Evaluates: MAX17527A – 5.5V to 60V, 6A Power Limiter with OV, UV, Reverse Polarity Protection

MAX17527A Evaluation Kit

General Description

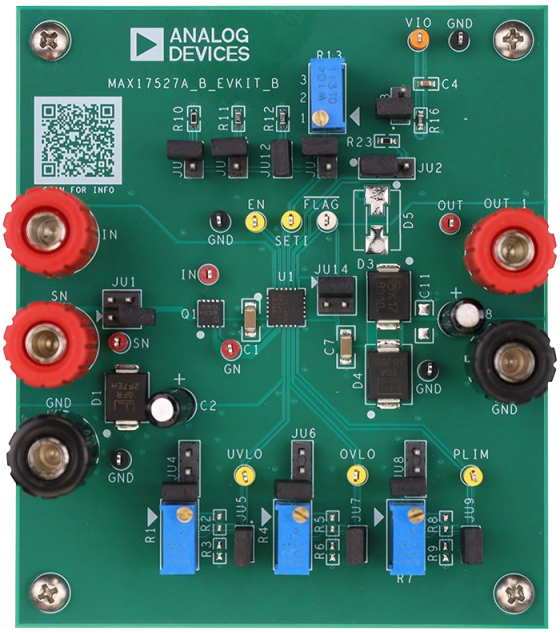
The MAX17527A evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the MAX17527A high accuracy adjustable power limiter with integrated 30mΩ field-effect transistor (FET) in a 20-pin 5mm x 5mm TQFN-EP package. The EV kit can be configured to demonstrate adjustable overvoltage (OV), undervoltage (UV), overcurrent (OC), different current-limit types, reverse output voltage, and power limit features. The EV kit also features an external N-Channel field-effect transistor (nFET) for reverse input voltage and reverse current protection evaluation.

Features

- 5.5V to 60V Wide Input Voltage Range
- Features TVS Diode (D1) across the Input Terminals
- Features TVS and Free-Wheeling Diodes (D3 and D4) across the Output Terminals
- One External nFET Installed
- Evaluates Undervoltage Lockout (UVLO), Overvoltage Lockout (OVLO), Three Current-Limit Types, and Current-Limit Threshold
- Demonstrates Internal UVLO Programmed to 12.4V
- Demonstrates Internal OVLO Programmed to 36.2V
- Active Power Limit to Protect Supply or Load
- Jumper-Configurable Current Limit
- Jumper-Configurable Current-Limit Type
- Features Fault Indication Signal ($\overline{FLAG}$)
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

MAX17527A EV Kit Photo



319-100966; Rev 0; 12/22

Quick Start

Configuration Diagram

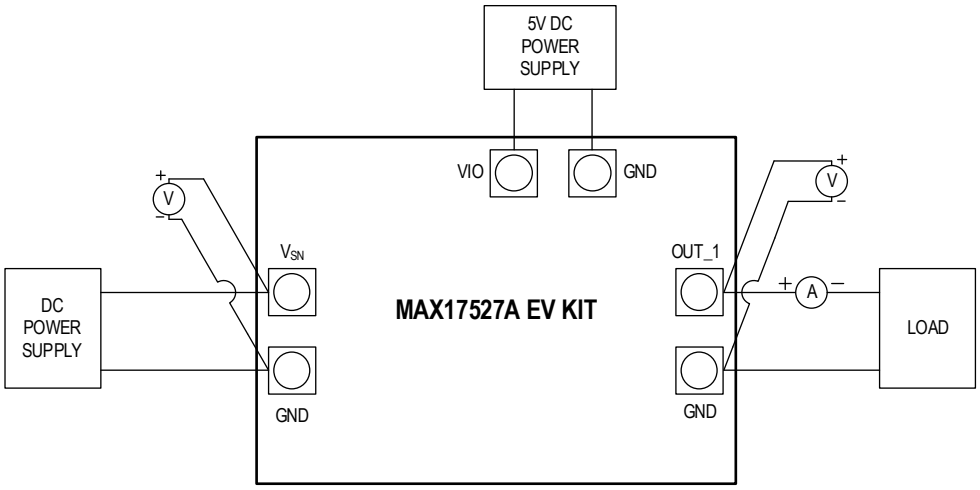


Figure 1. MAX17527A EV Kit Setup Diagram

Required Equipment

- MAX17527A EV kit
- 60V DC power supplies
- Digital multimeters (DMMs)
- Adjustable load (0-10A)
- 5V DC power supply

