

# CD54/74HC240, CD54/74HCT240, CD74HC241, CD54/74HCT241, CD54/74HC244, CD54/74HCT244

## High-Speed CMOS Logic Octal Buffer/Line Drivers, Three-State

### Features

- HC/HCT240 Inverting
- HC/HCT241 Non-Inverting
- HC/HCT244 Non-Inverting
- Typical Propagation Delay = 8ns at  $V_{CC} = 5V$ ,  $C_L = 15pF$ ,  $T_A = 25^{\circ}C$  for HC240
- Three-State Outputs
- Buffered Inputs
- High-Current Bus Driver Outputs
- Fanout (Over Temperature Range)
  - Standard Outputs . . . . . 10 LSTTL Loads
  - Bus Driver Outputs . . . . . 15 LSTTL Loads
- Wide Operating Temperature Range . . .  $-55^{\circ}C$  to  $125^{\circ}C$
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- HC Types
  - 2V to 6V Operation
  - High Noise Immunity:  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$  at  $V_{CC} = 5V$
- HCT Types
  - 4.5V to 5.5V Operation
  - Direct LSTTL Input Logic Compatibility,  $V_{IL} = 0.8V$  (Max),  $V_{IH} = 2V$  (Min)
  - CMOS Input Compatibility,  $I_I \leq 1\mu A$  at  $V_{OL}$ ,  $V_{OH}$

### Description

The 'HC240 and 'HCT240 are inverting three-state buffers having two active-low output enables. The CD74HC241, 'HCT241, 'HC244 and 'HCT244 are non-inverting three-state buffers that differ only in that the 241 has one active-high and one active-low output enable, and the 244 has two active-low output enables. All three types have identical pinouts.

### Ordering Information

| PART NUMBER   | TEMP. RANGE<br>( $^{\circ}C$ ) | PACKAGE      |
|---------------|--------------------------------|--------------|
| CD54HC240F3A  | -55 to 125                     | 20 Ld CERDIP |
| CD54HC244F3A  | -55 to 125                     | 20 Ld CERDIP |
| CD54HCT240F3A | -55 to 125                     | 20 Ld CERDIP |
| CD54HCT241F3A | -55 to 125                     | 20 Ld CERDIP |
| CD54HCT244F3A | -55 to 125                     | 20 Ld CERDIP |
| CD74HC240E    | -55 to 125                     | 20 Ld PDIP   |
| CD74HC240M    | -55 to 125                     | 20 Ld SOIC   |
| CD74HC240M96  | -55 to 125                     | 20 Ld SOIC   |
| CD74HC241E    | -55 to 125                     | 20 Ld PDIP   |
| CD74HC241M    | -55 to 125                     | 20 Ld SOIC   |
| CD74HC241M96  | -55 to 125                     | 20 Ld SOIC   |
| CD74HC244E    | -55 to 125                     | 20 Ld PDIP   |
| CD74HC244M    | -55 to 125                     | 20 Ld SOIC   |
| CD74HC244M96  | -55 to 125                     | 20 Ld SOIC   |
| CD74HCT240E   | -55 to 125                     | 20 Ld PDIP   |
| CD74HCT240M   | -55 to 125                     | 20 Ld SOIC   |
| CD74HCT240M96 | -55 to 125                     | 20 Ld SOIC   |
| CD74HCT240PW  | -55 to 125                     | 20 Ld TSSOP  |
| CD74HCT240PWR | -55 to 125                     | 20 Ld TSSOP  |
| CD74HCT240PWT | -55 to 125                     | 20 Ld TSSOP  |
| CD74HCT241E   | -55 to 125                     | 20 Ld PDIP   |
| CD74HCT241M   | -55 to 125                     | 20 Ld SOIC   |
| CD74HCT241M96 | -55 to 125                     | 20 Ld SOIC   |
| CD74HCT244E   | -55 to 125                     | 20 Ld PDIP   |
| CD74HCT244M   | -55 to 125                     | 20 Ld SOIC   |
| CD74HCT244M96 | -55 to 125                     | 20 Ld SOIC   |

NOTE: When ordering, use the entire part number. The suffixes 96 and R denote tape and reel. The suffix T denotes a small-quantity reel of 250.

