

MC830 Series (0 to +75°C)

MC930 Series (-55 to +125°C)

ISSUE A

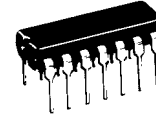
### MAXIMUM RATINGS

| Rating   | Value       | Unit |
|--|-------------|------|
| Supply Voltage —                               |             | Vdc  |
| Operating                                      | 4.5 to 5.5  |      |
| Continuous                                     | 8.0         |      |
| Pulsed, < 1 second                             | 12          |      |
| Output Current (Into Outputs with Outputs Low) |             | mAdc |
| Buffers, Power Gates — Continuous              | 100         |      |
| Pulsed, < 30 ms                                | 300         |      |
| All other types — Continuous                   | 30          |      |
| Pulsed, < 30 ms                                | 90          |      |
| Input Forward Current —                        |             | mAdc |
| Continuous                                     | -10         |      |
| Pulsed, < 30 ms                                | -30         |      |
| or   |             | Vdc  |
| Negative Voltage at Input —                    |             |      |
| Continuous                                     | -0.5        |      |
| Pulsed, < 30 ms                                | -1.5        |      |
| Input Reverse Current                          | 1.0         | mAdc |
| or   |             | Vdc  |
| Positive Voltage at Diode Input                | 5.5         |      |
| Operating Temperature Range                    |             | °C   |
| MC930 Series                                   | -55 to +125 |      |
| MC830 Series                                   | 0 to +75    |      |
| Storage Temperature Range                      |             | °C   |
| Metal Can, Ceramic Package                     | -65 to +150 |      |
| Plastic Package                                | -55 to +125 |      |
| Maximum Junction Temperature                   |             | °C   |
| MC930 Series                                   | 175         |      |
| MC830 Series                                   | 150         |      |

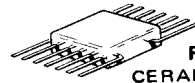
MDTL integrated circuits provide an excellent balance of speed, power dissipation, and noise immunity for general purpose digital applications. The line includes many multifunction types. Additional logic power is provided by the "wired OR" capability of the basic MDTL gate.



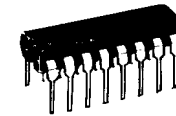
**G SUFFIX**  
METAL PACKAGE  
CASE 603-02  
TO-100



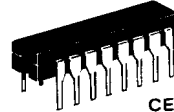
**P SUFFIX**  
PLASTIC PACKAGE  
CASE 646



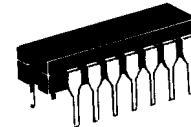
**F SUFFIX**  
CERAMIC PACKAGE  
CASE 607



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 648



**L SUFFIX**  
CERAMIC PACKAGE  
CASE 620



**L SUFFIX**  
CERAMIC PACKAGE  
CASE 632  
TO-116

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

| Function  | Type ①<br>0 to<br>+75°C | Case            | Type ①<br>-55 to<br>+125°C | Case        | Loading<br>Factor<br>Each<br>Output | Propaga-<br>tion<br>Delay<br>ns typ | Power<br>Dissipation<br>mW<br>typ/pkg |
|---|-------------------------|-----------------|----------------------------|-------------|-------------------------------------|-------------------------------------|---------------------------------------|
| Expandable Dual 4 Input NAND Gate   | MC830                   | 607,632,646     | MC930                      | 607,632     | 8                                   | 30                                  | 22                                    |
| Expandable Dual 3 2 Input NAND Gate   | MC830                   | 603             | MC930                      | 603         | 8                                   | 30                                  | 22                                    |
| Expandable Dual 4 Input Buffer  | MC832                   | 607,632,646     | MC932                      | 607,632     | 25                                  | 35                                  | 85                                    |
| Expandable Dual 3 2 Input Buffer  | MC832                   | 603             | MC932                      | 603         | 25                                  | 35                                  | 85                                    |
| Dual 4 Input Expander   | MC833                   | 607,632,646     | MC933                      | 607,632     | —                                   | —                                   | —                                     |
| Dual 4 3 Input Expander   | MC833                   | 603             | MC933                      | 603         | —                                   | —                                   | —                                     |
| Hex Inverter  | MC834                   | 607,632,646     | MC934                      | 607,632     | 8                                   | 30                                  | 66                                    |
| Hex Inverter (without output resistors)   | MC835                   | 607,632,646     | MC935                      | 607,632     | 8                                   | 30                                  | 42                                    |
| Hex Inverter  | MC836                   | 607,632,646     | MC936                      | 607,632     | 8                                   | 30                                  | 66                                    |
| Hex Inverter  | MC837                   | 607,632,646     | MC937                      | 607,632     | 7                                   | 25                                  | 90                                    |
| Decade Counter  | MC838                   | 607,632,646     | MC938                      | 607,632     | 8                                   | 30 MHz ③                            | 150                                   |
| Divide-by-Sixteen Counter   | MC839                   | 607,632,646     | MC939                      | 607,632     | 8                                   | 30 MHz ③                            | 150                                   |
| Hex Inverter (without input diodes)   | MC840                   | 607,632,646     | MC940                      | 607,632     | 8                                   | 30                                  | 66                                    |
| Hex Inverter (without output resistors and input diodes)                        | MC841                   | 607,632,646     | MC941                      | 607,632     | 8                                   | 30                                  | 42                                    |
| Expandable Dual 4 Input Power Gate  | MC844                   | 607,632,646     | MC944                      | 607,632     | 27                                  | 30                                  | 65                                    |
| Expandable Dual 3 2 Input Power Gate  | MC844                   | 603             | MC944                      | 603         | 27                                  | 30                                  | 65                                    |
| Clocked Flip-Flop   | MC845                   | 603,607,632,646 | MC945                      | 603,607,632 | 12/10 ②                             | 40                                  | 60                                    |
| Quad 2-Input NAND Gate  | MC846                   | 607,632,646     | MC946                      | 607,632     | 8                                   | 30                                  | 44                                    |
| Quad Inverter   | MC846                   | 603             | MC946                      | 603         | 8                                   | 30                                  | 44                                    |
| Quad 2-Input Gate Expander  | MC847                   | 607,632,646     | MC947                      | 607,632     | —                                   | —                                   | —                                     |
| Clocked Flip-Flop   | MC848                   | 603,607,632,646 | MC948                      | 603,607,632 | 11/9 ②                              | 40                                  | 70                                    |
| Quad 2-Input NAND Gate (2 k pullup resistor)                                    | MC849                   | 607,632,646     | MC949                      | 607,632     | 7                                   | 25                                  | 66                                    |
| Quad Inverter (2 k pullup resistor)   | MC849                   | 603             | MC949                      | 603         | 7                                   | 25                                  | 60                                    |
| Pulse Triggered Binary Monostable Multivibrator                                 | MC850                   | 603,607,632,646 | MC950                      | 603,607,632 | 10/8 ②                              | 15                                  | 50                                    |
| Dual J-K Flip-Flop (common clock and C <sub>D</sub> , separate S <sub>D</sub> ) | MC851                   | 603,607,632,646 | MC951                      | 603,607,632 | 10                                  | 40                                  | 30                                    |
| Dual J-K Flip-Flop (separate clock and S <sub>D</sub> , no C <sub>D</sub> )     | MC852                   | 607,632,646     | MC952                      | 607,632     | 12/10 ②                             | 40                                  | 120                                   |
| Dual J-K Flip-Flop (separate clock and S <sub>D</sub> , no C <sub>D</sub> )     | MC853                   | 607,632,646     | MC953                      | 607,632     | 12/10 ②                             | 40                                  | 120                                   |

