



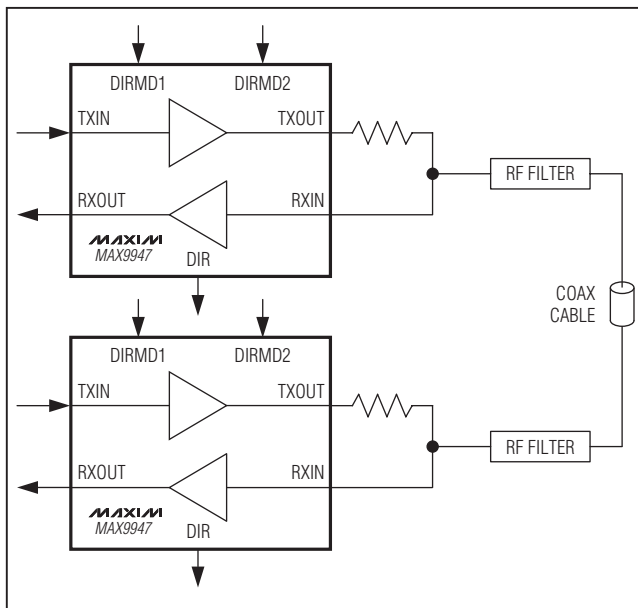
MAX9947 Evaluation Kit

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.

System Diagram



Features

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

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 |



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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+ |

| DESIGNATION | QTY | DESCRIPTION |
|-------------|-----|--|
| VR1, VR2 | 2 | 50k Ω 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.

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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 1k Ω resistor |
| | Open | U1 SYNCOUT not pulled up to VCC |
| JU16 | 1-2* | U2 SYNCOUT pulled up to VCC through a 1k Ω resistor |
| | Open | U2 SYNCOUT not pulled up to VCC |

*Default position.

MAX9947 Evaluation Kit

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 through 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:

$$\text{For U1: } V_{\text{TXOUT}} (V_{\text{P-P}}) = 2.52V_{\text{P-P}} \times R3 / (R3 + VR1)$$

$$\text{For U2: } V_{\text{TXOUT}} (V_{\text{P-P}}) = 2.52V_{\text{P-P}} \times R9 / (R9 + VR2)$$

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.

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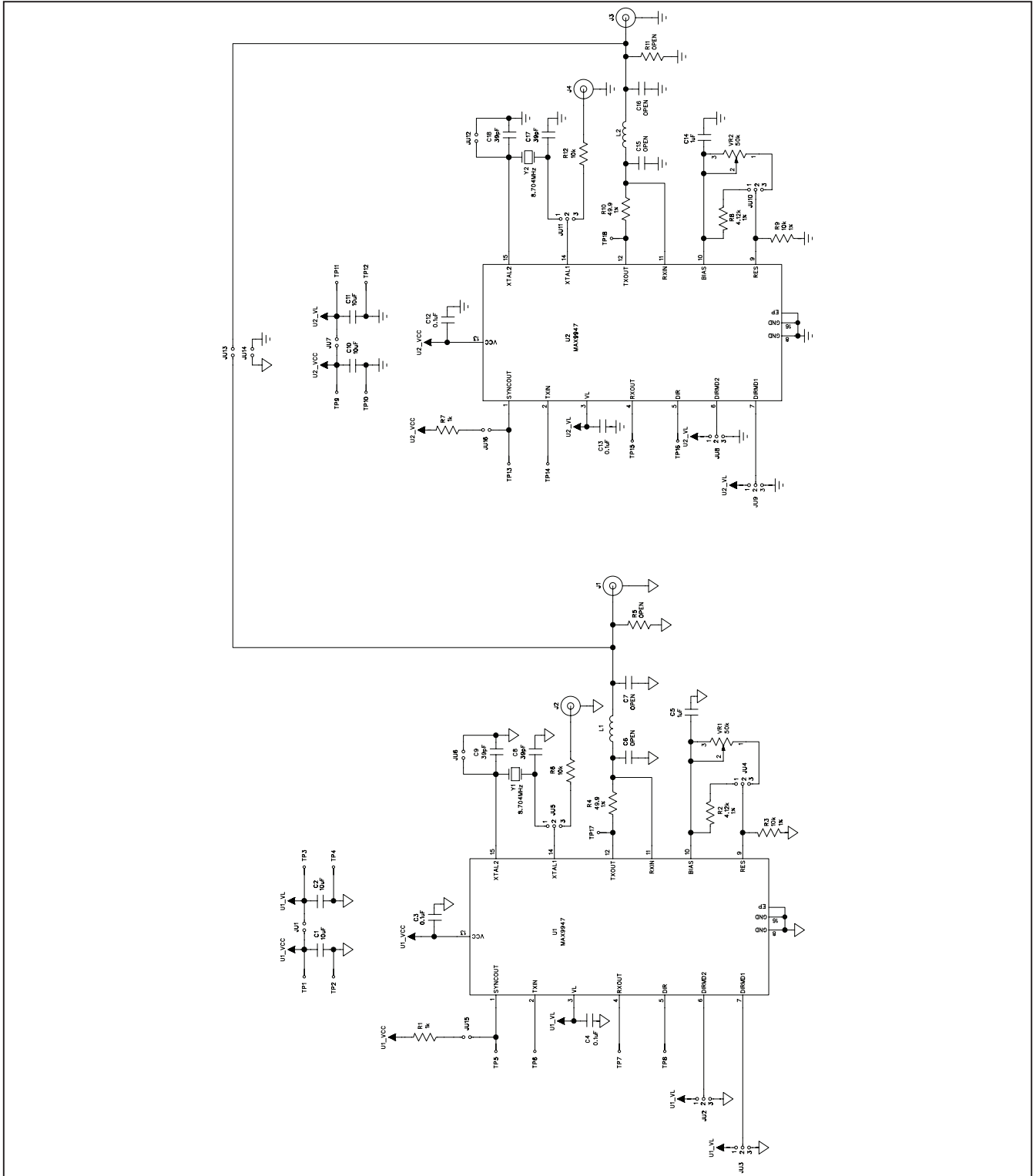


