

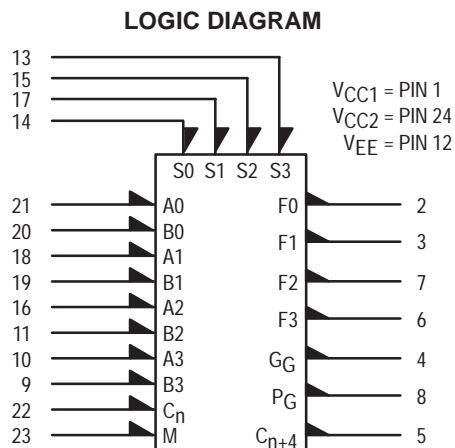
MC10181

4-Bit Arithmetic Logic Unit/ Function Generator

The MC10181 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 (PG) and carry generate (GG) 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).

- $P_D = 600 \text{ mW typ/pkg (No Load)}$
- $t_{pd} \text{ (typ): A1 to F} = 6.5 \text{ ns}$
- $C_n \text{ to } C_{n+4} = 3.1 \text{ ns}$
- A1 to $P_G = 5.0 \text{ ns}$
- A1 to $G_G = 4.5 \text{ ns}$
- A1 to $C_{n+4} = 5.0$



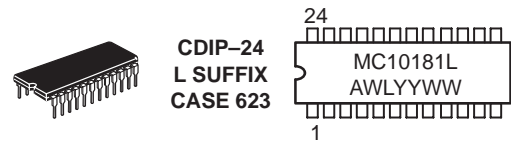
| Function Select | | | | Logic Functions M is High C = D.C. F | Arithmetic Operation M is Low C_n is low F |
|-----------------|----|----|----|--|--|
| S3 | S2 | S1 | S0 | | |
| L | L | L | L | $F = \bar{A}$ | $F = A$ |
| L | L | L | H | $F = \bar{A} + \bar{B}$ | $F = A \text{ plus } (A \cdot \bar{B})$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



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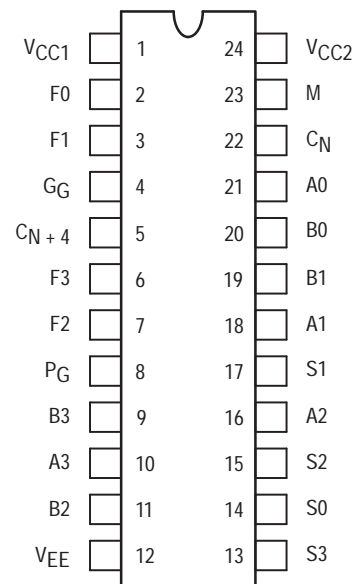
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MARKING DIAGRAMS



