P54/74FCT640/A (P54/74PCT640/A)
P54/74FCT643/A (P54/74PCT643/A)
OCTAL BIDIRECTIONAL TRANSCEIVERS WITH 3-STATE OUTPUTS

FEATURES

- Function, Pinout, and Drive Compatible with the FCT and F Logic

- FCT-A speed at 5.0ns max. (Com'l)
  FCT speed at 7.0ns max. (Com'l)

- CMOS V_{OH} Levels for Low Power Consumption — Typically 1/3 of FAST Bipolar Logic

- Edge-rate Control Circuitry for Significantly Improved Noise Characteristics

- ESD protection exceeds 2000V

- Inputs and Outputs Interface Directly with TTL, NMOS, and CMOS Devices

- Outputs Meet Levels Required for CMOS Static RAM Low Power Standby Mode

- 64 mA Sink Current (Com'l), 48 mA (Mil)
  15 mA Source Current (Com'l), 12 mA (Mil)

- 3-State Outputs

- Manufactured in 0.8 micron PACE Technology™

DESCRIPTION

The 'FCT640, 'FCT643 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 'FCT640 and 'FCT643 are identical except for the non-inversion on the B port for the 'FCT643.

The Transmit/Receive (T/$\overline{R}$) 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
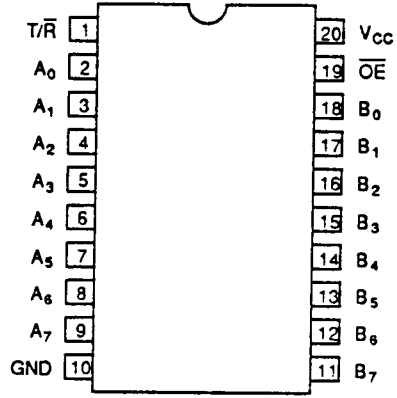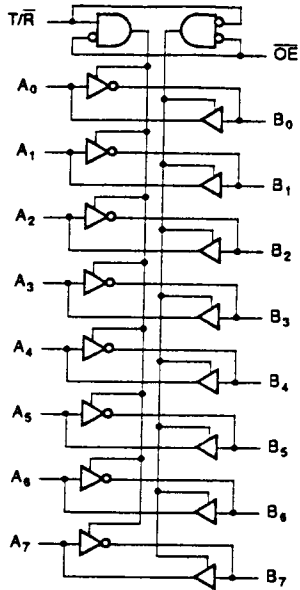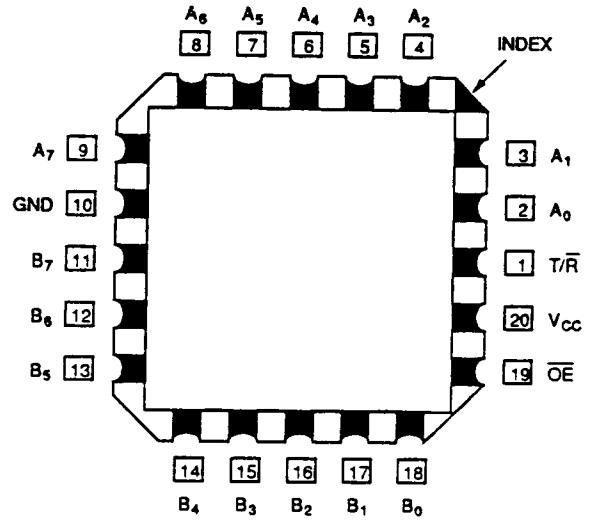
PIN CONFIGURATIONS

