

+15kV ESD Protected、10Mbps Data Rate RS-485

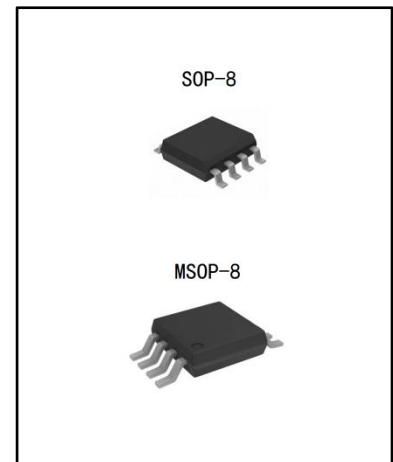
SSP3485

General Description

The SSP3485 is a half-duplex high speed transceiver for RS-485 and RS422 communication. IC contains one driver and one receiver.

The SSP3485 has a fail-safe circuit. It has a slew-rate-limited driver that reduces EMI and reflection due to improperly matched terminal cables, and achieves error-free data transmission of up to 10Mbps. Each driver output and receiver input is protected against $\pm 15\text{kV}$ electrostatic discharge (HBM) (ESD) shocks.

The SSP3485 receiver has 1/8 unit load input impedance, allows up to 256 devices can be attached to the bus. Mainly used in RS-485/RS-422 communication system.



Features

- I/O pin ESD protection: +15kV HBM
Other pins have level 3 ESD protection: >+8kV HBM
- Fractional unit load allows up to 256 devices on the bus
- + 5V operating voltage
- Data transmission up to 10Mbps
- SOP8 and MSOP8 package

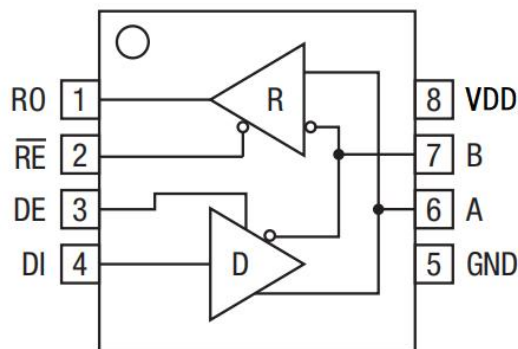
Applications

- Intelligent instrument
- Industrial process control
- Building automation network
- Motor control
- EMI sensitive transceiver application

Order specification

Part No	Package	Manner of Packing	Devices per bag/reel
SSP3485	SOP8	Reel	3500
SSP3485U	MSOP8	Reel	5000

Block Diagram and Pin Arrangement Diagram



Pin Assignment

Pin No.	Pin Name	Description	I/O
1	RO	Receiver output: If $A-B \geq -0.05V$, RO will be high; If $A-B \leq -0.2V$, RO will be low; If A and B are open or shorted, RO will be high.	O
2	\overline{RE}	Receiver output enable: RO is enabled when \overline{RE} is low; RO is high impedance when \overline{RE} is high.	I
3	DE	Driver output enable: The driver outputs, A and B are enabled by bringing DE high. They are high impedance when DE is low.	I
4	DI	Driver input: A low on DI forces output A low and output B high. Similarly, a high on DI forces output A high and output B low.	I
5	GND	Ground	
6	A	Receiver input and driver output	I/O
7	B	Receiver input and driver output	I/O
8	VDD	Supply voltage	

Functional Description

The SSP3485 is a half-duplex high speed transceiver for RS-485 and RS422 communication. IC contains one driver and one receiver. The SSP3485 receiver has 1/8 unit load input impedance, allows up to 256 devices can be attached to the bus.

Receiver Truth Table

Input			Output
\overline{RE}	DE	A - B	RO
L	X	$\geq -0.05V$	H
L	X	$\leq -0.2V$	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	

Absolute Maximum Ratings

Unless specified otherwise, $T_{amb} = 25^{\circ}C$

Parameter	Symbol	Value	Unit
Supply Voltage	V_{DD}	-0.3~7	V
Input / Output Voltage	V_{IN}/V_{OUT}	GND-0.3~ $V_{DD}+0.3$	V
A/B Input / Output Voltage	$V_{INA/B}/V_{OUTA/B}$	-13~13	V
Operating Temperature	T_{amb}	-40~85	$^{\circ}C$
Storage Temperature	T	-65~150	$^{\circ}C$

