

SN54LS138, SN54S138, SN74LS138, SN74S138A 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

SDLS014

DECEMBER 1972—REVISED MARCH 1988

- Designed Specifically for High-Speed:
Memory Decoders
Data Transmission Systems
- 3 Enable Inputs to Simplify Cascading
and/or Data Reception
- Schottky-Clamped for High Performance

description

These Schottky-clamped TTL MSI circuits are designed to be used in high-performance memory decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems, these decoders can be used to minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay times of these decoders and the enable time of the memory are usually less than the typical access time of the memory. This means that the effective system delay introduced by the Schottky-clamped system decoder is negligible.

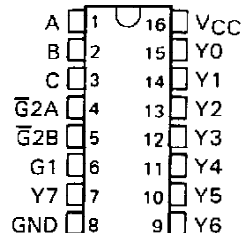
The 'LS138, SN54S138, and SN74S138A decode one of eight lines dependent on the conditions at the three binary select inputs and the three enable inputs. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented 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.

All of these decoder/demultiplexers feature fully buffered inputs, each of which represents only one normalized load to its driving circuit. All inputs are clamped with high-performance Schottky diodes to suppress line-ringing and to simplify system design.

The SN54LS138 and SN54S138 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74LS138 and SN74S138A are characterized for operation from 0°C to 70°C .

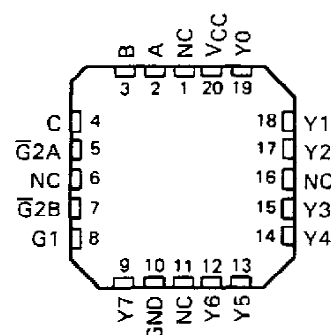
SN54LS138, SN54S138 . . . J OR W PACKAGE
SN74LS138, SN74S138A . . . D OR N PACKAGE

(TOP VIEW)



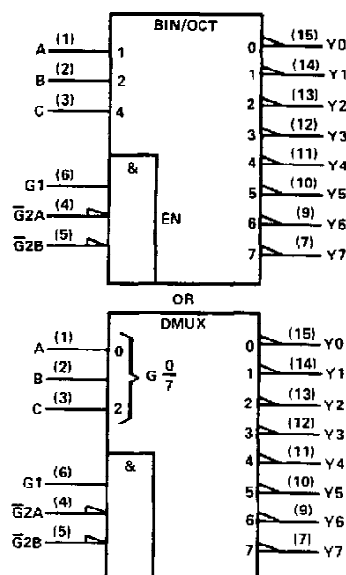
SN54LS138, SN54S138 . . . FK PACKAGE

(TOP VIEW)



NC—No internal connection

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.

PRODUCTION DATA documents contain information 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.

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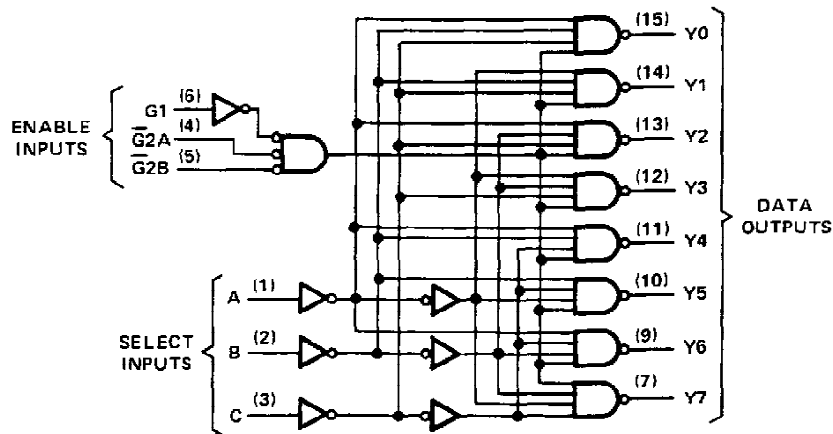
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SN54LS138, SN54S138, SN74LS138, SN74S138A 3-LINE-TO 8-LINE DECODERS/DEMULTIPLEXERS

