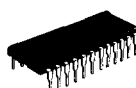
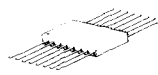
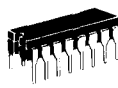
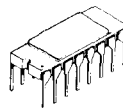
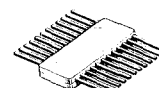


MC10,100/10,200 Series (-30 to +85°C)

MC10,500/10,600 Series (-55 to +125°C)

MECL 10,000 has an excellent speed-power product, has relatively slow rise and fall times, and transmission-line drive capability. The combination of versatile logic functions and the 2.0 ns propagation delay make MECL 10,000 a versatile family for data handling and processing systems.

Circuit design with MECL 10,000 is unusually convenient. The differential amplifier input and emitter-follower output permit high fanout, the wired-OR option, and complementary outputs. MECL III is directly compatible with MECL 10,000, and can be used to extend the speed capability of the MECL 10,000 series.

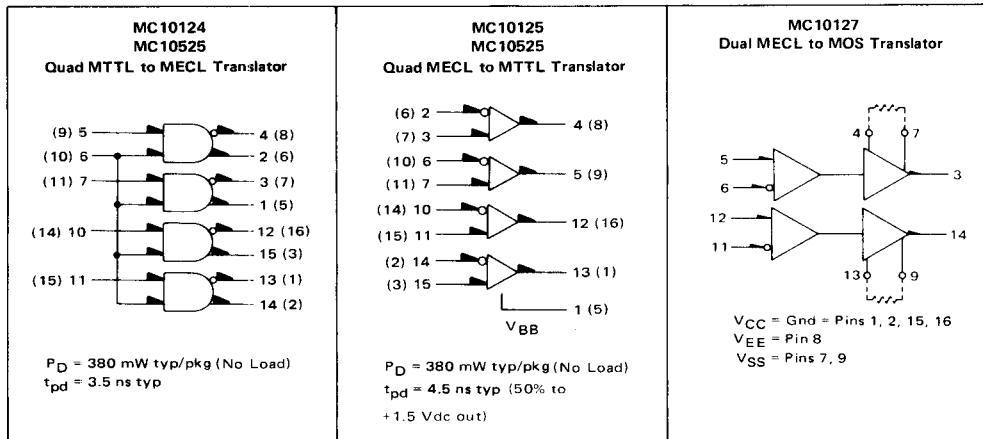
L SUFFIX  
CERAMIC PACKAGE  
CASE 623P SUFFIX  
PLASTIC PACKAGE  
CASE 648F SUFFIX  
CERAMIC PACKAGE  
CASE 650P SUFFIX  
PLASTIC PACKAGE  
CASE 649L SUFFIX  
CERAMIC PACKAGE  
CASE 620AL SUFFIX  
CERAMIC PACKAGE  
CASE 690F SUFFIX  
CERAMIC PACKAGE  
CASE 692FUNCTIONS AND CHARACTERISTICS ( $V_{CC} = 0$ ,  $V_{EE} = -5.2$  V,  $T_A = 25^\circ\text{C}$ )

