



FAST CMOS QUAD 2-INPUT MULTIPLEXER

IDT74FCT2257T/AT/CT

FEATURES:

- 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.)
- Meets or exceeds JEDEC standard 18 specifications
- Std., A, and C speed grades
- Resistor output (-15mA I_{OH} , 12mA I_{OL})
- Reduced system switching noise
- Available in SOIC and QSOP packages

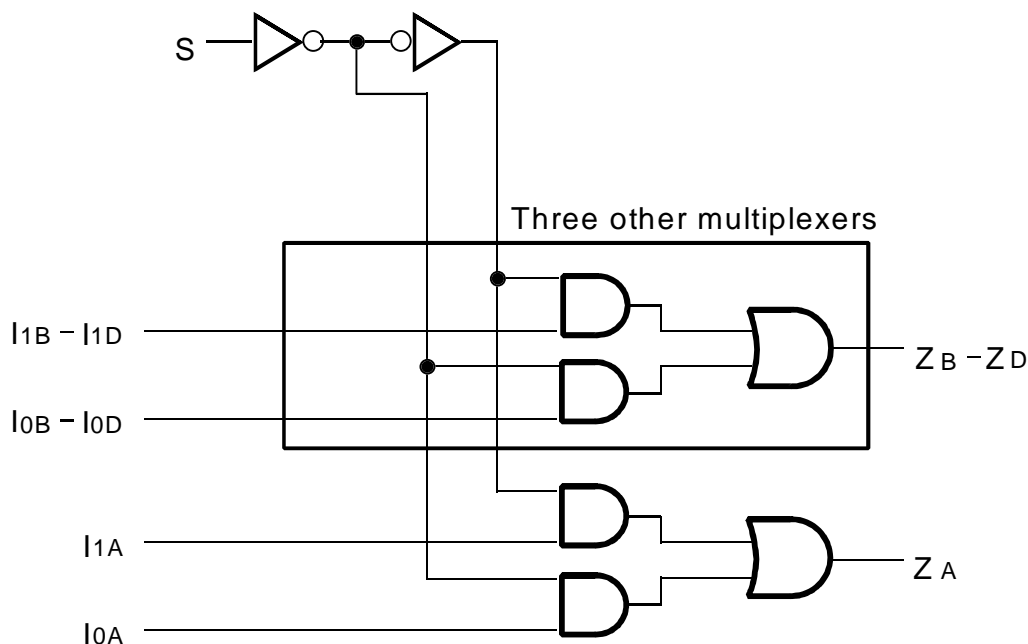
DESCRIPTION:

The FCT2257T 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.

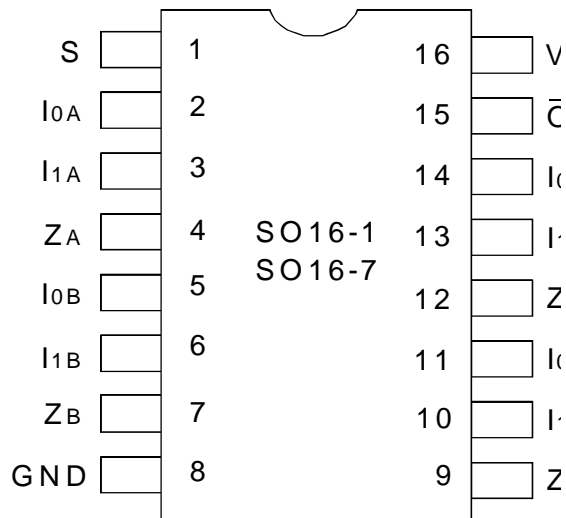
The 2257T has a common Output Enable (\overline{OE}) input. When \overline{OE} is high, all outputs are switched to a high-impedance state allowing the outputs to interface directly with bus-oriented systems.

The FCT2257T has balanced output drive with current limiting resistors. This offers low ground bounce, minimal undershoot and controlled output fall times-reducing the need for external series terminating resistors. FCT2257T parts are plug-in replacements for FCT257T parts.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



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
T _{STG}	Storage Temperature	-65 to +150	°C
I _{OUT}	DC Output Current	-60 to +120	mA

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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°C, f = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V	6	10	pF
C _{OUT}	Output Capacitance	V _{OUT} = 0V	8	12	pF

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NOTE:

- This parameter is measured at characterization but not tested.

