MAX16136 Evaluation Kit

Evaluates: MAX16136

General Description

The MAX16136 evaluation kit (EV kit) is fully tested and assembled circuit that demonstrates the capabilities of the MAX16136, a high-precision reset IC offering window-threshold and window-watchdog monitoring. The MAX16136 EV kit is designed to facilitate the evaluation of various features of the MAX16136 such as input overvoltage/undervoltage faults, window-watchdog violation, and $\overline{OV}$ latching/unlatching capability. The MAX16136 EV kit operates over the automotive temperature range.

The reset signal at $\overline{RST}$ asserts low when the voltage at IN falls outside of the overvoltage/undervoltage window-threshold settings. An overvoltage signal at $\overline{OV}$ latches low to indicate overvoltage condition at IN and a watchdog output signal at $\overline{WDO}$ pulses low when the signal period at WDI falls outside of the window-watchdog timing. The EV kit also features a push-button switch at $\overline{CLR}$ to unlatch the overvoltage fault output ($\overline{OV}$). Two indicators, OV_STATUS LED and UV_STATUS LED, provide visual fault status at the input for overvoltage and undervoltage conditions.

Features

- 3.3V Nominal Input Threshold Voltage
- ±4% Undervoltage/Overvoltage Thresholds with Respect to Nominal Input Threshold
- 8ms(t_{WD_F})/80ms (t_{WD_S}) Window-Watchdog Timeout
- 10ms Reset Timeout for $\overline{RST}$ signal
- Reset LED Indicator
- Overvoltage Fault LED Indicator
- Clear Fault Input Push-Button Switch
- -40°C to +125°C Operating Temperature Range
- Proven 2-Layer 2oz Copper PCB Layout
- Demonstrates Compact Solution Size
- Fully Assembled and Tested

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

Quick Start

Required Equipment

- MAX16136 EV kit
- DC power supplies: 3.5V/50mA and 5V/100mA
- One digital multimeter (DMM)
- Function generator
- Two-channel oscilloscope

Procedure

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

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

1) Connect the positive terminal of the 5V/100mA power supply to VDC test point. Connect the ground terminal of the power supply to GND post.
2) Connect the positive terminal of the 3.5V/50mA power supply IN test point. Connect the ground terminal of the power supply to GND post.
3) Connect the positive terminal of the DMM to IN test post and the negative terminal of the DMM to GND.
4) Connect oscilloscope channel 1 to WDI test point and channel 2 to $\overline{WDO}$ test point
5) Connect the function generator between WDI and GND terminal posts.

MAX16136 EV Kit Files

FILE	DECRIPTION
MAX16136 EV BOM	EV Kit Bill of Material
MAX16136 EV PCB Layout	EV Kit Layout
MAX16136 EV Schematic	EV Kit Schematic

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6) Turn on the 5V/100mA power supply and slowly increase its output voltage to 5V.
7) Turn on the 3.5V/50mA power supply and slow increase its output voltage to 3.3V.
8) Verify the reading on DMM is 3.3V and both signals and both LEDs are turned off.
9) Turn on the function generator and configure the output to generate a pulse period between 8ms and 80ms.
10) Verify on the oscilloscope the WDI signal and that $\overline{WDO}$ pulled high and not pulsing.
11) EV kit is ready for further testing.

Detailed Description of Hardware

The MAX16136 EV kit is fully tested and assembled circuit that operate from 1.7V to 5.5V input supply range. The EV kit is designed to monitor a 3.3V system supply within ±4% window threshold for undervoltage and overvoltage faults.

The MAX16136 EV kit includes two LEDs, OV_STATUS and UV_STATUS, to indicate the undervoltage and overvotlage faults at the input (IN). OV_STATUS turns red when the input voltage goes above the overvoltage threshold indicating an overvoltage fault. OV_STATUS LED remains on even if the voltage at the input goes below the overvotlage threshold. To turn off OV_STATUS LED, pull $\overline{CLR}$ to ground (refer to the device data sheet's electrical characteristics table for proper pulse-width duration on $\overline{CLR}$). UV_STATUS indicates the state of reset output of the MAX16136. UV_STATUS turns blue when the input voltage goes either below the undervoltage threshold or above the overvoltage threshold and turns off after the reset timeout period once the input voltage is within the input's window-threshold. To connect $\overline{OV}$ or $\overline{RST}$ to a voltage other than V_{DD}, remove R1 and connect external voltage at V_{PULLUP}.

