Click here for production status of specific part numbers.

MAX15062C5EVKITE# Evaluation Kit

Evaluates: MAX15062 in 5V Output-Voltage Application

General Description

The MAX15062C5EVKITE# evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX15062C 60V, 300mA ultra-small, high-efficiency, synchronous step-down converter. The EV kit operates over a wide input voltage range of 6.5V to 60V, and provides up to 300mA load current at 5V output voltage. The device features undervoltage lockout, overcurrent protection, and thermal shutdown. The EV kit switches at a frequency of 500kHz, and delivers a peak efficiency of 95% with the supplied components. The EV kit also provides a good layout example, which is optimized for conducted, radiated EMI, and thermal performance. For more details about the IC benefits and features, refer to the MAX15062 data sheet.

The EV kit comes installed with the MAX15062CATA+ in an 8-pin (2mm x 2mm) lead(Pb)-free/RoHS-compliant TDFN package.

Features and Benefits

- 6.5V to 60V Input Voltage Range
- 5V Output, 300mA Continuous Current
- Internal Compensation
- EN/UVLO for On/Off Control and Programmable Input Undervoltage Lockout
- 95% Peak Efficiency
- 500kHz Switching Frequency
- PFM or Forced-PWM Mode of Operation
- Hiccup Mode Overcurrent Protection
- Open-Drain $\overline{\text{RESET}}$ Output
- Thermal Shutdown
- Lead-Free, 8-Pin, 2mm x 2mm TDFN Package
- Proven PCB Layout
- Fully Assembled and Tested
- Complies with CISPR22(EN55022) Class B Conducted and Radiated Emissions

Quick Start

Recommended Equipment

- MAX15062C5EVKITE# Evaluation Kit
- 60V adjustable, 0.5A DC power supply
- Electronic load up to 300mA
- Voltmeter

Equipment Setup and Test Procedure

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

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

1) Verify that shunts are installed on jumper JU1 (EN/UVLO).
2) Set the electronic load to constant-current mode, 300mA, and disable the electronic load.
3) Connect the electronic load's positive terminal to the VOUT PCB pad. Connect the negative terminal to the GND PCB pad.
4) Connect the voltmeter across the VOUT and GND PCB pads.
5) Set the power-supply output to 24V. Disable the power supply.
6) Connect the 24V power-supply output to the VIN PCB pad. Connect the supply ground to the GND PCB pad.
7) Turn on the power supply.
8) Enable the electronic load and verify that output voltage is at 5V with respect to GND.
9) Vary the input voltage from 6.5V to 60V.
10) Vary the load current from 1mA to 300mA and verify that output voltage is 5V.

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

319-100344; Rev 1; 9/19

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Detailed Description

The MAX15062C5EVKITE# Evaluation Kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX15062C 60V, 300mA ultra-small, high-efficiency, synchronous step-down converter. The EV kit operates over a wide input voltage range of 6.5V to 60V, and provides up to 300mA load current at 5V output voltage. The device features undervoltage lockout, overcurrent protection, and thermal shutdown. The EV kit switches at a frequency of 500kHz, and delivers a peak efficiency of 95% with the supplied components.

The EV kit includes an EN/UVLO PCB pad and jumper JU1 to enable control of the converter output. An additional $\overline{\text{RESET}}$ PCB pad is available for monitoring the open-drain logic output.

Enable/Undervoltage-Lockout (EN/UVLO) Programming

The MAX15062 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 MAX15062 is enabled when the input voltage rises above 6.4V. To disable the MAX15062, 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 (VINU) above which the converter is enabled when JU1 is left open.

Choose R1 to be 3.3MΩ (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,

Refer to the Enable Input (EN/UVLO), Soft-Start sections in the MAX15062 data sheet for additional information on setting the UVLO threshold voltage.

