

# FAST 74F588 Transceiver

## FAST Products

### FEATURES

- High-impedance NPN base inputs for reduced loading (70 $\mu$ A in High and Low states)
- Non-inverting buffers
- Bidirectional data path
- B outputs sink 64mA and source 15mA

### DESCRIPTION

The 74F588 contains eight non-inverting bidirectional buffers with 3-state outputs and is intended for bus-oriented applications. The B port have termination resistors as specified in the IEEE-488 specifications. Current sinking capability is 24mA at the A ports and 64 mA at the B ports. The Transmit/Receive (T/R) input determines the direction of data flow through the bidirectional transceiver. Transmit (active High) enables data from A ports to B ports and Receive (active Low) enables data from B ports to A ports. The Output Enable input, when High, disables both A and B ports by placing them in a high-impedance condition.

## Octal Bidirectional Transceiver With IEEE-488 Termination Resistors (3 state Inputs and Outputs)

### Product Specification

| TYPE   | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|--------|---------------------------|--------------------------------|
| 74F588 | 4.0ns                     | 96mA                           |

### ORDERING INFORMATION

| PACKAGES                        | COMMERCIAL RANGE<br>$V_{CC} = 5V \pm 10\%$ ; $T_A = 0^\circ C$ to $+70^\circ C$ |
|---------------------------------|---|
| 20-Pin Plastic DIP              | N74F588N  |
| 20-Pin Plastic SOL <sup>1</sup> | N74F588D  |

#### NOTE 1:

Thermal mounting techniques are recommended. See SMD Process Applications (page 17) for a discussion of thermal consideration for surface mounted devices.

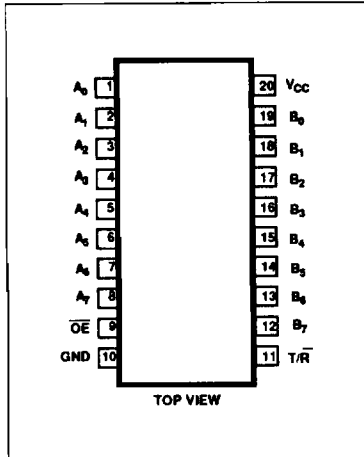
### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

| PINS                            | DESCRIPTION                      | 74F(U.L.) HIGH/LOW   | LOAD VALUE HIGH/LOW   |
|---------------------------------|----------------------------------|----------------------|-----------------------|
| A <sub>0</sub> - A <sub>7</sub> | Port A data inputs               | 3.5/0.117            | 70 $\mu$ A/70 $\mu$ A |
| B <sub>0</sub> - B <sub>7</sub> | Port B data inputs               | T <sup>2</sup> /5.33 | T <sup>2</sup> /3.2mA |
| $\overline{OE}$                 | Output Enable input (active Low) | 2.0/0.067            | 40 $\mu$ A/40 $\mu$ A |
| T/R                             | Transmit/Receive input           | 2.0/0.067            | 40 $\mu$ A/40 $\mu$ A |
| A <sub>0</sub> - A <sub>7</sub> | Port A outputs                   | 150/40               | 3.0mA/24mA            |
| B <sub>0</sub> - B <sub>7</sub> | Port B outputs                   | 750/106.7            | 15mA/64mA             |

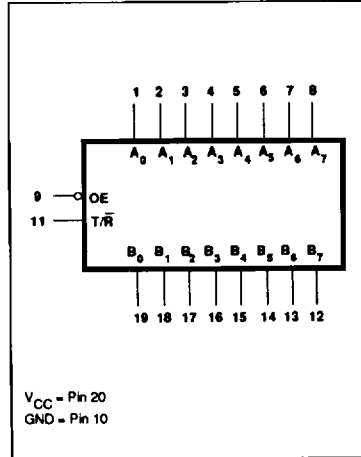
#### NOTE:

- One (1.0) FAST Unit Load is defined as: 20 $\mu$ A in the High state and 0.6mA in the Low state.
- T = Resistance Termination per IEEE-488 Standard

