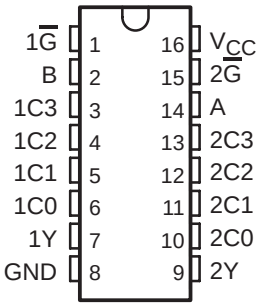
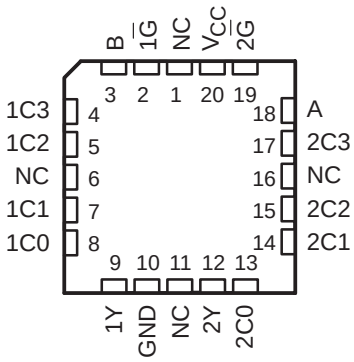
SDFS052A − D2932, MARCH 1987 − REVISED OCTOBER 1993

- **Permits Multiplexing From N Lines to One Line**
- **Performs Parallel-to-Serial Conversion**
- **Strobe (Enable) Line Provided for Cascading (N Lines to N Lines)**
- **Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**

**SN54F153 . . . J PACKAGE**
**SN74F153 . . . D OR N PACKAGE**
**(TOP VIEW)**




**SN54F153 . . . FK PACKAGE**
**(TOP VIEW)**




NC − No internal connection

## description

These data selectors/multiplexers contain inverters and drivers to supply full binary decoding data selection to the AND-OR gates. Separate strobe ($\overline{G}$) inputs are provided for each of the two 4-line sections.

The SN54F153 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74F153 is characterized for operation from 0°C to 70°C.

**FUNCTION TABLE**

| INPUTS | | | | | | STROBE $\overline{G}$ | OUTPUT Y |
|---|---|---|---|---|---|---|---|
| SELECT | | DATA | | | | | |
| B | A | C0 | C1 | C2 | C3 | | |
| X | X | X | X | X | X | H | L |
| L | L | L | X | X | X | L | L |
| L | L | H | X | X | X | L | H |
| L | H | X | L | X | X | L | L |
| L | H | X | H | X | X | L | H |
| H | L | X | X | L | X | L | L |
| H | L | X | X | H | X | L | H |
| H | H | X | X | X | L | L | L |
| H | H | X | X | X | H | L | H |

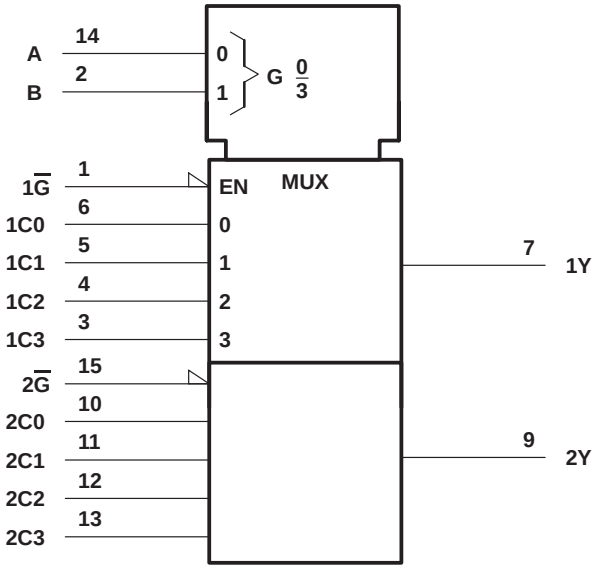
Select inputs A and B are common to both sections.

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.

Copyright © 1993, Texas Instruments Incorporated

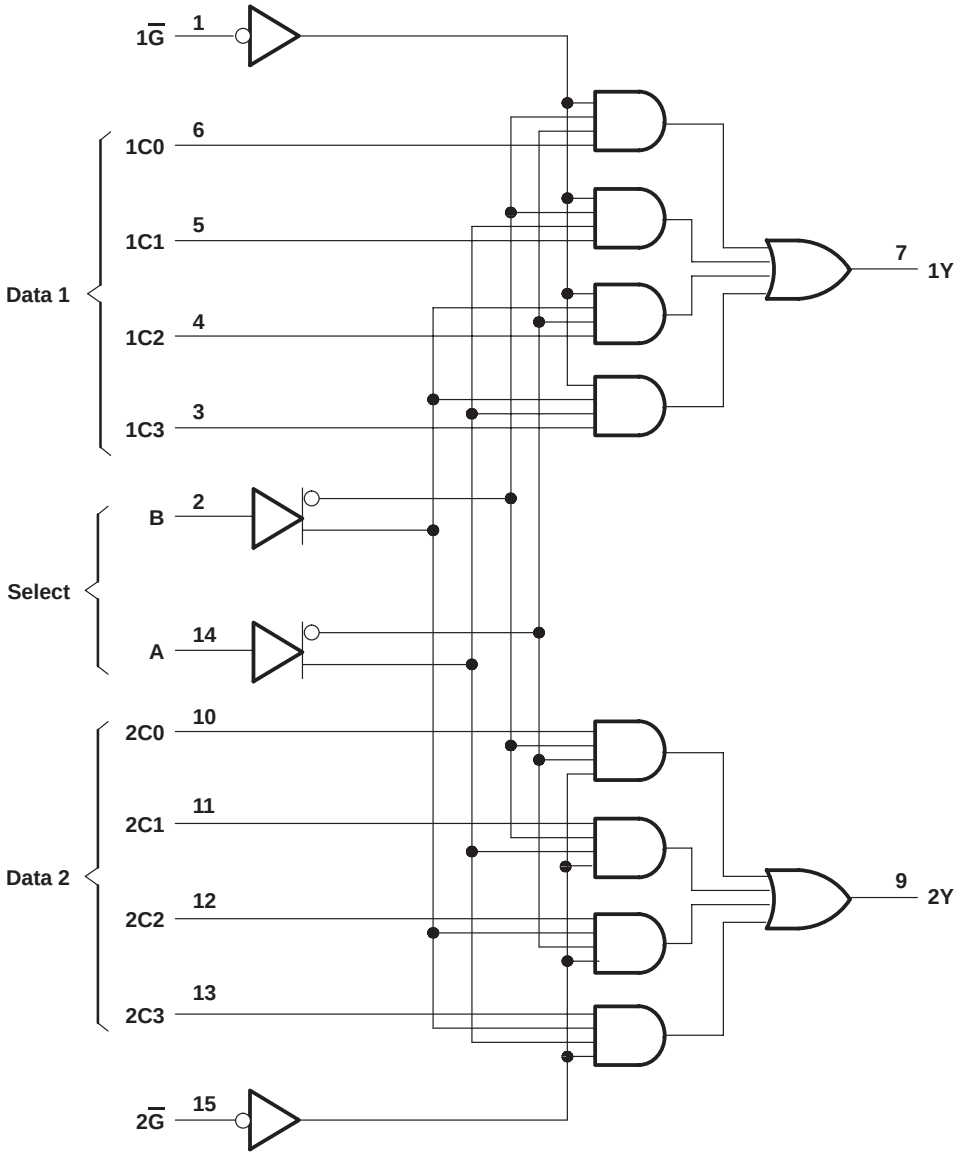
TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77251−1443

## logic symbol†




† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D, J, and N packages.

