

# Octal 3-State Noninverting Buffer/Line Driver/Line Receiver

High-Performance Silicon-Gate CMOS

## MC74HC541A, MC74HCT541A

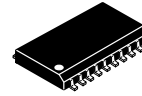
The MC74HC541A/MC74HCT541A is identical in pinout to the LS541. The MC74HC541A inputs are compatible with Standard CMOS outputs. External pull-up resistors make them compatible with LSTTL outputs. The MC74HCT541A may be used as a level converter for interfacing TTL or NMOS outputs to high speed CMOS inputs.

The HC541A/HCT541A 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. This device features inputs and outputs on opposite sides of the package and two ANDed active-low output enables.

The HC541A is similar in function to the HC540A, which has inverting outputs.

### Features

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2.0 to 6.0 V (HC), 4.5 to 5.5 V (HCT)
- Low Input Current: 1  $\mu$ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7 A Requirements
- Chip Complexity: 134 FETs or 33.5 Equivalent Gates
- -Q Suffix 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

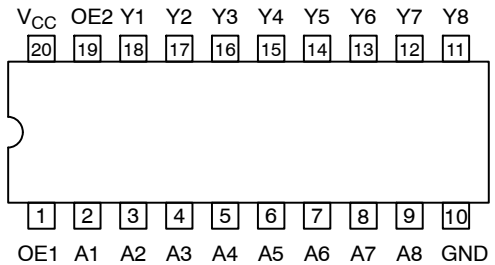


SOIC-20  
DW SUFFIX  
CASE 751D

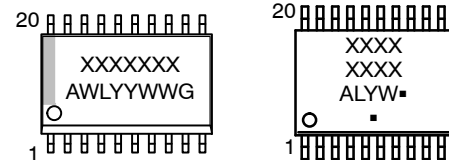


TSSOP-20  
DT SUFFIX  
CASE 948E

### PIN ASSIGNMENT



### MARKING DIAGRAMS



SOIC-20

TSSOP-20

XXXXXXXX = Specific Device Code  
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 |     |   | Output Y |
|--------|-----|---|----------|
| OE1    | OE2 | A |          |
| L      | L   | L | L        |
| L      | L   | H | H        |
| H      | X   | X | Z        |
| X      | H   | X | Z        |

