

# TC4583BP

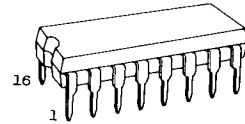
C<sup>2</sup>MOS DIGITAL INTEGRATED CIRCUIT  
SILICON MONOLITHIC

## TC4583BP DUAL SCHMITT TRIGGER

TC4583BP consists of two independent Schmitt trigger circuits.

By externally connecting resistors between POSITIVE terminal and COMMON terminal and between NEGATIVE terminal and COMMON terminal, hysteresis can be given to two inputs A<sub>IN</sub> and B<sub>IN</sub>. Furthermore, the width of hysteresis and the threshold voltage between high level and low level can be varied by varying the resistors. The outputs are available in the forms of positive outputs and inverted three-state outputs from both circuits. Exclusive-OR of both inputs is also output.

This is most suitable for line receivers.

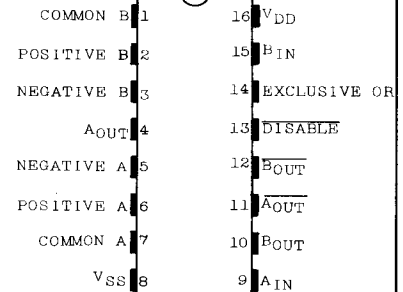


DIP 16 (3D16A-P)

## ABSOLUTE MAXIMUM RATINGS

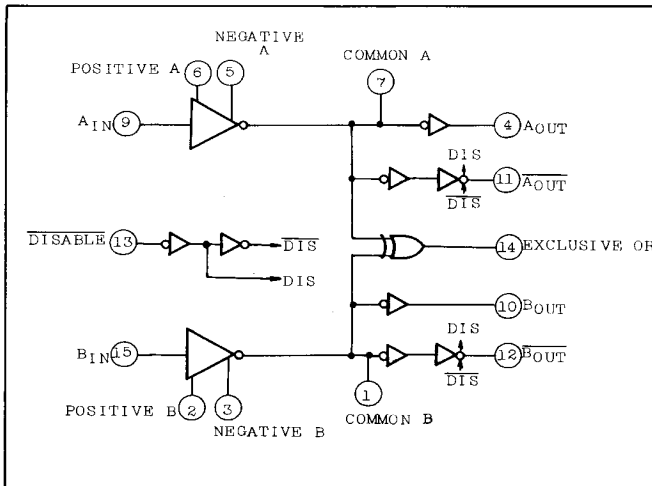
| CHARACTERISTIC              | SYMBOL           | RATING                                        | UNITS |
|-----------------------------|------------------|-----------------------------------------------|-------|
| DC Supply Voltage           | V <sub>DD</sub>  | V <sub>SS</sub> - 0.5 ~ V <sub>SS</sub> + 20  | 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     |
| DC Input Current            | I <sub>IN</sub>  | ±10                                           | mA    |
| Power Dissipation           | P <sub>D</sub>   | 300                                           | mW    |
| Operating Temperature Range | T <sub>A</sub>   | -40 ~ 85                                      | °C    |
| Storage Temperature Range   | T <sub>stg</sub> | -65 ~ 150                                     | °C    |
| Lead Temp./Time             | T <sub>sol</sub> | 260°C • 10 sec                                |       |

## PIN ASSIGNMENT



(TOP VIEW)

## LOGIC DIAGRAM



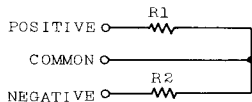
## TRUTH TABLE

| INPUTS |   |         | OUTPUTS          |                  |                  |                  |       |
|--------|---|---------|------------------|------------------|------------------|------------------|-------|
| A      | B | DISABLE | A <sub>OUT</sub> | A <sub>OUT</sub> | B <sub>OUT</sub> | B <sub>OUT</sub> | EX.OR |
| L      | L | L       | L                | HZ               | L                | HZ               | L     |
| L      | L | H       | L                | H                | L                | H                | L     |
| L      | H | L       | L                | HZ               | H                | HZ               | H     |
| L      | H | H       | L                | H                | H                | L                | H     |
| H      | L | L       | H                | HZ               | L                | HZ               | H     |
| H      | L | H       | H                | L                | L                | H                | H     |
| H      | H | L       | H                | HZ               | H                | HZ               | L     |
| H      | H | H       | H                | L                | H                | L                | L     |

