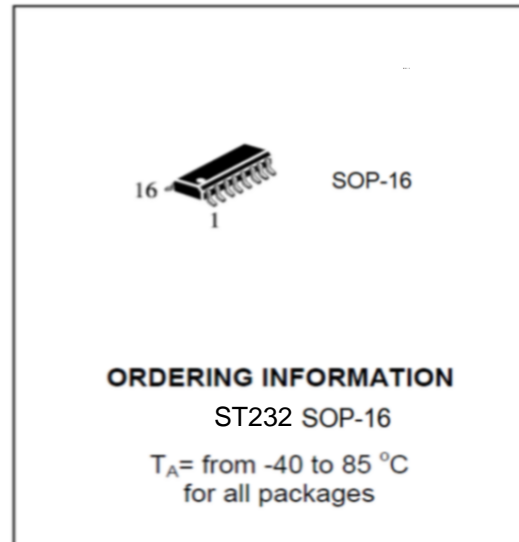


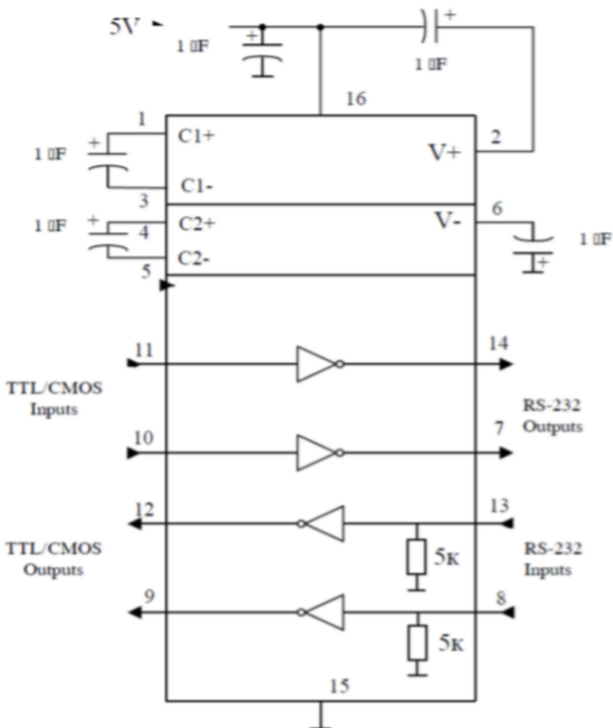
+5 V-Powered, Multi-Channel RS-232 Drivers/Receivers

The ST232 have two drives and two receivers. The drivers and receivers meet all EIA/TIA-232E and CCITT V.28 specifications at data rates up to 120 kbps when loaded in accordance with the EIA/TIA-232E specification

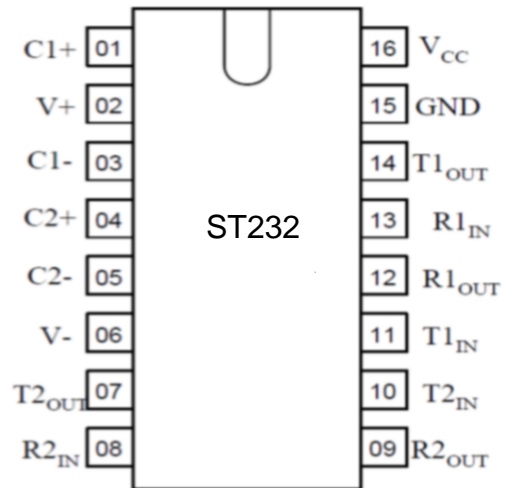
- Operate from Single +5 V Power Supply;
- Guaranteed 120 kbps Data Rate;
- Latchup Free;
- ESD Protection  $\pm 2kV$



**Typical Operating Circuit**



**Pin configuration**



**+5 V-Powered, Multi-Channel RS-232 Drivers/Receivers**
**Pin descriptions**

| Pin No | Symbol            | Function  |
|--------|-------------------|---|
| 01     | C1+               | Terminal for positive charge-pump capacitor             |
| 02     | V+                | +2 V <sub>CC</sub> voltage generated by the charge-pump |
| 03     | C1-               | Terminal for positive charge-pump capacitor             |
| 04     | C2+               | Terminal for negative charge-pump capacitor             |
| 05     | C2-               | Terminal for negative charge-pump capacitor             |
| 06     | V-                | -2 V <sub>CC</sub> voltage generated by the charge-pump |
| 07     | T2 <sub>OUT</sub> | RS – 232 Driver Output                                  |
| 08     | R2 <sub>IN</sub>  | RS – 232 Receiver Input                                 |
| 09     | R2 <sub>OUT</sub> | RS – 232 Receiver Output                                |
| 10     | T2 <sub>IN</sub>  | RS – 232 Driver Input                                   |
| 11     | T1 <sub>IN</sub>  | RS – 232 Driver Input                                   |
| 12     | R1 <sub>OUT</sub> | RS – 232 Receiver Output                                |
| 13     | R1 <sub>IN</sub>  | RS – 232 Receiver Input                                 |
| 14     | T1 <sub>OUT</sub> | RS – 232 Driver Output                                  |
| 15     | GND               | Ground  |
| 16     | V <sub>CC</sub>   | + 4.5 V to 5.5 V Supply Voltage Input                   |

