Evaluation Board User Guide

EVAL-MAX49918 Evaluation Kit

Evaluates: MAX49918

General Description

The MAX49918 evaluation kit (EV kit) is a fully tested and assembled circuit that demonstrates the capabilities of the MAX49918, a high-precision, wide measurement range, programmable gain, bidirectional current-sense amplifier that monitors two distinct current levels.

The gain of MAX49918 is programmed by I2C communication.

The MAX49918 EV kit operates over the automotive temperature range of -40°C to +125°C.

The EV kit reserves a PCB footprint so that a MAX32625PICO board can be soldered on it. With the MAX32625PICO board, users can control the gain conveniently with the GUI software.

Features

- Programmable Gain Options through I2C from 10V/V to 200V/V (8 steps)
- ±1µV (typ) Input Offset Voltage for REF1 = REF2 = VDD/2
- ±5µV (typ) Input Offset Voltage for REF1 = VDD and REF2 = GND for Gain = 20V/V
- ±0.01% (typ) Gain Error
- -5V to +70V Input Voltage Range
- -6V to +80V Protective Immunity
- 70kHz, -3dB Bandwidth for Gain = 20V/V
- 145dB DC CMRR
- Rail-to-Rail Output
- 3mm x 3mm TDFN-10 Package
- -40°C to +125°C Temperature Range

MAX49918 EV Kit Files

FILE	DESCRIPTION
max49918_tdfn10_evkit_a_ MARKETING_SCH.pdf	EV Kit Schematic
MAX49918_TDFN10_EVKIT_A _MARKETING_PCB.PDF	EV Kit PCB Layout
marketing_bom_max49918_tdf n10_evkit_a.csv	EV Kit Bill of Materials
max49918_tdfn10_evkit_a.brd	EV Kit PCB Layout file

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

Quick Start

Required Equipment

- MAX49918 EV kit
- 0 to 70V DC power supply for VCM input
- +3.3V, 100mA DC power supply
- Electronic load capable of sinking 3A
- One 6½ digital multimeter (DMM like 34401A)
- One 8½ digital multimeter (DMM like Agilent 3458)

Optional Equipment

- MAX32625PICO Board
- Windows® 10 PC
- MAX49918EV kit GUI software

Procedure

The MAX49918 EV kit is fully assembled and tested. Follow the steps to verify board operation: **Caution:** Do not turn on the power supply or the electronic load until all the connections are complete.

1. Connect a +3.3V power supply to the VDD connector, and the ground of this power supply to the GND connector.
2. Connect the positive terminal of the 0 to 100V DC (VCM) power supply to the VSENSE+ input and the negative terminal to the GND connector.
3. Set the VCM power supply to 50V.
4. Set the electronic load to sink 300mA.
5. Connect the positive terminal of the electronic load to the VSENSE- input and the negative terminal of the electronic load to the GND of the VCM power supply.
6. Connect REF1 to REF2.
7. Connect the positive terminal of the DC power supply to the REF1/REF2 input. Set the DC power supply voltage output to VDD/2 = 1.65V.
8. Connect the 8½ digital multimeter between the test points RS+ and RS- to measure the differential input voltage across the inputs (VSENSE).
9. Connect the 6½ digital multimeter across the VOUT and REF1/REF2 test points to measure the MAX49918 output.
10. Turn on the power supplies, then the electronic load.
11. Enable the electronic load.
12. Verify that the 8½ digital multimeter displays 300mA x 50mΩ = +15mV and the 6½ digital multimeter displays 150mV.
13. The EV kit is now ready for further testing.
14. After the functions are verified, do not forget to turn off the electronic load, calibrator, and power supply.

