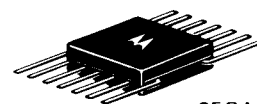


MC2000 Series (0 to +75°C)

MC2100 Series (-55 to +125°C)

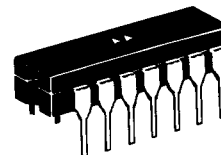
MTTL II integrated circuits comprise a family of transistor-transistor logic designed for general purpose digital applications. The family has a high operating speed (30-50 MHz clock rate), good external noise immunity, high fan out, and the capability of driving capacitive loads to 600 pF.



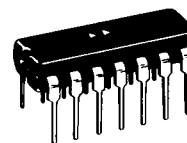
F SUFFIX
CERAMIC FLAT PACKAGE
CASE 607

MAXIMUM RATINGS

| Rating | Value | Unit |
|--|----------------------------|-----------------|
| Supply Voltage-Continuous — MC2100 Series MC2000 Series | +8.0 +7.0 | V _{dc} |
| Supply Operating Voltage Range | 4.5 to 6.0 | V _{dc} |
| Input Voltage | +5.5 | V _{dc} |
| Output Voltage | +5.5 | V _{dc} |
| Operating Temperature Range — MC2100 Series MC2000 Series | -55 to +125 0 to +75 | °C |
| Storage Temperature Range — Ceramic Package — Plastic Package | -65 to +150 -55 to +125 | °C |
| Maximum Junction Temperature — MC2100 Series MC2000 Series | +175 +150 | °C |
| Thermal Resistance-Junction to Case (θ_{JC}) — Ceramic Package — Plastic Package | 0.09 0.15 | °C/mW |
| Thermal Resistance-Junction to Ambient (θ_{JA}) — Ceramic Package — Plastic Package | 0.26 0.30 | °C/mW |



L SUFFIX
CERAMIC PACKAGE
CASE 632
TO-116



P SUFFIX
PLASTIC PACKAGE
CASE 646

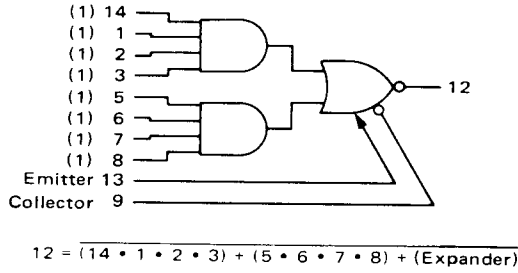
FUNCTIONS AND CHARACTERISTICS (V_{CC} = 5.0 V, T_A = 25°C)

