

## 1. DESCRIPTION

The XD/ XL3085 is a +5V, half-duplex,  $\pm 15\text{KV}$  ESD protected RS485/RS-422 transceiver circuit. The circuit contains one driver and one receiver.

The XD/XL3085 is a half-duplex type with drive enable (DE) and receive enable E()R pins, and the drive and receive outputs are high-impedance when in the off state.

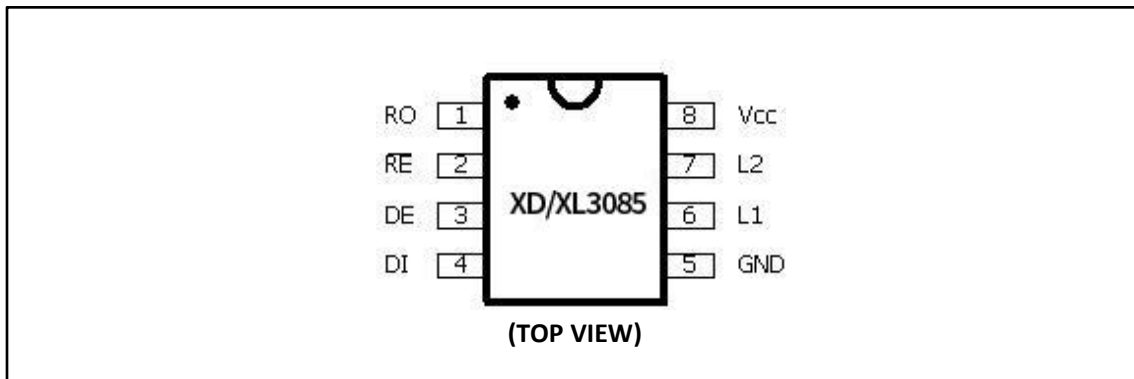
The XD/XL3085 has a failsafe circuit to ensure that the receiver output is correct when the receiver input is open or shorted.

The XD/XL3085 receiver input impedance is 1/8 unit load, allowing up to 256 transceivers to be hooked up to the bus.

## 2. FEATURES

- Electrostatic Protection (ESD): L1/L2  $\pm 15\text{KV}$  - Human Body Mode (HBM)
- bus allows up to 256 transceivers to be hooked up
- Strong swing rate limiting helps achieve error-free data transmission
- Tri-state outputs
- DIP8/SOP8 package
- Complies with Q/GDW 11179.11-2015 Technical Specification for Components for Energy Meters

### 3. PIN CONFIGURATIONS and FUNCTIONS



#### Pin Functions

Pin	Name	Description
1	RO	Receive Output
2	$\overline{\text{RE}}$	Receive enable terminal: active low, when DE is high, the receive output is high resistance.
3	DE	Transmit Enable: active high, when DE is low, transmit output is high resistance. DE
4	DI	When DE is high, the chip operates in transmit state, when DE is low and low level, the chip operates in receive state.
5	GND	Transmit Data Input
6	L1	Ground
7	L2	Receive Input/Transmit Output
8	Vcc	Receive Input/Transmit Output

## 4. Logical relationships

### 4.1. No polarity XD/XL3085 chip driver truth table

Input	Enable	Output	
DI	DE	A	B
<b>Active state</b>			
H	H	H	L
L	H	L	H
X	L	Z	Z
<b>Reverse state</b>			
H	H	L	H
L	H	H	L
X	L	Z	Z

### 4.2. No polarity XD/XL3085 chip receiver truth table

Input			Output
$\overline{\text{RE}}$	DE	AXB	RO
L	X	>100mV	H
L	X	<-100mV	L for polarity judgement time H (outside polarity judgement time)
L	X	open circuit	H (outside polarity judgement time)
L	X	short circuit	H (outside polarity judgement time)
H	H	X	Z
H	L	X	Z

