

MAX40025 Evaluation Kit

Evaluates: MAX40025A
MAX40025C

General Description

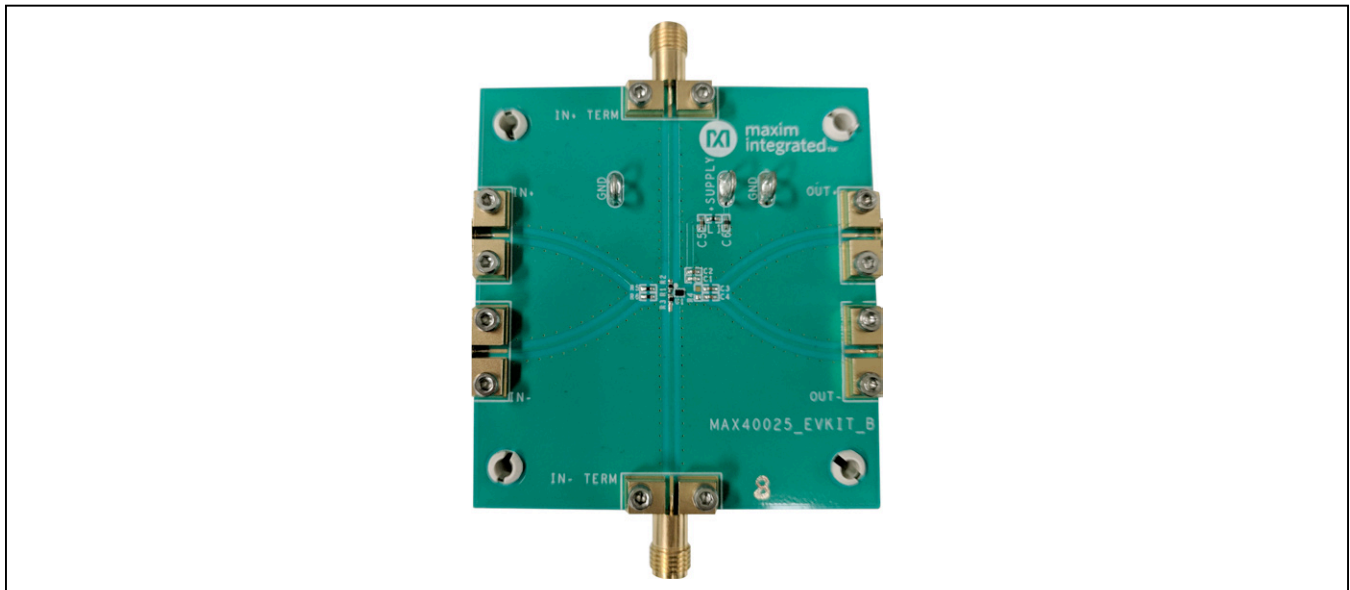
The MAX40025 evaluation kit (EV kit) is a fully assembled electrical demonstration kit that provides a proven design to evaluate the MAX40025 ultra-low 280ps propagation delay, ultra-low dispersion comparator. The board provides layout options that allow the input termination to be easily modified for 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, FPGAs and CPUs. The MAX40025 comparator is ideal for time of flight distance measurement applications.

This evaluation kit demonstrates the MAX40025CAWT+ in 6-pin wafer-level package (WLP). For other available pin-compatible option (MAX40025AAWT+), contact factory.

Features

- Fast Propagation Delay: 280ps (Typ)
- Low Over-Drive Dispersion: 25ps ($V_{OV} = 20\text{mV to } 100\text{mV}$)
- Supply Voltage 2.7V to 3.6V
- 39.4mW at 2.7V Supply
- Power-Efficient LVDS Outputs
- $-40^{\circ}\text{C to } +125^{\circ}\text{C}$ Temperature Range

MAX40025 EV Kit Photo



Quick Start

Required Equipment

- MAX40025 EV kit
- 6 matched-length SMA cables (preferably up to 18GHz capable), 2 feet, or less, in length
- +3.6V, 100mA DC power supply ($V_{CC}/+SUPPLY$)
- High-speed signal generator with differential outputs capable of generating square waves with $< 500\text{ps}$ rise times. (e.g., HP 8131A)
- High-speed oscilloscope with 50Ω termination

Procedure

The MAX40025 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 +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 a common mode voltage of +2.5V. Disable the signal generator outputs.

