CY54/74FCT245T

8-Bit Transceiver

Features

- **Function, pinout, and drive compatible with FCT, and F logic**
- **FCT-D speed at 3.8 ns max. (Com'l), FCT-C speed at 4.1 ns max. (Com'l)**
- **Reduced V_{OH} (typically = 3.3V) versions of equivalent FCT functions**
- **Edge-rate control circuitry for significantly improved noise characteristics**
- **Power-off disable feature**
- **ESD > 2000V**
- **Matched rise and fall times**
- **Fully compatible with TTL input and output logic levels**
- **Extended commercial range of −40°C to +85°C**
- **Sink current 64 mA (Com'l), 48 mA (Mil)**
  Source current 32 mA (Com'l), 12 mA (Mil)

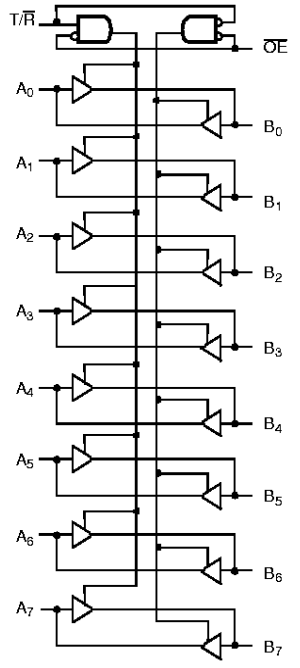
Functional Description

The FCT245T contains eight non-inverting bidirectional buffers with three-state outputs and is intended for bus oriented applications. For the FCT245T, current sinking capability is 64 mA at the A and B ports.

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

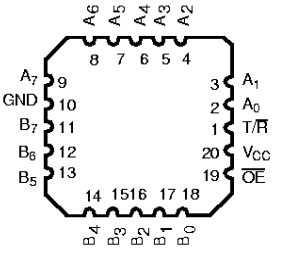
The outputs are designed with a power-off disable feature to allow for live insertion of boards.

Logic Block Diagram

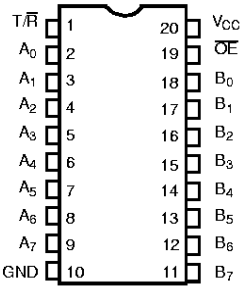


Pin Configurations

LCC
Top View



DIP/SOIC/QSOP
Top View



Function Table[1]

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

Note:
1. H = HIGH Voltage Level. L = LOW Voltage Level. X = Don't Care.

Maximum Ratings[2,3]

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature ..... –65°C to +150°C

Ambient Temperature with Power Applied..... –65°C to +135°C

Supply Voltage to Ground Potential ..... –0.5V to +7.0V

DC Input Voltage ..... –0.5V to +7.0V

DC Output Voltage ..... –0.5V to +7.0V

DC Output Current (Maximum Sink Current/Pin)..... 120 mA

Power Dissipation..... 0.5W

Static Discharge Voltage ..... >2001V (per MIL-STD-883, Method 3015)

Operating Range

Range	Range	Ambient Temperature	V_{CC}
Commercial	DT	0°C to +70°C	5V ± 5%
Commercial	T, AT, CT	–40°C to +85°C	5V ± 5%
Military[4]	All	–55°C to +125°C	5V ± 10%

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions		Min.	Typ.[5]	Max.	Unit
V_{OH}	Output HIGH Voltage	V_{CC}=Min., I_{OH}=–32 mA	Com'l	2.0			V
		V_{CC}=Min., I_{OH}=–15 mA	Com'l	2.4	3.3		V
		V_{CC}=Min., I_{OH}=–12 mA	Mil	2.4	3.3		V
V_{OL}	Output LOW Voltage	V_{CC}=Min., I_{OL}=64 mA	Com'l		0.3	0.55	V
		V_{CC}=Min., I_{OL}=48mA	Mil		0.3	0.55	V
V_{IH}	Input HIGH Voltage			2.0			V
V_{IL}	Input LOW Voltage					0.8	V
V_H	Hysteresis[6]	All inputs			0.2		V
V_{IK}	Input Clamp Diode Voltage	V_{CC}=Min., I_{IN}=–18 mA			–0.7	–1.2	V
I_I	Input HIGH Current	V_{CC}=Max., V_{IN}=V_{CC}				5	µA
I_{IH}	Input HIGH Current	V_{CC}=Max., V_{IN}=2.7V				±1	µA
I_{IL}	Input LOW Current	V_{CC}=Max., V_{IN}=0.5V				±1	µA
I_{OS}	Output Short Circuit Current[7]	V_{CC}=Max., V_{OUT}=0.0V		–60	–120	–225	mA
I_{OFF}	Power-Off Disable	V_{CC}=0V, V_{OUT}=4.5V				±1	µA

