User's Manual

ISL7202xCSEHEVAL1Z

User's Manual: Evaluation Board

High Reliability Space

Rev 0.00 May 2017

1. Overview

The Intersil ISL7202xCSEH family of devices are 3.3V radiation tolerant CAN transceivers that are compatible with the ISO11898-2 standard for use in Controller Area Network (CAN) serial communication systems. The transceiver performs transmit and receive functions between the CAN controller and the CAN differential bus. They were specifically designed to operate in harsh environments, such as space.

The ISL7202xCSEHEVAL1Z evaluation boards are designed to provide a quick and easy method for evaluating the ISL72026CSEH, ISL72027CSEH, and ISL72028CSEH 3.3V radiation tolerant CAN transceivers. These devices are unique ICs. To use this evaluation board properly requires a thorough knowledge of the operation of the ICs. Refer to the ISL72026CSEH, ISL72027CSEH, and ISL72028CSEH datasheets for an understanding of the functions and features of these devices.

The ISL72026CSEHEVAL1Z, ISL72027CSEHEVAL1Z, and ISL72028CSEHEVAL1Z evaluation boards are built using the same base board, P/N: ISL7202xCSEHEVAL1Z. Throughout this document when we use "ISL7202xCSEHEVAL1Z" the information applies to all three evaluation boards. The three boards are exactly the same, except for the CAN transceiver part installed at reference designator U1.

1.1 Key Features

- D-SUB 9-pin male connector for connection to another CAN evaluation board
- 60Ω resistor across the differential signal lines to evaluate propagation delay, rise/fall time, and skew parameters
- Convenient test points and connections for test equipment
- Jumpers to select between the three rise/fall settings or connect RS high to enter the low power Listen mode (ISL72026, ISL72027) or Shutdown mode (ISL72028)
- Banana jacks for power, ground, and Voltage Common-Mode (VCM) connections

1.2 Specifications

These evaluation boards have been configured and optimized for the following conditions:

- V_{CC} = 3V to 3.6V
- Data rate: ≤1Mbps
- CAN bus termination resistance of 60Ω across the CANH and CANL differential signal lines
- Board temperature: +25°C

1.3 Ordering Information

Part Number	Description
ISL72026CSEHEVAL1Z	ISL72026CSEH evaluation board
ISL72027CSEHEVAL1Z	ISL72027CSEH evaluation board
ISL72028CSEHEVAL1Z	ISL72028CSEH evaluation board

1.4 Related Literature

- For a full list of related documents, visit our website
  - ISL72026CSEH, ISL72027CSEH, and ISL72028CSEH product pages

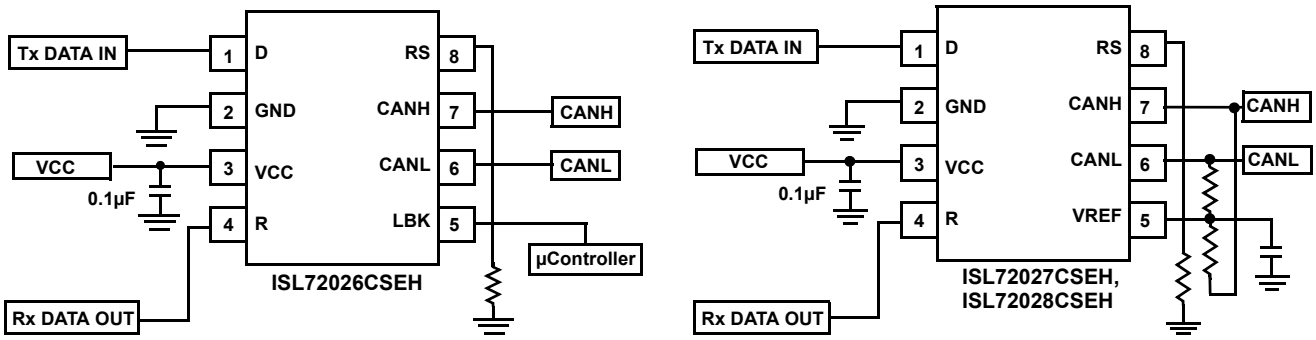

Figure 1. ISL7202xCSEHEVAL1Z Block Diagram

1.5 Introduction

The ISL72026CSEHEVAL1Z, ISL72027CSEHEVAL1Z, and ISL72028CSEHEVAL1Z evaluation boards are exactly the same, except for the CAN transceiver part installed at reference designator U1.

- The ISL72026CSEHEVAL1Z has an ISL72026CSEHF/PROTO IC installed at U1. It will have a paper label indicating it is an ISL72026CSEHEVAL1Z board.
- The ISL72027CSEHEVAL1Z has an ISL72027CSEHF/PROTO IC installed at U1. It will have a paper label indicating it is an ISL72027CSEHEVAL1Z board.
- The ISL72028CSEHEVAL1Z has an ISL72028CSEHF/PROTO IC installed at U1. It will have a paper label indicating it is an ISL72028CSEHEVAL1Z board.

The ISL7202xCSEHEVAL1Z boards are designed to provide a quick and easy method for evaluating the ISL72026CSEH, ISL72027CSEH, and ISL72028CSEH 3.3V radiation tolerant CAN transceivers.

Table 1 shows the functional differences between the three part types. Figure 1 shows the block diagrams/pinouts for the parts.

Table 1. Table of Differences Between the Part Types

Feature	ISL72026CSEH	ISL72027CSEH	ISL72028CSEH
Loopback	Yes	No	No
VREF Output	No	Yes	Yes
Listen Mode	Yes	Yes	No
Shutdown Mode	No	No	Yes
Supply Current in Listen Mode	2mA (maximum)	2mA (maximum)	N/A
Supply Current in Shutdown Mode	N/A	N/A	50µA (maximum)

Note: N/A = Not Applicable

A picture of the evaluation board for ISL72028CSEHEVAL1Z is shown in Figure 6 on page 12. The ISL72028CSEHF/PROTO 8 Ld flatpack IC is soldered onto the evaluation board. It is located in the upper center of the board and is designated as U1.

The transceivers perform transmit and receive functions between the CAN controller and the CAN differential bus. They can transmit and receive at bus speeds of up to 5Mbps. They are designed to operate over a common-mode range of -7V to +12V with a maximum of 120 nodes. The devices are capable of withstanding ±20V on the CANH and CANL bus pins outside of the ion beam and ±16V under the ion beam.

The parts have various configurations of operation. The ISL7202xCSEHEVAL1Z evaluation board contains standard jumpers, a BNC connector, banana connectors, a cable connector, and load resistors to allow the user to easily interface with the IC to evaluate its functions, features, and performance.

This user guide will guide the user through the process of configuring and using the evaluation board to evaluate the ISL7202xCSEH devices.

2. Functional Description

The ISL7202xCSEHEVAL1Z evaluation board provides a simple platform to demonstrate the features and evaluate the performance of the ISL7202xCSEH family of ICs. It provides easy access to the pins of the ISL7202xCSEH ICs and convenient connectors/test points for connecting test equipment. The schematic, bill of materials, and top silkscreen for the board are available on pages 13 through 15.

Figures 11 through 20 show performance data taken using the ISL7202xCSEHEVAL1Z evaluation board and basic lab equipment.

Table 1 shows the differences between the parts in the family.

The sections that follow discuss using the evaluation board.

