

QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

SDLS105 - DECEMBER 1983 - REVISED MARCH 1988

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

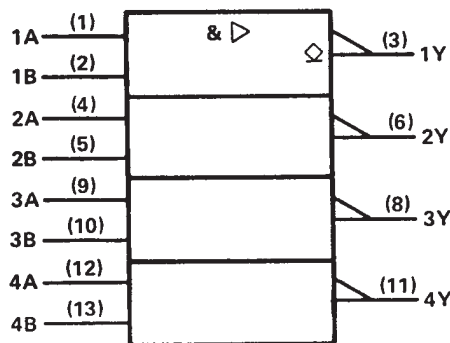
These devices contain four independent 2-input NAND buffer gates with open-collector outputs. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate high V_{OH} levels.

The SN5438, SN54LS38, and SN54S38 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7438, SN74LS38, and SN74S38 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

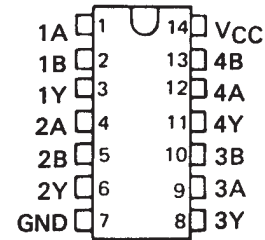
| INPUTS | | OUTPUT |
|--------|---|--------|
| A | B | Y |
| H | H | L |
| L | X | H |
| X | L | H |

logic symbol†

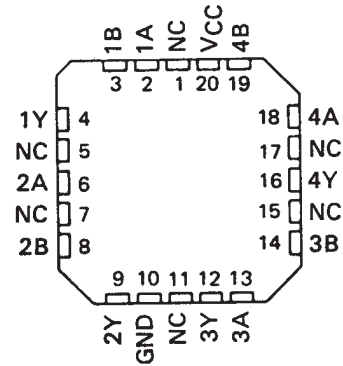


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, N, and W packages.

SN5438, SN54LS38, SN54S38 . . . J OR W PACKAGE
SN7438 . . . N PACKAGE
SN74LS38, SN74S38 . . . D OR N PACKAGE
(TOP VIEW)

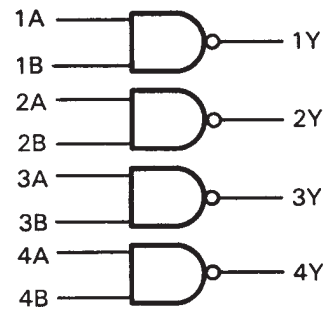


SN54LS38, SN54S38 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

logic diagram



positive logic

$$Y = \overline{A \cdot B} \text{ or } Y = \overline{\overline{A} + \overline{B}}$$

QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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schematics (each gate)



Resistor values shown are nominal.

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

| | |
|---|--|
| Supply voltage, V_{CC} (see Note 1) | 7 V |
| Input voltage: '38 | 5.5 V |
| LS38 | 7 V |
| Off-state output voltage | 7 V |
| Operating free-air temperature range: SN54' | -55°C to 125°C |
| SN74' | 0°C to 70°C |
| Storage temperature range | -65°C to 150°C |

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

QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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recommended operating conditions

| | SN5438 | | | SN7438 | | | 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 |
| V _{OH} High-level output voltage | 5.5 | | | 5.5 | | | V |
| I _{OL} Low-level output current | 48 | | | 48 | | | 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† | SN5438 | | | SN7438 | | | UNIT |
|------------------|---|--------|------|-----|--------|------|-----|------|
| | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V _{IK} | V _{CC} = MIN, I _I = -12 mA | -1.5 | | | -1.5 | | | V |
| I _{OH} | V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V | | | | 0.25 | | | mA |
| | V _{CC} = MIN, V _{IL} = 0.7 V, V _{OH} = 5.5 V | 0.25 | | | | | | |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 16 mA | 0.4 | | | 0.4 | | | V |
| I _I | V _{CC} = MAX, V _I = 5.5 V | 1 | | | 1 | | | mA |
| I _{IH} | V _{CC} = MAX, V _I = 2.4 V | 40 | | | 40 | | | μA |
| I _{IL} | V _{CC} = MAX, V _I = 0.4 V | -1.6 | | | -1.6 | | | mA |
| I _{CCH} | V _{CC} = MAX, V _I = 0 | 5 | 8.5 | | 5 | 8.5 | mA | |
| I _{CCL} | V _{CC} = MAX, V _I = 4.5 V | 34 | 54 | | 34 | 54 | 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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|--|-----|-----|-----|------|
| t _{PLH} | A or B | Y | R _L = 133 Ω, C _L = 45 pF | | 14 | 22 | ns |
| t _{PHL} | | | | | 11 | 18 | ns |