logic diagram and function table

LS138, SN54S138, SN74S138A



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

LS138, SN54138, SN74S138A

FUNCTION TABLE

| INPUTS | | | | | OUTPUTS | | | | | | | |
|--------|-----|--------|---|---|---------|----|----|----|----|----|----|----|
| ENABLE | | SELECT | | | | | | | | | | |
| G1 | G2* | C | B | A | Y0 | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| X | H | X | X | X | H | H | H | H | H | H | H | H |
| L | X | X | X | X | H | H | H | H | H | H | H | H |
| H | L | L | L | L | L | H | H | H | H | H | H | H |
| H | L | L | L | H | H | L | H | H | H | H | H | H |
| H | L | L | L | H | H | H | L | H | H | H | H | H |
| H | L | L | H | L | H | H | H | L | H | H | H | H |
| H | L | L | H | H | H | H | H | L | H | H | H | H |
| H | L | H | L | L | H | H | H | H | L | H | H | H |
| H | L | H | L | H | H | H | H | H | H | L | H | H |
| H | L | H | H | L | H | H | H | H | H | H | L | H |
| H | L | H | H | H | H | H | H | H | H | H | H | L |

*G2 = G2A + G2B

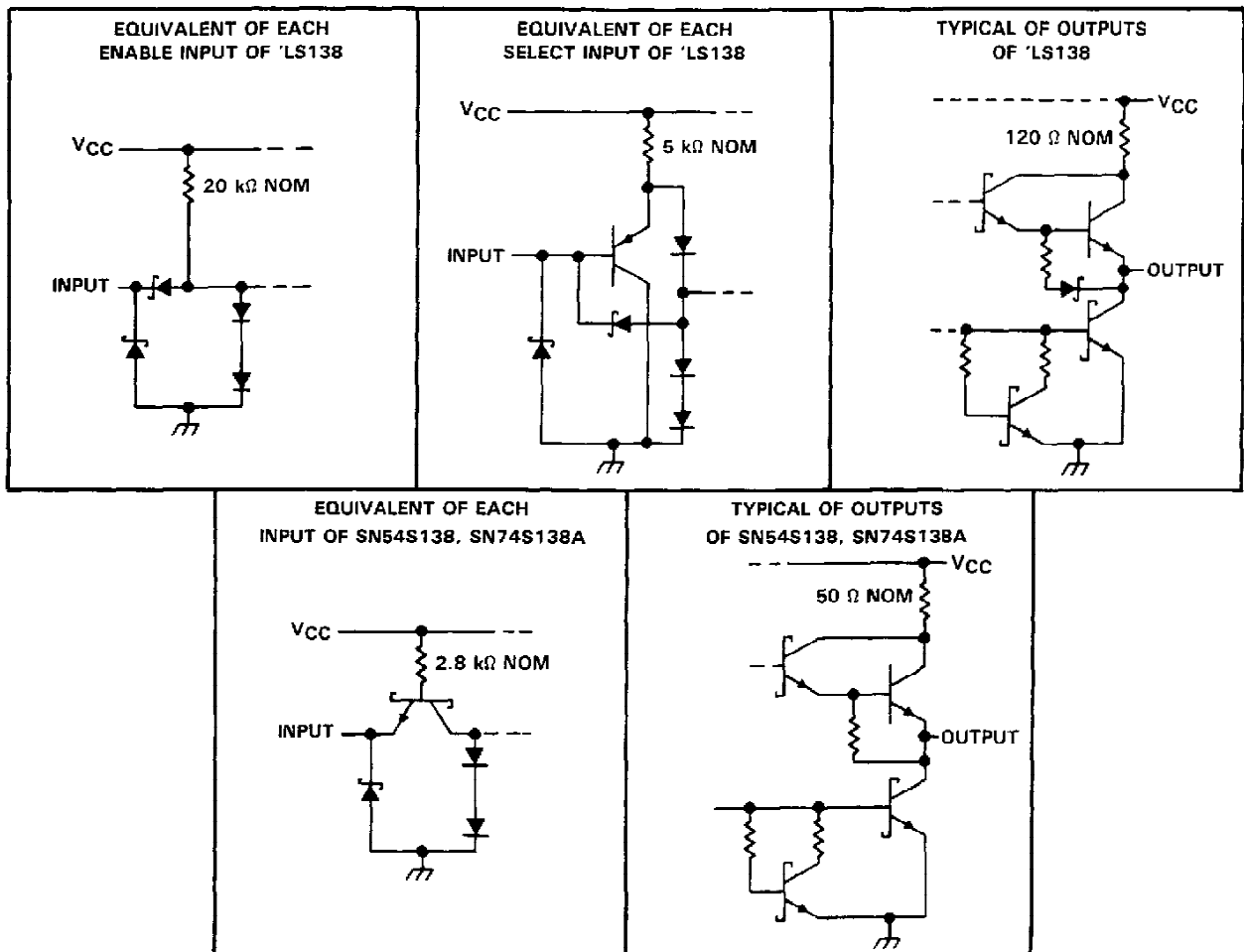
H = high level, L = low level, X = irrelevant

