MC10H181

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.

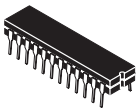
This 10H part is a functional/pinout duplication of the standard MECL 10K family part with 100% improvement in propagation delay and no increase in power supply current.

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

ON Semiconductor

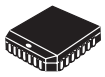
http://onsemi.com

MARKING DIAGRAMS

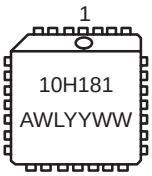


CDIP–24
L SUFFIX
CASE 758

PDIP–24
P SUFFIX
CASE 724



PLCC–28
FN SUFFIX
CASE 776

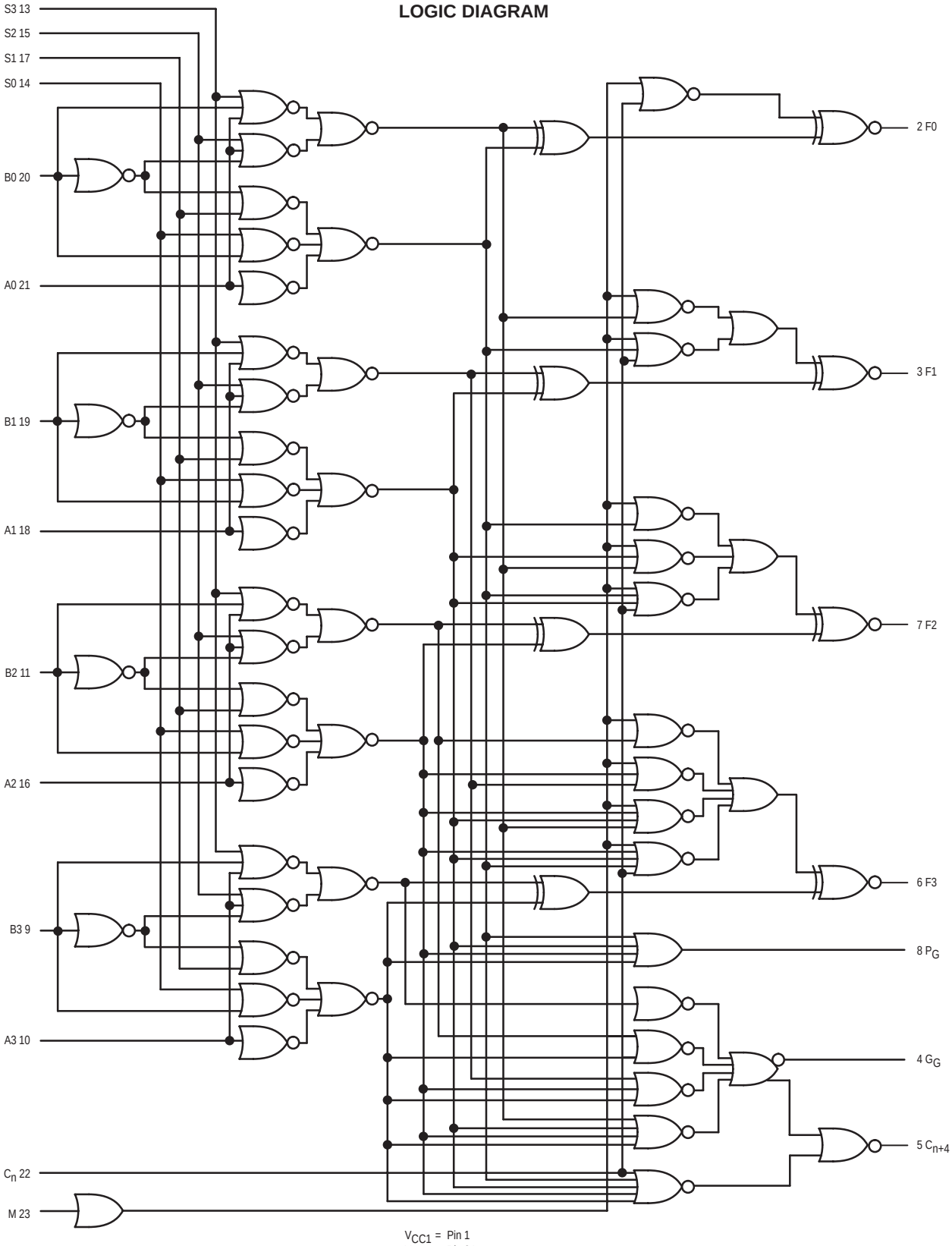


A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week

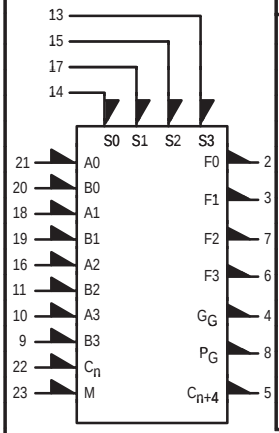
ORDERING INFORMATION

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

LOGIC DIAGRAM



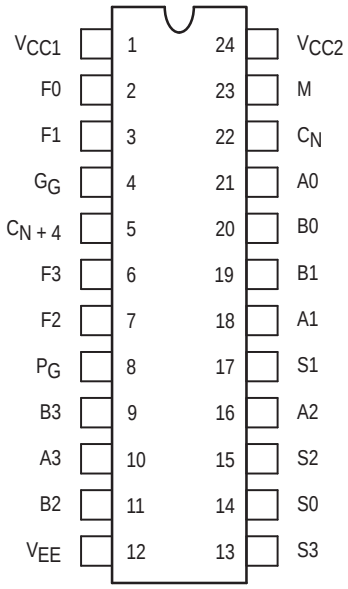
LOGIC DIAGRAM



FUNCTION SELECT TABLE

Function Select S3	S2	S1	S0	Logic Functions M is High C = D.C. F	Arithmetic Operation M is Low C_n is low F
L	L	L	L	$F = \overline{A}$	F = A
L	L	L	H	$F = \overline{A} + \overline{B}$	F = A plus $(A \cdot \overline{B})$
L	L	H	L	$F = \overline{A} + B$	F = A plus $(A \cdot B)$
L	L	H	H	F = Logical "1"	F = A times 2
L	H	L	L	$F = \overline{A} \cdot \overline{B}$	F = (A + B) plus 0
L	H	L	H	$F = \overline{B}$	F = (A + B) plus $(A \cdot \overline{B})$
L	H	H	L	$F = A \odot B$	F = A plus B
L	H	H	H	$F = A + \overline{B}$	F = A plus (A + B)
H	L	L	L	$F = \overline{A} \cdot B$	F = $(A + \overline{B})$ plus 0
H	L	L	H	$F = A \oplus B$	F = A minus B minus 1
H	L	H	L	F = B	F = $(A + \overline{B})$ plus $(A \cdot B)$
H	L	H	H	F = A + B	F = A plus $(A + \overline{B})$
H	H	L	L	F = Logical "0"	F = minus 1 (two's complement)
H	H	L	H	$F = A \cdot \overline{B}$	F = $(A \cdot \overline{B})$ minus 1
H	H	H	L	$F = A \cdot B$	F = $(A \cdot B)$ minus 1
H	H	H	H	F = A	F = A minus 1

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

ELECTRICAL CHARACTERISTICS (V_{EE} = –5.2 V ±5.0%) (See Note 1.)