Undervoltage/Overvoltage Functionality

- Slowly lower the 3.3V DC level at IN to about 3.168V (typ) and verify the UV_STATUS LED is turned on, indicating undervoltage fault. Bring the DC voltage at IN back to 3.3V while monitoring that UV_STATUS LED is turned off.
- Slowly increase the 3.3V DC level at IN to about 3.432V (typ). Verify that the OV_STATUS LED and UV_STATUS LEDs are both turned on due to an overvoltage fault. Bring the DC level at IN back to 3.3V and verify that the UV_STATUS LED is turned off while OV_STATUS LED stays on, indicating latched output at $\overline{OV}$.
- Press the push-button at $\overline{CLR}$ to unlatch overvoltage at $\overline{OV}$ and turn the OV_STATUS LED off.

Note: *See below calculation to accommodate IN accuracy and hysteresis for undervoltage and overvoltage thresholds.*

Window-Watchdog Functionality

While monitoring both WDI and $\overline{WDO}$ on the scope slowly increase the frequency of the signal at WDI such that the period between two falling edges of the signal is shorter than 8ms. Verify the pulse duration at $\overline{WDO}$ is 50ms indicating fast watchdog timeout period violation. Slowly decrease the frequency of the signal at WDI such that the period between two falling edges is longer than 80ms. Verify the pulse duration at $\overline{WDO}$ is 100ms indicating slow watchdog timeout period violation.

Overvoltage Latch

The open-drain output, $\overline{OV}$ latches low when the IN voltage exceeds the overvoltage threshold, the $\overline{OV}$ signal is latched to low, to clear the latch first make sure the input voltage is below the overvoltage threshold and then pull $\overline{CLR}$ low using the pushbutton switch.

Status LED

The MAX16136 EV kit features two status LED for $\overline{RST}$ and $\overline{OV}$ signal. 1KΩ pullup is connected to the LEDs to limit the sink current into the $\overline{RST}$ and $\overline{OV}$ pin. When IN voltage fall outside of nominal window voltage UV_STATUS LED will turn on showing the status of $\overline{RST}$ pin. OV_STATUS LED is used to indicate the status of $\overline{OV}$ pin, if IN voltage is more than overvoltage threshold OV_STATUS LED is turn on and latched to this state even IN voltage come back to its nominal voltage range. CLR push-button must be pressed to turn off the OV_STATUS LED.

PULLUP Voltage

The MAX16136 EV kit provides the option to connect different voltage rail for $\overline{RST}$, $\overline{OV}$, $\overline{WDO}$ pullup resistor. Remove the 0Ω resistor (R1) from the EV kit and connect the desired pullup voltage to V_{PULLUP}.

Setting Input Thresholds

The MAX16136 monitors a system supply voltage for undervoltage/overvoltage window-threshold. Depending on the system supply tolerance requirement, the undervoltage/overvoltage thresholds can be factory-trimmed from ±4% to ±11%. The tolerance setting is symmetrical with respect to the selected nominal input threshold voltage. Below is a detailed calculation of how to determine the undervoltage/overvoltage threshold levels with ±1% threshold accuracy for 3.3V ±4% supply voltage.

$$V_{INNOM} = 3.3V$$

$$T_{OL} = \pm 4\%$$

$$V_{UVTH} = V_{INNOM} (1 - 4\%) = 3.3V (1 - 0.04) = 3.3V - 0.132V = 3.168V$$

$$V_{OVTH} = V_{INNOM} (1 + 4\%) = 3.3V (1 + 0.04) = 3.3V + 0.132V = 3.432V$$

Where V_{INNOM} is the selected nominal input threshold voltage, T_{OL} is the input tolerance, V_{UVTH} is undervoltage threshold voltage and V_{OVTH} is the overvoltage threshold voltage.

The MAX16136 monitors the supply voltage with ±1% accuracy over the operating temperature and supply range. The accuracy range for the 3.3V ±5% is shown below:

$$V_{UVTH\_A} = V_{UVTH} (1 \pm 1\%) = 3.168V \pm 0.03168V$$

$$V_{OVTH\_A} = V_{OVTH} (1 \pm 1\%) = 3.432V \pm 0.03432V$$

Where V_{UVTH_A} is the undervoltage threshold accuracy range and V_{OVTH_A} is the overvoltage threshold accuracy.