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

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

Mode of Operation

The EV kit features fixed frequency PWM mode and PFM mode of operation for higher efficiency at light-load conditions. The mode can be selected by programming resistor R3 on the EV kit. Add a 0Ω resistor at R3 to operate in PWM mode, leave R3 open for PFM mode of operation. The EV kit is set to PWM mode of operation by default. Refer to the MAX15062 data sheet for more details on the modes of operation.

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

JUMPER	SHUNT POSITION	EN/UVLO PIN	MAX15062 OUTPUT
JU1	1-2*	Connected to VIN	Enabled
	Not installed	Connected to the center node of resistor-divider R1 and R2	Programmed to startup at desired input voltage level set by R1 and R2
	2-3	Connected to GND	Disabled

**Default position.*

Hot Plug-In and Long Input Cables

The MAX15062C5EVKITE# PCB layout provides an optional electrolytic capacitor (CIN4 = 22µF/100V). This capacitor limits the peak voltage at the input of the MAX15062 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.

Electromagnetic Interference (EMI)

Compliance to conducted emissions (CE) standards requires an EMI filter at the input of a switching power converter. The EMI filter attenuates high-frequency currents drawn by the switching power converter and limits the noise injected back into the input power source.

The MAX15062C5EVKITE# PCB has designated footprints on the bottom side for placement of EMI filter components. Use of these filter components results in lower conducted emissions below CISPR22 Class B limits. Remove the 0Ω resistor, which is placed on the L1 footprint before installing conducted EMI filter components. The MAX15062C5EVKITE# EV kit PCB layout is also designed to limit radiated emissions from switching nodes of the power converter resulting in radiated emissions below CISPR22 Class B limits.

Component Suppliers

SUPPLIER	WEBSITE
Coilcraft, Inc.	www.coilcraft.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
TDK Corp.	www.component.tdk.com
SullinsCorp	www.sullinscorp.com
Kemet	www.kemet.com
Taiyo yuden	www.ty-top.com

Note: *Indicate that you are using the MAX15062 when contacting these component suppliers.*

Ordering Information

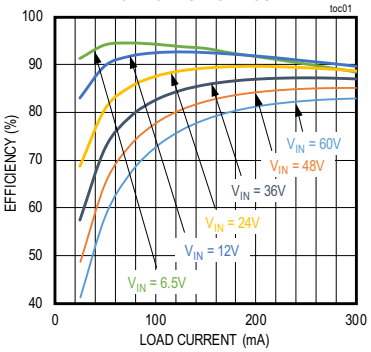
PART	TYPE
MAX15062C5EVKITE#	EV Kit

 # Denotes RoHS compliant.

EV Kit Performance Report

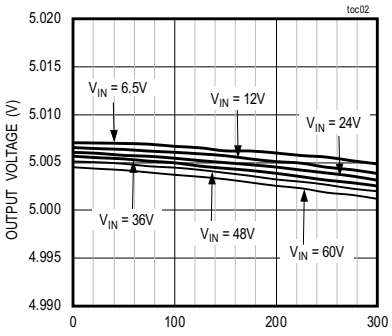
(V_{IN} = 24V, V_{OUT} = 5V, I_{OUT} = 300mA, f_{SW} = 500kHz, T_A = +25ºC, All voltages are referenced to GND, unless otherwise noted.)

