GENERAL DESCRIPTION

The **SP26LV432** is a quad differential line receiver with three-state outputs designed to meet the EIA specifications of the RS-422 serial protocol. The **SP26LV432** features Exar's BiCMOS process allowing low power operational characteristics of CMOS technology while meeting all of the demands of the RS-422 serial protocol at 50Mbps under load. The RS-422 protocol allows up to 10 receivers to be connected to a multipoint bus transmission line. The **SP26LV432** features a receiver enable control common to all four receivers and a high-Z output with 6mA source and sink capability. Since the cabling can be as long as 4,000 feet, the RS-422 receivers of the **SP26LV432** are equipped with a wide (-7.0V to +7.0V) common-mode input voltage range to accommodate ground potential differences.

FEATURES

- Quad Differential Line Receivers
- Compatible with the EIA standard for RS-422 serial protocol
- High-Z Output Control
- Switching Rates Up to 50Mbps
- 14ns Typical Receiver Propagation Delays
- 60mV Typical Input Hysteresis
- Single +3.3V Supply Operation
- Common Receiver Enable Control
- 26LV32 industry standard footprint compatible
- Ideal For Use with SP26LV431, Quad Drivers
- -7.0V to +7.0V Common-Mode Input Voltage range

FIGURE 1. TYPICAL APPLICATION CIRCUIT

ENABLE	$\overline{\text{ENABLE}}$	INPUT	OUTPUT
LOW	HIGH	don't care	High - Z
HIGH	don't care	$V_{ID} \geq V_{TH}$ (max)	HIGH
HIGH	don't care	$V_{ID} \leq V_{TH}$ (min)	LOW
don't care	LOW	$V_{ID} \geq V_{TH}$ (max)	HIGH
don't care	LOW	$V_{ID} \leq V_{TH}$ (min)	LOW
HIGH	don't care	OPEN	HIGH
don't care	LOW	OPEN	HIGH

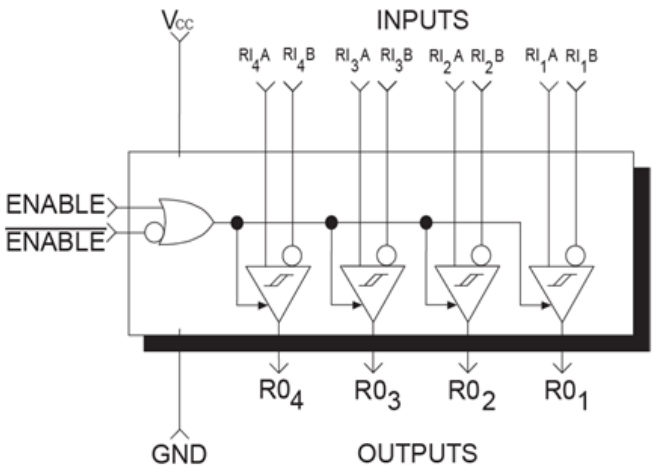
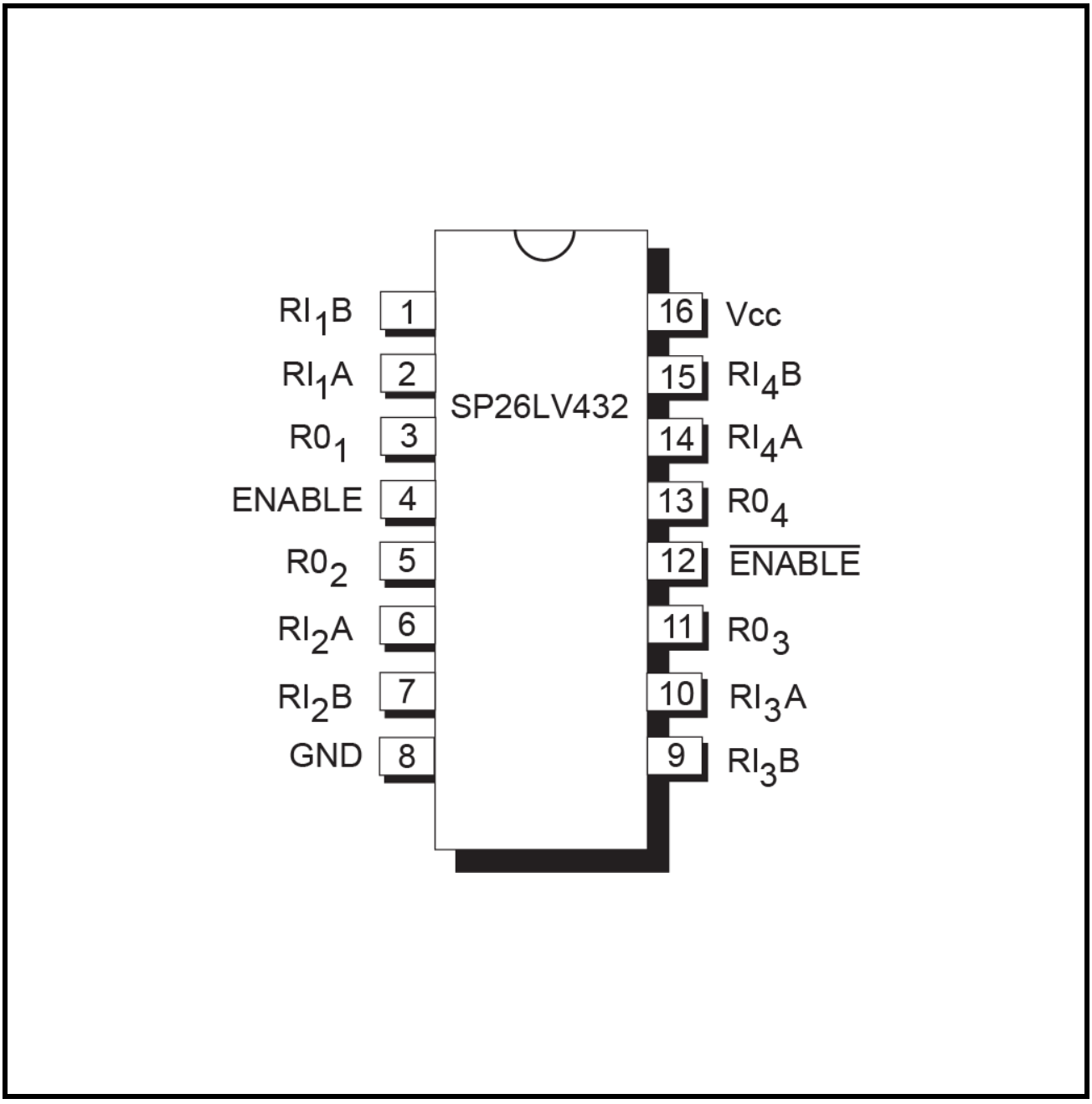


FIGURE 2. PIN OUT ASSIGNMENT



ORDERING INFORMATION

PART NUMBER	PACKAGE	OPERATING TEMPERATURE RANGE	DEVICE STATUS
SP26LV432CP-L	16-pin Plastic DIP	0°C to +70°C	Active
SP26LV432CN-L	16-pin Narrow SOIC	0°C to +70°C	Active
SP26LV432CN-L/TR	16-pin Narrow SOIC	0°C to +70°C	Active
SP26LV432EN-L	16-pin Narrow SOIC	-40°C to +85°C	Active
SP26LV432EN-L/TR	16-pin Narrow SOIC	-40°C to +85°C	Active

PIN DESCRIPTIONS

Pin Assignments

PIN NUMBER	PIN NAME	TYPE	DESCRIPTION
1	RI_1B	I	Inverted RS-422 receiver input.
2	R_1A	I	Non-inverted RS-422 Receiver input.
3	RO_1	O	TTL receiver output.
4	ENABLE	I	Receiver input enable, active HIGH.
5	RO_2	O	TTL receiver output.
6	RI_2A	I	Non-inverted RS-422 Receiver input.
7	RI_2B	I	Inverted RS-422 receiver input.
8	GND	Pwr	Ground.
9	RI_3B	I	Inverted RS-422 receiver input.
10	RI_3A	I	Non-inverted RS-422 Receiver input.
11	RO_3	O	TTL receiver output.
12	$\overline{\text{ENABLE}}$	I	Receiver input enable, active LOW.
13	RO_4	O	TTL receiver output.
14	RI_4A	I	Non-inverted RS-422 Receiver input.
15	RI_4B	I	Inverted RS-422 receiver input.
16	V_{CC}	Pwr	+3.0V to +3.6V power supply.

Pin type: I=Input, O=Output.

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 to the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability and cause permanent damage to the device.