## 5. SPECIFICATIONS

### 5.1. Absolute Maximum Ratings

SYMBOL	Supply Voltage	MIN	MAX	UNIT
VCC	Control input voltage (DE, RE)	-	+6.0	V
	Drive input voltage (DI)	-0.5	+6.0	V
	Drive output voltage (L1, L2)	-0.5	+6.0	V
	Receive input voltage (L1, L2)	-7.0	+12.0	V
	Receive output voltage (RO)	-7.0	+12.0	V
	Storage temperature range	-0.3	VCC+0.3	V
TSTG	Operating Temperature Range	-55	+150	°C
TOP	Maximum Operating Temperature Range	-40	+85	°C
TMOP	8-pin moulded DIP (above +70°C)	-55	+125	°C
Continuous power consumption	8-pin moulded SOP (above +70°C)	-	725	mW
	Soldering Temperature (10 seconds)	-	470	mW
	Supply Voltage	-	+300	°C

## 5.2. DC characteristics

(if not specified  $V_{CC}=5V\pm 5\%$ ,  $T_A=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Operating Voltage Range	$V_{CC}$		4.5		5.5	V	
Driver differential output (without load)	$V_{OD1}$	-	-	-	5	V	
Driver differential output (with load)	$V_{OD2}$	figure 1, $R=54\Omega$ or $R=27\Omega$	1.5	-	-	V	
Driver Differential Output Voltage	$\Delta V_{OD}$		-	-	0.2	V	
Amplitude of change (Note 2)	$V_{OC}$		1	-	3	V	
Driver common mode output voltage	$\Delta V_{OC}$		-	-	0.2	V	
Driver Common Mode Output Voltage	$V_{IH}$		$\overline{DE, RE, DI}$	2	-	-	V
Amplitude of change (Note 2)	$V_{IL}$	$\overline{DE, RE, DI}$	-	-	0.8	V	
Input High Voltage	$I_{IN1}$	$\overline{DE, RE, DI}$	-	-	$\pm 2$	$\mu A$	
Input low voltage	$I_{IN2}$	$\overline{DE, RE, DI}$ $DE=0V, V_{CC}=5V$	$V_{IN}=5V$	-	40	90	$\mu A$
Input current			$V_{IN}=0V$	-	60	100	
Input current (L1,L2) (Note 3)	$V_{TH}$	$-7V \leq V_{CM} \leq +12V$	-100	-	100	mV	
Receiver differential input threshold voltage	$\Delta V_{TH}$		-	25	-	mV	
Receiver input hysteresis	$V_{OH}$	$I_O=8mA$	4	-	-	V	
Receiver output high	$V_{OL}$	$I_O=8mA$	-	-	0.4	V	
Receiver output low level	$I_{OZR}$	$0.4V \leq V_O \leq 2.4V$	-	-	1	$\mu A$	
Receiver terminal tri-state (high resistance) output current	$R_{IN}$	$-7V \leq V_{CM} \leq +12V$	96	-	-	$k\Omega$	
Receiver Input Impedance	$I_{CC}$	unloaded, $\overline{RE=DI=GND}$ or $V_{CC}$	$DE = V_{CC}$	-	480	600	$\mu A$
No Load Supply Current			$DE=GND$	-	450	600	$\mu A$
Receiver output short-circuit current	$I_{OSR}$	$0V \leq V_{RO} \leq V_{CC}$	-	-	95	mA	
ESD Protection		L1, L2 Pins, Human Body Mode	$\pm 8$	$\pm 15$	-	kV	

[1] All currents flowing into the device are positive and currents flowing out of the device are negative; all voltages are referenced to ground if not otherwise noted.

[2]  $\Delta V_{OD}$  and  $\Delta V_{OC}$  are the respective changes in  $V_{OD}$  and  $V_{OC}$  when the  $DI$  input state is changed.

[3] The illustrations shown use L1 as the A port and L2 as the B port, and vice versa.

