



54LS490/DM74LS490 Dual Decade Counter

General Description

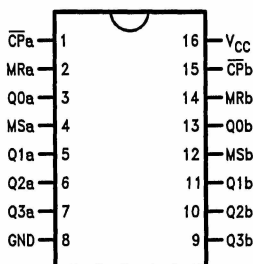
The 'LS490 contains a pair of high speed 4-stage ripple counters. Each half of the 'LS490 has individual Clock, Master Reset and Master Set (Preset 9) inputs. Each section counts in the 8421 BCD code.

Features

- Dual version of 54LS/74LS90
- Individual asynchronous clear and preset to 9 for each counter
- Count frequency—typically 65 MHz
- Input clamp diodes limit high speed termination effects
- TTL and CMOS compatible

Connection Diagram

Dual-In-Line Package



TL/F/10188-1

Order Number 54LS490DMQB, 54LS490FMQB, DM54LS490M or DM54LS490N
See NS Package Number J16A, M16A, N16E or W16A

Pin Names	Description
MS	Master Set (Set to 9) Input (Active HIGH)
MR	Master Reset Input (Active HIGH)
CP	Clock Pulse Input (Active Falling Edge)
Q0–Q3	Counter Outputs

Absolute Maximum Ratings (Note)

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

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
54LS	–55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	–65°C to +150°C

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	54LS490			DM74LS490			Units
		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			0.7			0.8	V
I _{OH}	High Level Output Current			–0.4			–0.4	mA
I _{OL}	Low Level Output Current			4			8	mA
T _A	Free Air Operating Temperature	–55		125	0		70	°C
t _w (L)	$\overline{CP}$ Pulse Width LOW	12.5			12.5			ns
t _w (H)	MR, MS Pulse Width HIGH	20			20			ns
t _{rec}	Recovery Time, MR or MS to $\overline{CP}$	15			15			ns

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = –18 mA			–1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max	54LS	2.5		V
			DM74	2.7		
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IH} = Min	54LS		0.4	V
			DM74		0.5	
		I _{OL} = 4 mA, V _{CC} = Min	DM74		0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 10V	Inputs		100	μA
			$\overline{CP}$		200	
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.7V	Inputs		20	μA
			$\overline{CP}$		40	
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V	Inputs	–0.03	–0.4	mA
			$\overline{CP}$	–0.18	–2.4	
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	54LS	–20	–100	mA
			DM74	–20	–100	
I _{CC}	Supply Current	V _{CC} = Max			26	mA

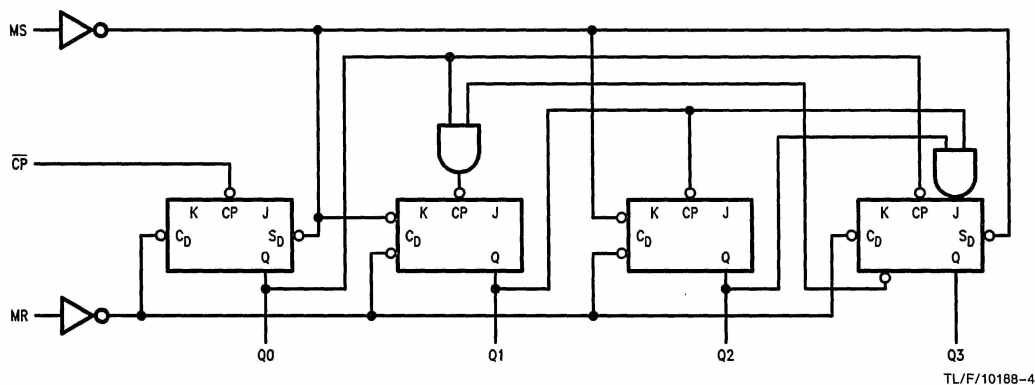
Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

$V_{CC} = +5.0V$, $T_A = +25^{\circ}C$ (See Section 1 for test waveforms and output load)

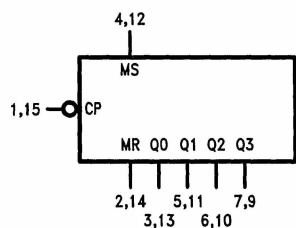
Symbol	Parameter	R _L = 2 kΩ, C _L = 15 pF		Units
		Min	Max	
f _{max}	Maximum Clock Frequency	40		MHz
t _{PLH} t _{PHL}	Propagation Delay CP to Q0		15 15	ns
t _{PLH} t _{PHL}	Propagation Delay CP to Q1 or Q3		30 30	ns
t _{PLH} t _{PHL}	Propagation Delay CP to Q2		45 45	ns
t _{PLH} t _{PHL}	Propagation Delay MS to Qn		35 35	ns
t _{PHL}	Propagation Delay MR to Qn		39	ns

Logic Diagram (one-half shown)



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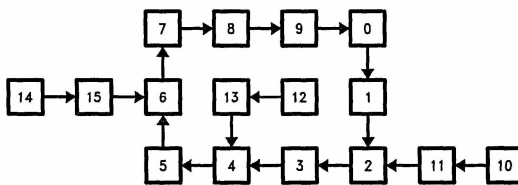
Logic Symbol



TL/F/10188-2

V_{CC} = Pin 16
GND = Pin 8

State Diagram



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