

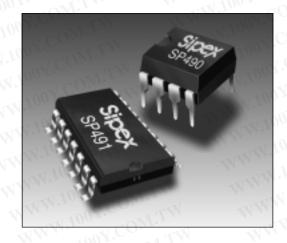
勝 特 力 材 料 886-3-5753170 胜特力电子(上海) 86-21-54151736 胜特力电子(深圳) 86-755-83298787

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SP490/SP491

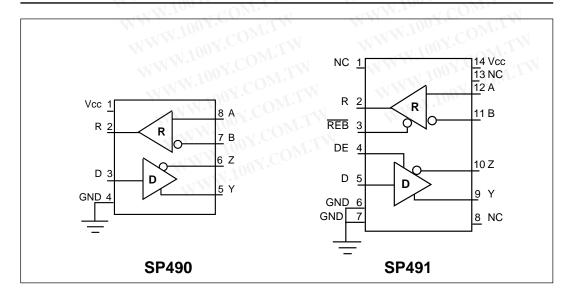
Full Duplex RS-485 Transceivers

- +5V Only
- Low Power BiCMOS
- Driver/Receiver Enable (SP491)
- RS-485 and RS-422 Drivers/Receivers
- Pin Compatible with LTC490 and SN75179 (SP490)
- Pin Compatible with LTC491 and SN75180 (SP491)



DESCRIPTION...

The **SP490** is a low power differential line driver/receiver meeting RS-485 and RS-422 standards up to 5Mbps. The **SP491** is identical to the **SP490** with the addition of driver and receiver tri-state enable lines. Both products feature ±200mV receiver input sensitivity, over wide common mode range. The **SP490** is available in 8-pin plastic DIP and 8-pin NSOIC packages for operation over the commercial and industrial temperature ranges. The **SP491** is available in 14-pin DIP and 14-pin NSOIC packages for operation over the commercial and industrial temperature ranges.



ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

V _{cc}	+7\
Input Voltages	
Drivers	
Receivers	±14V
Output Voltages	
Drivers	±14V
Receivers	0.5V to (V _{cc} +0.5V)
Storage Temperature	65°C to +150°
Dower Discinction	1000m\A

