ISO485EVM Isolated RS-485 EVM

This User Guide details evaluation module (EVM) operation of the factory installed isolated ISO3082 transceiver. The ISO485EVM can be reconfigured by a user for use with the ISO15, ISO35, ISO3080, ISO3082, ISO3086, or ISO3088 isolators. Contact a field representative or TI if a factory installed version of one these devices is desired.

This guide explains the user-configurable I/O loads for the half-duplex and full-duplex EVM configurations, and presents a typical lab setup and typical output waveform.

CAUTION

Although these devices provide galvanic isolation of up to 4000 V, this EVM cannot be used for isolation voltage testing. This EVM is designed for the evaluation of device operating parameters only and may be damaged if high voltage (> 5.5 V) is applied anywhere in the circuit.

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1 Introduction

1.1 Overview

The ISO15, ISO35, ISO3080, ISO3082, ISO3086, and ISO3088 isolated RS-485 transceivers have a logic input and output buffer separated by a silicon oxide (SiO_2) insulation barrier. Used in conjunction with isolated power supplies, these devices block high voltages, isolate grounds, and prevent noise currents on a data bus or other circuits from entering the local ground and interfering with or damaging sensitive circuitry.

These devices are ideal for long transmission lines because the ground loop is broken to allow for a much larger common-mode voltage range. The symmetrical isolation barrier of the device is tested to provide 2500 V_{RMS} of isolation for 60s between the bus-line transceiver and the logic-level interface.

Any cabled I/O can be subjected to electrical noise transients from various sources. These noise transients can cause damage to the transceiver, near-by sensitive circuitry, or both if they are of sufficient magnitude and duration. These isolated devices can significantly increase protection and reduce the risk of damage to expensive control circuits.

1.2 The Functional Configurations of the Isolated RS-485 Transceivers

Figure 1 and Figure 2 show the pinouts of the isolated RS-485 transceivers. The EVM comes with the ISO3082 half-duplex transceiver installed, however a user can reconfigure the EVM for use with any of the devices or can contact TI for a factory installation of any of the other devices.

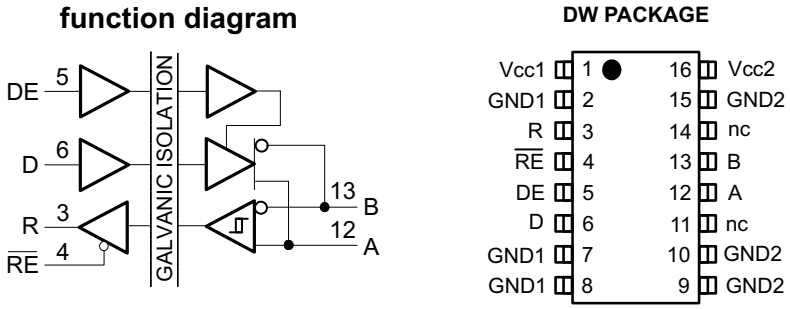

Figure 1. The ISO15, ISO3082 and ISO3088 Half-Duplex Function Diagram and Pinout

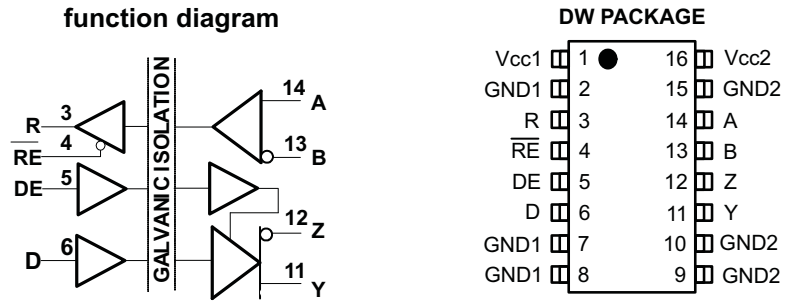

Figure 2. The ISO35, ISO3080, and ISO3086 Full-Duplex Function Diagram and Pinout

1.3 The Isolated RS-485 EVM

This multi-functional EVM is designed with the signal paths for the half-duplex or full-duplex operation displayed in Figure 1, Figure 2 and Figure 4 for the evaluation of any of the isolated RS-485 transceivers.

