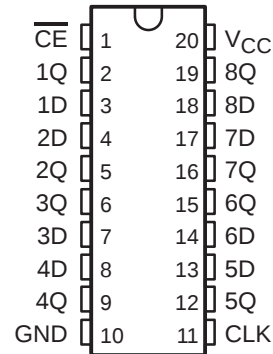


# SN74F377A OCTAL D-TYPE FLIP-FLOP WITH CLOCK ENABLE

SDFS018D – D2932, MARCH 1987 – REVISED OCTOBER 1993

- Contains Eight D-Type Flip-Flops With Single-Rail Outputs
- Clock Enable Latched to Avoid False Clocking
- Applications Include:  
Buffer/Storage Registers  
Shift Registers  
Pattern Generators
- Buffered Common Enable Input
- Package Options Include Plastic Small-Outline Packages and Standard Plastic 300-mil DIPs

DW OR N PACKAGE  
(TOP VIEW)



## description

The SN74F377A is a monolithic, positive-edge-triggered, octal, D-type flip-flop with clock enable inputs. The SN74F377A features a latched clock enable ( $\overline{CE}$ ) input.

Information at the data (D) inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse if  $\overline{CE}$  is low. Clock triggering occurs at a particular voltage level and is not directly related to the positive-going pulse. When the clock input is at either the high or low level, the D input signal has no effect at the output. The circuits are designed to prevent false clocking by transitions at the  $\overline{CE}$  input.

The SN74F377A is characterized for operation from 0°C to 70°C.

FUNCTION TABLE  
(each flip-flop)

| INPUTS          |     |   | OUTPUT<br>Q    |
|-----------------|-----|---|----------------|
| $\overline{CE}$ | CLK | D |                |
| H               | X   | X | Q <sub>0</sub> |
| L               | ↑   | H | H              |
| L               | ↑   | L | L              |
| X               | L   | X | Q <sub>0</sub> |

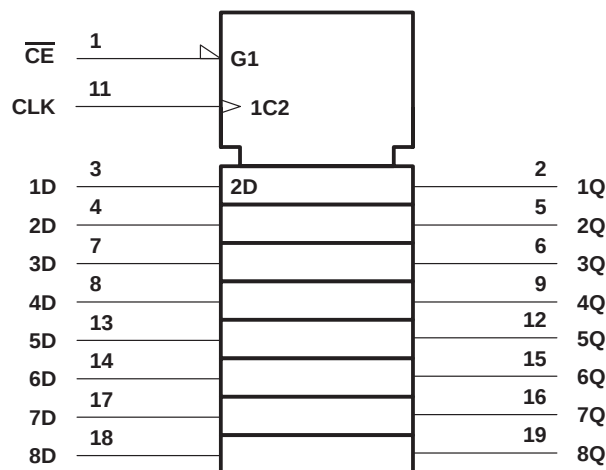
# SN74F377A

## OCTAL D-TYPE FLIP-FLOP

### WITH CLOCK ENABLE

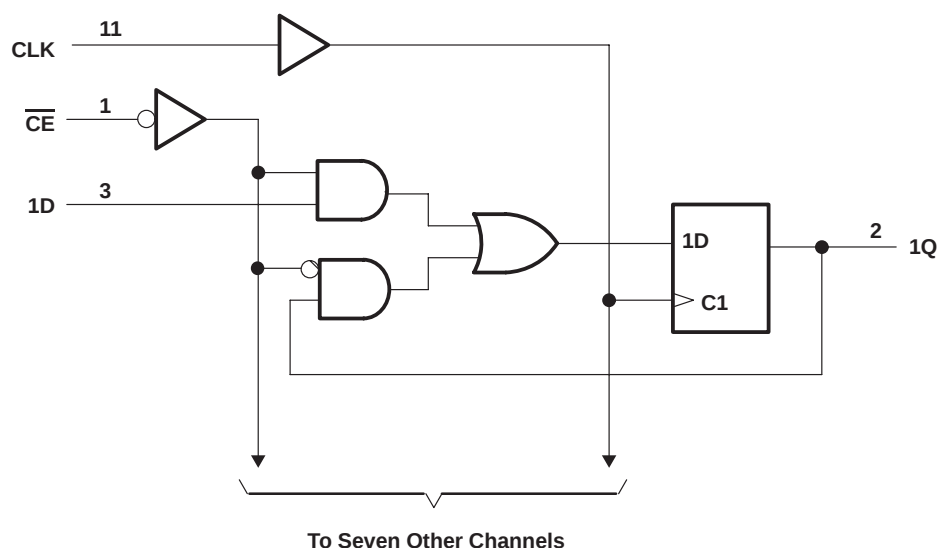
SDFS018D – D2932, MARCH 1987 – REVISED OCTOBER 1993

#### logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

#### logic diagram (positive logic)



#### 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 high state | –0.5 V to $V_{CC}$ |
| Current into any output in the low state              | 40 mA              |
| Operating free-air temperature range                  | 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 ratings may be exceeded provided the input-current ratings are observed.

**SN74F377A**  
**OCTAL D-TYPE FLIP-FLOP**  
**WITH CLOCK ENABLE**

SDFS018D – D2932, MARCH 1987 – REVISED OCTOBER 1993

**recommended operating conditions**

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

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

| PARAMETER           | TEST CONDITIONS                                    | MIN  | TYP <sup>†</sup> | MAX   | UNIT |
|---------------------|----------------------------------------------------|------|------------------|-------|------|
| $V_{OH}$            | $V_{CC} = 4.5\text{ V}$ , $I_{OH} = -1\text{ mA}$  | 2.5  | 3.4              |       | V    |
|                     | $V_{CC} = 4.75\text{ V}$ , $I_{OH} = -1\text{ mA}$ | 2.7  |                  |       |      |
| $V_{OL}$            | $V_{CC} = 4.5\text{ V}$ , $I_{OL} = 20\text{ mA}$  |      | 0.3              | 0.5   | V    |
| $I_I$               | $V_{CC} = 0$ , $V_I = 7\text{ V}$                  |      |                  | 0.1   | mA   |
| $I_{IH}$            | $V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$     |      |                  | 20    | μA   |
| $I_{IL}$            | $V_{CC} = 5.5\text{ V}$ , $V_I = 0.5\text{ V}$     |      |                  | – 0.6 | mA   |
| $I_{OS}^{\ddagger}$ | $V_{CC} = 5.5\text{ V}$ , $V_O = 0$                | – 60 |                  | – 150 | mA   |
| $I_{CCH}$           | $V_{CC} = 5.5\text{ V}$ , See Note 2               |      | 55               | 72    | mA   |
| $I_{CCL}$           | $V_{CC} = 5.5\text{ V}$ , See Note 3               |      | 70               | 90    | mA   |

<sup>†</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>‡</sup> Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

NOTES: 2.  $I_{CCH}$  is measured after applying a momentary ground, then 4.5 V, to the clock input with all data inputs at 4.5 V and the enable input at GND.

3.  $I_{CCL}$  is measured after applying a momentary ground, then 4.5 V, to the clock input with all data and enable inputs at GND.

