19-5114; Rev 0; 1/10

MAX9947 Evaluation Kit

Evaluates: MAX9947

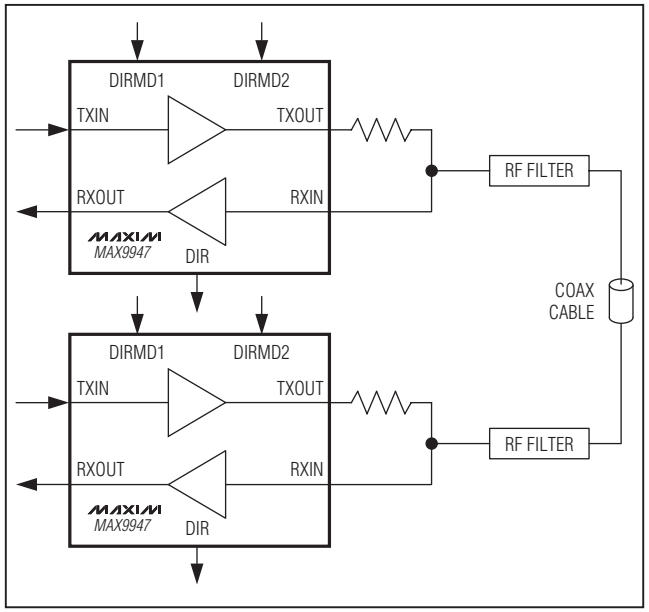
General Description

The MAX9947 evaluation kit (EV kit) provides a proven design to evaluate the MAX9947 AISG-compliant integrated transceiver. The EV kit has two MAX9947 devices installed on the board. When one MAX9947 works as a transmitter, the other works as a receiver.

Features

- **Two MAX9947 Devices (One Works as a Transmitter and the Other as a Receiver)**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

System Diagram



Ordering Information

PART	TYPE
MAX9947EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C10, C11	4	10µF ±10%, 10V X5R ceramic capacitors (0805) Murata GRM21BR61A106K
C3, C4, C12, C13	4	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C5, C14	2	1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C105K
C6, C7, C15, C16	0	Not installed, ceramic capacitors (0603)
C8, C9, C17, C18	4	39pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H390J

DESIGNATION	QTY	DESCRIPTION
J1, J3	2	SMA connectors, edge mount
J2, J4	2	SMA connectors, vertical mount
JU1, JU6, JU7, JU12–JU16	8	2-pin headers
JU2–JU5, JU8–JU11	8	3-pin headers
L1, L2	2	0Ω ±5% resistors (0805)
R1, R7	2	1kΩ ±5% resistors (0603)
R2, R8	2	4.12kΩ ±1% resistors (0603)
R3, R9	2	10kΩ ±1% resistors (0603)
R4, R10	2	49.9Ω ±1% resistors (0603)
R5, R11	0	Not installed, resistors (0603)
R6, R12	2	10kΩ ±5% resistors (0603)
TP1, TP9	2	Red multipurpose test points

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
TP2, TP4, TP10, TP12	4	Black multipurpose test points
TP3, TP11	2	Yellow multipurpose test points
TP5–TP8, TP13–TP18	10	Red miniature test points
U1, U2	2	AISG integrated transceivers (16 TQFN-EP*) Maxim MAX9947ETE+
VR1, VR2	2	50kΩ top-adjust 12-turn trimmers (2mm)
Y1, Y2	2	8.704MHz crystals Hong Kong X'tals SSL87040N1HS188F0-0
—	16	Shunts
—	1	PCB: MAX9947 EVALUATION KIT+

**EP = Exposed pad.*

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Hong Kong X'tals Ltd.	852-35112388	www.hongkongcrystal.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com

Note: *Indicate that you are using the MAX9947 when contacting these component suppliers.*

Quick Start

Required Equipment

- MAX9947 EV kit
- 3.3V 100mA DC power supply
- Waveform generator
- 2-channel oscilloscope

Procedure

The following procedure demonstrates one MAX9947 (as a transmitter) modulating a 38.4kbps OOK signal and transmitting the modulated signal to the second MAX9947 (as a receiver). The receiver demodulates the modulated signal and reconstructs the digital signal.

