EV24943DN-00A

3A, 55V, 100kHz Step-Down Converter with Programmable Output OVP Evaluation Board

The Future of Analog IC Technology

DESCRIPTION

The EV24943DN-00A is an evaluation board for the MP24943. The MP24943 is a monolithic step-down switch mode converter. It achieves 3A continuous output current over a wide input supply range with excellent load and line regulation. An external 4ms soft start setting prevents inrush current at turning on.

MP24943 achieves low EMI signature with well controlled switching edges.

Fault condition protection includes short circuit protection, programmable output over voltage protection and thermal shutdown.

The MP24943 requires a minimum number of readily available standard external components.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	8 to 55	V
Output Voltage	V_{OUT}	5	V
Output OVP	V_{OVP}	6	V

FEATURES

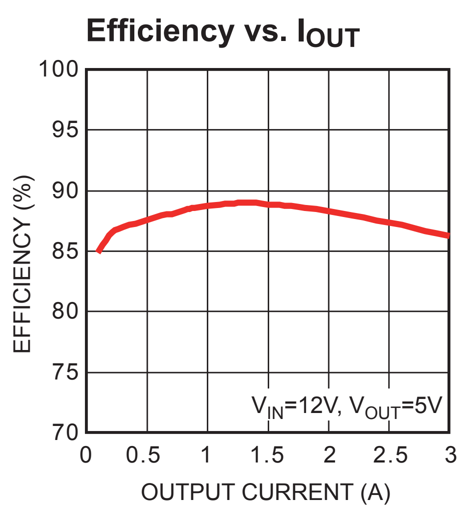
- Wide 8V to 55V Operating Input Range
- 3A Output Current
- Programmable Output Over Voltage Protection
- External 4ms Soft Start Setting
- Stable with Low ESR Output Ceramic Capacitors
- Fixed 100kHz Frequency
- Low EMI Signature
- Thermal Shutdown
- Short Circuit Protection

APPLICATIONS

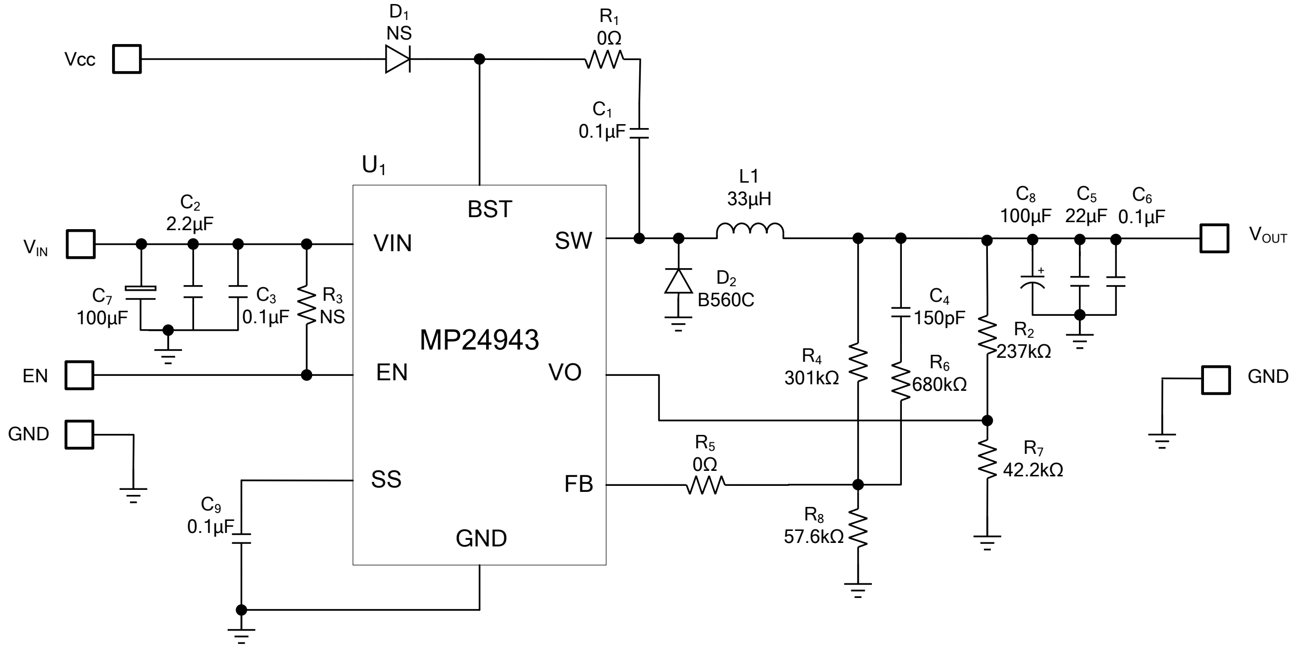
- Automotive GPS
- Car DVD
- Power Supply for Linear Chargers