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SPECIFICATIONS

 T_{MIN} to T_{MAX} and $V_{CC} = 5V \pm 5\%$ unless otherwise noted

5	NEW	V _{CC} V _{CC} V _{CC} 3	Volts Volts Volts Volts Volts	Unloaded; $R = \infty$; see figure 1 With Load; $R = 50\Omega$; (RS422); see figure 1 With Load; $R = 27\Omega$; (RS485); see figure 1 $R = 27\Omega$ or $R = 50\Omega$; see figure 1 $R = 27\Omega$ or $R = 50\Omega$; see figure 1
	NEW	V _{CC} V _{CC} 0.2	Volts Volts Volts Volts	With Load; $R = 50\Omega$; (RS422); see figure 1 With Load; $R = 27\Omega$; (RS485); see figure $R = 27\Omega$ or $R = 50\Omega$; see figure 1
	N EW TW	V _{CC} V _{CC} 0.2	Volts Volts Volts Volts	With Load; $R = 50\Omega$; (RS422); see figure 1 With Load; $R = 27\Omega$; (RS485); see figure $R = 27\Omega$ or $R = 50\Omega$; see figure 1
	N EW TW	V _{CC} V _{CC} 0.2	Volts Volts Volts	With Load; $R = 50\Omega$; (RS422); see figure 1 With Load; $R = 27\Omega$; (RS485); see figure $R = 27\Omega$ or $R = 50\Omega$; see figure 1
	N TW	V _{CC}	Volts Volts Volts	see figure 1 With Load; R = 27Ω ; (RS485); see figure R = 27Ω or R = 50Ω ; see figure 1
	N TW	0.2	Volts Volts	$R = 27\Omega$ or $R = 50\Omega$; see figure 1
	N TW	0.2	Volts	$R = 27\Omega$ or $R = 50\Omega$; see figure 1
A.TY M.T ONL	N TW		Volts	OV.COMP
A.T.Y MAI	TW		Volts	OV.COMP
MI	TW	3		OV.COMA TIN
OM	TW	3		$R = 27\Omega$ or $R = 50\Omega$; see figure 1
ONT	TW			
ON	TW		Volts	Applies to D
O_{D_T}		0.8	Volts	Applies to D
		±10	μΑ	Applies to D
	TW		por t	7,651100 to 2
-00	1.	250	mA	-7V ≤ V _O ≤ +12V
				$-7V \le V_0 \le +12V$
CO	1.	200		NN-10-112CONT
	-11T		- 1	100 1. ONI.
7	OM.		<1	
1.	~1/2		Mhns	
×7 (30	60		t_{PLH} ; $R_{DIFF} = 54\Omega$, $C_{L1} = C_{L2} = 100pF$;
0 2 .	30	00	113	See figures 3 and 6
- 47	30	60	ne	t_{PHL} ; $R_{DIFF} = 54\Omega$, $C_{L1} = C_{L2} = 100pF$;
00 x	30	00	113	see figures 3 and 6
	J E (U)	1	nc	see figures 3 and 6,
100	3		115	
, 1	15	40	no	t_{SKEW} = $ t_{DPLH}$ - t_{DPHL} From 10% to 90%; R_{DIFF} = 54 Ω ,
- 10	15	40	ns	From 10% to 90%, R _{DIFF} = 5452,
1.1	ost C		STN	$C_{L1} = C_{L2} = 100 pF$; see figures 3 and
OI I	On r.	and.	4,	
44.	. Voo.		TW	
	100 -	102	Volte	7\/ - \/ - 12\/
11.	70	+0.2		-7V ≤ V _{CM} ≤ 12V
-111	10		1	$V_{CM} = 0V$
M	1	0.4		$I_{O} = -4\text{mA}, V_{ID} = +200\text{mV}$
,	15	0.4		$I_0 = +4\text{mA}, V_{1D} = -200\text{mV}$
.	15	.40	l	-7V ≤ V _{CM} ≤ 12V
			1	$V_{IN} = 12 \text{ V}$
			l	$V_{IN}^{IN} = -7V$
		85	mA	$0 \stackrel{\text{IV}}{\text{V}} \leq \text{V}_{\text{O}} \leq \text{V}_{\text{CC}}$
				O CC
	1.10 00X 1.00 1.00 1.10 1.10	30 30 5 15	250 250 30 60 30 60 5 15 40 +0.2 6 0.4	250 mA mA 250 mA mA 30 60 ns 30 60 ns 5 ns 15 40 ns 40 ns 40 ns 41 ns 41 ns 42 ns 43 ns 44 ns 45 ns 46 ns 46 ns 47 ns

 $\rm T_{MIN}$ to $\rm T_{MAX}$ and $\rm V_{CC}$ = 5V \pm 5% unless otherwise noted.

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
SP490 RECEIVER	MA	-T 10	14.00	MIN	W 1001 CON.T.
AC Characteristics	-311	1111-7	J.C.) I'v	N MAIN ON CO.
Maximum Data Rate	5	-xxi 1	M r.	Mbps	, and the colors
Receiver Input to Output	60	90	150	ns	t_{PLH} ; $R_{DIFF} = 54\Omega$, $C_{1.1} = C_{1.2} = 100pF$; <i>Figures 3 & 8</i>
Receiver Input to Output	60	90	150	ns	t_{PHL} ; $R_{DIFF} = 54\Omega$, $C_{14} = C_{12} = 100 \text{pF}$; Figures 3 & 8
Diff. Receiver Skew It _{PLH} -t _{PHL} I		13	N.100	ns	$R_{DIFF} = 54\Omega; C_{L1} = C_{L2} = 100pF;$ Figures 3 & 8
POWER REQUIREMENTS			100	3.00	W.174 W.100
Supply Voltage Supply Current	+4.75	900	+5.25	Volts μA	ON.TW WW.100K.C
ENVIRONMENTAL AND MECHANICAL		W	WW.	907	勝 特 力 材 料 886-3-5753170
Operating Temperature Commercial (_C_)	0		+70	°C	胜特力电子(上海) 86-21-54151736
Industrial (_E_)	-40		+85	°C (()	胜特力电子(深圳) 86-755-8329878
Storage Temperature	-65		+150	°C	
Package	TY		14	-xi 100	Http://www.100y.com.tw
Plastic DIP (_S_) NSOIC (_N)	M.T.	N	WW	NY 10	ONITY THE
	174	CXI	1	M. A.	av.Co. av

