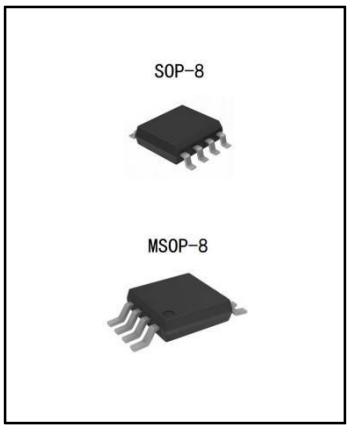
RS-485 Transceiver with failure protection, low slew rate, +15kv esd protection, 10mbps data rate

Description

- The SL3485 is designed for RS-485/RS-422 communication. It is a high-speed transceiver for half-duplex communication, which includes one driver and one receiver.
- The SL3485 features a failure protection circuit. With a low slew-rate driver, it can reduce EMI and reflections caused by improper terminal matching cables, achieving error-free data transmission up to 10Mbps. It also has a +15kV ESD protection feature.
- The SL3485 receiver has a 1/8 unit load input impedance, allowing up to 256 transceivers to be connected on the bus. It is primarily used in RS-485/RS-422 communication systems.

Features

- I/O pins with ESD protection: +15kV HBM
- all other pins have 3-level ESD protection: >+8kV HBM
- typical operating voltage: 5V
- maximum data rate: 10Mbps
- package forms: SOP8, MSOP8



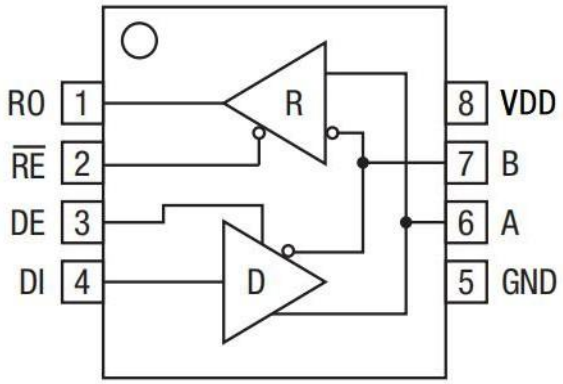
Application

- intelligent instrumentation
- industrial process control
- building automation networks
- motor control
- transceiver applications sensitive to em

Ordering information

PN	Package	Packaging	Minimum Package Quantity
SL3485S	SOP8	Tape and Reel	3500PCS
SL3485M	MSOP8	Tape and Reel	3500PCS

Pin configuration and function



Pin configuration

Pin function

Pin Number	Pin Name	Function	Attribute
1	RO	Receiver Output: RO is high if A-B ≥ -0.05V; RO is low if A-B ≤ -0.2V; RO is also high if A and B are floating or shorted.	O
2	RE	Receiver Output Enable: RO is enabled when RE is low; RO is in high impedance when RE is high.	I
3	DE	Driver Output Enable: The driver's output terminals Y and Z are enabled by pulling DE high; they are in high impedance when DE is low.	I
4	D_I	Driver Input: When DI is low, A is low and B is high; when DI is high, A is high and B is low.	I
5	GND	Ground	
6	A	Receiver's input and driver's output. I/O	I/O
7	B	Receiver's input and driver's output. I/O	I/O
8	V_{DD}	Power Supply	

Functional description

The SL3485 high-speed half-duplex transceiver includes a driver and a receiver, with the receiver having a 1/8 unit load input impedance, allowing up to 256 transceivers to be connected on the bus.

Receiver Truth Table

Input			Output
$\overline{RE}$	DE	A - B	RO
L	X	≥-0.05V	H
L	X	≤-0.2V	L
L	X	Open/shorted	H
H	H	X	Z
H	L	X	Z

Driver Truth Table

Input			Output	
$\overline{RE}$	DE	DI	B	A
X	H	H	L	H
X	H	L	H	L
L	L	X	Z	Z
H	L	X	Z	

Limiting parameters (Unless otherwise specified, T_{amb} = 25°C)

Parameter	Symbol	Value	Unit
Power Supply Voltage	V_{DD}	-0.3~7	V
Limit Input / Output Voltage	V_{IN}/V_{OUT}	GND-0.3~VDD+0.3	V
A/B Limit Input /Output Voltage	$V_{INA}/B/V_{OUTA/B}$	-13~13	V
Ambient Temperature Range	T_{amb}	-40~85	℃
Storage Temperature Range	T_{stg}	-65~150	℃

