MAX40204 Evaluation Kit

Evaluates: MAX40204

General Description

The MAX40204 evaluation kit (EV kit) is designed to evaluate the MAX40204ANA+, a precision bidirectional current-sense amplifier with wide common-mode input in an 8-bump WLP package. The EV kit provides bidirectional and unidirectional current-sensing options, a jumper (J1) to switch between two gain options (10V/V and 100V/V), and another jumper (J2) to place the board in low power mode.

The EV kit features Kelvin connections for force and sense at the amplifier inputs and a very precise current-sense resistor with a ±0.5% tolerance for accurate measurement. Various test points are included for additional evaluation. The EV kit PCB is available with the MAX40204ANA+ installed.

Features

- Wide -0.1V to 36V Input Range Common Mode Range
- Operates Off a Single 5V Supply
- Unidirectional/Bidirectional Operation
- On-the-Fly Gain Input Jumper
- Shutdown Mode Jumper
- -40°C to +125°C Temperature Range
- Lead(Pb)-Free and RoHS Compliant
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Required Equipment

- MAX40204 EV kit
- +5V, 10mA DC power supply
- 2.5V, 10mA DC power supply
- +12V, 1A DC power supply
- Electronic load or equivalent resistor load
- Two digital voltmeters (DVM1, DVM2)

Procedure

The MAX40204 EV kit is fully assembled and tested. Use the following steps to verify operation. **Caution: Do not turn on the power supplies until all connections are completed**.

1) Verify that the jumpers are in their default position, as shown in Table 1.
2) Connect the positive terminal of the +5V supply to VCC and the negative terminal to GND.
3) Connect the positive terminal of the +12V supply to VBATT and the negative terminal to TP1.
4) Connect the positive terminal of the 2.5V supply to REF, and the negative terminal to ground connection, TP3.
5) Connect the positive terminal of the electronic load to LOAD and the negative terminal of the electronic load to ground connection, TP2.
6) Connect the positive terminal of DVM1 to OUT and the negative terminal to ground connection TP3.
7) Connect the positive terminal of DVM2 to RS+ and the negative terminal to RS-.
8) Turn on the +5V supply first and then the +12V supply.
9) Set the electronic load to 250mA and turn the electronic load on. Observe DVM1 reading. It reads 125mV, approximately 10 times the voltage read on DVM2 above VREF voltage.
10) Set the gain for 100V/V and observe DVM1. It reads 1.25V.
11) Repeat the measurement for load currents of 500mA.

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Detailed Description

The MAX40204 EV kit provides a proven layout to demonstrate the true capability of the MAX40204, a 2µV (typ.) input offset high-side current-sense amplifier with 0.05% (typ.) gain error. The EV kit features various test points and jumpers to facilitate testing and evaluation of the current sense amplifier. In addition, optional input/output filtering component placeholder pads are provided to help evaluate the device's noise performance.

Measuring the Load Current

The MAX40204 EV kit comes with a 50mΩ (±0.5%) sense resistor (R_{SENSE}) connected to the RS+ and RS- inputs of the MAX40204 through Kelvin connections. The MAX40204 amplifies the voltage drop across the sense resistor and provides a voltage at it output, OUT. The output voltage depends on the sense current, current-sense resistor, and the gain configuration.

Unidirectional Current Sensing/Bidirectional Current Sensing

To configure the MAX40204 for unidirectional current sensing, connect REF to ground. In unidirectional configuration, the output voltage at OUT is referenced to ground. Use equation 1 below to determine the output voltage.

Equation 1:

$$V_{OUT} = I_{LOAD} \times R_{SENSE} \times GAIN$$

where I_{LOAD} is the load current, R_{SENSE} is sense resistor, and GAIN is gain of the current-sense amplifier set by jumper J1.

Bidirectional Current Sensing

For bidirectional configuration, connect REF to a voltage supply midlevel between VDD and ground. In this configuration, the output voltage at OUT is referenced the voltage at REF. Measured output voltage above the VREF indicates current flowing to the load, and measured output voltage below the VREF indicates current flowing from load to the source. Use equation 2 below to determine the output voltage.

Equation 2:

$$V_{OUT} = (I_{LOAD} \times R_{SENSE} \times GAIN) + VDD/2$$

where I_{LOAD} is the load current, R_{SENSE} is sense resistor, GAIN is gain of the current-sense amplifier set by jumper J1, and VDD/2 is the voltage connected to REF to set the output voltage reference level.

Gain Selection Jumper (J1)

Jumper J1 allows the MAX40204 EV kit to set the gain of the MAX40204 to either 10V/V or 100V/V. The default gain of the EV kit is 10V/V. See the Table 1 for more detail.

Shutdown Input (SHDN)

Use J2 jumper on the MAX40204 EV kit enable/disable the MAX40204 operation. See the Table 1 for more detail.

