

Single high speed high isolation RS485 isolation transceiver module



CE Report RoHS
EN62368-1

FEATURES

- Integrated high efficient isolated DC-DC converter
- High baud rate of up to 1Mbps
- Two-port isolation test voltage 5.0kVAC (Reinforced insulation)
- Operating ambient temperature range: -40°C to +105°C
- The bus supports maximum 128 nodes
- Set isolation and ESD bus protection in one

The main function of the TDH301D485H2/TDH501D485H2 series is to convert a logic level signal into isolated RS485 differential level signals. The special integrated IC technology of the RS485 transceiver achieves isolation between the power supply and the signal lines isolation, does RS485 communication and protects the bus all in one and the same module. The product's isolated power supply withstands a test voltage of up to 5000VAC. Also, they can easily be embedded in the user's end equipment, to achieve fully functional RS485 network connections.

Selection Guide

Certification	Part No.	Power Supply Input (VDC)	Baud Rate (bps)	Static Current (mA)	Maximum Operating Current(mA)	Number Of Nodes
EN	TDH301D485H2	3.15-3.45	1M	20	210	128
	TDH501D485H2	4.75-5.25	1M	20	150	128

Absolute Limits

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec.max.)	3.3V series	-0.7	--	5	VDC
	5.0V series	-0.7	--	7	
Pin Soldering Temperature	Soldering spot 1.5mm away from case, 10s max.	--	--	300	°C

3.3V series Input Specifications

Item	Symbol	Min.	Typ.	Max.	Unit	
Power Supply Input Voltage	V _{CC}	3.15	3.3	3.45	VDC	
TXD Logic Level	High-level	V _{IH}	0.7V _{CC}	--		V _{CC} +0.5
	Low-level	V _{IL}	0	--		0.8
RXD Logic Level	High-level	V _{OH}	V _{CC} -0.4	--		V _{CC}
	Low-level	V _{OL}	--	--	0.4	
TXD Drive Current	I _T	2	--	--	mA	
RXD Output Current	I _R	--	--	5		
Serial Interface	Compatible with + 3.3 V UART interface only					

5.0V series Input Specifications

Item	Symbol	Min.	Typ.	Max.	Unit	
Power Supply Input Voltage	V _{CC}	4.75	5	5.25	VDC	
TXD Logic Level	High-level	V _{IH}	0.7V _{CC}	--		V _{CC} +0.5
	Low-level	V _{IL}	0	--		0.8
RXD Logic Level	High-level	V _{OH}	V _{CC} -0.4	--		V _{CC}
	Low-level	V _{OL}	--	--	0.4	
TXD Drive Current	I _T	2	--	--	mA	
RXD Output Current	I _R	--	--	10		

Serial Interface	Compatible with + 5 V UART interface only
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Transmission Specifications

Item	Symbol	Min.	Typ.	Max.	Unit
Data Delay	TXD Transmitter Delay	t _T	--	100	ns
	RXD Receiver Delay	t _R	--	100	
Transceiver switching delay time	Switch from receiving data to sending data	--	5	18	us
	Switch from sending data to receiving data	--	30	100	

Output Specifications

Item	Symbol	Min.	Typ.	Max.	Unit
Difference Level	V _{diff(O)} , R _L =54Ω	1.5	2	--	VDC
Difference Input Impedance	-7V ≤ V _{CM} ≤ +12V	96	--	--	kΩ
Built-in Pull-down Resistor		--	51	--	
Bus Interface Protection		ESD protection			

Truth Table Specifications

Transceiver Control	Input		Output		
	CON	TXD	A	B	RXD
Send Status	0	1	1	0	1
	0	0	0	1	1
Receive Status ^①	CON	V _A -V _B	RXD		
	1	≥-20mV	1		
	1	≤-220mV	0		
	1	-220mV < V _A -V _B < -20mV	Undefined state		

Note: ①The receive threshold varies slightly with V_{cc}.

General Specifications

Item	Operating Conditions	Value
Isolation Test	Electric strength test for 1 min, leakage current <1mA	5000VAC (Reinforced insulation)
Insulation Resistance	At 500VDC	1000MΩ
Operating Temperature		-40°C to +105°C
Transportation and Storage Temperature		-50°C to +125°C
Operating Humidity	Non-condensing	10% - 90%
Max. Case Temperature	T _a =25°C, Free air convection	25°C
Safety Standard		EN62368-1 (Report)
Safety Class		CLASS III
Application Environment		The presence of dust, severe vibration, shock and corrosive gas may cause damage to the product