EV24943DN-00A EVALUATION BOARD

Board Number	MPS IC Number
EV24943DN-00A	MP24943



EVALUATION BOARD SCHEMATIC



EV24943DN-00A BILL OF MATERIALS

Qty	RefDes	Value	Description	Package	Manufacturer	Manufacturer P/N
3	C1,C6, C9	0.1µF	Ceramic Cap., 25V, X7R	0603	muRata	GRM188R71H104KA01D
1	C2	2.2µF	Ceramic Cap., 100V, X7R	1210	muRata	GRM32ER72A225KA35L
1	C3	0.1µF	Ceramic Cap., 100V, X7R	0603	muRata	GRM188R71H104KA35D
1	C4	150pF	Ceramic Cap., 50V, C0G	0603	muRata	GRM1885C1H151JA01
1	C5	22µF	Ceramic Cap., 16V, X7R	1210	muRata	GRM32ER71C226ME18L
1	C7	100µF	Electrolytic Cap., 100V	DIP	JiangHai	CD287-100V100
1	C8	100µF	Electrolytic Cap., 16V	SMD	JiangHai	VZ1-16V100
0	D1	NS	Do Not Stuff			
1	D2	B560C	Schottky Diode, 60V, 5A	SMC	Diodes	B560C
1	L1	33µH	Inductor, 5.5A/45mΩ	SMD	Wurth	7447709330
2	R1, R5	0	Film Resistor, 5%	0603	Yageo	RC0603JR-070RL
1	R2	237k	Film Resistor, 1%	0603	Yageo	RC0603FR-07237KL
0	R3	NS	Do Not Stuff			
1	R4	301k	Film Resistor, 1%	0603	Yageo	RC0603FR-07301KL
1	R6	680k	Film Resistor, 1%	0603	Yageo	RC0603FR-07680KL
1	R7	42.2k	Film Resistor, 1%	0603	Yageo	RC0603FR-0742K2L
1	R8	57.6k	Film Resistor, 1%	0603	Yageo	RC0603FR-0757K6L
1	U1		DC-DC Converter	SOIC8E	MPS	MP24943DN

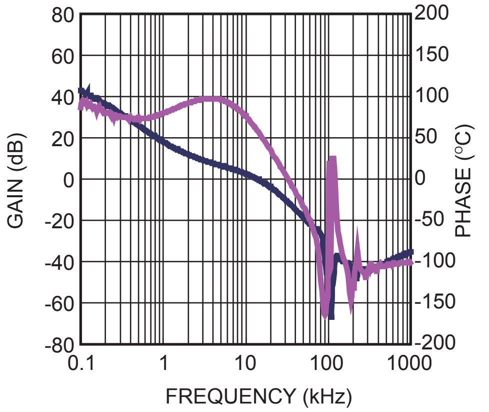
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

C7=100μF, C2=2.2μF, C8=100μF, C5=22μF, L1=33μH, T_A=25ºC, unless otherwise noted.

