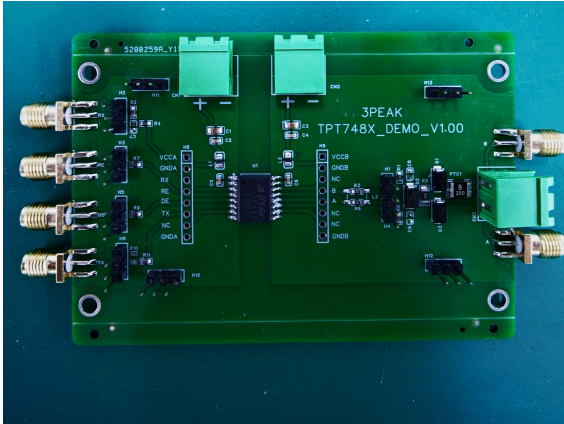


# TPT7481 EVM User's Guide

## EVM Picture



## DESCRIPTIONS

The TPT7481 is a  $\pm 15$ -kV IEC61000 ESD protected, 3.0-V ~ 5.5-V isolated RS485 transceivers that meet the RS-485 and RS-422 standards for Half Duplex communication.

The TPT7481 features a fail-safe receiver, which supports the output of the receiver to be logic high when the differential input (bus pin A/B) of the receiver is open, short, or idle.

Transmitters in this family deliver exceptional differential output voltages into the RS-485 required 54- $\Omega$  load. The 20-Mbps device has very low bus currents, so they present a true “1/8 unit load” to the RS-485 bus. This allows up to 256 transceivers on the network without using repeaters.

Receiver (Rx) inputs feature a “Full Fail-Safe” design, which ensures a logic-high Rx output if Rx inputs are floating, shorted, or on a terminated but undriven bus.

The TPT7481 is available in the WSOP16 package and is characterized from  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

## Key Features

- Exceeds Requirements of EIA-485 Standard
- Hot Plug Circuitry Tx and Rx Outputs Remain

Three- State During Power-up/Power-down

- Supply Voltage: 3.0 V ~ 5.5 V
- Data Rate: 20-Mbps Isolated RS485
- Full Fail-Safe Receiver (Open, Short, Terminated)
- 5-kV RMS Isolation Rating
- $\pm 200$ -kV/ $\mu\text{s}$  typ Static CMTI,  $\pm 150$ -kV/ $\mu\text{s}$  typ Dynamic CMTI
- Latch-up Performance Exceeds 600 mA
- Bus-Pin Protection (Between Bus pins and GNDB)
  - $\pm 15$ -kV IEC 61000-4-2 Contact Discharge
  - $\pm 20$ -kV IEC 61000-4-2 Air Discharge
- Safety-Related Certifications:
  - VDE Certification according to DIN VDE V 0884-17(IEC60747-17)
  - 5000-VRMS Isolation Rating per UL 1577
  - CQC Certification per GB 4943.1
  - CSA, TUV, and CB Certifications

## APPLICATIONS

- Home Appliance
- Motor Drives
- Industrial Control
- Communication Infrastructure

## Revision History

Revise Date	Version	Reason/Issue
2025-01-09	A0	First Issue

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# 1. Performance Specification

A summary of the TPT7481 EVM performance specifications is provided in Table.1.

Table. 1 TPT7481 EVM Performance Specification

PARAMETER		TEST CONDITIONS	MIN	Type	Max	UNITS
<b>INPUT CHARACTERISTICS</b>						
VCC	Supply Voltage		3.0		5.5	V
VI	Input Voltage at any Bus Terminal		-7		12	V
VIH	High-level Input Voltage (driver, driver enable, and receiver enable inputs)		2		VCC	V
VIL	Low-level Input Voltage (driver, driver enable, and receiver enable inputs)		0		0.8	V
<b>OUTPUT CHARACTERISTICS</b>						
VOD	Driver Differential Output Voltage Magnitude	RL = 54 Ω , VCCB = 3.3 V	1.5	2.2	-	V
		RL = 54 Ω , VCCB = 5.0 V	2.0	3.3	-	V
		RL = 100 Ω, VCCB= 3.3 V	1.5	2.6	-	V
		RL = 100 Ω, VCCB = 5.0 V	2.0	3.9	-	V
VOH	Receiver High-level Output Voltage	VCCA = 3.3 V, IOH = -2 mA	2.7	3.2	-	V
		VCCA = 5 V, IOH= -4 mA	4.1	4.8	-	
VOL	Receiver Low-level Output Voltage	VCCA = 3.3 V, IOL= 2 mA	-	0.09	0.3	V
		VCCA = 5 V, IOL= 4 mA	-	0.17	0.4	
<b>SYSTEMS CHARACTERISTICS</b>						
DATARATE					20M	bps