DC Electrical Characteristics

Unless specified otherwise, VDD=5V±5%, Tamb= 25°C

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Driver						
Differential driver output	V _{OD1}	No load			VDD	V
Differential driver output	V _{OD2}	R=50Ω (RS-422) ⁽¹⁾	2.0			V
		R=27Ω (RS-485) ⁽¹⁾	1.8			V
Change in magnitude of driver differential output voltage for complementary output states	ΔV _{OD}	R=50Ω or 27Ω ⁽¹⁾			0.2	V
Driver common-mode output voltage	V _{OC}	R=50Ω or 27Ω ⁽¹⁾			3	V
Change in magnitude of driver common-mode output voltage for complementary output states	ΔV _{OC}	R=50Ω or 27Ω ⁽¹⁾			0.2	V
Input high voltage	V _{IH1}	DE、 \overline{RE} 、DI	2.0			V
Input low voltage	V _{IL1}	DE、 \overline{RE} 、DI			0.8	V
Input current	I _{IN1}	DE、 \overline{RE} 、DI	-2		2	μA
DI Input hysteresis voltage	V _{hys}			100		mA
Input current (A, B)	I _{IN2}	DE=GND, V _{DD} =GND or 5.25V	Vin=12V		150	μA
			Vin=-7V	-150		μA
Driver 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	VDD-1			V
output low voltage	V _{OL}	I _O =4mA, V _{ID} =-200mV			0.4	V
3-state(high impedance) output current at receiver	I _{OZR}	0.4V ≤ V _O ≤ 2.4V			±1	μA
input resistance	R _{IN}	-7V ≤ V _{CM} ≤ 12V	96			kΩ
Receiver short-circuit current	I _{OSR}	0V ≤ V _{RO} ≤ V _{DD}	±7		±100	mA

Supply Current	I _{CC}	No load, $\overline{RE}=DI$ =GND or V _{DD}	DE=V _{DD}	450	1100	μA
			DE=GND	450	1000	μA
Supply Current in Shutdown	I _{SHDN}	DE=GND, $\overline{RE}=V_{DD}$			10	μA
ESD Protection (A/B)	ESD	Human Body Model		±15		kV

Transmission characteristics

Unless specified otherwise, V_{DD}=5V±5%, T_{amb}= 25°C

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
slew-rate-limited						
Driver Input to Output	t _{DPLH}	R _{DIFF} =54Ω, C _{L1} =C _{L2} =100pF ⁽²⁾		30	60	ns
Driver Input to Output	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 or Fall Time	t _{DR,tDF}	R _{DIFF} =54Ω, C _{L1} =C _{L2} =100pF ⁽²⁾		30		ns
Maximum Data Rate	f _{MAX}		10			Mbps
Driver Enable to Output High	t _{DZH}	C _L =100pF, S2 closed ⁽³⁾			70	ns
Driver Enable to Output Low	t _{DZL}	C _L =100pF, S1 closed ⁽³⁾			70	ns
Driver Disable Time from Low	t _{DLZ}	C _L =15pF, S1 closed ⁽³⁾			70	ns
Driver Disable Time from High	t _{DHZ}	C _L =15pF, S2 closed ⁽³⁾			70	ns
Receiver Input to Output	t _{RPLH}	V _{ID} ≥ 2.0V Rise or Fall Time ≤ 15ns ⁽⁴⁾		90	250	ns
Receiver Input to Output	t _{RPHL}			90	250	ns
t _{RPLH} -t _{RPHL}	t _{RSKD}	V _{ID} ≥ 2.0V Rise or Fall Time ≤ 15ns ⁽⁴⁾		30		ns
Receiver Enable to Output Low	t _{RZL}	C _L =100pF, S1 closed ⁽⁵⁾		30	70	ns
Receiver Enable to Output High	t _{RZH}	C _L =100pF, S2 closed ⁽⁵⁾		30	70	ns

Receiver Disable Time from Low	t_{RLZ}	$C_L=100\text{pF}$, S1 closed ⁽⁵⁾	30	70	ns
Receiver Disable Time from High	t_{RHZ}	$C_L=100\text{pF}$, S2 closed ⁽⁵⁾	30	70	ns
Time to Shutdown	t_{SHDN}		200	600	ns

Note:

- (1) Test circuit is shown in Figure 1
- (2) Test circuit is shown in Figure 2
- (3) Test circuit is shown in Figure 3
- (4) Test circuit is shown in Figure 4
- (5) Test circuit is shown in Figure 5

