



## DUAL DECADE COUNTER

### DESCRIPTION

The T54LS490/T74LS490 contains a pair of high-speed 4-stage ripple counters. Each half of the T54LS/T74LS490 has individual Clock, Master Reset and Master Set (Preset 9) inputs. Each section counts in 8, 4, 2, 1 BCD code.

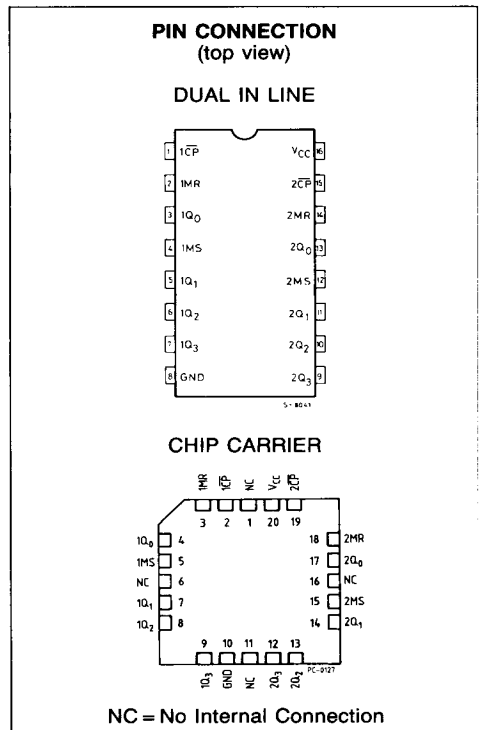
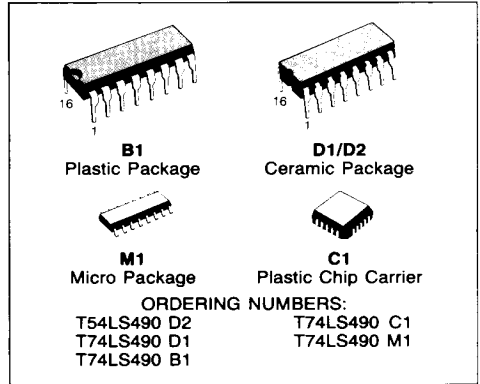
- DUAL VERSION OF 54LS/74LS90
- INDIVIDUAL ASYNCHRONOUS CLEAR AND PRESET TO 9 FOR EACH COUNTER
- COUNT FREQUENCY - TYPICALLY 65 MHz
- INPUT CLAMP DIODES LIMIT HIGH SPEED TERMINATION EFFECTS
- TTL AND CMOS COMPATIBLE

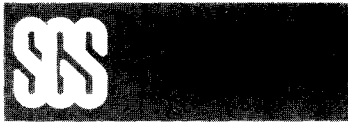
### TRUTH TABLE

COUNT	OUTPUTS			
	Q <sub>3</sub>	Q <sub>2</sub>	Q <sub>1</sub>	Q <sub>0</sub>
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H

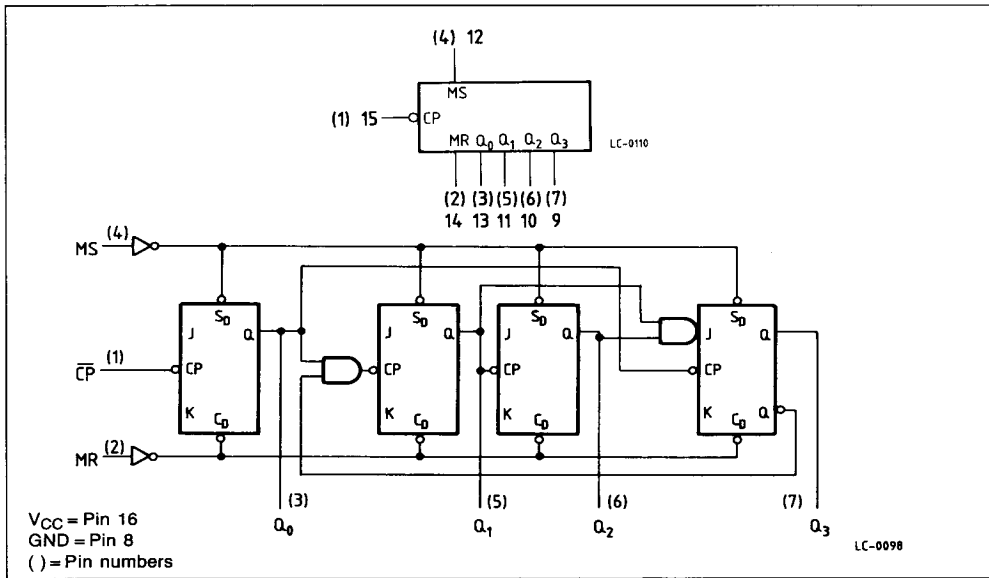
### PIN NAMES

MS	Master Set (Set to 9) Input
MR	Master Reset
CP	Clock Input (Active HIGH Going Edge)
Q <sub>0</sub> -Q <sub>3</sub>	Counter Outputs





