



钛迪半导体  
Tudi Semiconductor

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## Product Specification

TUDI-ADM483

5 V Low Power, Slew-Rate Limited RS-485/RS-422 Transceiver

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## Features

- Meets EIA RS-485/RS-422 standards
- Data rates up to 250 kbps
- Low EMI slew limiting
- Low power supply current in shutdown mode
- Low power dissipation
- Up to 32 drivers on one bus disabled or powered off to high Z outputs
- – 7 V to 12 V bus common mode range
- Hot and short circuit protection
- Specified for -40°C to 85°C temperature range

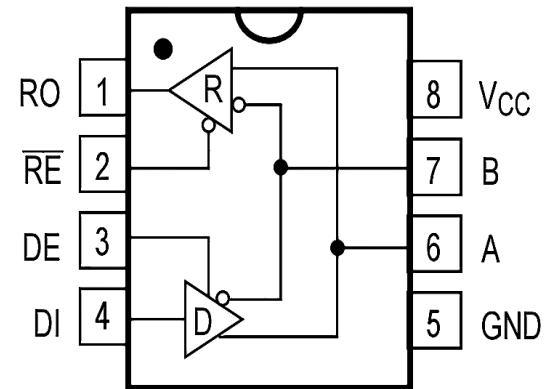


Figure 1. Pin Diagram

## Description

The ADM483 is a low power differential line transceiver suitable for half-duplex data communication on multipoint bus transmission lines. It is designed for balanced data transmission, and complies with EIA Standards RS-485 and RS-422. The part contains a differential line driver and a differential line receiver. Both share the same differential pins, with either the driver or the receiver being enabled at any given time. The device has an input impedance of 12 kΩ, allowing up to 32 transceivers on one bus. Since only one driver should be enabled at any time, the output of a disabled or powered-down driver is three-stated to avoid overloading the bus. This high impedance driver output is maintained over the entire common-mode voltage range from – 7 V to +12 V. The receiver contains a fail-safe feature that results in a logic high output state if the inputs are unconnected (floating). The driver outputs are slew-rate limited to reduce EMI and data errors caused by reflections from improperly terminated buses. Excessive power dissipation caused by bus contention or by output shorting is prevented by a thermal shutdown circuit. The part is fully specified over the industrial temperature range, and is available in an 8-lead SOIC and DIP package.

## Applications

- Low power RS-485 applications
- EMI sensitive systems
- DTE-DCE interfaces
- Industrial control
- Packet switching
- Local area networks
- Level translators



## Pin description

| Pin Number | Pin Name | FUNCTION  |
|------------|----------|---|
| 1          | RO       | Receiver Output. When enabled, if $A-B \geq -10mV$ , then $RO=high$ . If $A-B \leq -200 mV$ , then $RO=low$   |
| 2          | /RE      | Receiver Output Enable. A low level enables the RO; a high level places it in a high impedance state.   |
| 3          | DE       | Driver Output Enable. A high level enables the driver differential outputs, Pin A and Pin B; a low level places the driver in a high impedance state. |
| 4          | DI       | Driver Input. When the driver is enabled, a logic low on DI forces Pin A low and Pin B high; a logic high on DI forces Pin A high and Pin B low.      |
| 5          | GND      | Ground Connection (0V).   |
| 6          | A        | No inverting Receiver Input A/Driver Output A   |
| 7          | B        | Inverting Receiver Input B/Driver Output B.   |
| 8          | VCC      | Power Supply  |

## Parameter limit

| PARAMETER                      | Symbol          | Value        | Unit |
|--------------------------------|-----------------|--------------|------|
| CTR Port                       | /RE,DE,DI       | -0.3~VCC+0.3 | V    |
| Driver Output Voltage          | A、B             | -7~13        | V    |
| Receiver Output Voltage        | RO              | -0.3~VCC+0.3 | V    |
| Supply Voltage                 | VCC             | +7           | V    |
| Continuous Power Dissipation   | MSOP8.SOP8.DIP8 | 830          | mW   |
| Soldering Temperature (reflow) |                 | 300          | °C   |
| Storage Temperature Range      |                 | -60~150      | °C   |
| Temperature Range              |                 | -40~85       | °C   |

Stresses beyond those listed under "Parameter limit" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability



| PARAMETER                                    | SYMBOL  | CONDITIONS  | MIN | TYP | MAX      | UNITS |
|--|---------|---|-----|-----|----------|-------|
| SWITCHING CHARACTERISTICS OF RECEIVER        |         |   |     |     |          |       |
| Receiver Enable to Output Low                | tRZL    | CL=100 pF,<br>S1closed  |     | 20  | 50       | ns    |
| Receiver Enable to Output High               | tRZH    | CL=100 pF,<br>S2 closed   |     | 20  | 50       | ns    |
| Receiver Disable Time from Low               | tRLZ    | CL=100 pF,  |     | 20  | 50       | ns    |
| Receiver Disable Time from High              | tRHZ    | CL=100pF,<br>S2 closed  |     | 20  | 50       | ns    |
| Receiver Propagation Delay (low to high)     | tRPLH   | Fig 7 and 8<br>VD $\geq$ 2.0V;<br>Rise and fall time<br>VID $\leq$ 15ns |     | 50  | 200      | ns    |
| Receiver Propagation Delay (high to low)     | tRPHL   |   |     | 50  | 200      | ns    |
| tRPLH-tRPHL                                  | tsKEW2  |   |     | 13  | 15       | ns    |
| SWITCHING CHARACTERISTICS OF DRIVER          |         |   |     |     |          |       |
| Driver Enable to Output High                 | tDzH    | CL=100 pF,<br>S1 closed<br>(Fig 5,6)                                    |     |     | 70       | ns    |
| Driver Enable to Output Low                  | tDzL    |   |     |     | 70       | ns    |
| Driver Disable Time from Low                 | tDLz    | CL=15 pF,<br>S2 closed<br>(Fig 5,6)                                     |     |     | 70       | ns    |
| Driver Disable Time from High                | tDHZ    |   |     |     | 70       | ns    |
| Driver Propagation Delay(low to high)        | tDPLH   | RDIFF=54Ω,<br>CL <sub>i</sub> =CL <sub>2</sub> =100pF<br>(Fig 3,4)      |     | 60  |          | ns    |
| Driver Propagation Delay (high to low)       | tDPHL   |   |     | 60  |          | ns    |
| tDPLH-tDPHL                                  | tsKEW1  |   |     | 5   | $\pm$ 10 | ns    |
| Driver Differential Output Rise or Fall Time | tDR,tDF |   |     | 40  |          | ns    |



