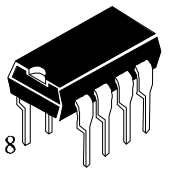
Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers

ILX3485

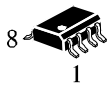
General Description

The ILX3485 is low-power transceivers for RS-485-3.3 and RS- 422-3.3 communication. IC contains one driver and one receiver. The driver slew rates of the ILX3485 is not limited, allowing them to transmit up to 2.5Mbps.

These transceivers draw between 120µA and 500µA of supply current when unloaded or fully loaded with disabled drivers. All parts operate from a single 3.3V supply. Drivers are short-circuit current limited and are protected against excessive power dissipation by thermal shutdown circuitry that places the driver outputs into a high-impedance state.The receiver input has a fail-safe feature that guarantees a logic-high output if the input is open circuit.



N SUFFIX
PLASTIC



D SUFFIX
SOIC

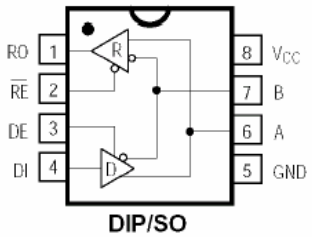
ORDERING INFORMATION

ILX3485N	Plastic
ILX3485D	SOIC

Features

- Low Quiescent Current: 300µA
- -7V to +12V Common-Mode Input Voltage Range
- Three-State Outputs
- 30ns Propagation Delays, 5ns Skew
- Full-Duplex and Half-Duplex Versions Available
- Operate from a Single 3.3V Supply
- Allows up to 32 Transceivers on the Bus
- Data rate: 2,5 Mbps
- Current-Limiting and Thermal Shutdown for Driver Overload Protection
- The transmitter outputs and receiver inputs are protected to ±15kV Air ESD.

Pinning



DIP/SO

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC}) 7V	Continuous Power Dissipation (T_A= +70°C)
Control Input Voltage -0.3V to 7V	8-Pin Plastic DIP (derate 9.09mW/°C above +70°C) 727mW
Driver Input Voltage (DI) -0.3V to 7V	8-Pin SOP (derate 5.88mW/°C above +70°C) 471mW
Driver Output Voltage (A, B) -7.5V to +12.5V	Operating Temperature Ranges 0°C to +70°C
Receiver Input Voltage (A, B) -7.5V to +12.5V	Storage Temperature Range -65°C to +160°C
Receiver Output Voltage (RO) -0.3V to (V_{CC}+0.3V)	Lead Temperature (soldering, 10sec) +300°C

DC ELECTRICAL CHARACTERISTICS

(V_{CC} = 3.3V ±10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V_{OD1}			2			V
Differential Driver Output (with load)	V_{OD2}	R = 100Ω (RS-422)		1			V
		R = 54Ω (RS-485), Figure 4		0.8			
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	ΔV_{OD}	R = 54Ω or 50Ω, Figure 4				0.2	V
Driver Common-Mode Output Voltage	V_{OC}	R = 54Ω or 100Ω, Figure 4				2	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	ΔV_{OD}	R = 54Ω or 100Ω, Figure 4				0.2	V
Input High Voltage	V_{IH}	DE, DI, $\overline{RE}$		2.0			V
Input Low Voltage	V_{IL}	DE, DI, $\overline{RE}$				0.8	V
Input Current	I_{IN1}	DE, DI, $\overline{RE}$				±2	µA
Input Current (A, B)	I_{IN2}	DE = 0V;	V_{IN} = 12V			1.0	mA
		V_{CC} = 0V or 5.25V,	V_{IN} = -7V			-0.8	
Receiver Differential Threshold Voltage	V_{TH}	-7V ≤ V_{CM} ≤12V		-0.2		0.2	V
Receiver Input Hysteresis	ΔV_{TH}	V_{CM} = 0V			70		mV
Receiver Output High Voltage	V_{OH}	I_O = -1.5mA, VID = 200mV		2.5			V
Receiver Output Low Voltage	V_{OL}	I_O = 2.5mA, VID = -200mV				0.4	V
Three-State (high impedance) Output Current at Receiver	I_{OZR}	0.4V ≤ V_O ≤ 2.4V				±1	µA
Receiver Input Resistance	R_{IN}	-7V ≤ V_{CM} ≤ 12V		12			kΩ

DC ELECTRICAL CHARACTERISTICS (continued)

