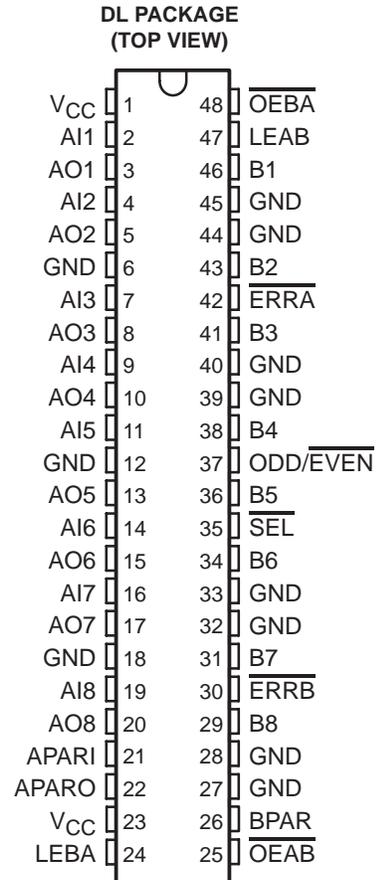


# SN74BCT979

## 9-BIT REGISTERED BTL TRANSCEIVER WITH PARITY GENERATOR/CHECKER

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- BiCMOS Design Significantly Reduces  $I_{CCZ}$
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model ( $C = 200$  pF,  $R = 0$ )
- Support IEEE BTL Standard 1194.1-1991
- Open-Collector B Port Drives Load Impedances as Low as  $10 \Omega$
- BTL Logic Level 1-V Bus Swing Reduces Power Consumption
- Latchable Transceiver With Output Sink of 24 mA at the A Bus and 100 mA at the B Bus
- Option to Generate and Check Parity or Feed-Through Data/Parity in Directions A to B or B to A
- Independent Latch Enables for A-to-B and B-to-A Directions
- Select Pin for ODD/ $\overline{\text{EVEN}}$  Parity
- $\overline{\text{ERRA}}$  and  $\overline{\text{ERRB}}$  Output Pins for Parity Checking
- Ability to Simultaneously Generate and Check Parity
- Packaged in 300-mil Plastic Shrink Small-Outline (DL) Package



### description

The SN74BCT979 is a 9-bit to 9-bit parity transceiver with transparent latches. The device can operate as a feed-through transceiver, or it can generate/check parity from the 8-bit data bus in either direction. It has a guaranteed current-sinking capability of 24 mA at the A bus and 100 mA at the open-collector B bus.

The SN74BCT979 features independent latch-enable (LEAB, LEBA) inputs for the A-to-B direction and the B-to-A direction, an ODD/ $\overline{\text{EVEN}}$  input to select odd or even parity, and separate error-signal ( $\overline{\text{ERRA}}$ ,  $\overline{\text{ERRB}}$ ) outputs for checking parity.

When communication between buses occurs, parity is generated and passed on to either bus as APARO or BPAR. Error detection of the parity generated from AI1–AI8 and B1–B8 can be checked by  $\overline{\text{ERRA}}$  and  $\overline{\text{ERRB}}$ , providing LEAB and LEBA are high and the mode select ( $\overline{\text{SEL}}$ ) is low. If  $\overline{\text{SEL}}$  is high, the communication between buses is in a feed-through mode where parity is still generated and checked as  $\overline{\text{ERRA}}$  and  $\overline{\text{ERRB}}$ .

The SN74BCT979 features open-collector driver outputs (B port) with a series Schottky diode to reduce capacitive loading to the bus. By using a 2-V pullup on the bus, the output signal swing will be approximately 1 V, which reduces the power necessary to drive the bus load capacitance. The driver outputs are capable of driving an equivalent dc load of as low as  $10 \Omega$ .

The transceiver has a precision threshold set by an internal bandgap reference to give accurate input thresholds over  $V_{CC}$  and temperature variations.

This transceiver is compatible with backplane transceiver logic (BTL) technology at significantly reduced power dissipation per channel.