## 2. EVM Documentation

### 2.1 Schematic

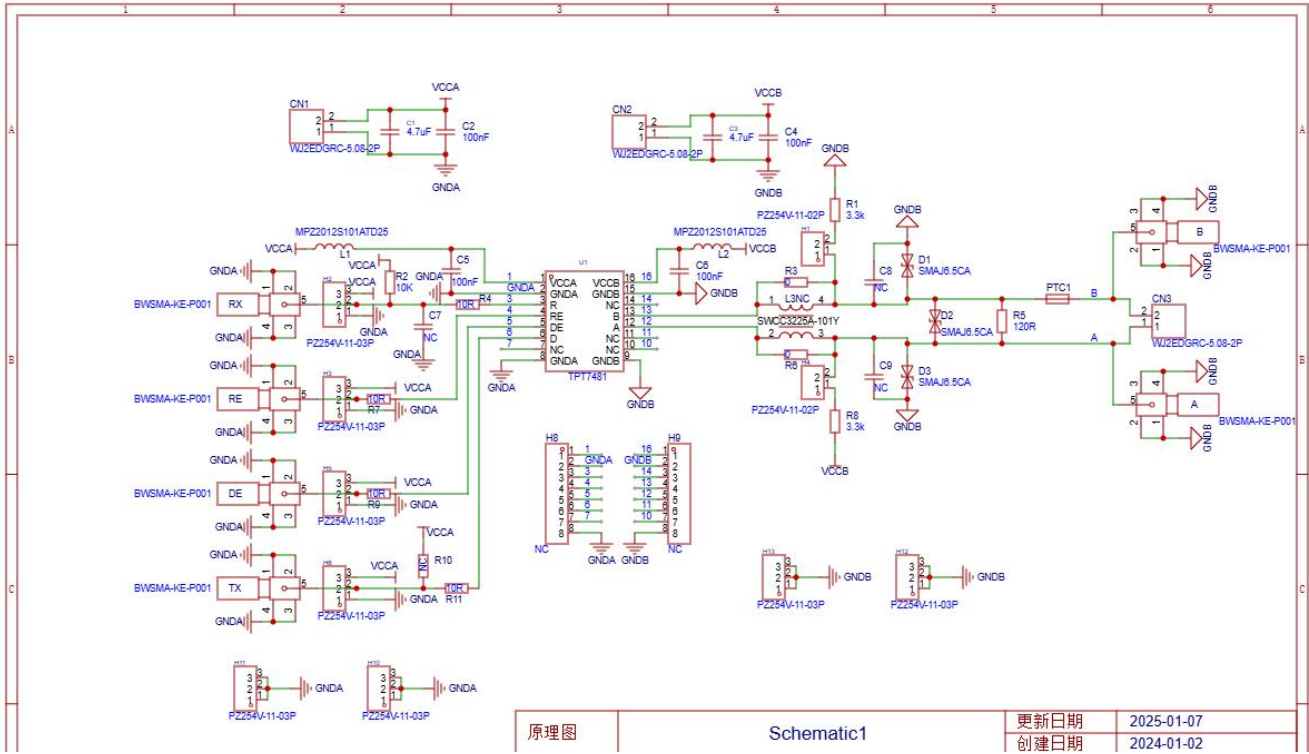


Figure. 1 TPT7481 EVM Schematic

### 2.2 PCB Layout

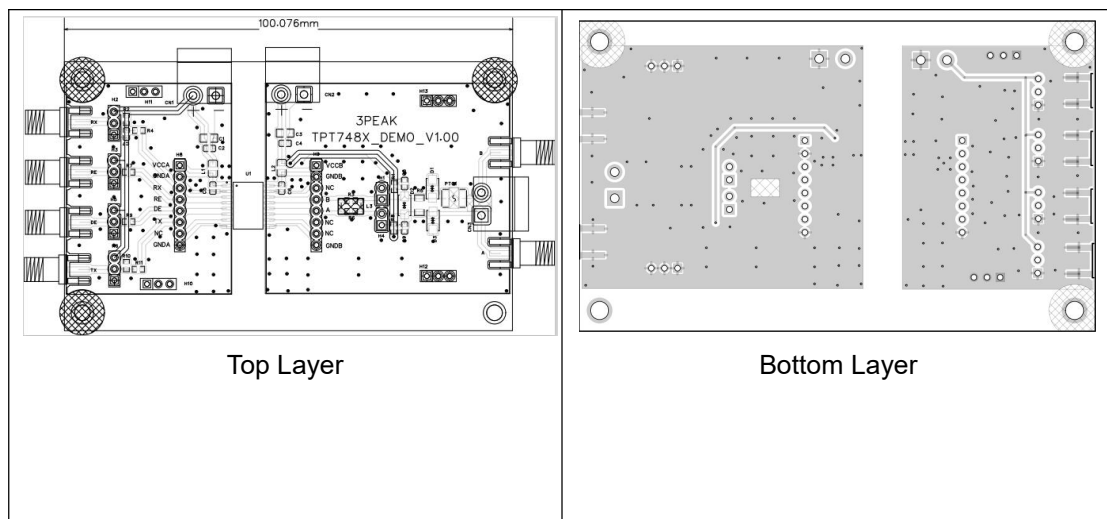


Figure. 2 TPT7481 EVM PCB Layout

## 2.3 Bill of Materials

Designator	Value	Comment	Footprint	Device	Manufacturer Part	Quantity
A,B,DE,RE,RX,T X		BWSMA-KE -P001	SMA-SMD_BWSMA- KE-P001	BWSMA-KE-P 001	BWSMA-KE-P001	6
C1,C3	4.7uF	4.7uF	C0805	GRM21BR71 E475KA73L	GRM21BR71E475K A73L	2
C2,C4,C5,C6	100nF	100nF	C0603	CAP_0603		4
C7,C8,C9	NC	NC	C0603	CAP_0603		3
CN1,CN2,CN3		WJ2EDGRC -5.08-2P	CONN-TH_2P-P5.08 _WJ2EDGRC-5.08-2 P	WJ2EDGRC-5 .08-2P	WJ2EDGRC-5.08-2 P	3
D1,D2,D3		SMAJ6.5CA	SMA_L4.4-W2.6-LS5. 0-BI	SMAJ6.5CA_ C78404	SMAJ6.5CA	3
H1,H4		PZ254V-11- 02P	HDR-TH_2P-P2.54-V -M	PZ254V-11-02 P	PZ254V-11-02P	2
H2,H3,H5,H6,H1 0,H11,H12,H13		PZ254V-11- 03P	HDR-TH_3P-P2.54-V -M	PZ254V-11-03 P	PZ254V-11-03P	8
H8,H9		NC	HDR-TH_8P-P2.54-V -F	PM2.54-1*8	NC	2
L1,L2		MPZ2012S1 01ATD25	L0805	MPZ2012S10 1ATD25	MPZ2012S101ATD 25	2
L3	NC	ACT45B-51 0-2P-TL003	IND-SMD_4P-L4.5-W 3.2-TL	ACT45B-510- 2P-TL003		1
PTC1		BSMD1812- 200-30V	F1812	BSMD1812-20 0-30V		1
R1,R8	3.3k	3.3k	R0603	Res_0603		2
R2	10K	10K	R0603	Res_0603		1
