

SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
 SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

'46A, '47A, 'LS47  
 feature

- Open-Collector Outputs Drive Indicators Directly
- Lamp-Test Provision
- Leading/Trailing Zero Suppression

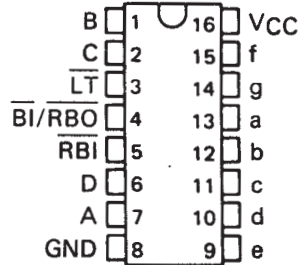
'48, 'LS48  
 feature

- Internal Pull-Ups Eliminate Need for External Resistors
- Lamp-Test Provision
- Leading/Trailing Zero Suppression

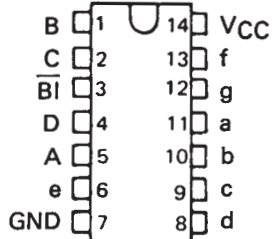
'LS49  
 feature

- Open-Collector Outputs
- Blanking Input

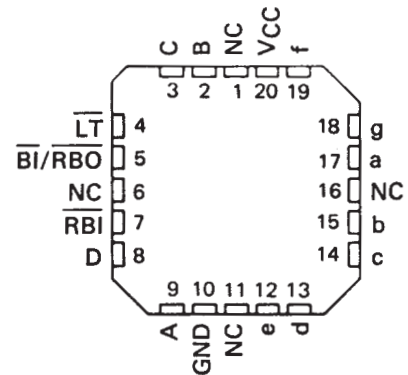
SN5446A, SN5447A, SN54LS47, SN5448,  
 SN54LS48 . . . J PACKAGE  
 SN7446A, SN7447A,  
 SN7448 . . . N PACKAGE  
 SN74LS47, SN74LS48 . . . D OR N PACKAGE  
 (TOP VIEW)



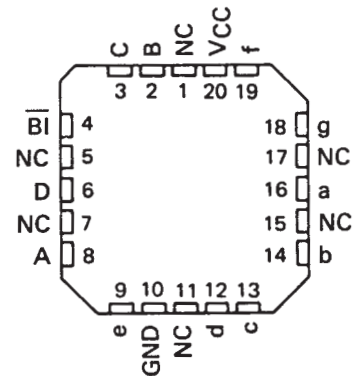
SN54LS49 . . . J OR W PACKAGE  
 SN74LS49 . . . D OR N PACKAGE  
 (TOP VIEW)



SN54LS47, SN54LS48 . . . FK PACKAGE  
 (TOP VIEW)



SN54LS49 . . . FK PACKAGE  
 (TOP VIEW)



NC — No internal connection

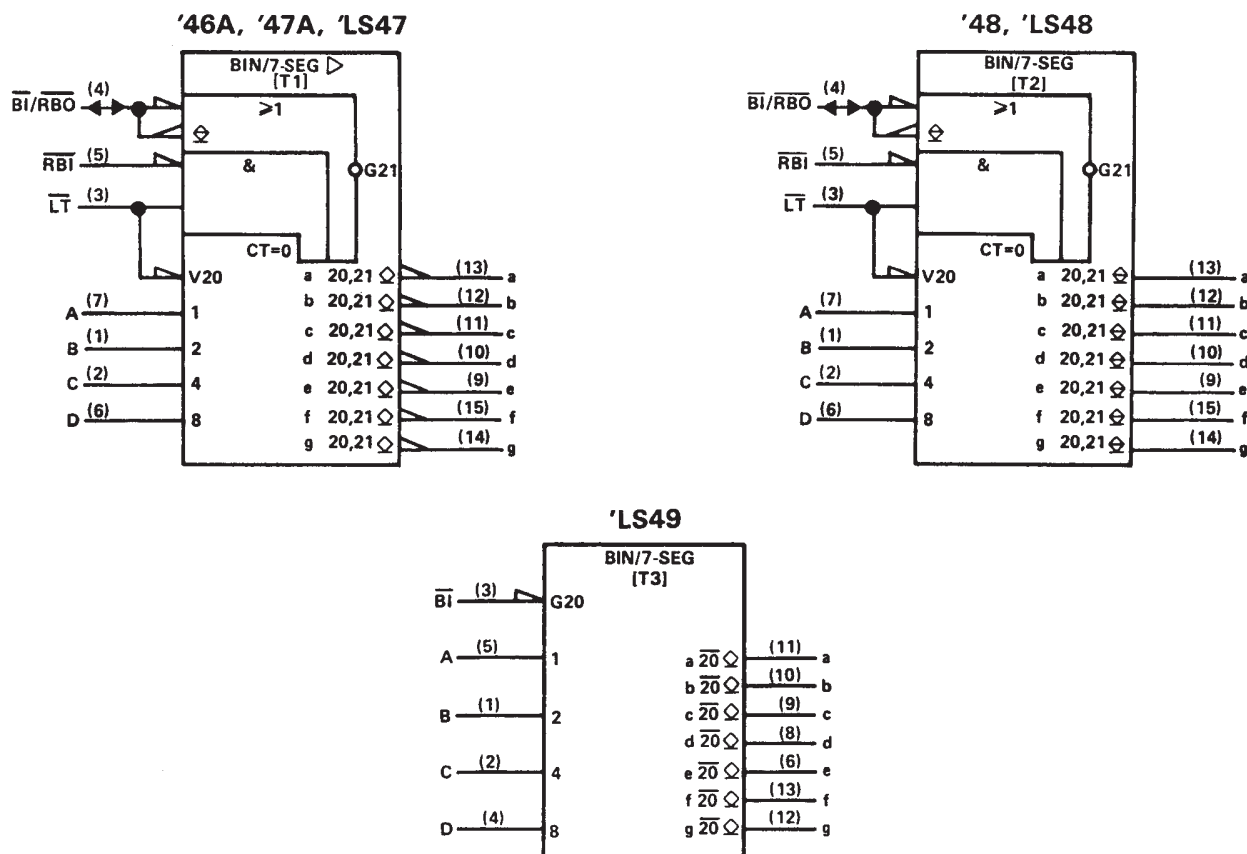
SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
 SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

- All Circuit Types Feature Lamp Intensity Modulation Capability

| TYPE     | DRIVER OUTPUTS  |                         |                 |                | TYPICAL<br>POWER<br>DISSIPATION | PACKAGES |
|----------|-----------------|-------------------------|-----------------|----------------|---------------------------------|----------|
|          | ACTIVE<br>LEVEL | OUTPUT<br>CONFIGURATION | SINK<br>CURRENT | MAX<br>VOLTAGE |                                 |          |
| SN5446A  | low             | open-collector          | 40 mA           | 30 V           | 320 mW                          | J, W     |
| SN5447A  | low             | open-collector          | 40 mA           | 15 V           | 320 mW                          | J, W     |
| SN5448   | high            | 2-k $\Omega$ pull-up    | 6.4 mA          | 5.5 V          | 265 mW                          | J, W     |
| SN54LS47 | low             | open-collector          | 12 mA           | 15 V           | 35 mW                           | J, W     |
| SN54LS48 | high            | 2-k $\Omega$ pull-up    | 2 mA            | 5.5 V          | 125 mW                          | J, W     |
| SN54LS49 | high            | open-collector          | 4 mA            | 5.5 V          | 40 mW                           | J, W     |
| SN7446A  | low             | open-collector          | 40 mA           | 30 V           | 320 mW                          | J, N     |
| SN7447A  | low             | open-collector          | 40 mA           | 15 V           | 320 mW                          | J, N     |
| SN7448   | high            | 2-k $\Omega$ pull-up    | 6.4 mA          | 5.5 V          | 265 mW                          | J, N     |
| SN74LS47 | low             | open-collector          | 24 mA           | 15 V           | 35 mW                           | J, N     |
| SN74LS48 | high            | 2-k $\Omega$ pull-up    | 6 mA            | 5.5 V          | 125 mW                          | J, N     |
| SN74LS49 | high            | open-collector          | 8 mA            | 5.5 V          | 40 mW                           | J, N     |

logic symbols†



†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
 Pin numbers shown are for D, J, N, and W packages.

SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

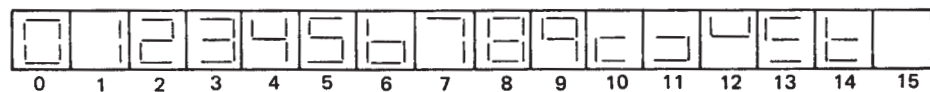
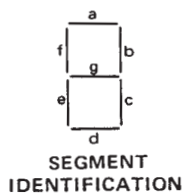
SDLS111 – MARCH 1974 – REVISED MARCH 1988

## description

The '46A, '47A, and 'LS47 feature active-low outputs designed for driving common-anode LEDs or incandescent indicators directly. The '48, 'LS48, and 'LS49 feature active-high outputs for driving lamp buffers or common-cathode LEDs. All of the circuits except 'LS49 have full ripple-blanking input/output controls and a lamp test input. The 'LS49 circuit incorporates a direct blanking input. Segment identification and resultant displays are shown below. Display patterns for BCD input counts above 9 are unique symbols to authenticate input conditions.

The '46A, '47A, '48, 'LS47, and 'LS48 circuits incorporate automatic leading and/or trailing-edge zero-blanking control ( $\overline{\text{RBI}}$  and  $\overline{\text{RBO}}$ ). Lamp test ( $\overline{\text{LT}}$ ) of these types may be performed at any time when the  $\overline{\text{BI/RBO}}$  node is at a high level. All types (including the '49 and 'LS49) contain an overriding blanking input ( $\overline{\text{BI}}$ ), which can be used to control the lamp intensity by pulsing or to inhibit the outputs. Inputs and outputs are entirely compatible for use with TTL logic outputs.

The SN54246/SN74246 and '247 and the SN54LS247/SN74LS247 and 'LS248 compose the  and the  with tails and were designed to offer the designer a choice between two indicator fonts.



