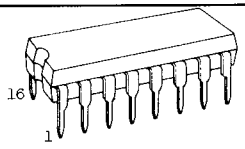
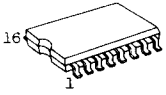
# TC4099BP/BF

## TC4099BP/TC4099BF 8-BIT ADDRESSABLE LATCH

TC4099BP/BF is eight bit latch having one common data input line and eight independent output lines and the latches are controlled by three bit binary address inputs (A0, A1 and A2).
When WRITE DISABLE input and RESET input is "L", the data is written into the bit selected by the binary address input and other bits retain their previous conditions. When W. DISABLE input becomes "H", write into any bits is inhibited. When W. DISABLE input and RESET input are "H", all the bits are reset to "L".




DIP16(3D16A-P)

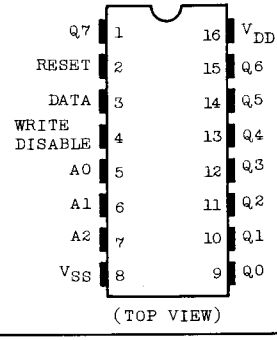



MFP16(F16GC-P)

## MAXIMUM RATINGS

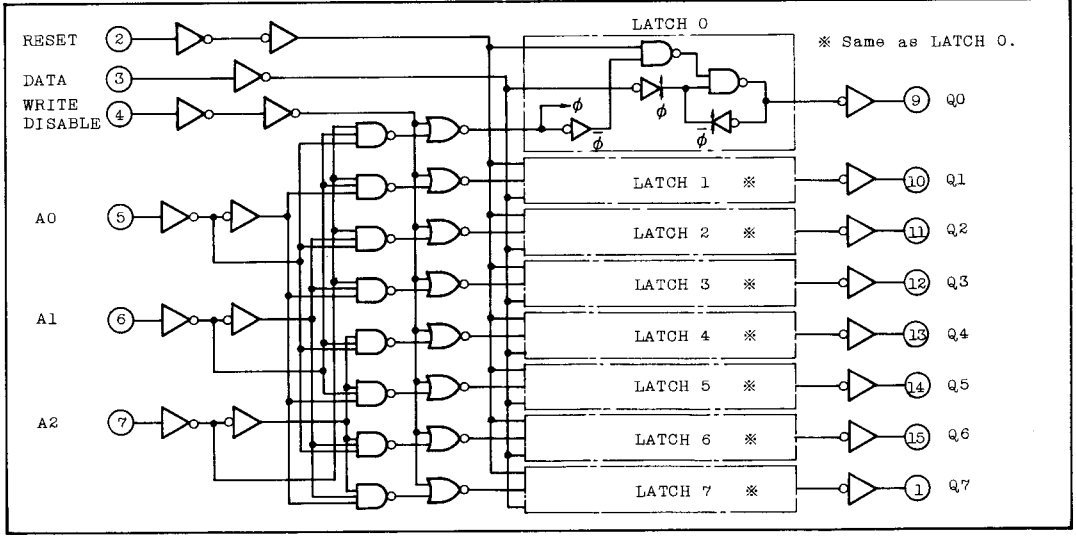
| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|
| DC Supply Voltage | $V_{DD}$ | $V_{SS}$-0.5 ∿ $V_{SS}$+20 | V |
| Input Voltage | $V_{IN}$ | $V_{SS}$-0.5 ∿ $V_{DD}$+0.5 | V |
| Output Voltage | $V_{OUT}$ | $V_{SS}$-0.5 ∿ $V_{DD}$+0.5 | V |
| DC Input Voltage | $I_{IN}$ | ±10 | mA |
| Power Dissipation | $P_D$ | 300(DIP)/180(MFP) | mW |
| Operating Temperature Range | $T_A$ | -40 ∿ 85 | °C |
| Storage Temperature Range | $T_{stg}$ | -65 ∿ 150 | °C |
| Lead Temp./Time | $T_{sol}$ | 260°C • 10 sec | |

## PIN ASSIGNMENT




(TOP VIEW)

