



钛迪半导体  
Tudi Semiconductor

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## Product Specification

TUDI-MAX3074

+3.3V, ±15kV ESD-Protected, Fail-Safe, Hot-Swap,  
RS-485/RS-422 Transceivers

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## Features

- Robust performance protection
  - $\pm 15\text{kV}$  human model ESD on I/O pins
  - True fail-safe receiver maintains EIATIA485 compatibility
- Enhanced rate limiting for error-free data transmission
- DE and RE hot-pluggable input structure
- Flexible design characteristics
- Up to 256 transceivers allowed on the bus
- Industry standard SO and DIP packages available
- Low current mode in shutdown for energy

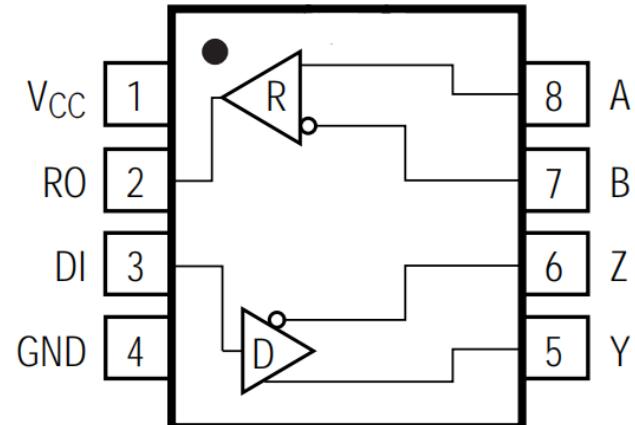


Figure 1. Pin Diagram

## Description

The MAX3074E is a single driver and receiver RS-485/RS-422 transceiver with 3.3V and  $\pm 15\text{kV}$  ESD protection. These devices include protection circuitry to guarantee a logic high receiver output when the receiver input is open circuit or shorted. If drivers on the terminated bus are disabled (high impedance), the receiver output is logic high. These devices include plug-and-play functionality to eliminate spurious transitions on the bus power up or warm insertion.

The MAX3074E features a slew-rate-limited driver that allows for data rates up to 500kbps. MAX3074E is suitable for full-duplex communication.

All devices feature a 1/8 unit load receiver input impedance allowing for up to 256 drivers on the bus.

## Applications

Lighting Systems  
Industrial Control  
Telecom  
Security Systems  
Instrumentation



## Pin description

| Pin number | Pin name | Pin function  |
|------------|----------|---|
| 1          | VCC      | Power supply:3.0V VCC 5.5V  |
| 2          | RO       | Receiver output. If A-B is greater than or equal to +200mV, RO output is high level; if A-B is less than or equal to -200mV, RO output is low level.  |
| 3          | DI       | DI driver input. A low level on DI causes the in-phase terminal Y output to be low and the out-of-phase terminal Z output to be high; a high level on DI causes the in-phase terminal Y output to be high and the out-of-phase terminal Z output to be low. |
| 4          | GND      | Landing   |
| 5          | Y        | Drive in-phase output terminal  |
| 6          | Z        | The inverting output of the driver  |
| 7          | B        | Receiver inverting input  |
| 8          | A        | Receiver in-phase input   |

## Extreme parameter

| Parameter                           | Symbol | Big or small | Unit |
|-------------------------------------|--------|--------------|------|
| Welding temperature range           |        | 300          | °C   |
| Operating temperature range         |        | -40~125      | °C   |
| Storage operating temperature range |        | -60~150      | °C   |
| Continuous power consumption        | SOP8   | 400          | mW   |
|                                     | DIP8   | 700          | mW   |
| Supply voltage                      | VCC    | +7           | V    |
| Control the port voltage            | DI     | -0.3~VCC+0.3 | V    |
| Bus-side input voltage              | A、B    | -8~13        | V    |
| Receiver output voltage             | RO     | -0.3~VCC+0.3 | V    |

The maximum limit parameter value is the value beyond which irreversible damage to the device may occur. Under these conditions, the device will not function properly and continuous operation at the maximum allowable rating may affect the reliability of the device. All voltage reference points are ground.