NUMERICAL DESIGNATIONS AND RESULTANT DISPLAYS

'46A, '47A, 'LS47 FUNCTION TABLE (T1)

| DECIMAL<br>OR<br>FUNCTION | INPUTS                 |                         |   |   |   |   | $\overline{\text{BI/RBO}}^\dagger$ | OUTPUTS |     |     |     |     |     |     | NOTE |
|---------------------------|------------------------|-------------------------|---|---|---|---|------------------------------------|---------|-----|-----|-----|-----|-----|-----|------|
|                           | $\overline{\text{LT}}$ | $\overline{\text{RBI}}$ | D | C | B | A |                                    | a       | b   | c   | d   | e   | f   | g   |      |
| 0                         | H                      | H                       | L | L | L | L | H                                  | ON      | ON  | ON  | ON  | ON  | ON  | OFF | 1    |
| 1                         | H                      | X                       | L | L | L | H | H                                  | OFF     | ON  | ON  | OFF | OFF | OFF | OFF |      |
| 2                         | H                      | X                       | L | L | H | L | H                                  | ON      | ON  | OFF | ON  | ON  | OFF | ON  |      |
| 3                         | H                      | X                       | L | L | H | H | H                                  | ON      | ON  | ON  | ON  | OFF | OFF | ON  |      |
| 4                         | H                      | X                       | L | H | L | L | H                                  | OFF     | ON  | ON  | OFF | OFF | ON  | ON  |      |
| 5                         | H                      | X                       | L | H | L | H | H                                  | ON      | OFF | ON  | ON  | OFF | ON  | ON  |      |
| 6                         | H                      | X                       | L | H | H | L | H                                  | OFF     | OFF | ON  | ON  | ON  | ON  | ON  |      |
| 7                         | H                      | X                       | L | H | H | H | H                                  | ON      | ON  | ON  | OFF | OFF | OFF | OFF |      |
| 8                         | H                      | X                       | H | L | L | L | H                                  | ON      | ON  | ON  | ON  | ON  | ON  | ON  |      |
| 9                         | H                      | X                       | H | L | L | H | H                                  | ON      | ON  | ON  | OFF | OFF | ON  | ON  |      |
| 10                        | H                      | X                       | H | L | H | L | H                                  | OFF     | OFF | OFF | ON  | ON  | OFF | ON  |      |
| 11                        | H                      | X                       | H | L | H | H | H                                  | OFF     | OFF | ON  | ON  | OFF | OFF | ON  |      |
| 12                        | H                      | X                       | H | H | L | L | H                                  | OFF     | ON  | OFF | OFF | OFF | ON  | ON  |      |
| 13                        | H                      | X                       | H | H | L | H | H                                  | ON      | OFF | OFF | ON  | OFF | ON  | ON  |      |
| 14                        | H                      | X                       | H | H | H | L | H                                  | OFF     | OFF | OFF | ON  | ON  | ON  | ON  |      |
| 15                        | H                      | X                       | H | H | H | H | H                                  | OFF     | OFF | OFF | OFF | OFF | OFF | OFF |      |
| BI                        | X                      | X                       | X | X | X | X | L                                  | OFF     | OFF | OFF | OFF | OFF | OFF | OFF | 2    |
| RBI                       | H                      | L                       | L | L | L | L | L                                  | OFF     | OFF | OFF | OFF | OFF | OFF | OFF | 3    |
| LT                        | L                      | X                       | X | X | X | X | H                                  | ON      | ON  | ON  | ON  | ON  | ON  | ON  | 4    |

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

NOTES: 1. The blanking input ( $\overline{\text{BI}}$ ) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input ( $\overline{\text{RBI}}$ ) must be open or high if blanking of a decimal zero is not desired.

2. When a low logic level is applied directly to the blanking input ( $\overline{\text{BI}}$ ), all segment outputs are off regardless of the level of any other input.

3. When ripple-blanking input ( $\overline{\text{RBI}}$ ) and inputs A, B, C, and D are at a low level with the lamp test input high, all segment outputs go off and the ripple-blanking output ( $\overline{\text{RBO}}$ ) goes to a low level (response condition).

4. When the blanking input/ripple blanking output ( $\overline{\text{BI/RBO}}$ ) is open or held high and a low is applied to the lamp-test input, all segment outputs are on.

$^\dagger \overline{\text{BI/RBO}}$  is wire AND logic serving as blanking input ( $\overline{\text{BI}}$ ) and/or ripple-blanking output ( $\overline{\text{RBO}}$ ).

SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
 SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

'48, 'LS48  
 FUNCTION TABLE (T2)

| DECIMAL<br>OR<br>FUNCTION | INPUTS |     |   |   |   |   | $\overline{\text{BI}}/\overline{\text{RBO}}^\dagger$ | OUTPUTS |   |   |   |   |   |   | NOTE |
|---------------------------|--------|-----|---|---|---|---|------------------------------------------------------|---------|---|---|---|---|---|---|------|
|                           | LT     | RBI | D | C | B | A |                                                      | a       | b | c | d | e | f | g |      |
| 0                         | H      | H   | L | L | L | L | H                                                    | H       | H | H | H | H | H | L | 1    |
| 1                         | H      | X   | L | L | L | H | H                                                    | L       | H | H | L | L | L | L |      |
| 2                         | H      | X   | L | L | H | L | H                                                    | H       | H | L | H | H | L | H |      |
| 3                         | H      | X   | L | L | H | H | H                                                    | H       | H | H | L | L | L | H |      |
| 4                         | H      | X   | L | H | L | L | H                                                    | L       | H | H | L | L | H | H |      |
| 5                         | H      | X   | L | H | L | H | H                                                    | H       | L | H | H | L | H | H |      |
| 6                         | H      | X   | L | H | H | L | H                                                    | L       | L | H | H | H | H | H |      |
| 7                         | H      | X   | L | H | H | H | H                                                    | H       | H | H | L | L | L | L |      |
| 8                         | H      | X   | H | L | L | L | H                                                    | H       | H | H | H | H | H | H |      |
| 9                         | H      | X   | H | L | L | H | H                                                    | H       | H | L | L | L | H | H |      |
| 10                        | H      | X   | H | L | H | L | H                                                    | L       | L | L | H | H | L | H |      |
| 11                        | H      | X   | H | L | H | H | H                                                    | L       | L | H | H | L | L | H |      |
| 12                        | H      | X   | H | H | L | L | H                                                    | L       | H | L | L | L | H | H |      |
| 13                        | H      | X   | H | H | L | H | H                                                    | H       | L | L | L | H | L | H |      |
| 14                        | H      | X   | H | H | H | L | H                                                    | L       | L | L | H | H | H | H |      |
| 15                        | H      | X   | H | H | H | H | H                                                    | L       | L | L | L | L | L | L |      |
| BI                        | X      | X   | X | X | X | X | L                                                    | L       | L | L | L | L | L | L | 2    |
| RBI                       | L      | L   | L | L | L | L | L                                                    | L       | L | L | L | L | L | L | 3    |
| LT                        | L      | X   | X | X | X | X | H                                                    | H       | H | H | H | H | H | H | 4    |

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

- NOTES: 1. The blanking input ( $\overline{\text{BI}}$ ) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input ( $\overline{\text{RBI}}$ ) must be open or high, if blanking of a decimal zero is not desired.
2. When a low logic level is applied directly to the blanking input ( $\overline{\text{BI}}$ ), all segment outputs are low regardless of the level of any other input.
3. When ripple-blanking input ( $\overline{\text{RBI}}$ ) and inputs A, B, C, and D are at a low level with the lamp-test input high, all segment outputs go low and the ripple-blanking output ( $\overline{\text{RBO}}$ ) goes to a low level (response condition).
4. When the blanking input/ripple-blanking output ( $\overline{\text{BI}}/\overline{\text{RBO}}$ ) is open or held high and a low is applied to the lamp-test input, all segment outputs are high.

$^\dagger \overline{\text{BI}}/\overline{\text{RBO}}$  is wire-AND logic serving as blanking input ( $\overline{\text{BI}}$ ) and/or ripple-blanking output ( $\overline{\text{RBO}}$ ).

'LS49  
 FUNCTION TABLE (T3)

| DECIMAL<br>OR<br>FUNCTION | INPUTS |   |   |   |                        |  | OUTPUTS |   |   |   |   |   |   | NOTE |
|---------------------------|--------|---|---|---|------------------------|--|---------|---|---|---|---|---|---|------|
|                           | D      | C | B | A | $\overline{\text{BI}}$ |  | a       | b | c | d | e | f | g |      |
| 0                         | L      | L | L | L | H                      |  | H       | H | H | H | H | H | L | 1    |
| 1                         | L      | L | L | H | H                      |  | L       | H | H | L | L | L | L |      |
| 2                         | L      | L | H | L | H                      |  | H       | H | L | H | H | L | H |      |
| 3                         | L      | L | H | H | H                      |  | H       | H | H | H | L | L | H |      |
| 4                         | L      | H | L | L | H                      |  | L       | H | H | L | L | H | H |      |
| 5                         | L      | H | L | H | H                      |  | H       | L | H | H | L | H | H |      |
| 6                         | L      | H | H | L | H                      |  | L       | L | H | H | H | H | H |      |
| 7                         | L      | H | H | H | H                      |  | H       | H | H | L | L | L | L |      |
| 8                         | H      | L | L | L | H                      |  | H       | H | H | H | H | H | H |      |
| 9                         | H      | L | L | H | H                      |  | H       | H | H | L | L | H | H |      |
| 10                        | H      | L | H | L | H                      |  | L       | L | L | H | H | L | H |      |
| 11                        | H      | L | H | H | H                      |  | L       | L | H | H | L | L | H |      |
| 12                        | H      | H | L | L | H                      |  | L       | H | L | L | L | H | H |      |
| 13                        | H      | H | L | H | H                      |  | H       | L | L | L | H | L | H |      |
| 14                        | H      | H | H | L | H                      |  | L       | L | L | H | H | H | H |      |
| 15                        | H      | H | H | H | H                      |  | L       | L | L | L | L | L | L |      |
| BI                        | X      | X | X | X | L                      |  | L       | L | L | L | L | L | L | 2    |

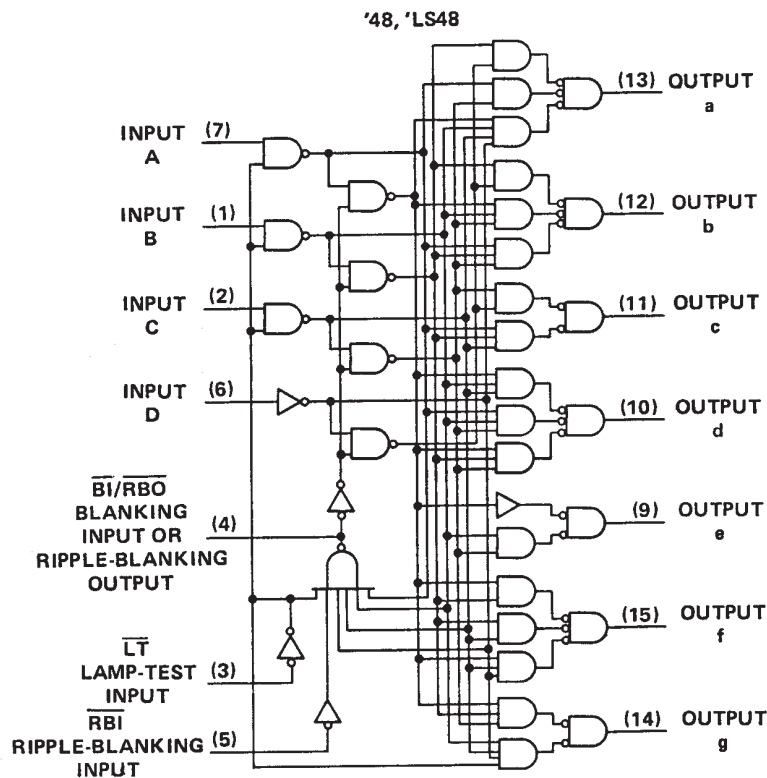
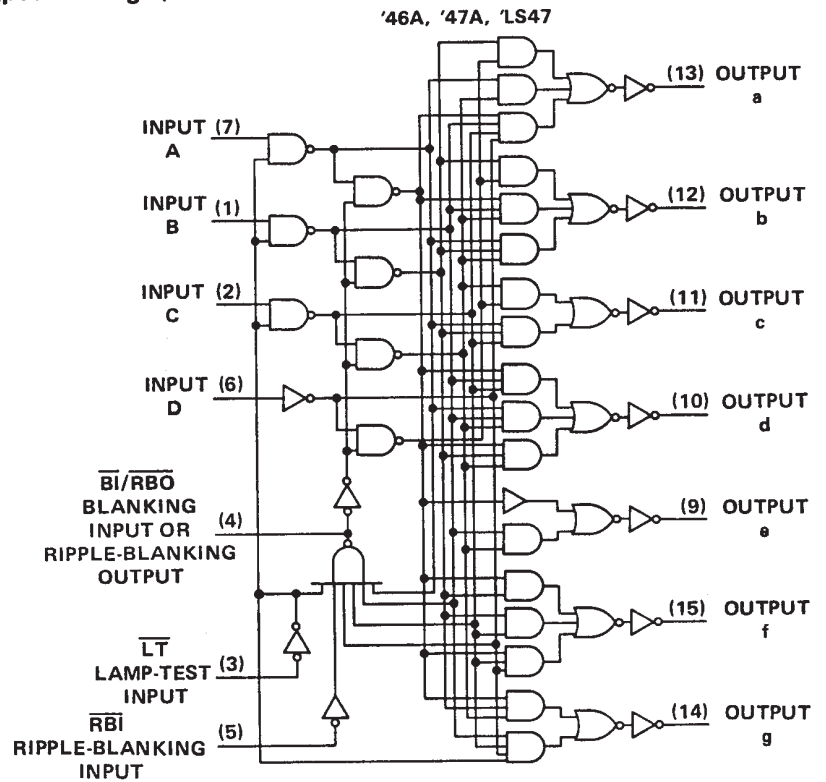
H = high level, L = low level, X = irrelevant

- NOTES: 1. The blanking input ( $\overline{\text{BI}}$ ) must be open or held at a high logic level when output functions 0 through 15 are desired.
2. When a low logic level is applied directly to the blanking input ( $\overline{\text{BI}}$ ), all segment outputs are low regardless of the level of any other input.

SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 - MARCH 1974 - REVISED MARCH 1988

logic diagrams (positive logic)



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

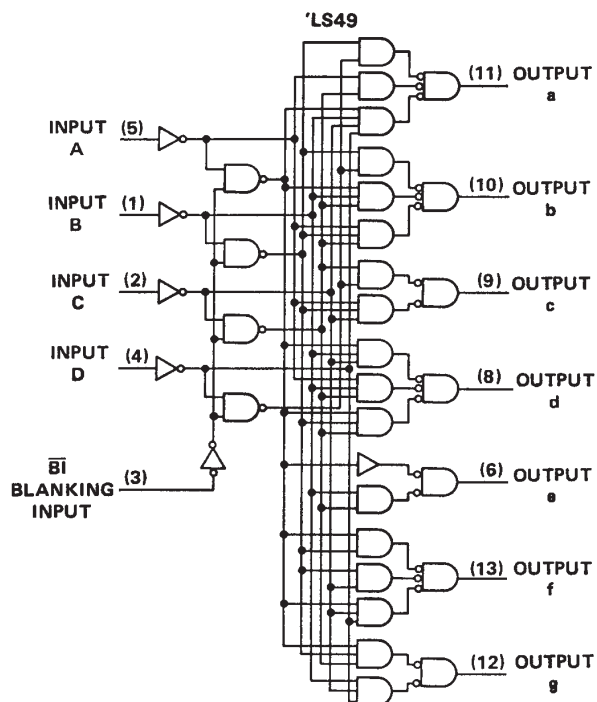


POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

logic diagrams (continued)



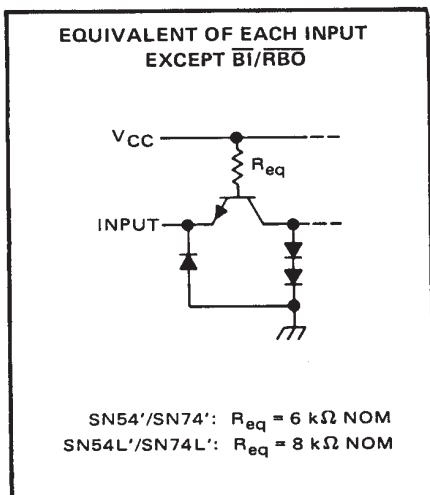
Pin numbers shown are for D, J, N, and W packages.

SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
 SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

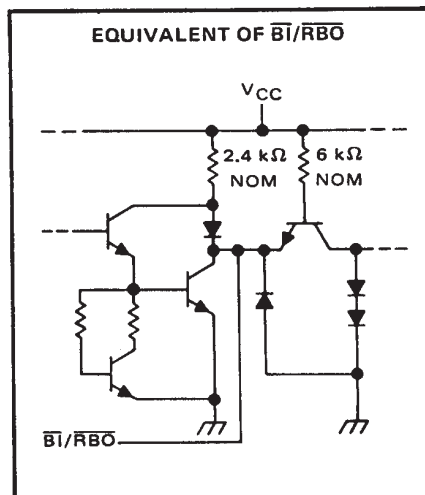
SDLS111 – MARCH 1974 – REVISED MARCH 1988

schematics of inputs and outputs

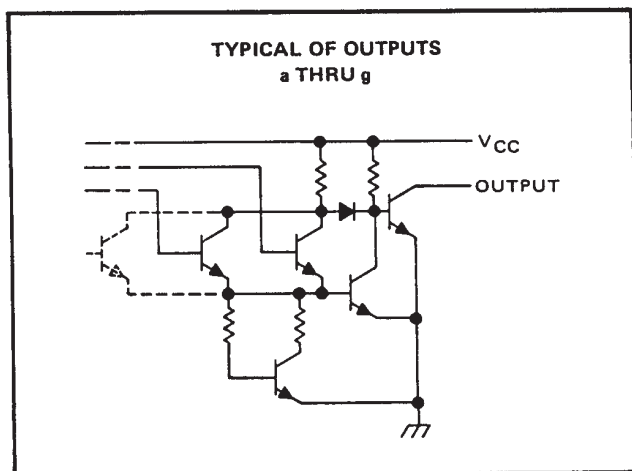
'46A, '47A, '48



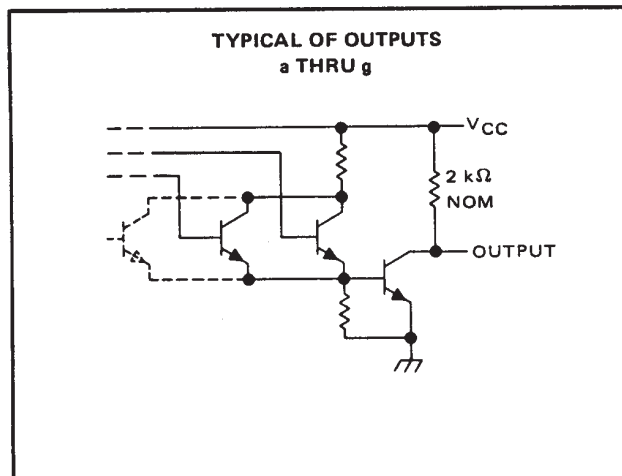
'46A, '47A, '48



'46A, '47A



'48



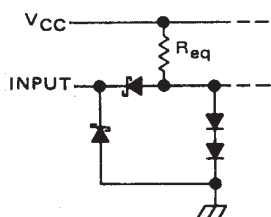
SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
 SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

schematics of inputs and outputs

'LS47, 'LS48, 'LS49

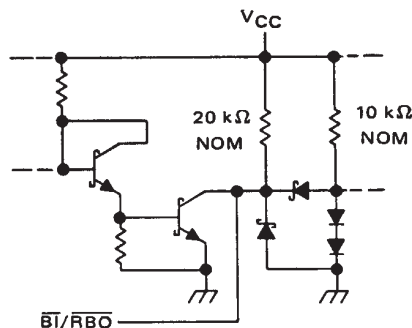
EQUIVALENT OF EACH INPUT  
 EXCEPT  $\overline{\text{BI}}/\overline{\text{RBO}}$



$\overline{\text{LT}}$  and  $\overline{\text{RB}}\overline{\text{I}}$  ('LS47, 'LS48):  $R_{eq} = 20 \text{ k}\Omega \text{ NOM}$   
 $\overline{\text{BI}}$  ('LS49):  $R_{eq} = 20 \text{ k}\Omega \text{ NOM}$   
 A, B, C, and D:  $R_{eq} = 25 \text{ k}\Omega \text{ NOM}$

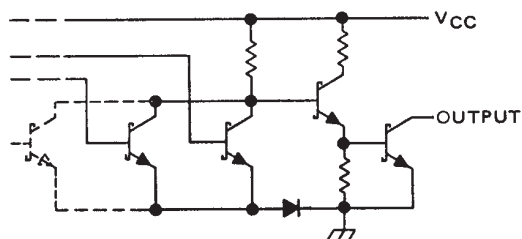
'LS47, 'LS48, 'LS49

EQUIVALENT OF  $\overline{\text{BI}}/\overline{\text{RBO}}$



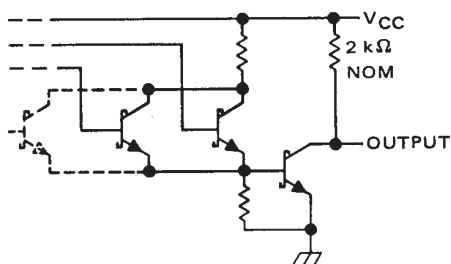
'LS47

TYPICAL OF OUTPUTS  
 a THRU g



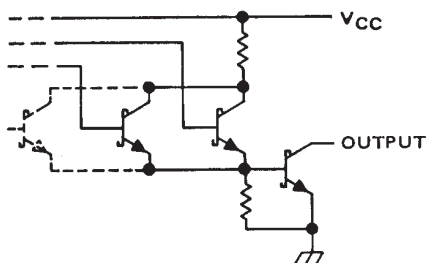
'LS48

TYPICAL OF OUTPUTS  
 a THRU g



'LS49

TYPICAL OF OUTPUTS  
 a THRU g





SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

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

|                                                        |                |
|--------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                  | 7 V            |
| Input voltage                                          | 5.5 V          |
| Current forced into any output in the off state        | 1 mA           |
| Operating free-air temperature range: SN5446A, SN5447A | –55°C to 125°C |
| SN7446A, SN7447A                                       | 0°C to 70°C    |
| Storage temperature range                              | –65°C to 150°C |

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

|                                        |                                | SN5446A |     |      | SN5447A |     |      | SN7446A |     |      | SN7447A |     |      | UNIT |
|----------------------------------------|--------------------------------|---------|-----|------|---------|-----|------|---------|-----|------|---------|-----|------|------|
|                                        |                                | MIN     | NOM | MAX  | MIN     | NOM | MAX  | MIN     | NOM | MAX  | MIN     | NOM | MAX  |      |
| Supply voltage, $V_{CC}$               |                                | 4.5     | 5   | 5.5  | 4.5     | 5   | 5.5  | 4.75    | 5   | 5.25 | 4.75    | 5   | 5.25 | V    |
| Off-state output voltage, $V_{O(off)}$ | a thru g                       |         |     | 30   |         |     | 15   |         |     | 30   |         |     | 15   | V    |
| On-state output current, $I_{O(on)}$   | a thru g                       |         |     | 40   |         |     | 40   |         |     | 40   |         |     | 40   | mA   |
| High-level output current, $I_{OH}$    | $\overline{BI}/\overline{RBO}$ |         |     | –200 |         |     | –200 |         |     | –200 |         |     | –200 | μA   |
| Low-level output current, $I_{OL}$     | $\overline{BI}/\overline{RBO}$ |         |     | 8    |         |     | 8    |         |     | 8    |         |     | 8    | mA   |
| Operating free-air temperature, $T_A$  |                                | –55     |     | 125  | –55     |     | 125  | 0       |     | 70   | 0       |     | 70   | °C   |

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

| PARAMETER    |                                        | TEST CONDITIONS†                                                                                                                     |       | MIN | TYP‡ | MAX  | UNIT |
|--------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------|-----|------|------|------|
| $V_{IH}$     | High-level input voltage               |                                                                                                                                      |       | 2   |      |      | V    |
| $V_{IL}$     | Low-level input voltage                |                                                                                                                                      |       |     |      | 0.8  | V    |
| $V_{IK}$     | Input clamp voltage                    | $V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$                                                                                          |       |     |      | –1.5 | V    |
| $V_{OH}$     | High-level output voltage              | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OH} = -200 \text{ μA}$ |       | 2.4 | 3.7  |      | V    |
| $V_{OL}$     | Low-level output voltage               | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OL} = 8 \text{ mA}$    |       |     | 0.27 | 0.4  | V    |
| $I_{O(off)}$ | Off-state output current               | a thru g<br>$V_{CC} = \text{MAX}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, V_{O(off)} = \text{MAX}$                        |       |     |      | 250  | μA   |
| $V_{O(on)}$  | On-state output voltage                | a thru g<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{O(on)} = 40 \text{ mA}$                      |       |     | 0.3  | 0.4  | V    |
| $I_I$        | Input current at maximum input voltage | Any input except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$                                        |       |     |      | 1    | mA   |
| $I_{IH}$     | High-level input current               | Any input except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$                                        |       |     |      | 40   | μA   |
| $I_{IL}$     | Low-level input current                | Any input except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$                                        |       |     |      | –1.6 | mA   |
|              |                                        | $\overline{BI}/\overline{RBO}$                                                                                                       |       |     |      | –4   |      |
| $I_{OS}$     | Short-circuit output current           | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}$                                                                              |       |     |      | –4   | mA   |
| $I_{CC}$     | Supply current                         | $V_{CC} = \text{MAX},$<br>See Note 2                                                                                                 | SN54' |     |      | 64   | mA   |
|              |                                        |                                                                                                                                      | SN74' |     |      | 64   |      |

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

‡All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

NOTE 2:  $I_{CC}$  is measured with all outputs open and all inputs at 4.5 V.