| Function                                        | Type ①       |               | Propagation Delay<br>ns typ | Power Dissipation<br>mW<br>typ/pkg* | Case        |
|-------------------------------------------------|--------------|---------------|-----------------------------|-------------------------------------|-------------|
|                                                 | -30 to +85°C | -55 to +125°C |                             |                                     |             |
| Quad 2-Input NOR Gate With Strobe               | MC10100      | —             | 2.0                         | 100                                 | 620         |
| Quad OR/NOR Gate                                | MC10101      | MC10501       | 2.0                         | 100                                 | 620,648,650 |
| Quad 2-Input NOR Gate                           | MC10102      | MC10502       | 2.0                         | 100                                 | 620,648,650 |
| Quad 2-Input OR Gate                            | MC10103      | —             | 2.0                         | 100                                 | 620         |
| Quad 2-Input AND Gate                           | MC10104      | MC10504       | 2.7                         | 140                                 | 620,648,650 |
| Triple 2-3-2-Input OR/NOR Gate                  | MC10105      | MC10505       | 2.0                         | 90                                  | 620,648,650 |
| Triple 4-3-3-Input NOR Gate                     | MC10106      | MC10506       | 2.0                         | 90                                  | 620,648,650 |
| Triple 2-Input Exclusive OR/Exclusive NOR       | MC10107      | MC10507       | 2.5                         | 110                                 | 620,648,650 |
| Dual 4-5-Input OR/NOR Gate                      | MC10109      | MC10509       | 2.0                         | 60                                  | 620,648,650 |
| Dual 3-Input 3-Output OR Gate                   | MC10110      | —             | 2.4                         | 160                                 | 620,648     |
| Dual 3-Input 3-Output NOR Gate                  | MC10111      | —             | 2.4                         | 160                                 | 620,648     |
| Quad Exclusive OR Gate                          | MC10113      | —             | 2.5                         | 175                                 | 620         |
| Triple Line Receiver                            | MC10114      | MC10514       | 2.4                         | 145                                 | 620,648,650 |
| Quad Line Receiver                              | MC10115      | MC10515       | 2.0                         | 110                                 | 620,648,650 |
| Triple Line Receiver                            | MC10116      | MC10516       | 2.0                         | 85                                  | 620,648,650 |
| Dual 2-Wide 2-3-Input OR-AND/OR-AND-INVERT Gate | MC10117      | MC10517       | 2.3                         | 100                                 | 620,648,650 |
| Dual 2-Wide 3-Input OR-AND Gate                 | MC10118      | MC10518       | 2.3                         | 100                                 | 620,648,650 |
| 4-Wide 4-3-3-Input OR-AND Gate                  | MC10119      | MC10519       | 2.3                         | 100                                 | 620,648,650 |
| 4-Wide OR-AND/OR-AND-INVERT Gate                | MC10121      | MC10521       | 2.3                         | 100                                 | 620,648,650 |
| Triple 4-3-3-Input Bus Driver                   | MC10123      | —             | 3.0                         | 310                                 | 620         |
| Quad MTTL to MECL Translator                    | MC10124      | MC10524       | 3.5                         | 380                                 | 620,648,650 |
| Quad MECL to MTTL Translator                    | MC10125      | MC10525       | 4.5                         | 380                                 | 620,648,650 |
| Dual MECL to MOS Translator                     | MC10127      | —             | —                           | —                                   | 620         |
| Bus Driver                                      | MC10128      | —             | 12.0                        | 700                                 | 620         |
| Quad Bus Receiver                               | MC10129      | —             | 10.0                        | 750                                 | 620         |
| Dual Latch                                      | MC10130      | MC10530       | 2.5                         | 155                                 | 620,648,650 |
| Dual Type D Master-Slave Flip-Flop              | MC10131      | MC10531       | $f = 160$ MHz               | 235                                 | 620,648,650 |
| Dual Multiplexer With Latch and Common Reset    | MC10132      | —             | 3.0                         | 225                                 | 620,648     |
| Quad Latch                                      | MC10133      | MC10533       | 4.0                         | 310                                 | 620,648,650 |
| Multiplexer with Latch                          | MC10134      | —             | 3.0                         | 225                                 | 620,648     |
| Dual J-K Master-Slave Flip-Flop                 | MC10135      | MC10535       | $f = 140$ MHz               | 280                                 | 620,648,650 |
| Universal Hexadecimal Counter                   | MC10136      | MC10536       | $f = 150$ MHz               | 625                                 | 620,650     |

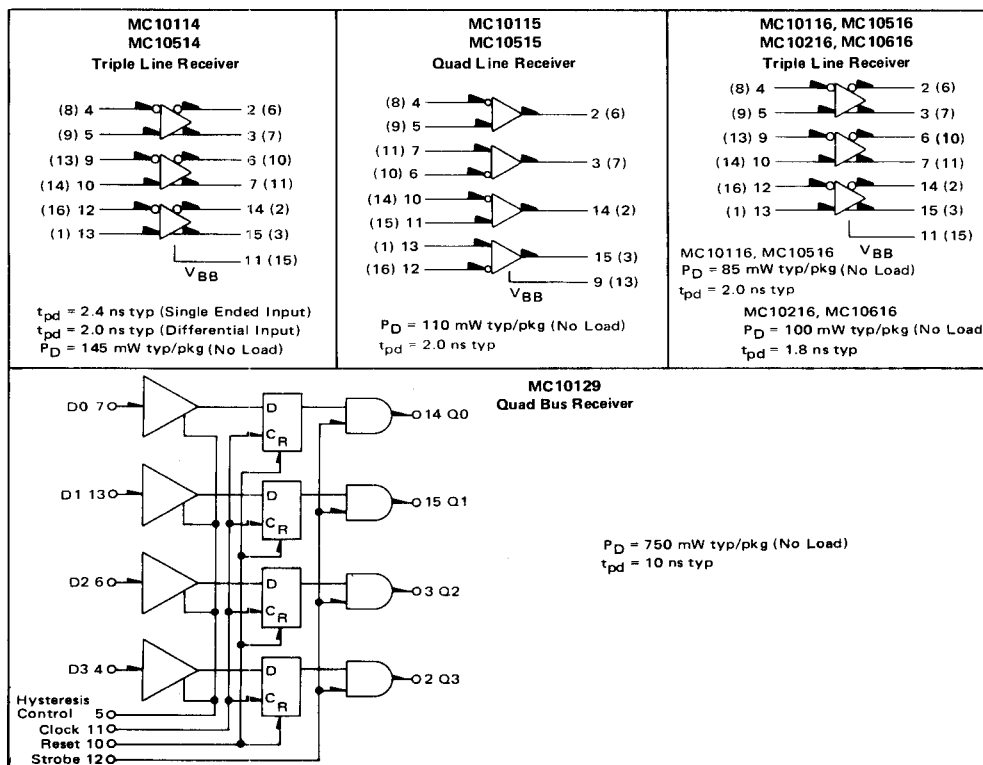
① L suffix denotes Dual In-Line Ceramic Package, P suffix denotes Dual In-Line Plastic Package, F suffix denotes flat package (i.e., MC10100L = Ceramic Dual In-Line Package, MC10100P = Plastic Dual In-Line Package and MC10500F = Ceramic Flat Package.)

