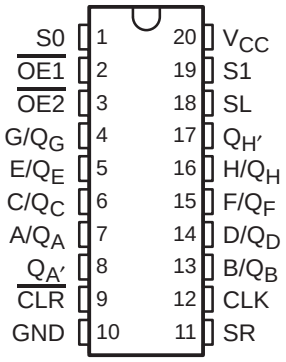
**The SN54F299 is obsolete and no longer supplied.**

# SN54F299, SN74F299
# 8-BIT UNIVERSAL SHIFT/STORAGE REGISTERS WITH 3-STATE OUTPUTS

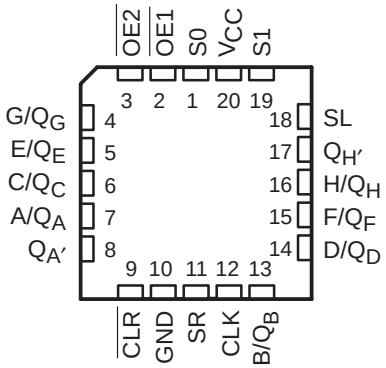
SDFS071B − MARCH 1987 − REVISED APRIL 2004

- **Four Modes of Operation:**
  - **Hold (Store)**
  - **Shift Right**
  - **Shift Left**
  - **Load Data**
- **Operates With Outputs Enabled or at High Impedance**
- **3-State Outputs Drive Bus Lines Directly**
- **Can Be Cascaded for N-Bit Word Lengths**
- **Direct Overriding Clear**
- **Applications:**
  - **Stacked or Pushdown Registers**
  - **Buffer Storage**
  - **Accumulator Registers**

**SN54F299 . . . J PACKAGE**
**SN74F299 . . . DW, N, OR NS PACKAGE**
**(TOP VIEW)**




**SN54F299 . . . FK PACKAGE**
**(TOP VIEW)**




## description/ordering information

These 8-bit universal shift/storage registers feature multiplexed I/O ports to achieve full 8-bit data handling in a single 20-pin package. Two function-select (S0, S1) inputs and two output-enable ($\overline{OE1}$, $\overline{OE2}$) inputs can be used to choose the modes of operation listed in the function table.

Synchronous parallel loading is accomplished by taking both S0 and S1 high. This places the 3-state outputs in a high-impedance state and permits data that is applied on the I/O ports to be clocked into the register. Reading out of the register can be accomplished while the outputs are enabled in any mode. Clearing occurs when the clear ($\overline{CLR}$) input is low. Taking either $\overline{OE1}$ or $\overline{OE2}$ high disables the outputs but has no effect on clearing, shifting, or storage of data.

**ORDERING INFORMATION**

| $T_A$ | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---|---|---|---|---|
| 0°C to 70°C | PDIP − N | Tube of 20 | SN74F299N | SN74F299N |
| | SOIC − DW | Tube of 25 | SN74F299DW | F299 |
| | | Reel of 2000 | SN74F299DWR | |
| | SOP − NS | Reel of 2000 | SN74F299NSR | 74F299 |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

