



## DESCRIPTION

The SP485EN is low-power transceivers for RS-485 and RS-422 communication.

IC contains one driver and one receiver.

The driver slew rates of the SP485EN 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 SP485EN is designed for half-duplex applications.

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage ( $V_{CC}$ ) 12V

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) -8V to +12.5V

Receiver Output Voltage (RO) -0.5V to ( $V_{CC} + 0.5V$ )

Continuous Power Dissipation ( $T_A = +70^\circ\text{C}$ )

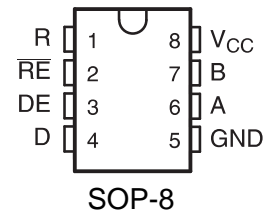
8-Pin SO (derate 5.88mW/ $^\circ\text{C}$  above +70 $^\circ\text{C}$ )  
471mW

Operating Temperature Ranges 0 $^\circ\text{C}$  to +70 $^\circ\text{C}$

Storage Temperature Range -65 $^\circ\text{C}$  to +160 $^\circ\text{C}$

Lead Temperature (soldering, 10sec) +300 $^\circ\text{C}$

## PIN CONFIGURATION



## 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

## APPLICATIONS

- Industrial Networks
- Utility Meters
- Motor Control



### DC ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	$V_{OD1}$				5	V
Differential Driver Output (with load)	$V_{OD2}$	$R = 50\Omega$ (RS-422)	2			V
		$R = 27\Omega$ (RS-485), Figure 4	1.5		5	
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	$\Delta V_{OD}$	$R = 27\Omega$ or $50\Omega$ , Figure 4			0.2	V
Driver Common-Mode Output Voltage	$V_{OC}$	$R = 27\Omega$ or $50\Omega$ , Figure 4			3	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	$\Delta V_{OD}$	$R = 27\Omega$ or $50\Omega$ , Figure 4			0.2	V
Input High Voltage	$V_{IH}$	DE, DI, $\overline{RE}$	2.0			V
Input Low Voltage	$V_{IL}$	DE, DI, $\overline{RE}$			0.8	V
Input Current	$I_{IN1}$	DE, DI, RE			$\pm 2$	$\mu A$
Input Current (A, B)	$I_{IN2}$	DE = 0V; $V_{CC} = 0V$ or $5.25V$ ,	$V_{IN} = 12V$		1.0	mA
			$V_{IN} = -7V$		-0.8	
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	$I_{OZR}$	$0.4V \leq V_O \leq 2.4V$			$\pm 1$	$\mu A$
Receiver Input Resistance	$R_{IN}$	$-7V \leq V_{CM} \leq 12V$				k $\Omega$

### DC ELECTRICAL CHARACTERISTICS (continued)

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
No-Load Supply Current	$I_{CC}$	DE = $V_{CC}$		500	900	$\mu A$
		$\overline{RE} = 0V$ or $V_{CC}$		300	500	
		DE = 0V				
Driver Short-Circuit Current,						
	$I_{OSD1}$	$-7V \leq V_O \leq 12V$ (Note 4)	35		250	mA
$V_O =$ High						
Driver Short-Circuit Current,						
	$I_{OSD2}$	$-7V \leq V_O \leq 12V$ (Note 4)	35		250	mA
$V_O =$ Low						
Receiver Short-Circuit Current	$I_{OSR}$	$0V \leq V_O \leq V_{CC}$	7		95	mA



