General Description

The MAX16956 evaluation kit (EV kit) demonstrates the MAX16956 36V, 300mA, 2µA ultra-low quiescent current, synchronous buck converter with integrated high-side and low-side switches. The EV kit operates over a wide input range of 3.5V to 36V, while using only 2µA quiescent current at no load (internal divider versions). The EV kit has a switching frequency of 2.1MHz and a voltage output of 3.3V at 300mA. The EV kit comes standard with the fixed 3.3V output version, but can easily be modified to evaluate the 5V or the programmable output versions of the MAX16956.

The EV kit features selectable jumpers to enable/disable (JU2) the device, as well as to select either forced-PWM or skip modes of operation (JU1). The EV kit provides a $\overline{\text{RESET}}$ test point to monitor the voltage quality of the device.

Features

- 3.5V to 36V Input Voltage Range
- 3.3V at 300mA Output
- 2µA Quiescent Current in Standby Mode (Internal Divider Versions Only)
- Fixed 2.1MHz Switching Frequency
- Forced-PWM or Skip Mode Operation
- $\overline{\text{RESET}}$ Output
- Proven PCB Layout
- Fully Assembled and Tested

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

Component List

DESIGNATION	QTY	DESCRIPTION
BIAS, $\overline{\text{RESET}}$	2	Test points
C1	1	0.1µF ±10%, 16V X7R ceramic capacitor (0402) Murata GRM155R71C104K
C2, C6	2	22µF ±10%, 10V X7R ceramic capacitors (1206) Murata GRM31CR71A226K
C3	1	1µF ±10%, 10V X7R ceramic capacitor (0603) Murata GRM188R71A105K
C5	1	2.2µF ±10%, 50V X7R ceramic capacitor (1206) Murata GRM31CR71H225K
C7	1	0.01µF ±10%, 50V X7R ceramic capacitor (0402) Murata GRM155R71H103K
C8	0	Not installed, capacitor (0402)
JU1, JU2	2	3-pin headers
L1	1	10µH, 1.2A inductor Coilcraft LPS4018-103MLB
L2	1	0Ω ±5% resistor (1206) Panasonic ERJ-8GEY0R00V
R1, R2, R4	0	Not installed, resistors (0402) R1, R4 are short (PCB trace); R2 is open
R3	1	100kΩ ±5% resistor (0402)
U1	1	Automotive mini buck converter (10 µMAX®-EP*) Maxim MAX16956AUBB/V+
—	2	Shunts
—	1	PCB: MAX16956 EV KIT

**EP = Exposed pad.*

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Component Suppliers

SUPPLIER	PHONE	WEBSITE
Coilcraft, Inc.	847-639-6400	www.coilcraft.com
Murata Americas	800-241-6574	www.murataamericas.com
Panasonic Corp.	800-344-2112	www.panasonic.com
TDK Corp.	847-803-6100	www.component.tdk.com
Würth Electronik GmbH & Co. KG	201-785-8800	www.we-online.com

Note: *Indicate that you are using the MAX16956 when contacting these component suppliers.*

Quick Start

Required Equipment

- MAX16956 EV kit
- 14V, 100mA power supply
- Electronic load capable of sinking up to 300mA
- Two digital voltmeters

Procedure

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

1) Verify that a shunt is installed on pins 1-2 of jumper JU1 (forced PWM mode).
2) Verify that a shunt is installed on pins 1-2 of jumper JU2 (output enabled).
3) Connect the positive and negative terminals of the power supply to the VBAT and PGND test pads, respectively.
4) Connect the positive and negative terminals of the electronic load to the VOUT and PGND test pads, respectively.
5) Connect a voltmeter across the VOUT and PGND test pads.
6) Connect a voltmeter across the $\overline{\text{RESET}}$ and PGND test pads.
7) Set the power-supply voltage to 14V.
8) Turn on the power supply.
9) Enable the electronic load.
10) Verify that the voltmeter connected to VOUT measures approximately 3.3V.
11) Verify that the voltmeter connected to $\overline{\text{RESET}}$ measures approximately 5V.

Detailed Description of Hardware

The MAX16956 EV kit is a fully assembled and tested circuit board to evaluate the performance of the MAX16956 synchronous step-down controller. The EV kit operates over a 3.5V to 36V wide input range, while using only 2µA quiescent current at no load (internal divider versions). The EV kit has a switching frequency of 2.1MHz and a voltage output of 3.3V at 300mA.

