



**MOTOROLA**

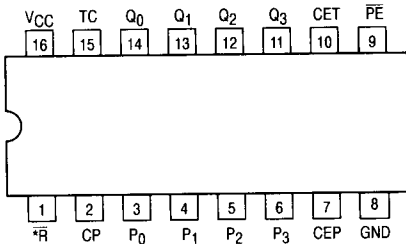
**MC74AC160  
MC74ACT160  
MC74AC162  
MC74ACT162**

**SYNCHRONOUS  
PRESETTABLE  
BCD DECADE COUNTER**

## Synchronous Presettable BCD Decade Counter

The MC74AC160/74ACT160 and MC74AC162/74ACT162 are high-speed synchronous decade counters operating in the BCD (8421) sequence. They are synchronously presettable for application in programmable dividers and have two types of Count Enable inputs plus a Terminal Count output for versatility in forming synchronous multistage counters. The MC74AC160/74ACT160 has an asynchronous Master Reset input that overrides all other inputs and forces the outputs LOW. The MC74AC162/74ACT162 has a Synchronous Reset input that overrides counting and parallel loading and allows all outputs to be simultaneously reset on the rising edge of the clock.

- Synchronous Counting and Loading
- High-Speed Synchronous Expansion
- Typical Count Rate of 120 MHz
- Outputs Source/Sink 24 mA
- 'ACT160 and 'ACT162 Have TTL Compatible Inputs



### PIN NAMES

CEP	Count Enable Parallel Input
CET	Count Enable Trickle Input
CP	Clock Pulse Input
MR	('160) Asynchronous Master Reset Input
SR	('162) Synchronous Reset Input
P <sub>0</sub> -P <sub>3</sub>	Parallel Data Inputs
PE	Parallel Enable Input
Q <sub>0</sub> -Q <sub>3</sub>	Flip-Flop Outputs
TC	Terminal Count Output

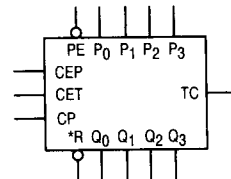


**N SUFFIX  
CASE 648-08  
PLASTIC**



**D SUFFIX  
CASE 751B-05  
PLASTIC**

### LOGIC SYMBOL



\*MR for '160  
\*SR for '162

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## FUNCTIONAL DESCRIPTION

The MC74AC160/74ACT160 and MC74AC162/74ACT162 count modulo-10 in the BCD (8421) sequence. From state 9 (HLLH) they increment to state 0 (LLLL). The clock inputs of all flip-flops are driven in parallel through a clock buffer. Thus all changes of the Q outputs (except due to Master Reset of the '160) occur as a result of, and synchronous with, the LOW-to-HIGH transition of the CP input signal. The circuits have four fundamental modes of operation, in order of precedence: asynchronous reset ('160), synchronous reset ('162), parallel load, count-up and hold. Five control inputs — Master Reset ( $\overline{MR}$ , '160), Synchronous Reset ( $\overline{SR}$ , '162), Parallel Enable ( $\overline{PE}$ ), Count Enable Parallel (CEP) and Count Enable Trickle (CET) — determine the mode of operation, as shown in the Mode Select Table. A LOW signal on  $\overline{MR}$  overrides all other inputs and asynchronously forces all outputs LOW. A LOW signal on  $\overline{SR}$  overrides counting and parallel loading and allows all outputs to go LOW on the next rising edge of CP. A LOW signal on  $\overline{PE}$  overrides counting and allows information on the Parallel Data ( $P_n$ ) inputs to be loaded into the flip-flops on the next rising edge of CP. With  $\overline{PE}$  and  $\overline{MR}$  ('160) or  $\overline{SR}$  ('162) HIGH, CEP and CET permit counting when both are HIGH. Conversely, a LOW signal on either CEP or CET inhibits counting.

The MC74AC160/74ACT160 and MC74AC162/74ACT162 use D-type edge-triggered flip-flops and changing the  $\overline{SR}$ ,  $\overline{PE}$ , CEP and CET inputs when the CP is in either state does not cause errors, provided that the recommended setup and hold times, with respect to the rising edge of CP, are observed.

