

# MC1488, SN55188, SN75188 QUADRUPLE LINE DRIVERS

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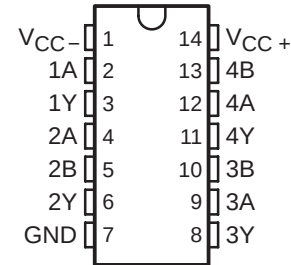
- Meet or Exceed the Requirements of ANSI TIA/EIA-232-E and ITU Recommendation V.28
- Current-Limited Output: 10 mA Typical
- Power-Off Output Impedance: 300  $\Omega$  Minimum
- Slew Rate Control by Load Capacitor
- Flexible Supply-Voltage Range
- Input Compatible With Most TTL Circuits

## description/ordering information

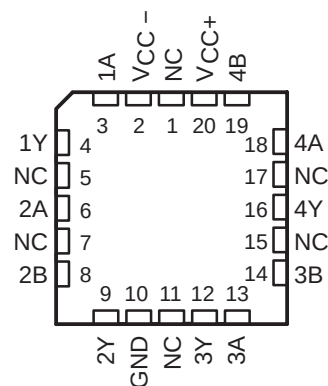
The MC1488, SN55188, and SN75188 are monolithic quadruple line drivers designed to interface data terminal equipment with data communications equipment in conformance with ANSI TIA/EIA-232-E, using a diode in series with each supply-voltage terminal as shown under typical applications.

The SN55188 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The MC1488 and SN75188 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN55188 . . . J OR W PACKAGE  
SN75188 . . . D, N, OR NS PACKAGE  
MC1488 . . . N PACKAGE  
(TOP VIEW)



SN55188 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## ORDERING INFORMATION

| T <sub>A</sub>                                 | PACKAGE†  |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|------------------------------------------------|-----------|--------------|-----------------------|------------------|
| 0°C to 70°C                                    | PDIP (N)  | Tube of 25   | MC1488N               | MC1488N          |
|                                                |           | Tube of 25   | SN75188N              | SN75188N         |
|                                                | SOIC (D)  | Tube of 50   | SN75188D              | SN75188          |
|                                                |           | Reel of 2500 | SN75188DR             |                  |
|                                                | SOP (NS)  | Reel of 2000 | SN75188NSR            | SN75188          |
| $-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$ | CDIP (J)  | Tube of 25   | SN55188J              | SN55188J         |
|                                                |           |              | SNJ55188J             | SNJ55188J        |
|                                                | CFP (W)   | Tube of 150  | SNJ55188W             | SNJ55188W        |
|                                                | LCCC (FK) | Tube of 55   | SNJ55188FK            | SNJ55188FK       |

† 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).



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 **TEXAS  
INSTRUMENTS**

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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.

MC1488, SN55188, SN75188  
QUADRUPLE LINE DRIVERS

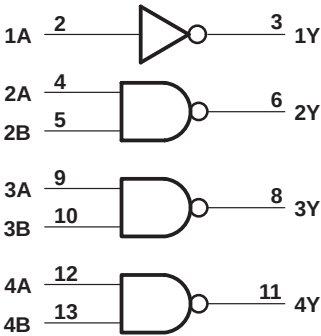
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FUNCTION TABLE  
(drivers 2–4)

| A | B | Y |
|---|---|---|
| H | H | L |
| L | X | H |
| X | L | H |

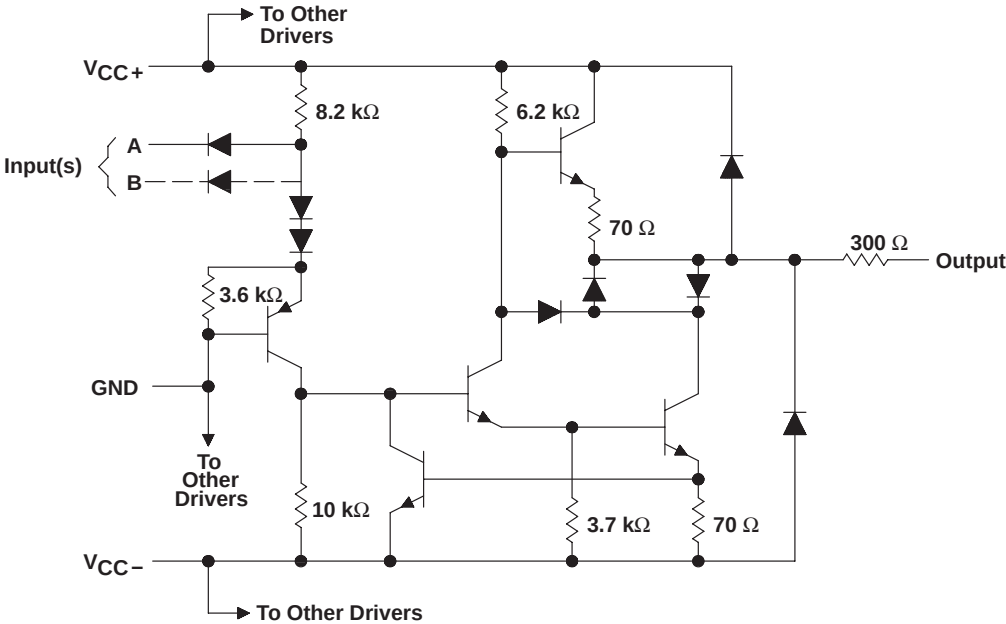
H = high level, L = low level,  
X = irrelevant

logic diagram (positive logic)



Positive logic  
 $Y = \overline{A}$  (driver 1)  
 $Y = AB$  or  $\overline{A} + \overline{B}$  (drivers 2 thru 4)

schematic (each driver)



Resistor values shown are nominal.

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

|                                                                                       |                              |
|---------------------------------------------------------------------------------------|------------------------------|
| Supply voltage, $V_{CC+}$ at (or below) 25°C free-air temperature (see Notes 1 and 2) | 15 V                         |
| Supply voltage, $V_{CC-}$ at (or below) 25°C free-air temperature (see Notes 1 and 2) | –15 V                        |
| Input voltage, $V_I$                                                                  | –15 V to 7 V                 |
| Output voltage, $V_O$                                                                 | –15 V to 15 V                |
| Continuous total power dissipation (see Note 2)                                       | See Dissipation Rating Table |
| Package thermal impedance, $\theta_{JA}$ (see Notes 3 and 4): D package               | 86°C/W                       |
| N package                                                                             | 80°C/W                       |
| NS package                                                                            | 76°C/W                       |
| Operating virtual junction temperature, $T_J$                                         | 150°C                        |
| Case temperature for 60 seconds, FK package                                           | 260°C                        |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J or W package          | 300°C                        |
| Storage temperature range, $T_{Stg}$                                                  | –65°C to 150°C               |

<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. All voltage values are with respect to the network ground terminal.
  2. For operation above 25°C free-air temperature, refer to the maximum supply voltage curve, Figure 6. In the J package, SN55188 chips are alloy mounted.
  3. Maximum power dissipation is a function of  $T_J(\max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\max) - T_A)/\theta_{JA}$ . Selecting the maximum of 150°C can affect reliability.
  4. The package thermal impedance is calculated in accordance with JESD 51-7.