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EV Kit Photo

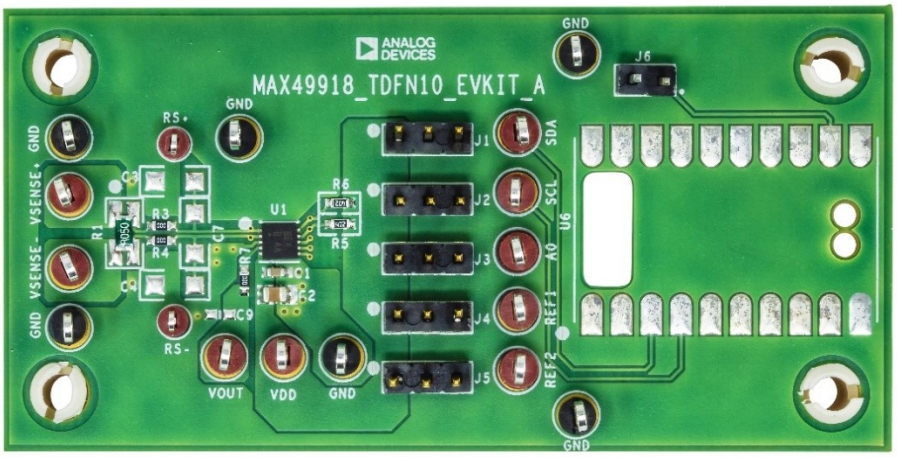


Table 1. Jumper Connection Guide

JUMPER	DEFAULT CONNECTION	FEATURE
J1	**Not Installed**	
J2	**Not Installed**	
J3	**2-3**	Set the least bit of I2C device address to 0
	1-2	Set the least bit of I2C device address to 1
J4	**1-2**	Connect REF1 to VDD
	2-3	Connect REF1 to GND
J5	**2-3**	Connect REF2 to GND
	1-2	Connect REF2 to VDD
J6	**Not Installed**	

Default options are in bold.

Gain Control

To set the gain of the device, it is recommended to use the PICO board (MAX32625PICO board) and MAX49918EV kit GUI software to control the gain. Or you need to use other devices or instruments to send I2C command to the MAX49918.

Gain Control with PICO Board and GUI

Please find and buy MAX32625PICO Board from *www.analog.com*.

Download the GUI (MAX49918 Evaluation Kit Tool) and firmware (usb_serial_bridge1.1.28.bin) from *www.analog.com*.

Install the MAX49918 Evaluation Kit Tool.

Solder the PICO board to the MAX49918 EV kit as shown in *Figure 1*.

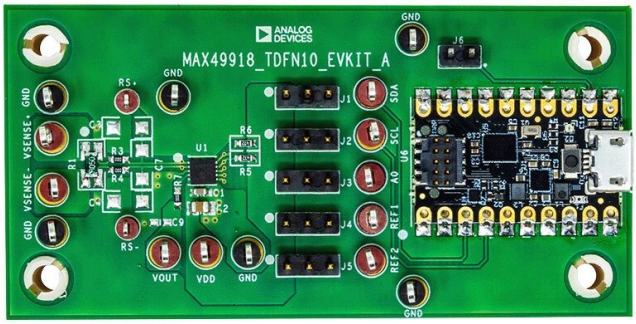


Figure 1. MAX49918 EV Kit with PICO Board

Press and hold the button on the PICO board until it is connected to the computer with a USB cable. Wait around two seconds for a new disk called 'MAINTENANCE' show up on the computer. Copy the firmware to the MAINTENANCE disk. Eject the disk and reconnect the USB cable; the firmware uploading process is now complete.

Connect the power supply for VDD and VSENSE and switch on the power.

Open the GUI and click the Connect button. The GUI is shown in *Figure 2*. To set the gain, click the button with Gain on it.

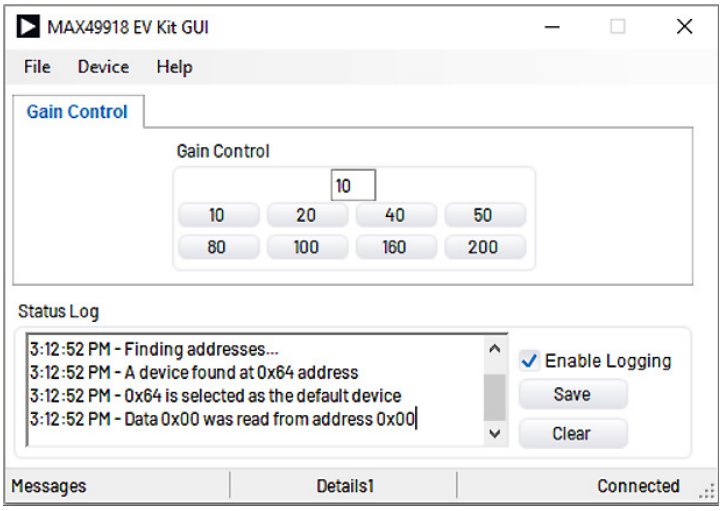


Figure 2. GUI–Gain Control

I2C Address and data for Gain control

If the user wants to send I2C with another method, check the below I2C address and data.

