Evaluation Board User Guide

MAX42406 Evaluation Kit

Evaluates: MAX42405/MAX42406

General Description

The MAX42406 evaluation kit (EV kit) provides a proven design to evaluate the MAX42406 1.5MHz synchronous buck converter with 10µA quiescent current. The standard EV kit Printed Circuit Board (PCB) comes with a MAX42406AFOB+ (1.5MHz, adjustable output) installed, as well as various test points and jumpers for evaluation. The EV kit output voltage is fixed and easily configured with minimum component changes. The default EV kit is designed to deliver up to 6A with an input voltage of 4.5V to 36V. Output voltage quality can be monitored by observing the PGOOD signal. The MAX42406 EV kit can also be used to evaluate all variants of the MAX42405 and MAX42406.

Features and Benefits

- Input Supply Range from 4.5V to 36V
- Adjustable from 0.8 to 10V
- Delivers up to 6A
- Frequency - Synchronization Input
- Enable Input
- Voltage Monitoring PGOOD Output Available
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

Quick Start

Required Equipment

- MAX42406 EV Kit
- 36V, 6A Power Supply (PS)
- Appropriate Resistive Load, or an Electronic Load that can Sink 6A
- Digital Multimeter (DMM)
- Oscilloscope

Procedure

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

1. While observing safe ESD practices, carefully unbox the MAX42403 EV kit board from its packaging. Inspect the board to ensure that no damage has occurred during the 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 VSUP_FILTER and GND test pads, respectively.
4. Set the power-supply voltage to 14V and the current limit to 6A.
5. Turn on the power supply.
6. Using the DMM, verify that the V_{OUT} is approximately 3.3V.
7. Verify that the switching frequency is 1.5MHz (approx.) by monitoring the inductor switching voltage with the oscilloscope.
8. Connect the positive and negative terminals of the electronic load to VOUT and GND3, respectively.
9. Set the electronic load to the desired current at or below 6A or use an equivalent resistive load with an appropriate power rating.
10. Adjust the current limit on the power supply as necessary.
11. Turn on the power supply and electronic load.
12. Verify that the voltage across the V_{OUT} and GND3 is 3.3V.

