

# SN54ALS138A, SN54AS138, SN74ALS138A, SN74AS138 3-LINE TO 8-LINE DECODERS/DEMULPLEXERS

SDAS055E – APRIL 1982 – REVISED JULY 1996

- Designed Specifically for High-Speed Memory Decoders and Data Transmission Systems
- Incorporate Three Enable Inputs to Simplify Cascading and/or Data Reception
- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

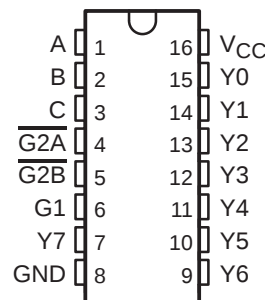
## description

The 'ALS138A and 'AS138 are 3-line to 8-line decoders/demultiplexers designed for high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance systems, these devices can be used to minimize the effects of system decoding. When employed with high-speed memories with a fast enable circuit, the delay times of the decoder and the enable time of the memory are usually less than the typical access time of the memory. The effective system delay introduced by the Schottky-clamped system decoder is negligible.

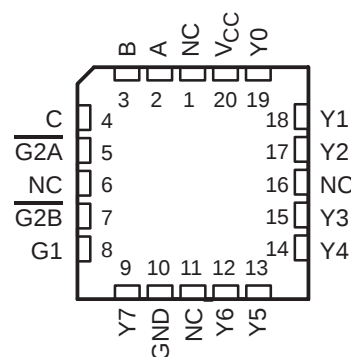
The conditions at the binary-select ( $\overline{A}$ ,  $\overline{B}$ , and  $\overline{C}$ ) inputs and the three enable ( $\overline{G1}$ ,  $\overline{G2A}$ , and  $\overline{G2B}$ ) inputs select one of eight output lines. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented without external inverters and a 32-line decoder requires only one inverter. An enable input can be used as a data input for demultiplexing applications.

The SN54ALS138A and SN54AS138 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS138A and SN74AS138 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS138A, SN54AS138 . . . J PACKAGE  
SN74ALS138A, SN74AS138 . . . D OR N PACKAGE  
(TOP VIEW)



SN54ALS138A, SN54AS138 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

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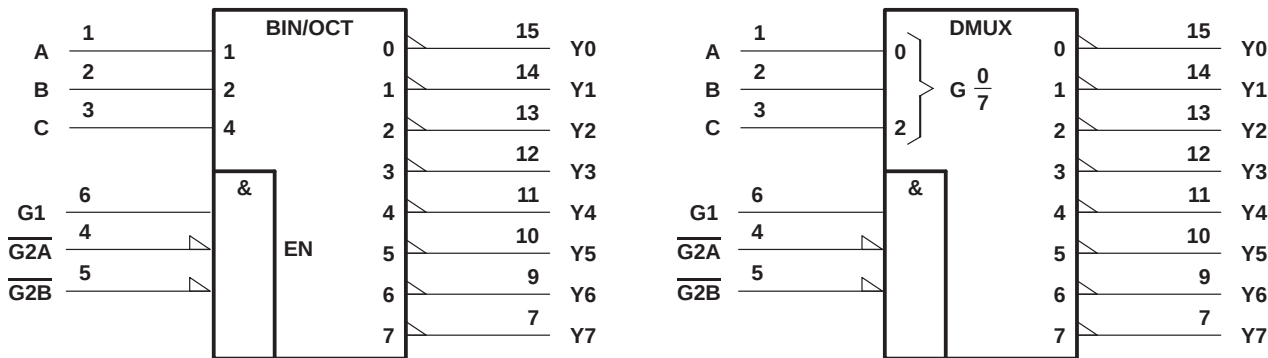
SN54ALS138A, SN54AS138, SN74ALS138A, SN74AS138  
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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FUNCTION TABLE

| INPUTS |                  |                  |        |   |   | OUTPUTS |    |    |    |    |    |    |    |
|--------|------------------|------------------|--------|---|---|---------|----|----|----|----|----|----|----|
| ENABLE |                  |                  | SELECT |   |   |         |    |    |    |    |    |    |    |
| G1     | $\overline{G2A}$ | $\overline{G2B}$ | C      | B | A | Y0      | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| X      | H                | X                | X      | X | X | H       | H  | H  | H  | H  | H  | H  | H  |
| X      | X                | H                | X      | X | X | H       | H  | H  | H  | H  | H  | H  | H  |
| L      | X                | X                | X      | X | X | H       | H  | H  | H  | H  | H  | H  | H  |
| H      | L                | L                | L      | L | L | L       | H  | H  | H  | H  | H  | H  | H  |
| H      | L                | L                | L      | L | H | H       | L  | H  | H  | H  | H  | H  | H  |
| H      | L                | L                | L      | H | L | H       | H  | L  | H  | H  | H  | H  | H  |
| H      | L                | L                | L      | H | H | H       | H  | H  | L  | H  | H  | H  | H  |
| H      | L                | L                | H      | L | L | H       | H  | H  | H  | L  | H  | H  | H  |
| H      | L                | L                | H      | L | H | H       | H  | H  | H  | H  | L  | H  | H  |
| H      | L                | L                | H      | H | L | H       | H  | H  | H  | H  | H  | L  | H  |
| H      | L                | L                | H      | H | H | H       | H  | H  | H  | H  | H  | H  | L  |

