

# Welcome!

## Texas Instruments New Product Update

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- Phone lines are muted
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# REDUCE SYSTEM DESIGN EFFORTS WITH INDUSTRY'S FIRST TRULY FLEXIBLE RS485 TRANSCEIVER

New Product  
Update

Brian Lin  
- Product Marketing Engineer

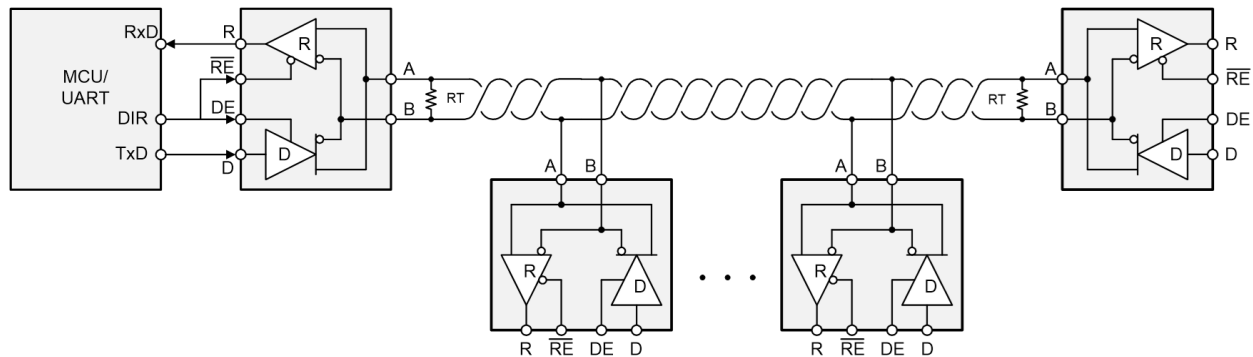
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# Agenda

- RS485 Introduction
- TI RS485 product portfolio overview
- Flexible RS485 Transceiver Product Highlight: THVD1424 / THVD1454
- TI.com resources

