MAX42403 Evaluation Kit

Evaluates: MAX42402/MAX42403

General Description

The MAX42403 evaluation kit (EV kit) provides a proven design to evaluate the MAX42402/MAX42403, high input-voltage, mini buck converter in a 15-pin, FC2QFN package. Various test points and jumpers are included for evaluation. The MAX42403 EV kit comes with the MAX42403AFLB+ installed (3.3V, 1.5MHz). This EV kit can be used to evaluate all variants of the MAX42402/MAX42403 with minimal component changes.

Benefits and Features

- 4.5V to 36V Input Supply Range
- Adjustable Output Between 0.8V and 12V
- Delivers up to 3.5A Output Current (up to 2.5A for the MAX42402)
- 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

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

Quick Start

Required Equipment

- MAX42403 EV Kit
- Power Supply
- Voltmeter
- Electronic Load

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

1. While observing safe ESD practices, carefully remove the MAX42403 EV kit board out of its packaging. Quickly inspect the board to ensure that no damage occurred during shipment. Jumpers/shunts are 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 V_{SUP} and GND2 test pads, respectively.
4. Connect the positive terminal of the voltmeter to V_{OUT}, 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 V_{OUT} 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.

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Board Photos

Figure 1. MAX42403 EV Kit Board Photo—Top

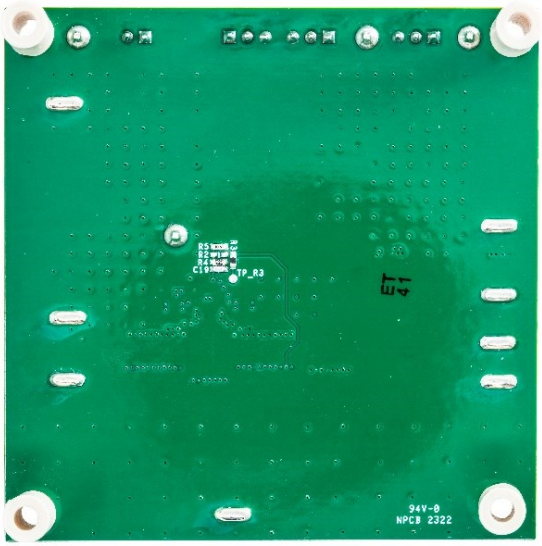


Figure 2. MAX42403 EV Kit Board Photo—Bottom

Detailed Description

This evaluation kit should be used with the following documents:

- MAX42402/MAX42403 data sheet
- MAX42403 EV kit data sheet (this document)

The MAX42403 EV kit provides a proven layout for all variants of the MAX42402/MAX42403 synchronous buck converter. The device accepts input voltages as high as 36V and delivers up to 3.5A (2.5A for the MAX42402). The EV kit can handle an input-supply transient up to 42V.

Switching Frequency/External Synchronization

The device can operate in two modes: forced PWM 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. Use jumper J2 to switch modes.

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. To do this, uninstall the J2 shunt and connect an external clock at the SYNC pin.

Buck Output Monitoring (PGOOD)

The EV kit provides a power-good output test point (PGOOD) to monitor the status of the buck output. 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 4% (typ) of its nominal regulated voltage. To obtain a logic signal, pull up PGOOD to V_{BIAS} by installing a shunt on jumper J3.

Programming Buck Output Voltage

The MAX42402/MAX42403 has an adjustable 0.8V to 12V output. An external divider connected between the buck output (FB) and GND is used to set the output voltage. To program the output voltage, place the appropriate resistors in the positions of R4 and R5 according to the following equation:

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

Where V_{FB} = 0.8V and R_5 = 10kΩ–50kΩ and replace the output capacitors C12–C17 with appropriate capacitors according to the adjustable tables in the data sheet.