Test Circuit

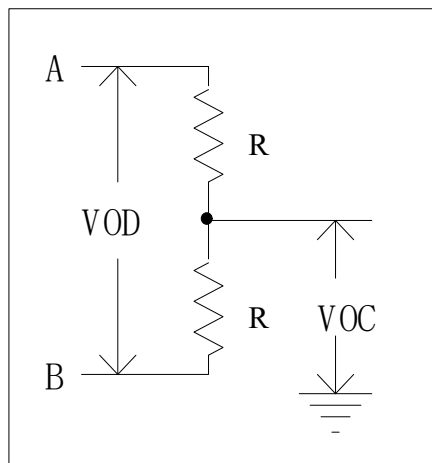


Figure 1 Driver DC Test Circuit

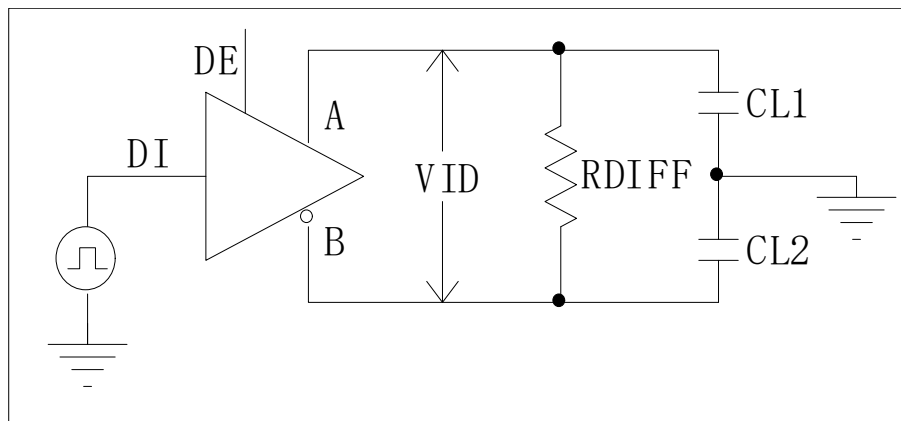


Figure 2 Driver Timing Test Circuit

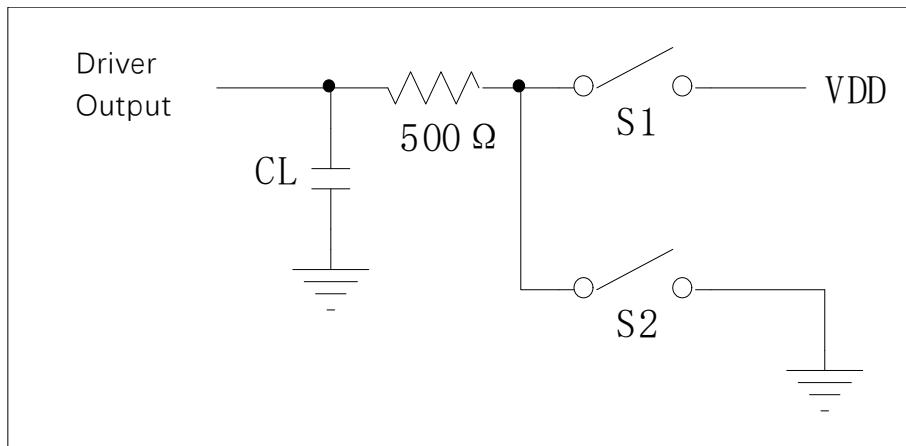


Figure 3 Driver Enable/Invalid Timing Test Circuit

