

# SN54LS348, SN74LS348 (TIM9908) 8-LINE TO 3-LINE PRIORITY ENCODERS WITH 3-STATE OUTPUTS

SDLS161 – OCTOBER 1976 – REVISED MARCH 1988

- 3-State Outputs Drive Bus Lines Directly
- Encodes 8 Data Lines to 3-Line Binary (Octal)
- Applications Include:  
N-Bit Encoding  
Code Converters and Generators
- Typical Data Delay . . . 15 ns
- Typical Power Dissipation . . . 60 mW

## description

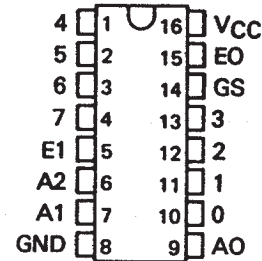
These TTL encoders feature priority decoding of the inputs to ensure that only the highest-order data line is encoded. The 'LS348 circuits encode eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input E1 and enable output EO) has been provided to allow octal expansion. Outputs A0, A1, and A2 are implemented in three-state logic for easy expansion up to 64 lines without the need for external circuitry. See Typical Application Data.

FUNCTION TABLE

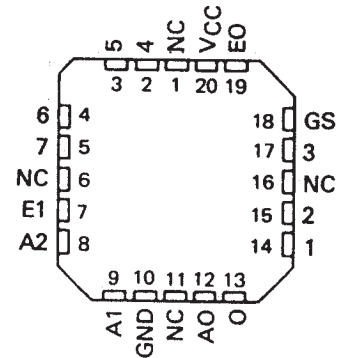
EI	INPUTS								OUTPUTS				
	0	1	2	3	4	5	6	7	A2	A1	A0	GS	EO
H	X	X	X	X	X	X	X	X	Z	Z	Z	H	H
L	H	H	H	H	H	H	H	H	Z	Z	Z	H	L
L	X	X	X	X	X	X	X	L	L	L	L	L	H
L	X	X	X	X	X	L	H	H	L	L	H	L	H
L	X	X	X	X	L	H	H	H	L	H	L	L	H
L	X	X	X	L	H	H	H	H	H	L	L	L	H
L	X	X	L	H	H	H	H	H	H	L	H	L	H
L	X	L	H	H	H	H	H	H	H	H	L	L	H
L	L	H	H	H	H	H	H	H	H	H	H	L	H

H = high logic level, L = low logic level, X = irrelevant  
Z = high-impedance state

SN54LS348 . . . J OR W PACKAGE  
SN74LS348 . . . D OR N PACKAGE  
(TOP VIEW)

