

MAX40026 Evaluation Kit

Evaluates: MAX40026

General Description

The MAX40026 evaluation kit (EV kit) is a fully assembled electrical demonstration kit that provides a proven design to evaluate the MAX40026 ultra-low 280ps propagation delay, ultra-low dispersion comparator with 2mV hysteresis. The board provides layout options that allow the input termination to be easily modified for alternative input terminations. The comparator outputs are designed to drive low voltage differential signal outputs (LVDS). The LVDS outputs help minimize power dissipation and interfaces directly with high speed interconnect devices, FPGA's and CPU. The MAX40026 comparator is ideal for time of flight distance measurement applications.

This EV kit demonstrates the MAX40026ATA/VY+ in an 8-pin TDFN package.

Features

- Fast Propagation Delay: 280ps typ
- Low Overdrive Dispersion: 25ps ($V_{OV} = 10\text{mV}$ to 100mV)
- Supply Voltage 2.7V to 3.6V
- 39.4mW at 2.7V Supply
- Power-Efficient LVDS Outputs
- -40°C to $+125^{\circ}\text{C}$ Temperature Range

Quick Start

Required Equipment

- MAX40026 EV kit
- 6 matched-length SMA cables (preferably up to 18GHz capable), 2 feet, or less, in length
- +3.6V, 100mA DC power supply (V_{CC})
- High-Speed signal generator with differential outputs capable of generating square waves with <500ps rise times. (Eg., HP8131A)
- High-speed oscilloscope with 50 Ω termination

Procedure

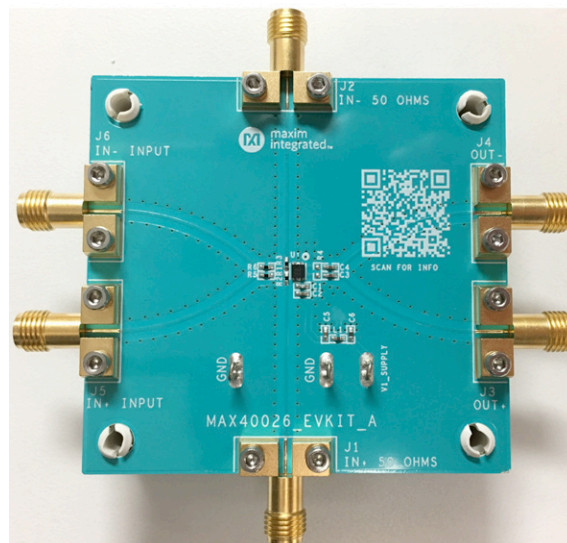
The MAX40026 EV kit is fully assembled and tested. Follow the steps below to verify board operation.

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

- 1) Set the V_{CC} power supply to +3.3V. Disable V_{CC} .
- 2) Connect the negative terminal of the V_{CC} power supply to the GND pad. Connect the positive terminal of the V_{CC} power supply to the V1_SUPPLY pad.
- 3) Set the signal generator to produce an output square-wave signal of 100mV_{P-P} differential at a frequency of 250MHz with common mode of +2.5V. Disable the signal generator outputs.

Ordering Information appears at end of data sheet.

MAX40026 EV Kit Photo



- 4) Connect the signal generator differential outputs to the edge-mount SMA connector marked INA+ INPUT/J5 and INA- INPUT/J6.
- 5) Enable all power supply. Enable the signal generator.
- 6) Verify if the supply current is within 5% of 17mA
- 7) Monitor and verify inputs IN+ 50Ω/J1 and IN- 50Ω/J2 with the oscilloscope. The oscilloscope must be configured for 50Ω input termination.
- 8) Monitor and verify outputs OUT+/J3 and OUT-/J4 with the oscilloscope. The oscilloscope must be configured for 50Ω input termination.

Detailed Description of Hardware

The MAX40026EV kit provides a proven design to evaluate MAX40026 comparator. The device offers ultra-low 280ps propagation delay, ultra-low dispersion of 25ps and 1.5mV hysteresis.

Supply Voltage

The MAX40026 EV kit operates from standard supply levels +2.7V to +3.6V. Connect the positive and negative supply voltages (ground return) to V1_SUPPLY and GND pads, respectively.