**Absolute maximum conditions**

| Symbol            | Parameter   | Rate                  |                      | Unit |
|-------------------|---|-----------------------|----------------------|------|
|                   |   | min                   | max                  |      |
| V <sub>CC</sub>   | Supply voltage  | -0.3                  | 6.0                  | V    |
| V+                | Transmitter high output voltage   | V <sub>CC</sub> – 0.3 | 14                   |      |
| V-                | Transmitter low output voltage  | -14                   | +0.3                 |      |
| V <sub>TIN</sub>  | Transmitter input voltage   | -0.3                  | V <sub>CC</sub> +0.3 |      |
| V <sub>RIN</sub>  | Receiver input voltage  | -30                   | 30                   |      |
| V <sub>TOUT</sub> | Output voltages (transmitters)  | V <sub>-</sub> -0.3   | V <sub>+</sub> +0.3  | V    |
| V <sub>ROUT</sub> | Output voltages (receivers)   | -0.3                  | V <sub>CC</sub> +0.3 |      |
| P <sub>D</sub>    | Power dissipation<br>DIP – package (derate 10.53 mW/°C above 70 °C)<br>SO – package (derate 9.52 mW/°C above 70 °C) | -                     | 842<br>762           | mW   |
| I <sub>SC</sub>   | Short-Circuit Duration (T <sub>out</sub> )  | -                     | Continu-<br>ous      |      |
| T <sub>stg</sub>  | Storage temperature   | -60                   | 150                  | °C   |
| T <sub>A</sub>    | Operating voltage range   | -40                   | 85                   | °C   |

**+5 V-Powered, Multi-Channel RS-232 Drivers/Receivers**
**ELECTRICAL CHARACTERISTICS**

 (V<sub>CC</sub> = 4.5V to 5.5V, C1-C4 = 1μF; T<sub>A</sub> = -40 to +85°C unless otherwise noted)

| Symbol                                   | Parameter                      | Conditions   | Min  | Max  | Units |
|--|--------------------------------|--|------|------|-------|
| <b>DC CHARACTERISTICS</b>                |                                |  |      |      |       |
| V <sub>CC</sub>                          | Operating Voltage Range        | V <sub>IL</sub> =0V  | 4.5  | 5.5  | V     |
| I <sub>CC</sub>                          | V <sub>CC</sub> Supply Current | No load, T <sub>A</sub> = 25°C   |      | 10.0 | mA    |
| <b>LOGIC</b>                             |                                |  |      |      |       |
| I <sub>I</sub>                           | Input Leakage Current          | T <sub>IN</sub> = 0V to V <sub>CC</sub>  | 0.2  | ±10  | μA    |
| V <sub>IL</sub>                          | Input Threshold Low            | T <sub>IN</sub>  |      | 0.8  | V     |
| V <sub>IH</sub>                          | Input Threshold High           | T <sub>IN</sub>  | 2.0  |      | V     |
| V <sub>OL</sub>                          | Output Voltage Low             | R <sub>OUT</sub> ; I <sub>OUT</sub> = 3.2mA  |      | 0.4  | V     |
| V <sub>OH</sub>                          | Output Voltage High            | R <sub>OUT</sub> ; I <sub>OUT</sub> = -1.0mA   | 3.5  |      | V     |
| <b>RECEIVER INPUTS</b>                   |                                |  |      |      |       |
| V <sub>RIN</sub>                         | Input Voltage Range            | All parts, normal operation  | -30  | +30  | V     |
| V <sub>ff</sub>                          | Input Threshold Low            | T <sub>A</sub> = +25°C, V <sub>CC</sub> =5V  | 0.8  |      | V     |
| I <sub>on</sub>                          | Input Threshold High           | T <sub>A</sub> = +25°C, V <sub>CC</sub> =5V  | -    | 2.4  | V     |
| V <sub>h</sub>                           | Input Hysteresis               | V <sub>CC</sub> = 5 V  | 0.2  | 1.0  | V     |
| R <sub>I</sub>                           | Input Resistance               | T <sub>A</sub> = +25°C, V <sub>CC</sub> =5V  | 3    | 7    | kΩ    |
| <b>TRANSMITTER OUTPUTS</b>               |                                |  |      |      |       |
| Δ V <sub>O</sub>                         | Output Voltage Swing           | All driver inputs loaded with 3kΩ to ground  | ±5.0 |      | V     |
| R <sub>O</sub>                           | Output resistance              | V <sub>CC</sub> =V+=V-=0V;<br>V <sub>OUT</sub> =±2V  | 300  |      | Ω     |
| I <sub>SC</sub>                          | Output Short-Circuit Current   |  |      | ±60  | mA    |
| <b>TIMING CHARACTERISTICS</b>            |                                |  |      |      |       |
| ST                                       | Maximum Data Rate              | R <sub>L</sub> =3.0kΩ to 7 kΩ,<br>C <sub>L</sub> =50pF to 1000pF, one transmitter switching  | 120  |      | kbps  |
| t <sub>PLHR</sub> ,<br>t <sub>PHLR</sub> | Receiver Propagation Delay     | C <sub>L</sub> = 150pF<br>All parts, normal operation (Fig. 1)   |      | 10   | μS    |
| t <sub>PLHT</sub> ,<br>t <sub>PHLT</sub> | Transmitter Propagation Delay  | R <sub>L</sub> =3.0kΩ, C <sub>L</sub> =2500pF, all transmitters loaded (Fig. 2)  |      | 6.0  | μS    |
| SR                                       | Transition-Region Slew Rate    | T <sub>A</sub> = 25°C, V <sub>CC</sub> = 5V,<br>R <sub>L</sub> =3.0kΩ to 7 kΩ,<br>C <sub>L</sub> =50pF to 2500pF,<br>measured from -3V to +3V or +3V to -3V (Fig. 3) | 3    | 30   | V/μS  |