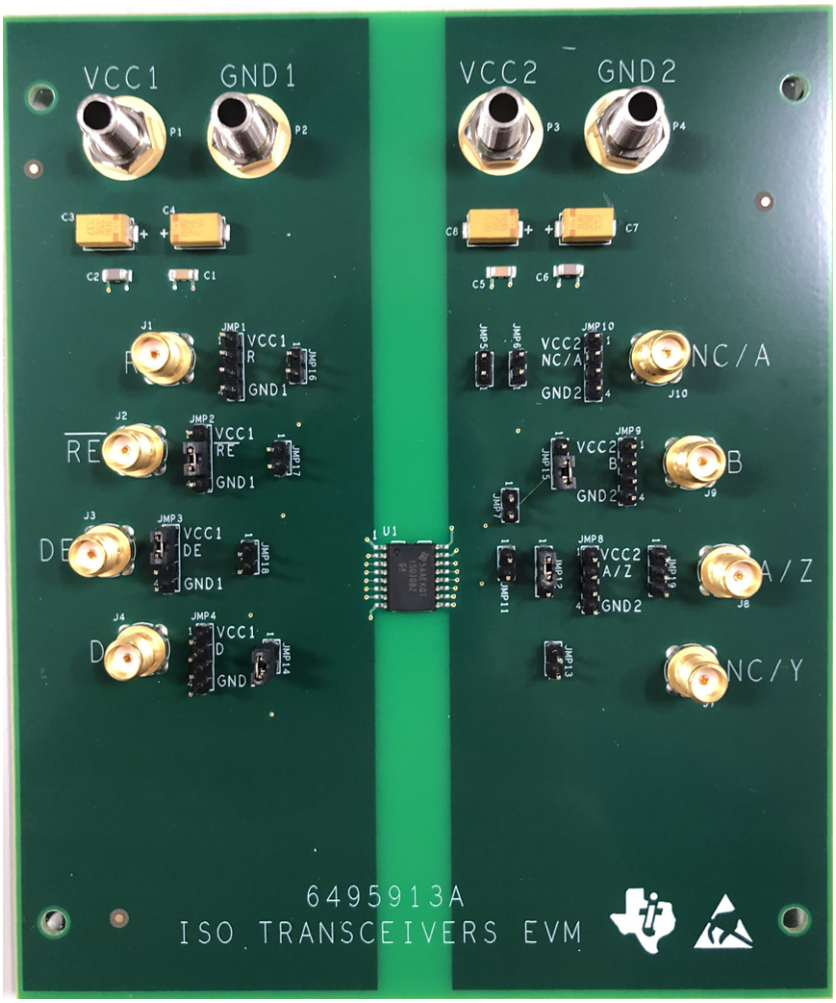

Figure 3. Board Layout

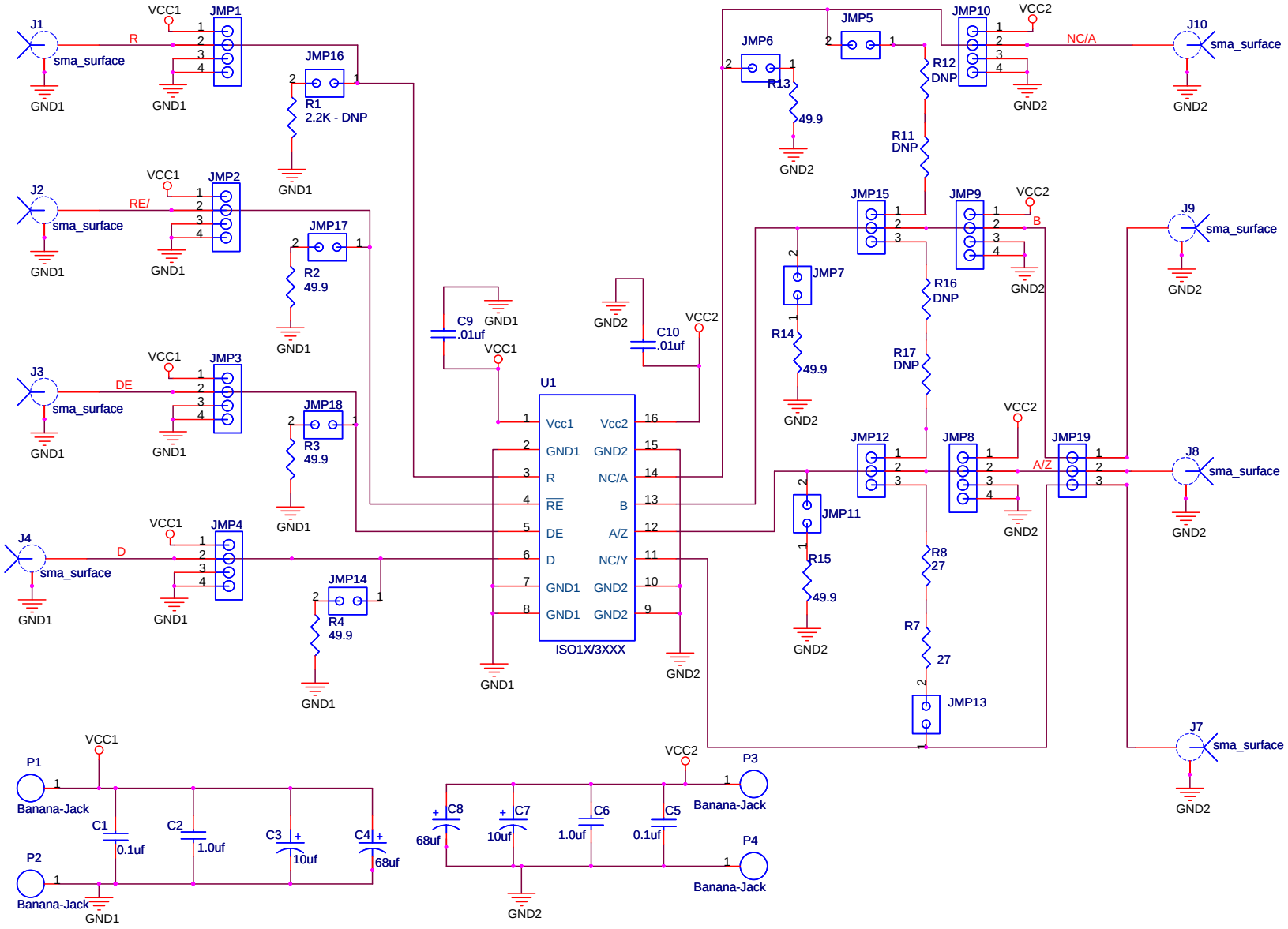

Figure 4. The Isolated RS-485 EVM Schematic

Table 1. Isolated RS-485 EVM Connections

Connection	Label	Description
J1	R	SMA connector to the receiver output pin
J2	$\overline{EN}$	SMA connector to the receiver enable input pin
J3	DE	SMA connector to the driver enable input pin
J4	D	SMA connector to the driver input pin
J10	NC/A	SMA connector to the Full-Duplex A bus pin
J9	B	SMA connector to the Half or Full-Duplex B bus pin
J8	A/Z	SMA connector to the Half-Duplex A bus pin or Full-Duplex Z bus pin
J7	NC/Y	SMA connector to the Full-Duplex Y output pin
P1	V_{CC1}	Input power supply banana jack
P2	GND1	Input power ground connection banana jack
P3	V_{CC2}	Output power supply banana jack
P4	GND2	Output power ground connection banana jack
JMP1		4-pin jumper – VCC1, receiver output, GND1
JMP2		4-pin jumper – VCC1, receiver enable input, GND1
JMP3		4-pin jumper – VCC1, driver enable input, GND1
JMP4		4-pin jumper – VCC1, driver input, GND1
JMP10		4-pin jumper – VCC2, Full-Duplex A bus pin receiver input, GND2
JMP9		4-pin jumper – VCC2, Full or Half-Duplex B bus pin, GND2
JMP8		4-pin jumper – VCC2, Half-Duplex A bus pin or Full-Duplex Z bus pin, GND2
JMP15		3-pin jumper – With JMP5 implements Full-Duplex receiver input 54 Ω termination
JMP12		3-pin jumper – With JMP15 implements Half-Duplex 54-Ω termination – With JMP13 implements Full-Duplex driver output 54-Ω termination
JMP19		3-pin jumper – Pins 1 and 2 provide oscilloscope access to Half-Duplex bus lines – Pins 2 and 3 provide access to Full-Duplex driver output bus lines
JMP5		2-pin jumper – With JMP15 implements Full-Duplex receiver input 54 Ω termination
JMP13		2-pin jumper – With JMP12 implements Full-Duplex driver output 54 Ω termination
JMP6, JMP7, JMP11,JMP17, JMP18, JMP14		2-pin jumper – Connects 50-Ω load resistor for input and monitoring waveform equipment
JMP16		2-pin jumper – Connects 2.2-kΩ TTL load resistor