\*External Load Power not included.

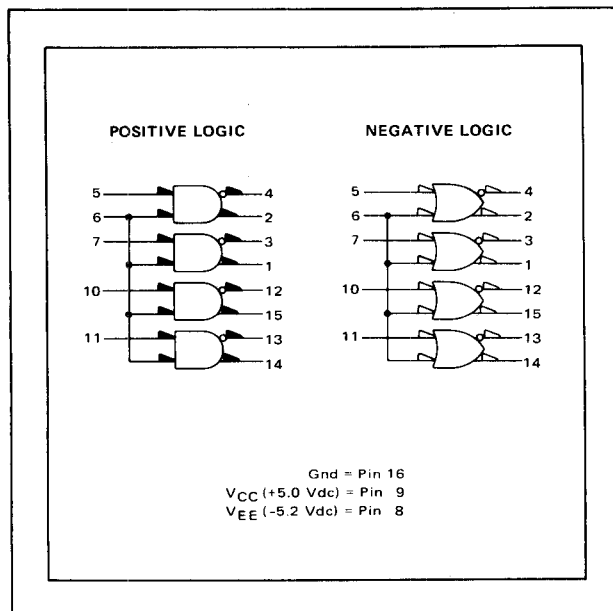
## TRANSLATORS



## RECEIVERS



# MC10124



The MC10124 is a quad translator for interfacing data and control signals between a saturated logic section and the MECL section of digital systems. The MC10124 has MTTL compatible inputs, and MECL complementary open-emitter outputs that allow use as an inverting/non-inverting translator or as a differential line driver. When the common strobe input is at the low logic level, it forces all true outputs to a MECL low logic state and all inverting outputs to a MECL high logic state.

Power supply requirements are ground, +5.0 Volts, and -5.2 Volts. Propagation delay of the MC10124 is typically 3.5 ns. The dc levels are standard or Schottky TTL in, MECL 10,000 out.

