

### 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 2x3mm 14-pin QFN package.

### 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     |

### 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

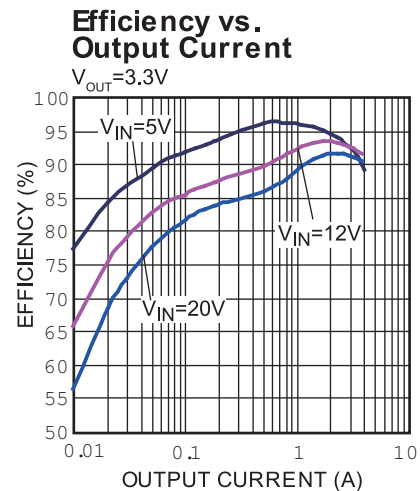
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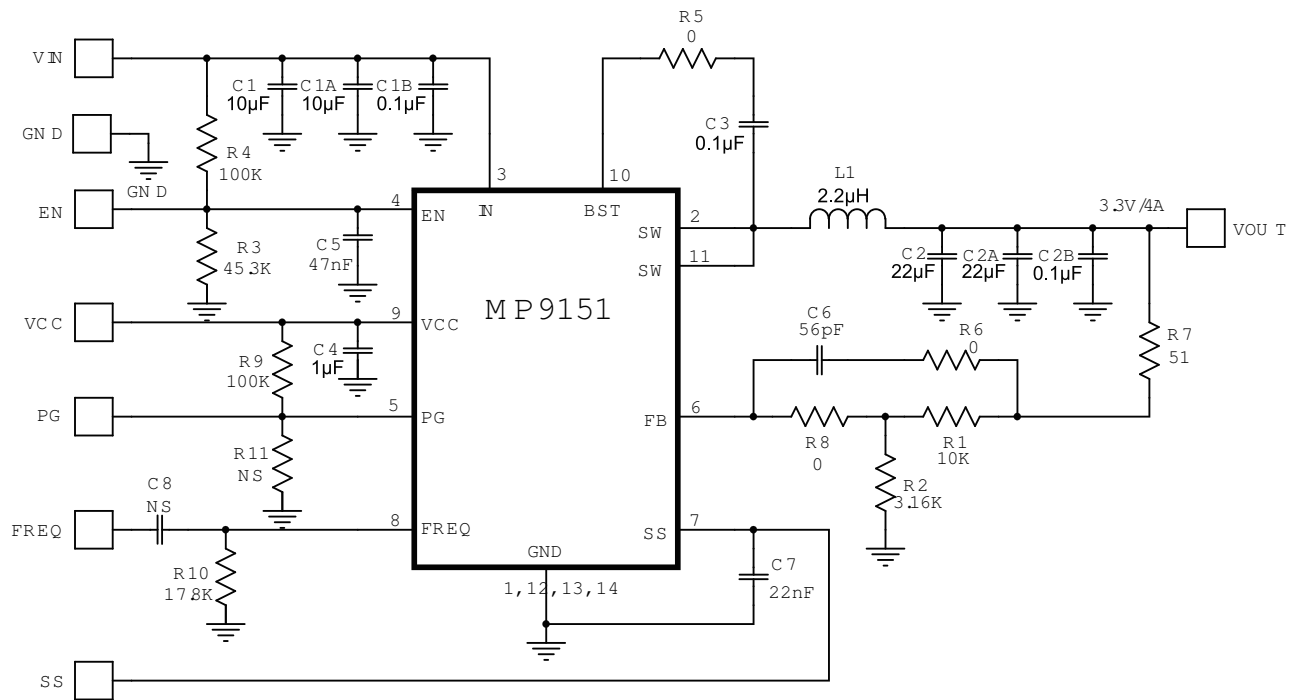
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### EV9151-D-00A EVALUATION BOARD



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



**EVALUATION BOARD SCHEMATIC**

**EV9151-D-00A BILL OF MATERIALS**

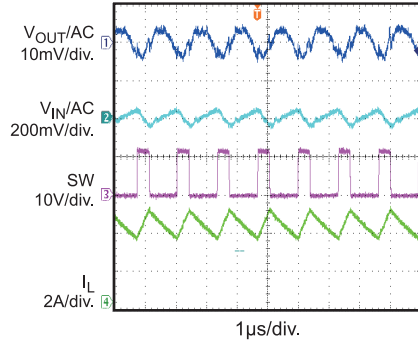
| Qty | Ref        | Value  | Description            | Package     | Manufacturer | Part Number        |
|-----|------------|--------|------------------------|-------------|--------------|--------------------|
| 2   | C1, C1A    | 10µF   | Ceramic Cap., 25V, X7R | 1210        | MuRata       | GRM32DR71E106KA12L |
| 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

