

### General Description

The MAX3232IDR consists of two drivers, two receivers, and a dual charge-pump circuit with  $\pm 12\text{kV}$  IEC 61000-4-2 Contact Discharge ESD protection.

The MAX3232IDR meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3V to 5.5V supply. The device operates at data signaling rates up to 250 kbps.

The MAX3232IDR is available in SOP16 package.

### Features

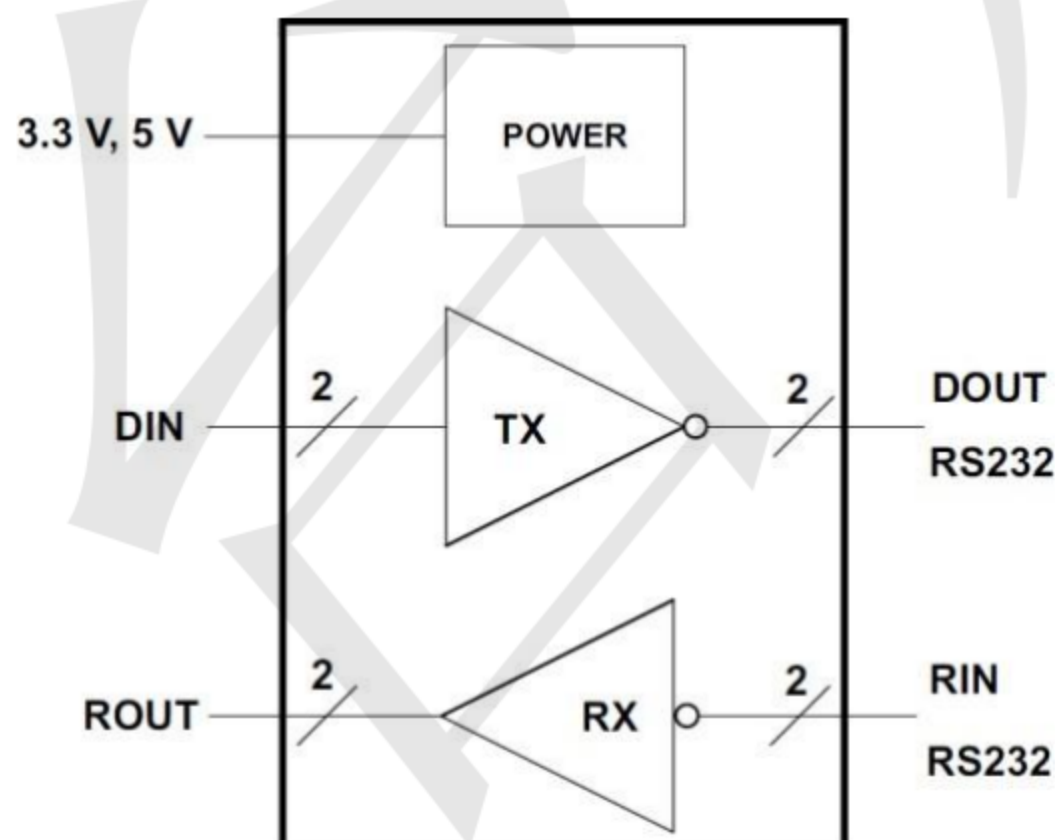
- ESD protection for RS-232 Bus Pins
  - $\pm 12\text{kV}$  (IEC61000-4-2, Contact Discharge)
  - $\pm 15\text{kV}$  (IEC61000-4-2, Air-Gap Discharge)
- Meets the Requirements of TIA/EIA-232-F standard
- Wide Power Supply Range: Single +3V to +5.5V
- Operates up to 250kbps
- Two Drivers and Two Receivers
- External Capacitors:  $4 \times 0.1 \mu\text{F}$
- Accepts 5V Logic Input With 3.3V Supply

