

74LVTH543

Low Voltage Octal Registered Transceiver with 3-STATE Outputs

General Description

The LVTH543 octal transceiver contains two sets of D-type latches for temporary storage of data flowing in either direction. Separate Latch Enable and Output Enable inputs are provided for each register to permit independent control of inputting and outputting in either direction of data flow.

The LVTH543 data inputs include bushhold, eliminating the need for external pull-up resistors to hold unused inputs.

This octal registered transceiver is designed for low-voltage (3.3V) V_{CC} applications, but with the capability to provide a TTL interface to a 5V environment. The LVTH543 is fabricated with an advanced BiCMOS technology to achieve high speed operation similar to 5V ABT while maintaining a low power dissipation.

Features

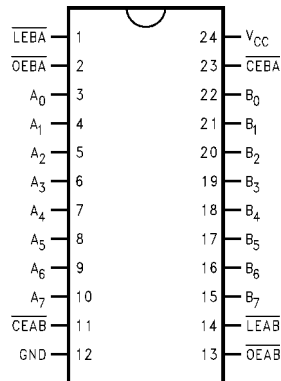
- Input and output interface capability to systems at 5V V_{CC}
- Bushhold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Power Up/Down high impedance provides glitch-free bus loading
- Outputs source/sink $-32\text{ mA}/+64\text{ mA}$
- Functionally compatible with the 74 series 543
- Latch-up performance exceeds 500 mA
- ESD performance:
 - Human-body model > 2000V
 - Machine model > 200V
 - Charged-device model > 1000V

Ordering Code:

| Order Number | Package Number | Package Description |
|--------------|----------------|---|
| 74LVTH543WM | M24B | 24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74LVTH543MTC | MTC24 | 24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

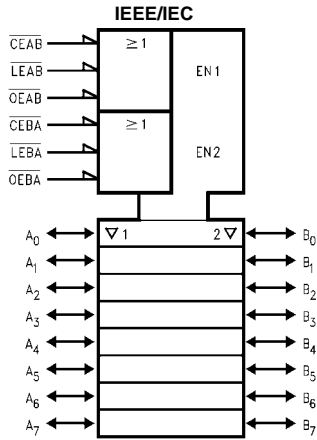
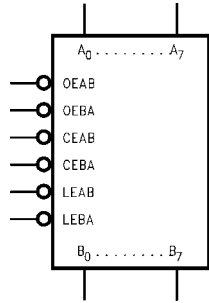
Connection Diagram



Pin Descriptions

| Pin Names | Description |
|---------------------------------------|-------------------------------------|
| \overline{OEAB} , \overline{OEBA} | Output Enable Inputs |
| \overline{LEAB} , \overline{LEBA} | Latch Enable Inputs |
| \overline{CEAB} , \overline{CEBA} | Chip Enable Inputs |
| A_0 – A_7 | Side A Inputs or 3-STATE Outputs |
| B_0 – B_7 | Side B Inputs or 3-STATE Outputs |

Logic Symbols



Functional Description

The LVTH543 contains two sets of D-type latches, with separate input and output controls for each. For data flow from A to B, for example, the A to B Enable (CEAB) input must be LOW in order to enter data from the A Port or take data from the B Port as indicated in the Data I/O Control Table. With CEAB LOW, a low signal on (LEAB) input makes the A to B latches transparent; a subsequent LOW-to-HIGH transition of the LEAB line puts the A latches in the storage mode and their outputs no longer change with the A inputs. With CEAB and OEAB both LOW, the B output buffers are active and reflect the data present on the output of the A latches. Control of data flow from B to A is similar, but using the CEBA, LEBA and OEBA.

