

MC74HCT244A

Octal 3-State Noninverting Buffer/Line Driver/ Line Receiver with LSTTL-Compatible Inputs

High-Performance Silicon-Gate CMOS

The MC74HCT244A is identical in pinout to the LS244. This device may be used as a level converter for interfacing TTL or NMOS outputs to High-Speed CMOS inputs. The HCT244A is an octal noninverting buffer line driver line receiver designed to be used with 3-state memory address drivers, clock drivers, and other bus-oriented systems. The device has non-inverted outputs and two active-low output enables.

The HCT244A is the non-inverting version of the HCT240. See also HCT241.

Features

- Output Drive Capability: 15 LSTTL Loads
- TTL NMOS-Compatible Input Levels
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 4.5 to 5.5 V
- Low Input Current: 1 μ A
- In Compliance with the Requirements Defined by JEDEC Standard No. 7 A
- Chip Complexity: 112 FETs or 28 Equivalent Gates
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

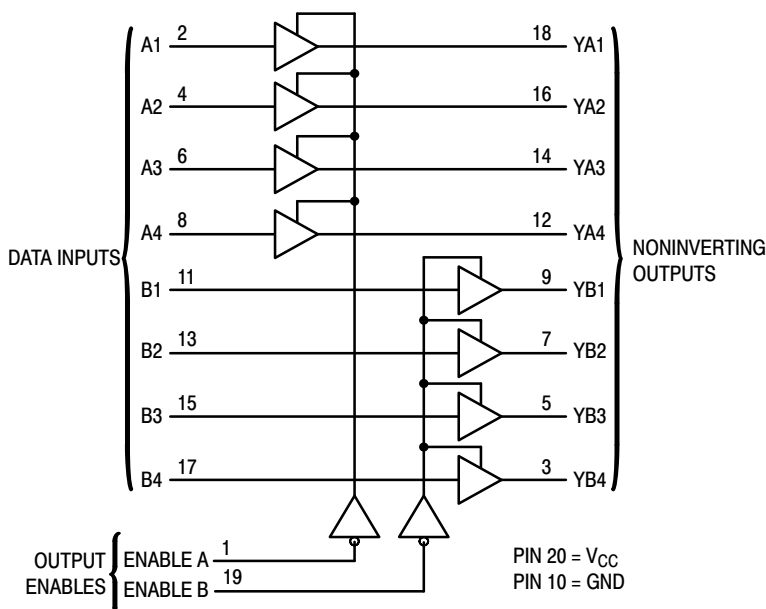
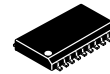


Figure 1. Logic Diagram

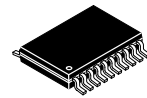


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SOIC-20W
DW SUFFIX
CASE 751D

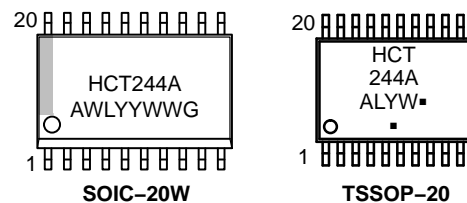


TSSOP-20
DT SUFFIX
CASE 948E

PIN ASSIGNMENT

| | | | |
|----------|----|----|-----------------|
| ENABLE A | 1 | 20 | V _{CC} |
| A1 | 2 | 19 | ENABLE B |
| YB4 | 3 | 18 | YA1 |
| A2 | 4 | 17 | B4 |
| YB3 | 5 | 16 | YA2 |
| A3 | 6 | 15 | B3 |
| YB2 | 7 | 14 | YA3 |
| A4 | 8 | 13 | B2 |
| YB1 | 9 | 12 | YA4 |
| GND | 10 | 11 | B1 |

MARKING DIAGRAMS



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

| Inputs | | Outputs |
|-----------------------|------|---------|
| Enable A, Enable B | A, B | YA, YB |
| L | L | L |
| L | H | H |
| H | X | Z |

Z = high impedance, X = don't care

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

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MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|------------------|---|-------------------------------|------|
| V _{CC} | DC Supply Voltage (Referenced to GND) | -0.5 to +7 | 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 Current, per Pin | ±35 | mA |
| I _{CC} | DC Supply Current, V _{CC} and GND Pins | ±75 | mA |
| P _D | Power Dissipation in Still Air, SOIC Package† TSSOP Package† | 500 450 | mW |
| T _{stg} | Storage Temperature | -65 to +150 | °C |
| T _L | Lead Temperature, 1 mm from Case for 10 Seconds (SOIC or TSSOP Package) | 260 | °C |

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range GND ≤ (V_{in} or V_{out}) ≤ V_{CC}. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

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.

