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MIC26950 Evaluation Board

26V/12A Hyper Speed Control™
Synchronous DC/DC Buck Regulator

SuperSwitcher II™

General Description

The MIC26950 DC/DC regulator operates over an input supply range of 4.5V to 26V and provides a regulated output at up to 12A of output current. The output voltage is adjustable down to 0.8V with a typical accuracy of $\pm 1\%$ and the device operates at a switching frequency of 300kHz. The switching frequency remains fairly constant with changes in input voltage and output load.

Micrel's Hyper Speed Control™ architecture allows for ultra-fast transient response while reducing the output capacitance and also makes (High V_{IN})/(Low V_{OUT}) operation possible. The MIC26950 utilizes an adaptive t_{ON} ripple control architecture. An undervoltage lockout feature is provided to ensure proper operation under power-sag conditions. An internal soft-start feature is provided to reduce the inrush current. Foldback current limit, "hiccup" mode short-circuit protection, and thermal shutdown ensure protection of the IC during fault conditions.

Note: This evaluation board is for 12A applications.

Datasheet and supporting documentation can be found on Micrel's web site at: www.micrel.com.

Requirements

The MIC26950 evaluation board requires two power supplies: one to provide V_{IN} and the other to provide V_{DD} . The V_{IN} power supply must be able to deliver greater than 3.0V with more than 12A capability. The V_{DD} power supply must be greater than 4.5V. The on-board V_{DD} regulator, using an NPN transistor, provides V_{DD} power supply. The output load can either be an active or passive load.

Precautions

The evaluation board does not have reverse polarity protection. Applying a negative voltage to the V_{IN} terminal may damage the device. In addition, the maximum V_{IN} operating voltage of the MIC26950 evaluation board is 26V. Exceeding 26V on V_{IN} or exceeding 5.5V on V_{DD} could damage the device.

If V_{DD} is not powered from the on-board V_{DD} regulator, an external V_{DD} power supply is required and must be powered up at the same time or after V_{IN} to make the soft-start function correctly.

Getting Started

1. **Connect an external supply to the V_{IN} terminal.** Apply the desired input voltage to the V_{IN} and ground terminals of the evaluation board, paying careful attention to polarity and supply voltage. An ammeter may be placed between the input supply and the V_{IN} terminal to the evaluation board. Ensure that the supply voltage is monitored at the V_{IN} terminal. The ammeter and/or power lead resistance can reduce the voltage supplied to the input.

2. **Connect the load to the V_{OUT} and ground terminals.** The load can be either passive (resistive) or active (as in an electronic load). An ammeter can be placed between the load and the V_{OUT} terminal. Ensure that the output voltage is monitored at the V_{OUT} terminal. V_{OUT} can be set to 0.9V, 1.0V, 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, or 5.0V by a jumper. If a different voltage is needed, it can be adjusted by changing the feedback resistors. See "Output Voltage" section.

3. **Enable the MIC26950.** The EN pin is provided on the evaluation board. The output of the MIC26950 turns on when V_{DD} exceeds the UVLO threshold. The output of the MIC26950 may be turned off by shorting the EN pin to ground. An connection on the board provides easy access to the enable pin.

Output Voltage

The output voltage on the MIC26950 evaluation board is adjustable. It is set by adjusting the feedback resistors (R4 and one of R5, R6, R7, R8, R9, R10, R11, or R12) and can be calculated as follows as an example:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R4}{R7}\right)$$

where $V_{REF} = 0.8V$.

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The output voltage above is set at the factory for a 1.2V output, but it can easily be modified by removing R4 and R7 and replacing them with the values that yield the desired output voltage. Once R4 is selected, R7 can be calculated using:

$$R7 = \frac{R4 \times V_{REF}}{V_{OUT} - V_{REF}}$$

For $V_{REF} = 0.8V$:

$$R7 = \frac{R4 \times 0.8V}{V_{OUT} - 0.8V}$$

The output voltage should not be set to exceed 5V due to the 6.3V rating of the output capacitor. If an output voltage greater than 5V is desired, the output capacitor must be replaced with another capacitor that has a higher voltage rating.