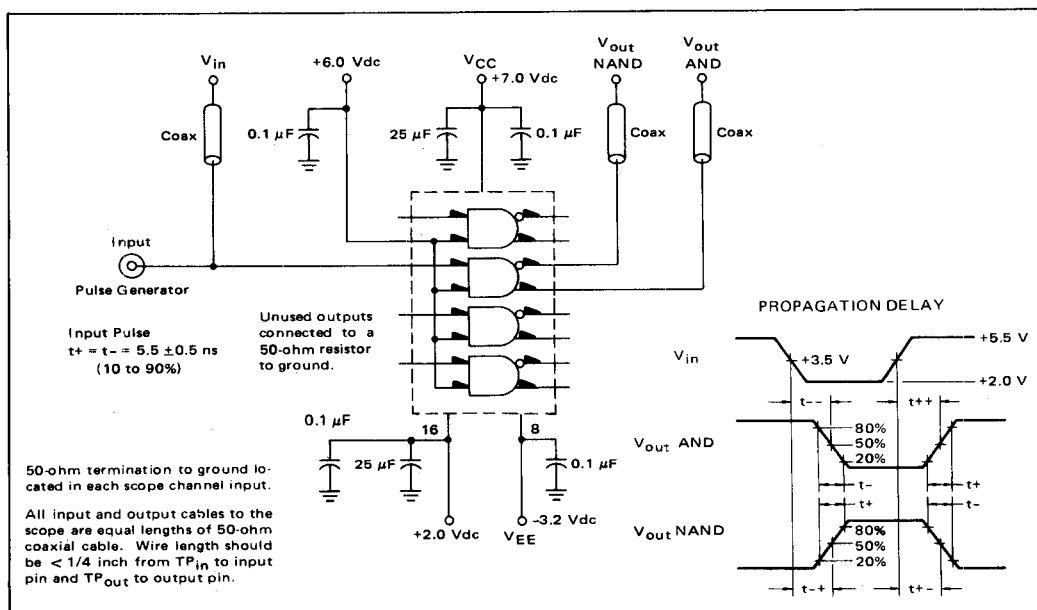
An advantage of this device is that MTTL level information can be transmitted differentially, via balanced twisted pair lines, to the MECL equipment, where the signal can be received by the MC10115 or MC10116 differential line receivers. The MC10124 is useful in computers, instrumentation, peripheral controllers, test equipment, and digital communications systems.

$P_D = 380 \text{ mW typ/pkg (No Load)}$

$t_{pd} = 3.5 \text{ ns typ (+1.5 Vdc in to 50% out)}$

Output Rise, Fall Times:  
2.5 ns typ (20% to 80%)

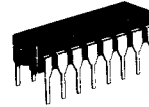
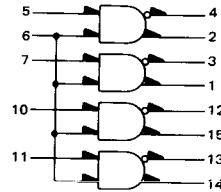
## SWITCHING TIME TEST CIRCUIT AND WAVEFORMS @ 25°C



See General Information section for packaging.

## ELECTRICAL CHARACTERISTICS

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 translator. The other translators are tested in the same manner.



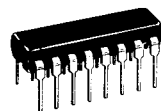
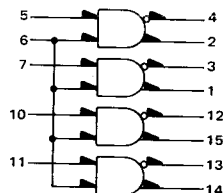
L SUFFIX  
CERAMIC PACKAGE  
CASE 620