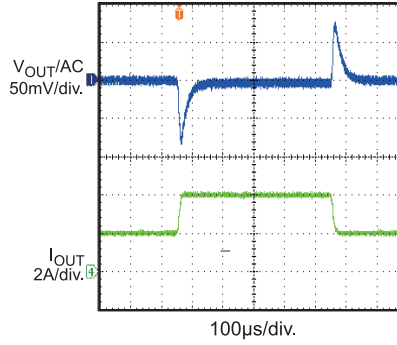
Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$ ,  $V_{OUT} = 3.3V$ ,  $L = 2.2\mu H$ ,  $f_{SW} = 800kHz$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

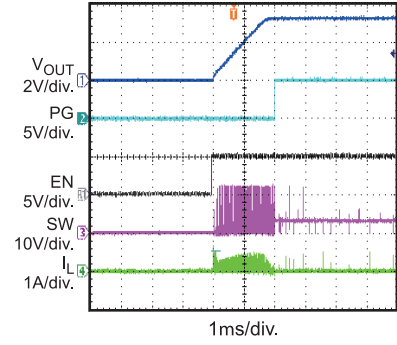
**Input / Output Ripple**  
 $I_{OUT} = 4A$



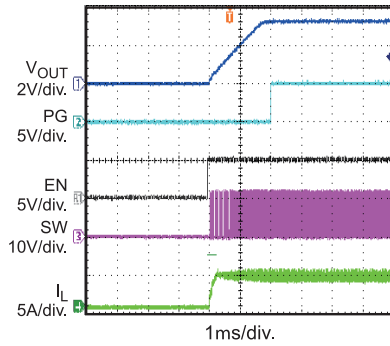
**Load Transient Reponse**  
 $I_{OUT} = 2A-4A, 250mA/\mu s$



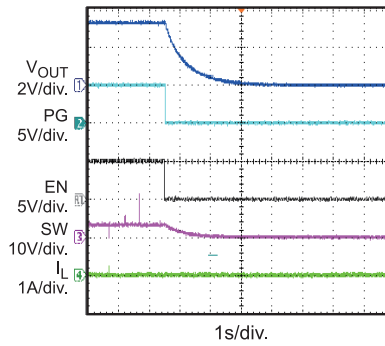
**Startup through Enable**  
 $I_{OUT} = 0A$



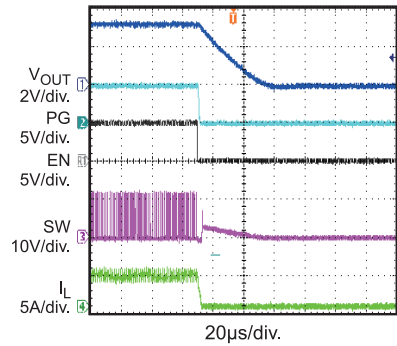
**Startup through Enable**  
 $I_{OUT} = 4A$



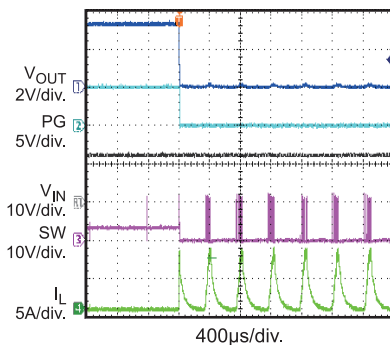
**Shutdown through Enable**  
 $I_{OUT} = 0A$



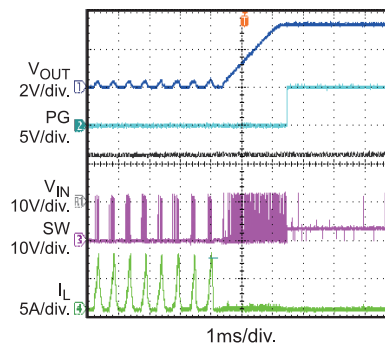
**Shutdown through Enable**  
 $I_{OUT} = 4A$



