

**IL75232N, IL75232D**  
EIA-232-D INTERFACE 1 CHIP IC

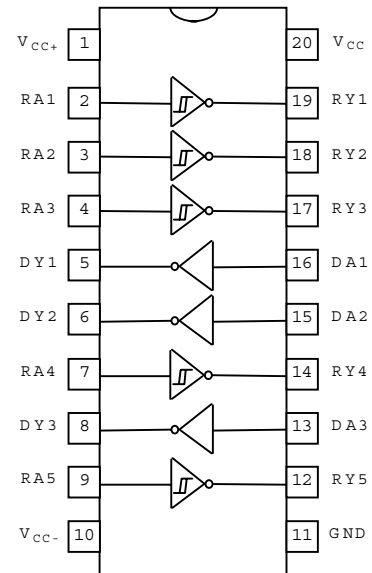
**Description**

The IL75232N, IL75232ND are monolithic device containing 3 independent drives and 5 receivers. These are designed to interface between data terminal equipment and data communication equipment as designed by EIA-232-D.

**Features**

- Meets standard EIA-232-D (Revision of RS-232-C)
- Drivers
  - Current Limited Output 10 mA Typical
  - Power-off Output Impedance 300  $\Omega$  Min
  - Slew Rate Control by Load Capacitor
  - Flexible Supply Voltage Range
  - Input Compatible with Most TTL and DTL Circuits
- Receivers
  - Input Resistance 3 k $\Omega$  to 7 k $\Omega$
  - Input Signal Range  $\pm 30$  V
  - Built-in Input Hysteresis (Double Threshold)
- 20 DIP/SO20: MS-001AD (IL75232N) / MS-013AC (IL75232D)

