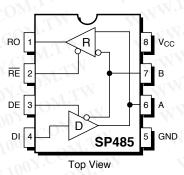
SP481/SP483/SP485

Low Power Half-Duplex RS-485 Transceivers

FEATURES

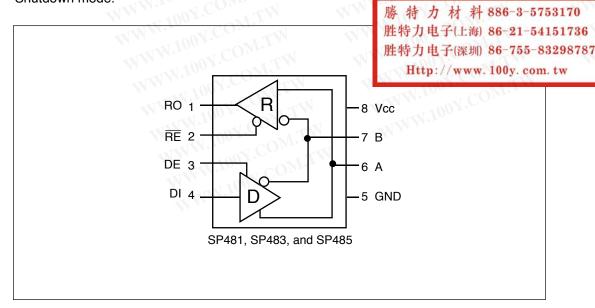
- +5V Only
- Low Power BiCMOS
- Driver/Receiver Enable
- Slew Rate Limited Driver for Low EMI (SP483)
- Low Power Shutdown Mode (SP481 and SP483)
- RS-485 and RS-422 Drivers/Receivers



SP481, SP483, SP485 Pinout (Top View)

DESCRIPTION

The **SP481**, **SP483**, and the **SP485** are a family of half-duplex transceivers that meet the requirements of RS-485 and RS-422. Their BiCMOS design allows low power operation without sacrificing performance. The **SP481** and **SP485** meet the requirements of RS-485 and RS-422 up to 5Mbps. Additionally, the **SP481** is equipped with a low power Shutdown mode. The **SP483** is internally slew rate limited to reduce EMI and can meet the requirements of RS-485 and RS-422 up to 250kbps. The **SP483** is also equipped with a low power Shutdown mode.



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}	±12V
Input Voltages	
Logic	0.3V to (V _{cc} +0.5V)
Drivers	-0.3V to (V _{cc} +0.5V)
Receivers	±15Ý
Output Voltages	
Logic	0.3V to (V _{cc} +0.5V)
Drivers	±15V
Receivers	0.3V to (V _{cc} +0.5V)
Storage Temperature	0.3V to (V _{cc} +0.5V) 65°C to+150°C
	500mW

