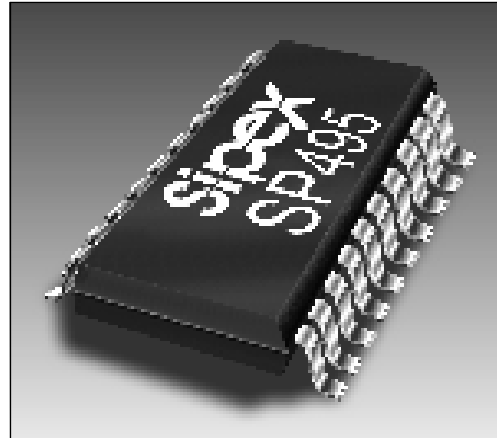Sipex

SP495

Quad Differential RS-485 Transceiver

- ■ Pinout for SCSI Interface
- ■ Meets EIA-485 Standard for Multipoint Bus Transmission
- ■ +5V-Only Power Supply Required
- ■ Receiver Fail-Safe Mode
- ■ Low Power BiCMOS Technology
- ■ Glitch-Free Power-Up/Down
- ■ Available in 20-Pin Plastic SOIC
- ■ Pin Compatible with DS36954

DESCRIPTION…

The **SP495** is a quad differential line driver/receiver meeting both RS-485 and RS-422 standards at data rates beyond 10Mbps. The **SP495** features three half-duplex transceivers suitable for data bus connections and a fourth full-duplex transceiver with independent driver, receiver enables. Ideal for use as a control bus transceiver. A complete SCSI initiator or target interface can be implemented using five **SP495**s. Propagation Delay Skew is tightly specified to aid in parallel interface designs. The **SP495** is available in a 20-pin plastic SOIC package for operation over the commercial and industrial temperature ranges. For PLCC availability, please consult factory.
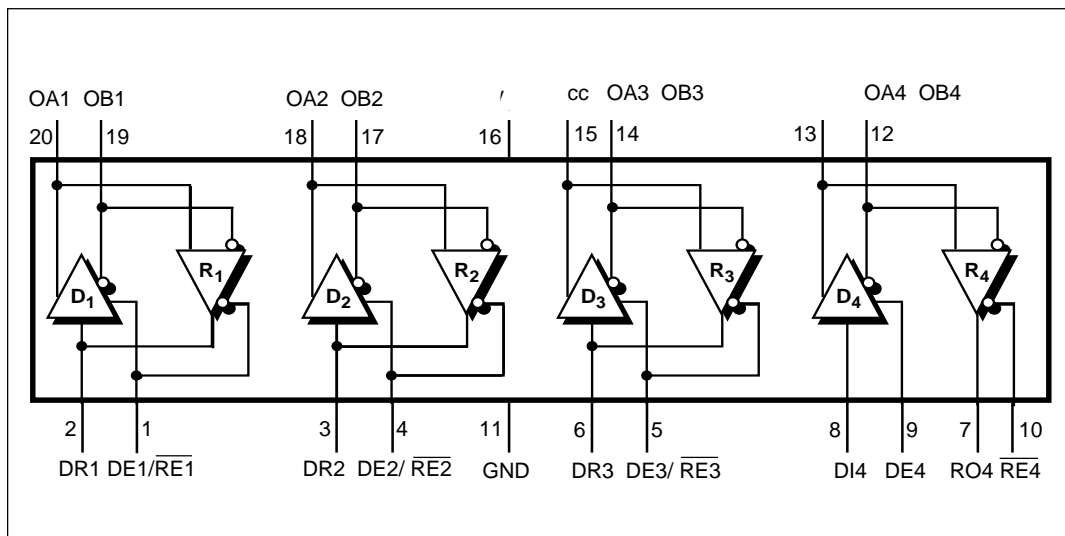
ABSOLUTE MAXIMUM RATINGS

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..-0.5V to (V_{CC}+0.5V)
    Receivers...15V
Output Voltages
    Logic..-0.5V to (V_{CC}+0.5V)
    Drivers..-8V to 12.5V
    Receivers...-0.5V to (V_{CC}+0.5V)
Storage Temperature...-65°C to +150°C
Power Dissipation...1000mW

