

Evaluates: MAX26402/MAX26403

## General Description

The MAX26403 evaluation kit (EV kit) provides a proven design to evaluate the MAX26403 2.1MHz high-voltage mini-buck converter in a side-wettable, 15-pin FC2QFN package. Various test points and jumpers are included for evaluation.

The MAX26403 EV kit comes with the MAX26403AFLB/Y+ installed (3.3V, 2.1MHz). This EV kit can be used to evaluate all variants of the MAX26402/MAX26403 with minimal component changes.

## Features and Benefits

- 3V to 36V Input Supply Range
- 5V or 3.3V Fixed Output Voltage, or Adjustable Between 0.8V and 12V
- Delivers up to 3.5A Output Current (up to 2.5A for MAX26402)
- Frequency Synchronization Input
- 99% Duty Cycle Operation with Low Dropout
- Voltage-Monitoring PGOOD Output with UV/OV Feature
- Proven PCB Layout
- Fully Assembled and Tested

## Quick Start

### Required Equipment

- MAX26403 EV Kit
- Power Supply
- Voltmeter
- Electronic Load

This EV kit should be used with the following documents:

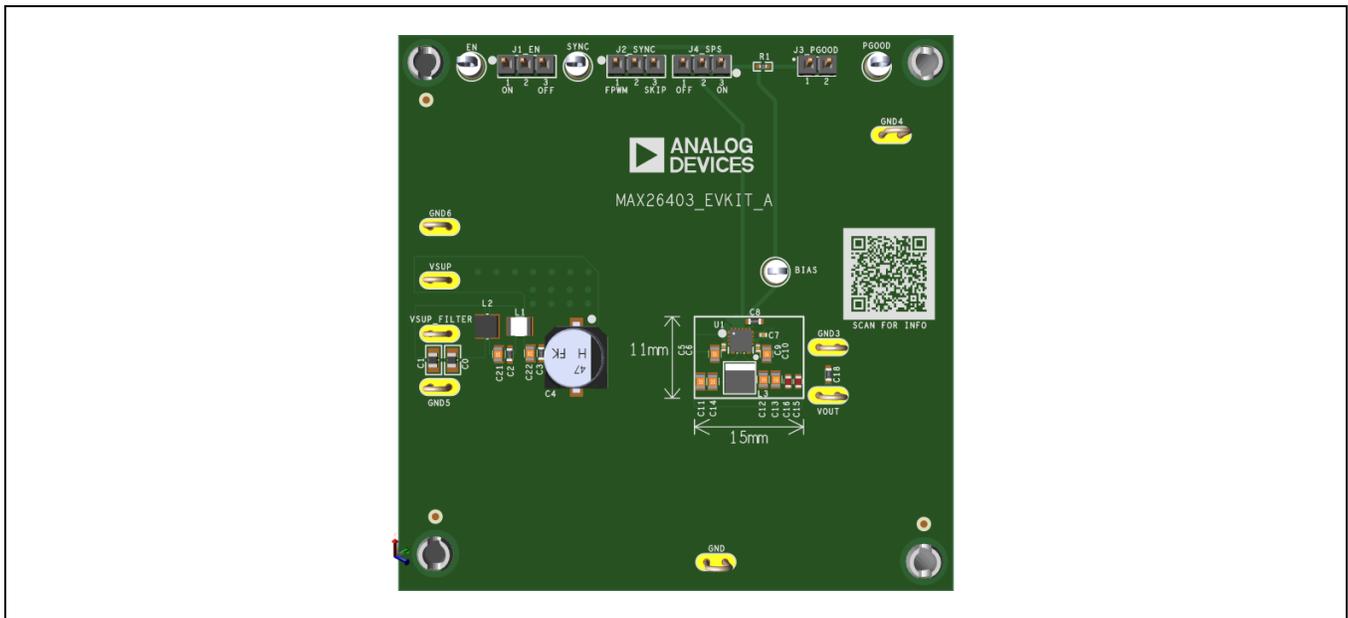
- MAX26402/MAX26403 Data Sheet
- MAX26403 EV Kit Data Sheet (this document)

## Procedure

The EV kit is fully assembled and tested. Use the following steps to verify board operation.

