

Evaluates: MAX17523A

MAX17523A Evaluation Kit

General Description

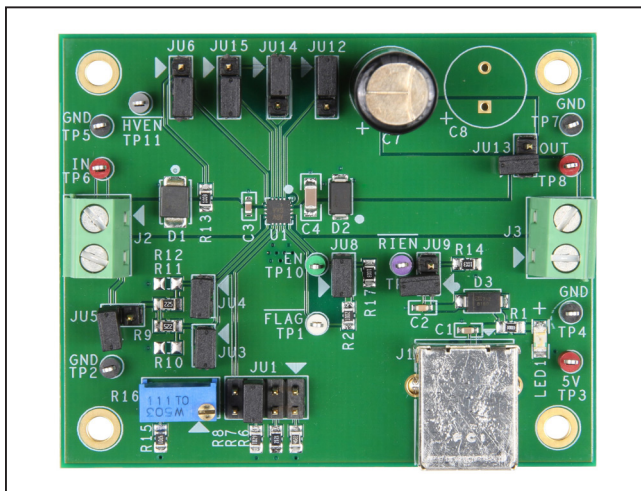
The MAX17523A evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the MAX17523A, a 4.2V to 36V, 1A, current limiter with OV, UV, and reverse voltage protection in a 16-pin TQFN package. The EV kit features a TVS diode on input and a Schottky diode on output. Input power to the EV kit uses a 4.2V to 36V input supply.

The EV kit circuit can be configured to demonstrate the device's different current-limit types, adjustable overvoltage, undervoltage, and different current-limit thresholds.

Features

- 4.2V to 36V Operating Voltage Range
- Features a TVS Diode Across the Input and a Schottky Diode Across the Output Terminals
- Internal UVLO Programmed to 18.5V
- Internal OVLO Programmed to 33V
- Evaluates Three Current-Limit Types: Current-Limit Threshold, OVLO, and UVLO
- Jumper-Configurable Current-Limit (Selected as 1A by Default)
- Current-Limit Mode Set To Autoretry by Default
- Proven PCB Layout
- Fully Assembled and Tested

MAX17523A EV Kit Photo



Quick Start

Required Equipment

- MAX17523A EV kit
- 36V DC power supply
- Multimeter
- USB-A male to USB-B male cable or 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 the USB cable to J1 from a computer or connect a 5V DC power supply to TP3.
- 3) Verify that LED1 is on.
- 4) Connect a 20V DC power supply to IN. Verify that OUT is 20V.
- 5) Gradually increase voltage on the DC power supply and verify that the OUT voltage goes down and $\overline{\text{FLAG}}$ goes low when the input reaches approximately 33V.
- 6) Gradually decrease voltage on the DC power supply and verify that OUT comes back and $\overline{\text{FLAG}}$ goes high when the input reaches approximately 32V.
- 7) Set the DC power-supply voltage to 24V, then connect the adjustable load between the OUT and GND terminals and a multimeter in series to measure the current. Gradually increase the load current and verify that the OUT goes down and $\overline{\text{FLAG}}$ goes low when the load current increases above 1A.
- 8) The jumper JU1 can be configured to change the current limit as shown in [Table 2](#). Verify various current limit operations by repeating step 7.

Ordering Information appears at end of data sheet.

Detailed Description of Hardware

The MAX17523A EV kit is a fully assembled and tested circuit board that demonstrates the MAX17523A, a 1A adjustable overcurrent and overvoltage protector IC in a 16-pin surface-mount TQFN-EP package.

Using jumper JU1, the EV kit circuit can be configured to evaluate different current-limit thresholds with a different resistor on SET1. Using jumpers JU3 to JU5, the EV kit circuit can be configured to evaluate the internal OVLO/UVLO threshold or external threshold using a resistor-divider. Using jumpers JU14 and JU15, the EV kit circuit can be configured to evaluate different current-limit types (autoretry, latching, and continuous). The EV kit also features a LED to indicate the power for logic pins.

The EV kit provides an on-board output electrolytic capacitor (C7) to enable demonstration of the MAX17523A protection features while charging large capacitor.

