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MAX17552AEVKIT# Evaluation Kit

Evaluates: MAX17552A (TDFN) in 5V Output Voltage Applications

General Description

The MAX17552AEVKIT# evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX17552A 60V, 100mA ultra-small, high-efficiency, Himalaya synchronous step-down DC-DC converter in a 10-pin TDFN package. The EV kit operates over a wide input-voltage range of 6V to 60V and provides up to 100mA load current at 5V output. It draws only 26µA supply current under no-load conditions (EN/UVLO connected to V_{IN}). The EV kit is programmed to switch at a frequency of 220kHz and delivers a peak efficiency of 93% with the supplied components. The device is simple to use and easily configurable with minimal external components. It features cycle-by-cycle peak current limit protection, undervoltage lockout, and thermal shutdown.

The EV kit comes installed with the MAX17552AATB+ in a 10-pin (3mm x 2mm) lead(Pb)-free/RoHS-compliant TDFN package.

Features

- Wide 6V to 60V Input Voltage Range
- 5V Output, 100mA Continuous Current
- 93% Peak Efficiency
- 26µA No Load Supply Current
- Enable/UVLO Input, Resistor-Programmable UVLO Threshold
- Internal or Programmable Soft-Start
- Selectable PWM and PFM Modes of Operation
- Open-Drain $\overline{\text{RESET}}$ Output
- Overcurrent Protection
- Overtemperature Protection
- Proven PCB Layout
- Fully Assembled and Tested

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

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Quick Start

Recommended Equipment

- MAX17552AEVKIT#
- 60V adjustable, 0.5A DC power supply
- Load capable of sinking 100mA at 5V
- Two digital multimeters (DMM)

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) Set the input voltage to 24V and 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 GND PCB pad.
3) Connect the positive terminal of the load to the VOUT PCB pad and the negative terminal to the nearest GND PCB pad.
4) Connect one DMM across the VOUT PCB pad and the nearest GND PCB pad, and another DMM across the $\overline{\text{RESET}}$ PCB pad and the GND PCB pad.
5) Verify that shunts are installed on jumpers JU1 and JU2. See Table 1 for details.
6) Select the shunt position on JU3 according to the intended mode of operation. See Table 2 for details.
7) Turn on the input power supply and enable the load.
8) Verify that the DMM across the output terminals displays 5V.
9) Verify that the DMM across the $\overline{\text{RESET}}$ PCB pad and GND PCB displays 5V.
10) Vary the input voltage between 6V and 60V and vary the load current from 1mA to 100mA. Verify that output voltage is 5V with respect to GND.
11) Reduce the input voltage to 5.3V.
12) Verify that both the DMMs display 0V.
13) Disable the input power supply.

Note: While performing an output short-circuit test, it is possible for the ceramic output capacitor to oscillate with the wiring inductance between the capacitor and

319-100802; Rev 1; 9/21

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short-circuited load, and thereby cause the absolute maximum rating of the V_{OUT} pin (-0.3V) to be exceeded. The resistor (R7) and the capacitor (C5) are included on this evaluation kit to protect against unintentional violation of the above mentioned rating. In the actual system design, parasitic board or wiring inductance should be minimized and the output-voltage waveform under short-circuit operation should be verified to ensure that the absolute maximum rating of the V_{OUT} pin is not exceeded.

Detailed Description

The MAX17552AEVKIT# EV kit is a fully assembled and tested circuit board that demonstrates the performance of the MAX17552A 60V, 100mA ultra-small, high-efficiency, synchronous step-down DC-DC converter in a 10-pin TDFN package. The EV kit operates over a wide input voltage range of 6V to 60V and provides up to 100mA load current at 5V output. It draws only 26µA supply current under no-load conditions (EN/UVLO connected to VIN). The EV kit is programmed to switch at a frequency of 220kHz and delivers a peak efficiency of 93% with the supplied components. The device is simple to use and easily configurable with minimal external components. It features cycle-by-cycle peak current limit protection, undervoltage lockout, and thermal shutdown.

The EV kit includes an EN/UVLO PCB pad and jumpers JU1 and JU2 to enable control of the converter output. The MODE PCB pad and jumper JU3 are provided for selecting the mode of operation of the converter. A $\overline{RESET}$ PCB pad is available for monitoring the status of the converter. The RT/SYNC PCB pad can be used to synchronize the EV kit to an external clock.