① F suffix denotes Ceramic Flat Package, G suffix denotes Metal Can, L suffix denotes Dual In-Line Ceramic Package, P suffix denotes Dual In-Line Plastic Package. (i.e., MC830G = Metal Can, MC830F = Flat Package, MC830L = Dual In-Line Ceramic Package, MC830P = Plastic Package)

② Fan-out for MC830 series type/Fan-out for MC930 series type.

③ Counting frequency.

MDTL (continued)

| Function   | Type ①<br>0 to<br>+75°C | Case        | Type ①<br>-55 to<br>+125°C | Case    | Loading<br>Factor<br>Each<br>Output | Propaga-<br>tion<br>Delay<br>ns typ | Power<br>Dissipation<br>mW<br>typ/pkg |
|--|-------------------------|-------------|----------------------------|---------|-------------------------------------|-------------------------------------|---------------------------------------|
| Dual J-K Flip-Flop (common clock and C <sub>D</sub> , separate S <sub>D</sub> , 2 k pullup resistor) | MC855                   | 607,632,646 | MC955                      | 607,632 | 11/9 ②                              | 40                                  | 140                                   |
| Dual J-K Flip-Flop (separate clock and S <sub>D</sub> , no C <sub>D</sub> , 2 k pullup resistor)     | MC856                   | 607,632,646 | MC956                      | 607,632 | 11/9 ②                              | 40                                  | 140                                   |
| Quad 2-Input Buffer  | MC857                   | 607,632,646 | MC957                      | 607,632 | 25                                  | 35                                  | 170                                   |
| Quad 2-Input NAND Power Gate   | MC858                   | 607,632,646 | MC958                      | 607,632 | 27                                  | 30                                  | 130                                   |
| Expandable Dual 4-Input NAND Gate (2 k pullup resistor)  | MC861                   | 607,632,646 | MC961                      | 607,632 | 7                                   | 25                                  | 33                                    |
| Expandable Dual 3:2 Input NAND Gate (2 k pullup resistor)  | MC861                   | 603         | MC961                      | 603     | 7                                   | 25                                  | 33                                    |
| Triple 3-Input NAND Gate   | MC862                   | 607,632,646 | MC962                      | 607,632 | 8                                   | 30                                  | 33                                    |
| Dual 2-Input NAND Gate plus Inverter   | MC862                   | 603         | MC962                      | 603     | 8                                   | 30                                  | 30                                    |
| Triple 3-Input NAND Gate (2 k pullup resistor)   | MC863                   | 607,632,646 | MC963                      | 607,632 | 7                                   | 25                                  | 50                                    |
| Dual 2-Input NAND Gate plus Inverter (2 k pullup resistor)   | MC863                   | 603         | MC963                      | 603     | 7                                   | 25                                  | 45                                    |
| Dual 5-Input NAND Gate (6K pullup resistor)  | MC1800                  | 607,632,646 | MC1900                     | 607,632 | 8                                   | 30                                  | 22                                    |
| Dual 5-Input NAND Gate (2k pullup resistor)  | MC1801                  | 607,632,646 | MC1901                     | 607,632 | 7                                   | 25                                  | 33                                    |
| Expandable 8-Input NAND Gate   | MC1802                  | 607,632,646 | MC1902                     | 607,632 | 8                                   | 30                                  | 11                                    |
| Expandable 8-Input NAND Gate (2 k pullup resistor)   | MC1803                  | 607,632,646 | MC1903                     | 607,632 | 7                                   | 25                                  | 16.5                                  |
| 10-Input NAND Gate   | MC1804                  | 607,632,646 | MC1904                     | 607,632 | 8                                   | 30                                  | 11                                    |
| 10-Input NAND Gate (2k pullup resistor)  | MC1805                  | 607,632,646 | MC1905                     | 607,632 | 7                                   | 25                                  | 16.5                                  |
| Quad 2-Input AND Gate  | MC1806                  | 607,632,646 | MC1906                     | 607,632 | 8                                   | 35                                  | 72                                    |
| Quad 2-Input AND Gate (2k pullup resistor)   | MC1807                  | 607,632,646 | MC1907                     | 607,632 | 7                                   | 30                                  | 85                                    |
| Quad 2-Input OR Gate   | MC1808                  | 607,632,646 | MC1908                     | 607,632 | 8                                   | 35                                  | 97                                    |
| Quad 2-Input OR Gate (2k pullup resistor)  | MC1809                  | 607,632,646 | MC1909                     | 607,632 | 7                                   | 30                                  | 115                                   |
| Quad 2-Input NOR Gate  | MC1810                  | 607,632,646 | MC1910                     | 607,632 | 8                                   | 30                                  | 60                                    |
| Quad 2-Input NOR Gate (2k pullup resistor)   | MC1811                  | 607,632,646 | MC1911                     | 607,632 | 7                                   | 25                                  | 72                                    |
| Quad 2-Input Exclusive OR Gate   | MC1812                  | 607,632,646 | MC1912                     | 607,632 | 8                                   | 40                                  | 120                                   |
| Quad Latch   | MC1813                  | 620,648     | -                          | -       | 7                                   | 35                                  | 220                                   |
| Quad Latch   | MC1814                  | 607,632,646 | MC1914                     | 607,632 | 7                                   | 35                                  | 220                                   |
| Parallel Gated Clocked Flip-Flop   | MC1815                  | 607,632,646 | MC1915                     | 607,632 | 12/10 ②                             | 40                                  | 65                                    |
| Parallel Gated Clocked Flip-Flop   | MC1816                  | 607,632,646 | MC1916                     | 607,632 | 11/9 ②                              | 40                                  | 75                                    |
| Quad 2-Input NAND Gate (without output resistor)   | MC1818                  | 607,632,646 | MC1918                     | 607,632 | 8                                   | 30                                  | 32                                    |
| High Voltage Hex Inverter  | MC1820                  | 632,646     | -                          | -       | 7                                   | 40                                  | 42                                    |