The EV kit can be configured to operate in forced fixed-frequency PWM mode or low-quiescent current skip mode using jumper JU1. The EV kit can be enabled/disabled using jumper JU2. The EV kit also provides a $\overline{\text{RESET}}$ test point to monitor the voltage quality of the converter.

Configuring the Output Voltage (VOUT)

The EV kit comes standard with the fixed 3.3V output version but can easily be modified to evaluate the 5V or the programmable output versions of the device.

To evaluate the 5V version, simply replace U1 with the fixed 5V version of the device. To evaluate the adjustable output version, remove the R1 short and connect a resistive divider from the output (VOUT) to FB to AGND. Select R2 (FB to AGND resistor) to be less than or equal to 100kΩ. Calculate R1 (VOUT to FB resistor) with the following equation:

$$R1 = R2 \times \left(\frac{V_{OUT}}{V_{FB}} - 1 \right)$$

where V_{FB} = 1V.

When evaluating other versions of the device, the inductor, input capacitors, and output capacitors might need to change. For further information, refer to the *Applications Information* section in the MAX16956 IC data sheet.

Mode of Operation

The EV kit features jumper JU1 to configure the device's mode switch-control input. Connect the MODE pin to BIAS (pins 1-2 on JU1) to enable forced-PWM mode. Connect the MODE pin to ground (pins 2-3 on JU1) or leave open to enable skip-mode operation under light loads. Table 1 summarizes JU1's functions.

Enable Control

The EV kit features jumper JU2 to control the enable (EN) input. Connect the EN pin to SUP (pins 1-2 on JU2) to enable the device. Connect the EN pin to ground (pins 2-3 on JU2) to disable the device.

The EN input can also be enabled by applying an external signal greater than 2.4V (typ) at the EN and PGND PCB pads. See Table 2 for proper JU2 settings.

$\overline{\text{RESET}}$ Output

The EV kit provides a $\overline{\text{RESET}}$ test point to monitor the status of the device output. $\overline{\text{RESET}}$ becomes high impedance and is pulled to the BIAS voltage level through resistor R3 after the regulator output increases above 92% of the nominal regulated voltage. $\overline{\text{RESET}}$ goes low when the regulator output drops to below 90% of the nominal regulated voltage.

Table 1. Mode of Operation (JU1)

SHUNT POSITION	MODE PIN	MODE
1-2*	Connected to BIAS	Forced-PWM mode
2-3	Connected to PGND	Skip mode

**Default position.*

Table 2. Enable Control (JU2)

SHUNT POSITION	EN1 PIN	VOUT
1-2*	Connected to SUP	Enabled
2-3	Connected to PGND	Disabled
Not installed	Connected to an external source	Enabled with logic-high on EN; Disabled with logic-low on EN

