

# 74ACT16543

## 16-Bit Registered Transceiver with 3-STATE Outputs

### General Description

The ACT16543 contains sixteen non-inverting transceivers containing two sets of D-type registers for temporary storage of data flowing in either direction. Each byte has separate control inputs which can be shorted together for full 16-bit operation. Separate Latch Enable and Output Enable inputs are provided for each register to permit independent input and output control in either direction of data flow.

### Features

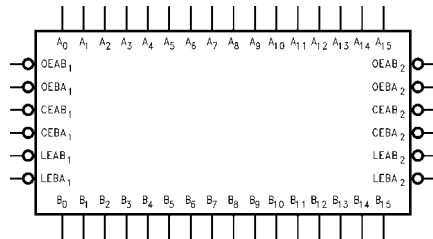
- Independent registers for A and B buses
- Separate controls for data flow in each direction
- Back-to-back registers for storage
- Multiplexed real-time and stored data transfers
- Separate control logic for each byte
- Outputs source/sink 24 mA
- TTL-compatible inputs

### Ordering Code:

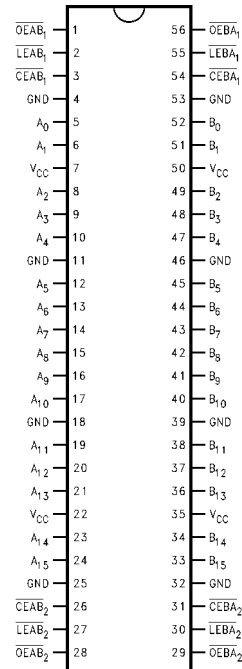
| Order Number  | Package Number | Package Description   |
|---------------|----------------|---|
| 74ACT16543SSC | MS56A          | 56-Lead Shrink Small Outline Package (SSOP), JEDEC MO-118, 0.300" Wide      |
| 74ACT16543MTD | MTD56          | 56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide |

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

### Logic Symbol



### Connection Diagram



### Pin Descriptions

| Pin Names           | Descriptions                                    |
|---------------------|---|
| $\overline{OEAB}_n$ | A-to-B Output Enable Input (Active LOW)         |
| $\overline{OEBA}_n$ | B-to-A Output Enable Input (Active LOW)         |
| $\overline{CEAB}_n$ | A-to-B Enable Input (Active LOW)                |
| $\overline{CEBA}_n$ | B-to-A Enable Input (Active LOW)                |
| $\overline{LEAB}_n$ | A-to-B Latch Enable Input (Active LOW)          |
| $\overline{LEBA}_n$ | B-to-A Latch Enable Input (Active LOW)          |
| $A_0$ - $A_{15}$    | A-to-B Data Inputs or<br>B-to-A 3-STATE Outputs |
| $B_0$ - $B_{15}$    | B-to-A Data Inputs or<br>A-to-B 3-STATE Outputs |