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EV Kit Photo

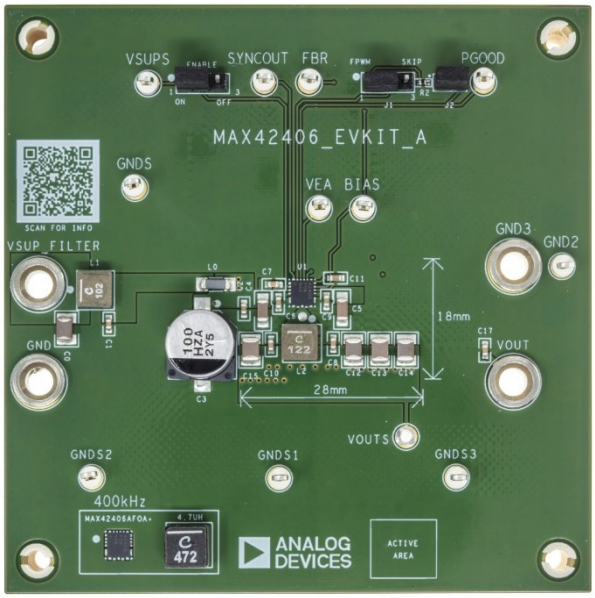


Figure 1. MAX42406 EV Kit Board Photo—Top View

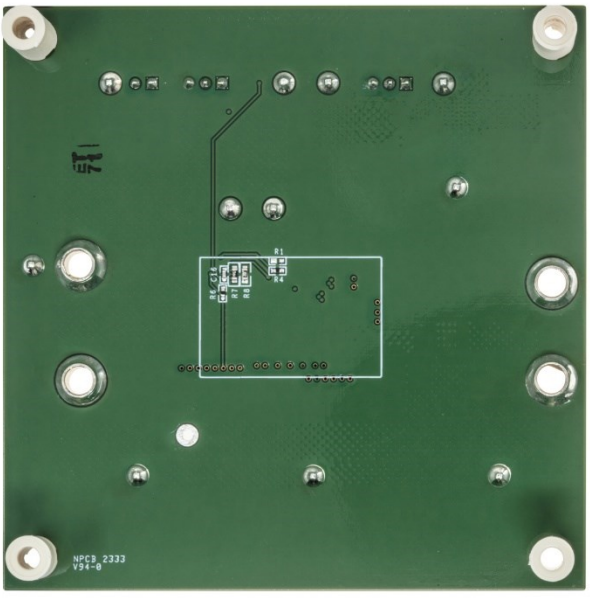


Figure 2. MAX42406 EV Kit Board Photo—Bottom View

Detailed Description of Hardware

This evaluation kit should be used with the following documents:

- MAX42405/MAX42406 data sheet
- MAX42406 EV kit data sheet (this document)

The MAX42406 EV kit provides a proven layout for the MAX42406 synchronous buck regulator IC. The IC accepts input voltages as high as 36V and delivers up to 6A. The EV kit can handle an input supply transient up to 42V. Various test points are included for evaluation.

External Synchronization

The IC can operate in two modes: forced-PWM (FPWM) or skip mode. Skip mode has better efficiency for light load conditions. When SYNC is pulled low, the IC operates in skip mode for light loads and PWM mode for larger loads. When SYNC is pulled high, the IC is forced to operate in PWM mode across all load conditions. SYNC can be used to synchronize with other supplies if a clock source is present. The IC is forced to operate in FPWM mode when SYNC is connected to a clock source.

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 is in regulation. PGOOD is low impedance when the output voltage drops below 7% (typ) of its nominal regulated voltage.

Programming Buck Output Voltage

The EV kit comes installed with MAX42406AFOB+, providing an adjustable output voltage of 0.8V to 10V. To program V_{OUT} voltage, place appropriate resistors in the positions R7 and R8 according to the following equation:

$$R7 = R8 (V_{OUT}/V_{FB} - 1)$$

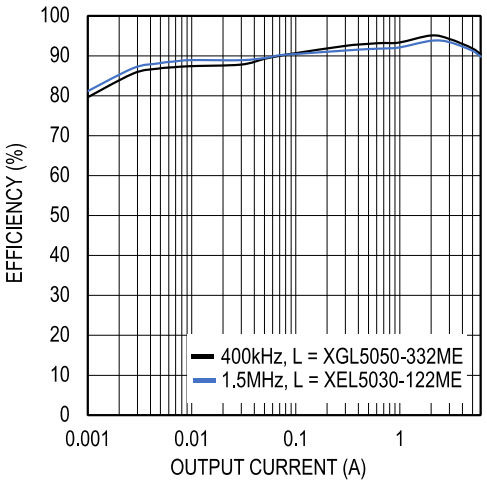
Where typically V_{FB} = 0.8V and R8 = 10k~100k.

Evaluating Other Variants

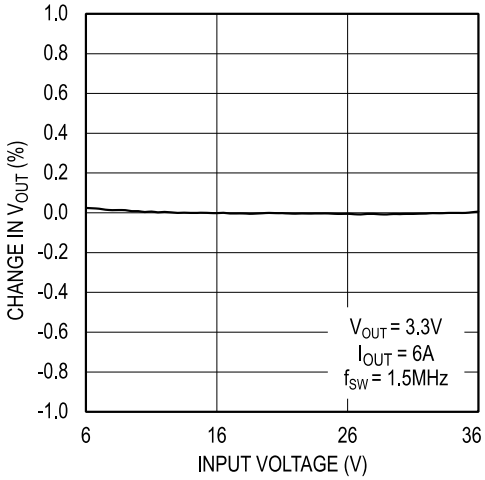
The EV kit comes installed with the 1.5MHz, 6A variant (MAX42406AFOB+). Additionally, a 400kHz variant with an inductor for 3.3V output is also available. Other variants can be installed with minimal component changes.