| Parameter   | Symbol  | Test condition  | Minimum | Typical case | Maximum | Unit |
|---|---------|---|---------|--------------|---------|------|
| supply current  |         |   |         |              |         |      |
| Supply current  | Icc     | DI=0 or VCC   |         | 240          | 400     | μA   |
| ESD protect   |         |   |         |              |         |      |
| A、B、Y、Z   |         | Mannequin (HBM)   |         | ±16          |         | kV   |
| Other ports   |         | Mannequin (HBM)   |         | ±6           |         | kV   |
| Drive switch characteristics  |         |   |         |              |         |      |
| Drive input to output propagation delay(low to high)                    | tDPLH   | RDIFF=54 Ω,<br>CL1=CL2=100pF<br>(see Figure 3<br>and Figure 4)                                  |         | 15           | 35      | ns   |
| Drive input to output propagation delay(high to low)                    | tDPHL   |   |         | 15           | 35      | ns   |
| tDPLH-tDPHL   | tSKEW1  |   |         | 7            | 10      | ns   |
| Rise time /fall time  | tDR,tDF |   |         | 10           | 25      | ns   |
| Acceptor The propagation delay from input to output is from low to high | tRPLH   | See Figure 5 and<br>Figure 6 VID<br>2.0V;<br>The rise and<br>fall time VID is<br>less than 15ns | 20      | 60           | 90      | ns   |
| Acceptor The propagation delay from input to output is from high to low | tRPHL   |   | 20      | 60           | 90      | ns   |
| tRPLH-tRPHL   | tSKEW2  |   |         | 7            | 10      | ns   |
| DC electrical characteristics of the driver                             |         |   |         |              |         |      |
| High-level input  | VIH     | DI  | 2.0     |              |         | V    |
| Low level input   | VIL     | DI  |         |              | 0.8     | V    |
| Logic input current   | IIN1    | DI  | -2      |              | 2       | μA   |
| Differential output of the driver(non-loaded)                           | VoD1    |   |         | 5            |         | V    |
| Drive differential output   | VoD2    | Graph 2,RL=27Ω  | 1.5     |              | VCC     | V    |
|   |         | Graph 2,RL=50Ω  | 2       |              | VCC     |      |
| The current output is short-circuited to high                           | IosD1   | Short circuit to 0V~12V   | 35      |              | 250     | mA   |
| The current output is short-circuited to low                            | IosD2   | Short circuit to -7V~0V   | -250    |              | -35     | mA   |
| Change in the amplitude of the output voltage (NOTE1)                   | △VoD    | Graph 2,RL=27Ω  |         |              | 0.2     | V    |
| Output common mode voltage  | Voc     | Graph 2,RL=27Ω  |         |              | 3       | V    |
| Change in the amplitude of the common-mode output voltage(NOTE1)        | △Voc    | Graph 2,RL=27Ω  |         |              | 0.2     | V    |



| Parameter                                     | Symbol           | Test condition                                      | Minimum              | Typical case | Maximum | Unit |
|---|------------------|---|----------------------|--------------|---------|------|
| DC electrical characteristics of the receiver |                  |   |                      |              |         |      |
| Positive input threshold voltage              | VIT+             | $-7V \leq V_{cM} \leq 12V$                          |                      |              | +200    | mV   |
| Reverse input threshold voltage               | VIT-             | $7V \leq V_{cM} \leq 12V$                           | -200                 |              |         | mV   |
| Enter the hysteresis voltage                  | V <sub>hys</sub> | $-7V \leq V_{cM} \leq 12V$                          | 10                   | 30           |         | mV   |
| Input current(A,B)                            | I <sub>IN2</sub> | V <sub>CC</sub> =0 or 3.3V<br>V <sub>IN</sub> =12 V |                      |              | 125     | μA   |
|   |                  | V <sub>CC</sub> =0 or 3.3V<br>V <sub>IN</sub> =-7 V | -100                 |              |         | μA   |
| Three state input leakage current             | I <sub>ozR</sub> | $0.4V < V_o < 2.4V$                                 |                      |              | ±1      | μA   |
| Receiver input resistance                     | R <sub>IN</sub>  | $-7V \leq V_{cM} \leq 12V$                          | 96                   |              |         | kΩ   |
| Receiver short circuit current                | I <sub>osR</sub> | $0V \leq V_o \leq V_{CC}$                           | ±7                   |              | ±95     | mA   |
| High level output voltage                     | V <sub>oH</sub>  | I <sub>oUT</sub> =-4mA,<br>V <sub>ID</sub> =+200 mV | V <sub>CC</sub> -1.5 |              |         | V    |
| Low level output voltage                      | V <sub>oL</sub>  | I <sub>oUT</sub> =+4mA,<br>V <sub>ID</sub> =-200 mV |                      |              | 0.4     | V    |

(If not otherwise specified, V<sub>CC</sub>=3.3V±10%, Temp=TMIN~TMAX, typical value is V<sub>CC</sub>=+3.3 V, Temp = 25 )