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

PIN ASSIGNMENT

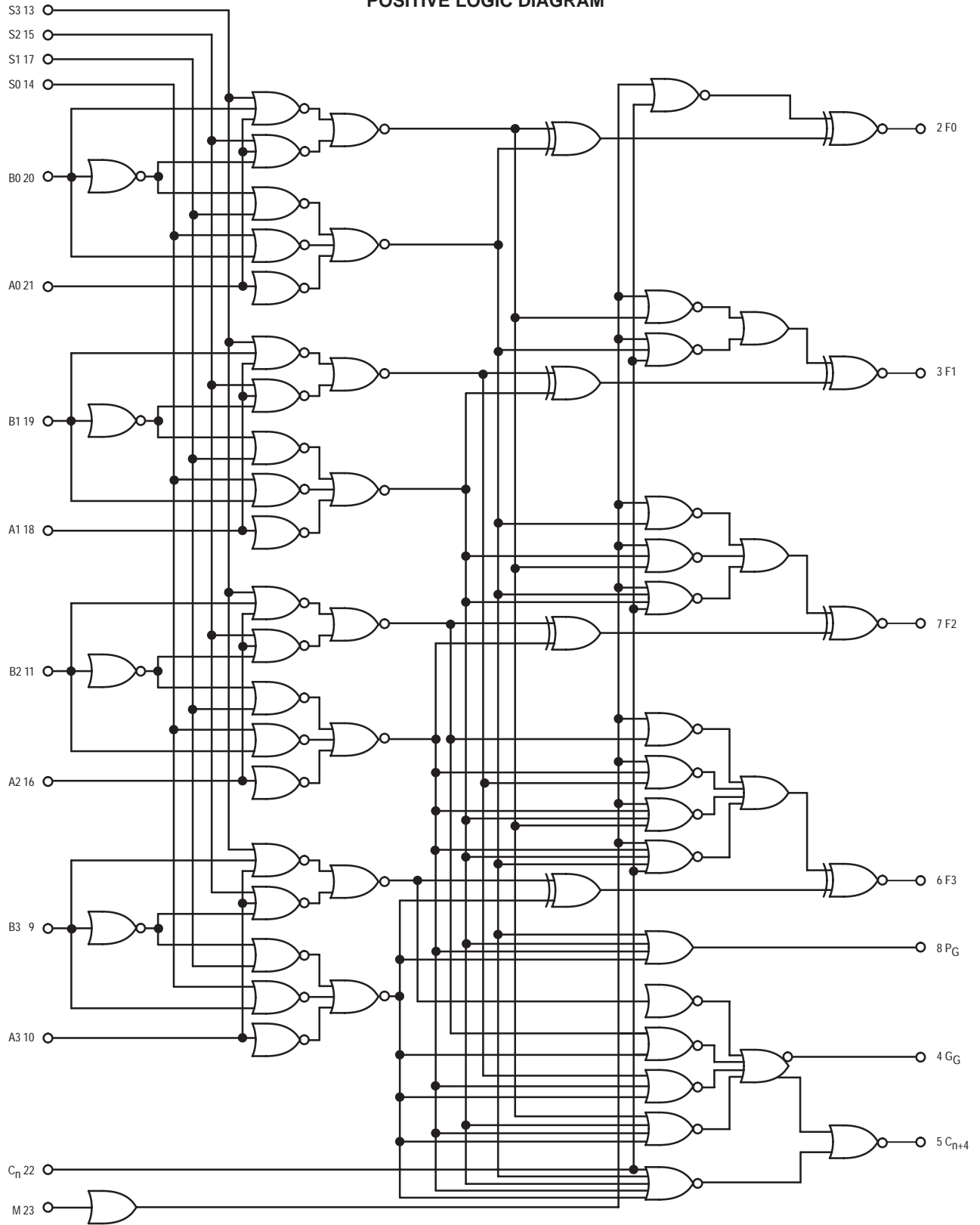


ORDERING INFORMATION

| Device | Package | Shipping |
|----------|---------|-----------------|
| MC10181L | CDIP-24 | 15 Units / Rail |

MC10181

POSITIVE LOGIC DIAGRAM



MC10181

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 | 12 | | 159 | | | 145 | | 159 | mAdc | |
| Input Current | I_{inH} | 9 | | 390 | | | 245 | | 245 | μ Adc | |
| | | 10 | | 350 | | | 220 | | 220 | | |
| | | 11 | | 390 | | | 245 | | 245 | | |
| | | 13 | | 320 | | | 200 | | 200 | | |
| | | 14 | | 425 | | | 265 | | 265 | | |
| | | 15 | | 425 | | | 265 | | 265 | | |
| | | 16 | | 350 | | | 220 | | 220 | | |
| | | 17 | | 425 | | | 265 | | 265 | | |
| | | 18 | | 350 | | | 220 | | 220 | | |
| | | 19 | | 390 | | | 245 | | 245 | | |
| | | 20 | | 390 | | | 245 | | 245 | | |
| | | 21 | | 350 | | | 220 | | 220 | | |
| | | 22 | | 460 | | | 290 | | 290 | | |
| 23 | | 320 | | | 200 | | 200 | | | | |
| Input Leakage Current | I_{inL} | 9 | 0.5 | | 0.5 | | | 0.3 | | μ Adc | |
| | | 10 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 11 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 13 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 14 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 15 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 16 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 17 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 18 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 19 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 20 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 21 | 0.5 | | 0.5 | | | 0.3 | | | |
| | | 22 | 0.5 | | 0.5 | | | 0.3 | | | |
| 23 | 0.5 | | 0.5 | | | 0.3 | | | | | |
| Output Voltage | Logic 1 | V_{OH} | * | -1.060 | -0.890 | -0.960 | | -0.810 | -0.890 | -0.700 | Vdc |
| Output Voltage | Logic 0 | V_{OL} | * | -2.000 | -1.675 | -1.990 | | -1.650 | -1.920 | -1.615 | Vdc |
| Threshold Voltage | Logic 1 | V_{OHA} | * | -1.080 | | -0.980 | | | -0.910 | | Vdc |
| Threshold Voltage | Logic 0 | V_{OLA} | * | | -1.655 | | | -1.630 | | -1.595 | Vdc |

* Test all input-output combinations according to Function Table.

