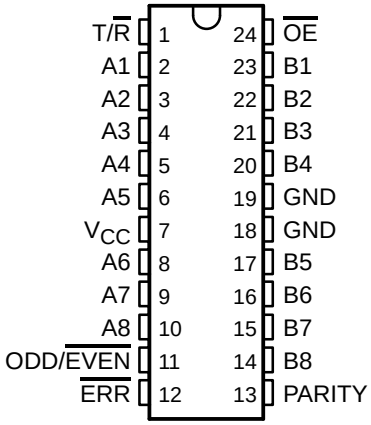
- **State-of-the-Art BiCMOS Design Significantly Reduces I_{CCZ}**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **3-State B Outputs Sink 48 mA or 64 mA and Source 12 mA or 15 mA**
- **Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic 300-mil DIPs (NT)**

DW OR NT PACKAGE
(TOP VIEW)



description

The SN74BCT657 contains eight noninverting transceivers with 3-state outputs and an 8-bit parity generator/checker. It is intended for bus-oriented applications.

The transmit/receive (T/$\overline{R}$) input determines the direction of the data flow through the bidirectional transceivers. When T/$\overline{R}$ is high, data is transmitted from the A port to the B port. When T/$\overline{R}$ is low, data is received at the A port from the B port.

When the output-enable ($\overline{OE}$) input is high, both the A and B ports are placed in a high-impedance state (disabled). The ODD/$\overline{EVEN}$ input allows the user to select between odd or even parity systems.

When transmitting from A port to B port (T/$\overline{R}$ high), PARITY is an output from the generator/checker. When receiving from B port to A port (T/$\overline{R}$ low), PARITY is an input.

When transmitting (T/$\overline{R}$ high), the parity-select (ODD/$\overline{EVEN}$) input is made high or low as appropriate. The A port is then polled to determine the number of high bits. The PARITY output goes to the logic state determined by the parity-select (ODD/$\overline{EVEN}$) input and the number of high bits on A port. When ODD/$\overline{EVEN}$ is low (for even parity) and the number of high bits on A port is odd, the PARITY will be high, transmitting even parity. If the number of high bits on A port is even, the PARITY will be low, keeping even parity.

When in the receive mode (T/$\overline{R}$ low), the B port is polled to determine the number of high bits. If ODD/$\overline{EVEN}$ is low (for even parity) and the number of highs on B port is as follows:

– Odd and the PARITY input is high, then $\overline{ERR}$ will be high signifying no error.

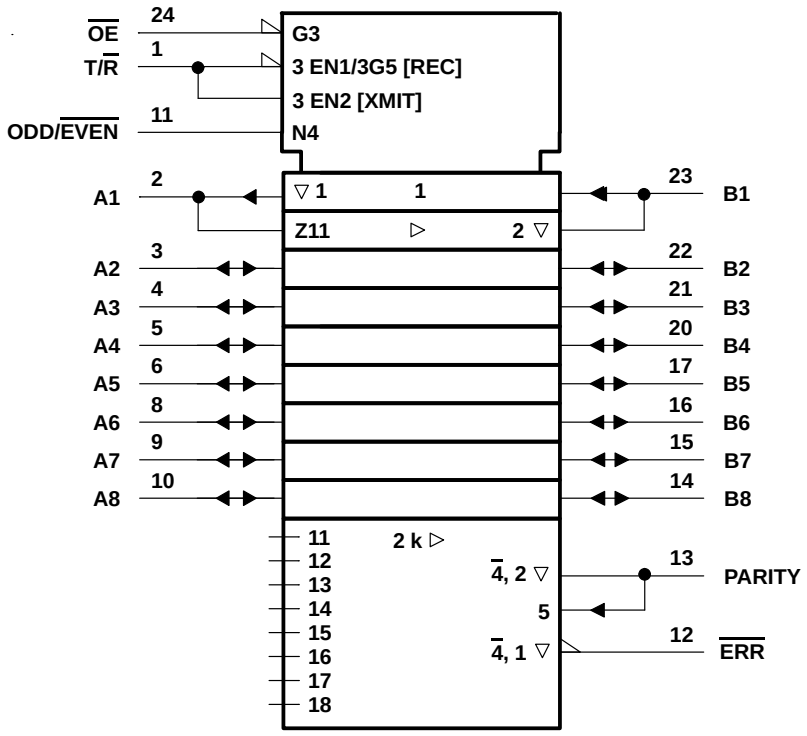
– Even and the PARITY input is high, then $\overline{ERR}$ will be low indicating an error.