## Test Circuit

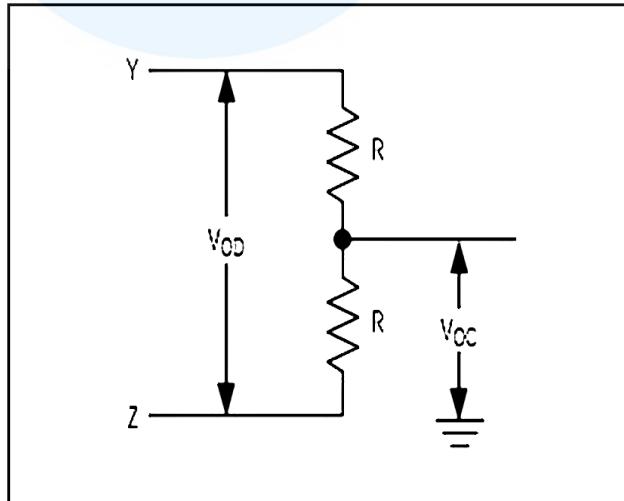


Figure 2 DC test load of the driver

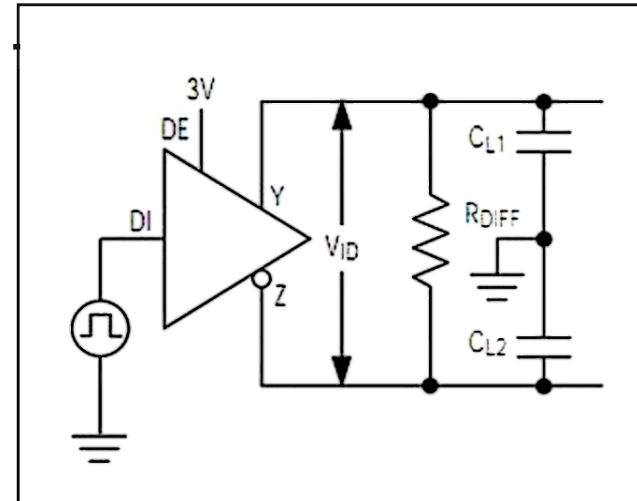


Figure 3 Driver timing test circuit

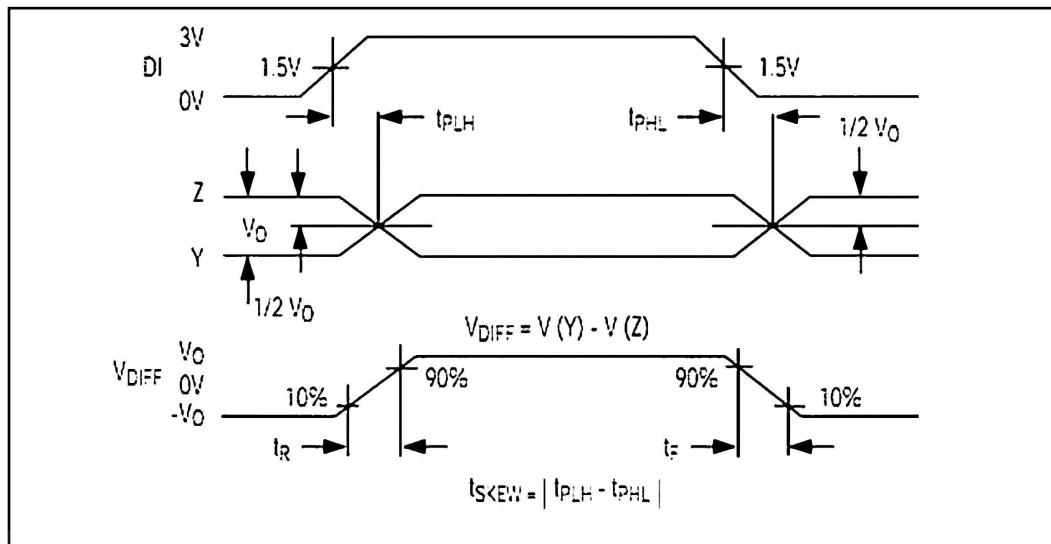


Figure 4 Driver propagation delay

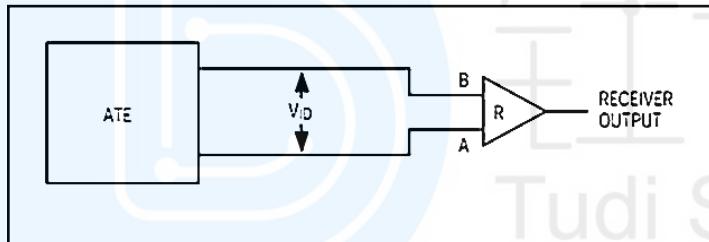


Figure 5 Receiver propagation delay test circuit

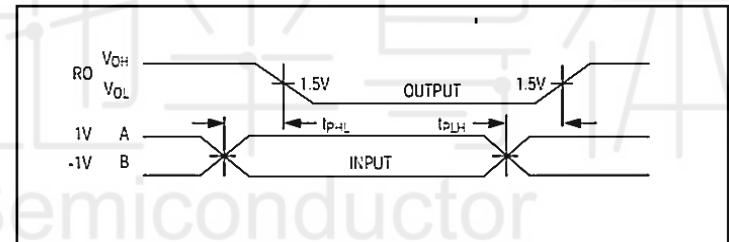


Figure 6 Receiver propagation delay timing

## Additional description

### resume

The 3074 is a full-duplex, high-speed transceiver for RS-485/RS-422 communication, incorporating driver and a receiver. It features fail-safe, overvoltage protection, and overcurrent protection. The 3074 achieves error-free data transmission up to 500kps.

### The bus is connected to 256 transceivers

The input impedance of the standard RS485 receiver is 12k (1 unit load), and the standard driver can drive up to 256 unit loads. The receiver of the 3074 transceiver has an input impedance of 1/8 unit load (96k), allowing up 256 transceivers to be connected in parallel on the same communication bus. These devices can be combined arbitrarily, or combined with other RS485 transceivers as long as the total load does not exceed 256 unit loads, they can be connected to the same bus.

