

# MC10H016

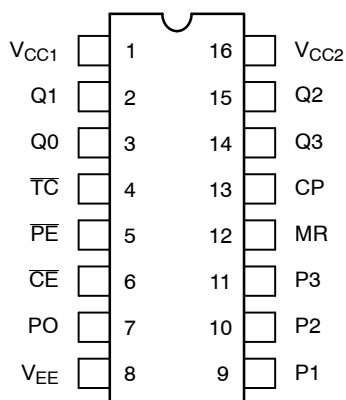
## 4-Bit Binary Counter

### Description

The MC10H016 is a high-speed synchronous, pre-settable, cascadable 4-bit binary counter. It is useful for a large number of conversion, counting and digital integration applications.

### Features

- Counting Frequency, 200 MHz Minimum
- Improved Noise Margin 150 mV (Over Operating Voltage and Temperature Range)
- Voltage Compensated
- MECL 10K™ – Compatible
- Positive Edge Triggered
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant



Pin assignment is for Dual-in-Line Package

**Figure 1. Pin Assignment**

**Table 1. TRUTH TABLE**

CE	PE	MR	CP	Function
L	L	L	Z	Load Parallel (P <sub>n</sub> to Q <sub>n</sub> )
H	L	L	Z	Load Parallel (P <sub>n</sub> to Q <sub>n</sub> )
L	H	L	Z	Count
H	H	L	Z	Hold
X	X	L	ZZ	Masters Respond; Slaves Hold
X	X	H	X	Reset (Q <sub>n</sub> = LOW, T <sub>C</sub> = HIGH)

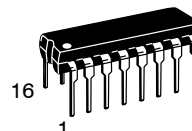
Z = Clock Pulse (Low to High); ZZ = Clock Pulse (High to Low)

Features include assertion inputs and outputs on each of the four master/slave counting flip-flops. Terminal count is generated internally in a manner that allows synchronous loading at nearly the speed of the basic counter.

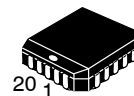


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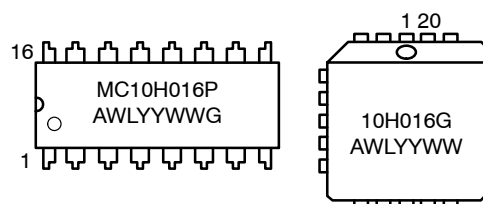


**PDIP-16  
P SUFFIX  
CASE 648-08**



**PLLC-20  
FN SUFFIX  
CASE 775-02**

### MARKING DIAGRAMS\*



- A = Assembly Location
- WL, L = Wafer Lot
- YY, Y = Year
- WW, W = Work Week
- G = Pb-Free Package

\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

Device	Package	Shipping†
MC10H016FNR2G	PLCC-20 (Pb-Free)	500/Tape & Reel
MC10H016PG	PDIP-16 (Pb-Free)	25 Units/Tube

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

# MC10H016

**Table 2. MAXIMUM RATINGS**

Symbol	Characteristic	Rating	Unit
$V_{EE}$	Power Supply ( $V_{CC} = 0$ )	-8.0 to 0	Vdc
$V_I$	Input Voltage ( $V_{CC} = 0$ )	0 to $V_{EE}$	Vdc
$I_{out}$	Output Current Continuous Surge	50 100	mA
$T_A$	Operating Temperature Range	0 to +75	°C
$T_{stg}$	Storage Temperature Range Plastic Ceramic	-55 to +150 -55 to +165	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**Table 3. ELECTRICAL CHARACTERISTICS** ( $V_{EE} = -5.2\text{ V} \pm 5\%$ ) (Note 1)

