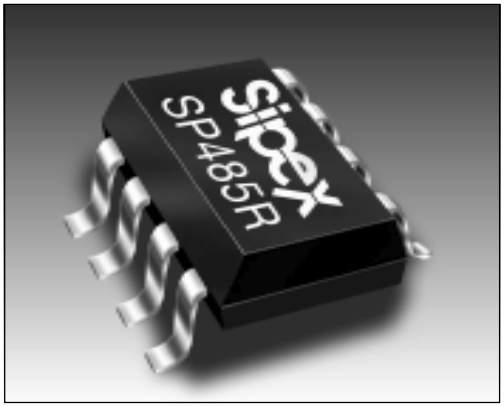
1/10th Unit Load RS-485 Transceiver

FEATURES

- Allows Over 400 Transceivers On A Transmission Line (1/10th Unit Load)
- High Impedance on Receiver Inputs (R_{IN} = 150kΩ typical)
- Half-Duplex Configuration Consistent With Industry Standard Pinout
- –7V to +12V Common Mode Input Voltage Range
- Includes Shutdown Mode (I_{CC} < 10μA) (For SP481R Only)
- Low Power Consumption (250mW)
- Separate Driver and Receiver Enable

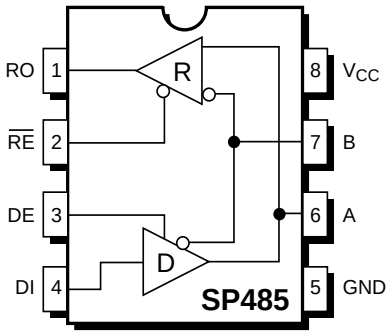


Now Available in Lead Free Packaging

DESCRIPTION

The **SP481R** and **SP485R** are pin-to-pin equivalent with our existing SP485 product and contain enhancements such as higher ESD tolerance and high receiver input impedance. The higher receiver input impedance allows for connecting over 400 transceivers on a single transmission line without degrading the RS-485 driver signal. Each device is packaged in an 8-pin plastic DIP or 8-pin narrow SOIC package. The **SP481R** offers a shutdown feature via the enable pins which will reduce the supply current (I_{CC}) below 0.5μA typical.

TYPICAL APPLICATION CIRCUIT



Top View

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
Storage Temperature.....-65˚C to +150˚C
Power Dissipation
8-pin Plastic DIP.....1000mW
8-pin Plastic N-SOIC.....1000mW

Package Derating:
8-pin Plastic DIP
$ø_{JA}$.....62 °C/W
8-pin Plastic N-SOIC
$ø_{JA}$.....62 °C/W

ELECTRICAL CHARACTERISTICS

Typically 25°C @ Vcc = +5V unless otherwise noted.

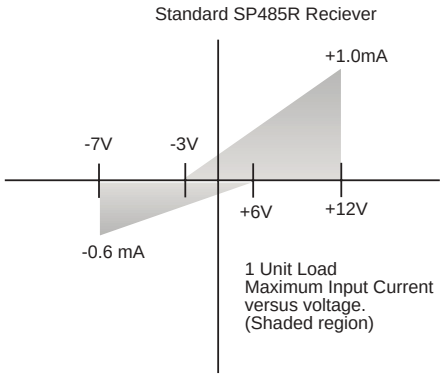
	MIN.	TYP.	MAX.	UNITS	CONDITIONS
LOGIC INPUTS					
V_{IL}			0.8	Volts	
V_{IH}	2.0			Volts	
LOGIC OUTPUTS					
V_{OL}			0.4	Volts	I_{OUT}= -3.2mA
V_{OH}	2.4			Volts	I_{OUT}= 1.0mA
RS-485 DRIVER					
DC Characteristics					
TTL Input Levels					
V_{IL}			0.8	Volts	
V_{IH}	2.0			Volts	
Outputs					
Open Circuit Voltage			6.0	Volts	
Differential Output	1.5		5.0	Volts	R_L=54Ω, C_L=50pF
Balance			±0.2	Volts	$\|V_T\| - \|\overline{V_T}\|$
Common-Mode Output			3.0	Volts	
Output Current	28.0			mA	R_L=54Ω
Short Circuit Current			±250	mA	Terminated in –7V to +12V
AC Characteristics					
Maximum Data Rate	5			Mbps	R_L=54Ω
Output Transition Time		30		ns	Rise/fall time, 10%–90%
Propagation Delay					See Figures 3 and 5
t_{PHL}		60	100	ns	R_{DIFF}=54Ω, C_{L1}=C_{L2}=100pF
t_{PLH}		60	100	ns	R_{DIFF}=54Ω, C_{L1}=C_{L2}=100pF
Driver Output Skew		5	15	ns	see Figure 3 and 5, $t_{SKEW} = \| t_{DPLH} - t_{DPHL} \|$
RS-485 RECEIVER					
DC Characteristics					
TTL Output Levels					
V_{OL}			0.4	Volts	
V_{OH}	2.4			Volts	
Tri-State Output Current			±1	µA	0.4V≤V_{OUT}≤2.4V; $\overline{RE}$ = V_{CC}
Inputs					
Common Mode Range	–7.0		+12.0	Volts	
Receiver Sensitivity			±0.2	Volts	–7V ≤ V_{CM} ≤ +12V
Input Impedance	120	150		kΩ	–7V ≤ V_{CM} ≤ +12V

