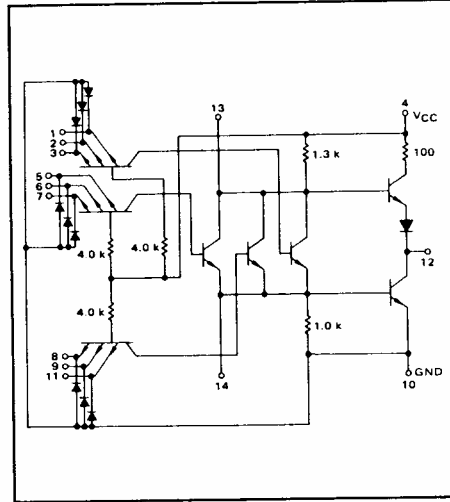


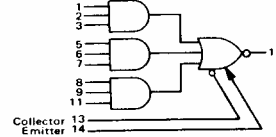
EXPANDABLE 3-WIDE 3-INPUT  
"AND-OR-INVERT" GATE

MTTL I MC500/400 series

MC504 · MC554  
MC404 · MC454



This device consists of three 3-input AND gates ORed together driving an output inverter. The common ORing nodes are available for expansion, and up to 10 AND gates can be ORed together using the MC509 or the MC510 series expanders. Care should be taken to minimize the amount of capacitance on the expander terminals in order to maintain switching speeds.



Positive Logic

$$12 - [(1 + 2 + 3) + (5 + 6 + 7) + (8 + 9 + 11)] + (\text{Expanders})$$

Negative Logic

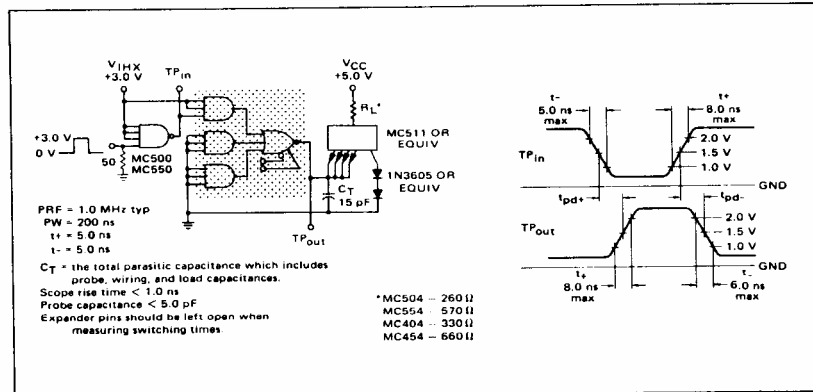
$$12 - [(1 + 2 + 3) + (5 + 6 + 7) + (8 + 9 + 11)] + (\text{Expanders})$$

Total Power Dissipation - 25 mW typ/pkg  
Propagation Delay Time - 12 ns typ

| TYPE NO.       | INPUT LOADING FACTOR (I <sub>F</sub> ) | OUTPUT DRIVE (I <sub>OL</sub> )                               | TEMPERATURE RANGE |
|----------------|--|---|-------------------|
| MC504<br>MC554 | 1 (-1.33 mA)                           | 15 MC500 series Gates (20 mA)<br>7 MC500 series Gates (10 mA) | -55°C to +125°C   |
| MC404<br>MC454 | 1 (-1.66 mA)                           | 12 MC400 series Gates (20 mA)<br>6 MC400 series Gates (10 mA) | 0° to +75°C       |

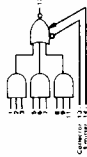
SWITCHING TIME TEST CIRCUIT

VOLTAGE WAVEFORMS AND DEFINITIONS



**ELECTRICAL CHARACTERISTICS**

Test procedures are shown for only one input of the device. To complete testing sequence through remaining inputs in the same manner.



