Isolated CAN Transceiver EVM

This User Guide details the design and operation of the evaluation module (EVM) for the ISO1050 isolated CAN transceiver.

This Guide explains the user configurable I/O loads for the EVM configurations, and presents a typical lab setup and typical output waveforms.

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 (> 5.25 V) is applied anywhere in the circuit.

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1 Introduction

1.1 Overview

The ISO1050 isolated CAN transceiver has an integrated silicon oxide (SiO2) insulation barrier, which provides galvanic isolation between the controller side of a high-speed CAN transceiver and the bus side. 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 60 seconds 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. The ISO1050 can significantly increase protection and reduce the risk of damage to expensive control circuits.

1.2 The Functional Configuration of the Isolated CAN Transceiver

The pin-out of the ISO1050 isolated CAN transceiver is displayed below. The EVM comes with the ISO1050 transceiver installed. For complete information on the ISO1050, refer to the latest datasheet from the Texas Instruments web site.

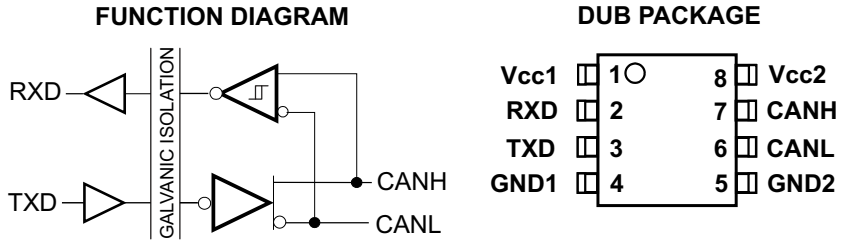

Figure 1. The ISO1050 Function Diagram and Pinout

1.3 The Isolated CAN EVM

This multi-functional EVM is designed for the evaluation of the ISO1050 isolated CAN transceiver. Input and output connections, as well as test points for measurements, are provided to help designers use this device, the world's first CAN transceiver with integrated isolation.