The MAX16136 also features input hysteresis that is factory programmable to either 0.25% or 0.50%. The hysteresis is calculated with respect to the nominal input voltage. For the 3.3V nominal input voltage and 0.25% hysteresis we have the following:

$$V_{INNOM} = 3.3V,$$

$$HYS = 0.25\%$$

$$V_{HYS} = V_{INNOM} (0.25\%) = 3.3V(0.0025) = 8.25mV$$

If the reset is due to an overvoltage event at the input, 8.25mV must be subtracted from the voltage point where the reset was triggered, as shown in Figure 1, where 8.25mV must be added in case of an undervoltage event, to bring the device out of reset at the end of reset timeout period.

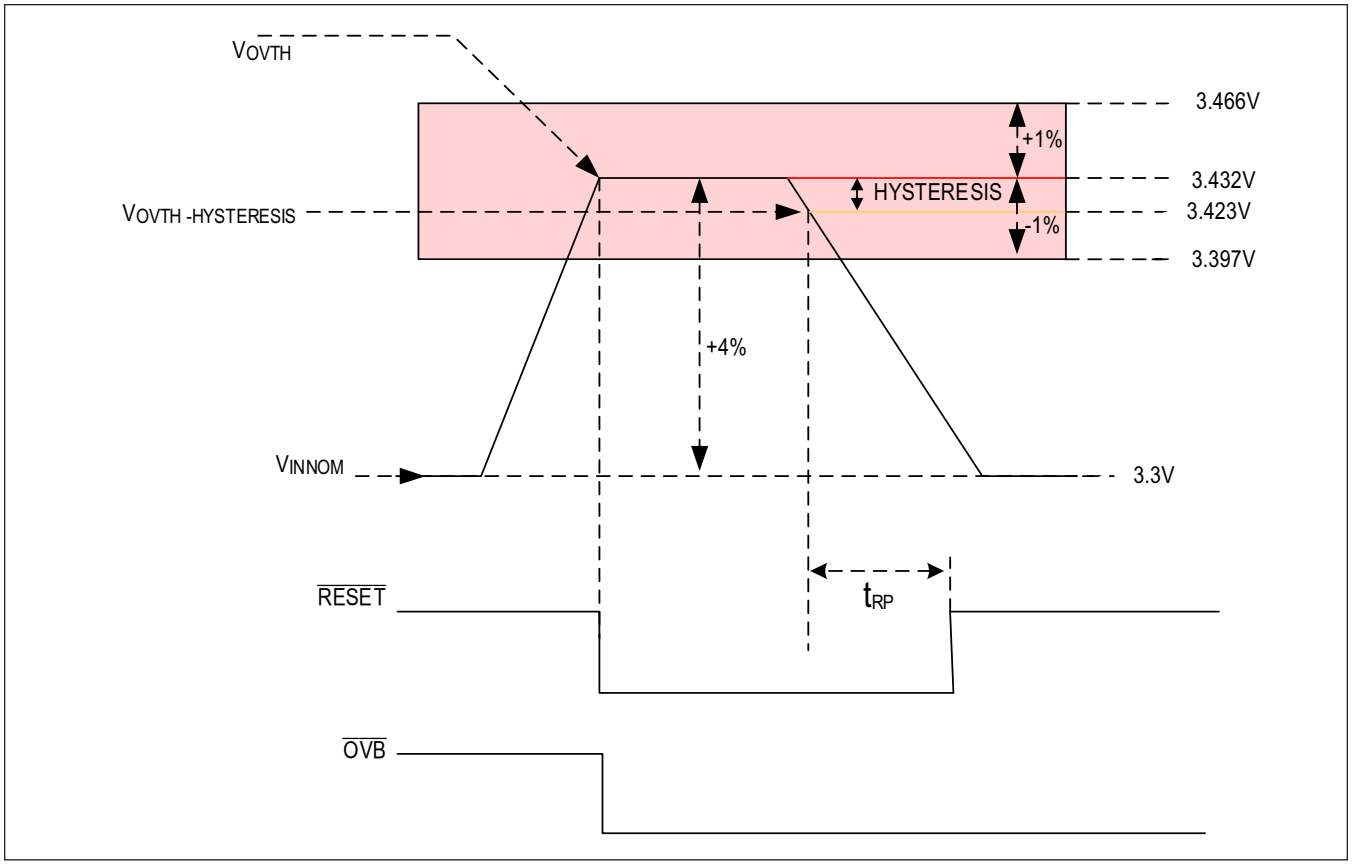


Figure 1: Graphical Description of Overvoltage Threshold

Component Suppliers

SUPPLIER	WEBSITE
Lite ON	www.liteon.com
WURTH ELECTRONICS	www.we-online.com
Panasonic	www.na.industrial.panasonic.com

