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Evaluates: MAX16173

MAX16173 Evaluation Kit

General Description

The MAX1673 evaluation kit (EV kit) is designed to evaluate the MAX16173, an automotive protection IC with up to 250kHz active rectification in a 10-pin TDFN package. Several test points are provided for device evaluation. The EV kit is fully assembled and tested over the automotive temperature range of -40°C and +125°C, and is available with the MAX16173ATB installed.

Benefits and Features

- -42V to +65V Protection Voltage Range
- 3V to 50V Operating Voltage Range
- PCB Pads for Optional TVS Diodes
- Proven 2-Layer 2oz Copper PCB Layout
- Automotive Temperature Range: -40°C and +125°C
- Fully Assembled and Tested

***Ordering Information* appears at end of data sheet.**

Quick Start

Required Equipment

- MAX16173 EV kit
- ±25V, 10A DC Power Supply
- 5V, 100mA DC Power Supply
- Electronic Load
- Two Digital Voltmeters (DVM1, DVM2)
- 4-Channel Oscilloscope

Procedure

The EV kit is fully assembled and tested. Follow these steps to verify board operation.

CAUTION: Do not turn on power supply until all connections are completed.

1) Verify the jumper (JP1) is in its default position (Table 1).
2) Connect the positive terminal of the ±25V DC power supply to the VIN banana jack connection and negative terminal to the PGND banana jack connection.
3) Connect the positive terminal of the 5V DC power supply to VEXT and negative terminal to the GPND banana jack connection.
4) Connect the positive terminal of the electronic load to the VOUT banana jack connection and negative terminal to the PGND banana jack connection.
5) Connect the positive terminal of DMV1 to the test point GATE and negative terminal to the test point VIN.
6) Connect the positive terminal of DVM2 from the test point SRC and negative terminal to DRN to monitor the voltage across the external MOSFET.
7) Connect channel one of the oscilloscope to the test point VIN, channel two to GATE, and channel 3 to VOUT to monitor their behavior during EV kit testing and evaluation.
8) Turn on the DC power supply at VIN and slowly increase the voltage level to 12V. Monitor the gate voltage on the scope to be slightly above the input voltage VIN and output voltage VOUT to be very close to VIN. There should be a 20mV difference between VIN and VOUT.
9) Measure the voltage reading of the DMV2 to be around 20mV.
10) After the proper output voltage is established, increase the load current while monitoring DVM1 and DVM2. DVM1 voltage reading should increase as the load current is increased while DVM2 voltage reading should remain constant.

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Detailed Description

The MAX16173 EV kit evaluates the MAX16173, an ideal diode controller and protection device that protects systems against fault conditions such as reverse current, reverse voltage, and negative transients, and helps designers to evaluate the operation and performance of MAX16173. The external N-channel MOSFET(Q1) emulates an ideal diode under the MAX16173's control. A Schottky diode with small forward voltage rating and small reverse current rating (D3) is used to reduce the leakage current of CD and LX pins to optimize the consumption of MAX16173. The Zener diode (D4) is uninstalled. It is an optional feature to clamp the GATE voltage below the MOSFET V(GS) maximum rating.

Enable Input (EN)

The MAX16173 EV kit provides a jumper (JP1) to enable or disable the MAX16173. See Table 1 for the JP1 jumper settings. Pulling EN to ground allows the MAX16173 to enter the shutdown mode and reduce the device supply current. While in shutdown, the power can still flow to the load through the body diode of the external MOSFET. Therefore, excessive load current while the device is in shutdown should be avoided to minimize power loss.

Active Rectifier

When VSRC < VDRN + 20mV, the MAX16173's GATE pin is driven to low and reduces the conduction of MOS (Q1) until the VSRC is higher 20mV than the VDRN. This is the regulation operation. When VSRC < VDRN - 10mV, the MAX16173's GATE pin is shorted to SRC fast through a small resistance to turn MOS (Q1) off. This is the reverse protection. When VSRC > VDRN + 70mV, the MAX16173's GATE pin is driven to highest as CD voltage to turn external MOS (Q1) on fully until VSRC is not higher 70mV than VDRN. Then, the MAX16173 is back to regulation operation. When the VIN is an AC wave input, the MAX16173 works alternately between these three modes and achieves the active rectifier function. The MAX16173 data sheet describes the operation and application information in more detail.

Power Good Output and FET condition Output, PG, and FETOK

The MAX16173 EV kit provides two TPs (PG and FETOK) to indicate the VOUT condition and FET conditions, respectively. To use the PG and FETOK, VEXT should be supplied by a power source not greater than 5V.