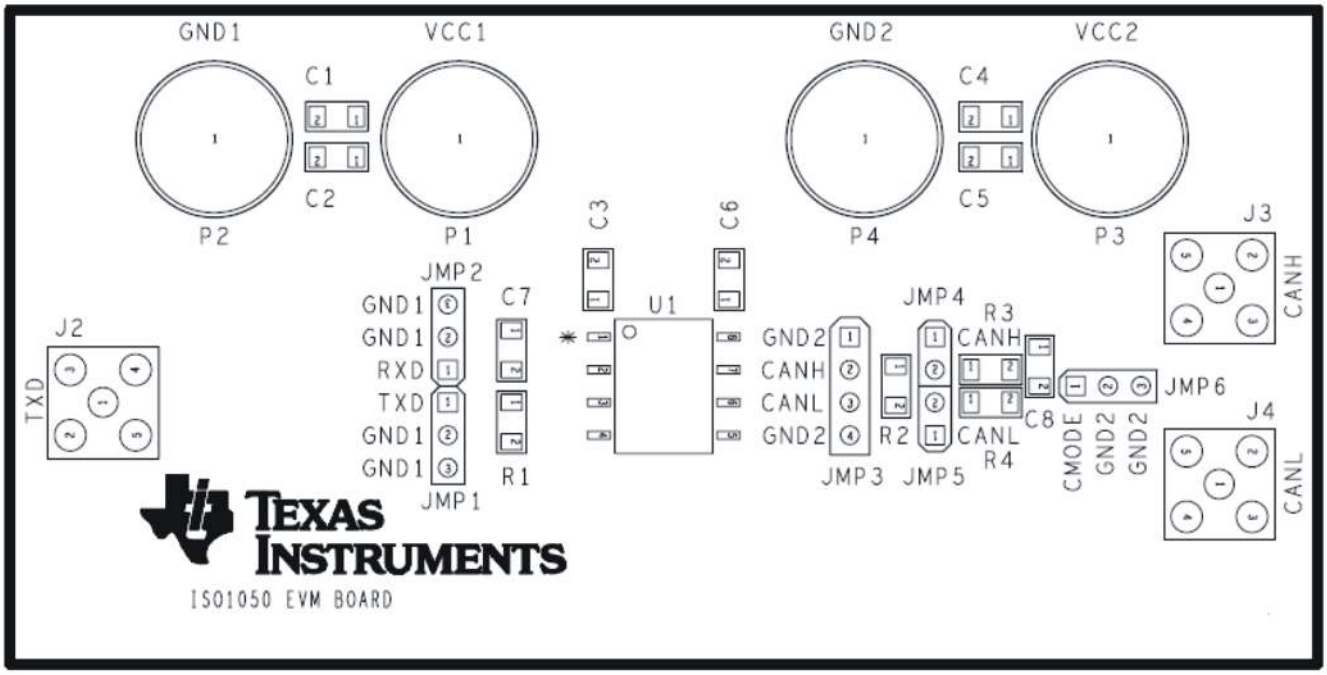

Figure 2. ISO CAN Transceiver EVM Layout

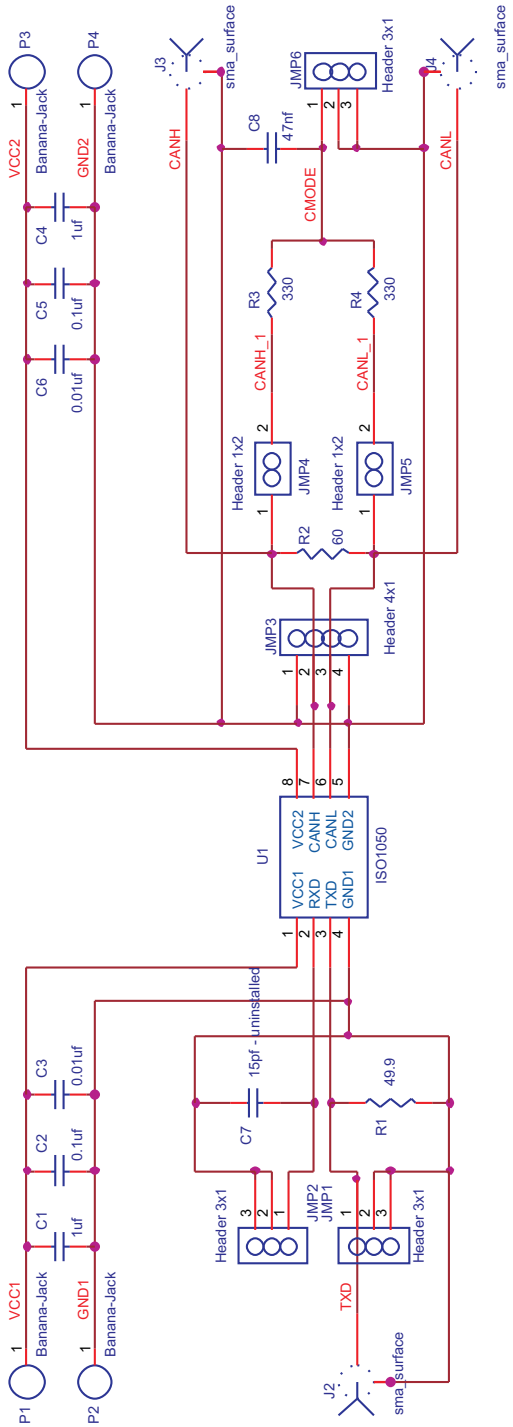

Figure 3. The Isolated CAN EVM Schematic

Table 1. Isolated CAN EVM Connections

Connection	Label	Description
P1	VCC1	Power supply for controller side of interface
P2	GND1	Ground for controller side of interface
P3	VCC2	Power supply for the bus side of interface
P4	GND2	Ground for the bus side of interface
J2	TXD	Transmit Data input to CAN transceiver
J3	CANH	CAN (High) bus input/output
J4	CANL	CAN (Low) bus input/output
JMP1	TXD, GND1, GND1	3-pin jumper - Test point jumper for Transmit Data input signal
JMP2	RXD, GND1, GND1	3-pin jumper – Test point jumper for Receive Data output signal
JMP3	GND2, CANH, CANL, GND2	4-pin jumper – Test points for CANH and CANL signals
JMP4	CANH	2-pin jumper – Jumper from CANH to common-mode load
JMP5	CANL	2-pin jumper – Jumper from CANL to common-mode load
JMP6	CMODE, GND2, GND2	3-pin jumper – Jumper for connection to common-mode voltage

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 ISO1050 EVM in Figure 4 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.

