

## MAX20408/MAX20410 Evaluation Kits

## Evaluate: MAX20408/MAX20410

### General Description

The MAX20408/MAX20410 evaluation kits (EV kits) provide a proven design to evaluate the MAX20408/MAX20410 automotive synchronous buck converter with 10 $\mu$ A quiescent current. The EV kit comes with a MAX20410AF0B/VY+(400kHz) or MAX20408AF0E/VY+(2.1MHz) installed, as well as various test points and jumpers for evaluation. The EV kit output voltage is fixed 3.3V or 4V and easily configured to 0.8V to 10V with minimum component changes.

The EV kit is designed to deliver up to 8A/10A with input voltage 3V to 36V. The output voltage quality can be monitored by observing the PGOOD signal.

### Features

- Input Supply Range from 3V to 36V
- Output Voltage: 3.3V/4V Fixed and Adjustable from 0.8V to 10V
- Delivers Up to 8A/10A
- Frequency-Synchronization Input
- Enable Input
- Spread Spectrum Available
- Voltage Monitoring PGOOD Output Available
- Proven PCB Layout
- Fully Assembled and Tested

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

### Quick Start

#### Required Equipment

- MAX20408/MAX20410 EV kit
- 36V, 10A DC power supply (PS)
- Appropriate resistive load, or an electronic load that can sink 10A
- Digital multimeter (DMM)
- Oscilloscope

#### Procedure

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

- 1) Verify that all jumpers are in their default positions, as shown in [Table 1](#).
- 2) Connect the positive and negative terminals of the power supply to the VSUP and GND test pads, respectively.
- 3) Set the power-supply voltage to 14V.
- 4) Turn on the power supply.
- 5) Using the DMM, verify the OUT is approximately 3.3V on MAX20410EVKIT# or 4V on MAX-20408EVKIT#.
- 6) Verify that the switching frequency is approximately either 2.1MHz on MAX20408EVKIT# or 400kHz on MAX20410EVKIT# by monitoring the inductor switching voltage with the oscilloscope.
- 7) Turn off the power supply.

#### Additional Evaluation

- 8) Connect the positive and negative terminals of the electronic load to VOUT and GND2, respectively.
- 9) Set the electronic load to the desired current at or below 10A or use an equivalent resistive load with an appropriate power rating.
- 10) Adjust current limit on the power supply as necessary.
- 11) Turn on the power supply and electronic load.
- 12) Verify that voltage across the VOUT and GND2 PCB pads is 3.3V  $\pm$  2% on MAX20410EVKIT# or 4V  $\pm$  2% on MAX20408EVKIT#.

### Detailed Description of Hardware

The MAX20408/MAX20410 EV kits provide a proven layout for the MAX20408/MAX20410 synchronous buck regulator IC. The IC accepts input voltages as high as 36V and delivers up to 10A. 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 external clock if a clock source is present. The IC is forced to operate in FPWM mode when SYNC is connected to a clock source.

**Table 1. Default Jumper Settings**

JUMPER	DEFAULT SHUNT POSITION	FUNCTIONS
ENABLE	1-2	Buck enabled
J1	1-2	Forced-PWM mode
J2	Installed	PGOOD pulled up to bias

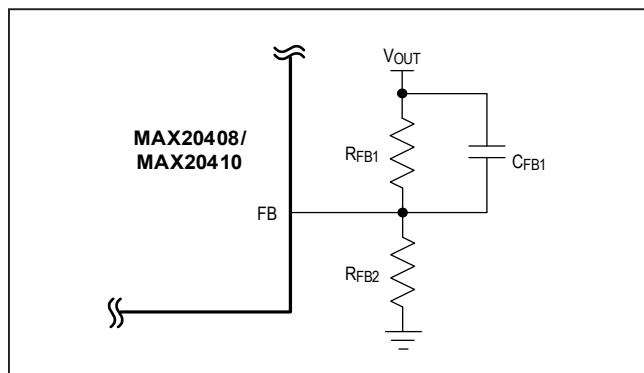


Figure 1. MAX20408 EV Kit Adjustable Output Voltage Setting

### 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 pulled to high when the output is on regulation. It is pulled to ground when the output voltage drops below 7% (typ) of its nominal regulated voltage.