The Terminal Count (TC) output is HIGH when CET is HIGH and counter is in state 9. To implement synchronous multistage counters, the TC outputs can be used with the CEP and CET inputs in two different ways. Please refer to the MC74AC568 data sheet. The TC output is subject to decoding spikes due to internal race conditions and is therefore not recommended for use as a clock or asynchronous reset for flip-flops, counters or registers. In the MC74AC160/74ACT160 and MC74AC162/74ACT162 decade counters, the TC output is fully decoded and can only be HIGH in state 9. If a decade counter is preset to an illegal state, or assumes an illegal state when power is applied, it will return to the normal sequence within two counts, as shown in the State Diagram.

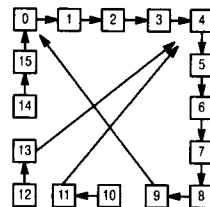
Logic Equations: Count Enable = CEP • CET •  $\overline{PE}$   
 $TC = Q_0 \cdot \overline{Q_1} \cdot \overline{Q_2} \cdot Q_3 \cdot CET$

MODE SELECT TABLE

$\overline{SR}$	$\overline{PE}$	CET	CEP	Action on the Rising Clock Edge ( $\uparrow$ )
L	X	X	X	Reset (Clear)
H	L	X	X	Load ( $P_n \rightarrow Q_n$ )
H	H	H	H	Count (Increment)
H	H	L	X	No Change (Hold)
H	H	X	L	No Change (Hold)

\*For '162 only  
 H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial

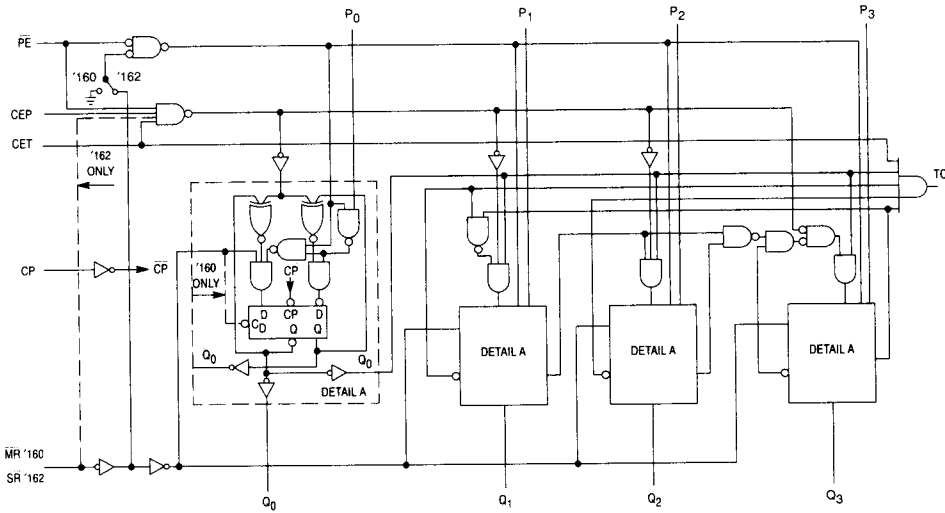
STATE DIAGRAM



5

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## LOGIC DIAGRAM



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

### MAXIMUM RATINGS\*

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
$V_{in}$	DC Input Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
$V_{out}$	DC Output Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
$I_{in}$	DC Input Current, per Pin	$\pm 20$	mA
$I_{out}$	DC Output Sink/Source Current, per Pin	$\pm 50$	mA
$I_{CC}$	DC $V_{CC}$ or GND Current per Output Pin	$\pm 50$	mA
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}C$

\* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
V <sub>CC</sub>	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Ref. to GND)	0		V <sub>CC</sub>	V	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V <sub>CC</sub> @ 3.0 V		150		ns/V
		V <sub>CC</sub> @ 4.5 V		40		
		V <sub>CC</sub> @ 5.5 V		25		
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V <sub>CC</sub> @ 4.5 V		10		ns/V
		V <sub>CC</sub> @ 5.5 V		8.0		
T <sub>J</sub>	Junction Temperature (PDIP)			140	°C	
T <sub>A</sub>	Operating Ambient Temperature Range	-40	25	85	°C	
I <sub>OH</sub>	Output Current — High			-24	mA	
I <sub>OL</sub>	Output Current — Low			24	mA	

1. V<sub>in</sub> from 30% to 70% V<sub>CC</sub>; see individual Data Sheets for devices that differ from the typical input rise and fall times.

