

## MAXM17552 Evaluation Kit

## Evaluates: MAXM17552 5V Output-Voltage Application

### General Description

The MAXM17552 evaluation kit (EV kit) is a demonstration circuit of the MAXM17552 ultra-small, high efficiency, current mode, synchronous step-down DC-DC switching power module. The EV kit operates over a wide input-voltage of 14V to 60V and provides up to 100mA load current with a 5V output voltage. The EV kit is programmed to switch at a frequency of 450kHz. The module is simple to use and easily configurable with minimal external components. It features cycle-by-cycle peak current-limit protection, undervoltage lockout (EN/UVLO), and thermal shutdown.

The EV kit comes with the compact 10-pin 2.6mm x 3mm x 1.5mm uSLIC™ package MAXM17552 module installed, and is rated to operate over the full industrial/automotive -40°C to +125°C temperature range. For full specifications, features and benefits of the IC, refer to the MAXM17552 data sheet.

### Features

- Wide 14V to 60V Input
- $\pm 1.75\%$  Feedback Voltage Accuracy
- Output: 5V, 100mA
- Internally Compensated
- All Ceramic Capacitors and Ultra-Compact Solution
- PFM or Forced-PWM Mode of Operation
- Shutdown Current as Low as 1.2 $\mu$ A (typ)
- Programmable Soft-Start and Prebias Startup
- Open-Drain Power Good Output ( $\overline{\text{RESET}}$  pin)
- Programmable EN/UVLO Threshold
- Hiccup Overcurrent Protection (OCP)
- Overtemperature Protection (OTP)
- -40°C to +125°C Industrial/Automotive Temperature Range
- Complies with CISPR22 (EN55022) Class B Conducted and Radiated Emissions
- Passes Drop, Shock, and Vibration Standards—JESD22-B103, B104, B111

### Quick Start

#### Recommended Equipment

- MAXM17552EVKIT#, MAXM17552 evaluation kit
- 60V DC power supply
- Dummy load capable of sinking 100mA
- Digital voltmeter (DVM)
- 100MHz dual-trace oscilloscope

#### Procedure

The MAXM17552 EV kit is fully assembled and tested. Please follow the steps below to verify the board operation. **Caution: Do not turn on the power supply until all connections are completed.**

- 1) Set the power supply at a voltage between 14V and 60V. Disable the power supply.
- 2) Connect the positive and negative terminals of the power supply to VIN and GND PCB pads, respectively.
- 3) Connect the positive and negative terminals of the 100mA load to VOUT and GND PCB pads respectively, and set the load to 0A.
- 4) Connect the DVM across the VOUT PCB pad and the GND PCB pad closest to VOUT PCB pad.
- 5) Enable the input power supply.
- 6) Verify the DVM across output display 5V.
- 7) Increase the load up to 100mA to verify the output voltage is 5V using DVM.

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

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Detailed Description of Hardware

The MAXM17552 EV kit is a proven circuit to demonstrate the high-voltage, high-efficiency, and compact solution size of the MAXM17552 synchronous step-down DC-DC power module. The output voltage is preset to 5V to operate from 14V to 60V input and provides up to 100mA load current. The optimal frequency is set at 450kHz to maximize efficiency and minimize component size. The EV kit includes two test points, TP1 for monitoring the LX and TP2 for measuring the  $\overline{\text{RESET}}$  voltage.

Soft-Start Input (SS)

The module offers a fixed 5.1ms internal soft-start when the SS pin is left unconnected. When adjustable soft-start time is required, connect a capacitor from SS to GND to program the soft-start time. The minimum soft-start time is related to the output capacitance ( $C_{OUT}$ ) and the output voltage ( $V_{OUT}$ ) by the following equation:

$$t_{SS} > 0.05 \times C_{OUT} \times V_{OUT}$$

where  $t_{SS}$  is in milliseconds and  $C_{OUT}$  is in  $\mu\text{F}$ .

Soft-start time ( $t_{SS}$ ) is related to the capacitor connected at SS ( $C_3$ ) by the following equation:

$$C_3 = 6.25 \times t_{SS}$$

where  $t_{SS}$  is in ms and  $C_3$  is in nF.

