



# FAST CMOS QUAD 2-INPUT MULTIPLEXER

IDT74FCT257T/AT/CT/DT

## FEATURES:

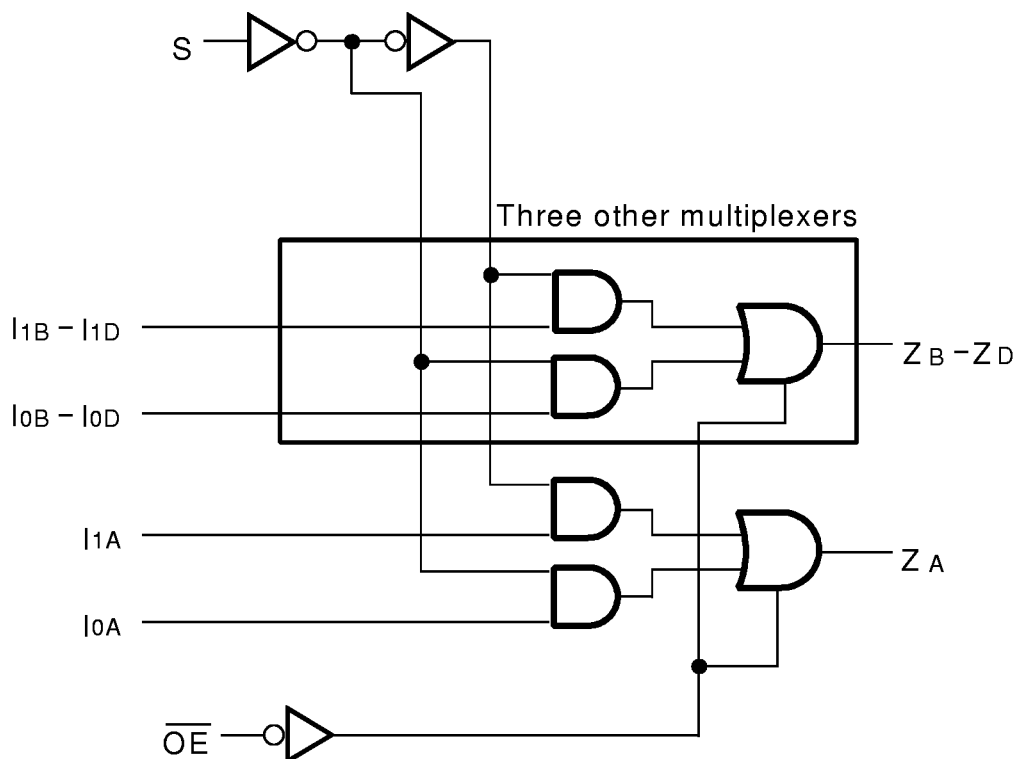
- Low input and output leakage  $\leq 1\mu\text{A}$  (max.)
- Extended commercial range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- CMOS power levels
- True TTL input and output compatibility
  - $V_{OH} = 3.3\text{V}$  (typ.)
  - $V_{OL} = 0.3\text{V}$  (typ.)
- Meets or exceeds JEDEC standard 18 specifications
- Product available in Radiation Tolerant and Radiation Enhanced versions
- Available in PDIP, SOIC, SSOP, and QSOP packages
- Std., A, C and D speed grades
- High drive outputs (-15mA  $I_{OH}$ , 48mA  $I_{OL}$ )

## DESCRIPTION:

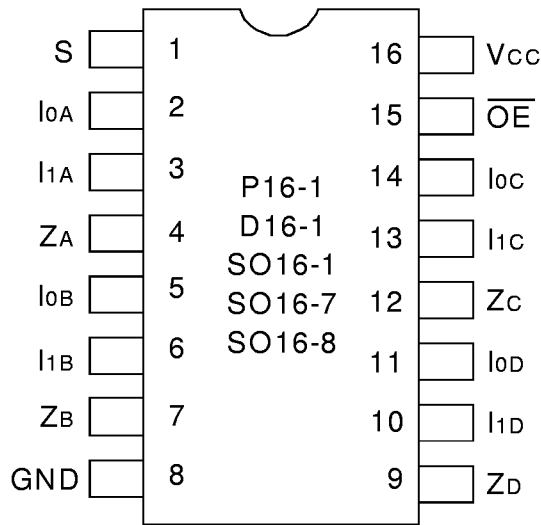
The FCT257T is a high-speed quad 2-input multiplexer built using an advanced dual metal CMOS technology. Four bits of data from two sources can be selected using the common select input. The four buffered outputs present the selected data in the true (non-inverting) form.

