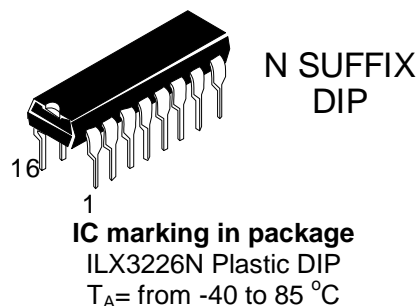
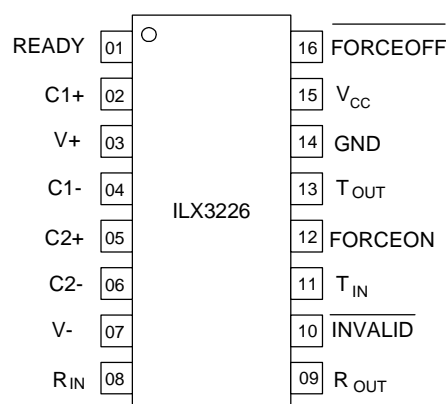


**MICROCIRCUIT ILX3226N INTERFACE TRANSCEIVER OF THE SERIAL DATA OF THE STANDARD RS -232
(compatible to MAX3226 (MAXIM USA))**

Microcircuits ILX3226 is interface transceiver of serial data under RS - 232 standard with single power supply source & bipolar output voltage of transmitter, forming by build-in voltage multiplier on 4 external capacities, 0.1 μ F. ILX3226 correspond to EIA/TIA-232E, V.28 standard and is purposed for application in modern high efficient calculating systems with the wide range of supply voltage, fast-operating electronic devices with high level of fidelity of information exchange among distant devices.



Pinning



Functions and structure:

- Microcircuit contains 1 transmitter and 1 receivers of the serial data of the standard RS-232.
- AutoShutdown function provide low power consumption.
- The microcircuit supply voltage range is from 3.0 to 5.5 V.
- The microcircuits is available in 16-pin DIP-package (MS-001BB).

Truth table

| Mode | Inputs | | | | Outputs | | |
|---|---------|----------|-----------------|-----------------|------------------|------------------|-------|
| | FORCEON | FORCEOFF | R _{IN} | T _{IN} | R _{OUT} | T _{OUT} | READY |
| Low power consumption data receiving (without Autoshtutdown function) | X | L | L | X | H | Z | L |
| | X | L | H | X | L | Z | L |
| Data transfer (without Autoshtutdown function) | H | H | L | L | H | H | H |
| | H | H | L | H | H | L | H |
| | H | H | H | L | L | H | H |
| | H | H | H | H | L | L | H |
| Data transfer & receiving (with Autoshtutdown function) | L | H | L1 | L1 | H | H | H |
| | L | H | L1 | H1 | H | L | H |
| | L | H | H1 | L1 | L | H | H |
| | L | H | H1 | H1 | L | L | H |
| Low power consumption (with Autoshtutdown function) | L | H | ND _H | ND | L | Z | L |
| | L | H | ND _L | ND | H | Z | L |

| Mode | Inputs | | | | Outputs | | |
|---------------------------|-------------------------------|----------------------------------|-------------------|-----------------|------------------|------------------|-------|
| | FORCEON | $\overline{\text{FORCEOFF}}$ | R _{IN} | T _{IN} | R _{OUT} | T _{OUT} | READY |
| Data transfer & receiving | $\overline{\text{INVALID}}^*$ | H | L | L | H | H | H |
| | $\overline{\text{INVALID}}^*$ | H | L | H | H | L | H |
| | $\overline{\text{INVALID}}^*$ | H | H | L | L | H | H |
| | $\overline{\text{INVALID}}^*$ | H | H | H | L | L | H |
| | $\overline{\text{INVALID}}^*$ | H | L _{INVL} | L1 | H | H | H |
| | $\overline{\text{INVALID}}^*$ | H | L _{INVL} | H1 | H | L | H |
| | $\overline{\text{INVALID}}^*$ | H | H/L | ND _L | L/H | H | H |
| Low power consumption | $\overline{\text{INVALID}}^*$ | H | L _{INVL} | ND | H | Z | L |
| | $\overline{\text{INVALID}}^*$ | $\overline{\text{INVALID}}^{**}$ | L | L | H | H | H |
| Data transfer & receiving | $\overline{\text{INVALID}}^*$ | $\overline{\text{INVALID}}^{**}$ | L | H | H | L | H |
| | $\overline{\text{INVALID}}^*$ | $\overline{\text{INVALID}}^{**}$ | H | L | L | H | H |
| | $\overline{\text{INVALID}}^*$ | $\overline{\text{INVALID}}^{**}$ | H | H | L | L | H |
| Low power consumption | $\overline{\text{INVALID}}^*$ | $\overline{\text{INVALID}}^{**}$ | L _{INVL} | X | H | Z | L |