## LOGIC DIAGRAM



TRUTH TABLE

| CONTROL INPUTS | | ADDRESS INPUTS | | | OUTPUTS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RESET | WRITE DISABLE | $A_2$ | $A_1$ | $A_0$ | $Q_0$ | $Q_1$ | $Q_2$ | $Q_3$ | $Q_4$ | $Q_5$ | $Q_6$ | $Q_7$ |
| H | H | * | * | * | L | L | L | L | L | L | L | L |
| L | H | * | * | * | - | - | - | - | - | - | - | - |
| H | L | L | L | L | D | L | L | L | L | L | L | L |
| H | L | L | L | H | L | D | L | L | L | L | L | L |
| H | L | L | H | L | L | L | D | L | L | L | L | L |
| H | L | L | H | H | L | L | L | D | L | L | L | L |
| H | L | H | L | L | L | L | L | L | D | L | L | L |
| H | L | H | L | H | L | L | L | L | L | D | L | L |
| H | L | H | H | L | L | L | L | L | L | L | D | L |
| H | L | H | H | H | L | L | L | L | L | L | L | D |
| L | L | L | L | L | D | - | - | - | - | - | - | - |
| L | L | L | L | H | - | D | - | - | - | - | - | - |
| L | L | L | H | L | - | - | D | - | - | - | - | - |
| L | L | L | H | H | - | - | - | D | - | - | - | - |
| L | L | H | L | L | - | - | - | - | D | - | - | - |
| L | L | H | L | H | - | - | - | - | - | D | - | - |
| L | L | H | H | L | - | - | - | - | - | - | D | - |
| L | L | H | H | H | - | - | - | - | - | - | - | D |

* : Don't care  D : Data input  - : Holds previous data

RECOMMENDED OPERATING CONDITIONS ($V_{SS}$=0V)

| CHARACTERISTIC | SYMBOL | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| DC Supply Voltage | $V_{DD}$ | | 3 | - | 18 | V |
| Input Voltage | $V_{IN}$ | | 0 | - | $V_{DD}$ | |

STATIC ELECTRICAL CHARACTERISTICS ($V_{SS}$=0V)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | $V_{DD}$ (V) | -40°C | | 25°C | | | 85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN. | MAX. | MIN. | TYP. | MAX. | MIN. | MAX. | |
| High-Level Output Voltage | $V_{OH}$ | $\|I_{OUT}\| < 1\mu A$ $V_{IN}=V_{SS},V_{DD}$ | 5 | 4.95 | - | 4.95 | 5.00 | - | 4.95 | - | V |
| | | | 10 | 9.95 | - | 9.95 | 10.00 | - | 9.95 | - | |
| | | | 15 | 14.95 | - | 14.95 | 15.00 | - | 14.95 | - | |