Ordering Information

Part Number	Description	Package
MIC26950YJL	IC	28-Pin 5mm × 6mm MLF™
MIC26950YJL EV	Evaluation Board	

Evaluation Board Schematic

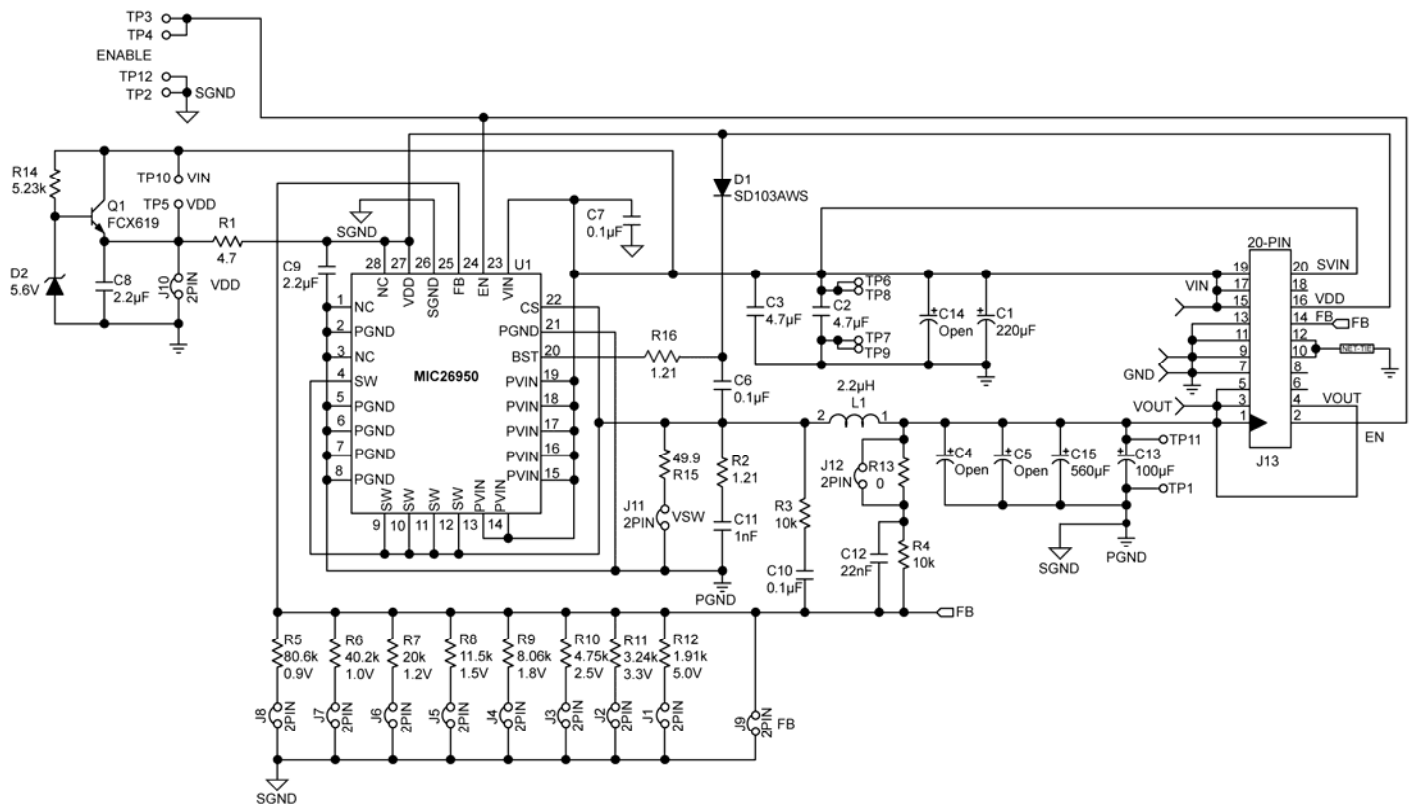


Figure 1. MIC26950 Evaluation Board (J13, R13, R15 Are for Testing Purposes)