EFFICIENCY VS. LOAD CURRENT



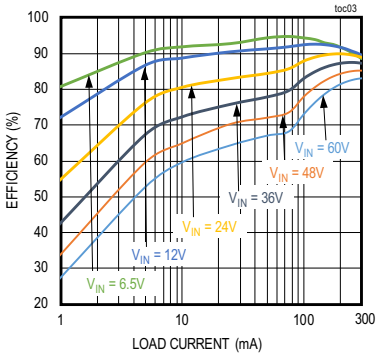
CONDITIONS: PWM MODE

LOAD AND LINE REGULATION



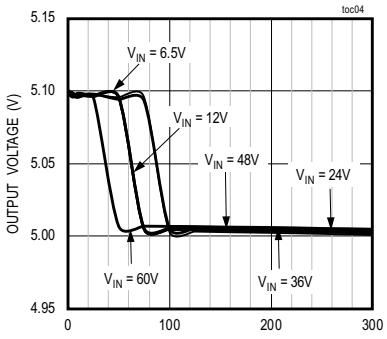
CONDITIONS: PWM MODE

EFFICIENCY VS. LOAD CURRENT



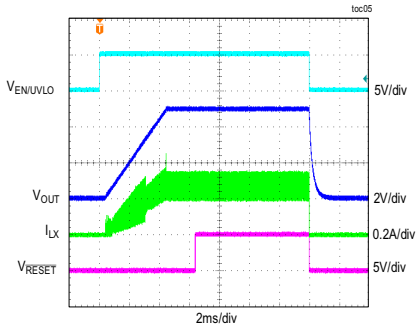
CONDITIONS: PFM MODE

LOAD AND LINE REGULATION



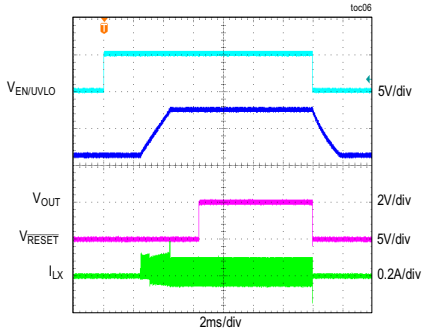
CONDITIONS: PFM MODE

SOFT-START / SHUTDOWN THROUGH EN/UVLO



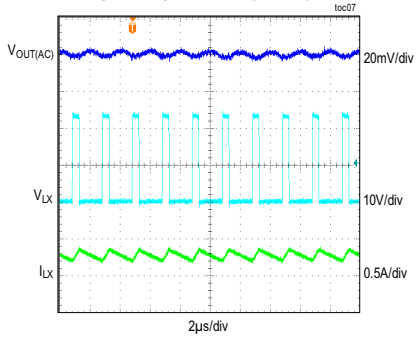
CONDITIONS: PWM MODE, 300mA LOAD

SOFT-START WITH 2.5V PREBIAS VOLTAGE



CONDITIONS: PWM MODE, 20mA LOAD

STEADY-STATE PERFORMANCE

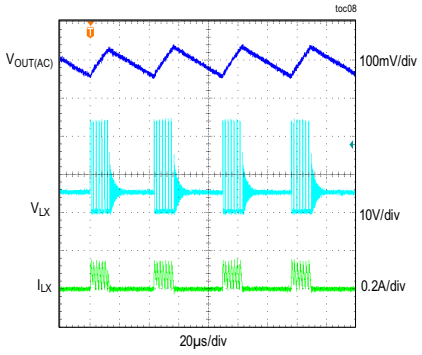


CONDITIONS: PWM MODE, 300mA LOAD

EV Kit Performance Report (continued)

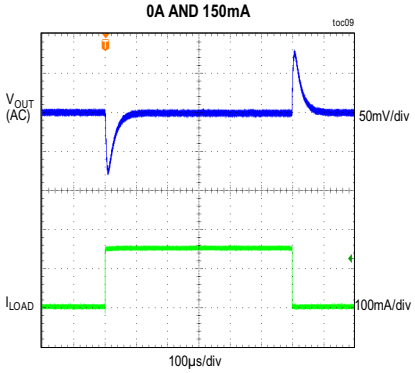
(V_{IN} = 24V, V_{OUT} = 5V, I_{OUT} = 300mA, f_{SW} = 500kHz, T_A = +25ºC, All voltages are referenced to GND, unless otherwise noted.)

