

SN5476, SN54LS76A SN7476, SN74LS76A DUAL J-K FLIP-FLOPS WITH PRESET AND CLEAR

SDLS121 – DECEMBER 1983 – REVISED MARCH 1988

- Package Options Include Plastic and Ceramic DIPs and Ceramic Flat Packages
- Dependable Texas Instruments Quality and Reliability

description

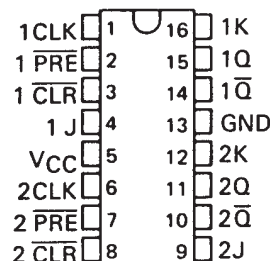
The '76 contains two independent J-K flip-flops with individual J-K, clock, preset, and clear inputs. The '76 is a positive-edge-triggered flip-flop. J-K input is loaded into the master while the clock is high and transferred to the slave on the high-to-low transition. For these devices the J and K inputs must be stable while the clock is high.

The 'LS76A contain two independent negative-edge-triggered flip-flops. The J and K inputs must be stable one setup time prior to the high-to-low clock transition for predicatble operation. The preset and clear are asynchronous active low inputs. When low they override the clock and data inputs forcing the outputs to the steady state levels as shown in the function table.

The SN5476 and the SN54LS76A are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7476 and the SN74LS76A are characterized for operation from 0°C to 70°C .

SN5476, SN54LS76A . . . J PACKAGE
SN7476 . . . N PACKAGE
SN74LS76A . . . D OR N PACKAGE

(TOP VIEW)



'76
FUNCTION TABLE

| INPUTS | | | | | OUTPUTS | |
|--------|-----|--------------|---|---|----------------|----------------|
| PRE | CLR | CLK | J | K | Q | \bar{Q} |
| L | H | X | X | X | H | L |
| H | L | X | X | X | L | H |
| L | L | X | X | X | H [†] | H [†] |
| H | H | \downarrow | L | L | Q ₀ | \bar{Q}_0 |
| H | H | \downarrow | H | L | H | L |
| H | H | \downarrow | L | H | L | H |
| H | H | \downarrow | H | H | TOGGLE | TOGGLE |

'LS76A
FUNCTION TABLE

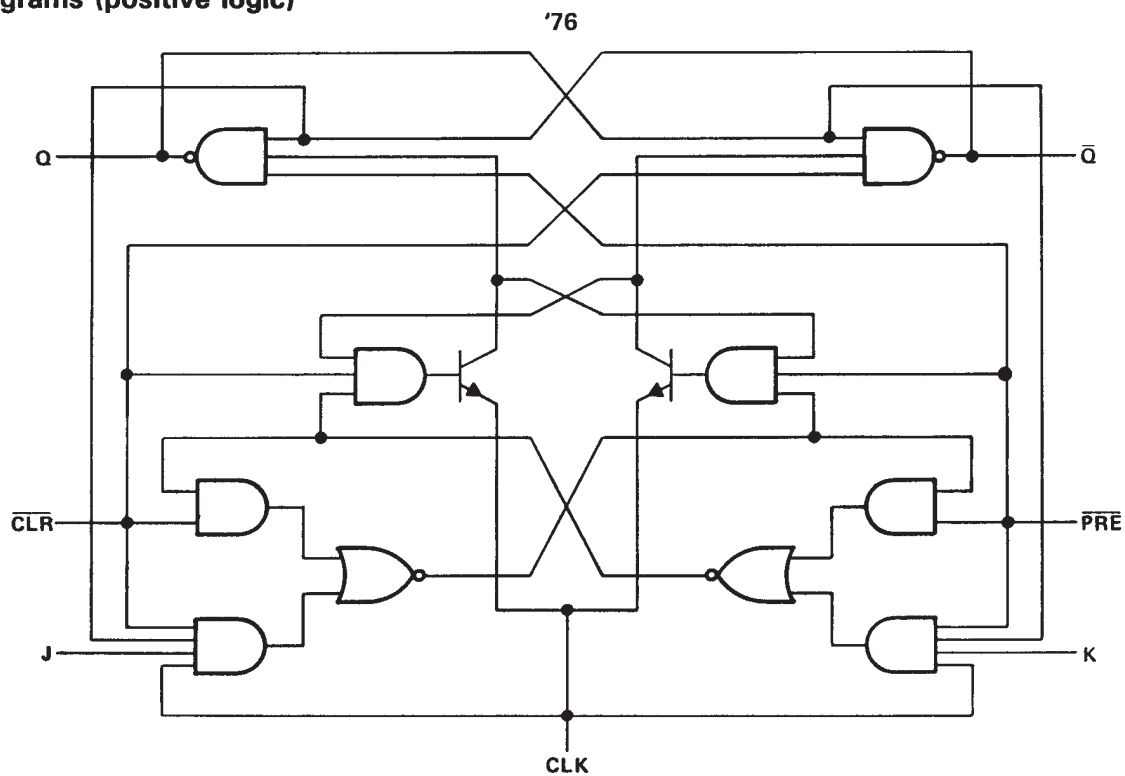
| INPUTS | | | | | OUTPUTS | |
|--------|-----|--------------|---|---|----------------|----------------|
| PRE | CLR | CLK | J | K | Q | \bar{Q} |
| L | H | X | X | X | H | L |
| H | L | X | X | X | L | H |
| L | L | X | X | X | H [†] | H [†] |
| H | H | \downarrow | L | L | Q ₀ | \bar{Q}_0 |
| H | H | \downarrow | H | L | H | L |
| H | H | \downarrow | L | H | L | H |
| H | H | \downarrow | H | H | TOGGLE | TOGGLE |
| H | H | H | X | X | Q ₀ | \bar{Q}_0 |

