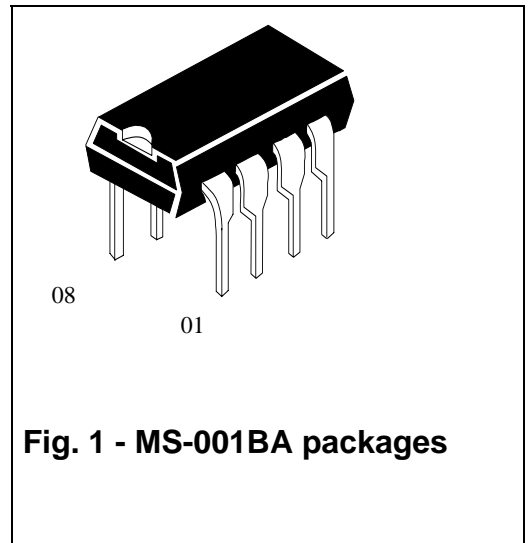


**Microcircuit ILX3483N, ILX3485N, ILX3486 N** (functional equivalents of MAX3483/ MAX3485/ MAX3486 MAXIM (USA)) - interface transceiver of the serial data of the standard RS - 485/422.

Microcircuit is interface transceiver (transmitter-receiver) of serial data of RS - 485, RS – 422 standards with low supply voltage (3V).

Microcircuit is purposed for application in low power telecom systems, that correspond to RS – 485, RS – 422 standards, level translators, transceiver units & E-field sensitive automation systems of industrial devices.



Functions and structure:

- Microcircuit contains 1 transmitter and 1 receivers of the serial data of the standards RS-485/422;
- Low dissipated power;
- One power supply voltage source  $U_{CC} = (3,0 - 3,6) V$ ;
- Maximum data transfer rate 0,25 Mbit/s (ILX3483N); 12 Mbit/s (ILX3485N); 2,5 Mbit/s (ILX3486N);
- Temperature range  $-40 \dots + 85 \text{ }^{\circ}\text{C}$ ;
- Permissible value of static electricity potential:
  - for inputs of the transmitter and outputs of the receiver 2000 V;
  - for inputs of the receiver and outputs of the transmitter 4000 V;
- Latch current not less than 300 mA for normal climatic conditions and supply voltage 3,3 V.

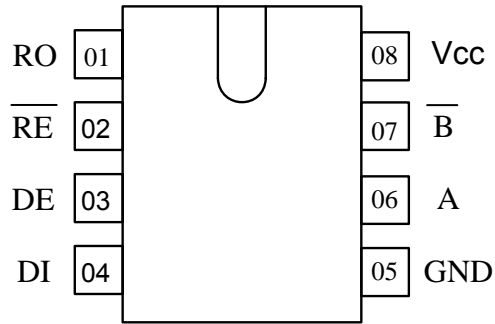


Fig. 2 – Pin configuration

Table 1 – Pin description

| Pin number | Symbol          | Description                                 |
|------------|-----------------|---|
| 01         | RO              | Receiver output                             |
| 02         | $\overline{RE}$ | Receiver output enable pin                  |
| 03         | DE              | Transmitter output enable pin               |
| 04         | DI              | Transmitter input                           |
| 05         | GND             | Common pin                                  |
| 06         | A               | Receiver/transmitter uncomplemented I/O pin |
| 07         | $\overline{B}$  | Receiver/transmitter complemented I/O pin   |
| 08         | V <sub>CC</sub> | Supply voltage pin                          |

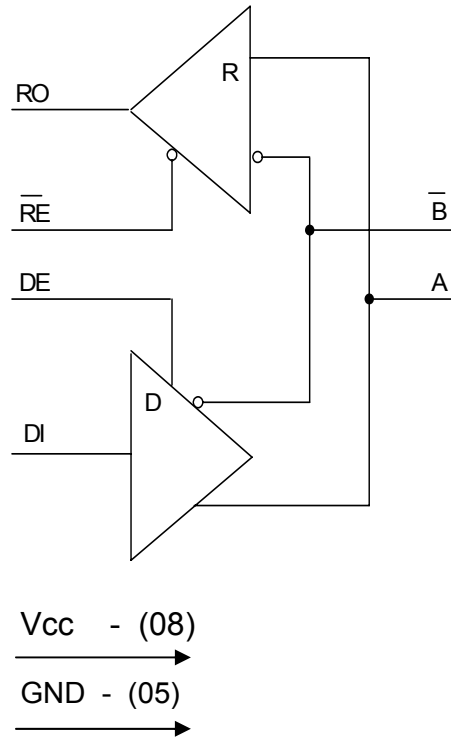


Fig. 3 – Block diagram

Table 2 – Transmitter truth table

| Inputs          |    |        | Outputs        |             |
|-----------------|----|--------|----------------|-------------|
| $\overline{RE}$ | DE | DI     | $\overline{B}$ | A           |
| H or L          | H  | H      | L              | H           |
| H or L          | H  | L      | H              | L           |
| L               | L  | H or L | «OFF» state    | «OFF» state |
| H*              | L* | H or L | «OFF» state    | «OFF» state |

Note - H – high level voltage;  
 L – low level voltage.