The SN74BCT657 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE

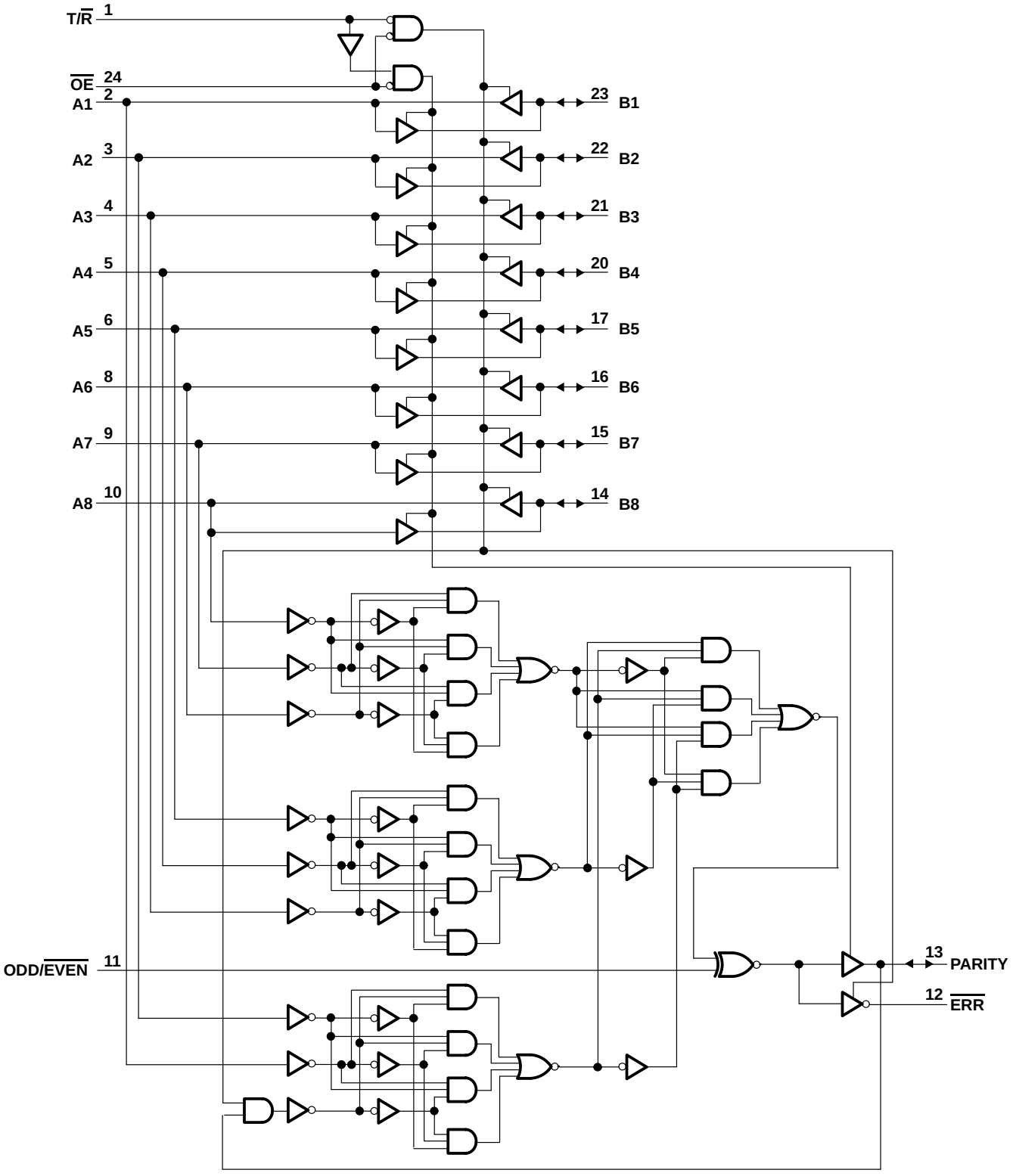
NUMBER OF A OR B INPUTS THAT ARE HIGH	INPUTS			INPUT/OUTPUT PARITY	OUTPUTS	
	$\overline{OE}$	T/$\overline{R}$	ODD/$\overline{EVEN}$		$\overline{ERR}$	OUTPUT MODE
0, 2, 4, 6, 8	L	H	H	H	Z	Transmit
	L	H	L	L	Z	Transmit
	L	L	H	H	H	Receive
	L	L	H	L	L	Receive
	L	L	L	H	L	Receive
	L	L	L	L	H	Receive
1, 3, 5, 7	L	H	H	L	Z	Transmit
	L	H	L	H	Z	Transmit
	L	L	H	H	L	Receive
	L	L	H	L	H	Receive
	L	L	L	H	H	Receive
	L	L	L	L	L	Receive
Don't care	H	X	X	Z	Z	Z

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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) . . . . . –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 5.5 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) . . . . . –30 mA
Current into any output in the low state, I_O . . . . . 128 mA
Operating free-air temperature range . . . . . 0°C to 70°C
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 and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are 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		2			V
V_{IL}	Low-level input voltage				0.8	V
I_{IK}	Input clamp current				–18	mA
I_{OH}	High-level output current	A port			–3	mA
		B port, PARITY, $\overline{ERR}$			–15	
I_{OL}	Low-level output current	A port			24	mA
		B port, PARITY, $\overline{ERR}$			64	
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.