[†] This configuration is nonstable; that is, it will not persist when either preset or clear returns to its inactive (high) level.

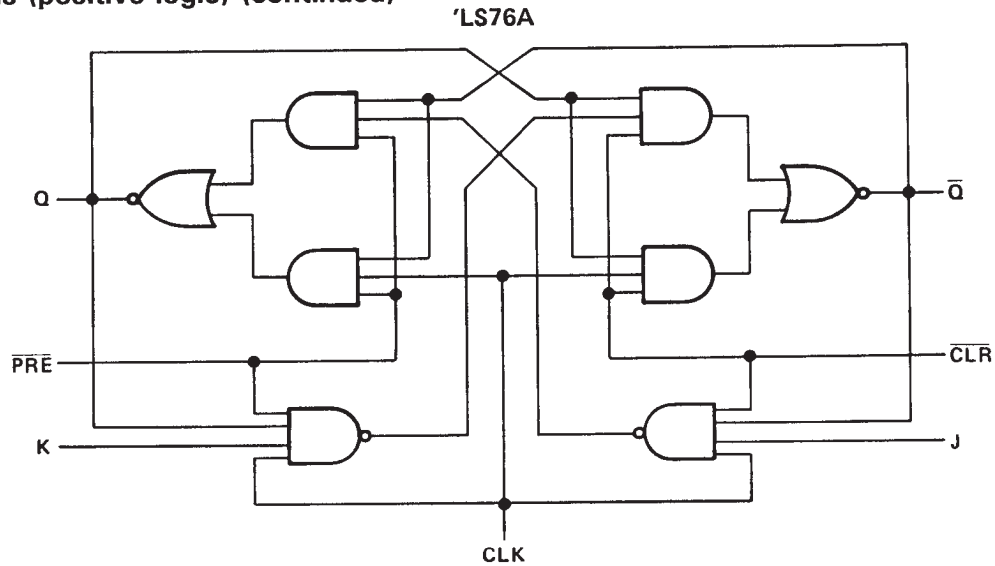
SN5476, SN54LS76A
SN7476, SN74LS76A
DUAL J-K FLIP-FLOPS WITH PRESET AND CLEAR

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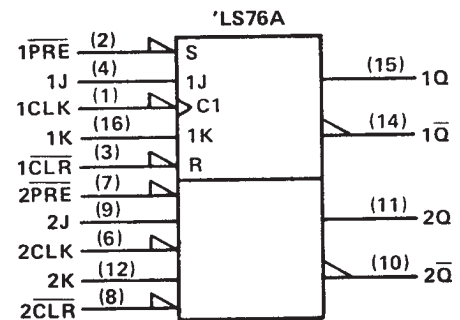
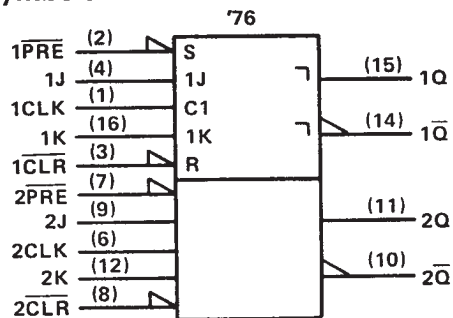
logic diagrams (positive logic)



logic diagrams (positive logic) (continued)

