

Am25LS148 • Am54LS/74LS148

Eight-Line To Three-Line Priority Encoder

DISTINCTIVE CHARACTERISTICS

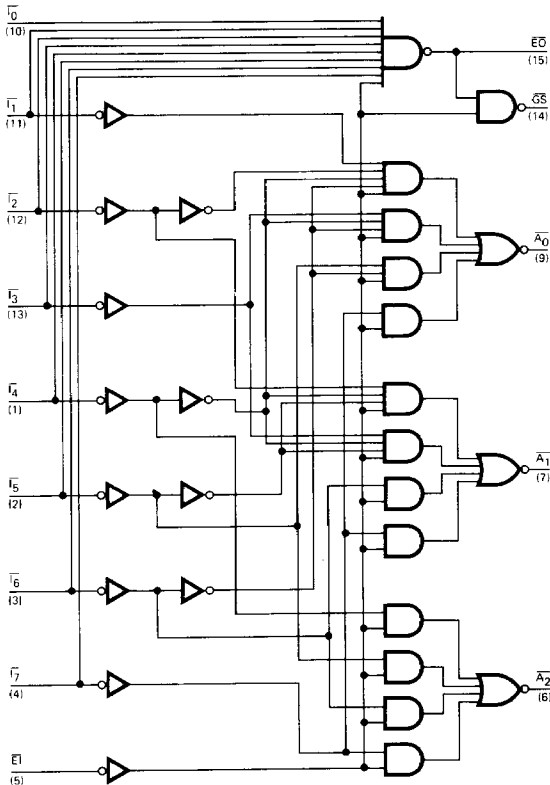
- Encodes eight inputs in priority
- Provides a 3-bit binary vector
- Indicates data present for all inputs
- Cascadable using available signals
- See Am25LS2513 for three-state output version of the Am25LS148
- Am25LS devices offer the following improvements over Am54/74LS
 - Higher speed
 - 50mV lower V_{OL} at $I_{OL} = 8\text{mA}$
 - Twice the fan-out over military range
 - 440 μA source current at high output
- 100% product assurance screening to MIL-STD-883 requirements

FUNCTIONAL DESCRIPTION

These TTL Encoders perform priority decoding from 8 inputs and provide a binary weighted code of the priority order of the inputs on three active LOW outputs (A_2, \bar{A}_1, A_0). An active LOW enable input ($\bar{E}1$) and enable output ($\bar{E}0$) allows cascading without the need for external circuitry. Enable input $\bar{E}1$ HIGH will force all outputs HIGH. The enable output is LOW when all inputs (I_0 to I_7) are HIGH and the enable input is LOW. A LOW group signal ($\bar{G}S$) indicates that one of the 8 inputs is LOW. When the enable input is LOW, the enable output is the logic inverse of the group signal.

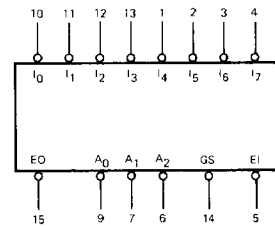
The Am54LS/74LS148 is a standard performance version of the Am25LS148. See appropriate electrical characteristic tables for detailed Am25LS improvements.

LOGIC DIAGRAM



Note: The Advanced Micro Devices' LS148 products were designed prior to publication of data sheets by T.I. Review specifications for possible differences.

LOGIC SYMBOL

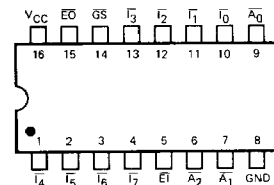


$V_{CC} = \text{Pin } 16$

$GND = \text{Pin } 8$

CONNECTION DIAGRAM

Top View



Note: Pin 1 is marked for orientation.

Am25LS148

ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$ MIN. = 4.75V MAX. = 5.25VMIL $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$ MIN. = 4.50V MAX. = 5.50V

DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)	Min.	Typ. (Note 2)	Max.	Units	
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{MIN.}, I_{OH} = -440\mu\text{A}$ $V_{IN} = V_{IH}$ or V_{IL}	MIL	2.5	3.4		Volts
			COM'L	2.7	3.4		
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.}$ $V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 4.0\text{mA}$			0.4	Volts
			$I_{OL} = 8.0\text{mA}$			0.45	
V_{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs	2.0			Volts	
V_{IL}	Input LOW Level	Guaranteed input logical LOW voltage for all inputs	MIL			0.7	Volts
			COM'L			0.8	
V_I	Input Clamp Voltage	$V_{CC} = \text{MIN.}, I_{IN} = -18\text{mA}$			-1.5	Volts	
I_{IL}	Input LOW Current	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$	$\bar{E}1, \bar{T}_0$			-0.4	mA
			All others			-0.8	
I_{IH}	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$	$\bar{E}1, \bar{T}_0$			20	μA
			All others			40	
I_I	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$	$\bar{E}1, \bar{T}_0$			0.1	mA
			All others			0.2	
I_{SC}	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$	-15		-85	mA	
I_{CC}	Power Supply Current (Note 4)	$V_{CC} = \text{MAX.}$	Condition a		11	19	mA
			Condition b		10	16	

Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical limits are at $V_{CC} = 5.0\text{V}$, 25°C ambient and maximum loading.