| PARAMETER                                 | SYMBOL           | CONDITIONS                             | MIN  | TYP | MAX | UNITS |
|---|------------------|--|------|-----|-----|-------|
| SUPPLY CURRENT                            |                  |  |      |     |     |       |
| Supply Current                            | I <sub>cc1</sub> | /RE=0V or VCC,<br>DE=0V                |      | 200 | 500 | uA    |
|   | I <sub>cc2</sub> | /RE=VCC,<br>DE=VCC                     |      | 300 | 600 | uA    |
|   | I <sub>cc3</sub> | /RE=0,<br>DE=VCC                       |      | 0.5 | 10  | uA    |
| DC ELECTRICAL CHARACTERISTICS OF RECEIVER |                  |  |      |     |     |       |
| Receiver Input Resistance                 | R <sub>N</sub>   | -7V≤V <sub>cM</sub> ≤12V               | 12   |     |     | kΩ    |
| Receiver Output Short-Circuit             | I <sub>osR</sub> | 0V≤V <sub>o</sub> ≤VCC                 | ±7   |     | ±95 | mA    |
| RO Output-Low Voltage                     | V <sub>oL</sub>  | I <sub>oUT</sub> =+4mA,<br>VID=-200 mV |      |     | 0.4 | V     |
| Three-State Output Current at Receiver    | I <sub>ozR</sub> | 0.4V<V <sub>o</sub> <2.4V              |      |     | ±1  | uA    |
| Receiver Input Hysteresis                 | V <sub>hys</sub> | -7V≤V <sub>cM</sub> ≤12V               |      | 30  |     | mV    |
| RO Output-High Voltage                    | V <sub>oH</sub>  | I <sub>oUT</sub> =-4mA,<br>VID=+200 mV | 3.5  |     |     | V     |
| Positive-going input threshold voltage    | V <sub>IT+</sub> | -7V≤V <sub>cM</sub> ≤12V               |      |     | -10 | mV    |
| Negative-going input threshold voltage    | V <sub>IT-</sub> | -7V≤V <sub>cM</sub> ≤12V               | -200 |     |     | mV    |
| Input Current(A,B)                        | IN2              | DE=0V,<br>VCC=0 or 5V                  |      |     | 1.0 | mA    |
|   |                  | DE=0V,<br>VCC=0 or 5V                  | 0.8  |     |     | mA    |

NOTE

If no special situation occurs , VCC=5V±5% ,Temp=T<sup>MIN</sup>~T<sup>MAX</sup> , typically VCC=+5V , Temp = 25



| PARAMETER  | SYMBOL | CONDITIONS      | MIN  | TYP | MAX | UNITS |
|--|--------|-----------------|------|-----|-----|-------|
| DC ELECTRICAL CHARACTERISTICS OF DRIVER                    |        |                 |      |     |     |       |
| Input High Voltage   | VH     | DE,DI,/RE       | 2.0  |     |     | V     |
| Input Low Voltage  | Vn     | DE,DI,/RE       |      |     | 0.8 | V     |
| Input Current (RE,DI,/RE)                                  | IN1    | DE,DI,/RE       | -2   |     | 2   | uA    |
| Thermal-Shutdown Threshold                                 |        |                 |      | 150 |     | °C    |
| Thermal-Shutdown Hysteresis                                |        |                 |      | 20  |     | °C    |
| Differential Driver Output(no load)                        | VoD1   |                 |      | 5   |     | V     |
| Differential Driver Output                                 | VoD2   | Fig 2,RL=27Ω    | 1.5  |     | VCC | V     |
|  |        | Fig 2,RL=50     | 2    |     | VCC |       |
| Change in Magnitude of Differential Output Voltage (NOTE1) | ΔVoD   | Fig 2,RL=27Ω    |      |     | 0.2 | V     |
| Driver Common-Mode Output Voltage                          | Voc    | Fig 2,RL=27Ω    |      |     | 3   | V     |
| Change In Magnitude of Common-Mode Voltage (NOTE1)         | ΔVoc   | Fig 2,RL=27Ω    |      |     | 0.2 | V     |
| Driver Short-Circuit Output Current (short to high)        | IosD1  | Short to 0V~12V | 35   |     | 250 | mA    |
| Driver Short-Circuit Output Current (short to low)         | IosD2  | Short to -7V~0V | -250 |     | -35 | mA    |

