

FEATURES

1. Powered by a single input supply
2. No isolated output power pin
3. Supports up to 64 nodes
4. Extremely low EMI radiation
5. Operating temperature range: -40°C to +85°C
6. Integrated power isolation, signal isolation, and bus ESD protection



3 years
Warranty

Product Description

The TD301D485H / TD501D485H primarily convert logic levels to RS-485 protocol differential levels, achieving signal isolation. They are RS-485 protocol transceiver modules that integrate power isolation, signal isolation, RS-485 communication, and bus protection using IC integration technology. The product comes with a built-in regulated isolated power supply, providing 2500VDC electrical isolation. It can be easily embedded into user equipment, enabling the device to effortlessly connect 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
TD301D485H	3.3 (3.15~3.45)	35	120	200	64	High-Speed
TD501D485H	5 (4.75~5.25)	28	100	200	64	High-Speed

Absolute Maximum Ratings

Items	Condition	Min.	Typ.	Max.	Unit
Input voltage range	TD301D485H	-0.7	3.3	5	VDC
	TD501D485H	-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}	TD301D485H	3.15	3.3	3.45	VDC
			TD501D485H	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}	TD301D485H	2.3	--	$V_{CC}+0.5$	
			TD501D485H	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			TD301D485H	3.3V standard UART interface			
			TD501D485H	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

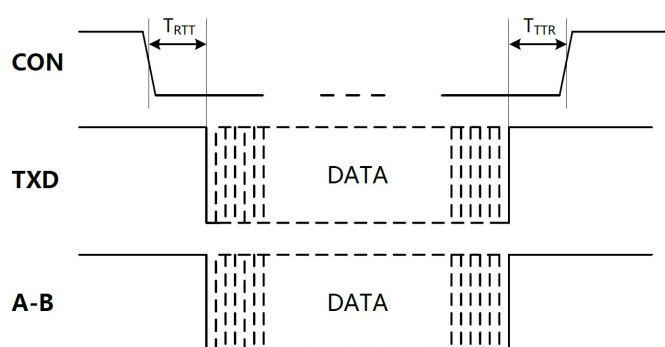


Figure 1. TDx01D485H Module Data Transmit Timing Diagram

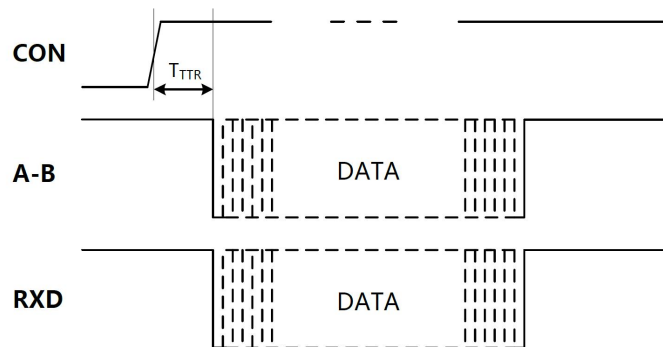


Figure 2. TDx01D485H Module Data Receive Timing Diagram

Typical Application

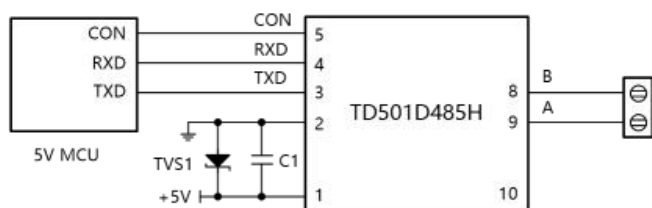


Figure 3. MCU 5V Power Supply Application Circuit

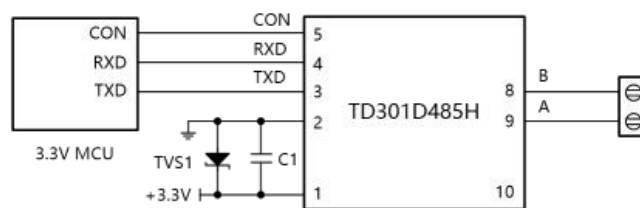


Figure 4. MCU 3.3V Power Supply Application Circuit

Figure 3 shows the connection diagram for a 5V MCU system UART interface with the TD501D485H isolated transceiver module. The module must be powered by a 5V supply. The TXD, RXD, and CON pins interface at 5V logic levels and do not support 3.3V systems.

