**CYPRESS**

FEATURES

- Function and pinout compatible with the FCT and F logic

- 25Ω Output series resistors to reduce transmission line reflection noise.

- FCT-C speed at 4.3ns max. (Commercial) FCT-A speed at 5.0ns max. (Commercial)

- TTL output level versions of equivalent FCT functions

- 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 (Commercial), 12mA (Mil) 15 mA Source Current (Commercial), 12mA (Mil)

- 3-State Outputs

DESCRIPTION

The 'FCT2257T has four identical 2-input multiplexers with 3-state outputs that select 4 bits of data from two sources under control of a common Data Select input (S). The I_0 inputs are selected when the Select input is LOW and the I_1 inputs are selected when the select input is HIGH. Data appears at the output in true noninverted form for the 'FCT2257T. On-chip termination resistors have been added to the outputs to reduce system noise caused by reflections. The 'FCT2257T can be used to replace the 'FCT257T to reduce noise in an existing design.

The 'FCT2257T is a logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the select input. Outputs are forced to a high-impedance "OFF" state when the Output Enable input ($\overline{OE}$) is HIGH.

All but one device must be in the high-impedance state to avoid currents exceeding the maximum ratings if outputs are tied together. Design of the output enable signals must ensure that there is no overlap when outputs of 3-state devices are tied together.

FUNCTIONAL BLOCK DIAGRAM

DIP (P1, D2), SOIC (S1), QSOP (Q1)

LCC (L61)

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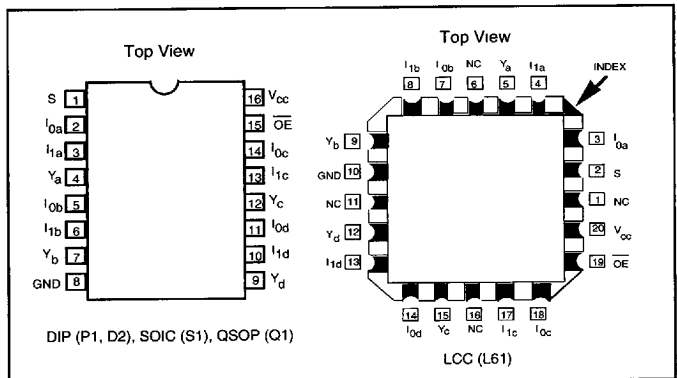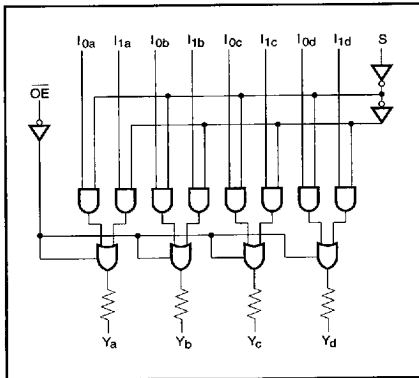
ABSOLUTE MAXIMUM RATINGS[1,2]

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
P_T	Power Dissipation	0.5	W
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			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	0.5	V	MIN	$I_{OL} = 12mA$
		Commercial		0.3	0.5	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_{IH}	Input HIGH Current				5	µA	MAX	$V_{IN} = 2.7V$
I_{IL}	Input LOW Current				−5	µA	MAX	$V_{IN} = 0.5V$
I_{OZH}	Off State I_{OUT} HIGH-Level Output Current				10	µA	MAX	$V_{OUT} = 2.7V$
I_{OZL}	Off State I_{OUT} LOW-Level Output Current				−10	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_{OUT}	Output Capacitance[5]			9	12	pF	MAX	All outputs
I_{CC}	Quiescent Power Supply Current			0.2	1.5	mA	MAX	$V_{IN} \leq 0.2V$, $V_{IN} \geq V_{CC} - 0.2V$

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.