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② Fan-out for MC830 series type / Fan-out for MC930 series type.

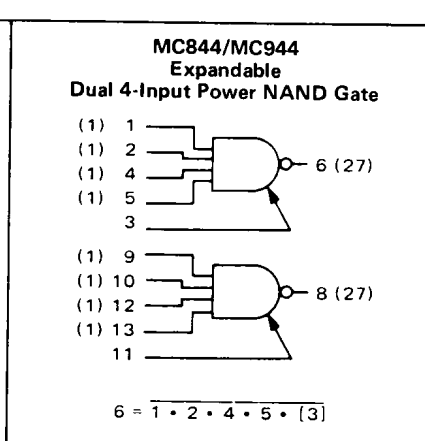
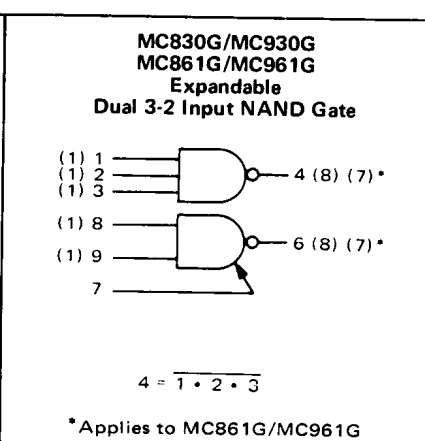
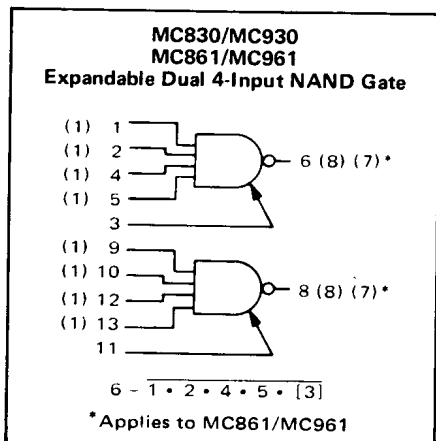
③ Counting frequency.

\*Unless otherwise noted

| Case | Gnd*<br>Pin No. | VCC*<br>Pin No. |
|------|-----------------|-----------------|
| 603  | 5               | 10              |
| 646  | 7               | 14              |
| 607  | 7               | 14              |
| 648  | 8               | 16              |
| 620  | 8               | 16              |
| 632  | 7               | 14              |

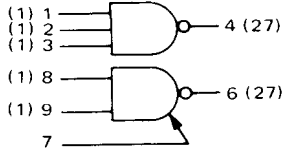
## GATES

Numbers at ends of terminals represent pin numbers. Numbers in parenthesis indicate loading.



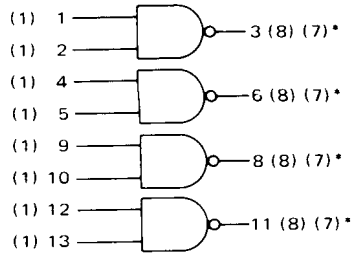
# GATES (continued)