Note: *Indicate that you are using the MAX16136 when contacting these component suppliers.*

Ordering Information

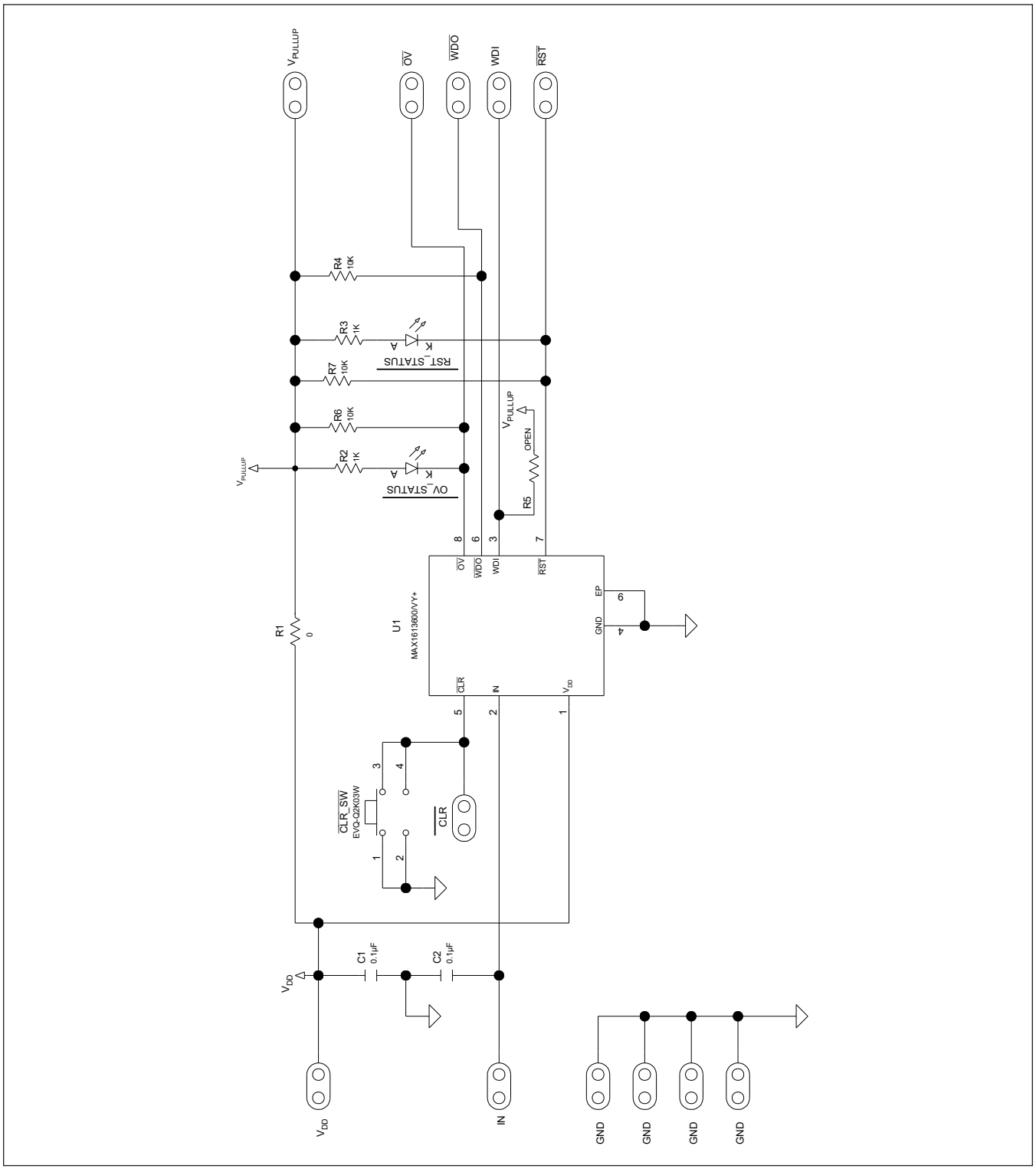
PART	TYPE
MAX16136EVKIT#	EV Kit

#Denotes RoHS

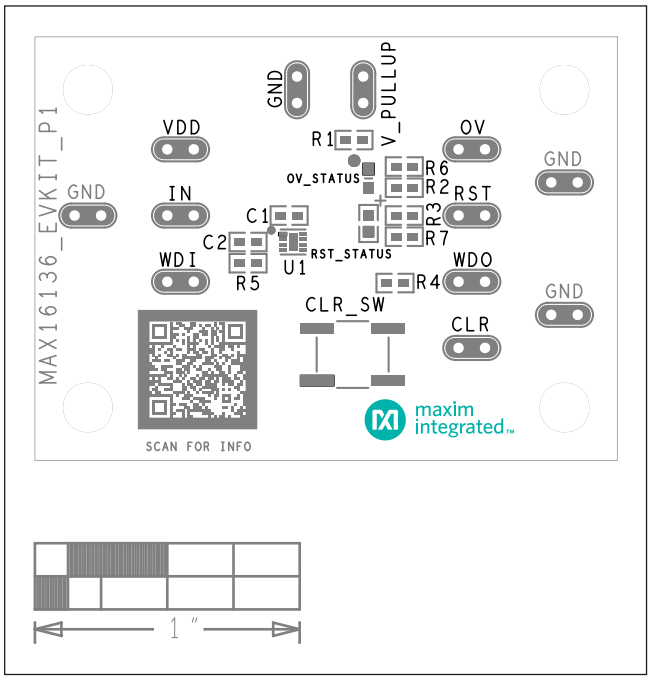
MAX16136 EV Kit Bill of Materials

ITEM	REF_DES		QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C2		2	885012206071;CGJ3E2X7R1E104K080AA; C1608X7R1E104K080AA;C0603C104K3RAC; GRM188R71E104KA01;C1608X7R1E104K; 06033C104KAT2A;CGA3E2X7R1E104K080AA; GCJ188R71E104KA12	WURTH ELECTRONICS INC; TDK;TDK;KEMET;AVX;TDK; MURATA	0.1UF	CAPACITOR; SMT; 0603; CERAMIC; 0.1uF; 25V;10%; X7R; -55degC to + 125degC; +/-15% from -55degC to +125degC
2	CLR, GND, GND1-GND3, IN, OV, RST, VDD, V_PULLUP, WDI, WDO		12	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG
3	CLR_SW		1	EVQ-Q2K03W	PANASONIC	EVQ-Q2K03W	SWITCH; SPST; SMT; 15V; 0.02A; LIGHT TOUCH SWITCH; RCOIL= OHM; RINSULATION= OHM; PANASONIC
4	MH1-MH4		4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
