



SCCS014 - May 1994 - Revised February 2000

CY54/74FCT157T

Quad 2-Input Multiplexer

Features

- Function, pinout, and drive compatible with FCT and F logic
- FCT-C speed at 4.3 ns max. (Com'l), FCT-A speed at 5.0 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
- Matched rise and fall times
- Fully compatible with TTL input and output logic levels
- ESD > 2000V
- Extended commercial range of -40°C to $+85^{\circ}\text{C}$
- Sink current 64 mA (Com'l), 32 mA (Mil)
- Source current 32 mA (Com'l), 12 mA (Mil)

Functional Description

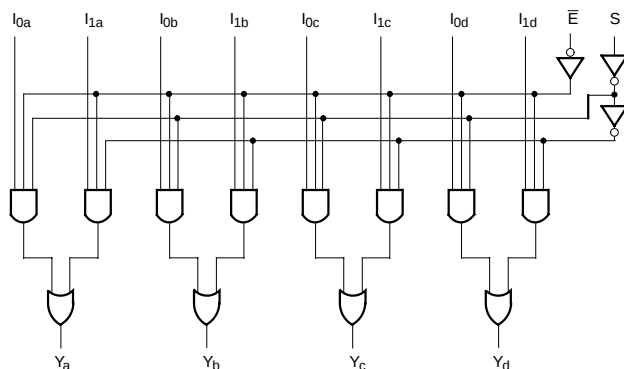
The FCT157T is a quad two-input multiplexer that selects four bits of data from two sources under the control of a common data Select input (S). The Enable input (E) is Active LOW. When (E) is HIGH, all of the outputs (Y) are forced LOW regardless of all other input conditions.

Moving data from two groups of registers to four common output buses is a common use of the FCT157T. The state of the Select input determines the particular register from which the data comes. It can also be used as a function generator. The device is useful for implementing highly irregular logic by generating any four of the sixteen different functions of two variables with one variable common.

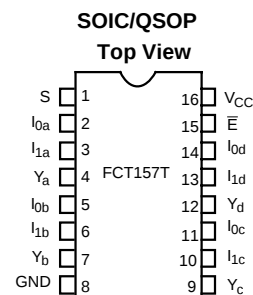
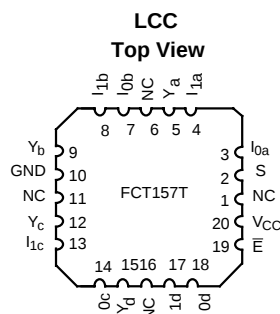
The FCT157T is a logic implementation of a four-pole, two-position switch where the position of the switch is determined by the logic levels supplied to the Select input.

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

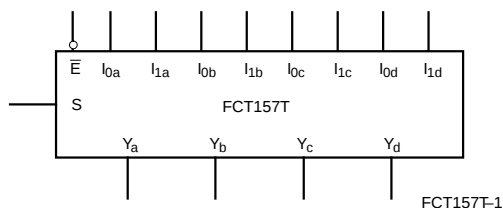
Logic Block Diagram, FCT157T



Pin Configurations



Logic Symbol



Pin Description

Name	Description
S	Common Select Input
$\bar{E}$	Enable Inputs (Active LOW)
I ₀	Data Inputs from Source 0
I ₁	Data Inputs from Source 1
Y	Non-Inverted Output

Function Table^[1]

Inputs				Outputs
E	S	I ₀	I ₁	Y
H	X	X	X	L
L	H	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	H	X	H

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	All	–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} =32 mA	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 _{OZH}	Off State HIGH-Level Output Current	V _{CC} = Max., V _{OUT} = 2.7V				10	μA
I _{OZL}	Off State LOW-Level Output Current	V _{CC} = Max., V _{OUT} = 0.5V				–10	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

Note:

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

Capacitance^[6]

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

Power Supply Characteristics

Parameter	Description	Test Conditions	Typ. ^[5]	Max.	Unit
I _{CC}	Quiescent Power Supply Current	V _{CC} =Max., V _{IN} ≤0.2V, V _{IN} ≥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, OE=GND, V _{IN} ≤0.2V or V _{IN} ≥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 Input Toggling at f ₁ =10 MHz, OE=GND, V _{IN} ≤0.2V or V _{IN} ≥V _{CC} -0.2V	0.7	1.4	mA
		V _{CC} =Max., 50% Duty Cycle, Outputs Open, One Input Toggling at f ₁ =10 MHz, OE=GND, V _{IN} =3.4V or V _{IN} =GND	1.0	2.4	mA
		V _{CC} =Max., 50% Duty Cycle, Outputs Open, Four Bits Toggling at f ₁ =2.5 MHz, OE=GND, V _{IN} ≤0.2V or V _{IN} ≥V _{CC} -0.2V	0.7	1.4 ^[11]	mA
		V _{CC} =Max., 50% Duty Cycle, Outputs Open, Four Bits Toggling at f ₁ =2.5 MHz, OE=GND, V _{IN} =3.4V or V _{IN} =GND	1.7	5.4 ^[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} + ΔI_{CC}D_HN_T + I_{CCD}(f₀/2 + f₁N₁)
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)
f₀ = Clock frequency for registered devices, otherwise zero
f₁ = Input signal frequency
N₁ = Number of inputs changing at f₁
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	FCT157T		FCT157AT				FCT157CT		Unit	Fig. No. ^[13]
		Commercial		Military		Commercial		Commercial			
		Min. ^[12]	Max.	Min. ^[12]	Max.	Min. ^[12]	Max.	Min. ^[12]	Max.		
t _{PLH} t _{PHL}	Propagation Delay I to Y	1.5	6.0	1.5	5.8	1.5	5.0	1.5	4.3	ns	1, 3
t _{PLH} t _{PHL}	Propagation Delay E to Y	1.5	10.5	1.5	7.4	1.5	6.0	1.5	4.8	ns	1, 5
t _{PLH} t _{PHL}	Propagation Delay S to Y	1.5	10.5	1.5	8.1	1.5	7.0	1.5	5.2	ns	1, 3

