SN55HVD233EVM-CVAL Evaluation Module

This user's guide details the SN55HVD233EVM-CVAL (Controller Area Network Evaluation Module). This document explains the EVM configurations for basic CAN (Controller Area Network) evaluation and various load and termination settings.

Contents

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1 Introduction

1.1 Overview

TI's SN55HVD233EVM-CVAL is an evaluation module intended to evaluate the operation and features of the radiation tolerant SN55HVD233-SP. The SN55HVD233-SP high-speed CAN transceiver is compatible with the ISO11898-2 high-speed CAN standards. The SN55HVD233-SP is powered with 3.3-V V_{CC} with 5-V tolerant inputs supporting both host diagnostic loopback and standby mode.

1.2 SN55HVD233EVM-CVAL

The EVM has simple connections to all necessary pins of the CAN transceiver device, and jumpers where necessary to provide flexibility for device pin and CAN bus configuration. There are test points (loops) for all main points where probing is necessary for evaluation such as GND, V_{CC}, D, R, CANH, CANL, Rs, and LBK. The EVM supports many options for CAN bus configuration. It is pre-configured with two 120-Ω resistors that may be connected on the bus via jumpers: a single resistor is used with the EVM as a terminated line end (CAN is defined for 120-Ω impedance twisted pair cable) or both resistors in parallel for electrical measurements representing the 60-Ω load the transceiver detects in a properly terminated network (that is, 120-Ω termination resistors at both ends of the cable).

Figure 1 illustrates the SN55HVD233EVM-CVAL board.

