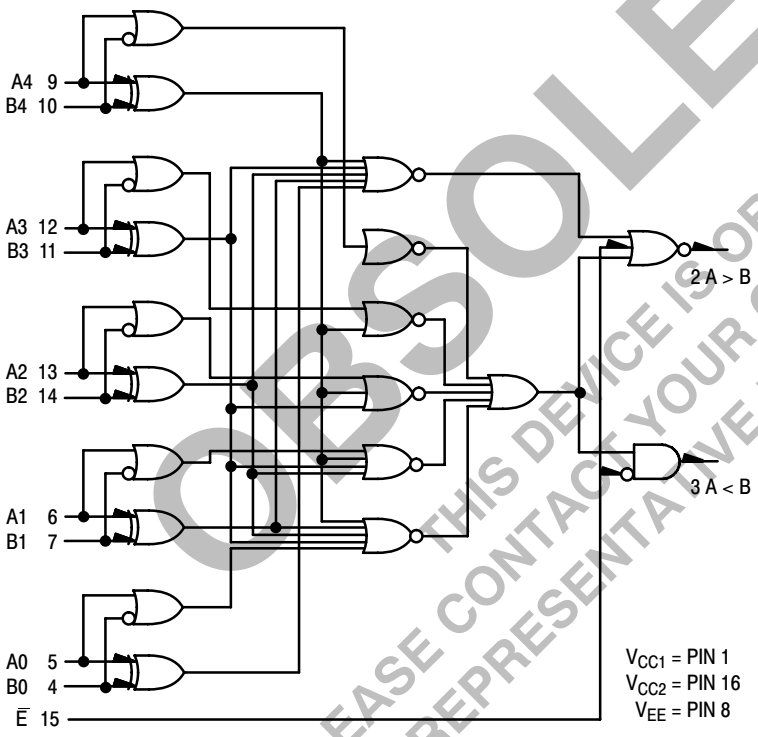
MC10166

5-Bit Magnitude Comparator

The MC10166 is a high speed expandable 5−bit comparator for comparing the magnitude of two binary words. Two outputs are provided: A < B and A > B. A = B can be obtained by NORing the two outputs with an additional gate. A high level on the enable function forces both outputs low. Multiple MC10166s may be used for larger word comparisons.

- P_D = 440 mW typ/pkg (No Load)
- t_{pd} =Data to Output 6.0 ns typ
- $\overline{E}$ to output 2.5 ns typ
- t_r, t_f = 2.0 ns typ (20%−80%)

LOGIC DIAGRAM



TRUTH TABLE

Inputs			Outputs	
$\overline{E}$	A	B	A < B	A > B
H	X	X	L	L
L	Word A = Word B		L	L
L	Word A > Word B		L	H
L	Word A < Word B		H	L

ON Semiconductor

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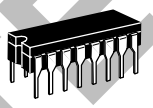
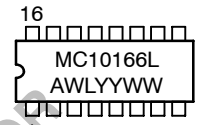
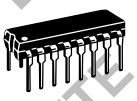
MARKING DIAGRAMS

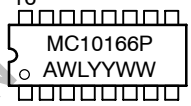


CDIP−16
L SUFFIX
CASE 620

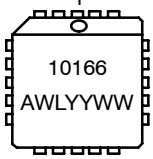




PDIP−16
P SUFFIX
CASE 648

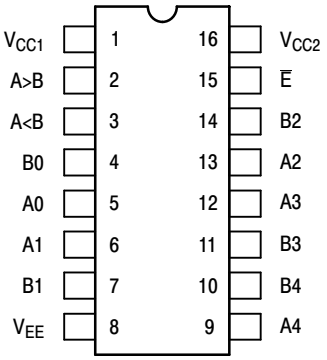


PLCC−20
FN SUFFIX
CASE 775



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

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).