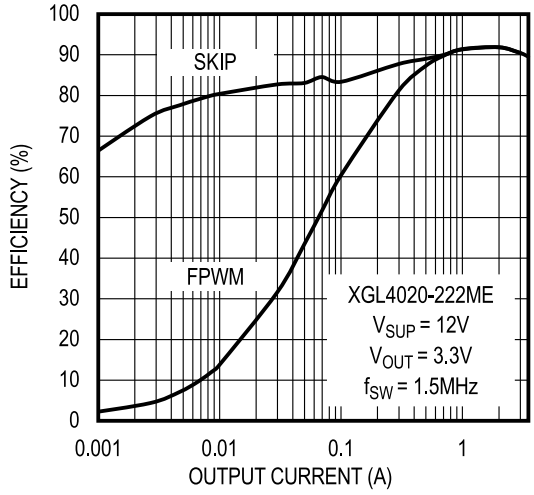
A feedforward capacitor, C19, in parallel with R_4 is also recommended to improve loop stability and bandwidth. Refer to the MAX42402/MAX42403 IC data sheet for C19 value.

Evaluating Other Variants

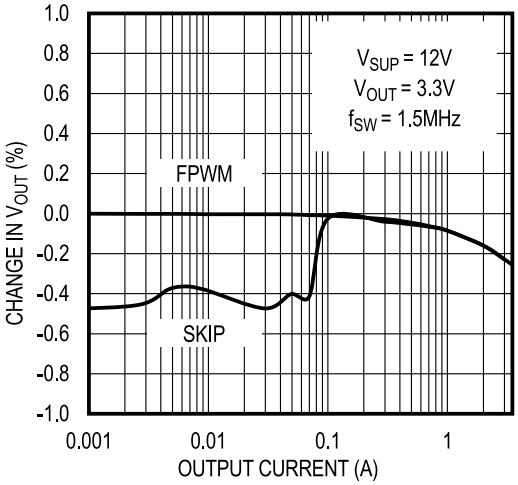
The MAX42403 EV kit comes installed with the 3.3V/1.5MHz, 3.5A variant (MAX42403AFLB+). Additionally, a 400kHz variant with inductor for 3.3V output is also available. The other MAX42402/MAX42403 variants can be installed with minimal component changes.

Evaluation Data

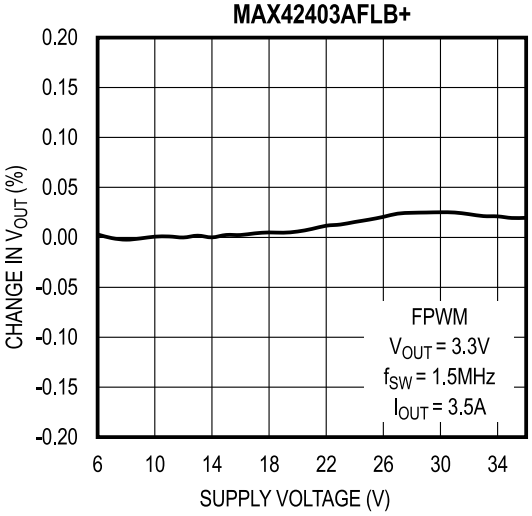
EFFICIENCY vs. OUTPUT CURRENT
MAX42403AFLB+



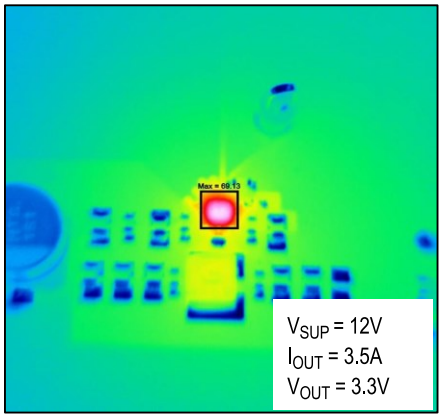
OUTPUT LOAD REGULATION
MAX42403AFLB+



OUTPUT LINE REGULATION
MAX42403AFLB+



THERMAL IMAGE
MAX42403AFLB+



MAX IC TEMP = +69.13°C

Table 1. Default Jumper Settings

JUMPER	SHUNT POSITION	FUNCTION
J1_EN	Pin 1-2	Buck controller enabled
J2_SYNC	Pin 1-2	Forced-PWM mode
J3_PGOOD	Installed	PGOOD is pulled up to BIAS when OUT is in regulation
J4_SPS	Pin 1-2	Spread spectrum disabled

