

Evaluate: MAX17570A/MAX17570D Converters

MAX17570A/MAX17570D Evaluation Kits

General Description

The MAX17570A/MAX17570D evaluation kits (EV kits) provide proven designs to evaluate the performance of the MAX17570A/MAX17570D high-voltage, high-efficiency, synchronous step-down DC-DC converters. The MAX17570A/MAX17570D EV kits operate over a 4.5V to 60V input range and can deliver up to 300mA at a fixed 3.3V output. The MAX17570A operates in PWM mode at all loads and the MAX17570D operates in PFM mode at light loads.

The EV kits feature an adjustable input undervoltage lockout, open-drain $\overline{\text{RESET}}$, overcurrent protection, external frequency synchronization, and thermal shutdown. The MAX17570 IC data sheet provides a complete description of the part that should be read in conjunction with this EV kit data sheet before operating these EV kits.

Features and Benefits

- Operates up to 60V Input Supply
- Fixed 3.3V PWM and PFM Application Circuits
- Up to 300mA Load Current
- 400kHz Switching Frequency
- Enable/UVLO Input, Resistor-Programmable UVLO Threshold
- Open-Drain $\overline{\text{RESET}}$ Output
- Provision to Synchronize MAX17570A to the External Clock Source
- Overcurrent and Overtemperature Protection
- Proven PCB Layout
- Fully Assembled and Tested
- Complies with CISPR32 (EN55032) Class B Conducted and Radiated Emissions

[Ordering Information](#) appears at end of data sheet.

Quick Start

Required Equipment

- One 60V, 300mA DC Power Supply
- Digital Multimeters (DMM)
- Load Resistors Capable of Sinking up to 300mA (11 Ω)

Procedure

The EV kits are fully assembled and tested. Follow the steps to verify and test individual converter operation:

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

1. Disable the power supply and set the input power supply at a valid input voltage.
2. Connect the positive terminal and negative terminal of the power supply to the V_{IN} pad and its adjacent PGND pad of the converter under evaluation.
3. Connect the positive terminal of the 300mA (max) load to the V_{OUT} pad and the negative terminal to the nearest PGND pad of the corresponding converter.
4. Connect the DMM across the V_{OUT} pad and the nearest PGND pad.
5. Verify that the shunts are not installed across pins on jumper JU101 for the MAX17570A and JU201 for the MAX17570D. See [Table 1](#) for details.
6. Turn on the input power supply.
7. Verify that the DMM displays the expected terminal voltage with respect to PGND.

