## MC74AC652, MC74ACT652

## Octal Transceiver/Register with 3-State Outputs (Non-Inverting)

The MC74AC/ACT652 consists of registered bus transceiver circuits, with outputs, D-type flip-flops and control circuitry providing multiplexed transmission of data directly from the input bus or from the internal storage registers. Data on the A or B bus will be loaded into the respective registers on the LOW-to-HIGH transition of the appropriate clock pin (CAB or CBA). The four fundamental data handling functions available are illustrated in Figures 1 to 4.

## Features

- Independent Registers for A and B Buses
- Multiplexed Real-Time and Stored Data Transfers
- Choice of True and Inverting Data Paths
- 3-State Outputs
- 300 mil Slim Dual-in-Line Package
- Outputs Source/Sink 24 mA
- 'ACT652 Has TTL Compatible Inputs
- These are $\mathrm{Pb}-F r e e ~ D e v i c e s ~$


Figure 1.
STORAGE FROM BUS TO REGISTER


Figure 3.

REAL TIME TRANSFER B-BUS TO A-BUS


Figure 2.

TRANSFER
FROM REGISTER TO BUS


Figure 4.

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Figure 5. Pinout: 24-Lead Plastic Package (Top View)


Figure 6. Logic Symbol


NOTE: This diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Figure 7. Logic Diagram

FUNCTION TABLE

| Inputs |  |  |  |  |  | Data I/O* |  | Operation or Function |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| GAB | GBA | CAB | CBA | SAB | SBA | $\mathrm{A}_{0}-\mathrm{A}_{7}$ | $\mathrm{B}_{0}-\mathrm{B}_{7}$ |  |
| $\begin{aligned} & \mathrm{L} \\ & \mathrm{~L} \end{aligned}$ | $\begin{aligned} & \mathrm{H} \\ & \mathrm{H} \end{aligned}$ | H or L $\Uparrow$ | H or L $\Uparrow$ | $\begin{aligned} & X \\ & X \end{aligned}$ | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ | Input | Input | Isolation <br> Store A and B Data |
| $\begin{aligned} & \mathrm{X} \\ & \mathrm{H} \end{aligned}$ | $\begin{aligned} & \mathrm{H} \\ & \mathrm{H} \end{aligned}$ | $\begin{aligned} & \Uparrow \\ & \Uparrow \end{aligned}$ | $\underset{\Uparrow}{\mathrm{H} \text { or } \mathrm{L}}$ | $\begin{gathered} X \\ X^{\star *} \end{gathered}$ | $\begin{aligned} & \hline X \\ & x \\ & \hline \end{aligned}$ | Input <br> Input | Unspecified* Output | Store A, Hold B <br> Store A in Both Registers |
| $\begin{aligned} & \mathrm{L} \\ & \mathrm{~L} \end{aligned}$ | $\begin{aligned} & \mathrm{X} \\ & \mathrm{~L} \end{aligned}$ | $\mathrm{H} \text { or } \mathrm{L}$ $\Uparrow$ | $\begin{aligned} & \Uparrow \\ & \Uparrow \end{aligned}$ | $\begin{aligned} & X \\ & X \\ & \hline \end{aligned}$ | $\begin{gathered} \mathrm{X} \\ \mathrm{X}^{\star *} \end{gathered}$ | Unspecified* Output | Input <br> Input | Hold A, Store B Store B in Both Registers |
| $\begin{aligned} & \mathrm{L} \\ & \mathrm{~L} \end{aligned}$ | $\begin{aligned} & \mathrm{L} \\ & \mathrm{~L} \end{aligned}$ | $\begin{aligned} & X \\ & X \end{aligned}$ | X H or L | $\begin{aligned} & X \\ & X \end{aligned}$ | $\begin{aligned} & \mathrm{L} \\ & \mathrm{H} \end{aligned}$ | Output | Input | Real-Time B Data to A Bus Stored B Data to A Bus |
| $\begin{aligned} & \mathrm{H} \\ & \mathrm{H} \end{aligned}$ | $\begin{aligned} & \mathrm{H} \\ & \mathrm{H} \end{aligned}$ | $X$ <br> H or L | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ | $\begin{aligned} & \mathrm{L} \\ & \mathrm{H} \end{aligned}$ | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ | Input | Output | Real-Time A Data to B Bus Stored A Data to B Bus |
| H | L | H or L | H or L | H | H | Output | Output | Stored A Data to B Bus and Stored B Data to A Bus |