### Applications

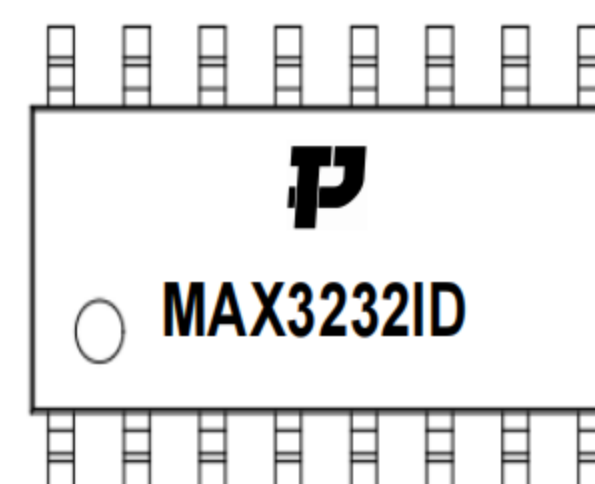
- Battery-Powered Equipment
- Industry Human Machine Interface
- Notebook, Computers
- Printers

### Mechanical Characteristics

- Shipping Qty :2.5kpcs Or 4k pcs 7Inch Tape & Reel



### Marking



### Absolute Maximum Ratings

| Characteristic                  |  | Min       | Max   | Unit                  |   |
|---------------------------------|--|-----------|-------|-----------------------|---|
| V <sub>CC</sub>                 | Supply voltage                         | -0.3      | 6     | V                     |   |
| V <sub>+</sub>                  | Positive output supply voltage         | -0.3      | 7     | V                     |   |
| V <sub>-</sub>                  | Negative output supply voltage         | 0.3       | -7    | V                     |   |
| V <sub>+</sub> - V <sub>-</sub> | Supply voltage difference              |           | 13    | V                     |   |
| V <sub>I</sub>                  | Input voltage                          | Drivers   | -0.3  | 6                     | V |
|                                 |  | Receivers | -25   | 25                    | V |
| V <sub>O</sub>                  | Output voltage                         | Drivers   | -13.2 | 13.2                  | V |
|                                 |  | Receivers | -0.3  | V <sub>CC</sub> + 0.3 | V |
| T <sub>J</sub>                  | Operating virtual junction temperature |           | 150   | °C                    |   |
| T <sub>stg</sub>                | Storage temperature                    | -65       | 150   | °C                    |   |

### Recommended Operating Conditions

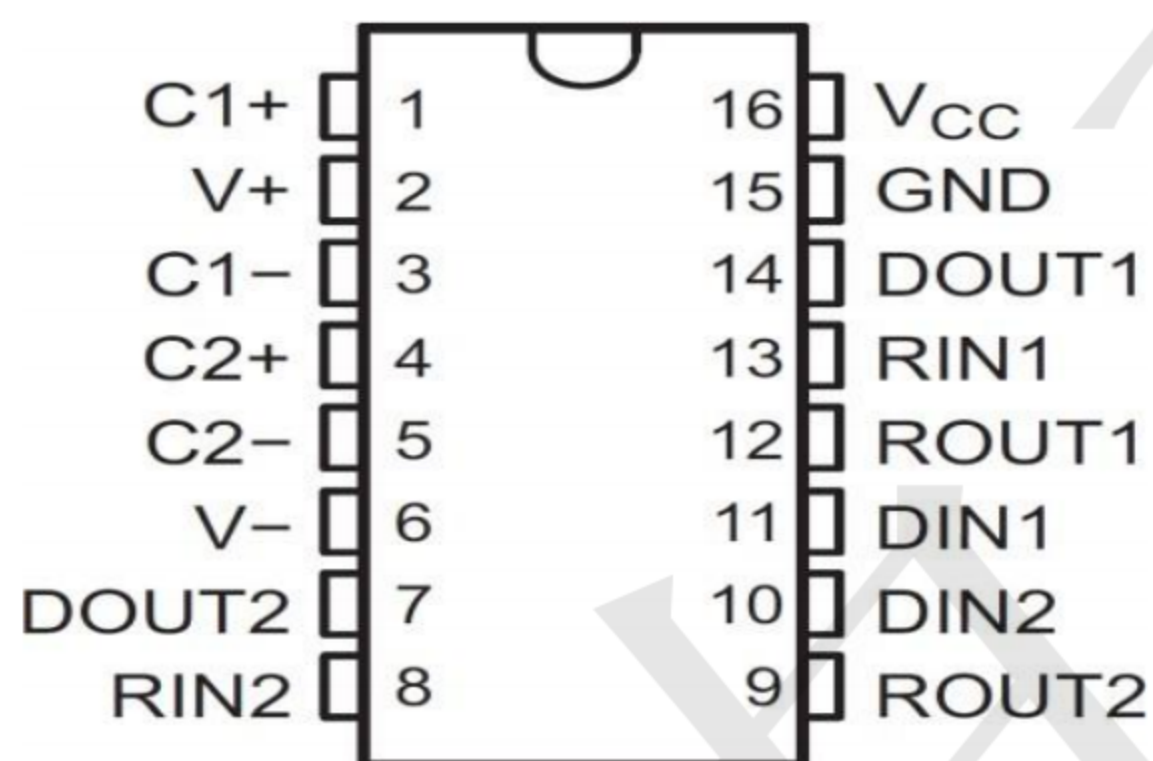
| Characteristic  |                                 | Min                    | Typ                    | Max | Unit |
|-----------------|---------------------------------|------------------------|------------------------|-----|------|
| Supply voltage  |                                 | V <sub>CC</sub> = 3.3V | 3                      | 3.3 | V    |
|                 |                                 | V <sub>CC</sub> = 5V   | 4.5                    | 5   |      |
| V <sub>IH</sub> | Driver high-level input voltage | DIN                    | V <sub>CC</sub> = 3.3V |     | 5.5  |
|                 |                                 |                        | V <sub>CC</sub> = 5V   | 2.4 | 5.5  |
| V <sub>IL</sub> | Driver low-level input          | DIN                    | 0                      | 0.8 | V    |
| V <sub>I</sub>  | Receiver input voltage          | RIN                    | -25                    | 25  | V    |
| T <sub>A</sub>  | Operating free-air temperature  |                        | -40                    | 125 | °C   |