Evaluation Data

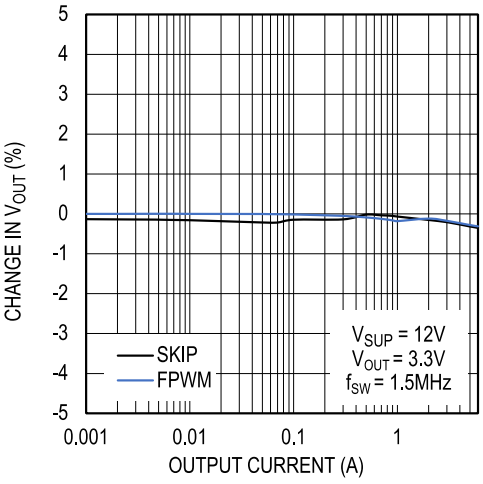
EFFICIENCY vs. OUTPUT CURRENT
SKIP MODE
V_{SUP} = 12V, V_{OUT} = 3.3V



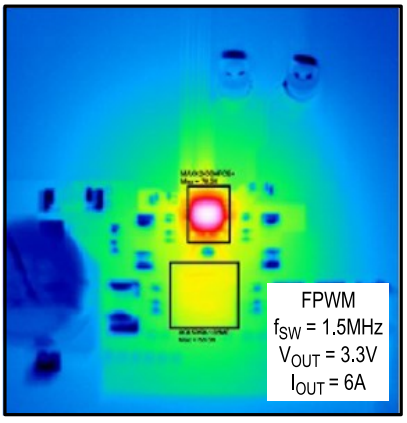
OUTPUT LINE REGULATION
MAX42406AFOB+



OUTPUT LOAD REGULATION
MAX42406AFOB+



THERMAL IMAGE
MAX42406AFOB+



MAX IC TEMP = 78.50°C

Table 1. Default Jumper Settings

JUMPER	DEFAULT CONNECTION	FEATURE
EN	1-2	Buck enabled
J1	1-2	Forced PWM mode
J2	Installed	PGOOD pulled-up to BIAS