DC electrical characteristics (unless otherwise specified, V_{DD}=5V±5%, T_{amb}= 25°C)

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Driver							
Differential Output Voltage	V_{OD1}	No load		-		V_{DD}	V
Differential Output Voltage	V_{OD2}	R=50Ω (RS-422)(1)		2.0			V
		R=27Ω (RS-485)(1)		1.8			V
Differential Output Voltage Increase	ΔV_{OD}	R=50Ω or 27Ω(1)		0.2			V
Common-Mode Output Voltage	V_{OC}	R=50Ω or 27Ω(1)		3			V
Common-Mode Output Voltage Increase	ΔV_{OC}	R=50Ω or 27Ω(1)		0.2			V
Digital Input High Level	V_{IH1}	DE, RE, DI		2.0			V
Digital Input Low Level	V_{IL1}	DE, RE, DI		0.8			V
Digital Input Current	I_{IN1}	DE, RE, DI		-2		2	μA
DI Input Hysteresis Voltage	V_{hys}				100		mA
A, B Input Current	I_{IN2}	DE=GND, V_{DD} = GND or 5.25V	V_{in}=12V			150	μA
			V_{in}=-7V	-150			μA
Output Short-Circuit Current	I_{OD1}	-7V≤V_{OUT}≤V_{DD}		-100			mA
		0V≤V_{OUT}≤12V				100	mA
		0V≤V_{OUT}≤V_{DD}		±25			mA
Receiver							
Differential Threshold Voltage	V_{TH}	7V≤V_{CM}≤12V		-200	-125	-50	mV
Input Hysteresis Voltage	ΔV_{TH}				40		mV
Output High Voltage	V_{OH}	I_O=-4mA, V_{ID}=-50mV		V_{DD}-1			V
Output Low Voltage	V_{OL}	I_O=4mA, V_{ID}=-200mV				0.4	V
Tri-State Output Current	I_{OZR}	0.4V≤VO≤2.4V				±1	μA
Input Resistance	R_{IN}	-7V≤V_{CM}≤12V		96			kΩ
Output Short-Circuit Current	I_{OSR}	0V≤VRO≤V_{DD}		±7		±100	mA
Operating Current							
Operating Current	I_{CC}	No load, RE=DI = GND or V_{DD}	DE=V_{DD}		450	900	μA
			DE=GND		450	600	μA
Shutdown Mode Operating Current	I_{SHDN}	DE=GND, RE=V_{DD}				10	μA
ESD Protection (A/B)	ESD	Human Body Model				±15	kV

Transmission characteristics (unless otherwise specified, V_{DD}=5V±5%, T_{amb}= 25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
It has a slope limit function						
driver input to output delay with limited slope	t_{DPLH}	R_{DIFF}=54Ω, C_L1=C_L2=100pF(2)		30	60	ns
driver input to output delay	t_{DPHL}	R_{DIFF}=54Ω, C_L1=C_L2=100pF(2)		30	60	ns
t_{DPLH}-t_{DPHL}	t_{DSKEW}	R_{DIFF}=54Ω, C_L1=C_L2=100pF(2)			20	ns
driver rise and fall time	t_{DR},t_{DF}	R_{DIF}F=54Ω, C_L1=C_L2=100pF(2)		30		ns
maximum data transmission rate	f_{MAX}	-	10			Mbps
driver enable delay	t_{DZH}	C_L=100pF, S2 closed(3)			70	ns
driver enable delay	t_{DZL}	C_L=100pF, S1 closed(3)			70	ns
driver shut down delay	t_{DLZ}	C_L=15pF, S1 closed(3)			70	ns
driver shut down delay	t_{DHZ}	C_L=15pF, S2 closed(3)			70	
receiver input to out put delay	t_{RPLH}	$\|V_{ID}\|$ ≥ 2.0V rise and fall time ≤15ns(4)		90	250	ns
receiver input to out put delay	t_{RPHL}			90	250	ns
$\|t_{RPLH}-t_{RPHL}\|$	t_{RSKD}	$\|V_{ID}\|$ ≥ 2.0V rise and fall time ≤ 15ns(4)		30		ns
receiver enable delay	t_{RZL}	C_L=100pF，S1closed(5)		30	70	ns
receiver enable delay	t_{RZH}	C_L=100pF，S2 closed(5)		30	70	ns
receiver shutdown delay	t_{RLZ}	C_L=100pF，S1 closed(5)		30	70	ns
receiver shutdown delay	t_{RHZ}	C_L=100pF，S2 closed(5)		30	70	ns
shutdown mode enable time	t_{SHDN}			200	600	ns

