

DM54LS469/DM74LS469 8-Bit Up/Down Counter

General Description

The 'LS469 is an 8-bit synchronous up/down counter with parallel load and hold capability. Three function-select inputs (\overline{LD} , \overline{UD} , \overline{CBI}) provide one of four operations which occur synchronously on the rising edge of the clock (CK).

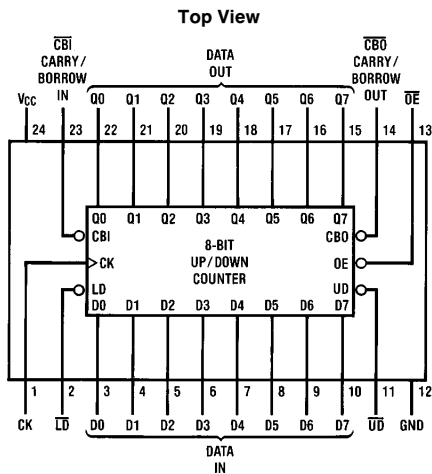
The LOAD operation loads the inputs (D_7 – D_0) into the output register (Q_7 – Q_0). The HOLD operation holds the previous value regardless of clock transitions. The INCREMENT operation adds one to the output register when the carry-in input is TRUE (\overline{CBI} =LOW), otherwise the operation is a HOLD. The carry-out (\overline{CBO}) is TRUE (\overline{CBO} =LOW) when the output register (Q_7 – Q_0) is all HIGHS, otherwise FALSE (\overline{CBO} =HIGH). The DECREMENT operation subtracts one from the output register when the borrow-in input is TRUE (\overline{CBI} =LOW), otherwise the operation is a HOLD. The borrow-out (\overline{CBO}) is TRUE (\overline{CBO} =LOW) when the output register (Q_7 – Q_0) is all LOWs, otherwise FALSE (\overline{CBO} =HIGH).

The output register (Q_7 – Q_0) is enabled when \overline{OE} is LOW, and disabled (HI-Z) when \overline{OE} is HIGH. The output drivers will sink the 24 mA required for many bus-interface standards. Two or more 'LS469 octal up/down counters may be cascaded to provide larger counters.

Features/Benefits

- 8-bit up/down counter for microprogram-counter, DMA controller and general-purpose counting applications
- 8 bits matches byte boundaries
- Bus-structured pinout
- 24-pin SKINNYDIP saves space
- TRI-STATE® outputs drive bus lines
- Low current PNP inputs reduce loading
- Expandable in 8-bit increments

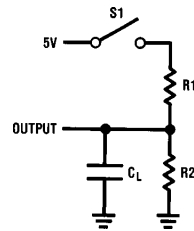
Connection Diagram



TL/L/8333-1

Order Number **DM54LS469J**,
DM74LS469J or **DM74LS469N**
See NS Package Number J24F or N24C

Standard Test Load



TL/L/8333-3

Function Table

| \overline{OE} | CK | \overline{LD} | \overline{UD} | \overline{CBI} | D7–D0 | Q7–Q0 | Operation |
|-----------------|----|-----------------|-----------------|------------------|-------|-----------|-----------|
| H | X | X | X | X | X | Z | HI-Z |
| L | ↑ | L | X | X | D | D | LOAD |
| L | ↑ | H | L | H | X | Q | HOLD |
| L | ↑ | H | L | L | X | Q plus 1 | INCREMENT |
| L | ↑ | H | H | H | X | Q | HOLD |
| L | ↑ | H | H | L | X | Q minus 1 | DECREMENT |

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Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage V_{CC} 7V
Input Voltage 5.5V

Off-State Output Voltage
Storage Temperature

5.5V
−65°C to +150°C

Operating Conditions

| Symbol | Parameter | Military | | | Commercial | | | Units |
|----------|--------------------------------|----------|-----|------|------------|-----|------|-------|
| | | Min | Typ | Max | Min | Typ | Max | |
| V_{CC} | Supply Voltage | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V |
| T_A | Operating Free-Air Temperature | −55 | | 125* | 0 | | 75 | °C |
| t_W | Width of Clock | Low | 40 | | 35 | 10 | | ns |
| | | High | 30 | | 25 | | | |
| t_{SU} | Set Up Time | 60 | | | 50 | | | ns |
| t_h | Hold Time | 0 | −15 | | 0 | −15 | | |