**The SN54F299 is obsolete and no longer supplied.**

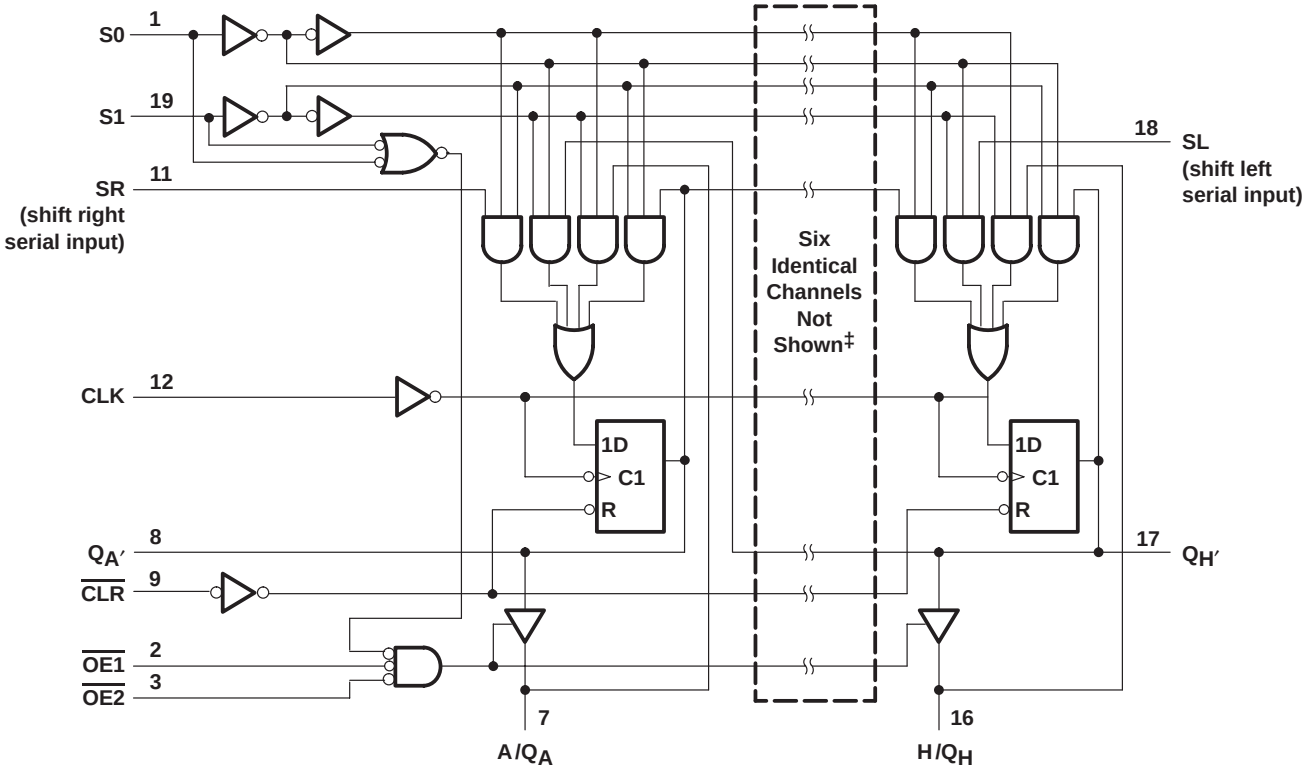
**FUNCTION TABLE**

| MODE | INPUTS | | | | | | | | I/O PORTS | | | | | | | | OUTPUTS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\overline{CLR}$ | S1 | S0 | $\overline{OE1}$† | $\overline{OE2}$† | CLK | SL | SR | A/$Q_A$ | B/$Q_B$ | C/$Q_C$ | D/$Q_D$ | E/$Q_E$ | F/$Q_F$ | G/$Q_G$ | H/$Q_H$ | $Q_{A'}$ | $Q_{H'}$ |
| Clear | L | X | L | L | L | X | X | X | L | L | L | L | L | L | L | L | L | L |
| | L | L | X | L | L | X | X | X | L | L | L | L | L | L | L | L | L | L |
| | L | H | H | X | X | X | X | X | X | X | X | X | X | X | X | X | L | L |
| Hold | H | L | L | L | L | X | X | X | $Q_{A0}$ | $Q_{B0}$ | $Q_{C0}$ | $Q_{D0}$ | $Q_{E0}$ | $Q_{F0}$ | $Q_{G0}$ | $Q_{H0}$ | $Q_{A0}$ | $Q_{H0}$ |
| | H | X | X | L | L | L | X | X | $Q_{A0}$ | $Q_{B0}$ | $Q_{C0}$ | $Q_{D0}$ | $Q_{E0}$ | $Q_{F0}$ | $Q_{G0}$ | $Q_{H0}$ | $Q_{A0}$ | $Q_{H0}$ |
| Shift Right | H | L | H | L | L | ↑ | X | H | H | $Q_{An}$ | $Q_{Bn}$ | $Q_{Cn}$ | $Q_{Dn}$ | $Q_{En}$ | $Q_{Fn}$ | $Q_{Gn}$ | H | $Q_{Gn}$ |
| | H | L | H | L | L | ↑ | X | L | L | $Q_{An}$ | $Q_{Bn}$ | $Q_{Cn}$ | $Q_{Dn}$ | $Q_{En}$ | $Q_{Fn}$ | $Q_{Gn}$ | L | $Q_{Gn}$ |
| Shift Left | H | H | L | L | L | ↑ | H | X | $Q_{Bn}$ | $Q_{Cn}$ | $Q_{Dn}$ | $Q_{En}$ | $Q_{Fn}$ | $Q_{Gn}$ | $Q_{Hn}$ | H | $Q_{Bn}$ | H |
| | H | H | L | L | L | ↑ | L | X | $Q_{Bn}$ | $Q_{Cn}$ | $Q_{Dn}$ | $Q_{En}$ | $Q_{Fn}$ | $Q_{Gn}$ | $Q_{Hn}$ | L | $Q_{Bn}$ | L |
| Load | H | H | H | X | X | ↑ | X | X | a | b | c | d | e | f | g | h | a | h |

NOTE: a . . . h = the level of the steady-state input at inputs A through H, respectively. This data is loaded into the flip-flops while the flip-flop outputs are isolated from the I/O terminals.

† When one or both output-enable inputs are high, the eight I/O terminals are disabled to the high-impedance state; however, sequential operation or clearing of the register is not affected.

## logic diagram (positive logic)




‡ I/O ports not shown: B/$Q_B$ (13), C/$Q_C$ (6), D/$Q_D$ (14), E/$Q_E$ (5), F/$Q_F$ (15), and G/$Q_G$ (4).

### 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, $V_I$ (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 disabled or power-off state . . . . . −0.5 V to 5.5 V
Voltage range applied to any output in the high state . . . . . −0.5 V to $V_{CC}$
Current into any output in the low state: $Q_{A'}$ or $Q_{H'}$ . . . . . 40 mA
SN54F299 ($Q_A$ thru $Q_H$) . . . . . 40 mA
SN74F299 ($Q_A$ thru $Q_H$) . . . . . 48 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DW package . . . . . 58°C/W
N package . . . . . 69°C/W
NS package . . . . . 60°C/W
Storage temperature range, $T_{stg}$ . . . . . −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.

