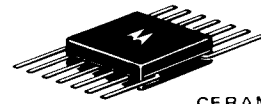


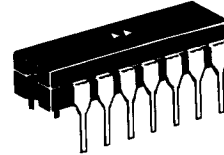
MC2000 Series (0 to +75°C)

MC2100 Series (-55 to +125°C)

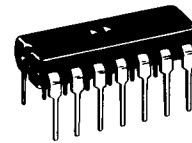
MTTL II integrated circuits comprise a family of transistor-transistor logic designed for general purpose digital applications. The family has a high operating speed (30-50 MHz clock rate), good external noise immunity, high fan out, and the capability of driving capacitive loads to 600 pF.



F SUFFIX  
CERAMIC FLAT PACKAGE  
CASE 607



L SUFFIX  
CERAMIC PACKAGE  
CASE 632  
TO-116



P SUFFIX  
PLASTIC PACKAGE  
CASE 646

### MAXIMUM RATINGS

Rating	Value	Unit
Supply Voltage-Continuous — MC2100 Series MC2000 Series	+8.0 +7.0	V <sub>dc</sub>
Supply Operating Voltage Range	4.5 to 6.0	V <sub>dc</sub>
Input Voltage	+5.5	V <sub>dc</sub>
Output Voltage	+5.5	V <sub>dc</sub>
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 ( $\theta_{JC}$ ) — Ceramic Package — Plastic Package	0.09 0.15	°C/mW
Thermal Resistance-Junction to Ambient ( $\theta_{JA}$ ) — Ceramic Package — Plastic Package	0.26 0.30	°C/mW

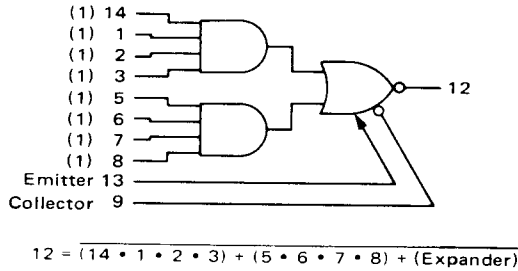
### FUNCTIONS AND CHARACTERISTICS (V<sub>CC</sub> = 5.0 V, T<sub>A</sub> = 25°C)

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		
	MC2000 MC2050	MC2100 MC2150				
Expandable 2-Wide 4-Input AND-OR-INVERT Gate	MC2000	MC2100	9	11	7.0	27
	MC2050	MC2150	5	6		
Quad 2-Input NAND Gate	MC2001	MC2101	9	11	6.0	88
	MC2051	MC2151	5	6		
4-Wide 3-2-2-3 Input Expander for AND-OR-INVERT Gates	MC2002	MC2102	9	11	—	28
	MC2052	MC2152	5	6		
Dual 4-Input NAND Gate	MC2003	MC2103	9	11	6.0	44
	MC2053	MC2153	5	6		
Expandable 4-Wide 2-2-2-3 Input AND-OR-INVERT Gate	MC2004	MC2104	9	11	7.0	36
	MC2054	MC2154	5	6		
8-Input NAND Gate	MC2005	MC2105	9	11	8.0	22
	MC2055	MC2155	5	6		
Dual 4-Input Expander for AND-OR-INVERT Gates	MC2006	MC2106	9	11	—	14
	MC2056	MC2156	5	6		
Triple 3-Input NAND Gate	MC2007	MC2107	9	11	6.0	66
	MC2057	MC2157	5	6		
Expandable 8-Input NAND Gate	MC2011	MC2111	9	11	11	22
	MC2061	MC2161	9	6		
Expandable 3-Wide 3-Input AND-OR-INVERT Gate	MC2012	MC2112	9	11	6.0	39
	MC2062	MC2162	5	6		
Expandable Dual 2-Wide 2-Input AND-OR-INVERT Gate	MC2013	MC2113	9	11	7.0	58
	MC2063	MC2163	5	6		
Quad 2-Input Lamp/ Line Driver (open collector)	—	—	—	—	20	105
	MC2065	MC2165	24	30		
Hex Inverter	MC2016	MC2116	5	9	6.0	132
	MC2066	MC2166	5	9		
Quad 2-Input Lamp/Line Driver	MC2018	MC2118	40MA	40MA	10.0	90
	MC2068	MC2168	20MA	20MA		
Dual J-K Flip-Flop (separate clock)	MC2023	MC2123	9	11	f = 70 MHz	110
	MC2073	MC2173	5	6		
Dual J-K Flip-Flop (common clock)	MC2024	MC2124	9	11	f = 70 MHz	110
	MC2074	MC2174	5	6		
AND J-K Flip-Flop	MC2025	MC2125	9	11	f = 50 MHz	50
	MC2075	MC2175	5	6		
OR J-K Flip-Flop	MC2026	MC2126	9	11	f = 50 MHz	60
	MC2076	MC2176	5	6		
OR J-K Flip-Flop	MC2028	MC2128	9	11	f = 35 MHz	60
	MC2078	MC2178	5	6		

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.)