X = Don't Care

Z = High Impedance

### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

# MC74HC541A, MC74HCT541A

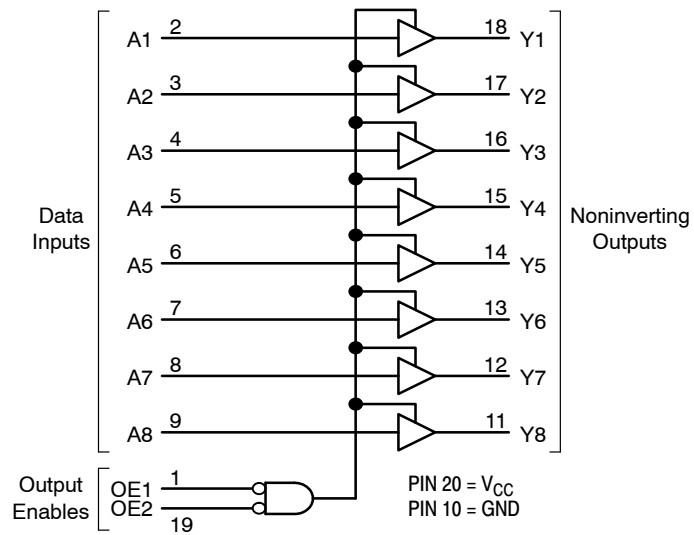


Figure 1. Logic Diagram

# MC74HC541A, MC74HCT541A

## MAXIMUM RATINGS

| Symbol               | Parameter                                                                          | Value                                    | Unit                        |      |
|----------------------|------------------------------------------------------------------------------------|------------------------------------------|-----------------------------|------|
| V <sub>CC</sub>      | DC Supply Voltage                                                                  | −0.5 to +6.5                             | V                           |      |
| V <sub>IN</sub>      | DC Input Voltage                                                                   | −0.5 to V <sub>CC</sub> +0.5             | V                           |      |
| V <sub>OUT</sub>     | DC Output Voltage                                                                  | −0.5 to V <sub>CC</sub> +0.5             | V                           |      |
| I <sub>IN</sub>      | DC Input Diode Current, per Pin                                                    | ±20                                      | mA                          |      |
| I <sub>OUT</sub>     | DC Input Diode Current, Per Pin                                                    | ±35                                      | mA                          |      |
| I <sub>CC</sub>      | DC Supply Current, V <sub>CC</sub> and GND Pins                                    | ±75                                      | mA                          |      |
| I <sub>IK</sub>      | Input Clamp Current (V <sub>IN</sub> < 0 or V <sub>IN</sub> > V <sub>CC</sub> )    | ±20                                      | mA                          |      |
| I <sub>OK</sub>      | Output Clamp Current (V <sub>OUT</sub> < 0 or V <sub>OUT</sub> > V <sub>CC</sub> ) | ±20                                      | mA                          |      |
| T <sub>STG</sub>     | Storage Temperature Range                                                          | −65 to +150                              | °C                          |      |
| T <sub>L</sub>       | Lead Temperature, 1 mm from Case for 10 secs                                       | 260                                      | °C                          |      |
| T <sub>J</sub>       | Junction Temperature Under Bias                                                    | +150                                     | °C                          |      |
| θ <sub>JA</sub>      | Thermal Resistance (Note 1)                                                        | SOIC−20W<br>WQFN20<br>QFN20<br>TSSOP−20  | 96<br>99<br>111<br>150      | °C/W |
| P <sub>D</sub>       | Power Dissipation in Still Air at 25°C                                             | SOIC−20W<br>WQFN20<br>QFN20<br>TSSOP−20  | 1302<br>1256<br>1127<br>833 | mW   |
| MSL                  | Moisture Sensitivity                                                               | SOIC−20W<br>All Other Packages           | Level 3<br>Level 1          | –    |
| F <sub>R</sub>       | Flammability Rating                                                                | Oxygen Index: 28 to 34                   | UL 94 V−0 @ 0.125 in        | –    |
| V <sub>ESD</sub>     | ESD Withstand Voltage (Note 2)                                                     | Human Body Model<br>Charged Device Model | > 4000<br>> 1000            | V    |
| I <sub>LATCHUP</sub> | Latchup Performance (Note 3)                                                       |                                          | ±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. Measured with minimum pad spacing on an FR4 board, using 76 mm-by-114 mm, 2-ounce copper trace no air flow per JESD51-7.
2. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.
3. Tested to EIA/JESD78 Class II.

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|--------|-----------|-----|-----|------|
|--------|-----------|-----|-----|------|

### MC74HC

|                   |                                           |                                                                               |                         |    |
|-------------------|-------------------------------------------|-------------------------------------------------------------------------------|-------------------------|----|
| $V_{CC}$          | DC Supply Voltage                         | 2.0                                                                           | 6.0                     | V  |
| $V_{IN}, V_{OUT}$ | DC Input Voltage, Output Voltage (Note 4) | 0                                                                             | $V_{CC}$                | V  |
| $T_A$             | Operating Free-Air Temperature            | -55                                                                           | +125                    | °C |
| $t_r, t_f$        | Input Rise or Fall Time                   | $V_{CC} = 2.0\text{ V}$<br>$V_{CC} = 4.5\text{ V}$<br>$V_{CC} = 6.0\text{ V}$ | 0<br>1000<br>500<br>400 | ns |

### MC74HCT

|                   |                                           |     |          |    |
|-------------------|-------------------------------------------|-----|----------|----|
| $V_{CC}$          | DC Supply Voltage                         | 4.5 | 5.5      | V  |
| $V_{IN}, V_{OUT}$ | DC Input Voltage, Output Voltage (Note 4) | 0   | $V_{CC}$ | V  |
| $T_A$             | Operating Free-Air Temperature            | -55 | +125     | °C |
| $t_r, t_f$        | Input Rise or Fall Time                   | 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.

# MC74HC541A, MC74HCT541A

4. 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.

