

# SN54LS620, SN54LS621, SN74LS620, SN74LS621, SN74LS623 OCTAL BUS TRANSCEIVERS

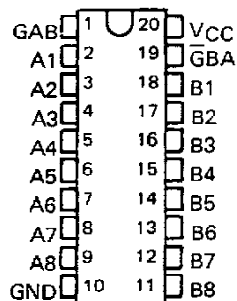
SDLS185

D2537, AUGUST 1979—REVISED MARCH 1988

- Bidirectional Bus Transceivers in High-Density 20-Pin Packages
- Local Bus-Latch Capability
- Hysteresis at Bus Inputs Improves Noise Margins
- Choice of True or Inverting Logic
- Choice of 3-State or Open-Collector Outputs

DEVICE	OUTPUT	LOGIC
'LS620	3-State	Inverting
'LS621	Open-Collector	True
'LS623	3-State	True

SN54LS620, SN54LS621,  
SN54LS622 . . . J PACKAGE  
SN74LS620, SN74LS621,  
SN74LS623 . . . DW OR N PACKAGE  
(TOP VIEW)



## description

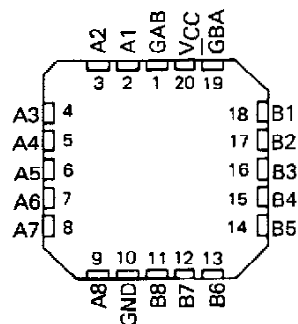
These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control function implementation allows for maximum flexibility in timing.

These devices allow data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic levels at the enable inputs ( $\overline{\text{GBA}}$  and GAB).

The enable inputs can be used to disable the device so that the buses are effectively isolated.

The dual-enable configuration gives the 'LS620, 'LS621, and 'LS623 the capability to store data by simultaneous enabling of  $\overline{\text{GBA}}$  and GAB. Each output reinforces its input in this transceiver configuration. Thus, when both control inputs are enabled and all other data sources to the two sets of bus lines are at high impedance, both sets of bus lines (16 in all) will remain at their last states. The 8-bit codes appearing on the two sets of buses will be identical for the 'LS621 and 'LS623 devices or complementary for the 'LS620.

SN54LS620, SN54LS621,  
SN54LS622 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE

ENABLE INPUTS		OPERATION	
$\overline{\text{GBA}}$	GAB	'LS620	'LS621, 'LS623
L	L	B data to A bus	B data to A bus
H	H	A data to B bus	A data to B bus
H	L	Isolation	Isolation
L	H	$\overline{\text{B}}$ data to A bus, $\overline{\text{A}}$ data to B bus	B data to A bus, A data to B bus

H = high level, L = low level

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

Supply voltage, $V_{\text{CC}}$ (see Note 1)	7 V
Input voltage	7 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS'	-55°C to 125°C
SN74LS'	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

