Silicore
芯谷科技

# D3485
## RS485 Transceivers

## General Description

The D3485 is high-speed transceiver for RS-485 communication, which contain one driver and one receiver. The D3485 feature fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiver output will be a logic high if all transmitters on a terminated bus are disabled (high impedance).


SOP8

The D3485 driver slew rates are not limited, making transmit speeds up to 10Mbps possible.. And this device has a 1/8-unit-load receiver input impedance that allows up to 256 transceivers on the bus.

The D3485 is available in SOP8 package.

## Features

- Fail-safe Circuitry
- Low Power Consumption
- Up to 256 Transceivers can be Attached to The Bus
- Maximum Transmission Rate: 10Mbps
- ESD: ≥±15kV
- SOP8 Package

## Applications

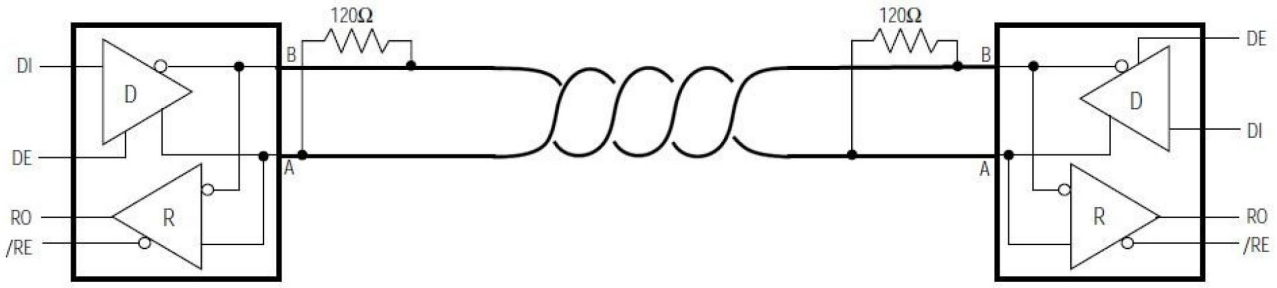
- RS-485 Communications
- Level Translators
- Security Equipment
- Industrial Control Equipment
- Watt-hour meter

## Package Information

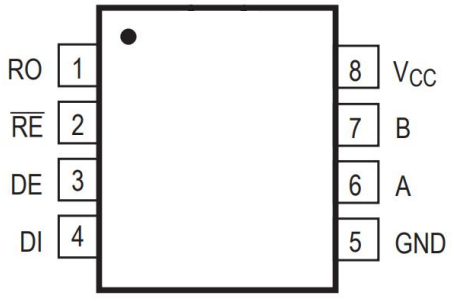
| Part NO. | Package Description | Package Marking | Package Option |
|---|---|---|---|
| D3485 | SOP8 | CHMC<br>D3485<br>SXXXX | 100/Tube<br>4000/Reel |

CHMC:Trademark D3485:Part NO. SXXXX:Lot NO.

## Typical application circuit




## Pin Configuration




SOP8

## Pin Description

| Pin Number | Pin Name | Function Description |
|---|---|---|
| 1 | RO | Receiver Output, When RE is low and if A - B≥-50mV, RO will be high; if A - B≤-200mV, RO will be low. |
| 2 | /RE | Receiver Output Enable. Drive RE low to enable RO; RO is high impedance when RE is high. Drive RE high and DE low to enter low-power shutdown mode. |
| 3 | DE | Driver Output Enable. Drive DE high to enable driver outputs. These outputs are high impedance when DE is low. Drive RE high and DE low to enter low-power shutdown mode. |
| 4 | DI | Driver Input. With DE high, a low on DI forces non-inverting output low and inverting output high. |
| 5 | GND | Ground |
| 6 | A | Non-inverting Receiver Input and Non-inverting Driver Output |
| 7 | B | Inverting Receiver Input and Inverting Driver Output |
| 8 | $V_{CC}$ | Positive Supply |

## Absolute Maximum Ratings (TA=25℃)

| Parameter Name | Value | Unit |
|---|---|---|
| Supply Voltage（$V_{CC}$） | 7 | V |
| Operating Voltage | +3~5.5 | V |
| Control Input Voltage（/RE, DE） | -0.3~Vcc+0.3 | V |
| Driver Input Voltage（DI） | -0.3~Vcc+0.3 | V |
| Driver Output Voltage（A,B） | ±13 | V |
| Receiver Input Voltage（A,B） | ±13 | V |
| Receiver Output Voltage（RO） | -0.3~Vcc+0.3 | V |
| Operating Temperature（$T_{OPR}$） | -40~+125 | ℃ |
| Storage Temperature（$T_{STG}$） | -65~+150 | ℃ |
| Operating voltage | +3~+5.5 | V |