## TEST CIRCUIT

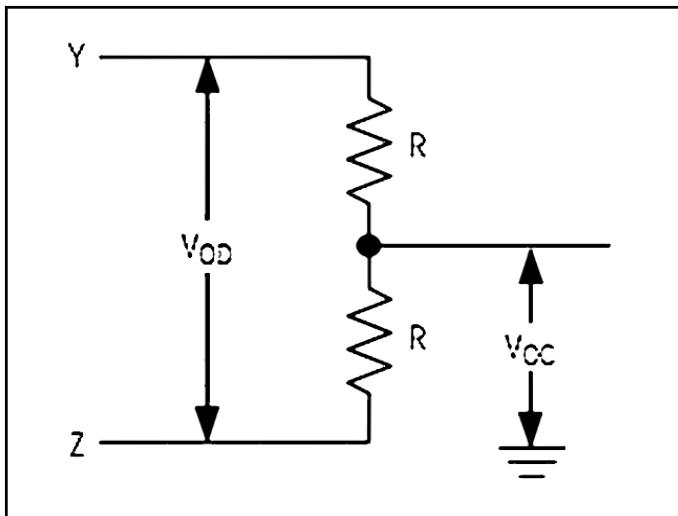


Fig 2 Driver DC Test Load

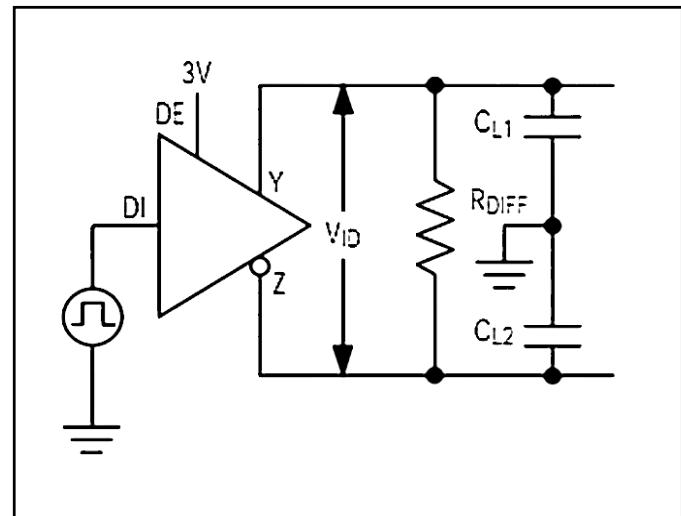


Fig 3 Driver Timing Test Circuit

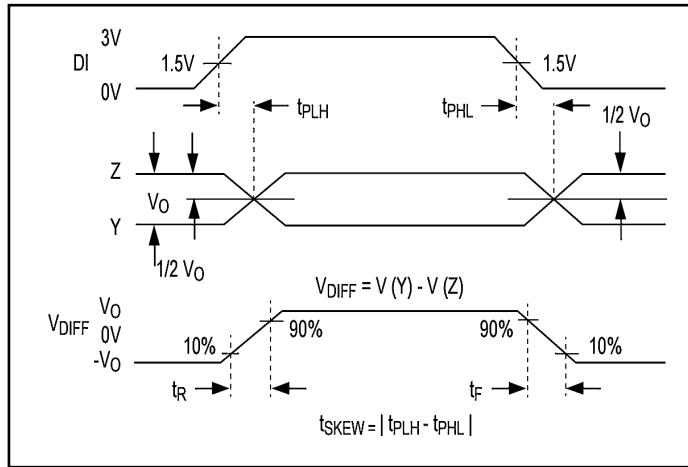


Fig 4 Driver Propagation Delays

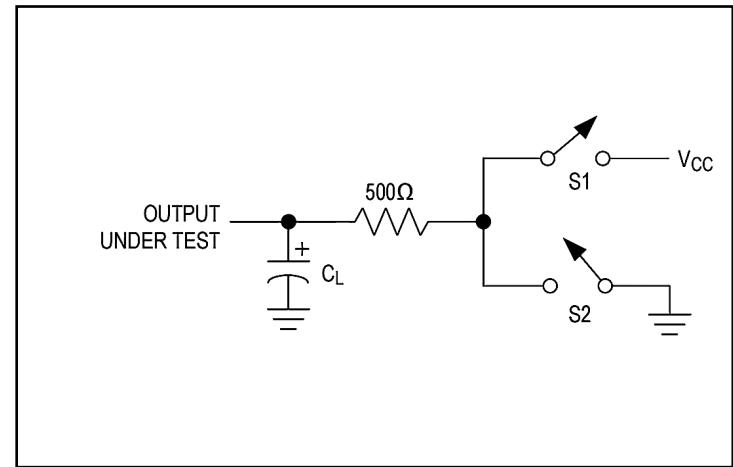


Fig 5 Driver Enable/Disable Timing Test Load