**Default position.*

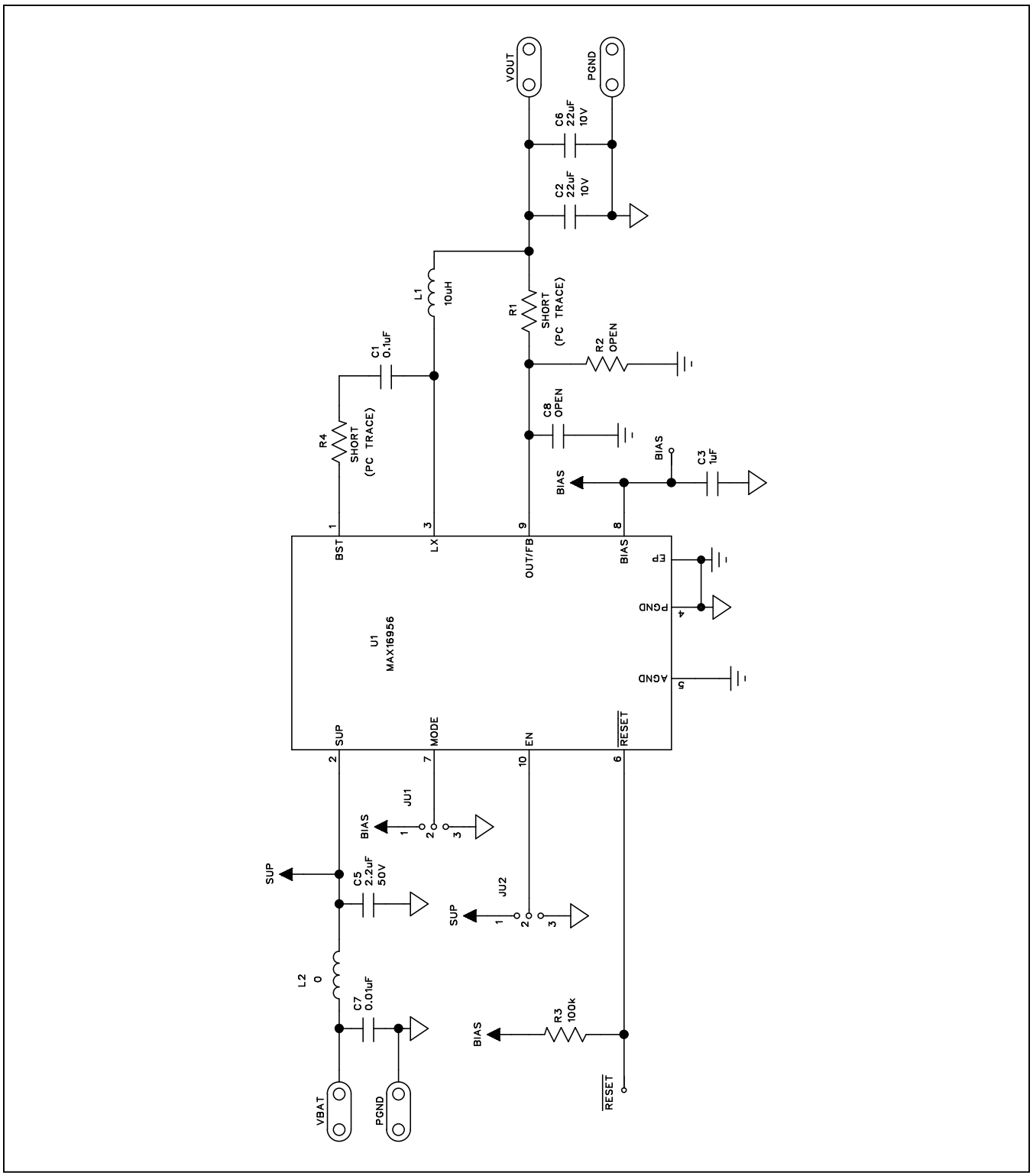

Figure 1. MAX16956 EV Kit Schematic

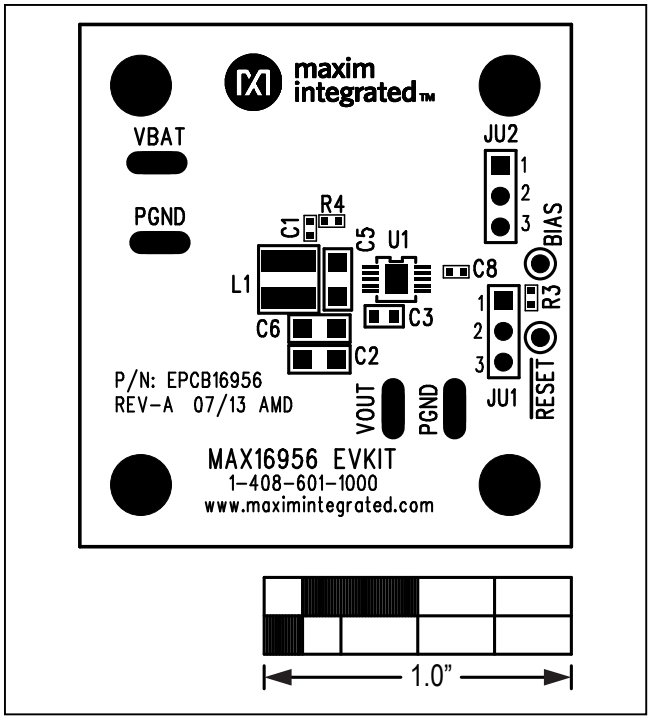

Figure 2. MAX16956 EV Kit Component Placement Guide—Component Side

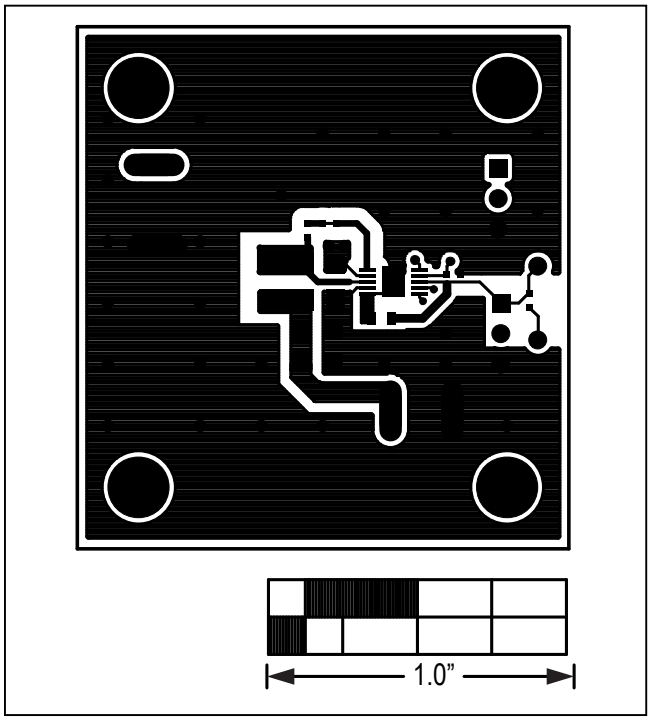

Figure 3. MAX16956 EV Kit PCB Layout—Component Side

