Click here to ask an associate for production status of specific part numbers.

Evaluates: MAX77348A, MAX77348B in WLP Package

MAX77348 Evaluation Kit

General Description

The MAX77348 evaluation kit (EV kit) provides a proven design to evaluate the MAX77348, a 3.5 W buck-boost converter. The IC is capable of 2.3 V to 5.5 V input, and its output voltage is adjustable between 2.5 V to 4.8 V. The factory default output voltage of this EV kit is set at 4.5 V. Output voltage can be adjusted through the software GUI. The EN pin supports hardware or software enabling of the device. The EV kit is compatible with any version of the MAX77348 WLP IC (MAX77348AEWE+ is the default).

Equipment Included

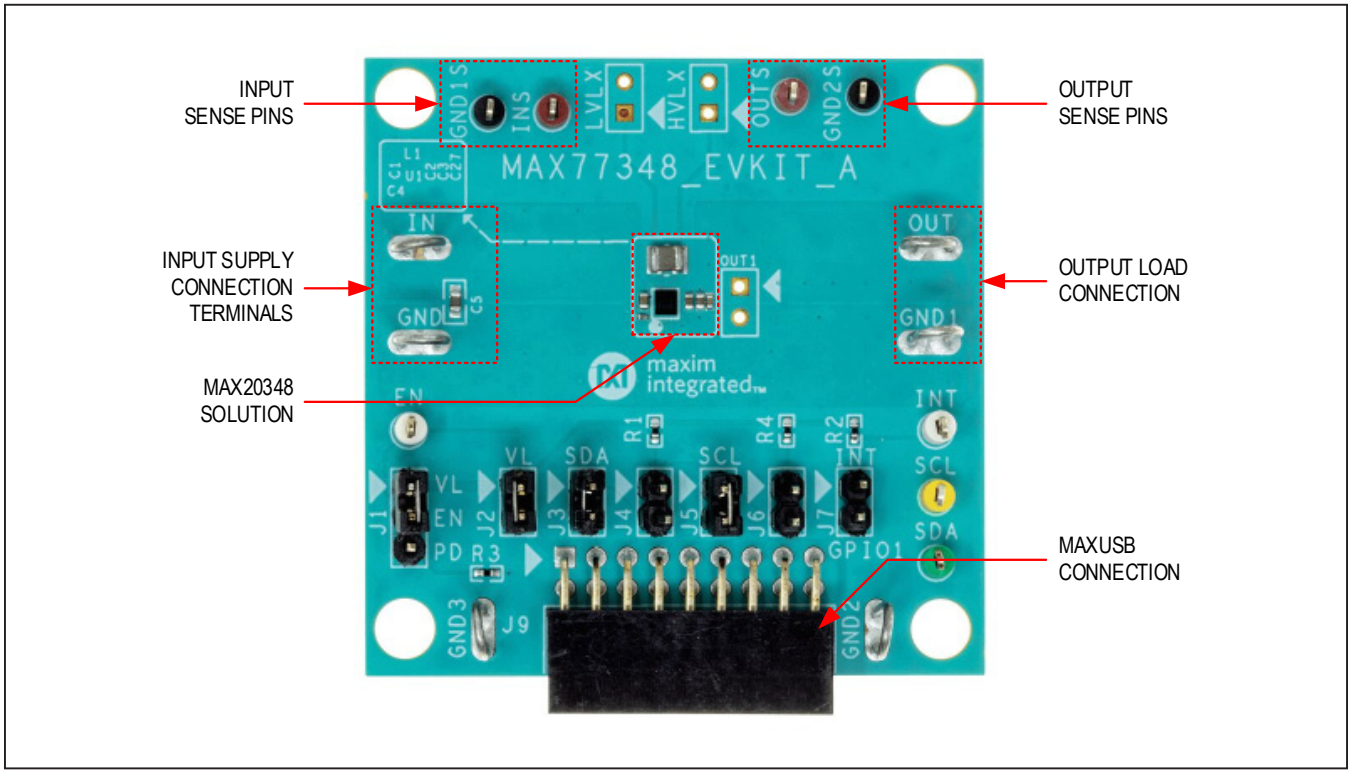
- The MAX77348 evaluation board
- USB to I2C interface (MAXUSB_INTERFACE#)
- USB Type A to Micro USB cable Windows®-based GUI software is available for use with the EV kit