Mechanical Specifications

Case Material	Black flame-retardant heat-proof plastic (UL94 V-0)
Dimensions	DIP10 (20.00 x 17.00 x 12.80mm)
Weight	7.2g(Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A (see Fig.3-①)
	RE	CISPR32/EN55032 CLASS A (see Fig.3-①)
Immunity	ESD	IEC/EN 61000-4-2 Contact±4kV/Air±8kV (without external components, A, B port) Perf. Criteria B
	RS	IEC/EN 61000-4-3 10V/m (without external components) Perf. Criteria B
	EFT	IEC/EN 61000-4-4 ±2kV (without external components, A, B port) Perf. Criteria B
	Surge	IEC/EN 61000-4-5 ±2kV (line to ground) (without external components, A, B port) ±2kV (line to line)/±4kV (line to ground) (see Fig.2-②, A, B port) Perf. Criteria B
	CS	IEC/EN 61000-4-6 3Vr.m.s Perf. Criteria A

Application Precautions

- Carefully read and follow the instructions before use; contact our technical support if you have any question;
- Do not use the product in hazardous areas;
- Use only DC power supply source for this product and AC power supply is prohibited;
- It is strictly forbidden to disassemble the product privately in order to avoid product failure or malfunction;
- If the external input of TXD is insufficient, the pull-up resistor should be added according to the situation;
- Hot swapping is not supported.

After-sales service

- Factory inspection and quality control are strictly enforced before shipping any product; please contact your local representative or our technical support if you experience any abnormal operation or possible failure of the module;
- The products have a 3-year warranty period, from the date of shipment. The product will be repaired or exchanged free of charge within the warranty period for any quality problem that occurs under normal use.

Applied circuit

Refer to the RS485 Isolated Industrial Bus Interface Module Application Manual.

Design Reference

1. Typical application circuit

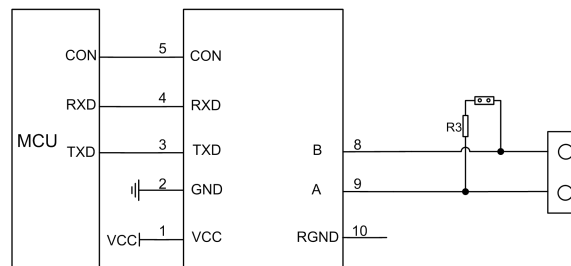


Fig. 1

Figure 1 shows a typical connection circuit for the isolated transceiver module TDH301D485H2 and TDH501D485H2. The TDH501D485H2 module's power supply must be 5V and match the module's TXD, RXD and CON pin interface level of 5V (not supporting any 3.3V system levels). Accordingly, TDH301D485H2 module's power supply must be 3.3V and match the module's TXD, RXD and CON pin interface level of 3.3V (not supporting any 5V system levels).

2. Recommended port protection circuit

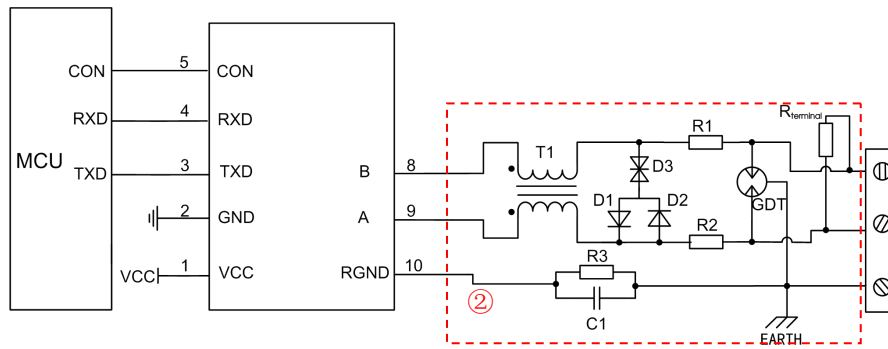


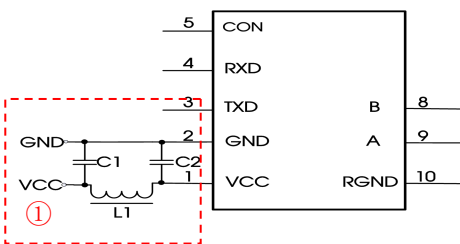
Fig. 2

Note: Ground shield of twisted wire pair reliably.

