



钜地半导体  
Tudi Semiconductor

## Product Specification

TUDI-SNx5HVD184

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers

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## FEATURES

- Thermal shutdown protection ;
- Low-Current Shutdown Mode ;
- True Fail-Safe Receiver ;
- Excellent noise immunity ;
- 2.5Mbps in Electrically Noisy Environments ;
- Hot-Swap Input Structures on DE and /RE ;
- 5V Power Supply, Half-duplex ;
- allows up to 32 transceivers on the bus ;
- Short-circuit protection ;

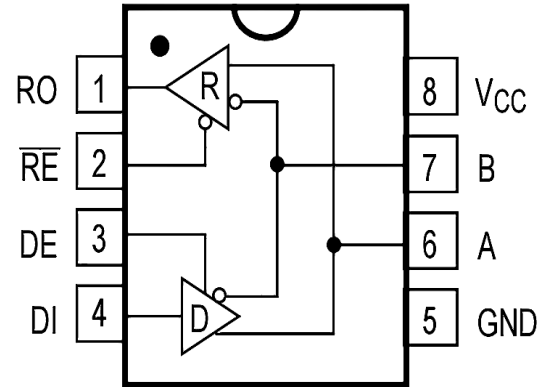


Figure 1. Pin Diagram

## Description

LBC184 operates under the supply voltage of 4.75V to 5.25V, LBC184 is a true fail-safe transceiver. LBC184 also has the function of thermal shutdown protection, current limiting protection, overvoltage protection. DE and /RE control port input features such as hot-swappable. LBC184 allows up to 32 transceivers on the bus, The LBC184 features reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 2.5Mbps. LBC184 is a 5V power supply, half-duplex, low power, high speed RS LBC184/RS422 Transceiver. LBC184 Fully meets the TIA/EIA- LBC184 standard. LBC184 includes a driver and a receiver, both of which can be independently enabled and disabled. When both are disabled, the driver and receiver outputs are high-impedance state.

## FUNCTION TABLES

| TRANSMITTING |     |   |   |   |   | RECEIVING           |                      |              |   |
|--------------|-----|---|---|---|---|---------------------|----------------------|--------------|---|
| CTR          | /RE | X | X | 0 | 1 | 0                   | 0                    | 0            | 1 |
|              | DE  | 1 | 1 | 0 | 0 | X                   | X                    | X            | X |
| INPUTS       | DI  | 1 | 0 | X | X |                     |                      |              |   |
|              | A-B |   |   |   |   | $\geq -10\text{mV}$ | $\leq -200\text{mV}$ | Open/shorted | X |
| OUTPUTS      | A   | H | L | Z |   |                     |                      |              |   |
|              | B   | L | H | Z |   |                     |                      |              |   |
|              | RO  |   |   |   |   | H                   | L                    | H            | Z |

X: Don't care; Z: high impedance.



## Pin description

| Pin Number | Pin Name | FUNCTION                                                                                                                                           |
|------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | RO       | Receiver Output.When enabled,ifA-B $\geq$ -10mV,then RO=high.IfA-B $\leq$ -200 mV,then RO=low                                                      |
| 2          | /RE      | Receiver Output Enable.Alow 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 PinA 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≥2.0V;<br><br>Rise and fall time<br>VID≤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>CLi=CL₂=100pF<br>(Fig 3,4)                      |     | 60  |     | ns    |
| Driver Propagation Delay (high to low)       | tDPHL   |                                                               |     | 60  |     | ns    |
| tDPLH-tDPHL                                  | tsKEW1  |                                                               |     | 5   | ±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>V <sub>ID</sub> =-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>V <sub>ID</sub> =+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)                        | I <sub>N2</sub>  | 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<br>(RE,DI,/RE)                                  | IN1               | DE,DI,/RE       | -2   |     | 2   | uA    |
| Thermal-Shutdown<br>Threshold                                 |                   |                 |      | 150 |     | °C    |
| Thermal-Shutdown<br>Hysteresis                                |                   |                 |      | 20  |     | °C    |
| Differential Driver<br>Output(no load)                        | VoD1              |                 |      | 5   |     | V     |
| Differential Driver<br>Output                                 | VoD2              | Fig 2,RL=27Ω    | 1.5  |     | VCC | V     |
|                                                               |                   | Fig 2,RL=50     | 2    |     | VCC |       |
| Change in Magnitude of Differential<br>Output Voltage (NOTE1) | ΔVoD              | Fig 2,RL=27Ω    |      |     | 0.2 | V     |
| Driver Common-Mode<br>Output Voltage                          | Voc               | Fig 2,RL=27Ω    |      |     | 3   | V     |
| Change In Magnitude of Common-<br>Mode Voltage (NOTE1)        | ΔVoc              | Fig 2,RL=27Ω    |      |     | 0.2 | V     |
| Driver Short-Circuit Output Current<br>(short to high)        | IosD <sub>1</sub> | Short to 0V~12V | 35   |     | 250 | mA    |
| Driver Short-Circuit Output Current<br>(short to low)         | IosD <sub>2</sub> | Short to -7V~0V | -250 |     | -35 | mA    |

