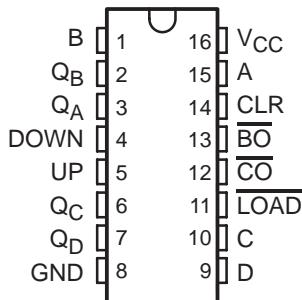


**SN54HC193, SN74HC193**  
**4-BIT SYNCHRONOUS UP/DOWN COUNTERS**  
**(DUAL CLOCK WITH CLEAR)**

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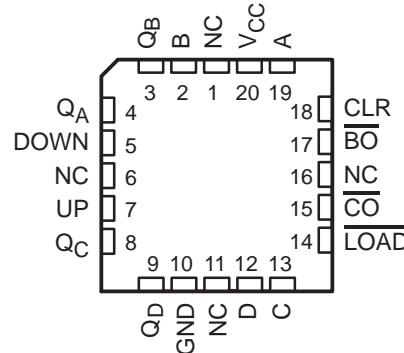
- Wide Operating Voltage Range of 2 V to 6 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 80- $\mu$ A Max  $I_{CC}$
- Typical  $t_{pd} = 20$  ns
- $\pm 4$ -mA Output Drive at 5 V
- Low Input Current of 1  $\mu$ A Max

**SN54HC193 . . . J OR W PACKAGE**  
**SN74HC193 . . . D, N, NS, OR PW PACKAGE**  
**(TOP VIEW)**



- Look-Ahead Circuitry Enhances Cascaded Counters
- Fully Synchronous in Count Modes
- Parallel Asynchronous Load for Modulo-N Count Lengths
- Asynchronous Clear

**SN54HC193 . . . FK PACKAGE**  
**(TOP VIEW)**



NC – No internal connection

### description/ordering information

The 'HC193 devices are 4-bit synchronous, reversible, up/down binary counters. Synchronous operation is provided by having all flip-flops clocked simultaneously so that the outputs change coincidentally with each other when so instructed by the steering logic. This mode of operation eliminates the output counting spikes normally associated with asynchronous (ripple-clock) counters.

### ORDERING INFORMATION

| <b>T<sub>A</sub></b>  | <b>PACKAGE<sup>†</sup></b> |              | <b>ORDERABLE PART NUMBER</b> | <b>TOP-SIDE MARKING</b> |
|-----------------------|----------------------------|--------------|------------------------------|-------------------------|
| <b>-40°C to 85°C</b>  | PDIP – N                   | Tube of 25   | SN74HC193N                   | SN74HC193N              |
|                       | SOIC – D                   | Tube of 40   | SN74HC193D                   | HC193                   |
|                       |                            | Reel of 2500 | SN74HC193DR                  |                         |
|                       |                            | Reel of 250  | SN74HC193DT                  |                         |
|                       | SOP – NS                   | Reel of 2000 | SN74HC193NSR                 | HC193                   |
|                       | TSSOP – PW                 | Tube of 90   | SN74HC193PW                  | HC193                   |
|                       |                            | Reel of 2000 | SN74HC193PWR                 |                         |
|                       |                            | Reel of 250  | SN74HC193PWT                 |                         |
| <b>-55°C to 125°C</b> | CDIP – J                   | Tube of 25   | SNJ54HC193J                  | SNJ54HC193J             |
|                       | CFP – W                    | Tube of 150  | SNJ54HC193W                  | SNJ54HC193W             |
|                       | LCCC – FK                  | Tube of 55   | SNJ54HC193FK                 | SNJ54HC193FK            |

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

**PRODUCTION DATA** information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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 On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

**SN54HC193, SN74HC193  
4-BIT SYNCHRONOUS UP/DOWN COUNTERS  
(DUAL CLOCK WITH CLEAR)**

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**description/ordering information (continued)**

The outputs of the four flip-flops are triggered on a low-to-high-level transition of either count (clock) input (UP or DOWN). The direction of counting is determined by which count input is pulsed while the other count input is high.

All four counters are fully programmable; that is, each output may be preset to either level by placing a low on the load (LOAD) input and entering the desired data at the data inputs. The output changes to agree with the data inputs independently of the count pulses. This feature allows the counters to be used as modulo-N dividers simply by modifying the count length with the preset inputs.

A clear (CLR) input has been provided that forces all outputs to the low level when a high level is applied. The clear function is independent of the count and LOAD inputs.

These counters were designed to be cascaded without the need for external circuitry. The borrow ( $\overline{BO}$ ) output produces a low-level pulse while the count is zero (all outputs low) and DOWN is low. Similarly, the carry ( $\overline{CO}$ ) output produces a low-level pulse while the count is maximum (9 or 15), and UP is low. The counters then can be cascaded easily by feeding  $\overline{BO}$  and  $\overline{CO}$  to DOWN and UP, respectively, of the succeeding counter.

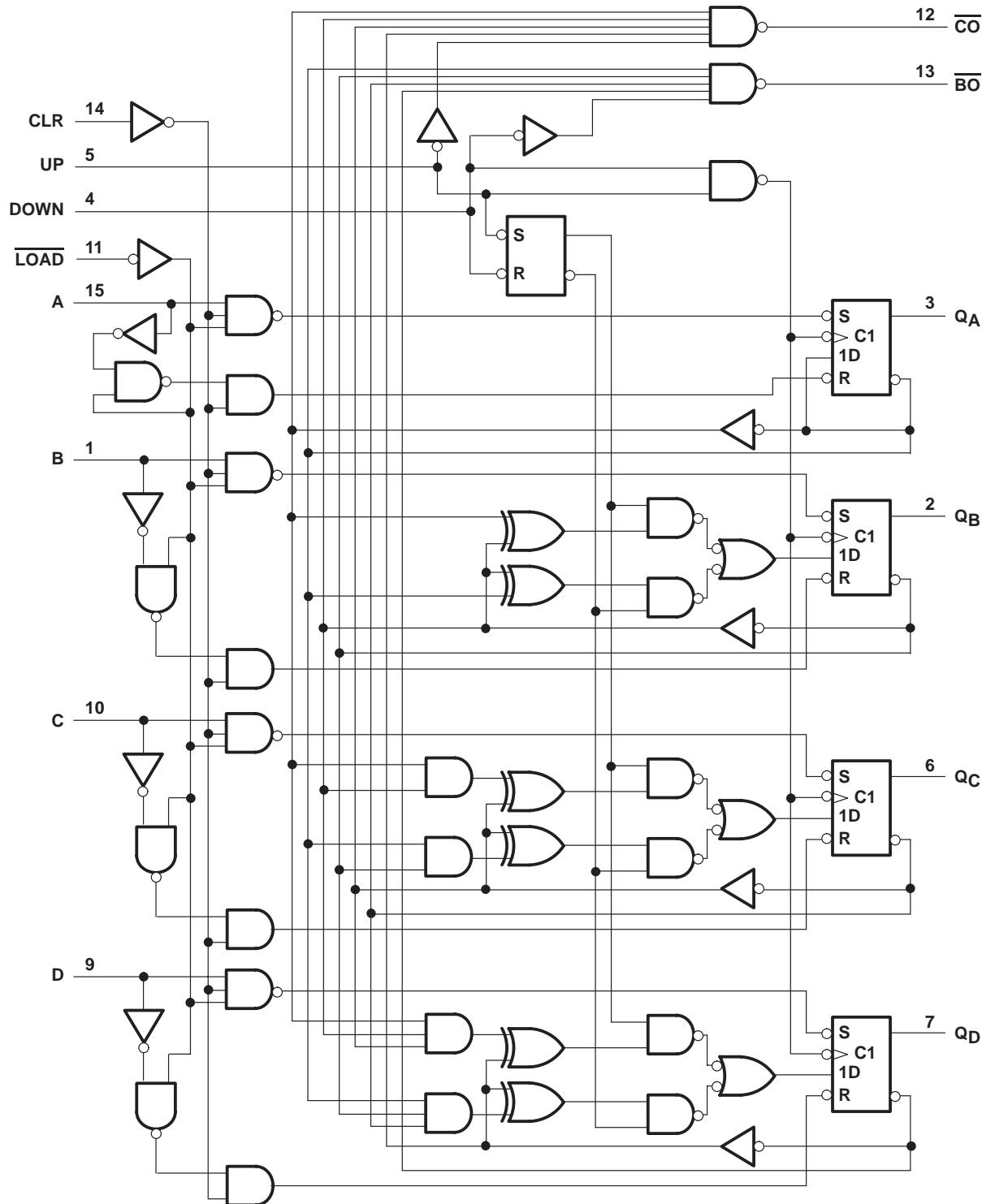


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**SN54HC193, SN74HC193**  
**4-BIT SYNCHRONOUS UP/DOWN COUNTERS**  
**(DUAL CLOCK WITH CLEAR)**

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**logic diagram (positive logic)**



Pin numbers shown are for the D, J, N, NS, PW, and W packages.