Ordering Information

PART	TYPE
MAX42406EVKIT#	EV Kit

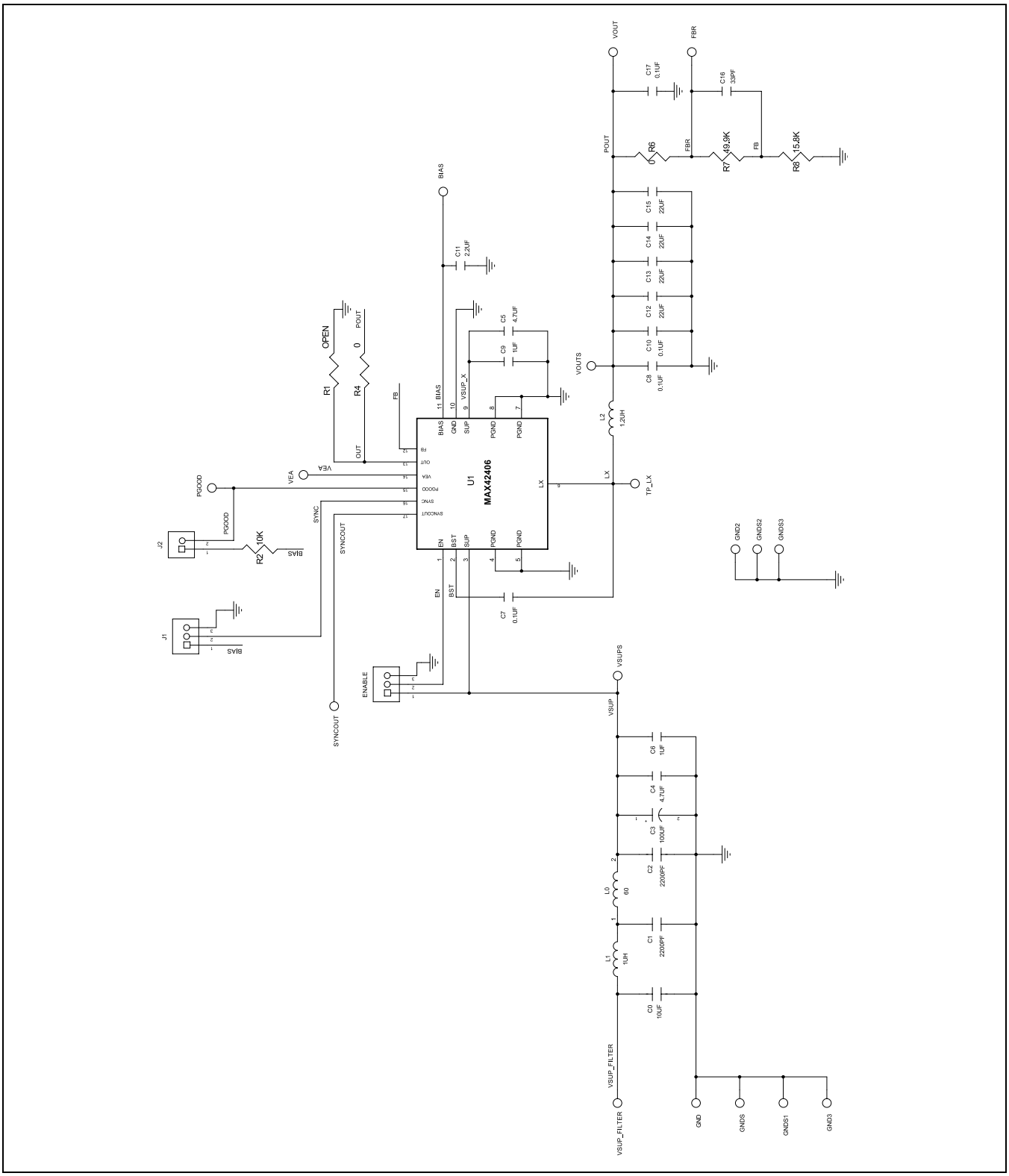
#Denotes RoHS-compliant.

