Click here for production status of specific part numbers.

MAX17572EVKITBE# Evaluation Kit

Evaluates: MAX17572 in 5V Output-Voltage Application

General Description

The MAX17572EVKITBE# evaluation kit (EV kit) provides a proven design to evaluate the MAX17572 high-voltage, high-efficiency, synchronous step-down DC-DC converter. The EV kit is preset for 5V output at load currents up to 1A and features a 500kHz switching frequency 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 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 MAX17572 data sheet.

Features

- Operates From a 6.5V to 60V Input Supply
- Programmed 5V Output Voltage, 1A Load Current
- 500kHz Switching Frequency
- Enable/UVLO Input, Resistor-Programmable UVLO Threshold
- Adjustable Soft-Start Time
- Open-Drain $\overline{\text{RESET}}$ Output
- External Clock Synchronization
- Overcurrent and Overtemperature Protection
- Proven PCB Layout
- Fully Assembled and Tested
- Complies with CISPR22(EN55022) Class B Conducted and Radiated Emissions

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

Quick Start

Recommended Equipment

- MAX17572EVKITBE#
- 6.5V to 60V, 2A 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 6.5V and 60V. Disable the power supply.
2) Connect the positive terminal of the power supply to the V_{IN} PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the 1A load to the V_{OUT} PCB pad and the negative terminal to the nearest PGND PCB pad.
3) Connect the DVM across the V_{OUT} 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).
5) Turn on the DC power supply.
6) Enable the load.
7) Verify that the DVM displays 5V

319-100345; Rev 0; 4/19

maxim integrated™

Detailed Description of Hardware

The MAX17572EVKITBE# EV kit provides a proven design to evaluate the MAX17572 high-voltage, high efficiency, synchronous step-down DC-DC converter. The EV kit is preset for 5V output from 6.5V to 60V input at load currents up to 1A and features a 500kHz switching frequency for optimum efficiency and component size. The EV kit includes an EN/UVLO PCB pad and jumper JU1 to enable the output at a desired input voltage. An additional $\overline{\text{RESET}}$ PCB pad is available for monitoring whether the converter output is in regulation.

Soft-Start Capacitor Selection

The EV kit offers an adjustable soft-start operation to reduce inrush current. The soft-start time is adjusted by the value of external soft-start capacitor (C5) connected between SS and SGND. The selected output capacitance (C_{SEL}) and the output voltage (V_{OUT}) determine the minimum required soft-start capacitor as follows:

$$C_{SS} \geq 56 \times 10^{-6} \times C_{SEL} \times V_{OUT}$$

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

$$t_{SS} = \frac{C_{SS}}{5.55 \times 10^{-6}}$$

For example, to program a 2ms soft-start time, a 12nF capacitor should be connected from the SS pin to GND.

Enable/Undervoltage-Lockout (EN/UVLO) Programming

The MAX17572 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 MAX17572 is enabled when the input voltage rises above 6.4V. To disable the MAX17572, 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 the 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,

For more details about setting the undervoltage lockout level, refer to the MAX17572 data sheet.

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 converter. $\overline{\text{RESET}}$ 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.

Hot Plug-In and Long Input Cables

The MAX17572EVKITBE# PCB layout provides an optional electrolytic capacitor (CIN4 = 33µF/80V). This capacitor limits the peak voltage at the input of the MAX17572 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 IC input.

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

SHUNT POSITION	EN/UVLO PIN	MAX17572 OUTPUT
1-2*	Connected to VIN	Enabled
Not installed	Connected to the center node of resistor-divider R1 and R2	Enabled, UVLO level set through the R1 and R2 resistors
2-3	Connected to SGND	Disabled

**Default position.*

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 MAX17572EVKITBE# 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 placed on the L1 footprint before installing conducted EMI filter components. The MAX17572EVKITBE# 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

