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

Evaluation Board for the ADM2682E/ADM2687E 5 kV rms Signal and Power Isolated RS-485 Transceivers with ±15 kV ESD Protection

FEATURES

5 kV rms power and signal isolated RS-485/RS-422 transceiver
Convenient connections for power and signal through screw terminal blocks
Configurable as half duplex or full duplex
5 V or 3.3 V operation
Easily configurable through jumper connections
Test points for measuring all signals
Layout optimized for emissions according to the AN-0971 Application Note

EVALUATION KIT CONTENTS

EVAL-ADM2682EEBZ or EVAL-ADM2687EEBZ

GENERAL DESCRIPTION

The ADM2682E/ADM2687E evaluation board can be used for easy evaluation of the ADM2682E and ADM2687E power and signal isolated RS-485 transceivers. Screw terminal blocks provide convenient connections for the power and signal connections.

The evaluation board is easily configured through jumper connections. The board can be used in half-duplex or full-duplex configurations and has a 120 Ω termination resistor fitted on the receiver input. The evaluation board can be used with either the ADM2682E 16 Mbps part or the ADM2687E 500 kbps part. The driver and receiver are enabled and disabled by jumper connections. Test points are included on the power and signal lines on both sides of the isolation barrier.

RADIATED EMISSIONS

The ADM2682E/ADM2687E evaluation board is designed to reduce emissions generated by the high frequency switching elements used by the *iso*Power® technology to transfer power through its transformer. The layout of the evaluation board was generated using the guidelines provided in the AN-0971 Application Note, *Recommendations for Control of Radiated Emissions with* iso*Power Devices*.

EVALUATION BOARD

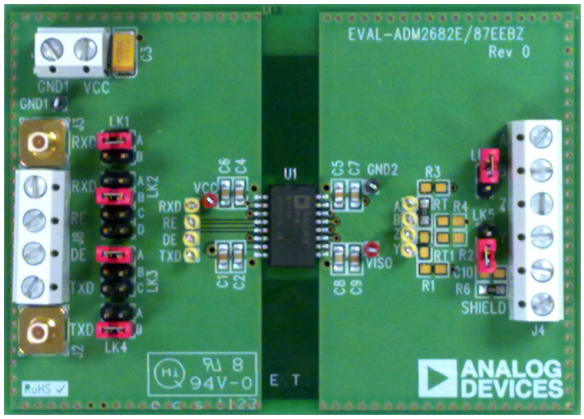


Figure 1.

TABLE OF CONTENTS

Features 1
Evaluation Kit Contents 1
General Description 1
Radiated Emissions 1
Evaluation Board 1
Revision History 2
Evaluation Board Hardware Configuration 3
Test Setup 3
Jumper Settings 3
Termination and Pull-Up/Pull-Down Resistors 4
Decoupling and Reservoir Capacitors 4
Board Internal Layer Thickness 4
Evaluation Board Schematics 5
Assembly Drawings and Board Layout 6
Ordering Information 9
Bill of Materials 9
Related Links 9

REVISION HISTORY

10/11—Revision 0: Initial Version

EVALUATION BOARD HARDWARE CONFIGURATION

TEST SETUP

The ADM2682E/ADM2687E evaluation board is shown in Figure 2 with the default jumper settings on LK1 through LK4 (driver and receiver enabled), power connection on J1, input signal connection on J2, and probes attached to RXD, TXD, Y, and Z for a loopback test (LK5 and LK6 are closed to connect A to Y and B to Z).

JUMPER SETTINGS

The inputs to the ADM2682E/ADM2687E can be configured using the jumpers on the evaluation board (see Table 1). Note that multiple jumper blocks should not be placed on LK1 to LK4 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.