Features

- Sense points for high-accuracy measurements
- Accessible test points for EN, SDA, SCL, INS, and OUTS
- Output voltage adjustable through software GUI
- FPWM and default skip mode configurability
- Active discharge functionality

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

EV Kit Photo



319-100955; Rev 1; 4/23

EV Kit Specifications and Default Configurations

- IC part number: MAX77348AEWE+T
- Maximum power limit = 3.5 A
- Active discharge engaged when EN = 0
- UVLO rising = 2.19 V, UVLO falling = 2.10 V (MAX77348AEWE+)

Table 1. EV Kit Default Specifications

SPECIFICATION	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage		2.3		5.5	V
Output Voltage	Configurable by SEL resistor R3 (see Table 2).	2.5		4.8	V
Default Output Voltage			4.5		V
Output Current		0		1	A
MAX Output Operative Power	FETSCALE = 0, L = 1 µH		3.5		W
Peak Efficiency	3.6 V_{IN}, 3.3 V_{OUT}, 300 mA load			94.0	%

Table 2. Default Shunt Positions and Jumper Descriptions

JUMPER	NODE OR FUNCTION	SHUNT POSITION	FUNCTION
J1	EN	1-2*	Connects EN to VL (MAX77348 is enabled by default)
J2	VL	1-2*	Connects VL to MAXUSB power rail
J3	SDA	1-2*	Enables I^2C (SDA)
J5	SCL	1-2*	Enables I^2C (SCL)

**Default position.*

Quick Start

Required Equipment

- MAX77348 EV kit
- Adjustable DC power supply
- A 1.8V DC power supply (optional)
- Digital multimeters
- MAXUSB_INTERFACE# for I2C Serial Interface (optional)
- USB Type-A to micro-USB cable (optional)
- Windows-based PC with MAX77348 EV kit GUI (optional)

Setup Overview

A typical bench setup for the MAX77348 WLP EV kit is shown in Figure 1. A simplified EV kit block diagram is shown in Figure 2.

Procedure

The EV kit is fully assembled and tested. Use the following steps to verify board operation. Use twisted wires of appropriate gauge (20AWG) that are as short as possible to connect the load and power sources.

