



FAST CMOS QUAD 2-INPUT MULTIPLEXER

IDT74FCT157AT/CT/DT

FEATURES:

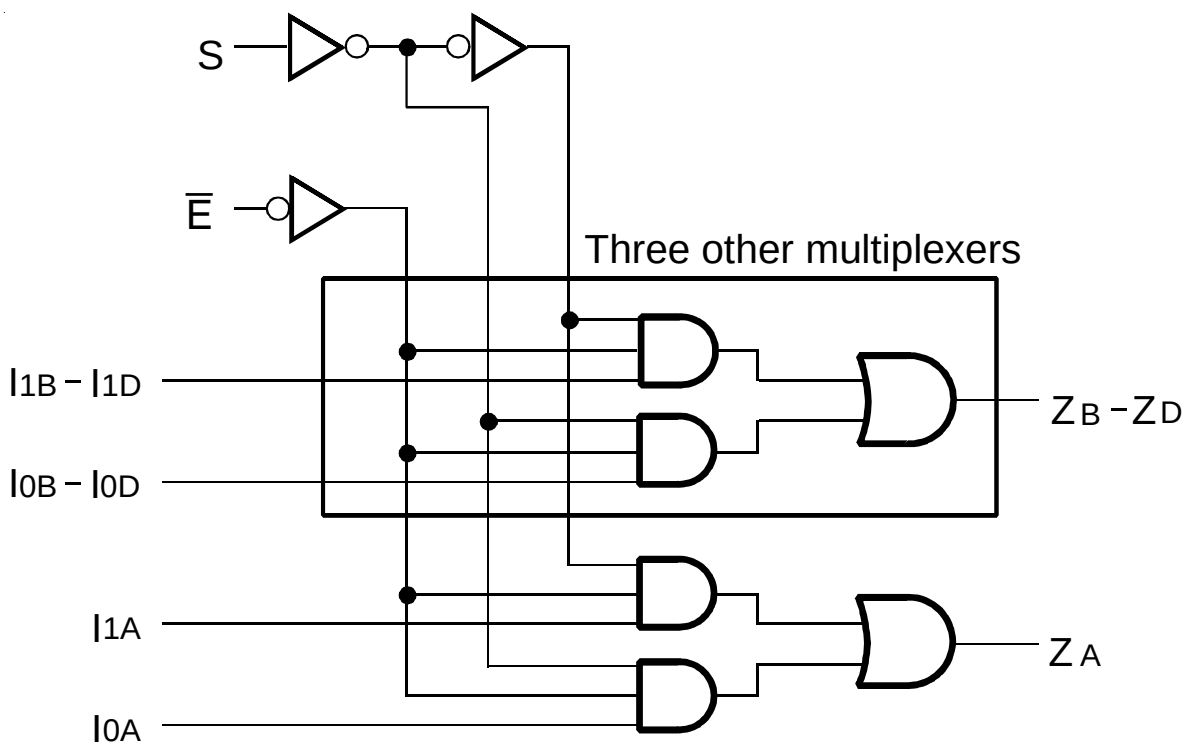
- A, C, and D grades
- Low input and output leakage $\leq 1\mu\text{A}$ (max.)
- CMOS power levels
- True TTL input and output compatibility:
 - $V_{OH} = 3.3\text{V}$ (typ.)
 - $V_{OL} = 0.3\text{V}$ (typ.)
- High Drive outputs (-15mA I_{OH} , 48mA I_{OL})
- Meets or exceeds JEDEC standard 18 specifications
- Power off disable outputs permit "live insertion"
- Available in SOIC and QSOP packages

DESCRIPTION:

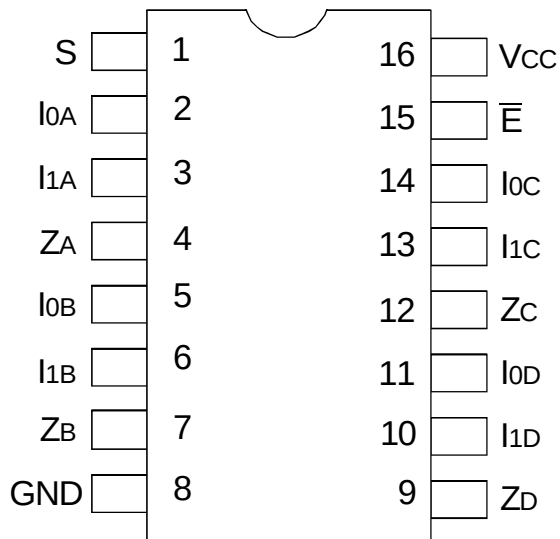
The FCT157T is a high-speed quad 2-input multiplexer built using an advanced dual metal CMOS technology. Four bits of data from two sources can be selected using the common select input. The four buffered outputs present the selected data in the true (non-inverting) form.