\* Shout-down mode

Table 3 – Receiver truth table

| Inputs          |    |                      | Output      |
|-----------------|----|----------------------|-------------|
| $\overline{RE}$ | DE | A-B                  | RO          |
| L               | L  | $\geq +0,2\text{ V}$ | H           |
| L               | L  | $\leq -0,2\text{ V}$ | L           |
| L               | L  | Input not used       | H           |
| H*              | L* | H or L               | «OFF» state |

Note - H – high level voltage;  
 L – low level voltage.

\* Shout-down mode

Table 4 – Absolute maximum ratings

| Symbol    | Parameter                                  | Norm |              | Unit |
|-----------|--|------|--------------|------|
|           |  | Min  | Max          |      |
| $U_{CC}$  | Supply voltage                             | -    | 7,0          | V    |
| $U_i$     | DI, DE, $\overline{RE}$ pins input voltage | -0,3 | 7,0          | V    |
| $U_{OD}$  | Voltage applied to transmitter output      | -7,5 | 12,5         | V    |
| $U_{RIN}$ | Receiver input voltage                     | -7,5 | 12,5         | V    |
| $U_{OR}$  | Voltage applied to receiver output         | -0,3 | $U_{CC}+0,3$ | V    |

Table 5 – Recommended operating mode

| Symbol    | Parameter   | Norm |          | Unit |
|-----------|---|------|----------|------|
|           |   | Min  | Max      |      |
| $U_{CC}$  | Supply voltage  | 3,0  | 3,6      | V    |
| $U_{IL}$  | DI, DE, $\overline{RE}$ pins low level input voltage  | 0    | 0,8      | V    |
| $U_{IH}$  | DI, DE, $\overline{RE}$ pins high level input voltage | 2,0  | $U_{CC}$ | V    |
| $U_{OD}$  | Voltage applied to transmitter output                 | -7,0 | 12,0     | V    |
| $U_{RIN}$ | Receiver input voltage                                | -7,0 | 12,0     | V    |
| $U_{OR}$  | Voltage applied to receiver output                    | 0    | $U_{CC}$ | V    |
| $U_{TH}$  | Receiver differential threshold voltage               | -0,2 | 0,2      | V    |