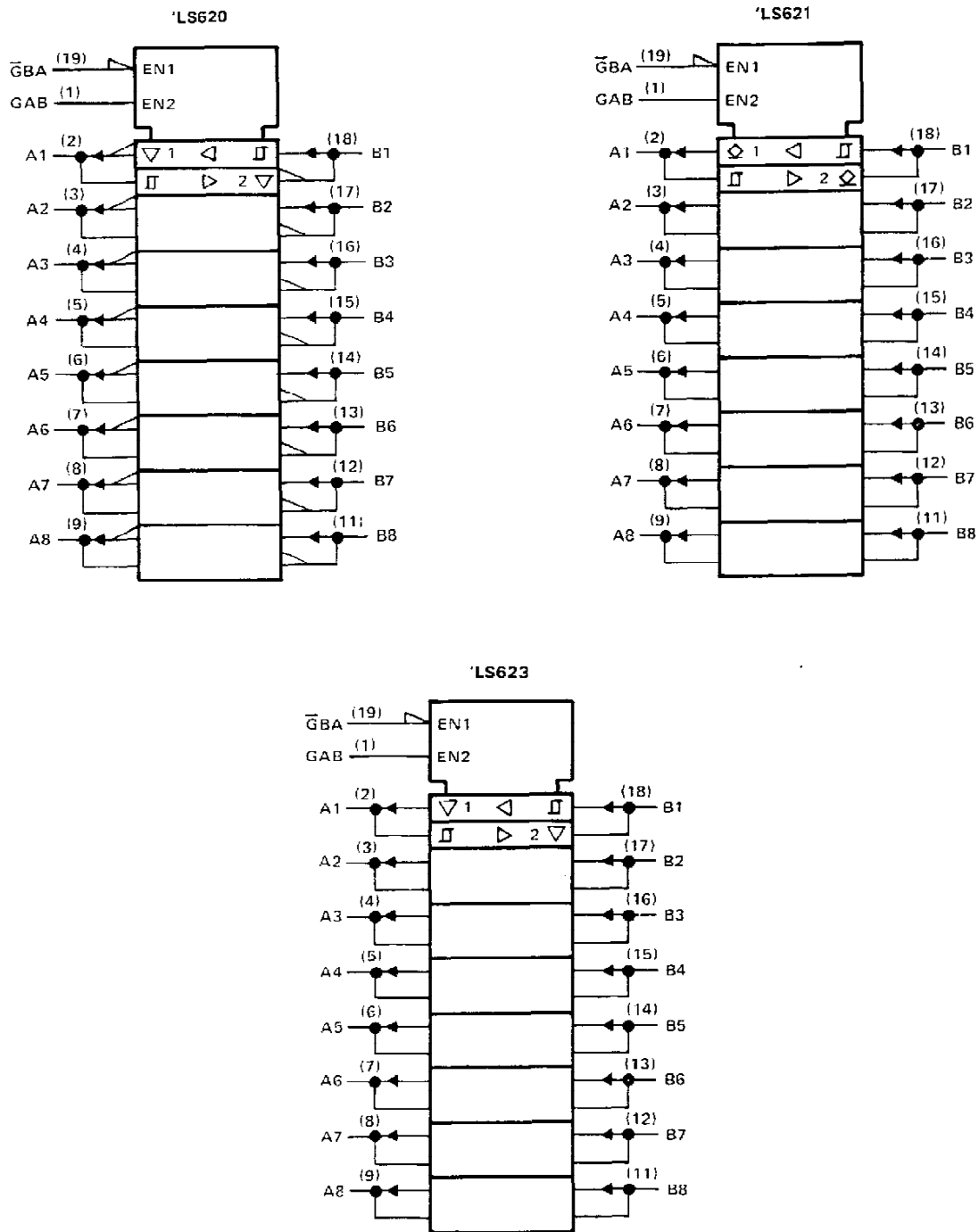
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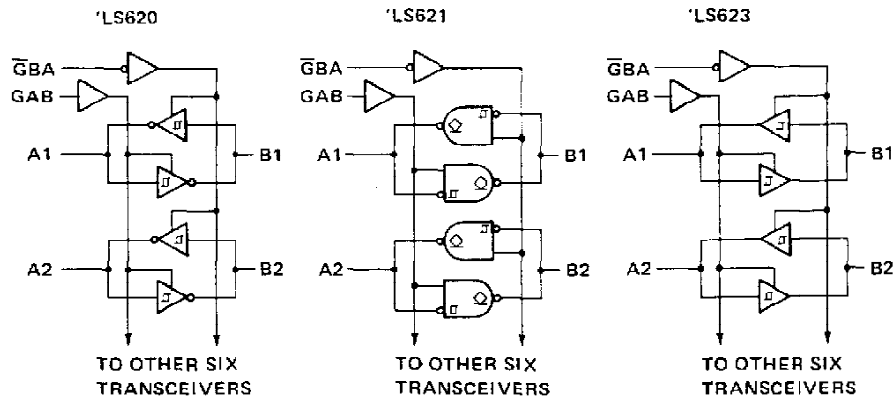
logic symbols†