## logic diagram (positive logic)




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

### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, $V_{CC}$ . . . . . −0.5 V to 7 V
Input voltage range (see Note 1) . . . . . −1.2 V to 7 V
Input current range . . . . . −30 mA to 5 mA
Voltage range applied to any output in the high state . . . . . −0.5 V to $V_{CC}$
Current into any output in the low state . . . . . 40 mA
Operating free-air temperature range: SN54F153 . . . . . −55°C to 125°C
SN74F153 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

† 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.

NOTE 1: The input voltage rating may be exceeded provided that the input current rating is observed.

### recommended operating conditions

| | | SN54F153 | | | SN74F153 | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | 0.8 | | | 0.8 | V |
| $I_{IK}$ | Input clamp current | | | −18 | | | −18 | mA |
| $I_{OH}$ | High-level output current | | | − 1 | | | − 1 | mA |
| $I_{OL}$ | Low-level output current | | | 20 | | | 20 | mA |
| $T_A$ | Operating free-air temperature | −55 | | 125 | 0 | | 70 | °C |

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

| PARAMETER | TEST CONDITIONS | | SN54F153 | | | SN74F153 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V, | $I_{OH}$ = − 1 mA | 2.5 | 3.4 | | 2.5 | 3.4 | | V |
| | $V_{CC}$ = 4.75 V, | $I_{OH}$ = − 1 mA | | | | 2.7 | | | |
| $V_{OL}$ | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 20 mA | | 0.3 | 0.5 | | 0.3 | 0.5 | V |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | µA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.5 V | | | − 0.6 | | | − 0.6 | mA |
| $I_{OS}$§ | $V_{CC}$ = 5.5 V, | $V_O$ = 0 | −60 | | −150 | −60 | | −150 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0 | | 12 | 20 | | 12 | 20 | mA |

‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.

§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

## switching characteristics (see Note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = 25°C | | | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = MIN to MAX† | | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ′F153 | | | SN54F153 | | SN74F153 | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | A or B | Y | 3.7 | 7.7 | 10.5 | 3.7 | 14 | 3.7 | 12 | ns |
| $t_{PHL}$ | | | 2.7 | 6.6 | 9 | 2.7 | 11 | 2.7 | 10.5 | |
| $t_{PLH}$ | $\overline{G}$ | Y | 3.7 | 6.7 | 9 | 3.7 | 11.5 | 3.7 | 10.5 | ns |
| $t_{PHL}$ | | | 2.2 | 5.3 | 7 | 1.7 | 9 | 1.7 | 8 | |
| $t_{PLH}$ | C | Y | 2.2 | 4.9 | 7 | 1.7 | 9 | 2.2 | 8 | ns |
| $t_{PHL}$ | | | 2.2 | 4.7 | 6.5 | 1.7 | 8 | 1.7 | 7.5 | |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5962-9758301Q2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9758301Q2A SNJ54F 153FK | Samples |
| 5962-9758301QEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9758301QEA SNJ54F153J | Samples |
| 5962-9758301QFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9758301QFA SNJ54F153W | Samples |
| JM38510/33902B2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 33902B2A | Samples |
| JM38510/33902BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 33902BEA | Samples |
| JM38510/33902BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 33902BFA | Samples |
| M38510/33902B2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 33902B2A | Samples |
| M38510/33902BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 33902BEA | Samples |
| M38510/33902BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 33902BFA | Samples |
| SN54F153J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54F153J | Samples |
| SN74F153D | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | F153 | Samples |
| SN74F153DR | ACTIVE | SOIC | D | 16 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | F153 | Samples |
| SN74F153N | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74F153N | Samples |
| SN74F153NSR | ACTIVE | SO | NS | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74F153 | Samples |
| SNJ54F153FK | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9758301Q2A SNJ54F 153FK | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SNJ54F153J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9758301QE A SNJ54F153J | Samples |
| SNJ54F153W | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9758301QF A SNJ54F153W | Samples |

(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 SN54F153, SN74F153 :**

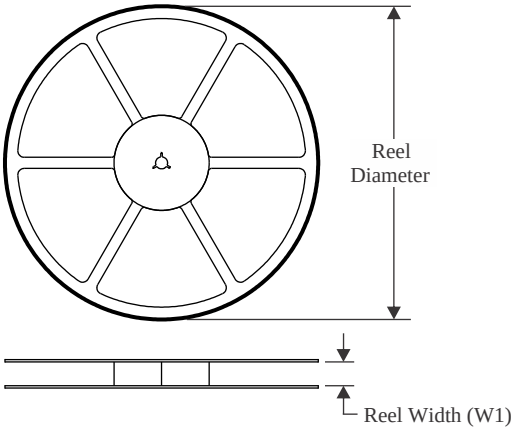
- Catalog : SN74F153
- Military : SN54F153

NOTE: Qualified Version Definitions:

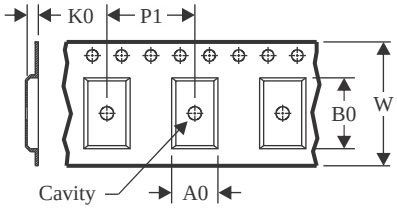
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