V_{CC} (Supply Voltage)	7.0V
V_{CM} (Common Mode Range)	±14V
V_{DIFF} (Differential Input Voltage)	±14V
V_{IN} (Enable Input Voltage)	Vcc + 1.5V
T_{STG} (Storage Temperature Range)	-65°C to +150°C
I_O (Maximum Current Per Output)	±25mA
Storage Temperature Range	-65°C to + 150°C
Power Dissipation 16-pin PDIP (derate 14.3mW/°C above +70°C)	1150mW
Power Dissipation 16-pin NSOIC (derate 8.95mW/°C above +70°C)	725mW

CAUTION:

ESD (Electrostatic Discharge) sensitive device. Permanent damage may occur on unconnected devices subject to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts. Personnel should be properly grounded prior to handling this device. The protective foam should be discharged to the destination socket before devices are removed.

ELECTRICAL CHARACTERISTICS

UNLESS OTHERWISE NOTED: THE FOLLOWING SPECIFICATIONS APPLY FOR VCC = +3.0V TO +3.6V WITH TA = +25°C AND ALL MIN AND MAX LIMITS APPLY ACROSS THE RECOMMENDED OPERATING TEMPERATURE RANGE.

SYMBOL	PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
V_{CC}	Supply Voltage	3.0		3.6	V	
	Enable Input Rise or Fall Times		3		ns	
Input Electrical Characteristics						
V_{TH}	Minimum Differential Input Voltage	-200	50	+200	mV	$V_{OUT} = V_{OH}$ or V_{OL}, $-7V < V_{CM} < +7V$
R_{IN}	Input Resistance	5.0			kΩ	V_{IN} = -7V, +7V, +10V Other input = GND
I_{IN}	Input Current		+1.25	+1.5	mA	V_{IN} = +10V, Other input = GND
I_{IN}	Input Current		-1.5V	-2.5V	mA	V_{IN} = -10V, Other input = GND
$V_{IH(EN)}$	Minimum Enable HIGH Input Level Voltage	2.0			V	
$V_{IL(EN)}$	Maximum Enable LOW Input Level Voltage			0.8	V	
I_{EN}	Maximum Enable Input Current		±1.0		µA	$V_{IN} = V_{CC}$ or GND
V_{HYST}	Input Hysteresis		60		mV	V_{CM} = 0V
I_{CC}	Quiescent Supply Current		5	15	mA	V_{CC} = +3.3V, V_{DIFF} = +1V

UNLESS OTHERWISE NOTED: THE FOLLOWING SPECIFICATIONS APPLY FOR VCC = +3.0V TO +3.6V WITH TA = +25°C AND ALL MIN AND MAX LIMITS APPLY ACROSS THE RECOMMENDED OPERATING TEMPERATURE RANGE.

SYMBOL	PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Output Electrical Characteristics						
V_{OH}	Minimum HIGH Level Output Voltage	2.4	2.8		V	V_{CC} = +3.0V, V_{DIFF} = +1V, I_{OUT} = -6mA
V_{OL}	Maximum LOW Level Output Voltage		0.2	0.5	V	V_{CC} = +3.0V, V_{DIFF} = -1V, I_{OUT} = +6mA
I_{OZQ}	Maximum Tri-State Output Leakage Current		±0.5	±5.0	µA	V_{OUT} = V_{CC} or GND, ENABLE = V_{IL} , $\overline{ENABLE}$ = V_{IH}
Switching Characteristics						
t_{PLH}, t_{PHL}	Propagation Delays		14	35	ns	C_L = 50pF, V_{DIFF} = 2.5V, V_{CM} = 0V, V_{CC} = +3.3V
t_{RISE}, t_{FALL}	Output Rise and Fall Times		5	10	ns	C_L = 50pF, V_{DIFF} = 2.5V, V_{CM} = 0V, V_{CC} = +3.3V
t_{PZH}, t_{PZL}	Output Enable Time			40	ns	C_L = 50pF, R_L = 1000Ω, V_{DIFF} = 2.5V, V_{CC} = +3.3V
t_{PHZ}, t_{PLZ}	Output Disable Time			40	ns	C_L = 50pF, R_L = 1000Ω, V_{DIFF} = 2.5V, V_{CC} = +3.3V