The SN74BCT979 is characterized for operation from 0°C to 70°C.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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# SN74BCT979

## 9-BIT REGISTERED BTL TRANSCEIVER WITH PARITY GENERATOR/CHECKER

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FUNCTION TABLE

INPUTS					OPERATION OR FUNCTION†
$\overline{OEAB}$	$\overline{OEBA}$	$\overline{SEL}$	LEAB	LEBA	
H	H	X	X	X	Isolation. AO1–AO8/APARO are in the high-impedance state and B1–B8/APAR are high.
H	L	L	X	H	Parity is generated from B1–B8 data and output on APARO and is checked against BPAR and output on ERRB.
H	L	L	X	L	Parity is generated from latched B1–B8 data and output on APARO and is checked against BPAR and output on ERRB.
H	L	H	X	H	BPAR is output on APARO. Parity is generated from B1–B8 data, checked against BPAR, and output on ERRB.
H	L	H	X	L	BPAR is output on APARO. Parity is generated from latched B1–B8 data, checked against BPAR, and output on ERRB.
L	H	L	H	X	Parity is generated from A11–A18 data and output on BPAR and is checked against APARI and output on ERRA.
L	H	L	L	X	Parity is generated from latched A11–A18 data and output on BPAR and is checked against APARI and output on ERRA.
L	H	H	H	X	APARI is output on BPAR. Parity is generated from A11–A18 data, checked against APARI, and output on ERRA.
L	H	H	L	X	APARI is output on BPAR. Parity is generated from latched A11–A18 data, checked against APARI, and output on ERRA.
L	L	X	X	X	AO1–AO8/APARO and B1–B8/BPAR are active (high or low logic levels).

† Parity is generated from A11–A18 and from B1–B8 based on the level present at ODD/EVEN. Parity is checked (A11–A18 against APARI and B1–B8 against BPAR) based on the level present at ODD/EVEN (see parity function table).

PARITY FUNCTION TABLE‡

INPUTS					OUTPUTS	
$\overline{OEAB}$	$\overline{SEL}$	ODD/EVEN	$\Sigma$ OF INPUTS A11–A18 = H	APARI	BPAR	$\overline{ERRA}$
L	L	L	0, 2, 4, 6, 8	L	L	H
L	L	L	1, 3, 5, 7	L	H	L
L	L	L	0, 2, 4, 6, 8	H	L	L
L	L	L	1, 3, 5, 7	H	H	H
L	L	H	0, 2, 4, 6, 8	L	H	L
L	L	H	1, 3, 5, 7	L	L	H
L	L	H	0, 2, 4, 6, 8	H	H	H
L	L	H	1, 3, 5, 7	H	L	L
L	H	L	0, 2, 4, 6, 8	L	L	H
L	H	L	1, 3, 5, 7	L	L	L
L	H	L	0, 2, 4, 6, 8	H	H	L
L	H	L	1, 3, 5, 7	H	H	H
L	H	H	0, 2, 4, 6, 8	L	L	L
L	H	H	1, 3, 5, 7	L	L	H
L	H	H	0, 2, 4, 6, 8	H	H	H
L	H	H	1, 3, 5, 7	H	H	L
H	X	X	X	X	H	X

‡ Parity functions for the A bus are shown. Parity functions for the B bus are similar, but use B1–B8 and BPAR as inputs and APARO and ERRB as outputs.



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LATCH FUNCTION TABLES

INPUTS†			OUTPUT B
$\overline{OEAB}$	LEAB	AI	
L	H	L	L
L	H	H	H
L	L	X	Q <sub>0</sub>
H	X	X	H

INPUTS†			OUTPUT AO
$\overline{OEBA}$	LEBA	B	
L	H	L	L
L	H	H	H
L	L	X	Q <sub>0</sub>
H	X	X	Z

† If LEAB = H, current AI1 – AI8 and APARI data is used. If LEAB = L, latched AI1 – AI8 and APARI data is used.

