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54F/74F148 8-Line to 3-Line Priority Encoder

General Description

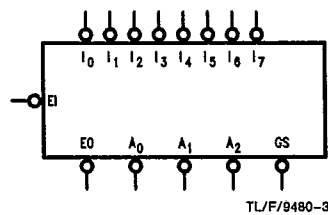
The 'F148 provides three bits of binary coded output representing the position of the highest order active input, along with an output indicating the presence of any active input. It is easily expanded via input and output enables to provide priority encoding over many bits.

Features

- Encodes eight data lines in priority
- Provides 3-bit binary priority code
- Input enable capability
- Signals when data is present on any input
- Cascadable for priority encoding of n bits

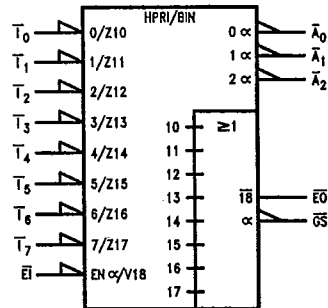
Ordering Code: See Section 5

Logic Symbols



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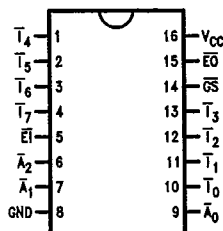
IEEE/IEC



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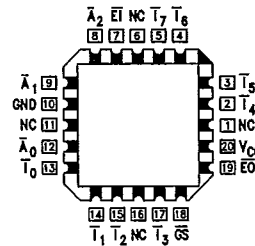
Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak



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Pin Assignment for LCC and PCC



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Unit Loading/Fan Out: See Section 2 for U.L. definitions

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I _{IH} /I _{IL} Output I _{OH} /I _{OL}
\bar{I}_0	Priority Input (Active LOW)	1.0/1.0	20 μ A / -0.6 mA
\bar{I}_1 - \bar{I}_7	Priority Inputs (Active LOW)	1.0/2.0	20 μ A / -1.2 mA
$\bar{E}I$	Enable Input (Active LOW)	1.0/1.0	20 μ A / -0.6 mA
$\bar{E}O$	Enable Output (Active LOW)	50/33.3	-1 mA / 20 mA
$\bar{G}S$	Group Signal Output (Active LOW)	50/33.3	-1 mA / 20 mA
\bar{A}_0 - \bar{A}_2	Address Outputs (Active LOW)	50/33.3	-1 mA / 20 mA

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Functional Description

The 'F148 8-input priority encoder accepts data from eight active LOW inputs (\bar{I}_0 - \bar{I}_7) 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 7 having the highest priority. A HIGH on the Enable Input (\bar{E}_1) will force all outputs to the inactive (HIGH) state and allow new data to settle without producing erroneous information at the outputs.

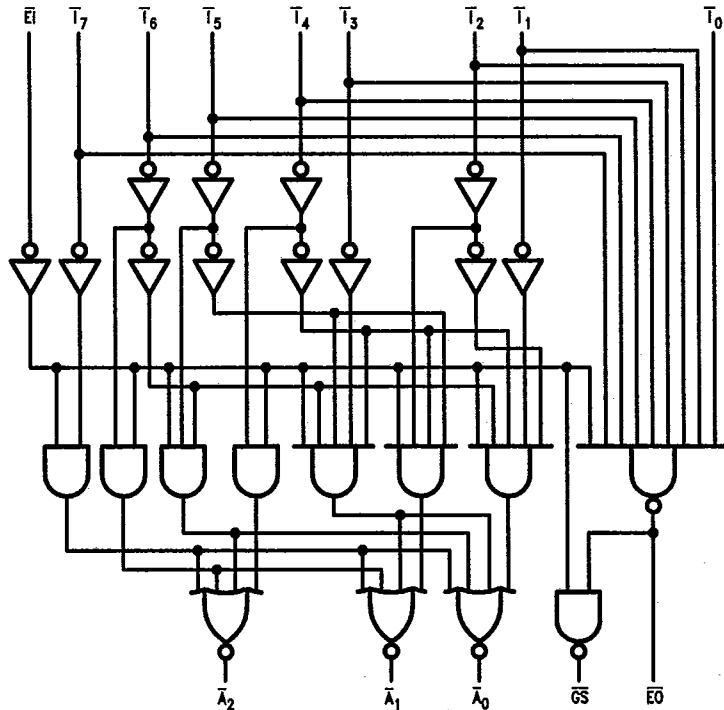
A Group Signal output (\bar{G}_S) and Enable Output (\bar{E}_0) are provided along with the three priority data outputs (\bar{A}_2 , \bar{A}_1 , \bar{A}_0). \bar{G}_S is active LOW when any input is LOW; this indicates when any input is active. \bar{E}_0 is active LOW when all inputs are HIGH. Using the Enable Output along with the Enable Input allows cascading for priority encoding on any number of input signals. Both \bar{E}_0 and \bar{G}_S are in the inactive HIGH state when the Enable Input is HIGH.