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

### recommended operating conditions (see Note 3)

| | | | SN54F299 | | | SN74F299 | | | 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 | $Q_{A'}$ or $Q_{H'}$ | | | −1 | | | −1 | mA |
| | | $Q_A$ thru $Q_H$ | | | −3 | | | −3 | |
| $I_{OL}$ | Low-level output current | $Q_{A'}$ or $Q_{H'}$ | | | 20 | | | 20 | mA |
| | | $Q_A$ thru $Q_H$ | | | 20 | | | 24 | |
| $T_A$ | Operating free-air temperature | | −55 | | 125 | 0 | | 70 | °C |

NOTE 3: All unused inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

**The SN54F299 is obsolete and no longer supplied.**

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

| PARAMETER | | TEST CONDITIONS | | SN54F299 | | | SN74F299 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| $V_{IK}$ | | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | $Q_{A'}$ or $Q_{H'}$ | $V_{CC}$ = 4.5 V | $I_{OH}$ = − 1 mA | 2.5 | 3.4 | | 2.5 | 3.4 | | V |
| | $Q_A$ thru $Q_H$ | | $I_{OH}$ = − 1 mA | 2.5 | 3.4 | | 2.5 | 3.4 | | |
| | | | $I_{OH}$ = − 3 mA | 2.4 | 3.3 | | 2.4 | 3.3 | | |
| | Any output | $V_{CC}$ = 4.75 V, | $I_{OH}$ = − 1 mA to −3 mA | | | | 2.7 | | | |
| $V_{OL}$ | $Q_{A'}$ or $Q_{H'}$ | $V_{CC}$ = 4.5 V | $I_{OL}$ = 20 mA | | 0.3 | 0.5 | | 0.3 | 0.5 | V |
| | $Q_A$ thru $Q_H$ | | $I_{OL}$ = 20 mA | | 0.3 | 0.5 | | | | |
| | | | $I_{OL}$ = 24 mA | | | | | 0.35 | 0.5 | |
| $I_I$ | A thru H | $V_{CC}$ = 5.5 V | $V_I$ = 5.5 V | | | 1 | | | 1 | mA |
| | Any other | | $V_I$ = 7 V | | | 0.1 | | | 0.1 | |
| $I_{IH}$‡ | A thru H | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 70 | | | 70 | µA |
| | Any other | | | | | 20 | | | 20 | |
| $I_{IL}$‡ | A thru H | $V_{CC}$ = 5.5 V, | $V_I$ = 0.5 V | | | −0.65 | | | −0.65 | mA |
| | S0 or S1 | | | | | −1.2 | | | −1.2 | |
| | Any other | | | | | −0.6 | | | −0.6 | |
| $I_{OS}$§ | | $V_{CC}$ = 5.5 V, | $V_O$ = 0 | −60 | | −150 | −60 | | −150 | mA |
| $I_{CC}$ | | $V_{CC}$ = 5.5 V, | See Note 4 | | 68 | 95 | | 68 | 95 | mA |

† All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡ For I/O ports ($Q_A$ thru $Q_H$), the parameters $I_{IH}$ and $I_{IL}$ include the off-state output current.
§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.
NOTE 4: $I_{CC}$ is measured with $\overline{OE1}$, $\overline{OE2}$, and CLK at 4.5 V.

## timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

| | | | | $V_{CC}$ = 5 V, $T_A$ = 25°C ′F299 | | SN54F299 | | SN74F299 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | MAX | MIN | MAX | MIN | MAX | |
| $f_{clock}$ | Clock frequency | | | | 70 | | 65 | | 70 | MHz |
| $t_w$ | Pulse duration | CLK high or low | | 7 | | 8 | | 7 | | ns |
| | | $\overline{CLR}$ low | | 7 | | 8 | | 7 | | |
| $t_{su}$ | Setup time before CLK↑ | S0 or S1 | High or low | 8.5 | | 9.5 | | 8.5 | | ns |
| | | A/$Q_A$ thru H/$Q_H$, SR, or SL | High or low | 5.5 | | 6.5 | | 5.5 | | |
| | Inactive-state setup time before CLK↑¶ | $\overline{CLR}$ | High | 7 | | 13 | | 7 | | |
| $t_h$ | Hold time after CLK↑ | S0 or S1 | High or low | 0 | | 0 | | 0 | | ns |
| | | A/$Q_A$ thru H/$Q_H$, SR, or SL | High or low | 2 | | 2 | | 2 | | |

¶ Inactive-state setup time also is referred to as recovery time.

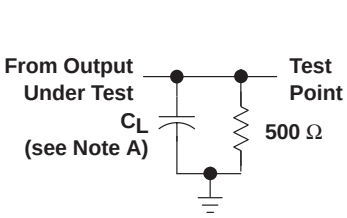
## switching characteristics (see Figure 1)

