

## CDx4HC4020, CDx4HCT4020 CDHigh-Speed CMOS Logic 14-Stage Binary Counter

### 1 Features

- Fully static operation
- Buffered inputs
- Common reset
- Negative edge clocking
- 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
  - 2 V to 6 V operation
  - High noise immunity:  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$  at  $V_{CC} = 5\text{ V}$
- HCT types
  - 4.5 V to 5.5 V operation
  - Direct LSTTL input logic compatibility,  $V_{IL} = 0.8\text{ V}$  (max),  $V_{IH} = 2\text{ V}$  (min)
  - CMOS input compatibility,  $I_I \leq 1\text{ }\mu\text{A}$  at  $V_{OL}, V_{OH}$

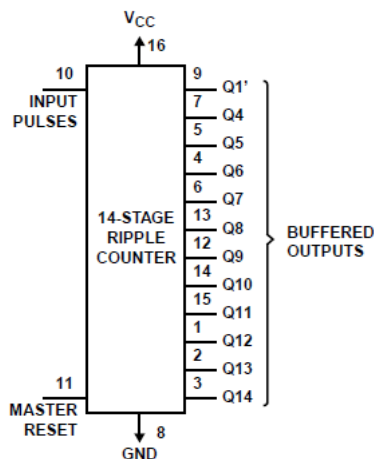
### 2 Description

The 'HC4020 and 'HCT4020 are 14-stage ripple-carry binary counters. All counter stages are controller/peripheral flip-flops. The state of the stage advances one count on the negative clock transition of each input pulse; a high voltage level on the MR line resets all counters to their zero state. All inputs and outputs are buffered.

#### Device Information

| PART NUMBER            | PACKAGE <sup>(1)</sup> | BODY SIZE (NOM)    |
|------------------------|------------------------|--------------------|
| CD54HC4020             | J (CDIP, 16)           | 24.38 mm × 6.92 mm |
| CD74HC4020CD74HC4020   | D (SOIC, 16)           | 9.90 mm × 3.90 mm  |
|                        | N (PDIP, 16)           | 19.31 mm × 6.35 mm |
| CD54HCT4020            | J (CDIP, 16)           | 24.38 mm × 6.92 mm |
| CD74HCT4020CD74HCT4020 | D (SOIC, 16)           | 9.90 mm × 3.90 mm  |
|                        | N (PDIP, 16)           | 19.31 mm × 6.35 mm |

- (1) For all available packages, see the orderable addendum at the end of the datasheet.



Functional Block Diagram



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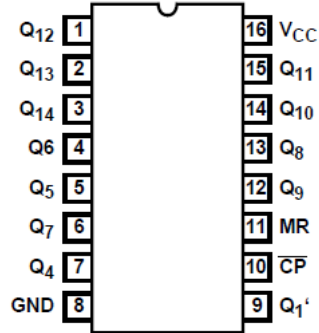
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### 3 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| <b>Changes from Revision C (October 2003) to Revision D (August 2022)</b>                                                                      | <b>Page</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| • Updated the numbering, formatting, tables, figures, and cross-references throughout the document to reflect modern data sheet standards..... | 1           |