**timing requirements**

|                    |                        |                                    | V <sub>CC</sub> = 5 V,<br>T <sub>A</sub> = 25°C |     | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>T <sub>A</sub> = MIN to MAX <sup>§</sup> |     | UNIT |
|--------------------|------------------------|------------------------------------|-------------------------------------------------|-----|-------------------------------------------------------------------------------|-----|------|
|                    |                        |                                    | MIN                                             | MAX | MIN                                                                           | MAX |      |
| f <sub>clock</sub> | Clock frequency        |                                    | 0                                               | 110 | 0                                                                             | 110 | MHz  |
| t <sub>W</sub>     | Pulse duration         |                                    | 4                                               |     | 5                                                                             |     | ns   |
| t <sub>su</sub>    | Setup time before CLK↑ | Data high or low                   | 2                                               |     | 2                                                                             |     | ns   |
|                    |                        | $\overline{\text{CE}}$ high        | 2.5                                             |     | 2.5                                                                           |     |      |
|                    |                        | $\overline{\text{CE}}$ low         | 4                                               |     | 4.5                                                                           |     |      |
| t <sub>h</sub>     | Hold time after CLK↑   | Data high or low                   | 1                                               |     | 1                                                                             |     | ns   |
|                    |                        | $\overline{\text{CE}}$ high or low | 0                                               |     | 0                                                                             |     |      |

<sup>\S</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



# SN74F377A

## OCTAL D-TYPE FLIP-FLOP WITH CLOCK ENABLE

SDFS018D – D2932, MARCH 1987 – REVISED OCTOBER 1993

### switching characteristics (see Note 4)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | V <sub>CC</sub> = 5 V,<br>C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω,<br>T <sub>A</sub> = 25°C |     |     | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω,<br>T <sub>A</sub> = MIN to MAX † |      | UNIT |
|------------------|-----------------|----------------|-------------------------------------------------------------------------------------------------------|-----|-----|--------------------------------------------------------------------------------------------------------------------------|------|------|
|                  |                 |                | MIN                                                                                                   | TYP | MAX | MIN                                                                                                                      | MAX  |      |
| f <sub>max</sub> |                 |                | 110                                                                                                   | 125 |     | 110                                                                                                                      |      | MHz  |
| t <sub>PLH</sub> | CLK             | Any Q          | 4                                                                                                     | 6.5 | 8.5 | 4                                                                                                                        | 10   | ns   |
| t <sub>PHL</sub> |                 |                | 4                                                                                                     | 7   | 9   | 4                                                                                                                        | 10.5 |      |

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

NOTE 4: Load circuit and waveforms are shown in Section 1.

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74F377ADW      | ACTIVE        | SOIC         | DW                 | 20   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | 0 to 70      | F377A                   | <a href="#">Samples</a> |
| SN74F377ADWR     | ACTIVE        | SOIC         | DW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | 0 to 70      | F377A                   | <a href="#">Samples</a> |
| SN74F377AN       | ACTIVE        | PDIP         | N                  | 20   | 20             | Pb-Free<br>(RoHS)          | NIPDAU                  | N / A for Pkg Type   | 0 to 70      | SN74F377AN              | <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) **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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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## PACKAGE OPTION ADDENDUM

6-Feb-2020

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**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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74F377ADWR | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 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) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74F377ADWR | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |

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

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



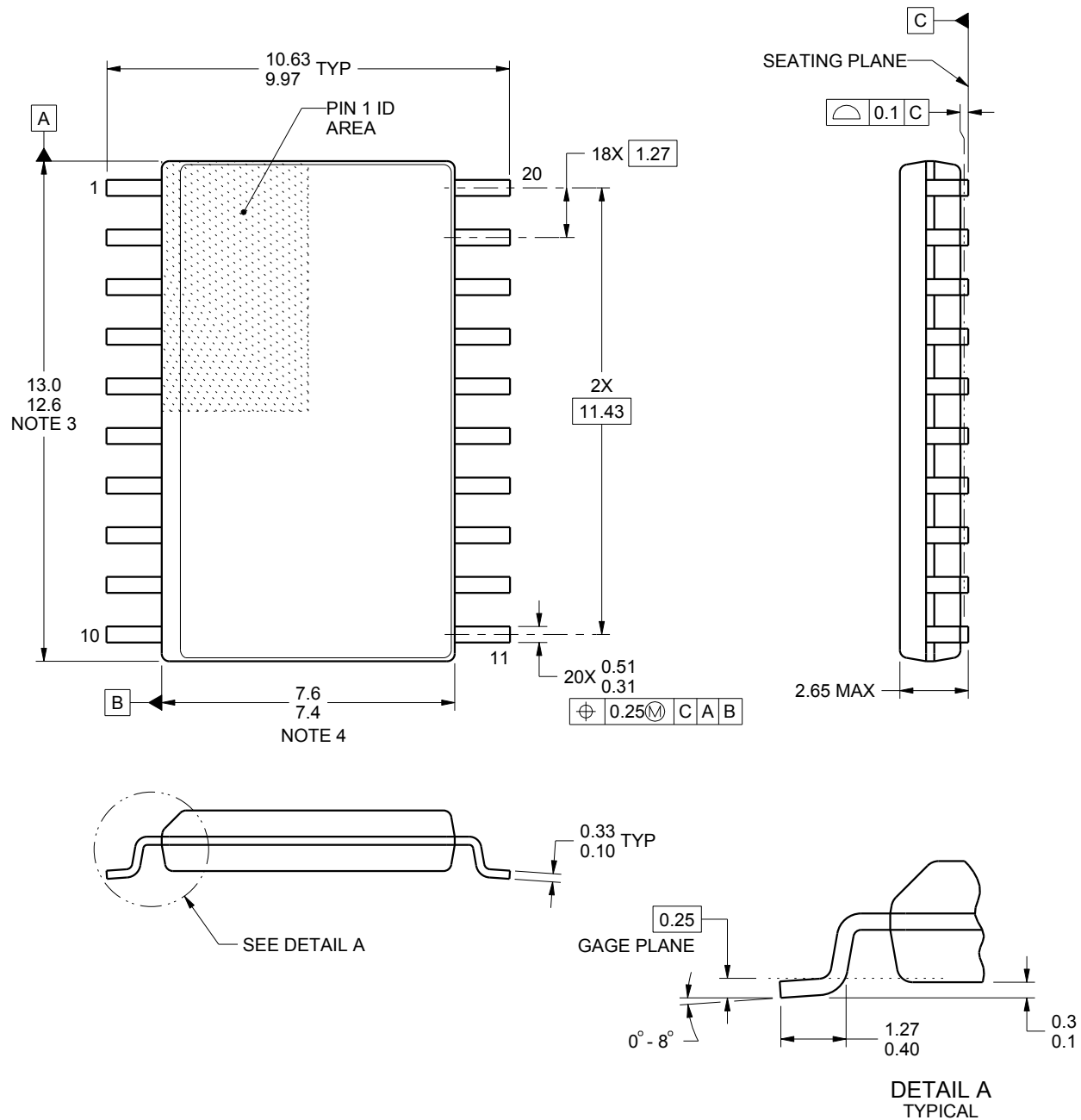
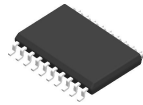
| PINS **<br>DIM      | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| 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.