Enable/Undervoltage Lockout Programming (EN/UVLO)

The EN/UVLO PCB pad on the EV kit serves as an on/off control while also allowing the user to program the input undervoltage lockout (UVLO) threshold. Jumpers JU1 and JU2 configure the EV kit's output for turn-on/turn-off control. See Table 1 for proper JU1, JU2 jumper configurations.

Additionally, resistors R1 and R2 are included to set the UVLO to a desired turn-on voltage. Refer to the *Setting the Input Undervoltage-Lockout Level* section in the MAX17552A IC data sheet for additional information on setting the UVLO threshold voltage.

Open-Drain $\overline{RESET}$ Output

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

Mode Selection (MODE)

The EV kit includes a jumper (JU3) to select the mode of operation of the converter. Install a shunt across JU3 before powering up the EV kit to enable the forced-PWM operation. Keep JU3 open to enable the light-load PFM operation. See Table 2 for proper JU3 settings.

Table 1. Converter EN/UVLO Jumpers (JU1, JU2) Settings

SHUNT POSITION		EN/UVLO PIN	OUTPUT
JU1	JU2		
1-2	Open	Connected to VIN	Enabled
Open	1-2	Connected to GND	Disabled
1-2*	1-2*	Connected to midpoint of R1, R2 resistor-divider	Enabled at VIN ≥ 6V

**Default position.*

Table 2. Mode Selection Jumper (JU3) Settings

SHUNT POSITION	MODE PIN	MODE OF OPERATION
1-2	Connected to GND	Forced PWM
Open*	Unconnected	PFM

**Default position.*

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Soft-Start Input (SS)

The EV kit offers a fixed 5ms soft-start time. Connect the capacitor C4 to adjust the soft-start time (t_{SS}). Use the following equation to determine the soft-start capacitance value (CSS).

$$CSS = 6.25 \times t_{SS}$$

where t_{SS} is in milliseconds and C_{SS} is in nanofarads.

External Clock Synchronization (RT/SYNC)

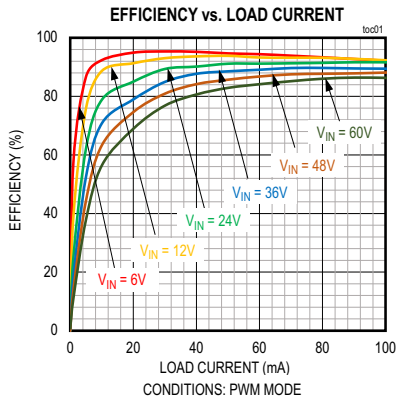
The EV kit provides a PCB pad to synchronize the MAX17552A to an optional external clock. Apply the external clock to the RT/SYNC PCB pad through an AC-coupling capacitor. Refer to the *External Synchronization* section in the MAX17552A IC data sheet for additional information on configuring the external clock and selecting the AC-coupling capacitor.

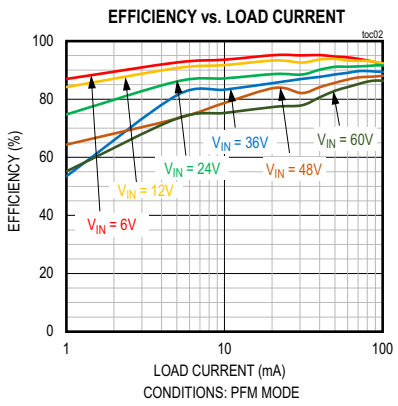
Hot Plug-in and Long Input Cables

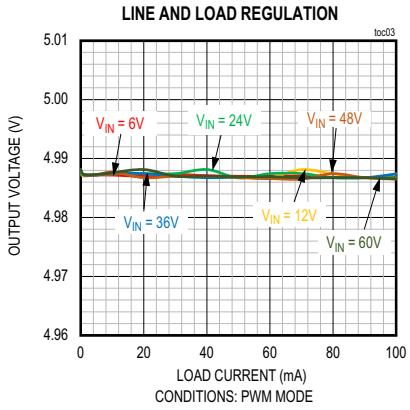
The MAX17552AEVKIT# EV kit PCB layout provides an optional electrolytic capacitor (C1 = 22µF/100V). This capacitor limits the peak voltage at the input of the converter when the DC input source is Hot Plugged into the EV kit input terminals with long input cables. The equivalent series resistance (ESR) of the electrolytic capacitor dampens the oscillations caused by the interaction of the inductance of the long input cables and the ceramic capacitors at the converter's input.