The MAX49918 uses an input pin (A0) that determines the least-significative bit (LSB) of the I2C device address word below.

Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	1	0	0	1	0	A0

The register address to set the gain is 0x00. And the data to set the gain is shown in the table below.

GAIN	10	20	40	50	80	100	160	200
Data (Hex)	0	1	2	3	4	5	6	7

Output Voltage

The MAX49918 has two reference inputs (REF1 and REF2) to set the device in either unidirectional or bidirectional operation mode. Connect the REF1 and REF2 inputs to low-impedance voltage source(s) to set the MAX49918 output (V_{OUT}) reference level. Do not connect REF1 and REF2 inputs to any voltages lower than GND or higher than V_{DD}. V_{REF} is defined as the average voltage of V_{REF1} and V_{REF2}, i.e., the output voltage refers to $V_{REF} = (V_{REF1} + V_{REF2})/2$.

Use the following equations to set the gain:

$V_{OUT} = V_{SENSE} * GAIN + V_{REF}$

Where $V_{SENSE} = V_{RS+} - V_{RS-}$, and GAIN is the voltage gain of the MAX49918.

The default state of the EV kit is REF1 = VDD and REF2 = GND, i.e., it is in bidirectional mode with $V_{REF} = V_{DD}/2$.

Refer to the MAX49918 data sheet application information for more detail about the reference.