### 5.3. Switching characteristics

(if not specified  $V_{CC}=5V\pm 5\%$ ,  $T_A=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Drive Input to Output	tDPLH	figure 3 and figure 5 RDIFF=50Ω CL1=CL2=100pF	250	-	1000	nS
	tDPHL		250	-	1000	nS
Drive Output Offset  tDPLH - tDPHL	tDSKEW		-	-3	±100	nS
Drive Rise, Fall Time	tDR		200	-	750	nS
	tDF		200	-	750	nS
Driver enable to output high	tDZH		figure 4 and figure 6, CL=100pF S2 close	-	-	2500
Drive enable to output low	tDZL	figure 4 and figure 6, CL=100pF S1 close	-	-	2500	nS
Drive low to off	tDLZ	figure 4 and figure 6, CL=15pF S1 close	-	-	100	nS
Driver high to off	tDHZ	figure 4 and figure 6, CL=15pF S2 close	-	-	100	nS
Receiver Input to Output	tRPLH	figure 7 and figure 9,  VID  ≥ 2.0V; VID 上升下降时间 ≤15nS	-	-	200	nS
	tRPHL		-	-	200	nS
Differential Receiver Offset  tRPLH - tRPHL	trsKEW		-	3	±30	nS
Receiver enable to output low	tRZL	figure 2 and figure 8 CL=100pF S1 close	-	20	50	nS
Receiver enable to output high	tRZH	figure 2 and figure 8 CL=100pF S2 close	-	20	50	nS
Receiver low to off	tRLZ	figure 2 and figure 8 CL=100pF S1 close	-	20	50	nS
Receiver high to off	tRHZ	figure 2 and figure 8 CL=100pF S2 close	-	20	50	nS
Driver output short-circuit current	IOD	Short circuit current between L1/L2	-	-	150	mA
Maximum Data Speed	fMAX		250	500	-	Kbps
Communication BER		Communication rate 250kbps	-	-	10 <sup>-7</sup>	-

### 5.4. Impolar characteristics

The polarity direction of the drive polarity switch and the receive polarity switch remain the same, and the polarity direction changes after a  $T_s$  time duration in the following cases DE=RE=0V and RO is low.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Infinitely switchable flip-flop wait time	$T_s$	DE=RE=0, RO is low	10	65	150	ms