2. V<sub>in</sub> from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74AC		74AC		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	3.15	3.15			
		5.5	2.75	3.85	3.85			
V <sub>IL</sub>	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9		V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	1.35	1.35			
		5.5	2.75	1.65	1.65			
V <sub>OH</sub>	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9		V	I <sub>OUT</sub> = -50 μA
		4.5	4.49	4.4	4.4			
		5.5	5.49	5.4	5.4			
		3.0		2.56	2.46		V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -12 mA I <sub>OH</sub> -24 mA -24 mA
		4.5		3.86	3.76			
		5.5		4.86	4.76			
V <sub>OL</sub>	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1		V	I <sub>OUT</sub> = 50 μA
		4.5	0.001	0.1	0.1			
		5.5	0.001	0.1	0.1			
		3.0		0.36	0.44		V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 12 mA I <sub>OL</sub> 24 mA 24 mA
		4.5		0.36	0.44			
		5.5		0.36	0.44			
I <sub>IN</sub>	Maximum Input Leakage Current	5.5		±0.1	±1.0		μA	V <sub>I</sub> = V <sub>CC</sub> , GND
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5			75		mA	V <sub>OLD</sub> = 1.65 V Max
I <sub>OHD</sub>		5.5			-75		mA	V <sub>OHD</sub> = 3.85 V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5		8.0	80		μA	V <sub>IN</sub> = V <sub>CC</sub> or GND

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

Note: I<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V<sub>CC</sub>

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## MC74AC160

AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC160		74ACT160		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Min	Max	Min	Max		
f <sub>max</sub>	Maximum Count Frequency	3.3	65	—	60	—	MHz	3-3
		5.0	110	—	95	—		
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> (P <sub>E</sub> Input HIGH)	3.3	2.0	12.0	1.5	14.0	ns	3-6
		5.0	1.5	9.0	1.0	10.5		
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> (P <sub>E</sub> Input HIGH)	3.3	2.0	12.0	1.5	14.0	ns	3-6
		5.0	1.5	9.0	1.5	10.5		
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> (P <sub>E</sub> Input LOW)	3.3	2.0	12.0	1.5	14.0	ns	3-6
		5.0	1.5	9.0	1.0	10.5		
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> (P <sub>E</sub> Input LOW)	3.3	2.0	12.0	1.5	14.0	ns	3-6
		5.0	1.5	9.0	1.5	10.5		
t <sub>PLH</sub>	Propagation Delay CP to TC	3.3	3.0	15.0	2.5	17.5	ns	3-6
		5.0	2.0	11.0	1.5	12.5		
t <sub>PHL</sub>	Propagation Delay CP to TC	3.3	3.5	14.5	2.5	16.5	ns	3-6
		5.0	2.0	11.0	2.0	12.5		
t <sub>PLH</sub>	Propagation Delay CET to TC	3.3	2.0	10.5	1.5	12.5	ns	3-6
		5.0	1.5	7.5	1.0	9.0		
t <sub>PHL</sub>	Propagation Delay CET to TC	3.3	2.5	11.5	2.0	13.5	ns	3-6
		5.0	2.0	9.0	1.5	10.5		
t <sub>PHL</sub>	Propagation Delay MR to Q <sub>n</sub> (AC160)	3.3	2.0	12.0	1.5	13.5	ns	3-6
		5.0	1.5	9.5	1.0	10.0		
t <sub>PHL</sub>	Propagation Delay MR to TC	3.3	3.5	15.0	3.0	17.0	ns	3-6
		5.0	2.5	12.0	2.0	13.5		

\* Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## MC74AC162

**AC CHARACTERISTICS** (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC162			74AC162		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Min	Typ	Max	Min	Max		
f <sub>max</sub>	Maximum Count Frequency	3.3 5.0	80 125			60 100		MHz	3-3
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input HIGH)	3.3 5.0	2.0 2.0		12.0 9.0	1.5 1.5	13.5 10.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input HIGH)	3.3 5.0	2.0 2.0		12.0 9.0	1.5 1.5	13.5 10.5	ns	3-6
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input LOW)	3.3 5.0	2.0 2.0		12.0 9.0	1.5 1.5	13.5 10.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input LOW)	3.3 5.0	2.0 2.0		12.0 9.0	1.5 1.5	13.5 10.5	ns	3-6
t <sub>PLH</sub>	Propagation Delay CP to TC	3.3 5.0	2.0 2.0		15.0 11.0	1.5 1.5	17.0 13.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to TC	3.3 5.0	2.0 2.0		14.0 11.0	1.5 1.5	16.0 13.0	ns	3-6
t <sub>PLH</sub>	Propagation Delay CET to TC	3.3 5.0	2.0 2.0		10.0 7.0	1.5 1.5	11.5 8.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CET to TC	3.3 5.0	2.0 2.0		11.0 8.0	1.5 1.5	12.5 9.5	ns	3-6

\*Voltage Range 3.3 V is 3.0 V ± 0.3 V.  
Voltage Range 5.0 V is 5.0 V ± 0.5 V.

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## MC74AC160

### AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC160	74AC160	Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF	T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		
			Guaranteed Maximum			
t <sub>s</sub>	Setup Time, HIGH or LOW P <sub>n</sub> to CP	3.3	13.5	16.0	ns	3-9
		5.0	8.5	10.5		
t <sub>h</sub>	Hold Time, HIGH or LOW P <sub>n</sub> to CP	3.3	-1.0	-0.5	ns	3-9
		5.0	0	0		
t <sub>s</sub>	Setup Time, HIGH or LOW P <sub>E</sub> or S <sub>R</sub> to CP	3.3	11.5	14.0	ns	3-9
		5.0	7.5	8.5		
t <sub>h</sub>	Hold Time, HIGH or LOW P <sub>E</sub> or S <sub>R</sub> to CP	3.3	0	0	ns	3-9
		5.0	0.5	1.0		
t <sub>s</sub>	Setup Time, HIGH or LOW CEP or CET to CP	3.3	6.0	7.0	ns	3-9
		5.0	4.5	5.0		
t <sub>h</sub>	Hold Time, HIGH or LOW CEP or CET to CP	3.3	0	0	ns	3-9
		5.0	0	0.5		
t <sub>w</sub>	Clock Pulse Width (Load) HIGH or LOW	3.3	4.0	5.0	ns	3-6
		5.0	3.0	3.5		
t <sub>w</sub>	Clock Pulse Width (Count) HIGH or LOW	3.3	7.0	7.5	ns	3-6
		5.0	4.5	5.5		
t <sub>w</sub>	MR Pulse Width, LOW (*AC160)	3.3	5.5	7.5	ns	3-6
		5.0	4.5	6.0		
t <sub>rec</sub>	Recovery Time MR to CP (*AC160)	3.3	-0.5	0	ns	3-9
		5.0	0	0.5		

\* Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## MC74AC162

### AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC162		74ACT162		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Typ	Guaranteed Minimum	Typ	Guaranteed Minimum		
t <sub>s</sub>	Setup Time, HIGH or LOW P <sub>n</sub> to CP	3.3		8.0	9.0	ns	3-9	
		5.0		5.0	6.0			
t <sub>h</sub>	Hold Time, HIGH or LOW P <sub>n</sub> to CP	3.3		0.5	1.0	ns	3-9	
		5.0		0.5	1.0			
t <sub>s</sub>	Setup Time, HIGH or LOW $\overline{PE}$ to CP	3.3		10.0	11.0	ns	3-9	
		3.3		6.0	7.0			
t <sub>h</sub>	Hold Time, HIGH or LOW $\overline{PE}$ to CP	3.3		0.5	1.0	ns	3-9	
		5.0		0.5	1.0			
t <sub>s</sub>	Setup Time, HIGH or LOW CEP or CET to CP	3.3		6.0	7.0	ns	3-9	
		5.0		4.0	5.0			
t <sub>h</sub>	Hold Time, HIGH or LOW CEP or CET to CP	3.3		0.5	1.0	ns	3-9	
		5.0		0.5	1.0			
t <sub>s</sub>	Setup Time, HIGH or LOW $\overline{SR}$ to CP	3.3		8.0	9.0	ns	3-9	
		5.0		6.0	7.0			
t <sub>h</sub>	Hold Time, HIGH or LOW $\overline{SR}$ to CP	3.3		0.5	1.0	ns	3-9	
		5.0		0.5	1.0			
t <sub>w</sub>	Clock Pulse Width (Load) HIGH or LOW	3.3		5.5	6.0	ns	3-6	
		5.0		4.5	5.0			
t <sub>w</sub>	Clock Pulse Width (Count) HIGH or LOW	3.3		5.0	5.5	ns	3-6	
		5.0		4.0	4.5			

\*Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.



# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74ACT		74ACT		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	2.0	2.0			
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	0.8	0.8			
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I <sub>OUT</sub> = -50 μA	
		5.5	5.49	5.4	5.4			
		4.5		3.86	3.76	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> -24 mA	
		5.5		4.86	4.76			-24 mA
V <sub>OL</sub>	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I <sub>OUT</sub> = 50 μA	
		5.5	0.001	0.1	0.1			
		4.5		0.36	0.44	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 24 mA	
		5.5		0.36	0.44			24 mA
I <sub>IN</sub>	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND	
ΔI <sub>CCCT</sub>	Additional Max. I <sub>CC</sub> /Input	5.5	0.6		1.5	mA	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V	
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5			75	mA	V <sub>OLD</sub> = 1.65 V Max	
I <sub>OHD</sub>		5.5			-75	mA	V <sub>OHD</sub> = 3.85 V Min	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND	

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## MC74ACT160

**AC CHARACTERISTICS** (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT160			74ACT160		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Min	Typ	Max	Min	Max		
f <sub>max</sub>	Maximum Count Frequency	5.0	120			100		MHz	3-3
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input HIGH)	5.0	2.0	6.0	10.0	2.0	11.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input HIGH)	5.0	2.0	6.0	10.0	2.0	11.0	ns	3-6
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input LOW)	5.0	2.0	6.0	10.0	2.0	11.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input LOW)	5.0	2.0	6.0	10.0	2.0	11.0	ns	3-6
t <sub>PLH</sub>	Propagation Delay CP to TC	5.0	2.0	8.0	12.0	2.0	14.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to TC	5.0	2.0	8.0	12.0	2.0	14.0	ns	3-6
t <sub>PLH</sub>	Propagation Delay CET to TC	5.0	2.0	6.0	8.5	2.0	9.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CET to TC	5.0	2.0	7.0	9.5	2.0	11.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay $\overline{MR}$ to Q <sub>n</sub> (AC160)	5.0	1.5	6.0	9.5	1.5	11.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay $\overline{MR}$ to TC	5.0	2.5	—	13.0	2.5	14.0	ns	3-6

\* Voltage Range 5.0 V is 5.0 V ±0.5 V.

## MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

### MC74ACT162

AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT162			74ACT162		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Min	Typ	Max	Min	Max		
f <sub>max</sub>	Maximum Count Frequency	5.0	120			100		MHz	3-3
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input HIGH)	5.0	2.0	6.0	10.0	2.0	11.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input HIGH)	5.0	2.0	6.0	10.0	2.0	11.0	ns	3-6
t <sub>PLH</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input LOW)	5.0	2.0	6.0	10.0	2.0	11.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub> ( $\overline{PE}$ Input LOW)	5.0	2.0	6.0	10.0	2.0	11.0	ns	3-6
t <sub>PLH</sub>	Propagation Delay CP to TC	5.0	2.0	8.0	13.0	2.0	14.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CP to TC	5.0	2.0	8.0	13.0	2.0	14.5	ns	3-6
t <sub>PLH</sub>	Propagation Delay CET to TC	5.0	2.0	6.0	9.0	2.0	10.5	ns	3-6
t <sub>PHL</sub>	Propagation Delay CET to TC	5.0	2.0	6.0	9.0	2.0	10.5	ns	3-6