|                                                  |                   |                |                      |        |        |     |       |        |        | TEST VOLTAGE/CURRENT VALUES                        |                     |                    |                    |                |                 |                 |                 |                |                 |                     |    |
|--------------------------------------------------|-------------------|----------------|----------------------|--------|--------|-----|-------|--------|--------|----------------------------------------------------|---------------------|--------------------|--------------------|----------------|-----------------|-----------------|-----------------|----------------|-----------------|---------------------|----|
|                                                  |                   |                |                      |        |        |     |       |        |        | Volts                                              |                     |                    |                    |                |                 |                 |                 |                |                 | mA                  |    |
|                                                  |                   |                |                      |        |        |     |       |        |        | V <sub>IH</sub>                                    | V <sub>IL</sub> max | V <sub>IHA</sub> * | V <sub>ILA</sub> * | V <sub>F</sub> | V <sub>R</sub>  | V <sub>CC</sub> | V <sub>EE</sub> | I <sub>I</sub> | I <sub>in</sub> |                     |    |
|                                                  |                   |                |                      |        |        |     |       |        |        | +4.0                                               | +0.40               | +2.00              | +1.10              | +0.40          | +2.40           | +5.00           | -5.2            | -10            | +1.0            |                     |    |
|                                                  |                   |                |                      |        |        |     |       |        |        | +4.0                                               | +0.40               | +1.80              | +1.10              | +0.40          | +2.40           | +5.00           | -5.2            | -10            | +1.0            |                     |    |
|                                                  |                   |                |                      |        |        |     |       |        |        | +4.0                                               | +0.40               | +1.80              | +0.90              | +0.40          | +2.40           | +5.00           | -5.2            | -10            | +1.0            |                     |    |
|                                                  |                   |                |                      |        |        |     |       |        |        | TEST VOLTAGE/CURRENT APPLIED TO PINS LISTED BELOW: |                     |                    |                    |                |                 |                 |                 |                |                 |                     |    |
|                                                  |                   |                |                      |        |        |     |       |        |        | V <sub>IH</sub>                                    | V <sub>IL</sub> max | V <sub>IHA</sub> * | V <sub>ILA</sub> * | V <sub>F</sub> | V <sub>R</sub>  | V <sub>CC</sub> | V <sub>EE</sub> | I <sub>I</sub> | I <sub>in</sub> | Gnd                 |    |
|                                                  |                   |                |                      |        |        |     |       |        |        |                                                    |                     |                    |                    |                |                 |                 |                 |                |                 |                     | 16 |
| Characteristic                                   | Symbol            | Pin Under Test | MC10124L Test Limits |        |        |     |       |        | Unit   |                                                    |                     |                    |                    |                |                 |                 |                 |                |                 |                     |    |
|                                                  |                   |                | -30°C                |        | +25°C  |     | +85°C |        |        |                                                    |                     |                    |                    |                |                 |                 |                 |                |                 |                     |    |
|                                                  |                   |                | Min                  | Max    | Min    | Typ | Max   | Min    | Max    |                                                    |                     |                    |                    |                |                 |                 |                 |                |                 |                     |    |
| Negative Power Supply Drain Current              | I <sub>E</sub>    | 8              | —                    | —      | —      | —   | —     | -66    | —      | mAdc                                               |                     |                    |                    |                |                 |                 |                 |                |                 |                     |    |
| Positive Power Supply Drain Current              | I <sub>CCH</sub>  | 9              | —                    | —      | —      | —   | —     | 16     | —      | mAdc                                               | 5, 6, 7, 10, 11     | —                  |                    | —              | —               | 9               | 8               | —              | —               | 16                  |    |
|                                                  | I <sub>CCL</sub>  | 9              | —                    | —      | —      | —   | —     | 25     | —      | mAdc                                               | —                   |                    | —                  | —              | —               | 9               | 8               | —              | —               | 5, 6, 7, 10, 11, 16 |    |
| Reverse Current                                  | I <sub>R</sub>    | 6              | —                    | —      | —      | —   | —     | 200    | —      | μAdc                                               | —                   | —                  | —                  | —              | 5, 7, 10, 11, 6 | 6               | 9               | 8              | —               | 16                  |    |
|                                                  |                   | 7              | —                    | —      | —      | —   | —     | 50     | —      | μAdc                                               | —                   | —                  | —                  | —              | 6               | 7               | 9               | 8              | —               | 16                  |    |
| Forward Current                                  | I <sub>F</sub>    | 6              | —                    | —      | —      | —   | —     | -12.8  | —      | mAdc                                               | 5, 7, 10, 11        | —                  | —                  | —              | 6               | —               | 9               | 8              | —               | 16                  |    |
|                                                  |                   | 7              | —                    | —      | —      | —   | —     | -3.2   | —      | mAdc                                               | 6                   | —                  | —                  | —              | 7               | —               | 9               | 8              | —               | 16                  |    |
| Input Breakdown Voltage                          | BV <sub>in</sub>  | 6              | —                    | —      | —      | —   | —     | —      | —      | Vdc                                                | —                   | —                  | —                  | —              | —               | 9               | 8               | —              | 6               | 5, 7, 10, 11, 16    |    |