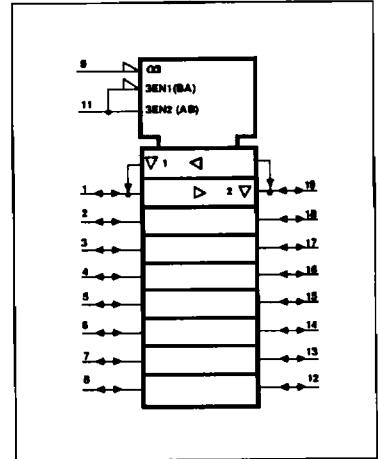
### PIN CONFIGURATION



### LOGIC SYMBOL



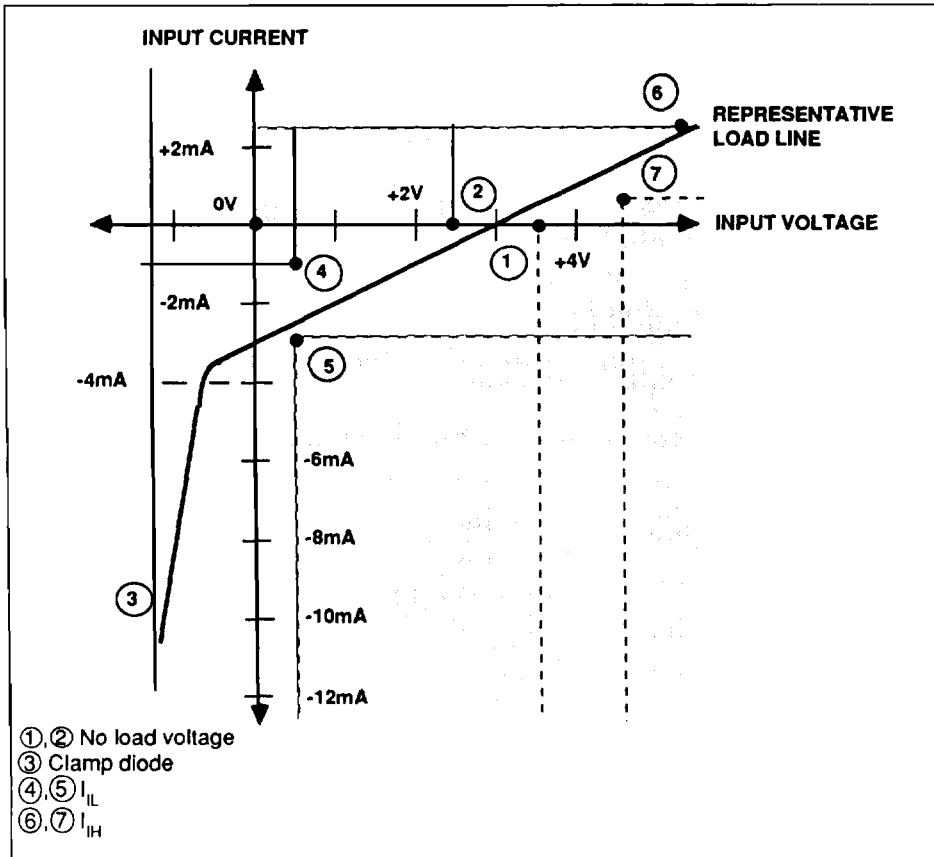
### LOGIC SYMBOL (IEEE/IEC)



Transceiver

FAST 74F588

B port Input Characteristics with  $T/\bar{R}$  Low



FUNCTION TABLE

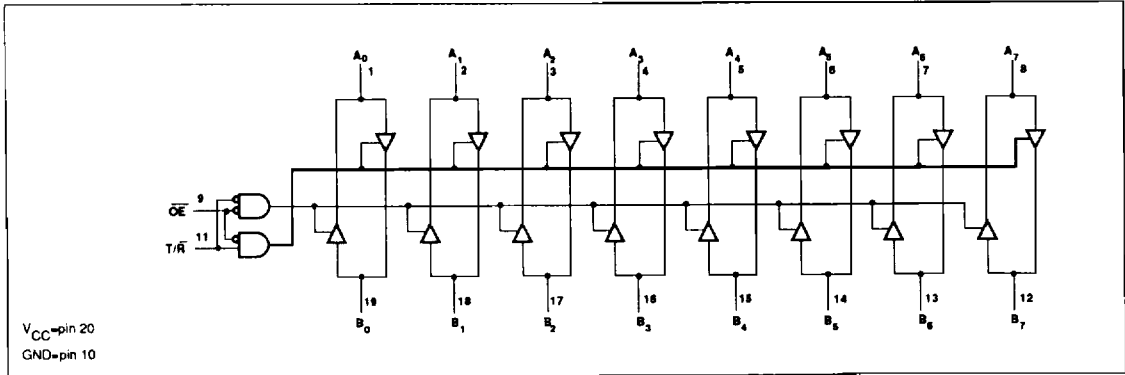
| INPUTS          |             | OUTPUTS             |
|-----------------|-------------|---------------------|
| $\overline{OE}$ | $T/\bar{R}$ |                     |
| L               | L           | Bus B data to Bus A |
| L               | H           | Bus A data to Bus B |
| H               | X           | Z                   |