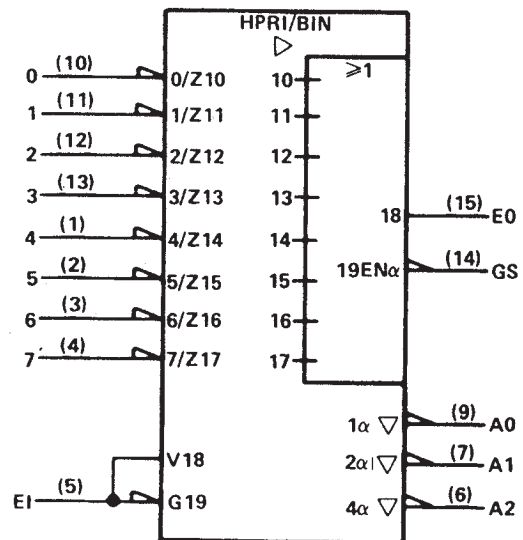


SN54LS348 . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

## logic symbol†



†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

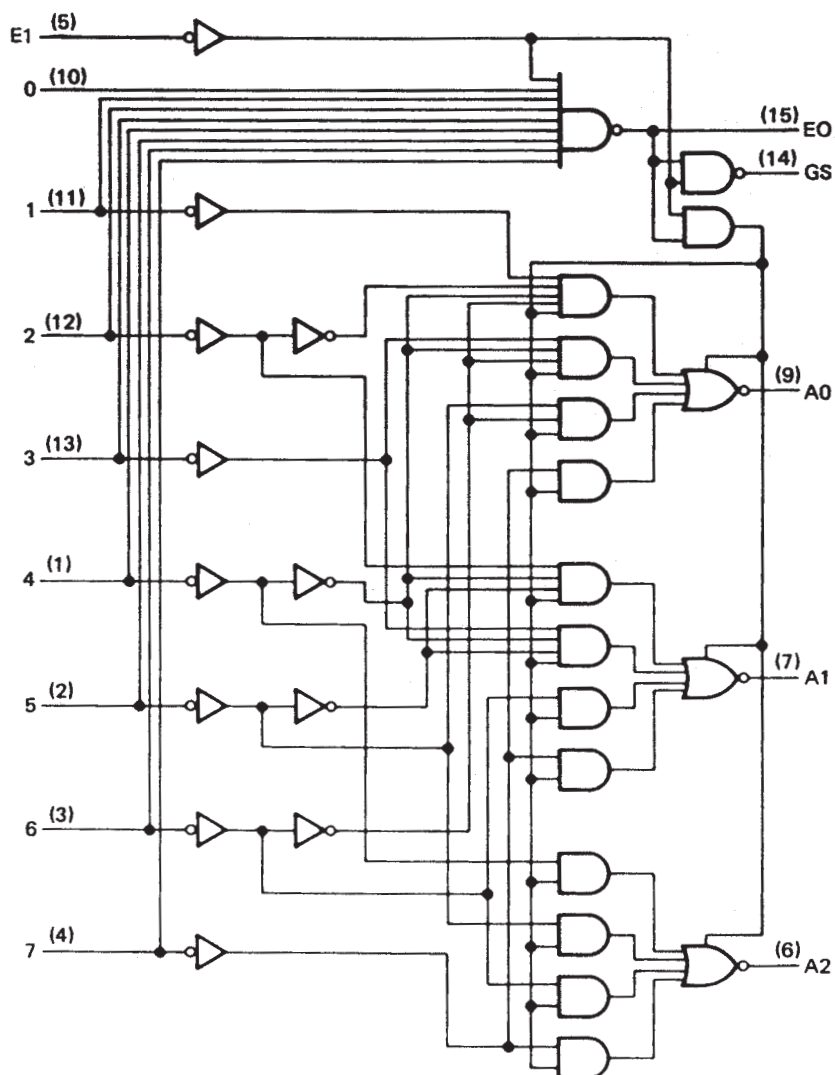
# SN54LS348, SN74LS348 (TIM9908)

## 8-LINE TO 3-LINE PRIORITY ENCODERS

### WITH 3-STATE OUTPUTS

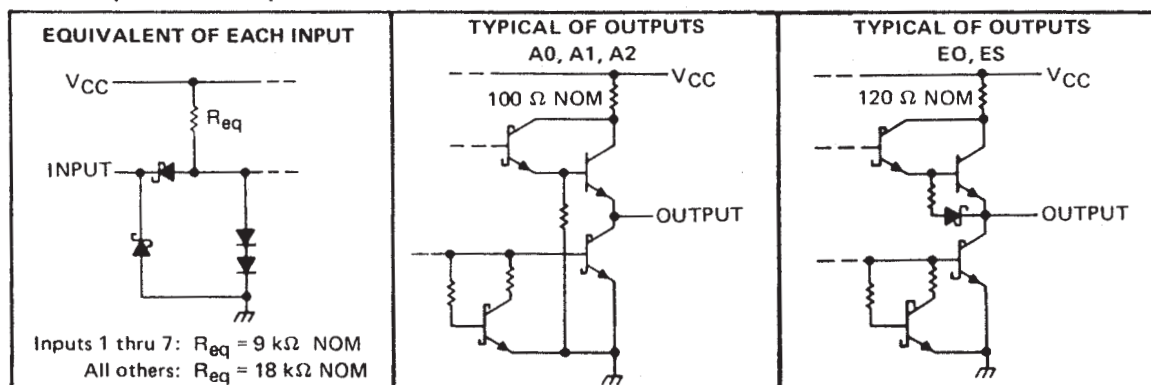
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#### logic diagram (positive logic)



Pin numbers shown are for D, J, N, and W packages.

#### schematic of inputs and outputs



# SN54LS348, SN74LS348 (TIM9908)

## 8-LINE TO 3-LINE PRIORITY ENCODERS

### WITH 3-STATE OUTPUTS

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#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range: SN54LS348	–55°C to 125°C
SN74LS348	0°C to 70°C
Storage temperature range	–65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

#### recommended operating conditions

		SN54LS348			SN74LS348			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC}$		4.5	5	5.5	4.75	5	5.25	V
High-level output current, $I_{OH}$	A0, A1, A2	–1			–2.6			mA
	EO, GS	–400			–400			μA
Low-level output current, $I_{OL}$	A0, A1, A2	12			24			mA
	EO, GS	4			8			mA
Operating free-air temperature, $T_A$		–55	125		0	70		°C

#### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		SN54LS348		SN74LS348		UNIT	
				MIN	TYP‡	MAX	MIN		TYP‡
$V_{IH}$	High-level input voltage			2		2		V	
$V_{IL}$	Low-level input voltage			0.7		0.8		V	
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$		-1.5		-1.5		V	
$V_{OH}$	High-level output voltage	A0, A1, A2	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$	$I_{OH} = -1 \text{ mA}$	2.4	3.1		V	
				$I_{OH} = -2.6 \text{ mA}$			2.4		3.1
		EO, GS	$V_{IL} = V_{IL\text{max}}$	$I_{OH} = -400 \mu\text{A}$	2.5	3.4			2.7
$V_{OL}$	Low-level Output voltage	A0, A1, A2	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$	$I_{OL} = 12 \text{ mA}$	0.25	0.4	0.25	0.4	V
				$I_{OL} = 24 \text{ mA}$			0.35	0.5	
				$I_{OL} = 4 \text{ mA}$	0.25	0.4	0.25	0.4	
		EO, GS	$V_{IL} = V_{IL\text{max}}$	$I_{OL} = 8 \text{ mA}$			0.35	0.5	
$I_{OZ}$	Off-State (high-impedance state) output current	A0, A1, A2	$V_{CC} = \text{MAX}, V_{IH} = 2 \text{ V}$	$V_O = 2.7 \text{ V}$	20	20		$\mu\text{A}$	
				$V_O = 0.4 \text{ V}$	-20	-20			
$I_I$	Input current at maximum input voltage	Inputs 1 thru 7	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$		0.2	0.2		mA	
		All other inputs			0.1	0.1			
$I_{IH}$	High-level input current	Inputs 1 thru 7	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$		40	40		$\mu\text{A}$	
		All other inputs			20	20			
$I_{IL}$	Low-level input current	Inputs 1 thru 7	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-0.8	-0.8		mA	
		All other inputs			-0.4	-0.4			
$I_{OS}$	Short-circuit output current§	Outputs A0, A1, A2	$V_{CC} = \text{MAX}$		-30	-130	-30	-130	mA
		Outputs EO, GS			-20	-100	-20	-100	
$I_{CC}$	Supply current		$V_{CC} = \text{MAX},$	Condition 1	13	25	13	25	mA
			See Note 2	Condition 2	12	23	12	23	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$ .

§ Not more than one output should be shorted at a time.

NOTE 2:  $I_{CC}$  (condition 1) is measured with inputs 7 and EI grounded, other inputs and outputs open.  $I_{CC}$  (condition 2) is measured with all inputs and outputs open.



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PARAMETER†	FROM (INPUT)	TO (OUTPUT)	WAVEFORM	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
t <sub>PLH</sub>	1 thru 7	A0, A1, or A2	In-phase output	C <sub>L</sub> = 45 pF, R <sub>L</sub> = 667 Ω, See Note 3		11	17	ns	
t <sub>PHL</sub>						20	30		
t <sub>PLH</sub>	1 thru 7	A0, A1, or A2	Out-of-phase output			23	35	ns	
t <sub>PHL</sub>						23	35		
t <sub>PZH</sub>	EI	A0, A1, or A2				25	39	ns	
t <sub>PZL</sub>						24	41		
t <sub>PLH</sub>	0 thru 7	EO	Out-of-phase output	C <sub>L</sub> = 15 pF R <sub>L</sub> = 2 kΩ, See Note 3		11	18	ns	
t <sub>PHL</sub>						26	40		
t <sub>PLH</sub>	0 thru 7	GS	In-phase output			38	55	ns	
t <sub>PHL</sub>						9	21		
t <sub>PLH</sub>	EI	GS	In-phase output			11	17	ns	
t <sub>PHL</sub>						14	36		
t <sub>PLH</sub>	EI	EO	In-phase output			17	26	ns	
t <sub>PHL</sub>						25	40		
t <sub>PHZ</sub>	EI	A0, A1, or A2		C <sub>L</sub> = 5 pF R <sub>L</sub> = 667 Ω		18	27	ns	
t <sub>PLZ</sub>						23	35		

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

**FIGURE 1—PRIORITY ENCODER WITH UP TO 64 INPUTS.**

## PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
JM38510/36002B2A	OBSOLETE	LCCC	FK	20		None	Call TI	Call TI
JM38510/36002BEA	OBSOLETE	CDIP	J	16		None	Call TI	Call TI
SN54LS348J	OBSOLETE	CDIP	J	16		None	Call TI	Call TI
SN74LS348D	ACTIVE	SOIC	D	16	40	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS348DR	ACTIVE	SOIC	D	16	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS348N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS348N3	OBSOLETE	PDIP	N	16		None	Call TI	Call TI
SN74LS348NSR	ACTIVE	SO	NS	16	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SNJ54LS348FK	OBSOLETE	LCCC	FK	20		None	Call TI	Call TI
SNJ54LS348J	OBSOLETE	CDIP	J	16		None	Call TI	Call TI
SNJ54LS348W	OBSOLETE	CFP	W	20		None	Call TI	Call TI

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**None:** Not yet available Lead (Pb-Free).

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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