| Characteristic              | Symbol               | Pin Under Test | MC504, MC554 Test Limits |       |       | MC404, MC454 Test Limits |       |       | TEST CONDITIONS |       |       |       |       |       |       |       |       |       |       |       | V <sub>DD</sub> | V <sub>DD</sub> |       |       |       |       |       |       |
|-----------------------------|----------------------|----------------|--------------------------|-------|-------|--------------------------|-------|-------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------|-----------------|-------|-------|-------|-------|-------|-------|
|                             |                      |                | -55°C                    |       | +25°C |                          | 0°C   |       | +25°C           |       | -55°C |       | +25°C |       | 0°C   |       | +25°C |       | -55°C |       |                 |                 | +25°C |       | 0°C   |       | +25°C |       |
|                             |                      |                | Min                      | Max   | Min   | Max                      | Min   | Max   | Min             | Max   | Min   | Max   | Min   | Max   | Min   | Max   | Min   | Max   | Min   | Max   |                 |                 | Min   | Max   | Min   | Max   | Min   | Max   |
| Input                       |                      |                |                          |       |       |                          |       |       |                 |       |       |       |       |       |       |       |       |       |       |       |                 |                 |       |       |       |       |       |       |
| Forward Current             | I <sub>F</sub>       | 1              | -1.33                    | -1.32 | -1.33 | -1.66                    | -1.66 | -1.66 | -1.66           | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66           | -1.66           | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 | -1.66 |
| Leakage Current             | I <sub>P</sub>       | 1              | 100                      | 100   | 100   | 100                      | 100   | 100   | 100             | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100             | 100             | 100   | 100   | 100   | 100   | 100   |       |
| Inverse Bias Current        | I <sub>L</sub>       | 1              | 100                      | 100   | 100   | 100                      | 100   | 100   | 100             | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100             | 100             | 100   | 100   | 100   | 100   | 100   |       |
| Breakdown Voltage           | BV <sub>pin 1</sub>  | 1              | 5.5                      | 5.5   | 5.5   | 5.5                      | 5.5   | 5.5   | 5.5             | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5             | 5.5             | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   |       |
|                             | BV <sub>pin 12</sub> | 1              | 5.5                      | 5.5   | 5.5   | 5.5                      | 5.5   | 5.5   | 5.5             | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 5.5             | 5.5             | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   |       |
| Output                      |                      |                |                          |       |       |                          |       |       |                 |       |       |       |       |       |       |       |       |       |       |       |                 |                 |       |       |       |       |       |       |
| Output Voltage              | V <sub>out 12</sub>  | 12             | 0.45                     | 0.45  | 0.45  | 0.45                     | 0.45  | 0.45  | 0.45            | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45            | 0.45            | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  |       |
|                             | V <sub>out 13</sub>  | 13             | 2.5                      | 2.4   | 2.7   | 2.5                      | 2.4   | 2.5   | 2.4             | 2.5   | 2.4   | 2.5   | 2.4   | 2.5   | 2.4   | 2.5   | 2.4   | 2.5   | 2.4   | 2.5   | 2.4             | 2.5             | 2.4   | 2.5   | 2.4   | 2.5   | 2.4   |       |
| Leakage Current             | I <sub>OLK</sub>     | 12             | 250                      | 250   | 250   | 250                      | 250   | 250   | 250             | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250   | 250             | 250             | 250   | 250   | 250   | 250   | 250   |       |
| Short-Circuit Current       | I <sub>SC</sub>      | 12             | 10                       | 10    | 10    | 10                       | 10    | 10    | 10              | 10    | 10    | 10    | 10    | 10    | 10    | 10    | 10    | 10    | 10    | 10    | 10              | 10              | 10    | 10    | 10    | 10    | 10    | 10    |
| Setup* Voltage              | V <sub>DC</sub>      | 12             | 0.45                     | 0.45  | 0.45  | 0.45                     | 0.45  | 0.45  | 0.45            | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45            | 0.45            | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  | 0.45  |
|                             | V <sub>OH</sub>      | 12             | 2.1                      | 3.2   | 3.35  | 3.0                      | 3.1   | 3.15  | 3.1             | 3.15  | 3.1   | 3.15  | 3.1   | 3.15  | 3.1   | 3.15  | 3.1   | 3.15  | 3.1   | 3.15  | 3.1             | 3.15            | 3.1   | 3.15  | 3.1   | 3.15  | 3.1   | 3.15  |
| Power Requirements          |                      |                |                          |       |       |                          |       |       |                 |       |       |       |       |       |       |       |       |       |       |       |                 |                 |       |       |       |       |       |       |
| Total Device Supply Current | I <sub>DD</sub>      | 4              | -                        | 10    | -     | -                        | -     | -     | -               | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -               | -               | -     | -     | -     | -     | -     | -     |
| Power Supply Delay          | t <sub>PLH</sub>     | 4              | 0                        | 0     | 0     | 0                        | 0     | 0     | 0               | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0               | 0               | 0     | 0     | 0     | 0     | 0     | 0     |
|                             | t <sub>PLL</sub>     | 4              | 0                        | 0     | 0     | 0                        | 0     | 0     | 0               | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0               | 0               | 0     | 0     | 0     | 0     | 0     | 0     |
| Switching Parameters        |                      |                |                          |       |       |                          |       |       |                 |       |       |       |       |       |       |       |       |       |       |       |                 |                 |       |       |       |       |       |       |
| Turn-On Delay               | t <sub>pd</sub>      | 1,12           | -                        | 22    | -     | -                        | -     | -     | -               | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -               | -               | -     | -     | -     | -     | -     | -     |
| Turn-Off Delay              | t <sub>ps</sub>      | 1,12           | -                        | 22    | -     | -                        | -     | -     | -               | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -               | -               | -     | -     | -     | -     | -     | -     |
| Rise Time                   | t <sub>r</sub>       | 1,12           | -                        | 5     | -     | -                        | -     | -     | -               | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -               | -               | -     | -     | -     | -     | -     | -     |
| Fall Time                   | t <sub>f</sub>       | 1,12           | -                        | 6.0   | -     | -                        | -     | -     | -               | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -     | -               | -               | -     | -     | -     | -     | -     | -     |

\* Prime Fall-Out