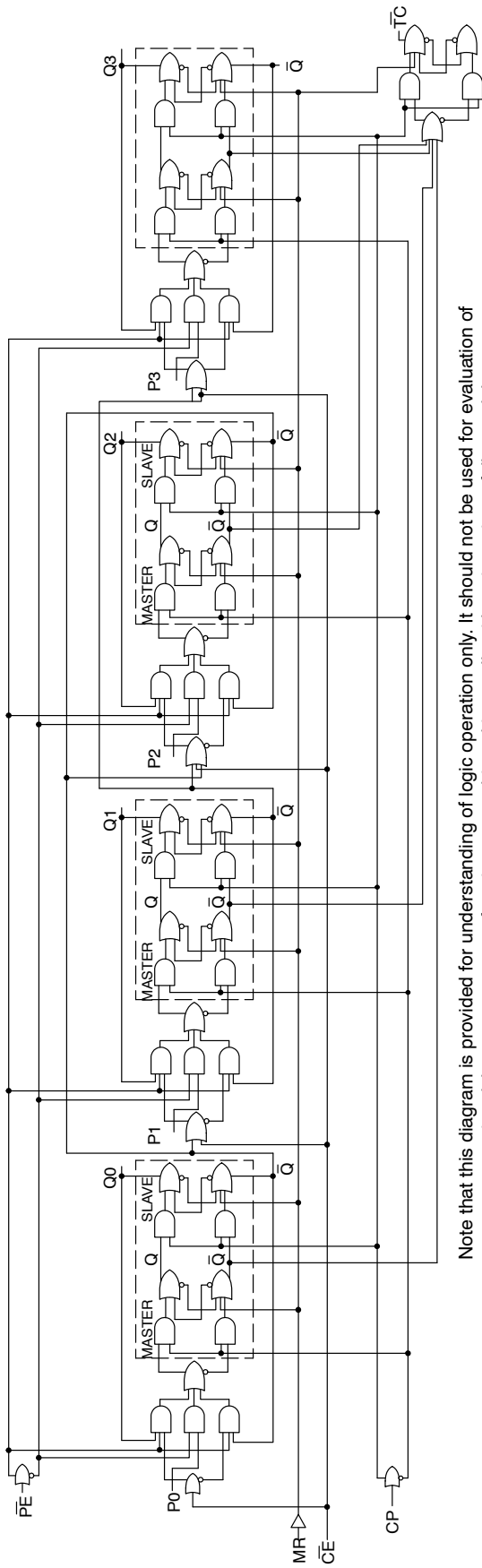
Symbol	Characteristic	0°		25°		75°		Unit
		Min	Max	Min	Max	Min	Max	
$I_E$	Power Supply Current	-	126	-	115	-	126	mA
$I_{inH}$	Input Current High All Except MR Pin 12 MR	-	450 1190	-	265 700	-	265 700	$\mu\text{A}$
$I_{inL}$	Input Current Low	0.5	-	0.5	-	0.3	-	$\mu\text{A}$
$V_{OH}$	High Output Voltage	-1.02	-0.84	-0.98	-0.81	-0.92	-0.735	Vdc
$V_{OL}$	Low Output Voltage	-1.95	-1.63	-1.95	-1.63	-1.95	-1.60	Vdc
$V_{IH}$	High Input Voltage	-1.17	-0.84	-1.13	-0.81	-1.07	-0.735	Vdc
$V_{IL}$	Low Input Voltage	-1.95	-1.48	-1.95	-1.48	-1.95	-1.45	Vdc

- Each MECL 10H™ series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained. Outputs are terminated through a 50  $\Omega$  resistor to -2.0 V.