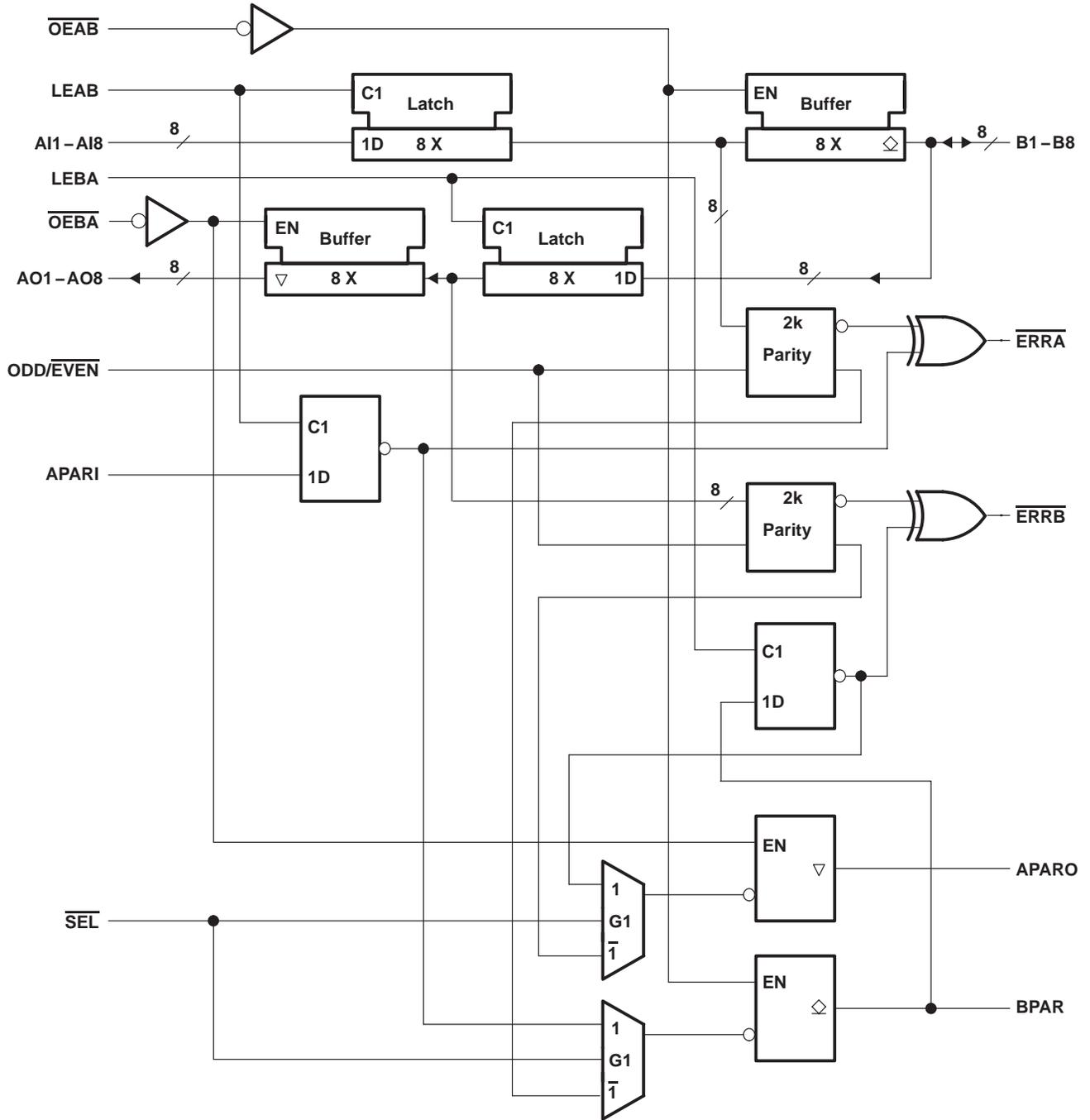


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## 9-BIT REGISTERED BTL TRANSCEIVER WITH PARITY GENERATOR/CHECKER

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### logic diagram (positive logic)



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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†**

Supply voltage range, $V_{CC}$ .....	–0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1): B1–B8, BPAR .....	–0.5 V to 5.5 V
Other inputs .....	–0.5 V to 7 V
Voltage range applied to any output in the disabled or power-off state, $V_O$ .....	–0.5 V to 7 V
Voltage range applied to any output in the high state, $V_O$ .....	–0.5 V to $V_{CC}$
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) (A port) .....	–30 mA
Current into any output in the low state, $I_O$ : A port .....	48 mA
B port .....	200 mA
Operating free-air temperature range .....	0°C to 70°C
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) .....	0.85 W
Storage temperature range .....	–65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The input negative-voltage rating may be exceeded if the input clamp-current rating is observed.