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

QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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recommended operating conditions

| | SN54LS38 | | | SN74LS38 | | | 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 |
| V _{OH} High-level output voltage | 5.5 | | | 5.5 | | | V |
| I _{OL} Low-level output current | 12 | | | 24 | | | 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 † | SN54LS38 | | | SN74LS38 | | | UNIT |
|------------------|---|----------|-------|-----|----------|-------|-----|------|
| | | MIN | TYP ‡ | MAX | MIN | TYP ‡ | MAX | |
| V _{IK} | V _{CC} = MIN, I _I = -18 mA | -1.5 | | | -1.5 | | | V |
| I _{OH} | V _{CC} = MIN, V _{IL} = MAX, V _{OH} = 5.5 V | 0.25 | | | 0.25 | | | mA |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 12 mA | 0.25 0.4 | | | 0.25 0.4 | | | V |
| | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 24 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 | -0.4 | | | -0.4 | | | mA |
| I _{CCH} | V _{CC} = MAX, V _I = 0 | 0.9 2 | | | 0.9 2 | | | mA |
| I _{CCL} | V _{CC} = MAX, V _I = 4.5 V | 6 12 | | | 6 12 | | | mA |

† For conditons 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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|--|-----|-----|-----|------|
| t _{PLH} | A or B | Y | R _L = 667 Ω, C _L = 45 pF | 20 | 32 | | ns |
| t _{PHL} | | | | 18 | 28 | | ns |

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



QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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recommended operating conditions

| | SN54S38 | | | SN74S38 | | | 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 |
| V _{OH} High-level output voltage | | | 5.5 | | | 5.5 | V |
| I _{OL} Low-level output current | | | 60 | | | 60 | 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† | SN54S38 | | SN74S38 | | UNIT | | |
|------------------|---|---------|------|---------|-----|------|------|-----|
| | | MIN | TYP‡ | MAX | MIN | | TYP‡ | MAX |
| V _{IK} | V _{CC} = MIN, I _I = -18 mA | | | -1.2 | | -1.2 | V | |
| I _{OH} | V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V | | | | | 0.25 | mA | |
| | V _{CC} = MIN, V _{IL} = 0.7 V, V _{OH} = 5.5 V | | | 0.25 | | | | |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 60 mA | | | 0.5 | | 0.5 | V | |
| I _I | V _{CC} = MAX, V _I = 5.5 V | | | 1 | | 1 | mA | |
| I _{IH} | V _{CC} = MAX, V _I = 2.4 V | | | 0.1 | | 0.1 | mA | |
| I _{IL} | V _{CC} = MAX, V _I = 0.5 V | | | -4 | | -4 | mA | |
| I _{CCH} | V _{CC} = MAX, V _I = 0 | | | 20 | 36 | 20 | 36 | mA |
| I _{CCL} | V _{CC} = MAX, V _I = 4.5 V | | | 46 | 80 | 46 | 80 | 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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|------------------------|-------------------------|-----|-----|-----|------|
| t _{PLH} | A or B | Y | R _L = 93 Ω, | C _L = 50 pF | 6.5 | | 10 | ns |
| t _{PHL} | | | | | 6.5 | | 10 | ns |
| t _{PLH} | | | R _L = 93 Ω, | C _L = 150 pF | 9 | | | ns |
| t _{PHL} | | | | | 8.5 | | | ns |

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

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 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| JM38510/00303BCA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 00303BCA | Samples |
| JM38510/30203B2A | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203B2A | Samples |
| JM38510/30203B2A | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203B2A | Samples |
| JM38510/30203BDA | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203BDA | Samples |
| JM38510/30203BDA | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203BDA | Samples |
| M38510/00303BCA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 00303BCA | Samples |
| M38510/00303BCA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 00303BCA | Samples |
| M38510/30203B2A | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203B2A | Samples |
| M38510/30203B2A | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203B2A | Samples |
| M38510/30203BDA | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203BDA | Samples |
| M38510/30203BDA | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 30203BDA | Samples |
| SN5438J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN5438J | Samples |
| SN5438J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN5438J | Samples |
| SN54S38J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54S38J | Samples |
| SN54S38J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54S38J | Samples |
| SN7438D | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | 0 to 70 | 7438 | |
| SN7438D | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | 0 to 70 | 7438 | |