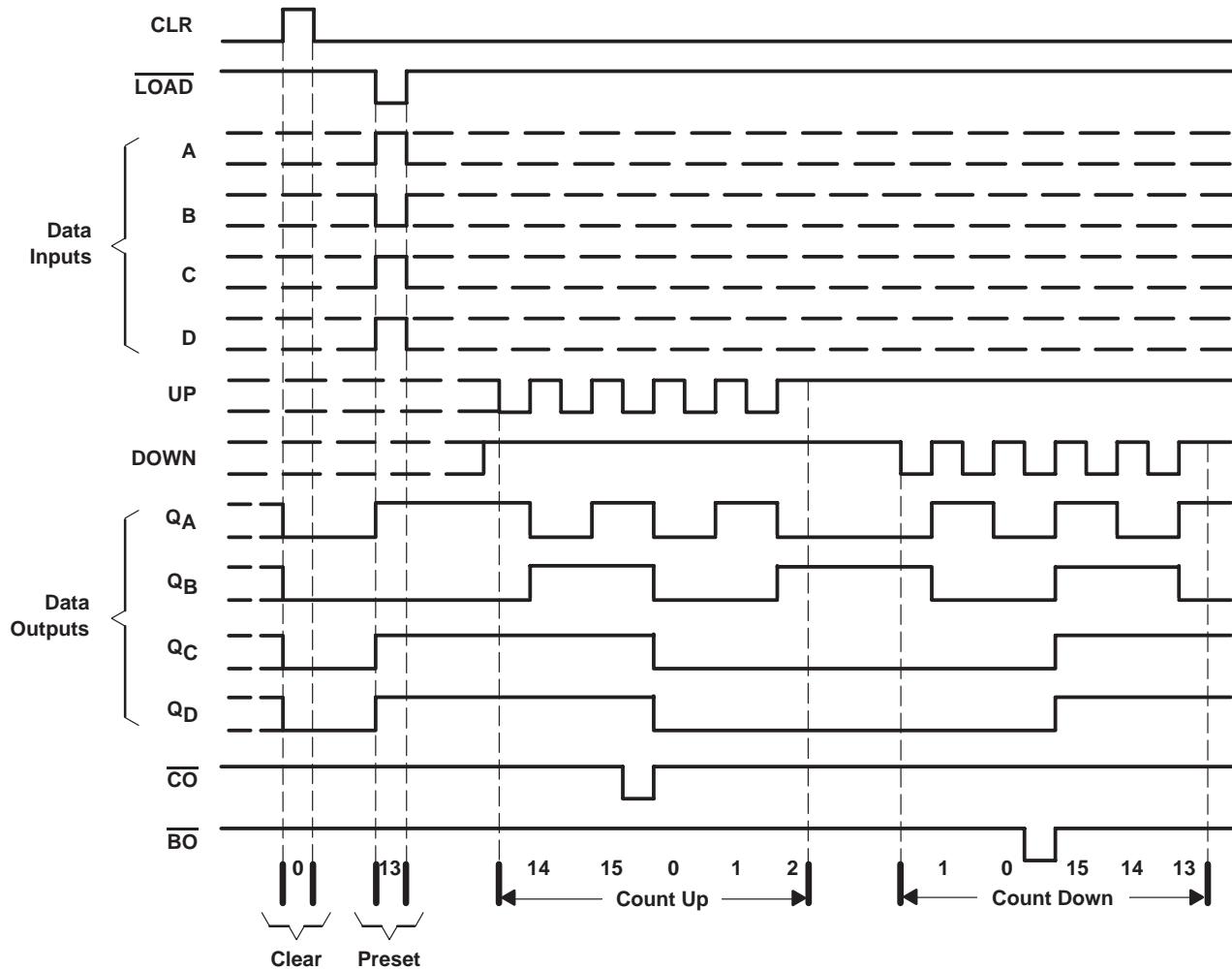
**SN54HC193, SN74HC193  
4-BIT SYNCHRONOUS UP/DOWN COUNTERS  
(DUAL CLOCK WITH CLEAR)**

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**typical clear, load, and count sequence**

The following sequence is illustrated below:

1. Clear outputs to 0
2. Load (preset) to binary 13
3. Count up to 14, 15, carry, 0, 1, and 2
4. Count down to 1, 0, borrow, 15, 14, and 13



NOTES: A. CLR overrides LOAD, data, and count inputs.

B. When counting up, count-down input must be high; when counting down, count-up input must be high.

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

|                    |                                 |                         | SN54HC193 |     |                 | SN74HC193 |                 |                 | UNIT |   |  |  |
|--------------------|---------------------------------|-------------------------|-----------|-----|-----------------|-----------|-----------------|-----------------|------|---|--|--|
|                    |                                 |                         | MIN       | NOM | MAX             | MIN       | NOM             | MAX             |      |   |  |  |
| V <sub>CC</sub>    | Supply voltage                  |                         |           | 2   | 5               | 6         | 2               | 5               | 6    | V |  |  |
| V <sub>IH</sub>    | High-level input voltage        | V <sub>CC</sub> = 2 V   | 1.5       |     | 1.5             |           | V               |                 |      |   |  |  |
|                    |                                 | V <sub>CC</sub> = 4.5 V | 3.15      |     | 3.15            |           |                 |                 |      |   |  |  |
|                    |                                 | V <sub>CC</sub> = 6 V   | 4.2       |     | 4.2             |           |                 |                 |      |   |  |  |
| V <sub>IL</sub>    | Low-level input voltage         | V <sub>CC</sub> = 2 V   | 0.5       |     | 0.5             |           | V               |                 |      |   |  |  |
|                    |                                 | V <sub>CC</sub> = 4.5 V | 1.35      |     | 1.35            |           |                 |                 |      |   |  |  |
|                    |                                 | V <sub>CC</sub> = 6 V   | 1.8       |     | 1.8             |           |                 |                 |      |   |  |  |
| V <sub>I</sub>     | Input voltage                   |                         |           | 0   | V <sub>CC</sub> | 0         | V <sub>CC</sub> | V <sub>CC</sub> | V    |   |  |  |
| V <sub>O</sub>     | Output voltage                  |                         |           | 0   | V <sub>CC</sub> | 0         | V <sub>CC</sub> | V <sub>CC</sub> | V    |   |  |  |
| Δt/Δv <sup>#</sup> | Input transition rise/fall time | V <sub>CC</sub> = 2 V   | 1000      |     | 1000            |           | ns              |                 |      |   |  |  |
|                    |                                 | V <sub>CC</sub> = 4.5 V | 500       |     | 500             |           |                 |                 |      |   |  |  |
|                    |                                 | V <sub>CC</sub> = 6 V   | 400       |     | 400             |           |                 |                 |      |   |  |  |
| T <sub>A</sub>     | Operating free-air temperature  |                         |           | -55 | 125             | -40       | 85              | °C              |      |   |  |  |

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

‡ If this device is used in the threshold region (from  $V_{IL\max} = 0.5\text{ V}$  to  $V_{IH\min} = 1.5\text{ V}$ ), there is a potential to go into the wrong state from induced grounding, causing double clocking. Operating with the inputs at  $t_f = 1000\text{ ns}$  and  $VCC = 2\text{ V}$  does not damage the device; however, functionally, the CLK inputs are not ensured while in the shift, count, or toggle operating modes.



