

AN-2087 LM5050-1EVAL Evaluation Board

1 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 High Side OR-ing FET Controller* ([SNVS629](#)) data sheet.

2 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

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.

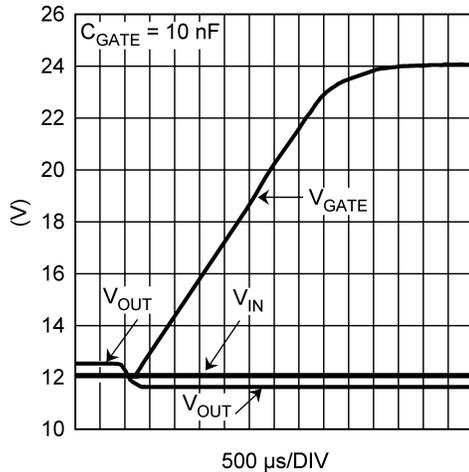
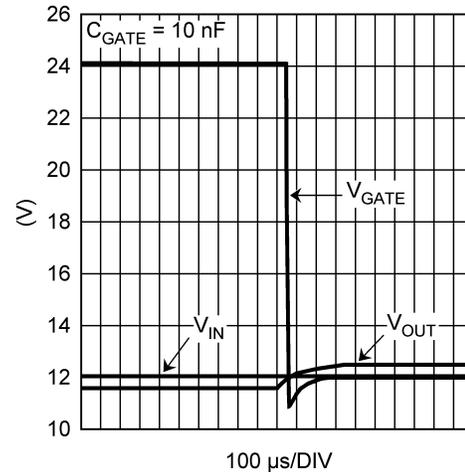
The maximum input voltage is limited by the breakdown voltage rating of both D1 and D2.

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.

3 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.


Figure 1. Forward Waveforms

Figure 2. Reverse Waveforms

4 Inductive Kick-Back Protection

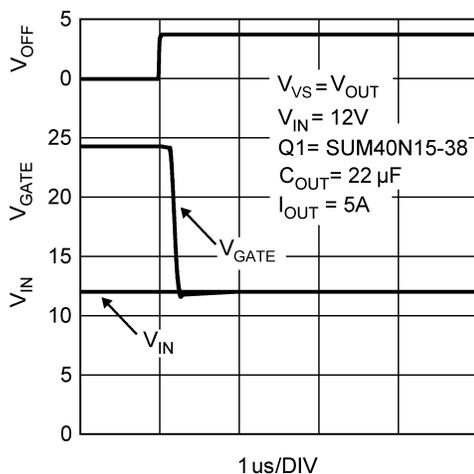
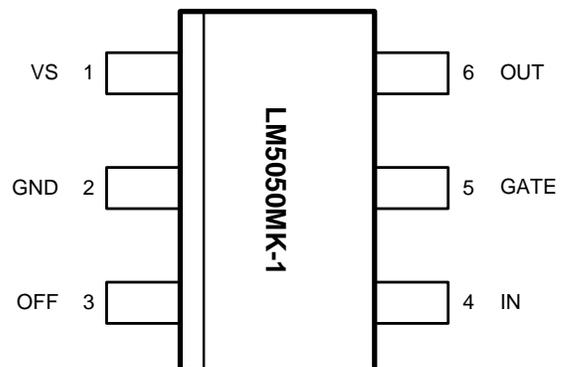
Diode D1 and capacitor C1 (as do diode D2 and capacitor C2) serve as inductive kick-back protection to limit negative transient voltage spikes generated on the input when the input supply voltage is abruptly taken to zero volts.

5 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 High Side OR-ing FET Controller* ([SNVS629](#)) data sheet 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.