1. While observing safe ESD practices, carefully remove the MAX26403 EV kit board from its packaging. Quickly inspect the board to ensure that no damage occurred during shipment. Jumpers/shunts were preinstalled prior to testing and packaging.
2. Verify that all jumpers are in their default positions, as shown in [Table 1](#).
3. Connect the positive and negative terminals of the power supply to the VSUP and GND6 test pads, respectively.
4. Connect the positive terminal of the voltmeter to VOUT, and the negative terminal to GND3.
5. Set the power supply to 14V and 3A current limit. Turn on the power supply.
6. The voltmeter should display an output voltage of 3.3V.
7. Connect an electronic load to VOUT and GND3 terminals and set it to 1A.
8. Turn ON the electronic load and increase the current to 3.5A. The voltmeter should display the output voltage of 3.3V  $\pm$ 1.8%.

## EV Kit Photo



**Table 1. Jumper Connection Guide**

JUMPER	DEFAULT CONNECTION	FEATURE
J1_EN	Pins 1-2	Buck controller enabled
J2_SYNC	Pins 1-2	Forced-PWM mode
J3_PGOOD	Installed	PGOOD is pulled up to BIAS when OUT is in regulation
J4_SPS	Pins 1-2	Spread spectrum disabled

## Detailed Description

The MAX26403 EV kit provides a proven layout for all variants of the MAX26402/MAX26403 synchronous buck regulator. The device accepts input voltages as high as 36V and delivers up to 3.5A (2.5A for MAX26402). The EV kit can handle an input-supply transient up to 42V.

### Switching Frequency/External Synchronization

The devices can operate in two modes: forced PWM (FPWM) or skip. Skip mode has better efficiency for light-load conditions. When SYNC is pulled low, the device operates in skip mode for light loads and in PWM mode for larger loads. When SYNC is pulled high, the device is forced to operate in PWM across all load conditions.

SYNC can also be used to synchronize with an external clock. The device operates in FPWM mode when SYNC is connected to an external clock.

### Buck Output Monitoring (PGOOD)

The EV kit provides a power-good output test point (PGOOD) to monitor the status of the buck output (OUT). PGOOD is high impedance when the output voltage is in regulation. PGOOD is low impedance when the output voltage drops below 7% (typ) or exceeds 5% (typ) of its nominal regulated voltage. To obtain a logic signal, pull up PGOOD to VBIAS by installing shunt on jumper J3.

### Programming Buck Output Voltage

The MAX26402/MAX26403 has a fixed output and an adjustable 0.8V to 12V output version. For the IC with fixed output voltage, the FB/OUT pin acts as an output voltage sense pin (OUT). In this case, OUT is connected to the buck output to

sense the output voltage. The default EV kit is set up with this connection. The EV kit comes installed with the MAX26403AFLB/Y+, which can provide a fixed 3.3V output voltage.

For the IC with adjustable output voltage, the FB/OUT pin acts as an output voltage feedback input (FB). In this case, an external divider connected between the output, FB, and GND is used to set the output voltage. To program the output voltage, remove the R2 resistor and place the appropriate resistors in the positions of R4 and R5 according to the following equation:

$$R_4 = R_5 * \left[ \frac{V_{OUT}}{V_{FB}} - 1 \right]$$

Where  $V_{FB} = 0.8V$  and  $R_5 = 10k\Omega$  to  $50k\Omega$  and replace output capacitors C11–C14 with appropriate capacitors according to the adjustable tables in the data sheet.

A feed-forward capacitor (C19) in parallel with R4 is also recommended for the adjustable output voltage version. Refer to the MAX26402/MAX26403 IC data sheet for the C19 value.

### Evaluating Other Variants

The MAX26403 EV kit comes installed with the 3.3V/2.1MHz 3.5A variant (MAX26403AFLB/Y+). The other MAX26402/MAX26403 variants can be installed with minimal component changes.

### Ordering Information

PART	TYPE
MAX26403EVKIT#	3.3V output, 2.1MHz EV kit

#Denotes RoHS-compliant.