**SN54HC193, SN74HC193**  
**4-BIT SYNCHRONOUS UP/DOWN COUNTERS**  
**(DUAL CLOCK WITH CLEAR)**

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER       | TEST CONDITIONS   | V <sub>CC</sub>           | T <sub>A</sub> = 25°C |       |       | SN54HC193 | SN74HC193 | UNIT |
|-----------------|---|---------------------------|-----------------------|-------|-------|-----------|-----------|------|
|                 |   |                           | MIN                   | TYP   | MAX   | MIN       | MAX       |      |
| V <sub>OH</sub> | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>       | I <sub>OH</sub> = -20 µA  | 2 V                   | 1.9   | 1.998 | 1.9       | 1.9       | V    |
|                 |   |                           | 4.5 V                 | 4.4   | 4.499 | 4.4       | 4.4       |      |
|                 |   |                           | 6 V                   | 5.9   | 5.999 | 5.9       | 5.9       |      |
|                 |   | I <sub>OH</sub> = -4 mA   | 4.5 V                 | 3.98  | 4.3   | 3.7       | 3.84      |      |
|                 |   | I <sub>OH</sub> = -5.2 mA | 6 V                   | 5.48  | 5.8   | 5.2       | 5.34      |      |
| V <sub>OL</sub> | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>       | I <sub>OL</sub> = 20 µA   | 2 V                   | 0.002 | 0.1   | 0.1       | 0.1       | V    |
|                 |   |                           | 4.5 V                 | 0.001 | 0.1   | 0.1       | 0.1       |      |
|                 |   |                           | 6 V                   | 0.001 | 0.1   | 0.1       | 0.1       |      |
|                 |   | I <sub>OL</sub> = 4 mA    | 4.5 V                 | 0.17  | 0.26  | 0.4       | 0.33      |      |
|                 |   | I <sub>OL</sub> = 5.2 mA  | 6 V                   | 0.15  | 0.26  | 0.4       | 0.33      |      |
| I <sub>I</sub>  | V <sub>I</sub> = V <sub>CC</sub> or 0                     | 6 V                       | ±0.1                  | ±100  |       | ±1000     | ±1000     | nA   |
| I <sub>CC</sub> | V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0 | 6 V                       |                       |       | 8     | 160       | 80        | µA   |
| C <sub>i</sub>  |   | 2 V to 6 V                |                       | 3     | 10    | 10        | 10        | pF   |

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

|                    |                                   | V <sub>CC</sub>                  | T <sub>A</sub> = 25°C |     | SN54HC193 | SN74HC193 | UNIT |
|--------------------|-----------------------------------|----------------------------------|-----------------------|-----|-----------|-----------|------|
|                    |                                   |                                  | MIN                   | MAX | MIN       | MAX       |      |
| f <sub>clock</sub> | Clock frequency                   | 2 V                              |                       | 4.2 | 2.8       | 3.3       | MHz  |
|                    |                                   | 4.5 V                            |                       | 21  | 14        | 17        |      |
|                    |                                   | 6 V                              |                       | 24  | 16        | 19        |      |
| t <sub>w</sub>     | Pulse duration                    | CLR high                         | 2 V                   | 120 | 180       | 150       | ns   |
|                    |                                   |                                  | 4.5 V                 | 24  | 36        | 30        |      |
|                    |                                   |                                  | 6 V                   | 21  | 31        | 26        |      |
|                    | LOAD low                          |                                  | 2 V                   | 120 | 180       | 150       |      |
|                    |                                   |                                  | 4.5 V                 | 24  | 36        | 30        |      |
|                    |                                   |                                  | 6 V                   | 21  | 31        | 26        |      |
|                    | UP or DOWN high or low            |                                  | 2 V                   | 120 | 180       | 150       |      |
|                    |                                   |                                  | 4.5 V                 | 24  | 36        | 30        |      |
|                    |                                   |                                  | 6 V                   | 21  | 31        | 26        |      |
| t <sub>su</sub>    | Setup time                        | Data before <u>LOAD</u> inactive | 2 V                   | 110 | 165       | 140       | ns   |
|                    |                                   |                                  | 4.5 V                 | 22  | 33        | 28        |      |
|                    |                                   |                                  | 6 V                   | 19  | 28        | 24        |      |
|                    |                                   | CLR inactive before UP↑ or DOWN↑ | 2 V                   | 110 | 165       | 140       |      |
|                    |                                   |                                  | 4.5 V                 | 22  | 33        | 28        |      |
|                    | LOAD inactive before UP↑ or DOWN↑ |                                  | 2 V                   | 110 | 165       | 140       |      |
|                    |                                   |                                  | 4.5 V                 | 22  | 33        | 28        |      |
|                    |                                   |                                  | 6 V                   | 19  | 28        | 24        |      |
|                    |                                   | Data after <u>LOAD</u> inactive  | 2 V                   | 5   | 5         | 5         |      |
|                    |                                   |                                  | 4.5 V                 | 5   | 5         | 5         |      |
|                    |                                   |                                  | 6 V                   | 5   | 5         | 5         |      |
| t <sub>h</sub>     | Hold time                         |                                  |                       |     |           |           |      |



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SN54HC193, SN74HC193  
**4-BIT SYNCHRONOUS UP/DOWN COUNTERS**  
**(DUAL CLOCK WITH CLEAR)**  
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switching characteristics over recommended operating free-air temperature range,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM<br>(INPUT)   | TO<br>(OUTPUT)  | $V_{CC}$ | $T_A = 25^\circ\text{C}$ |     |     | SN54HC193 | SN74HC193 | UNIT |
|-----------|-------------------|-----------------|----------|--------------------------|-----|-----|-----------|-----------|------|
|           |                   |                 |          | MIN                      | TYP | MAX | MIN       | MAX       |      |
| $f_{max}$ |                   |                 | 2 V      | 4.2                      | 8   |     | 2.8       | 3.3       | MHz  |
|           |                   |                 | 4.5 V    | 21                       | 55  |     | 14        | 17        |      |
|           |                   |                 | 6 V      | 24                       | 60  |     | 16        | 19        |      |
| $t_{pd}$  | UP                | $\overline{CO}$ | 2 V      | 75                       | 165 |     | 250       | 205       | ns   |
|           |                   |                 | 4.5 V    | 24                       | 33  |     | 50        | 41        |      |
|           |                   |                 | 6 V      | 20                       | 28  |     | 43        | 35        |      |
|           | DOWN              | $\overline{BO}$ | 2 V      | 75                       | 165 |     | 250       | 205       |      |
|           |                   |                 | 4.5 V    | 24                       | 33  |     | 50        | 41        |      |
|           |                   |                 | 6 V      | 20                       | 28  |     | 43        | 35        |      |
|           | UP or DOWN        | Any Q           | 2 V      | 190                      | 250 |     | 375       | 315       |      |
|           |                   |                 | 4.5 V    | 40                       | 50  |     | 75        | 63        |      |
|           |                   |                 | 6 V      | 35                       | 43  |     | 64        | 54        |      |
|           | $\overline{LOAD}$ | Any Q           | 2 V      | 190                      | 260 |     | 390       | 325       |      |
|           |                   |                 | 4.5 V    | 40                       | 52  |     | 78        | 65        |      |
|           |                   |                 | 6 V      | 35                       | 44  |     | 66        | 55        |      |
| $t_{PHL}$ | CLR               | Any Q           | 2 V      | 170                      | 240 |     | 360       | 300       | ns   |
|           |                   |                 | 4.5 V    | 36                       | 48  |     | 72        | 60        |      |
|           |                   |                 | 6 V      | 31                       | 41  |     | 61        | 51        |      |
| $t_t$     |                   | Any             | 2 V      | 38                       | 75  |     | 110       | 95        | ns   |
|           |                   |                 | 4.5 V    | 8                        | 15  |     | 22        | 19        |      |
|           |                   |                 | 6 V      | 6                        | 13  |     | 19        | 16        |      |

operating characteristics,  $T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS | TYP | UNIT |
|-----------|-------------------------------|-----------------|-----|------|
| $C_{pd}$  | Power dissipation capacitance | No load         | 50  | pF   |

