Click here for production status of specific part numbers.

MAX17630AEVKIT# Evaluation Kit

Evaluates: MAX17630 3.3V Output-Voltage Application

General Description

The MAX17630AEVKIT# Evaluation Kit (EV kit) provides a proven design to evaluate the MAX17630A high-efficiency, synchronous step-down DC-DC converter. The EV kit provides 3.3V/1A at the output from a 4.5V to 36V input supply. The switching frequency of the EV kit is preset to 400kHz for optimum efficiency and component size. The EV kit features adjustable input undervoltage lockout, adjustable soft-start, open-drain $\overline{\text{RESET}}$ signal, and external clock synchronization. The EV kit layout is optimized for thermal performance. For more details about the IC benefits and features, refer to MAX17630 data sheet.

Features

- Operates from a 4.5V to 36V Input Supply
- 3.3V Output Voltage
- Delivers Up to 1A Output Current
- 400kHz Switching Frequency
- Enable/UVLO Input, Resistor-Programmable UVLO Threshold
- Adjustable Soft-Start Time
- Open-Drain $\overline{\text{RESET}}$ Output
- Overcurrent and Overtemperature Protection
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Recommended Equipment

- MAX17630AEVKIT# Evaluation Kit
- 4.5V to 36V, 1A DC-input power supply
- Load capable of sinking 1A
- Digital voltmeter (DVM)

Equipment Setup and Test Procedure

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

Caution: Do not turn on power supply until all connections are completed.

1) Set the power supply at a voltage between 4.5V and 36V. Then, disable the power supply.
2) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the 1A load to the VOUT PCB pad and the negative terminal to the nearest PGND PCB pad.
3) Connect the DVM across the VOUT PCB pad and the nearest PGND PCB pad.
4) Verify that shunts are installed across pins 1-2 on jumper JU1 (see Table 1 for details) and pins 2-3 on jumper JU2 (see Table 2 for details)
5) Turn on the DC power supply.
6) Enable the load.
7) Verify that the DVM displays 3.3V.

319-100371; Rev 0; 5/19

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Detailed Description

The EV kit is designed to deliver 3.3V at load current up to 1A at the output from a 4.5V to 36V input supply. The switching frequency of the EV kit is configured at 400 kHz by leaving RT resistor open.

The EV kit includes an EN/UVLO PCB pad and jumper JU1 to enable the output at a desired input voltage. The MODE/SYNC PCB pad and jumper JU2 allow an external clock to synchronize the device. Jumper JU2 allows the selection of the mode of operation based on light load-performance requirements. An additional $\overline{\text{RESET}}$ PCB pad is available for monitoring whether the converter output is in regulation or not.

Soft-Start Input (SS)

The EV kit offers an adjustable soft-start function to limit inrush current during the startup. The soft-start time is adjusted by the value of external soft start capacitor C3, connected between SS and SGND. The selected output capacitance (C_{SEL}) and the output voltage (V_{OUT}) determine the minimum value of C3, as shown by the following equation:

$$C3 \geq 28 \times 10^{-6} \times C_{SEL} \times V_{OUT}$$

The soft-start time (t_{SS}) is related to the soft-start capacitor C3 by the following equation:

$$t_{SS} = \frac{C3}{\left(5.55 \times 10^{-6}\right)}$$

For example, in order to program a 1ms soft-start time, C3 should be 5600pF.

Enable/Undervoltage-Lockout (EN/UVLO) Programming

The MAX17630 offers an Enable and adjustable input undervoltage-lockout feature. In this EV kit, for normal operation, leave the EN/UVLO jumper (JU1) open. When JU1 is left open, the MAX17630 is enabled when the input voltage rises above 4.4V. To disable the MAX17630, install a jumper across pins 2-3 on JU1. See Table 1 for JU1 settings. The EN/UVLO PCB pad on the EV kit supports external Enable/Disable control of the device. Leave JU1 open when external Enable/Disable control is desired. A potential divider formed by R1 and R2 sets the input voltage (V_{INU}) above which the converter is enabled when JU1 is left open.

Choose R1 to be 3.32MΩ (max), and then calculate R2 as follows:

$$R_2 = \frac{R_1 \times 1.215}{(V_{INU} - 1.215)}$$

where, V_{INU} is the voltage at which the device is required to turn on, and R1 and R2 are in kΩ.

For more details about setting the undervoltage lockout level, refer to the MAX17630 data sheet.