FIGURE 3. SP26LV432 BLOCK DIAGRAM

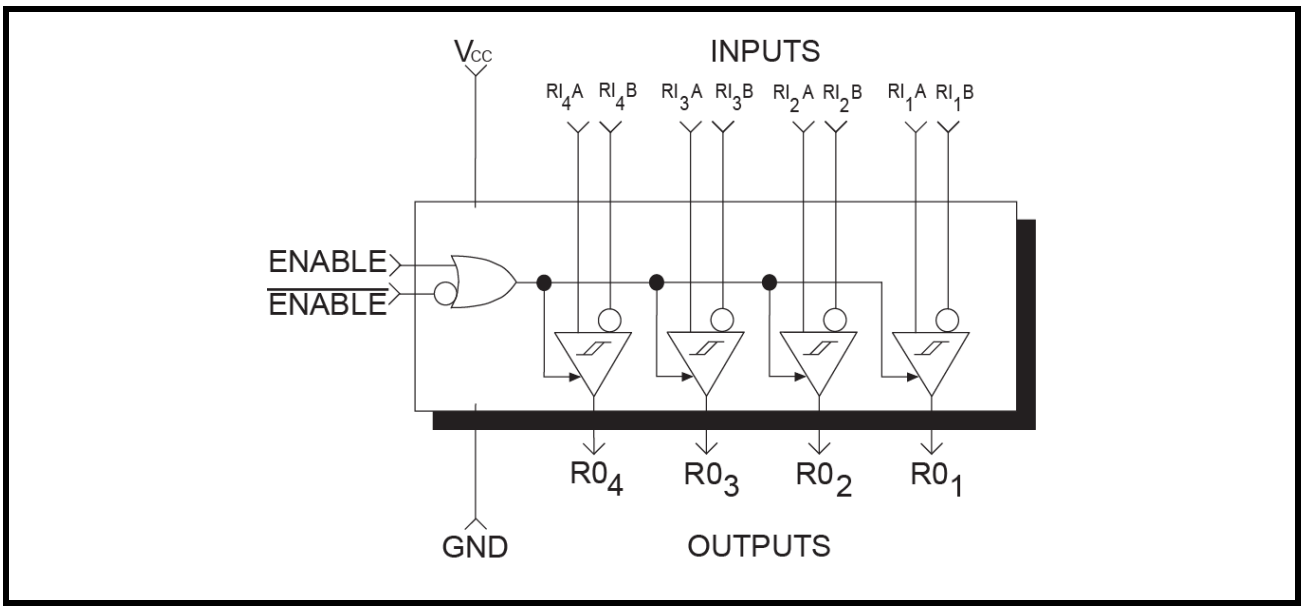


FIGURE 4. PROPAGATION DELAY

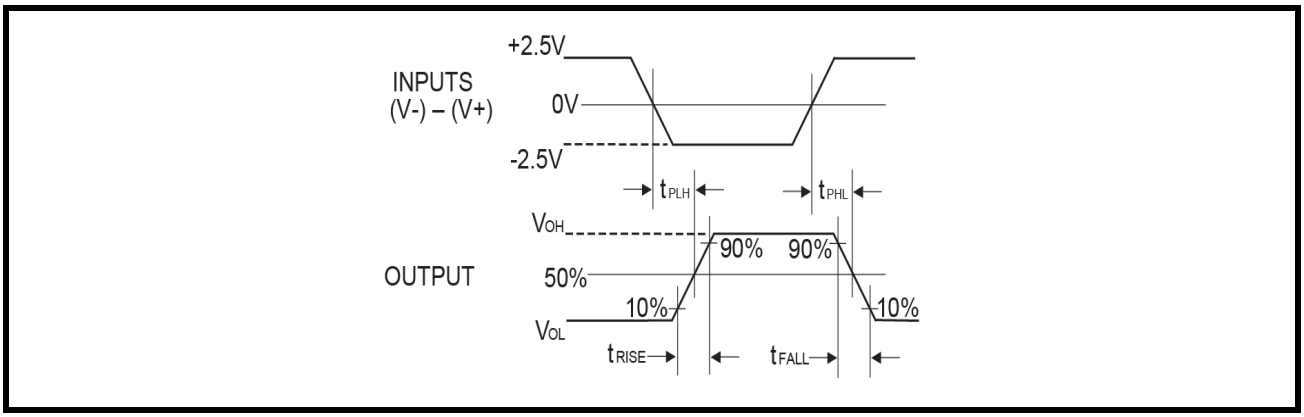


FIGURE 5. TEST CIRCUIT FOR HIGH-Z OUTPUT TIMING

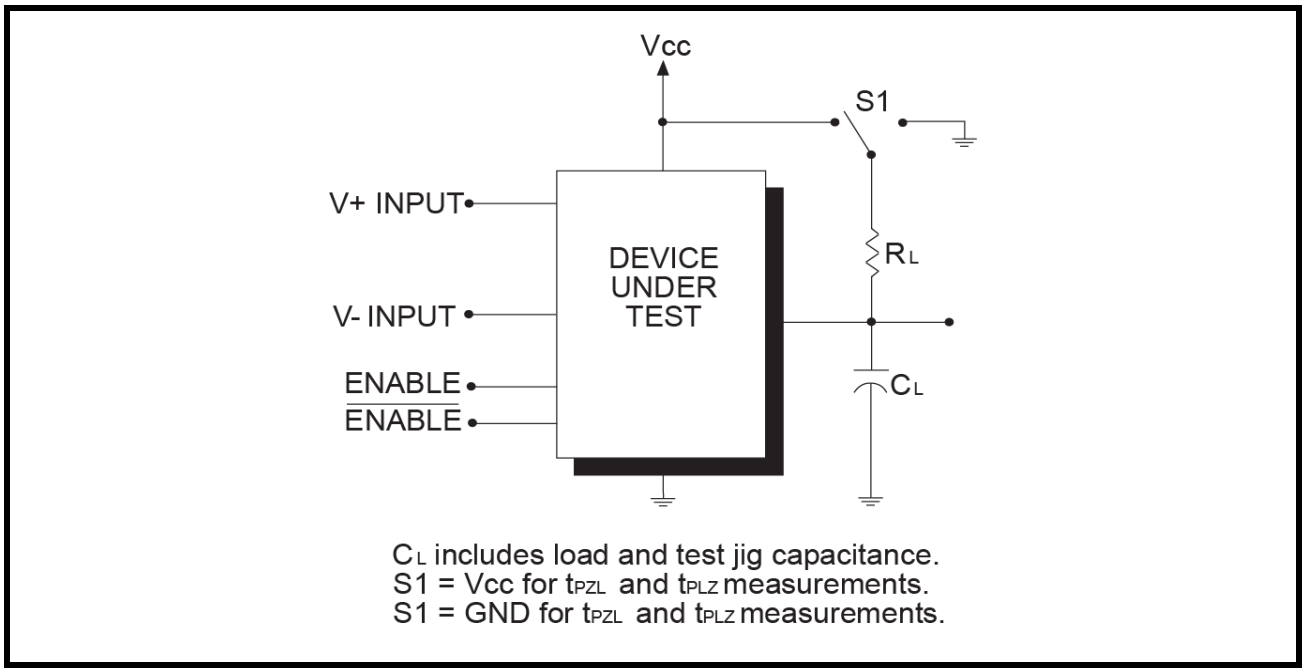


FIGURE 6. HIGH IMPEDANCE OUTPUT ENABLE AND DISABLE WAVEFORMS

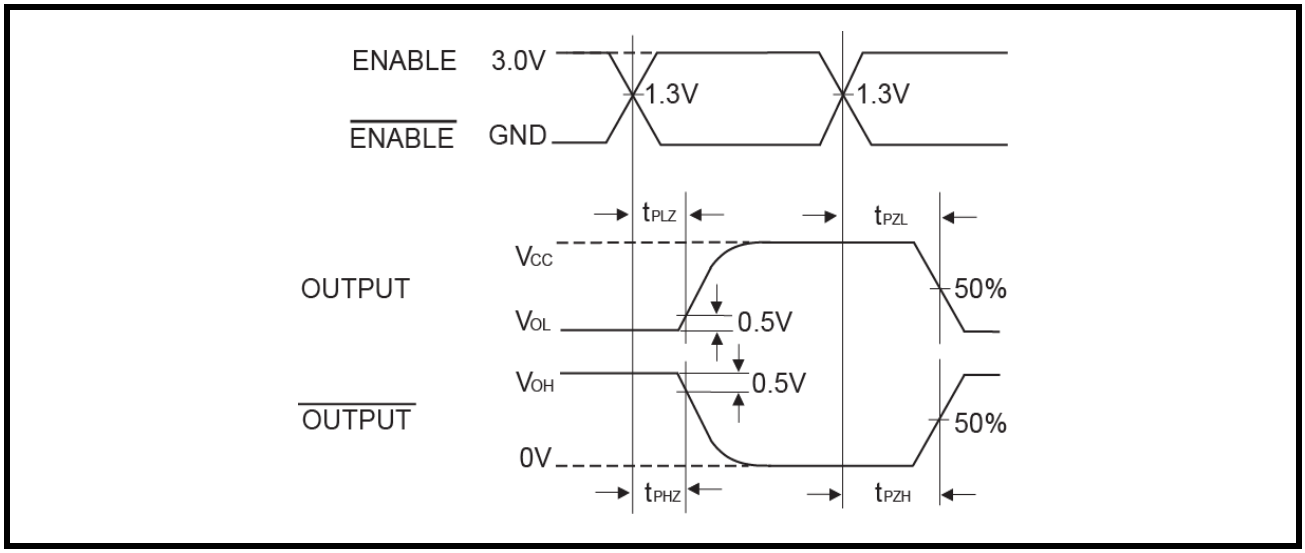


FIGURE 7. DIFFERENTIAL PROPAGATION DELAY VS TEMPERATURE

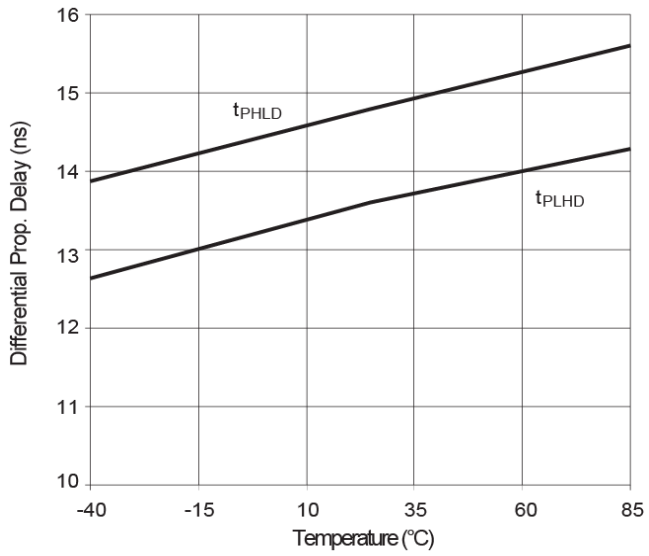


FIGURE 8. DIFFERENTIAL PROPAGATION DELAY VS SUPPLY VOLTAGE

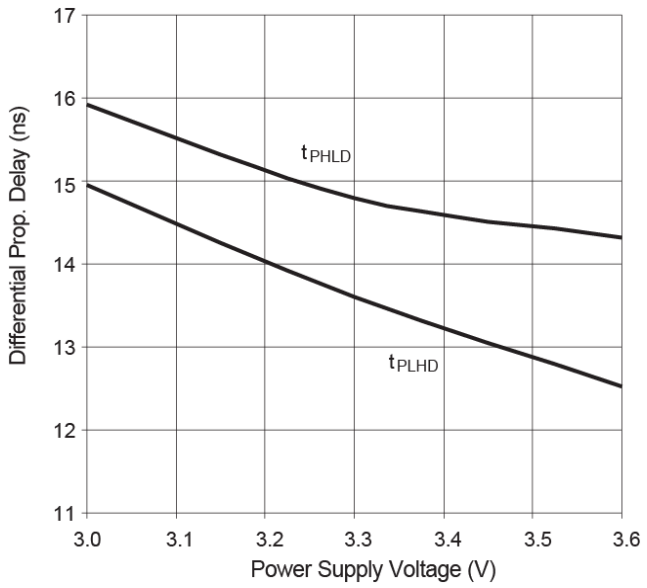


FIGURE 9. DIFFERENTIAL SKEW VS TEMPERATURE

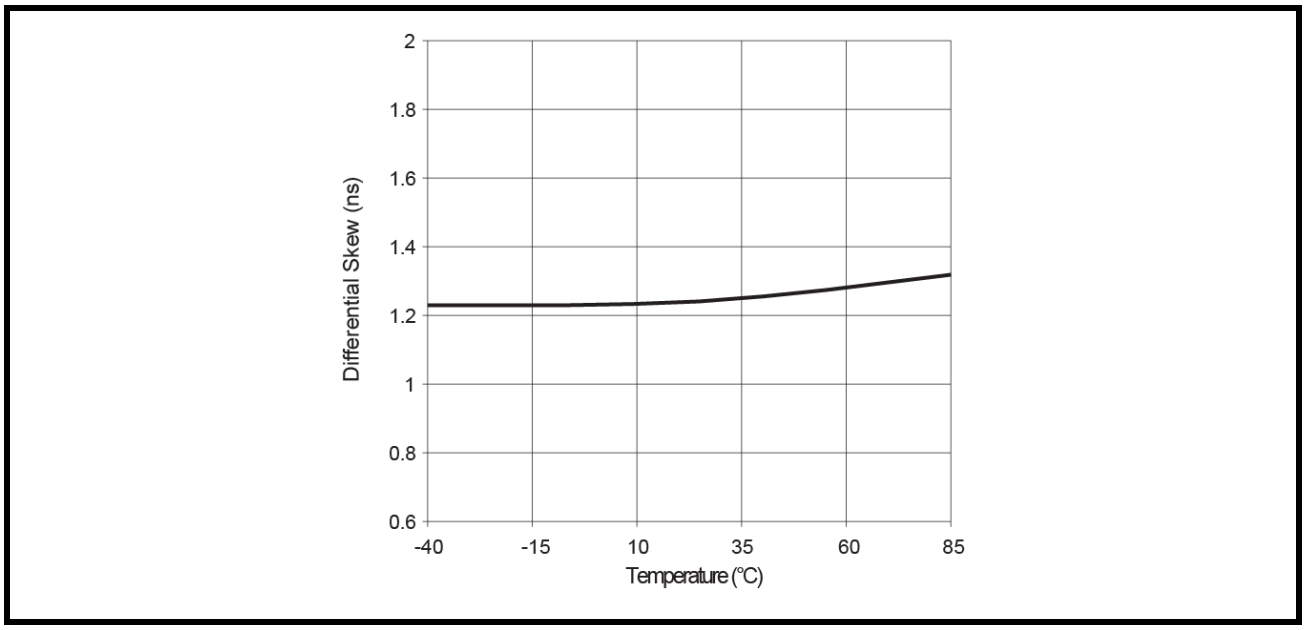


FIGURE 10. DIFFERENTIAL SKEW VS SUPPLY VOLTAGE

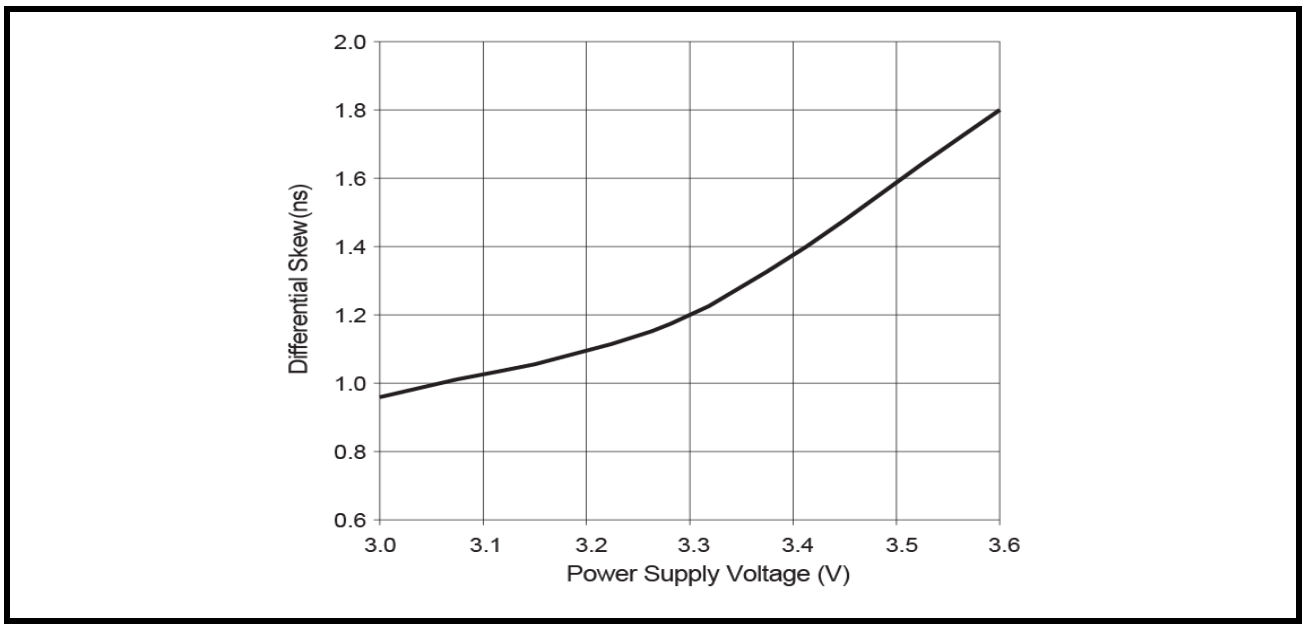


FIGURE 11. HIGH OUTPUT VOLTAGE VS CURRENT OVER TEMPERATURE