### Electrical Characteristics

| Parameter        |   | Test Conditions  | Min                  | Typ                  | Max | Unit |
|------------------|---|--|----------------------|----------------------|-----|------|
| I <sub>CC</sub>  | Supply current  | No load, V <sub>CC</sub> = 3.3 V or 5 V  |                      | 1.5                  |     | mA   |
| <b>Driver</b>    |   |  |                      |                      |     |      |
| V <sub>OH</sub>  | High-level output voltage                               | DOUT at R <sub>L</sub> = 3 kΩ to GND, DIN = GND                                    | 5                    | 5.4                  |     | V    |
| V <sub>OL</sub>  | Low-level output voltage                                | DOUT at R <sub>L</sub> = 3 kΩ to GND, DIN = V <sub>CC</sub>                        | -5                   | -5.4                 |     | V    |
| I <sub>IH</sub>  | High-level input current                                | V <sub>I</sub> = V <sub>CC</sub>   |                      | ±0.01                | ±1  | μA   |
| I <sub>IL</sub>  | Low-level input current                                 | V <sub>I</sub> at GND  |                      | ±0.01                | ±1  | μA   |
| I <sub>OS</sub>  | Short-circuit output current                            | V <sub>CC</sub> = 3.6 V, V <sub>O</sub> = 0 V                                      |                      | ±30                  | ±60 | mA   |
|                  |   | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0 V                                      |                      |                      |     |      |
| r <sub>O</sub>   | Output resistance                                       | V <sub>CC</sub> , V <sub>+</sub> , and V <sub>-</sub> = 0 V, V <sub>O</sub> = ±2 V | 300                  | 10M                  |     | Ω    |
| <b>Receiver</b>  |   |  |                      |                      |     |      |
| V <sub>OH</sub>  | High-level output voltage                               | I <sub>OH</sub> = -1 mA  | V <sub>CC</sub> -0.6 | V <sub>CC</sub> -0.1 |     | V    |
| V <sub>OL</sub>  | Low-level output voltage                                | I <sub>OL</sub> = 1.6 mA   |                      |                      | 0.4 | V    |
| V <sub>IT+</sub> | Positive-going input threshold voltage                  | V <sub>CC</sub> = 3.3 V  |                      | 1.5                  | 2.4 | V    |
|                  |   | V <sub>CC</sub> = 5 V  |                      | 2.0                  | 2.4 |      |
| V <sub>IT-</sub> | Negative-going input threshold voltage                  | V <sub>CC</sub> = 3.3 V  | 0.6                  | 1.1                  |     | V    |
|                  |   | V <sub>CC</sub> = 5 V  | 0.8                  | 1.5                  |     |      |
| V <sub>hys</sub> | Input hysteresis (V <sub>IT+</sub> - V <sub>IT-</sub> ) |  |                      | 0.4                  |     | V    |
| r <sub>i</sub>   | Input resistance  | V <sub>I</sub> = ±3 V to ±25 V   | 3                    | 5                    | 7   | kΩ   |