## 4 Pin Configuration and Functions



J, N, or D package  
16-PIN CDIP, PDIP, or SOIC  
Top View

## 5 Specifications

### 5.1 Absolute Maximum Ratings

|           |                                                          | MIN                                                        | MAX      | UNIT               |
|-----------|----------------------------------------------------------|------------------------------------------------------------|----------|--------------------|
| $V_{CC}$  | Supply voltage                                           | -0.5                                                       | 7        | V                  |
| $I_{IK}$  | Input diode current                                      | For $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ |          | $\pm 20$ mA        |
| $I_{OK}$  | Output diode current                                     | For $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ |          | $\pm 20$ mA        |
| $I_O$     | Output source or sink current per output pin             | For $V_O > -0.5\text{ V}$ or $V_O < V_{CC} + 0.5\text{ V}$ |          | $\pm 25$ mA        |
|           | Continuous current through $V_{CC}$ or GND               |                                                            | $\pm 50$ | mA                 |
| $T_J$     | Junction temperature                                     |                                                            | 150      | $^{\circ}\text{C}$ |
| $T_{stg}$ | Storage temperature range                                | -65                                                        | 150      | $^{\circ}\text{C}$ |
|           | Lead temperature (Soldering 10s) (SOIC - lead tips only) |                                                            | 300      | $^{\circ}\text{C}$ |

### 5.2 Recommended Operating Conditions

|            |                            | MIN       | MAX      | UNIT               |    |
|------------|----------------------------|-----------|----------|--------------------|----|
| $V_{CC}$   | Supply voltage range       | HC types  | 2        | 6                  | V  |
|            |                            | HCT types | 4.5      | 5.5                |    |
| $V_I, V_O$ | DC input or output voltage | 0         | $V_{CC}$ | V                  |    |
|            | Input rise and fall time   | 2 V       |          | 1000               | ns |
|            |                            | 4.5 V     |          | 500                |    |
|            |                            | 6 V       |          | 400                |    |
| $T_A$      | Temperature range          | -55       | 125      | $^{\circ}\text{C}$ |    |

### 5.3 Thermal Information

| THERMAL METRIC  |                                                       | D (SOIC) | N (PDIP) | UNIT                        |
|-----------------|-------------------------------------------------------|----------|----------|-----------------------------|
|                 |                                                       | 16 PINS  | 16 PINS  |                             |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance <sup>(1)</sup> | 73       | 67       | $^{\circ}\text{C}/\text{W}$ |