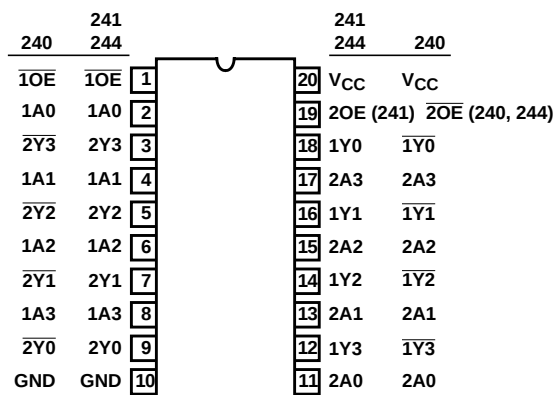
## Pinout

CD54HC240, CD54HCT240, CD54HCT241,  
CD54HC244, CD54HCT244  
(CERDIP)

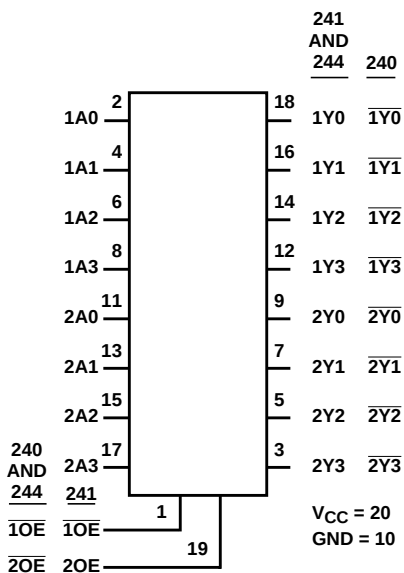
CD74HC240, CD74HC241, CD74HCT241,  
CD74HC244, CD74HCT244  
(PDIP, SOIC)

CD74HCT240,  
(PDIP, SOIC, TSSOP)

### TOP VIEW



## Functional Diagram



**Absolute Maximum Ratings**

DC Supply Voltage,  $V_{CC}$  ..... -0.5V to 7V  
 DC Input Diode Current,  $I_{IK}$   
     For  $V_I < -0.5V$  or  $V_I > V_{CC} + 0.5V$  .....  $\pm 20mA$   
 DC Output Diode Current,  $I_{OK}$   
     For  $V_O < -0.5V$  or  $V_O > V_{CC} + 0.5V$  .....  $\pm 20mA$   
 DC Drain Current, per Output,  $I_O$   
     For  $-0.5V < V_O < V_{CC} + 0.5V$  .....  $\pm 35mA$   
 DC Output Source or Sink Current per Output Pin,  $I_O$   
     For  $V_O > -0.5V$  or  $V_O < V_{CC} + 0.5V$  .....  $\pm 25mA$   
 DC  $V_{CC}$  or Ground Current,  $I_{CC}$  .....  $\pm 70mA$

**Thermal Information**

Thermal Resistance (Typical, Note 1)  $\theta_{JA}$   
     E (PDIP) Package .....  $69^{\circ}C/W$   
     M (SOIC) Package .....  $58^{\circ}C/W$   
     PW (TSSOP) Package .....  $83^{\circ}C/W$   
 Maximum Junction Temperature .....  $150^{\circ}C$   
 Maximum Storage Temperature Range .....  $-65^{\circ}C$  to  $150^{\circ}C$   
 Maximum Lead Temperature (Soldering 10s) .....  $300^{\circ}C$   
     (SOIC - Lead Tips Only)

**Operating Conditions**

Temperature Range ( $T_A$ ) .....  $-55^{\circ}C$  to  $125^{\circ}C$   
 Supply Voltage Range,  $V_{CC}$   
     HC Types ..... 2V to 6V  
     HCT Types ..... 4.5V to 5.5V  
 DC Input or Output Voltage,  $V_I$ ,  $V_O$  ..... 0V to  $V_{CC}$   
 Input Rise and Fall Time  
     2V ..... 1000ns (Max)  
     4.5V ..... 500ns (Max)  
     6V ..... 400ns (Max)