3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

4. a. $\bar{T}_7, \bar{E}1$ Gnd all others open.b. $\bar{T}_0 - \bar{T}_7, \bar{E}1$ open.

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MAXIMUM RATINGS (Above which the useful life may be impaired)

Storage Temperature	-65°C to $+150^\circ\text{C}$
Temperature (Ambient) Under Bias	-55°C to $+125^\circ\text{C}$
Supply Voltage to Ground Potential Continuous	-0.5V to $+7.0\text{V}$
DC Voltage Applied to Outputs for High Output State	-0.5V to $+V_{CC}$ max.
DC Input Voltage	-0.5V to $+7.0\text{V}$
DC Output Current, Into Outputs	30mA
DC Input Current	-30mA to $+5.0\text{mA}$

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Am54LS/74LS148

ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$ MIN. = 4.75V MAX. = 5.25V
 MIL $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$ MIN. = 4.50V MAX. = 5.50V

DC CHARACTERISTICS OVER OPERATING RANGE

Parameters	Description	Test Conditions (Note 1)		Min.	Typ. (Note 2)	Max.	Units
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{MIN.}, I_{OH} = -400\mu\text{A},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	MIL	2.5	3.4		Volts
			COM'L	2.7	3.4		
V_{OL}	Output LOW Voltage	$V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	All, $I_{OL} = 4.0\text{mA}$			0.4	Volts
			74LS only, $I_{OL} = 8.0\text{mA}$			0.5	
V_{IH}	Input HIGH Level	Guaranteed input logical HIGH voltage for all inputs		2.0			Volts
V_{IL}	Input LOW Level	Guaranteed input logical LOW voltage for all inputs		MIL		0.7	Volts
				COM'L		0.8	
V_I	Input Clamp Voltage	$V_{CC} = \text{MIN.}, I_{IN} = -18\text{mA}$				-1.5	Volts
I_{IL}	Input LOW Current	$V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$		$\bar{E}1, \bar{T}_0$		-0.4	mA
				All others		-0.8	
I_{IH}	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$		$\bar{E}1, \bar{T}_0$		20	μA
				All others		40	
I_I	Input HIGH Current	$V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$		$\bar{E}1, \bar{T}_0$		0.1	mA
				All others		0.2	
I_{SC}	Output Short Circuit Current (Note 3)	$V_{CC} = \text{MAX.}$		-15		-100	mA
I_{CC}	Power Supply Current (Note 4)	$V_{CC} = \text{MAX.}$		Condition a	12	20	mA
				Condition b	10	17	

- Notes: 1. For conditions shown as MIN. or MAX., use the appropriate value specified under Electrical Characteristics for the applicable device type.
 2. Typical limits are at $V_{CC} = 5.0\text{V}, 25^\circ\text{C}$ ambient and maximum loading.
 3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.
 4. a. $\bar{T}_7, \bar{E}1$ Gnd all others open.
 b. $\bar{T}_0 \rightarrow \bar{T}_7, \bar{E}1$ open.

TRUTH TABLE

ENABLE IN	INPUTS								GROUP SELECT	OUTPUTS			ENABLE OUT
	$\bar{E}1$	\bar{I}_0	\bar{I}_1	\bar{I}_2	\bar{I}_3	\bar{I}_4	\bar{I}_5	\bar{I}_6		\bar{I}_7	GS	A_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	H	L	L	H
L	X	X	X	X	X	L	H	H	L	H	H	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	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

SWITCHING CHARACTERISTICS

(T_A = +25°C, V_{CC} = 5.0V)