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 Http://www.100y.com.tw

ELECTRICAL CHARACTERISTICS

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

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
SP481/SP483/SP485 DRIVER	A.	4/	_31	00 7	LIVE WELLOW
DC Characteristics	- XX	-			
Differential Output Voltage	GND		V _{cc}	Volts	Unloaded; R = ∞ ; see figure 1
Differential Output Voltage	2		V _{CC}	Volts	with load; $R = 50\Omega$; (RS422);
Billoreritial Catput Voltage	17-11		, cc	Volto	see figure 1
Differential Output Voltage	1.5		V _{CC}	Volts	with load; R = 27Ω ; (RS485); see figure 1
Change in Magnitude of Driver	1.0		*cc	Voito	With 10dd, 11 = 2752, (110400), 300 ligare 1
Differential Output Voltage for	120	KT	- 11	111	
Complimentary States	TI		0.2	Volts	$R = 27\Omega$ or $R = 50\Omega$; see figure 1
Driver Common-Mode	Mrs	cxI	0.2	VOILS	11 = 27 32 01 11 = 3032, 300 ligare 1
Output Voltage	-113	11	3	Volts	$R = 27\Omega$ or $R = 50\Omega$; see figure 1
Input High Voltage	2.0		0	Volts	Applies to DE, DI, RE
Input Low Voltage	2.0	LAA	0.8	Volts	Applies to DE, DI, RE
Input Current	-OM	- 1	±10	μA	Applies to DE, DI, RE
Driver Short-Circuit Current	_ 1	TW	±10	μΑ	Applies to DL, DI, HL
	35	- 1	250	mA	7// - // - 110//
V _{OUT} = HIGH	35	TIVE	250	mA	$-7V \le V_0 \le +12V$
V _{OUT} = LOW	35	NI.	250	IIIA	-7V ≤ V _O ≤ +12V
SP481/SP485 DRIVER	1.	11.11		44.	100 x 0M.1
AC Characteristics	~7 C) N =	(X)	- XX	
Maximum Data Rate	5	~1.7		Mbps	$\overline{RE} = 5V$, DE = 5V
Driver Input to Output	~ < 7	30	60	ns	$t_{PLH}; R_{DIFF} = 54\Omega, C_{L1} = C_{L2} = 100pF;$
- III	00 x .		1.44		see figures 3 and 6
Driver Input to Output		30	60	ns	$t_{PHL}; R_{DIFF} = 54\Omega, C_{L1} = C_{L2} = 100pF;$
The state of the s	100 r		1.		see figures 3 and 6
Driver Skew		C5	10	ns	see figures 3 and 6,
	100		$V_{i,T,J_{i,J_{i}}}$		tekew = topi u - topui
Driver Rise or Fall Time	N	15	40	ns	t_{SKEW} = I t_{DPLH} - t_{DPHL} I From 10% to 90%; R_{DIFF} = 54 Ω ,
	- 10 ¹	13.	M'		$C_{1,1} = C_{1,2} = 100 \text{pF}$; see figures 3 and 6
Driver Enable to Output High	11.5	40	70	√ ns	C ₁ = 100pF; see figures 4 & 7; S ₂ closed
Driver Enable to Output Low	-311	40	70	ns	C ₁ = 100pF; see figures 4 & 7; S ₁ closed
Driver Disable Time from Low	1111.2	40	70	ns	C ₁ = 15pF; see figures 2 & 9; S ₁ closed
Driver Disable Time from High		40	70	ns	C ₁ = 15pF; see figures 2 & 9; S ₂ closed
Bilver Bicable Time iron Tilgir	MM.		COver		5[= 1661 , 666 ligares 2 & 6, 6 ₂ dioded
SP481/SP483/SP485 RECEIVE	R	100	COM	7	
DC Characteristics	VIN V	005	Co		
Differential Input Threshold	-11	v.100	+0.2	Volts	-7V ≤ V _{CM} ≤ +12V
Input Hysteresis	WW	10		mV	$V_{CM} = 0V$
Output Voltage High	7.			Volts	$I_0 = -4mA, V_{1D} = +200mV$
Output Voltage Low			0.4	Volts	$I_0^0 = +4 \text{mA}, \ V_{1D}^1 = -200 \text{mV}$
Three-State (High Impedance)					
Output Current			±1	μA	$0.4V \le V_O \le 2.4V; \overline{RE} = 5V$
Input Resistance		15		kΩ	-7V ≤ V _{CM} ≤ +12V
Input Current (A, B); V _{IN} = 12V		-	+1.0	mA	DE = 0V, V_{CC} = 0V or 5.25V, V_{IN} = 12V
Input Current (A, B); $V_{IN} = -7V$			-0.8	mA	DE = 0V, $V_{CC} = 0V$ or 5.25V, $V_{IN} = -7V$
Short-Circuit Current			95	mA	$0V \le V_{CM} \le V_{CC}$
The state of the s	<u> </u>	<u> </u>		,	CM CC

T	. to	T	and	٧	= 5V	± 5%	unless	otherwise	noted.