** For threshold level test, apply threshold input level to only one input pin at a time.

MC10181

ELECTRICAL CHARACTERISTICS (continued)

| | | | TEST VOLTAGE VALUES (Volts) | | | | | | |
|----------------------------|------------------|------------------|---|--------------------|---------------------|--------------------|-----------------|------------------------|-------|
| | | | V _{IHmax} | V _{ILmin} | V _{IHAmin} | V _{ILAmx} | V _{EE} | | |
| @ Test Temperature | | | | | | | | | |
| -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 | | |
| Characteristic | Symbol | Pin Under Test | TEST VOLTAGE APPLIED TO PINS LISTED BELOW | | | | | (V _{CC}) Gnd | |
| | | | V _{IHmax} | V _{ILmin} | V _{IHAmin} | V _{ILAmx} | V _{EE} | | |
| Power Supply Drain Current | I _E | 12 | | | | | 12 | 1, 24 | |
| Input Current | I _{inH} | 9 | 9 | | | | 12 | 1, 24 | |
| | | 10 | 10 | | | | 12 | 1, 24 | |
| | | 11 | 11 | | | | 12 | 1, 24 | |
| | | 13 | 13 | | | | 12 | 1, 24 | |
| | | 14 | 14 | | | | 12 | 1, 24 | |
| | | 15 | 15 | | | | 12 | 1, 24 | |
| | | 16 | 16 | | | | 12 | 1, 24 | |
| | | 17 | 17 | | | | 12 | 1, 24 | |
| | | 18 | 18 | | | | 12 | 1, 24 | |
| | | 19 | 19 | | | | 12 | 1, 24 | |
| | | 20 | 20 | | | | 12 | 1, 24 | |
| | | 21 | 21 | | | | 12 | 1, 24 | |
| | | 22 | 22 | | | | 12 | 1, 24 | |
| 23 | 23 | | | | 12 | 1, 24 | | | |
| Input Leakage Current | I _{inL} | 9 | | 9 | | | 12 | 1, 24 | |
| | | 10 | | 10 | | | 12 | 1, 24 | |
| | | 11 | | 11 | | | 12 | 1, 24 | |
| | | 13 | | 13 | | | 12 | 1, 24 | |
| | | 14 | | 14 | | | 12 | 1, 24 | |
| | | 15 | | 15 | | | 12 | 1, 24 | |
| | | 16 | | 16 | | | 12 | 1, 24 | |
| | | 17 | | 17 | | | 12 | 1, 24 | |
| | | 18 | | 18 | | | 12 | 1, 24 | |
| | | 19 | | 19 | | | 12 | 1, 24 | |
| | | 20 | | 20 | | | 12 | 1, 24 | |
| | | 21 | | 21 | | | 12 | 1, 24 | |
| | | 22 | | 22 | | | 12 | 1, 24 | |
| 23 | | 23 | | | 12 | 1, 24 | | | |
| Output Voltage | Logic 1 | V _{OH} | * | * | * | | 12 | 1, 24 | |
| Output Voltage | Logic 0 | V _{OL} | * | * | * | | 12 | 1, 24 | |
| Threshold Voltage | Logic 1 | V _{OHA} | * | | | ** | ** | 12 | 1, 24 |
| Threshold Voltage | Logic 0 | V _{OLA} | * | | | ** | ** | 12 | 1, 24 |

* Test all input-output combinations according to Function Table.

** For threshold level test, apply threshold input level to only one input pin at a time.

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.

