



ON Semiconductor

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## 4-Bit Arithmetic Logic Unit/ Function Generator

The MC10H181 is a high-speed arithmetic logic unit capable of performing 16 logic operations and 16 arithmetic operations on two four-bit words. Full internal carry is incorporated for ripple through operation.

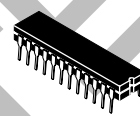
Arithmetic logic operations are selected by applying the appropriate binary word to the select inputs (S0 through S3) as indicated in the tables of arithmetic/logic functions. Group carry propagate ( $P_G$ ) and carry generate ( $G_G$ ) are provided to allow fast operations on very long words using a second order look-ahead. The internal carry is enabled by applying a low level voltage to the mode control input (M).

When used with the MC10H179, full-carry look-ahead, as a second order look-ahead block, the MC10H181 provides high-speed arithmetic operations on very long words.

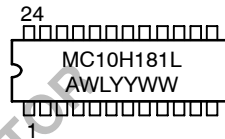
This 10H part is a functional/pinout duplication of the standard MECL 10K family part with 100% improvement in propagation delay and no increase in power supply current.

- Improved Noise Margin, 150 mV (Over Operating Voltage and Temperature Range)
- Voltage Compensated
- MECL 10K – Compatible

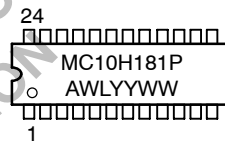
### MARKING DIAGRAMS



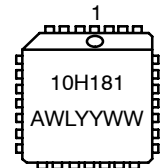
CDIP-24  
L SUFFIX  
CASE 758



PDIP-24  
P SUFFIX  
CASE 724



PLCC-28  
FN SUFFIX  
CASE 776



A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week

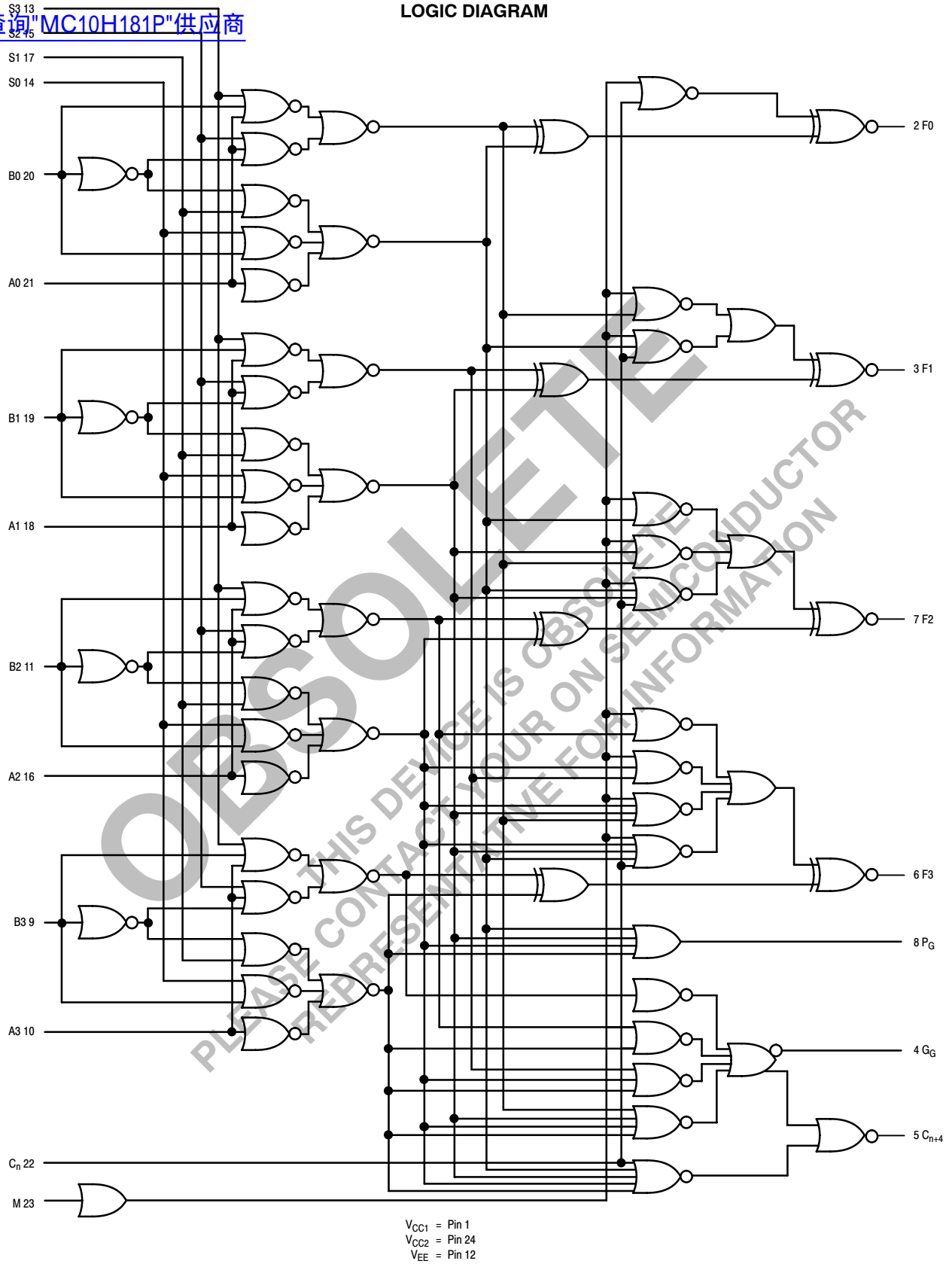
### ORDERING INFORMATION

Device	Package	Shipping
MC10H181L	CDIP-24	15 Units/Rail
MC10H181P	PDIP-24	15 Units/Rail
MC10H181FN	PLCC-28	37 Units/Rail

# MC10H181

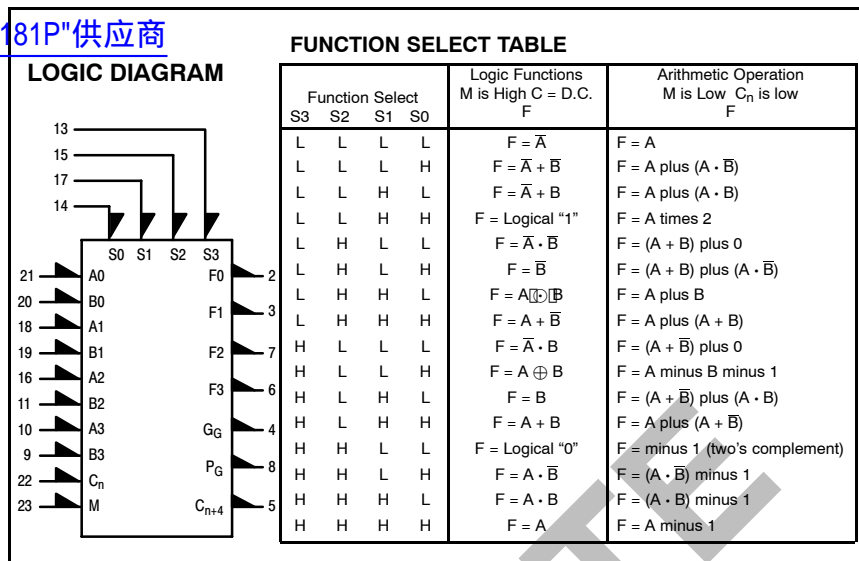
## LOGIC DIAGRAM

S3 13  
S2 15  
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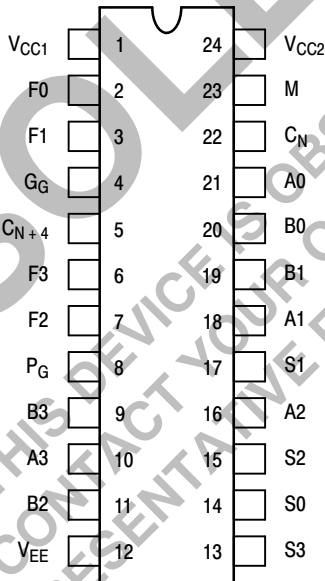


# MC10H181

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### DIP PIN ASSIGNMENT



Pin assignment is for Dual-in-Line Package.  
For PLCC pin assignment, see the Pin Conversion Tables on page 18  
of the ON Semiconductor MECL Data Book (DL122/D).

