



MAX9621 Evaluation Kit

General Description

The MAX9621 evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the MAX9621 dual, 2-wire Hall-effect sensor interface with analog and digital outputs in a 10-pin μ MAX[®] surface-mount package. The EV kit features two on-board analog Hall-effect sensors, demonstrates BAT supply pin isolation, and digital logic for driving status LEDs. Input power to the EV kit circuit can be supplied by a 5.5V to 18V DC source.

The MAX9621 EV kit circuit can be configured to demonstrate the MAX9621's Hall input short-to-ground and 60V fault-protection feature. The EV kit also demonstrates the MAX9621's analog output and filtered digital output features for each sensor input. The EV kit's PCB features an 8-pin, dual-row header to facilitate interfacing with a user's external system.

Features

- ◆ 5.5V to 18V Operating Voltage Range
- ◆ Up to 60V Fault Protection
- ◆ Features Two On-Board 2-Wire Hall-Effect Sensors
- ◆ Evaluates Sensor Short-to-Ground Fault Conditions
- ◆ Demonstrates Adjustable Input Current Threshold
- ◆ Demonstrates Analog Output Feature
- ◆ Two Digital Output Status LED Indicators
- ◆ Demonstrates Reverse-Supply Protection
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

Ordering Information

PART	TYPE
MAX9621EVKIT+	EV Kit

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

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	2.2 μ F \pm 10%, 100V X5R ceramic capacitor (1812) TDK C4532X7R2A225K
C2, C5, C7	3	0.1 μ F \pm 10%, 100V X7R ceramic capacitors (0805) TDK C2012X7R2A104K
C3, C4	2	0.01 μ F \pm 10%, 100V X7R ceramic capacitors (0603) TDK C1608X7R2A103K
C6	1	1 μ F \pm 10%, 25V X5R ceramic capacitor (0805) TDK C2012X5R1E105K
D1	1	100V, 200mA diode (SOD-123) Central Semi CMHD4448 (Top Mark: C48)
D2, D3	2	Green LEDs (0603)
J1	0	Not installed, 2 x 4-pin header
JU1, JU4, JU5	3	2-pin single-row headers
JU2, JU3	2	5-pin 4-way headers

DESIGNATION	QTY	DESCRIPTION
JU6, S3, S4	0	Not installed, 2-pin single-row headers
R1	1	61.9k Ω \pm 1% resistor (0603)
R2, R3	2	4.99k Ω \pm 1% resistors (0603)
R4, R5, R8	3	100k Ω \pm 5% resistors (0603)
R6, R7	2	240 Ω \pm 5% resistors (0603)
S1, S2	2	2-wire Hall-effect switch (SIP-3) Allegro A1140EUA-T
U1	1	Dual, 2-wire Hall-effect sensor interface (10 μ MAX) Maxim MAX9621AUB+
U2	1	Automotive linear regulator (6 TDFN-EP*) Maxim MAX6765TTL2+ (Top Mark: AQB)
U3	1	Triple buffer gate (8 SSOP)
—	5	Shunts (JU1–JU5)
—	1	PCB: MAX9621 EVALUATION KIT+

*EP = Exposed pad.

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Component Suppliers

SUPPLIER	PHONE	WEBSITE
Central Semiconductor Corp.	631-435-1110	www.centralsemi.com
TDK Corp.	847-803-6100	www.component.tdk.com

Note: Indicate that you are using the MAX9621 when contacting these component suppliers.

Quick Start

Required Equipment

- MAX9621 EV kit
- One 5.5V to 18V DC power supply
- One magnet

Procedure

The MAX9621 EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not turn on the power supply until all connections are completed.**

- 1) Verify that a shunt is installed across jumpers JU1 (enabled), JU4, and JU5 (digital outputs pulled up to VCC).
- 2) Verify that a shunt is installed across pins 1-3 of jumpers JU2 and JU3 (U1 inputs connected to Hall sensors).
- 3) Connect the DC power supply between the MAX9621 EV kit's VBAT and GND pads.
- 4) Turn on the DC power supply and set it to 12V, then enable the power-supply output.
- 5) Move the magnet in front of Hall-effect sensors S1 and then S2. Observe the illumination of the DOUT1 and DOUT2 green LEDs (D2 and D3), respectively.
- 6) The AOUT1, AOUT2, and adjacent GND pad can be used to determine the current drawn by the respective Hall sensor. See the *Analog Outputs (AOUT1, AOUT2)* section for more information.