|                                                  |                   | 7              | —                    | —      | —      | —   | —     | —      | —      | Vdc                                                | —                   | —                  | —                  | —              | —               | 9               | 8               | —              | 7               | 6, 16               |    |
| Clamp Input Voltage                              | V <sub>I</sub>    | 6              | —                    | —      | —      | —   | —     | -1.5   | —      | Vdc                                                | —                   | —                  | —                  | —              | —               | 9               | 8               | 6              | —               | 16                  |    |
|                                                  |                   | 7              | —                    | —      | —      | —   | —     | -1.5   | —      | Vdc                                                | —                   | —                  | —                  | —              | —               | 9               | 8               | 7              | —               | 16                  |    |
| High Output Voltage                              | V <sub>OH</sub>   | 1              | -1.060               | -0.890 | -0.960 | —   | —     | -0.810 | -0.890 | -0.700                                             | Vdc                 | 6, 7               | —                  | —              | —               | —               | 9               | 8              | —               | 16                  |    |
|                                                  |                   | 3              | -1.060               | -0.890 | -0.960 | —   | —     | -0.810 | -0.890 | -0.700                                             | Vdc                 | —                  | 6, 7               | —              | —               | —               | 9               | 8              | —               | 16                  |    |
| Low Output Voltage                               | V <sub>OL</sub>   | 1              | -1.890               | -1.675 | -1.850 | —   | —     | -1.650 | -1.825 | -1.615                                             | Vdc                 | —                  | —                  | —              | —               | —               | 9               | 8              | —               | 16                  |    |
|                                                  |                   | 3              | -1.890               | -1.675 | -1.850 | —   | —     | -1.650 | -1.825 | -1.615                                             | Vdc                 | 6, 7               | —                  | —              | —               | —               | 9               | 8              | —               | 16                  |    |
| High Threshold Voltage                           | V <sub>OHA</sub>  | 1              | -1.080               | —      | -0.980 | —   | —     | —      | -0.910 | —                                                  | Vdc                 | 6                  | —                  | 7              | —               | —               | 9               | 8              | —               | 16                  |    |
|                                                  |                   | 3              | -1.080               | —      | -0.980 | —   | —     | —      | -0.910 | —                                                  | Vdc                 | 6                  | —                  | 7              | —               | —               | 9               | 8              | —               | 16                  |    |
| Low Threshold Voltage                            | V <sub>OLA</sub>  | 1              | —                    | -1.655 | —      | —   | —     | -1.630 | —      | -1.595                                             | Vdc                 | 6                  | —                  | —              | —               | —               | 9               | 8              | —               | 16                  |    |
|                                                  |                   | 3              | —                    | -1.655 | —      | —   | —     | -1.630 | —      | -1.595                                             | Vdc                 | 6                  | —                  | —              | —               | —               | 9               | 8              | —               | 16                  |    |
| Switching Time (50:1 load)                       |                   |                |                      |        |        |     |       |        |        |                                                    | +6.0 Vdc            | Pulse In           | Pulse Out          |                |                 | +7.0 Vdc        | -3.2 Vdc        |                | +2.0 Vdc        |                     |    |
| Propagation Delay (+3.5 Vdc to 50%) <sup>①</sup> | t <sub>p+1+</sub> | 1              | 1.5                  | 6.8    | 1.5    | 3.5 | 6.0   | 1.0    | 6.0    | ns                                                 | 7                   | 6                  | 1                  | —              | —               | —               | 9               | 8              | —               | 16                  |    |
|                                                  | t <sub>p-1-</sub> | 1              | 1.0                  | 6.0    | —      | —   | —     | 1.5    | 6.8    | —                                                  | 7                   | 6                  | —                  | —              | —               | —               | —               | —              | —               | —                   |    |
|                                                  | t <sub>p+1+</sub> | 1              | 1.5                  | 6.8    | —      | —   | —     | 1.0    | 6.0    | —                                                  | 6                   | 7                  | —                  | —              | —               | —               | —               | —              | —               | —                   |    |
|                                                  | t <sub>p-1-</sub> | 1              | 1.0                  | 6.0    | —      | —   | —     | 1.5    | 6.8    | —                                                  | —                   | —                  | —                  | —              | —               | —               | —               | —              | —               | —                   |    |
|                                                  | t <sub>p+3-</sub> | 3              | 1.5                  | 6.8    | —      | —   | —     | 1.0    | 6.0    | —                                                  | —                   | —                  | 3                  | —              | —               | —               | —               | —              | —               | —                   |    |
|                                                  | t <sub>p-3+</sub> | 3              | 1.0                  | 6.0    | —      | —   | —     | 1.5    | 6.8    | —                                                  | —                   | —                  | —                  | —              | —               | —               | —               | —              | —               | —                   |    |
| Rise Time (20% to 80%)                           | t <sub>1+</sub>   | 1              | 1.0                  | 4.2    | 1.1    | 2.5 | 3.9   | 1.1    | 4.3    | —                                                  | —                   | —                  | 1                  | —              | —               | —               | —               | —              | —               | —                   |    |
| Fall Time (80% to 20%)                           | t <sub>1-</sub>   | 1              | 1.0                  | 4.2    | 1.1    | 2.5 | 3.9   | 1.1    | 4.3    | —                                                  | —                   | —                  | —                  | —              | —               | —               | —               | —              | —               | —                   |    |