### 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 °C

# MC10H181

## ELECTRICAL CHARACTERISTICS (V<sub>EE</sub> = -5.2 V ±5.0%) (See Note 1.)

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Characteristic	Symbol	0°		+25°		+75°		Unit
		Min	Max	Min	Max	Min	Max	
Power Supply Current	I <sub>E</sub>	-	159	-	145	-	159	mA
Input Current High	I <sub>inH</sub>	-	720	-	450	-	450	μA
Pin 22		-	405	-	255	-	255	
Pins 14,23		-	515	-	320	-	320	
Pins 13,15,17		-	475	-	300	-	300	
Pins 10,16,18,21		-	465	-	275	-	275	
Pins 9,11,19,20		-		-		-		
Input Current Low	I <sub>inL</sub>	0.5	-	0.5	-	0.3	-	μA
Pins 9-11, 13-22								
High Output Voltage	V <sub>OH</sub>	-1.02	-0.84	-0.98	-0.81	-0.92	-0.735	Vdc
Low Output Voltage	V <sub>OL</sub>	-1.95	-1.63	-1.95	-1.63	-1.95	-1.60	Vdc
High Input Voltage	V <sub>IH</sub>	-1.17	-0.84	-1.13	-0.81	-1.07	-0.735	Vdc
Low Input Voltage	V <sub>IL</sub>	-1.95	-1.48	-1.95	-1.48	-1.95	-1.45	Vdc

1. 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-ohm resistor to -2.0 volts.

## AC PARAMETERS

Characteristic	Symbol	Input	Output	Conditions †	AC Switching Characteristics						Unit
					0°C		+25°C		+75°C		
					Min	Max	Min	Max	Min	Max	
Propagation Delay	t <sub>+</sub> +, t <sub>-</sub> -	C <sub>n</sub>	C <sub>n+4</sub>	A0,A1,A2,A3	0.7	2.0	0.7	2.0	0.7	2.2	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	C <sub>n</sub>	C <sub>n+4</sub>	A0,A1,A2,A3	0.6	2.0	0.6	2.0	0.7	2.2	ns
Propagation Delay	t <sub>+</sub> +, t <sub>+</sub> -, t <sub>-</sub> +, t <sub>-</sub> -	C <sub>n</sub>	F1	A0	1.0	3.0	1.0	3.0	1.2	3.3	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	C <sub>n</sub>	F1	A0	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t <sub>+</sub> +, t <sub>+</sub> -, t <sub>-</sub> +, t <sub>-</sub> -	A1	F1		1.5	3.7	1.5	3.7	1.6	4.0	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	A1	F1		0.7	2.0	0.7	2.0	0.7	2.2	ns
Propagation Delay	t <sub>+</sub> +, t <sub>-</sub> -	A1	P <sub>G</sub>	S0,S3	1.5	3.7	1.5	3.7	1.6	4.0	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	A1	P <sub>G</sub>	S0,S3	0.9	2.4	0.9	2.4	0.9	2.6	ns
Propagation Delay	t <sub>+</sub> +, t <sub>-</sub> -	A1	G <sub>G</sub>	A0,A2,A3,C <sub>n</sub>	1.5	3.7	1.5	3.7	1.6	3.9	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	A1	G <sub>G</sub>	A0,A2,A3,C <sub>n</sub>	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t <sub>+</sub> -, t <sub>-</sub> +	A1	C <sub>n+4</sub>	A0,A2,A3,C <sub>n</sub>	1.5	3.6	1.5	3.6	1.6	3.9	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	A1	C <sub>n+4</sub>	A0,A2,A3,C <sub>n</sub>	0.5	2.0	0.5	2.0	0.5	2.2	ns
Propagation Delay	t <sub>+</sub> +, t <sub>-</sub> +	B1	F1	S3,C <sub>n</sub>	2.0	4.5	2.0	4.5	2.1	4.8	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	B1	F	S3,C <sub>n</sub>	0.7	2.3	0.7	2.3	0.7	2.5	ns
Propagation Delay	t <sub>+</sub> +, t <sub>-</sub> -	B1	P <sub>G</sub>	S0,A1	1.5	3.8	1.5	3.8	1.6	4.0	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	B1	P <sub>G</sub>	S0,A1	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t <sub>+</sub> +, t <sub>-</sub> -	B1	G <sub>G</sub>	S3,C <sub>n</sub>	1.5	3.7	1.5	3.7	1.6	4.0	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	B1	G <sub>G</sub>	S3,C <sub>n</sub>	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t <sub>+</sub> -, t <sub>-</sub> +	B1	C <sub>n+4</sub>	S3,C <sub>n</sub>	2.0	4.0	2.0	4.0	2.1	4.3	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	B1	C <sub>n+4</sub>	S3,C <sub>n</sub>	0.5	2.0	0.5	2.2	0.5	2.2	ns
Propagation Delay	t <sub>+</sub> +, t <sub>+</sub> -	M	F1	-	1.5	4.2	1.5	4.2	1.6	4.5	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	M	F1	-	0.8	2.3	0.8	2.3	0.8	2.5	ns
Propagation Delay	t <sub>+</sub> -, t <sub>-</sub> +	S1	F1	A1,B1	1.5	4.5	1.5	4.5	1.6	4.8	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	S1	F1	A1,B1	0.7	2.0	0.7	2.0	0.7	2.2	ns
Propagation Delay	t <sub>-</sub> +, t <sub>+</sub> -	S1	P <sub>G</sub>	A3,B3	1.5	4.0	1.5	4.0	1.6	4.3	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	S1	P <sub>G</sub>	A3,B3	0.7	2.0	0.7	2.2	0.7	2.4	ns
Propagation Delay	t <sub>+</sub> -, t <sub>-</sub> +	S1	C <sub>n+4</sub>	A3,B3	1.5	4.1	1.5	4.1	1.6	4.4	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	S1	C <sub>n+4</sub>	A3,B3	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t <sub>+</sub> -, t <sub>-</sub> +	S1	G <sub>G</sub>	A3,B3	1.3	4.5	1.3	4.5	1.4	4.8	ns
Rise Time, Fall Time	t <sub>+</sub> , t <sub>-</sub>	S1	G <sub>G</sub>	A3,B3	0.5	3.2	0.5	3.2	0.5	3.4	ns

