

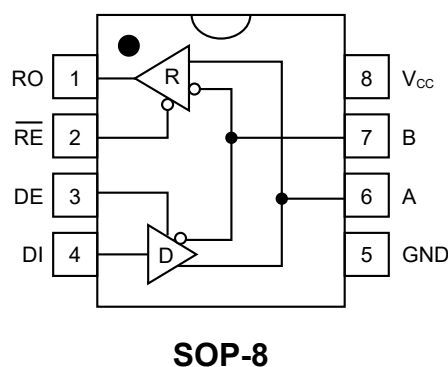
## 1.Description

The SP485 is low-power transceivers for RS-485 and RS-422 communication. IC contains one driver and one receiver. The driver slew rates of the SP485 is not limited, allowing them to transmit up to 2.5Mbps. These transceivers draw between 120 $\mu$ A and 500 $\mu$ A of supply current when unloaded or fully loaded with disabled drivers. All parts operate from a single 5V 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. The SP485 is designed for half-duplex applications.

## 2.Features

- Low Quiescent Current: 300 $\mu$ A
- -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 5V Supply
- Allows up to 32 Transceivers on the Bus
- Data rate: 2,5 Mbps
- Current-Limiting and Thermal Shutdown for Driver Overload Protection

## 3.Pinning Information





#### 4. Absolute Maximum Ratings

Parameter	Symbol	Value
Supply Voltage	$V_{CC}$	7V
Control Input Voltage		-0.5V to ( $V_{CC} + 0.5V$ )
Driver Input Voltage	DI	-0.5V to ( $V_{CC} + 0.5V$ )
Driver Output Voltage	A, B	-8V to +12.5V
Receiver Input Voltage (A, B)	A, B	-8V to +12.5V
Receiver Output Voltage	RO	-0.5V to ( $V_{CC} + 0.5V$ )
Continuous Power Dissipation		$T_A = 70^\circ\text{C}$
8-Pin Plastic DIP (derate 9.09mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$ )		727mW
8-Pin SO (derate 5.88mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$ )		471mW
Operating Temperature Ranges		$-40^\circ\text{C}$ to $+105^\circ\text{C}$
Storage Temperature Range		$-65^\circ\text{C}$ to $+160^\circ\text{C}$
Lead Temperature (soldering, 10sec)		$300^\circ\text{C}$



## 5.DC Electrical Characteristics

( $V_{CC}=5V \pm 5\%$ ,  $T_A=T_{MIN}$  to  $T_{MAX}$ , unless otherwise noted.) (Notes 1, 2)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Differential Driver Output (noload)	$V_{OD1}$					5	V
Differential Driver Output (with load)	$V_{OD2}$	R=50Ω (RS-422)		2			V
		R=27Ω (RS-485), Figure 4		1.5		5	V
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	$\Delta V_{OD}$	R=27Ω or 50Ω, Figure 4				0.2	V
Driver Common-Mode Output Voltage	$V_{OC}$	R=27Ω or 50Ω, Figure 4				3	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	$\Delta V_{OD}$	R=27Ω or 50Ω, Figure 4				0.2	V
Input High Voltage	$V_{IH}$	DE, DI, $\overline{RE}$		2			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	mA
		$V_{CC}=0V$ or 5.25V	$V_{IN}=-7V$			-0.8	mA
Receiver Differential Threshold Voltage	$V_{TH}$	$-7V \leq V_{CM} \leq 12V$		-0.2		0.2	V
Receiver Input Hysteresis	$\Delta V_{TH}$	$V_{CM}=0V$			70		mV
Receiver Output High Voltage	$V_{OH}$	$I_O=-4mA$ , $V_{ID}=200mV$		3.5			V
Receiver Output Low Voltage	$V_{OL}$	$I_O=4mA$ , $V_{ID}=-200mV$				0.4	V
Three-State (high impedance) Output Current at Receiver	$I_{OZR}$	$0.4V \leq V_O \leq 2.4V$				±1	μA
Receiver Input Resistance	$R_{IN}$	$-7V \leq V_{CM} \leq 12V$		12			kΩ
No-Load Supply Current (Note 3)	$I_{CC}$	DE= $V_{CC}$			500	900	μA
		RE=0V or $V_{CC}$			300	500	μA
		DE=0V			400	900	μA



Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Driver Short-Circuit Current, $V_O$ =High	$I_{OSD1}$	$-7V \leq V_O \leq 12V$ (Note 4)	35		250	mA
Driver Short-Circuit Current, $V_O$ =LOW	$I_{OSD2}$	$-7V \leq V_O \leq 12V$ (Note 4)	35		250	mA
Receiver Short-Circuit Current	$I_{OSR}$	$0V \leq V_O \leq V_{CC}$	7		95	mA