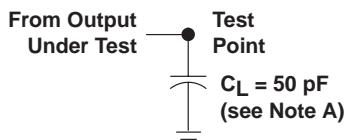


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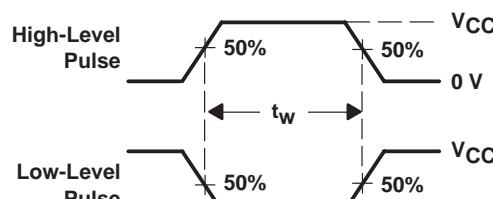
**SN54HC193, SN74HC193  
4-BIT SYNCHRONOUS UP/DOWN COUNTERS  
(DUAL CLOCK WITH CLEAR)**

SCLS122D - DECEMBER 1982 - REVISED OCTOBER 2003

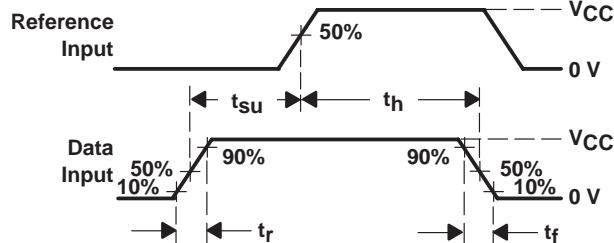
**PARAMETER MEASUREMENT INFORMATION**



LOAD CIRCUIT

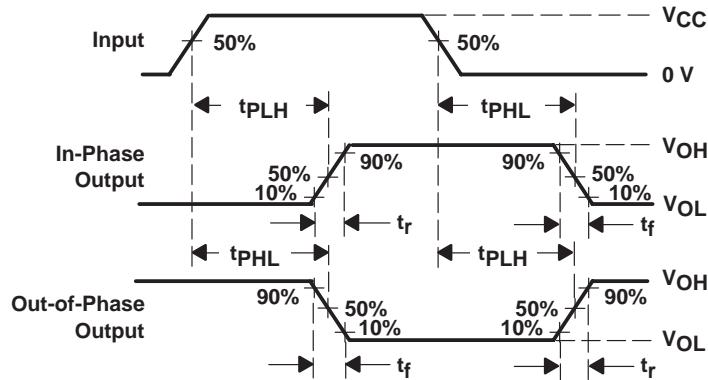


VOLTAGE WAVEFORMS  
PULSE DURATIONS



VOLTAGE WAVEFORMS

SETUP AND HOLD AND INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS

PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

NOTES: A.  $C_L$  includes probe and test-fixture capacitance.

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

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

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

E.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

| Orderable part number | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)           |
|-----------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|-------------------------------|
| 5962-8772401EA        | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8772401EA<br>SNJ54HC193J |
| SN54HC193J            | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN54HC193J                    |
| SN54HC193J.A          | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN54HC193J                    |
| SN74HC193D            | Obsolete      | Production           | SOIC (D)   16   | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | HC193                         |
| SN74HC193DR           | Active        | Production           | SOIC (D)   16   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HC193                         |
| SN74HC193DR.A         | Active        | Production           | SOIC (D)   16   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HC193                         |
| SN74HC193N            | Active        | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | SN74HC193N                    |
| SN74HC193N.A          | Active        | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | SN74HC193N                    |
| SN74HC193NE4          | Active        | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | SN74HC193N                    |
| SN74HC193NSR          | Active        | Production           | SOP (NS)   16   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HC193                         |
| SN74HC193NSR.A        | Active        | Production           | SOP (NS)   16   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HC193                         |
| SN74HC193PW           | Obsolete      | Production           | TSSOP (PW)   16 | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | HC193                         |
| SN74HC193PWR          | Active        | Production           | TSSOP (PW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HC193                         |
| SN74HC193PWR.A        | Active        | Production           | TSSOP (PW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HC193                         |
| SNJ54HC193J           | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8772401EA<br>SNJ54HC193J |
| SNJ54HC193J.A         | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8772401EA<br>SNJ54HC193J |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts 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.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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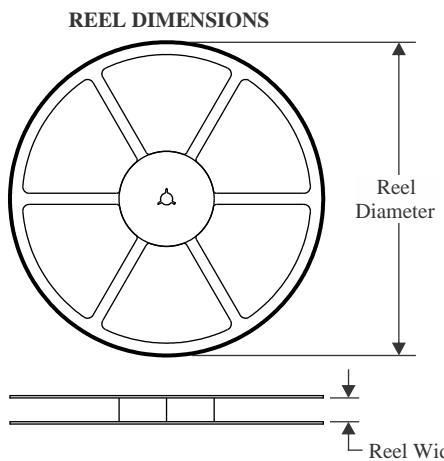
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN54HC193, SN74HC193 :**

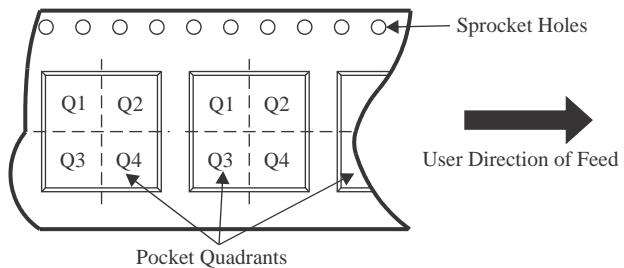
- Catalog : [SN74HC193](#)
- Automotive : [SN74HC193-Q1](#), [SN74HC193-Q1](#)
- Military : [SN54HC193](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

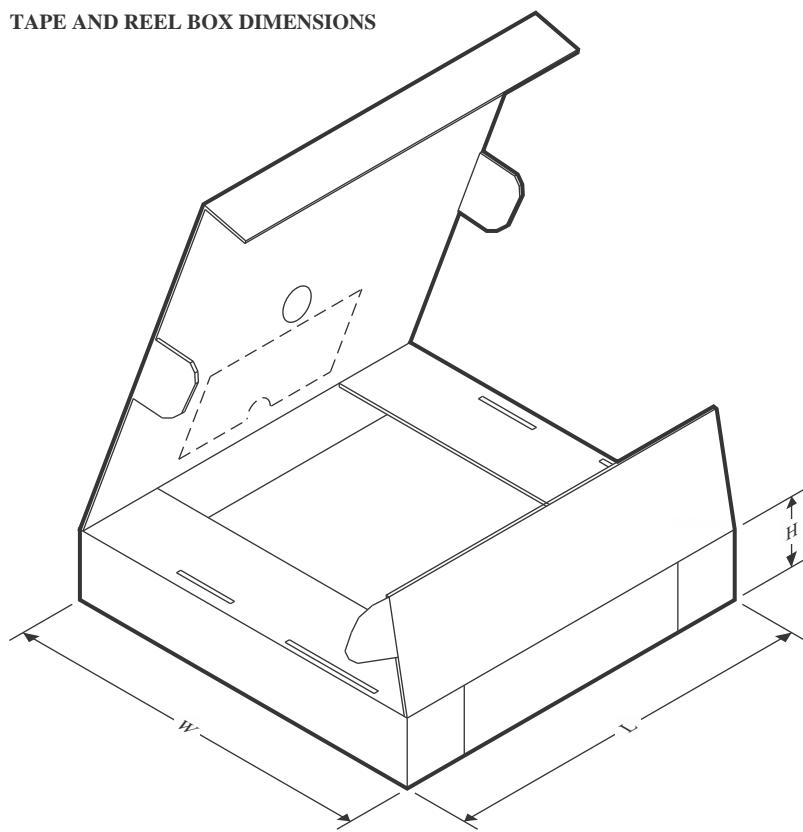
**TAPE AND REEL INFORMATION**


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

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


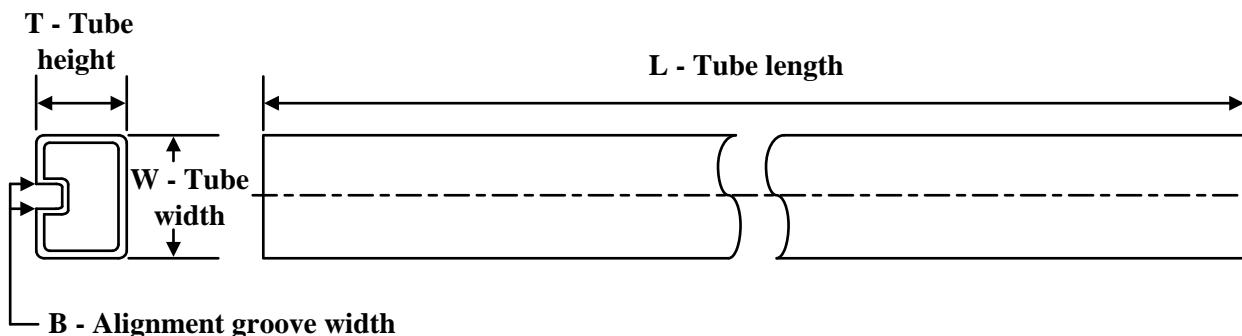
\*All dimensions are nominal

| 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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74HC193DR  | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74HC193NSR | SOP          | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74HC193PWR | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

| Device       | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74HC193DR  | SOIC         | D               | 16   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74HC193NSR | SOP          | NS              | 16   | 2000 | 356.0       | 356.0      | 35.0        |
| SN74HC193PWR | TSSOP        | PW              | 16   | 2000 | 356.0       | 356.0      | 35.0        |

