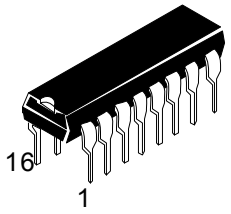
MICROCIRCUIT ILX3221EN INTERFACE TRANSCEIVER OF THE SERIAL DATA OF THE STANDARD RS -232

(compatible to MAX3221E (MAXIM USA)

The ILX3221EN is interface transceiver of serial data under RS - 232 standard with single power supply source & bipolar output voltage of transmitter, low power consumption

The ILX3221EN 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. The chip is designed in 16-pin DIP case MS-001BB.



N SUFFIX
DIP

Fig.1 - ILX3221EN in Plastic DIP case (MS-001BB)

Main features

- 1 transmitter and 1 receivers of the serial data of the standard RS-232;
- AutoShutdown function provide low power consumption;
- Supply voltage range: 3.0 … 5.5 V;
- Operating temperature range: -40 … +85 °C;
- ESD protection up to 2000 V for transmitter input and receiver output (TTL/CMOS levels) and up to 15000V for transmitter output and receiver input (RS-232 levels);
- Latch current, min – 100 mA at normal climatic condition.

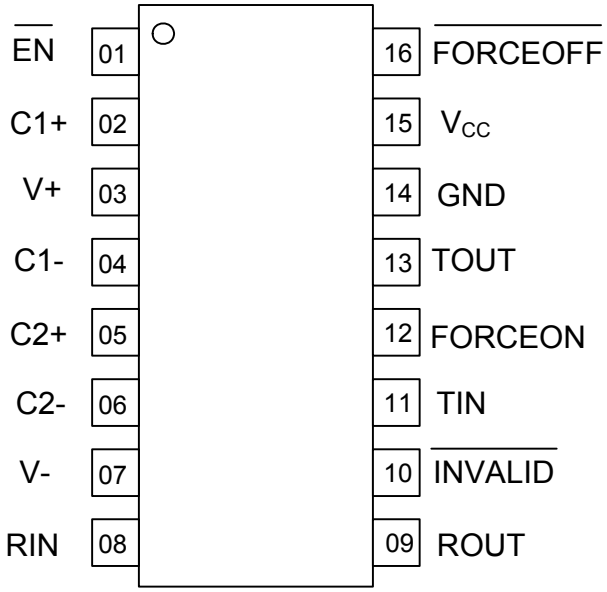
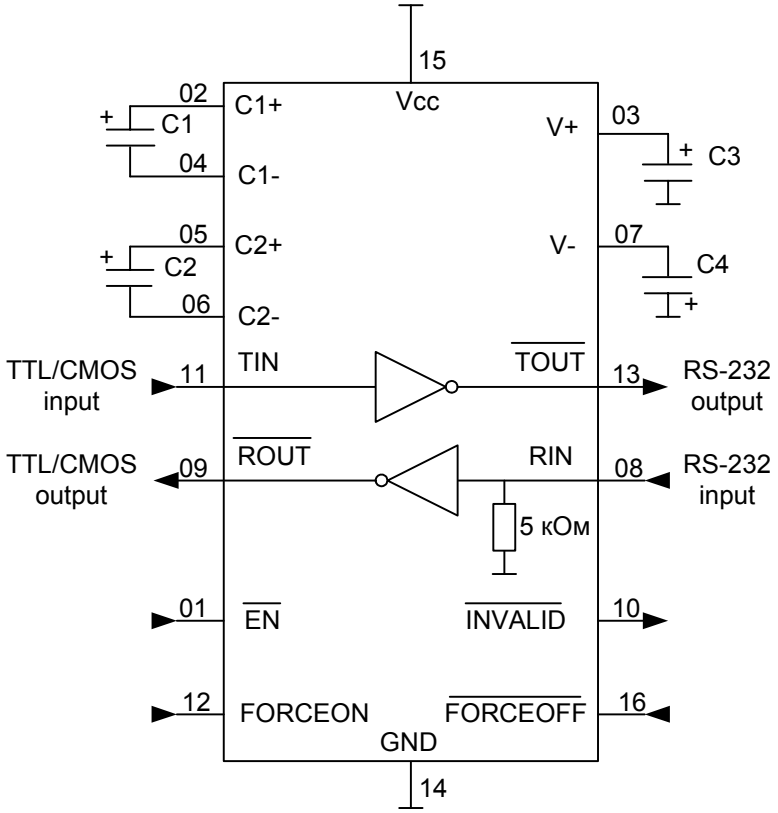