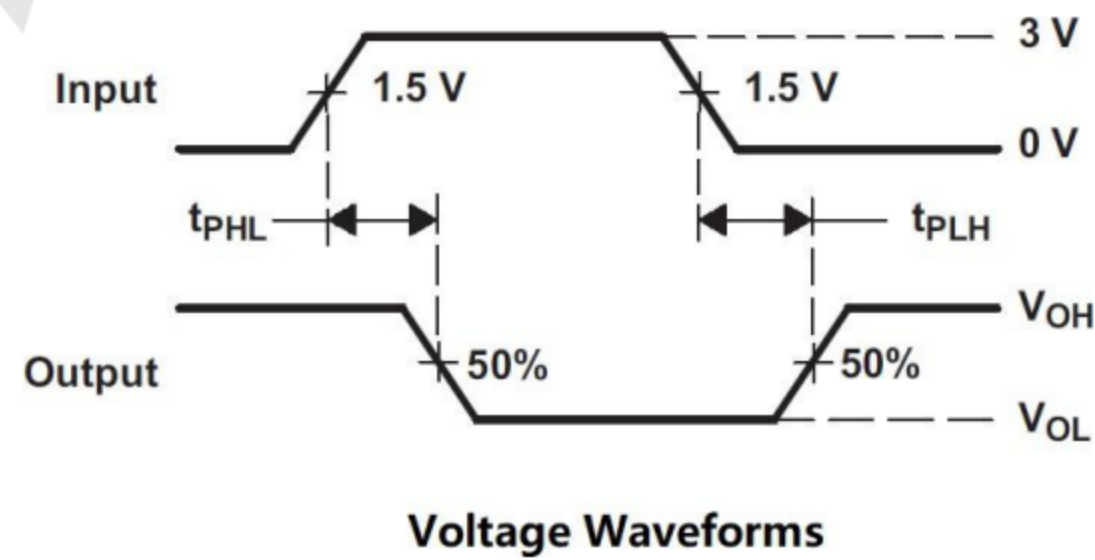
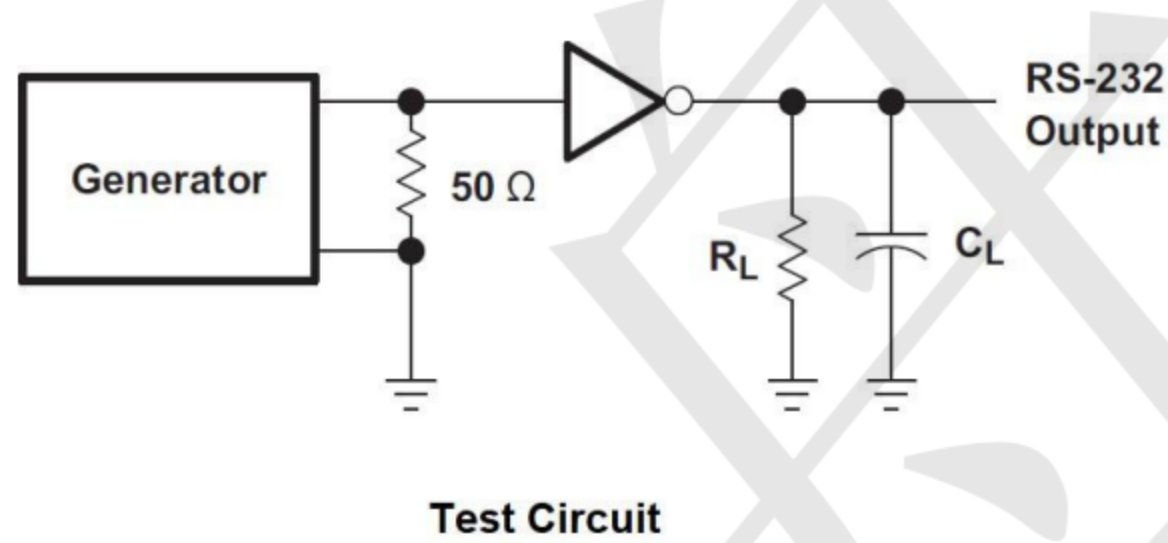
### Pin Configuration and Functions