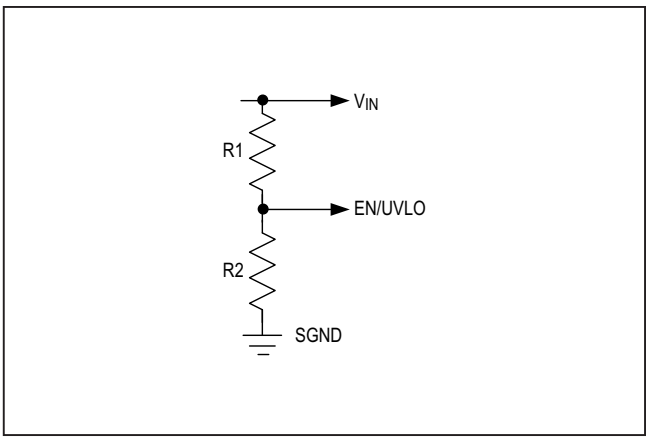


Figure 1. Setting the Input Undervoltage Lockout

Component Suppliers

SUPPLIER	WEBSITE
Coilcraft, Inc.	www.coilcraft.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
Vishay	www.vishay.com
Onsemi	www.onsemi.com
Taiyo Yuden	www.ty-top.com

Note: *Indicate that you are using the MAX17572 when contacting these component suppliers.*

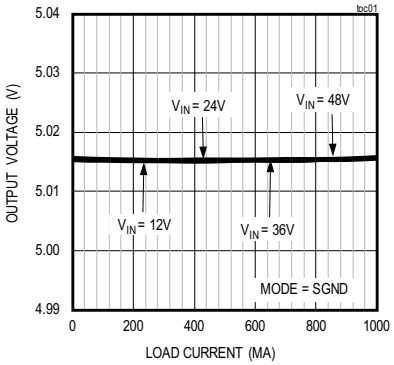
Ordering Information

PART	TYPE
MAX17572EVKITBE#	EV KIT

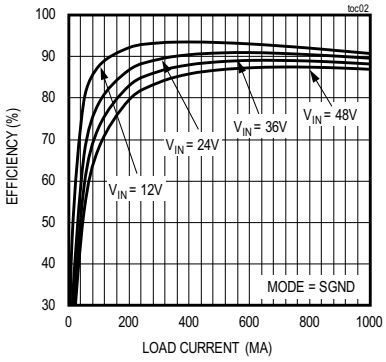
EV Kit Performance Report

(V_{IN} = 24V, V_{OUT} = 5V, I_{OUT} = 1A, f_{SW} = 500kHz, T_A = +25ºC, unless otherwise noted.)