## TEST CIRCUIT

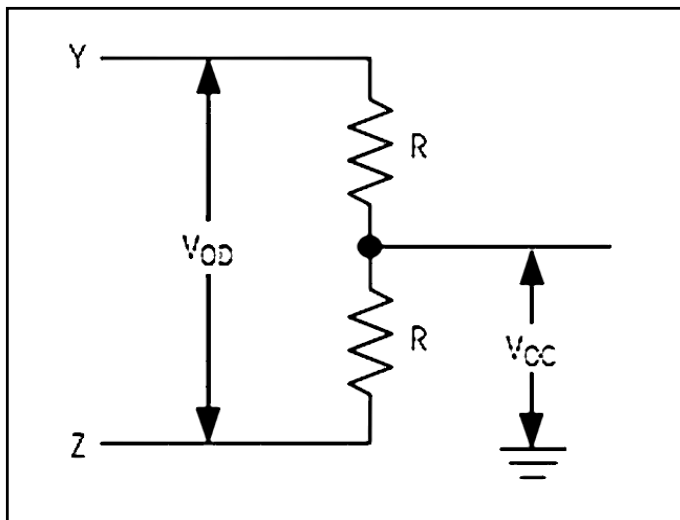


Fig 2 Driver DC Test Load

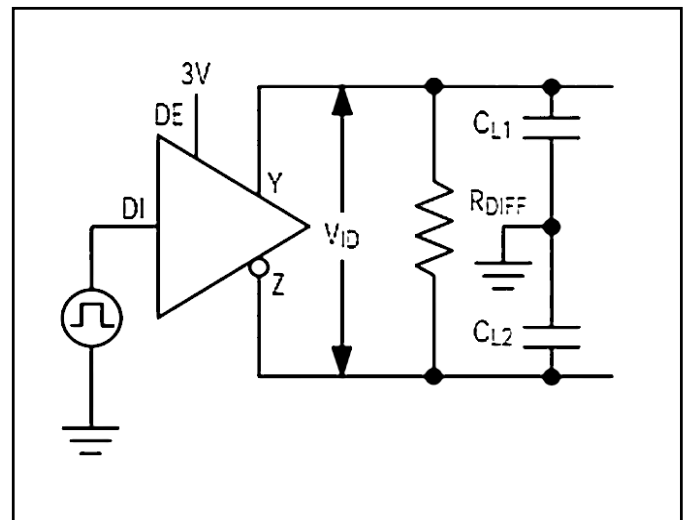


Fig 3 Driver Timing Test Circuit