Notes:

- Test circuit diagrams see Figure 1
- Test circuit diagrams see Figure 2
- Test circuit diagrams see Figure 3
- Test circuit diagrams see Figure 4
- Test circuit diagrams see Figure 5

Test circuits

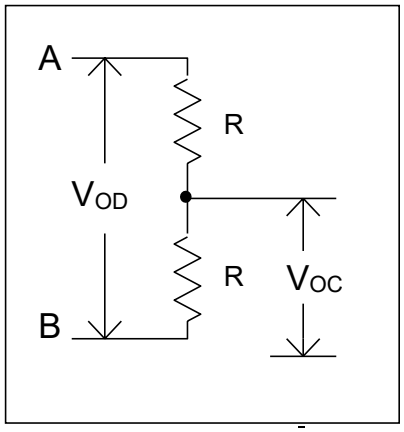


Figure 1 Driver DC Test

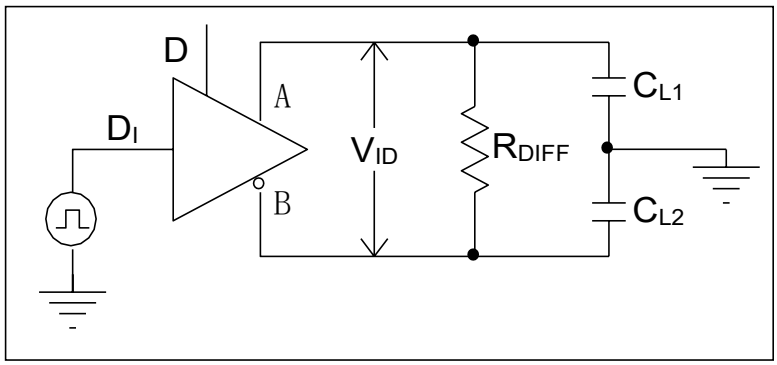


Figure 2 Driver Timing Test Circuit

