

LM5050-1EVAL Evaluation Board

National Semiconductor
Application Note 2087
Donald P. Jones
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Introduction

The LM5050-1 evaluation board is designed to demonstrate the capabilities of the LM5050-1 OR-ing Diode Controller. One high side N-channel power MOSFET is used. The LM5050-1 evaluation board schematic is shown in [Figure 5](#). The evaluation board is designed to highlight applications with a small solution size. For more information about LM5050-1 functional and electrical characteristics, refer to the LM5050-1 datasheet.

Operating Range

- Minimum Input Voltage, 6V
- Maximum Input Voltage, 50V
- Output Current Range: 0A to 15A
- Ambient Temperature Range 0°C to 50°C
- Board Size 1.50 inches x 2.25 inches

To aid in the demonstration and evaluation of high-side OR-ing diode controller solution based on the LM5050-1.

The load current capability is limited at 15A by the ratings of the terminals and the PCB copper area and weight. The PCB layout has not been tested for currents above 15A, so this should only be done with some degree of caution.

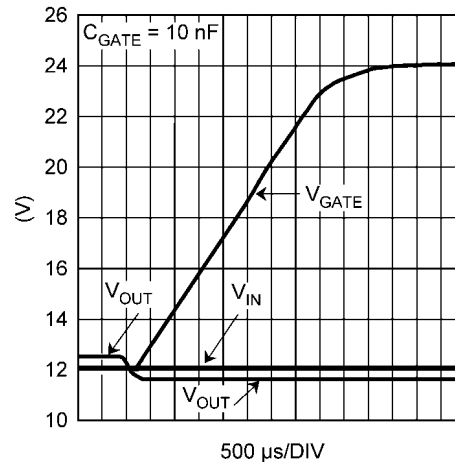
The maximum input voltage is limited by the breakdown voltage rating of both D1 and D2.

Typical evaluation board performance and characteristics curves are shown in [Figure 1](#) through [Figure 2](#). The PCB layout is shown in [Figure 7](#) and [Figure 8](#). Test points are provided for optional control and signal monitoring.

Evaluation Board Start-Up

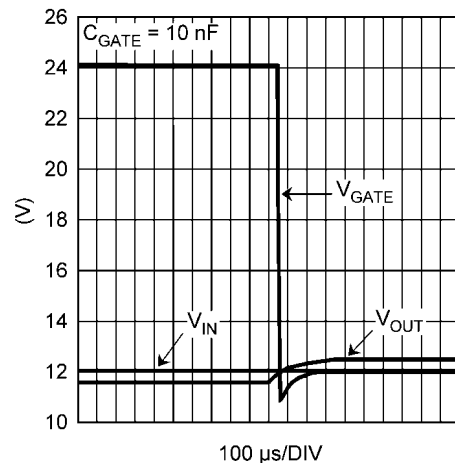
Before applying power to the LM5050-1 evaluation board, all external connections should be verified. The external power supply must be turned off and connected with proper polarity to the VS, VIN, VOUT, and GND terminals. Under basic evaluation conditions the Off test point is left open.

The evaluation board will be in the normal operating mode when power is applied. The Off terminal is used only when there is a desire to disable normal operation.



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FIGURE 1. Forward Waveforms



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FIGURE 2. Reverse Waveforms

Inductive Kick-Back Protection

Diode D1 and capacitor C1 serve as inductive kick-back protection to limit negative transient voltage spikes generated on the input when the input supply voltage is abruptly taken to zero volts.

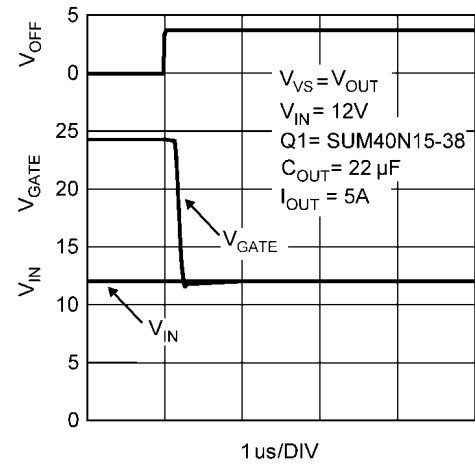
Diode D2 and capacitor C2 serve as inductive kick-back protection to limit positive transient voltage spikes generated on the output when the input supply voltage is abruptly taken to zero volts.

