Low power consumption single RS485 isolated transceiver module, SMD package

CE RoHS EN 62368-1

FEATURES

- Ultra-low quiescent current, 8 mA
- Small size, SMD package
- Integrated high efficient isolated DC-DC converter
- High baud rate up to 19200bps
- Two-port isolation test voltage (2.5kVDC)
- Operating ambient temperature range: -40℃ to +85℃
- The bus supports maximum 16 nodes
- Set isolation and ESD bus protection in one
- Used in coal mines, chemical industries request ultra-low power consumption

The main function of the TD331S485-L / TD531S485-L 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 2500VDC. The Products are using pick and place SMD technology, thus enabling the use of fully automated processing. Also, they can easily be embedded in the user's end equipment, to achieve fully functional RS485 network connections. The products feature ultra-low power consumption and are guaranteed in coal mines, chemical industry areas with continue operating at low energy consumption.

Selection Guide

Certification	Part No.	Power Input (VDC)	Baud Rate (kbps)	Static Current (mA)(typ.)	Max.Operating Current (mA)(typ)	Isolated Power Output (VDC) (typ.)	Number Of Nodes
EN	TD331S485-L	3.15-3.45	19.2	8	90	5	16
	TD531S485-L	4.75-5.25	19.2	8	70	5	16

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	
Reflow Soldering Temperature		Peak temp. ≤245℃, duration ≤60s max.at 217℃. For details, please refer to IPC/JEDEC J-STD-020D.1.			

3.3V 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}	$0.7V_{CC}$	--	3.6	
	Low-level	V_{IL}	0	--	0.8	
RXD Logic Level	High-level	V_{OH}	$V_{CC}-0.4$	3.1	--	
	Low-level	V_{OL}	0	0.2	0.4	
TXD Drive Current		I_T	2	--	--	mA
CON Drive Current		I_{CON}	--	--	5	
RXD Output Current		I_R	--	--	3.5	
Serial Interface	Compatible with + 3.3 V UART interface only					

5.0V 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}	$0.7V_{CC}$	--	5.5	
	Low-level	V_{IL}	0	--	0.8	
RXD Logic Level	High-level	V_{OH}	$V_{CC}-0.4$	4.8	--	
	Low-level	V_{OL}	0	0.2	0.4	

MORNSUN®

TXD Drive Current	I_T		2	--	--	
CON Drive Current	I_{CON}		--	--	5	mA
RXD Output Current	I_R		--	--	3.5	
Serial Interface	Compatible with + 5 V UART interface only					

Transmission Specifications

Item		Symbol	Min.	Typ.	Max.	Unit
Data Delay	TXD Transmitter Delay	t_T	2	3	4	
	RXD Receiver Delay	t_R	2	3	4	us
Transceiver switching delay time	Switch from receiving data to sending data		--	5	18	
	Switch from sending data to receiving data		--	30	100	

Output Specifications

Item	Symbol	Min.	Typ.	Max.	Unit
Difference Level	$V_{diff(d)}$, R_L=90 Ω	1.5	2	--	VDC
Difference Load Resistance		90	--	--	Ω
Difference Input Impedance	-7V$\leqslant$$V_{CM}$$\leqslant$+12V	96	--	--	kΩ
Built-in Pull-down Resistor		--	2.7	--	
Isolation Power Output Voltage*	Nominal input voltage	4.9	5	5.5	VDC
Bus Interface Protection	ESD protection				

Note: *Isolated output power pins are for external pull-up, pull-down resistors only (recommended maximum current <25mA) and are not meant for any other purpose.

Truth Table Specifications

Transceiver Control	Input		Output		
	CON	TXD	A	B	RXD
Send Status	0	1	1	0	1
	0	0	0	1	1
	CON	V_A-V_B	RXD		
Receive Status①	1	$\geqslant$-20mV	1		
	1	$\leqslant$-220mV	0		
	1	-220mV$<$$V_A$-$V_B$$<$-20mV	Undefined state		

Note: ①Receiving threshold varies with Vcc will produce subtle error.