*The data output functions may be enabled or disabled by various signals at the GBA and GAB inputs. Data input functions are always enabled;
i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the appropriate clock inputs.
**Select control $=\mathrm{L}$ : clocks can occur simultaneously.
H = HIGH Voltage Level; L = LOW Voltage Level; X = Immaterial; $\uparrow=$ LOW-to-HIGH Transition

## MC74AC652, MC74ACT652

MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
| :---: | :---: | :---: | :---: |
| $V_{\text {CC }}$ | DC Supply Voltage (Referenced to GND) | -0.5 to +7.0 | V |
| $\mathrm{V}_{\text {IN }}$ | DC Input Voltage (Referenced to GND) | -0.5 to $\mathrm{V}_{\mathrm{CC}}+0.5$ | V |
| $\mathrm{V}_{\text {OUT }}$ | DC Output Voltage (Referenced to GND) (Note 1) | -0.5 to $\mathrm{V}_{\mathrm{CC}}+0.5$ | V |
| $\mathrm{I}_{\mathrm{K}}$ | DC Input Diode Current | $\pm 20$ | mA |
| lok | DC Output Diode Current | $\pm 50$ | mA |
| Iout | DC Output Sink/Source Current | $\pm 50$ | mA |
| $\mathrm{I}_{\mathrm{CC}}$ | DC Supply Current, per Output Pin | $\pm 50$ | mA |
| $\mathrm{I}_{\text {GND }}$ | DC Ground Current, per Output Pin | $\pm 100$ | mA |
| TSTG | Storage Temperature Range | -65 to +150 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{L}}$ | Lead temperature, 1 mm from Case for 10 Seconds | 260 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{J}$ | Junction Temperature Under Bias | 140 | ${ }^{\circ} \mathrm{C}$ |
| $\theta_{\text {JA }}$ | Thermal Resistance (Note 2) | 59.8 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| MSL | Moisture Sensitivity | Level 1 |  |
| $\mathrm{F}_{\mathrm{R}}$ | Flammability Rating Oxygen Index: 30\% - 35\% | UL 94 V-0 @ 0.125 in |  |
| $\mathrm{V}_{\text {ESD }}$ | ESD Withstand VoltageHuman Body Model (Note 3) <br> Machine Model (Note 4) <br> Charged Device Model (Note 5) | $\begin{gathered} >2000 \\ >200 \\ >1000 \end{gathered}$ | V |
| ILatchup | Latchup Performance $\quad$ Above $\mathrm{V}_{\mathrm{CC}}$ and Below GND at $85^{\circ} \mathrm{C}$ (Note 6) | $\pm 100$ | mA |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. lout absolute maximum rating must be observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.
3. Tested to EIA/JESD22-A114-A.
4. Tested to EIA/JESD22-A115-A.
5. Tested to JESD22-C101-A.
6. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter |  | Min | Typ | Min | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{V}_{\mathrm{CC}}$ | Supply Voltage | 'AC | 2.0 | 5.0 | 6.0 | V |
|  |  | 'ACT | 4.5 | 5.0 | 5.5 |  |
| $\mathrm{V}_{\text {in }}, \mathrm{V}_{\text {out }}$ | DC Input Voltage, Output Voltage (Ref. to GND) |  | 0 | - | $\mathrm{V}_{\mathrm{CC}}$ | V |
| $\mathrm{tr}_{\mathrm{r}}, \mathrm{t}_{\mathrm{f}}$ | Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs | $\mathrm{V}_{\mathrm{CC}}$ @ 3.0 V | - | 150 | - | ns/V |
|  |  | $\mathrm{V}_{\mathrm{Cc}} @ 4.5 \mathrm{~V}$ | - | 40 | - |  |
|  |  | $\mathrm{V}_{\mathrm{Cc}}$ @ 5.5 V | - | 25 | - |  |
| $\mathrm{tr}_{\mathrm{r}}, \mathrm{t}_{\mathrm{f}}$ | Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs | $\mathrm{V}_{\text {Cc }} @ 4.5 \mathrm{~V}$ | - | 10 | - | $\mathrm{ns} / \mathrm{V}$ |
|  |  | $\mathrm{V}_{\mathrm{CC}} @ 5.5 \mathrm{~V}$ | - | 8.0 | - |  |
| $\mathrm{T}_{\mathrm{A}}$ | Operating Ambient Temperature Range |  | -40 | 25 | 85 | ${ }^{\circ} \mathrm{C}$ |
| IOH | Output Current - HIGH |  | - | - | -24 | mA |
| l L | Output Current - LOW |  | - | - | 24 | mA |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