MAX17570A/MAX17570D EV Kits Board

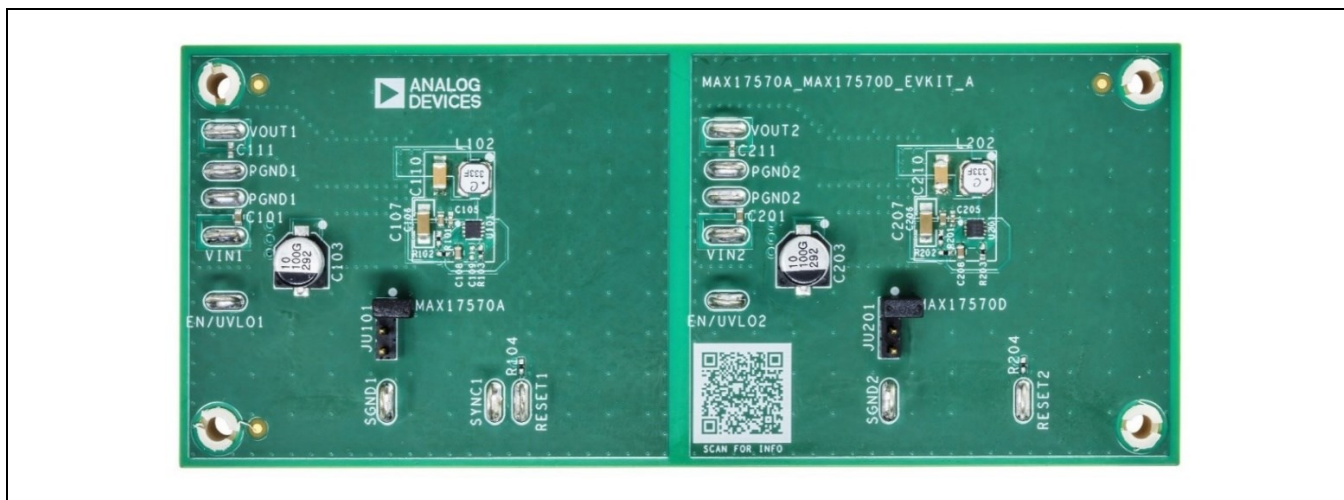


Figure 1. MAX17570A/MAX17570D EV Kit Board—Top View

MAX17570A/MAX17570D EV Kits Configuration

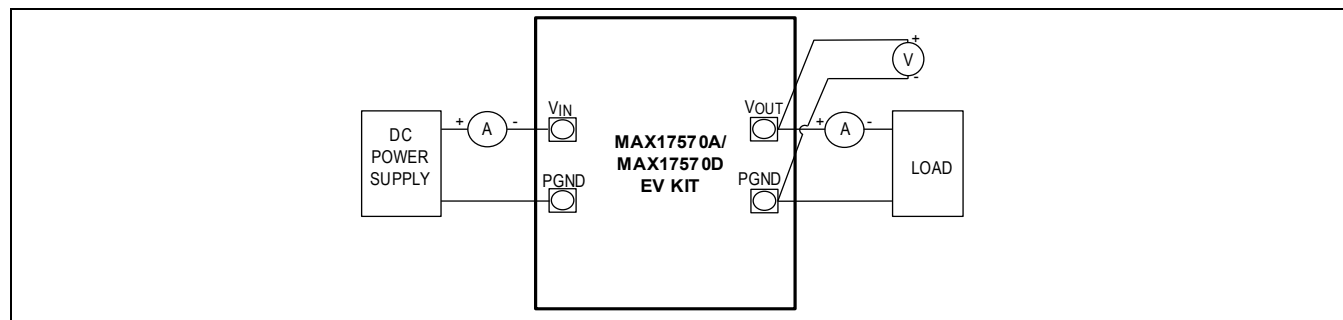


Figure 2. MAX17570A/MAX17570D EV Kit Board—Top View

Detailed Description

The MAX17570A/MAX17570D EV kits are designed to demonstrate the salient features of the MAX17570 high-voltage, high-efficiency, synchronous step-down DC-DC converter family. The EV kits consist of typical application circuits of two different converters. Each of these circuits are electrically isolated from each other and hosted on the same PCB. Each of these converters can be evaluated for their performance under different operating conditions by powering them from their respective input pins.

Enable/Undervoltage Lockout (EN/UVLO) Programming

The EV kits offer an adjustable input undervoltage-lockout level feature for the converters. For the MAX17570A, when jumper JU101 is left open, the converter is enabled when the input voltage rises above 4.5V. To disable the MAX17570A, install a shunt across pins 2-3 on jumper JU101. For the MAX17570D, when jumper JU201 is left open, the converter is enabled when the input voltage rises above 4.5V. To disable the MAX17570D, install a shunt across pins 2-3 on jumper JU201. See [Table 1](#) for jumper settings. Refer to the *Setting the Input Undervoltage-Lockout Level* section in the MAX17570 data sheet for more details.

If the EN/UVLO pin is driven from an external signal source, it is recommended that a minimum 1k Ω series resistance is placed between the signal source output and the EN/UVLO pin to reduce voltage ringing on the line.

Switching Frequency and External Clock Synchronization (RT/SYNC)

The switching frequency of the MAX17570A/MAX17570D converters can be programmed from 200kHz to 1MHz by using a resistor connected from the RT/SYNC pin to SGND. Resistors R103 for the MAX17570A and R203 for the MAX17570D program the desired switching frequencies. The default switching frequency with the RT/SYNC pin open is 400kHz. To optimize performance and component size in these EV kits, 400kHz is chosen for the MAX17570A/MAX17570D.

The MAX17570A EV kit can be synchronized to an external clock source using the SYNC pad and optional C109 capacitor. The external synchronization clock frequency must be between $1.1 \times f_{SW}$ and $1.4 \times f_{SW}$, where f_{SW} is the switching frequency programmed by the resistor R103 connected to the RT/SYNC pin. Refer to the *Switching Frequency and Clock Synchronization* section of the MAX17570 data sheet for guidance on selecting C109. The external synchronization feature is not available for the MAX17570D.

Input-Capacitor Selection

The input capacitors C107 for the MAX17570A and C207 for the MAX17570D serve to reduce current peaks drawn from the input power supply and reduce switching frequency ripple at the input. Input capacitors are chosen to be 1 μ F/100V for the MAX17570A/MAX17570D EV kits. Refer to the *Input Capacitor* section in the MAX17570 data sheet to choose input capacitance.

Output-Capacitor Selection

X7R ceramic capacitors are preferred due to their stability over temperature in industrial applications. The required output capacitors C110 for the MAX17570A and C210 for the MAX17570D are chosen to be 22 μ F/10V/1206. Refer to the *Output Capacitor* section in the MAX17570 data sheet for more details.