MAX42406 EV Kit Bill of Materials

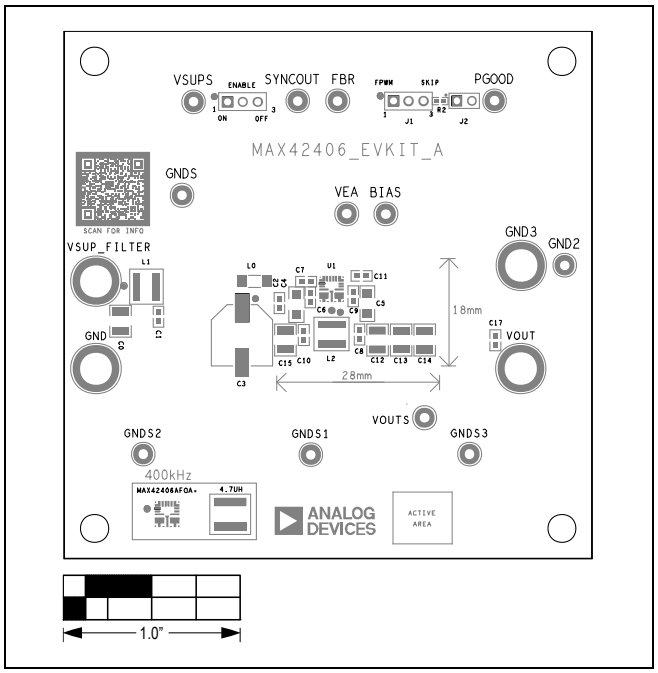
PART	MFG PART#	MANUFACTURER	VALUE	DESCRIPTION
4.7UH	XEL6060-472ME	COILCRAFT	4.7UH	INDUCTOR; SMT; COMPOSITE; 4.7UH; 20%; 12.1A
BIAS, FBR, GND2, GNDS, GNDS1-GNDS3, PGOOD, SYNCOUT, VEA, VSUPS	5012	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH
C0	C3225X7S1H106K250AB; CGA6P3X7S1H106K250AB; GCM32EC71H106K; CGA6P3X7S1H106K250AE	TDK;TDK;MURATA; TDK	10UF	CAP; SMT (1210); 10UF; 10%; 50V; X7S; CERAMIC
C1, C2	C0603C222K5RAC; GCM188R71H222K; CGA3E2X7R1H222K080AD; GRM39X7R222K50V; C1608X7R1H222K	KEMET;MURATA; TDK;MURATA;TDK	2200PF	CAP; SMT (0603); 2200PF; 10%; 50V; X7R; CERAMIC
C3	EEH-ZA1H101P	PANASONIC	100UF	CAP; SMT (CASE_G); 100UF; 20%; 50V; ALUMINUM-ELECTROLYTIC
C4, C5	CGA5L3X7R1H475K160AB; C1206C475K5RACAUTO	TDK;KEMET	4.7UF	CAP; SMT (1206); 4.7UF; 10%; 50V; X7R; CERAMIC
C6, C9	UMK107BJ105KA; C1608X5R1H105K080AB; CL10A105KB8NNN; GRM188R61H105KAAL; UMK107ABJ105KAH	TAIYO YUDEN;TDK; SAMSUNG;MURATA; TAIYO YUDEN	1UF	CAP; SMT (0603); 1UF; 10%; 50V; X5R; CERAMIC
C7, C8, C10, C17	CGA3E2X7R1H104K080AE; UMK107B7104KAH	TDK	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 50V; X7R; CERAMIC
C11	GRM188Z71C225KE43; EMK107BB7225KA	MURATA; TAIYO YUDEN	2.2UF	CAP; SMT (0603); 2.2UF; 10%; 16V; X7R; CERAMIC
C12-C15	GCM32ER71C226ME15; CGA6P1X7R1C226M250AC; GCM32ER71C226ME19	MURATA;TDK; MURATA	22UF	CAP; SMT (1210); 22UF; 20%; 16V; X7R; CERAMIC
C16	C1005C0G1H330J050BA; GRM1555C1H330JA01	TDK;MURATA	33PF	CAP; SMT (0402); 33PF; 5%; 50V; C0G; CERAMIC
ENABLE, J1	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS

GND, GND3, VOUT, VSUP_FILTER	575-4	KEYSTONE	575-4	RECEPTACLE; JACK; BANANA; 0.203IN [5.2MM] DIA X 0.218IN [5.5MM] L; 0.203D/0.218L; NICKEL PLATED BRASS
J2	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
L0	BLM41PG600SH1	MURATA	60	INDUCTOR; SMT (1806); FERRITE-BEAD; 60 IMPEDANCE AT 100MHz; 6A
L1	XEL5030-102ME	COILCRAFT	1UH	INDUCTOR; SMT; COMPOSITE; 1UH; 20%; 15.4A
L2	XEL5030-122ME	COILCRAFT	1.2UH	INDUCTOR; SMT; SHIELDED; 1.2UH; 20%; 14.4A
R2	ERA-2AEB103	PANASONIC	10K	RES; SMT (0402); 10K; 0.10%; +/- 25PPM/DEGK; 0.0630W
R4, R6	RC0402JR-070RL; CR0402-16W-000RJT	YAGEO PHYCOMP; VENKEL LTD.	0	RES; SMT (0402); 0; 5%; JUMPER; 0.0630W
R7	CRCW060349K9FK; ERJ-3EKF4992	VISHAY DALE; PANASONIC	49.9K	RES; SMT (0603); 49.9K; 1%; +/- 100PPM/DEGC; 0.1000W
R8	AC0603FR-0715K8L; CRCW060315K8FK; ERJ-3EKF1582	YAGEO;VISHAY; PANASONIC	15.8K	RES; SMT (0603); 15.8K; 1%; +/- 100PPM/DEGC; 0.1000W
U1	MAX42406AFOB+	ANALOG DEVICES	MAX42406AFOB+	MAX42406AFOB+; 1.5MHz
U2	MAX42406AFOA+	ANALOG DEVICES	MAX42406AFOA+	MAX42406AFOA+; 400kHz