① See switching time test circuit. Propagation delay for this circuit is specified from +1.5 Vdc in to the 50% point on the output waveform. The +3.5 Vdc is shown here because all logic and supply levels are shifted 2 volts positive.

## ELECTRICAL CHARACTERISTICS

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 translator. The other translators are tested in the same manner.



P SUFFIX  
PLASTIC PACKAGE  
CASE 648

② Test  
Temperature  
-30°C  
+25°C  
+85°C

|                                       |                   |   |        |        |        |     |        |        |        |      | TEST VOLTAGE/CURRENT VALUES                        |                     |                    |                    |                |                |                 |                 |                |                 |  |  |                 |
|---------------------------------------|-------------------|---|--------|--------|--------|-----|--------|--------|--------|------|----------------------------------------------------|---------------------|--------------------|--------------------|----------------|----------------|-----------------|-----------------|----------------|-----------------|--|--|-----------------|
|                                       |                   |   |        |        |        |     |        |        |        |      | Volts                                              |                     |                    |                    |                |                |                 |                 |                | mA              |  |  |                 |
|                                       |                   |   |        |        |        |     |        |        |        |      | V <sub>IH</sub>                                    | V <sub>IL max</sub> | V <sub>IHA</sub> * | V <sub>ILA</sub> * | V <sub>F</sub> | V <sub>R</sub> | V <sub>CC</sub> | V <sub>EE</sub> | I <sub>I</sub> |                 |  |  | I <sub>in</sub> |
|                                       |                   |   |        |        |        |     |        |        |        |      |                                                    |                     |                    |                    |                |                |                 |                 |                |                 |  |  |                 |
| ② Test Temperature                    |                   |   |        |        |        |     |        |        |        |      | +4.0                                               | +0.40               | +2.00              | +1.10              | +0.40          | +2.40          | +5.00           | -5.2            | -10            | +1.0            |  |  |                 |
|                                       |                   |   |        |        |        |     |        |        |        |      | +4.0                                               | +0.40               | +1.80              | +1.10              | +0.40          | +2.40          | +5.00           | -5.2            | -10            | +1.0            |  |  |                 |
|                                       |                   |   |        |        |        |     |        |        |        |      | +4.0                                               | +0.40               | +1.80              | +0.90              | +0.40          | +2.40          | +5.00           | -5.2            | -10            | +1.0            |  |  |                 |
| MC10124P Test Limits                  |                   |   |        |        |        |     |        |        |        |      | TEST VOLTAGE/CURRENT APPLIED TO PINS LISTED BELOW: |                     |                    |                    |                |                |                 |                 |                |                 |  |  |                 |
|                                       |                   |   |        |        |        |     |        |        |        |      | V <sub>IH</sub>                                    | V <sub>IL max</sub> | V <sub>IHA</sub> * | V <sub>ILA</sub> * | V <sub>F</sub> | V <sub>R</sub> | V <sub>CC</sub> | V <sub>EE</sub> | I <sub>I</sub> | I <sub>in</sub> |  |  | Gnd             |
| Negative Power Supply Drain Current   | I <sub>E</sub>    | 8 | —      | —      | —      | —   | -66    | —      | —      | mAdc | 5,6,7,10,11                                        | —                   | —                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
| Positive Power Supply Drain Current   | I <sub>CCH</sub>  | 9 | —      | —      | —      | —   | 16     | —      | —      | mAdc | —                                                  | —                   | —                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
|                                       | I <sub>CCL</sub>  | 9 | —      | —      | —      | —   | 25     | —      | —      | mAdc | —                                                  | —                   | —                  | —                  | —              | 9              | 8               | —               | —              | 5,6,7,10,11,16  |  |  |                 |
| Reverse Current                       | I <sub>R</sub>    | 6 | —      | —      | —      | —   | 200    | —      | —      | μAdc | —                                                  | —                   | —                  | —                  | 5,7,10,11      | 6              | 9               | 8               | —              | 16              |  |  |                 |
|                                       | I <sub>F</sub>    | 7 | —      | —      | —      | —   | 50     | —      | —      | μAdc | —                                                  | —                   | —                  | —                  | 6              | 7              | 9               | 8               | —              | 16              |  |  |                 |
| Forward Current                       | I <sub>F</sub>    | 6 | —      | —      | —      | —   | -12.8  | —      | —      | mAdc | 5,7,10,11                                          | —                   | —                  | —                  | 6              | —              | 9               | 8               | —              | 16              |  |  |                 |
|                                       |                   | 7 | —      | —      | —      | —   | -3.2   | —      | —      | mAdc | 6                                                  | —                   | —                  | —                  | 7              | —              | 9               | 8               | —              | 16              |  |  |                 |
| Input Breakdown Voltage               | BV <sub>in</sub>  | 6 | —      | —      | —      | 5.5 | —      | —      | —      | Vdc  | —                                                  | —                   | —                  | —                  | —              | 9              | 8               | —               | 6              | 5,7,10,11,16    |  |  |                 |