Table 1. Converter EN/UVLO Jumper (JU1) Settings

SHUNT POSITION	EN/UVLO PIN	MAX17630A OUTPUT
1-2	Connected to VIN	Enabled
Not installed*	Connected to the center node of resistor-divider R1 and R2	Enabled, UVLO level is set by the resistor-divider between VIN and SGND
2-3	Connected to SGND	Disabled

**Default position.*

Mode Selection (MODE/SYNC)

The EV kit provides a jumper (JU2) that allows the MAX17630 to operate in PWM, PFM and DCM modes. Refer to the MAX17630 data sheet for more details on the modes of operation. Table 2 shows the MODE SELECTION (JU2) settings that can be used to configure the desired mode of operation.

External Clock Synchronization (MODE/SYNC)

The EV kit provides a MODE/SYNC PCB pad to synchronize the MAX17630 to an optional external clock. Leave Jumper (JU3) open when external clock signals are applied. In the presence of a valid external clock for synchronization, the MAX17630 operates in PWM mode only. For more details about external clock synchronization, refer to the MAX17630 data sheet.

Active-Low, Open-Drain Reset Output ($\overline{RESET}$)

The EV kit provides a $\overline{RESET}$ PCB pad to monitor the status of the converter. $\overline{RESET}$ goes high when VOUT rises above 95% (typ) of its nominal regulated output voltage. $\overline{RESET}$ goes low when VOUT falls below 92% (typ) of its nominal regulated voltage.

Hot Plug-In and Long Input Cables

The MAX17630AEVKIT# PCB layout provides an optional electrolytic capacitor (C6 = 22µF/50V). This capacitor limits the peak voltage at the input of the MAX17630A when the DC input source is “Hot-Plugged” to the EV kit input terminals with long input cables. The equivalent series resistance (ESR) of the electrolytic capacitor dampens the oscillations caused by interaction of the inductance of the long input cables, and the ceramic capacitors at the buck converter input.

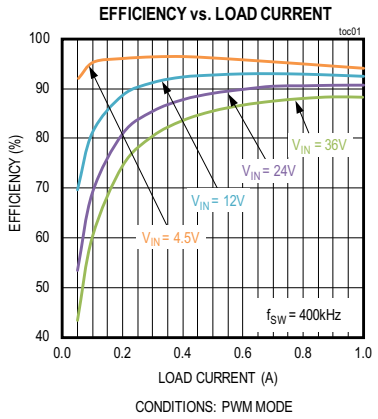
Table 2. Mode Selection Jumper (JU2) Settings

SHUNT POSITION	MODE/SYNC PIN	MAX17630A OUTPUT
1-2	Connected to V_{CC}	DCM mode of operation
2-3*	Connected to SGND	PWM mode of operation
Not installed	OPEN	PFM mode of operation

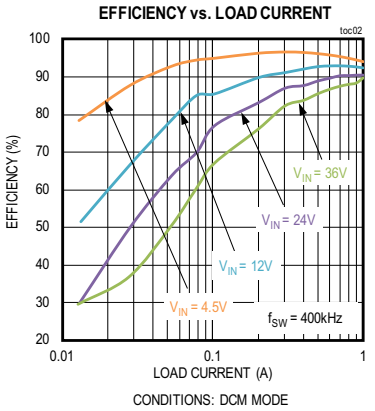
**Default position.*

MAX17630AEVKIT# EV Kit Performance Report

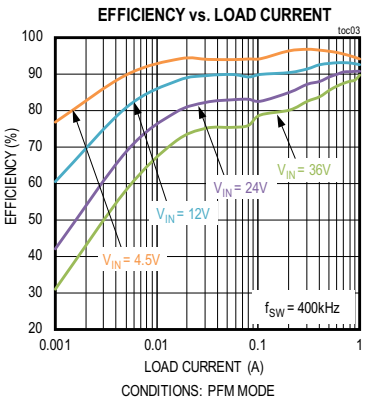
(V_{IN} = 24V, V_{OUT} = 3.3V, f_{SW} = 400kHz, unless otherwise noted.)