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## Functional Description

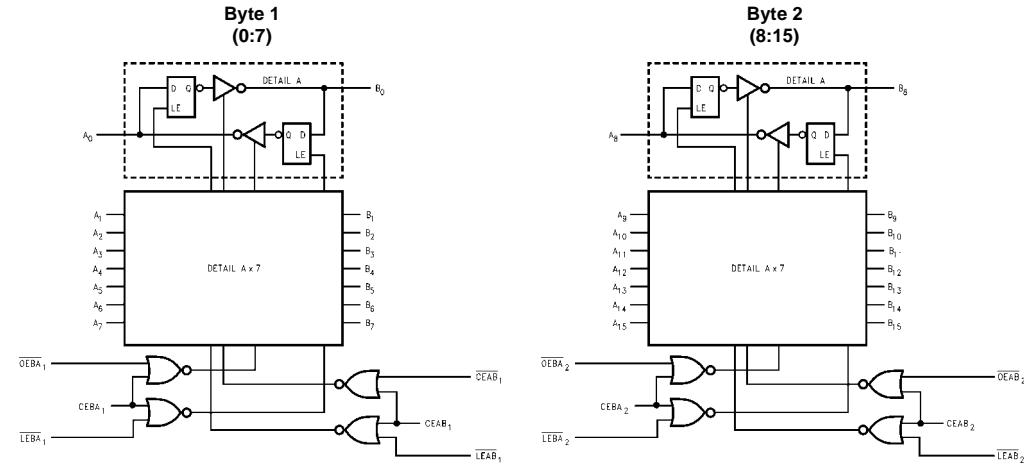
The ACT16543 contains sixteen non-inverting transceivers with 3-STATE outputs. The device is byte controlled with each byte functioning identically, but independent of the other. The control pins may be shorted together to obtain full 16-bit operation. The following description applies to each byte. For data flow from A to B, for example, the A-to-B Enable ( $\overline{CEAB}_n$ ) input must be LOW in order to enter data from  $A_0$ – $A_{15}$  or take data from  $B_0$ – $B_{15}$ , as indicated in the Data I/O Control Table. With  $\overline{CEAB}_n$  LOW, a LOW signal on the A-to-B Latch Enable ( $\overline{LEAB}_n$ ) input makes the A-to-B latches transparent; a subsequent LOW-to-HIGH transition of the  $\overline{LEAB}_n$  signal puts the A latches in the storage mode and their outputs no longer change with the A inputs. With  $\overline{CEAB}_n$  and  $\overline{OEAB}_n$  both LOW, the 3-STATE B output buffers are active and reflect the data present at the output of the A latches. Control of data flow from B to A is similar, but using the  $\overline{CEBA}_n$ ,  $\overline{LEBA}_n$  and  $\overline{OEBA}_n$  inputs.

## Data I/O Control Table

| Inputs              |                     |                     | Latch Status (Byte n) | Output Buffers (Byte n) |
|---------------------|---------------------|---------------------|-----------------------|-------------------------|
| $\overline{CEAB}_n$ | $\overline{LEAB}_n$ | $\overline{OEAB}_n$ |                       |                         |
| 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  
 A-to-B data flow shown; B-to-A flow control is the same, except using  $\overline{CEBA}_n$ ,  $\overline{LEBA}_n$  and  $\overline{OEBA}_n$

## Logic Diagrams



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)

|  |                          |
|--|--------------------------|
| Supply Voltage ( $V_{CC}$ )                  | -0.5V to +7.0V           |
| DC Input Diode Current ( $I_{IK}$ )          |                          |
| $V_I = -0.5V$                                | -20 mA                   |
| $V_I = V_{CC} + 0.5V$                        | +20 mA                   |
| DC Output Diode Current ( $I_{OK}$ )         |                          |
| $V_O = -0.5V$                                | -20 mA                   |
| $V_O = V_{CC} + 0.5V$                        | +20 mA                   |
| DC Output Voltage ( $V_O$ )                  | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source/Sink Current ( $I_O$ )      | $\pm 50$ mA              |
| DC $V_{CC}$ or Ground Current per Output Pin | $\pm 50$ mA              |
| Storage Temperature                          | -65°C to +150°C          |

**Recommended Operating Conditions**

|   |                |
|---|----------------|
| Supply Voltage ( $V_{CC}$ )                     | 4.5V to 5.5V   |
| Input Voltage ( $V_I$ )                         | 0V to $V_{CC}$ |
| Output Voltage ( $V_O$ )                        | 0V to $V_{CC}$ |
| Operating Temperature ( $T_A$ )                 | -40°C to +85°C |
| Minimum Input Edge Rate ( $\Delta V/\Delta t$ ) | 125 mV/ns      |
| $V_{IN}$ from 0.8V to 2.0V                      |                |
| $V_{CC}$ @ 4.5V, 5.5V                           |                |