Hot Plug-In and Long Input Cables

The EV kits provide optional electrolytic capacitors 10 μ F/100V (C103 for the MAX17570A and C203 for the MAX17570D) to dampen input-voltage peaks and oscillations that may arise during hot plug-in and/or due to long input cables. These capacitors limit the peak voltage at the input of the DC-DC converters when the EV kits are powered directly from a precharged capacitive source or an industrial backplane PCB. Long input cables between the input power source and the EV kit circuit can cause input-voltage oscillations due to the inductance of the cables. The equivalent series resistance (ESR) of the electrolytic capacitor helps damp out the oscillations caused by long input cables.

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. Use of EMI filter components as shown in the EV kit schematic results in lower conducted emissions, below CISPR32 Class B limits. The manufacturer part numbers of the EMI filter components are listed as optional in the BOM. The EV kits' PCB layout are also designed to limit radiated emissions from the switching nodes of the power converter, resulting in radiated emissions below CISPR32 Class B limits. Further, capacitors placed near the input of the board help in attenuating high-frequency noise.

Table 1. EN/UVLO Jumper Description (JU101 and JU201)

SHUNT POSITION	EN/UVLO PIN	OUTPUT
Not installed*	Connected to the center nodes of the respective resistor-dividers (R101 and R102 for the MAX17570A; R201 and R202 for the MAX17570D)	Programmed to start up at desired input-voltage level
1-2	Connected to V _{IN}	Enabled
2-3	Connected to PGND	Disabled

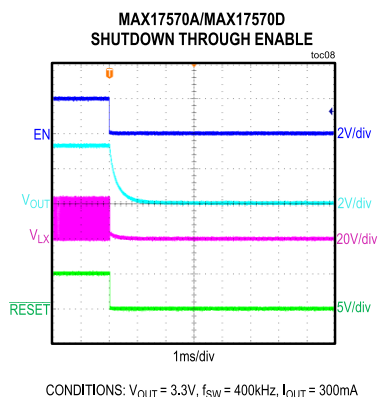
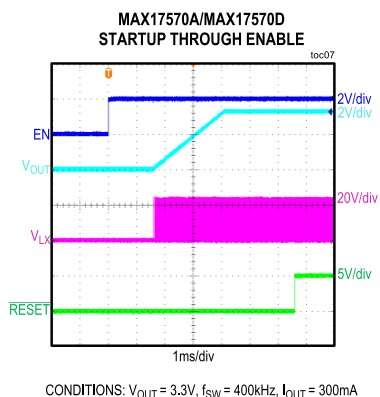
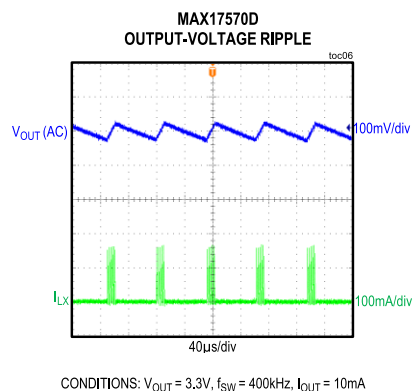
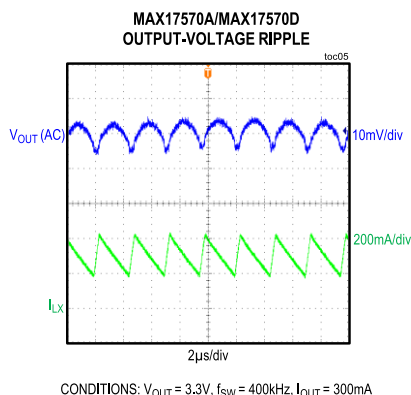
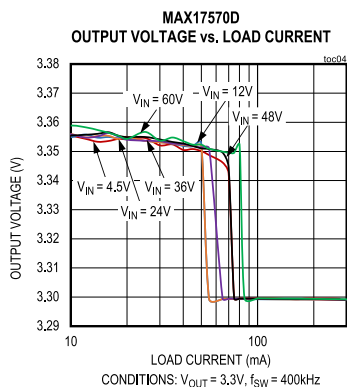
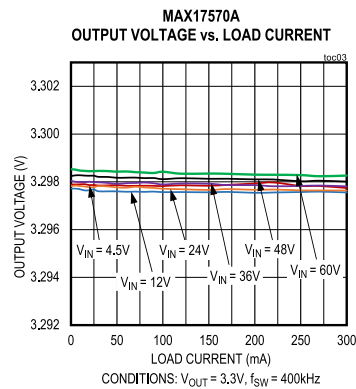
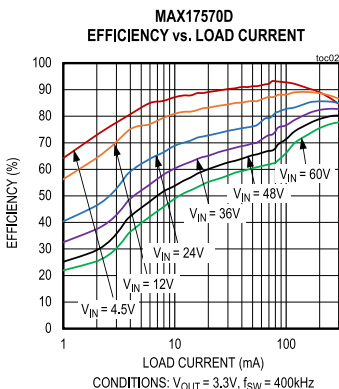
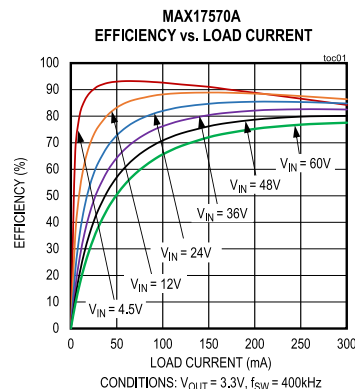
*Default position.