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
SP481/SP485 RECEIVER	MM	100		TIM	WW. 100x.
AC Characteristics	-311	11.70		17.	N WWW. CO.
AC Characteristics	711	-x1 10		NAL-	DE OV DE OV
Maximum Data Rate	5	00	000	Mbps	RE = 0V, DE = 0V
Receiver Input to Output	60	90	200	ns	$t_{PLH}; R_{DIFF} = 54\Omega, \\ C_{L1} = C_{L2} = 100pF; Figures 3 \& 8$
Desciver Input to Output	00	00	000	$\mathbb{C}_{\Omega_{P_1}}$	$C_{L1} = C_{L2} = 100 \text{pF}$; Figures 3 & 8
Receiver Input to Output	60	90	200	ns	t_{PHL} ; $R_{DIFF} = 54\Omega$, $C_{L1} = C_{L2}^{=} 100 pF$; Figures 3 & 8
Diff Dessiver Clean It + 1		13	000	CON	$C_{L1} = C_{L2} = 100 \text{ pr}, \text{ Figures 3 & 8}$
Diff. Receiver Skew It _{PLH} -t _{PHL} I		13	1700,	ns	$R_{DIFF}^{L1} = 54\Omega; C_{L1} = C_{L2} = 100pF;$ Figures 3 & 8
Receiver Enable to				V.CO	Figures 3 & 6
Output Low		20	50	ns	C _{BI} = 15pF; Figures 2 & 9; S ₁ closed
Receiver Enable to		20	30	113	O _{RL} = 15pr , r igures 2 & 9, 3 ₁ closed
Output High		20	50	ns	C _{BL} = 15pF; Figures 2 & 9; S ₂ closed
Receiver Disable from Low	N	20	50	ns	$C_{\text{Pl}} = 15\text{pF}$; Figures 2 & 9; S_1 closed
Receiver Disable from High		20	50	ns	$C_{RL} = 15pF$; Figures 2 & 9; S_2 closed
Tieceivei Disable Iroili Tiigii	W	20	30	113	O _{RL} = 15p1 , 1 igures 2 & 9, 5 ₂ closed
SP481	-1		XIVI		COMP.
31 401		1	N. A. A.	1007	TITI
Shutdown Timing				1.70	COM.
Time to Shutdown	50	200	600	ns	RE = 5V, DE = 0V
Driver Enable from Shutdown	30	200	000	113	TIE = 5V, DE = 0V
to Output High	TY	40	100	ns	C ₁ = 100pF; See figures 4 & 7; S ₂ closed
Driver Enable from Shutdown	Mr.	-10	100	110	0[= 100p1 , 000 ligares 4 a 7, 02 010000
to Output Low	TILL	40	100	ns	C ₁ = 100pF; See figures 4 & 7; S ₁ closed
Receiver Enable from	Direc				5[.50p., , 555ga. 65 . a , 5] 6.5554
Shutdown to Output High		300	1000	ns	C _L = 15pF; See figures 2 & 9; S ₂ closed
Receiver Enable from	Ohr	-XX			
Shutdown to Output Low	Mo.	300	1000	ns	C _L = 15pF; See figures 2 & 9; S ₁ closed
WWW.	Co_{r_r}	TW			TYN Y
POWER REQUIREMENTS		1.1			N.To. COM.
Supply Voltage	+4.75	TVV -	+5.25	Volts	1007.0
Supply Current	dC	Mr. r			M.In. COM.
SP481/485		- 1	N		100Y.
No Load		900		μΑ	\overline{RE} , DI = 0V or V_{CC} ; DE = V_{CC} RE = 0V, DI = 0V or 5V; DE = 0V
MW.		-17		μΑ	$\overrightarrow{RE} = 0V$, DI = $0\overrightarrow{V}$ or $5\overrightarrow{V}$; DE = $0\overrightarrow{V}$
SP483	-7 (OM			Tal W. I COM
No Load	1007.	600		μΑ	\overrightarrow{RE} , DI = 0V or V_{CC} ; DE = V_{CC} RE=0V, DI = 0V or 5V; DE = 0V
William	100	COM.		μΑ	RE= $0V$, DI = $0V$ or $5V$; DE = $0V$
SP481/SP483	1007				$M_{\perp} = 400$
Shutdown Mode	. 10	of COM	10	μΑ	$DE = 0V, \overline{RE} = V_{CC}$
ENVIRONMENT IN THE	x 100	7.			TO THE CONT.
ENVIRONMENTAL AND	14.	V.CO	T	N	WWW. CON.CO.
MECHANICAL	XX 10	A 2.		T	W.In
Operating Temperature	1	OV.CV	70	N.,	MW.
Commercial (_C_)	0	An .	+70	°C	
Industrial (_E_)	-40	L.VO.	+85	°C	ml 11 11 11 11 00 00 00 00 00 00 00 00 00
Storage Temperature	-65	100.	+150	°C	勝 特 力 材 料 886-3-575
Package	11/1/4	LOON.			胜特力电子(上海) 86-21-541
Plastic DIP (_S) NSOIC (_N)	- XIV	1.Ing			Control of the contro
143010 (_14)					胜特力电子(深圳) 86-755-83