Ordering Information

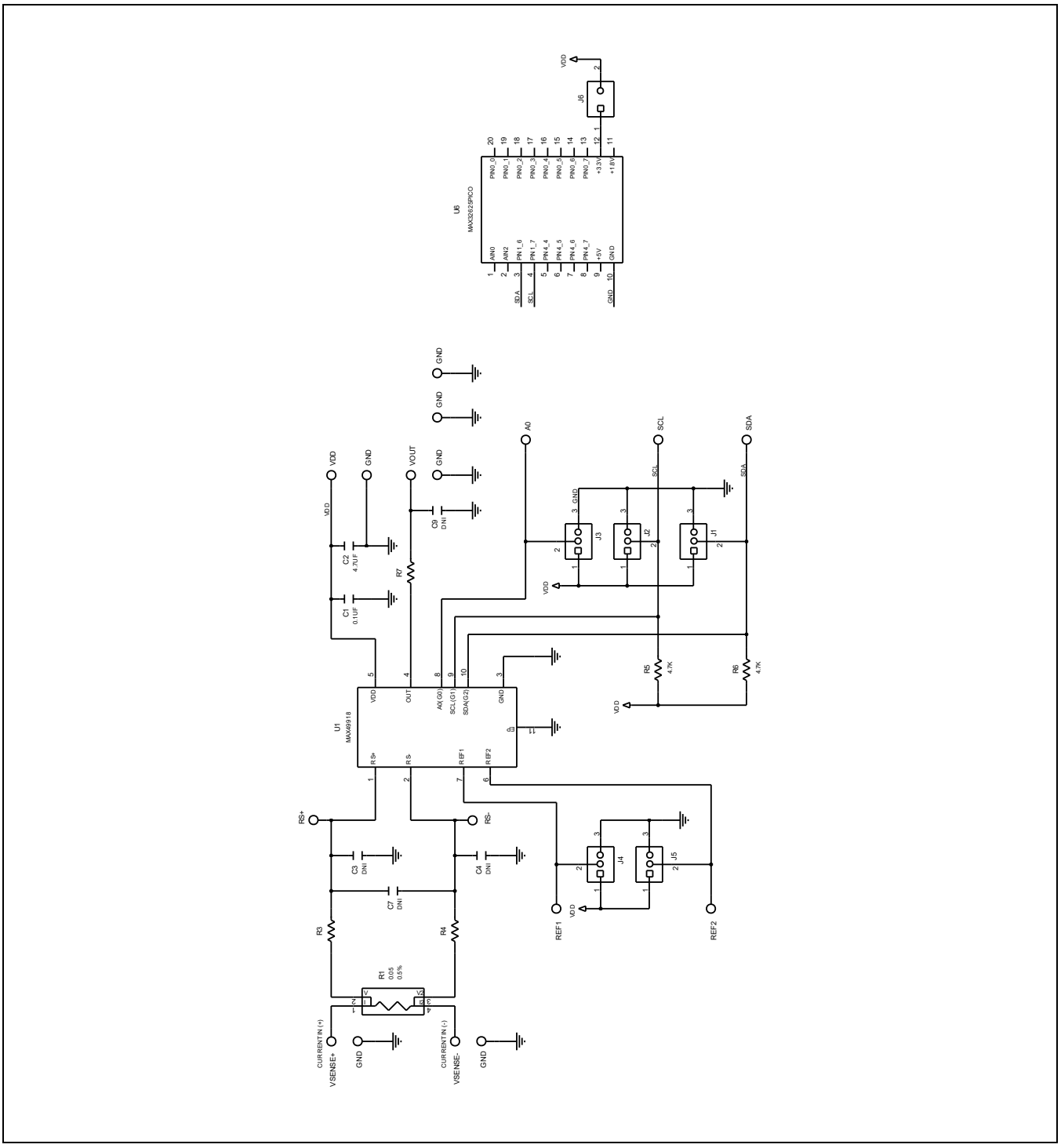
PART	TYPE
MAX49918EVKIT#	EV Kit

#Denotes RoHS-compliance.

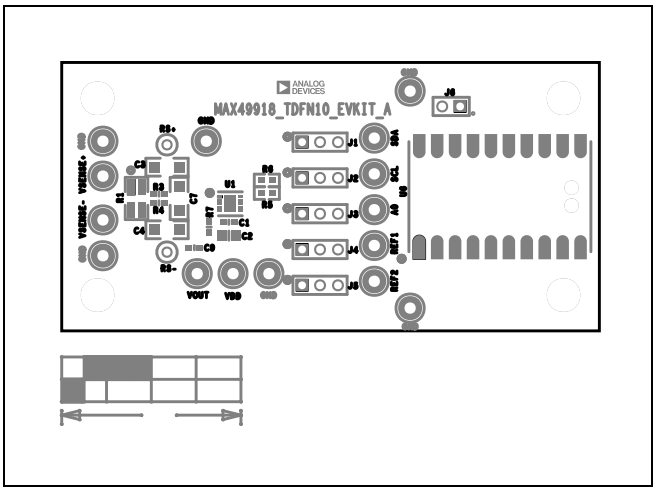
MAX49918 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	A0, REF1, REF2, SCL, SDA, VDD, VOUT, VSENSE+, VSENSE-	-	9	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
2	C1	-	1	C0603C104K4RAC;GCM188R71C104KA37;C1608X7R1C104K;GRM188R71C104KA01;C0603X7R160-104KNE;VJ0603Y104KXJCW1BC;0603YC104KAT4A;8850122206046	KEMET;MURATA;TDK;MURATA;VENKEL LTD;VISHAY DALE;AVX;WURTH ELECTRONICS INC	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 16V; X7R; CERAMIC;
3	C2	-	1	GRM21BR71C475KA73;0805YC475KAT2A;GCM21BR71C475KA73;CGA4J3X7R1C475K125AE	MURATA;AVX;MURATA;TDK	4.7UF	CAP; SMT (0805); 4.7UF; 10%; 16V; X7R; CERAMIC
4	GND, TP2-TP6	-	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;
5	J1-J5	-	5	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC
6	J6	-	1	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
7	MTH1-MTH4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
8	R1	-	1	LVK12R050DE	OHMITE MFG CO.	0.05	RESISTOR; 1206; 0.05 OHM; 0.5%; 50PPM; 0.5W; METAL FILM
9	R3, R4, R7	-	3	CRCW06030000ZS;MCR03EZPJ000;ERJ-3GEY0R00;CR0603AJ/-000ELF	VISHAY;ROHM SEMICONDUCTOR;PANASONIC;BOURNS	0	RES; SMT (0603); 0; JUMPER; JUMPER; 0.1000W
10	R5, R6	-	2	ERJ-3GEYJ472	PANASONIC	4.7K	RES; SMT (0603); 4.7K; 5%; +/-200PPM/DEGC; 0.1000W
11	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;
12	U1	-	1	MAX49918IATB+	ANALOG DEVICES	MAX49918	BI-DIRECTIONAL WIDE MEASUREMENT RANGE WITH PROGRAMMABLE GAIN CURRENT SENSE AMPLIFIER; PACKAGE OUTLINE: 21-0137; PACKAGE LAND PATTERN DRAWING: 90-0003; TDFN10-EP
14	PCB	-	1	MAX49918TDFN10	MAXIM	PCB	PCB:MAX49918TDFN10
15	C3, C4, C7	DNP	0	C1206C102K1RAC	KEMET	1000PF	CAP; SMT (1206); 1000PF; 10%; 100V; X7R; CERAMIC
16	C9	DNP	0	C0603C181K5GAC	KEMET	180PF	CAP; SMT (0603); 180PF; 10%; 50V; C0G; CERAMIC
TOTAL			38				