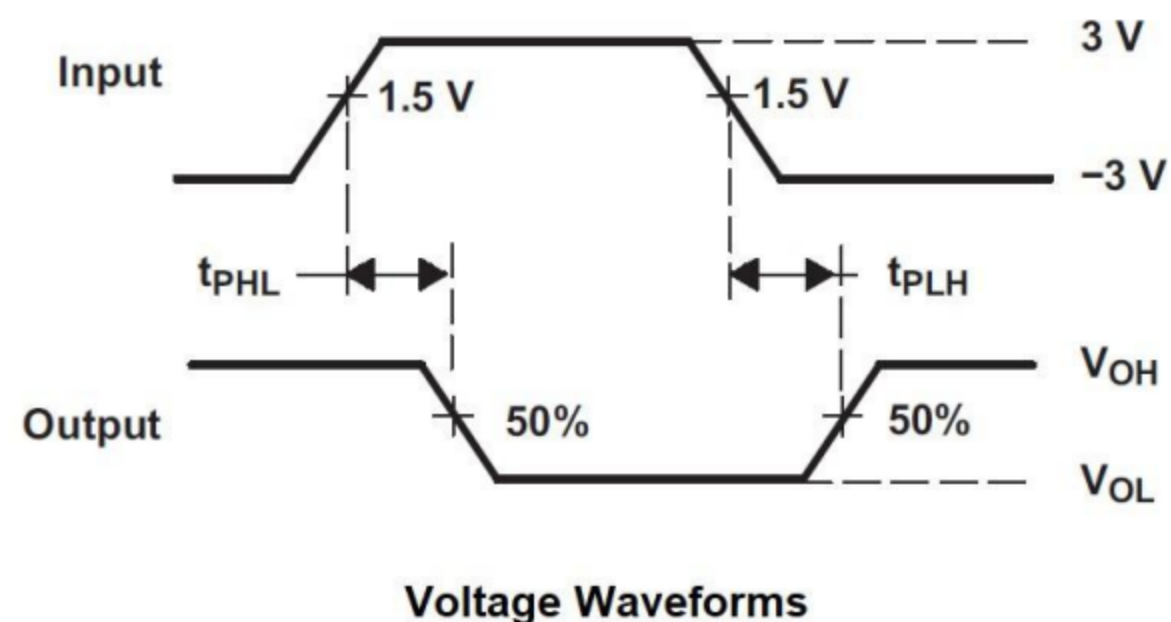
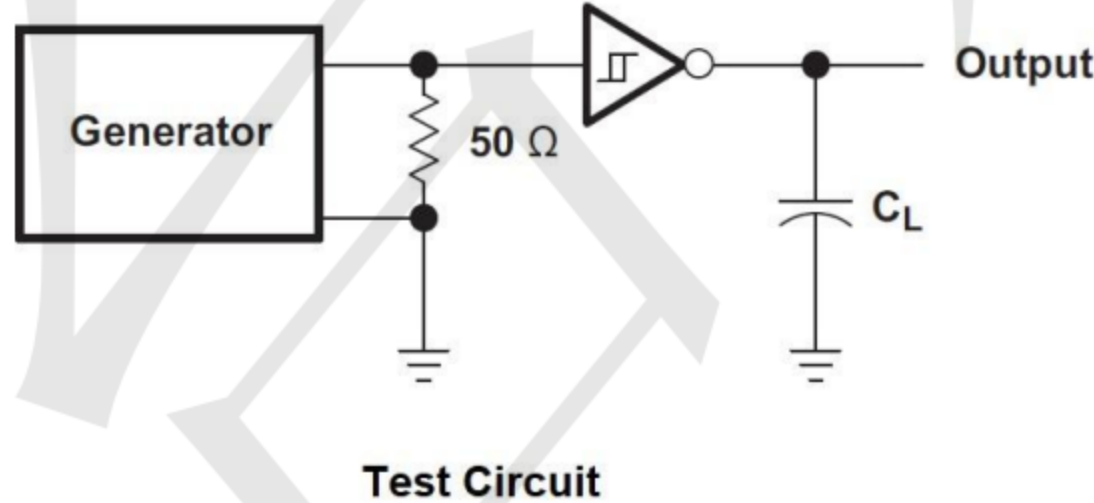
| Pin NO. | Name  | I/O | Description  |
|---------|-------|-----|--|
| 1       | C1+   | —   | Positive lead of C1 capacitor                          |
| 2       | V+    | O   | Positive charge pump output for storage capacitor only |
| 3       | C1-   | —   | Negative lead of C1 capacitor                          |
| 4       | C2+   | —   | Positive lead of C2 capacitor                          |
| 5       | C2-   | —   | Negative lead of C2 capacitor                          |
| 6       | V-    | O   | Negative charge pump output for storage capacitor only |
| 7       | DOUT2 | O   | RS232 Driver Output                                    |
| 8       | RIN2  | I   | RS232 Receiver Input                                   |
| 9       | ROUT2 | O   | TTL/CMOS Receiver Output                               |
| 10      | DIN2  | I   | TTL/CMOS Driver Input                                  |
| 11      | DIN1  | I   | TTL/CMOS Driver Input                                  |
| 12      | ROUT1 | O   | TTL/CMOS Receiver Output                               |
| 13      | RIN1  | I   | RS232 Receiver Input                                   |
| 14      | DOUT1 | O   | RS232 Driver Output                                    |
| 15      | GND   | —   | Ground   |
| 16      | VCC   | —   | Supply Voltage   |