General Specifications

Item	Operating Conditions	Value
Isolation Test	Electric strength test for 1 minute, leakage current <1mA	2500VDC
Insulation Resistance	At 500VDC	1000MΩ (input-output)
Operating Temperature		-40℃ to +85℃
Transportation And Storage Temperature		-50℃ to +105℃
Operating Humidity	Non-condensing	10% - 90%
Safety Standard		EN62368-1(Report)
Safety Class		CLASS III
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 1

Mechanical Specifications

Case Material	WH9100-F (UL94 V-0)
Dimensions	SMD12; Dimension 17.00 x 12.14 x 9.45mm
Weight	2.8g (Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS B (see Fig. 4)

MORNSUN®

MORNSUN®

Immunity	ESD	IEC/EN 61000-4-2	Contact ± 4kV / Air ± 8kV (A, B port, without external components)	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, signal port)	Perf. Criteria B
		IEC/EN 61000-4-4	±4kV (see Fig.2, A, B port)	Perf. Criteria B
	Surge	IEC/EN 61000-4-5	±2kV (without external components, common mode, A, B port)	Perf. Criteria B
	CS	IEC/EN 61000-4-6	3Vr.m.s	Perf. Criteria A

Application Precautions

1. Carefully read and follow the instructions before use; contact our technical support if you have any question;

2. Do not use the product in hazardous areas;

3. Use only DC power supply source for this product. 220V AC power supply is prohibited;

4. It is strictly forbidden to disassemble the product privately in order to avoid product failure or malfunction;

5. If the external input of TXD is insufficient, the pull-up resistor should be added according to the situation;

6. Hot swapping is not supported.

7. The various components of the product may have inconsistent screens due to different production batches, it does not affect the product performance.

After-sales service

1. 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;

2. 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
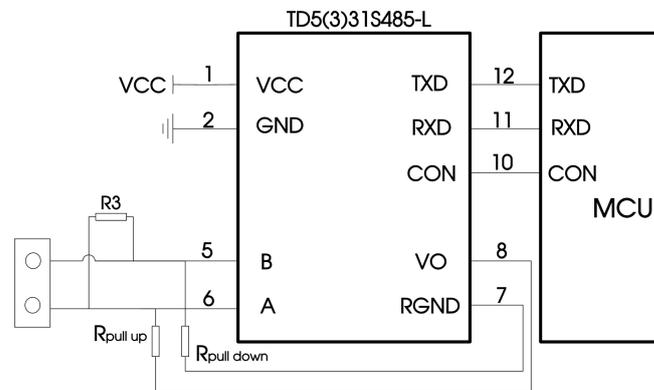
1. Typical application circuit

Fig. 1: Typical application

Figure 1 shows a typical connection circuit for the isolated transceiver module TD331S485-L and TD531S485-L. The TD531S485-L 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, TD331S485-L 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).

The module has a built-in 2.7kΩ pull-down resistor, which under normal circumstances meets the demand for the use of internal pull-up and pull-down resistors. Depending on the actual circuit, the use of additional external R pull-up and R pull-down resistor may be chosen.