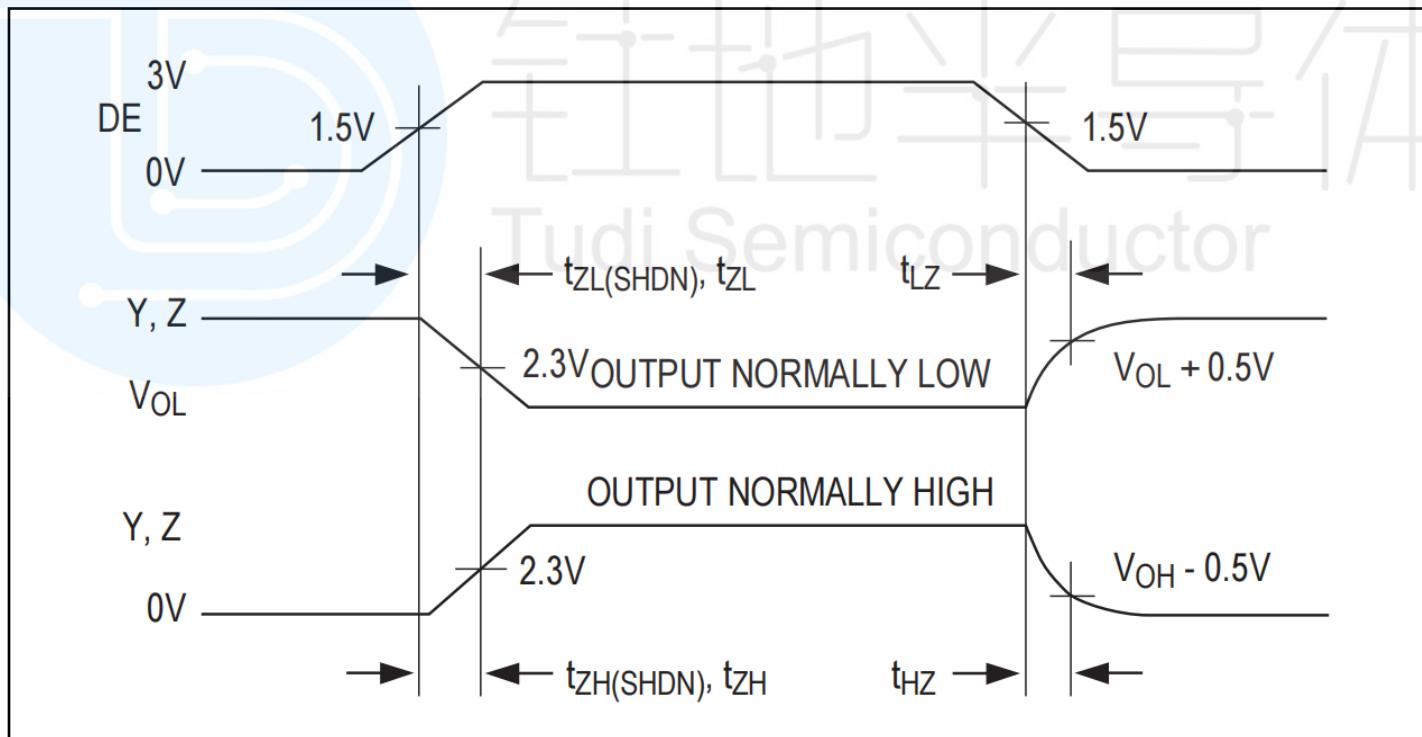


Fig 6 Driver Enable and Disable Times

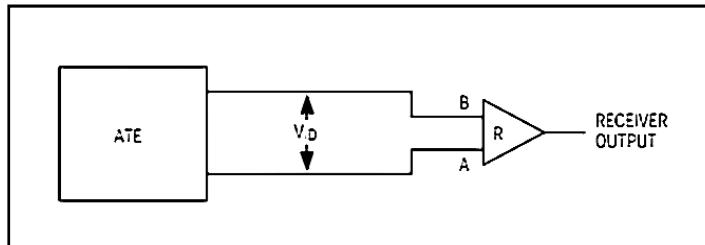


Fig 7 Receiver Propagation Delay Test Circuit

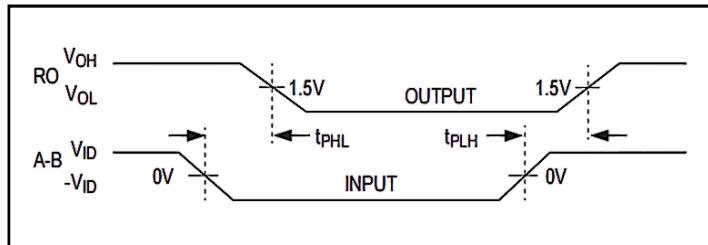


Fig 8 Receiver Propagation Delays

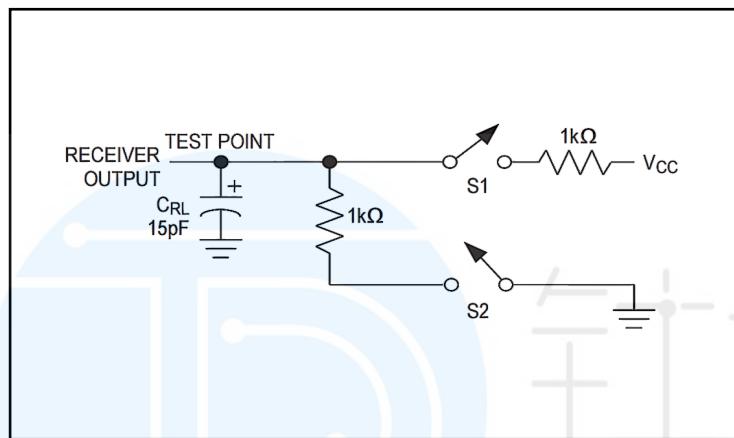


Fig 9 Receiver Enable/Disable Timing Test Load

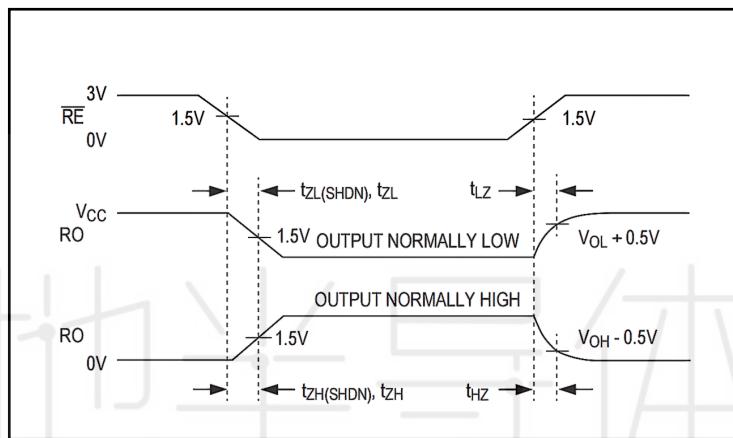


