

Interface Solutions for Industrial Applications

Transceiver interface portfolio overview

RS-485 | RS-422 RS-232 | UART

Overview

- Industry leader with LARGEST portfolio of RS-485 / RS232 Transceivers
- Low power modes and support for voltages as low as 1.8V
- Half-duplex and Full-duplex devices with high ESD performance and broad range of Bus Fault Protection
- Single and multi-channel UART devices
- FIFO and No FIFO UART options

Applications

- Motor Drives
- Point of Sale (POS)
- Security and Surveillance Networks
- Grid Infrastructure
- Appliances



I2C | I3C

Overview

- Complete line of I2C repeaters, expanders, switches, and special function devices
- Wider voltage range and lower power consumption than competitive solutions
- I3C Roadmap Developments to increase speed capability of the I2C bus with additional features (i.e. dynamic addressing)

Applications

- Servers, Enterprise SSD
- PC & Notebooks
- Enterprise Switching
- Access Points
- IP Cameras



IO-Link

Overview

- Fully integrated IEC ESD, EFT and Surge protection eliminating the need of external protection components
- $\pm 65V$ fault tolerance and full reverse polarity protection for accidental mis-wiring during installation
- Lowest power dissipation at the maximum driver current output minimizing system level thermal concerns

Applications

- FA Transmitters (Sensors)
- Process Automation Sensors
- PLCs



CAN | LIN | SBC

Overview

- Industry leading 3.3V portfolio
- Best performance, most robust 5V portfolio
- High immunity, low emission, Fault protected solutions
- Fastest Data Rate devices on the Market (5Mbps)
- SBC w/ integrated regulators

Applications

- In-Vehicle Networking
- Avionics
- Elevators / Lifts
- Building Automation
- Drones



Transceivers interface RS-485 products

www.ti.com/rs485

TI RS-485 Overview

Broad Portfolio

Features

- Half-duplex and full-duplex transceivers
- 3V, 5V, 3.3V-5V VCC supply
- 1.8V IO support
- Maximum 50Mbps data rate
- Autopolarity correction, Auto direction selection, RS-485 over power line

High Performance

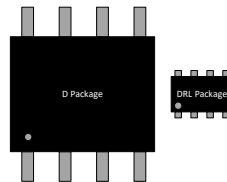
Features

- Integrated IEC 61000-4-2 ESD and IEC 61000-4-4 EFT protections
- Integrated IEC 61000-4-5 Surge protection
- Up to -70V to 70V bus fault protection
- Up to -25V to 25V common mode voltage range
- -40C to 125C operating temperature range

Small Packages

Features

- Regular packages compatible with industry standards
- Various small package options:
 - 2.1x1.2 mm SOT
 - 2.9x1.6 mm SOT
 - 3x3 mm VSON
 - 3x3 mm VSSOP



RS-485 Transceiver Half-Duplex

	<u>THVD1505</u>	<u>THVD1500</u> <u>THVD1520</u>	<u>THVD1510</u> <u>THVD1550</u>	<u>THVD1400</u> <u>THVD1420</u>	<u>THVD1406</u> <u>THVD1426</u>	<u>THVD1410</u> <u>THVD1450</u>	<u>THVD1419</u> <u>THVD1429</u>	<u>THVD2410</u> <u>THVD2450</u>	<u>THVD8010</u> <u>THVD8000</u>
Feature	Auto Polarity Correction + IEC ESD, EFT	IEC ESD + IEC EFT	High IEC ESD + IEC EFT	IEC ESD + IEC EFT	Automatic Direction Control	High IEC ESD + IEC EFT	IEC Surge + ESD + EFT	High bus fault + Wide common mode range	RS-485 over power line, OOK
Supply Voltage	5V	5V	5V	3.3V to 5V	3.3V to 5V	3.3V to 5V	3.3V to 5V	3.3V to 5V	3.3V to 5V
Maximum data rate	1 Mbps	1500: 0.5 Mbps 1520: 10 Mbps	1510: 0.5 Mbps 1550: 50Mbps	1400: 0.5 Mbps 1420: 12 Mbps	1406: 0.5 Mbps 1426: 12 Mbps	1410: 0.5 Mbps 1450: 50Mbps	1419: 0.25Mbps 1429: 20 Mbps	2410: 0.5 Mbps 2450: 50Mbps	OOK max freq. 8010: 300KHz 8000: 5MHz
Extended bus fault protection	-18V to 18V	-18V to 18V	-18V to 18V	-16V to 16V	-16V to 16V	-18V to 18V	-15V to 15V	-70V to 70V	-18V to 18V
Extended common mode range	-7V to 12V	-7V to 12V	-15V to 15V	-7V to 12V	-7V to 12V	-15V to 15V	-12V to 12V	-25V to 25V	-7V to 12V
Integrated IEC 61000-4-2 ESD protection	8kV	8kV	18kV	8kV	8kV	18kV	8kV	12kV	8kV
Integrated IEC 61000-4-4 EFT protection	2kV	1500: 2kV 1520: 4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV
Integrated IEC 61000-4-5 Surge protection	2.5 kV								
HBM ESD	16kV	16kV	30kV	16kV	16kV	30kV	16kV	16kV	16kV
Package, Temperature	SOIC-8 (5x4mm) -40 to 125C	SOIC-8 (5x4mm) -40 to 125C	SOIC-8 (5x4mm) VSSOP-8 (3x3mm) -40 to 125C	SOIC-8 (5x4mm) SOT-8 (2.1x1.2mm) -40 to 125C	SOIC-8 (5x4mm) SOT-8 (2.1x1.2mm) -40 to 125C	SOIC-8 (5x4mm) VSSOP-8 (3x3mm) VSON-8 ₁₄₅₀ (3x3mm) -40 to 125C	SOIC-8 (5x4mm) -40 to 125C	SOIC-8 (5x4mm) VSSOP-8, VSON-8 (3x3mm) -40 to 125C	SOT-8 (2.9x1.6mm) -40 to 125C

RS-485 Transceiver Full-Duplex

	<u>THVD1512</u>	<u>THVD1551</u> <u>THVD1552</u>	<u>SN65HVD1791</u> <u>SN65HVD1792</u>	<u>SN65HVD1793</u>	<u>SN65HVD1470</u> <u>SN65HVD1471</u>	<u>SN65HVD1473</u> <u>SN65HVD1474</u>	<u>THVD1451</u> <u>THVD1452</u>
Feature	High IEC ESD + IEC EFT	High IEC ESD + IEC EFT	High bus fault + Wide common mode range	High bus fault + Wide common mode range	High IEC ESD + IEC EFT	High IEC ESD + IEC EFT	High IEC ESD + IEC EFT
Supply Voltage	5V	5V	5V	5V	3.3V	3.3V	3.3V to 5V
Maximum data rate	0.5 Mbps	50 Mbps	91: 0.115 Mbps 92: 1Mbps	10 Mbps	0.4 Mbps	20 Mbps	50 Mbps
Extended bus fault protection	-18V to 18V	-18V to 18V	-70V to 70V	-30V to 30V	-13V to 16.5V	-13V to 16.5V	-18V to 18V
Extended common mode range	-15V to 15V	-15V to 15V	-20V to 25V	-20V to 25V	-7V to 12V	-7V to 12V	-15V to 15V
Integrated IEC 61000-4-2 ESD protection	18kV	18kV	-	-	16kV	16kV	18kV
Integrated IEC 61000-4-4 EFT protection	4kV	4kV	-	-	4kV	4kV	4kV
HBM ESD	30kV	30kV	16kV	16kV	30kV	30kV	30kV
Package, Temperature	VSSOP-10 (3x3mm) -40 to 125C	51: VSSOP-8 (3x3mm) 52: VSSOP-10 (3x3mm), SOIC-14 (8.6x4mm) -40 to 125C	SOIC-14 (8.6x4mm) -40 to 105C	SOIC-14 (8.6x4mm) -40 to 105C	70: MSOP-10 (3x3mm), SOIC-14 (8.6x4mm) 71: MSOP-8 (3x3mm), SOIC-8 (5x4mm) -40 to 125C	73: MSOP-10 (3x3mm), SOIC-14 (8.6x4mm) 74: MSOP-8 (3x3mm), SOIC-8 (5x4mm) -40 to 125C	51: VSON-8 (3x3mm), SOIC-8 (5x4mm) 52: VSSOP-10 (3x3mm), SOIC-14 (8.6x4mm) -40 to 125C

