

General Description

The MAX16963 evaluation kit (EV kit) is a fully assembled and tested circuit board that evaluates the MAX16963 dual synchronous step-down converter IC with integrated high-side and low-side switches. The EV kit output is configured for 1.2V and 1.8V outputs up to 1.5A each. The EV kit circuit operates at the IC's internally set 2.2MHz switching frequency and features PCB pads to monitor the IC power-good output signals (PG1, PG2) and jumpers to enable the EV kit outputs (EN1, EN2).

The MAX16963 EV kit is designed to operate from a single DC power supply that is capable of up to 5.5V at 3A for full range operation. The EV kit is shipped with a MAX16963RAUEA/V+ IC in a 16-pin TSSOP package with exposed pad

Features

- 2.7V to 5.5V Input Voltage Range
- Dual Outputs (1.2V at 1.5A, 1.8V at 1.5A)
- Fixed 2.2MHz Switching Frequency
- Forced-PWM and Skip-Mode Operation
- External Synchronization
- High Efficiency
- Power-Good Outputs (PG1, PG2)
- Overcurrent and Thermal-Shutdown Protection
- Fully Assembled and Tested

Quick Start

Required Equipment

- Adjustable DC power supply capable of 5.5V at 3A
- Two electronic loads capable of sinking up to 1.5A each.
- Four 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 shunts are installed at jumpers EN1 (output 1 enabled), EN2 (output 2 enabled) and PWM (forced-PWM mode).
- 2) Connect the power-supply positive and ground terminals to the VSUP and PGND test points, respectively.
- 3) Connect electronic loads to the VOUT1, VOUT2 and PGND test points, observing the proper polarities.
- 4) Connect voltmeters to the VOUT1, VOUT2, and PGND test points.
- 5) Connect voltmeters to the PG1, PG2, and PGND test points.
- 6) Turn on the power supply.
- 7) Set the power-supply voltage to 5V.
- 8) Enable the electronic loads and set them to 1.5A.
- 9) Verify that the voltmeter connected to VOUT1 measures 1.2V.
- 10) Verify that the voltmeter connected to PG1 measures approximately 5V.
- 11) Verify that the voltmeter connected to VOUT2 measures 1.8V.
- 12) Verify that the voltmeter connected to PG2 measures approximately 5V

[Ordering Information](#) appears at end of data sheet.

Detailed Description of Hardware

The MAX16963 EV kit is a fully assembled and tested circuit board that contains all the components necessary to evaluate the performance of the MAX16963 dual synchronous step-down converter IC. The IC is available in a 16-pin TSSOP package and features an exposed pad for thermal dissipation. The EV kit circuit uses a MAX16963R dual step-down converter IC to implement a dual step-down synchronous DC-DC converter circuit with a fixed 2.2MHz switching frequency. The EV kit is designed to operate from a single DC power supply that can provide up to 5.5V at 3A.

The IC features a fixed 2.2MHz switching frequency, an 8ms soft-start time, and a SYNC input that can be used to synchronize the IC to frequencies in the 1.7MHz to 2.4MHz range.

The EV kit is configured for 1.2V at VOUT1 using resistors R6 and R8, and 1.8V at VOUT2 using resistors R11 and R12. Each output is capable of providing up to 1.5A output current. The EV kit can be configured to operate in forced fixed-frequency PWM mode or low-quiescent current skip mode using a jumper at PWM. PCB test points are available for monitoring the circuit power-good outputs (PG1, PG2) and the SYNC input.

Configuring the Output Voltage (VOUT1, VOUT2)

The EV kit VOUT1 output is set to 1.2V using resistors R6 and R8, and the VOUT2 output is set to 1.8V using resistors R11 and R12. To reconfigure the EV kit outputs, use the equations below:

$$V_{OUT1} = V_{OUTS} \times \left(1 + \frac{R6}{R8}\right), V_{OUT2} = V_{OUTS} \times \left(1 + \frac{R12}{R11}\right)$$

where $V_{OUTS} = 0.8V$; R6, R8, R11, and R12 are in k Ω and $V_{OUT_}$ is in volts.