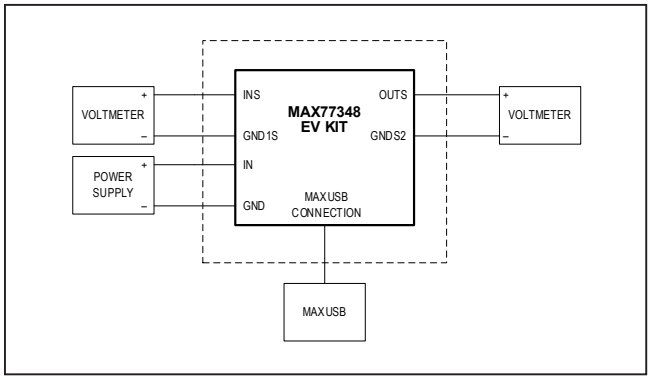


Figure 1. EV Kit Connection Block Diagram

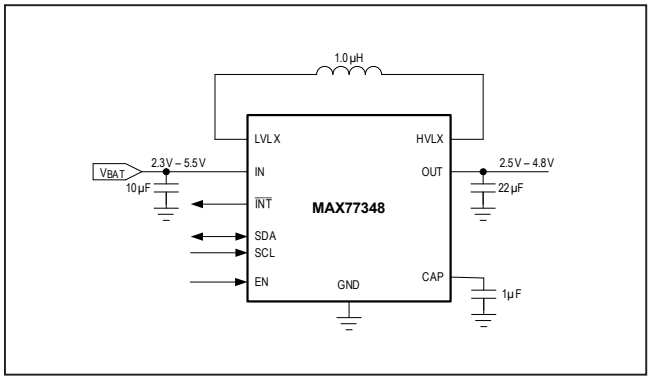


Figure 2. EV Kit Simplified Block Diagram

1) Ensure that the EV kit has the correct jumper settings as shown in Table 1.
2) Connect a DVM to the INS and GND1S sense pins to measure the input voltage.
3) Connect a DVM to the OUTS and GNDS2 sense pins to measure the output voltage.
4) Apply a power supply set to 0 V (100 mA current limit) across the IN and GND terminals of the EV kit. Turn on the supply and increase the voltage to 3.8 V.
5) Apply a secondary power supply of 1.8 V to VL or use a MAXUSB plugged in to a PC to get a 1.8 V supply on VL.
6) Confirm the DVM connected to OUTS and GNDS2 reads the default output voltage of the EV kit (4.5 V).

The next steps of the procedure use the EV kit GUI and MAXUSB_INTERFACE# to evaluate the MAX77348's I2C serial interface. If evaluation of the I2C serial interface is not required, skip the following set of steps. The EV kit includes onboard 2.2 kΩ pull-up resistor to VL.

1) Install GUI software. Run the .exe file and follow the on-screen instructions to complete installation.
2) Turn off the 1.8 V VL power supply and input power supply connected in steps 4 and 5.
3) Disconnect the 1.8 V VL power supply connected in step 5 from the EV kit. The MAXUSB_INTERFACE# has an on-board LDO to supply 1.8 V to VL.
4) Ensure the SW1 and SW2 switches on the MAXUSB_INTERFACE# are set to the ON position. This enables I2C mode on MAXUSB_INTERFACE#.
5) Ensure VL jumper on MAXUSB_INTERFACE# (J5) is set to 1.8 V. This sets MAXUSB_INTERFACE#'s VIO voltage. If set incorrectly to 3.3 V, potential damage can be done the MAX77348 IC.
6) Connect MAXUSB_INTERFACE# to MAX77348 EV kit. Connect the MAXUSB_INTERFACE# to your PC's USB port through a USB Type-A to Micro-USB cable.
7) Turn on the input power supply.
8) Open the GUI. The EV kit automatically connects to the GUI. **Connected** appears at the bottom right of the GUI window.
9) Drag the slide bar in **Output Voltage Configuration** section to change the output voltage and click **Write**.
10) Confirm with a DVM that the software instruction to change output voltage was successful. If so, the I2C serial interface is working.

This concludes the *Quick Start* procedure. Explore the device and its register settings further using the GUI software. For more information on the GUI, see the *EV Kit Software* section.

EV Kit Hardware

MAXUSB_INTERFACE#

The MAXUSB_INTERFACE#, along with the companion EV kit GUI software, facilitates changing the MAX77348's register settings with a Windows PC. Before connecting the MAXUSB_INTERFACE# to the EV kit's MAXUSB_INTERFACE# connector (J5), make sure the MAXUSB_INTERFACE# is configured with the following settings:

- Set SW1, SW2 to the ON position to enable I²C mode on the MAXUSB_INTERFACE#.
- Set the VL jumper (J5) to 1.8 V to set the MAXUSB_INTERFACE#'s VIO voltage.

WARNING: Incorrectly setting this to 3.3V can potentially damage the MAX77348 IC.

The MAXUSB_INTERFACE# also includes an on-board LDO that can supply necessary voltage to V_{IO}. If the MAXUSB_INTERFACE# is used, disconnect any external V_{IO} supply from the EV kit, and make sure header jumpers (J3, J4) and the 0 Ω jumper (R3) are installed to connect the MAXUSB_INTERFACE# to the EV kit.