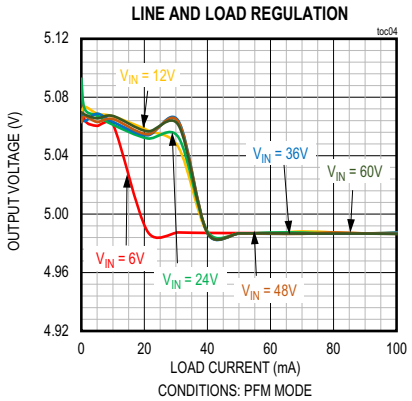
EV Kit Performance Report

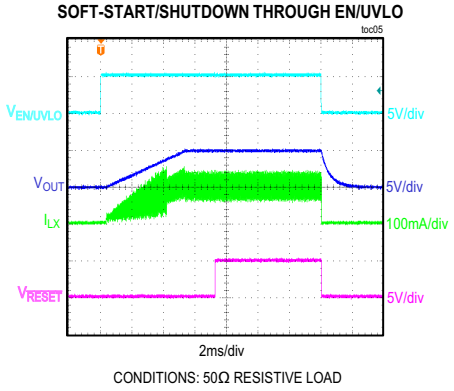
(V_{IN} = 24V, f_{SW} = 220kHz, T_A = +25°C, unless otherwise noted)

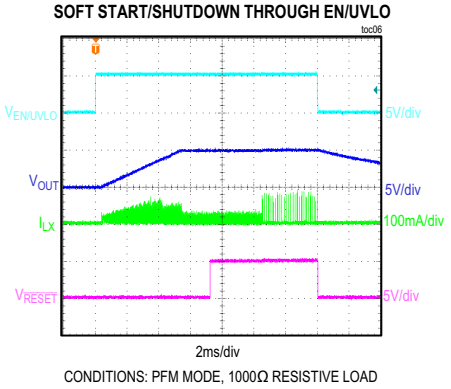










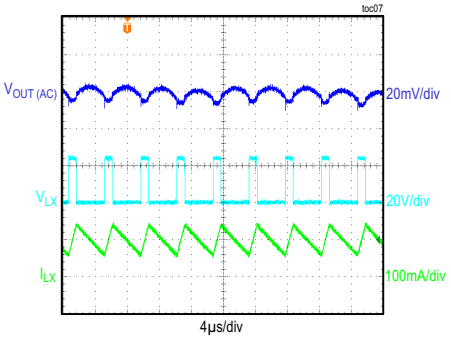


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EV Kit Performance Report (continued)

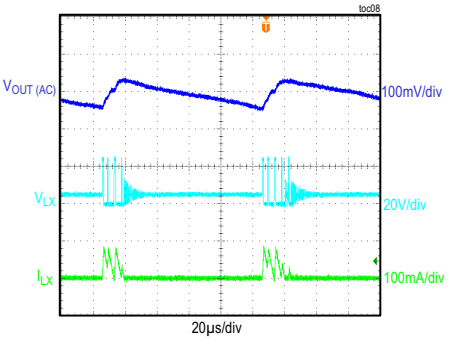
(V_{IN} = 24V, f_{SW} = 220kHz, T_A = +25°C, unless otherwise noted)

STEADY-STATE PERFORMANCE



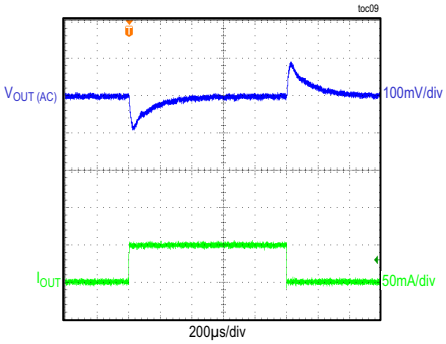
CONDITIONS: 50Ω RESISTIVE LOAD

STEADY-STATE PERFORMANCE



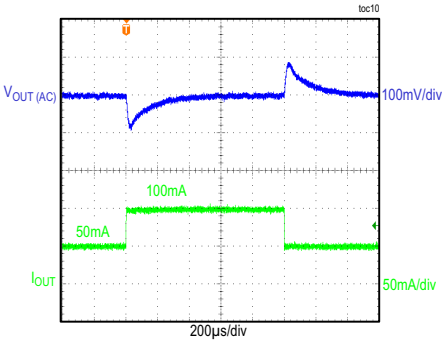
CONDITIONS: PFM MODE, 1000Ω RESISTIVE LOAD