Table 6 – Electric parameters

| Symbol              | Parameter  | Mode of measurement  | Norm                 |              | T <sub>A</sub> , °C | Unit |
|---------------------|--|--|----------------------|--------------|---------------------|------|
|                     |  |  | Min                  | Max          |                     |      |
| I <sub>ILL</sub>    | Low level input leakage current                  | U <sub>DE</sub> =U <sub>DI</sub> =U <sub>RE</sub> =0V<br>U <sub>CC</sub> = 3,6 V   | -                    | -0,2<br>-2,0 | 25 ± 10<br>-40; 85  | uA   |
| I <sub>ILH</sub>    | High level input leakage current                 | U <sub>DE</sub> =U <sub>DI</sub> =U <sub>RE</sub> = U <sub>CC</sub><br>U <sub>CC</sub> = 3,6 V   | -                    | 0,2<br>2,0   | 25 ± 10<br>-40; 85  | uA   |
| I <sub>CC</sub>     | Supply current                                   | U <sub>RE</sub> = 0 V or U <sub>CC</sub><br>U <sub>DI</sub> = 0 V or U <sub>CC</sub><br>U <sub>DE</sub> = U <sub>CC</sub><br>U <sub>CC</sub> = 3,6 V | -                    | 1,9<br>2,2   | 25 ± 10<br>-40; 85  | mA   |
|                     |  | U <sub>RE</sub> = 0 V<br>U <sub>DI</sub> = 0 V or U <sub>CC</sub><br>U <sub>DE</sub> = 0<br>U <sub>CC</sub> = 3,6 V                                  | -                    | 1,6<br>1,9   | 25 ± 10<br>-40; 85  |      |
|                     |  |  |                      |              |                     |      |
| I <sub>SHDN</sub>   | Shutdown mode supply current                     | U <sub>DE</sub> = 0<br>U <sub>RE</sub> = U <sub>CC</sub><br>U <sub>DI</sub> = 0 V or U <sub>CC</sub><br>U <sub>CC</sub> = 3,6 V                      | -                    | 0,7<br>1,0   | 25 ± 10<br>-40; 85  | uA   |
| t <sub>SHDN</sub>   | Time of transition to low power consumption mode | U <sub>CC</sub> = 3,3 V  | 80                   | 300          | 25 ± 10             | ns   |
| Receiver parameters |  |  |                      |              |                     |      |
| U <sub>OL</sub>     | Low level output voltage                         | U <sub>ID</sub> =U <sub>TH</sub> =-190 mV<br>I <sub>OL</sub> = 2,5 mA  | -                    | 0,36         | 25 ± 10             | V    |
|                     |  | U <sub>ID</sub> =U <sub>TH</sub> =-200 mV<br>I <sub>OL</sub> = 2,5 mA  |                      | 0,40         | -40; 85             |      |
| U <sub>OH</sub>     | High level output voltage                        | U <sub>ID</sub> = U <sub>TH</sub> =190 mV<br>I <sub>OH</sub> = - 1,5 mA  | U <sub>CC</sub> -0,4 | -            | 25 ± 10             | V    |
|                     |  | U <sub>ID</sub> = U <sub>TH</sub> =200 mV<br>I <sub>OH</sub> = - 1,5 mA  |                      |              | -40; 85             |      |
| R <sub>IN</sub>     | Receiver input resistance                        | - 7 V ≤ U <sub>RIN</sub> ≤ 12 V  | 12                   | -            | 25±10;<br>-40; 85   | kΩ   |
| I <sub>IN2</sub>    | Input current                                    | U <sub>DE</sub> =0V<br>U <sub>CC</sub> =3,6V   | -                    | 0,95         | 25 ± 10             | mA   |
|                     |  |  |                      | -0,7         |                     |      |
|                     |  |  |                      | 1,0          | -40; 85             |      |
|                     |  |  |                      | -0,8         |                     |      |
| I <sub>OZLR</sub>   | Low level output current for "OFF" state         | U <sub>OR</sub> = 0 V<br>U <sub>CC</sub> =3,6 V  | -                    | -0,5<br>-1,0 | 25 ± 10<br>-40; 85  | uA   |
| I <sub>OZHR</sub>   | High level output current for "OFF" state        | U <sub>OR</sub> = U <sub>CC</sub><br>U <sub>CC</sub> =3,6 V  | -                    | 0,5<br>1,0   | 25 ± 10<br>-40; 85  | uA   |
| I <sub>OSHR</sub>   | High level short circuit output current          | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0 V<br>U <sub>OR</sub> =3,6V; U <sub>CC</sub> =3,6V   | 9,0                  | 50           | 25 ± 10             | mA   |
|                     |  |  | 8,0                  | 60           | -40; 85             |      |
| I <sub>OSLR</sub>   | Low level short circuit output current           | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0 V<br>U <sub>OR</sub> = 0 V; U <sub>CC</sub> = 3,6 V   | -9,0                 | -50          | 25 ± 10             | mA   |
|                     |  |  | -8,0                 | -60          | -40; 85             |      |

