

SN55ALS160 OCTAL GENERAL-PURPOSE INTERFACE BUS TRANSCEIVER

D3276, APRIL 1989

SUITABLE FOR IEEE STANDARD 488-1978 (GPIB)[†]

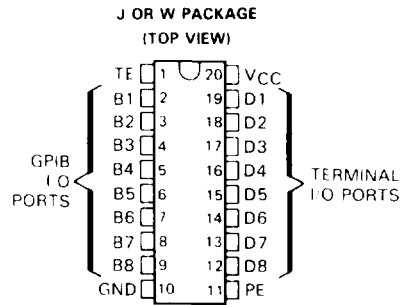
- 8-Channel Bidirectional Transceiver
- High-Speed Advanced Low-Power Schottky Circuitry
- Low Power Dissipation . . . 56 mW Max per Channel
- Fast Propagation Times . . . 20 ns Max
- High-Impedance P-N-P Inputs
- Receiver Hysteresis . . . 550 mV Typ
- Open-Collector Driver Output Option
- No Loading of Bus When Device Is Powered Down ($V_{CC} = 0$)
- Power-Up/Power-Down Protection (Glitch-Free)

description

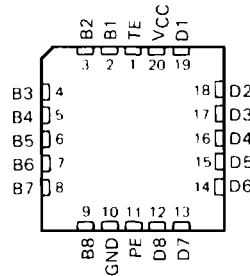
The SN55ALS160 eight-channel general-purpose interface bus transceiver is a monolithic, high-speed, Advanced Low-Power Schottky device designed for two-way data communications over single-ended transmission lines. The transceiver features driver outputs that can be operated in either the passive-pullup or three-state mode. If Talk Enable (TE) is high, these ports have the characteristics of passive-pullup outputs when Pullup Enable (PE) is low and of three-state outputs when PE is high. Taking TE low places these ports in the high-impedance state. The driver outputs are designed to handle loads up to 48 mA of sink current.

An active turn-off feature has been incorporated into the bus-terminating resistors so that the device exhibits a high impedance to the bus when $V_{CC} = 0$. When combined with the SN55ALS161 management bus transceiver, the device provides the complete 16-wire interface for the IEEE 488 bus.

The SN55ALS160 is characterized for operation from -55°C to 125°C .



**FK PACKAGE
(TOP VIEW)**



FUNCTION TABLES

EACH DRIVER				EACH RECEIVER			
INPUTS			OUTPUT	INPUTS			OUTPUT
D	TE	PE	B	B	TE	PE	D
H	H	H	H	L	L	X	L
L	H	X	L	H	L	X	H
H	X	L	Z [†]	X	H	X	Z
X	L	X	Z [†]				

H = high level, L = low level, X = irrelevant, Z = high impedance state.

[†] This is the high-impedance state of a normal 3-state output modified by the internal resistors to V_{CC} and ground.

[†] The transceivers are suitable for IEEE Standard 896 applications to the extent of the operating conditions and characteristics specified in this data sheet. Certain limits contained in the IEEE specification are not met or cannot be tested over the entire military temperature range.

PRODUCTION DATA documents contain information 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.

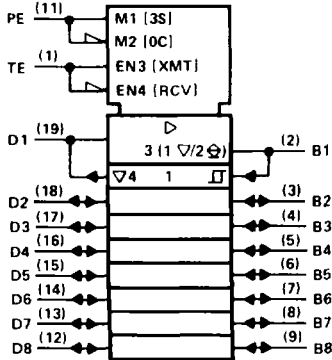
**TEXAS
INSTRUMENTS**

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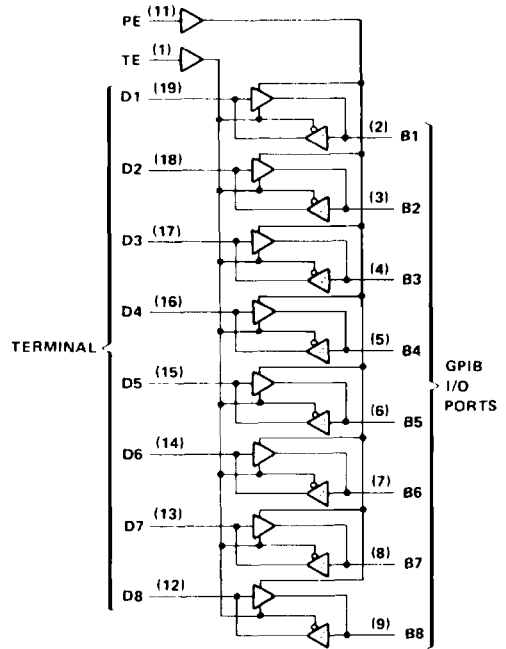
SN55ALS160 OCTAL GENERAL-PURPOSE INTERFACE BUS TRANSCEIVER