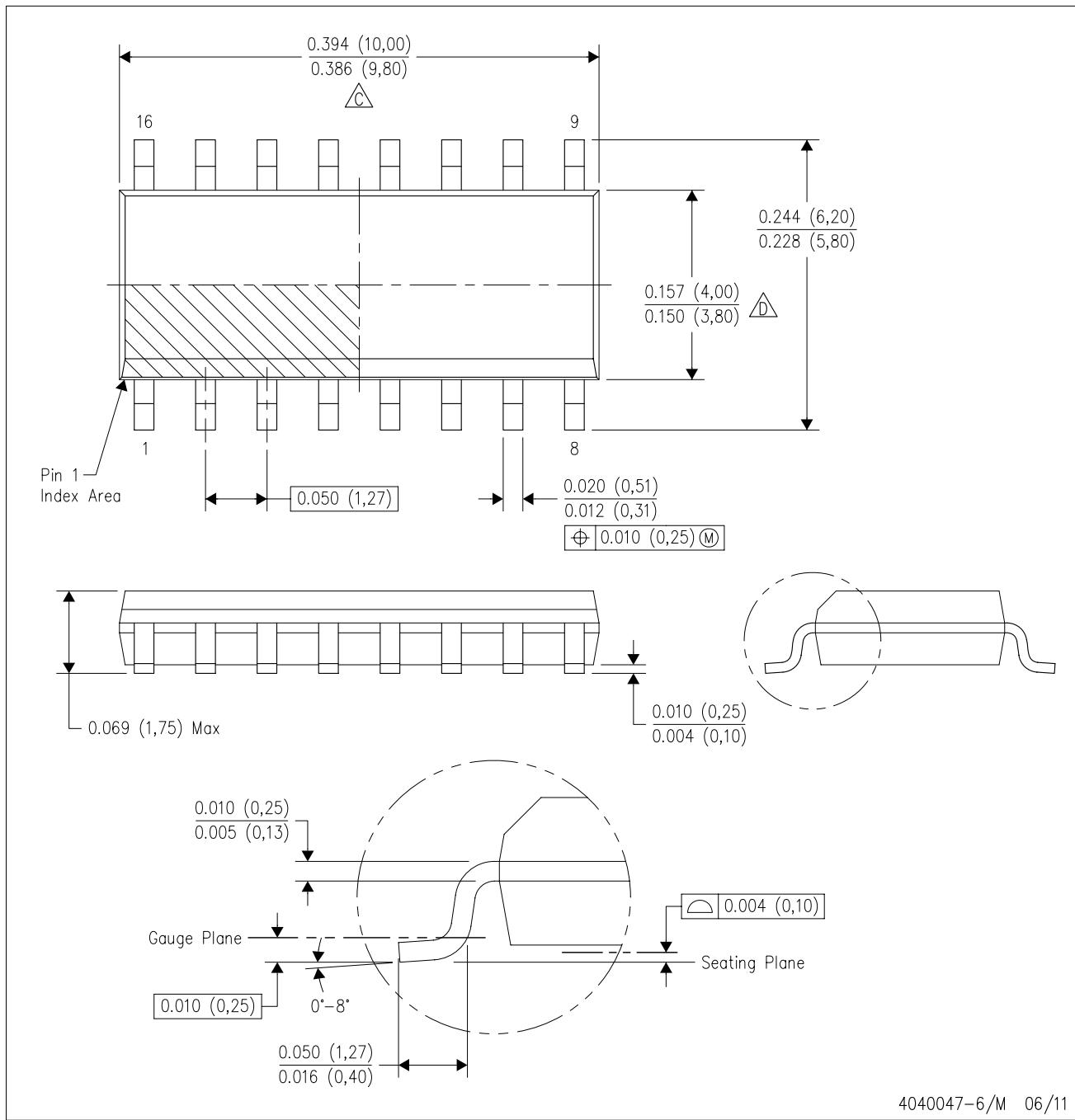
**TUBE**


\*All dimensions are nominal

| Device       | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T ( $\mu$ m) | B (mm) |
|--------------|--------------|--------------|------|-----|--------|--------|--------------|--------|
| SN74HC193N   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230        | 4.32   |
| SN74HC193N   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230        | 4.32   |
| SN74HC193N.A | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230        | 4.32   |
| SN74HC193N.A | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230        | 4.32   |
| SN74HC193NE4 | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230        | 4.32   |
| SN74HC193NE4 | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230        | 4.32   |

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.

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.