**MC844G/MC944G**  
Expandable  
Dual 3-2 Input NAND Power Gate



$$4 = \overline{1 \cdot 2 \cdot 3}$$

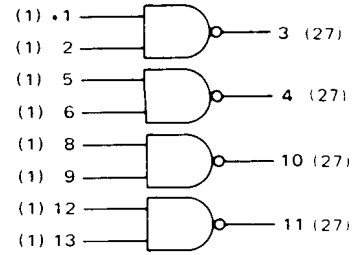
**MC846/MC946**  
**MC849/MC949**  
Quad 2-Input NAND Gate



$$3 = \overline{1 \cdot 2}$$

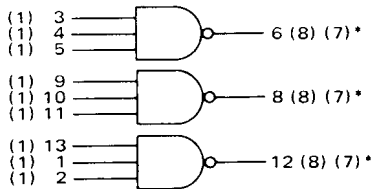
\*Applies to MC849/MC949

**MC858/MC958**  
Quad 2-Input NAND Power Gate



$$3 = \overline{1 \cdot 2}$$

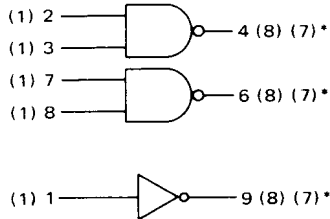
**MC862/MC962**  
**MC863/MC963**  
Triple 3-Input NAND Gate



$$6 = \overline{3 \cdot 4 \cdot 5}$$

\*Applies to MC863/MC963

**MC862G/MC962G**  
**MC863G/MC963G**  
Dual 2-Input NAND Gate  
Plus Inverter



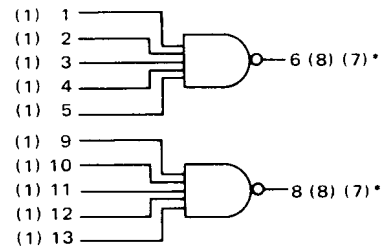
$$4 = \overline{2 \cdot 3}$$

$$6 = \overline{7 \cdot 8}$$

$$9 = \overline{1}$$

\*Applies to MC863G/MC963G

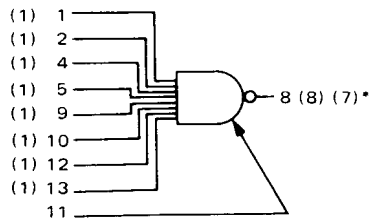
**MC1800/MC1900**  
**MC1801/MC1901**  
Dual 5-Input NAND Gate



$$6 = \overline{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5}$$

\*Applies to MC1801/MC1901

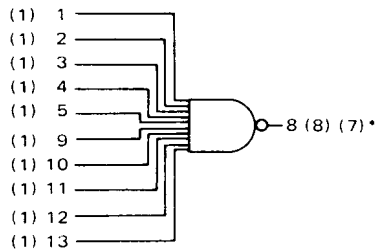
**MC1802/MC1902**  
**MC1803/MC1903**  
Expandable 8-Input NAND Gate



$$8 = \overline{1 \cdot 2 \cdot 4 \cdot 5 \cdot 9 \cdot 10 \cdot 12 \cdot 13 \cdot [11]}$$

\*Applies to MC1803/MC1903

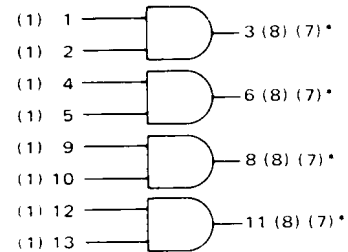
**MC1804/MC1904**  
**MC1805/MC1905**  
10-Input NAND Gate



$$8 = \overline{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 9 \cdot 10 \cdot 11 \cdot 12 \cdot 13}$$

\*Applies to MC1805/MC1905

**MC1806/MC1906**  
**MC1807/MC1907**  
Quad 2-Input AND Gate



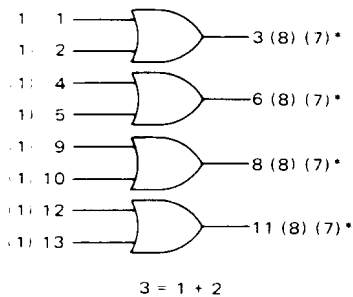
$$3 = 1 \cdot 2$$

\*Applies to MC1807/MC1907

(continued)

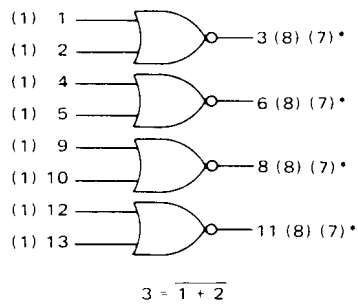
# GATES (continued)

**MC1808/MC1908  
MC1809/MC1909  
Quad 2-Input OR Gate**



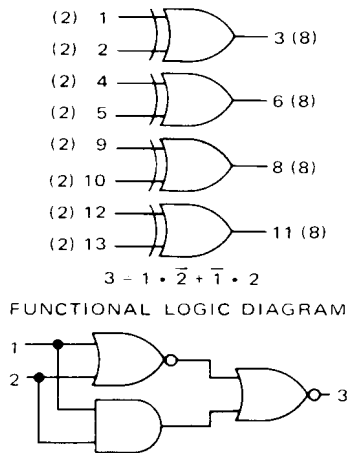
\*Applies to MC1809/MC1909

**MC1810/MC1910  
MC1811/MC1911  
Quad 2-Input NOR Gate**

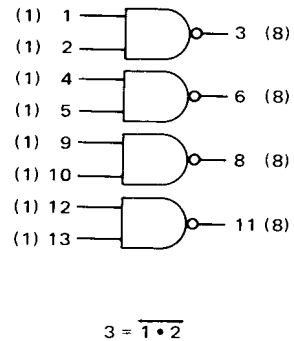


\*Applies to MC1811/MC1911

**MC1812/MC1912  
Quad 2-Input Exclusive OR Gate**



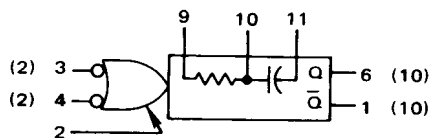
**MC1818/MC1918  
Quad 2-Input NAND Gate  
(Without Output Resistors)**