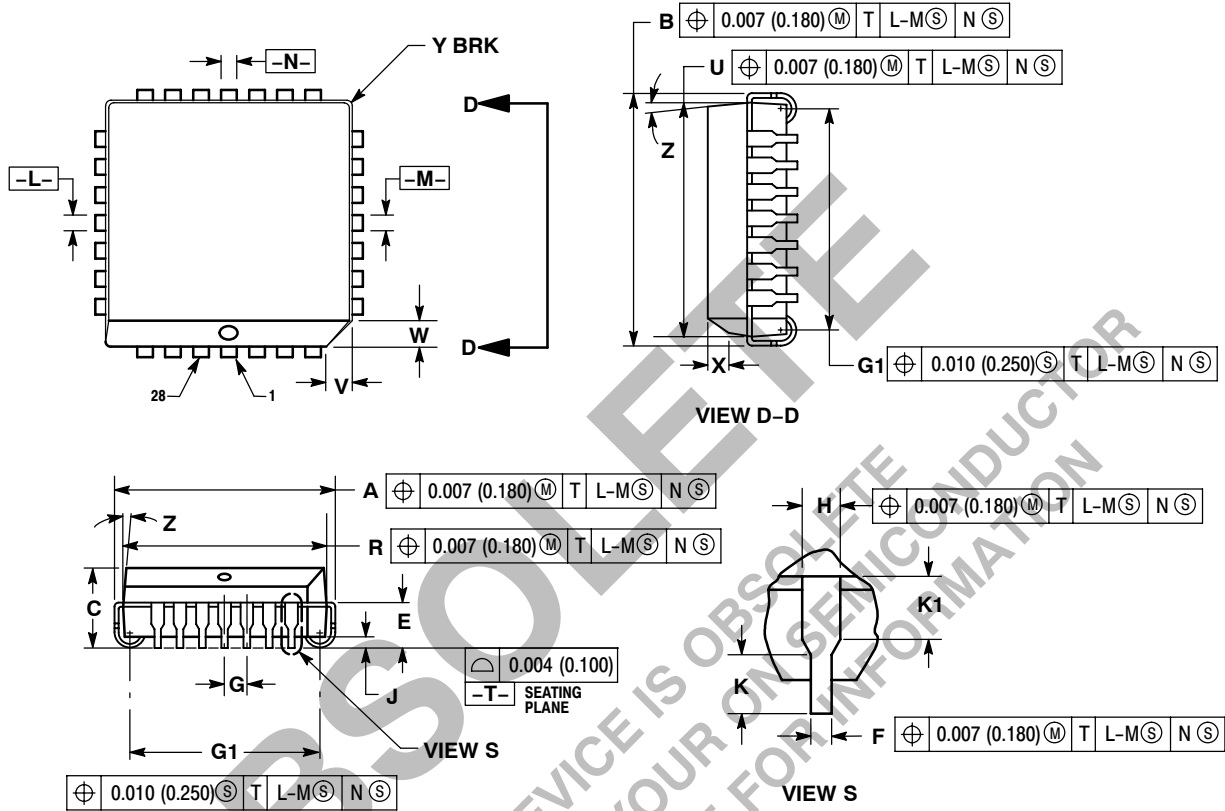
† Logic high level (+1.11 Vdc) applied to pins listed. All other input pins are left floating or tied to +0.31 Vdc. V<sub>CC1</sub> = V<sub>CC2</sub> = +2.0 Vdc, V<sub>EE</sub> = -3.2 Vdc

# MC10H181

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## PACKAGE DIMENSIONS

PLCC-28  
FN SUFFIX  
PLASTIC PLCC PACKAGE  
CASE 776-02  
ISSUE D



### NOTES:

- DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
- DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
- DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- 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.
- 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).