LOAD TRANSIENT BETWEEN 0mA AND 50mA



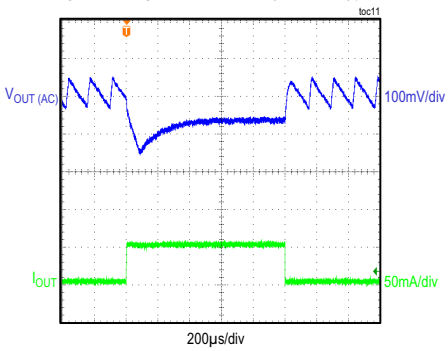
CONDITIONS: PWM MODE

LOAD TRANSIENT BETWEEN 50mA AND 100mA



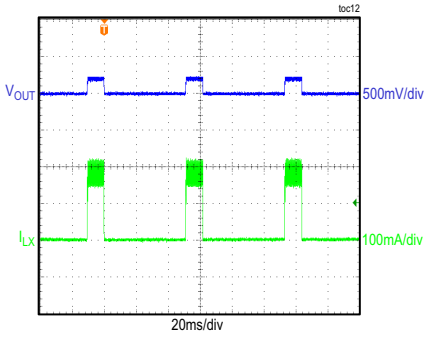
CONDITIONS: PWM MODE

LOAD TRANSIENT BETWEEN 5mA AND 50mA



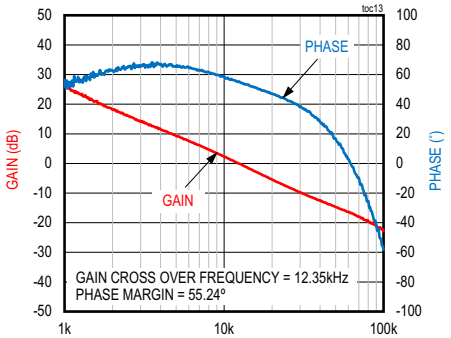
CONDITIONS: PFM MODE

OVERLOAD PROTECTION



CONDITIONS: PWM MODE, 1Ω RESISTIVE LOAD

BODE PLOT



CONDITIONS: 50Ω RESISTIVE LOAD

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Component Suppliers

SUPPLIER	WEBSITE
Coilcraft	www.coilcraft.com
Murata Americas	www.murata.com
Panasonic	www.panasonic.com
TDK corp.	www.tdk.com

Note: *Indicate that you are using the MAX17552AATB when contacting these component suppliers.*

Ordering Information

PART	TYPE
MAX17552AEVKIT#	EV Kit

#Denotes RoHS compliance

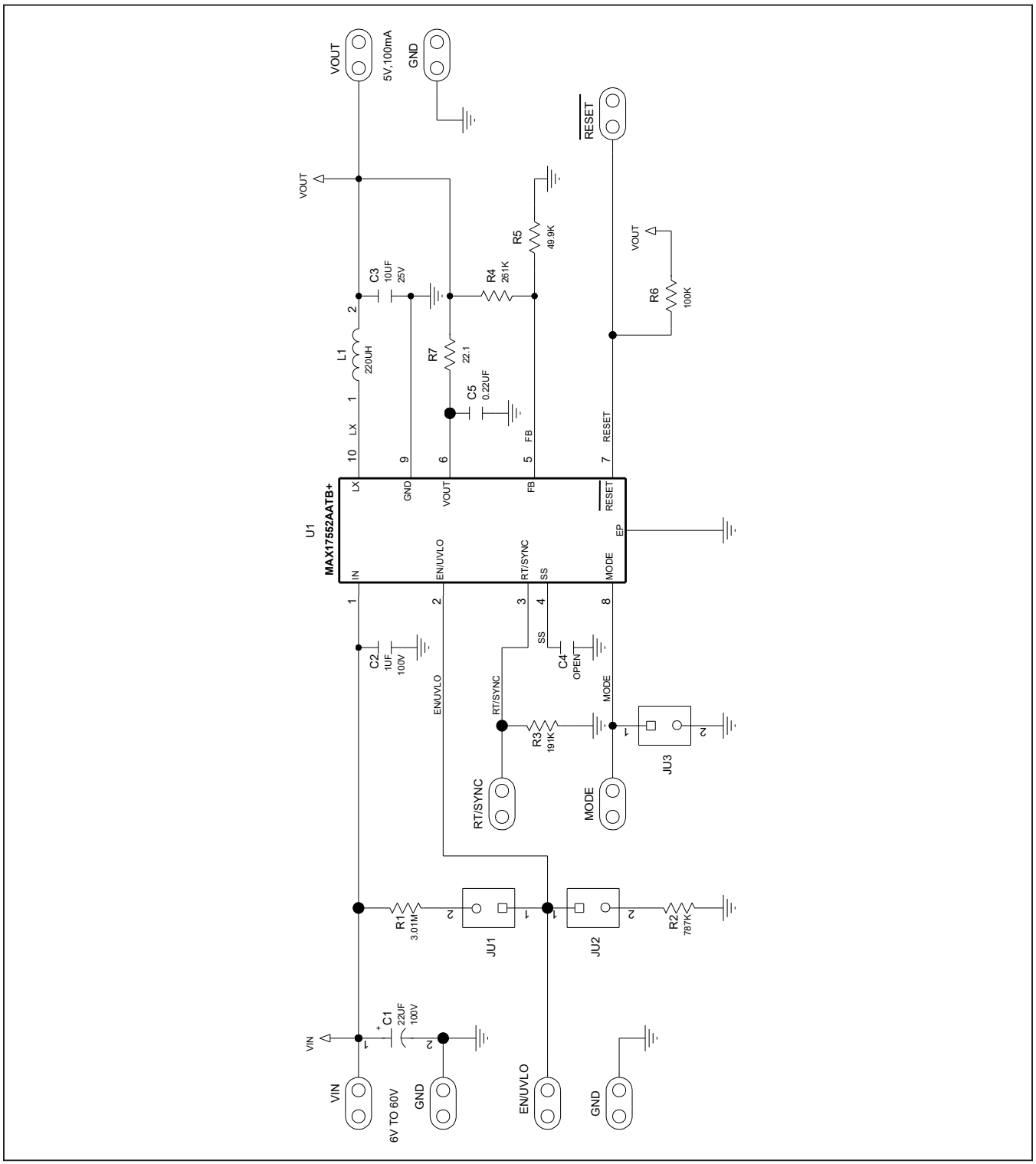
MAX17552A 5V EV Kit (TDFN) Bill of Materials