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

## 5.4 Electrical Characteristics

| PARAMETER                       |                                         | TEST CONDITIONS <sup>(2)</sup>         | V <sub>CC</sub> (V) | 25°C |      |      | -40°C to 85°C |       | -55°C to 125°C |       | UNIT |
|---------------------------------|-----------------------------------------|----------------------------------------|---------------------|------|------|------|---------------|-------|----------------|-------|------|
|                                 |                                         |                                        |                     | MIN  | TYP  | MAX  | MIN           | MAX   | MIN            | MAX   |      |
| <b>HC TYPES</b>                 |                                         |                                        |                     |      |      |      |               |       |                |       |      |
| V <sub>IH</sub>                 | High level input voltage                |                                        | 2                   | 1.5  |      | 1.5  |               | 1.5   |                | V     |      |
|                                 |                                         |                                        | 4.5                 | 3.15 |      | 3.15 |               | 3.15  |                |       |      |
|                                 |                                         |                                        | 6                   | 4.2  |      | 4.2  |               | 4.2   |                |       |      |
| V <sub>IL</sub>                 | Low level input voltage                 |                                        | 2                   |      | 0.5  |      | 0.5           |       | 0.5            | V     |      |
|                                 |                                         |                                        | 4.5                 |      | 1.35 |      | 1.35          |       | 1.35           |       |      |
|                                 |                                         |                                        | 6                   |      | 1.8  |      | 1.8           |       | 1.8            |       |      |
| V <sub>OH</sub>                 | High level output voltage<br>CMOS loads | I <sub>OH</sub> = -20 μA               | 2                   | 1.9  |      | 1.9  |               | 1.9   |                | V     |      |
|                                 |                                         | I <sub>OH</sub> = -20 μA               | 4.5                 | 4.4  |      | 4.4  |               | 4.4   |                |       |      |
|                                 |                                         | I <sub>OH</sub> = -20 μA               | 6                   | 5.9  |      | 5.9  |               | 5.9   |                |       |      |
|                                 | High level output voltage<br>TTL loads  | I <sub>OH</sub> = 4 mA                 | 4.5                 | 3.98 |      | 3.84 |               | 3.7   |                | V     |      |
|                                 |                                         | I <sub>OH</sub> = 5.2 mA               | 6                   | 5.48 |      | 5.34 |               | 5.2   |                |       |      |
| V <sub>OL</sub>                 | Low level output voltage<br>CMOS loads  | I <sub>OL</sub> = 20 μA                | 2                   |      | 0.1  |      | 0.1           |       | 0.1            | V     |      |
|                                 |                                         | I <sub>OL</sub> = 20 μA                | 4.5                 |      | 0.1  |      | 0.1           |       | 0.1            |       |      |
|                                 |                                         | I <sub>OL</sub> = 20 μA                | 6                   |      | 0.1  |      | 0.1           |       | 0.1            |       |      |
|                                 | Low level output voltage<br>TTL loads   | I <sub>OL</sub> = 4 mA                 | 4.5                 |      | 0.26 |      | 0.33          |       | 0.4            | V     |      |
|                                 |                                         | I <sub>OL</sub> = 5.2 mA               | 6                   |      | 0.26 |      | 0.33          |       | 0.4            |       |      |
| I <sub>I</sub>                  | Input leakage current                   | V <sub>CC</sub> or GND                 | 6                   |      | ±0.1 |      | ±1            |       | ±1             | μA    |      |
| I <sub>CC</sub>                 | Supply current                          | V <sub>CC</sub> or GND                 | 6                   |      | 8    |      | 80            |       | 160            | μA    |      |
| <b>HCT TYPES</b>                |                                         |                                        |                     |      |      |      |               |       |                |       |      |
| V <sub>IH</sub>                 | High level input voltage                |                                        | 4.5 to 5.5          | 2    |      |      | 2             |       | 2              | V     |      |
| V <sub>IL</sub>                 | Low level input voltage                 |                                        | 4.5 to 5.5          |      | 0.8  |      | 0.8           |       | 0.8            | V     |      |
| V <sub>OH</sub>                 | High level output voltage<br>CMOS loads | I <sub>OH</sub> = -20 μA               | 4.5                 | 4.4  |      |      | 4.4           |       | 4.4            | V     |      |
|                                 | High level output voltage<br>TTL loads  | I <sub>OH</sub> = -4 mA                | 4.5                 | 3.98 |      |      | 3.84          |       | 3.7            | V     |      |
| V <sub>OL</sub>                 | Low level output voltage<br>CMOS loads  | I <sub>OL</sub> = 20 μA                | 4.5                 |      | 0.1  |      | 0.1           |       | 0.1            | V     |      |
|                                 | Low level output voltage<br>TTL loads   | I <sub>OL</sub> = 4 mA                 | 4.5                 |      | 0.26 |      | 0.33          |       | 0.4            | V     |      |
| I <sub>I</sub>                  | Input leakage current                   | V <sub>CC</sub> and GND                | 5.5                 |      | ±0.1 |      | ±1            |       | ±1             | μA    |      |
| I <sub>CC</sub>                 | Supply current                          | V <sub>CC</sub> or GND                 | 5.5                 |      | 8    |      | 80            |       | 160            | μA    |      |
| ΔI <sub>CC</sub> <sup>(1)</sup> | Additional supply current per input pin | MR input held at V <sub>CC</sub> - 2.1 | 4.5 to 5.5          |      | 100  | 234  |               | 292.5 |                | 318.5 | μA   |
|                                 |                                         | CP input held at V <sub>CC</sub> - 2.1 | 4.5 to 5.5          |      | 100  | 180  |               | 225   |                | 245   | μA   |

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

(2) V<sub>I</sub> = V<sub>IH</sub> or V<sub>IL</sub>, unless otherwise noted.