Ordering Information

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
4.3	CY74FCT157CTQCT	Q1	16-Lead (150-Mil) QSOP	Commercial
	CY74FCT157CTSOC/SOCT	S1	16-Lead (300-Mil) Molded SOIC	
5.0	CY74FCT157ATQCT	Q1	16-Lead (150-Mil) QSOP	Commercial
	CY74FCT157ATSOC/SOCT	S1	16-Lead (300-Mil) Molded SOIC	
5.8	CY54FCT157ATLMB	L61	20-Pin Square Leadless Chip Carrier	Military

Note:

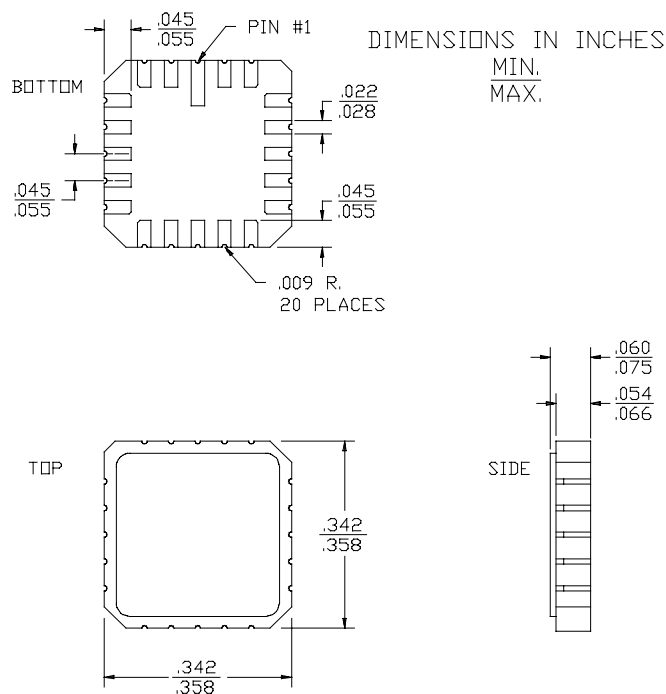
12. Minimum limits are specified but not tested on Propagation Delays.

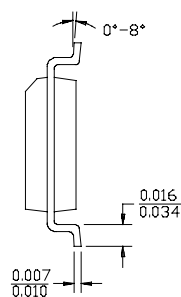
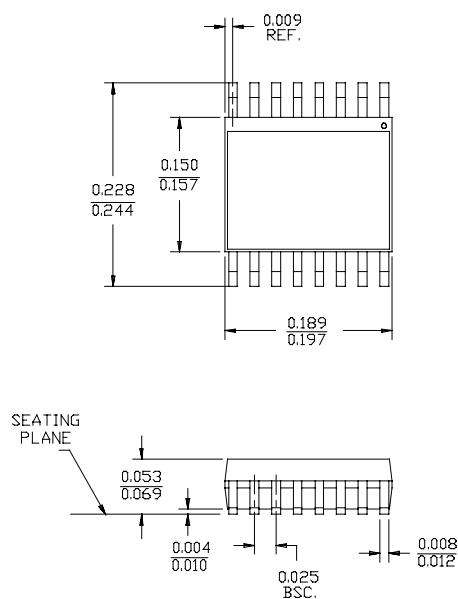
13. See "Parameter Measurement Information" in the General Information Section

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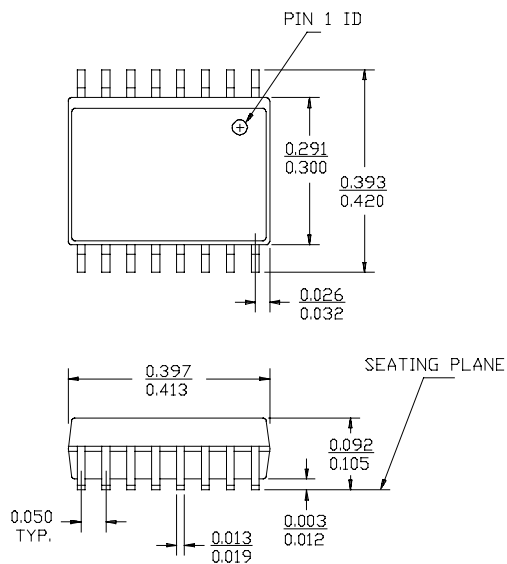
Package Diagrams
20-Pin Square Leadless Chip Carrier L61

MIL-STD-1835 C-2A

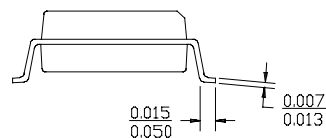


Package Diagrams (continued)
16-Lead Quarter Size Outline Q1


DIMENSIONS IN INCHES MIN.
MAX.
LEAD COPLANARITY 0.004 MAX.

16-Lead Molded SOIC S1


DIMENSIONS IN INCHES MIN.
MAX.
LEAD COPLANARITY 0.004 MAX.



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