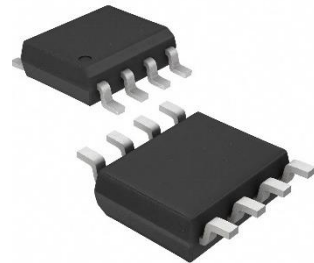


## HX81487-S High speed bus transceiver

The HX81487-S is a high-speed RS485/RS-422 transceiver circuit that operates on a +5V power supply with half-duplex functionality. It features one driver and one receiver, achieving transmission speeds of up to 10Mbps. The circuit includes  $\pm 15\text{KV}$  ESD protection to safeguard the chip from electrostatic discharge. Both the driver and receiver have enable pins (DE and RE). When these pins are disabled, the output enters a high-resistance state. Additionally, the HX81487-S incorporates a fail-safe circuit that ensures correct output in open or short circuits at the receiver input. The receiver's input impedance is 1/8 unit load, allowing for a maximum of 256 transceivers on the same bus.



SOP-8

### Characteristic

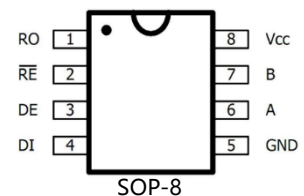
- Tri state output.
- Electrostatic Discharge (ESD): A/B  $\pm 15\text{KV}$ , compliant with Human Body Mode (HBM) standards.
- The bus allows up to 256 transceivers to be connected.
- Maximum data speed of 10 Mbps
- Adopting SOP8 encapsulation.

### Application

- Industrial control
- RS485/RS422
- interface Industrial motor drive
- Automated HVAC system

### Chip Pin Description

| ID | NUME                   | Function                                                           |
|----|------------------------|--------------------------------------------------------------------|
| 1  | RO                     | Receiver data output                                               |
| 2  | $\overline{\text{RE}}$ | The receiver output is effective at low levels and high when high. |
| 3  | DE                     | SET: High valid when DE low, output high                           |
| 4  | DI                     | Drive data input                                                   |
| 5  | GND                    | Ground                                                             |
| 6  | A                      | Driver data output, receiver data input                            |
| 7  | B                      | Driver data output, receiver data input                            |
| 8  | Vcc                    | power supply                                                       |



### Driver Truth Table

| Input | Enable | Output |   |
|-------|--------|--------|---|
| DI    | DE     | A      | B |
| H     | H      | H      | L |
| L     | H      | L      | H |
| X     | L      | Z      | Z |

### Receiver Truth Table

| Input                  |    |                      | Output |
|------------------------|----|----------------------|--------|
| $\overline{\text{RE}}$ | DE | A-B                  | RO     |
| L                      | X  | $\geq -50\text{mV}$  | H      |
| L                      | X  | $\leq -200\text{mV}$ | L      |
| L                      | X  | open circuit         | H      |
| L                      | X  | short circuit        | H      |
| H                      | H  | X                    | Z      |
| H                      | L  | X                    | Z      |