Ordering Information

PART	TYPE
MAX42403EVKIT#	3.3V Output, 1.5MHz EV Kit

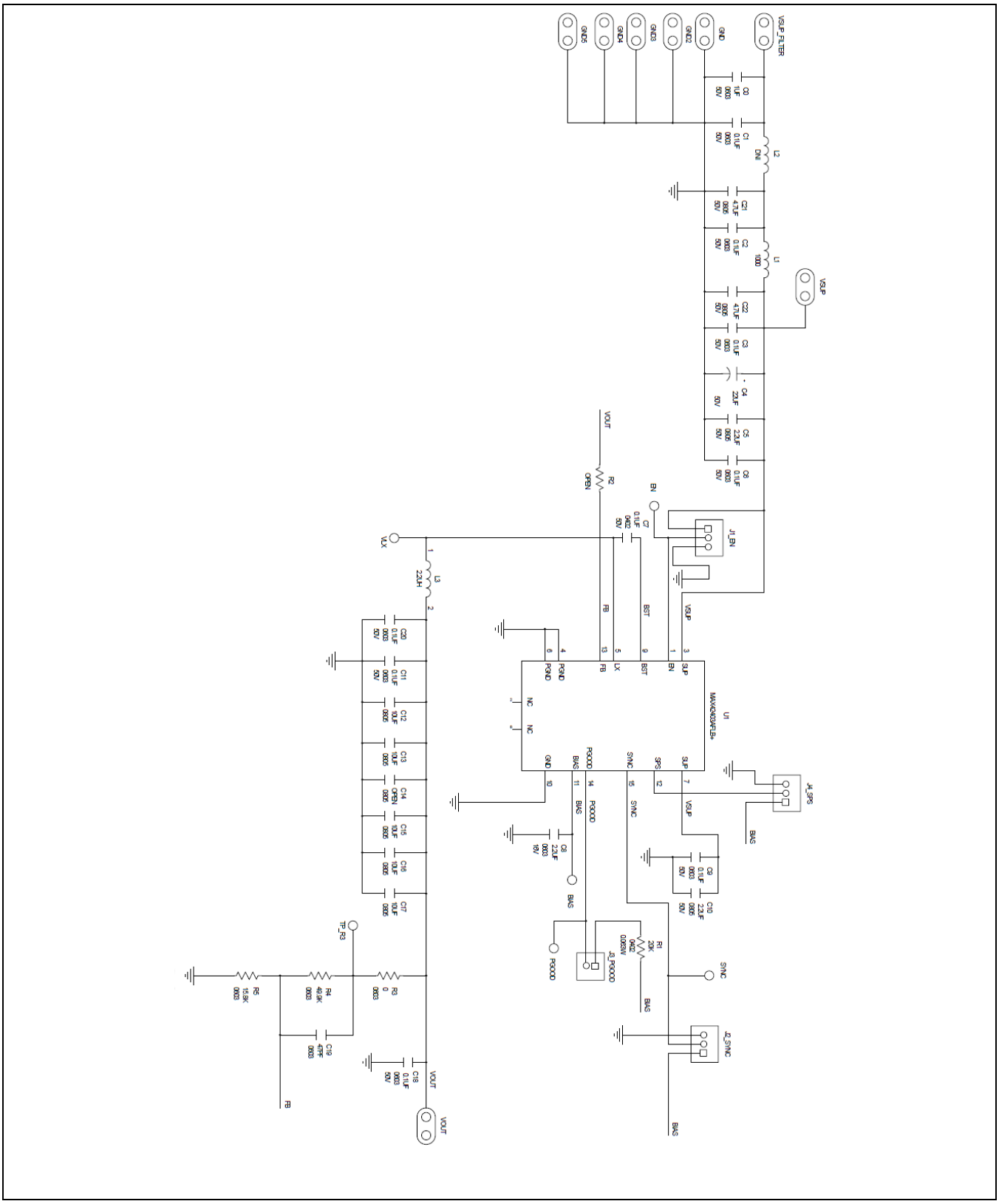
 # Denotes RoHS-compliant.