Mode Selection (MODE)

The device features a MODE pin for selecting either forced-PWM or PFM mode of operation. If the MODE pin is left unconnected, the device operates in PFM mode at light loads. If the MODE pin is grounded, the device

operates in a constant-frequency forced-PWM mode at all loads. The mode of operation cannot be changed on-the-fly during normal operation of the device. Refer to the MAXM17552 module datasheet for more information on the PWM and PFM modes of operation. [Table 1](#) shows EV kit jumper settings that can be used to configure the desired mode of operation.

External Synchronization (RT/SYNC)

The RT/SYNC pin can be used to synchronize module's internal oscillator to an external system clock. Refer to the *External Synchronization* section in the **MAXM17552 data sheet** for additional information on configuring the external clock synchronization.

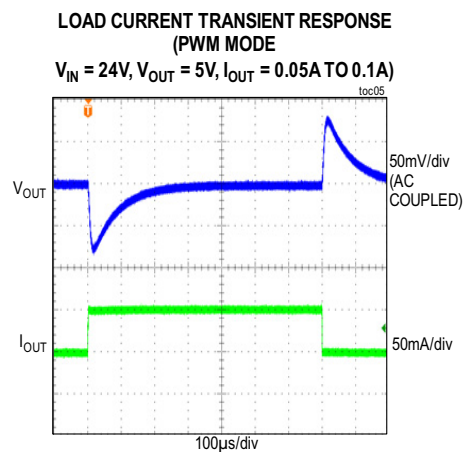
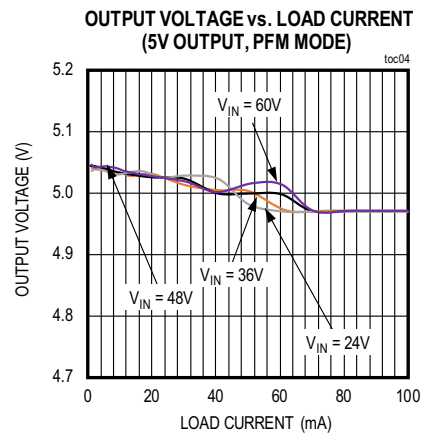
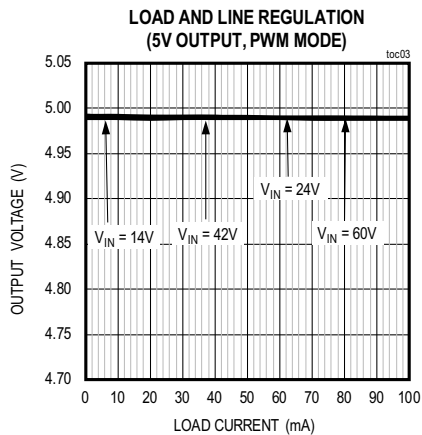
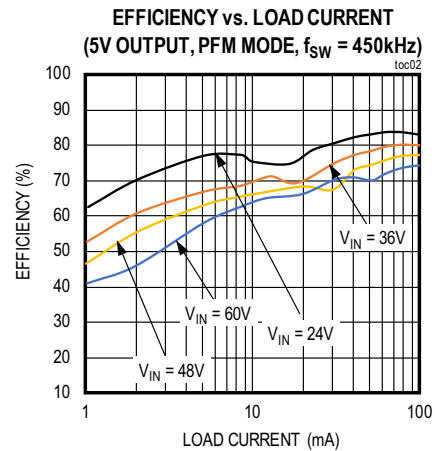
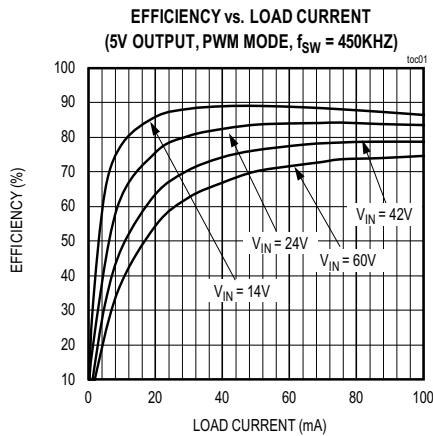
Reset Output ( $\overline{\text{RESET}}$ )

