

# P54/74FCT640T/AT/CT—P54/74FCT643T/AT/CT OCTAL BIDIRECTIONAL TRANSCEIVERS WITH 3-STATE OUTPUTS

## ★ FEATURES

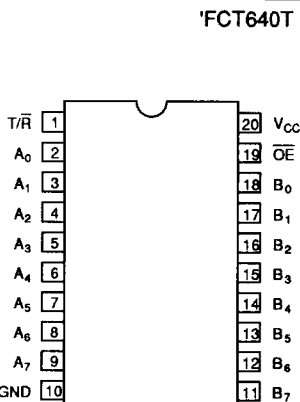
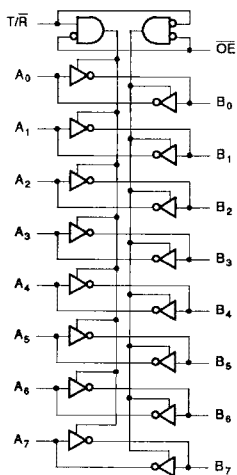
- Function, Pinout and Drive Compatible with the FCT and F Logic
- FCT-C speed at 4.4ns max. (Com'I)  
FCT-A speed at 5.0ns max. (Com'I)
- Reduced  $V_{OH}$  (typically = 3.3V) versions of Equivalent FCT functions
- Edge-rate Control Circuitry for Significantly Improved Noise Characteristics
- ESD protection exceeds 2000V
- Power-off disable feature
- Matched Rise and Fall times
- Fully Compatible with TTL Input and Output Logic Levels
- 64 mA Sink Current (Com'I), 32 mA (MII)  
15 mA Source Current (Com'I), 12 mA (MII)
- 3-State Outputs
- Manufactured in 0.7 micron PACE Technology™

## ★ DESCRIPTION

The 'FCT640T, 'FCT643T contain eight bidirectional buffers with 3-state outputs and is intended for bus oriented applications. Current sinking capability is 64 mA at the A & B ports. The 'FCT640T and 'FCT643T are identical except for the non-inversion on the B port for the 'FCT643T.

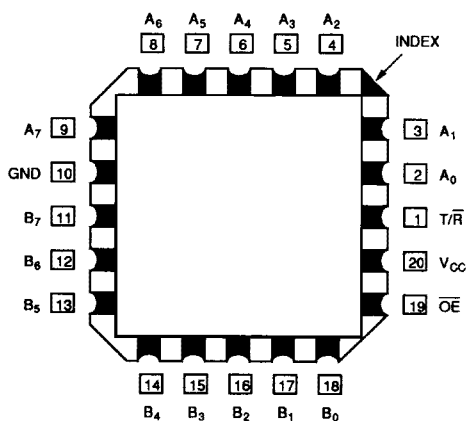
The Transmit/Receive ( $T/\bar{R}$ ) input determines the direction of data flow through the bidirectional transceiver. Transmit (Active HIGH) enables data from A ports to B ports; receive (Active LOW) enables data from B ports to A ports. The output enable input, when HIGH, disables both the A and B ports by putting them in a high Z condition.

## ★ LOGIC BLOCK DIAGRAM



DIP (D2, P2), SOIC (S2)

## PIN CONFIGURATIONS



LCC (L2)