ORDERING INFORMATION

Device	Package	Shipping
MC10166L	CDIP−16	25 Units / Rail
MC10166P	PDIP−16	25 Units / Rail
MC10166FN	PLCC−20	46 Units / Rail

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Pin Under Test	Test Limits							Unit
			−30°C		+25°C			+85°C		
			Min	Max	Min	Typ	Max	Min	Max	
Power Supply Drain Current	I_E	8		117		85	106		117	mAdc
Input Current	I_{inH}	5		350			220		220	μAdc
	I_{inL}	5	0.5		0.5			0.3		μAdc
Output Voltage Logic 1	V_{OH}	2 3	−1.060 −1.060	−0.890 −0.890	−0.960 −0.960		−0.810 −0.810	−0.890 −0.890	−0.700 −0.700	Vdc
Output Voltage Logic 0	V_{OL}	2 3	−1.890 −1.890	−1.675 −1.675	−1.850 −1.850		−1.650 −1.650	−1.825 −1.825	−1.615 −1.615	Vdc
Threshold Voltage Logic 1	V_{OHA}	2 3	−1.080 −1.080		−0.980 −0.980			−0.910 −0.910		Vdc
Threshold Voltage Logic 0	V_{OLA}	2 3		−1.655 −1.655			−1.630 −1.630		−1.595 −1.595	Vdc
Switching Times (50Ω Load)										ns
Propagation Data to Output Delay	t_{9+2+}	2	1.0	8.0	1.0	6.0	7.6	1.0	8.4	
	t_{9-2-}	2	1.0	8.0	1.0	6.0	7.6	1.0	8.4	
	t_{11-2+}	2	1.0	8.0	1.0	6.0	7.6	1.0	8.4	
	t_{11+2-}	2	1.0	8.0	1.0	6.0	7.6	1.0	8.4	
	t_{7+3+}	3	1.0	8.0	1.0	6.0	7.6	1.0	8.4	
	t_{7-3-}	3	1.0	8.0	1.0	6.0	7.6	1.0	8.4	
Enable to Output	t_{15-3+}	3	1.0	3.8	1.0	2.5	3.6	1.0	4.0	
	t_{15+3-}	3	1.0	3.8	1.0	2.5	3.6	1.0	4.0	
Rise Time (20 to 80%)	t_{2+}	2	1.0	3.6	1.1	2.0	3.5	1.1	3.8	
Fall Time (20 to 80%)	t_{2-}	2	1.0	3.6	1.1	2.0	3.5	1.1	3.8	

ELECTRICAL CHARACTERISTICS (continued)

@ Test Temperature	V_{IHmax}	V_{ILmin}	V_{IHAmin}	V_{ILAmax}	V_{EE}
–30°C	–0.890	–1.890	–1.205	–1.500	–5.2
+25°C	–0.810	–1.850	–1.105	–1.475	–5.2
+85°C	–0.700	–1.825	–1.035	–1.440	–5.2

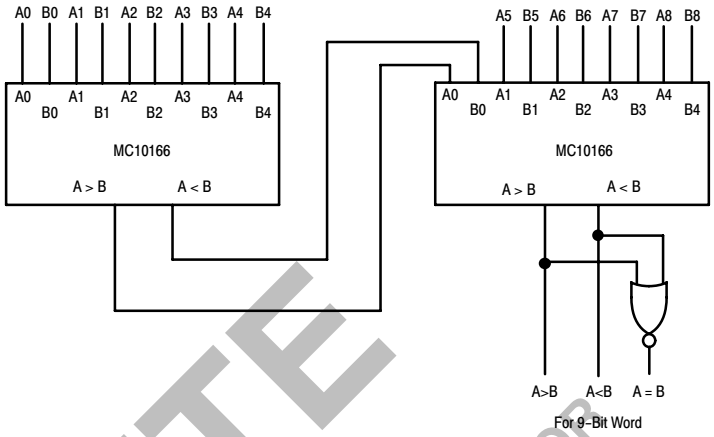
TEST VOLTAGE VALUES (Volts)