The module includes an open-drain  $\overline{\text{RESET}}$  output to monitor output voltage.  $\overline{\text{RESET}}$  should be pulled up with an external resistor to the desired external power supply less than or equal to 5.5V.  $\overline{\text{RESET}}$  goes high-impedance 2ms after the output rises above 95% of its nominal set value and pulls low when the output voltage falls below 92% of the set nominal output voltage.  $\overline{\text{RESET}}$  asserts low during the hiccup timeout period. In this EV kit, R7 resistor is used to pull up the  $\overline{\text{RESET}}$  to the output voltage.

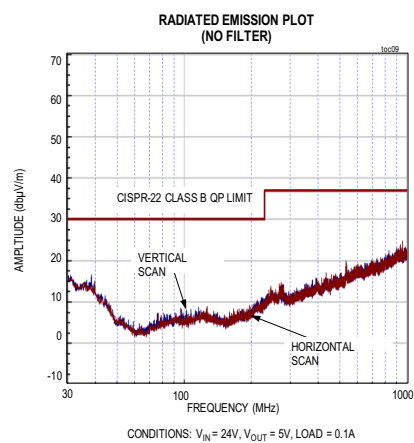
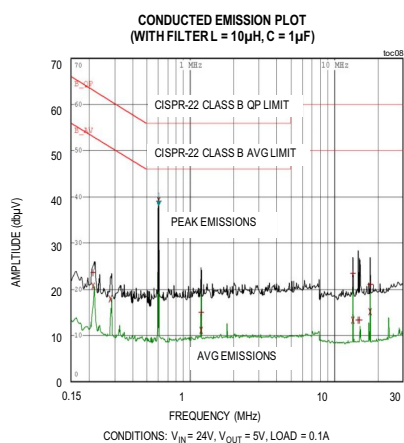
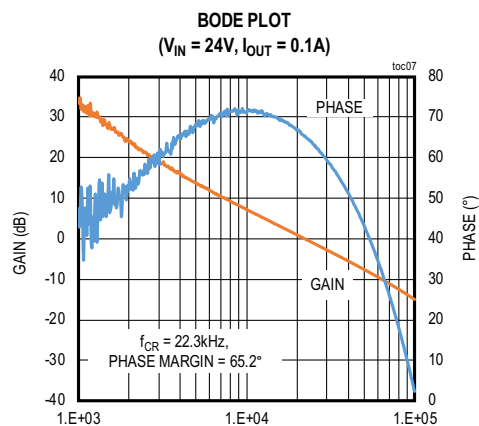
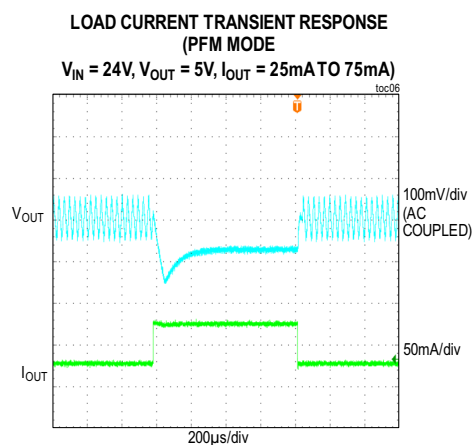
Table 1. Mode Configuration (JU1)

| JU1 POSITION  | MODE PIN         | MAXM17552 OPERATION |
|---------------|------------------|---------------------|
| 1-2           | Connected to GND | PWM mode            |
| Not Installed | Open             | PFM mode            |

