

## DM74LS197 Presettable Binary Counters

### General Description

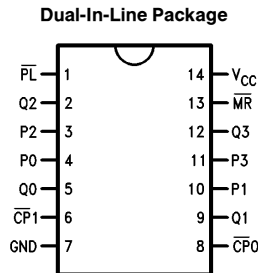
The 'LS197 ripple counter contains divide-by-two and divide-by-eight sections which can be combined to form a modulo-16 binary counter. State changes are initiated by the falling edge of the clock. The 'LS197 has a Master Reset ( $\overline{MR}$ ) input which overrides all other inputs and asynchronously forces all outputs LOW. A Parallel Load input ( $\overline{PL}$ ) overrides clocked operations and asynchronously loads the data on the Parallel Data inputs ( $P_n$ ) into the flip-flops. This preset feature makes the circuit usable as a programmable counter. The circuit can also be used as a 4-bit

latch, loading data from the Parallel Data inputs when  $\overline{PL}$  is LOW and storing the data when  $\overline{PL}$  is HIGH. For detail specifications and functional description, please refer to the 'LS196 data sheet.

### Features

- High counting rates—Typically 70 MHz
- Asynchronous preset
- Asynchronous master reset

### Connection Diagram




TL/F/10180-1

Order Number DM74LS197M or DM74LS197N  
See NS Package Number M14A or N14A

Pin Names	Description
$\overline{CP0}$	$\div 2$ Section Clock Input (Active Falling Edge)
$\overline{CP1}$	$\div 8$ Section Clock Input (Active Falling Edge)
$\overline{MR}$	Asynchronous Master Reset Input (Active LOW)
P0–P3	Parallel Data Inputs
$\overline{PL}$	Asynchronous Parallel Load Input (Active LOW)
Q0	$\div 2$ Section Output*
Q1–Q3	$\div 8$ Section Outputs

Mode Select Table

Inputs			Response
$\overline{MR}$	$\overline{PL}$	$\overline{CP}$	
L	X	X	Qn Forced LOW
H	L	X	$P_n \rightarrow Q_n$
H	H		Count Up

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

\*Q0 output is guaranteed to drive the full rated fan-out plus the  $\overline{CP1}$  input.

## 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	0°C to +70°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	DM74LS197			Units
		Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			V
V <sub>IL</sub>	Low Level Input Voltage			0.8	V
I <sub>OH</sub>	High Level Output Current			-0.4	mA
I <sub>OL</sub>	Low Level Output Current			8	mA
T <sub>A</sub>	Free Air Operating Temperature	0		70	°C

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

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = -18 mA			-1.5	V
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max, V <sub>IL</sub> = Max	2.7	3.4		V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IH</sub> = Min		0.35	0.5	V
		I <sub>OL</sub> = 4 mA, V <sub>CC</sub> = Min		0.25	0.4	
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 7V			0.1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			-0.4	mA
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	-20		-100	mA
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max			27	mA

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

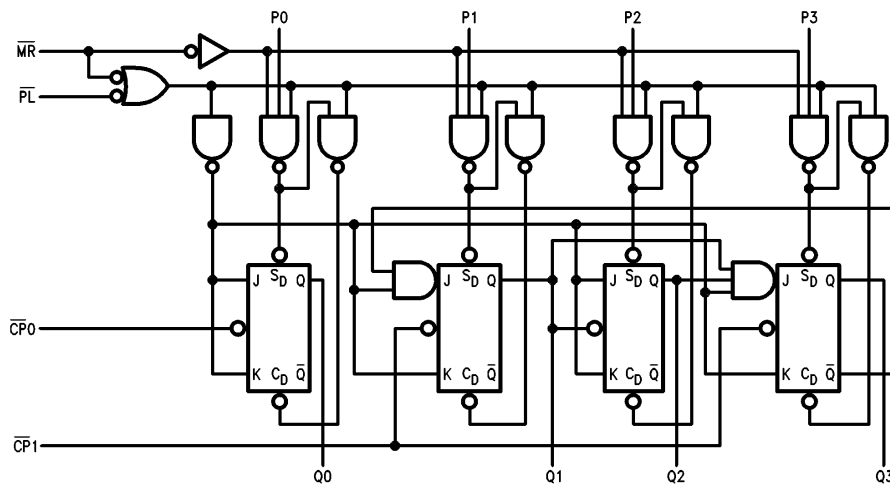
Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

## Switching Characteristics

$V_{CC} = +5.0V, T_A = +25^\circ C$

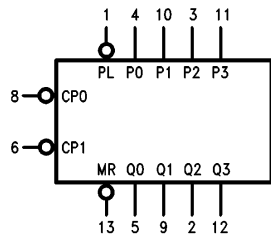
Symbol	Parameter	$R_L = 2\text{ k}\Omega$ $C_L = 15\text{ pF}$		Units
		Min	Max	
$f_{MAX}$	Max CLK Frequency	55		MHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\overline{CP0}$ to Q0		15 15	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\overline{CP1}$ to Q2		34 34	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay P2 to Q2		27 44	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\overline{PL}$ to Q2		39 45	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\overline{CP1}$ to Q1		15 17	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\overline{CP1}$ to Q3		55 63	ns
$t_{PHL}$	Propagation Delay $\overline{MR}$ to Q3		42	ns