## Function Tables

- **TRANSMITTING**

| INPUTS | | | OUTPUTS | |
|---|---|---|---|---|
| /RE | DE | DI | A | B |
| X | 1 | 1 | 1 | 0 |
| X | 1 | 0 | 0 | 1 |
| 0 | 0 | X | High-Z | High-Z |
| 1 | 0 | X | Shutdown | |

- **BECEIVING**

| INPUTS | | | OUTPUTS |
|---|---|---|---|
| /RE | DE | A-B | RO |
| 0 | X | ≥-0.05V | 1 |
| 0 | X | ≤-0.2V | 0 |
| 0 | X | Open / Shorted | 1 |
| 1 | 1 | X | High-Z |
| 1 | 0 | X | Shutdown |

## DC Electrical Characteristics (VCC=5V, Ta=25°C ) [1]

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Differential Driver Output（no load） | $V_{OD1}$ | R=27Ω, Figure 1 | | --- | --- | VCC | V |
| Differential Driver Output | $V_{OD2}$ | | | 1.5 | --- | --- | V |
| Change in Magnitude of Differential Output Voltage | $\Delta V_{OD}$ | | | --- | --- | 0.2 | V |
| Driver Common-Mode Output Voltage | $V_{OC}$ | | | 1.0 | --- | 3.0 | V |
| Change in Magnitude of Common-Mode Voltage2 | $\Delta V_{OC}$ | | | --- | --- | 0.2 | V |
| Input High Voltage | $V_{IH}$ | DE, DI, /RE | | 2.0 | --- | --- | V |
| Input Low Voltage | $V_{IL}$ | DE, DI, /RE | | --- | --- | 0.8 | V |
| DI Input Hysteresis | $V_{HYS}$ | --- | | --- | 100 | --- | mV |
| Driver Input Current（A And B） | $I_{IN1}$ | VIN=12V | DE=0V, Vcc=5.0V | --- | --- | 250 | uA |
| | | VIN=-7V | | -150 | --- | --- | uA |
| Driver Short-Circuit Output Current3 | $I_{OSD}$ | A and B Short-Circuit | | -100 | --- | 100 | mA |
| Receiver Differential Threshold Voltage | $V_{TH}$ | -7V≤$V_{CM}$≤12V | | -200 | -125 | -50 | mV |
| Receiver Input Hysteresis | $\triangle V_{TH}$ | --- | | --- | 40 | --- | mV |
| Receiver Output High Voltage | $V_{OH}$ | $I_O$=-8mA | | VCC-1 | --- | --- | V |
| Receiver Output Low Voltage | $V_{OL}$ | $I_O$=8mA | | --- | --- | 0.4 | V |
| Three-State Output Current at Receiver | $I_{OZR}$ | Vo=1V | | -1 | --- | 1 | μA |
| Receiver Input Resistance | $R_{IN}$ | -7V≤$V_{CM}$≤12V | | 96 | --- | --- | KΩ |
| Receiver Output Short-Circuit Current | $I_{OSR}$ | 0V≤$V_{RO}$≤VCC | | ±7 | --- | ±100 | mA |
| Supply Current | $I_{CC}$ | DE=VCC | No Load /RE=DI=VCC/GND | --- | 700 | 1200 | μA |
| | | DE=GND | | --- | 600 | 1200 | μA |
| Supply Current in Shutdown Mode | $I_{SHDN}$ | DE=GND, /RE=VCC, DI=VCC/GND | | --- | --- | 3 | μA |