| Dc Electrical Parameter                                                  |                                            |                                                                                         |                     |      |      |          |
|--------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------|---------------------|------|------|----------|
| Limiting Parameter                                                       |                                            |                                                                                         |                     |      |      |          |
| SYMBOL                                                                   | PARAMETER NAME                             | M I N                                                                                   | MAX                 | UNIT |      |          |
| VCC                                                                      | Supply voltage                             |                                                                                         | +6.0                | V    |      |          |
| DE, RE                                                                   | Control input voltage                      | -0.5                                                                                    | +6.0                | V    |      |          |
| DI                                                                       | Drive input voltage                        | -0.5                                                                                    | +6.0                | V    |      |          |
| A,B                                                                      | Drive output voltage/receive input voltage | -7.0                                                                                    | +12.0               | V    |      |          |
| RO                                                                       | Receiving output voltage                   | -0.3                                                                                    | VCC+0.3             | V    |      |          |
| TSTG                                                                     | Storage temperature range                  | -55                                                                                     | +150                | °C   |      |          |
| TOP                                                                      | Operating temperature range                | -40                                                                                     | +85                 | °C   |      |          |
| TMOP                                                                     | Maximum operating temperature range        | -55                                                                                     | +125                | °C   |      |          |
| P <sub>D</sub>                                                           | SOP-8 (+70°C or above)                     |                                                                                         | 470                 | mW   |      |          |
| T <sub>L</sub>                                                           | Solder temperature (10 seconds)            |                                                                                         | +300                | °C   |      |          |
| DC characteristics (unless otherwise specified, Vcc=5V ± 5%, TA=25 °C) 2 |                                            |                                                                                         |                     |      |      |          |
| ARGUMENT                                                                 | SYMBOL                                     | Test condition                                                                          |                     | MIN  | TYP  | MAX UNIT |
| Working voltage range                                                    | V <sub>CC</sub>                            |                                                                                         |                     | 4.5  |      | 5.5 V    |
| Driver differential output (no load )                                    | VOD1                                       | -                                                                                       |                     | -    |      | 5 V      |
| Driver differential output (with load )                                  | VOD2                                       | R=54ΩorR=27Ω Figure 1                                                                   |                     | 1.5  |      | - V      |
| AVDV_DO_Driver1                                                          | ΔV <sub>Op</sub>                           |                                                                                         |                     | -    |      | 0.2 V    |
| Driver common mode output voltage                                        | VOC                                        |                                                                                         |                     | 1    |      | 3 V      |
| ΔVCOM_DRV1                                                               | ΔV <sub>OC</sub>                           |                                                                                         |                     |      |      | 0.2 V    |
| Input high voltage                                                       | VIH                                        | DE,RE ,DI                                                                               |                     | 2    |      | V        |
| Input undervoltage                                                       | VIL                                        | DE,RE ,DI                                                                               |                     |      |      | 0.8 V    |
| Input current                                                            | IIN1                                       | DE,RE ,DI                                                                               |                     |      |      | ±2 uA    |
| Input current (A, B)                                                     | IIN2                                       | DE=0V,Vcc=5V                                                                            | V <sub>IN</sub> =5V |      | 40   | 90 uA    |
|                                                                          |                                            |                                                                                         | V <sub>IN</sub> =0V |      | 60   | 100 uA   |
| Receiver differential input threshold voltage                            | VTH                                        | -7V ≤V <sub>CM</sub> ≤ +12V                                                             |                     | -200 |      | -50 mV   |