SPECIFICATIONS

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

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
DRIVER					
DC Characteristics					
Differential Output Voltage	GND		V_{CC}	Volts	Unloaded; R = ∞ ; *see Figure 1*
Differential Output Voltage	2		V_{CC}	Volts	With Load; R = 50Ω; (RS-422); *see Figure 1*
Differential Output Voltage	1.5		V_{CC}	Volts	With Load; R = 27Ω; (RS-485); *see Figure 1*
Change in Magnitude of Driver Differential Output Voltage for					
Complimentary States	0.2			Volts	R = 27Ω or R = 50Ω; *see Figure 1*
Driver Common-Mode Output Voltage			3	Volts	R = 27Ω or R = 50Ω; *see Figure 1*
Input High Voltage	2.0			Volts	Applies to DRx, DEx/ $\overline{REx}$
Input Low Voltage			0.8	Volts	Applies to DRx, DEx/ $\overline{REx}$
Input Current			±10	µA	Applies to DRx, DEx/ $\overline{REx}$
Driver Short-Circuit Current					
V_{OUT} = HIGH			±250	mA	-7V ≤ V_O ≤ 10V
V_{OUT} = LOW			±250	mA	-7V ≤ V_O ≤ 10V
DRIVER					
AC Characteristics					
Maximum Driver Data Rate	10			Mbps	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF
Driver Input to Output	20	30	60	ns	t_{PLH}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF; *see Figures 3 and 6*
Driver Input to Output	20	30	60	ns	t_{PHL}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF; *see Figures 3 and 6*
Driver Skew		10		ns	*see Figures 3 and 6*
Driver Rise or Fall Time	3	15	40	ns	From 10% to 90%; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF; *see Figures 3 and 6*
Driver Enable to Output HIGH		40	70	ns	C_{L1} = C_{L2} = 100pF; *see Figures 4 and 7;* S_2 closed
Driver Enable to Output LOW		40	70	ns	C_{L1} = C_{L2} = 100pF; *see Figures 4 and 7;* S_1 closed
Driver Disable Time from LOW		40	70	ns	C_{L1} = C_{L2} = 15pF; *see Figures 4 and 7;* S_1 closed
Driver Disable Time from HIGH		40	70	ns	C_{L1} = C_{L2} = 15pF; *see Figures 4 and 7;* S_2 closed
RECEIVER					
DC Characteristics					
Differential Input Threshold	-0.2		+0.2	Volts	-7V ≤ V_{CM} ≤ 12V
Input Hysteresis		70		mV	V_{CM} = 0V
Output Voltage HIGH	3.5			Volts	I_O = -4mA, V_{ID} = +200mV

SPECIFICATIONS (continued)

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

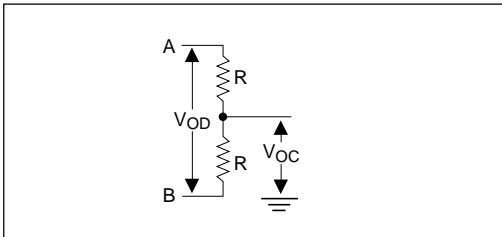| PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
RECEIVER					
DC Characteristics					
Output Voltage LOW			0.4	Volts	I_O = +4mA, V_{ID} = -200mV
Three State (high impedance)					
Output Current		±0.5	10	µA	0.4V ≤ V_O ≤ 2.4V; DEx/ $\overline{REx}$ = 5V
Input Resistance	12	15		kΩ	-7V ≤ V_{CM} ≤ 12V
Input 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			85	mA	0V ≤ V_O ≤ V_{CC}
RECEIVER					
AC Characteristics					
Maximum Data Rate	10			Mbps	DEx/ $\overline{REx}$ = 0V
Receiver Input to Output		60	200	ns	t_{PLH}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF; *Figures 3 & 8*
Receiver Input to Output		60	200	ns	t_{PHL}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF; *Figures 3 & 8*
Diff. Receiver Skew It_{PLH}-t_{PHL}I		13		ns	R_{DIFF} = 54Ω; C_{L1} = C_{L2} = 100pF; *Figures 3 & 8*
Receiver Enable to Output LOW		45	70	ns	C_{RL} = 15pF; *Figures 2 and 9*; S_1 closed
Receiver Enable to Output HIGH		45	70	ns	C_{RL} = 15pF; *Figures 2 and 9*; S_2 closed
Receiver Disable from LOW		45	70	ns	C_{RL} = 15pF; *Figures 2 and 9*; S_1 closed
Receiver Disable from HIGH		45	70	ns	C_{RL} = 15pF; *Figures 2 and 9*; S_2 closed
POWER REQUIREMENTS					
Supply Voltage	+4.75		+5.25	Volts	
Supply Current		2	5	mA	DEx/ $\overline{REx}$, DRx = 0V or V_{CC}
ENVIRONMENTAL AND					
MECHANICAL					
Operating Temperature					
Commercial (_C_)	0		+70	°C	
Industrial (_E_)	-40		+85	°C	
Storage Temperature	-65		+150	°C	
Package					
Plastic LCC (_L)					