Figure 1. MAX9947 EV Kit Schematic

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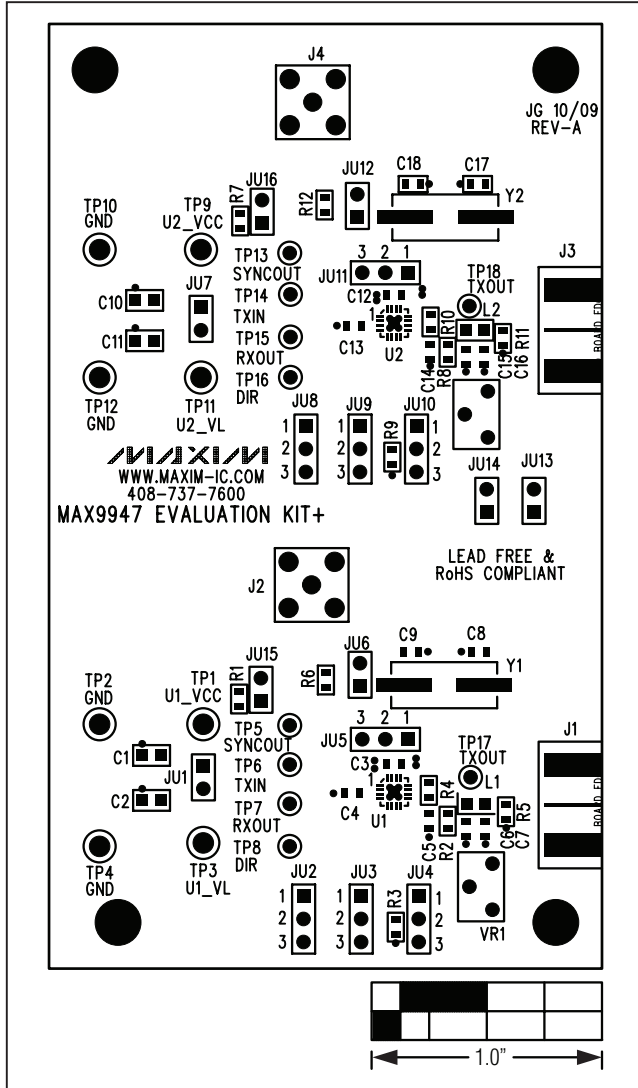


Figure 2. MAX9947 EV Kit Component Placement Guide—Component Side

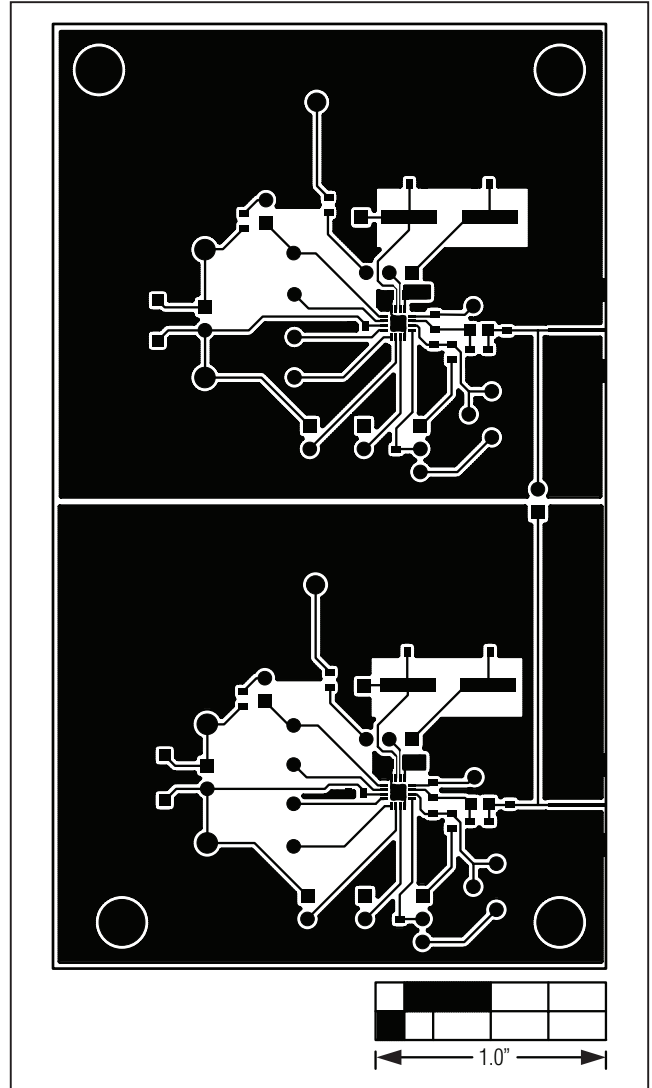


Figure 3. MAX9947 EV Kit PCB Layout—Component Side