## 5.5 Prerequisite for Switching Characteristics

| PARAMETER        |                               | V <sub>CC</sub> (V) | 25°C |     |     | -40°C to 85°C |     | -55°C to 125°C |     | UNIT |
|------------------|-------------------------------|---------------------|------|-----|-----|---------------|-----|----------------|-----|------|
|                  |                               |                     | MIN  | TYP | MAX | MIN           | MAX | MIN            | MAX |      |
| <b>HC TYPES</b>  |                               |                     |      |     |     |               |     |                |     |      |
| f <sub>MAX</sub> | Maximum input pulse frequency | 2                   | 6    |     |     | 5             |     | 4              |     | MHz  |
|                  |                               | 4.5                 | 30   |     |     | 25            |     | 20             |     |      |
|                  |                               | 6                   | 35   |     |     | 29            |     | 24             |     |      |
| t <sub>W</sub>   | Input pulse width             | 2                   | 80   |     |     | 100           |     | 120            |     | ns   |
|                  |                               | 4.5                 | 16   |     |     | 20            |     | 24             |     |      |
|                  |                               | 6                   | 14   |     |     | 17            |     | 20             |     |      |
| t <sub>REM</sub> | Reset removal time            | 2                   | 50   |     |     | 65            |     | 75             |     | ns   |
|                  |                               | 4.5                 | 10   |     |     | 13            |     | 15             |     |      |
|                  |                               | 6                   | 9    |     |     | 11            |     | 13             |     |      |
| t <sub>W</sub>   | Reset pulse width             | 2                   | 80   |     |     | 100           |     | 120            |     | ns   |
|                  |                               | 4.5                 | 16   |     |     | 20            |     | 24             |     |      |
|                  |                               | 6                   | 14   |     |     | 17            |     | 20             |     |      |
| <b>HCT TYPES</b> |                               |                     |      |     |     |               |     |                |     |      |
| f <sub>MAX</sub> | Maximum input pulse frequency | 4.5                 | 25   |     |     | 20            |     | 16             |     | MHz  |
| t <sub>W</sub>   | Input pulse width             | 4.5                 | 20   |     |     | 25            |     | 30             |     | ns   |
| t <sub>REC</sub> | Reset recovery time           | 4.5                 | 10   |     |     | 13            |     | 15             |     | ns   |
| t <sub>W</sub>   | Reset pulse width             | 4.5                 | 20   |     |     | 25            |     | 30             |     | ns   |

## 5.6 Switching Characteristics

Input t<sub>r</sub>, t<sub>f</sub> = 6 ns. See [Parameter Measurement Information](#)

| PARAMETER                              |                                                  | TEST CONDITIONS        | V <sub>CC</sub> (V) | 25°C |     |     | -40°C to 85°C |     | -55°C to 125°C |     | UNIT |
|----------------------------------------|--------------------------------------------------|------------------------|---------------------|------|-----|-----|---------------|-----|----------------|-----|------|
|                                        |                                                  |                        |                     | MIN  | TYP | MAX | MIN           | MAX | MIN            | MAX |      |
| <b>HC TYPES</b>                        |                                                  |                        |                     |      |     |     |               |     |                |     |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Propagation delay time<br>CP to Q1' Output       | C <sub>L</sub> = 50 pF | 2                   | 140  |     |     | 175           |     | 210            |     | ns   |
|                                        |                                                  |                        | 4.5                 | 28   |     |     | 35            |     | 42             |     |      |
|                                        |                                                  | C <sub>L</sub> = 15 pF | 5                   | 11   |     |     |               |     |                |     |      |
|                                        |                                                  | C <sub>L</sub> = 50 pF | 6                   | 24   |     |     | 30            |     | 36             |     |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Q <sub>n</sub> to Q <sub>n</sub> + 1             | C <sub>L</sub> = 50 pF | 2                   | 75   |     |     | 95            |     | 110            |     | ns   |
|                                        |                                                  |                        | 4.5                 | 15   |     |     | 19            |     | 22             |     |      |
|                                        |                                                  | C <sub>L</sub> = 15 pF | 5                   | 6    |     |     |               |     |                |     |      |
|                                        |                                                  | C <sub>L</sub> = 50 pF | 6                   | 13   |     |     | 16            |     | 19             |     |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | MR to Q <sub>n</sub>                             | C <sub>L</sub> = 50 pF | 2                   | 170  |     |     | 215           |     | 255            |     | ns   |
|                                        |                                                  |                        | 4.5                 | 34   |     |     | 43            |     | 51             |     |      |
|                                        |                                                  |                        | 5                   | 14   |     |     |               |     |                |     |      |
|                                        |                                                  |                        | 6                   | 29   |     |     | 37            |     | 43             |     |      |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Output transition time                           | C <sub>L</sub> = 50 pF | 2                   | 75   |     |     | 95            |     | 110            |     | ns   |
|                                        |                                                  |                        | 4.5                 | 15   |     |     | 19            |     | 22             |     |      |
|                                        |                                                  |                        | 6                   | 13   |     |     | 16            |     | 19             |     |      |
| C <sub>IN</sub>                        | Input capacitance                                | C <sub>L</sub> = 50 pF |                     | 10   |     |     | 10            |     | 10             |     | pF   |
| C <sub>PD</sub>                        | Power dissipation capacitance <sup>(1) (2)</sup> | C <sub>L</sub> = 15 pF | 5                   | 30   |     |     |               |     |                |     | pF   |
| <b>HCT TYPES</b>                       |                                                  |                        |                     |      |     |     |               |     |                |     |      |