R3,R6	0	0	R0603	Res_0603		2
R4,R7,R9,R11	10R	10R	R0603	Res_0603		4
R5	120R	120R	R1206	Res_0603		1
R10	NC	NC	R0603	Res_0603		1
U1		TPT7481	SOIC-16_L10.3-W7.5 -P1.27-LS10.3-BL	TPT7481	TPT7481	1

Table. 2 TPT7481 EVM Bill of Materials

### 3. Test Setup and Procedure

#### 3.1 Test Setup

The TPT7481 -EVM is provided with input/output connectors and test points as shown in Table.2.

Table. 3 TPT7481 EVM Connections

Designator	Name	Description
CN1	VCCA-GNDA	Logic-side power supply
CN2	VCCB-GNDB	Transceiver-side power supply
CN3	A,B	Bus line A and line B
RX	R	Receiver output
RE	RE/	Receiver enable. This pin disables the receiver output when high or open and enables the receiver output when low.
DE	DE	Driver enable. This pin enables the driver output when high and disables the driver output when low or open.
TX	D	Driver input
A	A	Transceiver non-inverting input or output (I/O) on the bus side
B	B	Transceiver inverting input or output (I/O) on the bus side
H10	GNDA	Ground connection for VCCA
H11	GNDA	Ground connection for VCCA
H12	GNDB	Ground connection for VCCB
H13	GNDB	Ground connection for VCCB

Referring to Table.3, the recommended connections to evaluate TPT7481-EVM is shown in Fig.3.