External I²C Bus

To connect an external I²C serial bus and not use the MAXUSB_INTERFACE#, unplug the MAXUSB_INTERFACE# from the MAX77348 EV kit's MAXUSB_INTERFACE# connector (J9) and remove header jumpers (J2) to isolate the MAXUSB_INTERFACE# connector from the EV kit. Apply external IO supply to VIO pin. Make sure the external I²C serial bus's logic voltage level is compatible to the MAX77348's IO logic voltage level. Refer to MAX77348 IC data sheet for appropriate IO logic voltage level.

Detailed Description of Hardware

The MAX77348 EV kit demonstrates the MAX77348 buck-boost. It regulates output from input voltage ranges from 2.3 V to 5.5 V. Programmable output range is from 2.5 V to 4.8 V with 50 mV steps. The EV kit includes a general DC input. Table 2 lists the jumpers and associated functions that are available on the EV kit.

High Temperature Testing

The MAX77348 is rated for operation under ambient temperatures up to 125°C. Note that not all components on the EV kit are rated for temperatures that high. Some ceramic capacitors experience extra leakage when put under temperatures higher than they are rated and supply current readings for the IC might be larger than expected. Double check the components on the EV kit if testing at 125°C ambient temperatures.

List of caps not rated for 125°C:

- C2, C3 (output capacitor)
- C1 (input capacitor)

Consider replacing these components if IC operation at 125°C ambient temperature is an important use case.

Test Points and Critical Node Measurement (VOUT and LX)

The EV kit comes with sockets presoldered onto the board for measuring the critical nodes OUT1, LVLX, and HVLX. Use these probe sockets to eliminate as much noise as possible when measuring the critical nodes. To ensure best results, use a very short ground wire from the ground sleeve of the scope probe to the GND side of the probe socket, and use the bare tip of the probe directly to the signal side of the probe socket. Following these guidelines provides the most accurate results when measuring parameters such as output voltage ripple, switching waveforms, and load transient response.