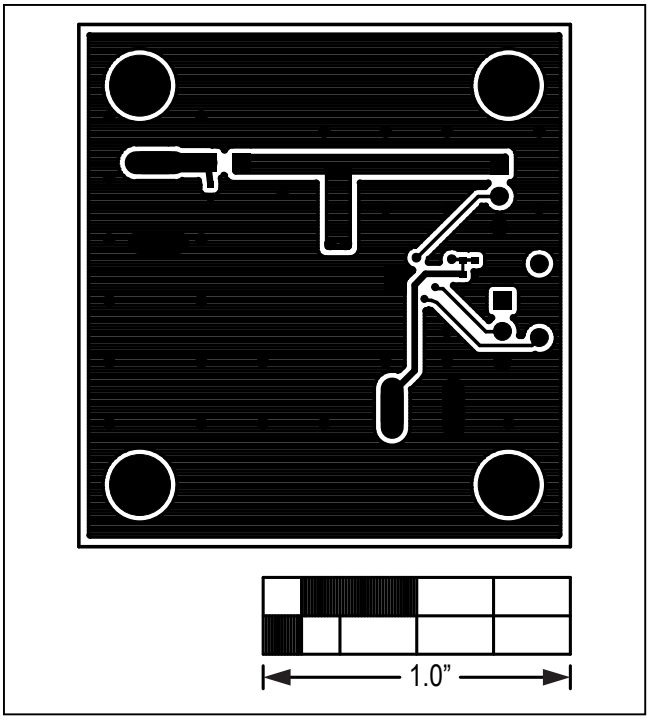

Figure 4. MAX16956 EV Kit PCB Layout—Solder Side

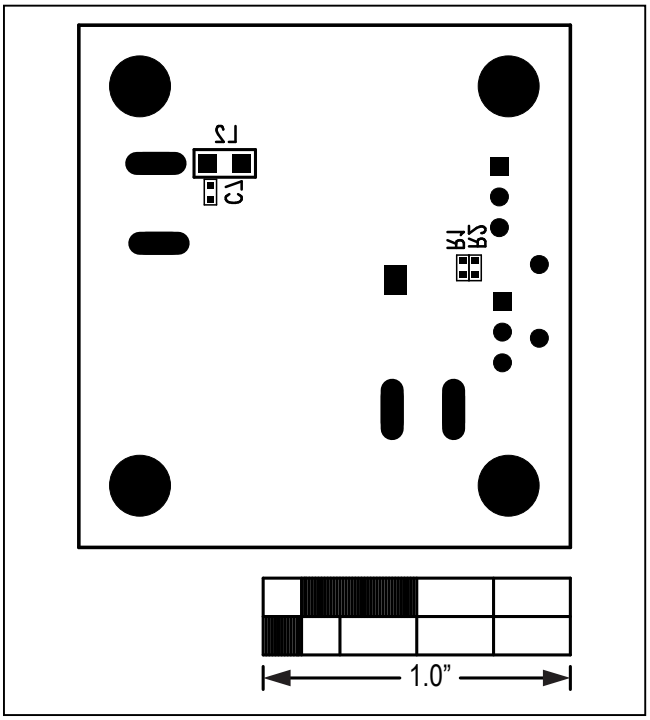

Figure 5. MAX16956 EV Kit Component Placement Guide—Solder Side

Ordering Information

PART	TYPE
MAX16956EVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/13	Initial release	—