**Block Diagram**



**IL75232N , IL75232D**

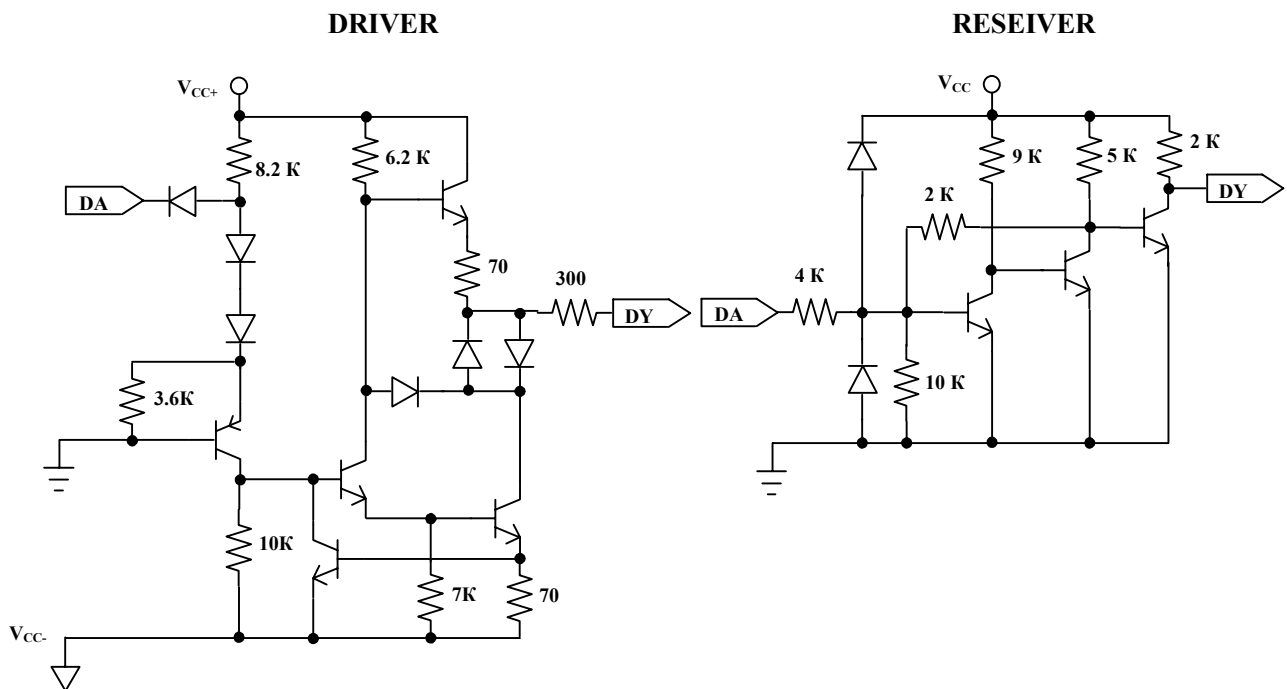
**Pin Description**

| Name             | Pin No | Function                | Name             | Pin No | Function                |
|------------------|--------|-------------------------|------------------|--------|-------------------------|
| V <sub>CC+</sub> | 1      | Driver Section Supply + | V <sub>CC-</sub> | 10     | Driver Section Supply - |
| DA1              | 16     | Driver Input            | DY1              | 5      | Driver Output           |
| DA2              | 15     |                         | DY2              | 6      |                         |
| DA3              | 13     |                         | DY3              | 8      |                         |
| V <sub>CC</sub>  | 20     | Receiver Section Supply | GND              | 11     | Ground                  |
| RA1              | 2      | Receiver Input          | RY1              | 19     | Receiver Output         |
| RA2              | 3      |                         | RY2              | 18     |                         |
| RA3              | 4      |                         | RY3              | 17     |                         |
| RA4              | 7      |                         | RY4              | 14     |                         |
| RA5              | 9      |                         | RY5              | 12     |                         |

**Absolute Maximum Ratings**

| Symbol           | Parameter                                  | Rating     | Unit |
|------------------|--------------------------------------------|------------|------|
| V <sub>CC+</sub> | Supply Voltage                             | 15         | V    |
| V <sub>CC-</sub> | Supply Voltage                             | -15        | V    |
| V <sub>CC</sub>  | Supply Voltage                             | 10         | V    |
| VI (Driver)      | Input Voltage                              | -15 ÷ +7   | V    |
| VI (Reciver)     | Input Voltage                              | ± 30       | V    |
| VO (Driver)      | Output Voltage                             | -15 ÷ +15  | V    |
| PT               | Continuous Power Dissipation (Below 25 °C) | 1.0        | W    |
| T <sub>STG</sub> | Storage Temperature                        | -65 ÷ +175 | °C   |
| Top              | Operating Temperature                      | 0 ÷ +75    | °C   |

## Schematic



## Electrical Characteristics

### Supply Current

$V_{CC} = 5V, T_A = 25^\circ C$

| Symbol    | Parameter                     | Test Conditions  |                 | Min | Max  | Unit |
|-----------|-------------------------------|------------------|-----------------|-----|------|------|
| $I_{CC+}$ | Supply Current from $V_{CC+}$ | $V_{CC+} = 9V$   | $V_{IN} = 1.9V$ |     | 15   | mA   |
|           |                               | No Load          | $V_{IN} = 0.8V$ |     | 4.5  |      |
|           |                               | $V_{CC+} = 12V$  | $V_{IN} = 1.9V$ |     | 19   |      |
|           |                               | No Load          | $V_{IN} = 0.8V$ |     | 5.5  |      |
| $I_{CC-}$ | Supply Current from $V_{CC-}$ | $V_{CC-} = -9V$  | $V_{IN} = 1.9V$ |     | -15  | mA   |
|           |                               | No Load          | $V_{IN} = 0.8V$ |     | -3.2 |      |
|           |                               | $V_{CC-} = -12V$ | $V_{IN} = 1.9V$ |     | -19  |      |
|           |                               | No Load          | $V_{IN} = 0.8V$ |     | -3.2 |      |
| $I_{CC}$  | Supply Current from $V_{CC}$  | $V_{CC} = 5V$    | $V_{IN} = 5.0V$ |     | 30   | mA   |
|           |                               |                  |                 |     |      |      |