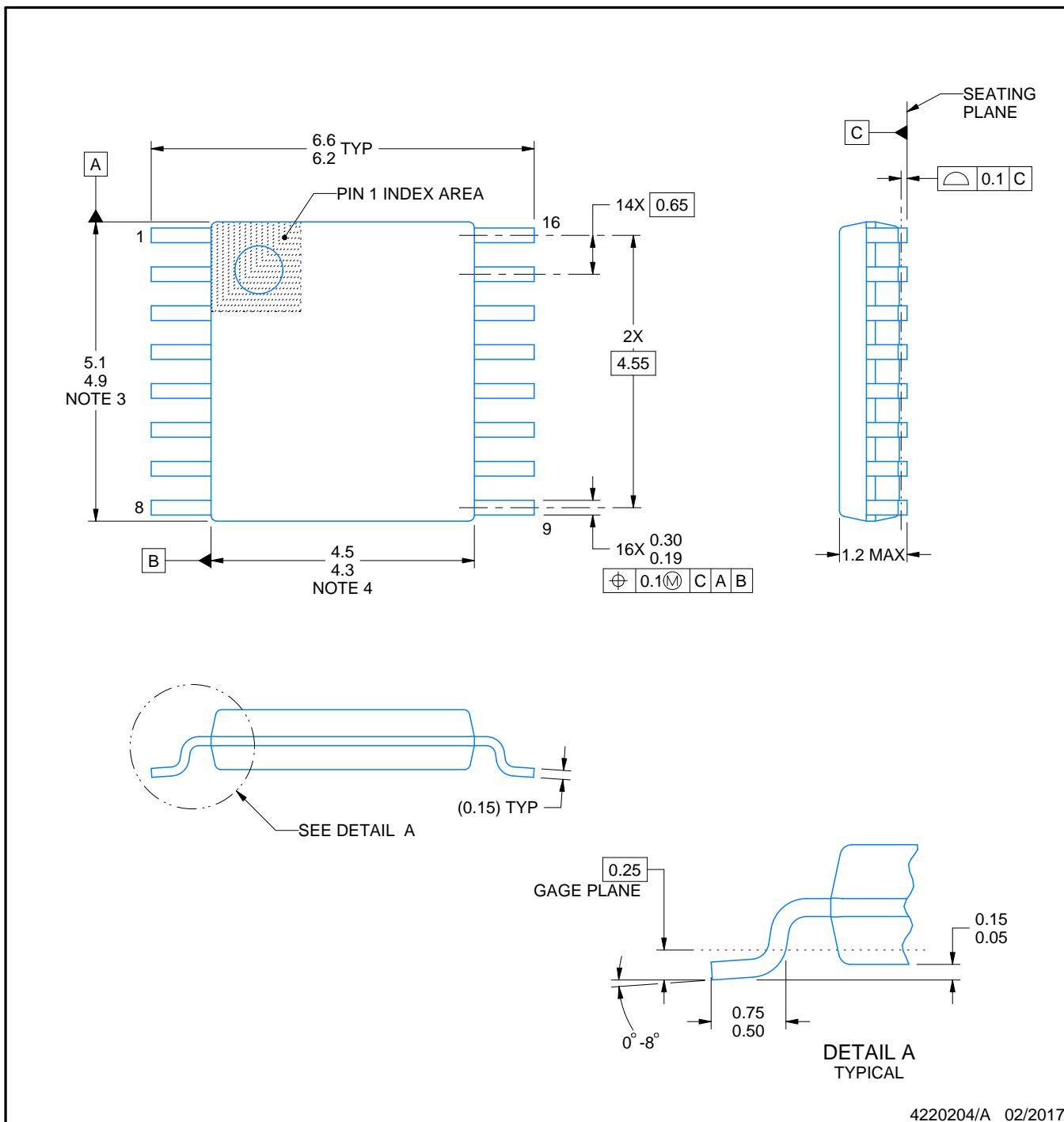
# PACKAGE OUTLINE

PW0016A



TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



## NOTES:

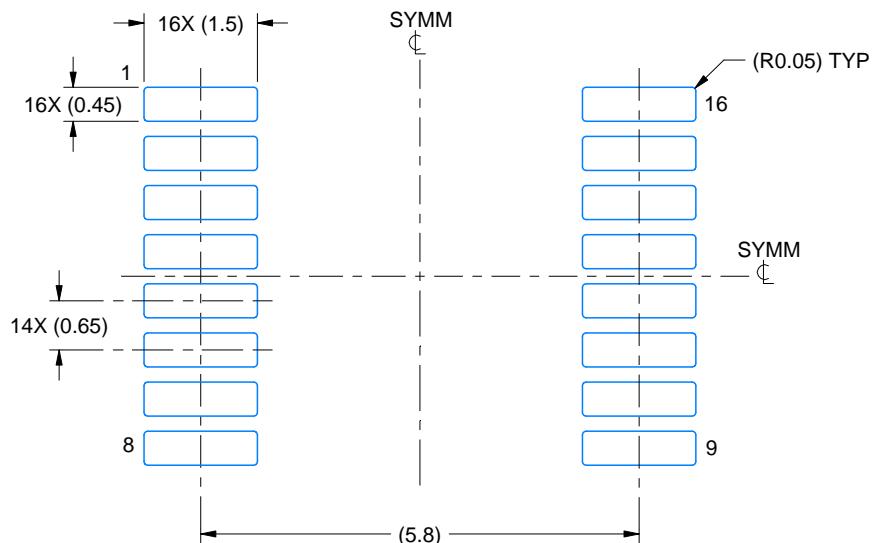
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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

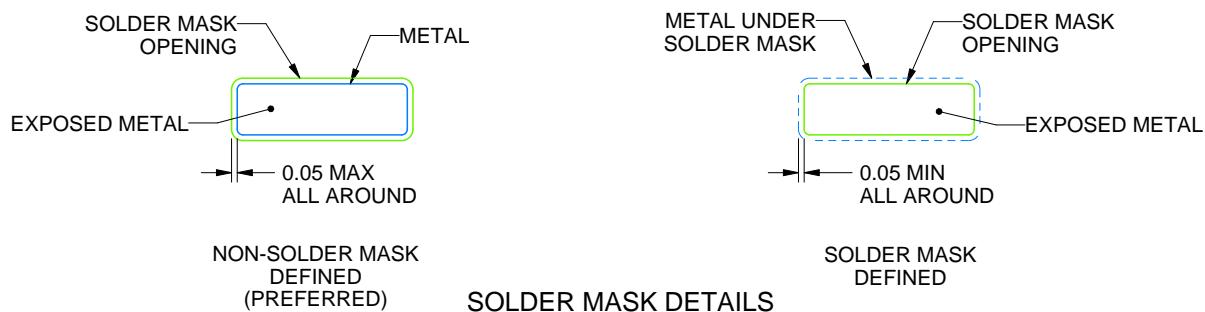
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220204/A 02/2017

NOTES: (continued)

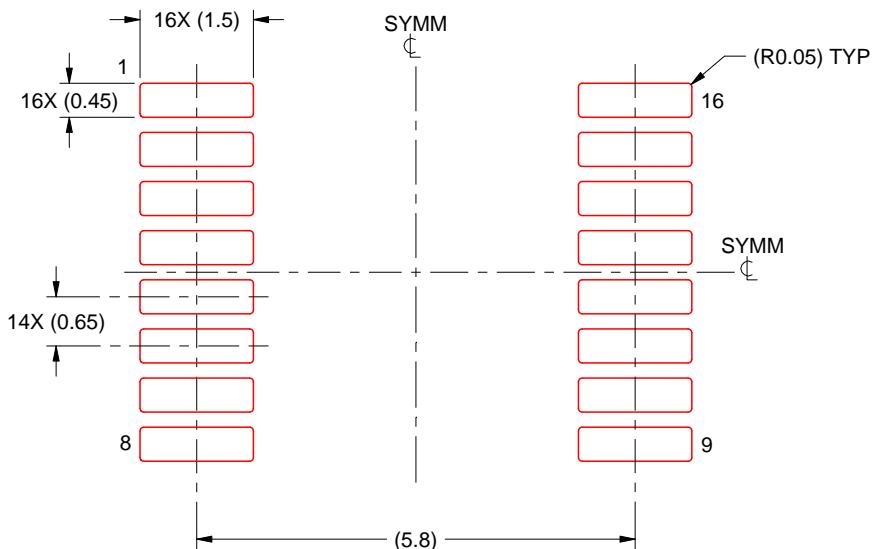
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# 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)

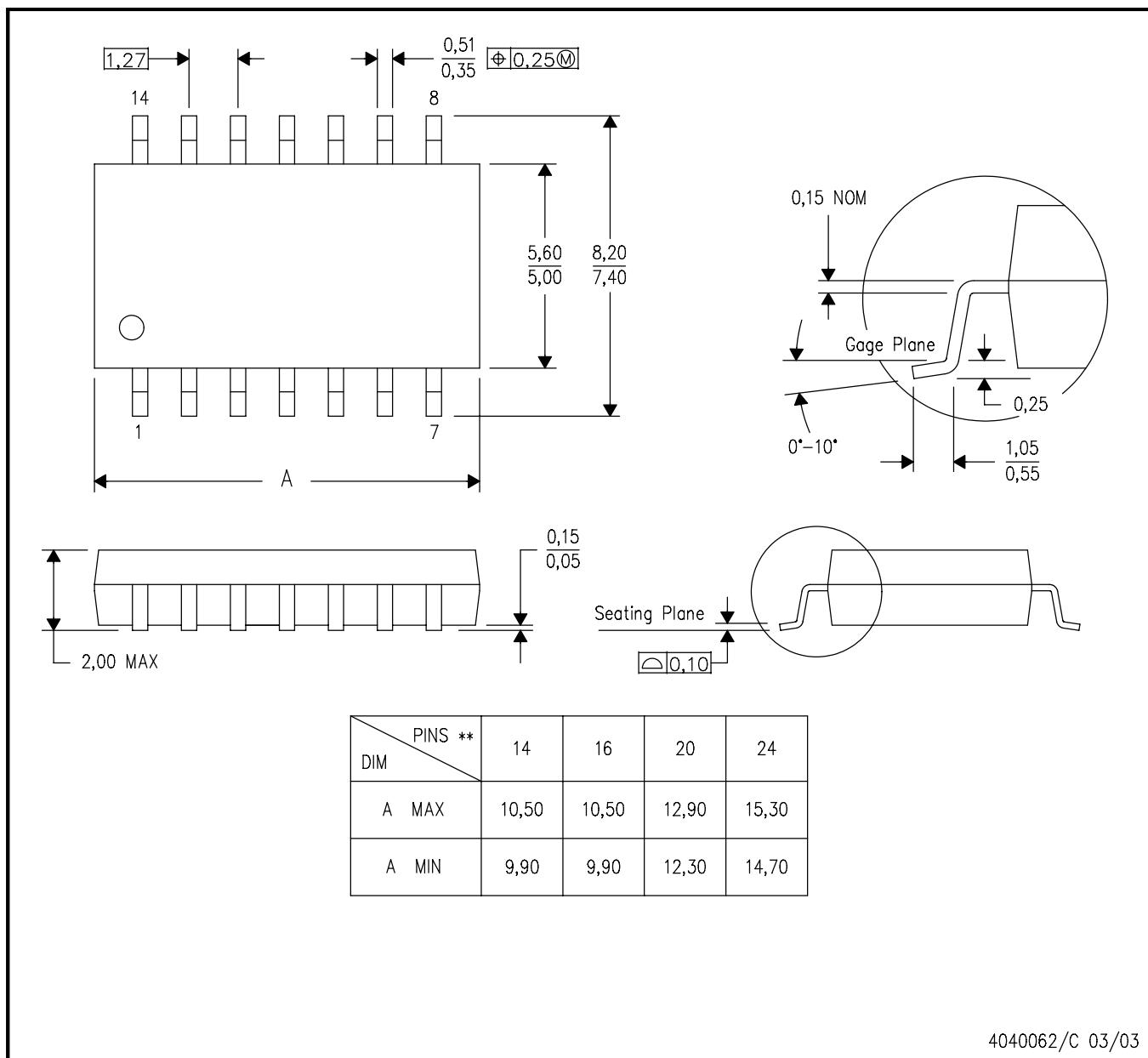
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