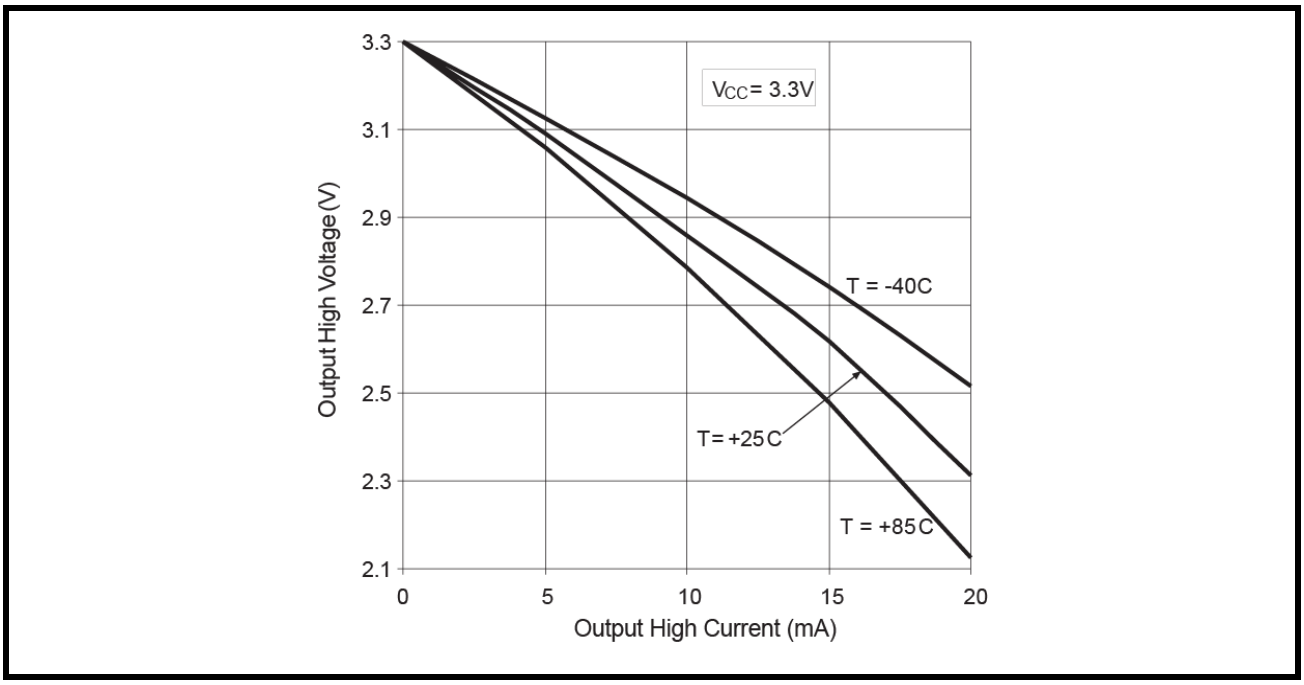


FIGURE 12. HIGH OUTPUT VOLTAGE VS CURRENT OVER SUPPLY VOLTAGE

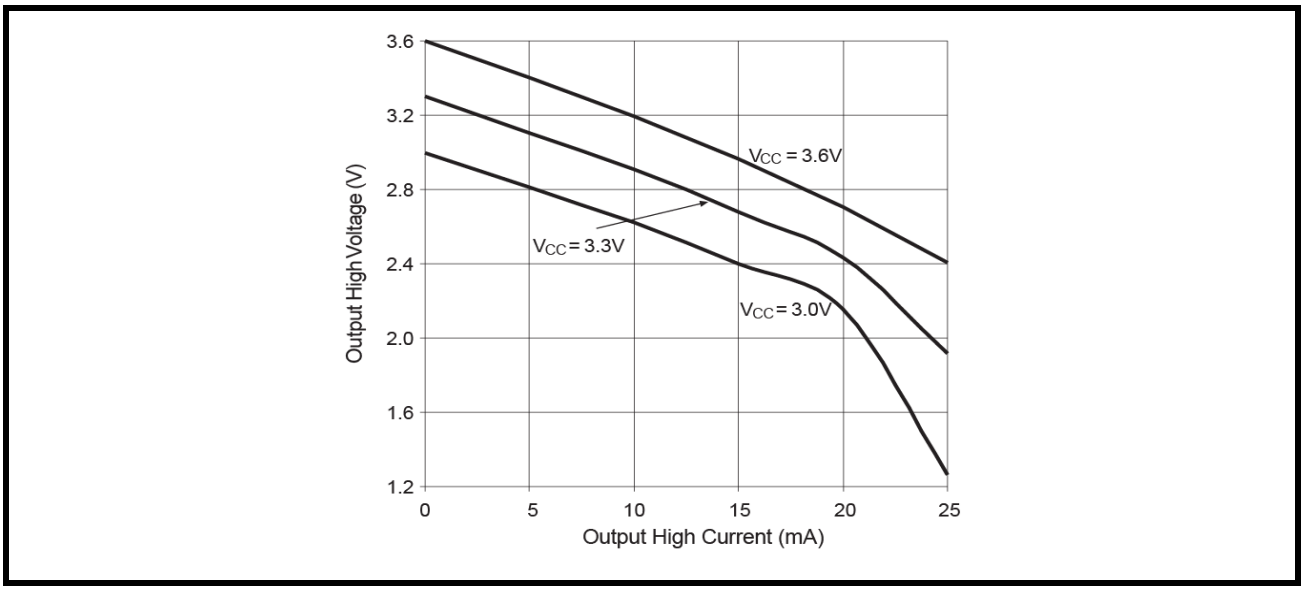


FIGURE 13. LOW OUTPUT VOLTAGE VS CURRENT OVER TEMPERATURE

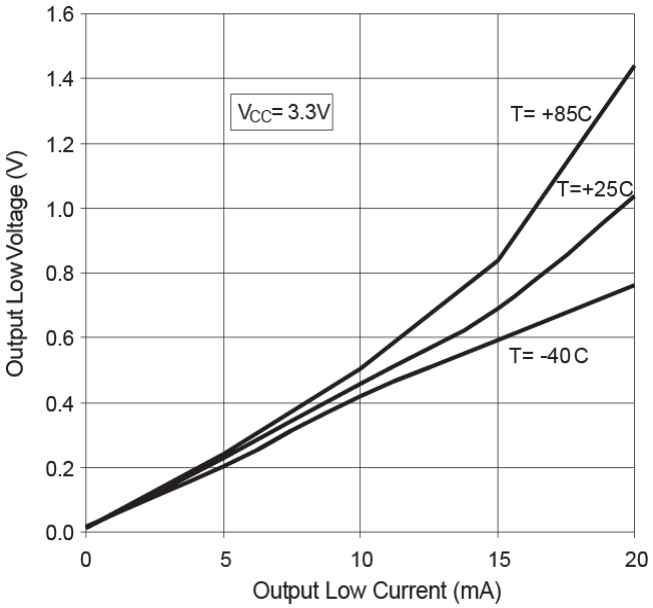


FIGURE 14. LOW OUTPUT VOLTAGE VS CURRENT OVER SUPPLY VOLTAGE

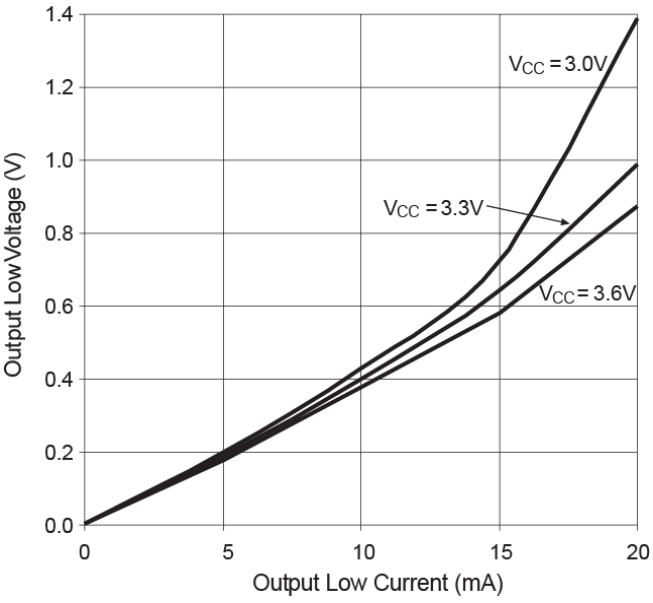


FIGURE 15. INPUT RESISTANCE VS INPUT VOLTAGE

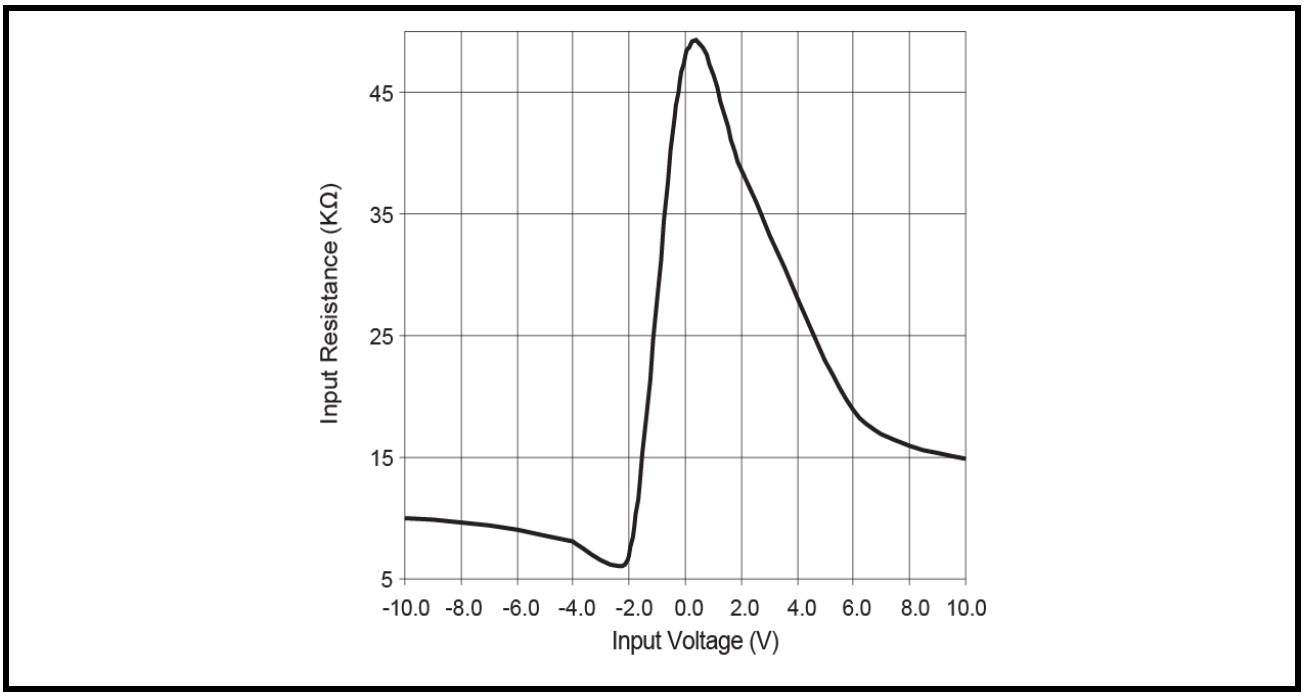


FIGURE 16. INPUT CURRENT VS SUPPLY VOLTAGE

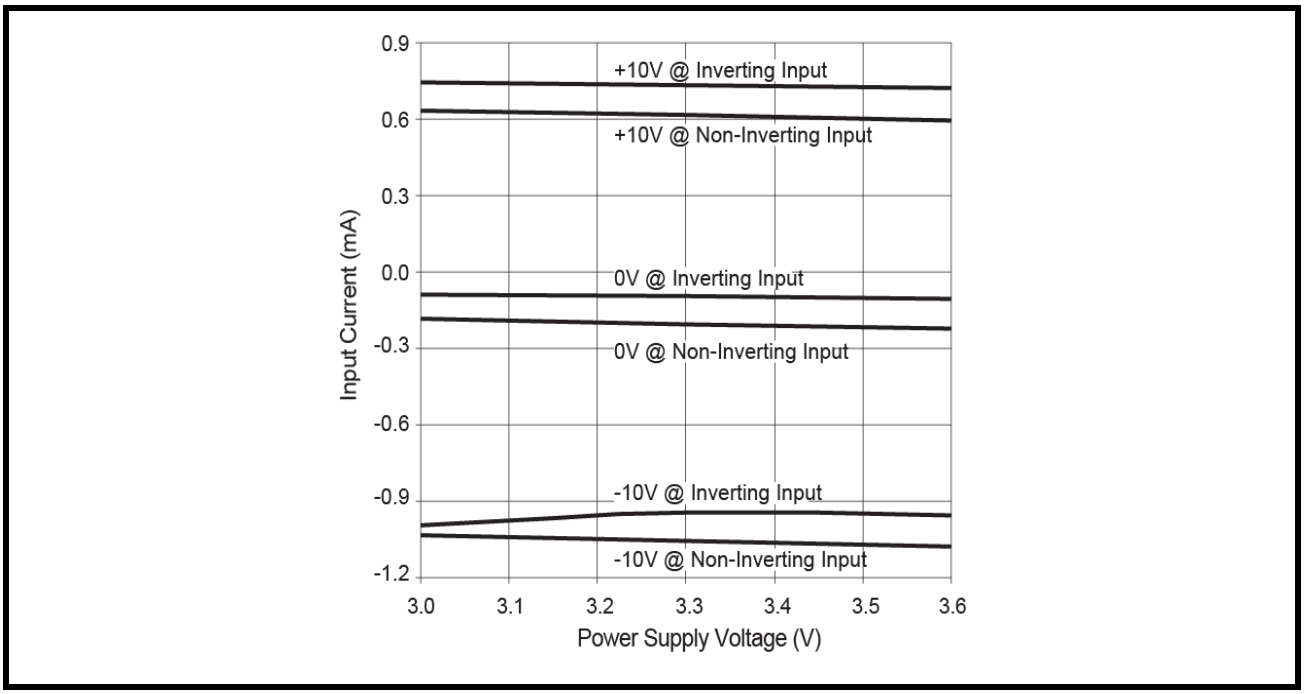


FIGURE 17. TRANSITION VOLTAGE VS TEMPERATURE

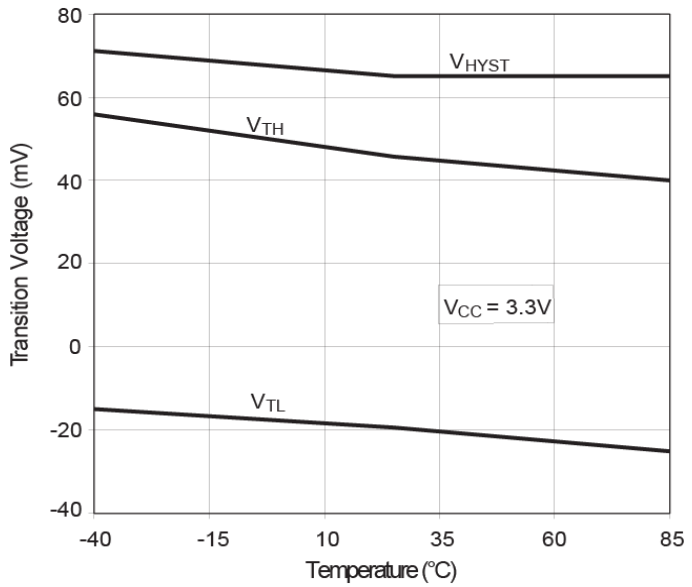


FIGURE 18. TRANSITION VOLTAGE VS SUPPLY VOLTAGE

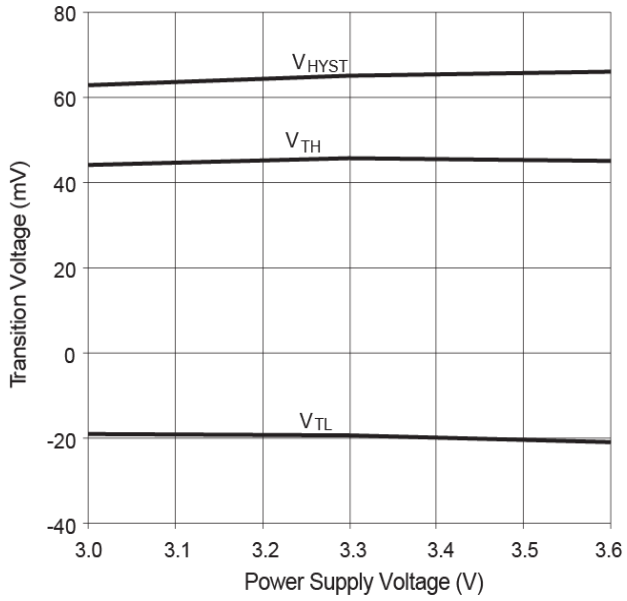


FIGURE 19. SUPPLY CURRENT VS TEMPERATURE

