

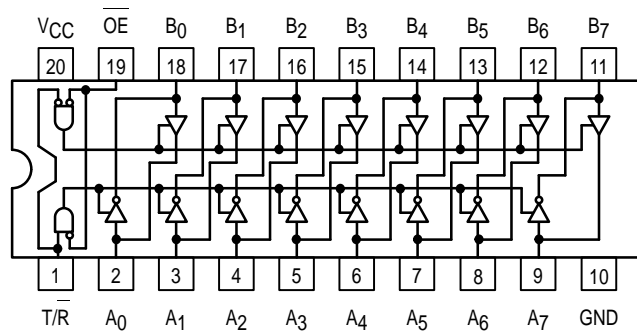


MC74AC643 MC74ACT643

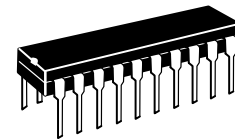
Octal Bidirectional Transceiver with 3-State Outputs

The MC74AC643/74ACT643 octal bus transceiver is designed for asynchronous two-way communication between data buses. The device transmits data from bus A to bus B when T/R = HIGH, or from bus B to bus A when T/R = LOW. The enable input can be used to disable the device so the buses are effectively isolated.

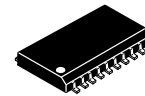
- Bidirectional Data Path
- A and B Outputs Sink 24 mA/Source -24 mA
- 'ACT643 Has TTL Compatible Inputs



OCTAL BIDIRECTIONAL
TRANSCEIVER WITH
3-STATE OUTPUTS



N SUFFIX
CASE 738-03
PLASTIC



DW SUFFIX
CASE 751D-04
PLASTIC

PIN NAMES

- A₀-A₇ Side A Inputs or 3-State Outputs
 OE Output Enable Input
 T/R Transmit/Receive Input
 B₀-B₇ Side B Inputs or 3-State Outputs

TRUTH TABLE

| OE | T/R | Applied Inputs | Valid Direction I/P → O/P | Output |
|----|-----|----------------|---------------------------|--------|
| H | X | X | X | X |
| L | H | H | A to B | L |
| L | H | L | A to B | H |
| L | L | H | B to A | H |
| L | L | L | B to A | L |

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

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MAXIMUM RATINGS*

| Symbol | Parameter | Value | Unit |
|------------------|--|------------------------------|------|
| V _{CC} | DC Supply Voltage (Referenced to GND) | -0.5 to +7.0 | V |
| V _{in} | DC Input Voltage (Referenced to GND) | -0.5 to V _{CC} +0.5 | V |
| V _{out} | DC Output Voltage (Referenced to GND) | -0.5 to V _{CC} +0.5 | V |
| I _{in} | DC Input Current, per Pin | ±20 | mA |
| I _{out} | DC Output Sink/Source Current, per Pin | ±50 | mA |
| I _{CC} | DC V _{CC} or GND Current per Output Pin | ±50 | mA |
| T _{stg} | Storage Temperature | -65 to +150 | °C |

* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Typ | Max | Unit | |
|------------------------------------|---|-------------------------|-----|-----------------|------|------|
| V _{CC} | Supply Voltage | 'AC | 2.0 | 5.0 | 6.0 | V |
| | | 'ACT | 4.5 | 5.0 | 5.5 | |
| V _{in} , V _{out} | DC Input Voltage, Output Voltage (Ref. to GND) | 0 | | V _{CC} | V | |
| t _r , t _f | Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs | V _{CC} @ 3.0 V | | 150 | | ns/V |
| | | V _{CC} @ 4.5 V | | 40 | | |
| | | V _{CC} @ 5.5 V | | 25 | | |
| t _r , t _f | Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs | V _{CC} @ 4.5 V | | 10 | | ns/V |
| | | V _{CC} @ 5.5 V | | 8.0 | | |
| T _J | Junction Temperature (PDIP) | | | 140 | °C | |
| T _A | Operating Ambient Temperature Range | -40 | 25 | 85 | °C | |
| I _{OH} | Output Current — High | | | -24 | mA | |
| I _{OL} | Output Current — Low | | | 24 | mA | |