MAX42403 EV Kit Bill of Materials

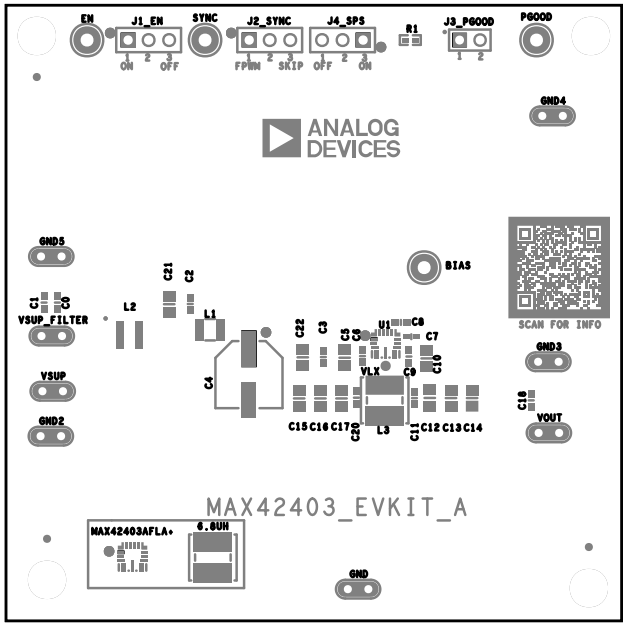
PART	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
BIAS, EN, PGOOD, SYNC	5012	KEYSTONE	N/A	Test Point Pin Diameter 0.125 inches
C0	UMK107AB7105KA;CC0603 KRX7R9BB105	TAIYO YUDEN;YAGEO	1µF	CAP; SMT (0603); 1UF; 10%; 50V; X7R; CERAMIC
C1-C3, C6, C9, C11, C18, C20	CGA3E2X7R1H104K080AE; UMK107B7104KAH	TDK	0.1µF	CAP; SMT (0603); 0.1UF; 10%; 50V; X7R; CERAMIC
C4	EEE-TG1H220P	PANASONIC	22µF	CAP; SMT (CASE_E); 22UF; 20%; 50V; ALUMINUM-ELECTROLYTIC
C5, C10	C2012X7R1H225K125AC	TDK	2.2µF	CAP; SMT (0805); 2.2UF; 10%; 50V; X7R; CERAMIC
C7	CGA2B3X7R1H104M050BB	TDK	0.1µF	CAP; SMT (0402); 0.1UF; 20%; 50V; X7R; CERAMIC
C8	GRM188Z71C225KE43;EMK 107BB7225KA	MURATA;TAIYO YUDEN	2.2µF	CAP; SMT (0603); 2.2UF; 10%; 16V; X7R; CERAMIC
C12, C13, C15-C17	CGA4J1X7S1C106K125	TDK	10µF	CAP; SMT (0805); 10UF; 10%; 16V; X7S; CERAMIC
C19	GRM1885C1H470JA01	MURATA	47pF	CAP; SMT (0603); 47PF; 5%; 50V; C0G; CERAMIC
C21, C22	GRM21BZ71H475KE15;C20 12X7R1H475K125AC	MURATA;TDK	4.7µF	CAP; SMT (0805); 4.7UF; 10%; 50V; X7R; CERAMIC
GND, GND2-GND5, VOUT, VSUP, VSUP_FILTER	5020	KEYSTONE	N/A	Test Point Diameter 0.094 inches
J1_EN, J2_SYNC, J4_SPS	PEC03SAAN	SULLINS	N/A	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS
J3_PGOOD	PEC02SAAN	SULLINS	N/A	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
L1	FBMH3225HM102N	TAIYO YUDEN	1000	INDUCTOR; SMT (1210); FERRITE-BEAD; 1000 IMPEDANCE AT 100MHZ; TOL=+/-30%; 2A