### Programming Buck Output Voltage

The EV kit comes installed with MAX20410AFOB/VY+ or MAX20408AFOE/VY+ (2.1MHz), which provides an adjustable 0.8V to 10V output voltage. To program VOUT voltage, removing R5 and place appropriate resistors in the positions R7 and R8 according to the following equation:

**Equation 1:**

$$R7 = R8 \times [(VOUT/VFB) - 1]$$

Where typically VFB = 0.8V and R8 = 10kΩ.

Refer to the IC data sheet for C16 value.

### Evaluating Other Variants

The EV kit comes installed with either the 4V/2.1MHz, 8A variant (MAX20408AFOE/VY+ (2.1MHz)) or 3.3V/400kHz, 10A variant (MAX20410AFOB/VY+). The other variants can be installed with minimal component changes.

To use the 2.1MHz devices on the MAX20410EVKIT#, change inductor L2 to 0.47μH and output capacitors C12, C13, C14, and C15 needs to change to 22μF.

### Ordering Information

PART	TYPE
MAX20408EVKIT#	4V/2.1MHz EV Kit
MAX20410EVKIT#	3.3V/400kHz EV Kit

#Denotes RoHS compliance.

**MAX20408/MAX20410 EV Kit Bill of Materials**

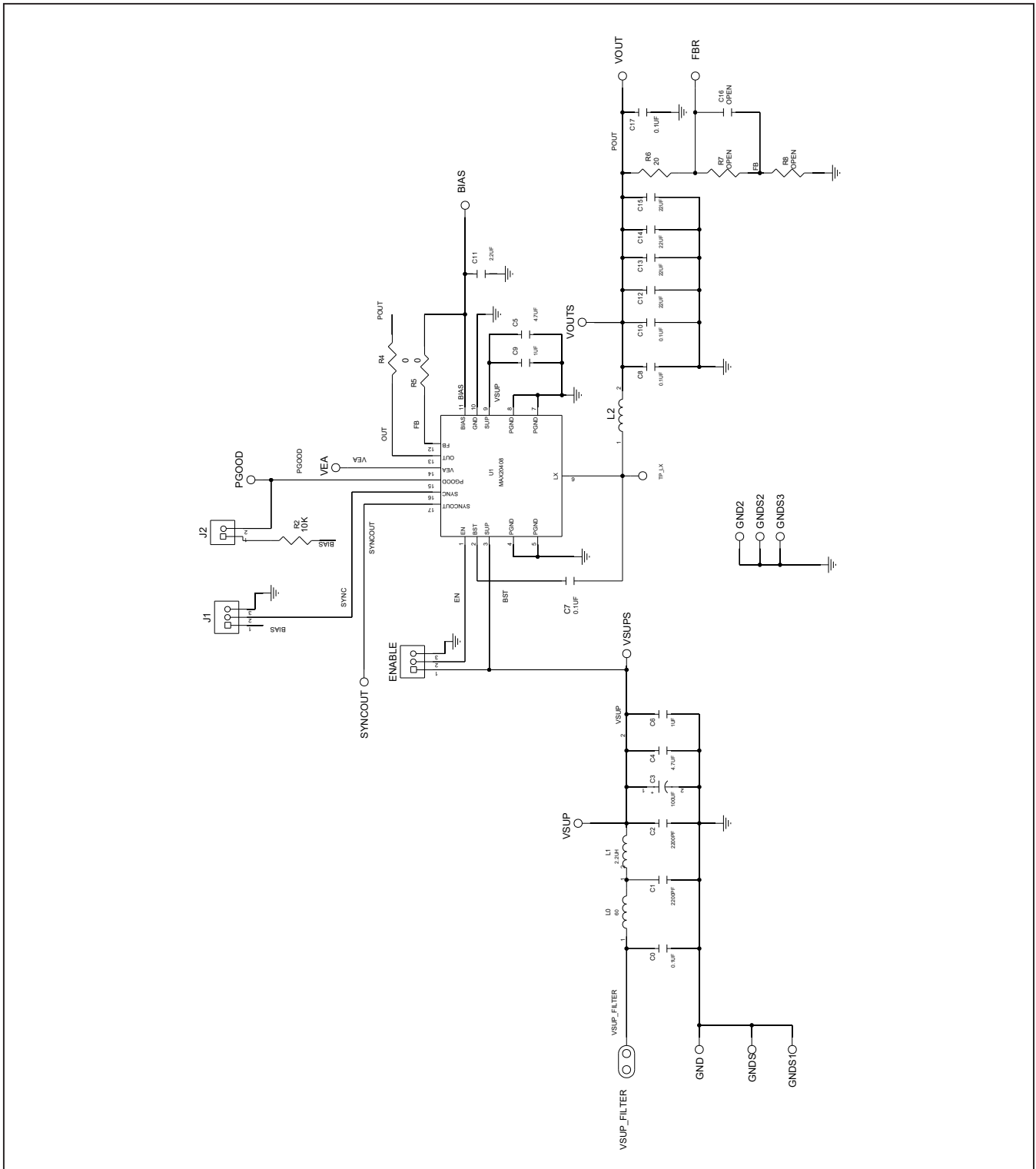
**MAX20408/MAX20410 EV Kit BOM–400kHz**

REF DES	MFG PART #	MANUFACTURER	DESCRIPTION
