CY54/74FCT157T
CY54/74FCT158T

Quad 2-Input Multiplexers

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**
- **Sink current 64 mA (Com'l), 32 mA (Mil)**
- **Source current 32 mA (Com'l), 12 mA (Mil)**

Functional Description

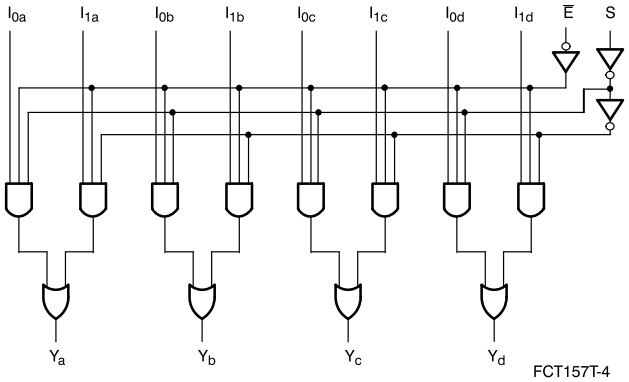
The FCT157T and FCT158T are quad two-input multiplexers that select four bits of data from two sources under the control of a common data Select input (S). The Enable input ($\overline{E}$) is Active LOW. When ($\overline{E}$) is HIGH, all of the outputs (Y) are forced LOW regardless of all other input conditions.

Moving data from two groups of registers to four common output buses is a common use of the FCT157T and FCT158T. 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.

These devices are 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 of the FCT157T are non-inverting whereas the FCT158T has inverting outputs.

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

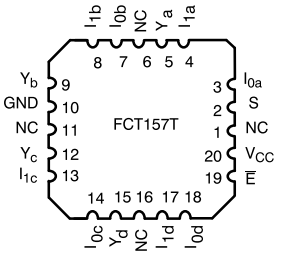
Logic Block Diagram, FCT157T



FCT157T-4

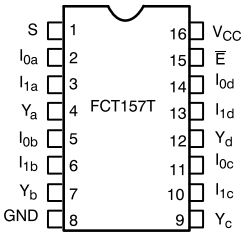
Pin Configurations

LCC
Top View



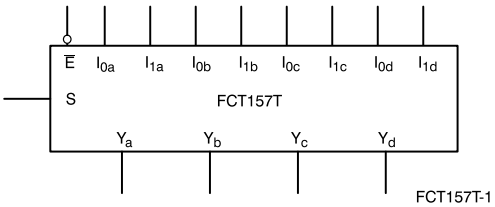
FCT157T-3

DIP/SOIC/QSOP
Top View



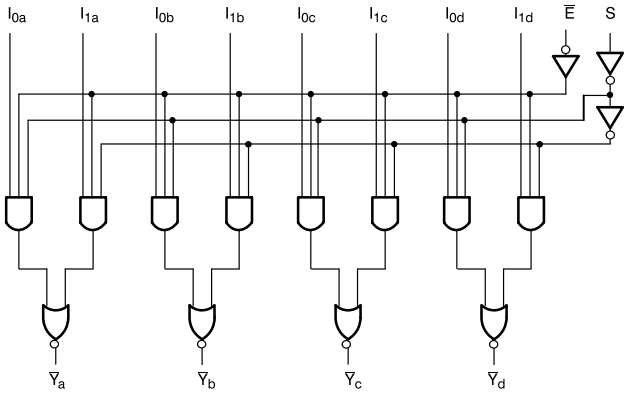
FCT157T-2

Logic Symbol



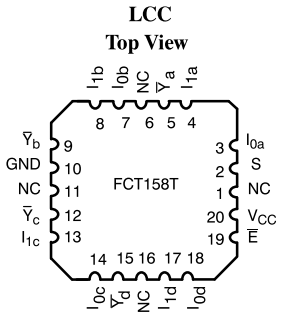
FCT157T-1

Logic Block Diagram, FCT158T

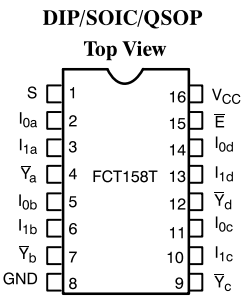


FCT157T-6

Pin Configurations

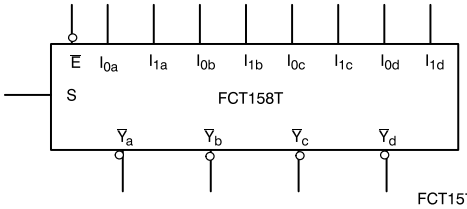


FCT157T-8



FCT157T-7

Logic Symbol



FCT157T-5

Pin Description

Name	Description
S	Common Select Input
$\overline{E}$	Enable Inputs (Active LOW)
I_0	Data Inputs from Source 0
I_1	Data Inputs from Source 1
Y	Non-Inverted Output (FCT157T)
$\overline{Y}$	Inverted Output (FCT158T)