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ′F299 | | | SN54F299 | | SN74F299 | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $f_{max}$ | | | 70 | 100 | | 65 | | 70 | | MHz |
| $t_{PLH}$ | CLK | $Q_{A'}$ or $Q_{H'}$ | 3.2 | 6.6 | 9 | 2.7 | 10.5 | 3.2 | 10 | ns |
| $t_{PHL}$ | | | 2.7 | 6.1 | 8.5 | 2.2 | 10 | 2.7 | 9.5 | |
| $t_{PLH}$ | CLK | $Q_A$ thru $Q_H$ | 3.2 | 6.6 | 9 | 2.7 | 11 | 3.2 | 10 | ns |
| $t_{PHL}$ | | | 4.2 | 8.1 | 11 | 3.7 | 12.5 | 4.2 | 12 | |
| $t_{PHL}$ | $\overline{CLR}$ | $Q_{A'}$ or $Q_{H'}$ | 3.7 | 7.1 | 9.5 | 3.2 | 11.5 | 3.7 | 10.5 | ns |
| | | $Q_A$ thru $Q_H$ | 5.7 | 10.6 | 14 | 5 | 15.5 | 5.7 | 15 | |
| $t_{PZH}$ | $\overline{OE1}$ or $\overline{OE2}$ | $Q_A$ thru $Q_H$ | 2.7 | 5.6 | 8 | 2.2 | 10.5 | 2.7 | 9 | ns |
| $t_{PZL}$ | | | 3.2 | 6.6 | 10 | 2.7 | 12 | 3.2 | 11 | |
| $t_{PHZ}$ | $\overline{OE1}$ or $\overline{OE2}$ | $Q_A$ thru $Q_H$ | 1.7 | 4.1 | 6 | 1.7 | 9 | 1.7 | 7 | ns |
| $t_{PLZ}$ | | | 1.2 | 3.6 | 5.5 | 1.2 | 7.5 | 1.2 | 6.5 | |

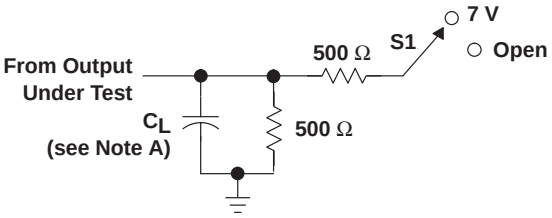
† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

**The SN54F299 is obsolete and no longer supplied.**

## PARAMETER MEASUREMENT INFORMATION

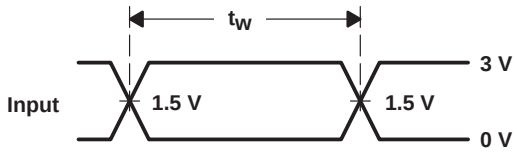



LOAD CIRCUIT FOR
TOTEM-POLE OUTPUTS

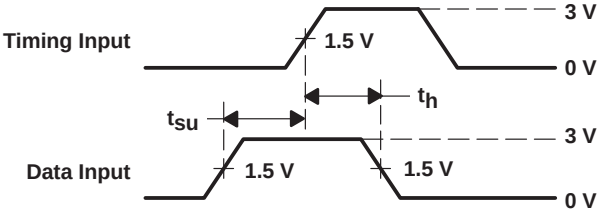



LOAD CIRCUIT FOR
3-STATE AND OPEN-DRAIN OUTPUTS

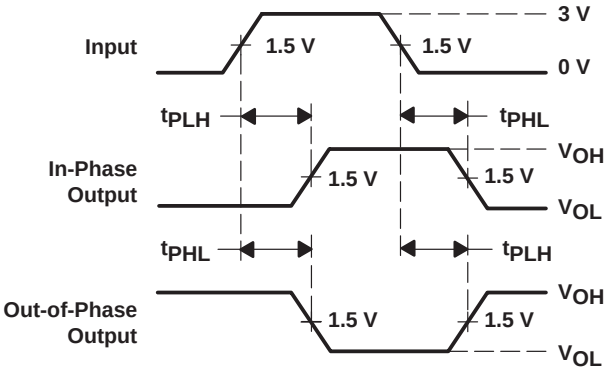
| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | 7 V |
| $t_{PHZ}/t_{PZH}$ | Open |
| Open Collector | 7 V |



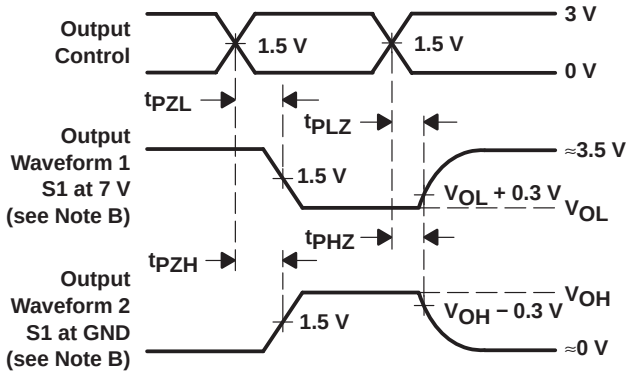

VOLTAGE WAVEFORMS
PULSE DURATION




VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES




VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS




VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES: A. $C_L$ includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O$ = 50 Ω, $t_r$ ≤ 2.5 ns, $t_f$ ≤ 2.5 ns, duty cycle = 50%.
D. The outputs are measured one at a time, with one input transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

## PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package \| Pins | Package qty \| Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|---|---|---|---|---|---|---|---|---|---|
| SN74F299DW | Obsolete | Production | SOIC (DW) \| 20 | - | - | Call TI | Call TI | 0 to 70 | F299 |
| SN74F299DWR | Active | Production | SOIC (DW) \| 20 | 2000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | F299 |
| SN74F299DWR.A | Active | Production | SOIC (DW) \| 20 | 2000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | F299 |
| SN74F299N | Active | Production | PDIP (N) \| 20 | 20 \| TUBE | Yes | NIPDAU | N/A for Pkg Type | 0 to 70 | SN74F299N |
| SN74F299N.A | Active | Production | PDIP (N) \| 20 | 20 \| TUBE | Yes | NIPDAU | N/A for Pkg Type | 0 to 70 | SN74F299N |
| SN74F299NS.A | Active | Production | SOP (NS) \| 20 | 40 \| TUBE | Yes | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74F299 |

(1) **Status:** For more details on status, see our product life cycle.

