



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).

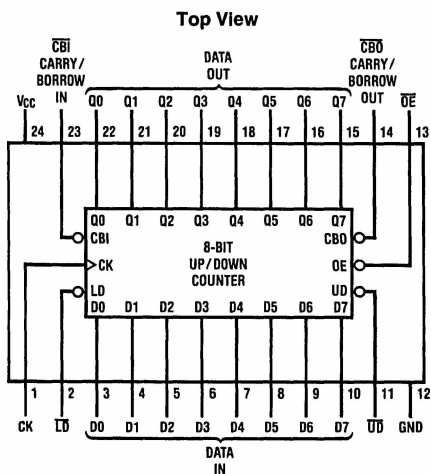
The LOAD operation loads the inputs (D_7 – D_0) into the output register (Q_7 – Q_0). The HOLD operation holds the previous value regardless of clock transitions. The INCREMENT operation adds one to the output register when the carry-in input is TRUE ($\overline{CBI}$ =LOW), otherwise the operation is 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

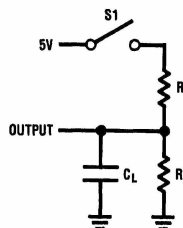
Connection Diagram



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	$\overline{LD}$	$\overline{UD}$	$\overline{CBI}$	D_7 – D_0	Q_7 – Q_0	Operation
H	X	X	X	X	X	Z	HI-Z
L	$\uparrow$	L	X	X	D	D	LOAD
L	$\uparrow$	H	L	H	X	Q	HOLD
L	$\uparrow$	H	L	L	X	Q plus 1	INCREMENT
L	$\uparrow$	H	H	H	X	Q	HOLD
L	$\uparrow$	H	H	L	X	Q minus 1	DECREMENT

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	$I_{OL} = 12 \text{ mA}$	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

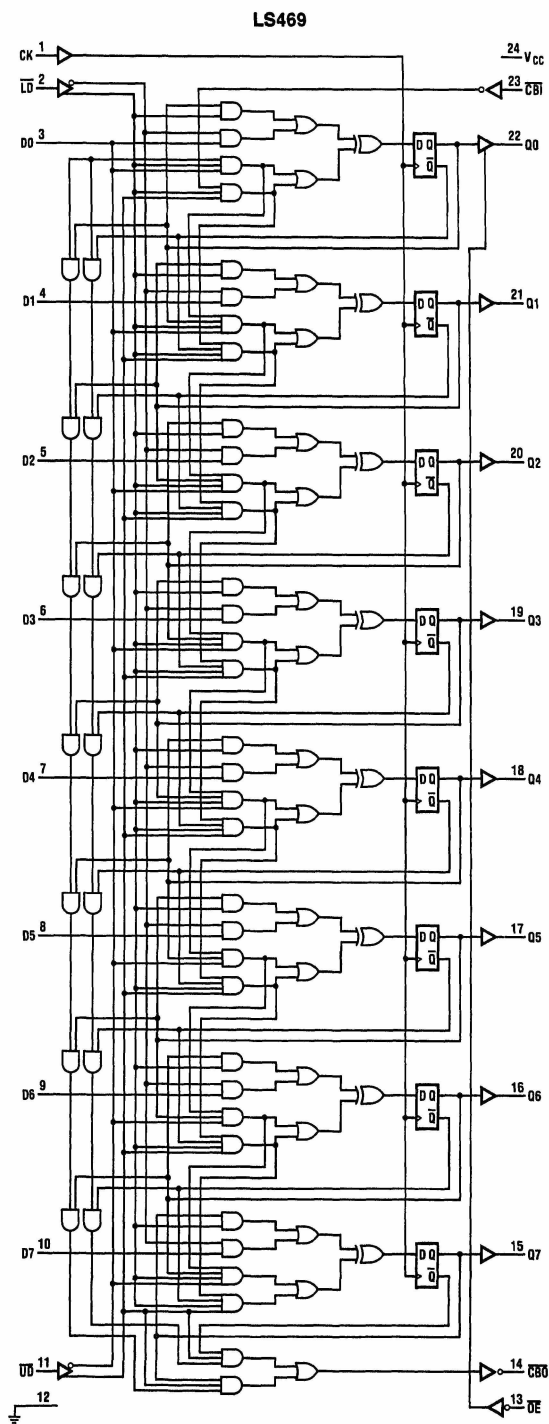
*No more than one output should be shorted at a time and duration of the short-circuit should not exceed one second

† 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 $\overline{CBO}$			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