Off Test Point

The Off test point provided on the LM5050-1 evaluation board is used to control the LM5050-1 operation. The Off test point is connected directly to the LM5050-1 OFF pin. See the LM5050-1 datasheet for more details.

To enable the LM5050-1 apply a voltage less than 0.8V to the Off test point, connect the Off test point to GND, or leave the Off test point open (default). If the Off test point is left open, the LM5050-1 OFF pin internal pull-down will ensure that the LM5050-1 becomes operational.

To disable the LM5050-1 apply a voltage greater than 2.0V to the Off test point.



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FIGURE 3. OFF pin vs GATE

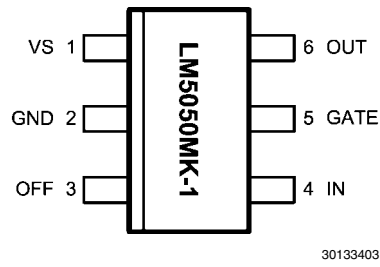


FIGURE 4. Connection Diagram

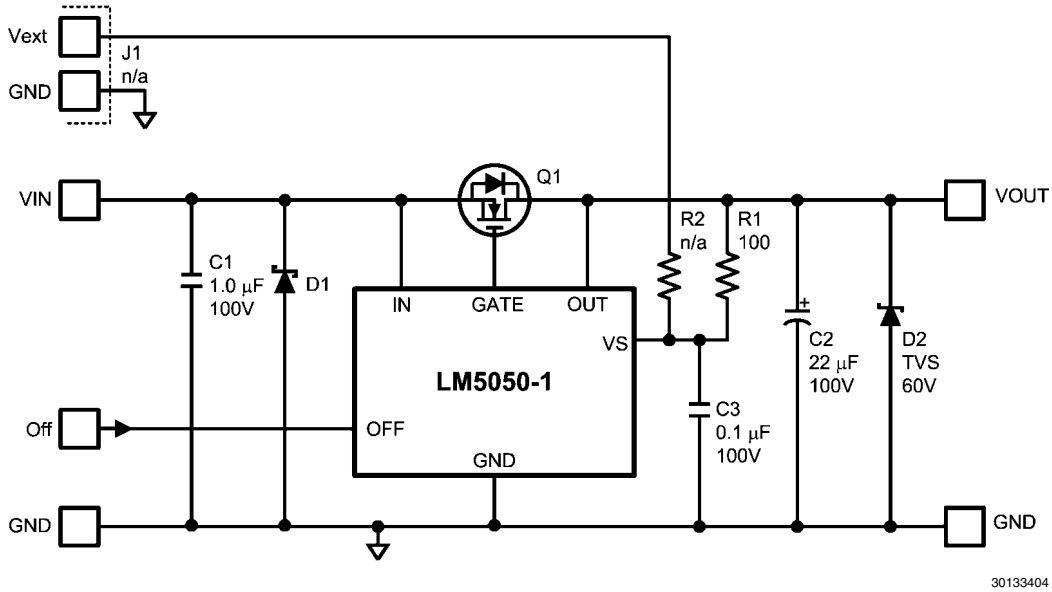


FIGURE 5. Schematic Diagram

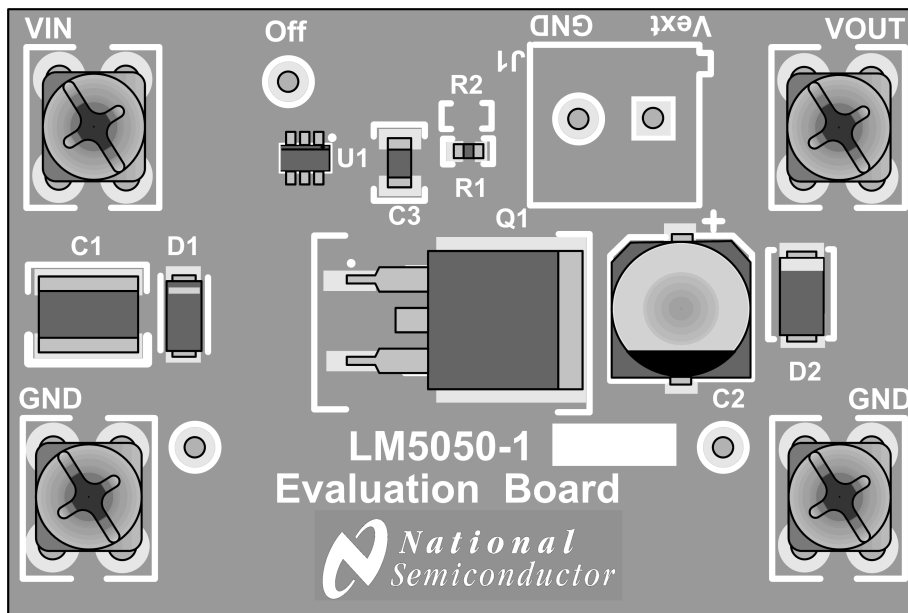
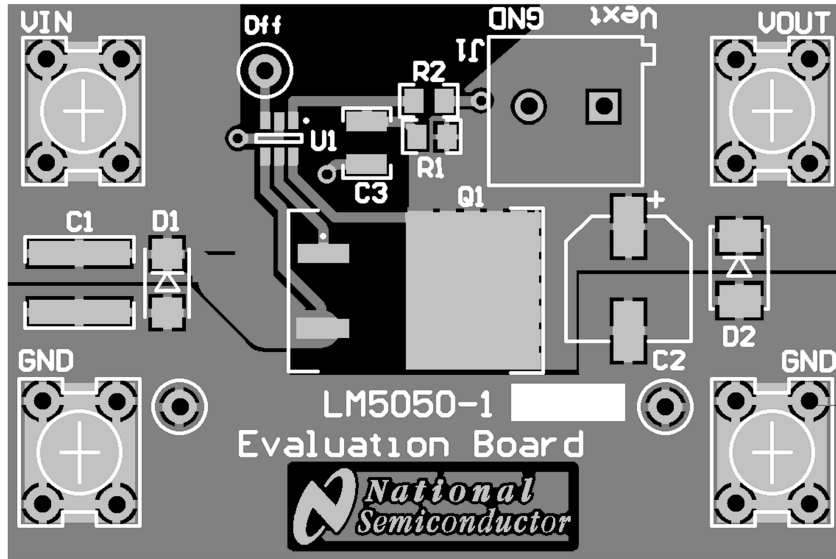


FIGURE 6. Component Placement



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FIGURE 7. Evaluation Board, Top Side (Component)



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FIGURE 8. Evaluation Board, Bottom Side