Evaluate: MAX17570A/MAX17570D Converters

MAX17570A/MAX17570D Evaluation Kits

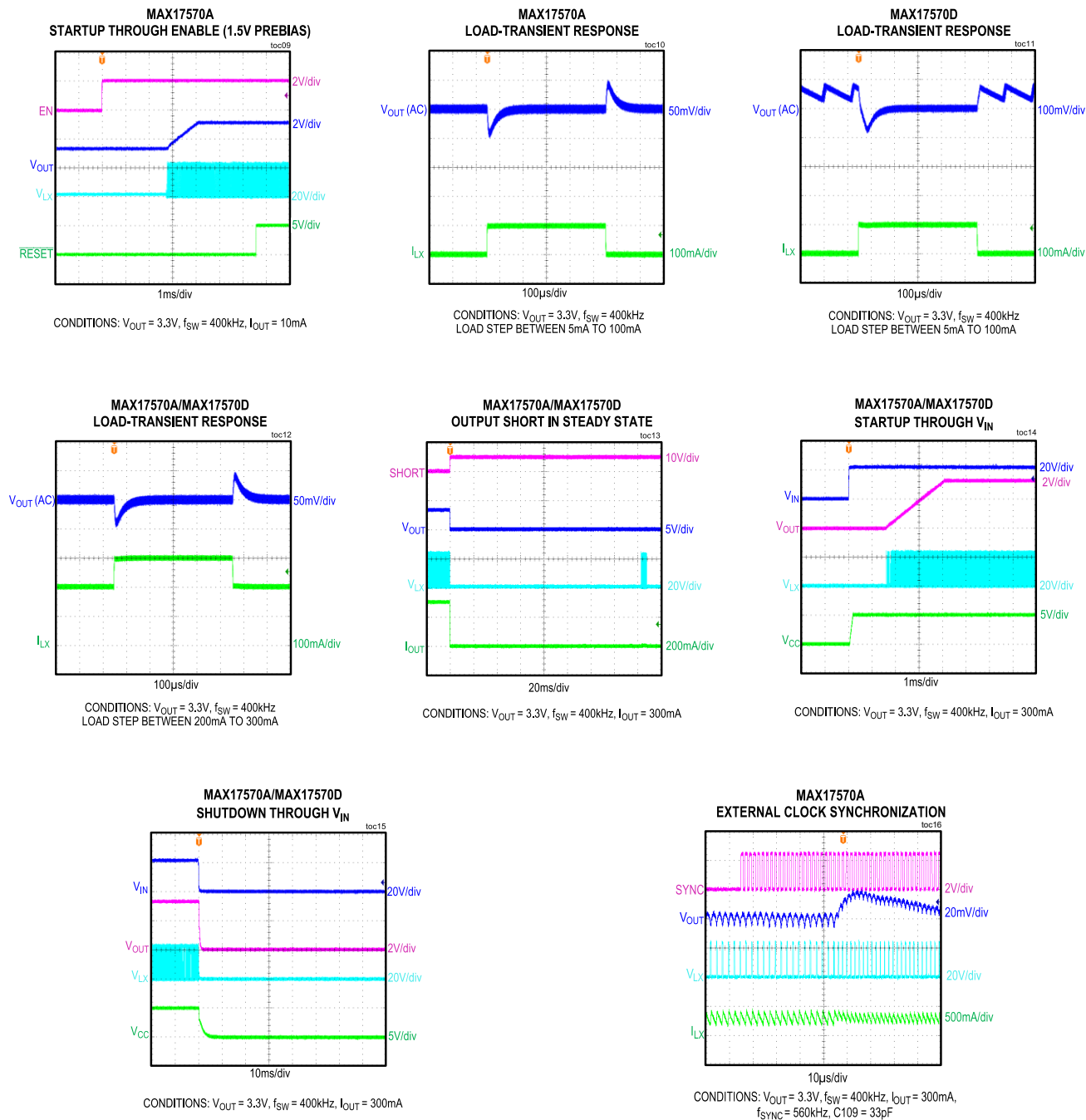
MAX17570A/MAX17570D EV Kits Typical Operating Characteristics

($V_{IN} = V_{EN}/UV_{LO} = 24V$, $C_{IN} = C_{VCC} = 1\mu F$, $T_A = +25^\circ C$, unless otherwise noted.)