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

| PARAMETER |                                           | TEST CONDITIONS                                        |  | MIN | TYP | MAX | UNIT |
|-----------|-------------------------------------------|--------------------------------------------------------|--|-----|-----|-----|------|
| $t_{off}$ | Turn-off time from A input                | $C_L = 15 \text{ pF}, R_L = 120 \Omega,$<br>See Note 3 |  |     |     | 100 | ns   |
| $t_{on}$  | Turn-on time from A input                 |                                                        |  |     |     | 100 |      |
| $t_{off}$ | Turn-off time from $\overline{RBI}$ input |                                                        |  |     |     | 100 | ns   |
| $t_{on}$  | Turn-on time from $\overline{RBI}$ input  |                                                        |  |     |     | 100 |      |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
 SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
 BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

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

|                                              |                |
|----------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)        | 7 V            |
| Input voltage                                | 5.5 V          |
| Operating free-air temperature range: SN5448 | –55°C to 125°C |
| SN7448                                       | 0°C to 70°C    |
| Storage temperature range                    | –65°C to 150°C |

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

|                                       |                                | SN5448 |     |      | SN7448 |     |      | UNIT    |
|---------------------------------------|--------------------------------|--------|-----|------|--------|-----|------|---------|
|                                       |                                | MIN    | NOM | MAX  | MIN    | NOM | MAX  |         |
| Supply voltage, $V_{CC}$              |                                | 4.5    | 5   | 5.5  | 4.75   | 5   | 5.25 | V       |
| High-level output current, $I_{OH}$   | a thru g                       |        |     | –400 |        |     | –400 | $\mu$ A |
|                                       | $\overline{BI}/\overline{RBO}$ |        |     | –200 |        |     | –200 |         |
| Low-level output current, $I_{OL}$    | a thru g                       |        |     | 6.4  |        |     | 6.4  | mA      |
|                                       | $\overline{BI}/\overline{RBO}$ |        |     | 8    |        |     | 8    |         |
| Operating free-air temperature, $T_A$ |                                | –55    |     | 125  | 0      |     | 70   | °C      |

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

| PARAMETER |                                        | TEST CONDITIONS†                                                                                          | MIN  | TYP‡ | MAX  | UNIT    |
|-----------|----------------------------------------|-----------------------------------------------------------------------------------------------------------|------|------|------|---------|
| $V_{IH}$  | High-level input voltage               |                                                                                                           | 2    |      |      | V       |
| $V_{IL}$  | Low-level input voltage                |                                                                                                           |      |      | 0.8  | V       |
| $V_{IK}$  | Input clamp voltage                    | $V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$                                                               |      |      | –1.5 | V       |
| $V_{OH}$  | High-level output voltage              | a thru g<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OH} = \text{MAX}$ | 2.4  | 4.2  |      | V       |
|           |                                        |                                                                                                           | 2.4  | 3.7  |      |         |
| $I_O$     | Output current                         | a thru g<br>$V_{CC} = \text{MIN}, V_O = 0.85 \text{ V},$<br>Input conditions as for $V_{OH}$              | –1.3 | –2   |      | mA      |
| $V_{OL}$  | Low-level output voltage               | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OL} = \text{MAX}$             | 0.27 |      | 0.4  | V       |
| $I_I$     | Input current at maximum input voltage | Any input<br>except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$          |      |      | 1    | mA      |
| $I_{IH}$  | High-level input current               | Any input<br>except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$          |      |      | 40   | $\mu$ A |
| $I_{IL}$  | Low-level input current                | Any input<br>except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$          |      |      | –1.6 | mA      |
|           |                                        | $\overline{BI}/\overline{RBO}$                                                                            |      |      | –4   |         |
| $I_{OS}$  | Short-circuit output current           | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}$                                                   |      |      | –4   | mA      |
| $I_{CC}$  | Supply current                         | $V_{CC} = \text{MAX},$<br>See Note 2                                                                      |      |      |      | mA      |
|           |                                        | SN5448                                                                                                    |      | 53   | 76   |         |
|           |                                        | SN7448                                                                                                    |      | 53   | 90   |         |

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

‡ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

NOTE 2:  $I_{CC}$  is measured with all outputs open and all inputs at 4.5 V.

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

| PARAMETER                                                                              | TEST CONDITIONS                                              | MIN | TYP | MAX | UNIT |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------|-----|-----|-----|------|
| $t_{PHL}$ Propagation delay time, high-to-low-level output from A input                | $C_L = 15 \text{ pF}, R_L = 1 \text{ k}\Omega$<br>See Note 3 |     |     | 100 | ns   |
| $t_{PLH}$ Propagation delay time, low-to-high-level output from A input                |                                                              |     |     | 100 |      |
| $t_{PHL}$ Propagation delay time, high-to-low-level output from $\overline{RBI}$ input |                                                              |     |     | 100 | ns   |
| $t_{PLH}$ Propagation delay time, low-to-high-level output from $\overline{RBI}$ input |                                                              |     |     | 100 |      |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

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

|                                                                 |                                                |
|-----------------------------------------------------------------|------------------------------------------------|
| Supply voltage, $V_{CC}$ (see Note 1)                           | 7 V                                            |
| Input voltage                                                   | 7 V                                            |
| Peak output current ( $t_W \leq 1$ ms, duty cycle $\leq 10\%$ ) | 200 mA                                         |
| Current forced into any output in the off state                 | 1 mA                                           |
| Operating free-air temperature range: SN54LS47                  | $-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$ |
| SN74LS47                                                        | $0^{\circ}\text{C}$ to $70^{\circ}\text{C}$    |
| Storage temperature range                                       | $-65^{\circ}\text{C}$ to $150^{\circ}\text{C}$ |

NOTE 1: Voltage values are with respect to network ground terminal.

**recommended operating conditions**

|                                        |                                | SN54LS47 |     |     | SN74LS47 |     |      | UNIT               |
|----------------------------------------|--------------------------------|----------|-----|-----|----------|-----|------|--------------------|
|                                        |                                | MIN      | NOM | MAX | MIN      | NOM | MAX  |                    |
| Supply voltage, $V_{CC}$               |                                | 4.5      | 5   | 5.5 | 4.75     | 5   | 5.25 | V                  |
| Off-state output voltage, $V_{O(off)}$ | a thru g                       |          |     | 15  |          |     | 15   | V                  |
| On-state output current, $I_{O(on)}$   | a thru g                       |          |     | 12  |          |     | 24   | mA                 |
| High-level output current, $I_{OH}$    | $\overline{BI}/\overline{RBO}$ |          |     | -50 |          |     | -50  | $\mu\text{A}$      |
| Low-level output current, $I_{OL}$     | $\overline{BI}/\overline{RBO}$ |          |     | 1.6 |          |     | 3.2  | mA                 |
| Operating free-air temperature, $T_A$  |                                | -55      |     | 125 | 0        |     | 70   | $^{\circ}\text{C}$ |

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

| PARAMETER    |                                        | TEST CONDITIONS†                                                                                                                                                      | SN54LS47 |      |      | SN74LS47 |      |      | UNIT          |
|--------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|------|----------|------|------|---------------|
|              |                                        |                                                                                                                                                                       | MIN      | TYP‡ | MAX  | MIN      | TYP‡ | MAX  |               |
| $V_{IH}$     | High-level input voltage               |                                                                                                                                                                       | 2        |      |      | 2        |      |      | V             |
| $V_{IL}$     | Low-level input voltage                |                                                                                                                                                                       |          |      | 0.7  |          |      | 0.8  | V             |
| $V_{IK}$     | Input clamp voltage                    | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$                                                                                                                           |          |      | -1.5 |          |      | -1.5 | V             |
| $V_{OH}$     | High-level output voltage              | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = V_{IL \text{ max}}, I_{OH} = -50 \mu\text{A}$                             | 2.4      | 4.2  |      | 2.4      | 4.2  |      | V             |
| $V_{OL}$     | Low-level output voltage               | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = V_{IL \text{ max}}, I_{OL} = 1.6 \text{ mA}$<br>$I_{OL} = 3.2 \text{ mA}$ | 0.25     | 0.4  |      | 0.25     | 0.4  |      | V             |
| $I_{O(off)}$ | Off-state output current               | a thru g<br>$V_{CC} = \text{MAX}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = V_{IL \text{ max}}, V_{O(off)} = 15 \text{ V}$                                                  |          |      | 250  |          |      | 250  | $\mu\text{A}$ |
| $V_{O(on)}$  | On-state output voltage                | a thru g<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = V_{IL \text{ max}}, I_{O(on)} = 12 \text{ mA}$<br>$I_{O(on)} = 24 \text{ mA}$                   | 0.25     | 0.4  |      | 0.25     | 0.4  |      | V             |
| $I_I$        | Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 7 \text{ V}$                                                                                                                              |          |      | 0.1  |          |      | 0.1  | mA            |
| $I_{IH}$     | High-level input current               | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$                                                                                                                            |          |      | 20   |          |      | 20   | $\mu\text{A}$ |
| $I_{IL}$     | Low-level input current                | Any input except $\overline{BI}/\overline{RBO}$<br>$\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$                                       |          |      | -0.4 |          |      | -0.4 | mA            |
|              |                                        |                                                                                                                                                                       |          |      | -1.2 |          |      | -1.2 |               |
| $I_{OS}$     | Short-circuit output current           | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}$                                                                                                               | -0.3     |      | -2   | -0.3     |      | -2   | mA            |
| $I_{CC}$     | Supply current                         | $V_{CC} = \text{MAX},$ See Note 2                                                                                                                                     | 7        |      | 13   | 7        |      | 13   | mA            |

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

‡ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}\text{C}$ .

NOTE 2:  $I_{CC}$  is measured with all outputs open and all inputs at 4.5 V.

**switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}\text{C}$**

| PARAMETER | TEST CONDITIONS                                               | MIN | TYP | MAX | UNIT |
|-----------|---------------------------------------------------------------|-----|-----|-----|------|
| $t_{off}$ | Turn-off time from A input                                    |     |     | 100 | ns   |
| $t_{on}$  | Turn-on time from A input                                     |     |     | 100 | ns   |
| $t_{off}$ | Turn-off time from $\overline{RBI}$ input, outputs (a-f) only |     |     | 100 | ns   |
| $t_{on}$  | Turn-on time from $\overline{RBI}$ input, outputs (a-f) only  |     |     | 100 | ns   |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



**SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS**

SDLS111 – MARCH 1974 – REVISED MARCH 1988

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

|                                                |                |
|------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)          | 7 V            |
| Input voltage                                  | 7 V            |
| Operating free-air temperature range: SN54LS48 | –55°C to 125°C |
| SN74LS48                                       | 0°C to 70°C    |
| Storage temperature range                      | –65°C to 150°C |

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

|                                       |                                | SN54LS48 |     |      | SN74LS48 |     |      | UNIT    |
|---------------------------------------|--------------------------------|----------|-----|------|----------|-----|------|---------|
|                                       |                                | MIN      | NOM | MAX  | MIN      | NOM | MAX  |         |
| Supply voltage, $V_{CC}$              |                                | 4.5      | 5   | 5.5  | 4.75     | 5   | 5.25 | V       |
| High-level output current, $I_{OH}$   | a thru g                       |          |     | –100 |          |     | –100 | $\mu$ A |
|                                       | $\overline{BI}/\overline{RBO}$ |          |     | –50  |          |     | –50  |         |
| Low-level output current, $I_{OL}$    | a thru g                       |          |     | 2    |          |     | 6    | mA      |
|                                       | $\overline{BI}/\overline{RBO}$ |          |     | 1.6  |          |     | 3.2  |         |
| Operating free-air temperature, $T_A$ |                                | –55      |     | 125  | 0        |     | 70   | °C      |

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

| PARAMETER |                                        | TEST CONDITIONS†                                                                                                                             | SN54LS48 |      |      | SN74LS48 |      |      | UNIT    |
|-----------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------|------|------|----------|------|------|---------|
|           |                                        |                                                                                                                                              | MIN      | TYP‡ | MAX  | MIN      | TYP‡ | MAX  |         |
| $V_{IH}$  | High-level input voltage               |                                                                                                                                              | 2        |      |      | 2        |      |      | V       |
| $V_{IL}$  | Low-level input voltage                |                                                                                                                                              |          |      | 0.7  |          |      | 0.8  | V       |
| $V_{IK}$  | Input clamp voltage                    | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$                                                                                                  |          |      | –1.5 |          |      | –1.5 | V       |
| $V_{OH}$  | High-level output voltage              | a thru g and $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL} \text{ max}, I_{OH} = \text{MAX}$ | 2.4      | 4.2  |      | 2.4      | 4.2  |      | V       |
| $I_O$     | Output current                         | a thru g<br>$V_{CC} = \text{MIN}, V_O = 0.85 \text{ V},$<br>Input conditions as for $V_{OH}$                                                 | –1.3     | –2   |      | –1.3     | –2   |      | mA      |
| $V_{OL}$  | Low-level output voltage               | a thru g<br>$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL} \text{ max}, I_{OL} = 2 \text{ mA}$                                  |          | 0.25 | 0.4  |          | 0.25 | 0.4  | V       |
|           |                                        | $I_{OL} = 6 \text{ mA}$                                                                                                                      |          |      |      |          | 0.35 | 0.5  |         |
|           | $\overline{BI}/\overline{RBO}$         | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL} \text{ max}, I_{OL} = 1.6 \text{ mA}$                                            |          | 0.25 | 0.4  |          | 0.25 | 0.4  | V       |
|           |                                        | $I_{OL} = 3.2 \text{ mA}$                                                                                                                    |          |      |      |          | 0.35 | 0.5  |         |
| $I_I$     | Input current at maximum input voltage | Any input except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$                                                  |          |      | 0.1  |          |      | 0.1  | mA      |
| $I_{IH}$  | High-level input current               | Any input except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$                                                |          |      | 20   |          |      | 20   | $\mu$ A |
| $I_{IL}$  | Low-level input current                | Any input except $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$                                                |          |      | –0.4 |          |      | –0.4 | mA      |
|           |                                        | $\overline{BI}/\overline{RBO}$                                                                                                               |          |      | –1.2 |          |      | –1.2 |         |
| $I_{OS}$  | Short-circuit output current           | $\overline{BI}/\overline{RBO}$<br>$V_{CC} = \text{MAX}$                                                                                      | –0.3     |      | –2   | –0.3     |      | –2   | mA      |
| $I_{CC}$  | Supply current                         | $V_{CC} = \text{MAX},$ See Note 2                                                                                                            |          | 25   | 38   |          | 25   | 38   | mA      |

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

‡All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

NOTE 2:  $I_{CC}$  is measured with all outputs open and all inputs at 4.5 V.

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

| PARAMETER                                                                                         | TEST CONDITIONS                                 | MIN | TYP | MAX | UNIT |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------|-----|-----|-----|------|
| $t_{PHL}$ Propagation delay time, high-to-low-level output from A input                           | $C_L = 15 \text{ pF}, R_L = 4 \text{ k}\Omega,$ |     | 100 |     | ns   |
| $t_{PLH}$ Propagation delay time, low-to-high-level output from A input                           | See Note 3                                      |     | 100 |     |      |
| $t_{PHL}$ Propagation delay time, high-to-low-level output (a-f only) from $\overline{RBI}$ input | $C_L = 15 \text{ pF}, R_L = 6 \text{ k}\Omega,$ |     | 100 |     | ns   |
| $t_{PLH}$ Propagation delay time, low-to-high-level output (a-f only) from $\overline{RBI}$ input | See Note 3                                      |     | 100 |     |      |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265



SN5446A, '47A, '48, SN54LS47, 'LS48, 'LS49  
SN7446A, '47A, '48, SN74LS47, 'LS48, 'LS49  
BCD-TO-SEVEN-SEGMENT DECODERS/DRIVERS

SDLS111 – MARCH 1974 – REVISED MARCH 1988

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

|                                                 |                |
|-------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)           | 7 V            |
| Input voltage                                   | 7 V            |
| Current forced into any output in the off state | 1 mA           |
| Operating free-air temperature range: SN54LS49  | –55°C to 125°C |
| SN74LS49                                        | 0°C to 70°C    |
| Storage temperature range                       | –65°C to 150°C |

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

|                                       | SN54LS49 |     |     | SN74LS49 |     |      | UNIT |
|---------------------------------------|----------|-----|-----|----------|-----|------|------|
|                                       | MIN      | NOM | MAX | MIN      | NOM | MAX  |      |
| Supply voltage, $V_{CC}$              | 4.5      | 5   | 5.5 | 4.75     | 5   | 5.25 | V    |
| High-level output voltage, $V_{OH}$   |          |     | 5.5 |          |     | 5.5  | V    |
| Low-level output current, $I_{OL}$    |          |     | 4   |          |     | 8    | mA   |
| Operating free-air temperature, $T_A$ | –55      |     | 125 | 0        |     | 70   | °C   |

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

| PARAMETER                                    | TEST CONDITIONS†                                                                                 | SN54LS49 |      |      | SN74LS49 |      |      | UNIT |
|----------------------------------------------|--------------------------------------------------------------------------------------------------|----------|------|------|----------|------|------|------|
|                                              |                                                                                                  | MIN      | TYP‡ | MAX  | MIN      | TYP‡ | MAX  |      |
| $V_{IH}$ High-level input voltage            |                                                                                                  | 2        |      |      | 2        |      |      | V    |
| $V_{IL}$ Low-level input voltage             |                                                                                                  |          |      | 0.7  |          |      | 0.8  | V    |
| $V_{IK}$ Input clamp voltage                 | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$                                                      |          |      | –1.5 |          |      | –1.5 | V    |
| $I_{OH}$ High-level output current           | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, V_{OH} = 5.5 \text{ V}$ |          |      | 250  |          |      | 250  | µA   |
| $V_{OL}$ Low-level output voltage            | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OL} = 4 \text{ mA}$  |          | 0.25 | 0.4  |          | 0.25 | 0.4  | V    |
|                                              | $I_{OL} = 8 \text{ mA}$                                                                          |          |      |      |          | 0.35 | 0.5  |      |
| $I_I$ Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 7 \text{ V}$                                                         |          |      | 0.1  |          |      | 0.1  | mA   |
| $I_{IH}$ High-level input current            | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$                                                       |          |      | 20   |          |      | 20   | µA   |
| $I_{IL}$ Low-level input current             | $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$                                                       |          |      | –0.4 |          |      | –0.4 | mA   |
| $I_{CC}$ Supply current                      | $V_{CC} = \text{MAX}, \text{ See Note 2}$                                                        | 8        |      | 15   | 8        |      | 15   | mA   |

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

‡All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

NOTE 2:  $I_{CC}$  is measured with all outputs open and all inputs at 4.5 V.

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

| PARAMETER                                                                                         | TEST CONDITIONS                                | MIN | TYP | MAX | UNIT |
|---------------------------------------------------------------------------------------------------|------------------------------------------------|-----|-----|-----|------|
| $t_{PHL}$ Propagation delay time, high-to-low-level output from A input                           | $C_L = 15 \text{ pF}, R_L = 4 \text{ k}\Omega$ |     |     | 100 | ns   |
| $t_{PLH}$ Propagation delay time, low-to-high-level output from A input                           | See Note 3                                     |     |     | 100 |      |
| $t_{PHL}$ Propagation delay time, high-to-low-level output (a-f only) from $\overline{RBI}$ input | $C_L = 15 \text{ pF}, R_L = 6 \text{ k}\Omega$ |     |     | 100 | ns   |
| $t_{PLH}$ Propagation delay time, low-to-high-level output (a-f only) from $\overline{RBI}$ input | See Note 3                                     |     |     | 100 |      |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