L2	XGL4020-222ME	COILCRAFT	2.2µH	INDUCTOR; SMT; COMPOSITE; 2.2UH; 20%; 8.9A
L3	XGL4030-222ME	COILCRAFT	2.2µH	INDUCTOR; SMT; COMPOSITE; 2.2UH; 20%; 8.7A
MH1-MH4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
R1	CRCW040220K0FK	VISHAY DALE	20K	RES; SMT (0402); 20K; 1%; +/-100PPM/DEGC; 0.0630W
R3	CRCW06030000Z0EAHP	VISHAY DRALORIC	0	RES; SMT (0603); 0; JUMPER; JUMPER; 0.2500W
R4	CRCW060349K9FK;ERJ-3EKF4992	VISHAY DALE;PANASONIC	49.9K	RES; SMT (0603); 49.9K; 1%; +/-100PPM/DEGC; 0.1000W
R5	AC0603FR-0715K8L;CRCW060315K8FK;ERJ-3EKF1582	YAGEO;VISHAY;PANASONIC	15.8K	RES; SMT (0603); 15.8K; 1%; +/-100PPM/DEGC; 0.1000W
U1	MAX42403AFLB+	ANALOG DEVICES	N/A	IC MAX42403 1.5MHz
MAX42403AFLA+	MAX42403AFLA+	ANALOG DEVICES	N/A	IC MAX42403 400kHz
6.8UH	XAL5050-682ME	COILCRAFT	6.8µH	EVKIT PART – INDUCTOR; SMT; COMPOSITE CORE; 6.8UH; TOL=+/-20%; 6.4A