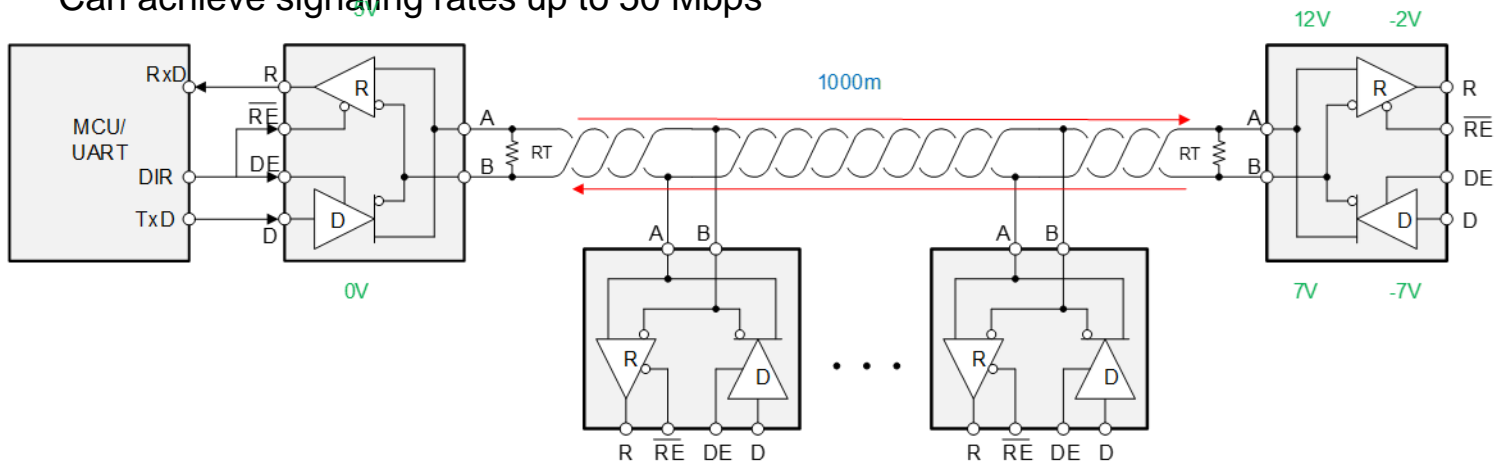
# RS-485 standard

- “Recommended Standard” jointly published by Telecommunications Industry Association (TIA) and Electronic Industries Alliance (EIA).
- Defines the electrical characteristics of interface circuits (line drivers/transmitters and receivers) used for serial communications over a multipoint network. Examples include:
  - Signal amplitude
  - Input sensitivity
  - Input impedance
- Does not define:
  - Cabling
  - Connectors
  - Data protocol

