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MAX40024 Evaluation Kit

Evaluates: MAX40024

General Description

The MAX40024 evaluation kit (EV kit) provides a proven design to evaluate the MAX40024 low-noise, low-power, low-bias-current, rail-to-rail dual-operational amplifiers (op amps) in an 9-bump (1.23mm x 1.23mm x 0.5mm) wafer-level package (WLP). The EV kit circuit is preconfigured as noninverting amplifiers, but can be adapted to other topologies by changing a few components.

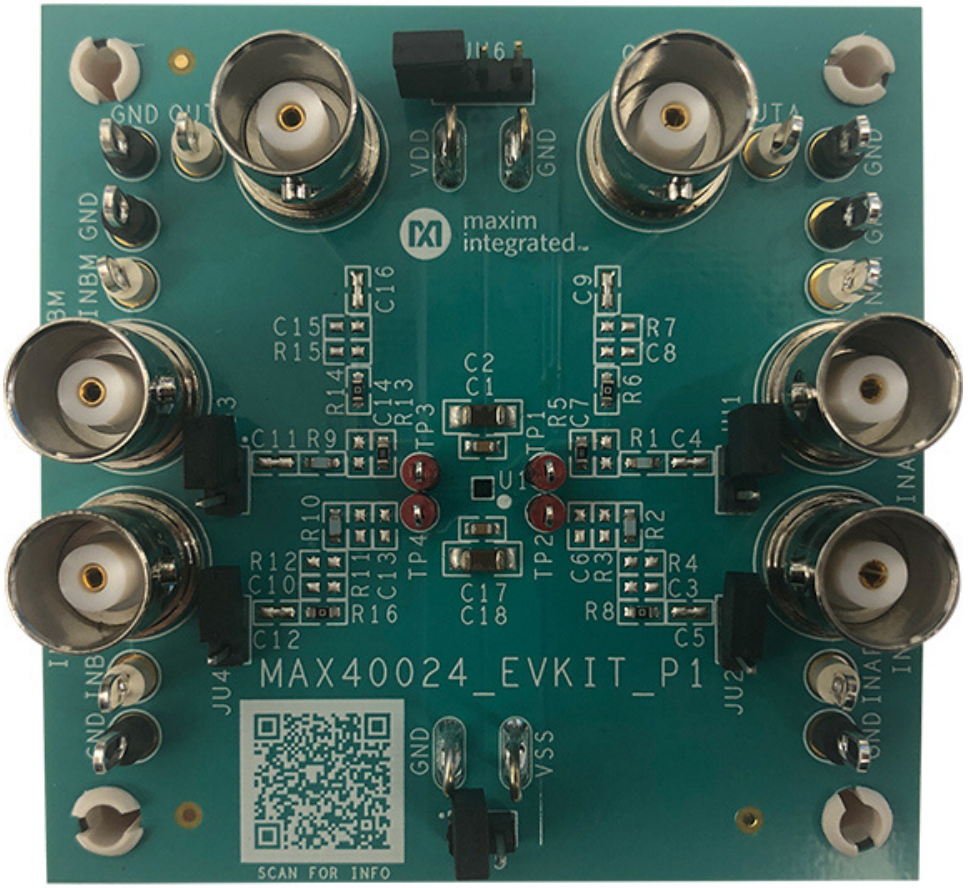
The EV kit comes with a MAX40024ANL+ installed.

Features

- Accommodates Multiple Op Amp Configurations
- Accommodates Easy-to-Use Components
- Proven PCB Layout
- Fully Assembled and Tested

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

MAX40024 EV Kit Photo



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Quick Start

Required Equipment

- MAX40024 EV kit
- +5V, 10mA DC power supply (PS1)
- Two precision voltage sources
- Two digital multimeters (DMMs)

Procedure

The EV kit is fully assembled and tested. Use the following steps to verify board operation:

1) Verify that all jumpers (JU1–JU6) are in their default positions, as shown in Table 1.
2) Connect the positive terminal of the +1.8V supply to V_{DD} and the negative terminal to GND and V_{SS}.
3) Connect the positive terminal of the precision voltage source to IN1+. Connect the negative terminal of the precision voltage source to GND. IN1- is already connected to GND through jumper JU1.
4) Connect the positive terminal of the second precision voltage source to the IN2+ test point. Connect the negative terminal of the precision voltage source to GND. IN2- is already connected to GND through jumper JU3.
5) Connect the DMMs to monitor the voltages on OUT1 and OUT2. With the 10kΩ feedback resistors and 1kΩ series resistors, the gain of each noninverting amplifier is +11.
6) Turn on the +1.8V power supply.
7) Apply 100mV from the precision voltage sources. Observe the output at OUTA and OUTB on the DMMs. Both should read approximately +1.1V.
8) Apply 40mV from the precision voltage sources. Both OUT1 and OUT2 should read approximately +0.44V.

Note: For dual-supply operation, a ±0.9V to ±1.8V can be applied to V_{DD} and V_{SS}, respectively. In this case, remove the shunt on jumper JU5. The rest of the procedure remains the same as that of the single-supply operation.

Detailed Description of Hardware

The MAX40024 EV kit provides a proven layout for the MAX40024 low-noise, low-power, low-bias-current, dual op amp. The device is a single/dual-supply, dual op amp (op amp 1 and op amp 2) that is ideal for sensors.

The default configuration for the device in the EV kit is dual-supply operation in noninverting configuration. However, the device can operate with a single-supply as long as the voltage across the V_{DD} and V_{SS} pins of the IC do not exceed the absolute maximum ratings. When operating with a single supply, short V_{SS} to GND using jumper JU5.

Op-Amp Configurations

The device is a single/dual-supply dual op amp that is ideal for differential sensing, noninverting amplification, buffering, and filtering. A few common configurations are shown in the next few sections.

The following sections explain how to configure one of the device's op amps (op amp 1). To configure the device's second op amp (op amp 2), the same equations can be used after modifying the component reference designators.

Noninverting Configuration

The EV kit comes preconfigured as a noninverting amplifier. The gain is set by the ratio of R5 and R1. The EV kit comes preconfigured for a gain of +11. The output voltage for the noninverting configuration is given by the equation below:

$$V_{OUT1} = (1 + \frac{R5}{R1})[V_{IN1+} \pm V_{OS}]$$

Inverting Configuration

To configure the EV kit as an inverting amplifier, remove the shunt on jumper JU1 and install a shunt on jumper JU2 and feed an input signal on the IN1- test point.

Differential Amplifier

To configure the EV kit as a differential amplifier, replace R1–R3 and R5 with appropriate resistors. When R1 = R2 and R3 = R5, the CMRR of the differential amplifier is determined by the matching of the resistor ratios R1/R2 and R3/R5.

$$V_{OUT1} = GAIN \times (V_{IN1+} - V_{IN1-})$$

where:

$$GAIN = \frac{R5}{R1} = \frac{R3}{R2}$$

Capacitive Loads

Some applications require driving large capacitive loads. The EV kit provides C8 and R6 pads for optional capacitive-load driving circuit. C8 simulates the capacitive load while R6 acts as an isolation resistor to improve the op amp's stability at higher capacitive loads. To improve the stability of the amplifier in such cases, replace R6 with a suitable resistor value to improve amplifier phase margin.

Table 1. Jumper Descriptions (JU1–JU5)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	Pin 1	Disconnects IN1- from GND.
	1-2*	Connects IN1- to GND through R1 for noninverting configuration.
JU2	Pin 1*	Disconnects IN1+ from GND.
	1-2	Connects IN1+ to GND through R2.
JU3	Pin 1	Disconnects IN2- from GND.
	1-2*	Connects IN2- to GND through R9 for noninverting configuration.
JU4	Pin 1*	Disconnects IN2+ from GND.
	1-2	Connects IN2+ to GND through R10.
JU5	Pin 1*	VSS and GND are independently supplied for dual-supply operation.
	1-2	Connects VSS to GND for single-supply operation.
JU6	1-2*	Set Op amp to normal operation mode
	2.3	Set Op amp to Shutdown mode