| Function | Type ① | | Loading Factor Each Output | | Propagation Delay ns typ | Power Dissipation mW typ/pkg |
|--|---|-----------------------------------|-------------------------------|------------------|--------------------------------|---------------------------------------|
| | Case 607, 632, 646 0 to +75°C | Case 607, 632 -55 to +125°C | MC2000 Series | MC2100 Series | | |
| | Expandable 2-Wide 4-Input AND-OR-INVERT Gate | MC2000 MC2050 | MC2100 MC2150 | 9 5 | 11 6 | 7.0 |
| Quad 2-Input NAND Gate | MC2001 MC2051 | MC2101 MC2151 | 9 5 | 11 6 | 6.0 | 88 |
| 4-Wide 3-2-2-3 Input Expander for AND-OR-INVERT Gates | MC2002 MC2052 | MC2102 MC2152 | 9 5 | 11 6 | — | 28 |
| Dual 4-Input NAND Gate | MC2003 MC2053 | MC2103 MC2153 | 9 5 | 11 6 | 6.0 | 44 |
| Expandable 4-Wide 2-2-2-3 Input AND-OR-INVERT Gate | MC2004 MC2054 | MC2104 MC2154 | 9 5 | 11 6 | 7.0 | 36 |
| 8-Input NAND Gate | MC2005 MC2055 | MC2105 MC2155 | 9 5 | 11 6 | 8.0 | 22 |
| Dual 4-Input Expander for AND-OR-INVERT Gates | MC2006 MC2056 | MC2106 MC2156 | 9 5 | 11 6 | — | 14 |
| Triple 3-Input NAND Gate | MC2007 MC2057 | MC2107 MC2157 | 9 5 | 11 6 | 6.0 | 66 |
| Expandable 8-Input NAND Gate | MC2011 MC2061 | MC2111 MC2161 | 9 9 | 11 6 | 11 | 22 |
| Expandable 3-Wide 3-Input AND-OR-INVERT Gate | MC2012 MC2062 | MC2112 MC2162 | 9 5 | 11 6 | 6.0 | 39 |
| Expandable Dual 2-Wide 2-Input AND-OR-INVERT Gate | MC2013 MC2063 | MC2113 MC2163 | 9 5 | 11 6 | 7.0 | 58 |
| Quad 2-Input Lamp/ Line Driver (open collector) | — MC2065 | — MC2165 | — 24 | — 30 | 20 | 105 |
| Hex Inverter | MC2016 MC2066 | MC2116 MC2166 | 5 5 | 9 9 | 6.0 | 132 |
| Quad 2-Input Lamp/Line Driver | MC2018 MC2068 | MC2118 MC2168 | 40MA 20MA | 40MA 20MA | 10.0 | 90 |
| Dual J-K Flip-Flop (separate clock) | MC2023 MC2073 | MC2123 MC2173 | 9 5 | 11 6 | f = 70 MHz | 110 |
| Dual J-K Flip-Flop (common clock) | MC2024 MC2074 | MC2124 MC2174 | 9 5 | 11 6 | f = 70 MHz | 110 |
| AND J-K Flip-Flop | MC2025 MC2075 | MC2125 MC2175 | 9 5 | 11 6 | f = 50 MHz | 50 |
| OR J-K Flip-Flop | MC2026 MC2076 | MC2126 MC2176 | 9 5 | 11 6 | f = 50 MHz | 60 |
| OR J-K Flip-Flop | MC2028 MC2078 | MC2128 MC2178 | 9 5 | 11 6 | f = 35 MHz | 60 |

① F suffix denotes Flat Package, L denotes Dual In-Line Ceramic Package, P denotes Plastic Package, (i.e., MC2000F = Flat Package, MC2100L = Dual In-Line Ceramic, MC2000P = Plastic Package.)

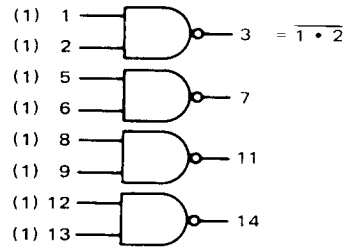
GATES

**MC2000/MC2050
MC2100/MC2150
Expandable 2-Wide 4-Input
AND-OR-INVERT Gate**



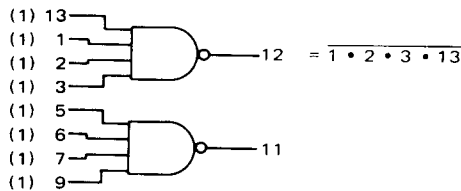
$t_{pd} = 7.0 \text{ ns typ}$
 $P_D = 27 \text{ mW typ/pkg}$

**MC2001/MC2051
MC2101/MC2151
Quad 2-Input NAND Gate**



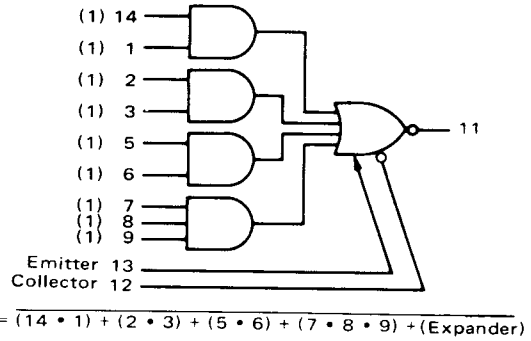
$t_{pd} = 6.0 \text{ ns typ}$
 $P_D = 88 \text{ mW typ/pkg}$