Fig 10 Receiver Enable and Disable Times

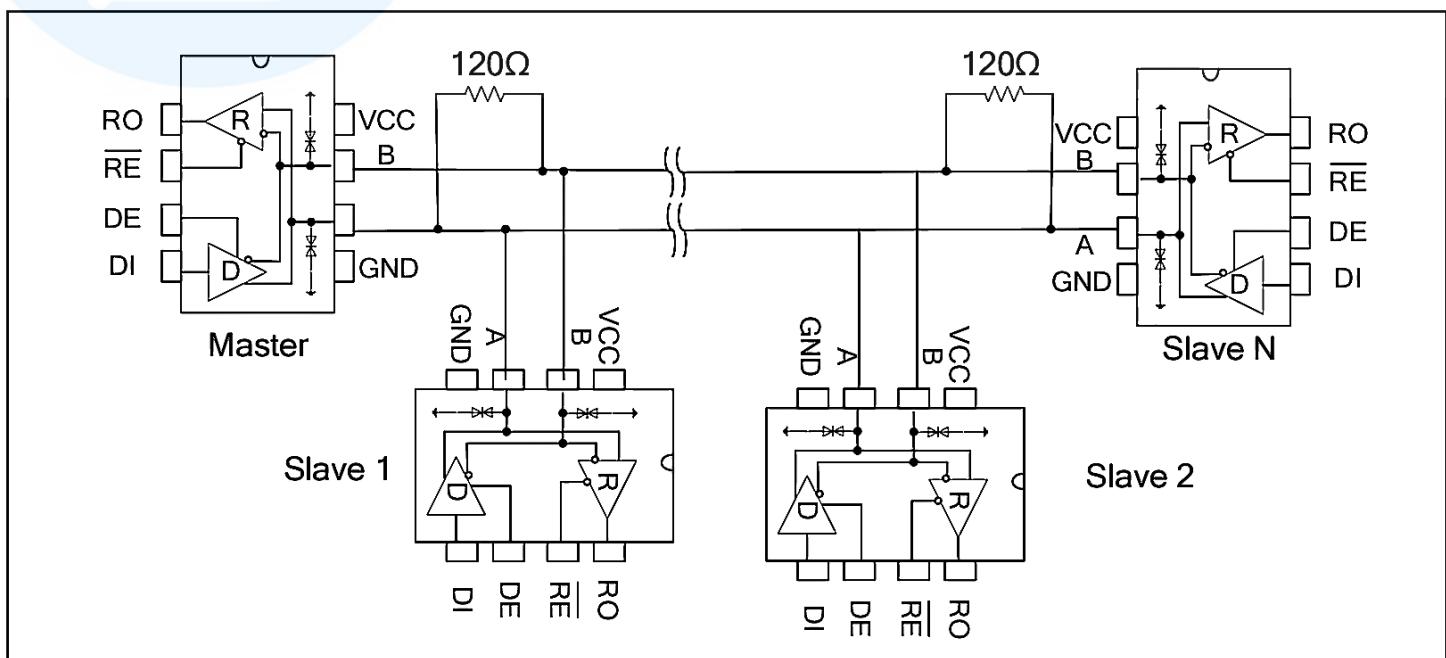


Fig 11 Backbone cable type RS45 communications network

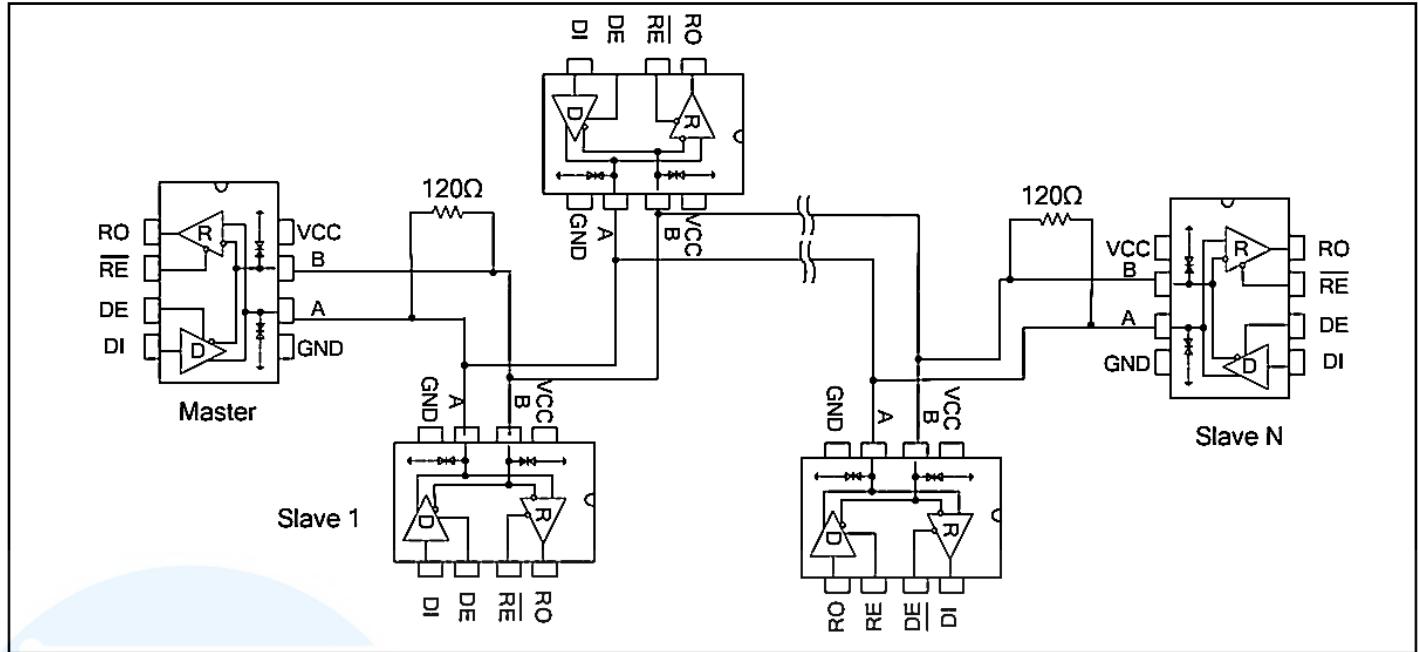


Fig12 Daisy chain topology type RS485 communications network

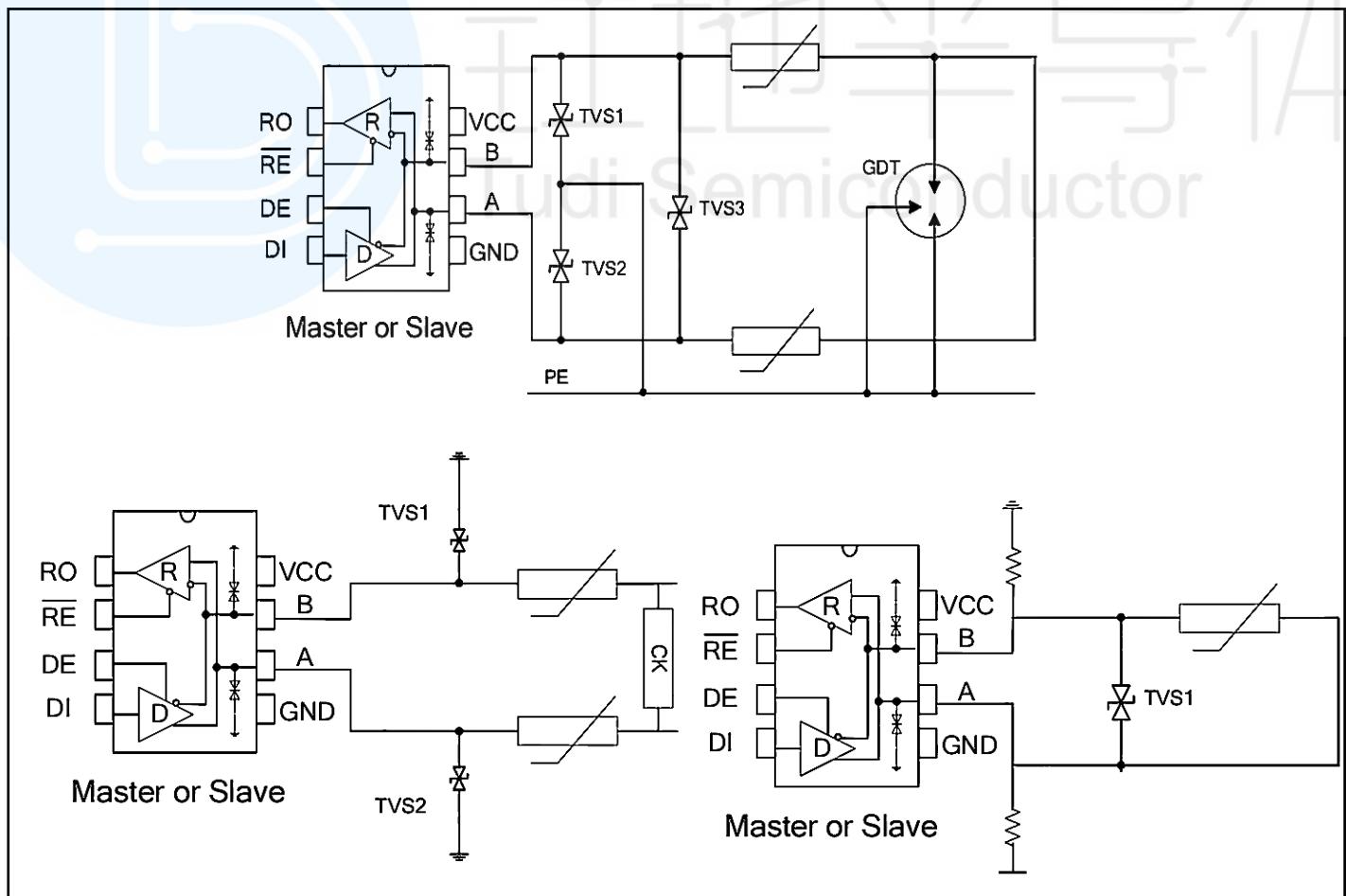


Fig13 RS485 bus ports Protection configuration



## Additional description

### Description

483, including a driver and a receiver, is a half-duplex high-speed transceivers for RS485 / RS-422 communications. 483 features fail-safe, overvoltage protection, overcurrent protection, thermal protection, and allows / RE, DE hot-swappable. The 483 allows an error-free data transmission up to 250kbps.