3170 51736 胜特力电子(深圳) 86-755-83298787

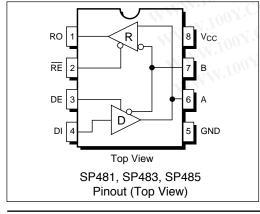
Http://www.100y.com.tw

SP483 AC SPECIFICATIONS

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

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PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS	The same of the sa	
SP483 DRIVER	44.4	-xxi 10	03.	MIT		111,100	
AC Characteristics	1	1111.	onv.C	D 2.	W W	N TOOK	
Maximum Data Rate	250	- TW.1	00 -	kbps		WW.100 = CO	
Driver Input to Output	250	800	2000	ns	t_{PLH} ; $R_{DIFF} = 54\Omega$,	$C_{L1} = C_{L2}^{-1} 100 pF;$	
Line COM.			100	CO_{Mr}	see figures 3 & 6	- WW.	
Driver Skew	250	800	2000	ns	t_{PHL} ; $R_{DIFF} = 54\Omega$, see figures 3 & 6	$C_{L1} = C_{L2}^{-100pF};$	
Driver Rise and Fall Time		100	800	ns	see figures 3 & 6,	MM TOOK	
Biver rise and rail rime		100	W.190	- CO	$t_{SKEW} = It_{DPLH} - t_{DPHL}$	WW.Inc	
	250		2000	ns	From 10% to 90%	$R_{\text{DIFF}} = 54\Omega,$	
SIN Juy COM.	ď		111.70	~<7 C	$C_{11} = C_{12} = 100 pF$, see figures 3 & 6	
Driver Enable to Output High	250		2000	ns	$C_L = 100 \text{pF}$; See fig.	gures 4 & 7; S ₂ closed	
Driver Enable to Output Low Driver Disable Time from Low	250 300	***	2000 3000	ns ns		gures 4 & 7; S ₁ closed ures 4 & 7; S ₁ closed	
Driver Disable Time from High	300		3000	ns		ures 4 & 7; S ₂ closed	
Zivel Ziedzie Time Irem Tilgir		1	0000	1007		aros 7 a 7, 0 ₂ 0,000 a	
SP483 RECEIVER	-31		- 11111	1.5	1 COM	M. W.	
AC Characteristics	TIM		111.	x 100	. OM.I	N TO THE REAL PROPERTY.	
Maximum Data Rate	250		WW	kbps	V.CO. TW	MW	
Receiver Input to Output	250		2000	ns	t_{PLH} ; $R_{DIFF} = 54\Omega$,	$C_{L1} = C_{L2} = 100pF;$	
B. W. D. W. O. W. O. W. C. W.	17	400		1	Figures 3 & 8	0 400 5	
Diff. Receiver Skew It _{PLH} -t _{PHL} I)Mr	100	- 1	ns	$R_{DIFF} = 54\Omega, C_{L1} =$ Figures 3 & 8	: C _{L2} = 100pF;	
Receiver Enable to	~1.7		1/1	-XXI	Figures 3 & 6		
Output Low	On-	20	50 <	ns	C _{BI} = 15pF; Figures 2	& 9; S ₁ closed	
Receiver Enable to	COM	. 1		TAIN!	1700		
Output High		20	50	ns	C _{RL} = 15pF; Figures 2		
Receiver Disable from Low		20	50 50	ns	C _{RL} = 15pF; <i>Figures 2</i>		
Receiver Disable from High		20	50	ns	C _{RL} = 15pF; Figures 2	& 9; S ₂ closed	
SP483	V.C		Ĭ	W	1001.00	WILL	
Shutdown Timing	-7 (1)	D_{Mr}	- 1		NW.IO	DIAT.	
Time to Shutdown	50	200	600	ns	$\overline{RE} = 5V$, $DE = 0V$	OW.T.	
Driver Enable from Shutdown	os/ (Chin.		110	IN WILLIAM	WITT	
to Output High	$f_{00,r}$.	Mor.	2000	ns	C _L = 100pF; <i>See fi</i>	gures 4 & 7; S ₂ closed	
Driver Enable from Shutdown	· ooV	Cor	2000		100 5 0 5	10.70	
to Output Low Receiver Enable from	Jan	CON	2000	ns	$U_L = 100pF$; See fig	gures 4 & 7; S ₁ closed	
Shutdown to Output High	100	1.0	2500	ns	C. = 15pF: See fig.	ures 4 & 7; S ₂ closed	
Receiver Enable from	N.T.	T CO	2000	110		100 / u /, 0 ₂ 01000u	
Shutdown to Output Low	-x1 10	11.	2500	ns	C ₁ = 15pF: See fig	ures 4 & 7; S ₁ closed	