## DC CHARACTERISTICS (MC74HC541A)

| Symbol   | Parameter                                      | Condition                                                                                                               | $V_{CC}$<br>V | Guaranteed Limit |       |        | Unit |
|----------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------|------------------|-------|--------|------|
|          |                                                |                                                                                                                         |               | -55 to<br>25°C   | ≤85°C | ≤125°C |      |
| $V_{IH}$ | Minimum High-Level Input Voltage               | $V_{OUT} = 0.1\text{ V}$<br>$ I_{OUT}  \leq 20\text{ }\mu\text{A}$                                                      | 2.0           | 1.50             | 1.50  | 1.50   | V    |
|          |                                                |                                                                                                                         | 3.0           | 2.10             | 2.10  | 2.10   |      |
|          |                                                |                                                                                                                         | 4.5           | 3.15             | 3.15  | 3.15   |      |
|          |                                                |                                                                                                                         | 6.0           | 4.20             | 4.20  | 4.20   |      |
| $V_{IL}$ | Maximum Low-Level Input Voltage                | $V_{OUT} = V_{CC} - 0.1\text{ V}$<br>$ I_{OUT}  \leq 20\text{ }\mu\text{A}$                                             | 2.0           | 0.50             | 0.50  | 0.50   | V    |
|          |                                                |                                                                                                                         | 3.0           | 0.90             | 0.90  | 0.90   |      |
|          |                                                |                                                                                                                         | 4.5           | 1.35             | 1.35  | 1.35   |      |
|          |                                                |                                                                                                                         | 6.0           | 1.80             | 1.80  | 1.80   |      |
| $V_{OH}$ | Minimum High-Level Output Voltage              | $V_{IN} = V_{IL}$<br>$ I_{OUT}  \leq 20\text{ }\mu\text{A}$                                                             | 2.0           | 1.9              | 1.9   | 1.9    | V    |
|          |                                                |                                                                                                                         | 4.5           | 4.4              | 4.4   | 4.4    |      |
|          |                                                |                                                                                                                         | 6.0           | 5.9              | 5.9   | 5.9    |      |
|          |                                                | $V_{IN} = V_{IL}$<br>$ I_{OUT}  \leq 3.6\text{ mA}$<br>$ I_{OUT}  \leq 6.0\text{ mA}$<br>$ I_{OUT}  \leq 7.8\text{ mA}$ | 3.0           | 2.48             | 2.34  | 2.20   |      |
|          |                                                |                                                                                                                         | 4.5           | 3.98             | 3.84  | 3.70   |      |
|          |                                                |                                                                                                                         | 6.0           | 5.48             | 5.34  | 5.20   |      |
| $V_{OL}$ | Maximum Low-Level Output Voltage               | $V_{IN} = V_{IH}$<br>$ I_{OUT}  \leq 20\text{ }\mu\text{A}$                                                             | 2.0           | 0.1              | 0.1   | 0.1    | V    |
|          |                                                |                                                                                                                         | 4.5           | 0.1              | 0.1   | 0.1    |      |
|          |                                                |                                                                                                                         | 6.0           | 0.1              | 0.1   | 0.1    |      |
|          |                                                | $V_{IN} = V_{IH}$<br>$ I_{OUT}  \leq 3.6\text{ mA}$<br>$ I_{OUT}  \leq 6.0\text{ mA}$<br>$ I_{OUT}  \leq 7.8\text{ mA}$ | 3.0           | 0.26             | 0.33  | 0.40   |      |
|          |                                                |                                                                                                                         | 4.5           | 0.26             | 0.33  | 0.40   |      |
|          |                                                |                                                                                                                         | 6.0           | 0.26             | 0.33  | 0.40   |      |
| $I_{IN}$ | Maximum Input Leakage Current                  | $V_{IN} = V_{CC}$ or GND                                                                                                | 6.0           | ±0.1             | ±1.0  | ±1.0   | μA   |
| $I_{OZ}$ | Maximum 3-State Leakage Current                | Output in High Impedance State<br>$V_{IN} = V_{IL}$ or $V_{IH}$<br>$V_{OUT} = V_{CC}$ or GND                            | 6.0           | ±0.5             | ±5.0  | ±10.0  | μA   |
| $I_{CC}$ | Maximum Quiescent Supply Current (per Package) | $V_{IN} = V_{CC}$ or GND<br>$I_{OUT} = 0\text{ }\mu\text{A}$                                                            | 6.0           | 4                | 40    | 160    | μA   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# MC74HC541A, MC74HCT541A