5	OV_STATUS		1	LTST-C190CKT	LITE-ON ELECTRONICS INC.	LTST-C190CKT	DIODE; LED; STANDARD; RED; SMT (0603); PIV=5.0V; IF=0.04A; -55 DEGC TO +85 DEGC
6	R1		1	CRCW06030000Z0	VISHAY DALE	0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.1W; THICK FILM
7	R2, R3		2	CRCW06031K00FK;ERJ-3EKF1001	VISHAY DALE;PANASONIC	1K	RESISTOR; 0603; 1K; 1%; 100PPM; 0.10W; THICK FILM
8	R4, R6, R7		3	CRCW060310K0FK;ERJ-3EKF1002	VISHAY DALE;PANASONIC	10K	RESISTOR; 0603; 10K; 1%; 100PPM; 0.10W; THICK FILM
9	RST_STATUS		1	LTST-C191TBKT	LITE-ON ELECTRONICS INC	LTST-C191TBKT	DIODE; LED; ; SMT (0603); PIV=5V; IF=0.02A; BLUE
10	U1		1	MAX1613600/VY+	MAXIM	MAX1613600/VY+	EVKIT PART - IC; MAX1613600/VY+T; CS04; HIGH-PRECISION SUPERVISORY WITH WINDOW WATCHDOG AND OVERVOLTAGE INDICATOR; PACKAGE OUTLINE: 21-100185; PACKAGE LAND PATTERN: 90-100070; PACKAGE CODE: T822Y+3C
11	PCB		1	MAX16136	MAXIM	PCB	PCB:MAX16136
12	R5	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0603 RESISTOR
TOTAL			29				