logic symbols (alternatives)<sup>†</sup>

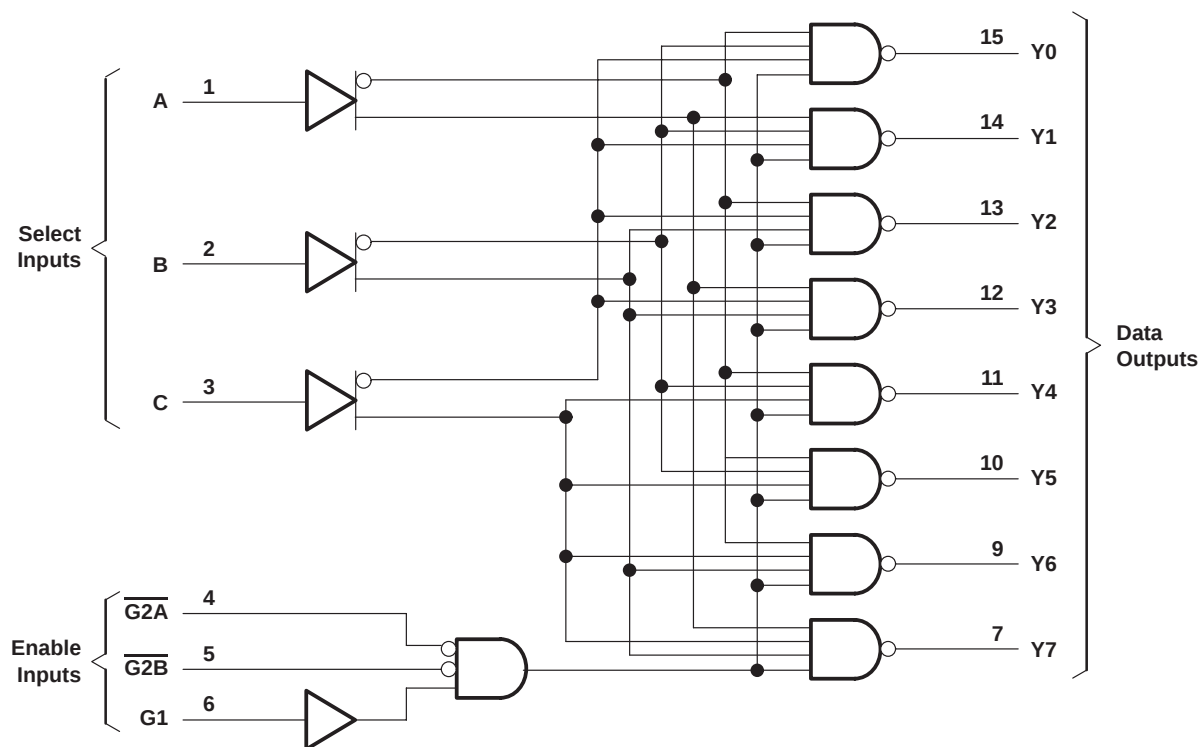


<sup>†</sup> These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for the D, J, and N packages.

## SN54ALS138A, SN54AS138, SN74ALS138A, SN74AS138 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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**logic diagram (positive logic)**



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

# SN54ALS138A, SN54AS138, SN74ALS138A, SN74AS138

## 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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

|                                                           |                |
|-----------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                                  | 7 V            |
| Input voltage, $V_I$                                      | 7 V            |
| Operating free-air temperature range, $T_A$ : SN54ALS138A | –55°C to 125°C |
| SN74ALS138A                                               | 0°C to 70°C    |
| Storage temperature range, $T_{stg}$                      | –65°C to 150°C |

<sup>†</sup> Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

### recommended operating conditions

|          |                                | SN54ALS138A |     |      | SN74ALS138A |     |      | UNIT |
|----------|--------------------------------|-------------|-----|------|-------------|-----|------|------|
|          |                                | MIN         | NOM | MAX  | MIN         | NOM | MAX  |      |
| $V_{CC}$ | Supply voltage                 | 4.5         | 5   | 5.5  | 4.5         | 5   | 5.5  | V    |
| $V_{IH}$ | High-level input voltage       | 2           |     |      | 2           |     |      | V    |
| $V_{IL}$ | Low-level input voltage        |             |     | 0.7  |             |     | 0.8  | V    |
| $I_{OH}$ | High-level output current      |             |     | –0.4 |             |     | –0.4 | mA   |
| $I_{OL}$ | Low-level output current       |             |     | 4    |             |     | 8    | mA   |
| $T_A$    | Operating free-air temperature | –55         |     | 125  | 0           |     | 70   | °C   |

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

| PARAMETER | TEST CONDITIONS                      |  | SN54ALS138A  |                  |      | SN74ALS138A  |                  |      | UNIT |
|-----------|--------------------------------------|--|--------------|------------------|------|--------------|------------------|------|------|
|           |                                      |  | MIN          | TYP <sup>‡</sup> | MAX  | MIN          | TYP <sup>‡</sup> | MAX  |      |
| $V_{IK}$  | $V_{CC} = 4.5$ V, $I_I = -18$ mA     |  |              |                  | –1.5 |              |                  | –1.5 | V    |
| $V_{OH}$  | $V_{CC} = 4.5$ V, $I_{OH} = -0.4$ mA |  | $V_{CC} - 2$ |                  |      | $V_{CC} - 2$ |                  |      | V    |
| $V_{OL}$  | $V_{CC} = 4.5$ V, $I_{OL} = 4$ mA    |  | 0.25         | 0.4              |      | 0.25         | 0.4              |      | V    |
|           | $V_{CC} = 4.5$ V, $I_{OL} = 8$ mA    |  |              |                  |      | 0.35         | 0.5              |      |      |
| $I_I$     | $V_{CC} = 5.5$ V, $V_I = 7$ V        |  |              | 0.1              |      |              | 0.1              |      | mA   |
| $I_{IH}$  | $V_{CC} = 5.5$ V, $V_I = 2.7$ V      |  |              | 20               |      |              | 20               |      | μA   |
| $I_{IL}$  | $V_{CC} = 5.5$ V, $V_I = 0.4$ V      |  |              | –0.1             |      |              | –0.1             |      | mA   |
| $I_O^S$   | $V_{CC} = 5.5$ V, $V_O = 2.25$ V     |  | –20          | –112             |      | –30          | –112             |      | mA   |
| $I_{CC}$  | $V_{CC} = 5.5$ V                     |  | 5            | 10               |      | 5            | 10               |      | mA   |

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

<sup>S</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

### switching characteristics (see Figure 1)

| PARAMETER | FROM<br>(INPUT)     | TO<br>(OUTPUT) | VCC = 4.5 V to 5.5 V,<br>CL = 50 pF,<br>RL = 500 Ω,<br>TA = MIN to MAX†† |     |             |     | UNIT |
|-----------|---------------------|----------------|--------------------------------------------------------------------------|-----|-------------|-----|------|
|           |                     |                | SN54ALS138A                                                              |     | SN74ALS138A |     |      |
|           |                     |                | MIN                                                                      | MAX | MIN         | MAX |      |
| tPLH      | A, B, C             | Any Y          | 2                                                                        | 28  | 5           | 22  | ns   |
| tPHL      |                     |                | 6                                                                        | 22  | 6           | 18  |      |
| tPLH      | G or $\overline{G}$ | Any Y          | 2                                                                        | 22  | 3           | 17  | ns   |
| tPHL      |                     |                | 4                                                                        | 21  | 4           | 17  |      |