(2) **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.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **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.

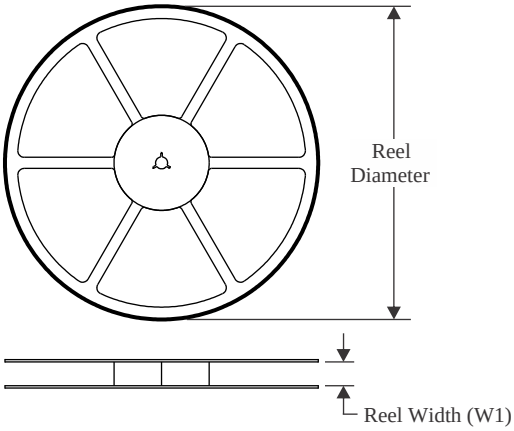
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will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

(6) **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.

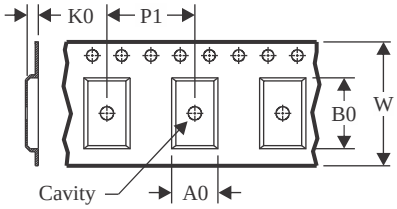
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

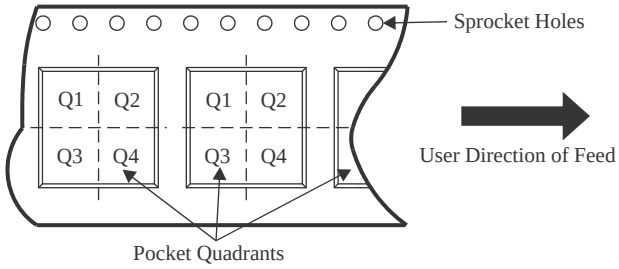



**TAPE DIMENSIONS**




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

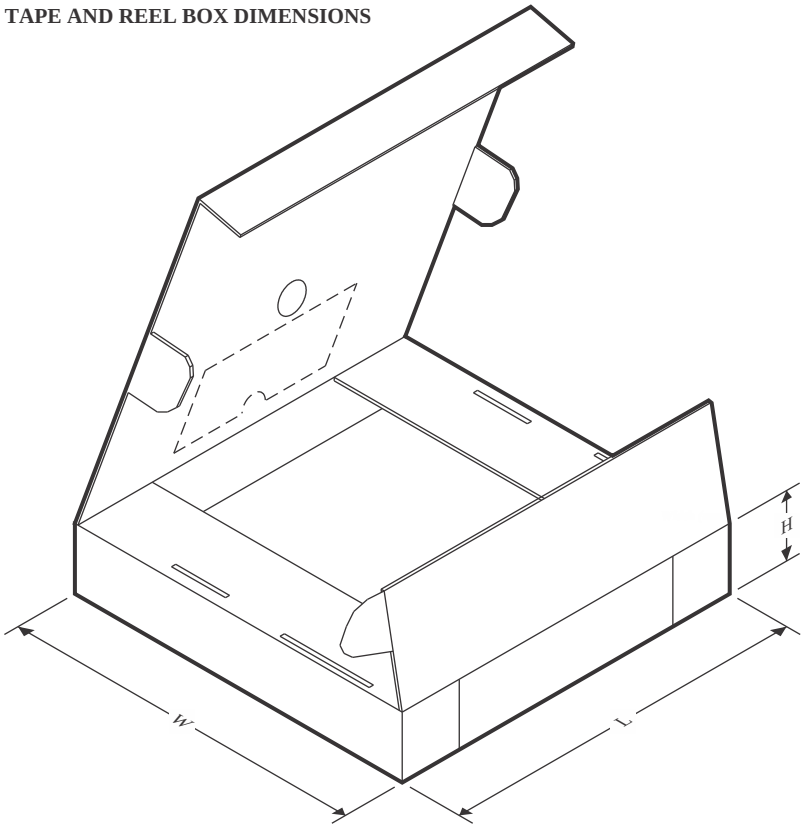
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74F299DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.3 | 2.7 | 12.0 | 24.0 | Q1 |

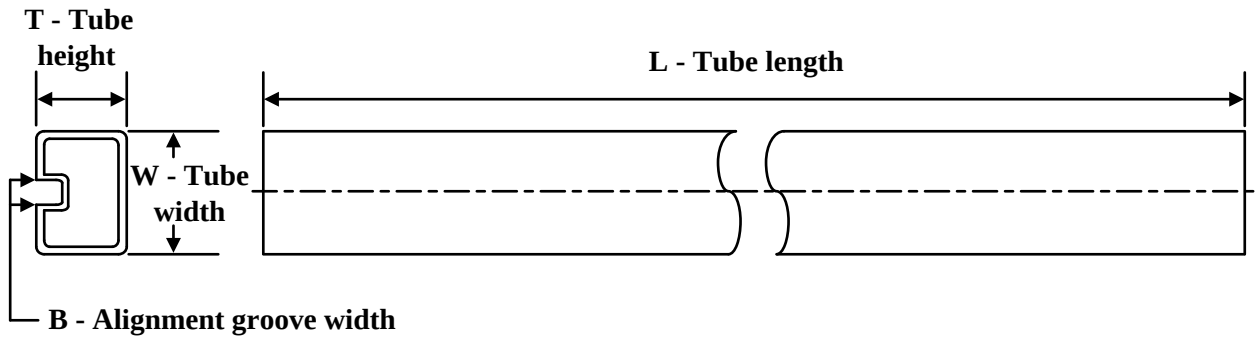
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| SN74F299DWR | SOIC | DW | 20 | 2000 | 356.0 | 356.0 | 45.0 |

