Isolated RS-485 EVM

This User Guide details evaluation module (EVM) operation of the factory installed isolated ISO3082 transceiver. The ISO3082 EVM may be reconfigured by a user for use with the ISO15, ISO35, ISO3080, and 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

Please note that while these devices provide galvanic isolation of up to 4000 V, this EVM cannot be used for isolation voltage testing. It 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 (SiO2) insulation barrier. Used in conjunction with isolated power supplies, these devices block high voltage, 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 since 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 Vrms 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 and/or near-by sensitive circuitry 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

The pin-outs of the isolated RS-485 transceivers are displayed below. The EVM comes with the ISO3082 half-duplex transceiver installed, however a user may reconfigure the EVM for use with any of the devices or may contact TI for a factory installation of any of the other devices.

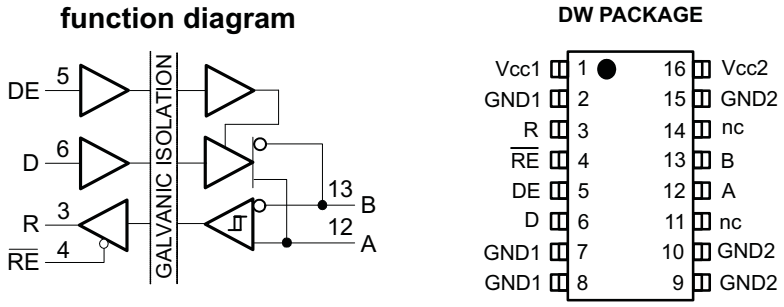


Figure 1. The ISO15, ISO3082 and ISO3088 Half-Duplex Function Diagram and Pinout

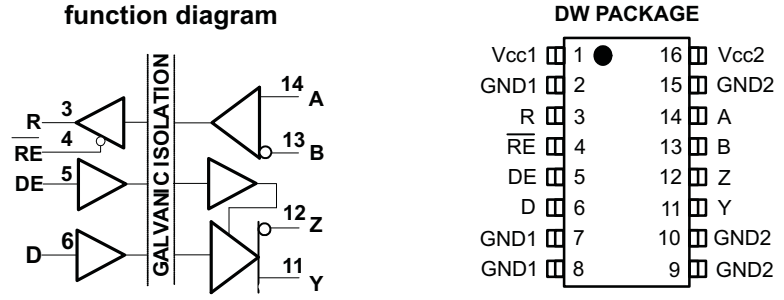
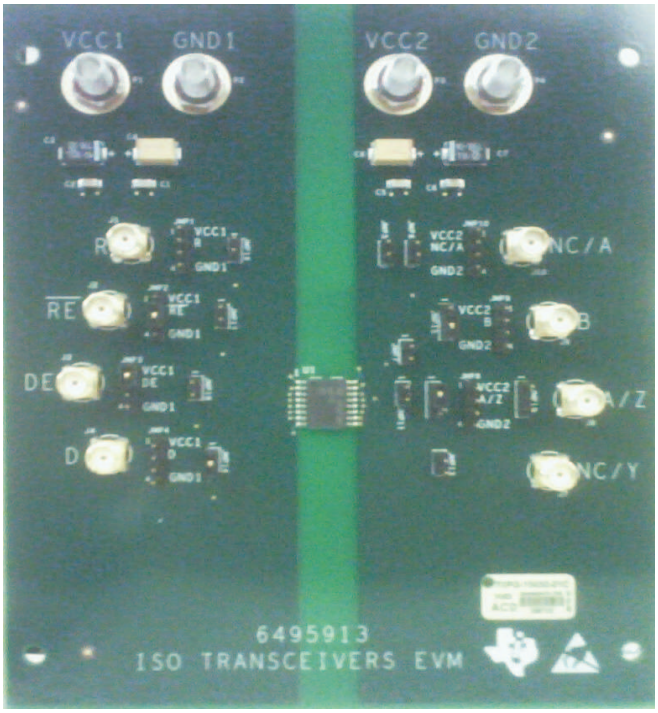


Figure 2. The ISO35, ISO3080, and ISO3086 Full-Duplex Function Diagram and Pinout

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 3 for the evaluation of any of the isolated RS-485 transceivers.