## DC Electrical Characteristics (VCC=3V, Ta=25°C ) [1]

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Differential Driver Output（no load） | $V_{OD1}$ | R=27Ω, Figure 1 | | --- | --- | VCC | V |
| Differential Driver Output | $V_{OD2}$ | | | 0.9 | --- | --- | V |
| Change in Magnitude of Differential Output Voltage | $\Delta V_{OD}$ | | | --- | --- | 0.2 | V |
| Driver Common-Mode Output Voltage | $V_{OC}$ | | | 1.0 | --- | 3.0 | V |
| Change in Magnitude of Common-Mode Voltage2 | $\Delta V_{OC}$ | | | --- | --- | 0.2 | V |
| Input High Voltage | $V_{IH}$ | DE, DI, /RE | | 1.5 | --- | --- | V |
| Input Low Voltage | $V_{IL}$ | DE, DI, /RE | | --- | --- | 0.6 | V |
| DI Input Hysteresis | $V_{HYS}$ | --- | | --- | 100 | --- | mV |
| Driver Input Current（A And B） | $I_{IN1}$ | VIN=12V | DE=0V, Vcc=3V | --- | --- | 150 | uA |
| | | VIN=-7V | | -150 | --- | --- | uA |
| Driver Short-Circuit Output Current3 | $I_{OSD}$ | A and B Short-Circuit | | -100 | --- | 100 | mA |
| Receiver Differential Threshold Voltage | $V_{TH}$ | -7V≤$V_{CM}$≤12V | | -200 | --- | 200 | mV |
| Receiver Input Hysteresis | $\triangle V_{TH}$ | --- | | --- | 40 | --- | mV |
| Receiver Output High Voltage | $V_{OH}$ | $I_O$=-8mA | | VCC-1 | --- | --- | V |
| Receiver Output Low Voltage | $V_{OL}$ | $I_O$=8mA | | --- | --- | 0.6 | V |
| Three-State Output Current at Receiver | $I_{OZR}$ | Vo=1V | | -1 | --- | 1 | μA |
| Receiver Input Resistance | $R_{IN}$ | -7V≤$V_{CM}$≤12V | | 96 | --- | --- | KΩ |
| Receiver Output Short-Circuit Current | $I_{OSR}$ | 0V≤$V_{RO}$≤VCC | | ±7 | --- | ±10 0 | mA |
| Supply Current | $I_{CC}$ | DE=VCC | No Load | --- | --- | 1000 | μA |
| | | DE=GND | /RE=DI=VCC/GND | --- | --- | 1000 | μA |
| Supply Current in Shutdown Mode | $I_{SHDN}$ | DE=GND, /RE=VCC DI=VCC/GND | | --- | --- | 3 | μA |

Note 1: All currents into the device are positive; all currents out of the device are negative. All voltages are referred to device ground unless otherwise noted.

Note 2: $\Delta V_{OD}$ and $\Delta V_{OC}$ are the changes in $V_{OD}$ and $V_{OC}$, respectively, when the DI input changes state.

Note 3: Maximum current level applies to peak current just prior to foldback current limiting; minimum current level Applies during current limiting.

## SWITCHING CHARACTERISTICS (VCC=5V，TA=25℃)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Driver Rise or Fall Time | $t_R$, $t_F$ | Figure 3 and 5，$R_{DIFF}$=54Ω $C_{L1}$=$C_{L2}$=100pF | --- | 30 | --- | ns |
| Driver Input to Output | $t_{PLH}$，$t_{PHL}$ | | --- | 30 | 60 | ns |
| Driver Output Skew \|$T_{DPLH}$ – $T_{DPHL}$\| | $t_{SKEW}$ | | --- | --- | 20 | ns |
| Driver Enable time | $t_{LZ}$，$t_{HZ}$ | Figure 4 and 6，$C_L$=100pF （Receiver enabled） | --- | --- | 70 | ns |
| Driver Enable time | $t_{LZ(SHDN)}$，$t_{HZ(SHDN)}$ | Figure 4 and 6，$C_L$=100pF （Receiver disabled） | --- | 1400 | 3000 | ns |
| Driver disable time | $t_{LZ}$ ,$t_{ZL}$ | Figure 4 and 6，$C_L$=100pF | --- | --- | 70 | ns |
| Maximum Data Rate | $F_{MAX}$ | --- | 10 | --- | --- | Mbps |
| Receiver Rise or Fall Time | $t_R$, $t_F$ | Figure 7 | --- | 20 | --- | ns |
| Receiver propagation delay time | $t_{PLH}$, $t_{PHL}$ | | --- | 90 | 250 | ns |
| \|$T_{RPLH}$–$T_{RPHL}$\| Differential Receiver Skew | $t_{SKD}$ | | --- | 30 | --- | ns |
| Receiver enable time | $t_{ZL}$, $t_{ZH}$ | Figure 2 and 8，$C_{RL}$=15pF (Driver enabled) | --- | 30 | 70 | ns |
| Receiver enable time | $t_{ZL(SHDN)}$, $t_{ZH(SHDN)}$ | Figure 2 and 8，$C_{RL}$=15pF (Driver disabled) | --- | 1400 | 3000 | ns |
| Receiver disable time | $t_{LZ}$, $t_{HZ}$ | Figure 2 and 8，$C_{RL}$=15pF | --- | 30 | 70 | ns |
| Time to Shutdown | $t_{SHDN}$ | --- | --- | 200 | 600 | ns |