HZ: HIGH IMPEDANCE

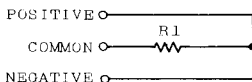
# EXTERNAL RESISTER CONNECTION

(A)



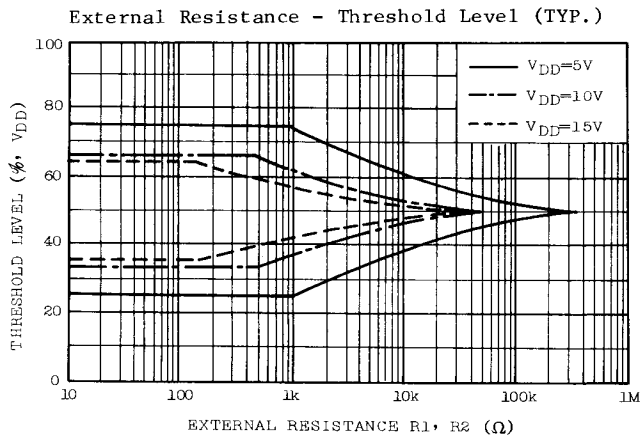
Negative Threshold Voltage,  $V_N$  can be varied by changing  $R_2$  and Positive Threshold Voltage,  $V_P$  can be varied by changing  $R_1$ .

(B)



Hysteresis Voltage,  $V_H$  can be varied by changing  $R_1$ .

Hysteresis Voltage  $V_H = V_P - V_N$



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

| CHARACTERISTIC      | SYMBOL     | MIN.      | TYP. | MAX.     | UNITS    |
|---------------------|------------|-----------|------|----------|----------|
| DC Supply Voltage   | $V_{DD}$   | 3         | -    | 18       | V        |
| Input Voltage       | $V_{IN}$   | 0         | -    | $V_{DD}$ | V        |
| External Resistance | $R_1, R_2$ | No Limits |      |          | $\Omega$ |

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

| CHARACTERISTIC            | SYMBOL   | TEST CONDITION                                  | $V_{DD}$<br>(V) | -40°C |      | 25°C  |       |      | 85°C  |      | UNITS |
|---------------------------|----------|-------------------------------------------------|-----------------|-------|------|-------|-------|------|-------|------|-------|
|                           |          |                                                 |                 | 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  | 5.00  | -    | 4.95  | -    | V     |
|                           |          |                                                 | 10              | 9.95  | -    | 9.95  | 10.00 | -    | 9.95  | -    |       |
|                           |          |                                                 | 15              | 14.95 | -    | 14.95 | 15.00 | -    | 14.95 | -    |       |
| Low-Level Output Voltage  | $V_{OL}$ | $ I_{OUT}  < 1\mu A$<br>$V_{IN}=V_{SS}, V_{DD}$ | 5               | -     | 0.05 | -     | 0.00  | 0.05 | -     | 0.05 | V     |
|                           |          |                                                 | 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  | 1.5   | -    | 0.42  | -    | mA    |
|                           |          | $V_{OL}=0.5V$                                   | 10              | 1.5   | -    | 1.3   | 3.8   | -    | 1.1   | -    |       |
|                           |          | $V_{OL}=1.5V$                                   | 15              | 4.0   | -    | 3.4   | 15.0  | -    | 2.8   | -    |       |
|                           |          | $V_{IN}=V_{SS}, V_{DD}$                         |                 |       |      |       |       |      |       |      |       |

