



## 54F/74F588

# Octal Bidirectional Transceiver with TRI-STATE® Inputs/Outputs and IEEE-488 Termination Resistors

### General Description

The 'F588 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. The B ports have termination resistors as specified in the IEEE-488 specifications. Current sinking capability is 24 mA (20 mA Mil) at the A ports and 64 mA (48 mA Mil) 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; Receive (active LOW) enables

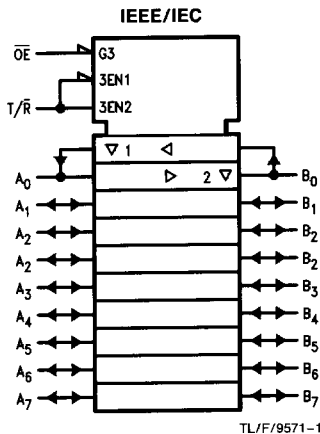
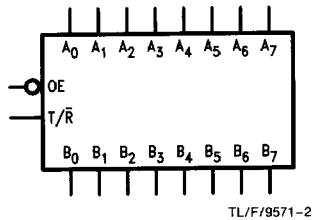
data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a high impedance condition.

### Features

- Non-inverting buffers
- Bidirectional data path
- B outputs sink 64 mA (48 mA Mil), source 12 mA
- Guaranteed 4000V minimum ESD protection

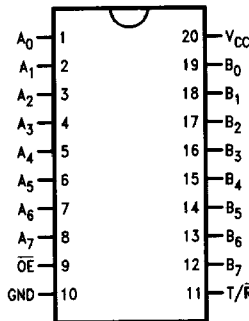
**Ordering Code:** See Section 5

### Logic Symbols

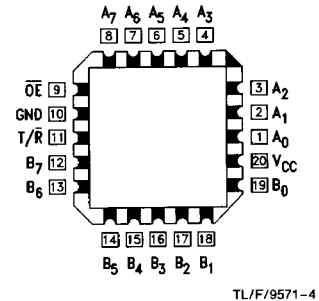


### Connection Diagrams

Pin Assignment  
for DIP, SOIC and Flatpak



Pin Assignment  
for LCC



## Unit Loading/Fan Out: See Section 2 for U.L. definitions

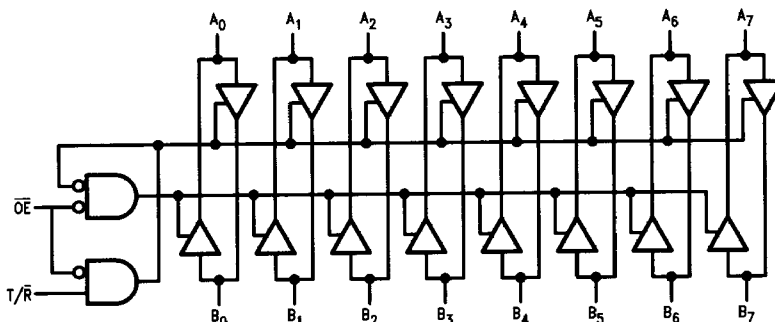
Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$\overline{OE}$	Output Enable Input (Active LOW)	1.0/2.0	20 $\mu\text{A}$ / -1.2 mA
$T/\overline{R}$	Transmit/Receive Control Input	1.0/2.0	20 $\mu\text{A}$ / -1.2 mA
$A_0$ - $A_7$	A Port Inputs or TRI-STATE Outputs	3.5/1.083	70 $\mu\text{A}$ / -0.65 mA
$B_0$ - $B_7$	B Port Inputs or TRI-STATE Outputs	150/40 (33.3) *T/5.33	-3 mA/24 mA (20 mA) *T/3.2 mA
		600/106.6 (80)	-12 mA/64 mA (48 mA)

\*T = Resistive Termination per IEEE-488 Standard

## Truth Table

Inputs		Outputs
$\overline{OE}$	$T/\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Impedance

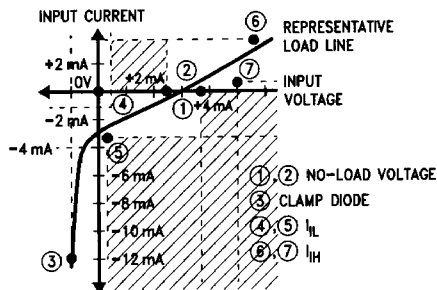
## Logic Diagram



TL/F/9571-5

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

## B Port Input Characteristic with $T/\overline{R}$ LOW



TL/F/9571-6

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	-55°C to +175°C
V <sub>CC</sub> Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V <sub>CC</sub> = 0V)	
Standard Output	-0.5V to V <sub>CC</sub>
TRI-STATE Output	-0.5V to +5.5V

Current Applied to Output in LOW State (Max) twice the rated I<sub>OL</sub> (mA)

ESD Last Passing Voltage (Min) 4000V

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

## Recommended Operating Conditions

Free Air Ambient Temperature	
Military	-55°C to +125°C
Commercial	0°C to +70°C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

