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

SSP3485

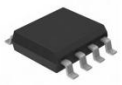
General Description

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 ±15kV 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.

SOP-8



MSOP-8

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

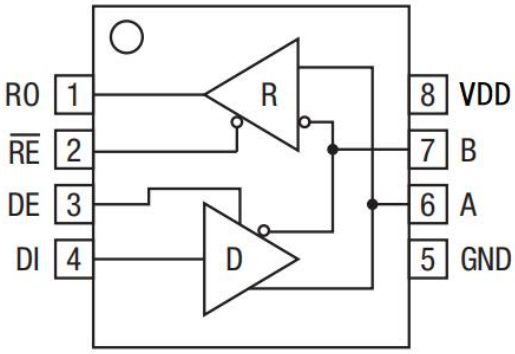
Applications

- 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≥-0.05V，RO will be high; If A-B≤-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	≥-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	

Absolute Maximum Ratings

Unless specified otherwise, Tamb= 25℃

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	℃
Storage Temperature	T	-65~150	℃

DC Electrical Characteristics

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

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，VDD=5V±5%，Tamb= 25℃

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, CL1=CL2=100pF(2)			20	ns
Driver Rise or Fall Time	t_{DR},t_{DF}	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 Low	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=100pF，S1 closed(5)		30	70	ns
Receiver Disable Time from High	t_{RHZ}	C_L=100pF，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