## SWITCHING CHARACTERISTICS (VCC=3V，TA=25℃)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Driver Rise or Fall Time | $t_R$, $t_F$ | Figure 3 and 5，$R_{DIFF}$=54Ω $C_{L1}$=$C_{L2}$=100pF | --- | 30 | --- | ns |
| Driver Input to Output | $t_{PLH}$，$t_{PHL}$ | | --- | 30 | 60 | ns |
| Driver Output Skew $\|T_{DPLH} - T_{DPHL}\|$ | $t_{SKEW}$ | | --- | --- | 20 | ns |
| Driver Enable time | $t_{LZ}$，$t_{HZ}$ | Figure 4 and 6，$C_L$=100pF （Receiver enabled） | --- | --- | 70 | ns |
| Driver Enable time | $t_{LZ(SHDN)}$，$t_{HZ(SHDN)}$ | Figure 4 and 6，$C_L$=100pF （Receiver disabled） | --- | 1600 | 3000 | ns |
| Driver disable time | $t_{LZ}$ ,$t_{ZL}$ | Figure 4 and 6，$C_L$=100pF | --- | --- | 70 | ns |
| Maximum Data Rate | $F_{MAX}$ | --- | 10 | --- | --- | Mbps |
| Receiver Rise or Fall Time | $t_R$, $t_F$ | Figure 7 | --- | 20 | --- | ns |
| Receiver propagation delay time | $t_{PLH}$, $t_{PHL}$ | | --- | 90 | 250 | ns |
| $\|T_{RPLH}-T_{RPHL}\|$ Differential Receiver Skew | $t_{SKD}$ | | --- | 30 | --- | ns |
| Receiver enable time | $t_{ZL}$, $t_{ZH}$ | Figure 2 and 8，$C_{RL}$=15pF (Driver enabled) | --- | 25 | 70 | ns |
| Receiver enable time | $t_{ZL(SHDN)}$, $t_{ZH(SHDN)}$ | Figure 2 and 8，$C_{RL}$=15pF (Driver disabled) | --- | 1600 | 3000 | ns |
| Receiver disable time | $t_{LZ}$, $t_{HZ}$ | Figure 2 and 8，$C_{RL}$=15pF | --- | 30 | 70 | ns |
| Time to Shutdown | $t_{SHDN}$ | --- | --- | 230 | 800 | ns |