**Switchin Characteristics**

| Parameter         |  | Test Conditions   | Min                                       | Typ | Max | Unit       |
|-------------------|--|---|---|-----|-----|------------|
| Maximum data rate |  | $R_L = 3\text{ k}\Omega$ , $C_L = 1000\text{ pF}$ ,<br>One DOUT switching                                 | 250                                       |     |     | kbps       |
| $t_{sk(p)}$       | Driver pulse skew  | $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$ , $C_L = 150\text{ pF}$ to $2500\text{ pF}$ , see Figure 1 |   | 100 |     | ns         |
| $SR(tr)$          | Driver slew rate, transition region                        | $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$ ,<br>$V_{CC} = 3.3\text{ V}$                               | $C_L = 150\text{ pF}$ to $1000\text{ pF}$ | 6   | 30  | V/ $\mu$ s |
|                   |  |   | $C_L = 150\text{ pF}$ to $2500\text{ pF}$ | 4   | 30  |            |
| $t_{PLH}$         | Receiver propagation delay time, low- to high-level output | $C_L = 150\text{ pF}$<br>see Figure 2   |   | 150 |     | ns         |
| $t_{PHL}$         | Receiver propagation delay time, high- to low-level output |   |   | 150 |     | ns         |
| $t_{sk(p)}$       | Receiver pulse skew  |   |   | 60  |     | ns         |