Detailed Description of Hardware

The MAX9621 EV kit is a fully assembled and tested circuit board demonstrating the MAX9621 dual, 2-wire Hall-effect sensor interface IC in a 10-pin surface-mount μ MAX package. Included on the EV kit circuit are two analog Hall-effect sensors (S1, S2), a BAT supply isolation diode (D1), and digital logic (U3) for driving digital status LEDs (D2, D3). The EV kit also features a MAX6765T LDO voltage regulator (U2) for powering the digital logic (5V). ICs U2 and U3 are typically not required in a sensor design and are only provided to ease evaluation of the EV kit. Input power to the EV kit

circuit can be supplied by a 5.5V to 18V DC source. A 0 to 60V DC source can be used to evaluate the fault-protection capability of the device.

Do not reverse the VBAT and GND connections. The only purpose for diode D1 is to evaluate the MAX9621 with a diode-isolated BAT supply pin.

Using jumpers JU2 and JU3, the EV kit circuit can be configured to evaluate the MAX9621's short-to-ground and 60V fault-protection features. Resistors R2 and R3 convert the MAX9621's analog 1-to-20 current mirror signal to a voltage for the AOUT1 and AOUT2 outputs, respectively. Resistors R4 and R5 pull up the DOUT1 and DOUT2 digital outputs to VCC (5V), respectively. Jumpers JU4 and JU5 can be used to disable this feature. The EV kit's PCB is designed with 1oz copper and features an 8-pin dual-row header (J1) footprint to facilitate interfacing with external systems or monitoring.

External Power Supply

The MAX9621 EV kit is powered by a user-supplied 5.5V to 18V DC power supply connected between VBAT and GND. Jumpers JU2 and JU3 can be utilized to emulate a short-to-VBAT, a short-to-GND Hall output, or an open condition. See the *S1/S2 Hall-Effect Sensors and External-User Sensor Evaluation* section for more information.

During the emulation of a short to GND, the MAX9621 EV kit draws substantial shorting current until the EV kit turns off the shorted input. The shorting current can reach a peak of 100mA, and the entire event lasts 1.2 μ s. Many common regulated lab power supplies overshoot in response to a large, short-term current pulse. When evaluating the short-to-GND fault, it is recommended to use an unregulated supply (e.g., wet-cell battery).

SLEEP and Enable Operation

The MAX9621 EV kit features a jumper to enable or place U1 in sleep mode. Jumper JU1 places U1 in sleep mode when the shunt is removed. Installing the shunt enables U1. Refer to the *Sleep Mode Input (SLEEP)* section in the MAX9621 IC data sheet for information. See Table 1 for jumper JU1 settings.

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Evaluates: MAX9621

S1/S2 Hall-Effect Sensors and External-User Sensor Evaluation

The MAX9621 EV kit has two on-board analog Hall-effect sensors (S1, S2). Jumpers JU2 and JU3 provide a convenient way to evaluate the MAX9621 with the on-board sensors, emulate different fault conditions, or evaluate different user-supplied Hall-effect sensors. Additionally, header PCB pads S3 and S4 can be utilized to interface with user-supplied sensors. Pin 2 of header PCB pads S3 and S4 are the external sensor GND connections. See Table 2 for configuring the respective sensor evaluation.

Digital Outputs (DOUT1, DOUT2) and Indicating LEDs

The MAX9621 has two digital outputs (DOUT1 and DOUT2) and the EV kit circuit features two green LEDs (D2 and D3) to indicate the digital output status. The DOUT1 signal is pulled up to VCC by resistor R4 and jumper JU4, while LED D2 indicates the status. The DOUT2 signal is pulled up to VCC by resistor R5 and

jumper JU5, while LED D3 indicates the status. The DOUT1 and DOUT2 signals are available at PCB pads. Refer to the MAX9621 IC data sheet for additional information on the MAX9621 DOUT1 and DOUT2 pins. See Tables 3 and 4 for configuring jumpers JU4 and JU5.

Analog Outputs (AOUT1, AOUT2)

The MAX9621 has two analog outputs (AOUT1 and AOUT2) to indicate the respective Hall-effect sensor operating current. Resistors R2 and R3 convert the MAX9621's analog output current to a voltage for the respective output. PCB pads are provided on the EV kit for evaluating these voltages at the AOUT1 and AOUT2 outputs. To determine the current drawn by the respective Hall sensor, use the following equation:

$$I_{N_} = \frac{20 \times V_{AOUT_}}{4.990}$$

where $V_{AOUT_}$ is the AOUT_ voltage and $I_{N_}$ is the sensor current in milliamps. Refer to the MAX9621 IC data sheet for additional information on the MAX9621 AOUT1 and AOUT2 pins.

Table 1. SLEEP and Enable (JU1)

SHUNT POSITION	SLEEP PIN	U1 OPERATION
Installed*	Connected to VCC	Enabled
Not installed	Internally pulled to GND	Sleep mode

*Default position.