### Driver Section

| Symbol      | Parameter                                  | Test Conditions                                   |                                         | Min | Max  | Unit     |
|-------------|--------------------------------------------|---------------------------------------------------|-----------------------------------------|-----|------|----------|
| $V_{IH}$    | High Level Input Voltage                   | $V_{CC+} = 9V$<br>$V_{CC-} = -9V$                 |                                         | 1.9 |      | V        |
| $V_{IL}$    | Low Level Input Voltage                    |                                                   |                                         |     | 0.8  | V        |
| $V_{OH}$    | High Level Output Voltage                  | $V_{IL} = 0.8V$<br>$RL = 3k\Omega$                | $V_{CC+} = 9V$<br>$V_{CC-} = -9V$       | 6   |      | V        |
|             |                                            |                                                   | $V_{CC+} = 13.2V$<br>$V_{CC-} = -13.2V$ | 9   |      |          |
| $V_{OL}$    | Low Level Output Voltage                   | $V_{IH} = 1.9V$<br>$RL = 3k\Omega$                | $V_{CC+} = 9V$<br>$V_{CC-} = -9V$       |     | -6   | V        |
|             |                                            |                                                   | $V_{CC+} = 13.2V$<br>$V_{CC-} = -13.2V$ |     | -9   |          |
| $I_{IH}$    | High Level Input Current                   | $V_I = 5V$                                        |                                         |     | 10   | $\mu A$  |
| $I_{IL}$    | Low Level Input Current                    | $V_I = 0$                                         |                                         |     | -1.6 | mA       |
| $I_{OS(H)}$ | Short Circuit Output Current at High Level | $V_I = 0.8V$<br>$V_O = 0$                         |                                         | -6  | -12  | mA       |
| $I_{OS(L)}$ | Short Circuit Output Current at Low Level  | $V_I = 1.9V$<br>$V_O = 0$                         |                                         | 6   | 12   | mA       |
| $R_O$       | Output Resistance, Power Off               | $V_{CC+} = 0, V_{CC-} = 0$<br>$V_O = -2V$ to $2V$ |                                         | 300 |      | $\Omega$ |

### Driver Switching Characteristic

$V_{CC+} = 9V$ ,  $V_{CC-} = -9V$   $T_A = 25^\circ C$

| Symbol    | Parameter                                           | Test Conditions                                                        | Min          | Max | Unit    |
|-----------|-----------------------------------------------------|------------------------------------------------------------------------|--------------|-----|---------|
| $t_{PLH}$ | Propagation Delay Time, Low-To-High-Level Output    | $RL = 3\text{ k}\Omega$<br>$CL = 15\text{ }\mu F$<br>See Figure 1      |              | 500 | ns      |
| $t_{PHL}$ | Propagation Delay Time, High -To- Low -Level Output |                                                                        |              | 175 | ns      |
| $t_{TLH}$ | Transition Time, Low-To-High-Level Output *         |                                                                        |              | 100 | ns      |
| $t_{THL}$ | Transition Time, High -To- Low -Level Output*       |                                                                        |              | 75  | ns      |
| $t_{TLH}$ | Transition Time, Low-To-High-Level Output**         | $RL = 3\text{ k}\Omega$ to $7\text{ k}\Omega$<br>$CL = 2500\text{ pF}$ | 2.5<br>(tip) |     | $\mu s$ |
| $t_{THL}$ | Transition Time, High-To-Low -Level Output**        | See Figure 1                                                           | 3.0<br>(tip) |     | $\mu s$ |

\*- Measured between 10 % and 90 % Points of Output Waveform

\*\* - Measured between +3V and -3V Points on the Output Waveform (EIA-232-D Condition)

### Receiver Section

| Symbol   | Parameter                        | Test Conditions                       | Min         | Max  | Unit |
|----------|----------------------------------|---------------------------------------|-------------|------|------|
| VT+      | Positive-Going Threshold Voltage |                                       | 1.75        | 2.25 | V    |
| VT-      | Negative-Going Threshold Voltage |                                       | 0.75        | 1.25 | V    |
| $V_{OH}$ | High Level Output Voltage        | $V_I = 0.75V$ , $I_{OL} = -0.5mA$     | 2.6         | 5    | V    |
|          |                                  | Input Open, $I_{OL} = -0.5\text{ mA}$ | 2.6         | 5    |      |
| $V_{OL}$ | Low Level Output Voltage         | $V_I = 3V$ , $I_{OL} = 10\text{ mA}$  |             | 0.45 | V    |
| $I_{IH}$ | High-Level Input Current         | $V_I = 25V$                           | 3.6         | 8.3  | mA   |
|          |                                  | $V_I = 3V$                            | 0.43        |      |      |
| $I_{IL}$ | Low-Level Input Current          | $V_I = -25V$                          | -3.6        | -8.3 | mA   |
|          |                                  | $V_I = -3V$                           | -0.43       |      |      |
| $I_{OS}$ | Short-Circuit Output Current     |                                       | -3<br>(tip) |      | mA   |