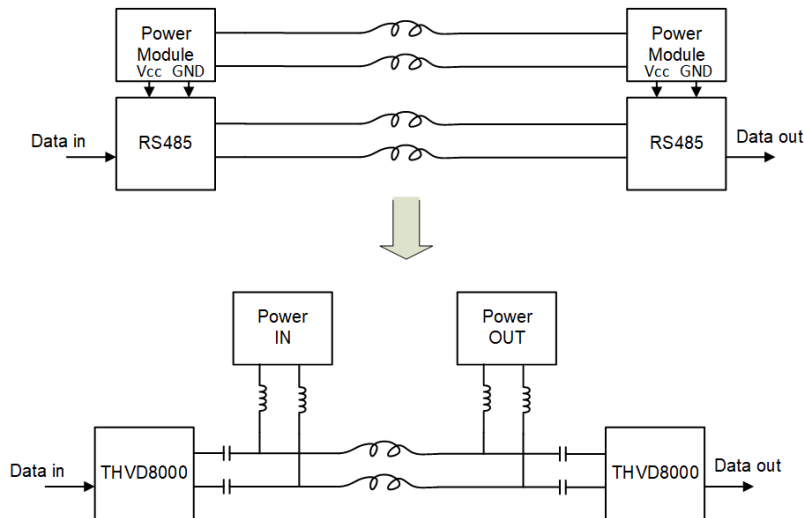
When a 4-wire application only needs 2-wires

Traditionally the power line and data line are carried separately.

If data could be transmitted over power lines, the total wires would be reduced from 4 to 2.

- **Result: Up to 50% cost savings**

Key applications include HVAC, E-meters, elevator, lighting, fire & safety, E-bike, PLC, solar, appliances etc.



THVD8000/THVD8010

RS-485 transceiver with OOK modulation for power line communication

Features

- 3 V – 5.5 V Supply Voltage, half-duplex
- RS-485 Electrical Signaling with On-Off Keying (OOK) Modulation
- Polarity Free Operation in OOK Mode
- Pin Selectable Carrier Frequency (data rate = 1/10 to 1/5 carrier frequency):
 - THVD8000: 125 kHz – 5 MHz
 - THVD8010: 125 kHz – 300 kHz
- Bus Input Protection
 - ± 18-V Fault Protection
 - ± 16-kV HBM ESD
 - ± 8-kV IEC61000-4-2 ESD Contact Discharge
 - ± 4-kV IEC61000-4-4 Fast Transient Burst
- Extended Temperature Range: –40°C to +125°C
- 8-Pin SOT-23 Package (3 x 1.6 x 1.1 mm)

Applications

- HVAC Systems
- Appliance
- Building Automation
- Factory Automation & Control
- Grid Infrastructure
- Lighting

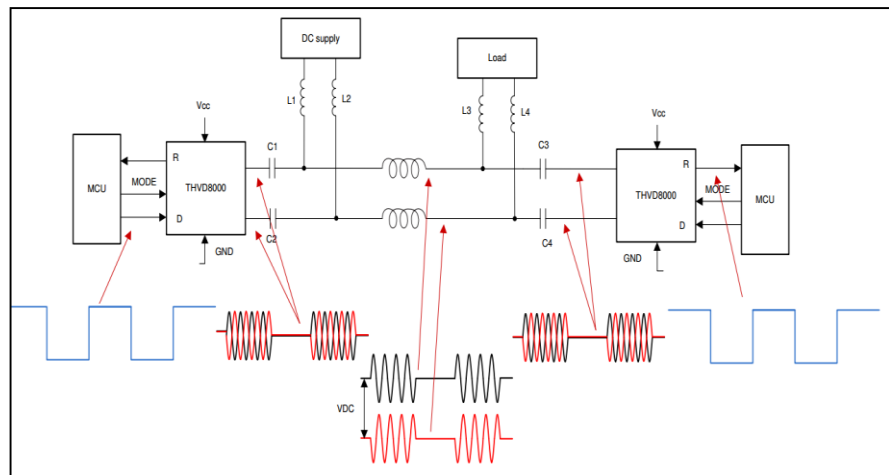
Resources

- [Samples](#)
- [THVD8000EVM](#)
- [THVD8000 Design Guide](#)
- [Technical article](#)

Benefits

- Eliminates pair of data cables, connectors by using power lines for RS-485 communication: reduced system cost, simplified system design

Key difference	THVD8000	THVD8010
Carrier frequency range	125KHz to 5MHz	125KHz to 300KHz
VMAG_ZERO: OOK signal differential swing (magnitude) to detect a zero at the R output	225mV (max) @ 125KHz	1200mV (max) @ 125KHz
VMAG_ONE: OOK signal differential swing (magnitude) to detect an one at the R output	20mV (min) @ 125KHz	400mV (min) @ 125KHz



THVD1400/20 Transceivers

3.3V to 5V RS-485 Transceivers With $\pm 8\text{kV}$ IEC ESD and SOT-23 Package Option

Features

- 3V – 5.5V Supply Voltage
- Half-Duplex
- ESD Protection
 - $\pm 16\text{kV}$ HBM Protection
 - $\pm 8\text{kV}$ IEC61000-4-2 Contact Discharge
 - $\pm 15\text{kV}$ IEC61000-4-2 Air Gap Discharge
 - $\pm 4\text{kV}$ IEC61000-4-4 EFT Criterion A
- Common-Mode Range: -7V to 12V
- Bus Fault Protection: $\pm 16\text{V}$
- Open, Short, and Idle Bus Failsafe
- 1/8 Unit Load: Up to 256 Nodes on the Bus
- Low Quiescent Current
- Hot Plug-in Capability
- Temperature Range: -40°C to $+125^{\circ}\text{C}$
- Package: SOIC (4.90mm x 3.91mm); **SOT-23 (2.10mm x 1.20mm)**
- **0.5mm pitch DRL package for low cost assembly**

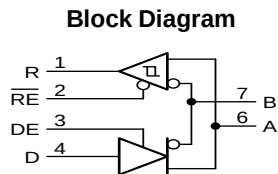
Applications

- Motor Drives
- Building Automation
- Video Surveillance
- HVAC
- E-meters

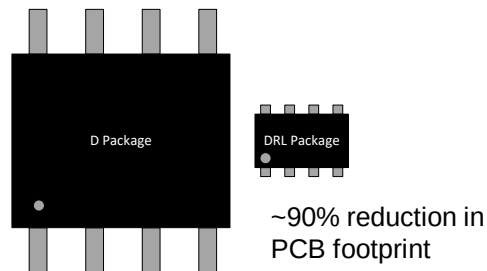
Benefits

- IEC Contact Discharge ESD – Eliminate system level protection components and reduce system BOM
- Small SOT-23 package to reduce RS-485 footprint in space constrained PCBs
- Low power dissipation – ideal for battery operated applications
- High noise immunity to guarantee robust system operation in noisy environments

Part Number	Data Rate (Mbps)	Pkg
THVD1400	0.5	8-Pin SOIC (D) 8-Pin SOT-23 (DRL)
THVD1420	12	



Package Options to Scale



THVD24xx RS-485 Transceivers

3.3V - 5V RS-485/Profibus Transceivers With IEC ESD, Fault Protection

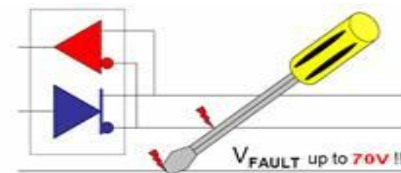
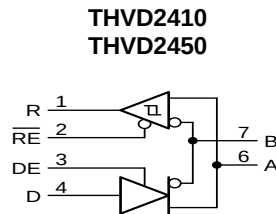
Common Features