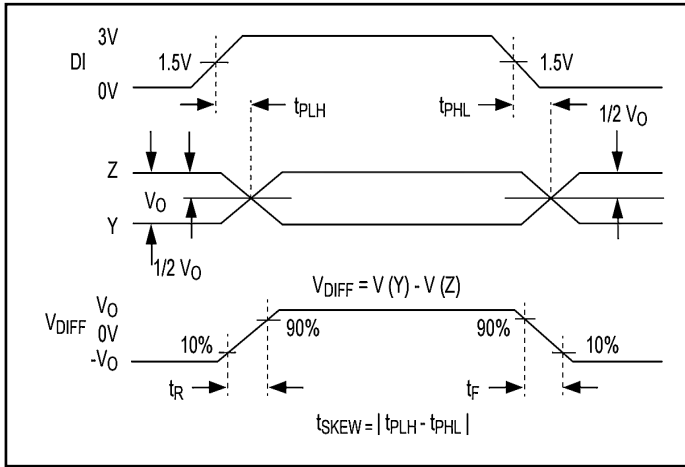


Fig 4 Driver Propagation Delays

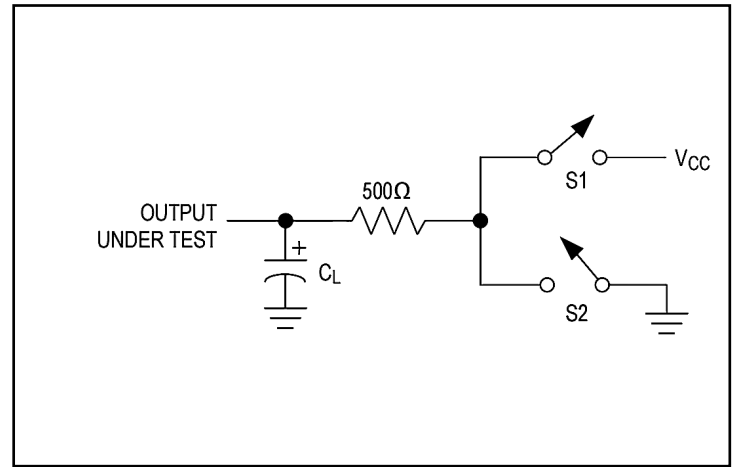


Fig 5 Driver Enable/Disable Timing Test Load

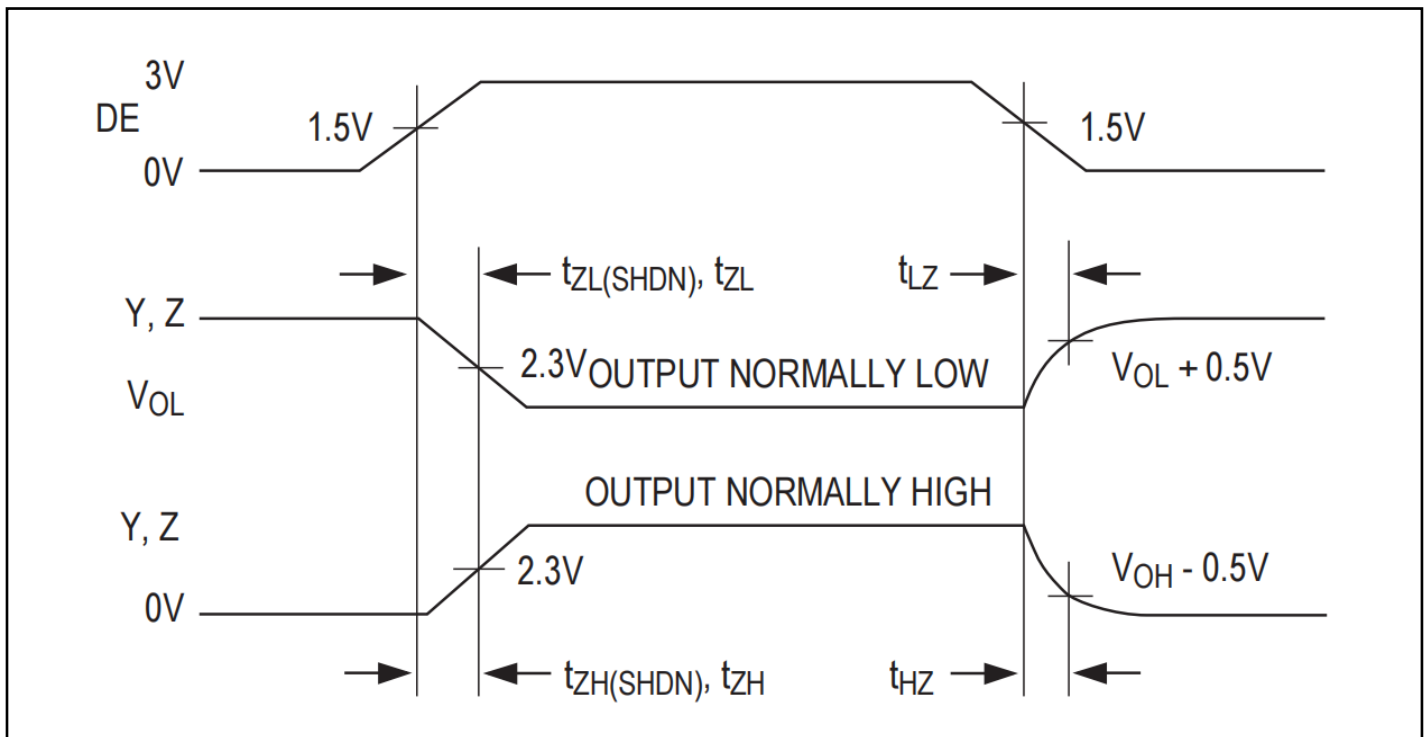