**PACKAGING INFORMATION**

| Orderable part number           | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)              |
|---------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|----------------------------------|
| <a href="#">5962-9856401QEA</a> | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9856401QE<br>A<br>SNJ5447AJ |
| <a href="#">5962-9856401QFA</a> | Active        | Production           | CFP (W)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9856401QF<br>A<br>SNJ5447AW |
| <a href="#">7604501EA</a>       | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 7604501EA<br>SNJ54LS47J          |
| <a href="#">SN5447AJ</a>        | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN5447AJ                         |
| SN5447AJ.A                      | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN5447AJ                         |
| <a href="#">SN54LS47J</a>       | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN54LS47J                        |
| SN54LS47J.A                     | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN54LS47J                        |
| <a href="#">SN54LS49J</a>       | Active        | Production           | CDIP (J)   14  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN54LS49J                        |
| SN54LS49J.A                     | Active        | Production           | CDIP (J)   14  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SN54LS49J                        |
| <a href="#">SN7447AN</a>        | Active        | Production           | PDIP (N)   16  | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | SN7447AN                         |
| SN7447AN.A                      | Active        | Production           | PDIP (N)   16  | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | SN7447AN                         |
| SN7447ANE4                      | Active        | Production           | PDIP (N)   16  | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | SN7447AN                         |
| <a href="#">SN74LS47D</a>       | Active        | Production           | SOIC (D)   16  | 40   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | LS47                             |
| SN74LS47D.A                     | Active        | Production           | SOIC (D)   16  | 40   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | LS47                             |
| <a href="#">SN74LS47DR</a>      | Active        | Production           | SOIC (D)   16  | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -            | LS47                             |
| SN74LS47DR.A                    | Active        | Production           | SOIC (D)   16  | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | LS47                             |
| <a href="#">SN74LS47N</a>       | Active        | Production           | PDIP (N)   16  | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | SN74LS47N                        |
| SN74LS47N.A                     | Active        | Production           | PDIP (N)   16  | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | SN74LS47N                        |
| SN74LS47NE4                     | Active        | Production           | PDIP (N)   16  | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | SN74LS47N                        |
| <a href="#">SN74LS47NSR</a>     | Active        | Production           | SOP (NS)   16  | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | 74LS47                           |
| SN74LS47NSR.A                   | Active        | Production           | SOP (NS)   16  | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | 74LS47                           |
| SN74LS47NSR.B                   | Active        | Production           | SOP (NS)   16  | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | 74LS47                           |
| <a href="#">SNJ5447AJ</a>       | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9856401QE<br>A<br>SNJ5447AJ |

| Orderable part number       | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)              |
|-----------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|----------------------------------|
| SNJ5447AJ.A                 | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9856401QE<br>A<br>SNJ5447AJ |
| <a href="#">SNJ5447AW</a>   | Active        | Production           | CFP (W)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9856401QF<br>A<br>SNJ5447AW |
| SNJ5447AW.A                 | Active        | Production           | CFP (W)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9856401QF<br>A<br>SNJ5447AW |
| <a href="#">SNJ54LS47FK</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SNJ54LS<br>47FK                  |
| SNJ54LS47FK.A               | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SNJ54LS<br>47FK                  |
| <a href="#">SNJ54LS47J</a>  | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 7604501EA<br>SNJ54LS47J          |
| SNJ54LS47J.A                | Active        | Production           | CDIP (J)   16  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 7604501EA<br>SNJ54LS47J          |
| <a href="#">SNJ54LS49J</a>  | Active        | Production           | CDIP (J)   14  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SNJ54LS49J                       |
| SNJ54LS49J.A                | Active        | Production           | CDIP (J)   14  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | SNJ54LS49J                       |

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

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

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

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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

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

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

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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 SN5447A, SN54LS47, SN7447A, SN74LS47 :**

- Catalog : [SN7447A](#), [SN74LS47](#)
- Military : [SN5447A](#), [SN54LS47](#)

NOTE: Qualified Version Definitions:

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



## 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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS47DR  | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LS47NSR | SOP          | NS              | 16   | 2000 | 330.0              | 16.4               | 8.1     | 10.4    | 2.5     | 12.0    | 16.0   | Q1            |

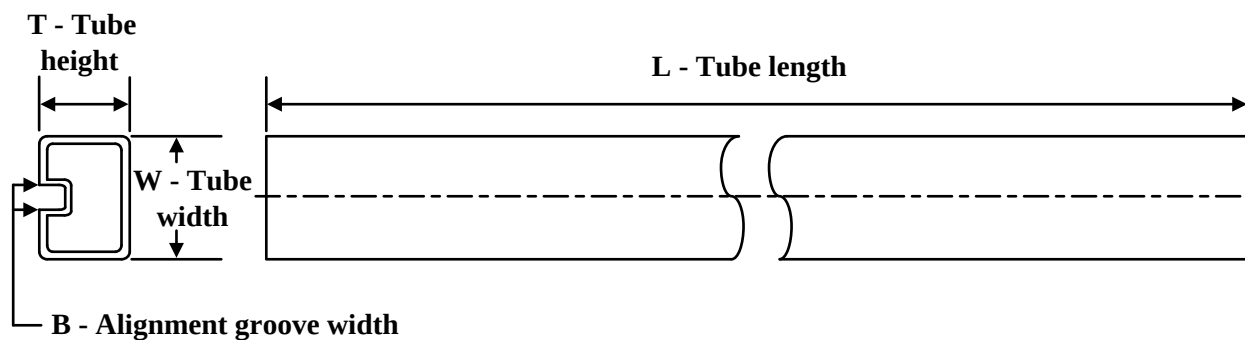
## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS47DR  | SOIC         | D               | 16   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74LS47NSR | SOP          | NS              | 16   | 2000 | 353.0       | 353.0      | 32.0        |

## TUBE

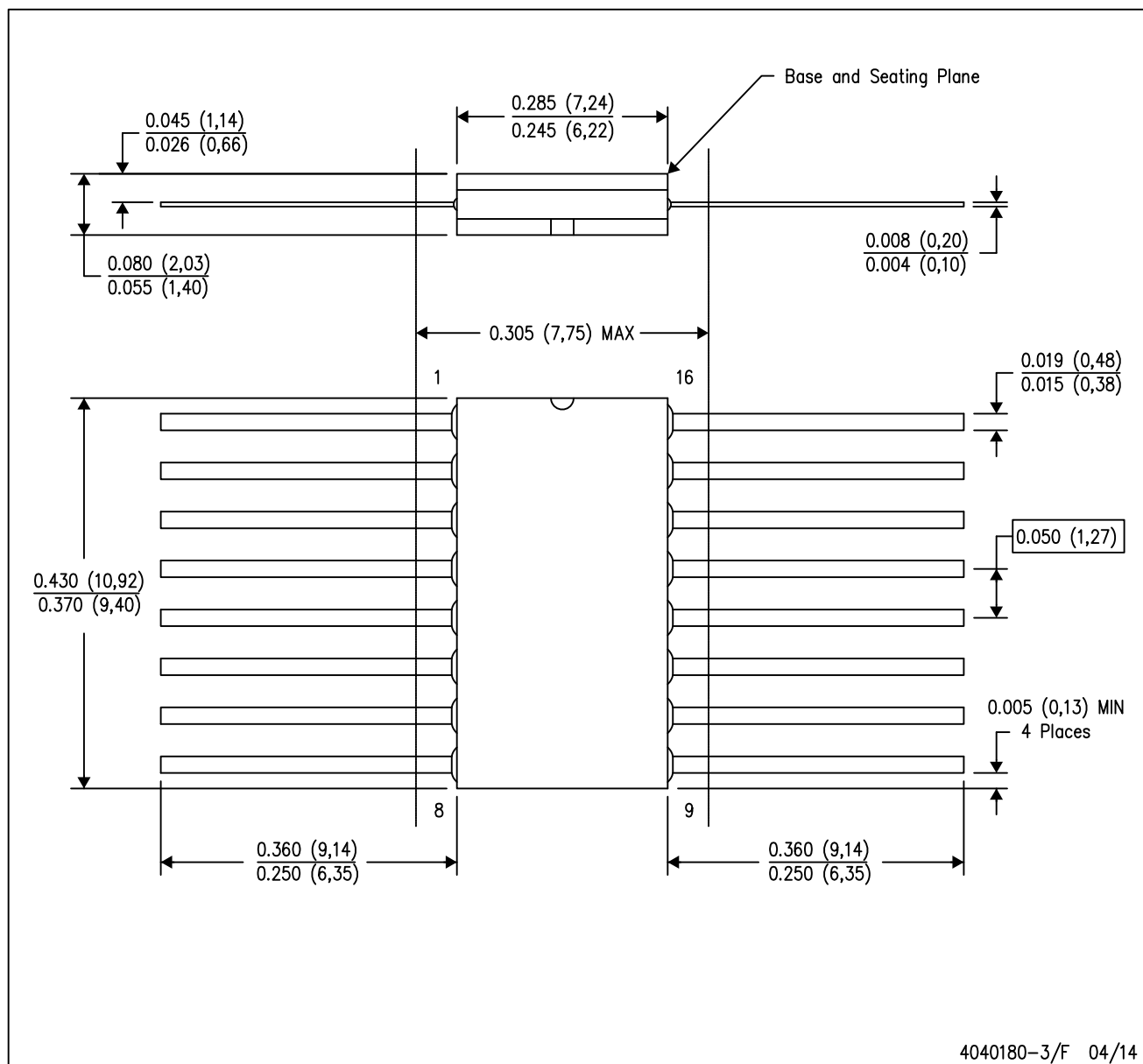


\*All dimensions are nominal

| Device          | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 5962-9856401QFA | W            | CFP          | 16   | 25  | 506.98 | 26.16  | 6220   | NA     |
| SN7447AN        | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN7447AN        | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN7447AN.A      | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN7447AN.A      | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN7447ANE4      | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN7447ANE4      | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS47D       | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| SN74LS47D.A     | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| SN74LS47N       | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS47N       | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS47N.A     | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS47N.A     | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS47NE4     | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS47NE4     | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SNJ5447AW       | W            | CFP          | 16   | 25  | 506.98 | 26.16  | 6220   | NA     |
| SNJ5447AW.A     | W            | CFP          | 16   | 25  | 506.98 | 26.16  | 6220   | NA     |
| SNJ54LS47FK     | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| SNJ54LS47FK.A   | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