Characteristic	Symbol	Pin Under Test	TEST VOLTAGE APPLIED TO PINS LISTED BELOW					(V_{CC}) Gnd
			V_{IHmax}	V_{ILmin}	V_{IHAmin}	V_{ILAmax}	V_{EE}	
Power Supply Drain Current	I_E	8		4,7,10,11,14			8	1, 16
Input Current	I_{inH}	5	5				8	1, 16
	I_{inL}	5		5			8	1, 16
Output Voltage Logic 1	V_{OH}	2	5				8	1, 16
		3	4				8	1, 16
Output Voltage Logic 0	V_{OL}	2	5, 15				8	1, 16
		3	4, 15				8	1, 16
Threshold Voltage Logic 1	V_{OHA}	2	5			15	8	1, 16
		3	4			15	8	1, 16
Threshold Voltage Logic 0	V_{OLA}	2	5		15		8	1, 16
		3	4		15		8	1, 16
Switching Times (50Ω Load)			**+1.11V**		**Pulse In**	**Pulse Out**	**–3.2 V**	**+2.0**
Propagation Delay Data to Output	t_{9+2+}	2			9	2	8	1, 16
	t_{9-2-}	2			9	2	8	1, 16
	t_{11-2+}	2	12		11	2	8	1, 16
	t_{11+2-}	2	12		11	2	8	1, 16
	t_{7+3+}	3	6		7	3	8	1, 16
	t_{7-3-}	3	6		7	3	8	1, 16
Enable to Output	t_{15-3+}	3	10		15	3	8	1, 16
	t_{15+3-}	3	10		15	3	8	1, 16
Rise Time (20 to 80%)	t_{2+}	2			9	2	8	1, 16
Fall Time (20 to 80%)	t_{2-}	2			9	2	8	1, 16

Each MECL 10,000 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 linear fpm is maintained. Outputs are terminated through a 50–ohm resistor to –2.0 volts. Test procedures are shown for only one gate. The other gates are tested in the same manner.