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

**NOTE:**

1. The package thermal impedance is calculated in accordance with JESD 51-7.

**DC Electrical Specifications**

| PARAMETER                               | SYMBOL          | TEST CONDITIONS                       |                     | V <sub>CC</sub> (V) | 25°C |     |      | -40°C TO 85°C |      | -55°C TO 125°C |      | UNITS |
|-----------------------------------------|-----------------|---------------------------------------|---------------------|---------------------|------|-----|------|---------------|------|----------------|------|-------|
|                                         |                 | V <sub>I</sub> (V)                    | I <sub>O</sub> (mA) |                     | MIN  | TYP | MAX  | MIN           | MAX  | MIN            | MAX  |       |
| HC TYPES                                |                 |                                       |                     |                     |      |     |      |               |      |                |      |       |
| High Level Input Voltage                | V <sub>IH</sub> | -                                     | -                   | 2                   | 1.5  | -   | -    | 1.5           | -    | 1.5            | -    | V     |
|                                         |                 |                                       |                     | 4.5                 | 3.15 | -   | -    | 3.15          | -    | 3.15           | -    | V     |
|                                         |                 |                                       |                     | 6                   | 4.2  | -   | -    | 4.2           | -    | 4.2            | -    | V     |
| Low Level Input Voltage                 | V <sub>IL</sub> | -                                     | -                   | 2                   | -    | -   | 0.5  | -             | 0.5  | -              | 0.5  | V     |
|                                         |                 |                                       |                     | 4.5                 | -    | -   | 1.35 | -             | 1.35 | -              | 1.35 | V     |
|                                         |                 |                                       |                     | 6                   | -    | -   | 1.8  | -             | 1.8  | -              | 1.8  | V     |
| High Level Output Voltage<br>CMOS Loads | V <sub>OH</sub> | V <sub>IH</sub> or<br>V <sub>IL</sub> | -0.02               | 2                   | 1.9  | -   | -    | 1.9           | -    | 1.9            | -    | V     |
|                                         |                 |                                       | -0.02               | 4.5                 | 4.4  | -   | -    | 4.4           | -    | 4.4            | -    | V     |
|                                         |                 |                                       | -0.02               | 6                   | 5.9  | -   | -    | 5.9           | -    | 5.9            | -    | V     |
| High Level Output Voltage<br>TTL Loads  | V <sub>OH</sub> | V <sub>IH</sub> or<br>V <sub>IL</sub> | -6                  | 4.5                 | 3.98 | -   | -    | 3.84          | -    | 3.7            | -    | V     |
|                                         |                 |                                       | -7.8                | 6                   | 5.48 | -   | -    | 5.34          | -    | 5.2            | -    | V     |
| Low Level Output Voltage<br>CMOS Loads  | V <sub>OL</sub> | V <sub>IH</sub> or<br>V <sub>IL</sub> | 0.02                | 2                   | -    | -   | 0.1  | -             | 0.1  | -              | 0.1  | V     |
|                                         |                 |                                       | 0.02                | 4.5                 | -    | -   | 0.1  | -             | 0.1  | -              | 0.1  | V     |
|                                         |                 |                                       | 0.02                | 6                   | -    | -   | 0.1  | -             | 0.1  | -              | 0.1  | V     |
| Low Level Output Voltage<br>TTL Loads   | V <sub>OL</sub> | V <sub>IH</sub> or<br>V <sub>IL</sub> | 6                   | 4.5                 | -    | -   | 0.26 | -             | 0.33 | -              | 0.4  | V     |
|                                         |                 |                                       | 7.8                 | 6                   | -    | -   | 0.26 | -             | 0.33 | -              | 0.4  | V     |
| Input Leakage Current                   | I <sub>I</sub>  | V <sub>CC</sub> or<br>GND             | -                   | 6                   | -    | -   | ±0.1 | -             | ±1   | -              | ±1   | μA    |
| Quiescent Device Current                | I <sub>CC</sub> | V <sub>CC</sub> or<br>GND             | 0                   | 6                   | -    | -   | 8    | -             | 80   | -              | 160  | μA    |

