

## CMx01D485H-E 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 256 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-E / CM501D485H-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

Product Model	Voltage Range (VDC)	Quiescent Current (mA, Typ)	Max. Operating Current (mA)	Transmission Baud Rate (kbps)	Node Count (pcs)	Type
CM301D485H-E	3.3 (3.15~3.45)	36	130	500	256	High Speed
CM501D485H-E	5 (4.75~5.25)	32	100	500	256	High Speed

## RS-485 Transceiver

### INPUT CHARACTERISTICS

Parameter	Symbol	Operating Conditions	Min.	Typ.	Max.	Units	
Input voltage	V <sub>CC</sub>	CM301D485H-E	3.15	3.3	3.45	VDC	
		CM501D485H-E	4.75	5	5.25		
TXD logic level	High Level	V <sub>IH</sub>	0.7V <sub>CC</sub>	--	V <sub>CC</sub> +0.5		
	Low Level	V <sub>IL</sub>	0	--	0.3V <sub>CC</sub>		
RXD logic level	High Level	V <sub>OH</sub>	I <sub>RXD</sub> =-2mA	2.0	--		
	Low Level	V <sub>OL</sub>	I <sub>RXD</sub> =-2mA	--	0.8		
CON control level	High Level	V <sub>CON_H</sub>	CM301D485H-E	2.3	--		V <sub>CC</sub> +0.5
		CM501D485H-E	3.8	--	V <sub>CC</sub> +0.5		
	Low Level	V <sub>CON_L</sub>		0	--		0.3V <sub>CC</sub>
TXD drive current	I <sub>TXD</sub>		--	--	2		mA
CON drive current	I <sub>CON</sub>		--	5	--		
RXD output current	I <sub>RXD</sub>		--	--	2		
TXD Pull-up resistor	R <sub>TXD</sub>		--	5.1	--	kΩ	
Serial interface		CM301D485H-E	3.3V standard UART interface				
		CM501D485H-E	5V standard UART interface				

### OUTPUT CHARACTERISTICS

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

### ABSOLUTE MAXIMUM RATINGS

Parameter	Operating Conditions	Min.	Nom.	Max.	Units
Input voltage range	CM301D485H-E	-0.7	3.3	5	VDC
	CM501D485H-E	-0.7	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

## RS-485 Transceiver

### 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	$T_{RTT}, T_{TR}$	--	--	25		μs

### TRUTH TABLE

Parameter	Input		Output	
	CON	TXD	A	B
Transmit function	0	1	1	0
	0	0	0	1
	1	1	1	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

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 ±4KV/Air ±8KV(bare module)	Perf.Criteria B
		IEC/EN 61000-4-2 contact ±8KV/Air ±15KV (with recommended circuit Fig 5)	Perf.Criteria B
	EFT/Burst	IEC/EN 61000-4-4 ±2KV	Perf.Criteria B
	Surge	IEC/EN 61000-4-5 common mode ±2KV (Bare board)	Perf.Criteria B
		IEC/EN 61000-4-5 differential ±2KV, common mode ±4KV (with recommended circuit Fig 5)	Perf.Criteria B
Conducted	IEC/EN61000-4-6 3Vr.m.s	Perf.Criteria A	