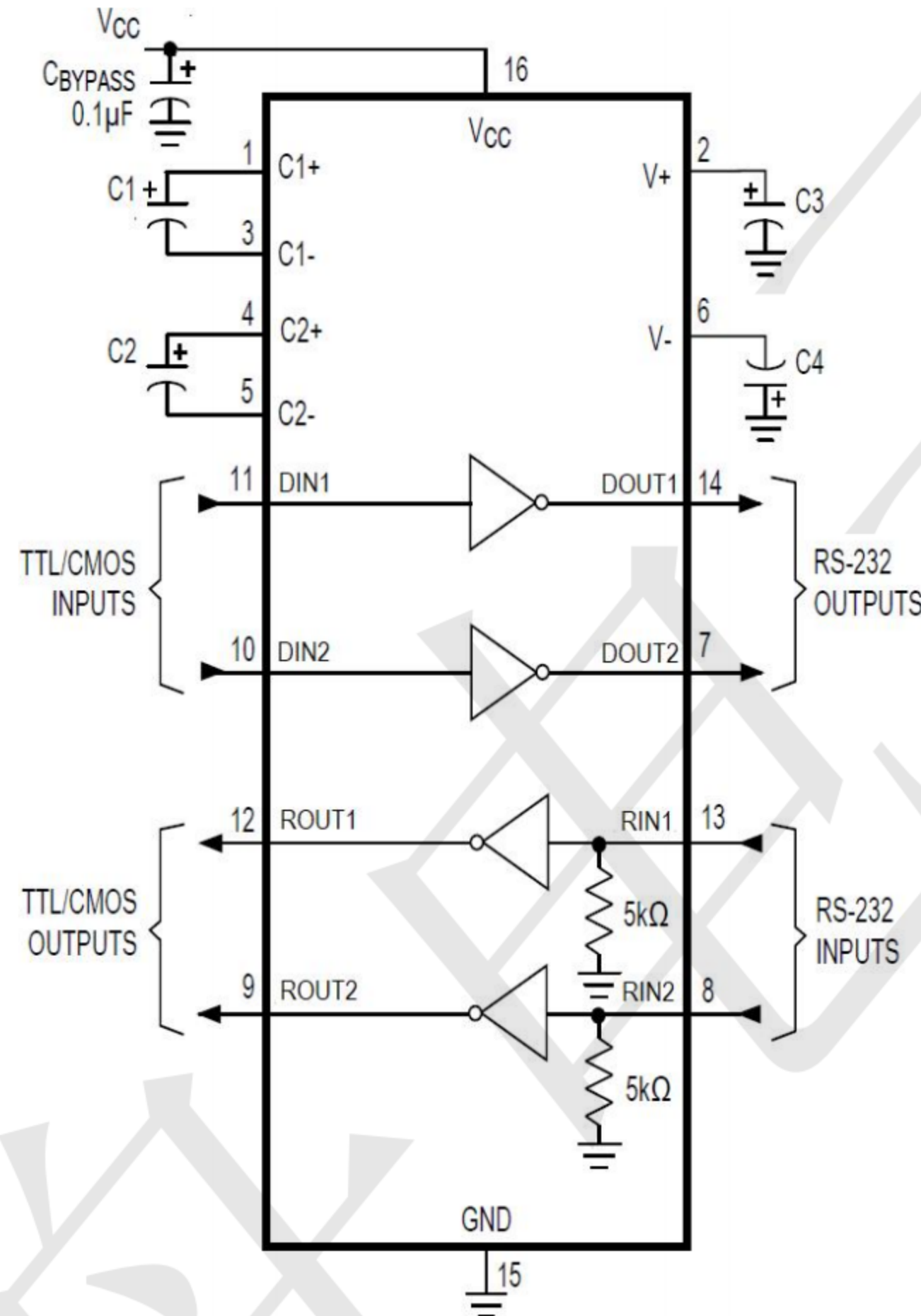
**Figure 1. Driver Pulse Skew**



**Figure 2. Receiver Propagation Delay Times**



**Typical Application**



Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown.

**Figure 3. Typical Operating Circuit**

**Table 1. VCC vs Capacitor Values**

| VCC           | C1       | C2, C3, C4 |
|---------------|----------|------------|
| 3.3 V ± 0.3 V | 0.1 µF   | 0.1 µF     |
| 5 V ± 0.5 V   | 0.047 µF | 0.33 µF    |
| 3 V to 5.5 V  | 0.1 µF   | 0.47 µF    |