*Case Temperature

Electrical Characteristics Over Operating Conditions

| Symbol | Parameter | Test Conditions | | Min | Typ† | Max | Units |
|-----------|-------------------------------|---|------------------------|----------------------------|------|-------|-------|
| V_{IL} | Low-Level Input Voltage | | | | | 0.8 | V |
| V_{IH} | High-Level Input Voltage | | | 2 | | | V |
| V_{IC} | Input Clamp Voltage | $V_{CC} = \text{MIN}$ | $I_I = -18 \text{ mA}$ | | | −1.5 | V |
| I_{IL} | Low-Level Input Current | $V_{CC} = \text{MAX}$ | $V_I = 0.4 \text{ V}$ | | | −0.25 | mA |
| I_{IH} | High-Level Input Current | $V_{CC} = \text{MAX}$ | $V_I = 2.4 \text{ V}$ | | | 25 | μA |
| I_I | Maximum Input Current | $V_{CC} = \text{MAX}$ | $V_I = 5.5 \text{ V}$ | | | 1 | mA |
| V_{OL} | Low-Level Output Voltage | $V_{CC} = \text{MIN}$ $V_{IL} = 0.8 \text{ V}$ $V_{IH} = 2 \text{ V}$ | MIL | $I_{OL} = 12 \text{ mA}$ | 2.4 | 0.5 | V |
| | | | COM | $I_{OL} = 24 \text{ mA}$ | | | |
| V_{OH} | High-Level Output Voltage | $V_{CC} = \text{MIN}$ $V_{IL} = 0.8 \text{ V}$ $V_{IH} = 2 \text{ V}$ | MIL | $I_{OH} = -2 \text{ mA}$ | 2.4 | | V |
| | | | COM | $I_{OH} = -3.2 \text{ mA}$ | | | |
| I_{OZL} | Off-State Output Current | $V_{CC} = \text{MAX}$ $V_{IL} = 0.8 \text{ V}$ $V_{IH} = 2 \text{ V}$ | $V_O = 0.4 \text{ V}$ | | | −100 | μA |
| I_{OZH} | | | $V_O = 2.4 \text{ V}$ | | | 100 | μA |
| I_{OS} | Output Short-Circuit Current* | $V_{CC} = 5.0 \text{ V}$ | $V_O = 0 \text{ V}$ | −30 | | −130 | mA |
| I_{CC} | Supply Current | $V_{CC} = \text{MAX}$ | | | 120 | 180 | mA |

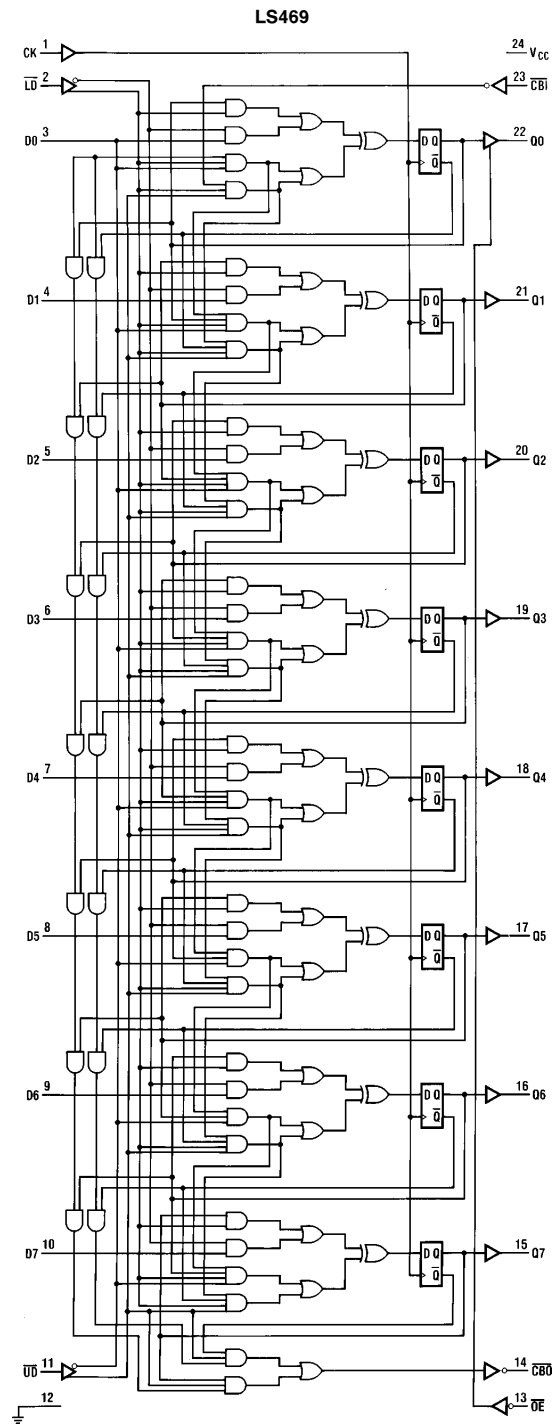
*No more than one output should be shorted at a time and duration of the short-circuit should not exceed one second