## Test Circuit

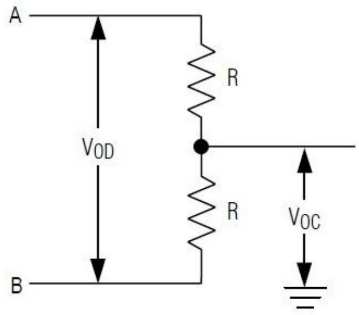



Figure 1. Driver DC Test Load

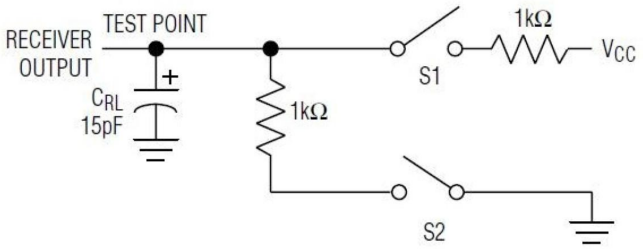



Figure 2. Receiver Enable/Disable Timing Test Load

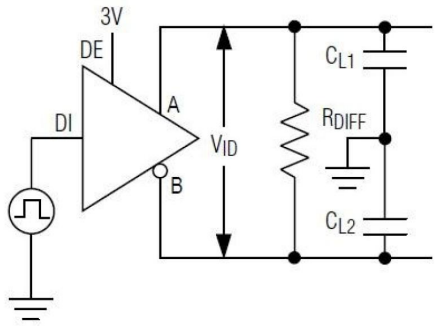



Figure 3. Driver Timing Test Circuit

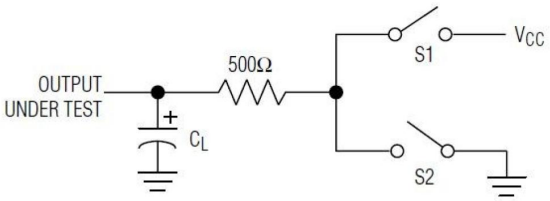



Figure 4. Driver Enable/Disable Timing Test Load

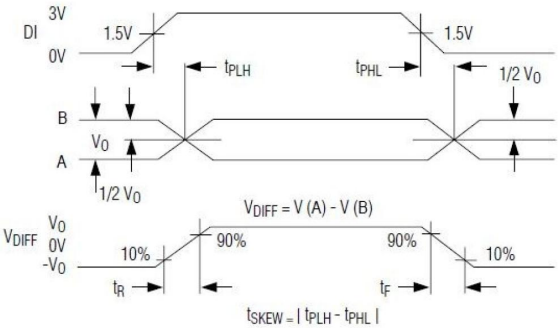



Figure 5. Driver Propagation Delays

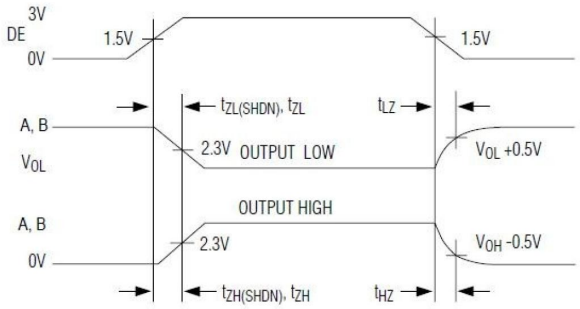



Figure 6. Driver Enable and Disable Times

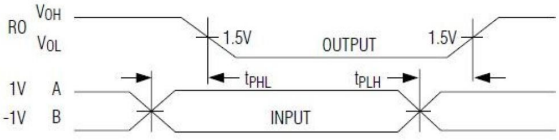



Figure 7. Receiver Propagation Delays

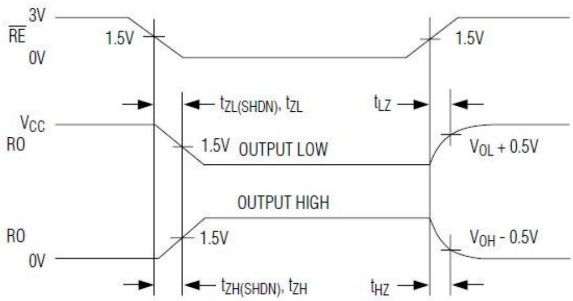
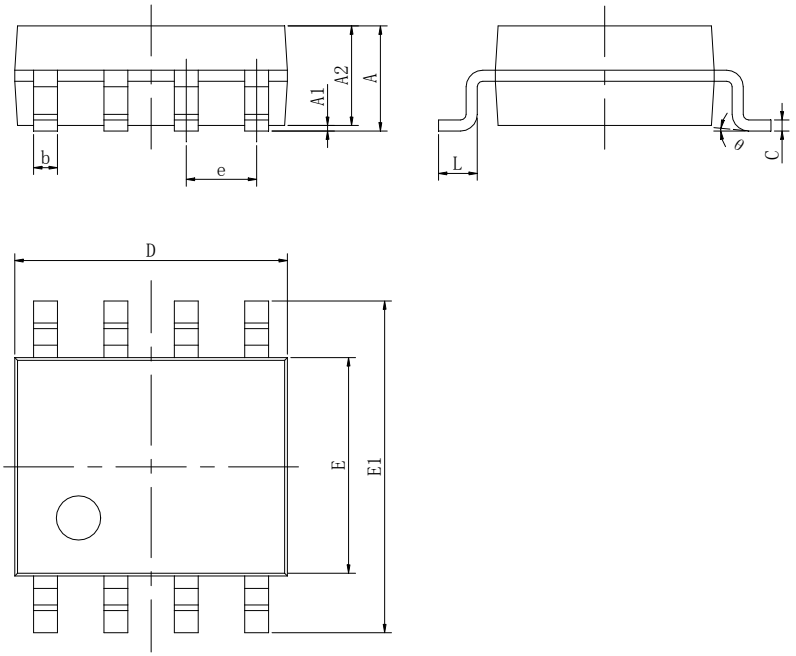



Figure 8. Receiver Enable and Disable Times

## Outline Dimensions

**SOP8** Unit:mm




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.350 | 1.800 | 0.053 | 0.071 |
| A1 | 0.000 | 0.250 | 0.000 | 0.010 |
| A2 | 1.250 | 1.550 | 0.053 | 0.061 |
| b | 0.300 | 0.510 | 0.011 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.201 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.300 | 0.228 | 0.244 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

## Statements

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