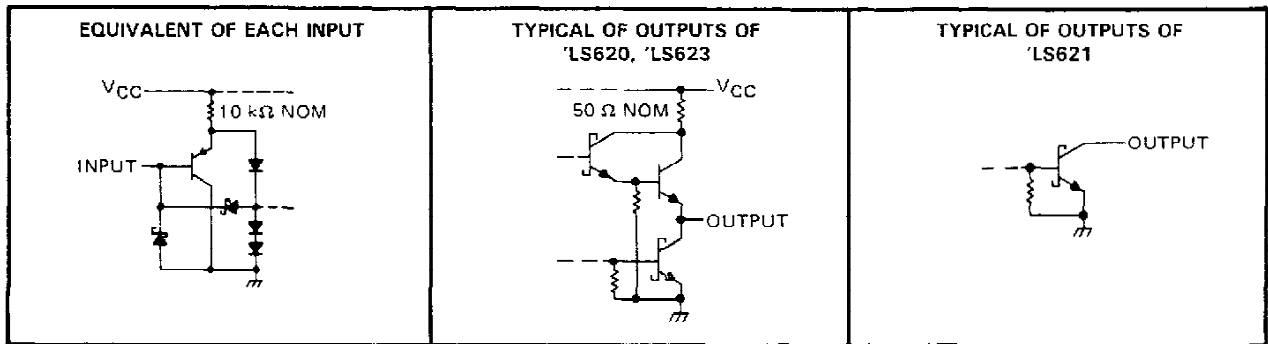
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for DW, J, and N packages.

**SN54LS620, SN54LS621,  
SN74LS620, SN74LS621, SN74LS623  
OCTAL BUS TRANSCEIVERS**

logic diagrams (positive logic)



schematics of inputs and outputs



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# SN54LS620, SN74LS620, SN74LS623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

## recommended operating conditions

PARAMETER	SN54LS620			SN74LS620 SN74LS623			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC}$ (see Note 1)	4.5	5	5.5	4.75	5	5.25	V
High-level output current, $I_{OH}$			-12			-15	mA
Low-level output current, $I_{OL}$			12			24	mA
Operating free-air temperature, $T_A$	-55		125	0		70	$^{\circ}$ C

NOTE 1: Voltage values are with respect to network ground terminal.

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

PARAMETER	TEST CONDITIONS†	SN54LS620			SN74LS620 SN74LS623			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IH}$ High-level input voltage							V	
$V_{IL}$ Low-level input voltage				0.5		0.6	V	
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5		-1.5	V	
Hysteresis ( $V_{T+} - V_{T-}$ ) A or B input	$V_{CC} = \text{MIN}$	0.1	0.4		0.2	0.4	V	
$V_{OH}$ High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$ $I_{OH} = -3 \text{ mA}$	2.4	3.4		2.4	3.4	V	
	$I_{OH} = \text{MAX}$	2			2			
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$ $I_{OL} = 12 \text{ mA}$		0.25	0.4		0.25	V	
	$I_{OL} = 24 \text{ mA}$					0.35		0.5
$I_{OZH}$ Off-state output current, high-level voltage applied	$V_{CC} = \text{MAX}, V_O = 2.7 \text{ V}, \bar{G}$ at 2 V,			20		20	$\mu$ A	
$I_{OZL}$ Off-state output current, low-level voltage applied	$V_{CC} = \text{MAX}, V_O = 0.4 \text{ V}, \bar{G}$ at 2 V,			-400		-400	$\mu$ A	
$I_I$ Input current at maximum input voltage	A or B			0.1		0.1	mA	
	$\bar{G}$ BA or $\bar{G}$ AB			0.1		0.1		
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20		20	$\mu$ A	
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.4		-0.4	mA	
$I_{OS}$ Short-circuit output current §	$V_{CC} = \text{MAX}$	-40		-225	-40		mA	
$I_{CC}$ Total supply current	Outputs high		48	70		48	70	mA
	Outputs low		62	90		62	90	
	Outputs at Hi-Z		64	95		64	95	

† For conditions shown as MIN or MAX use the appropriate value specified under recommended operating conditions.