1. $V_{\text {in }}$ from $30 \%$ to $70 \% \mathrm{~V}_{\mathrm{cc}}$; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. $\mathrm{V}_{\text {in }}$ from 0.8 V to 2.0 V ; see individual Data Sheets for devices that differ from the typical input rise and fall times.

DC CHARACTERISTICS

| Symbol | Parameter | $\begin{aligned} & \mathrm{V}_{\mathrm{Cc}} \\ & (\mathrm{~V}) \end{aligned}$ |  |  | 74AC | Unit | Conditions |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C}$ |  | $\begin{gathered} \mathrm{T}_{\mathrm{A}}= \\ -40^{\circ} \mathrm{C} \text { to } \\ +85^{\circ} \mathrm{C} \end{gathered}$ |  |  |
|  |  |  | Typ | Guaranteed Limits |  |  |  |
| $\mathrm{V}_{\mathrm{IH}}$ | Minimum High Level Input Voltage | $\begin{aligned} & 3.0 \\ & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{gathered} 1.5 \\ 2.25 \\ 2.75 \end{gathered}$ | $\begin{gathered} \hline 2.1 \\ 3.15 \\ 3.85 \end{gathered}$ | $\begin{gathered} \hline 2.1 \\ 3.15 \\ 3.85 \end{gathered}$ | V | $\begin{aligned} & \mathrm{V}_{\text {OUT }}=0.1 \mathrm{~V} \\ & \text { or } \mathrm{V}_{\mathrm{CC}}-0.1 \mathrm{~V} \end{aligned}$ |
| $\mathrm{V}_{\text {IL }}$ | Maximum Low Level Input Voltage | $\begin{aligned} & 3.0 \\ & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{gathered} 1.5 \\ 2.25 \\ 2.75 \end{gathered}$ | $\begin{gathered} \hline 0.9 \\ 1.35 \\ 1.65 \end{gathered}$ | $\begin{gathered} 0.9 \\ 1.35 \\ 1.65 \end{gathered}$ | V | $\begin{aligned} & \mathrm{V}_{\text {OUT }}=0.1 \mathrm{~V} \\ & \text { or } \mathrm{V}_{\mathrm{CC}}-0.1 \mathrm{~V} \end{aligned}$ |
| $\mathrm{V}_{\mathrm{OH}}$ | Minimum High Level Output Voltage | $\begin{aligned} & 3.0 \\ & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{aligned} & 2.99 \\ & 4.49 \\ & 5.49 \end{aligned}$ | $\begin{aligned} & 2.9 \\ & 4.4 \\ & 5.4 \end{aligned}$ | $\begin{aligned} & 2.9 \\ & 4.4 \\ & 5.4 \end{aligned}$ | V | $\mathrm{I}_{\text {OUT }}=-50 \mu \mathrm{~A}$ |