PIN DESCRIPTION

Pin Names	Description
I _{0A} -I _{0D}	Source 0 Data Inputs
I _{1A} -I _{1D}	Source 1 Data Inputs
\overline{OE}	Output Enable (Active LOW)
S	Select Input
Z _A -Z _D	Outputs

FUNCTION TABLE⁽¹⁾

\overline{OE}	Inputs			Outputs
	S	I ₀	I ₁	
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:

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⁾		$V_I = 0.5\text{V}$	—	—	
I_{OZH}	High Impedance Output Current	$V_{CC} = \text{Max.}$ $V_O = 2.7\text{V}$	—	—	± 1	
I_{OZL}	(3-State Output pins) ⁽⁴⁾		$V_O = 0.5\text{V}$	—	—	
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

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OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Unit
I_{ODL}	Output LOW Current	$V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_{OUT} = 1.5\text{V}^{(3)}$	16	48	—	mA
I_{ODH}	Output HIGH Current	$V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_{OUT} = 1.5\text{V}^{(3)}$	-16	-48	—	mA
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -15\text{mA}$	2.4	3.3	—	V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = 12\text{mA}$	—	0.3	0.5	V

NOTES:

1. For conditions shown as Max. or Min., 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 shorted at one time. Duration of the short circuit 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	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4^{(3)}$		—	0.5	2	mA
I_{CCD}	Dynamic Power Supply Current ⁽⁴⁾	$V_{CC} = \text{Max.}$ Outputs Open $\overline{OE} = \text{GND}$ One Bit Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.06	0.12	mA/ MHz
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}$ Outputs Open $f_o = 10\text{MHz}$ 50% Duty Cycle $\overline{OE} = \text{GND}$ One Bit Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.6	2.2	mA
			$V_{IN} = 3.4$ $V_{IN} = \text{GND}$	—	0.9	3.2	
		$V_{CC} = \text{Max.}$ Outputs Open $f_o = 2.5\text{MHz}$ 50% Duty Cycle $\overline{OE} = \text{GND}$ Four Bits Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.6	2.2 ⁽⁵⁾	
			$V_{IN} = 3.4$ $V_{IN} = \text{GND}$	—	1.6	6.2 ⁽⁵⁾	

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 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.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} \text{DHNT} + I_{CCD} (f_o N_o)$
 $I_{CC} = \text{Quiescent Current}$
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4\text{V})$
 $\text{DH} = \text{Duty Cycle for TTL Inputs High}$
 $\text{NT} = \text{Number of TTL Inputs at DH}$
 $I_{CCD} = \text{Dynamic Current Caused by an Output Transition Pair (HLH or LHL)}$
 $f_o = \text{Output Frequency}$
 $N_o = \text{Number of Outputs at } f_o$
 All currents are in milliamps and all frequencies are in megahertz.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

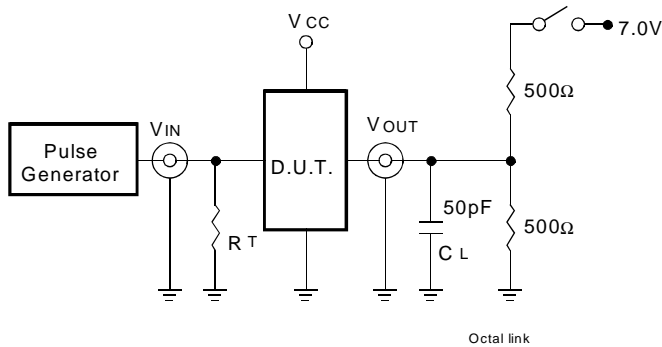
Symbol	Parameter	Condition ⁽¹⁾	FCT2257T		FCT2257AT		FCT2257CT		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH} t_{PHL}	Propagation Delay IN to ZN	$C_L = 50\text{pF}$ $R_L = 500\Omega$	1.5	6	1.5	5	1.5	4.3	ns
t_{PLH} t_{PHL}	Propagation Delay S to ZN		1.5	10.5	1.5	7	1.5	5.2	ns
t_{PZH} t_{PZL}	Output Enable Time		1.5	8.5	1.5	7	1.5	6	ns
t_{PHZ} t_{PLZ}	Output Disable Time		1.5	6	1.5	5.5	1.5	5	ns

NOTES:

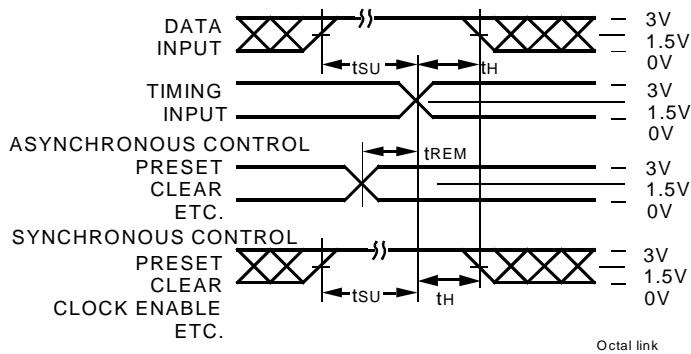
- See test circuits and waveforms.
- Minimum limits are guaranteed but not tested on Propagation Delay.

