

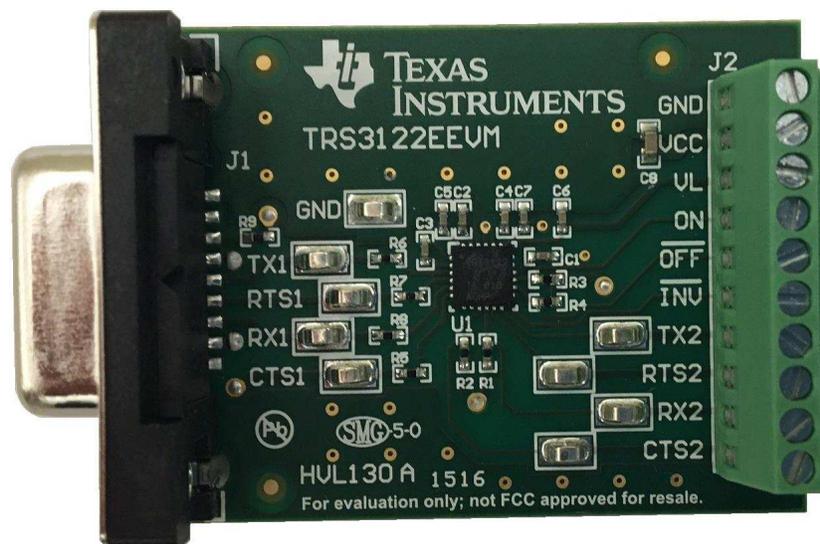
TRS3122EVM User's Guide

Abstract

This user's guide describes the functional operation of the TRS3122EVM Evaluation Module (EVM) for use as a design reference as well as a general engineering demonstration for the TRS3122E RS-232 Transceiver. Included in this User's Guide are setup instructions, features, a schematic diagram, an example layout, layout guidelines, and a bill of materials.

Introduction

The TRS3122EVM is an evaluation module for the TRS3122E device, a 1.8-V high-speed RS-232 transceiver. The module enables device evaluation using the installed DB9 connector and terminal block. The board interfaces data and control CMOS logic levels on the terminal block to RS-232 levels supporting data [RX, TX] channels and flow control [RTS, CTS] channels on the DB9 connector.



TRS3122EVM Board

Features

- Interface with MCUs or processor from 1.65 V up to 5.5 V
- High-speed RS-232 communication, up to 1 Mbps
- Auto-powerdown plus for very low power consumption (1 μ A) during shutdown
- Robust IEC61000-4-2 qualification provides robust protection from electrostatic discharge events
- DB9 female connector for direct connection with a computer's RS-232 port
- Screw terminals for easy connection for all power and logic signals

Applications

Any application that needs short range point to point full duplex data communications with hardware flow control.

- Remote Radio Unit (RRU)
- Base Band Unit (BBU)
- Electronic Point of Sale (EPOS)
- Diagnostics & Data Transmission Battery-Powered Equipment

Setup

The VCC screw terminal point needs to be supplied with external power; 1.8 V or 3.3 V is recommended. The VL screw terminal point needs to be supplied with external power; 1.8 V to VCC is recommended. The GND screw terminal point is the ground connection for the TRS3122EEVM.

The DB9 connector mates with a personal computer's RS-232 port or a USB to RS-232 adapter. For initial testing, external wires can be added to screw terminals; CTS2 to RTS2 and TX2 to RX2 to loop back the signal.

The ideal usage involves connecting the terminal block data and control lines to a system that has an UART (Universal asynchronous receiver/transmitter) onboard.

The EVM has pull up resistors on the TRS3122E $\overline{\text{FORCEOFF}}$ and FORCEON pins to keep both driver and receiver active. If desired, these signal can be driven by the external system to fully control all the features of auto-powerdown plus circuitry. The system may also benefit from monitoring the $\overline{\text{INVALID}}$ output to detect if an active connection has been made to the RS-232 port.