## 6.Switching Characteristics

( $V_{CC} = 5V \pm 5\%$ ,  $T_A = T_{MIN}$  to  $T_{MAX}$ , unless otherwise noted.) (Notes 1, 2)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Driver Input to Output	$t_{PLH}$	$R_{DIFF}=54\Omega$	10	30	60	ns
	$t_{PHL}$	$C_{L1}=C_{L2}=100pF$	10	30	60	ns
Driver Output Skew to Qutput	$t_{SKEW}$	$R_{DIFF}=54\Omega$ , $C_{L1}=C_{L2}=100pF$		5	10	ns
Driver Enable to Output High	$t_{ZH}$	$C_L=100pF$ , S2 closed		40	70	ns
Driver Enable to Output Low	$t_{ZL}$	$C_L=100pF$ , S1 closed		40	70	ns
Driver Disable Time from Low	$t_{LZ}$	$C_L=15pF$ , S1 closed		40	70	ns
Driver Disable Time from High	$t_{HZ}$	$C_L=15pF$ , S2 closed		40	70	ns
$ t_{PLH} - t_{PHL} $ Differential	$t_{SKD}$	$R_{DIFF}=54\Omega$		13		ns
Receiver Skew		$C_{L1}=C_{L2}=100pF$		10		ns
Receiver Enable to Output Low	$t_{ZL}$	$C_{RL}=15pF$ , S1 closed		20	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