Function Table[1]—FCT157T

Inputs				Outputs
$\overline{E}$	S	I_0	I_1	Y
H	X	X	X	H
L	H	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	H	X	H

Function Table[1]—FCT158T

Inputs				Outputs
$\overline{E}$	S	I_0	I_1	$\overline{Y}$
H	X	X	X	H
L	H	X	L	H
L	H	X	H	L
L	L	L	X	H
L	L	H	X	L

Note:
1. 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	CT	0°C to +70°C	5V ± 5%
Commercial	T, AT	−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

Capacitance[6]

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

Notes:

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 guaranteed 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.

Power Supply Characteristics

Parameter	Description	Test Conditions	Typ.[5]	Max.	Unit
I_{CC}	Quiescent Power Supply Current	V_{CC}=Max., $V_{IN} \le 0.2V$, $V_{IN} \ge V_{CC}-0.2V$	0.1	0.2	mA
ΔI_{CC}	Quiescent Power Supply Current (TTLinputs 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, $\overline{OE}$=GND, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC}-0.2V$	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, $\overline{OE}$=GND, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC}-0.2V$	0.7	1.4	mA
		V_{CC}=Max., 50% Duty Cycle, Outputs Open, One Input Toggling at f_1=10 MHz, $\overline{OE}$=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, $\overline{OE}$=GND, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC}-0.2V$	0.7	1.4[11]	mA
		V_{CC}=Max., 50% Duty Cycle, Outputs Open, Four Bits Toggling at f_1=2.5 MHz, $\overline{OE}$=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. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
    $I_C = I_{CC}+\Delta I_{CC} D_H N_T + I_{CCD}(f_0/2 + f_1 N_1)$
    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 guaranteed but not tested.

Switching Characteristics Over the Operating Range

Parameter	Description	FCT157T				FCT157AT				Unit	Fig. No.[13]
		Military		Commercial		Military		Commercial			
		Min.[12]	Max.	Min.[12]	Max.	Min.[12]	Max.	Min.[12]	Max.		
t_{PLH} t_{PHL}	Propagation Delay I to Y	1.5	7.0	1.5	6.0	1.5	5.8	1.5	5.0	ns	1, 3
t_{PLH} t_{PHL}	Propagation Delay $\overline{E}$ to Y	1.5	12.0	1.5	10.5	1.5	7.4	1.5	6.0	ns	1, 5
t_{PLH} t_{PHL}	Propagation Delay S to Y	1.5	12.0	1.5	10.5	1.5	8.1	1.5	7.0	ns	1, 3

Parameter	Description	FCT157CT				Unit	Fig. No.[13]
		Military		Commercial			
		Min.[12]	Max.	Min.[12]	Max.		
t_{PLH} t_{PHL}	Propagation Delay I to Y	1.5	5.0	1.5	4.3	ns	1, 3
t_{PLH} t_{PHL}	Propagation Delay $\overline{E}$ to Y	1.5	5.9	1.5	4.8	ns	1, 5
t_{PLH} t_{PHL}	Propagation Delay S to Y	1.5	6.0	1.5	5.2	ns	1, 3

Switching Characteristics Over the Operating Range

Parameter	Description	FCT158T				FCT158AT				Unit	Fig. No.[13]
		Military		Commercial		Military		Commercial			
		Min.[12]	Max.	Min.[12]	Max.	Min.[12]	Max.	Min.[12]	Max.		
t_{PLH} t_{PHL}	Propagation Delay I to $\overline{Y}$	1.5	7.5	1.5	6.5	1.5	6.3	1.5	5.5	ns	1, 2
t_{PLH} t_{PHL}	Propagation Delay $\overline{E}$ to $\overline{Y}$	1.5	12.5	1.5	11.0	1.5	7.9	1.5	6.5	ns	1, 5
t_{PLH} t_{PHL}	Propagation Delay S to $\overline{Y}$	1.5	12.5	1.5	11.0	1.5	8.6	1.5	7.5	ns	1, 2

