



Integrated Device Technology, Inc.

FAST CMOS 8-INPUT MULTIPLEXER (3-STATE)

PRELIMINARY
IDT 54/74FCT251T
IDT 54/74FCT251AT

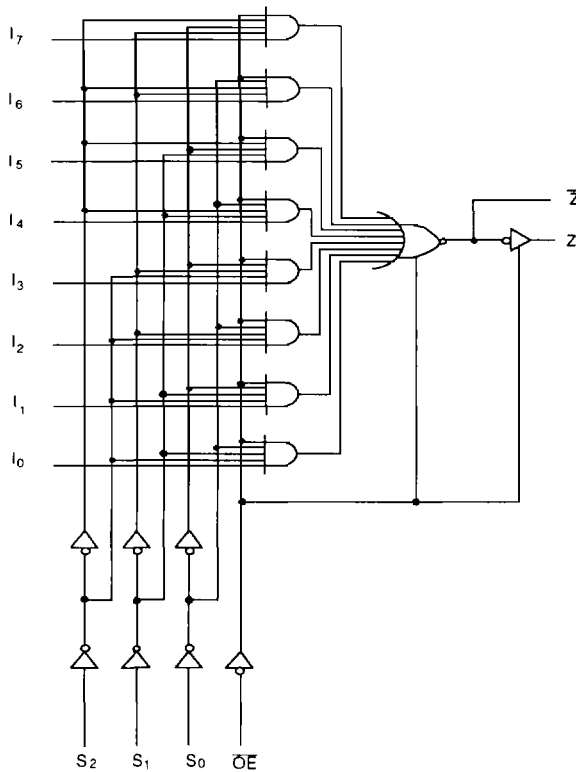
FEATURES:

- IDT54/74FCT251T equivalent to FAST™ speed
- IDT54/74FCT251AT 25% faster than FAST™ speed.
- Equivalent to FAST™ output drive over full temperature and voltage supply extremes
- $I_{OL} = 48\text{mA}$ (commercial) and 32mA (military)
- CMOS power levels ($5\mu\text{W}$ typ. static)
- TTL input and output level compatible
- Substantially lower input current levels than FAST™ ($5\mu\text{A}$ max.)
- JEDEC standard pinout for DIP and LCC
- Product available in Radiation Tolerant and Enhanced versions
- Military product compliant to MIL-STD-883, Class B

DESCRIPTION:

The IDT54/74FCT251T is an 8-input multiplexer with 3-state outputs built using advanced CEMOS™, a dual metal CMOS technology. The 251 has the ability to select one line of data from up to eight sources. It can be used as a universal function generator to generate any logic function of four variables. Both assertion and negation outputs are provided.

FUNCTIONAL BLOCK DIAGRAM



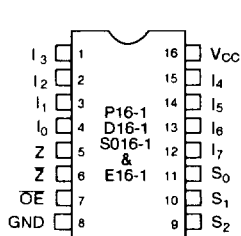
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FAST is a trademark of Fairchild Semiconductor Co.

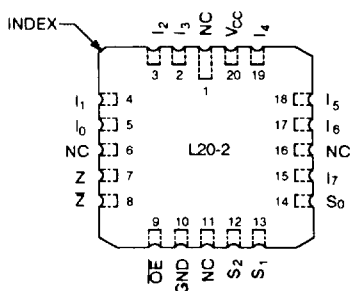
MILITARY AND COMMERCIAL TEMPERATURE RANGES

JANUARY 1989

PIN CONFIGURATIONS



DIP/SOIC/CERPACK
TOP VIEW



LCC
TOP VIEW

DEFINITION OF FUNCTIONAL TERMS

PIN NAMES	DESCRIPTION
S ₀ - S ₂	Select Inputs
OE	3-State Output Enable Input (Active LOW)
I ₀ - I ₇	Multiplexer Inputs
Z	3-State Multiplexer Output
Z	Complementary 3-State Multiplexer Output