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



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# SN54ALS138A, SN54AS138, SN74ALS138A, SN74AS138 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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

|                                                         |                |
|---------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                                | 7 V            |
| Input voltage, $V_I$                                    | 7 V            |
| Operating free-air temperature range, $T_A$ : SN54AS138 | –55°C to 125°C |
| SN74AS138                                               | 0°C to 70°C    |
| Storage temperature range, $T_{stg}$                    | –65°C to 150°C |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## recommended operating conditions

|          |                                | SN54AS138 |     |     | SN74AS138 |     |     | UNIT |
|----------|--------------------------------|-----------|-----|-----|-----------|-----|-----|------|
|          |                                | MIN       | NOM | MAX | MIN       | NOM | MAX |      |
| $V_{CC}$ | Supply voltage                 | 4.5       | 5   | 5.5 | 4.5       | 5   | 5.5 | V    |
| $V_{IH}$ | High-level input voltage       | 2         |     |     | 2         |     |     | V    |
| $V_{IL}$ | Low-level input voltage        |           |     | 0.8 |           |     | 0.8 | V    |
| $I_{OH}$ | High-level output current      |           |     | –2  |           |     | –2  | mA   |
| $I_{OL}$ | Low-level output current       |           |     | 20  |           |     | 20  | mA   |
| $T_A$    | Operating free-air temperature | –55       |     | 125 | 0         |     | 70  | °C   |

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

| PARAMETER    | TEST CONDITIONS                                                    | SN54AS138    |                  |      | SN74AS138    |                  |      | UNIT |
|--------------|--------------------------------------------------------------------|--------------|------------------|------|--------------|------------------|------|------|
|              |                                                                    | MIN          | TYP <sup>‡</sup> | MAX  | MIN          | TYP <sup>‡</sup> | MAX  |      |
| $V_{IK}$     | $V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$                    |              |                  | –1.2 |              |                  | –1.2 | V    |
| $V_{OH}$     | $V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $I_{OH} = -2\text{ mA}$ | $V_{CC} - 2$ |                  |      | $V_{CC} - 2$ |                  |      | V    |
| $V_{OL}$     | $V_{CC} = 4.5\text{ V}$ , $I_{OL} = 20\text{ mA}$                  |              | 0.35             | 0.5  |              | 0.35             | 0.5  | V    |
| $I_I$        | $V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$                       |              |                  | 0.1  |              |                  | 0.1  | mA   |
| $I_{IH}$     | $V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$                     |              |                  | 20   |              |                  | 20   | μA   |
| $I_{IL}$     | $V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$                     |              |                  | –0.5 |              |                  | –0.5 | mA   |
| $I_{O}^{\S}$ | $V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$                    | –30          |                  | –112 | –30          |                  | –112 | mA   |
| $I_{CCH}$    | $V_{CC} = 5.5\text{ V}$                                            |              | 12               | 17.5 |              | 12               | 17.5 | mA   |
| $I_{CCL}$    | $V_{CC} = 5.5\text{ V}$                                            |              | 14               | 20   |              | 14               | 20   | mA   |

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

<sup>\S</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .



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3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

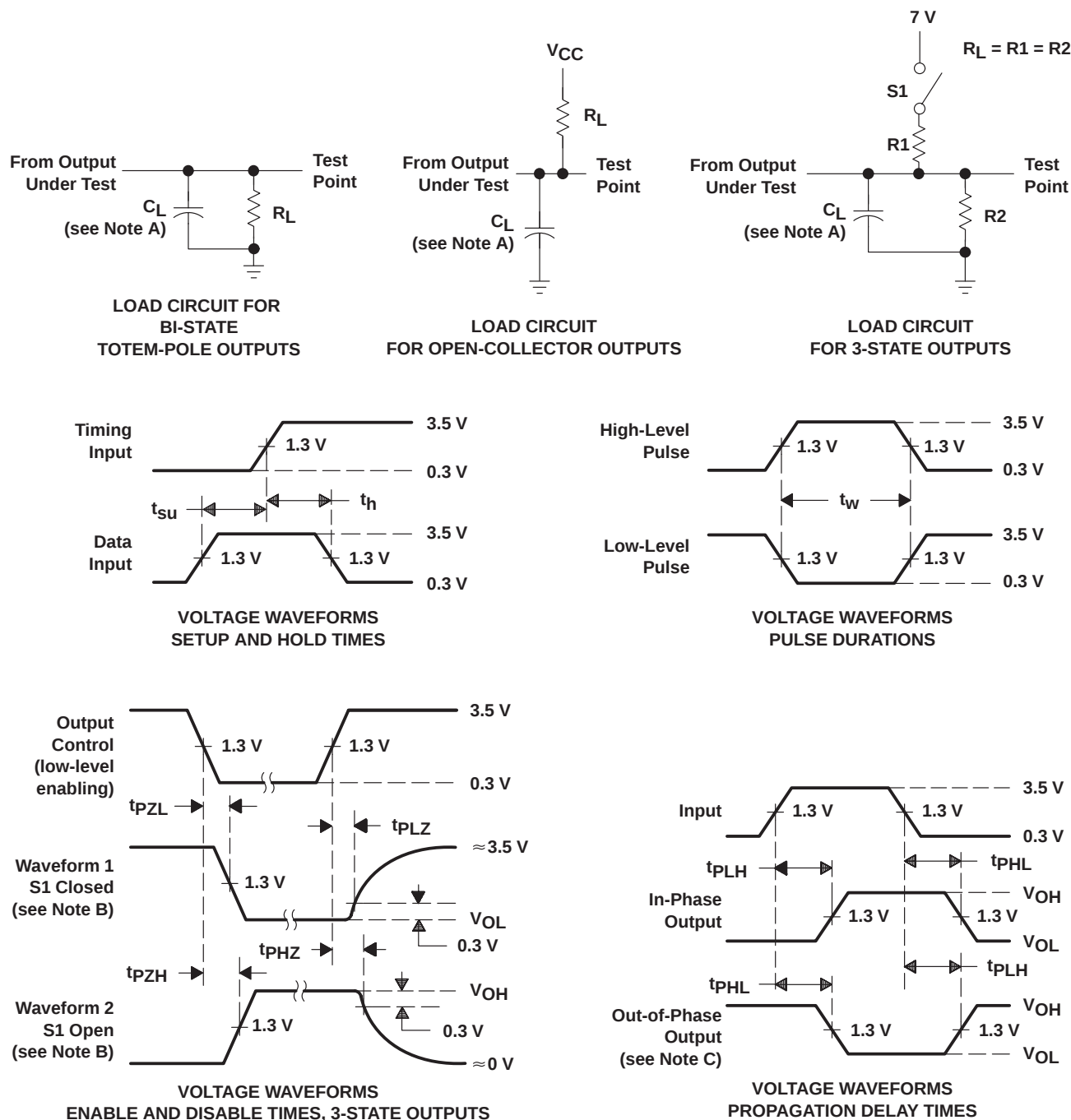
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switching characteristics (see Figure 1)

| PARAMETER        | FROM<br>(INPUT)        | TO<br>(OUTPUT) | 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 |
|------------------|------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------|------|-----------|-----|------|
|                  |                        |                | SN54AS138                                                                                                               |      | SN74AS138 |     |      |
|                  |                        |                | MIN                                                                                                                     | MAX  | MIN       | MAX |      |
| t <sub>PLH</sub> | A, B, C                | Any Y          | 2                                                                                                                       | 11   | 2         | 10  | ns   |
| t <sub>PHL</sub> |                        |                | 2                                                                                                                       | 11   | 2         | 9.5 |      |
| t <sub>PLH</sub> | G1                     | Any Y          | 2                                                                                                                       | 11.5 | 2         | 10  | ns   |
| t <sub>PHL</sub> |                        |                | 2                                                                                                                       | 11   | 2         | 10  |      |
| t <sub>PLH</sub> | $\overline{\text{G2}}$ | Any Y          | 2                                                                                                                       | 9    | 2         | 7.5 | ns   |
| t <sub>PHL</sub> |                        |                | 2                                                                                                                       | 10   | 2         | 8.5 |      |