Parameter	Description	FCT158CT				Unit	Fig. No.[13]
		Military		Commercial			
		Min.[12]	Max.	Min.[12]	Max.		
t_{PLH} t_{PHL}	Propagation Delay I to $\overline{Y}$	1.5	5.5	1.5	4.3	ns	1, 2
t_{PLH} t_{PHL}	Propagation Delay $\overline{E}$ to $\overline{Y}$	1.5	6.4	1.5	4.8	ns	1, 5
t_{PLH} t_{PHL}	Propagation Delay S to $\overline{Y}$	1.5	6.5	1.5	5.2	ns	1, 2

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

Ordering Information—FCT157T

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
4.3	CY74FCT157CTPC	P1	16-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT157CTQC	Q1	16-Lead (150-Mil) QSOP	
	CY74FCT157CTSOC	S1	16-Lead (300-Mil) Molded SOIC	
5.0	CY74FCT157ATPC	P1	16-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT157ATQC	Q1	16-Lead (150-Mil) QSOP	
	CY74FCT157ATSOC	S1	16-Lead (300-Mil) Molded SOIC	
5.0	CY54FCT157CTDMB	D2	16-Lead (300-Mil) CerDIP	Military
	CY54FCT157CTLMB	L61	20-Pin Square Leadless Chip Carrier	
5.8	CY54FCT157ATDMB	D2	16-Lead (300-Mil) CerDIP	Military
	CY54FCT157ATLMB	L61	20-Pin Square Leadless Chip Carrier	
6.0	CY74FCT157TPC	P1	16-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT157TQC	Q1	16-Lead (150-Mil) QSOP	
	CY74FCT157TSOC	S1	16-Lead (300-Mil) Molded SOIC	
7.0	CY54FCT157TDMB	D2	16-Lead (300-Mil) CerDIP	Military
	CY54FCT157TLMB	L61	20-Pin Square Leadless Chip Carrier	

Ordering Information—FCT158T

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
4.3	CY74FCT158CTPC	P1	16-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT158CTQC	Q1	16-Lead (150-Mil) QSOP	
	CY74FCT158CTSOC	S1	16-Lead (300-Mil) Molded SOIC	
5.5	CY74FCT158ATPC	P1	16-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT158ATQC	Q1	16-Lead (150-Mil) QSOP	
	CY74FCT158ATSOC	S1	16-Lead (300-Mil) Molded SOIC	
5.5	CY54FCT158CTDMB	D2	16-Lead (300-Mil) CerDIP	Military
	CY54FCT158CTLMB	L61	20-Pin Square Leadless Chip Carrier	
6.3	CY54FCT158ATDMB	D2	16-Lead (300-Mil) CerDIP	Military
	CY54FCT158ATLMB	L61	20-Pin Square Leadless Chip Carrier	
6.5	CY74FCT158TPC	P1	16-Lead (300-Mil) Molded DIP	Commercial
	CY74FCT158TQC	Q1	16-Lead (150-Mil) QSOP	
	CY74FCT158TSOC	S1	16-Lead (300-Mil) Molded SOIC	
7.5	CY54FCT158TDMB	D2	16-Lead (300-Mil) CerDIP	Military
	CY54FCT158TLMB	L61	20-Pin Square Leadless Chip Carrier	

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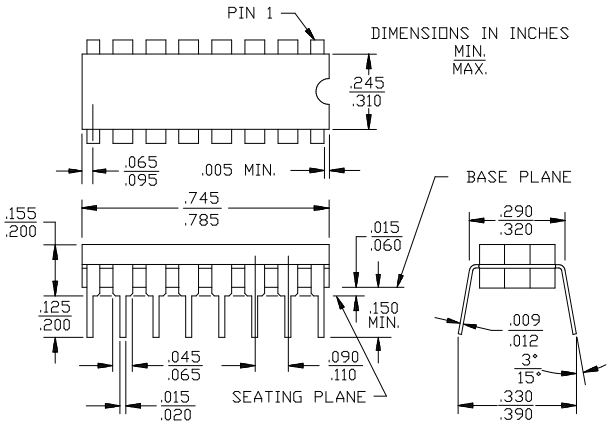
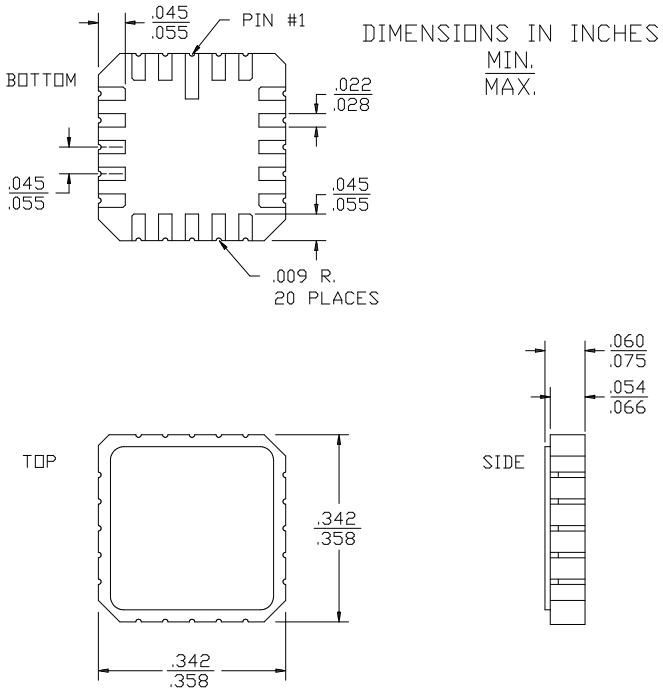
Package Diagrams