|  |  | $\begin{aligned} & 3.0 \\ & 4.5 \\ & 5.5 \end{aligned}$ | - | $\begin{aligned} & 2.56 \\ & 3.86 \\ & 4.86 \end{aligned}$ | $\begin{aligned} & 2.46 \\ & 3.76 \\ & 4.76 \end{aligned}$ | V | $\begin{array}{\|cc} { }^{*} \mathrm{~V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IL}} \text { or } \mathrm{V}_{\mathrm{IH}} \\ & -12 \mathrm{~mA} \\ \mathrm{I}_{\mathrm{OH}} & -24 \mathrm{~mA} \\ & -24 \mathrm{~mA} \end{array}$ |
| $\mathrm{V}_{\text {OL }}$ | Minimum Low Level Output Voltage | $\begin{aligned} & \hline 3.0 \\ & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{aligned} & 0.002 \\ & 0.001 \\ & 0.001 \end{aligned}$ | $\begin{aligned} & \hline 0.1 \\ & 0.1 \\ & 0.1 \end{aligned}$ | $\begin{aligned} & 0.1 \\ & 0.1 \\ & 0.1 \end{aligned}$ | V | lout $=50 \mu \mathrm{~A}$ |
|  |  | $\begin{aligned} & 3.0 \\ & 4.5 \\ & 5.5 \end{aligned}$ | - | $\begin{aligned} & 0.36 \\ & 0.36 \\ & 0.36 \end{aligned}$ | $\begin{aligned} & 0.44 \\ & 0.44 \\ & 0.44 \end{aligned}$ | V | $\begin{array}{\|cc} * \mathrm{~V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IL}} \text { or } \mathrm{V}_{\mathrm{HH}} \\ & 12 \mathrm{~mA} \\ \mathrm{IOL} & 24 \mathrm{~mA} \\ & 24 \mathrm{~mA} \end{array}$ |
| 1 N | Maximum Input Leakage Current | 5.5 | - | $\pm 0.1$ | $\pm 1.0$ | $\mu \mathrm{A}$ | $\mathrm{V}_{1}=\mathrm{V}_{\mathrm{CC}}, \mathrm{GND}$ |
| Iozt | Maximum 3-State Current | 5.5 | - | $\pm 0.6$ | $\pm 6.0$ | $\mu \mathrm{A}$ | $\begin{aligned} & \mathrm{V}_{\mathrm{I}}(\mathrm{OE})=\mathrm{V}_{\mathrm{IL}}, \mathrm{~V}_{\mathrm{IH}} \\ & \mathrm{~V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}, \mathrm{GND} \\ & \mathrm{~V}_{\mathrm{O}}=\mathrm{V}_{\mathrm{CC}}, G N D \end{aligned}$ |
| Iold | $\dagger$ Minimum Dynamic Output Current | 5.5 | - | - | 75 | mA | $\mathrm{V}_{\text {OLD }}=1.65 \mathrm{~V}$ Max |
| IOHD |  | 5.5 | - | - | -75 | mA | $\mathrm{V}_{\text {OHD }}=3.85 \mathrm{~V}$ Min |
| ICC | Maximum Quiescent Supply Current | 5.5 | - | 8.0 | 80 | $\mu \mathrm{A}$ | $\mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{CC}}$ or GND |