Timing diagram

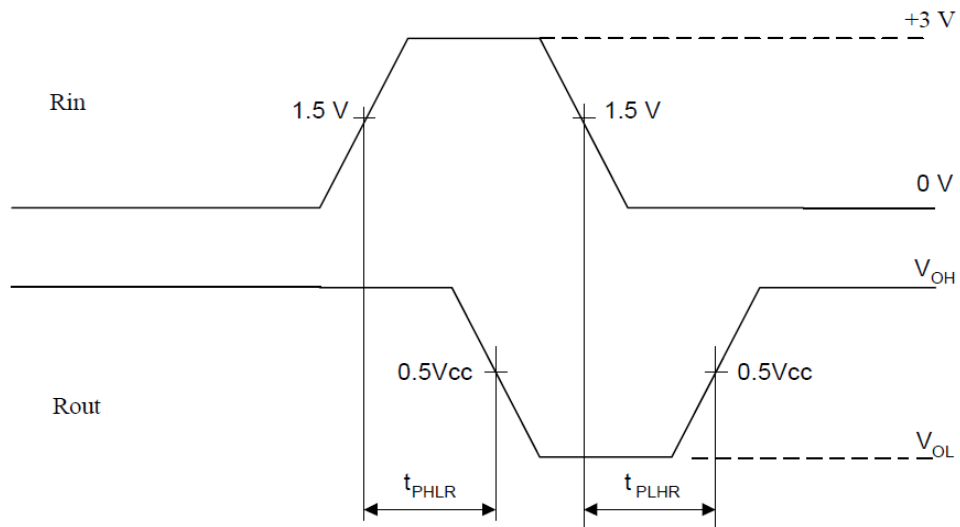


Figure 1

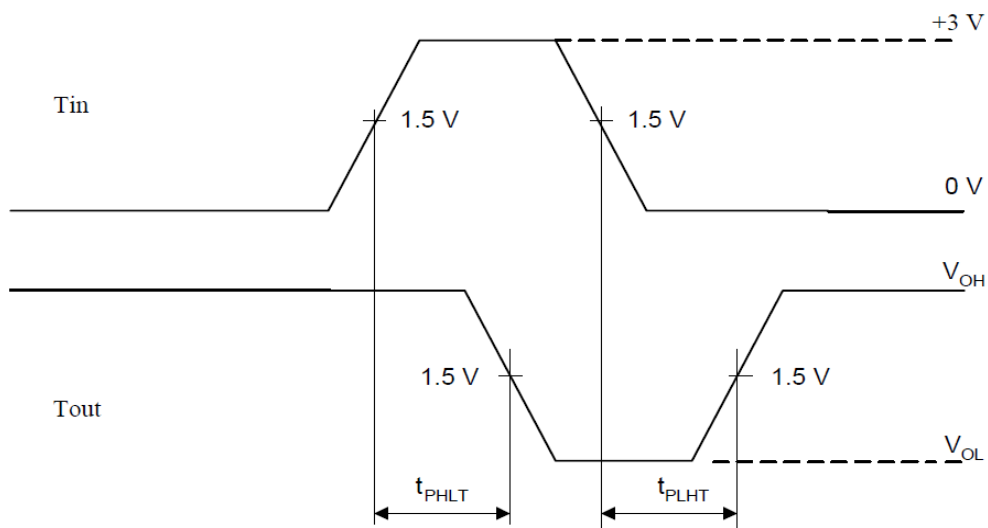


Figure 2

+5 V-Powered, Multi-Channel RS-232 Drivers/Receivers

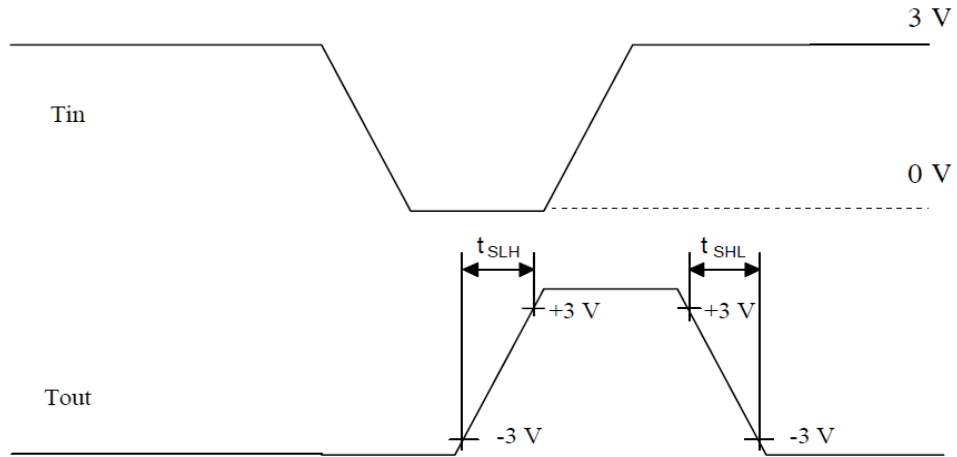


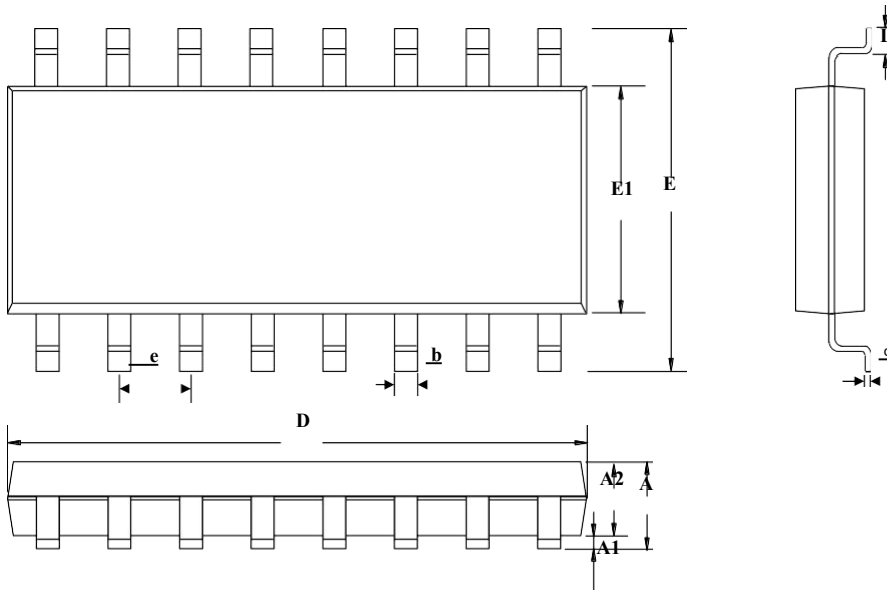
Figure 3

+5 V-Powered, Multi-Channel RS-232 Drivers/Receivers

PACKAGE OUTLINE

SOP-16

UNIT: mm



| SYMBOL | MILLIMETER |      |       |
|--------|------------|------|-------|
|        | MIN        | NOM  | MAX   |
| A      | —          | —    | 1.80  |
| A1     | 0.10       | 0.15 | 0.25  |
| A2     | 1.25       | 1.45 | 1.65  |
| b      | 0.33       | —    | 0.51  |
| c      | 0.17       | —    | 0.25  |
| D      | 9.50       | —    | 10.20 |
| E      | 5.80       | 6.00 | 6.20  |
| E1     | 3.70       | —    | 4.10  |
| e      | 1.27BSC    |      |       |
| L      | 0.45       | 0.60 | 0.80  |

Ordering information

| Order code   | Package | Baseqty | Deliverymode  | Operating temperature range |
|--------------|---------|---------|---------------|-----------------------------|
| UMW ST232BDR | SOP-16  | 2500    | Tape and reel | -40° - +85°                 |