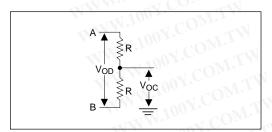


Figure 1. Driver DC Test Load Circuit

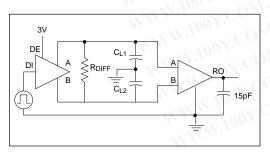


Figure 3. Driver/Receiver Timing Test Circuit

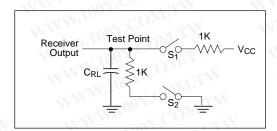


Figure 2. Receiver Timing Test Load Circuit

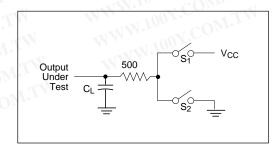


Figure 4. Driver Timing Test Load #2 Circuit

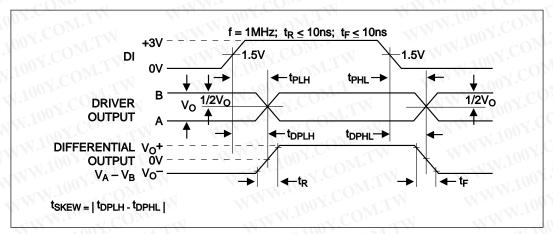


Figure 6. Driver Propagation Delays

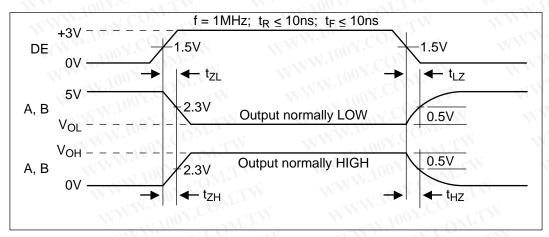
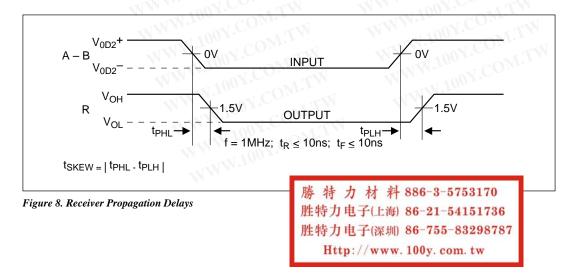


Figure 7. Driver Enable and Disable Times



ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

V _{cc}	+7V
Input Voltages	
Logic	0.5V to (V _{cc} +0.5V)
Drivers	
Receivers	±14Ý
Output Voltages	
Logic	0.5V to (V _{cc} +0.5V)
Drivers	±14V
Receivers	0.5V to (V _{cc} +0.5V)
Storage Temperature	65°C to +150
Power Dissipation	1000mW

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SPECIFICATIONS

 T_{MN} to T_{MAX} and $V_{\text{CC}} = 5V \pm 5\%$ unless otherwise noted.