| 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 |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN7438DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 7438 | Samples |
| SN7438DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 7438 | Samples |
| SN7438N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN7438N | Samples |
| SN7438N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN7438N | Samples |
| SN7438NSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | SN7438 | Samples |
| SN7438NSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | SN7438 | Samples |
| SN74LS38D | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | 0 to 70 | LS38 | |
| SN74LS38D | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | 0 to 70 | LS38 | |
| SN74LS38DBR | ACTIVE | SSOP | DB | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | LS38 | Samples |
| SN74LS38DBR | ACTIVE | SSOP | DB | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | LS38 | Samples |
| SN74LS38DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS38 | Samples |
| SN74LS38DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS38 | Samples |
| SN74LS38N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS38N | Samples |
| SN74LS38N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS38N | Samples |
| SN74LS38NE4 | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS38N | Samples |
| SN74LS38NE4 | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS38N | Samples |
| SN74LS38NSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS38 | Samples |
| SN74LS38NSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74LS38 | Samples |
| SN74S38D | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | 0 to 70 | S38 | |
| SN74S38D | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | 0 to 70 | S38 | |
| SN74S38DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | S38 | Samples |
| SN74S38DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | S38 | 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 |
|------------------|---------------|--------------|-----------------|------|-------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74S38N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74S38N | Samples |
| SN74S38N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74S38N | Samples |
| SN74S38NSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74S38 | Samples |
| SN74S38NSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 74S38 | Samples |
| SNJ5438J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ5438J | Samples |
| SNJ5438J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ5438J | Samples |
| SNJ5438W | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ5438W | Samples |
| SNJ5438W | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ5438W | Samples |
| SNJ54LS38FK | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54LS 38FK | Samples |
| SNJ54LS38FK | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54LS 38FK | Samples |
| SNJ54S38FK | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54S 38FK | Samples |
| SNJ54S38FK | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54S 38FK | Samples |
| SNJ54S38J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54S38J | Samples |
| SNJ54S38J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54S38J | Samples |
| SNJ54S38W | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54S38W | Samples |
| SNJ54S38W | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54S38W | 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 SN5438, SN54LS38, SN54S38, SN7438, SN74LS38, SN74S38 :

● Catalog : [SN7438](#), [SN74LS38](#), [SN74S38](#)

● Military : [SN5438](#), [SN54LS38](#), [SN54S38](#)

NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

● Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN7438DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN7438NSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74LS38DBR | SSOP | DB | 14 | 2000 | 330.0 | 16.4 | 8.35 | 6.6 | 2.4 | 12.0 | 16.0 | Q1 |
| SN74LS38DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74LS38NSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74S38DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74S38NSR | SO | NS | 14 | 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) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN7438DR | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| SN7438NSR | SO | NS | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74LS38DBR | SSOP | DB | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74LS38DR | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| SN74LS38NSR | SO | NS | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74S38DR | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| SN74S38NSR | SO | NS | 14 | 2000 | 356.0 | 356.0 | 35.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| JM38510/30203B2A | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| JM38510/30203BDA | W | CFP | 14 | 25 | 506.98 | 26.16 | 6220 | NA |
| M38510/30203B2A | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| M38510/30203BDA | W | CFP | 14 | 25 | 506.98 | 26.16 | 6220 | NA |
| SN7438N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74LS38N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74LS38N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74LS38NE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74LS38NE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74S38N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74S38N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SNJ5438W | W | CFP | 14 | 25 | 506.98 | 26.16 | 6220 | NA |
| SNJ54LS38FK | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| SNJ54S38FK | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| SNJ54S38W | W | CFP | 14 | 25 | 506.98 | 26.16 | 6220 | NA |

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-F14)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD 1835 GDFP1-F14

DB0014A



PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



NOTES:

1. All linear dimensions are in millimeters. Any 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. Reference JEDEC registration MO-150.

EXAMPLE BOARD LAYOUT

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220762/A 05/2024

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

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220762/A 05/2024

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.

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 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

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 -  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.
 -  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211283-3/E 08/12

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - 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.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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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