Equipment Setup and Test Procedure

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

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

1. Verify that all jumpers are in their default positions.
2. Connect a 5V DC power supply across VIO and GND terminals.
3. Set the 60V DC power supply to 10V and connect it between V_{SN} and GND. Verify that $\overline{FLAG}$ is 0V.
4. Increase the DC power supply voltage and verify that when voltage reaches approximately 12.4V, the voltage on OUT_1 is 12.4V and $\overline{FLAG}$ is 5V.
5. Gradually increase the DC power supply voltage and verify that when voltage reaches approximately 36.2V, the voltage on OUT_1 goes down and $\overline{FLAG}$ is 0V.
6. Gradually decrease the DC power supply voltage and verify that when voltage reaches approximately 34.1V, the voltage on OUT_1 is 34.1V and $\overline{FLAG}$ is 5V.
7. Set the DC power supply voltage to 24V and connect the adjustable load between OUT_1 and GND terminals and a DMM in series to measure the current. Gradually increase the load current and verify that the OUT_1 voltage reduces and $\overline{FLAG}$ goes low when the load current increases above 6A.
8. The jumpers JU10-JU13 may be configured to change the current limit as given in *Table 5*. Verify the various current limit operations by repeating Step 7.

Detailed Description

The EV kit circuit can be configured to evaluate user-defined UVLO and OVLO thresholds using resistor-dividers. The OC threshold is determined by external resistors connected to the SETI pin and is jumper-configurable through jumpers JU10–JU13. Using Jumper JU2, the EV kit circuit can be configured to evaluate different current limit types (Autoretry, Continuous, and Latch-off). Jumper JU5 may be used to select the internal UVLO threshold. Jumper JU7 may be used to select the internal OVLO threshold. Jumper JU9 may be installed to disable Power Limit function.

Input Power Supply

The EV kit is powered by an external 5.5V to 60V power supply connected between SN and GND. The EV kit features a 40V TVS diode (D1) at input terminals which limits input surge voltages to a maximum of 65V and enhances protection.

Power Supply for Logic Pins

The logic pins on the EV kit, EN pin and open-drain fault indicator output $\overline{FLAG}$ pin are pulled up by a user-supplied 5V power supply connected between VIO and GND.

Enable Inputs

The MAX17527A has internal pullup to 1.45V when the EN pin is left floating. Use Jumper JU3 to connect EN pin to GND to turn off the MAX17527A.

Table 1. EN (JU3) Settings

JUMPER	SHUNT POSITION	DESCRIPTION	SWITCH STATUS
JU3	Not installed*	EN pin unconnected	ON
	1-2	EN pin connected to GND	OFF

**Default position*

Undervoltage Lockout Threshold

Install Jumper JU5 to select the internal UVLO threshold of 12.4V (typ). Install Jumper JU4 to select the external UVLO threshold programmed by resistor-dividers.

The external UVLO threshold for input voltage is set through either R1 or R2/R3 resistive divider. Use the following equation to calculate the value of R3 for a required UVLO threshold level:

$$R3 = \frac{R2}{\left(\frac{V_{UVLO}}{V_{SET\_UVLO}} - 1\right)}$$

where R2 may be chosen as 2.2MΩ

V_{SET_UVLO} = 1.26V

V_{UVLO} = Input supply voltage at which the device exits the UVLO condition.