STEADY-STATE PERFORMANCE



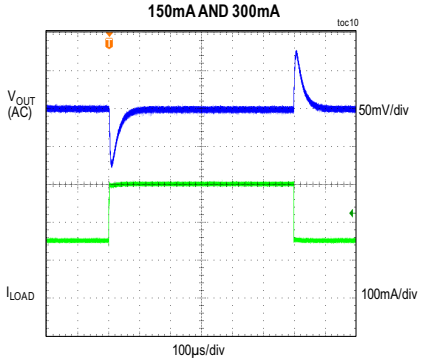
CONDITIONS: PFM MODE, 20mA LOAD

LOAD TRANSIENT RESPONSE BETWEEN 0A AND 150mA



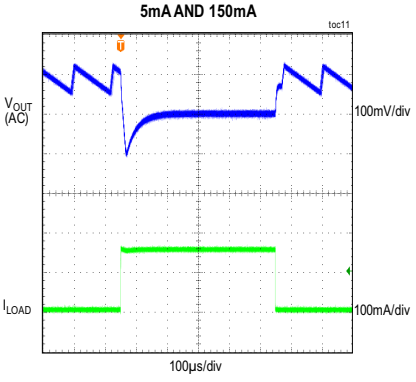
CONDITIONS: PWM MODE

LOAD TRANSIENT RESPONSE BETWEEN 150mA AND 300mA



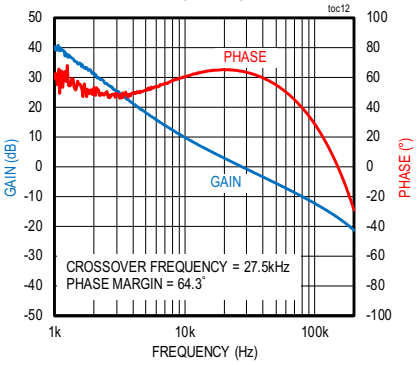
CONDITIONS: PWM MODE

LOAD TRANSIENT RESPONSE BETWEEN 5mA AND 150mA



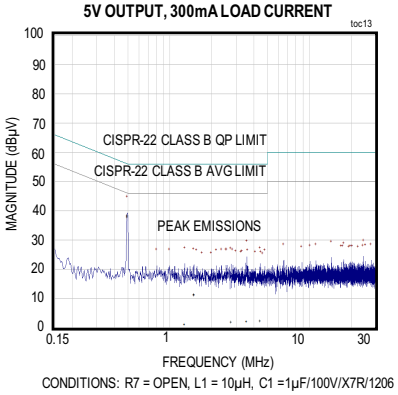
CONDITIONS: PFM MODE

BODE PLOT



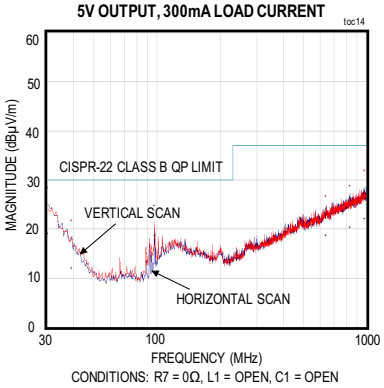
CONDITIONS: 5V OUTPUT, 300mA LOAD CURRENT