Note

- H – high level;
- L – low level;
- X – any level (H or L);
- L1, H1 –Low & high levels after data changed with duration not more than t_{AUTOSHDN};
- L_{INVL} – low level signal not less – 0.3 V & not more 0.3 V with duration not less than t_{PHLINV};
- ND – defined level signal (L or H) with duration not less t_{AUTOSHDN};
- ND_L – low level L with duration not less t_{AUTOSHDN};
- ND_H – high level H with duration not less t_{AUTOSHDN};
- Z – third state of output

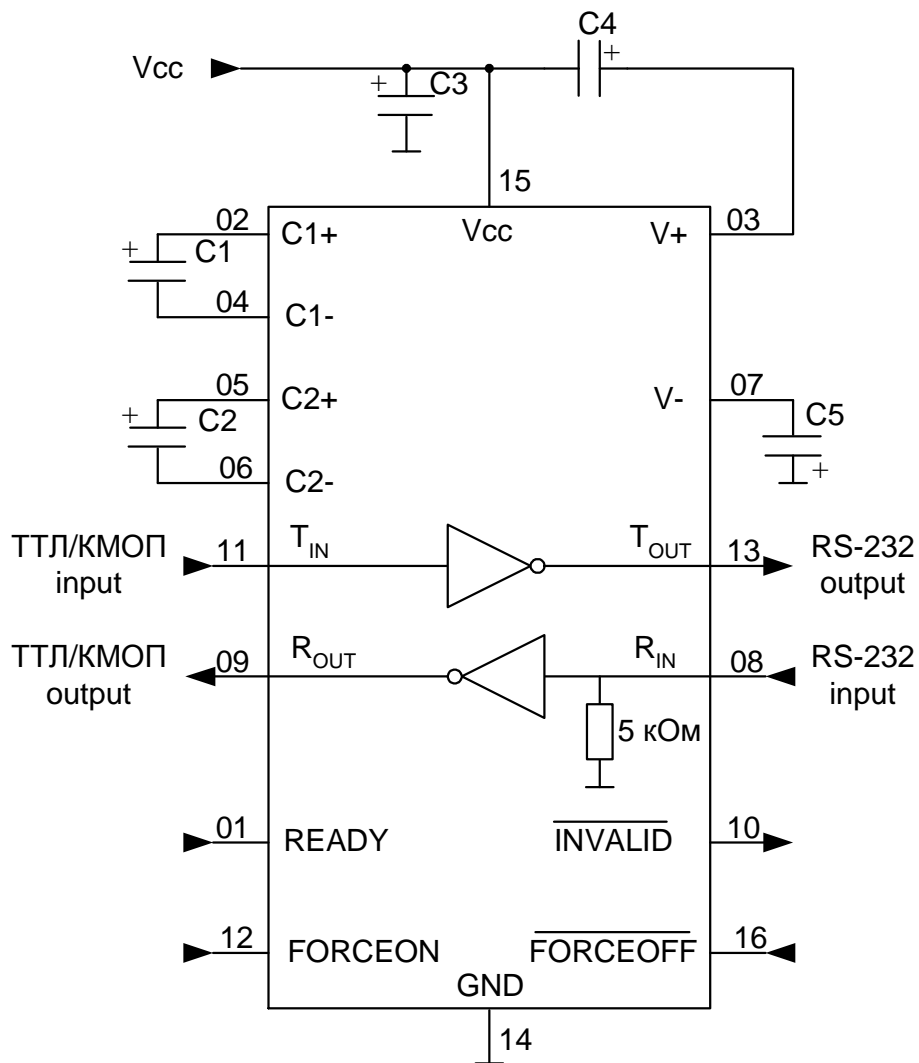
* $\overline{\text{INVALID}}$ is connected to FORCEON.

** $\overline{\text{INVALID}}$ is connected to FORCEON & $\overline{\text{FORCEOFF}}$

Truth table for $\overline{\text{INVALID}}$ pin

| R _{IN} | $\overline{\text{INVALID}}$ |
|-------------------|-----------------------------|
| L | H |
| H | H |
| L _{INVL} | L |

Functional diagram



C1 – capacitor 0.1 μF ± 10 % for U_{CC} = 3.3 V ± 10% (0.047 μF ± 10 % for U_{CC} = 5.0 V ± 10%)

C2, C4, C5– capacitors 0.1 μF ± 10 % for U_{CC} = 3.3 V ± 10% (0.33 μF ± 10 % for U_{CC} = 5.0 V ± 10%)

C3 – capacitor 0.1 μF ± 10 %

Pin description table

| Pin number | Symbol | Pin description |
|------------|------------------|---|
| 01 | READY | Control input (for mode selection) |
| 02 | C1+ | Positive terminal of the voltage multiplier charge-pump capacitor |
| 03 | V+ | Positive voltage multiplier output |
| 04 | C1- | Negative terminal of the voltage multiplier charge-pump capacitor |
| 05 | C2+ | Positive terminal of the voltage multiplier charge-pump capacitor |
| 06 | C2- | Negative terminal of the voltage multiplier charge-pump capacitor |
| 07 | V- | Negative voltage multiplier output |
| 08 | R _{IN} | RS-232 Receiver data inputs |
| 09 | R _{OUT} | TTL/CMOS Receiver data output |
| 10 | INVALID | Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic "1". |
| 11 | T _{IN} | TTL/CMOS transmitter data input |
| 12 | FORCEON | Autoshutdown mode control input (enable active operation of the IC) |
| 13 | T _{OUT} | RS-232 transmitter data outputs |
| 14 | GND | Common pin |
| 15 | V _{CC} | Supply voltage |
| 16 | FORCEOFF | Autoshutdown mode control input (switch the IC to low power consumption mode) |