Table 2. UVLO Threshold Jumper Settings (JU4 and JU5)

JUMPER	SHUNT POSITION	DESCRIPTION
JU5	Installed*	UVLO is connected to ground; Internal UVLO threshold is used (Do not install JU4)
	Not installed	UVLO is programmable
JU4	1-2	UVLO is connected to V_{SN} with external voltage-divider; Use either R1 or R2/R3 to set UV threshold (Do not install JU5)
	2-3	UVLO is connected to V_{IN} with external voltage-divider; Use either R1 or R2/R3 to set UV threshold (Do not install JU5)
	Not installed*	Internal UVLO is selected through JU5

**Default position*

Overvoltage Lockout Threshold

Install Jumper JU7 to select internal OVLO threshold of 36.2V (typ). Install Jumper JU6 to select the external OVLO threshold programmed by resistor-dividers.

The external OVLO threshold for input voltage is set through either R4 or R5/R6 resistive divider. Use the following equation to calculate the value of R6 for a required OVLO threshold level:

$$R6 = \frac{R5}{\left(\frac{V_{OVLO}}{V_{SET\_OVLO}} - 1\right)}$$

where R5 may be chosen as 2.2MΩ

V_{SET_OVLO} = 1.22V

V_{OVLO} = Input supply voltage at which the device enters the OVLO condition.

Table 3. OVLO Threshold Jumper Settings (JU6 and JU7)

JUMPER	SHUNT POSITION	DESCRIPTION
JU7	Installed*	OVLO is connected to ground; Internal OVLO threshold is used (Do not install JU6)
	Not installed	OVLO is programmable
JU6	1-2	OVLO is connected to V_{SN} with external voltage-divider; Use either R4 or R5/R6 to set OV threshold (Do not install JU7)
	2-3	OVLO is connected to V_{IN} with external voltage-divider; Use either R4 or R5/R6 to set OV threshold (Do not install JU7)
	Not installed*	Internal OVLO is selected through JU7

**Default position*

Power-Limit Threshold

The EV kit features configuration settings to demonstrate the unique programmable Power Limit feature of the MAX17527A. The power limit is configurable based on the input or output voltage. The MAX17527A allows the set current limit to be modified automatically based on an input or output voltage level, and limits input power or output power, respectively. The EV kit features jumpers JU8 and JU9 to program different power-limit thresholds. Install jumpers as shown in *Table 4* to change the power-limit thresholds. Refer to the MAX17527A data sheet to program PLIM threshold using R7 or R8/R9 resistor-divider.

Table 4. PLIM Threshold Jumper Settings (JU8 and JU9)

JUMPER	SHUNT POSITION	DESCRIPTION
JU9	Installed*	PLIM pin is connected to ground; PLIM is disabled (Do not install JU8)
	Not installed	PLIM is programmable
JU8	1-2	PLIM pin is connected to V_{OUT} with external voltage-divider; Use either R7 or R8/R9 to set PLIM threshold (Do not install JU9)
	2-3	PLIM pin is connected to V_{IN} with external voltage-divider; Use either R7 or R8/R9 to set PLIM threshold (Do not install JU9)
	Not installed*	PLIM is disabled

**Default position*

Current-Limit Threshold

The EV kit features jumpers JU10–JU13 to use different resistors to program current-limit threshold. Install a jumper as shown in *Table 5* to change the current-limit threshold.

Table 5. Current-Limit Threshold (JU10–JU13)

JUMPER	SHUNT POSITION	DESCRIPTION
JU10	Installed	Current limit 0.6A
	Not installed*	SETI open. Part is disabled
JU11	Installed	Current limit 2.9A
	Not installed*	SETI open. Part is disabled
JU12	Installed*	Current limit 6.0A
	Not installed	SETI open. Part is disabled
JU13	Installed	Current limit adjustable using R13
	Not installed*	SETI open. Part is disabled

**Default position*

Current-Limit Type Select

The EV kit features Jumper JU2 to select different current-limit responses. See *Table 6* for jumper setting.