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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, Outputs Open, $\overline{OE}$ = GND, $V_{IN} \leq$ 0.2V or $V_{IN} \geq V_{CC}$ − 0.2V
I_C	Total Power Supply Current[9]	1.7	4.0	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, One Input Toggling at f_1 = 10MHz, $\overline{OE}$ = GND, $V_{IN} \leq$ 0.2V or $V_{IN} \geq V_{CC}$ − 0.2V
		2.0	5.0	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, One Input Toggling at f_1 = 10MHz, $\overline{OE}$ = GND, V_{IN} = 3.4V or V_{IN} = GND
		1.7	4.0[8]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Four Bits Toggling at f_1 = 2.5MHz, $\overline{OE}$ = GND, $V_{IN} \leq$ 0.2V or $V_{IN} \geq V_{CC}$ − 0.2V
		2.7	8.0[8]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Four Bits Toggling at f_1 = 2.5MHz, $\overline{OE}$ = GND, V_{IN} = 3.4V or V_{IN} = GND

FUNCTION TABLE

Inputs				Output
$\overline{OE}$	S	I_0	I_1	Y
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	H	X	H

H = High voltage level
L = Low voltage level
X = Don't care
Z = High impedance (OFF) state

DEFINITION OF FUNCTIONAL TERMS

Pins	Description
$I_{0n} - I_{1n}$	Data inputs
S	Common select input
$\overline{OE}$	Enable input (Active-Low)
$Y_a - Y_d$	Data outputs 'FCT2257T

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 limits 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.

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AC CHARACTERISTICS

Sym.	Parameter	'FCT2257T				'FCT2257AT				'FCT2257CT		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}	Prop Delay I_{na}, I_{nb} to Y_n	1.5	7.0	1.5	6.0	1.5	5.8	1.5	5.0	1.5	4.3	ns	1, 3
t_{PLH} t_{PHL}	Prop Delay S to O_n	1.5	12.0	1.5	10.5	1.5	8.1	1.5	7.0	1.5	5.2	ns	1, 3
t_{PZH} t_{PZL}	Output Enable Time to High or Low	1.5	10.0	1.5	8.5	1.5	8.0	1.5	7.0	1.5	6.0	ns	1, 7, 8
t_{PHZ} t_{PLZ}	Output Disable Time from High or Low	1.5	8.0	1.5	6.0	1.5	5.8	1.5	5.5	1.5	5.0	ns	1, 7, 8

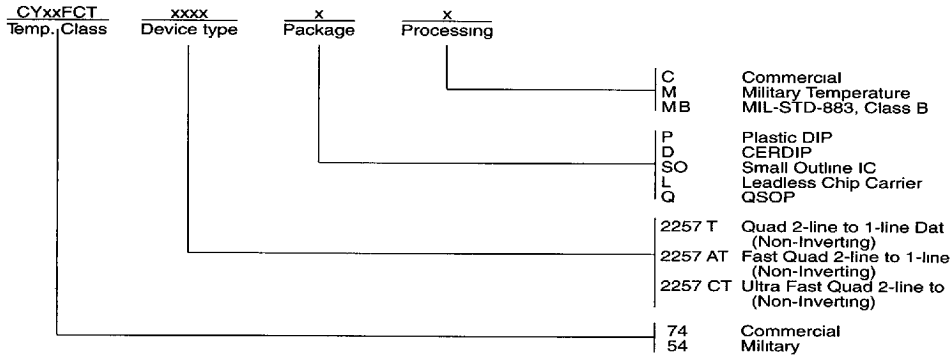**Note**
10. Minimum limits are guaranteed but not tested on propagation delays.
* AC characteristics guaranteed with $C_L = 50pF$.
*Refer to the 'Parameter Measurement Information' section of this book.

ORDERING INFORMATION

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CYxxFCT        xxxx          x            x
Temp. Class    Device type   Package      Processing
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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

2257 T	Quad 2-line to 1-line Dat (Non-Inverting)
2257 AT	Fast Quad 2-line to 1-line (Non-Inverting)
2257 CT	Ultra Fast Quad 2-line to (Non-Inverting)

74	Commercial
54	Military

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