Optional Components

The EV kit features optional components to facilitate the evaluation of the MAX16173 in a system. They are the two clamp diodes D1 and D2. If two clamp diodes (D1 and D2) are installed, the EV kit can clamp the positive and negative transients for some automotive standard tests or limit the application's DC input voltage range.

Note: These optional components are not necessary for the proper operation of the MAX16173 but are provided to optimize system operation, facilitate testing, and evaluate the IC.

Table 1. NR (JP1)

JP1 SHUNT POSITION	DESCRIPTION
Short 1 to 2*	Enabled. VEN = VIN
Short 2 to 3	Disabled. VEN = GND

**Default position.*

Component Suppliers

SUPPLIER	PHONE NUMBER	WEBSITE
MURATA	770-436-1300	www.murata.com
TDK	847-803-6100	www.component.tdk.com
STMICROELECTRONICS		www.st.com
PANASONIC	800-344-2112	www.panasonic.com
VISHAY SEMICONDUCTORS	402-563-6866	www.vishay.com

Note: *Indicate using the MAX16173 when contacting these component suppliers.*

Ordering Information

PART	TYPE
MAX16173EVKIT#	EV Kit

#Denotes RoHS

MAX16137EV Kit Bill of Materials

PART	QTY	DESCRIPTION
SHDN, CD, DRN, FETOK, GATE, PG, PGND, SRC, VEXT, VIN, VOUT	12	TEST POINT KEYSTONE:5000
C1, C3	2	1µF, 10%, 100V, X7R MURATA: GRM31CR72A105KA01 TDK: C3216X7R2A105K160AA MURATA: GCH31CR72A105KE01 TAIYO YUDEN: HMK316B7105KLH
C2, C5	2	0.1µF, 10%, 100V, X7R KEMET: C1206C104K1RAC TDK: C3216X7R2A104K160AA MURATA: GRM319R72A104KA01
C4	1	1µF, 10%, 50V, X7R, CERAMIC MURATA: GRM21BR71H105KA12 SAMSUNG: CL21B105KBFNNN TDK: C2012X7R1H105K085AC
C6	1	470µF, 20%, 80V, ALUMINUM-ELECTROLYTIC PANASONIC: EEV-TG1K471M
D3	1	DIODE STMicroelectronics: STPS2H100ZF PANJIT:SS10100FL
L1	1	INDUCTOR MURATA: LQH3NPN181MGRL
PGND, VIN, VOUT	4	BANANA JACK EMERSON NETWORK POWER: 108-0740-001
PGND, VIN, VOUT	4	WEICO WIRE: 9020 BUS
Q1	1	MOSFET VISHAY: SQM70060EL_GE3
R1, R2	2	10K; ±5% (0603)
U1	1	MAX16173
D1	uninstall	LITTELFUSE: SLD8S36A
D2	uninstall	STMicroelectronics: SM30T23AY
PCB	1	PCB: MAX16173 EVALUATION KIT