## 7. Operation Timing Diagrams of SP485

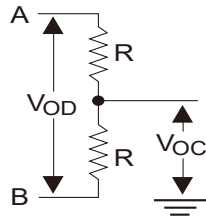


Figure 2. DC test load of the drive

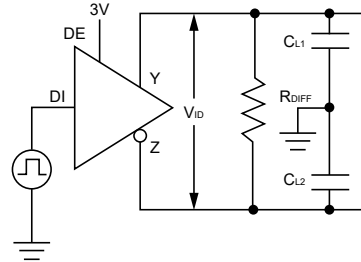


Figure 3. Drive timing test circuit

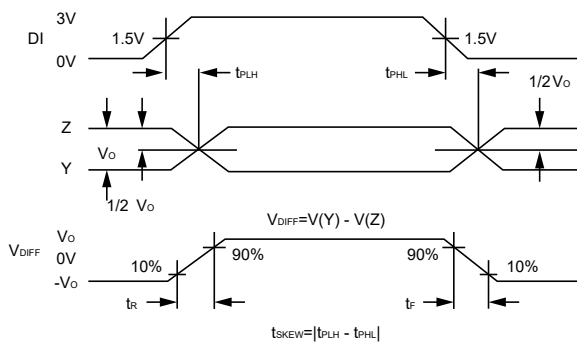


Figure 4. Drive propagation delay

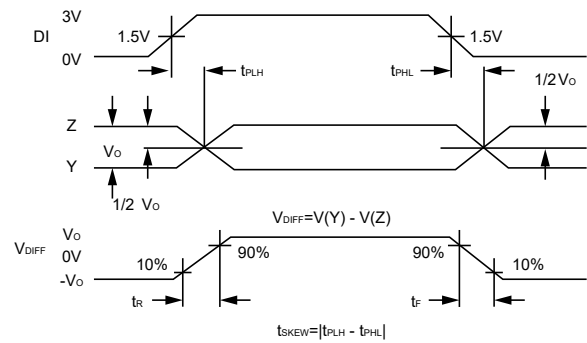


Figure 5. Drive enable/disable timing sequence

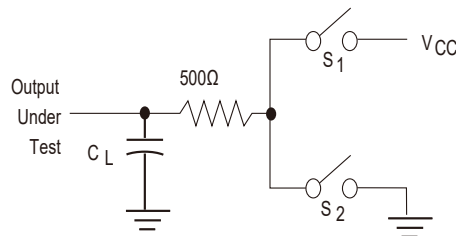


Figure 6. Drive enable/disable timing test circuit

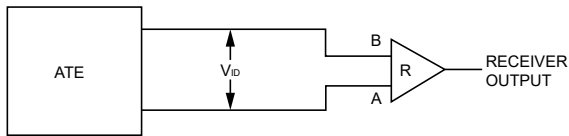


Figure 7. Receiver propagation delay test circuit

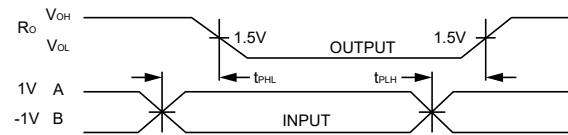
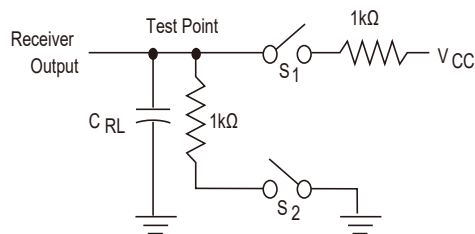
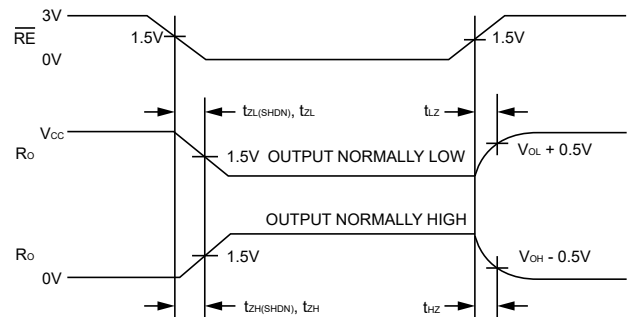


Figure 8. Receiver propagation delay timing

Figure 9. Receiver Enable/Disable  
Timing Test CircuitFigure 10. Receiver enable and disable  
timing sequence

## 8. Table of SP485 Operation

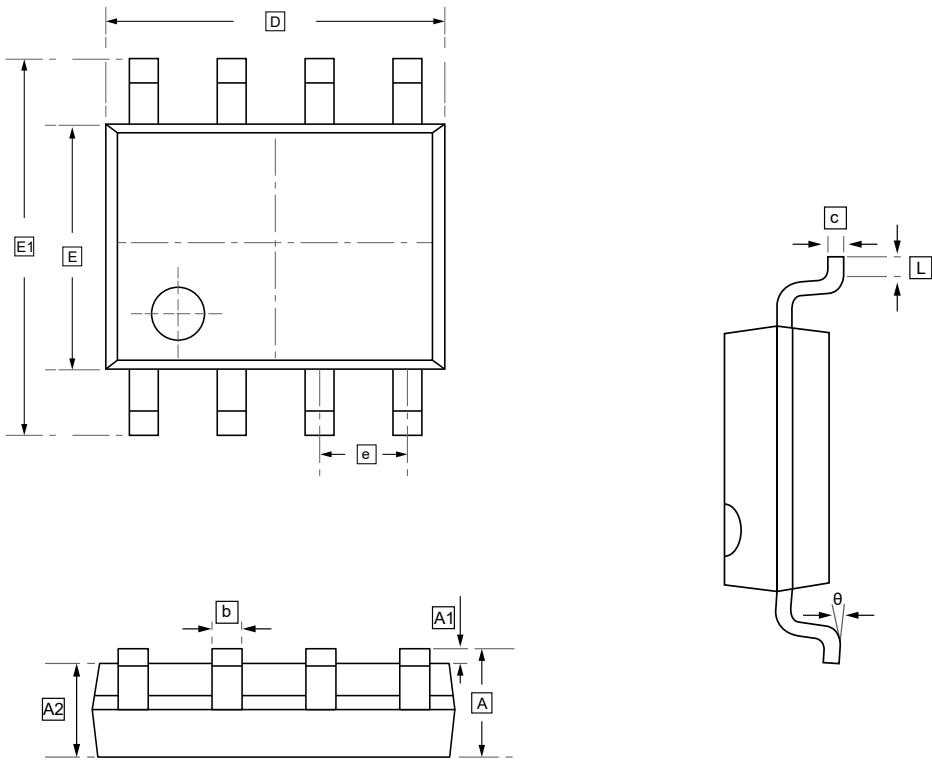
Transmission					Receipt			
Inputs			Outputs X		Inputs			Outputs
$\overline{RE}$	DE	DI	B	A	$\overline{RE}$	DE	A-B	RO
X	1	1	0	1	0	0	+0.2V	1
X	1	0	1	0	0	0	-0.2V	0
0	0	X	Z	Z	0	0	open	1
1	0	X	Z	Z	1	1	X	Z

X-don't care

Z-high resistance



9.SOP-8 Package Outline Dimensions

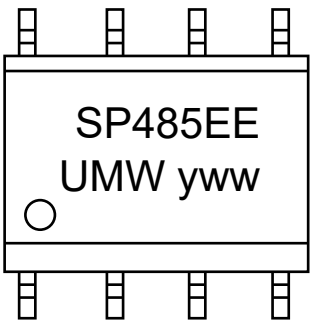


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E	E1	e	L	θ
Min	1.350	0.000	1.350	0.330	0.170	4.700	3.800	5.800	1.270	0.400	0°
Max	1.750	0.100	1.550	0.510	0.250	5.100	4.000	6.200	BSC	1.270	8°



10.Ordering Information



yww: Batch Code

Order Code	Package	Base QTY	Delivery Mode
UMW SP485EEN	SOP-8	2500	Tape and reel





## **11.Disclaimer**

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