Fig. 2 – Pinning

Table 1. Pin description table

Pin number	Symbol	Pin description
01	$\overline{EN}$	Receiver enable control input
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	RIN	RS-232 Receiver data inputs
09	$\overline{ROUT}$	TTL/CMOS Receiver data output
10	$\overline{INVALID}$	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic “1”.
11	TIN	TTL/CMOS transmitter data input
12	FORCEON	Autoshutdown mode control input (enable active operation of the IC)
13	$\overline{TOUT}$	RS-232 transmitter data outputs
14	GND	Common pin
15	Vcc	Supply voltage
16	$\overline{FORCEOFF}$	Autoshutdown mode control input (switch the IC to low power consumption mode)



C1 – capacitor 0.1 μF ± 10 % for U_{CC} = 3.0 … 3.6V and
0.047 μF ± 10 % for U_{CC} = 4.5 … 5.5V
C2, C3, C4– capacitors 0.1 μF ± 10 % for U_{CC} = 3.0 … 3.6V and
0.33 μF ± 10 % for U_{CC} = 4.5 … 5.5V

Fig. 3 - Functional diagram

Table2. Truth table

Mode	Inputs					Outputs	
	FORCEON	$\overline{\text{FORCEOFF}}$	$\overline{\text{EN}}$	RIN	TIN	$\overline{\text{ROUT}}$	$\overline{\text{TOUT}}$
Low power consumption (without Autoshutdown function)	X	L	L	L	X	H	Z
	X	L	L	H	X	L	Z
	X	L	H	X	X	Z	Z
Data transfer (without Autoshutdown function)	H	H	L	L	L	H	H
	H	H	L	L	H	H	L
	H	H	L	H	L	L	H
	H	H	L	H	H	L	L
	H	H	H	X	L	Z	H
	H	H	H	X	H	Z	L
Data transfer (with Autoshutdown function)	L	H	L	L	L	H	H
	L	H	L	L	H	H	L
	L	H	L	H	L	L	H
	L	H	L	H	H	L	L
	L	H	H	X	H	Z	L
	L	H	H	X	L	Z	H
Low power consumption (with Autoshutdown function)	L	H	L	L_{INVL}	X	H	Z
	L	H	H	L_{INVL}	X	Z	Z

Note - H – high level;
- L – low level;
- X – any level (H or L);
- L_{INVL} – low level signal not less than -0,3 V & not more than 0,3 V with duration not less that t_{PHLINV};
- Z – third state of output

Table 3. Truth table for $\overline{\text{INVALID}}$ pin

RIN	$\overline{\text{INVALID}}$
L	H
H	H
L_{INVL}	L

Note - H – high level;
- L – low level;
- L_{INVL} – low level signal not less than -0,3 V & not more than 0,3 V with duration not less that t_{PHLINV};

Table 4. – Maximum Ratings

Symbol	Parameter	Norm		Unit
		min	max	
U_{CC}	Supply voltage	–0,3	6,0	V
U_{IL}	Transmitter low level input voltage	–0,3	–	V
U_{IH}	Transmitter high level input voltage	–	6,0	V
U_{OT}	Voltage applied to transmitter output	– 13,2	13,2	V
U_{OR}	Receiver output voltage	–0,3	U_{CC} + 0,3	V
U_O	$\overline{\text{INVALID}}$ pin voltage	–0,3	U_{CC} + 0,3	V
$U_{V+} + U_{V-}$	Multiplier outputs voltages difference	–	13	V
U_{V+}	Multiplier positive output voltage, V	–0,3	7,0	V
U_{V-}	Multiplier negative output voltage, V	–7,0	0,3	V
U_{IR}	Receiver input voltage, V	–25	25	V
T	Ambient temperature	–60	150	°C