**Table 4. AC CHARACTERISTICS**

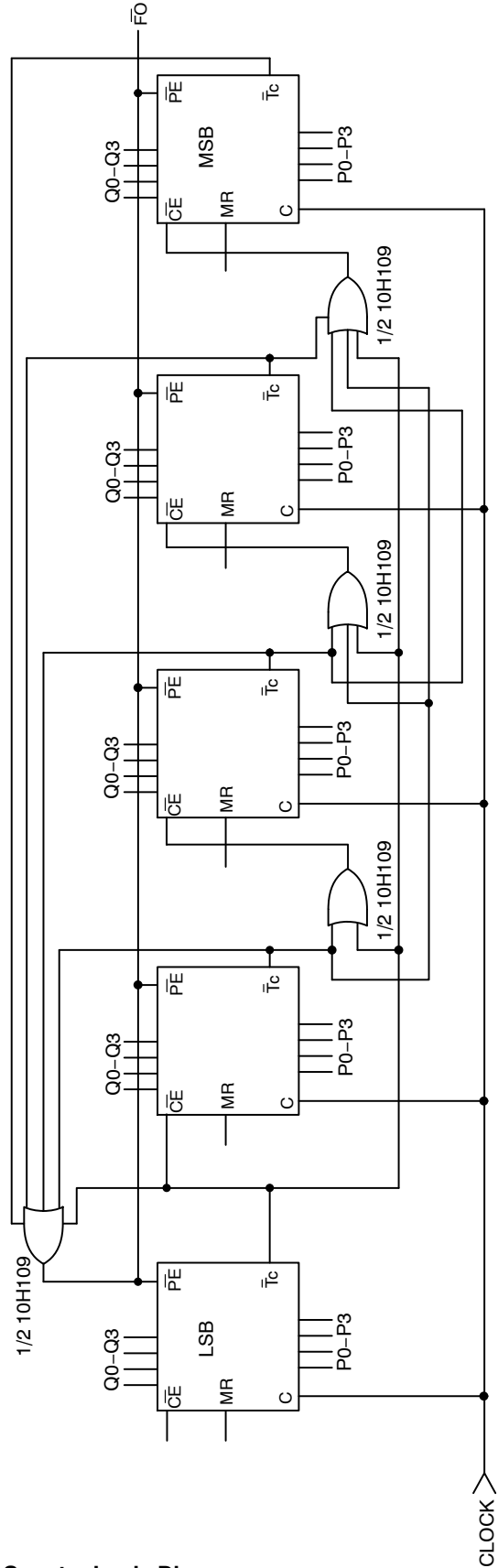
Symbol	Characteristic	0°		25°		75°		Unit
		Min	Max	Min	Max	Min	Max	
$t_{pd}$	Propagation Delay Clock to Q Clock to $\overline{TC}$ MR to Q	1.0 0.7 0.7	2.4 2.4 2.4	1.0 0.7 0.7	2.5 2.5 2.5	1.0 0.7 0.7	2.7 2.6 2.6	ns
$t_{set}$	Set-up Time $P_n$ to Clock $\overline{CE}$ or PE to Clock	2.0 2.5	- -	2.0 2.5	- -	2.0 2.5	- -	ns
$t_{hold}$	Hold Time Clock to $P_n$ Clock to $\overline{CE}$ or PE	1.0 0.5	- -	1.0 0.5	- -	1.0 0.5	- -	ns
$f_{count}$	Counting Frequency	200	-	200	-	200	-	MHz
$t_r$	Rise Time	0.5	2.0	0.5	2.1	0.5	2.2	ns
$t_f$	Fall Time	0.5	2.0	0.5	2.1	0.5	2.2	ns

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.



Note that this diagram is provided for understanding of logic operation only. It should not be used for evaluation of propagation delays as many gate functions are achieved internally without incurring a full gate delay.

