

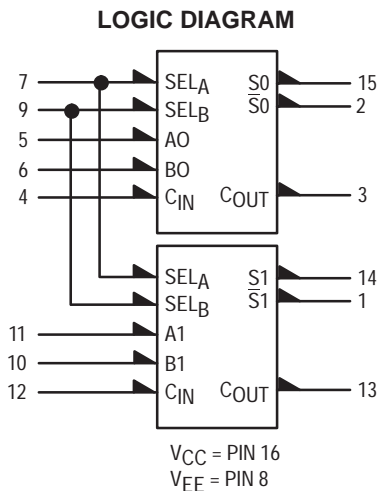
# MC10H180

## Dual 2-Bit Adder/Subtractor

The MC10H180 is a high-speed, low-power, general-purpose adder/subtractor. It is designed to be used in special purpose adders/subtractors or in high-speed multiplier arrays.

Inputs for each adder are Carry-in, Operand A, and Operand B; outputs are Sum,  $\bar{\text{Sum}}$  and Carry-out. The common select inputs serve as a control line to Invert A for subtract, and a control line to Invert B.

- Propagation Delay, 1.8 ns Typical, Operand and Select to Output
- Power Dissipation, 360 mW Typicalh180
- Improved Noise Margin 150 mV (Over Operating Voltage and Temperature Range)
- Voltage Compensated
- MECL 10K-Compatible



POSITIVE LOGIC ONLY

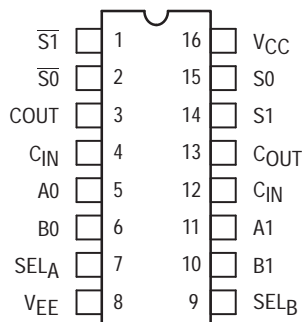
$$A' = \bar{A} \oplus \overline{\text{SELA}} = A \odot \text{SELA}$$

$$B' = \bar{B} \oplus \overline{\text{SELB}} = B \odot \text{SELB}$$

$$S = \overline{C_{IN}} (\bar{A}' B' + A' \bar{B}') + C_{IN} (A' B' + \bar{A}' \bar{B}')$$

$$C_{OUT} = C_{IN} A' + C_{IN} B' + A' B'$$

### DIP PIN ASSIGNMENT



Pin assignment is for Dual-in-Line Package.

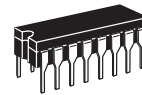
For PLCC pin assignment, see the Pin Conversion Tables on page 18 of the ON Semiconductor MECL Data Book (DL122/D).



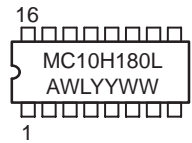
ON Semiconductor

<http://onsemi.com>

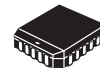
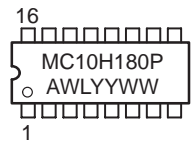
### MARKING DIAGRAMS



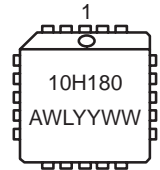
CDIP-16  
L SUFFIX  
CASE 620



PDIP-16  
P SUFFIX  
CASE 648



PLCC-20  
FN SUFFIX  
CASE 775



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

### ORDERING INFORMATION

Device	Package	Shipping
MC10H180L	CDIP-16	25 Units/Rail
MC10H180P	PDIP-16	25 Units/Rail
MC10H180FN	PLCC-20	46 Units/Rail

# MC10H180

## 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 ( $V_{EE} = -5.2 \text{ V} \pm 5\%$ ) (See Note 1.)

Symbol	Characteristic	0°		25°		75°		Unit
		Min	Max	Min	Max	Min	Max	
$I_E$	Power Supply Current	–	95	–	86	–	95	mA
$I_{inH}$	Input Current High	–	665	–	417	–	417	$\mu\text{A}$
	Pins 4, 12	–	515	–	320	–	320	
	Pins 7, 9 Pins 5, 6, 10, 11	–	410	–	255	–	255	
$I_{inL}$	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)	-1.17	-0.84	-1.13	-0.81	-1.07	-0.735	Vdc
$V_{IL}$	Low Input Voltage (1)	-1.95	-1.48	-1.95	-1.48	-1.95	-1.45	Vdc

## AC PARAMETERS

$t_{pd}$	Propagation Delay	0.6	2.4	0.7	2.5	0.8	2.8	ns
	Operand to Output	0.6	2.2	0.7	2.3	0.8	2.6	
	Select to Output Carry-in to Output	0.4	1.6	0.4	1.7	0.4	1.8	
$t_r$	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

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.