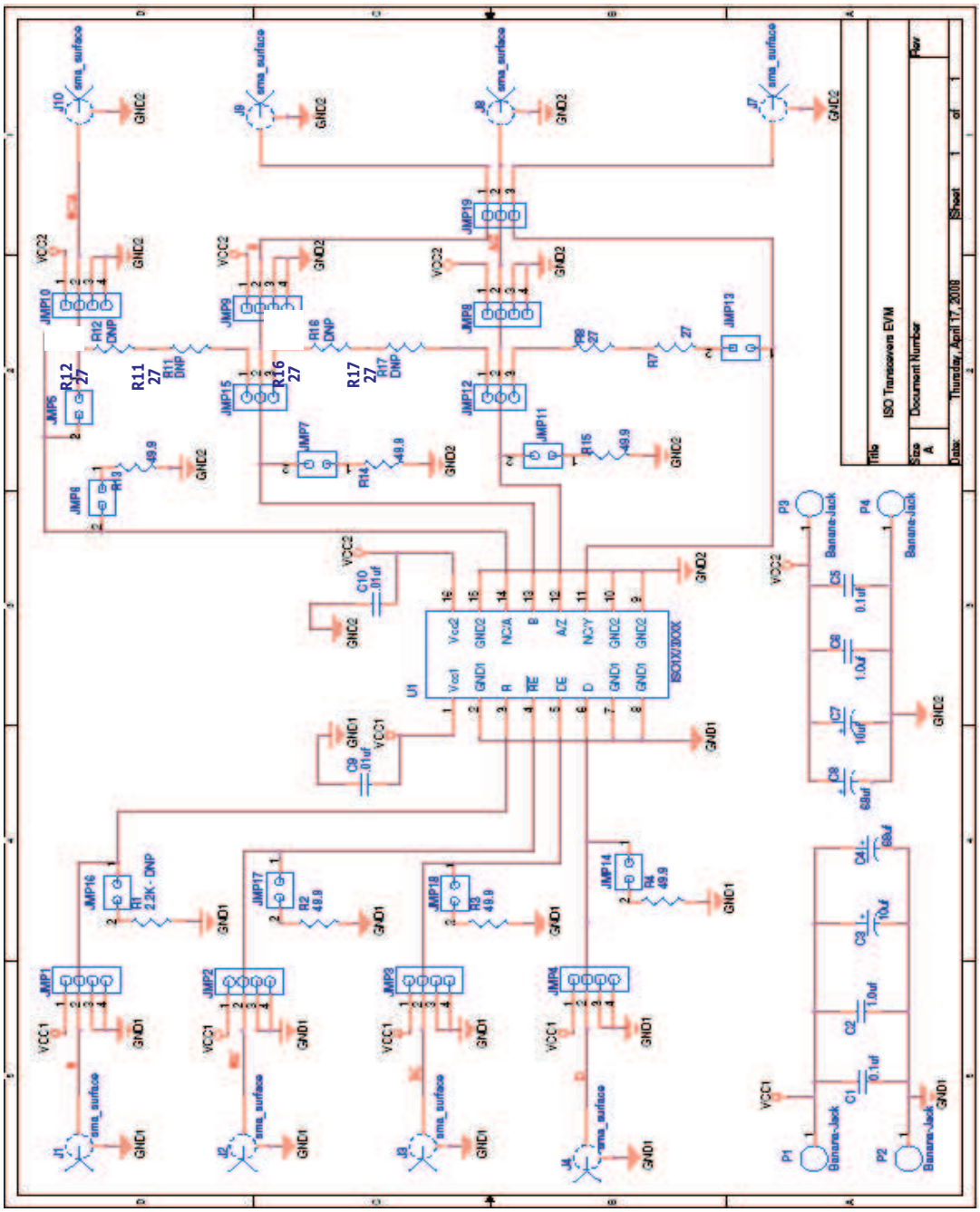


Figure 3. The Isolated RS-485 EVM Schematic

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 SMA connector J1 set up as the receiver output connection to R, the receiver output pin 3. R1, a 2.2 kΩ TTL load resistor may be connected by jumping the pins of JMP16 together.

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

50 Ω load resistors may be engaged at JMP 7 and JMP11 for any half-duplex bus waveform input equipment.

