

## MAX49921 Evaluation Kit

Evaluates: MAX49921

### General Description

The MAX49921 evaluation kit (EV kit) provides a proven design to evaluate the MAX49921 high precision, high voltage, unidirectional current-sense amplifier. This EV kit demonstrates the MAX49921 in a small, 2mm x 3mm 8-pin TDFN package.

The EV kit PCB comes with a MAX49921FATA/VY+ installed, which is the 50V/V gain version. The other gain option available is the pin-compatible MAX49921TATA/VY+ (G = 20V/V). Contact the factory for MAX49921TATA/VY+ availability.

### EV Kit Contents

MAX49921 EV kit board

### Features

- Precision Real-Time Current Monitoring
- 0V to +70V Input Common-Mode Range
- Proven PCB Layout
- Fully Assembled and Tested

[Ordering Information](#) appears at end of data sheet.

### Quick Start

#### Required Equipment

The following items are required for operation:

- MAX49921 EV kit
- DC PS1 (power supply 1 for the IC, 2.7V to 5.5V, 100mA)
- DC PS2 (power supply 2 for the common-mode input, up to 70V, 3A)
- Electronic load (capable of sinking up to 3A and up to 70V)  
Note that if the electronic load is not available, remove the R1 sense resistor, and directly apply a sense voltage across the RS+ and RS- test points.
- Two digital multimeters (DMMs)

### MAX49921 EV Kit Photo



## Procedure

### MAX49921 Evaluation

The MAX49921 EV kit is fully assembled and tested. Use the following steps to verify board operation.

**Caution: Do not turn on power supply or the electronic load until all connections are made.**

- 1) Set the PS1 to 5V and turn it off. Connect the positive terminal of the PS1 to the VDD test point and the negative terminal of the supply to the nearest GND test point.
- 2) Set the PS2 to 12V (common-mode voltage) and turn it off. Connect the positive terminal of the PS2 to the VSENSE+ test point and the negative terminal of the PS2 to the nearest GND test point.
- 3) Set the electronic load to sink 1A.  
Note that the voltage at PS2 together with this 1A load develops approximately 50mV input voltage across the sense resistor (R1).
- 4) Connect the positive terminal of the electronic load to the VSENSE- test point and the negative terminal of the supply to the nearest GND test point.
- 5) Connect the first voltmeter between test points RS+ and RS- to measure VSENSE.
- 6) Connect the second voltmeter between VOUT and the nearest GND test points.
- 7) Enable the PS1 and then PS2 power supplies.
- 8) Enable the electronic load.  
Note that if the electronic load is not available, remove the R1 sense resistor, and directly apply a 50mV sense voltage across the RS+ and RS- test points.
- 9) Verify that the first voltmeter displays 50mV and the second voltmeter displays 2.5V.
- 10) Disable the electronic load first, then turn off the PS2 and then PS1 last.

## Detailed Description of Hardware

The MAX49921 EV kit provides a proven design to evaluate the MAX49921 high-side, unidirectional current-sense amplifier, which offers precision accuracy specifications of input offset voltage ( $V_{OS}$ ) of  $\pm 0.5\mu\text{V}$  (typ) and a gain error of  $\pm 0.05\%$  (typ).

### Applying the VRS+ Supply and the Load

The EV kit is installed with a MAX49921FATA/VY+, which has a 50V/V gain. The current-sense resistor R1 ( $R_{SENSE}$ ) value is  $0.05\Omega$  with  $\pm 0.5\%$  tolerance. The  $V_{OUT}$  can be estimate by:

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

where  $A_V$  is the gain and  $I_{LOAD}$  is the current load applied to the device. Normal operating  $V_{RS+}$  and  $V_{RS-}$  range is 0V to 70V.

### Measuring the Load Current

The load current is measured as a voltage drop ( $V_{SENSE}$ ) across an external sense resistor (R1). This voltage is then amplified by the current-sense amplifier and presented at its  $V_{OUT}$  pin. Like all differential amplifiers, the output voltage has two components of error (an offset error and a gain error). The offset error affects accuracy at low currents and a gain error affects accuracy at large currents. Both errors affect accuracy of measurement at intermediate currents. By minimizing both offset and gain errors, accuracy can be optimized over a wide dynamic range.