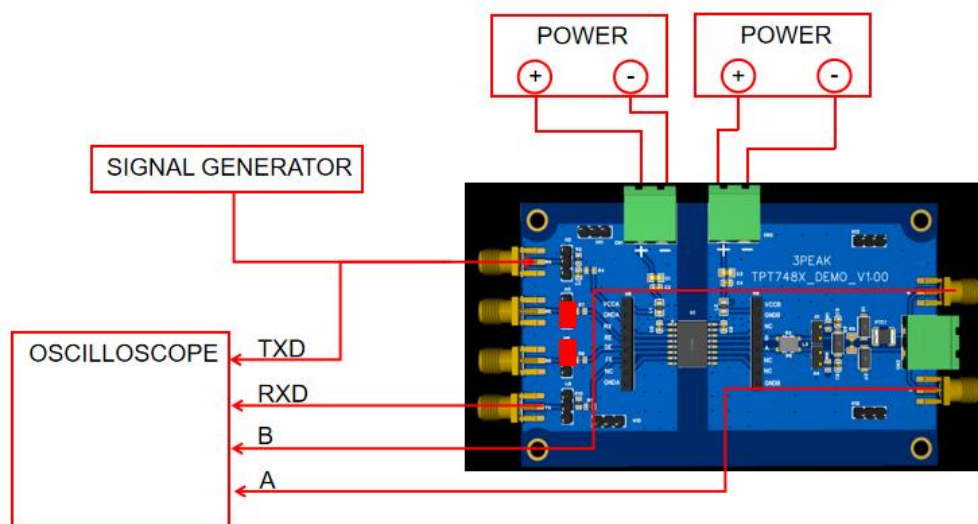


Figure. 3 EVM Test Setup

### 3.2 Test Equipment

Table.4 is the equipment used by 3PEAK, can also use other model of instruments which can support the voltage, current and power level of this EVM test.

Table. 4 Test Equipment Used by 3PEAK

Instruments	Model	Vender
DC Source and Multimeter	B2962B	Keysight
Signal Generator	33600A	Keysight
Oscilloscope	MSO58	Tektronix

### 3.3 Test Procedure

- Set up the EVM as described in Fig.3.
- Power up the EVM.
- Use the signal generator to input the square waveform.
- Oscilloscope is used to capture waveforms like bus signal and others.

