Click here for production status of specific part numbers.

MAX40027 Evaluation Kit

Evaluates: MAX40027

General Description

The MAX40027 evaluation kit (EV kit) is a fully assembled electrical demonstration kit that provides a proven design to evaluate the MAX40027 ultra-low 280ps propagation delay, ultra-low dispersion dual 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 MAX40027 comparator is ideal for time of flight distance measurement applications.

This evaluation kit demonstrates the MAX40027.

Features

- Fast Propagation Delay: 280ps (Typ)
- Low Over-Drive Dispersion: 25ps (V_{OV} = 10mV to 1V)
- Supply Voltage 2.7V to 3.6V
- 45.9mW at 2.7V Supply (Per Comparator)
- Power-Efficient LVDS Outputs
- -40°C to +125°C Temperature Range

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

Quick Start

Required Equipment

- MAX40027 EV kit
- 6 matched-length SMA cables (preferably up to 18GHz capable), 2 feet, or less, in length
- +3.6V, 100mA DC power supply
- High-speed signal generator with differential outputs capable of generating square waves with < 500ps rise times. (e.g., HP 8131A)
- High-speed oscilloscope with 50Ω termination

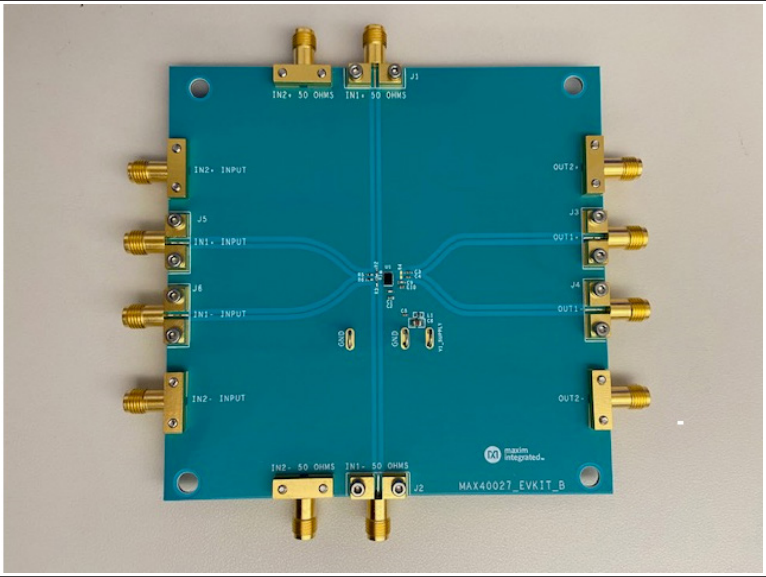
Procedure

The MAX40027 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 power supply to +3.3V. Disable the power supply.
2) Connect the negative terminal of the power supply to the GND pad. Connect the positive terminal of the 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 a common mode voltage of +2.5V. Disable the signal generator outputs.

MAX40027 EV Kit Photo



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4) Connect the signal generator differential outputs to the edge-mount SMA connector marked IN1+ INPUT and IN1- INPUT.
5) Enable power supply. Enable the signal generator.
6) Verify that the supply current is within 5% of 35mA
7) Monitor and verify inputs “IN1+ 50Ω” and “IN1- 50Ω” with the oscilloscope. The oscilloscope must be configured for 50Ω input termination.
8) Monitor and verify outputs OUT1+ and OUT1- with the oscilloscope. The oscilloscope must be configured for 50Ω input termination.
9) To test comparator 2, repeat steps 4 to 8 but using the inputs and outputs intended for comparator 2.

Detailed Description of Hardware

The MAX40027 EV kit provides a proven design to evaluate MAX40027 dual comparator. The device offers ultra-low 280ps propagation delay, ultra-low dispersion of 25ps.