### 5.5. Test line and switch waveforms

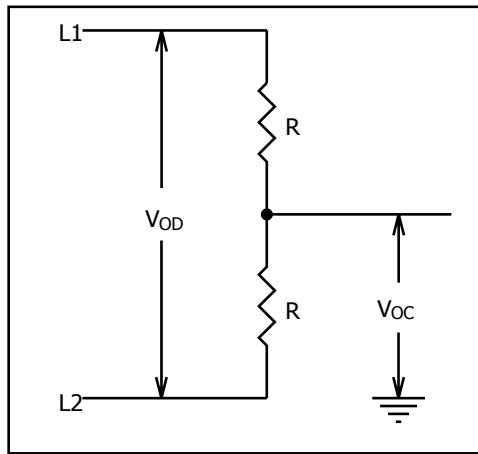


figure 1: Driver DC Characterisation Test Load

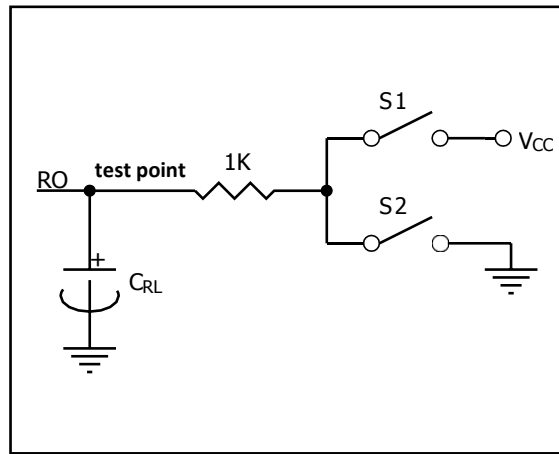


figure 2: Receiver Enable/Off Switching Characteristics Test Load

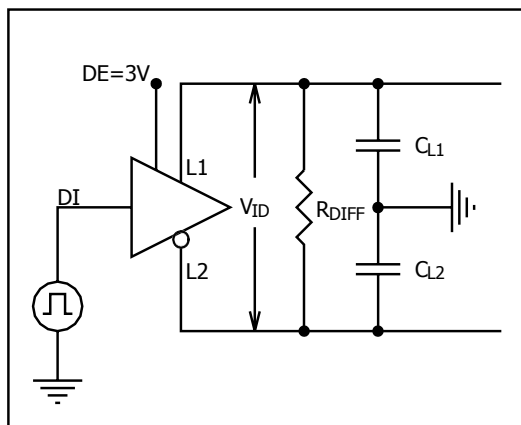


figure 3: Driver Switching Characteristics Test Load

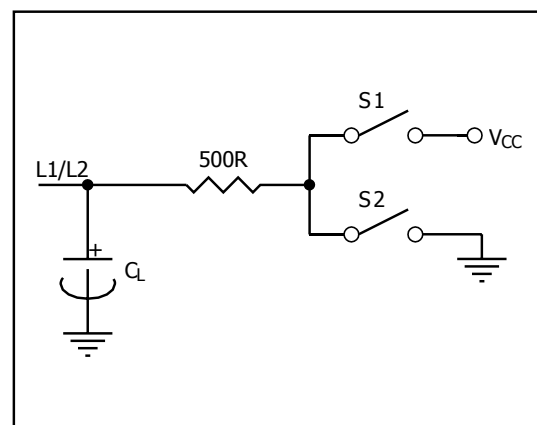


figure 4: Driver Enable/Off Switching Characteristics Test Load

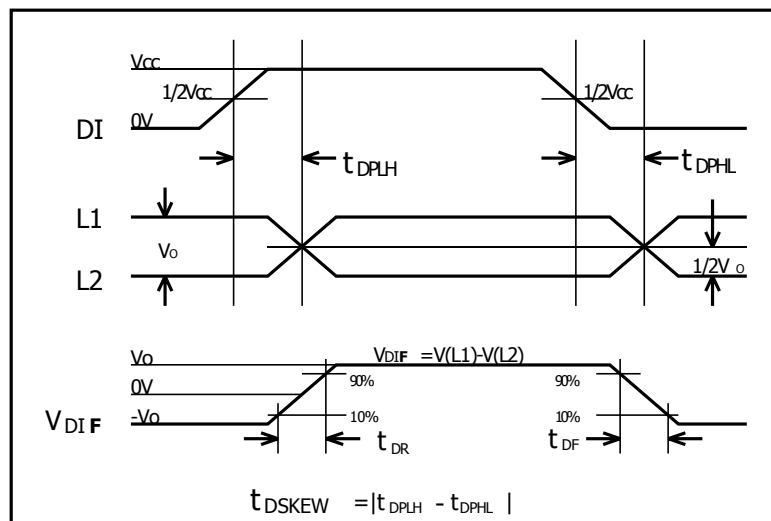


figure 5: Drive Transfer Delay

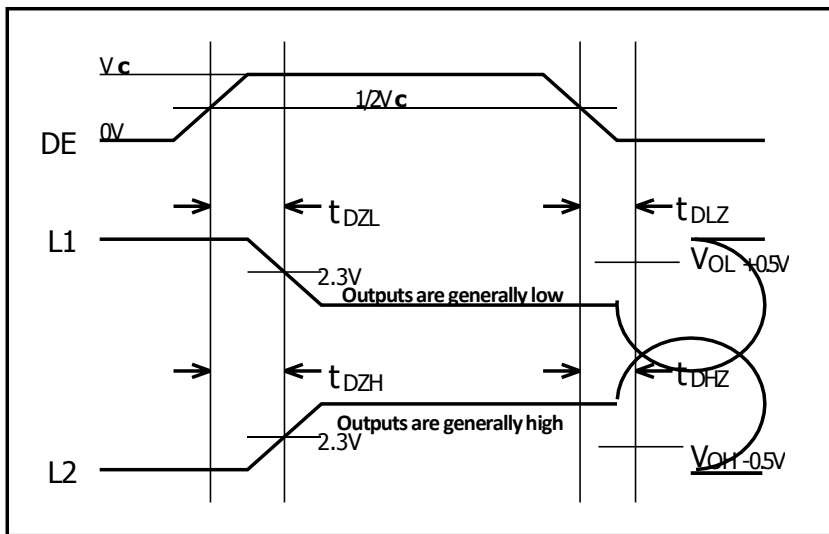


figure 6: Driver Enable/Disable Timing

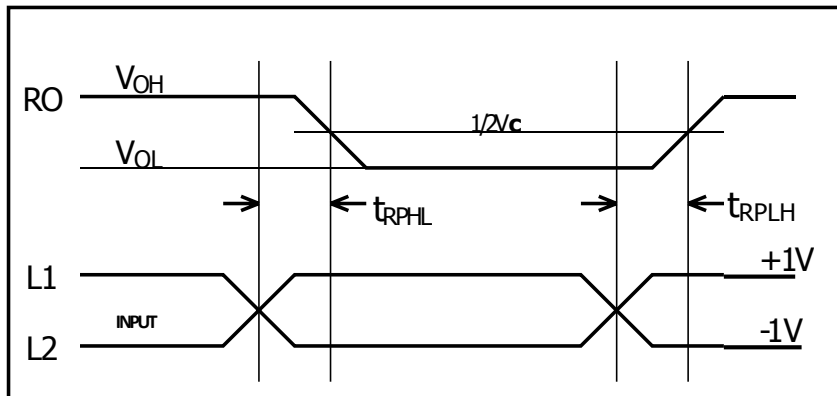


figure 7: Receiver transmission delay

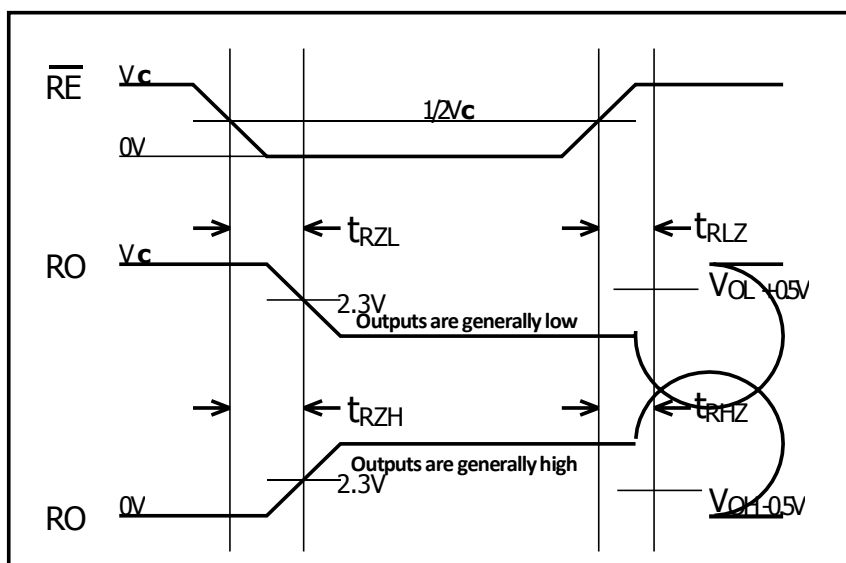


figure 8: Receiver Enable/Off Timing



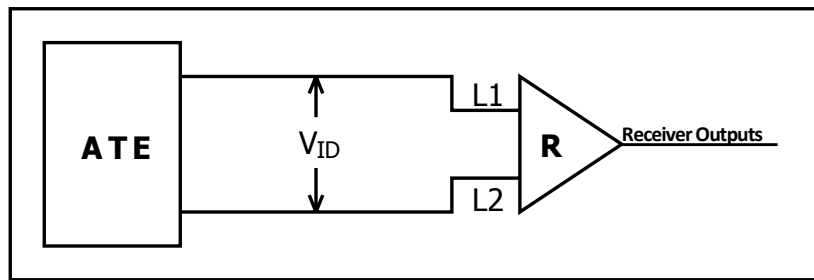


figure 9: Receiver Transmission Delay Test Circuit

## 6. 1.Application information

### 6.1. Detailed Description

The XD/XL3085 high speed transceiver for RS-485/RS-422 communications consists of a driver and a receiver. The XD/XL3085 high-speed transceiver for RS-485/RS-422 communication consists of a driver and a receiver. It is equipped with a fail-safe circuit that ensures that the receiver output goes logic high when the receiver input is open or shorted. If all transmitters hooked up to the termination matching bus are disabled (high resistance), the receiver will output a logic high. x d/xl3085 has a low-swing driver that reduces EMI and reflections due to improper cable termination, enabling error-free data transmission up to 500 kbps. x d/xl3085 is a half-duplex transceiver.