'FCT640

DIP (D2, P2), SOIC (S2)
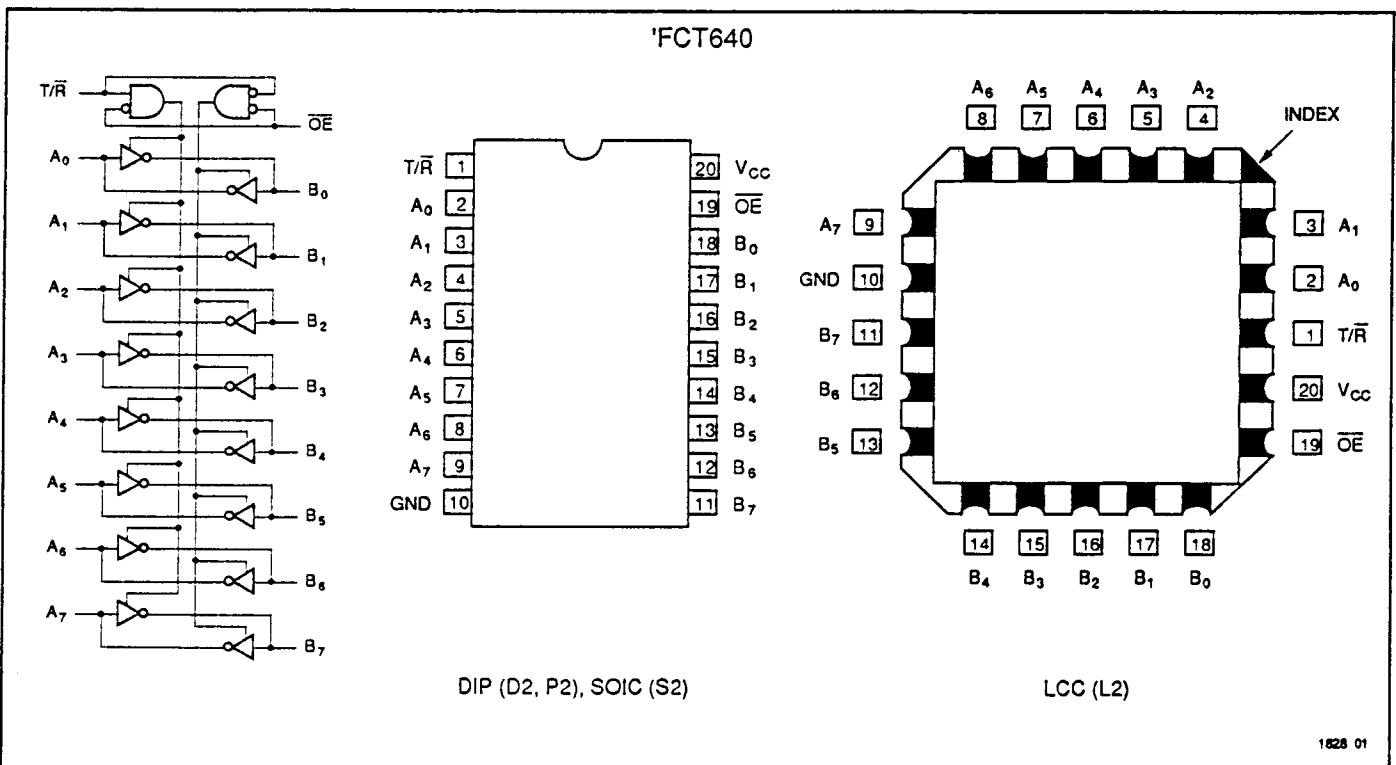
LCC (L2)

1828 01

LOGIC BLOCK DIAGRAM

PIN CONFIGURATIONS

'FCT643

DIP (D2, P2), SOIC (S2)

LCC (L2)

1828 02

ABSOLUTE MAXIMUM RATINGS[1,2]

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
I_{IN}	Input Current	–30 to +5.0	mA

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

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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.