Maximum Ratings & Recommended Operating Conditions

| Parameter, unit | Symbol | Recommended operating conditions | | Maximum rate | |
|--|---------------------------------|----------------------------------|-----------------|--------------|----------------------|
| | | min | max | min | max |
| Supply voltage, V | U _{CC} | 3.0 | 5.5 | -0.3 | 6.0 |
| Voltage applied to transmitter output, V | U _{OT} | – | – | -13.2 | 13.2 |
| Multiplier positive output voltage, V | U ₊ | 5.0 | – | -0.3 | 7.0 |
| Multiplier negative output voltage, V | U ₋ | -5.0 | – | -7.0 | 0.3 |
| Receiver input voltage, V | U _{IR} | -25 | 25 | -25 | 25 |
| Receiver output voltage, V | U _{OR} | – | – | -0.3 | U _{CC} +0.3 |
| Transmitter low level input voltage, V | U _{IL} | 0 | 0.8 | -0.3 | – |
| Transmitter high level input voltage, V | U _{IH} | 2.0 (U _{CC} =3.3 V) | U _{CC} | – | 6 |
| | | 2.4 (U _{CC} =5.0 V) | | | |
| Multiplier outputs voltages difference, V | U ₊ + U ₋ | – | – | – | 13 |
| Receiver low level threshold input voltage, V | U _{ITL} | 0.6 (U _{CC} =3.3 V) | – | – | – |
| | | 0.8 (U _{CC} =5.0 V) | | | |
| Receiver high level threshold input voltage, V | U _{ITH} | – | 2.4 | – | – |
| Receiver threshold input voltage corresponding to low level on INVALID pin, V | U _{INVL} | -0.3 | 0.3 | – | – |
| Receiver threshold input voltage corresponding to high level on INVALID pin, V | U _{INVH} | -2.7 | 2.7 | – | – |

Electric parameters

| Parameter, unit | Symbol | Norm | | Mode | T _A , °C | |
|---|---------------------|-------------|------|--|---|---------|
| | | Min | Max | | | |
| AutoShutdown mode supply current, μA | I _{CC1} | - | 10 | U _{CC} = 3.3; 5.0 V; FORCEON is connected to GND; | 25±10 | |
| | | | 14 | $\overline{\text{FORCEOFF}}$ is connected to V _{CC} R _{IN} not connected | -40; 85 | |
| Low power consumption mode supply current, μA | I _{CC2} | - | 10 | U _{CC} = 3.3; 5.0 V; $\overline{\text{FORCEOFF}}$ is connected to GND | 25±10 | |
| | | | 14 | R _{IN} connected to GND | -40; 85 | |
| AutoShutdown Disabled supply current, μA | I _{CC3} | - | 1.0 | U _{CC} = 3.3 V; 5.0 V; FORCEON & $\overline{\text{FORCEOFF}}$ are connected to V _{CC} without load | 25±10 | |
| | | | 1.4 | | -40; 85 | |
| Low level input leakage current, μA (for control inputs) | I _{ILL} | - | -0.5 | U _{CC} = 5.5 V | 25±10 | |
| | | | -1.0 | | -40; 85 | |
| High level input leakage current, μA (for control inputs) | I _{ILH} | - | 0.5 | U _{CC} = 5.5 V | 25±10 | |
| | | | 1.0 | | -40; 85 | |
| Receiver | | | | | | |
| Low level output voltage, V | U _{OLR} | - | 0.3 | U _{CC} = 3.3V ±10%; U _{ITH} = 2.4V; I _{OL} = 1.6 mA | 25±10 | |
| | | | 0.4 | | -40; 85 | |
| | | | 0.3 | | U _{CC} = 5.0V ±10%; U _{ITH} = 2.4V; | 25±10 |
| | | | 0.4 | | I _{OL} = 1.6 mA | -40; 85 |
| High level output voltage, V | U _{OHR1} | 2.5 2.37 | - | U _{CC} = 3.3V ±10%; U _{ITL} = 0.6 V; I _{OH} = -1.0 mA | 25±10 | |
| | | | | | -40; 85 | |
| | U _{OHR2} | 4.0 3.9 | - | U _{CC} = 5.0V ±10%; U _{ITL} = 0.8 V; I _{OH} = -1.0 mA | 25±10 | |
| | | | | | -40; 85 | |
| Low level output voltage, V (for $\overline{\text{INVALID}}$ pin) | U _{OLINV} | - | 0.3 | U _{CC} = 3.3V ±10 %; I _{OL} = 1.6 mA; U _{INVL} = 0.3 V or -0.3 V; FORCEON is connected to V _{CC} ; $\overline{\text{FORCEOFF}}$ is connected to V _{CC} | 25±10 | |
| | | | 0.4 | | -40; 85 | |
| | | | 0.3 | | U _{CC} = 5.0V ±10 %; I _{OL} = 1.6 mA; | 25±10 |
| | | | 0.4 | | U _{INVL} = 0.3 V or -0.3 V; FORCEON is connected to V _{CC} ; $\overline{\text{FORCEOFF}}$ is connected to V _{CC} | -40; 85 |
| High level output voltage, V (for $\overline{\text{INVALID}}$ pin) | U _{OHINV1} | 2.5 2.37 | - | U _{CC} = 3.3 V ±10 %; I _{OH} = -1.0 mA; U _{INVH} = 2.7 V or -2.7 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to V _{CC} | 25±10 | |
| | | | | | -40; 85 | |
| | U _{OHINV2} | 4.0 3.9 | - | U _{CC} = 5.0V ±10%; I _{OH} = -1.0 mA; U _{INVH} = 2.7 V or -2.7 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to V _{CC} | 25±10 | |
| | | | | | -40; 85 | |