**DC Electrical Specifications** (Continued)

| PARAMETER                                                      | SYMBOL                   | TEST CONDITIONS      |            | $V_{CC}$ (V) | 25°C |     |           | -40°C TO 85°C |           | -55°C TO 125°C |          | UNITS   |
|----------------------------------------------------------------|--------------------------|----------------------|------------|--------------|------|-----|-----------|---------------|-----------|----------------|----------|---------|
|                                                                |                          | $V_I$ (V)            | $I_O$ (mA) |              | MIN  | TYP | MAX       | MIN           | MAX       | MIN            | MAX      |         |
| Three-State Leakage Current                                    | $I_{OZ}$                 | $V_{IL}$ or $V_{IH}$ | -          | 6            | -    | -   | $\pm 0.5$ | -             | $\pm 0.5$ | -              | $\pm 10$ | $\mu A$ |
| <b>HCT TYPES</b>                                               |                          |                      |            |              |      |     |           |               |           |                |          |         |
| High Level Input Voltage                                       | $V_{IH}$                 | -                    | -          | 4.5 to 5.5   | 2    | -   | -         | 2             | -         | 2              | -        | V       |
| Low Level Input Voltage                                        | $V_{IL}$                 | -                    | -          | 4.5 to 5.5   | -    | -   | 0.8       | -             | 0.8       | -              | 0.8      | V       |
| High Level Output Voltage<br>CMOS Loads                        | $V_{OH}$                 | $V_{IH}$ or $V_{IL}$ | -0.02      | 4.5          | 4.4  | -   | -         | 4.4           | -         | 4.4            | -        | V       |
| High Level Output Voltage<br>TTL Loads                         |                          |                      | -6         | 4.5          | 3.98 | -   | -         | 3.84          | -         | 3.7            | -        | V       |
| Low Level Output Voltage<br>CMOS Loads                         | $V_{OL}$                 | $V_{IH}$ or $V_{IL}$ | 0.02       | 4.5          | -    | -   | 0.1       | -             | 0.1       | -              | 0.1      | V       |
| Low Level Output Voltage<br>TTL Loads                          |                          |                      | 6          | 4.5          | -    | -   | 0.26      | -             | 0.33      | -              | 0.4      | V       |
| Input Leakage Current                                          | $I_I$                    | $V_{CC}$ to GND      | 0          | 5.5          | -    | -   | $\pm 0.1$ | -             | $\pm 1$   | -              | $\pm 1$  | $\mu A$ |
| Quiescent Device Current                                       | $I_{CC}$                 | $V_{CC}$ or GND      | 0          | 5.5          | -    | -   | 8         | -             | 80        | -              | 160      | $\mu A$ |
| Additional Quiescent Device Current Per Input Pin: 1 Unit Load | $\Delta I_{CC}$ (Note 2) | $V_{CC}$ -2.1        | -          | 4.5 to 5.5   | -    | 100 | 360       | -             | 450       | -              | 490      | $\mu A$ |
| Three-State Leakage Current                                    | $I_{OZ}$                 | $V_{IL}$ or $V_{IH}$ | -          | 5.5          | -    | -   | $\pm 0.5$ | -             | $\pm 5$   | -              | $\pm 10$ | $\mu A$ |

NOTE:

2. For dual-supply systems theoretical worst case ( $V_I = 2.4V$ ,  $V_{CC} = 5.5V$ ) specification is 1.8mA.

**HCT Input Loading Table**

| INPUT            | UNIT LOADS |
|------------------|------------|
| <b>HCT240</b>    |            |
| nA0-A3           | 1.5        |
| $\overline{1OE}$ | 0.7        |
| $\overline{2OE}$ | 0.7        |
| <b>HCT241</b>    |            |
| nA0-A3           | 0.7        |
| $\overline{1OE}$ | 0.7        |
| $\overline{2OE}$ | 1.5        |
| <b>HCT244</b>    |            |
| nA0-A3           | 0.7        |
| $\overline{1OE}$ | 0.7        |
| $\overline{2OE}$ | 0.7        |

NOTE: Unit Load is  $\Delta I_{CC}$  limit specified in DC Electrical Specifications table, e.g., 360 $\mu A$  max at 25°C.