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
SP491 DRIVER		*	-11/	700	COM.
DC Characteristics	TV.	-			CO TIN WW.
Differential Output Voltage	GND		V _{cc}	Volts	Unloaded; R = ∞ ; see figure 1
Differential Output Voltage	2		VCC	Volts	With Load; $R = 50\Omega$; (RS422);
Differential Gutput Voltage	1,21		V _{cc}	Volto	see figure 1
Differential Output Voltage	1.5	1	W	Volts	With Load; $R = 27\Omega$; (RS485); see figure
	1.3		V _{cc}	VOILS	Will Load, N = 27 52, (N 3403), See ligure
Change in Magnitude of Driver	Mr.	T.	-17	111	TO COM TO THE
Differential Output Voltage for	TI	N.A.		J. 1411	D 070 D 500 " 1
Complimentary States	Diar.	-1	0.2	Volts	$R = 27\Omega$ or $R = 50\Omega$; see figure 1
Driver Common-Mode	- 1			1	1001.
Output Voltage	$^{\prime}OMr$.	-1	3	Volts	$R = 27\Omega$ or $R = 50\Omega$; see figure 1
Input High Voltage	2.0		4	Volts	Applies to D, REB, DE
Input Low Voltage			0.8	Volts	Applies to D, REB, DE
Input Current			±10	μA	Applies to D, REB, DE
Driver Short-Circuit Current	~ ~ ~ ~ ~ ~	1.1.			M. To.
V _{OUT} = HIGH	35		250	mA	-7V < V < 12V
V _{OUT} = LOW	35	11.	250	mA	-7V ≤ V _O ≤ 12V -7V ≤ V _O ≤ 12V
VOUT = 2000	00	- 11	200		1 4 3 4 0 3 12 4
SP491 DRIVER	- 0	174.	-1		NN. COM
AC Characteristics		- T			1007.
Maximum Data Rate	5	-0M.	-7	Mbps	REB = 5V, DE = 5V
	7	20	60		KED = 5V, DE = 5V
Driver Input to Output	20	30	60	ns	t_{PLH} ; $R_{DIFF} = 54\Omega$, $C_{L1} = C_{L2} = 100pF$; see figures 3 and 6
D: 1 11 01 W	00		00		see rigures 3 and 6
Driver Input to Output	20	30	60	ns	t_{PHL} ; $R_{DIFF} = 54\Omega$, $C_{L1} = C_{L2} = 100pF$; see figures 3 and 6
	~ 0	V.Co.	- TV		see figures 3 and 6
Driver Skew	xī 100	5	10	ns	see figures 3 and 6,
		V.CU		N	$t_{\text{SKEW}} = t_{\text{DPLH}} - t_{\text{DPHL}} $ From 10% to 90%; $R_{\text{DIFF}} = 54\Omega$,
Driver Rise or Fall Time	3	15	40	ns	From 10% to 90%; $R_{DIFF} = 54\Omega$,
	1111.	~<7 C	Or.	XX	$C_{14} = C_{12} = 100 \text{pF}$; see figures 3 and
Driver Enable to Output High	-x1 1	40	70	ns	$C_{14}^{L1} = C_{12}^{L2} = 100 \text{pF}$; see figures
		~ 1	OB		$C_{L1} = C_{L2} = 100pF; see figures 3 and C_{L1} = C_{L2} = 100pF; see figures 4 and 7; S2 closed C_{L1} = C_{L2} = 100pF; see figures 4 and 7; S2 closed C_{L1} = C_{L2} = 100pF; see figures 4 and 7; S2 closed$
Driver Enable to Output Low	-1	40	70	ns	$C_{1,1} = C_{1,2} \stackrel{?}{=} 100 pF$: see figures
·		. 1	CO_{2i}		4 and 7; S, closed
Driver Disable Time from Low	14.	40	70	ns	$C_{L1} = C_{L2} = 100 pF$; see figures
	-1111	1.7.			4 and 7: S. closed
Driver Disable Time from High	M. a.	40	70	ns	$4 \stackrel{\text{L}}{a}$ and $7 \stackrel{\text{L}}{;} S_1$ closed $C_{\text{L}1} = C_{\text{L}2} = 100 \text{pF}; see figures$
zc. zioazio riino irom riigii					4 and 7; S ₂ closed
					, -2

SPECIFICATIONS (continued)