The FCT157T has a common, active-low, enable input. When the enable input is not active, all four outputs are held low. A common application of FCT157T is to move data from two different groups of registers to a common bus. Another application is as a function generator. The FCT157T can generate any four of the 16 different functions of two variables with one variable common.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SOIC/ QSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Description	Max	Unit
VTERM ⁽²⁾	Terminal Voltage with Respect to GND	-0.5 to +7	V
VTERM ⁽³⁾	Terminal Voltage with Respect to GND	-0.5 to VCC+0.5	V
TSTG	Storage Temperature	-65 to +150	°C
IOUT	DC Output Current	-60 to +120	mA

NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability. No terminal voltage may exceed VCC by +0.5V unless otherwise noted.
- Inputs and VCC terminals only.
- Output and I/O terminals only.

CAPACITANCE (TA = +25°C, F = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
CIN	Input Capacitance	VIN = 0V	6	10	pF
COUT	Output Capacitance	VOUT = 0V	8	12	pF

NOTE:

- This parameter is measured at characterization but not tested.

PIN DESCRIPTION

Pin Names	Description
I0A - I0D	Source 0 Data Inputs
I1A - I1D	Source 1 Data Inputs
E-bar	Enable Input (Active LOW)
S	Select Input
ZA - ZD	Outputs

FUNCTION TABLE⁽¹⁾

Inputs				Outputs
E-bar	S	I0	I1	Zx
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

NOTE:

- H = HIGH Voltage Level
X = Don't Care
L = LOW Voltage Level
Z = High Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 5.0\text{V} \pm 5\%$

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
V_{IH}	Input HIGH Level	Guaranteed Logic HIGH Level		2	—	—	V
V_{IL}	Input LOW Level	Guaranteed Logic LOW Level		—	—	0.8	V
I_{IH}	Input HIGH Current ⁽⁴⁾	$V_{CC} = \text{Max.}$	$V_I = 2.7\text{V}$	—	—	± 1	μA
I_{IL}	Input LOW Current ⁽⁴⁾	$V_{CC} = \text{Max.}$	$V_I = 0.5\text{V}$	—	—	± 1	μA
I_{OZH}	High Impedance Output Current ⁽⁴⁾	$V_{CC} = \text{Max.}, V_I = V_{CC} (\text{Max.})$	$V_I = 2.7\text{V}$	—	—	± 1	μA
I_{OZL}			$V_I = 0.5\text{V}$	—	—	± 1	
I_I	Input HIGH Current ⁽⁴⁾	$V_{CC} = \text{Max.}, V_I = V_{CC} (\text{Max.})$		—	—	± 1	μA
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$		—	-0.7	-1.2	V
V_H	Input Hysteresis	—		—	200	—	mV
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ $V_{IN} = \text{GND or } V_{CC}$		—	0.01	1	mA

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -8\text{mA}$	2.4	3.3	—	V
			$I_{OH} = -15\text{mA}$	2	3	—	
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 48\text{mA}$	—	0.3	0.5	V
I_{OS}	Short Circuit Current	$V_{CC} = \text{Max.}, V_O = \text{GND}^{(3)}$		-60	-120	-225	mA
I_{OFF}	Input/Output Power Off Leakage ⁽⁵⁾	$V_{CC} = 0\text{V}, V_{IN} \text{ or } V_O \leq 4.5\text{V}$		—	—	± 1	μA

NOTES:

1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 5.0\text{V}$, $+25^{\circ}\text{C}$ ambient.
3. Not more than one output should be tested at one time. Duration of the test should not exceed one second.
4. The test limit for this parameter is $\pm 5\mu\text{A}$ at $T_A = -55^{\circ}\text{C}$.
5. This parameter is guaranteed but not tested.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	0.5	2	mA
I_{CCD}	Dynamic Power Supply Current ⁽⁴⁾	$V_{CC} = \text{Max.}$ Outputs Open $\bar{E} = \text{GND}$ One Input Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.15	0.25	mA/ MHz
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}$ Outputs Open $f_o = 10\text{MHz}$ 50% Duty Cycle $\bar{E} = \text{GND}$ One Bit Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	1.5	3.5	mA
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	1.8	4.5	
		$V_{CC} = \text{Max.}$ Outputs Open $f_o = 2.5\text{MHz}$ 50% Duty Cycle $\bar{E} = \text{GND}$ Four Bits Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	1.5	3.5 ⁽⁵⁾	mA
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	2.5	7.5 ⁽⁵⁾	

NOTES:

1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient.