## TUBE



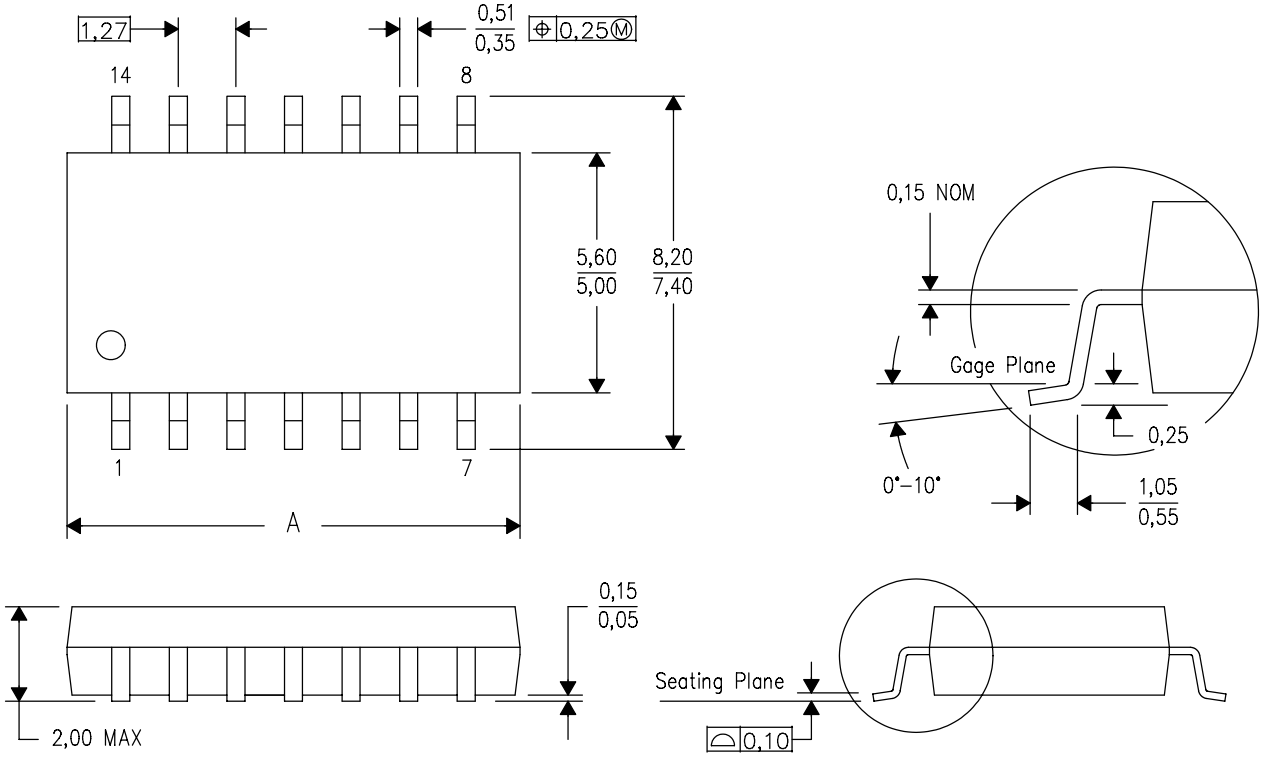

*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|---|---|---|---|---|---|---|---|---|
| SN74F299N | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |
| SN74F299N.A | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |
| SN74F299NS.A | NS | SOP | 20 | 40 | 530 | 10.5 | 4000 | 4.1 |

## 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 |

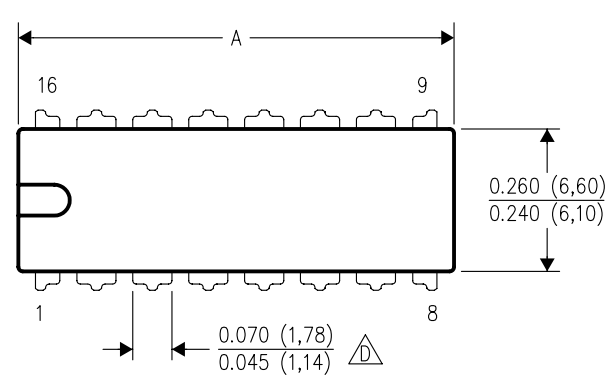
4040062/C 03/03

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.