MAX16137EV Kit Schematic

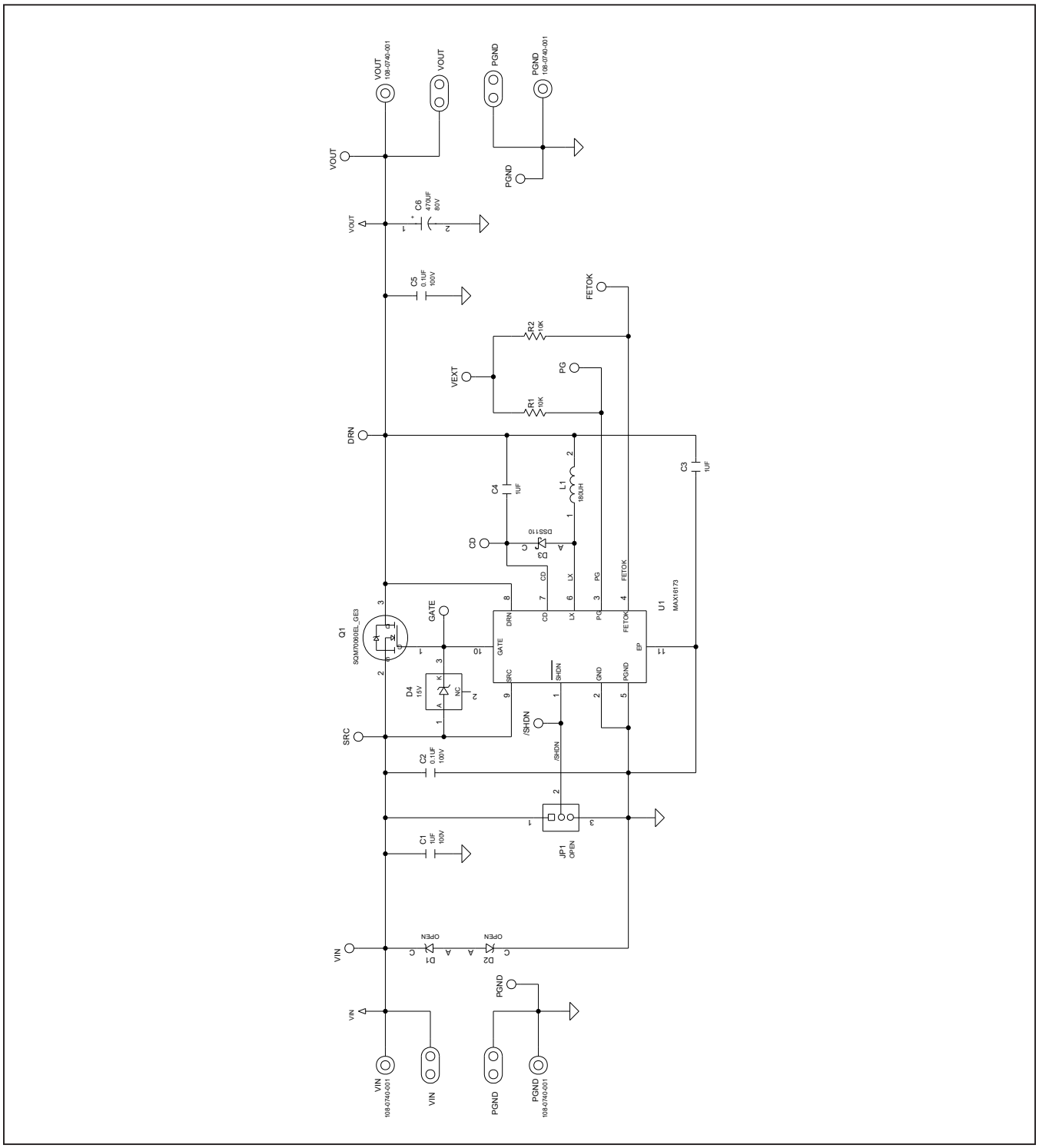

Figure 1. MAX16173 EV Kit Schematic

MAX16137EV Kit PCB Layout

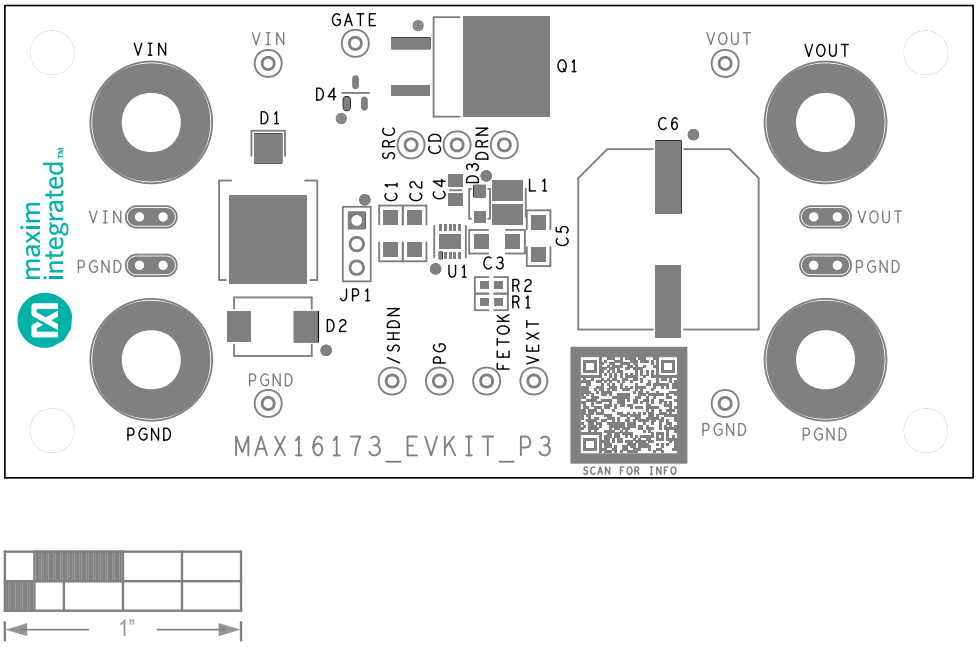

Figure 2. MAX16173 EV Kit Component Placement Guide—Component Side

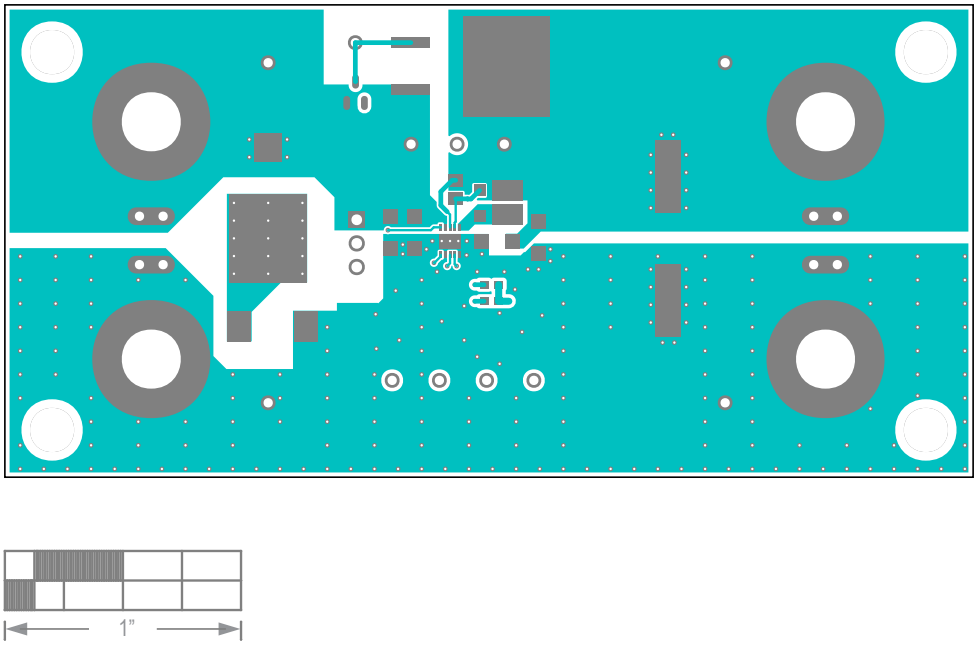