4220724/A 05/2016

## NOTES:

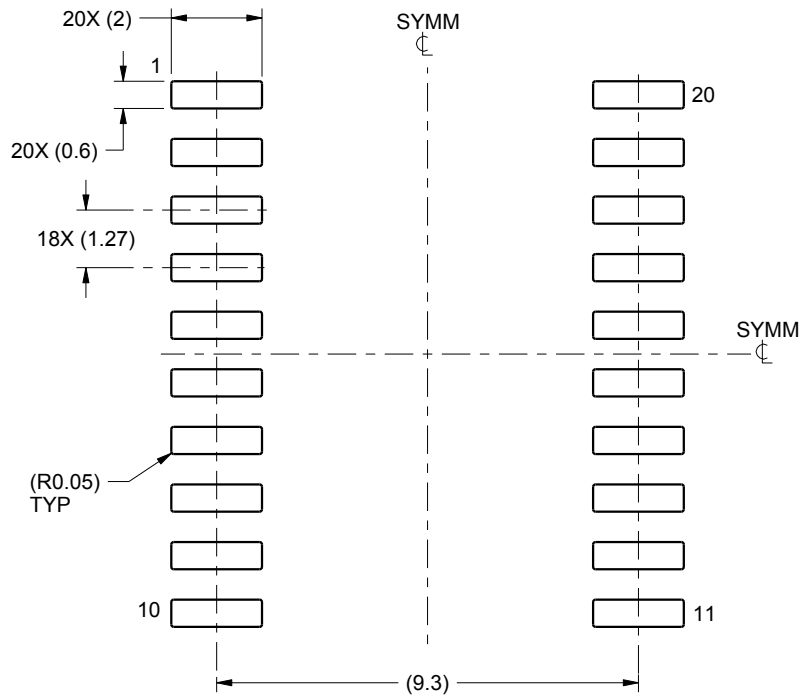
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate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

# EXAMPLE BOARD LAYOUT

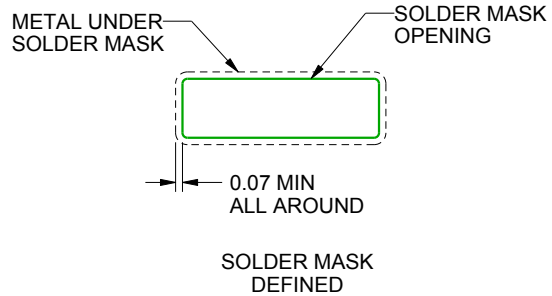
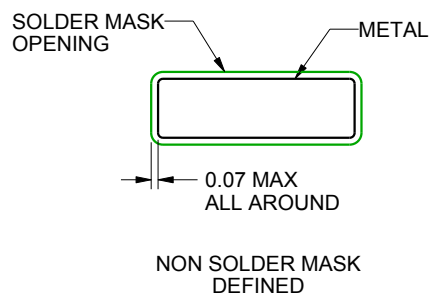
DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

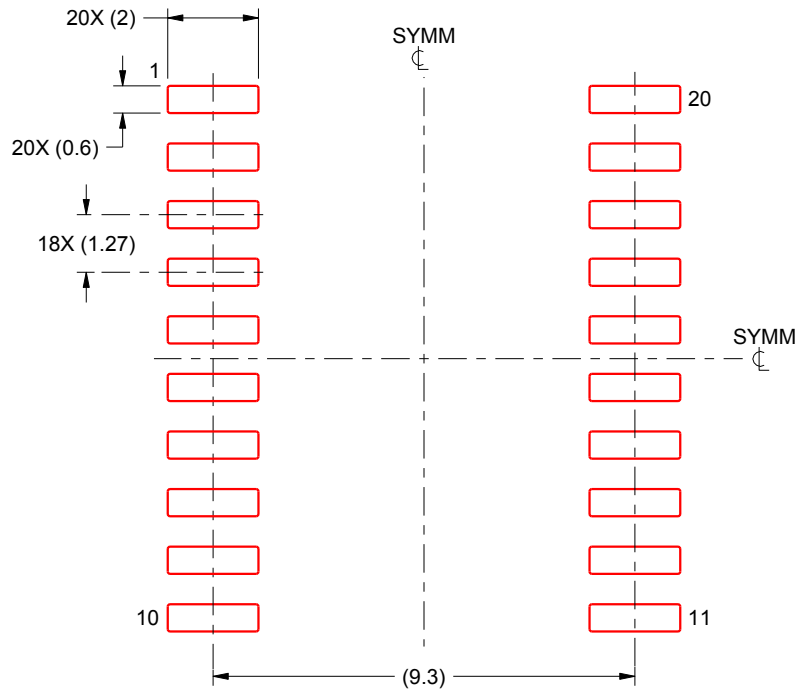
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



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

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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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