Table 6. Current-Limit Type Select (JU2)

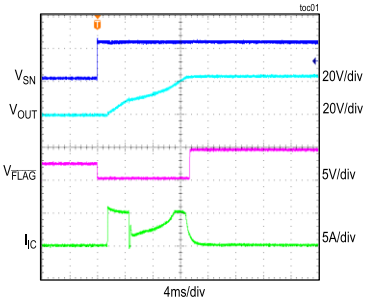
JUMPER	SHUNT POSITION	DESCRIPTION
JU2	1-2*	Autoretry
	2-3	Latch-off
	Open	Continuous

**Default position*

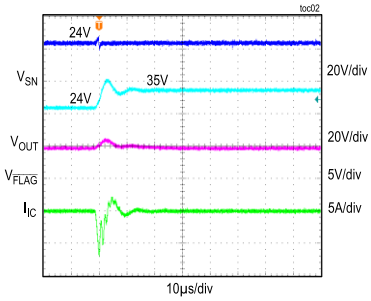
MAX17527A EV Kit Typical Operating Characteristics

(V_{SN} = 24V, C_{IN} = 1µF, C_{OUT} = 1µF, T_A = +25°C, unless otherwise noted.)

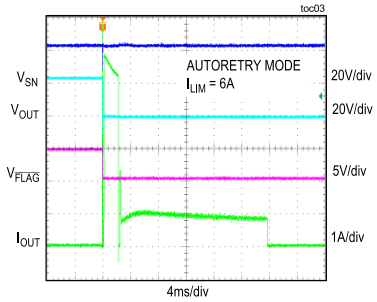
POWER-UP RESPONSE WITH 2200µF CAPACITOR AT NO LOAD



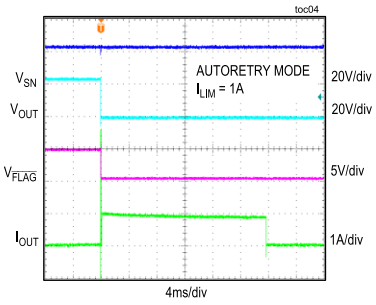
REVERSE-BLOCKING RESPONSE



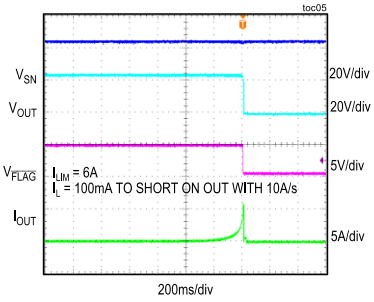
THERMAL FOLDBACK DUE TO OUTPUT SHORT-CIRCUIT