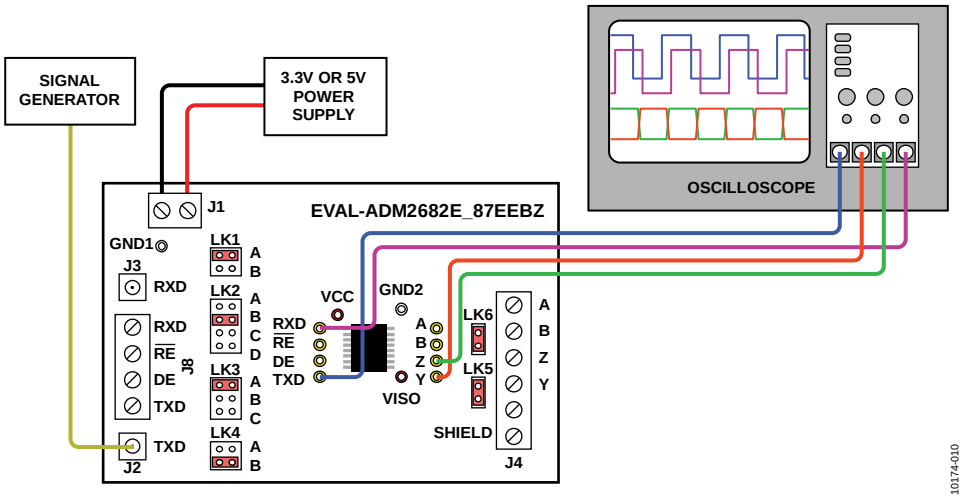


Figure 2. Basic Operation of the Evaluation Board for the ADM2682E/ADM2687E Isolated RS-485 Transceivers

Table 1. Jumper Configuration

Link	Connection	Description
LK1	A	Connects the receiver output (RxD) of the ADM2682E/ADM2687E to the J3 connector.
	B	Connects the receiver output (RxD) of the ADM2682E/ADM2687E to the J8-1 terminal block connector.
LK2	A	Connects the receiver enable input ($\overline{RE}$) of the ADM2682E/ADM2687E to V_{CC}. This setting disables the receiver.
	B	Connects the receiver enable input ($\overline{RE}$) of the ADM2682E/ADM2687E to GND_1. This setting enables the receiver.
	C	Connects the receiver enable input ($\overline{RE}$) of the ADM2682E/ADM2687E to the J8-2 terminal block connector.
	D	Connects the receiver enable input ($\overline{RE}$) of the ADM2682E/ADM2687E to the driver enable input (DE); that is, the input for both $\overline{RE}$ and DE is set by LK3. This setting ensures that when the driver is enabled, the receiver is disabled, or when the driver is disabled, the receiver is enabled.
LK3	A	Connects the driver enable input (DE) of the ADM2682E/ADM2687E to V_{CC}. This setting enables the driver.
	B	Connects the driver enable input (DE) of the ADM2682E/ADM2687E to GND_1. This setting disables the driver.
	C	Connects the driver enable input (DE) of the ADM2682E/ADM2687E to the J8-3 terminal block connector.
LK4	A	Connects the driver input (TxD) of the ADM2682E/ADM2687E to the J8-4 terminal block connector.
	B	Connects the driver input (TxD) of the ADM2682E/ADM2687E to the J2 connector.
LK5	Closed	Connects the ADM2682E/ADM2687E Receiver Input A to Driver Output Y. When LK5 and LK6 are both connected, the evaluation board is configured for half-duplex operation.
	Open	When LK5 and LK6 are both open, the evaluation board is configured for full-duplex operation.
LK6	Closed	Connects the ADM2682E/ADM2687E Receiver Input B to Driver Output Z. When LK5 and LK6 are both connected, the evaluation board is configured for half-duplex operation.
	Open	When LK5 and LK6 are both open, the evaluation board is configured for full-duplex operation.

TERMINATION AND PULL-UP/PULL-DOWN RESISTORS

The evaluation board includes the RT and RT1 footprints for fitting termination resistors between the A and B receiver inputs and the Y and Z driver outputs. By default, the board is fitted with a 120 Ω resistor, RT, between A and B. This resistor should be removed if the board is connected to a bus that is already terminated at both ends. For more information about proper termination, see the AN-960 Application Note, *RS-485/RS-422 Circuit Implementation Guide*.