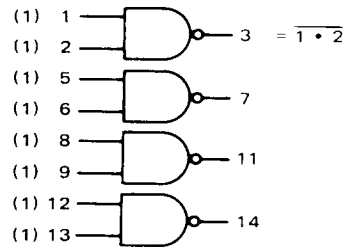
# GATES

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



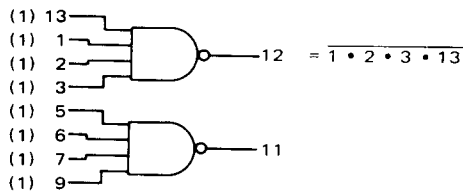
$t_{pd} = 7.0 \text{ ns typ}$   
 $P_D = 27 \text{ mW typ/pkg}$

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



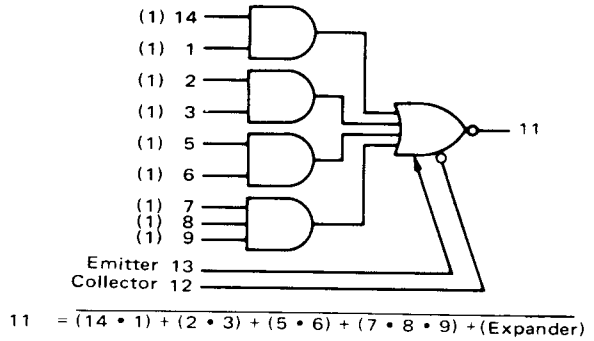
$t_{pd} = 6.0 \text{ ns typ}$   
 $P_D = 88 \text{ mW typ/pkg}$

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



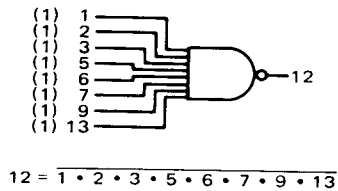
$t_{pd} = 6.0 \text{ ns typ}$   
 $P_D = 44 \text{ mW typ/pkg}$

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



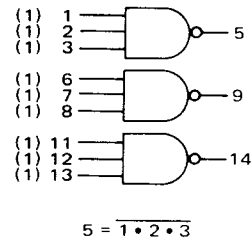
$t_{pd} = 7.0 \text{ ns typ}$   
 $P_D = 36 \text{ mW typ/pkg}$

**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**



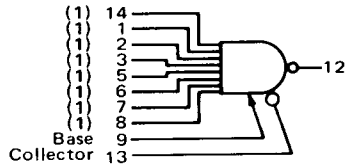
$t_{pd} = 6.0 \text{ ns typ}$   
 $P_D = 66 \text{ mW typ/pkg}$

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<sub>CC</sub> = Pin 4, Gnd = Pin 10.

## GATES (continued)

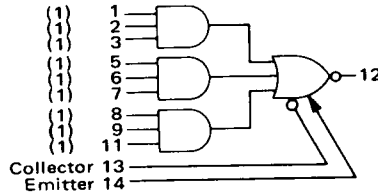
**MC2011/MC2061  
 MC2111/MC2161  
 Expandable 8-Input  
 NAND Gate**



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

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

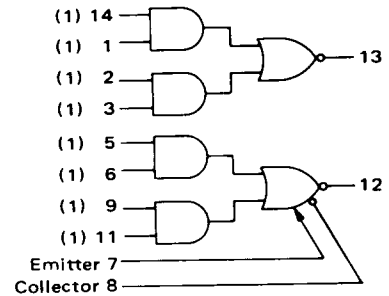
**MC2012/MC2062  
 MC2112/MC2162  
 Expandable 3-Wide 3-Input  
 AND-OR-INVERT Gate**



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

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

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



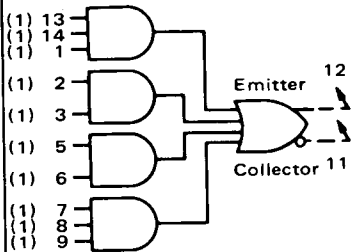
$$13 = (1 \cdot 14) + (2 \cdot 3)$$

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

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

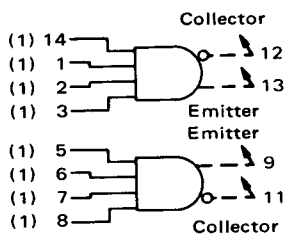
## EXPANDERS

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



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

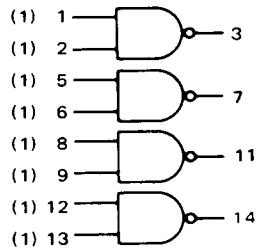
**MC2006/MC2056  
 MC2106/MC2156  
 Dual 4-Input Expander for  
 AND-OR-INVERT Gates**