Table 5 – Recommended Operating Conditions

Symbol	Parameter	Norm		Unit
		min	max	
U_{CC}	Supply voltage	3,0	5,5	V
U_{IL}	Transmitter low level input voltage	0	0,8	V
U_{IH}	Transmitter high level input voltage			V
	- for U_{CC} = 3,3 B ± 10 %	2,0	U_{CC}	
	- for U_{CC} = 5,0 B ± 10 %	2,4		
U_{INVL}	Receiver threshold input voltage corresponding to low level on $\overline{\text{INVALID}}$ pin	–0,3	0,3	V
U_{INVH}	Receiver threshold input voltage corresponding to high level on $\overline{\text{INVALID}}$ pin	–2,7	2,7	V
U_{ITH}	Receiver high level threshold input voltage,	–	2,4	V
U_{ITL}	Receiver low level threshold input voltage			V
	for U_{CC} = 3,3 V ± 10 %	0,6	–	
	for U_{CC} = 5,0 V ± 10 %	0,8		
U_{V+}	Multiplier positive output voltage, V	5,0	–	V
U_{V-}	Multiplier negative output voltage, V	–	–5,0	V
U_{IR}	Receiver input voltage, V	–25	25	V
T	Ambient temperature	–40	85	°C

Table 6 –Electric parameters(Ucc = 3,0 – 5,5 V)

Symbol	Parameter	Mode	Target		T_A, °C	Unit
			Min	Max		
I_{CC1}	AutoShutdown mode supply current	Ucc = 3,3; 5,0 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc RIN not connected	–	10	25±10	μA
				14	-40; 85	
I_{CC2}	Low power consumption mode supply current	Ucc = 3,3; 5,0 V; $\overline{\text{FORCEOFF}}$ is connected to GND RIN connected to GND	–	10	25±10	μA
				14	-40; 85	
I_{CC3}	AutoShutdown Disabled supply current	Ucc = 3,3; 5,0 V; FORCEON & $\overline{\text{FORCEOFF}}$ is connected to Vcc without load	–	1,0	25±10	mA
				1,4	-40; 85	
I_{ILL}	Low level input leakage current (for control inputs and transmitter inputs)	Ucc = 5,5 V; U_{IL} = 0 V	–	-0,5	25±10	μA
				-1,0	-40; 85	
I_{ILH}	High level input leakage current (for control inputs and transmitter inputs)	Ucc = 5,5 V; $U_{IH} = U_{CC}$	–	0,5	25±10	μA
				1,0	-40; 85	
Receiver						
U_{OLR}	Low level output voltage, V	I_{OL} = 1,6 mA	–	0,3	25±10	V
				0,4	-40; 85	
U_{OHR}	High level output voltage	I_{OH} = -1,0 mA	U_{CC}–0,6	–	25±10	V
					-40; 85	
Uh_R *	Receiver hysteresis, V	–	0,2	1,0	25±10	V
U_{OLINV}	Low level output voltage (for $\overline{\text{INVALID}}$ pin)	I_{OL} = 1,6 mA; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc	–	0,3	25±10	V
				0,4	-40; 85	
U_{OHINV}	High level output voltage (for $\overline{\text{INVALID}}$ pin)	I_{OH} = –1,0 mA; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc	U_{CC}–0,6	–	25±10;	V
					-40; 85	