Fig 6 Driver Enable and Disable Times

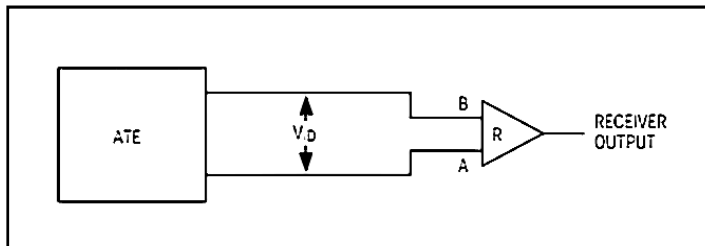


Fig 7 Receiver Propagation Delay Test Circuit

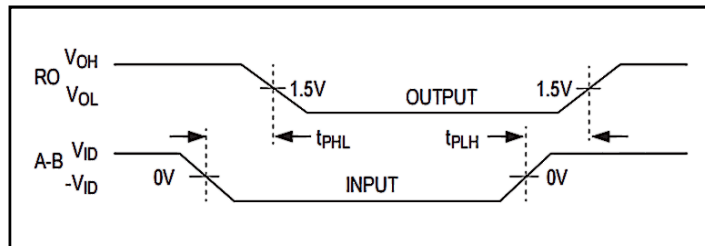