Table 6 continued

| Symbol                                    | Parameter  | Mode of measurement  | Norm |      | T <sub>A</sub> , °C | Unit |
|---|--|--|------|------|---------------------|------|
|   |  |  | Min  | Max  |                     |      |
| <b>Receiver parameters</b>                |  |  |      |      |                     |      |
| t <sub>PHLR</sub><br>(t <sub>PLHR</sub> ) | OFF-ON switching propagation delay,<br>ILX3483N  | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0 V<br>t <sub>LH</sub> =t <sub>HL</sub> ≤ 6 ns<br>C <sub>L</sub> = 15 pF          | 25   | 120  | 25 ± 10             | ns   |
|   | ILX3485N, ILX3486N   | U <sub>CC</sub> = 3,3 V  | 25   | 90   |                     |      |
| t <sub>PZHR</sub><br>(t <sub>PZLR</sub> ) | Propagation delay time of transition from "OFF" state to high (low) level              | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0 V<br>C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 1 kΩ<br>U <sub>CC</sub> = 3,3 V | -    | 50   | 25 ± 10             | ns   |
| t <sub>PHZR</sub><br>(t <sub>PLZR</sub> ) | Receiver output disable time for transition from high (low) level state to "OFF" state | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0 V<br>C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 1 kΩ<br>U <sub>CC</sub> = 3,3 V | -    | 45   | 25 ± 10             | ns   |
| t <sub>SKD</sub>                          | OFF-ON switching propagation delays difference<br>ILX3483N                             | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0 V<br>C <sub>L</sub> = 15 pF; U <sub>CC</sub> = 3,3V                             | -    | 20   | 25 ± 10             | ns   |
|   | ILX3485N, ILX3486N   |  |      | 10   |                     |      |
| t <sub>PSLR</sub>                         | Receiver transition time from shutdown to low level                                    | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0V<br>C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1kΩ<br>U <sub>CC</sub> = 3,3 V     | -    | 1400 | 25 ± 10             | us   |
| t <sub>PSHR</sub>                         | Receiver transition time from shutdown to high level                                   | U <sub>IH</sub> = 3,0 V; U <sub>IL</sub> = 0V<br>C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ<br>U <sub>CC</sub> = 3,3 V    | -    | 1400 | 25 ± 10             | us   |
| <b>Transmitter parameters</b>             |  |  |      |      |                     |      |
| U <sub>OD</sub>                           | Low level differential output voltage  | R <sub>L1</sub> = 54 Ω (RS-485)<br>U <sub>CC</sub> =3,0; 3,6 V   | 1,56 | -    | 25 ± 10             | V    |
|   |  |  | 1,50 |      | -40; 85             |      |
|   |  | R <sub>L1</sub> = 100 Ω (RS-422)<br>U <sub>CC</sub> =3,0; 3,6 V  | 2,08 |      | 25 ± 10             |      |
|   |  |  | 2,00 |      | -40; 85             |      |
|   |  | R <sub>L2</sub> = 60 Ω (RS-485)<br>U <sub>CC</sub> =3,3 V  | 1,56 |      | 25 ± 10             |      |
|   |  |  | 1,50 |      | -40; 85             |      |
| δU <sub>OD</sub>                          | Change in value of differential output voltage for complementary output states         | R <sub>L</sub> = 54; 100 Ω<br>U <sub>CC</sub> =3,0 V; 3,6 V  | -    | 0,18 | 25 ± 10             | V    |
|   |  |  |      | 0,20 | -40; 85             |      |
| U <sub>OC</sub>                           | Output bias voltage refer to common pin, V   | R <sub>L</sub> = 54; 100 Ω<br>U <sub>CC</sub> =3,0 V; 3,6 V  | -    | 2,9  | 25 ± 10             | V    |
|   |  |  |      | 3,0  | -40; 85             |      |
| δU <sub>OC</sub>                          | Change in value of bias output voltage for complementary output states                 | R <sub>L</sub> = 54; 100 Ω<br>U <sub>CC</sub> =3,0 V; 3,6 V  | -    | 0,18 | 25 ± 10             | V    |
|   |  |  |      | 0,20 | -40; 85             |      |

Table 6 continued

| Symbol                                  | Parameter   | Mode of measurement   | Norm              |                   | T <sub>A</sub> , °C | Unit   |
|---|---|---|-------------------|-------------------|---------------------|--------|
|   |   |   | Min               | Max               |                     |        |
| Transmitter parameters                  |   |   |                   |                   |                     |        |
| I <sub>OSLD</sub>                       | Low level receiver short circuit output current   | U <sub>OD</sub> = 12 V; U <sub>IL</sub> = 0V<br>U <sub>IH</sub> = 3,0V; U <sub>CC</sub> =3,6V   | -                 | 240<br>250        | 25 ± 10<br>-40; 85  | mA     |
| I <sub>OSHD</sub>                       | High level receiver short circuit output current  | U <sub>OD</sub> = -7 V; U <sub>IL</sub> = 0 V<br>U <sub>IH</sub> =3,0V; U <sub>CC</sub> = 3,6V  | -                 | -240<br>-250      | 25 ± 10<br>-40; 85  | mA     |
| t <sub>PHL</sub><br>(t <sub>PLH</sub> ) | ON/OFF switching propagation delay<br><br>ILX3483N<br>ILX3485N<br>ILX3486N                                      | C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 27 Ω<br>U <sub>IL</sub> = 0 V<br>U <sub>IH</sub> = 3,0 V<br>U <sub>CC</sub> = 3,3 V        | 700<br>7<br>20    | 1500<br>35<br>70  | 25 ± 10             | ns     |
| t <sub>SKEW</sub>                       | OFF-ON switching propagation delays difference,<br>ILX3483N<br>ILX3485N<br>ILX3486N                             | C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 27 Ω<br>U <sub>IL</sub> = 0 V<br>U <sub>IH</sub> = 3,0 V<br>U <sub>CC</sub> = 3,3 V        | -                 | 100<br>8<br>11    | 25 ± 10             | ns     |
| t <sub>PZH</sub>                        | Output transition time OFF state to high level,<br>ILX3483N<br>ILX3485N<br>ILX3486N                             | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 110 Ω<br>U <sub>CC</sub> = 3,3 V   | -                 | 800<br>90<br>100  | 25 ± 10             | ns     |
| t <sub>PZL</sub>                        | Output enable time for transition transition from "OFF" state to low level,<br>ILX3483N<br>ILX3485N<br>ILX3486N | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 110 Ω<br>U <sub>CC</sub> = 3,3 V   | -                 | 1300<br>90<br>100 | 25 ± 10             | ns     |
| t <sub>PHZ</sub><br>(t <sub>PLZ</sub> ) | Output disable time for transition high (low) level to "OFF" state  | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 110 Ω<br>U <sub>CC</sub> = 3,3 V   | -                 | 80                | 25 ± 10             | ns     |
| t <sub>TD</sub>                         | Differential output transition (fall/rise) time<br>ILX3483N<br>ILX3485N<br>ILX3486N                             | C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 60 Ω<br>U <sub>CC</sub> = 3,3 V  | 400<br>3,0<br>15  | 1200<br>25<br>60  | 25 ± 10             | ns     |
| ST                                      | Maximum data transfer rate,<br>ILX3483N<br>ILX3485N<br>ILX3486N   | C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 27 Ω<br>U <sub>IL</sub> = 0 V<br>U <sub>IH</sub> = 3,0 V<br>Q ≥ 2; U <sub>CC</sub> = 3,3 V | 0,25<br>12<br>2,5 | -                 | 25 ± 10             | Mbit/s |