Electric parameters

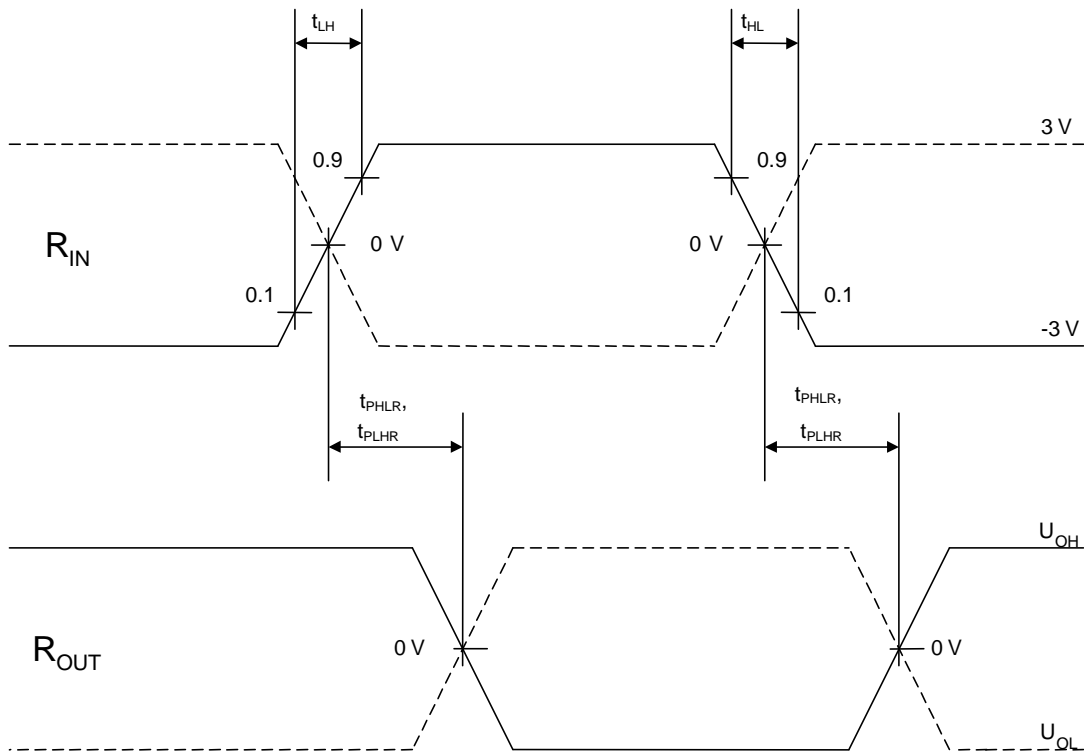
| Parameter, unit | Symbol | Norm | | Mode | T _A , °C |
|---|--|------|-------|---|---------------------|
| | | Min | Max | | |
| Receiver | | | | | |
| Low level output voltage (READY pin), V | U _{OLRE} | - | 0.3 | U _{CC} =3.3V ±10 %; I _{OL} = 1.6 mA; FORCEON is connected to Vcc ; FORCEOFF is connected to GND | 25±10 |
| | | | 0.4 | | -40; 85 |
| | | - | 0.3 | U _{CC} =5.0V ±10 %; I _{OL} = 1.6 mA; FORCEON is connected to Vcc ; FORCEOFF is connected to GND | 25±10 |
| | | | 0.4 | | -40; 85 |
| High level output voltage (READY pin), V | U _{OHRE1} | 2.5 | - | U _{CC} =3.3V ±10 %; I _{OL} = 1.6 mA; FORCEON is connected to Vcc ; FORCEOFF is connected to Vcc | 25±10 |
| | | 2.37 | | | -40; 85 |
| | U _{OHRE2} | 4.0 | - | U _{CC} =5.0V ±10 %; I _{OL} = 1.6 mA; FORCEON is connected to Vcc ; FORCEOFF is connected to Vcc | 25±10 |
| | | 3.9 | | | -40; 85 |
| Receiver hysteresis, V | U _{hR} | 0.2 | 1.0 | U _{CC} = 3.3 V ± 10%; 5.0 V ± 10% | 25±10 |
| Input resistance, kOhm | R _I | 3 | 7 | - | 25±10 |
| OFF-ON switching propagation delay, ns | t _{PHLR} , t _{PLHR} | - | 500 | U _{CC} = 5.0V ±10 %; C _L = 150 pF; | |
| Propagation delays difference, ns | t _{SKD} | - | 200 | U _{IL} = 0 V; U _{IH} = 3.0 V; t _{LH} = t _{HL} ≤ 10 ns | |
