One Technology Way • P.O. Box 9106 • Norwood, MA 02062-9106, U.S.A. • Tel: 781.329.4700 • Fax: 781.461.3113 • www.analog.com

Evaluating the ADM4168E ±15 kV ESD Protected Dual RS-422 Transceiver

FEATURES

Easy evaluation of the ADM4168E dual RS-422 transceivers
±15 kV ESD protection on bus input/output pins
Suitable for 5 V power supply applications
Convenient connections through screw terminal blocks
5 V power supply connection
Logic signals: DE1, DI1, RO1, DE2, DI2, RO2
RS-422 receiver inputs: A1, B1, A2, B2
RS-422 driver outputs: Y1, Z1, Y2, Z2
Cable shield and ground connections
Jumper-selectable driver enable settings
Termination resistors (100 Ω) on RS-422 inputs/outputs
Options to switch termination resistors in/out using jumpers
Test points for measuring all signals

DOCUMENTS NEEDED

ADM4168E data sheet
AN-960 application note

GENERAL DESCRIPTION

The EVAL-ADM4168EEBZ allows easy and quick evaluation of the ADM4168E RS-422 dual transceiver. The evaluation board allows all of the input and output functions to be exercised without the need for external components. Screw terminal blocks provide convenient connections for bus or logic signals and power. The evaluation board is easily configured by using jumper connections.

The main device on the board, the ADM4168E, is designed for balanced transmission lines and complies with TIA/EIA-422-B. The differential driver outputs and receiver inputs feature electrostatic discharge circuitry that provides protection up to ±15 kV. The ADM4168E operates from a single 5 V power supply.

EVALUATION BOARD DIAGRAM

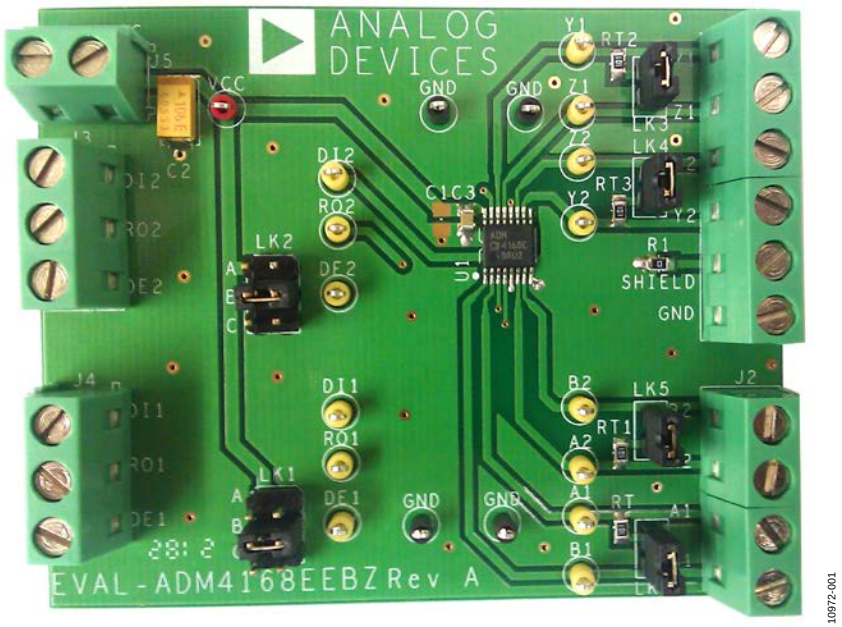

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

8/12—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

TEST SETUP

The EVAL-ADM4168EEBZ provides fast and easy evaluation of the ADM4168E RS-422 transceivers. Test points allow all inputs and outputs to be monitored.

The ADM4168E is powered by a 5 V supply connected to J5. Signals to be transmitted on the RS-422 outputs (Y1, Z1, Y2, and Z2 on J1) can be connected to DI1 and/or DI2 on J4 and J3, respectively.