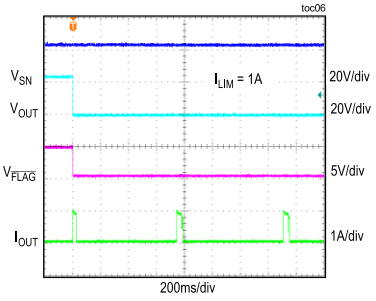
OUTPUT SHORT-CIRCUIT RESPONSE



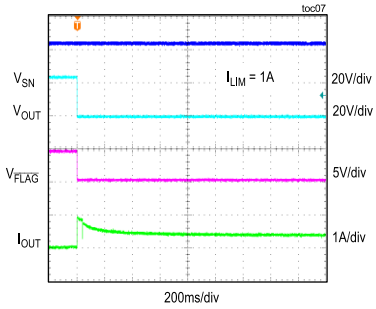
CURRENT-LIMIT RESPONSE



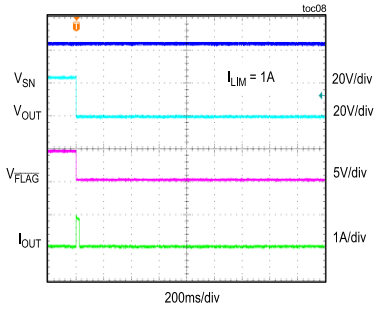
AUTORETRY CURRENT-LIMIT MODE



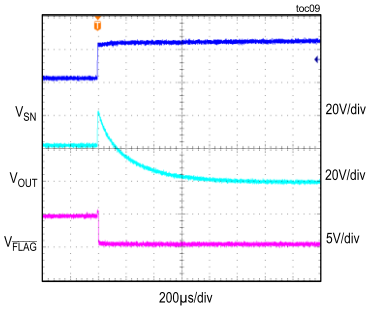
CONTINUOUS CURRENT-LIMIT MODE

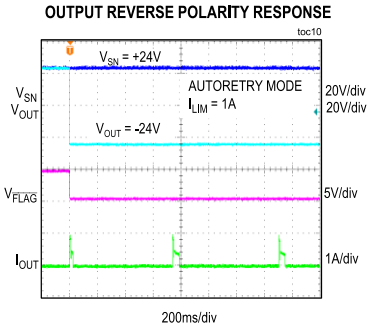


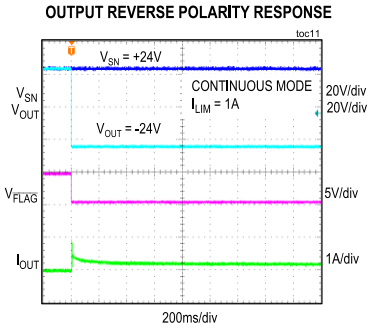
LATCH-OFF CURRENT-LIMIT MODE

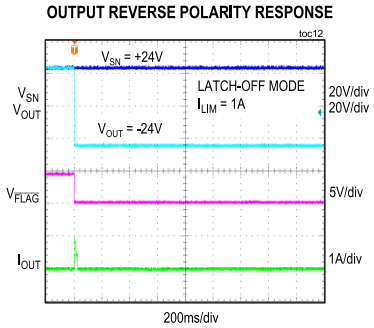


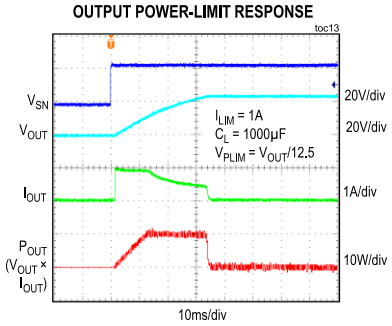
OVERVOLTAGE FAULT RESPONSE