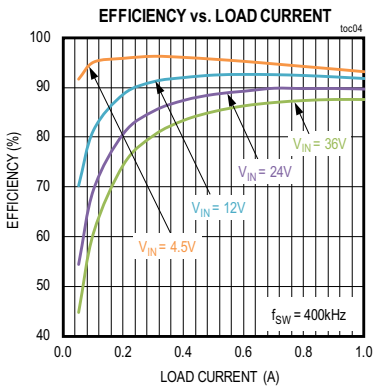
CONDITIONS: PWM MODE



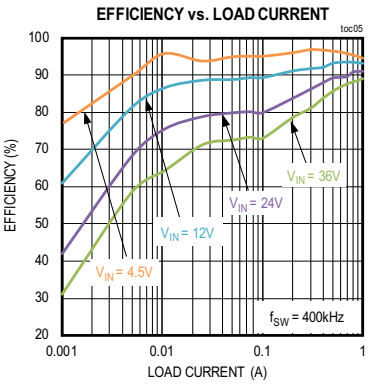
CONDITIONS: DCM MODE



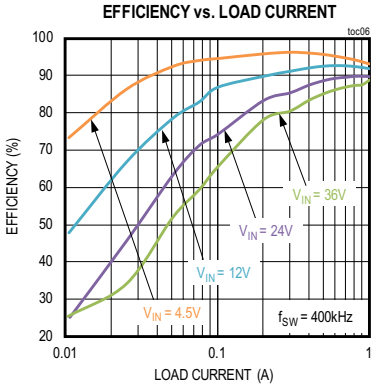
CONDITIONS: PFM MODE



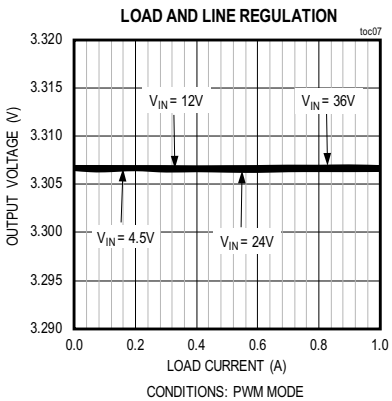
CONDITIONS: PWM MODE, L1 = XAL4040 - 103ME



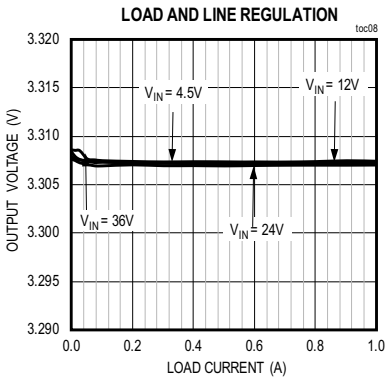
CONDITIONS: PFM MODE, L1 = XAL4040-103ME



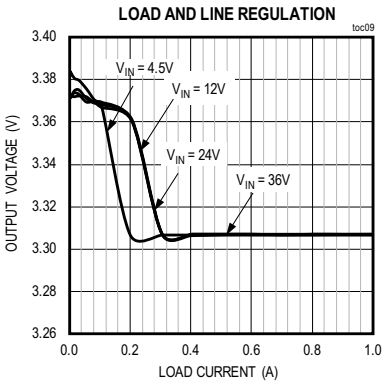
CONDITIONS: DCM MODE, L1 = XAL4040 - 103ME



CONDITIONS: PWM MODE



CONDITIONS: DCM MODE

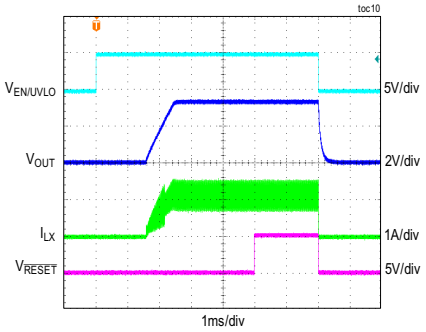


CONDITIONS: PFM MODE

MAX17630AEVKIT# EV Kit Performance Report (continued)

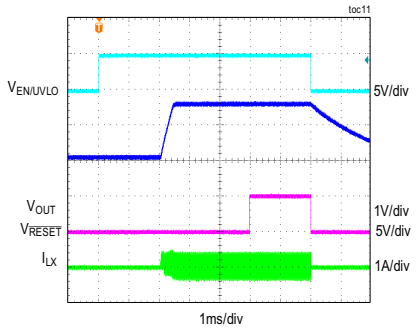
(V_{IN} = 24V, V_{OUT} = 3.3V, f_{SW} = 400kHz, unless otherwise noted.)