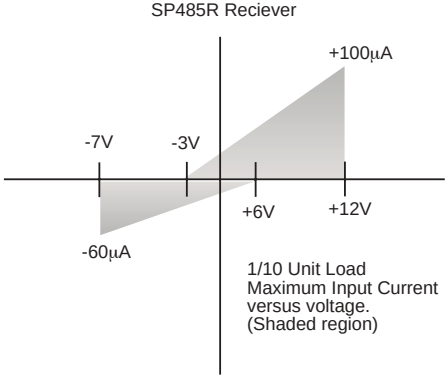
ELECTRICAL CHARACTERISTICS

Typically 25°C @ Vcc = +5V unless otherwise noted.

	MIN.	TYP.	MAX.	UNITS	CONDITIONS
AC Characteristics					
Maximum Data Rate	1			Mbps	
Propagation Delay					See Figures 3 and 7
t_{PHL}			1200	ns	R_{DIFF}=54Ω, C_{L1}=C_{L2}=100pF
t_{PLH}			1200	ns	R_{DIFF}=54Ω, C_{L1}=C_{L2}=100pF
Differential Receiver Skew		60		ns	$\lvert t_{PLH} - t_{PHL} \rvert$; R_{DIFF}=54Ω, C_{L1}=C_{L2}=100pF, see Figures 3 and 7
SHUTDOWN TIMING (SP481R)					
Time to Shutdown	50		600	ns	$\overline{RE}$ = V_{CC}, DE = 0V
RS-485 Driver					
Enable Time					See Figures 4 and 6
Enable to Low		40	500	ns	C_L=15pF, S_1 Closed
Enable to High		40	500	ns	C_L=15pF, S_2 Closed
Disable Time					See Figures 4 and 6
Disable From Low		40	500	ns	C_L=15pF, S_1 Closed
Disable From High		40	500	ns	C_L=15pF, S_2 Closed
RS-485 Receiver					
Enable Time					See Figures 2 and 8
Enable to Low		40	500	ns	C_L=15pF, S_1 Closed
Enable to High		40	500	ns	C_L=15pF, S_2 Closed
Disable Time					See Figures 2 and 8
Disable From Low		40	500	ns	C_L=15pF, S_1 Closed
Disable From High		40	500	ns	C_L=15pF, S_2 Closed
POWER REQUIREMENTS					
Supply Voltage V_{CC}	+4.75		+5.25	Volts	
Supply Current I_{CC}					
No Load		300	500	µA	$\overline{RE}$ = V_{CC} or 0V, DE = 0V
No Load		500	900	µA	$\overline{RE}$ = V_{CC} or 0V, DE = V_{CC}
Supply Current in Shutdown		0.5	10	µA	$\overline{RE}$ = V_{CC}, DE = ØV
ENVIRONMENTAL					
Operating Temperature					
Commercial (..C..)	0		+70	°C	
Industrial (..E..)	–40		+85	°C	
Storage Temperature	–65		+150	°C	

