19-5299; Rev 0; 6/10

MAX16833 Evaluation Kit

Evaluates: MAX16833/MAX16833B

General Description

The MAX16833 evaluation kit (EV kit) provides a proven design to evaluate the MAX16833 high-voltage HB LED driver with integrated high-side current sense. The EV kit is set up for boost and buck-boost configurations and operates from a 5V to 18V DC supply voltage. The EV kit is configured to deliver up to 1A to one string of LEDs. The total voltage of the string can vary from 3V to 36V. The anode of the LED string should be connected to the LED+ terminal. The cathode of the LED string can be connected either to the PGND (boost mode) or LED- (buck-boost mode) terminal. In the case of the boost mode, the input voltage should not exceed the LED string voltage.

The EV kit PCB comes with a MAX16833AUE+ installed, which is the frequency-dithering version. The EV kit also comes with the pin-compatible MAX16833BAUE+, which is the reference-voltage output version.

Features

- **Configured for Boost and Buck-Boost**
- **Analog Dimming Control**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX16833EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	22µF ±20%, 50V electrolytic capacitor (6.3mm x 7.7mm) SUN Electronic 50CE22PC
C2, C5, C13, C14	4	4.7µF ±10%, 100V X7R ceramic capacitors (2220) Murata GRM55ER72A475K
C3, C4	2	1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C05K
C6, C11, C15	3	4.7µF ±10%, 50V X7R ceramic capacitors (1210) Murata GRM32ER71H475K
C7, C10	2	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C8	1	680pF ±5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H681JA01D
C9	1	33000pF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C333KA01D
C12	1	4.7µF ±10%, 25V X7R ceramic capacitor (1206) Murata GRM31CR71E475M
C16	1	0.1µF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H104K
C17	1	22pF ±10%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H220J
C18	1	1000pF ±10%, 50V X7R ceramic capacitor (0603) Murata GCM188R71H102KA37D
D1	1	100V, 3A Schottky diode (SMC) Vishay 30BQ100TRPbF
D2	1	75V, 15mA diode (3 SOT323) Diodes Inc. MMBD4148W
D3	0	Not installed, diode (3 SOT323)
D4	1	40V, 350mA Schottky diode (3 SOD323) Diodes Inc. SD103AWS-7-F
JU1, JU2	2	2-pin headers
JU3	1	3-pin header

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
L1	1	9.5µH, 8.5A inductor (14.9mm x 14.9mm) Sumida CDEP147NP-9R5MC-95
M1	1	100V, 42A n-channel MOSFET (DPAK) International Rectifier IRLR3110ZPbF
M2	1	100V, 12A p-channel MOSFET (D^2PAK) Vishay SiHF9530S
M3	0	Not installed, MOSFET (DPAK)
R1, R16	0	Not installed, resistors (0603) R1 is shorted by PC trace; R16 is open
R2, R14	2	0.05Ω ±1% sense resistors (2512) IRC LRC-LR2512LF-01-R050-F
R3	1	536kΩ ±1% resistor (0603)
R4	1	0.2Ω ±1% sense resistor (1210) IRC LRC-LR2010LF-01-R200-J
R5, R8	2	10kΩ ±1% resistors (0603)
R6	1	22Ω ±1% resistor (0603)
R7	1	44.2kΩ ±1% resistor (0603)
R9	1	150kΩ ±1% resistor (0603)
R10	1	20kΩ ±1% resistor (0603)
R11	1	49.9kΩ ±1% resistor (0603)
R12	1	2.2Ω ±5% resistor (0603)
R13	1	4.02kΩ ±1% resistor (0603)
R15	1	10Ω ±5% resistor (0603)
R17	1	100Ω ±1% resistor (0603)
R18	1	50kΩ potentiometer (9.53mm x 4.83mm x 10.03mm)
R19	1	24.9kΩ ±1% resistor (0603)
R20	1	220Ω ±1% resistor (0603)
U1	1	LED driver (16 TSSOP-EP*) Maxim MAX16833AUE+
—	1	LED driver (16 TSSOP-EP*) Maxim MAX16833BAUE+
—	3	Shunts
—	1	PCB: MAX16833 EVALUATION KIT+