1) Verify that all jumpers (JU1–JU16) are in their default positions, as shown in Table 1.
2) Connect the 3.3V DC power supply between TP1 (U1_VCC) and TP2 (GND).
3) Connect the 3.3V DC power supply between TP9 (U2_VCC) and TP10 (GND).
4) Set the waveform generator to output a square wave. Set the amplitude to 3.3V, frequency to 38.4kHz, duty cycle to 50%, and offset to 1.65V.
5) Connect the waveform-generator output between TP6 (TXIN) and TP2 (GND).
6) Unused TXIN pin must be tied to VL to avoid data collision. Tie TP14 to VL when using U2 as a receiver.
7) Connect the oscilloscope channel 1 to TP6 (TXIN).
8) Connect the oscilloscope channel 2 to TP15 (RXOUT).
9) Verify that the waveforms of channels 1 and 2 are similar.
10) Verify that TP16 (DIR) is asserted high, indicating data is flowing from U1 to U2.

Table 1. Jumper Descriptions (JU1–JU16)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	U1 VL pin connected to U1 VCC pin
	Open	U1 VL pin disconnected from U1 VCC pin
JU2	—	See Table 2
JU3	—	See Table 2
JU4	1-2*	U1 output level at TXOUT is set at +3dBm
	2-3	U1 output level at TXOUT is adjustable by VR1
JU5	1-2*	U1 uses on-board crystal
	2-3	U1 uses external clock applied on SMA J2
JU6	Open*	U1 uses on-board crystal
	1-2	U1 uses external clock applied on SMA J2
JU7	1-2*	U2 VL pin connected to U2 VCC pin
	Open	U2 VL pin disconnected from U2 VCC pin
JU8	—	See Table 2
JU9	—	See Table 2
JU10	1-2*	U2 output level at TXOUT is set at +3dBm
	2-3	U2 output level at TXOUT is adjustable by VR2
JU11	1-2*	U2 uses on-board crystal
	2-3	U2 uses external clock applied on SMA J4
JU12	Open*	U2 uses on-board crystal
	1-2	U2 uses external clock applied on SMA J4
JU13	1-2*	SMA J1 and J3 signals connected by a PCB trace
	Open	SMA J1 and J3 signals not connected
JU14	1-2*	U1 and U2 grounds connected
	Open	U1 and U2 grounds disconnected
JU15	1-2*	U1 SYNCOUT pulled up to VCC through a 1kΩ resistor
	Open	U1 SYNCOUT not pulled up to VCC
JU16	1-2*	U2 SYNCOUT pulled up to VCC through a 1kΩ resistor
	Open	U2 SYNCOUT not pulled up to VCC

**Default position.*

_Detailed Description of Hardware

The MAX9947 IC is an AISG-compliant, fully integrated transceiver.

The EV kit has two MAX9947 devices on the board. When one MAX9947 is configured as a transmitter, the other can be configured as a receiver. A user can connect the transmitter and the receiver though a user-supplied coaxial cable, or by simply shorting a jumper on the board for quick testing.

Transmission Output Power

The IC output level at TXOUT can be set by using two external resistors that connect at the RES and BIAS pins.

The EV kit defaults to the nominal power level of +3dBm at the feeder cable as the AISG standard requires. Using the U1 transceiver as an example, with R2 = 4.12kΩ and R3 = 10kΩ, provides 1.78V_{P-P} at TXOUT.

By placing a shunt on jumper JU4 (JU10 in the case of U2 transceiver) across pins 2-3, the TXOUT voltage level can be varied by using the on-board variable resistor VR1 (VR2 in the case of U2). TXOUT is varied according to the following equations:

For U1: V_{TXOUT} (V_{P-P}) = 2.52V_{P-P} x R3/(R3 + VR1)

For U2: V_{TXOUT} (V_{P-P}) = 2.52V_{P-P} x R9/(R9 + VR2)

External Clock for AISG Transceiver

By default, nominal 8.704MHz crystals are connected to each MAX9947 AISG transceiver. Alternatively, a user can apply an external clock on SMA connector J2 (J4 in the case of U2) and place shunts across pins 2-3 of jumper JU5 and pins 1-2 of jumper JU6 (JU11 and JU12 in the case of U2) to disable the on-board crystals.