|                                       |                   | 7 | —      | —      | —      | 5.5 | —      | —      | —      | Vdc  | —                                                  | —                   | —                  | —                  | —              | 9              | 8               | —               | 7              | 6,16            |  |  |                 |
| Clamp Input Voltage                   | V <sub>I</sub>    | 6 | —      | —      | —      | —   | -1.5   | —      | —      | Vdc  | —                                                  | —                   | —                  | —                  | —              | 9              | 8               | 6               | —              | 16              |  |  |                 |
|                                       |                   | 7 | —      | —      | —      | —   | -1.5   | —      | —      | Vdc  | —                                                  | —                   | —                  | —                  | —              | 9              | 8               | 7               | —              | 16              |  |  |                 |
| High Output Voltage                   | V <sub>OH</sub>   | 1 | -1.060 | -0.890 | -0.960 | —   | -0.810 | -0.890 | -0.700 | Vdc  | 6,7                                                | —                   | —                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
|                                       |                   | 3 | -1.060 | -0.890 | -0.960 | —   | -0.810 | -0.890 | -0.700 | Vdc  | —                                                  | 6,7                 | —                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
| Low Output Voltage                    | V <sub>OL</sub>   | 1 | -1.890 | -1.675 | -1.850 | —   | -1.650 | -1.825 | -1.615 | Vdc  | —                                                  | 6,7                 | —                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
|                                       |                   | 3 | -1.890 | -1.675 | -1.850 | —   | -1.650 | -1.825 | -1.615 | Vdc  | 6,7                                                | —                   | —                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
| High Threshold Voltage                | V <sub>OH</sub> A | 1 | -1.080 | —      | -0.980 | —   | —      | -0.910 | —      | Vdc  | 6                                                  | —                   | 7                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
|                                       |                   | 3 | -1.080 | —      | -0.980 | —   | —      | -0.910 | —      | Vdc  | 6                                                  | —                   | 7                  | —                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
| Low Threshold Voltage                 | V <sub>OL</sub> A | 1 | —      | -1.655 | —      | —   | -1.630 | —      | -1.595 | Vdc  | 6                                                  | —                   | —                  | 7                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
|                                       |                   | 3 | —      | -1.655 | —      | —   | -1.630 | —      | -1.595 | Vdc  | 6                                                  | —                   | —                  | 7                  | —              | 9              | 8               | —               | —              | 16              |  |  |                 |
| Switching Time (50-11 load)           |                   |   |        |        |        |     |        |        |        |      | 46.0 Vdc                                           | Pulse In            | Pulse Out          |                    |                |                | +7.0 Vdc        | -3.2 Vdc        |                | +2.0 Vdc        |  |  |                 |
| Propagation Delay (1.3.5 Vdc to 50%)① | t <sub>g+1+</sub> | 1 | —      | —      | 1.0    | 3.5 | 6.0    | —      | —      | ns   | 7                                                  | 6                   | 1                  | —                  | —              | —              | 9               | 8               | —              | 16              |  |  |                 |
|                                       | t <sub>g-1-</sub> | ↓ | —      | —      | —      | —   | —      | —      | —      | —    | 7                                                  | 6                   | —                  | —                  | —              | —              | —               | —               | —              | —               |  |  |                 |
|                                       | t <sub>g+1+</sub> | 3 | —      | —      | —      | —   | —      | —      | —      | —    | 6                                                  | 7                   | ↓                  | —                  | —              | —              | —               | —               | —              | —               |  |  |                 |
|                                       | t <sub>g-1-</sub> | 3 | —      | —      | —      | —   | —      | —      | —      | —    | —                                                  | —                   | 3                  | —                  | —              | —              | —               | —               | —              | —               |  |  |                 |
|                                       | t <sub>g+3-</sub> | 3 | —      | —      | —      | —   | —      | —      | —      | —    | —                                                  | —                   | 3                  | —                  | —              | —              | —               | —               | —              | —               |  |  |                 |
| Rise Time (20% to 80%)                | t <sub>r+</sub>   | 1 | —      | —      | 1.1    | 2.5 | 3.9    | —      | —      | —    | —                                                  | —                   | 1                  | —                  | —              | —              | —               | —               | —              | —               |  |  |                 |
| Fall Time (80% to 20%)                | t <sub>f-</sub>   | 1 | —      | —      | 1.1    | 2.5 | 3.9    | —      | —      | —    | —                                                  | —                   | 1                  | —                  | —              | —              | —               | —               | —              | —               |  |  |                 |

① See switching time test circuit. Propagation delay for this circuit is specified from +1.5 Vdc in to the 50% point on the output waveform. The +3.5 Vdc is shown here because all logic and supply levels are shifted 2 volts positive.)