**Default position.*

Ordering Information

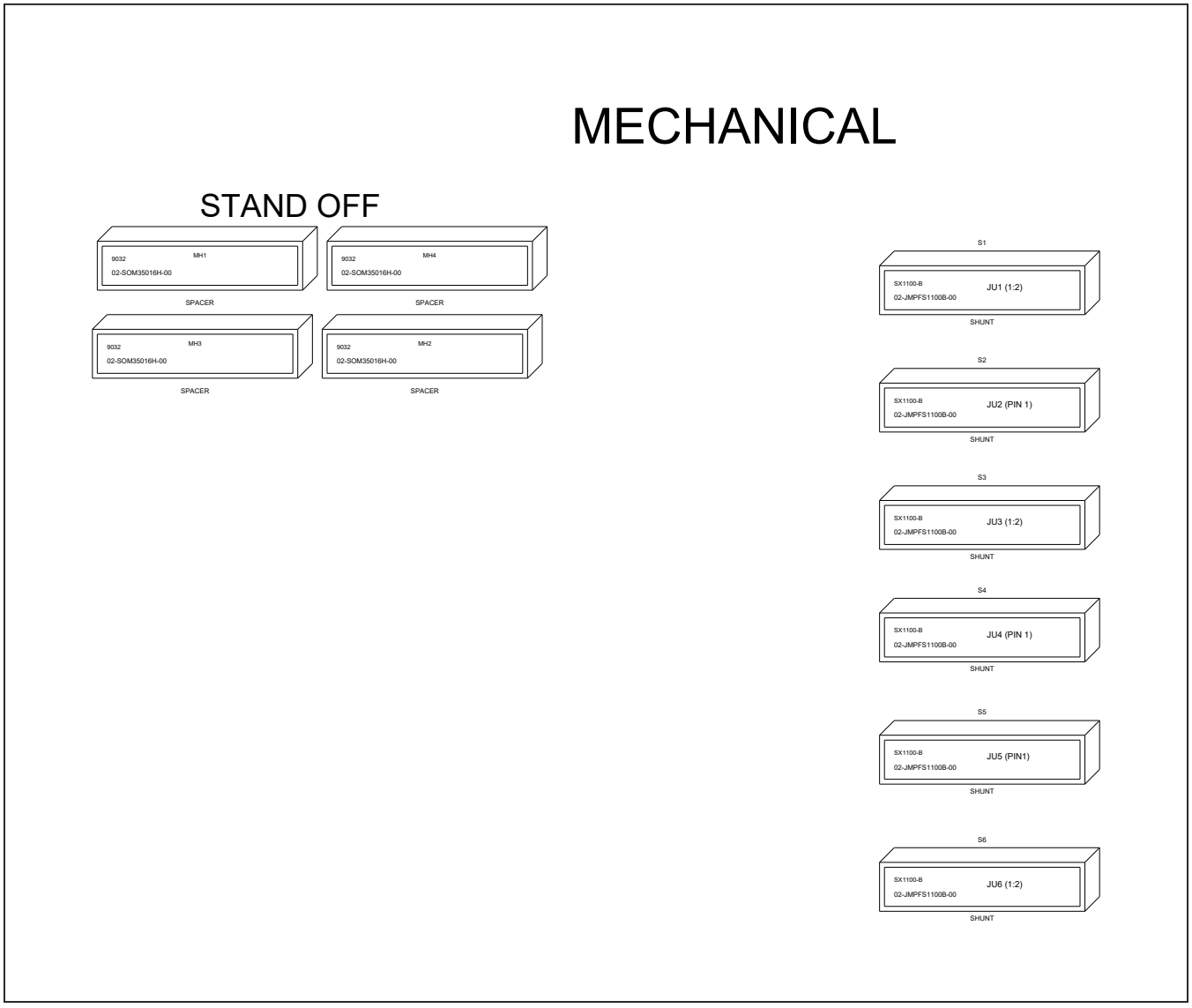
PART	TYPE
MAX40024EVKIT#	EV Kit

#Denotes RoHS compliance.