**EP = Exposed pad.*

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Diodes Incorporated	805-446-4800	www.diodes.com
International Rectifier	310-322-3331	www.irf.com
IRC, Inc.	361-992-7900	www.irctt.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
SUN Electronic Industries Corporation	619-661-8288	www.sunelec.co.jp
Sumida Corp.	847-545-6700	www.sumida.com
Vishay	402-563-6866	www.vishay.com

Note: *Indicate that you are using the MAX16833 when contacting these component suppliers.*

Quick Start

Required Equipment

- MAX16833 EV kit
- 5V to 18V, 8A DC power supply
- A series-connected LED string rated at 1A
- Oscilloscope with a current probe

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify the board operation. **Caution: Do not turn on power supply until all connections are completed.**

1) Verify that all jumpers (JU1, JU2, and JU3) are in their default positions, as shown in Table 1.
2) Connect the positive terminal of the DC supply to the VIN pad and the negative terminal to the nearest PGND pad.
3) Connect the LED string across the LED+ and LED- pads of the EV kit for buck-boost configuration (for boost configuration, connect the LED string across the LED+ and PGND pads of the EV kit. The LED string voltage should be higher than the input voltage in this configuration).
4) Clip the current probe on the wire connected to the LED string.
5) Turn on the DC power supply.
6) Verify that the LEDs turn on.
7) Verify that the oscilloscope displays approximately 1A.

Table 1. Jumper Descriptions (JU1, JU2, JU3)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	Connects the ICTRL pin of the MAX16833 to a voltage higher than 1.23V. The LED current level is now using the internal reference. The shunt of JU2 must not be installed for proper operation.
	Open	Disconnects the ICTRL pin of the MAX16833 from the external voltage-divider on the VCC pin. Allows the user to apply an external voltage to set the LED current level.
JU2	1-2	Used only for the MAX16833B. For the MAX16833, this jumper is open. For the MAX16833B, this allows adjustment of the voltage on the ICTRL pin by adjusting potentiometer R18.
	Open*	Disconnects the ICTRL pin of the MAX16833/MAX16833B from potentiometer R18. An external voltage between 0 and 5.5V can be applied to the ICTRL pad.
JU3	1-2*	Install for the default position for both the MAX16833 and MAX16833B.
	2-3	Allows dithering of the switching frequency to achieve spread spectrum for the MAX16833. The shunt of JU2 must not be installed for proper operation.
	Open	The voltage at the ICTRL pin of the MAX16833 is determined by the voltage at the ICTRL pad, or if JU1 is installed, the voltage-divider R7 and R8.

**Default position.*

Detailed Description of Hardware

The MAX16833 EV kit provides a proven design to evaluate the MAX16833 high-voltage HB LED driver with integrated high-side current sense. The EV kit is set up for boost and buck-boost configurations and operates from a 5V to 18V DC supply voltage. The EV kit is configured to deliver up to 1A to a series LED string. The string forward voltage can vary from 3V to 36V.

Analog Dimming Control (ICTRL)

When JU1 is installed, the ICTRL pin is connected to the voltage-divider of R7 and R8, which sets the voltage at ICTRL (V_{ICTRL}) to 1.29V when input supply is above 7V and 890mV when the input supply is 5V. When V_{ICTRL} > 1.23V, the internal reference sets the LED current (I_{LED}) using the following formula:

$$I_{LED} = \frac{200mV}{R4}$$

In the case of the EV kit, I_{LED} is set to 1A. If V_{ICTRL} < 1.23V, then V_{ICTRL} sets the LED current level.

Alternatively, the analog dimming can be controlled by removing the shunt of JU1 and applying a voltage between 0 and 5.5V on the ICTRL pad of the EV kit.