Supply Voltage

The MAX40027 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 MAX40027 EV kit provides an efficient and simple method to evaluate the comparator. The inputs to the device are from INx+ INPUT and INx- INPUT SMA connectors. INx+ 50Ω and INx- 50Ω 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 INx+ 50Ω and INx- 50Ω connectors, R1/R8 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

OUTx+ and OUTx- SMA connectors access the MAX40027 outputs. Both OUTx+ and OUTx- output traces are in default AC- coupled for easy evaluation when connecting to a 50Ω terminated oscilloscope. The outputs OUTx+ and OUTx- 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 (or C7 and C8 for comparator B) with 0Ω shorts and R4/R12 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 INx+ 50Ω and INx- 50Ω termination SMA edge connectors. When inputs from a signal generator are connected to the INx+ INPUT and INx- INPUT SMA connector inputs, INx+ 50Ω and INx- 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. Populate R5, R2, R6, and R3 (or R7, R10, R9, and R11 for comparator 2) 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 INx+ INPUT and INx- INPUT SMA connectors and when it is not desired to terminate the inputs to a scope, then the 0Ω resistor at R2 and R3 (or R10 and R11 for comparator 2) resistors must be de-populated and the 100Ω termination resistor must be populated at R1/R8.

This is helpful when high-speed devices (TIAs, differential amplifiers) connect directly to the inputs of MAX40027 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 OUTx+ and OUTx- SMA’s. C3 and C4 (or C7 and C8 for comparator 2) AC coupling capacitors couple the outputs to the 50Ω oscilloscope inputs. R4/R12 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 (or C7 and C8 for comparator 2) capacitors must be replaced with 0Ω resistor shorts and R4/R12 resistor must be populated with 100Ω termination.

Input and Output Delay Compensation

The MAX40027 EV kit provides ease of access to evaluate the propagation delay of the comparator. The length of the trace from R2 (or R10) to INx+ 50Ω and R3 (or R11) to INx- 50Ω is equal to the length of the trace from differential outputs of the MAX40027 to the OUTx+ and OUTx-SMA connectors. Hence the time taken for the input signal to travel from R2 (or R10) to INx+ 50Ω will be equal to the time taken by the output signal to reach the OUTx+ 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 MAX40027.

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.
- Use a 100Ω termination resistor for the LVDS output, connected directly between OUTx+ and OUTx-, 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 MAX40027 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.

Ordering Information

PART	TYPE
MAX40027EVKIT#	EV Kit

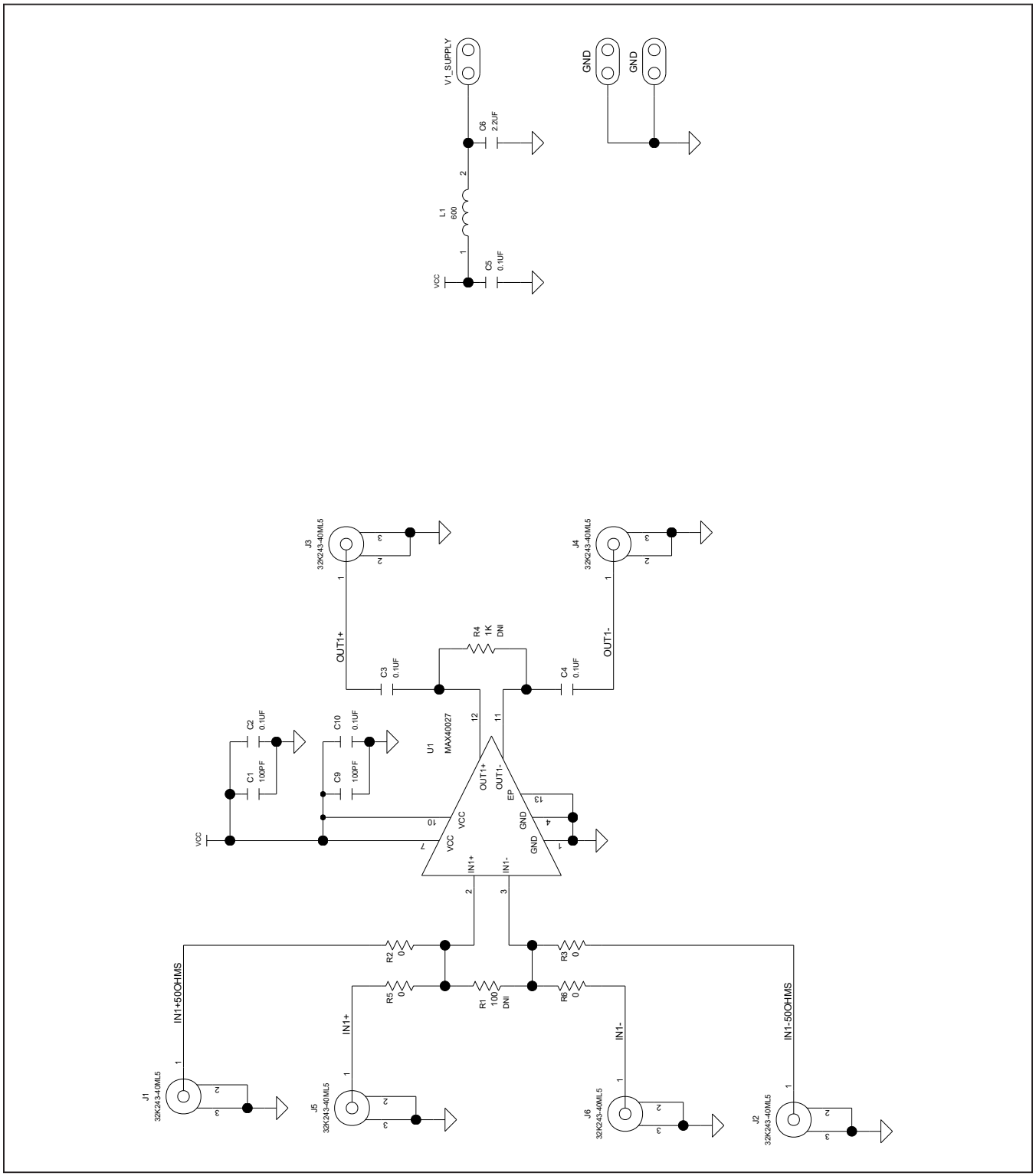
#Denotes RoHS compliant.