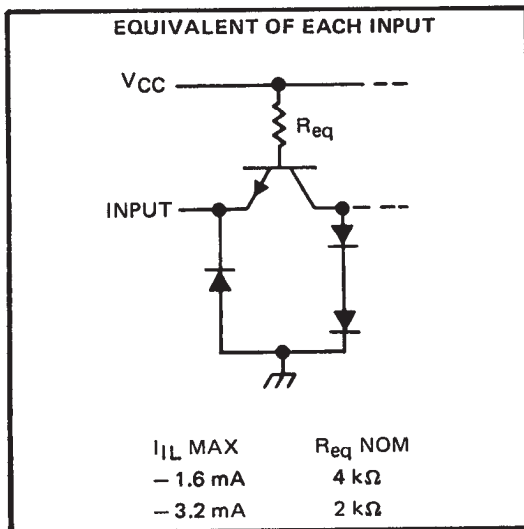


logic symbols†

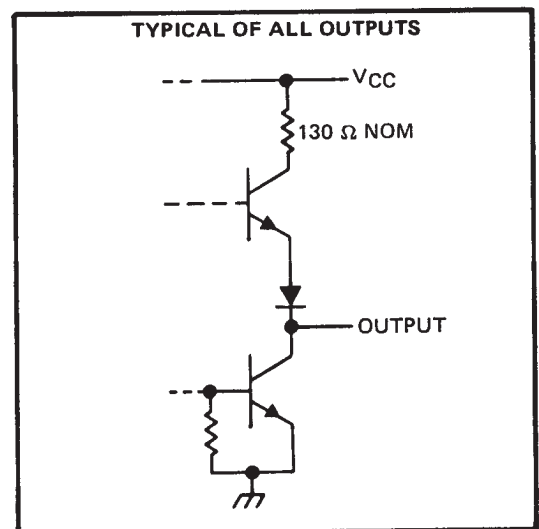


†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

schematics of inputs and outputs



'76

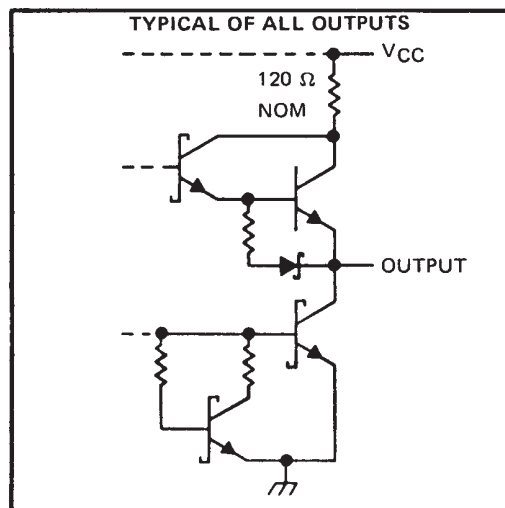
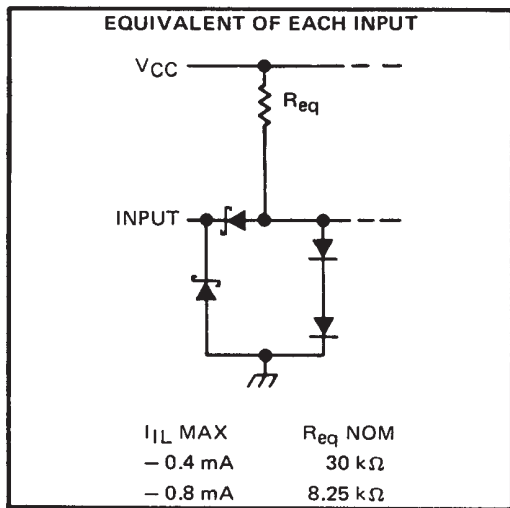


DUAL J-K FLIP-FLOPS WITH PRESET AND CLEAR

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schematics of inputs and outputs (continued)

'LS76A



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

| | |
|--|----------------|
| Supply voltage, V _{CC} (see Note 1) | 7 V |
| Input voltage: '76 | 5.5 V |
| 'LS76A | 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.

