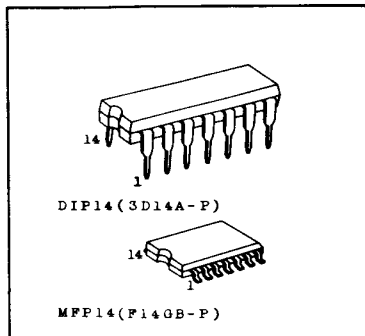
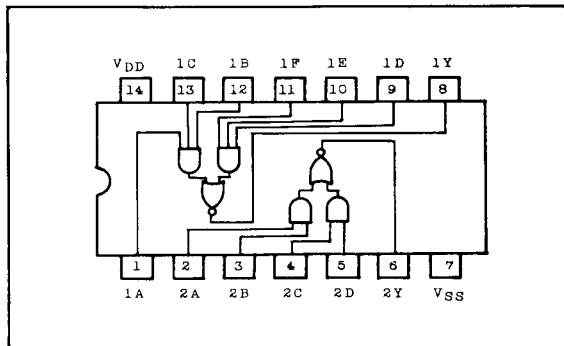


# TC40H051P/F

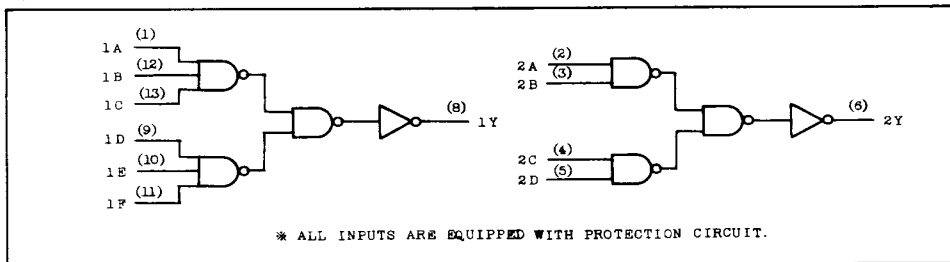
**C<sup>2</sup>MOS DIGITAL INTEGRATED CIRCUIT  
SILICON MONOLITHIC****TC40H051 DUAL AND-OR-INVERT GATE****MAXIMUM RATINGS**

| CHARACTERISTIC      | SYMBOL           | RATING                                      | UNIT |
|---------------------|------------------|---------------------------------------------|------|
| Supply Voltage      | V <sub>DD</sub>  | V <sub>SS</sub> -0.5 ~ V <sub>SS</sub> +10  | V    |
| Input Voltage       | V <sub>IN</sub>  | V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5 | V    |
| Output Voltage      | V <sub>OUT</sub> | V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5 | V    |
| Input Current       | I <sub>IN</sub>  | ±10                                         | mA   |
| Power Dissipation   | PD               | 300(DIP)/180(MFP)                           | mW   |
| Storage Temperature | T <sub>stg</sub> | -65 ~ 150                                   | °C   |
| Lead Temp./Time     | T <sub>sol</sub> | 260°C • 10 sec                              |      |

**TRUTH TABLE**

$$1Y = \overline{(1A \cdot 1B \cdot 1C)} + \overline{(1D \cdot 1E \cdot 1F)}$$

$$2Y = \overline{(2A \cdot 2B)} + \overline{(2C \cdot 2D)}$$

**LOGIC DIAGRAM****RECOMMENDED OPERATING CONDITIONS (V<sub>SS</sub>=0.0V)**

| CHARACTERISTIC        | SYMBOL           | TEST CONDITION | MIN. | TYP. | MAX.            | UNIT |
|-----------------------|------------------|----------------|------|------|-----------------|------|
| Supply Voltage        | V <sub>DD</sub>  | -              | 2.0  | -    | 8.0             | V    |
| Input Voltage         | V <sub>IN</sub>  | -              | 0    | -    | V <sub>DD</sub> | V    |
| Operating Temperature | T <sub>opr</sub> | -              | -40  | -    | 85              | °C   |

**TOSHIBA**

## TC40H051P/F

ELECTRICAL CHARACTERISTICS ( $V_{SS}=0.0V$ )