(V_{CC} = 3.3V ±10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
No-Load Supply Current (Note 3)	I_{CC}	$\overline{DE}$ = V_{CC}		500	800	µA
		$\overline{RE}$ = 0V or V_{CC}		300	400	
		DE = 0V				
Driver Short-Circuit Current,						
	I_{OSD1}	-7V ≤ V_O ≤ 12V (Note 4)			250	mA
V_O = High						
Driver Short-Circuit Current,						
	I_{OSD2}	-7V ≤ V_O ≤12V (Note 4)			250	mA
V_O = Low						
Receiver Short-Circuit Current	I_{OSR}	0V ≤ V_O ≤ V_{CC}	±6.5		95	mA

SWITCHING CHARACTERISTICS

(V_{CC} = 3.3V ±10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Input to Output	t_{PLH}	R_{DIFF} = 54Ω	10	30	60	ns
	t_{PHL}	C_{L1} = C_{L2} = 100pF	10	30	60	
Driver Output Skew to Output	t_{SKEW}	R_{DIFF} = 54Ω, CL1 = CL2 = 100pF		5	10	ns
Driver Enable to Output High	t_{ZH}	C_L= 100pF, S2 closed		45	90	ns
Driver Enable to Output Low	t_{ZL}	C_L= 100pF, S1 closed		45	90	ns
Driver Disable Time from Low	t_{LZ}	C_L= 15pF, S1 closed		40	80	ns
Driver Disable Time from High	t_{HZ}	C_L= 15pF, S2 closed		40	80	ns
| tPLH - tPHL | Differential	t_{SKD}	R_{DIFF} = 54Ω		13		ns
Receiver Skew		C_{L1} = C_{L2} = 100pF				
Receiver Enable to Output Low	t_{ZL}	C_{RL} = 15pF, S1 closed			50	ns
Receiver Enable to Output High	t_{ZH}	C_{RL} = 15pF, S2 closed		20	50	ns
Receiver Disable Time from Low	t_{LZ}	C_{RL} = 15pF, S1 closed		20	50	ns
Receiver Disable Time from High	t_{HZ}	C_{RL} = 15pF, S2 closed		20	50	ns
Maximum Data Rate	f_{MAX}		2.5			Mbps

Note 1: All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to device ground unless otherwise specified.
Note 2: All typical specifications are given for V_{CC} = 3.3V and T_A = +25°C.
Note 3: Supply current specification is valid for loaded transmitters when DE = 0V.
Note 4: Applies to peak current. See *Typical Operating Characteristics*.