Table 1. Jumper Table (J1, J2)

JUMPER	SHUNT POSITION	DESCRIPTION
J1	1-2	Connects GAIN to VCC (Gain = 100V/V)
	2-3*	Connects GAIN to GND (Gain = 10V/V)
J2	1-2*	Connects $\overline{SHDN}$ to VCC (normal operation)
	2-3	Connects $\overline{SHDN}$ to GND (shutdown)

**Default position.*

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Wurth Electronics Inc.	248 756-5355	www.we-online.com
Murata	770-436-1300	www.murata.com
TDK	847-803-6100	www.component.tdk.com

Note: *Indicate that you are using the MAX40204 when contacting these component suppliers.*

Ordering Information

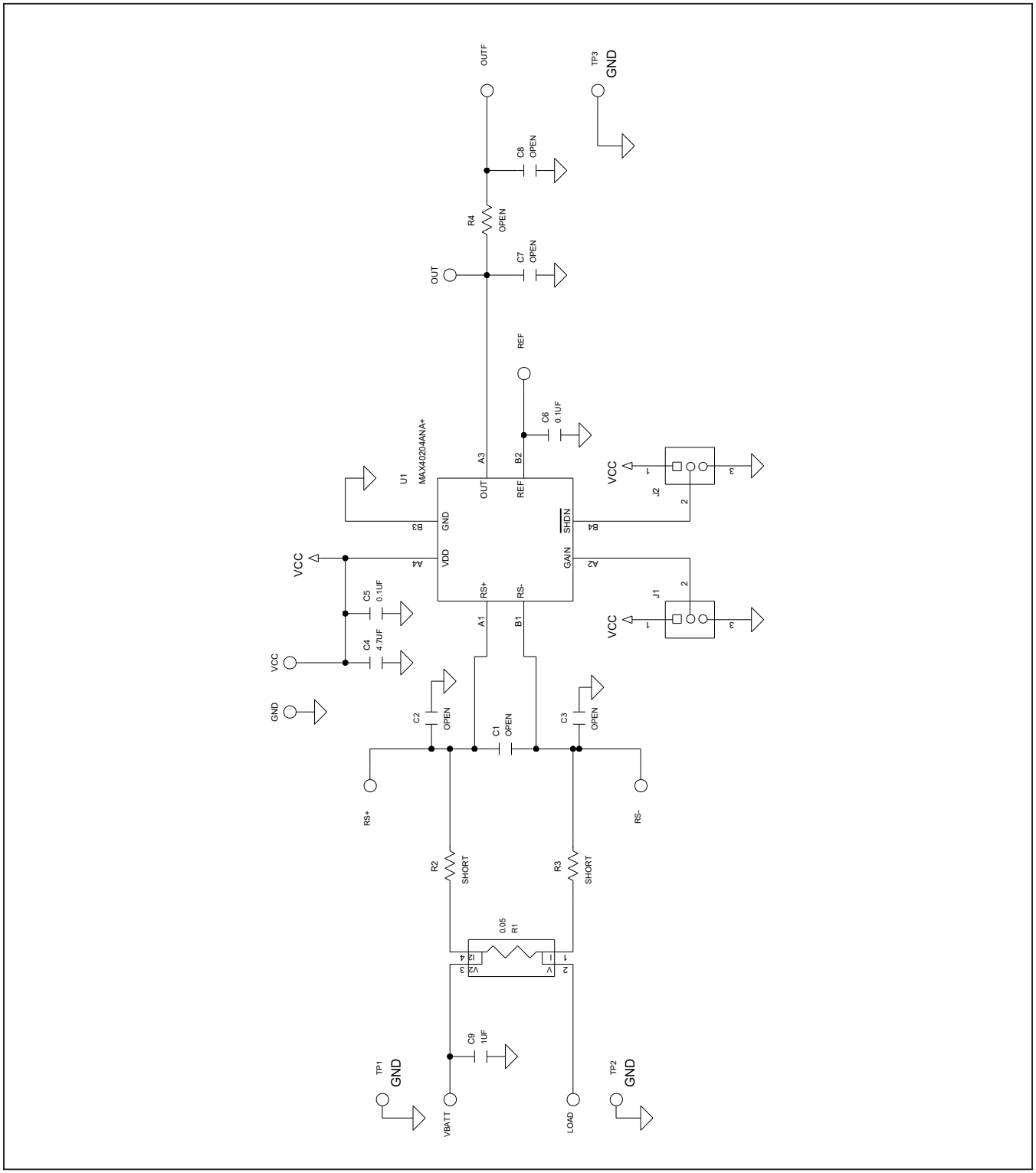
PART	TYPE
MAX40204EVKIT#	EV Kit

#Denotes RoHS compliance.

