

# CD54/74HC123, CD54/74HCT123, CD74HC423, CD74HCT423

## High-Speed CMOS Logic Dual Retriggerable Monostable Multivibrators with Resets

### Features

- Overriding Reset Terminates Output Pulse
- Triggering From the Leading or Trailing Edge
- Q and  $\bar{Q}$  Buffered Outputs
- Separate Resets
- Wide Range of Output-Pulse Widths
- Schmitt Trigger on Both  $\bar{A}$  and B Inputs
- Fanout (Over Temperature Range)
  - Standard Outputs . . . . . 10 LSTTL Loads
  - Bus Driver Outputs . . . . . 15 LSTTL Loads
- Wide Operating Temperature Range . . . -55°C to 125°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 'HC123, 'HCT123, CD74HC423 and CD74HCT423 are dual monostable multivibrators with resets. They are all retriggerable and differ only in that the 123 types can be triggered by a negative to positive reset pulse; whereas the 423 types do not have this feature. An external resistor ( $R_X$ ) and an external capacitor ( $C_X$ ) control the timing and the accuracy for the circuit. Adjustment of  $R_X$  and  $C_X$  provides a wide range of output pulse widths from the Q and  $\bar{Q}$  terminals. Pulse triggering on the  $\bar{A}$  and B inputs occur at a particular voltage level and is not related to the rise and fall times of the trigger pulses.

Once triggered, the output pulse width may be extended by retriggering inputs  $\bar{A}$  and B. The output pulse can be terminated by a LOW level on the Reset (R) pin. Trailing edge triggering ( $\bar{A}$ ) and leading edge triggering (B) inputs are provided for triggering from either edge of the input pulse. If either Mono is not used each input on the unused device ( $\bar{A}$ , B, and R) must be terminated high or low.

The minimum value of external resistance,  $R_X$  is typically 5k $\Omega$ . The minimum value external capacitance,  $C_X$ , is 0pF. The calculation for the pulse width is  $t_W = 0.45 R_X C_X$  at  $V_{CC} = 5V$ .

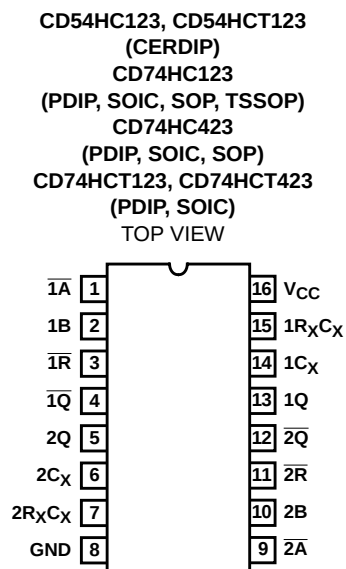
### Ordering Information

| PART NUMBER   | TEMP. RANGE (°C) | PACKAGE      |
|---------------|------------------|--------------|
| CD54HC123F3A  | -55 to 125       | 16 Ld CERDIP |
| CD54HCT123F3A | -55 to 125       | 16 Ld CERDIP |
| CD74HC123E    | -55 to 125       | 16 Ld PDIP   |
| CD74HC123M    | -55 to 125       | 16 Ld SOIC   |
| CD74HC123MT   | -55 to 125       | 16 Ld SOIC   |
| CD74HC123M96  | -55 to 125       | 16 Ld SOIC   |
| CD74HC123NSR  | -55 to 125       | 16 Ld SOP    |
| CD74HC123PW   | -55 to 125       | 16 Ld TSSOP  |
| CD74HC123PWR  | -55 to 125       | 16 Ld TSSOP  |
| CD74HC123PWT  | -55 to 125       | 16 Ld TSSOP  |
| CD74HC423E    | -55 to 125       | 16 Ld PDIP   |
| CD74HC423M    | -55 to 125       | 16 Ld SOIC   |
| CD74HC423MT   | -55 to 125       | 16 Ld SOIC   |
| CD74HC423M96  | -55 to 125       | 16 Ld SOIC   |
| CD74HC423NSR  | -55 to 125       | 16 Ld SOP    |
| CD74HCT123E   | -55 to 125       | 16 Ld PDIP   |
| CD74HCT123M   | -55 to 125       | 16 Ld SOIC   |
| CD74HCT123MT  | -55 to 125       | 16 Ld SOIC   |
| CD74HCT123M96 | -55 to 125       | 16 Ld SOIC   |
| CD74HCT423E   | -55 to 125       | 16 Ld PDIP   |
| CD74HCT423MT  | -55 to 125       | 16 Ld SOIC   |
| CD74HCT423M96 | -55 to 125       | 16 Ld SOIC   |

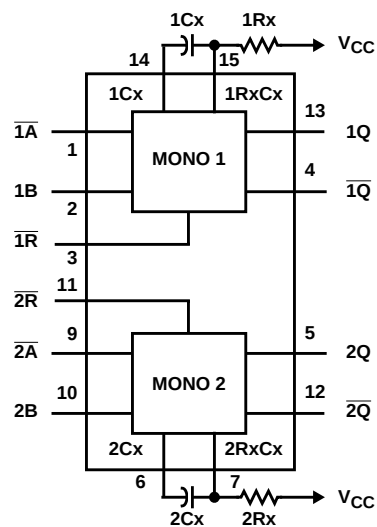
NOTE: When ordering, use the entire part number. The suffixes 96 and R denote tape and reel. The suffix T denotes a small-quantity reel of 250.