*All outputs loaded; thresholds on input associated with output under test.
$\dagger$ Maximum test duration 2.0 ms , one input loaded at a time.
NOTE: $I_{\mathbb{N}}$ and $I_{C C} @ 3.0 \mathrm{~V}$ are guaranteed to be less than or equal to the respective limit @ 5.5 V .

AC CHARACTERISTICS

| Symbol | Parameter | $\begin{aligned} & \mathrm{V}_{\mathrm{CC}}{ }^{*} \\ & \text { (V) } \end{aligned}$ | 74AC |  | 74AC |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & \mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C} \\ & \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF} \end{aligned}$ |  | $\begin{gathered} \mathrm{T}_{\mathrm{A}}=-40^{\circ} \mathrm{C} \\ \text { to }+85^{\circ} \mathrm{C} \\ \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF} \end{gathered}$ |  |  |
|  |  |  | Min | Max | Min | Max |  |
| tple | Propagation Delay CPBA or CPAB to $A_{n}$ or $B_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 4.0 \\ & 2.5 \end{aligned}$ | $\begin{aligned} & 17.0 \\ & 12.0 \end{aligned}$ | $\begin{aligned} & 3.0 \\ & 2.0 \end{aligned}$ | $\begin{aligned} & 19.0 \\ & 14.0 \end{aligned}$ | ns |
| $\mathrm{t}_{\text {PHL }}$ | Propagation Delay CPBA or CPAB to $A_{n}$ or $B_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 3.0 \\ & 2.0 \end{aligned}$ | $\begin{aligned} & 14.5 \\ & 10.5 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 16.5 \\ & 12.0 \end{aligned}$ | ns |
| tpli | Propagation Delay $A$ or $B$ to $B_{n}$ or $A_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 3.0 \\ & 2.0 \end{aligned}$ | $\begin{gathered} 14.0 \\ 9.5 \end{gathered}$ | $\begin{aligned} & 2.5 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 16.0 \\ & 11.0 \end{aligned}$ | ns |
| $\mathrm{t}_{\text {PHL }}$ | Propagation Delay <br> $A$ or $B$ to $B_{n}$ or $A_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 1.5 \end{aligned}$ | $\begin{gathered} 13.0 \\ 9.0 \end{gathered}$ | $\begin{aligned} & 2.0 \\ & 1.0 \end{aligned}$ | $\begin{aligned} & 15.0 \\ & 10.5 \\ & \hline \end{aligned}$ | ns |
| tpli | Propagation Delay SBA or SAB to $A_{n}$ or $B_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 3.0 \\ & 2.5 \end{aligned}$ | $\begin{aligned} & 14.0 \\ & 10.0 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 2.0 \end{aligned}$ | $\begin{aligned} & 16.0 \\ & 11.5 \end{aligned}$ | ns |
| $\mathrm{t}_{\text {PHL }}$ | Propagation Delay SBA or SAB to $A_{n}$ or $B_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 2.0 \end{aligned}$ | $\begin{aligned} & 13.5 \\ & 10.0 \end{aligned}$ | $\begin{aligned} & 2.0 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 15.5 \\ & 11.5 \end{aligned}$ | ns |
| tpzH | Output Enable Time OEBA to $A_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 1.5 \end{aligned}$ | $\begin{gathered} 12.0 \\ 9.0 \end{gathered}$ | $\begin{aligned} & \hline 2.0 \\ & 1.0 \end{aligned}$ | $\begin{aligned} & \hline 13.5 \\ & 10.0 \end{aligned}$ | ns |
| $t_{\text {PzL }}$ | Output Enable Time OEBA to $A_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 1.5 \end{aligned}$ | $\begin{gathered} 12.0 \\ 9.0 \end{gathered}$ | $\begin{aligned} & 2.0 \\ & 1.0 \end{aligned}$ | $\begin{aligned} & 14.0 \\ & 10.5 \end{aligned}$ | ns |
| tPhz | Output Disable Time OEBA to $A_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \end{aligned}$ | $\begin{aligned} & 3.0 \\ & 2.0 \end{aligned}$ | $\begin{aligned} & 13.0 \\ & 11.0 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 14.0 \\ & 12.0 \end{aligned}$ | ns |
| tpLz | Output Disable Time OEBA to $A_{n}$ | $\begin{aligned} & 3.0 \\ & 5.0 \\ & \hline \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 2.0 \\ & \hline \end{aligned}$ | $\begin{aligned} & 12.5 \\ & 10.5 \\ & \hline \end{aligned}$ | $\begin{aligned} & 2.0 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 14.0 \\ & 12.0 \\ & \hline \end{aligned}$ | ns |

*Voltage Range 3.3 V is $3.3 \mathrm{~V} \pm 0.3 \mathrm{~V}$.
Voltage Range 5.0 V is $5.0 \mathrm{~V} \pm 0.5 \mathrm{~V}$.