Figure 1. Driver DC Test Load Circuit
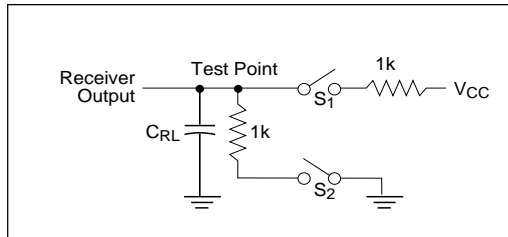
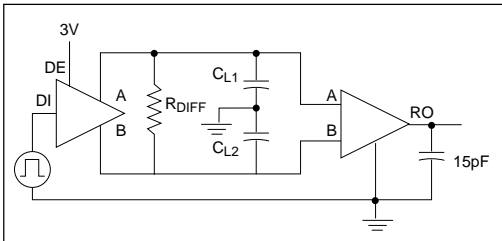*Figure 2. Receiver Timing Test Load Circuit*

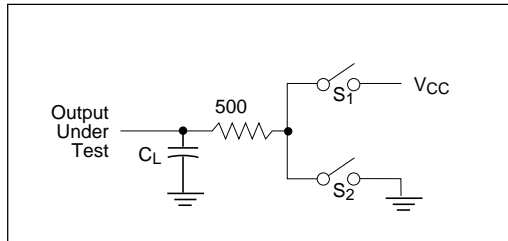*Figure 3. Driver/Receiver Timing Test Circuit*

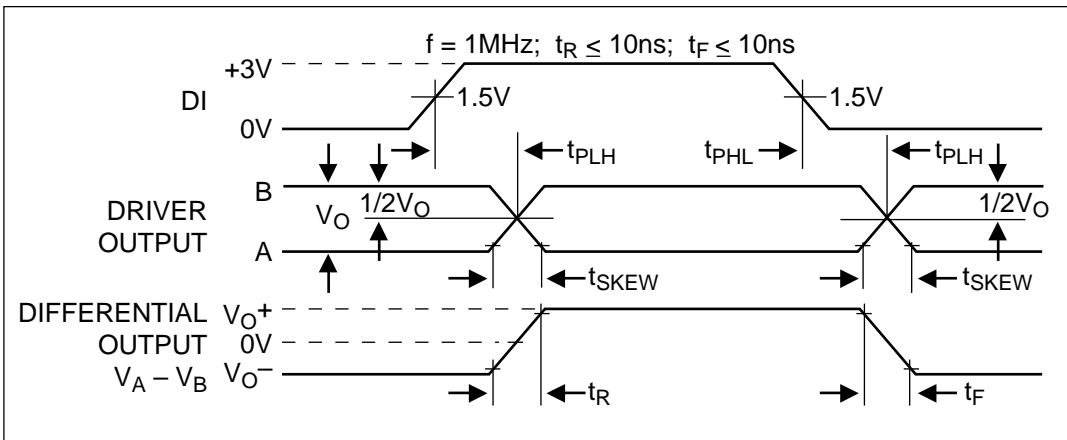*Figure 4. Driver Timing Test Load #2 Circuit*

Figure 6. Driver Propagation Delays

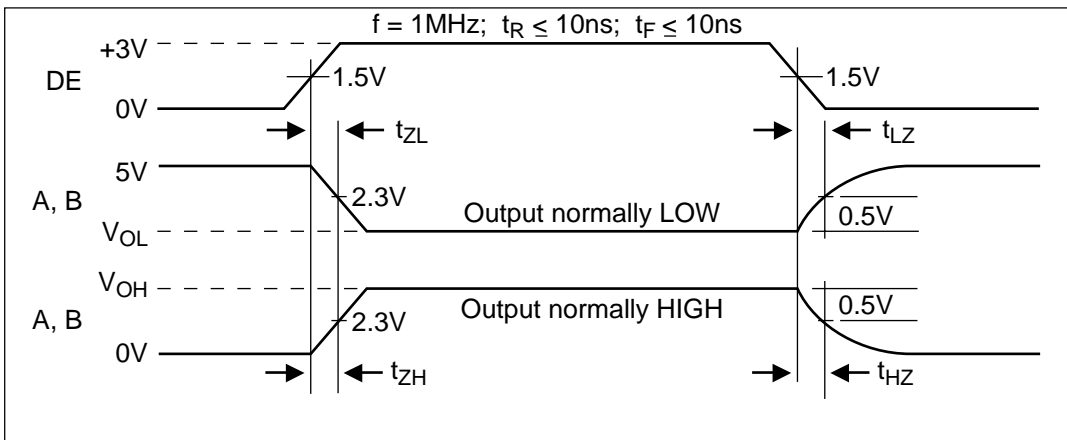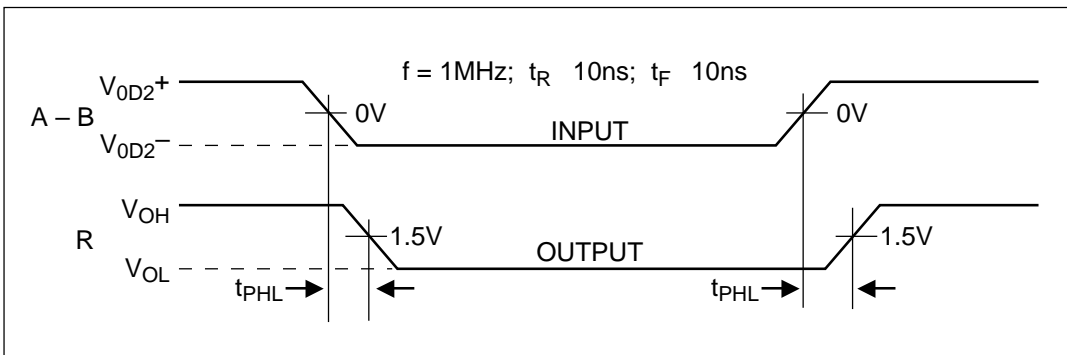*Figure 7. Driver Enable and Disable Times*

