range.

Current-mode operation provides fast transient response and eases loop stabilization. The full protection features include over-current protection and thermal shutdown.

The MP9151 requires a minimal number of readily-available standard external components and comes in a space saving 2×3mm 14-pin QFN package.

FEATURES

- Wide 5V to 20V Operating Input Range
- 4A Output Current
- Low $R_{DS(ON)}$ Internal Power MOSFETs
- Programmable Switching Frequency from 300kHz to 1.6MHz
- EN ON/OFF Control
- Power Good Indicator
- External Soft Start
- OCP and Thermal Shutdown
- Available in 14-pin QFN2x3 Package

APPLICATIONS

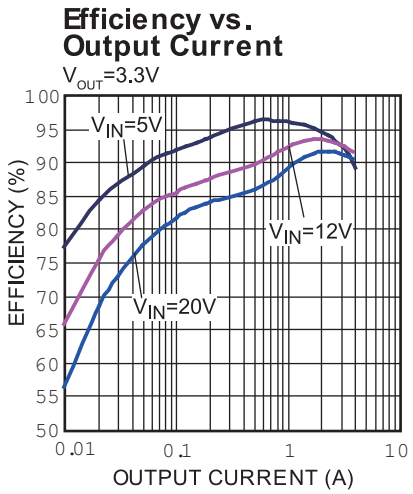
- DSL Modems
- Cable Modems
- Set Top Boxes

ELECTRICAL SPECIFICATION

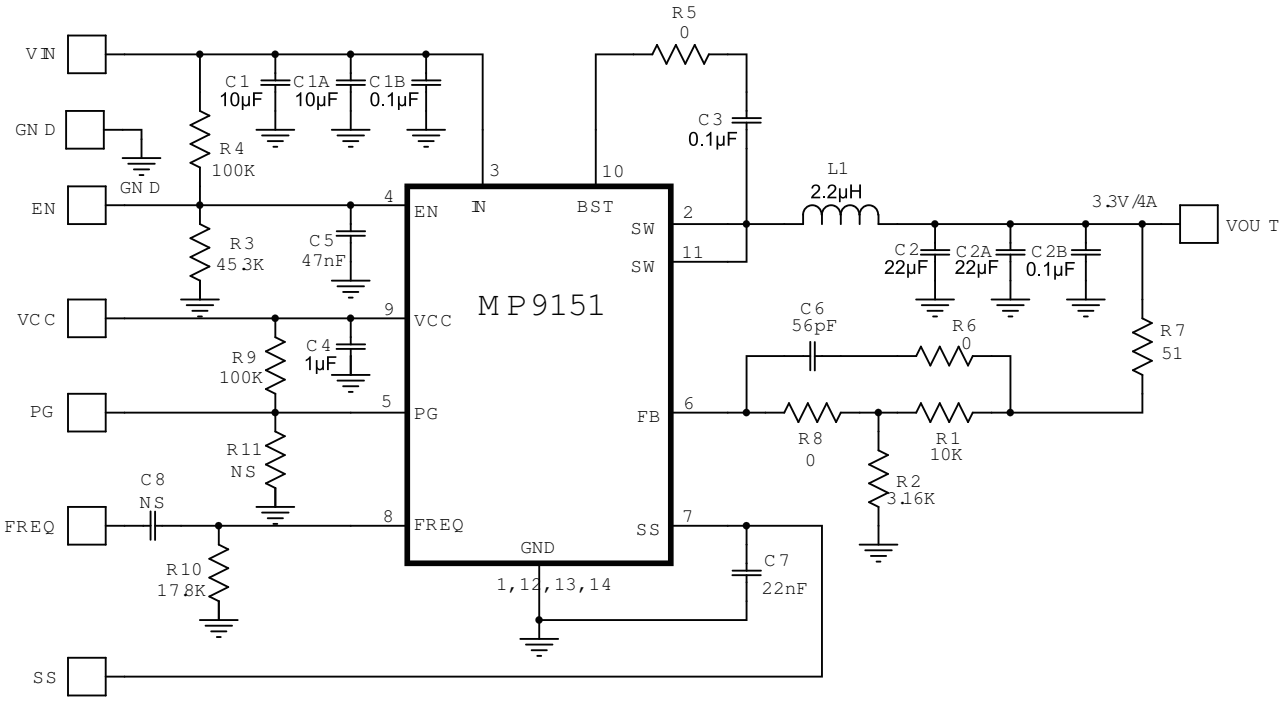
Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	5 – 20	V
Output Voltage	V_{OUT}	3.3	V
Output Current	I_{OUT}	4	A