CONDUCTED EMISSIONS PLOT 5V OUTPUT, 300mA LOAD CURRENT



CONDITIONS: R7 = OPEN, L1 = 10µH, C1 =1µF/100V/X7R/1206

RADIATED EMISSIONS PLOT 5V OUTPUT, 300mA LOAD CURRENT



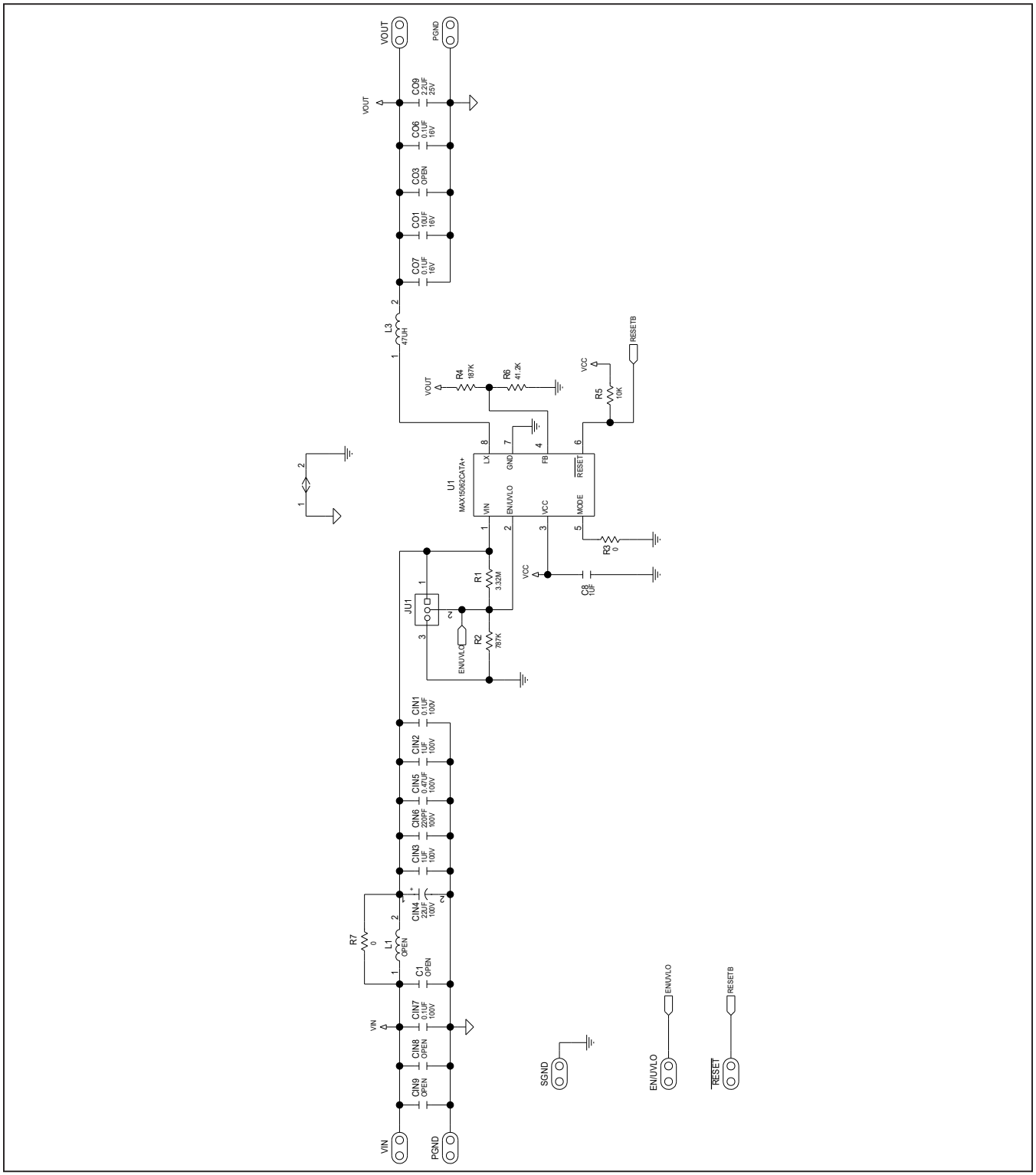
CONDITIONS: R7 = 0Ω, L1 = OPEN, C1 = OPEN

