P54/74FCT157T/AT/CT
P54/74FCT158T/AT/CT
DATA SELECTOR/MULTIPLEXER

FEATURES

- **Function, Pinout and Drive Compatible with the FCT and F Logic**
- **FCT-C speed at 4.3ns max. (Com'l) FCT-A speed at 5.0ns max. (Com'l)**
- **Reduced V_{OH} (typically = 3.3V) versions of Equivalent FCT functions**
- **Edge-rate Control Circuitry for Significantly Improved Noise Characteristics**
- **ESD protection exceeds 2000V**
- **Power-off disable feature**
- **Matched Rise and Fall times**
- **Fully Compatible with TTL Input and Output Logic Levels**
- **64 mA Sink Current (Com'l), 32 mA (Mil) 15 mA Source Current (Com'l), 12 mA (Mil)**
- **Manufactured in 0.7 micron PACE Technology™**

DESCRIPTION

The 'FCT157T and 'FCT158T are quad 2-input multiplexers which select 4 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 inputs (Y) are forced LOW regardless of all other input conditions.

Moving data from two groups of registers to four common output busses 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 16 different functions of two variables with one variable common.

These devices are 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. The outputs of the 'FCT157T are Non-Inverting whereas the 'FCT158T has Inverting outputs.

The 'FCT157T/158T is manufactured using PACE Technology™ which is **P**erformance **A**dvanced **C**MOS **E**ngineered to use 0.7 micron effective channel lengths giving 400 picoseconds loaded* internal gate delays. Pace Technology includes two-level metal and epitaxial substrates. In addition to very high performance and very high density, the technology features latch-up protection, single event upset protection, and is supported by a Class 1 enviroment volume production facility.

*For a fan-in/fan-out of 4, at 85°C junction temperature and 5.0V.

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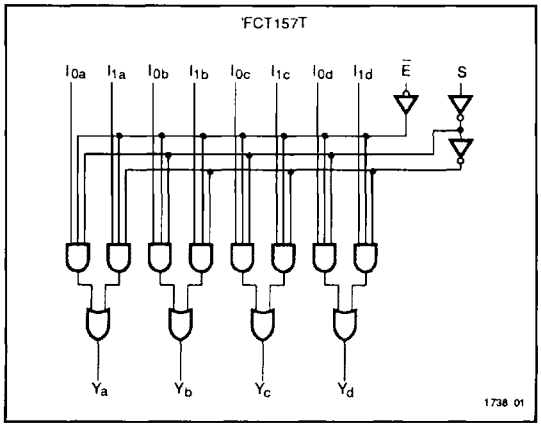
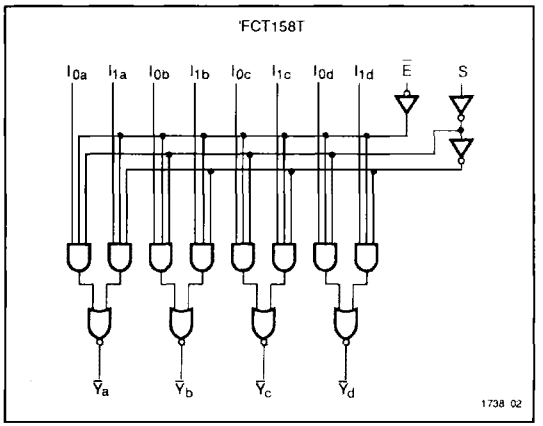
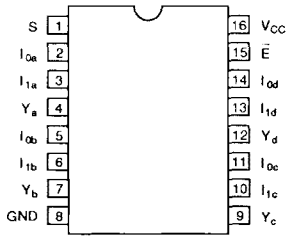
FUNCTIONAL BLOCK DIAGRAM