**DISSIPATION RATING TABLE**

| PACKAGE | $T_A \leq 25^\circ\text{C}$<br>POWER RATING | DERATING FACTOR<br>ABOVE $T_A = 25^\circ\text{C}$ | $T_A = 70^\circ\text{C}$<br>POWER RATING | $T_A = 125^\circ\text{C}$<br>POWER RATING |
|---------|---------------------------------------------|---------------------------------------------------|------------------------------------------|-------------------------------------------|
| FK      | 1375 mW                                     | 11.0 mW/°C                                        | 880 mW                                   | 275 mW                                    |
| J       | 1375 mW                                     | 11.0 mW/°C                                        | 880 mW                                   | 275 mW                                    |
| W       | 1000 mW                                     | 8.0 mW/°C                                         | 640 mW                                   | 200 mW                                    |

**recommended operating conditions**

|           |                                | SN55188 |     |     | MC1488, SN75188 |     |     | UNIT |
|-----------|--------------------------------|---------|-----|-----|-----------------|-----|-----|------|
|           |                                | MIN     | NOM | MAX | MIN             | NOM | MAX |      |
| $V_{CC+}$ | Supply voltage                 | 7.5     | 9   | 15  | 7.5             | 9   | 15  | V    |
| $V_{CC-}$ | Supply voltage                 | –7.5    | –9  | –15 | –7.5            | –9  | –15 | V    |
| $V_{IH}$  | High-level input voltage       | 1.9     |     |     | 1.9             |     |     | V    |
| $V_{IL}$  | Low-level input voltage        |         |     | 0.8 |                 |     | 0.8 | V    |
| $T_A$     | Operating free-air temperature | –55     |     | 125 | 0               |     | 70  | °C   |

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electrical characteristics over operating free-air temperature range,  $V_{CC\pm} = \pm 9\text{ V}$  (unless otherwise noted)

| PARAMETER          |                                             | TEST CONDITIONS                                             |                                                          | SN55188                   |        |       | MC1488, SN75188 |       |        | UNIT |
|--------------------|---------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|---------------------------|--------|-------|-----------------|-------|--------|------|
|                    |                                             |                                                             |                                                          | MIN                       | TYP†   | MAX   | MIN             | TYP†  | MAX    |      |
| V <sub>OH</sub>    | High-level output voltage                   | V <sub>IL</sub> = 0.8 V,<br>R <sub>L</sub> = 3 kΩ           | V <sub>CC+</sub> = 9 V,<br>V <sub>CC-</sub> = -9 V       | 6                         | 7      |       | 6               | 7     |        | V    |
|                    |                                             |                                                             | V <sub>CC+</sub> = 13.2 V,<br>V <sub>CC-</sub> = -13.2 V | 9                         | 10.5   |       | 9               | 10.5  |        |      |
| V <sub>OL</sub>    | Low-level output voltage                    | V <sub>IH</sub> = 1.9 V,<br>R <sub>L</sub> = 3 kΩ           | V <sub>CC+</sub> = 9 V,<br>V <sub>CC-</sub> = -9 V       |                           | -7‡    | -6    |                 | -7    | -6     | V    |
|                    |                                             |                                                             | V <sub>CC+</sub> = 13.2 V,<br>V <sub>CC-</sub> = -13.2 V |                           | -10.5‡ | -9    |                 | -10.5 | -9     |      |
| I <sub>IH</sub>    | High-level input current                    | V <sub>I</sub> = 5 V                                        |                                                          |                           |        |       | 10              |       |        | μA   |
| I <sub>IL</sub>    | Low-level input current                     | V <sub>I</sub> = 0                                          |                                                          |                           |        |       | -1 -1.6         |       |        | mA   |
| I <sub>OS(H)</sub> | Short-circuit output current at high level§ | V <sub>I</sub> = 0.8 V,                                     | V <sub>O</sub> = 0                                       | -4.6                      | -9     | -13.5 | -6              | -9    | -12    | mA   |
| I <sub>OS(L)</sub> | Short-circuit output current at low level§  | V <sub>I</sub> = 1.9 V,                                     | V <sub>O</sub> = 0                                       | 4.6                       | 9      | 13.5  | 6               | 9     | 12     | mA   |
| r <sub>o</sub>     | Output resistance, power off                | V <sub>CC+</sub> = 0,<br>V <sub>O</sub> = -2 V to 2 V       |                                                          | 300                       |        |       | 300             |       |        | Ω    |
| I <sub>CC+</sub>   | Supply current from V <sub>CC+</sub>        | V <sub>CC+</sub> = 9 V,<br>No load                          | All inputs at 1.9 V                                      |                           | 15     | 20    |                 | 15    | 20     | mA   |
|                    |                                             |                                                             | All inputs at 0.8 V                                      |                           | 4.5    | 6     |                 | 4.5   | 6      |      |
|                    |                                             | V <sub>CC+</sub> = 12 V,<br>No load                         | All inputs at 1.9 V                                      |                           | 19     | 25    |                 | 19    | 25     |      |
|                    |                                             |                                                             | All inputs at 0.8 V                                      |                           | 5.5    | 7     |                 | 5.5   | 7      |      |
|                    |                                             | V <sub>CC+</sub> = 15 V,<br>No load, T <sub>A</sub> = 25°C  | All inputs at 1.9 V                                      |                           |        | 34    |                 |       | 34     |      |
|                    |                                             |                                                             | All inputs at 0.8 V                                      |                           |        | 12    |                 |       | 12     |      |
| I <sub>CC-</sub>   | Supply current from I <sub>CC-</sub>        | V <sub>CC-</sub> = -9 V,<br>No load                         | All inputs at 1.9 V                                      |                           | -13    | -17   |                 | -13   | -17    | mA   |
|                    |                                             |                                                             | All inputs at 0.8 V                                      |                           |        | -0.5  |                 |       | -0.015 |      |
|                    |                                             | V <sub>CC-</sub> = -12 V,<br>No load                        | All inputs at 1.9 V                                      |                           | -18    | -23   |                 | -18   | -23    |      |
|                    |                                             |                                                             | All inputs at 0.8 V                                      |                           |        | -0.5  |                 |       | -0.015 |      |
|                    |                                             | V <sub>CC-</sub> = -15 V,<br>No load, T <sub>A</sub> = 25°C | All inputs at 1.9 V                                      |                           |        | -34   |                 |       | -34    |      |
|                    |                                             |                                                             | All inputs at 0.8 V                                      |                           |        | -2.5  |                 |       | -2.5   |      |
| P <sub>D</sub>     | Total power dissipation                     | V <sub>CC+</sub> = 9 V,<br>No load                          |                                                          | V <sub>CC-</sub> = -9 V,  |        |       | 333             |       |        | mW   |
|                    |                                             | V <sub>CC+</sub> = 12 V,<br>No load                         |                                                          | V <sub>CC-</sub> = -12 V, |        |       | 576             |       |        |      |

† All typical values are at  $T_A = 25^\circ\text{C}$ .