RECEIVER INPUT GRAPH





TEST CIRCUITS

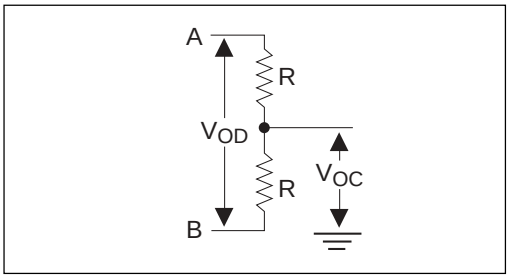


Figure 1. Driver DC Test Load Circuit

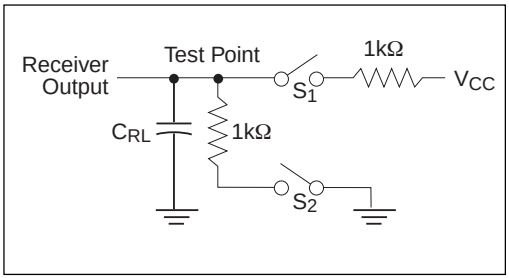


Figure 2. Receiver Timing Test Load Circuit

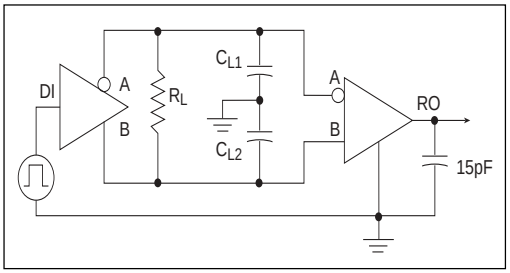


Figure 3. Driver/Receiver Timing Test Circuit

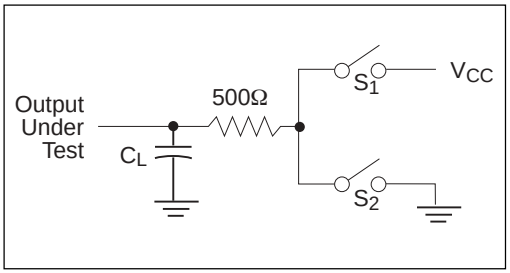


Figure 4. Driver Timing Test Load #2 Circuit

SWITCHING WAVEFORMS

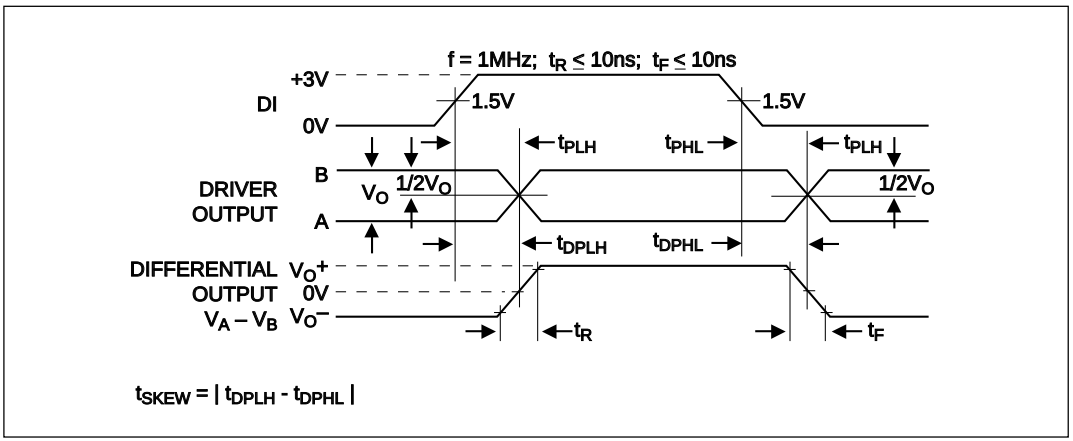


Figure 5. Driver Propagation Delays

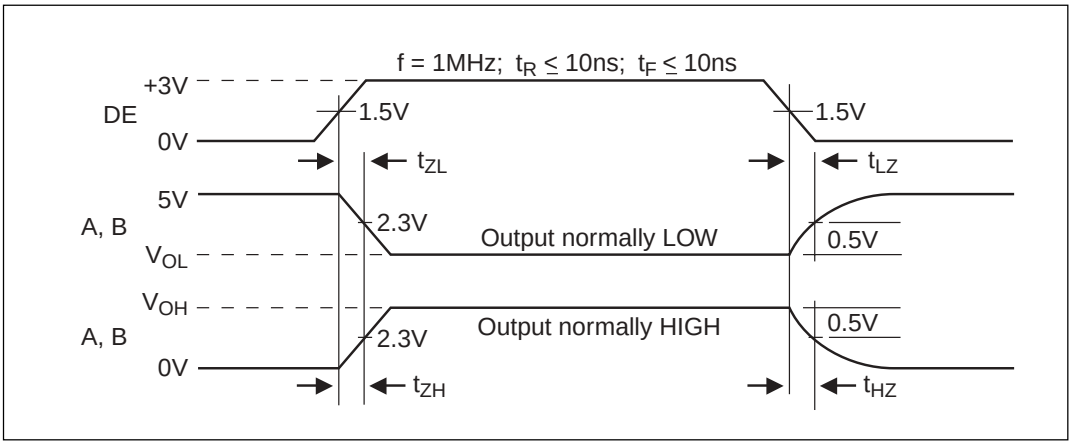


Figure 6. Driver Enable and Disable Times

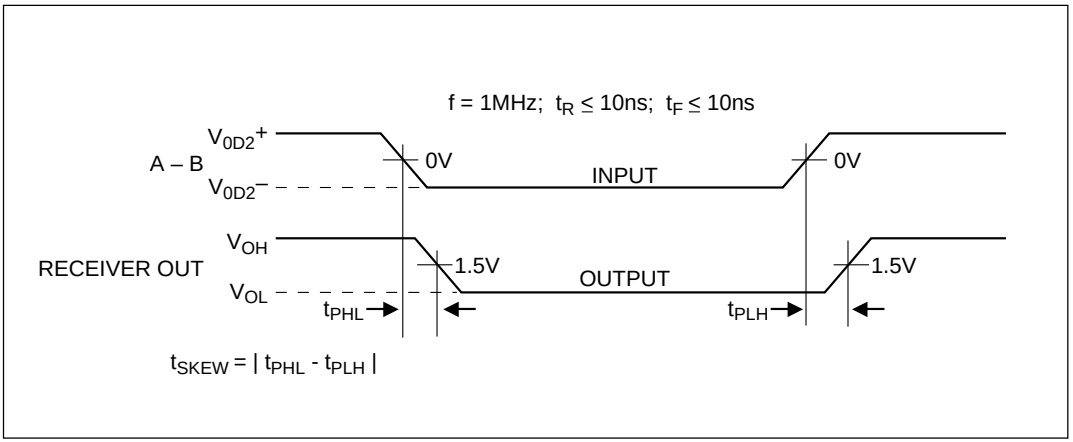


Figure 7. Receiver Propagation Delays

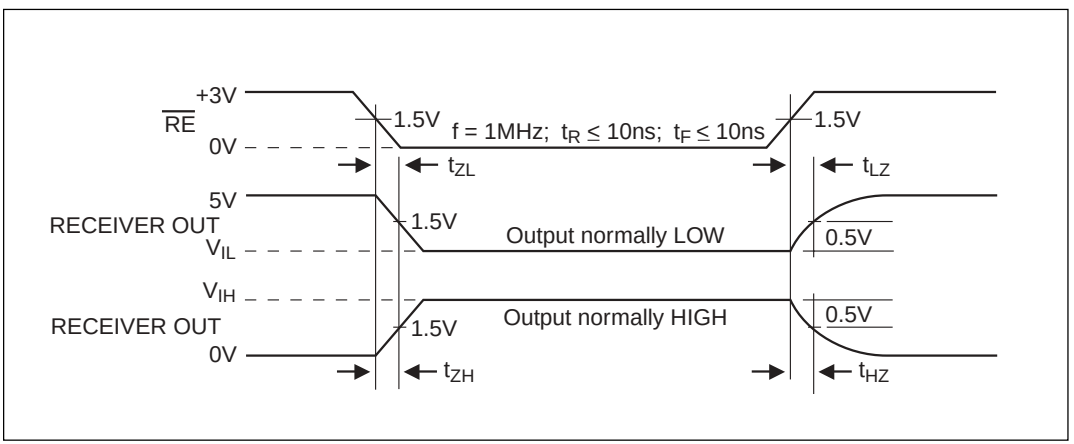


Figure 8. Receiver Enable and Disable Times

GENERAL DESCRIPTION

The **SP485R** is a low power RS-485 differential transceiver. Similar to the SP485, the **SP485R** contains a half-duplex driver and receiver with tri-state control. However, the SP485R is intended for increased connections on a single bus compared to the orignal RS-485 specification.

The RS-485 standard is ideal for multi-drop applications where one bus can contain many drivers and/or receivers. The RS-485 standard implementation allows up to 32 transceivers to be connected on to the data bus. RS-485 is also specified for driving higher speeds over long cable lengths of up to 4,000 feet. The SP485R and SP481R exceed the standard b allowing up to 400 receivers to share a bus.