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

PARAMETER MEASUREMENT INFORMATION  
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
C. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

**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                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|------------------------------------------|-------------------------|
| 5962-86866012A   | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | 5962-<br>86866012A<br>SNJ54ALS<br>138AFK | <a href="#">Samples</a> |
| 5962-8686601FA   | ACTIVE        | CFP          | W                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 5962-8686601FA<br>SNJ54ALS138AW          | <a href="#">Samples</a> |
| JM38510/37701B2A | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | JM38510/<br>37701B2A                     | <a href="#">Samples</a> |
| JM38510/37701BEA | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | JM38510/<br>37701BEA                     | <a href="#">Samples</a> |
| M38510/37701B2A  | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | JM38510/<br>37701B2A                     | <a href="#">Samples</a> |
| M38510/37701BEA  | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | JM38510/<br>37701BEA                     | <a href="#">Samples</a> |
| SN54ALS138AJ     | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | SN54ALS138AJ                             | <a href="#">Samples</a> |
| SN54AS138J       | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | SN54AS138J                               | <a href="#">Samples</a> |
| SN74ALS138AD     | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | ALS138A                                  | <a href="#">Samples</a> |
| SN74ALS138ADE4   | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | ALS138A                                  | <a href="#">Samples</a> |
| SN74ALS138ADG4   | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | ALS138A                                  | <a href="#">Samples</a> |
| SN74ALS138ADR    | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | ALS138A                                  | <a href="#">Samples</a> |
| SN74ALS138ADRE4  | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | ALS138A                                  | <a href="#">Samples</a> |
| SN74ALS138ADRG4  | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | ALS138A                                  | <a href="#">Samples</a> |
| SN74ALS138AN     | ACTIVE        | PDIP         | N                  | 16   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | SN74ALS138AN                             | <a href="#">Samples</a> |
| SN74ALS138ANE4   | ACTIVE        | PDIP         | N                  | 16   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | SN74ALS138AN                             | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)                  | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|------------------------------------------|-------------------------|
| SN74ALS138ANSR   | ACTIVE        | SO           | NS                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | ALS138A                                  | <a href="#">Samples</a> |
| SN74AS138D       | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | AS138                                    | <a href="#">Samples</a> |
| SN74AS138DR      | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | AS138                                    | <a href="#">Samples</a> |
| SN74AS138N       | ACTIVE        | PDIP         | N                  | 16   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | SN74AS138N                               | <a href="#">Samples</a> |
| SN74AS138N3      | OBSOLETE      | PDIP         | N                  | 16   |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                                          |                         |
| SN74AS138NE4     | ACTIVE        | PDIP         | N                  | 16   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | SN74AS138N                               | <a href="#">Samples</a> |
| SN74AS138NSR     | ACTIVE        | SO           | NS                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 74AS138                                  | <a href="#">Samples</a> |
| SNJ54ALS138AFK   | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | 5962-<br>86866012A<br>SNJ54ALS<br>138AFK | <a href="#">Samples</a> |
| SNJ54ALS138AJ    | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | SNJ54ALS138AJ                            | <a href="#">Samples</a> |
| SNJ54ALS138AW    | ACTIVE        | CFP          | W                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 5962-8686601FA<br>SNJ54ALS138AW          | <a href="#">Samples</a> |
| SNJ54AS138FK     | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | SNJ54AS<br>138FK                         | <a href="#">Samples</a> |
| SNJ54AS138J      | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | SNJ54AS138J                              | <a href="#">Samples</a> |

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

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

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

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

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

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

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

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

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

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

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

<sup>(3)</sup> MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> 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.

<sup>(6)</sup> 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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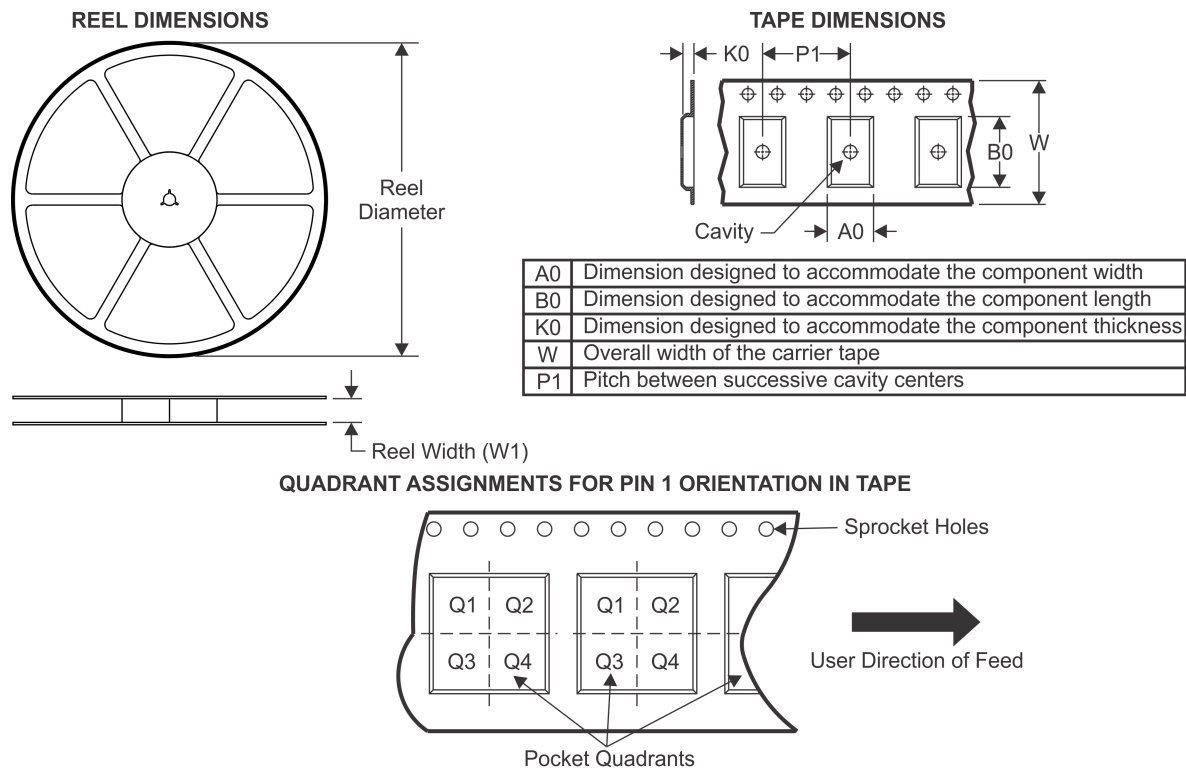
**OTHER QUALIFIED VERSIONS OF SN54ALS138A, SN54AS138, SN74ALS138A, SN74AS138 :**