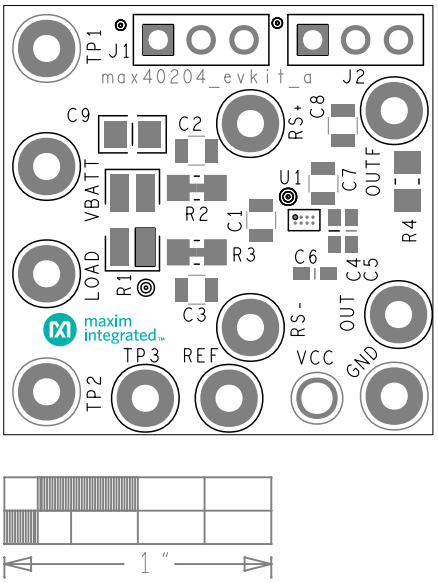
MAX40204 EV Kit Bill of Materials

PART	QTY	DESCRIPTION
C4	1	4.7µF ±10%, 16V X7R ceramic capacitor (0603) Murata: GRM188Z71C475KE21
C5, C6	2	0.1µF ±15%, 25V ceramic capacitors (0603) Murata: GRM18871E104KA01, Wurth Electronics Inc.885012206071, TDK:CGJ3E2XR1E104K080AA
C9	1	1µF ±10%, 100V ceramic capacitor (0805), Murat: GRJ21BC72A105KE11 TDK: C2012X7S2A105K125AB
C1-C3, C7, C8	5	Not installed, ceramic capacitors (0805)
	4	Test Points, Keystone 5011
	2	3-pin header
	7	Test Points, Keystone 5012
	1	0.05Ω ± 0.5% resistor (1206)
	3	Not installed, resistors (0805)
	1	MAX40204ANA+
	1	Test Points, Keystone 5023
	1	PCB, MAX40204 Evaluation kit

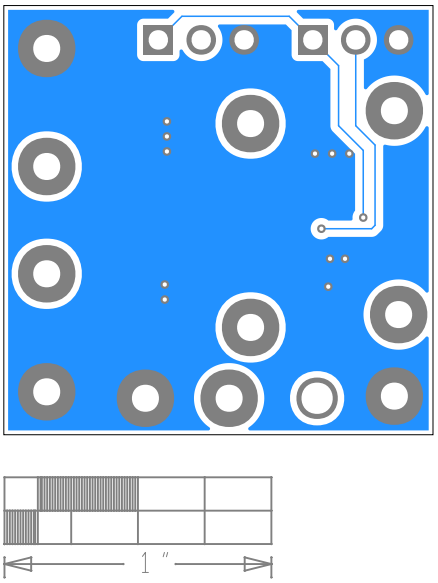
MAX40204 EV Kit Schematic



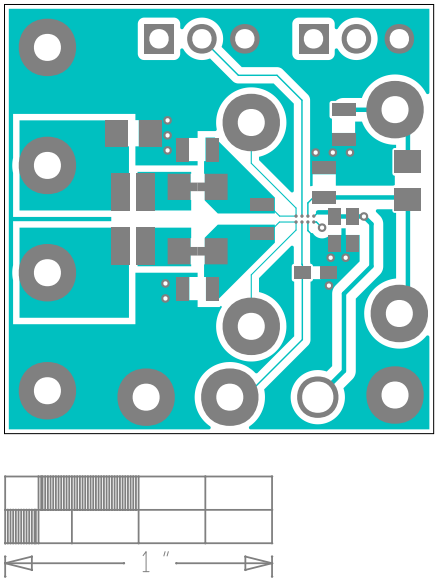
MAX40204 EV Kit PCB Layouts



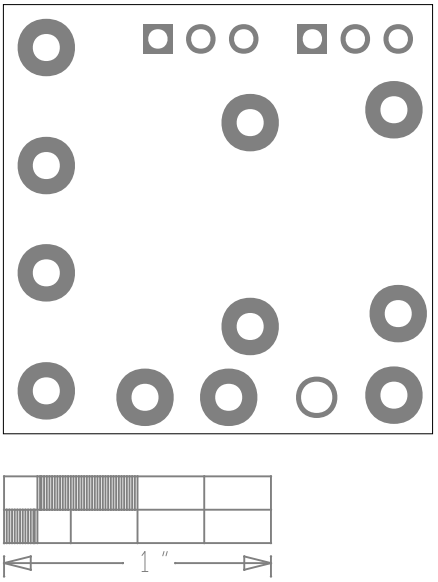
MAX40204 EV Kit Component Placement Guide—Top Silkscreen



MAX40204 EV Kit PCB Layout—Bottom



MAX40204 EV Kit PCB Layout—Top



MAX40204 EV Kit Component Placement Guide—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/20	Initial release	—

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