## STATIC ELECTRICAL CHARACTERISTICS (Continued)

| CHARACTERISTIC                 |           | SYMBOL          | TEST CONDITIONS                                    | V <sub>DD</sub><br>(V) | -40°C |      | 25°C |                   |      | 85°C |      | UNITS |
|--------------------------------|-----------|-----------------|----------------------------------------------------|------------------------|-------|------|------|-------------------|------|------|------|-------|
|                                |           |                 |                                                    |                        | MIN.  | MAX. | MIN. | TYP.              | MAX. | MIN. | MAX. |       |
| Input High Voltage             |           | V <sub>IH</sub> | V <sub>OUT</sub> =0.5V, 4.5V                       | 5                      | 3.5   | -    | 3.5  | 2.75              | -    | 3.5  | -    | V     |
|                                |           |                 | V <sub>OUT</sub> =1.0V, 9.0V                       | 10                     | 7.0   | -    | 7.0  | 5.5               | -    | 7.0  | -    |       |
|                                |           |                 | V <sub>OUT</sub> =1.5V, 13.5V                      | 15                     | 11.0  | -    | 11.0 | 8.25              | -    | 11.0 | -    |       |
| Input Low Voltage              |           | V <sub>IL</sub> | I <sub>OUT</sub>   < 1μA                           | 15                     | 11.0  | -    | 11.0 | 8.25              | -    | 11.0 | -    |       |
|                                |           |                 | V <sub>OUT</sub> =0.5V, 4.5V                       | 5                      | -     | 1.5  | -    | 2.25              | 1.5  | -    | 1.5  |       |
|                                |           |                 | V <sub>OUT</sub> =1.0V, 9.0V                       | 10                     | -     | 3.0  | -    | 5.5               | 3.0  | -    | 3.0  |       |
|                                |           |                 | V <sub>OUT</sub> =1.5V, 13.5V                      | 15                     | -     | 4.0  | -    | 6.75              | 4.0  | -    | 4.0  |       |
|                                |           |                 | I <sub>OUT</sub>   < 1μA                           | 15                     | -     | 4.0  | -    | 6.75              | 4.0  | -    | 4.0  |       |
| Input Current                  | "H" Level | I <sub>IH</sub> | V <sub>IH</sub> =18V                               | 18                     | -     | 0.1  | -    | 10 <sup>-5</sup>  | 0.1  | -    | 1.0  | μA    |
|                                | "L" Level | I <sub>IL</sub> | V <sub>IL</sub> =0V                                | 18                     | -     | -0.1 | -    | -10 <sup>-5</sup> | -0.1 | -    | -1.0 |       |
| 3-State Output Leakage Current | "H" Level | I <sub>DH</sub> | V <sub>OUT</sub> =18V                              | 18                     | -     | 0.4  | -    | 10 <sup>-4</sup>  | 0.4  | -    | 7.5  | μA    |
|                                | "L" Level | I <sub>DL</sub> | V <sub>OUT</sub> =0V                               | 18                     | -     | -0.4 | -    | -10 <sup>-4</sup> | -0.4 | -    | -7.5 |       |
| Quiescent Device Current       |           | I <sub>DD</sub> | V <sub>IN</sub> =V <sub>SS</sub> , V <sub>DD</sub> | 5                      | -     | 1    | -    | 0.002             | 1    | -    | 3.8  | μA    |
|                                |           |                 | *                                                  | 10                     | -     | 2    | -    | 0.004             | 2    | -    | 9.5  |       |
|                                |           |                 |                                                    | 15                     | -     | 4    | -    | 0.008             | 4    | -    | 15   |       |

\* All valid input combinations.

 DYNAMIC ELECTRICAL CHARACTERISTICS (T<sub>a</sub>=25°C, V<sub>SS</sub>=0V, C<sub>L</sub>=50pF)