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[1]	Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		
V_{IL}	Input LOW Voltage				0.8	V		
V_H	Hysteresis			0.35		V		All inputs
V_{CD}	Input clamp diode voltage			–0.7	–1.2	V	MIN	I_{IN} = –18mA
V_{OH}	Output HIGH voltage	V_{CC} = 3V, V_{IN} = 0.2V, or V_{CC} – 0.2V	V_{CC} – 0.2	V_{CC}		V		I_{OH} = –32µA
		Military/Commercial (CMOS)	V_{CC} – 0.2	V_{CC}		V	MIN	I_{OH} = –300µA
		Military (TTL)	2.4	4.3		V	MIN	I_{OH} = –12mA
		Commercial (TTL)	2.4	4.3		V	MIN	I_{OH} = –15mA
V_{OL}	Output LOW voltage	V_{CC} = 3V, V_{IN} = 0.2V, or V_{CC} – 0.2V		GND	0.2	V		I_{OL} = 300µA
		Military/Commercial (CMOS)		GND	0.2	V	MIN	I_{OL} = 300µA
		Military (TTL)		0.3	0.55	V	MIN	I_{OL} = 48mA
		Commercial (TTL)		0.3	0.55	V	MIN	I_{OL} = 64mA
I_{IH}	Input HIGH Current (Except I/O Pins)				5	µA	MAX	V_{IN} = V_{CC}
I_{IL}	Input LOW Current (Except I/O Pins)				–5	µA	MAX	V_{IN} = GND
I_{IH}	Input HIGH Current[3] (Except I/O Pins)				5	µA	MAX	V_{IN} = 2.7V
I_{IL}	Input LOW Current[3] (Except I/O Pins)				–5	µA	MAX	V_{IN} = 0.5V
I_{IH}	Input HIGH Current (I/O Pins only)				15	µA	MAX	V_{IN} = V_{CC}
I_{IL}	Input LOW Current (I/O Pins only)				–15	µA	MAX	V_{IN} = GND
I_{IH}	Input HIGH Current[3] (I/O Pins only)				15	µA	MAX	V_{IN} = 2.7V
I_{IL}	Input LOW Current[3] (I/O Pins only)				–15	µA	MAX	V_{IN} = 0.5V
I_{OS}	Output short circuit[2]		–60	–120		mA	MAX	V_{OUT} = 0.0V
C_{IN}	Input capacitance[3]			5	10	pF		All inputs
C_{OUT}	Output capacitance[3]			9	12	pF		All outputs

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Notes:

1. Typical limits are at V_{CC} = 5.0V, T_A = +25°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.

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

Symbol	Parameter	Typ[1]	Max	Units	Conditions
I_{cc}	Quiescent Power Supply Current (CMOS inputs)	0.003	0.5	mA	V_{CC} = MAX, f_1 = 0, Outputs Open, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
ΔI_{cc}	Quiescent Power Supply Current (TTL inputs)	0.5	2.0	mA	V_{CC} = MAX, V_{IN} = 3.4V[2], f_1 = 0, Outputs Open
I_{CCD}	Dynamic Power Supply Current[3]	0.15	0.25	mA/ mHz	V_{CC} = MAX, One Input Toggling, 50% Duty Cycle, Outputs Open, T/$\overline{R}$ = $\overline{OE}$ = GND and $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$,
I_c	Total Power Supply Current[5]	2.0	4.0	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, One Bit Toggling at f_1 = 10MHz, T/$\overline{R}$ = $\overline{OE}$ = GND and $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		2.3	5.0	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, One Bit Toggling at f_1 = 10MHz, T/$\overline{R}$ = $\overline{OE}$ = GND and V_{IN} = 3.4V or V_{IN} = GND
		3.5	6.5[4]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f_1 = 2.5MHz, T/$\overline{R}$ = $\overline{OE}$ = GND and $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		5.5	14.5[4]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f_1 = 2.5MHz, T/$\overline{R}$ = $\overline{OE}$ = GND and V_{IN} = 3.4V or V_{IN} = GND

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Notes:

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

'FCT640		
Enable $\overline{OE}$	Direction Control T/$\overline{R}$	Operation
L	L	$\overline{B}$ Data to Bus A
L	H	$\overline{A}$ Data to Bus B
H	X	High Z State

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'FCT643		
Enable $\overline{OE}$	Direction Control T/$\overline{R}$	Operation
L	L	B Data to Bus A
L	H	$\overline{A}$ Data to Bus B
H	X	High Z State

