



SCCS037 - July 1994 - Revised March 2000

CY74FCT2245T

8-Bit Transceiver

Features

- Function and pinout compatible with FCT and F logic
- 25Ω output series resistors to reduce transmission line reflection noise
- FCT-C speed at 4.1 ns max.
FCT-A speed at 4.6 ns max.
- Edge-rate control circuitry for significantly improved noise characteristics
- Power-off disable feature
- Fully compatible with TTL input and output logic levels
- ESD > 2000V
- Sink current 12 mA
Source current 15 mA
- Extended commercial temp. range of -40°C to +85°C
- Three-state outputs

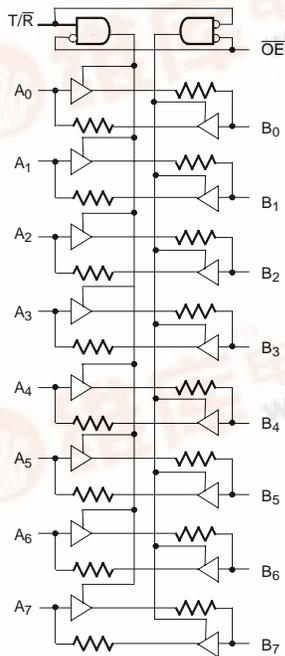
Functional Description

The FCT2245T contains eight non-inverting, bidirectional buffers with three-state outputs intended for bus oriented applications. On-chip termination resistors have been added to the outputs to reduce system noise caused by reflections. For this reason, the FCT2245T can be used in an existing design to replace the FCT245T. The FCT2245T current sinking capability is 12 mA at the A and B ports.

The Transmit/Receive (T/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 (\overline{OE}) input, 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.

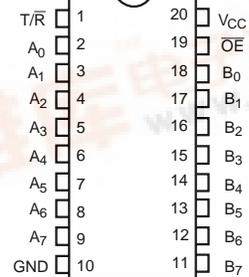
Logic Block Diagram



FCT2245T-1

Pin Configurations

DIP/SOIC/QSOP Top View



FCT2245T-3

Function Table^[1]

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

Note: 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	T, AT, CT	-40°C to +85°C	5V ± 5%

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} =-15 mA	2.4	3.3		V
V _{OL}	Output LOW Voltage	V _{CC} =Min., I _{OL} =12 mA		0.3	0.55	V
R _{OUT}	Output Resistance	V _{CC} =Min., I _{OL} =12 mA	20	25	40	Ω
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	Test Conditions	Typ. ^[5]	Max.	Unit
C _{IN}	Input Capacitance		5	10	pF
C _{OUT}	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_{CC} or ground.
- T_A is the "instant on" case temperature.
- Typical values are at V_{CC}=5.0V, T_A=+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_{OS} tests should be performed last.

Power Supply Characteristics

Parameter	Description	Test Conditions	Typ. ^[5]	Max.	Unit
I_{CC}	Quiescent Power Supply Current	$V_{CC}=\text{Max.}, V_{IN} \leq 0.2V,$ $V_{IN} \geq V_{CC}-0.2V$	0.1	0.2	mA
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs)	$V_{CC}=\text{Max.}, V_{IN}=3.4V,$ ^[8] $f_1=0, \text{Outputs Open}$	0.5	2.0	mA
I_{CCD}	Dynamic Power Supply Current ^[9]	$V_{CC}=\text{Max.}, \text{One Input Toggling},$ 50% Duty Cycle, Outputs Open, $T/R=OE=GND,$ $V_{IN} \leq 0.2V \text{ or } V_{IN} \geq V_{CC}-0.2V$	0.06	0.12	mA/MHz
I_C	Total Power Supply Current ^[10]	$V_{CC}=\text{Max.}, 50\% \text{ Duty Cycle},$ Outputs Open, One Bit Toggling at $f_1=10 \text{ MHz},$ $T/R=OE=GND,$ $V_{IN} \leq 0.2V \text{ or } V_{IN} \geq V_{CC}-0.2V$	0.7	1.4	mA
		$V_{CC}=\text{Max.},$ 50% Duty Cycle, Outputs Open, One Bit Toggling at $f_1=10 \text{ MHz},$ $T/R=OE=GND,$ $V_{IN}=3.4V \text{ or } V_{IN}=GND$	1.0	2.4	mA
		$V_{CC}=\text{Max.},$ 50% Duty Cycle, Outputs Open, Eight Bits Toggling at $f_1=2.5 \text{ MHz},$ $T/R=OE=GND,$ $V_{IN} \leq 0.2V \text{ or } V_{IN} \geq V_{CC}-0.2V$	1.3	2.6 ^[11]	mA
		$V_{CC}=\text{Max.},$ 50% Duty Cycle, Outputs Open, Eight Bits Toggling at $f_1=2.5 \text{ MHz},$ $T/R=OE=GND,$ $V_{IN}=3.4V \text{ or } V_{IN}=GND$	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. $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_0/2 + f_1 N_1)$
 I_{CC} = Quiescent Current with CMOS input levels
 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 specified but not tested.