Bit-Time Duration Selector

Jumpers JU2 and JU3 (JU8 and JU9 in the case of U2) define the duration of the bit time, as shown in Table 2.

Table 2. Bit-Time Duration Selector (JU2, JU3, JU8, JU9)

DIRMD2 (JU2, JU8 SHUNT POSITION)	DIRMD1 (JU3, JU9 SHUNT POSITION)	AISG DATA RATE (kbps)	UNITY BIT TIME (µs)
0 (2-3)	0 (2-3)	9.6	104.16
0 (2-3*)	1 (1-2*)	38.4	26.04
1 (1-2)	0 (2-3)	115.2	8.68
1 (1-2)	1 (1-2)	—	—

**Default position.*

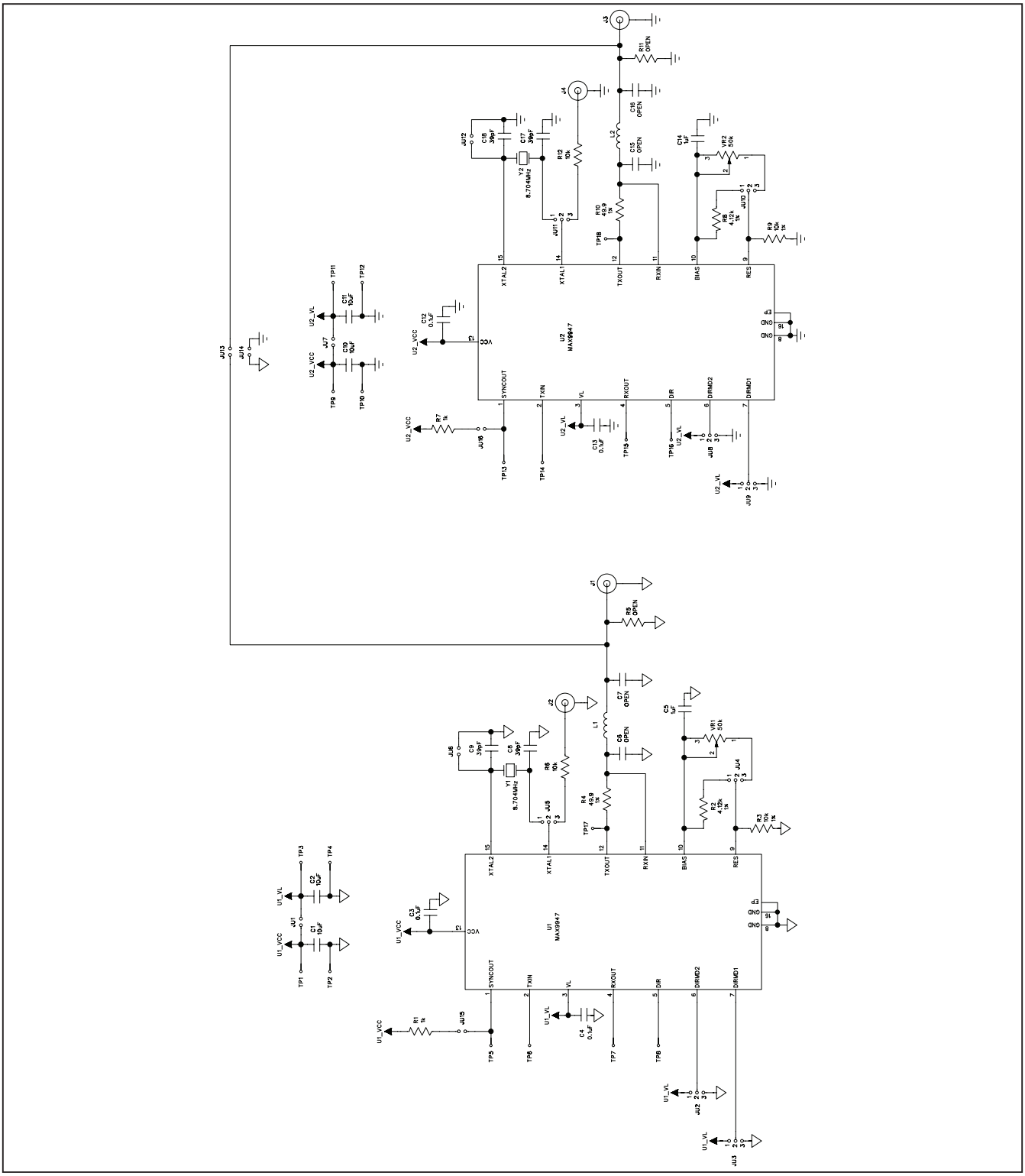


Figure 1. MAX9947 EV Kit Schematic

MAX9947 Evaluation Kit

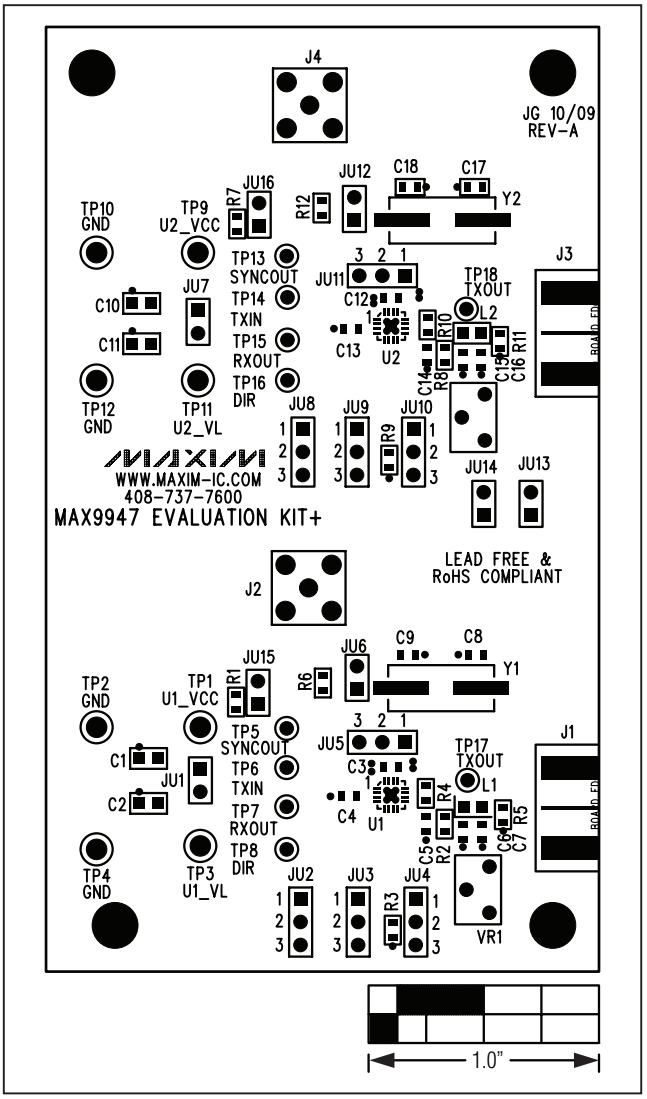


Figure 2. MAX9947 EV Kit Component Placement Guide—Component Side