SOFT-START/SHUTDOWN THROUGH EN/UVLO



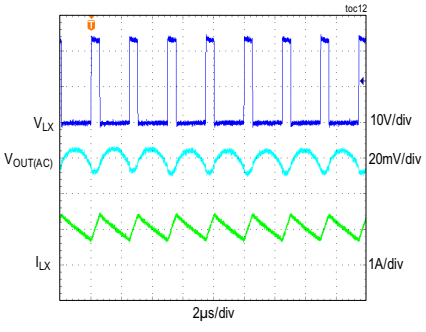
CONDITIONS: PWM MODE, 1A LOAD

SOFT-START WITH PREBIAS VOLTAGE OF 1.65V



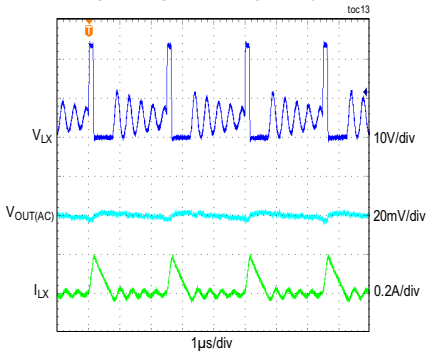
CONDITIONS: PWM MODE, 20mA LOAD

STEADY-STATE PERFORMANCE



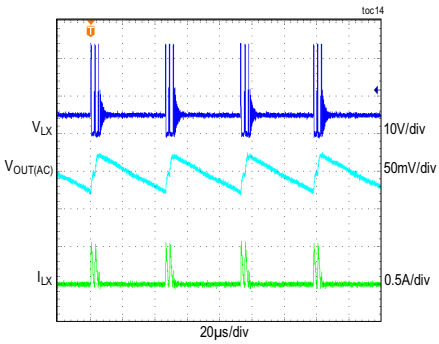
CONDITIONS: PWM MODE, 1A LOAD

STEADY-STATE PERFORMANCE



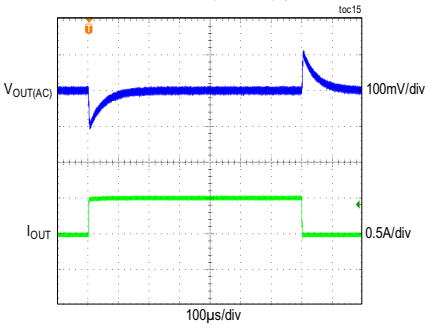
CONDITIONS: DCM MODE, 20mA LOAD

STEADY-STATE PERFORMANCE



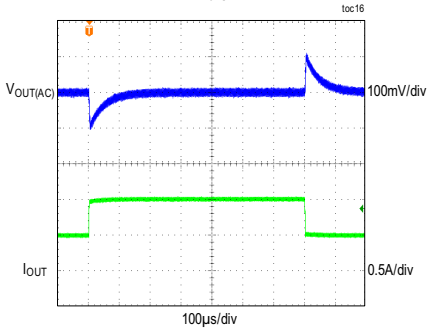
CONDITIONS: PFM MODE, 20mA LOAD

LOAD TRANSIENT RESPONSE BETWEEN 0A AND 0.5A



CONDITIONS: PWM MODE

LOAD TRANSIENT RESPONSE BETWEEN 0.5A AND 1A

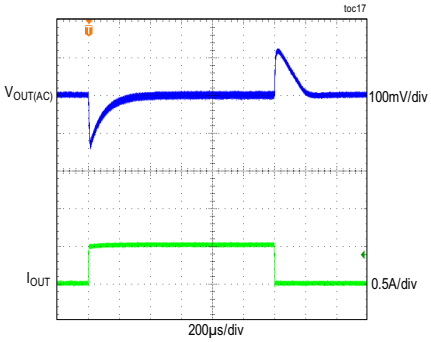


CONDITIONS: PWM MODE

MAX17630AEVKIT# EV Kit Performance Report (continued)

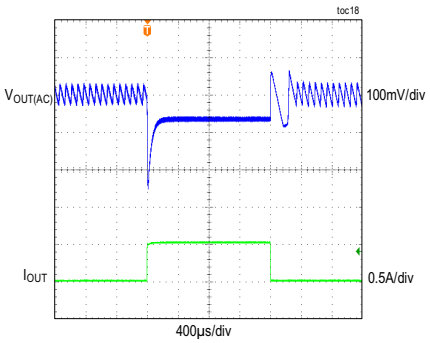
(V_{IN} = 24V, V_{OUT} = 3.3V, f_{SW} = 400kHz, unless otherwise noted.)

