

TYPES SN54LS620 THRU SN54LS623, SN74LS620 THRU SN74LS623 OCTAL BUS TRANSCEIVERS

D2537, AUGUST 1979 — REVISED DECEMBER 1983

- 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 |
| 'LS622 | Open-Collector | Inverting |
| 'LS623 | 3-State | True |

description

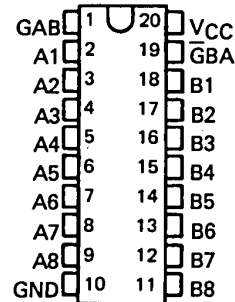
These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control function implementation allows for maximum flexibility in timing.

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 ($\bar{G}BA$ and GAB).

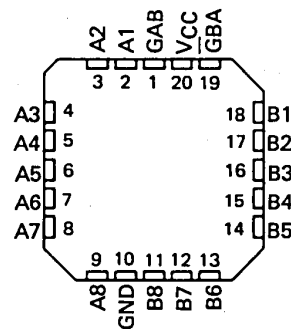
The enable inputs can be used to disable the device so that the buses are effectively isolated.

The dual-enable configuration gives the 'LS620 thru 'LS623 the capability to store data by simultaneous enabling of $\bar{G}BA$ 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 and 'LS622.

SN54LS620, SN54LS621, SN54LS622
SN54LS623 ... J PACKAGE
SN74LS620, SN74LS621, SN74LS622
SN74LS623 ... DW, J OR N PACKAGE
(TOP VIEW)



SN54LS620, SN54LS621, SN54LS622
SN54LS623 ... FK PACKAGE
SN74LS620, SN74LS621, SN74LS622
SN74LS623 ... FN PACKAGE
(TOP VIEW)



FUNCTION TABLE

| ENABLE INPUTS | | OPERATION | |
|---------------|-------|-------------------------------------|-------------------------------------|
| $\bar{G}BA$ | GAB | 'LS620, 'LS622 | '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, 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.

PRODUCTION DATA
This document contains 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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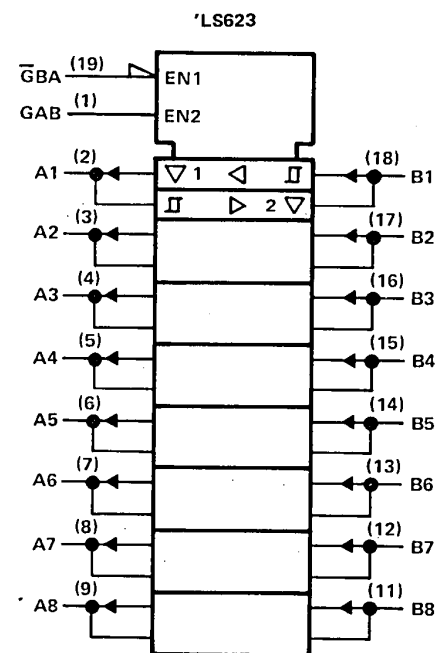
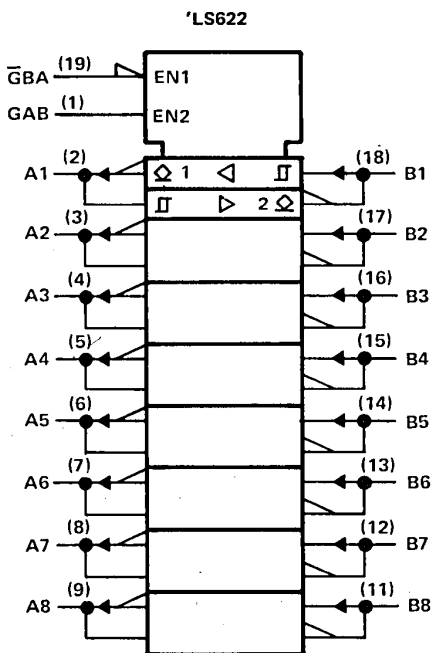
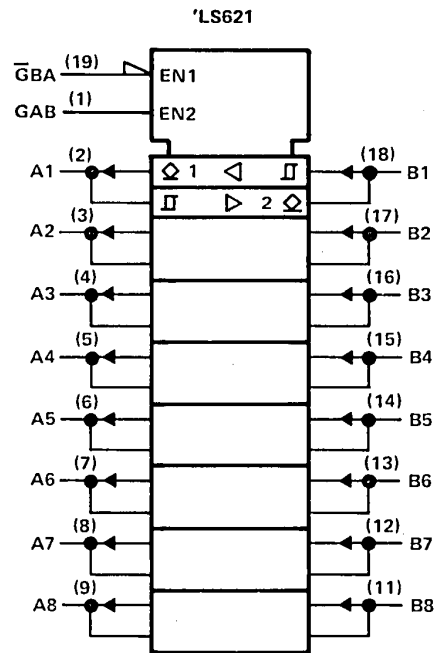
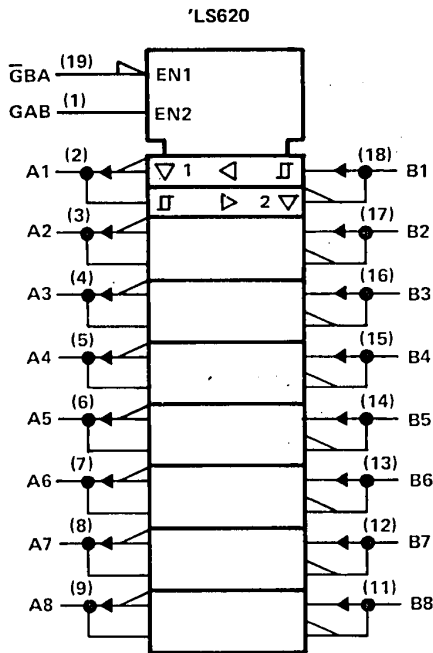
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TTL DEVICES