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SN54LS138, SN54S138, SN74LS138, SN74S138A 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

schematics of inputs and outputs



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: SN54LS138, SN54S138 | -55°C to 125°C |
| SN74LS138, SN74S138A | 0°C to 70°C |
| Storage temperature range | -65°C to 150°C |

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

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SN54LS138, SN74LS138

3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

recommended operating conditions

| | | SN54LS138 | | | SN74LS138 | | | UNIT |
|-----------------|--------------------------------|-----------|-----|------|-----------|-----|------|------|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| V _{CC} | Supply voltage | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | 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† | | SN54LS138 | | SN74LS138 | | UNIT | | |
|-------------------|--|------------------------|-----------|------|-----------|-----|------|------|-----|
| | | | MIN | TYP‡ | MAX | MIN | | TYP‡ | MAX |
| V _{IK} | V _{CC} = MIN, I _I = -18 mA | | | | -1.5 | | -1.5 | V | |
| V _{OH} | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX, I _{OH} = -0.4 mA | | 2.5 | 3.4 | | 2.7 | 3.4 | V | |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX | I _{OL} = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | I _{OL} = 8 mA | | | | | 0.35 | 0.5 | |
| I _I | V _{CC} = MAX, V _I = 7 V | | | | 0.1 | | | 0.1 | mA |
| I _{IH} | V _{CC} = MAX, V _I = 2.7 V | | | | 20 | | 20 | | μA |
| I _{IL} | V _{CC} = MAX, V _I = 0.4 V | Enable | | | -0.4 | | -0.4 | | mA |
| | | A, B, C | | | -0.2 | | -0.2 | | |
| I _{OS} § | V _{CC} = MAX | | -20 | | 100 | -20 | | -100 | mA |
| I _{CC} | V _{CC} = MAX, Outputs enabled and open | | | 6.3 | 10 | | 6.3 | 10 | 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 V, T_A = 25°C.

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

switching characteristics, V_{CC} = 5 V, T_A = 25°C

| PARAMETER† | FROM (INPUT) | TO (OUTPUT) | LEVELS OF DELAY | TEST CONDITIONS | SN54LS138 SN74LS138 | | | UNIT |
|------------------|------------------|----------------|--------------------|---|------------------------|-----|-----|------|
| | | | | | MIN | TYP | MAX | |
| t _{PLH} | Binary Select | Any | 2 | R _L = 2 kΩ, C _L = 15 pF. See Note 2 | | 11 | 20 | ns |
| t _{PHL} | | | | | | 18 | 41 | ns |
| t _{PLH} | | | 3 | | | 21 | 27 | ns |
| t _{PHL} | | | | | | 20 | 39 | ns |
| t _{PLH} | Enable | Any | 2 | | | 12 | 18 | ns |
| t _{PHL} | | | | | | 20 | 32 | ns |
| t _{PLH} | | | 3 | | | 14 | 26 | ns |
| t _{PHL} | | | | | | 13 | 38 | ns |

† t_{PLH} = propagation delay time, low-to-high-level output

t_{PHL} = propagation delay time, high-to-low-level output

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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SN54S138, SN74S138A

3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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: SN54S138 | -55°C to 125°C |
| SN74S138A | 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

| | | SN54S138 | | | SN74S138A | | | UNIT |
|----------|--------------------------------|----------|-----|-----|-----------|-----|------|------|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | 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 | | | -1 | | | -1 | mA |
| I_{OL} | Low-level output current | | | 20 | | | 20 | mA |
| T_A | Operating free-air temperature | -55 | | 125 | 0 | | 70 | °C |