# CD54/74HC123, CD54/74HCT123, CD74HC423, CD74HCT423

## Pinout



## Functional Diagram



TRUTH TABLE

| INPUTS               |   |   | OUTPUTS |   |
|----------------------|---|---|---------|---|
| A                    | B | R | Q       | Q |
| <b>CD74HC/HCT123</b> |   |   |         |   |
| H                    | X | H | L       | H |
| X                    | L | H | L       | H |
| L                    | ↑ | H | ⌋       | ⌋ |
| ↓                    | H | H | ⌋       | ⌋ |
| X                    | X | L | L       | H |
| L                    | H | ↑ | ⌋       | ⌋ |
| <b>CD74HC/HCT423</b> |   |   |         |   |
| H                    | X | H | L       | H |
| X                    | L | H | L       | H |
| L                    | ↑ | H | ⌋       | ⌋ |
| ↓                    | H | H | ⌋       | ⌋ |
| X                    | X | L | L       | H |

H = High Voltage Level, L = Low Voltage Level,  
 X = Don't Care.

# CD54/74HC123, CD54/74HCT123, CD74HC423, CD74HCT423

## 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 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,  $I_{CC}$  or  $I_{GND}$  .....  $\pm 50mA$

## Thermal Information

Package Thermal Impedance,  $\theta_{JA}$  (see Note 1):  
 E (PDIP) Package .....  $67^{\circ}C/W$   
 M (SOIC) Package .....  $73^{\circ}C/W$   
 NS (SOP) Package .....  $64^{\circ}C/W$   
 PW (TSSOP) Package .....  $108^{\circ}C/W$   
 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><br>(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 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     |
| -                                       |                 |                                    | -                   | -                      | -    | -   | -    | -             | -    | -              | V    |       |
| High Level Output Voltage<br>TTL Loads  |                 |                                    | -4                  | 4.5                    | 3.98 | -   | -    | 3.84          | -    | 3.7            | -    | V     |
|                                         |                 |                                    | -5.2                | 6                      | 5.48 | -   | -    | 5.34          | -    | 5.2            | -    | V     |
| Low Level Output Voltage<br>CMOS Loads  | V <sub>OL</sub> | V <sub>IH</sub> or 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     |
| -                                       |                 |                                    | -                   | -                      | -    | -   | -    | -             | -    | -              | V    |       |
| Low Level Output Voltage<br>TTL Loads   |                 |                                    | 4                   | 4.5                    | -    | -   | 0.26 | -             | 0.33 | -              | 0.4  | V     |
|                                         |                 |                                    | 5.2                 | 6                      | -    | -   | 0.26 | -             | 0.33 | -              | 0.4  | V     |
| Input Leakage Current                   | I <sub>I</sub>  | V <sub>CC</sub> or GND             | -                   | 6                      | -    | -   | ±0.1 | -             | ±1   | -              | ±1   | µA    |
| Quiescent Device Current                | I <sub>CC</sub> | V <sub>CC</sub> or GND             | 0                   | 6                      | -    | -   | 8    | -             | 80   | -              | 160  | µA    |

**CD54/74HC123, CD54/74HCT123, CD74HC423, CD74HCT423**

**DC Electrical Specifications (Continued)**

| 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 |       |
| HCT TYPES                                                      |                           |                                    |                     |                     |      |     |      |               |      |                |     |       |
| High Level Input Voltage                                       | V <sub>IH</sub>           | -                                  | -                   | 4.5 to 5.5          | 2    | -   | -    | 2             | -    | 2              | -   | V     |
| Low Level Input Voltage                                        | V <sub>IL</sub>           | -                                  | -                   | 4.5 to 5.5          | -    | -   | 0.8  | -             | 0.8  | -              | 0.8 | V     |
| High Level Output Voltage<br>CMOS Loads                        | V <sub>OH</sub>           | V <sub>IH</sub> or V <sub>IL</sub> | -0.02               | 4.5                 | 4.4  | -   | -    | 4.4           | -    | 4.4            | -   | V     |
| High Level Output Voltage<br>TTL Loads                         |                           |                                    | -4                  | 4.5                 | 3.98 | -   | -    | 3.84          | -    | 3.7            | -   | V     |
| Low Level Output Voltage<br>CMOS Loads                         | V <sub>OL</sub>           | V <sub>IH</sub> or V <sub>IL</sub> | 0.02                | 4.5                 | -    | -   | 0.1  | -             | 0.1  | -              | 0.1 | V     |
| Low Level Output Voltage<br>TTL Loads                          |                           |                                    | 4                   | 4.5                 | -    | -   | 0.26 | -             | 0.33 | -              | 0.4 | V     |
| Input Leakage Current                                          | I <sub>I</sub>            | V <sub>CC</sub> and GND            | 0                   | 5.5                 | -    |     | ±0.1 | -             | ±1   | -              | ±1  | μA    |
| Quiescent Device Current                                       | I <sub>CC</sub>           | V <sub>CC</sub> or GND             | 0                   | 5.5                 | -    | -   | 8    | -             | 80   | -              | 160 | μA    |
| Additional Quiescent Device Current Per Input Pin: 1 Unit Load | ΔI <sub>CC</sub> (Note 2) | V <sub>CC</sub> -2.1               | -                   | 4.5 to 5.5          | -    | 100 | 360  | -             | 450  | -              | 490 | μA    |

NOTE:

2. For dual-supply systems theoretical worst case (V<sub>I</sub> = 2.4V, V<sub>CC</sub> = 5.5V) specification is 1.8mA.

**HCT Input Loading Table**

| INPUT | UNIT LOADS |
|-------|------------|
| All   | 0.35       |

NOTE: Unit Load is ΔI<sub>CC</sub> limit specified in DC Electrical Table, e.g. 360μA max at 25°C.

