

MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A QUADRUPLE LINE RECEIVERS

SLLS095D – SEPTEMBER 1973 – REVISED OCTOBER 1998

- Input Resistance . . . 3 k Ω to 7 k Ω
- Input Signal Range . . . ± 30 V
- Operate From Single 5-V Supply
- Built-In Input Hysteresis (Double Thresholds)
- Response Control that Provides:
Input Threshold Shifting
Input Noise Filtering
- Meet or Exceed the Requirements of
TIA/EIA-232-F and ITU Recommendation
V.28
- Fully Interchangeable With Motorola™
MC1489 and MC1489A

SN55189, SN55189A . . . J OR W PACKAGE
MC1489, MC1489A, SN75189, SN75189A
D, N, OR NS† PACKAGE
(TOP VIEW)



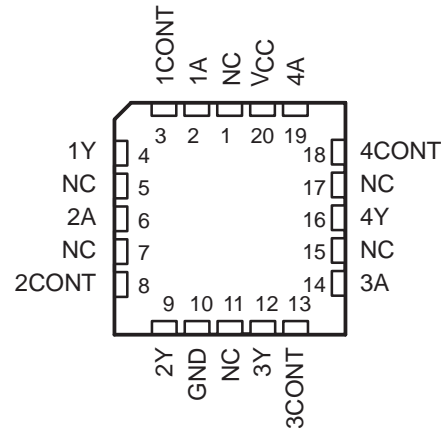
† The NS package is only available left-end taped and reeled.
For SN75189, order SN75189NSR.

description

These devices are monolithic low-power Schottky quadruple line receivers designed to satisfy the requirements of the standard interface between data-terminal equipment and data-communication equipment as defined by TIA/EIA-232-F. A separate response-control (CONT) terminal is provided for each receiver. A resistor or a resistor and bias-voltage source can be connected between this terminal and ground to shift the input threshold levels. An external capacitor can be connected between this terminal and ground to provide input noise filtering.

The SN55189 and SN55189A are characterized for operation over the full military temperature range of -55°C to 125°C . The MC1489, MC1489A, SN75189, and SN75189A are characterized for operation from 0°C to 70°C .

SN55189, SN55189A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection



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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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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

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logic symbol†



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

logic diagram (positive logic)



schematic (each receiver)



| | | |
|----|------------------------------|---------------------------------|
| | MC1489 SN55189 SN75189 | MC1489A SN55189A SN75189A |
| R1 | 8.4 kΩ | 1.84 kΩ |

Resistor values shown are nominal.

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

| | |
|---|------------------------------|
| Supply voltage, V_{CC} (see Note 1) | 10 V |
| Input voltage, V_I | ± 30 V |
| Output voltage, I_O | 20 mA |
| Continuous total power dissipation | See Dissipation Rating Table |
| Operating free-air temperature range, T_A : SN55189, SN55189A | –55°C to 125°C |
| MC1489, MC1489A, SN75189, SN75189A | 0°C to 70°C |
| Storage temperature range, T_{stg} | –65°C to 150°C |
| Case temperature for 60 seconds, FK package | 260°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J or W package | 300°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, N, or NS package | 260°C |

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

NOTES: 1. All voltage values are with respect to the network ground terminal.

DISSIPATION RATING TABLE

| PACKAGE | $T_A \leq 25^\circ\text{C}$ POWER RATING | DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$ | $T_A = 70^\circ\text{C}$ POWER RATING | $T_A = 125^\circ\text{C}$ POWER RATING |
|---------|---|---|--|---|
| D | 950 mW | 7.6 mW/°C | 608 mW | N/A |
| FK | 1375 mW | 11.0 mW/°C | 880 mW | 275 mW |
| J‡ | 1375 mW | 11.0 mW/°C | 880 mW | 275 mW |
| N | 1150 mW | 9.2 mW/°C | 736 mW | N/A |
| NS | 625 mW | 4.0 mW/°C | 445 mW | N/A |
| W | 1000 mW | 8.0 mW/°C | 640 mW | 200 mW |

‡ In the J package, SN55189 and SN55189A chips are either silver glass or alloy mounted.

recommended operating conditions

| | MIN | NOM | MAX | UNIT |
|---------------------------------------|-----|-----|------|------|
| Supply voltage, V_{CC} | 4.5 | 5 | 5.5 | V |
| Input voltage, V_I | –25 | | 25 | V |
| High-level output current, I_{OH} | | | –0.5 | mA |
| Low-level output current, I_{OL} | | | 10 | mA |
| Operating free-air temperature, T_A | 0 | | 70 | °C |