- 3.3V - 5V Supply Voltage, Profibus @ 5V (VOD = 2.1)
- ESD Protection
 - HBM Protection
 - IEC 61000-4-2 Contact Discharge
 - IEC 61000-4-4 EFT
- **High Bus Fault protection (70V) to exceed Functional Safety req. (60V)**
- Extended Common Mode
- Large receiver hysteresis
- Low EMI low-speed and high-speed data rates
- Low quiescent current
- Hot plug-in capability
- Temperature range: -40°C to +125°C
- Packages: SOIC-8 (4.90mm x 3.91mm); VSSOP-8 (3mm x 3mm), VSON-8 (3mm x 3mm)

Applications

- Networks in electrically high-noise environment:
 - Industrial Automation
 - Process control
 - Building Automation and HVAC
 - Motion Encoders
 - Grid Infrastructure (Electricity Meters)
- **Footprint compatible: SN65HVD178x**

Feature Device	THVD2450	THVD2410
Supply Voltage	3.3 V - 5 V	3.3 V - 5 V
Data Rate	50Mbps	500kbps
Duplex	Half	Half
IEC ESD Contact	12 kV	12 kV
EFT	4 kV	4 kV
Fault Protection	70 V	70 V
Common Mode Range	25 V	25 V
Packages	SOIC, VSSOP, VSON	SOIC, VSSOP, VSON



THVD14x9 RS-485 Transceivers

3.3V - 5V RS-485 Transceivers With Surge Protection

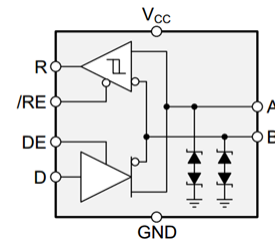
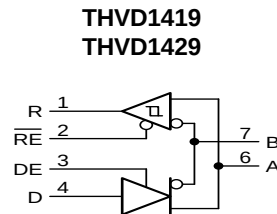
Common Features

- 3.3V - 5V Supply Voltage
- ESD Protection
 - HBM Protection
 - IEC 61000-4-2 Contact Discharge
 - IEC 61000-4-4 EFT
 - **IEC 61000-4-5 Surge**
- Large receiver hysteresis
- Low EMI low-speed and high-speed data rates
- Low quiescent current
- Hot plug-in capability
- Temperature range: -40°C to $+125^{\circ}\text{C}$
- Packages: SOIC-8 (4.90mm x 3.91mm)

Applications

- Networks in electrically high-noise environment:
 - Industrial Automation
 - Process control
 - Building Automation and HVAC
 - Motion Encoders
 - Grid Infrastructure (Electricity Meters)
 - Security Systems
 - Wireless Infrastructure
- **Footprint compatible: SN65LBC184, SN65HVD7x / HVD3x / HVD1x**

Feature	THVD1429	THVD1419
Supply Voltage	3.3 V - 5 V	3.3 V - 5 V
Data Rate	20Mbps	250kbps
Duplex	Half	Half
IEC ESD Contact	8 kV	8 kV
EFT	4 kV	4 kV
Key Feature	2.5kV Surge Integrated	2.5kV Surge Integrated
Packages	SOIC	SOIC



Download RS-485 Hero Device Flyer

RS-485 Transceiver Half-Duplex

	THVD1505	THVD1500 THVD1520	THVD1510 THVD1550	THVD1400 THVD1420	THVD1406 THVD1426	THVD1410 THVD1450	THVD1419 THVD1429	THVD2410 THVD2450	THVD8010 THVD8000
Feature	Auto Polarity Correction + IEC ESD, EFT	IEC ESD + IEC EFT	High IEC ESD + IEC EFT	IEC ESD + IEC EFT	Automatic Deviation Control	High IEC ESD + IEC EFT	IEC Surge + ESD + EFT	High bus fault + Wide common mode range	RS-485 over power line, OOK
Supply Voltage	5V	5V	5V	3.3V to 5V	3.3V to 5V	3.3V to 5V	3.3V to 5V	3.3V to 5V	3.3V to 5V
Maximum data rate	1 Mbps	1500: 0.5 Mbps 1520: 10 Mbps	1510: 0.5 Mbps 1550: 50Mbps	1400: 0.5 Mbps 1420: 12 Mbps	1406: 0.5 Mbps 1426: 12 Mbps	1410: 0.5 Mbps 1450: 50Mbps	1419: 0.25Mbps 1429: 20 Mbps	2410: 0.5 Mbps 2450: 50Mbps	OOK max freq. 8010: 300KHz 8000: 5MHz
Extended bus fault protection	-18V to 18V	-18V to 18V	-18V to 18V	-16V to 16V	-16V to 16V	-18V to 18V	-15V to 15V	-70V to 70V	-18V to 18V
Extended common mode range	-7V to 12V	-7V to 12V	-15V to 15V	-7V to 12V	-7V to 12V	-15V to 15V	-12V to 12V	-25V to 25V	-7V to 12V
Integrated IEC 61000-4-2 ESD protection	8kV	8kV	18kV	8kV	8kV	18kV	8kV	12kV	8kV
Integrated IEC 61000-4-4 EFT protection	2kV	1500: 2kV 1520: 4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV
Integrated IEC 61000-4-5 Surge protection							2.5 kV		
HBM ESD	16kV	16kV	30kV	16kV	16kV	30kV	16kV	16kV	16kV
Package, Temperature	SOIC-8 (8x4mm) -40 to 125C	SOIC-8 (8x4mm) -40 to 125C	SOIC-8 (8x4mm) VSOP-8 (3x3mm) -40 to 125C	SOIC-8 (8x4mm) SOT-8 (2.1x1.2mm) -40 to 125C	SOIC-8 (8x4mm) SOT-8 (2.1x1.2mm) -40 to 125C	SOIC-8 (8x4mm) VSOP-8 (3x3mm) VSOP-8 _{max} (3x3mm) -40 to 125C	SOIC-8 (8x4mm) VSOP-8 (3x3mm) -40 to 125C	SOIC-8 (8x4mm) VSOP-8, VSOP-8A (3x3mm) -40 to 125C	SOT-8 (2.9x1.6mm) -40 to 125C

RS-485 Transceiver Full-Duplex

	THVD1512	THVD1551 THVD1552	SN65HVD1791 SN65HVD1792	SN65HVD1793	SN65HVD1470 SN65HVD1471	SN65HVD1473 SN65HVD1474	THVD1451 THVD1452
Feature	High IEC ESD + IEC EFT	High IEC ESD + IEC EFT	High bus fault + Wide common mode range	High bus fault + Wide common mode range	High IEC ESD + IEC EFT	High IEC ESD + IEC EFT	High IEC ESD + IEC EFT
Supply Voltage	5V	5V	5V	5V	3.3V	3.3V	3.3V to 5V
Maximum data rate	0.5 Mbps	50 Mbps	91: 0.115 Mbps 92: 1Mbps	10 Mbps	0.4 Mbps	20 Mbps	50 Mbps
Extended bus fault protection	-18V to 18V	-18V to 18V	-70V to 70V	-30V to 30V	-13V to 16.5V	-13V to 16.5V	-18V to 18V
Extended common mode range	-15V to 15V	-15V to 15V	-20V to 25V	-20V to 25V	-7V to 12V	-7V to 12V	-15V to 15V
Integrated IEC 61000-4-2 ESD protection	18kV	18kV	-	-	16kV	16kV	18kV
Integrated IEC 61000-4-4 EFT protection	4kV	4kV	-	-	4kV	4kV	4kV
HBM ESD	30kV	30kV	16kV	16kV	30kV	30kV	30kV
Package, Temperature	VSOP-10 (3x3mm) -40 to 125C	91: VSOP-8 (3x3mm) 92: VSOP-10 (3x3mm), SOIC-14 (8.6x4mm) -40 to 125C	SOIC-14 (8.6x4mm) -40 to 105C	SOIC-14 (8.6x4mm) -40 to 105C	70: MSOP-10 (2x3mm), SOIC-14 (8.6x4mm) 71: MSOP-8 (3x3mm), SOIC-8 (8x4mm) -40 to 125C	73: MSOP-10 (2x3mm), SOIC-14 (8.6x4mm) 74: MSOP-8 (3x3mm), SOIC-8 (8x4mm) -40 to 125C	91: VSOP-8 (3x3mm), SOIC-14 (8.6x4mm) 92: VSOP-10 (3x3mm), SOIC-14 (8.6x4mm) -40 to 125C