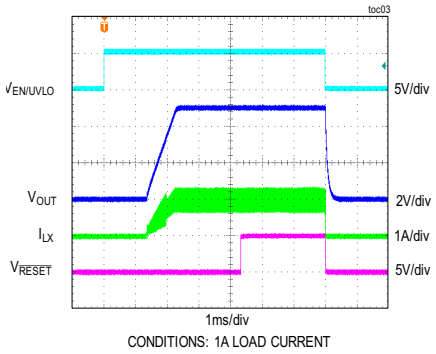
LOAD AND LINE REGULATION



EFFICIENCY VS. LOAD CURRENT

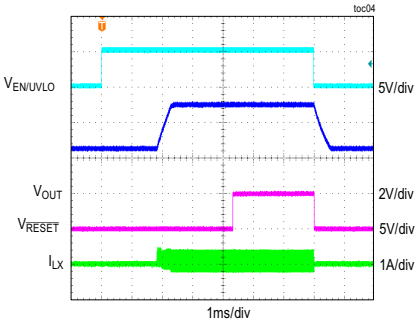


SOFT-START/SHUTDOWN THROUGH EN/UVLO



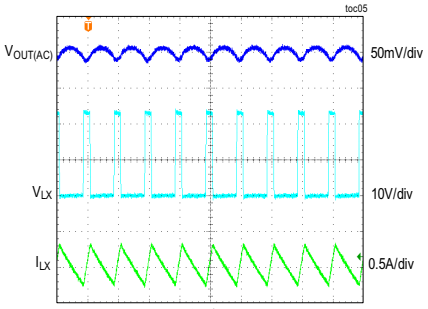
CONDITIONS: 1A LOAD CURRENT

SOFT-START WITH 2.5V PREBIAS VOLTAGE



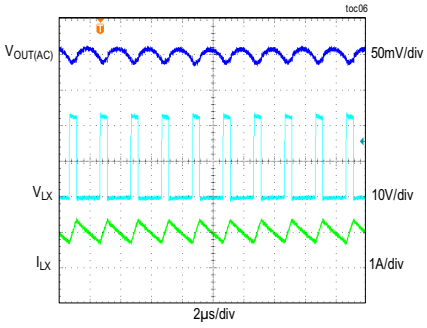
CONDITIONS: 25mA LOAD CURRENT

STEADY-STATE PERFORMANCE



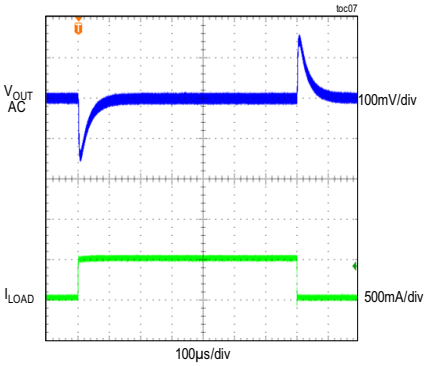
CONDITIONS: NO LOAD

STEADY-STATE PERFORMANCE



CONDITIONS: 1A LOAD CURRENT

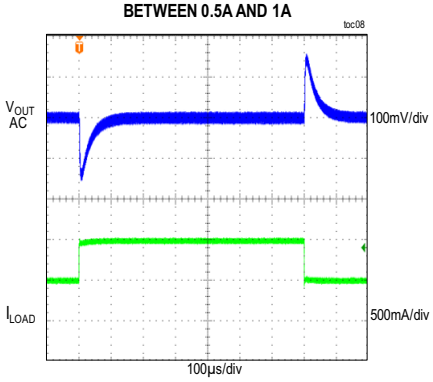
LOAD TRANSIENT RESPONSE BETWEEN NO LOAD AND 0.5A



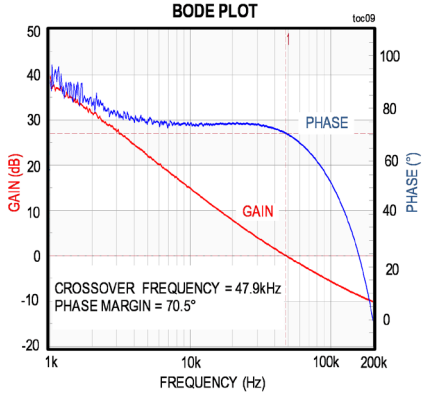
EV Kit Performance Report (continued)

(V_{IN} = 24V, V_{OUT} = 5V, I_{OUT} = 1A, f_{SW} = 500kHz, T_A = +25ºC, unless otherwise noted.)