Table 6 continued

Sym-bol	Parameter	Mode	Target		T_A, °C	Unit
			Min	Max		
Receiver						
I_{OZLR}	Low level output current for OFF-state	Receiver output is disabled; U_O = 0 V	–	-2,5	25±10	μA
				-10	-40; 85	
I_{OZHR}	High level output current for "OFF"-state	Receiver output is disabled; U_O = 5,5 V	–	2,5	25±10	μA
				10	-40; 85	
R_I	Input resistance	-	3,0	7,0	25±10	kΩ
t_{PHLR}, t_{PLHR}	OFF-ON switching propagation delay	U_{CC} = 5,0 V; C_L = 150 pF; U_{IL} = 0 V; U_{IH} = 3,0 V; $t_{LH} = t_{HL} \leq$ 10 ns	–	500		ns
t_{SKD}	Propagation delays difference		–	200		ns
t_{PLZR}, t_{PHZR}	Propagation delay of transition from high (low) level state to OFF-state	U_{CC} = 5,0 V; U_{IL} = 0 V; U_{IH} = 3,0 V; $t_{LH} = t_{HL} \leq$ 10 ns; R_L = 1 kΩ	–	400		ns
t_{PZLR}, t_{PZHR}	Propagation delay of transition from OFF-state to high (low) level state		–	400		ns
t_{PHLINV}	Propagation delay of transition $\overline{\text{INVALID}}$ pin to low level state	U_{CC} = 5,0 V; U_{IL} = 0; -3,0 V; U_{IH} = 3,0; 0 V; $t_{LH} = t_{HL} \leq$ 10 ns; C_L = 15 pF	–	80		μs
t_{PLHINV}	Propagation delay of transition $\overline{\text{INVALID}}$ pin to high level state		–	2,9		μs
Transmitter						
U_{OLT}	Low level output voltage	R_L = 3 kΩ	–	-5,07	25±10	V
				-5,0	-40; 85	
U_{OHT}	High level output voltage	R_L = 3 kΩ	5,07	–	25±10	V
			5,0		-40; 85	
Uh_T	Transmitter hysteresis	–	0,1	1,0	25±10	V
R_O	Output resistance	$U_{CC} = U_{V+} = U_V$ = 0 V; U_O = ±2 V	350	–	25±10	Ω
			300		-40; 85	

Table 6 continued

Sym-bol	Parameter, unit	Mode	Target		T_A, °C	Unit
			Min	Max		
Transmitter						
I_{OS}	Short circuit current	–	–	53	25±10	mA
				60	-40; 85	
				-53	25±10	
				-60	-40; 85	
I_{OZLT}	Low level output current for OFF-state	U_{CC} = 0; 3,0 – 5,5 V; U_O= -12 V; transmitter output is disabled	–	-10	25±10	µA
				-25	-40; 85	
I_{OZHT}	High level output current for OFF-state	U_{CC} = 0; 3,0 – 5,5 V; U_O = 12 V; transmitter output is disabled	–	10	25±10	µA
				25	-40; 85	
ST	Maximum Data Rate	R_L = 3 kΩ; C_L = 1000 pF; only transmitter is switching	250	–	25±10; -40; 85	kbit/s
SR	Transition-Region Slew Rate	U_{CC} = 3,3 V; R_L = (3-7) kΩ; U_{OT} is changing from +3 to -3 V or from -3 to +3 V; only transmitter is switching C_L = (150 -1000) pF	6,0	30	25±10	V/µs
t_{SKEW}	Propagation delays difference	U_{CC} = 5,0 V; U_{IL} = 0 V; U_{IH} = 3,0 V; $t_{LH} = t_{HL} \leq 10$ ns; R_L=3 kOhm; C_L=1000 pF	–	300		ns
t_{WU}	Transmitter output enable time	U_{CC} = 5,0 V; U_{IL} = 0 V; U_{IH} = 3,0 V; U_{IL} = -3,0 V; U_{IH} = 0 V	–	120		µs

* 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} = 3,0 … 3,6V (or C1-C4 = 0,1 µF & U_{CC} = 4,5 … 5,5)