RS-422 signals are input to the device by connecting to A1, B1, A2, and B2 on J2. Connect driver enable signals to DE1 and/or DE2 on J4 and J3, respectively (see the Jumper Settings section to select these inputs).

Jumpers also allow the 100 Ω termination resistors to be switched in or out on the receiver inputs and/or the driver outputs. Consequently, the device can be evaluated on its own with standard loads or in a bus application where termination is already present elsewhere on the bus.

JUMPER SETTINGS

The inputs to the ADM4168E can be configured using the jumpers on the evaluation board (see Table 1). Note, do not place multiple jumper blocks on LK1 and LK2 because the input sources may be shorted together. For each link, a single jumper block can be moved from one position to another, as specified in Table 1.

The driver outputs can be configured either as terminated or not terminated using LK3 and LK4 on the evaluation board (see Table 1). The receiver inputs can also be configured as terminated or not terminated using LK5 and LK6 on the evaluation board.

An example operation of the EVAL-ADM4168EEBZ is shown in Figure 2, where Channel 1 of the transceiver is being tested.

- A signal generator is connected to DI1, A1 is connected to Y1, and B1 is connected to Z1.
- DE1 is enabled with LK1 in Position A. Termination resistors are present on the receiver inputs with the LK6 jumper closed and LK3 open to disconnect termination resistors on the driver outputs.
- The oscilloscope monitors DI1, A1, B1, and RO1.