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

| PARAMETER | TEST CONDITIONS† | | SN54S138 SN74S138A | | | UNIT |
|------------|---|--------|-----------------------|------|------|------|
| | | | MIN | TYP‡ | MAX | |
| V_{IK} | $V_{CC} = \text{MIN.}$, $I_I = -18 \text{ mA}$ | | | | -1.2 | V |
| V_{OH} | $V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OH} = -1 \text{ mA}$ | SN54S' | 2.5 | 3.4 | | V |
| | | SN74S' | 2.7 | 3.4 | | |
| V_{OL} | $V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = 20 \text{ mA}$ | | | | 0.5 | V |
| I_I | $V_{CC} = \text{MAX.}$, $V_I = 5.5 \text{ V}$ | | | | 1 | mA |
| I_{IH} | $V_{CC} = \text{MAX.}$, $V_I = 2.7 \text{ V}$ | | | | 50 | μA |
| I_{IL} | $V_{CC} = \text{MAX.}$, $V_I = 0.5 \text{ V}$ | | | | -2 | mA |
| $I_{OS}^§$ | $V_{CC} = \text{MAX.}$ | | -40 | | -100 | mA |
| I_{CC} | $V_{CC} = \text{MAX.}$, Outputs enabled and open | | | 49 | 74 | mA |

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

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

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

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SN54S138, SN74S138A
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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

| PARAMETER† | FROM (INPUT) | TO (OUTPUT) | LEVELS OF DELAY | TEST CONDITIONS | SN54S138 SN74S138A | | | UNIT | |
|------------|------------------|----------------|--------------------|--|-----------------------|-----|------|------|--|
| | | | | | MIN | TYP | MAX | | |
| tPLH | Binary Select | Any | 2 | RL = 280 Ω, CL = 15 pF, See Note 2 | | 4.5 | 7 | ns | |
| tPHL | | | | | | 7 | 10.5 | ns | |
| tPLH | | | 3 | | | 7.5 | 12 | ns | |
| tPHL | | | | | | 8 | 12 | ns | |
| tPLH | Enable | Any | 2 | | | 5 | 8 | ns | |
| tPHL | | | | | | 7 | 11 | ns | |
| tPLH | | | 3 | | | 7 | 11 | ns | |
| tPHL | | | | | | 7 | 11 | ns | |

†t_{PLH} = propagation delay time, low-to-high-level output

t_{PHL} = propagation delay time, high-to-low-level output

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------------|-------------------------|
| 76005012A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 76005012A SNJ54LS 138FK | Samples |
| 7600501EA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501EA SNJ54LS138J | Samples |
| 7600501EA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501EA SNJ54LS138J | Samples |
| 7600501FA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501FA SNJ54LS138W | Samples |
| 7600501FA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501FA SNJ54LS138W | Samples |
| 7604101EA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101EA SNJ54S138J | Samples |
| 7604101EA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101EA SNJ54S138J | Samples |
| 7604101FA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101FA SNJ54S138W | Samples |
| 7604101FA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101FA SNJ54S138W | Samples |
| JM38510/07701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BEA | Samples |
| JM38510/07701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BEA | Samples |
| JM38510/07701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BFA | Samples |
| JM38510/07701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BFA | Samples |
| JM38510/30701B2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701B2A | Samples |
| JM38510/30701B2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701B2A | Samples |
| JM38510/30701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BEA | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| JM38510/30701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BEA | Samples |
| JM38510/30701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BFA | Samples |
| JM38510/30701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BFA | Samples |
| JM38510/30701SEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SEA | Samples |
| JM38510/30701SEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SEA | Samples |
| JM38510/30701SFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SFA | Samples |
| JM38510/30701SFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SFA | Samples |
| M38510/07701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BEA | Samples |
| M38510/07701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BEA | Samples |
| M38510/07701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BFA | Samples |
| M38510/07701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 07701BFA | Samples |
| M38510/30701B2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701B2A | Samples |
| M38510/30701B2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701B2A | Samples |
| M38510/30701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BEA | Samples |
| M38510/30701BEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BEA | Samples |
| M38510/30701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BFA | Samples |
| M38510/30701BFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701BFA | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| M38510/30701SEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SEA | Samples |
| M38510/30701SEA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SEA | Samples |
| M38510/30701SFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SFA | Samples |
| M38510/30701SFA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30701SFA | Samples |
| SN54LS138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54LS138J | Samples |
| SN54LS138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54LS138J | Samples |
| SN54S138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54S138J | Samples |
| SN54S138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54S138J | Samples |
| SN74LS138D | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS138 | Samples |
| SN74LS138D | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS138 | Samples |
| SN74LS138DG4 | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS138 | Samples |
| SN74LS138DG4 | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS138 | Samples |
| SN74LS138DR | ACTIVE | SOIC | D | 16 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS138 | Samples |
| SN74LS138DR | ACTIVE | SOIC | D | 16 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS138 | Samples |
| SN74LS138N | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS138N | Samples |
| SN74LS138N | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS138N | Samples |
| SN74LS138NE4 | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS138N | Samples |
| SN74LS138NE4 | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS138N | Samples |
| SN74LS138NSR | ACTIVE | SO | NS | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS138 | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------------|-------------------------|
| SN74LS138NSR | ACTIVE | SO | NS | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS138 | Samples |
| SN74S138AD | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | S138A | Samples |
| SN74S138AN | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74S138AN | Samples |
| SN74S138ANE4 | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74S138AN | Samples |
| SNJ54LS138FK | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 76005012A SNJ54LS 138FK | Samples |
| SNJ54LS138FK | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 76005012A SNJ54LS 138FK | Samples |
| SNJ54LS138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501EA SNJ54LS138J | Samples |
| SNJ54LS138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501EA SNJ54LS138J | Samples |
| SNJ54LS138W | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501FA SNJ54LS138W | Samples |
| SNJ54LS138W | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7600501FA SNJ54LS138W | Samples |
| SNJ54S138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101EA SNJ54S138J | Samples |
| SNJ54S138J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101EA SNJ54S138J | Samples |
| SNJ54S138W | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101FA SNJ54S138W | Samples |
| SNJ54S138W | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 7604101FA SNJ54S138W | Samples |