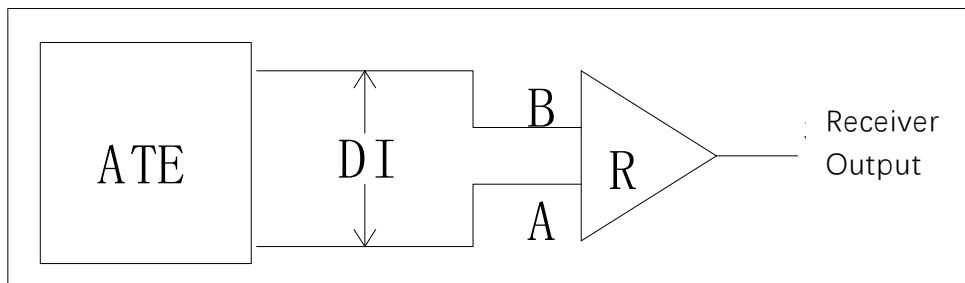


Figure 4 Receiver Propagation Delay Test Circuit

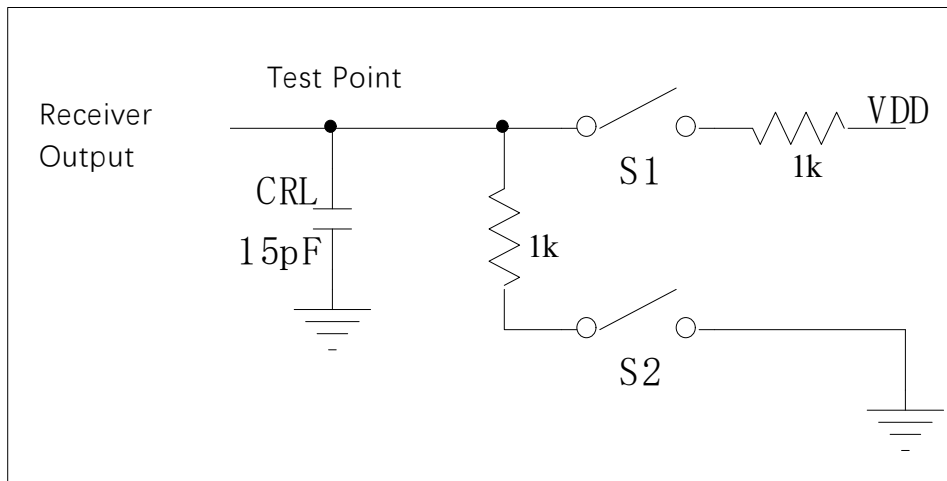


Figure 5 Receiver Enable/Invalid Timing Test Circuit

Application Circuits

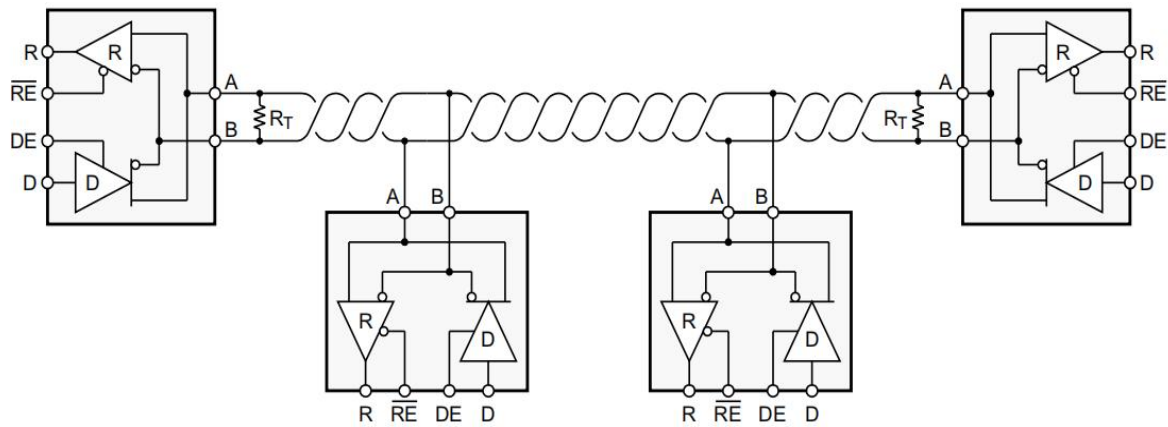
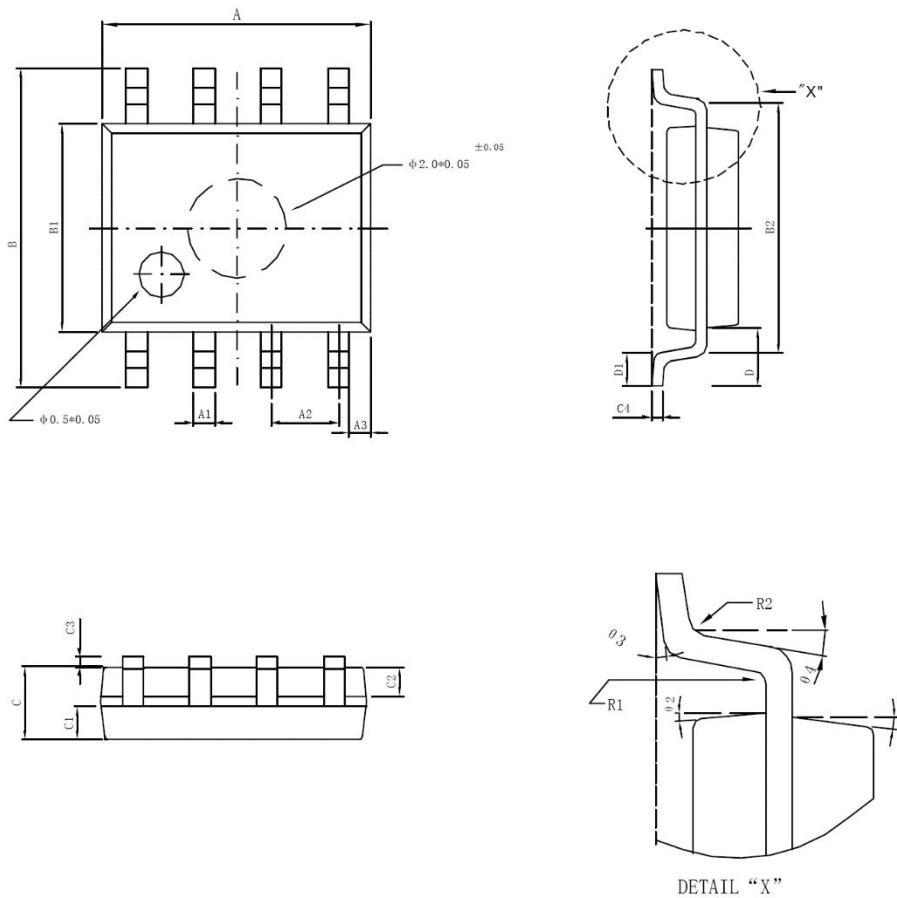