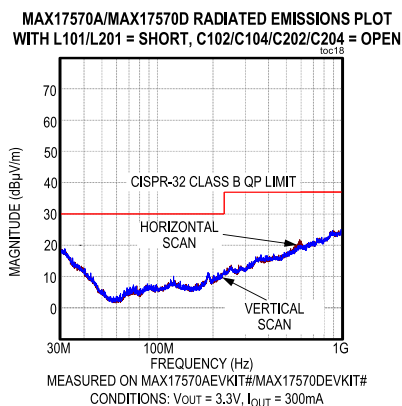
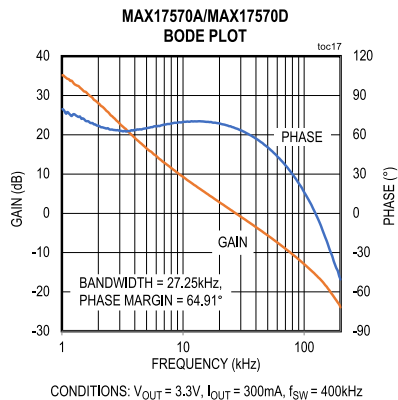
MAX17570A/MAX17570D EV Kits Typical Operating Characteristics (continued)

($V_{IN} = V_{EN/UVLO} = 24V$, $C_{IN} = C_{VCC} = 1\mu F$, $T_A = +25^\circ C$, unless otherwise noted.)

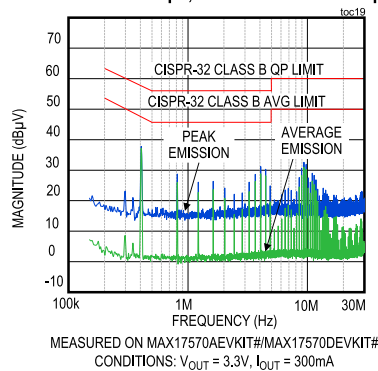


MAX17570A/MAX17570D EV Kits Typical Operating Characteristics (continued)

($V_{IN} = V_{EN/UVLO} = 24V$, $C_{IN} = C_{VCC} = 1\mu F$, $T_A = +25^\circ C$, unless otherwise noted.)



**MAX17570A/MAX17570D CONDUCTED EMISSIONS PLOT
WITH L101/L201 = 22μH, C102/C104/C202/C204 = 1μF**



Evaluate: MAX17570A/MAX17570D Converters

MAX17570A/MAX17570D Evaluation Kits

Component Suppliers

SUPPLIER	WEBSITE
Murata Americas	www.murata.com
Kemet	www.kemet.com
Taiyo Yuden	www.yuden.co.jp
Coilcraft	www.coilcraft.com
Vishay	www.vishay.com
Panasonic Corp.	www.panasonic.com

Note: When contacting these component suppliers, indicate that the MAX17570 is being used.

Ordering Information

PART	TYPE
MAX17570AEVKIT#	EV Kit
MAX17570DEVKIT#	EV Kit

#Denotes RoHS compliance.