TRUTH TABLE

INPUTS				OUTPUT	
S ₂	S ₁	S ₀	OE	Z	Z
X	X	X	H	Z	Z
L	L	L	L	I ₀	I ₀
L	L	H	L	I ₁	I ₁
L	H	L	L	I ₂	I ₂
L	H	H	L	I ₃	I ₃
H	L	L	L	I ₄	I ₄
H	L	H	L	I ₅	I ₅
H	H	L	L	I ₆	I ₆
H	H	H	L	I ₇	I ₇

H = High voltage level
L = Low voltage level
X = Don't care
Z = High-impedance (OFF) state

ABSOLUTE MAXIMUM RATINGS (1)

SYMBOL	RATING	COMMERCIAL	MILITARY	UNIT
V _{TERM} (2)	Terminal Voltage with Respect to GND	-0.5 to +7.0	-0.5 to +7.0	V
V _{TERM} (3)	Terminal Voltage with Respect to GND	-0.5 to V _{CC}	-0.5 to V _{CC}	V
T _A	Operating Temperature	0 to +70	-55 to +125	°C
T _{BIAS}	Temperature Under Bias	-55 to +125	-65 to +135	°C
T _{STG}	Storage Temperature	-55 to +125	-65 to +150	°C
P _T	Power Dissipation	0.5	0.5	W
I _{OUT}	DC Output Current	120	120	mA

NOTE:

1. 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.
2. Input and V_{CC} terminals only.
3. Output and I/O terminals only.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Commercial: T_A = 0°C to +70°C; V_{CC} = 5.0V±5%

Military: T_A = -55°C to +125°C; V_{CC} = 5.0V±10%

SYMBOL	PARAMETER	TEST CONDITIONS (1)	MIN.	TYP.(2)	MAX.	UNIT	
V _{IH}	Input HIGH Level	Guaranteed Logic High Level	2.0	—	—	V	
V _{IL}	Input LOW Level	Guaranteed Logic Low Level	—	—	0.8	V	
I _{IH}	Input HIGH Current	V _{CC} = Max.	V _I = V _{CC}	—	—	5	μA
I _{IL}	Input LOW Current		V _I = 2.7V	—	—	5(4)	
			V _I = 0.5V	—	—	-5(4)	
			V _I = GND	—	—	-5	
I _{OZ}	Off State (High Impedance) Output Current	V _{CC} = Max.	V _O = V _{CC}	—	—	10	μA
			V _O = 2.7V	—	—	10	
			V _O = 0.5V	—	—	-10	
			V _O = GND	—	—	-10	
V _{IK}	Clamp Diode Voltage	V _{CC} = Min., I _N = -18mA	—	-0.7	-1.2	V	
I _{OS}	Short Circuit Current	V _{CC} = Max.(3), V _O = GND	-60	—	-225	mA	
V _{OH}	Output HIGH Voltage	V _{CC} = Min. V _{IN} = V _{IH} or V _{IL}	I _{OH} = -6mA MIL.	2.4	3.3	—	V
			I _{OH} = -8mA COM'L.	2.4	3.3	—	
			I _{OH} = -12mA MIL.	2.0	3.0	—	
			I _{OL} = -15mA COM'L.	2.0	3.0	—	
V _{OL}	Output LOW Voltage	V _{CC} = Min. V _{IN} = V _{IH} or V _{IL}	I _{OL} = 32mA MIL.	—	0.3	0.5	V
			I _{OL} = 48mA COM'L.	—	0.3	0.5	
V _H	Input Hysteresis	—	—	200	—	mV	
I _{CC}	Quiescent Power Supply Current	V _{CC} = Max. V _{IN} = GND or V _{CC}	—	0.2	1.5	mA	

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} = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.
4. This parameter is guaranteed but not tested.