Switching Characteristics—Over the Operating Range^[12]

Parameter	Description	FCT2245T		FCT2245AT		FCT2245CT		Unit	Fig. No. ^[13]
		Commercial		Commercial		Commercial			
		Min.	Max.	Min.	Max.	Min.	Max.		
t _{PLH} t _{PHL}	Propagation Delay A _n to B _n or B _n to A _n	1.5	7.0	1.5	4.6	1.5	4.1	ns	1, 3
t _{PZH} t _{PZL}	Output Enable Time	1.5	9.5	1.5	6.2	1.5	5.8	ns	1, 7, 8
t _{PHZ} t _{PLZ}	Output Disable Time	1.5	7.5	1.5	5.0	1.5	4.5	ns	1, 7, 8

Ordering Information—FCT2245T

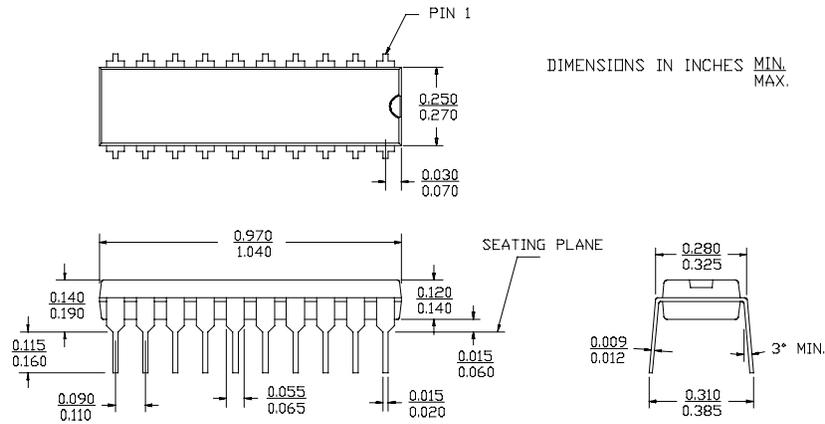
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
4.1	CY74FCT2245CTQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT2245CTSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	
4.6	CY74FCT2245ATPC	P5	20-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT2245ATQCT	Q5	20-Lead (150-Mil) QSOP	
	CY74FCT2245ATSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	
7.5	CY74FCT2245TQCT	Q5	20-Lead (150-Mil) QSOP	Commercial
	CY74FCT2245TSOC/SOCT	S5	20-Lead (300-Mil) Molded SOIC	

Notes:

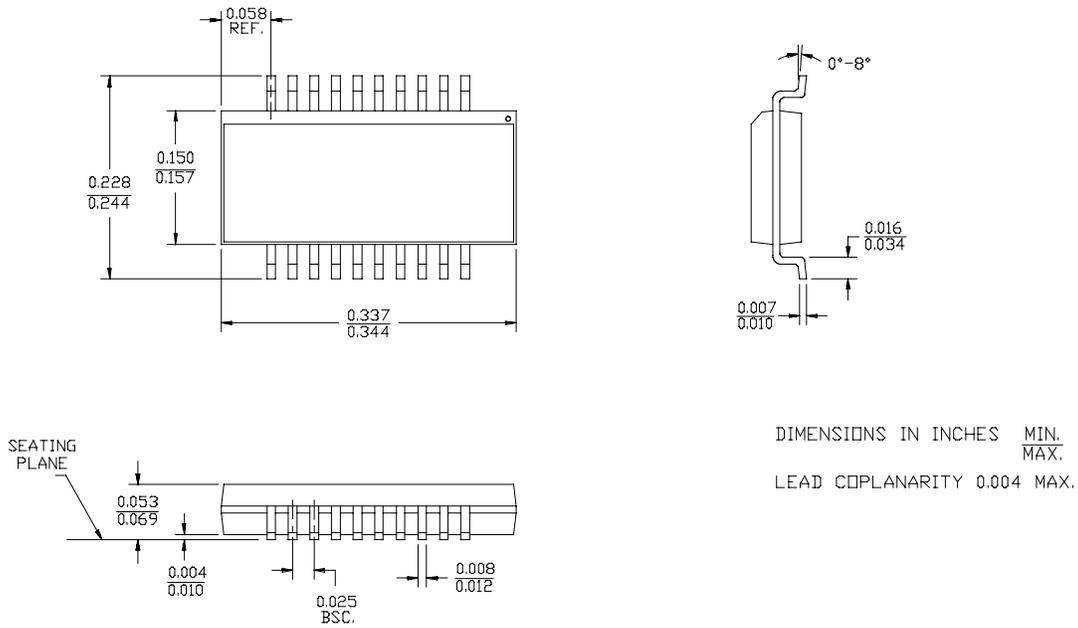
12. Minimum limits are specified but not tested on Propagation Delays.
13. See "Parameter Measurement Information" in the General Information section.

Package Diagrams

20-Lead (300-Mil) Molded DIP P5

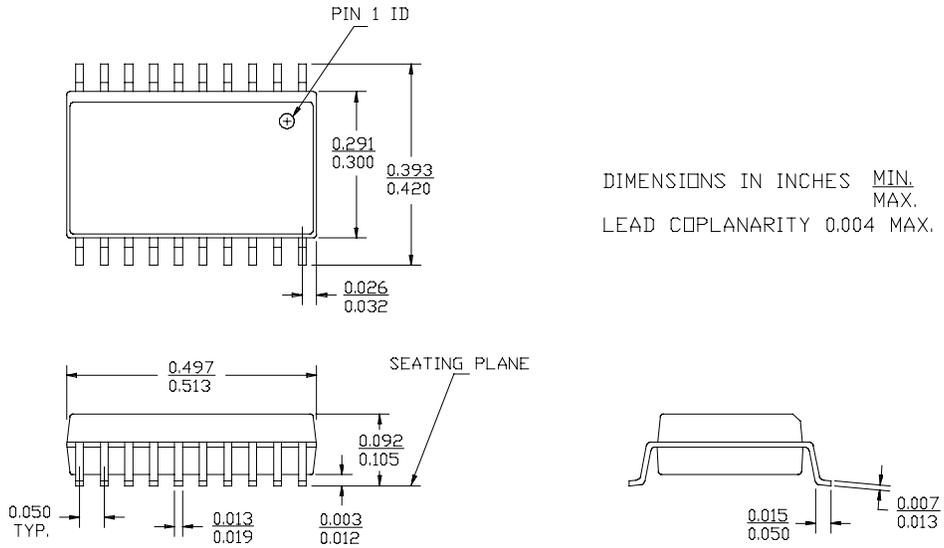


20-Lead Quarter Size Outline Q5



Package Diagrams (continued)

20-Lead (300-Mil) Molded SOIC S5



IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.