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

ACTIVE: Product device recommended for new designs.

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

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

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

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of ≤ 1000 ppm threshold. Antimony trioxide based flame retardants must also meet the ≤ 1000 ppm threshold requirement.

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

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

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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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 SN54LS138, SN54LS138-SP, SN74LS138 :

● Catalog : [SN74LS138](#), [SN54LS138](#)

● Military : [SN54LS138](#)

● Space : [SN54LS138-SP](#)

NOTE: Qualified Version Definitions:

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

- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS138DR | SOIC | D | 16 | 2500 | 330.0 | 16.4 | 6.5 | 10.3 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74LS138NSR | SO | NS | 16 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |

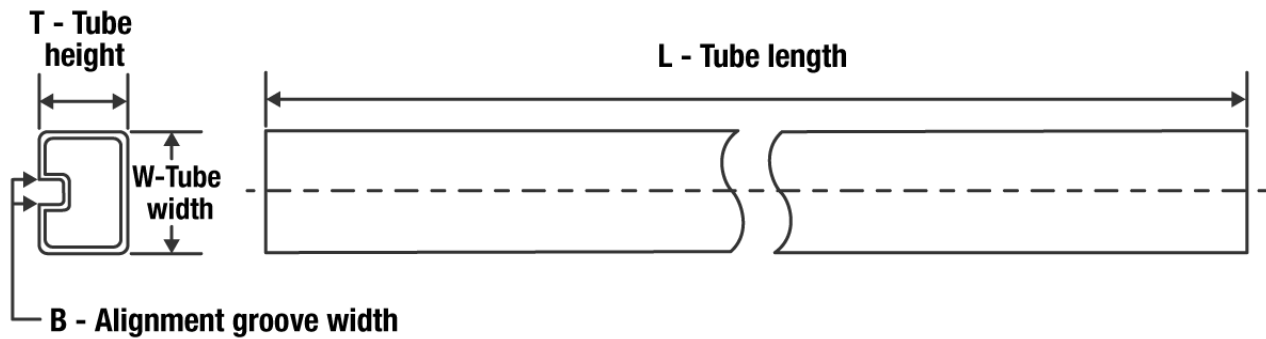
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

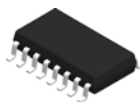
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS138DR | SOIC | D | 16 | 2500 | 340.5 | 336.1 | 32.0 |
| SN74LS138NSR | SO | NS | 16 | 2000 | 853.0 | 449.0 | 35.0 |

TUBE



*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 76005012A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| JM38510/30701B2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| M38510/30701B2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| SN74LS138D | D | SOIC | 16 | 40 | 507 | 8 | 3940 | 4.32 |
| SN74LS138DG4 | D | SOIC | 16 | 40 | 507 | 8 | 3940 | 4.32 |
| SN74LS138N | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74LS138N | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74LS138NE4 | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74LS138NE4 | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74S138AD | D | SOIC | 16 | 40 | 507 | 8 | 3940 | 4.32 |
| SN74S138AN | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74S138AN | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74S138ANE4 | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74S138ANE4 | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SNJ54LS138FK | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |

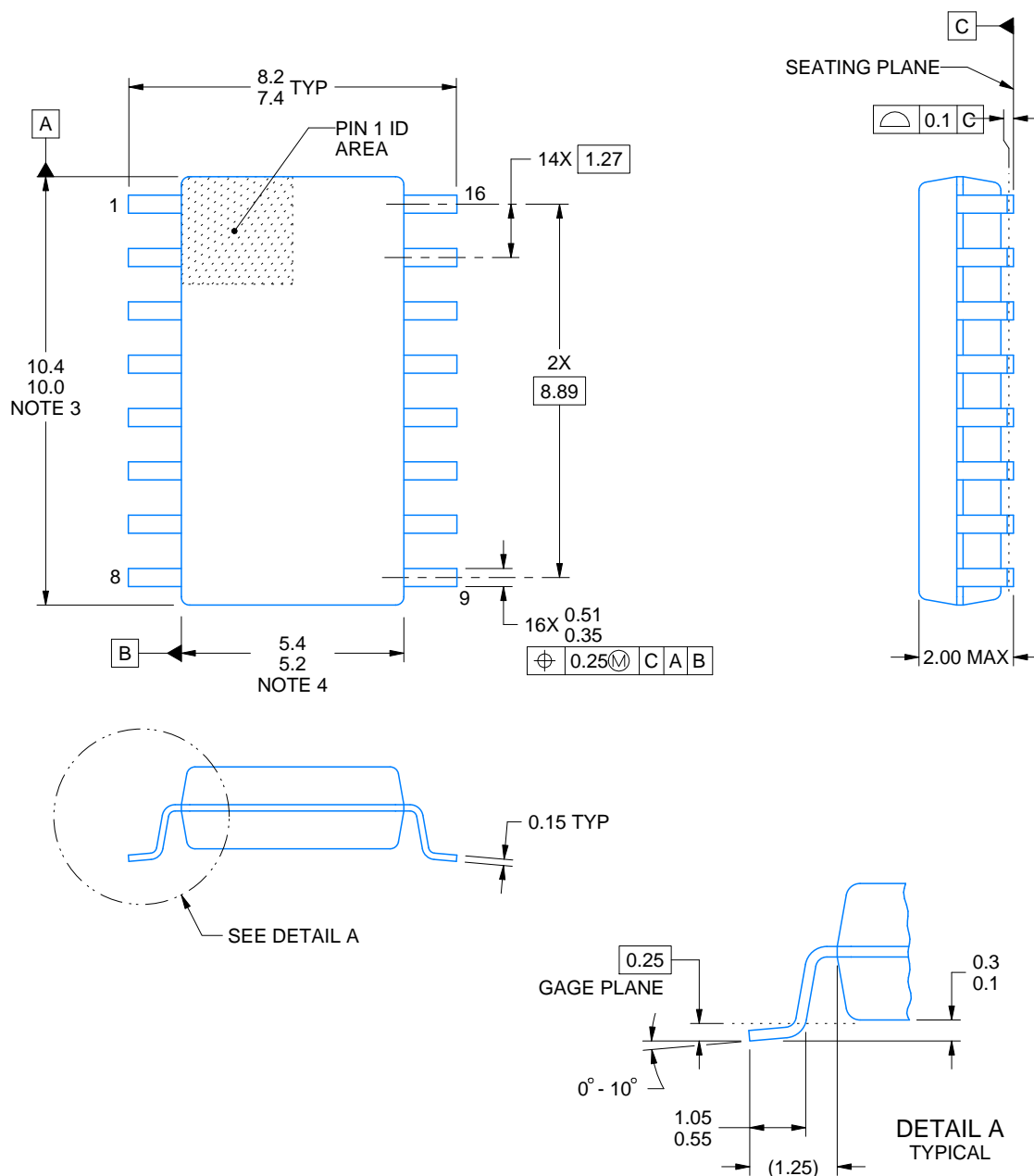


PACKAGE OUTLINE

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

NOTES:

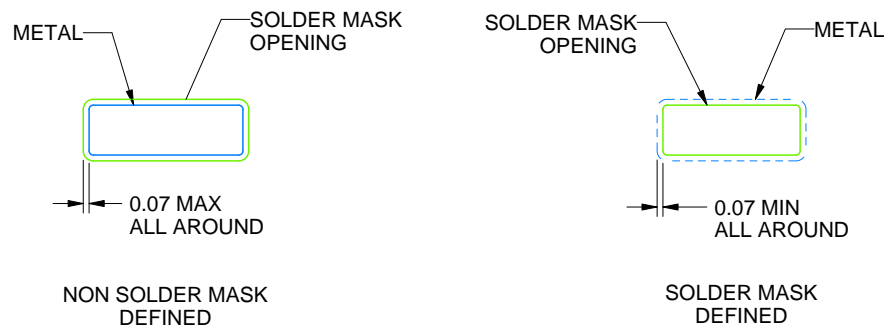
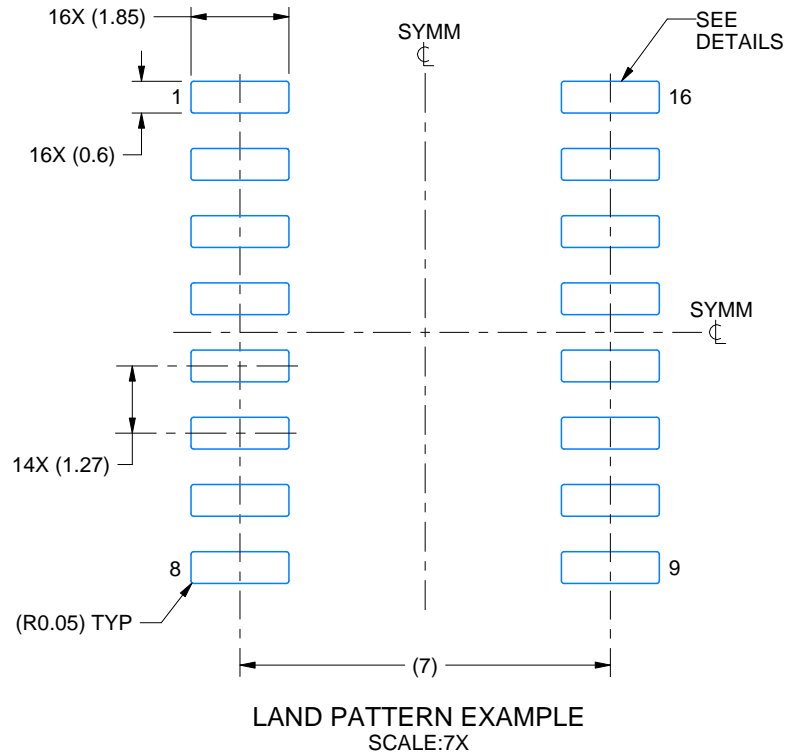
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate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

EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

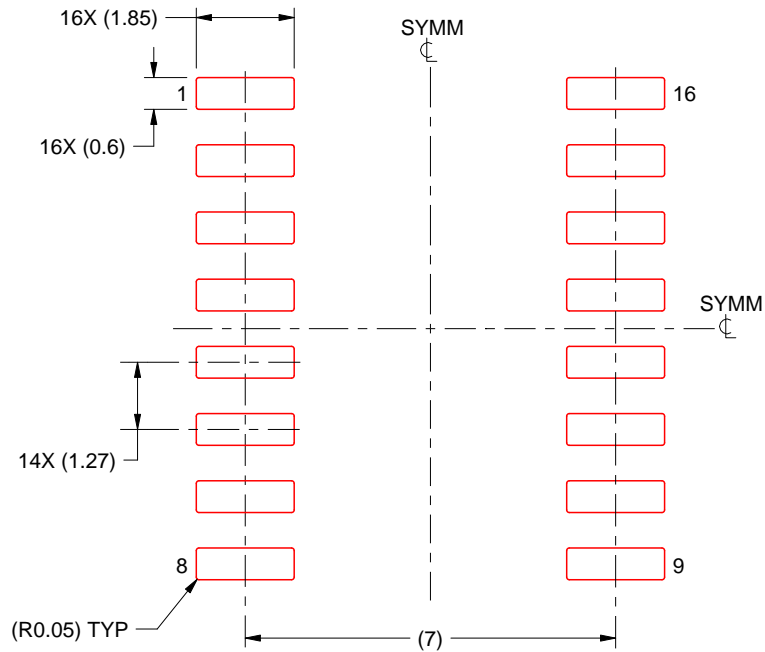
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