DC CHARACTERISTICS

| Symbol | Parameter | $\begin{aligned} & V_{c c} \\ & \text { (V) } \end{aligned}$ |  |  | 74ACT | Unit | Conditions |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\mathrm{T}_{\mathrm{A}}=+25^{\circ} \mathrm{C}$ |  | $\begin{gathered} \mathrm{T}_{\mathrm{A}}= \\ -40^{\circ} \mathrm{C} \text { to } \\ +85^{\circ} \mathrm{C} \end{gathered}$ |  |  |
|  |  |  | Typ | Guaranteed Limits |  |  |  |
| $\mathrm{V}_{\mathrm{IH}}$ | Minimum High Level Input Voltage | $\begin{aligned} & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{aligned} & 1.5 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 2.0 \\ & 2.0 \end{aligned}$ | $\begin{aligned} & 2.0 \\ & 2.0 \end{aligned}$ | V | $\begin{aligned} & \mathrm{V}_{\text {OUT }}=0.1 \mathrm{~V} \\ & \text { or } \mathrm{V}_{\mathrm{CC}}-0.1 \mathrm{~V} \end{aligned}$ |
| VIL | Maximum Low Level Input Voltage | $\begin{aligned} & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{aligned} & 1.5 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 0.8 \\ & 0.8 \end{aligned}$ | $\begin{aligned} & 0.8 \\ & 0.8 \end{aligned}$ | V | $\begin{aligned} & \mathrm{V}_{\text {OUT }}=0.1 \mathrm{~V} \\ & \text { or } \mathrm{V}_{\mathrm{CC}}-0.1 \mathrm{~V} \end{aligned}$ |
| $\mathrm{V}_{\mathrm{OH}}$ | Minimum High Level Output Voltage | $\begin{aligned} & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{array}{r} 4.49 \\ 5.49 \end{array}$ | $\begin{aligned} & 4.4 \\ & 5.4 \end{aligned}$ | $\begin{aligned} & 4.4 \\ & 5.4 \end{aligned}$ | V | $\mathrm{l}_{\text {OUT }}=-50 \mu \mathrm{~A}$ |
|  |  | $\begin{aligned} & 4.5 \\ & 5.5 \end{aligned}$ | - | $\begin{aligned} & 3.86 \\ & 4.86 \end{aligned}$ | $\begin{aligned} & 3.76 \\ & 4.76 \end{aligned}$ | V | $\begin{cases}{ }^{\mathrm{V}_{\mathrm{IN}}=} \mathrm{V}_{\mathrm{IL}} \text { or } \mathrm{V}_{\mathrm{IH}} \\ \mathrm{I}_{\mathrm{OH}} & -24 \mathrm{~mA} \\ -24 \mathrm{~mA}\end{cases}$ |
| $\mathrm{V}_{\mathrm{OL}}$ | Minimum Low Level Output Voltage | $\begin{aligned} & 4.5 \\ & 5.5 \end{aligned}$ | $\begin{aligned} & 0.001 \\ & 0.001 \end{aligned}$ | $\begin{aligned} & 0.1 \\ & 0.1 \end{aligned}$ | $\begin{aligned} & 0.1 \\ & 0.1 \end{aligned}$ | V | $\mathrm{I}_{\text {OUT }}=-50 \mu \mathrm{~A}$ |
|  |  | $\begin{aligned} & 4.5 \\ & 5.5 \end{aligned}$ | - | $\begin{aligned} & 0.36 \\ & 0.36 \end{aligned}$ | $\begin{aligned} & 0.44 \\ & 0.44 \end{aligned}$ | V | $\begin{aligned} & { }^{*} \mathrm{~V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IL}} \text { or } \mathrm{V}_{\mathrm{IH}} \\ & \mathrm{I}_{\mathrm{OH}} \\ & -24 \mathrm{~mA} \\ & -24 \mathrm{~mA} \end{aligned}$ |
| $\mathrm{I}_{\mathrm{N}}$ | Maximum Input Leakage Current | 5.5 | - | $\pm 0.1$ | $\pm 1.0$ | $\mu \mathrm{A}$ | $\mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}, \mathrm{GND}$ |
| $\Delta \mathrm{l}_{\text {CCT }}$ | Additional Max. ICC/Input | 5.5 | 0.6 | - | 1.5 | mA | $\mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}-2.1 \mathrm{~V}$ |
| lozt | Maximum 3-State Current | 5.5 | - | $\pm 0.6$ | $\pm 6.0$ | $\mu \mathrm{A}$ | $\begin{aligned} & \mathrm{V}_{\mathrm{I}}(\mathrm{OE})=\mathrm{V}_{\mathrm{IL}}, \mathrm{~V}_{\mathrm{IH}} \\ & \mathrm{~V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}, \mathrm{GND} \\ & \mathrm{~V}_{\mathrm{O}}=\mathrm{V}_{\mathrm{CC}}, G N D \end{aligned}$ |
| Iold | $\dagger$ Minimum Dynamic Output Current | 5.5 | - | - | 75 | mA | $\mathrm{V}_{\text {OLD }}=1.65 \mathrm{~V}$ Max |
| ${ }^{\text {OHD }}$ |  | 5.5 | - | - | -75 | mA | $\mathrm{V}_{\text {OHD }}=3.85 \mathrm{~V}$ Min |
| Icc | Maximum Quiescent Supply Current | 5.5 | - | 8.0 | 80 | $\mu \mathrm{A}$ | $\mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{CC}}$ or GND |

