# CY54/74FCT2245T
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 4.1ns max. (Commercial) FCT-A speed at 4.6ns max. (Commercial)**

- **Edge-rate Control Circuitry for Significantly Improved Noise Characteristics**

- **Power-off disable feature**

- **Fully Compatible with TTL Input and Output Logic Levels**

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

- **3-State Outputs**

DESCRIPTION

The 'FCT2245T contains eight noninverting, bidirectional buffers with 3-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 purpose, the 'FCT2245T can be used in an existing design to replace the 'FCT245T. For the 'FCT2245T current sinking capability is 12mA at the A & B ports.

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 ($\overline{OE}$), input, when HIGH, disables both the A and B ports by putting them in a high Z condition.

LOGIC BLOCK DIAGRAM

PIN CONFIGURATIONS

DIP (P5, D6), SOIC (S5), QSOP (Q5)

Top View

LCC (L61)
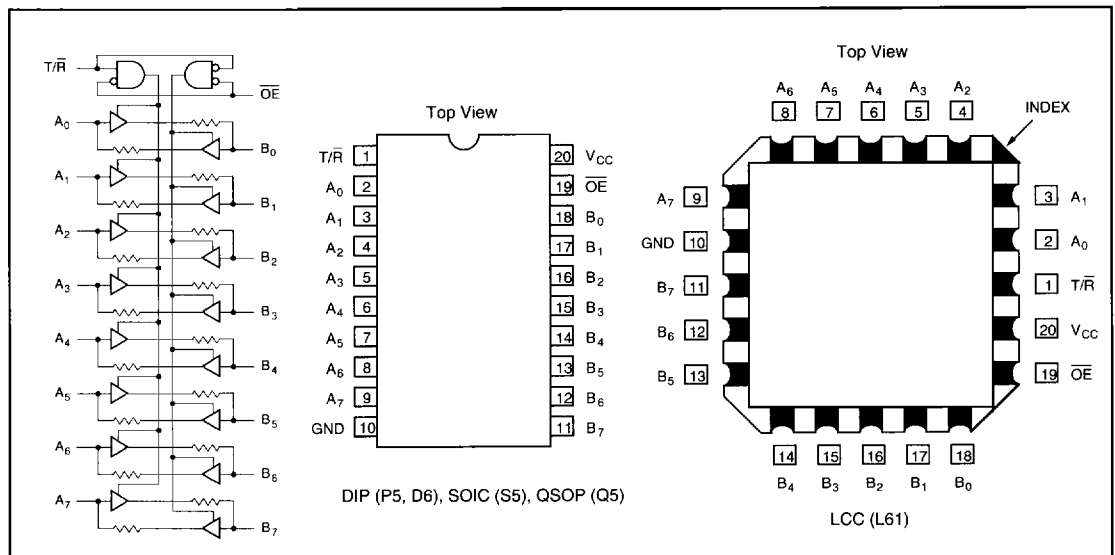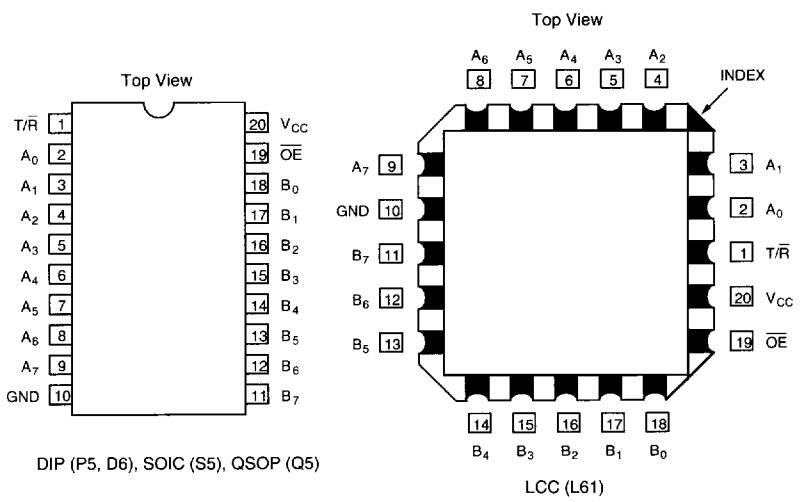
ABSOLUTE MAXIMUM RATINGS[1,2]

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
P_T	Power Dissipation	0.5	W

Symbol	Parameter	Value	Unit
I_{OUTPUT}	Current Applied to Output	120	mA
V_{IN}	Input Voltage	−0.5 to +7.0	V
V_{OUT}	Voltage Applied to Output	−0.5 to +7.0	V

RECOMMENDED OPERATING CONDITIONS

Free Air Ambient Temperature	Min	Max
Military	−55°C	+125°C
Commercial	0°C	+70°C

Supply Voltage (V_{CC})	Min	Max
Military	+4.5V	+5.5V
Commercial	+4.75V	+5.25V

DC ELECTRICAL CHARACTERISTICS (Over recommended operating conditions)

