

# TC3W02F, TC3W02FU

## 2-TO-3 LINE DECODER WITH ENABLE

The TC3W02 is a high speed C<sup>2</sup>MOS 2 to 3 LINE DECODER / DEMULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the C<sup>2</sup>MOS low power dissipation. The active low enable input can be used for gating or it can be used as a data input for demultiplexing applications. When the enable input is held "H", all three outputs are fixed at a high logic level independent of the other inputs. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

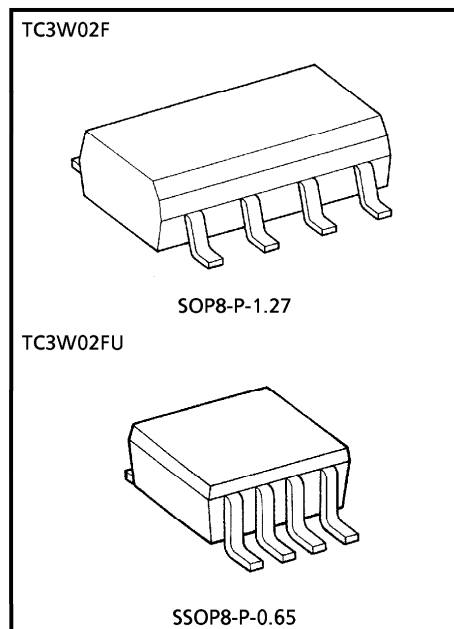
### FEATURES

- High Speed .....  $t_{pd} = 16ns$  (Typ.) at  $V_{CC} = 5V$
- Low Power Dissipation .....  $I_{CC} = 2\mu A$  (Max.) at  $T_a = 25^\circ C$
- High Noise Immunity .....  $V_{NIH} = V_{NIL} = 28\%$ ,  $V_{CC}$  (Min.)
- Output Drive Capability ..... 10 LSTTL Loads
- Symmetrical Output Impedance ...  $|I_{OH}| = I_{OL} = 4mA$  (Min.)
- Balanced Propagation Delays .....  $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range ...  $V_{CC} (opr) = 2\sim 6V$

### TRUTH TABLE

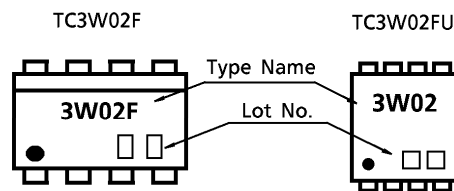
| INPUTS    |        |   | OUTPUTS    |            |            | SELECTED OUTPUT |
|-----------|--------|---|------------|------------|------------|-----------------|
| ENABLE    | SELECT |   | $\bar{Y}1$ | $\bar{Y}2$ | $\bar{Y}3$ |                 |
| $\bar{G}$ | B      | A |            |            |            |                 |
| H         | x      | x | H          | H          | H          | NONE            |
| L         | L      | L | H          | H          | H          | NONE            |
| L         | L      | H | L          | H          | H          | $\bar{Y}1$      |
| L         | H      | L | H          | L          | H          | $\bar{Y}2$      |
| L         | H      | H | H          | H          | L          | $\bar{Y}3$      |

x : Don't care

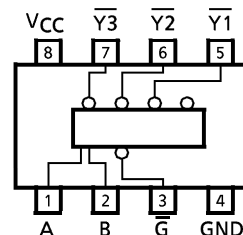


Weight SOP8-P-1.27 : 0.05g (Typ.)  
 SSOP8-P-0.65 : 0.02g (Typ.)

### MARKING



### PIN ASSIGNMENT (TOP VIEW)



## MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC                      | SYMBOL           | RATING                     | UNIT |
|-------------------------------------|------------------|----------------------------|------|
| Supply Voltage Range                | V <sub>CC</sub>  | -0.5~7                     | V    |
| DC Input Voltage                    | V <sub>IN</sub>  | -0.5~V <sub>CC</sub> + 0.5 | V    |
| DC Output Voltage                   | V <sub>OUT</sub> | -0.5~V <sub>CC</sub> + 0.5 | V    |
| Input Diode Current                 | I <sub>IJK</sub> | ± 20                       | mA   |
| Output Diode Current                | I <sub>OK</sub>  | ± 20                       | mA   |
| DC Output Current                   | I <sub>OUT</sub> | ± 25                       | mA   |
| DC V <sub>CC</sub> / Ground Current | I <sub>CC</sub>  | ± 25                       | mA   |
| Power Dissipation                   | P <sub>D</sub>   | 300                        | mW   |
| Storage Temperature                 | T <sub>stg</sub> | -65~150                    | °C   |
| Lead Temperature (10s)              | T <sub>L</sub>   | 260                        | °C   |

## RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC           | SYMBOL                          | RATING  | UNIT |
|--------------------------|---------------------------------|---|------|
| Supply Voltage           | V <sub>CC</sub>                 | 2~6   | V    |
| Input Voltage            | V <sub>IN</sub>                 | 0~V <sub>CC</sub>   | V    |
| Output Voltage           | V <sub>OUT</sub>                | 0~V <sub>CC</sub>   | V    |
| Operating Temperature    | T <sub>opr</sub>                | -40~85  | °C   |
| Input Rise and Fall Time | t <sub>r</sub> , t <sub>f</sub> | 0~1000 (V <sub>CC</sub> = 2.0V)<br>0~ 500 (V <sub>CC</sub> = 4.5V)<br>0~ 400 (V <sub>CC</sub> = 6.0V) | ns   |

## DC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC            | SYMBOL          | TEST CONDITION  | Ta = 25°C               |                          |                 | Ta = -40~85°C                            |      | UNIT |      |   |     |   |      |
|---------------------------|-----------------|---|-------------------------|--------------------------|-----------------|--|------|------|------|---|-----|---|------|
|                           |                 |   | V <sub>CC</sub>         | MIN.                     | TYP.            | MAX.                                     | MIN. |      | MAX. |   |     |   |      |
| High-Level Input Voltage  | V <sub>IH</sub> | —   | 2.0                     | 1.5                      | —               | —  | 1.5  | —    | V    |   |     |   |      |
|                           |                 |   | 4.5                     | 3.15                     | —               | —  | 3.15 | —    |      |   |     |   |      |
|                           |                 |   | 6.0                     | 4.2                      | —               | —  | 4.2  | —    |      |   |     |   |      |
| Low-Level Input Voltage   | V <sub>IL</sub> | —   | 2.0                     | —                        | —               | 0.5                                      | —    | 0.5  | V    |   |     |   |      |
|                           |                 |   | 4.5                     | —                        | —               | 1.35                                     | —    | 1.35 |      |   |     |   |      |
|                           |                 |   | 6.0                     | —                        | —               | 1.8                                      | —    | 1.8  |      |   |     |   |      |
| High-Level Output Voltage | V <sub>OH</sub> | V <sub>IN</sub> = V <sub>IH</sub><br>or V <sub>IL</sub> | I <sub>OH</sub> = -20μA | 2.0                      | 1.9             | 2.0                                      | —    | 1.9  | —    | V |     |   |      |
|                           |                 |   |                         | 4.5                      | 4.4             | 4.5                                      | —    | 4.4  | —    |   |     |   |      |
|                           |                 |   |                         | 6.0                      | 5.9             | 6.0                                      | —    | 5.9  | —    |   |     |   |      |
| Low-Level Output Voltage  | V <sub>OL</sub> | V <sub>IN</sub> = V <sub>IH</sub><br>or V <sub>IL</sub> | I <sub>OL</sub> = 20μA  | 2.0                      | —               | 0.0                                      | 0.1  | —    | 0.1  | V |     |   |      |
|                           |                 |   |                         | 4.5                      | —               | 0.0                                      | 0.1  | —    | 0.1  |   |     |   |      |
|                           |                 |   |                         | 6.0                      | —               | 0.0                                      | 0.1  | —    | 0.1  |   |     |   |      |
| Input Leakage Current     | I <sub>IN</sub> | V <sub>IN</sub> = V <sub>CC</sub> or GND                | 6.0                     | —                        | —               | ±0.1                                     | —    | ±1.0 | μA   |   |     |   |      |
|                           |                 |   |                         | Quiescent Supply Current | I <sub>CC</sub> | V <sub>IN</sub> = V <sub>CC</sub> or GND | 6.0  | —    |      | — | 2.0 | — | 20.0 |

AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 15pF, V<sub>CC</sub> = 5V, Ta = 25°C)

| PARAMETER  | SYMBOL           | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|------------------|----------------|------|------|------|------|
| Output Transition Time                           | t <sub>TLH</sub> | —              | —    | 4    | 8    | ns   |
|  | t <sub>THL</sub> |                |      |      |      |      |
| Propagation Delay Time (A, B- $\bar{Y}$ )        | t <sub>pLH</sub> | —              | —    | 12   | 22   |      |
|  | t <sub>pHL</sub> |                |      |      |      |      |
| Propagation Delay Time ( $\bar{G}$ - $\bar{Y}$ ) | t <sub>pLH</sub> | —              | —    | 10   | 18   |      |
|  | t <sub>pHL</sub> |                |      |      |      |      |