TEST CIRCUITS AND WAVEFORMS

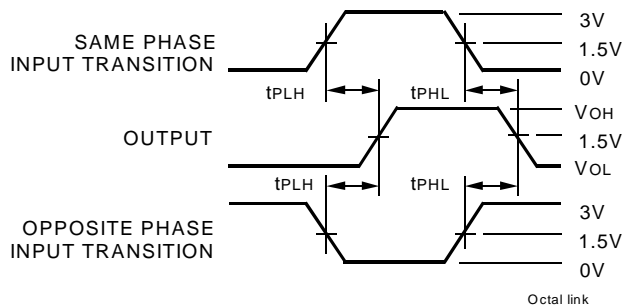
TEST CIRCUITS FOR ALL OUTPUTS



SET-UP, HOLD, AND RELEASE TIMES



PROPAGATION DELAY



SWITCH POSITION

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

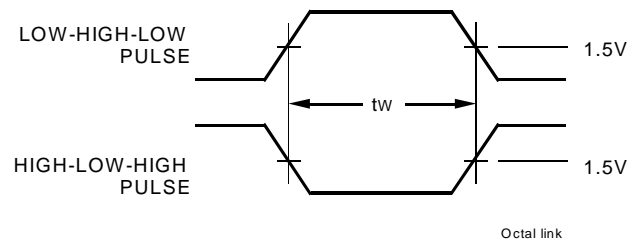
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DEFINITIONS:

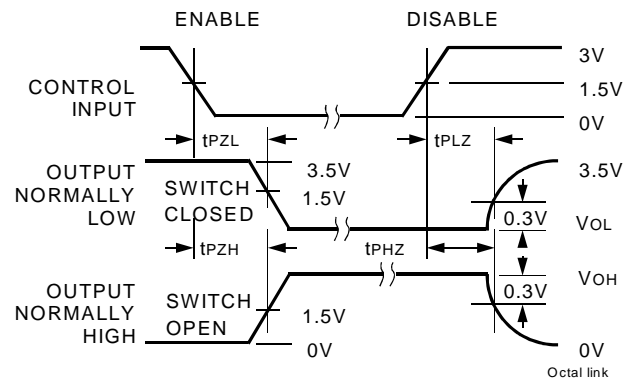
C_L = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

PULSE WIDTH



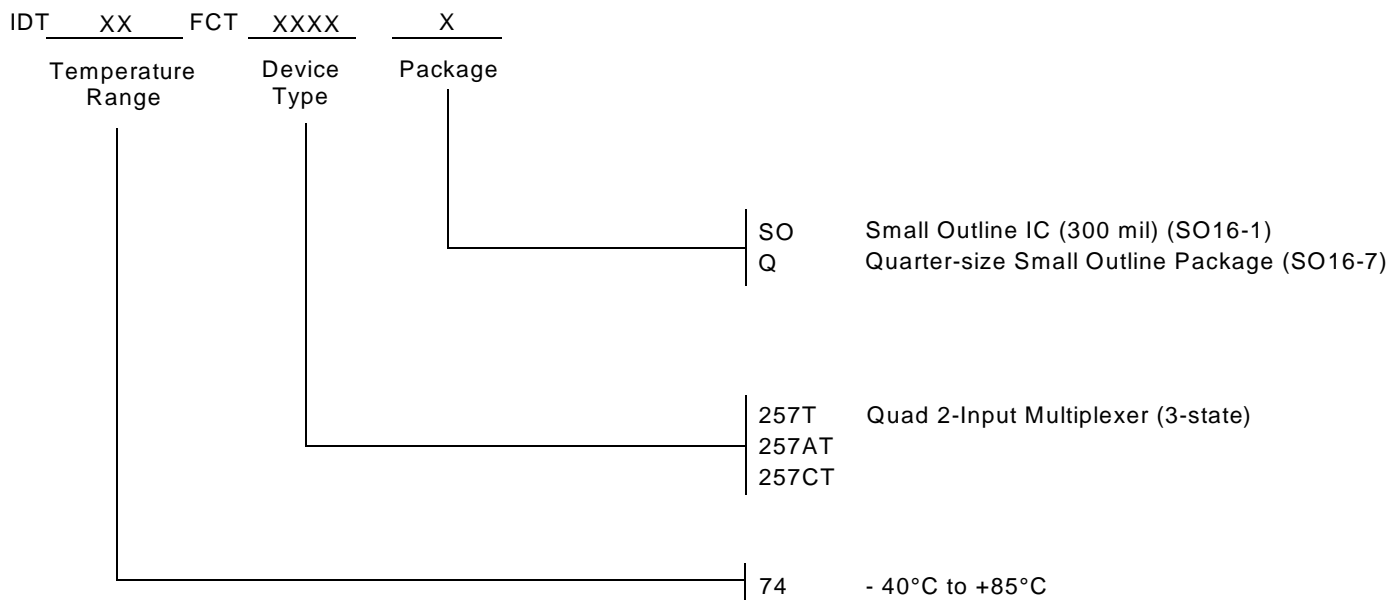
ENABLE AND DISABLE TIMES



NOTES:

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

ORDERING INFORMATION



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