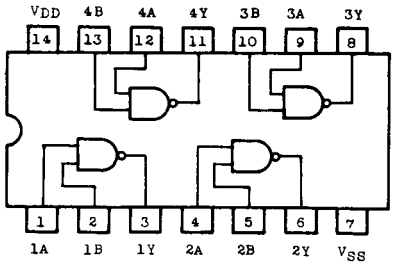
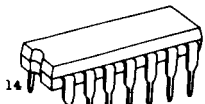
C²MOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC

# TC40H000P/F

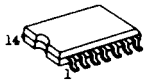
## TC40H000 QUAD 2-INPUT NAND GATE

PIN CONNECTION




DIP14(3D14A-P)




MFP14(F14GB-P)

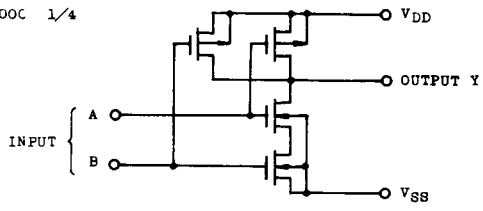
MAXIMUM RATINGS

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | $V_{SS}-0.5 \sim V_{SS}+10$ | V |
| Input Voltage | $V_{IN}$ | $V_{SS}-0.5 \sim V_{DD}+0.5$ | V |
| Output Voltage | $V_{OUT}$ | $V_{SS}-0.5 \sim V_{DD}+0.5$ | V |
| Input Current | $I_{IN}$ | ±10 | mA |
| Power Dissipation | $P_D$ | 300(DIP)/180(MFP) | mW |
| Storage Temperature | $T_{stg}$ | -65 ~ 150 | °C |
| Lead Temp./Time | $T_{sol}$ | 260°C · 10 sec | |

TRUTH TABLE

| INPUT | | OUTPUT |
|---|---|---|
| A | B | Y |
| L | L | H |
| H | L | H |
| L | H | H |
| H | H | L |

CIRCUIT DIAGRAM




* ALL INPUTS ARE EQUIPPED WITH PROTECTION CIRCUIT.

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

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{DD}$ | - | 2.0 | - | 8.0 | V |
| Input Voltage | $V_{IN}$ | - | 0 | - | $V_{DD}$ | V |
| Operating Temperature | $T_{opr}$ | - | -40 | - | 85 | °C |

# TC40H000P/F

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

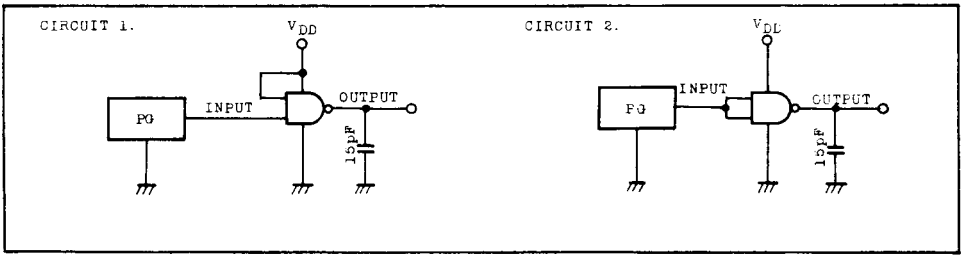
| CHARACTERISTIC | SYMBOL | TEST CONDITION | $V_{DD}$ (V) | -40°C | | 25°C | | | 85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN. | MAX. | MIN. | TYP. | MAX. | MIN. | MAX. | |
| High Level Output Voltage | $V_{OH}$ | $\|I_{OUT}\|$<1μA, $V_{IN}=V_{SS}$, $V_{DD}$ | 5 | 4.95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

* All valid input combinations.

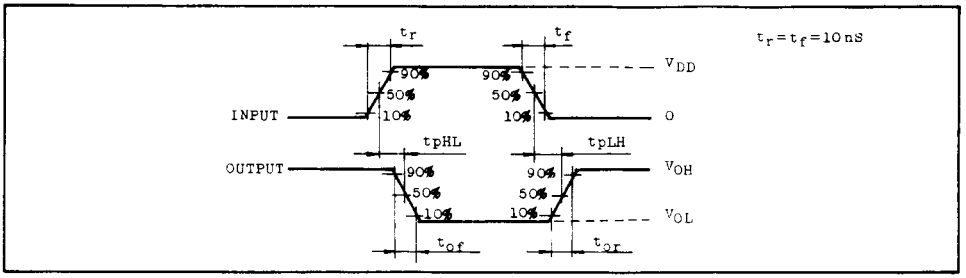
SWITCHING CHARACTERISTICS (Ta=25°C, $V_{SS}$=0.0V, $C_L$=15pF)

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | $V_{DD}$(V) | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| Output Rise Time | | $t_{or}$ | Circuit 1 | 5 | - | 26 | 40 | ns |
| Output Fall Time | | $t_{of}$ | Circuit 1 | 5 | - | 16 | 30 | ns |
| Propagation Delay Time | (Low-High) | $t_{pLH}$ | Circuit 1 | 5 | - | 18 | 27 | ns |
| | (High-Low) | $t_{pHL}$ | | 5 | - | 14 | 21 | |
| Propagation Delay Time | (Low-High) | $t_{pLH}$ | Circuit 2 | 5 | - | 13 | 20 | ns |
| | (High-Low) | $t_{pHL}$ | | 5 | - | 15 | 23 | |
| Input Capacitance | | $C_{IN}$ | | | - | 5 | - | pF |

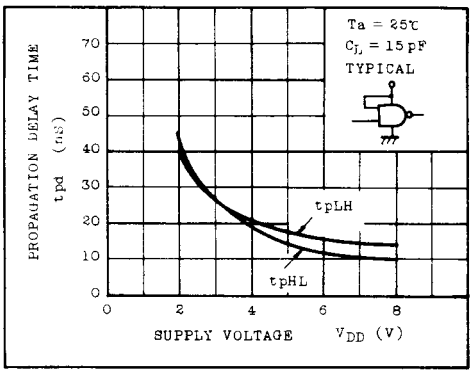
SWITCHING TIME TEST CIRCUIT



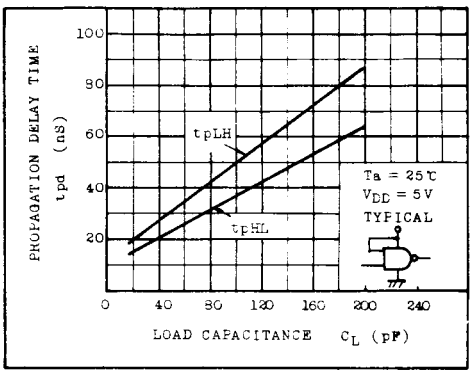
## SWITCHING TIME TEST WAVEFORM



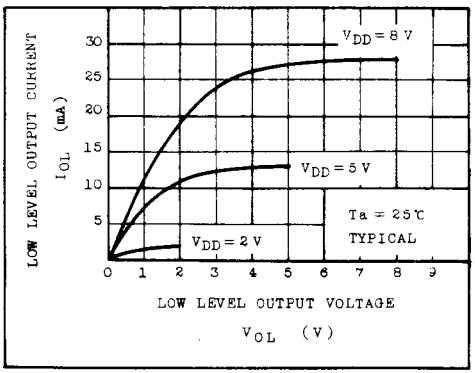

### $t_{pd}$ - $V_{DD}$




### $t_{pd}$ - $C_L$




### $I_{OL}$ - $V_{OL}$




### $I_{OH}$ - ($V_{DD}$ - $V_{OH}$ )