LOAD TRANSIENT RESPONSE
BETWEEN 20mA AND 0.5A



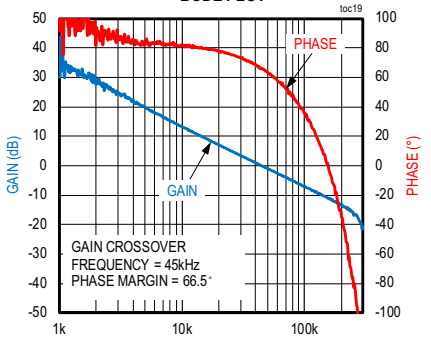
CONDITIONS: DCM MODE

LOAD TRANSIENT RESPONSE
BETWEEN 20mA AND 0.5A



CONDITIONS: PFM MODE

BODE PLOT



CONDITIONS: PWM MODE, 1A LOAD

Component Suppliers

SUPPLIER	WEBSITE
Coilcraft	www.coilcraft.com
Murata Americas	www.murata.com
Panasonic	www.panasonic.com
Taiyo Yuden	www.ty-top.com
TDK Corp.	www.tdk.com
SullinsCorp	www.sullinscorp.com

Note: *Indicate that you are using the MAX17630A when contacting these component suppliers.*

Ordering Information

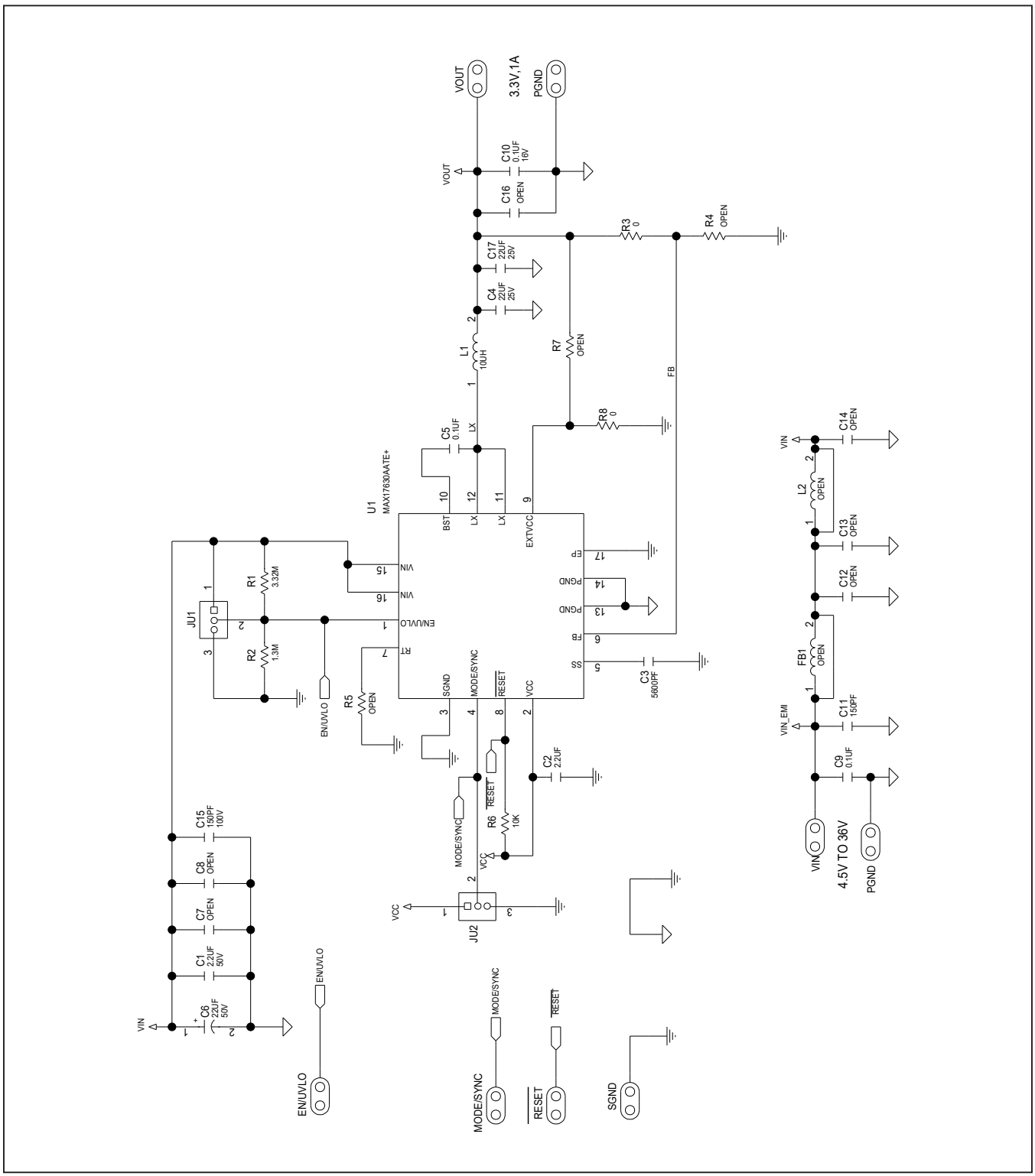
PART	TYPE
MAX17630AEVKIT#	EVKIT

MAX17630AEVKIT# EV Kit Bill of Materials

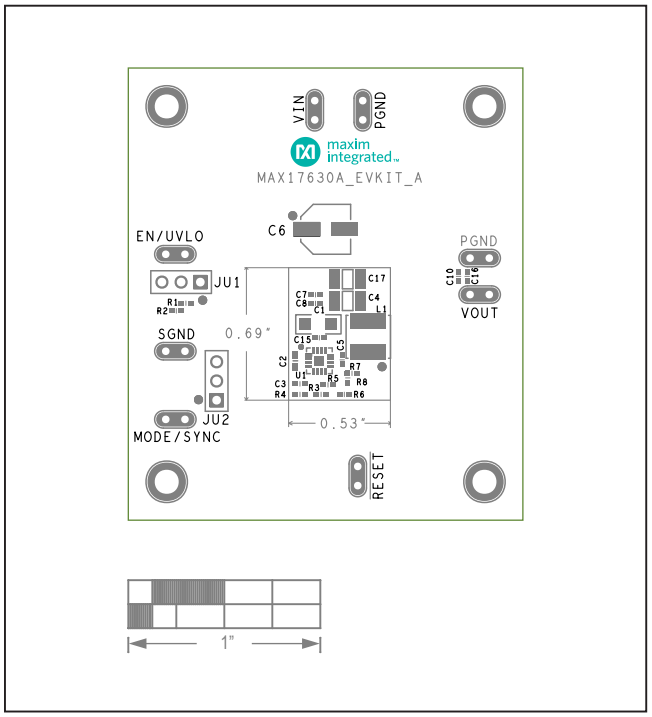
S.No	Designator	Description	Quantity	Manufacturer Part Number
1	C1	2.2µF, 10%, 50V, X7R, Ceramic capacitor (1206)	1	TDK C3216X7R1H225K160AE
2	C2	2.2µF, 10%, 10V, X7R, Ceramic capacitor (0603)	1	MURATA GRM188R71A225KE15
3	C3	5600pF, 2%, 50V, COG, Ceramic capacitor (0402)	1	MURATA GRM1555C1H562GE01
4	C4	22µF, 20%, 25V, X7R, Ceramic capacitor (1210)	1	MURATA GRM32ER71E226ME15