MAX40027 EV Kit Bill of Materials

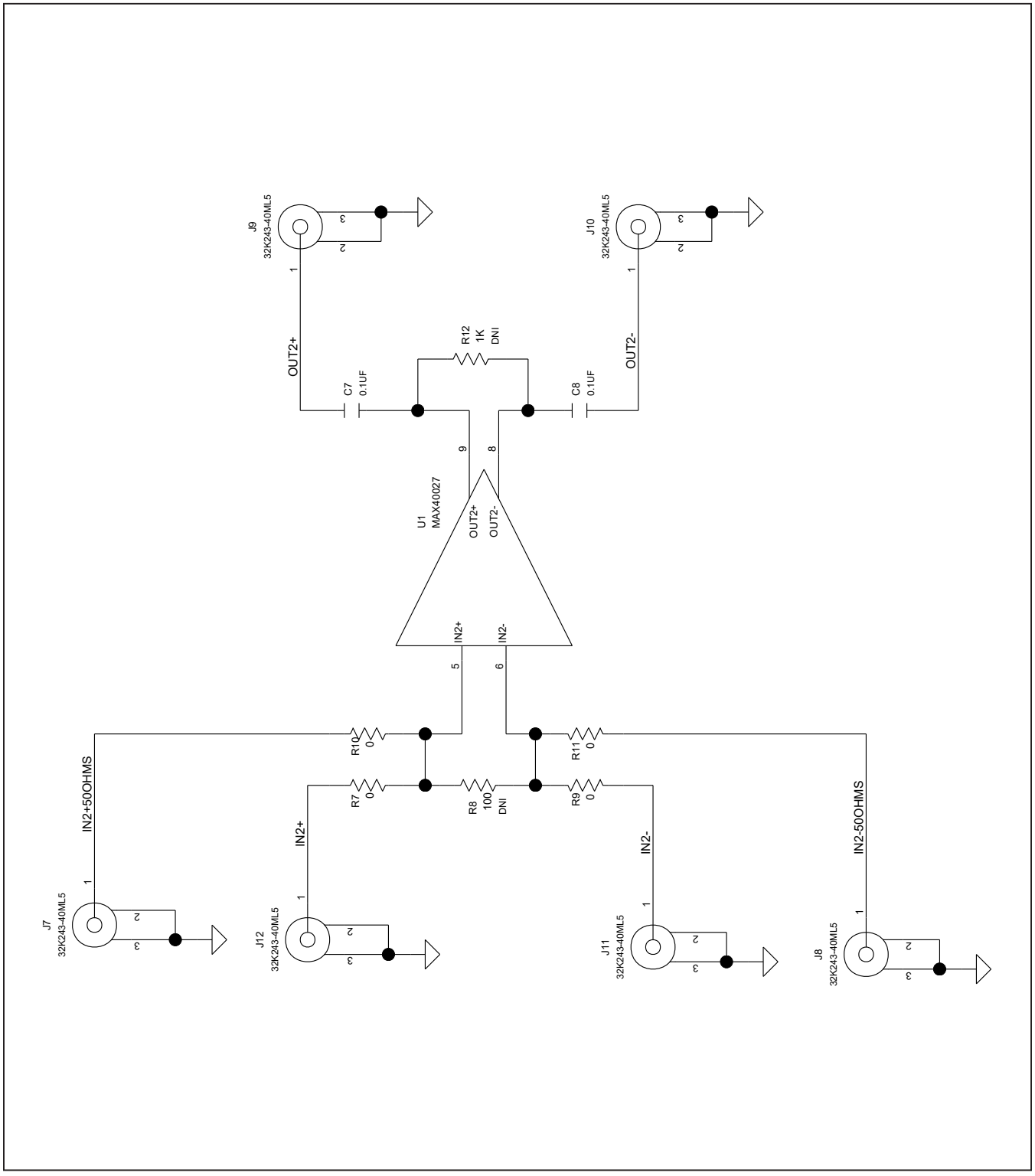
NOTE: DNI--> DO NOT INSTALL(PACKOUT) ; DNP--> DO NOT PROCURE