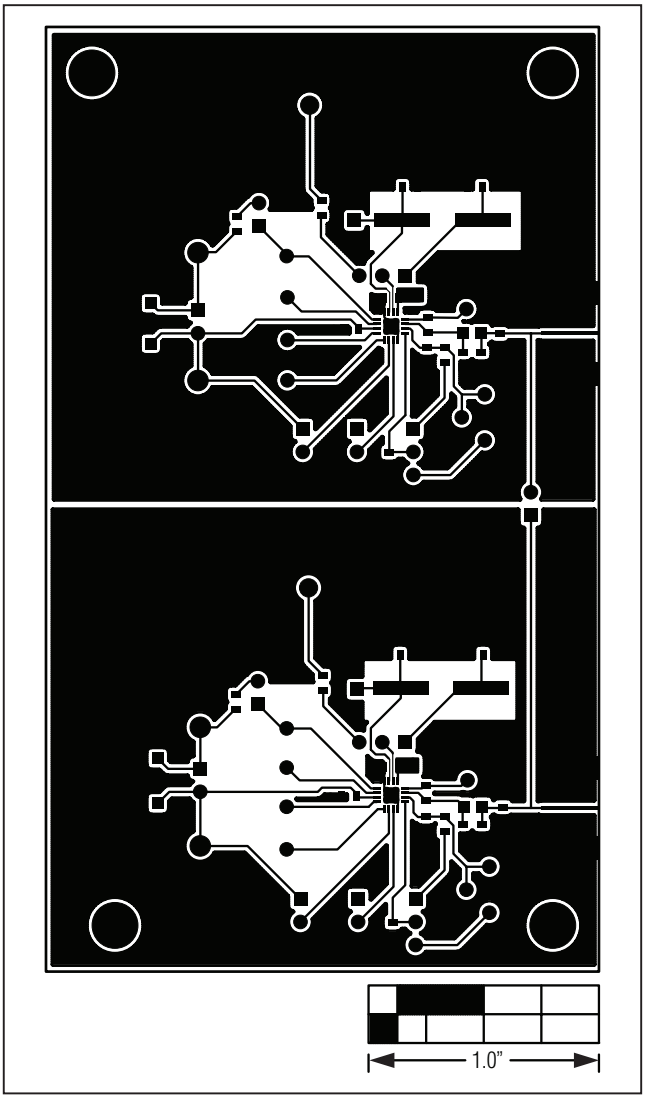


Figure 3. MAX9947 EV Kit PCB Layout—Component Side

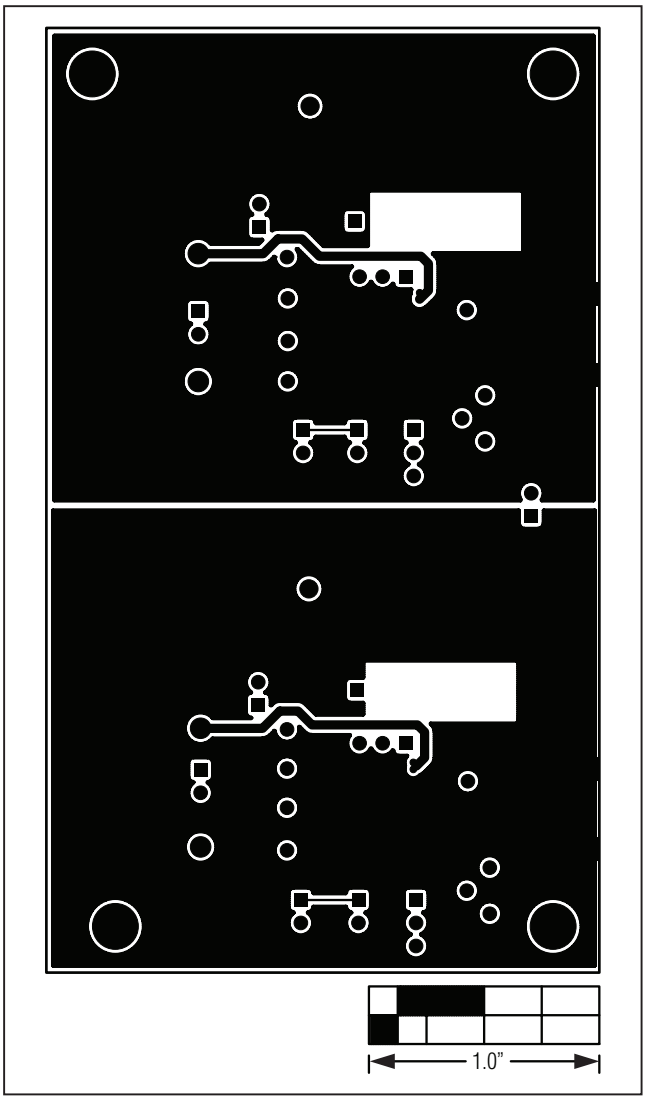


Figure 4. MAX9947 EV Kit PCB Layout—Solder Side

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Analog Devices Inc.:

MAX9947EVKIT+