| Propagation delay of transition INVALID pin to low level state, μs | t _{PHLINV} | - | 80 | U _{CC} = 5.0V ±10 %; U _{IL} = 0; -3.0 V; U _{IH} = 3.0; 0 V; | |
| Propagation delay of transition INVALID pin to high level state, μs | t _{PLHINV} | - | 2.9 | t _{LH} = t _{HL} ≤ 10 ns; C _L = 15 pF | |
| Transmitter | | | | | |
| Low level output voltage, V | U _{OLT1} | - | -5.07 | U _{CC} =3.3V ±10%; U _{IH} = 2.0V; R _L = 3 kOhm | 25±10 |
| | | | -5.0 | | -40; 85 |
| | U _{OLT2} | - | -5.07 | U _{CC} =5.0V ±10%; U _{IH} = 2.4V; R _L = 3 kOhm | 25±10 |
| | | | -5.0 | | -40; 85 |
| High level output voltage, V | U _{OHT} | 5.07 | - | U _{CC} =3.3V ±10%; U _{IL} = 0.8V; R _L = kOhm | 25±10 |
| | | 5.0 | | | -40; 85 |
| | | 5.07 | - | U _{CC} =5.0V ±10%; U _{IL} = 0.8V; R _L = kOhm | 25±10 |
| | | 5.0 | | | -40; 85 |
| Transmitter hysteresis, V | U _{hT} | 0.1 | 1.0 | U _{CC} = 3.3 V ± 10%; 5.0 V ± 10% | 25±10 |
| Output resistance, Ohm | R _O | 350 | - | U _{CC} = U _{V+} * = U _{V-} * = 0 V; U _O = ±2 V | 25±10 |
| | | 300 | | | -40; 85 |
| Short circuit current, mA | I _{OS} | - | 53 | U _{CC} = 3.63 V; U _{IH} = 2.0V | 25±10 |
| | | | 60 | | -40; 85 |
| | | | -53 | U _{CC} = 3.63 V; U _{IH} = 2.0V | 25±10 |
| | | | -60 | | -40; 85 |
| | | | 53 | U _{CC} = 5.5 V; U _{IH} = 2.0V | 25±10 |
| | | | 60 | | -40; 85 |
| | | | -53 | U _{CC} = 5.5 V; U _{IH} = 2.0V | 25±10 |
| | | | -60 | | -40; 85 |