\* Voltage Range 5.0 V is 5.0 V ±0.5 V. 3

## MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

### MC74ACT160

#### AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT160		74ACT160		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Typ	Guaranteed Maximum				
t <sub>s</sub>	Setup Time, HIGH or LOW P <sub>n</sub> to CP	5.0	4.0	6.5	8.0	ns	3-9	
t <sub>h</sub>	Hold Time, HIGH or LOW P <sub>n</sub> to CP	5.0	-4.0	-0.5	0	ns	3-9	
t <sub>s</sub>	Setup Time, HIGH or LOW $\overline{PE}$ or $\overline{MR}$ to CP	5.0	4.0	8.5	10.5	ns	3-9	
t <sub>h</sub>	Hold Time, HIGH or LOW $\overline{PE}$ or $\overline{MR}$ to CP	5.0	-4.0	0	0	ns	3-9	
t <sub>s</sub>	Setup Time, HIGH or LOW CEP or CET to CP	5.0	3.0	6.0	7.0	ns	3-9	
t <sub>h</sub>	Hold Time, HIGH or LOW CEP or CET to CP	5.0	-3.0	0	0	ns	3-9	
t <sub>w</sub>	Clock Pulse Width (Load) HIGH or LOW	5.0	3.0	4.0	4.0	ns	3-6	
t <sub>w</sub>	Clock Pulse Width (Count) HIGH or LOW	5.0	3.0	4.0	4.0	ns	3-6	
t <sub>w</sub>	$\overline{MR}$ Pulse Width, LOW (ACT160)	5.0	2.0	4.0	6.0	ns	3-6	
t <sub>rec</sub>	Recovery Time $\overline{MR}$ to CP (ACT160)	5.0	-1.0	0	0	ns	3-9	

\* Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC160 • MC74ACT160 • MC74AC162 • MC74ACT162

## MC74ACT162

### AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT162		74ACT162		Unit	Fig. No.
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF			
			Typ	Guaranteed Maximum				
t <sub>s</sub>	Setup Time, HIGH or LOW P <sub>n</sub> to CP	5.0	4.0	7.0	10.0		ns	3-9
t <sub>h</sub>	Hold Time, HIGH or LOW P <sub>n</sub> to CP	5.0	-3.0	-1.0	0		ns	3-9
t <sub>s</sub>	Setup Time, HIGH or LOW P <sub>E</sub> to CP	5.0	4.0	7.0	10.0		ns	3-9
t <sub>h</sub>	Hold Time, HIGH or LOW P <sub>E</sub> to CP	5.0	-3.0	-1.0	0		ns	3-9
t <sub>s</sub>	Setup Time, HIGH or LOW S <sub>R</sub> to CP	5.0	5.0	10	11.5		ns	3-9
t <sub>h</sub>	Hold Time, HIGH or LOW S <sub>R</sub> to CP	5.0	-5.0	0	0		ns	3-9
t <sub>s</sub>	Setup Time, HIGH or LOW CET to CP	5.0	3.0	6.0	7.0		ns	3-9
t <sub>h</sub>	Hold Time, HIGH or LOW CET to CP	5.0	-3.0	0	0		ns	3-9
t <sub>w</sub>	Clock Pulse Width (Load) HIGH or LOW	5.0	2.0	4.5	5.0		ns	3-6
t <sub>w</sub>	Clock Pulse Width (Count) HIGH or LOW	5.0	2.0	4.0	4.5		ns	3-6

\* Voltage Range 5.0 V is 5.0 V ±0.5 V.

### CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = 5.0 V
CPD	Power Dissipation Capacitance	45	pF	V <sub>CC</sub> = 5.0 V