**Prerequisite for Switching Specifications**

| PARAMETER                                    | SYMBOL          | V <sub>CC</sub> (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                                     |                 |                     |      |     |     |               |     |     |                |     |     |       |
| Minimum Input, Pulse Width<br>$\overline{A}$ | t <sub>WL</sub> | 2                   | 100  | -   | -   | 125           | -   | -   | 150            | -   | -   | ns    |
|                                              |                 | 4.5                 | 20   | -   | -   | 25            | -   | -   | 30             | -   | -   | ns    |
|                                              |                 | 6                   | 17   | -   | -   | 21            | -   | -   | 26             | -   | -   | ns    |
| B                                            | t <sub>WH</sub> | 2                   | 100  | -   | -   | 125           | -   | -   | 150            | -   | -   | ns    |
|                                              |                 | 4.5                 | 20   | -   | -   | 25            | -   | -   | 30             | -   | -   | ns    |
|                                              |                 | 6                   | 17   | -   | -   | 21            | -   | -   | 26             | -   | -   | ns    |

**CD54/74HC123, CD54/74HCT123, CD74HC423, CD74HCT423**

**Prerequisite for Switching Specifications (Continued)**

| PARAMETER                                                                | SYMBOL    | V <sub>CC</sub> (V) | 25°C |     |     | -40°C TO 85°C |     |      | -55°C TO 125°C |     |      | UNITS   |
|--------------------------------------------------------------------------|-----------|---------------------|------|-----|-----|---------------|-----|------|----------------|-----|------|---------|
|                                                                          |           |                     | MIN  | TYP | MAX | MIN           | TYP | MAX  | MIN            | TYP | MAX  |         |
| $\bar{R}$                                                                | $t_{WL}$  | 2                   | 100  | -   | -   | 125           | -   | -    | 150            | -   | 150  | ns      |
|                                                                          |           | 4.5                 | 20   | -   | -   | 25            | -   | -    | 30             | -   | 30   | ns      |
|                                                                          |           | 6                   | 17   | -   | -   | 21            | -   | -    | 26             | -   | 26   | ns      |
| $\bar{A}$ and B Hold Time                                                | $t_H$     | 2                   | 50   | -   | -   | 65            | -   | -    | 75             | -   | 75   | ns      |
|                                                                          |           | 4.5                 | 10   | -   | -   | 13            | -   | -    | 15             | -   | 15   | ns      |
|                                                                          |           | 6                   | 9    | -   | -   | 11            | -   | -    | 13             | -   | 13   | ns      |
| Reset Removal Time                                                       | $t_{REM}$ | 2                   | 50   | -   | -   | 65            | -   | -    | 75             | -   | 75   | ns      |
|                                                                          |           | 4.5                 | 10   | -   | -   | 13            | -   | -    | 15             | -   | 15   | ns      |
|                                                                          |           | 6                   | 9    | -   | -   | 11            | -   | -    | 13             | -   | 13   | ns      |
| Retrigger Time Number<br>$R_X = 10K\Omega$ , $C_X = 0$                   | $t_{rT}$  | 5                   | -    | -   | -   | -             | -   | -    | -              | -   | -    | ns      |
|                                                                          |           |                     | -    | 50  | -   | -             | 63  | -    | -              | 76  | -    | ns      |
| Output Pulse Width<br>Q or $\bar{Q}$<br>$R_X = 10K\Omega$ , $C_X = 10nF$ | $t_W$     | 5                   | 40   | -   | 50  | 38.7          | -   | 51.3 | 38.2           | -   | 51.8 | $\mu s$ |
| <b>HCT TYPES</b>                                                         |           |                     |      |     |     |               |     |      |                |     |      |         |
| Minimum Input, Pulse Width<br>$\bar{A}$                                  | $t_{WL}$  | 5                   | 20   | -   | -   | 25            | -   | -    | 30             | -   | -    | ns      |
| B                                                                        | $t_{WH}$  |                     | 20   | -   | -   | 25            | -   | -    | 30             | -   | -    | ns      |
| $\bar{R}$                                                                | $t_{WL}$  |                     | 20   | -   | -   | 25            | -   | -    | 30             | -   | -    | ns      |
| $\bar{A}$ and B Hold Time                                                | $t_H$     | 5                   | 10   | -   | -   | 13            | -   | -    | 15             | -   | -    | ns      |
| Reset Removal Time                                                       | $t_{REM}$ | 5                   | 10   | -   | -   | 13            | -   | -    | 15             |     | -    | ns      |
| Retrigger Time Number (Note 3)<br>$R_X = 10K\Omega$ , $C_X = 0$          | $t_{rT}$  | 5                   | -    | 50  | -   | -             | 63  | -    | -              | 76  | -    | ns      |
| Output Pulse Width Q or $\bar{Q}$<br>$R_X = 10K\Omega$ , $C_X = 10nF$    | $t_W$     | 5                   | 40   | -   | 50  | 38.7          | -   | 51.3 | 38.2           | -   | 51.8 | $\mu s$ |

NOTE:

- Time to trigger depends on the values of  $R_X$  and  $C_X$ . The output pulse width can only be extended when the time between the active-going edges of the trigger input pulses meet the minimum retrigger time requirement.