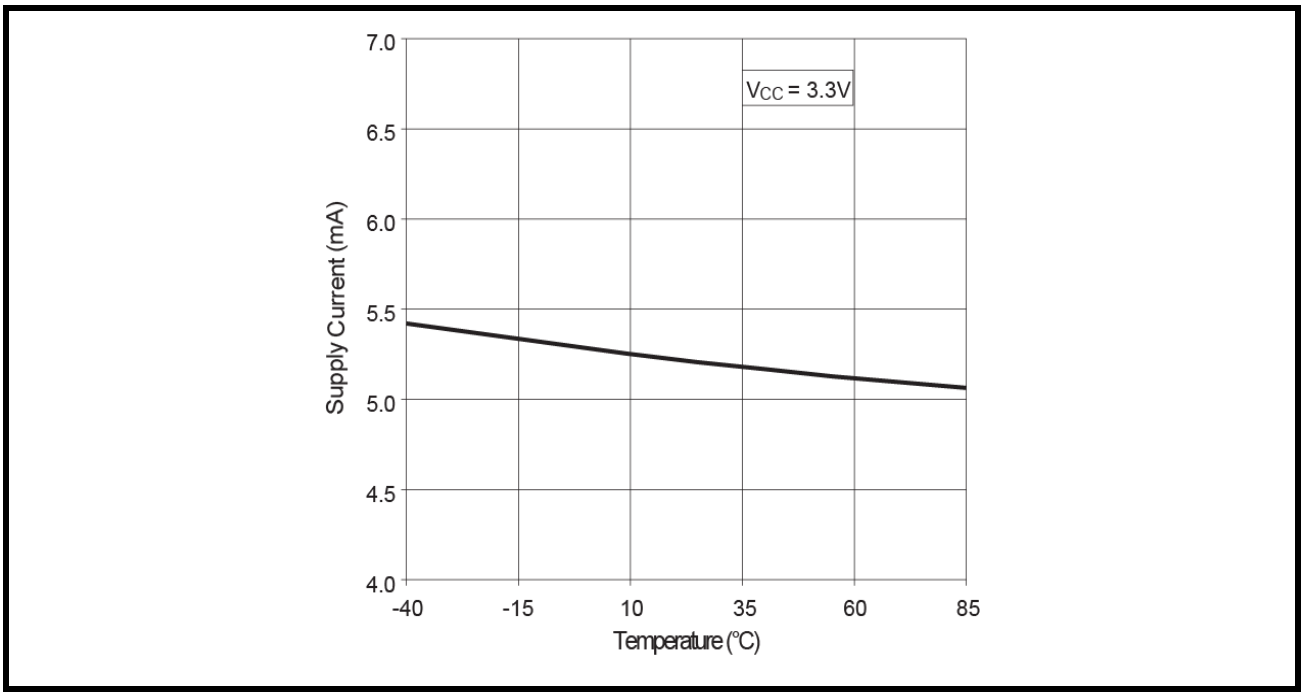


FIGURE 20. DISABLED SUPPLY CURRENT VS SUPPLY VOLTAGE

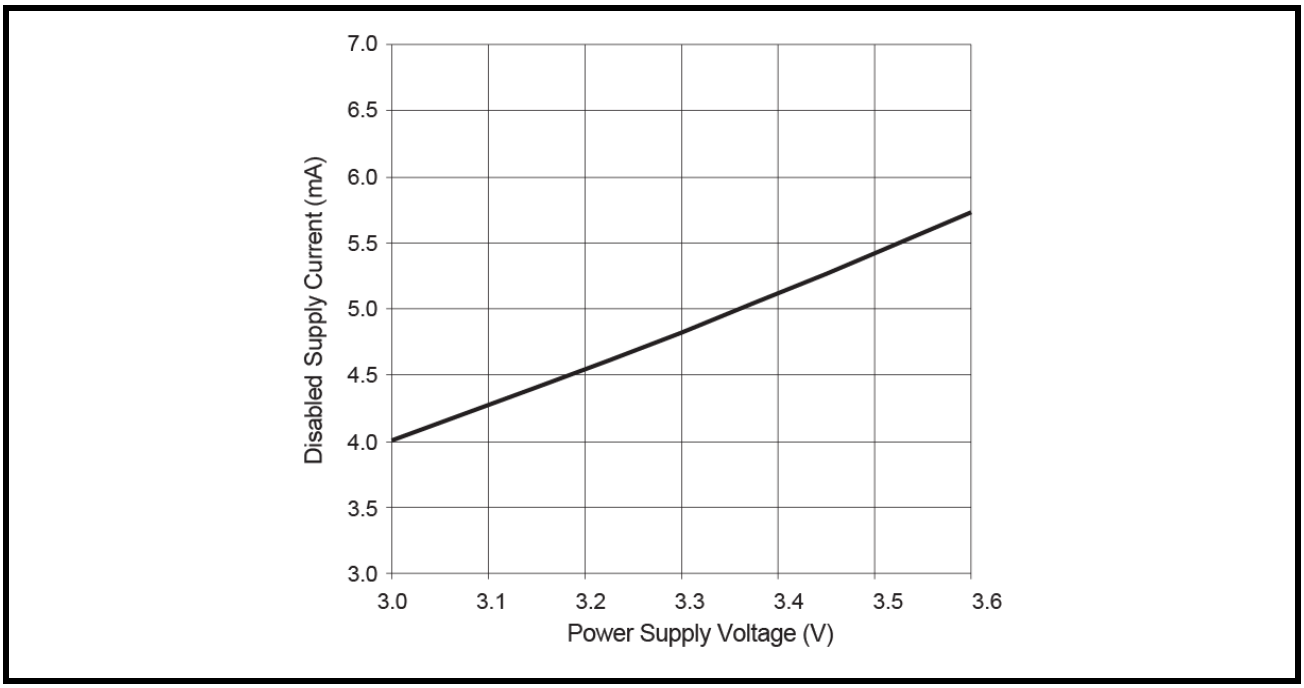
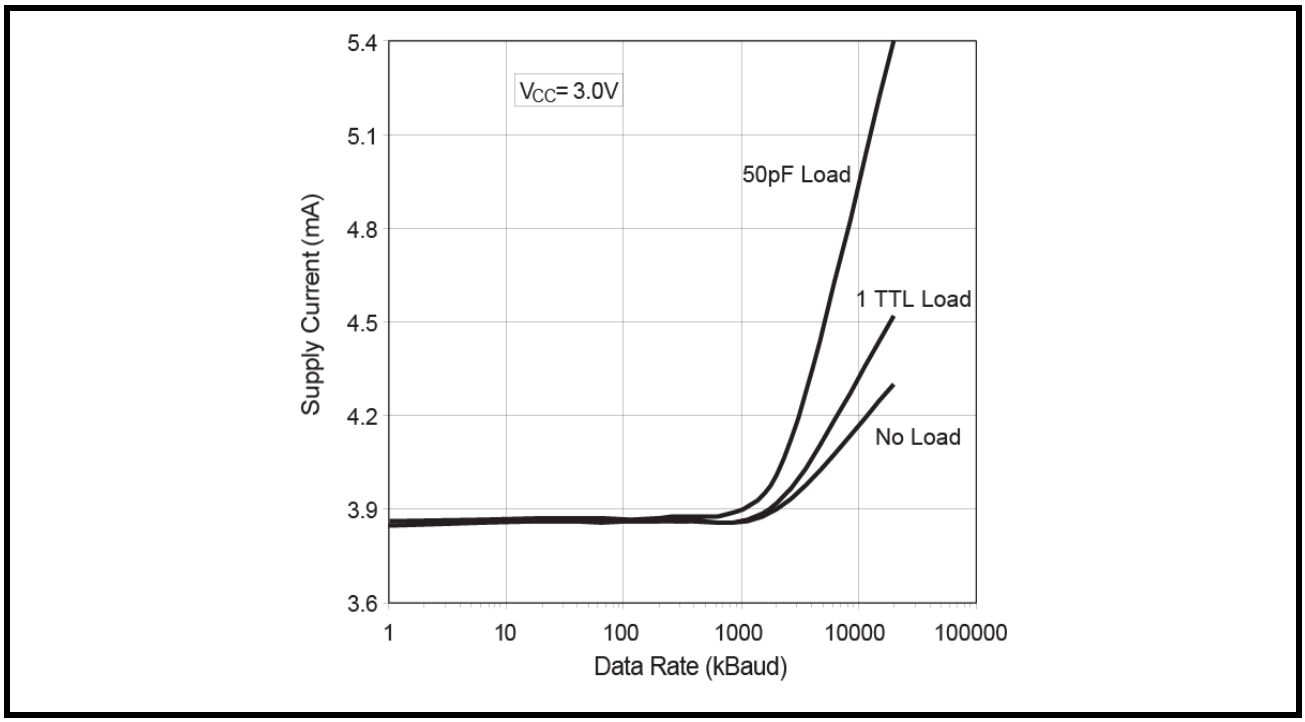


FIGURE 21. SUPPLY CURRENT VS DATA RATE



1.0 PRODUCT DESCRIPTION

The **SP26LV432** is a low-power quad differential line receiver designed for digital data transmission meeting the specifications of the EIA standard RS-422 serial protocol. The **SP26LV432** features Exar's BiCMOS process allowing low power operational characteristics of CMOS technology while meeting all of the demands of the RS-422 serial protocol up to 50Mbps under load in harsh environments.

The RS-422 standard is ideal for multi-drop applications and for long-distance communication. The RS-422 protocol allows up to 10 