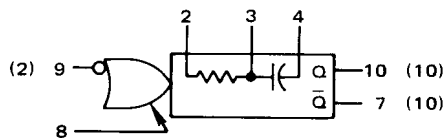
# MULTIVIBRATOR

**MC851/MC951  
Monostable Multivibrator**

F, L, P, PACKAGES



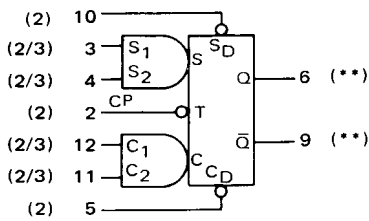
G PACKAGE  
VCC = Pin 6, Gnd = Pin 1



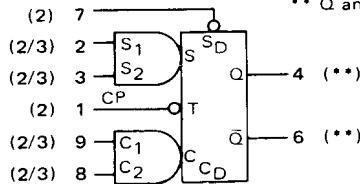
# FLIP-FLOPS

## MC845/MC945 MC848/MC948 Clocked Flip-Flop

F, L, & P PACKAGES



G PACKAGES



\*\* Q and  $\bar{Q}$  loading factor: 12 for MC845 types  
10 for MC945 types  
11 for MC848 types  
9 for MC948 types

SYNCHRONOUS TRUTH TABLE

| $t_n$ |       |       |       | $t_{n+1}$ |
|-------|-------|-------|-------|-----------|
| $S_1$ | $S_2$ | $C_1$ | $C_2$ | $Q$       |
| 0     | X     | 0     | X     | $Q_n$     |
| 0     | X     | X     | 0     | $Q_n$     |
| X     | 0     | 0     | X     | $Q_n$     |
| X     | 0     | X     | 0     | $Q_n$     |
| 0     | X     | 1     | 1     | 0         |
| X     | 0     | 1     | 1     | 0         |
| 1     | 1     | 0     | X     | 1         |
| 1     | 1     | X     | 0     | 1         |
| 1     | 1     | 1     | 1     | U         |

0 — Low State (more negative)  
1 — High State (more positive)  
X — State of the input does not affect the state of the circuit.  
U — Indeterminate State

J-K TRUTH TABLE  
(Connect  $S_2$  to  $\bar{Q}$ ,  $C_2$  to Q)

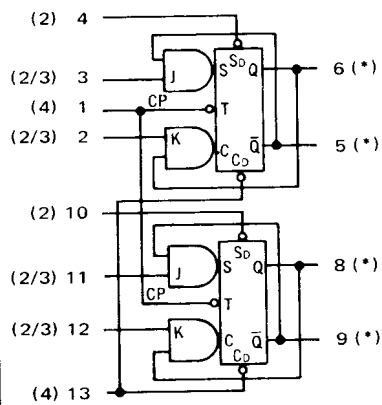
| $t_n$ |       | $t_{n+1}$   |
|-------|-------|-------------|
| $S_1$ | $C_1$ | $Q$         |
| 0     | 0     | $Q_n$       |
| 1     | 0     | 1           |
| 0     | 1     | 0           |
| 1     | 1     | $\bar{Q}_n$ |

ASYNCHRONOUS TRUTH TABLE

| $S_D$ | $C_D$ | $Q$ | $\bar{Q}$ |
|-------|-------|-----|-----------|
| 1     | 1     | NC  | NC        |
| 0     | 1     | 1   | 0         |
| 1     | 0     | 0   | 1         |
| 0     | 0     | 1   | 1         |

Asynchronous inputs, direct set ( $S_D$ ) and direct clear ( $C_D$ ), override the synchronous inputs; they are independent of all other inputs.

## MC852/MC952 MC855/MC955 Dual J-K Flip-Flop



\*Q and  $\bar{Q}$  loading factor:  
12 — MC852  
10 — MC952  
11 — MC855  
9 — MC955

ASYNCHRONOUS TRUTH TABLE  
MC952/MC852 and MC955/MC855

| $S_D$ | $C_D$ | $Q$ | $\bar{Q}$ |
|-------|-------|-----|-----------|
| 1     | 1     | NC  | NC        |
| 0     | 1     | 1   | 0         |
| 1     | 0     | 0   | 1         |
| 0     | 0     | 1   | 1         |

ASYNCHRONOUS TRUTH TABLE  
MC953/MC853 and MC956/MC856

| $S_D$ | $Q$ | $\bar{Q}$ |
|-------|-----|-----------|
| 1     | NC  | NC        |
| 0     | 1   | 0         |

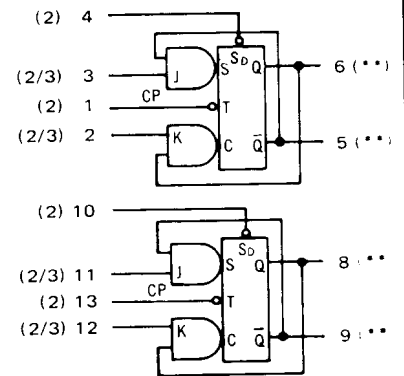
Asynchronous inputs, direct set ( $S_D$ ) and direct clear ( $C_D$ ), override the synchronous inputs; they are independent of all other inputs.

J-K TRUTH TABLE  
All Types

| $t_n$ |   | $t_{n+1}$   |
|-------|---|-------------|
| J     | K | $Q$         |
| 0     | 0 | $Q_n$       |
| 1     | 0 | 1           |
| 0     | 1 | 0           |
| 1     | 1 | $\bar{Q}_n$ |

J & K inputs must not change while clock is high.