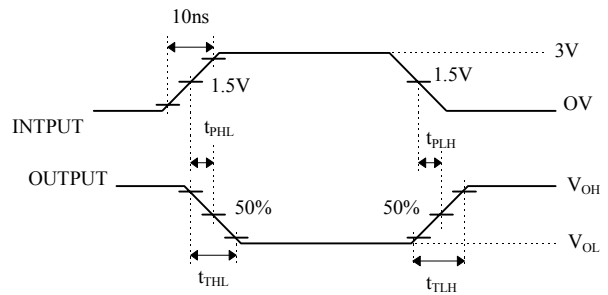
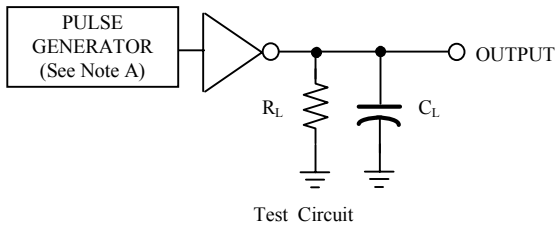
### Receiver Switching Characteristic

$V_{CC} = 5V$

| Symbol    | Parameter                                           | Test Conditions                                    | Min | Max | Unit |
|-----------|-----------------------------------------------------|----------------------------------------------------|-----|-----|------|
| $t_{PLH}$ | Propagation Delay Time, Low-To-High-Level Output    | $C_L = 15\text{ pF}$<br>$R_L = 3.9\text{ k}\Omega$ |     | 150 | ns   |
| $t_{PHL}$ | Propagation Delay Time, High -To- Low -Level Output | $C_L = 15\text{ pF}$<br>$R_L = 390\text{ k}\Omega$ |     | 50  | ns   |
| $t_{TLH}$ | Transition Time, Low-To-High-Level Output           | $C_L = 15\text{ pF}$<br>$R_L = 3.9\text{ k}\Omega$ |     | 175 | ns   |
| $t_{THL}$ | Transition Time, High -To- Low -Level Output        | $C_L = 15\text{ pF}$<br>$R_L = 390\text{ k}\Omega$ |     | 20  | ns   |

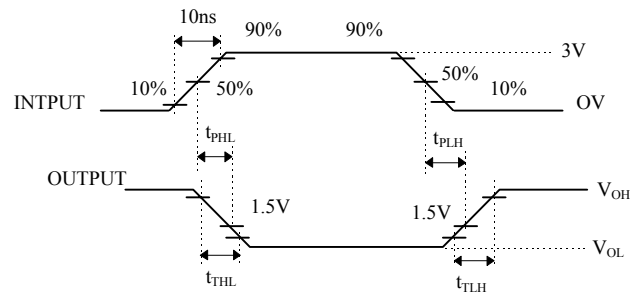
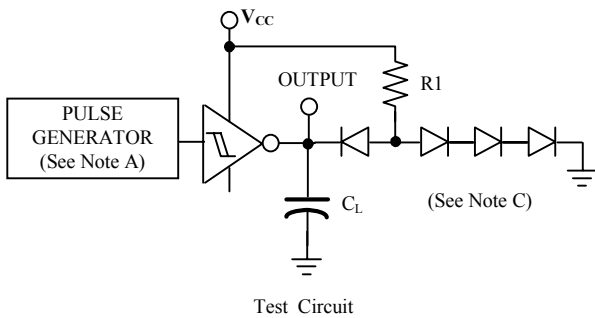
## Parameter Measurement Information