| Receiver input delay                                                     | ΔV <sub>TH</sub>                           |                                                                                         |                     |      | 25   | mV       |
| Receiver output high level                                               | VOH                                        | I <sub>o</sub> =-8mA                                                                    |                     | 4    |      | V        |
| Receiver output low level                                                | VOL                                        | I <sub>o</sub> =8mA                                                                     |                     |      |      | 0.4 V    |
| RT-HI-OC                                                                 | IOZR                                       | 0.4V ≤V <sub>o</sub> ≤2.4V                                                              |                     |      |      | 1 uA     |
| Receiver input impedance                                                 | RIN                                        | -7V ≤V <sub>CM</sub> ≤ +12V                                                             |                     | 96   |      | kΩ       |
| No load operating current                                                | ICC                                        | no-load                                                                                 | DE = Vcc            |      | 480  | 600 uA   |
|                                                                          |                                            | RE=DI=GND <sub>o</sub> r Vc                                                             | DE=GND              |      | 450  | 600 uA   |
| Receiver output short-circuit current                                    | IOSR                                       | 0V ≤VRO≤VCC                                                                             |                     |      |      | 95 mA    |
| ESD protection                                                           |                                            | Between A/B, human body mode                                                            |                     | ±8   | ±15  | kV       |
| Switch characteristics not specified otherwise Vcc=5V±5%, TA=25°C        |                                            |                                                                                         |                     |      |      |          |
| Parameter                                                                | Symbol                                     | Test Conditions                                                                         |                     | MIN  | TYP  | MAX UNIT |
| Drive input to output                                                    | tDPLH                                      | R <sub>DIFF</sub> =50Ω<br><br>C <sub>L1</sub> =C <sub>L2</sub> =100Pf<br><br>Figure3, 5 |                     |      | 34   | 60 nS    |
|                                                                          | tDPHL                                      |                                                                                         |                     |      | 34   | 60 nS    |
| Driver output offset tDPLH – tDPHL                                       | tDSKEW                                     |                                                                                         |                     |      | -2.5 | ±10 nS   |
|                                                                          |                                            |                                                                                         |                     |      |      |          |
| Drive up and down time                                                   | tDR                                        |                                                                                         |                     |      | 10   | 25 nS    |
|                                                                          | tDF                                        |                                                                                         |                     |      | 10   | 25 nS    |
| Driver enables high output                                               | tDZH                                       | C <sub>L</sub> 00pF Figure4,6 S2 close                                                  |                     |      |      | 150 nS   |
| Driver enables output to be low                                          | tDZL                                       | C <sub>L</sub> =100pF Figure4,6 S1 close                                                |                     |      |      | 150 nS   |
| Drive from low to off                                                    | tDLZ                                       | C <sub>L</sub> =15pF Figure4,6 S1 close                                                 |                     |      |      | 100 nS   |
| Drive from high to off                                                   | tDHZ                                       | C <sub>L</sub> =15pF Figure4,6 S2 close                                                 |                     |      |      | 100 nS   |
| Receiver input to output                                                 | tRPLH                                      | V <sub>ID</sub>   ≥2.0V;V <sub>ID</sub><br>Rising and falling<br>time≤15nS Figure 7,9   |                     |      |      | 150 nS   |
|                                                                          | tRPHL                                      |                                                                                         |                     |      |      | 150 nS   |
| Differential receiver offset                                             | tRSKEW                                     |                                                                                         |                     |      | 0    | ±10 nS   |
| The receiver stays on until output is low                                | tRZL                                       | C <sub>L</sub> =100pF Figure 2,8                                                        |                     |      | 20   | 50 nS    |
| Enable the receiver to output high                                       | tRZH                                       | C <sub>L</sub> =100pF Figure 2,8                                                        |                     |      | 20   | 50 nS    |
| Receiver from low to off                                                 | tRLZ                                       | C <sub>L</sub> =100pF Figure 2,8                                                        |                     |      | 20   | 50 nS    |
| Receiver from high to off                                                | tRHZ                                       | C <sub>L</sub> =100pF Figure 2,8                                                        |                     |      | 20   | 50 nS    |