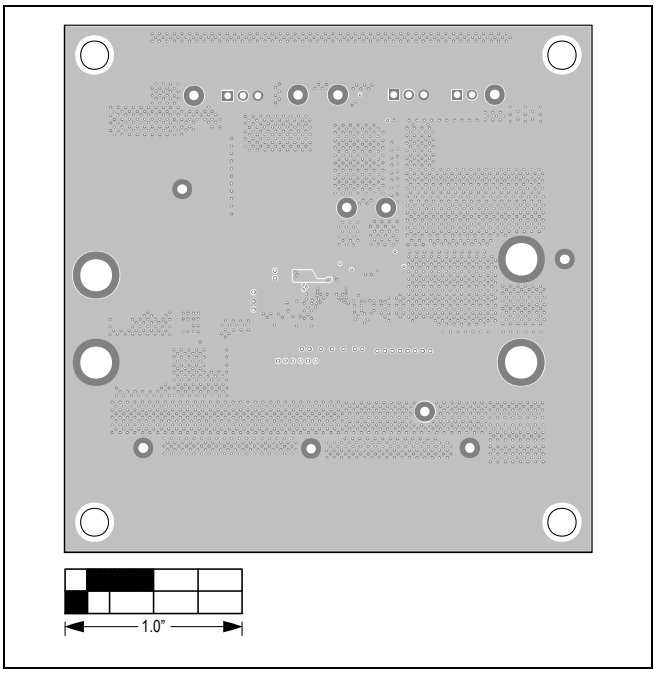
MAX42406 EV Kit Schematic



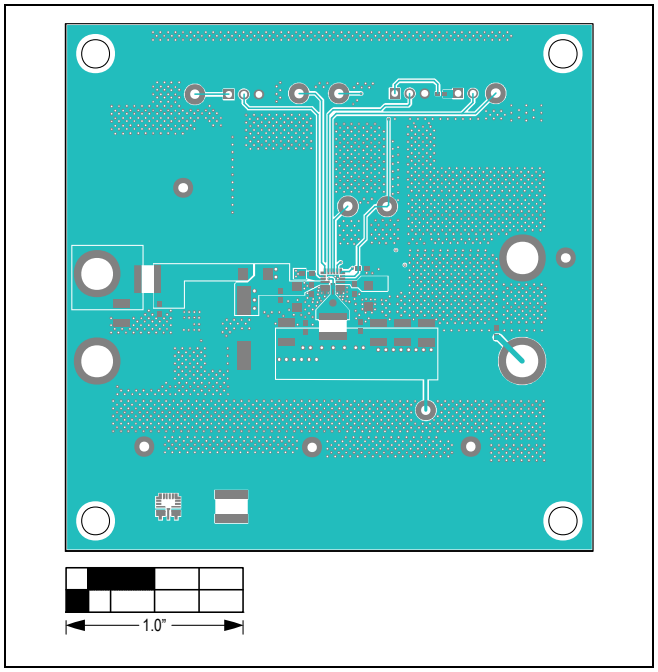
MAX42406 EV Kit PCB Layout



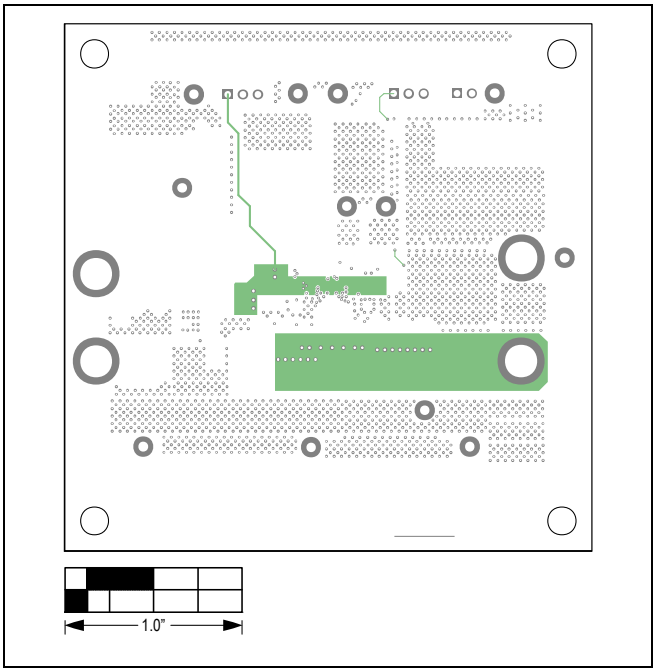
MAX42406 EV Kit Component Placement Guide—Top Silkscreen



MAX42406 EV Kit PCB Layout—Layer 2

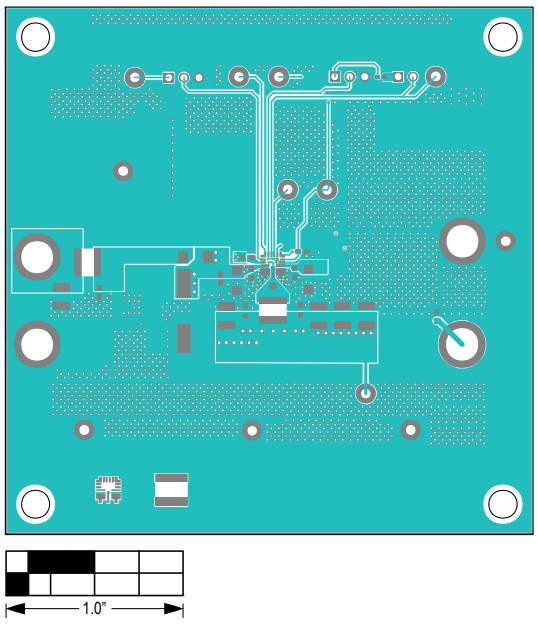