### Drive output protection

Protection against excessive output current and dissipation by fault or bus contention is provided by overcurrent and overvoltage protection mechanisms, with fast short-circuit protection throughout the common-mode voltage range (see Typical Operating Characteristics).



## Function table

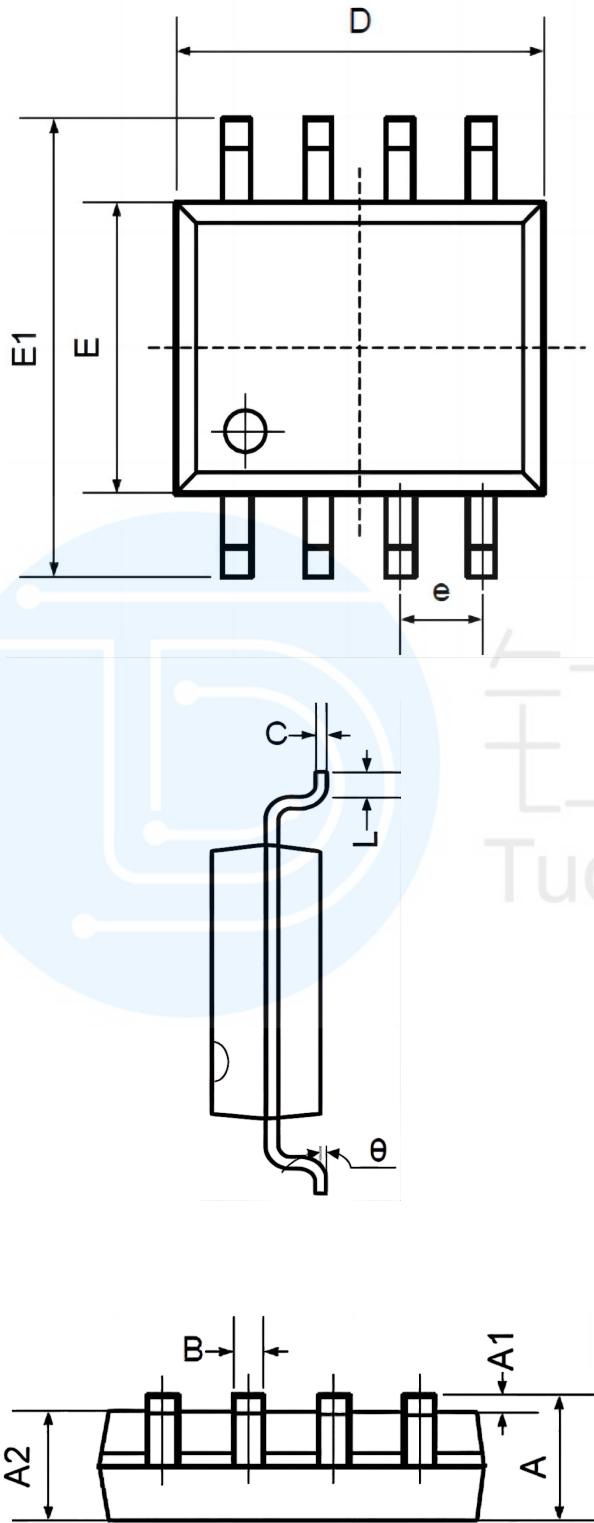
| Send function table |     |                      |                      |                    | Receiving function table |    |   |   |
|---------------------|-----|----------------------|----------------------|--------------------|--------------------------|----|---|---|
| input               | A-B | $\geq +200\text{mV}$ | $\leq -200\text{mV}$ | Open/short circuit | input                    | DI | 1 | 0 |
| output              | RO  | H                    | L                    | H                  | Y                        | H  | L |   |
|                     |     |                      |                      |                    | Z                        | L  | H |   |