Fig 8 Receiver Propagation Delays

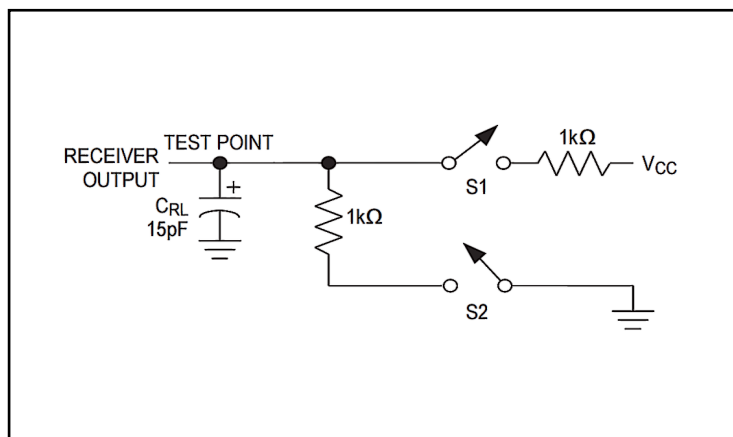


Fig 9 Receiver Enable/Disable Timing Test Load

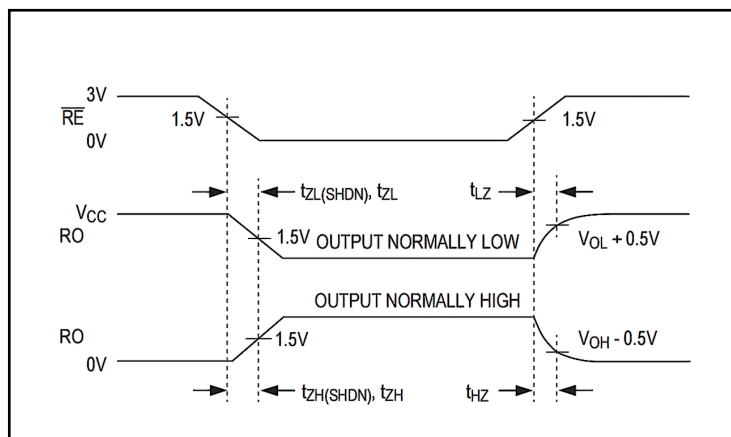