- Use RS-485 transceivers from this flyer for:
 - New projects
 - Migrating from older parts (SN) to pin-to-pin compatible THVD devices

Download link:

https://e2e.ti.com/cfs-file/_key/communityserver-discussions-components-files/138/8463.RS_2D00_485-Hero-Device-Flyer.pdf

RS-485 resources

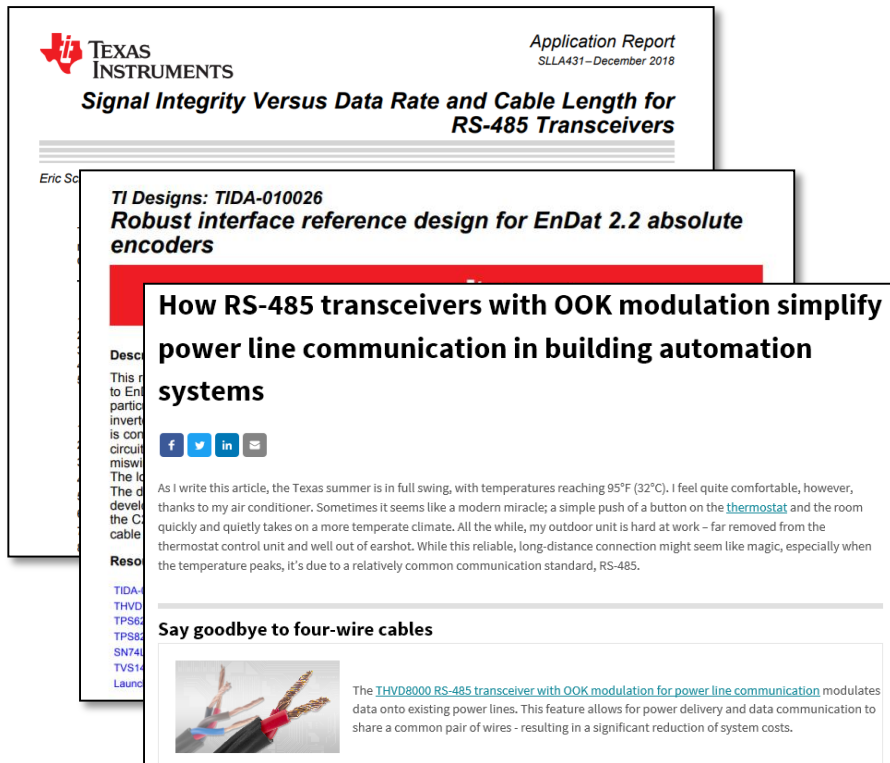
ti.com/RS485

- **New Content:**

- [How RS-485 transceivers with OOK modulation simplify power line communication in building automation systems](#) THVD8000
- [RS485 frequently asked questions](#) blog
- [Signal Integrity vs. Data Rate and Cable Length](#) app note
- [Surge protected RS485 for outdoor communication](#) THVD14x9 blog

- **RS485 Basics:**

- [RS-485 Overview](#) video
- [RS-485/422 Standard Overview](#), [RS-422 Overview](#)
- [Termination – when and how?](#) (Bus Topology)
- [Fail safe biasing](#)
- [How many nodes on your network?](#)
- [Power dissipation](#)
- [How to choose TVS diodes](#) (ESD)
- [What is EFT part 1](#), [part 2](#)



Reference designs

Reference Design	Descriptions
TIDA-00527 TIDA-010035 RS-485 Power Over Bus	Implementation of a bus-powered RS-485 application and allows to evaluate different filters for the DC power. This saves the cost and space for a separate power wiring.
TIDA-00730 , TIDA-00731 IEC ESD, EFT, Surge protection	Protect an RS-485 bus against lethal transient waveforms such as IEC ESD, IEC EFT, and IEC surge.
TIDA-01171 AC-Coupled Communication	RS-485 communication over an AC-coupled link. This allows for nodes to communicate even when large ground potential differences exist between nodes. Using AC coupling also helps to protect transceivers from bus faults that can result in direct shorts to high-voltage power supplies.
TIDA-00790 Passive Equalization	An evaluation of special transmission line termination networks to compensate for high frequency cable losses. Using this technique helps to achieve better jitter performance for bidirectional point to point connections at higher data rate across long cables.
TIDA-00862 Full Duplex Over Two Wires	Enables full duplex RS-485 communications over a single pair of conductors. Simple digital logic and analog filtering techniques enable both transceivers to drive and receive from each other simultaneously without the need for 2 additional bus wires.
TIDA-01090 Automatic Direction Control	Enables half-duplex communication over an RS-485 bus without requiring additional driver-enable/receiver-enable controls.
TIDA-060008 Converting RS-232 Signaling to RS-485 Signaling	Provides a circuit of converting RS-232 signaling to RS-485 signaling. This allows for long-distance communication.
TIDA-00540 RS-485 / RS-232 Multiprotocol Transceiver	Allows for communication over RS-485 or RS-232 data buses without requiring separate wiring for each
TIDA-01365 Bidirectional RS-485 Fan-Out Hub	The Bidirectional RS-485 Fan-Out Hub Reference Design (TIDA-01365) documents and tests an RS-485 fan-out hub design where 1:N and N:1 RS-485 signals are aggregated in and out of any bus topology. This design also features automatic direction control and a DC-to-DC.
TIDM-1005 Data Collector With M-Bus And RS-485 Protocol Conversion	Implements a smart meter data collector with protocol conversion between Meter Bus (M-Bus) and RS-485 networks
TIDA-01401 TIDA-01630 High EMC immunity for absolute/Tamagawa encoders	Demonstrates a RS-485 transceiver to use on both the drive and within encoders such as: EnDat 2.2, BiSS®, Tamagawa™, etc.
TIDA-010026 Robust interface for EnDat2.2 absolute encoders	EMC immunity robust interface to EnDat 2.2 Encoders

Transceivers interface

RS-232 products

<https://www.ti.com/rs232>

Interface | RS-232 portfolio overview

Flexible-single supply

Products

- >100 transceivers with single or split power supply
- 1.8V to 5V logic voltage
- Data rates from 7 kbps to 1Mbps
- Great for all applications from automation to EPOs

Hero Products

- TRS3122E
- TRS3253E
- TRS232
- TRS3318E



High-ESD transceivers

Products

- Rugged devices designed for harsh environments
- Up to +8kV Contact Discharge and IEC-61000-4-2 support
- +15 kV HBM model ESD

Hero Products

- TRS3232E
- TRS3221E
- TRS3253E
- TRS3243E



High-speed transceivers

Products

- Transceivers with data rates up to 1Mbps
- Wide configuration offering from single channel up to 10 receivers per device
- Perfect for telecom units and server applications

Hero Products

- TRS3122E
- TRS3253E
- TRS3227E
- TRSF3223E



Low-voltage transceivers

Products

- Transceivers compatible with multiple processors with interfaces down to 1.8V
- Industry leading, smallest package (4mmx4mm) QFN
- Devices perfect for EPOS and battery based systems

Hero Products

- TRS3122E
- TRS3318E
- TRS3386E
- TRS3253E



Interface | RS-232 Selection Guide

Tx/Rx	1/1	2/2	3/5	4/5	5/3	Other
< 3.3 Voltage		TRS3122E (1.65V)	TRS3253E (1.8V)			
= 3.3 Voltage	TRS3221	TRS3232	TRS3243		TRS3238	TRSF23243 (6Tx/10Rx)
= 5 Voltage	SN75155	TRS232E	GD75232	TRS213	GD75323	TRS208 (4Tx/4Rx)
Auto power down	TRS3221	TRS3223	TRS3243		TRS3238	TRSF23243 (6Tx/10Rx)
1000 kbps data rate	TRSF3221	TRSF3232	TRSF3243		TRS3237E	SN75189A 0Tx/4Rx
IEC-61000-4-2	TRS3221E	TRS3232E	TRS3243E		TRS3238E	
Smallest package	TRS3221 (32mm ²)	TRS3122E (16mm ²)	TRS3253E (16mm ²)	TRS213 (80mm ²)	Multiple (62mm ²)	