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

Switching Characteristics Over Operating Conditions

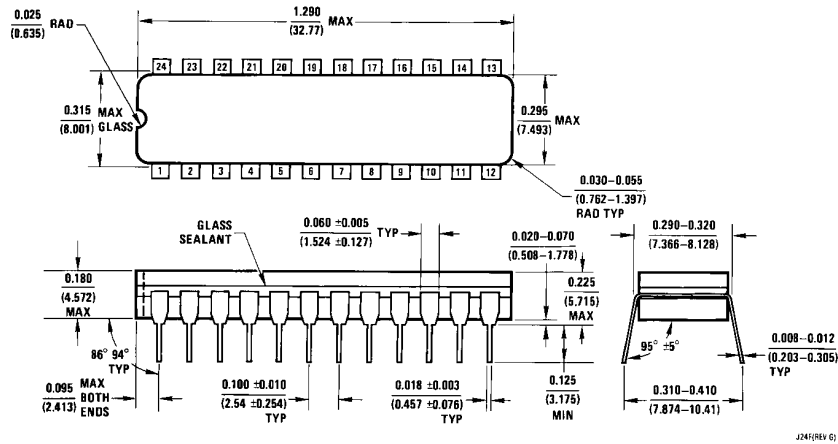
| Symbol | Parameter | Test Conditions (See Test Load/Waveforms) | Military | | | Commercial | | | Units |
|-----------|--|---|----------|-----|-----|------------|-----|-----|-------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| f_{MAX} | Maximum Clock Frequency | $C_L = 50 \text{ pF}$ $R_1 = 200 \Omega$ $R_2 = 390 \Omega$ | 10.5 | | | 12.5 | | | MHz |
| t_{pD} | \overline{CBI} to \overline{CBO} Delay | | | 35 | 60 | | 35 | 50 | ns |
| t_{pD} | Clock to Q | | | 20 | 35 | | 20 | 30 | ns |
| t_{pD} | Clock to CBO | | | 55 | 95 | | 55 | 80 | ns |
| t_{pZX} | Output Enable Delay | | | 20 | 45 | | 20 | 35 | ns |
| t_{pXZ} | Output Disable Delay | | | 20 | 45 | | 20 | 35 | ns |

Logic Diagram

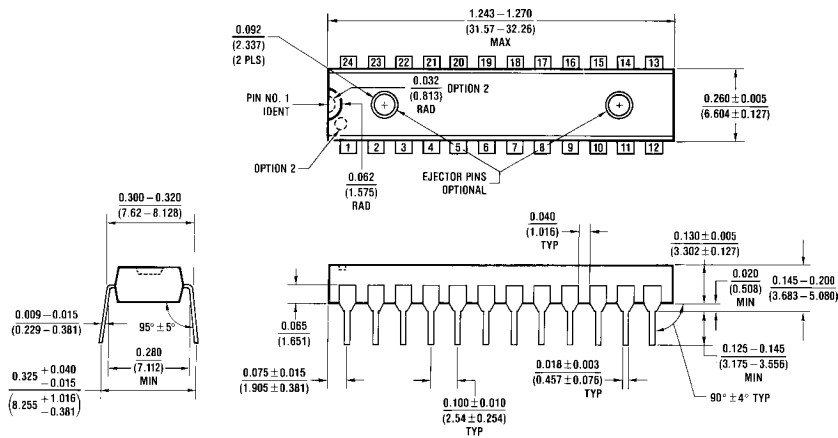


TL/L/8333-2

Physical Dimensions inches (millimeters)



24-Pin Narrow Ceramic Dual-In-Line Package (J)
Order Number DM54LS469J or DN74LS469J
NS Package Number J24F



24-Pin Narrow Plastic Dual-In-Line Package (N)
Order Number DN74LS469N
NS Package Number N24C

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