TYPES SN54LS620 THRU SN54LS623, SN74LS620 THRU SN74LS623 OCTAL BUS TRANSCEIVERS

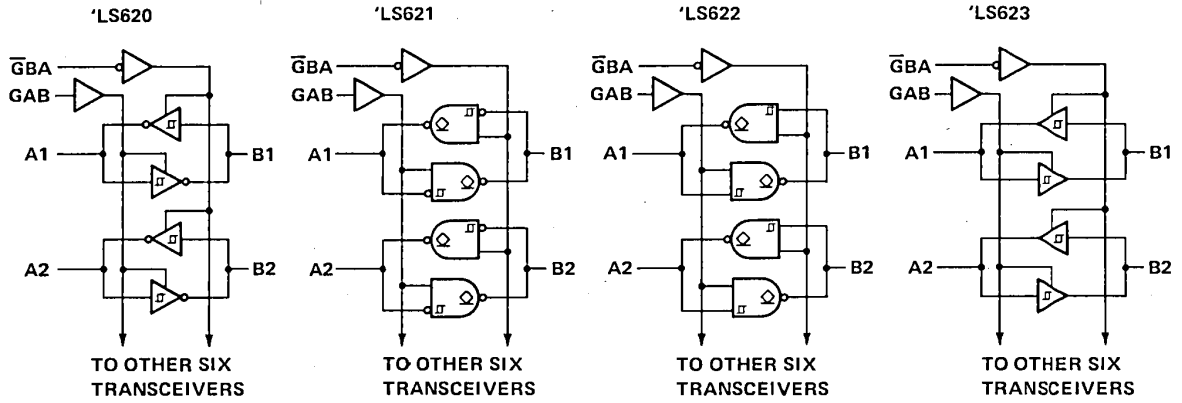
logic symbols



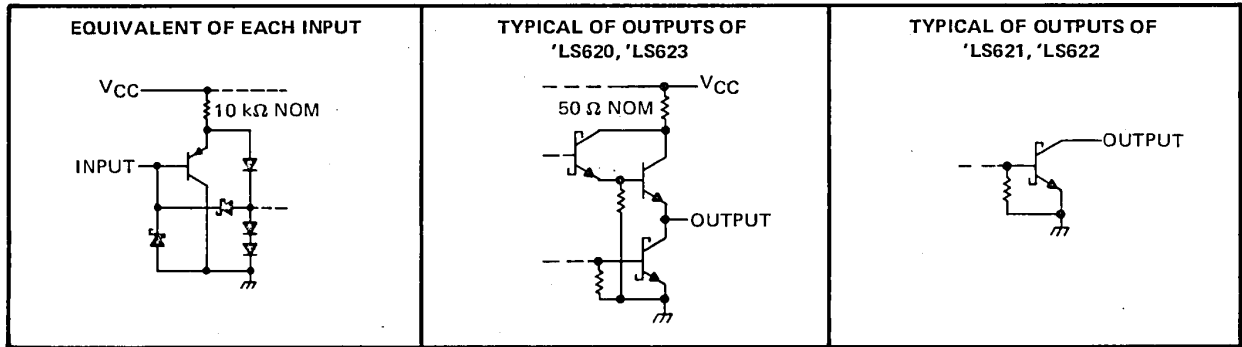
Pin numbers shown on logic notation are for DW, J or N packages.