1.4 The Isolated RS-485 EVM Half-Duplex Configuration

The EVM Half-Duplex configuration has an SMA connector, J1, set up as the receiver output connection to the receiver output pin 3 (R). The R1 resistor, a 2.2-kΩ TTL load resistor, can be connected by jumping the pins of JMP16 together.

The J2 jumper connects to pin 4, the receiver enable pin. The J3 jumper is connected to pin 5, the driver enable pin. The J2 and J3 jumpers can be connected together externally to input a logic-high or logic-low to enable or disable the driver and receiver from a single source.

For any half-duplex bus waveform input equipment, engage 50-Ω load resistors at JMP 7 and JMP11..

Table 2 lists the Half-Duplex EVM connections shown in Figure 5.

Table 2. Half-Duplex EVM Connections

Connection	Label	Description
J1	R	SMA connector to the receiver output pin
J2	$\overline{EN}$	SMA connector to the receiver enable input pin
J3	DE	SMA connector to the driver enable input pin
J4	D	SMA connector to the driver input pin
J9	B	SMA connector to the Half-Duplex B bus pin
J8	A/Z	SMA connector to the Half-Duplex A bus pin
JMP15		3-pin jumper – Pins 2 and 3 connect the 54 Ω termination
JMP12		3-pin jumper – Pins 1 and 2 connect 54 Ω termination