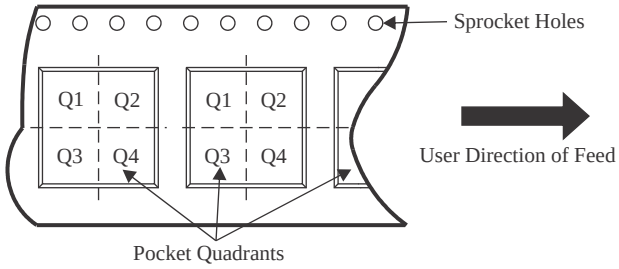



**TAPE DIMENSIONS**




| | |
|---|---|
| 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 |

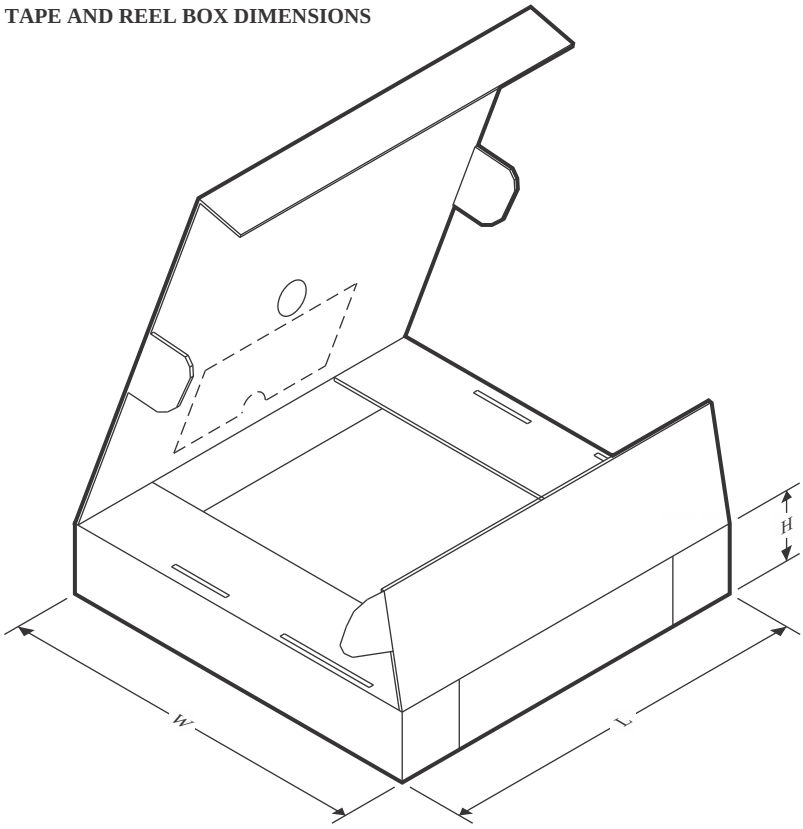
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74F153DR | SOIC | D | 16 | 2500 | 330.0 | 16.4 | 6.5 | 10.3 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74F153NSR | SO | NS | 16 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |

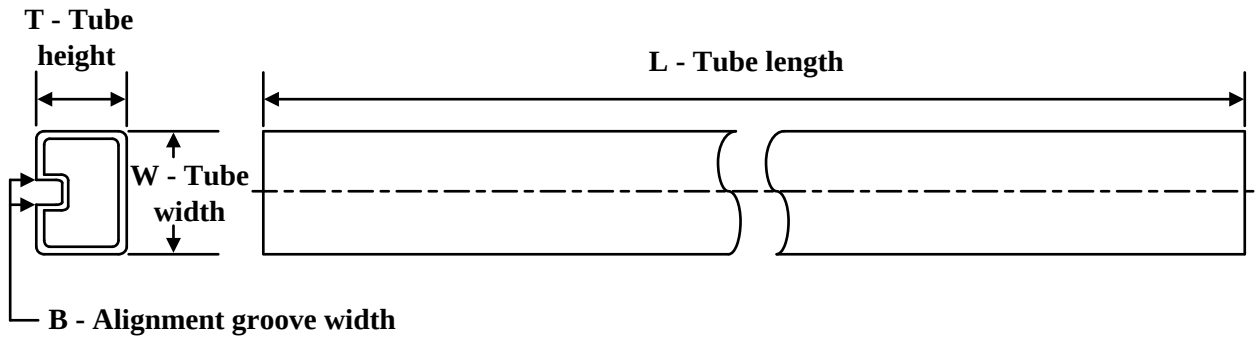
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| SN74F153DR | SOIC | D | 16 | 2500 | 340.5 | 336.1 | 32.0 |
| SN74F153NSR | SO | NS | 16 | 2000 | 356.0 | 356.0 | 35.0 |

## TUBE



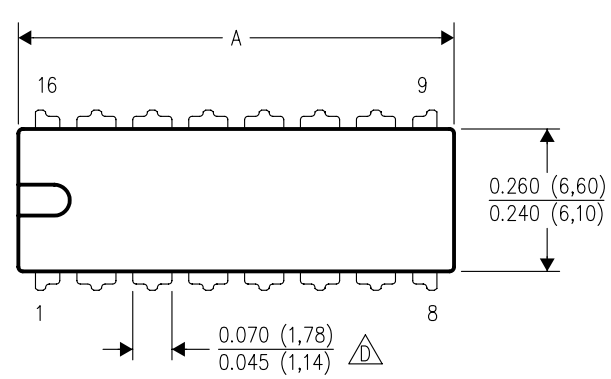

*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|---|---|---|---|---|---|---|---|---|
| 5962-9758301Q2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| 5962-9758301QFA | W | CFP | 16 | 1 | 506.98 | 26.16 | 6220 | NA |
| JM38510/33902B2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| JM38510/33902BFA | W | CFP | 16 | 1 | 506.98 | 26.16 | 6220 | NA |
| M38510/33902B2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| M38510/33902BFA | W | CFP | 16 | 1 | 506.98 | 26.16 | 6220 | NA |
| SN74F153D | D | SOIC | 16 | 40 | 507 | 8 | 3940 | 4.32 |
| SN74F153N | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74F153N | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SNJ54F153FK | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| SNJ54F153W | W | CFP | 16 | 1 | 506.98 | 26.16 | 6220 | NA |