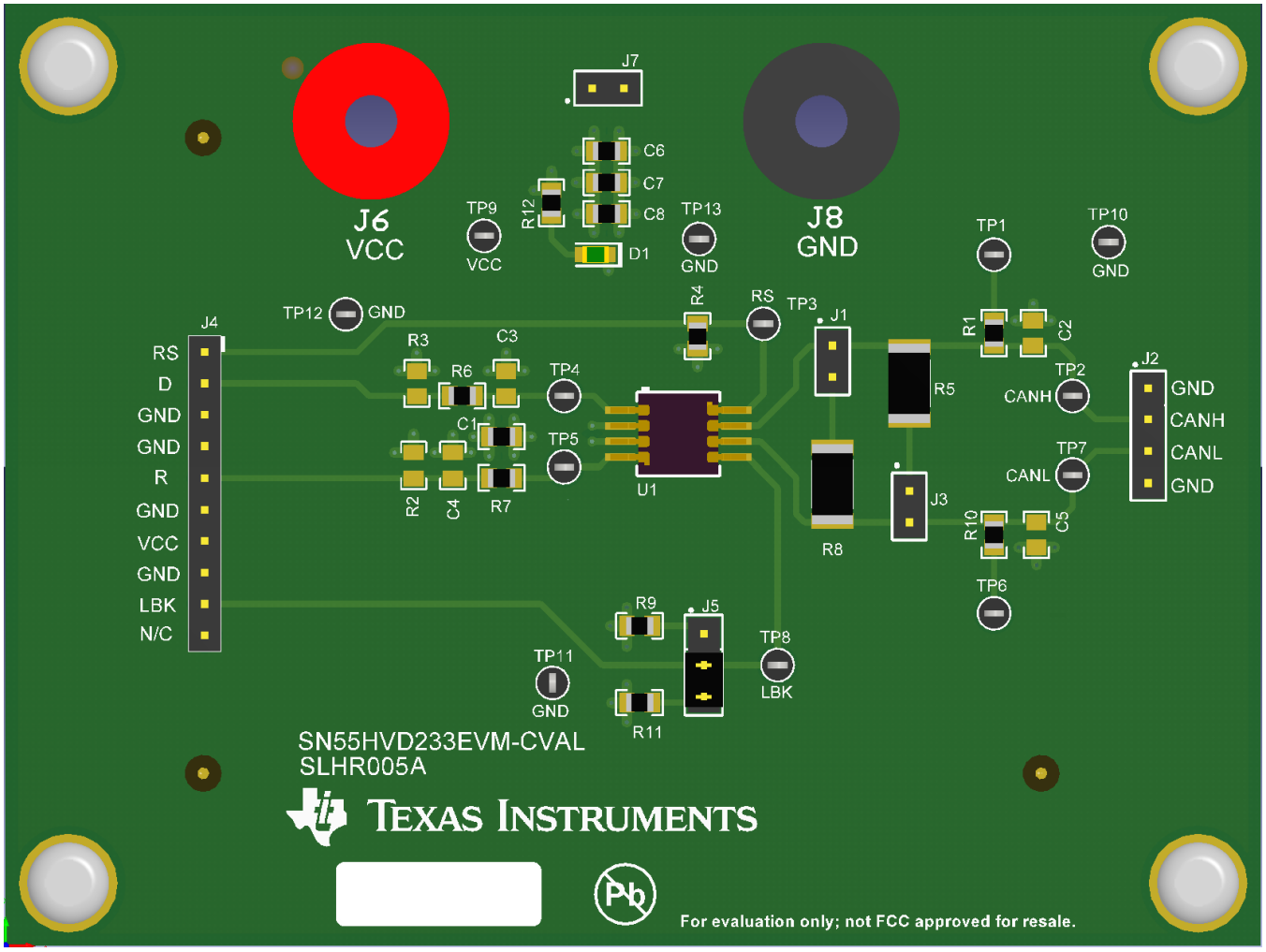

Figure 1. SN55HVD233EVM-CVAL

Figure 2 illustrates the SN55HVD233EVM-CVAL schematic.