2.1 Basic Layout of the Evaluation Board

The basic layout of the evaluation board is as follows: Refer to Figure 10 on page 15 or the actual ISL7202xCSEHEVAL1Z evaluation board.

Located in the upper center of the board is the ISL7202xCSEHF/PROTO transceiver IC (U1). The evaluation board has a Pin 1 dot, to show how the IC should be oriented onto the evaluation board. The IC Pin 1 indicator dot needs to be aligned with the evaluation board Pin 1 dot indicator. The board comes with the IC soldered onto the board.

Power for the IC is located at the left side of the board through banana jacks labeled VCC and GND. A DC voltage source of 3.3V must be connected between VCC and GND to power the part. Test points TP13 (VCC) and TP2 (GND) are available to measure the VCC voltage to the part.

Access to the D input to the transceiver is at the BNC connector labeled D at the upper right corner of the evaluation board. Connect the digital source of the CAN digital test pattern at this connector.

Access to the R output of the transceiver is at the test point labeled TP4 located at the top center of the evaluation board. There is a through-hole labeled R that can have a wire soldered to it, if you want to feed the digital output into a CAN controller board.

Control of the RS pin is through jumpers J5, J6, J7, and J8 located at the middle right side of the evaluation board. Only one of these jumper locations should have a jumper installed at any one time. Putting the jumper at J5 will put the transceiver in the listen mode for the ISL72026, ISL72027 parts and in the low power Shutdown mode for the ISL72028 part. Putting the jumper at J6 will put the transceiver driver in the Slow Speed mode, at J7 in the Medium Speed mode, and at J8 in the Fast Speed mode. Note: J4 and R5 are not populated. They can be used to put a mechanical potentiometer at the RS pin.

Access to the differential pins (CANH and CANL) are through the test points TP7 and TP8, through the BNC connectors labeled CANH and CANL (not populated), or through the D-SUB 9-pin male connector J1, located at the bottom of the board. The J1 connector can be used to connect two evaluation boards together to evaluate the performance of two boards communicating with each other over various length cables. The CANH and CANL BNCs can be used to apply voltages to the differential pins to evaluate the receiver of the transceiver.

The board comes populated with a 60Ω resistor (R_{10}) installed across the CANH and CANL lines. Many performance tests for the transceiver such as propagation delay, rise time, fall time, and skew are done with a 60Ω resistor. In a normal CAN system, the bus is terminated at both ends with a 120Ω resistor, which gives a differential loading of 60Ω. When connecting two boards together the 60Ω resistors on each board should be replaced with 120Ω resistors.

See the board schematic (Figure 7 on page 13) for the reference designators of the jumpers, resistors, and connectors associated with each I/O.

2.1.1 Power Supply

The ISL7202xCSEH ICs require a DC power supply in the range of 3.0V to 3.6V for proper operation.

The power supply is connected at banana jacks VCC and GND. The power supply should be capable of delivering 100mA of current.

2.1.2 Evaluation Board Logic Control

The ISL72026CSEH IC has three logic control input pins: the D (Pin 1), RS (Pin 8), and LBK (Pin 5).

The ISL72027CSEH and ISL72028CSEH ICs have two logic control input pins: the D (Pin 1) and RS (Pin 8).

2.1.2.1 D Pin

The D pin is the digital input to the driver of the transceiver. A digital bit pattern is applied at this pin. A Logic 1 on the D pin puts the CANH and CANL differential pins in the recessive state. A Logic 0 on the D pin puts the CANH and CANL differential pins in the dominant state.

The logic 1 V_{IH} level is from 2.0V to 5.5V with a VCC supply voltage of 3.0V to 3.6V. The logic 0 V_{IL} level is from 0.8V to 0V.

2.1.2.2 RS Pin

The output driver rise and fall time has three distinct selections that may be chosen by using a resistor from the RS pin to GND. Connecting the RS pin directly to GND results in output switching times that are the fastest, limited only by the drive capability of the output stage. RS = 10kΩ provides for a typical slew rate of 12V/µs and RS = 50kΩ provides for a typical slew rate of 8V/µs.

Putting a high logic level to the RS pin places the transceiver in a low current Listen mode for the ISL72026CSEH and ISL72027CSEH parts and a low current Shutdown mode for the ISL72028CSEH part.

2.1.3 LBK Pin (ISL72026CSEH)

When a high level is applied to the LBK pin, the device enters the loopback state. The transceiver CANH and CANL pins are disconnected from the bus. The driver and receiver circuitry of the transceiver remains active to allow for diagnostic testing of the node. Installing a jumper at Position 1 to 2 on jumper J9 of the evaluation board will connect the LBK pin to VCC putting the part in loopback state. Removing the jumper will put the part back into normal operation. LBK pin of the transceiver has an internal pull-down.

2.1.4 VREF Pin (ISL72027CSEH and ISL72028CSEH)

The VREF pin (Pin 5) of the ISL72027CSEH and ISL72028CSEH parts outputs a voltage equal to VCC/2. This voltage is available for applications that want to implement a split termination configuration on the bus. See the application section titled “Split Mode Termination” in the ISL72027CSEH datasheet or in the ISL72028CSEH datasheet for more information. To implement a split termination on the bus pins of the evaluation board, a capacitor can be installed at C_7, R_{11} and R_{12} can be populated with resistors, and a jumper installed at Position 2 and 3 of jumper J9.

2.1.5 Test Points

The board has various test points for ease of connecting probes to make measurements. The test points available are described in Table 2..

Table 2.

Designator	Description
TP1	Ground test point
TP2	Ground test point
TP3	D input test point
TP4	R output test point
TP5	LBK or VREF test point
TP6	RS pin test point
TP7	CANH pin test point
TP8	CANL pin test point
TP9	Ground test point
TP10	Not populated - VCM test point
TP11	Ground test point
TP12	Not populated - R output test point
TP13	VCC test point

Table 3. Board Component Definitions

Designator	Description
U1	ISL7202xCSEHF/PROTO flatpack IC
VCC	V_{CC} power supply connection ($3.3V_{DC}$)
GND	Ground connection
J1	9-pin male D-SUB connector (used to connect to another CAN evaluation board)
J4	Not populated - jumper on RS pin to connect mechanical potentiometer
J5	Jumper on RS pin to connect it to VCC. A jumper installed at this location will put the transceiver in Listen mode (ISL72026CSEH, ISL72027CSEH) or Shutdown mode (ISL72028CSEH).
J6	Jumper on RS pin to connect the RS pin to ground through a 50kΩ resistor (jumper installed at this location will put the transceiver in Slow Speed mode).
J7	Jumper on RS pin to connect the RS pin to ground through a 10kΩ resistor (jumper installed at this location will put the transceiver in Medium Speed mode).
J8	Jumper on RS pin to connect the RS pin to ground (jumper installed at this location will put the transceiver in High Speed mode).
J9	Three-pin jumper on the LBK pin (ISL72026CSEH) or VREF pin (ISL72027CSEH, ISL72028CSEH). Install jumper in upper position (1 to 2) to put the ISL72026CSEH device in Loop-Back mode. Remove jumper for normal operation. Put jumper in lower position (2 to 3) to connect CANH to CANL differential output pins for evaluation of split mode termination for ISL72027CSEH and ISL72028CSEH.
J10	Jumper, location is not populated. It needs to be populated if you are going to use the BNC connector labeled CANH.
J11	Jumper, location is not populated. It needs to be populated if you are going to use the BNC connector labeled CANL.
D	BNC connector. Provides access to the D pin of the transceiver.
CANH	BNC connector, location is not populated. Provides access to the CANH pin for special receiver testing and fault testing.
CANL	BNC connector, location is not populated. Provides access to the CANL pin for special receiver testing and fault testing.