†Derating: SOIC Package: -7 mW/°C from 65° to 125°C
TSSOP Package: -6.1 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|------------------------------------|--|-----|-----------------|------|
| V _{CC} | DC Supply Voltage (Referenced to GND) | 4.5 | 5.5 | V |
| V _{in} , V _{out} | DC Input Voltage, Output Voltage (Referenced to GND) | 0 | V _{CC} | V |
| T _A | Operating Temperature, All Package Types | -55 | +125 | °C |
| t _r , t _f | Input Rise and Fall Time (Figure 2) | 0 | 500 | ns |

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.

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

| Symbol | Parameter | Test Conditions | V _{CC} V | Guaranteed Limit | | | Unit |
|------------------|--|--|----------------------|------------------|---------------|---------|------|
| | | | | -55 to 25°C | ≤ 85°C | ≤ 125°C | |
| V _{IH} | Minimum High-Level Input Voltage | V _{out} = 0.1 V or V _{CC} - 0.1 V I _{out} ≤ 20 μA | 4.5 | 2 | 2 | 2 | V |
| | | | 5.5 | 2 | 2 | 2 | |
| V _{IL} | Maximum Low-Level Input Voltage | V _{out} = 0.1 V or V _{CC} - 0.1 V I _{out} ≤ 20 μA | 4.5 | 0.8 | 0.8 | 0.8 | V |
| | | | 5.5 | 0.8 | 0.8 | 0.8 | |
| V _{OH} | Minimum High-Level Output Voltage | V _{in} = V _{IH} or V _{IL} I _{out} ≤ 20 μA | 4.5 | 4.4 | 4.4 | 4.4 | V |
| | | 5.5 | 5.4 | 5.4 | 5.4 | | |
| V _{OL} | Maximum Low-Level Output Voltage | V _{in} = V _{IH} or V _{IL} I _{out} ≤ 6 mA | 4.5 | 3.98 | 3.84 | 3.7 | V |
| | | 5.5 | 0.1 | 0.1 | 0.1 | | |
| I _{in} | Maximum Input Leakage Current | V _{in} = V _{CC} or GND | 4.5 | 0.1 | 0.1 | 0.1 | μA |
| | | | 5.5 | 0.1 | 0.1 | 0.1 | |
| I _{oz} | Maximum Three-State Leakage Current | Output in High-Impedance State V _{in} = V _{IL} or V _{IH} ; V _{out} = V _{CC} or GND | 5.5 | ±0.5 | ±5.0 | ±10 | μA |
| I _{CC} | Maximum Quiescent Supply Current (per Package) | V _{in} = V _{CC} or GND I _{out} = 0 μA | 5.5 | 4 | 40 | 160 | μA |
| ΔI _{CC} | Additional Quiescent Supply Current | V _{in} = 2.4 V, Any One Input V _{in} = V _{CC} or GND, Other Inputs I _{out} = 0 μA | 5.5 | ≥ -55°C | 25°C to 125°C | | mA |
| | | | | 2.9 | 2.4 | | |

1. Total Supply Current = I_{CC} + ΣΔI_{CC}.

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AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5.0 \text{ V} \pm 10\%$, $C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

| Symbol | Parameter | Guaranteed Limit | | | Unit |
|--------------------------|--|--|---------|----------|------|
| | | -55 to 25 °C | ≤ 85 °C | ≤ 125 °C | |
| t_{PLH} , t_{PHL} | Maximum Propagation Delay, A to YA or B to YB (Figures 2 and 4) | 20 | 25 | 30 | ns |
| t_{PLZ} , t_{PHZ} | Maximum Propagation Delay, Output Enable to YA or YB (Figures 3 and 5) | 26 | 33 | 39 | ns |
| t_{PZL} , t_{PZH} | Maximum Propagation Delay, Output Enable to YA or YB (Figures 3 and 5) | 22 | 28 | 33 | ns |
| t_{TLH} , t_{THL} | Maximum Output Transition Time, Any Output (Figures 2 and 4) | 12 | 15 | 18 | ns |
| C_{in} | Maximum Input Capacitance | 10 | 10 | 10 | pF |
| C_{out} | Maximum Three-State Output Capacitance (Output in High-Impedance State) | 15 | 15 | 15 | pF |
| C_{PD} | Power Dissipation Capacitance (Per Enabled Output)* | Typical @ 25°C, $V_{CC} = 5.0 \text{ V}$ | | | pF |
| | | 55 | | | |

* Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$.