Test Circuits

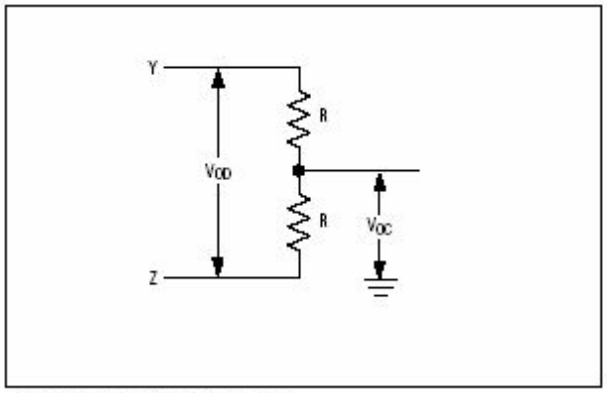


Figure 4. Driver DC Test Load

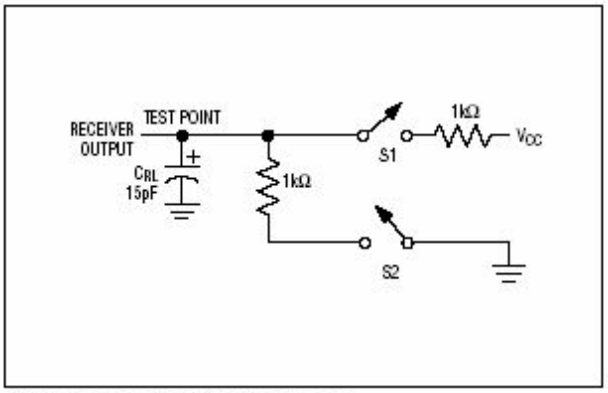


Figure 5. Receiver Timing Test Load

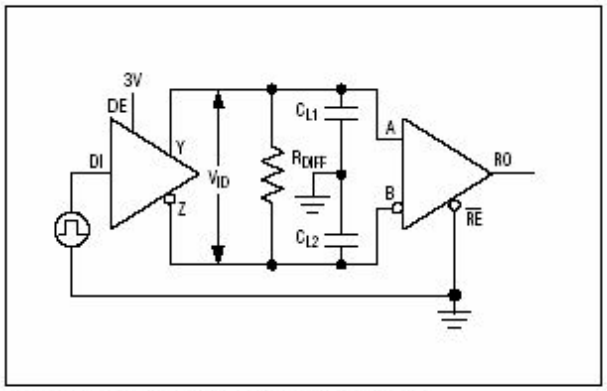


Figure 6. Driver/Receiver Timing Test Circuit

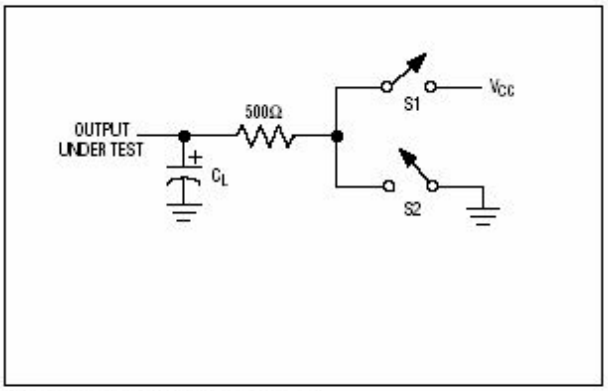


Figure 7. Driver Timing Test Load

Operation timing diagrams of ILX3485

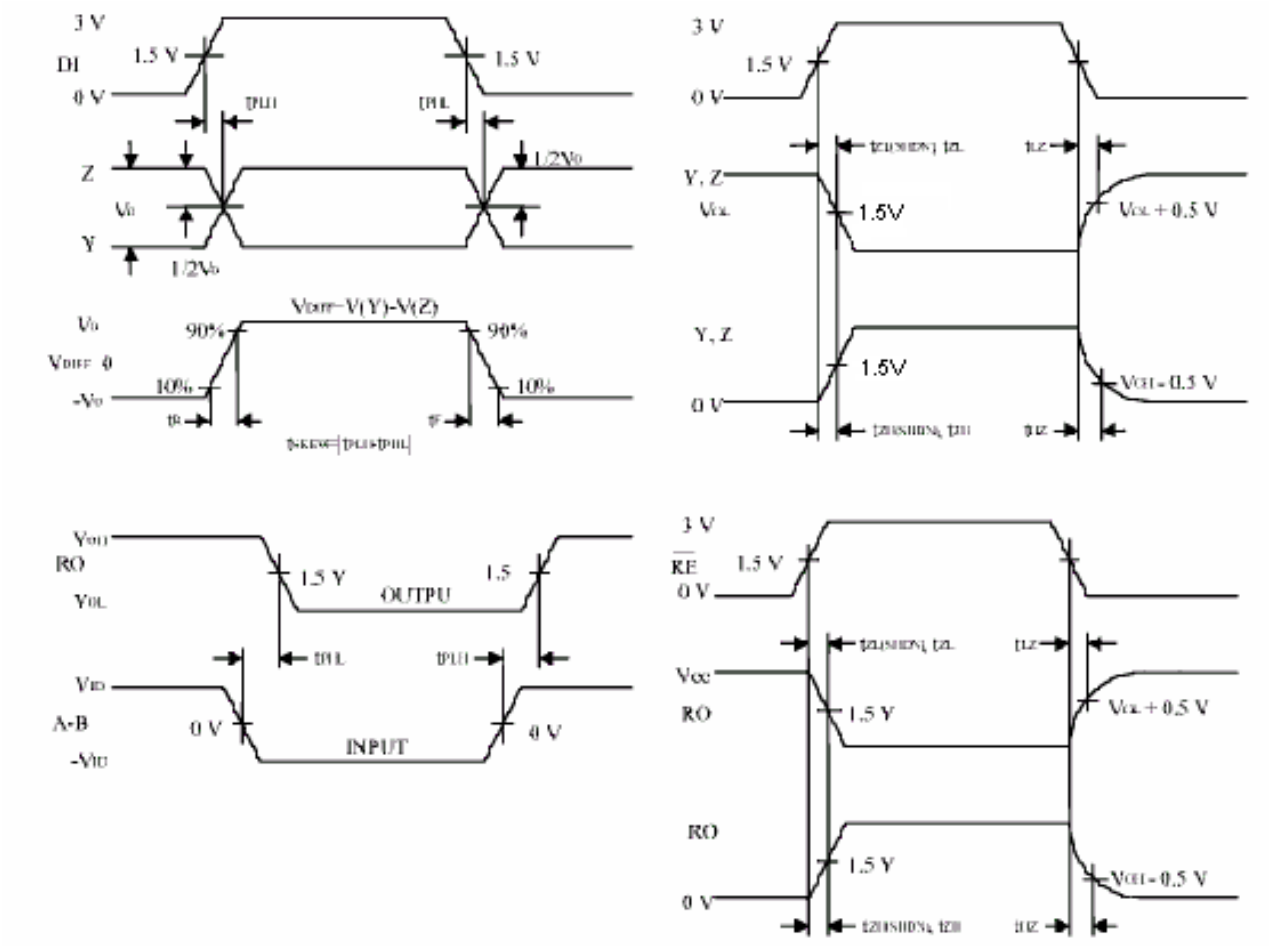
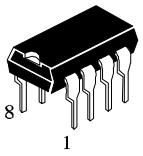