Table 6 continued

| Symbol                 | Parameter  | Mode of measurement   | Norm |      | T <sub>A</sub> , °C | Unit |
|------------------------|--|---|------|------|---------------------|------|
|                        |  |   | Min  | Max  |                     |      |
| Transmitter parameters |  |   |      |      |                     |      |
| t <sub>DD</sub>        | Differential output delay time,<br>ILX3483N                  | C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 60 Ω<br>U <sub>CC</sub> = 3,3 V  | 600  | 1400 | 25 ± 10             | ns   |
|                        | ILX3485N   |   | 1,0  | 35   |                     |      |
|                        | ILX3486N   |   | 24   | 70   |                     |      |
| t <sub>PSL</sub>       | Output enable time from shut-down to low level,<br>ILX3483N  | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 110 Ω<br>U <sub>CC</sub> = 3,3 V | –    | 2700 | 25 ± 10             | ns   |
|                        | ILX3485N   |   |      | 900  |                     |      |
|                        | ILX3486N   |   |      | 1000 |                     |      |
| t <sub>PSH</sub>       | Output enable time from shut-down to high level,<br>ILX3483N | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 110 Ω<br>U <sub>CC</sub> = 3,3 V | –    | 3000 | 25 ± 10             | ns   |
|                        | ILX3485N   |   |      | 900  |                     |      |
|                        | ILX3486N   |   |      | 1000 |                     |      |





## Operation description

The microcircuit consist of two main units: transmitter and receiver. Inputs of the receiver are connected to outputs of the transmitter that provides a half-duplex mode data transfer. The microcircuit provide function of switching to shutdown mode with consumption current not more 1  $\mu$ A.

Switching to shutdown mode performed at simultaneous transition of the receiver and the transmitter to the third state after certain hold time which provides dynamic noise immunity.

