FAST 74F257, 74F257A
Data Selectors/Multiplexers

74F257 Quad 2-Line To 1-Line Selector/Multiplexer, Non-Inverting (3-State)

74F257A Quad 2-Line To 1-Line Selector/Multiplexer, Non-Inverting (3-State)

FEATURE
- **Multifunction capability**
- **Non-inverting data path**
- **3-state outputs**
- **See 'F258A for inverting version**

DESCRIPTION

The 74F257/74F257A has four identical 2-input multiplexers with 3-state outputs which select 4 bits of data from two sources under control of a common Select (S) input. The I_{0n} inputs are selected when the common Select input is Low and the I_{1n} inputs are selected when the common Select input is High. Data appears at the outputs in true non-inverted form from the selected inputs. The 'F257/'F257A is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the common Select input. Outputs are forced to a high impedance "off" state when the Output Enable ($\overline{OE}$) is High. All but one device must be in high impedance state to avoid currents that would exceed the maximum ratings if the outputs were tied together. Design of the Output Enable signals must ensure that there is no overlap when outputs of 3-state devices were tied together.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F257	4.3ns	12mA
74F257A	4.3ns	12mA

ORDERING INFORMATION

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$; $T_A = 0°C$ to $+70°C$
16-Pin Plastic DIP	N74F257N, N74F257AN
16-Pin Plastic SO	N74F257D, N74F257AD

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE
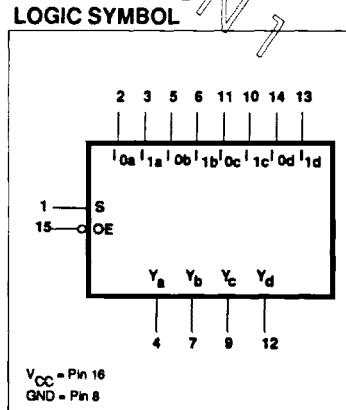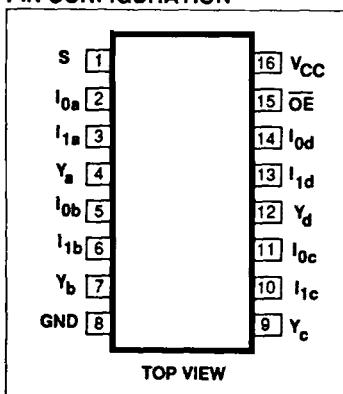
PINS	DESCRIPTION	74F(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I_{0n}, I_{1n}	Data inputs	1.0/1.0	20µA/0.6mA
S	Common Select input	1.0/1.0	20µA/0.6mA
$\overline{OE}$	Output Enable input (active Low)	1.0/1.0	20µA/0.6mA
Y_a - Y_d	Data outputs	150/33	3.0mA/20mA
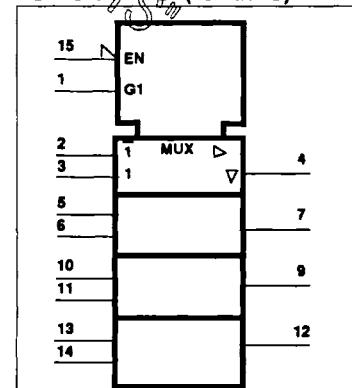
NOTE:
One (1.0) FAST Unit Load is defined as: 20µA in the High state and 0.6mA in the Low state.

The 74F257A is the faster version of 74F257.

PIN CONFIGURATION

S	1		16	V_{CC}
I_{0a}	2		15	$\overline{OE}$
I_{1a}	3		14	I_{0d}
Y_a	4		13	I_{1d}
I_{0b}	5		12	Y_d
I_{1b}	6		11	I_{0c}
Y_b	7		10	I_{1c}
GND	8		9	Y_c

TOP VIEW

LOGIC SYMBOL

V_{CC} = Pin 16
GND = Pin 8
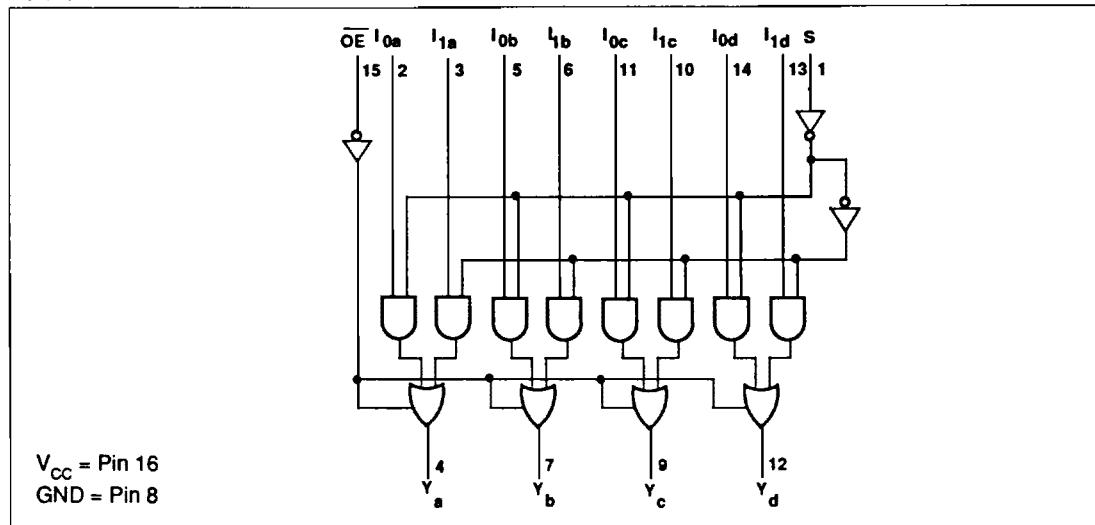
LOGIC SYMBOL (IEEE/IEC)