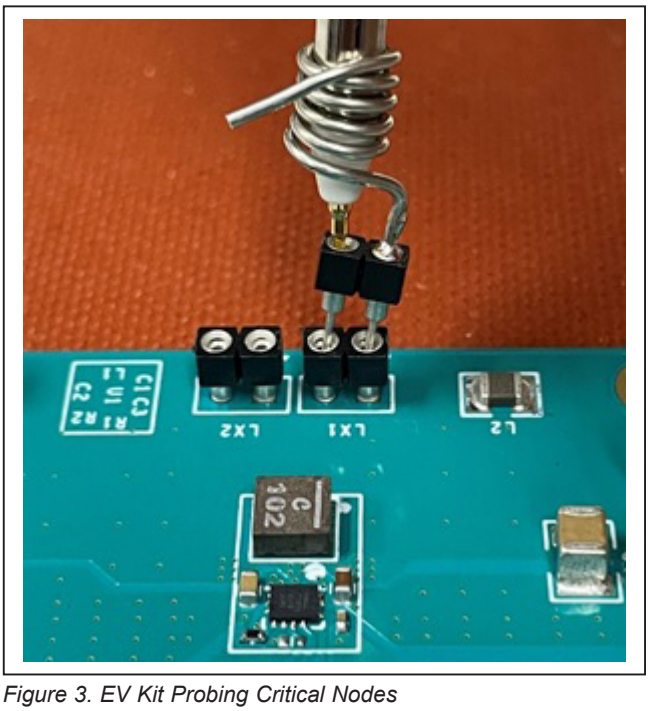


Figure 3. EV Kit Probing Critical Nodes

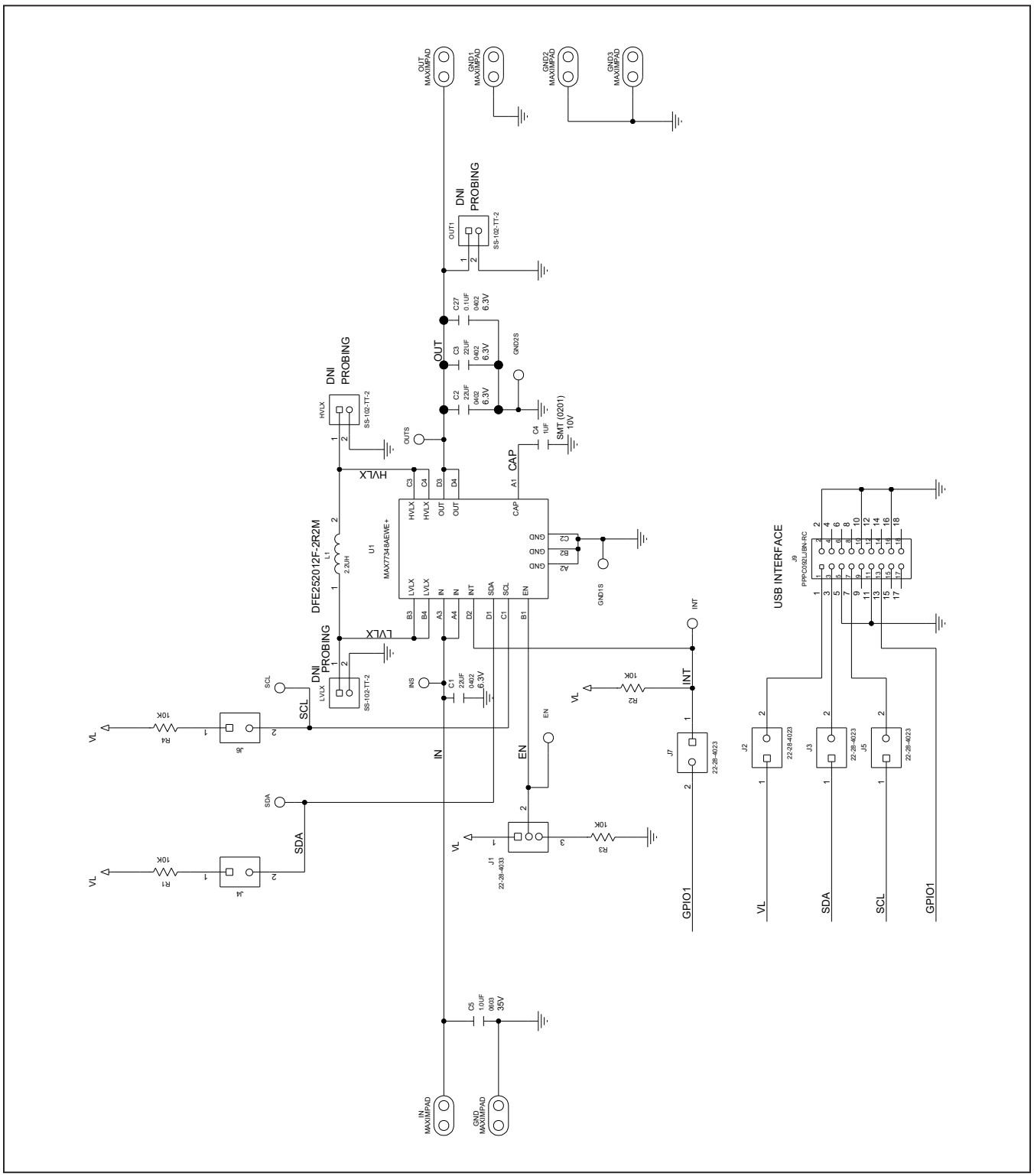
Ordering Information

PART	U1 IC	DEFAULT OUTPUT VOLTAGE (V)	UVLO FALLING (V)	UVLO RISING (V)
MAX77348EVKIT#	MAX77348AEWE+	4.5	2.10	2.19

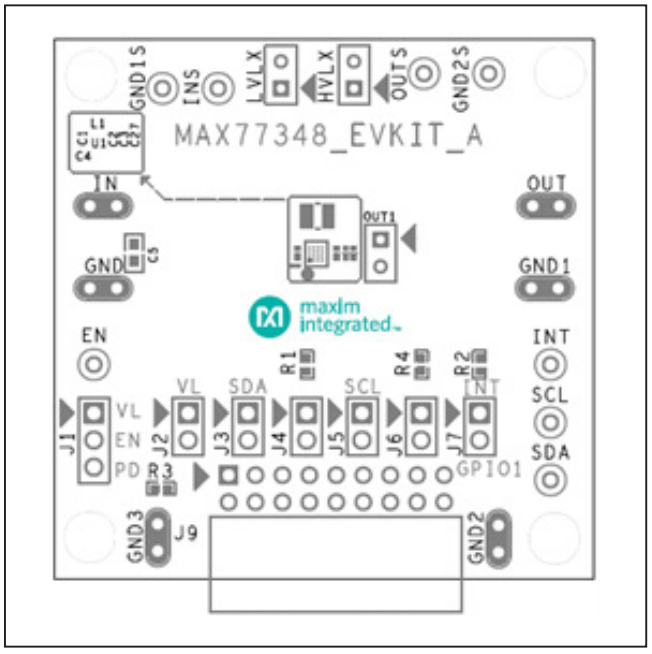
MAX77348 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	C1-C3	-	3	04026D226MAT2A; CL05A226MQ5QUNC	AVX;SAMSUNG	22UF	CAP; SMT (0402); 22UF; 20%; 6.3V; X5R; CERAMIC	
2	C4	-	1	GRM033R61A105ME15	MURATA	1UF	CAP; SMT (0201); 1UF; 20%; 10V; X5R; CERAMIC	
3	C5	-	1	GMK107BJ105KA; C1608X5R1V105K080AB	TAIYO YUDEN;TDK	1.0UF	CAP; SMT (0603); 1.0UF; 10%; 35V; X5R; CERAMIC	
4	C27	-	1	GRM155R60J104KA01; C0402C104K9PAC	MURATA;KEMET	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 6.3V; X5R; CERAMIC	
5	EN, INT	-	2	5002	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER;	