The FCT257T has a common Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is high, all outputs are switched to a high-impedance state allowing the outputs to interface directly with bus-oriented systems.

## FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION



PDIP/ SOIC/ QSOP  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating	Max.	Unit
$V_{TERM}^{(2)}$	Terminal Voltage with Respect to GND	-0.5 to +7	V
$V_{TERM}^{(3)}$	Terminal Voltage with Respect to GND	-0.5 to $V_{CC}+0.5$	V
TSTG	Storage Temperature	-65 to +150	°C
I <sub>OUT</sub>	DC Output Current	-65 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  $V_{CC}$  by +0.5V unless otherwise noted.
- Inputs and  $V_{CC}$  terminals only.
- Outputs and I/O terminals only.

## CAPACITANCE ( $T_A = +25^\circ\text{C}$ , $f = 1.0\text{MHz}$ )

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Max.	Unit
C <sub>IN</sub>	Input Capacitance	$V_{IN} = 0V$	6	10	pF
C <sub>OUT</sub>	Output Capacitance	$V_{OUT} = 0V$	8	12	pF

8T-link

### NOTE:

- This parameter is measured at characterization but not tested.

## PIN DESCRIPTION

Pin Names	Description
I <sub>0A</sub> -I <sub>0D</sub>	Source 0 Data Inputs
I <sub>1A</sub> -I <sub>1D</sub>	Source 1 Data Inputs
$\overline{OE}$	Output Enable (Active LOW)
S	Select Input
Z <sub>A</sub> -Z <sub>D</sub>	Outputs

## FUNCTION TABLE(1)

$\overline{OE}$	Inputs			Output Z <sub>N</sub>
	S	I <sub>0</sub>	I <sub>1</sub>	
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

### NOTE:

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

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

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

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	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 <sup>(4)</sup>	$V_{CC} = \text{Max.}$	$V_I = 2.7\text{V}$	—	—	$\pm 1$	$\mu\text{A}$
$I_{IL}$	Input LOW Current <sup>(4)</sup>		$V_I = 0.5\text{V}$	—	—	$\pm 1$	
$I_{OZH}$	High Impedance Output Current (3-State Output pins) <sup>(4)</sup>	$V_{CC} = \text{Max.}$	$V_O = 2.7\text{V}$	—	—	$\pm 1$	
$I_{OZL}$			$V_O = 0.5\text{V}$	—	—	$\pm 1$	
$I_I$	Input HIGH Current <sup>(4)</sup>	$V_{CC} = \text{Max.}, V_I = V_{CC} (\text{Max.})$		—	—	$\pm 1$	$\mu\text{A}$
$V_{IK}$	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 <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	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 <sup>(5)</sup>	$V_{CC} = 0\text{V}, V_{IN} \text{ or } V_O \leq 4.5\text{V}$		—	—	$\pm 1$	$\mu\text{A}$

### NOTES:

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

## POWER SUPPLY CHARACTERISTICS

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

### NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0\text{V}$ ,  $+25^\circ\text{C}$  ambient.
- Per TTL driven input ( $V_{IN} = 3.4\text{V}$ ); all other inputs at  $V_{CC}$  or  $\text{GND}$ .
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- Values for these conditions are examples of the  $I_{CC}$  formula. These limits are guaranteed but not tested.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$   
 $I_C = I_{CC} + \Delta I_{CC} \text{DHNT} + I_{CCD} (f_o N_o)$   
 $I_{CC} = \text{Quiescent Current}$   
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4\text{V})$   
 $\text{DH} = \text{Duty Cycle for TTL Inputs High}$   
 $N_T = \text{Number of TTL Inputs at DH}$   
 $I_{CCD} = \text{Dynamic Current Caused by an Output Transition Pair (HLH or LHL)}$   
 $f_o = \text{Output Frequency}$   
 $N_o = \text{Number of Outputs at } f_o$   
 All currents are in milliamps and all frequencies are in megahertz.