MC10181

| Characteristic | Symbol | Input | Output | Conditions† | AC Switching Characteristics | | | | | | | Unit |
|---|---|--|--------------------------------------|----------------------------------|------------------------------|------|-------|-----|-----|---------|------|------|
| | | | | | -30°C * | | +25°C | | | +85°C * | | |
| | | | | | Min | Max | Min | Typ | Max | Min | Max | |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₋₋ t ₊ , t ₋ | C _n C _n | C _{n+4} C _{n+4} | A0, A1, A2, A3 A0, A1, A2, A3 | 1.0 | 5.1 | 1.1 | 3.1 | 5.0 | 1.1 | 5.4 | ns |
| | | | | | 1.0 | 3.2 | 1.0 | 2.0 | 3.0 | 1.0 | 3.2 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₊₋ t ₋₊ , t ₋₋ t ₊ , t ₋ | C _n C _n C _n | F1 F1 F1 | A0 | 1.7 | 7.2 | 2.0 | 4.5 | 7.0 | 2.0 | 7.5 | ns |
| | | | | A0 | 1.7 | 7.2 | 2.0 | 4.5 | 7.0 | 2.0 | 7.5 | ns |
| | | | | A0 | 1.3 | 5.3 | 1.5 | 3.0 | 5.0 | 1.5 | 5.3 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₊₋ t ₋₊ , t ₋₋ t ₊ , t ₋ | A1 A1 A1 | F1 F1 F1 | — | 2.6 | 10.4 | 3.0 | 6.5 | 10 | 3.0 | 10.8 | ns |
| | | | | — | 2.6 | 10.4 | 3.0 | 6.5 | 10 | 3.0 | 10.8 | ns |
| | | | | — | 1.3 | 5.4 | 1.5 | 3.0 | 5.0 | 1.5 | 5.3 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₋₋ t ₊ , t ₋ | A1 A1 | P _G P _G | S0, S3 | 1.6 | 7.0 | 2.0 | 5.0 | 6.5 | 2.0 | 7.0 | ns |
| | | | | S0, S3 | 0.8 | 3.7 | 1.1 | 2.0 | 3.5 | 1.1 | 3.8 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₋₋ t ₊ , t ₋ | A1 A1 | G _G G _G | A0, A2, A3, C _n | 1.1 | 7.4 | 2.0 | 4.5 | 7.0 | 1.3 | 7.7 | ns |
| | | | | A0, A2, A3, C _n | 1.2 | 5.1 | 1.5 | 4.0 | 5.0 | 1.2 | 5.3 | ns |
| Propagation Delay Rise Time, Fall Time | t ₋₊ , t ₊₋ t ₊ , t ₋ | A1 A1 | C _{n+4} C _{n+4} | A0, A2, A3, C _n | 1.7 | 7.3 | 2.0 | 5.0 | 7.0 | 2.0 | 7.8 | ns |
| | | | | A0, A2, A3, C _n | 1.0 | 3.1 | 1.0 | 2.0 | 3.0 | 1.0 | 3.2 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₊₋ t ₊ , t ₋ | B1 B1 | F1 F1 | S3, C _n | 2.7 | 11.3 | 3.0 | 8.0 | 11 | 3.0 | 11.9 | ns |
| | | | | S3, C _n | 1.2 | 5.3 | 1.5 | 3.5 | 5.0 | 1.5 | 5.3 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₋₋ t ₊ , t ₋ | B1 B1 | P _G P _G | S0, A1 | 1.6 | 7.7 | 2.0 | 6.0 | 7.5 | 2.0 | 8.0 | ns |
| | | | | S0, A1 | 1.0 | 3.6 | 1.1 | 2.0 | 3.5 | 1.1 | 3.9 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₋₋ t ₊ , t ₋ | B1 B1 | G _G G _G | S3, C _n | 1.7 | 8.2 | 2.0 | 6.0 | 8.0 | 2.0 | 8.6 | ns |
| | | | | S3, C _n | 1.4 | 5.2 | 1.5 | 3.0 | 5.0 | 1.2 | 5.4 | ns |
| Propagation Delay Rise Time, Fall Time | t ₋₊ , t ₊₋ t ₊ , t ₋ | B1 B1 | C _{n+4} C _{n+4} | S3, C _n | 1.8 | 8.2 | 2.0 | 6.0 | 8.0 | 2.0 | 8.7 | ns |
| | | | | S3, C _n | 0.9 | 3.1 | 1.0 | 2.0 | 3.0 | 1.0 | 3.2 | ns |
| Propagation Delay Rise Time, Fall Time | t ₊₊ , t ₊₋ t ₊ , t ₋ | M M | F1 F1 | — | 2.4 | 10.3 | 3.0 | 6.5 | 10 | 3.0 | 10.8 | ns |
| | | | | — | 1.1 | 5.1 | 1.5 | 4.0 | 5.0 | 1.5 | 5.3 | ns |
| Propagation Delay Rise Time, Fall Time | t ₋₊ , t ₊₋ t ₊ , t ₋ | S1 S1 | F1 F1 | A1, B1 | 2.5 | 10.7 | 3.0 | 6.5 | 10 | 3.0 | 10.8 | ns |
| | | | | A1, B1 | 1.0 | 5.4 | 1.5 | 3.0 | 5.0 | 1.5 | 5.4 | ns |
| Propagation Delay Rise Time, Fall Time | t ₋₊ , t ₊₋ t ₊ , t ₋ | S1 S1 | P _G P _G | A3, B3 | 1.7 | 8.3 | 2.0 | 6.0 | 8.0 | 2.0 | 8.4 | ns |
| | | | | A3, B3 | 0.8 | 5.1 | 1.1 | 3.0 | 5.0 | 1.1 | 5.2 | ns |
| Propagation Delay Rise Time, Fall Time | t ₋₊ , t ₊₋ t ₊ , t ₋ | S1 S1 | C _{n+4} C _{n+4} | A3, B3 | 1.6 | 9.3 | 2.0 | 6.0 | 9.0 | 2.0 | 9.9 | ns |
| | | | | A3, B3 | 0.9 | 5.3 | 1.1 | 3.0 | 5.0 | 1.0 | 5.2 | ns |
| Propagation Delay Rise Time, Fall Time | t ₋₊ , t ₊₋ t ₊ , t ₋ | S1 S1 | G _G G _G | A3, B3 | 1.5 | 9.6 | 2.0 | 6.0 | 9.0 | 1.9 | 9.7 | ns |
| | | | | A3, B3 | 0.8 | 6.2 | 0.8 | 3.0 | 6.0 | 0.8 | 6.5 | ns |