## 4. Test Results and Performance Evaluation

### 4.1 Application Curves

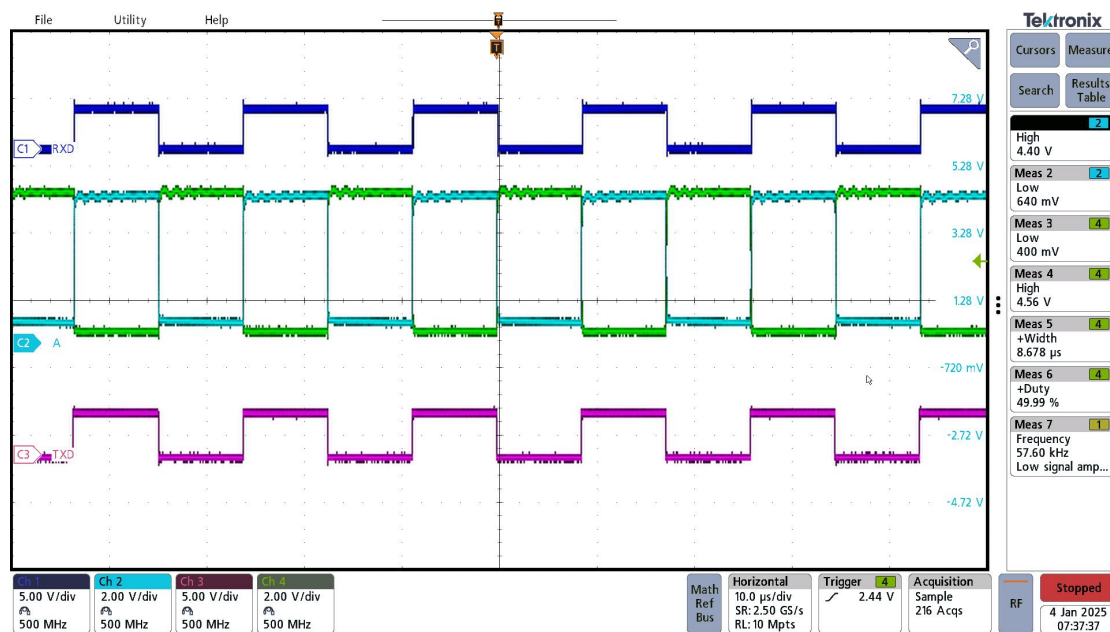


Figure. 4 Waveforms at datarate=115200bps, bus load=120 $\Omega$ , VCCA=3.3V, VCCB=5V