Electric parameters

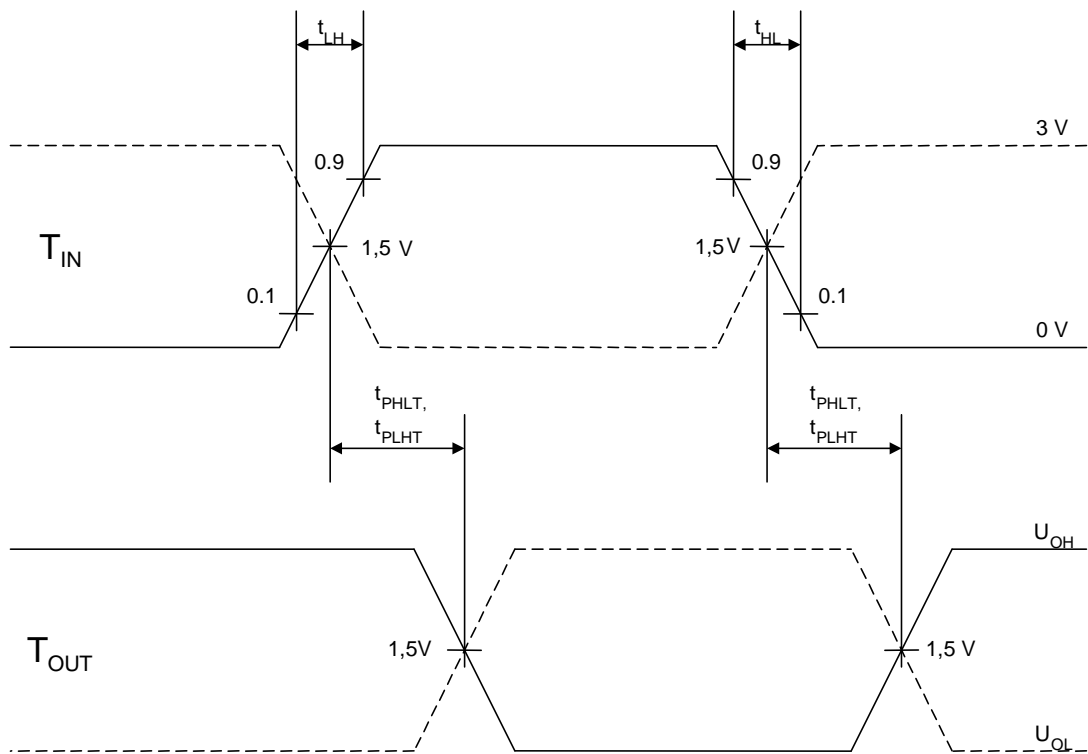
| Parameter, unit | Symbol | Norm | | Mode | T _A , °C |
|---|-----------------------|------|------------|---|---------------------|
| | | Min | Max | | |
| Transmitter | | | | | |
| Maximum Data Rate, Kbit/s | ST | 250 | – | R _L = 3 kOhm; C _L = 1000 pF | -40÷85 |
| Low level output current for OFF-state, µA | I _{OZLT} | – | -10 -25 | U _{CC} = 0; 3.3; 5.5 V; U _O = -12 V; transmitter output is disabled | 25±10 -40; 85 |
| High level output current for OFF-state, µA | I _{OZHT} | – | 10 25 | U _{CC} = 0; 3.3; 5.5 V U _O = 12 V; transmitter output is disabled | 25±10 -40; 85 |
| Transition-Region Slew Rate, V/us | SR | 6 | 30 | U _{CC} = 3.3 V; R _L = (3-7) kOhm; U _{OT} is from +3 to -3 V or from -3 to +3 V; C _L = (150-1000) pF | 25±10 |
| | | 4 | 30 | U _{CC} = 3.3 V; R _L = (3-7) kOhm; U _{OT} is from +3 to -3 V or from -3 to +3 V; C _L = (150-2500) pF | |
| Propagation delays difference, ns | t _{SKEW} | – | 300 | U _{CC} = 5.0V ±10 %; U _{IL} = 0 V; U _{IH} = 3.0 V; t _{LH} = t _{HL} ≤ 10 ns; R _L =3 kOhm; C _L =1000 pF | |
| Transmitter output enable time, µs | t _{WU} | – | 120 | U _{CC} = 5.0V ±10 %; U _{IL} = 0 V; U _{IH} = 3.0 V; U _{IL} = -3.0 V; U _{IH} = 0 V | |
| Propagation delay of switching to low power consumption mode, s | t _{AUTOSHDN} | 15 | 60 | U _{CC} = 5.0V ; U _{IL} = 0 V; U _{IH} = 3.0 V | -40; 85 |

* U_{V+}, U_{V-} - voltages applied to pins 03 , 07.

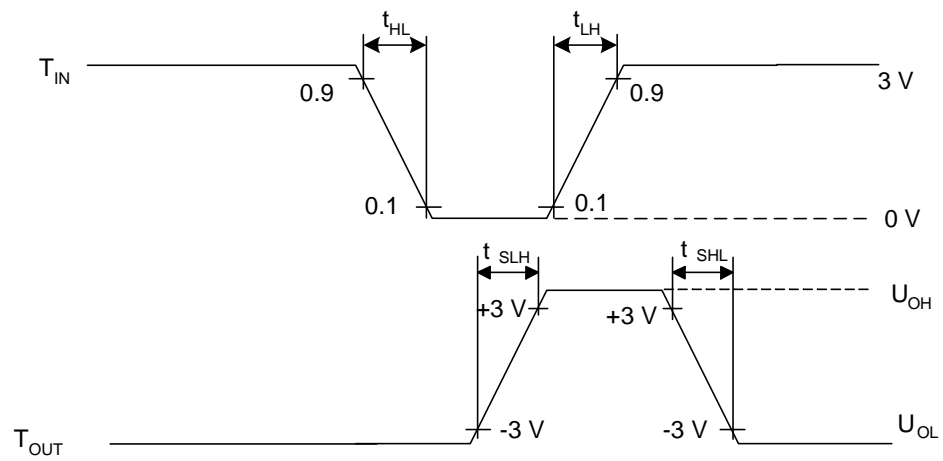
Note – Electric parameters is indicated for C1=0.047 µF, C2-C4 = 0,33 µF & U_{CC} = 5.0 V±10 %
(or C1-C4 = 0.1 µF & U_{CC} = 3.3 V±10 %)