### SWITCHING CHARACTERISTICS

(V<sub>CC</sub> = 5V ±5%, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub>, unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Input to Output	t <sub>PLH</sub>	R <sub>DIFF</sub> = 54Ω	10	30	60	ns
	t <sub>PHL</sub>	C <sub>L1</sub> = C <sub>L2</sub> = 100pF	10	30	60	
Driver Output Skew to Output	t <sub>SKEW</sub>	R <sub>DIFF</sub> = 54Ω, C <sub>L1</sub> = C <sub>L2</sub> = 100pF		5	10	ns
Driver Enable to Output High	t <sub>ZH</sub>	C <sub>L</sub> = 100pF, S2 closed		40	70	ns
Driver Enable to Output Low	t <sub>ZL</sub>	C <sub>L</sub> = 100pF, S1 closed		40	70	ns
Driver Disable Time from Low	t <sub>LZ</sub>	C <sub>L</sub> = 15pF, S1 closed		40	70	ns
Driver Disable Time from High	t <sub>HZ</sub>	C <sub>L</sub> = 15pF, S2 closed		40	70	ns
t <sub>PLH</sub> - t <sub>PHL</sub>   Differential	t <sub>SKD</sub>	R <sub>DIFF</sub> = 54Ω		13		ns
Receiver Skew		C <sub>L1</sub> = C <sub>L2</sub> = 100pF				
Receiver Enable to Output Low	t <sub>ZL</sub>	C <sub>RL</sub> = 15pF, S1 closed		20	50	ns
Receiver Enable to Output High	t <sub>ZH</sub>	C <sub>RL</sub> = 15pF, S2 closed		20	50	ns
Receiver Disable Time from Low	t <sub>LZ</sub>	C <sub>RL</sub> = 15pF, S1 closed		20	50	ns
Receiver Disable Time from High	t <sub>HZ</sub>	C <sub>RL</sub> = 15pF, S2 closed		20	50	ns
Maximum Data Rate	f <sub>MAX</sub>		2.5			Mbps

### TABLE OF SP485EN OPERATION

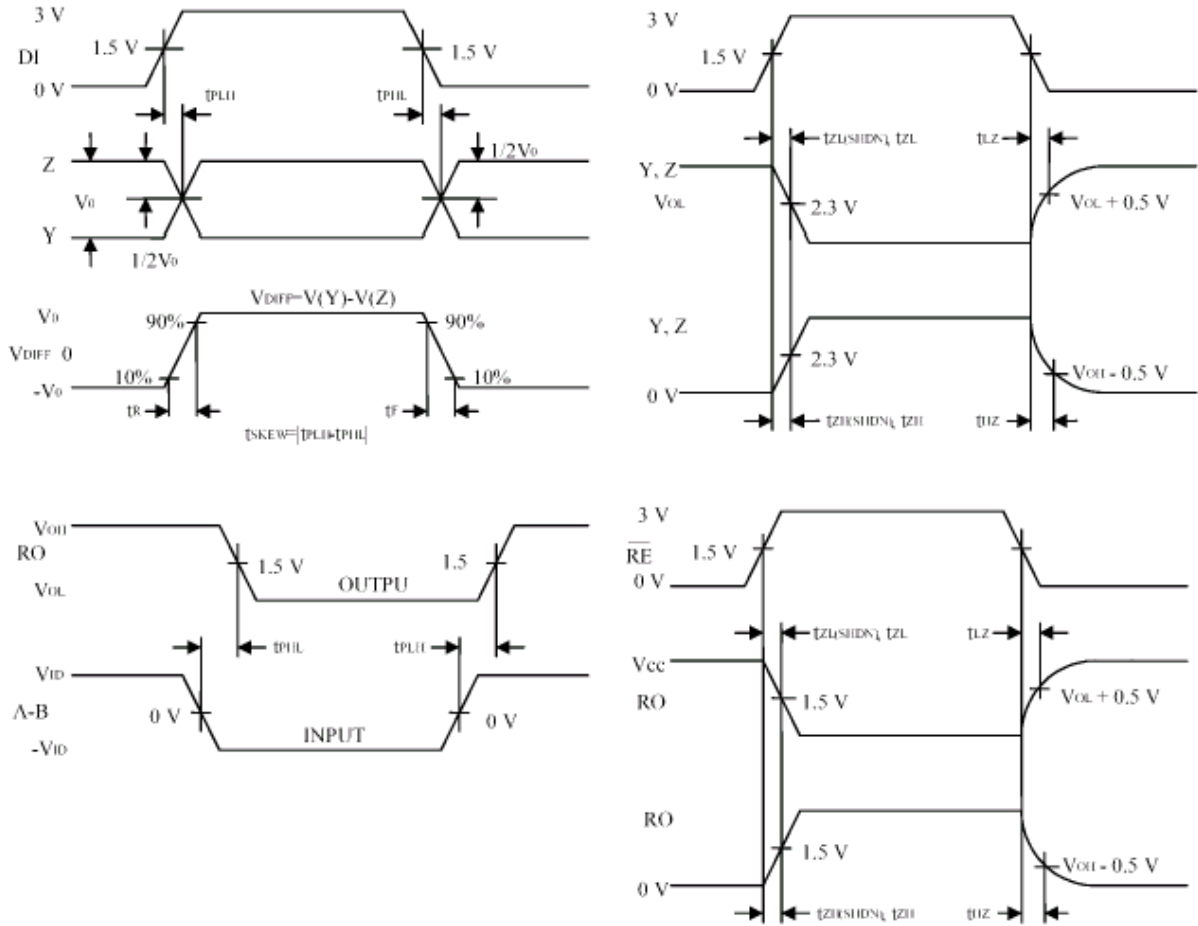
Transmission					Receipt			
Inputs			Outputs X		Inputs			Outputs
RE	DE	DI	Z	Y	RE	DE	A-B	RO
X	1	1	0	1	0	0	+0.2V	1
X	1	0	1	0	0	0	-0.2V	0
0	0	X	Z	Z	0	0	open	1
1	0	X	Z	Z	1	0	X	Z