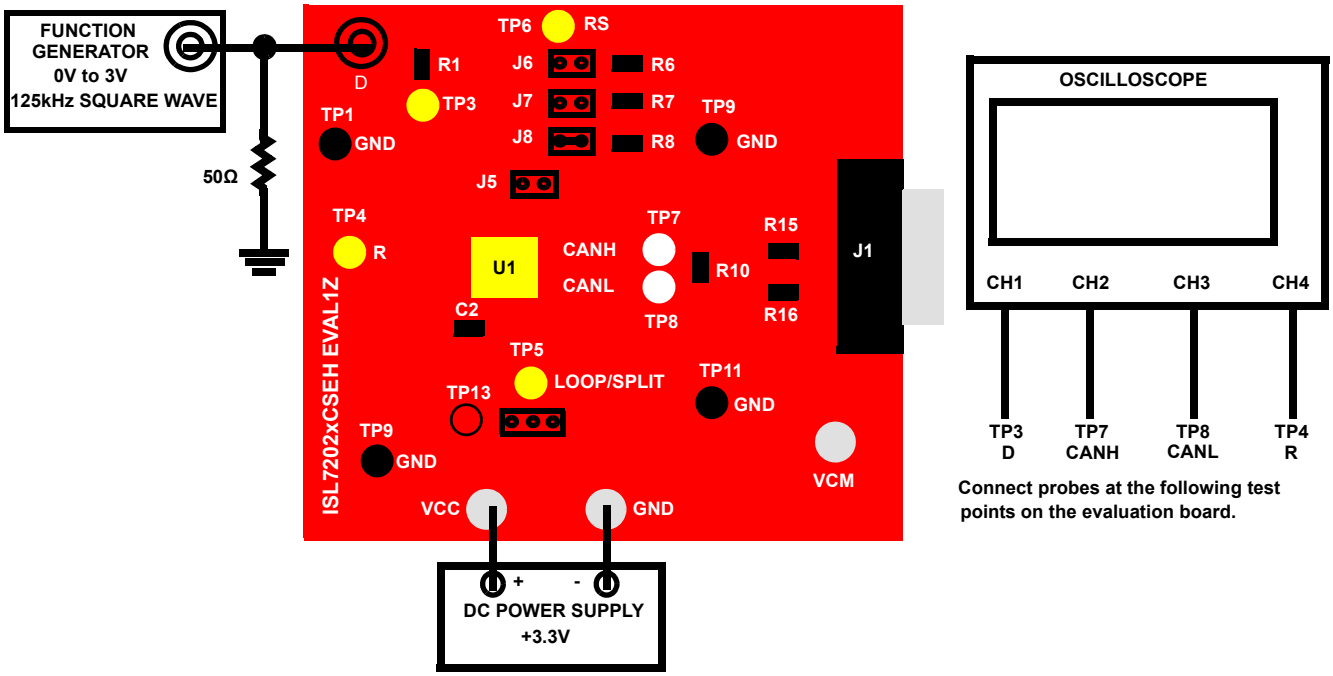

Figure 2. Basic Evaluation Test Setup Block Diagram (Measuring Propagation Delay, Skew, and Rise/Fall Time)

3. Using the Board to Measure Propagation Delay, Skew, and Rise/Fall Time

Refer to Figure 2 on page 7.

3.1 Lab Equipment

The equipment, external supplies, and signal sources needed to operate the board:

(1) 3.3V DC power supply.
(2) Function/signal generator (HP 8112A pulse generator or equivalent).
(3) Four channel oscilloscope (Tektronix TDS5140 digital oscilloscope or equivalent).

3.2 Initial Board Setup Procedure

(1) Attach the main evaluation board to the DC power supply to the banana jacks labeled VCC and GND as shown in Figure 2. Positive terminal at VCC and negative terminal at GND. The supply should be capable of delivering 3.0V to 3.6V and 100mA of current. Set the supply voltage to 3.3V.
(2) Configure the board for High Speed mode by installing a jumper at J8. No jumpers should be installed at J5, J6, J7, and J9.
(3) Connect the oscilloscope to the evaluation board as indicated in Figure 2.
  (a) Connect the Channel 1 probe to the D pin by connecting the oscilloscope probe at TP3 on the evaluation board and the probe ground at TP1.
  (b) Connect the Channel 2 probe to the CANH differential pin by connecting the oscilloscope probe at TP7 on the evaluation board and the probe ground at TP9.
  (c) Connect the Channel 3 probe to the CANL differential pin by connecting the oscilloscope probe at TP8 on the evaluation board and the probe ground at TP11.
  (d) Connect the Channel 4 probe to the R pin by connecting the oscilloscope probe at TP4 on the evaluation board and the probe ground at TP2.
(4) Connect the function/signal generator at the BNC connector labeled D on the evaluation board as shown in Figure 2. Set the generator to output a 125kHz square wave, 0V to 3.3V amplitude, and 50% duty cycle with a $t_{rise} = t_{fall} \leq 6ns$. Disable the generator output.
(5) Verify that a 60Ω resistor is installed at location R_{10} on the evaluation board.

blah blah the next three items are critical:

(1)

3.3 Calculating V_{DIFF} and Taking Measurements

(1) Set the oscilloscope to 2.0µs/division.
(2) Set CH1 of the oscilloscope to 5V/division.
(3) Set CH2, CH3, and CH4 of the oscilloscope to 2V/division.
(4) Using the math function of the oscilloscope, set the Math 1 selection to measure CH2 - CH3 and display the M1 trace on the oscilloscope screen.
M1 = CH2 - CH3 = V_{DIFF} = CANH - CANL.
(5) Use the "Measure" menu of the oscilloscope to set up the following four measurements:
  (a) LOW to HIGH propagation delay (t_{PLH}) to measure the time from the 50% point of the falling edge of CH1 (D pin) to the 900mV point on the rising edge of the M1 trace (V_{DIFF}).
  (b) HIGH to LOW propagation delay (t_{PHL}) to measure the time from the 50% point of the rising edge of CH1 (D pin) to the 500mV point on the falling edge of M1 trace (V_{DIFF}).
  (c) Output rise time (t_r) to measure the 10% to 90% time of the rise edge of the M1 trace (V_{DIFF}).
  (d) Output fall time (t_f) to measure the 90% to 10% time of the falling edge of the M1 trace (V_{DIFF}).
(6) Ensure that a jumper is installed at J8 (selects fast driver edges by connecting the RS pin to ground) and no jumpers are installed at J5, J6, J7, and J9.