### 6.2. Application areas

- Industrial control
- Meters
- Industrial motor drives
- Automatic HVAC systems
- RS485/RS422 interface

### 6.3. Receiver Input Filtering

When operating the XD/XL3085 in 500kbps mode, the receiver includes an input filter function in addition to input hysteresis. This filtering improves noise rejection of differential signals with slow rise and fall.

### 6.4. Reducing EMI and reflections

The low-swing drivers of the XD/XL3085 reduce EMI and reflections caused by improperly terminated matching cables.

## 6.5. Bus-mounted 256 loads

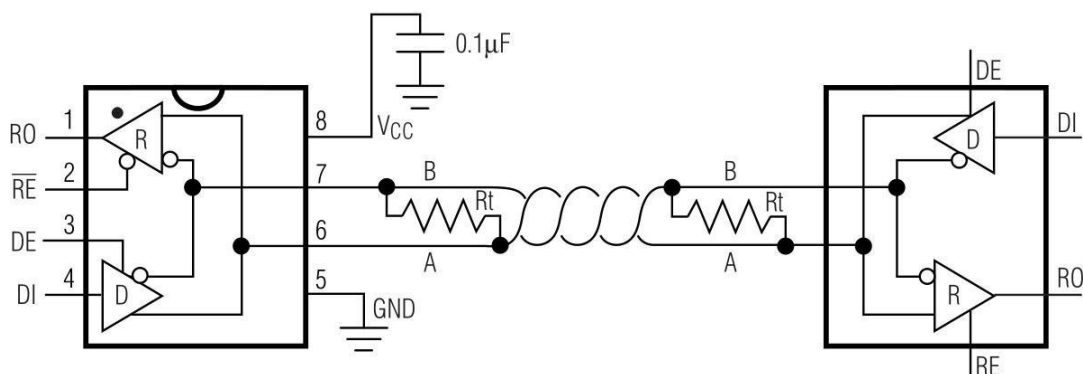
The XD/XL 3085 has a load input impedance greater than 96KΩ, allowing up to 256 transceivers to be hooked up to the same communications bus. The communication error rate is less than 10<sup>-5</sup> at 2.4kbps and 9.6kbps.

## 6.6. ESD Protection

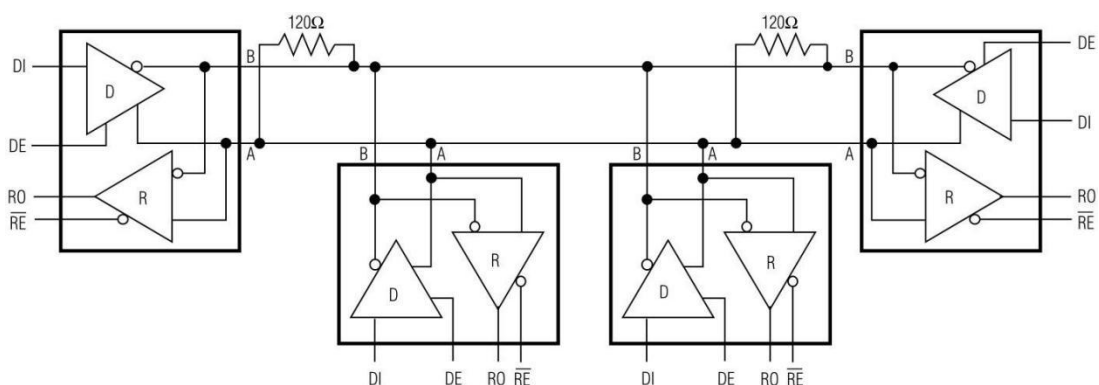
All pins of the XD/XL3085 have electrostatic discharge (ESD) protection circuitry to prevent damage to the chip from human touch or ESD events during assembly. The driver's output and receiver's input pins are additionally enhanced with ESD protection circuitry that allows these pins to withstand an ESD shock of ±15kV without damage.