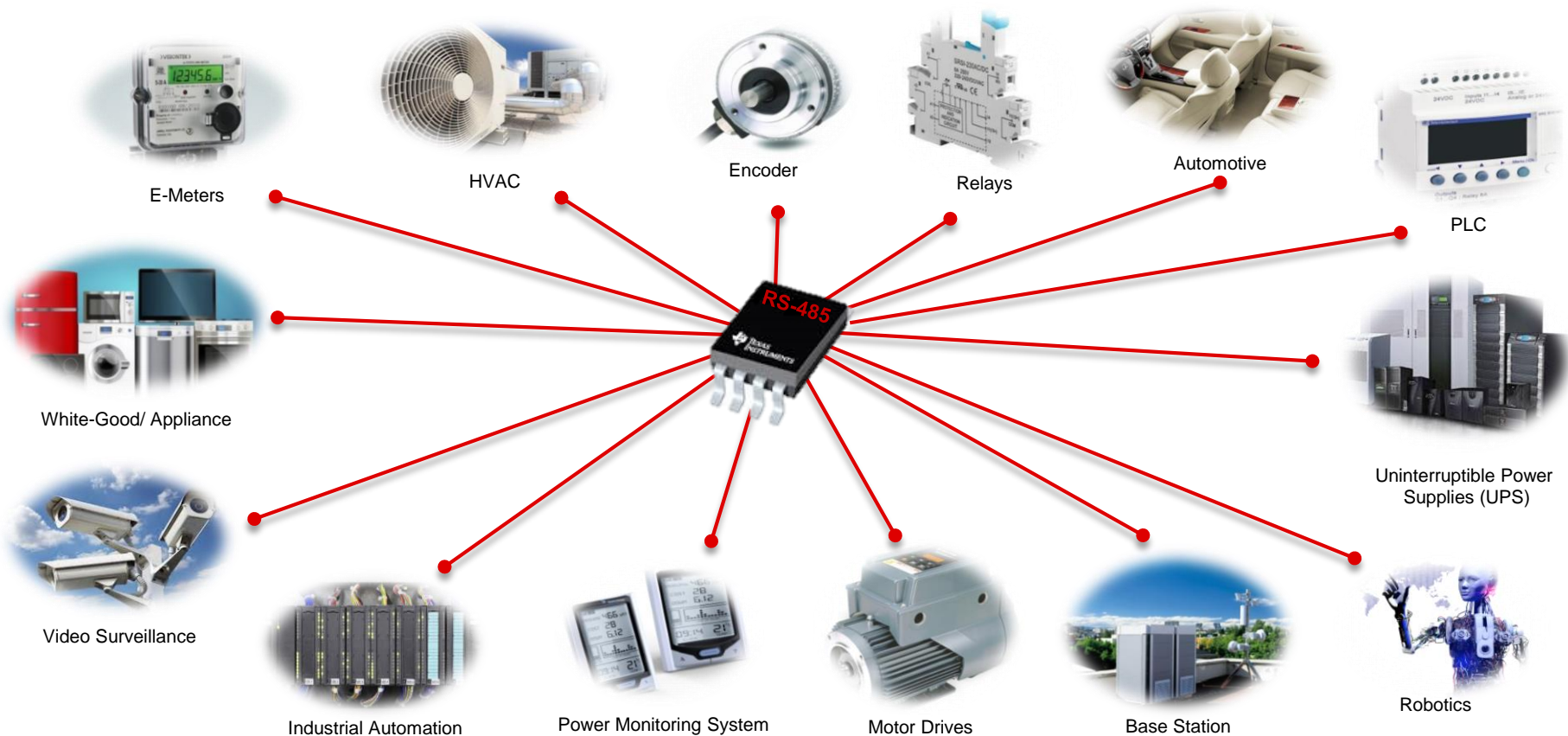


# RS-485 benefits

1. Balanced interface (good noise immunity and low EMI)
2. Multipoint, bi-directional communication on a single pair of wires
3. Large differential signal, large common-mode range
4. Can achieve signaling rates up to 50 Mbps



# End applications for RS-485/422



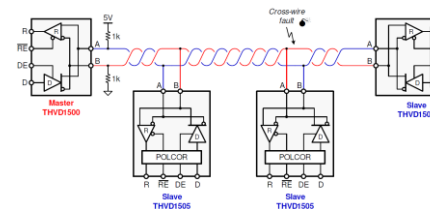
# TI RS-485 Features | Broad portfolio

## Broad Portfolio

### Features

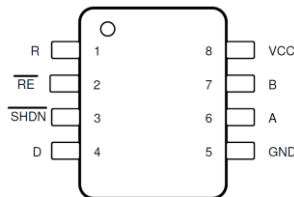
- Half-duplex and full-duplex transceivers
- 3V, 5V, 3.3V-5V VCC supply
- 1.8V IO support working with FPGA
- Maximum 50Mbps data rate
- Multi-channel driver/receiver
- Special function parts:
  - Autopolarity correction
  - Auto direction selection
  - RS-485 power line communication

### Autopolarity correction (THVD1505)



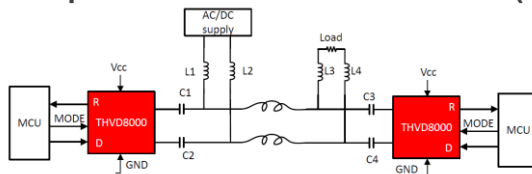
- Work properly even A/B lines are swapped

### Auto direction selection (THVD1406)



- Detect and transmit data automatically without control signal through driver enable pin (DE)
- Save isolation channel. Less timing concern in MCU firmware

### RS-485 power line communication/PLC (THVD8000)



- Transmit data over AC/DC power line
- Only two wires are needed
- Polarity free
- No software change needed

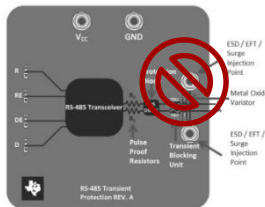
# TI RS-485 Features | High performance

## High Performance

### Features

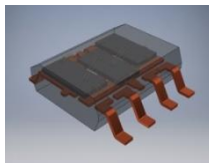
- Integrated IEC 61000-4-2 ESD and IEC 61000-4-4 EFT protections
- Integrated IEC 61000-4-5 Surge protection
- Up to -70V to 70V bus fault protection
- Up to -25V to 25V common mode voltage range
- -40C to 125C operating temperature range

### Integrated IEC 61000-4-2 ESD, IEC 61000-4-4 EFT protections (all THVD)



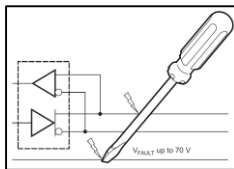
- No need external protection circuits
- High noise immunity without wrong data

### Integrated IEC 61000-4-5 surge protection (THVD14x9 family)



- Integrate TVS diodes inside the package
- Protect direct or indirect lightning strikes, load changes and short circuits.

