

DM54LS491/74LS491 10-Bit Counter

General Description

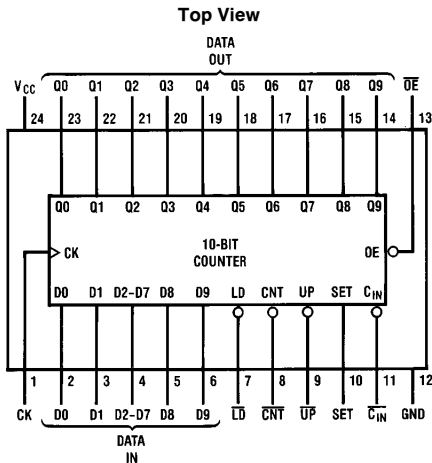
The ten-bit counter can count up, count down, set, and load 2 LSB's, 2 MSB's and 6 middle bits high or low as a group. All operations are synchronous with the clock. SET overrides LOAD, COUNT and HOLD. LOAD overrides COUNT. COUNT is conditional on C_{IN} , otherwise it holds.

All outputs are enabled when \overline{OE} is low, otherwise HIGH-Z. The 24 mA I_{OL} outputs are suitable for driving RAM/PROM address lines in video graphics systems.

Features/Benefits

- CRT vertical and horizontal timing generation
- Bus-structured pinout
- 24-pin SKINNYDIP saves space
- TRI-STATE® outputs drive bus lines
- Low current PNP inputs reduce loading

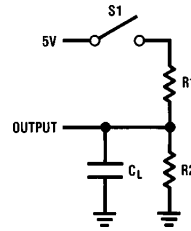
Connection Diagram



TL/L/8332-1

Order Number DM54LS491J,
DM74LS491J or DM74LS491N
See NS Package Number J24F or N24C

Standard Test Load



TL/L/8332-2

Function Table

\overline{OE}	CK	SET	LD	CNT	C_{IN}	UP	D9-D0	Q9-Q0	Operation
H	X	X	X	X	X	X	X	Z	Hi-Z
L	↑	H	X	X	X	X	X	H	Set all HIGH
L	↑	L	L	X	X	X	D	D	LOAD D
L	↑	L	H	H	X	X	X	Q	HOLD
L	↑	L	H	L	H	X	X	Q	HOLD
L	↑	L	H	L	L	L	X	Q plus 1	Count UP
L	↑	L	H	L	L	H	X	Q minus 1	Count DN

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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° to $+150^{\circ}$ 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	$^{\circ}$ C
t_w	Width of Clock	High	40		40			ns
		Low	35		35			
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	μ 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	μ A	
I_{OZH}			$V_O = 2.4 \text{ V}$		100	μ 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	

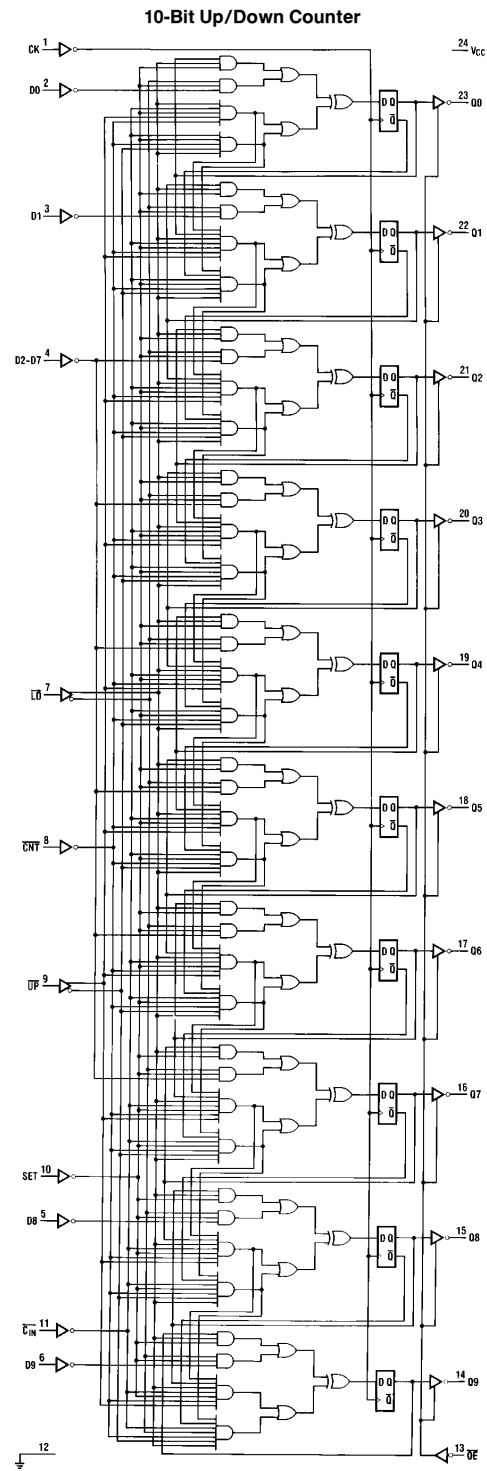
* No more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