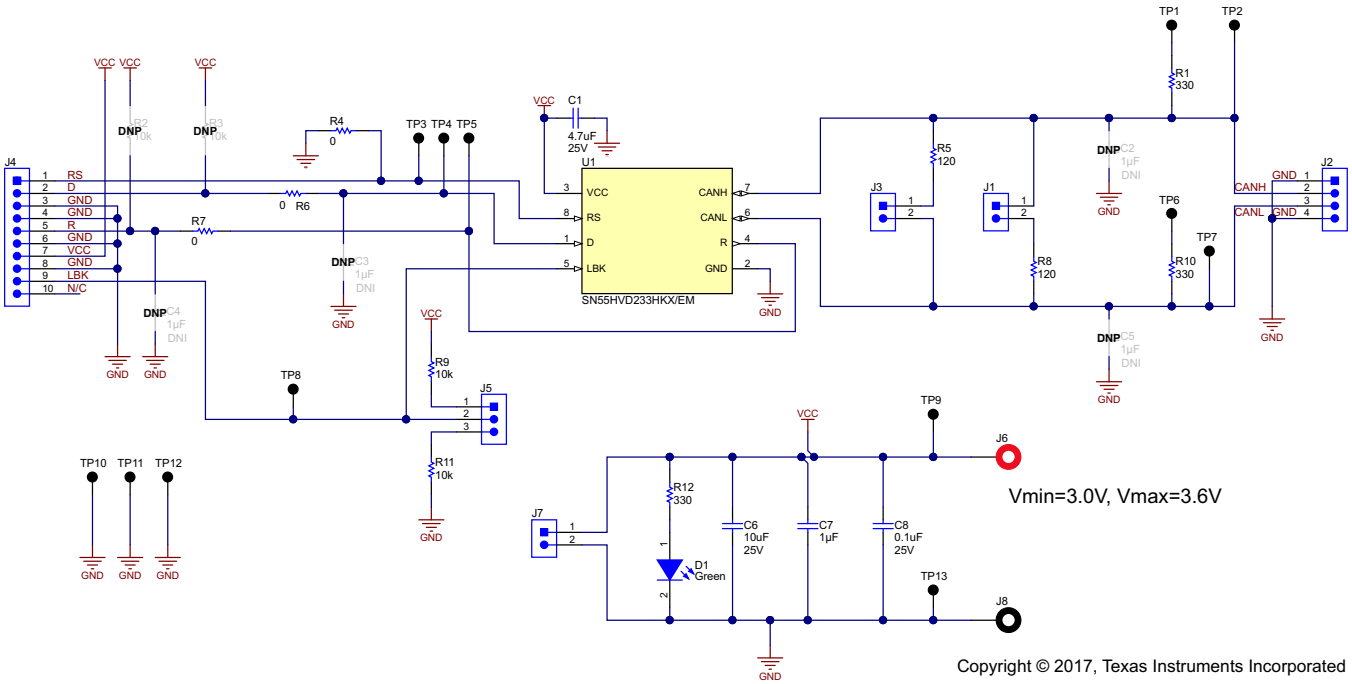

Figure 2. SN55HVD233EVM-CVAL Schematic

Table 1. Jumper Connections

Connection	Type	Description
J1	2-pin jumper	Connect 120-Ω CAN termination to the bus. Use separately for a single termination if the EVM is at end of the CAN bus and termination is not in the cable. Used in combination with J3 to get to a second CAN termination to represent the combined 60-Ω load for CAN transceiver parametric measurement.
J2	4-pin jumper	CAN bus header
J3	2-pin jumper	Connect 120-Ω CAN termination to the bus. Used in combination with J1 to get to second CAN termination to represent the combined 60-Ω load for CAN transceiver parametric measurement.
J4	10-pin jumper	Controller connections to all digital I/O and supply
J5	3-pin jumper	Place jumper on pins 1-2 to pullup LBK and enable D to R loopback. Place jumper on pins 2-3 to pulldown LBK and enable normal mode without controller loopback.
J6	Banana jack	3.3-V V_{CC} supply power
J7	2-pin jumper	2-pin header to allow alternate power connection from banana jacks
J8	Banana jack	Supply GND
TP1	Test point	CANH via 330-Ω serial resistor test point
TP2	Test point	CANH
TP3	Test point	Rs
TP4	Test point	D
TP5	Test point	R
TP6	Test point	CANL via 330-Ω serial resistor test point
TP7	Test point	CANL
TP8	Test point	LBK
TP9	Test point	V_{CC}
TP10	Test point	GND
TP11	Test point	GND
TP12	Test point	GND
TP13	Test point	GND

2 EVM Setup and Operation

This section describes the setup and operation of the EVM for evaluation.

2.1 Overview and Basic Operation Settings

2.1.1 V_{CC} Power Supply (J6, J8; or J7; or J4 Pins 7, 8)

The basic setup of the CAN EVM uses a single power supply required to evaluate 3.3-V single supply transceiver device performance. Connect a 3.3-V V_{CC} supply to the J6, J8 banana jacks, or using the V_{CC} and GND test-point loops, or J7, or V_{CC} and GND pins on J4. The power supply should meet V_{CC} requirements for the SN55HVD233 transceiver being tested. V_{CC} range is 3 V to 3.6 V. LED D3 is used to indicate V_{CC} presence. The EVM consumes approximately 25 mA with 60-Ω termination and 500-kHz clock transmitting on D.

2.1.2 Main Supply and I/O Header (J4)

All key I/O including supply V_{CC} and GND functions are brought to this header. The header may be used to directly interface to test equipment or a short cable connection can be made to an existing customer application board or MCU or DSP EVM board for a processor with a CAN controller.

Table 2. J4 Pin Definitions

Pin	Connection	Description
1	Rs	Transceiver pin 8, slew rate control
2	D	Transceiver pin 1, D (Transmit Data)
3	GND	Transceiver pin 2, GND
4	GND	Transceiver pin 2, GND
5	R	Transceiver pin 4, R (Receive Data)
6	GND	Transceiver pin 2, GND
7	V_{CC}	Transceiver pin 3, V_{CC}
8	GND	Transceiver pin 2, GND
9	LBK	Transceiver pin 5, LBK
10	N/C	No connect

This header is arranged to provide separate grounds for each signal pair (D and GND, R and GND). If the EVM is being used with lab equipment, separate cables can be connected to these main points via simple 2-pin header connectors. If the board is being connected to a processor-based system, a single cable with all power and signals can be connected via a 10-pin header cable to this port.

2.1.3 D Input (J2 or TP4)

The D input (pin 1) of the transceiver, transmit data is routed to J4 and TP4. The signal path to the J4 header is pre-installed with a 0-Ω series resistor, R6.

2.1.4 R Output (J4 or TP5)

The R output (pin 4) of the transceiver, receive data is routed to J4 and TP5. The signal path to the J4 header is pre-installed with a 0-Ω series resistor, R7.

2.1.5 Rs Configuration

When Rs (pin 8) is pulled to GND the device is in “normal” or high-speed mode. R4 is pre-installed with a 0-Ω resistor to GND for this purpose. When pin 8 is pulled to V_{CC}, the device is in a silent or low-power standby mode. Slope control mode uses the resistance to ground value to determine the slope of the driver output. R4 can be removed and left open for customers who want to install a resistance to ground and use slope mode.

2.1.6 TP3 Configuration

This connects directly to pin 8 on the device. Ensure J4 configuration is not conflicting if TP3 is used as the input connection.

2.1.7 Pin 5 – J5 Configurations (3-Way Jumper)

J5 is used to configure the LBK pin to logic high or low depending on jumper settings. Place jumper on pins 1 and 2 to enable diagnostic loopback for the controller. Place jumper on pins 2 and 3 to disable loopback mode and place the transceiver into normal operation.

2.1.8 J4 Configuration

Using header J4 assumes all the digital I/O signals, V_{CC}, and GND are routed to an external system. Ensure that pin 5 (J5) jumper settings are not conflicting with signals to J4.

2.1.9 TP8 (LBK) Configuration

This connects directly to device pin 5. Ensure J5 and J4 configuration is not conflicting if TP8 is used as an input connection.