## EV Kit Performance Report



## EV Kit Performance Report (continued)



# MAXM17552 Evaluation Kit

Evaluates: MAXM17552  
5V Output-Voltage Application

## MAXM17552 EV Kit Bill of Materials

| ITEM | REF. DES | QTY | MFG PART #        | MANUFACTURER  | VALUE         | DESCRIPTION                                                                                         |
|------|----------|-----|-------------------|---------------|---------------|-----------------------------------------------------------------------------------------------------|
| 1    | C1       | 1   | C2012X7S2A105K125 | TDK           | 1UF           | CAPACITOR; SMT (0805); CERAMIC CHIP; 1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S           |
| 2    | C2       | 1   | GRM21BZ71E106KE15 | MURATA        | 10UF          | CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R           |
| 3    | C5       | 1   | EEE-FK1J220XP     | PANASONIC     | 22UF          | CAPACITOR; SMT (CASE D8); ALUMINUM-ELECTROLYTIC; 22UF; 63V; TOL=20%; TG=-55 DEGC TO +105 DEGC; AUTO |
| 4    | C7, C11  | 2   | GCM155R71H104KE02 | MURATA        | 0.1UF         | CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R          |
| 5    | R1       | 1   | CRCW0402261KFK    | VISHAY DALE   | 261K          | RESISTOR; 0402; 261K OHM; 1%; 100PPM; 0.063W; METAL FILM                                            |
| 6    | R2       | 1   | CRCW040249K9FK    | VISHAY DALE   | 49.9K         | RESISTOR; 0402; 49.9K; 1%; 100PPM; 0.0625W; THICK FILM                                              |
| 7    | R3       | 1   | CRCW040293K1FKED  | VISHAY DALE   | 93.1K         | RESISTOR; 0402; 93.1K OHM; 1%; 100PPM; 0.063W; METAL FILM                                           |
| 8    | R4       | 1   | RC0402JR-070RL    | YAGEO PHYCOMP | 0             | RESISTOR; 0402; 0 OHM; 5%; JUMPER; 0.063W; THICK FILM                                               |
| 9    | R7       | 1   | ERJ-2RKF1003X     | PANASONIC     | 100K          | RESISTOR; 0402; 100K OHM; 1%; 100PPM; 0.10W; THICK FILM                                             |
| 10   | U1       | 1   | MAXM17552AMB+     | MAXIM         | MAXM17552AMB+ | EVKIT PART-IC; COMPACT HIGH VOLTAGE; HIGH-EFFICIENCY STEP-DOWN POWER MODULE; PKG. CODE: M102A3+1    |
| 11   | C3       | 0   | N/A               | N/A           | OPEN          | PACKAGE OUTLINE 0402 NON-POLAR CAPACITOR                                                            |
| 12   | C4       | 0   | N/A               | N/A           | OPEN          | PACKAGE OUTLINE 0805 NON-POLAR CAPACITOR                                                            |
| 13   | R5       | 0   | N/A               | N/A           | OPEN          | PACKAGE OUTLINE 0402 RESISTOR                                                                       |