STATIC ELECTRICAL CHARACTERISTICS ($V_{SS}$=0V)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | $V_{DD}$ (V) | -40°C MIN. | -40°C MAX. | 25°C MIN. | 25°C TYP. | 25°C MAX. | 85°C MIN. | 85°C MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Low-Level Output Voltage | $V_{OL}$ | $\|I_{OUT}\| < 1\mu A$ | 5 | - | 0.05 | - | 0.00 | 0.05 | - | 0.05 | V |
| | | $V_{IN}=V_{SS},V_{DD}$ | 10 | - | 0.05 | - | 0.00 | 0.05 | - | 0.05 | |
| | | | 15 | - | 0.05 | - | 0.00 | 0.05 | - | 0.05 | |
| Output High Current | $I_{OH}$ | $V_{OH}$=4.6V | 5 | -0.61 | - | -0.51 | -1.0 | - | -0.42 | - | mA |
| | | $V_{OH}$=2.5V | 5 | -2.5 | - | -2.1 | -4.0 | - | -1.7 | - | |
| | | $V_{OH}$=9.5V | 10 | -1.5 | - | -1.3 | -2.2 | - | -1.1 | - | |
| | | $V_{OH}$=13.5V | 15 | -4.0 | - | -3.4 | -9.0 | - | -2.8 | - | |
| | | $V_{IN}=V_{SS},V_{DD}$ | | | | | | | | | |
| Output Low Current | $I_{OL}$ | $V_{OL}$=0.4V | 5 | 0.61 | - | 0.51 | 1.2 | - | 0.42 | - | |
| | | $V_{OL}$=0.5V | 10 | 1.5 | - | 1.3 | 3.2 | - | 1.1 | - | |
| | | $V_{OL}$=1.5V | 15 | 4.0 | - | 3.4 | 12.0 | - | 2.8 | - | |
| | | $V_{IN}=V_{SS},V_{DD}$ | | | | | | | | | |
| Input High Voltage | $V_{IH}$ | $V_{OUT}$=0.5V, 4.5V | 5 | 3.5 | - | 3.5 | 2.75 | - | 3.5 | - | V |
| | | $V_{OUT}$=1.0V, 9.0V | 10 | 7.0 | - | 7.0 | 5.5 | - | 7.0 | - | |
| | | $V_{OUT}$=1.5V,13.5V | 15 | 11.0 | - | 11.0 | 8.25 | - | 11.0 | - | |
| | | $\|I_{OUT}\| < 1\mu A$ | | | | | | | | | |
| Input Low Voltage | $V_{IL}$ | $V_{OUT}$=0.5V, 4.5V | 5 | - | 1.5 | - | 2.25 | 1.5 | - | 1.5 | |
| | | $V_{OUT}$=1.0V, 9.0V | 10 | - | 3.0 | - | 4.5 | 3.0 | - | 3.0 | |
| | | $V_{OUT}$=1.5V,13.5V | 15 | - | 4.0 | - | 6.75 | 4.0 | - | 4.0 | |
| | | $\|I_{OUT}\| < 1\mu A$ | | | | | | | | | |
| Input Current "H" Level | $I_{IH}$ | $V_{IH}$=18V | 18 | - | 0.1 | - | $10^{-5}$ | 0.1 | - | 1.0 | μA |
| Input Current "L" Level | $I_{IL}$ | $V_{IL}$=0V | 18 | - | -0.1 | - | $-10^{-5}$ | -0.1 | - | -1.0 | |
| Quiescent Device Current | $I_{DD}$ | $V_{IN}=V_{SS},V_{DD}$ * | 5 | - | 5 | - | 0.005 | 5 | - | 150 | μA |
| | | | 10 | - | 10 | - | 0.010 | 10 | - | 300 | |
| | | | 15 | - | 20 | - | 0.015 | 20 | - | 600 | |

*All valid input combinations.

DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, $V_{SS}$=0V, $C_L$=50pF)

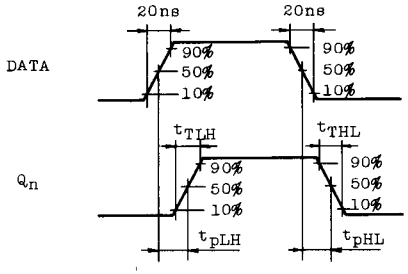
| CHARACTERISTIC | SYMBOL | TEST CONDITION | $V_{DD}$ (V) | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Output Transition Time (Low to High) | $t_{TLH}$ | | 5 | - | 70 | 200 | ns |
| | | | 10 | - | 35 | 100 | |
| | | | 15 | - | 30 | 80 | |

DYNAMIC ELECTRICAL CHARACTERIATICS (Ta=25°C, $V_{SS}$=0V, $C_L$=50pF)

