



SCCS018 - May 1994 - Revised February 2000

# 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), FCT-A speed at 4.6 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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Sink current 64 mA (Com'l), 48 mA (Mil)
- Source current 32 mA (Com'l), 12 mA (Mil)

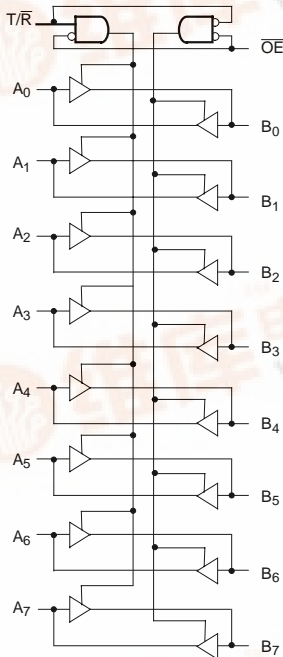
### Functional Description

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.

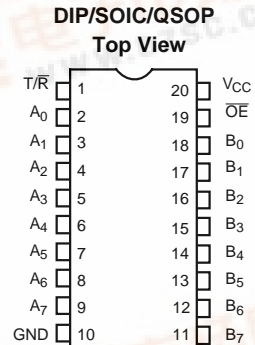
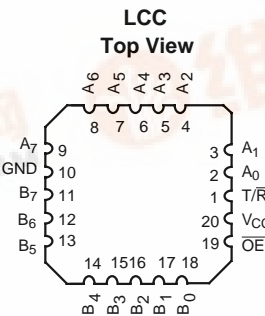
The Transmit/Receiver ( $T/\bar{R}$ ) input determines the direction of data flow through bidirectional transceiver. Transmit (Active HIGH) enables data from A ports to B ports. The output enable ( $\overline{OE}$ ), when HIGH, disables both the A and B ports by putting them in a High Z condition.

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

### Logic Block Diagram



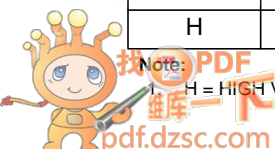
### Pin Configurations



### Function Table<sup>[1]</sup>

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

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



**Maximum Ratings**<sup>[2,3]</sup>

(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 <sub>CC</sub>
Commercial	DT	0°C to +70°C	5V ± 5%
Commercial	T, AT, CT	-40°C to +85°C	5V ± 5%
Military <sup>[4]</sup>	All	-55°C to +125°C	5V ± 10%

**Electrical Characteristics** Over the Operating Range

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

**Capacitance**<sup>[6]</sup>

Parameter	Description	Typ. <sup>[5]</sup>	Max.	Unit
C <sub>IN</sub>	Input Capacitance	5	10	pF
C <sub>OUT</sub>	Output Capacitance	9	12	pF

**Notes:**

- Unless otherwise noted, these limits are over the operating free-air temperature range.
- Unused inputs must always be connected to an appropriate logic voltage level, preferably either V<sub>CC</sub> or ground.
- T<sub>A</sub> is the "instant on" case temperature.
- Typical values are at V<sub>CC</sub>=5.0V, T<sub>A</sub>=+25°C ambient.
- This parameter is specified but not tested.
- 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<sub>OS</sub> tests should be performed last.

**Power Supply Characteristics**

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

**Notes:**

8. Per TTL driven input ( $V_{IN}=3.4\text{V}$ ); 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.  $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$   
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_0/2 + f_1 N_1)$   
 $I_{CC}$  = Quiescent Current with CMOS input levels  
 $\Delta I_{CC}$  = Power Supply Current for a TTL HIGH input ( $V_{IN}=3.4\text{V}$ )  
 $D_H$  = 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 specified but not tested.

**Switching Characteristics** Over the Operating Range

Parameter	Description	FCT245T				FCT245AT				Unit	Fig. No. <sup>[13]</sup>
		Military		Commercial		Military		Commercial			
		Min. <sup>[12]</sup>	Max.	Min. <sup>[12]</sup>	Max.	Min. <sup>[12]</sup>	Max.	Min. <sup>[12]</sup>	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	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 <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time OE or T/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 <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time OE or T/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. <sup>[13]</sup>
		Military		Commercial		Commercial			
		Min. <sup>[12]</sup>	Max.	Min. <sup>[12]</sup>	Max.	Min. <sup>[12]</sup>	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	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 <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time OE or T/R to A or B	1.5	6.2	1.5	5.8	1.5	5.0	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	5.2	1.5	4.8	1.5	4.3	ns	1, 7, 8