[^0]AC CHARACTERISTICS

| Symbol | Parameter | $\begin{gathered} \mathrm{V}_{\mathrm{Cc}}{ }^{*} \\ (\mathrm{~V}) \end{gathered}$ | $\begin{gathered} 74 \mathrm{ACT} \\ \hline \mathrm{~T}_{\mathrm{A}}=+25^{\circ} \mathrm{C} \\ \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF} \end{gathered}$ |  | $\begin{gathered} 74 \mathrm{ACT} \\ \hline \mathrm{~T}_{\mathrm{A}}=-40^{\circ} \mathrm{C} \\ \text { to }+85^{\circ} \mathrm{C} \\ \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF} \end{gathered}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |
|  |  |  | Min | Max | Min | Max |  |
| tpLH | Propagation Delay CPBA or CPAB to $A_{n}$ or $B_{n}$ | 5.0 | 4.0 | 14.5 | 3.5 | 16.5 | ns |
| tphL | Propagation Delay <br> CPBA or CPAB to $A_{n}$ or $B_{n}$ | 5.0 | 3.5 | 14.5 | 3.0 | 16.5 | ns |
| tpli | Propagation Delay <br> $A$ or $B$ to $B_{n}$ or $A_{n}$ | 5.0 | 2.5 | 11.5 | 2.0 | 13.0 | ns |
| $\mathrm{t}_{\text {PHL }}$ | Propagation Delay $A$ or $B$ to $B_{n}$ or $A_{n}$ | 5.0 | 2.5 | 11.5 | 2.0 | 13.0 | ns |
| tple | Propagation Delay SBA or SAB to $A_{n}$ or $B_{n}$ | 5.0 | 2.5 | 12.0 | 2.0 | 13.5 | ns |
| $\mathrm{t}_{\text {PHL }}$ | Propagation Delay SBA or SAB to $A_{n}$ or $B_{n}$ | 5.0 | 3.0 | 12.0 | 2.5 | 13.5 | ns |
| tPZH | Output Enable Time OEBA to $A_{n}$ | 5.0 | 2.0 | 11.5 | 1.5 | 13.0 | ns |
| tpzL | Output Enable Time OEBA to $A_{n}$ | 5.0 | 2.5 | 11.5 | 2.0 | 13.0 | ns |
| tphz | Output Disable Time OEBA to $A_{n}$ | 5.0 | 3.0 | 13.0 | 2.5 | 14.0 | ns |
| tpLz | Output Disable Time OEBA to $A_{n}$ | 5.0 | 2.5 | 12.5 | 2.0 | 14.0 | ns |
| tpzH | Output Enable time OEAB to $\mathrm{B}_{\mathrm{n}}$ | 5.0 | 2.5 | 12.0 | 2.0 | 13.5 | ns |
| tpzL | Output Enable Time OEAB to $\mathrm{B}_{\mathrm{n}}$ | 5.0 | 2.5 | 12.0 | 2.0 | 13.5 | ns |
| tPHZ | Output Enable Time OEAB to $\mathrm{B}_{\mathrm{n}}$ | 5.0 | 3.5 | 13.5 | 3.0 | 14.5 | ns |
| tpLZ | Output Enable Time OEAB to $\mathrm{B}_{\mathrm{n}}$ | 5.0 | 3.0 | 13.5 | 2.5 | 15.0 | ns |
| $\mathrm{t}_{\text {s }}$ | Setup Time, HIGH or LOW $A_{n}$ or $B_{n}$ to CPBA or CPAB | 5.0 | 7.0 | - | 8.0 | - | ns |
| $t_{h}$ | Hold Time, HIGH or LOW $A_{n}$ or $B_{n}$ to CPBA or CPAB | 5.0 | 2.5 | - | 2.5 | - | ns |
| $t_{w}$ | CPAB, CPBA Pulse Width HIGH or LOW | 5.0 | 6.0 | - | 7.0 | - | ns |

*Voltage Range 3.3 V is $3.3 \mathrm{~V} \pm 0.3 \mathrm{~V}$.
Voltage Range 5.0 V is $5.0 \mathrm{~V} \pm 0.5 \mathrm{~V}$.