**recommended operating conditions (see Note 2)**

		MIN	NOM	MAX	UNIT	
$V_{CC}$	Supply voltage	4.5	5	5.5	V	
$V_{IH}$	High-level input voltage	B1–B8, BPAR		1.6	V	
		Other inputs		2		
$V_{IL}$	Low-level input voltage	B1–B8, BPAR		1.47	V	
		Other inputs		0.8		
$V_{OH}$	High-level output voltage	B1–B8, BPAR		2.1	mA	
$I_{IK}$	Input clamp current				–18	mA
$I_{OH}$	High-level output current	AO1–AO8, APARO, $\overline{ERRA}$ , $\overline{ERRB}$		–3	mA	
$I_{OL}$	Low-level output current	AO1–AO8, APARO, $\overline{ERRA}$ , $\overline{ERRB}$		24	mA	
		B1–B8, BPAR		100		
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10	ns/V	
$T_A$	Operating free-air temperature	0	70		°C	

NOTE 2: Unused or floating pins (input or I/O) must be held high or low.



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## 9-BIT REGISTERED BTL TRANSCEIVER WITH PARITY GENERATOR/CHECKER

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT	
$V_{IK}$	LE, $\overline{OE}$ , $\overline{SEL}$ , ODD/ $\overline{EVEN}$ , AI1 – AI8, APARI	$V_{CC} = 4.5 V$ ,	$I_I = -18 mA$			-1.2	V	
$I_{OH}$	B1 – B8, BPAR	$V_{CC} = 5.5 V$ ,	$V_{OH} = 2.1 mA$			100	$\mu A$	
$V_{OH}$	AO1 – AO8, APARO, $\overline{ERRA}$ , $\overline{ERRB}$	$V_{CC} = 4.5 V$	$I_{OH} = -1 mA$	2.5	3.4		V	
			$I_{OH} = -3 mA$	2.4	3.3			
$V_{OL}$	AO1 – AO8, APARO, $\overline{ERRA}$ , $\overline{ERRB}$	$V_{CC} = 4.5 V$	$I_{OL} = 24 mA$		0.35	0.5	V	
			$I_{OL} = 80 mA$	0.75		1.1		
			$I_{OL} = 100 mA$	0.75		1.15		
$I_I$	LE, $\overline{OE}$ , $\overline{SEL}$ , ODD/ $\overline{EVEN}$ , AI1 – AI8, APARI	$V_{CC} = 5.5 V$ ,	$V_I = 5.5 V$			100	$\mu A$	
$I_{IH}$	LE, $\overline{OE}$ , $\overline{SEL}$ , ODD/ $\overline{EVEN}$ , AI1 – AI8, APARI	$V_{CC} = 5.5 V$	$V_I = 2.7 V$			20	$\mu A$	
	B1 – B8, BPAR‡		$V_I = 2.1 V$			100		
$I_{IL}$	LE, $\overline{OE}$ , $\overline{SEL}$ , ODD/ $\overline{EVEN}$ , AI1 – AI8, APARI	$V_{CC} = 5.5 V$	$V_I = 0.5 V$			-20	$\mu A$	
	B1 – B8, BPAR‡		$V_I = 0.3 V$			-100		
$I_{OZH}$	AO1 – AO8, APARO	$V_{CC} = 5.5 V$ ,	$V_O = 2.7 V$			50	$\mu A$	
$I_{OZL}$	AO1 – AO8, APARO	$V_{CC} = 5.5 V$ ,	$V_O = 0.5 V$			-50	$\mu A$	
$I_{OS}§$	AO1 – AO8, APARO	$V_{CC} = 5.5 V$ ,	$V_O = 0$			-60	-200	mA
$I_{CC}$	Outputs high	$V_{CC} = 5.5 V$ ,	Outputs open			17	36	mA
	Outputs low					69	85	
	Outputs disabled					21	42	
$C_i$	LE, $\overline{OE}$ , $\overline{SEL}$ , ODD/ $\overline{EVEN}$	$V_{CC} = 5 V$ ,	$V_I = 2.5 V$ or $0.5 V$			8		pF
	AI1 – AI8, APARI					8		
$C_{io}$	B1 – B8, BPAR	$V_{CC} = 5 V$ ,	$V_O = 2.5 V$ or $0.5 V$			5	pF	
$C_o$	AO1 – AO8, APARO	$V_{CC} = 5 V$ ,	$V_O = 2.5 V$ or $0.5 V$			6.5	pF	
$T_T$	Output transition time	B port¶				1	ns	