**Ordering Information**

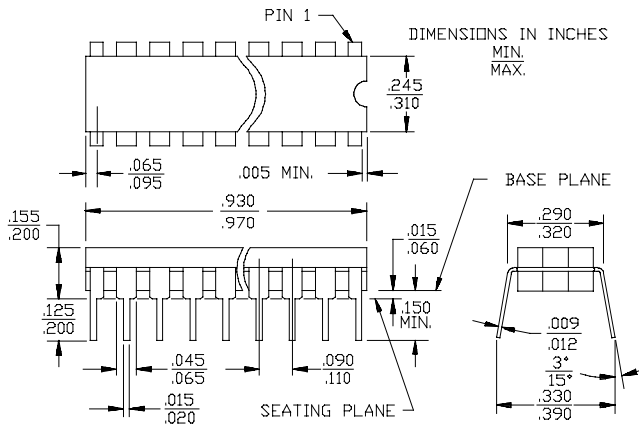
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
3.8	CY74FCT245DTQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT245DTSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	
4.1	CY74FCT245CTQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT245CTSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	
4.5	CY54FCT245CTDMB	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
	CY74FCT245ATQCT	Q5	20-Lead (150-Mil) QSOP	
	CY74FCT245ATSOC/SOCT	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	CY74FCT245TQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT245TSOC/SOCT	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:**

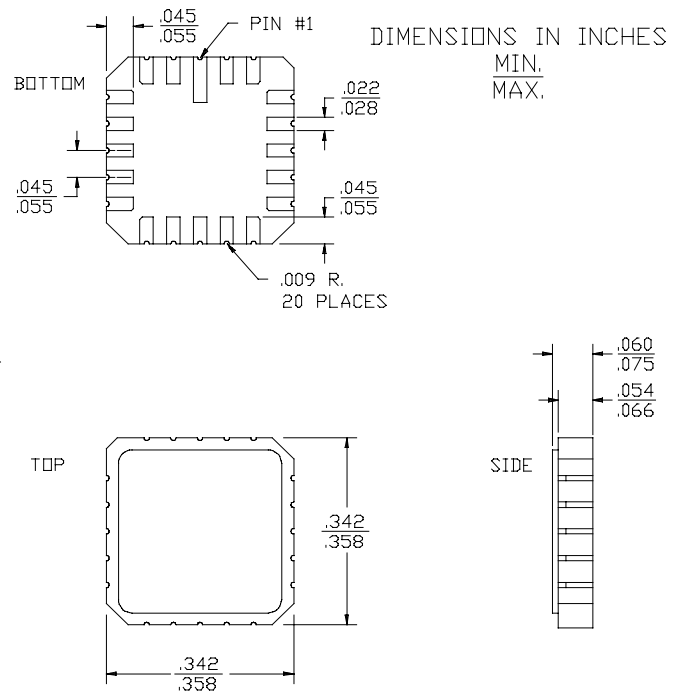
12. Minimum limits are specified but not tested on Propagation Delays.  
13. See "Parameter Measurement Information" in the General Information section.

**Package Diagrams**

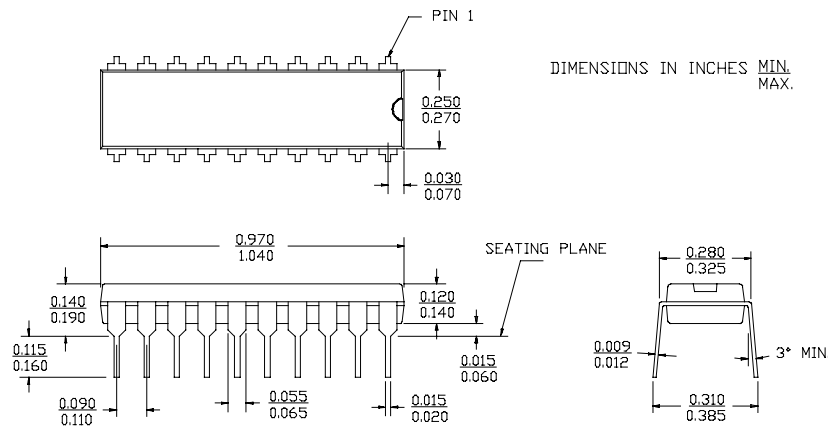
**20-Lead (300-Mil) CerDIP D6**  
MIL-STD-1835 D-8 Config.A