The external feedback resistive dividers must be frequency compensated for proper operation. Place a capacitor across each high-side resistor in the resistive-divider networks. Use the following equations to determine the value of the capacitors:

$$C13 = 10\text{pf} \left(\frac{R11}{R12}\right), C14 = 10\text{pf} \left(\frac{R8}{R6}\right)$$

Mode of Operation (PWM)

Jumper PWM configures the IC for forced-PWM or skip-mode operation. Install a shunt to operate the EV kit

in forced-PWM mode. Remove the shunt to operate in skip mode.

Enable Control (EN1, EN2)

Jumpers EN1 and EN2 configure the on/off state of the EV kit outputs (VOUT1, VOUT2). Install a shunt on an EN jumper to enable its respective output. Remove a shunt from an EN jumper to disable its respective output. See Table 2 for proper EN configuration.

Power-Good Outputs (PG1, PG2)

The EV kit circuit provides test points to monitor the status of the power-good outputs (PG1, PG2). PG_ outputs can be used as system-reset signals during power-up. A PG_ is high when its respective VOUT_ is between 92% and 110% of its programmed output voltage. PG_ is pulled low when its respective VOUT_ is below 92% of its nominal set voltage or above 110% of its nominal set voltage. PG1, PG2 are pulled up to VSUP using resistors R1 and R14, respectively.

Synchronization Input (SYNC)

The EV kit's SYNC test point can be used to synchronize the IC with an external 1.7MHz to 2.4MHz digital clock. When SYNC is driven with an external digital clock, the IC synchronizes to the rising edge of the external clock.

The digital square-wave clock source must have a frequency between 1.7MHz and 2.4MHz and comply with the following voltage levels:

- Logic-low = 0 to 0.4V
- Logic-high = 1.8V to VSUP

To use external synchronization, connect an external square-wave source to the SYNC and PGND pads.

Table 1. Mode of Operation (PWM)

SHUNT POSITION	PWM PIN	MODE
Installed	Connected to VSUP	Forced-PWM mode
Not installed	Connected to ground through R10	Skip mode

Table 2. Enable Control (EN1, EN2)

SHUNT POSITION	EN_ PIN	VOUT_
Installed	Connected to VSUP	Enabled
Not installed	Connected to ground through R13, R2	Disabled

Component List

DESIGNATORS	QTY	DESCRIPTION
C1, C2	2	10 μ F \pm 10%, 10V X7R ceramic capacitors (1206) Murata GRM31CR71A106K
C3, C9	2	47 μ F \pm 20%, 6.3V X7R ceramic capacitors (1210) Murata GRM32ER70J476K
C5	1	1 μ F \pm 10%, 10V X7R ceramic capacitor (0603) Murata GRM188R71A105K
C8	1	47 μ F \pm 20%, 10V aluminum electrolytic capacitor (5.3mm x 5.3mm) Panasonic EEE-HA1A470WR
C4, C10	0	Not installed, ceramic capacitors (1210)
C13	1	22pF \pm 5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H220J
C14	1	47pF \pm 5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H470J
EN1, EN2, PWM	3	2-pin headers Sullins PEC36SAAN

DESIGNATORS	QTY	DESCRIPTION
L1, L2	2	1 μ H, 3.5A inductors Coilcraft XAL4020-102
PG1, PG2, SYNC	3	Small red test points Keystone 5000
PGND (x2), PGND1, PGND2	4	Black multipurpose test points, 63mil drill size Keystone 5011
R1, R9, R10, R14	4	20k Ω \pm 5% resistors (0603)
R2, R13	2	100k Ω \pm 5% resistors (0603)
R6	1	26.1k Ω \pm 1% resistor (0603)
R8, R11	2	49.9k Ω 1% resistors (0603)
R12	1	64.9k Ω \pm 1% resistor (0603)
R15	1	10 Ω \pm 5% resistor (0603)
U1	1	Dual 2.2MHz, low-voltage step-down converter (16 TSSOP-EP*) Maxim MAX16963RAUEA/V+
VOUT1, VOUT2, VSUP	3	Red multipurpose test points, 63mil drill size Keystone 5010
—	3	Shunts Kycon SX1100-B
—	1	PCB: MAX19693 EVKIT