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

PARAMETER		TEST CONDITIONS			MIN	TYP†	MAX	UNIT
V_{IK}		V_{CC} = 4.5 V,	I_I = –18 mA				–1.2	V
V_{OH}	Any output	V_{CC} = 4.5 V,	I_{OH} = –3 mA		2.4	3.3		V
	B port, PARITY, $\overline{ERR}$	V_{CC} = 4.5 V,	I_{OH} = –15 mA		2	3.1		
	Any output	V_{CC} = 4.75 V,	I_{OH} = –3 mA		2.7			
V_{OL}	A port	V_{CC} = 4.5 V,	I_{OL} = 24 mA			0.35	0.5	V
	B port, PARITY, $\overline{ERR}$	V_{CC} = 4.5 V,	I_{OL} = 64 mA			0.42	0.55	
I_I	T/$\overline{R}$	V_{CC} = 0,	V_I = 7 V,	$\overline{OE}$ = 4.5 V			20	µA
	$\overline{OE}$	V_{CC} = 0,	V_I = 7 V,	T/$\overline{R}$ = 4.5 V			20	
	ODD/$\overline{EVEN}$	V_{CC} = 0,	V_I = 7 V				20	
	A port	V_{CC} = 5.5 V,	V_I = 5.5 V				100	
	B port, PARITY						200	
I_{IH}‡	A or B port, PARITY	V_{CC} = 5.5 V,	V_I = 2.7 V				200	µA
	T/$\overline{R}$, $\overline{OE}$						20	
	ODD/$\overline{EVEN}$						20	
I_{IL}‡	A or B port, PARITY	V_{CC} = 5.5 V,	V_I = 0.5 V				–70	µA
	T/$\overline{R}$, $\overline{OE}$						–20	
	ODD/$\overline{EVEN}$						–20	
I_{OS}§	A port	V_{CC} = 5.5 V,	V_O = 0		–60		–200	mA
	B port, PARITY, $\overline{ERR}$				–125		–300	
I_{OZH}	$\overline{ERR}$	V_{CC} = 5.5 V,	V_O = 2.7 V				50	µA
I_{OZL}	$\overline{ERR}$	V_{CC} = 5.5 V,	V_O = 0.5 V				–50	µA
I_{CCL}		V_{CC} = 5.5 V,	Outputs open				90	mA
I_{CCH}		V_{CC} = 5.5 V,	Outputs open				2	mA
I_{CCZ}		V_{CC} = 5.5 V,	Outputs open				1	mA
C_i	Control input	V_{CC} = 5 V,	V_I = 2.5 V or 0.5 V			6.5		pF
C_{io}	A port	V_{CC} = 5 V,	V_O = 2.5 V or 0.5 V			10		pF
	B port, PARITY					14		
C_o	$\overline{ERR}$	V_{CC} = 5 V,	V_O = 2.5 V or 0.5 V			10		pF

† All typical values are at V_{CC} = 5 V, T_A = 25°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.

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°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t_{PLH}	A or B	B or A	1.1	3.1	6	1.1	6.6	ns
t_{PHL}			2	5.3	8.5	2	9	
t_{PLH}	A	PARITY	3	7.4	12.7	3	15.4	ns
t_{PHL}			4.6	8.6	14.1	4.6	15.9	
t_{PLH}	ODD/$\overline{\text{EVEN}}$	PARITY, ERR	1.1	4.1	6.4	1.1	7.1	ns
t_{PHL}			2.6	5.5	8.3	2.6	9	
t_{PLH}	B	$\overline{\text{ERR}}$	3.1	7.4	12.6	3.1	15.3	ns
t_{PHL}			4.4	6.5	13.3	4.4	15.5	
t_{PLH}	PARITY	$\overline{\text{ERR}}$	3.4	7.7	10.7	3.4	13.2	ns
t_{PHL}			5.5	8.8	12	5.5	13.9	
t_{PZH}	$\overline{\text{OE}}$	A, B, PARITY, or $\overline{\text{ERR}}$	1.8	5.1	7.7	1.8	9.1	ns
t_{PZL}			3.2	6.7	14.2	3.2	16.3	
t_{PHZ}	$\overline{\text{OE}}$	A, B, PARITY, or $\overline{\text{ERR}}$	2.6	5.7	8	2.6	9.1	ns
t_{PLZ}			2	5	7.4	2	8	

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

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