● Catalog: [SN74ALS138A](#), [SN74AS138](#)

● Military: [SN54ALS138A](#), [SN54AS138](#)

NOTE: Qualified Version Definitions:

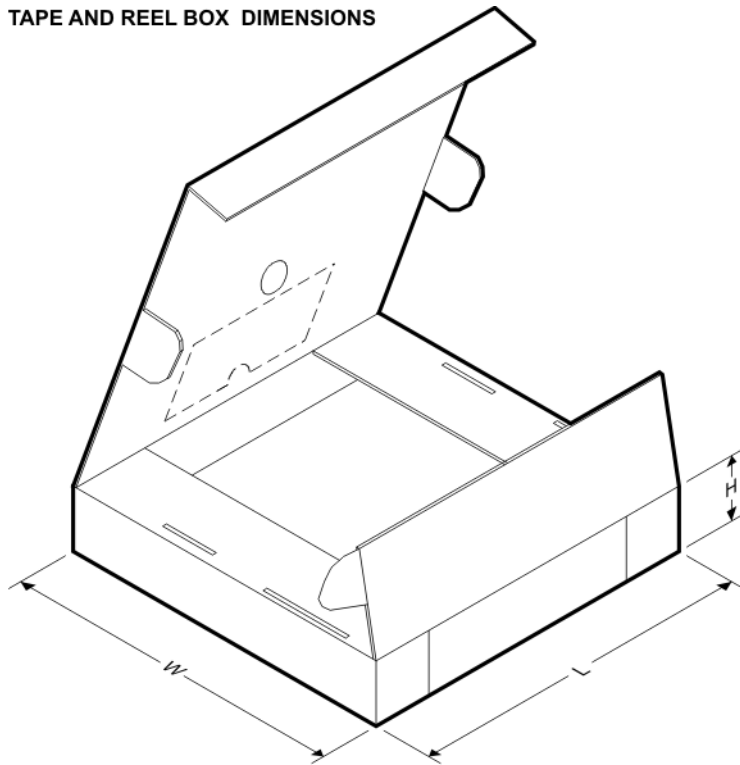
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

**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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ALS138ADR | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74AS138DR   | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74AS138NSR  | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



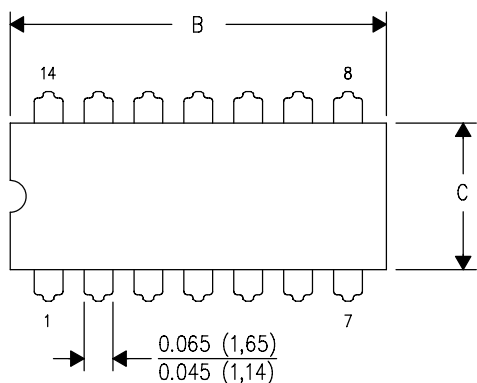
\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ALS138ADR | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74AS138DR   | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74AS138NSR  | SO           | NS              | 16   | 2000 | 367.0       | 367.0      | 38.0        |

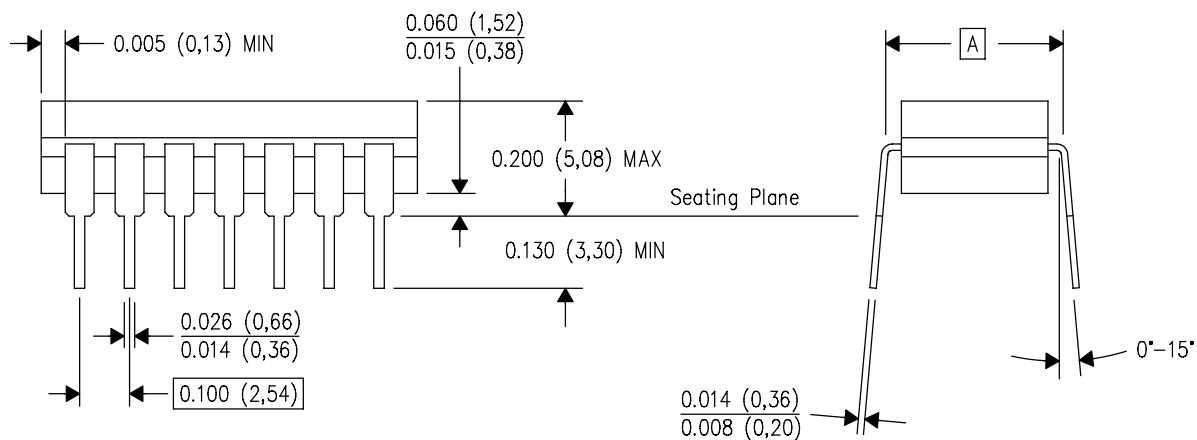
J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