MAX15062C5EVKITE# Bill of Materials

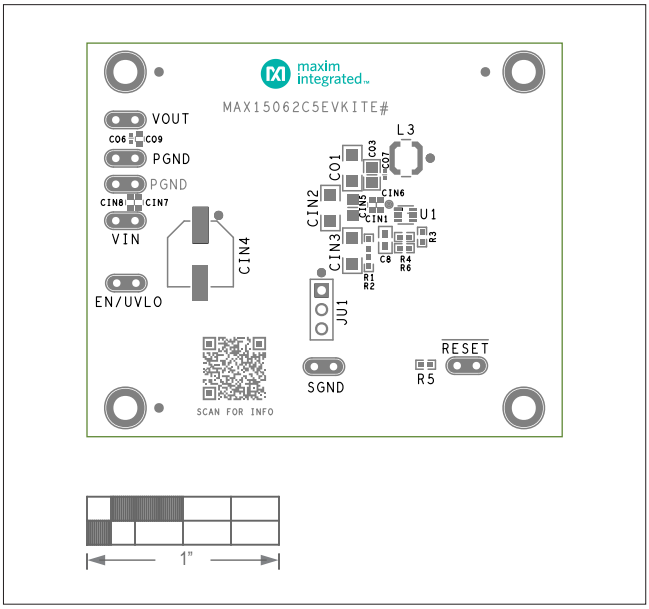
No.	DESIGNATOR	DESCRIPTION	QUANTITY	PART NUMBER
1	CIN1, CIN7	0.1µF, 10%, 100V, X7R, Ceramic capacitor (0603)	2	TAIYO YUDEN HMK107B7104KA-T
2	CIN2, CIN3	1µF, 10%, 100V, X7R, Ceramic capacitor (1206)	2	TAIYO YUDEN HMK316B7105KLH-T
3	CIN4	ALUMINUM-ELECTROLYTIC; 22UF; 100V; TOL=20%; MODEL=EEV SERIES	1	PANASONIC EEE-FK2A220P
4	CIN5	0.47µF, 10%, 100V, X7R, Ceramic capacitor (0805)	1	MURATA GRM21BR72A474KA73
5	CIN6	220pF, 5%, 100V, COG, Ceramic capacitor (0603)	1	TDK C1608C0G2A221J080AA
6	C8	1µF, 10%, 10V, X7R, Ceramic capacitor (0603)	1	TDK C1608X7R1E105K080AE
7	CO1	10µF, 10%, 16V, X7R, Ceramic capacitor (1206)	1	TDK C3216X7R1C106K160AC
8	CO6, CO7	0.1µF, 10%, 16V, X7R, Ceramic capacitor (0402)	2	TAIYO YUDEN EMK105B7104KV-F
9	CO9	2.2µF, 10%, 25V, X7R, Ceramic capacitor (0603)	1	MURATA GRM188R61E225KA12
10	L3	INDUCTOR, 47µH, 0.68A (4mm x 4mm)	1	LPS4018-473MLB
11	R1	RES+, 3.32MΩ, 1% (0402)	1	VISHAY DALE CRCW04023M32FK
12	R2	RES+, 787KΩ, 1% (0402)	1	VISHAY DALE CRCW0402787KFK
13	R3	RES+, 0Ω (0402)	1	PANASONIC ERJ-2GE0R00
14	R4	RES+, 187KΩ, 1% (0402)	1	VISHAY DALE CRCW0402187KFK
15	R5	RES+, 10KΩ, 1% (0402)	1	VISHAY DALE CRCW040210K0FK
16	R6	RES+, 41.2KΩ, 1% (0402)	1	PANASONIC ERJ-2RKF4122
17	R7	RES+, 0Ω, 0.5W (0805)	1	VISHAY CRCW08050000Z0EAHP
18	U1	ULTRA-SMALL; HIGH EFFICIENCY; SYNCHRONOUS STEP-DOWN DC-DC CONVERTER; (TDFN8 2mm x 2mm)	1	MAX15062CATA+
19	JU1	3-pin header (36-pin header 0.1" centers)	1	Sullins: PEC03SAAN
20	-	Shunts	1	SULLINS STC02SYAN
21	MH1-MH4	MACHINE SCREW; SLOTTED	4	EAGLE PLASTIC DEVICES P440.375
22	MH1-MH4	HEX STANDOFF #4-40 NYLON 3/8"	4	KEYSTONE ELECTRONICS 1902B
23	C1	OPTIONAL: 1µF, 10%, 100V, X7R, Ceramic capacitor (1206)	1	TAIYO YUDEN HMK316B7105KLH-T
24	L1	OPTIONAL: INDUCTOR, 10µH, 0.66A (2mm x 2mm)	1	COILCRAFT XPL2010-103ML
25	CIN8, CIN9	OPEN: Capacitor (0603)	0	
26	CO3	OPEN: Capacitor (0805)	0	