† All typical values are at  $V_{CC} = 5 V$ ,  $T_A = 25^\circ C$ .

‡ For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

§ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

¶ Measured from 1.3 V to 1.8 V (see Figure 1).

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

			$V_{CC} = 5 V$ , $T_A = 25^\circ C$		MIN	MAX	UNIT
			MIN	MAX			
$t_w$	Pulse duration	LEAB high	5		5		ns
		LEBA high	4		4		
$t_{su}$	Setup time	AI1 – AI8, APARI before LEAB↓	Data high	4		4	ns
			Data low	3		3	
		B1 – B8, BPAR before LEBA↓	Data high	8.5		8.5	
			Data low	7		7	
$t_h$	Hold time	AI1 – AI8, APARI after LEAB↓	Data high	1		1	ns
			Data low	2.5		2.5	
		B1 – B8, BPAR after LEBA↓	Data high	0.5		0.5	
			Data low	0.5		0.5	



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switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50$  pF (unless otherwise noted) (see Note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN	MAX	UNIT
			MIN	TYP	MAX			
$t_{PLH}$	AI	B	1.3	6.8	8.6	1.3	10.4	ns
$t_{PHL}$			2.1	7.8	9.8	2.1	11.8	
$t_{PLH}$	AI	BPAR	3.7	11.6	13.9	3.7	17.6	ns
$t_{PHL}$			5.4	13.9	15.7	5.4	19.2	
$t_{PLH}$	B	AO	2.8	9	11.1	2.8	14.3	ns
$t_{PHL}$			2.4	8.1	10	2.4	12.3	
$t_{PLH}$	B	APARO	4.5	14.1	16.1	4.5	20.9	ns
$t_{PHL}$			4.2	13.3	15.9	4.2	20.5	
$t_{PLH}$	APARI	BPAR	1.6	6	7.7	1.6	9.3	ns
$t_{PHL}$			3.4	9.5	11.2	3.4	13.6	
$t_{PLH}$	BPAR	APARO	2.7	7.9	9.9	2.7	12.8	ns
$t_{PHL}$			3	8.1	10	3	12.5	
$t_{PLH}$	AI	$\overline{\text{ERRA}}$	3	10.9	13	3	16.1	ns
$t_{PLH}$	APARI		2.8	8.2	10.2	2.8	12.6	
$t_{PHL}$	AI	$\overline{\text{ERRA}}$	4.2	11.8	14	4.2	16.7	ns
$t_{PHL}$	APARI		4	8.9	10.9	4	12.8	
$t_{PLH}$	B	$\overline{\text{ERRB}}$	4.3	13.4	15.9	4.3	20.6	ns
$t_{PLH}$	BPAR		4.2	10.8	13.1	4.2	16.6	
$t_{PHL}$	B	$\overline{\text{ERRB}}$	5.5	14.5	17	5.5	21.5	ns
$t_{PHL}$	BPAR		5.5	11.3	13.5	5.5	16.5	
$t_{PLH}$	ODD/ $\overline{\text{EVEN}}$	$\overline{\text{ERRA}}$	3.4	9.1	10.9	3.4	13.7	ns
$t_{PHL}$			4.4	10.3	12.2	4.4	14.5	
$t_{PLH}$	ODD/ $\overline{\text{EVEN}}$	$\overline{\text{ERRB}}$	3.4	8.7	10.7	3.4	13.3	ns
$t_{PHL}$			4.6	10	11.9	4.6	14.2	
$t_{PLH}$	ODD/ $\overline{\text{EVEN}}$	APARO	3.4	8.7	10.6	3.4	13.5	ns
$t_{PHL}$			3.1	9	10.9	3.1	13.4	
$t_{PLH}$	ODD/ $\overline{\text{EVEN}}$	BPAR	4	10.3	12.1	4	15.8	ns
$t_{PHL}$			4.9	12.3	14.1	4.9	17.3	
$t_{PLH}$	$\overline{\text{SEL}}$	APARO	0.7	5.3	6.9	0.7	8.4	ns
$t_{PHL}$			1.1	5	6.5	1.1	7.8	
$t_{PLH}$	$\overline{\text{SEL}}$	BPAR	1.1	6.4	8.1	1.1	10.1	ns
$t_{PHL}$			2.8	8.3	9.9	2.8	12.6	