Table 1. LED Indicator

LED	NAME	DESCRIPTION
LED1	POWER	LED1 is on when the V _{BUS} /5V supply for the logic pins is powered

Table 2. Current-Limit Threshold (JU1)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2	Current limit 0.15A
	3-4	Current limit 0.5A
	5-6*	Current limit 0.98A
	7-8	Current limit adjustable

*Default position.

Table 3. UVLO/OVLO Threshold (JU3 to JU5)

JUMPER	SHUNT POSITION	DESCRIPTION
JU3	Installed*	UVLO connected to ground. Internal UVLO threshold is selected.
	Not installed	UVLO not connected to ground. Install JU5 to use external resistors to set UVLO threshold.
JU4	Installed*	OVLO connected to ground. Internal OVLO threshold is selected.
	Not installed	OVLO not connected to ground. Install JU5 to use external resistors to set OVLO threshold.
JU5	Installed	Calculate and install R8 and R10 to set the UVLO/OVLO threshold before using external resistor divider feature.
	Not installed*	Not using external resistors to set the OVLO/UVLO threshold.

*Default position.

Current-Limit Threshold

The EV kit features a jumper (JU1) to select the current-limit threshold. Install a jumper as shown in [Table 2](#) to change the current-limit threshold.

Use the following equation to calculate the SET1 resistance for a desired current limit:

$$R_{SET1} (k\Omega) = \frac{6100}{I_{LIM} (mA)}$$

UVLO/OVLO Threshold

Use jumpers JU3 to JU5 to select UVLO and OVLO threshold. See [Table 3](#) for jumper settings.

The UVLO threshold for input voltage is set through the R9, R10 resistive divider. Use the following equation to calculate the value of R10 for a required undervoltage threshold level:

$$R10 = \frac{R9}{\left(\frac{V_{UVLO}}{V_{UVLO_F}} - 1\right)}$$

where R9 can be chosen as 2.2MΩ, V_{UVLO_F} is 1.222V, and V_{UVLO} is the required undervoltage protection threshold.

The OVLO threshold for input voltage is set through the R11, R12 resistive divider. Use the following equation to calculate the value of R12 for a required overvoltage threshold level:

$$R12 = \frac{R11}{\left(\frac{V_{OVLO}}{V_{OVLO_R}} - 1\right)}$$

where R11 can be chosen as 2.2MΩ, V_{OVLO_R} is 1.222V, and V_{OVLO} is the required overvoltage protection threshold.

Switch Control

The EV kit features two jumpers (JU6, JU8) to enable or disable the switch. See [Table 4](#) for jumper settings and [Table 5](#) for switch status.

Reverse-Current Block Enable

Use jumper JU9 to enable or disable the reverse-current flow protection. MAX17523A blocks any reverse current from the OUT to IN pin when RIEN is logic 0. See [Table 6](#) for jumper settings.

Table 4. Switch Control (JU6, JU8)

JUMPER	SHUNT POSITION	DESCRIPTION
JU6	1-2	HVEN connected to IN through 100kΩ (HVEN logic 1).
	2-3*	HVEN connected to ground (HVEN logic 0).
JU8	Installed*	EN connected to VBUS (EN Logic 1).
	Not Installed	EN connected to ground through 100kΩ (EN Logic 0).

*Default position.

Table 5. Enable Inputs

HVEN	EN	SWITCH STATUS
0	0	On
0	1	On*
1	0	Off
1	1	On

*Default position.

Table 6. Reverse-Current Block Enable (JU9)

JUMPER	SHUNT POSITION	DESCRIPTION
JU9	Installed	RIEN connected to VBUS (RIEN logic 1).
	Not Installed*	RIEN connected to ground through 100kΩ (RIEN logic 0).

*Default position.

Current-Limit Type Select

The EV kit features jumpers JU12, JU14, JU15 to select different current-limit type and sampled time. See [Table 7](#) and [Table 8](#) for jumper settings.

Output Load Capacitor

Use jumper JU13 to connect output to 330μF capacitor. See [Table 9](#) for jumper settings.