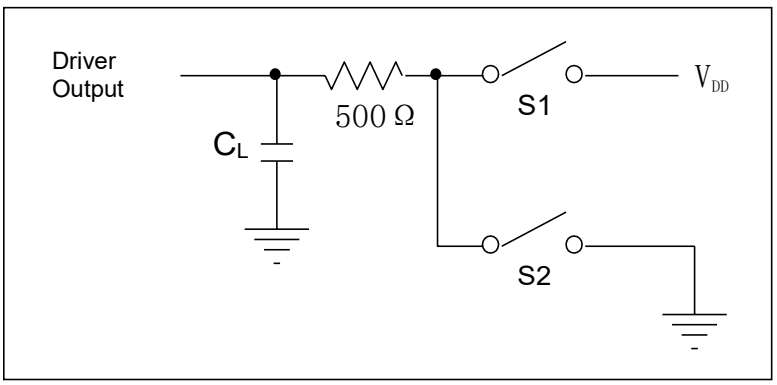


Figure 3 Driver Enable/Disable Timing Test

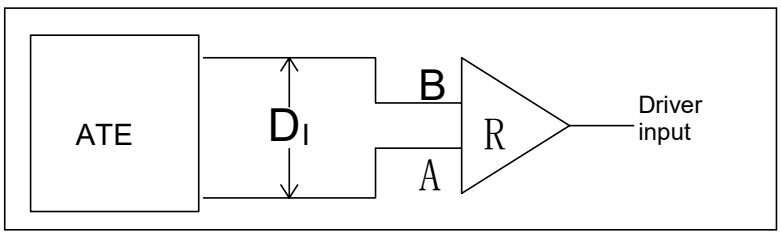


Figure 4 Receiver Propagation Delay Test Circuit

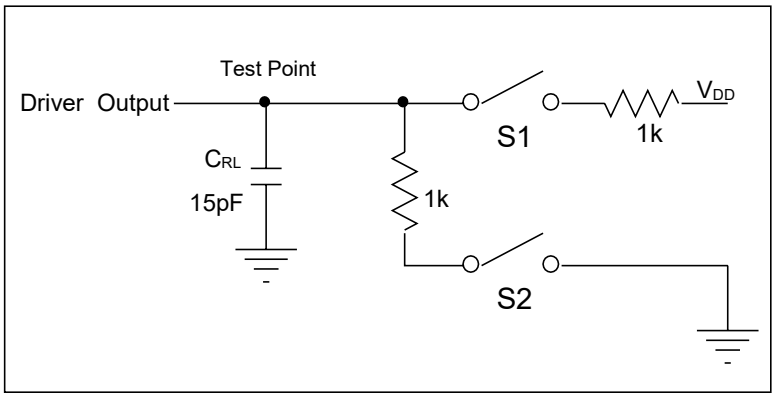


Figure 5 Receiver Enable/Disable Timing Test

Typical application circuit

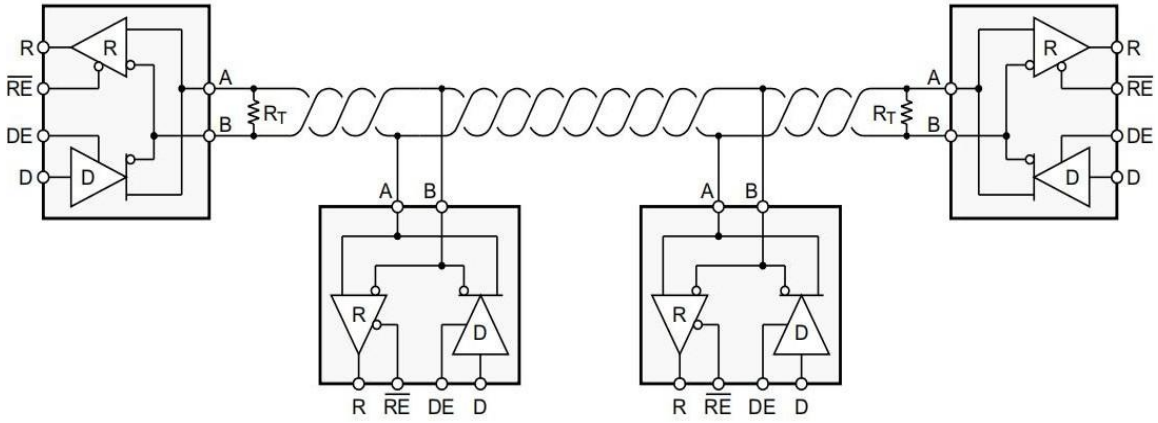
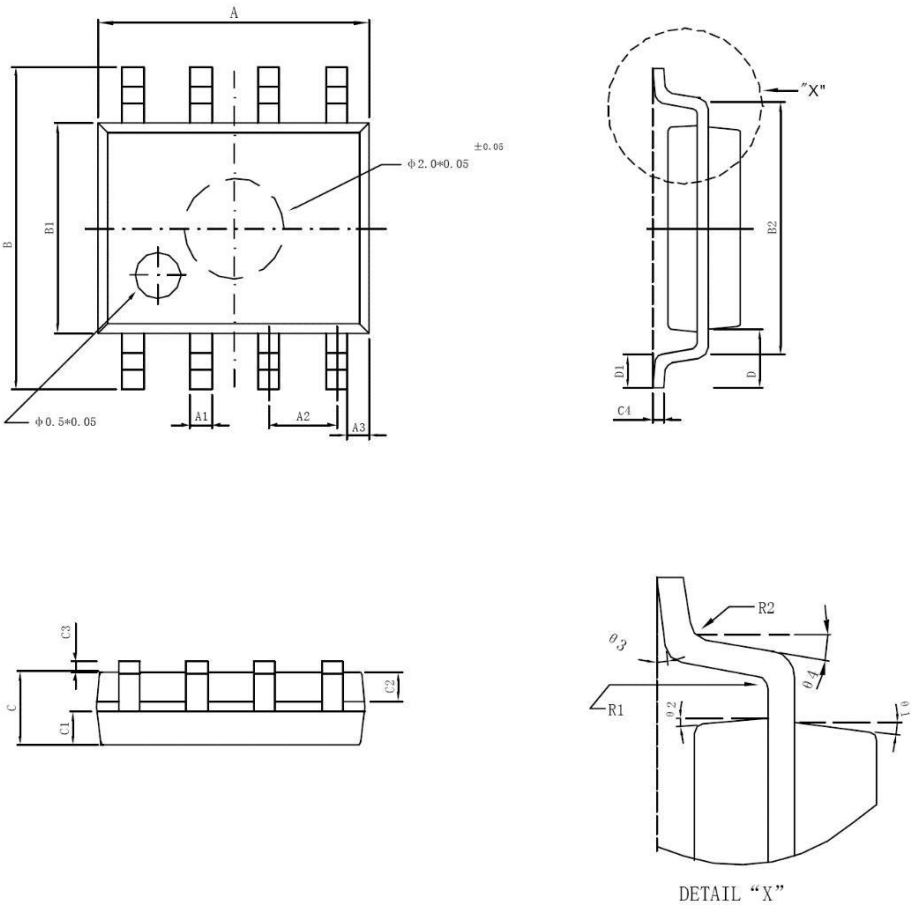