There are many ways to test the ESD protection performance. The outputs of the driver and the inputs of the receiver are measured for ESD performance using the following ESD test method: ± 15kV human body model.

## 6.7. Typical Application Diagram



**figure 10: XD/XL3085 Typical Half-Duplex Operating Circuits**



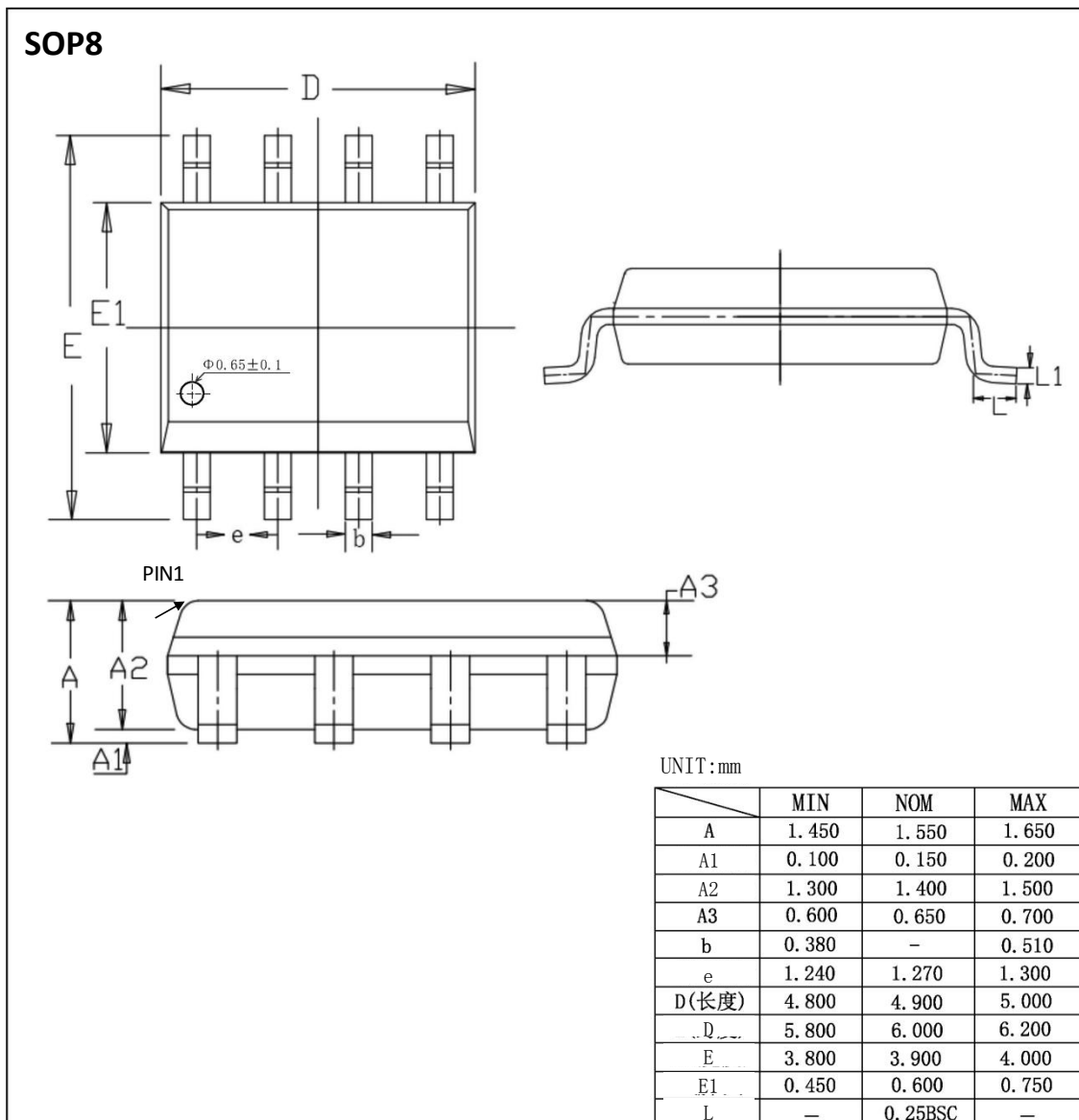
**figure 11: Typical half-duplex XD/XL3085 operating network**