Table 7. Current-Limit Type Select (JU12, JU14, JU15)

JUMPER	SHUNT POSITION	DESCRIPTION
JU12	1-2*	CLTS_MODE logic 1. CLTS1 and CLTS2 are sampled continuously.
	2-3	CLTS_MODE logic 0. CLTS1 and CLTS2 are sampled only when $V_{IN} - V_{OUT} < 0.6V$.
JU14	1-2*	CLTS1 logic 1.
	2-3	CLTS1 logic 0.
JU15	1-2	CLTS2 logic 1.
	2-3*	CLTS2 logic 0.

*Default position.

Table 8. Logic Inputs

CLTS2	CLTS1	CURRENT-LIMIT TYPE
0	0	Latchoff
0	1	Autoretry
1	0	Continuous
1	1	Continuous

Table 9. Output Load Capacitor (JU13)

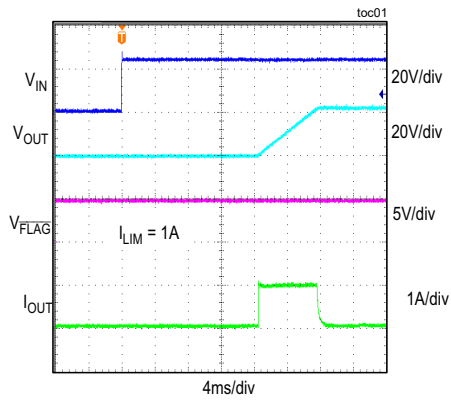
JUMPER	SHUNT POSITION	DESCRIPTION
JU13	Installed	OUT connected to C7 and C8.
	Not Installed*	OUT not connected to C7 and C8.

*Default position.

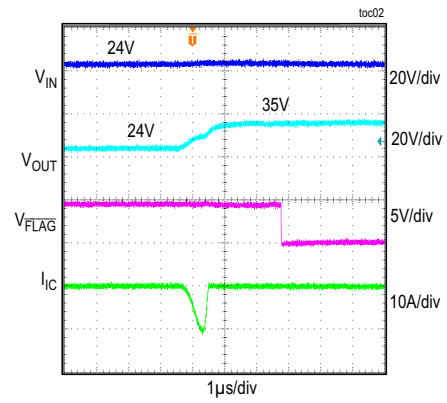
Typical Operating Characteristics

($V_{IN} = 24V$, $T_A = +25^{\circ}C$ unless otherwise noted.)

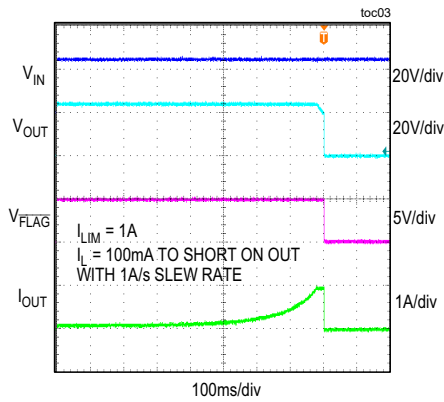
POWER-UP RESPONSE
WITH 330 μ F CAPACITOR AT NO LOAD