Figure 3. OFF pin vs GATE

Figure 4. Connection Diagram

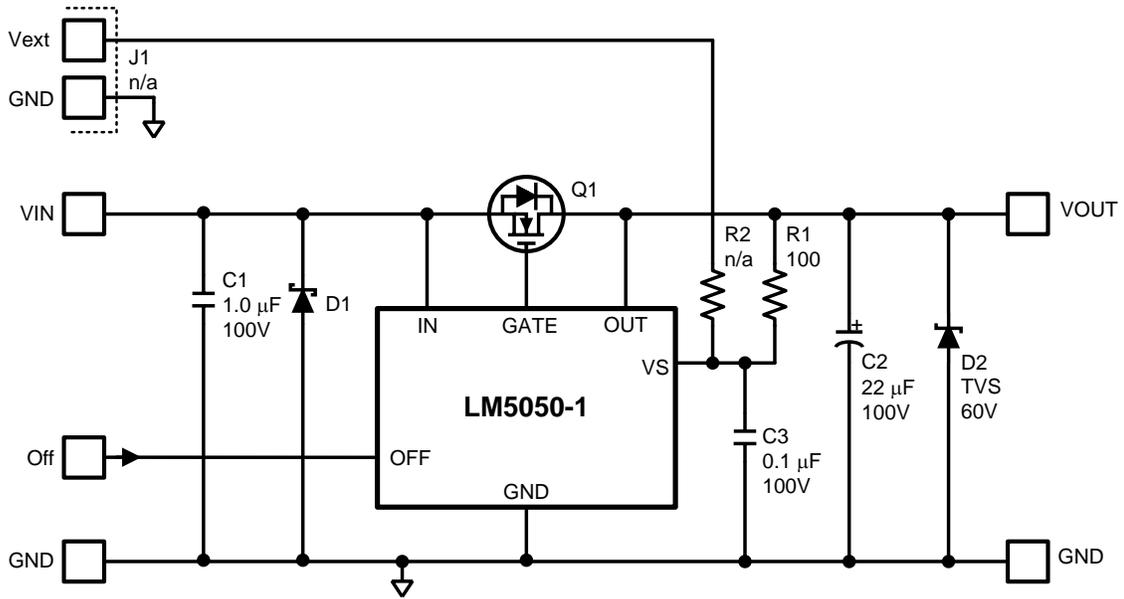


Figure 5. Schematic Diagram

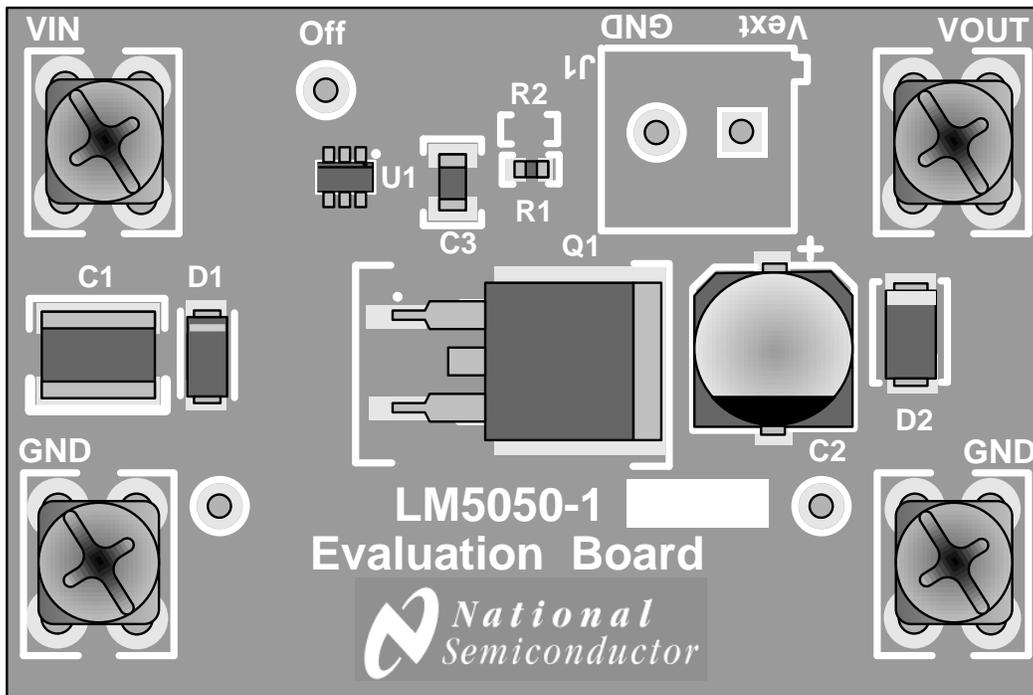


Figure 6. Component Placement

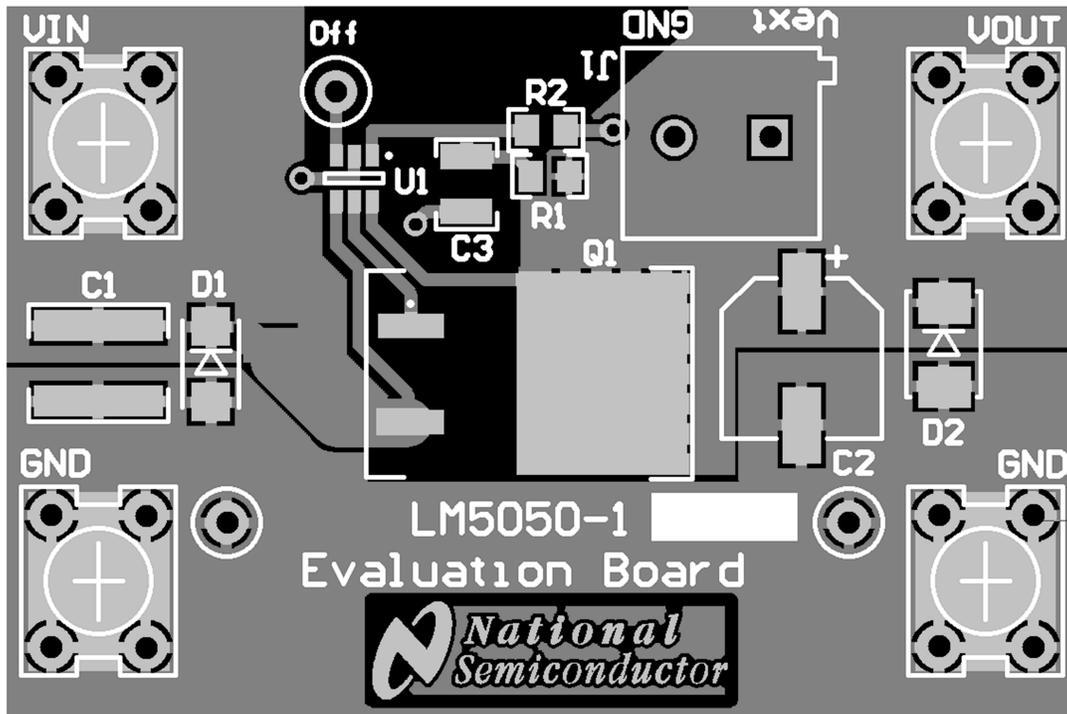


Figure 7. Evaluation Board, Top Side (Component)



Figure 8. Evaluation Board, Bottom Side

6 Bill of Materials

ID	Description	Manufacturer	Mfrg Part Number
U1	IC; Ideal OR-ing Diode Controller	Texas Instruments	LM5050
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			

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com