6	GND, GND1-GND3, IN, OUT	-	6	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG	
7	GND1S, GND2S	-	2	5001	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
8	INS, OUTS	-	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;	
9	J1	-	1	22-28-4033	MOLEX	22-28-4033	CONNECTOR; MALE; THROUGH HOLE; FLAT VERTICAL BREAKAWAY; STRAIGHT; 3PINS	
10	J2-J7	-	6	22-28-4023	MOLEX	22-28-4023	CONNECTOR; MALE; THROUGH HOLE; FLAT VERTICAL BREAKAWAY; STRAIGHT; 2PINS	
11	J9	-	1	PPPC092LJBN-RC	SULLINS ELECTRONICS CORP	PPPC092LJBN-RC	CONNECTOR; FEMALE; THROUGH HOLE; PPP SERIES; RIGHT ANGLE; 18PINS	
12	L1	-	1	DFE252012F-2R2M	MURATA	2.2UH	INDUCTOR; SMT (1008); SHIELDED; 2.2UH; 20%; 2.3A	
13	MISC1	-	1	AK67421-2	ASSMANN	AK67421-2	CABLE; MALE; USB; USB2.0 MICRO CONNECTION CABLE; USB B MICRO MALE TO USB A MALE; 2000 MILLIMETERS; 5PINS-4PINS	DO NOT INSTAll