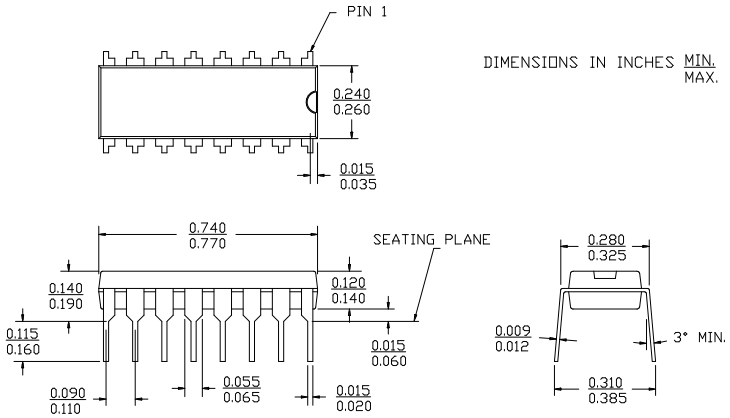
16-Lead (300-Mil) CerDIP D2
MIL−STD−1835 D−2 Config. A



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

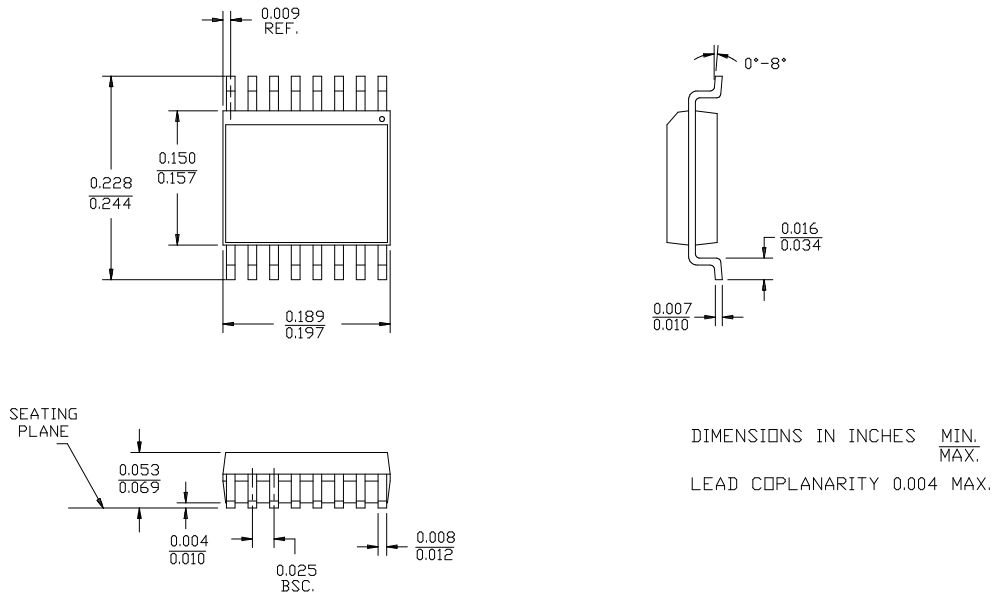


16-Lead (300-Mil) Molded DIP P1



Package Diagrams(continued)

16-Lead Quarter Size Outline Q1



16-Lead Molded SOIC S1