(7) Enable the function generator. The scope plots should look like the ones shown in Figure 3 on page 10.
(8) In Fast Speed mode (RS = 0V):
   (a) t_{PLH} should be around 90ns and no greater than 160ns.
   (b) t_{PHL} should be around 115ns and no greater than 180ns.
   (c) t_{rise} should be around 30ns and no less than 15ns or greater than 85ns.
   (d) t_{fall} should be around 20ns and no less than 10ns or greater than 65ns.
(9) Move the jumper from J8 to J7 (selects medium driver edges by connecting the RS pin to ground through a 10kΩ resistor). Note: No jumpers should be installed at J5, J6, J8, and J9.
(10) The scope plot should look like the ones in Figure 4 on page 10.
(11) In Medium Speed mode (RS = 10kΩ):
   (a) t_{PLH} should be around 350ns and no greater than 550ns.
   (b) t_{PHL} should be around 410ns and no greater than 650ns.
   (c) t_r should be around 250ns and no less than 125ns or greater than 550ns.
   (d) t_f should be around 250ns and no less than 100ns or greater than 425ns.
(12) Move the jumper from J7 to J6 (selects slow driver edges by connecting the RS pin to ground through a 50kΩ resistor). Note: No jumpers should be installed at J5, J7, J8, and J9.
(13) The scope plot should look like the ones in Figure 5 on page 11.
(14) In Slow Speed mode (RS = 50kΩ):
   (a) t_{PLH} should be around 475ns and no greater than 800ns.
   (b) t_{PHL} should be around 550ns and no greater than 900ns.
   (c) t_r should be around 360ns and no less than 200ns or greater than 800ns.
   (d) t_f should be around 390ns and no less than 175ns or greater than 600ns.