Interface | RS-232 power down modes

	PIN = State	Definition	Device Examples
Power down	$\overline{\text{PWRDOWN}} = \text{Low}$	Receivers = active; drivers = high-impedance, charge pump = disabled V+ to VCC, V- toward GND	TRS3222E TRS3386E
Auto power down	$\text{FORCEON} = \text{Low}$ $\overline{\text{FORCEOFF}} = \text{High}$	Driver outputs are disabled if no valid RS-232 signal is present. Additional options include disabling both drivers and receivers. Disconnection or turning off peripheral driver enable auto-power down.	TRS3243E TRS3221E TRS3223E
Auto power down plus	$\text{FORCEON} = \text{Low}$ $\overline{\text{FORCEOFF}} = \text{High}$	Automatically places device in low power mode when the device has not received or transmitted data for more than 30 seconds. Charge pump disabled during power down.	TRS3122E TRS3227E TRS3253E
	PIN = State	Definition	Device Examples

Interface | RS-232 development tools & resources

Development tools

TRS3122E: 1.8V RS-232 Transceiver Evaluation Module



TRS3122EEVM enables easy device evaluation using the installed DB-9 connector and terminal block. The board can be set in a loopback state for very simple evaluation or operated in tandem with diagnostic software for more detailed understanding.

TRS3122E: RS-232 Transceiver BoosterPack



BOOSTXL-RS232 BoosterPack for TI LaunchPads enables quick RS232 prototyping with TRS3122E. The board is equipped with a DB-9 connector and standard 40-pin LaunchPad headers

BeagleBoard-xM Development Board



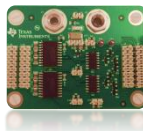
BeagleBoard-xM delivers extra MIPS with 1-GHz ARM® Cortex™-A8 performance from the Sitara™ ARM Cortex-A8 Processor and 512MB of low-power DDR RAM, enabling hobbyists, innovators and engineers to go beyond their current imagination and be inspired by the BeagleBoard.org community.

Additional tools

[DLP® LightCrafter™ 4500](#)
[DLP® LightCrafter™ Evaluation Module](#)
[66AK2Gx \(K2G\) Evaluation Module](#)
[TMS320DM36x Evaluation Module](#)
[DM388 DaVinci Evaluation Module](#)

Design resources

RS-485 / RS-232 Multiprotocol Transceiver Reference Design



This design (TIDA-00540) allows for communication over RS-485 or RS-232 data buses without requiring separate wiring for each. Data lines are shared between two different transceiver types, and a single control signal is used to determine which protocol is to be used. Uses TRS3223E

USB High Speed Reference Design



Features transceivers for CAN and UART serial interfaces to connect to legacy RS232 machines or to interface with CAN bus. Provision for digital communication interfaces like UART, I2C and SSI to bridge external devices and aggregate data from slow interfaces to a high speed USB link. Uses MAX3232

[High Resolution, Portable Light Steering Reference Design using DLP Technology](#)
[Automotive eCall Reference Design](#)
[RS-232 Modem Interface Module for Protection Relay, IED, and Substation Automation Reference Design](#)
[UART to Bluetooth® Low Energy \(BLE\) Bridge Reference Design](#)
[Software Defined Radio \(SDR\) OMAPL-138-based Hardware/Software Reference Design](#)
[Isolated RS-232 to UART Converter Reference Design](#)
[Data Concentrator Cape for BeagleBone Black](#)
Plus many [more](#)

Application Notes

[Designing with the TRS3122E \(Rev. A\)](#)
[Understanding Power Requirements in RS-232 Applications \(Rev. B\)](#)
[Interface Circuits for TIA/EIA-232-F \(Rev. A\)](#)
Plus many [more](#)

E2E Forums

TI's Engineer to Engineer Community: <http://e2e.ti.com>

Transceivers interface I2C products

<https://www.ti.com/i2c>

Interface | I2C Portfolio Overview

Level shifters, buffers & hubs

Overview

- Strengthen your I2C bus signal and resolve voltage mismatch
- Buffering translators
- Translators
- FM, FM+ support

Hero Products

- PCA9306
- TCA9406
- TCA9509
- TCA9617A/B

Applications

- Servers, Enterprise SSD
- Routers (Telecom Switching Equipment)
- I2C, SMBus, PMBus, MDIO, UART, low-speed SDIO, GPIO, and other two-signal interfaces
- Factory Automation
- Automotive – HUD, Clusters, ADAS



IO expanders

Overview

- Increase the number of available I2C I/O pins
- 4-, 8-, 16-, 24-bit
- Level translating expanders
- Open drain, push-pull I/Os
- I2C based key pad scanners and LED drivers

Hero Products

- TCA9555
- TCA9539
- TCA6424A
- TCA6416A
- TCA6507
- TCA6408A

Applications

- Servers, Enterprise SSD
- Routers (Telecom Switching Equipment)
- PC & Notebooks
- Mobile Phones
- Factory Automation
- Automotive – Infotainment / BCM



Switches & muxes

Overview

- Expand the capability of your control system by switching between I2C buses.
- 1:2, 1:4, 1:8
- Level translating switches
- Cascaded interrupts

Hero Products

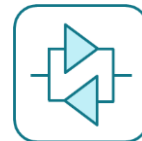
- TCA9546A
- TCA9543A
- TCA9548A
- TCA9545A

Applications

- Servers, Enterprise SSD
- Routers (Telecom Switching Equipment)
- Factory Automation
- Products With I2C Slave Address Conflicts (Ex: Multiple Sensors))
- Automotive – Infotainment / BCM

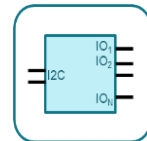


Interface | I2C level shifters, buffers & hubs



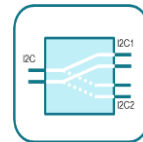
Parameter/Feature	Unit	PCA9306	TCA9406	TCA9517	TCA9517A	TCA9617B	TCA9509	TCA980x x=0,1,2,3	TCA4311A	TCA9511A	P82B715	P82B96	PCA9515A/B
Function		Translator	Translator	Buffer, Translator	Buffer, Translator	Buffer, Translator	Buffer, Translator	Buffer, Translator	Buffer	Buffer	Buffer	Buffer	Buffer
Output Mode		N/A	N/A	Static offset	Static offset	Static offset	Static offset	Static offset	Dynamic offset	Dynamic offset	Cable extender	Cable extender	Static offset
Max Capacitive load	pF			400	400	400	400	400	400	400	3000	4000	400
I2C-bus speed	kHz	400	1000	400	400	1000	400	400	400	400	400	400	400
Hot-swappable (w/ idle detect)									•	•			
Stuck bus recovery													
Voltage translation		•	•	•	•	•	•	•					
Min. supply voltage (VCCA)	V	1.2	1.65	0.9	0.9	0.8	0.9	0.8	2.7	2.3	3	2	2.3
Max. supply voltage (VCCA)	V	5.5	3.6	5.5	5.5	5.5	5.5	3.6	5.5	5.5	12	15	3.6
Min. supply voltage (VCCB)	V	1.8	2.3	2.7	2.7	2.2	2.7	1.65	-	-	-	-	-
Max. supply voltage (VCCB)	V	5.5	5.5	5.5	5.5	5.5	5.5	3.6	-	-	-	-	-
Integrated pull-up on A-side			10kΩ, RTA				1mA		RTA	RTA			
Integrated pull-up on B-side			10kΩ, RTA					0.5, 1, 2, 3mA	RTA	RTA			
Hi-Z SDA, SCL pins @ VCC=0V			•	•	•	•	•	•	•	•	•	•	•
Supply Dependency (VCCA w.r.t VCCB)		VCCA <= VCCB	VCCA <= VCCB	VCCA <= VCCB	VCCA <= VCCB	VCCA <= VCCB	VCCA <= (VCCB-1)	None	None	None	None	None	None
Automotive Option		•			•								
Package Group		DSBGA 8, SM8 8, VSSOP 8, X2SON 8	DSBGA 8, SM8 8, VSSOP 8	SOIC 8, VSSOP 8	VSSOP 8	VSSOP 8	VSSOP 8, X2QFN 8	VSSOP 8	SOIC 8, VSSOP 8	VSSOP 8	PDIP 8, SOIC 8	PDIP 8, SOIC 8, TSSOP 8, VSSOP 8	SOIC 8, SON 8, TSSOP 8, VSSOP 8