Ordering Information appears at end of data sheet.

- 4) Connect the signal generator differential outputs to the edge-mount SMA connector marked INA+ and INA-.
- 5) Enable power supply. Enable the signal generator.
- 6) Verify that the supply current is within 5% of 17mA
- 7) Monitor and verify inputs “IN+ TERM” and “IN- TERM” with the oscilloscope. The oscilloscope must be configured for 50Ω input termination.
- 8) Monitor and verify outputs OUT+ and OUT- with the oscilloscope. The oscilloscope must be configured for 50Ω input termination.

Detailed Description of Hardware

The MAX40025 EV kit provides a proven design to evaluate MAX40025 comparator. The device offers ultra-low 280ps propagation delay, ultra-low dispersion of 25ps.

Supply Voltage

The MAX40025 EV kit operates from standard supply levels +2.7V to +3.6V. Connect the positive and negative supply voltages (ground return) to +SUPPLY and GND pads, respectively.

Inputs

The MAX40025 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+ TERM and IN- TERM 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+ TERM and IN- TERM 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 MAX40025 outputs. Both OUT+ and OUT- output traces are in default AC- coupled for easy evaluation when connecting to a 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 the IN+ TERM and IN- TERM termination SMA edge connectors. When inputs from a signal generator are connected to the IN+ and IN- SMA connector inputs, IN+ TERM and IN- TERM 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. Populate R5, R2, R6, and R3 resistors 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 the 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 MAX40025 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 couple 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 connecting 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 MAX40025 EV kit provides ease of access to evaluate the propagation delay of the comparator. The length of the trace from R2 to IN+ TERM and R2 to IN- TERM is equal to the length of the trace from differential outputs of the MAX40025 to the OUT+ and OUT- SMA connectors. Hence the time taken for the input signal to travel from R2 to IN+ TERM 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 MAX40025.

Layout Guidelines

- Use a PCB with a low-impedance ground plane.
- Mount one or more 10nF ceramic capacitors between GND and V_{CC}, 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
MAX40025EVKIT#	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.