TYPES SN54LS620 THRU SN54LS623,
SN74LS620 THRU SN74LS623
OCTAL BUS TRANSCEIVERS

logic diagrams (positive logic)



schematics of inputs and outputs



TTL DEVICES

TYPES SN54LS620, SN54LS623, SN74LS620, SN74LS623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

recommended operating conditions

| PARAMETER | SN54LS620 SN54LS623 | | | 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 SN54LS623 | | | 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 | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$ | | | -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 | 0.4 | | 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 | | 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 | $V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$ | | 0.1 | | 0.1 | | mA |
| | \bar{G} A or \bar{G} B | | $V_I = 7 \text{ V}$ | | 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_{OS} Short-circuit output current § | $V_{CC} = \text{MAX}$ | | | -40 | -225 | -40 | -225 | mA |
| I_{CC} Total supply current | Outputs high | $V_{CC} = \text{MAX},$ 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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

§ 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 | | | 'LS623 | | | UNIT | |
|--|---------------|-------------|--|------------|-----|-----|--------|-----|-----|------|----|
| | | | | MIN | TYP | MAX | MIN | TYP | MAX | | |
| t_{PLH} Propagation delay time, low-to-high-level output | A | B | $C_L = 45 \text{ pF}, R_L = 667 \Omega,$ | | 6 | 10 | | 8 | 15 | ns | |
| | B | A | | | 6 | 10 | | 8 | 15 | | |
| t_{PHL} Propagation delay time, high-to-low-level output | A | B | | See Note 2 | | 8 | 15 | | 11 | 15 | ns |
| | B | A | | | | 8 | 15 | | 11 | 15 | |
| t_{pZL} Output enable time to low level | \bar{G} B A | A | See Note 2 | | 31 | 40 | | 31 | 40 | ns | |
| | \bar{G} A B | B | | | 31 | 40 | | 31 | 40 | | |
| t_{pZH} Output enable time to high level | \bar{G} B A | A | See Note 2 | | 23 | 40 | | 26 | 40 | ns | |
| | \bar{G} A B | B | | | 23 | 40 | | 26 | 40 | | |
| t_{pLZ} Output disable time from low level | \bar{G} B A | A | $C_L = 5 \text{ pF}, R_L = 667 \Omega,$ | | 15 | 25 | | 15 | 25 | ns | |
| | \bar{G} A B | B | | | 15 | 25 | | 15 | 25 | | |
| t_{pHZ} Output disable time from high level | \bar{G} B A | A | See Note 2 | | 15 | 25 | | 15 | 25 | ns | |
| | \bar{G} A B | 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: See General Information Section for load circuits and voltage waveforms.

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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TTL DEVICES

TYPES SN54LS621, SN54LS622, SN74LS621, SN74LS622 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

| PARAMETER | SN54LS621 SN54LS622 | | | SN74LS621 SN74LS622 | | | 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 SN54LS622 | | | SN74LS621 SN74LS622 | | | 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 | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OL} = 12 \text{ mA}$ | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OL} = 24 \text{ mA}$ | | | | | 0.35 | 0.5 | |
| I_I Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 7 \text{ V}$ | | | 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_{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 at $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | 'LS621 | | | 'LS622 | | | UNIT |
|--|--------------|-------------|--|--------|-----|-----|--------|-----|-----|------|
| | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| t_{PLH} Propagation delay time, low-to-high-level output | A | B | $C_L = 45 \text{ pF}, R_L = 667 \Omega,$ | 17 | 25 | | 19 | 25 | ns | |
| | B | A | | 17 | 25 | | 19 | 25 | | |
| t_{PHL} Propagation delay time, high-to-low-level output | A | B | See Note 2 | 16 | 25 | | 14 | 25 | ns | |
| | B | A | | 16 | 25 | | 14 | 25 | | |
| t_{PLH} Output disable time from low level | GBA | A | See Note 2 | 23 | 40 | | 26 | 40 | ns | |
| | GAB | B | | 25 | 40 | | 28 | 40 | | |
| t_{PHL} Output enable time from high level | GBA | A | See Note 2 | 34 | 50 | | 43 | 60 | ns | |
| | GAB | B | | 37 | 50 | | 39 | 60 | | |

t_{PLH} = Propagation delay time, low-to-high-level input.

t_{PHL} = Propagation delay time, high-to-low-level input.

NOTE 2: See General Information Section for load circuits and voltage waveforms.