LOAD TRANSIENT RESPONSE
BETWEEN 0.5A AND 1A

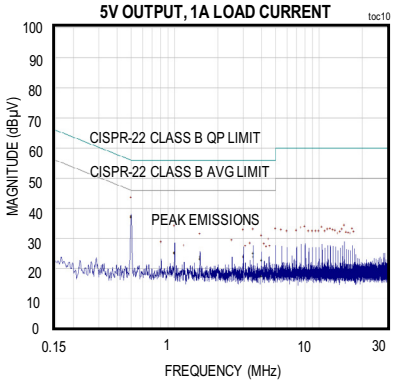


BODE PLOT



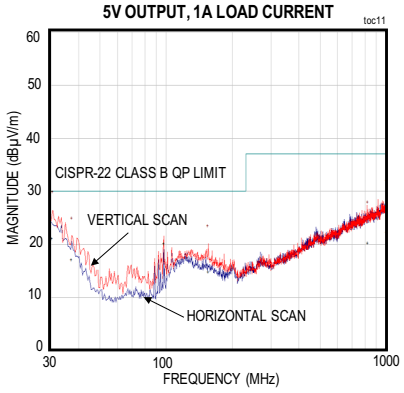
CONDITIONS: 5V OUTPUT, 1A LOAD CURRENT

CONDUCTED EMISSIONS PLOT
5V OUTPUT, 1A LOAD CURRENT



CONDITIONS: L1 = 10µH, C1 = 4.7µF/80V/X7R/1210

RADIATED EMISSIONS PLOT
5V OUTPUT, 1A LOAD CURRENT



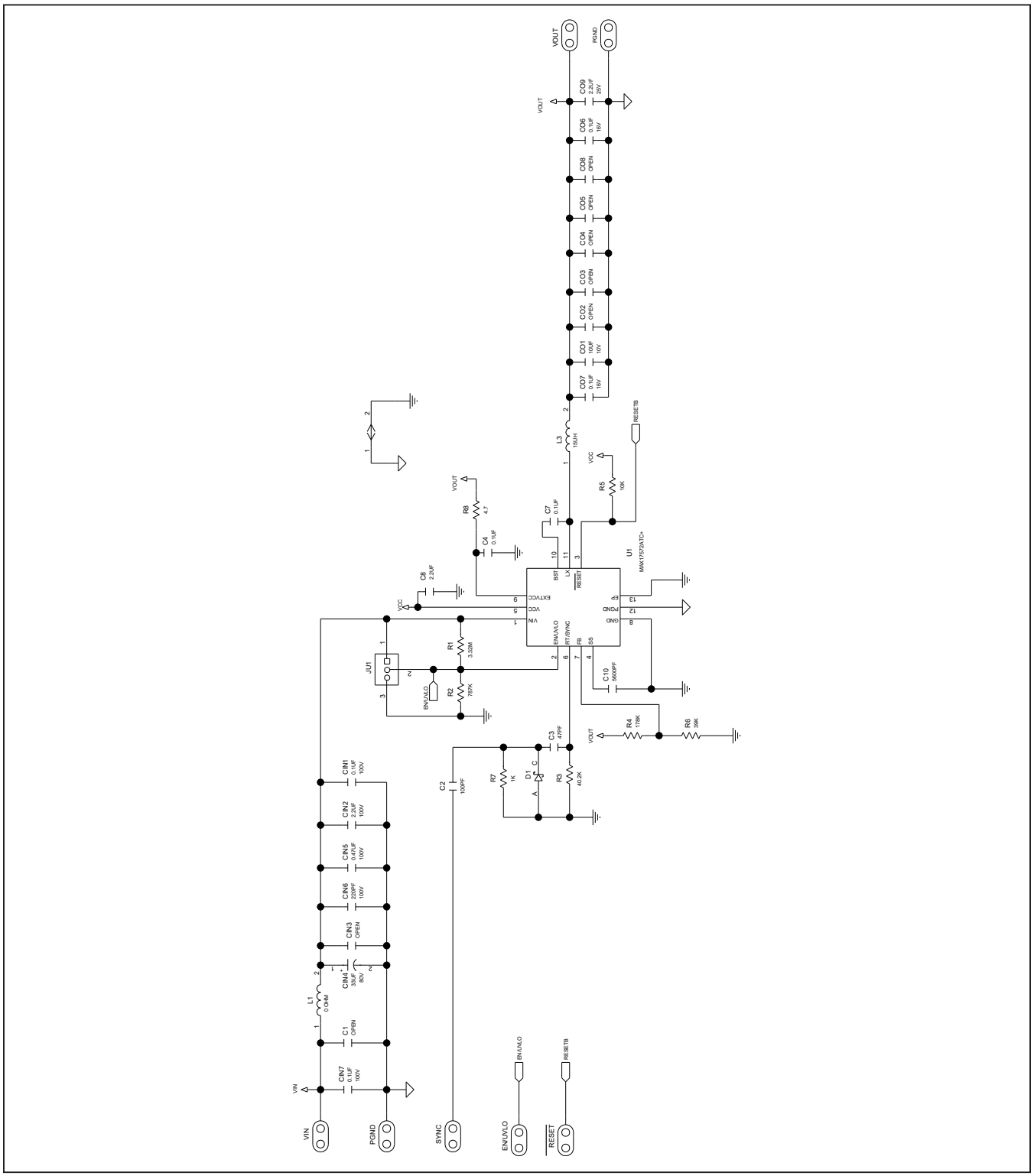
CONDITIONS: L1 = 0Ω, C1 = OPEN

MAX17572EVKITBE# Bill of Materials

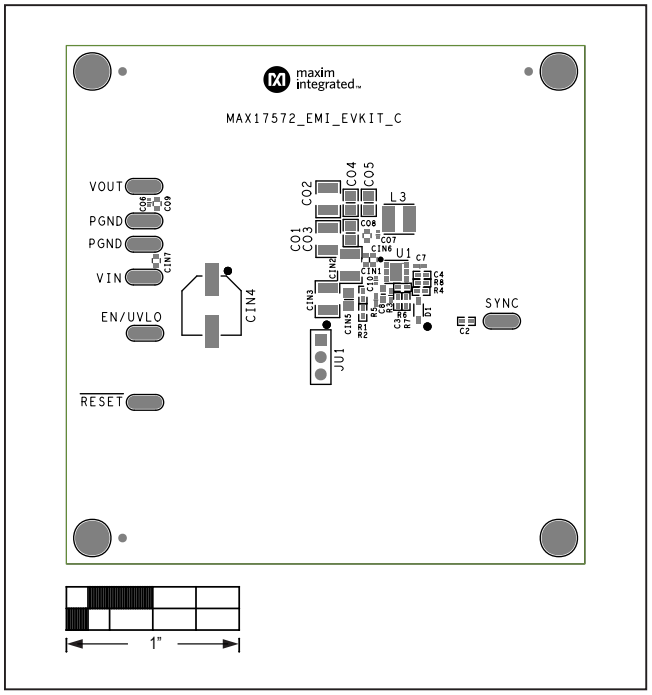
S.No	DESIGNATOR	DESCRIPTION	QUANTITY	MANUFACTURER PART NUMBER
1	C2	100pF 10%, 50V, COG, Ceramic capacitor (0402)	1	KEMET C0402C101K5GAC; TDK C1005C0G1H101K050BA
2	C3	47pF 5%, 50V, COG, Ceramic capacitor (0402)	1	MURATA GRM1555C1H470JA01
3	C4, C7, CO6, CO7	0.1µF 10%, 16V, X7R, 0402, Ceramic capacitor (0402)	4	TAIYO YUDEN EMK105B7104KV-F
4	C8	2.2µF 10%, 10V, X7R, Ceramic capacitor (0402)	1	MURATA GRM188R71A225KE15
5	C10	5600pF 5%, 50V, COG, Ceramic capacitor (0402)	1	MURTA GRM1555C1H562GE01
6	CIN1,CIN7	0.1µF 10%, 100V, X7R, Ceramic capacitor (0603)	2	TAIYO YUDEN HMK107B7104KA-T
7	CIN2	2.2µF 10%, 100V ,X7R,Ceramic capacitor (1210)	1	TAIYO YUDEN HMK325B7225KM-P
8	CIN4	ALUMINUM-ELECTROLYTIC; 33UF; 80V; TOL=20%; MODEL=FK SERIES	1	PANASONIC EEE-FK1K330P
9	CIN5	0.47µF 10%, 100V, X7R, Ce\ramic capacitor (0805)	1	AVX 08051C474KAT2A
10	CIN6	220pF 5%, 100V, COG, Ceramic capacitor (0402)	1	TDK C1608C0G2A221J080AA