Pulse-Dimming Input (PWMDIM)

Pulse dimming can be achieved by applying a pulsating voltage source on the PWMDIM pad of the EV kit. When PWMDIM is pulled low, $\overline{DIMOUT}$ is pulled high and the pulse-width modulated (PWM) switching is disabled.

Frequency Dithering (LFRAMP)

When JU3 is in the 2-3 position and JU2 is not installed, frequency dithering is achieved.

Frequency Synchronization (RT/SYNC)

The devices can be synchronized to an external clock by applying a synchronizing pulse on the RT/SYNC input pin. Refer to the MAX16833/MAX16833B IC data sheet for more information regarding synchronizing to an external clock. Frequency dithering must be disabled for external frequency synchronization.

Evaluating the MAX16833B

For evaluating the MAX16833B, replace the MAX16833 on the EV kit with a MAX16833B. The jumper configurations are as follows: JU1 (open shunt position), JU2 (1-2 shunt position), JU3 (1-2 shunt position). See Table 1 for details.

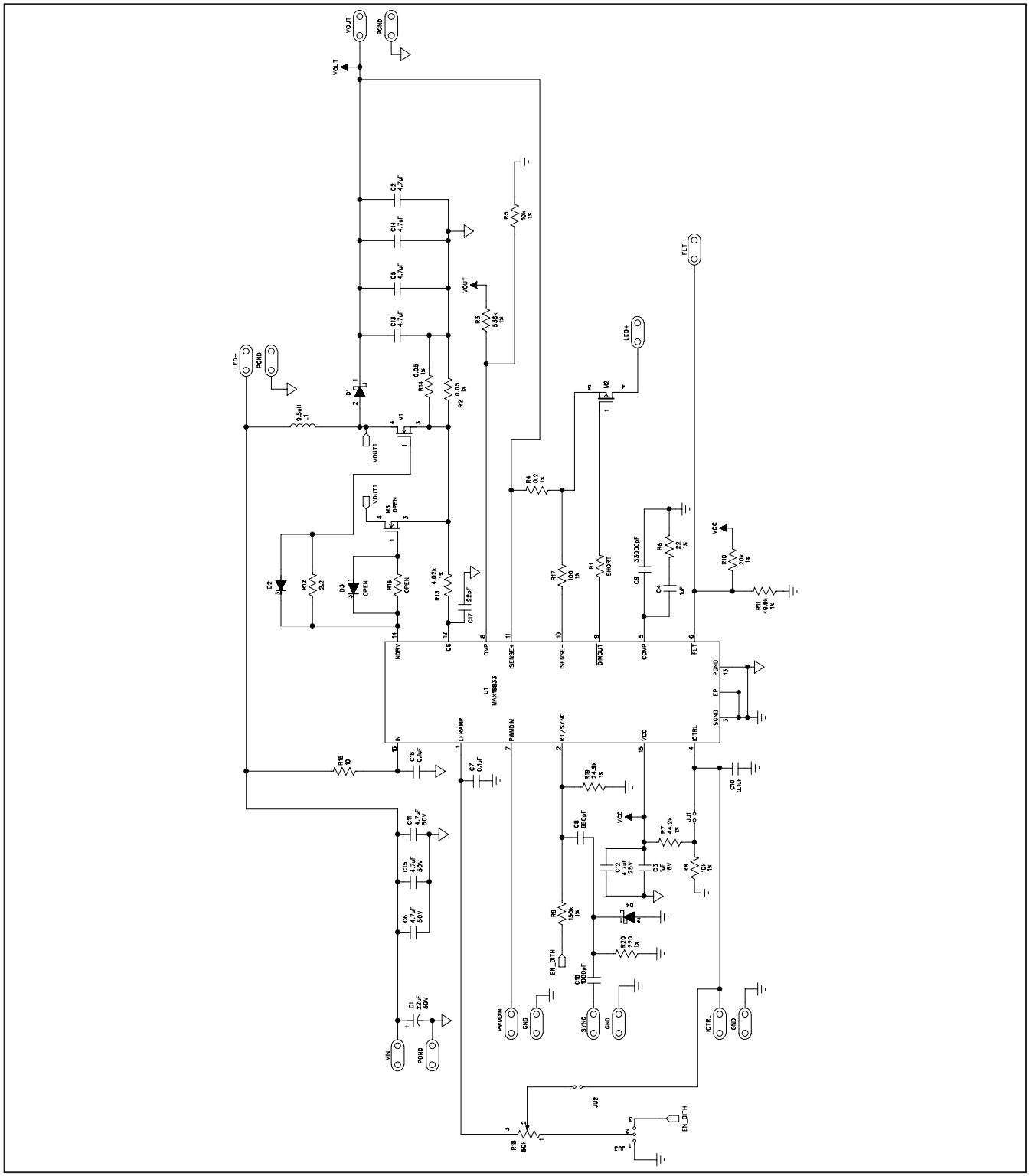