## Ordering Information

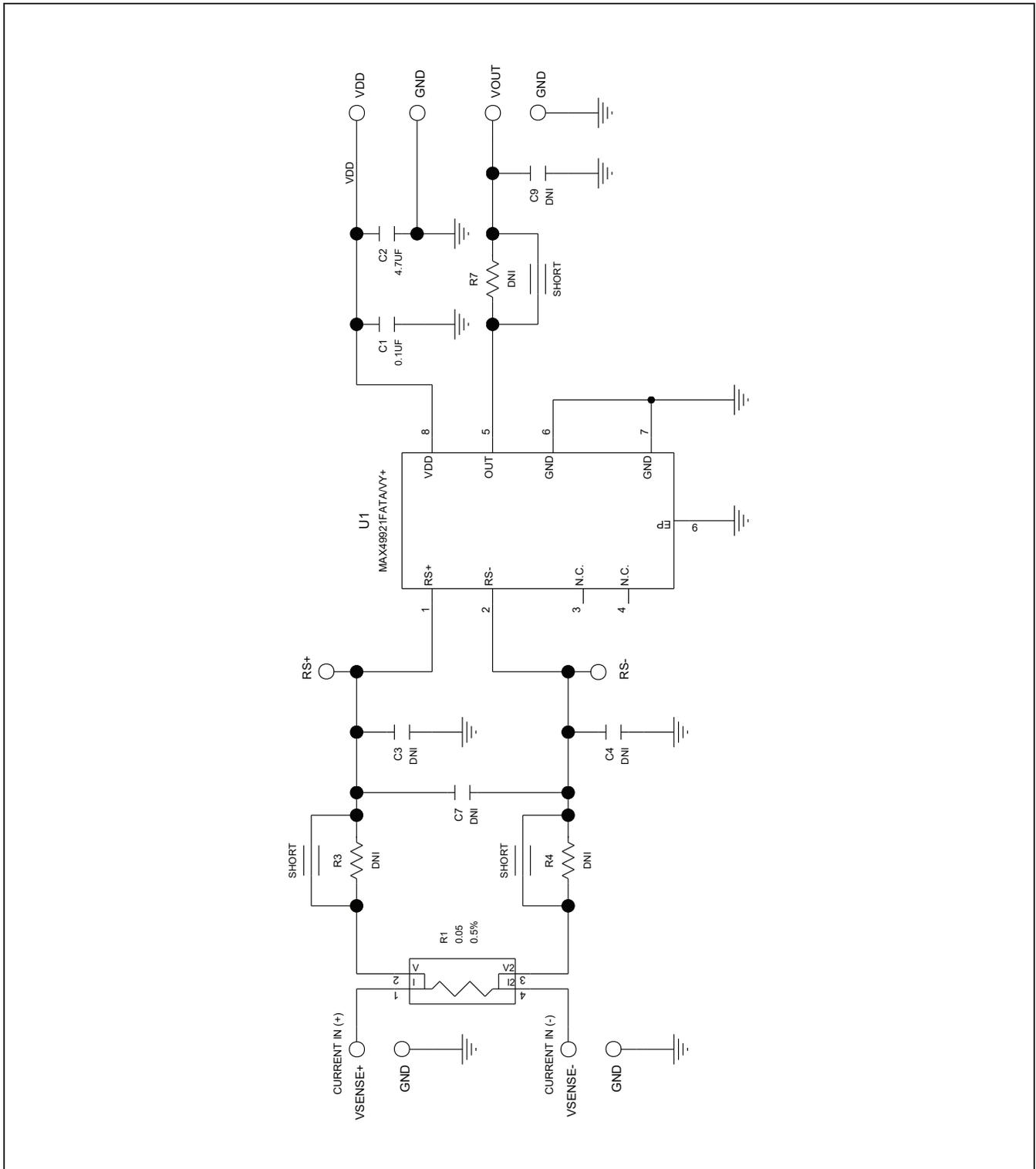
PART	U1 (INSTALLED)	TYPE
MAX49921EVKIT#	MAX49921FATA/VY+	EV Kit

#Denotes RoHS compliance.