11	CO1	10µF 10%, 10V, X7R, Ceramic capacitor (1210)	1	TAIYO YUDEN LMK325B7106KN-T
12	CO9	2.2µF 10%, 25V, X7R, Ceramic capacitor (0603)	1	MURATA GRM188R71A225KE15
13	D1	Diode PIV=30V; IF=0.2A	1	VISHAY BAT54WS-E3-08
14	L1	RES+, 0Ω OHM, 1% (1812)	1	VISHAY DALE RCA12180000Z0EKLS
15	L3	INDUCTOR, 15µH, 2.8A (4mm x 4mm)	1	COILCRAFT XAL4040-153ME
16	R1	RES+, 3.32MΩ, 1% (0402)	1	VISHAY DALE CRCW04023M32FK
17	R2	RES+, 787KΩ, 1% (0402)	1	VISHAY DALE CRCW0402787KFK
18	R3	RES+, 40.2KΩ, 1% (0402)	1	VISHAY DALE CRCW040240K2FK
19	R4	RES+, 178KΩ, 1% (0402)	1	BOURNS CR0402-FX-1783GLF
20	R5	RES+, 10KΩ, 1% (0402)	1	VISHAY DALE CRCW040210K0FK
21	R6	RES+, 39KΩ, 1% (0402)	1	VISHAY DALE CRCW040239K0FK
22	R7	RES+, 1KΩ, 1% (0402)	1	IMS RCC-0805-1001J
23	R8	RES+, 4.7Ω, 1% (0402)	1	VISHAY DALE CRCW04024R70FK
24	U1	HIGH-EFFICIENCY; SYNCHRONOUS STEP-DOWN DC-DC CONVERTER; (TDFN12-EP 3mm x 3mm)	1	MAX17572ATC+
25	JU1	3-pin header (36-pin header 0.1” centers)	1	Sullins: PEC03SAAN
26	-	Shunts	1	SULLINS STC02SYAN
27	MH1-MH4	MACHINE SCREW; SLOTTED	4	EAGLE PLASTIC DEVICES P440.375
28	MH1-MH4	HEX STANDOFF #4-40 NYLON 3/8"	4	KEYSTONE ELECTRONICS 1902B
29	C1	OPTIONAL: 4.7µF, 10%, 80V, X7R, Ceramic capacitor (1210)	1	MURATA GRM32ER71K475KE14
30	L1	OPTIONAL: INDUCTOR, 10µH, 3.1A (4mm x 4mm)	1	COILCRAFT XAL4040-103ME
31	CIN3, CO2	OPEN: Capacitor (1210)	0	
32	CO3, CO4, CO5	OPEN: Capacitor (0805)	0	
33	CO8	OPEN: Capacitor (0603)	0	