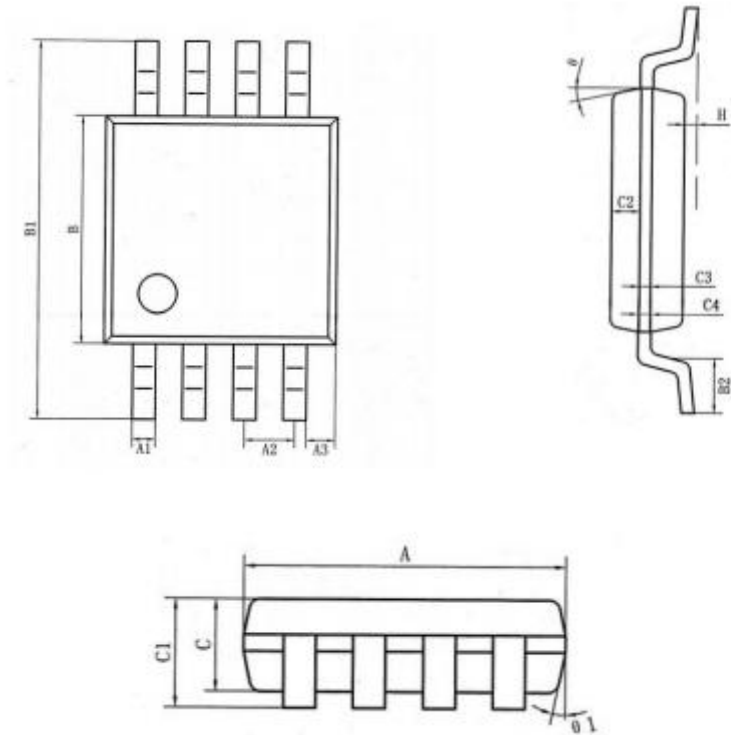
Figure 6 Typical Application Chart

Transceivers are designed for bidirectional data communication over multi-point bus transmission lines. Figure 6 shows a typical network application circuit. These devices can also be used as linear transponders with cable lengths up to 4000 ft. In order to reduce reflection, terminals should be matched with their characteristic impedance at both ends of the transmission line, and the length of the branch line outside the main line should be as short as possible.

Package Information (SOP8)



Symbol	Min. (mm)	Max.(mm)	Symbol	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		θ1	17°TYP	
C	1.30	1.50	θ2	13°TYP	
C1	0.55	0.65	θ3	4°TYP	
C2	0.55	0.65	θ4	12°TYP	

Package Information (MSOP8)


Symbol	Min. (mm)	Normal (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
θ	12°TYP		

Special Instructions

The company reserves the right of final interpretation of this specification.

Version Change Description

Version: V1.2	Author: Yangyang	Time: 2021.8.12
Modify the record:		
1. Re-typesetting the manual and checking some data		
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Version: V1.3	Author: Yangyang	Time: 2022.3.19
Modify the record:		
1. Update order specification		
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Version: V1.5	Author: Yangyang	Time: 2022.4.1
Modify the record:		
1. Add MSOP8 package, named SSP3485U		
2. Revision of relevant data about SSP3485U		
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Version: V1.6	Author: Yangyang	Time: 2022.9.6
Modify the record:		
1. Update order specification(SSP3485U)		

Statement

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