‡ The algebraic convention, in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for logic voltage levels only, e.g., if  $-6\text{ V}$  is a maximum, the typical value is a more negative voltage.

§ Not more than one output should be shorted at a time.



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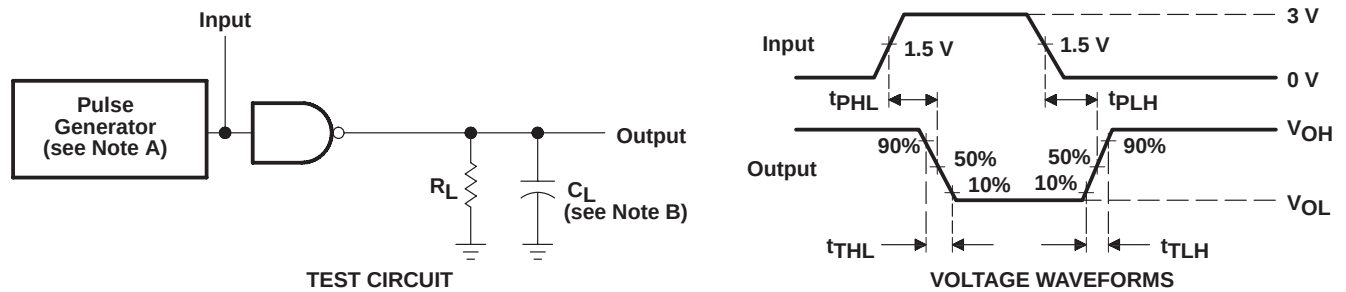
switching characteristics,  $V_{CC\pm} = \pm 9\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER                                                         | TEST CONDITIONS                                                                            | MIN | TYP | MAX | UNIT          |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $t_{PLH}$ Propagation delay time, low- to high-level output       | $R_L = 3\text{ k}\Omega$ ,<br>See Figure 1<br>$C_L = 15\text{ pF}$                         |     | 220 | 350 | ns            |
| $t_{PHL}$ Propagation delay time, high- to low-level output       |                                                                                            |     | 100 | 175 | ns            |
| $t_{TLH}$ Transition time, low- to high-level output <sup>†</sup> |                                                                                            |     | 55  | 100 | ns            |
| $t_{THL}$ Transition time, high- to low-level output <sup>†</sup> |                                                                                            |     | 45  | 75  | ns            |
| $t_{TLH}$ Transition time, low- to high-level output <sup>‡</sup> | $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$ ,<br>See Figure 1<br>$C_L = 2500\text{ pF}$ |     | 2.5 |     | $\mu\text{s}$ |
| $t_{THL}$ Transition time, high- to low-level output <sup>‡</sup> |                                                                                            |     | 3.0 |     | $\mu\text{s}$ |

<sup>†</sup> Measured between 10% and 90% points of output waveform

<sup>‡</sup> Measured between 3 V and  $-3\text{ V}$  points on the output waveform (TIA/EIA-232-E conditions)

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The pulse generator has the following characteristics:  $t_W = 0.5\text{ }\mu\text{s}$ ,  $\text{PRR} \leq 1\text{ MHz}$ ,  $Z_O = 50\text{ }\Omega$ .  
B.  $C_L$  includes probe and jig capacitance.