PIN CONFIGURATIONS

'FCT157T



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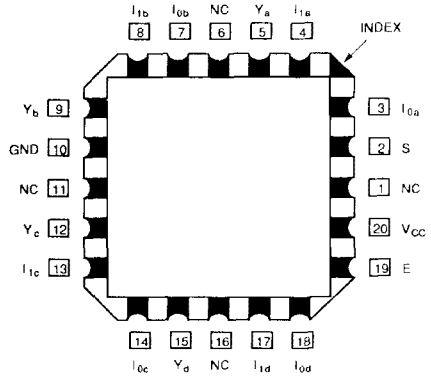
SOIC (S10)

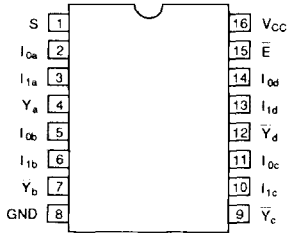


LCC (L2)

1738 03

PIN CONFIGURATIONS

'FCT158T



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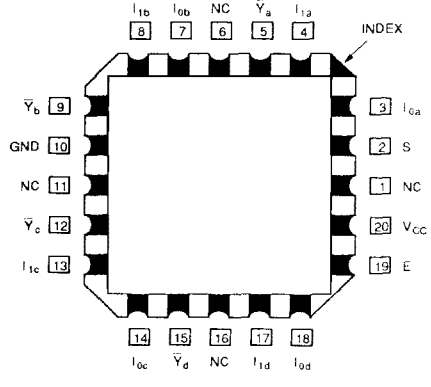
SOIC (S10)

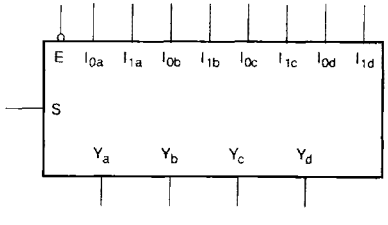


LCC (L2)

1738 04

LOGIC SYMBOL

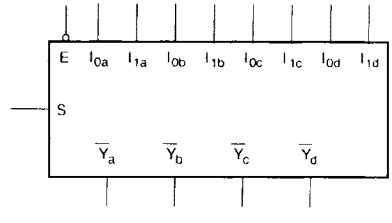
'FCT157T



1738 05

LOGIC SYMBOL

'FCT158T



1738 06

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

1738 Tbl 01

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

1738 Tbl 02

Notes:

1. Operation beyond the limits 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.

RECOMMENDED OPERATING CONDITIONS

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

1738 Tbl 03

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

1738 Tbl 04

DC ELECTRICAL CHARACTERISTICS (Over recommended operating conditions)

Symbol	Parameter		Min	Typ[1]	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} = 32mA
		Commercial		0.3	0.5	V	MIN	I_{OL} = 48mA
		Commercial		0.3	0.5	V	MIN	I_{OL} = 64mA
I_I	Input HIGH Current				20	µA	MAX	$V_{IN} = V_{CC}$
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[2]		–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[3]			5	10	pF	MAX	All inputs
C_{OUT}	Output Capacitance[3]			9	12	pF	MAX	All outputs
I_{CC}	Quiescent Power Supply Current			0.2	1.5	mA	MAX	$V_{IN} \leq 0.2V$, $V_{IN} \geq V_{CC}-0.2V$

1738 Tbl 05

Notes:

1. Typical limits are at V_{CC} = 5.0V, T_A = +25°C ambient.
2. 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.
3. This parameter is guaranteed but not tested.

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

Symbol	Parameter	Typ.[1]	Max.	Units	Conditions
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs)	0.5	2.0	mA	V_{CC} = MAX, V_{IN} = 3.4V[2], f_1 = 0, Outputs Open
I_{CCD}	Dynamic Power Supply Current[3]	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[5]	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[4]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Eight 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[4]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f_1 = 2.5MHz, $\overline{OE}$ = GND, V_{IN} = 3.4V or V_{IN} = GND

1738 Tbl 06

Notes:

1. Typical values are at V_{CC} = 5.0V, +25°C ambient and maximum loading.
2. Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.
3. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
4. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
5. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD}(f_0/2 + f_1 N_1)$
   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.