H=High voltage level  
 L=Low voltage level  
 X=Don't care  
 Z=High impedance "off" state

Transceiver

FAST 74F588

LOGIC DIAGRAM



**ABSOLUTE MAXIMUM RATINGS** (Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

| SYMBOL    | PARAMETER                                      | RATING        | UNIT |    |
|-----------|--|---------------|------|----|
| $V_{CC}$  | Supply voltage                                 | -0.5 to +7.0  | V    |    |
| $V_{IN}$  | Input voltage                                  | -0.5 to +7.0  | V    |    |
| $I_{IN}$  | Input current                                  | -30 to +5     | mA   |    |
| $V_{OUT}$ | Voltage applied to output in High output state | -0.5 to +5.5  | V    |    |
| $I_{OUT}$ | Current applied to output in Low output state  | $A_0$ - $A_7$ | 48   | mA |
|           |  | $B_0$ - $B_7$ | 128  | mA |
| $T_A$     | Operating free-air temperature range           | 0 to +70      | °C   |    |
| $T_{STG}$ | Storage temperature                            | -65 to +150   | °C   |    |

**RECOMMENDED OPERATING CONDITIONS**

| SYMBOL   | PARAMETER                            | LIMITS        |     |     | UNIT |
|----------|--------------------------------------|---------------|-----|-----|------|
|          |                                      | Min           | Nom | Max |      |
| $V_{CC}$ | Supply voltage                       | 4.5           | 5.0 | 5.5 | V    |
| $V_{IH}$ | High-level input voltage             | 2.0           |     |     | V    |
| $V_{IL}$ | Low-level input voltage              |               |     | 0.8 | V    |
| $I_{IK}$ | Input clamp current                  |               |     | -18 | mA   |
| $I_{OH}$ | High-level output current            | $A_0$ - $A_7$ |     | -3  | mA   |
|          |                                      | $B_0$ - $B_7$ |     | -15 | mA   |
| $I_{OL}$ | Low-level output current             | $A_0$ - $A_7$ |     | 24  | mA   |
|          |                                      | $B_0$ - $B_7$ |     | 64  | mA   |
| $T_A$    | Operating free-air temperature range | 0             |     | 70  | °C   |