Figure 1. Test Circuit and Voltage Waveforms

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## TYPICAL CHARACTERISTICS†

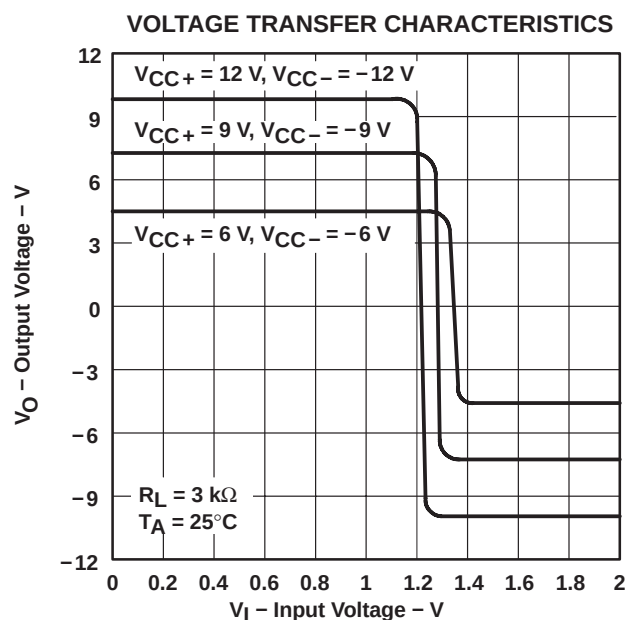


Figure 2

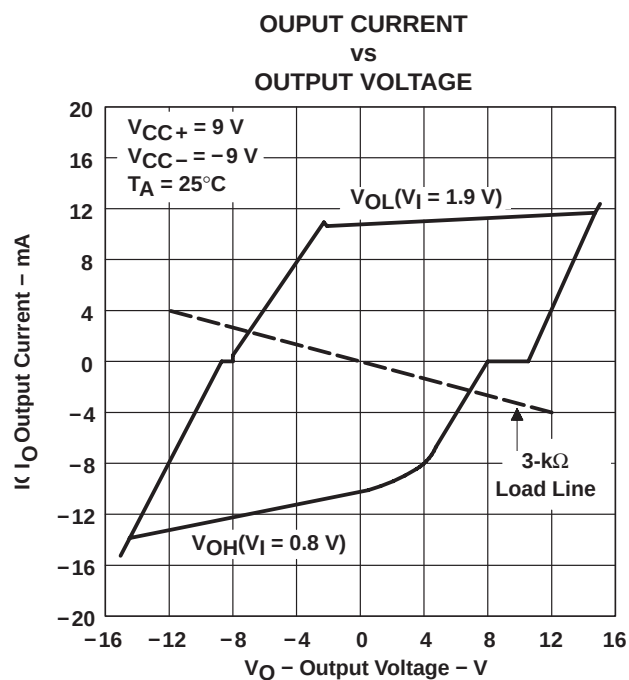


Figure 3

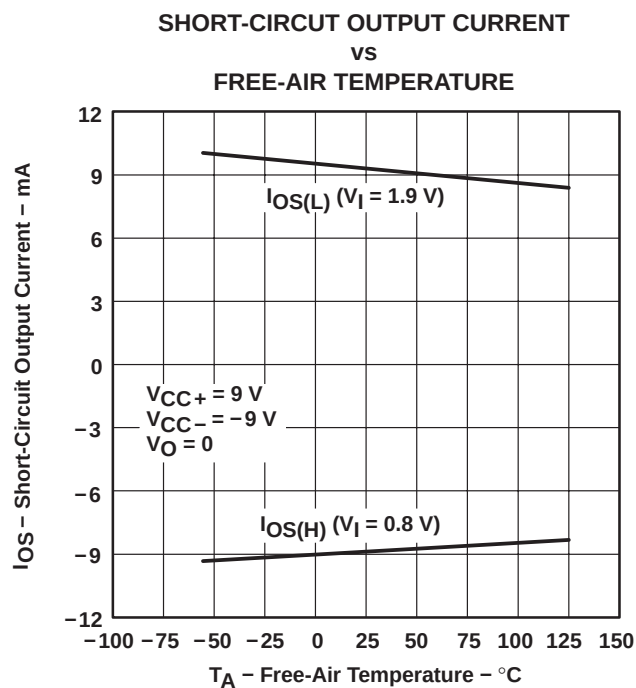


Figure 4

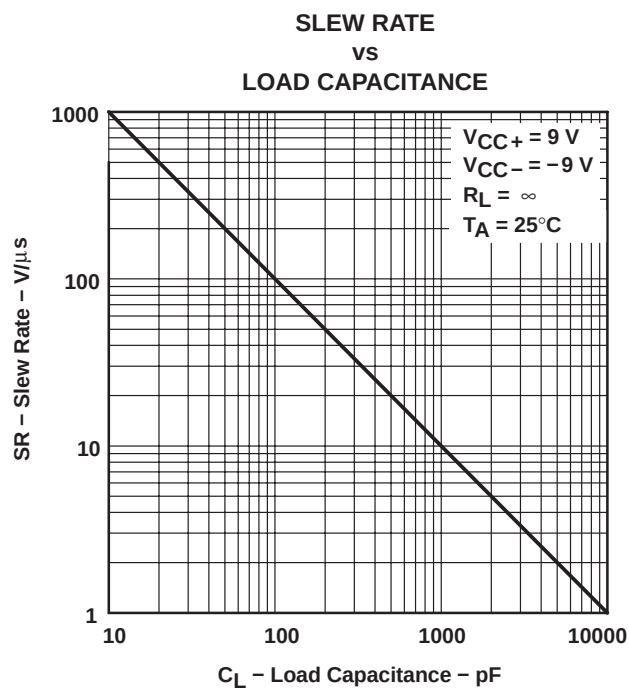


Figure 5

† Data for temperatures below  $0^\circ\text{C}$  and above  $70^\circ\text{C}$  are applicable to SN55188 circuit only.

## THERMAL INFORMATION†

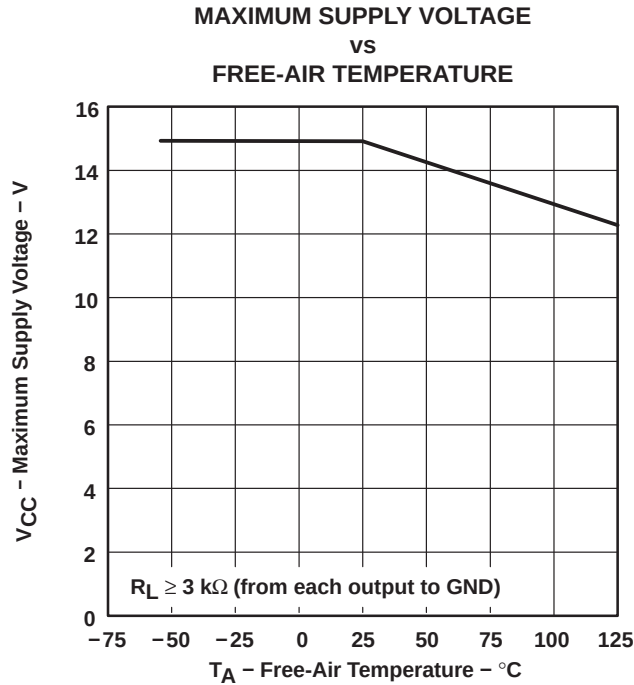


Figure 6

† Data for temperatures below 0°C and above 70°C are applicable to the SN55188 circuit only.

## APPLICATION INFORMATION

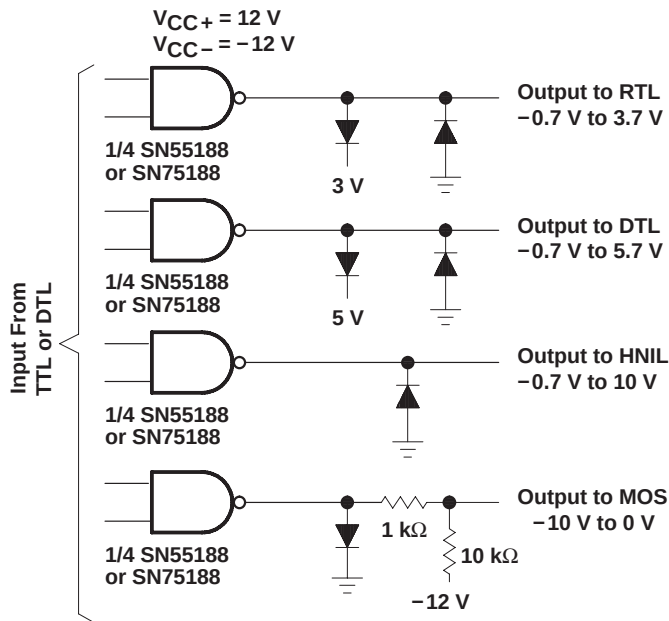
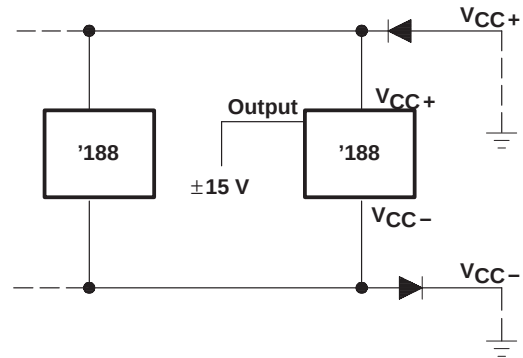


Figure 7. Logic Translator Applications



Diodes placed in series with the  $V_{CC+}$  and  $V_{CC-}$  leads protect the SN55188/SN75188 in the fault condition in which the device outputs are shorted to  $\pm 15 \text{ V}$ , and the power supplies are at low voltage and provide low-impedance paths to ground.