Inputs

The MAX40026 EV kit provides an efficient and simple method to evaluate the comparator. The inputs to the device are from IN+ and IN- SMA connectors. IN+ 50Ω and V1_SUPPLY SMA connectors serve as terminating leads at the input when using an oscilloscope to terminate and observe the input signal. During this condition R1 is not populated. When not using IN+ 50Ω and IN- 50Ω SMA connectors, R1 should be populated with 100Ω. The differential inputs accept input signals in the common mode range from +1.5V to $V_{CC} + 0.1V$.

Outputs

OUT+ and OUT- SMA connectors access the MAX40026 outputs. Both OUT+ and OUT- output traces are in default AC- coupled for easy and simple evaluation when connecting to 50Ω terminated oscilloscope. The outputs OUT+ and OUT- are 50Ω single ended characteristic lines either terminated by an oscilloscope or a subsequent high-speed device. The outputs are LVDS levels. When terminating with a scope, the outputs are AC coupled.

When connecting the outputs to an LVDS device such as an FPGA, replace the AC coupling capacitors C3 and C4 with 0Ω shorts and R4 populated with 100Ω termination resistor.

Input and Output Termination

Input Termination

Terminating Inputs with a 50Ω Oscilloscope

By default, the EV kit is designed to terminate the inputs when 50Ω oscilloscope probes are connected to IN+ 50Ω and IN- 50Ω termination SMA edge connectors. When inputs from a signal generator are connected to IN+ and IN- SMA connector inputs, IN+ 50Ω and IN- 50Ω are used to terminate the input signals with a 50Ω oscilloscope. This enables the input signals to be observed at the oscilloscope and at the same time terminates the micro-strip line. During this condition. Populate R5, R2, R6, and R3 with 0Ω resistors when operating this way.

When a 50Ω Oscilloscope is Not Terminated at Inputs

When inputs from a signal generator are connected to IN+ and IN- SMA connectors and when it is not desired to terminate the inputs to a scope, then the 0Ω resistor at R2 and R3 resistors must be de-populated and the 100Ω termination resistor must be populated at R1.

This is helpful when high-speed devices (TIAs, differential amplifiers) connect directly to the inputs of MAX40026 for signal discrimination.

Output Termination

Terminating Outputs with a 50Ω Oscilloscope

By default, the EV kit is designed to terminate the outputs when a 50Ω oscilloscope is connected to the OUT+ and OUT- SMA's. C3 and C4 AC coupling capacitors facilitates the outputs to the 50Ω oscilloscope inputs. R4 termination resistor is not populated in this case.

When a 50Ω Oscilloscope is Not Terminated at Inputs

When interconnecting to a subsequent high-speed device designed to accept LVDS inputs, then C3 and C4 capacitors must be replaced with 0Ω resistor shorts and R4 resistor must be populated with 100Ω termination.

Input and Output Delay Compensation

The MAX40026 EV kit provides ease of access to evaluate the propagation delay of the comparator. The length of the trace from R2 to IN+ 50Ω and R2 to IN- 50Ω is equal to the length of the trace from differential outputs of the MAX40026 to the OUT+ and OUT- SMA connectors. Hence the time taken for the input signal to travel from R2 to IN+ 50Ω will be equal to the time taken by the output signal to reach the OUT+ connector, thereby cancelling delay of the EV kit PCB itself. When terminating input and output signals with a scope, the delay observed is the delay of the MAX40026.

Layout Guidelines

- Use a PCB with a low-impedance ground plane.
- Mount one or more 10nF ceramic capacitors between GND and VCC, as close to the pins as possible.
- Multiple bypass capacitors help to reduce the effect of trace impedance and capacitor ESR.
- Choose bypass capacitors for minimum inductance and ESR.

Ordering Information

PART	TYPE
MAX40026EVKIT#	EV Kit

#Denotes RoHS compliant.