|                                     |      |                                   |    |   |     |      |
|-------------------------------------|------|-----------------------------------|----|---|-----|------|
| Driver output short-circuit current | IOD  | Short circuit current between A/B |    | - | 100 | mA   |
| Maximum data speed                  | fMAX |                                   | 10 | - | -   | Mbps |

Notes : 1  $\Delta VOD$  and  $\Delta VOC$  respectively represent the changes in  $VOD$  and  $VOC$  when DI changes.  
2 When the current flows into the device, it is positive, and when it flows out of the device, it is negative; Unless otherwise specified, all voltages are referenced to ground.

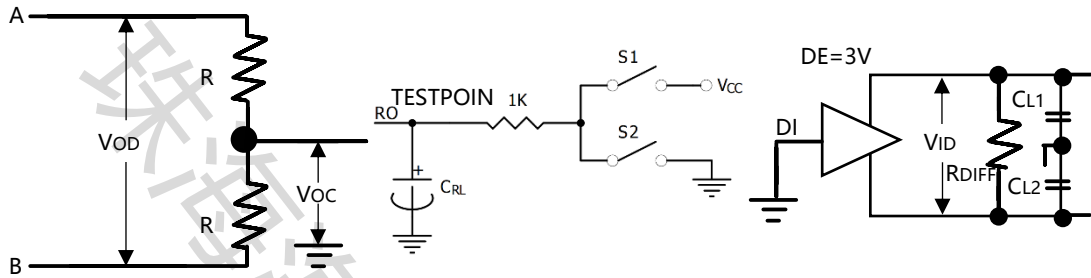


Figure 1 DC characteristic test load of driver

Figure 3 Driver switch characteristic test circuit

Figure 2 Receiver Enable/Off Switch Characteristics Test Load

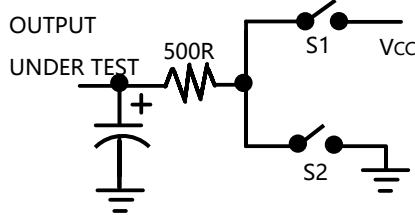


Figure 4 Driver Enable/Off Switch Characteristics Test Load

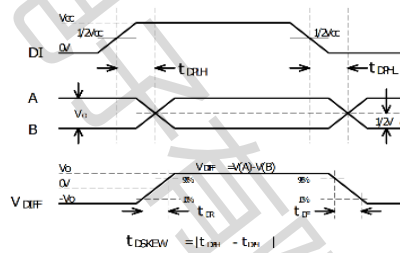


Figure 5 Drive transmission delay

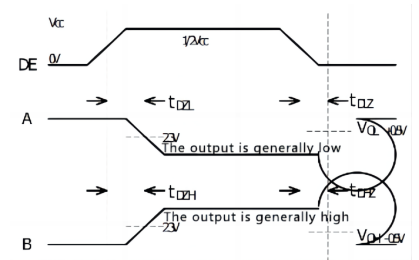


Figure 6 Driver Enable/Off Timing

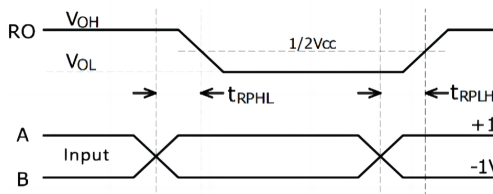


Figure 7 Receiver transmission delay

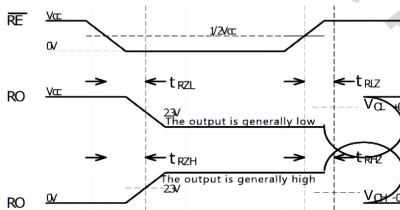


Figure 8 Receiver Enable/Off Timing

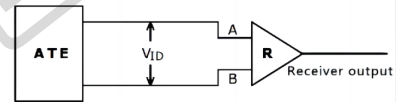
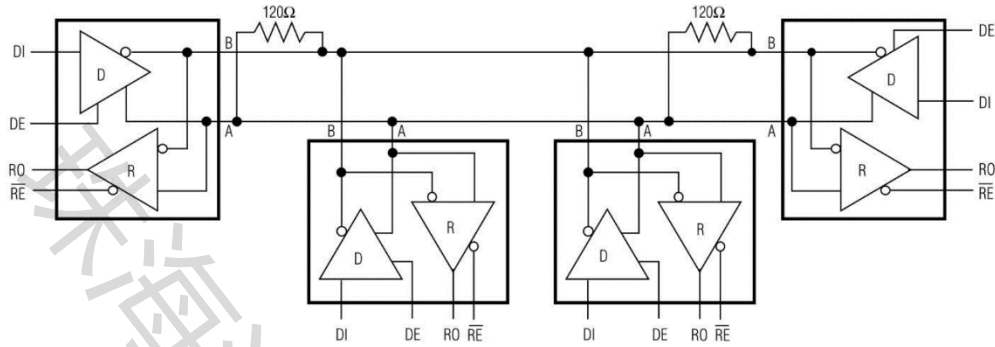


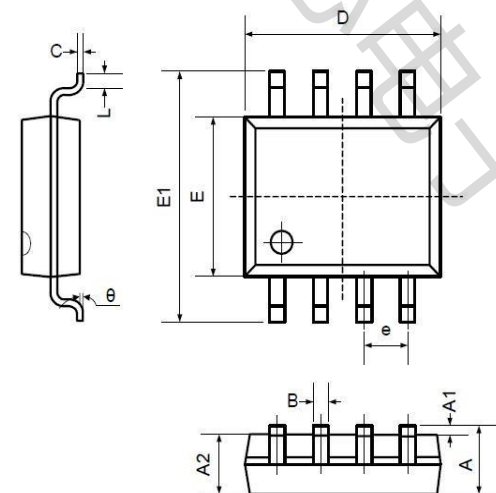
Figure 9 Receiver Transmission Delay Test

## Typical Application

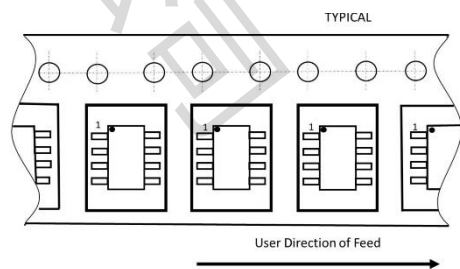
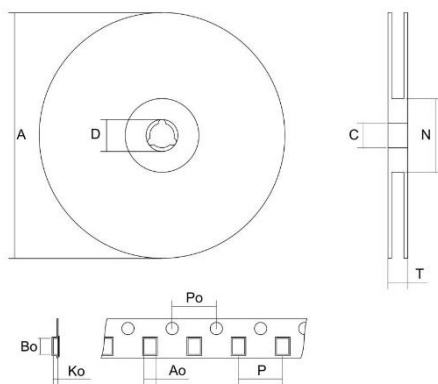


## Packaging and packaging

### SOP8 (Package Outline Dimensions)



| 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°                      |       |



| Packaging Method | Number       |
|------------------|--------------|
| Braid            | 2500PCS/Disk |