Component Suppliers

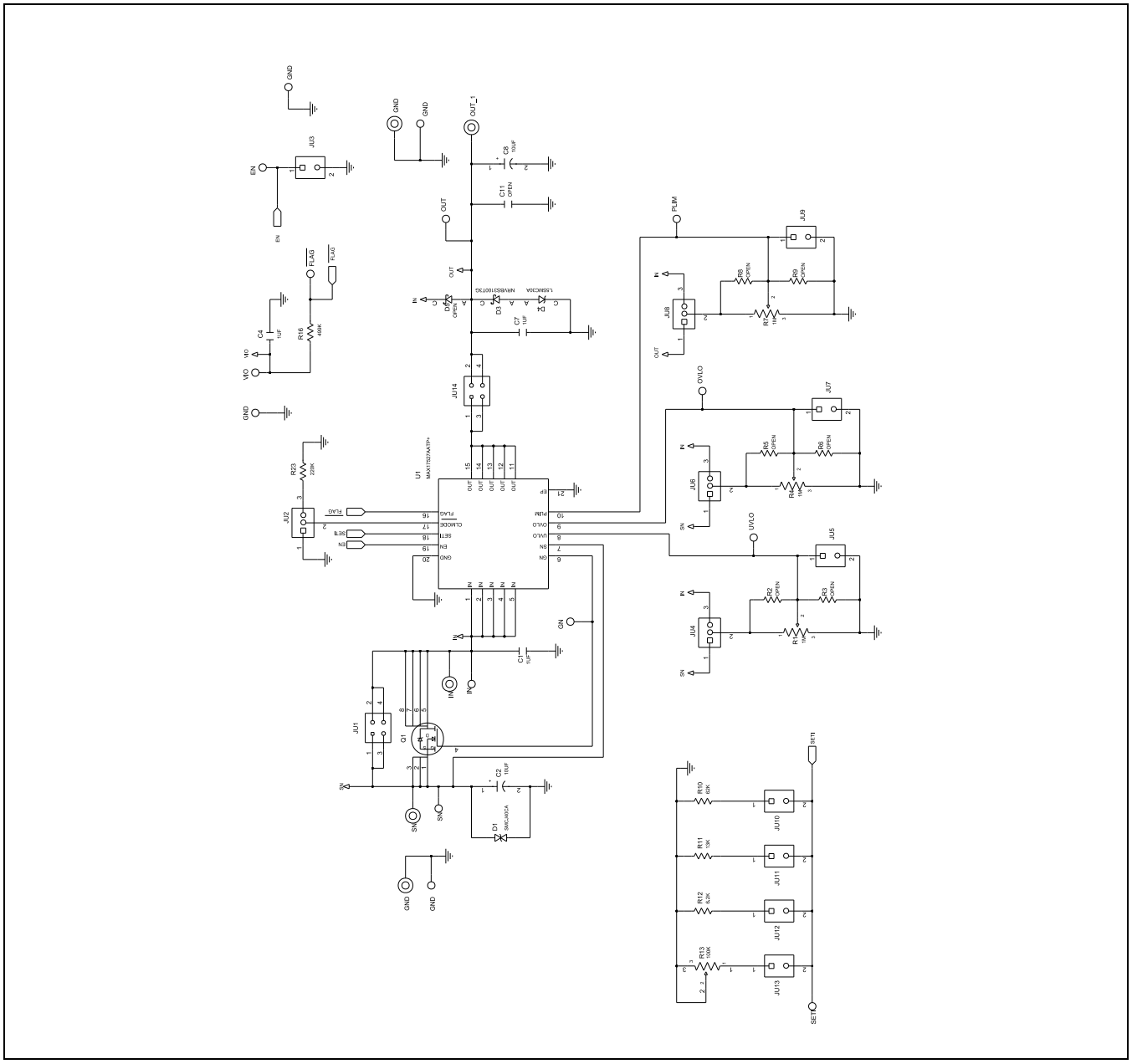
SUPPLIER	WEBSITE
Bourns, Inc.	www.bourns.com
Infineon	www.infineon.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
TDK Corp.	www.component.tdk.com
ON Semiconductor	www.onsemi.com
SullinsCorp Connector Solutions	www.sullinscorp.com
Keystone Electronics Corp.	www.keyelco.com
Littlefuse	www.littelfuse.com
Diodes Incorporated	www.diodes.com

Note: Indicate that you are using the MAX17527A when contacting these component suppliers.