PIN FUNCTION

Pin#	Name	Description
1	RO	Receiver Output.
2	$\overline{\text{RE}}$	Receiver Output Enable
		Active LOW.
3	DE	Driver Output Enable
		Active HIGH.
4	DI	Driver Input.
5	GND	Ground Connection.
6	A	Driver Output/Receiver Input
		Non-inverting.
7	В	Driver Output/Receiver Input
		Inverting.
8	Vcc	Positive Supply 4.75V <vcc< 5.25v<="" td=""></vcc<>

DESCRIPTION SP481, SP483, SP485

The **SP481**, **SP483**, and **SP485** are half-duplex differential transceivers that meet the requirements of RS-485 and RS-422. Fabricated with a Sipex proprietary BiCMOS process, all three products require a fraction of the power of older bipolar designs.

The RS-485 standard is ideal for multi-drop applications and 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.

Drivers SP481, SP483, SP485

The driver outputs of the **SP481**, **SP483**, and **SP485** are differential outputs meeting the RS-485 and RS-422 standards. 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 drivers can maintain greater than 1.5V voltage levels. The drivers of the **SP481**, **SP483** and **SP485** have an enable control line which is active HIGH. A logic HIGH on DE (pin 5) will enable the differential driver outputs. A logic LOW on DE (pin 5) will tri-state the driver outputs.

The transmitters of the **SP481** and **SP485** will operate up to at least 5Mbps. The **SP483** has internally slew rate limited driver outputs to minimize EMI. The maximum data rate for the **SP483** driver is 250kbps.

Receivers SP481, SP483, SP485

The SP481, SP483, and SP485 receivers 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 of the SP481, SP483 and SP485 have a tri-state enable control pin. A logic LOW on $\overline{\text{RE}}$ (pin 4) will enable the receiver, a logic HIGH on $\overline{\text{RE}}$ (pin 4) will disable the receiver.

The receiver for the **SP481** and **SP485** will operate up to at least 5Mbps. The **SP483** receiver is rated for data rates up to 250kbps. The receiver for each of the three devices is 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 and floating.