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-422 Receivers have an input sensitivity of 200mV over the wide (-7.0V to +7.0V) common mode range to accommodate ground potential differences. Internal pull-up and pull-down resistors prevent output oscillation on unused channels. Because the RS-422 is a differential interface, data is virtually immune to noise in the transmission line.

The **SP26LV432** accepts RS-422 levels and translates these into TTL or CMOS output levels. The **SP26LV432** features active HIGH and active LOW receiver enable controls common to all four receiver channels see **Table 1**. A logic HIGH on the ENABLE pin (pin 4) or a logic LOW on the $\overline{\text{ENABLE}}$ pin (pin 12) will enable the receiver outputs. A logic LOW on the ENABLE pin (pin 4) and a logic HIGH on the $\overline{\text{ENABLE}}$ pin (pin 12) will force the receiver outputs into high impedance (high-Z). Refer to the truth table in **Table 1**.

The RS-422 line receivers feature high source and sink current capability. All receivers are internally protected against short circuits on their inputs. The receivers feature tri-state outputs with 6mA source and sink capability. The typical receiver propagation delay is 14ns (35ns max). To minimize reflections, the multipoint bus transmission line should be terminated at both ends in its characteristic impedance, and stub lenghts off the main line should be kept as short as possible.

FIGURE 22. TWO-WIRE BALANCED SYSTEM, RS-422

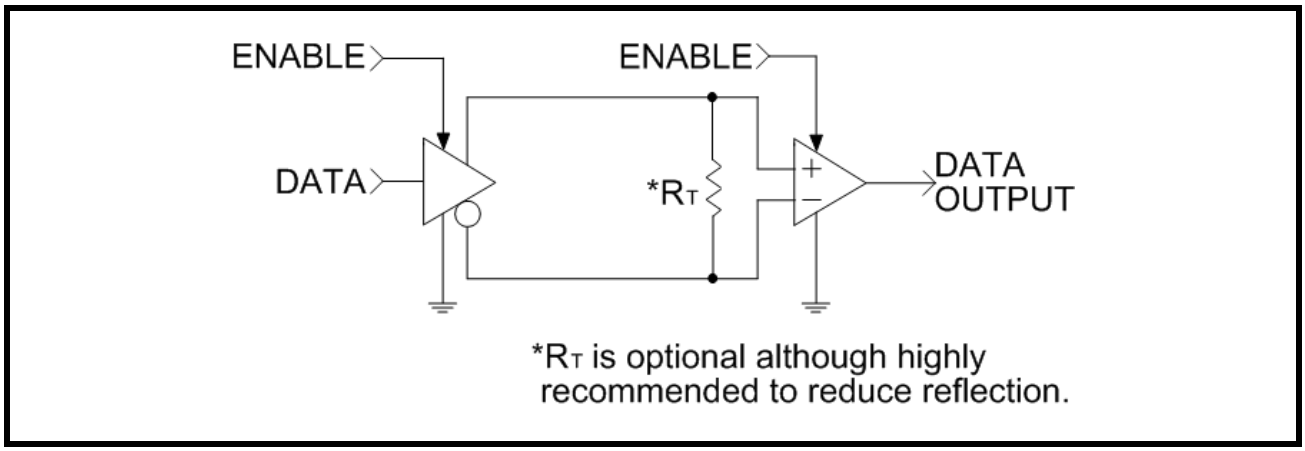
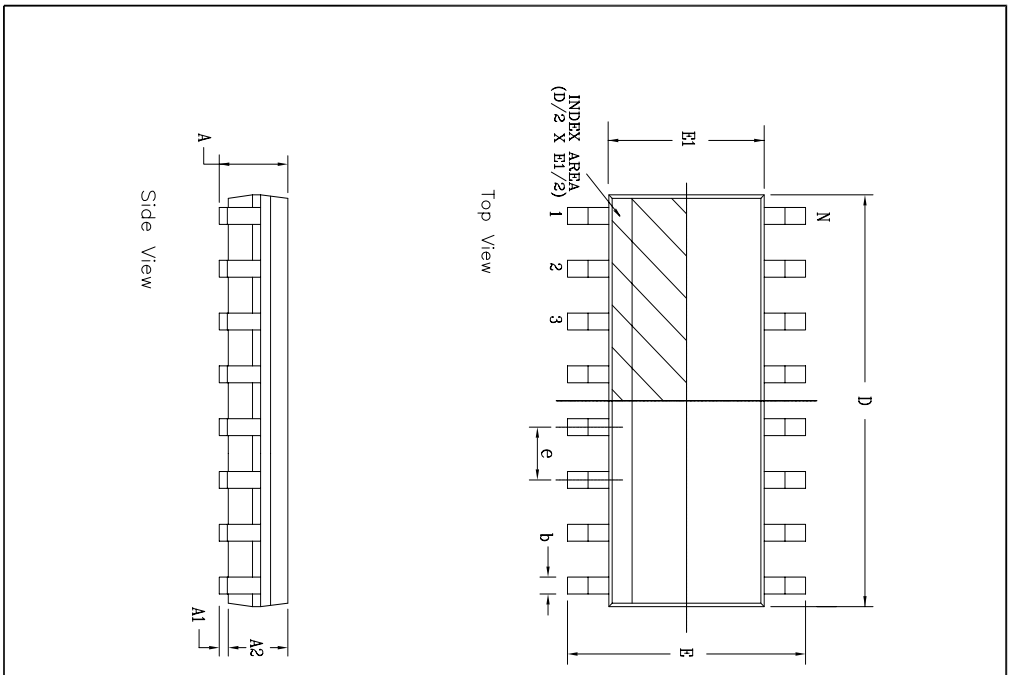