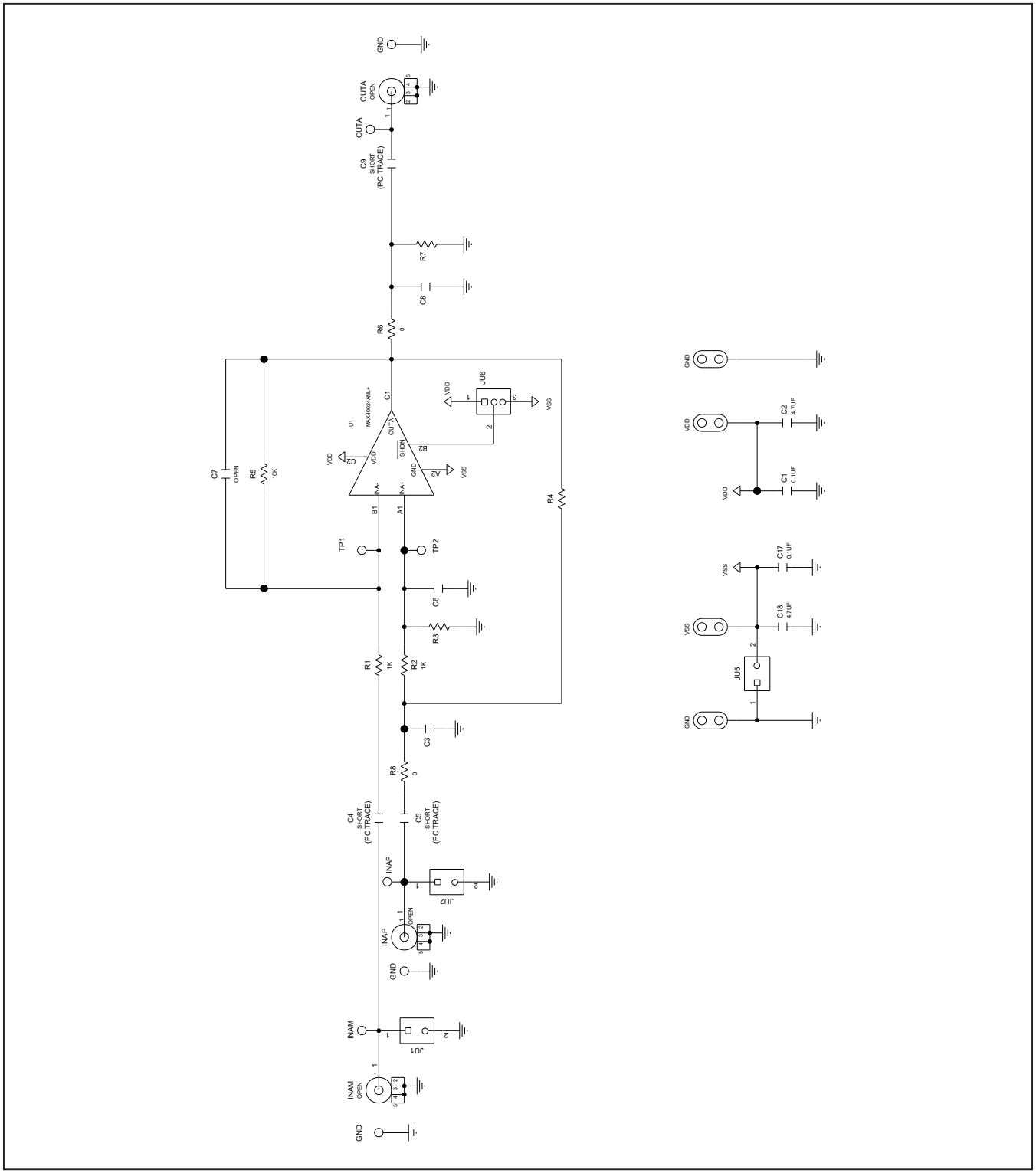
MAX40024 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C17	-	2	C1608X5R1H104K080AA	TDK	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 50V; X5R; CERAMIC
2	C2, C18	-	2	GRM31CR71H475KA12; GRJ31CR71H475KE11; GXM31CR71H475KA10; UMK316AB7475KL	MURATA;MURATA; MURATA;TAIYO YUDEN	4.7UF	CAP; SMT (1206); 4.7UF; 10%; 50V; X7R; CERAMIC
3	GND, TP0_GND, TP1_GND-TP4_GND	-	6	5011	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
4	JU1-JU5	-	5	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
5	JU6	-	1	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC
6	MH1-MH4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
7	R1, R2, R9, R10	-	4	MCT06030C1001F	VISHAY BEYSCHLAG	1K	RES; SMT (0603); 1K; 1%; +/-50PPM/DEGK; 0.1250W
8	R5, R13	-	2	CRCW060310K0FKEAHP	VISHAY DRALORIC	10K	RES; SMT (0603); 10K; 1%; 100PPM; 0.2500W
9	R6, R8, R14, R16	-	4	RC1608J000CS; CR0603-J/-000ELF; RC0603JR-070RL	SAMSUNG ELECTRONICS; BOURNS;YAGEO PH	0	RES; SMT (0603); 0; 5%; JUMPER; 0.1000W