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

## GENERIC PACKAGE VIEW

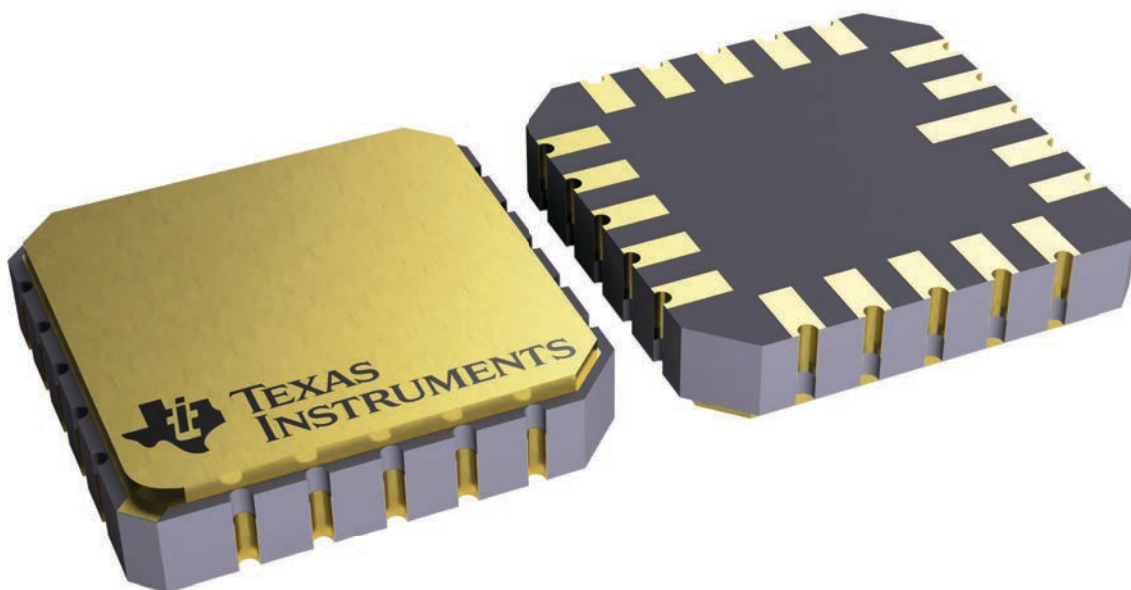
**FK 20**

**LCCC - 2.03 mm max height**

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

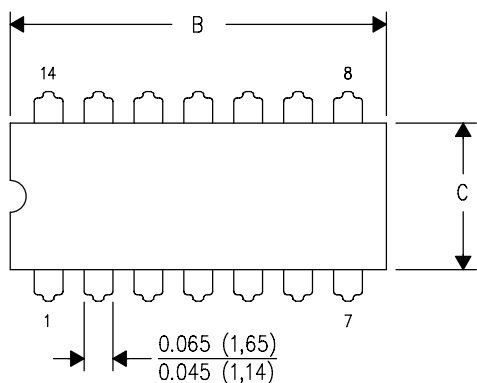


4229370VA\

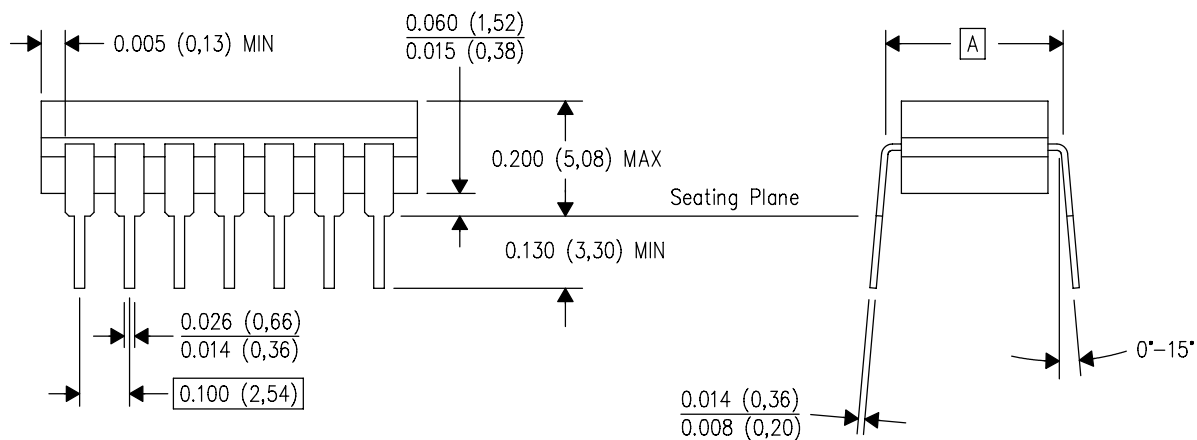
J (R-GDIP-T\*\*)

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.

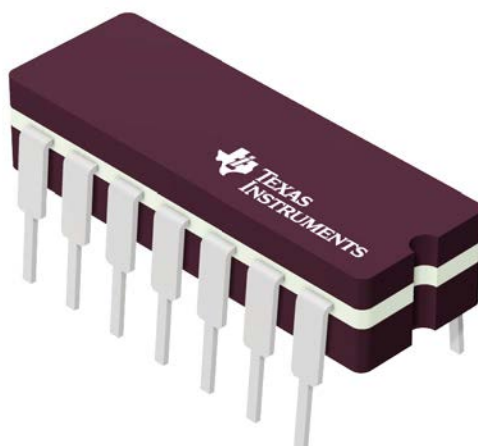


**J 14**

## GENERIC PACKAGE VIEW

**CDIP - 5.08 mm max height**

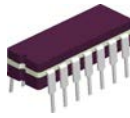
CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

4040083-5/G

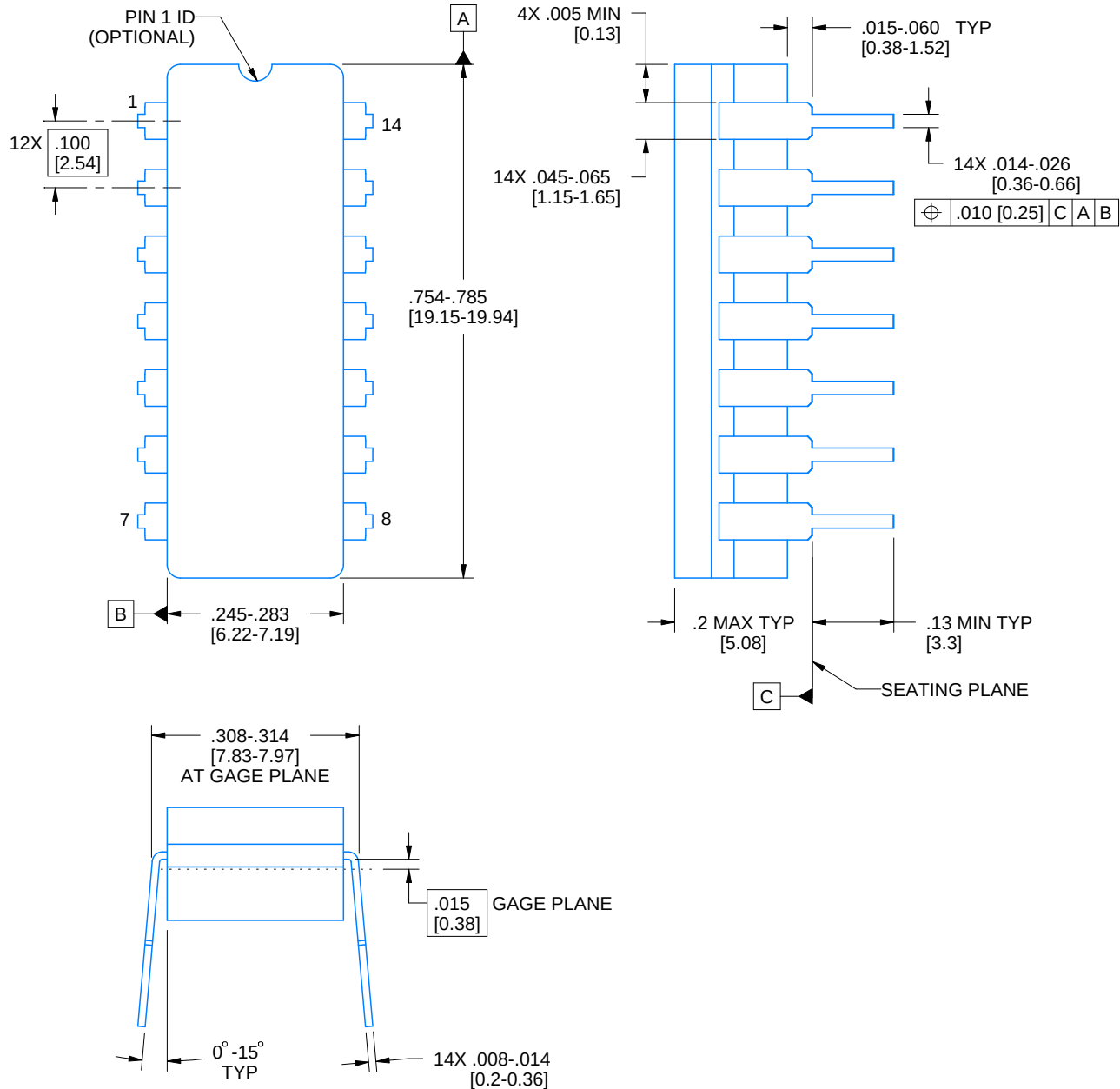
J0014A



## PACKAGE OUTLINE

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

### NOTES:

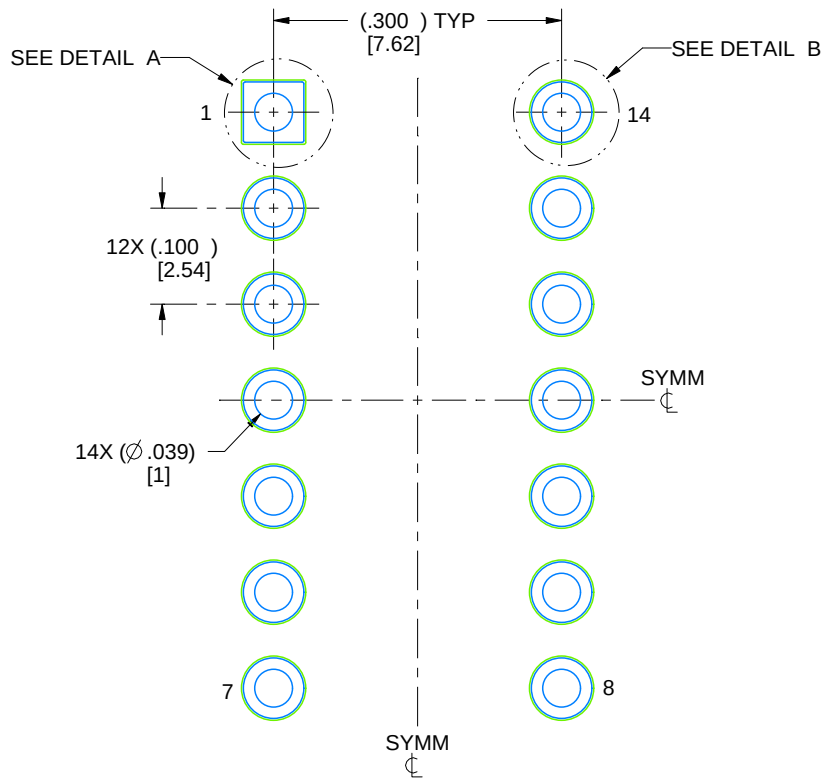
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

# EXAMPLE BOARD LAYOUT

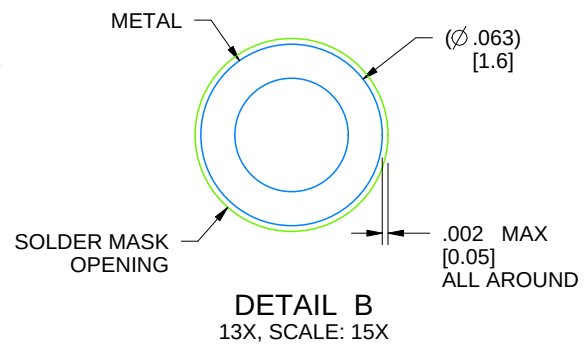
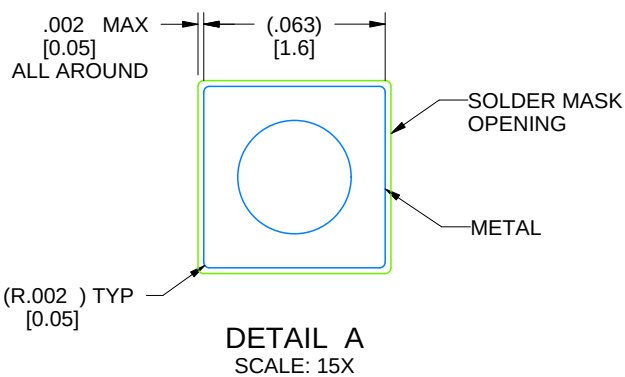
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE  
NON-SOLDER MASK DEFINED  
SCALE: 5X