EV9151-D-00A EVALUATION BOARD

Board Number	MPS IC Number
EV9151-D-00A	MP9151GD



EVALUATION BOARD SCHEMATIC



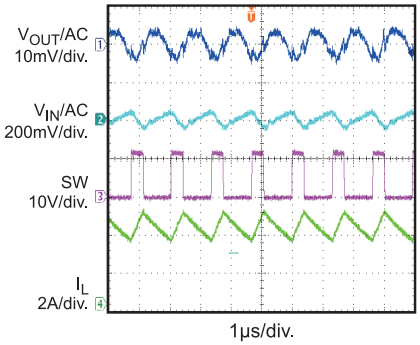
EV9151-D-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
2	C1, C1A	10µF	Ceramic Cap., 25V, X7R	1210	MuRata	GRM32DR71E106KA12L
2	C1B,C2B	0.1µF	Ceramic Cap., 25V, X7R	0805	MuRata	GRM21BR71E104KA01L
2	C2, C2A	22µF	Ceramic Cap., 10V, X7R	1210	MuRata	GRM32ER71A226KE20L
1	C3	0.1µF	Ceramic Cap., 25V, X7R	0603	MuRata	GRM188R71E104KA01D
1	C4	1µF	Ceramic Cap., 16V, X7R	0603	MuRata	GRM188R71C105KA12D
1	C5	47nF	Ceramic Cap., 16V, X7R	0603	MuRata	GRM188R71C473KA01D
1	C6	56pF	Ceramic Cap., 50V, C0G	0603	Murata	GRM1885C1H560JA01D
1	C7	22nF	Ceramic Cap., 50V, X7R	0603	Murata	GRM188R71H223KA01D
1	R1	10kΩ	Film Res., 1%	0603	Yageo	RC0603FR-0710KL
1	R2	3.16kΩ	Film Res., 1%	0603	Yageo	RC0603FR-073K16L
1	R3	45.3kΩ	Film Res., 1%	0603	Yageo	RC0603FR-0745K3L
2	R4, R9	100kΩ	Film Res., 1%	0603	Yageo	RC0603FR-07100KL
3	R5, R6, R8	0	Film Res., 1%	0603	Yageo	RC0603JR-070RL
1	R7	51Ω	Film Res.,1%	0603	Yageo	RC0603FR-0751RL
1	R10	17.8kΩ	Film Res., 1%	0603	Yageo	RC0603FR-0717K8L
0	R11, C8	NS				
1	L1	2.2µH	DCR=11.4mΩ, Is=13A	7x7x4mm	Wurth	744311220
1	U1	MP9151	Step-Down Converter	QFN14 (2x3)	MPS	MP9151GD

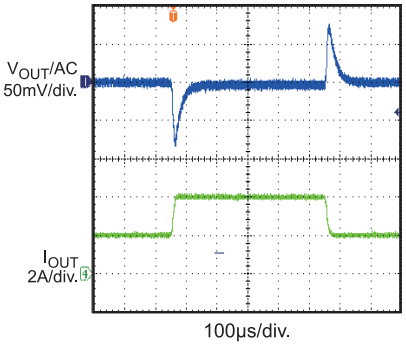
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN} = 12V, V_{OUT} = 3.3V, L = 2.2μH, f_{SW}=800kHz, T_A = +25°C, unless otherwise noted.