*EP = Exposed pad.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Coilcraft	847-639-6400	www.coilcraft.com
Murata Americas	770-436-1300	www.murataamericas.com
Panasonic Corp	714-373-7366	www.panasonic.com

Note: Indicate that you are using the MAX16963 when contacting these component suppliers.

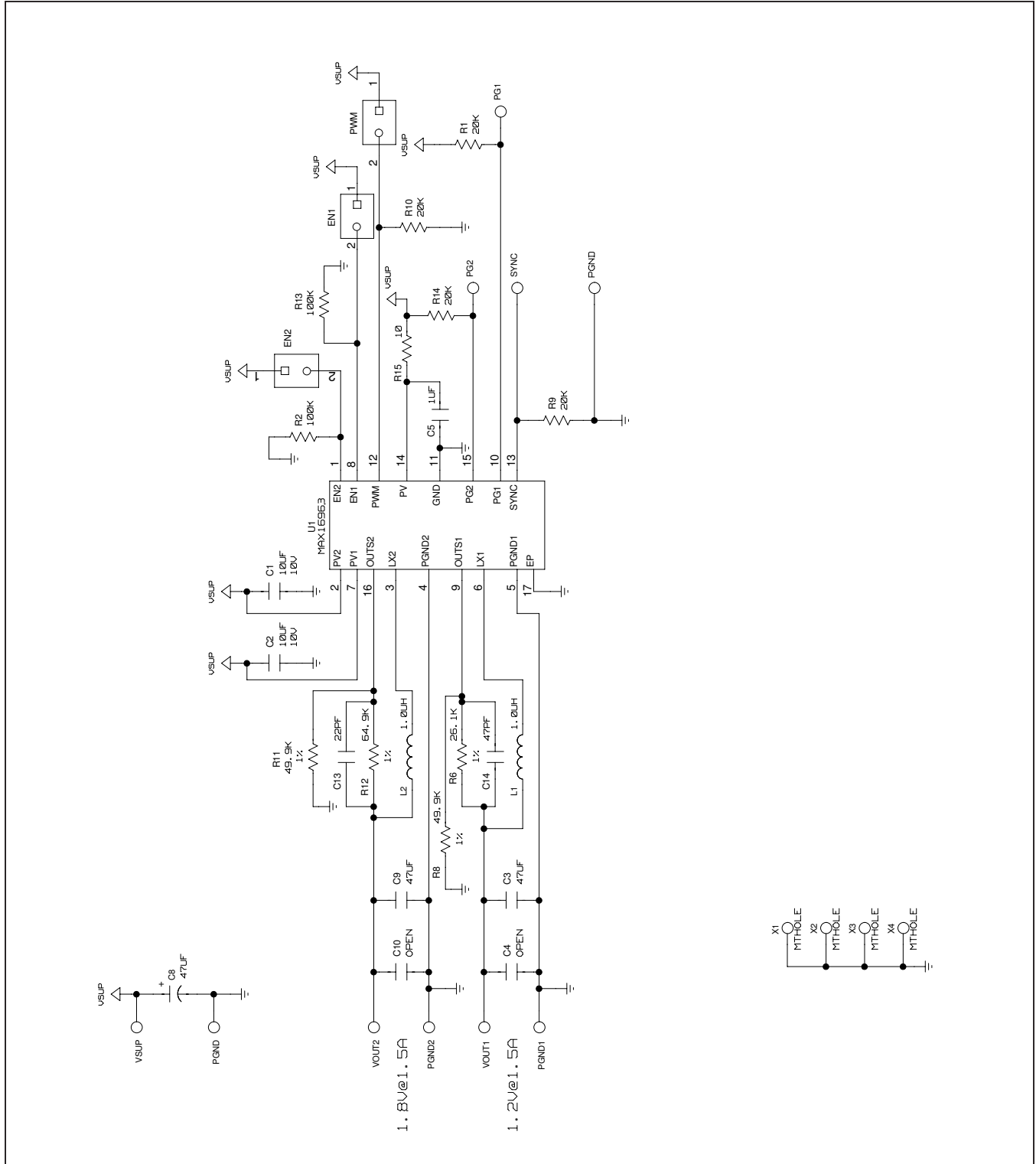


