- 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)

GAB	1	20	VCC
A1	2	19	$\overline{\text{GBA}}$
A2	3	18	B1
A3	4	17	B2
A4	5	16	B3
A5	6	15	B4
A6	7	14	B5
A7	8	13	B6
A8	9	12	B7
GND	10	11	B8

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)
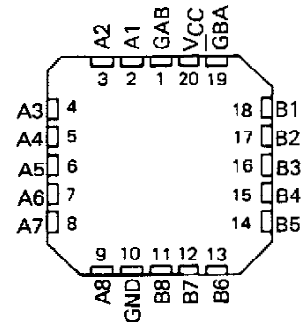
FUNCTION TABLE

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	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, VCC (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.

TEXAS
INSTRUMENTS

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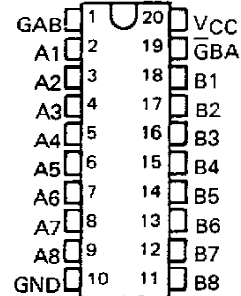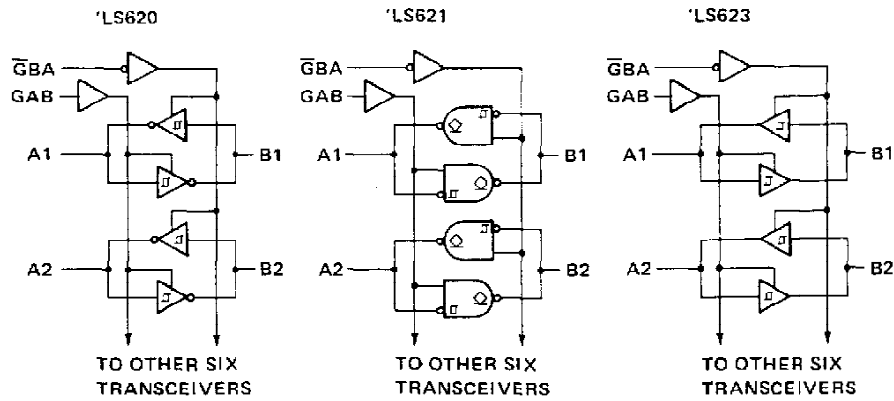# SN54LS620, SN54LS621, SN74LS620, SN74LS621, SN74LS623
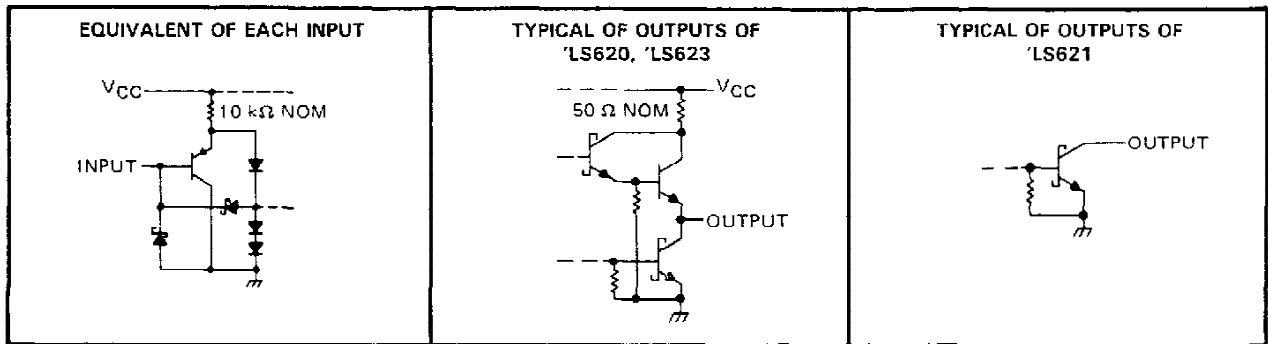## OCTAL BUS TRANSCEIVERS