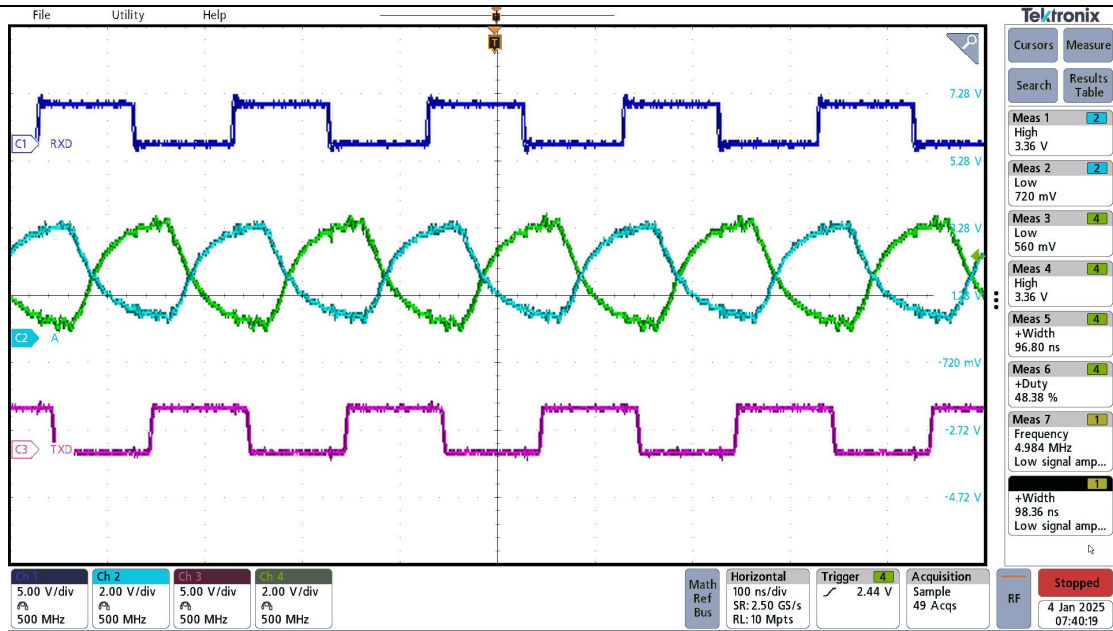


Figure. 5 Waveforms at datarate=10Mbps, bus load=120Ω, VCCA=3.3V, VCCB=5V

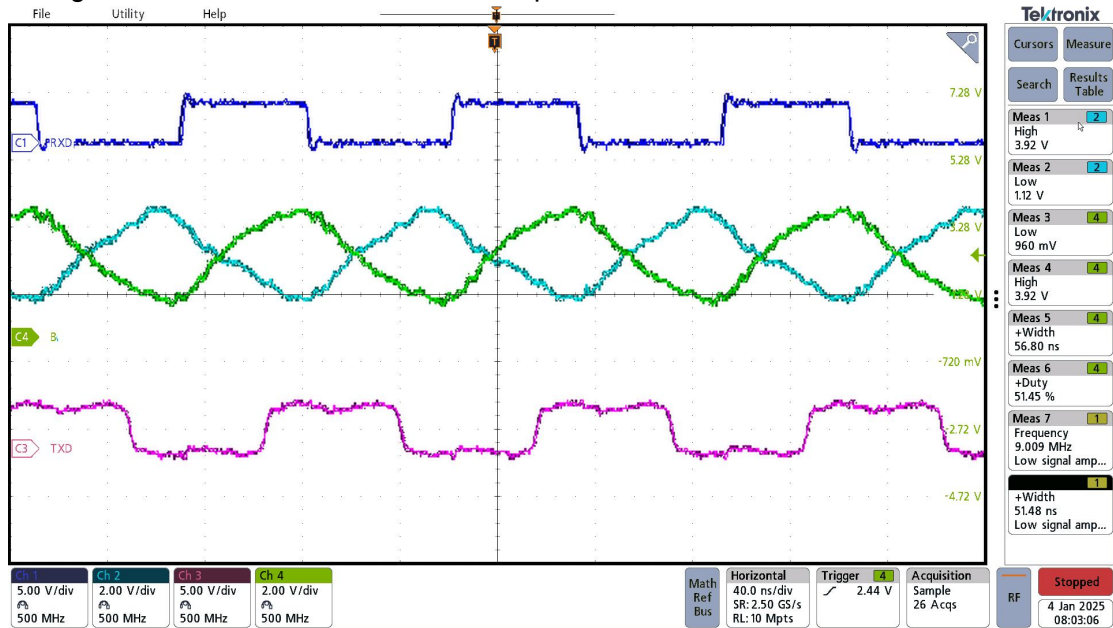


Figure. 6 Waveforms at datarate=18Mbps, bus load=120Ω, VCCA=3.3V, VCCB=5V



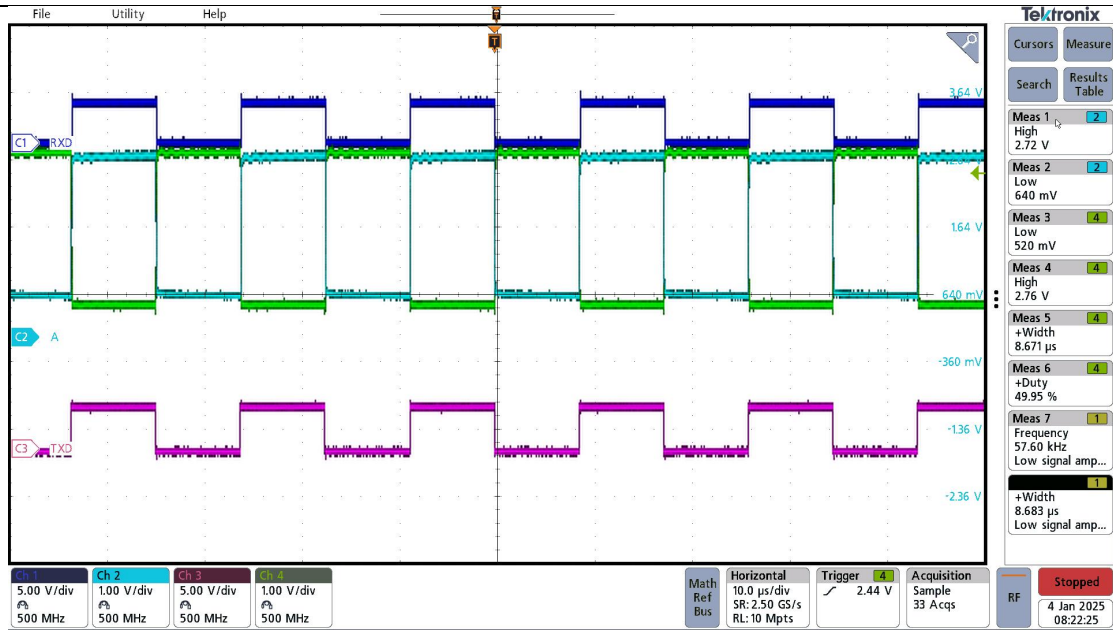