## Order information

| Order Number      | Package | Package Quantity     | Marking On The park | Temperature     |
|-------------------|---------|----------------------|---------------------|-----------------|
| MAX3074EEPA-TUDI  | DIP8    | Tube,50A box of 2000 | MAX3074EEPA         | - 40°C to 85°C  |
| MAX3074EEASA-TUDI | SOP8    | Tape,Reel,2500       | MAX3074EEASA        |                 |
| MAX3074EAPA-TUDI  | DIP8    | Tube,50A box of 2000 | MAX3074EAPA         | - 40°C to 125°C |
| MAX3074EASA-TUDI  | SOP8    | Tape,Reel,2500       | MAX3074EASA         |                 |



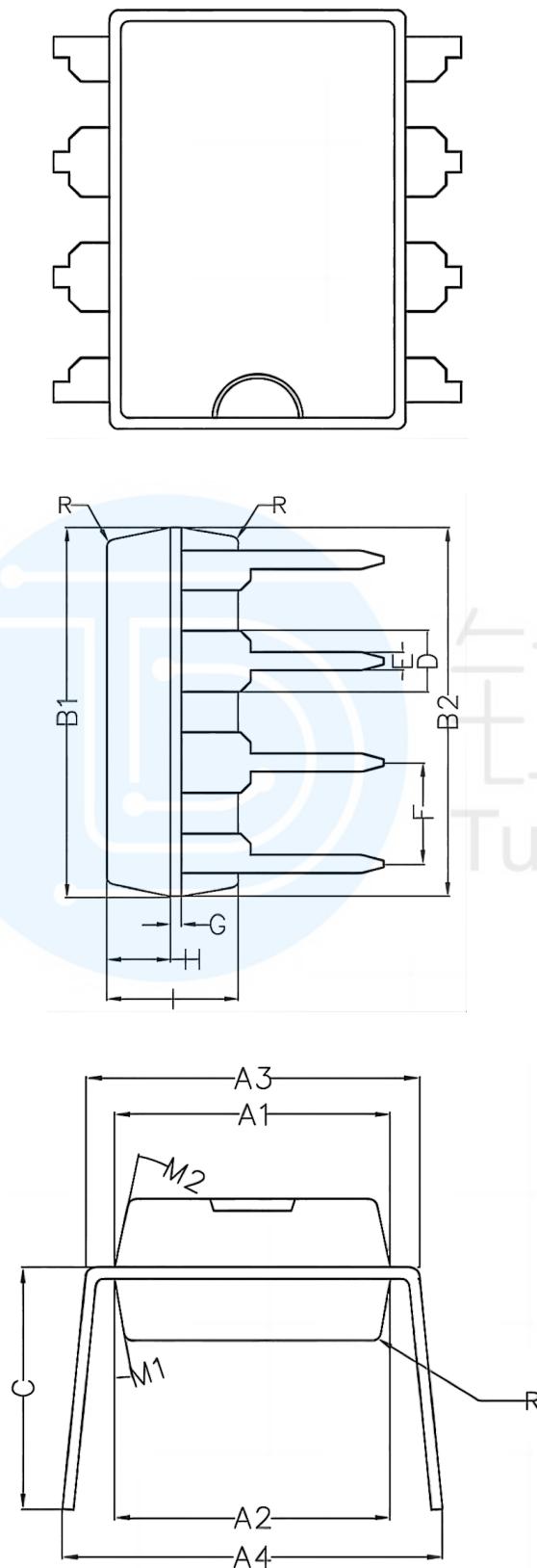
## Package SOP8



| 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 |
| I      | 3.22 | 3.27 | 3.32 |
| R      |      | 0.20 |      |
| M1     | 9°   | 10°  | 11°  |
| M2     | 11°  | 12°  | 13°  |



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