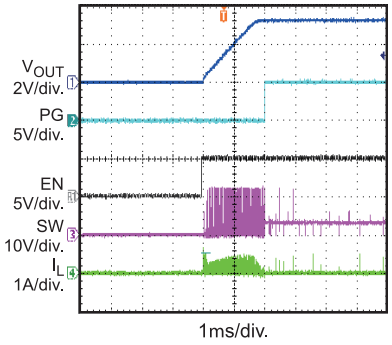
Input / Output Ripple
I_{OUT} = 4A



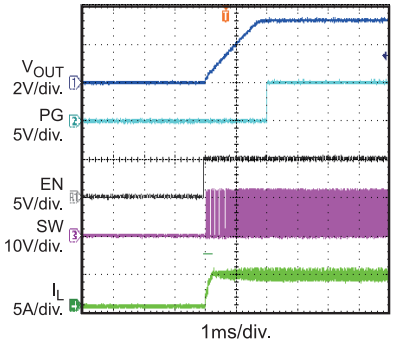
Load Transient Reponse
I_{OUT} = 2A-4A, 250mA/μs



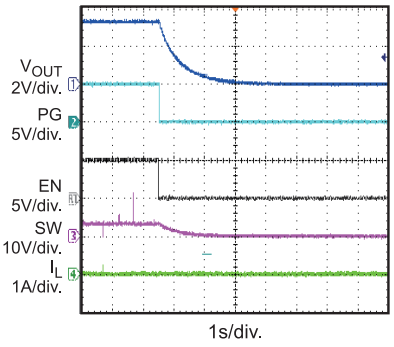
Startup through Enable
I_{OUT} = 0A



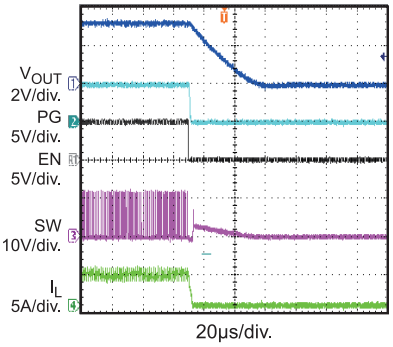
Startup through Enable
I_{OUT} = 4A



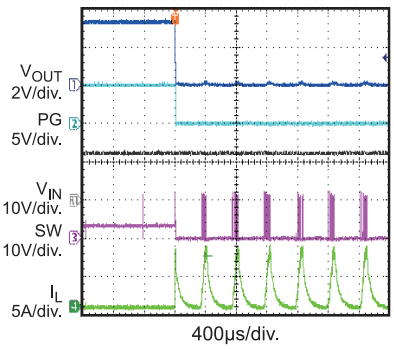
Shutdown through Enable
I_{OUT} = 0A



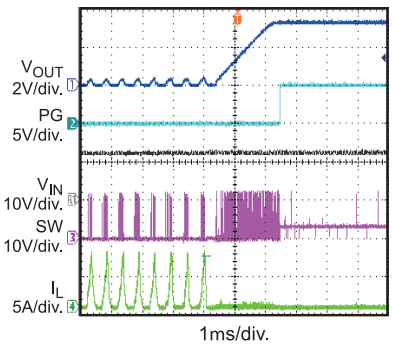
Shutdown through Enable
I_{OUT} = 4A



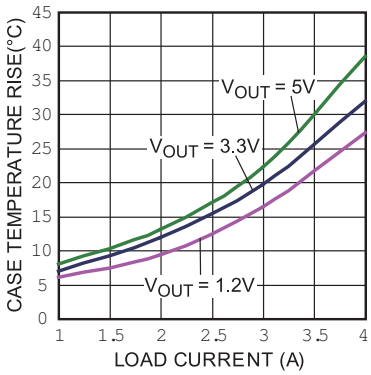
Short Entry
I_{OUT} = 0A



Short Recovery
I_{OUT} = 0A



Case Temperature Rise vs. Output Current
V_{IN} = 12V, I_{OUT} = 1A-4A, T_A = 21.5°C