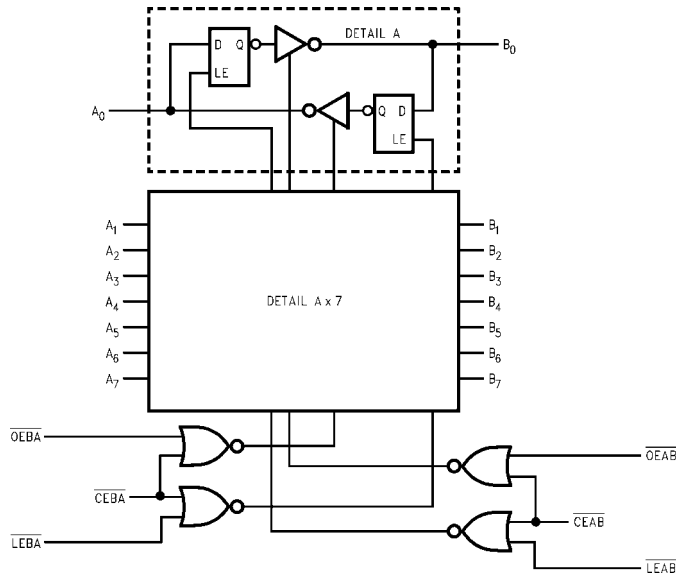
Data I/O Control Table

| Inputs | | | Latch Status | Output Buffers |
|--------|------|------|--------------|----------------|
| CEAB | LEAB | OEAB | | |
| H | X | X | Latched | High Z |
| X | H | X | Latched | — |
| L | L | X | Transparent | — |
| X | X | H | — | High Z |
| L | X | L | — | Driving |

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial

Note: A-to-B data flow shown; B-to-A flow control is the same, except using CEBA, LEBA, and OEBA.

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

| Absolute Maximum Ratings ^(Note 1) | | | | |
|--|----------------------------------|--------------|--------------------------------------|-------------|
| Symbol | Parameter | Value | Conditions | Units |
| V_{CC} | Supply Voltage | -0.5 to +4.6 | | V |
| V_I | DC Input Voltage | -0.5 to +7.0 | | V |
| V_O | DC Output Voltage | -0.5 to +7.0 | Output in 3-STATE | V |
| | | -0.5 to +7.0 | Output in HIGH or LOW State (Note 2) | V |
| I_{IK} | DC Input Diode Current | -50 | $V_I < GND$ | mA |
| I_{OK} | DC Output Diode Current | -50 | $V_O < GND$ | mA |
| I_O | DC Output Current | 64 | $V_O > V_{CC}$ Output at HIGH State | mA |
| | | 128 | $V_O > V_{CC}$ Output at LOW State | |
| I_{CC} | DC Supply Current per Supply Pin | ± 64 | | mA |
| I_{GND} | DC Ground Current per Ground Pin | ± 128 | | mA |
| T_{STG} | Storage Temperature | -65 to +150 | | $^{\circ}C$ |

| Recommended Operating Conditions | | | | |
|----------------------------------|---|-----|-----|-------------|
| Symbol | Parameter | Min | Max | Units |
| V_{CC} | Supply Voltage | 2.7 | 3.6 | V |
| V_I | Input Voltage | 0 | 5.5 | V |
| I_{OH} | HIGH Level Output Current | | -32 | mA |
| I_{OL} | LOW Level Output Current | | 64 | |
| T_A | Free-Air Operating Temperature | -40 | 85 | $^{\circ}C$ |
| $\Delta t/\Delta V$ | Input Edge Rate, $V_{IN} = 0.8V-2.0V$, $V_{CC} = 3.0V$ | 0 | 10 | ns/V |

Note 1: Absolute Maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum rated conditions is not implied.

Note 2: I_O Absolute Maximum Rating must be observed.