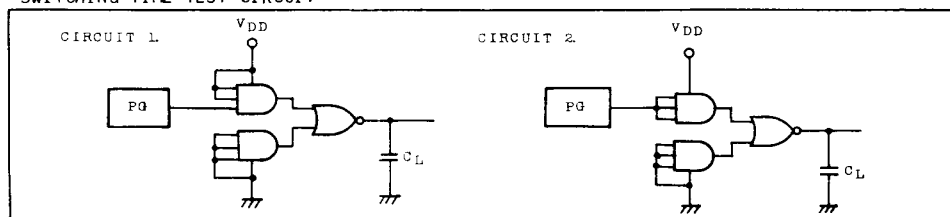
| CHARACTERISTIC            | SYMBOL                | TEST CONDITION                                  | $V_{DD}$<br>(V) | -40°C |      | 25°C  |            |      | 85°C  |      | UNIT    |
|---------------------------|-----------------------|-------------------------------------------------|-----------------|-------|------|-------|------------|------|-------|------|---------|
|                           |                       |                                                 |                 | MIN.  | MAX. | MIN.  | TYP.       | MAX. | MIN.  | MAX. |         |
| High Level Output Voltage | $V_{OH}$              | $ I_{OUT}  < 1\mu A$<br>$V_{IN}=V_{SS}, V_{DD}$ | 5               | 4.95  | -    | 4.95  | 5.0        | -    | 4.95  | -    | V       |
| Low Level Output Voltage  | $V_{OL}$              | $ I_{OUT}  < 1\mu A$<br>$V_{IN}=V_{SS}, V_{DD}$ | 5               | -     | 0.05 | -     | 0.0        | 0.05 | -     | 0.05 | V       |
| High Level Output Current | $I_{OH}$              | $V_{OH}=4.6V$<br>$V_{IN}=V_{SS}, V_{DD}$        | 5               | -0.52 | -    | -0.44 |            | -    | -0.36 | -    | mA      |
| Low Level Output Current  | $I_{OL}$              | $V_{OL}=0.4V$<br>$V_{IN}=V_{SS}, V_{DD}$        | 5               | 1.4   | -    | 1.1   |            | -    | 0.8   | -    | mA      |
| Input Voltage             | "H" Level<br>$V_{IH}$ | $ I_{OUT}  < 1\mu A$                            | 5               | 4.0   | -    | 4.0   |            | -    | 4.0   | -    | V       |
|                           | "L" Level<br>$V_{IL}$ | $V_{OUT}=0.5V$<br>$V_{IN}=4.5V$                 | 5               | -     | 1.0  | -     |            | 1.0  | -     | 1.0  |         |
| Input Current             | "H" Level<br>$I_{IH}$ | $V_{IH}=8.0V$                                   | 8               | -     | 0.3  | -     | $10^{-5}$  | 0.3  | -     | 1.0  | $\mu A$ |
|                           | "L" Level<br>$I_{IL}$ | $V_{IL}=0.0V$                                   | 8               | -     | -0.3 | -     | $-10^{-5}$ | -0.3 | -     | -1.0 |         |
| Quiescent Supply Current  | $I_{DD}$              | $*V_{IN}=V_{SS}, V_{DD}$                        | 5               | -     | 2.0  | -     | $10^{-3}$  | 2.0  | -     | 10.0 | $\mu A$ |

\* All valid input combinations.

SWITCHING CHARACTERISTICS ( $T_a=25^\circ C$ ,  $V_{SS}=0.0V$ ,  $C_L=15pF$ )

| CHARACTERISTIC                    | SYMBOL    | TEST CONDITION | $V_{DD}$ (V) | MIN. | TYP. | MAX. | UNIT |
|-----------------------------------|-----------|----------------|--------------|------|------|------|------|
| Output Rise Time                  | $t_{or}$  | Circuit 1      | 5            | -    | 14   | 30   | ns   |
| Output Fall Time                  | $t_{of}$  | Circuit 1      | 5            | -    | 10   | 30   |      |
| Propagation Delay Time (Low-High) | $t_{PLH}$ | Circuit 1      | 5            | -    | 24   | 36   | ns   |
| Propagation Delay Time (High-Low) | $t_{pHL}$ |                | 5            | -    | 20   | 30   |      |
| Propagation Delay Time (Low-High) | $t_{pLH}$ | Circuit 2      | 5            | -    | 18   | 28   | ns   |
| Propagation Delay Time (High-Low) | $t_{pHL}$ |                | 5            | -    | 22   | 33   |      |
| Input Capacitance                 | $C_{IN}$  |                |              | -    | 5    | -    | pF   |

## SWITCHING TIME TEST CIRCUIT



# TC40H051P/F

## SWITCHING TIME TEST WAVEFORM