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

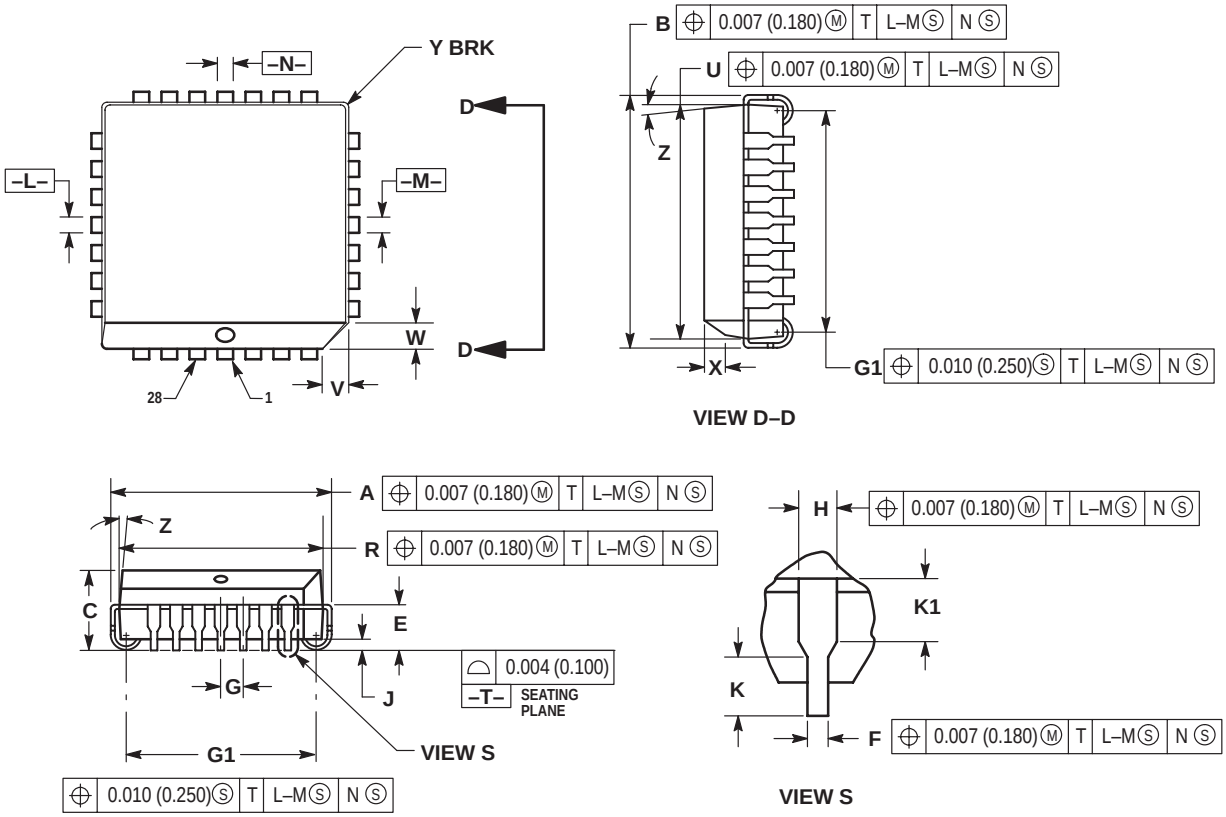
AC PARAMETERS

Characteristic	Symbol	Input	Output	Conditions †	AC Switching Characteristics						Unit
					0°C		+25°C		+75°C		
					Min	Max	Min	Max	Min	Max	
Propagation Delay	t+ +, t– –	C_n	C_{n+4}	A0,A1,A2,A3	0.7	2.0	0.7	2.0	0.7	2.2	ns
Rise Time, Fall Time	t+, t–	C_n	C_{n+4}	A0,A1,A2,A3	0.6	2.0	0.6	2.0	0.7	2.2	ns
Propagation Delay	t+ +, t+ –,	C_n	F1	A0							ns
	t– +, t– –	C_n	F1		1.0	3.0	1.0	3.0	1.2	3.3	
Rise Time, Fall Time	t+, t–	C_n	F1		0.7	2.2	0.7	2.2	0.7	2.4	
Propagation Delay	t+ +, t+ –,	A1	F1								ns
	t– +, t– –	A1	F1		1.5	3.7	1.5	3.7	1.6	4.0	
Rise Time, Fall Time	t+, t–	A1	F1		0.7	2.0	0.7	2.0	0.7	2.2	
Propagation Delay	t+ +, t– –	A1	P_G	S0,S3	1.5	3.7	1.5	3.7	1.6	4.0	ns
Rise Time, Fall Time	t+, t–	A1	P_G	S0,S3	0.9	2.4	0.9	2.4	0.9	2.6	ns
Propagation Delay	t+ +, t– –	A1	G_G	A0,A2,A3,C_n	1.5	3.7	1.5	3.7	1.6	3.9	ns
Rise Time, Fall Time	t+, t–	A1	G_G	A0,A2,A3,C_n	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t+ –, t– +	A1	C_{n+4}	A0,A2,A3,C_n	1.5	3.6	1.5	3.6	1.6	3.9	ns
Rise Time, Fall Time	t+, t–	A1	C_{n+4}	A0,A2,A3,C_n	0.5	2.0	0.5	2.0	0.5	2.2	ns
Propagation Delay	t+ +, t– +	B1	F1	S3,C_n	2.0	4.5	2.0	4.5	2.1	4.8	ns