C0, C1	GRM188R72A104KA35D	MURATA	CAP CER 0.1UF 100V X7R 0603
L0	FBMJ4516HS720NT	Taiyo Yuden	FERRITE BEAD 72 OHM 1806 1LN
C2	CGA4J3X7R1H225M125AE	TDK	CAP CER 2.2UF 50V X7R 0805
L1	XEL6030-222ME	Coilcraft	2.2uH, XEL6030
C3	EEH-ZA1H101V	Panasonic	CAP ALUM POLY 100UF 20% 50V SMD
C4, C5	CGA5L3X7R1H475K160AB	TDK	CAP CER 4.7UF 50V X7R 1206
C8, C7, C10	CGA2B3X7R1H104M050BB	TDK	CAP CER 0.1UF 50V X7R 0402
C6, C17, C9	CGA3E2X7R1H104K080AD	TDK	CAP CER 0.1UF 50V X7R 0603
R5, R4	RC0402JR-070RL	Yageo	RES SMD 0 OHM JUMPER 1/16W 0402
L2	XEL6060-222ME	Coilcraft	2.2uH, XEL6060
C12, C13, C14, C15	1210ZC476MAT2A	AVX	CAP CER 47UF 10V X7R 1210
R6, R7, R8, C16	–	–	Do Not Install
C11	C1608X7R1A225K080AE	TDK	CAP CER 2.2UF 10V X7R 0603
R2	ERA-2AEB103X	Panasonic	RES SMD 10K OHM 0.1% 1/16W 0402
U1	MAX20410AFOB/VY+	Maxim Integrated	IC STEP DOWN CONVERTER 17L-FC2QFN
VSUP, GND, VOUT, GND2	575-4	Keystone	
FBR, VSUPS, GNDS, GNDS2, GNDS3, SYNCOUT, BIAS, VEA, PGOOD, VOUTS	5012	Keystone Electronics	TEST POINT PC MULTI PURPOSE WHT
J1, ENABLE	PEC03SAAN	Sullins	CONN HEADER .100 SINGL STR 3POS
J2	PEC02SAAN	Sullins	CONN HEADER .100 SINGL STR 2POS