Usage at 5 V

The capacitors installed on the TRS3122EEVM were selected for VCC = 1.8 V and VCC = 3.3 V operation. It is required to change some of the onboard capacitors for 5 V testing.

Capacitor Changes

VCC voltage	C1	C2	C4	C5
1.8 V, 3.3 V	100 nF	100 nF	100 nF	100 nF
5 V	47 nF	330 nF	330 nF	330 nF

Connector/Test Points

DB9 Connector

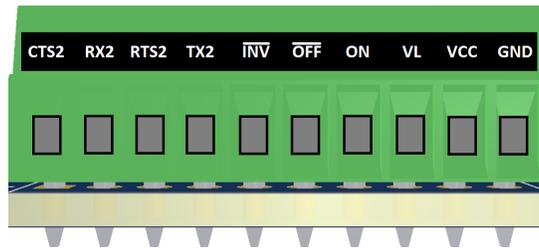


DB9 Connector Pinout

The female DB9 port provides access to the TRS3122E device through a standard RS-232 pinout. The TRS3122E female port is DCE to mate with a computer's male DTE port. The pin names are counterintuitive on the DCE side. For example the RX pin on EVM is connected to a driver and TX connects to a receiver.

- Pins 1 and 9 are not connected.
- Pins 2, 3, 7, 8 provide access to the RS-232 communication lines RX1, TX1, RTS1, CTS1 respectively.
- Pins 4 and 6 are shorted together by a 0 Ω resistor to loopback the unused handshaking lines.
- Pin 5 is grounded.

Screw Terminal Connector



Screw Terminal Connector Pinout

The screw terminal port provides access to the TRS3122E device communication pins as well as control, output, and power pins. Note that pins are numbered from left to right in the description below.

- Pins 1 through 4 provide access to the logic communication lines CTS2, RX2, RTS2, and TX2 respectively.
- Pin 5 connects to the $\overline{\text{INVALID}}$ pin, which has the function described by the [INVALID Pin Function Table](#).

$\overline{\text{INVALID}}$ Pin Function

INPUTS				OUTPUT
RIN1, RIN2	FORCEON	FORCEOFF	TIME ELAPSED SINCE LAST RIN OR DIN TRANSITION	$\overline{\text{INVALID}}$
Any L or H	X	X	X	H
All Open	X	X	X	L

- Pin 6 connects to the $\overline{\text{FORCEOFF}}$ pin, and Pin 7 connects to the FORCEON pin. Please see the [Driver Function Table](#) and the [Receiver Function Table](#) for pin functions.

Driver Function Table

INPUTS				OUTPUT	DRIVER STATUS
DIN	FORCEON	FORCEOFF	TIME ELAPSED SINCE LAST RIN OR DIN TRANSITION	DOUT	
X	X	L	X	Hi-Z	Powered off
L	H	H	X	H	Normal operation with auto-powerdown plus enabled
H	H	H	X	L	
L	L	H	<30s	H	Normal operation with auto-powerdown plus enabled
H	L	H	<30s	L	
L	L	H	>30s	Hi-Z	Powered off by auto-powerdown plus feature
H	L	H	>30s	Hi-Z	

Receiver Function Table

INPUTS				OUTPUT	RECEIVER STATUS
RIN	FORCEOFF	FORCEON	TIME ELAPSED SINCE LAST RIN OR DIN TRANSITION	ROUT	
X	L	X	X	Hi-Z	Powered off
L	H	X	X	H	Normal Operation with auto-powerdown plus disabled/enabled
H	H	X	X	L	
Open	H	X	X	H	

- Pin 8 connects to the VL pin, which is the logic level supply to which all logic inputs and outputs are referenced.
- Pin 9 is connected to VCC, the supply voltage for the device's charge pump.
- Pin 10 is connected to GND.