**Note 1:** Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

**DC Electrical Characteristics**

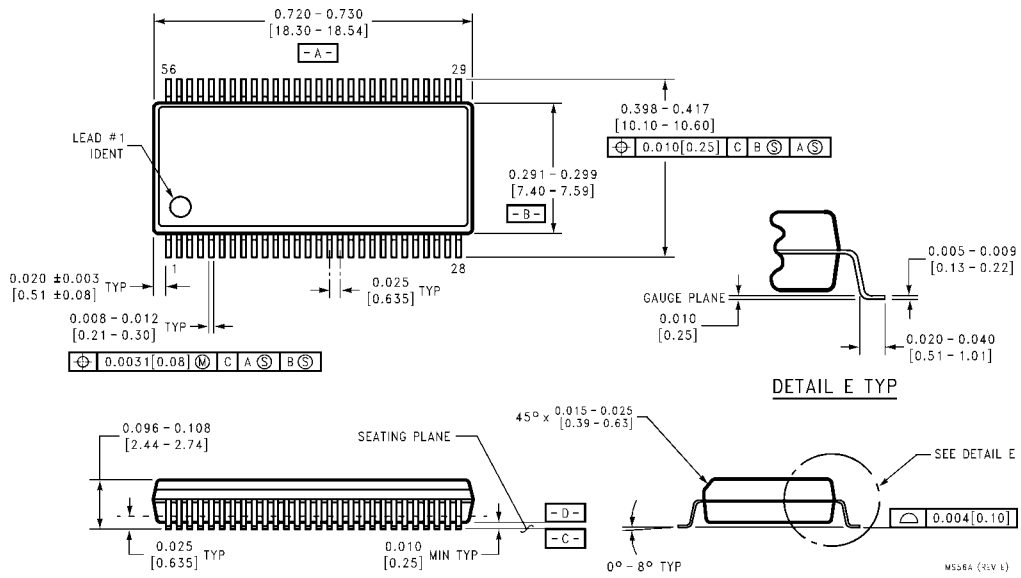
| Symbol    | Parameter                               | $V_{CC}$<br>(V) | $T_A = +25^\circ\text{C}$ |                   | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ |         | Units  | Conditions |
|-----------|---|-----------------|---------------------------|-------------------|---|---------|--|------------|
|           |   |                 | Typ                       | Guaranteed Limits |   |         |  |            |
| $V_{IH}$  | Minimum HIGH Input Voltage              | 4.5             | 1.5                       | 2.0               | 2.0   | V       | $V_{OUT} = 0.1V$<br>or $V_{CC} - 0.1V$   |            |
|           | 5.5                                     | 1.5             | 2.0                       | 2.0               |   |         |  |            |
| $V_{IL}$  | Maximum LOW Input Voltage               | 4.5             | 1.5                       | 0.8               | 0.8   | V       | $V_{OUT} = 0.1V$<br>or $V_{CC} - 0.1V$   |            |
|           | 5.5                                     | 1.5             | 0.8                       | 0.8               |   |         |  |            |
| $V_{OH}$  | Minimum HIGH Output Voltage             | 4.5             | 4.49                      | 4.4               | 4.4   | V       | $I_{OUT} = -50 \mu A$  |            |
|           |   | 5.5             | 5.49                      | 5.4               | 5.4   |         |  |            |
|           |   | 4.5             |                           | 3.86              | 3.76  | V       | $V_{IN} = V_{IL}$ or $V_{IH}$<br>$I_{OH} = -24 \text{ mA}$                                     |            |
| 5.5       |   | 4.86            | 4.76                      | V                 | $I_{OH} = -24 \text{ mA}$ (Note 2)              |         |  |            |
| $V_{OL}$  | Maximum LOW Output Voltage              | 4.5             | 0.001                     | 0.1               | 0.1   | V       | $I_{OUT} = 50 \mu A$   |            |
|           |   | 5.5             | 0.001                     | 0.1               | 0.1   |         |  |            |
|           |   | 4.5             |                           | 0.36              | 0.44  | V       | $V_{IN} = V_{IL}$ or $V_{IH}$<br>$I_{OL} = 24 \text{ mA}$<br>$I_{OL} = 24 \text{ mA}$ (Note 2) |            |
| 5.5       |   | 0.36            | 0.44                      | V                 |   |         |  |            |
| $I_{OZT}$ | Maximum I/O Leakage Current             | 5.5             |                           | $\pm 0.5$         | $\pm 5.0$                                       | $\mu A$ | $V_I = V_{IL}, V_{IH}$<br>$V_O = V_{CC}, \text{GND}$   |            |
| $I_{IN}$  | Maximum Input Leakage Current           | 5.5             |                           | $\pm 0.1$         | $\pm 1.0$                                       | $\mu A$ | $V_I = V_{CC}, \text{GND}$   |            |
| $I_{CCT}$ | Maximum $I_{CC}$ /Input                 | 5.5             | 0.6                       |                   | 1.5   | mA      | $V_I = V_{CC} - 2.1V$  |            |
| $I_{CC}$  | Max Quiescent Supply Current            | 5.5             |                           | 8.0               | 80.0  | $\mu A$ | $V_{IN} = V_{CC}$<br>or GND  |            |
| $I_{OLD}$ | Minimum Dynamic Output Current (Note 3) | 5.5             |                           |                   | 75  | mA      | $V_{OLD} = 1.65V \text{ Max}$  |            |
| $I_{OHD}$ |   |                 |                           |                   | -75   | mA      | $V_{OHD} = 3.85V \text{ Min}$  |            |