logic symbol†

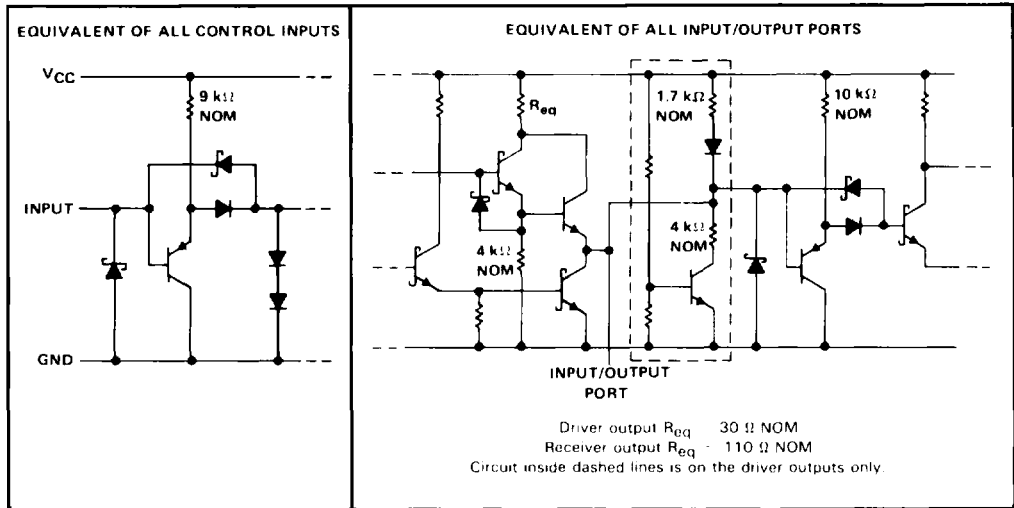


† This symbol is in accordance with ANSI-IEEE Std 91 1984 and IEC Publication 617 12.

logic diagram (positive logic)



schematics of inputs and outputs



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OCTAL GENERAL-PURPOSE INTERFACE BUS TRANSCEIVER

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Low-level driver output current	100 mA
Low-level output current	50 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2):	1375 mW
Operating free-air temperature range	-55°C to 125°C
Storage temperature range	-65°C to 150°C
Lead temperature 1.6 mm (1/16 inch) from the case for 60 seconds: J or W package	300°C
Case temperature for 60 seconds: FK package	260°C

NOTES: 1. All voltage values are with respect to network ground terminal.

2. For operation above 25°C free-air temperature, derate to 275 mW at 125°C at the rate of 11.0 mW/°C.

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
High level input voltage, V_{IH}	TE and PE at $T_A = -55^\circ\text{C}$ to 125°C	2			V
	Bus and terminal at $T_A = 25^\circ\text{C}$ or 125°C	2			
	Bus and terminal at $T_A = -55^\circ\text{C}$	2.1			
Low level input voltage, V_{IL}	TE and PE at $T_A = -55^\circ\text{C}$ to 125°C	0.8			V
	Bus and terminal at $T_A = 25^\circ\text{C}$ or 55°C	0.8			
	Bus and terminal at $T_A = 125^\circ\text{C}$	0.7			
High level output current, I_{OH}	Bus ports with pullups active ($V_{CC} = 5\text{ V}$)	-5.2			mA
	Terminal ports	-800			μA
Low level output current, I_{OL}	Bus ports	48			mA
	Terminal ports	16			
Operating free-air temperature, T_A		55		125	$^\circ\text{C}$