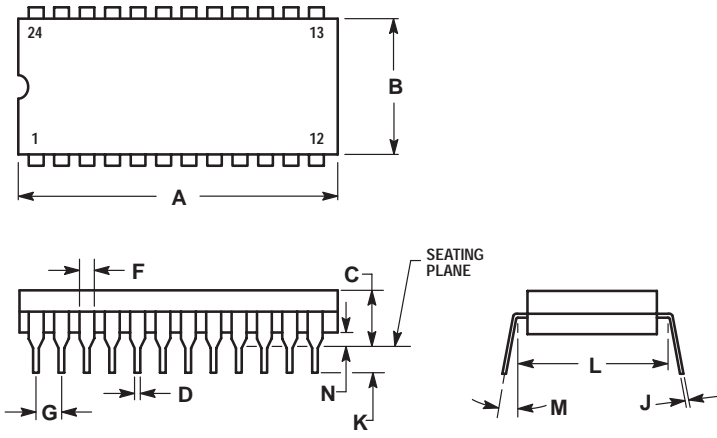
† Logic high level (+1.11 Vdc) applied to pins listed. All other input pins are left floating or tied to +0.31 Vdc.
V_{CC1} = V_{CC2} = +2.0 Vdc, V_{EE} = -3.2 Vdc

* L Suffix Only

MC10181

PACKAGE DIMENSIONS

CDIP-24
L SUFFIX
CERAMIC PACKAGE
CASE 623-05
ISSUE M




NOTES:

1. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
2. LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION (WHEN FORMED PARALLEL).

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 31.24 | 32.77 | 1.230 | 1.290 |
| B | 12.70 | 15.49 | 0.500 | 0.610 |
| C | 4.06 | 5.59 | 0.160 | 0.220 |
| D | 0.41 | 0.51 | 0.016 | 0.020 |
| F | 1.27 | 1.52 | 0.050 | 0.060 |
| G | 2.54 BSC | | 0.100 BSC | |
| J | 0.20 | 0.30 | 0.008 | 0.012 |
| K | 3.18 | 4.06 | 0.125 | 0.160 |
| L | 15.24 BSC | | 0.600 BSC | |
| M | 0° | 15° | 0° | 15° |
| N | 0.51 | 1.27 | 0.020 | 0.050 |

Notes

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