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE

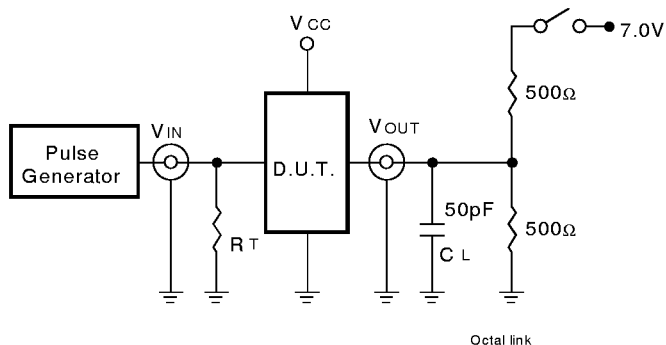
Symbol	Parameter	Condition <sup>(1)</sup>	FCT257T		FCT257AT		FCT257CT		FCT257DT		Unit
			Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	
$t_{PLH}$ $t_{PHL}$	Propagation Delay $I_N$ to $Z_N$	$C_L = 50\text{pF}$ $R_L = 500\Omega$	1.5	6	1.5	5	1.5	4.3	1.5	3.9	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $S$ to $Z_N$		1.5	10.5	1.5	7	1.5	5.2	1.5	4.4	ns
$t_{PZH}$ $t_{PZL}$	Output Enable Time		1.5	8.5	1.5	7	1.5	6	1.5	4.4	ns
$t_{PHZ}$ $t_{PLZ}$	Output Disable Time		1.5	6	1.5	5.5	1.5	5	1.5	4.4	ns

### NOTES:

- See test circuits and waveforms.
- Minimum limits are guaranteed but not tested on Propagation Delay.

## TEST CIRCUITS AND WAVEFORMS

### TEST CIRCUITS FOR ALL OUTPUTS



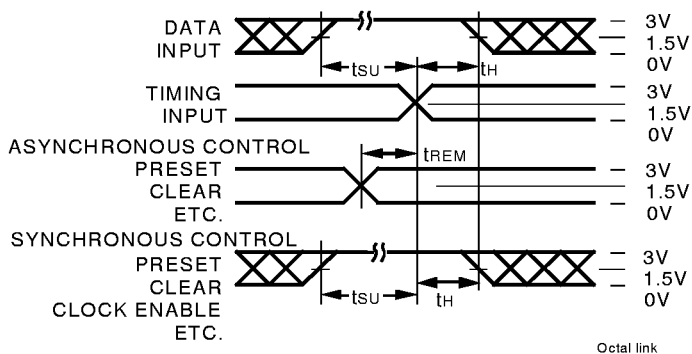
### SWITCH POSITION

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

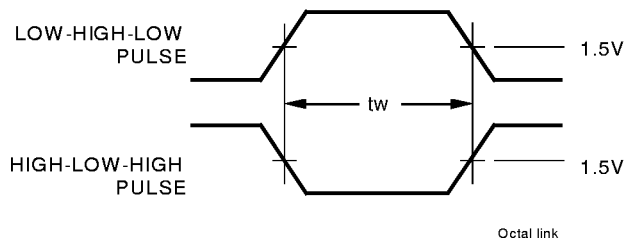
#### DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.  
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.