2.2 Using CAN Bus Load Termination

The SN55HVD233EVM-CVAL is populated with two 120-Ω power resistors selectable via jumpers between CANH and CANL. By using one, the EVM may be used as a terminated end of a bus. For electrical measurements to represent the total loading of the bus, use both 120-Ω resistors in parallel to give the standard 60-Ω load for parametric measurement.

Table 3. Bus Termination Configuration

Termination Configuration	120-Ω Resistors	
	J1	J3
Standard termination (120 Ω)	Shorted	Open
60-Ω load - electrical parametrics	Shorted	Shorted

The EVM also includes TP1 and TP6 through 330-Ω resistors. These test points allow the user to force a common-mode voltage.

2.3 Using Customer Installable I/O options for Current Limiting, Pullup/Pulldown, Noise Filtering

The SN55HVD233EVM-CVAL has several footprints on the PCB for the installation of various filtering options to adapt the EVM to match CAN network topology requirements if the EVM is being used as a CAN node.

Both pins D and R have footprints to allow for series current limiting resistors (default populated with 0 Ω), pull up or down resistors depending on pin use and a capacitor to GND which allows for RC filters when configured with a series resistor.

3 CAN EVM Configuration

The SN55HVD233 is compatible with the ISO 11898 high-speed CAN (Controller Area Network) physical layer standards: 11898-2.

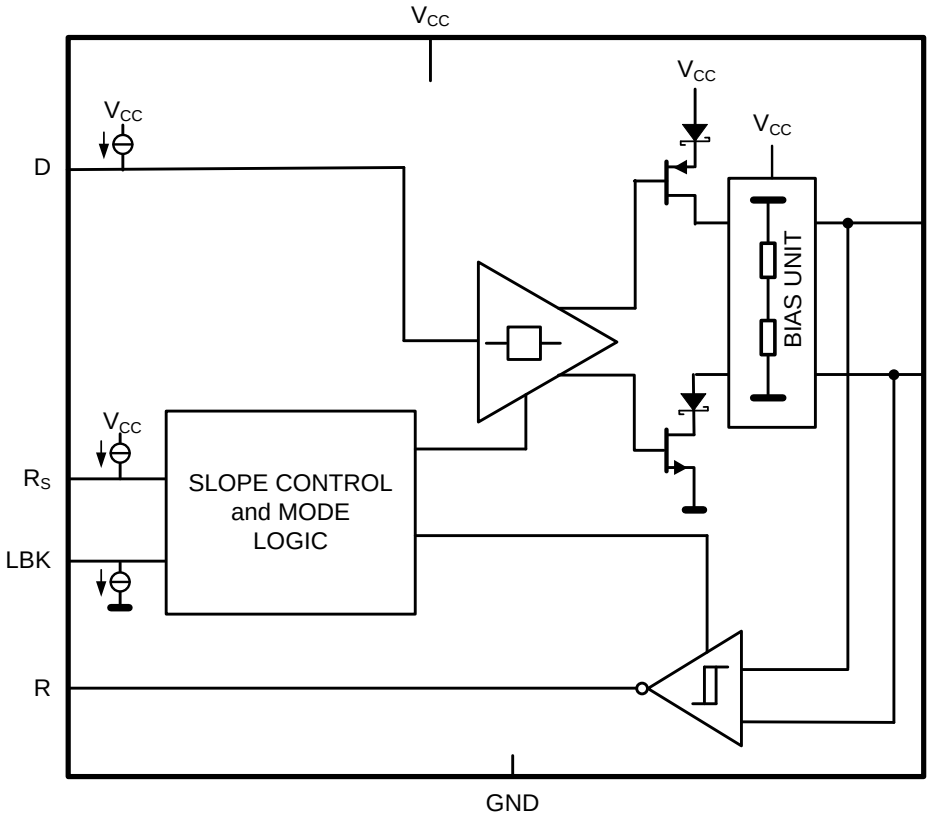

Figure 3. SN55HVD233 Basic Block Diagram

Table 4. EVM Connection Settings for SN55HVD233EVM-CVAL

Connection	Description
J1	Connect if necessary for a single CAN network termination.
J2	CAN bus connection (CANH, CANL) and GND, as necessary, if interfacing EVM to a CAN network
J3	Connect if necessary for in parallel with J1 to get a 60-Ω load to measure CAN parametrics
J4	Connection for access to all critical digital I/O, supply, and GND, if being externally driven by test equipment or interfaced to a processor EVM. Note: Ensure that TP3, TP4, TP5, TP8, or J5 do not conflict if used with J4.
J5	Connect between pins 2 and 3 for normal operation. Connect between pins 1 and 2 for diagnostic loopback (LBK = high).
J6	Connect to V_{CC} 3 V–3.6 V
J7	Optional power connection
J8	Connect to supply GND

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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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- *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.*
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