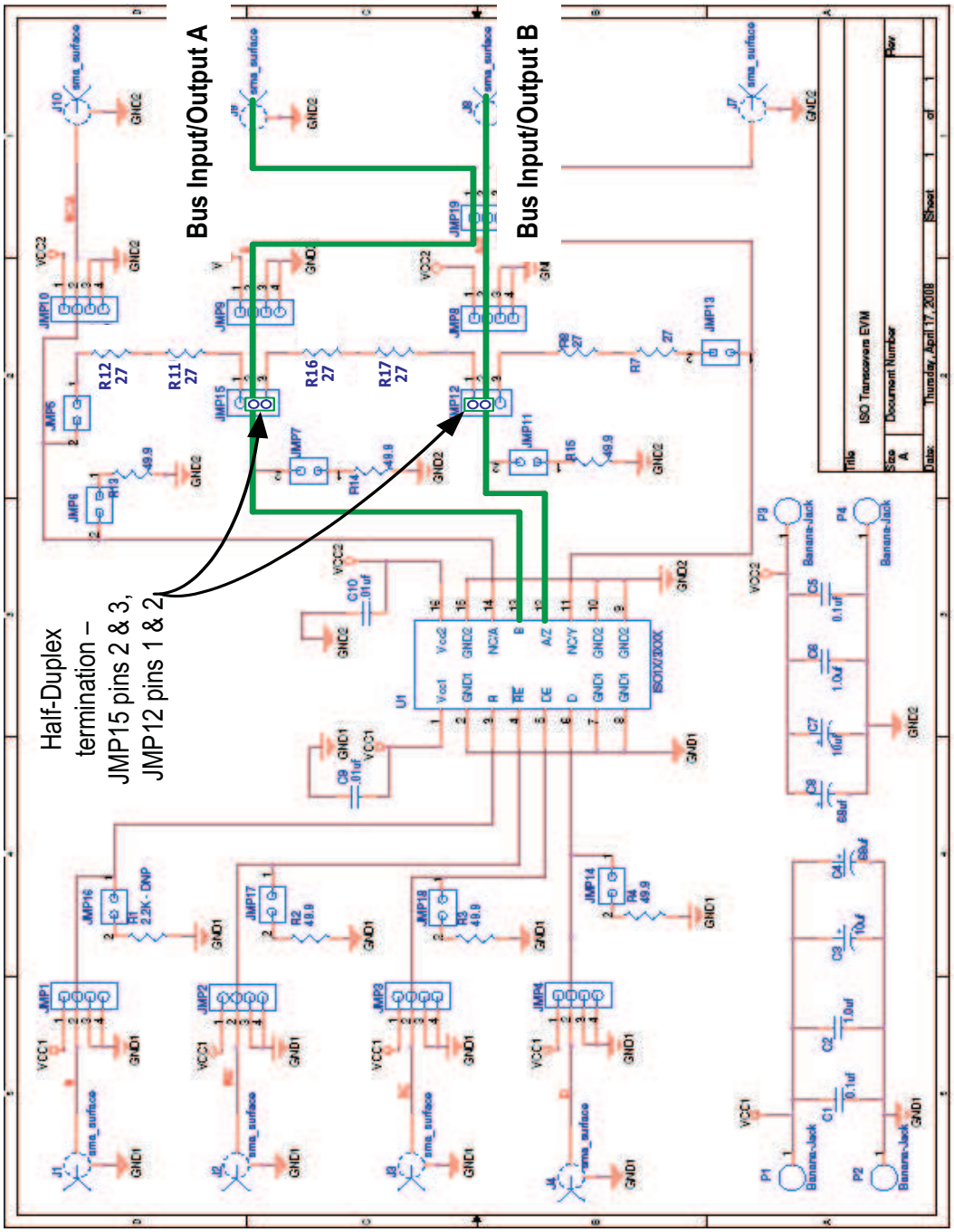


Figure 4. The Half-Duplex Operation Schematic

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

1.5 The Isolated RS-485 EVM Full-Duplex Configuration

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

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

50 Ω load resistors may be engaged at JMP 6 and JMP7 for receiver waveform input equipment.