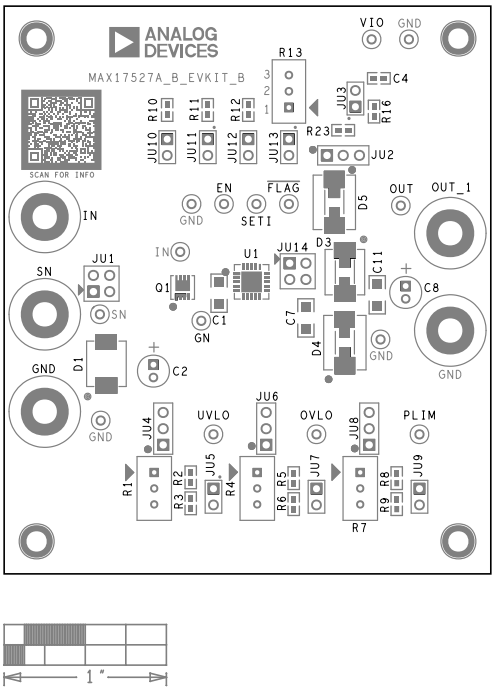
MAX17527A EV Kit Bill of Materials

PART REFERENCE	QTY	DESCRIPTION	MANUFACTURER PART NUMBER
C1, C7	2	1µF 10%, 100V X7R Ceramic Capacitors (1206)	Murata GCH31CR72A105KE01; TDK C3216X7R2A105K160AA
C2, C8	2	10µF 20%, 63V Aluminium Electrolytic (5mm)	Panasonic ECA-1JHG100
C4	1	1µF 10%, 6.3V X7R Ceramic Capacitors (0603)	Murata GRM188R60J105KA01
D1	1	TVS Diode, 1500W (SMC)	Littlefuse SMCJ40CA
D3	1	Power Schottky Diode, 100V, 3A (SMC)	ON Semiconductor NRVBS3100T3G Vishay SS3H10-M3
D4	1	TVS Diode, 1500W (SMC)	Littlefuse 1.5SMC30A
Q1	1	N-CH MOSFET 100V 40A	Infineon BSZ150N10LS3 G Infineon BSZ146N10LS5
R1, R4, R7	3	1MΩ, 0.5W, Trimmer Potentiometers 10%, 100PPM	Murata PV36W105C01
R10	1	62kΩ 1% Resistor (0603)	-
R11	1	13kΩ 1% Resistors (0603)	-
R12	1	6.2kΩ 1% Resistors (0603)	-
R13	1	100kΩ Trimmer Potentiometers	Bourns Inc. 3296W-1-104LF
R16	1	499kΩ 1% Resistors (0603)	-
R23	1	220kΩ 1% Resistors (0603)	-
IN, OUT_1, SN	3	Red Banana Connector	Keystone Electronics Corp 7006
GND	2	Black Banana Connector	Keystone Electronics Corp 7007
GN, OUT, TP8, TP9	4	Red Test Point	Keystone Electronics Corp 5000
TP1, TP7, TP22, TP23	4	Black Test Point	Keystone Electronics Corp 5001
$\overline{\text{FLAG}}$	1	White Test Point	Keystone Electronics Corp 5002
VIO	1	Orange Test Point	Keystone Electronics Corp 5003
EN, OVLO, PLIM, SETI, UVLO	5	Yellow Test Point	Keystone Electronics Corp 5004
U1	1	5.5V to 60V, 6A Power Limiter with OV, UV, Reverse Polarity Protection (20-Pin TQFN-EP 5mm x 5mm)	MAX17527AATP+
JU1, JU14	2	4-Pins Two-Row Header, 0.1in Centers, cut to fit	Sullins Connector PEC02DAAN
JU2, JU4, JU6, JU8	4	3-Pins Single-Row Header, 0.1in Centers, cut to fit	Sullins Connector PEC03SAAN
JU3, JU5, JU7, JU9-JU13	9	2-Pins Single-Row Header, 0.1in Centers, cut to fit	Sullins Connector PEC02SAAN
C11	0	1µF 10%, 100V X7R Ceramic Capacitors (1206)	Murata GRM31CR72A105KA01; TDK C3216X7R2A105K160AA
D5	0	40V, 5A Diode (SMC)	Diode Incorporated B540CQ-13-F
D9-D11	0	Power Schottky Diode, 50V, 1A (SMA)	ON Semiconductor MURA105T3G
R2, R3, R5, R6, R8, R9	0	0603 Resistors (Open)	-
PCB	1	PCB: MAX17527A Evaluation Kit	-