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

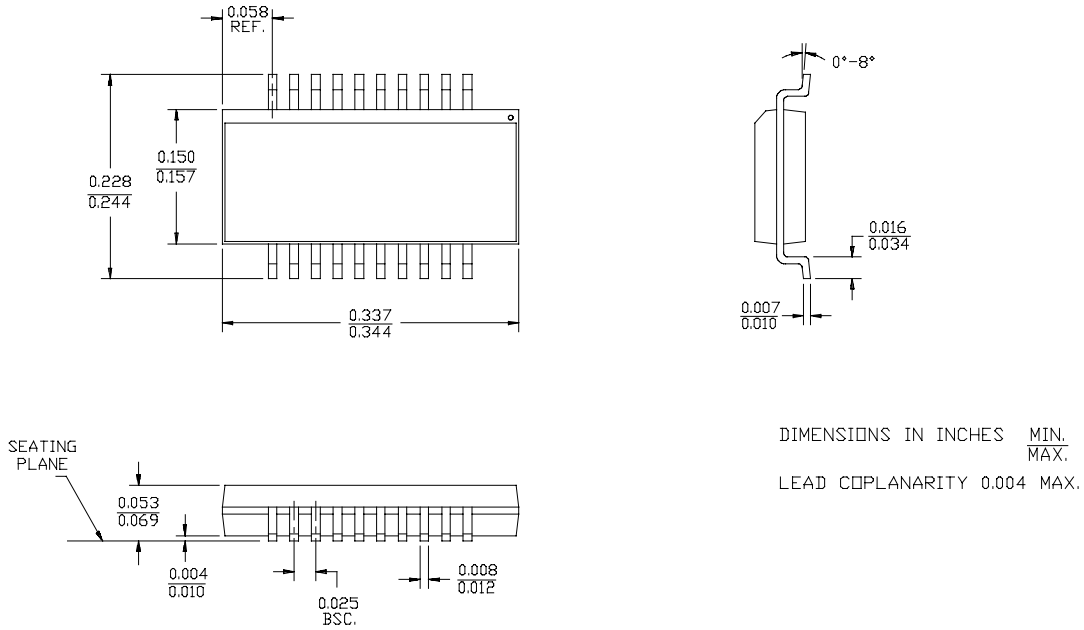


**20-Lead (300-Mil) Molded DIP P5**

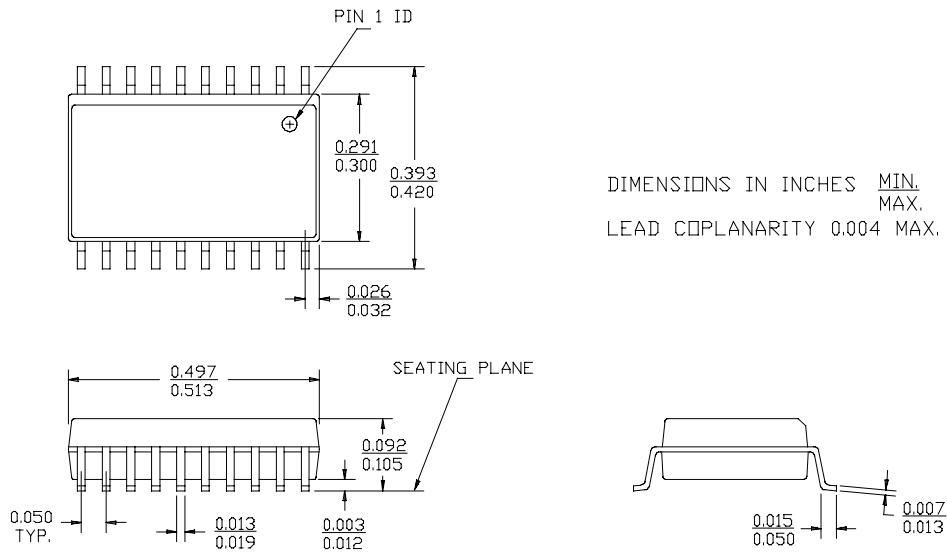


Package Diagrams (continued)

**20-Lead Quarter Size Outline Q5**



**20-Lead (300-Mil) Molded SOIC S5**



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