4. ISL7202xCSEHEVAL1Z Waveforms

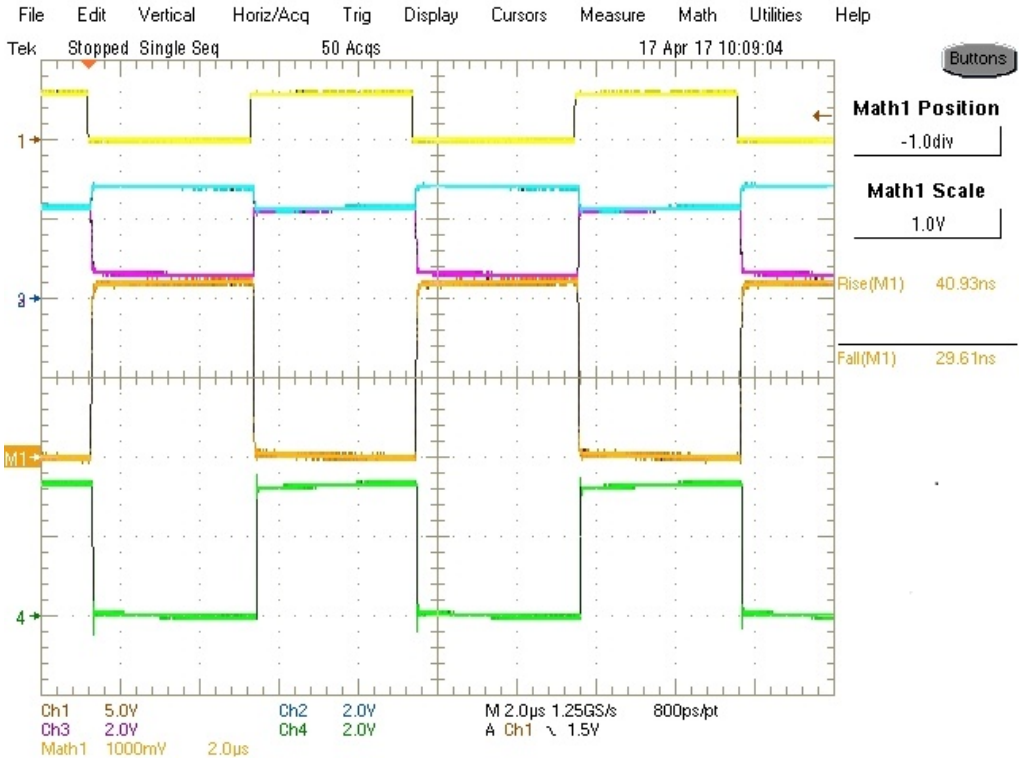

Figure 3. Oscilloscope Plot (Fast Speed) Waveforms and Measurements

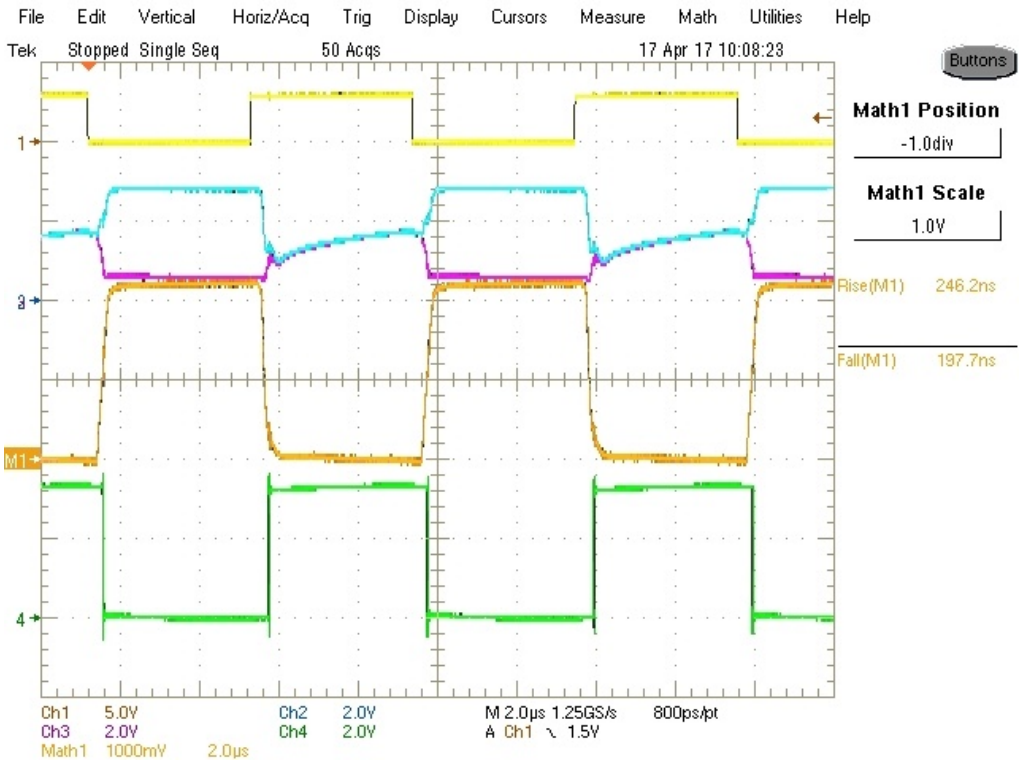

Figure 4. Oscilloscope Plot (Medium Speed) Waveforms and Measurements

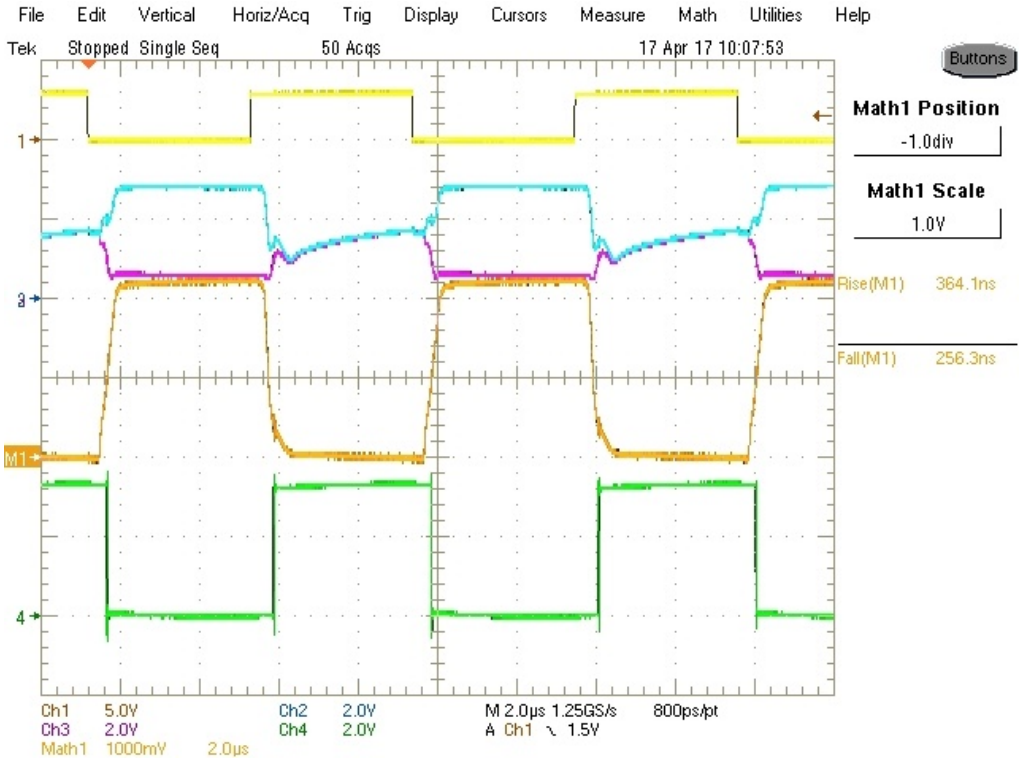

Figure 5. Oscilloscope Plot (Slow Speed) Waveforms and Measurements

5. PCB Layout Guidelines

5.1 ISL7202xCSEHEVAL1Z Evaluation Board

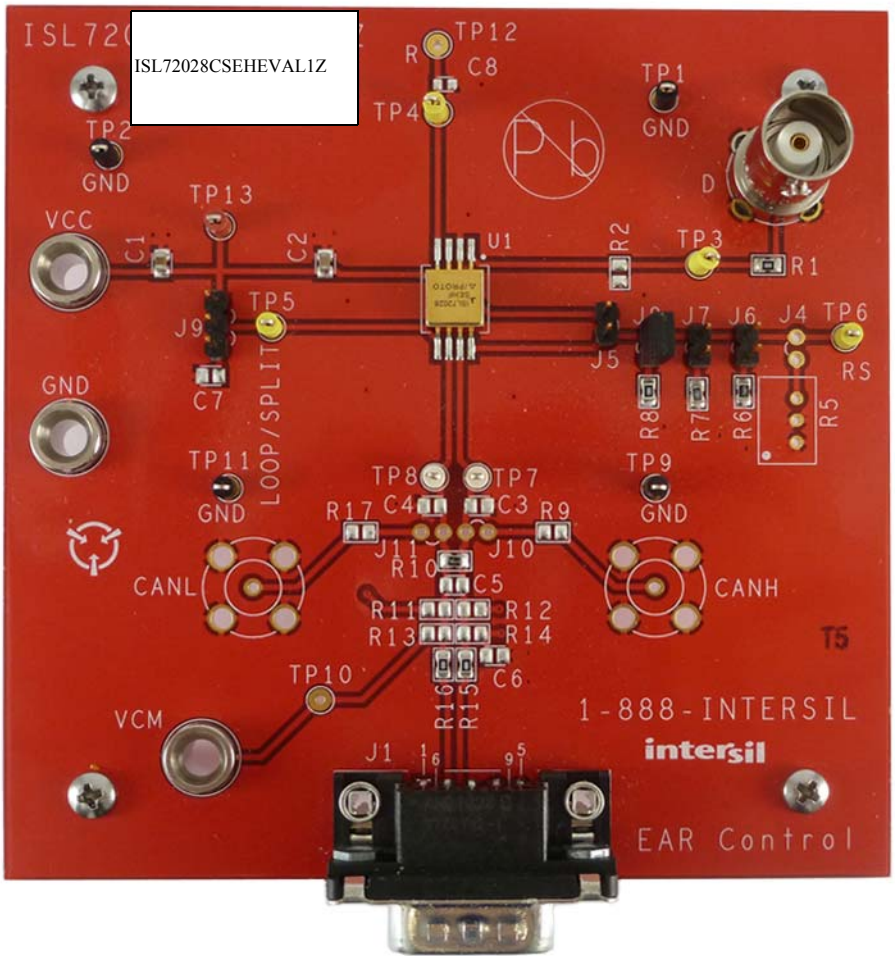

Figure 6. ISL72028CSEHEVAL1Z Evaluation Board

5.2 ISL7202xCSEHEVAL1Z Circuit Schematic

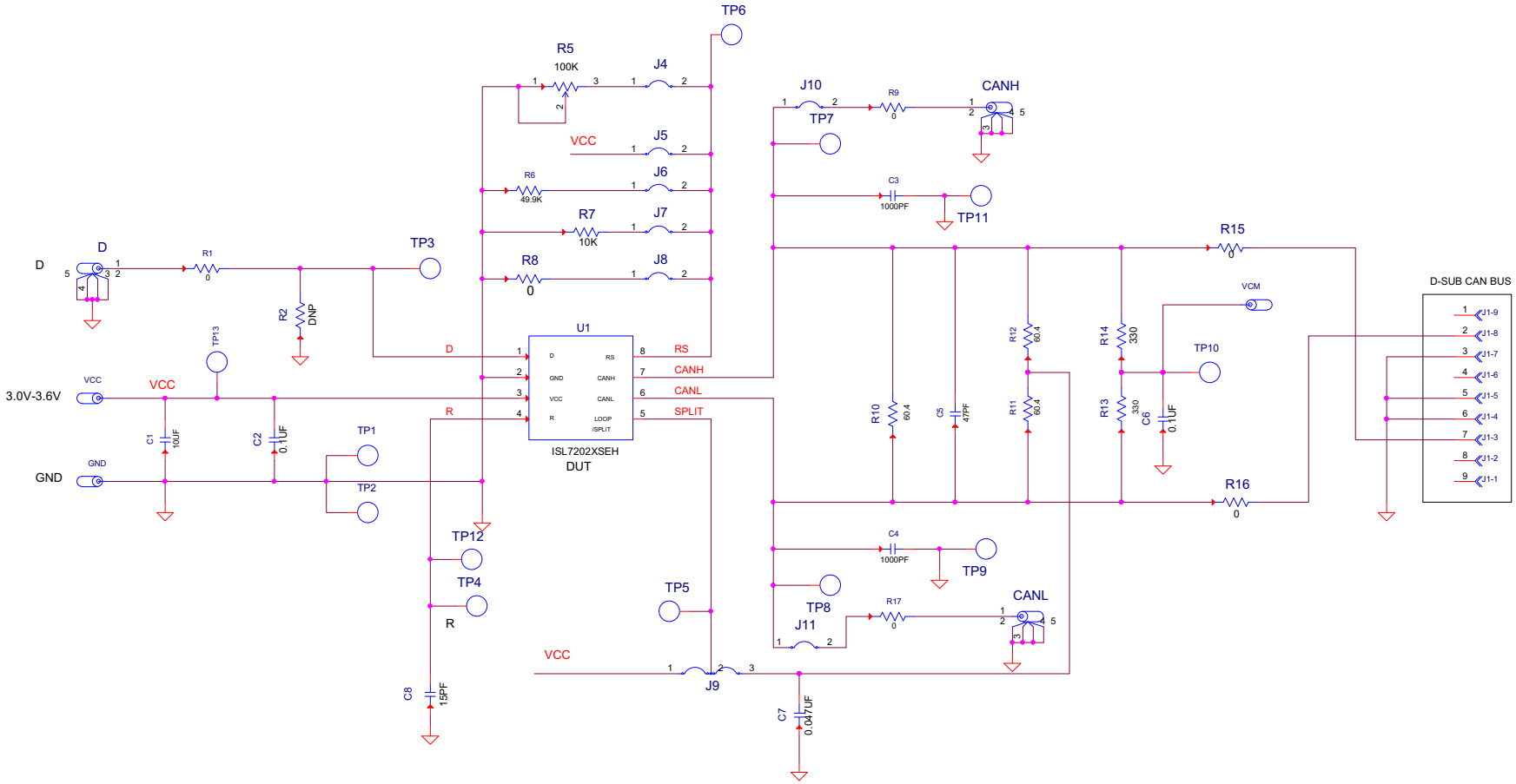

Figure 7. Schematic

5.3 Bill of Materials

Qty	Reference Designator	Description	Mfr	Manufacturer Part Number
1	SEE LABEL RENAME BOARD	PWB-PCB, ISL7202XEVAL1Z, Rev A, ROHS	IMAGINEERING INC	ISL7202XEVAL1ZREVAPCB
1	C2	CAP, SMD, 0805, 0.1µF, 50V, 10%, X7R, ROHS	KEMET	C0805C104K5RACTU
1	C1	CAP, SMD, 0805, 10µF, 25V, 10%, X5R, ROHS	TDK	C2012X5R1E106K
1	D	CONN - BNC, RECEPTACLE, TH, 4 POST, 50Ω, GOLDCONTACT, ROHS	AMPHENOL	31-5329-52RFX
1	TP13	CONN - MINI TEST PT, VERTICAL, RED, ROHS	KEYSTONE	5000
4	TP1, TP2, TP9, TP11	CONN - MINI TEST PT, VERTICAL, BLK, ROHS	KEYSTONE	5001
2	TP7, TP8	CONN-MINI TEST PT, VERTICAL, WHITE, ROHS	KEYSTONE	5002
4	TP3, TP4, TP5, TP6	CONN-MINI TEST PT, VERTICAL, YEL, ROHS	KEYSTONE	5004