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

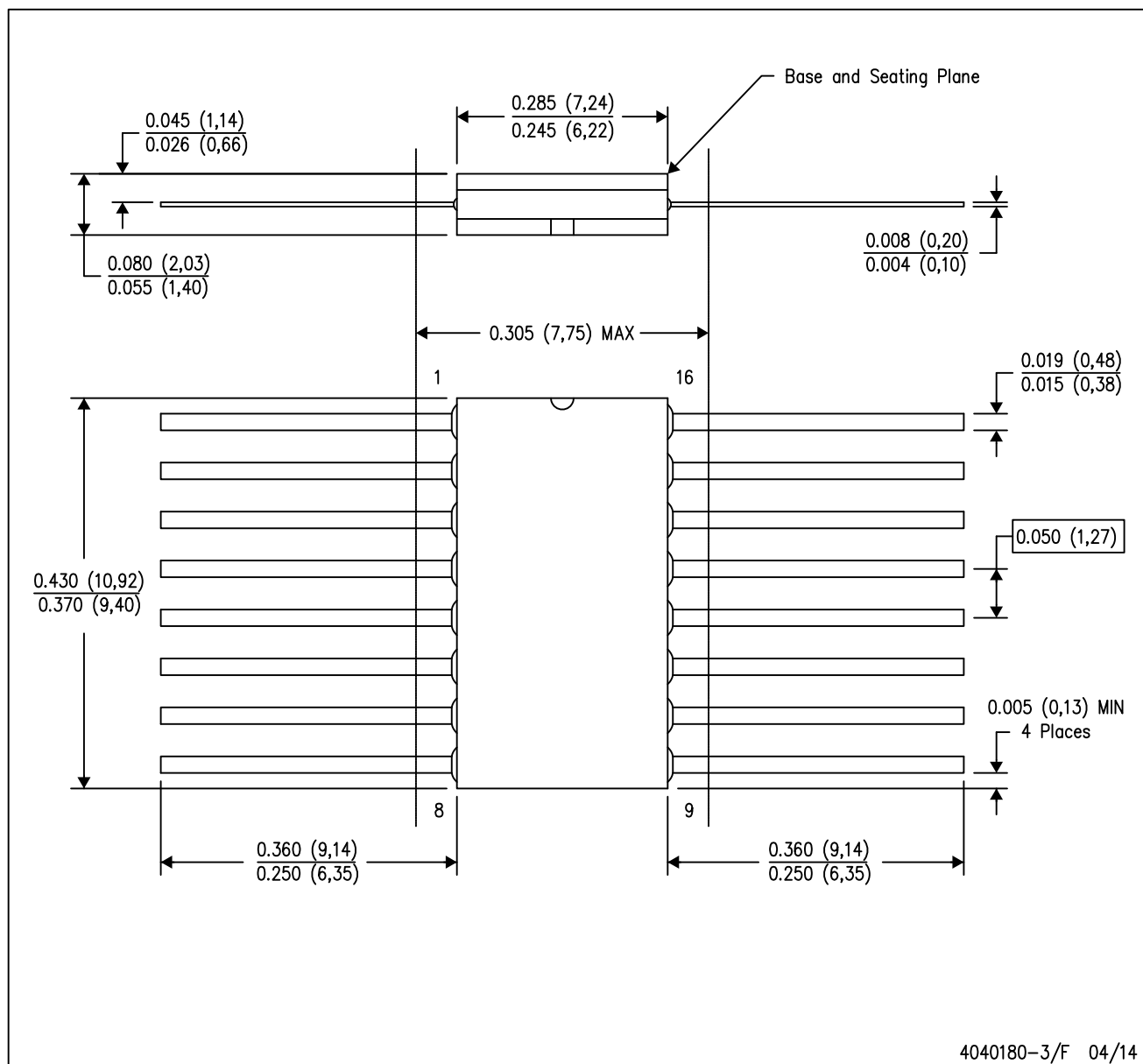


4040083/F 03/03

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

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK

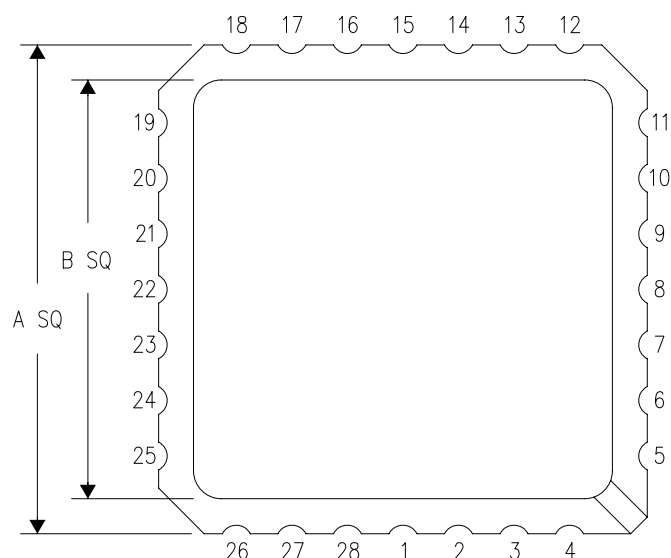


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP2-F16

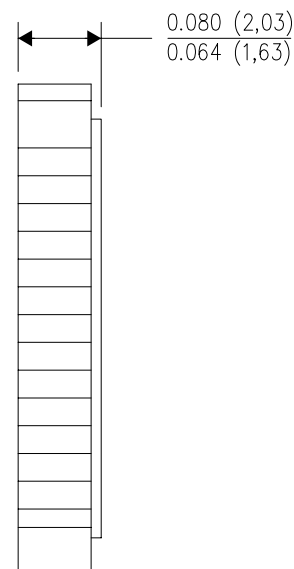
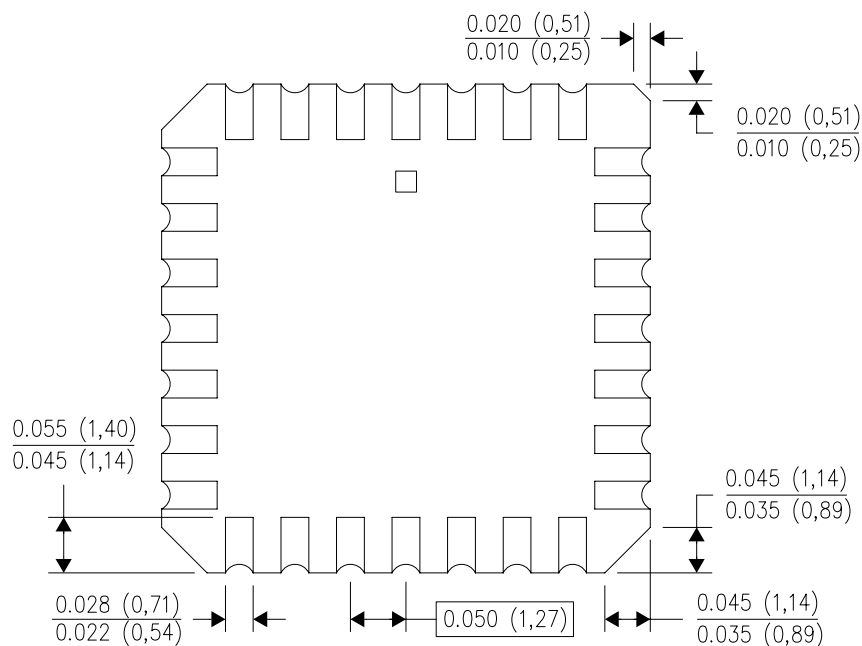
FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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