## 5.6 Switching Characteristics (continued)

Input  $t_r$ ,  $t_f$  = 6 ns. See [Parameter Measurement Information](#)

| PARAMETER                |                                                  | 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 |      |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation delay time                           | $C_L = 50$ pF   | 4.5          |      | 40  |     | 50            |     | 60             | ns  |      |
|                          | CP to Q1' Output                                 | $C_L = 15$ pF   | 5            | 17   |     |     |               |     |                |     |      |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Qn to Q <sub>n</sub> + 1                         | $C_L = 50$ pF   | 4.5          |      | 15  |     | 19            |     | 22             | ns  |      |
|                          |                                                  | $C_L = 15$ pF   | 5            | 6    |     |     |               |     |                |     |      |
| $t_{PLH}$ ,<br>$t_{PHL}$ | MR to Q <sub>n</sub>                             | $C_L = 50$ pF   | 4.5          |      | 40  |     | 50            |     | 60             | ns  |      |
|                          |                                                  | $C_L = 15$ pF   | 5            | 17   |     |     |               |     |                |     |      |
| $t_{TLH}$ ,<br>$t_{THL}$ | Output transition                                | $C_L = 50$ pF   | 4.5          |      | 15  |     | 19            |     | 22             | ns  |      |
| $C_{IN}$                 | Input capacitance                                | $C_L = 50$ pF   |              |      | 10  |     | 10            |     | 10             | pF  |      |
| $C_{PD}$                 | Power dissipation capacitance <sup>(1) (2)</sup> | $C_L = 15$ pF   | 5            | 30   |     |     |               |     |                | pF  |      |

(1)  $C_{PD}$  is used to determine the dynamic power consumption, per package.

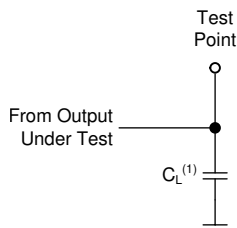
(2)  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = Input frequency,  $C_L$  = Output load capacitance,  $V_{CC}$  = Supply Voltage.

## 6 Parameter Measurement Information

Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_t < 6 \text{ ns}$ .