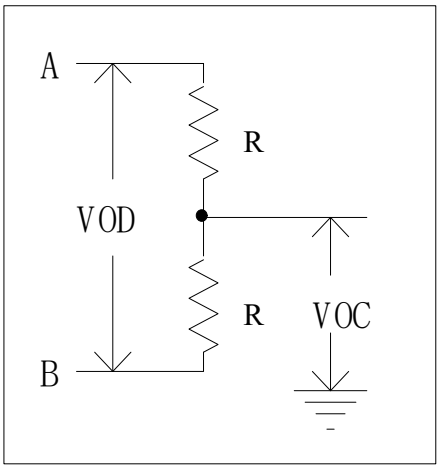


Figure 1 Driver DC Test Circuit

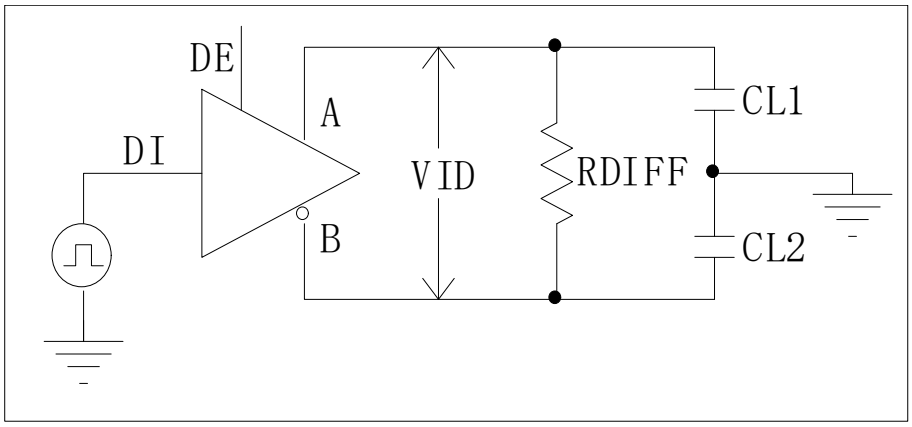


Figure 2 Driver Timing Test Circuit

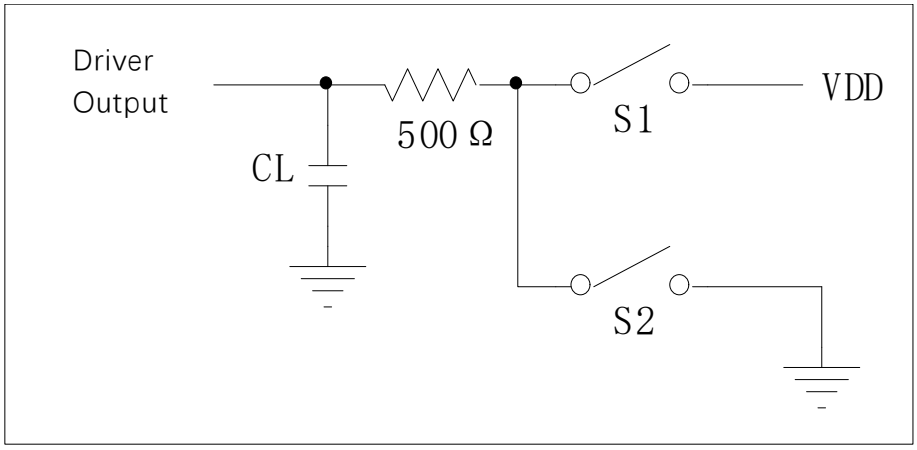


Figure 3 Driver Enable/Invalid Timing Test Circuit

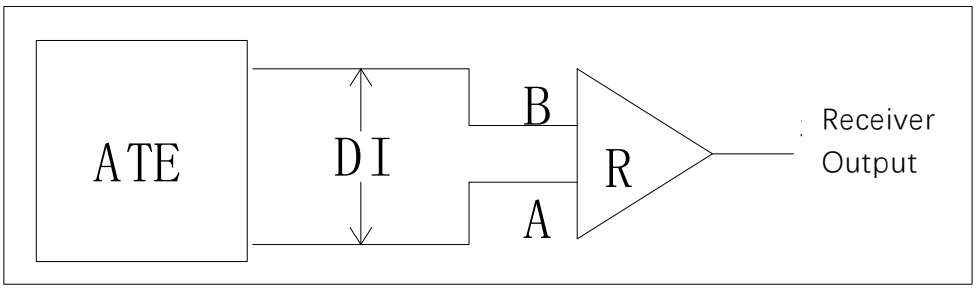


Figure 4 Receiver Propagation Delay Test Circuit

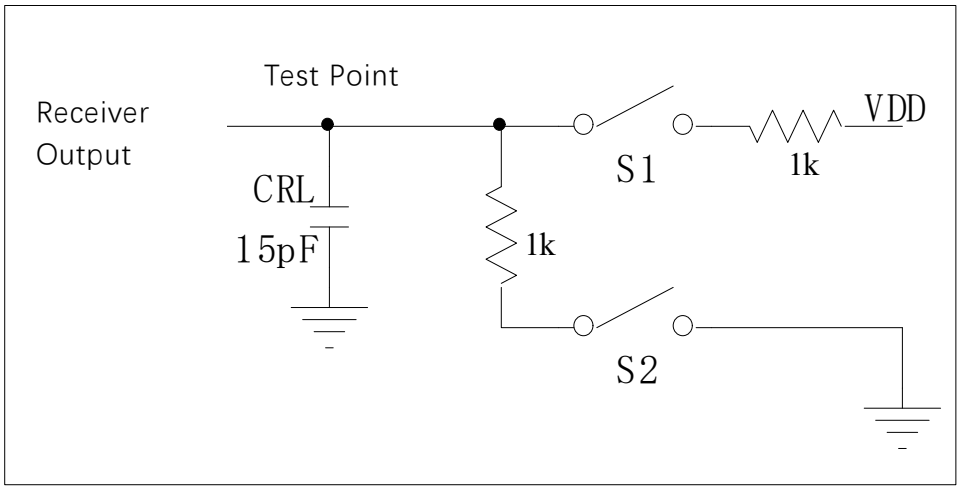


Figure 5 Receiver Enable/Invalid Timing Test Circuit

Application Circuits

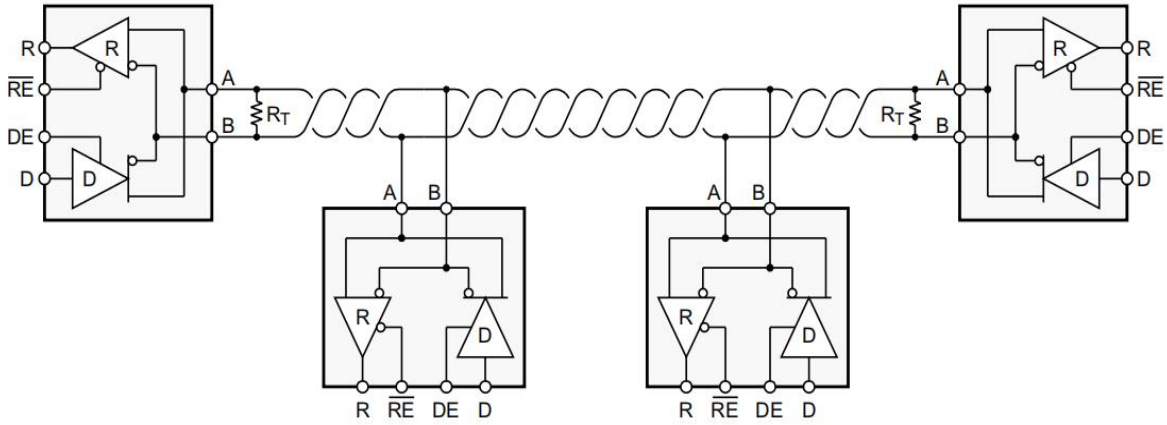
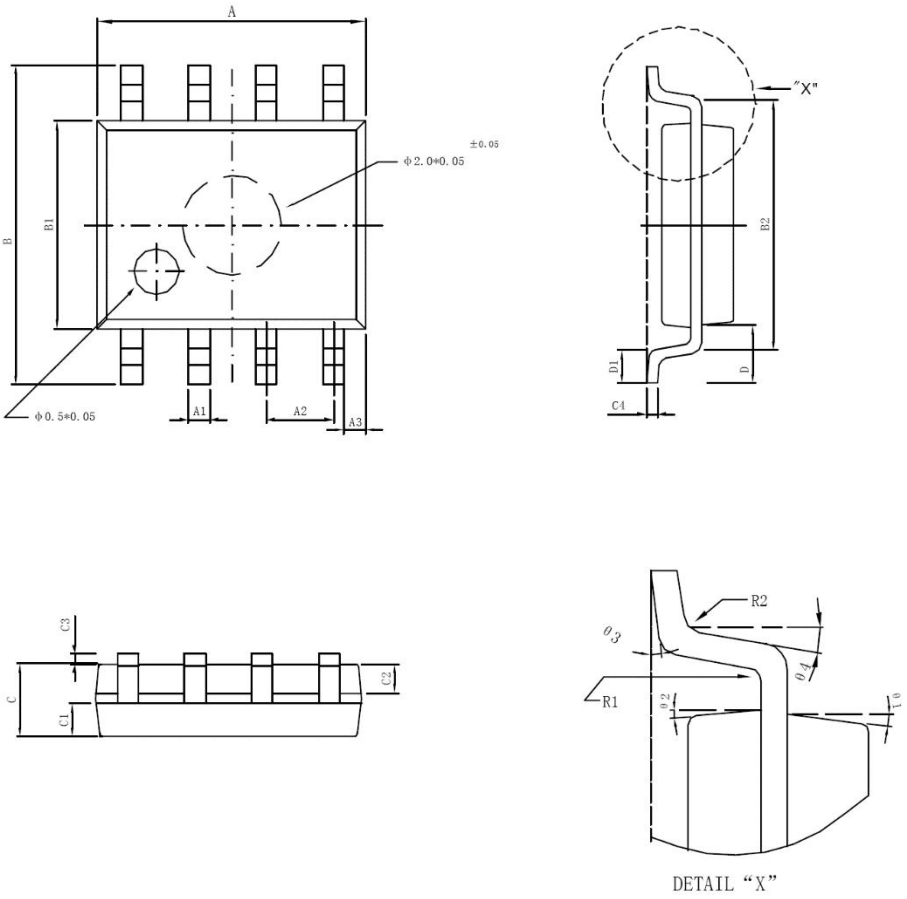


Figure 6 Typical Application Chart

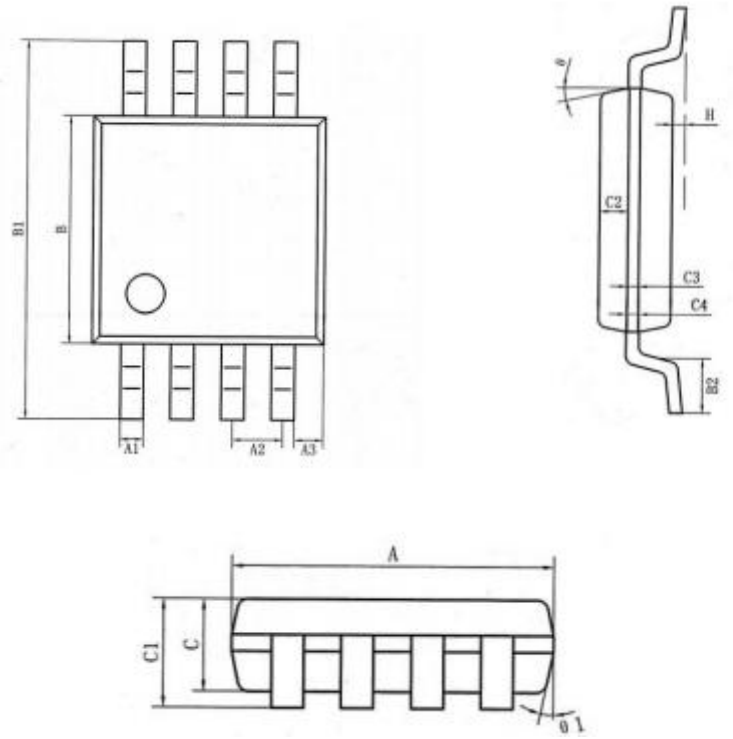
Transceivers are designed for bidirectional data communication over multi-point bus transmission lines. Figure 6 shows a typical network application circuit. These devices can also be used as linear transponders with cable lengths up to 4000 ft. In order to reduce reflection, terminals should be matched 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		
Version：V1.3	Author：Yangyang	Time：2022.3.19
Modify the record：		
1. Update order specification		
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		
Version：V1.6	Author：Yangyang	Time：2022.9.6
Modify the record：		
1. Update order specification(SSP3485U)		

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