### *RS-485/422 transmitter*

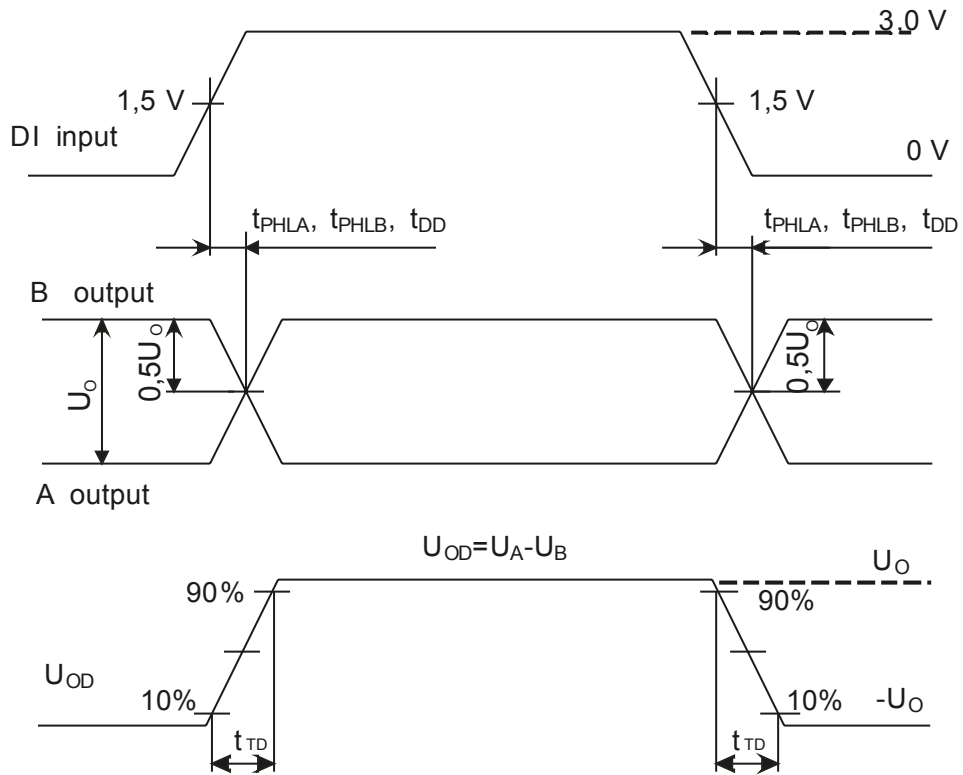
CMOS/TTL levels signals come to transmitter input DI, splited inside the microcircuit on complement and uncomplemented, converted to RS-485/422 standard levels, after that signals transmitted in a long line through output ports with high load capacity. The differential signal has high level of noise immunity on background of common-mode interference that provides high reliability in a mode of signal transmitting in a long line. The microcircuit has some levels of protection against a overload of the power output stage for case of occurrence of a strong disturbance in a line. At voltage increase in a line load capacity of the output stage of the transmitter is reduced.

### *RS-485/422 receiver*

The receiver processes reverse conversion of RS-485/422 levels to CMOS/TTL levels. The minimum differential input voltage of the receiver is + 200 mV for bias voltage range -7 ... +12V, simulating an in-phase component of a noise in a line. In a limiting (extrime) mode the level of an inphase noise changes in a range -8 ... +12,5 V. Operation stability of the microcircuit in case of receiving from a line signals with flat fronts is provided by a 40 - 70 mV hysteresis. According to requirements of standard RS-485/422 the input impedance of the receiver is not more than 12 k $\Omega$ . At absence of a signal on a differential input of the receiver the output of the receiver is switched in the state corresponding to a level of logical one.

Fig. 4, 5 display time diagrams of the microcircuit operating.





$U_O$  – differential output voltage on condition UA low level  
 $-U_O$  – differential output voltage on condition UA high level