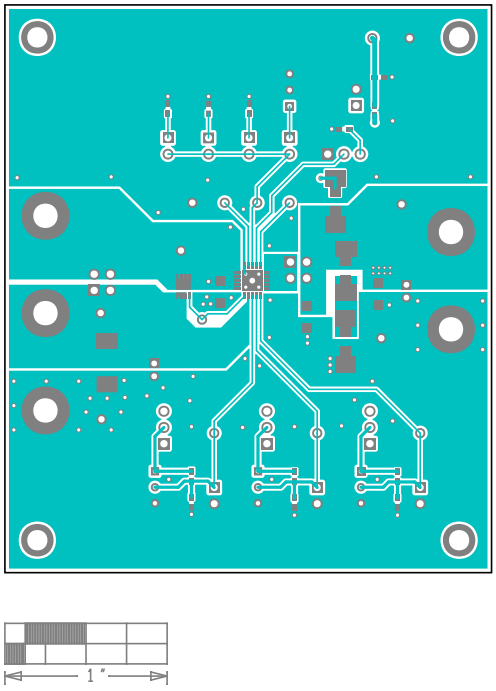
MAX17527A EV Kit Schematics



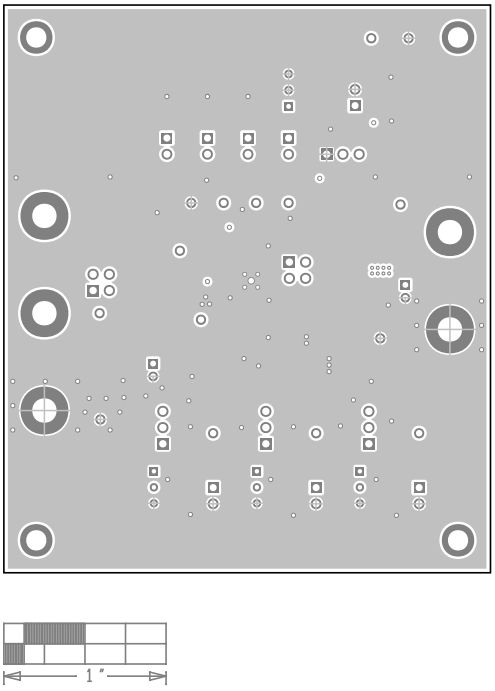
MAX17527A EV Kit PCB Layouts

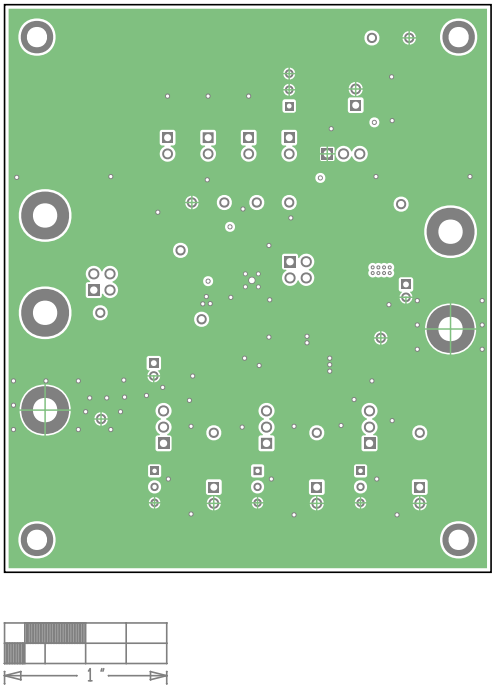
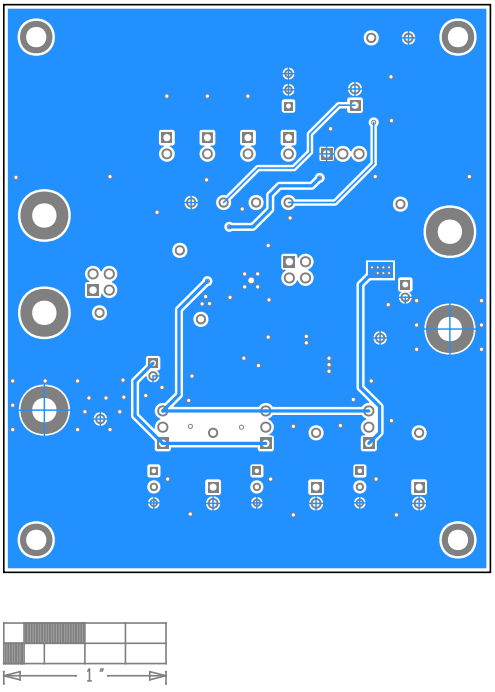


MAX17527A EV Kit PCB Layout–Silk_Top



MAX17527A EV Kit PCB Layout–Top



MAX17527A EV Kit PCB Layout–Internal 2	
	
MAX17527A EV Kit PCB Layout–Internal 3	*MAX17527A EV Kit PCB Layout–Bottom*

Ordering Information

PART	TYPE
MAX17527AEVKITB#	EV Kit

#Denotes RoHS compliance.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	12/22	Initial release	—