to T_{MAX} and $V_{CC} = 5V \pm 5\%$ unless otherw PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
SP491 RECEIVER	1/1/1/	-110	01.	TIME	M 1003.
DC Characteristics	-31		C C	Diag.	W WWW. CO.CO
Differential Input Threshold	-0.2	-xxi 1	+0.2	Volts	-7V ≤ V _{CM} ≤ 12V
nput Hysteresis	0.5	70	. No.	mV	$V_{CM} = 0V$
Output Voltage High	3.5		100	Volts	$I_O^{CM} = -4\text{mA}, V_{ID} = +200\text{mV}$ $I_O = +4\text{mA}, V_{ID} = -200\text{mV}$
Output Voltage Low Three State (high impedance)	4		0.4	Volts	$I_0 = +4mA, \ V_{ID} = -200mV$
Output Current			±1	μA	0.4V ≤ V _O ≤ 2.4V; REB = 5V
nput Resistance	12	15	1100	kΩ	$-7V \le V_{CM} \le 12V$
nput Current (A, B); V _{IN} = 12V		-XIXN	±1.0	mA	$DE = 0V, V_{CC} = 0V \text{ or } 5.25V, V_{IN} = 12V$
Input Current (A, B); $V_{IN}^{IN} = -7V$			-0.8	mA	DE = 0V, V_{CC}^{CC} = 0V or 5.25V, V_{IN}^{IN} = -7V
Short-Circuit Current	7		85	mA	$0V \le V_O \le V_{CC}$
SP491 RECEIVER			-11V.3	00 -	ON. I
DC Characteristics	W		11	OOY.	- TA AM. 1103.
Maximum Data Rate	5		WIX	Mbps	REB = 0V
Receiver Input to Output	60	90	150	ns	t_{PLH} ; $R_{DIFF} = 54\Omega$,
Parativa langua da Organia	co	00	450	1.10	$C_{L1} = C_{L2} = 100 \text{pF}$; Figures 3 & 8
Receiver Input to Output	60	90	150	ns	t_{PHL} ; $R_{DIFF} = 54\Omega$, $C_{L1} = C_{L2} = 100 pF$; Figures 3 & 8
Diff. Receiver Skew It _{PLH} -t _{PHI} I	- XX	13		ns	$R_{DIFF} = 54\Omega$; $C_{L1} = C_{L2} = 100pF$;
Dim. Receiver Great RPLH RPHL	$\Lambda_{i,T,J}$.0	1	1.0 10	Figures 3 & 8
Receiver Enable to Output Low		20	50	ns	C _{Pl} = 15pF; Figures 2 and 9; S ₁ closed
Receiver Enable to Output High	111.	20	50	ns	C _{RL} = 15pF; <i>Figures 2 and 9;</i> S ₂ closed
Receiver Disable from Low		20	50	ns	C _{RI} = 15pF; Figures 2 and 9; S ₁ closed
Receiver Disable from High	$O_{M^{-1}}$	20	50	ns	C _{RL} = 15pF; <i>Figures 2 and 9;</i> S ₂ closed
POWER REQUIREMENTS	- 7/			N 4.	1001. OW.I.A.
Supply Voltage	+4.75	-31	+5.25	Volts	" <u></u>
Supply Current	10	600		μΑ	\overline{REB} , D = 0V or V_{CC} ; DE = V_{CC}
SP491 ENVIRONMENTAL	ľ.Co.	WT		MM	TION TO THE WAY
AND MECHANICAL	-1 CO		ı.T	- 11	M. T. COM.
Operating Temperature Commercial (_C_)	0		+70	°C	1003. M. T.M.
Industrial (E)	-40		+70	°C <√	勝 特 力 材 料 886-3-5753170
Storage Temperature	-65		+150	°C	
Package					胜特力电子(上海) 86-21-5415173
Plastic DIP (_S_)	100 .		7		胜特力电子(深圳) 86-755-832987
NSOIC (_N)	Your		TW		
	The		10.2		Http://www. 100y. com. tw

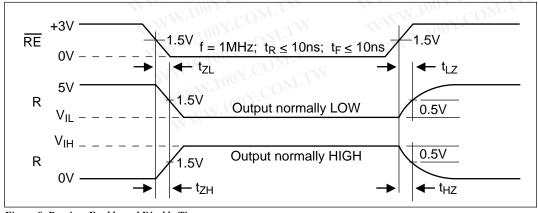


Figure 9. Receiver Enable and Disable Times

DESCRIPTION

The **SP490** and **SP491** are full-duplex differential transceivers that meet the requirements of RS-485 and RS-422. Fabricated with a **Sipex** proprietary BiCMOS process, both products require a fraction of the power of older bipolar designs.

The RS-485 standard is ideal for multi-drop applications or for long-distance interfaces. RS-485 allows up to 32 drivers and 32 receivers to be connected to a data bus, making it an ideal choice for multi-drop applications. Since the cabling can be as long as 4,000 feet, RS-485 transceivers are equipped with a wide (-7V to +12V) common mode range to accommodate ground potential differences. Because RS-485 is a differential interface, data is virtually immune to noise in the transmission line.

Driver...

The drivers for both the SP490 and SP491 have differential outputs. The typical voltage output swing with no load will be 0 volts to +5 volts. With worst case loading of 54Ω across the differential outputs, the driver can maintain greater than 1.5V voltage levels.