5	C5, C10	0.1µF, 10%, 16V, X7R, Ceramic capacitor (0402)	2	TAIYO YUDEN EMK105B7104KV
6	C11, C15	150pF, 5%, 100V, X7R, Ceramic capacitor (0402)	2	TDK C1005C0G2A151J050BA
7	C9	0.1µF, 10%, 50V, X7R, Ceramic capacitor (0402)	1	TDK C1005X7R1H104K050BE
8	C6	ALUMINUM-ELECTROLYTIC; 22UF; 50V; TOL = 20%; MODEL = FK SERIES	1	PANASONIC EEE-FK1H220P
9	L1	INDUCTOR, 10µH; 20%; 4.9A (5mm x 5mm) INDUCTOR, 10µH; 20%; 3A (4mm x 4mm)	1	COILCRAFT XAL5050-103ME Alternate part: XAL4040-103ME
10	R1	RESISTOR, 3.32MΩ, 1% (0402)	1	VISHAY DALE CRCW04023M32FK
11	R2	RESISTOR, 1.3MΩ, 1% (0402)	1	VISHAY DALE CRCW04021M30FK
12	R3	RESISTOR, 0Ω (0402)	1	PANASONIC ERJ-2GE0R00
13	R6	RESISTOR, 10KΩ, 1% (0402)	1	VISHAY DALE CRCW040210K0FK
14	U1	HIGH-EFFICIENCY; SYNCHRONOUS STEP-DOWN DC-DC CONVERTER (TQFN16-EP 3mm x 3mm)	1	MAX17630AATE+
15	JU1, JU2	3-pin header (36-pin header 0.1” centers)	2	SULLINS PEC03SAAN
16	-	Shunts	2	SULLINS STC02SYAN
17	C13, C14	OPEN: Capacitor (1210)	0	N/A
18	L2	OPEN: Inductor (4mm x 4mm)	0	N/A
19	C7, C8, C12, C16	OPEN: Capacitor (0402)	0	N/A
20	R4, R5, R7	OPEN: Resistor (0402)	0	N/A
21	FB1	OPEN: Ferrite Bead (0805)	0	N/A