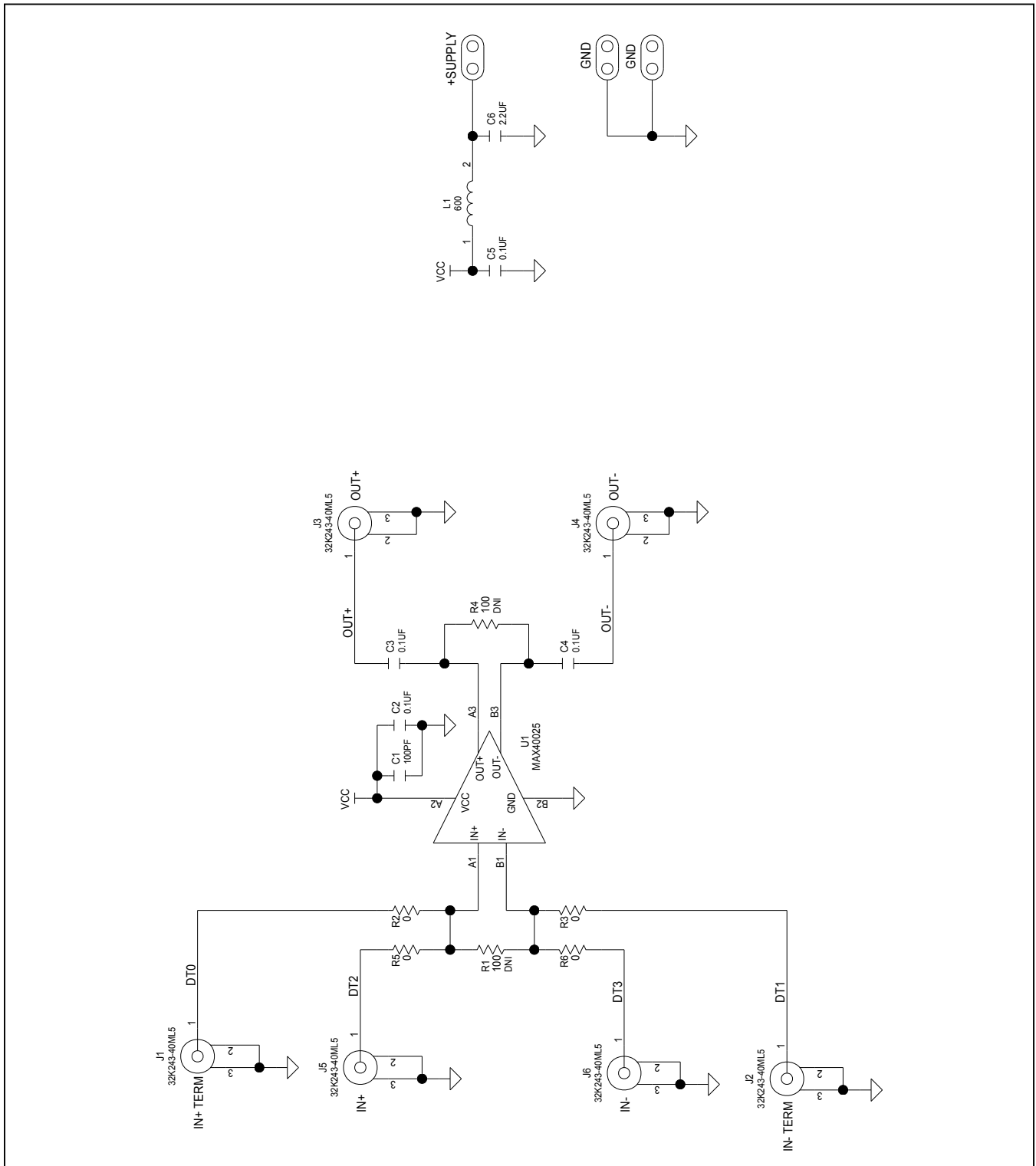
Test Setup

Note that a test setup optimized for high-speed measurement is essential to observe the true performance of the MAX40025 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.

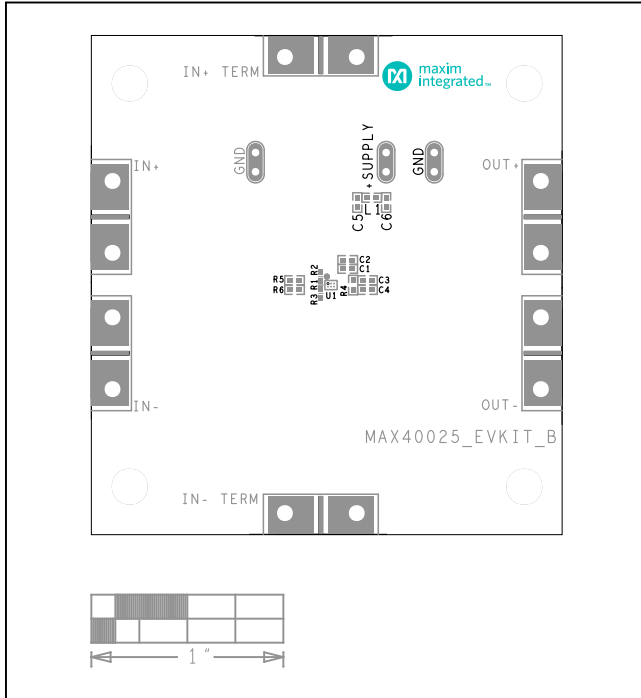
MAX40025 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	GND, +SUPPLY	-	3	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG
2	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=C0G
3	C2-C5	-	4	CGA2B3X7R1H104K;C1005X7R1H104K050BB; 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
4	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
5	J1-J6	-	6	32K243-40ML5	ROSENBERGER	32K243-40ML5	CONNECTOR; FEMALE; SMT; SMA JACK PCB; RIGHT ANGLE; 2PINS
6	L1	-	1	BLM15PX601SN1	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; CR0402-16W-000RJT	YAGEO PHYCOMP;VENKEL LTD.	0	RESISTOR; 0402; 0 OHM; 5%; JUMPER; 0.063W; THICK FILM
9	U1	-	1	MAX40025	MAXIM	MAX40025	EVKIT PART-IC; MAX40025; PACKAGE OUTLINE: 21-100183; PACKAGE CODE: N60G1+1; WLP6
10	PCB	-	1	MAX40025	MAXIM	PCB	PCB;MAX40025
11	R1, R4	DNP	0	CRCW0402100RFK; 9C04021A1000FL; RC0402FR-07100RL	VISHAY DALE;PANASONIC; YAGEO PHYCOMP	100	RESISTOR; 0402; 100 OHM; 1%; 100PPM; 0.063W; THICK FILM
TOTAL			26				