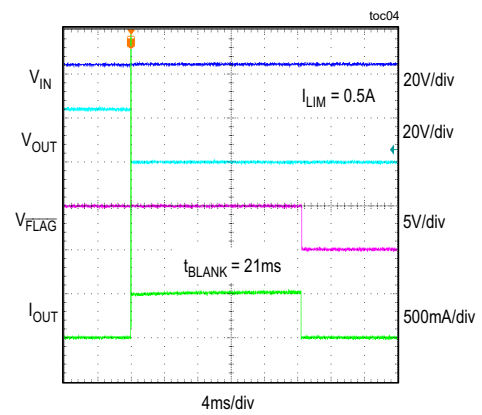
REVERSE-BLOCKING RESPONSE



CURRENT LIMIT RESPONSE

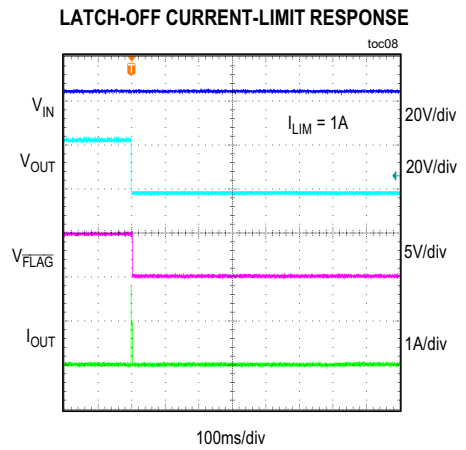
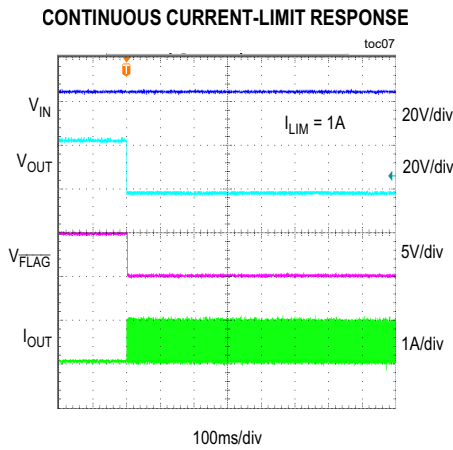
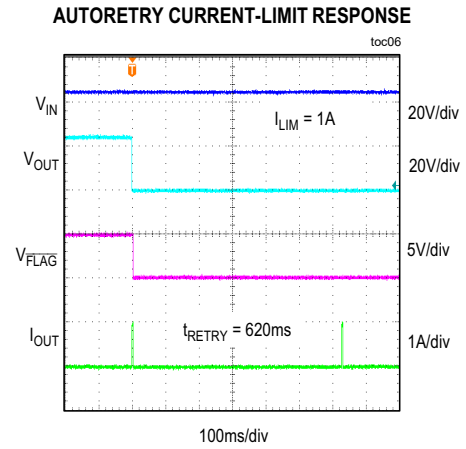
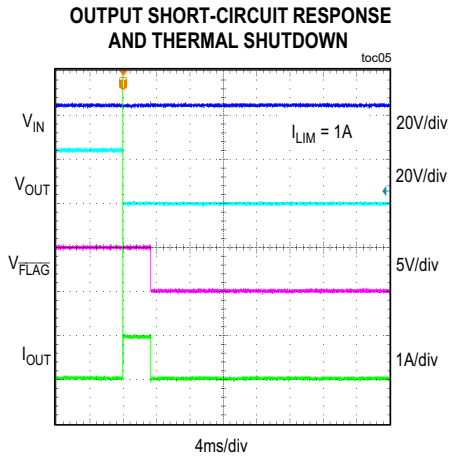


OUTPUT SHORT CIRCUIT RESPONSE



Typical Operating Characteristics (continued)

($V_{IN} = 24V$, $T_A = +25^{\circ}C$ unless otherwise noted.)



Component Suppliers

SUPPLIER	WEBSITE
Bourns, Inc.	www.bourns.com
Sullins	www.sullinscorp.com
FCI Electronics Interconnection Solutions	www.fciconnect.com
Keystone	www.keyelco.com
Diodes Incorporated	www.diodes.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
Phoenix Contact, Inc.	www.phoenixcontact.com
STMicroelectronics	www.us.st.com
TDK Corp.	www.component.tdk.com

Note: Indicate that you are using the MAX17523A EV Kit when contacting these component suppliers.