1. V_{in} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.

2. V_{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.

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DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | 74AC | | 74AC | | Unit | Conditions |
|------------------|-----------------------------------|------------------------|------------------------|-------------------|------------------------------------|----|---|------------|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | | | | |
| V _{IH} | Minimum High Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V | |
| | | 4.5 | 2.25 | 3.15 | 3.15 | | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | | | |
| V _{IL} | Maximum Low Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V | |
| | | 4.5 | 2.25 | 1.35 | 1.35 | | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | | | |
| V _{OH} | Minimum High Level Output Voltage | 3.0 | 2.99 | 2.9 | 2.9 | V | I _{OUT} = -50 μA | |
| | | 4.5 | 4.49 | 4.4 | 4.4 | | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | | |
| | | 3.0 | | 2.56 | 2.46 | V | *V _{IN} = V _{IL} or V _{IH} -12 mA I _{OH} -24 mA -24 mA | |
| | | 4.5 | | 3.86 | 3.76 | | | |
| | | 5.5 | | 4.86 | 4.76 | | | |
| V _{OL} | Maximum Low Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | V | I _{OUT} = 50 μA | |
| | | 4.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 3.0 | | 0.36 | 0.44 | V | *V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA | |
| | | 4.5 | | 0.36 | 0.44 | | | |
| | | 5.5 | | 0.36 | 0.44 | | | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | | ±0.1 | ±1.0 | μA | V _I = V _{CC} , GND | |
| I _{OZT} | Maximum 3-State Current | 5.5 | | ±0.6 | ±6.0 | μA | V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = V _{CC} , GND | |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | | | 75 | mA | V _{OLD} = 1.65 V Max | |
| I _{OHD} | | 5.5 | | | -75 | mA | V _{OHD} = 3.85 V Min | |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | | 8.0 | 80 | μA | V _{IN} = V _{CC} or GND | |

* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

Note: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

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AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

| Symbol | Parameter | V _{CC} * (V) | 74AC | | | 74AC | | Unit | Fig. No. |
|------------------|---|-----------------------|--|-----|-------------|--|--------------|------|----------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | | |
| | | | Min | Typ | Max | Min | Max | | |
| t _{PLH} | Propagation Delay A _n to B _n or B _n to A _n | 3.3 5.0 | 1.5 1.5 | | 8.5 6.5 | 1.0 1.0 | 9.5 7.5 | ns | 3-5 |
| t _{PHL} | Propagation Delay A _n to B _n or B _n to A _n | 3.3 5.0 | 1.5 1.5 | | 8.5 6.5 | 1.0 1.0 | 9.5 7.5 | ns | 3-5 |
| t _{PZH} | Output Enable Time | 3.3 5.0 | 2.5 1.5 | | 12.5 9.5 | 2.0 1.0 | 13.5 10.0 | ns | 3-7 |
| t _{PZL} | Output Enable Time | 3.3 5.0 | 2.5 1.5 | | 12.5 9.5 | 2.0 1.0 | 13.5 10.0 | ns | 3-8 |
| t _{PHZ} | Output Disable Time | 3.3 5.0 | 2.0 1.5 | | 12.0 9.0 | 1.0 1.0 | 12.5 10.0 | ns | 3-7 |
| t _{PLZ} | Output Disable Time | 3.3 5.0 | 2.0 1.5 | | 12.0 9.5 | 1.5 1.0 | 13.5 10.5 | ns | 3-8 |

* Voltage Range 3.3 V is 3.3 V ± 0.3 V.
Voltage Range 5.0 V is 5.0 V ± 0.5 V.

DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | 74ACT | | 74ACT | | Unit | Conditions |
|--------------------|--|---------------------|------------------------|-------------------|---------------------------------|----|---|------------|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | | | | |
| V _{IH} | Minimum High Level Input Voltage | 4.5 5.5 | 1.5 1.5 | 2.0 2.0 | 2.0 2.0 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V | |
| V _{IL} | Maximum Low Level Input Voltage | 4.5 5.5 | 1.5 1.5 | 0.8 0.8 | 0.8 0.8 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V | |
| V _{OH} | Minimum High Level Output Voltage | 4.5 5.5 | 4.49 5.49 | 4.4 5.4 | 4.4 5.4 | V | I _{OUT} = -50 μA | |
| | | 4.5 5.5 | | 3.86 4.86 | 3.76 4.76 | V | *V _{IN} = V _{IL} or V _{IH} -24 mA I _{OH} -24 mA | |
| V _{OL} | Maximum Low Level Output Voltage | 4.5 5.5 | 0.001 0.001 | 0.1 0.1 | 0.1 0.1 | V | I _{OUT} = 50 μA | |
| | | 4.5 5.5 | | 0.36 0.36 | 0.44 0.44 | V | *V _{IN} = V _{IL} or V _{IH} 24 mA I _{OL} 24 mA | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | | ±0.1 | ±1.0 | μA | V _I = V _{CC} , GND | |
| ΔI _{CC} T | Additional Max. I _{CC} /Input | 5.5 | 0.6 | | 1.5 | mA | V _I = V _{CC} - 2.1 V | |
| I _{OZT} | Maximum 3-State Current | 5.5 | | ±0.6 | ±6.0 | μA | V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = V _{CC} , GND | |
| I _{OLD} | † Minimum Dynamic Output Current | 5.5 | | | 75 | mA | V _{OLD} = 1.65 V Max | |
| I _{OHD} | | 5.5 | | | -75 | mA | V _{OHD} = 3.85 V Min | |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | | 8.0 | 80 | μA | V _{IN} = V _{CC} or GND | |

* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

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AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

| Symbol | Parameter | V _{CC} * (V) | 74ACT | | | 74ACT | | Unit | Fig. No. |
|------------------|---|-----------------------|--|-----|------|--|------|------|----------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | | |
| | | | Min | Typ | Max | Min | Max | | |
| t _{PLH} | Propagation Delay A _n to B _n or B _n to A _n | 5.0 | 1.5 | | 8.0 | 1.0 | 9.0 | ns | 3-5 |
| t _{PHL} | Propagation Delay A _n to B _n or B _n to A _n | 5.0 | 1.5 | | 8.0 | 1.0 | 9.0 | ns | 3-5 |
| t _{pZH} | Output Enable Time | 5.0 | 1.5 | | 10.5 | 1.0 | 11.5 | ns | 3-7 |
| t _{pZL} | Output Enable Time | 5.0 | 1.5 | | 10.5 | 1.0 | 11.5 | ns | 3-8 |
| t _{PHZ} | Output Disable Time | 5.0 | 1.5 | | 10.5 | 1.0 | 11.5 | ns | 3-7 |
| t _{PLZ} | Output Disable Time | 5.0 | 1.5 | | 10.5 | 1.0 | 11.5 | ns | 3-8 |

* Voltage Range 5.0 V is 5.0 V ±0.5 V.

