

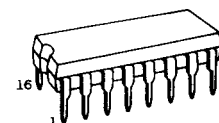
# TC40H139P/F

C<sup>2</sup>MOS DIGITAL INTEGRATED CIRCUIT  
SILICON MONOLITHIC

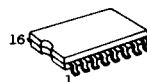
## TC40H139 DUAL 2-TO-4-LINE DECODER/DEMULTIPLEXER

The TC40H139 is a dual decoder/demulti-plexer, which can select one of four output lines through two input lines A and B according to the following truth table. The selected output at this time is at "L" level.

Further, when ENABLE input  $\bar{G}$  is set to "H" level, the selection is inhibited regardless of SELECT signal and all the outputs go to "H" level.



DIP16(3D16A-P)

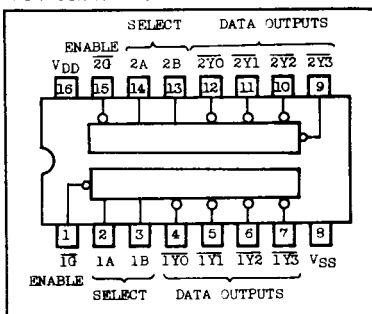


MFP16(F16QC-P)

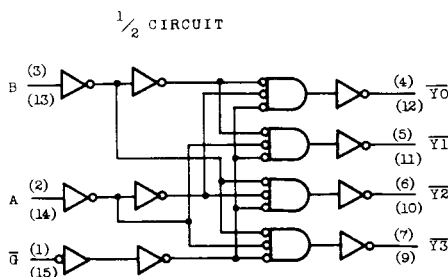
### MUXMUM RATINGS

| 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       | $I_{IN}$  | $\pm 10$                                 | mA   |
| Power Dissipation   | $P_D$     | 300(DIP)/180(MFP)                        | mW   |
| Storage Temperature | $T_{stg}$ | $-65 \sim 150$                           | °C   |
| Lead Temp./Time     | $T_{sol}$ | $260^\circ\text{C} \cdot 10 \text{ sec}$ |      |

### PIN CONNECTION



### LOGIC DIAGRAM



### TRUTH TABLE

| INPUTS    |        |   | OUTPUTS |       |       |       |
|-----------|--------|---|---------|-------|-------|-------|
| ENABLE    | SELECT |   |         |       |       |       |
| $\bar{G}$ | A      | B | $Y_0$   | $Y_1$ | $Y_2$ | $Y_3$ |
| H         | *      | * | H       | H     | H     | H     |
| L         | L      | L | L       | H     | H     | H     |
| L         | H      | L | H       | L     | H     | H     |
| L         | L      | H | H       | H     | L     | H     |
| L         | H      | H | H       | H     | H     | L     |

\* don't care

\* ALL INPUTS ARE EQUIPPED WITH PROTECTION CIRCUIT.

## TC40H139P/F

RECOMMENDED OPERATING CONDITIONS ( $V_{SS}=0.0V$ )

| CHARACTERISTIC        | SYMBOL   | TEST CONDITION | MIN. | TYP. | MAX.     | UNIT |
|-----------------------|----------|----------------|------|------|----------|------|
| Supply Voltage        | $V_{DD}$ | -              | 2.0  | -    | 8.0      | V    |
| Input Voltage         | $V_{IN}$ | -              | 0.0  | -    | $V_{DD}$ | V    |
| Operating Temperature | $T_{OP}$ | -              | -40  | -    | 85       | °C   |

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 |         |
| 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   | -    |         |
| Input Voltage             | "H" Level<br>$V_{IH}$ | $ I_{OUT}  < 1\mu A$<br>$V_{OH}=4.5V$<br>$V_{OL}=0.5V$ | 5               | 4.0   | -    | 4.0   | -          | -    | 4.0   | -    | V       |
|                           | "L" Level<br>$V_{IL}$ |  | 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               | -     | 12.5 | -     | $10^{-3}$  | 12.5 | -     | 75   | $\mu A$ |

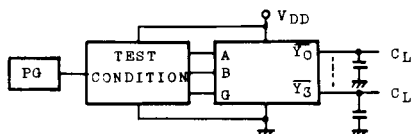
\* All valid input combinations.

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       |            | $t_{OR}$  |                | 5            | -    | 17   | 35   | ns   |
| Output Fall Time       |            | $t_{OF}$  |                | 5            | -    | 13   | 30   |      |
| Propagation Delay Time | (Low-High) | $t_{PLH}$ | SELECT - Y     | 5            | -    | 32   | 48   | ns   |
|                        | (High-Low) | $t_{PHL}$ |                | 5            | -    | 30   | 45   |      |
| Propagation Delay Time | (Low-High) | $t_{PLH}$ | ENABLE - Y     | 5            | -    | 32   | 48   | ns   |
|                        | (High-Low) | $t_{PHL}$ |                | 5            | -    | 30   | 45   |      |
| Input Capacitance      |            | $C_{IN}$  |                |              | -    | 5    | -    | pF   |

# TC40H139P/F

## SWITCHING TIME TEST CIRCUIT AND WAVEFORM



| TEST NO. | INPUTS         |           |           | OUTPUTS         |                 |
|----------|----------------|-----------|-----------|-----------------|-----------------|
|          | ENABLE         | SELECT    |           |                 |                 |
|          | $\overline{Y}$ | A         | B         |                 |                 |
| 1        | L              | $\square$ | L         | $\overline{Y0}$ | $\overline{Y1}$ |
| 2        | L              | L         | $\square$ | $\overline{Y0}$ | $\overline{Y2}$ |
| 3        | L              | $\square$ | H         | $\overline{Y0}$ | $\overline{Y3}$ |
| 4        | $\square$      | H         | H         | $\overline{Y0}$ | -               |

\* ALL OUTPUTS ARE MEASURED ACCORDING TO THE LEFT TABLE.