Capacitance[6]

Parameter	Description	Typ.[5]	Max.	Unit
C_{IN}	Input Capacitance	5	10	pF
C_{OUT}	Output Capacitance	9	12	pF

Notes:

2. Unless otherwise noted, these limits are over the operating free-air temperature range.
3. Unused inputs must always be connected to an appropriate logic voltage level, preferably either V_{CC} or ground.
4. T_A is the "instant on" case temperature.
5. Typical values are at V_{CC}=5.0V, T_A=+25°C ambient.
6. This parameter is guaranteed but not tested.
7. 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 parametric tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

Power Supply Characteristics

Parameter	Description	Test Conditions	Typ.[5]	Max.	Unit
I_{CC}	Quiescent Power Supply Current	V_{CC}=Max., $V_{IN}\leq$0.2V, $V_{IN}\geq V_{CC}-$0.2V	0.1	0.2	mA
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs HIGH)	V_{CC}=Max., V_{IN}=3.4V,[8] f_1=0, Outputs Open	0.5	2.0	mA
I_{CCD}	Dynamic Power Supply Current[9]	V_{CC}=Max., One Input Toggling, 50% Duty Cycle, Outputs Open, T/$\overline{R}$ or $\overline{OE}$=GND and $V_{IN}\leq$0.2V or $V_{IN}\geq V_{CC}-$0.2V	0.06	0.12	mA/MHz
I_C	Total Power Supply Current[10]	V_{CC}=Max., 50% Duty Cycle, Outputs Open, One Bit Toggling at f_1=10 MHz, T/$\overline{R}$ or $\overline{OE}$=GND and $V_{IN}\leq$0.2V or $V_{IN}\geq V_{CC}-$0.2V	0.7	1.4	mA
		V_{CC}=Max., 50% Duty Cycle, Outputs Open, One Bit Toggling at f_1=10 MHz, T/$\overline{R}$ or $\overline{OE}$=GND and V_{IN}=3.4V or V_{IN}=GND	1.2	3.4	mA
		V_{CC}=Max., 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f_1=2.5 MHz, T/$\overline{R}$ or $\overline{OE}$=GND and $V_{IN}\leq$0.2V or $V_{IN}\geq V_{CC}-$0.2V	1.3	2.6[11]	mA
		V_{CC}=Max., 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f_1=2.5 MHz, T/$\overline{R}$ or $\overline{OE}$=GND and V_{IN}=3.4V or V_{IN}=GND	3.3	10.6[11]	mA

Notes:

8. Per TTL driven input (V_{IN}=3.4V); all other inputs at V_{CC} or GND.
9. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
10. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
    $I_C = I_{CC}+\Delta I_{CC}D_HN_T+I_{CCD}(f_0/2 + f_1N_1)$
    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 registered devices, otherwise zero
    f_1 = Input signal frequency
    N_1 = Number of inputs changing at f_1
    All currents are in milliamps and all frequencies are in megahertz.
11. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.

Switching Characteristics Over the Operating Range

Parameter	Description	FCT245T				FCT245AT				Unit	Fig. No.[13]
		Military		Commercial		Military		Commercial			
		Min.[12]	Max.	Min.[12]	Max.	Min.[12]	Max.	Min.[12]	Max.		
t_{PLH} t_{PHL}	Propagation Delay A to B or B to A	1.5	7.5	1.5	7.0	1.5	4.9	1.5	4.6	ns	1, 3
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}$ or T/$\overline{R}$ to A or B	1.5	10.0	1.5	9.5	1.5	6.5	1.5	6.2	ns	1, 7, 8
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}$ or T/$\overline{R}$ to A or B	1.5	10.0	1.5	7.5	1.5	6.0	1.5	5.0	ns	1, 7, 8

Switching Characteristics Over the Operating Range (continued)

Parameter	Description	FCT245CT				FCT245DT		Unit	Fig. No.[13]
		Military		Commercial		Commercial			
		Min.[12]	Max.	Min.[12]	Max.	Min.[12]	Max.		
t_{PLH} t_{PHL}	Propagation Delay A to B or B to A	1.5	4.5	1.5	4.1	1.5	3.8	ns	1, 3
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}$ or T/$\overline{R}$ to A or B	1.5	6.2	1.5	5.8	1.5	5.0	ns	1, 7, 8
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}$ or T/$\overline{R}$ to A or B	1.5	5.2	1.5	4.8	1.5	4.3	ns	1, 7, 8

Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
3.8	CY74FCT245DTQC	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT245DTSOC	S5	20-Lead (300-Mil) Molded SOIC	
4.1	CY74FCT245CTQC	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT245CTSOC	S5	20-Lead (300-Mil) Molded SOIC	
4.5	CY54FCT245CTDMB	D6	20-Lead (300-Mil) CerDIP	Military
	CY54FCT245CTLMB	L61	20-Square Leadless Chip Carrier	
4.6	CY74FCT245ATPC	P5	20-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT245ATQC	Q5	20-Lead (150-Mil) QSOP	
	CY74FCT245ATSOC	S5	20-Lead (300-Mil) Molded SOIC	
4.9	CY54FCT245ATDMB	D6	20-Lead (300-Mil) CerDIP	Military
	CY54FCT245ATLMB	L61	20-Square Leadless Chip Carrier	
7.0	CY74FCT245TQC	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT245TSOC	S5	20-Lead (300-Mil) Molded SOIC	
7.5	CY54FCT245TDMB	D6	20-Lead (300-Mil) CerDIP	Military
	CY54FCT245TLMB	L61	20-Square Leadless Chip Carrier	

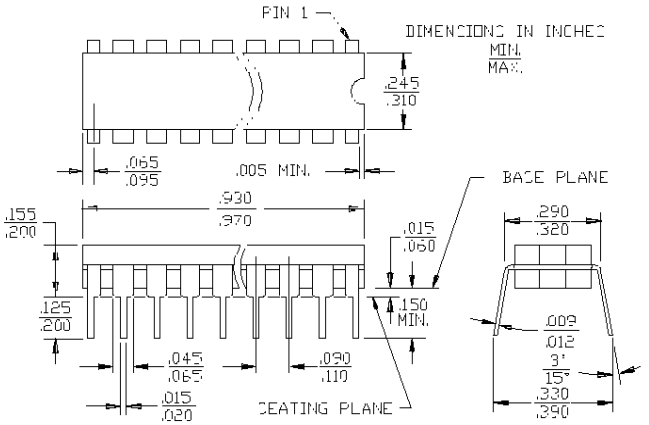
Notes:

12. Minimum limits are guaranteed but not tested on Propagation Delays.
13. See "Parameter Measurement Information" in the General Information section.

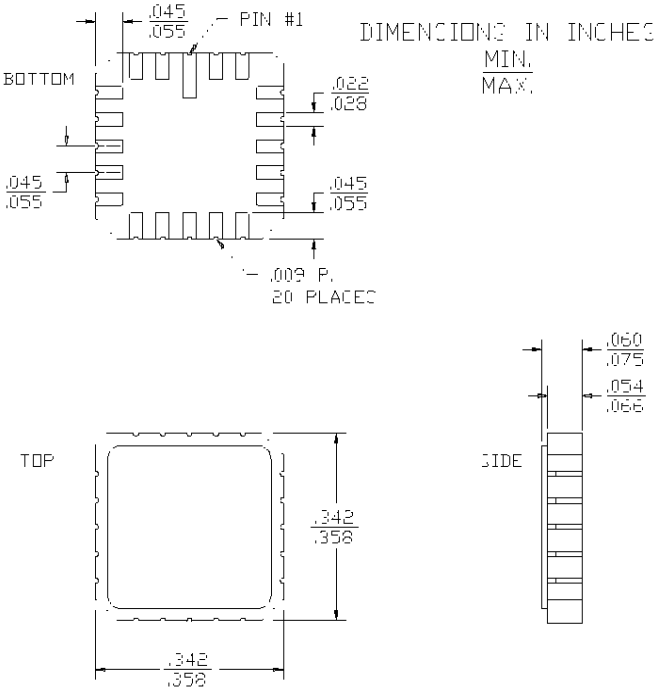
Document #: 38–00318–B

Package Diagrams

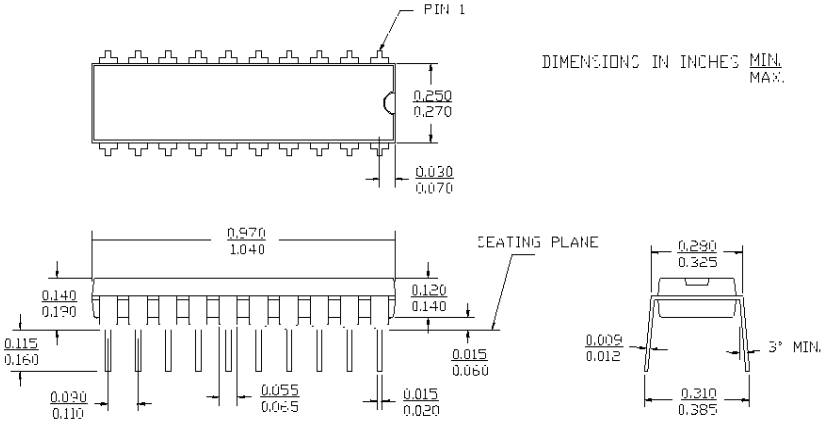
20-Lead (300-Mil) CerDIP D6
MIL–STD–1835 D–8 Config.A