## AC CHARACTERISTICS (MC74HC541A)

| Symbol                                 | Parameter                                                                 | V <sub>CC</sub><br>V | Guaranteed Limit |       |        | Unit |
|----------------------------------------|---------------------------------------------------------------------------|----------------------|------------------|-------|--------|------|
|                                        |                                                                           |                      | -55 to<br>25°C   | ≤85°C | ≤125°C |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Input A to Output Y<br>(Figures 2 and 3)       | 2.0                  | 80               | 100   | 120    | ns   |
|                                        |                                                                           | 3.0                  | 30               | 40    | 55     |      |
|                                        |                                                                           | 4.5                  | 18               | 23    | 28     |      |
|                                        |                                                                           | 6.0                  | 15               | 20    | 25     |      |
| t <sub>PLZ</sub> ,<br>t <sub>PHZ</sub> | Maximum Propagation Delay, Output Enable to Output Y<br>(Figures 2 and 3) | 2.0                  | 110              | 140   | 165    | ns   |
|                                        |                                                                           | 3.0                  | 45               | 60    | 75     |      |
|                                        |                                                                           | 4.5                  | 25               | 31    | 38     |      |
|                                        |                                                                           | 6.0                  | 21               | 26    | 31     |      |
| t <sub>PZL</sub> ,<br>t <sub>PZH</sub> | Maximum Propagation Delay, Output Enable to Output Y<br>(Figures 2 and 3) | 2.0                  | 110              | 140   | 165    | ns   |
|                                        |                                                                           | 3.0                  | 45               | 60    | 75     |      |
|                                        |                                                                           | 4.5                  | 25               | 31    | 38     |      |
|                                        |                                                                           | 6.0                  | 21               | 26    | 31     |      |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Maximum Output Transition Time, Any Output<br>(Figures 2 and 3)           | 2.0                  | 60               | 75    | 90     | ns   |
|                                        |                                                                           | 3.0                  | 22               | 28    | 34     |      |
|                                        |                                                                           | 4.5                  | 12               | 15    | 18     |      |
|                                        |                                                                           | 6.0                  | 10               | 13    | 15     |      |
| C <sub>IN</sub>                        | Maximum Input Capacitance                                                 |                      | 10               | 10    | 10     | pF   |
| C <sub>OUT</sub>                       | Maximum 3-State Output Capacitance (High Impedance State Output)          |                      | 15               | 15    | 15     | pF   |

|                 |                                                     |                                                                |    |
|-----------------|-----------------------------------------------------|----------------------------------------------------------------|----|
| C <sub>PD</sub> | Power Dissipation Capacitance (Per Buffer) (Note 5) | Typical @ 25°C, V <sub>CC</sub> = 5.0 V, V <sub>EE</sub> = 0 V | pF |
|                 |                                                     | 35                                                             |    |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