- Use a 100Ω termination resistor for the LVDS output, connected directly between OUT+ and OUT-, if practical. If the termination resistor can't be located adjacent to the outputs, use a 100Ω microstrip between the output pins and the termination resistor.
- Ensure that there is no parasitic coupling between the inputs and the outputs. Such coupling serves as feedback and can result in oscillation.
- Minimize any parasitic layout inductance.

Test Setup

Note that a test setup optimized for high-speed measurement is essential to observe the true performance of the MAX40026 device. Use matched SMA cables for the differential inputs and outputs. Also, account for the time delay and skew of the test setup. For accurate measurement of the device's rise and fall times, an oscilloscope with a bandwidth several times larger than the maximum signal frequency must be used.

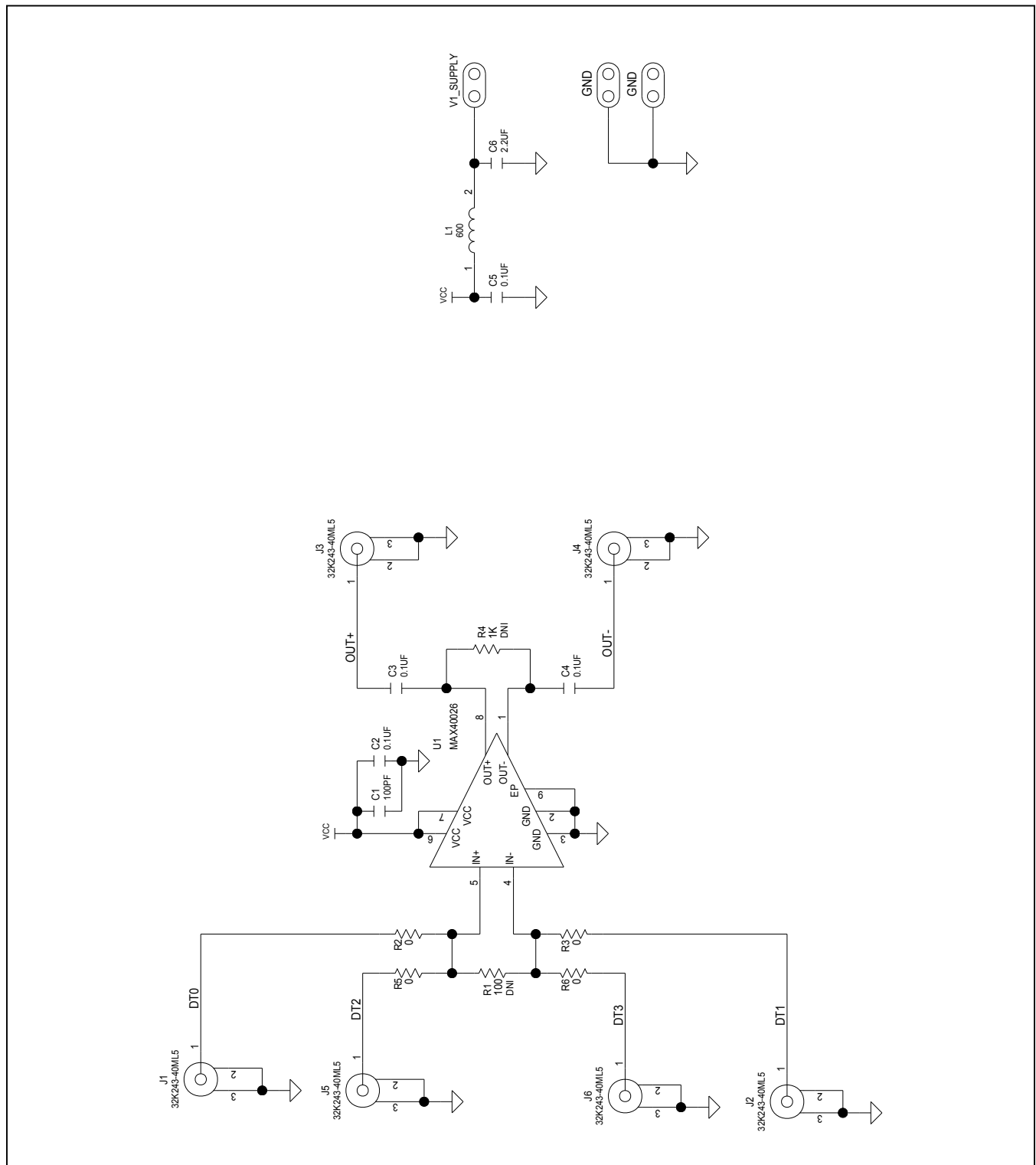
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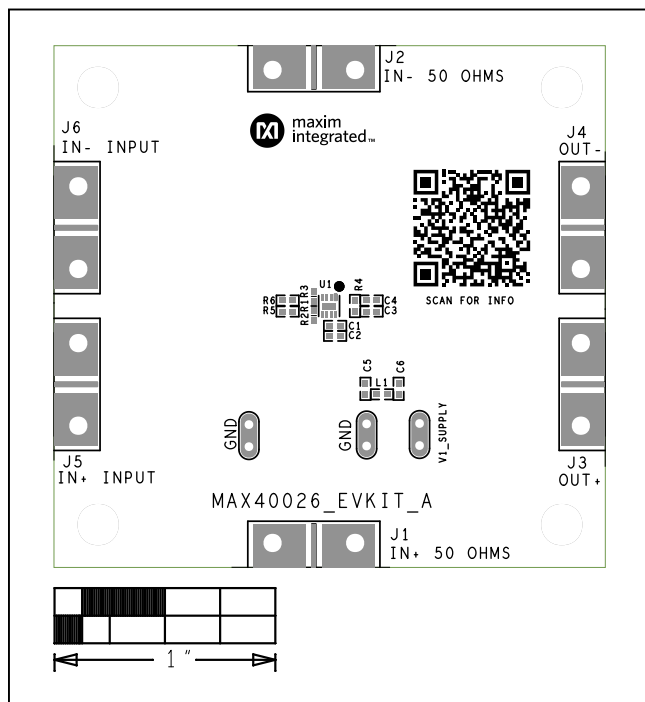
MAX40026 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	C1	-	1	C0402C101J5GAC;NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005C0G1H101J050; CGA2B2C0G1H101J050BA	KEMET;NIC COMPONENTS CORP.; YAGEO PHICOMP;MURATA;TDK;TDK	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=COG	