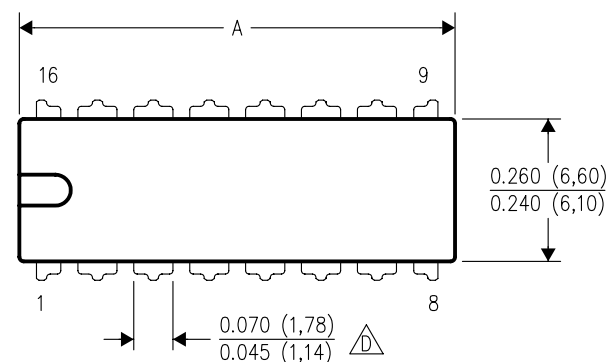


4214771/A 05/2017

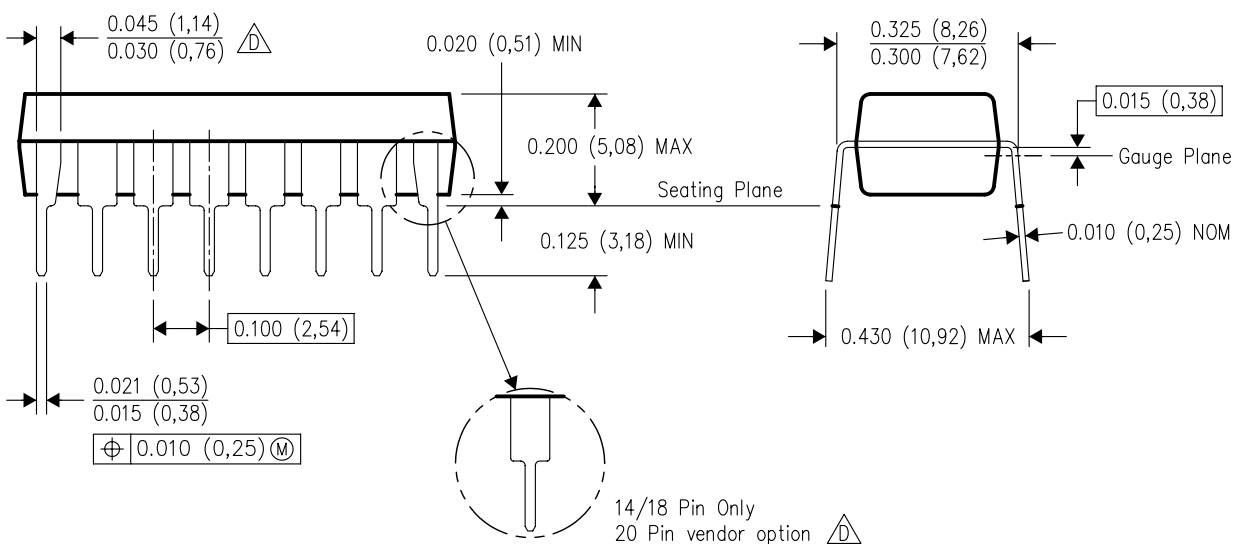
N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



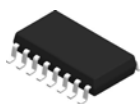
| PINS **<br>DIM      | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
|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

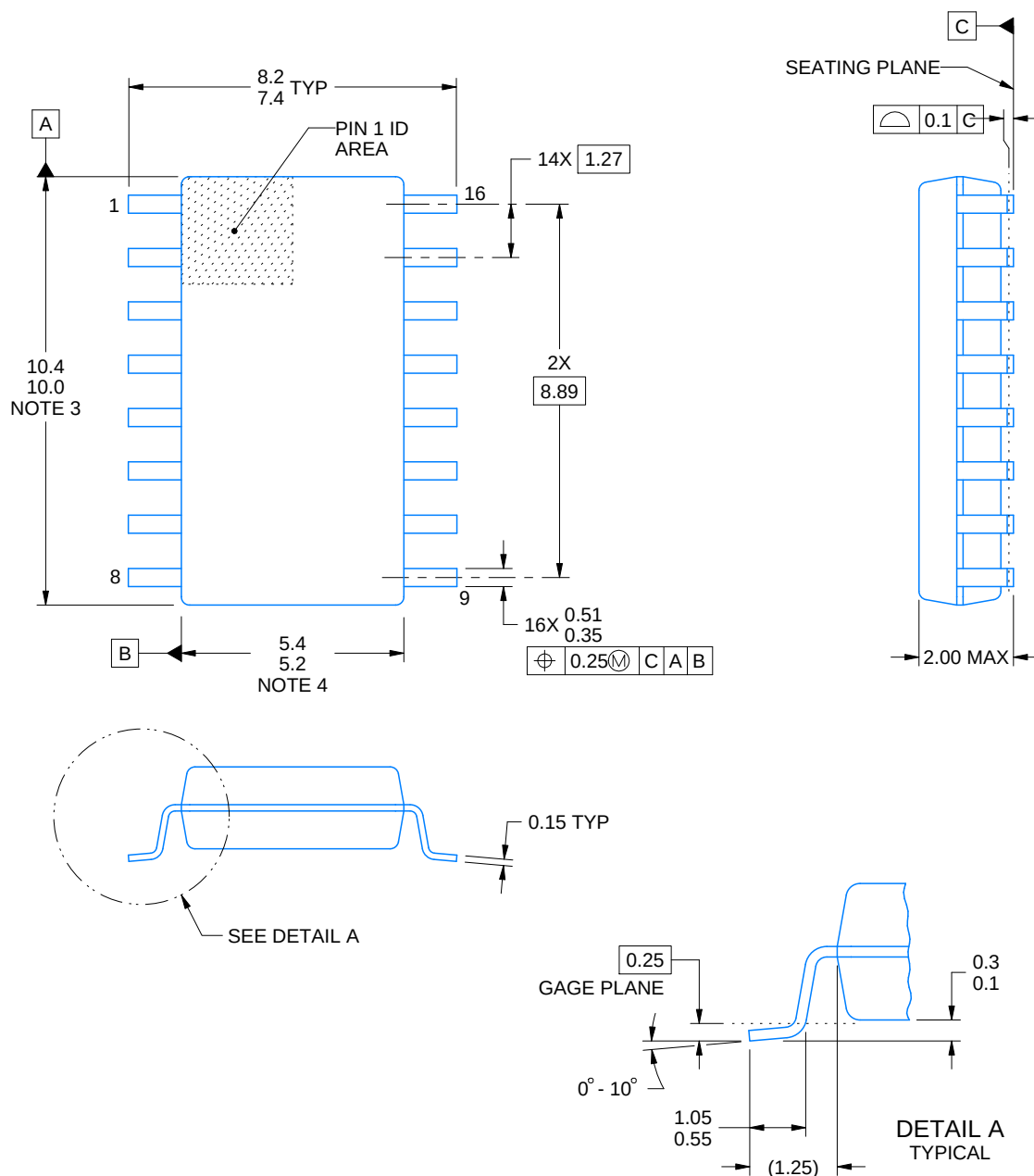


# PACKAGE OUTLINE

NS0016A

SOP - 2.00 mm max height

SOP

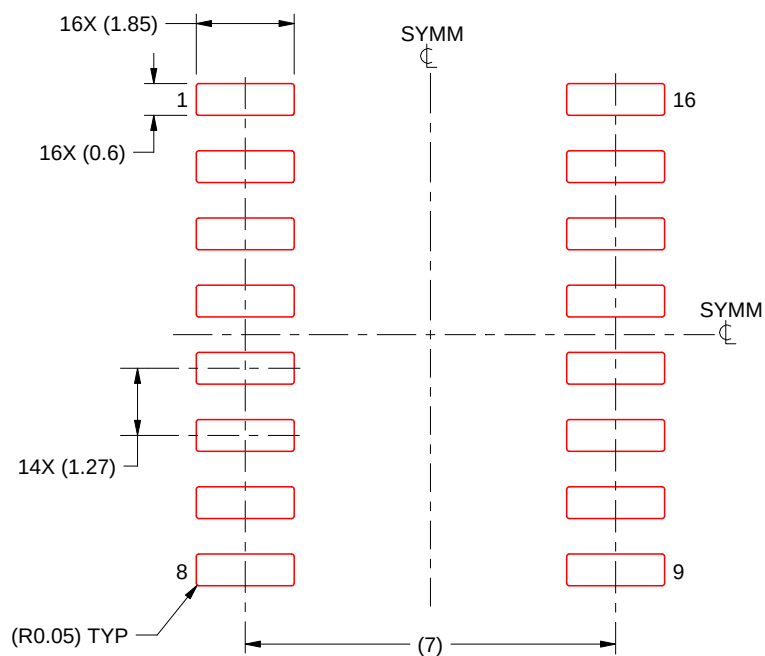


4220735/A 12/2021

## NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.





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

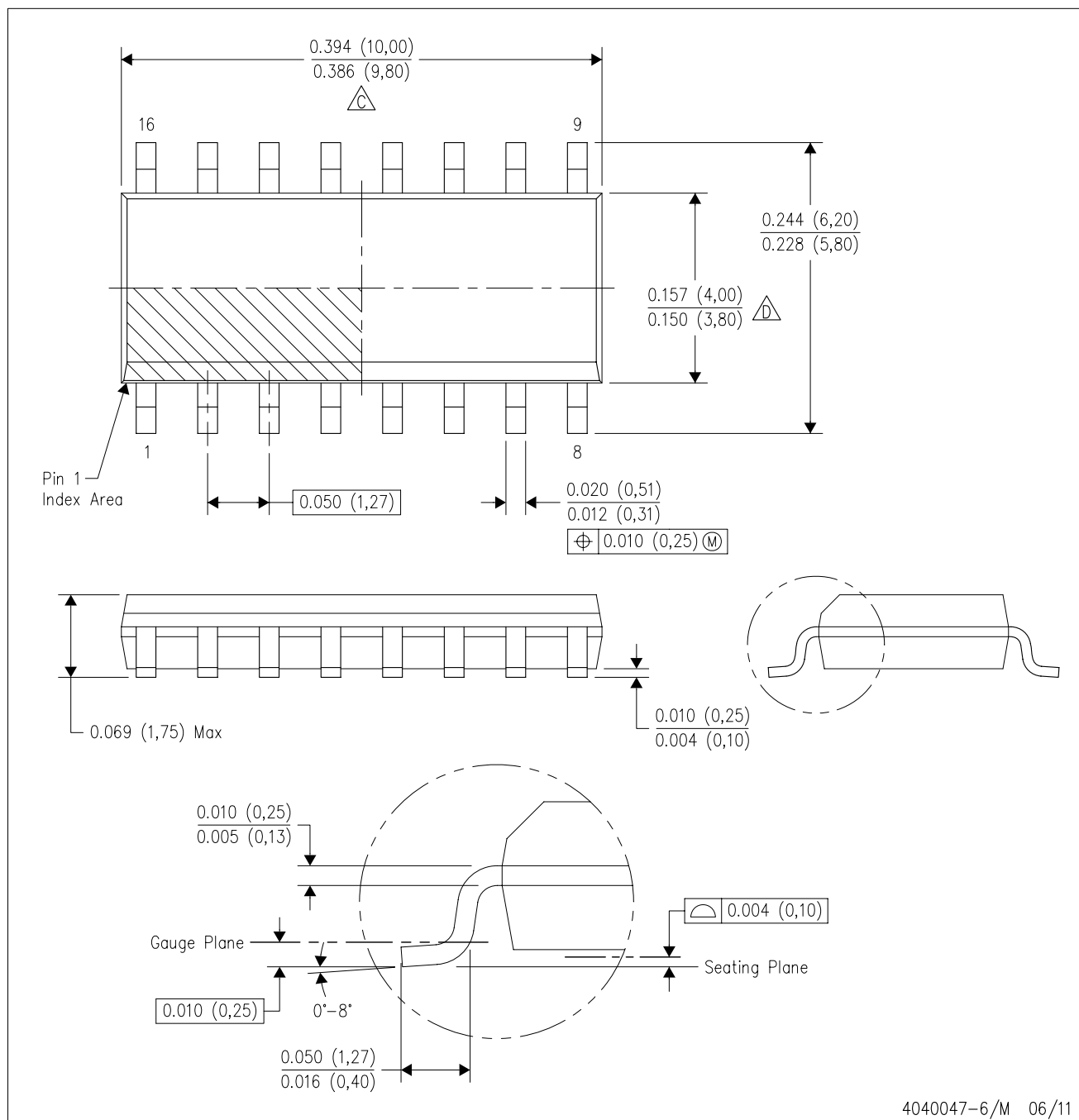
4220735/A 12/2021

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.

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.
  - $\triangle C$  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 AC.



## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2025, Texas Instruments Incorporated