**PRODUCT CHARACTERISTIC CURVES**

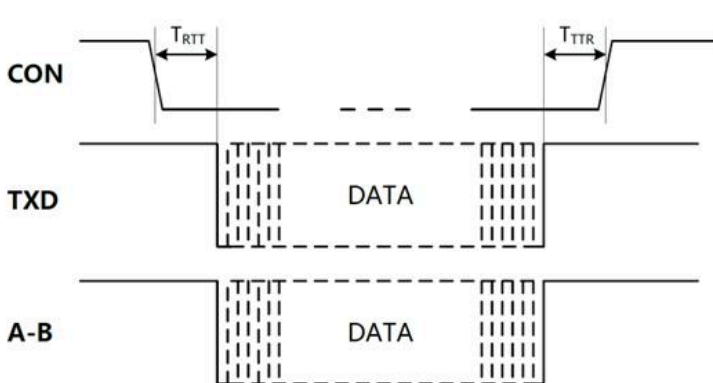


Fig 1.  
CMx01D485H-E module data transmit timing diagram

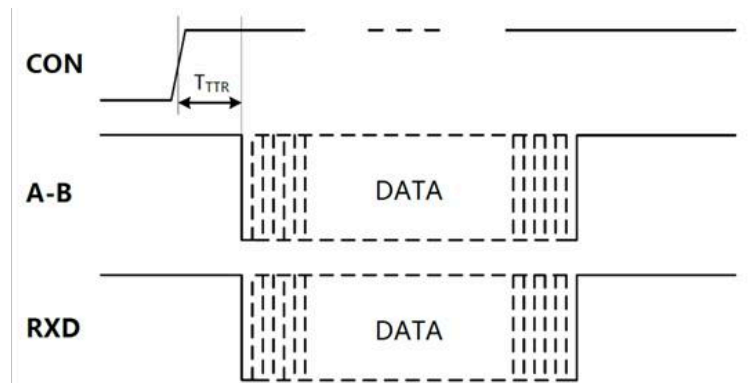


Fig 2.  
CMx01D485H-E module data receive timing diagram

**DESIGN REFERENCE**

**TYPICAL APPLICATION**

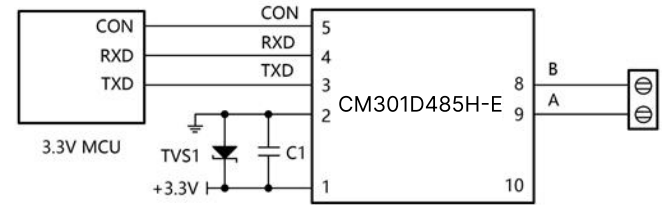
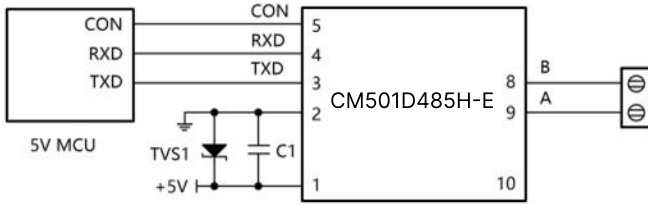


Figure 3. MCU 5V POWER SUPPLY APPLICATION CIRCUIT

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-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 CM301D485H-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.

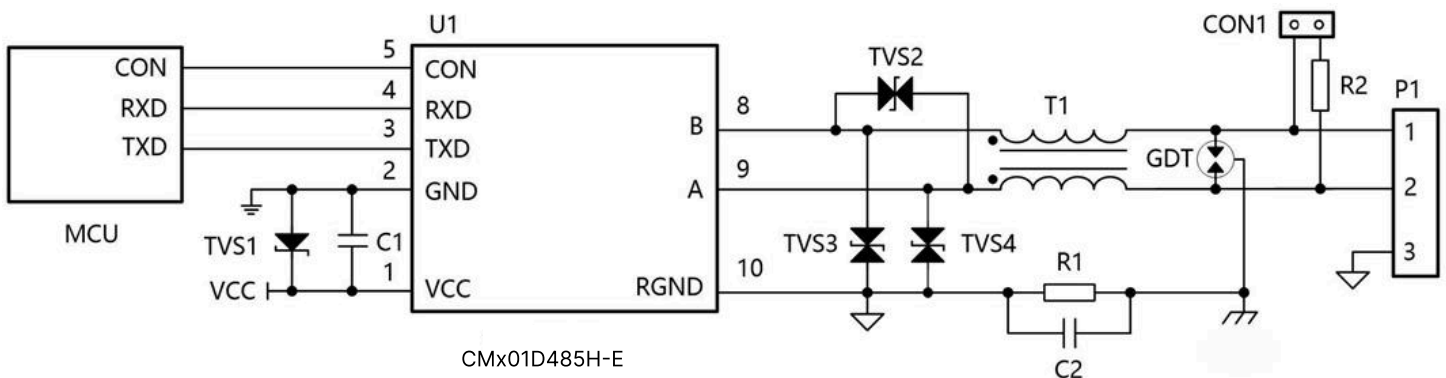


Figure 5. EMC Recommended Circuit

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.