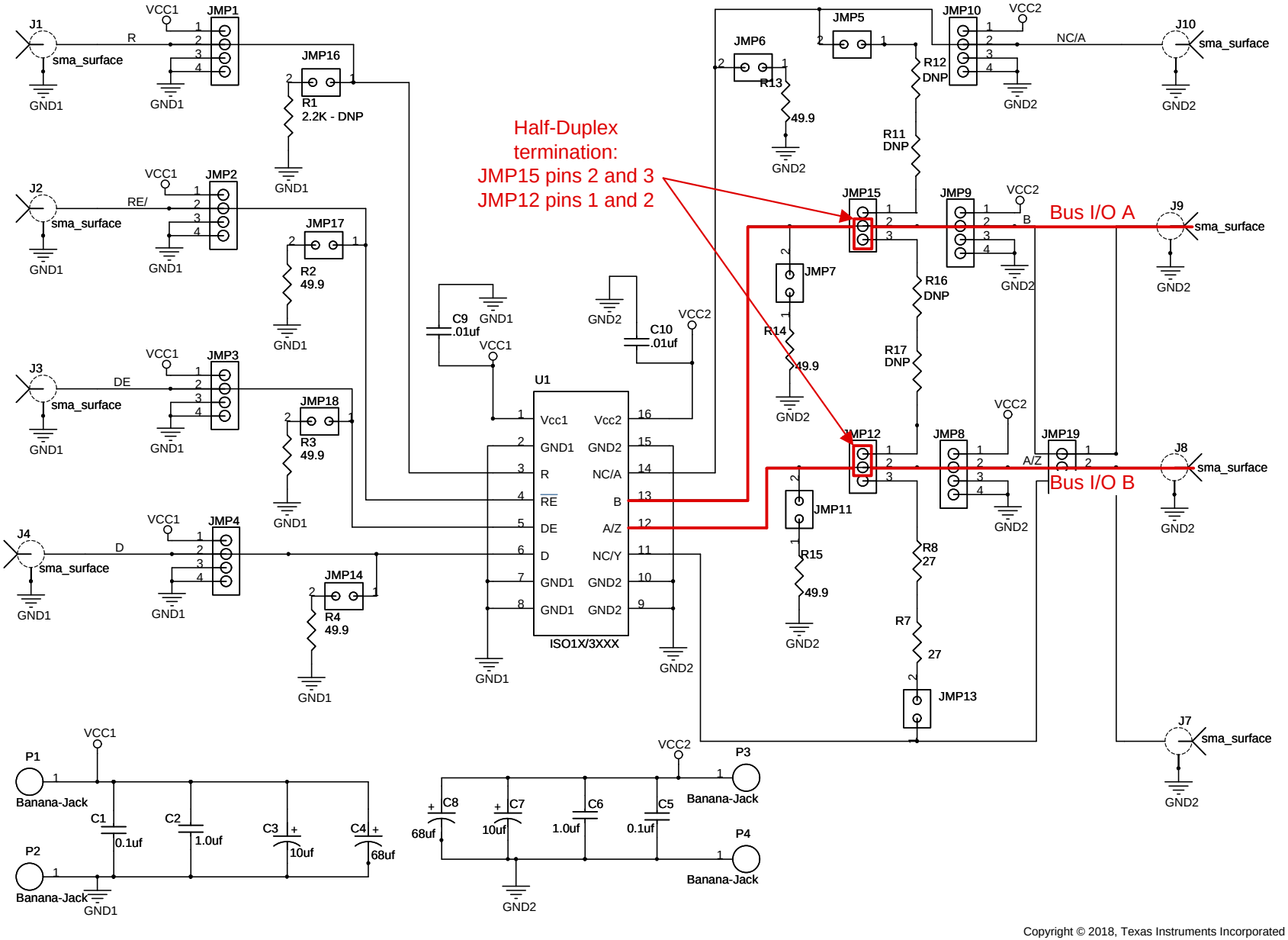

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Figure 5. The Half-Duplex Operation Schematic

1.5 The Isolated RS-485 EVM Full-Duplex Configuration

The EVM Full-Duplex configuration has an SMA connector, J1, set up as the receiver output connection to the receiver output pin 3 (R). The R1 resistor, a 2.2-kΩ TTL load resistor can be connected by jumping the pins of JMP16 together.

The J2 jumper connects to pin 4, the receiver enable pin. The J3 jumper is connected to pin 5, the driver enable pin. The J2 and J3 jumpers can be connected together externally to input a logic-high or logic-low to enable or disable the driver and receiver from a single source.

For receiver waveform input equipment, engage 50-Ω load resistors at JMP 6 and JMP7.

Table 3 lists the Full-Duplex EVM connections shown in Figure 6.

Table 3. Full-Duplex EVM Connections

Connection	Label	Description
J1	R	SMA connector to the receiver output pin
J2	$\overline{EN}$	SMA connector to the receiver enable input pin
J3	DE	SMA connector to the driver enable input pin
J4	D	SMA connector to the driver input pin
J10	NC/A	SMA connector to the Full-Duplex receiver input bus pin A
J9	B	SMA connector to the Full-Duplex receiver input bus pin B
J8	A/Z	SMA connector to the Full-Duplex driver output bus pin Z
J7	NC/Y	SMA connector to the Full-Duplex driver output bus pin Y
JMP15		3-pin jumper – Pins 1 and 2 connect the 54-Ω receiver input termination
JMP5		2-pin jumper – Pins 1 and 2 connect the 54-Ω receiver input termination
JMP12		3-pin jumper – Pins 2 and 3 connect the 54-Ω driver input termination
JMP13		2-pin jumper – Pins 1 and 2 connect the 54-Ω driver input termination