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

§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

## switching characteristics at $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}\text{C}$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS620			SN74LS623			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
$t_{PLH}$ Propagation delay time, low-to-high-level output	A	B	$C_L = 45 \text{ pF}, R_L = 667 \Omega,$ See Note 2	6	10		8	15	ns	
	B	A		6	10		8	15		
$t_{PHL}$ Propagation delay time, high-to-low-level output	A	B		8	15		11	15	ns	
	B	A		8	15		11	15		
$t_{PZL}$ Output enable time to low level	$\bar{G}$ BA	A	See Note 2	31	40		31	40	ns	
	$\bar{G}$ AB	B		31	40		31	40		
$t_{PZH}$ Output enable time to high level	$\bar{G}$ BA	A		23	40		26	40	ns	
	$\bar{G}$ AB	B		23	40		26	40		
$t_{PLZ}$ Output disable time from low level	$\bar{G}$ BA	A	$C_L = 5 \text{ pF}, R_L = 667 \Omega,$ See Note 2	15	25		15	25	ns	
	$\bar{G}$ AB	B		15	25		15	25		
$t_{PHZ}$ Output disable time from high level	$\bar{G}$ BA	A		15	25		15	25	ns	
	$\bar{G}$ AB	B		15	25		15	25		

$t_{PLH}$  = Propagation delay time, low-to-high-level output

$t_{PHL}$  = Propagation delay time, high-to-low-level output

$t_{PZH}$  = Output enable time to high level

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

$t_{PZL}$  = Output enable time to low level

$t_{PHZ}$  = Output disable time from high level

$t_{PLZ}$  = Output disable time from low level

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# SN54LS621, SN74LS621 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

## recommended operating conditions

PARAMETER	SN54LS621			SN74LS621			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC}$ (see Note 1)	4.5	5	5.5	4.75	5	5.25	V
High-level output voltage, $V_{OH}$			5.5			5.5	V
Low-level output current, $I_{OL}$			12			24	mA
Operating free-air temperature, $T_A$	-55		125	0		70	°C

NOTE 1: Voltage values are with respect to network ground terminal.

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

PARAMETER		TEST CONDITIONS†	SN54LS621			SN74LS621			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IH}$	High-level input voltage		2			2			V
$V_{IL}$	Low-level input voltage				0.5			0.6	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V
	Hysteresis ( $V_{T+} - V_{T-}$ ) A or B input	$V_{CC} = \text{MIN}$	0.1	0.4		0.2	0.4		V
$I_{OH}$	High-level output current	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, V_{OH} = 5.5 \text{ V}$			100			100	μA
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}, I_{OL} = 12 \text{ mA}$	0.25	0.4		0.25	0.4		V
		$V_{CC} = \text{MIN}, I_{OL} = 24 \text{ mA}$				0.35	0.5		
$I_I$	Input current at maximum input voltage	A or B			0.1			0.1	mA
		GAB or $\overline{\text{GBA}}$	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$			0.1		0.1	
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20			20	μA
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.4			-0.4	mA
$I_{CC}$	Total supply current	Outputs high		48	70		48	70	mA
		Outputs low	$V_{CC} = \text{MAX}, \text{Outputs open}$	62	90		62	90	

†For conditions shown as MIN or MAX use the appropriate value specified under recommended operating conditions.

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

## switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS621			UNIT
				MIN	TYP	MAX	
$t_{PLH}$	Propagation delay time, low-to-high-level output	A	$C_L = 45 \text{ pF}, R_L = 667 \Omega,$ See Note 2		17	25	ns
		B			17	25	
$t_{PHL}$	Propagation delay time, high-to-low-level output	A			16	25	ns
		B			16	25	
$t_{PLH}$	Output disable time from low level	$\overline{\text{GBA}}$			23	40	ns
		GAB			25	40	
$t_{PHL}$	Output enable time from high level	$\overline{\text{GBA}}$			34	50	ns
		GAB			37	50	

$t_{PLH}$  = Propagation delay time, low-to-high-level output

$t_{PHL}$  = Propagation delay time, high-to-low-level output

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

  
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**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS623DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74LS623NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1



**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS623DWR	SOIC	DW	20	2000	346.0	346.0	41.0
SN74LS623NSR	SO	NS	20	2000	346.0	346.0	41.0

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