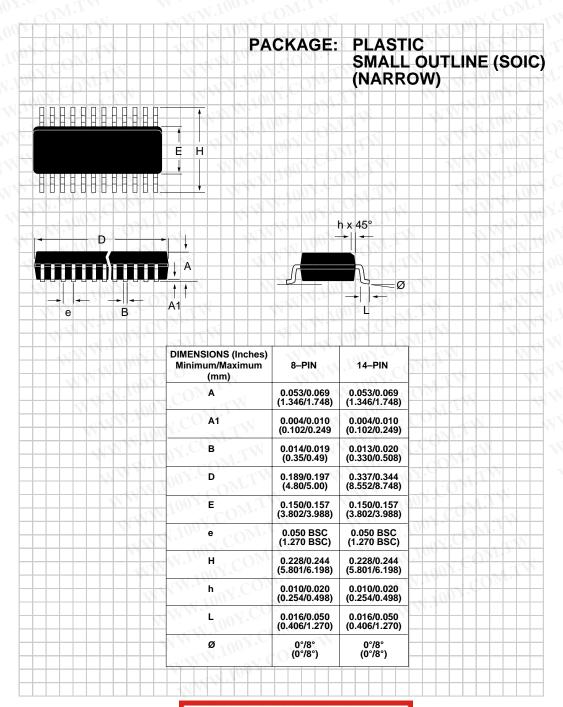
The driver of the **SP491** has a driver enable control line which is active high. A logic high on DE (pin 4) of the **SP491** will enable the differential driver outputs. A logic low on DE (pin 4) of the **SP491** will tri-state the driver outputs. The **SP490** does not have a driver enable.

Receiver...

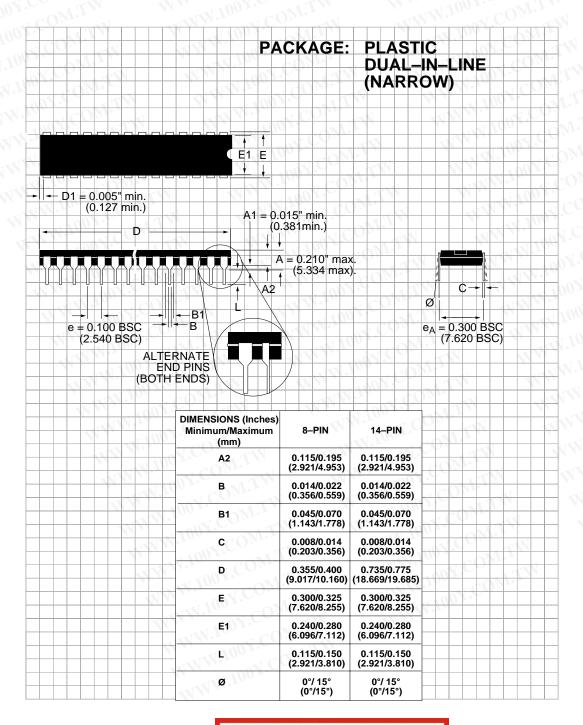
The receivers for both the **SP490** and **SP491** have differential inputs with an input sensitivity as low as $\pm 200 \text{mV}$. Input impedance of the receivers is typically $15 \text{K}\Omega$ ($12 \text{K}\Omega$ minimum). A wide common mode range of -7V to +12V allows for large ground potential differences between systems. The receivers for both the **SP490** and **SP491** are equipped with the fail-safe feature. Fail-safe guarantees that the receiver output will be in a high state when the input is left unconnected.

The receiver of the **SP491** has a receiver enable control line which is active low. A logic low on \overline{REB} (pin 3) of the **SP491** will enable the differential receiver. A logic high on \overline{REB} (pin 3) of the **SP491** will tri-state the receiver.

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ORDERING INFORMATION

Model	Temperature Range	Package
SP490CN	0°C to +70°C	8-Pin NSOIC
	0°C to +70°C	
SP490EN	-40°C to +85°C	8-Pin NSOIC
SP490ES		8-Pin DIP
SP491CN	0°C to +70°C	14-Pin NSOIC
SP491CS	0°C to +70°C	14-Pin DIP
SP491EN	40°C to +85°C	14-Pin NSOIC
SP491ES	40°C to +85°C	14-Pin DIP

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