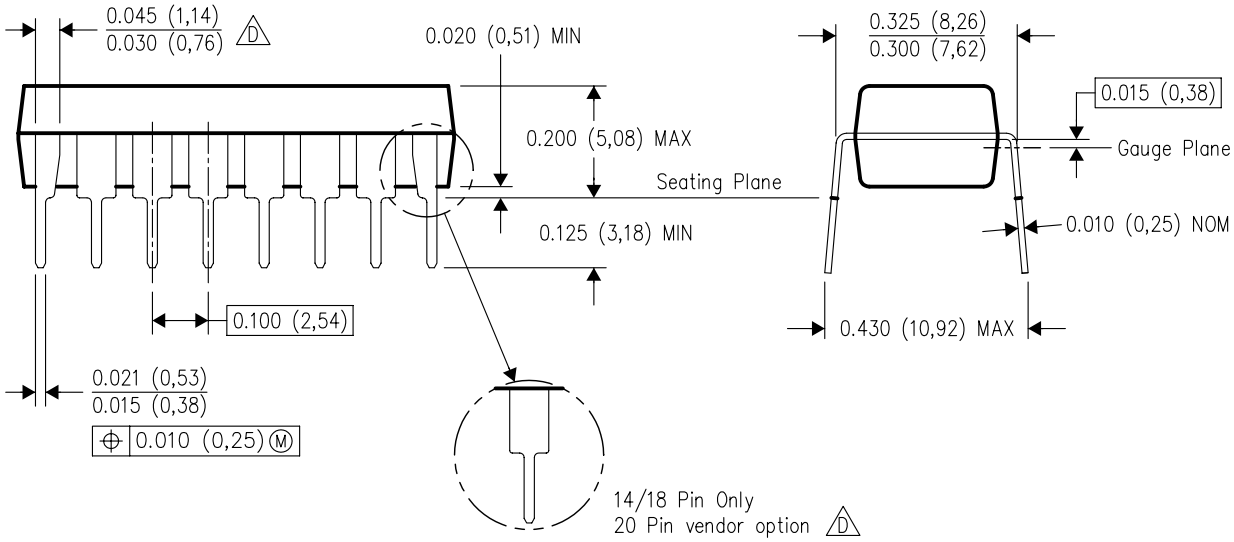
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

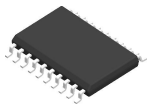



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |




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.