Figure 1. MAX16963 EV Kit Schematic

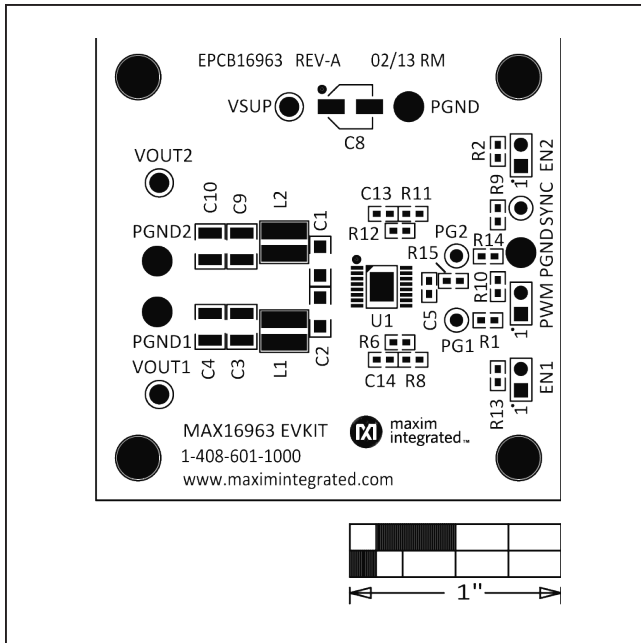


Figure 2. MAX16963 EV Kit Component Placement Guide—Component Side

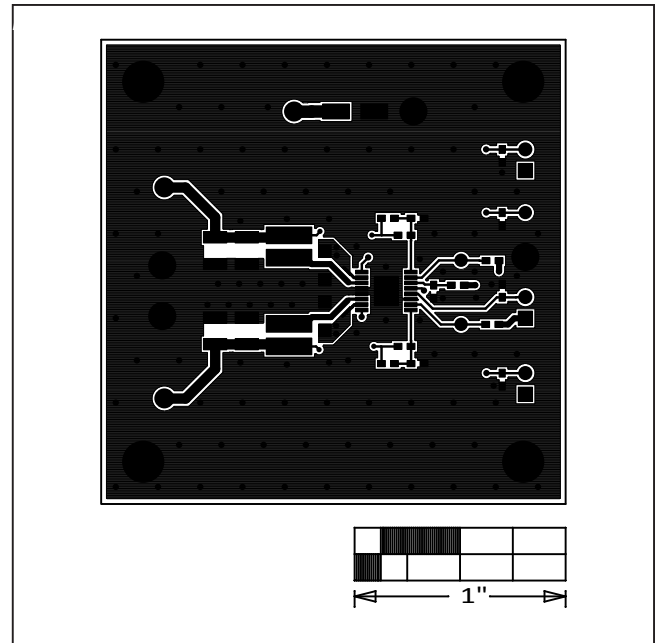


Figure 3. MAX16963 EV Kit PCB Layout—Component Side

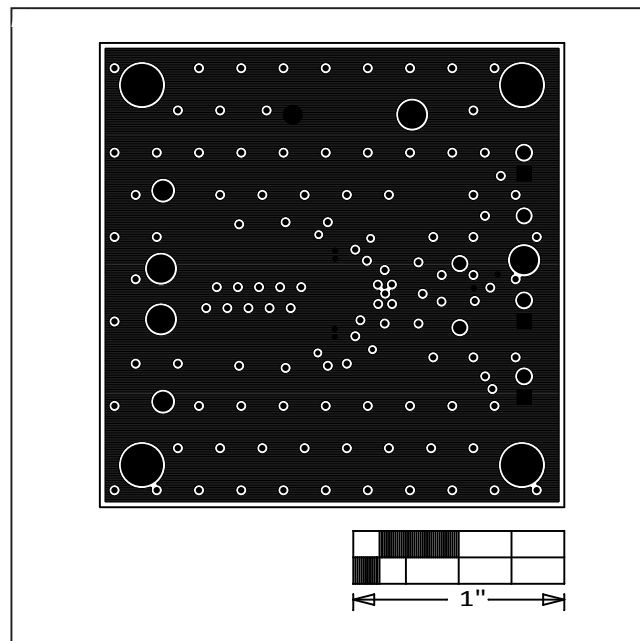


Figure 4. MAX16963 EV Kit PCB Layout—PGND Layer 2