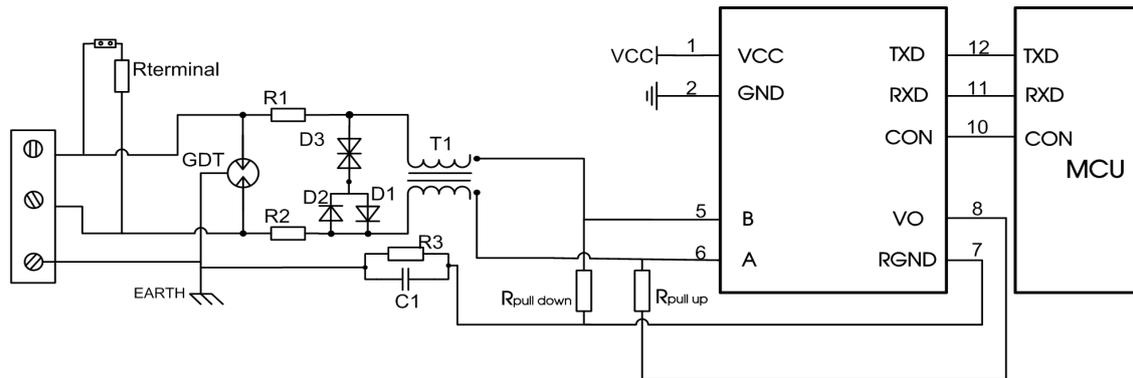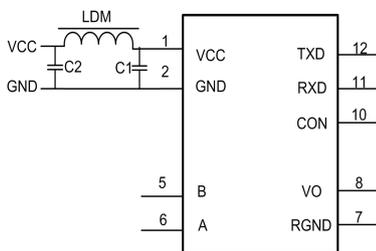### 2. Recommended port protection circuit

TD5(3)31S485-L

Fig. 2:Recommended protection circuit

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

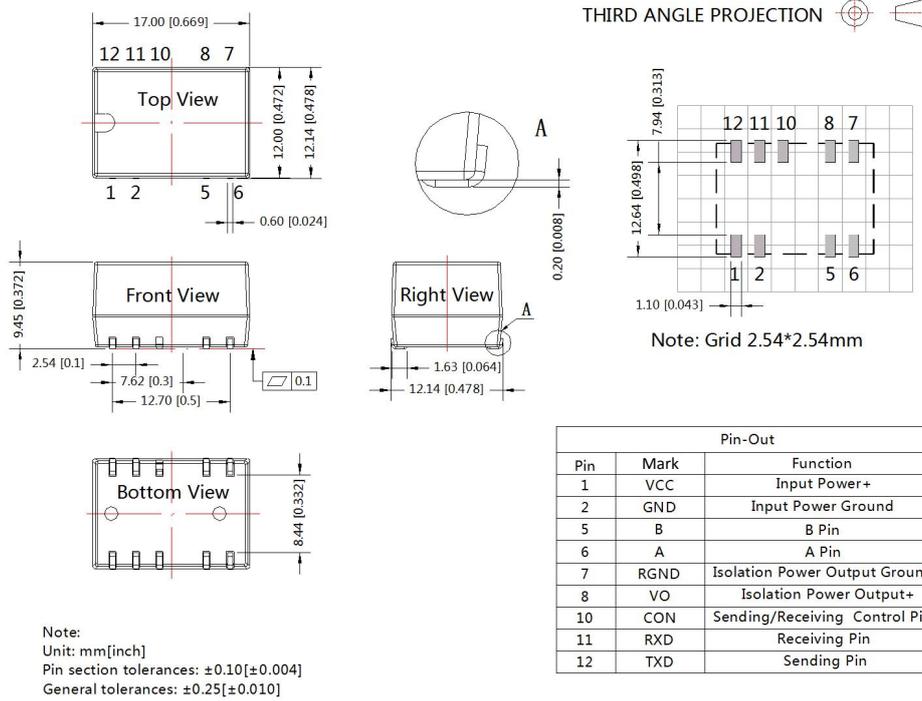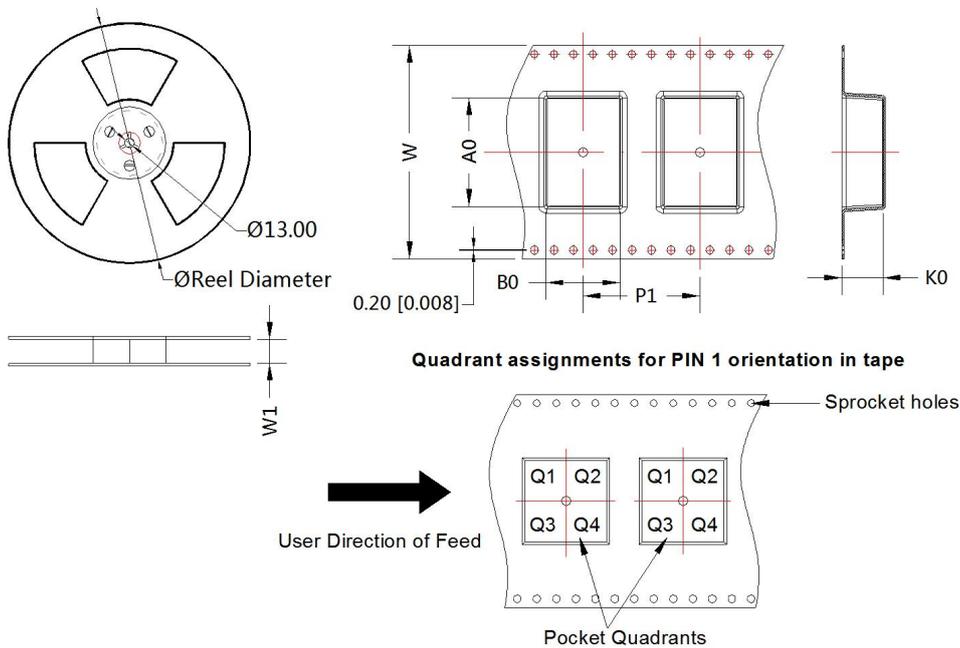| Component	Recommended part, value
C1, C2	1uF/16V
LDM	CD43-12uH