**Switching Specifications**  $C_L = 50\text{pF}$ , Input  $t_r, t_f = 6\text{ns}$

| PARAMETER                                      | SYMBOL                              | TEST<br>CONDI-<br>TIONS | V <sub>CC</sub><br>(V) | 25°C |     |     | -40°C TO 85°C |     |     | -55°C TO 125°C |     |     | UNITS |
|------------------------------------------------|-------------------------------------|-------------------------|------------------------|------|-----|-----|---------------|-----|-----|----------------|-----|-----|-------|
|                                                |                                     |                         |                        | MIN  | TYP | MAX | MIN           | TYP | MAX | MIN            | TYP | MAX |       |
| HC TYPES                                       |                                     |                         |                        |      |     |     |               |     |     |                |     |     |       |
| Propagation Delay<br>Data to Outputs<br>HC240  | t <sub>PLH</sub> , t <sub>PHL</sub> | C <sub>L</sub> = 50pF   | 2                      | -    | -   | 100 | -             | -   | 125 | -              | -   | 150 | ns    |
|                                                |                                     |                         | 4.5                    | -    | -   | 20  | -             | -   | 25  | -              | -   | 30  | ns    |
|                                                |                                     | C <sub>L</sub> = 15pF   | 5                      | -    | 8   | -   | -             | -   | -   | -              | -   | -   | ns    |
|                                                |                                     | C <sub>L</sub> = 50pF   | 6                      | -    | -   | 17  | -             | -   | 21  | -              | -   | 26  | ns    |
| Data to Outputs<br>HC241                       | t <sub>PLH</sub> , t <sub>PHL</sub> | C <sub>L</sub> = 50pF   | 2                      | -    | -   | 110 | -             | -   | 140 | -              | -   | 165 | ns    |
|                                                |                                     |                         | 4.5                    | -    | -   | 22  | -             | -   | 28  | -              | -   | 33  | ns    |
|                                                |                                     | C <sub>L</sub> = 15pF   | 5                      | -    | 9   | -   | -             | -   | -   | -              | -   | -   | ns    |
|                                                |                                     | C <sub>L</sub> = 50pF   | 6                      | -    | -   | 19  | -             | -   | 24  | -              | -   | 28  | ns    |
| Data to Outputs<br>HC244                       | t <sub>PLH</sub> , t <sub>PHL</sub> | C <sub>L</sub> = 50pF   | 2                      | -    | -   | 110 | -             | -   | 140 | -              | -   | 165 | ns    |
|                                                |                                     |                         | 4.5                    | -    | -   | 22  | -             | -   | 28  | -              | -   | 33  | ns    |
|                                                |                                     | C <sub>L</sub> = 15pF   | 5                      | -    | 9   | -   | -             | -   | -   | -              | -   | -   | ns    |
|                                                |                                     | C <sub>L</sub> = 50pF   | 6                      | -    | -   | 19  | -             | -   | 24  | -              | -   | 28  | ns    |
| Output Enable and Disable<br>Time              | t <sub>THL</sub> , t <sub>TLH</sub> | C <sub>L</sub> = 50pF   | 2                      | -    | -   | 150 | -             | -   | 190 | -              | -   | 225 | ns    |
|                                                |                                     |                         | 4.5                    | -    | -   | 30  | -             | -   | 38  | -              | -   | 45  | ns    |
|                                                |                                     |                         | 5                      | -    | 12  | -   | -             | -   | -   | -              | -   | -   | ns    |
|                                                |                                     |                         | 6                      | -    | -   | 26  | -             | -   | 33  | -              | -   | 38  | ns    |
| Output Transition Time                         | t <sub>TLH</sub> , t <sub>THL</sub> | C <sub>L</sub> = 50pF   | 2                      | -    | -   | 60  | -             | -   | 75  | -              | -   | 90  | ns    |
|                                                |                                     |                         | 4.5                    | -    | -   | 12  | -             | -   | 15  | -              | -   | 18  | ns    |
|                                                |                                     |                         | 6                      | -    | -   | 10  | -             | -   | 13  | -              | -   | 15  | ns    |
| Input Capacitance                              | C <sub>I</sub>                      | C <sub>L</sub> = 50pF   | -                      | 10   | -   | 10  | -             | -   | 10  | -              | -   | 10  | pF    |
| Three-State Output<br>Capacitance              | C <sub>O</sub>                      | C <sub>L</sub> = 50pF   | -                      | -    | -   | 20  | -             | -   | 20  | -              | -   | 20  | pF    |
| Power Dissipation Capacitance<br>(Notes 3, 4)  | C <sub>PD</sub>                     | C <sub>L</sub> = 15pF   |                        |      |     |     |               |     |     |                |     |     |       |
| HC240                                          |                                     |                         | 5                      | -    | 38  | -   | -             | -   | -   | -              | -   | -   | pF    |
| HC241                                          |                                     |                         | 5                      | -    | 34  | -   | -             | -   | -   | -              | -   | -   | pF    |
| HC244                                          |                                     |                         | 5                      | -    | 46  | -   | -             | -   | -   | -              | -   | -   | pF    |
| HCT TYPES                                      |                                     |                         |                        |      |     |     |               |     |     |                |     |     |       |
| Propagation Delay<br>Data to Outputs<br>HCT240 | t <sub>PHL</sub> , t <sub>PLH</sub> | C <sub>L</sub> = 50pF   | 4.5                    | -    | -   | 22  | -             | -   | 28  | -              | -   | 33  | ns    |
|                                                |                                     | C <sub>L</sub> = 15pF   | 5                      | -    | 9   | -   | -             | -   | -   | -              | -   | -   | ns    |
| Data to Outputs<br>HCT241                      | t <sub>PHL</sub> , t <sub>PLH</sub> | C <sub>L</sub> = 50pF   | 4.5                    | -    | -   | 25  | -             | -   | 31  | -              | -   | 38  | ns    |
|                                                |                                     | C <sub>L</sub> = 15pF   | 5                      | -    | 10  | -   | -             | -   | -   | -              | -   | -   | ns    |
| Data to Outputs<br>HCT244                      | t <sub>PHL</sub> , t <sub>PLH</sub> | C <sub>L</sub> = 50pF   | 4.5                    | -    | -   | 25  | -             | -   | 31  | -              | -   | 38  | ns    |
|                                                |                                     | C <sub>L</sub> = 15pF   | 5                      | -    | 10  | -   | -             | -   | -   | -              | -   | -   | ns    |