### MAX26403 EV Kit Bill of Materials

REF DES	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
BIAS, EN, PGOOD, SYNC	5012	KEYSTONE	N/A	Test Point, Pin Diameter 0.125in
C0, C1, C5, C10	C2012X7R1H225K125AC	TDK	2.2 $\mu$ F	2.2 $\mu$ F $\pm$ 10%, 50V X7R Ceramic Capacitor (0805)
C2, C3, C18	CGA3E2X7R1H104K080AE	TDK	0.1 $\mu$ F	0.1 $\mu$ F $\pm$ 10%, 50V X7R Ceramic Capacitor (0603)
C4	EEE-TG1H220P	PANASONIC	22 $\mu$ F	22 $\mu$ F $\pm$ 20%, 50V X7R Aluminum-Electrolytic Capacitor (Case-E)
C6, C7, C9	CGA2B3X7R1H104K050BB	TDK	0.1 $\mu$ F	0.1 $\mu$ F $\pm$ 10%, 50V X7R Ceramic Capacitor (0402)
C8	GRM188Z71C225KE43	MURATA	2.2 $\mu$ F	2.2 $\mu$ F $\pm$ 10%, 16V X7R Ceramic Capacitor (0603)
C15, C16	C1608X7R1C105K080AC	TDK	1 $\mu$ F	1 $\mu$ F $\pm$ 10%, 16V X7R Ceramic Capacitor (0603)
C21, C22	C2012X7R1H475K125AC	TDK	4.7 $\mu$ F	4.7 $\mu$ F $\pm$ 10%, 50V X7R Ceramic Capacitor (0805)
GND, GND3-GND6, VOUT, VSUP, VSUP_FILTER	5020	KEYSTONE	N/A	Test Point, Pin Diameter 0.094in
J1_EN, J2_SYNC, J4_SPS	PEC03SAAN	SULLINS	N/A	Connector, Through Hole, Male, 3 Pins
J3_PGOOD	PEC02SAAN	SULLINS	N/A	Connector, Through Hole, Male, 2 Pins
L2	74438336010	WURTH ELECTRONICS INC	1 $\mu$ H	1 $\mu$ H $\pm$ 20%, 4A, Shielded, SMT, Inductor

MH1-MH4	9032	KEYSTONE	N/A	Machine-Fabricated; Round Thru-Hole Spacer
R1	CRCW040220K0FK	VISHAY	20k $\Omega$	20k $\Omega$ 1% 0.063W Resistor 0402
R2, R3	CRCW06030000Z0EAHP	VISHAY	0 $\Omega$	0 $\Omega$ 0.25W Resistor 0603
SU1-SU4	2-382811-1	TE	N/A	Test Point, Economy Shunt Assembly

**MAX26402: 2.1MHz FIXED-OUTPUT VARIANT**

REF DES	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
U1	MAX26402AFLAY+/ MAX26402AFLBY+	ANALOG DEVICES	MAX26402	EV Kit Part – IC; Automotive 36V, 2.1MHz, 2.5A Buck Converter
L3	XGL4020-222ME	COILCRAFT	2.2 $\mu$ H	2.2 $\mu$ H $\pm$ 20%, 6.7A, Shielded Power Inductor
C11-C13	CGA4J1X7S1C106K125	TDK	10 $\mu$ F	10 $\mu$ F $\pm$ 10%, 16V X7S Ceramic Capacitor (0805)

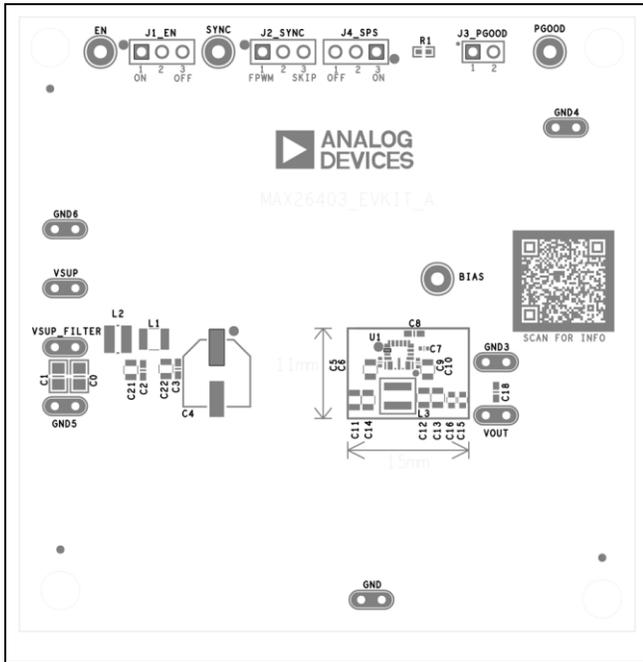
**MAX26403: 2.1MHz FIXED-OUTPUT VARIANT**