Truth Table

\bar{E}_1	Inputs								Outputs				
	\bar{I}_0	\bar{I}_1	\bar{I}_2	\bar{I}_3	\bar{I}_4	\bar{I}_5	\bar{I}_6	\bar{I}_7	\bar{G}_S	\bar{A}_0	\bar{A}_1	\bar{A}_2	\bar{E}_0
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	X	L	H	L	L	L	L	H
L	X	X	X	X	X	L	H	H	L	L	L	L	H
L	X	X	X	L	H	H	H	H	L	L	L	H	H
L	X	X	L	H	H	H	H	H	L	L	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 = Immaterial

Logic Diagram



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Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	-55°C to +175°C
V _{CC} Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V _{CC} = 0V)	
Standard Output	-0.5V to V _{CC}
TRI-STATE® Output	-0.5V to +5.5V

Current Applied to Output in LOW State (Max) twice the rated I_{OL} (mA)

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	-55°C to +125°C
Commercial	0°C to +70°C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

DC Electrical Characteristics

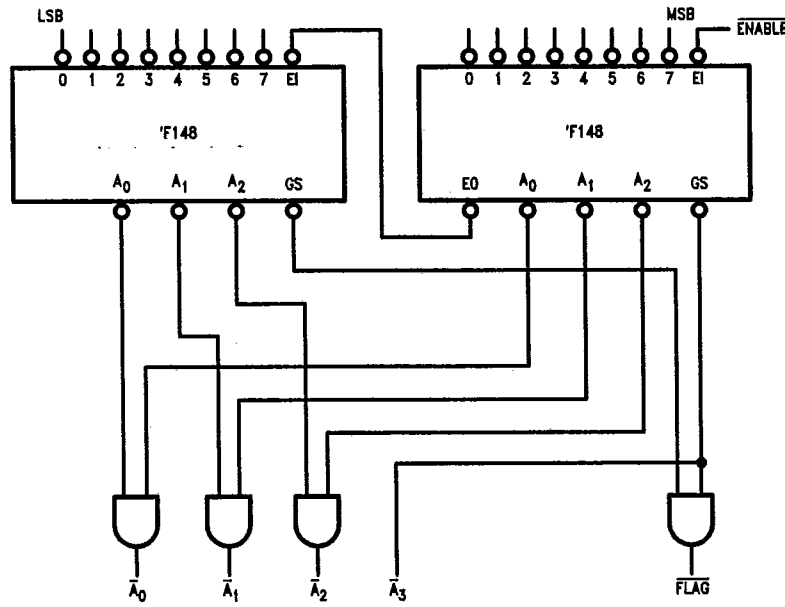
Symbol	Parameter	54F/74F			Units	V _{CC}	Conditions
		Min	Typ	Max			
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage			-1.2	V	Min	I _{IN} = -18 mA
V _{OH}	Output HIGH Voltage	54F 10% V _{CC}	2.5		V	Min	I _{OH} = -1 mA
		74F 10% V _{CC}	2.5				
		74F 5% V _{CC}	2.7				
V _{OL}	Output LOW Voltage	54F 10% V _{CC}		0.5	V	Min	I _{OL} = 20 mA
		74F 10% V _{CC}		0.5			
I _{IH}	Input HIGH Current			20	μA	Max	V _{IN} = 2.7V
I _{BVI}	Input HIGH Current Breakdown Test			100	μA	Max	V _{IN} = 7.0V
I _{IL}	Input LOW Current			-0.6	mA	Max	V _{IN} = 0.5V (I ₀ , E ₁)
				-1.2			
I _{OS}	Output Short-Circuit Current	-60		-150	mA	Max	V _{OUT} = 0V
I _{CEX}	Output HIGH Leakage Current			250	μA	Max	V _{OUT} = V _{CC}
I _{CCH}	Power Supply Current			35	mA	Max	V _O = HIGH
I _{CCL}	Power Supply Current			35	mA	Max	V _O = LOW

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Application

16-Input Priority Encoder



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AC Electrical Characteristics: See Section 2 for Waveforms and Load Configurations

Symbol	Parameter	74F			54F		74F		Units	Fig No
		T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A , V _{CC} = MII C _L = 50 pF		T _A , V _{CC} = Com C _L = 50 pF			
		Min	Typ	Max	Min	Max	Min	Max		
t _{PLH} t _{PHL}	Propagation Delay I _n to \bar{A}_n	3.0	7.0	9.0			3.0	10.0	ns	2-3
t _{PLH} t _{PHL}	Propagation Delay I _n to $\bar{E}O$	2.5	5.0	6.5			2.5	7.5	ns	2-3
t _{PLH} t _{PHL}	Propagation Delay I _n to $\bar{G}S$	2.5	7.0	9.0			2.5	10.0	ns	2-3
t _{PLH} t _{PHL}	Propagation Delay $\bar{E}I$ to \bar{A}_n	2.5	6.5	8.5			2.5	9.5	ns	2-3
t _{PLH} t _{PHL}	Propagation Delay $\bar{E}I$ to $\bar{G}S$	2.5	5.0	7.0			2.5	8.0	ns	2-3
t _{PLH} t _{PHL}	Propagation Delay $\bar{E}I$ to $\bar{E}O$	2.5	5.5	7.0			2.5	8.0	ns	2-3
t _{PLH} t _{PHL}	Propagation Delay $\bar{E}I$ to $\bar{E}O$	3.0	8.0	10.5			3.0	12.0	ns	2-3