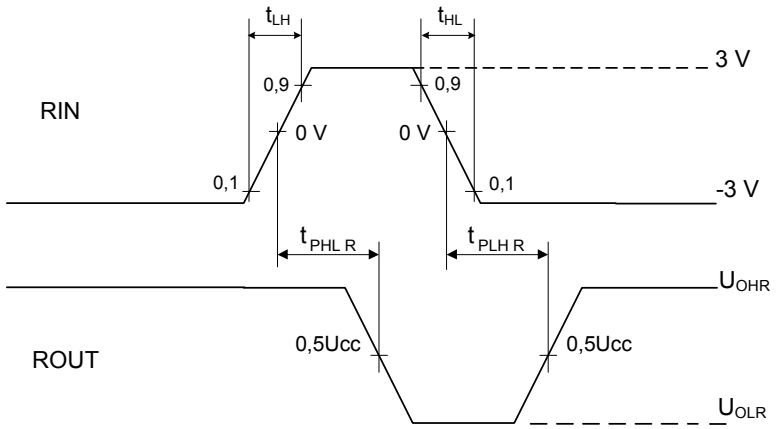


Fig. 4 – Receiver output & input signals time diagram

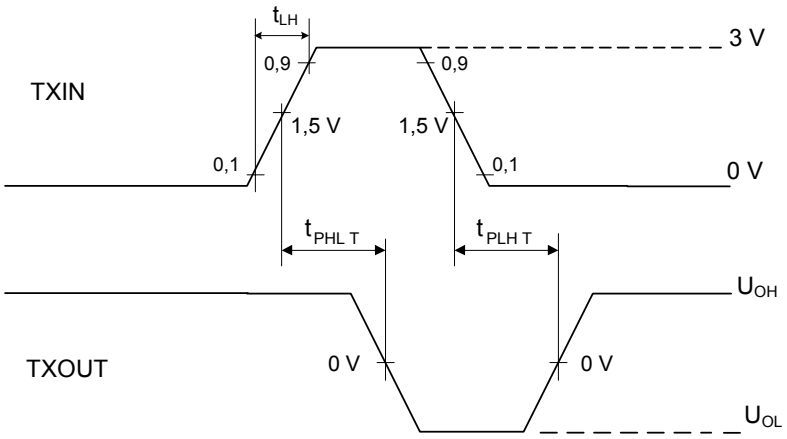


Fig. 5 – Transmitter output & input signals time diagram

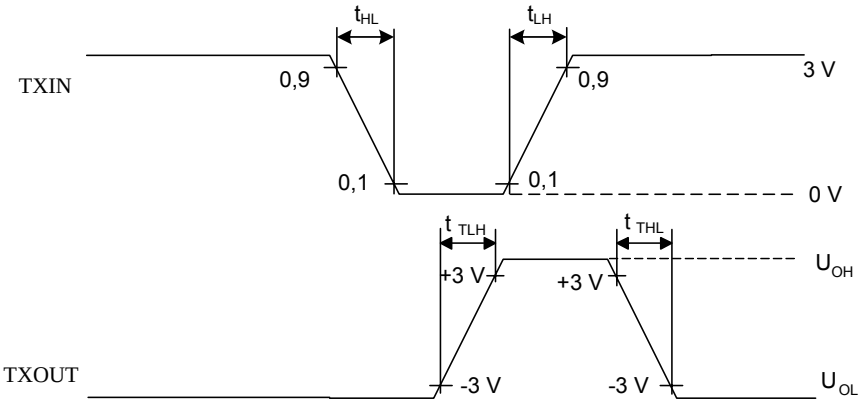
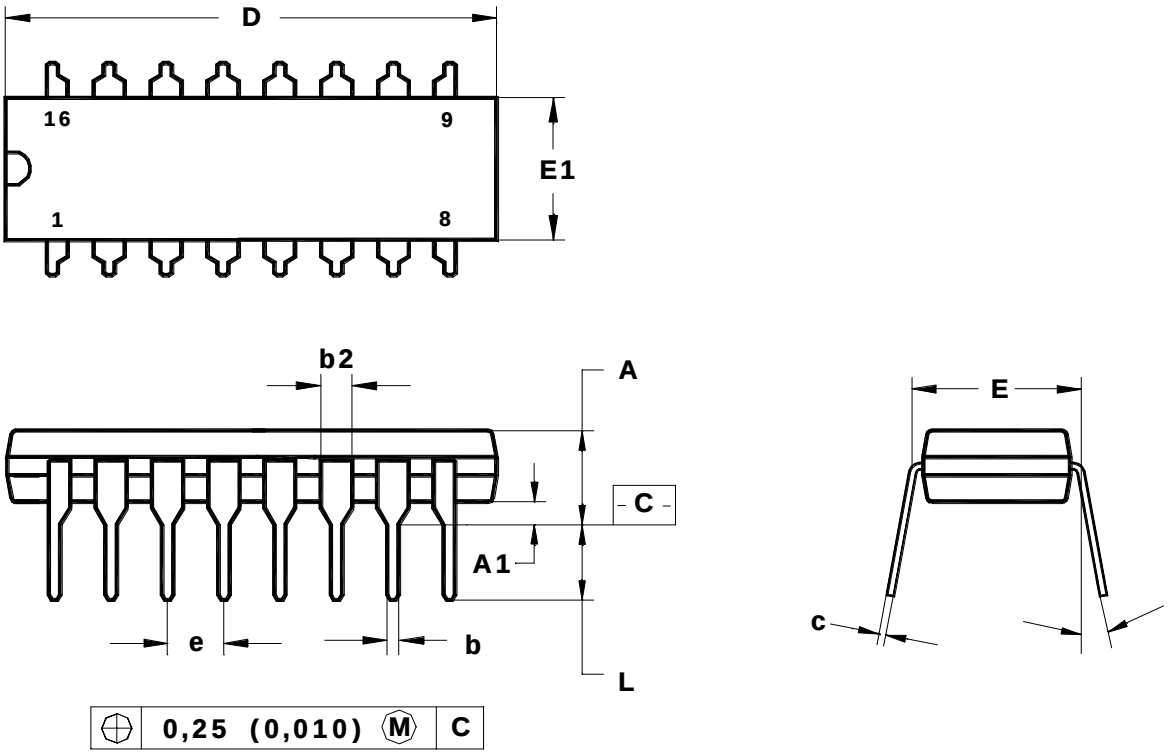