# MC74HC541A, MC74HCT541A

## DC CHARACTERISTICS (MC74HCT541A)

| Symbol           | Parameter                                         | Condition                                                                                                                           | V <sub>CC</sub><br>V | Guaranteed Limit |             |            | Unit |
|------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|-------------|------------|------|
|                  |                                                   |                                                                                                                                     |                      | −55 to 25°C      | ≤85°C       | ≤125°C     |      |
| V <sub>IH</sub>  | Minimum High-Level Input Voltage                  | V <sub>out</sub> = 0.1V or V <sub>CC</sub> − 0.1 V<br> I <sub>out</sub>   ≤ 20 μA                                                   | 4.5<br>5.5           | 2.0<br>2.0       | 2.0<br>2.0  | 2.0<br>2.0 | V    |
| V <sub>IL</sub>  | Maximum Low-Level Input Voltage                   | V <sub>out</sub> = 0.1V or V <sub>CC</sub> − 0.1 V<br> I <sub>out</sub>   ≤ 20 μA                                                   | 4.5<br>5.5           | 0.8<br>0.8       | 0.8<br>0.8  | 0.8<br>0.8 | V    |
| V <sub>OH</sub>  | Minimum High-Level Output Voltage                 | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub><br> I <sub>out</sub>   ≤ 20 μA                                                 | 4.5<br>5.5           | 4.4<br>5.4       | 4.4<br>5.4  | 4.4<br>5.4 | V    |
|                  |                                                   | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 6.0 mA                                                   | 4.5                  | 3.98             | 3.84        | 3.70       |      |
| V <sub>OL</sub>  | Maximum Low-Level Output Voltage                  | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub><br> I <sub>out</sub>   ≤ 20μA                                                  | 4.5<br>5.5           | 0.1<br>0.1       | 0.1<br>0.1  | 0.1<br>0.1 | V    |
|                  |                                                   | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 6.0 mA                                                   | 4.5                  | 0.26             | 0.33        | 0.40       |      |
| I <sub>in</sub>  | Maximum Input Leakage Current                     | V <sub>in</sub> = V <sub>CC</sub> or GND                                                                                            | 5.5                  | ±0.1             | ±1.0        | ±1.0       | μA   |
| I <sub>OZ</sub>  | Maximum 3-State Leakage Current                   | Output in High Impedance State<br>V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>out</sub> = V <sub>CC</sub> or GND | 5.5                  | ±0.5             | ±5.0        | ±10.0      | μA   |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current<br>(per Package) | V <sub>in</sub> = V <sub>CC</sub> or GND<br>I <sub>out</sub> = 0 μA                                                                 | 5.5                  | 4                | 40          | 160        | μA   |
| ΔI <sub>CC</sub> | Additional Quiescent Supply Current               | V <sub>in</sub> = 2.4 V, Any One Input<br>V <sub>in</sub> = V <sub>CC</sub> or GND, Other Inputs<br>I <sub>out</sub> = 0 μA         |                      | ≥ −55°C          | 25 to 125°C |            | mA   |
|                  |                                                   |                                                                                                                                     | 5.5                  | 2.9              | 2.4         |            |      |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

6. Total Supply Current = I<sub>CC</sub> + ΣΔI<sub>CC</sub>.

## AC CHARACTERISTICS (MC74HCT541A)

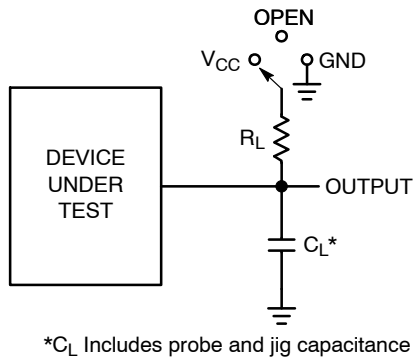
| Symbol                                 | Parameter                                                                 | Guaranteed Limit |       |        | Unit |
|----------------------------------------|---------------------------------------------------------------------------|------------------|-------|--------|------|
|                                        |                                                                           | -55 to 25°C      | ≤85°C | ≤125°C |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Input A to Output Y<br>(Figures 2 and 3)       | 23               | 28    | 32     | ns   |
| t <sub>PLZ</sub> ,<br>t <sub>PHZ</sub> | Maximum Propagation Delay, Output Enable to Output Y<br>(Figures 2 and 3) | 30               | 34    | 38     | ns   |
| t <sub>PZL</sub> ,<br>t <sub>PZH</sub> | Maximum Propagation Delay, Output Enable to Output Y<br>(Figures 2 and 3) | 30               | 34    | 38     | ns   |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Maximum Output Transition Time, Any Output<br>(Figures 2 and 3)           | 12               | 15    | 18     | ns   |
| C <sub>in</sub>                        | Maximum Input Capacitance                                                 | 10               | 10    | 10     | pF   |
| C <sub>out</sub>                       | Maximum 3-State Output Capacitance (Output in High Impedance State)       | 15               | 15    | 15     | pF   |

| C <sub>PD</sub> | Power Dissipation Capacitance (Per Buffer)* | Typical @ 25°C, V <sub>CC</sub> = 5.0 V | pF |
|-----------------|---------------------------------------------|-----------------------------------------|----|
|                 |                                             | 55                                      |    |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