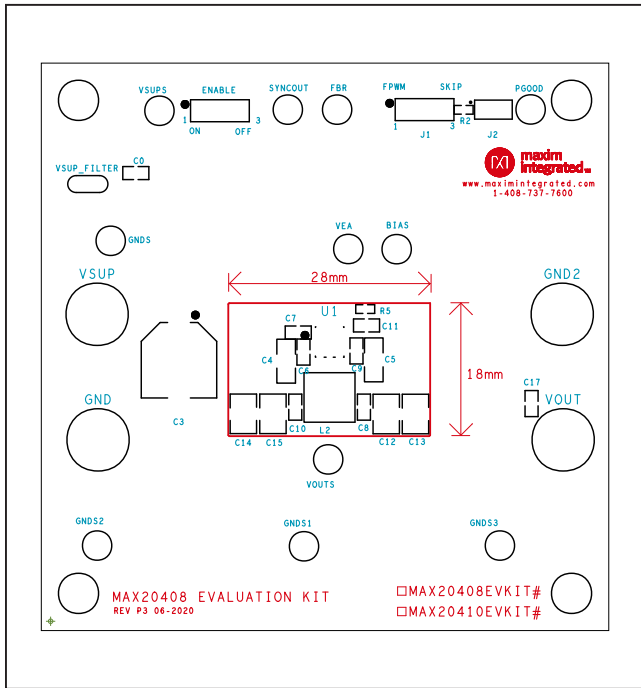
**MAX20408/MAX20410 EV Kit BOM–2.1MHz**

REF DES	MFG PART #	MANUFACTURER	DESCRIPTION
C0, C1	GRM188R72A104KA35D	MURATA	CAP CER 0.1UF 100V X7R 0603
L0	FBMJ4516HS720NT	Taiyo Yuden	FERRITE BEAD 72 OHM 1806 1LN
C2	CGA4J3X7R1H225M125AE	TDK	CAP CER 2.2UF 50V X7R 0805
L1	XEL6030-222ME	Coilcraft	2.2uH, XEL6030
C3	EEH-ZA1H101V	Panasonic	CAP ALUM POLY 100UF 20% 50V SMD
C4, C5	CGA5L3X7R1H475K160AB	TDK	CAP CER 4.7UF 50V X7R 1206
C8, C7, C10	CGA2B3X7R1H104M050BB	TDK	CAP CER 0.1UF 50V X7R 0402
C6, C17, C9	CGA3E2X7R1H104K080AD	TDK	CAP CER 0.1UF 50V X7R 0603
R5, R4	RC0402JR-070RL	Yageo	RES SMD 0 OHM JUMPER 1/16W 0402
L2	XEL6030-471ME	Coilcraft	0.47uH, XEL6030
C12, C13, C14, C15	CGA6P1X7R1C226M250AC	TDK	CAP CER 22UF 16V X7R 1210
R6, R7, R8, C16	–	–	Do Not Install
C11	C1608X7R1A225K080AE	TDK	CAP CER 2.2UF 10V X7R 0603
R2	ERA-2AEB103X	Panasonic	RES SMD 10K OHM 0.1% 1/16W 0402
U1	MAX20408AFOE/VY+	Maxim Integrated	IC STEP DOWN CONVERTER 17L-FC2QFN
VSUP, GND, VOUT, GND2	575-4	Keystone	
FBR, VSUPS, GNDS, GNDS2, GNDS3, SYNCOUT, BIAS, VEA, PGOOD, VOUTS	5012	Keystone Electronics	TEST POINT PC MULTI PURPOSE WHT
J1, ENABLE	PEC03SAAN	Sullins	CONN HEADER .100 SINGL STR 3POS
J2	PEC02SAAN	Sullins	CONN HEADER .100 SINGL STR 2POS