logic symbols†
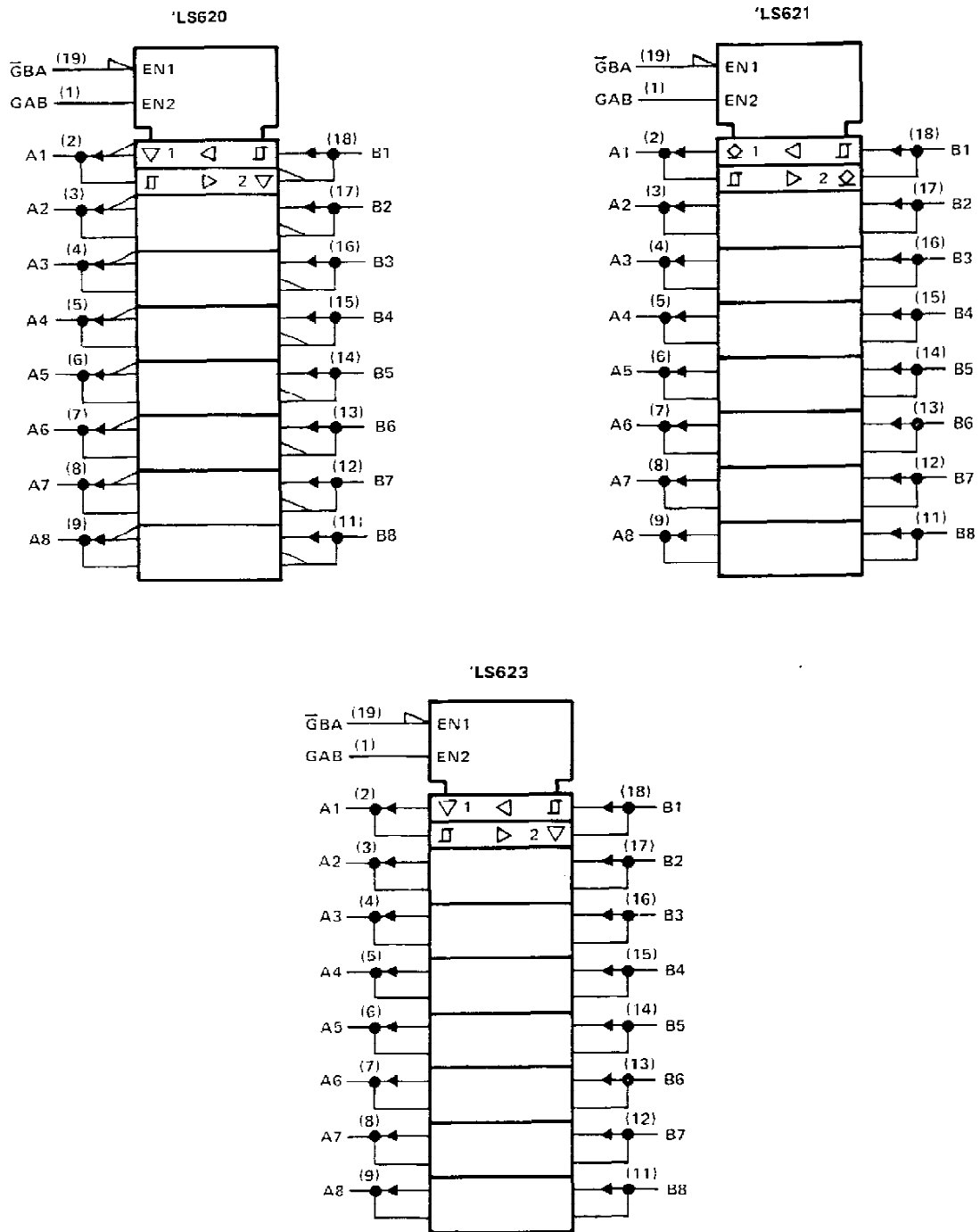
'LS620

'LS621

'LS623

† 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.

logic diagrams (positive logic)

'LS620   'LS621   'LS623

TO OTHER SIX   TO OTHER SIX   TO OTHER SIX
TRANSCEIVERS   TRANSCEIVERS   TRANSCEIVERS

schematics of inputs and outputs

EQUIVALENT OF EACH INPUT	TYPICAL OF OUTPUTS OF 'LS620, 'LS623	TYPICAL OF OUTPUTS OF 'LS621

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	°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			2			2			V
V_{IL}	Low-level input voltage					0.5			0.6	V
V_{IK}	Input clamp voltage	V_{CC} = MIN,	I_I = −18 mA			−1.5			−1.5	V
	Hysteresis ($V_{T+} − V_{T−}$) A or B input	V_{CC} = MIN		0.1	0.4		0.2	0.4		V
V_{OH}	High-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max	I_{OH} = −3 mA	2.4	3.4		2.4	3.4		V
			I_{OH} = MAX	2			2			
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max	I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 24 mA					0.35	0.5	
I_{OZH}	Off-state output current, high-level voltage applied	V_{CC} = MAX, V_O = 2.7 V	$\overline{G}$ at 2 V,			20			20	μA
I_{OZL}	Off-state output current, low-level voltage applied	V_{CC} = MAX, V_O = 0.4 V	$\overline{G}$ at 2 V,			−400			−400	μA
I_I	Input current at maximum input voltage	A or B	V_{CC} = MAX,	V_I = 5.5 V			0.1			0.1	mA
		$\overline{GBA}$ or GAB		V_I = 7 V			0.1			0.1	
I_{IH}	High-level input current	V_{CC} = MAX,	V_I = 2.7 V			20			20	μA
I_{IL}	Low-level input current	V_{CC} = MAX,	V_I = 0.4 V			−0.4			−0.4	mA
I_{OS}	Short-circuit output current §	V_{CC} = MAX		−40		−225	−40		−225	mA
I_{CC}	Total supply current	Outputs high	V_{CC} = MAX, Outputs open		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 V, T_A = 25°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 V, T_A = 25°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 pF, R_L = 667 Ω, 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	$\overline{GBA}$	A			31	40		31	40	ns
		GAB	B			31	40		31	40	
t_{PZH}	Output enable time to high level	$\overline{GBA}$	A			23	40		26	40	ns
		GAB	B			23	40		26	40	
t_{PLZ}	Output disable time from low level	$\overline{GBA}$	A	C_L = 5 pF, R_L = 667 Ω, See Note 2		15	25		15	25	ns
		GAB	B			15	25		15	25	
t_{PHZ}	Output disable time from high level	$\overline{GBA}$	A			15	25		15	25	ns
		GAB	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