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

## DRIVER

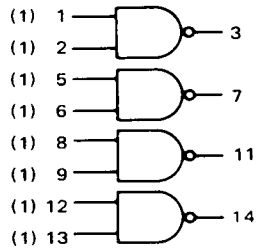
**MC2018/MC2068  
 MC2118/MC2168  
 Quad 2-Input Lamp Driver**



$$3 = 1 \cdot 2$$

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

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

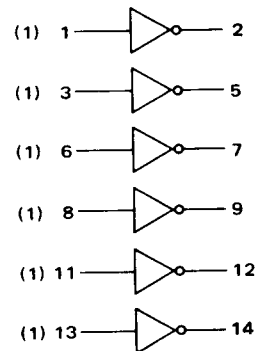


$$3 = 1 \cdot 2$$

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

## INVERTER

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

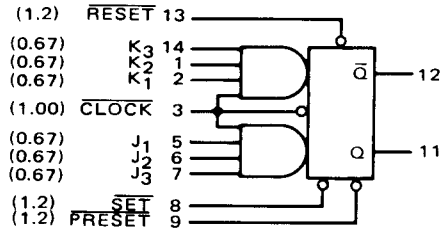


$$2 = \bar{1}$$

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

# FLIP-FLOPS

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



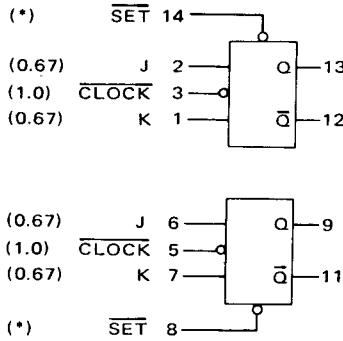
J	K	Q <sub>n</sub>	Q <sub>n+1</sub>
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

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

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

f = 50 MHz typ  
P<sub>D</sub> = 50 mW typ/pkg

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



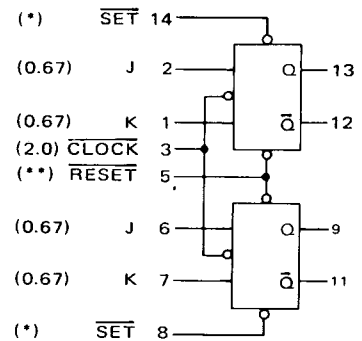
t <sub>n</sub>		t <sub>n+1</sub>	
J	K	Q	Q̄
0	0	Q <sub>n</sub>	Q̄ <sub>n</sub>
0	1	0	1
1	0	1	0
1	1	Q̄ <sub>n</sub>	Q <sub>n</sub>

MC2000 Series  
\*1.15

MC2100 Series  
\*1.2

f = 70 MHz typ  
P<sub>D</sub> = 110 mW typ/pkg

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



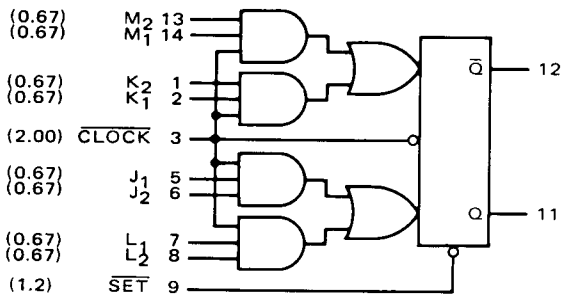
t <sub>n</sub>		t <sub>n+1</sub>	
J	K	Q	Q̄
0	0	Q <sub>n</sub>	Q̄ <sub>n</sub>
0	1	0	1
1	0	1	0
1	1	Q̄ <sub>n</sub>	Q <sub>n</sub>

MC2000 Series  
\*1.15

MC2100 Series  
\*1.2

f = 70 MHz typ  
P<sub>D</sub> = 110 mW typ/pkg

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



J	L	K	M	Q <sub>n</sub>	Q <sub>n+1</sub>
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

$$J = J_1 \cdot J_2$$

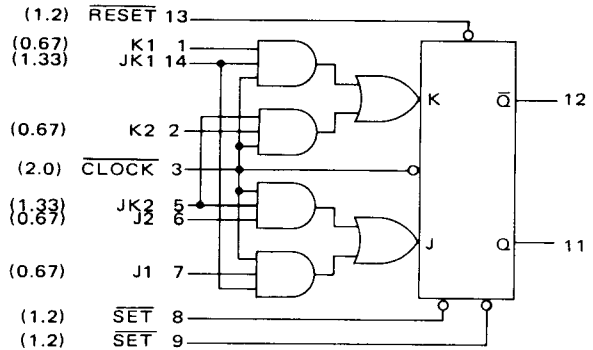
$$L = L_1 \cdot L_2$$

$$K = K_1 \cdot K_2$$

$$M = M_1 \cdot M_2$$

f = 50 MHz typ  
P<sub>D</sub> = 60 mW typ/pkg

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



J1	J2	K1	K2	JK1	JK2	Q <sub>n+1</sub>
X	X	X	X	0	0	Q <sub>n</sub>
X	1	X	0	0	1	1
X	0	X	1	0	1	0
X	1	X	1	0	1	Q <sub>n</sub>
1	X	0	X	1	0	1
0	X	1	X	1	0	0
1	X	1	X	1	0	Q <sub>n</sub>
0	0	0	0	1	1	Q <sub>n</sub>
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 <sub>n</sub>
X	1	X	1	1	1	Q <sub>n</sub>

X = Don't Care

f = 35 MHz typ  
P<sub>D</sub> = 60 mW typ/pkg