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electrical characteristics over operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 1\%$ (unless otherwise noted)

| PARAMETER | TEST FIGURE | TEST CONDITIONS† | | SN55189 SN55189A | | | MC1489, MC1489A SN75189 SN75189A | | | UNIT |
|--|-------------|--|---|---------------------|------|------|--|------|------|------|
| | | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V_{IT+} Positive-going input threshold voltage | 1 | '89 | $T_A = 25^\circ\text{C}$ | 1 | 1.3 | 1.5 | 1 | 1.3 | 1.5 | V |
| | | | $T_A = 0^\circ\text{C to } 70^\circ\text{C}$ | | | | 0.9 | 1.6 | | |
| | | | $T_A = -55^\circ\text{C to } 125^\circ\text{C}$ | 0.6 | 1.9 | | | | | |
| | | '89A | $T_A = 25^\circ\text{C}$ | 1.75 | 1.9 | 2.25 | 1.75 | 1.9 | 2.25 | |
| | | | $T_A = 0^\circ\text{C to } 70^\circ\text{C}$ | | | | 1.55 | 2.25 | | |
| | | | $T_A = -55^\circ\text{C to } 125^\circ\text{C}$ | 1.30 | 2.65 | | | | | |
| V_{IT-} Negative-going input threshold voltage | 1 | '89, '89A | $T_A = 25^\circ\text{C}$ | 0.75 | 1.0 | 1.25 | 0.75 | 1.0 | 1.25 | V |
| | | | $T_A = 0^\circ\text{C to } 70^\circ\text{C}$ | | | | 0.65 | 1.25 | | |
| | | | $T_A = -55^\circ\text{C to } 125^\circ\text{C}$ | 0.35 | 1.6 | | | | | |
| V_{OH} High-level output voltage | 1 | $V_I = 0.75\text{ V}, I_{OH} = -0.5\text{ mA}$ | | 2.6 | 4 | 5 | 2.6 | 4 | 5 | V |
| | | Input open, $I_{OH} = -0.5\text{ mA}$ | | 2.6 | 4 | 5 | 2.6 | 4 | 5 | |
| V_{OL} Low-level output voltage | 1 | $V_I = 3\text{ V}, I_{OL} = 10\text{ mA}$ | | 0.2 | | 0.45 | 0.2 | | 0.45 | V |
| I_{IH} High-level input current | 2 | $V_I = 25\text{ V}$ | | 3.6 | 8.3 | | 3.6 | 8.3 | | mA |
| | | $V_I = 3\text{ V}$ | | 0.43 | | | 0.43 | | | |
| I_{IL} Low-level input current | 2 | $V_I = -25\text{ V}$ | | -3.6 | -8.3 | | -3.6 | -8.3 | | mA |
| | | $V_I = -3\text{ V}$ | | -0.43 | | | -0.43 | | | |
| I_{OS} Short-circuit output current | 3 | | | -3 | | -3 | | | | mA |
| I_{CC} Supply current | 2 | $V_I = 5\text{ V},$ Outputs open | | 20 | 26 | | 20 | 26 | | mA |

† All characteristics are measured with the response-control terminal open.

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

switching characteristics, $V_{CC} = 5\text{ V}, C_L = 15\text{ pF}, T_A = 25^\circ\text{C}$

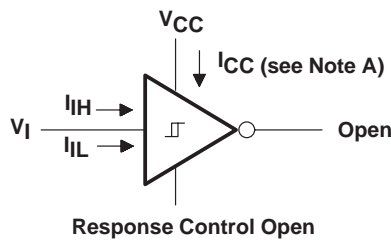
| PARAMETER | TEST FIGURE | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|-------------|----------------------------|-----|-----|-----|------|
| t_{PLH} Propagation delay time, low- to high-level output | 4 | $R_L = 3.9\text{ k}\Omega$ | | 25 | 85 | ns |
| t_{PHL} Propagation delay time, high- to low-level output | | $R_L = 390\ \Omega$ | | 25 | 50 | |
| t_{TLH} Transition time, low- to high-level output | | $R_L = 3.9\text{ k}\Omega$ | | 120 | 175 | ns |
| t_{THL} Transition time, high- to low-level output | | $R_L = 390\ \Omega$ | | 10 | 20 | |



PARAMETER MEASUREMENT INFORMATION†



Figure 1. V_{IT+} , V_{IT-} , V_{OH} , V_{OL}



NOTE A: I_{CC} is tested for all four receivers simultaneously.