1	J1	9-PIN MALE RIGHT ANGLE D-SUB CONNECTOR	TE CONNECTIVITY/ AMP	5788792-1
3	GND, VCC, VCM	CONN - JACK, MINI BANANA, 0.175 PLUG, NICKEL/BRASS, ROHS	KEYSTONE	575-4
1	U1	CAN BUS PART, 8P, FLAT-PACK, GOLD, ROHS	INTERSIL	ISL7202xCSEHF/PROTO
1	J9	CONN - HEADER, 1x3, BREAKAWY 1x36, 2.54mm, ROHS	BERG/FCI	68000-236HLF
4	J5, J6, J7, J8	CONN - HEADER, 1x2, RETENTIVE, 2.54mm, 0.230x0.120, ROHS	BERG/FCI	69190-202HLF
0	R2, R9, R11, R12, R13, R14, R17	RESISTOR, SMD, 0805, DNP, TF, ROHS	-	-
4	R1, R8, R15, R16	RES, SMD, 0805, 0Ω, 1/8W, TF, ROHS	YAGEO	RC0805JR-070RL
1	R7	RES, SMD, 0805, 10kΩ, 1/8W, 1%, TF, ROHS	VENKEL	CR0805-8W-1002FT (PbFREE)
1	R6	RES, SMD, 0805, 49.9kΩ, 1/8W, 1%, TF, ROHS	PANASONIC	ERJ-6ENF4992V
1	R10	RES, SMD, 0805, 60.4Ω, 1/8W, 1%, TF, ROHS	PANASONIC	ERJ-6ENF60R4V
4	Four Corners	SCREW, 4-40x1/4in, PAN, SS, PHILLIPS	-	-
4	Four Corners	STANDOFF, 4-40x3/4in, F/F, HEX, ALUMINUM, ROHS	KEYSTONE	2204 (.250 OD)
1	Place assy in bag	BAG, STATIC, 6x8, ZIP LOC, ROHS	ULINE	S-2262
0	TP10, TP12	CONN-MINI TEST POINT, VERTICAL, ROHS	KEYSTONE	5004
0	C3, C4, C5, C6, C7, C8	DO NOT POPULATE OR PURCHASE		
0	J4, J10, J11	DO NOT POPULATE OR PURCHASE		
0	R5	DO NOT POPULATE OR PURCHASE		
0	CANH, CANL	DO NOT POPULATE OR PURCHASE		
1	AFFIX TO BACK OF PCB	LABEL-DATE CODE_LINE 1: YRWK/REV#, LINE 2: BOM NAME	INTERSIL	LABEL-DATE CODE