Fig 10 Receiver Enable and Disable Times

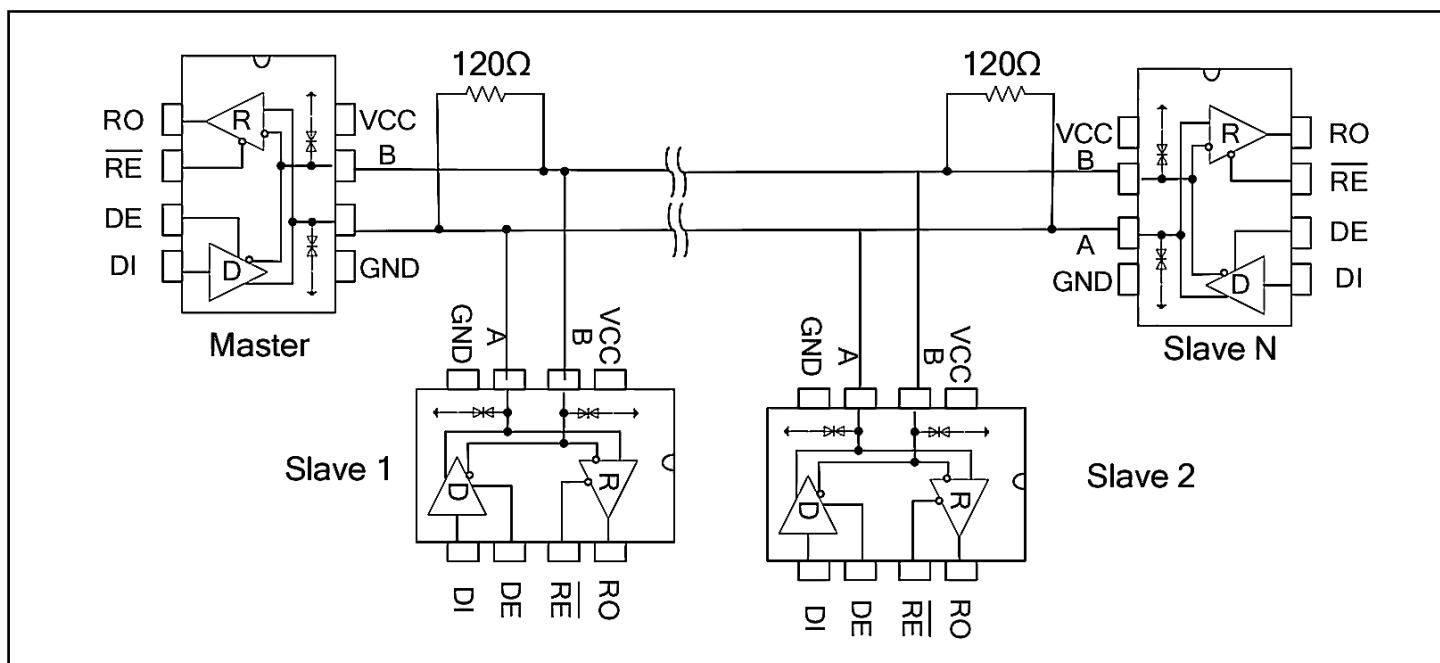


Fig11 Backbone cable type RS485 communications network

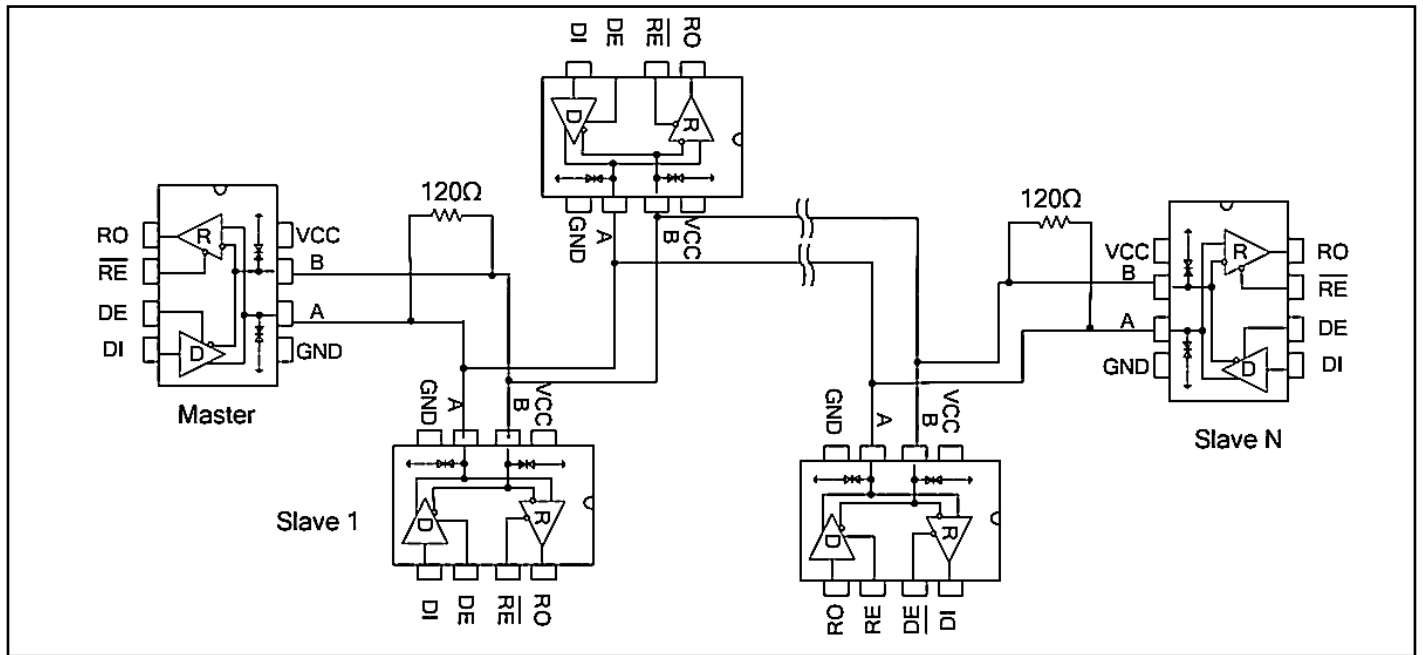