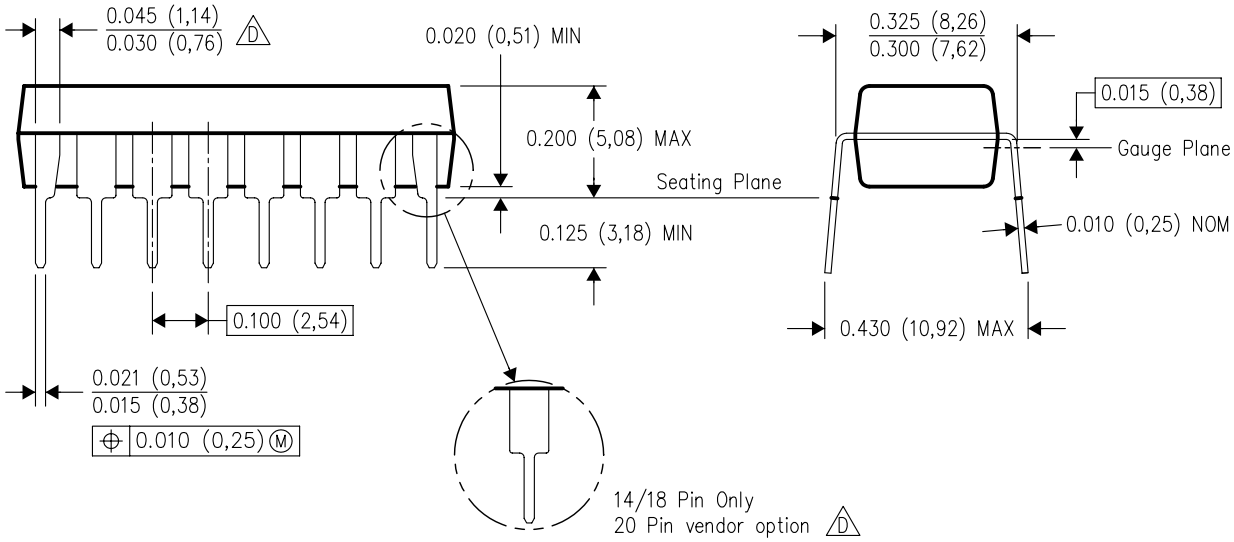
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