5.4 Board Layout

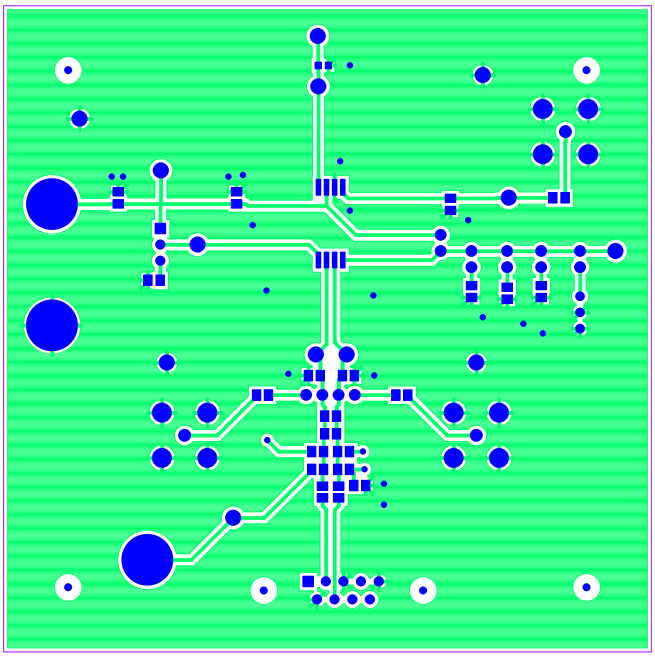

Figure 8. Top Layer

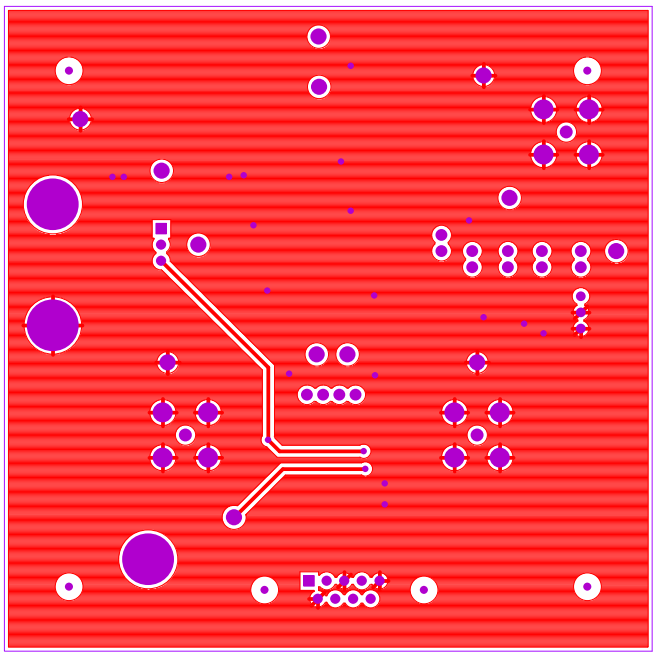

Figure 9. Bottom Layer

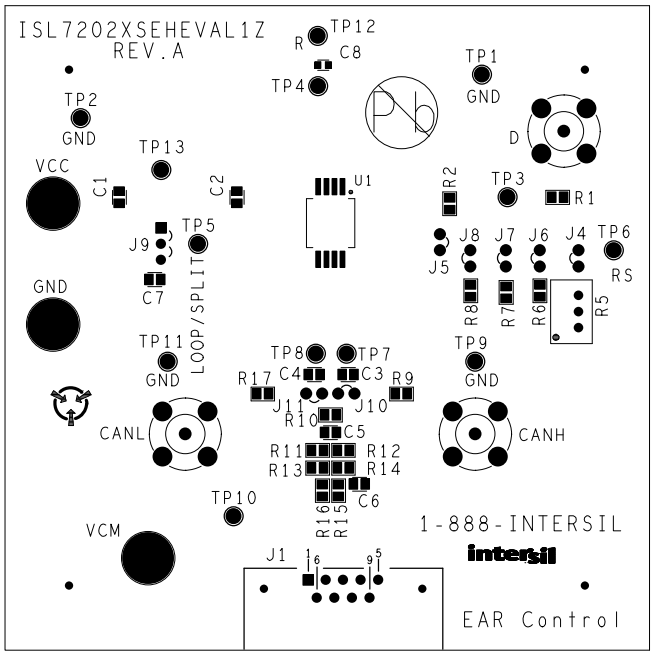

Figure 10. Top Layer Silk Screen

6. Typical Performance Curves

Unless noted: V_{CC} = 3.3V, D = 125kHz, square wave, 0 to V_{CC}, 50% duty cycle, t_r = t_f ≤6ns, T_A = +25°C

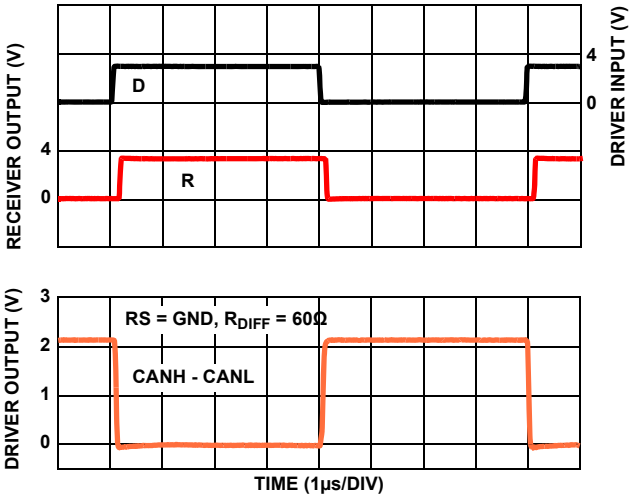

Figure 11. Fast Driver and Receiver Waveforms

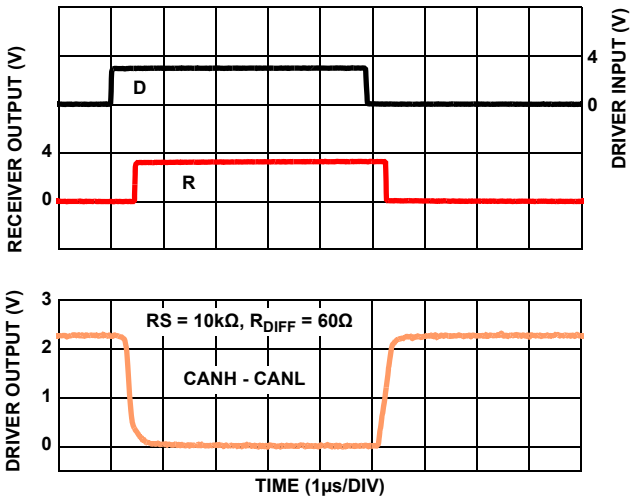

Figure 12. Medium Driver and Receiver Waveforms

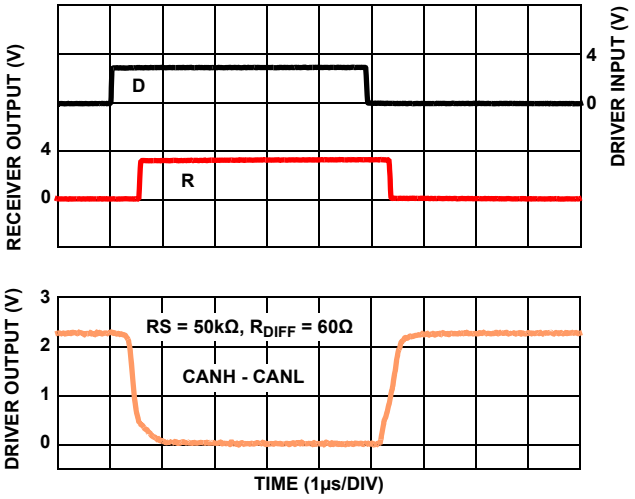

Figure 13. Slow Driver and Receiver Waveforms

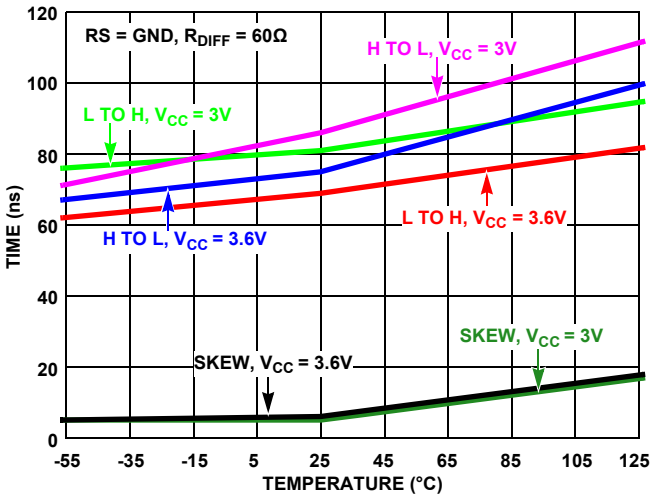

Figure 14. Transmitter Propagation Delay and Skew vs Temperature at Fast Speed

Unless noted: V_{CC} = 3.3V, D = 125kHz, square wave, 0 to V_{CC}, 50% duty cycle, t_r = t_f ≤6ns, T_A = +25°C **(Continued)**