Figure 8. Power-Supply Protection to Meet  
Power-Off Fault Conditions of  
ANSI TIA/EIA-232-E

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)              | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|------------------|----------------------|--------------|--------------------------------------|-------------------------|
| 5962-86889012A   | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | 5962-<br>86889012A<br>SNJ55<br>188FK | <a href="#">Samples</a> |
| 5962-8688901CA   | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-8688901CA<br>SNJ55188J          | <a href="#">Samples</a> |
| 5962-8688901DA   | ACTIVE        | CFP          | W                  | 14   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-8688901DA<br>SNJ55188W          | <a href="#">Samples</a> |
| MC1488N          | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | MC1488N                              | <a href="#">Samples</a> |
| MC1488NE4        | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | MC1488N                              | <a href="#">Samples</a> |
| SN55188J         | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | SN55188J                             | <a href="#">Samples</a> |
| SN75188D         | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SN75188DE4       | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SN75188DG4       | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SN75188DR        | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SN75188DRE4      | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SN75188DRG4      | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SN75188N         | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN75188N                             | <a href="#">Samples</a> |
| SN75188NE4       | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN75188N                             | <a href="#">Samples</a> |
| SN75188NSR       | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SN75188NSRE4     | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |



| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)              | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|------------------|----------------------|--------------|--------------------------------------|-------------------------|
| SN75188NSRG4     | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | SN75188                              | <a href="#">Samples</a> |
| SNJ55188FK       | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | 5962-<br>86889012A<br>SNJ55<br>188FK | <a href="#">Samples</a> |
| SNJ55188J        | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-8688901CA<br>SNJ55188J          | <a href="#">Samples</a> |
| SNJ55188W        | ACTIVE        | CFP          | W                  | 14   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-8688901DA<br>SNJ55188W          | <a href="#">Samples</a> |

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

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

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

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

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

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

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(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.

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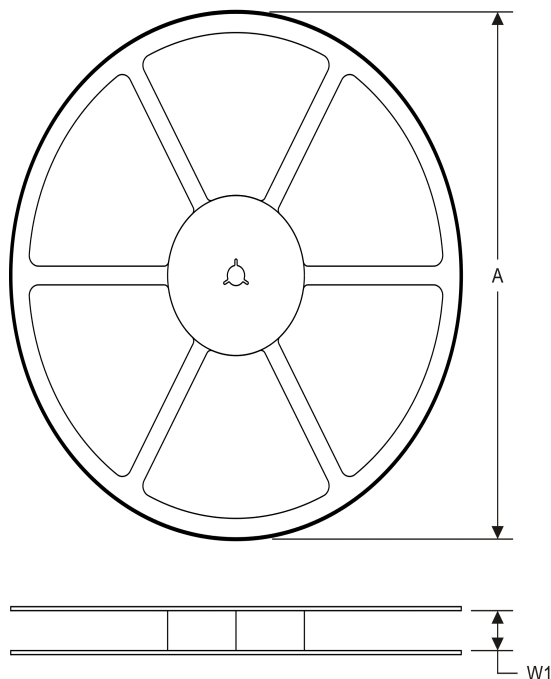
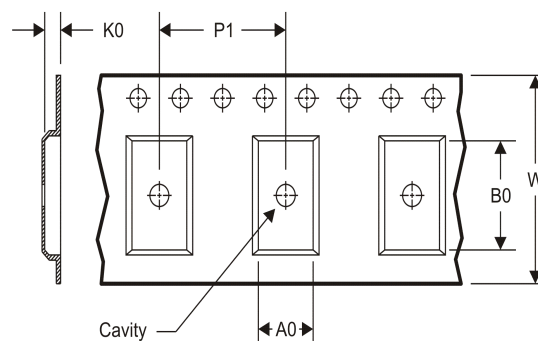
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN55188, SN75188 :**

- Catalog: [SN75188](#)
- Military: [SN55188](#)

**NOTE:** Qualified Version Definitions:

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

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

**TAPE DIMENSIONS**


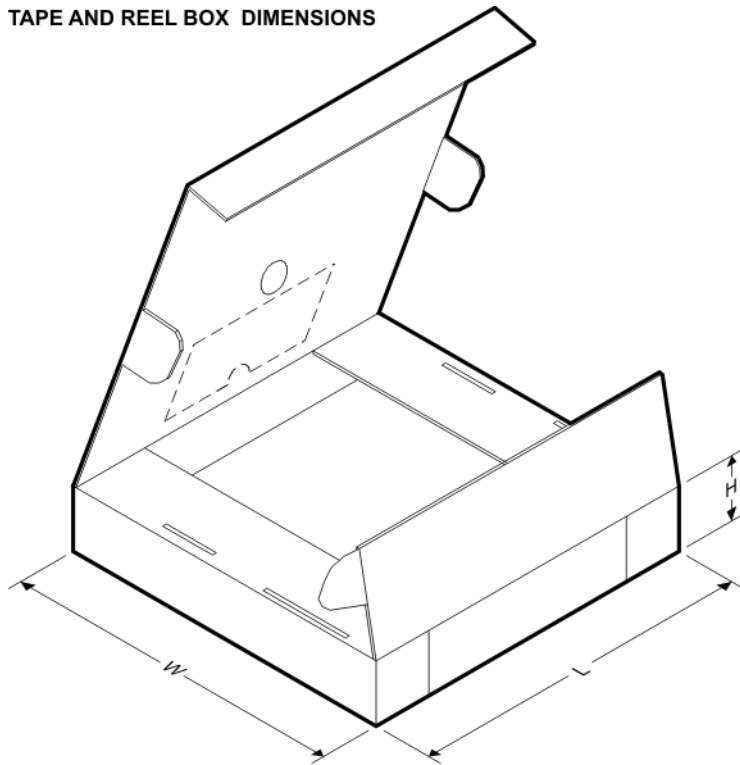
|    |                                                           |
|----|-----------------------------------------------------------|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate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

**TAPE AND REEL INFORMATION**

\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN75188DR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN75188NSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



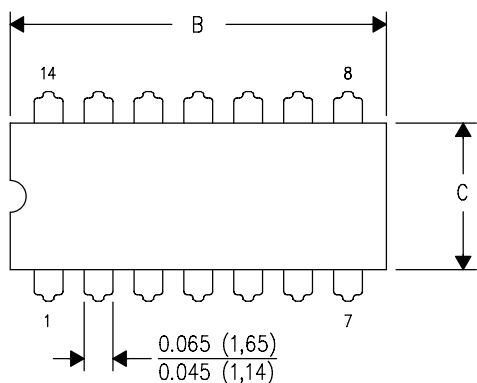
\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN75188DR  | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| SN75188NSR | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |

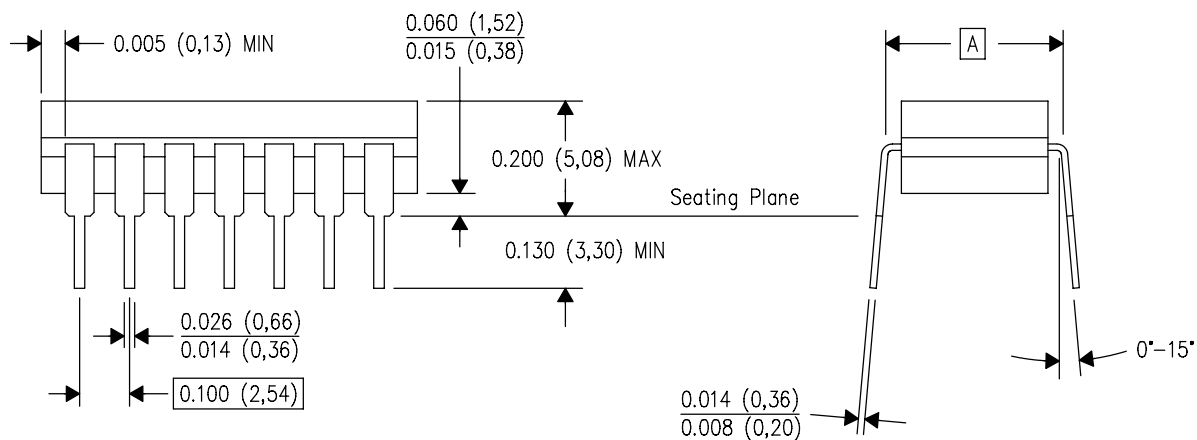
J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE

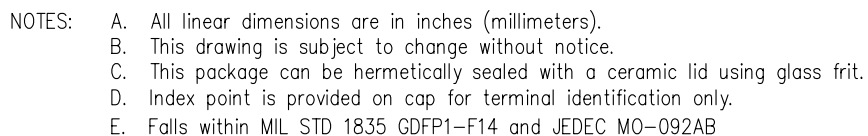


| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC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



4040083/F 03/03

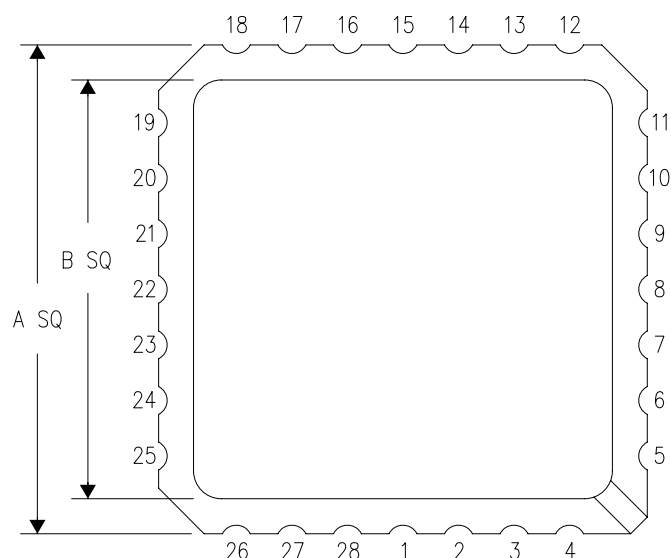
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit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



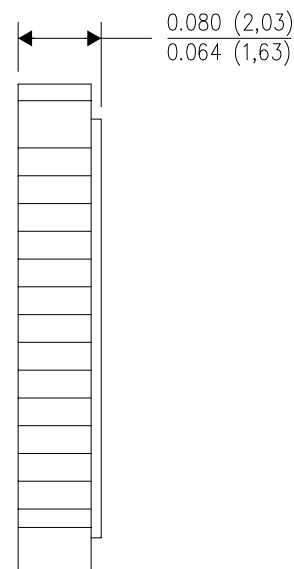
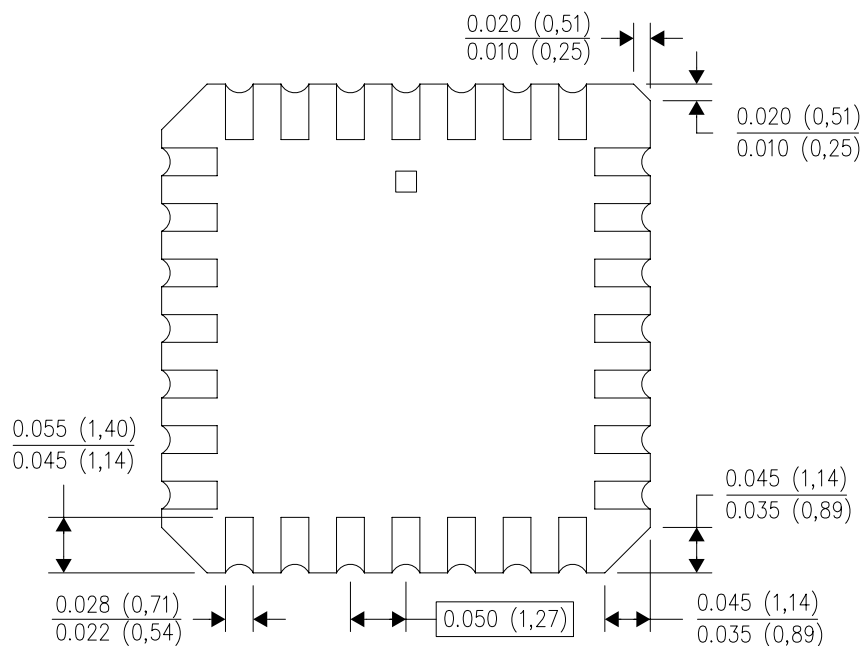
FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF<br>TERMINALS<br>** | A                |                  | B                |                  |
|---------------------------|------------------|------------------|------------------|------------------|
|                           | MIN              | MAX              | MIN              | MAX              |
| 20                        | 0.342<br>(8,69)  | 0.358<br>(9,09)  | 0.307<br>(7,80)  | 0.358<br>(9,09)  |
| 28                        | 0.442<br>(11,23) | 0.458<br>(11,63) | 0.406<br>(10,31) | 0.458<br>(11,63) |
| 44                        | 0.640<br>(16,26) | 0.660<br>(16,76) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 52                        | 0.740<br>(18,78) | 0.761<br>(19,32) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 68                        | 0.938<br>(23,83) | 0.962<br>(24,43) | 0.850<br>(21,6)  | 0.858<br>(21,8)  |
| 84                        | 1.141<br>(28,99) | 1.165<br>(29,59) | 1.047<br>(26,6)  | 1.063<br>(27,0)  |



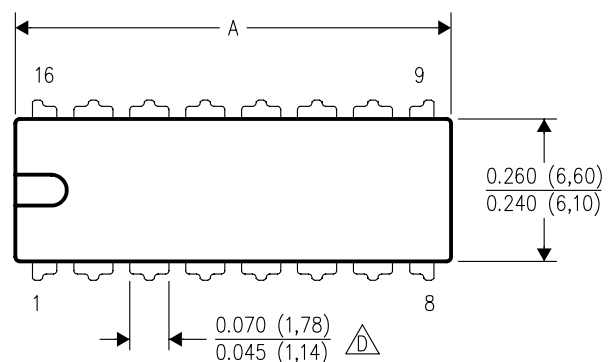
4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