Although the ADM2682E/ADM2687E have a built-in receiver fail-safe for the bus idle condition, there are footprints on the evaluation board for fitting the R3 and R1 pull-up resistors to VISO on A and Y, as well as the R4 and R2 pull-down resistors to GND on B and Z. These resistors can be fitted if the user is connecting to other parts that require such external biasing resistors on the bus. The exact value required for a 200 mV minimum differential voltage in the bus idle condition depends on the supply voltage (for example, 960 Ω for 3.3 V and 1440 Ω for 5 V).

For more information about the bus idle fail-safe, see the AN-960 Application Note, *RS-485/RS-422 Circuit Implementation Guide*.

DECOUPLING AND RESERVOIR CAPACITORS

The evaluation board uses the following decoupling and reservoir capacitors:

- On the logic side of the board, the C1 and C2 capacitors should be 10 µF and 100 nF ceramic capacitors, respectively, and the C4 and C6 capacitors should be 10 nF and 100 nF ceramic capacitors, respectively.
- On the bus side of the board, the C5 and C7 capacitors should be 10 nF and 100 nF, respectively, and the C8 and C9 capacitors should be 100 nF and 10 µF, respectively.

BOARD INTERNAL LAYER THICKNESS

The ADM2682E/ADM2687E evaluation board consists of six layers with four internal layers. The spacing between the internal board layers was chosen as specified in Table 2 to maximize the stitching capacitance on the board.

Table 2. Spacing Between Layers of the Evaluation Board

Layers	Thickness of Space Between Layers (mm)
1 to 2	0.1016
2 to 3	0.2032
3 to 4	0.2032
4 to 5	0.2032
5 to 6	0.1016