Components	Models	Components	Models
C1	10 $\mu$ F, 25V	TVS1	SMBJ5.0A
C2	102, 2KV, 1206	TVS2	SMBJ12CA
GDT	3RL090M-5-S	TVS3, TVS4	SMBJ6.5CA
R1	1M $\Omega$ , 1206	T1	B82793S0513N201
R2	120 $\Omega$ , 1206	U1	CMx01D485H-E Module

Table 1. EMC Recommended Parameters

## PRODUCT USAGE NOTES

### 1. MCU IO Level Matching

The TXD, RXD, and CON pin interface levels of the CM501D485H-E are 5V and do not support 3.3V system logic. The TXD, RXD, and CON pin interface levels of the CM301D485H-E are 3.3V and do not support 5V system logic.

### 2. RS485 A-B Bus Level Threshold Description

From the truth table characteristics, when the A/B line differential voltage is  $\geq -10\text{mV}$ , the module receive level is high; when the A/B line differential voltage is  $\leq -200\text{mV}$ , the module receive level is low; when the A/B line differential voltage is between  $-200\text{mV}$  and  $-10\text{mV}$ , the module receive level is indeterminate. Design must ensure the module does not operate in this indeterminate state. Therefore, when designing or applying an RS-485 network, users must decide whether to add a 120 $\Omega$  termination resistor based on actual conditions. The principle is: regardless of whether the RS-485 network is static or dynamic, the A/B line differential voltage must not fall between  $-200\text{mV}$  and  $-10\text{mV}$ ; otherwise, communication errors may occur.

### 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

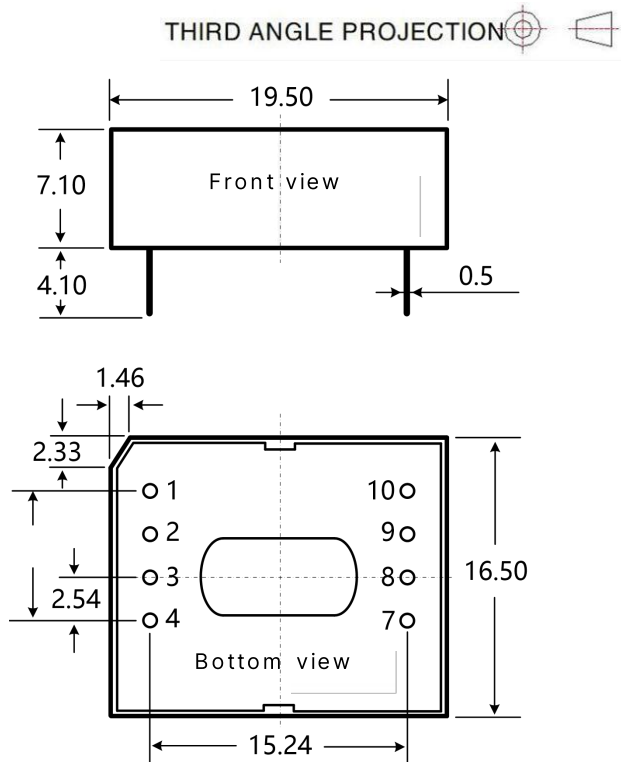
Pins 6 and 7 are not brought out. If pin 10 is not used, leave it floating.

### 5. Module Pin Description

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. 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.

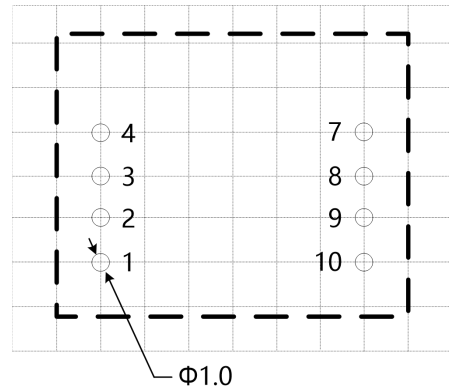
**OVERALL DIMENSIONS AND PIN FUNCTIONS**

**1. Appearance Dimension Drawing**



Note: Unit: mm  
diameter tolerance:  $\pm 0.10$   
Unmarked tolerance:  $\pm 0.25$

**4.2 Recommended Layout Drawing**



Note: Grid spacing 2.54x2.54mm

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

Table 1: Pin Function Table