Table 2. Sensor Evaluation (JU2, JU3)

SHUNT POSITION	DESCRIPTION
1-2	Emulates Hall input shorted to battery
1-3*	Demonstrates normal operation with on-board Hall sensor
1-4	Emulates Hall input shorted to GND
1-5	Evaluates user-supplied Hall sensors at header PCB pads S3 and S4
Open	Emulates the open-circuit failure

*Default position.

Table 3. DOUT1 Pullup (JU4)

SHUNT POSITION	DOUT1 PIN	DOUT1 SIGNAL
Installed*	Connected to VCC through resistor R4	Pulled up to VCC
Not installed	Indeterminate	Not pulled up

*Default position.

Table 4. DOUT2 Pull Up (Jumper JU5)

SHUNT POSITION	DOUT2 PIN	DOUT2 SIGNAL
Installed*	Connected to VCC through resistor R5	Pulled up to VCC
Not installed	Indeterminate	Not pulled up

*Default position.

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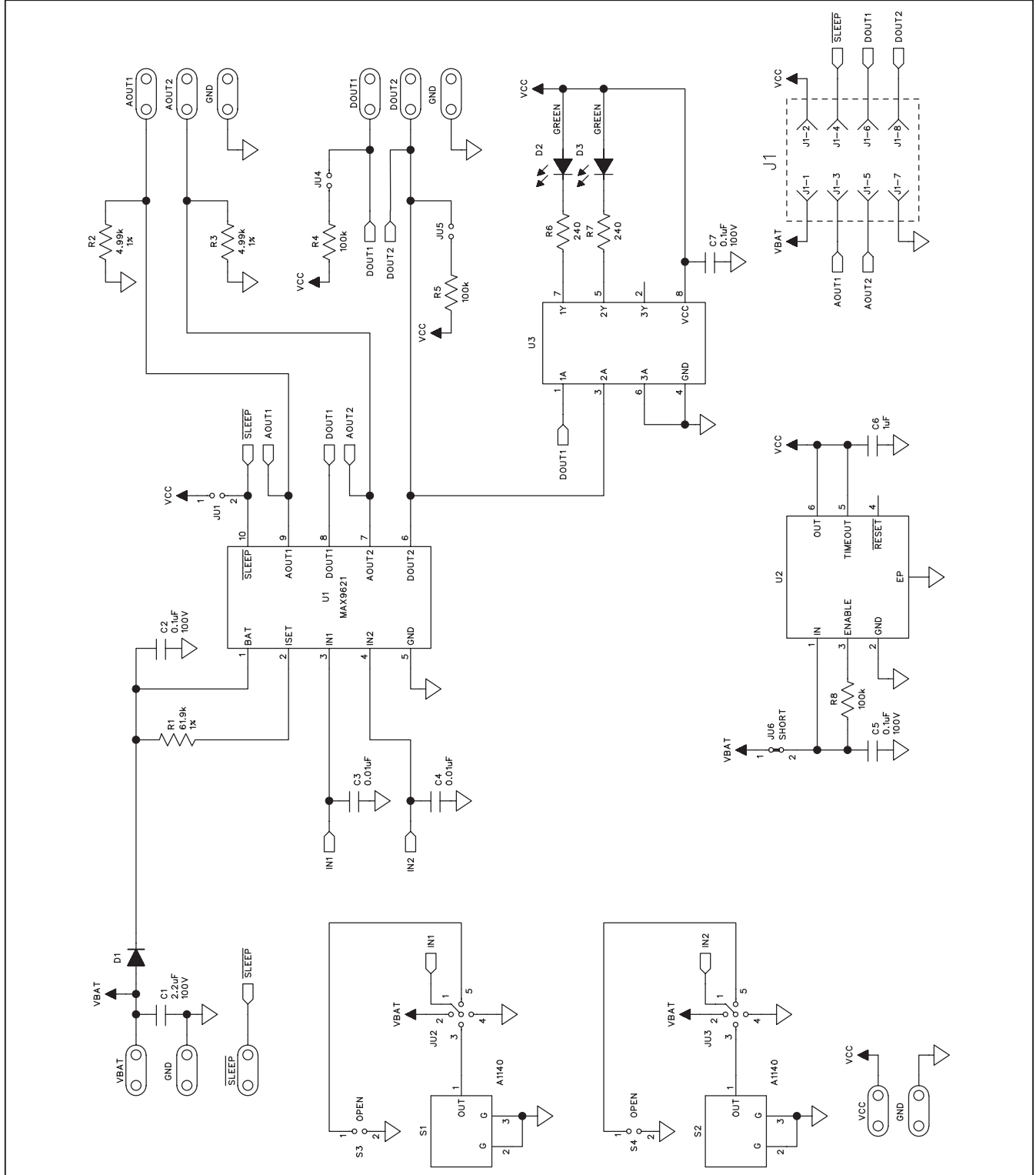