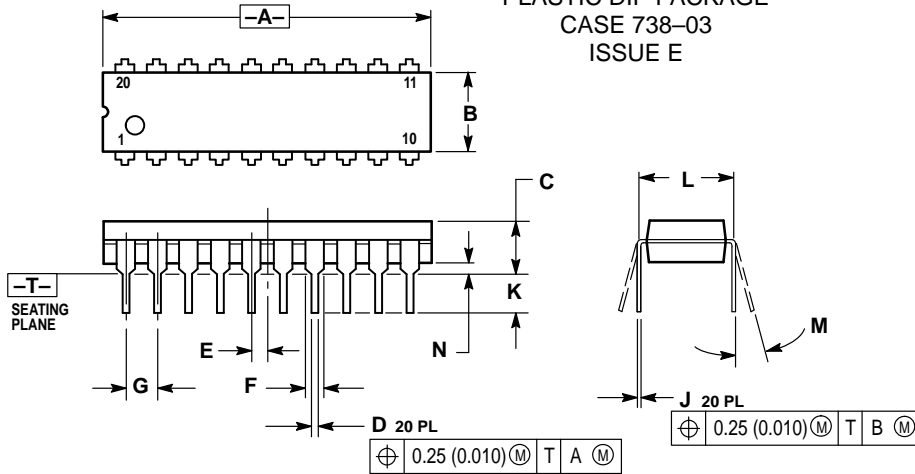
CAPACITANCE

| Symbol | Parameter | Value Typ | Unit | Test Conditions |
|------------------|-------------------------------|--------------|------|-------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = 5.0 V |
| C _{I/O} | Input/Output Capacitance | 15 | pF | V _{CC} = 5.0 V |
| C _{PD} | Power Dissipation Capacitance | 45 | pF | V _{CC} = 5.0 V |

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OUTLINE DIMENSIONS

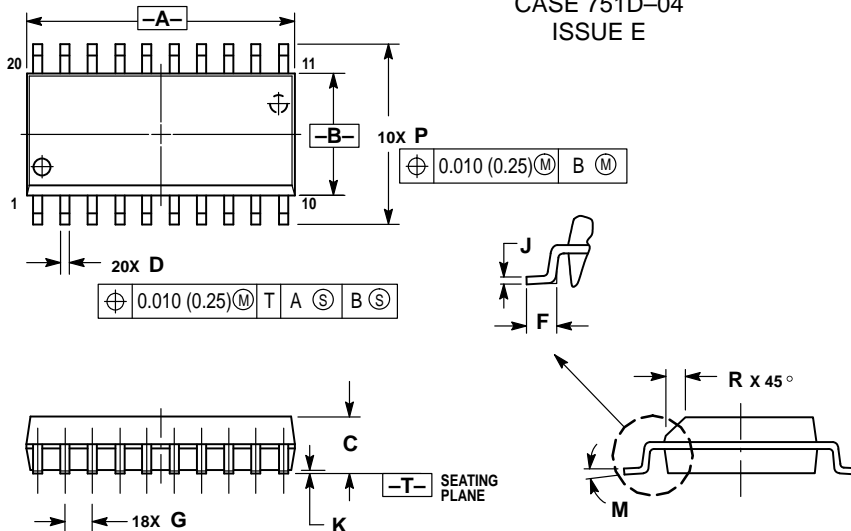
N SUFFIX PLASTIC DIP PACKAGE CASE 738-03 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.


| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.010 | 1.070 | 25.66 | 27.17 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.150 | 0.180 | 3.81 | 4.57 |
| D | 0.015 | 0.022 | 0.39 | 0.55 |
| E | 0.050 BSC | | 1.27 BSC | |
| F | 0.050 | 0.070 | 1.27 | 1.77 |
| G | 0.100 BSC | | 2.54 BSC | |
| J | 0.008 | 0.015 | 0.21 | 0.38 |
| K | 0.110 | 0.140 | 2.80 | 3.55 |
| L | 0.300 BSC | | 7.62 BSC | |
| M | 0° | 15° | 0° | 15° |
| N | 0.020 | 0.040 | 0.51 | 1.01 |

DW SUFFIX PLASTIC SOIC PACKAGE CASE 751D-04 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.150 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 12.65 | 12.95 | 0.499 | 0.510 |
| B | 7.40 | 7.60 | 0.292 | 0.299 |
| C | 2.35 | 2.65 | 0.093 | 0.104 |
| D | 0.35 | 0.49 | 0.014 | 0.019 |
| F | 0.50 | 0.90 | 0.020 | 0.035 |
| G | 1.27 BSC | | 0.050 BSC | |
| J | 0.25 | 0.32 | 0.010 | 0.012 |
| K | 0.10 | 0.25 | 0.004 | 0.009 |
| M | 0° | 7° | 0° | 7° |
| P | 10.05 | 10.55 | 0.395 | 0.415 |
| R | 0.25 | 0.75 | 0.010 | 0.029 |

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MC74AC643/D