Interface | I2C general-purpose I/O (GPIO) expanders



Parameter/Feature	Unit	TCA9534/A	TCA9535	TCA9538	TCA9539	TCA9554/A	TCA9555	TCA6408A	TCA6416A	TCA6424A	TCA6418E	PCA9536	TCA6507	TCA8418E
Function		IO Expander	IO Expander	IO Expander	IO Expander	IO Expander	IO Expander	IO Expander	IO Expander	IO Expander	IO Expander	IO Expander	LED driver	Key board Controller
Number of I/Os		8	16	8	16	8	16	8	16	24	18	4	7	18
Min. supply voltage	V	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	2.3	1.65	1.65
Max. supply voltage	V	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	3.6	5.5	3.6	3.6
Level Translation								•	•	•				
Reset Input				•	•			•	•	•	•			•
Interrupt output		•	•	•	•	•	•	•	•	•	•			•
Internal pull-up resistor	kΩ					100	100							100
I2C-bus speed	kHz	400	400	400	400	400	400	400	400	400	1000	400	400	1000
Number of Addresses		8	8	4	4	8	8	2	2	2	1	1	1	1
Special Features											Controllable pull-down			80-input key pad scan, Controllable pull-up
Automotive					•			•						
Package Group		SOIC 16, TSSOP 16	SSOP 24, TSSOP 24, VQFN 24, WQFN 24	SSOP 16, TSSOP 16	TSSOP 24, VQFN 24, WQFN 24	SOIC 16, SSOP 16, SSOP 16, TSSOP 16	SSOP 24, TSSOP 24, VQFN 24, WQFN 24	TSSOP 16, UQFN 16, VQFN 16	TSSOP 24, WQFN 24	UQFN 32	DSBGA 25	SOIC 8, VSSOP 8	TSSOP 14, X2QFN 12	DSBGA 25

Interface | I2C switches & multiplexers



Parameter/Feature	Unit	TCA9543A	TCA9544A	TCA9545A	TCA9546A	TCA9548A
Function		Switch	Mux	Switch	Switch	Switch
Number of Channels		2	4	4	4	8
Number of Addresses		4	8	4	8	8
Min. supply voltage	V	1.65	1.65	1.65	1.65	1.65
Max. supply voltage	V	5.5	5.5	5.5	5.5	5.5
Level Translation		•	•	•	•	•
Reset Input		•		•	•	•
Interrupt Output		•	•	•		
I2C-bus speed	kHz	400	400	400	400	400
Automotive						•
Package Group		SOIC 14, TSSOP 14	TSSOP 20	TSSOP 20	SOIC 16, TSSOP 16	TSSOP 24, VQFN 24

TCA9511A

Sampling Now

Hot swappable I²C and SMBus buffer with rise time accelerators

Features

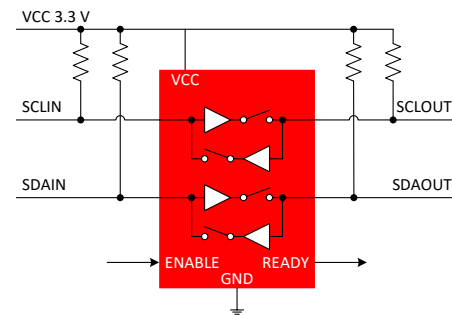
- Supply range of 2.3 V to 5.5 V
- Supports **hot bus insertion**
- Pre-charge on all SDA and SCL pins
- Supports bi-directional data transfer
- Bus capacitance isolation
- Rise time accelerators
- Standard mode and fast mode I²C support
- Low sleep current when EN is low
- Bus ready indication output
- Supports clock stretching, arbitration, and synchronization
- Powered-off high impedance for all pins
- Bus idle detect
- Temperature Range: -40°C to +125°C
- ESD protection: 2000-V Human-body model (A114-A)
- Packages:
 - Small 8-pin VSSOP package (DGK, 3mm x 3mm)
 - Small 8-pin QFN package (TBD)

Applications

- Server
- Telecom central office equipment
- Base Stations
- Any hot-swap application

Benefits

- Bus idle detect and pre-charge on SDA/SCL pin prevents corruption during hot insertion into a live backplane
- Capacitance isolation allows for 400-pF load to be connected to each side of the device, increasing the total allowed system bus capacitance
- Rise time accelerators allow for weaker external pull-up resistors
- Ready output indicates to host system when the device is ready for passing I²C traffic
- Support of clock stretching, arbitration, and synchronization allows for device to bus used in any I²C system



TEXAS INSTRUMENTS

TCA4307

Sampling 2Q20

Hot swappable I²C and SMBus buffer with rise time accelerators and stuck bus recovery

Features

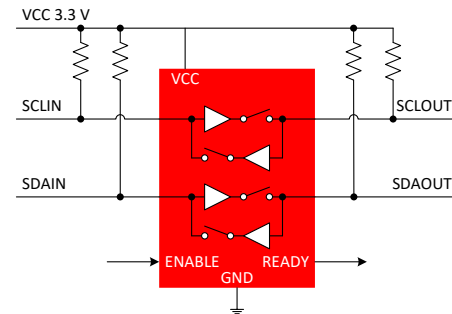
- Supply range of 2.3 V to 5.5 V
- Supports hot bus insertion
- Pre-charge on all SDA and SCL pins
- Supports bi-directional data transfer
- Bus capacitance isolation
- Rise time accelerators
- Standard mode and fast mode I²C support
- Low sleep current when EN is low
- Bus ready indication output
- Supports clock stretching, arbitration, and synchronization
- Powered-off high impedance for all pins
- Bus idle detect
- Stuck bus recovery
- Temperature Range: -40°C to +125°C
- ESD protection: 2000-V Human-body model (A114-A)
- Small 8-pin VSSOP package (DGK, 3mm x 3mm)

Applications

- Server
- Telecom central office equipment
- Base Stations
- Any hot-swap application

Benefits

- Bus idle detect and pre-charge on SDA/SCL pin prevents corruption during hot insertion into a live backplane
- Capacitance isolation allows for 400-pF load to be connected to each side of the device, increasing the total allowed system bus capacitance
- Rise time accelerators allow for weaker external pull-up resistors
- Ready output indicates to host system when the device is ready for passing I²C traffic
- Support of clock stretching, arbitration, and synchronization allows for device to bus used in any I²C system
- **Stuck bus recovery allows the system to recover from slave I²C failures without the need for power-cycling the system**



TEXAS INSTRUMENTS

Interface | I2C references

Type	Title / Link
Application Note	I2C Bus Pullup Resistor Calculation
Application Note	Why, When, and How to use I2C Buffers
Application Note	Choosing the correct I2C device for new designs
Training	I2C Precision Labs
Training	I2C Deep Dive

Delivering **MORE** Together - TI's Engineer to Engineer Support Forums:
<http://e2e.ti.com>