**CD54/74HC123, CD54/74HCT123, CD74HC423, CD74HCT423**

**Switching Specifications** Input  $t_r, t_f = 6\text{ns}$ ,  $R_X = 10\text{K}\Omega$ ,  $C_X = 0$

| PARAMETER                                                                                                 | SYMBOL                              | TEST<br>CONDITIONS    | V <sub>CC</sub> (V) | 25°C |     |     | -40°C TO<br>85°C |     | -55°C TO<br>125°C |     | UNIT<br>S |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------|---------------------|------|-----|-----|------------------|-----|-------------------|-----|-----------|
|                                                                                                           |                                     |                       |                     | MIN  | TYP | MAX | MIN              | MAX | MIN               | MAX |           |
| HC TYPES                                                                                                  |                                     |                       |                     |      |     |     |                  |     |                   |     |           |
| Trigger Propagation Delay<br>A̅, B, R̅ to Q                                                               | t <sub>PLH</sub>                    | C <sub>L</sub> = 50pF | 2                   | -    | -   | 300 | -                | 375 | -                 | 450 | ns        |
|                                                                                                           |                                     |                       | 4.5                 | -    | -   | 60  | -                | 75  | -                 | 90  | ns        |
|                                                                                                           |                                     | C <sub>L</sub> = 15pF | 5                   | -    | 25  | -   | -                | -   | -                 | -   | ns        |
|                                                                                                           |                                     | C <sub>L</sub> = 50pF | 6                   | -    | -   | 51  | -                | 64  | -                 | 76  | ns        |
| A̅, B, R̅ to Q̅                                                                                           | t <sub>PHL</sub>                    | C <sub>L</sub> = 50pF | 2                   | -    | -   | 320 | -                | 400 | -                 | 480 | ns        |
|                                                                                                           |                                     |                       | 4.5                 | -    | -   | 64  | -                | 80  | -                 | 96  | ns        |
|                                                                                                           |                                     | C <sub>L</sub> = 15pF | 5                   | -    | 26  | -   | -                | -   | -                 | -   | ns        |
|                                                                                                           |                                     | C <sub>L</sub> = 50pF | 6                   | -    | -   | 54  | -                | 68  | -                 | 82  | ns        |
| Reset Propagation Delay<br>R̅ to Q or Q̅                                                                  | t <sub>PHL</sub> , t <sub>PLH</sub> | C <sub>L</sub> = 50pF | 2                   | -    | -   | 215 | -                | 270 | -                 | 325 | ns        |
|                                                                                                           |                                     |                       | 4.5                 | -    | -   | 43  | -                | 54  | -                 | 65  | ns        |
|                                                                                                           |                                     |                       | 6                   | -    | -   | 37  | -                | 46  | -                 | 55  | ns        |
| Output Transition Time                                                                                    | t <sub>THL</sub> , t <sub>TLH</sub> | C <sub>L</sub> = 50pF | 2                   | -    | -   | 75  | -                | 95  | -                 | 110 | ns        |
|                                                                                                           |                                     |                       | 4.5                 | -    | -   | 15  | -                | 19  | -                 | 22  | ns        |
|                                                                                                           |                                     |                       | 6                   | -    | -   | 13  | -                | 16  | -                 | 19  | ns        |
| Output Pulse Width<br>R <sub>X</sub> = 10KΩ, C <sub>X</sub> = 10nF                                        | -                                   | -                     | 5                   | -    | 45  | -   | -                | -   | -                 | -   | μs        |
| Pulse Width Match Between<br>Circuits In the Same Package<br>R <sub>X</sub> = 10KΩ, C <sub>X</sub> = 10pF | -                                   | -                     | 5                   | -    | ±2  | -   | -                | -   | -                 | -   | %         |
| Power Dissipation Capacitance<br>(Note 4)                                                                 | C <sub>PD</sub>                     | C <sub>L</sub> = 15pF | 5                   | -    | -   | -   | -                | -   | -                 | -   | pF        |
| Input Capacitance                                                                                         | C <sub>IN</sub>                     | C <sub>L</sub> = 50pF | -                   | 10   | -   | 10  | -                | 10  | -                 | 10  | pF        |
| HCT TYPES                                                                                                 |                                     |                       |                     |      |     |     |                  |     |                   |     |           |
| Trigger Propagation Delay<br>A̅, B, R̅ to Q                                                               | t <sub>PLH</sub>                    | C <sub>L</sub> = 50pF | 4.5                 | -    | -   | 60  | -                | 75  | -                 | 90  | ns        |
|                                                                                                           |                                     | C <sub>L</sub> = 15pF | 5                   | -    | 25  | -   | -                | -   | -                 | -   | ns        |
| A̅, B, R̅ to Q̅                                                                                           | t <sub>PHL</sub>                    | C <sub>L</sub> = 50pF | 4.5                 | -    | -   | 68  | -                | 85  | -                 | 102 | ns        |
|                                                                                                           |                                     | C <sub>L</sub> =15pF  | 5                   | -    | 27  | -   | -                | -   | -                 | -   | ns        |
| Reset Propagation Delay<br>R̅ to Q or Q̅                                                                  | t <sub>PHL</sub> , t <sub>PLH</sub> | C <sub>L</sub> = 50pF | 4.5                 | -    | -   | 48  | -                | 60  | -                 | 72  | ns        |
| Output Transition Time                                                                                    | t <sub>THL</sub> , t <sub>TLH</sub> | C <sub>L</sub> = 50pF | 4.5                 | -    | -   | 15  | -                | 19  | -                 | 22  | ns        |
| Output Pulse Width<br>R <sub>X</sub> = 10KΩ, C <sub>X</sub> = 10nF                                        | -                                   | -                     | 5                   | -    | 45  | -   | -                | -   | -                 | -   | μs        |

**CD54/74HC123, CD54/74HCT123, CD74HC423, CD74HCT423**

**Switching Specifications** Input  $t_r, t_f = 6\text{ns}$ ,  $R_X = 10\text{K}\Omega$ ,  $C_X = 0$  (Continued)

| PARAMETER                                                                                                | SYMBOL   | TEST CONDITIONS     | $V_{CC}$ (V) | 25°C |         |     | -40°C TO 85°C |     | -55°C TO 125°C |     | UNIT |
|----------------------------------------------------------------------------------------------------------|----------|---------------------|--------------|------|---------|-----|---------------|-----|----------------|-----|------|
|                                                                                                          |          |                     |              | MIN  | TYP     | MAX | MIN           | MAX | MIN            | MAX |      |
| Pulse Width Match Between Circuits In the Same Package<br>$R_X = 10\text{K}\Omega$ , $C_X = 10\text{pF}$ | -        | -                   | 5            |      | $\pm 2$ | -   | -             | -   | -              | -   | %    |
| Input Capacitance                                                                                        | $C_{IN}$ | $C_L = 50\text{pF}$ | -            | -    | -       | 10  | -             | 10  | -              | 10  | pF   |

NOTE:

4.  $C_{PD}$  is used to determine the dynamic power consumption, per multivibrator.