DC Electrical Characteristics

| Symbol | Parameter | V _{CC} (V) | T _A = -40°C to +85°C | | Units | Conditions | |
|----------------------|--|------------------------|---------------------------------|------|-------|---|--|
| | | | Min | Max | | | |
| V _{IK} | Input Clamp Diode Voltage | 2.7 | | -1.2 | V | I _I = -18 mA | |
| V _{IH} | Input HIGH Voltage | 2.7-3.6 | 2.0 | | V | V _O ≤ 0.1V or | |
| V _{IL} | Input LOW Voltage | 2.7-3.6 | | 0.8 | | V _O ≥ V _{CC} - 0.1V | |
| V _{OH} | Output HIGH Voltage | 2.7-3.6 | V _{CC} - 0.2 | | V | I _{OH} = -100 μA | |
| | | 2.7 | 2.4 | | V | I _{OH} = -8 mA | |
| | | 3.0 | 2.0 | | V | I _{OH} = -32 mA | |
| V _{OL} | Output LOW Voltage | 2.7 | | 0.2 | V | I _{OL} = 100 μA | |
| | | 2.7 | | 0.5 | V | I _{OL} = 24 mA | |
| | | 3.0 | | 0.4 | V | I _{OL} = 16 mA | |
| | | 3.0 | | 0.5 | V | I _{OL} = 32 mA | |
| | | 3.0 | | 0.55 | V | I _{OL} = 64 mA | |
| I _{I(HOLD)} | Bushold Input Minimum Drive | 3.0 | 75 | | μA | V _I = 0.8V | |
| | | | -75 | | μA | V _I = 2.0V | |
| I _{I(OD)} | Bushold Input Over-Drive Current to Change State | 3.0 | 500 | | μA | (Note 3) | |
| | | | -500 | | μA | (Note 4) | |
| I _I | Input Current | 3.6 | | 10 | μA | V _I = 5.5V | |
| | | Control Pins | 3.6 | | ±1 | μA | V _I = 0V or V _{CC} |
| | | Data Pins | 3.6 | | -5 | μA | V _I = 0V |
| I _{OFF} | Power Off Leakage Current | 0 | | ±100 | μA | 0V ≤ V _I or V _O ≤ 5.5V | |
| I _{PU/PD} | Power Up/Down 3-STATE Output Current | 0-1.5V | | ±100 | μA | V _O = 0.5V to 3.0V V _I = GND or V _{CC} | |
| I _{OZL} | 3-STATE Output Leakage Current | 3.6 | | -5 | μA | V _O = 0.0V | |
| I _{OZH} | 3-STATE Output Leakage Current | 3.6 | | 5 | μA | V _O = 3.6V | |
| I _{OZH+} | 3-STATE Output Leakage Current | 3.6 | | 10 | μA | V _{CC} < V _O ≤ 5.5V | |
| I _{CCH} | Power Supply Current | 3.6 | | 0.19 | mA | Outputs HIGH | |
| I _{CCL} | Power Supply Current | 3.6 | | 5 | mA | A or B Port Outputs LOW | |
| I _{CCZ} | Power Supply Current | 3.6 | | 0.19 | mA | Outputs Disabled | |
| I _{CCZ+} | Power Supply Current | 3.6 | | 0.19 | mA | V _{CC} ≤ V _O ≤ 5.5V Outputs Disabled | |
| ΔI _{CC} | Increase in Power Supply Current (Note 5) | 3.6 | | 0.2 | mA | One Input at V _{CC} - 0.6V Other Inputs at V _{CC} or GND | |

Note 3: An external driver must source at least the specified current to switch from LOW-to-HIGH.

Note 4: An external driver must sink at least the specified current to switch from HIGH-to-LOW.

Note 5: This is the increase in supply current for each input that is at the specified voltage level rather than V_{CC} or GND.

Dynamic Switching Characteristics (Note 6)

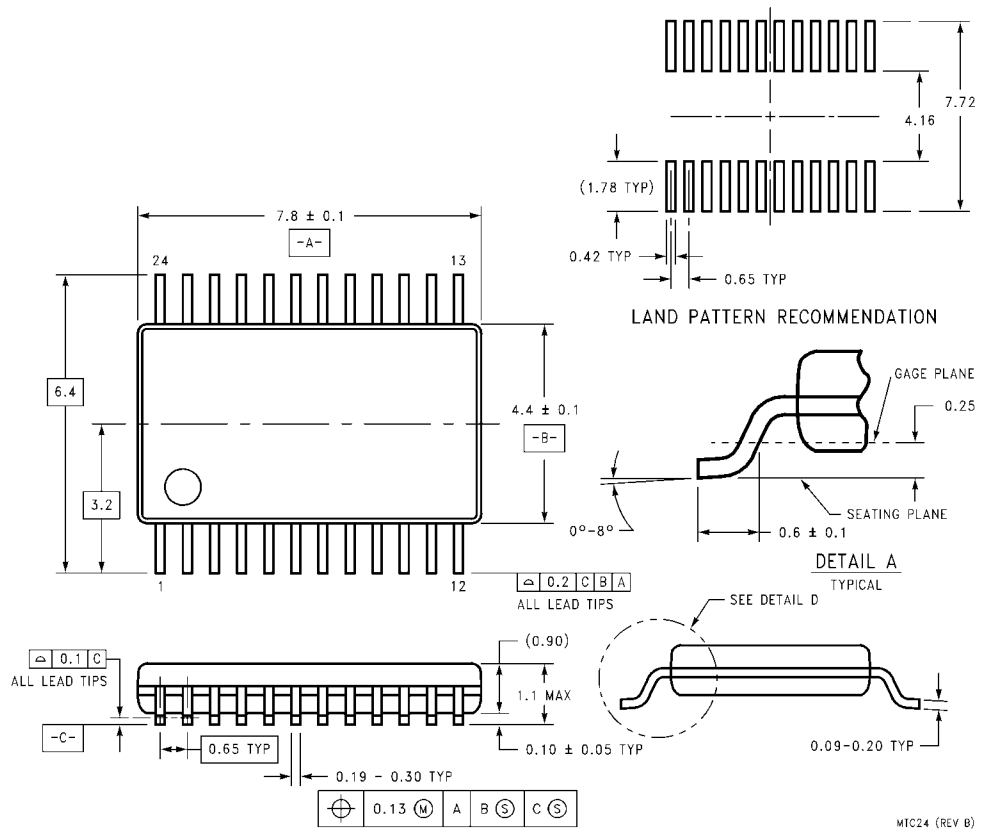
| Symbol | Parameter | V _{CC} (V) | T _A = 25°C | | | Units | Conditions C _L = 50 pF, R _L = 500Ω |
|------------------|--|------------------------|-----------------------|------|-----|-------|---|
| | | | Min | Typ | Max | | |
| V _{OLP} | Quiet Output Maximum Dynamic V _{OL} | 3.3 | | 0.8 | | V | (Note 7) |
| V _{OLV} | Quiet Output Minimum Dynamic V _{OL} | 3.3 | | -0.8 | | V | (Note 7) |