## Ordering Information

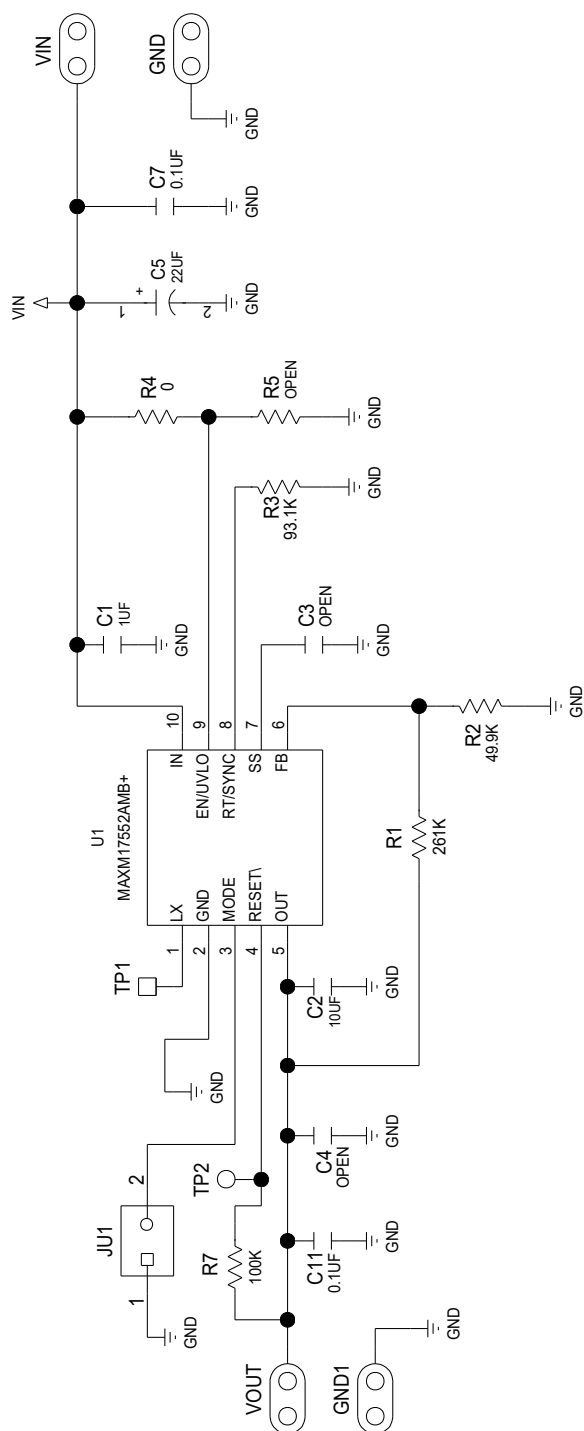
| PART            | TYPE   |
|-----------------|--------|
| MAXM17552EVKIT# | EV KIT |

#Denotes RoHS compliant.

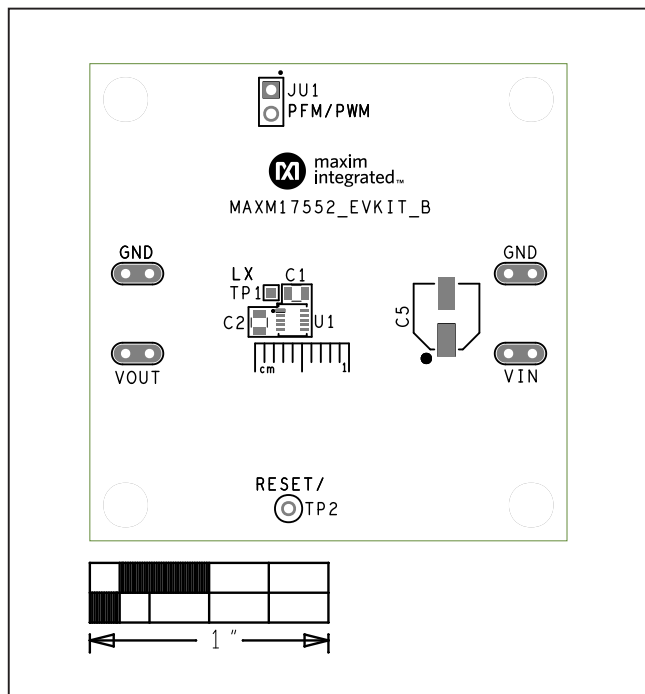
## Component Suppliers

| SUPPLIER        | WEBSITE                                                  |
|-----------------|----------------------------------------------------------|
| Murata Americas | <a href="http://www.murata.com">www.murata.com</a>       |
| Panasonic Corp. | <a href="http://www.panasonic.com">www.panasonic.com</a> |