### Typical Application

Backbone cable type: 483 transceiver is designed for multi-point bi-directional data communication bus transmission lines. Figure 11 shows a typical network application circuit. These devices can also be used as a cable longer than 4,000 feet of line repeater, to reduce the reflection, the transmission line should be in its ends terminated in its characteristic impedance, and stub lengths off the main line should be as short as possible. Hand in hand type: Also known as daisy chain topology, is the prior RS485 bus topology recommended by the TIA organization. The routing method is the master device and a number of slave devices connected in hand-handle configuration, as shown in Figure 12. It should be noted at that hand in handle means no branch line. This kind of topology has the advantages of small reflection and high rate of success communication. The bus port protection : In harsh environments, RS485 communication ports are usually done with static protection, lightning surge protection, and other additional protection, even prepared to prevent 380V electricity access by mistake. To avoid the destruction of intelligent instruments and industrial control host, figure 13 demonstrates three general kinds of RS485 bus port protection configuration.

### Connecting 32 Transceivers on one Bus

The standard 483 receiver input impedance is guaranteed  $>12k\Omega$ , the standard driver can drive up to 32 unit loads. These devices can be any combination, or in combination with other RS485 transceiver combination, as long as the total load does not load more than 32 units, can be connected on the same bus.

### Drive Output Protection

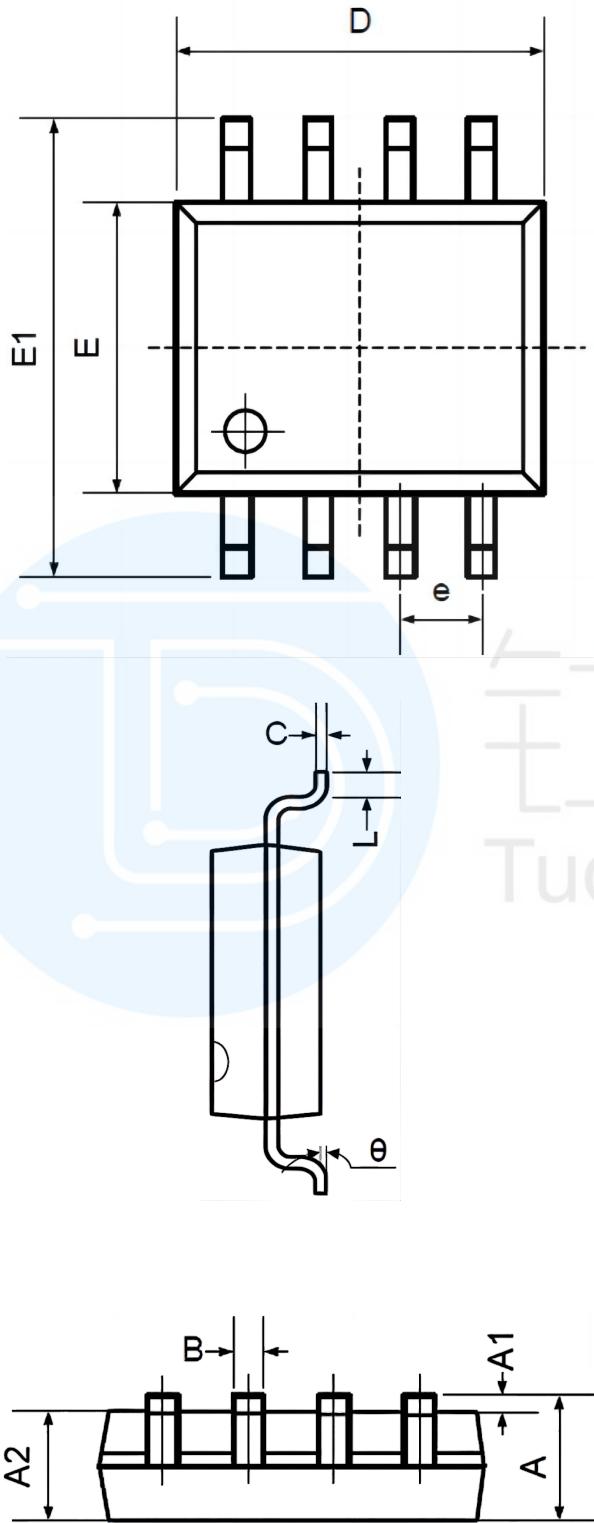
Through two mechanisms to avoid failure or a bus contention causes power consumption is too high. First, in the entire common Mode voltage range, overcurrent protection circuit provides a fast short protection. Second, when the die temperature exceeds  $150^{\circ}\text{C}$ , driver output is forced into a high impedance state by the thermal shutdown circuit.