SWITCHING WAVEFORMS

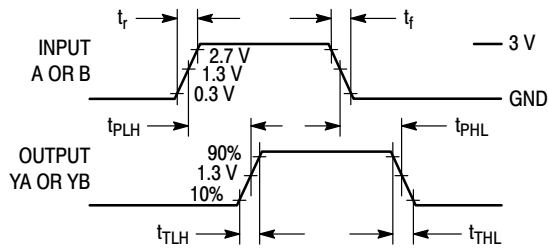


Figure 2.

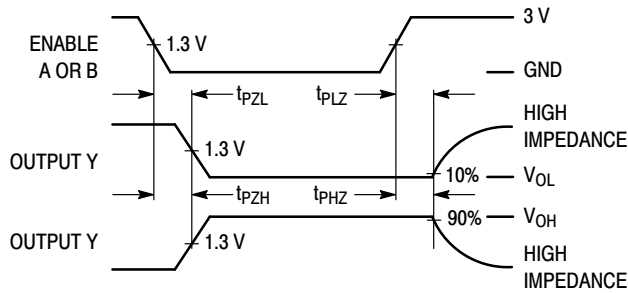


Figure 3.

MC74HCT244A

ORDERING INFORMATION

| Device | Package | Shipping† |
|------------------|-----------------------|--------------------|
| MC74HCT244ADWG | SOIC-20 (Pb-Free) | 38 Units / Rail |
| MC74HCT244ADWR2G | SOIC-20 (Pb-Free) | 1000 / Tape & Reel |
| MC74HCT244ADTR2G | TSSOP-20 (Pb-Free) | 2500 / Tape & Reel |
| NLVHCT244ADTR2G* | TSSOP-20 (Pb-Free) | 2500 / Tape & Reel |

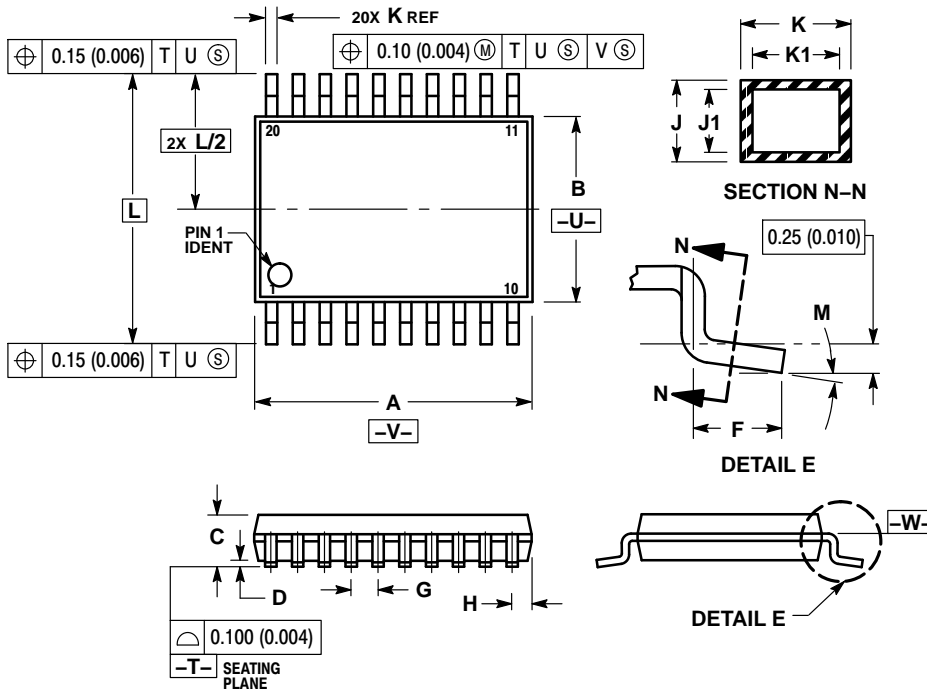
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