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



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switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50$  pF (unless otherwise noted) (see Note 3) (continued)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN	MAX	UNIT
			MIN	TYP	MAX			
$t_{PLH}$	LEAB	B	1.6	7.6	9.5	1.6	11.6	ns
$t_{PHL}$			2.7	8.1	10	2.7	11.7	
$t_{PLH}$	LEAB	BPAR (parity feed through)	2.3	7.3	9.2	2.3	10.8	ns
$t_{PHL}$			4.6	9.3	11	4.6	13.3	
$t_{PLH}$	LEAB	BPAR (parity generated)	4.7	10.7	13	4.7	16.2	ns
$t_{PHL}$			6.2	11.5	13.4	6.2	16	
$t_{PLH}$	LEAB	$\overline{ERRA}$	3.3	8.6	10.7	3.3	12.8	ns
$t_{PHL}$			4.7	9.8	12	4.7	13.7	
$t_{PLH}$	LEBA	AO	1.3	6.5	8.5	1.3	10	ns
$t_{PHL}$			1.4	5.9	7.6	1.4	8.5	
$t_{PLH}$	LEBA	APARO (parity feed through)	1.7	5.9	7.7	1.7	9.1	ns
$t_{PHL}$			1.9	6	7.8	1.9	9	
$t_{PLH}$	LEBA	APARO (parity generated)	3.5	9.3	11.5	3.5	14.1	ns
$t_{PHL}$			3.1	8.2	10.3	3.1	12.2	
$t_{PLH}$	LEBA	$\overline{ERRB}$	3.4	8.7	10.8	3.4	12.7	ns
$t_{PHL}$			4.6	9	11	4.6	12.5	
$t_{PLH}$	$\overline{OEAB}$	B	1.5	5.5	7	1.5	7.9	ns
$t_{PHL}$			4.9	10.4	12.1	4.9	14.1	
$t_{PLH}$	$\overline{OEAB}$	BPAR	1.4	5.4	6.9	1.4	7.8	ns
$t_{PHL}$			4.8	10.6	12.5	4.8	14.9	
$t_{PZH}$	$\overline{OEBA}$	AO	1.4	6	7.8	1.4	9.2	ns
$t_{PZL}$			6	10.7	12.5	6	14.6	
$t_{PHZ}$	$\overline{OEBA}$	AO	2.4	6.7	8.6	2.4	9.5	ns
$t_{PLZ}$			1.2	4.7	6.3	1.2	7.1	
$t_{PZH}$	$\overline{OEBA}$	APARO	1.7	6.1	7.8	1.7	9.3	ns
$t_{PZL}$			1.4	5.1	6.7	1.4	7.8	
$t_{PHZ}$	$\overline{OEBA}$	APARO	2.7	6.8	8.6	2.7	9.5	ns
$t_{PLZ}$			1.2	4.7	6.2	1.2	7.1	

NOTE 3: Load circuits and waveforms are shown in Section 1.



**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
SN74BCT979DL	OBSOLETE	SSOP	DL	48		TBD	Call TI	Call TI	
SN74BCT979DLR	OBSOLETE	SSOP	DL	48		TBD	Call TI	Call TI	

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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