14	MOD1	-	1	MAXUSB_INTERFACE#	MAXIM	MAXUSB_INTERFACE#	EVKIT PART-MODULE; KIT; MAXUSB INTERFACE; DUAL-PORT USB-TO-SERIAL INTERFACE BOARD	DO NOT INSTAll
15	R1-R4	-	4	CRCW040210K0FK; RC0402FR-0710KL	VISHAY DALE;YAGEO PHICOMP	10K	RES; SMT (0402); 10K; 1%; +/-100PPM/DEGC; 0.0630W	
16	SCL	-	1	5004	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
17	SDA	-	1	5116	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; GREEN; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
18	SU1, SU2, SU4-SU7	-	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	SHUNTS
19	U1	-	1	MAX77348AEWE+	MAXIM	MAX77348AEWE+	IC; CONV; ULTRA LOW IQ; LOW NOISE 3.5W BUCK-BOOST CONVERTER; WLP16	DO NOT INSTALL
20	PCB	-	1	MAX77348	MAXIM	PCB	PCB:MAX77348	-
21	HVLX, LVLX, OUT1	DNP	0	SS-102-TT-2	SAMTEC	SS-102-TT-2	IC-SOCKET; SIP; STRAIGHT; PRECISION MACHINED SOCKET STRIP; OPEN FRAME; 2PINS; 100MIL	BUY THIS, DO NOT INSTALL
TOTAL			43					