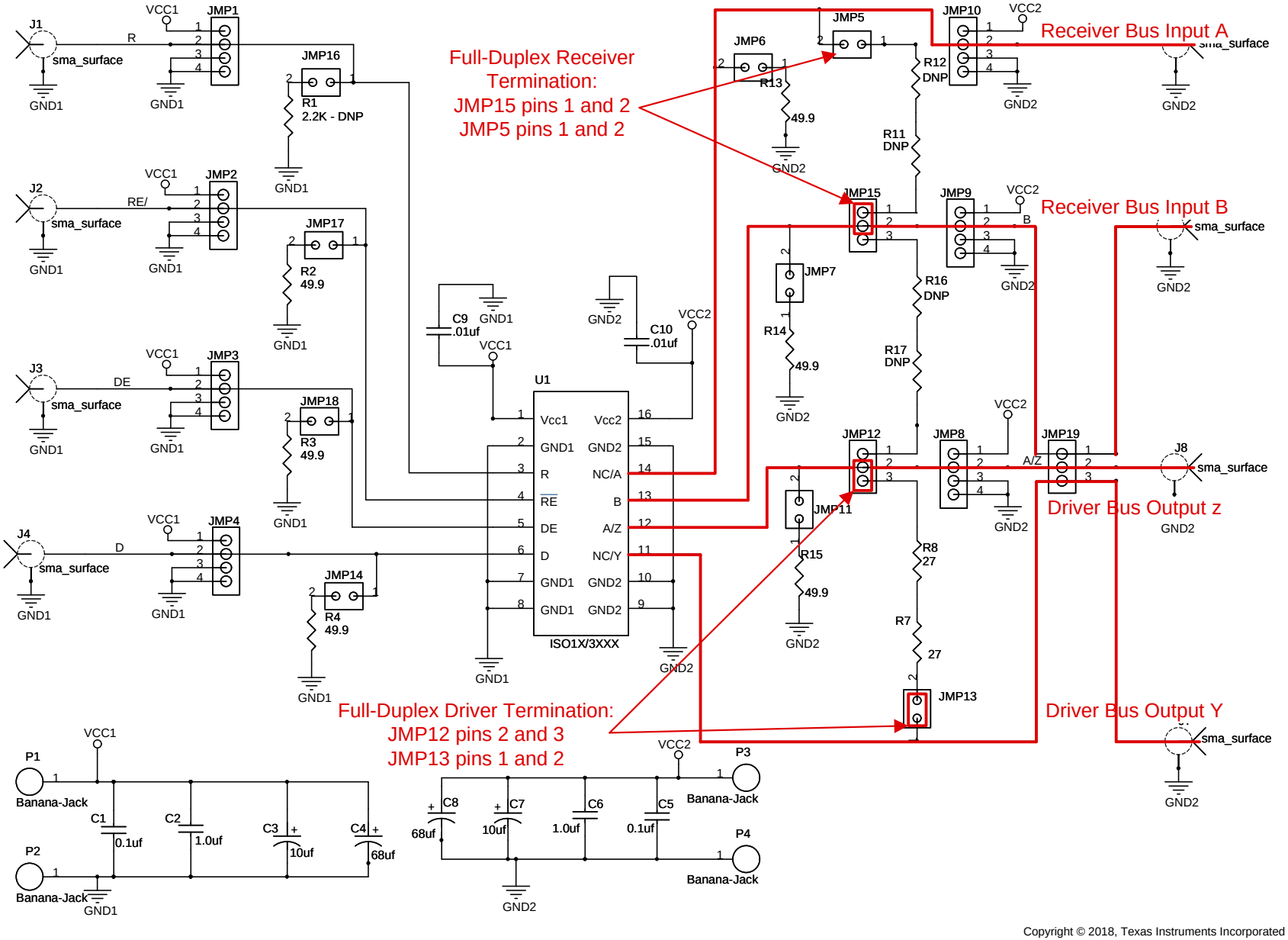

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Figure 6. The Full-Duplex Operation Schematic

2 EVM Setup and Operation

This section includes the setup and operation of the EVM for parameter performance evaluation. Typical waveforms are included.

2.1 Overview

The basic setup of the ISO3082 EVM in Figure 7 has the two power supplies required to evaluate isolator performance with 3.3 V on one side and 5 V on the other. If both side are to be evaluated at the same supply voltage, only one power supply is required which can be used to power both sides of the EVM.

CAUTION

This EVM is for operating parameter performance evaluation only and not designed for isolation voltage testing. Any voltage applied that is greater than the 5.5-V maximum recommended operating voltage of the RS-485 device will damage the EVM.