Fig.6 – Transmitter output & input signals time diagram

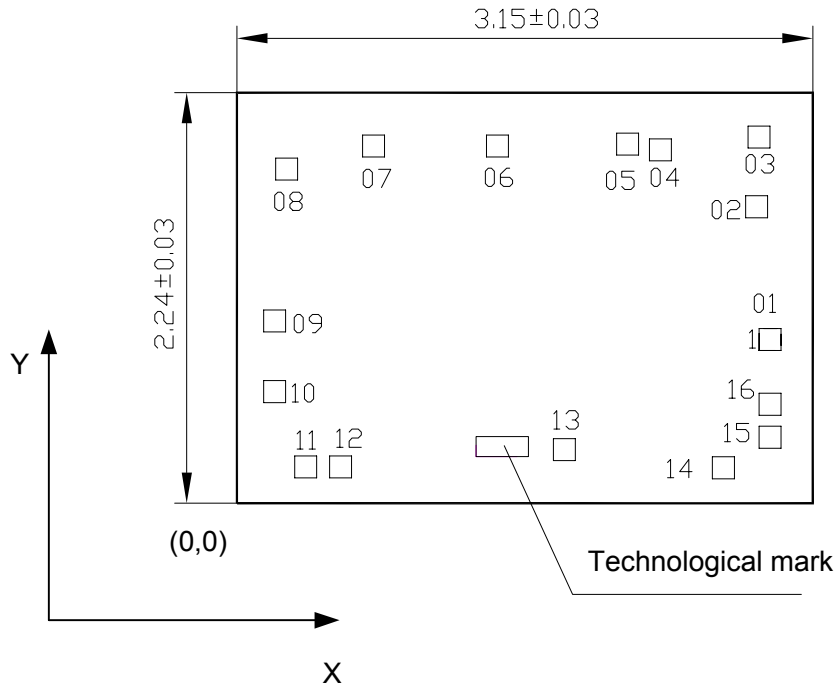
PACKAGE DIMENSION



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	—

Fig.7 – Package dimension of DIP-case MS-001BB



Technological mark “ILX3221E” coordinates, um: x = 1,308, y = 0,260.
Die thichness 0,46±0,02 mm.

Contact pad number	Coordinates (left bottom corner), um	
	X	Y
01	2,856	0,833
02	2,782	1,558
03	2,796	1,938
04	2,257	1,868
05	2,077	1,900
06	1,365	1,889
07	0,688	1,889
08	0,212	1,763
09	0,146	0,934
10	0,146	0,549
11	0,316	0,138
12	0,506	0,138
13	1,731	0,232
14	2,601	0,133
15	2,856	0,300
16	2,856	0,480
Note - Contact pad coordinates and dimensions 0.120 x 0.120mm are indicated under “Metallization” layer		

Fig. 8 – Chip and contact pad layout diagram