Figure. 7 Waveforms at datarate=115200bps, bus load=60Ω, VCCA=3.3V, VCCB=3.3V

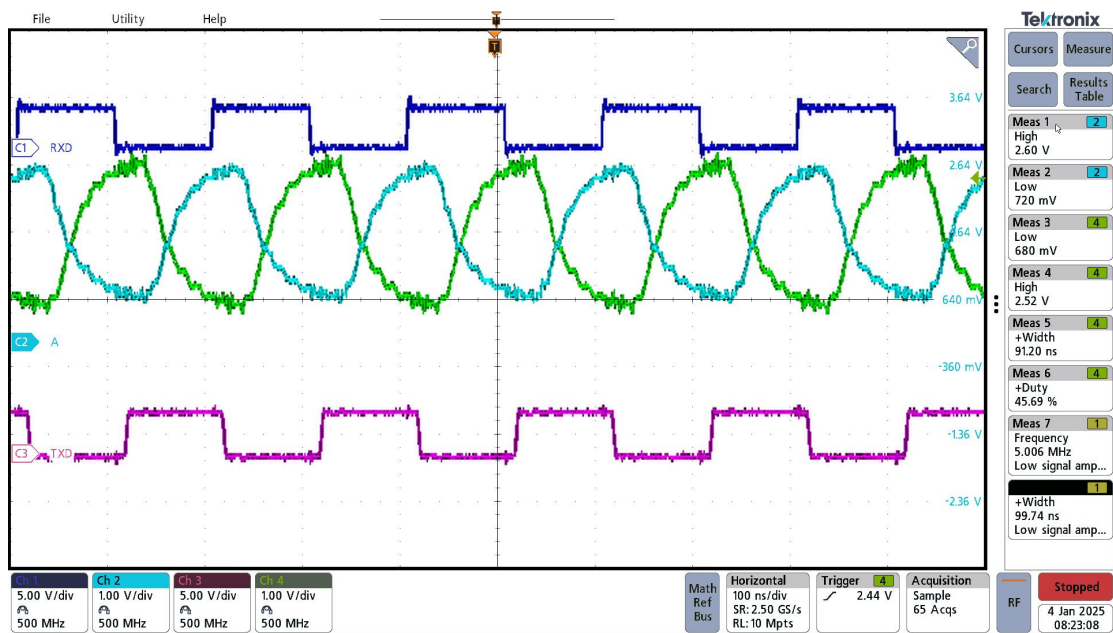


Figure. 8 Waveforms at datarate=10Mbps, bus load=60Ω, VCCA=3.3V, VCCB=3.3V

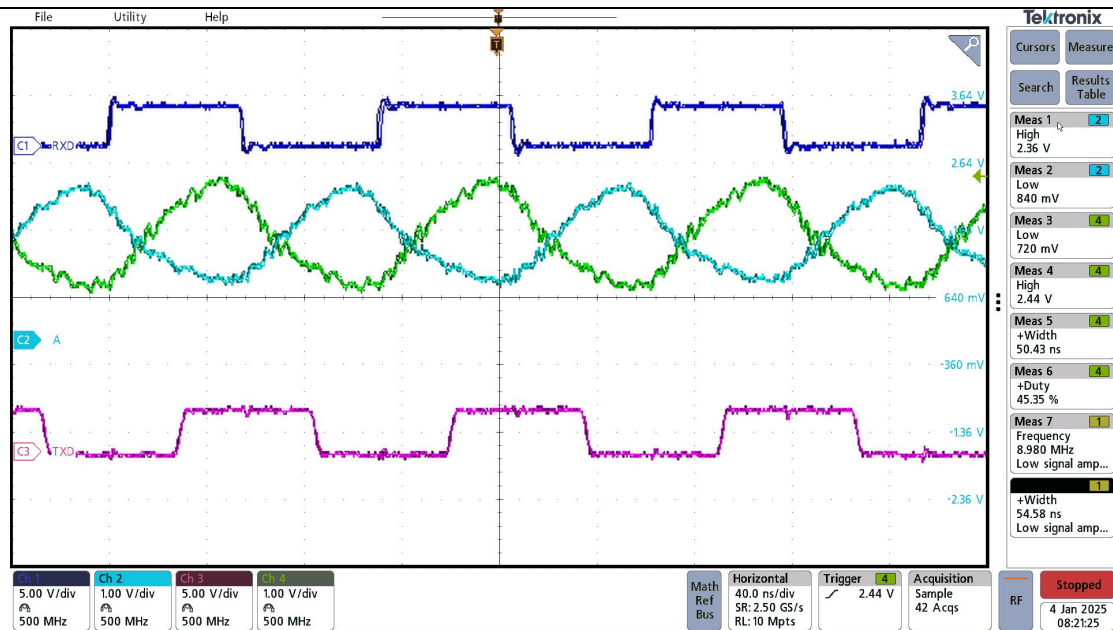


Figure. 9 Waveforms at datarate=18Mbps, bus load=60Ω, VCCA=3.3V, VCCB=3.3V