$$P_D = (C_{PD} + C_X) V_{CC}^2 f_i \sum (C_L V_{CC}^2 f_O)$$

Where

$f_i$  = input frequency

$f_O$  = Output Frequency

$C_L$  = Output Load Capacitance

$C_X$  = External Capacitance

$V_{CC}$  = Supply Voltage,

assuming  $f_i \ll \frac{1}{t_W}$

## Test Circuits and Waveforms

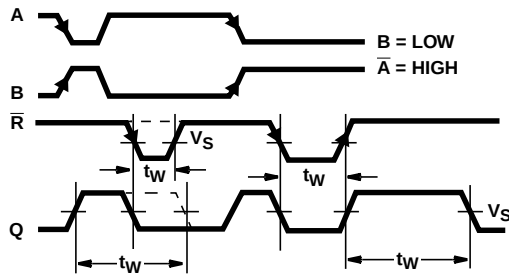


FIGURE 1. OUTPUT PULSE CONTROL USING RESET INPUT ( $\bar{R}$ ) PULSE FOR 123

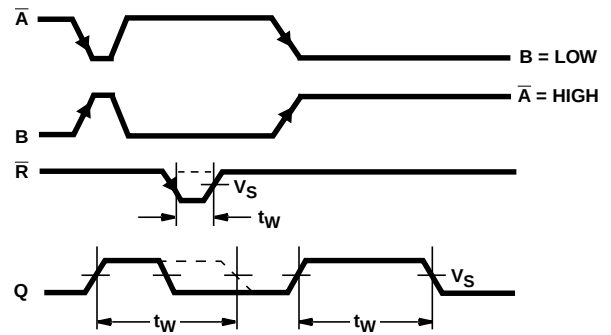
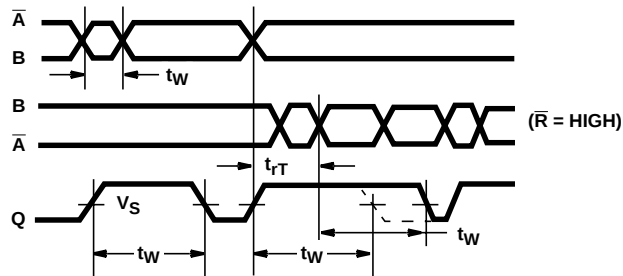


FIGURE 2. OUTPUT PULSE CONTROL USING RESET INPUT ( $\bar{R}$ ) FOR 423



NOTE: Output pulse control using retrigger pulse for 123 and 423.