DEFAULT JUMPER TABLE	
JUMPER	SHUNT POSITION
JU1	1 - 2

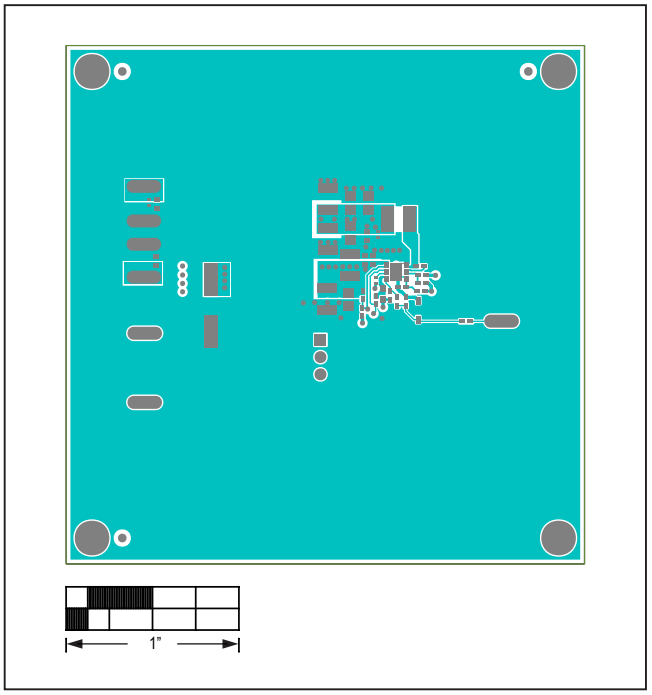
MAX17572EVKITBE# Schematic



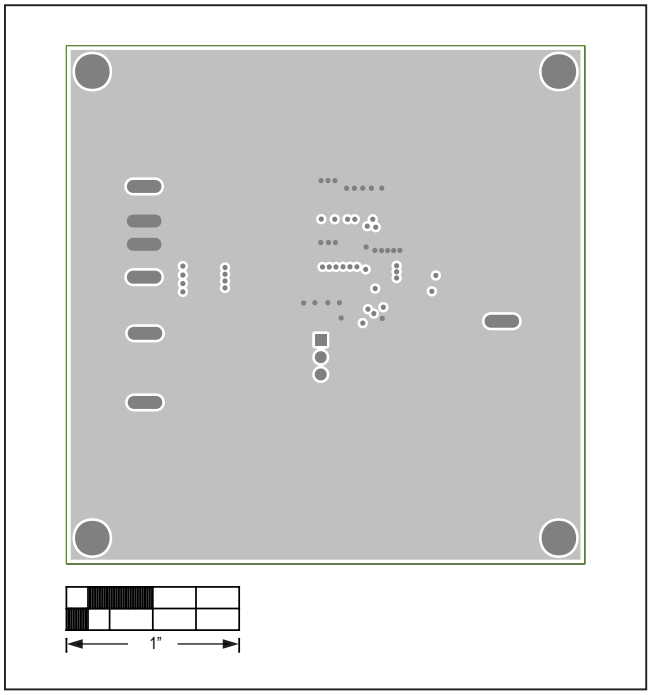
MAX17572EVKITBE# PCB Layout



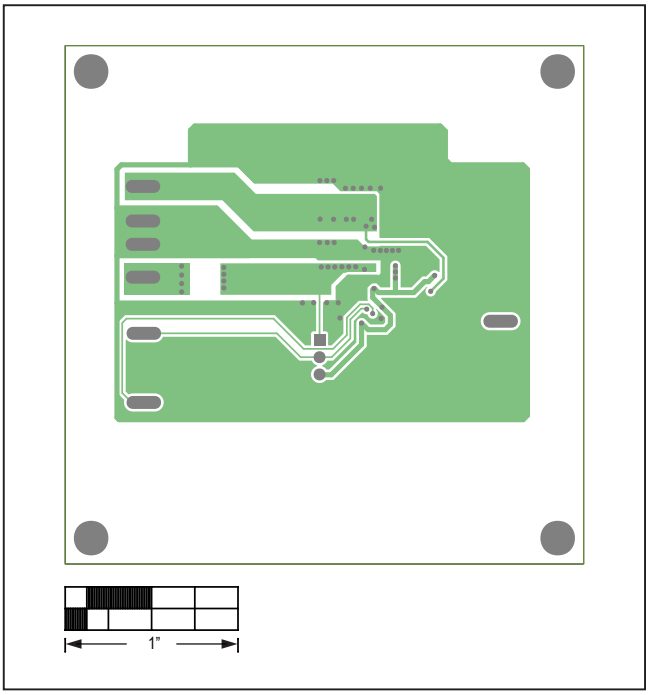
MAX17572EVKITBE# PCB Layout—Top Silkscreen



MAX17572EVKITBE# PCB Layout—Top Layer

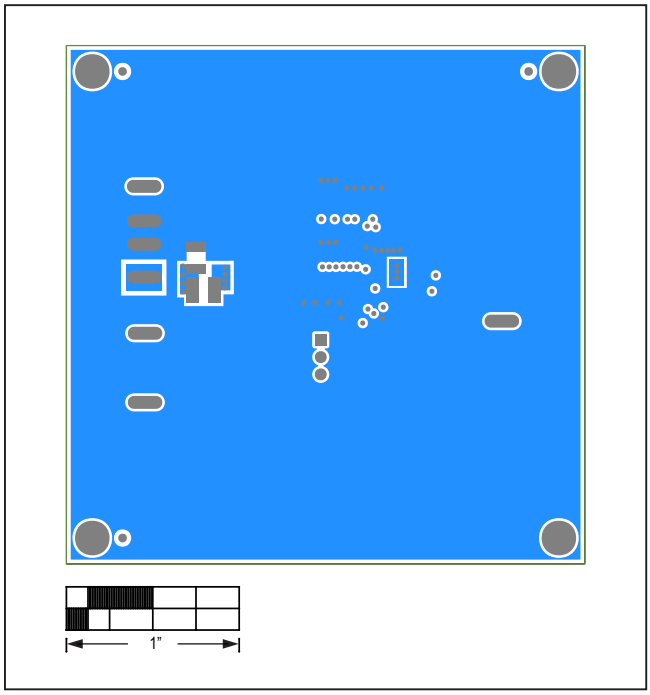


MAX17572EVKITBE# PCB Layout—Layer 2