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PACKAGE DIMENSIONS

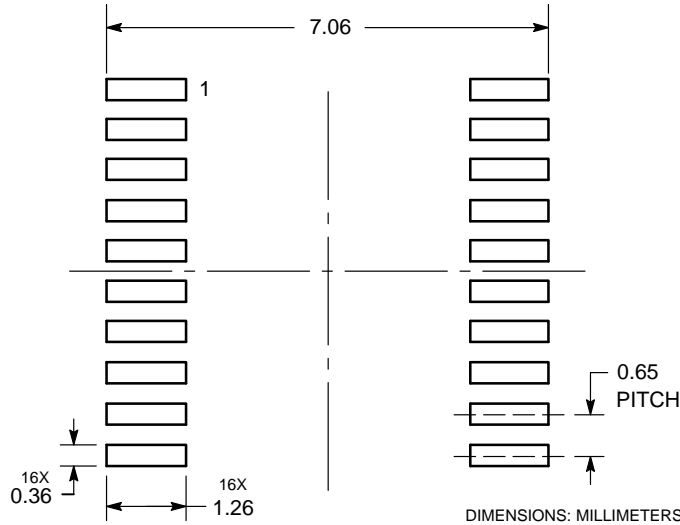
TSSOP-20
DT SUFFIX
CASE 948E-02
ISSUE C



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 6.40 | 6.60 | 0.252 | 0.260 |
| B | 4.30 | 4.50 | 0.169 | 0.177 |
| C | --- | 1.20 | --- | 0.047 |
| D | 0.05 | 0.15 | 0.002 | 0.006 |
| F | 0.50 | 0.75 | 0.020 | 0.030 |
| G | 0.65 BSC | | 0.026 BSC | |
| H | 0.27 | 0.37 | 0.011 | 0.015 |
| J | 0.09 | 0.20 | 0.004 | 0.008 |
| J1 | 0.09 | 0.16 | 0.004 | 0.006 |
| K | 0.19 | 0.30 | 0.007 | 0.012 |
| K1 | 0.19 | 0.25 | 0.007 | 0.010 |
| L | 6.40 BSC | | 0.252 BSC | |
| M | 0° | 8° | 0° | 8° |

SOLDERING FOOTPRINT*

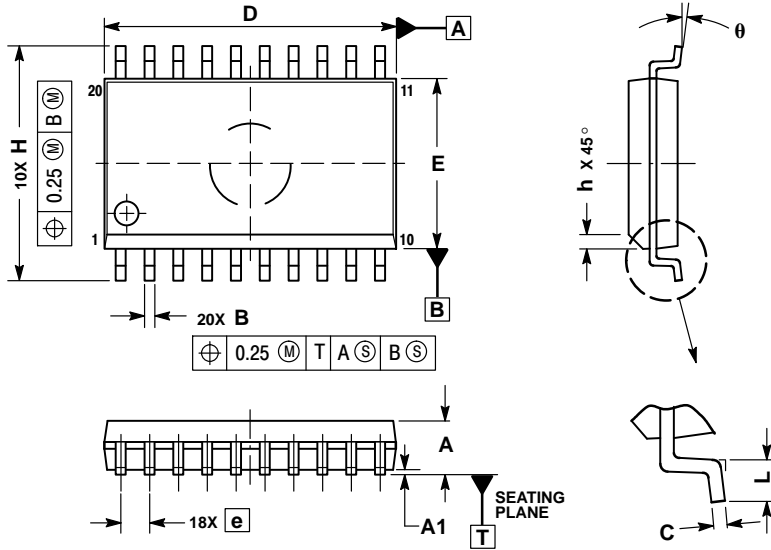


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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PACKAGE DIMENSIONS

SOIC-20W
DW SUFFIX
CASE 751D-05
ISSUE G



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS | |
|-------|-------------|-------|
| | MIN | MAX |
| A | 2.35 | 2.65 |
| A1 | 0.10 | 0.25 |
| B | 0.35 | 0.49 |
| C | 0.23 | 0.32 |
| D | 12.65 | 12.95 |
| E | 7.40 | 7.60 |
| e | 1.27 BSC | |
| H | 10.05 | 10.55 |
| h | 0.25 | 0.75 |
| L | 0.50 | 0.90 |
| theta | 0° | 7° |

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