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C9	-	2	C0402C101J5GAC; NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005C0G1H101J050BA; 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
2	C2-C5, C7, C8, C10	-	7	CGA2B3X7R1H104K050BB; C1005X7R1H104K050BB; GRM155R71H104KE14; GCM155R71H104KE02; C1005X7R1H104K050BE; UMK105B7104KV-FR; CGA2B3X7R1H104K050BE	TDK;TDK;MURATA; MURATA;TDK;TAIYO YUDEN;TDK	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
3	C6	-	1	C2012X7R1H225K125AC; CGA4J3X7R1H225K125AB; CGA4J3X7R1H225K125AE	TDK;TDK;TDK	2.2UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 2.2UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
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-J12	-	12	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-R7, R9-R11	-	8	RC0402JR-070RL; CR0402-16W-000RJT	YAGEO PHYCOMP;VENKEL LTD.	0	RESISTOR; 0402; 0 OHM; 5%; JUMPER; 0.063W; THICK FILM
9	U1	-	1	MAX40027	MAXIM	MAX40027	EVKIT PART - IC; MAX40027; CC08; FAST DUAL COMPARATOR; PACKAGE OUTLINE DRAWING: 21-100369; LAND PATTERN DRAWING: 90-100136
10	PCB	-	1	MAX40027	MAXIM	PCB	PCB:MAX40027
11	R1, R8	DNP	0	CRCW0402100RFK; 9C04021A1000FL; RC0402FR-07100RL	VISHAY DALE; PANASONIC; YAGEO PHYCOMP	100	RESISTOR; 0402; 100 OHM; 1%; 100PPM; 0.063W; THICK FILM
12	R4, R12	DNP	0	CRCW04021K00FK; RC0402FR-071KL; MCR01MZPF1001	VISHAY DALE;YAGEO PHICOMP;ROHM	1K	RESISTOR; 0402; 1K; 1%; 100PPM; 0.0625W; THICK FILM
TOTAL			40				