Bill of Materials

ID	Description	Manufacturer	Mfgr Part Number
U1	IC; Ideal OR-ing Diode Controller	National Semiconductor Corporation	LM5050MK-1
C1	Capacitor: MLCC; 1.0 μ F; \pm 10%; 100V; X7R; 1825	Vishay/Vitramon	VJ1825Y105KBBAT4X
C2	Capacitor: 22 μ F; \pm 20%; 100V; Aluminum Electrolytic; SMT	Panasonic/ECG	EEE-HA2A220P
C3	Capacitor: 0.1 μ F; MLCC; \pm 10%; 100V; X7R; 1210	Murata Electronics North America	GRM32NR72A104KA01L
D1	Diode: Schottky Barrier Rectifier; 1A; 60V; SMA	ON Semiconductor	SS16T3G
		Micro Commercial Components	SS16-TP
D2	Diode: TVS; Unidirectional; 600W; 60V; SMB	Diodes Inc	SMBJ60A-13-F
J1	Not Installed	-	-
Q1	MOSFET: N-Channel; 100V; 40A; 0.025 Ω ; D ² PAK	Vishay/Siliconix	SUM40N10-30-E3
R1	Resistor: 100 Ω ; 0.10W; \pm 1%; 100ppm; Thick Film; 0603	Vishay/Dale	CRCW0603100RFKEA
		ROHM Semiconductor	MCR03EZPFX1000
R2	Not Installed	-	-
VIN	Terminal: 6-32 Screw; Vertical; Snap-In PCB Mount; 15A	Keystone Electronics	7693
VOUT			
GND			
GND			
Off	Test Point Terminal: 0.040in Dia Mtg Hole; White	Keystone Electronics	5012
GND			
GND			

Notes

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