Rise Time, Fall Time	t+, t–	B1	F	S3,C_n	0.7	2.3	0.7	2.3	0.7	2.5	ns
Propagation Delay	t+ +, t– –	B1	P_G	S0,A1	1.5	3.8	1.5	3.8	1.6	4.0	ns
Rise Time, Fall Time	t+, t–	B1	P_G	S0,A1	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t+ +, t– –	B1	G_G	S3,C_n	1.5	3.7	1.5	3.7	1.6	4.0	ns
Rise Time, Fall Time	t+, t–	B1	G_G	S3,C_n	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t+ –, t– +	B1	C_{n+4}	S3,C_n	2.0	4.0	2.0	4.0	2.1	4.3	ns
Rise Time, Fall Time	t+, t–	B1	C_{n+4}	S3,C_n	0.5	2.0	0.5	2.2	0.5	2.2	ns
Propagation Delay	t+ +, t+ –	M	F1	–	1.5	4.2	1.5	4.2	1.6	4.5	ns
Rise Time, Fall Time	t+, t–	M	F1	–	0.8	2.3	0.8	2.3	0.8	2.5	ns
Propagation Delay	t+ –, t– +	S1	F1	A1,B1	1.5	4.5	1.5	4.5	1.6	4.8	ns
Rise Time, Fall Time	t+, t–	S1	F1	A1,B1	0.7	2.0	0.7	2.0	0.7	2.2	ns
Propagation Delay	t– +, t+ –	S1	P_G	A3,B3	1.5	4.0	1.5	4.0	1.6	4.3	ns
Rise Time, Fall Time	t+, t–	S1	P_G	A3,B3	0.7	2.0	0.7	2.2	0.7	2.4	ns
Propagation Delay	t+ –, t– +	S1	C_{n+4}	A3,B3	1.5	4.1	1.5	4.1	1.6	4.4	ns
Rise Time, Fall Time	t+, t–	S1	C_{n+4}	A3,B3	0.7	2.2	0.7	2.2	0.7	2.4	ns
Propagation Delay	t+ –, t– +	S1	G_G	A3,B3	1.3	4.5	1.3	4.5	1.4	4.8	ns
Rise Time, Fall Time	t+, t–	S1	G_G	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.
$V_{CC1} = V_{CC2}$ = +2.0 Vdc, V_{EE} = –3.2 Vdc