REF DES	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
U1	MAX26403AFLAY+/ MAX26403AFLBY+	ANALOG DEVICES	MAX26403	EV Kit Part – IC; Automotive 36V, 2.1MHz, 3.5A Buck Converter
L3	XGL4020-152ME	COILCRAFT	1.5 $\mu$ H	1.5 $\mu$ H $\pm$ 20%, 8.0A, Shielded Power Inductor
C11-C13	CGA4J1X7S1C106K125	TDK	10 $\mu$ F	10 $\mu$ F $\pm$ 10%, 16V X7S Ceramic Capacitor (0805)

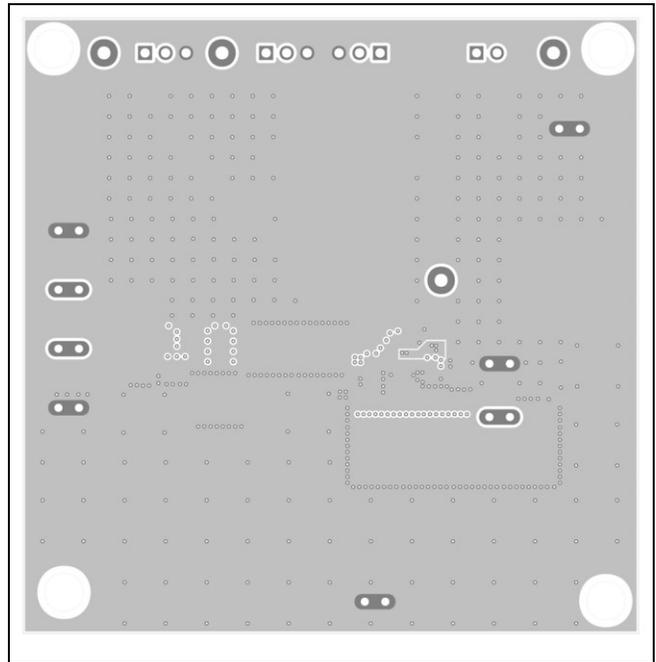




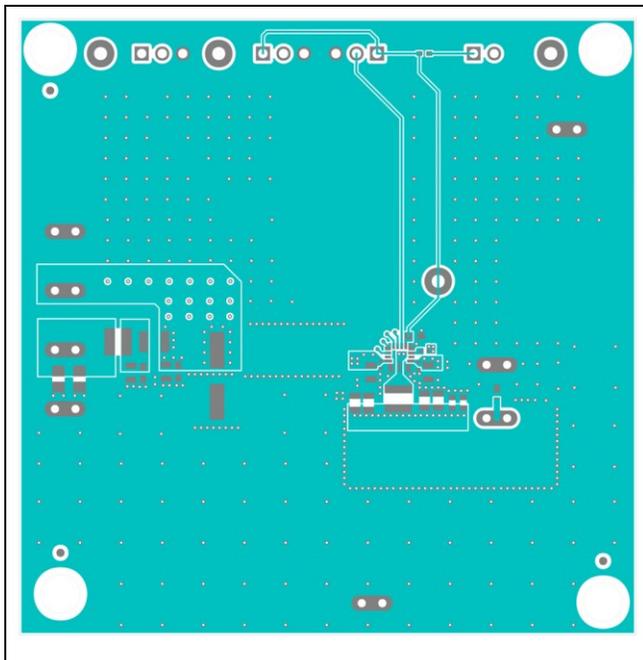
## MAX26403 EV Kit PCB Layouts



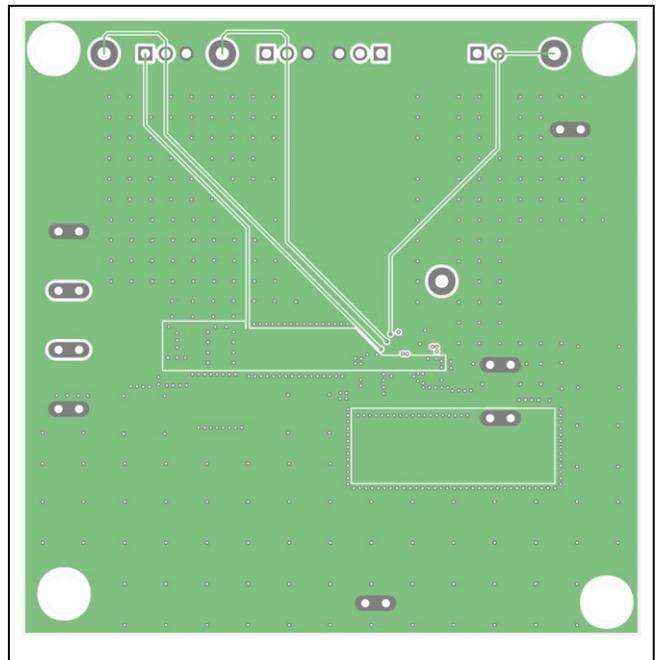