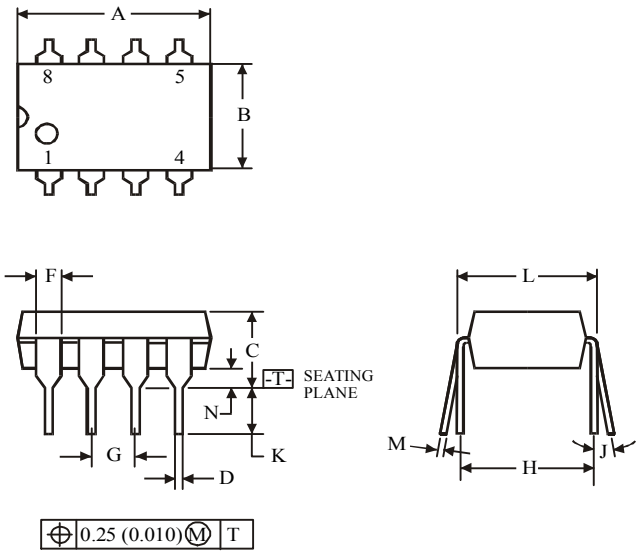
Table of ILX 3485 operation

Transmitting					Receiving			
Inputs			Outputs X		Inputs			Outputs
RE	DE	DI	Z	Y	RE	DE	A-B	RO
X	1	1	0	1	0	0	+0.2V	1
X	1	0	1	0	0	0	-0.2V	0
0	0	X	Z	Z	0	0	open	1
1	0	X	Z	Z	1	0	X	Z

X-don't care
Z-high impedance

N SUFFIX PLASTIC DIP
(MS – 001BA)



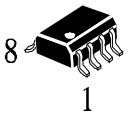


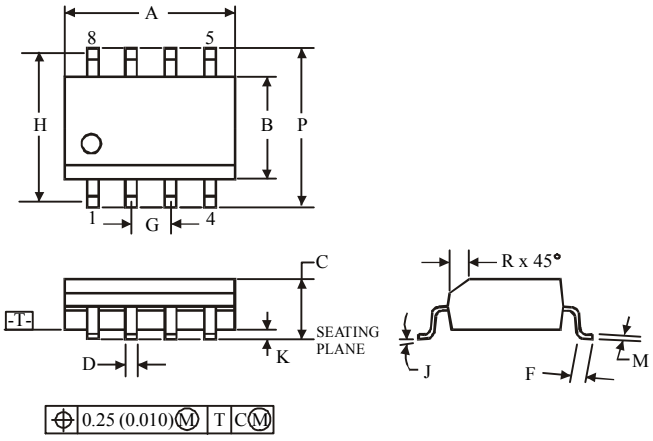
	Dimension, mm	
Symbol	**MIN**	**MAX**
A	8.51	10.16
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

NOTES:

1. Dimensions “A”, “B” do not include mold flash or protrusions.
   Maximum mold flash or protrusions 0.25 mm (0.010) per side.

D SUFFIX SOIC
(MS - 012AA)





	Dimension, mm	
Symbol	**MIN**	**MAX**
A	4.8	5
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5

NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side
   for A; for B – 0.25 mm (0.010) per side.