Note that the EVM will typically have supply current from Vcc1 (Icc1) of less than 2 mA when idle and less than 3 mA when actively switching states. The supply current from Vcc2 (Icc2) will typically be less than 10 mA when idle in the recessive state, and will be typically be less than 80 mA in the dominant state with the default 60 Ohm load installed.

CAUTION

Note that this EVM is for operating parameter performance evaluation only and is not designed for isolation voltage testing. Any voltage applied beyond the maximum ratings of the CAN device may damage the EVM.

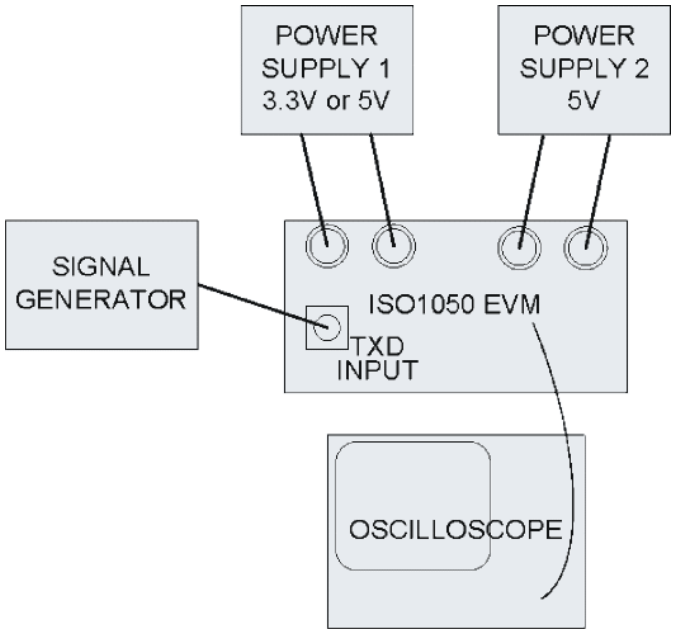

Figure 4. Basic Isolated CAN Transceiver EVM Operation

Operation without Common-mode Loading

With JMP4 and JMP5 open (no jumpers installed) the bus loading is a simple 60 Ohm resistor (R2) between CANH and CANL. This load represents a properly terminated CAN network with a 120 Ohm termination resistor at each end of the bus. This configuration may be used to examine the input and output characteristics of the isolated CAN transceiver.

In the plot below, Channel 1 is the TXD input data from a signal generator, representing 1 Mbps data to be transmitted. Channel 2 is the CANH signal, Channel 3 is the CANL signal. Channel 4 shows the received data on the RXD output. In this case, both supplies Vcc1 and Vcc2 were set to 5V.