### Up to -70V to 70V bus fault protection (THVD24xx family)



- RS-485 bus short circuit protection
- Prevent fails in short to power supplies, mis-wiring, connector failure, cable crushes and tool mis-application

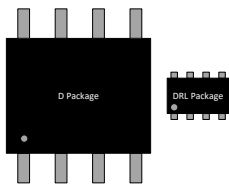


# TI RS-485 Features | Small packages

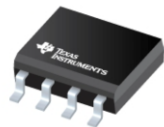
## Small Packages

### Features

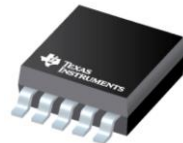
- Regular packages compatible with industry standards
- Various small package options:
  - 2.1x1.2 mm SOT
  - 2.9x1.6 mm SOT
  - 3x3 mm VSON
  - 3x3 mm VSSOP



### Industry standard packages



SOIC

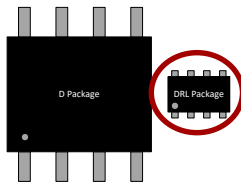


VSSOP



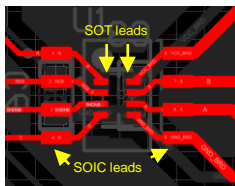
VSON

### Smallest RS-485 transceiver (THVD1400, THVD1420)

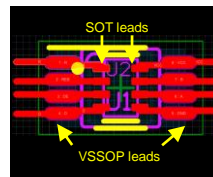


- 2.1x1.2 mm SOT package
- Only 12% size of regular 5x4 mm SOIC

### Dual-footprint to co-layout SOT with standard packages



5x4 mm SOIC  
/  
2.1x1.2 mm  
SOT



3x3 mm  
VSSOP /  
2.1x1.2 mm  
SOT

# TI's New RS-485 product portfolio

Power line communication	THVD8010, THVD8000		
Termination integrated	THVD1454	THVD1424	
High bus-fault protection	THVD2410, THVD2450		
1.65-V to VCC Flexible IO	THVD2410V, THVD2450V		
Integrated IEC 61000-4-5 surge protection	THVD1439, THVD1449		3.3V to 5V wide VCC
High IEC 61000-4-2 ESD protection	THVD1410, THVD1450	THVD1451, THVD1452	5V VCC only
	THVD1510, THVD1550	THVD1551, THVD1552	
Automatic Direction	THVD1406, THVD1426		
Auto-polarity	THVD1505		
Basic function	THVD1400, THVD1420	THVD1512	
	THVD1500, THVD1520		
	Half-Duplex RS-485 Transceiver	Full-Duplex RS-485 Transceiver	

# THVD1424 Flexible RS485 Transceiver

3 V to 5.5 V RS-485 Transceiver with slew rate control, integrated switchable termination and duplex switching

## Features

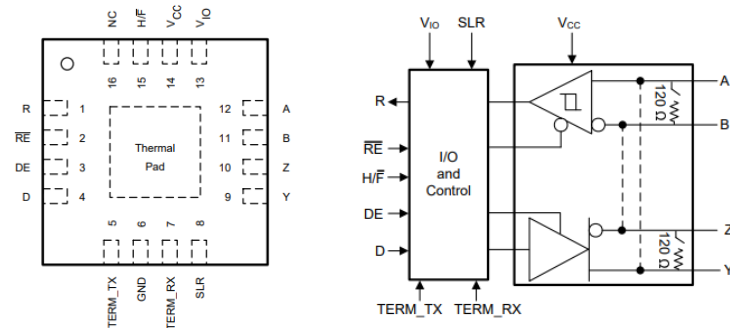
- **Half-duplex/full-duplex switchable**
- 3V – 5.5V Supply Voltage
- **Pin controlled slew rate 500kbps/20Mbps**
- **Pin controlled integrated 120Ω termination resistor**
- **I/O logic supply: 1.65 V to 5.5 V**
- Bus I/O Protection
  - ± 15V Fault Protection
  - ± 16kV HBM ESD
  - ± 8kV IEC61000-4-2 ESD Contact Discharge
  - ± 15kV IEC61000-4-2 ESD Air Discharge
- Open, Short, and Idle Bus Failsafe
- Junction Temperature Range: –40°C to +150°C
- Package: VQFN-16 (3 x 3 mm)