Figure 1. MAX9621 EV Kit Schematic

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Evaluates: MAX9621

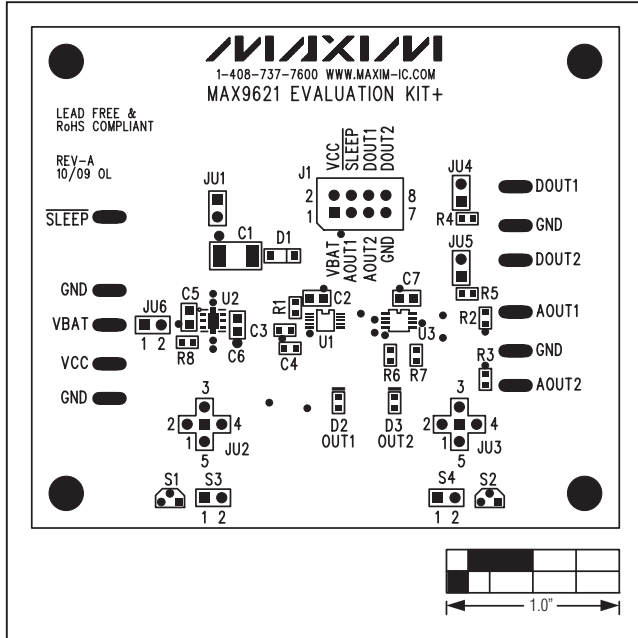


Figure 2. MAX9621 EV Kit Component Placement Guide—Component Side

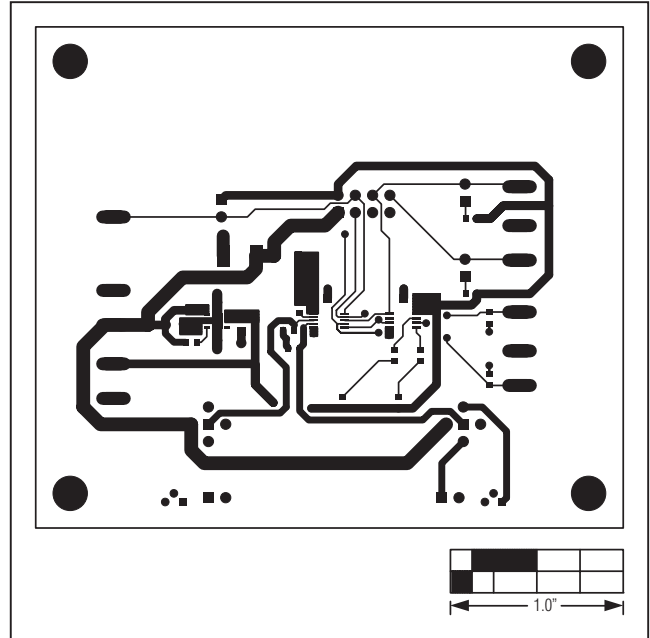


Figure 3. MAX9621 EV Kit PCB Layout—Component Side

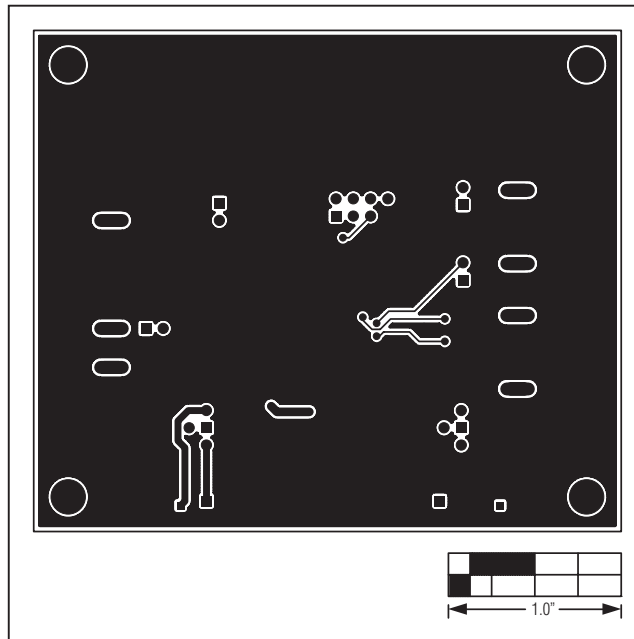


Figure 4. MAX9621 EV Kit PCB Layout—Solder Side

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