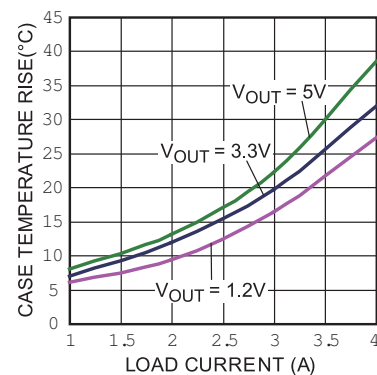
**Short Entry**  
 $I_{OUT} = 0A$



**Short Recovery**  
 $I_{OUT} = 0A$



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



### PRINTED CIRCUIT BOARD LAYOUT

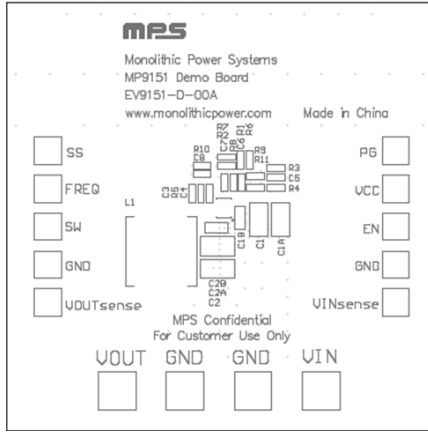


Figure 1—Top Silk Layer

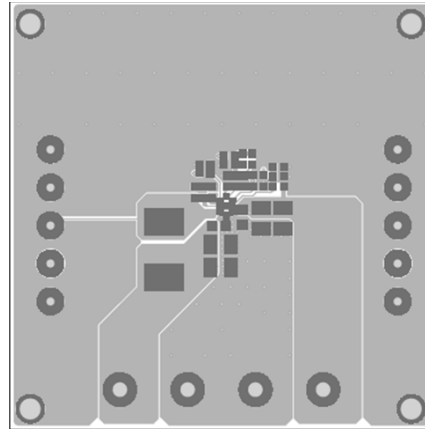


Figure 2—Top Layer

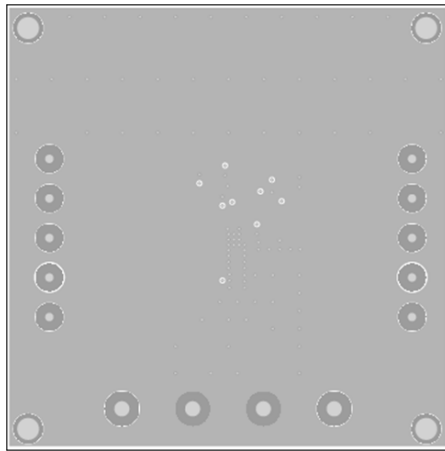


Figure 3—Inner 1 Layer

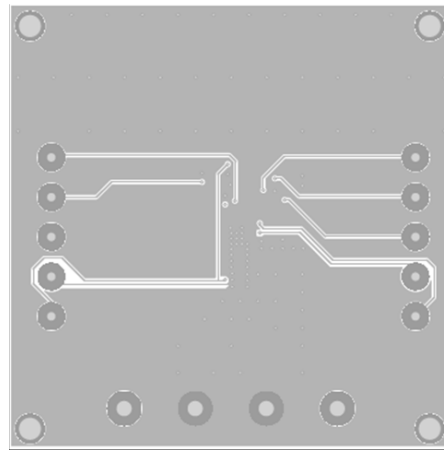


Figure 4— Inner 2 Layer

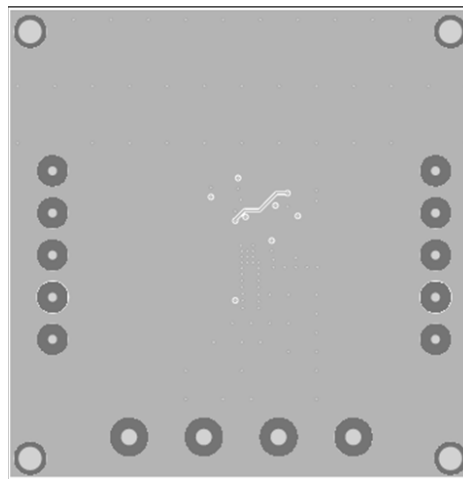


Figure 5— Bottom Layer

## 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.

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