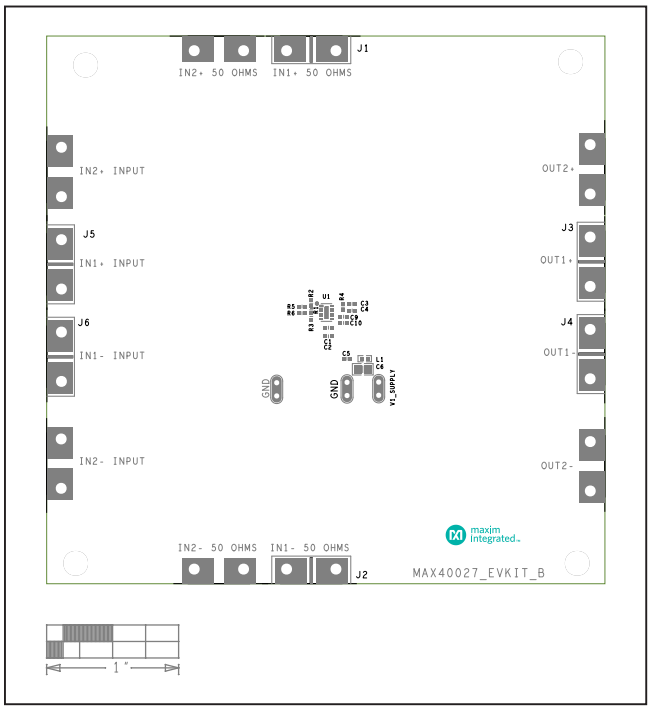
MAX40027 EV Kit Schematics



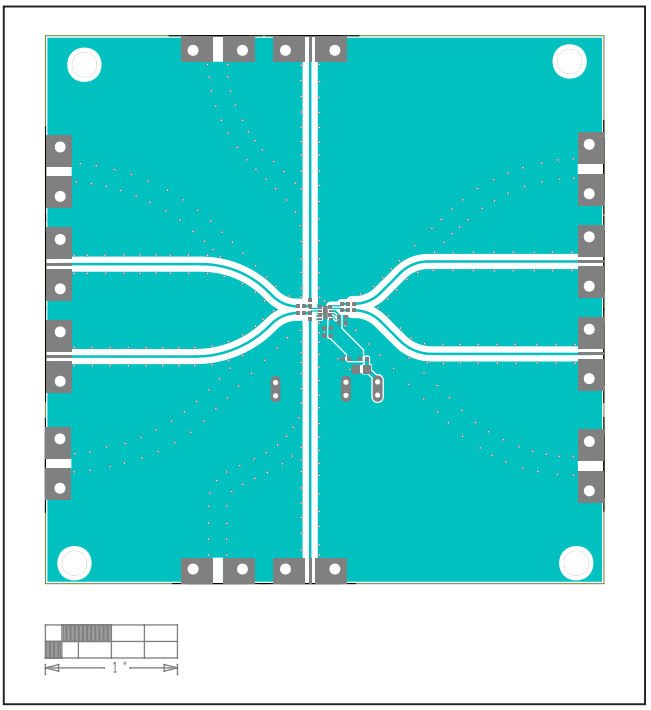
MAX40027 EV Kit Schematics (continued)