## 7. ORDERING INFORMATION

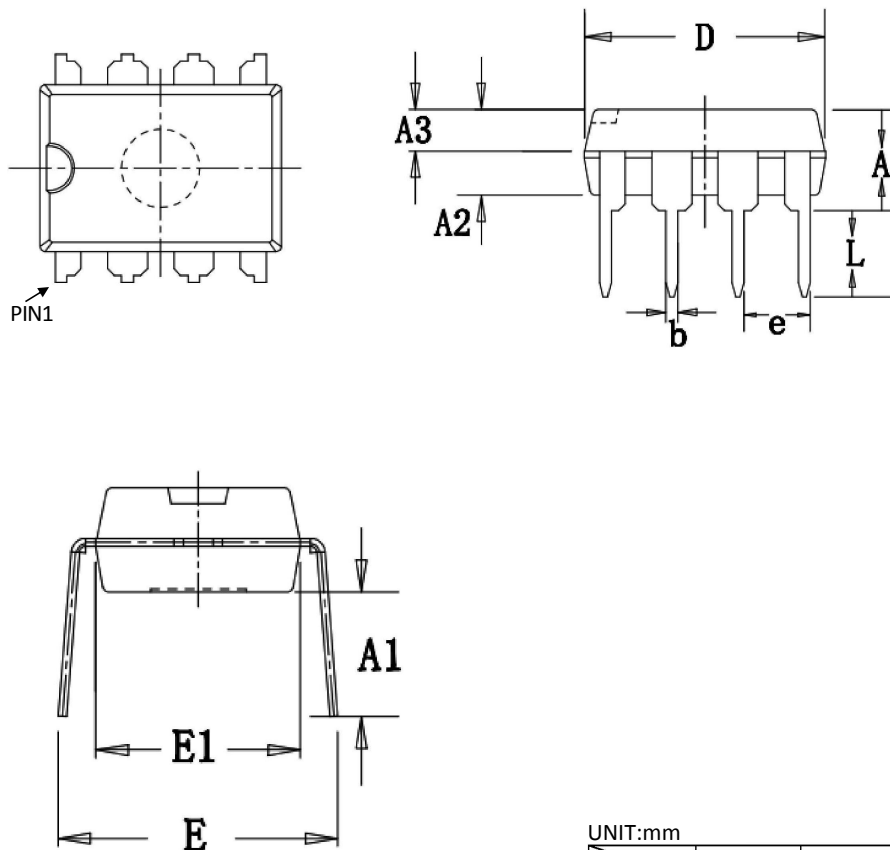
Ordering Information

Part Number	Device Marking	Package Type	Body size (mm)	Temperature (°C)	MSL	Transport Media	Package Quantity
XL3085	XL3085	SOP8	4.90 * 3.90	-40 to +85	MSL3	T&R	2500
XD3085	XD3085	DIP8	9.25 * 6.38	-40 to +85	MSL3	Tube 50	2000

## 8. DIMENSIONAL DRAWINGS



**DIP8**



UNIT:mm

	MIN	NOM	MAX
A	3.600	3.800	4.000
A1	3.786	3.886	3.986
A2	3.200	3.300	3.400
A3	1.550	1.600	1.650
b	0.440	—	0.490
e	2.510	2.540	2.570
D	9.150	9.250	9.350
E	7.800	8.500	9.200
E1	6.280	6.380	6.480
L	3.000	—	—