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LOGIC DIAGRAM

V_{CC} = Pin 16
GND = Pin 8

FUNCTION TABLE

INPUTS				OUTPUT
$\overline{OE}$	S	I_0	I_1	$\overline{Y}$
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

H = High voltage level
L = Low voltage level
X = Don't care
Z = High impedance "off" state
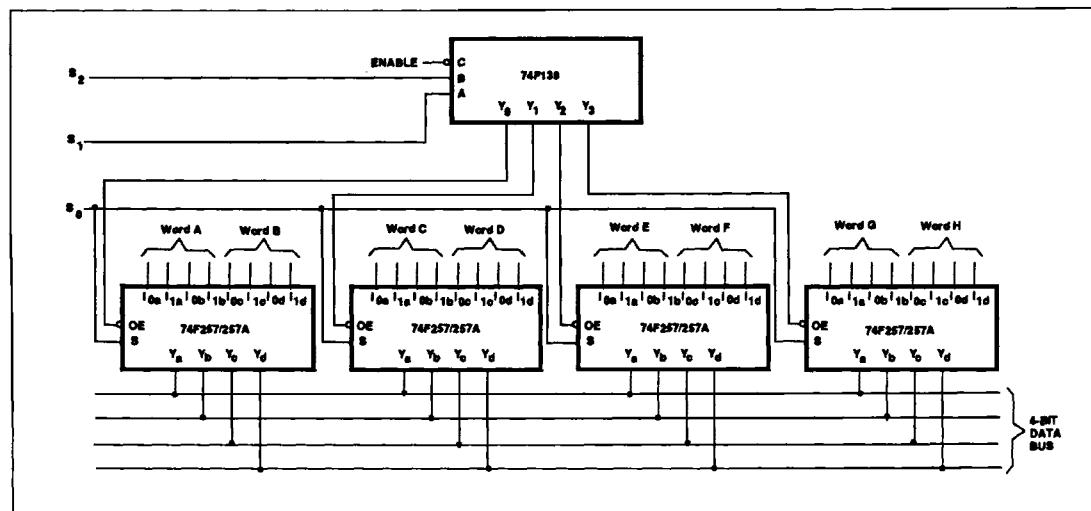
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APPLICATION

ABSOLUTE MAXIMUM RATINGS (Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage	-0.5 to +7.0	V
V_{IN}	Input voltage	-0.5 to +7.0	V
I_{IN}	Input current	-30 to +5	mA
V_{OUT}	Voltage applied to output in High output state	-0.5 to +V_{CC}	V
I_{OUT}	Current applied to output in Low output state	48	mA
T_A	Operating free-air temperature range	0 to +70	°C
T_{STG}	Storage temperature	-65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			UNIT
		Min	Nom	Max	
V_{CC}	Supply voltage	4.5	5.0	5.5	V
V_{IH}	High-level input voltage	2.0			V
V_{IL}	Low-level input voltage			0.8	V
I_{IK}	Input clamp current			-18	mA
I_{OH}	High-level output current			-3	mA
I_{OL}	Low-level output current			24	mA
T_A	Operating free-air temperature range	0		70	°C

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DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS[1]			LIMITS			UNIT
					Min	Typ[2]	Max	
V_{OH}	High-level output voltage	V_{CC} = MIN, V_{IL} = MAX V_{IH} = MIN, I_{OH} = MAX		$\pm10\%V_{CC}$	2.4			V
				$\pm5\%V_{CC}$	2.7	3.3		V
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IL} = MAX V_{IH} = MIN, I_{OL} = MAX		$\pm10\%V_{CC}$		0.35	0.50	V
				$\pm5\%V_{CC}$		0.35	0.50	V
V_{IK}	Input clamp voltage	V_{CC} = MIN, $I_I = I_{IK}$				-0.73	-1.2	V
I_I	Input current at maximum input voltage	V_{CC} = MAX, V_I = 7.0V					100	μA
I_{IH}	High-level input current	V_{CC} = MAX, V_I = 2.7V					20	μA
I_{IL}	Low-level input current	V_{CC} = MAX, V_I = 0.5V					-0.6	mA
I_{OZH}	Off state output current, High-level voltage applied	V_{CC} = MAX, V_O = 2.7V					50	μA
I_{OZL}	Off state output current, Low-level voltage applied	V_{CC} = MAX, V_O = 0.5V					-50	μA
I_{OS}	Short circuit output current[3]	V_{CC} = MAX			-60		-150	mA
I_{CC}	Supply current[4] (total)	'F257	I_{CCH}	V_{CC} = MAX			9.0	16.0	mA
			I_{CCL}				14.5	22.0	mA
			I_{CCZ}				15.0	23.0	mA
		'F257A	I_{CCH}	V_{CC} = MAX			9.0	15.0	mA
			I_{CCL}				14.5	22.0	mA
			I_{CCZ}				15.0	23.0	mA