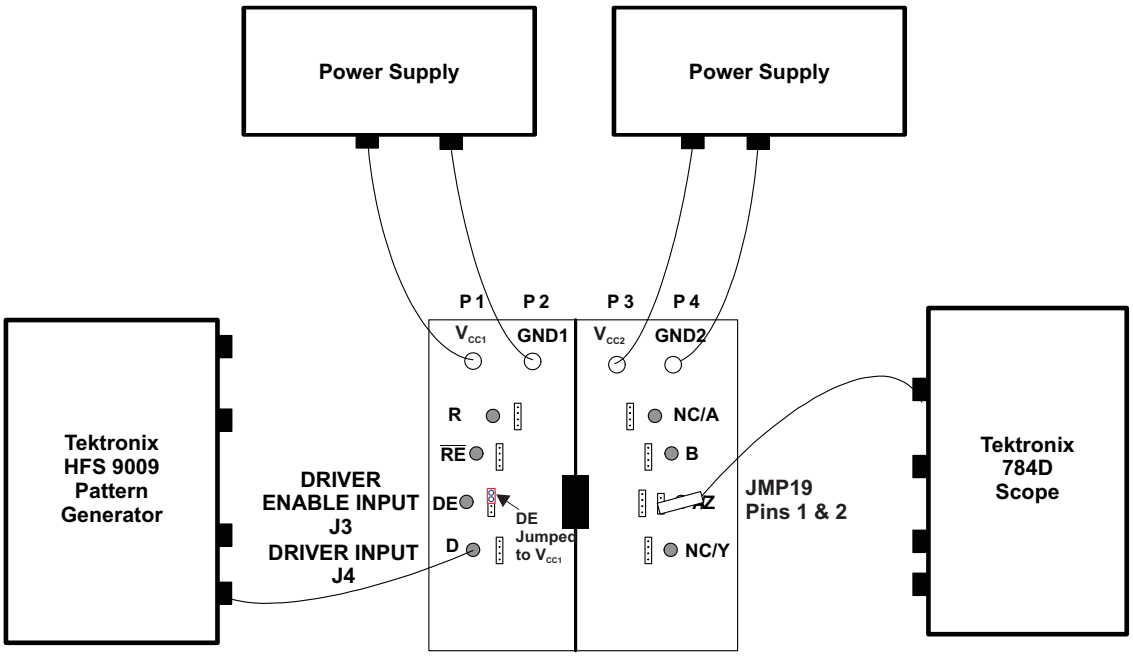

Figure 7. Basic ISO3082 Half-Duplex EVM Operation

The Figure 7 J4 input to the EVM is a 200-kbps PRBS NRZ data displayed on channel 1 in Figure 8. The differential output is from JMP19, pins 1 and 2, of the EVM with a Tektronix P6247 differential probe.

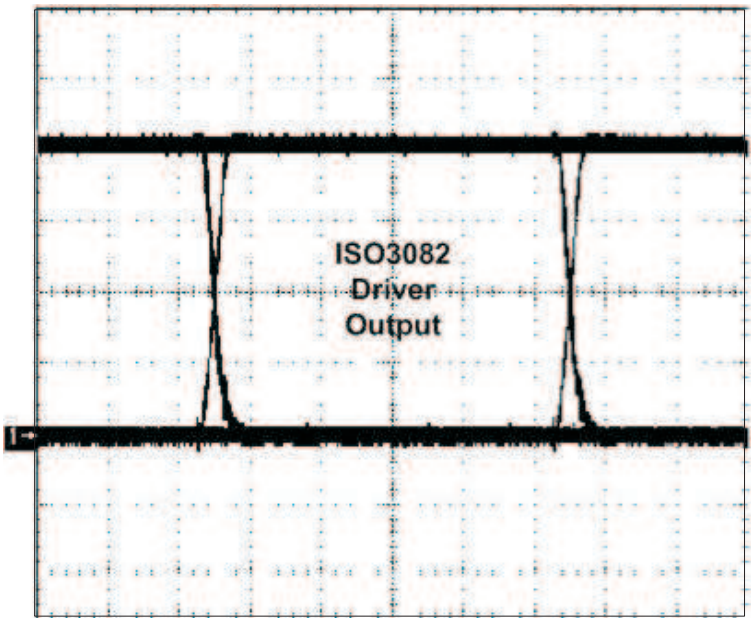

Figure 8. Typical Output Waveform

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (July 2008) to A Revision	Page
• Changed the ISO3082 EVM name to ISO485EVM	1
• Improved quality of the board layout image and schematics	3

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      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

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Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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