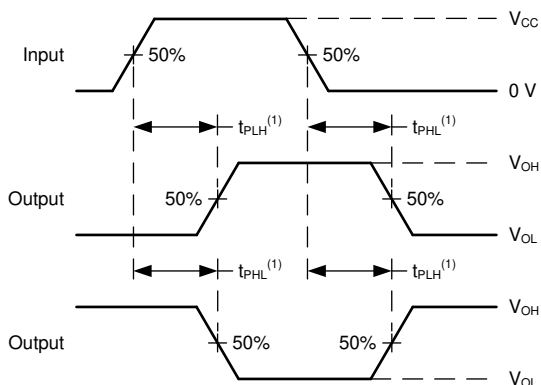
For clock inputs,  $f_{\text{max}}$  is measured when the input duty cycle is 50%.

The outputs are measured one at a time with one input transition per measurement.



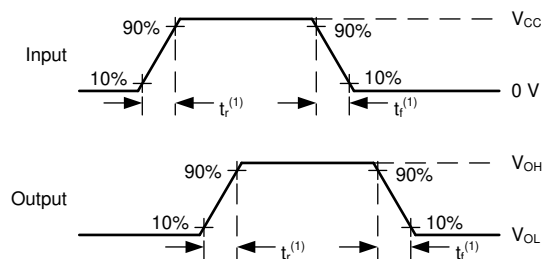
(1)  $C_L$  includes probe and test-fixture capacitance.

**Figure 6-1. Load Circuit for Push-Pull Outputs**



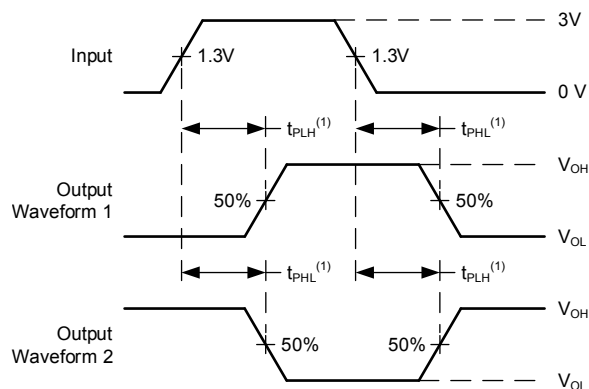
(1) The greater between  $t_{\text{PLH}}$  and  $t_{\text{PHL}}$  is the same as  $t_{\text{pd}}$ .

**Figure 6-2. Voltage Waveforms, Propagation Delays for Standard CMOS Inputs**



(1) The greater between  $t_r$  and  $t_f$  is the same as  $t_t$ .

**Figure 6-3. Voltage Waveforms, Input and Output Transition Times for Standard CMOS Inputs**



(1) The greater between  $t_{\text{PLH}}$  and  $t_{\text{PHL}}$  is the same as  $t_{\text{pd}}$ .

**Figure 6-4. Voltage Waveforms, Propagation Delays for TTL-Compatible Inputs**



## 7 Detailed Description

### 7.1 Overview

The 'HC4020 and 'HCT4020 are 14-stage ripple-carry binary counters. All counter stages are controller flipflops. The state of the stage advances one count on the negative clock transition of each input pulse; a high voltage level on the CLR line resets all counters to their zero state. All inputs and outputs are buffered.