APPLICATION INFORMATION

FIGURE 1 — 9–BIT MAGNITUDE COMPARATOR



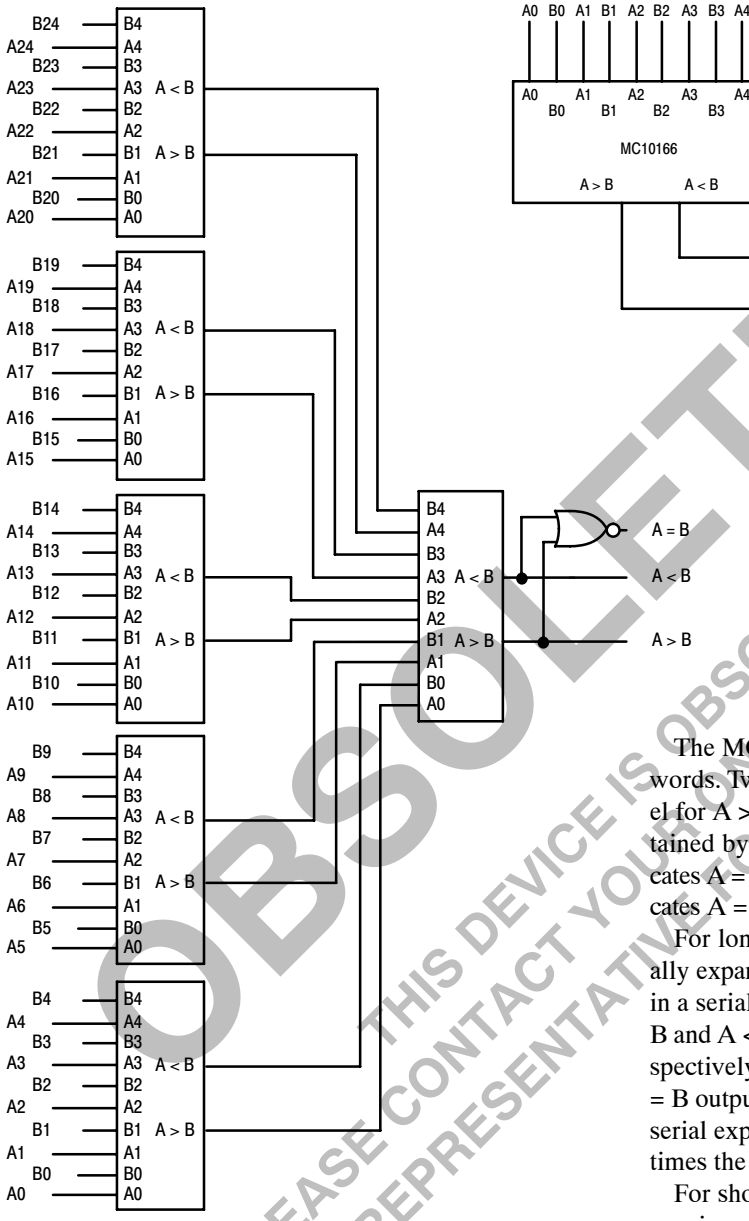


FIGURE 2 — 25–BIT MAGNITUDE COMPARATOR

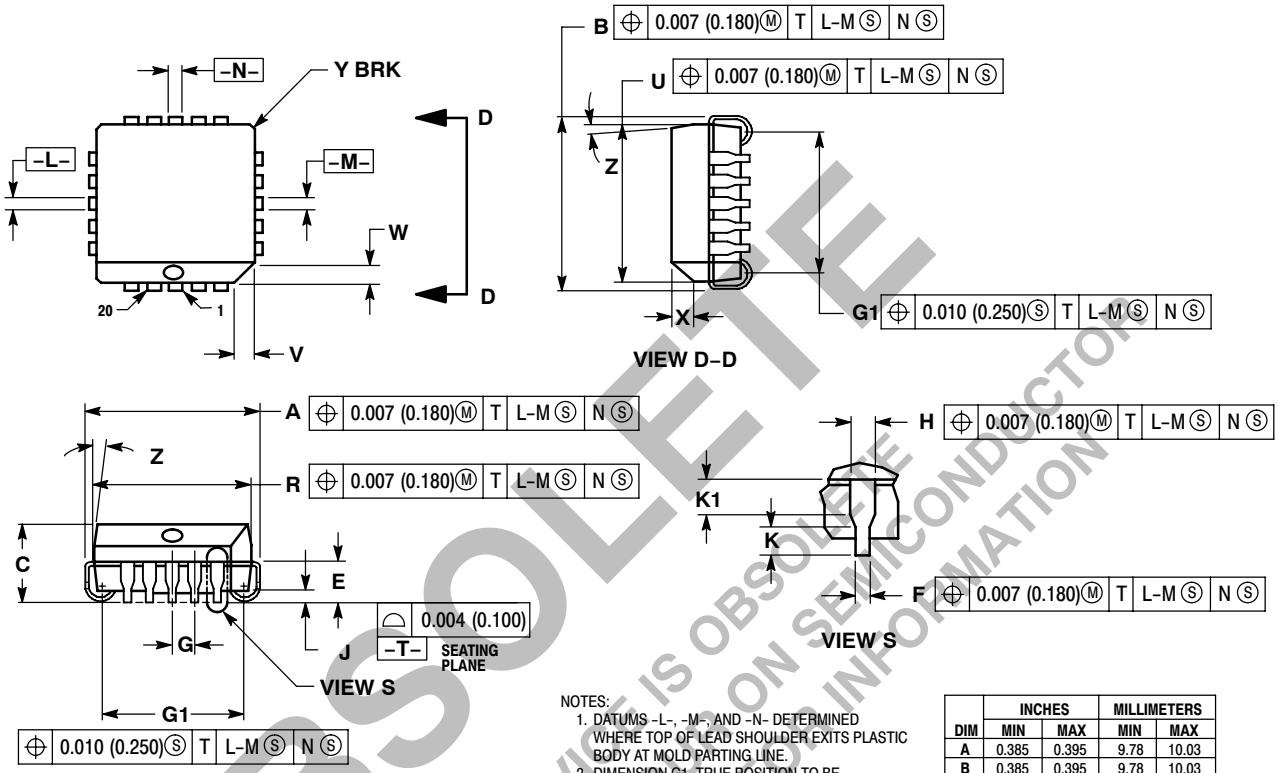
The MC10166 compares the magnitude of two 5–bit words. Two outputs are provided which give a high level for A > B and A < B. The A = B function can be obtained by wire–ORing these outputs (a low level indicates A = B) or by NORing the outputs (a high level indicates A = B).