X-don't care

Z-high resistance



OPERATIONTIMINGDIAGRAMSOF SP485EN



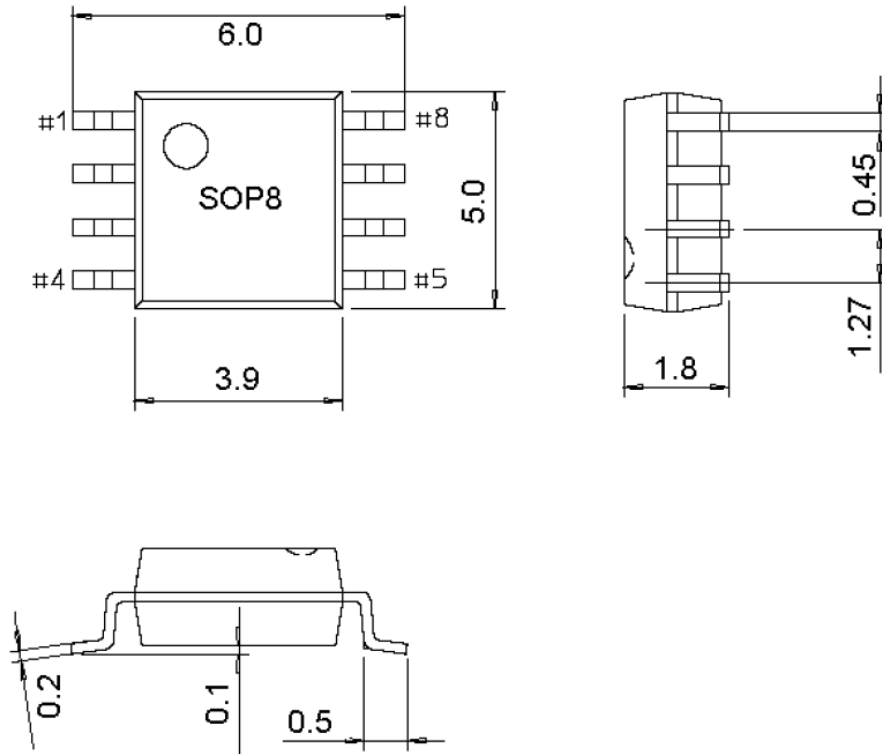
ORDERING GUIDE

Model	Package Description	Qty(PCS)
SP485EN	SOP-8	3000



## PACKAGE OUTLINE DIMENSIONS

### SOP-8





### Attention

- Any and all HUA XUAN YANG ELECTRONICS products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your HUA XUAN YANG ELECTRONICS representative nearest you before using any HUA XUAN YANG ELECTRONICS products described or contained herein in such applications.
- HUA XUAN YANG ELECTRONICS assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein.
- Specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- HUA XUAN YANG ELECTRONICS CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all HUA XUAN YANG ELECTRONICS products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of HUA XUAN YANG ELECTRONICS CO.,LTD.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. HUA XUAN YANG ELECTRONICS believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the HUA XUAN YANG ELECTRONICS product that you intend to use.