TABLE 1: TRUTH TABLE, ENABLE/DISABLE FUNCTION COMMON TO ALL FOUR RS-422 RECEIVERS

ENABLE	$\overline{\text{ENABLE}}$	INPUT	OUTPUT
LOW	HIGH	don't care	high-Z
HIGH	don't care	$V_{ID} \geq V_{TH}$ (max)	HIGH
HIGH	don't care	$V_{ID} \leq V_{TH}$ (min)	LOW
don't care	LOW	$V_{ID} \geq V_{TH}$ (max)	HIGH
don't care	LOW	$V_{ID} \leq V_{TH}$ (min)	LOW
HIGH	don't care	Open	HIGH
don't care	LOW	Open	HIGH

PACKAGE DIMENSIONS (16 PIN NSOIC)



REVISION HISTORY

REV.	DESCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	10/12/05	JL
B	DRAWING FORMAT MODIFICATION	07/19/06	JL
C	CHANGE DRAWING LOGO AND COMPANY NAME	11/21/07	JL

16 Pin SOICN JEDEC MS-012 Variation AC

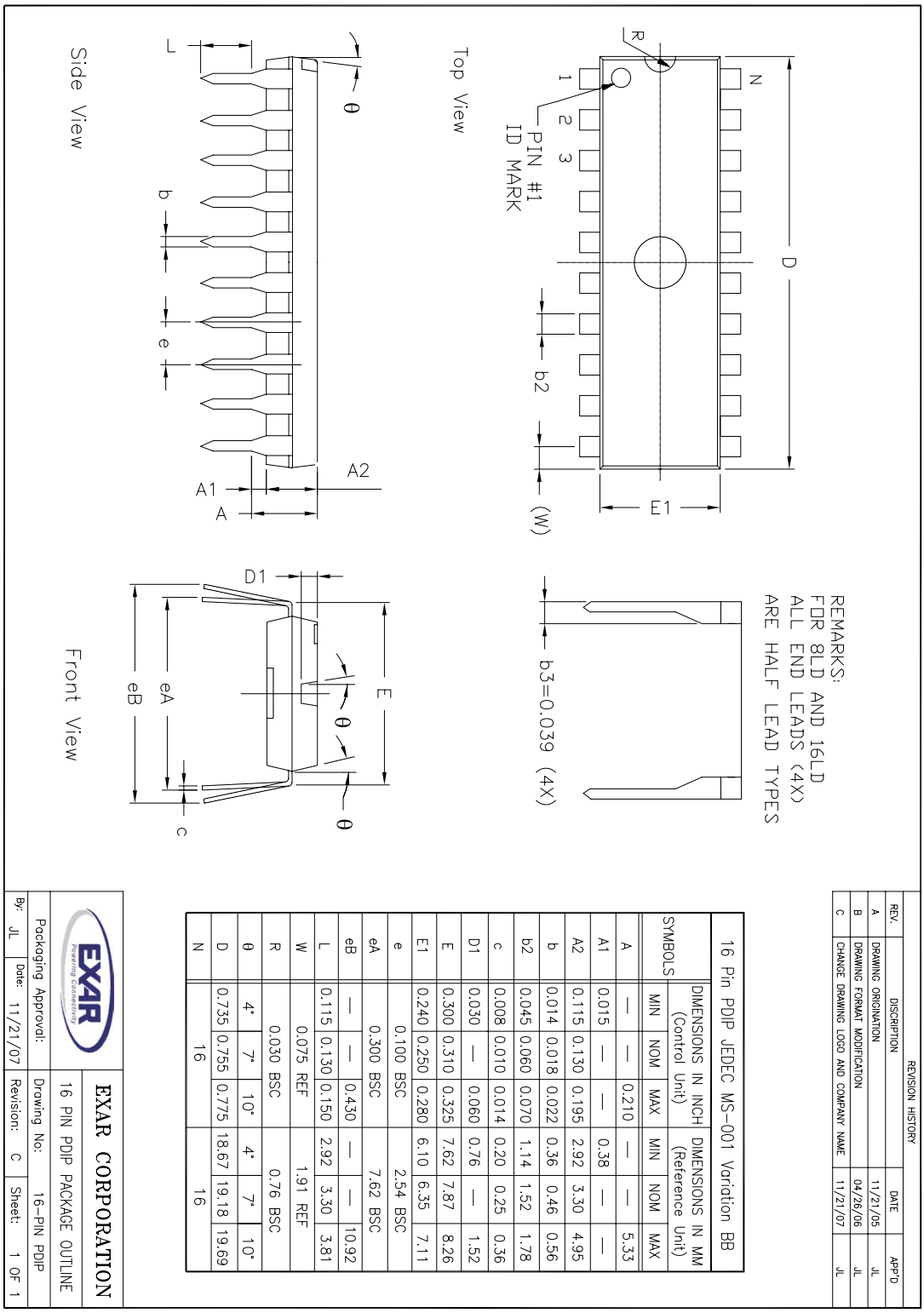
SYMBOLS	DIMENSIONS IN MM (Control Unit)			DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	—	1.75	0.053	—	0.069
A1	0.10	—	0.25	0.004	—	0.010
A2	1.25	—	1.65	0.049	—	0.065
b	0.31	—	0.51	0.012	—	0.020
c	0.17	—	0.25	0.007	—	0.010
E		6.00 BSC			0.236 BSC	
E1		3.90 BSC			0.154 BSC	
e		1.27 BSC			0.050 BSC	
h	0.25	—	0.50	0.010	—	0.020
L	0.40	—	1.27	0.016	—	0.050
L1		1.04 REF			0.041 REF	
L2		0.25 BSC			0.010 BSC	
R	0.07	—	—	0.003	—	—
R1	0.07	—	—	0.003	—	—
θ	0°	—	8°	0°	—	8°
θ1	5°	—	15°	5°	—	15°
θ2	0°	—	—	0°	—	—
D		9.90 BSC			0.390 BSC	
N		16			16	

EXAR CORPORATION

16 PIN SOICN PACKAGE OUTLINE

By:	Date:	Packaging Approval:	Drawing No:	16-PIN SOICN
JL	11/21/07		Revision: C	Sheet: 1 OF 1

PACKAGE DIMENSIONS (16 PIN PDIP)



REVISION HISTORY			
REV.	DISCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	11/21/05	JL
B	DRAWING FORMAT MODIFICATION	04/26/06	JL
C	CHANGE DRAWING LOGO AND COMPANY NAME	11/21/07	JL

16 Pin PDIP JEDEC MS-001 Variation BB

SYMBOLS	DIMENSIONS IN INCH (Control Unit)			DIMENSIONS IN MM (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	—	0.210	—	—	5.33
A1	0.015	—	—	0.38	—	—
A2	0.115	0.130	0.195	2.92	3.30	4.95
b	0.014	0.018	0.022	0.36	0.46	0.56
b2	0.045	0.060	0.070	1.14	1.52	1.78
c	0.008	0.010	0.014	0.20	0.25	0.36
D1	0.030	—	0.060	0.76	—	1.52
E	0.300	0.310	0.325	7.62	7.87	8.26
E1	0.240	0.250	0.280	6.10	6.35	7.11
e	0.100 BSC			2.54 BSC		
eA	0.300 BSC			7.62 BSC		
eB	—	—	0.430	—	—	10.92
L	0.115	0.130	0.150	2.92	3.30	3.81
W	0.075 REF			1.91 REF		
R	0.030 BSC			0.76 BSC		
θ	4°	7°	10°	4°	7°	10°
D	0.735	0.755	0.775	18.67	19.18	19.69
N	16			16		

EXAR CORPORATION

16 PIN PDIP PACKAGE OUTLINE

Packaging Approval: | Drawing No: 16-PIN PDIP

By: JL | Date: 11/21/07 | Revision: C | Sheet: 1 OF 1

REVISION HISTORY

DATE	REVISION	DESCRIPTION
3/08/04	A	Production Release.
3/08/04	B	Include tape and reel p/n's.
4/17/06	C	Fixed Truth Table typo page 1
9/05/08	1.0.0	Converted to Exar standard datasheet format. Added Ordering Information for -40C to +85C operating temperature range NSOIC package. Changed revision to 1.0.0.

NOTICE

Datasheet September 2008.

Send your UART technical inquiry with technical details to hotline: uarttechsupport@exar.com.