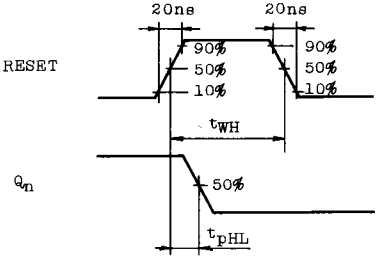
| CHARACTERISTIC | SYMBOL | TEST CONDITION | $V_{DD}$ (V) | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Output Transition Time (High to Low) | $t_{THL}$ | | 5 | - | 70 | 200 | ns |
| | | | 10 | - | 35 | 100 | |
| | | | 15 | - | 30 | 80 | |
| Propagation Delay Time (DATA - Q) | $t_{pLH}$ $t_{pHL}$ | | 5 | - | 110 | 400 | ns |
| | | | 10 | - | 50 | 150 | |
| | | | 15 | - | 40 | 100 | |
| Propagation Delay Time (WRITE DISABLE - Q) | $t_{pLH}$ $t_{pHL}$ | | 5 | - | 130 | 400 | |
| | | | 10 | - | 60 | 160 | |
| | | | 15 | - | 45 | 120 | |
| Propagation Delay Time (ADDRESS - Q) | $t_{pLH}$ $t_{pHL}$ | | 5 | - | 150 | 450 | |
| | | | 10 | - | 70 | 200 | |
| | | | 15 | - | 50 | 150 | |
| Propagation Delay Time (RESET - Q) | $t_{pHL}$ | | 5 | - | 100 | 350 | |
| | | | 10 | - | 50 | 160 | |
| | | | 15 | - | 35 | 130 | |
| Min. Pulse Width (DATA) | $t_w$ | | 5 | - | 90 | 200 | |
| | | | 10 | - | 45 | 100 | |
| | | | 15 | - | 35 | 80 | |
| Min. Pulse Width (WIRTE DISABLE ADDRESS) | $t_w$ | | 5 | - | 35 | 320 | |
| | | | 10 | - | 20 | 160 | |
| | | | 15 | - | 15 | 120 | |
| Min. Pulse Width (RESET) | $t_{WH}$ | | 5 | - | 50 | 150 | |
| | | | 10 | - | 25 | 75 | |
| | | | 15 | - | 20 | 50 | |
| Min. Set-up Time (DATA - WRITE DISABLE) | $t_{SU}$ | | 5 | - | 15 | 100 | |
| | | | 10 | - | 10 | 50 | |
| | | | 15 | - | 8 | 35 | |
| Min. Hold Time (DATA - WRITE DISABLE) | $t_H$ | | 5 | - | - | 150 | |
| | | | 10 | - | - | 75 | |
| | | | 15 | - | - | 50 | |
| Min. Set-up Time (ADDRESS-WRITE DISABLE) | $t_{SU}$ | | 5 | - | 20 | 100 | |
| | | | 10 | - | 10 | 50 | |
| | | | 15 | - | 5 | 35 | |
| Min. Hold Time (ADDRESS-WRITE DISABLE) | $t_H$ | | 5 | - | - | 0 | |
| | | | 10 | - | - | 0 | |
| | | | 15 | - | - | 0 | |
| Input Capacitance | $C_{IN}$ | | | - | 5 | 7.5 | pF |

## WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

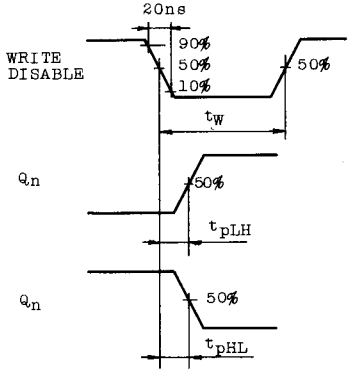
### WAVEFORM 1



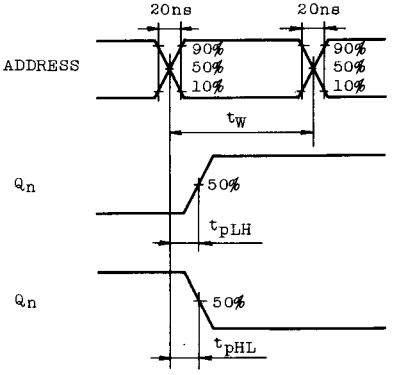

### WAVEFORM 2



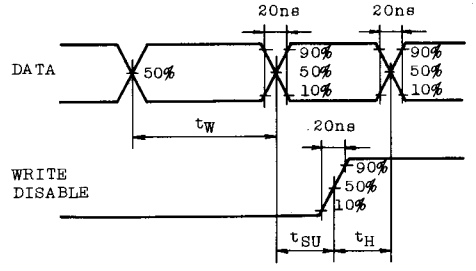

### WAVEFORM 3




### WAVEFORM 4




### WAVEFORM 5




### WAVEFORM 6