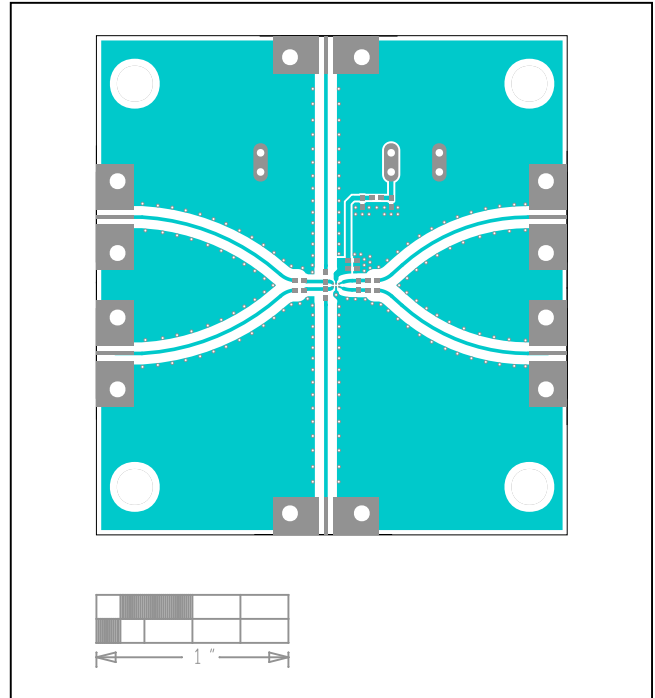
MAX40025 EV Kit Schematic



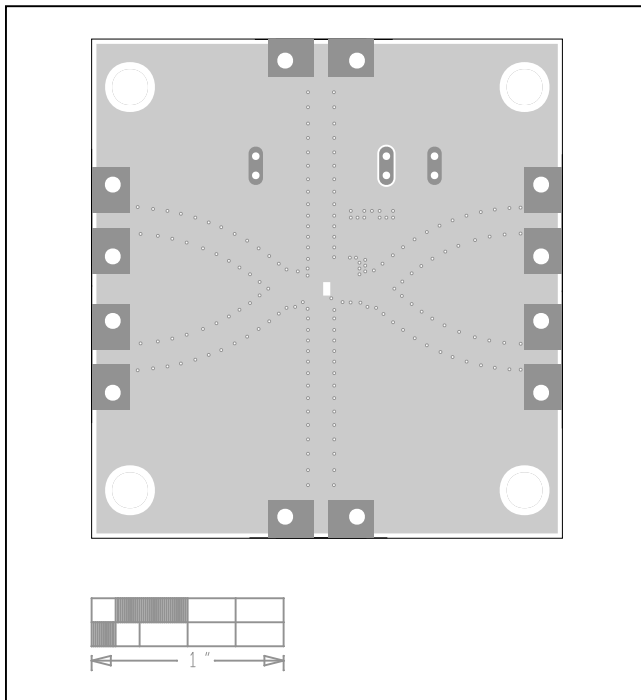
MAX40025 EV Kit PCB Layout Diagrams



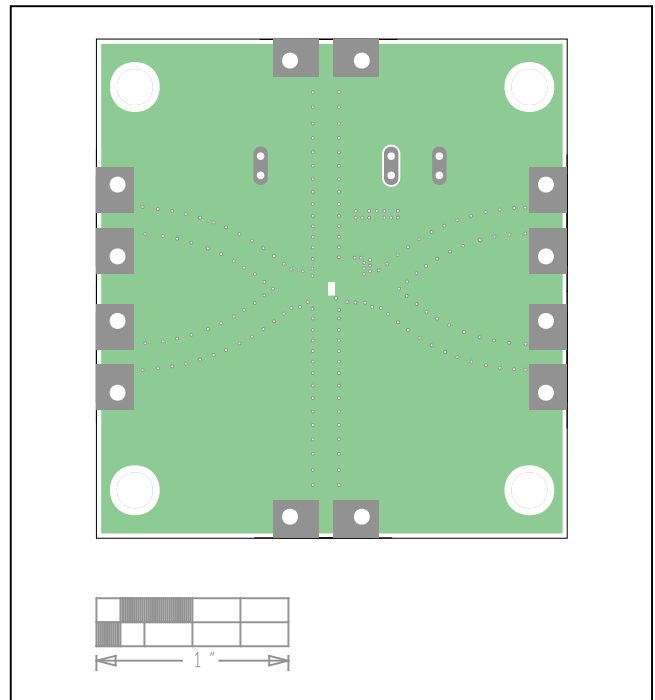
MAX40025 EV Kit—Top Silkscreen



MAX40025 EV Kit—Top