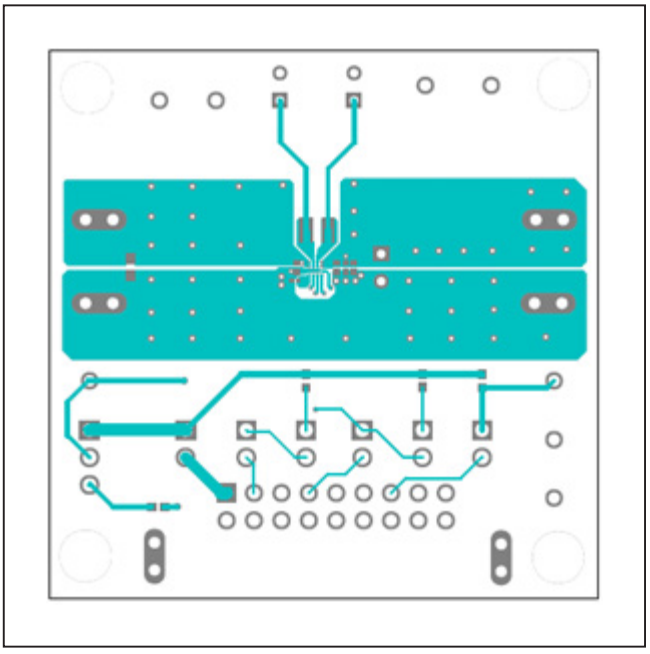
MAX77348 EV Kit Schematic



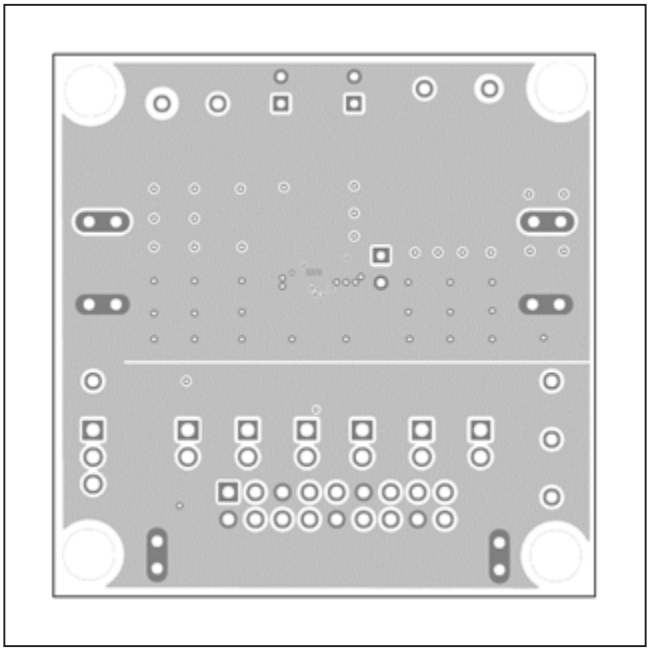
MAX77348 EV Kit PCB Layout



MAX77348 EV Kit Component Placement Guide—Top Side

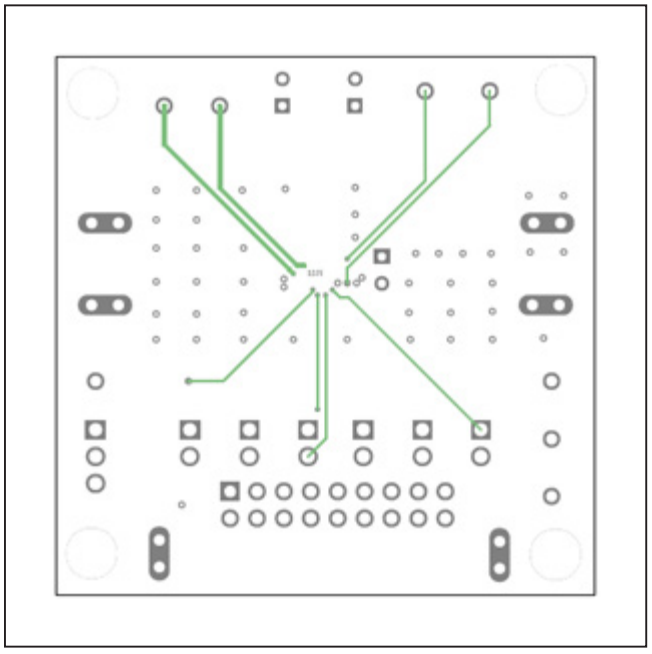


MAX77348 EV Kit Component Placement Guide—Top Side

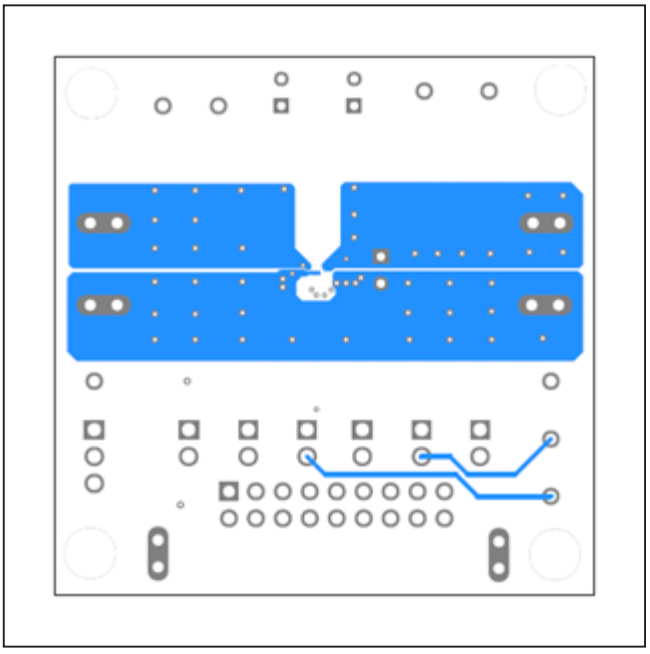


MAX77348 EV Kit PCB Layout—Layer 2

MAX77348 EV Kit PCB Layout (continued)



MAX77348 EV Kit PCB Layout—Layer 3



MAX77348 EV Kit PCB Layout—Bottom Layer

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	9/22	Initial Release	—
1	4/23	Updated EV Kit Board Photo	1