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

Switching Characteristics Over Operating Conditions

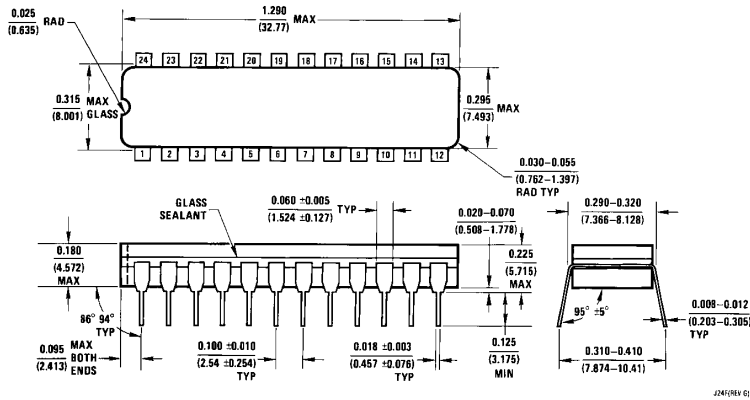
Symbol	Parameter	Test Conditions (See Test Load)	Military			Commercial			Units
			Min	Typ	Max	Min	Typ	Max	
f_{MAX}	Maximum Clock Frequency	$C_L = 50 \text{ pF}$ $R_1 = 200 \Omega$ $R_2 = 390 \Omega$	10.5			12.5			MHz
t_{PD}	Clock to Q			20	35		20	30	ns
t_{PZX}	Output Enable Delay			35	55		35	45	ns
t_{PXZ}	Output Disable Delay			35	55		35	45	ns

Logic Diagram

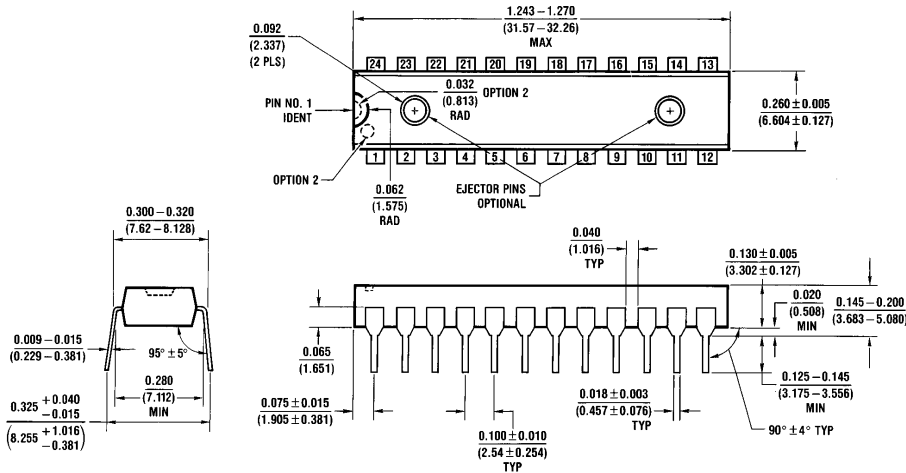


TL/L/8332-3

Physical Dimensions inches (millimeters)



24-Pin Narrow Ceramic Dual-In-Line Package (J)
Order Number DM54LS491J or DM74LS491J
NS Package Number J24F



24-Pin Narrow Plastic Dual-In-Line Package (N)
Order Number DM74LS491N
NS Package Number N24C

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