

RS-485 Transceiver Module

CMx01D485H Series



CE Report

RoHS



FEATURES

- Operating temperature range: -40°C ~ +85°C
- No isolated output power pin
- Single input power supply
- Extremely low electromagnetic radiation (EMI)
- Up to 64 nodes can be connected
- Integrated isolation, signal isolation, and bus ESD protection

APPLICATIONS

- Industrial communication
- Power monitoring
- Coal mining industry
- Building automation

DESCRIPTION

The CM301D485H / CM501D485H 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

Product Model	Voltage Range (VDC)	Quiescent Current (mA, Typ)	Max. Operating Current (mA)	Transmission Baud Rate (kbps)	Node Count (pcs)	Type
CM301D485H	3.3 (3.15~3.45)	35	120	200	64	High Speed
CM501D485H	5 (4.75~5.25)	28	100	200	64	High Speed

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INPUT CHARACTERISTICS

Parameter		Symbol	Operating Conditions	Min.	Typ.	Max.	Units
Input voltage		V _{CC}	CM301D485H	3.15	3.3	3.45	VDC
			CM501D485H	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}	CM301D485H	2.3	--	V _{CC} +0.5	
			CM501D485H	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	--	kΩ
Serial interface			CM301D485H	3.3V standard UART interface			
			CM501D485H	5V standard UART interface			

OUTPUT CHARACTERISTICS

Parameter	Symbol	Operating Conditions	Min.	Typ.	Max.	Units
Built-in isolated output power voltage	V _O	Nominal input voltage	--	--	--	mA
Differential output voltage (A-B)	V _{OD}	Nominal input voltage, differential load 54Ω	1.5	--	V _O	
Differential output current (A-B)	I _{OD}		28	--	--	
Bus interface protection			ESD protection			

ABSOLUTE MAXIMUM RATINGS

Parameter	Operating Conditions	Min.	Nom.	Max.	Units
Input voltage range	CM301D485H	3.15	3.3	5	VDC
	CM501D485H	4.75	5	7	
Pin soldering temperature	Manual soldering @3~5s	--	370	--	°C
	Wave soldering @5~10s	--	265	--	
Hot plugging	Not supported				

Note: This series has no reverse polarity protection. DO NOT reverse power polarity, or irreversible damage will occur

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TRANSMISSION CHARACTERISTICS

Parameter	Symbol	Operating Conditions	Min.	Typ.	Max.	Units
Built-in Pull-up/Pull-down resistors			--	120	--	kΩ
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

Parameter	Input		Output	
Transmit function	CON	TXD	A	B
	0	1	1	0
	0	0	0	1
Receive function	CON	VA-VB	RXD	
	1	$\geq -10mV$	1	
	1	$\leq -200mV$	0	
	1	$-200mV < VA-VB < -10mV$	Indeterminate	

GENERAL CHARACTERISTICS

Parameter	Operating Conditions	Min.	Typ.	Max.	Units
Electrical isolation		Isolated between input and output			
Isolation voltage	Test time 1 minute, leakage <5mA, humidity <95%	--	2.5K	--	VDC
Operating temperature	Full load	-40	--	+85	°C
Storage temperature	--	-55	--	+105	
Storage humidity	Non-condensing	--	--	95	%
Case temperature rise during operation		--	20	--	°C
Operating environment	Dust, strong vibration, shock or corrosive gases may damage the module				

PHYSICAL CHARACTERISTICS

Parameter	Operating Conditions
Housing material	Black flame-retardant heat-resistant plastic (UL94-V0)
Package size	19.50 × 16.50 × 7.10 mm
Weight	4.0g (Nominal)
Cooling method	Natural air cooling

EMC CHARACTERISTICS

Category	Item	Parameter	
EMS	ESD	IEC/EN 61000-4-2 contact $\pm 4\text{KV}$ /Air $\pm 8\text{KV}$ (bare module)	Perf.Criteria B
		IEC/EN 61000-4-2 contact $\pm 8\text{KV}$ /Air $\pm 15\text{KV}$ (with recommended circuit Fig 5)	Perf.Criteria B
	EFT/Burst	IEC/EN 61000-4-4 $\pm 2\text{KV}$	Perf.Criteria B
	Surge	IEC/EN 61000-4-5 common mode $\pm 2\text{KV}$ (Bare board)	Perf.Criteria B
		IEC/EN 61000-4-5 differential $\pm 2\text{KV}$, common mode $\pm 4\text{KV}$ (with recommended circuit Fig 5)	Perf.Criteria B
	Conducted	IEC/EN61000-4-6 3Vr.m.s	Perf.Criteria A