CAPACITANCE

| Symbol | Parameter | 74ACT <br> Typ | Unit | Test Conditions |
| :--- | :--- | :---: | :---: | :---: |
| $\mathrm{C}_{\text {IN }}$ | Input Capacitance | 4.5 | pF | $\mathrm{V}_{\mathrm{CC}}=5.0 \mathrm{~V}$ |
| $\mathrm{C}_{\text {I/ }}$ | Input/Output Capacitance | 15 | pF | $\mathrm{V}_{\mathrm{CC}}=5.0 \mathrm{~V}$ |
| $\mathrm{C}_{\mathrm{PD}}$ | Power Dissipation Capacitance | 60.0 | pF | $\mathrm{V}_{\mathrm{CC}}=5.0 \mathrm{~V}$ |

## MC74AC652, MC74ACT652

ORDERING INFORMATION

| Device | Package | Shipping ${ }^{\dagger}$ |
| :---: | :---: | :---: |
| MC74AC652DWG | SOIC-24 <br> (Pb-Free) | 30 Units / Rail |
| MC74AC652DWR2G |  | 1000 / Tape \& Reel |
| MC74ACT652DWG |  | 30 Units / Rail |
| MC74ACT652DWR2G |  | 1000 / Tape \& Reel |

$\dagger$ For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## MC74AC652, MC74ACT652

## PACKAGE DIMENSIONS

SOIC-24 WB
DW SUFFIX
CASE 751E-04
ISSUE F


NOTES:

1. Dimensioning and tolerancing per asme Y14.5M, 1994
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS b AND $\operatorname{c}$ APPLY TO THE FLAT SECTION OF THE LEAD AND ARE MEASURED BE TWEEN 0.10 AND 0.25 FROM THE LEAD TIP.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 mm PER SIDE. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST FROM THE SEATING PLANE TO
POINT ON THE PACKAGE BODY.
POINT ON THE PACKAG

|  | MILLIMETERS |  |
| :---: | :---: | :---: |
| $\mathbf{D I M}$ | $\mathbf{M I N}$ | MAX |
| $\mathbf{A}$ | 2.35 | 2.65 |
| $\mathbf{A 1}$ | 0.13 | 0.29 |
| $\mathbf{b}$ | 0.35 | 0.49 |
| $\mathbf{c}$ | 0.23 | 0.32 |
| $\mathbf{D}$ | 15.25 | 15.54 |
| $\mathbf{E}$ | 10.30 BSC |  |
| $\mathbf{E 1}$ | 7.40 | 7.60 |
| $\mathbf{e}$ | 1.27 | BSC |
| $\mathbf{h}$ | 0.25 | 0.75 |
| $\mathbf{L}$ | 0.41 | 0.90 |
| $\mathbf{M}$ | 0 | $\mathbf{0}^{\circ}$ |

RECOMMENDED SOLDERING FOOTPRINT*


PITCH
DIMENSIONS: MILLIMETERS
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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TC74VCX164245(EL,F MC74LCX245MNTWG TC7WPB8306L8X,LF(S TC7WPB9307FC(TE85L 74FCT16245CTPVG8
74FCT16543CTPVG 74FCT245CTPYG8 MM74HC245AMTCX 74LVCH16245APVG 74LVX245MTC 5962-9221405M2A NTS0102DP-
Q100H 74ALVC16245MTDX 74ALVCH32245BF 74FCT163245APVG 74FCT245ATPYG8 74FCT245CTQG 74FCT3245AQG
74LCXR162245MTX 74VHC245M 74VHC245MX TC7WPB9306FC(TE85L TC7WPB9306FK(T5L,F JM38510/65553BRA ST3384EBDR
74LVC1T45GF,132 74AVC4TD245BQ,115 PQJ7980AHN/C0JL,51 MC100EP16VBDG FXL2TD245L10X 74LVC1T45GM,115
TC74AC245P(F) PSB21150F S LLHR SNJ54LS245FK SNJ54AHC245J SNJ54ABT245AFK


[^0]:    *All outputs loaded; thresholds on input associated with output under test. $\dagger$ Maximum test duration 2.0 ms , one input loaded at a time.

