

FEATURES

1. Single input power supply
2. No isolated output power pin
3. Up to 256 nodes can be connected
4. Extremely low electromagnetic radiation (EMI)
5. Operating temperature range: -40°C ~ +85°C
6. Integrated isolation, signal isolation, and bus ESD protection



3 years
Warranty

Product Description

The TD321D485H-E / TD521D485H-E modules primarily convert logic levels to RS-485 protocol differential levels while providing signal isolation. These are RS-485 protocol transceiver modules that integrate power isolation, signal isolation, RS-485 communication, and bus protection using IC integration technology. The product includes a built-in regulated isolated power supply, achieving 2500VDC electrical isolation. The module can be easily embedded into user equipment, enabling easy connection to an RS-485 protocol network.

Selection Guide

Part No.	Voltage Range (VDC)	Quiescent Current (mA, Typ)	Max Operating Current (mA)	Baud Rate (kbps)	Node Count (pcs)	Type
TD321D485H-E	3.3 (3.15~3.45)	36	130	500	256	High-Speed
TD521D485H-E	5 (4.75~5.25)	32	100	500	256	High-Speed

Absolute Maximum Ratings

Items	Condition	Min.	Typ.	Max.	Unit
Input voltage range	TD321D485H-E	-0.7	3.3	5	VDC
	TD521D485H-E	-0.7	5	7	VDC
Pin soldering temperature	Hand soldering @3~5 sec	--	370	--	°C
	Wave soldering @5~10 sec	--	265	--	°C
Hot Plug	unavailable				

Note: This series of modules does not have input reverse polarity protection. Reverse connection of input positive and negative is strictly prohibited, as it will cause irreversible damage to the module.

Input Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit
Input voltage		V_{CC}	TD321D485H-E	3.15	3.3	3.45	VDC
			TD521D485H-E	4.75	5	5.25	
TXD logic level	High level	V_{IH}		$0.7V_{CC}$	--	$V_{CC}+0.5$	
	Low level	V_{IL}		0	--	$0.3V_{CC}$	
RXD logic level	High level	V_{OH}	$I_{RXD}=-2mA$	2.0	--	--	
	Low level	V_{OL}	$I_{RXD}=2mA$	--	--	0.8	
CON control level	High level	V_{CON_H}	TD321D485H-E	2.3	--	$V_{CC}+0.5$	
			TD521D485H-E	3.8	--	$V_{CC}+0.5$	
	Low level	V_{CON_L}		0	--	$0.3V_{CC}$	
TXD drive current		I_{TXD}		--	--	2	mA
CON drive current		I_{CON}		--	5	--	
RXD output current		I_{RXD}		--	--	2	
TXD pull-up resistor		R_{TXD}		--	5.1	--	k Ω
Serial interface			TD321D485H-E	3.3V standard UART interface			
			TD521D485H-E	5V standard UART interface			

Output Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Built-in isolated output supply voltage	V _O	Nominal input voltage	--	--	--	mA
Differential output voltage (A-B)	V _{OD}	Nominal input voltage, differential load 54Ω	1.5	--	VO	
Differential output current (A-B)	I _{OD}		28	--	--	
Bus interface protection			ESD protection			

Transmission Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Built-in pull-up/pull-down resistor			--	120	--	k Ω
Transceiver input impedance		$-7V \leq V_{CM} \leq +12V$	96	--	--	
Data transmit delay			--	400	--	ns
Data receive delay			--	150	--	
Transceiver state delay	T_{RTT}, T_{TTR}	--	--	25		μs

Truth Table Characteristics

Item	Input		Output	
Transmit Function	CON	TXD	A	B
	0	1	1	0
	0	0	0	1
Receive Function	CON	V_A-V_B	RXD	
	1	$\geq -10mV$	1	
	1	$\leq -200mV$	0	
	1	$-200mV < V_A-V_B < -10mV$	Indeterminate	