Figure 6 Typical Application Diagram

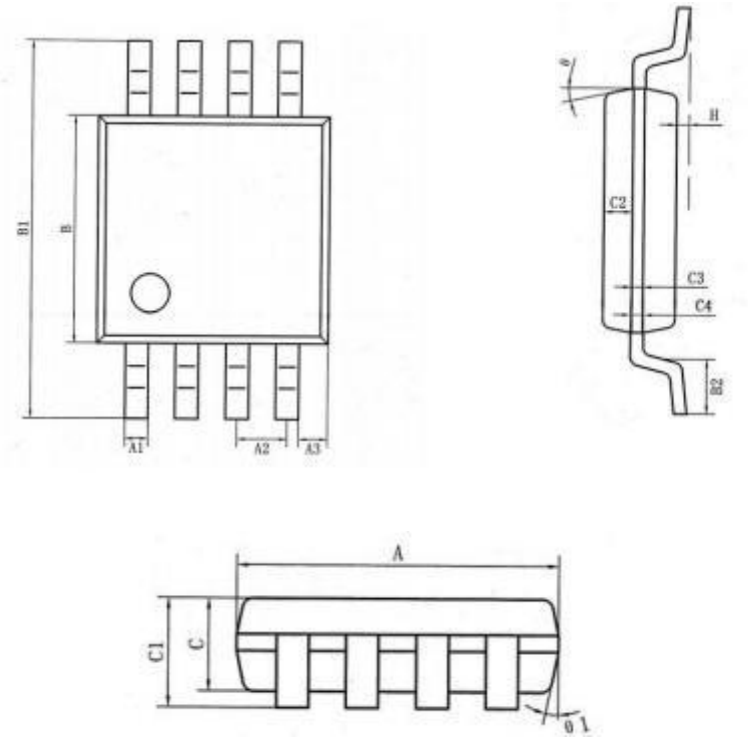
The transceiver is designed for bidirectional data communication on multi-drop bus transmission lines. Figure 6 shows a typical network application circuit. These devices can also be used as linear repeaters for cables longer than 4000 feet. To minimize reflections, the transmission lines should be terminated at both ends with their characteristic impedance, and branch lines other than the main trunk should be as short as possible.

Package Dimensions (SOP8)



Marking	Min（mm）	Max（mm）	Marking	Min（mm）	Max（mm）
A	4.95	5.15	C3	0.10	0.20
A1	0.37	0.47	C4	0.20TYP	
A2	1.27TYP		D	1.05TYP	
A3	0.41TYP		D1	0.50TYP	
B	5.80	6.20	R1	0.07TYP	
B1	3.80	4.00	R2	0.07TYP	
B2	5.0TYP		1	17 TYP	
C	1.30	1.50	2	13 TYP	
C1	0.55	0.65	3	4 TYP	
C2	0.55	0.65	4	12 TYP	

Package dimensions (MSOP8)



Marking	Min（mm）	Typ（mm）	Max（mm）
A	2.90	3.0	3.10
A1	0.28		0.35
A2	0.65TYP		
A3	0.375TYP		
B	2.90	3.0	3.10
B1	4.70		5.10
B2	0.45		0.75
C	0.75		0.95
C1			1.10
C2	0.328TYP		
C3	0.152		
C4	0.15		0.23
H	0.00		0.09
	12 TYP		