DRIVERS

The driver output complies with the RS-485 electrical characteristics as specified by the standard. The output swings from 0V to V_{CC} and maintains greater than +1.5V with a 54Ω load attached between the two outputs. In adhering to the RS-485 specification, the driver outputs inherently comply with the RS-422 standard. With a load of 100Ω between the two outputs, the driver can sustain at least +2.0V.

The driver contains an enable pin (DE) which tri-states the output when DE is a logic LOW. The outputs during the tri-stated condition are at a high impedance (>100kΩ). A logic HIGH enables the driver for normal operation. The driver can operate to at least 5Mbps.

RECEIVERS

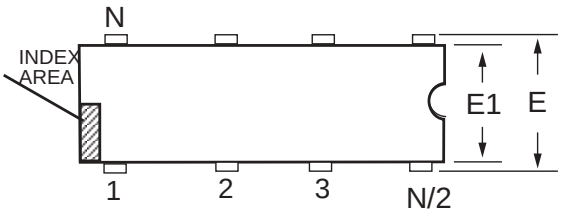
The **SP485R** receiver has differential inputs with an input sensitivity of lower than ±200mV. As mentioned above, the RS-485 specification allows up to 32 transceivers on a the same bus. The **SP485R** allows over 400 transceivers on the same bus due to the high input impedance of at least 120kΩ. This higher capacity allows more components to be attached to the same bus without degrading the signal quality. The drivers are still able to drive an equivalent 54Ω from the 320 transceivers with an input impedance of at least 120kΩ in parallel along with the two 125Ω cable termination resistors on each end.

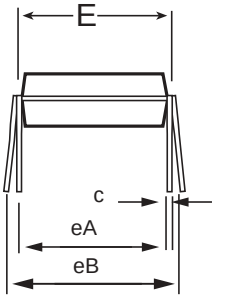
The receiver contains a enable pin ($\overline{RE}$) which enables the receiver when a logic LOW is asserted. A logic HIGH will tri-state the receiver output and the inputs will maintain at least 120kΩ impedance. The receiver can operate to at least 1Mbps.

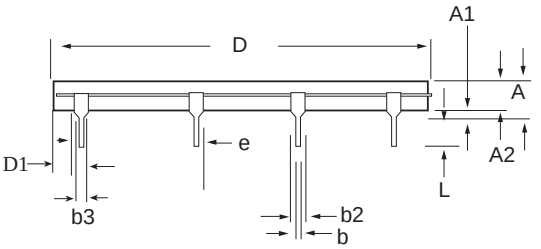
The receiver also contains a fail-safe feature which outputs a logic HIGH when the inputs are open as in a disconnected cable.

SHUTDOWN MODE

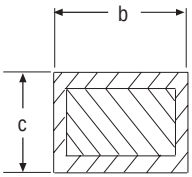
The **SP481R** includes a shutdown function to reduce power consumption. The shutdown is activated by simultaneously applying a logic LOW to DE and a logic HIGH to $\overline{RE}$. While in the shutdown mode, the power supply current is typically less than 1µA. The driver outputs are disabled and are at a high impedance state determined by the receiver input impedance which should be at least 120kΩ. The receiver output is at also at high impedance during shutdow. Output leakage current when the receiver is disabled is under 1µA.



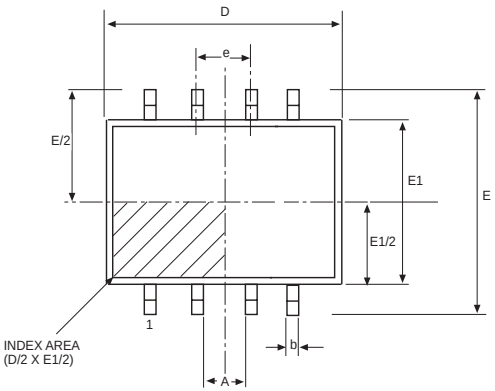




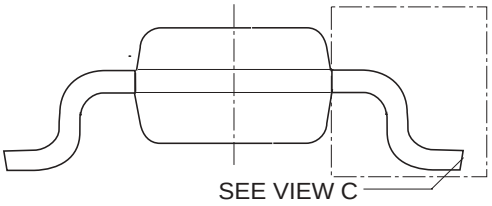
8 PIN PDIP JEDEC MS-001 (BA) Variation	Dimensions in inches		
	MIN	NOM	MAX
A	-	-	.210
A1	.015	-	-
A2	.115	.130	.195
b	.014	.018	.022
b2	.045	.060	.070
b3	.030	.039	.045
c	.008	.010	.014
D	.355	.365	.400
D1	.005	-	-
E	.300	.310	.325
E1	.240	.250	.280
e	.100 BSC		
eA	.300 BSC		
eB	-	-	.430
L	.115	.130	.150