Ordering Information

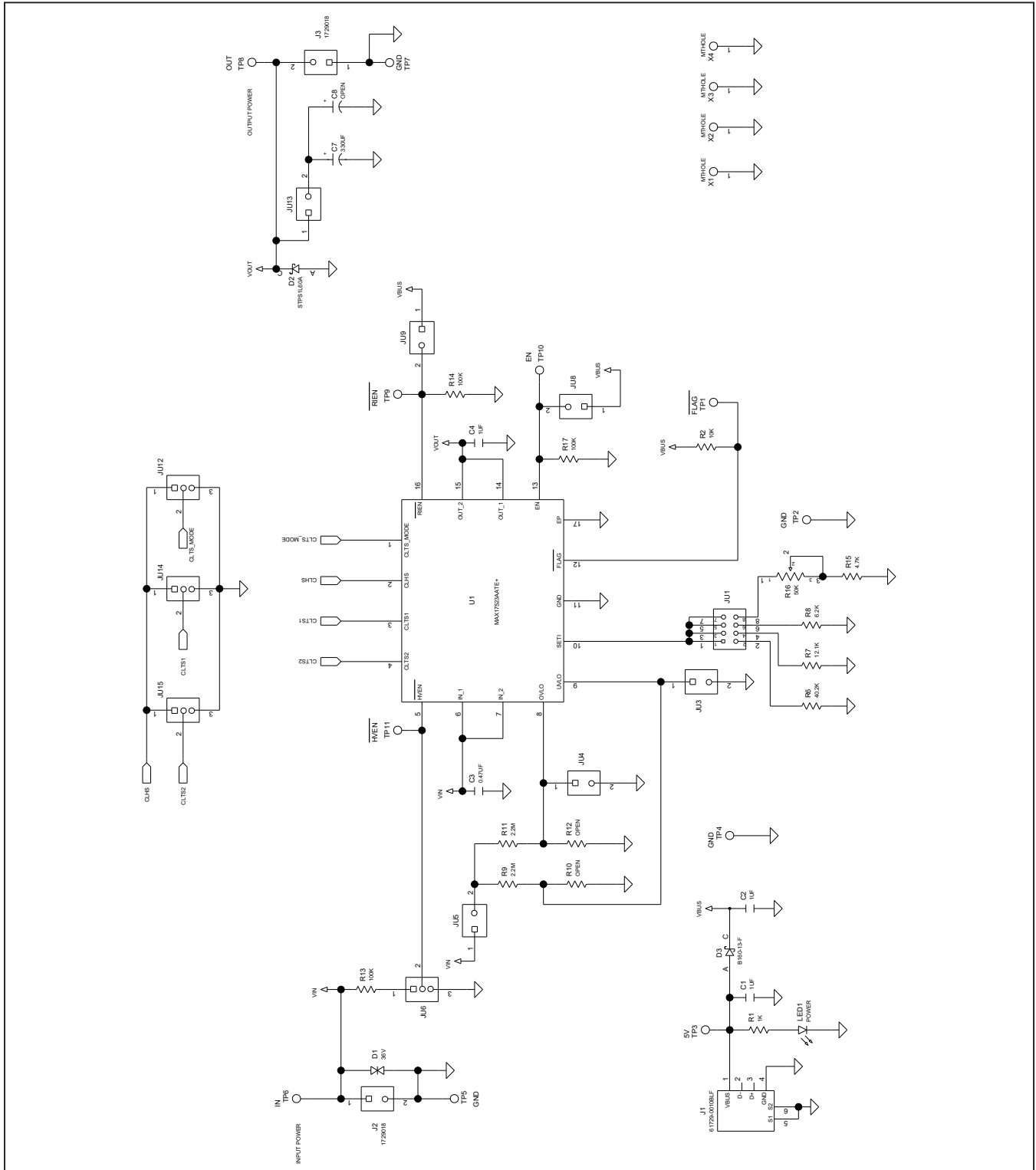
PART	TYPE
MAX17523AEVKIT#	EV Kit

#Denotes RoHS compliant.