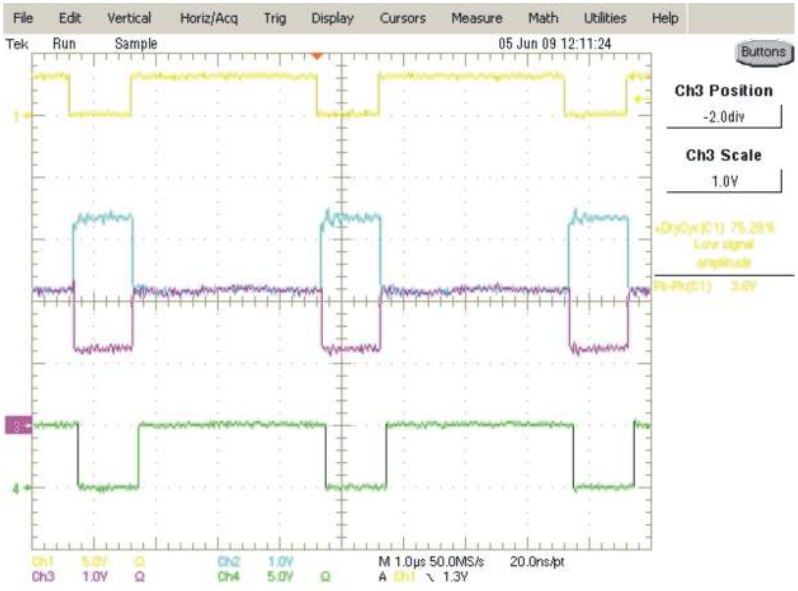

Figure 5. Typical Waveforms Without Common-mode Loading

Operation with Common-mode Loading

If jumpers are installed on JMP4 and JMP5, a connection is made from each bus line (CANH and CANL) through 330 Ohm resistors to a common-mode point (JMP6-1). This common-mode point can be used to measure the common-mode output voltage from the transceiver, or it can be used to apply a common-mode offset from an external source.

When measuring the common-mode output voltage from the transceiver, use a high-impedance oscilloscope probe at JMP6-1 with respect to GND2. The common-mode voltage will be observed for both Dominant and Recessive outputs from the transceiver. In this configuration, R3 and R4 in series act as a load resistance in parallel with R2. This creates an effective load resistance of 55 Ohms.

An external common-mode offset voltage may be applied to JMP6-1 with respect to GND2. The ISO 11898-2 CAN standard specifies operation with common-mode offsets in the range from -2V to +7V.

In the plot below, the common-mode output is measured. Channel 1 is the TXD input data from a signal generator, representing 100 kbps data to be transmitted. Channel 2 is the CANH signal, Channel 3 is the CANL signal. Channel 4 shows the common-mode output signal at JMP6-1. In this case, both supplies Vcc1 and Vcc2 were set to 5V. The very small peak-to-peak amplitude of the common-mode signal indicates the well-balanced CANH and CANL outputs will generate very low electromagnetic emissions.

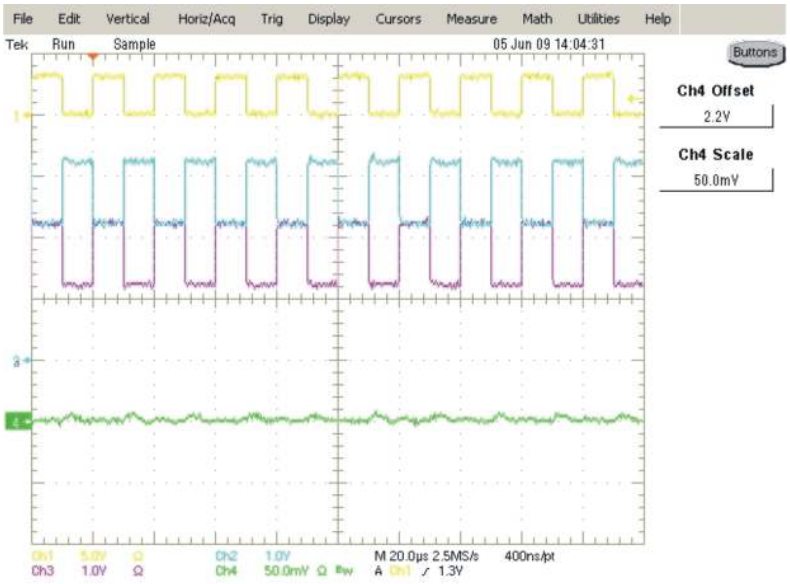

Figure 6. Common-mode Measurement Waveforms

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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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