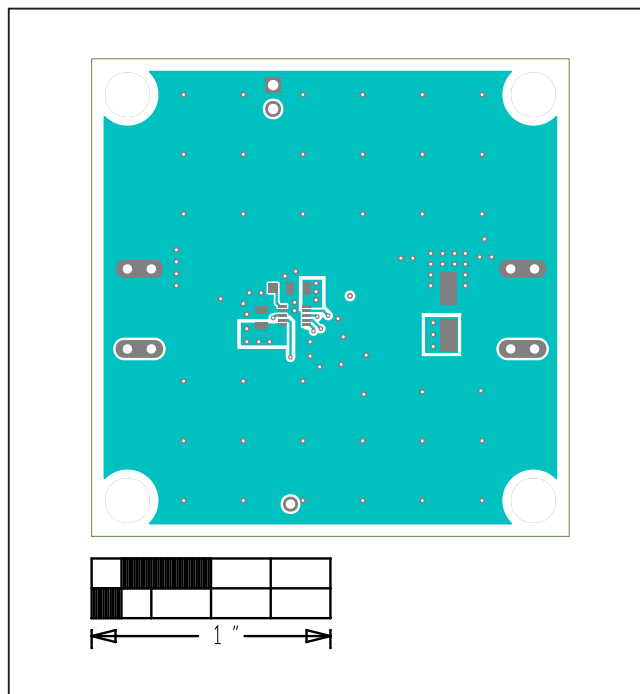
## MAXM17552 EV Kit Schematic



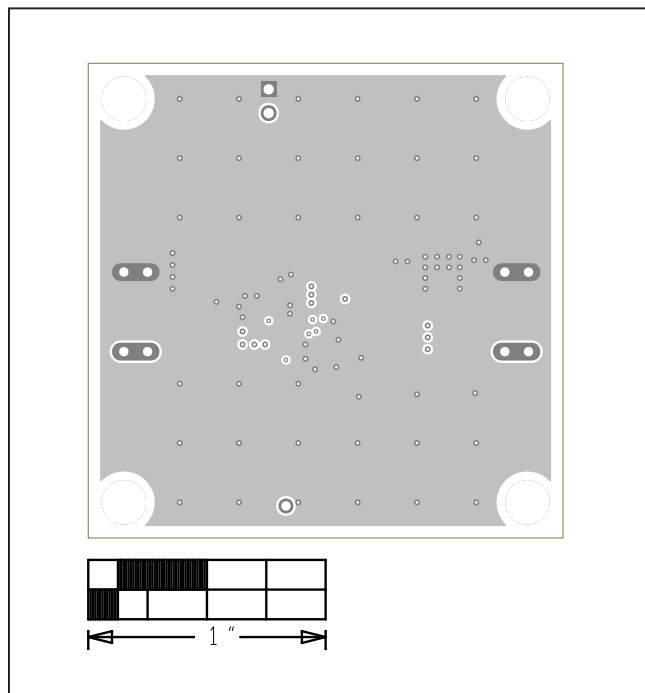
## MAXM17552 EV Kit PCB Layouts



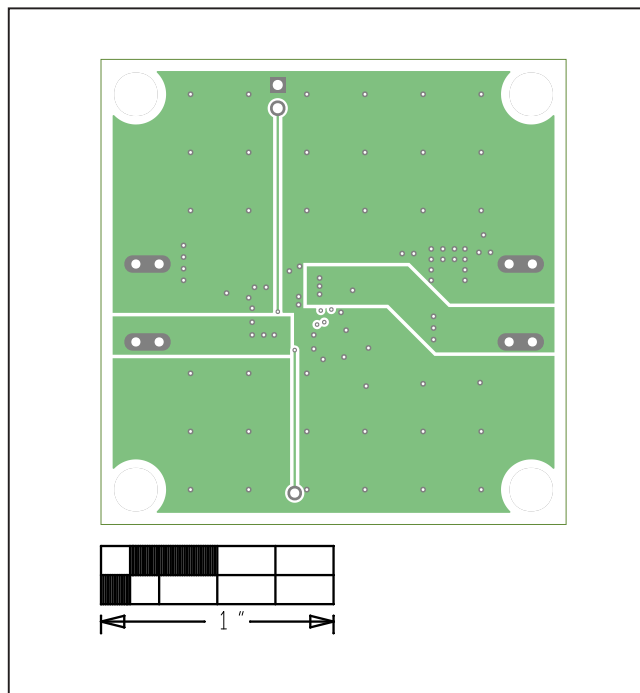
MAXM17552 EV Kit PCB Layout—Top Silkscreen