Evaluate: MAX17570A/MAX17570D Converters

MAX17570A/MAX17570D Evaluation Kits

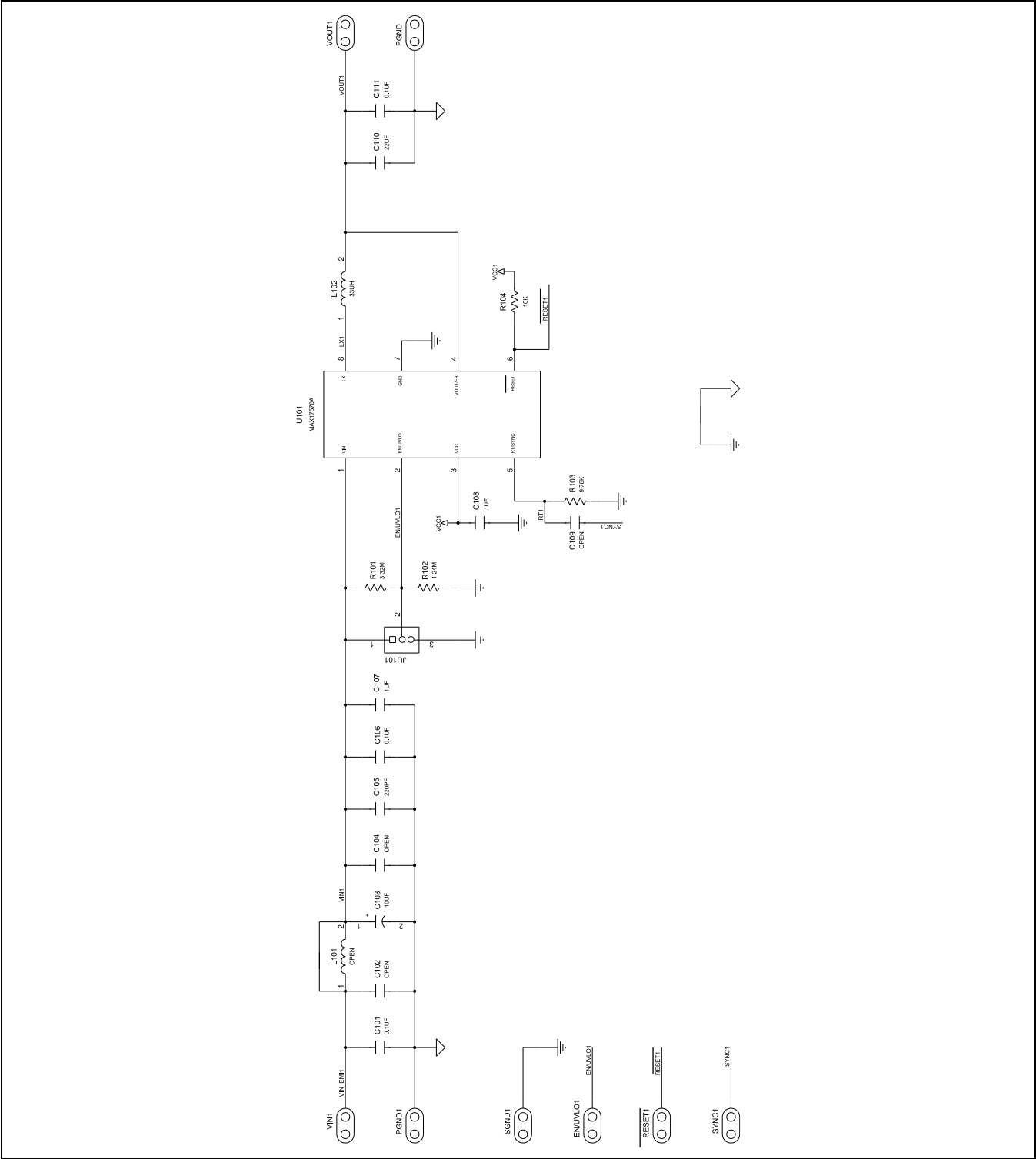
MAX17570A EV Kit Bill of Materials

ITEM	QTY	DESIGNATION	DESCRIPTION	MANUFACTURER PART NUMBER
1	2	C101, C106	0.1 μ F \pm 10%, 100V, X7R Ceramic Capacitor (0603)	TAIYO YUDEN HMK107B7104KA
2	1	C103	10 μ F \pm 20%, 100V, Aluminum Electrolytic Capacitor	KEMET EDK106M100A9HAA
3	1	C105	220pF \pm 10%, 100V, Ceramic Capacitor (0402)	MURATA GRM155R72A221KA01
4	1	C107	1 μ F \pm 10%, 100V, X7R Ceramic Capacitor (1206)	TAIYO YUDEN HMK316B7105KLH
5	1	C108	1 μ F \pm 10%, 16V, X7R Ceramic Capacitor (0603)	TAIYO YUDEN EMK107B7105KA
6	1	C110	22 μ F \pm 10%, 10V, X7R Ceramic Capacitor (1206)	MURATA GRM31CR71A226KE15
7	1	C111	0.1 μ F \pm 10%, 25V, X7R Ceramic Capacitor (0402)	MURATA GRM155R71E104KE14
8	1	L102	33 μ H \pm 20%, Inductor 0.8A	COILCRAFT LPS4018-333MR
9	1	R101	3.32M Ω \pm 1% Resistor (0402)	VISHAY DALE CRCW04023M32FK
10	1	R102	1.24M Ω \pm 1% Resistor (0402)	VISHAY DALE CRCW04021M24FK
11	1	R103	9.76k Ω \pm 1% Resistor (0402)	PANASONIC ERJ-2RKF9761
12	1	R104	10k Ω \pm 1% Resistor (0402)	VISHAY DALE CRCW040210K0FK
13	1	U101	MAX17570A, Integrated Step-Down Converter	MAXIM MAX17570AATA+
14	1	L101	OPTIONAL: 22 μ H \pm 20%, Inductor 0.57A	COILCRAFT LPS3015-223MR
15	2	C102, C104	OPTIONAL: 1 μ F \pm 10%, 100V, X7R Ceramic Capacitor (1206)	TAIYO YUDEN HMK316B7105KLH
16	1	C109	OPEN: Capacitor (0402)	—