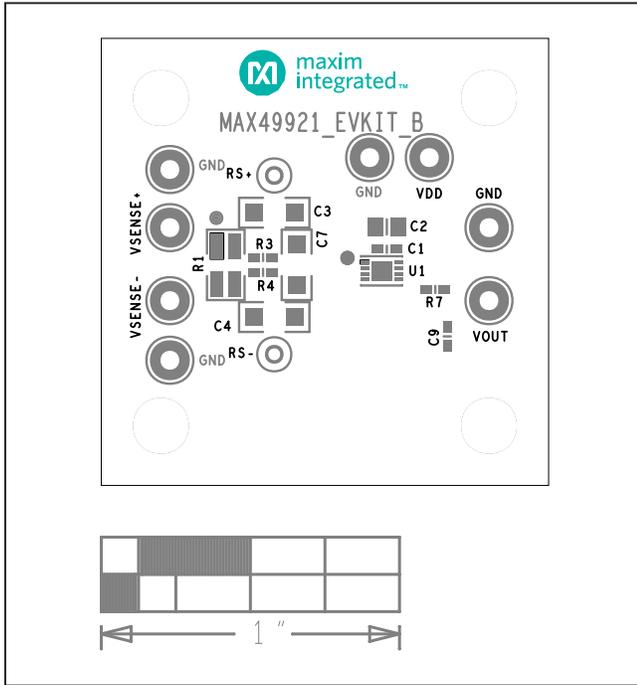
**MAX49921 EV Kit Bill of Materials**

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1	-	1	C0603C104K4RAC;GCM188R71C104KA37; C1608X7R1C104K;GRM188R71C104KA01; C0603X7R160-104KNE;VJ0603Y104KJCW18C; 0603YC104KAT4A;885012206046	KEMET;MURATA;TDK; MURATA; VENKEL LTD;VISHAY DALE;AVX; WURTH ELECTRONICS INC;TDK	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 16V; X7R; CERAMIC;
2	C2	-	1	GRM21BR71C475KA73;0805YC475KAT2A; GCM21BR71C475KA73;CGA4J3X7R1C475K125AE	MURATA;AVX;MURATA;TDK	4.7UF	CAP; SMT (0805); 4.7UF; 10%; 16V; X7R; CERAMIC
3	GND, TP2-TP4	-	4	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	MTH1-MTH4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
5	R1	-	1	LVK12R050DE	OHMITE MFG CO.	0.05	RESISTOR; 1206; 0.05 OHM; 0.5%; 50PPM; 0.5W; METAL FILM
6	RS+, RS-	-	2	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;
7	U1	-	1	MAX49921FATA/VY+	MAXIM	MAX49921FATA/VY+	EVKIT PART - IC; OZ93; MAX49921FATA/VY+; BI- AND UNIDIRECTIONAL; -0.1V TO 70V CURRENT-SENSE AMPLIFIERS; PACKAGE OUTLINE: 21-100417; PACKAGE LAND PATTERN DRAWING: 90-0091; TDFN8
8	VDD, VOUT, VSENSE+, VSENSE-	-	4	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
9	PCB	-	1	MAX49921	MAXIM	PCB	PCB:MAX49921
10	C3, C4, C7	DNP	0	C1206C102K1RAC	KEMET	1000PF	CAP; SMT (1206); 1000PF; 10%; 100V; X7R; CERAMIC
11	C9	DNP	0	C0603C181K5GAC	KEMET	180PF	CAP; SMT (0603); 180PF; 10%; 50V; COG; CERAMIC
12	R3, R4, R7	DNP	0	CRCW06030000ZS;MCR03EZP1000; ERJ-3GEY0R00;CR0603AJ/-000ELF	VISHAY;ROHM SEMICONDUCTOR; PANASONIC;BOURNS	0	RES; SMT (0603); 0; JUMPER; JUMPER; 0.1000W
TOTAL			19				