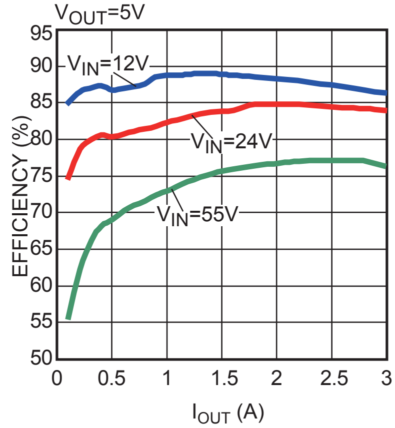
Loop Gain with Phase Margin

V_{IN}=12V, V_{OUT}=5V, I_{OUT}=3A, Resistor Load

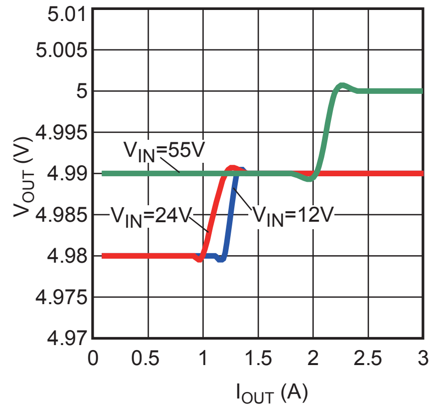


Efficiency vs. Output Current

V_{OUT}=5V

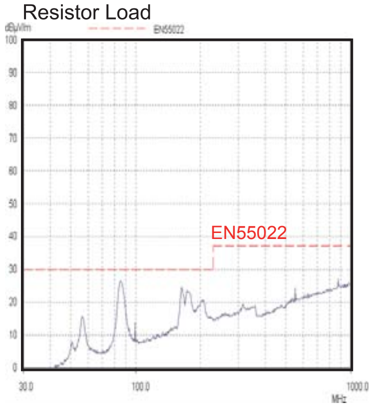


Load Regulation



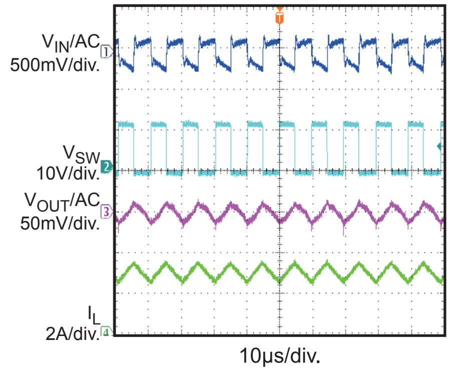
EMI Radiation

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, Resistor Load



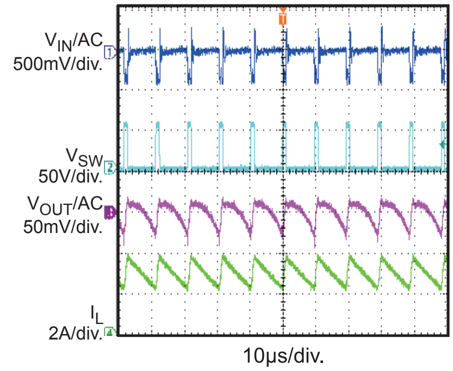
Steady State

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, E-Load



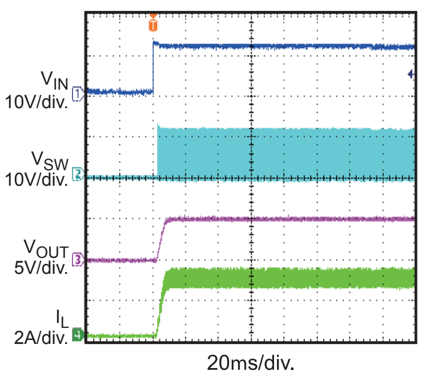
Steady State