10	S1-S6	-	6	S1100-B;SX1100-B; STC02SYAN	KYCON;KYCON; SULLINS ELECTRONICS CORP.	SX1100-B	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.24IN; BLACK; INSULATION=PBT;PHOSPHOR BRONZE CONTACT=GOLD PLATED
11	TP1-TP4	-	4	5000	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
12	TP6_GND, TP7_GND, VDD, VSS	-	4	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG
13	TP_INAM, TP_INAP, TP_INBM, TP_INBP, TP_OUTA, TP_OUTB	-	6	5012	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
14	U1	-	1	MAX40024ANL+	MAXIM	MAX40024ANL+	EVKIT PART - IC; MAX40024ANL+; PACKAGE OUTLINE DRAWING: 21-100549; PACKAGE CODE: N91G1+; WLP9
15	PCB	-	1	MAX40024	MAXIM	PCB	PCB:MAX40024
16	INAM, INAP, INBM, INBP, OUTA, OUTB	DNP	0	CN-BNC-011PG	FIRST TECH ELECTRONICS, CO.	CN-BNC-011PG	CONNECTOR; FEMALE; THROUGH HOLE; BNC JACK; STRAIGHT; 5PINS
17	C3, C6-C8, C10, C13-C15	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0603 NON-POLAR CAPACITOR
18	C4, C5, C9, C11, C12, C16	DNP	0	N/A	N/A	SHORT	PACKAGE OUTLINE 0603 NON-POLAR CAPACITOR
19	R3, R4, R7, R11, R12, R15	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0603 RESISTOR
TOTAL			52				

