

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

SDLS185

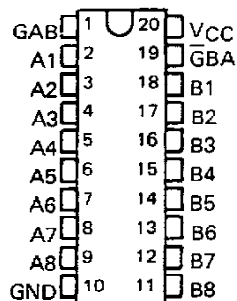
D2537, AUGUST 1979—REVISED MARCH 1988

- 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.

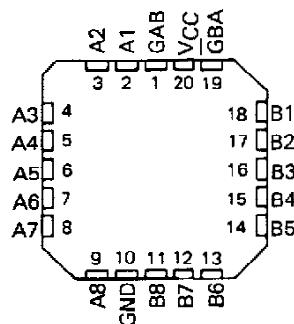
These devices allow data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic levels at the enable inputs ($\overline{\text{GBA}}$ and GAB).

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_{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.

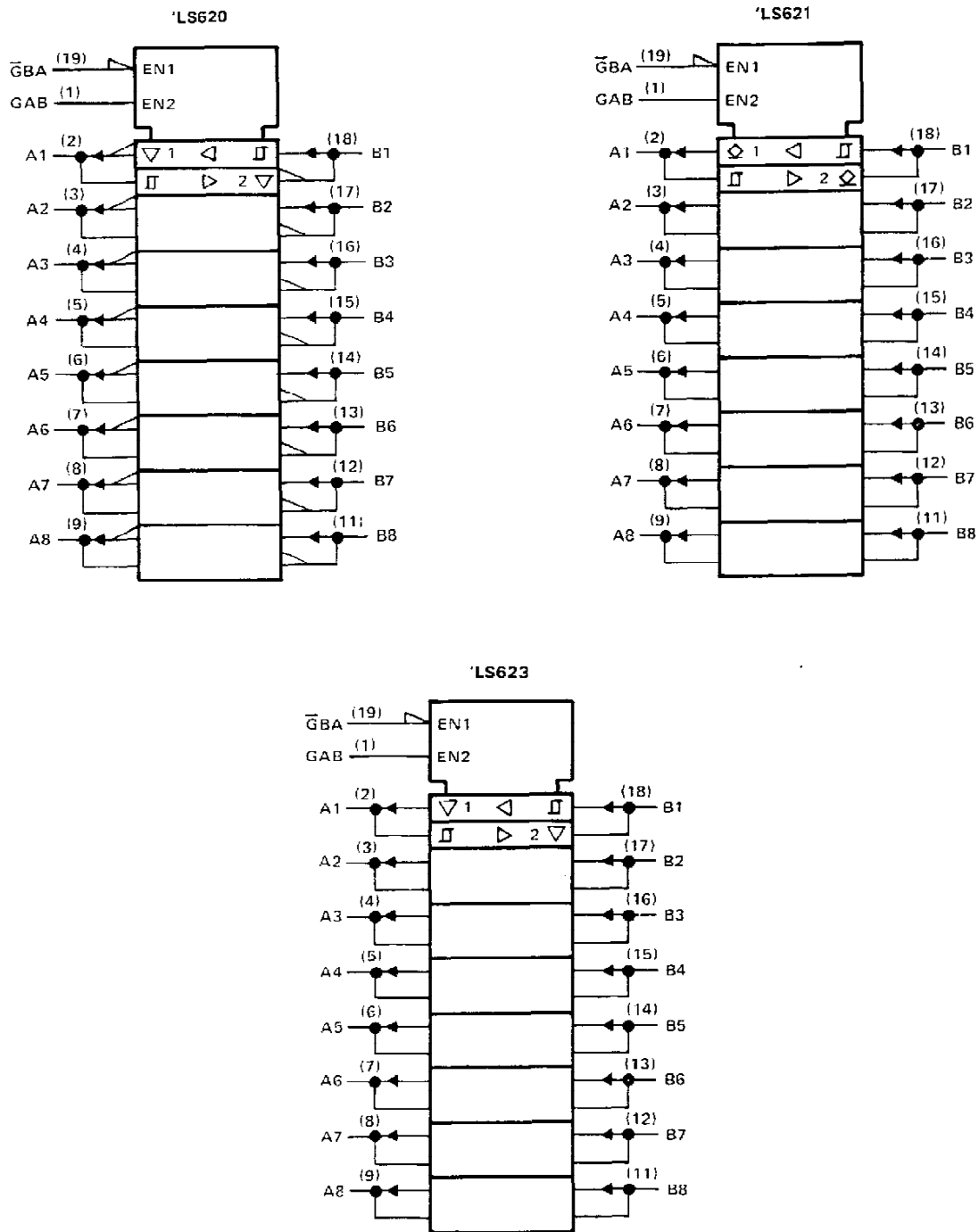
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SN54LS620, SN54LS621, SN74LS620, SN74LS621, SN74LS623 OCTAL BUS TRANSCEIVERS