V_{IN} = 55V, V_{OUT} = 5V, I_{OUT} = 3A, E-Load



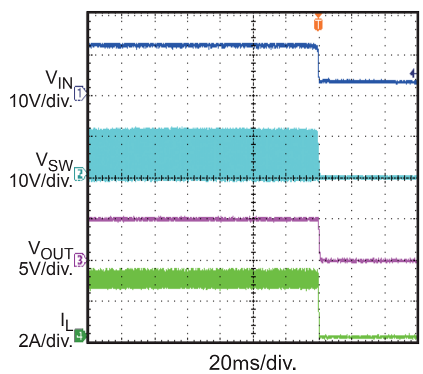
Power Ramp Up

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, Resistor Load



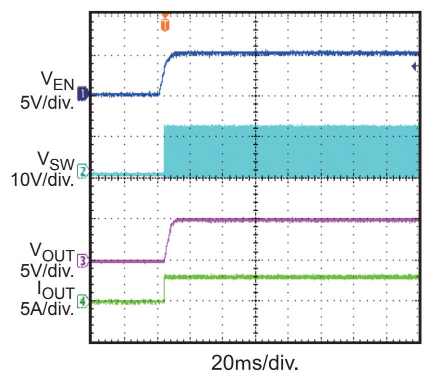
Power Ramp Down

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, Resistor Load



Enable Start Up

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, Resistor Load



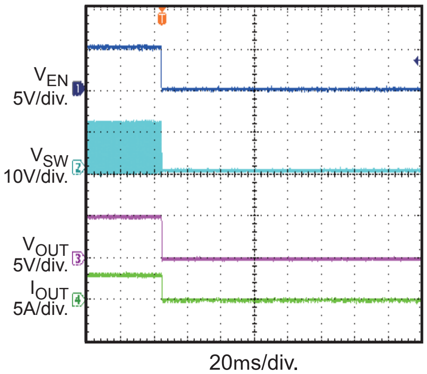
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

C7=100μF, C2=2.2μF, C8=100μF, C5=22μF, L1=33μH, T_A=25ºC，unless otherwise noted.