Figure 4 shows the connection diagram for a 3.3V MCU system UART interface with the TD301D485H isolated transceiver module. The module must be powered by a 3.3V supply. The TXD, RXD, and CON pins interface at 3.3V logic levels and do not support 5V systems.

EMC Typical Recommended Circuit

As the module has built-in pull-up/pull-down resistors and ESD protection components on the A/B lines, additional ESD protection devices are generally unnecessary for benign environments (use the typical circuit shown in 8.1). However, if the application environment is harsh (e.g., high-voltage power, lightning), it is strongly recommended to add external protection measures such as TVS tubes, common mode chokes, lightning arrestors, shielded twisted pair cables, or single-point chassis grounding on the module's A/B lines.

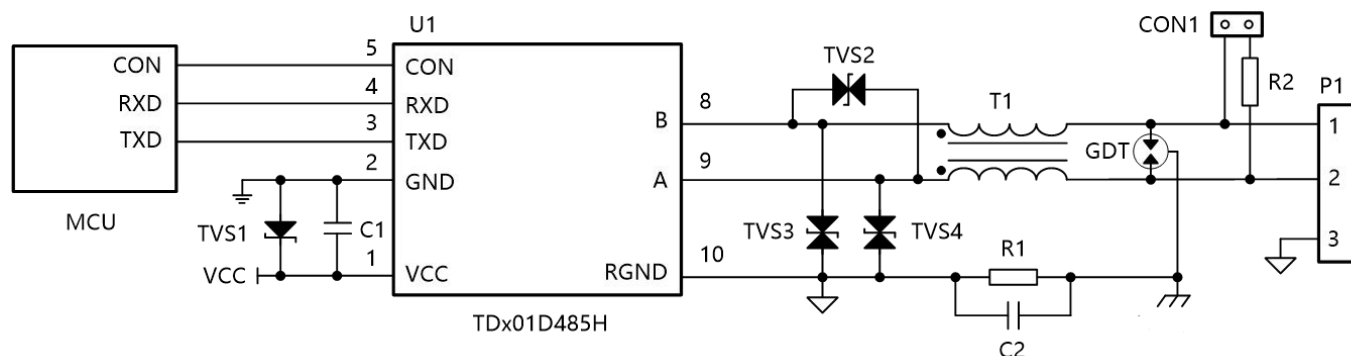


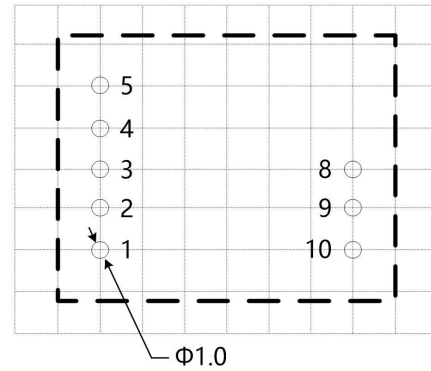
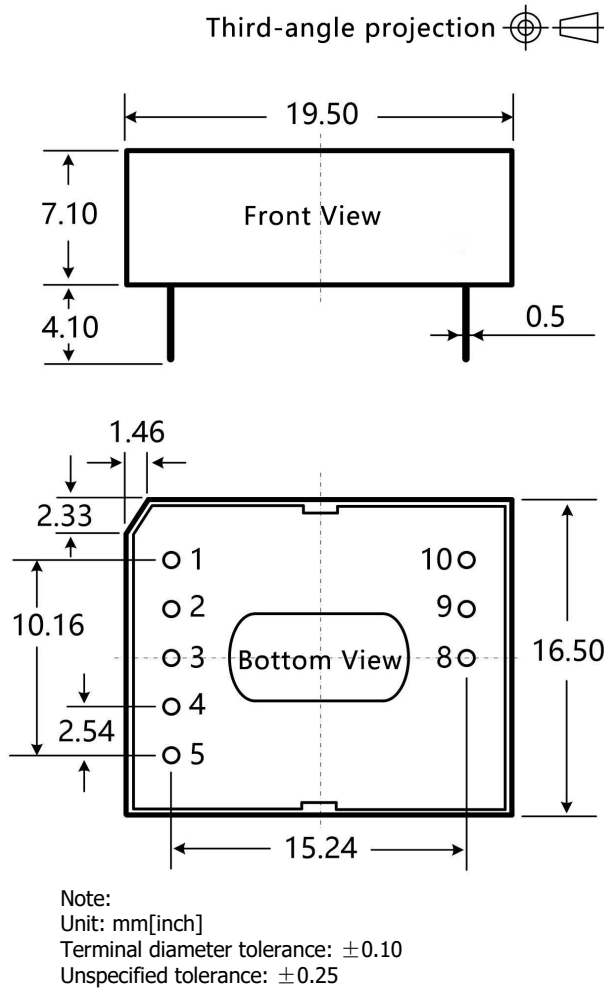
Figure 5. EMC Recommended Circuit

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

Designator	Model/Value	Designator	Model/Value
C1	10 μ F, 25V	TVS1	SMBJ5.0A
C2	102, 2KV, 1206	TVS2	SMBJ12CA
GDT	3RL090M-5-S	TVS3, TVS4	SMBJ6.5CA
R1	1M Ω , 1206	T1	B82793S0513N201
R2	120 Ω , 1206	U1	TDx01D485H Module

Table 1. EMC Recommended Parameters

Product Dimensions & Recommended PCB Layout



Note: Grid 2.54 * 2.54mm

Pin	Name	Function
1	VCC	Power input positive
2	GND	Power input ground
3	TXD	Data transmit pin
4	RXD	Data receive pin
5	CON	Transceiver control pin
8	B	RS-485 B pin
9	A	RS-485 A pin
10	RGND	Isolated output power ground

Product Usage Precautions

1,MCU IO Level Matching