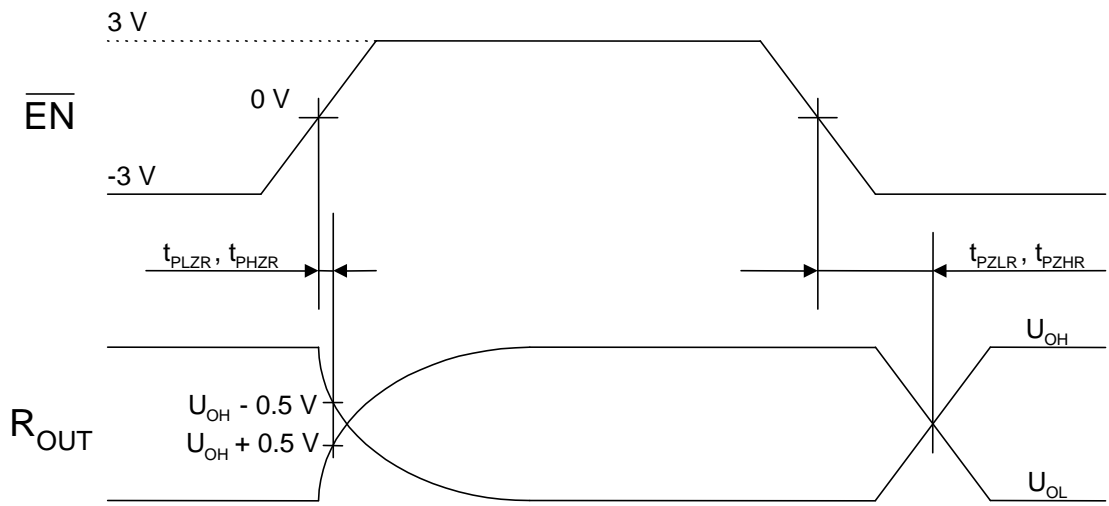
Receiver output & input signals time diagram



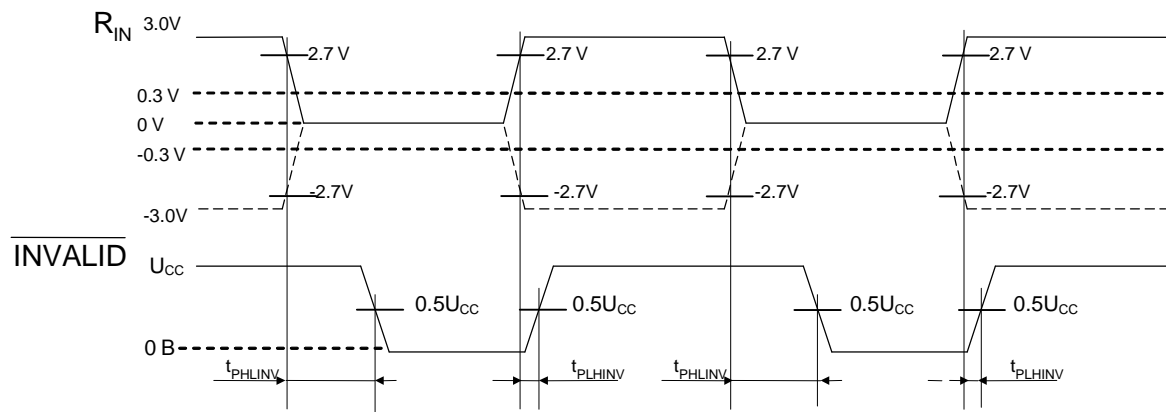
Transmitter output & input signals time diagram



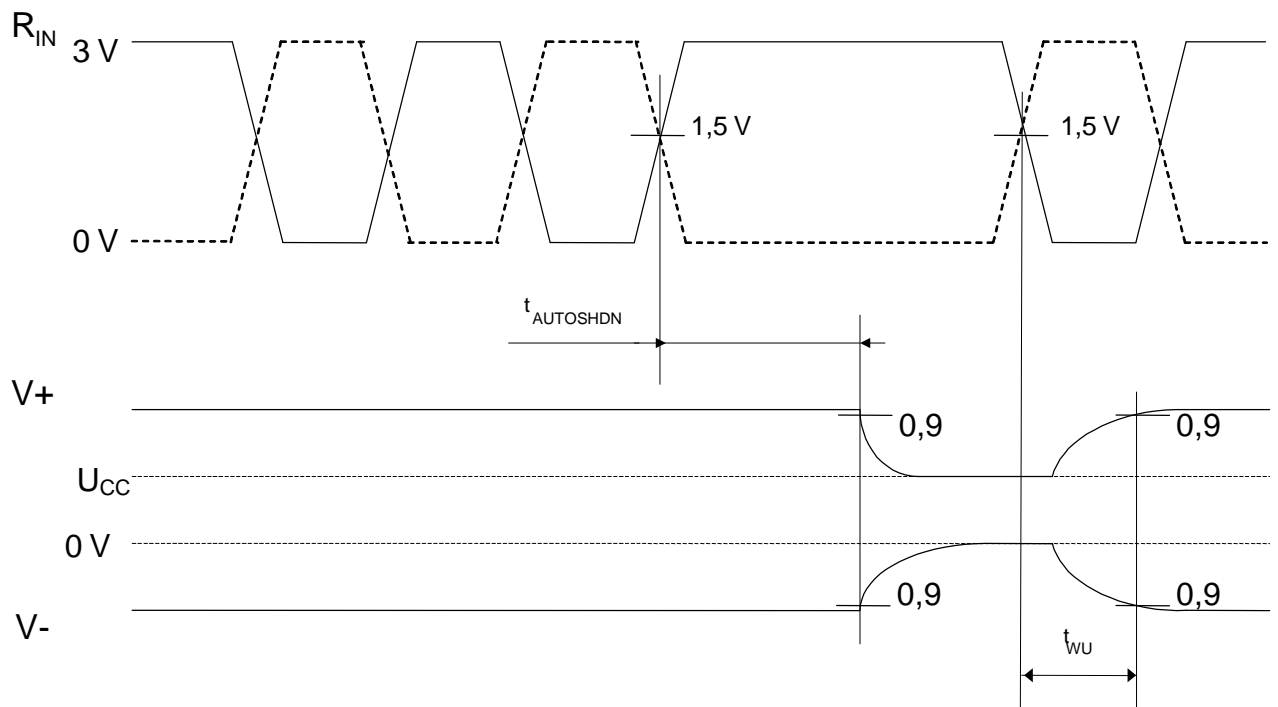
Transmitter output & input signals time diagram