FIGURE 3. TRIGGERING OF ONE SHOT BY INPUT  $\bar{A}$  OR INPUT B FOR A PERIOD  $t_W$

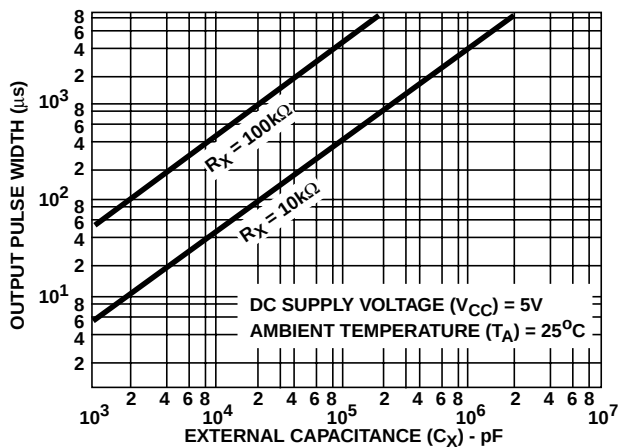


FIGURE 4. TYPICAL OUTPUT PULSE WIDTH AS A FUNCTION OF  $C_X$  FOR  $R_X = 10k\Omega$  AND  $100k\Omega$

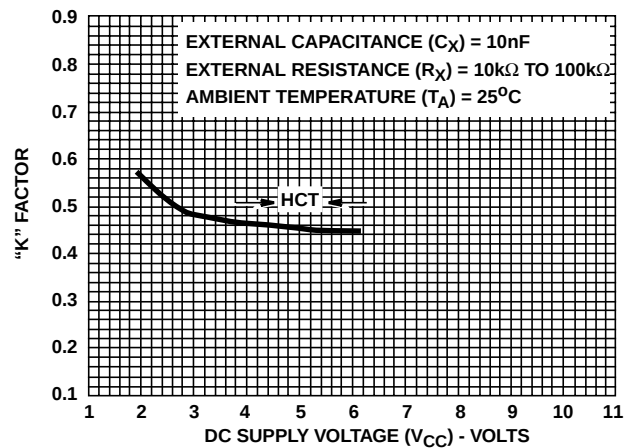


FIGURE 5. TYPICAL "K" FACTOR AS A FUNCTION OF  $V_{CC}$

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)     | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)         | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|---------------------|--------------------------------------|----------------------|--------------|---------------------------------|-------------------------|
| 5962-8684701EA   | ACTIVE        | CDIP         | J                  | 16   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 5962-8684701EA<br>CD54HC123F3A  | <a href="#">Samples</a> |
| 5962-8970001EA   | ACTIVE        | CDIP         | J                  | 16   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 5962-8970001EA<br>CD54HCT123F3A | <a href="#">Samples</a> |
| CD54HC123F       | ACTIVE        | CDIP         | J                  | 16   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | CD54HC123F                      | <a href="#">Samples</a> |
| CD54HC123F3A     | ACTIVE        | CDIP         | J                  | 16   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 5962-8684701EA<br>CD54HC123F3A  | <a href="#">Samples</a> |
| CD54HCT123F3A    | ACTIVE        | CDIP         | J                  | 16   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 5962-8970001EA<br>CD54HCT123F3A | <a href="#">Samples</a> |
| CD74HC123E       | ACTIVE        | PDIP         | N                  | 16   | 25             | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HC123E                      | <a href="#">Samples</a> |
| CD74HC123EE4     | ACTIVE        | PDIP         | N                  | 16   | 25             | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HC123E                      | <a href="#">Samples</a> |
| CD74HC123M       | ACTIVE        | SOIC         | D                  | 16   | 40             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123M96     | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green        | NIPDAU   SN                          | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123M96E4   | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123M96G4   | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123ME4     | ACTIVE        | SOIC         | D                  | 16   | 40             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123MG4     | ACTIVE        | SOIC         | D                  | 16   | 40             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123MT      | ACTIVE        | SOIC         | D                  | 16   | 250            | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123MTG4    | ACTIVE        | SOIC         | D                  | 16   | 250            | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123NSR     | ACTIVE        | SO           | NS                 | 16   | 2000           | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC123M                          | <a href="#">Samples</a> |
| CD74HC123PW      | ACTIVE        | TSSOP        | PW                 | 16   | 90             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HJ123                           | <a href="#">Samples</a> |
| CD74HC123PWE4    | ACTIVE        | TSSOP        | PW                 | 16   | 90             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HJ123                           | <a href="#">Samples</a> |
| CD74HC123PWR     | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | RoHS & Green        | NIPDAU   SN                          | Level-1-260C-UNLIM   | -55 to 125   | HJ123                           | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD74HC123PWRE4   | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HJ123                   | <a href="#">Samples</a> |
| CD74HC123PWRG4   | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HJ123                   | <a href="#">Samples</a> |
| CD74HC123PWT     | ACTIVE        | TSSOP        | PW                 | 16   | 250            | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HJ123                   | <a href="#">Samples</a> |
| CD74HC423E       | ACTIVE        | PDIP         | N                  | 16   | 25             | RoHS & Green    | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HC423E              | <a href="#">Samples</a> |
| CD74HC423M       | ACTIVE        | SOIC         | D                  | 16   | 40             | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC423M                  | <a href="#">Samples</a> |
| CD74HC423M96     | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC423M                  | <a href="#">Samples</a> |
| CD74HC423M96G4   | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC423M                  | <a href="#">Samples</a> |
| CD74HC423MG4     | ACTIVE        | SOIC         | D                  | 16   | 40             | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC423M                  | <a href="#">Samples</a> |
| CD74HC423MT      | ACTIVE        | SOIC         | D                  | 16   | 250            | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC423M                  | <a href="#">Samples</a> |
| CD74HC423NSR     | ACTIVE        | SO           | NS                 | 16   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HC423M                  | <a href="#">Samples</a> |
| CD74HCT123E      | ACTIVE        | PDIP         | N                  | 16   | 25             | RoHS & Green    | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HCT123E             | <a href="#">Samples</a> |
| CD74HCT123M      | ACTIVE        | SOIC         | D                  | 16   | 40             | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT123M                 | <a href="#">Samples</a> |
| CD74HCT123M96    | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT123M                 | <a href="#">Samples</a> |
| CD74HCT123M96G4  | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT123M                 | <a href="#">Samples</a> |
| CD74HCT123MT     | ACTIVE        | SOIC         | D                  | 16   | 250            | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT123M                 | <a href="#">Samples</a> |
| CD74HCT423E      | ACTIVE        | PDIP         | N                  | 16   | 25             | RoHS & Green    | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HCT423E             | <a href="#">Samples</a> |
| CD74HCT423M96    | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT423M                 | <a href="#">Samples</a> |
| CD74HCT423M96G4  | ACTIVE        | SOIC         | D                  | 16   | 2500           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT423M                 | <a href="#">Samples</a> |
| CD74HCT423MT     | ACTIVE        | SOIC         | D                  | 16   | 250            | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT423M                 | <a href="#">Samples</a> |
| CD74HCT423MTE4   | ACTIVE        | SOIC         | D                  | 16   | 250            | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT423M                 | <a href="#">Samples</a> |
| CD74HCT423MTG4   | ACTIVE        | SOIC         | D                  | 16   | 250            | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT423M                 | <a href="#">Samples</a> |

<sup>(1)</sup> 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.

<sup>(2)</sup> **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  $\leq 1000$ ppm threshold. Antimony trioxide based flame retardants must also meet the  $\leq 1000$ ppm threshold requirement.

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

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

<sup>(5)</sup> 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.

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

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**OTHER QUALIFIED VERSIONS OF CD54HC123, CD54HCT123, CD74HC123, CD74HCT123 :**

- Catalog : [CD74HC123](#), [CD74HCT123](#)
- Military : [CD54HC123](#), [CD54HCT123](#)

NOTE: Qualified Version Definitions:

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

**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

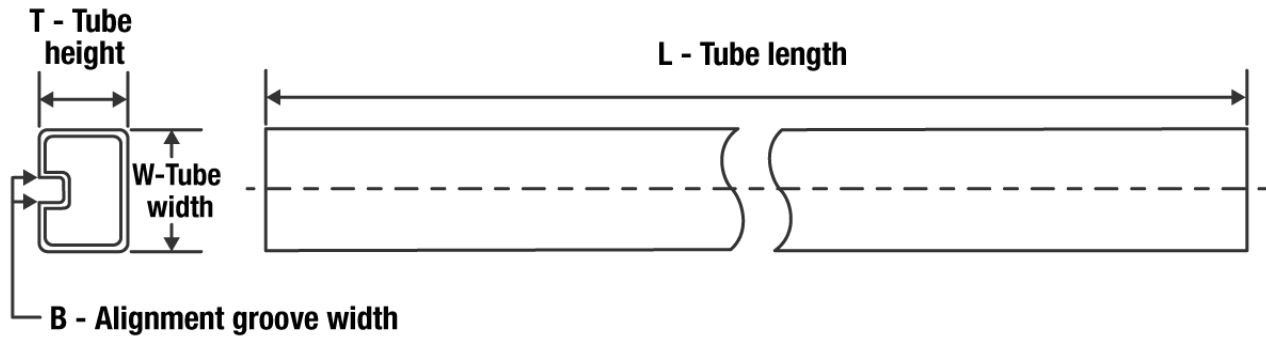
| Device         | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD74HC123M96   | SOIC         | D               | 16   | 2500 | 330.0              | 16.8               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD74HC123M96   | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD74HC123M96G4 | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD74HC123NSR   | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| CD74HC123PWR   | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| CD74HC123PWR   | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| CD74HC123PWRG4 | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| CD74HC123PWT   | TSSOP        | PW              | 16   | 250  | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| CD74HC423M96   | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD74HC423NSR   | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| CD74HCT123M96  | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD74HCT423M96  | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD74HC123M96   | SOIC         | D               | 16   | 2500 | 364.0       | 364.0      | 27.0        |
| CD74HC123M96   | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |
| CD74HC123M96G4 | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |
| CD74HC123NSR   | SO           | NS              | 16   | 2000 | 853.0       | 449.0      | 35.0        |
| CD74HC123PWR   | TSSOP        | PW              | 16   | 2000 | 364.0       | 364.0      | 27.0        |
| CD74HC123PWR   | TSSOP        | PW              | 16   | 2000 | 853.0       | 449.0      | 35.0        |
| CD74HC123PWRG4 | TSSOP        | PW              | 16   | 2000 | 853.0       | 449.0      | 35.0        |
| CD74HC123PWT   | TSSOP        | PW              | 16   | 250  | 853.0       | 449.0      | 35.0        |
| CD74HC423M96   | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |
| CD74HC423NSR   | SO           | NS              | 16   | 2000 | 853.0       | 449.0      | 35.0        |
| CD74HCT123M96  | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |
| CD74HCT423M96  | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |

**TUBE**


\*All dimensions are nominal

| Device        | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|---------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD74HC123E    | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC123E    | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC123EE4  | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC123EE4  | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC123M    | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| CD74HC123ME4  | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| CD74HC123MG4  | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| CD74HC123PW   | PW           | TSSOP        | 16   | 90  | 530    | 10.2   | 3600   | 3.5    |
| CD74HC123PWE4 | PW           | TSSOP        | 16   | 90  | 530    | 10.2   | 3600   | 3.5    |
| CD74HC423E    | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC423E    | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC423M    | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| CD74HC423MG4  | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| CD74HCT123E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT123E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT123M   | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| CD74HCT423E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT423E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |

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.

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.



# PACKAGE OUTLINE

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

## 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 0.25 mm, per side.

# EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

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



SOLDER PASTE EXAMPLE  
 BASED ON 0.125 mm THICK STENCIL  
 SCALE:7X

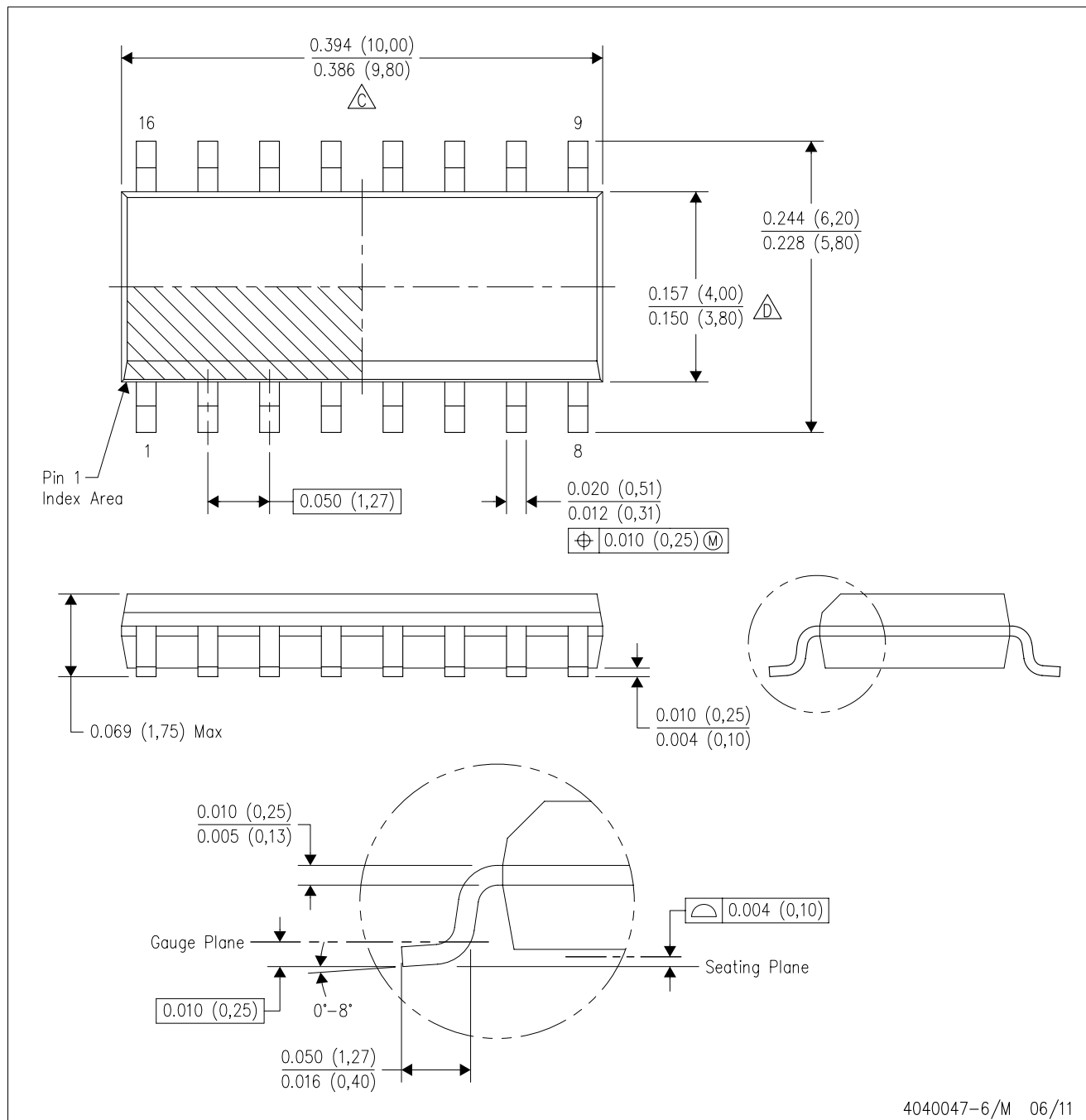
4220735/A 12/2021

NOTES: (continued)