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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}	Input clamp voltage	V _{CC} = 4.75 V, I _I = 18 mA		-0.8	-1.5		V
V _{hys}	Hysteresis (V _{T+} , V _{T-})	Bus	V _{CC} = 5 V, T _A = 25°C	0.4	0.55		V
			V _{CC} = 5 V, T _A = 125°C	0.25			
			V _{CC} = 5 V, T _A = -55°C	0.4			
V _{OH}	High-level output voltage	Terminal	V _{CC} = 4.75 V, I _{OH} = -800 μA, TE at 0.8 V	2.7	3.5		V
		Bus	V _{CC} = 5 V, I _{OH} = -5.2 mA, PE and TE at 2 V	2.5	3.3		
			V _{CC} = 4.75 V, I _{OH} = -5.2 mA, PE and TE at 2 V	2.2			
V _{OL}	Low level output voltage	Terminal	V _{CC} = 4.75 V, I _{OL} = 16 mA, TE at 0.8 V	0.3	0.5		V
		Bus	V _{CC} = 4.75 V, I _{OL} = 48 mA, TE at 2 V, T _A = 25°C or 125°C	0.35	0.5		
			V _{CC} = 4.75 V, I _{OL} = 48 mA, TE at 2 V, T _A = -55°C	0.35	0.55		
I _I	Input current at maximum input voltage	Terminal	V _{CC} = 5.25 V, V _I = 5.5 V	0.2	100		μA
I _{IH}	High level input current	Terminal, PE, or TE	V _{CC} = 5.25 V, V _I = 2.7 V	0.1	20		μA
I _{IL}	Low level input current		V _{CC} = 5.25 V, V _I = 0.5 V	30	100		μA
V _{I0(bus)}	Voltage at bus port	V _{CC} = 5 V, Driver disabled	I _{I(bus)} = 0	2.5	3.0	3.7	V
			I _{I(bus)} = 12 mA			1.5	
I _{I0(bus)}	Current into bus port	Power on	V _{CC} = 5 V, Driver disabled	V _{I(bus)} = -1.5 V to 0.4 V	-1.3		mA
				V _{I(bus)} = 0.4 V to 2.5 V	0	-3.2	
				V _{I(bus)} = 2.5 V to 3.7 V		2.5	
				V _{I(bus)} = 3.7 V to 5 V	0	2.5	
				V _{I(bus)} = 5 V to 5.5 V	0.7	2.5	
		Power off	V _{CC} = 0, V _{I(bus)} = 0 to 2.5 V		40	μA	
I _{OS}	Short circuit output current	Terminal	V _{CC} = 5.25 V	15	35	75	mA
		Bus		25	50	125	
I _{CC}	Supply current	V _{CC} = 5.25 V, No load	Terminal outputs low and enabled	42	56		mA
			Bus outputs low and enabled	52	85		
C _{I0(bus)}	Bus port capacitance	V _{CC} = 5 V to 0, V _{I0} = 0 to 2 V, f = 1 MHz		30			pF

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

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switching characteristics at $V_{CC} = 4.75\text{ V}, 5\text{ V}, \text{ and } 5.25\text{ V}$ and $C_L = 50\text{ pF}$ (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	T_A †	MIN	TYP ‡	MAX	UNIT
t_{PLH} Propagation delay time, low- to high-level output	Terminal	Bus	See Figure 1	25°C		10	17	ns
t_{PHL} Propagation delay time, high- to low-level output				Full range		20		
t_{PLH} Propagation delay time, low- to high-level output	Bus	Terminal	See Figure 2	25°C		8	15	ns
t_{PHL} Propagation delay time, high- to low-level output				Full range		18		
t_{PZH} Output enable time to high level	TE	Bus	See Figure 3	25°C		24	30	ns
t_{PHZ} Output disable time from high level				Full range		41		
t_{PZL} Output enable time to low level				25°C		9	14	
t_{PLZ} Output disable time from low level				Full range		16	28	
t_{PZH} Output enable time to high level	TE	Terminal	See Figure 4	25°C		24	36	ns
t_{PHZ} Output disable time from high level				Full range		50		
t_{PZL} Output enable time to low level				25°C		10	18	
t_{PLZ} Output disable time from low level				Full range		23	26	
t_{en} Output pullup enable time	PE	Bus	See Figure 5	25°C		16	24	ns
t_{dis} Output pullup disable time				Full range		25		
				25°C		9	16	
				Full range			20	

† Full range is -55°C to 125°C.

‡ All typical values are at $V_{CC} = 5\text{ V}$.