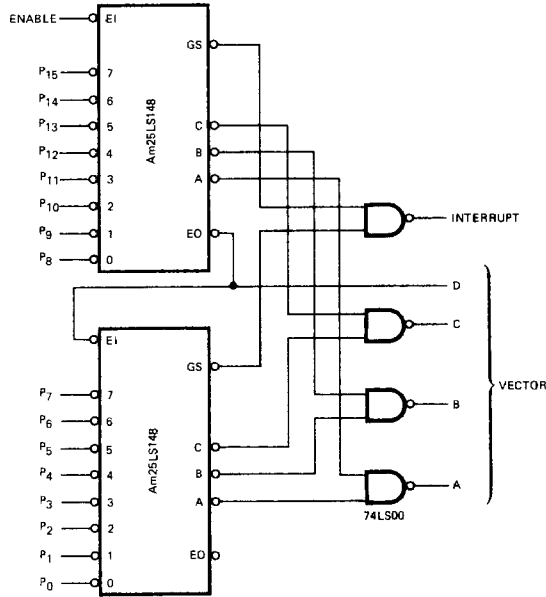
Parameters	Description	Am25LS			Am54LS/74LS			Units	Test Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
t _{PLH}	\bar{I}_i to \bar{A}_n (In Phase Output)		12	18		12	18	ns	C _L = 15pF R _L = 2.0kΩ
t _{PHL}			9	14		17	25		
t _{PLH}	\bar{I}_i to \bar{A}_n (Out-of-Phase Output)		16	24		24	36	ns	
t _{PHL}			12	18		19	29		
t _{PLH}	\bar{I}_i to $\bar{E}O$		7	11		12	18	ns	
t _{PHL}			23	35		23	40		
t _{PLH}	\bar{I}_i to $\bar{G}S$		32	48		32	55	ns	
t _{PHL}			12	18		14	21		
t _{PLH}	$\bar{E}I$ to \bar{A}_i		13	20		13	25	ns	
t _{PHL}			8	12		17	25		
t _{PLH}	$\bar{E}I$ to $\bar{G}S$		12	17		12	17	ns	
t _{PHL}			9	14		24	36		
t _{PLH}	$\bar{E}I$ to $\bar{E}O$		9	14		14	21	ns	
t _{PHL}			25	35		25	35		

Am25LS ONLY
SWITCHING CHARACTERISTICS
OVER OPERATING RANGE*

Parameters	Description	Am25LS COM'L		Am25LS MIL		Units	Test Conditions
		T _A = 0°C to +70°C V _{CC} = 5.0V ±5%		T _A = -55°C to +125°C V _{CC} = 5.0V ±10%			
		Min.	Max.	Min.	Max.		
t _{PLH}	\bar{I}_i to \bar{A}_n (In Phase Output)		23		27	ns	C _L = 50pF R _L = 2.0kΩ
t _{PHL}			21		27		
t _{PLH}	\bar{I}_i to \bar{A}_n (Out-of-Phase Output)		33		39	ns	
t _{PHL}			30		34		
t _{PLH}	\bar{I}_i to $\bar{E}O$		15		16	ns	
t _{PHL}			50		60		
t _{PLH}	\bar{I}_i to $\bar{G}S$		75		90	ns	
t _{PHL}			30		33		
t _{PLH}	$\bar{E}I$ to \bar{A}_i		28		33	ns	
t _{PHL}			21		25		
t _{PLH}	$\bar{E}I$ to $\bar{G}S$		26		30	ns	
t _{PHL}			26		30		
t _{PLH}	$\bar{E}I$ to $\bar{E}O$		19		22	ns	
t _{PHL}			60		75		

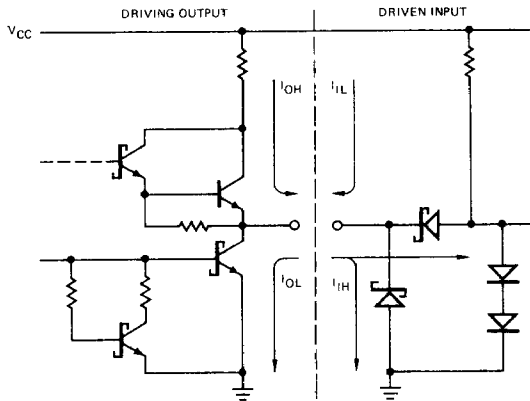
*AC performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

APPLICATION



Priority interrupt encoding expanded to 16.

Am25LS • Am54LS/74LS
LOW-POWER SCHOTTKY INPUT/OUTPUT
CURRENT INTERFACE CONDITIONS

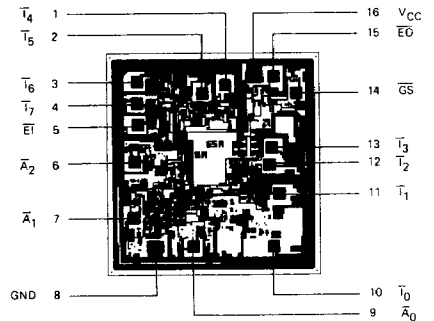


Note: Actual current flow direction shown.

DEFINITION OF FUNCTIONAL TERMS

- \overline{A}_n Address Data Outputs. Low address of most significant low data input ($n = 0, 2$).
- $\overline{E}1$ Low Enable Input. Enable input HIGH forces all outputs HIGH.
- $\overline{E}0$ Low Enable Output. Indicates that enable input is LOW and no input is active.
- $\overline{G}S$ Low Group Signal. If enable input is LOW, indicates when any input is active.
- \overline{I}_i Data Inputs. Designates one of the eight active LOW inputs ($i = 0-7$).

Metallization and Pad Layout



DIE SIZE 0.082" X 0.085"