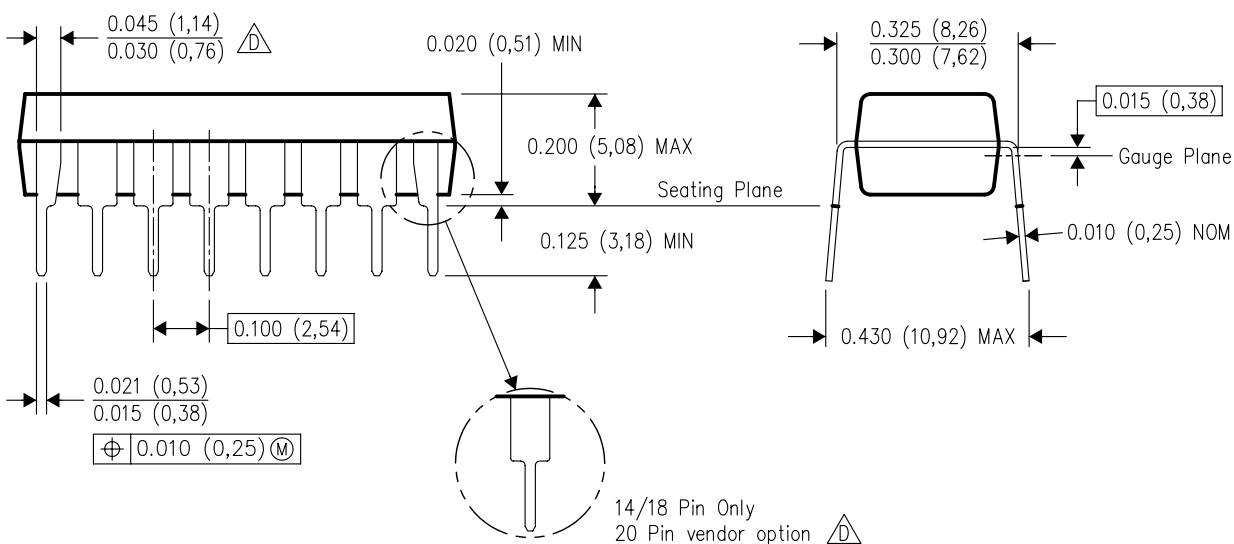
N (R-PDIP-T\*\*)

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               |



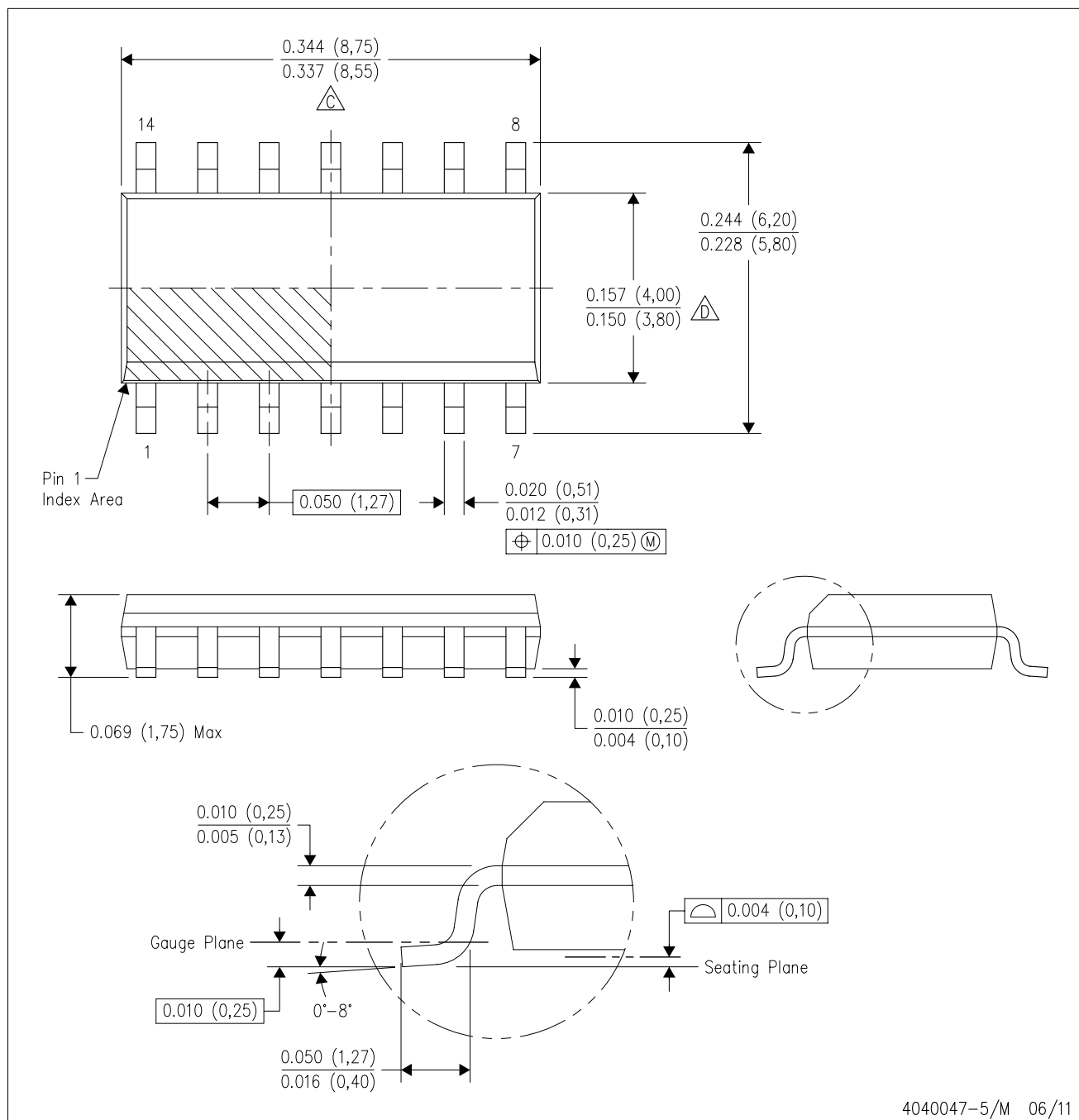
4040049/E 12/2002

- 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.