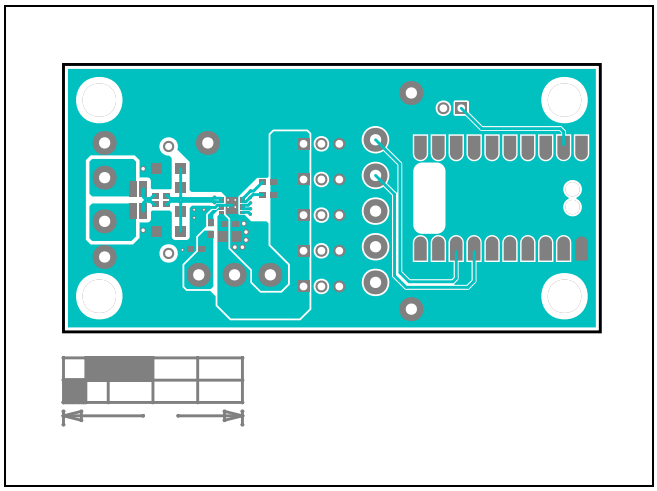
MAX49918 EV Kit Schematic



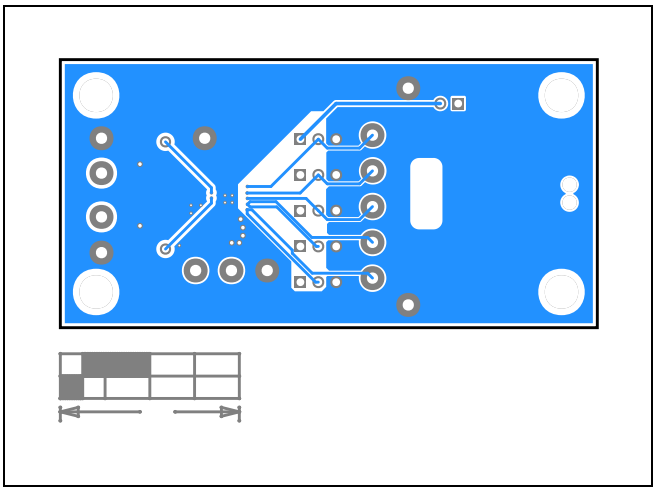
MAX49918 EV Kit PCB Layout



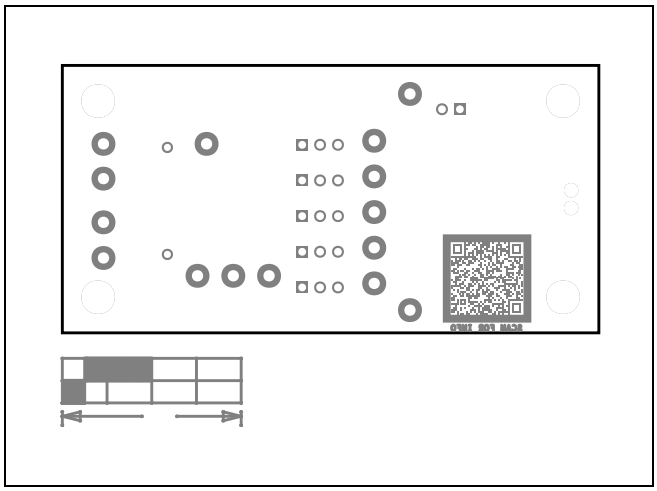
MAX49918 EV Kit Component Placement Guide—Top Silkscreen



MAX49918 EV Kit PCB Layout—Top



MAX49918 EV Kit PCB Layout—Bottom



MAX49918 EV Kit PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/23	Initial release	—