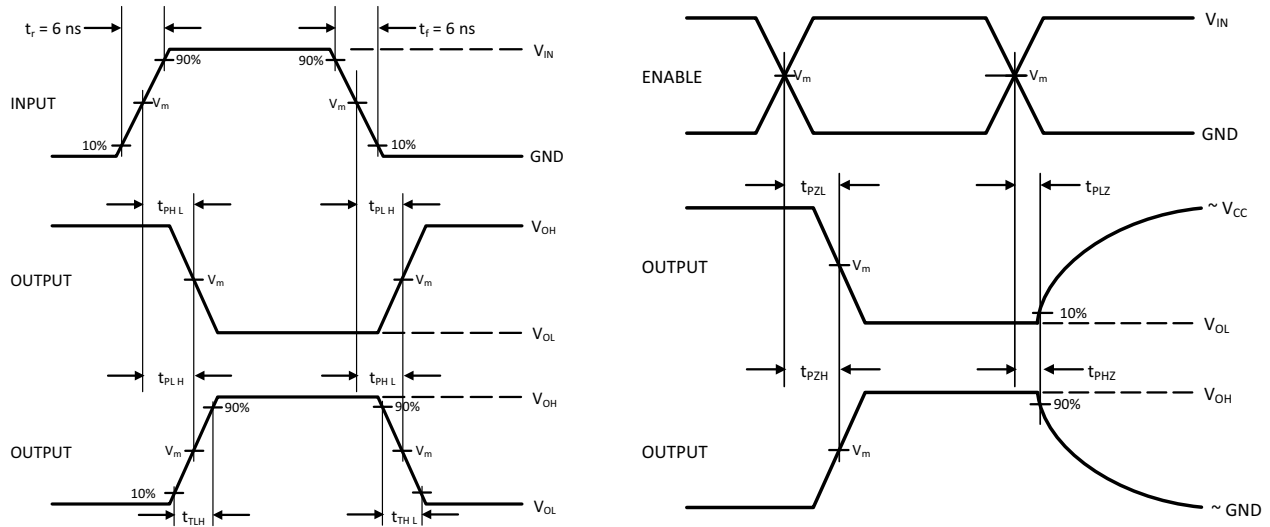
\*Used to determine the no-load dynamic power consumption: P<sub>D</sub> = C<sub>PD</sub> V<sub>CC</sub><sup>2</sup>f + I<sub>CC</sub> V<sub>CC</sub>.

## MC74HC541A, MC74HCT541A



| Test                                | Switch Position | C <sub>L</sub> | R <sub>L</sub> |
|-------------------------------------|-----------------|----------------|----------------|
| t <sub>PLH</sub> / t <sub>PHL</sub> | Open            | 50 pF          | 1 kΩ           |
| t <sub>PLZ</sub> / t <sub>PZL</sub> | V <sub>CC</sub> |                |                |
| t <sub>PHZ</sub> / t <sub>PZH</sub> | GND             |                |                |

Figure 2. Test Circuit



| Device      | V <sub>IN</sub> , V | V <sub>m</sub> , V    |
|-------------|---------------------|-----------------------|
| MC74HC541A  | V <sub>CC</sub>     | 50% x V <sub>CC</sub> |
| MC74HCT541A | 3 V                 | 1.3 V                 |

Figure 3. Switching Waveforms

# MC74HC541A, MC74HCT541A

## PIN DESCRIPTIONS

### INPUTS

#### A1, A2, A3, A4, A5, A6, A7, A8 (PINS 2, 3, 4, 5, 6, 7, 8, 9)

Data input pins. Data on these pins appear in non-inverted form on the corresponding Y outputs, when the outputs are enabled.

### CONTROLS

#### OE1, OE2 (PINS 1, 19)

Output enables (active-low). When a low voltage is applied to both of these pins, the outputs are enabled and the

device functions as a non-inverting buffer. When a high voltage is applied to either input, the outputs assume the high impedance state.

### OUTPUTS

#### Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8 (PINS 18, 17, 16, 15, 14, 13, 12, 11)

Device outputs. Depending upon the state of the output enable pins, these outputs are either non-inverting outputs or high-impedance outputs.

