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Status	Product Specification
FAST Products	

FAST 74F148

Encoder

8-Input Priority Encoder

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F148	6.0ns	23mA

FEATURES

- Code conversions
- Multi-channel D/A converter
- Decimal-to-BCD converter
- Cascading for priority encoding of "N" bits
- Input enable capability
- Priority encoding-automatic selection of highest priority input line
- Output enable-active Low when all inputs are High
- Group signal output-active when any input is Low

DESCRIPTION

The 74F148 8-input priority encoder accepts data from eight active-Low inputs and provides a binary representation on the three active-Low outputs. A priority is assigned to each input so that when two or more inputs are simultaneously active the input with the highest priority is represented on the output, with input line \bar{I}_7 having the highest priority. A High on the Enable Input (\bar{EI}) will force all outputs to the inactive (High) state and allow new data to settle without producing erroneous information at the outputs. A Group

ORDERING INFORMATION

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$; $T_A = 0^\circ C$ to $+70^\circ C$
16-Pin Plastic DIP	N74F148N
16-Pin Plastic SO	N74F148D

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

	DESCRIPTION	74F(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
$\bar{I}_1 - \bar{I}_7$	Priority inputs (active Low)	1.0/2.0	20 μ A/1.2mA
\bar{I}_0	Priority input (active Low)	1.0/1.0	20 μ A/0.6mA
\bar{EI} PINS	Enable input (active Low)	1.0/2.0	20 μ A/1.2mA
\bar{EO}	Enable output (active Low)	50/33	1.0mA/20mA
\bar{GS}	Group select output (active Low)	50/33	1.0mA/20mA
$\bar{A}_0 - \bar{A}_2$	Address outputs (active Low)	50/33	1.0mA/20mA

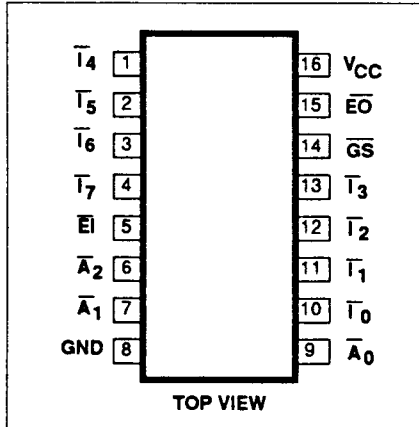
NOTE:

One (1.0) FAST Unit Load is defined as: 20 μ A in the High state and 0.6mA in the Low state.

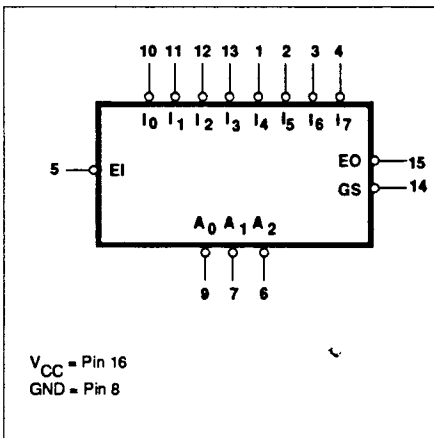
Signal (\bar{GS}) output and an Enable Output (\bar{EO}) are provided with the three data outputs. The \bar{GS} is active-Low when any input is Low: this indicates when any input is active. The \bar{EO} is active-Low when all

inputs are High. Using the Enable Output along with the Enable Input allows priority encoding of N input signals. Both \bar{EO} and \bar{GS} are active-High when the Enable Input is High.