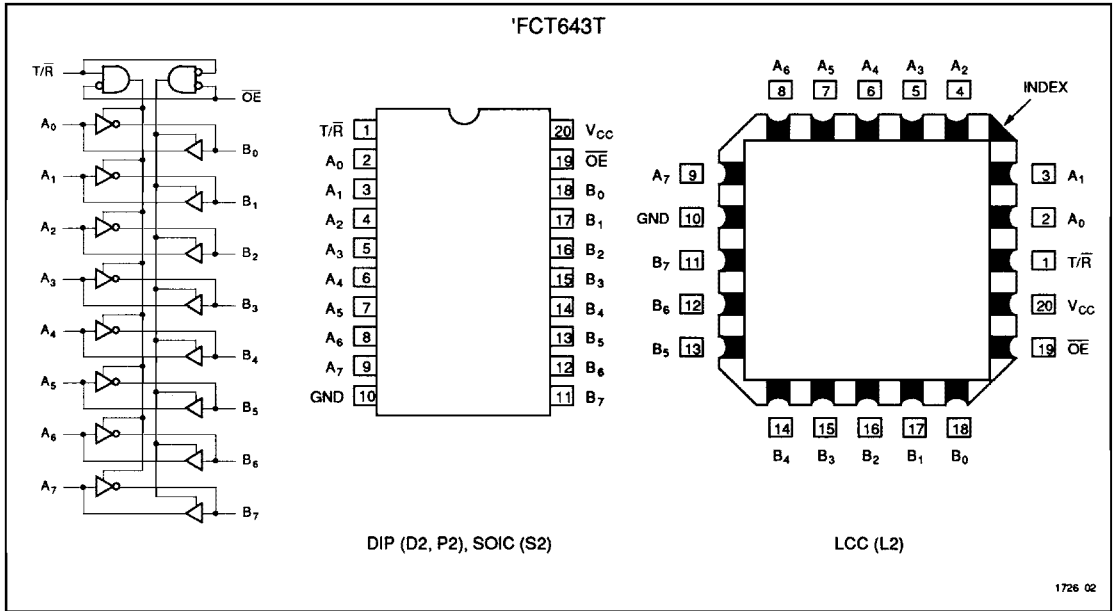
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**LOGIC BLOCK DIAGRAM**

**PIN CONFIGURATIONS**



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**ABSOLUTE MAXIMUM RATINGS<sup>1,2</sup>**

Symbol	Parameter	Value	Unit
$T_{STG}$	Storage Temperature	-65 to +150	°C
$T_A$	Ambient Temperature Under Bias	-65 to +135	°C
$V_{CC}$	$V_{CC}$ Potential to Ground	-0.5 to +7.0	V
$P_T$	Power Dissipation	0.5	W

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**Notes:**

1. Operation beyond the limits set forth in the above table may impair the useful life of the device. Unless otherwise noted, these limits are over the operating free-air temperature range.

Symbol	Parameter	Value	Unit
$I_{OUTPUT}$	Current Applied to Output	120	mA
$V_{IN}$	Input Voltage	-0.5 to +7.0	V
$V_{OUT}$	Voltage Applied to Output	-0.5 to +7.0	V

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2. Unused inputs must always be connected to an appropriate logic voltage level, preferably either  $V_{CC}$  or ground.

**RECOMMENDED OPERATING CONDITIONS**

Free Air Ambient Temperature	Min.	Max.
Military	-55°C	+125°C
Commercial	0°C	+70°C

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Supply Voltage ( $V_{CC}$ )	Min.	Max.
Military	+4.5V	+5.5V
Commercial	+4.75V	+5.25V

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**DC ELECTRICAL CHARACTERISTICS** (Over recommended operating conditions)

Symbol	Parameter	Min	Typ <sup>1</sup>	Max	Units	$V_{CC}$	Conditions
$V_{IH}$	Input HIGH Voltage	2.0			V		
$V_{IL}$	Input LOW Voltage			0.8	V		
$V_H$	Hysteresis <sup>3</sup>		0.2		V		All inputs
$V_{IK}$	Input Clamp Diode Voltage		-0.7	-1.2	V	MIN	$I_{IN} = -18mA$
$V_{OH}$	Output HIGH Voltage	Military Commercial	2.4 3.3	3.3 3.3	V	MIN	$I_{OH} = -15mA$ $I_{OH} = -24mA$
$V_{OL}$	Output LOW Voltage	Military Commercial Commercial		0.3 0.3 0.3	V	MIN	$I_{OL} = 32mA$ $I_{OL} = 48mA$ $I_{OL} = 64mA$
$I_I$	Input HIGH Current			20	μA	MAX	$V_{IN} = V_{CC}$
$I_{IH}$	Input HIGH Current (Except I/O Pins)			5	μA	MAX	$V_{IN} = 2.7V$
$I_{IL}$	Input LOW Current (Except I/O Pins)			-5	μA	MAX	$V_{IN} = 0.5V$
$I_{IH}$	Input HIGH Current (I/O Pins only)			15	μA	MAX	$V_{OUT} = 2.7V$
$I_{IL}$	Input LOW Current (I/O Pins only)			-15	μA	MAX	$V_{OUT} = 0.5V$
$I_{OS}$	Output Short Circuit Current <sup>2</sup>	-60	-120	-225	mA	MAX	$V_{OUT} = 0.0V$
$I_{OFF}$	Power-off Disable			100	μA	0V	$V_{OUT} = 4.5V$
$C_{IN}$	Input Capacitance <sup>3</sup>		5	10	pF	MAX	All inputs
$C_{IO}$	I/O Capacitance <sup>3</sup>		9	12	pF	MAX	All outputs
$I_{CC}$	Quiescent Power Supply Current		0.2	1.5	mA	MAX	$V_{IN} \leq 0.2V$ , $V_{IN} \geq V_{CC} - 0.2V$