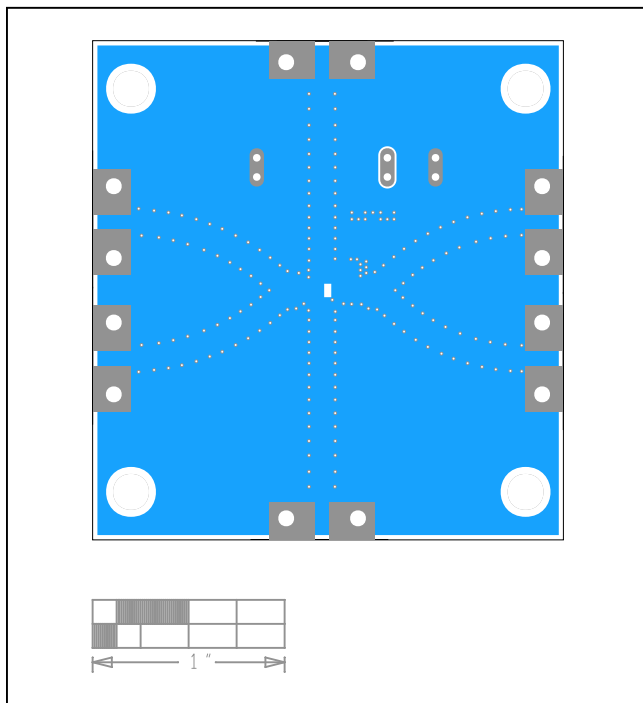


MAX40025 EV Kit—GND2

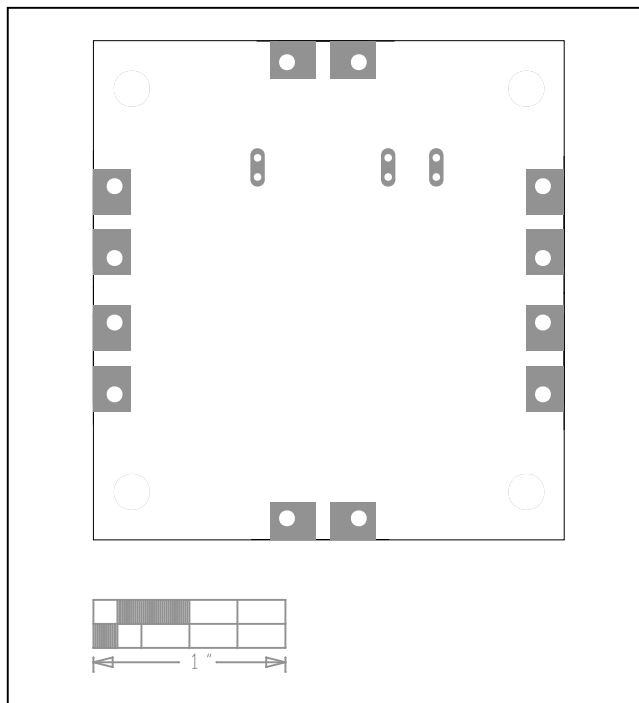


MAX40025 EV Kit—GND3

MAX40025 EV Kit PCB Layout Diagrams (continued)



MAX40025 EV Kit—Bottom



MAX40025 EV Kit—Bottom Silkscreen