Figure 2. I_{iH} , I_{iL} , I_{CC}

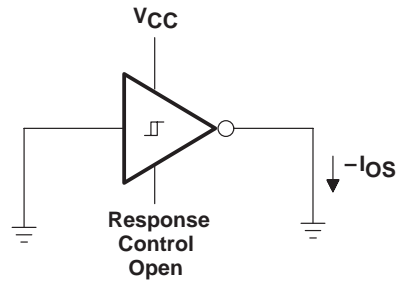


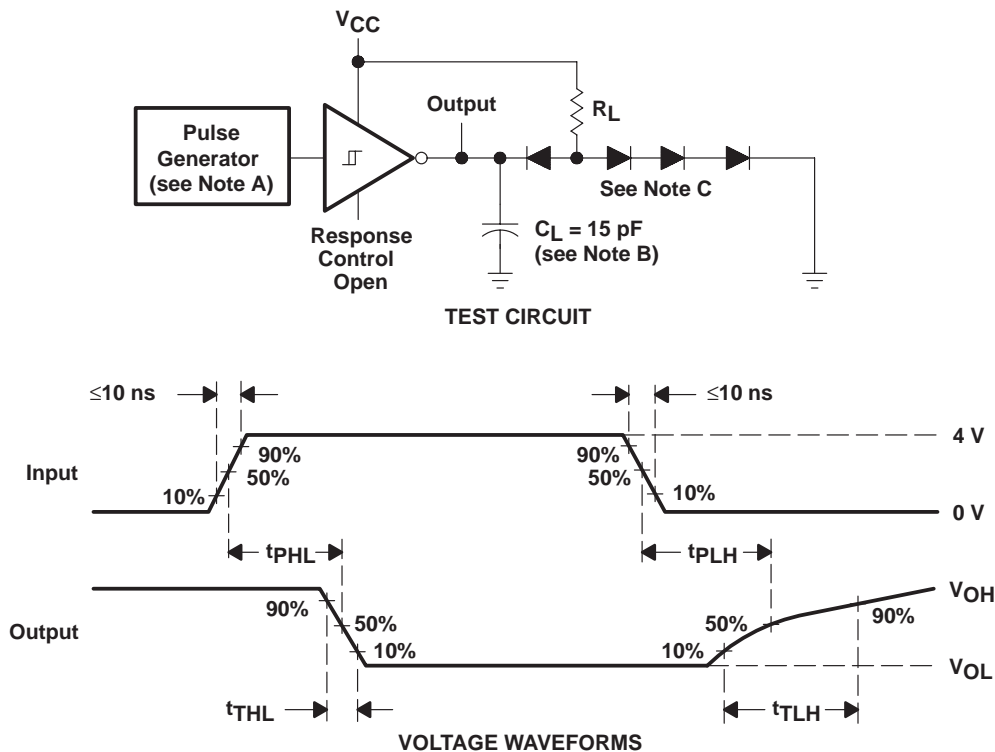
Figure 3. I_{OS}

† Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The pulse generator has the following characteristics: $Z_O = 50 \Omega$, $t_w = 500 \text{ ns}$.
 B. C_L includes probe and jig capacitances.
 C. All diodes are 1N3064 or equivalent.

Figure 4. Test Circuit and Voltage Waveforms

MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A
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TYPICAL CHARACTERISTICS

SN65189, SN75189
 OUTPUT VOLTAGE
 vs
 INPUT VOLTAGE



Figure 5

SN65189A, SN75189A
 OUTPUT VOLTAGE
 vs
 INPUT VOLTAGE



Figure 6

MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A QUADRUPLE LINE RECEIVERS

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TYPICAL CHARACTERISTICS†



Figure 7



Figure 8



NOTE A: Maximum amplitude of a positive-going pulse that, starting from 0 V, will not cause a change in the output level.

Figure 9



NOTE A: Maximum amplitude of a positive-going pulse that, starting from 0 V, will not cause a change in the output level.

Figure 10

† Data for free-air temperatures below 0°C and above 70°C are applicable to SN55189 and SN55189A circuits only.

TYPICAL CHARACTERISTICS



Figure 11

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PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-86888022A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 5962-8688802CA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 5962-8688802DA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| MC1489AN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| MC1489ANE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| MC1489N | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| MC1489NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN55189AJ | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SN55189J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI |
| SN75189AD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189ADE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189ADG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189ADR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189ADRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189ADRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189AN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN75189ANE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN75189ANSLE | OBSOLETE | SO | NS | 14 | | TBD | Call TI | Call TI |
| SN75189ANSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189ANSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189N | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN75189NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN75189NSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189NSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN75189NSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SNJ55189AFK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ55189AJ | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ55189AW | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ55189FK | OBSOLETE | LCCC | FK | 20 | | TBD | Call TI | Call TI |
| SNJ55189J | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI |

⁽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)

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

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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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN75189ADR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN75189ANSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN75189DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN75189NSR | 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) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN75189ADR | SOIC | D | 14 | 2500 | 346.0 | 346.0 | 33.0 |
| SN75189ANSR | SO | NS | 14 | 2000 | 346.0 | 346.0 | 33.0 |
| SN75189DR | SOIC | D | 14 | 2500 | 346.0 | 346.0 | 33.0 |
| SN75189NSR | SO | NS | 14 | 2000 | 346.0 | 346.0 | 33.0 |

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- 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 metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

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 and JEDEC MO-092AB

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- 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 .006 (0,15) per end.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 - E. Reference JEDEC MS-012 variation AB.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



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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