MAX17570D EV Kit Bill of Materials

ITEM	QTY	DESIGNATION	DESCRIPTION	MANUFACTURER PART NUMBER
1	2	C201, C206	0.1 μ F \pm 10%, 100V, X7R Ceramic Capacitor (0603)	TAIYO YUDEN HMK107B7104KA
2	1	C203	10 μ F \pm 20%, 100V, Aluminum Electrolytic Capacitor	KEMET EDK106M100A9HAA
3	1	C205	220pF \pm 10%, 100V, Ceramic Capacitor (0402)	MURATA GRM155R72A221KA01
4	1	C207	1 μ F \pm 10%, 100V, X7R Ceramic Capacitor (1206)	TAIYO YUDEN HMK316B7105KLH
5	1	C208	1 μ F \pm 10%, 16V, X7R Ceramic Capacitor (0603)	TAIYO YUDEN EMK107B7105KA
6	1	C210	22 μ F \pm 10%, 10V, X7R Ceramic Capacitor (1206)	MURATA GRM31CR71A226KE15
7	1	C211	0.1 μ F \pm 10%, 25V, X7R Ceramic Capacitor (0402)	MURATA GRM155R71E104KE14
8	1	L202	33 μ H \pm 20%, Inductor 0.8A	COILCRAFT LPS4018-333MR
9	1	R201	3.32M Ω \pm 1% Resistor (0402)	VISHAY DALE CRCW04023M32FK
10	1	R202	1.24M Ω \pm 1% Resistor (0402)	VISHAY DALE CRCW04021M24FK
11	1	R203	9.76k Ω \pm 1% Resistor (0402)	PANASONIC ERJ-2RKF9761
12	1	R204	10k Ω \pm 1% Resistor (0402)	VISHAY DALE CRCW040210K0FK
13	1	U201	MAX17570D, Integrated Step-Down Converter	MAXIM MAX17570DATA+
14	1	L201	OPTIONAL: 22 μ H \pm 20%, Inductor 0.57A	COILCRAFT LPS3015-223MR
15	2	C202, C204	OPTIONAL: 1 μ F \pm 10%, 100V, X7R Ceramic Capacitor (1206)	TAIYO YUDEN HMK316B7105KLH

MAX17570A EV Kit Schematic



The figure consists of two grayscale images of a 10x10 grid, each containing a different arrangement of obstacles. The obstacles include large circles in the corners, horizontal bars with two dots, vertical bars with two dots, and clusters of small circles. A scale bar at the bottom left indicates a length of 1 unit.

MAX17570A/MAX17570D EV Kits PCB Layout Diagrams (continued)