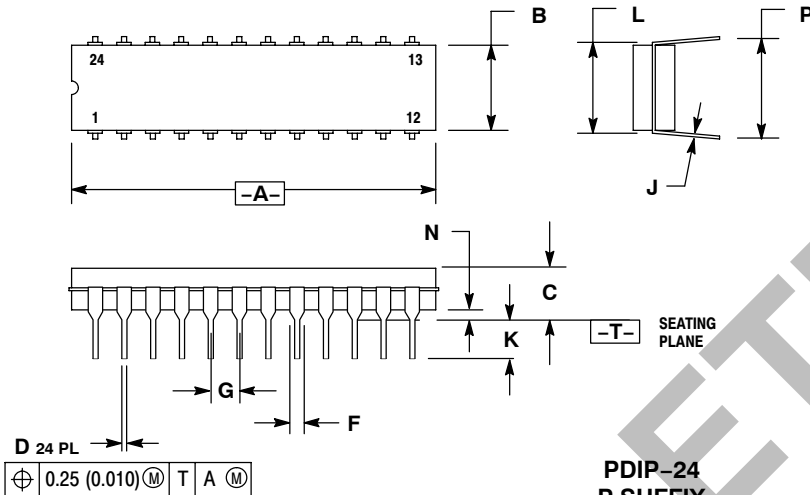
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.485	0.495	12.32	12.57
B	0.485	0.495	12.32	12.57
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.019	0.33	0.48
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	---	0.51	---
K	0.025	---	0.64	---
R	0.450	0.456	11.43	11.58
U	0.450	0.456	11.43	11.58
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	0.410	0.430	10.42	10.92
K1	0.040	---	1.02	---

# MC10H181

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## PACKAGE DIMENSIONS

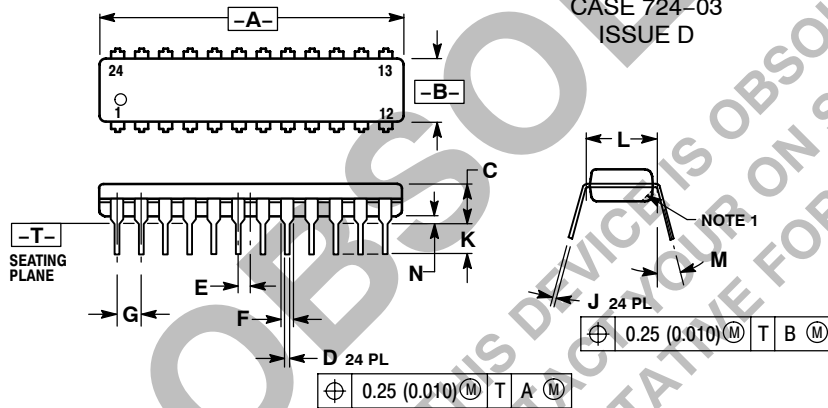
CDIP-24  
L SUFFIX  
CERAMIC DIP PACKAGE  
CASE 758-02  
ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.240	1.285	31.50	32.64
B	0.285	0.305	7.24	7.75
C	0.160	0.200	4.07	5.08
D	0.015	0.021	0.38	0.53
F	0.045	0.062	1.14	1.57
G	0.100 BSC		2.54 BSC	
J	0.008	0.013	0.20	0.33
K	0.100	0.165	2.54	4.19
L	0.300	0.310	7.62	7.87
N	0.020	0.050	0.51	1.27
P	0.360	0.400	9.14	10.16

PDIP-24  
P SUFFIX  
PLASTIC DIP PACKAGE  
CASE 724-03  
ISSUE D



- NOTES:
1. CHAMFERED CONTOUR OPTIONAL.
  2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
  3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  4. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.230	1.265	31.25	32.13
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.020	0.38	0.51
E	0.050 BSC		1.27 BSC	
F	0.040	0.060	1.02	1.52
G	0.100 BSC		2.54 BSC	
J	0.007	0.012	0.18	0.30
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

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