DEFAULT JUMPER TABLE	
JUMPER	SHUNT POSITION
JU1	1 - 2

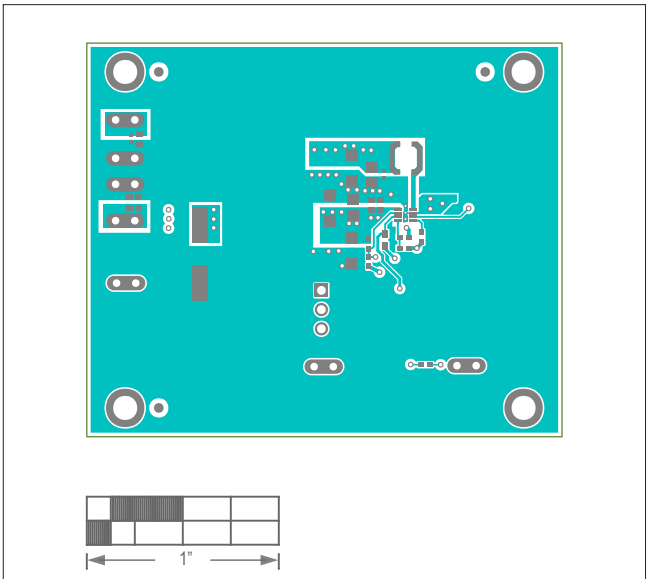
MAX15062C5EVKITE# Schematic



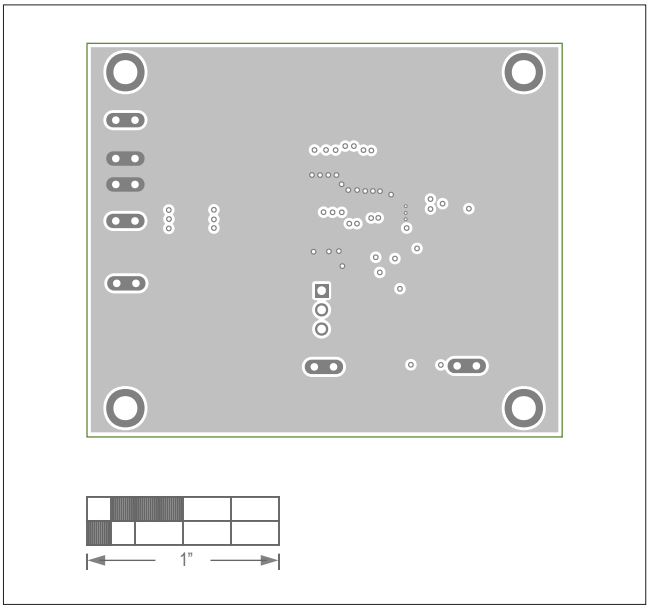
MAX15062C5EVKITE# PCB Layout



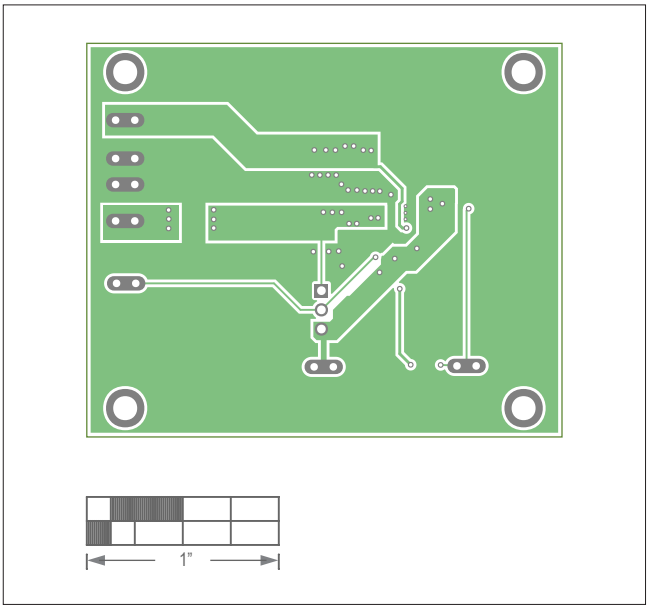
MAX15062C5EVKITE# PCB Layout—Top Silkscreen



MAX15062C5EVKITE# PCB Layout—Top Layer

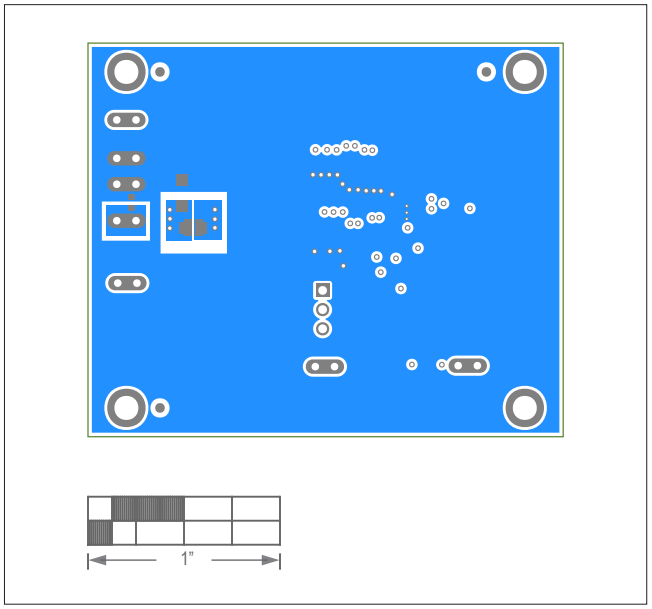


MAX15062C5EVKITE# PCB Layout—Layer 2