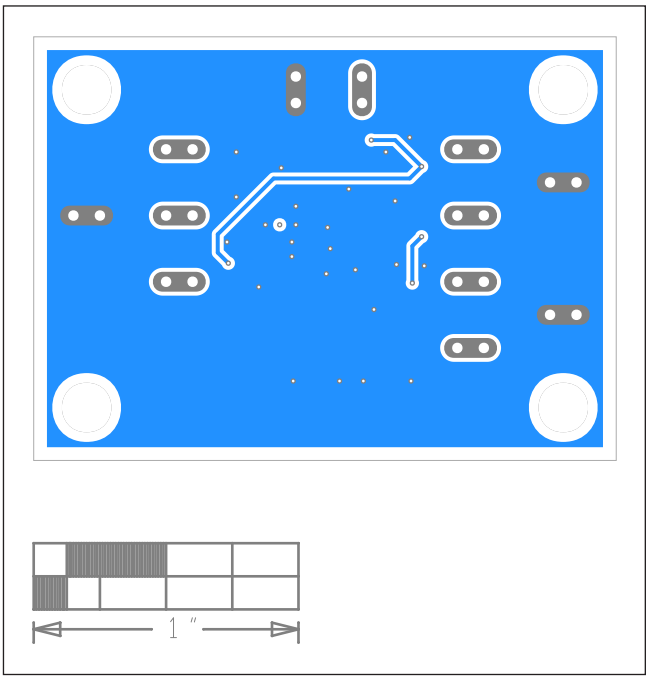
MAX16136 EV Kit Schematic



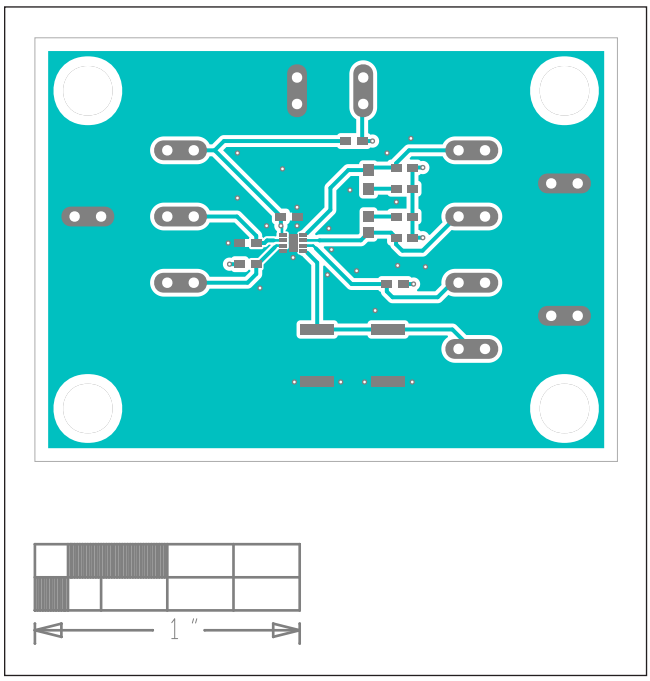
MAX16136 EV Kit PCB Layout Diagrams



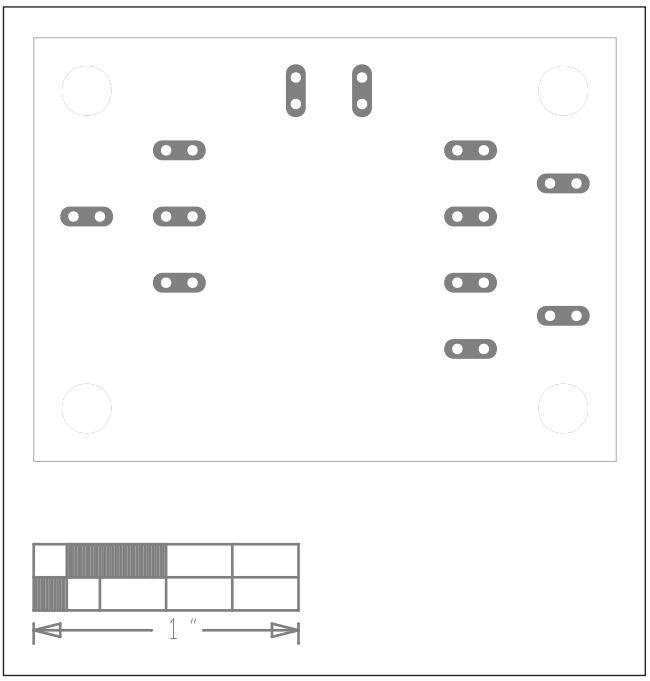
MAX16136 EV Kit PCB Layout—Top Silkscreen



MAX16136 EV Kit PCB Layout—Bottom



MAX16136 EV Kit PCB Layout—Top



MAX16136 EV Kit PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/19	Initial release	—

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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