**Switching Specifications**  $C_L = 50\text{pF}$ , Input  $t_r, t_f = 6\text{ns}$  (Continued)

| PARAMETER                                  | SYMBOL             | TEST CONDITIONS     | $V_{CC}$ (V) | 25°C |     |     | -40°C TO 85°C |     |     | -55°C TO 125°C |     |     | UNITS |
|--------------------------------------------|--------------------|---------------------|--------------|------|-----|-----|---------------|-----|-----|----------------|-----|-----|-------|
|                                            |                    |                     |              | MIN  | TYP | MAX | MIN           | TYP | MAX | MIN            | TYP | MAX |       |
| Output Enable and Disable Times            | $t_{TLH}, t_{THL}$ | $C_L = 50\text{pF}$ | 4.5          | -    | -   | 30  | -             | -   | 38  | -              | -   | 45  | ns    |
| Output Transition Time                     | $t_{THL}, t_{TLH}$ | $C_L = 50\text{pF}$ | 4.5          | -    | -   | 12  | -             | -   | 15  | -              | -   | 18  | ns    |
| Input Capacitance                          | $C_I$              | $C_L = 50\text{pF}$ | -            | 10   | -   | 10  | -             | -   | 10  | -              | -   | 10  | pF    |
| Power Dissipation Capacitance (Notes 3, 4) | $C_{PD}$           |                     |              |      |     |     |               |     |     |                |     |     |       |
| HCT240                                     |                    | -                   | 5            | -    | 40  | -   | -             | -   | -   | -              | -   | -   | pF    |
| HCT241                                     |                    | -                   | 5            | -    | 38  | -   | -             | -   | -   | -              | -   | -   | pF    |
| HCT244                                     |                    | -                   | 5            | -    | 40  | -   | -             | -   | -   | -              | -   | -   | pF    |

## NOTES:

- $C_{PD}$  is used to determine the dynamic power consumption, per channel.
- $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = Input Frequency,  $f_o$  = Output Frequency,  $C_L$  = Output Load Capacitance,  $V_{CC}$  = Supply Voltage.