MAXM17552 EV Kit PCB Layout—Top Layer

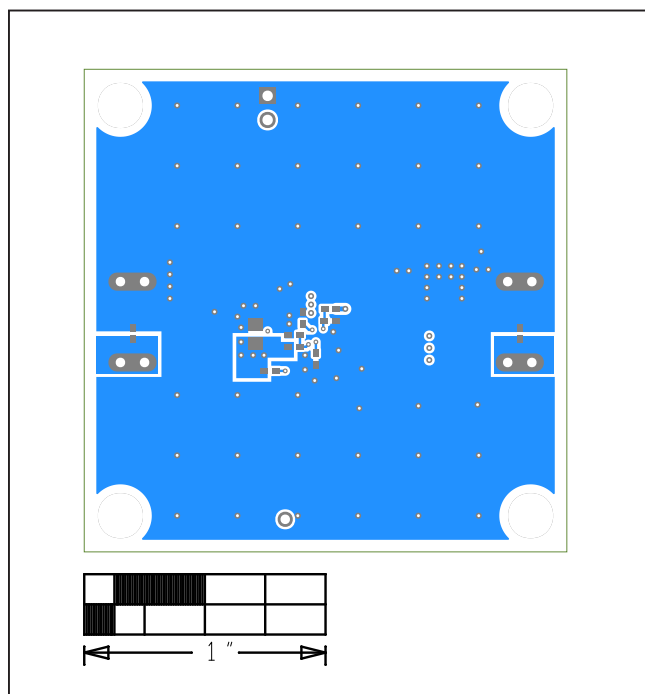


MAXM17552 EV Kit PCB Layout—GND Layer

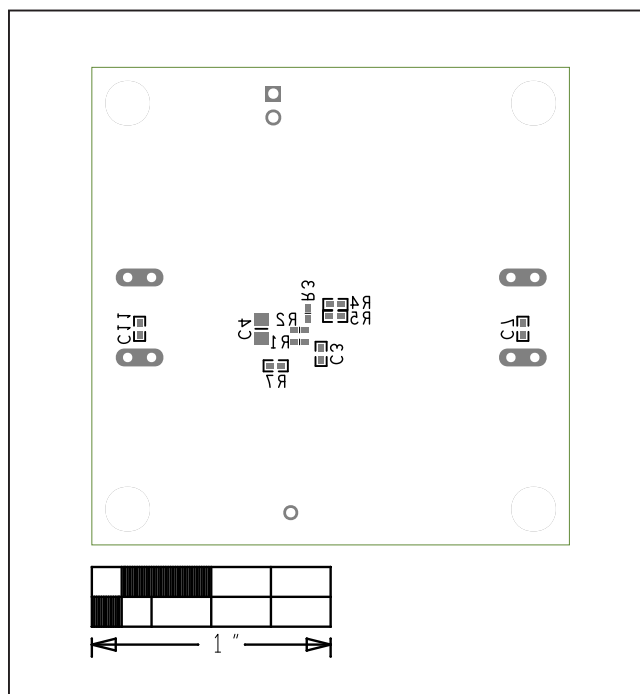


MAXM17552 EV Kit PCB Layout—Inner Layer

## MAXM17552 EV Kit PCB Layouts (continued)



MAXM17552 EV Kit PCB Layout—Bottom Layer



MAXM17552 EV Kit PCB Layout—Bottom Silkscreen

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION                                                                                                                                                                                                                                                                                                                          | PAGES CHANGED |
|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 0               | 9/17          | Initial release                                                                                                                                                                                                                                                                                                                      | —             |
| 1               | 10/18         | Updated the <i>General Description</i> , <i>Features</i> , <i>Quick Start</i> , <i>Detailed Description</i> , and <i>Reset Output (RESET)</i> sections; added the Mode Selection (MODE) section and Table 1; replaced <i>EV Kit Performance Report</i> charts, <i>Bill of Materials</i> , <i>Schematic</i> , and <i>PCB Layout</i> . | 1–8           |
| 1.1             |               | Corrected missing overbar                                                                                                                                                                                                                                                                                                            | 1             |

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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