## MC853/MC953 MC856/MC956 Dual J-K Flip-Flop



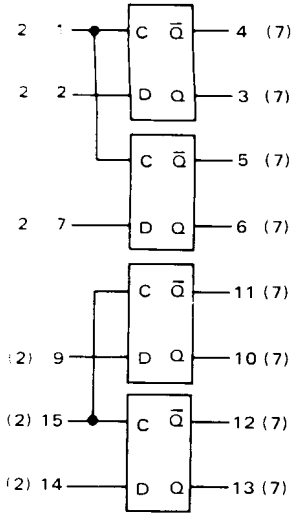
\*\*Q and  $\bar{Q}$  loading factor  
12 — MC853  
10 — MC953  
11 — MC856  
9 — MC956

(cont. next)

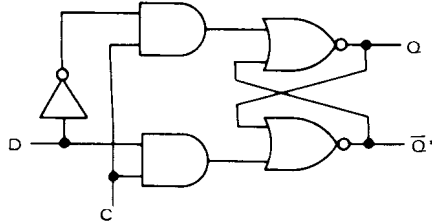
# MDTL LOGIC DIAGRAMS

## FLIP-FLOPS (continued)

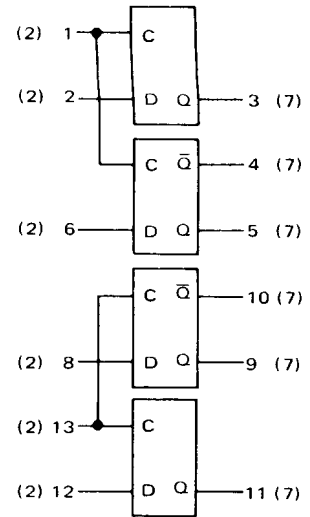
**MC1813**  
Quad Latch



FUNCTIONAL LOGIC DIAGRAM



**MC1814/MC1914**  
Quad Latch



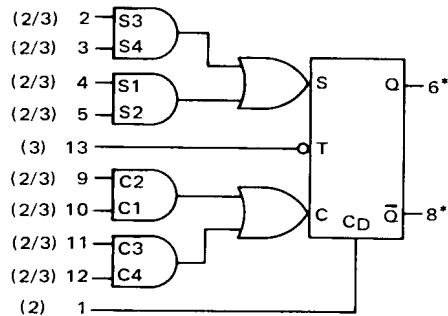
Information present at the Data input D is transferred to the Q output when the clock is high, and the Q output will follow the state of the Data input as long as the clock remains high. Information present at the Q output will be retained as the clock goes low until such time as the clock is permitted to go high.

TRUTH TABLE

| t <sub>n</sub> | t <sub>n+1</sub> |    |
|----------------|------------------|----|
|                | Q                | Q* |
| D              | Q                | Q* |
| 1              | 1                | 0  |
| 0              | 0                | 1  |

\* As applicable  
(see loading diagram)

**MC1815/MC1915**  
**MC1816/MC1916**  
Parallel Gated Clocked Flip-Flop



\* Q and Q-bar loading factor  
12 - MC1815  
10 - MC1915  
11 - MC1816  
9 - MC1916

SYNCHRONOUS TRUTH TABLE

| t <sub>n</sub> |    |    |    |    |    |    |    |    | t <sub>n+1</sub> |
|----------------|----|----|----|----|----|----|----|----|------------------|
| C <sub>D</sub> | C3 | C4 | C1 | C2 | S3 | S4 | S1 | S2 | Q                |
| 1              | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | Q <sub>n</sub>   |
| 1              | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0                |
| 1              | 0  | 0  | 1  | 1  | 0  | 0  | 0  | 0  | 0                |
| 1              | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0                |
| 1              | 0  | 0  | 0  | 0  | 1  | 1  | 0  | 0  | 1                |
| 1              | 1  | 1  | 0  | 0  | 0  | 1  | 1  | 0  | 0                |
| 1              | 0  | 0  | 1  | 1  | 1  | 1  | 0  | 0  | U                |
| 1              | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | U                |
| 1              | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1                |
| 1              | 1  | 1  | 0  | 0  | 0  | 0  | 1  | 1  | U                |
| 1              | 0  | 0  | 1  | 1  | 0  | 0  | 1  | 1  | U                |
| 1              | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | U                |
| 1              | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | U                |
| 1              | 1  | 1  | 0  | 0  | 1  | 1  | 1  | 1  | U                |
| 1              | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | U                |
| 1              | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | U                |

0 - Low State (more negative)  
1 - High State (more positive)

NC - No Change  
U - Indeterminate State

J-K TRUTH TABLE

(Connect S2 and S4 to Q-bar, C2 and C4 to Q)

| t <sub>n</sub> |    |    |    | t <sub>n+1</sub> |
|----------------|----|----|----|------------------|
| S1             | S3 | C1 | C3 | Q                |
| 0              | 0  | 0  | 0  | Q <sub>n</sub>   |
| 1              | 1  | 0  | 0  | 1                |
| 0              | 0  | 1  | 1  | 0                |
| 1              | 1  | 1  | 1  | Q <sub>n</sub>   |

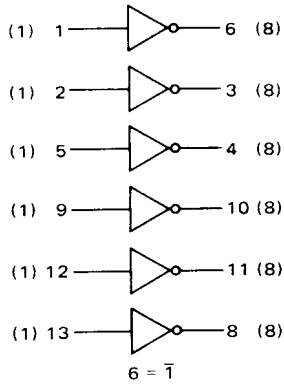
ASYNCHRONOUS TRUTH TABLE

| C <sub>D</sub> | Q  | Q-bar |
|----------------|----|-------|
| 1              | NC | NC    |
| 0              | 0  | 1     |

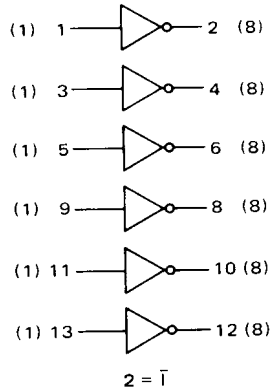
Asynchronous input, direct clear (C<sub>D</sub>), overrides the synchronous inputs. Clocked operation will occur only when C<sub>D</sub> is in the High State.