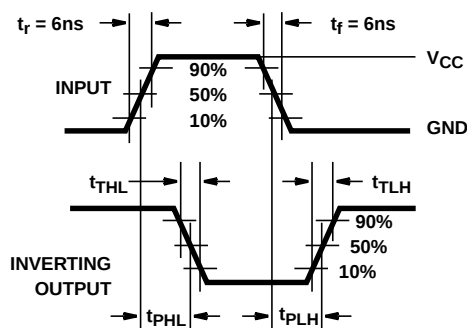
**Test Circuits and Waveforms**

FIGURE 1. HC TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

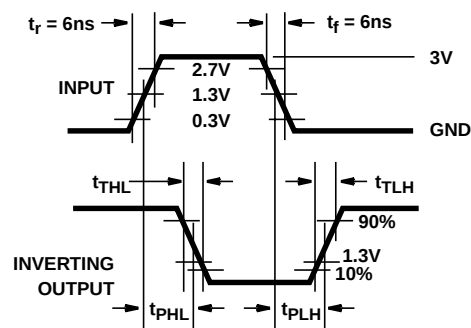


FIGURE 2. HCT TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

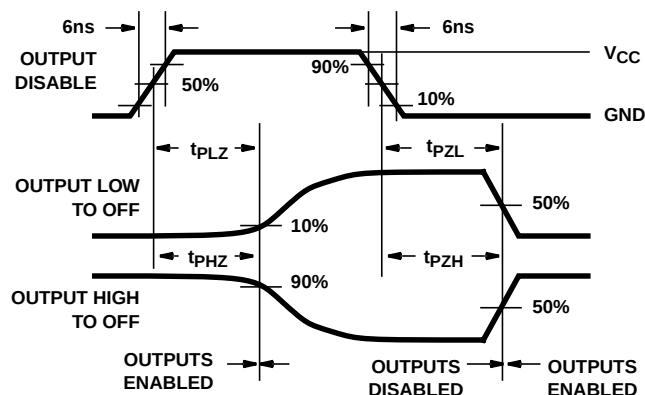


FIGURE 3. HC THREE-STATE PROPAGATION DELAY WAVEFORM

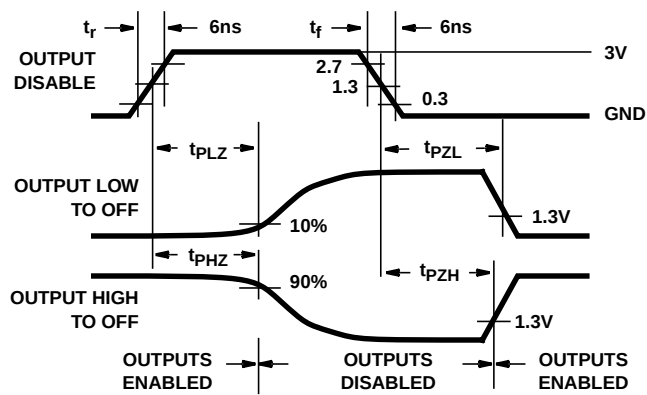
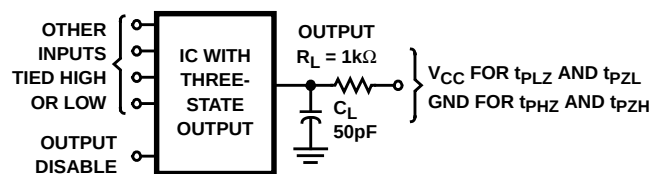


FIGURE 4. HCT THREE-STATE PROPAGATION DELAY WAVEFORM

## Test Circuits and Waveforms (Continued)



NOTE: Open drain waveforms  $t_{PLZ}$  and  $t_{PZL}$  are the same as those for three-state shown on the left. The test circuit is Output  $R_L = 1k\Omega$  to  $V_{CC}$ ,  $C_L = 50pF$ .