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

NOTE:

1. This parameter is measured at characterization but not tested.

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POWER SUPPLY CHARACTERISTICS

$V_{LC} = 0.2V$; $V_{HC} = V_{CC} - 0.2V$

SYMBOL	PARAMETER	TEST CONDITIONS ⁽¹⁾		MIN.	TYP. ⁽²⁾	MAX.	UNIT
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ $V_{IN} \geq V_{HC}$; $V_{IN} \leq V_{LC}$ $f_I = 0$		—	0.2	1.5	mA
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	0.5	2.0	mA
I_{CCD}	Dynamic Power Supply Current ⁽⁴⁾	$V_{CC} = \text{Max.}$ Outputs Open $\overline{OE} = \text{GND}$ One Bit Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \geq V_{LC}$	—	0.15	0.25	mA/ MHz
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}$ Outputs Open $f_I = 10\text{MHz}$ 50% Duty Cycle $\overline{OE} = \text{GND}$ One Bit Toggling	$V_{IN} \geq V_{HC}$ $V_{IN} \geq V_{LC}$ (FCT)	—	1.7	4.0	mA
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	2.0	5.0	

NOTES:

- For conditions shown as max. or min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient and maximum loading.
- Per TTL driven input ($V_{IN} = 3.4V$), 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.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_I N_I)$
 I_{CC} = Quiescent Current
 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_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
 f_I = Input Frequency
 N_I = Number of Inputs at f_I
 All currents are in milliamps and all frequencies are in megahertz.

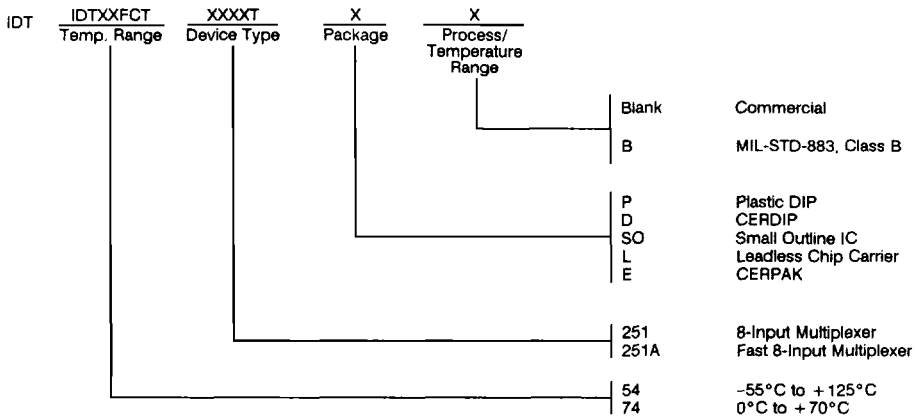
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

SYMBOL	PARAMETER	CONDITION ⁽¹⁾	IDT54/74FCT251T					IDT54/74FCT251AT					UNIT
			TYP. ⁽³⁾	COM'L.		MIL.		TYP. ⁽³⁾	COM'L.		MIL.		
				MIN. ⁽²⁾	MAX.	MIN. ⁽²⁾	MAX.		MIN. ⁽²⁾	MAX.	MIN. ⁽²⁾	MAX.	
t _{PLH} t _{PHL}	Propagation Delay S _N to Z	C _L = 50pF R _L = 500Ω	5.9	1.5	9.0	1.5	9.5	-	-	-	-	-	ns
t _{PLH} t _{PHL}	Propagation Delay S _N to Z		9.5	1.5	11.0	1.5	14	-	-	-	-	-	ns
t _{PHL} t _{PLH}	Propagation Delay I _N to Z		4.0	1.5	7.0	1.5	8.0	-	-	-	-	-	ns
t _{PLH} t _{PHL}	Propagation Delay I _N to Z		7.0	1.5	7.0	1.5	8.0	-	-	-	-	-	ns
t _{PZH} t _{PZL}	Output Enable Time OE to Z		6.4	1.5	9.0	1.5	10.0	-	-	-	-	-	ns
t _{PHZ} t _{PLZ}	Output Disable Time OE to Z		5.0	1.5	7.5	1.5	8.5	-	-	-	-	-	ns
t _{PZH} t _{PZL}	Output Enable Time OE to Z		6.7	1.5	9.0	1.5	10.0	-	-	-	-	-	ns
t _{PHZ} t _{PLZ}	Output Disable Time OE to Z		4.5	1.5	7.0	1.5	7.0	-	-	-	-	-	ns

NOTES:

- See test circuit and waveforms
- Minimum limits are guaranteed but not tested on Propagation Delays.
- Typical values are at V_{CC} = 5.0V, + 25°C ambient and maximum loading.

ORDERING INFORMATION



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