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$ )

| PARAMETER  | SYMBOL                 | TEST CONDITION | $V_{CC}$ | $T_a = 25^\circ\text{C}$ |      |      | $T_a = -40 \sim 85^\circ\text{C}$ |      | UNIT |
|--|------------------------|----------------|----------|--------------------------|------|------|-----------------------------------|------|------|
|  |                        |                |          | MIN.                     | TYP. | MAX. | MIN.                              | MAX. |      |
| Output Transition Time                           | $t_{TLH}$<br>$t_{THL}$ | —              | 2.0      | —                        | 30   | 75   | —                                 | 95   | ns   |
|  |                        |                | 4.5      | —                        | 8    | 15   | —                                 | 19   |      |
|  |                        |                | 6.0      | —                        | 7    | 13   | —                                 | 16   |      |
| Propagation Delay Time (A, B- $\bar{Y}$ )        | $t_{pLH}$<br>$t_{pHL}$ | —              | 2.0      | —                        | 45   | 130  | —                                 | 165  |      |
|  |                        |                | 4.5      | —                        | 15   | 26   | —                                 | 33   |      |
|  |                        |                | 6.0      | —                        | 13   | 22   | —                                 | 28   |      |
| Propagation Delay Time ( $\bar{G}$ - $\bar{Y}$ ) | $t_{pLH}$<br>$t_{pHL}$ | —              | 2.0      | —                        | 39   | 110  | —                                 | 140  |      |
|  |                        |                | 4.5      | —                        | 13   | 22   | —                                 | 28   |      |
|  |                        |                | 6.0      | —                        | 11   | 19   | —                                 | 24   |      |
| Input Capacitance                                | $C_{IN}$               | —              | —        | 5                        | 10   | —    | 10                                | pF   |      |
| Power Dissipation Capacitance                    | $C_{PD}$               | (Note 1)       | —        | 46                       | —    | —    | —                                 |      |      |

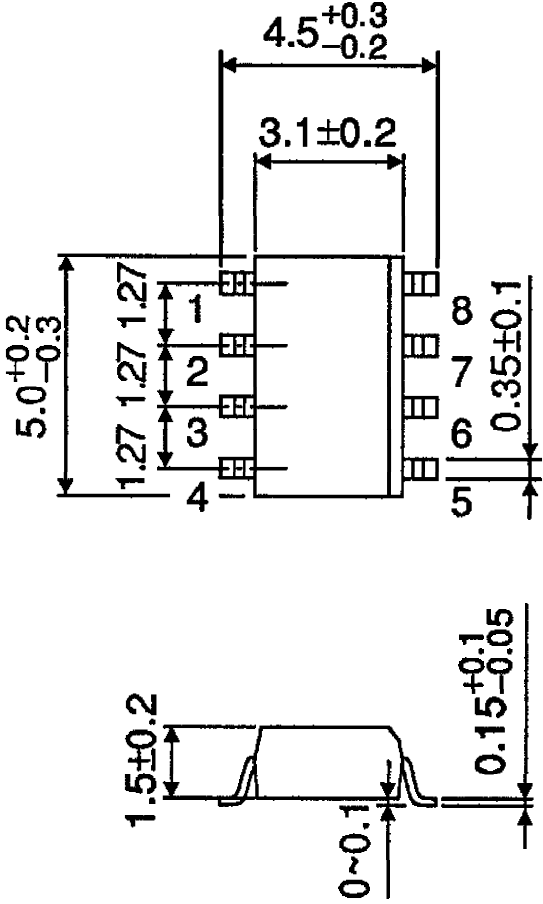
Note 1 :  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation.

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

PACKAGE DIMENSIONS  
SOP8-P-1.27

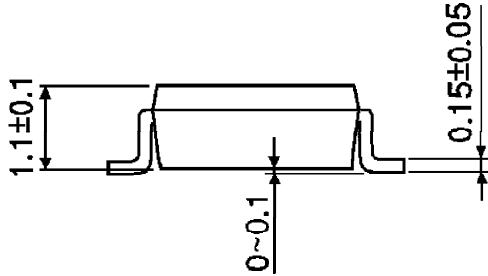
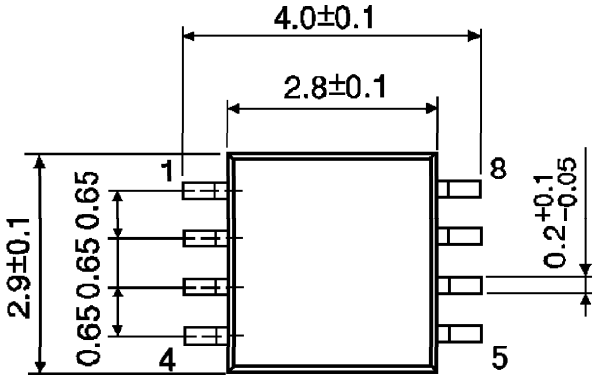
Unit : mm



Weight : 0.05g (Typ.)

PACKAGE DIMENSIONS  
SSOP8-P-0.65

Unit : mm



Weight : 0.02g (Typ.)

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