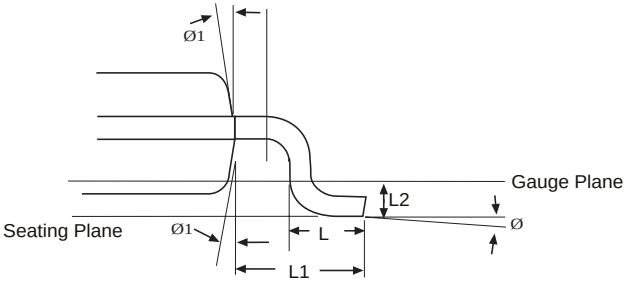


8 PIN PDIP

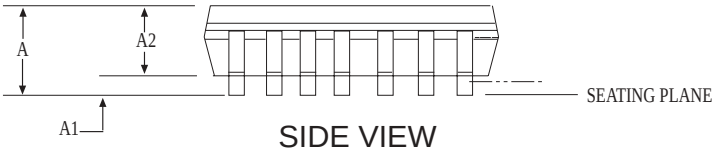


TOP VIEW



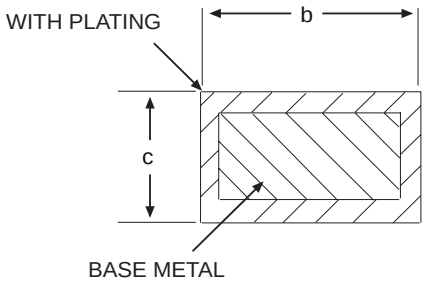


VIEW C



SIDE VIEW

DIMENSIONS Minimum/Maximum (mm)	8 Pin NSOIC (JEDEC MS-012, AA - VARIATION)		
COMMON HEIGHT DIMENSION			
SYMBOL	MIN	NOM	MAX
A	1.35	-	1.75
A1	0.10	-	0.25
A2	1.25	-	1.65
b	0.31	-	0.51
c	0.17	-	0.25
D	4.90 BSC		
E	6.00 BSC		
E1	3.90 BSC		
e	1.27 BSC		
L	0.40	-	1.27
L1	1.04 REF		
L2	0.25 BSC		
Ø	0º	-	8º
Ø1	5º	-	15º



CONTACT AREA

PACKAGE: 8 PIN NSOIC

ORDERING INFORMATION

Part Number	Temperature Range	Package Types
SP481RCP	0°C to +70°C	8 Pin PDIP
SP481RCN	0°C to +70°C	8 Pin NSOIC
SP481RCN/TR	0°C to +70°C	8 Pin NSOIC
SP481REP	-40°C to +85°C	8 Pin PDIP
SP481REN	-40°C to +85°C	8 Pin NSOIC
SP481REN/TR	-40°C to +85°C	8 Pin NSOIC
SP485RCP	0°C to +70°C	8 Pin PDIP
SP485RCN	0°C to +70°C	8 Pin NOIC
SP485RCN/TR	0°C to +70°C	8 Pin NOIC
SP485REP	-40°C to +85°C	8 Pin PDIP
SP485REN	-40°C to +85°C	8 Pin NOIC
SP485REN/TR	-40°C to +85°C	8 Pin NOIC

Available in lead free packaging. To order add "-L" suffix to part number.
Example: SP485REN/TR = standard; SP485REN-L/TR = lead free

/TR = Tape and Reel

Pack quantity is 2,500 for NSOIC.

REVISION HISTORY

DATE	REVISION	DESCRIPTION
6/21/04	A	Added extended temp range and tape and reel part numbers. Updated packaging specs.

Sipex Corporation

ANALOG EXCELLENCE

Sipex Corporation

Headquarters and
Sales Office
233 South Hillview Drive
Milpitas, CA 95035
TEL: (408) 934-7500
FAX: (408) 935-7600

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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- Экспресс доставка в любую точку России;
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- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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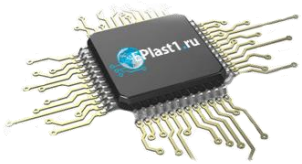
- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.