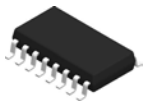



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |




4040049/E 12/2002

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

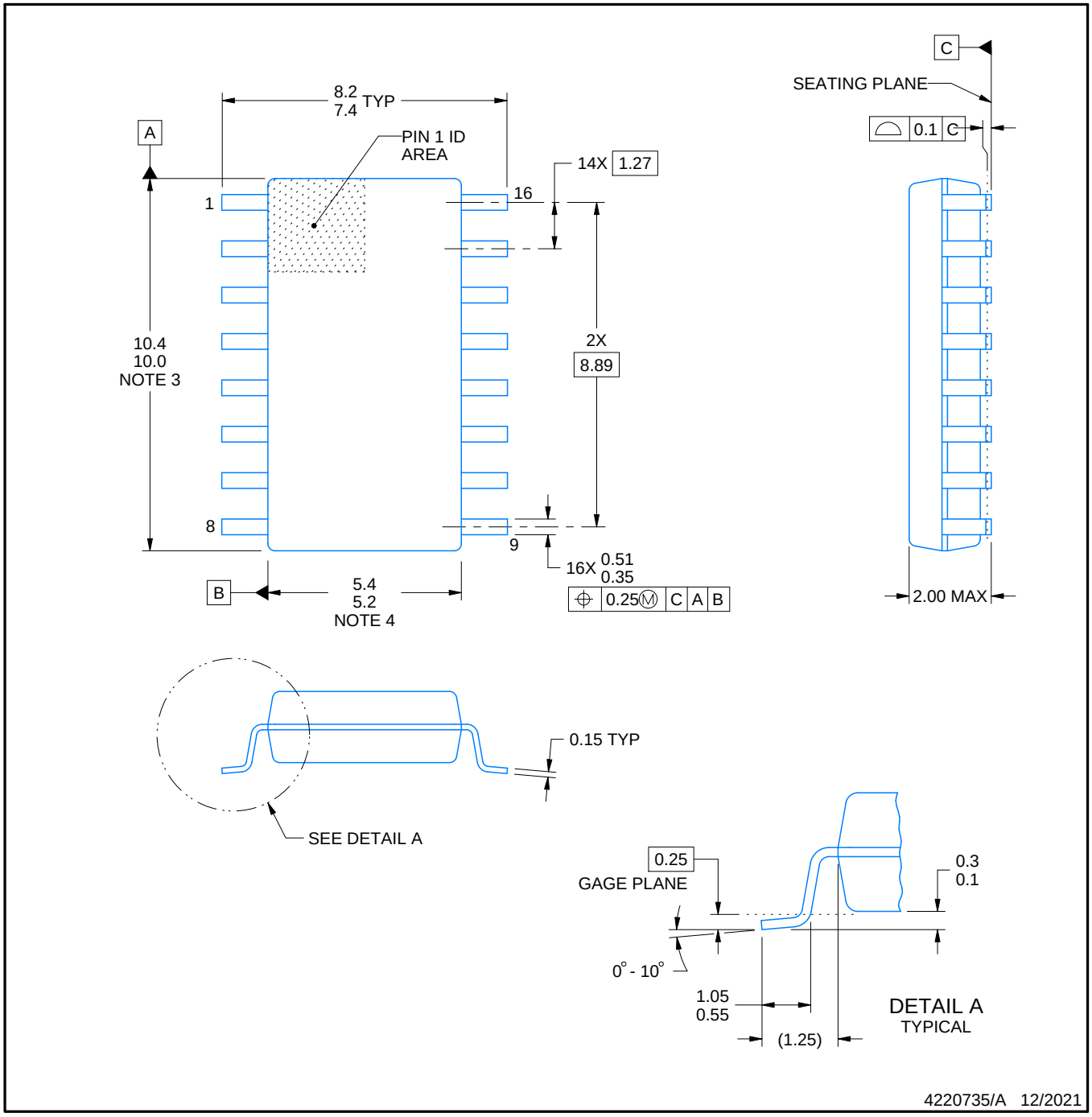


# PACKAGE OUTLINE

## NS0016A

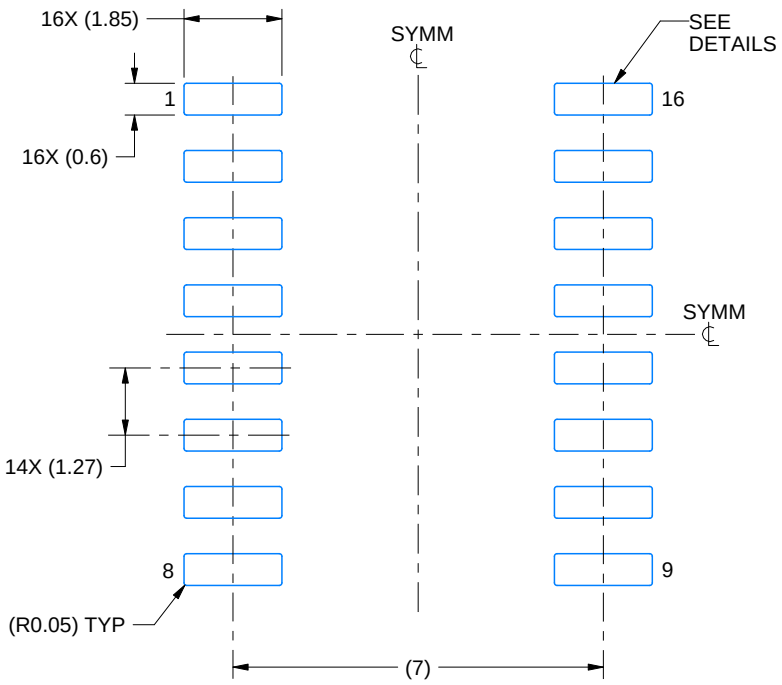
## SOP - 2.00 mm max height

SOP

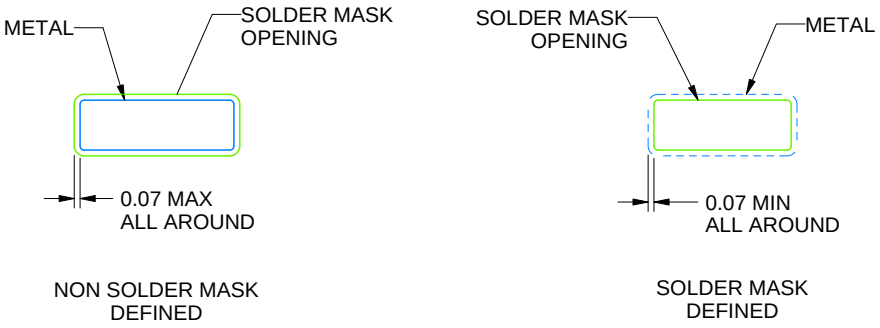



NOTES:

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.




LAND PATTERN EXAMPLE
SCALE:7X




NON SOLDER MASK
DEFINED

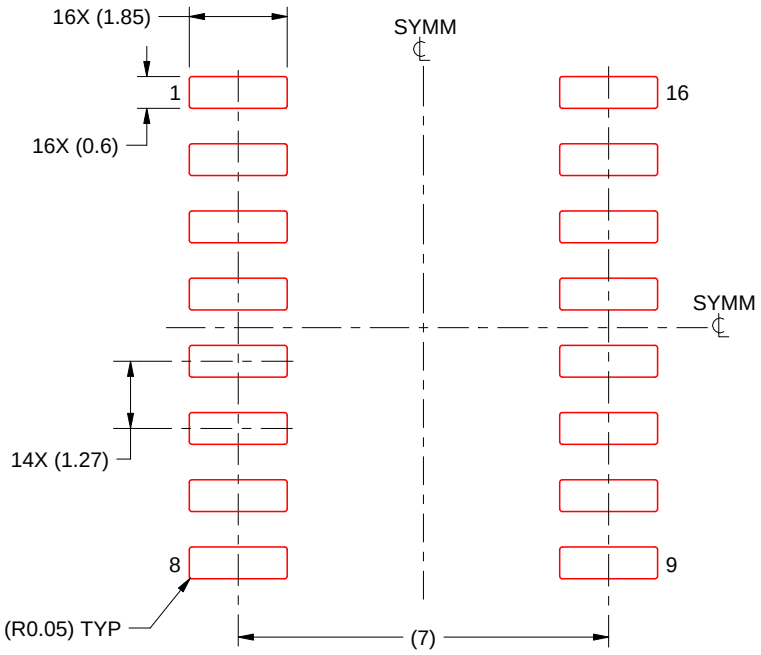
SOLDER MASK
DEFINED

SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

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




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

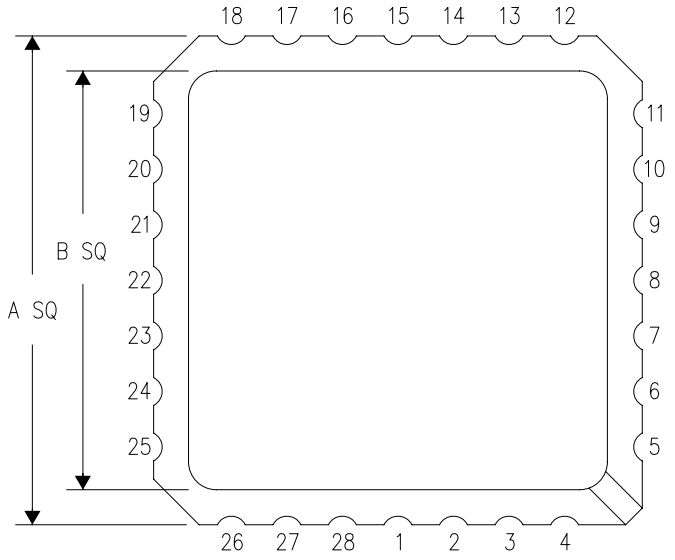
4220735/A 12/2021

NOTES: (continued)

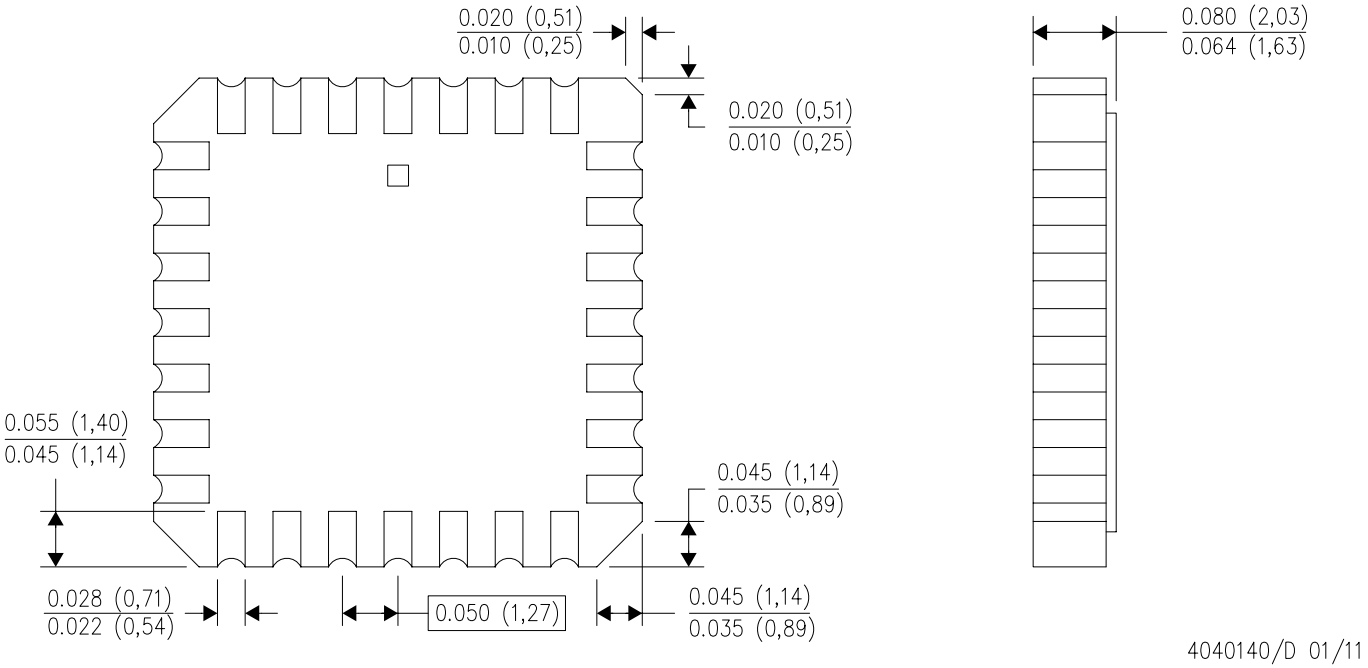
7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