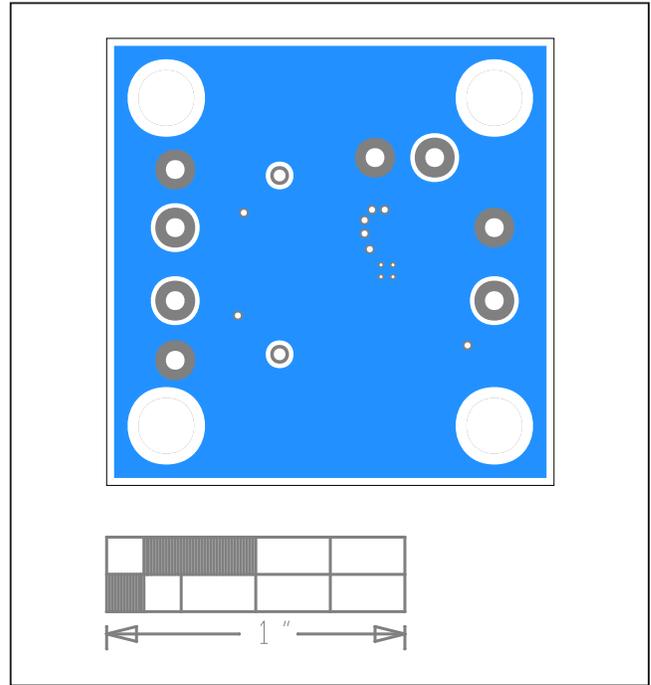
MAX49921 EV Kit Schematic



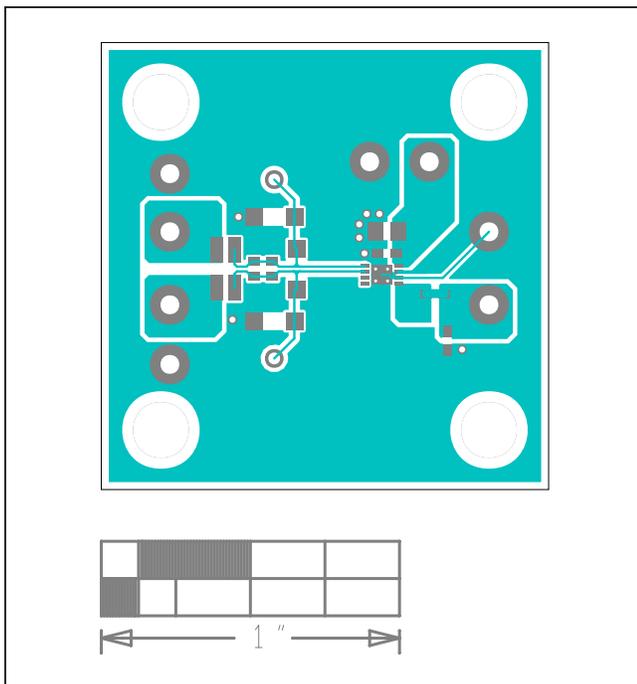
MAX49921 EV Kit PCB Layout



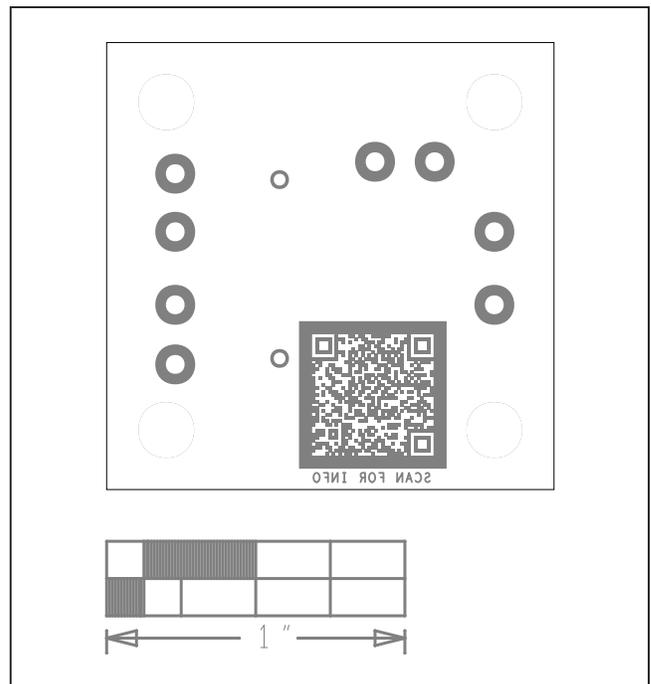
MAX49921 EV Kit Component Placement Guide—Top Silkscreen



MAX49921 EV Kit PCB Layout—Bottom



MAX49921 EV Kit PCB Layout—Top



MAX49921 EV Kit Component Placement Guide—Bottom Silkscreen

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/20	Initial release	—
1	11/20	Removed references to MAX49920	1–6
2	1/21	Updated EV kit photo, MAX49921 EV Kit Bill of Materials, MAX49921 EV Kit Schematic, and MAX49921 EV Kit PCB Layout	1, 3–5

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