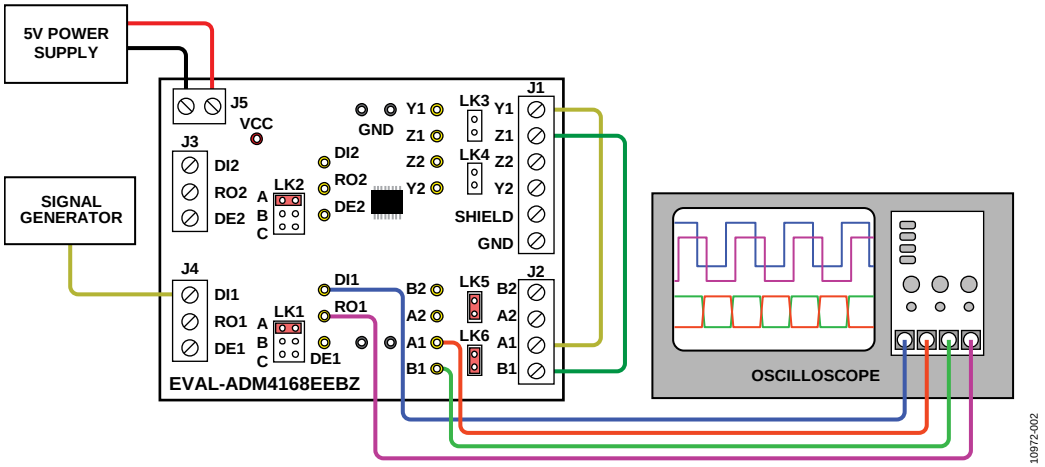

Figure 2. Basic Test, Channel 1

Table 1. Jumper Configuration

Link	Connection	Description
LK1	A	Connects the driver enable input (DE1) of the ADM4168E to VCC. This setting enables the driver.
	B	Connects the driver enable input (DE1) of the ADM4168E to GND. This setting disables the driver.
	C	Connects the driver enable input (DE1) of the ADM4168E to Pin 3 of the J3 terminal block connector.
LK2	A	Connects the driver enable input (DE2) of the ADM4168E to VCC. This setting enables the driver.
	B	Connects the driver enable input (DE2) of the ADM4168E to GND. This setting disables the driver.
	C	Connects the driver enable input (DE2) of the ADM4168E to Pin 3 of the J4 terminal block connector.
LK3	Closed	When closed, LK3 connects a 100 Ω termination resistor between Driver Output Y1 and Driver Output Z1. This allows termination of Driver 1 without the ADM4168E being connected into a bus.
	Open	When LK3 is open, Driver 1 has no termination resistor. This allows the driver to connect to a bus that has already been terminated correctly.
LK4	Closed	When closed, LK4 connects a 100 Ω termination resistor between Driver Output Y2 and Driver Output Z2. This allows termination of Driver 2 without the ADM4168E being connected into a bus.
	Open	When LK4 is open, Driver 2 has no termination resistor. This allows the driver to connect to a bus that has already been terminated correctly.
LK5	Closed	When closed, LK5 connects a 100 Ω termination resistor between Receiver Input A1 and Receiver Input B1. This allows termination of Receiver 1 for connection into a bus that is not terminated.
	Open	When LK5 is open, Driver 1 has no termination resistor. This allows the driver to connect to a bus that has already been terminated correctly.
LK6	Closed	When closed, LK6 connects a 100 Ω termination resistor between Receiver Input A2 and Receiver Input B2. This allows termination of Receiver 2 for connection into a bus that is not terminated.
	Open	When LK6 is open, Receiver 2 has no termination. This allows the receiver to connect to a bus that has already been terminated correctly.

TERMINATION RESISTORS

The EVAL-ADM4168EEBZ evaluation board includes the RT and RT1 footprints for termination resistors between the receiver inputs (A and B) on each channel. The evaluation board also includes the RT2 and RT3 footprints for termination resistors between the driver outputs (Y and Z) on each channel.

In addition to switching these resistors in or out on the driver outputs and receiver inputs, using the jumper settings, the resistors can be removed or replaced with another value of termination resistor to suit application testing requirements.

For more information about proper termination, see the AN-960 Application Note, *RS-485/RS-422 Circuit Implementation Guide*.

DECOUPLING CAPACITORS

The evaluation board uses the following decoupling capacitors:

- 10 µF tantalum capacitor for C2
- 100 nF ceramic capacitor for C3

EVALUATION BOARD SCHEMATICS AND ARTWORK

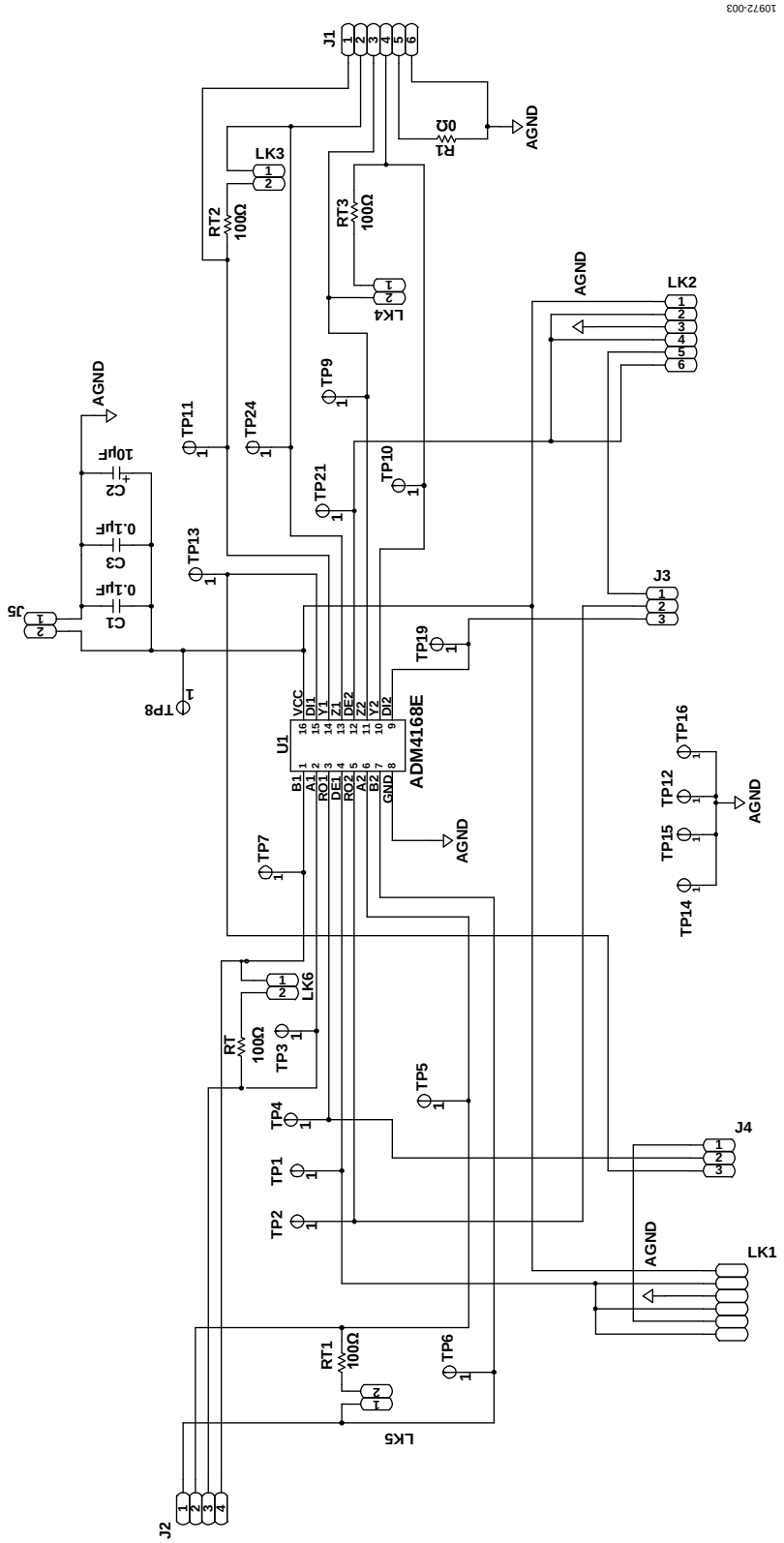

Figure 3. Evaluation Board Schematic

ASSEMBLY DRAWINGS AND BOARD LAYOUT

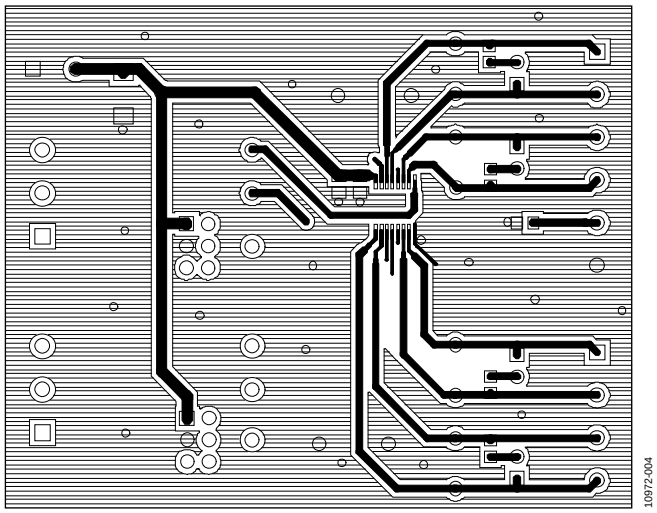

Figure 4. Top Layer PCB

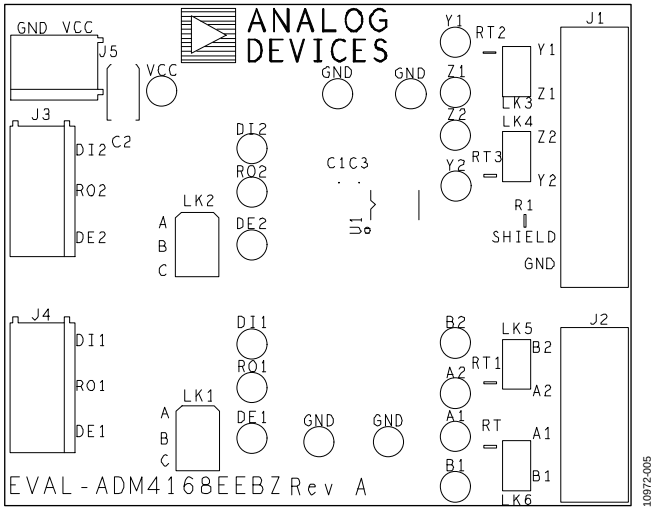

Figure 5. Silkscreen PCB

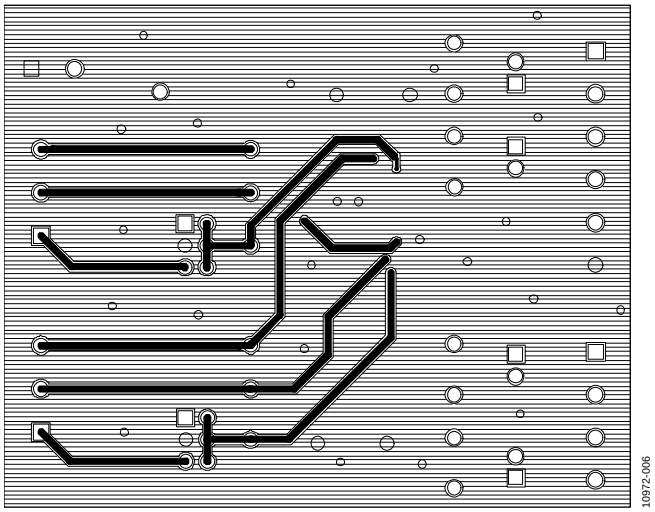

Figure 6. Bottom Layer PCB

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Quantity	Reference Designator	Description	Supplier	Part No.
1	R4	Resistor, 0 Ω, Size 0805	Yageo/Phycomp	RC0805JR-070RL
4	RT, RT1, RT2, RT3	Resistor, 100 Ω, Size 0805	Yageo/Phycomp	RC0805JR-07100RL
1	C1	Capacitor, Size 0805 (not inserted)	N/A[1]	N/A[1]
1	C3	Capacitor, Size 0805, 100 nF	Yageo/Phycomp	CC0805KRX7R7BB104
1	C2	Capacitor, Size Case C, 10 µF	AVX	TPSC106K025R0300
1	J1	Power Connector 6, 6-pin terminal block	Lumberg	KRM 06