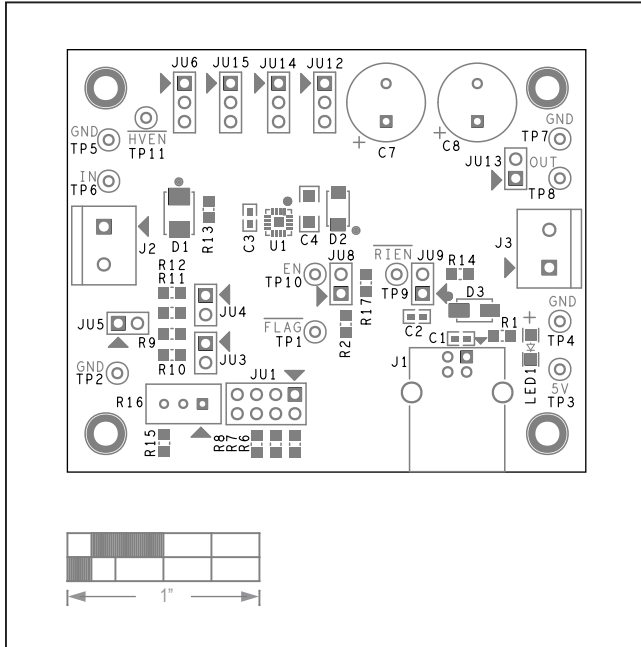
MAX17523A EV Kit Bill of Materials

PART REFERENCE	QTY	DESCRIPTION	MANUFACTURER PART NUMBER
C1, C2	2	1µF 10% 25V X7R Ceramic Capacitors (0603)	TDK C1608X7R1E105K080AE, TAIYO YUDEN TMK107B7105KA
C3	1	0.47µF 10% 50V X5R Ceramic Capacitors (0603)	TDK C1608X5R1H474K080AB
C4	1	1µF 10% 50V X7R Ceramic Capacitors (1206)	MURATA GRM31CR71H105KA61, TDK CGA5L3X7R1H105K160AB
C7	1	330µF 20% 50V Aluminium Electrolytic Capacitor (10mm)	PANASONIC EEU-EB1H331
D1	1	TVS Diode, 600W (SMB)	ST MICROELECTRONICS SM6T36CA
D2	1	Power Schottky Diode, 60V, 1A (SMA)	ST MICROELECTRONICS STPS1L60A
D3	1	Power Schottky Diode, 60V, 1A (SMA)	DIODES INCORPORATED B160-13-F
J1	1	USB B-Type Connector	FCI CONNECT 61729-0010BLF
J2, J3	2	2-Pin Green PC Terminal Block	PHOENIX CONTACT 1729018
JU1	1	2x4 Dual-Row Header, 0.1in centers, cut to fit	SULLINS ELECTRONICS PBC04DAAN
JU3-JU5, JU8, JU9, JU13	6	2-Pin Single-Row Header, 0.1in centers, cut to fit	MOLEX 22-28-4023
JU6, JU12, JU14, JU15	4	3-Pin Single-Row Header, 0.1in centers, cut to fit	MOLEX 22-28-4033
LED1	1	Green LED (1206)	KINGBRIGHT APT3216SGC
R1	1	1K OHM 1% resistors (0805)	-
R2	1	10K OHM 1% resistors (0805)	-
R6	1	40.2K OHM 1% resistors (0805)	-
R7	1	12.1K OHM 1% resistors (0805)	-
R8	1	6.2K OHM 1% resistors (0805)	-
R9, R11	2	2.2M OHM 5% resistors (0805)	-
R13, R14, R17	3	100K OHM 1% resistors (0805)	-
R15	1	4.7K OHM 1% resistors (0805)	-
R16	1	50K OHM Trimmer Potentiometers	BOURNS 3296W-1-503LF
TP1	1	White Test Point	KEYSTONE 5002
TP2, TP4, TP5, TP7	4	Black Test Point	KEYSTONE 5001
TP3, TP6, TP8	3	Red Test Point	KEYSTONE 5000
TP9	1	Purple Test Point	KEYSTONE 5119
TP10	1	Green Test Point	KEYSTONE 5116
TP11	1	Grey Test Point	KEYSTONE 5118
U1	1	4.2V to 36V, 1A Current Limiter with OV, UV, Reverse Voltage Protection (16 Pin TQFN 3mm X 3mm)	MAX17523AATE+
C8	0	Not Installed; 330µF 20% 50V Aluminium Electrolytic Capacitor (10mm)	PANASONIC EEU-EB1H331
R10, R12	0	Not Installed; 1% resistors (0805)	-
PCB	1	PCB: MAX17523A Evaluation Kit	-