Note 6: Characterized in SOIC package. Guaranteed parameter, but not tested.

Note 7: Max number of outputs defined as (n). n-1 data inputs are driven 0V to 3V. Output under test held LOW.

| AC Electrical Characteristics | | | | | | |
|---|--------------------------------|--|-----|------------------------|-------|-------|
| Symbol | Parameter | T _A = -40°C to +85°C C _L = 50 pF, R _L = 500Ω | | | | Units |
| | | V _{CC} = 3.3V ± 0.3V | | V _{CC} = 2.7V | | |
| | | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 1.3 | 4.4 | 1.3 | 4.8 | ns |
| t _{PHL} | Data to Outputs | 1.3 | 4.6 | 1.3 | 5.2 | |
| t _{PLH} | Propagation Delay | 1.3 | 5.4 | 1.3 | 6.4 | ns |
| t _{PHL} | \overline{LE} to A or B | 1.3 | 5.8 | 1.3 | 6.6 | |
| t _{PZH} | Output Enable Time | 1.1 | 5.5 | 1.1 | 6.3 | ns |
| t _{PZL} | \overline{OE} to A or B | 1.1 | 6.1 | 1.1 | 7.2 | |
| t _{PHZ} | Output Disable Time | 2.0 | 5.7 | 2.0 | 5.9 | ns |
| t _{PLZ} | \overline{OE} to A or B | 2.0 | 5.3 | 2.0 | 5.9 | |
| t _{PZH} | Output Enable Time | 1.3 | 5.9 | 1.3 | 6.8 | ns |
| t _{PZL} | \overline{CE} to A or B | 1.3 | 6.2 | 1.3 | 7.4 | |
| t _{PHZ} | Output Disable Time | 2.1 | 5.8 | 2.1 | 6.1 | ns |
| t _{PLZ} | \overline{CE} to A or B | 1.6 | 5.4 | 1.6 | 5.9 | |
| t _W | Pulse Duration | \overline{LE} LOW | 3.3 | | 3.3 | ns |
| t _S | Setup Time | A or B before \overline{LE} , Data HIGH | 0.4 | | 0.4 | ns |
| | | A or B before \overline{LE} , Data LOW | 1.0 | | 1.5 | |
| | | A or B before \overline{CE} , Data HIGH | 0.2 | | 0.2 | |
| | | A or B before \overline{CE} , Data LOW | 0.7 | | 1.2 | |
| t _H | Hold Time | A or B before \overline{LE} , Data HIGH | 1.5 | | 0.6 | ns |
| | | A or B before \overline{LE} , Data LOW | 1.3 | | 1.5 | |
| | | A or B before \overline{CE} , Data HIGH | 1.6 | | 0.5 | |
| | | A or B before \overline{CE} , Data LOW | 1.4 | | 1.6 | |
| t _{OSHL} | Output to Output Skew (Note 8) | | 1.0 | | 1.0 | ns |
| t _{OSLH} | | | 1.0 | | 1.0 | |
| Note 8: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t _{OSHL}) or LOW-to-HIGH (t _{OSLH}). | | | | | | |
| Capacitance (Note 9) | | | | | | |
| Symbol | Parameter | Conditions | | Typical | Units | |
| C _{IN} | Input Capacitance | V _{CC} = 0V, V _I = 0V or V _{CC} | | 4 | pF | |
| C _{I/O} | Input/Output Capacitance | V _{CC} = 3.0V, V _O = 0V or V _{CC} | | 8 | pF | |
| Note 9: Capacitance is measured at frequency f = 1 MHz, per MIL-STD-883B, Method 3012. | | | | | | |

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



**24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC24**

MTC24 (REV B)

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