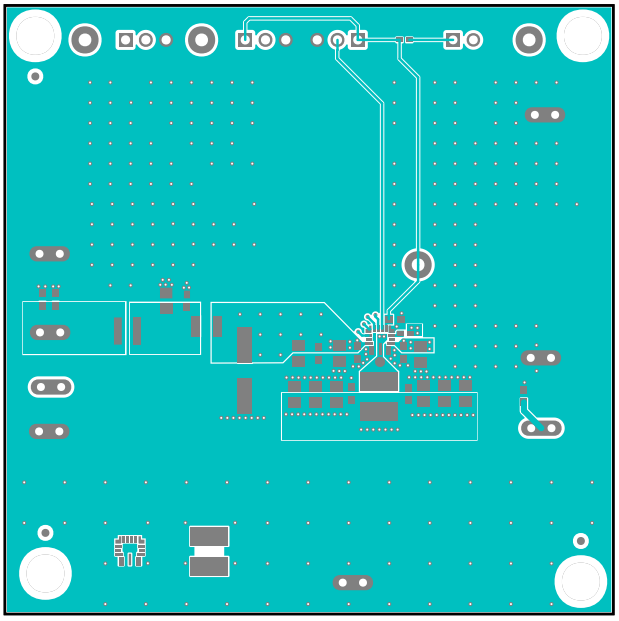
MAX42403 EV Kit Schematic



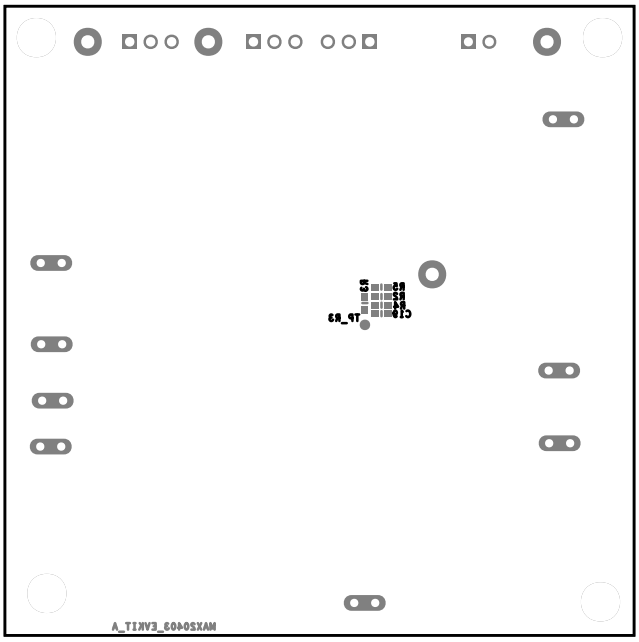
MAX42403 EV Kit PCB Layout



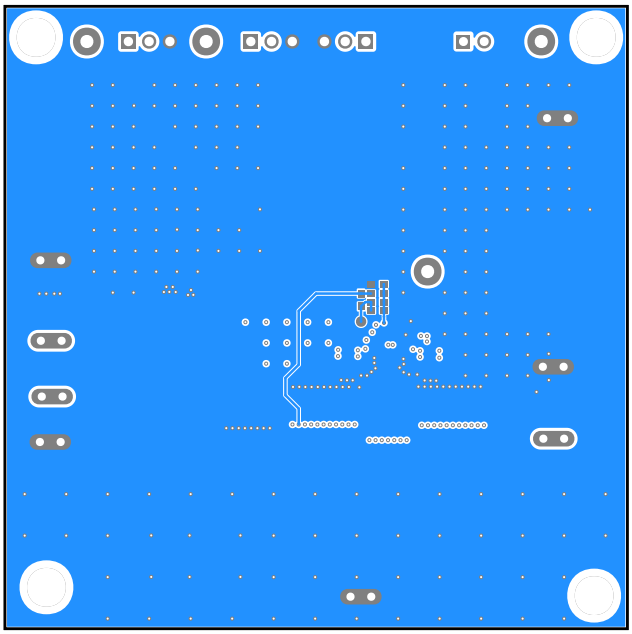
MAX42403 EV Kit Layout—Top Silk Layer



MAX42403 EV Kit Layout—Top Layer

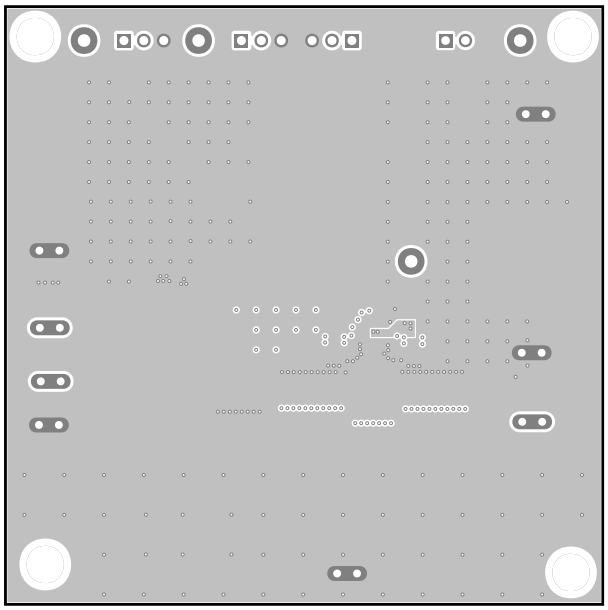


MAX42403 EV Kit Layout—Bottom Silk Layer

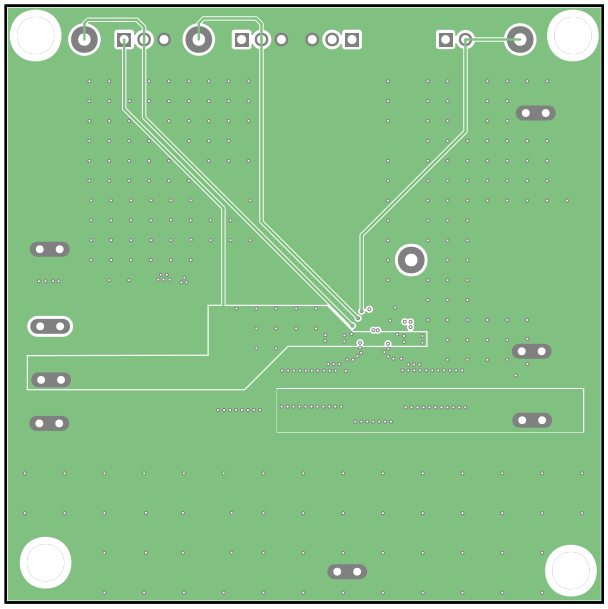


MAX42403 EV Kit Layout—Bottom Layer

MAX42403 EV Kit PCB Layout (continued)



MAX42403 EV Kit Layout—Internal Layers are Ground Planes



MAX42403 EV Kit Layout—Internal Layer

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	9/23	Initial Release	—