## FUNCTION SELECT TABLE

Sel <sub>A</sub>	Sel <sub>B</sub>	Function
H	H	S = A plus B
H	L	S = A minus B
L	H	S = B minus A
L	L	S = 0 minus A minus B

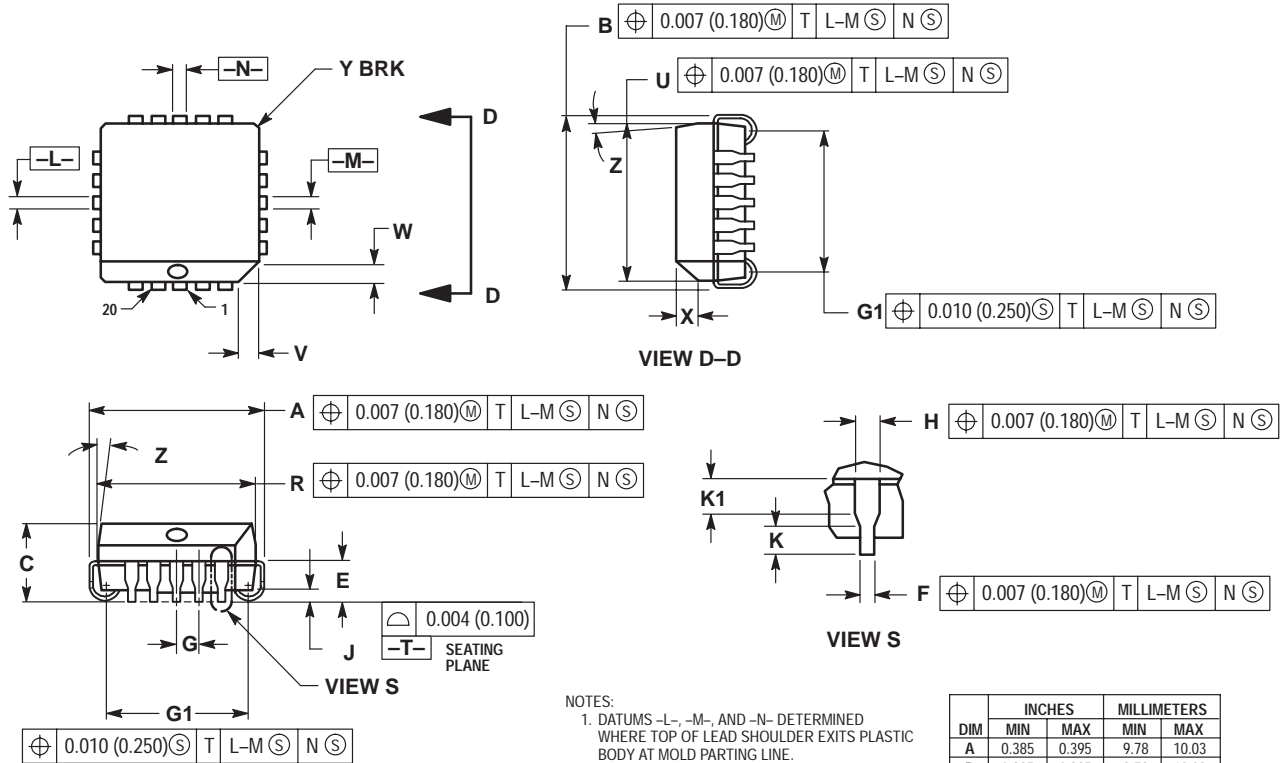
## TRUTH TABLE

FUNCTION	INPUTS							
	Sel <sub>A</sub>	Sel <sub>B</sub>	A0	B0	C <sub>in</sub>	S0	S0	C <sub>out</sub>
ADD	H	H	L	L	L	H	L	L
	H	H	L	L	L	H	L	L
	H	H	L	L	L	H	L	L
	H	H	L	L	L	H	L	L
	H	H	L	L	L	H	L	L
	H	H	L	L	L	H	L	L
	H	H	L	L	L	H	L	L
	H	H	L	L	L	H	L	L
SUBTRACT	H	L	L	L	L	H	L	L
	H	L	L	L	L	H	L	L
	H	L	L	L	L	H	L	L
	H	L	L	L	L	H	L	L
	H	L	L	L	L	H	L	L
	H	L	L	L	L	H	L	L
	H	L	L	L	L	H	L	L
	H	L	L	L	L	H	L	L
REVERSE SUBTRACT	L	H	L	L	L	H	L	L
	L	H	L	L	L	H	L	L
	L	H	L	L	L	H	L	L
	L	H	L	L	L	H	L	L
	L	H	L	L	L	H	L	L
	L	H	L	L	L	H	L	L
	L	H	L	L	L	H	L	L
	L	H	L	L	L	H	L	L

# MC10H180

## PACKAGE DIMENSIONS

PLCC-20  
FN SUFFIX  
PLASTIC PLCC PACKAGE  
CASE 775-02  
ISSUE C



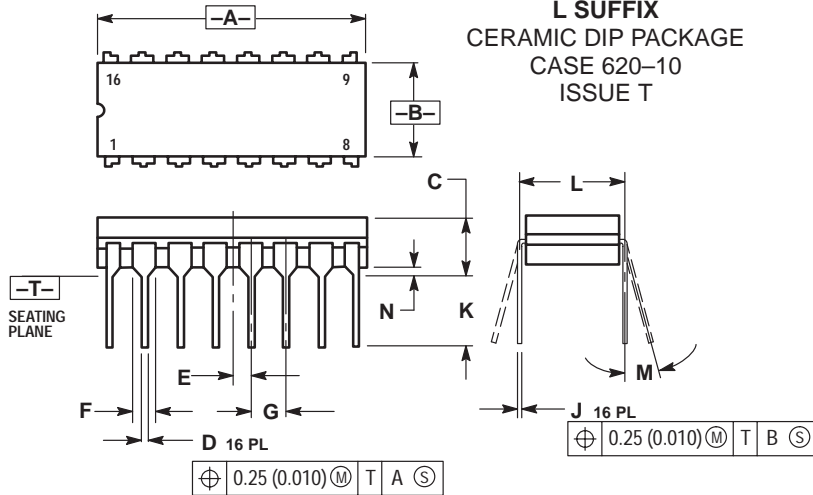