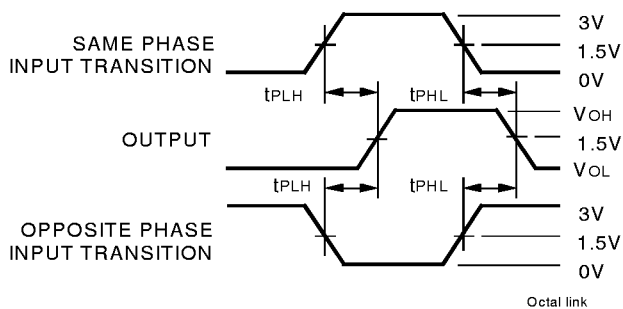
### SET-UP, HOLD, AND RELEASE TIMES



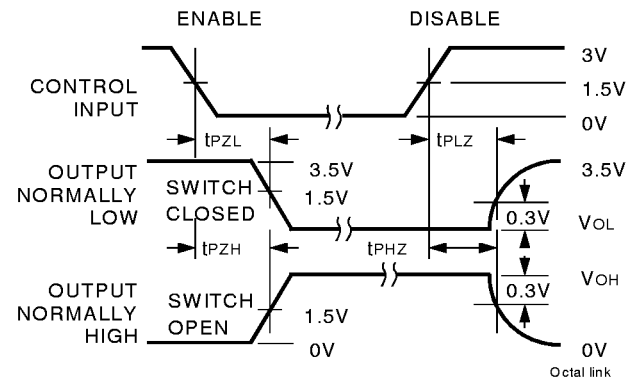
### PULSE WIDTH



### PROPAGATION DELAY



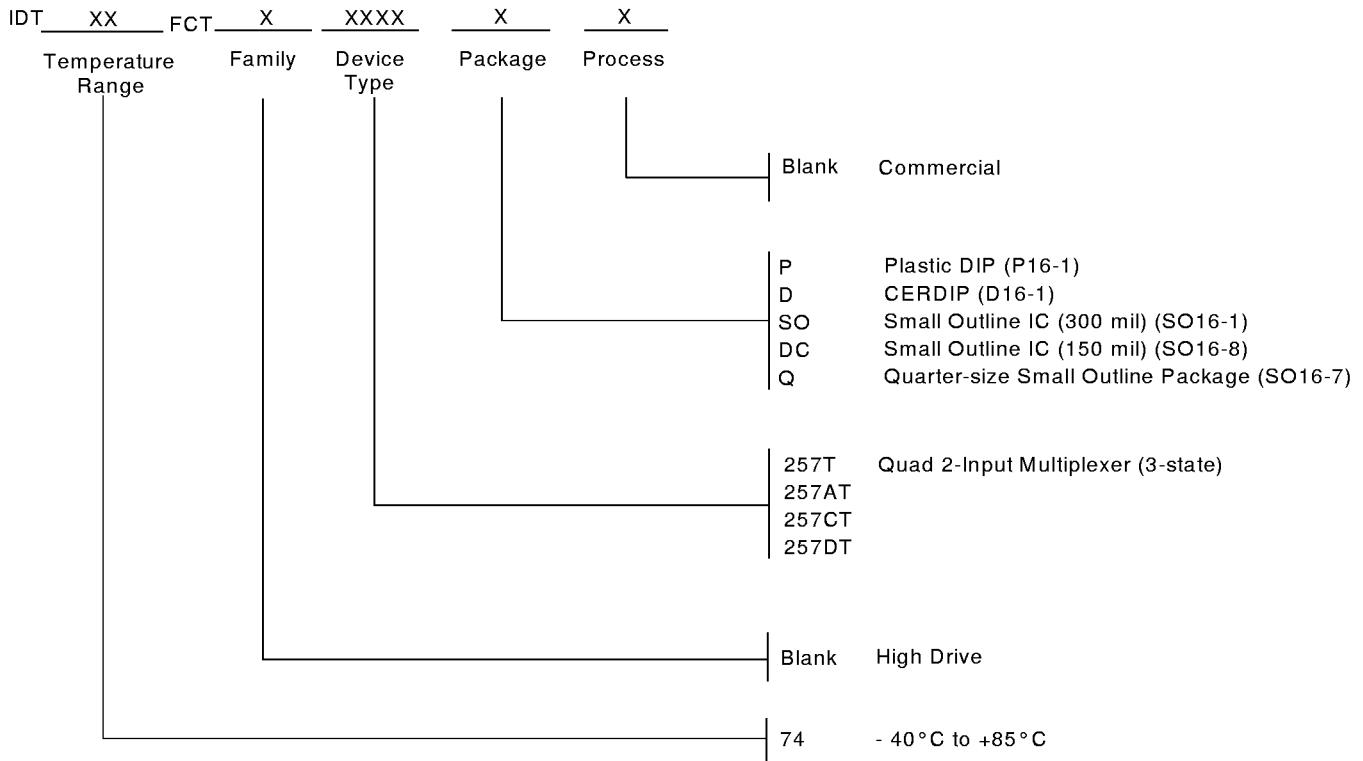
### ENABLE AND DISABLE TIMES



#### 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**



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