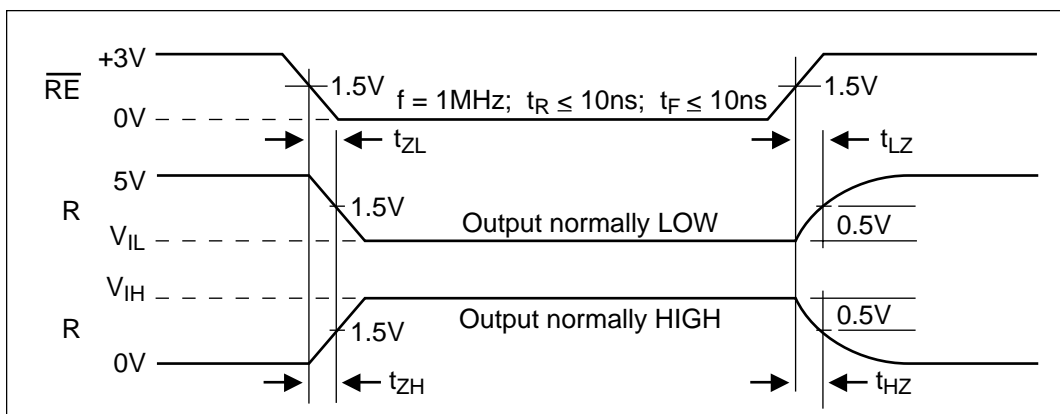*Figure 8. Receiver Propagation Delays*

Figure 9. Receiver Enable and Disable Times

DESCRIPTION

General Description...

The **SP495** is a quad differential transceiver that meets the requirements of RS-485, RS-422, and differential SCSI at data rates to beyond 10Mbps. Fabricated with a proprietary Sipex BiCMOS process, the **SP495** requires only a fraction of the power of older bipolar designs.

The **SP495** features three half-duplex transceivers suitable for data bus connections and a fourth full-duplex transceiver with independent enables ideal for use as a control bus transceiver. A complete SCSI initiator or target interface can be implemented using five **SP495**s.

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 single 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 specified for operation with a wide (-7V to +12V) common mode range to accommodate ground potential differences. Because RS-485 is a low impedance differential interface, data is virtually immune to noise in the transmission line.

Drivers...

The differential drivers for the **SP495** have typical output voltage swings (no load) of 0 to +5Volts. With loading to the RS-485 specification (54Ω), drivers must maintain outputs greater than 1.5V.

The three half-duplex drivers of the **SP495** have independent Driver Enable control lines which are active HIGH. A logic HIGH on DEx (pins 1, 4, or 5 of the **SP495**) will enable the addressed differential driver output. A logic LOW on DEx will tri-state the driver output and enable the receiver. The fourth driver is controlled by its own DE4 Enable line and can be used in half-duplex or full-duplex modes.

Receivers...

The differential receivers for the **SP495** have an input sensitivity of ±200mV. Input impedance is typically 15kΩ (12kΩ minimum). A wide common mode range of -7V to +12V allows for large ground potential differences between widely separated systems. These receivers are equipped with a fail-safe feature which guarantees that the receiver output will be in a HIGH state when the input is left unconnected (note: this feature operates with floating inputs, not terminated inputs).

Like the half-duplex drivers, the three half-duplex receivers of the **SP495** have independent Receiver Enable control lines which are active LOW. A logic LOW on $\overline{RE}x$ (pins 1, 4, or 5 of the **SP495**) enables the differential receivers. A logic HIGH on $\overline{RE}x$ tri-states the receivers. The fourth receiver is controlled by its own RE4 Enable line and can be used in half-duplex or full-duplex modes.

ORDERING INFORMATION

Model	Temperature Range	Package
SP495CT.	0˚C to +70˚C	20-Pin SOIC
SP495ET	-40˚C to +85˚C	20-Pin SOIC

For PLCC availability, please consult factory.

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