## Logic Diagram



TL/F/10180-4

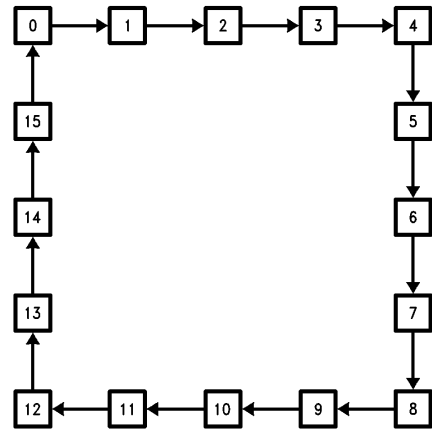
### Logic Symbol



V<sub>CC</sub> = Pin 14  
GND = Pin 7

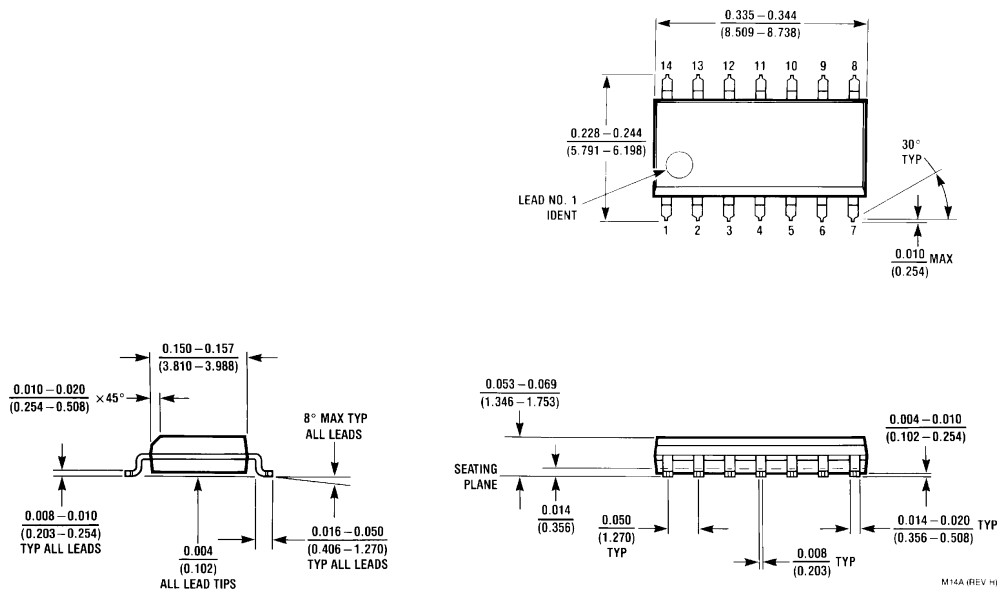
TL/F/10180-2

### ÷ 16 State Diagram



TL/F/10180-3

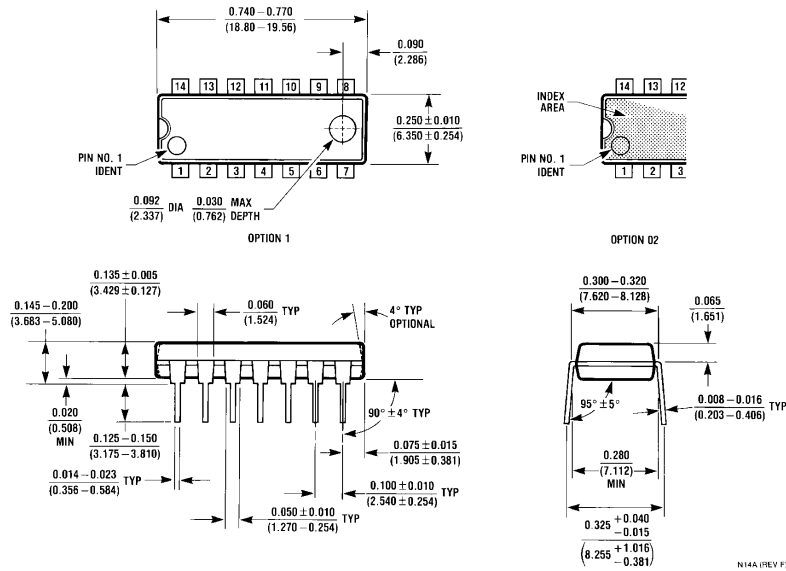
**Physical Dimensions** inches (millimeters)



**14-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS197M**  
**NS Package Number M14A**

M14A (REV HI)

**Physical Dimensions** inches (millimeters) (Continued)



**14-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS197N**  
**NS Package Number N14A**

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