Figure 3. MAX16173 EV Kit PCB Layout—Component Side

MAX16137EV Kit PCB Layout (continued)

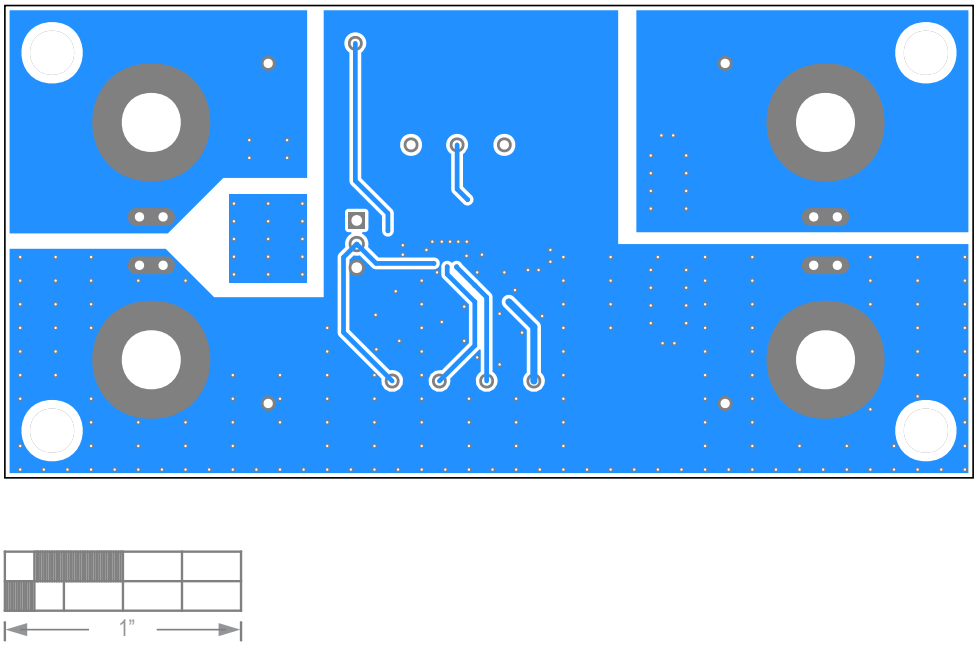

Figure 4. MAX16173 EV Kit PCB Layout—Bottom Side

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/21	Initial release	—