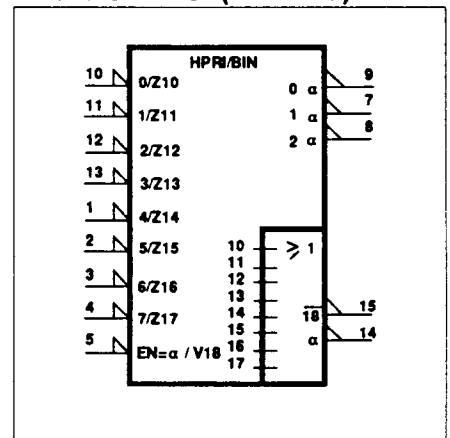
PIN CONFIGURATION



LOGIC SYMBOL



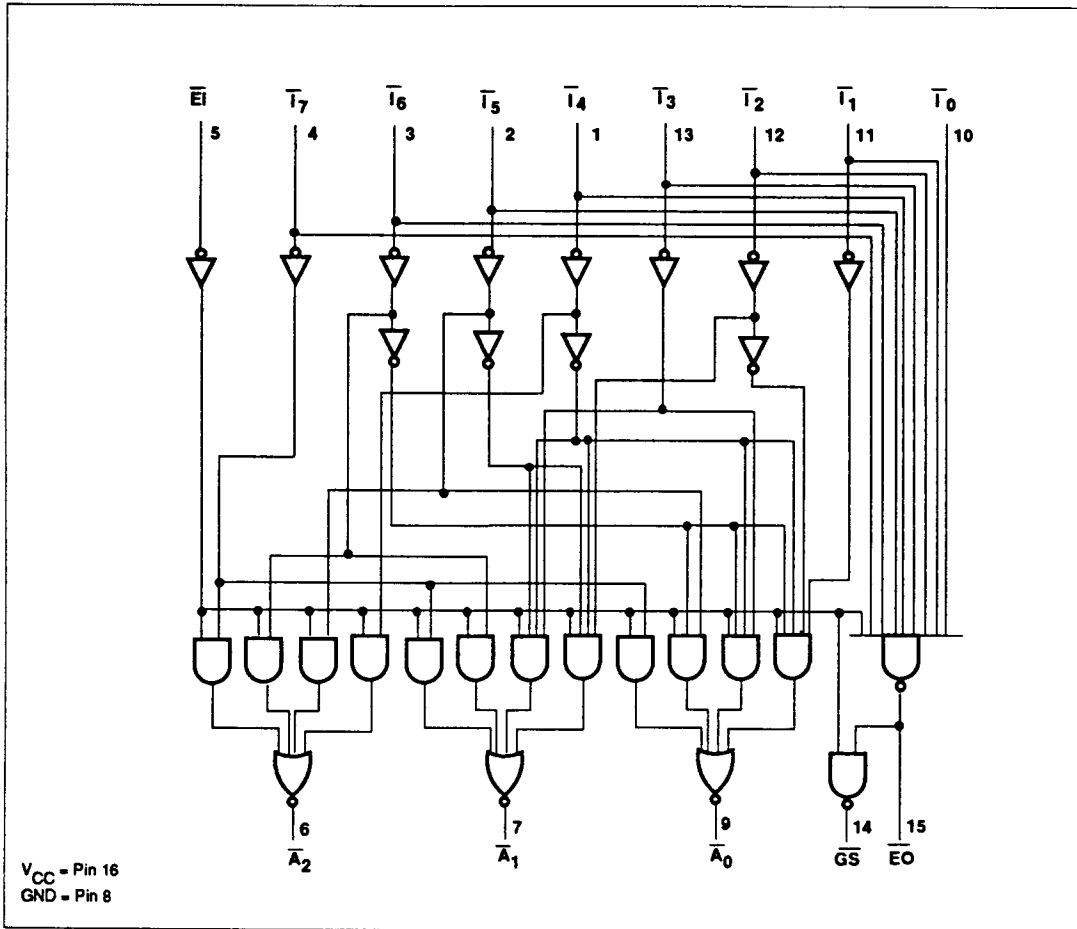
LOGIC SYMBOL (IEEE/IEC)



Encoder

FAST 74F148

LOGIC DIAGRAM



FUNCTION TABLE

INPUTS									OUTPUTS				
$\bar{E}i$	I_0	I_1	I_2	I_3	I_4	I_5	I_6	I_7	\overline{GS}	\bar{A}_0	\bar{A}_1	\bar{A}_2	$\bar{E}O$
H	X	X	X	X	X	X	X	X	H	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	H	H	L
L	X	X	X	X	X	X	X	L	L	L	L	L	H
L	X	X	X	X	X	L	H	H	L	H	L	L	H
L	X	X	X	X	L	H	H	H	L	H	H	L	H
L	X	X	L	H	H	H	H	H	L	H	L	H	H
L	X	L	H	H	H	H	H	H	L	L	H	H	H
L	L	H	H	H	H	H	H	H	L	H	H	H	H

H = High voltage level
 L = Low voltage level
 X = Don't care

Encoder

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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	40	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_H	High-level input voltage	2.0			V
V_L	Low-level input voltage			0.8	V
I_{IK}	Input clamp current			-18	mA
I_{OH}	High-level output current			-1	mA
I_{OL}	Low-level output current			20	mA
T_A	Operating free-air temperature range	0		70	°C