### 7.2 Functional Block Diagram

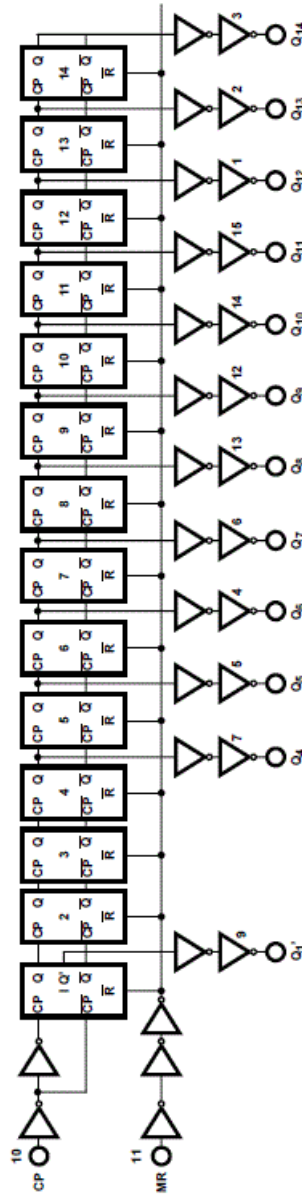


Figure 7-1. Functional Diagram

## 7.3 Device Functional Modes

**Table 7-1. Truth Table**

| CP COUNT <sup>(1)</sup> | MR | OUTPUT STATE          |
|-------------------------|----|-----------------------|
| ↑                       | L  | No change             |
| ↓                       | L  | Advance to next state |
| X                       | H  | All outputs are low   |

- (1) H = High Voltage Level, L = Low Voltage Level, X = Don't Care  
↑ = Transition from Low to High Level, ↓ = Transition from High to Low.

## 8 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- $\mu\text{F}$  capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- $\mu\text{F}$  and 1- $\mu\text{F}$  capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

## 9 Layout

### 9.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or  $V_{CC}$ , whichever makes more sense for the logic function or is more convenient.

## 10 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

### 10.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://ti.com). Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 10.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

### 10.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.  
All trademarks are the property of their respective owners.

### 10.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 10.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package 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                 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|----------------------------------|-------------------------|
| 5962-8945801EA   | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 5962-8945801EA<br>CD54HCT4020F3A | <a href="#">Samples</a> |
| CD54HC4020F      | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | CD54HC4020F                      | <a href="#">Samples</a> |
| CD54HC4020F3A    | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 8500301EA<br>CD54HC4020F3A       | <a href="#">Samples</a> |
| CD54HCT4020F3A   | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 5962-8945801EA<br>CD54HCT4020F3A | <a href="#">Samples</a> |
| CD74HC4020E      | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green     | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HC4020E                      | <a href="#">Samples</a> |
| CD74HC4020EE4    | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green     | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HC4020E                      | <a href="#">Samples</a> |
| CD74HC4020M      | OBSOLETE      | SOIC         | D               | 16   |             | TBD              | Call TI                              | Call TI              | -55 to 125   | HC4020M                          |                         |
| CD74HC4020M96    | ACTIVE        | SOIC         | D               | 16   | 2500        | RoHS & Green     | NIPDAU   SN                          | Level-1-260C-UNLIM   | -55 to 125   | HC4020M                          | <a href="#">Samples</a> |
| CD74HCT4020E     | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green     | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD74HCT4020E                     | <a href="#">Samples</a> |
| CD74HCT4020M     | OBSOLETE      | SOIC         | D               | 16   |             | TBD              | Call TI                              | Call TI              | -55 to 125   | HCT4020M                         |                         |
| CD74HCT4020M96   | ACTIVE        | SOIC         | D               | 16   | 2500        | RoHS & Green     | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | HCT4020M                         | <a href="#">Samples</a> |
| CD74HCT4020MT    | OBSOLETE      | SOIC         | D               | 16   |             | TBD              | Call TI                              | Call TI              | -55 to 125   | HCT4020M                         |                         |

(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 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 CD54HC4020, CD54HCT4020, CD74HC4020, CD74HCT4020 :**

- Catalog : [CD74HC4020](#), [CD74HCT4020](#)
- Military : [CD54HC4020](#), [CD54HCT4020](#)

NOTE: Qualified Version Definitions:

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

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD74HC4020M96  | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD74HCT4020M96 | 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) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD74HC4020M96  | SOIC         | D               | 16   | 2500 | 356.0       | 356.0      | 35.0        |
| CD74HCT4020M96 | 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) |
|---------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD74HC4020E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC4020E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC4020EE4 | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC4020EE4 | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT4020E  | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT4020E  | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040047-6/M 06/11

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - 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 0.006 (0,15) each side.
  -  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.

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

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.

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