## MECHANICAL DATA

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

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



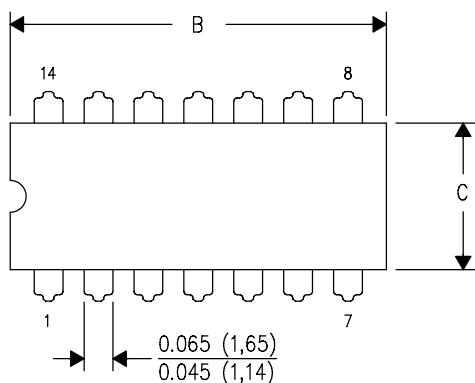
NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

4040062/C 03/03

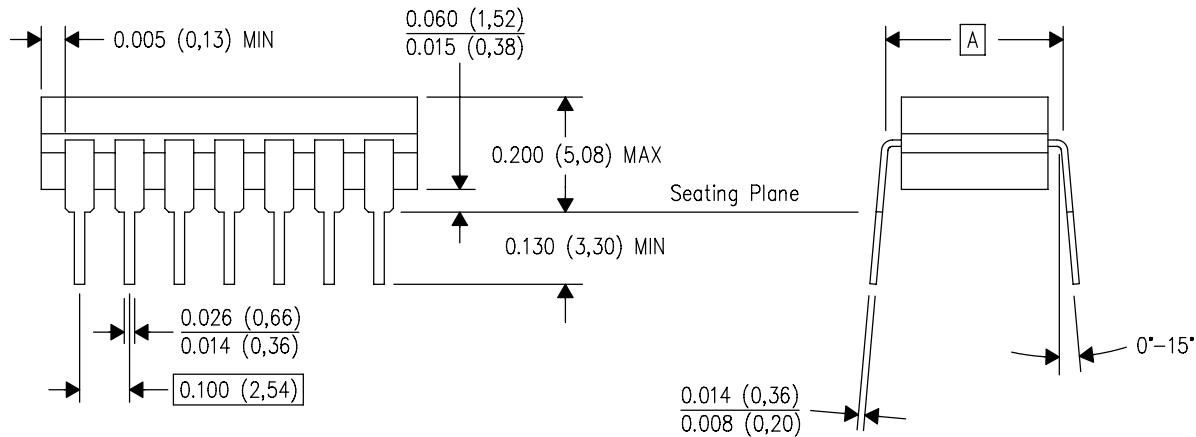
J (R-GDIP-T\*\*)

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

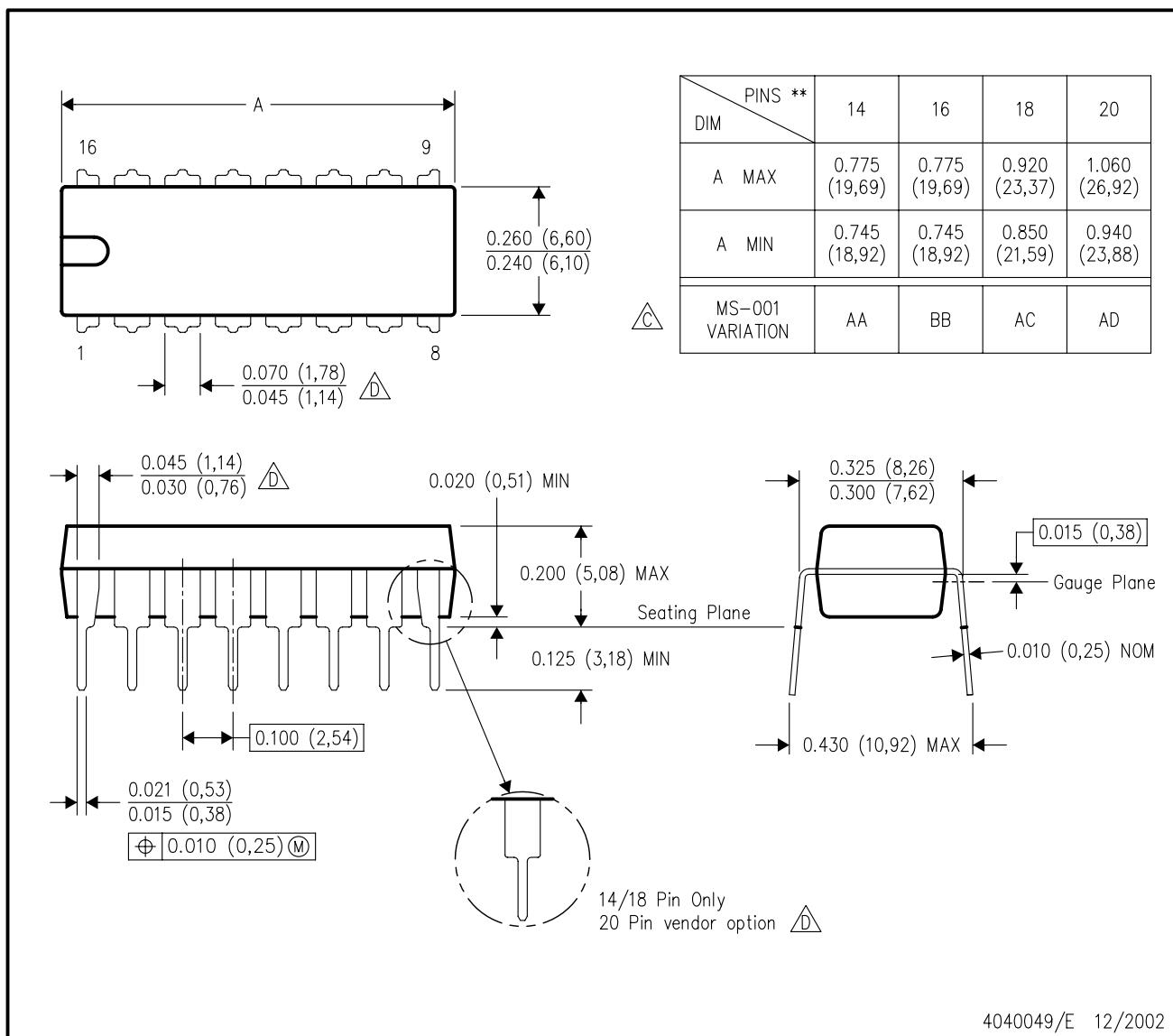
NOTES:

- 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

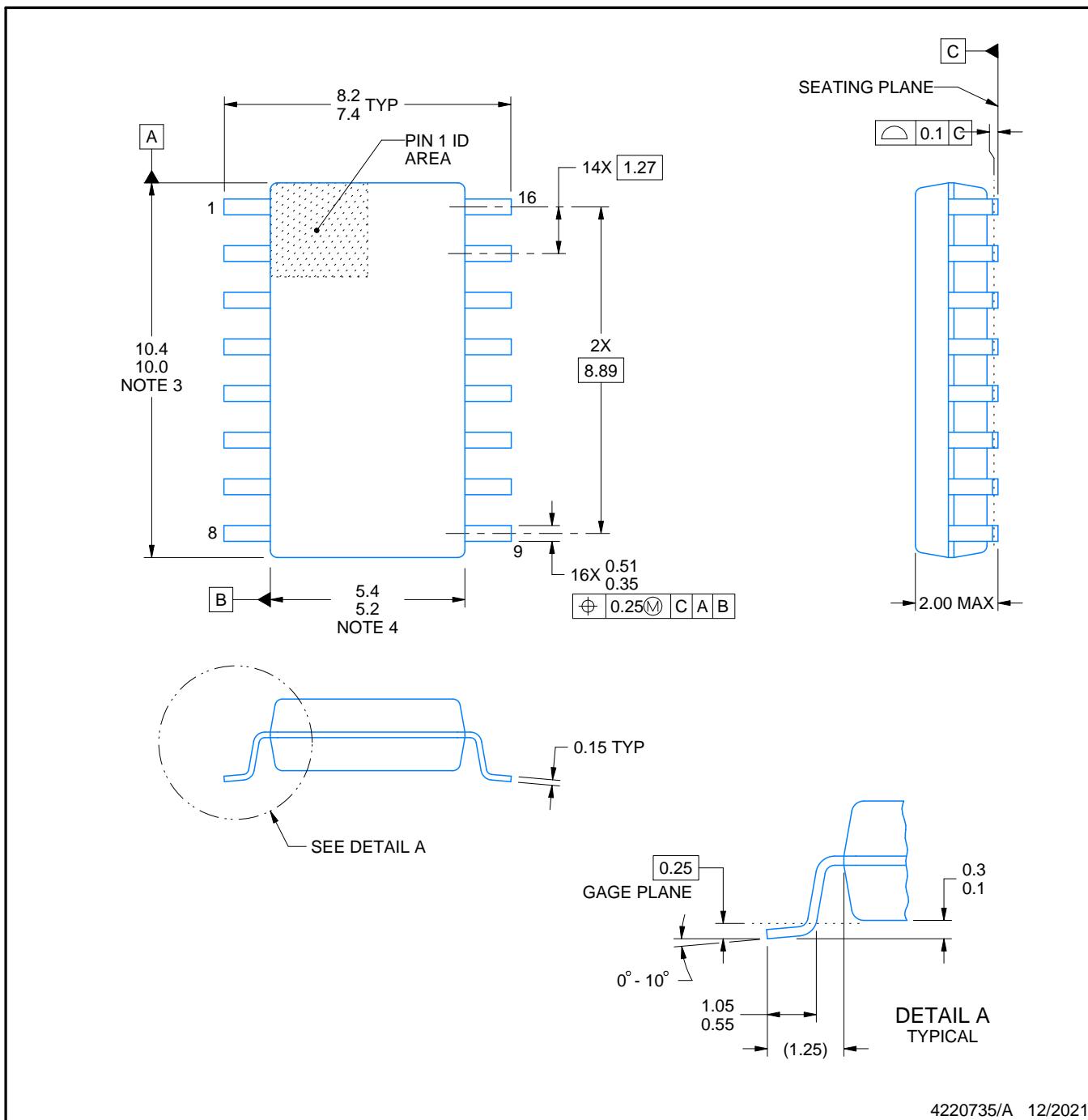




## PACKAGE OUTLINE

**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.

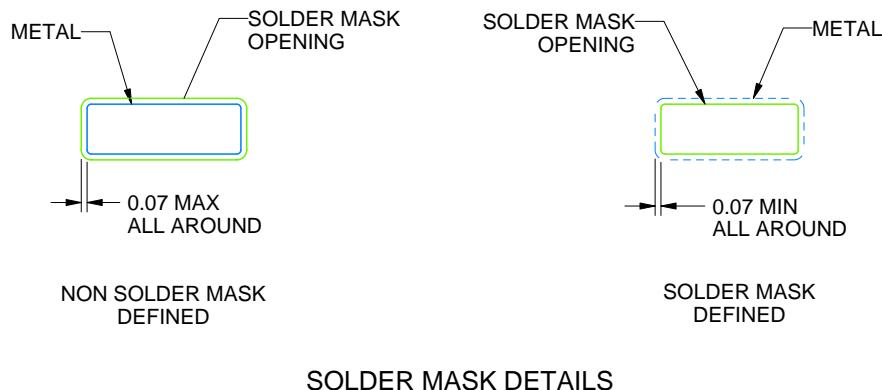
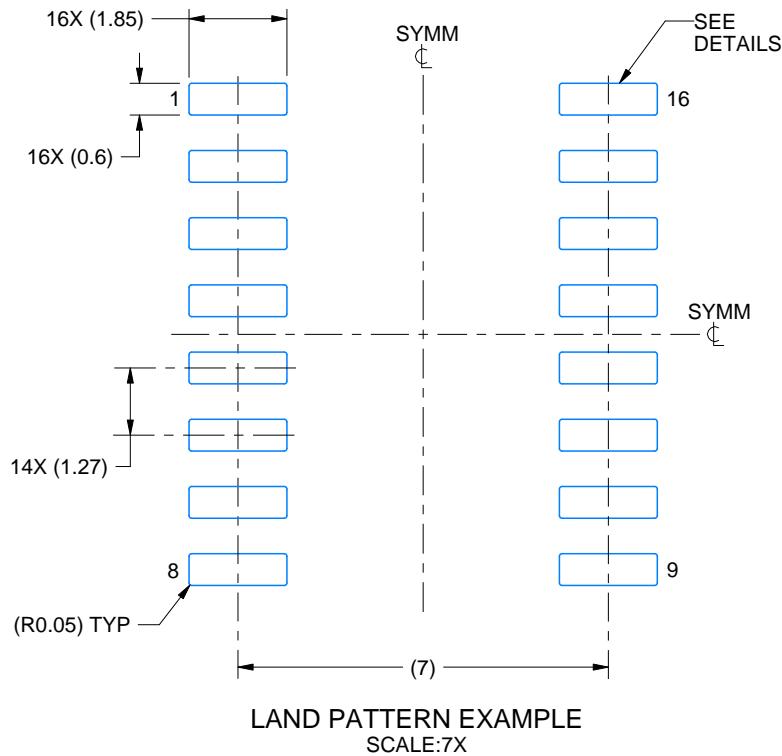


# EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

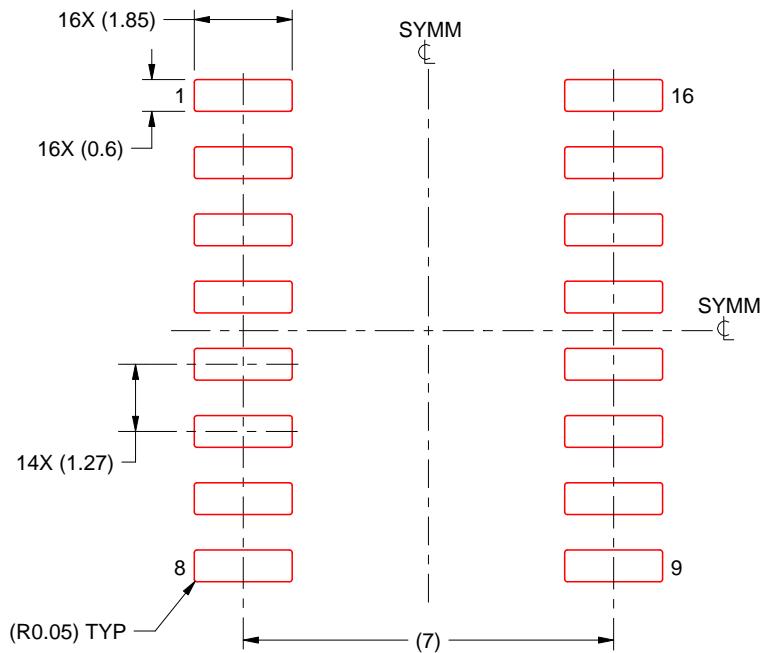
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



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.

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