Encoder

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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	±10%V _{CC}	2.5		V	
		V _{IH} = MIN, I _{OH} = MAX	±5%V _{CC}	2.7	3.4	V	
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IL} = MAX	±10%V _{CC}		0.30	0.50	V
		V _{IH} = MIN, I _{OL} = MAX	±5%V _{CC}		0.30	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			I ₀	-0.6	mA
					I ₁ - I ₇ , E _I	-1.2	mA
I _{OS}	Short-circuit output current ³	V _{CC} = MAX		-60	-150	mA	
I _{CC}	Supply current (total) ⁴	V _{CC} = MAX		23	35	mA	

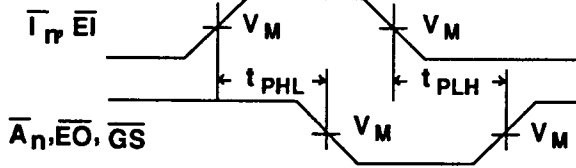
NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_A = 25°C
- 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 last.
- To measure I_{CC}, outputs must be open, V_{IN} on all inputs=4.5V.

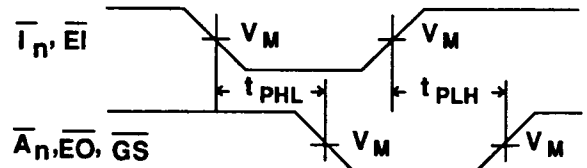
AC ELECTRICAL CHARACTERISTICS

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 A _n	Waveform 2	3.5 3.5	6.0 6.0	9.0 9.0	3.5 3.5	10.0 10.0	ns
t _{PLH} t _{PHL}	Propagation delay I _n to E _O	Waveform 1	1.5 1.5	3.0 2.5	6.5 6.5	1.5 1.5	7.5 7.5	ns
t _{PLH} t _{PHL}	Propagation delay I _n to G _S	Waveform 2	2.0 2.0	4.0 4.0	8.0 8.0	2.0 2.0	9.0 9.0	ns
t _{PLH} t _{PHL}	Propagation delay E _I to A _n	Waveform 2	3.5 3.0	6.0 5.5	8.5 8.0	3.5 3.0	9.5 9.0	ns
t _{PLH} t _{PHL}	Propagation delay E _I to G _S	Waveform 2	2.5 3.0	4.5 5.5	7.0 7.5	2.5 3.0	8.0 8.5	ns
t _{PLH} t _{PHL}	Propagation delay E _I to E _O	Waveform 2	3.0 3.5	5.0 5.0	7.0 7.5	3.0 3.5	8.0 9.0	ns

AC WAVEFORMS



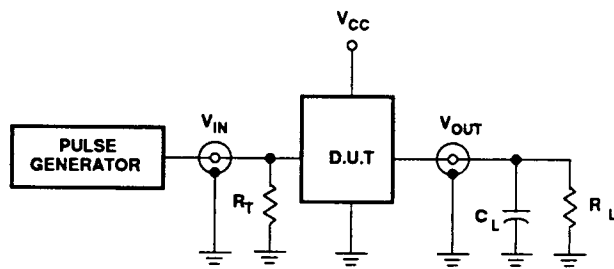
Waveform 1. For Inverting Outputs



Waveform 2. For Non-Inverting Outputs

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

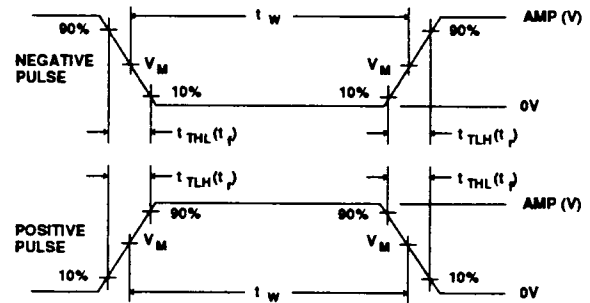
TEST CIRCUIT AND WAVEFORMS



Test Circuit For Totem-Pole Outputs

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.



$V_M = 1.5V$
Input Pulse Definition

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_w	$t_{TLH}(t_p)$	$t_{THL}(t_p)$
74F	3.0V	1MHz	500ns	2.5ns	2.5ns