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**Notes:**

1. Typical limits are at  $V_{CC} = 5.0V$ ,  $T_A = +25^\circ C$  ambient.  
2. Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high speed test apparatus and/or sample and hold techniques are preferable in order to minimize internal chip 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.

3. This parameter is guaranteed but not tested.

**DC CHARACTERISTICS** (Over recommended operating conditions unless otherwise specified.)

Symbol	Parameter	Typ <sup>1</sup>	Max	Units	Conditions
$\Delta I_{CC}$	Quiescent Power Supply Current (TTL inputs)	0.5	2.0	mA	$V_{CC} = \text{MAX}$ , $V_{IN} = 3.4V^2$ , $f_1 = 0$ , Outputs Open
$I_{CCD}$	Dynamic Power Supply Current <sup>3</sup>	0.15	0.25	mA/ mHz	$V_{CC} = \text{MAX}$ , One Input Toggling, 50% Duty Cycle, Outputs Open, $T/\bar{R} = \overline{OE} = \text{GND}$ and $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$ ,
$I_C$	Total Power Supply Current <sup>5</sup>	2.0	4.0	mA	$V_{CC} = \text{MAX}$ , 50% Duty Cycle, Outputs Open, One Bit Toggling at $f_1 = 10\text{MHz}$ , $T/\bar{R} = \overline{OE} = \text{GND}$ and $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		2.3	5.0	mA	$V_{CC} = \text{MAX}$ , 50% Duty Cycle, Outputs Open, One Bit Toggling at $f_1 = 10\text{MHz}$ , $T/\bar{R} = \overline{OE} = \text{GND}$ and $V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$
		3.5	6.5 <sup>4</sup>	mA	$V_{CC} = \text{MAX}$ , 50% Duty Cycle, Outputs Open, Eight Bits Toggling at $f_1 = 2.5\text{MHz}$ , $T/\bar{R} = \overline{OE} = \text{GND}$ and $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		5.5	14.5 <sup>4</sup>	mA	$V_{CC} = \text{MAX}$ , 50% Duty Cycle, Outputs Open, Eight Bits Toggling at $f_1 = 2.5\text{MHz}$ , $T/\bar{R} = \overline{OE} = \text{GND}$ and $V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$

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**Notes:**

- Typical values are at  $V_{CC} = 5.0V$ , +25°C ambient.
- Per TTL driven input ( $V_{IN} = 3.4V$ ); all other inputs at  $V_{CC}$  or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- Values for these conditions are examples of the  $I_{CC}$  formula. These limits are guaranteed but not tested.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$   
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_o/2 + f_1 N_1)$   
 $I_{CC}$  = Quiescent Current with CMOS input levels  
 $\Delta I_{CC}$  = Power Supply Current for a TTL High Input ( $V_{IN} = 3.4V$ )

- $D_H$  = Duty Cycle for TTL Inputs High
- $N_T$  = Number of TTL Inputs at  $D_H$
- $I_{CCD}$  = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
- $f_o$  = Clock Frequency for Register Devices (Zero for Non-Register Devices)
- $f_1$  = Input Frequency
- $N_1$  = Number of Inputs at  $f_1$
- All currents are in milliamps and all frequencies are in megahertz.