Board Test Points

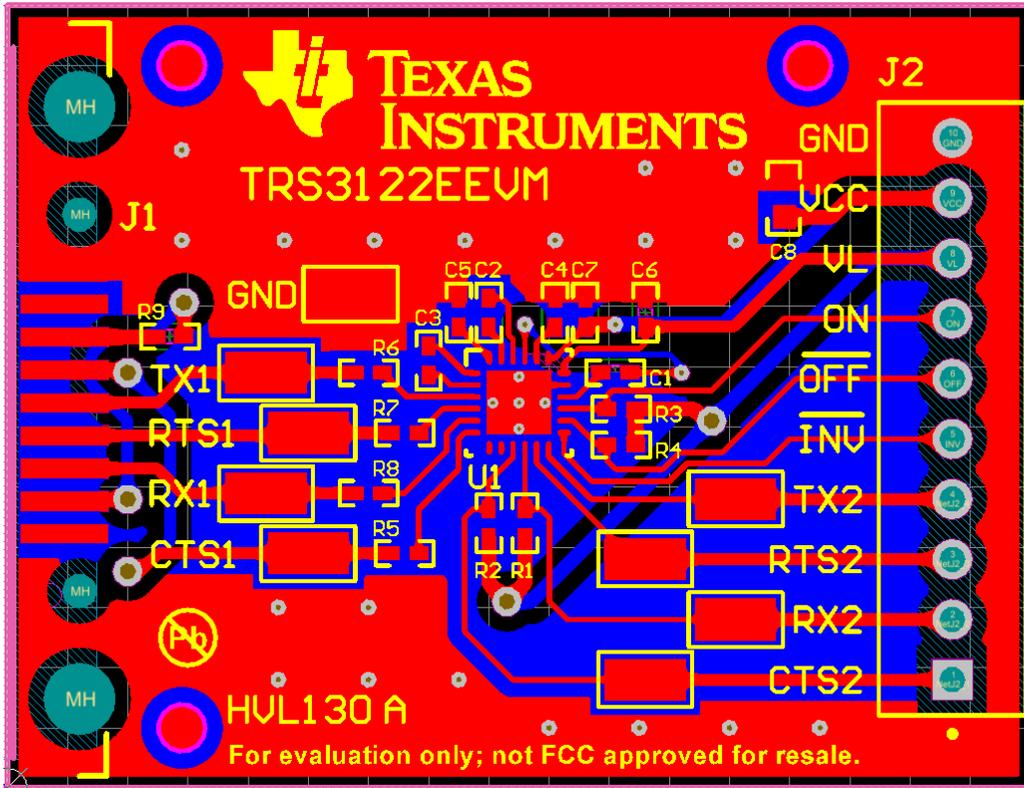


EVM top view image

The TRS3122EEVM provides test points for all RS-232 (TX1, RTS1, RX1, CTS1) and logic (TX2, RTS2, RX2, CTS2) communication lines in addition to a ground test point.