| CHARACTERISTIC                                                                                                              | SYMBOL                                                                     | TEST CONDITIONS     | V <sub>DD</sub> (V) | MIN. | TYP. | MAX. | UNITS |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------|---------------------|------|------|------|-------|
| Output Transition Time (Low to High)                                                                                        | t <sub>TLH</sub>                                                           |                     | 5                   | -    | 80   | 200  |       |
|                                                                                                                             |                                                                            |                     | 10                  | -    | 50   | 100  |       |
|                                                                                                                             |                                                                            |                     | 15                  | -    | 40   | 80   |       |
| Output Transition Time (High to Low)                                                                                        | t <sub>THL</sub>                                                           |                     | 5                   | -    | 80   | 200  |       |
|                                                                                                                             |                                                                            |                     | 10                  | -    | 50   | 100  |       |
|                                                                                                                             |                                                                            |                     | 15                  | -    | 40   | 80   |       |
| Propagation Delay Time (A <sub>IN</sub> , B <sub>IN</sub> - A <sub>OUT</sub> , B <sub>OUT</sub> )                           | t <sub>pLH</sub><br>t <sub>pHL</sub>                                       |                     | 5                   | -    | 200  | 1300 | ns    |
|                                                                                                                             |                                                                            |                     | 10                  | -    | 80   | 460  |       |
|                                                                                                                             |                                                                            |                     | 15                  | -    | 60   | 300  |       |
| Propagation Delay Time (A <sub>IN</sub> , B <sub>IN</sub> - $\overline{A}$ <sub>OUT</sub> , $\overline{B}$ <sub>OUT</sub> ) | t <sub>pLH</sub><br>t <sub>pHL</sub>                                       |                     | 5                   | -    | 200  | 2200 |       |
|                                                                                                                             |                                                                            |                     | 10                  | -    | 80   | 760  |       |
|                                                                                                                             |                                                                            |                     | 15                  | -    | 60   | 520  |       |
| Propagation Delay Time (A <sub>IN</sub> , B <sub>IN</sub> - EX, OR)                                                         | t <sub>pLH</sub><br>t <sub>pHL</sub>                                       |                     | 5                   | -    | 210  | 1500 |       |
|                                                                                                                             |                                                                            |                     | 10                  | -    | 80   | 560  |       |
|                                                                                                                             |                                                                            |                     | 15                  | -    | 60   | 340  |       |
| 3-State Disable Time ( $\overline{DISABLE}$ - $\overline{A}$ <sub>OUT</sub> , $\overline{B}$ <sub>OUT</sub> )               | t <sub>pLZ</sub> , t <sub>pHZ</sub><br>t <sub>pZL</sub> , t <sub>pZH</sub> | R <sub>L</sub> =1kΩ | 5                   | -    | 110  | 450  |       |
|                                                                                                                             |                                                                            |                     | 10                  | -    | 50   | 180  |       |
|                                                                                                                             |                                                                            |                     | 15                  | -    | 35   | 110  |       |

DYNAMIC ELECTRICAL CHARACTERISTICS (Continued)

| CHARACTERISTIC                      | SYMBOL       | TEST CONDITION      | $V_{DD}(V)$   | MIN.              | TYP.               | MAX.              | UNITS |
|-------------------------------------|--------------|---------------------|---------------|-------------------|--------------------|-------------------|-------|
| Positive Threshold Voltage          | $V_P$        | $R_1, R_2=5k\Omega$ | 5<br>10<br>15 | -<br>-<br>-       | 3.2<br>5.55<br>8.0 | -<br>-<br>-       | V     |
| Negative Threshold Voltage          | $V_N$        | $R_1, R_2=5k\Omega$ | 5<br>10<br>15 | -<br>-<br>-       | 1.8<br>4.45<br>7.0 | -<br>-<br>-       |       |
| Hysteresis Voltage                  | $V_H$        | $R_1, R_2=5k\Omega$ | 5<br>10<br>15 | 0.5<br>0.3<br>0.2 | 1.4<br>1.1<br>1.0  | 3.0<br>1.9<br>1.8 |       |
| Threshold Voltage Variation (A - B) | $\Delta V_T$ | $R_1, R_2=5k\Omega$ | 5<br>10<br>15 | -<br>-<br>-       | 0.1<br>0.15<br>0.2 | -<br>-<br>-       |       |
| Input Capacitance                   | $C_{IN}$     |                     |               | -                 | 5                  | 7.5               | pF    |

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

