

P54/74FCT245/A/C (P54/74PCT245/A/C) P54/74FCT645/A/C (P54/74PCT645/A/C) Octal Bidirectional Transceivers with 3-State Outputs



FEATURES

- Function, Pinout, and Drive Compatible with the FCT and F Logic
- FCT-C speed at 4.1ns max. (Com'I)
FCT-A speed at 4.6ns max. (Com'I)
- 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'I), 48 mA (MII)
15 mA Source Current (Com'I), 12 mA (MII)
- 3-State Outputs
- Manufactured in 0.8 micron PACE Technology™



DESCRIPTION

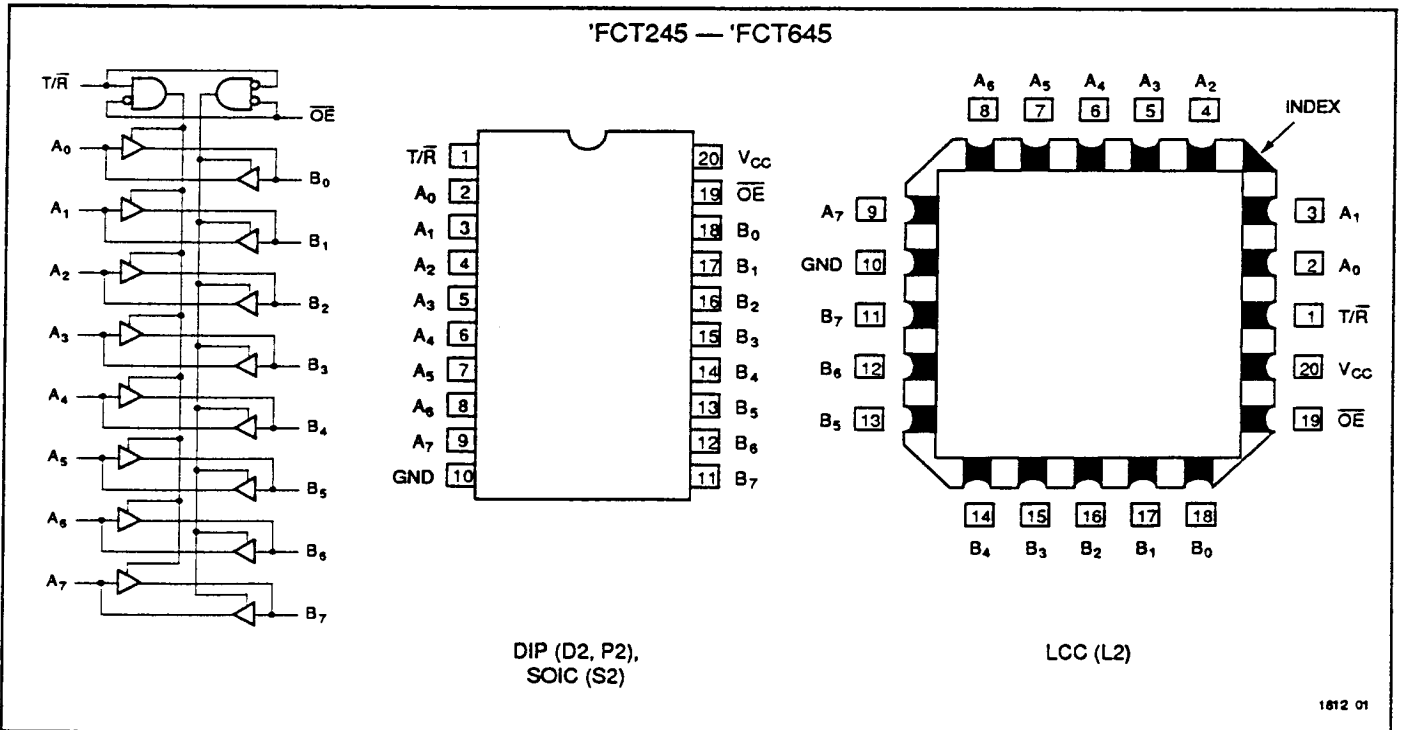
The 'FCT245 and 'FCT645 contain eight non-inverting bidirectional buffers with 3-state outputs and is intended for bus oriented applications. For the 'FCT245 and 'FCT645 current sinking capability is 64 mA at the A & B ports. The 'FCT245 and 'FCT645 are identical.

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

PIN CONFIGURATIONS



Means Quality, Service and Speed

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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

Notes:

1812 Tbl 01

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.

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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

1812 Tbl 04

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 Current 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	

Notes:

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

- This parameter is guaranteed but not tested.