Receiver output & input signals time diagram

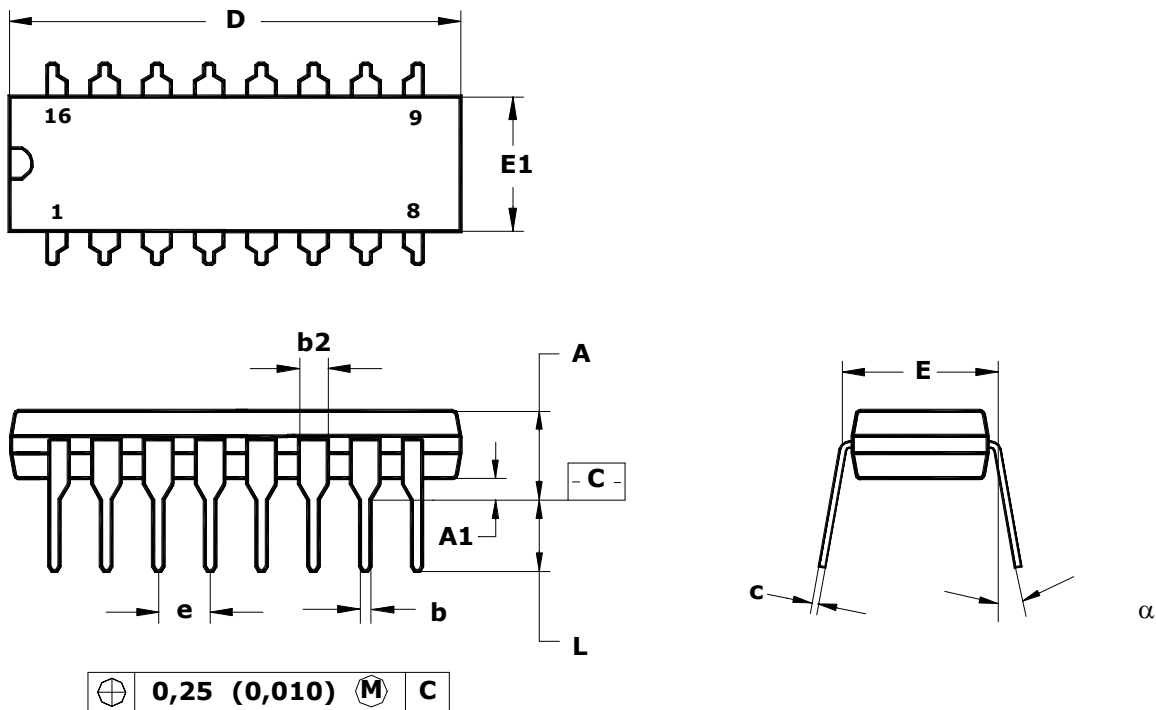


t_{PHLINV} , t_{PLHINV} dynamic parameters timing diagram



$t_{AUTOSHDN}$, t_{WU} dynamic parameters timing diagram

Package Dimensions
DIP-package MS-001BB



Note - Dimensions D, E1 do not include the fin value, which should not exceed 0.25 mm (0.010) per side.

| | D | E1 | A | b | b2 | e | α | L | E | c | A1 |
|--------|-------|-------|-------|-------|-------|------|----------|-------|-------|-------|-------|
| mm | | | | | | | | | | | |
| min | 18.93 | 6.07 | — | 0.36 | 1.14 | 2.54 | 0° | 2.93 | 7.62 | 0.20 | 0.38 |
| max | 19.43 | 7.11 | 5.33 | 0.56 | 1.78 | | 15° | 3.81 | 8.26 | 0.36 | — |
| Inches | | | | | | | | | | | |
| min | 0.355 | 0.240 | — | 0.014 | 0.045 | 0.1 | 0° | 0.115 | 0.300 | 0.008 | 0.015 |
| max | 0.400 | 0.280 | 0.210 | 0.022 | 0.070 | | 15° | 0.150 | 0.325 | 0.014 | — |