2	C2-C5	-	4	CGA2B3X7R1H104K;C1005X7R1H104K050B8; GRM155R71H104KE14;GCM155R71H104KE02	TDK;TDK;MURATA;MURATA	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
3	C6	-	1	C1005X5R1V225M050BC	TDK	2.2UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 2.2UF; 35V; TOL=20%; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R	
4	GND, GND1, V1_SUPPLY	-	3	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG	
5	J1-J6	-	6	32K243-40ML5	ROSENBERGER	32K243-40ML5	CONNECTOR; FEMALE; SMT; SMA JACK PCB; RIGHT ANGLE; 2PINS	
6	L1	-	1	BLM15PX6015N1	MURATA	600	INDUCTOR; SMT (0402); FERRITE-BEAD; 600; TOL=+/-25%; 0.9A	
7	MH1-MH4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON	
8	R2, R3, R5, R6	-	4	RC0402JR-070RL; RC0402-16W-000RJT	YAGEO PHYCOMP;VENKEL LTD.	0	RESISTOR; 0402; 0 OHM; 5%; JUMPER; 0.063W; THICK FILM	
9	U1	-	1	MAX40026ATA/VY+	MAXIM	MAX40026	EVKIT PART - IC; MAX40026; PACKAGE OUTLINE: 21-100185; PACKAGE CODE: T822Y+3; TDFN8-EP	
10	PCB	-	1	MAX40026	MAXIM	PCB	PCB:MAX40026	-
11	R1	DNP	0	CRCW0402100RFK; 9C04021A1000FL; RC0402FR-07100RL	VISHAY DALE;PANASONIC; YAGEO PHYCOMP	100	RESISTOR; 0402; 100 OHM; 1%; 100PPM; 0.063W; THICK FILM	
12	R4	DNP	0	CRCW04021K00FK; RC0402FR-071KL	VISHAY DALE;YAGEO PHICOMP	1K	RESISTOR; 0402; 1K; 1%; 100PPM; 0.0625W; THICK FILM	
TOTAL			26					