FK (S–CQCC–N**) LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



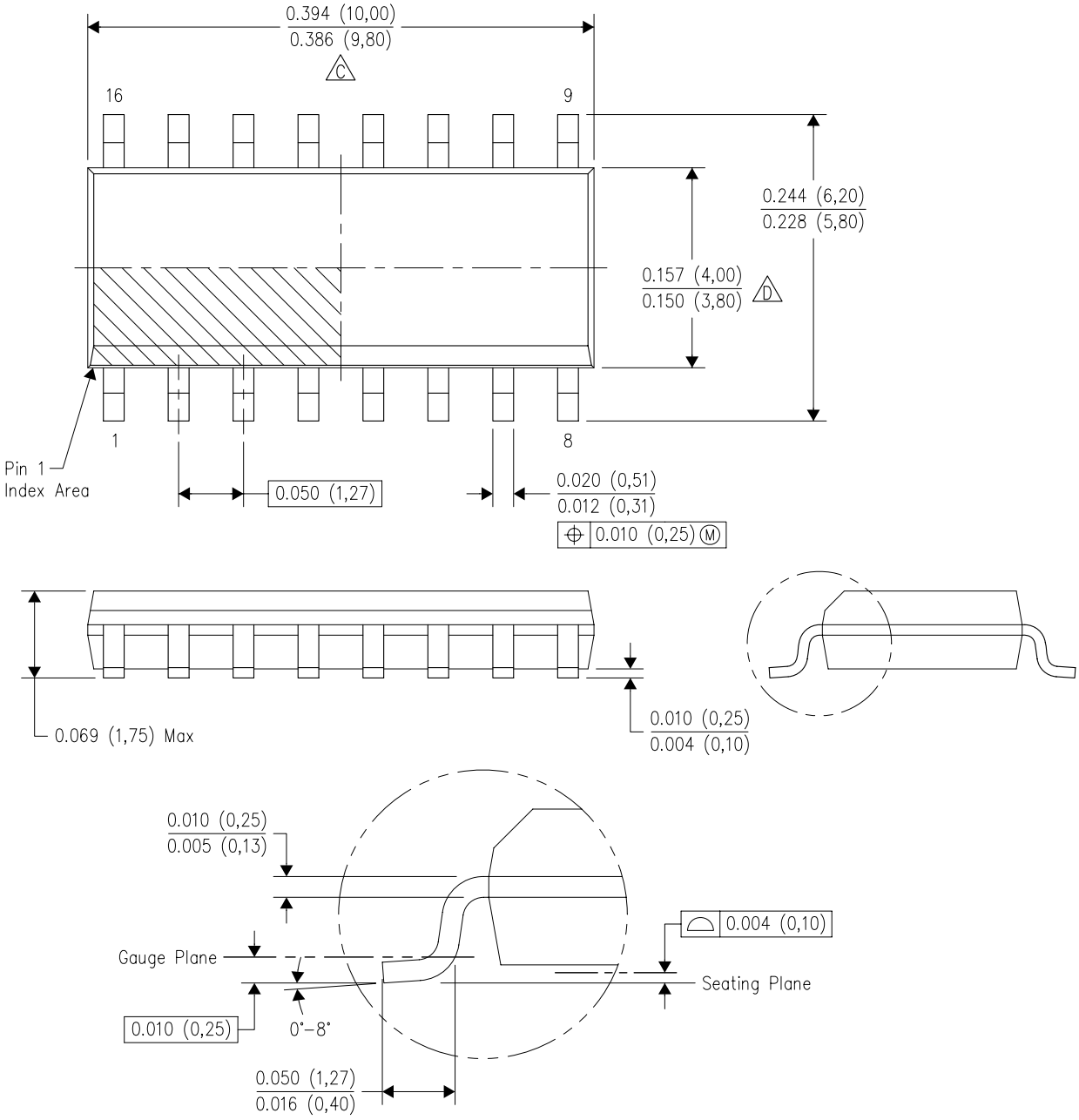

| NO. OF TERMINALS ** | A | | B | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 |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