### NOTES:

- 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	0.385	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	0.019	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	0.350	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	---

# MC10H180

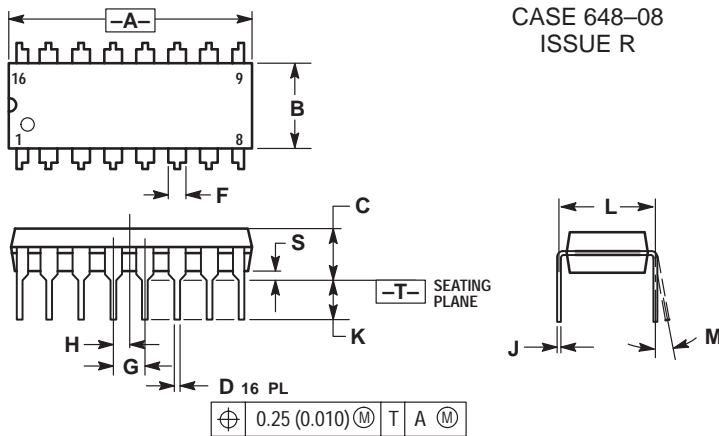
## CDIP-16 L SUFFIX CERAMIC DIP PACKAGE CASE 620-10 ISSUE T



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
  4. DIMENSION F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.750	0.785	19.05	19.93
B	0.240	0.295	6.10	7.49
C	---	0.200	---	5.08
D	0.015	0.020	0.39	0.50
E	0.050 BSC		1.27 BSC	
F	0.055	0.065	1.40	1.65
G	0.100 BSC		2.54 BSC	
H	0.008	0.015	0.21	0.38
K	0.125	0.170	3.18	4.31
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

## PDIP-16 P SUFFIX PLASTIC DIP PACKAGE CASE 648-08 ISSUE R



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
  4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
  5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

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