### Fail Safe

When the receiver inputs are shorted or open, or when they are connected to a terminated transmission line with all drivers disabled, 483 guarantees a logic-high receiver output. This is done by the receiver input thresholds are set between  $-10\text{mV}$  and  $-200\text{mV}$ . If the differential receiver input voltage  $(A-B) \geq -10\text{mV}$ , RO is logic high; if the voltage  $(A-B) \leq -200\text{mV}$ , RO is logic low. When attached to the terminal all transmitters on the bus are disabled, the receiver differential input voltage is pulled to  $0\text{V}$  by the termination resistor. With the receiver threshold of the 483, this results in a logic-high with a  $10\text{mV}$  minimum noise margin. The  $-10\text{mV}$  to  $-200\text{mV}$  threshold complies with the  $\pm 200\text{mV}$  EIA/TIA-485 standard.



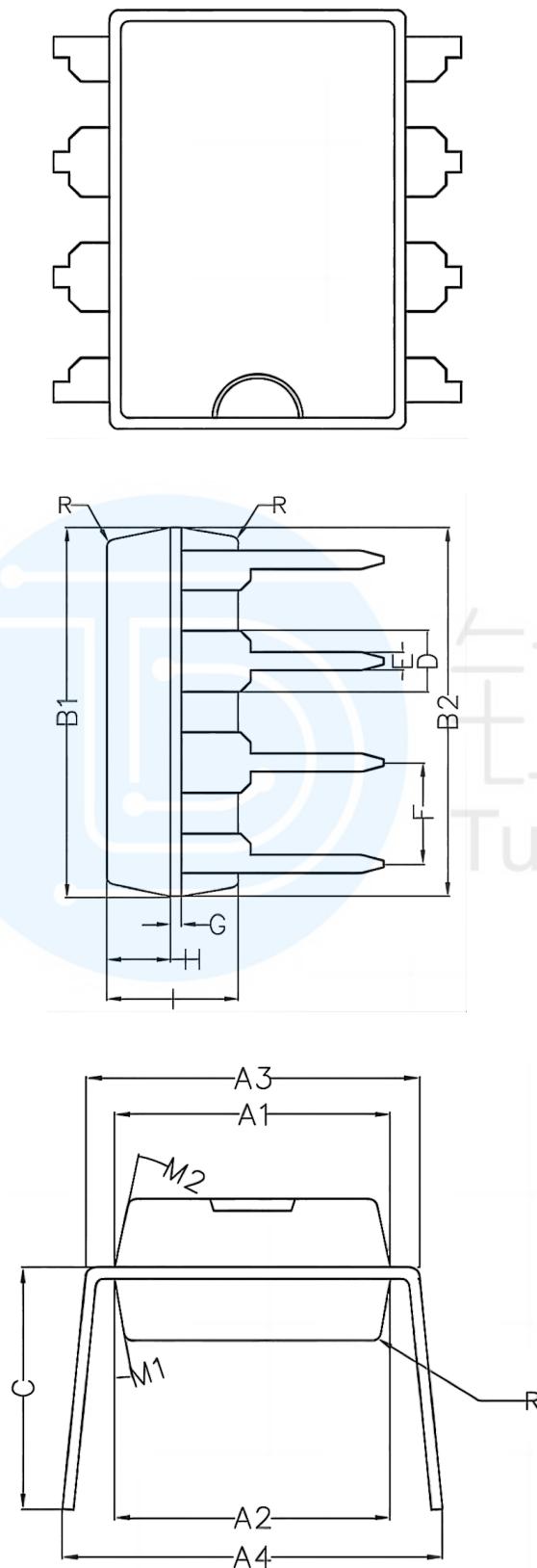
## Package SOP8



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| B      | 0.330                     | 0.510 | 0.013                | 0.020 |
| C      | 0.190                     | 0.250 | 0.007                | 0.010 |
| D      | 4.780                     | 5.000 | 0.188                | 0.197 |
| E      | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1     | 5.800                     | 6.300 | 0.228                | 0.248 |
| e      | 1.270TYP                  |       | 0.050TYP             |       |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |



## Package DIP8



| Symbol | Min  | Non  | Max  |
|--------|------|------|------|
| A1     | 6.28 | 6.33 | 6.38 |
| A2     | 6.33 | 6.38 | 6.43 |
| A3     | 7.52 | 7.62 | 7.72 |
| A4     | 7.80 | 8.40 | 9.00 |
| B1     | 9.15 | 9.20 | 9.25 |
| B2     | 9.20 | 9.25 | 9.30 |
| C      |      | 5.57 |      |
| D      |      | 1.52 |      |
| E      | 0.43 | 0.45 | 0.47 |
| F      |      | 2.54 |      |
| G      |      | 0.25 |      |
| H      | 1.54 | 1.59 | 1.64 |
| 工      | 3.22 | 3.27 | 3.32 |
| R      |      | 0.20 |      |
| M1     | 9°   | 10°  | 11°  |
| M2     | 11°  | 12°  | 13°  |



## Order information

| Order Number        | Package | Package Quantity      | Marking<br>On The park | Temperature    |
|---------------------|---------|-----------------------|------------------------|----------------|
| ADM483JRZ-REEL-TUDI | SOP8    | Tape,Reel,2500        | ADM483JRZ              | 0°C to 70°C    |
| ADM483JNZ-TUDI      | DIP8    | Tube,50,A box of 2000 | ADM483JNZ              |                |
| ADM483ARZ-REEL-TUDI | SOP8    | Tape,Reel,2500        | ADM483ARZ              | - 40°C to 85°C |
| ADM483ANZ-TUDI      | DIP8    | Tube,50,A box of 2000 | ADM483ANZ              |                |



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