# INVERTERS

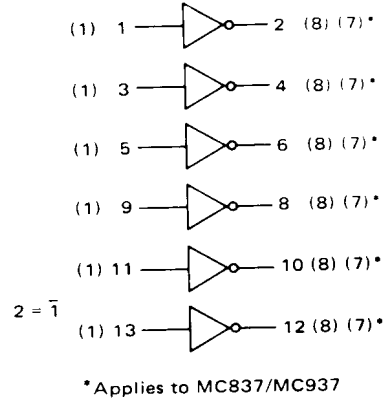
**MC834/MC934  
Hex Inverter**



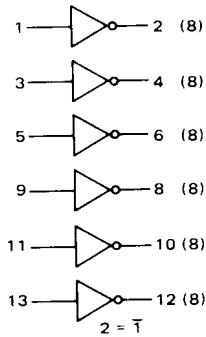
**MC835/MC935  
Hex Inverter  
(Without Output Resistors)**



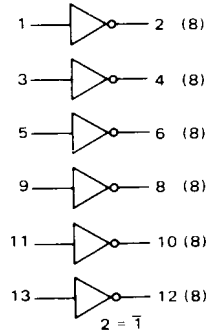
**MC836/MC936  
MC837/MC937  
Hex Inverter**



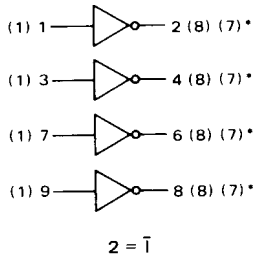
**MC840/MC940  
Hex Inverter  
(Without Input Diodes)**



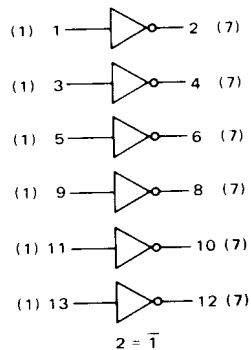
**MC841/MC941  
Hex Inverter  
(Without Output Resistors  
and Input Diodes)**



**MC846G/MC946G  
MC849G/MC949G  
Quad Inverter**

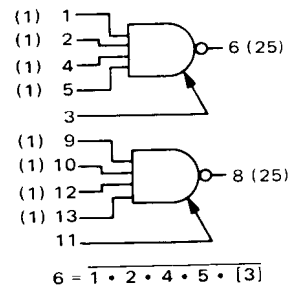


**MC1820  
High Voltage  
Hex Inverter  
(Without Output Resistors)**

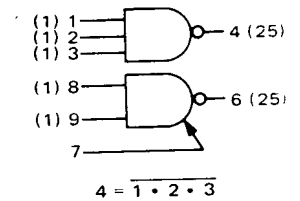


# BUFFERS

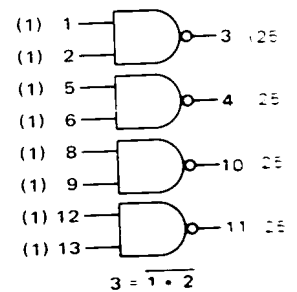
**MC832/MC932  
Expandable Dual 4-Input Buffer**



**MC832G/MC932G  
Expandable Dual 3-2 Input Buffer**

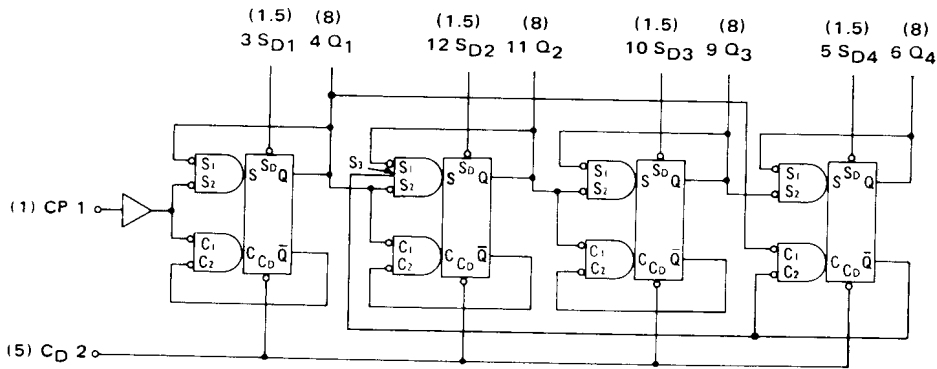


**MC857/MC957  
Quad 2-Input Buffers**



# COUNTERS

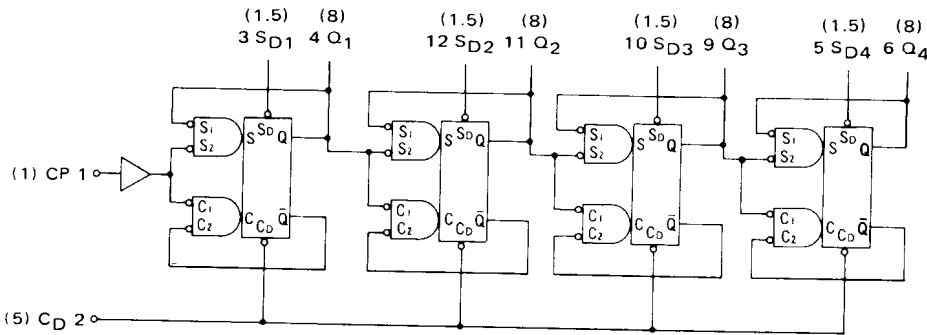
**MC838/MC938**  
Decade Counter



**DECODING LOGIC**

|   |             |             |             |             |
|---|-------------|-------------|-------------|-------------|
| 0 | $\bar{Q}_3$ | $\bar{Q}_2$ | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 1 | $Q_3$       | $\bar{Q}_2$ | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 2 | $\bar{Q}_3$ | $Q_2$       | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 3 | $Q_3$       | $Q_2$       | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 4 | $\bar{Q}_3$ | $\bar{Q}_2$ | $Q_1$       | $\bar{Q}_0$ |
| 5 | $Q_3$       | $\bar{Q}_2$ | $Q_1$       | $\bar{Q}_0$ |
| 6 | $\bar{Q}_3$ | $Q_2$       | $Q_1$       | $\bar{Q}_0$ |
| 7 | $Q_3$       | $Q_2$       | $Q_1$       | $\bar{Q}_0$ |
| 8 | $\bar{Q}_3$ |             |             | $Q_0$       |
| 9 | $Q_3$       |             |             | $Q_0$       |