3. Per TTL driven input ($V_{IN} = 3.4V$). All other inputs at V_{CC} or GND .

4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.

5. Values for these conditions are examples of ΔI_{CC} formula. These limits are guaranteed but not tested.

6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_o N_o)$

$I_{CC} = \text{Quiescent Current}$

$\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$

$D_H = \text{Duty Cycle for TTL Inputs High}$

$N_T = \text{Number of TTL Inputs at } D_H$

$I_{CCD} = \text{Dynamic Current caused by an Input Transition Pair (HLH or LHL)}$

$f_o = \text{Output Frequency}$

$N_o = \text{Number of Outputs at } f_o$

All currents are in milliamps and all frequencies are in megahertz.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

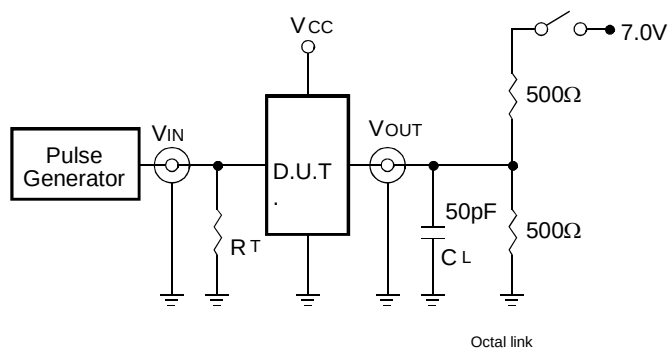
Symbol	Parameter	Condition ⁽¹⁾	IDT74FCT151AT		IDT74FCT151CT		IDT74FCT151DT		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH} t_{PHL}	Propagation Delay Ix to Zx	$C_L = 50\text{pF}$ $R_L = 500\Omega$	1.5	5	1.5	4.3	1.5	3.9	ns
t_{PLH} t_{PHL}	Propagation Delay $\bar{E}$ to Zx		1.5	6	1.5	4.8	1.5	4.4	ns
t_{PLH} t_{PHL}	Propagation Delay S to Zx		1.5	7	1.5	5.2	1.5	4.6	ns

NOTES:

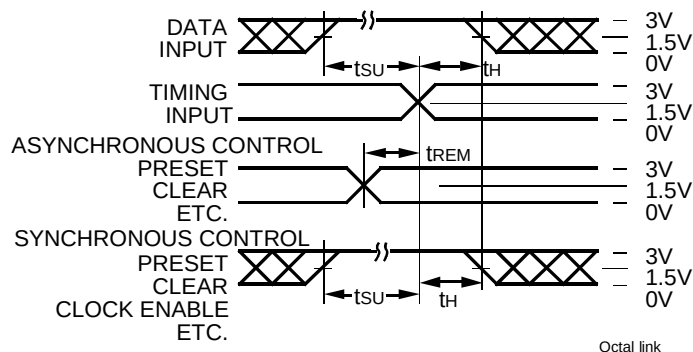
1. See test circuit and waveforms.

2. Minimum limits are guaranteed but not tested on Propagation Delays.

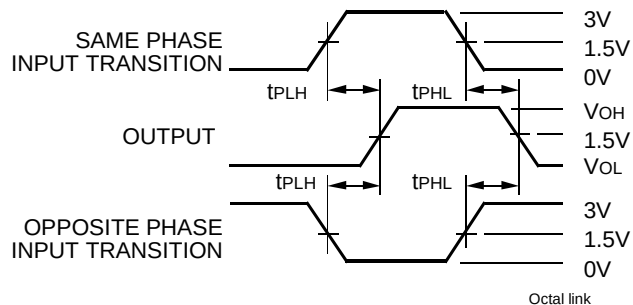
TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-Up, Hold, and Release Times



Propagation Delay

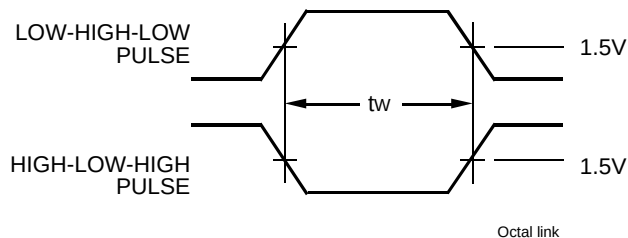
SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	Closed
All Other Tests	Open