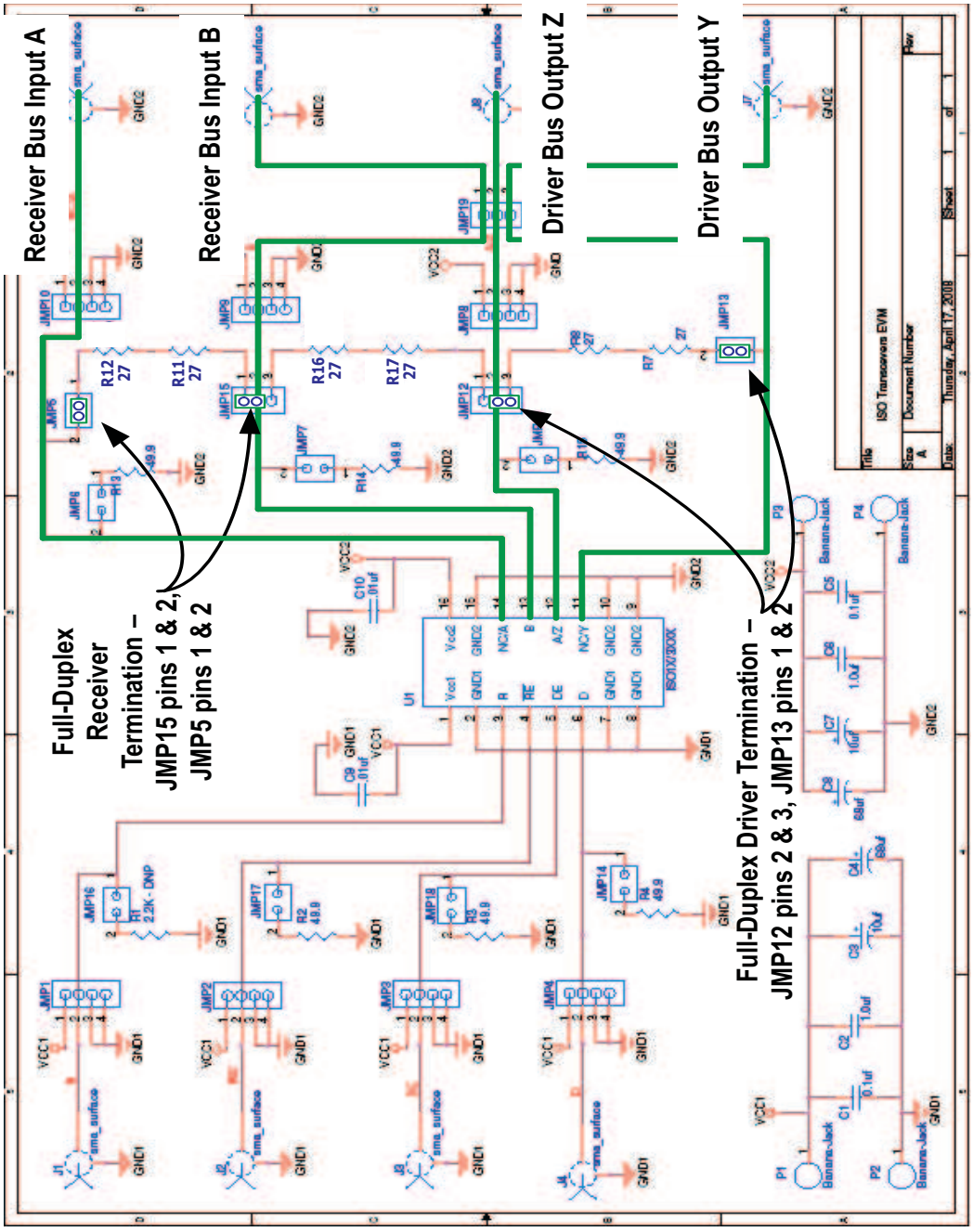


Figure 5. The Full-Duplex Operation Schematic

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

2 EVM Setup and Operation

This chapter 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 6 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, and can be used to power both sides of the EVM.