**MC839/MC939**  
Divide-by-Sixteen Counter

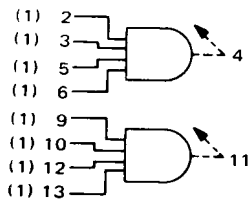


**DECODING LOGIC**

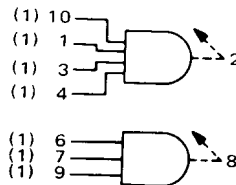
|    |             |             |             |             |
|----|-------------|-------------|-------------|-------------|
| 0  | $\bar{Q}_3$ | $\bar{Q}_2$ | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 1  | $Q_3$       | $\bar{Q}_2$ | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 2  | $\bar{Q}_3$ | $Q_2$       | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 3  | $Q_3$       | $Q_2$       | $\bar{Q}_1$ | $\bar{Q}_0$ |
| 4  | $\bar{Q}_3$ | $\bar{Q}_2$ | $Q_1$       | $\bar{Q}_0$ |
| 5  | $Q_3$       | $\bar{Q}_2$ | $Q_1$       | $\bar{Q}_0$ |
| 6  | $\bar{Q}_3$ | $Q_2$       | $Q_1$       | $\bar{Q}_0$ |
| 7  | $Q_3$       | $Q_2$       | $Q_1$       | $\bar{Q}_0$ |
| 8  | $\bar{Q}_3$ | $\bar{Q}_2$ | $\bar{Q}_1$ | $Q_0$       |
| 9  | $Q_3$       | $\bar{Q}_2$ | $\bar{Q}_1$ | $Q_0$       |
| 10 | $\bar{Q}_3$ | $Q_2$       | $\bar{Q}_1$ | $Q_0$       |
| 11 | $Q_3$       | $Q_2$       | $\bar{Q}_1$ | $Q_0$       |
| 12 | $\bar{Q}_3$ | $\bar{Q}_2$ | $Q_1$       | $Q_0$       |
| 13 | $Q_3$       | $\bar{Q}_2$ | $Q_1$       | $Q_0$       |
| 14 | $\bar{Q}_3$ | $Q_2$       | $Q_1$       | $Q_0$       |
| 15 | $Q_3$       | $Q_2$       | $Q_1$       | $Q_0$       |

# EXPANDERS

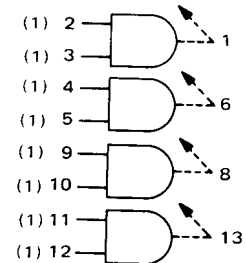
**MC833/MC933**  
Dual 4-Input Expander



**MC833G/MC933G**  
Dual 4-3 Input Expander



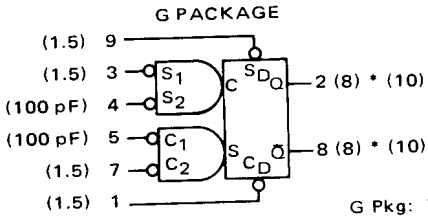
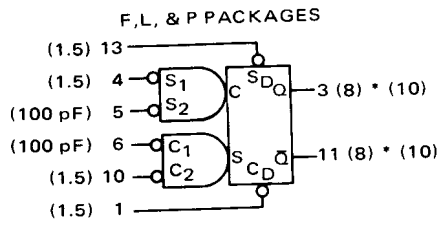
**MC847/MC947**  
Quad 2-Input Gate Expander





# PULSE TRIGGERED BINARY

## MC850/MC950 Pulse Triggered Binary



G Pkg:  $V_{CC}$  = Pin 10, Gnd = Pin 6

\* Applies to MC950

### SYNCHRONOUS TRUTH TABLE

| $t_n$ |       |       |       | $t_{n+1}$ |
|-------|-------|-------|-------|-----------|
| $S_1$ | $S_2$ | $C_1$ | $C_2$ | $Q$       |
| 0     | 0     | 0     | 0     | U         |
| 1     | X     | 1     | X     | $Q_n$     |
| X     | 1     | X     | 1     | $Q_n$     |
| 0     | 1     | 1     | 0     | $Q_n$     |
| 0     | 0     | X     | 1     | 1         |
| 0     | 0     | 1     | X     | 1         |
| 1     | X     | 0     | 0     | 0         |
| X     | 1     | 0     | 0     | 0         |

### ASYNCHRONOUS TRUTH TABLE

| $S_D$ | $C_D$ | $Q$ | $\bar{Q}$ |
|-------|-------|-----|-----------|
| 1     | 1     | NC  | NC        |
| 0     | 1     | 1   | 0         |
| 1     | 0     | 0   | 1         |
| 0     | 0     | 1   | 1         |

0 = low state (more negative)  
1 = high state (more positive)  
X = don't care  
U = indeterminate state  
NC = no change

### SINGLE TRIGGER TRUTH TABLE (Pins $S_2$ and $C_1$ tied together)

| $t_n$ |       | $t_{n+1}$ |
|-------|-------|-----------|
| $S_1$ | $C_2$ | $Q$       |
| 0     | 0     | U         |
| 1     | 0     | 0         |
| 0     | 1     | 1         |
| 1     | 1     | $Q_n$     |