FUNCTION TABLE — 'FCT157T

Enable	Select Inputs	Data Inputs		Output
$\overline{E}$	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

1738 Tbl 07

H = High voltage level
L = Low voltage level
X = Don't care

FUNCTION TABLE — 'FCT158T

Enable	Select Inputs	Data Inputs		Output
$\overline{E}$	S	I_0	I_1	$\overline{Y}$
H	X	X	X	H
L	L	X	L	H
L	L	X	H	L
L	H	L	X	H
L	H	H	X	L

1738 Tbl 08

PIN DESCRIPTIONS

Pin Names	Description
S	Common Select Input
$\overline{E}$	Enable Input (Active LOW)
$I_{0A} - I_{0D}$	Data Inputs from Source 0
$I_{1A} - I_{1D}$	Data Inputs from Source 1
$Y_A - Y_D$	Non-Inverted Output
$\overline{Y}_A - \overline{Y}_D$	Inverted Output

1738 Tbl 09

AC CHARACTERISTICS ('FCT157T)

Symbol	Parameter	'FCT157T				'FCT157AT				'FCT157CT				Units	Fig. No.
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_{PLH} t_{PHL}	Propagation Delay I_n to Y	1.5	7.0	1.5	6.0	1.5	5.8	1.5	5.0	1.5	5.0	1.5	4.3	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	1.5	5.9	1.5	4.8	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	1.5	6.0	1.5	5.2	ns	1, 3

1738 Tbl 10

Note: Minimum limits are guaranteed but not tested on Propagation Delays.

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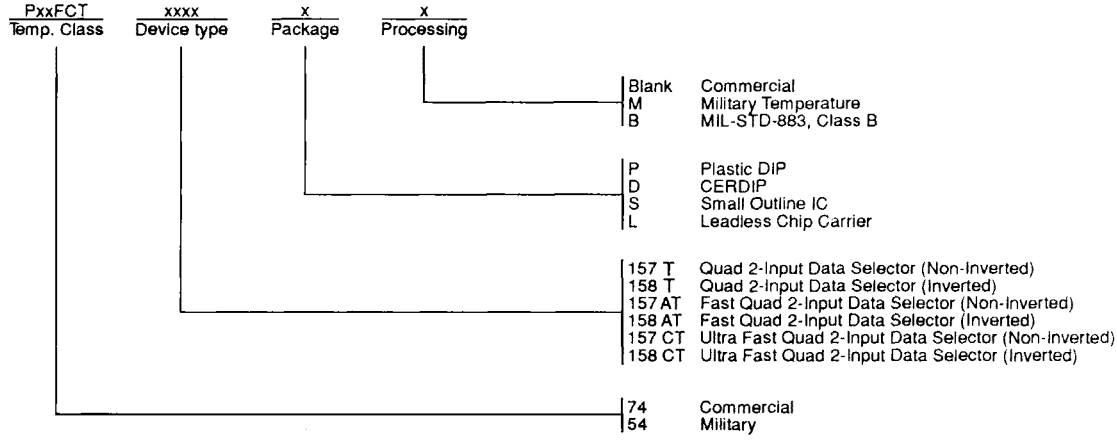
AC CHARACTERISTICS ('FCT158T)

Symbol	Parameter	'FCT158T				'FCT158AT				'FCT158CT				Units	Fig. No.
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_{PLH} t_{PHL}	Propagation Delay I_n to Y	1.5	7.5	1.5	6.5	1.5	6.3	1.5	5.5	1.5	5.5	1.5	4.8	ns	1, 2
t_{PLH} t_{PHL}	Propagation Delay $\overline{E}$ to Y	1.5	12.5	1.5	11.0	1.5	7.9	1.5	6.5	1.5	6.4	1.5	5.3	ns	1, 5
t_{PLH} t_{PHL}	Propagation Delay S to Y	1.5	12.5	1.5	11.0	1.5	8.6	1.5	7.5	1.5	6.5	1.5	5.7	ns	1, 2

1738 Tbl 11

Note: Minimum limits are guaranteed but not tested on Propagation Delays.

ORDERING INFORMATION



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