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty
C1	B41125A7227M	EPCOS ⁽¹⁾	220 μ F Aluminum Capacitor, SMD, 35V	1
C2, C3	12105C475KAZ2A	AVX ⁽²⁾	4.7 μ F Ceramic Capacitor, X7R, Size 1210, 50V	2
	GRM32ER71H475KA88L	Murata ⁽³⁾		
C4, C5	Open			
C6, C7, C10	06035C104KAT2A	AVX ⁽²⁾	0.1 μ F Ceramic Capacitor, X7R, Size 0603, 50V	3
	GRM188R71H104KA93D	Murata ⁽³⁾		
	C1608X7R1H104K	TDK ⁽⁴⁾		
C8, C9	0805ZC225MAT2A	AVX ⁽²⁾	2.2 μ F Ceramic Capacitor, X7R, Size 0805, 10V	2
	GRM21BR71A225KA01L	Murata ⁽³⁾		
	C2012X7R1A225K	TDK ⁽⁴⁾		
C11	06035C102KAT2A	AVX ⁽²⁾	1nF Ceramic Capacitor, X7R, Size 0603, 50V	1
	GRM188R71H102KA01D	Murata ⁽³⁾		
	C1608X7R1H102K	TDK ⁽⁴⁾		
C12	06035C223KAZ2A	AVX ⁽²⁾	22nF Ceramic Capacitor, X7R, Size 0603, 50V	1
	GRM188R71H223K	Murata ⁽³⁾		
	C1608X7R1H223K	TDK ⁽⁴⁾		
C13	12106D107MAT2A	AVX ⁽²⁾	100 μ F Ceramic Capacitor, X5R, Size 1210, 6.3V	1
	GRM32ER60J107ME20L	Murata ⁽³⁾		
C14	Open			
C15	6SEPC560MX	SANYO ⁽⁵⁾	560 μ F OSCON Capacitor, 6.3V	1
D1	SD103AWS-7	Diodes Inc ⁽⁶⁾	Small Signal Schottky Diode	1
	SD103AWS	Vishay ⁽⁷⁾		
D2	CMDZ5L6	Central Semi ⁽⁸⁾	5.6V Zener Diode	1
L1	HCF1305-2R2-R	Cooper Bussmann ⁽⁹⁾	2.2 μ H Inductor, 15A Saturation Current	1
Q1	FCX619	ZETEX ⁽⁶⁾	50V NPN Transistor	1
R1	CRCW06034R75FKEA	Vishay Dale ⁽⁷⁾	4.75 Ω Resistor, Size 0603, 1%	1
R2	CRCW08051R21FKEA	Vishay Dale ⁽⁷⁾	1.21 Ω Resistor, Size 0805, 1%	1
R3, R4	CRCW060310K0FKEA	Vishay Dale ⁽⁷⁾	10k Ω Resistor, Size 0603, 1%	2
R5	CRCW060380K6FKEA	Vishay Dale ⁽⁷⁾	80.6k Ω Resistor, Size 0603, 1%	1
R6	CRCW060340K2FKEA	Vishay Dale ⁽⁷⁾	40.2k Ω Resistor, Size 0603, 1%	1
R7	CRCW060320K0FKEA	Vishay Dale ⁽⁷⁾	20k Ω Resistor, Size 0603, 1%	1
R8	CRCW060311K5FKEA	Vishay Dale ⁽⁷⁾	11.5k Ω Resistor, Size 0603, 1%	1
R9	CRCW06038K06FKEA	Vishay Dale ⁽⁷⁾	8.06k Ω Resistor, Size 0603, 1%	1

Bill of Materials (Continued)

Item	Part Number	Manufacturer	Description	Qty
R10	CRCW06034K75FKEA	Vishay Dale ⁽⁷⁾	4.75k Ω Resistor, Size 0603, 1%	1
R11	CRCW06033K24FKEA	Vishay Dale ⁽⁷⁾	3.24k Ω Resistor, Size 0603, 1%	1
R12	CRCW06031K91FKEA	Vishay Dale ⁽⁷⁾	1.91k Ω Resistor, Size 0603, 1%	1
R13	CRCW06030000FKEA	Vishay Dale ⁽⁷⁾	0 Ω Resistor, Size 0603, 5%	1
R14	CRCW06035K23FKEA	Vishay Dale ⁽⁷⁾	5.23k Ω Resistor, Size 0603, 1%	1
R15	CRCW060349R9FKEA	Vishay Dale ⁽⁷⁾	49.9 Ω Resistor, Size 0603, 1%	1
R16	CRCW06031R21FKZA	Vishay Dale ⁽⁷⁾	1.21 Ω Resistor, Size 0603, 1%	1
U1	MIC26950YJL	Micrel, Inc. ⁽¹⁰⁾	26V/12A Synchronous Buck DC-DC Regulator	1

Notes:

1. EPCOS: www.epcos.com.
2. AVX: www.avx.com.
3. Murata: www.murata.com.
4. TDK: www.tdk.com.
5. SANYO: www.sanyo.com.
6. Diode Inc.: www.diodes.com.
7. Vishay: www.vishay.com.
8. Central Semi: www.centalsemi.com.
9. Cooper Bussmann: www.cooperbussmann.com.
10. Micrel, Inc.: www.micrel.com.