**Note 2:** All outputs loaded; thresholds associated with output under test.

**Note 3:** Maximum test duration 2.0 ms; one output loaded at a time.

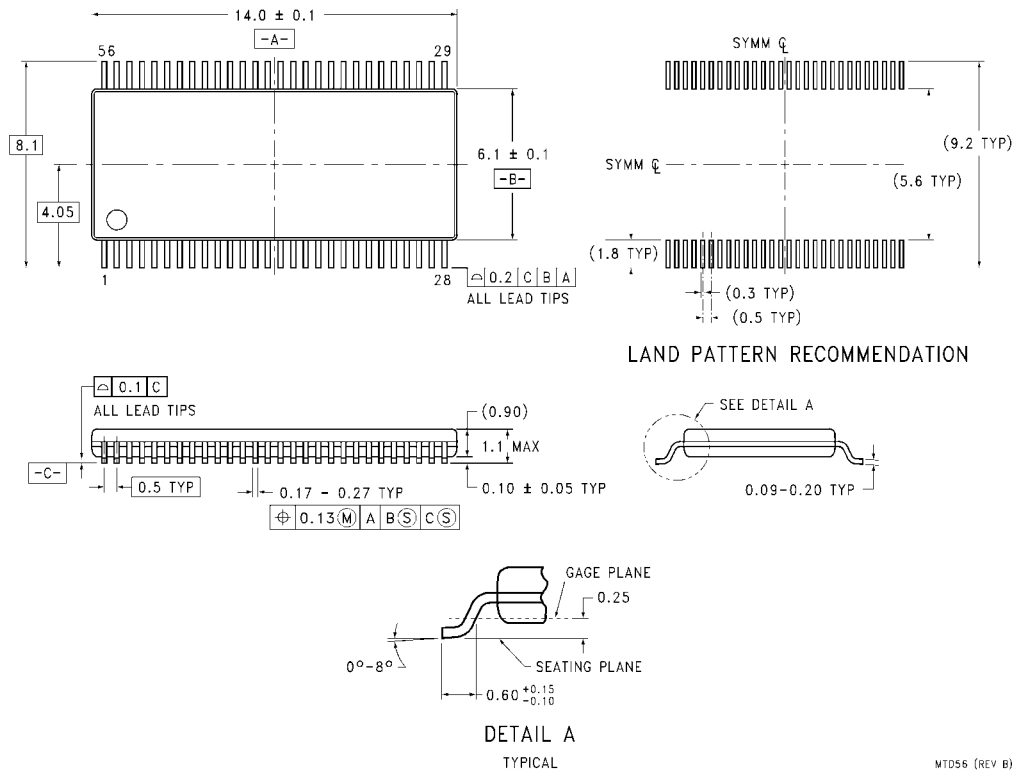
| AC Electrical Characteristics                    |  |                                    |  |                                 |      |   |      |       |
|--|--|------------------------------------|--|---------------------------------|------|---|------|-------|
| Symbol   | Parameter  | V <sub>CC</sub><br>(V)<br>(Note 4) | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |                                 |      | T <sub>A</sub> = -40°C to +85°C<br>C <sub>L</sub> = 50 pF |      | Units |
|  |  |                                    | Min  | Typ                             | Max  | Min   | Max  |       |
| t <sub>PLH</sub>                                 | Propagation Delay  | 5.0                                | 3.8  | 5.9                             | 8.3  | 3.0   | 9.0  | ns    |
| t <sub>PHL</sub>                                 | Transparent Mode<br>A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub>   |                                    | 3.5  | 5.5                             | 7.9  | 2.6   | 8.5  |       |
| t <sub>PLH</sub>                                 | Propagation Delay  | 5.0                                | 4.7  | 6.9                             | 9.8  | 3.4   | 10.8 | ns    |
| t <sub>PHL</sub>                                 | $\overline{LEBA}_n$ , $\overline{LEAB}_n$<br>to A <sub>n</sub> , B <sub>n</sub>  |                                    | 3.9  | 6.3                             | 9.0  | 3.1   | 9.8  |       |
| t <sub>PZH</sub>                                 | Output Enable Time   | 5.0                                | 4.2  | 6.3                             | 9.2  | 3.0   | 9.9  | ns    |
| t <sub>PZL</sub>                                 | $\overline{OEBA}_n$ or $\overline{OEAB}_n$ to A <sub>n</sub> or B <sub>n</sub><br>$\overline{CEBA}_n$ or $\overline{CEAB}_n$ to A <sub>n</sub> or B <sub>n</sub> |                                    | 4.9  | 7.3                             | 10.3 | 3.6   | 10.3 |       |
| t <sub>PHZ</sub>                                 | Output Disable Time  | 5.0                                | 2.8  | 5.2                             | 8.0  | 2.1   | 8.3  | ns    |
| t <sub>PLZ</sub>                                 | $\overline{OEBA}_n$ or $\overline{OEAB}_n$ to A <sub>n</sub> or B <sub>n</sub><br>$\overline{CEBA}_n$ or $\overline{CEAB}_n$ to A <sub>n</sub> or B <sub>n</sub> |                                    | 2.6  | 5.0                             | 7.6  | 2.0   | 8.1  |       |