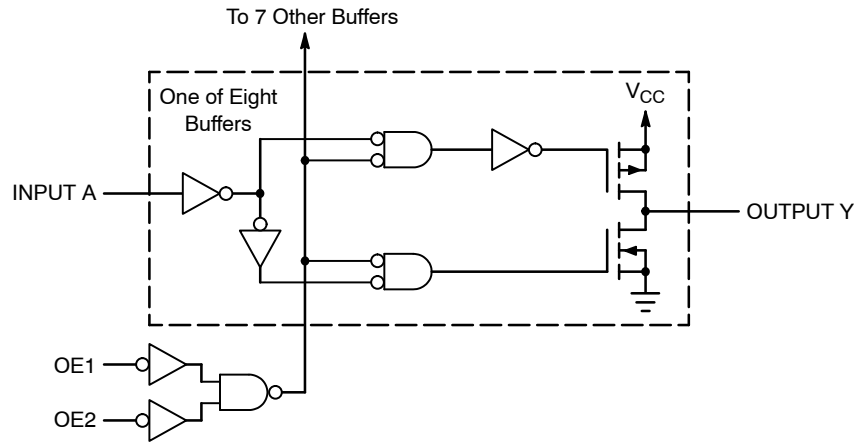


Figure 4. Logic Detail

## ORDERING INFORMATION

| Device              | Marking     | Package      | Shipping <sup>†</sup> |
|---------------------|-------------|--------------|-----------------------|
| MC74HC541ADWG       | HC541A      | SOIC-20 Wide | 38 Units / Rail       |
| MC74HC541ADWR2G     | HC541A      | SOIC-20 Wide | 1000 / Tape & Reel    |
| MC74HC541ADWR2G-Q*  | HC541A      | SOIC-20 Wide | 1000 / Tape & Reel    |
| MC74HC541ADTG       | HC<br>541A  | TSSOP-20     | 75 Units / Rail       |
| MC74HC541ADTR2G     | HC<br>541A  | TSSOP-20     | 2500 / Tape & Reel    |
| MC74HC541ADTR2G-Q*  | HC<br>541A  | TSSOP-20     | 2500 / Tape & Reel    |
| MC74HCT541ADWG      | HCT541A     | SOIC-20 Wide | 38 Units / Rail       |
| MC74HCT541ADWR2G    | HCT541A     | SOIC-20 Wide | 1000 / Tape & Reel    |
| MC74HCT541ADTR2G    | HCT<br>541A | TSSOP-20     | 2500 / Tape & Reel    |
| MC74HCT541ADTR2G-Q* | HCT<br>541A | TSSOP-20     | 2500 / Tape & Reel    |

<sup>†</sup>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.

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



SCALE 1:1

SOIC-20 WB  
CASE 751D-05  
ISSUE H

DATE 22 APR 2015



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  |
| θ   | 0°          | 7°    |

GENERIC  
MARKING DIAGRAM\*



XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

RECOMMENDED  
SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

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

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                  |             |                                                                                                                                                                                     |
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| DESCRIPTION:     | SOIC-20 WB  | PAGE 1 OF 1                                                                                                                                                                         |

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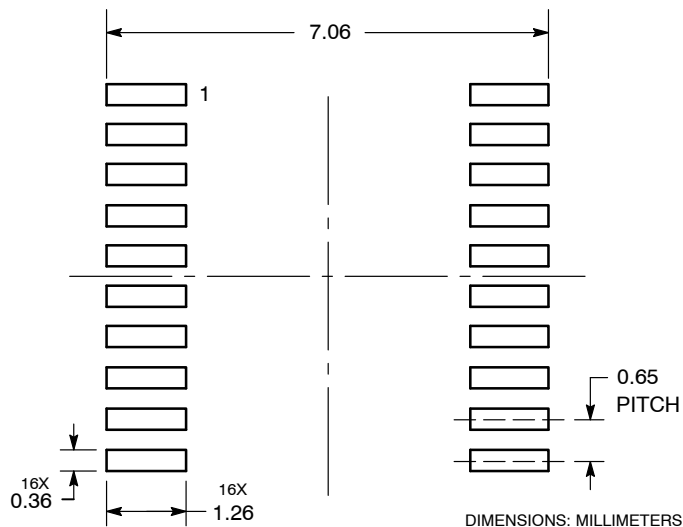

**TSSOP-20 WB**  
**CASE 948E**  
**ISSUE D**

DATE 17 FEB 2016

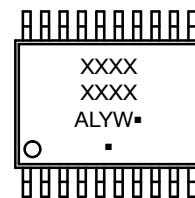

**NOTES:**

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°    |

**RECOMMENDED  
SOLDERING FOOTPRINT\***


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

**GENERIC  
MARKING DIAGRAM\***


A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                         |                    |                                                                                                                                                                                  |
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