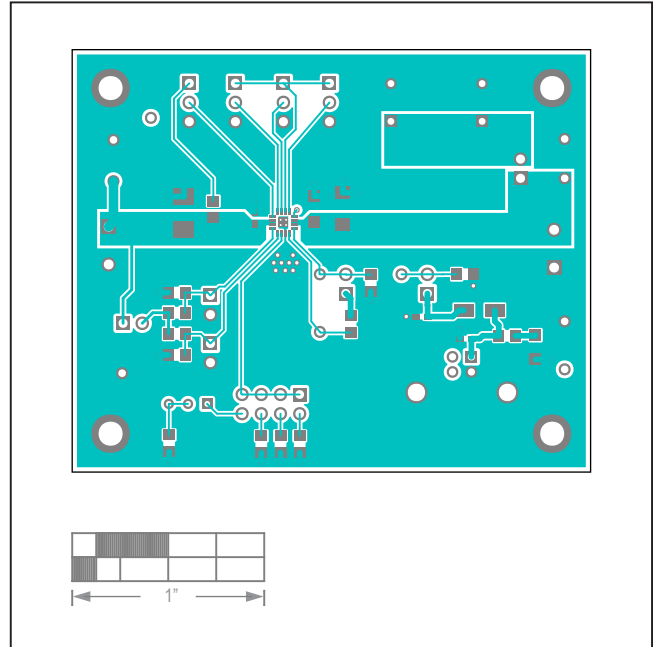
MAX17523A EV Kit Schematic



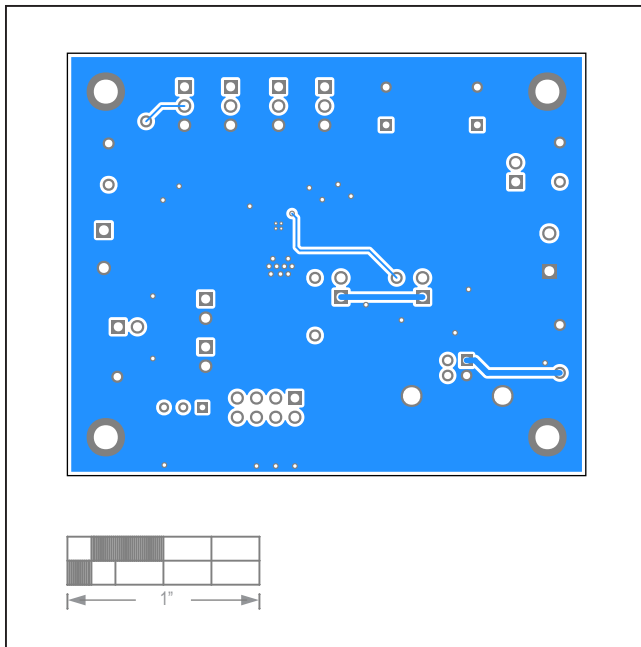
MAX17523A EV Kit PCB Layout



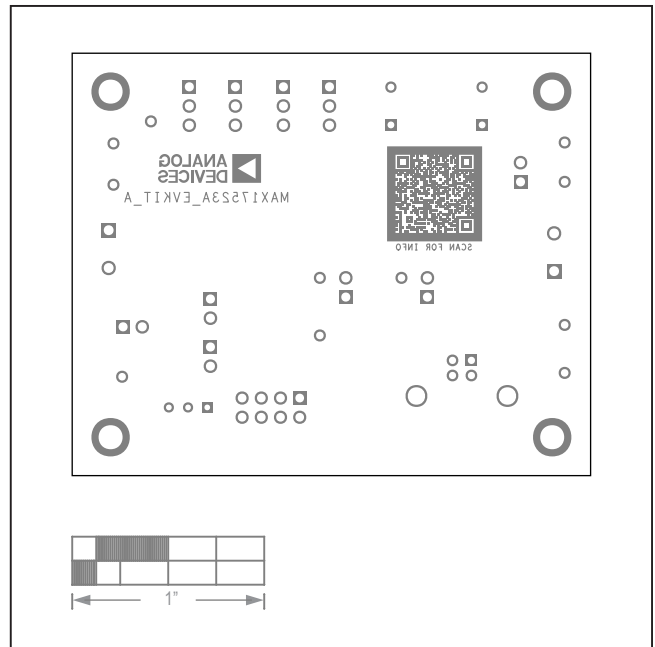
MAX17523A EV Kit PCB Layout—Silkscreen Top



MAX17523A EV Kit PCB Layout—Top Layer



MAX17523A EV Kit PCB Layout—Bottom Layer



MAX17523A EV Kit PCB Layout—Silkscreen Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/22	Initial release	—