4040140/D 01/11

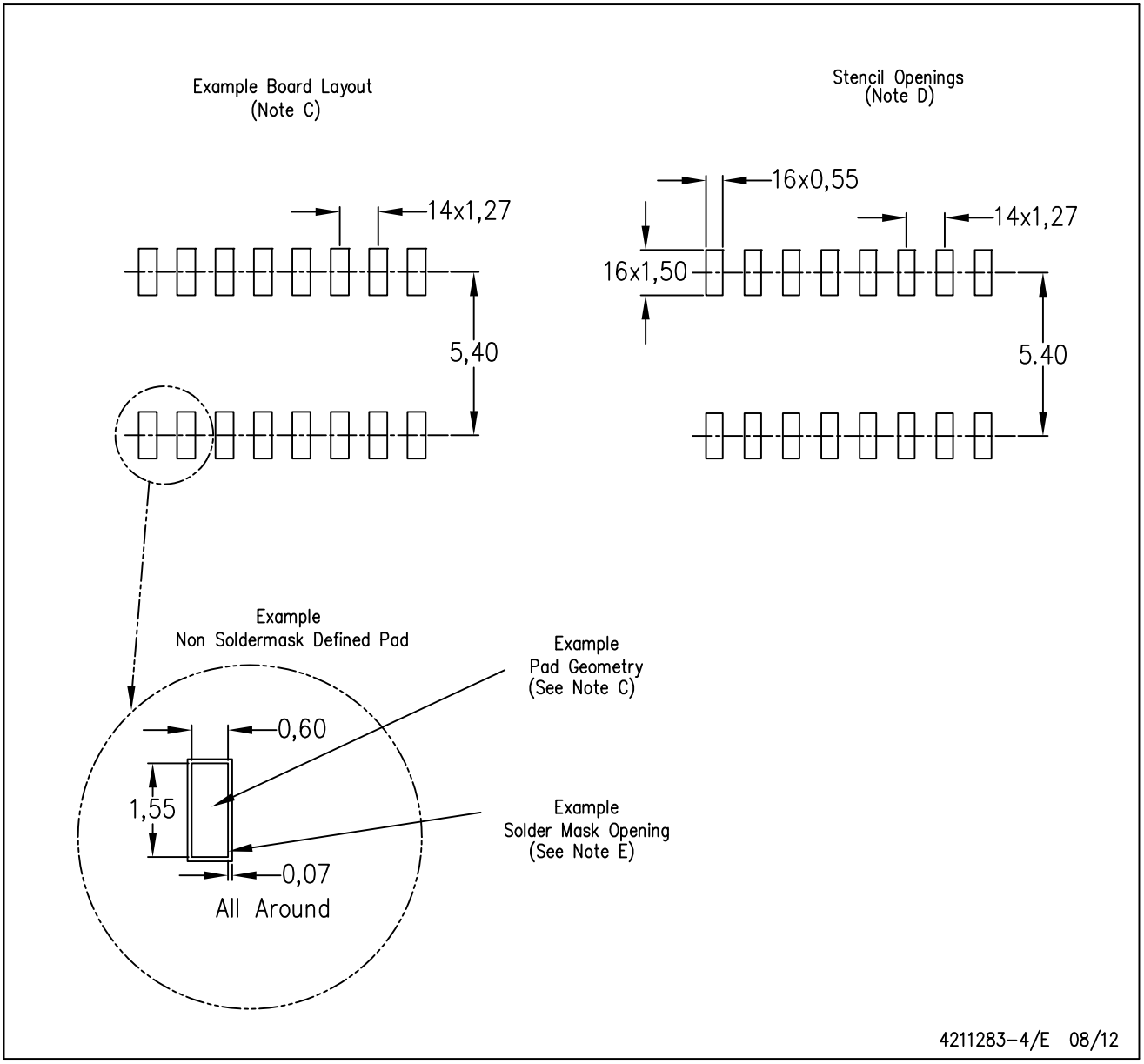
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a metal lid.
D. Falls within JEDEC MS–004

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.

D (R–PDSO–G16) PLASTIC SMALL OUTLINE

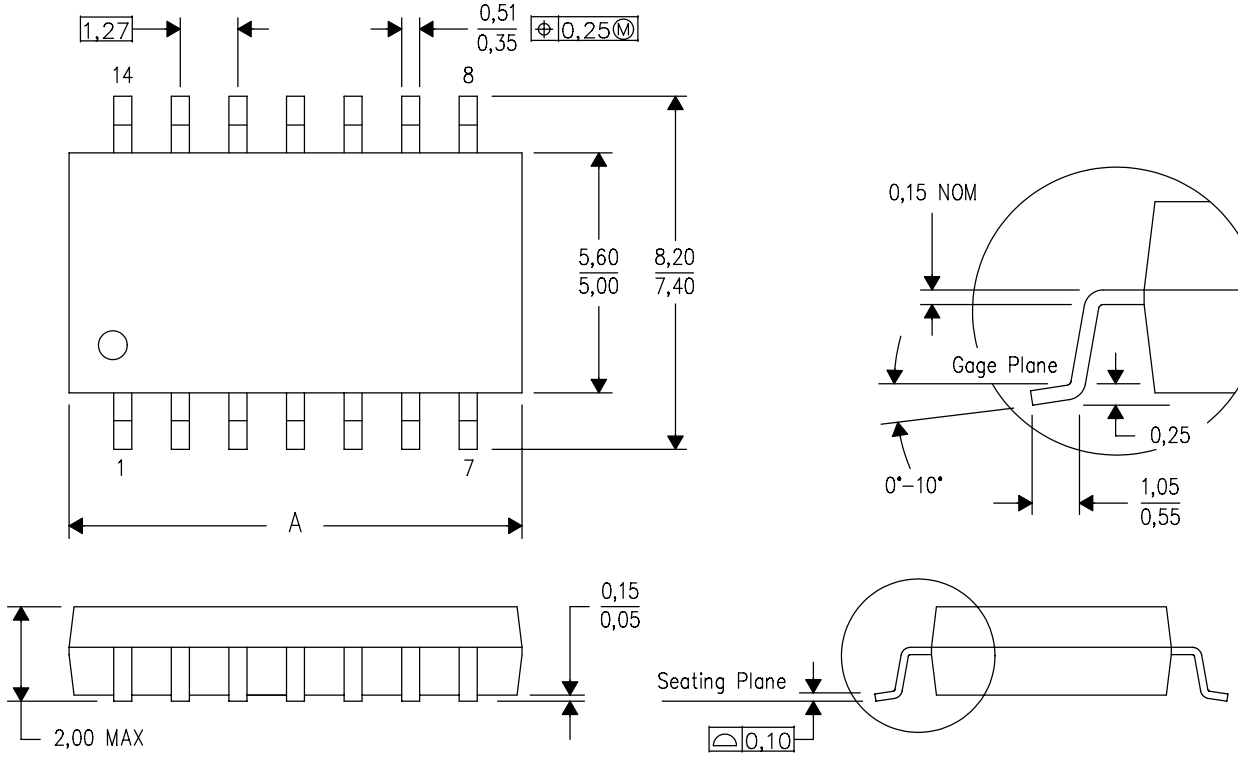



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact 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**