Fig. 4 – Transmitter I/O signals time diagram

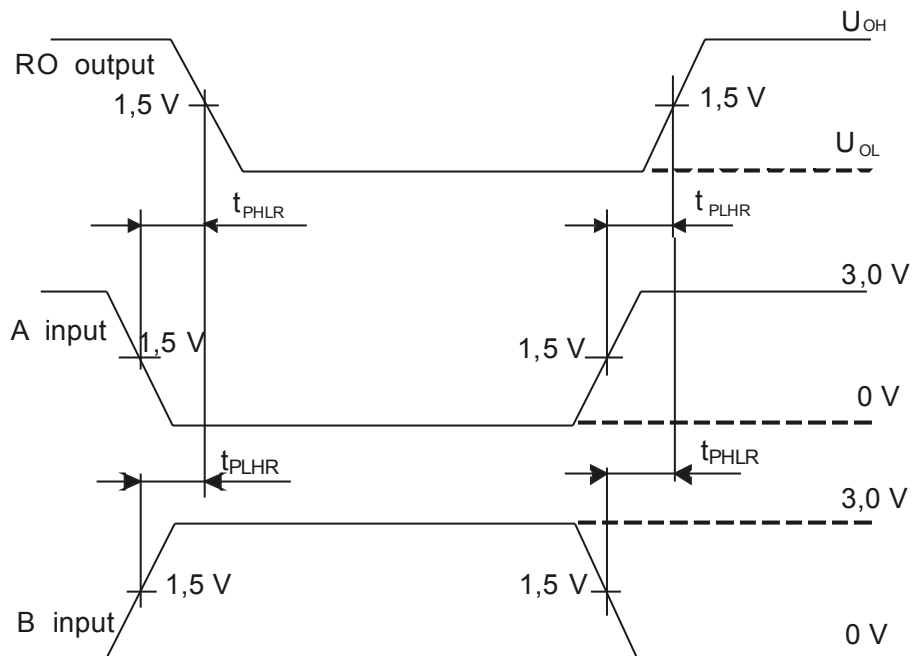
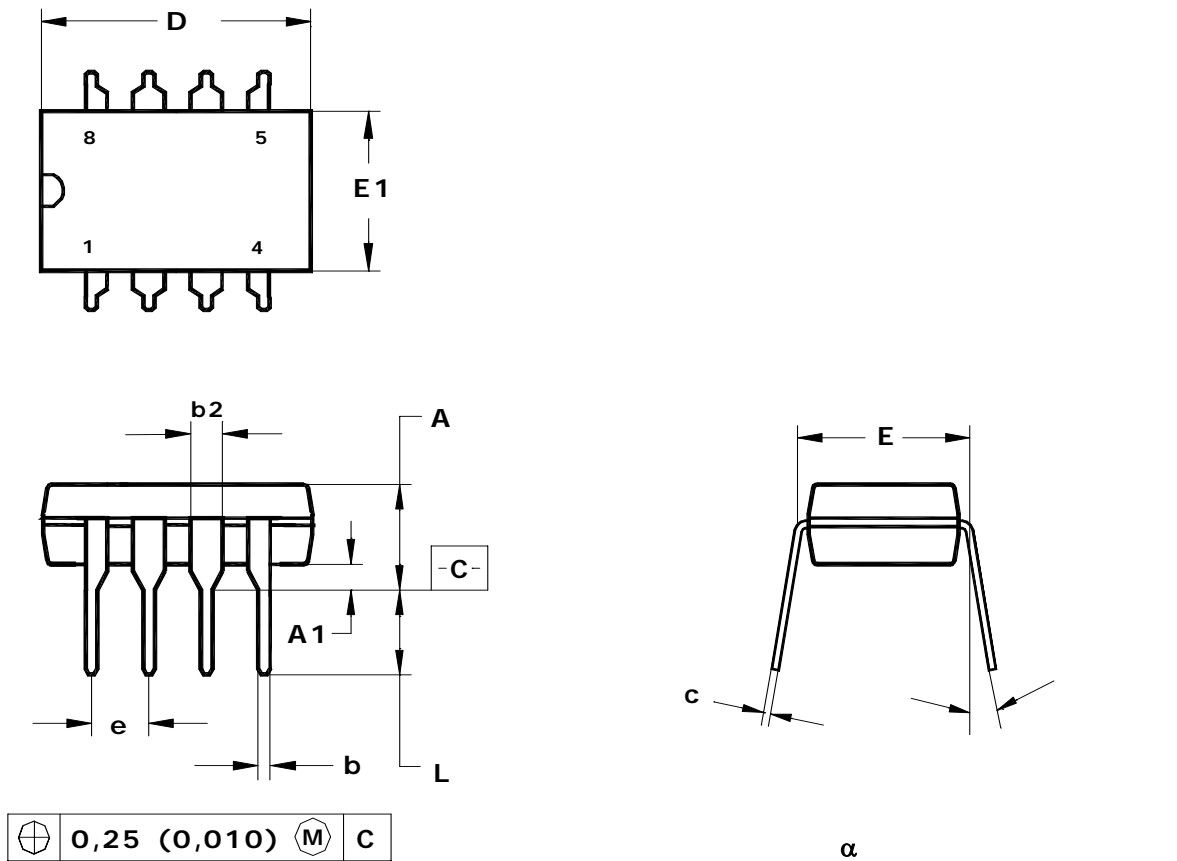