SN5476, SN54LS76A
SN7476, SN74LS76A
DUAL J-K FLIP-FLOPS WITH PRESET AND CLEAR
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recommended operating conditions

| | | SN5476 | | | SN7476 | | | 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 | | | – 0.4 | | | – 0.4 | mA |
| I _{OL} | Low-level output current | | | 16 | | | 16 | mA |
| t _w | Pulse duration | | CLK high | 20 | | 20 | | ns |
| | | | CLK low | 47 | | 47 | | |
| | | | PRE or CLR low | 25 | | 25 | | |
| t _{su} | Input setup time before CLK ↑ | 0 | | | 0 | | | ns |
| t _h | Input hold time-data after CLK ↓ | 0 | | | 0 | | | ns |
| 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† | | SN5476 | | | SN7476 | | | UNIT |
|-------------------|------------|---|--|--------|------|-------|--------|------|-------|------|
| | | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V _{IK} | | V _{CC} = MIN, I _I = – 12 mA | | | | – 1.5 | | | – 1.5 | V |
| V _{OH} | | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = – 0.4 mA | | 2.4 | 3.4 | | 2.4 | 3.4 | | V |
| V _{OL} | | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = 16 mA | | | 0.2 | 0.4 | | 0.2 | 0.4 | V |
| I _I | | V _{CC} = MAX, V _I = 5.5 V | | | | 1 | | | 1 | mA |
| I _{IH} | J or K | V _{CC} = MAX, V _I = 2.4 V | | | | 40 | | | 40 | μA |
| | All other | | | | | 80 | | | 80 | |
| I _{IL} | J or K | V _{CC} = MAX, V _I = 0.4 V | | | | – 1.6 | | | – 1.6 | mA |
| | All other¶ | | | | | – 3.2 | | | – 3.2 | |
| I _{OS} § | | V _{CC} = MAX | | – 20 | | – 57 | – 18 | | – 57 | mA |
| I _{CC} # | | V _{CC} = MAX, See Note 2 | | | 10 | 20 | | 10 | 20 | 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.

¶ Clear is tested with preset high and preset is tested with clear high.

Average per flip-flop.

NOTE 2: With all outputs open, I_{CC} is measured with the Q and \bar{Q} outputs high in turn. At the time of measurement, the clock input is grounded.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------|--|----------------------------|---|-----|-----|-----|------|
| f _{max} | | | R _L = 400 Ω, C _L = 15 pF | 15 | 20 | | MHz |
| t _{PLH} | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ | Q or $\overline{\text{Q}}$ | | | 16 | 25 | ns |
| t _{PHL} | | | | | 25 | 40 | ns |
| t _{PLH} | CLK | Q or $\overline{\text{Q}}$ | | | 16 | 25 | ns |
| t _{PHL} | | | | | 25 | 40 | ns |

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

SN5476, SN54LS76A SN7476, SN74LS76A DUAL J-K FLIP-FLOPS WITH PRESET AND CLEAR

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recommended operating conditions

| | | | SN54LS76A | | | SN74LS76A | | | UNIT |
|--------------------|--------------------------------|--|-----------|-----|-----|-----------|-----|------|------|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| V _{CC} | Supply voltage | | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.75 | 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 |
| f _{clock} | Clock frequency | | 0 | 30 | | 0 | 30 | | MHz |
| t _w | Pulse duration | CLK high | 20 | | | 20 | | | ns |
| | | $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ low | 25 | | | 25 | | | |
| t _{su} | Setup time before CLK↓ | data high or low | 20 | | | 20 | | | ns |
| | | $\overline{\text{CLR}}$ inactive | 20 | | | 20 | | | |
| | | $\overline{\text{PRE}}$ inactive | 25 | | | 25 | | | |
| t _h | Hold time-data after CLK↓ | | 0 | | | 0 | | | ns |
| T _A | Operating free-air temperature | | − 55 | | | 125 | | | °C |
| | | | − 55 | | | 125 | | | °C |