Shutdown Mode SP481/SP483

The **SP481** and **SP483** are equipped with a Shutdown mode. To enable the Shutdown state, both the driver and receiver must be disabled simultaneously. A logic LOW on DE (pin 5) and a logic HIGH on \overline{RE} (pin 4) will put the **SP481** or **SP483** into Shutdown mode. In Shutdown, supply current will drop to typically 1µA.

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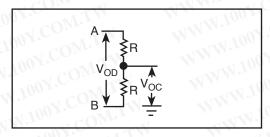


Figure 1. Driver DC Test Load Circuit

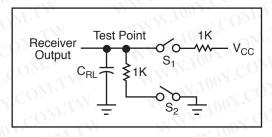


Figure 2. Receiver Timing Test Load Circuit

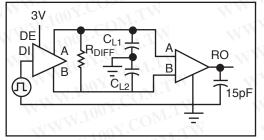


Figure 3. Driver/Receiver Timing Test Circuit

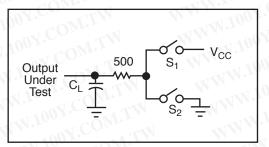


Figure 4. Driver Timing Test Load #2 Circuit

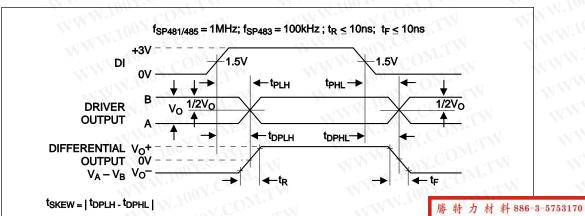


Figure 6. Driver Propagation Delays

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I	NPUT	NPUTS			OUTPUTS		
RE	DE	DI	LINE CONDITION	В	A		
X	1	1	No Fault	0	1		
X	1	0	No Fault	1	0		
X	0	X	X	Z	Z		
X	1	X	Fault	Z	Z		

Table 1. Transmit Function Truth Table

INP	UTS		OUTPUTS
RE	DE	A - B	R
0	0	+0.2V	1
0	0	-0.2V	0
0	0	Inputs Open	1
1	0	X	Z

Table 2. Receive Function Truth Table

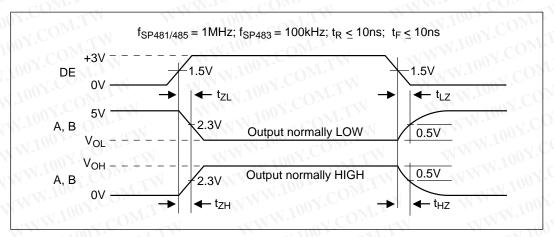


Figure 7. Driver Enable and Disable Times

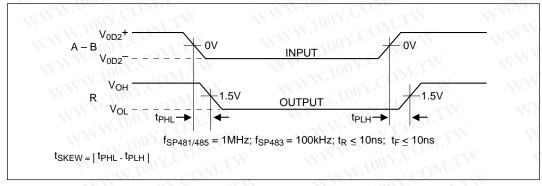


Figure 8. Receiver Propagation Delays

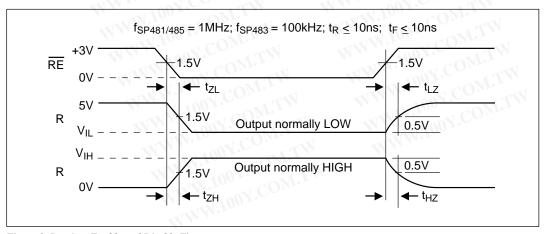
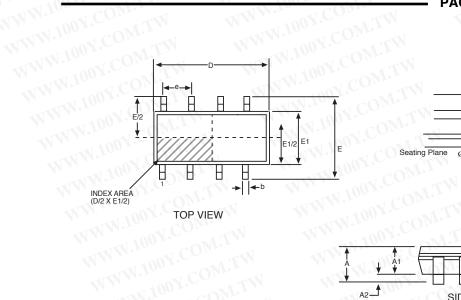
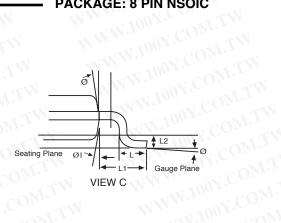