The TXD, RXD, and CON pins of the TD501D485H interface at 5V logic levels and do not support 3.3V systems. The TXD, RXD, and CON pins of the TD301D485H interface at 3.3V logic levels and do not support 5V systems.

2,RS485 A-B Bus Level Threshold Description

As per the truth table, the module's receive output is high when the A/B differential voltage is $\geq -10\text{mV}$, and low when it is $\leq -200\text{mV}$. The receive output is uncertain when the voltage is between -200mV and -10mV . Design must ensure the module does not operate in this uncertain state. Whether to add a 120Ω terminating resistor depends on the specific application. The principle is: ensure the A/B differential voltage is never between -200mV and -10mV , whether the RS-485 network is idle or active, to prevent communication errors.

3,Module RS485 Transmit/Receive Data Control Pin CON Level Description

As shown in the truth table, this series of isolated transceivers transmits when CON is low and receives when CON is high. This is opposite to the control logic of standard RS-485 transceiver chips. To reverse the logic to match standard chips, add an inverting circuit between the MCU and the module's CON pin.

4,Module Pin Description

Pins 6 and 7 are not internally connected. If pin 10 (RGND) is not used, leave it floating.

5,Use of Shielded Cable

Use shielded twisted pair cables for data transmission. Connect the shield to chassis ground at a single point for the entire network. For higher noise immunity, use double-shielded twisted pair cable: connect each node's RGND to the inner shield, and connect the outer shield to chassis ground at a single point.