FIGURE 5. HC AND HCT THREE-STATE PROPAGATION DELAY TEST CIRCUIT

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)    | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|----------------------------|-------------------------|
| CD54HC240F3A     | ACTIVE        | CDIP         | J                  | 20   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | 8407401RA<br>CD54HC240F3A  | <a href="#">Samples</a> |
| CD54HC244F       | ACTIVE        | CDIP         | J                  | 20   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | CD54HC244F                 | <a href="#">Samples</a> |
| CD54HC244F3A     | ACTIVE        | CDIP         | J                  | 20   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | 8409601RA<br>CD54HC244F3A  | <a href="#">Samples</a> |
| CD54HCT240F3A    | ACTIVE        | CDIP         | J                  | 20   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | 8550501RA<br>CD54HCT240F3A | <a href="#">Samples</a> |
| CD54HCT241F3A    | ACTIVE        | CDIP         | J                  | 20   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | CD54HCT241F3A              | <a href="#">Samples</a> |
| CD54HCT244F      | ACTIVE        | CDIP         | J                  | 20   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | CD54HCT244F                | <a href="#">Samples</a> |
| CD54HCT244F3A    | ACTIVE        | CDIP         | J                  | 20   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | 8513001RA<br>CD54HCT244F3A | <a href="#">Samples</a> |
| CD74HC240E       | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HC240E                 | <a href="#">Samples</a> |
| CD74HC240M       | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC240M                     | <a href="#">Samples</a> |
| CD74HC240M96     | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC240M                     | <a href="#">Samples</a> |
| CD74HC241E       | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HC241E                 | <a href="#">Samples</a> |
| CD74HC241M       | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC241M                     | <a href="#">Samples</a> |
| CD74HC241M96     | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC241M                     | <a href="#">Samples</a> |
| CD74HC241M96E4   | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC241M                     | <a href="#">Samples</a> |
| CD74HC241MG4     | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC241M                     | <a href="#">Samples</a> |
| CD74HC244E       | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HC244E                 | <a href="#">Samples</a> |
| CD74HC244EE4     | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HC244E                 | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD74HC244M       | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC244M                  | <a href="#">Samples</a> |
| CD74HC244M96     | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC244M                  | <a href="#">Samples</a> |
| CD74HC244M96E4   | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC244M                  | <a href="#">Samples</a> |
| CD74HC244M96G4   | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HC244M                  | <a href="#">Samples</a> |
| CD74HCT240E      | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HCT240E             | <a href="#">Samples</a> |
| CD74HCT240EE4    | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HCT240E             | <a href="#">Samples</a> |
| CD74HCT240M      | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT240M                 | <a href="#">Samples</a> |
| CD74HCT240M96    | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT240M                 | <a href="#">Samples</a> |
| CD74HCT240MG4    | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT240M                 | <a href="#">Samples</a> |
| CD74HCT240PW     | ACTIVE        | TSSOP        | PW                 | 20   | 70             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HK240                   | <a href="#">Samples</a> |
| CD74HCT240PWR    | ACTIVE        | TSSOP        | PW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HK240                   | <a href="#">Samples</a> |
| CD74HCT240PWT    | ACTIVE        | TSSOP        | PW                 | 20   | 250            | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HK240                   | <a href="#">Samples</a> |
| CD74HCT241E      | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HCT241E             | <a href="#">Samples</a> |
| CD74HCT241EE4    | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HCT241E             | <a href="#">Samples</a> |
| CD74HCT241M      | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT241M                 | <a href="#">Samples</a> |
| CD74HCT241M96    | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT241M                 | <a href="#">Samples</a> |
| CD74HCT244E      | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | -55 to 125   | CD74HCT244E             | <a href="#">Samples</a> |
| CD74HCT244M      | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT244M                 | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD74HCT244M96    | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT244M                 | <a href="#">Samples</a> |
| CD74HCT244ME4    | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | HCT244M                 | <a href="#">Samples</a> |

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBsolete:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**OTHER QUALIFIED VERSIONS OF CD54HC240, CD54HC244, CD54HCT240, CD54HCT241, CD54HCT244, CD74HC240, CD74HC244, CD74HCT240, CD74HCT241, CD74HCT244 :**

- Catalog: [CD74HC240](#), [CD74HC244](#), [CD74HCT240](#), [CD74HCT241](#), [CD74HCT244](#)
- Military: [CD54HC240](#), [CD54HC244](#), [CD54HCT240](#), [CD54HCT241](#), [CD54HCT244](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


|    |                                                           |
|----|-----------------------------------------------------------|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

**TAPE AND REEL INFORMATION**

\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD74HC240M96  | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| CD74HC241M96  | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| CD74HC244M96  | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| CD74HCT240M96 | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| CD74HCT240PWR | TSSOP        | PW              | 20   | 2000 | 330.0              | 16.4               | 6.95    | 7.1     | 1.6     | 8.0     | 16.0   | Q1            |
| CD74HCT240PWT | TSSOP        | PW              | 20   | 250  | 330.0              | 16.4               | 6.95    | 7.1     | 1.6     | 8.0     | 16.0   | Q1            |
| CD74HCT241M96 | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| CD74HCT244M96 | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD74HC240M96  | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| CD74HC241M96  | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| CD74HC244M96  | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| CD74HCT240M96 | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| CD74HCT240PWR | TSSOP        | PW              | 20   | 2000 | 367.0       | 367.0      | 38.0        |
| CD74HCT240PWT | TSSOP        | PW              | 20   | 250  | 367.0       | 367.0      | 38.0        |
| CD74HCT241M96 | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| CD74HCT244M96 | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **<br>DIM      | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).  
 The 20 pin end lead shoulder width is a vendor option, either half or full width.



4220724/A 05/2016

## NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
5. Reference JEDEC registration MS-013.

# EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4220724/A 05/2016

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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