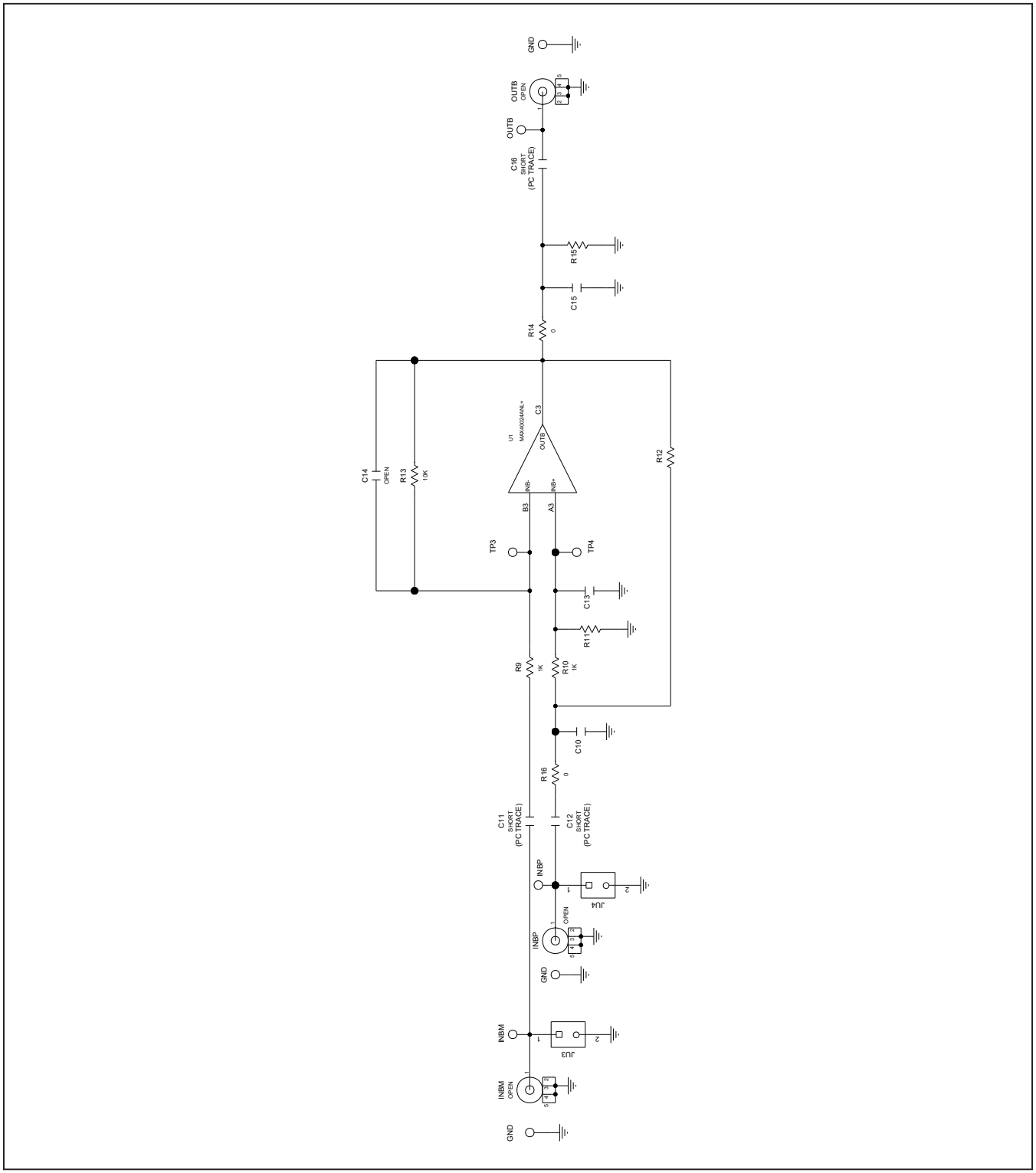
MAX40024 EV Kit Schematics



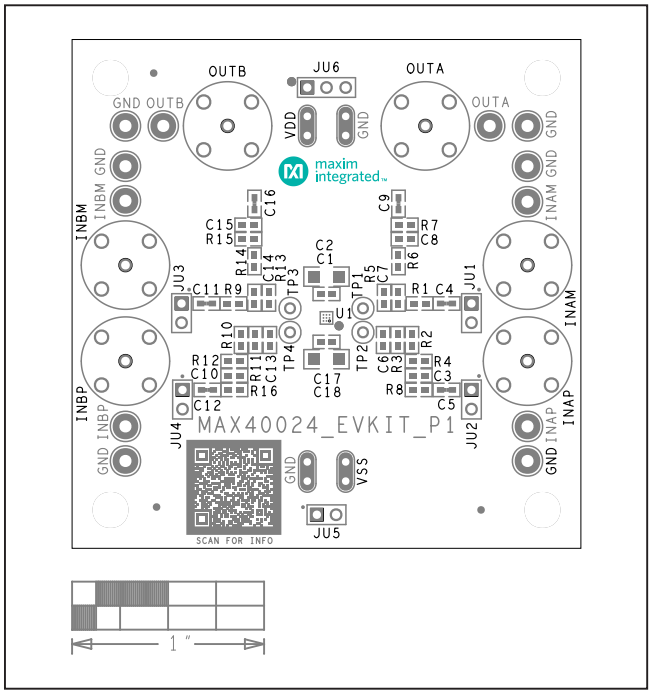
MAX40024 EV Kit Schematics (continued)