Printed Circuit Board Layouts

PCB Layout



PCB Layout

PCB Layer Plots

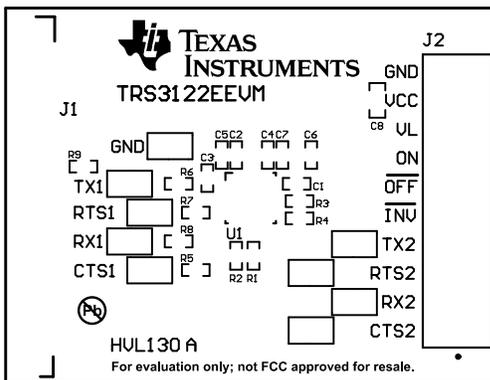


Figure 0-1. Top Layer

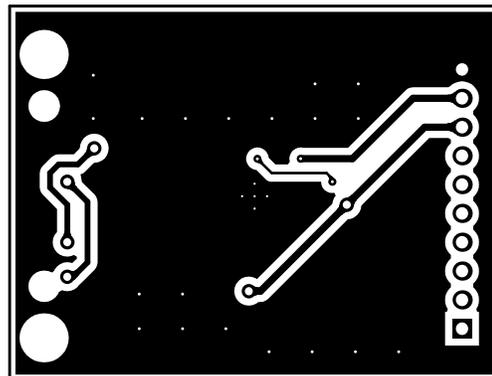


Figure 0-2. Bottom Layer

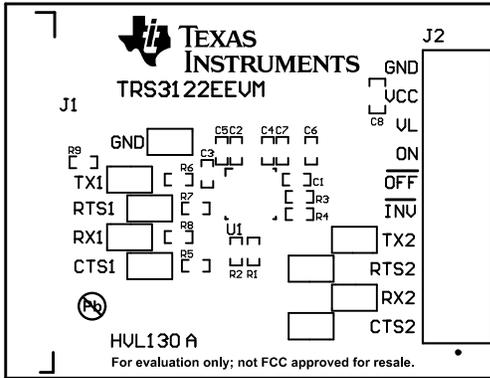


Figure 0-3. Top Overlay

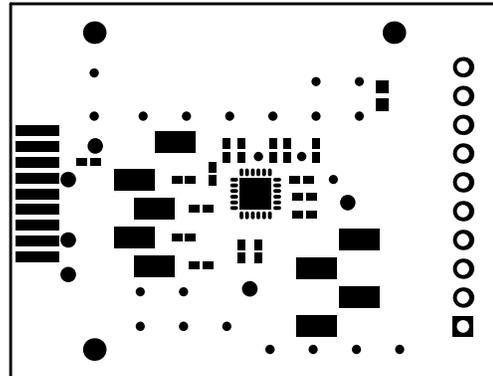


Figure 0-4. Top Solder Mask

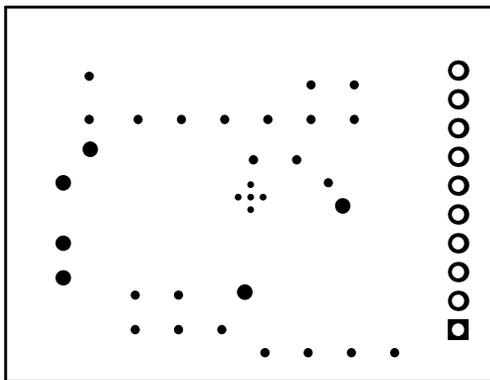


Figure 0-5. Bottom Solder Mask

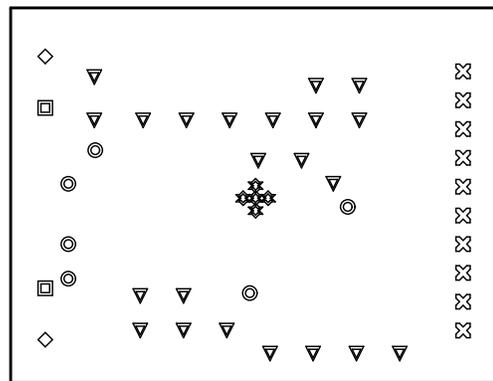


Figure 0-6. Drill Drawing

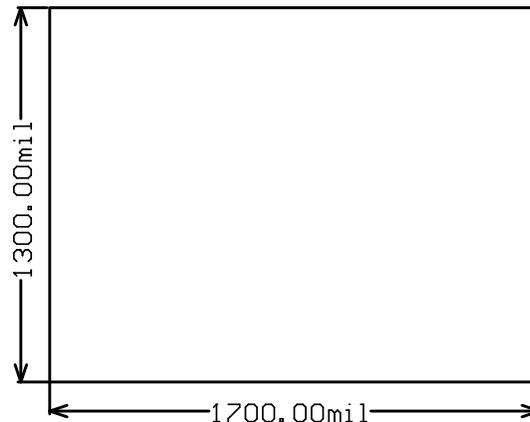
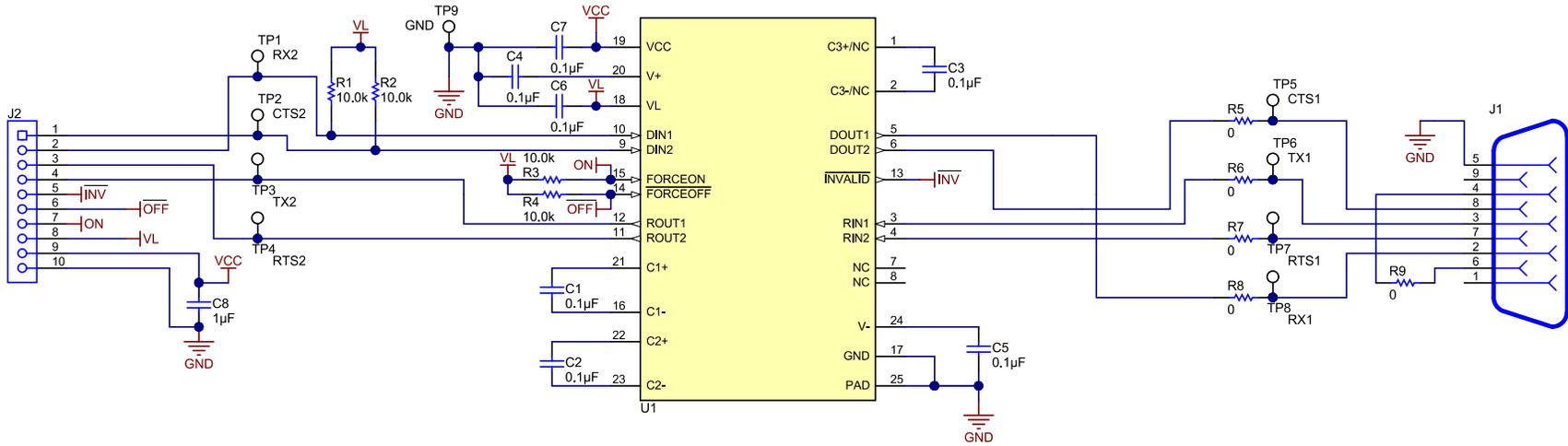


Figure 0-7. Board Dimensions

Schematic



TRS3122EEVM Schematic

Bill of Materials

			Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		HVL130	Any
C1, C2, C3, C4, C5, C6, C7	7	0.1 μ F	CAP, CERM, 0.1 μ F, 25 V, +/- 10%, X7R, 0402	0402	GRM155R71E104K E14D	MuRata
C8	1	1 μ F	CAP, CERM, 1 μ F, 25 V, +/- 10%, X7R, 0603	0603	GRM188R71E105K A12	MuRata
J1	1		CONN DB9 FEMALE R/A SOLDER SMD	30.81 x10.28 x10.10 mm	190-009-263R001	NorComp
J2	1		Terminal Block, 10x1, 2.54 mm, TH	Term Block, 10x1, 2.54 mm, TH	1725737	Phoenix Contact
R1, R2, R3, R4	4	10.0 k	RES, 10.0 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1002X	Panasonic
R5, R6, R7, R8, R9	5	0	RES, 0, 5%, 0.063 W, 0402	0402	ERJ-2GE0R00X	Panasonic
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	8	SMT	Test Point, Miniature, SMT	Testpoint_Keys tone_Miniature	5015	Keystone
TP9	1		Test Point, Miniature, SMT	Testpoint_Keys tone_Miniature	5015	Keystone
U1	1		RS-232 (2 - 2) TRANSCEIVER WITH SPLIT SUPPLY PIN FOR LOGIC SIDE, RGE0024H	RGE0024H	TRS3122ERGER	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A

Reference

1. *TRS3122E 2Tx/2Rx Low Voltage, Low Power RS232 Transceiver* data sheet ([SLLSET7](#))

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