Figure 9. Receiver Enable and Disable Times

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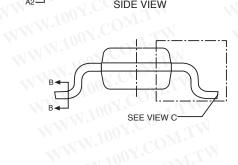
MMM.100x.CO



↑ ↓ Å1		Seating Plane
WWW.100	SIDE VIEW	M.M.M. 100X

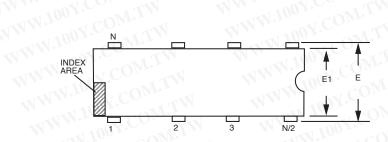
in NSOIC	JEDEC MO	D-012 (AA)	Variation
YMBOL	MIN	NOM	MAX
Α	1.35		1.75
A1	0.1		0.25
A2	1.25	Co	1.65
b	0.31		0.51
C	0.17	V.C.O.	0.24
D	xx 100	4.90 BSC	1.1
E	/ / / · ·	6.00 BSC	
E1		3.90 BSC	M.r.
e	Maria	1.27 BSC	- 177
L	0.4	00:	1.27
L1 <	VIVI I	1.04 REF	. 1
L2	-111	0.25 BSC	JONE !
ø	00	-07.	80
ø1	50	1700	15°

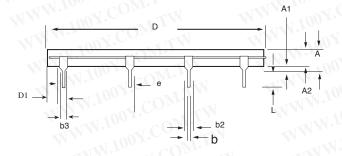


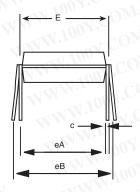


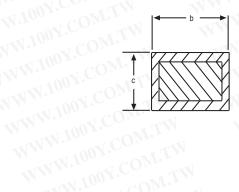


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WW	11007	COM				
8 PIN PDIF	JEDEC MS MIN	-001 (BA) NOM	Variation MAX			
A	IVIIIV	- INOIVI	0.21			
A1	0.15	-CO	-01			
A2	0.115	0.13	0.195			
b	0.014	0.018	0.022			
b2	0.045	0.06	0.07			
b3	0.3	0.039	0.045			
С	0.008	0.01	0.014			
D	0.355	0.365	0.4			
D1	0.005	M - 01	$^{1}Co_{r}$			
E	0.3	0.31	0.325			
E1	0.24	0.25	0.28			
е		.100 BSC				
eA		.300 BSC				
еВ	-	-	0.43			
L	0.115	0.13	0.15			

Note: Dimensions in (mm)

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ORDERING INFORMATION

Model	Temperature Range	Package
SP481CN		8-pin NSOIC
SP481CS		8-pin PDIP
SP481EN	40°C to +85°C	8-pin NSOIC
SP481EN/TR	40°C to +85°C	8-pin NSOIC
SP481ES		8-pin PDIP
SP483CN/TR		8-pin NSOIC
SP483CS		8-pin PDIP
SP483EN	40°C to +85°C	8-pin NSOIC
SP483EN/TR	40°C to +85°C	8-pin NSOIC
SP483ES	-40°C to +85°C	8-pin PDIP
SP485CN		8-pin NSOIC
SP485CN/TR		8-pin NSOIC
SP485CS		8-pin PDIP
SP485EN	-40°C to +85°C	8-pin NSOIC
	40°C to +85°C	
SP485ES	-40°C to +85°C	8-nin PDIP

For lead-free packages, improved ESD protection and performance: upgrade to SP485E, SP481E, SP483E Example: SP485EN/TR = upgrade to SP485EEN-L/TR

/TR = Tape and Reel

Pack quantity is 2,500 for NSOIC.





ANALOG EXCELLENCE

Sipex Corporation

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