PRODUCT CHARACTERISTIC CURVES

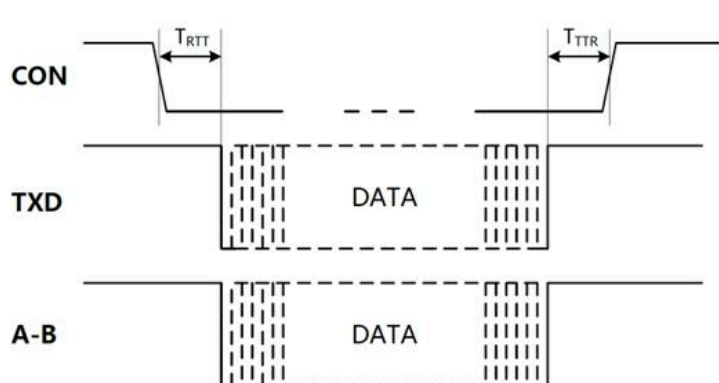


Fig 1.
CMx01D485H module data transmit timing diagram

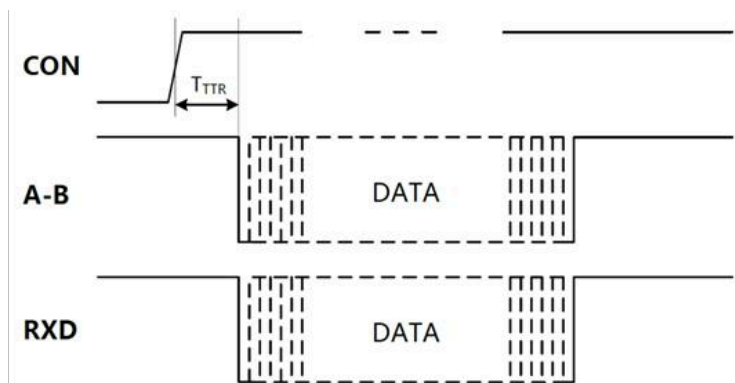


Fig 2.
CMx01D485H module data receive timing diagram

DESIGN REFERENCE

TYPICAL APPLICATION

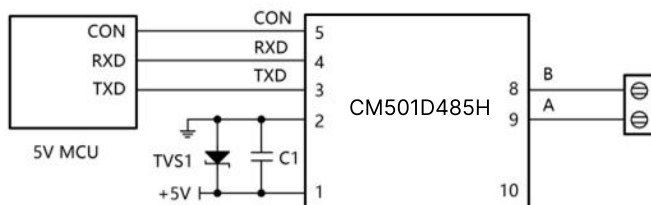


Figure 3. MCU 5V POWER SUPPLY APPLICATION CIRCUIT

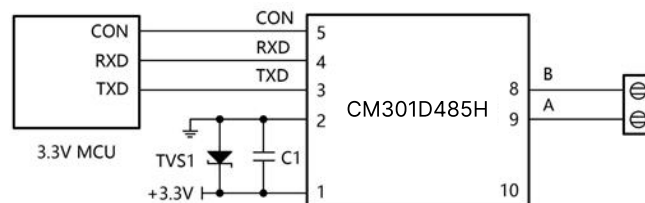


Figure 4. MCU 3.3V POWER SUPPLY APPLICATION CIRCUIT

Figure 3 shows the connection diagram for a 5V MCU system UART interface with the CM501D485H 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 CM301D485H 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

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.