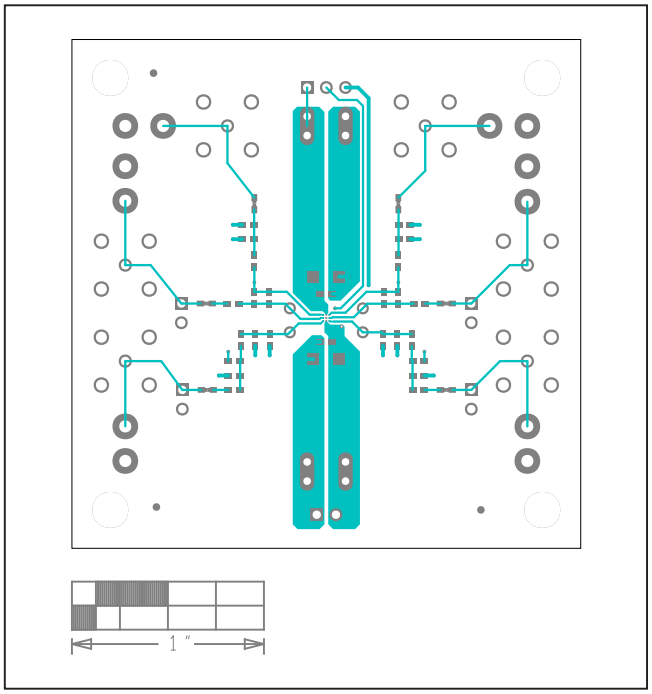
MAX40024 EV Kit Schematics (continued)



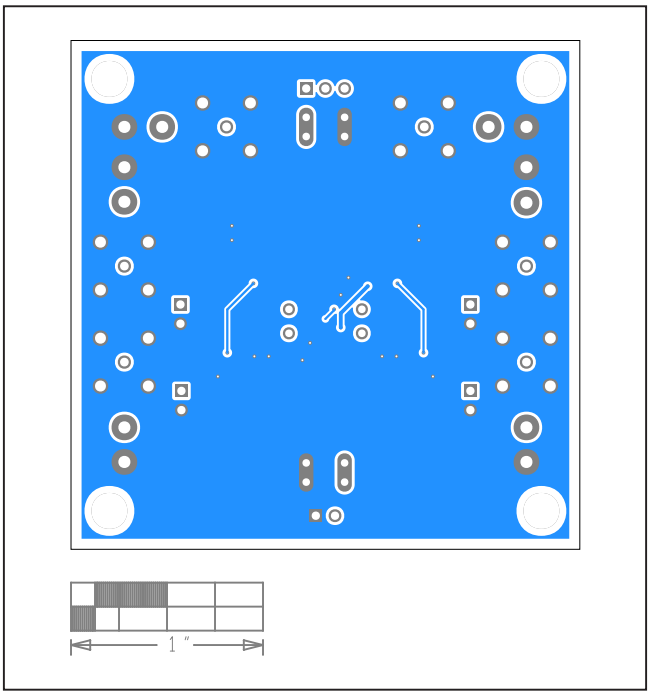
MAX40024 EV Kit PCB layouts



MAX40024 EV Kit Component Placement Guide—Top Silkscreen



MAX40024 EV Kit PCB Layout—Top



MAX40024 EV Kit PCB Layout—Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/21	Initial release	—