## DC Electrical Characteristics

Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA (OE, T/ $\bar{R}$ )
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub> 54F 10% V <sub>CC</sub> 54F 10% V <sub>CC</sub> 74F 10% V <sub>CC</sub> 74F 10% V <sub>CC</sub> 74F 10% V <sub>CC</sub> 74F 5% V <sub>CC</sub> 74F 5% V <sub>CC</sub>	2.5 2.4 2.0 2.5 2.4 2.0 2.7 2.7		V	Min	I <sub>OH</sub> = -1 mA (A <sub>n</sub> ) I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> ) I <sub>OH</sub> = -12 mA (B <sub>n</sub> ) I <sub>OH</sub> = -1 mA (A <sub>n</sub> ) I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> ) I <sub>OH</sub> = -15 mA (B <sub>n</sub> ) I <sub>OH</sub> = -1 mA (A <sub>n</sub> ) I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> )
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub> 54F 10% V <sub>CC</sub> 74F 10% V <sub>CC</sub> 74F 10% V <sub>CC</sub>		0.5 0.55 0.5 0.55	V	Min	I <sub>OL</sub> = 20 mA (A <sub>n</sub> ) I <sub>OL</sub> = 48 mA (B <sub>n</sub> ) I <sub>OL</sub> = 24 mA (A <sub>n</sub> ) I <sub>OL</sub> = 64 mA (B <sub>n</sub> )
I <sub>IH</sub>	Input HIGH Current			20	μA	Max	V <sub>IN</sub> = 2.7V (OE, T/ $\bar{R}$ )
I <sub>IH</sub> + I <sub>OZH</sub>	I <sub>IH</sub> IEEE-488		700	2.5	μA mA	4.75 5.25	V <sub>IN</sub> = 5.0V (B <sub>n</sub> ) V <sub>IN</sub> = 5.5V (B <sub>n</sub> )
I <sub>IL</sub> + I <sub>OZL</sub>	I <sub>IL</sub> IEEE-488		-1.3	-3.2	mA	4.75 5.25	V <sub>IN</sub> = 0.4V (B <sub>n</sub> ) V <sub>IN</sub> = 0.4V (B <sub>n</sub> )
V <sub>NL</sub>	No Load Voltage		2.5	3.7	V	4.75 5.25	I <sub>IN</sub> = 0V (B <sub>n</sub> ) I <sub>IN</sub> = 0V (B <sub>n</sub> )
I <sub>BVI</sub>	Input HIGH Current Breakdown Test			100	μA	Max	V <sub>IN</sub> = 7.0V (OE, T/ $\bar{R}$ )
I <sub>BVIT</sub>	Input HIGH Current Breakdown Test (I/O)			1.0	mA	Max	V <sub>IN</sub> = 5.5V (A <sub>n</sub> )

## DC Electrical Characteristics (Continued)

Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
I <sub>IL</sub>	Input LOW Current			-1.2	mA	Max	V <sub>IN</sub> = 0.5V ( $\overline{OE}$ , T/ $\overline{R}$ )
I <sub>IH</sub> + I <sub>OZH</sub>	Output Leakage Current			70	$\mu$ A	Max	V <sub>OUT</sub> = 2.7V (A <sub>n</sub> )
I <sub>IL</sub> + I <sub>OZL</sub>	Output Leakage Current			-650	$\mu$ A	Max	V <sub>OUT</sub> = 0.5V (A <sub>n</sub> )
I <sub>OS</sub>	Output Short-Circuit Current	-60 -100		-150 -225	mA	Max	V <sub>OUT</sub> = 0V (A <sub>n</sub> ) V <sub>OUT</sub> = 0V (B <sub>n</sub> )
I <sub>CEX</sub>	Output HIGH Leakage Current			250	$\mu$ A	Max	V <sub>OUT</sub> = V <sub>CC</sub> (A <sub>n</sub> )
I <sub>ZZ</sub>	Bus Drainage Test			500	$\mu$ A	0.0V	V <sub>OUT</sub> = 5.25V (A <sub>n</sub> , B <sub>n</sub> )
I <sub>CCH</sub>	Power Supply Current		67	100	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current		90	135	mA	Max	V <sub>O</sub> = LOW
I <sub>CCZ</sub>	Power Supply Current		83	125	mA	Max	V <sub>O</sub> = HIGH Z

## AC Electrical Characteristics: See Section 2 for Waveforms and Load Configurations

Symbol	Parameter	74F			54F		74F		Units	Fig. No.
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF			
		Min	Typ	Max	Min	Max	Min	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A to B or B to A	2.5 2.5	4.5 5.0	6.0 6.5			2.5 2.5	7.0 7.5	ns	2-3
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time T/ $\overline{R}$ or $\overline{OE}$ to A or B	2.5 2.5	5.0 7.0	7.0 9.0			2.5 2.5	8.0 10.0	ns	2-5
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time T/ $\overline{R}$ or $\overline{OE}$ to A or B	2.5 2.5	5.5 5.5	7.0 7.0			2.5 2.5	8.0 8.0		