Fig.4

3. Precautions

1) TD531S485-L is for 5V TTL level only (not compatible with 3.3V); TD331S485-L is for 3.3V TTL level only (not compatible with 5V).

2) Pin3, Pin4 and Pin9 are not drawn. Please leave pin7 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 ≥ -10mV. the modules receiving level is high and when the A / B line differential voltage is ≤ -200mV the modules receiving level is low. the modules receiving level is undefined when the A / B line differential voltage is greater than -200mV but less than -10mV. 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 -200mV and -10mV. For long distance use. the terminal resistance value can be appropriately reduced to meet this principle.

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

MORNSUN®

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION

Top View

17.00 [0.669]

12 11 10 8 7

1 2 5 6

12.00 [0.472]
12.14 [0.478]
0.60 [0.024]

Front View

9.45 [0.372]
2.54 [0.1]
7.62 [0.3]
12.70 [0.5]
0.1

Right View

0.20 [0.008]
1.63 [0.064]
12.14 [0.478]

Bottom View

8.44 [0.332]

7.94 [0.313]

12 11 10 8 7

1 2 5 6

12.64 [0.498]
1.10 [0.043]

Note: Grid 2.54*2.54mm

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

Pin-Out		
Pin	Mark	Function
1	VCC	Input Power+
2	GND	Input Power Ground
5	B	B Pin
6	A	A Pin
7	RGND	Isolation Power Output Ground
8	VO	Isolation Power Output+
10	CON	Sending/Receiving Control Pin
11	RXD	Receiving Pin
12	TXD	Sending Pin

Package diagram:

Ø13.00
ØReel Diameter

W
A0
B0
P1
K0
0.20 [0.008]

W1

Quadrant assignments for PIN 1 orientation in tape

Sprocket holes

Q1	Q2		Q1	Q2
Q3	Q4		Q3	Q4

User Direction of Feed

Pocket Quadrants

Device	Package Type	Pin	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TDx31S485-L	SMD	9	300	330.0	32.5	17.72	12.92	10.5	20.0	32.0	Q1

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Tube Packaging bag number: 58240014; The Roll Packaging bag number: 58240013;

2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;

3. All index testing methods in this datasheet are based on company corporate standards;

4. 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;

5. We can provide product customization service, please contact our technicians directly for specific information;

6. Products are related to laws and regulations: see "Features" and "EMC";

7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.