NOTES:
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5V, T_A = 25°C.
3. Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal 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 lasty.
4. Measure I_{CC} with all outputs open and inputs grounded.

AC ELECTRICAL CHARACTERISTICS for 'F257

| SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			T_A = +25°C V_{CC} = 5V C_L = 50pF R_L = 500Ω			T_A = 0°C to +70°C V_{CC} = 5V ±10% C_L = 50pF R_L = 500Ω		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay I_n to Y_n	Waveform 1	3.0 2.0	4.5 3.5	6.0 5.5	3.0 2.0	7.0 6.5	ns
t_{PLH} t_{PHL}	Propagation delay S to Y_n	Waveform 1	4.5 3.5	8.0 6.0	13.0 8.5	4.5 3.5	15.0 9.5	ns
t_{PZH} t_{PZL}	Output Enable time to High or Low level	Waveform 2 Waveform 3	3.0 3.0	6.0 6.0	7.5 7.5	3.0 3.0	8.5 8.5	ns
t_{PHZ} t_{PLZ}	Output Disable time from High or Low level	Waveform 2 Waveform 3	2.0 2.0	4.0 3.5	6.0 6.0	2.0 2.0	7.0 7.0	ns
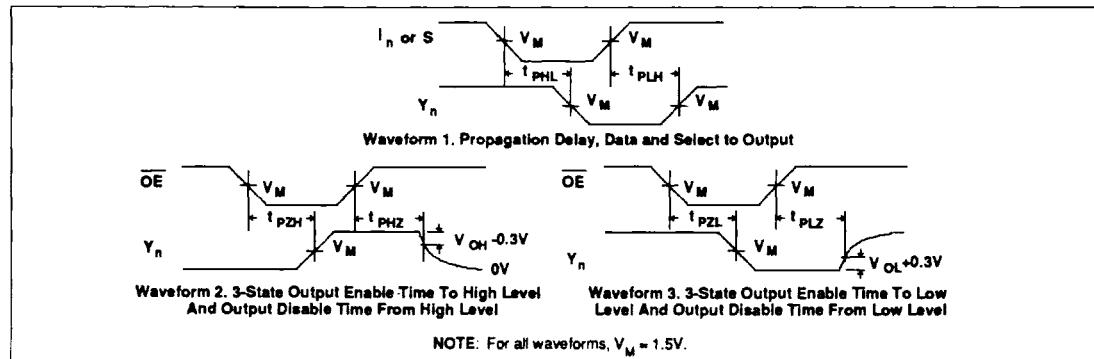
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AC ELECTRICAL CHARACTERISTICS for 'F257A

SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			$T_A = +25°C$ $V_{CC} = 5V$ $C_L = 50pF$ $R_L = 500\Omega$			$T_A = 0°C$ to $+70°C$ $V_{CC} = 5V \pm 10\%$ $C_L = 50pF$ $R_L = 500\Omega$		
			Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay I_n to Y_n	Waveform 1	3.0 2.0	4.5 3.5	6.0 5.0	3.0 2.0	7.0 6.0	ns
t_{PLH} t_{PHL}	Propagation delay S to Y_n	Waveform 1	5.5 4.0	7.5 5.5	9.5 7.0	5.0 4.0	10.5 8.0	ns
t_{PZH} t_{PZL}	Output Enable time to High or Low level	Waveform 2 Waveform 3	4.5 4.5	6.5 6.0	7.5 7.5	4.5 4.5	8.5 8.5	ns
t_{PHZ} t_{PLZ}	Output Disable time from High or Low level	Waveform 2 Waveform 3	2.0 2.0	4.0 3.5	5.5 5.5	2.0 2.0	6.0 6.0	ns

AC WAVEFORMS

Waveform 1. Propagation Delay, Data and Select to Output

Waveform 2. 3-State Output Enable Time To High Level And Output Disable Time From High Level

Waveform 3. 3-State Output Enable Time To Low Level And Output Disable Time From Low Level

NOTE: For all waveforms, $V_M = 1.5V$.

TEST CIRCUIT AND WAVEFORMS

Test Circuit For 3-State Outputs

SWITCH POSITION

TEST	SWITCH
t_{PLZ}	closed
t_{PZL}	closed
All other	open

$V_M = 1.5V$

Input Pulse Definition

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_W	t_{TLH}	t_{THL}
74F	3.0V	1MHz	500ns	2.5ns	2.5ns