EVALUATION BOARD SCHEMATICS

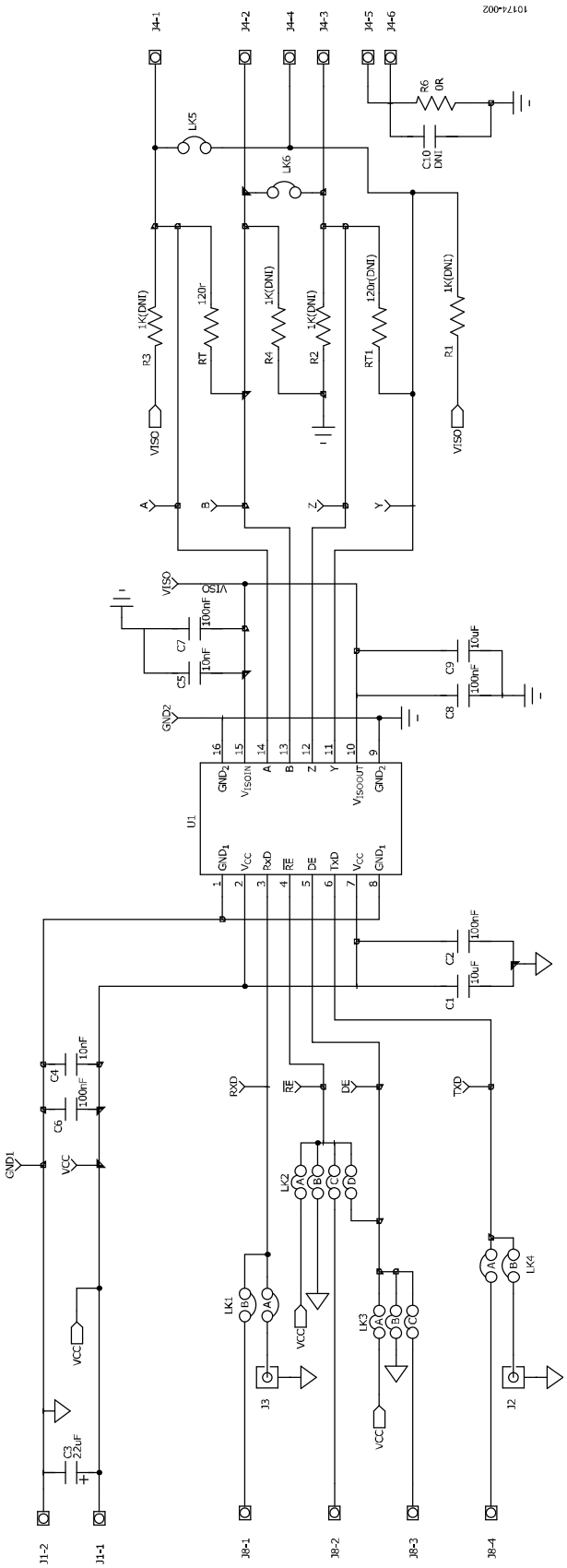


Figure 3. Schematics of the ADM2682E/ADM2687E Evaluation Board

ASSEMBLY DRAWINGS AND BOARD LAYOUT

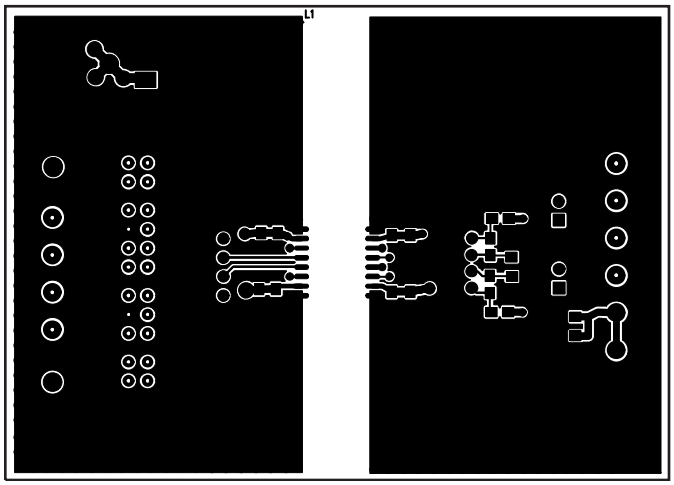


Figure 4. Top Layer

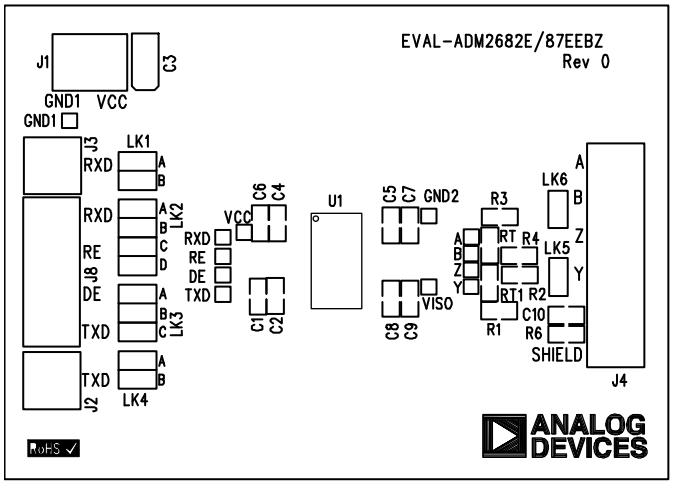


Figure 5. Silkscreen

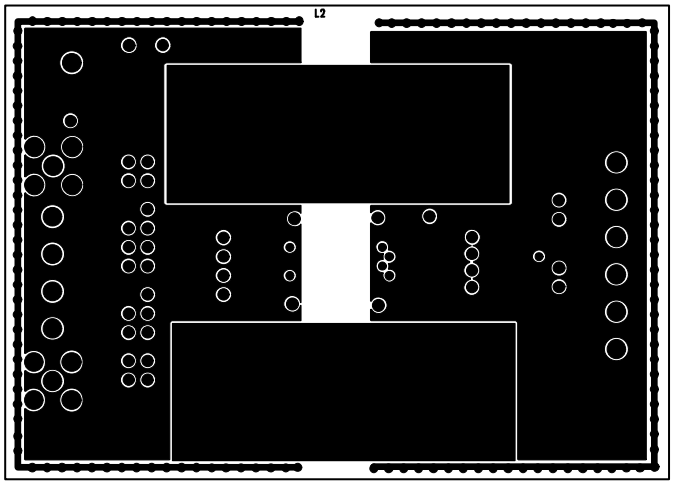


Figure 6. Internal Layer 2

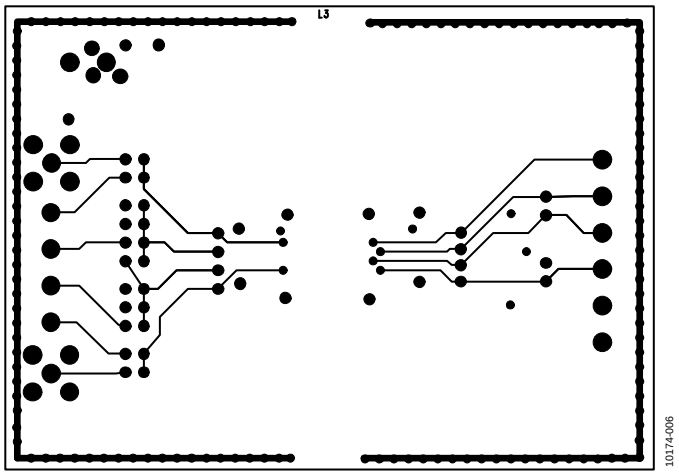


Figure 7. Internal Layer 3

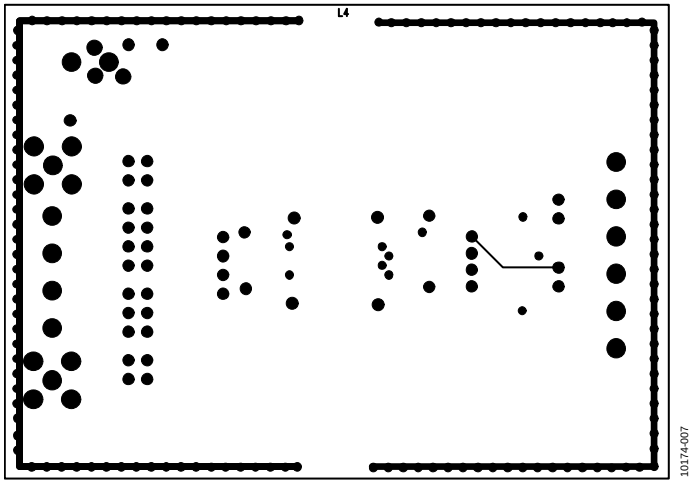


Figure 8. Internal Layer 4

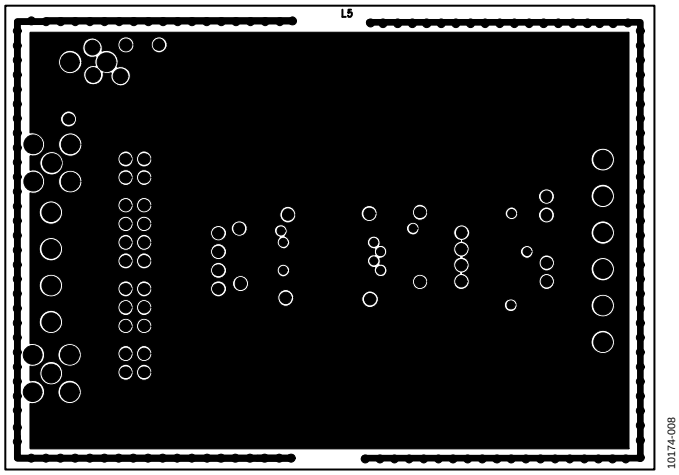


Figure 9. Internal Layer 5

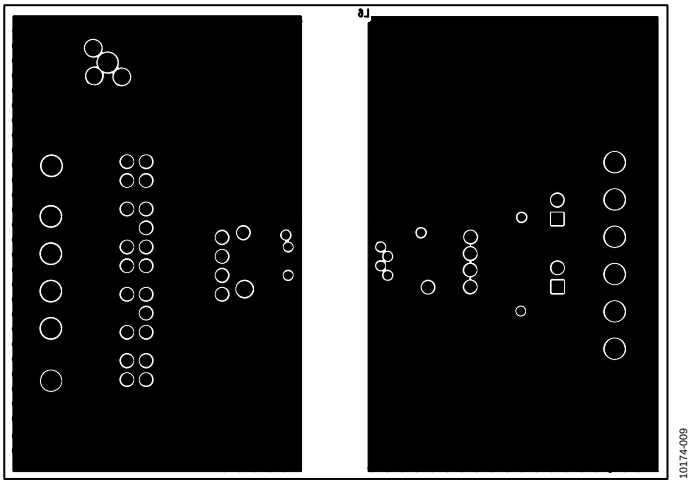


Figure 10. Bottom Solder Layer

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Quantity	Reference Designator	Description	Supplier	Part No.
4	R1, R2, R3, R4	Resistor, size 0805 (not inserted)	Not inserted	Not inserted
1	R6	Resistor, 0 Ω, size 0805	Vishay Draloric	CRCW08050000Z0EA
1	RT	Resistor, 120 Ω, size 0805	Multicomp	MC 0.1W 0805 1%