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PARAMETER MEASUREMENT INFORMATION

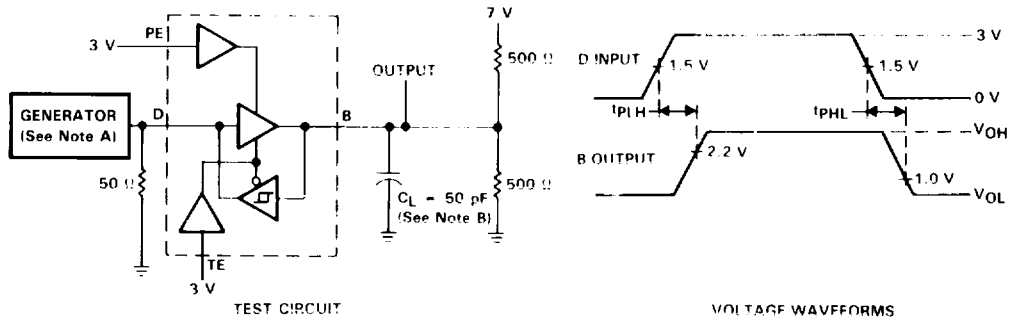


FIGURE 1. TERMINAL-TO-BUS PROPAGATION DELAY TIMES

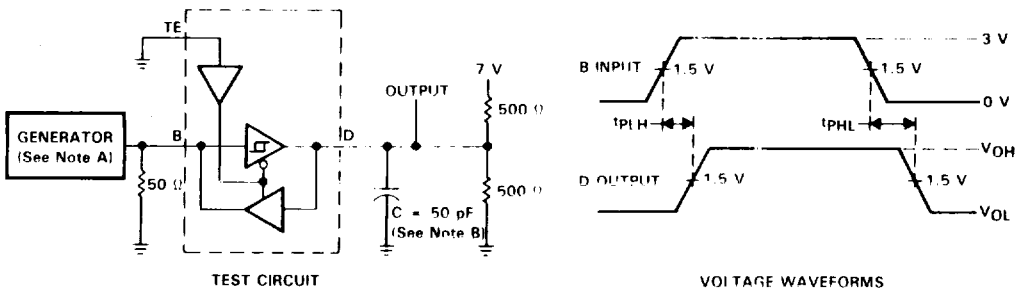


FIGURE 2. BUS TO TERMINAL PROPAGATION DELAY TIMES

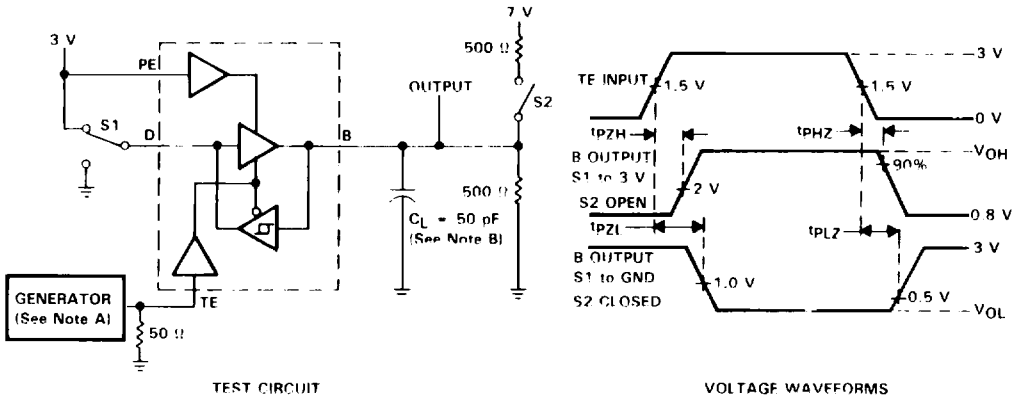


FIGURE 3. TE-TO-BUS ENABLE AND DISABLE TIMES

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR \leq MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 5$ ns, $Z_0 = 50 \Omega$.
 B. C_L includes probe and jig capacitance.

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PARAMETER MEASUREMENT INFORMATION