MAX26403 EV Kit Component Placement Guide—Top Silkscreen



MAX26403 EV Kit PCB Layout—Layer 2

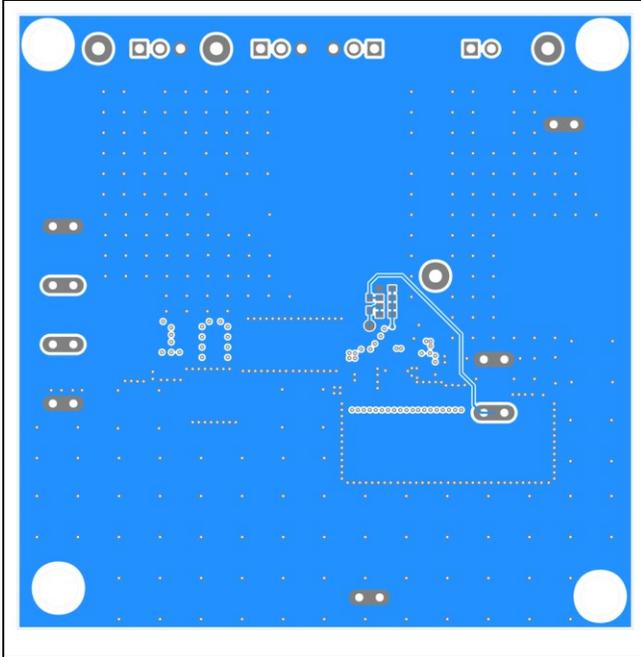


MAX26403 EV Kit PCB Layout—Top

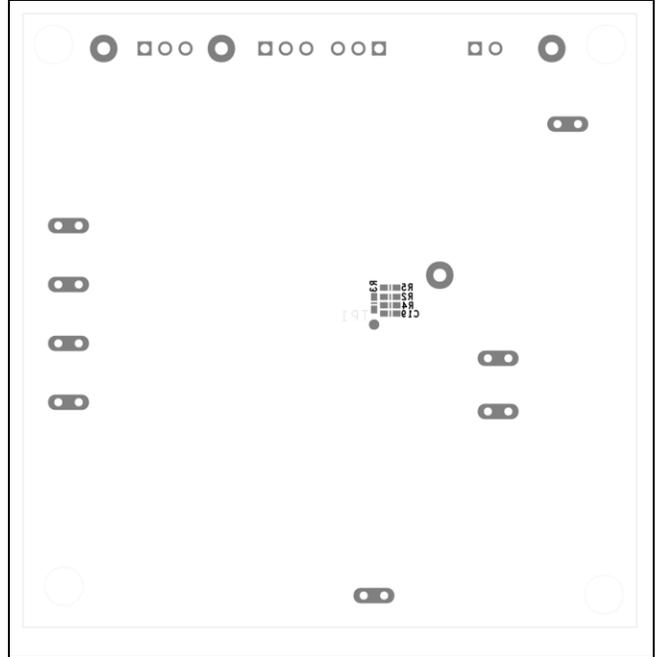


MAX26403 EV Kit PCB Layout—Layer 3

## MAX26403 EV Kit PCB Layouts (continued)



MAX26403 EV Kit PCB Layout—Bottom



MAX26403 EV Kit Component Placement Guide—Bottom Silkscreen

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/24	Initial release	—

## Notes

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