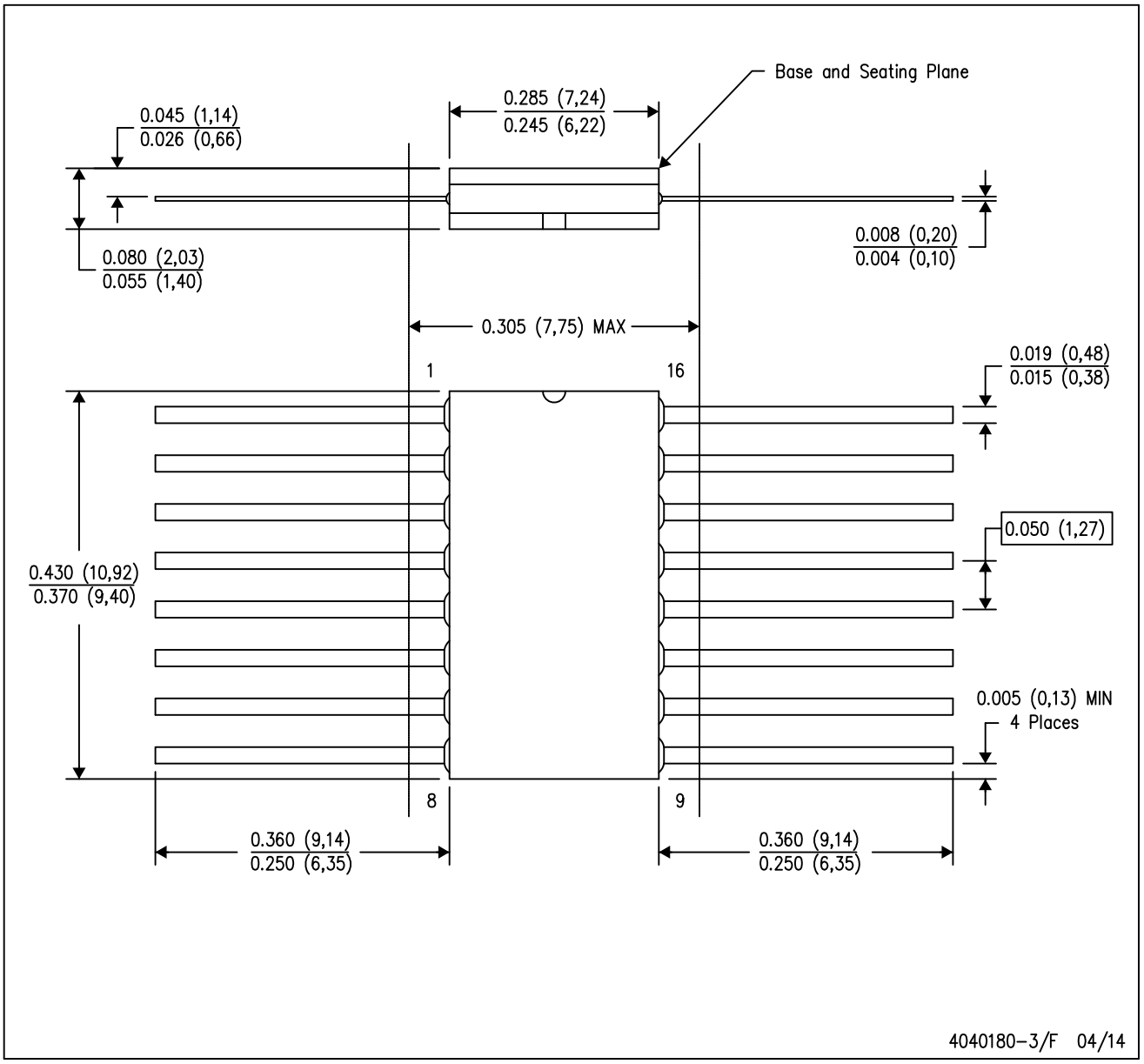



| DIM \ PINS ** | 14 | 16 | 20 | 24 |
|---|---|---|---|---|
| A MAX | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN | 9,90 | 9,90 | 12,30 | 14,70 |

4040062/C 03/03

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.

W (R–GDFP–F16) CERAMIC DUAL FLATPACK

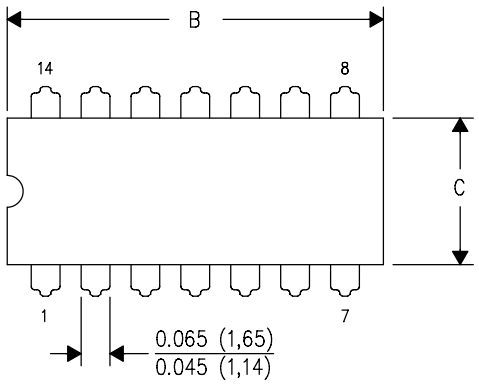



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP2–F16

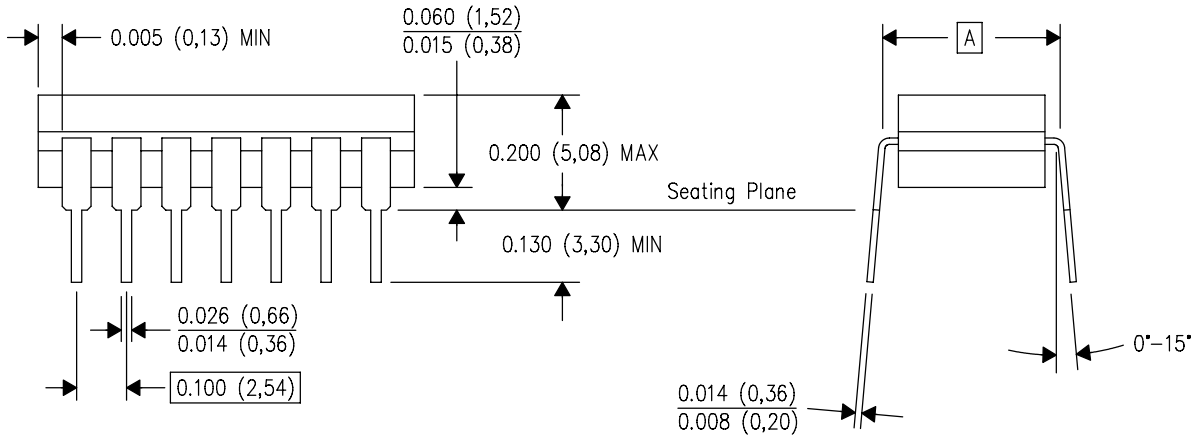
J (R–GDIP–T**)

14 LEADS SHOWN

# CERAMIC DUAL IN–LINE PACKAGE




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

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