PCB Layout Recommendations

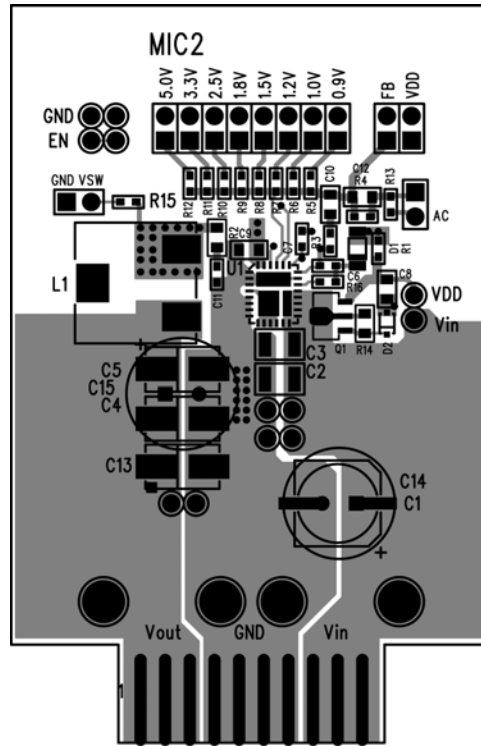


Figure 2. MIC26950 Evaluation Board Top Layer

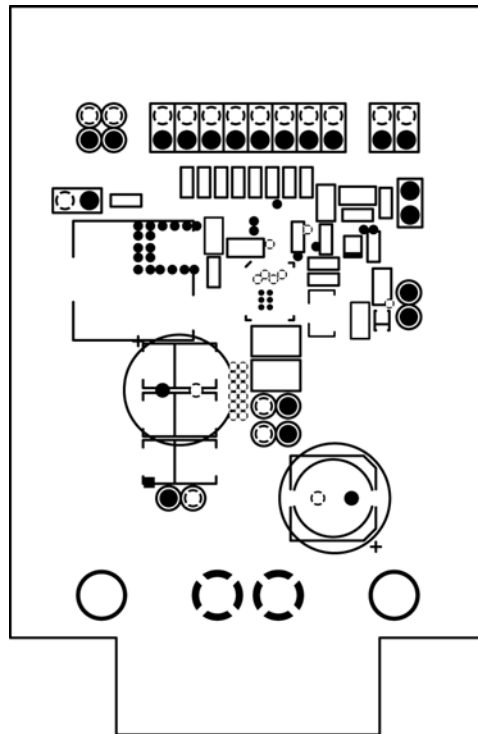


Figure 3. MIC26950 Evaluation Board Mid-Layer 1 (Ground Plane)

PCB Layout Recommendations (Continued)

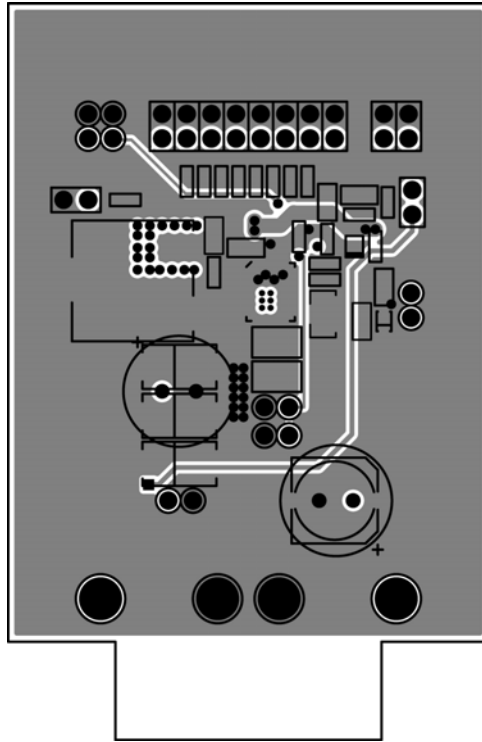


Figure 4. MIC26950 Evaluation Board Mid-Layer 2

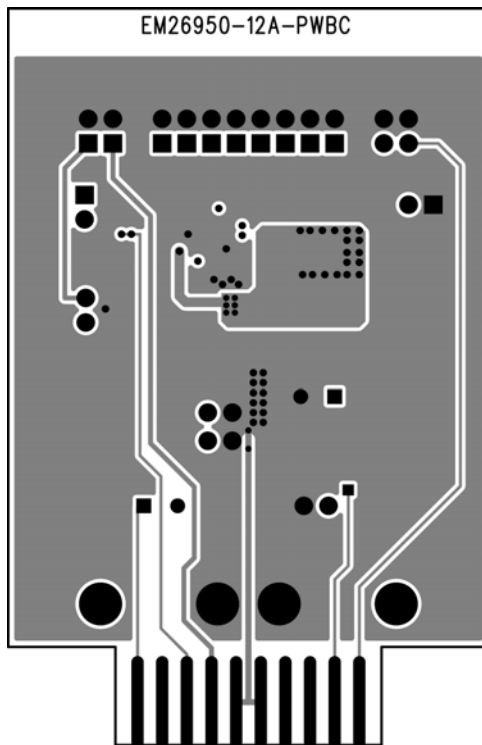


Figure 5. MIC26950 Evaluation Board Bottom Layer

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