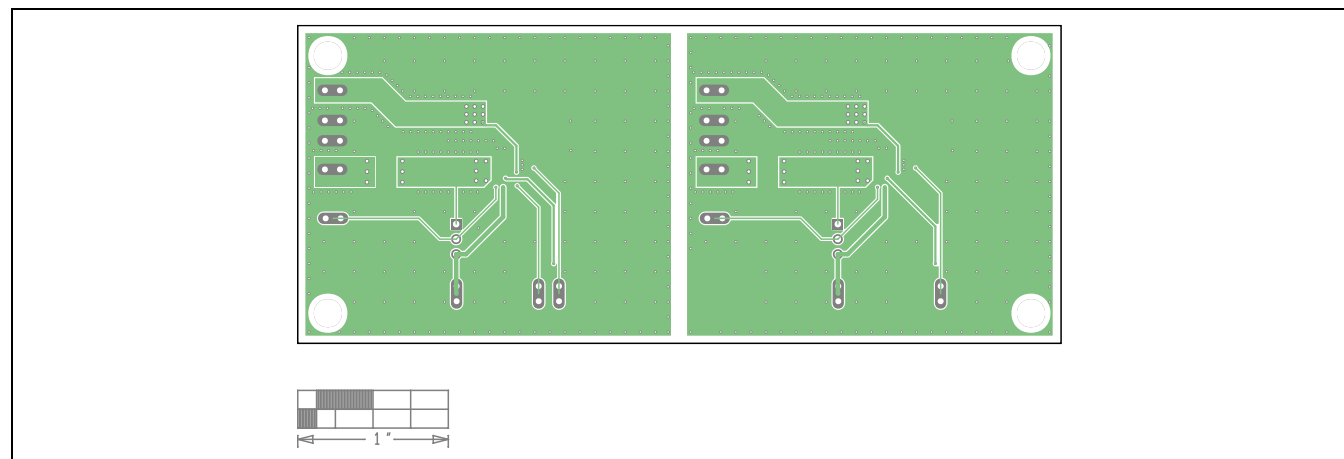


Figure 6. MAX17570A/MAX17570D EV Kits PCB Layout Diagram—Layer 3

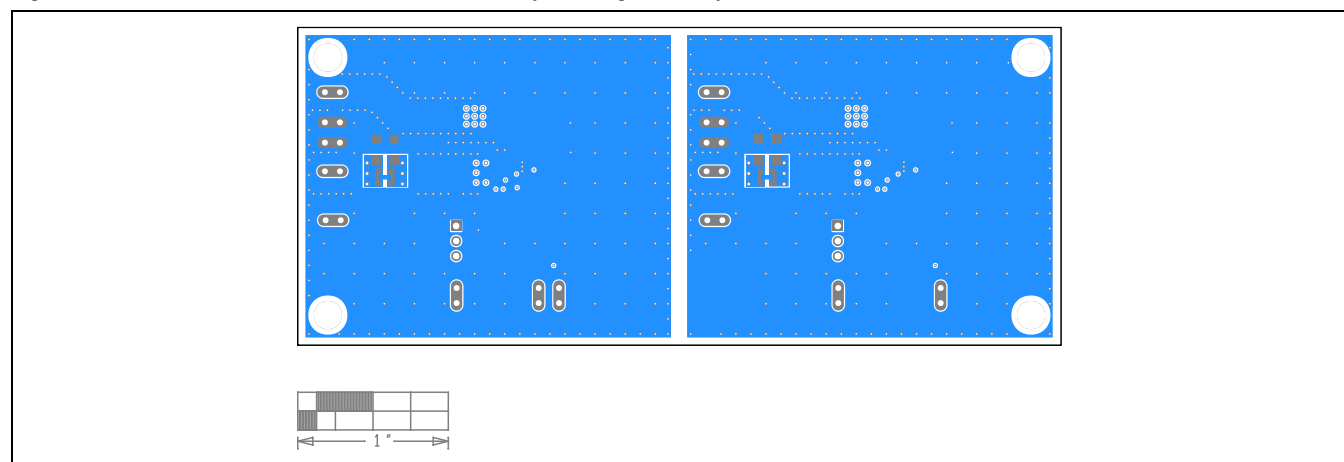


Figure 7. MAX17570A/MAX17570D EV Kits PCB Layout Diagram—Bottom Layer

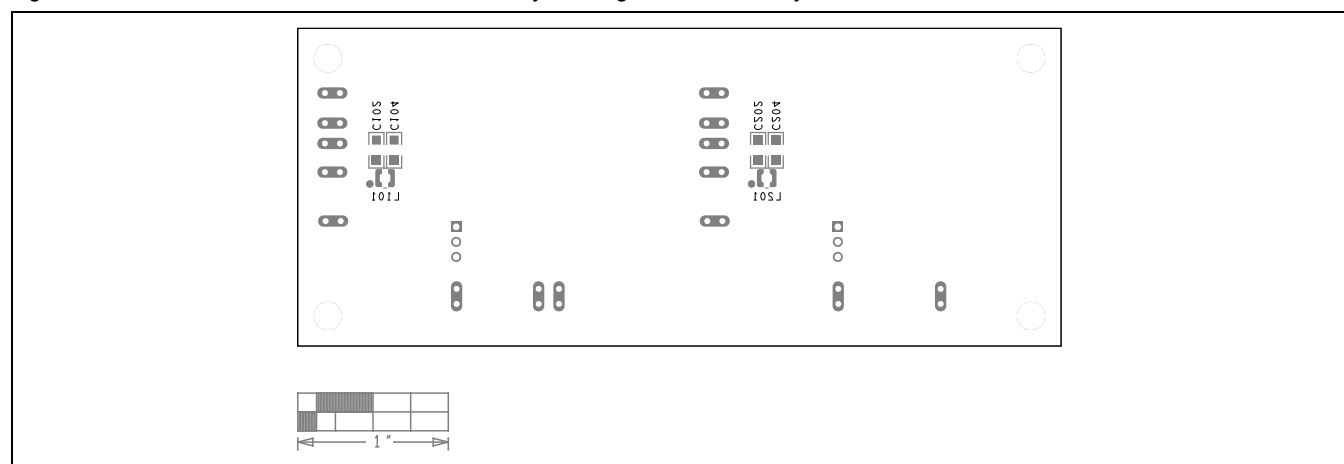


Figure 8. MAX17570A/MAX17570D EV Kits PCB Layout Diagram—Bottom Silkscreen

Evaluate: MAX17570A/MAX17570D Converters

MAX17570A/MAX17570D Evaluation Kits

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/23	Initial release	—

