

## 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).

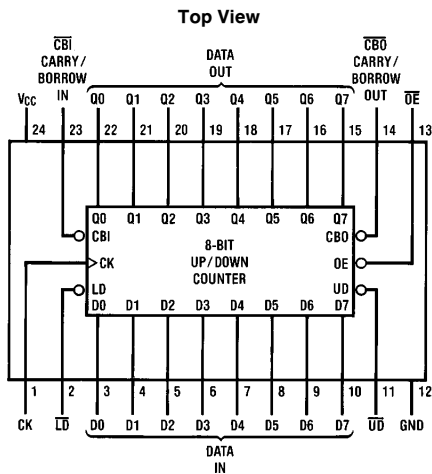
The LOAD operation loads the inputs ( $D_7-D_0$ ) into the output register ( $Q_7-Q_0$ ). The HOLD operation holds the previous value regardless of clock transitions. The INCREMENT operation adds one to the output register when the carry-in input is TRUE ( $\overline{CBI} = \text{LOW}$ ), otherwise the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

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

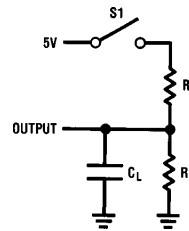
### Connection Diagram



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 5.5V  
Storage Temperature  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$

## 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	$^{\circ}\text{C}$
$t_W$	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	$\mu\text{A}$	
$I_I$	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	$I_{OL} = 12 \text{ mA}$		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	$\mu\text{A}$	
$I_{OZH}$			$V_O = 2.4 \text{ V}$		100	$\mu\text{A}$	
$I_{OS}$	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	

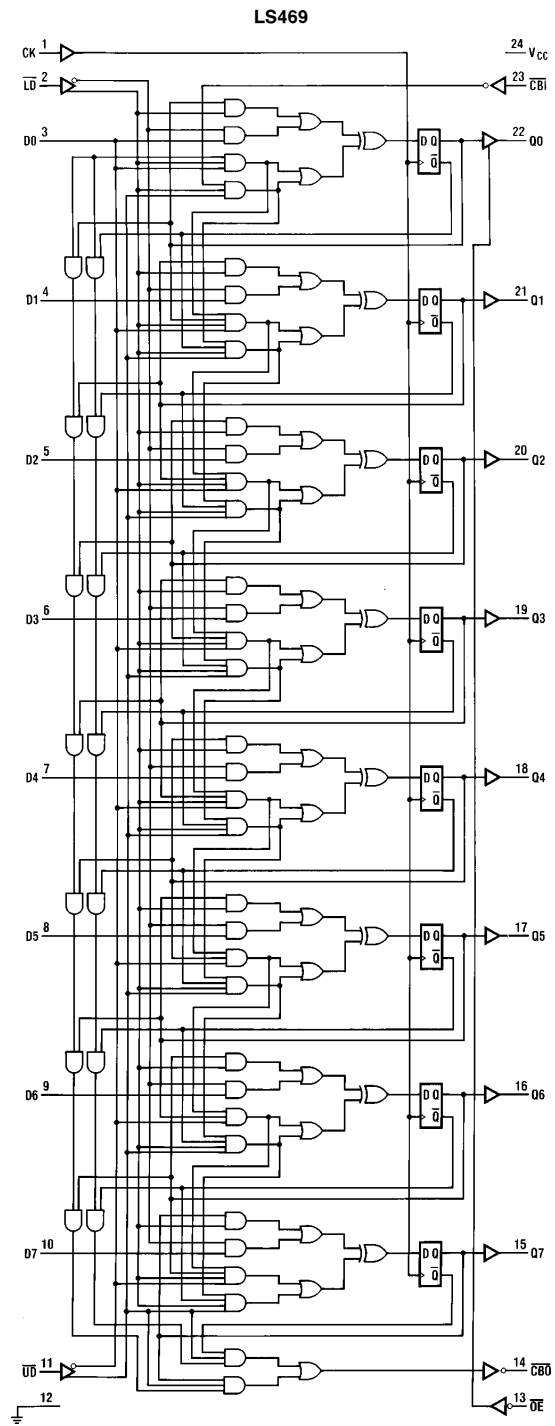
\*No more than one output should be shorted at a time and duration of the short-circuit should not exceed one second

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

## Switching Characteristics Over Operating Conditions

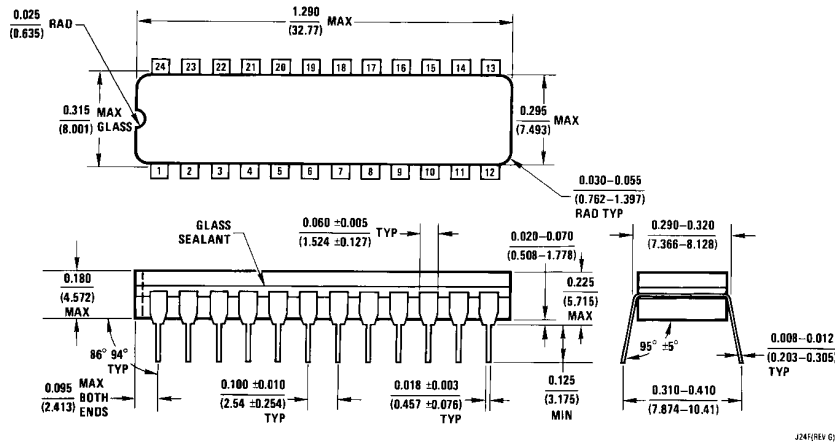
Symbol	Parameter	Test Conditions (See Test Load/Waveforms)	Military			Commercial			Units
			Min	Typ	Max	Min	Typ	Max	
$f_{MAX}$	Maximum Clock Frequency	$C_L = 50 \text{ pF}$ $R_1 = 200 \Omega$ $R_2 = 390 \Omega$	10.5			12.5			MHz
$t_{pD}$	$\overline{\text{CB}}\overline{\text{I}}$ to $\overline{\text{C}}\overline{\text{B}}\overline{\text{O}}$ 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

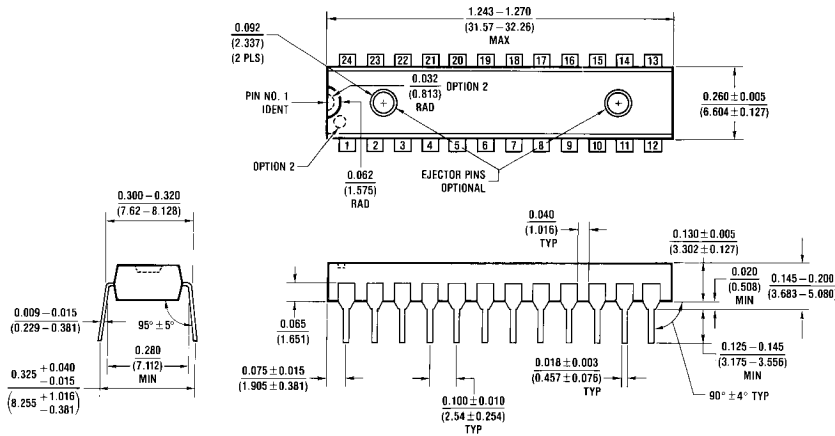


TL/L/8333-2

**Physical Dimensions** inches (millimeters)



**24-Pin Narrow Ceramic Dual-In-Line Package (J)**  
**Order Number DM54LS469J or DM74LS469J**  
**NS Package Number J24F**



**24-Pin Narrow Plastic Dual-In-Line Package (N)**  
**Order Number DM74LS469N**  
**NS Package Number N24C**

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