**MC2003/MC2053
MC2103/MC2153
Dual 4-Input NAND Gate**



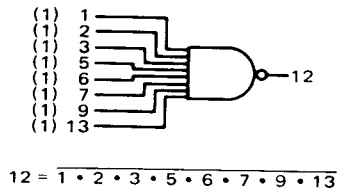
$t_{pd} = 6.0 \text{ ns typ}$
 $P_D = 44 \text{ mW typ/pkg}$

**MC2004/MC2054
MC2104/MC2154
Expandable 4-Wide 2-2-2-3 Input
AND-OR-INVERT Gate**



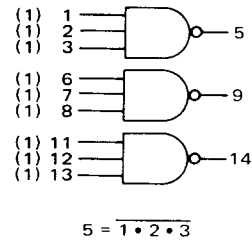
$t_{pd} = 7.0 \text{ ns typ}$
 $P_D = 36 \text{ mW typ/pkg}$

**MC2005/MC2055
MC2105/MC2155
8-Input NAND Gate**



$t_{pd} = 8.0 \text{ ns typ}$
 $P_D = 22 \text{ mW typ/pkg}$

**MC2007/MC2057
MC2107/MC2157
Triple 3-Input NAND Gate**



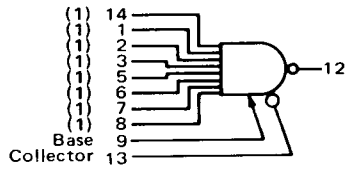
$t_{pd} = 6.0 \text{ ns typ}$
 $P_D = 66 \text{ mW typ/pkg}$

Numbers at ends of terminals represent pin numbers.
 Numbers in parenthesis indicate input loading factor.
 For output loading capability, see Functions and Characteristics table.

V_{CC} = Pin 4, Gnd = Pin 10.

GATES (continued)

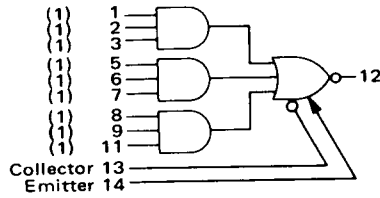
**MC2011/MC2061
 MC2111/MC2161**
 Expandable 8-Input
 NAND Gate



$$12 = 1 \cdot 2 \cdot 3 \cdot 5 \cdot 6 \cdot 7 \cdot 8 \cdot 14 \cdot \text{Exp}$$

$t_{pd} = 11 \text{ ns typ}$
 $P_D = 22 \text{ mW typ/pkg}$

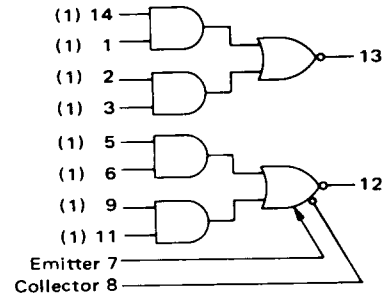
**MC2012/MC2062
 MC2112/MC2162**
 Expandable 3-Wide 3-Input
 AND-OR-INVERT Gate



$$12 = (1 \cdot 2 \cdot 3) + (5 \cdot 6 \cdot 7) + (8 \cdot 9 \cdot 11) + \text{Exp}$$