t_{PZL} = Output enable time to low level
t_{PHZ} = Output disable time from high level
t_{PLZ} = Output disable time from low level

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

recommended operating conditions

PARAMETER	SN54LS621 MIN	NOM	MAX	SN74LS621 MIN	NOM	MAX	UNIT
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 MIN	TYP‡	MAX	SN74LS621 MIN	TYP‡	MAX	UNIT
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} = MIN,	I_I = −18 mA			−1.5			−1.5	V
	Hysteresis ($V_{T+} - V_{T-}$) A or B input	V_{CC} = MIN		0.1	0.4		0.2	0.4		V
I_{OH}	High-level output current	V_{CC} = MIN, V_{IH} = 2 V, $V_{IL} = V_{IL}$ max, V_{OH} = 5.5 V				100			100	μA
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, $V_{IL} = V_{IL}$ max	I_{OL} = 12 mA	0.25	0.4		0.25	0.4		V
			I_{OL} = 24 mA				0.35	0.5		
I_I	Input current at maximum input voltage	A or B	V_{CC} = MAX,	5.5 V		0.1			0.1		mA
		GAB or GBA		V_I = 7 V		0.1			0.1		
I_{IH}	High-level input current	V_{CC} = MAX,	V_I = 2.7 V			20			20	μA
I_{IL}	Low-level input current	V_{CC} = MAX,	V_I = 0.4 V			−0.4			−0.4	mA
I_{CC}	Total supply current	Outputs high	V_{CC} = MAX,	Outputs open		48	70		48	70	mA
		Outputs low				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 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

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

REEL DIMENSIONS

TAPE DIMENSIONS

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers
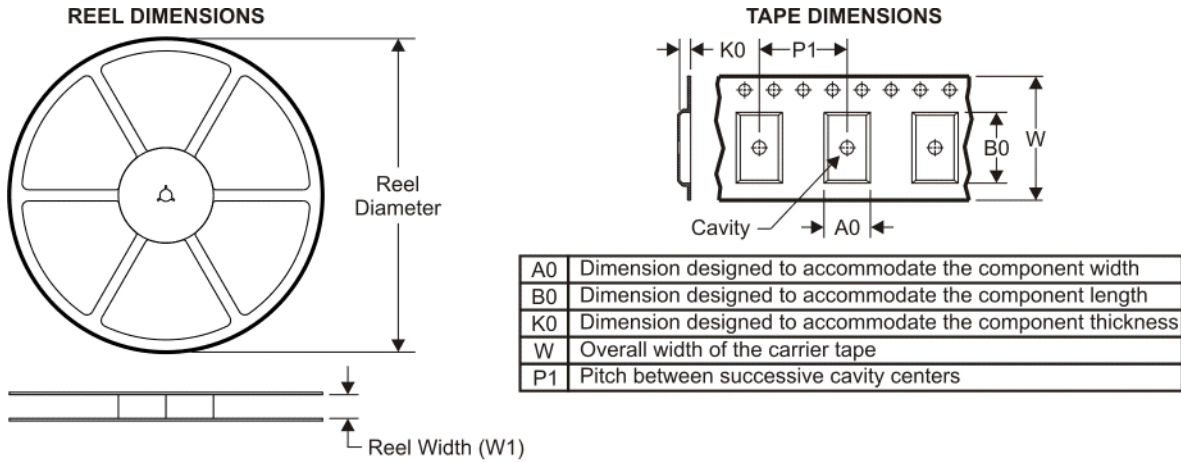
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE
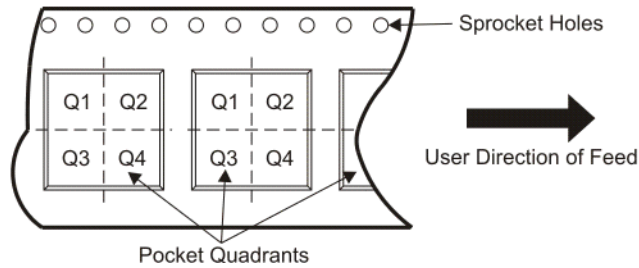
*All dimensions are nominal

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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