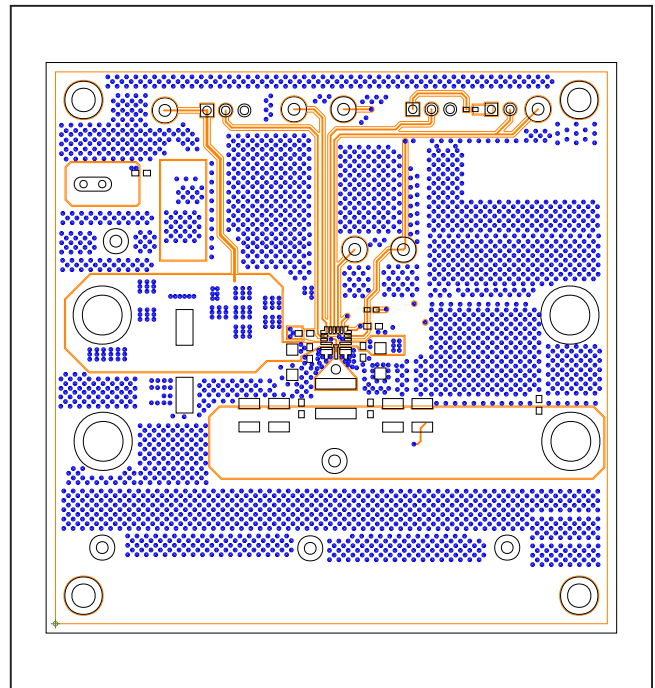
MAX20408/MAX20410 EV Kit Schematic



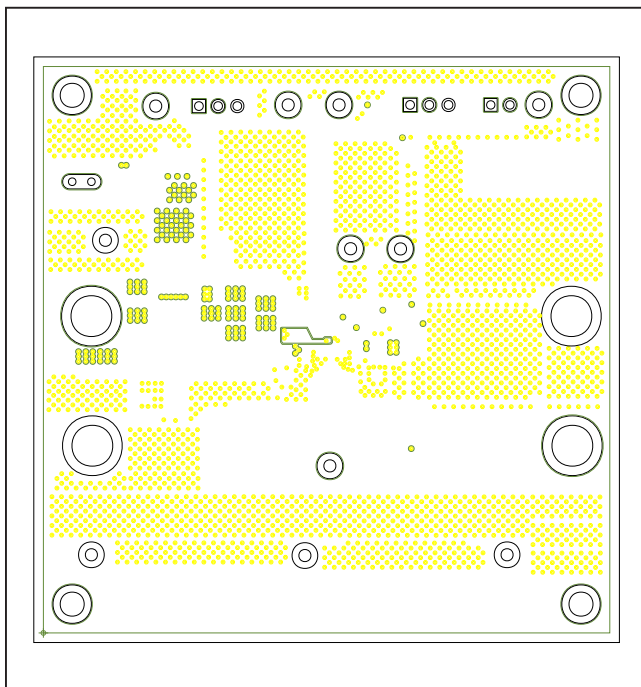
MAX20408/MAX20410 EV Kit PCB Layouts



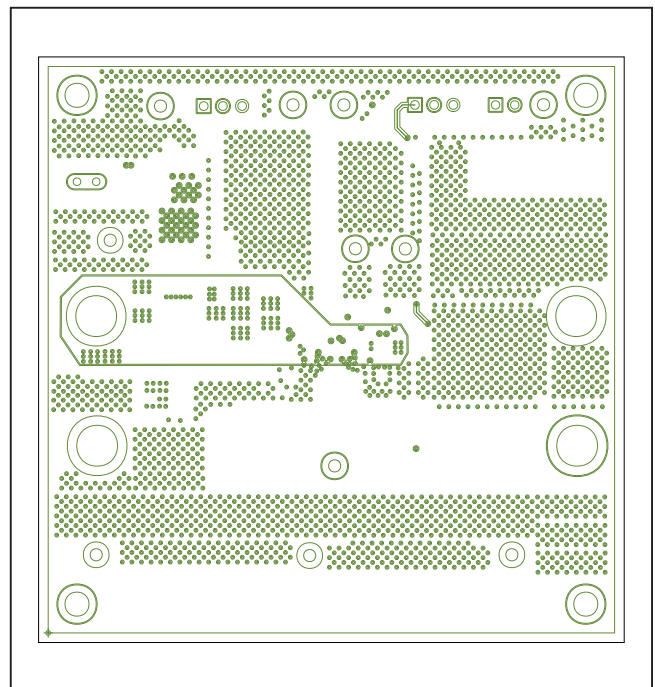
MAX20408/MAX20410 EV Kit Component Placement Guide—  
Top Silkscreen