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

| PARAMETER | | TEST CONDITIONS† | | SN54LS76A | | SN74LS76A | | UNIT |
|-------------------------|------------|---|---|-----------|-------|-----------|-------|------|
| | | | | MIN | TYP‡ | MAX | MIN | |
| 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 _{IL} = MAX, V _{IH} = 2 V, I _{OL} = 4 mA | 0.25 0.4 | | 0.25 0.4 | | V |
| | | V _{CC} = MIN, | V _{IL} = MAX, V _{IH} = 2 V, I _{OL} = 8 mA | | | 0.35 0.5 | | |
| I _I | J or K | V _{CC} = MAX, V _I = 7 V | | 0.1 | | 0.1 | | mA |
| | CLR or PRE | | | 0.3 | | 0.3 | | |
| | CLK | | | 0.4 | | 0.4 | | |
| I _{IH} | J or K | V _{CC} = MAX, V _I = 2.7 V | | 20 | | 20 | | μA |
| | CLR or PRE | | | 60 | | 60 | | |
| | CLK | | | 80 | | 80 | | |
| I _{IL} | J or K | V _{CC} = MAX, V _I = 0.4 V | | – 0.4 | | – 0.4 | | mA |
| | All other | | | – 0.8 | | – 0.8 | | |
| I _{OS} § | | V _{CC} = MAX, | See Note 4 | – 20 | – 100 | – 20 | – 100 | mA |
| I _{CC} (Total) | | V _{CC} = MAX, | See Note 2 | 4 6 | | 4 6 | | 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 the duration of the short circuit should not exceed one second.

NOTE 2: With all outputs open, I_{CC} is measured with the Q and \bar{Q} outputs high in turn. At the time of measurement, the clock input is grounded.

NOTE 4: For certain devices where state commutation can be caused by shorting an output to ground, an equivalent test may be performed with V_O = 2.25 V and 2.125 V for the 54 family and the 74 family, respectively, with the minimum and maximum limits reduced to one half of their stated values.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------|-----------------|----------------|---|-----|-----|-----|------|
| f _{max} | | | R _L = 2 kΩ, C _L = 15 pF | 30 | 45 | | MHz |
| t _{PLH} | PRE, CLR or CLK | Q or \bar{Q} | | | 15 | 20 | ns |
| t _{PHL} | | | | | 15 | 20 | ns |

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



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|----------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------------------|
| 5962-9557501QEA | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QE A SNJ5476J |
| 5962-9557501QFA | Active | Production | CFP (W) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QF A SNJ5476W |
| 5962-9557501QFA | Active | Production | CFP (W) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QF A SNJ5476W |
| 7601301EA | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 7601301EA SNJ54LS76AJ |
| 7601301EA | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 7601301EA SNJ54LS76AJ |
| JM38510/00204BEA | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | JM38510/ 00204BEA |
| JM38510/00204BEA | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | JM38510/ 00204BEA |
| JM38510/00204BEA.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | JM38510/ 00204BEA |
| JM38510/00204BEA.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | JM38510/ 00204BEA |
| M38510/00204BEA | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | JM38510/ 00204BEA |
| M38510/00204BEA | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | JM38510/ 00204BEA |
| SN5476J | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN5476J |
| SN5476J | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN5476J |
| SN5476J.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN5476J |
| SN5476J.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN5476J |
| SN54LS76AJ | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN54LS76AJ |
| SN54LS76AJ | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN54LS76AJ |
| SN54LS76AJ.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN54LS76AJ |
| SN54LS76AJ.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | SN54LS76AJ |

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|-----------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------------------|
| SNJ5476J | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QE A SNJ5476J |
| SNJ5476J | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QE A SNJ5476J |
| SNJ5476J.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QE A SNJ5476J |
| SNJ5476J.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QE A SNJ5476J |
| SNJ5476W | Active | Production | CFP (W) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QF A SNJ5476W |
| SNJ5476W | Active | Production | CFP (W) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QF A SNJ5476W |
| SNJ5476W.A | Active | Production | CFP (W) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QF A SNJ5476W |
| SNJ5476W.A | Active | Production | CFP (W) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9557501QF A SNJ5476W |
| SNJ54LS76AJ | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 7601301EA SNJ54LS76AJ |
| SNJ54LS76AJ | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 7601301EA SNJ54LS76AJ |
| SNJ54LS76AJ.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 7601301EA SNJ54LS76AJ |
| SNJ54LS76AJ.A | Active | Production | CDIP (J) 16 | 25 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 7601301EA SNJ54LS76AJ |

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

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

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

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

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

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

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

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TUBE



*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 5962-9557501QFA | W | CFP | 16 | 25 | 506.98 | 26.16 | 6220 | NA |
| SNJ5476W | W | CFP | 16 | 25 | 506.98 | 26.16 | 6220 | NA |
| SNJ5476W.A | W | CFP | 16 | 25 | 506.98 | 26.16 | 6220 | NA |

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



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

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.

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