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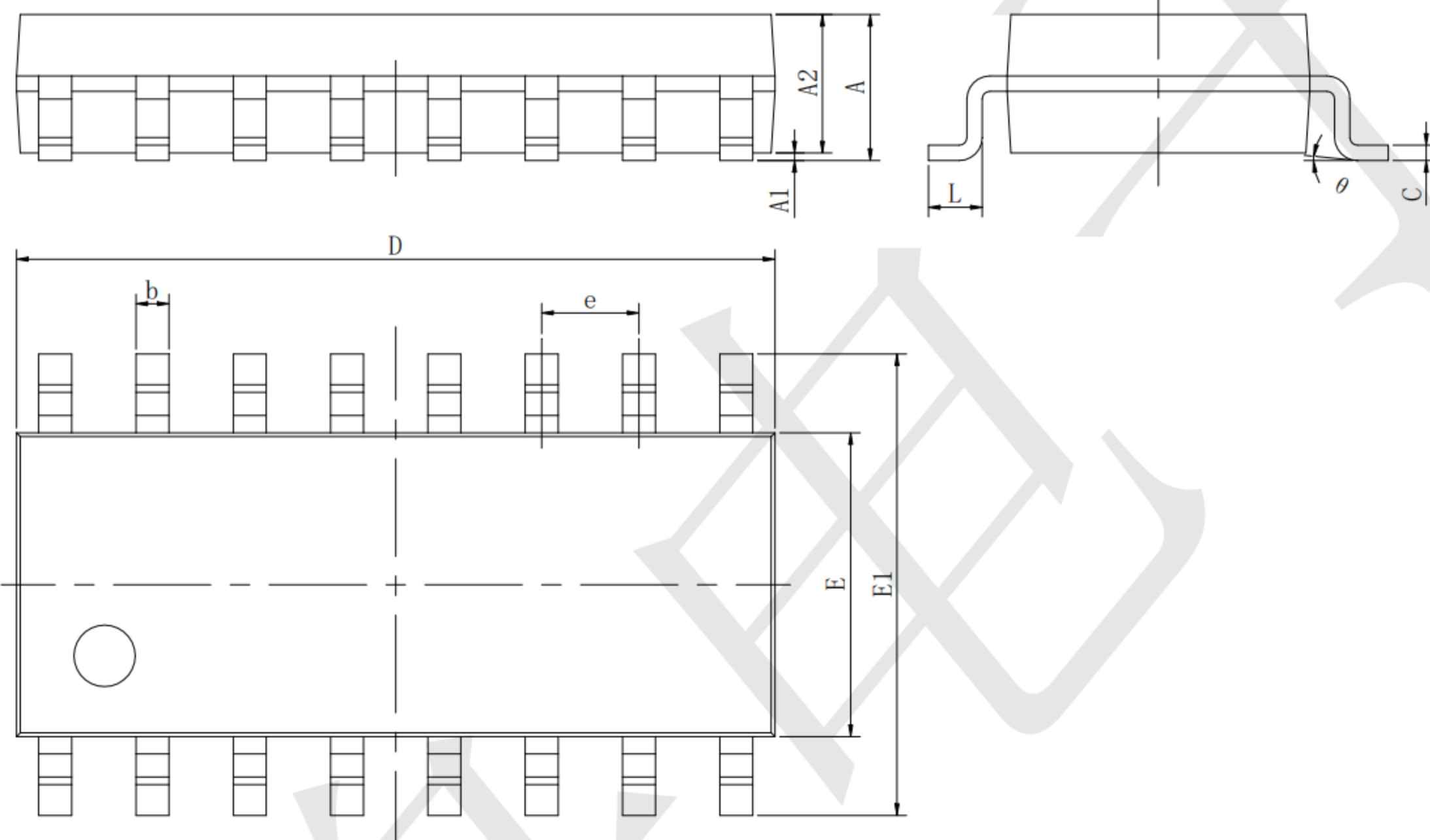
MAX3232IDR

3V to 5.5V 250kbps RS-232 Transceivers

www.sot23.com.tw

Outline Dimensions SOP16

Unit:mm



| 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      | 0.170                     | 0.250  | 0.007                | 0.010 |
| D      | 9.800                     | 10.200 | 0.386                | 0.402 |
| E      | 3.800                     | 4.000  | 0.150                | 0.157 |
| E1     | 5.800                     | 6.200  | 0.228                | 0.244 |
| e      | 1.270(BSC)                |        | 0.050(BSC)           |       |
| L      | 0.400                     | 1.270  | 0.016                | 0.050 |
| theta  | 0°                        | 8°     | 0°                   | 8°    |