CAUTION

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

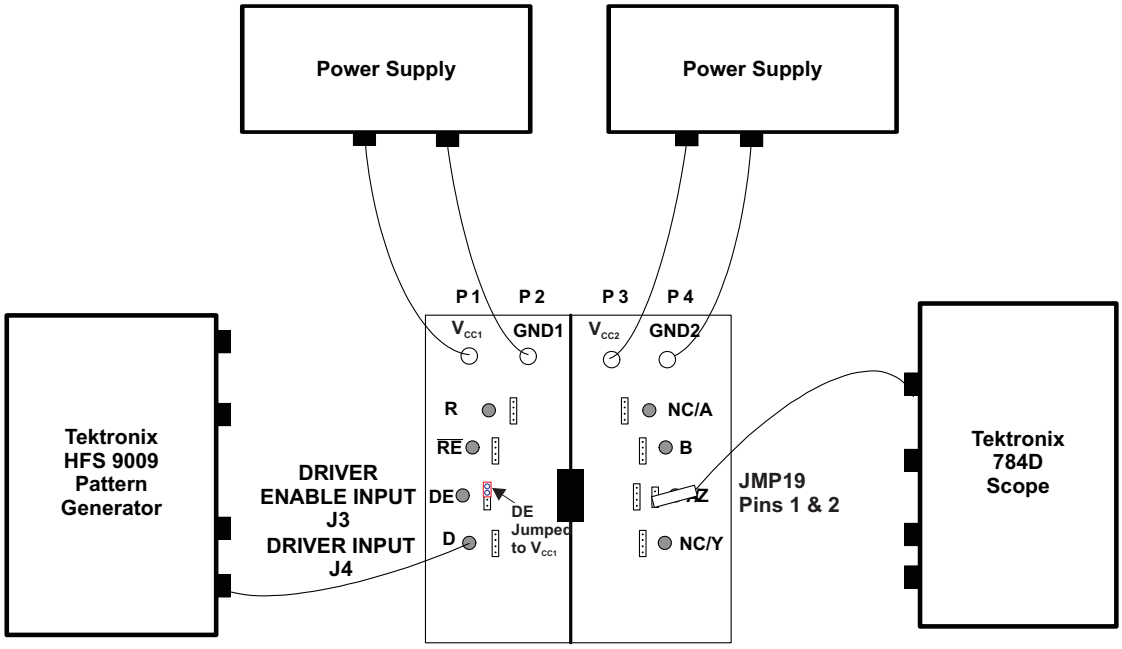


Figure 6. Basic ISO3082 Half-Duplex EVM Operation

The Figure 6 J4 input to the EVM is a 200 kbps PRBS NRZ data displayed on channel 1 in Figure 7. The differential output is taken from JMP19, pins 1 and 2 of the EVM with a Tektronix P6247 differential probe.

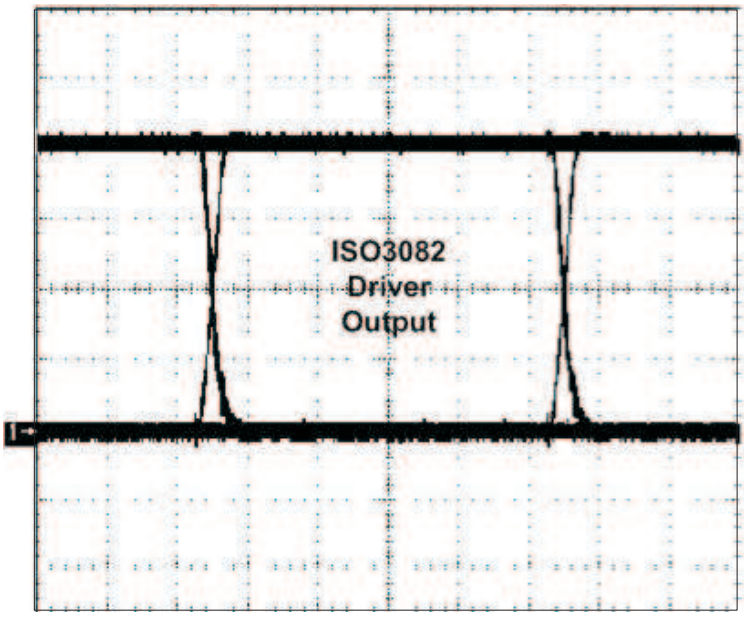


Figure 7. Typical Output Waveform

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V to 5 V and the output voltage range of 0 V to 5 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 60°C. The EVM is designed to operate properly with certain components above 60°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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