PACKAGE DIMENSIONS

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

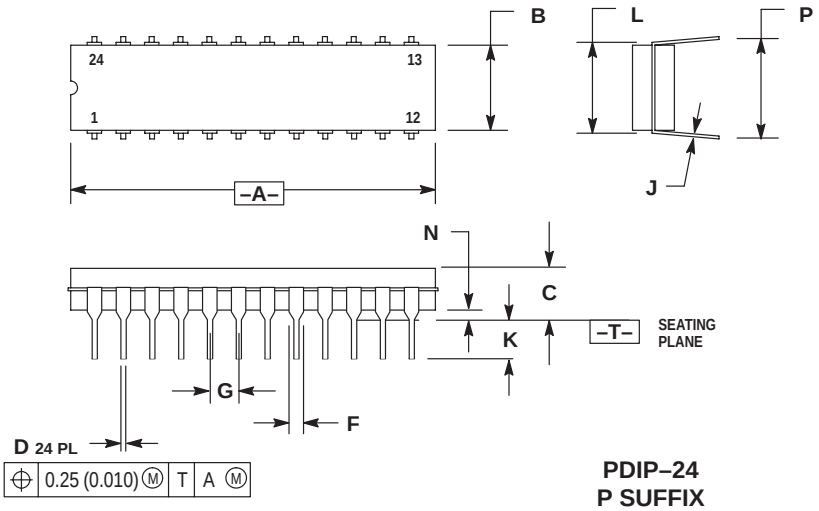


NOTES:
1. DATUMS –L–, –M–, AND –N– DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM –T–, SEATING PLANE.
3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
5. CONTROLLING DIMENSION: INCH.
6. 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).

	INCHES		MILLIMETERS	
DIM	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	—

PACKAGE DIMENSIONS

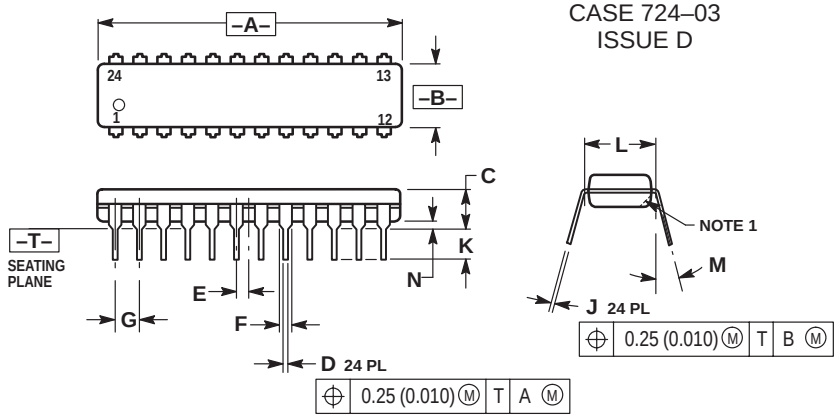
CDIP–24
L SUFFIX
CERAMIC DIP PACKAGE
CASE 758–02
ISSUE A



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

	INCHES		MILLIMETERS	
DIM	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.

	INCHES		MILLIMETERS	
DIM	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

Notes

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