$t_{pd} = 6.0 \text{ ns typ}$
 $P_D = 39 \text{ mW typ/pkg}$

**MC2013/MC2063
 MC2113/MC2163**
 Expandable Dual 2-Wide 2-Input
 AND-OR-INVERT Gate



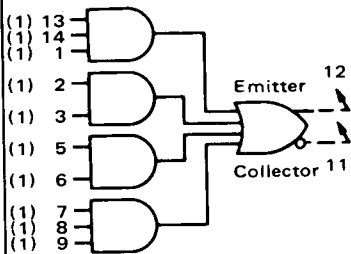
$$13 = (1 \cdot 14) + (2 \cdot 3)$$

$$12 = (5 \cdot 6) + (9 \cdot 11) + (\text{Expander})$$

$t_{pd} = 7.0 \text{ ns typ}$
 $P_D = 58 \text{ mW typ/pkg}$

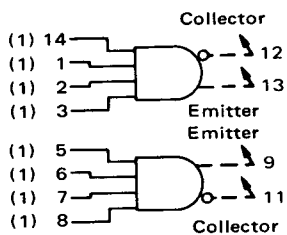
EXPANDERS

**MC2002/MC2052
 MC2102/MC2152**
 4-Wide 3-2-2-3 Input Expander
 for AND-OR-INVERT Gates



$P_D = 28 \text{ mW typ/pkg}$

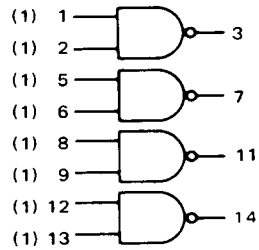
**MC2006/MC2056
 MC2106/MC2156**
 Dual 4-Input Expander for
 AND-OR-INVERT Gates



$P_D = 14 \text{ mW typ/pkg}$

DRIVER

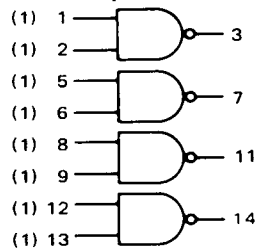
**MC2018/MC2068
 MC2118/MC2168**
 Quad 2-Input Lamp Driver



$$3 = 1 \cdot 2$$

$t_{pd} = 20 \text{ ns typ}$
 $P_D = 105 \text{ mW typ/pkg}$

MC2165/MC2065
 Quad 2-Input Lamp/Line
 Driver (open collector)

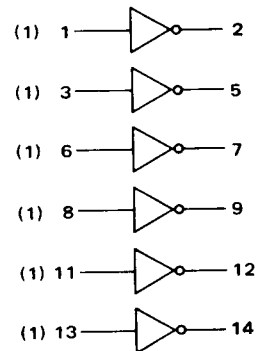


$$3 = 1 \cdot 2$$

$t_{pd} = 20 \text{ ns typ}$
 $P_D = 105 \text{ mW typ/pkg}$

INVERTER

**MC2016/MC2066
 MC2116/MC2166**
 Hex Inverter

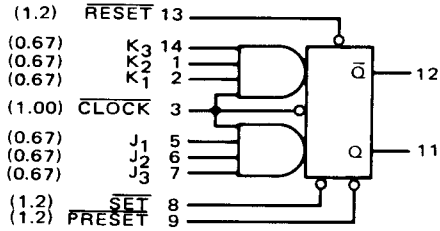


$$2 = \bar{1}$$

$t_{pd} = 6.0 \text{ ns typ}$
 $P_D = 132 \text{ mW typ/pkg}$

FLIP-FLOPS

MC2025/MC2075, MC2125/MC2175 AND J-K Flip-Flop



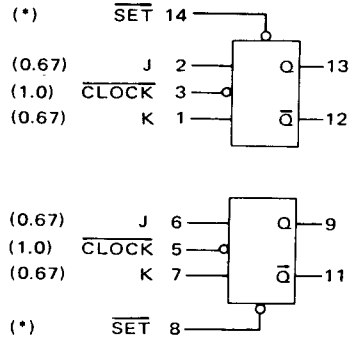
| J | K | Q _n | Q _{n+1} |
|---|---|----------------|------------------|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

$$J = J_1 \cdot J_2 \cdot J_3$$

$$K = K_1 \cdot K_2 \cdot K_3$$

f = 50 MHz typ
P_D = 50 mW typ/pkg

MC2023/MC2073 MC2123/MC2173 Dual J-K Flip-Flop (Separate Clock)

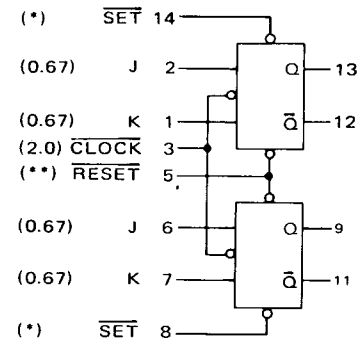


| t _n | | t _{n+1} | |
|----------------|---|------------------|-----------------|
| J | K | Q | Q̄ |
| 0 | 0 | Q _n | Q̄ _n |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | Q̄ _n | Q _n |