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	$V_{CC} = \text{MAX}$, $f_1 = 0$, 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	$V_{CC} = \text{MAX}$, $V_{IN} = 3.4V^2$, $f_1 = 0$, Outputs Open
I_{CCD}	Dynamic Power Supply Current ³	0.15	0.25	mA/ mHz	$V_{CC} = \text{MAX}$, One Input Toggling, 50% Duty Cycle, $\overline{OE} = \text{GND}$, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$, Outputs Open, $T/R = \text{GND}$ or V_{CC}
I_C	Total Power Supply Current ⁵	2.0	4.0	mA	$V_{CC} = \text{MAX}$, 50% Duty Cycle, Outputs Open, One Bit Toggling at $f_1 = 10\text{MHz}$, $T/R = \overline{OE} = \text{GND}$ 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 $f_1 = 10\text{MHz}$, $T/R = \overline{OE} = \text{GND}$ and $V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$
		3.5	6.5 ⁴	mA	$V_{CC} = \text{MAX}$, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at $f_1 = 2.5\text{MHz}$, $T/R = \overline{OE} = \text{GND}$ and $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		5.5	14.5 ⁴	mA	$V_{CC} = \text{MAX}$, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at $f_1 = 2.5\text{MHz}$, $T/R = \overline{OE} = \text{GND}$ and $V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$

1812 Tbl 06

Notes:

1. Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient and maximum loading.
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. $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_1/2 + f_1 N_1)$
 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_0 = 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.

TRUTH TABLE

Inputs		Output
\overline{OE}	T/R	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z State

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

1812 Tbl 07

AC CHARACTERISTICS

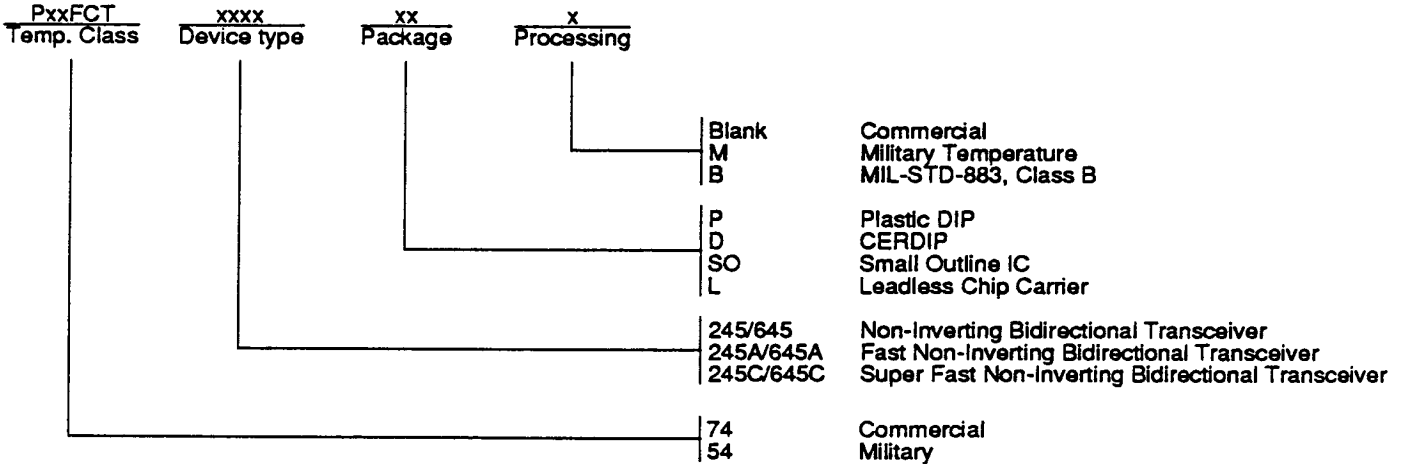
Symbol	Parameter	'FCT245 'FCT645				'FCT245A 'FCT645A				'FCT245C 'FCT645C				Units	Fig. No.
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min. ¹	Max.	Min. ¹	Max.	Min. ¹	Max.	Min. ¹	Max.	Min. ¹	Max.	Min. ¹	Max.		
t _{PLH} t _{PHL}	Propagation Delay A _n to B _n or B _n to A _n	1.5	7.5	1.5	6.5	1.5	4.9	1.5	4.6	1.5	4.5	1.5	4.1	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	1.5	6.2	1.5	5.8	ns	1 7
t _{PHZ} t _{PLZ}	Output Disable Time	1.5	9.0	1.5	7.5	1.5	6.0	1.5	5.0	1.5	5.2	1.5	4.8	ns	8

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Note:

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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