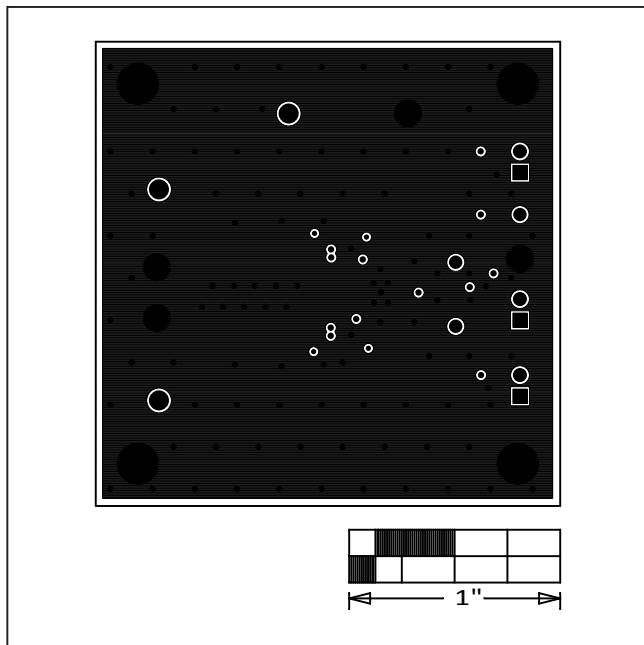


Figure 5. MAX16963 EV Kit PCB Layout—SGND Layer 3

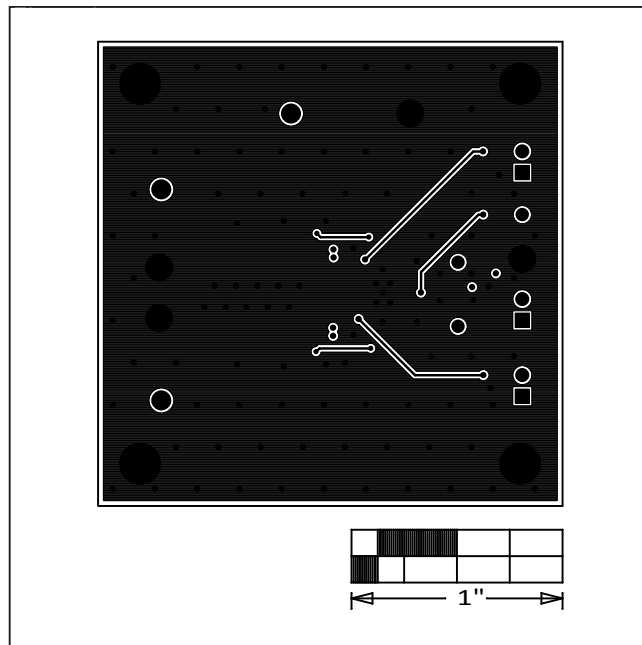


Figure 6. MAX16963 EV Kit PCB Layout—Solder Side

Ordering Information

PART	TYPE
MAX16963EVKIT#	EV Kit

Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/14	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time.