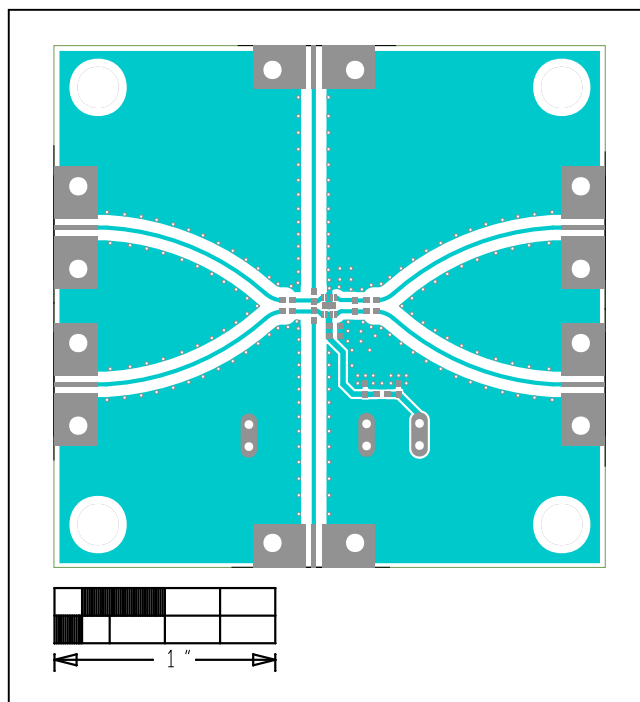
MAX40026 EV Kit Schematic



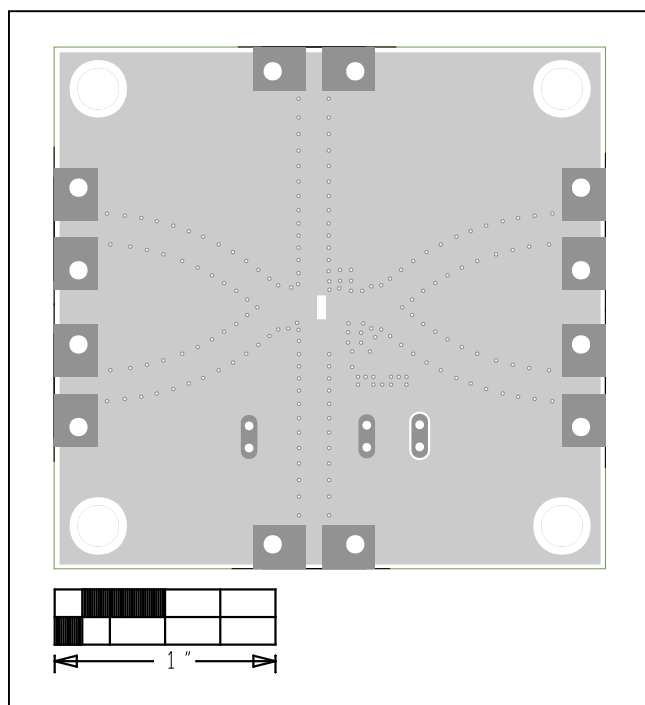
MAX40026 EV Kit PCB Layout Diagrams



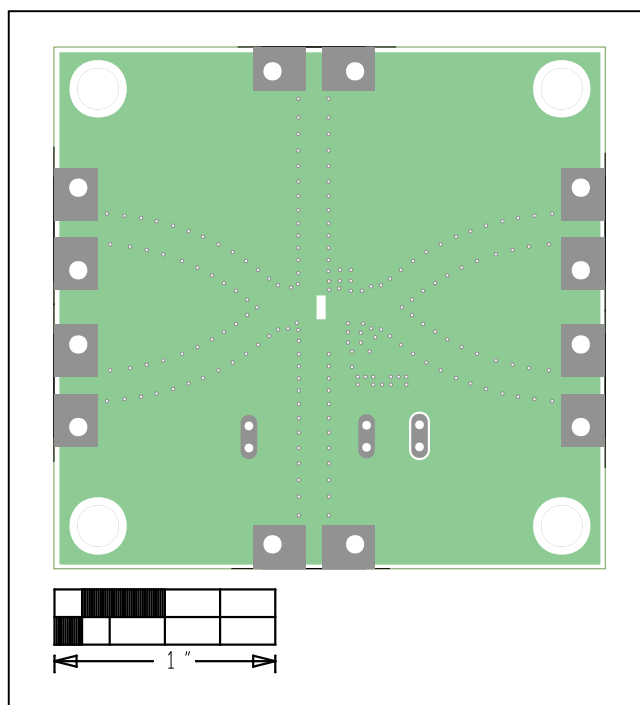
MAX40026 EV—Top Silkscreen



MAX40026 EV—Top

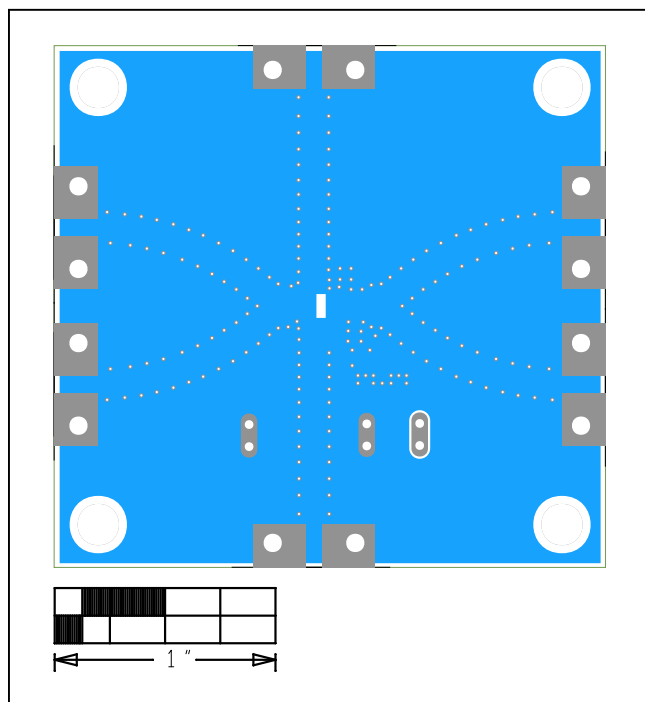