## Applications

- Factory Automation and Control
- Building automation
- Industrial Transport
- HVAC Systems
- Grid Infrastructure

## Benefits

- Integrated pin selectable termination resistor reduces PCB space and allows for easy reconfiguration of networks
- Independent control of termination across driver pins and receiver pins to allow complete flexibility
- Integrated IEC contact discharge ESD to eliminate system level protection components and to reduce system BOM
- 1.8V/2.5V Low level logic support to interface to MCUs/FPGAs
- Small package to reduce RS-485 footprint in space constrained PCBs
- Slew rate control pin allows same device to work in different data rate platforms
- Switchable duplex allows same device to be used across different platforms



# THVD1454

3 V to 5.5 V Half duplex RS-485 Transceiver with integrated 120 ohm switchable termination and slew rate control

## Features

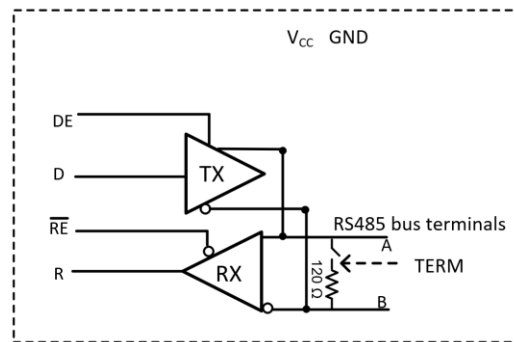
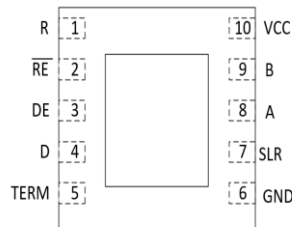
- **Half-Duplex Configuration**
- 3V – 5.5V Supply Voltage
- **Pin controlled slew rate: 500kbps/20Mbps**
- **Pin controlled integrated 120Ω termination resistor**
- Bus I/O Protection
  - ± 16V Fault Protection
  - ± 16kV HBM ESD
  - ± 8kV IEC61000-4-2 ESD Contact Discharge
  - ± 15kV IEC61000-4-2 ESD Air Discharge
- Open, Short, and Idle Bus Failsafe
- Junction Temperature Range: –40°C to +150°C
- Package: VSON-10 (3 x 3 mm)

## Applications

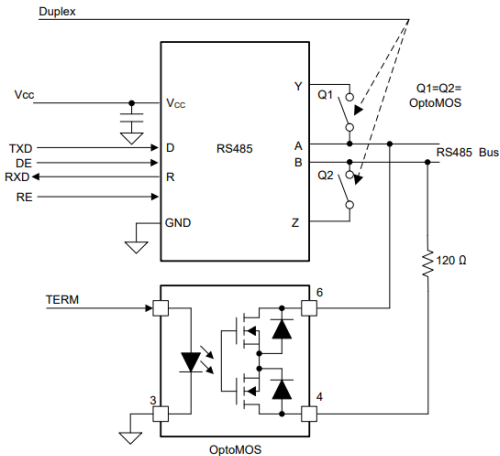
- Factory Automation and Control
- Building automation
- Industrial Transport
- HVAC Systems
- Grid Infrastructure

## Benefits

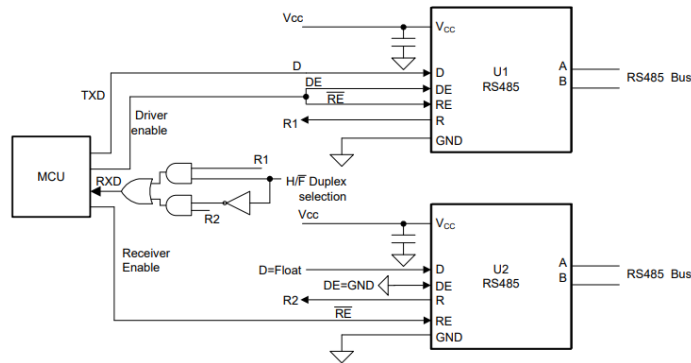
- Integrated pin selectable termination resistor reduces PCB space and allows for easy reconfiguration of networks
- Integrated IEC contact discharge ESD to eliminate system level protection components and to reduce system BOM
- Slew rate control pin allows same device to work in different data rate platforms
- Small package to reduce RS-485 footprint in space constrained PCBs