S.No	DESIGNATOR	DESCRIPTION	QTY	MANUFACTURER PART NUMBER
1	C1	22µF, 100V Electrolytic Capacitor (8.3mm x 8.3mm)	1	PANASONIC EEVFK2A220P
2	C2	1µF±10%; 100V; X7R; Ceramic Capacitor (1206)	1	TDK C3216X7R2A105K160AA
3	C3	10µF±10%; 25V; X7R; Ceramic Capacitor (1206)	1	TDK C3216X7R1E106K160AB
4	C5	0.22µF±10%; 16V; X7R; Ceramic Capacitor (0402)	1	MURATA GRM155R71C224KA12
5	JU1-JU3	2-Pin Headers	3	SAMTEC TSW-102-07-T-S
6	L1	220µH±20%; IRMS = 0.235A; Inductor (4.8mmx4.8mm)	1	COILCRAFT LPS5030-224MR
7	R1	3.01MΩ ±1%; 0.063W, Resistor (0402)	1	
8	R2	787kΩ ±1%; 0.063W, Resistor (0402)	1	
9	R3	191kΩ ±1%; 0.063W, Resistor (0402)	1	
10	R4	261kΩ ±1%; 0.063W, Resistor (0402)	1	
11	R5	49.9kΩ ±1%; 0.063W, Resistor (0402)	1	
12	R6	100kΩ ±1%; 0.063W, Resistor (0402)	1	
13	R7	22.1Ω ±1%; 0.063W, Resistor (0402)	1	
14	SU1-SU3	Jumper Socket (2.54mm)	3	SULLINS STC02SYAN
15	U1	60V, 100mA, ultra-small, highefficiency, synchronous step-down DC-DC converter with 22µA noload supply current (10 TDFN-EP*)	1	MAXIM INTEGRATED MAX17552AATB+
16	C4	Open: Capacitor (0402)	0	