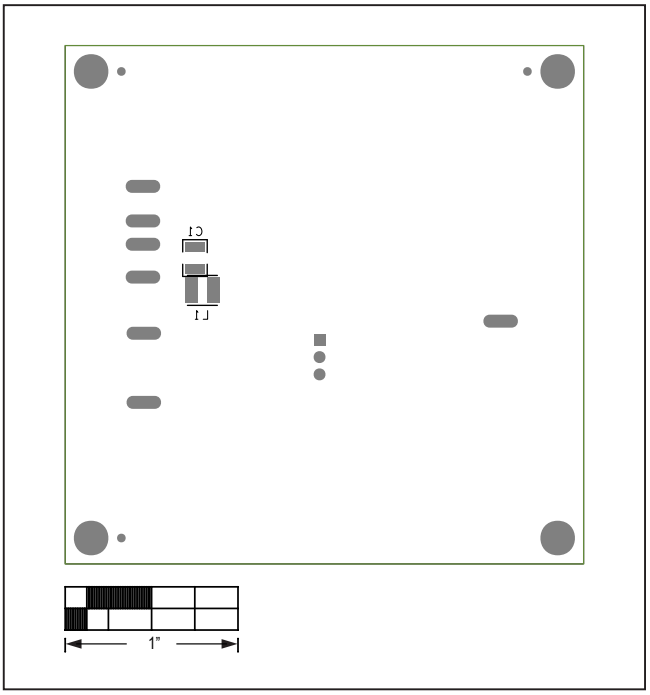


MAX17572EVKITBE# PCB Layout—Layer 3

MAX17572EVKITBE# PCB Layout (continued)



MAX17572EVKITBE# PCB Layout—Bottom Layer



MAX17572EVKITBE# PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/19	Initial release	—

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

Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time.