General Characteristics

Item	Condition	Min	Typ	Max	Unit
Electrical isolation		Isolation between input and output			
Isolation voltage	Test time 1 minute, leakage <5mA, humidity <95%	--	2.5K	--	VDC
Operating temperature range	Output at full load	-40	--	+85	°C
Storage temperature	--	-55	--	+105	°C
Storage humidity	Non-condensing	--	--	95	%
Case temperature rise during operation		--	20	--	°C
Operating environment	Dust, strong vibration, shock, and corrosive gases may damage the product				

Mechanical Characteristics

Case Material	Black flame-retardant heat-resistant plastic (UL94-V0)
Dimensions	19.50 × 16.50 × 7.10 mm
Weight	4.0g (Typ.)
Cooling Method	Free air convection

EMC Characteristics

EMS	ESD	IEC/EN 61000-4-2 Contact ±4KV/Air ±8KV(bare module)	Perf.Criteria B
		IEC/EN 61000-4-2 Contact ±8KV/Air ±15KV (with recommended circuit Figure 5)	Perf.Criteria B
	EFT	IEC/EN 61000-4-4 ±2KV	Perf.Criteria B
	Surge	IEC/EN 61000-4-5 Common mode ±2KV (bare module)	Perf.Criteria B
		IEC/EN 61000-4-5 Differential ±2KV, Common mode ±4KV (with recommended circuit Figure 5)	Perf.Criteria B
	CS	IEC/EN61000-4-6 3Vr.m.s	Perf.Criteria A

Product Characteristic Curves

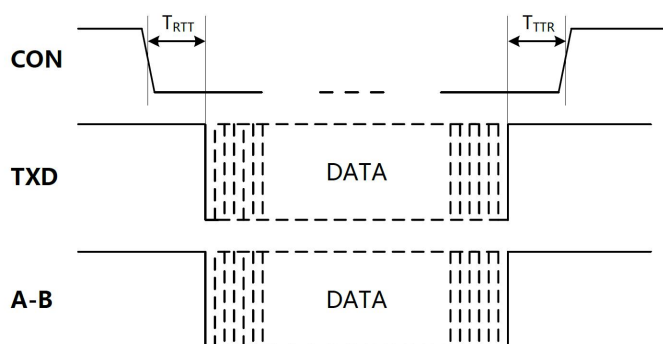


Figure 1. TDx01D485H-E Module Data Transmit Timing Diagram

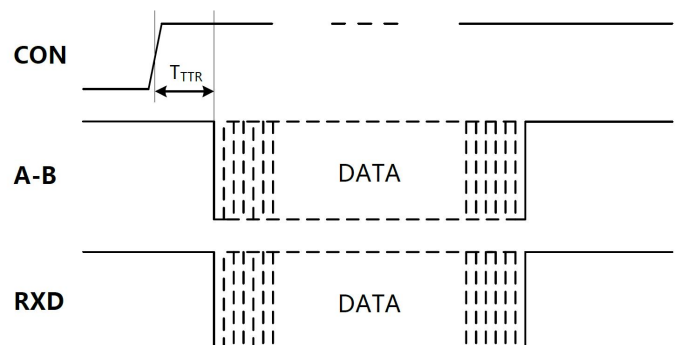


Figure 2. TDx01D485H-E Module Data Receive Timing Diagram

Typical Application

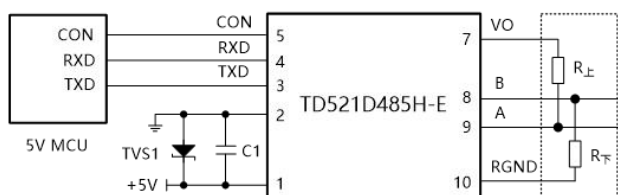


Figure 3. MCU 5V Power Supply Application Circuit

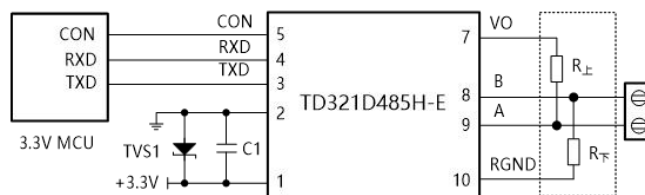


Figure 4. MCU 3.3V Power Supply Application Circuit

Figure 3 shows the connection diagram for a 5V MCU system UART interface with the TD521D485H-E isolated transceiver module. The module must be powered by a 5V supply. The TXD, RXD, and CON pin interface levels are 5V and do not support 3.3V system logic.