# Challenge for Flexible RS485 with Discrete Solutions



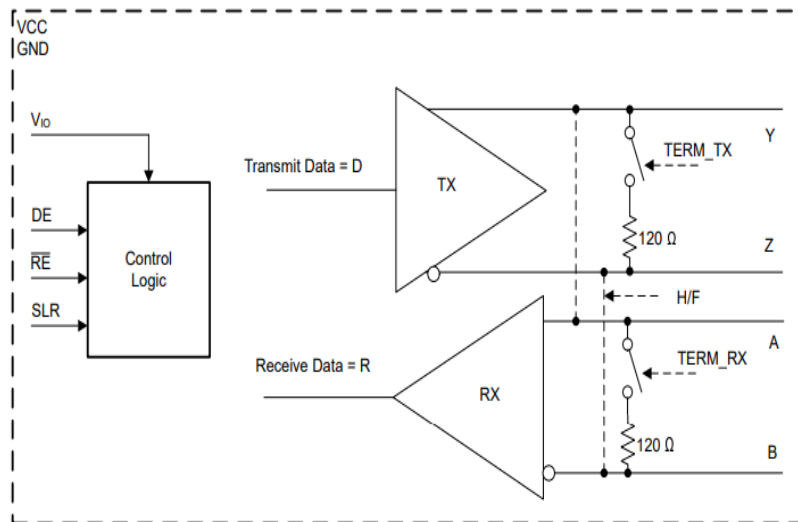
Switchable Termination and Duplex Switching



Duplex Switching

- ❑ Complex design
- ❑ More discrete components
- ❑ Large board space
- ❑ High system BOM cost

# THVD1424 value proposition



THVD1424 Block Diagram

## Major Benefits

- One single transceiver for all of the most common RS-485 use cases
- Simplifies process to optimize signal quality in any RS-485 network topology
- Reduce design, test and qualification time and accelerate Time to Market
- Reduces BOM costs and board space

THVD1424 enables customers use ONLY one device for variant applications

# Getting started

You can start evaluating this device leveraging the following:

Content type	Content title	Link to content or more details
E2E Design Support Forums	Interface forum	<a href="https://e2e.ti.com/support/interface-group/interface/f/interface-forum">https://e2e.ti.com/support/interface-group/interface/f/interface-forum</a>
Technical Documents	Reduce System Design Time and Cost with Flexible RS-485 Transceivers Signal Integrity vs. Data Rate and Cable Length Frequently asked questions and answers for RS-485 transceivers	<a href="https://www.ti.com/lit/wp/slla595b/slla595b.pdf?ts=1681949553932">https://www.ti.com/lit/wp/slla595b/slla595b.pdf?ts=1681949553932</a> <a href="https://www.ti.com/lit/an/slla431/slla431.pdf">https://www.ti.com/lit/an/slla431/slla431.pdf</a> <a href="https://e2e.ti.com/blogs_/b/analogwire/posts/frequently-asked-questions-and-answers-for-rs-485-transceivers">https://e2e.ti.com/blogs_/b/analogwire/posts/frequently-asked-questions-and-answers-for-rs-485-transceivers</a>
Product Folder	THVD1424 Product Folder	<a href="https://www.ti.com/product/THVD1424">https://www.ti.com/product/THVD1424</a>
Evaluation Module	THVD1424 evaluation module for RS-485 integrated switchable termination and duplex switching	<a href="https://www.ti.com/tool/THVD1424EVM">https://www.ti.com/tool/THVD1424EVM</a>

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