1	RT1	Resistor, size 0805 (not inserted)	Not inserted	Not inserted
2	C1, C9	Capacitor, size 0805, 10 µF	AVX	0805ZD106KAT2A
4	C2, C6, C7, C8	Capacitor, size 0805, 100 nF	Multicomp	MCCA000274
1	C3	Capacitor, tantalum, Case C, 22 µF	AVX	TAJC226K016RNJ
2	C4, C5	Capacitor, size 0805, 10 nF	AVX	08053C103KAT2A
1	C10	Capacitor, size 0805 (not inserted)	Not inserted	Not inserted
1	J1	CON\POWER, 2-pin terminal block (5 mm pitch)	Camden Electronics	CTB5000/2
2	J2, J3	PCB SMB jack (square)	Multicomp	24-14-2-TGG
1	J4	CON\POWER6, 6-pin terminal block	Camden Electronics	CTB5000/6
1	J8	CON\POWER4, 4-pin terminal block	Camden Electronics	CTB5000/4
2	LK1, LK4	4-pin (2 × 2), 2.54 mm header and shorting block	Harwin	M20-9953646 and M7566-05
1	LK2	8-pin (4 × 2), 2.54 mm header and shorting block	Harwin	M20-9953646 and M7566-05
1	LK3	6-pin (3 × 2), 2.54 mm header and shorting block	Harwin	M20-9953646 and M7566-05
2	LK5, LK6	2-pin (1 × 2), 2.54 mm header and shorting block	Harwin	M20-9953646 and M7566-05
1	U1	16-lead, wide body SOIC with increased creepage	Analog Devices	ADM2682EBRIZ or ADM2687EBRIZ
2	GND1, GND2	Test point, black	Vero Technologies	20-2137
2	VCC, VISO	Test point, red	Vero Technologies	20-313137
8	RXD, $\overline{RE}$, DE, TXD, A, B, Z, Y	Test point, yellow	Vero Technologies	20-313140

RELATED LINKS

Resource	Description
ADM2682E	16 Mbps, 5 kV rms Signal and Power Isolated RS-485 Transceiver with ±15 kV ESD Protection
ADM2687E	500 kbps, 5 kV rms Signal and Power Isolated RS-485 Transceiver with ±15 kV ESD Protection
AN-960	RS-485/RS-422 Circuit Implementation Guide
AN-0971	Recommendations for Control of Radiated Emissions with *iso*Power Devices

NOTES

NOTES

NOTES



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.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS ($100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.

©2011 Analog Devices, Inc. All rights reserved. Trademarks and registered trademarks are the property of their respective owners.

UG10174-0-10/11(0)



www.analog.com