For longer word lengths, the MC10166 can be serially expanded or cascaded. Figure 1 shows two devices in a serial expansion for a 9–bit word length. The A > B and A < B outputs are fed to the A0 and B0 inputs respectively of the next device. The connection for an A = B output is also shown. The worst case delay time of serial expansion is equal to the number of comparators times the data–to–output delay.

For shorter delay times than possible with serial expansion, devices can be cascaded. Figure 2 shows a 25–bit cascaded comparator whose worst case delay is two data–to–output delays. The cascaded scheme can be extended to longer word lengths.

PACKAGE DIMENSIONS

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

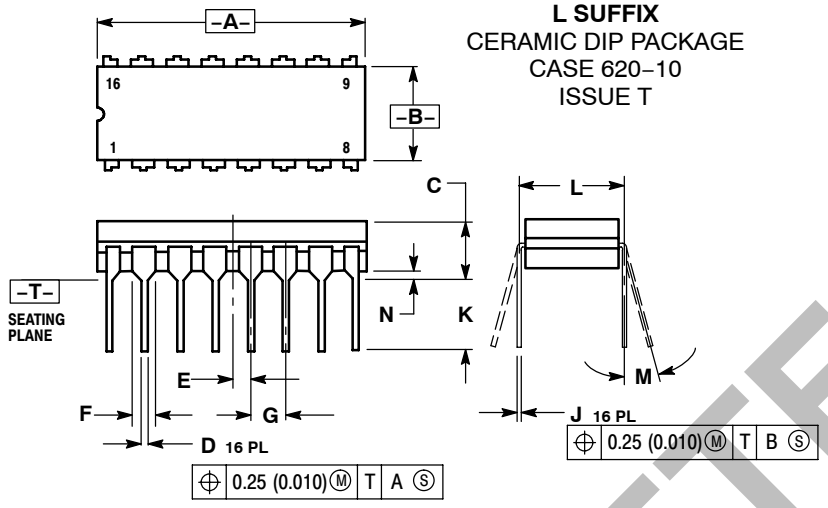


NOTES:
1. DATUMS –L–, –M–, AND –N– DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM –T–, SEATING PLANE.
3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING 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	0.385	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	---

PACKAGE DIMENSIONS

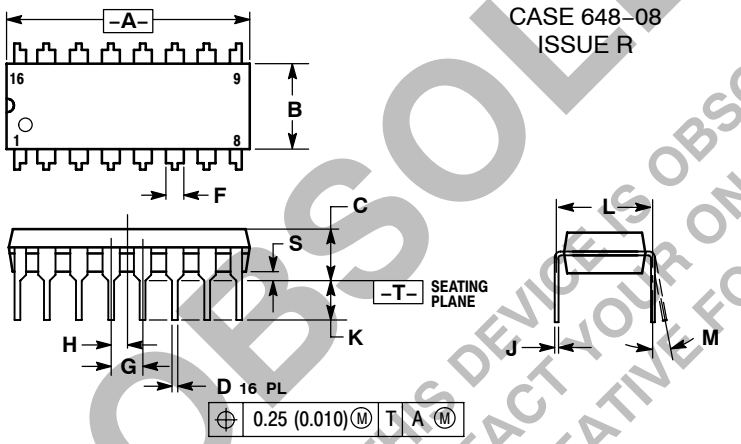
CDIP–16
L SUFFIX
CERAMIC DIP PACKAGE
CASE 620–10
ISSUE T



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.

	INCHES		MILLIMETERS	
DIM	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.

	INCHES		MILLIMETERS	
DIM	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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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