MAX40026 EV—GND2

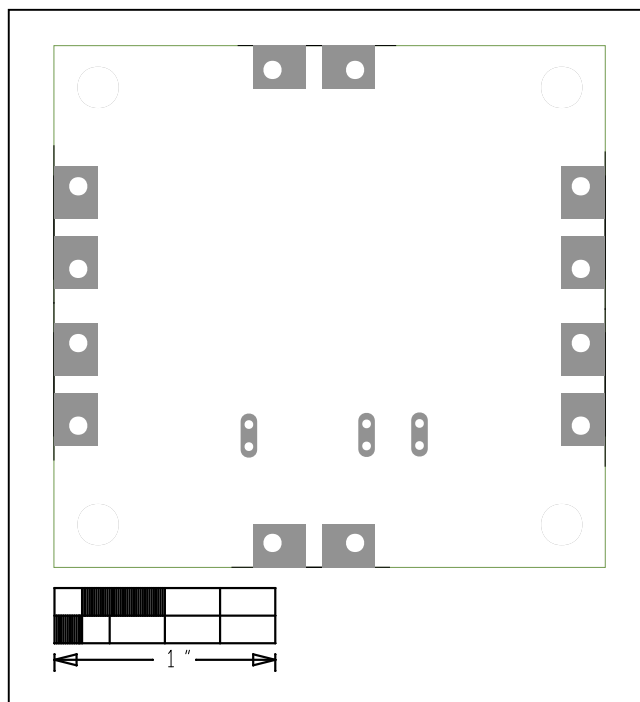


MAX40026 EV—GND3

MAX40026 EV Kit PCB Layout Diagrams (continued)



MAX40026 EV—Bottom



MAX40026 EV—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/19	Initial release	—

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