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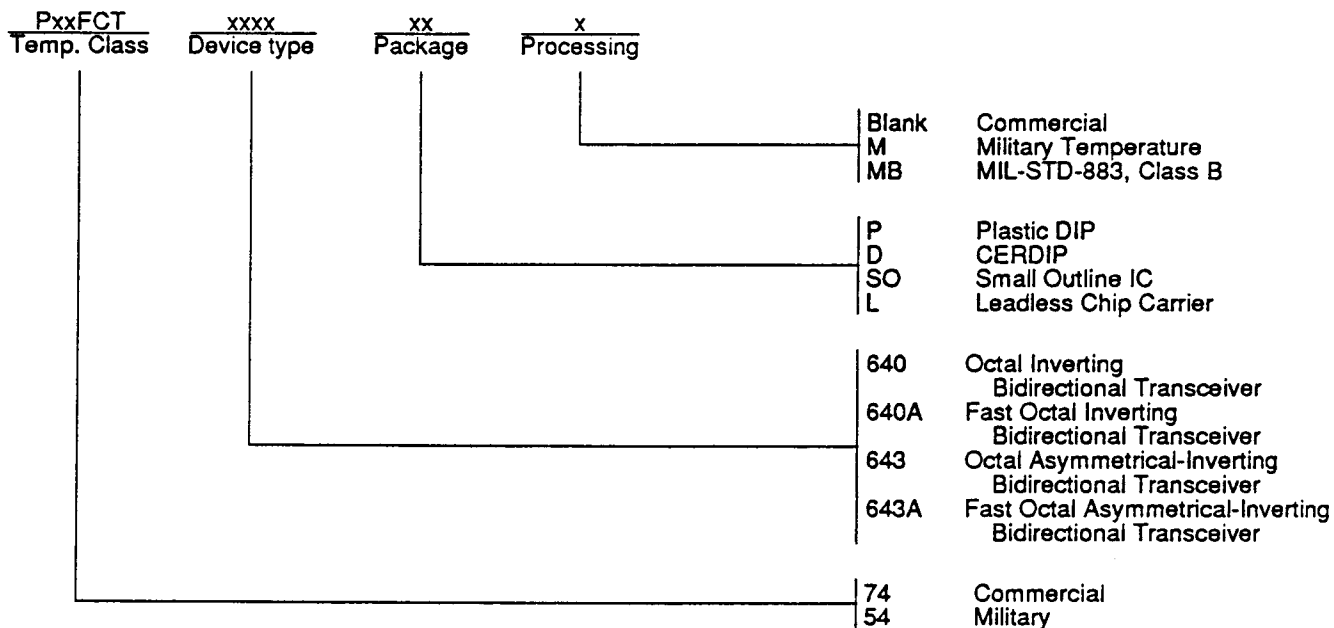H = HIGH Voltage Level, L = LOW Voltage Level, X = Don't Care

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AC CHARACTERISTICS

Symbol	Parameter	'FCT640 'FCT643				'FCT640A 'FCT643A				Units	Fig. No.
		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_{PLH} t_{PHL}	Propagation Delay A_n to B_n or B_n to A_n	1.5	8.0	1.5	7.0	1.5	5.3	1.5	5.0	ns	1 3
t_{PZH} t_{PZL}	Output Enable Time	1.5	9.5	1.5	8.0	1.5	6.5	1.5	6.2	ns	1 7 8
t_{PHZ} t_{PLZ}	Output Disable Time	1.5	9.0	1.5	7.5	1.5	5.3	1.5	5.0		

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Notes:

1. Minimum limits are guaranteed but not tested on Propagation Delays.
   AC Characteristics guaranteed with C_L = 50pF as shown in Figure 1.

ORDERING INFORMATION

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PxxFCT        xxxx        xx          x
Temp. Class   Device type  Package    Processing
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Blank	Commercial
M	Military Temperature
MB	MIL-STD-883, Class B
P	Plastic DIP
D	CERDIP
SO	Small Outline IC
L	Leadless Chip Carrier
640	Octal Inverting Bidirectional Transceiver
640A	Fast Octal Inverting Bidirectional Transceiver
643	Octal Asymmetrical-Inverting Bidirectional Transceiver
643A	Fast Octal Asymmetrical-Inverting Bidirectional Transceiver
74	Commercial
54	Military

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