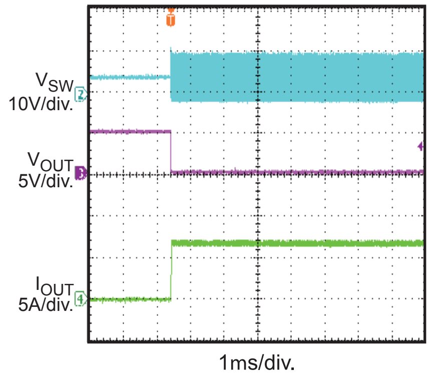
Enable Shutdown

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, Resistor Load



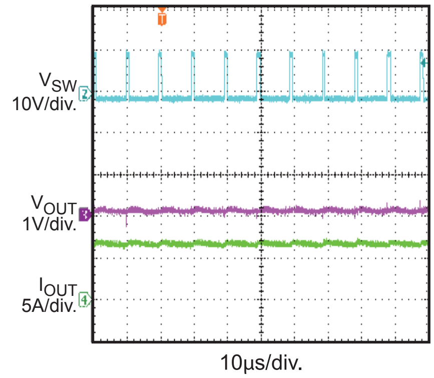
Short Circuit Enter

V_{IN} =12V, V_{OUT} = 5V, I_{OUT} = 0A



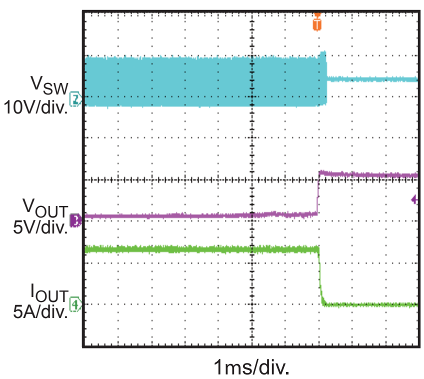
Short Circuit Steady

V_{IN} =12V, V_{OUT} = 5V



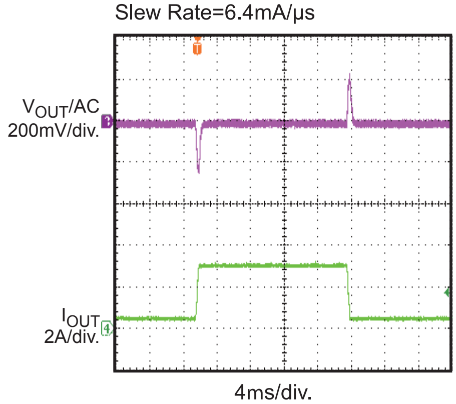
Short Circuit Recovery

V_{IN} =12V, V_{OUT} = 5V, I_{OUT} = 0A



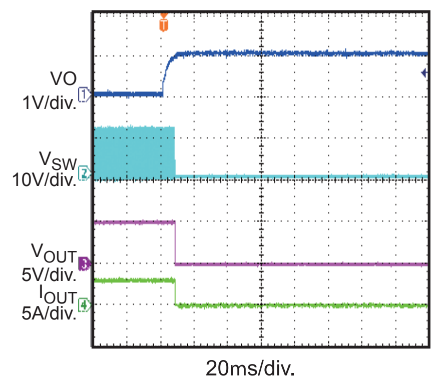
Load Transient Response

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, Slew Rate=6.4mA/μs



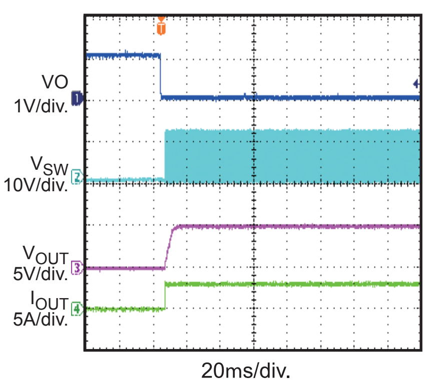
OVP Enter

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, E-Load



OVP Recovery

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, E-Load



PRINTED CIRCUIT BOARD LAYOUT

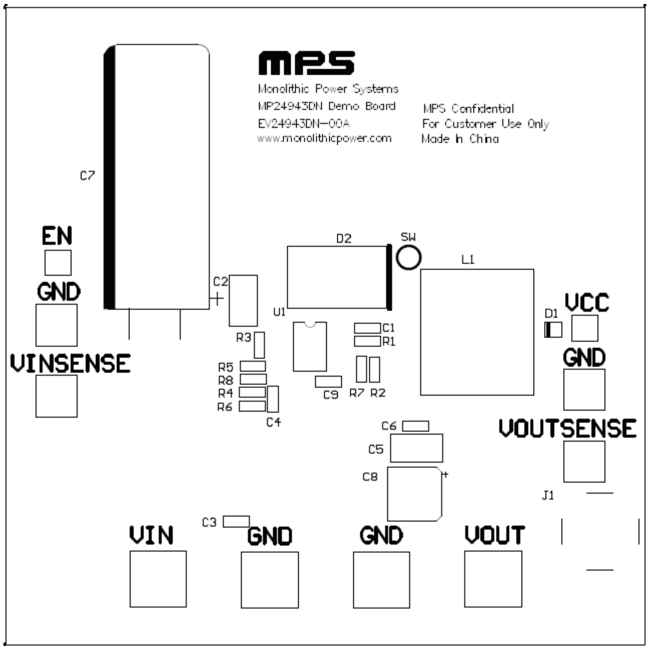


Figure 1—Top Silk Layer

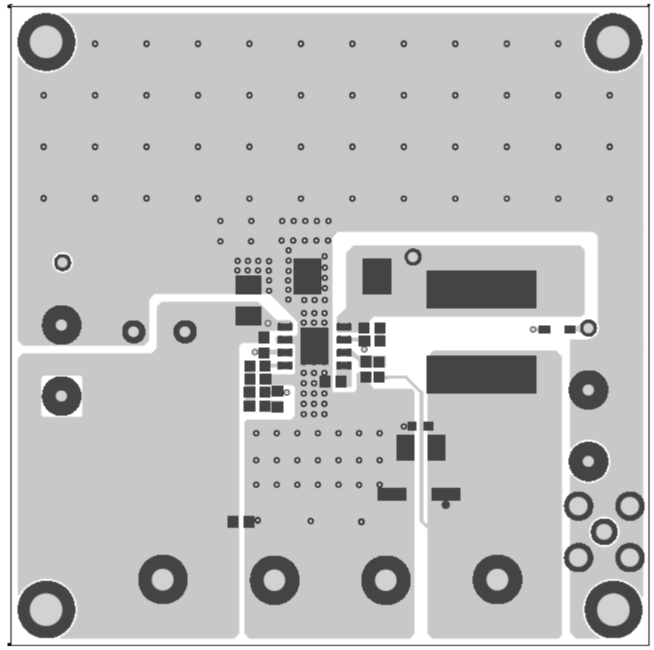


Figure 2—Top Layer

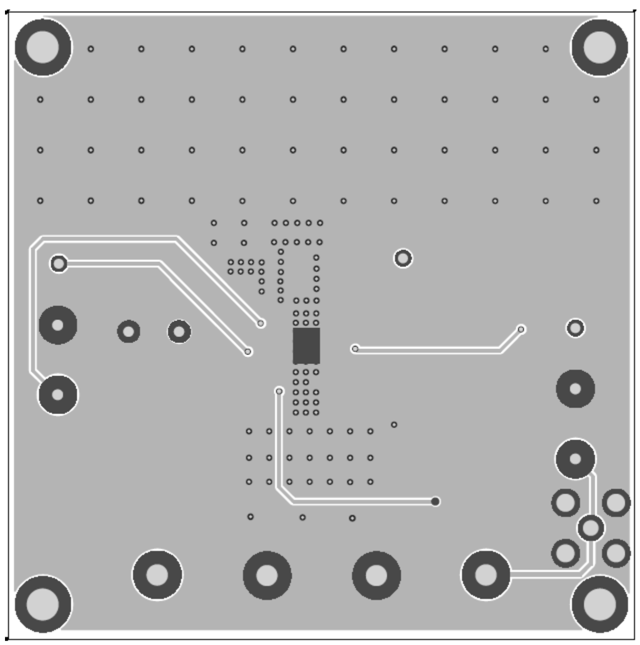


Figure 3—Bottom Layer

QUICK START GUIDE

1. The output voltage of this board is set to 5V. The board layout accommodates most commonly used inductors and output capacitors.
2. Attach the positive and negative ends of the load to the VOUT and GND pins, respectively.
3. Attach the input voltage ($8V \leq V_{IN} \leq 55V$) and input ground to the VIN and GND pins, respectively.
4. To use the Enable supply on, apply a digital input to the EN pin. Drive EN higher than 1.8V to turn on the regulator, drive EN less than 0.4V to turn it off.
5. The output voltage V_{OUT} can be set by R8. The formula is:

$$R8 = R4 \times \frac{V_{FB}}{V_{OUT} - V_{FB}}$$

Where V_{FB} = 0.8V

For example, for V_{OUT} = 5V, R4=301kΩ:

$$R8 = R4 \times \frac{V_{FB}}{V_{OUT} - V_{FB}} = 301k\Omega \times \frac{0.8V}{5V - 0.8V} \approx 57.6k\Omega$$

For the closest standard 1% value.

6. When the VO pin voltage is higher than 0.9V, the part will shutdown until VO pin voltage drops below 0.9V. The R7 is set as:

$$R7 = R2 \times \frac{0.9V}{(V_{OVP} - 0.9V)}$$