Figure 2. 4-Bit Binary Counter Logic Diagram

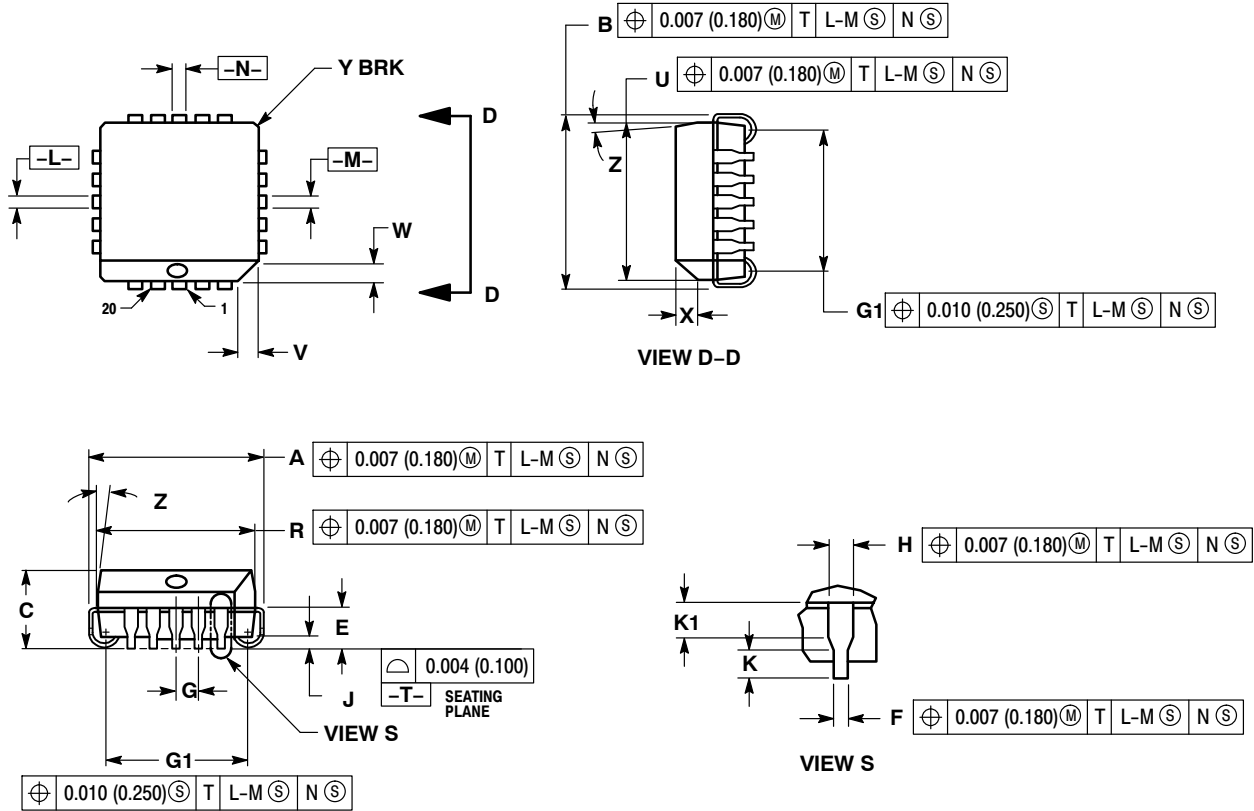


PN Counter 1 to 165  
**MC10H016 Cascaded for 5 Stage Presettable Counter**  
 Max freq. is only OR gate delay below max when counting alone.

# MC10H016

## PACKAGE DIMENSIONS

20 LEAD PLLC  
CASE 775-02  
ISSUE F



**NOTES:**

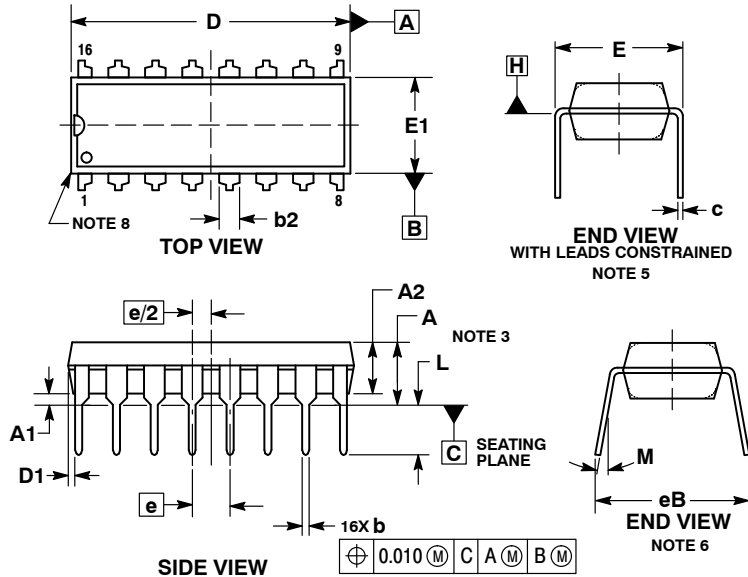
1. DIMENSIONS AND TOLERANCING PER ANSI Y14.5M, 1982.
2. DIMENSIONS IN INCHES.
3. DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
4. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
5. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
6. DIMENSIONS IN THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
7. DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.385	0.395	9.78	10.03
B	0.385	0.395	9.78	10.03
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.021	0.33	0.53
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	----	0.51	----
K	0.025	----	0.64	----
R	0.350	0.356	8.89	9.04
U	0.350	0.356	8.89	9.04
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	----	0.020	----	0.50
Z	2° 10°		2° 10°	
G1	0.310	0.330	7.88	8.38
K1	0.040	----	1.02	----

# MC10H016

## PACKAGE DIMENSIONS

### PDIP-16 CASE 648-08 ISSUE V



#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS-3.
4. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 0.10 INCH.
5. DIMENSION E IS MEASURED AT A POINT 0.015 BELOW DATUM PLANE H WITH THE LEADS CONSTRAINED PERPENDICULAR TO DATUM C.
6. DIMENSION eB IS MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
7. DATUM PLANE H IS COINCIDENT WITH THE BOTTOM OF THE LEADS, WHERE THE LEADS EXIT THE BODY.
8. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).

#### STYLE 1:

- PIN 1. CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE

#### STYLE 2:

- PIN 1. COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- GATE
- SOURCE
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