Fig12 Daisy chain topology type RS485 communications network

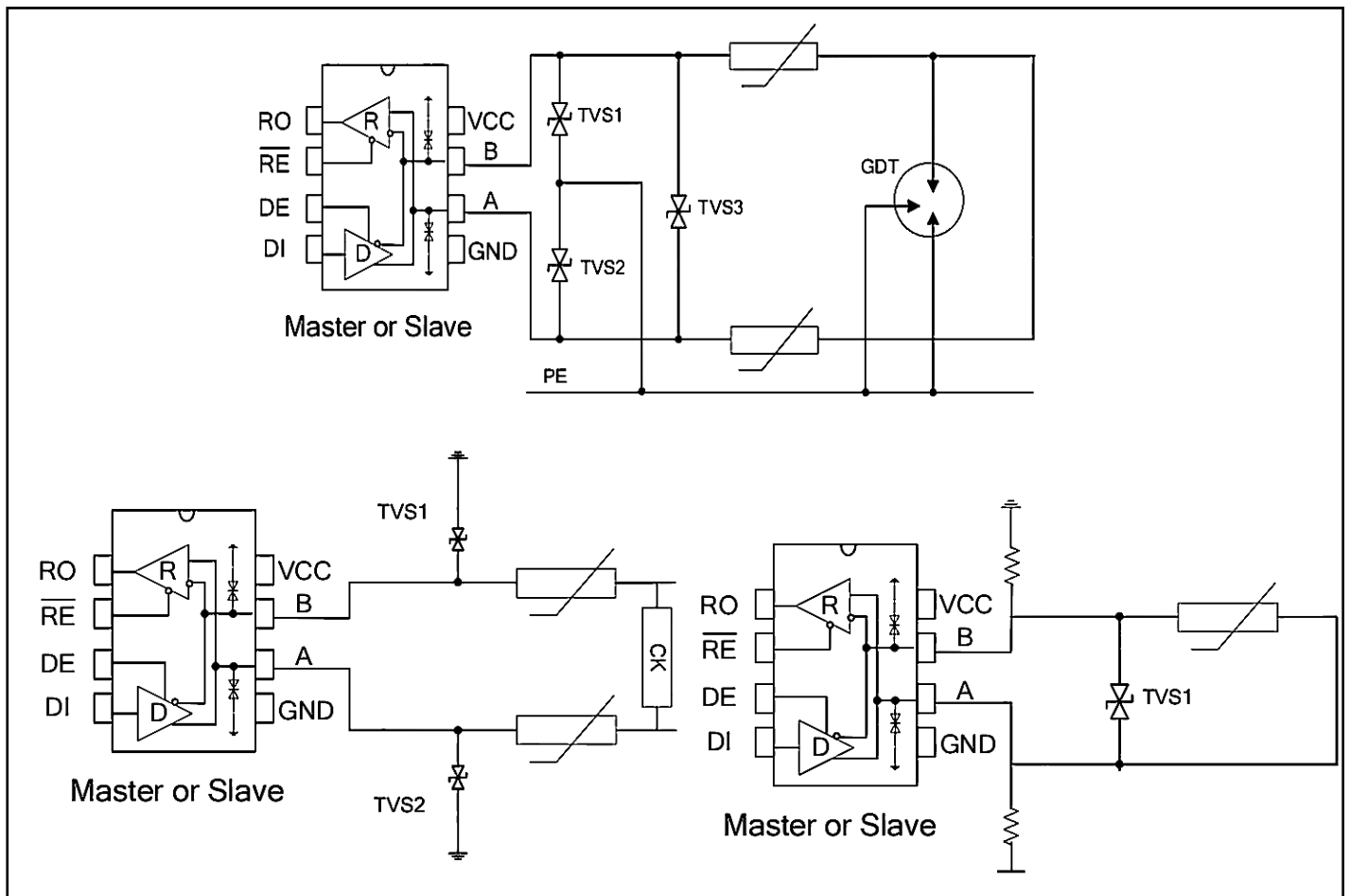
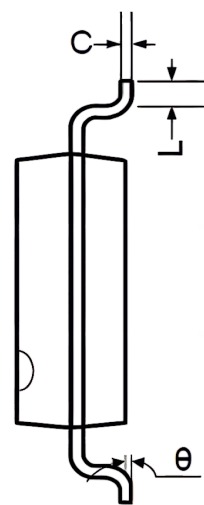
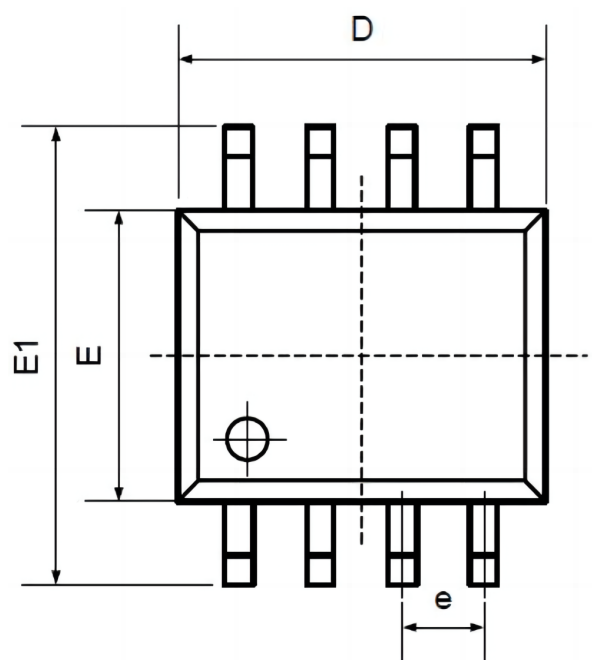