D (R-PDSO-G14)

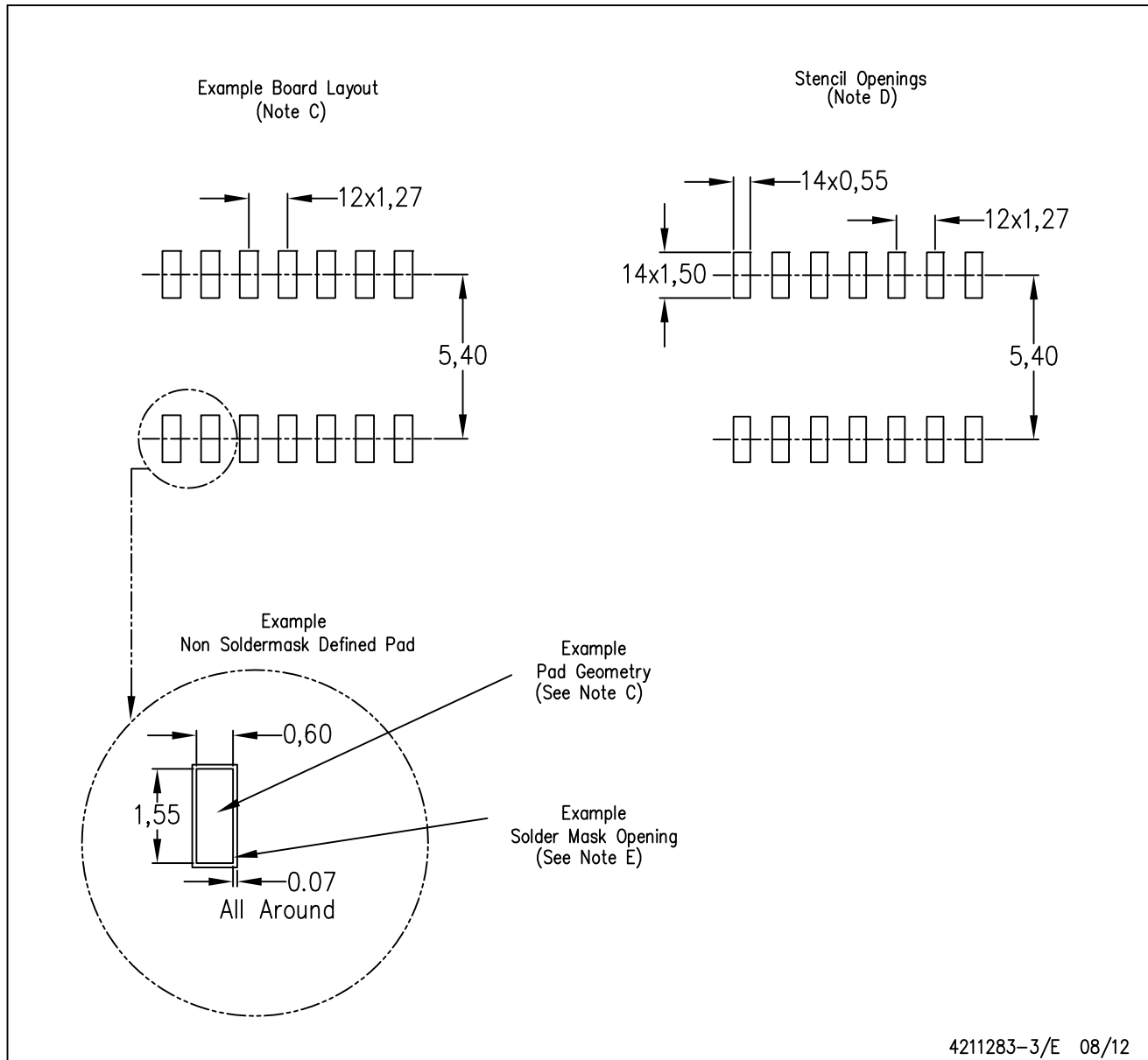
PLASTIC SMALL OUTLINE



- 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 AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



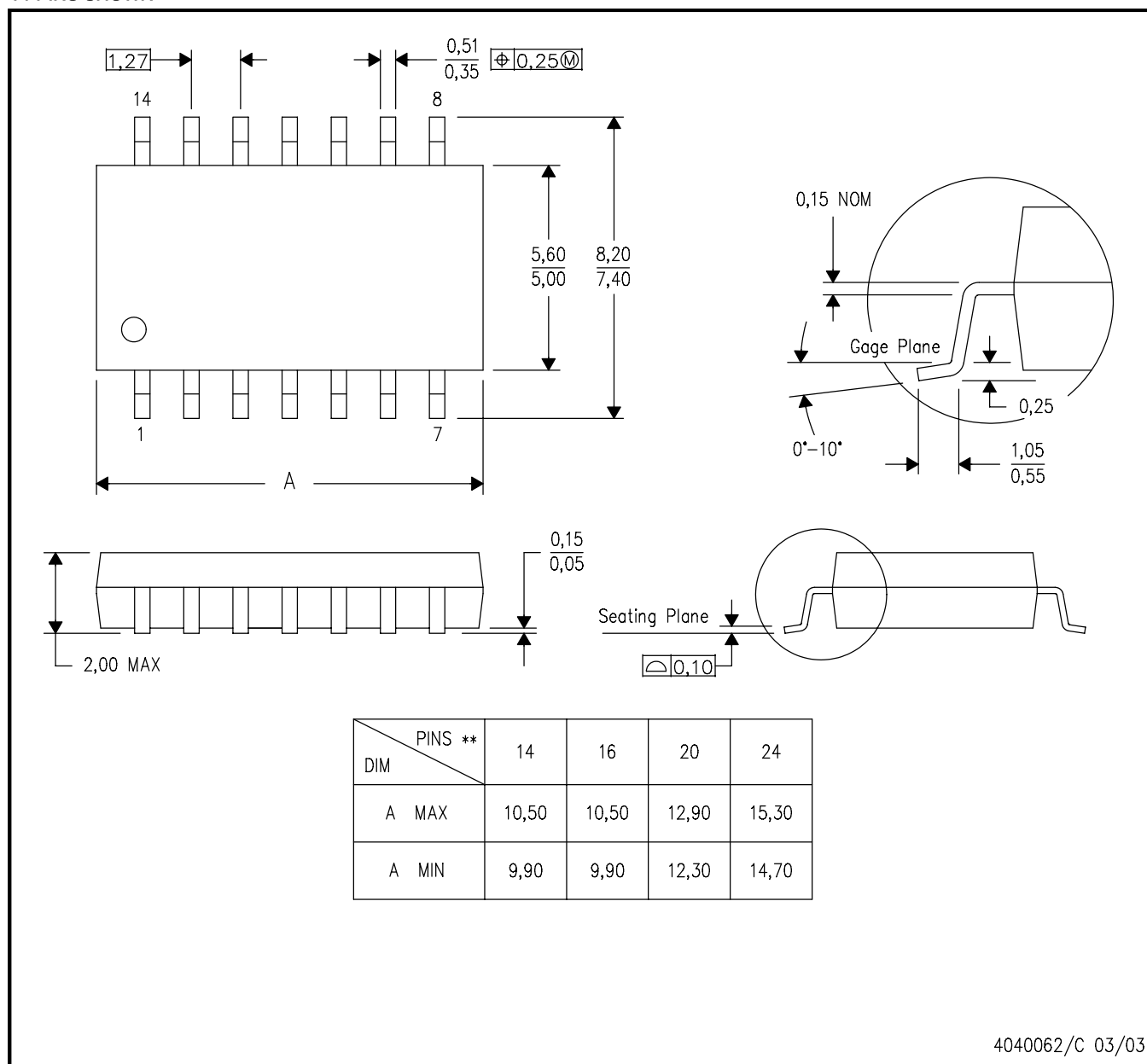
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers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

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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

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