20-Pin Square Leadless Chip Carrier L61
MIL–STD–1835 C–2A

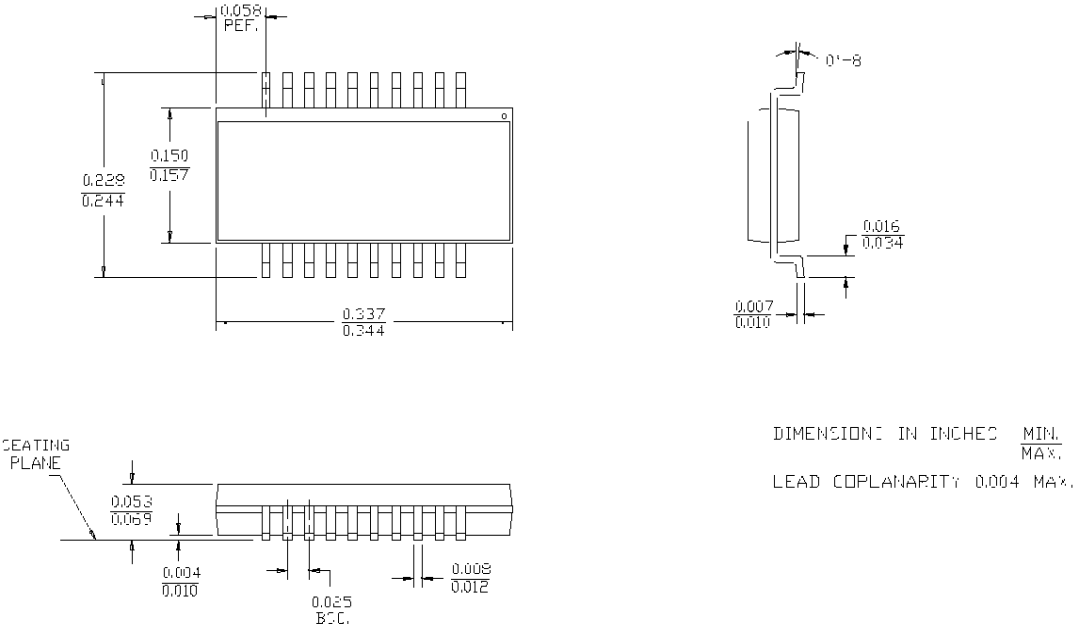


20-Lead (300-Mil) Molded DIP P5

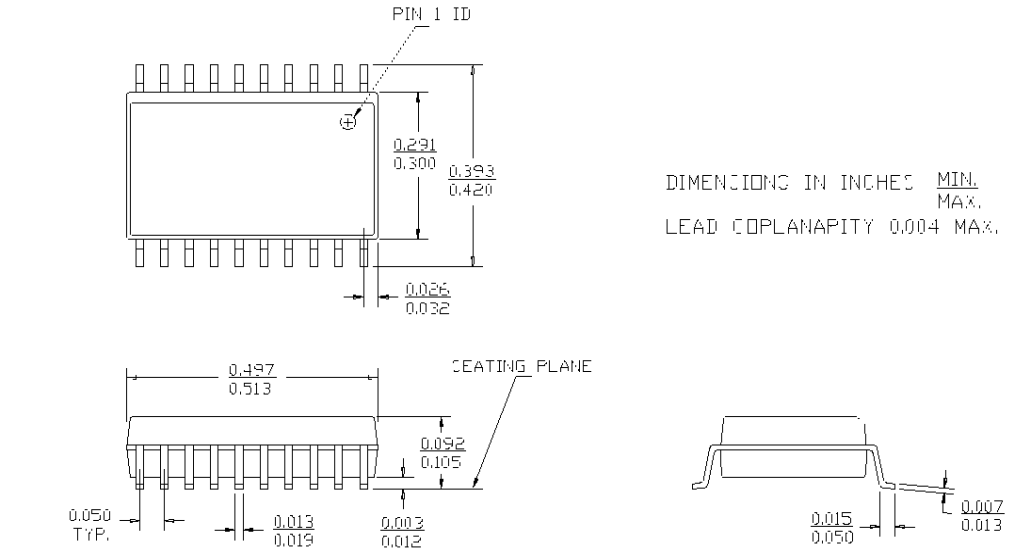


Package Diagrams (continued)

20-Lead Quarter Size Outline Q5



20-Lead (300-Mil) Molded SOIC S5



© Cypress Semiconductor Corporation, 1997. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress Semiconductor product. Nor does it convey or imply any license under patent or other rights. Cypress Semiconductor does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress Semiconductor products in life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress Semiconductor against all charges.