**FUNCTION TABLES**

'FCT640T		
Enable OE	Direction Control T/R	Operation
L	L	$\bar{B}$ Data to Bus A
L	H	$\bar{A}$ Data to Bus B
H	X	High Z State

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'FCT643T		
Enable OE	Direction Control T/R	Operation
L	L	B Data to Bus A
L	H	$\bar{A}$ Data to Bus B
H	X	High Z State

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H = HIGH Voltage Level, L = LOW Voltage Level, X = Don't Care

**AC CHARACTERISTICS**

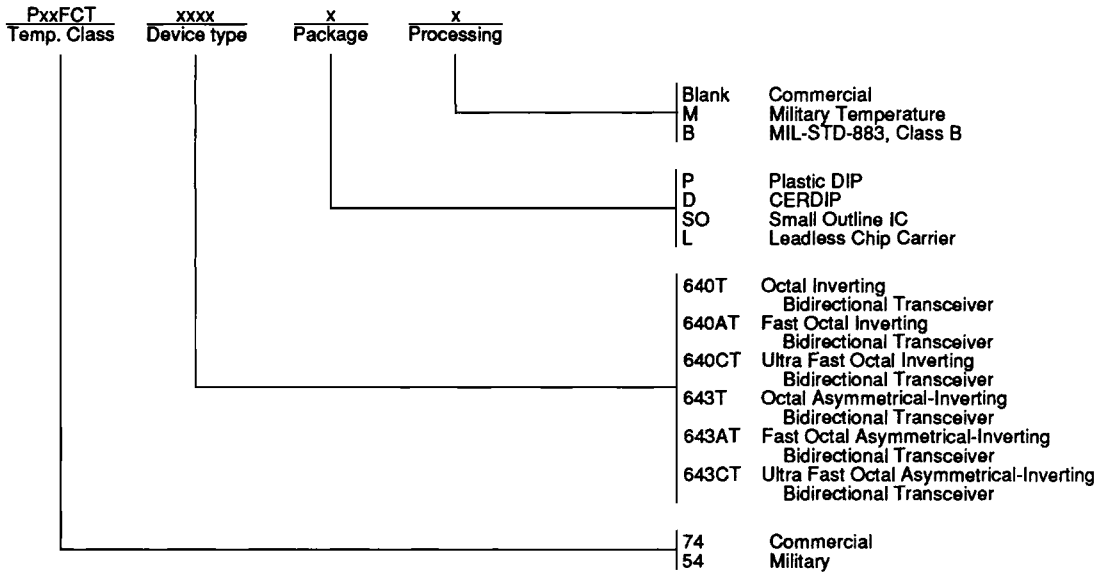
Symbol	Parameter	'FCT640T 'FCT643T				'FCT640AT 'FCT643AT				'FCT640CT 'FCT643CT				Units	Fig. No.
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min. <sup>1</sup>	Max.	Min. <sup>1</sup>	Max.	Min. <sup>1</sup>	Max.	Min. <sup>1</sup>	Max.	Min. <sup>1</sup>	Max.	Min. <sup>1</sup>	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub>	1.5	8.0	1.5	7.0	1.5	5.3	1.5	5.0	1.5	4.7	1.5	4.4	ns	1, 3
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time OE or T/R to A or B	1.5	16.0	1.5	13.0	1.5	6.5	1.5	6.2	1.5	6.2	1.5	5.8	ns	1, 7, 8
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time OE or T/R to A or B	1.5	12.0	1.5	10.0	1.5	6.0	1.5	5.0	1.5	5.2	1.5	4.8	ns	1, 7, 8

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**Note:**

1. Minimum limits are guaranteed but not tested on Propagation Delays.  
AC Characteristics guaranteed with C<sub>L</sub> = 50pF as shown in Figure 1.

**ORDERING INFORMATION**



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