4040140/D 01/11

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

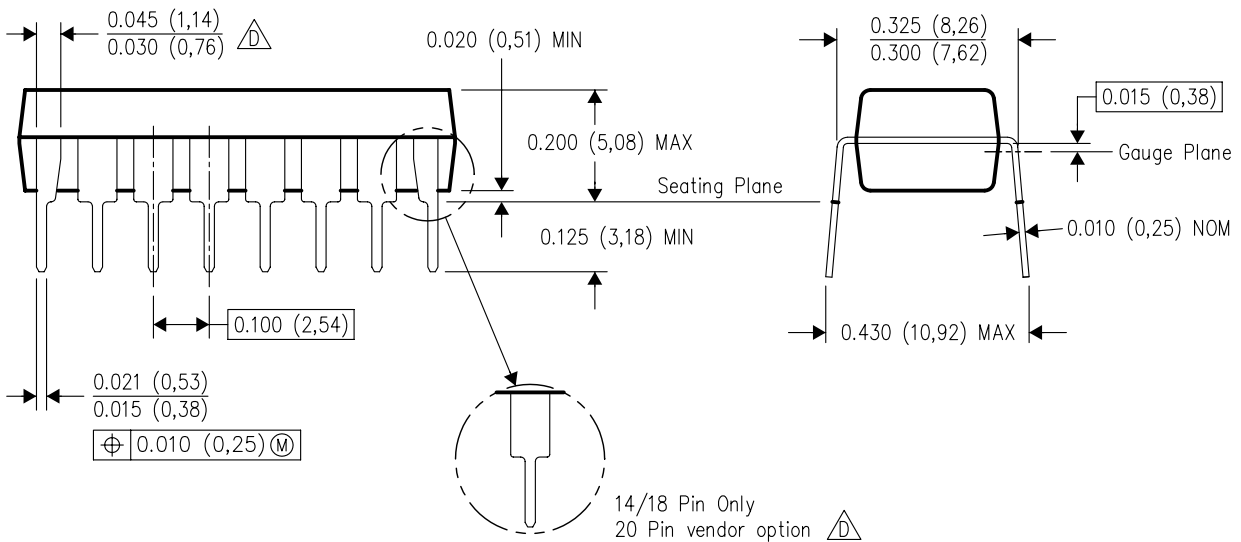
## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| 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               |



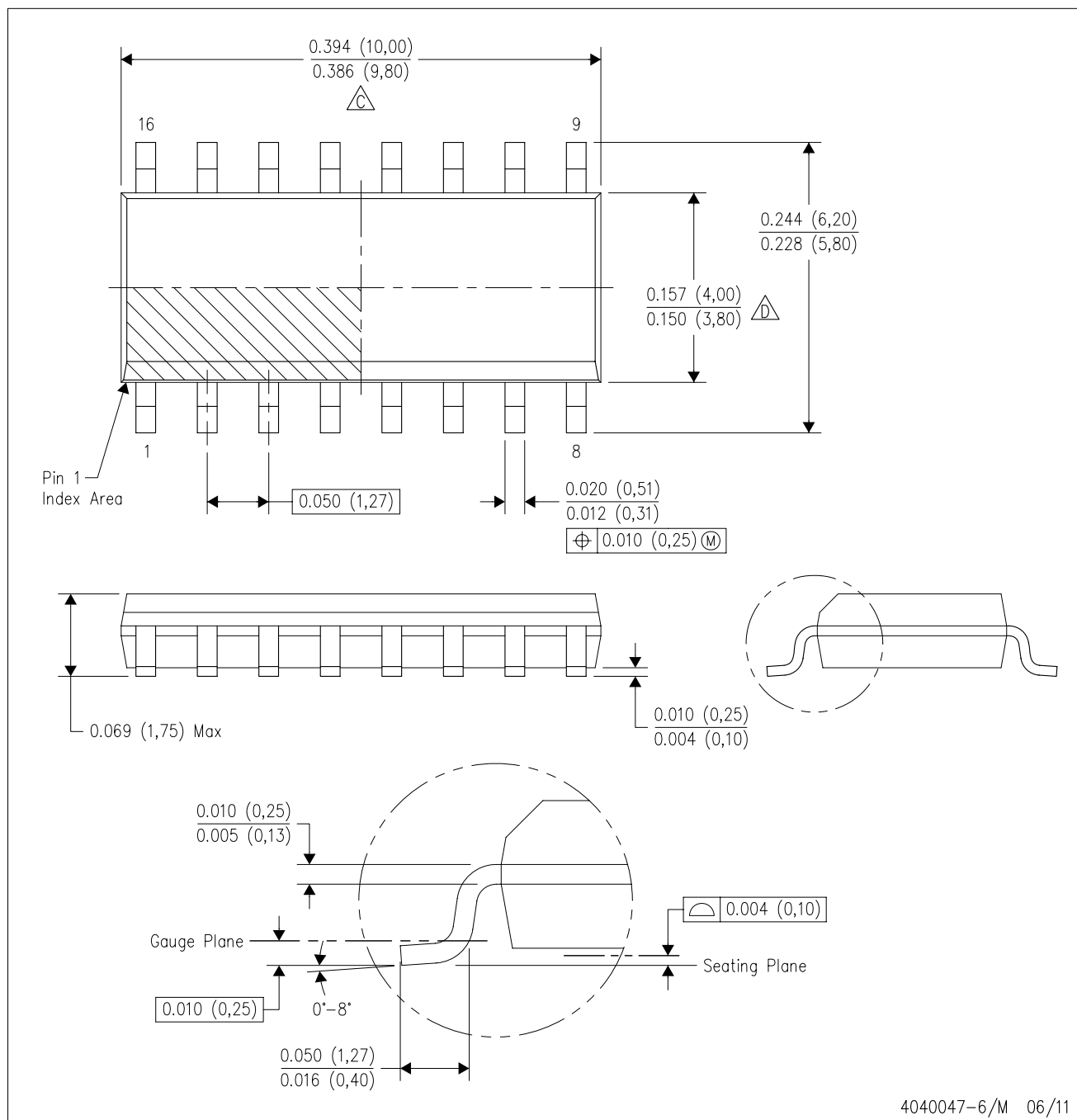
14/18 Pin Only  
20 Pin vendor option

4040049/E 12/2002

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

D (R-PDSO-G16)