1	J2	Power Connector 4, 4-pin terminal block	Lumberg	KRM 04
2	J3, J4	Power Connector 3, 3-pin terminal block	Lumberg	KRM 03
1	J5	Power Connector 2, 2-pin terminal block	Lumberg	KRM 02
2	LK1, LK2	6-pin (3 × 2), 2.54 mm header	Harwin	M20-9953646
		Shorting block	Harwin	M7567-05
2	LK3, LK4, LK5, LK6	2-pin (1 × 2), 2.54 mm header	Harwin	M20-9993646
		Shorting block	Harwin	M7567-05
1	U1	16-lead, TSSOP	Analog Devices, Inc.	ADM4168E
4	GND	Test point, black	Vero Technologies	20-2137
1	VCC	Test point, red	Vero Technologies	20-313137
14	DE1, DE2, DI1, DI2, Y1, Z1, Y2, Z2, A1, B1, A2, B2, RO1, RO2	Test point, yellow	Vero Technologies	20-313140

[1] N/A means not applicable.

RELATED LINKS

Resource	Description
ADM4168E	Product Page, ADM4168E ±15 kV ESD Protected Dual RS-422 Transceiver
AN-960	Application Note, *RS-485/RS-422 Circuit Implementation Guide*

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

UG10972-0-8/12(0)