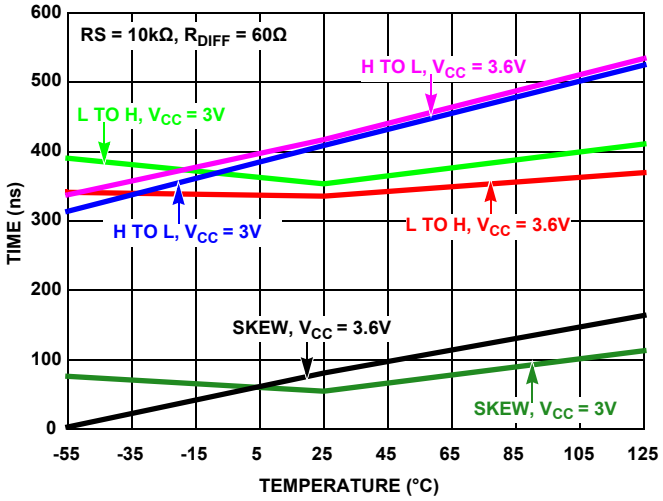

Figure 15. Transmitter Propagation Delay and Skew vs Temperature at Medium Speed

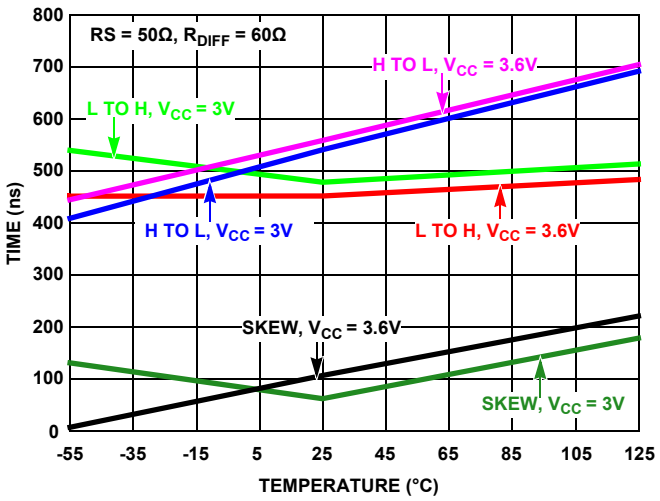

Figure 16. Transmitter Propagation Delay and Skew vs Temperature at Slow Speed

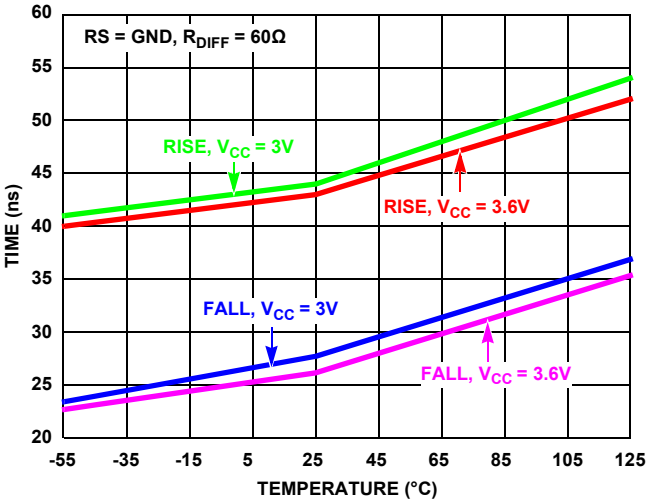

Figure 17. Transmitter Rise and Fall Times vs Temperature at Fast Speed

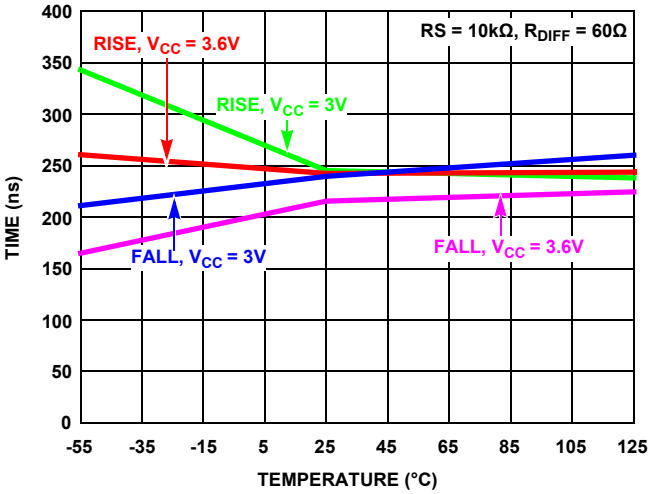

Figure 18. Transmitter Rise and Fall Times vs Temperature at Medium Speed

Unless noted: V_{CC} = 3.3V, D = 125kHz, square wave, 0 to V_{CC}, 50% duty cycle, t_r = t_f ≤6ns, T_A = +25°C **(Continued)**

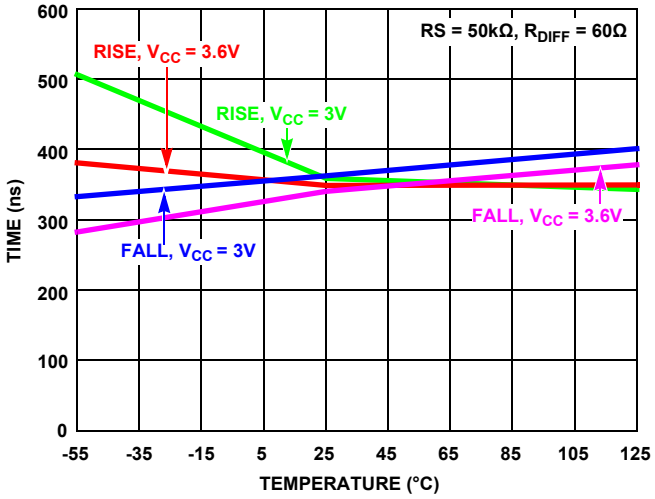

Figure 19. Transmitter Rise and Fall Times vs Temperature at Slow Speed

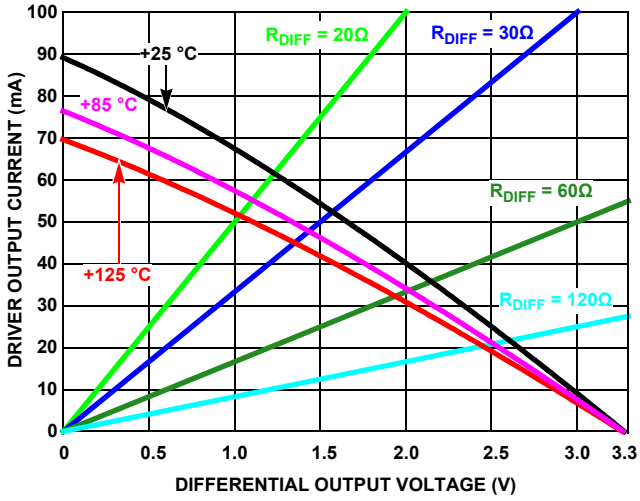

Figure 20. Driver Output Current vs Differential Output Voltage

7. Revision History

Rev.	Date	Description	
		Page	Summary
0.00	May 5, 2017	—	Initial release

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Rev.1.0 Mar 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

ISL7202xCSEHEVAL1Z

intersil™

UG118