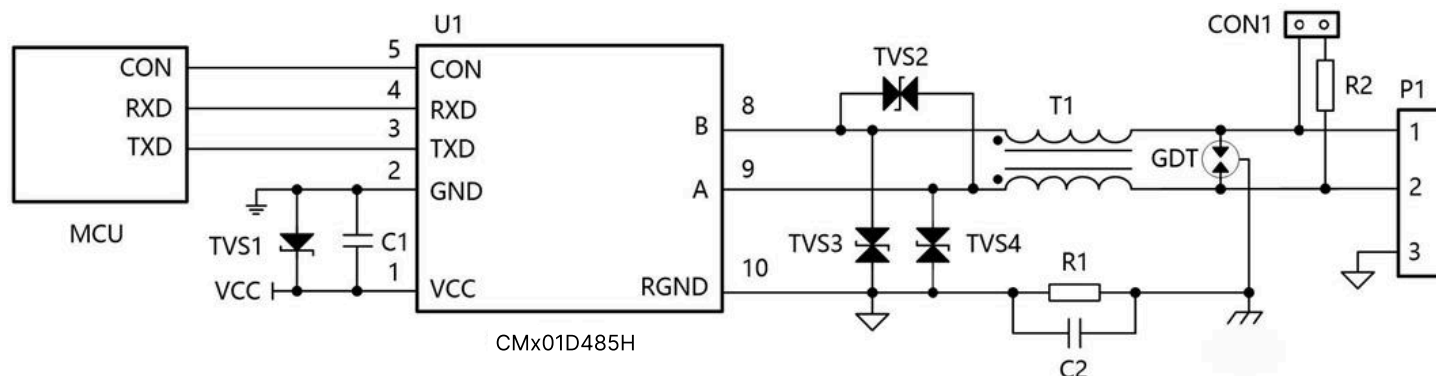


Figure 5. EMC Recommended Circuit

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.

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Components	Models	Components	Models
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	CMx01D485H Module

Table 1. EMC Recommended Parameters

PRODUCT USAGE NOTES

1. MCU IO Level Matching

The TXD, RXD, and CON pins of the CM501D485H interface at 5V logic levels and do not support 3.3V systems. The TXD, RXD, and CON pins of the CM301D485H 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

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

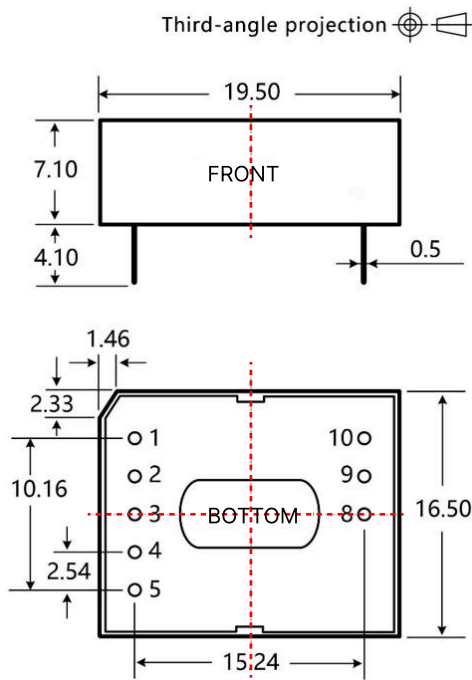
Pins 6 and 7 are not brought out. If pin 10 is not used, leave it floating.

5. Use of Shielded Cable

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.

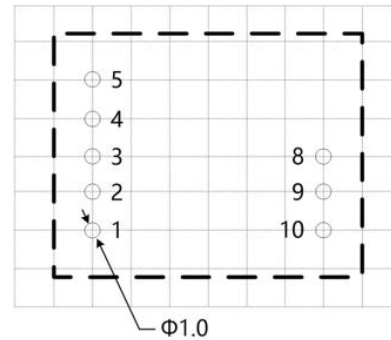
OVERALL DIMENSIONS AND PIN FUNCTIONS

1. Appearance Dimension Drawing



Note: Unit: mm
diameter tolerance: ± 0.10
Unmarked tolerance: ± 0.25

4.2 Recommended Layout Drawing



Note: Grid spacing 2.54×2.54mm

Pin	Function	Description
1	VCC	Positive Power Input
2	GND	Power Input Ground
3	TXD	Transmit Data Pin
4	RXD	Receive Data Pin
5	CON	Transceiver control pin
8	B	RS-485 B Line
9	A	RS-485 A Line
10	RGND	Isolated Output Power Ground