Transceivers interface industrial CAN products

www.ti.com/can



TEXAS INSTRUMENTS

3.3 V CAN transceiver portfolio

SN65HVD230, SN65HVD231
SN65HVD232

SN65HVD233, SN65HVD234
SN65HVD235

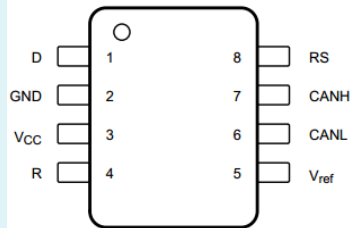
TCAN330, TCAN332
TCAN334, TCAN337

TCAN330G, TCAN332G
TCAN334G, TCAN337G

CAN / CAN-FD	CAN			CAN			CAN			CAN-FD		
Data rate	1 Mbps			1 Mbps			1 Mbps			5 Mbps		
Bus fault protection	-4V to 16V			-36V to 36V			-14V to 14V			-14V to 14V		
Common mode range	-2V to 7V			-7V to 12V			-12V to 12V			-12V to 12V		
Integrated IEC 61000-4-2 ESD	--			--			12kV			12kV		
HBM ESD	16kV			16kV			25kV			25kV		
Low Power Mode	230: Standby (370uA _{TYP}) 231: Sleep (40nA _{TYP}) 232: None (normal mode only)			233: Standby (200uA _{TYP}) 234: Standby (200uA _{TYP}), Sleep (50nA _{TYP}) 235: Standby (200uA _{TYP})			330: Silent (2.5mA _{MAX}), Shutdown (2.5uA _{MAX}) 332: None (normal mode only) 334: Standby (20uA _{MAX}), Shutdown (2.5uA _{MAX}) 337: Silent (2.5mA _{MAX})			330: Silent (2.5mA _{MAX}), Shutdown (2.5uA _{MAX}) 332: None (normal mode only) 334: Standby (20uA _{MAX}), Shutdown (2.5uA _{MAX}) 337: Silent (2.5mA _{MAX})		
Pin-5, Pin-8 Configuration		Pin-5	Pin-8		Pin-5	Pin-8		Pin-5	Pin-8		Pin-5	Pin-8
	230	Vref (1/2 Vcc)	Mode selection: • high speed • low power • slope control	233	Diagnostic loopback	Mode selection: • high speed • low power • slope control	330	SHDN	Silent enable	330	SHDN	Silent enable
	231			234	Enable (normal, sleep)		332	NC	NC	332	NC	NC
	232	NC	NC	235	Autobaud loopback		334	SHDN	Standby enable	334	SHDN	Standby enable
Package, Temperature							337	FAULT output	Silent enable	337	FAULT output	Silent enable
	SOIC-8 (5x4mm)			SOIC-8 (5x4mm)			SOIC-8 (5x4mm), SOT-8 (3x1.6mm)			SOIC-8 (5x4mm), SOT-8 (3x1.6mm)		
	-40 to 85C			-40 to 125C			-40 to 125C			-40 to 125C		

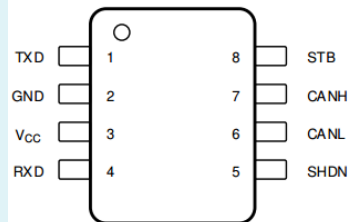
Easily move from SN65HVD23x to TCAN33x

SN65HVD23X



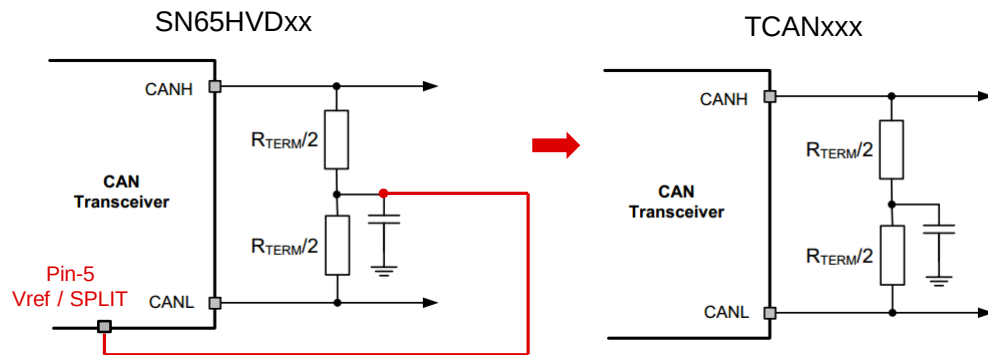
Pin-8 RS	Tie to High: Low power mode	Tie to Low: Normal operation mode
Pin-5 Vref, SPLIT	Tie to split terminal	Floating

TCAN33X



Pin-8 STB, S	Tie to High: Low power mode	Tie to Low: Normal operation mode
Pin-5 SHDN	Tie to High: Shutdown mode	Floating: Normal operation mode. Recommend tie to GND

Pin has same condition



- The function of Vref or SPLIT pin's from SN65HVDxxx parts is to drive a stronger recessive voltage level to the CAN bus, minimizing and thus lowering the potential for common-mode emitted noise.
- In the latest generation CAN transceiver TCAN33x, TCAN1042/51, they don't need the SPLIT pin to function correctly. These devices are designed with modern processes to help increase symmetry for CANH and CANL signals. As a result, there is little deviation in the differential signals, which helps lower common-mode emissions.
- When replacing SN65HVD23x by TCAN33x in the existing design, just leave pin-5 floating.

5 V CAN transceiver portfolio

SN65HVD255, SN65HVD256
SN65HVD257

TCAN4420

TCAN1042H, TCAN1042HV
TCAN1042HG, TCAN1042HGV

TCAN1051H, TCAN1051HV
TCAN1051HG, TCAN1051HGV

CAN / CAN-FD	CAN			CAN-FD			CAN-FD			CAN-FD		
Data rate	1 Mbps			5 Mbps			G: 5Mbps, non-G: 2Mbps			G: 5Mbps, non-G: 2Mbps		
Bus fault protection	-27V to 40V			-46V to 46V			-70V to 70V			-70V to 70V		
Common mode range	-2V to 7V			-12V to 12V			-30V to 30V			-30V to 30V		
Integrated IEC 61000-4-2 ESD	8kV			8kV			15kV			15kV		
HBM ESD	12kV			12kV			16kV			16kV		
Low Power Mode	Silent (2.5mA _{TYP})			None (normal operation mode)			Standby (22uA _{MAX})			Silent (2.5mA _{MAX})		
Pin-5, Pin-8 Configuration		Pin-5	Pin-8		Pin-5	Pin-8		Pin-5	Pin-8		Pin-5	Pin-8
	255	NC	Silent mode enable	4420	VIO (3.3-5V I/O level shifting supply)	Polarity switch control (to switch polarity to normal or reverse of CAN bus)	H, HG	NC	Standby mode enable	H, HG	NC	Silent mode enable
	256	VRXD (CAN output voltage supply)					HV, HGV	VIO (3.3-5V I/O level shifting supply)		HV, HGV	VIO (3.3-5V I/O level shifting supply)	
	257	Fault output										
Package, Temperature	SOIC-8 (5x4mm) -40 to 125C			SOIC-8 (5x4mm) -40 to 125C			SOIC-8 (5x4mm), VSON-8 (3x3mm) -55 to 125C			SOIC-8 (5x4mm), VSON-8 (3x3mm) -55 to 125C		

TCAN330 / 332 / 334 / 337

3.3V Industrial CAN Transceivers

Features

- ISO 11898-2 Compatible
- Common-Mode Range: $\pm 12V$
- Speed: 1Mbps (standard), 5Mbps (optional)
- Protection Features:
 - $\pm 14V$ Bus-Fault Protection
 - $\pm 25kV$ HBM ESD Protection
 - $\pm 12kV$ IEC61000-4-2 Contact Discharge
- Special Features: FAULT output pin for fault indication to host processor (TCAN337)
- RXD & TXD Dominant State Time Outs
- Packages:
 - SOT23-8 (3mm x 3mm)
 - SOIC-8 (5mm x 6mm)

Applications

- “Classic CAN Applications”: Supports CAN
- Telecom & Backplanes
- Factory Automation / Control
- Smart Grid
- Building Automation

Benefits

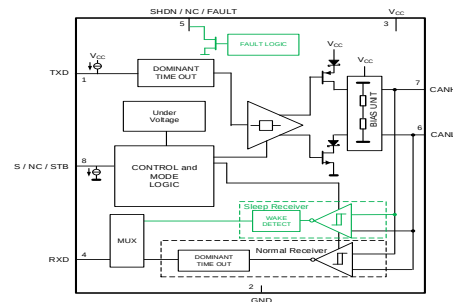
- Direct interface to 3.3V MCU's and DSPs with simplified system voltage rails and regulation design
- 3.3V CAN requires less power and excellent for low power applications while still monitoring the bus
- EMC Performance yields high reliability in harsh environments
- Wide temp. range to accommodate harsh industrial environment
- Small footprint SOT-23 package saves >70% PCB space

TCAN330: Shutdown and Silent Modes

TCAN332: Normal Mode Only

TCAN334: Shutdown and Standby with Wake Modes

TCAN337: Silent Mode



TCAN1042H / TCAN1051H

± 70V CAN XCVRs with optional Bus Wake Up and Flexible Data (FD)