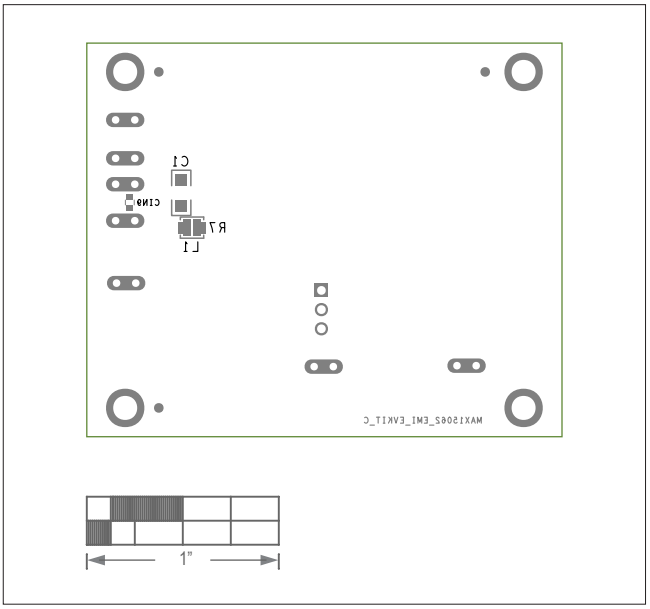


MAX15062C5EVKITE# PCB Layout—Layer 3

MAX15062C5EVKITE# PCB Layout (continued)



MAX15062C5EVKITE# PCB Layout—Bottom Layer



MAX15062C5EVKITE# PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/19	Initial release	—
1	9/19	Updated the title on all pages	1–10

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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