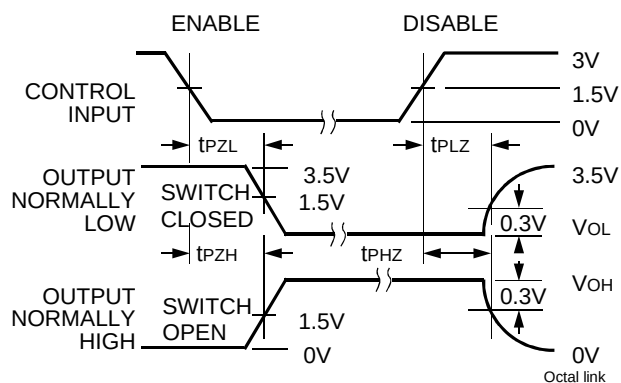
DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.

RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



Pulse Width

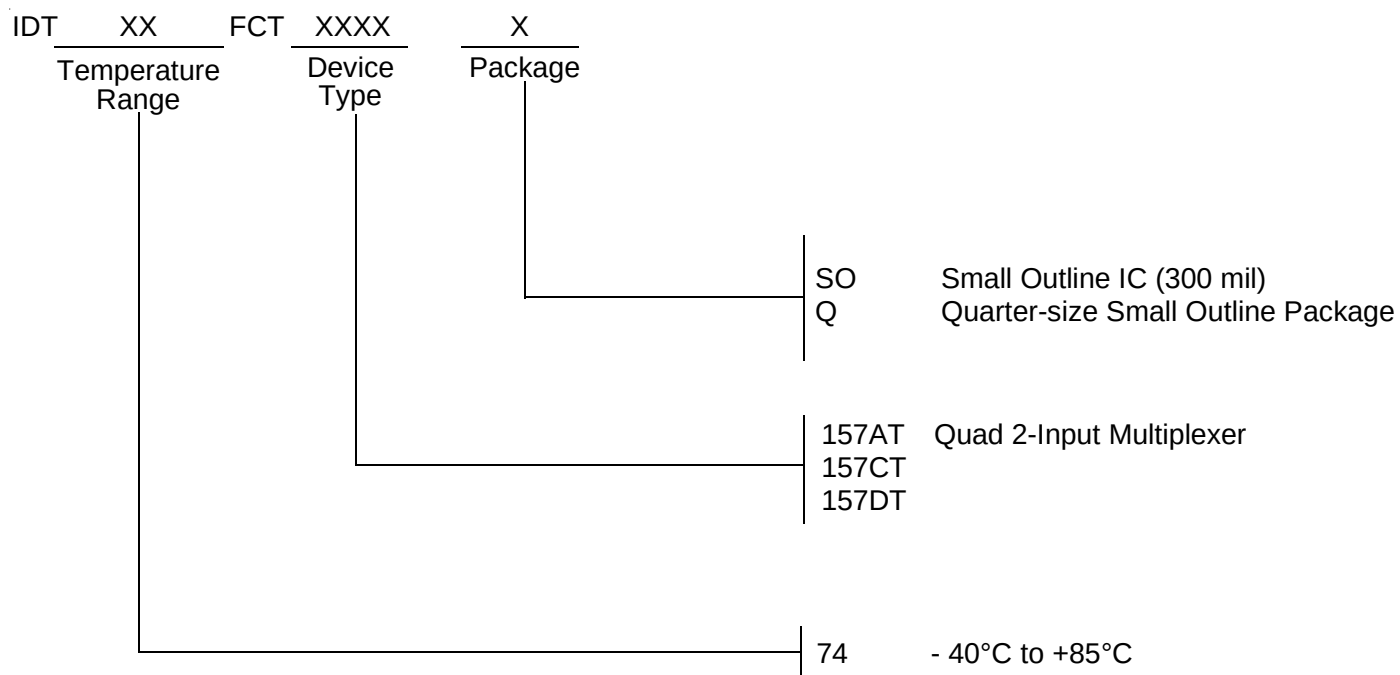


Enable and Disable Times

NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate $\leq 1.0\text{MHz}$; $t_f \leq 2.5\text{ns}$; $t_r \leq 2.5\text{ns}$.

ORDERING INFORMATION



DATA SHEET DOCUMENT HISTORY

3/25/2002 Removed standard speed grade



CORPORATE HEADQUARTERS
2975 Stender Way
Santa Clara, CA 95054

for SALES:
800-345-7015 or 408-727-6116
fax: 408-492-8674
www.idt.com

for Tech Support:
logichelp@idt.com
(408) 654-6459