MC2000 Series
*1.15
MC2100 Series
*1.2

f = 70 MHz typ
P_D = 110 mW typ/pkg

MC2024/MC2074 MC2124/MC2174 Dual J-K Flip-Flop (Common Clock)

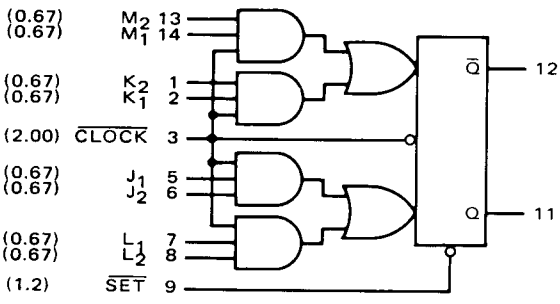


| t _n | | t _{n+1} | |
|----------------|---|------------------|-----------------|
| J | K | Q | Q̄ |
| 0 | 0 | Q _n | Q̄ _n |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | Q̄ _n | Q _n |

MC2000 Series
*1.15
*2.3
MC2100 Series
*1.2
*2.4

f = 70 MHz typ
P_D = 110 mW typ/pkg

MC2026/MC2076, MC2126/MC2176 OR J-K Flip-Flop



| J | L | K | M | Q _n | Q _{n+1} |
|---|---|---|---|----------------|------------------|
| 0 | 0 | X | X | 0 | 0 |
| 1 | X | X | X | 0 | 1 |
| X | 1 | X | X | 0 | 1 |
| X | X | 0 | 0 | 1 | 1 |
| X | X | 1 | X | 1 | 0 |
| X | X | X | 1 | 1 | 0 |

X = Don't Care

$$J = J_1 \cdot J_2$$

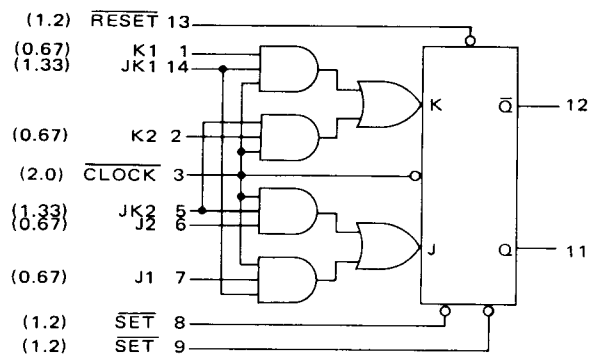
$$L = L_1 \cdot L_2$$

$$K = K_1 \cdot K_2$$

$$M = M_1 \cdot M_2$$

f = 50 MHz typ
P_D = 60 mW typ/pkg

MC2028/MC2078 MC2128/MC2178 OR J-K FLIP-FLOP



| J1 | J2 | K1 | K2 | JK1 | JK2 | Q _{n+1} |
|----|----|----|----|-----|-----|------------------|
| X | X | X | X | 0 | 0 | Q _n |
| X | 1 | X | 0 | 0 | 1 | 1 |
| X | 0 | X | 1 | 0 | 1 | 0 |
| X | 1 | X | 1 | 0 | 1 | Q _n |
| 1 | X | 0 | X | 1 | 0 | 1 |
| 0 | X | 1 | X | 1 | 0 | 0 |
| 1 | X | 1 | X | 1 | 0 | Q _n |
| 0 | 0 | 0 | 0 | 1 | 1 | Q _n |
| X | 1 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | X | 1 | 1 | 1 | 0 |
| 0 | 0 | 1 | X | 1 | 1 | 0 |
| 1 | X | 1 | X | 1 | 1 | Q _n |
| X | 1 | X | 1 | 1 | 1 | Q _n |

X = Don't Care f = 35 MHz typ
P_D = 60 mW typ/pkg