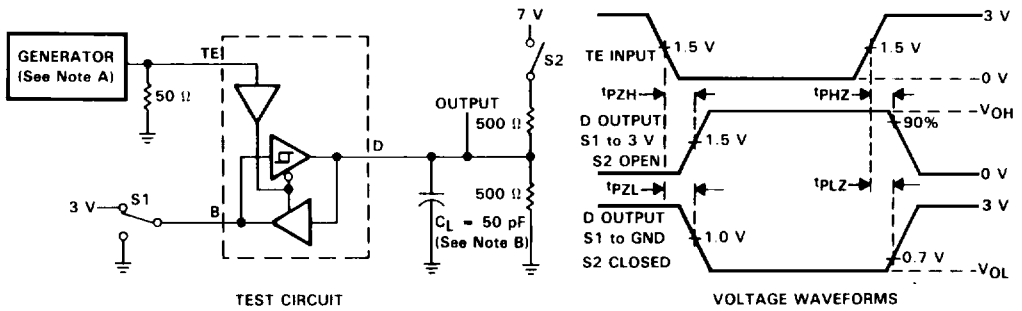


FIGURE 4. TE-TO-TERMINAL ENABLE AND DISABLE TIMES

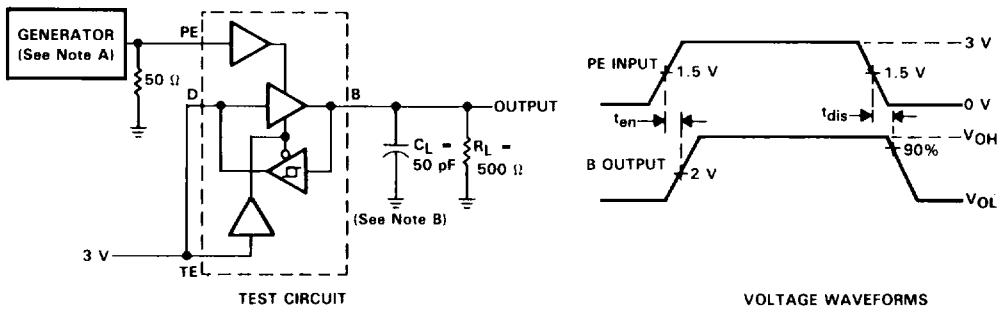


FIGURE 5. PE-TO-BUS PULLUP ENABLE AND DISABLE TIMES

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR \leq MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 5$ ns, $Z_o = 50 \Omega$.
 B. C_L includes probe and jig capacitance.

TYPICAL CHARACTERISTICS

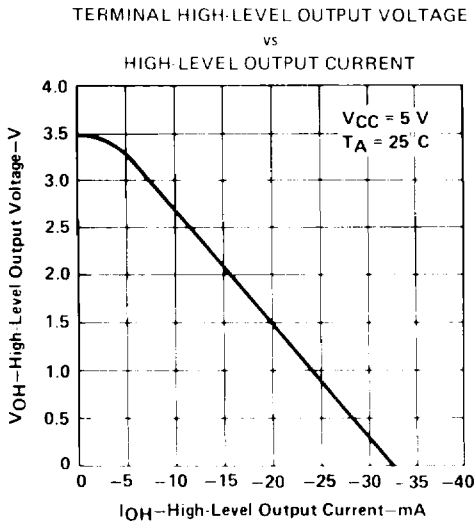


FIGURE 6

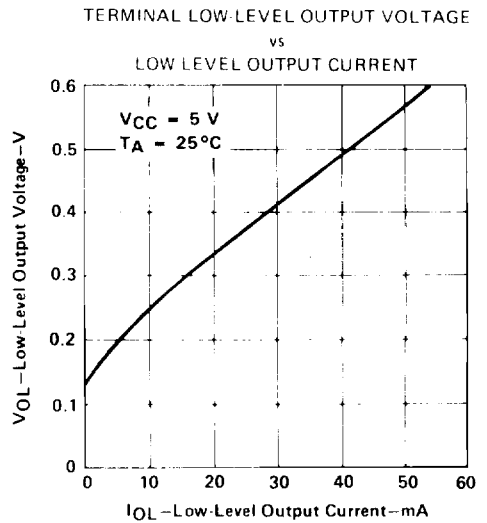


FIGURE 7

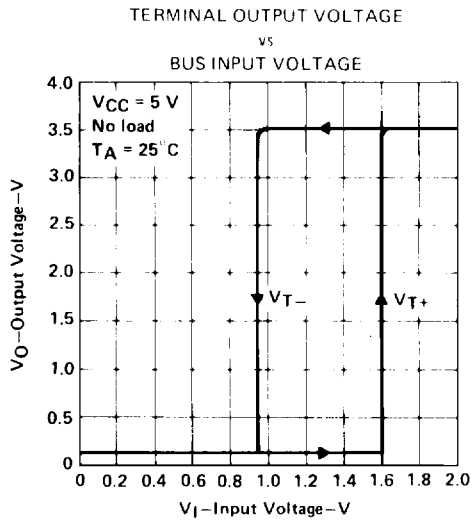


FIGURE 8

TYPICAL CHARACTERISTICS