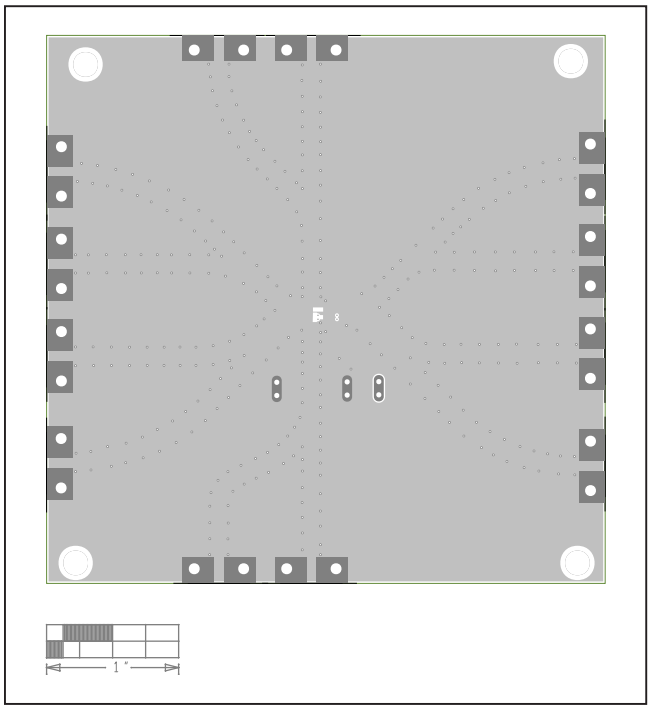
MAX40027 EV Kit PCB Layout Diagrams



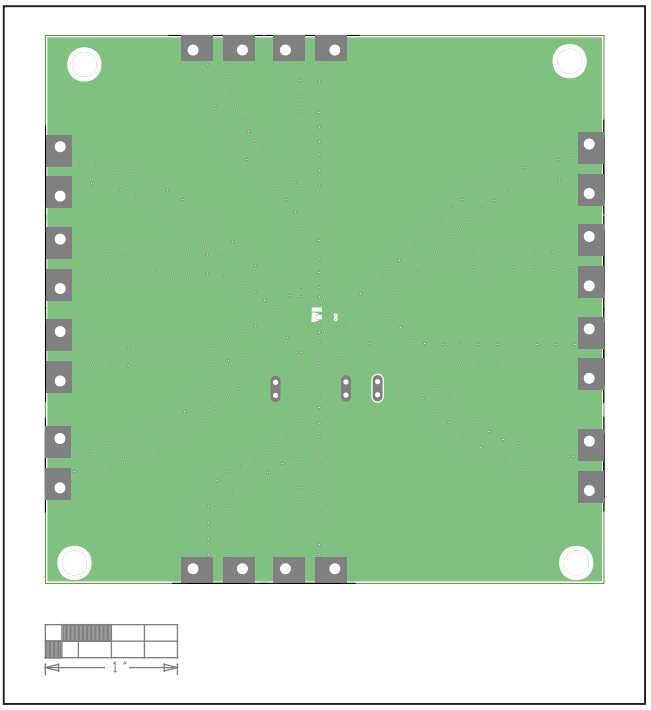
MAX40027 EV Kit—Top Silkscreen



MAX40027 EV Kit—Top

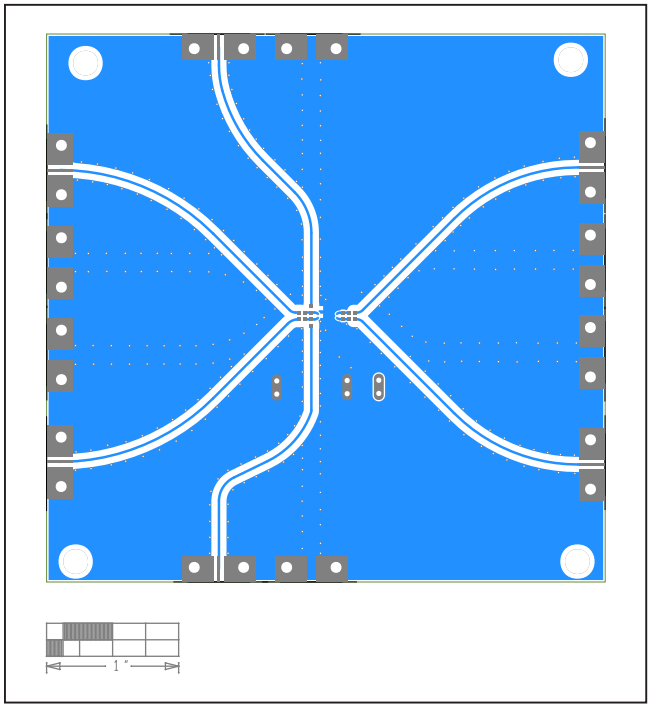


MAX40027 EV Kit—GND2

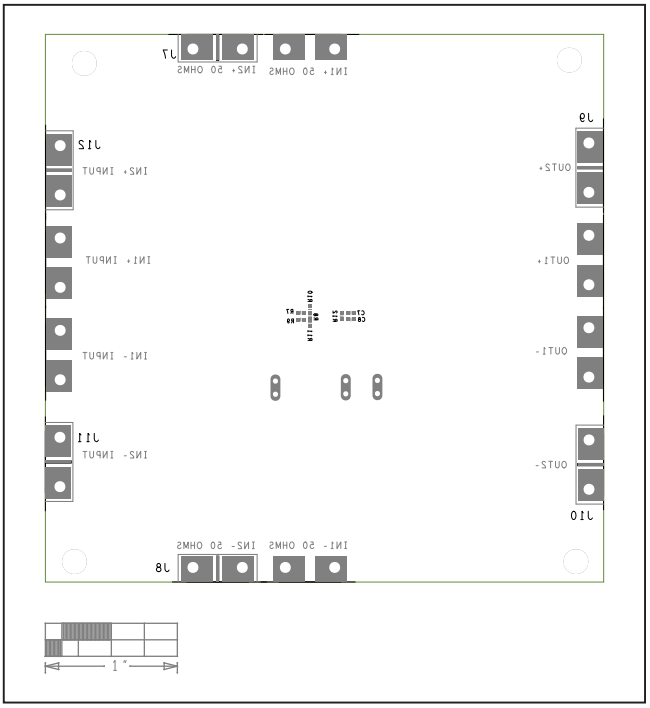


MAX40027 EV Kit—GND3

MAX40027 EV Kit PCB Layout Diagrams (continued)



MAX40027 EV Kit—Bottom



MAX40027 EV Kit—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/20	Initial release	—

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