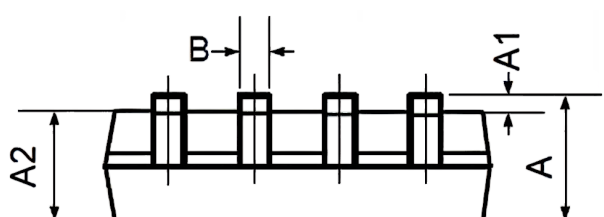
Fig13 RS485 bus ports Protection configuration



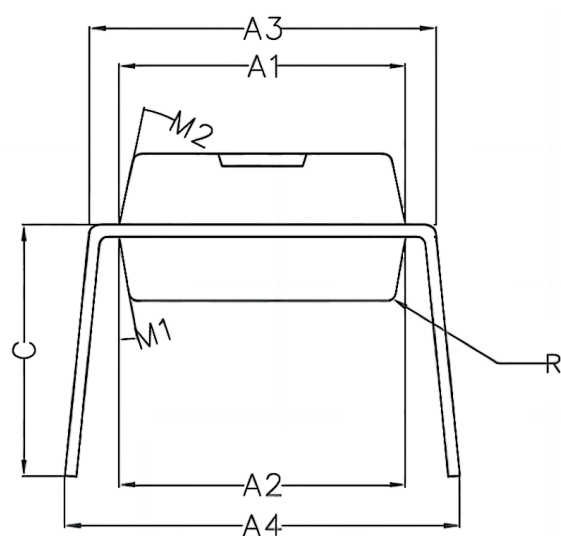
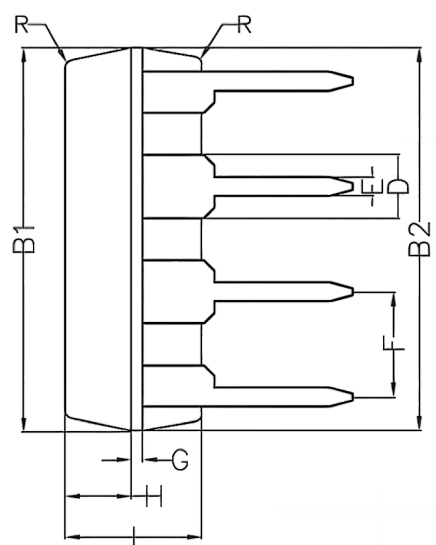
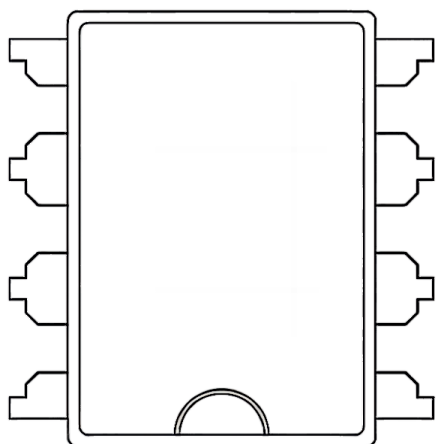
## Package SOP8



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>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 |
| I      | 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    |
|---------------------|---------|-----------------------|------------------------|----------------|
| SN75LBC184DR-TUDI-A | SOP8    | Tape,Reel,4000        | 7LB184A                | 0°C to +70°C   |
| SN75LBC184P-TUDI-A  | DIP8    | Tube,50,A box of 2000 | 75LBC184A              |                |
| SN65LBC184DR-TUDI-A | SOP8    | Tape,Reel,4000        | 6LB184A                | -40°C to +85°C |
| SN65LBC184P-TUDI-A  | DIP8    | Tube,50,A box of 2000 | 65LBC184A              |                |

高级应用版本，请参考 SN65LBC184DR-TUDI 或者 SN75LBC184DR-TUDI



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