Figure 4 shows the connection diagram for a 3.3V MCU system UART interface with the TD321D485H-E isolated transceiver module. The module must be powered by a 3.3V supply. The TXD, RXD, and CON pin interface levels are 3.3V and do not support 5V system logic.

EMC Typical Recommended Circuit

Since the module has built-in pull-up/pull-down resistors and ESD protection devices on the A/B lines, additional ESD protection devices are generally not required in benign environments, as shown in the typical connection circuit diagrams in Section 8.1. However, if the application environment is harsh (e.g., high voltage power, lightning, etc.), it is recommended to add external protection measures such as TVS tubes, common mode chokes, surge arresters, shielded twisted pair cables, or single-point earth grounding for the same network at the module's A/B line terminals.

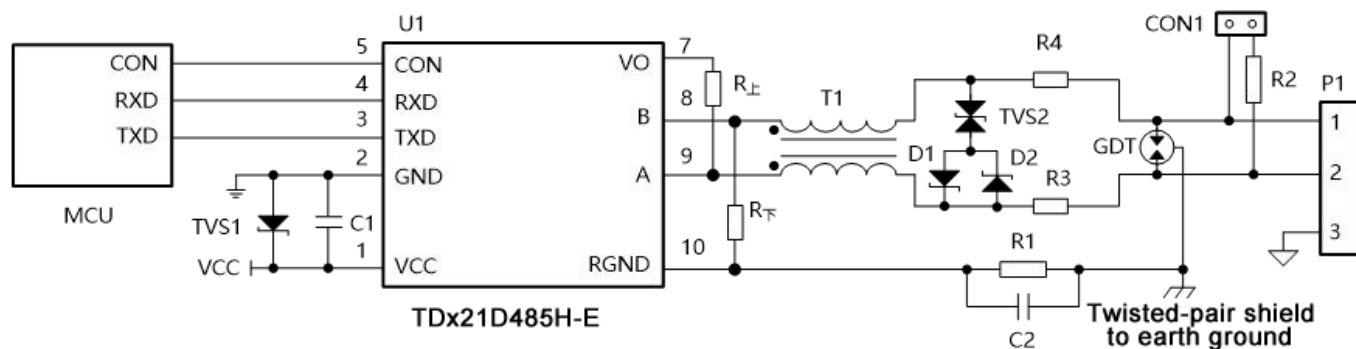


Figure 5. EMC Recommended Circuit

To meet specific surge immunity levels, the recommended protection circuit shown in Figure 5 is suggested. Table 1 provides a set of recommended component parameters. The recommended circuit and parameter values are for reference only; appropriate values should be determined based on actual conditions.

Designator	Model/Value	Designator	Model/Value
C1	10μF, 25V	TVS1	SMBJ5.0A
C2	102, 2KV, 1206	TVS2	SMBJ12CA
GDT	3RL090M-5-S	TVS3, TVS4	SMBJ6.5CA
R1	1MΩ, 1206	T1	B82793S0513N201
R2	120Ω, 1206	U1	TDx21D485H-E Module

Table 1. EMC Recommended Parameters

From the truth table characteristics, this series of embedded isolated RS-485 transceiver modules transmits data when the CON pin is low and receives data when the CON pin is high, which is the opposite of standard RS-485 transceiver chip control logic. Therefore, if the user wishes to use the same control logic as standard RS-485 transceiver chips, it is recommended to add an inverting circuit between the MCU and the module's CON pin.

4,Module Pin Description

Pins 6 and 7 are not brought out. If pin 10 is not used, leave it floating.

5,Use of Shielded Cable

For data transmission lines, use shielded twisted pair cables. The shield of the same network should be single-point grounded to earth. For better noise immunity of the RS-485 network, double-shielded twisted pair cable can be used. Connect the RGND of each node to the inner shield, and single-point ground the outer shield to earth.