## LOGIC SYMBOL AND LOGIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.5 to 7	V
$V_I$	Input Voltage, Applied to Input	-0.5 to 5.5	V
$V_O$	Output Voltage, Applied to Output	-0.5 to 10	V
$I_I$	Input Current, Into Inputs	-30 to 5	mA
$I_O$	Output Current, Into Outputs	50	mA

Stresses in excess of those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## GUARANTEED OPERATING RANGES

Part Numbers	Supply Voltage			Temperature
	Min	Typ	Max	
T54LS490D2	4.5 V	5.0 V	5.5 V	-55°C to +125°C
T74LS490XX	4.75 V	5.0 V	5.25 V	0°C to +70°C

XX = package type.



### DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

Symbol	Parameter		Limits			Test Conditions (Note 1)		Units
			Min.	Typ.	Max.			
V <sub>IH</sub>	Input HIGH Voltage		2.0			Guaranteed input HIGH Voltage for all Inputs		V
V <sub>IL</sub>	Input LOW Voltage	54			0.7	Guaranteed input LOW Voltage for all Inputs		V
		74			0.8			
V <sub>CD</sub>	Input Clamp Diode Voltage			-0.65	-1.5	V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18mA		V
V <sub>OH</sub>	Output HIGH Voltage	54	2.5			V <sub>CC</sub> = MIN, I <sub>OH</sub> = -400μA, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table		V
		74	2.7					
V <sub>OL</sub>	Output LOW Voltage	54,74	0.25	0.4	I <sub>OL</sub> = 4.0mA	V <sub>CC</sub> = MIN, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table		V
		74	0.35	0.5	I <sub>OL</sub> = 8.0mA			
I <sub>IH</sub>	Input HIGH Current	MR, MS			20	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7V		μA
		$\overline{CP}$			60			
		$\overline{CP}$			-300	V <sub>IN</sub> = 5.5V $\overline{CP}$ only		μA
		MR, MS			100	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0V		
I <sub>IL</sub>	Input LOW Current	$\overline{CP}$			-2.4	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4V		mA
		MR, MS			-0.4			
I <sub>OS</sub>	Output Short Circuit Current (Note 2)		-20		-100	V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0V		mA
I <sub>CC</sub>	Power Supply Current			19	30	V <sub>CC</sub> = MAX		mA

### AC CHARACTERISTICS: T<sub>A</sub> = 25°C

Symbol	Parameter		Limits			Test Conditions		Units
			Min.	Typ.	Max.			
f <sub>MAX</sub>	Maximum Input Count Frequency		25	35		Fig. 1	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 15pF R <sub>L</sub> = 2 kΩ	MHz
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, $\overline{CP}$ to Q <sub>0</sub>			12 13	20 20	Fig. 1		ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, $\overline{CP}$ to Q <sub>1</sub> or Q <sub>3</sub>			24 26	39 39	Fig. 3		ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, $\overline{CP}$ to Q <sub>2</sub>			32 36	54 54	Fig. 2		ns
t <sub>PHL</sub>	Propagation Delay, MR to Output			24	39	Fig. 2		ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, Q <sub>0</sub> , Q <sub>3</sub> MS to Output Q <sub>1</sub> , Q <sub>2</sub>			24 20	39 36	Fig. 2		ns

#### Notes:

- 1) For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating conditions for the device type.
- 2) Not more than one output should be shorted at a time.
- 3) Typical values are at V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C



**AC SET-UP REQUIREMENTS:**  $T_A = 25^\circ\text{C}$

Symbol	Parameter	Limits			Test Conditions	Units
		Min.	Typ.	Max.		
$t_w$	$\overline{\text{CP}}$ , MR or MS Pulse Width	20	14		Fig. 1	$V_{CC} = 5.0\text{V}$
$t_{\text{rec}}$	MR or MS to $\overline{\text{CP}}$	15	12		Fig. 1	
$t_s$	Set-up time	25	11		Fig. 1	

RECOVERY TIME ( $t_{\text{rec}}$ ) - is defined as the minimum time required between the end of the MS or MR pulse and the clock transition from HIGH to LOW in order to recognize and transfer HIGH Data to the Q outputs.

**AC WAVEFORMS**