DEFAULT JUMPER TABLE	
JUMPER	**SHUNT POSITION**
JU1, JU2	1-2
JU3	Open

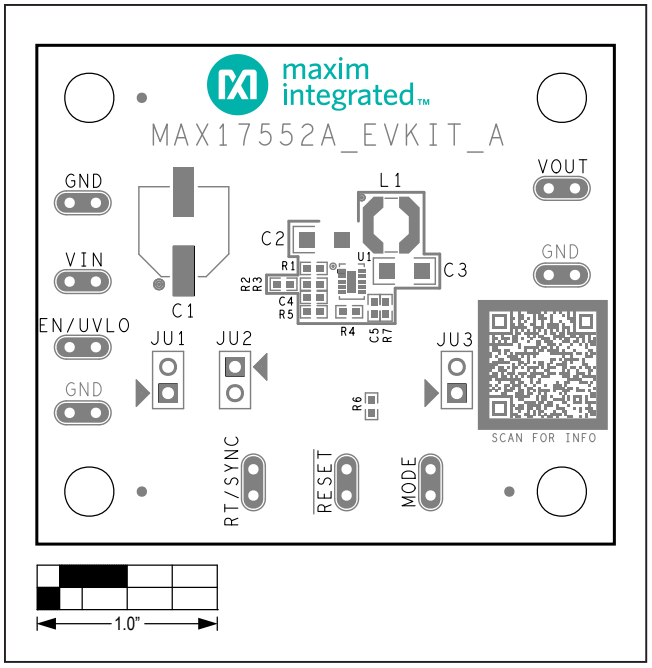
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MAX17552A 5V EV Kit (TDFN) Schematic Diagram

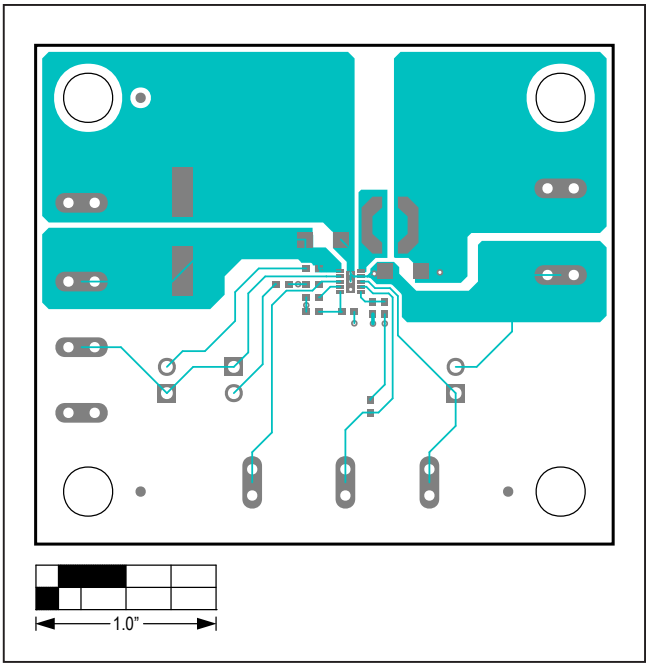


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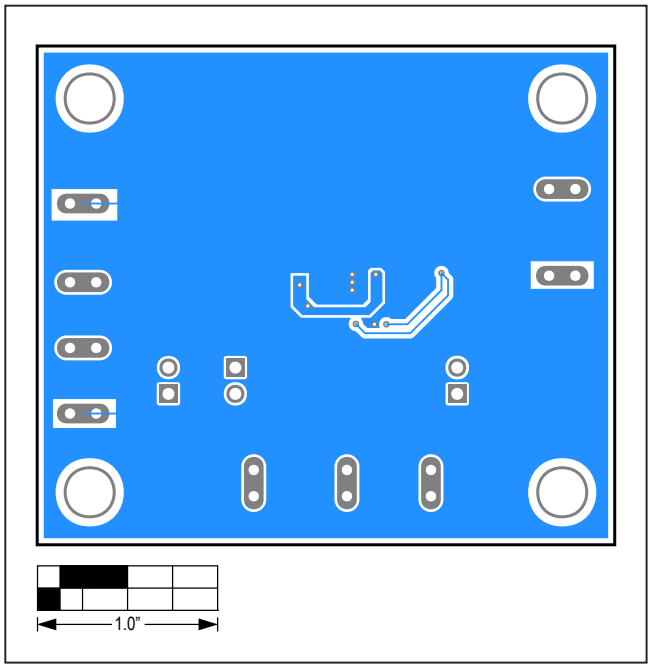
MAX17552A 5V EV Kit (TDFN) PCB Layout Diagrams



MAX17552A 5V EV Kit (TDFN)—Top Silkscreen



MAX17552A 5V EV Kit (TDFN)—Top Layer



MAX17552A 5V EV Kit (TDFN)—Bottom Layer

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Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/21	Release for Market Intro	—
1	9/21	Updated *General Description*, *EV Kit Performance Report*, *Bill of Materials* Title, and *PCB Layout Diagram* Captions	1, 3-5, 7

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