Figure 1. MAX16833 EV Kit Schematic

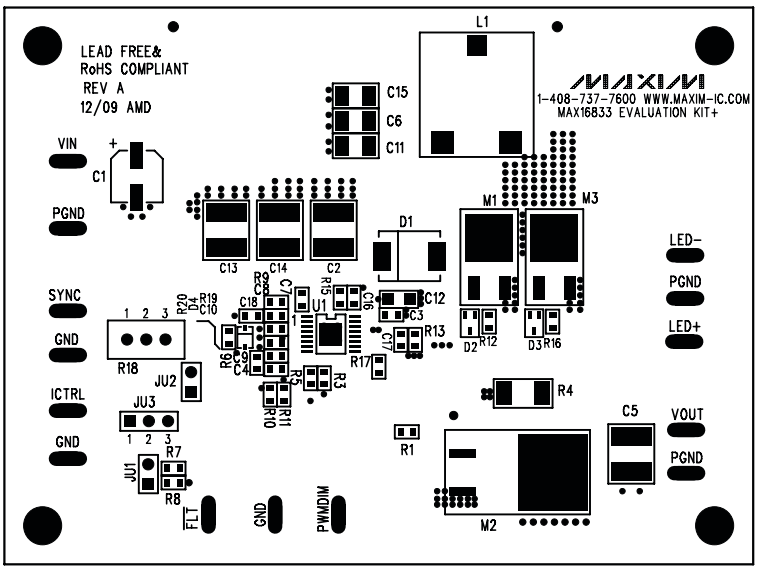

Figure 2. MAX16833 EV Kit Component Placement Guide—Component Side

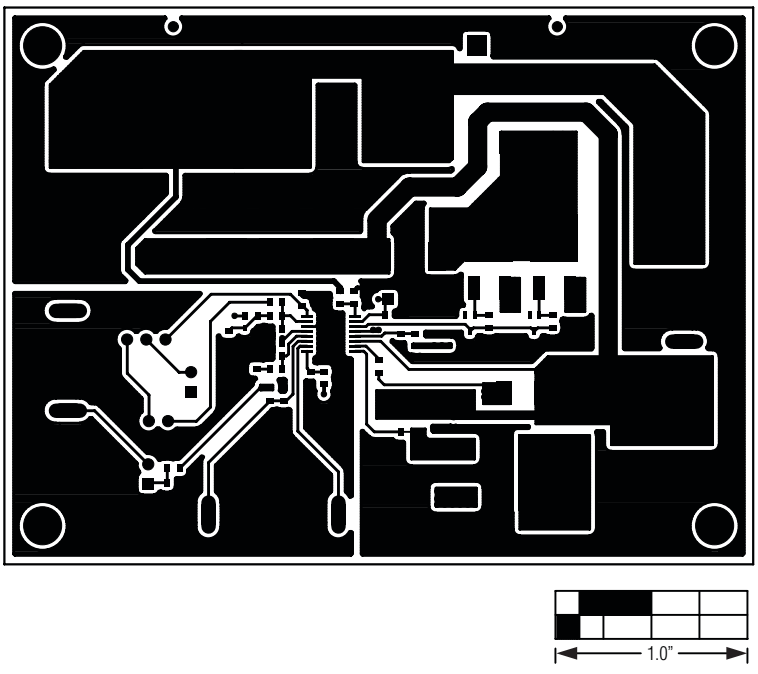

Figure 3. MAX16833 EV Kit Component PCB Layout—Component Side

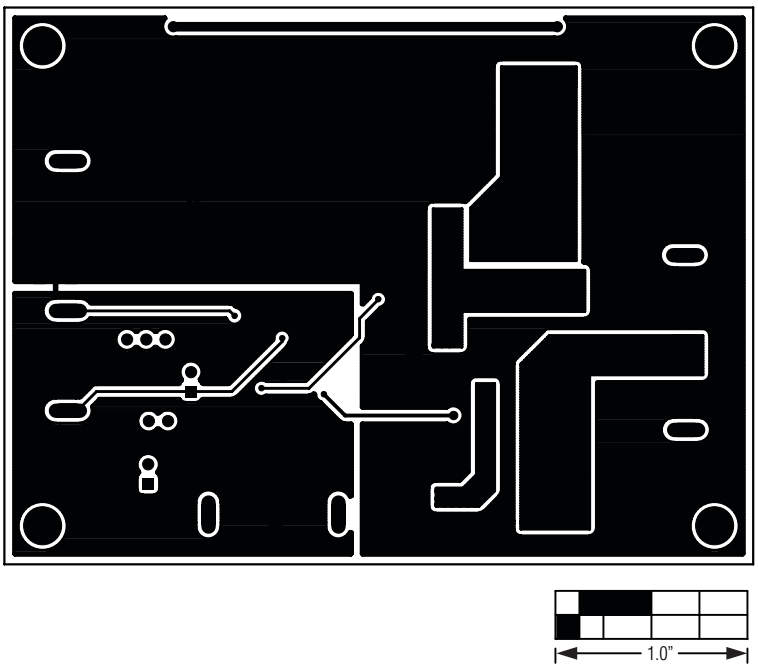

Figure 4. MAX16833 EV Kit PCB Layout—Solder Side

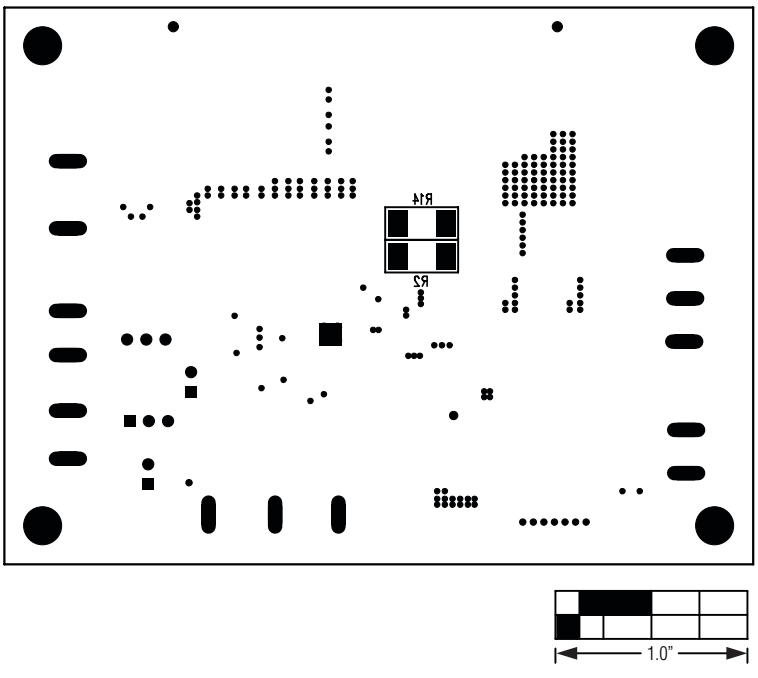

Figure 5. MAX16833 EV Kit Component Placement Guide—Solder Side

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/10	Initial release	—