Features

- ISO 11898-2 and -5 compliant **and** Draft CAN FD
- Signaling Rate Optimized for up to:
 - Standard: 2Mbps
 - CAN FD: 5Mbps ("G" Version)
- DC Bus-Fault Protection: ± 70V ("H")
- Common mode range: ±30V
- Fast Loop Times: <175ns
- V_{IO} Supply: 2.8 - 5.5V ("V" version)
- Ultra-Low Power Standby Mode with Bus Wakeup (TCAN1042)
- Low Power Silent Mode (TCAN1051)
- ±16kV HBM ESD and ±15kV IEC for bus pins
- Ideal Passive – High impedance I/Os when unpowered
- TXD dominant state time out
- Under-voltage Protection
- Thermal Shutdown
- Package: 8-SOIC (D) 5mm x 4mm and 8-VSON (DRB) 3mm x 3mm

Applications

- Body Electronics
- Power Train
- Infotainment / ADAS
- Building Automation
- Factory Automation

Benefits

- Common Mode Choke not required (per OEM)
- Wide V_{CC} Range (4.5V to 5.5V) for start/stop w/out boost
- Wide I/O voltage level adapting reduces external components
- Extended Bus-Fault Protection supporting 48V systems
- Hot swap support with glitch free bus I/O on power-up / down
- Industry Standard Packaging: P2P compatible

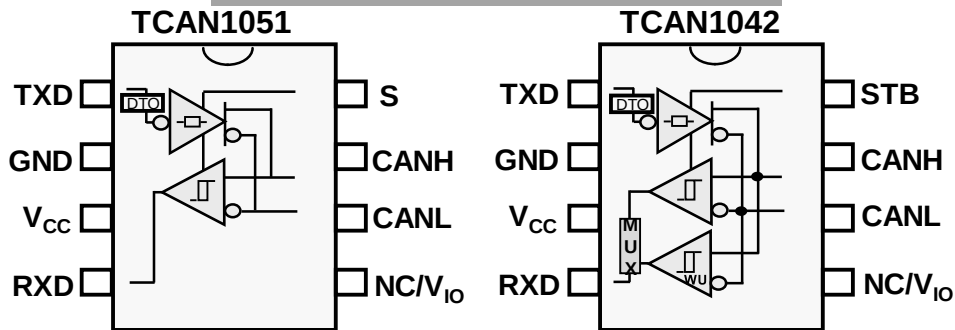
TCAN10xxHGV

xx = numerical part number

H = ±70V Bus Fault Protection

G = 5Mbps Flexible Data Rate Capable

V = 3V Level Shifter Integrated (V_{IO} pin)



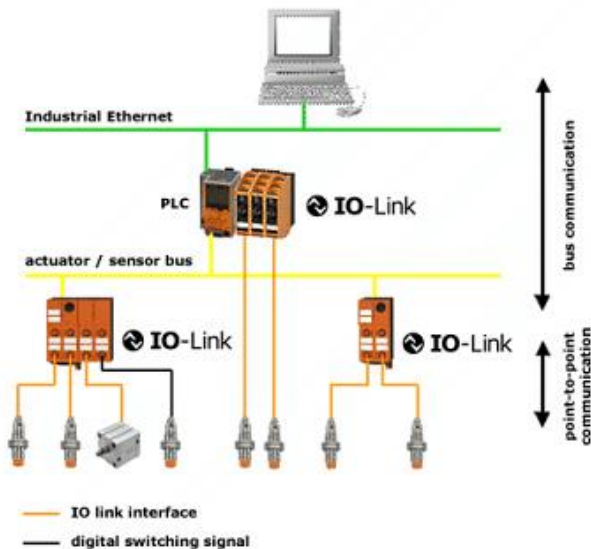
CAN application notes

- [SLOA101A](#): Introduction to the Controller Area Network (CAN)
- [SLLA270](#): Controller Area Network Physical Layer Requirements
- [SLLA337](#): Overview of 3.3V CAN (Controller Area Network) Transceivers
- [SLLA271](#): Common Mode Chokes in CAN Networks: Source of Unexpected Transients
- [SLLA279A](#): Critical Spacing of CAN Bus Connections
- [SLLA109](#): A System Evaluation of CAN Transceivers
- [SLLA123](#): Using CAN Arbitration for Electrical Layer Testing
- [SLLA298B](#): Isolated CAN Reference Design
- [SLLA107](#): Live Insertion With Differential Interface Products
- [SLLA067B](#): Comparing Bus Solutions
- [Article](#): “Signaling rate versus cable length: the CAN-bus timing trade-off” – CAN loop timing and arbitration
- [Blog](#): TI Analog Wire, “How “CAN” you make safe circuits safer? Redundancy!”
- [Blog](#): TI Analog Wire, “The need for speed - Turbo Charged CAN”

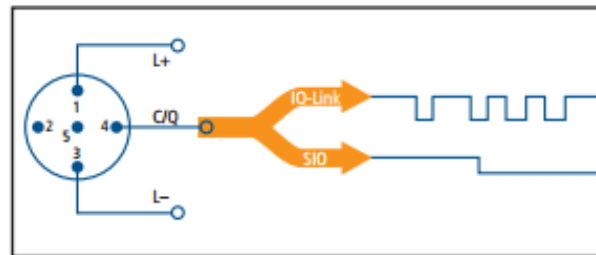
Transceivers interface IO-LINK

www.ti.com/iolink

What's IO-link?

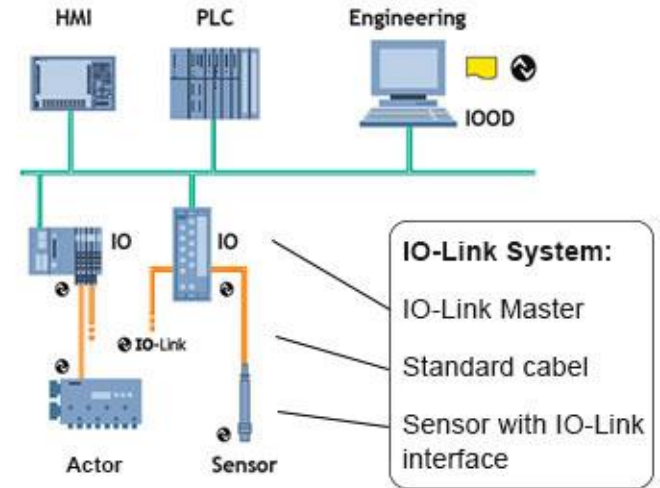


- First Standardized IO communication for sensors and actuators
 - IEC 61131-9
- **Bi-directional communication**
- **Point-to-point** 3-wire interface
- Backward compatible to SIO



IO-link system components

- **IO-link master (PLCs, remote IOs)**
 - Establishes connection between IO-Link devices
 - Multiple IO-Link channels; typically 2, 4, 8, 16 and etc.
- **IO-Link Device (sensors and actuators)**
 - Point-to-point communication with Master channel
- **Unshielded 3 or 5 conductor standard cable**



TIOL111 / TIOS101 feature and benefits

Feature	Benefit	
<u>Lowest</u> Residual Voltage	<u>Lowest</u> power = <u>Lowest</u> temp	
<u>Integrated</u> EMC Protection	<u>Reduce</u> BOM by up to \$0.25	
<u>Highest</u> Transient Voltage Tolerance	<u>No or Smaller, lower cost</u> TVS diodes	
Mis-wiring protection	<u>No external reverse blocking diodes</u>	
Configurable current output	Current output for all applications	
2.5mm x 3.0mm package	Suitable for smallest sensor PCBs	

Where to find resources

TI offers an extensive portfolio of interface devices that help you increase system performance and reliability.

- Find out the latest transceivers information and documents at ti.com
 - RS-485: www.ti.com/rs485
 - RS-232: www.ti.com/rs232
 - I2C: www.ti.com/i2c
 - CAN: www.ti.com/can
 - IO-LINK: www.ti.com/iolink
- 24-hour online technical support: TI E2E Interface Forum e2e.ti.com/support/interface
- Sample Store: samples.ti.com
- BOM and Cross Reference Tool: bomcross.ti.com

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