MAX20408/MAX20410 EV Kit PCB Layout—Top

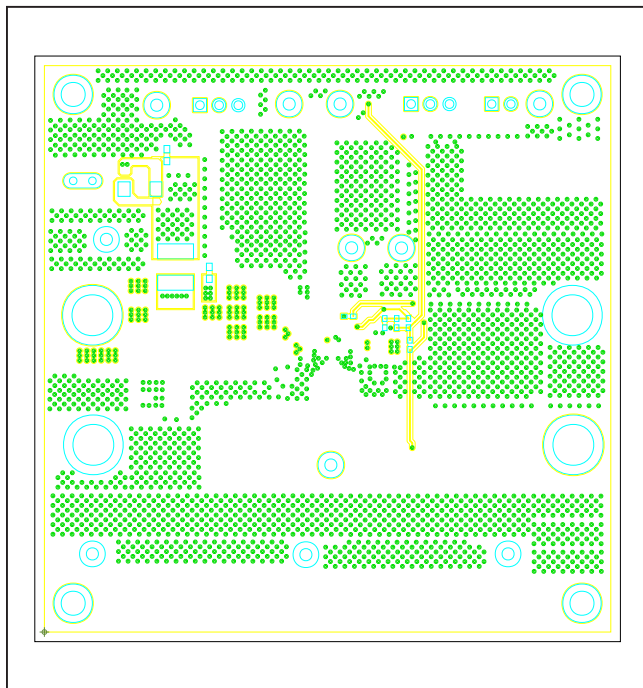


MAX20408/MAX20410 EV Kit PCB Layout—Inner Layer 2

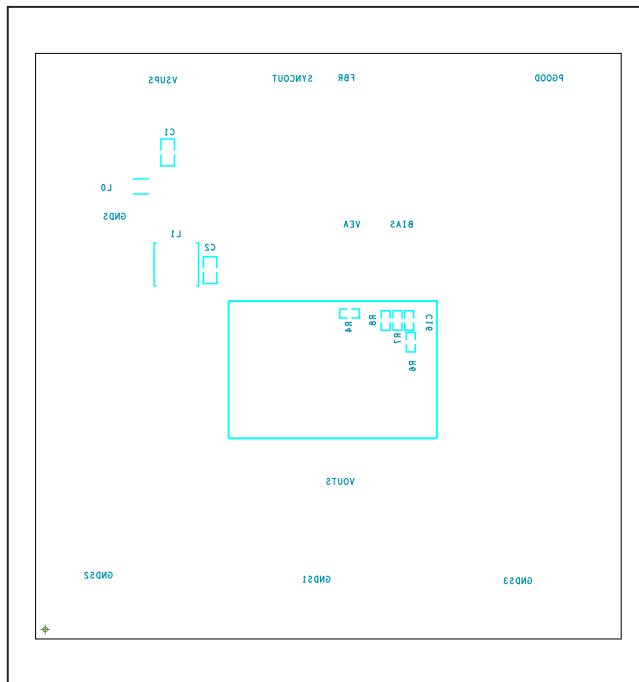


MAX20408/MAX20410 EV Kit PCB Layout—Inner Layer 3

**MAX20408/MAX20410 EV Kit PCB Layouts (continued)**



MAX20408/MAX20410 EV Kit PCB Layout—Bottom



MAX20408/MAX20410 EV Kit Component Placement Guide—  
Bottom Silkscreen

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/20	Initial release	—
1	5/21	Replaced part number MAX20408 with MAX20408/MAX20410, updated <i>General Description</i> , <i>Quick Start</i> , <i>Detailed Description of Hardware</i> sections, and <i>MAX20408/MAX20410 EV Kit Bill of Materials</i>	1–7
2	5/21	Updated <i>General Description</i> , <i>Quick Start</i> , <i>Detailed Description of Hardware</i> sections, Table 1, <i>Ordering Information</i> table, <i>MAX20408/MAX20410 EV Kit Bill of Materials</i> , and <i>MAX20408/MAX20410 EV Kit PCB Layouts</i>	1–3, 5, 6
3	7/21	Updated <i>General Description</i> , <i>Detailed Description of Hardware</i> sections, <i>Ordering Information</i> table and <i>MAX20408/MAX20410 EV Kit Bill of Materials</i>	1–3
4	7/21	Updated <i>General Description</i> , <i>Features</i> , <i>Quick Start</i> and <i>Detailed Description of Hardware</i> sections	1–3

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