Recommended components and values:

Component	Recommended part, value	Component	Recommended part, value
R3	1MΩ	R1, R2	2.7Ω /2W
C1	1nF, 2kV	D1, D2	1N4007
T1	ACM2520-301-2P	D3	SMBJ8.5CA
GDT	B3D090L	R _{terminal}	120Ω

As the modules internal A / B lines come with its own ESD protection, which generally satisfy most application environments without the need for additional ESD protection devices, as shown in the typical circuit in Figure 1. For harsh and noisy application environments such as motors, high voltage/current switches, lightning and similar however, we recommended that the user protects the module's A / B lines with additional measures and external components such as TVS, common mode inductors, gas discharge tube, shielded twisted pair of wires with the same single network Earth point. Figure 2 shows our recommended circuit diagram for such type of applications with components and values given in the table above. This recommendation is for reference only and may have to be adapted accordingly with appropriate component values in order to match the actual situation and application.



Component	Recommended part, value
C1, C2	1uF/50V
LDM	12uH

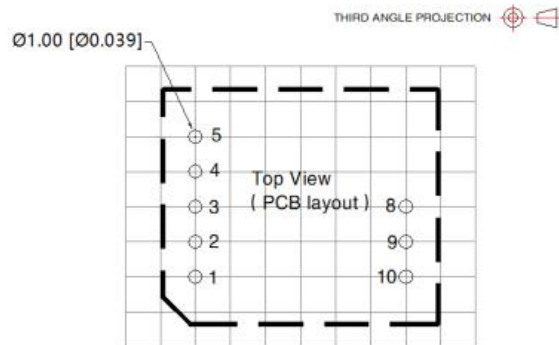
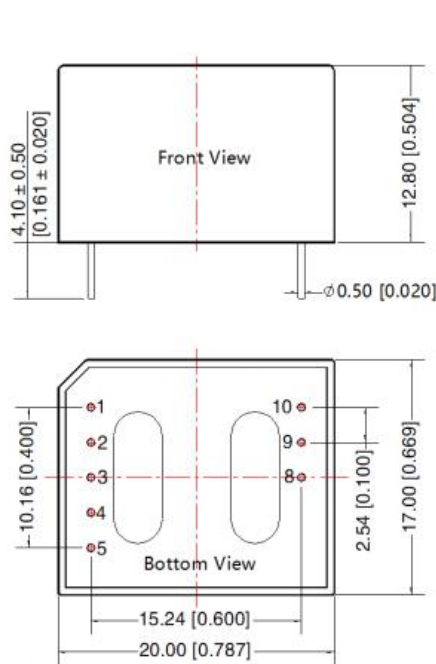
Fig. 3

3. Precautions

- 1) TDH501D485H2 is for 5V TTL level only (not compatible with 3.3V); TDH301D485H2 is for 3.3V TTL level only (not compatible with 5V).
- 2) Pin6 and Pin7 are not drawn. Please leave pin 10 open if unused.
- 3) We recommend using a shielded twisted pair of wires for the Data transmission line and using same single point earth connection for each of the networks.
- 4) From the truth table characteristics, it can be derived that the isolated RS-485 transceiver module's CON pin is low to send data and high when receiving data. Note that the general 485 transceiver chip control level is exactly the opposite, therefore, if the customer desires to change the level to the ordinary 485 transceiver chip control level, we recommend using a transistor circuit between the MCU and the CON feed to reverse this signal.
- 5) Reference the truth table characteristics: When the A / B line differential voltage of the series of embedded isolated RS-485 transceiver module is $\geq -20\text{mV}$, the modules receiving level is high and when the A / B line differential voltage is $\leq -220\text{mV}$ the modules receiving level is low; the modules receiving level is undefined when the A / B line differential voltage is greater than -220mV but less than -20mV , so the design is to ensure that the module will not be receiving this state. Depending on the actual situation, it is up to the user of the RS-485 network design or application to decide whether to add a 120Ω termination resistor. Avoiding data communication errors: Regardless if the RS-485 network is static or dynamic, it is essential to avoid that the differential voltage of A / B line ever comes between -220mV and -20mV .

4. For additional information, please refer to our application note on www.mornsun-power.com

Dimensions Recommended Layout



Note: Grid 2.54*2.54mm

Pin-Out		
Pin	Mark	Function
1	VCC	Input Power
2	GND	GND
3	TXD	TDH_D485H(H2, H-E) Sending Pin
4	RXD	TDH_D485H(H2, H-E) Receiving Pin
5	CON	Sending&Receiving Control Pin
8	B	TDH_D485H(H2, H-E) B Pin
9	A	TDH_D485H(H2, H-E) A Pin
10	RGND	Isolation Power Output RGND

Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.25[±0.010]

Notes:

- For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number: 58220015;
- It is recommended that do not open hole on the PCB to avoid thermal deformation of the product base, if customer uses this product to solder by wave soldering;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on company corporate standards;
- The above are the performance indicators of the product models listed in this datasheet. Some indicators of non-standard models will exceed the above requirements. For details, please contact our technical staff;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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