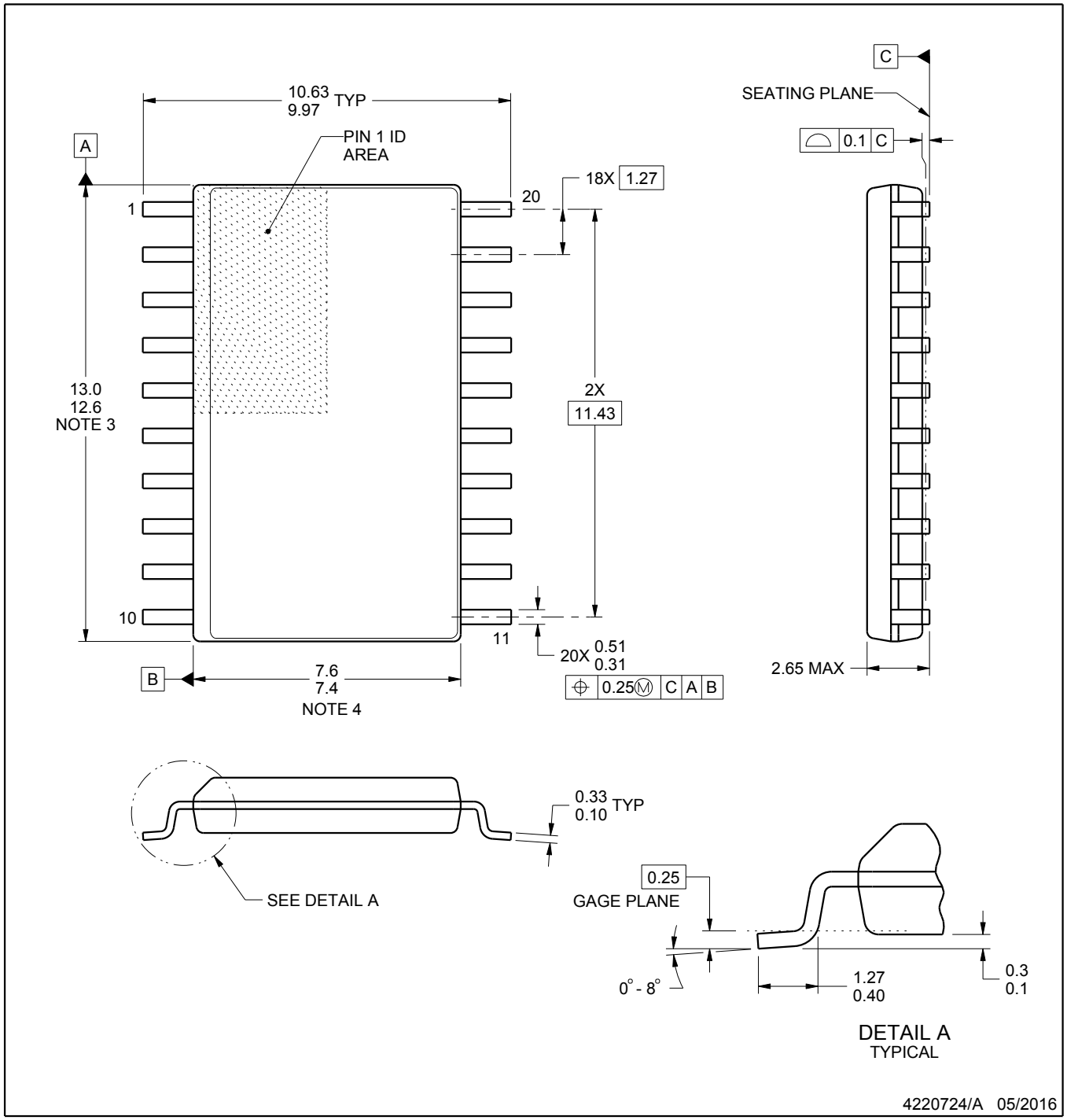


# PACKAGE OUTLINE

## DW0020A

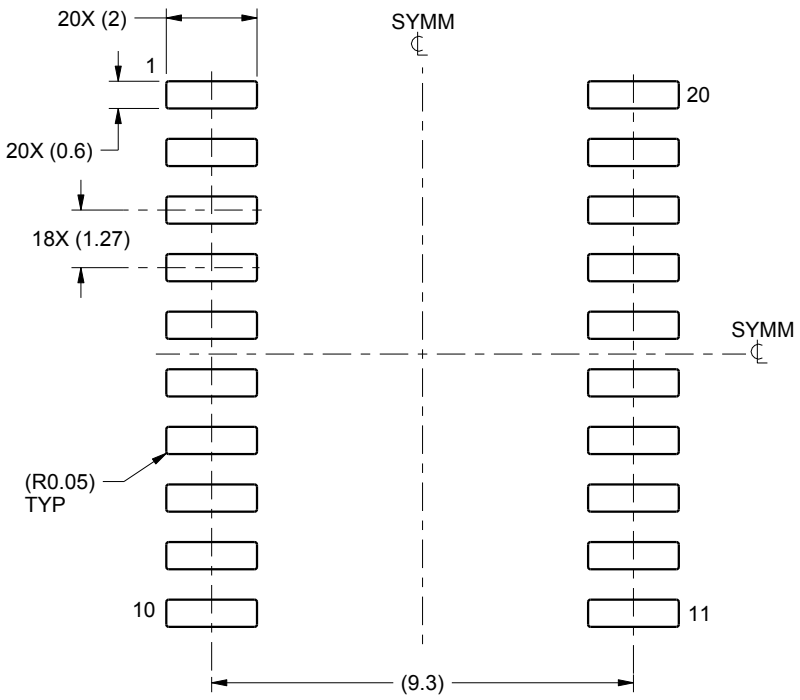
## SOIC - 2.65 mm max height

SOIC

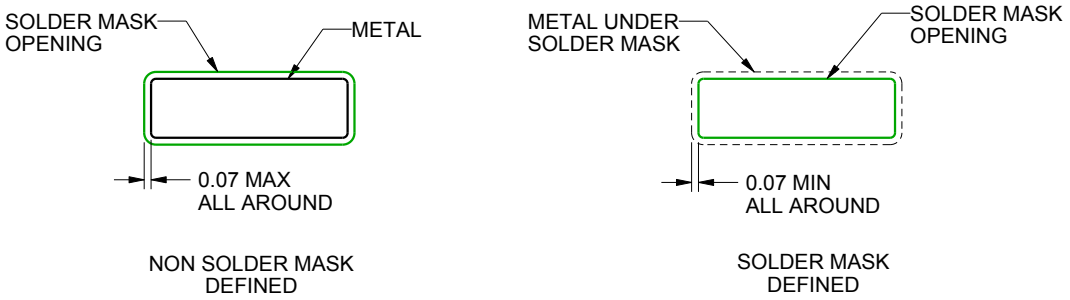



NOTES:

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 0.43 mm per side.
5. Reference JEDEC registration MS-013.




LAND PATTERN EXAMPLE
SCALE:6X

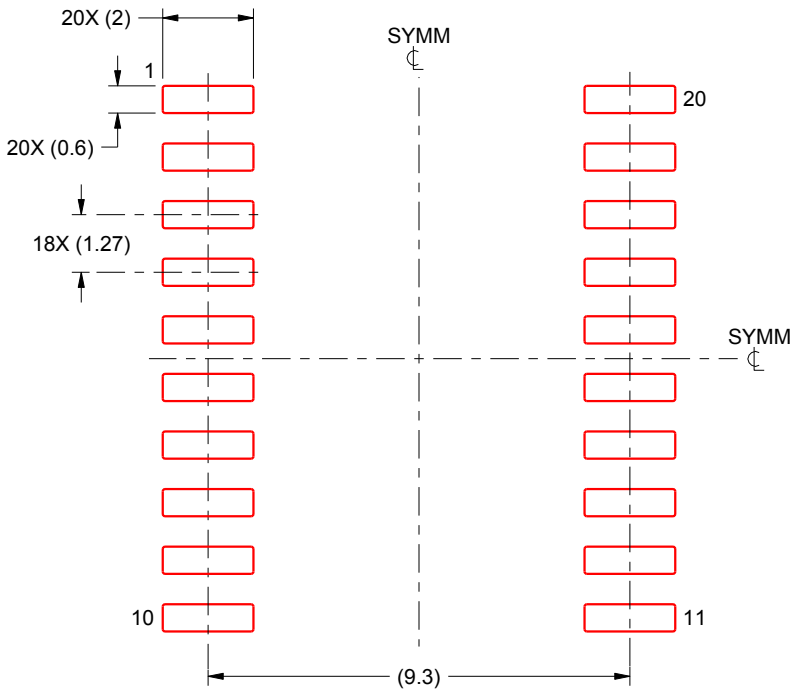



SOLDER MASK DETAILS

4220724/A 05/2016

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.




SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

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.

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