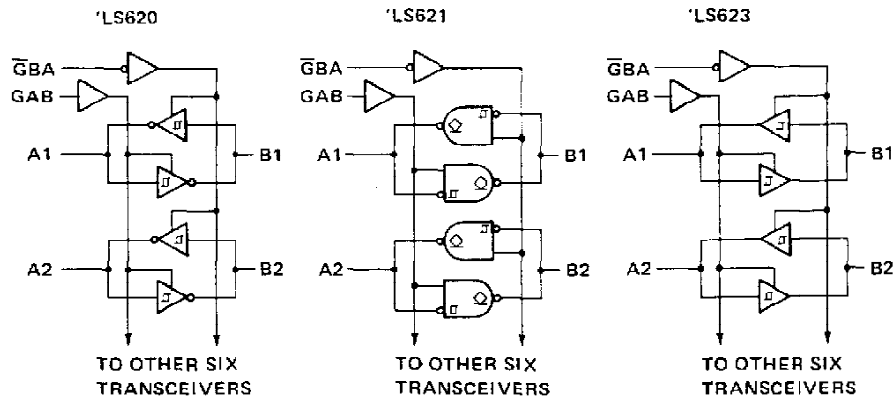
logic symbols†



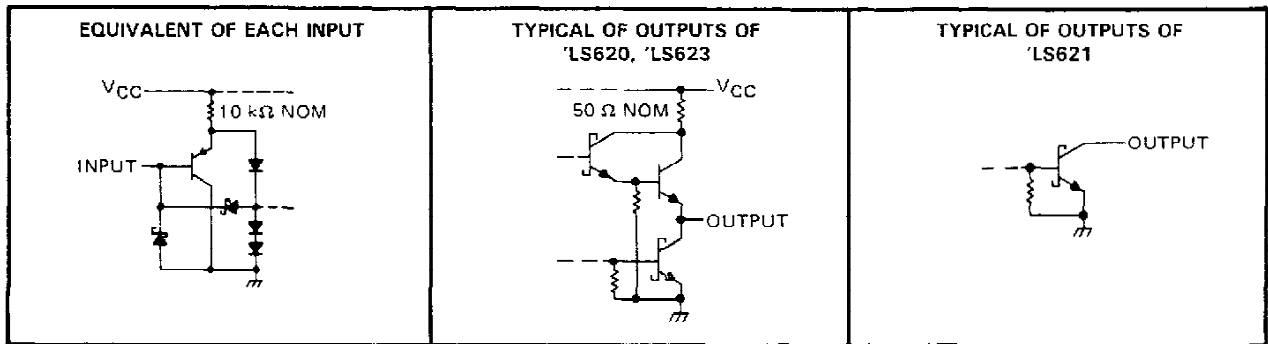
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for DW, J, and N packages.

**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 | °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 | | 0.5 | 2 | | 0.6 | 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 |
| 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 | 0.4 | V |
| | $I_{OL} = 24 \text{ mA}$ | | | | | 0.35 | 0.5 | V |
| 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 | μA |
| 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 | μA |
| I_I Input current at maximum input voltage | A or B | | | 0.1 | | | 0.1 | mA |
| | GBA or GAB | | | 0.1 | | | 0.1 | mA |
| 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_{OS} Short-circuit output current § | $V_{CC} = \text{MAX}$ | -40 | | -225 | -40 | | -225 | mA |
| I_{CC} Total supply current | Outputs high | | 48 | 70 | | 48 | 70 | mA |
| | Outputs low | | 62 | 90 | | 62 | 90 | mA |
| | Outputs at Hi-Z | | 64 | 95 | | 64 | 95 | mA |

† 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 | |
| | GAB | B | | 31 | 40 | | 31 | 40 | | |
| t_{PZH} Output enable time to high level | \bar{G} BA | A | | 23 | 40 | | 26 | 40 | ns | |
| | GAB | 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 | |
| | GAB | B | | 15 | 25 | | 15 | 25 | | |
| t_{PHZ} Output disable time from high level | \bar{G} BA | 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

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 | 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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TAPE AND REEL INFORMATION



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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