DEFAULT JUMPER TABLE	
JUMPER	**SHUNT POSITION**
JU1	OPEN
JU2	2 - 3 SHORT

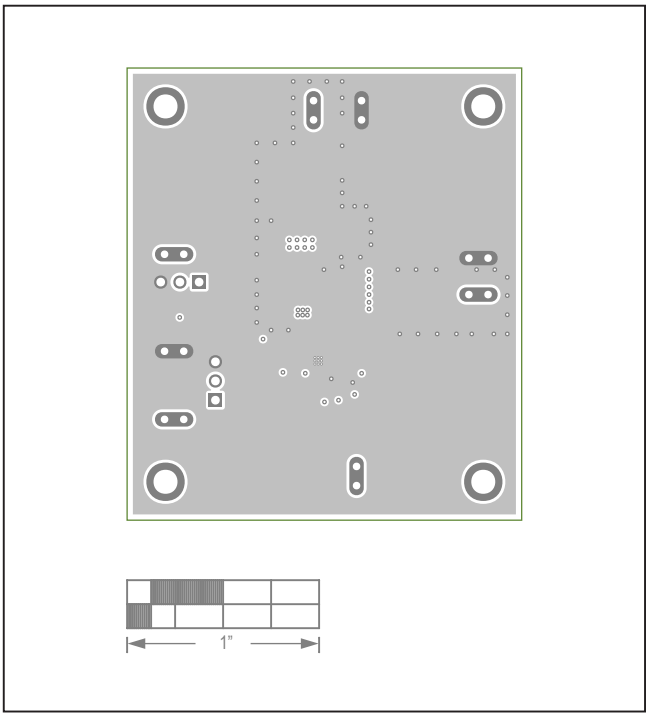
MAX17630AEVKIT# EV Kit Schematic



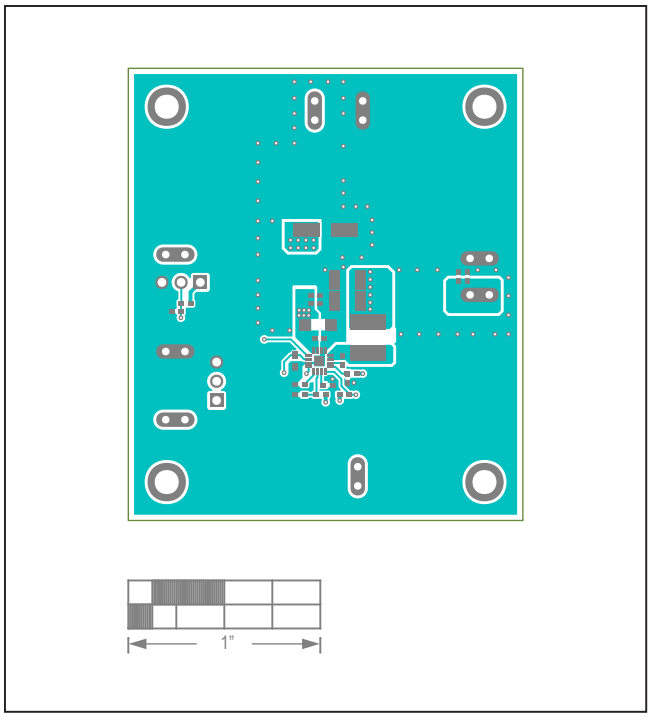
MAX17630AEVKIT# EV Kit PCB Layout



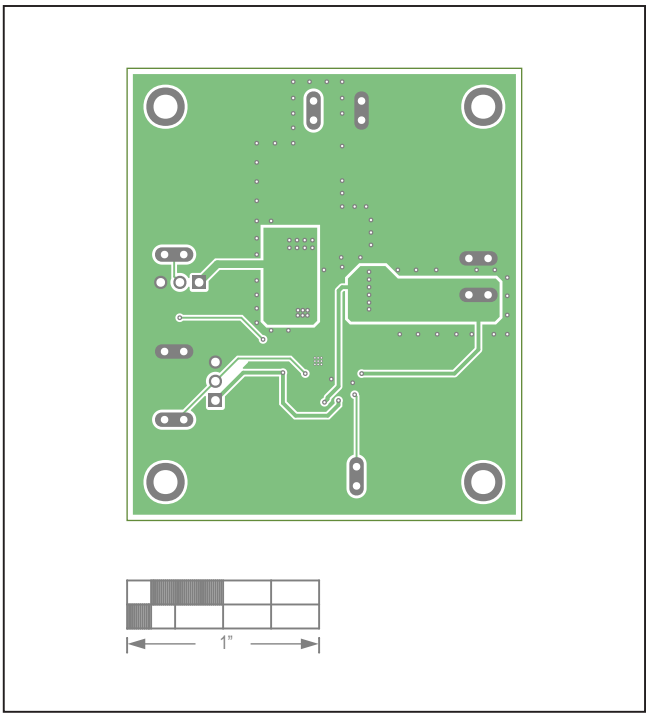
MAX17630AEVKIT# EV Kit—Top Silkscreen



MAX17630AEVKIT# EV Kit—Layer 2

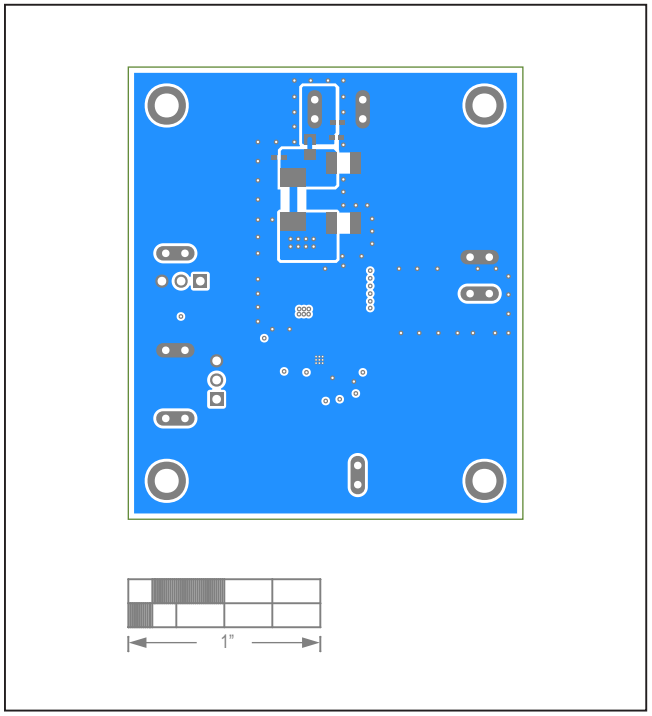


MAX17630AEVKIT# EV Kit—Top Layer