| <b>Note 4:</b> Voltage Range 5.0 is 5.0V ± 0.5V. |  |                                    |  |                                 |      |   |      |       |
| AC Operating Requirements                        |  |                                    |  |                                 |      |   |      |       |
| Symbol   | Parameter  | V <sub>CC</sub><br>(V)<br>(Note 5) | T <sub>A</sub> = +25°C                           | T <sub>A</sub> = -40°C to +85°C |      | Units   |      |       |
|  |  |                                    | C <sub>L</sub> = 50 pF                           | C <sub>L</sub> = 50 pF          |      |   |      |       |
|  |  |                                    | Guaranteed Minimum                               |                                 |      |   |      |       |
| t <sub>S</sub>                                   | Setup Time, HIGH or LOW<br>A <sub>n</sub> or B <sub>n</sub> to $\overline{LEBA}_n$ or $\overline{LEAB}_n$  | 5.0                                | 3.0  | 3.0                             | 3.0  | ns  |      |       |
| t <sub>H</sub>                                   | Hold Time, HIGH or LOW<br>A <sub>n</sub> or B <sub>n</sub> to $\overline{LEBA}_n$ or $\overline{LEAB}_n$   | 5.0                                | 1.5  | 1.5                             | 1.5  | ns  |      |       |
| t <sub>W</sub>                                   | Latch Enable, B to A<br>Pulse Width, LOW   | 5.0                                | 4.0  | 4.0                             | 4.0  | ns  |      |       |
| <b>Note 5:</b> Voltage Range 5.0 is 5.0V ± 0.5V  |  |                                    |  |                                 |      |   |      |       |
| Capacitance                                      |  |                                    |  |                                 |      |   |      |       |
| Symbol   | Parameter  | Typ                                | Units  | Conditions                      |      |   |      |       |
| C <sub>IN</sub>                                  | Input Capacitance  | 4.5                                | pF   | V <sub>CC</sub> = 5.0V          |      |   |      |       |
| C <sub>PD</sub>                                  | Power Dissipation Capacitance  | 95.0                               | pF   | V <sub>CC</sub> = 5.0V          |      |   |      |       |

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



**56-Lead Thin Shrink Small Outline Package (SSOP), JEDEC MO-153, 6.1mm Wide  
Package Number MS56A**

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



**56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide Package Number MTD56**

MTD56 (REV B)

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