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

D (R-PDSO-G16)

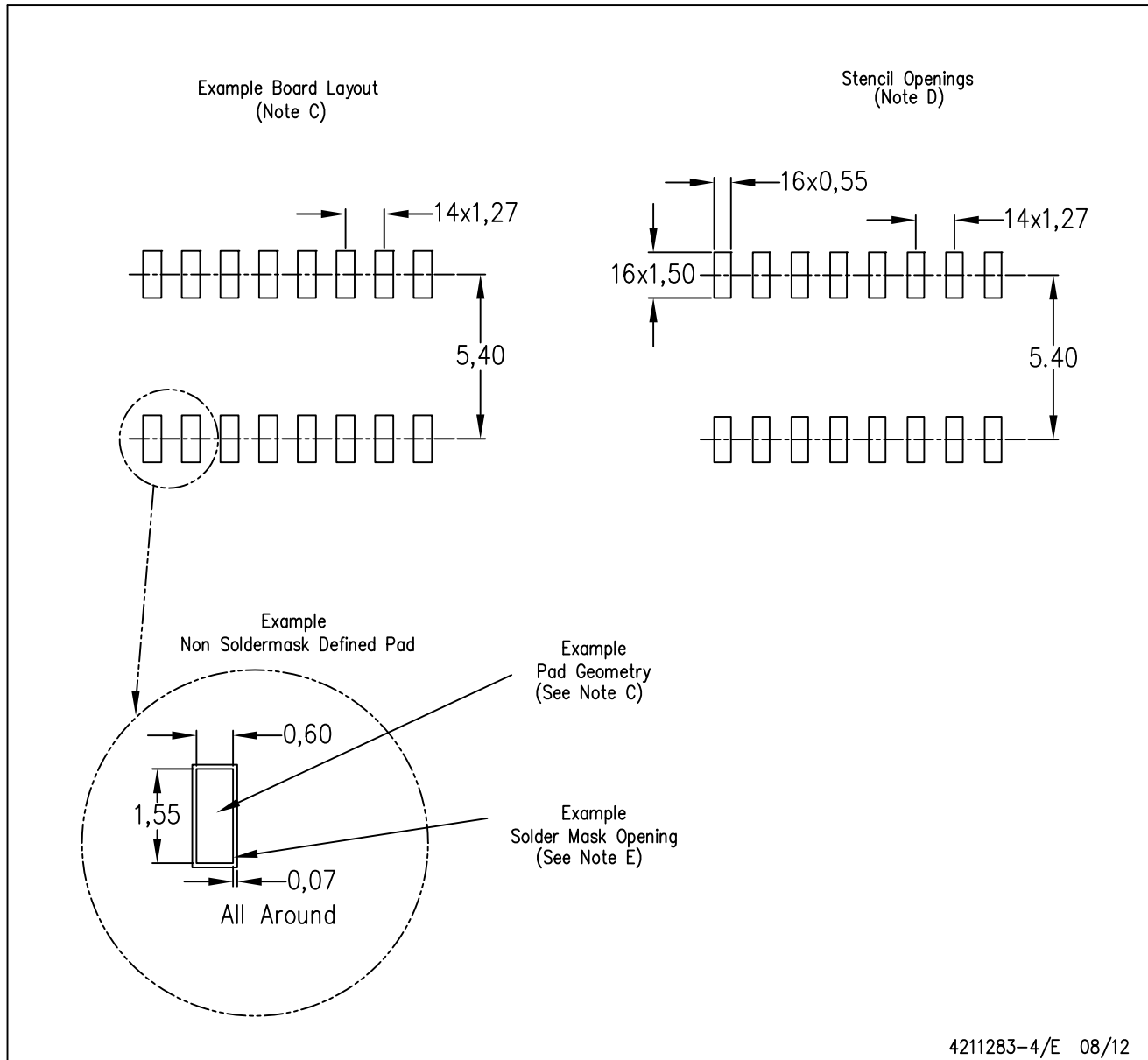
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  - $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - 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.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



4220204/A 02/2017

## NOTES:

1. All linear dimensions are in millimeters. Any 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 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

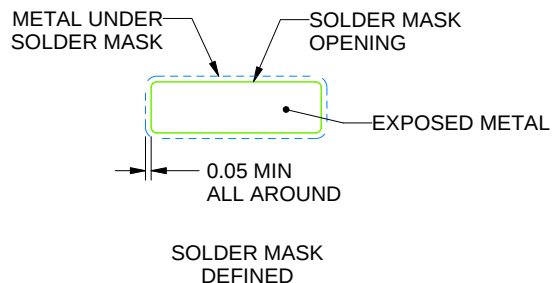
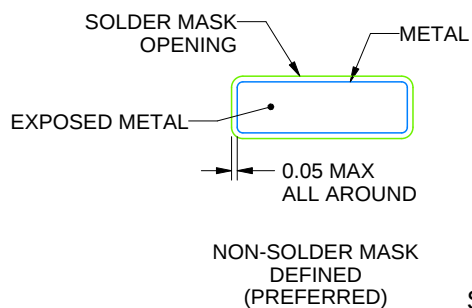
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220204/A 02/2017

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

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220204/A 02/2017

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.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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