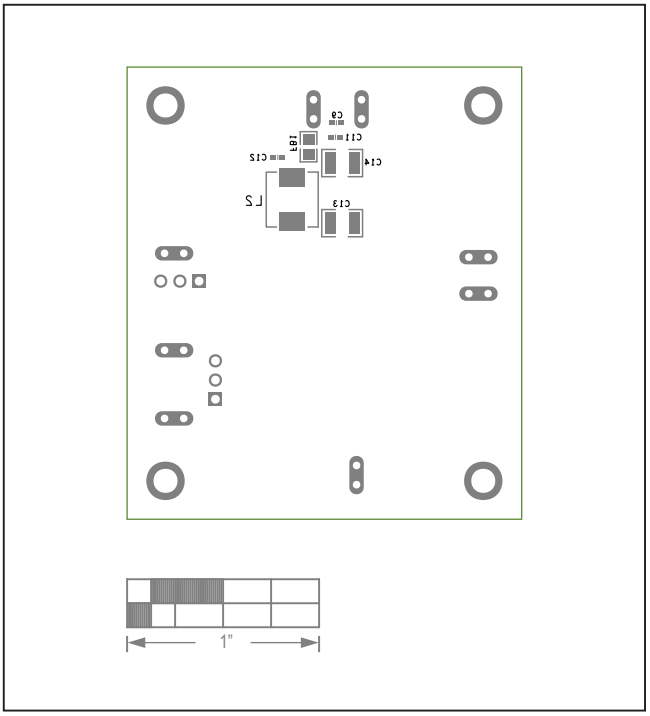


MAX17630AEVKIT# EV Kit—Layer 3

MAX17630AEVKIT# EV Kit PCB Layout (continued)



MAX17630AEVKIT# EV Kit—Bottom Layer



MAX17630AEVKIT# EV Kit—Silk Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/19	Initial release	—

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at https://www.maximintegrated.com/en/storefront/storefront.html.

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