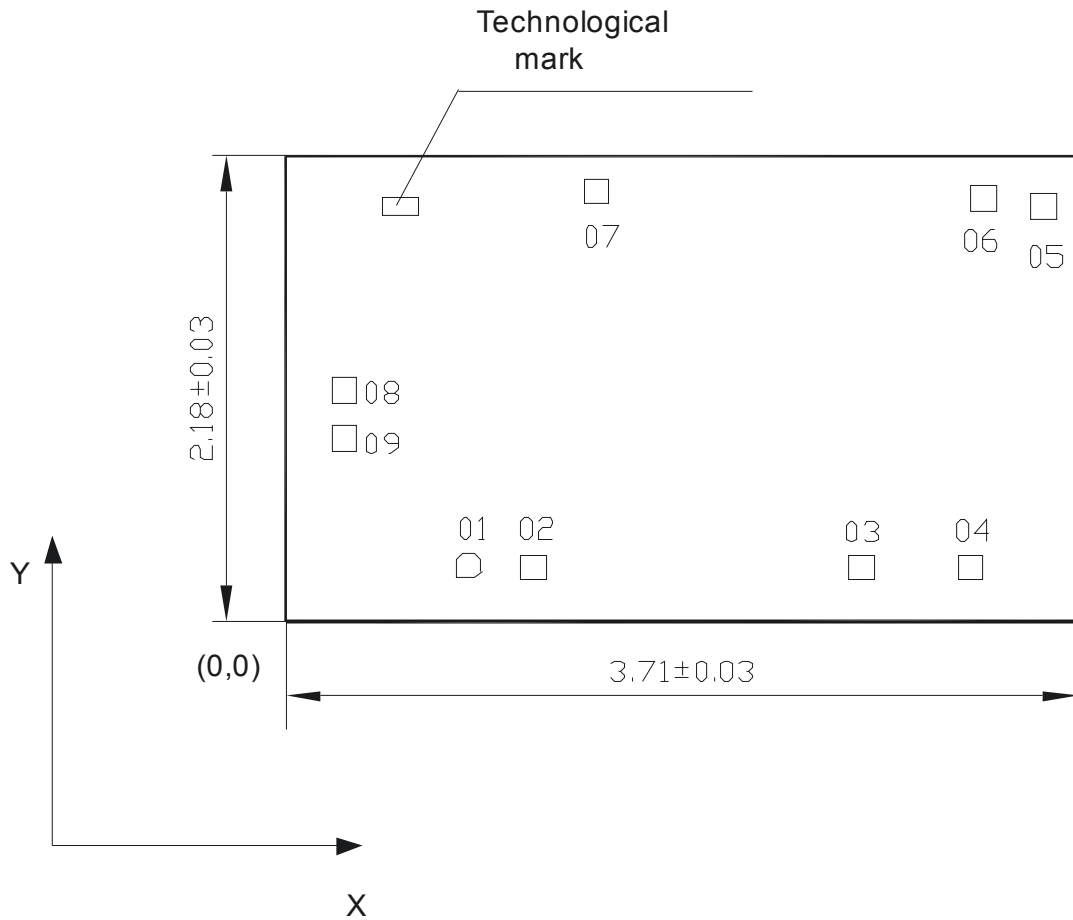
Fig. 5 – Receiver I/O signals time diagram

PLASTIC DIP-8 (MS-001BA)



|        | D     | E1    | A     | b     | b2    | e    | $\alpha$ | L     | E     | c     | A1    |
|--------|-------|-------|-------|-------|-------|------|----------|-------|-------|-------|-------|
| mm     |       |       |       |       |       |      |          |       |       |       |       |
| min    | 9.02  | 6.07  | —     | 0.36  | 1.14  |      | 0°       | 2.93  | 7.62  | 0.20  | 0.38  |
| max    | 10.16 | 7.11  | 5.33  | 0.56  | 1.78  | 2.54 | 15°      | 3.81  | 8.26  | 0.36  | —     |
| inches |       |       |       |       |       |      |          |       |       |       |       |
| min    | 0.355 | 0.240 | —     | 0.014 | 0.045 |      | 0°       | 0.115 | 0.300 | 0.008 | 0.015 |
| max    | 0.400 | 0.280 | 0.210 | 0.022 | 0.070 | 0.1  | 15°      | 0.150 | 0.325 | 0.014 | —     |

Fig. 6 –DIP-package (MS-001BA) overall dimensions



Technological mark coordinates ILX3483 / ILX3485 / ILX3486 (mm):  
 left bottom corner  $x = 0,45$ ;  $y = 1,91$ .  
 Die thickness  $0,46 \pm 0,02$  mm.

| Contact pad number | Coordinates (left bottom corner), um |       | Contact pad dimension, um |
|--------------------|--------------------------------------|-------|---------------------------|
|                    | X                                    | Y     |                           |
| 01                 | 0,797                                | 0,205 | 0,120 x 0,120             |
| 02                 | 1,100                                | 0,195 | 0,120 x 0,120             |
| 03                 | 2,635                                | 0,195 | 0,120 x 0,120             |
| 04                 | 3,145                                | 0,195 | 0,120 x 0,120             |
| 05                 | 3,485                                | 1,885 | 0,120 x 0,120             |
| 06                 | 3,205                                | 1,925 | 0,120 x 0,120             |
| 07                 | 1,395                                | 1,955 | 0,120 x 0,120             |
| 08                 | 0,215                                | 1,023 | 0,120 x 0,120             |
| 09                 | 0,215                                | 0,800 | 0,120 x 0,120             |

Note - Contact pad coordinates are indicated under "metal" layer

Fig. 7 – Die diagram and contact pad coordinates