MAX42406 EV Kit PCB Layout—Top View

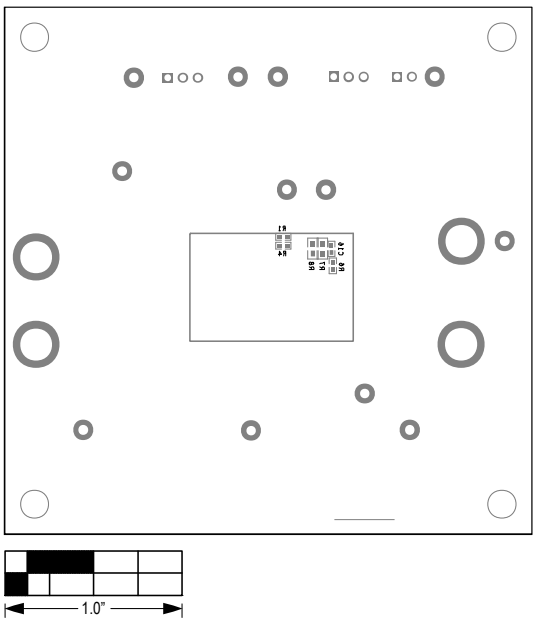


MAX42406 EV Kit PCB Layout—Layer 3

MAX42406 EV Kit PCB Layout (continued)



MAX42406 EV Kit PCB Layout—Bottom View



MAX42406 EV Kit Component Placement Guide—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/23	Initial release	—