Symbol	Parameter		Min	Typ[3]	Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		
V_{IL}	Input LOW Voltage				0.8	V		
V_H	Hysteresis[5]			0.2		V		All inputs
V_{IK}	Input Clamp Diode Voltage			−0.7	−1.2	V	MIN	$I_{IN} = -18mA$
V_{OH}	Output HIGH Voltage	Military	2.4	3.3		V	MIN	$I_{OH} = -12mA$
		Commercial	2.4	3.3		V	MIN	$I_{OH} = -15mA$
V_{OL}	Output LOW Voltage	Military		0.3	0.50	V	MIN	$I_{OL} = 12mA$
		Commercial		0.3	0.50	V	MIN	$I_{OL} = 12mA$
R_{OUT}	Output Resistance	Military		25		Ω	MIN	$I_{OL} = 12mA$
		Commercial	20	25	40	Ω	MIN	$I_{OL} = 12mA$
I_I	Input HIGH Current				20	μA	MAX	$V_{IN} = V_{CC}$
I_{IH}	Input HIGH Current (Except I/O Pins)				5	μA	MAX	$V_{IN} = 2.7V$
I_{IL}	Input LOW Current (Except I/O Pins)				−5	μA	MAX	$V_{IN} = 0.5V$
I_{IH}	Input HIGH Current (I/O Pins only)				15	μA	MAX	$V_{OUT} = 2.7V$
I_{IL}	Input LOW Current (I/O Pins only)				−15	μA	MAX	$V_{OUT} = 0.5V$
I_{OS}	Output Short Circuit Current[4]		−60	−120	−225	mA	MAX	$V_{OUT} = 0.0V$
I_{OFF}	Power-off Disable				100	μA	0V	$V_{OUT} = 4.5V$
C_{IN}	Input Capacitance[5]			5	10	pF	MAX	All inputs
$C_{I/O}$	I/O Capacitance[5]			9	12	pF	MAX	All outputs
I_{CC}	Quiescent Power Supply Current			0.2	1.5	mA	MAX	$V_{IN} \leq 0.2V$, $V_{IN} \geq V_{CC} - 0.2V$

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Notes:

1. Operation beyond the values 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.
3. Typical values are at $V_{CC} = 5.0V$, $T_A = +25°C$ ambient.
4. 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.
5. This parameter is guaranteed but not tested.

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

Symbol	Parameter	Typ[3]	Max	Units	Conditions
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs)	0.5	2.0	mA	V_{CC} = MAX, V_{IN} = 3.4V[6], f_1 = 0, Outputs Open
I_{CCD}	Dynamic Power Supply Current[7]	0.15	0.25	mA/MHz	V_{CC} = MAX, One Input Toggling, 50% Duty Cycle, $T/\overline{R} = \overline{OE}$ = GND, Outputs Open, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
I_C	Total Power Supply Current[9]	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[8]	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[8]	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

Notes:

6. Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.
7. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
8. Values for these conditions are examples of the I_{CC} formula. These values are guaranteed but not tested.
9. I_C = $I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   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 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
$\overline{OE}$	$T/\overline{R}$	
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

AC CHARACTERISTICS

| Symbol | Parameter | 'FCT2245T | | | | 'FCT2245AT | | | | 'FCT2245CT | | UNITS | Fig. No.* |
| | | MIL | | COM'L | | MIL | | COM'L | | COM'L | | | |
		Min.[10]	Max.	Min.[10]	Max.	Min.[10]	Max.	Min.[10]	Max.	Min.[10]	Max.		
t_{PLH} t_{PHL}	Propagation Delay A_n to B_n or B_n to A_n	1.5	7.5	1.5	7.0	1.5	4.9	1.5	4.6	1.5	4.1	ns	1, 3
t_{PZH} t_{PZL}	Output Enable Time	1.5	10.0	1.5	9.5	1.5	6.5	1.5	6.2	1.5	5.8	ns	1, 7, 8
t_{PHZ} t_{PLZ}	Output Disable Time	1.5	10.0	1.5	7.5	1.5	6.0	1.5	5.0	1.5	4.5	ns	

Note:

10. Minimum limits are guaranteed but not tested on Propagation Delays.
    AC Characteristics guaranteed with $C_L = 50pF$.
* Refer to the 'Parameter Measurement Information' section of this book.

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ORDERING INFORMATION

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CYxxFCT        xxxx          x            x
 Temp.       Device type   Package    Processing
 Class
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C — Commercial
M — Military Temperature
MB — MIL-STD-883, Class B

P — Plastic DIP
D — CERDIP
SO — Small Outline IC
L — Leadless Chip Carrier
Q — QSOP

2245T — Non-Inverting Bidirectional Transceiver
2245AT — Fast Non-Inverting Bidirectional Transceiver
2245CT — Ultra Fast Non-Inverting Bidirectional Transceiver

74 — Commercial
54 — Military