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

4220735/A 12/2021

NOTES: (continued)

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

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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



4040140/D 01/11

- NOTES:
- 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

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040047-6/M 06/11

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

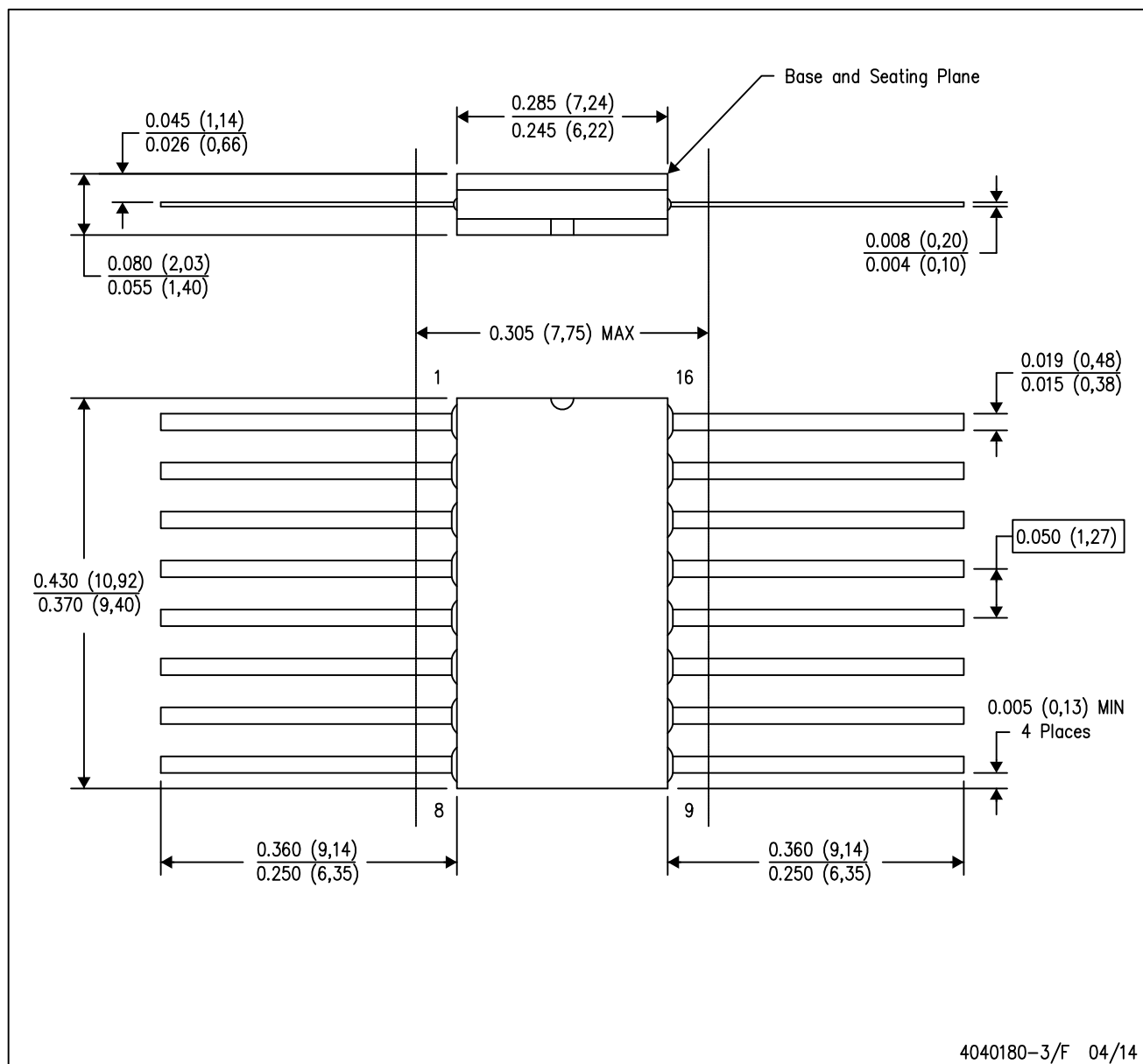
14-PINS SHOWN



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

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



- NOTES:
- 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

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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



4040083/F 03/03

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

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



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

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