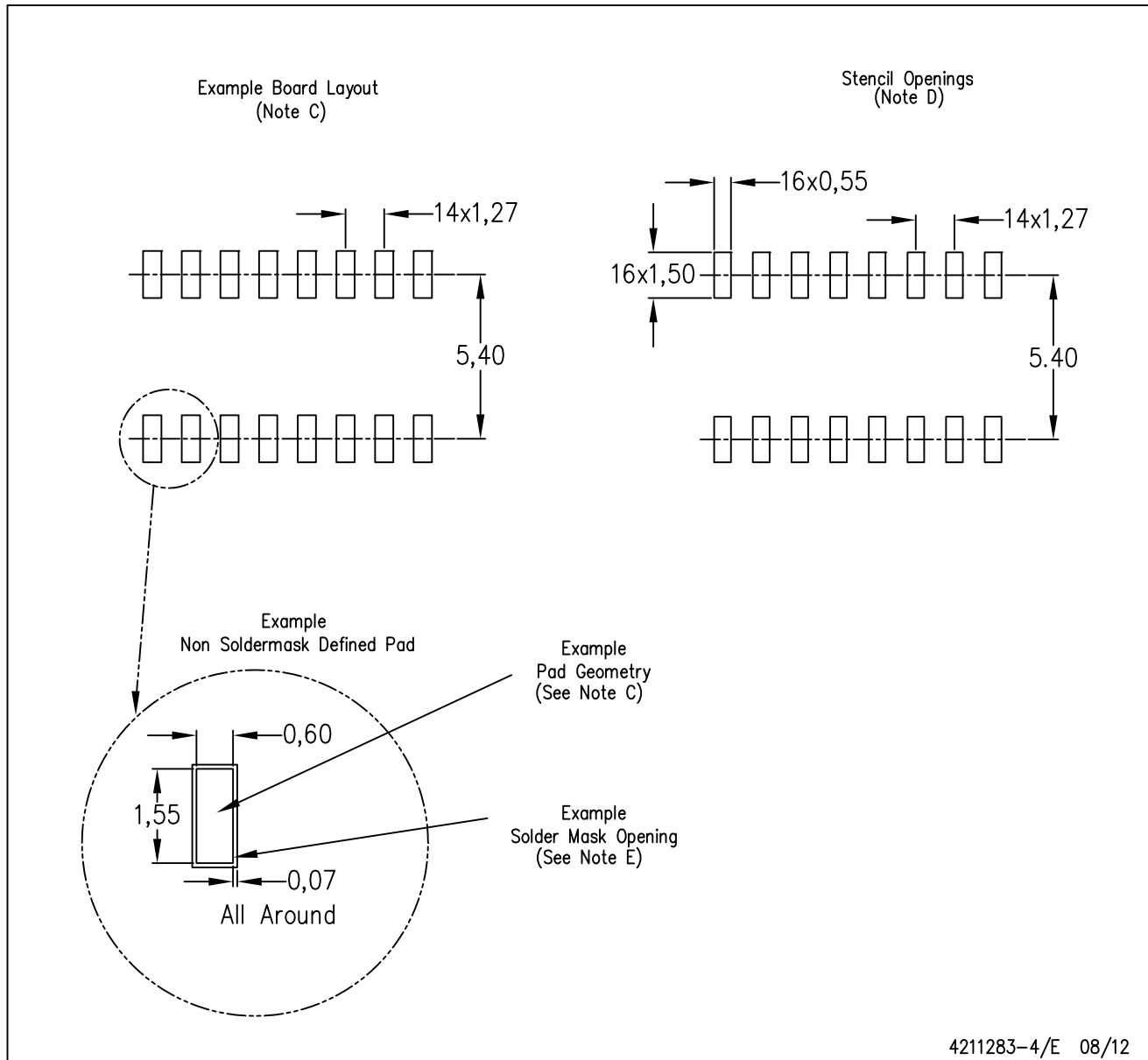
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



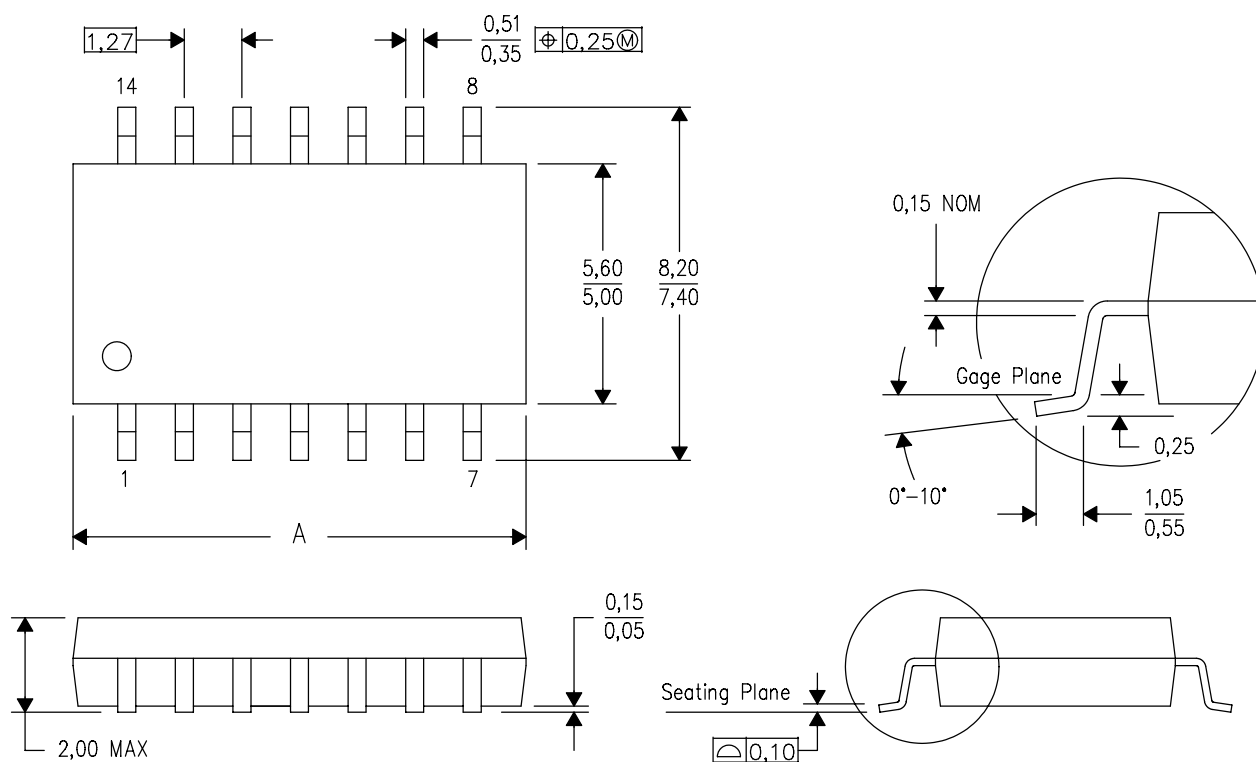
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers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

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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

4040062/C 03/03

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

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| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
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| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
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