### DRIVER



Voltage Waveform

### RESEIVER

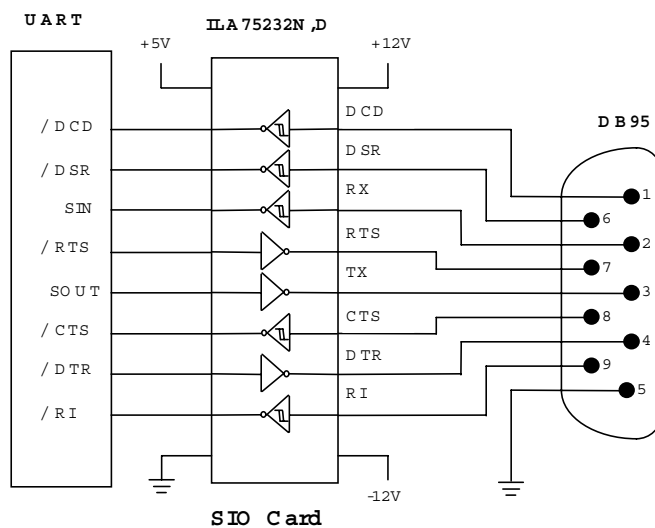


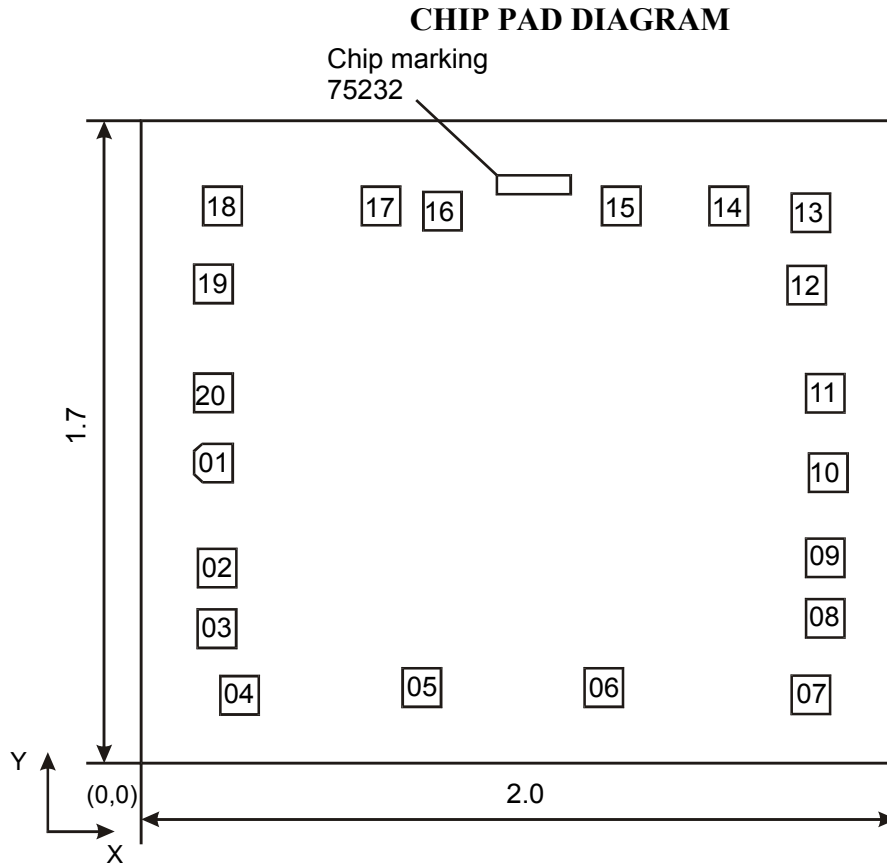
$T_w=25 \mu s$ , Voltage Waveform

- Note
- A. The pulse generator has the following characteristics.  $f = 200 \text{ KHz}$ ,  $Z_0 = 50 \Omega$
  - B. C included probe and jig capacitance.
  - C. All diodes are 1N3064 or equivalent.

Fig1. Propagation and Transition Times

## Typical Application





**Location of marking (mm):** left lower corner  $x=0.942$ ,  $y=1.506$ , right higher corner  $x=1.137$ ,  $y=1.556$ .

**PAD LOCATION**

| Pad No | Location (left lower corner), mm |       | Pad size, mm  |
|--------|----------------------------------|-------|---------------|
|        | X                                | Y     |               |
| 01     | 0.141                            | 0.743 | 0.102 x 0.102 |
| 02     | 0.151                            | 0.466 | 0.102 x 0.102 |
| 03     | 0.151                            | 0.306 | 0.102 x 0.102 |
| 04     | 0.210                            | 0.128 | 0.102 x 0.102 |
| 05     | 0.692                            | 0.149 | 0.102 x 0.102 |
| 06     | 1.174                            | 0.149 | 0.102 x 0.102 |
| 07     | 1.722                            | 0.130 | 0.102 x 0.102 |
| 08     | 1.760                            | 0.333 | 0.102 x 0.102 |
| 09     | 1.760                            | 0.493 | 0.102 x 0.102 |
| 10     | 1.768                            | 0.718 | 0.102 x 0.102 |
| 11     | 1.760                            | 0.928 | 0.102 x 0.102 |
| 12     | 1.711                            | 1.214 | 0.102 x 0.102 |
| 13     | 1.722                            | 1.406 | 0.102 x 0.102 |
| 14     | 1.504                            | 1.424 | 0.102 x 0.102 |
| 15     | 1.220                            | 1.424 | 0.102 x 0.102 |
| 16     | 0.747                            | 1.410 | 0.102 x 0.102 |
| 17     | 0.584                            | 1.424 | 0.102 x 0.102 |
| 18     | 0.165                            | 1.424 | 0.102 x 0.102 |
| 19     | 0.141                            | 1.217 | 0.102 x 0.102 |
| 20     | 0.106                            | 0.929 | 0.102 x 0.102 |

Note: Size is given as per passivation layer