## Transceiver

FAST 74F588

## DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

| SYMBOL             | PARAMETER  |                            | TEST CONDITIONS <sup>1</sup>   |  |                  | LIMITS |                  |      | UNIT    |
|--------------------|--|----------------------------|--|--|------------------|--------|------------------|------|---------|
|                    |  |                            |  |  |                  | Min    | Typ <sup>2</sup> | Max  |         |
| $V_{OH}$           | High-level output voltage                              | $A_0-A_7$                  | $V_{CC} = \text{MIN},$<br>$V_{IL} = \text{MAX},$<br>$\frac{V_{OH}}{OE} = 0.0V$ | $I_{OH} = -3mA$                                | $\pm 10\%V_{CC}$ | 2.4    |                  |      | V       |
|                    |  | $B_0-B_7$                  |  |  | $\pm 5\%V_{CC}$  | 2.7    | 3.4              |      | V       |
|                    |  | $B_0-B_7$                  | $V_{CC} = \text{MIN},$<br>$V_{IL} = \text{MAX},$<br>$\frac{V_{OH}}{OE} = 0.0V$ | $I_{OH} = -15mA$                               | $\pm 10\%V_{CC}$ | 2.0    |                  |      | V       |
|                    |  |                            |  |  | $\pm 5\%V_{CC}$  | 2.0    |                  |      | V       |
| $V_{OL}$           | Low-level output voltage                               | $A_0-A_7$                  | $V_{CC} = \text{MIN},$<br>$V_{IL} = \text{MAX},$<br>$\frac{V_{OL}}{OE} = 0.0V$ | $I_{OL} = 24mA$                                | $\pm 10\%V_{CC}$ |        | 0.35             | 0.50 | V       |
|                    |  | $B_0-B_7$                  |  |  | $\pm 5\%V_{CC}$  |        | 0.35             | 0.50 | V       |
|                    |  | $B_0-B_7$                  | $V_{CC} = \text{MIN},$<br>$V_{IL} = \text{MAX},$<br>$\frac{V_{OL}}{OE} = 0.0V$ | $I_{OL} = \text{MAX}$                          | $\pm 10\%V_{CC}$ |        |                  | 0.55 | V       |
|                    |  |                            |  |  | $\pm 5\%V_{CC}$  |        | 0.42             | 0.55 | V       |
| $V_{NL}$           | No load voltage  | $B_0-B_7$                  | $I_{OUT} = 0.0mA, T/\bar{R} = 0.0V$  |  |                  | 2.5    |                  | 3.7  | mA      |
| $V_{IK}$           | Input clamp voltage                                    |                            | $V_{CC} = \text{MIN}, I_I = I_{IK}$  |  |                  |        | -0.73            | -1.2 | V       |
| $I_I$              | Input current at maximum input voltage                 | $A_0-A_7$                  | $V_{CC} = \text{MAX}, V_I = 5.5V$  |  |                  |        |                  | 1.0  | mA      |
|                    |  | $\overline{OE}, T/\bar{R}$ | $V_{CC} = 0.0V, V_I = 7.0V$  |  |                  |        |                  | 100  | $\mu A$ |
| $I_{IH}$           | High-level input current                               | $\overline{OE}, T/\bar{R}$ | $V_{CC} = \text{MAX}, V_I = 2.7V$  |  |                  |        |                  | 40   | $\mu A$ |
| $I_{IL}$           | Low-level input current                                | $\overline{OE}, T/\bar{R}$ | $V_{CC} = \text{MAX}, V_I = 0.5V$  |  |                  |        |                  | -40  | $\mu A$ |
| $I_{IH} + I_{OZH}$ | Off-state output current<br>High-level voltage applied | $A_0-A_7$                  | $V_{CC} = \text{MAX}, V_I = 2.7V, T/\bar{R} = 4.5V$                            |  |                  |        |                  | 70   | $\mu A$ |
|                    |  | $B_0-B_7$                  | $V_{CC} = \text{MAX}, V_I = 5.0V, T/\bar{R} = 0.0V$                            |  |                  | 0.7    |                  |      | mA      |
|                    |  |                            | $V_{CC} = \text{MAX}, V_I = 5.5V, T/\bar{R} = 0.0V$                            |  |                  |        |                  | 2.5  | mA      |
| $I_{IL} + I_{OZL}$ | Off-state output current<br>Low-level voltage applied  | $A_0-A_7$                  | $V_{CC} = \text{MAX}, V_I = 0.5V, T/\bar{R} = 4.5V$                            |  |                  |        |                  | -70  | mA      |
|                    |  | $B_0-B_7$                  | $V_{CC} = \text{MAX}, V_I = 0.4V, T/\bar{R} = 0.0V$                            |  |                  | -1.3   |                  | -3.2 | mA      |
|                    |  |                            |  |  |                  |        |                  |      |         |
| $I_{OS}$           | Short-circuit output current <sup>3</sup>              | $A_0-A_7$                  | $V_{CC} = \text{MAX}$  |  |                  | -60    |                  | -150 | mA      |
|                    |  | $B_0-B_7$                  |  |  |                  | -100   |                  | -225 | mA      |
| $I_{CC}$           | Supply current (total)                                 | $I_{CCH}$                  | $V_{CC} = \text{MAX}$  | $A_n = T/\bar{R} = 4.5V, \overline{OE} = 0.0V$ |                  | 82     | 100              | mA   |         |
|                    |  | $I_{CCL}$                  |  | $A_n = \overline{OE} = 0.0V, T/\bar{R} = 4.5V$ |                  | 110    | 135              | mA   |         |
|                    |  | $I_{CCZ}$                  |  | $\overline{OE} = 4.5V$                         |                  | 95     | 125              | mA   |         |

## NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at  $V_{CC} = 5V, T_A = 25^\circ C$ .
- Not more than one output should be shorted at a time. For testing  $I_{OS}$ , the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests,  $I_{OS}$  tests should be performed last.