PRINTED CIRCUIT BOARD LAYOUT

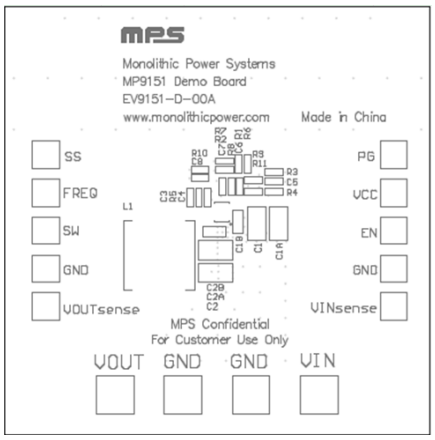


Figure 1—Top Silk Layer

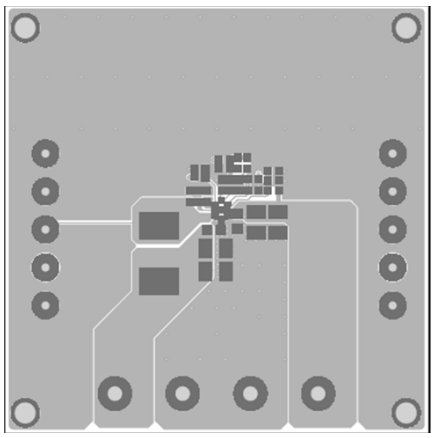


Figure 2—Top Layer

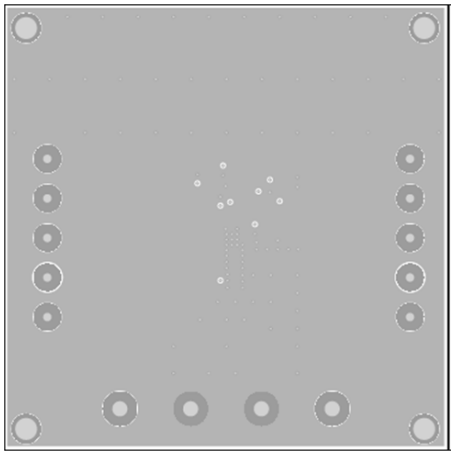


Figure 3—Inner 1 Layer

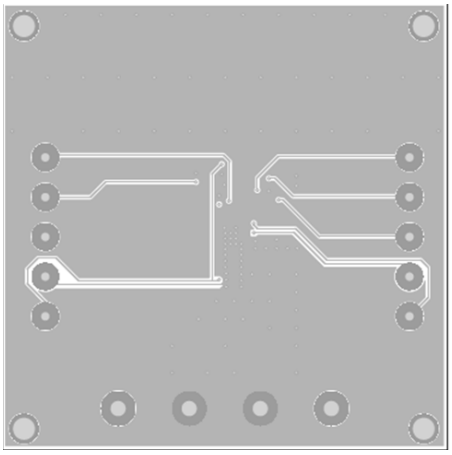


Figure 4— Inner 2 Layer

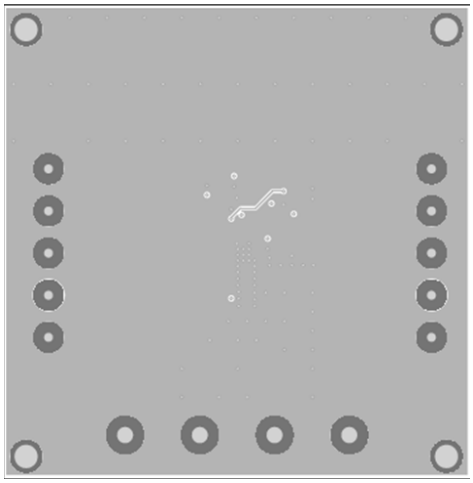


Figure 5— Bottom Layer

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 between 5V and 20V, and then turn off the power supply.
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 board will automatically start up.
5. To use the Enable function, apply a digital input to the EN pin. Drive EN higher than 1.6V to turn on the regulator or less than 0.4V to turn it off.
6. Change the external resistor from FREQ pin to GND to set frequency from 300kHz to 1.6MHz.