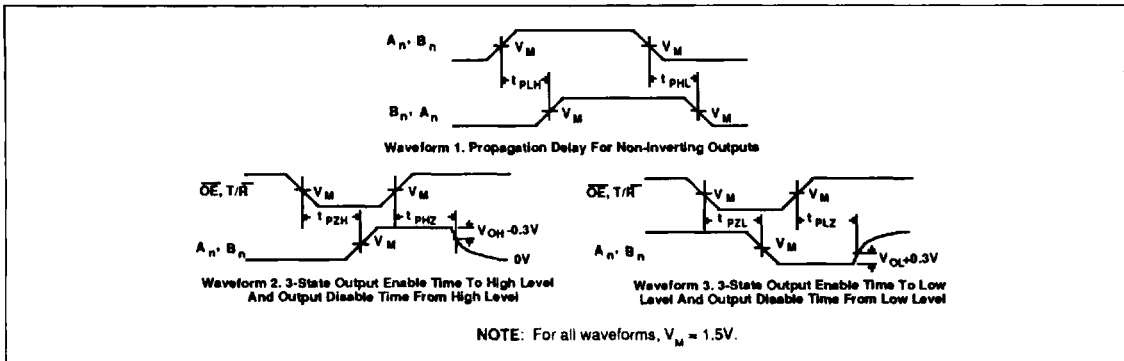
# Transceiver

# FAST 74F588

## AC ELECTRICAL CHARACTERISTICS

| SYMBOL                 | PARAMETER  | TEST CONDITION           | LIMITS                    |            |             |   |              | UNIT |
|------------------------|--|--------------------------|---------------------------|------------|-------------|---|--------------|------|
|                        |  |                          | $T_A = +25^\circ\text{C}$ |            |             | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ |              |      |
|                        |  |                          | Min                       | Typ        | Max         | Min   | Max          |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>$A_n$ to $B_n$ , $B_n$ to $A_n$ | Waveform 1               | 2.0<br>2.5                | 3.5<br>4.5 | 6.0<br>7.0  | 2.0<br>2.0                                    | 7.0<br>7.5   | ns   |
| $t_{PZH}$<br>$t_{PZL}$ | Output Enable time<br>to High or Low level           | Waveform 2<br>Waveform 3 | 5.5<br>5.0                | 7.5<br>7.5 | 10.0<br>9.5 | 5.5<br>5.0                                    | 11.0<br>10.0 | ns   |
| $t_{PHZ}$<br>$t_{PLZ}$ | Output Disable time<br>from High or Low level        | Waveform 2<br>Waveform 3 | 2.5<br>2.5                | 4.5<br>4.0 | 7.0<br>7.0  | 2.5<br>2.5                                    | 8.0<br>7.5   | ns   |

## AC WAVEFORMS



## TEST CIRCUIT AND WAVEFORMS

**Test Circuit For 3-State Outputs**

| TEST      | SWITCH |
|-----------|--------|
| $t_{PLZ}$ | closed |
| $t_{PZL}$ | closed |
| All other | open   |

**DEFINITIONS**

$R_L$  = Load resistor; see AC CHARACTERISTICS for value.

$C_L$  = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

$R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.

**Input Pulse Definition**

$V_M = 1.5V$

| FAMILY | INPUT PULSE REQUIREMENTS |           |       |           |           |
|--------|--------------------------|-----------|-------|-----------|-----------|
|        | Amplitude                | Rep. Rate | $t_W$ | $t_{TLH}$ | $t_{THL}$ |
| 74F    | 3.0V                     | 1MHz      | 500ns | 2.5ns     | 2.5ns     |