

# DATA SHEET

**74F148**

8-input priority encoder

Product specification

1990 Mar 01

IC15 Data Handbook

## 8-input priority encoder

74F148

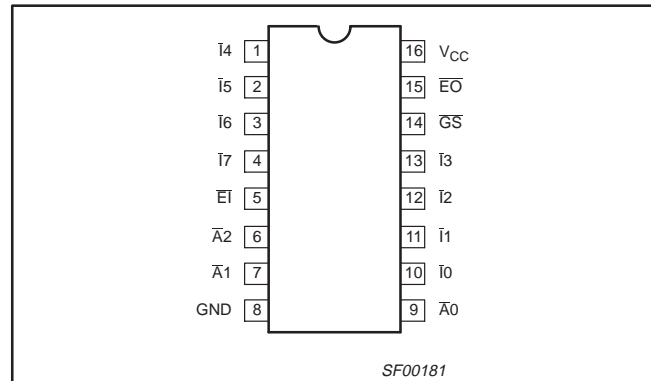
## FEATURES

- 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 ( $\bar{E}I$ ) 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 ( $\bar{G}S$ ) output and an Enable Output ( $\bar{E}O$ ) are provided with the three data outputs. The  $\bar{G}S$  is active-Low when any input is Low: this indicates when any input is active. The  $\bar{E}O$  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  $\bar{E}O$  and  $\bar{G}S$  are active-High when the Enable Input is High.

## PIN CONFIGURATION



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

## ORDERING INFORMATION

DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	PKG DWG #
16-pin plastic DIP	N74F148N	SOT38-4
16-pin plastic SO	N74F148D	SOT109-1

## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

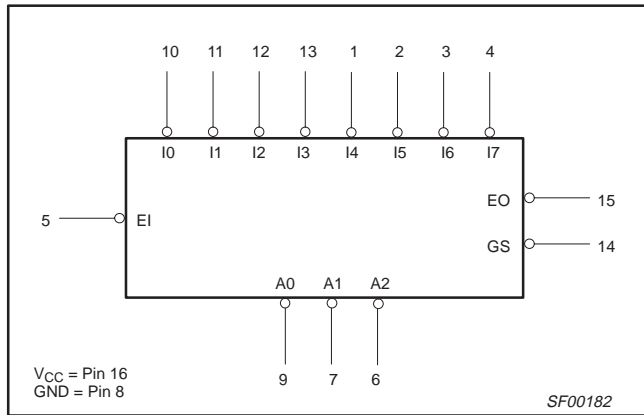
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
$\bar{I}1 - \bar{I}7$	Priority inputs (active Low)	1.0/2.0	20 $\mu$ A/1.2mA
$\bar{I}0$	Priority input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
$\bar{E}I$	Enable input (active Low)	1.0/2.0	20 $\mu$ A/1.2mA
$\bar{E}O$	Enable output (active Low)	50/33	1.0mA/20mA
$\bar{G}S$	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 $\mu$ A in the High state and 0.6mA in the Low state.

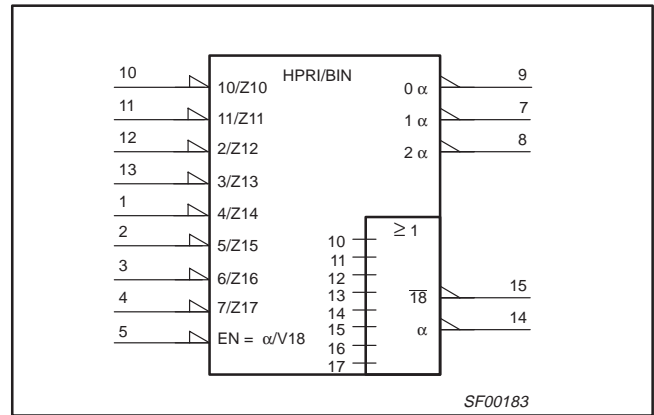
# 8-input priority encoder

## 74F148

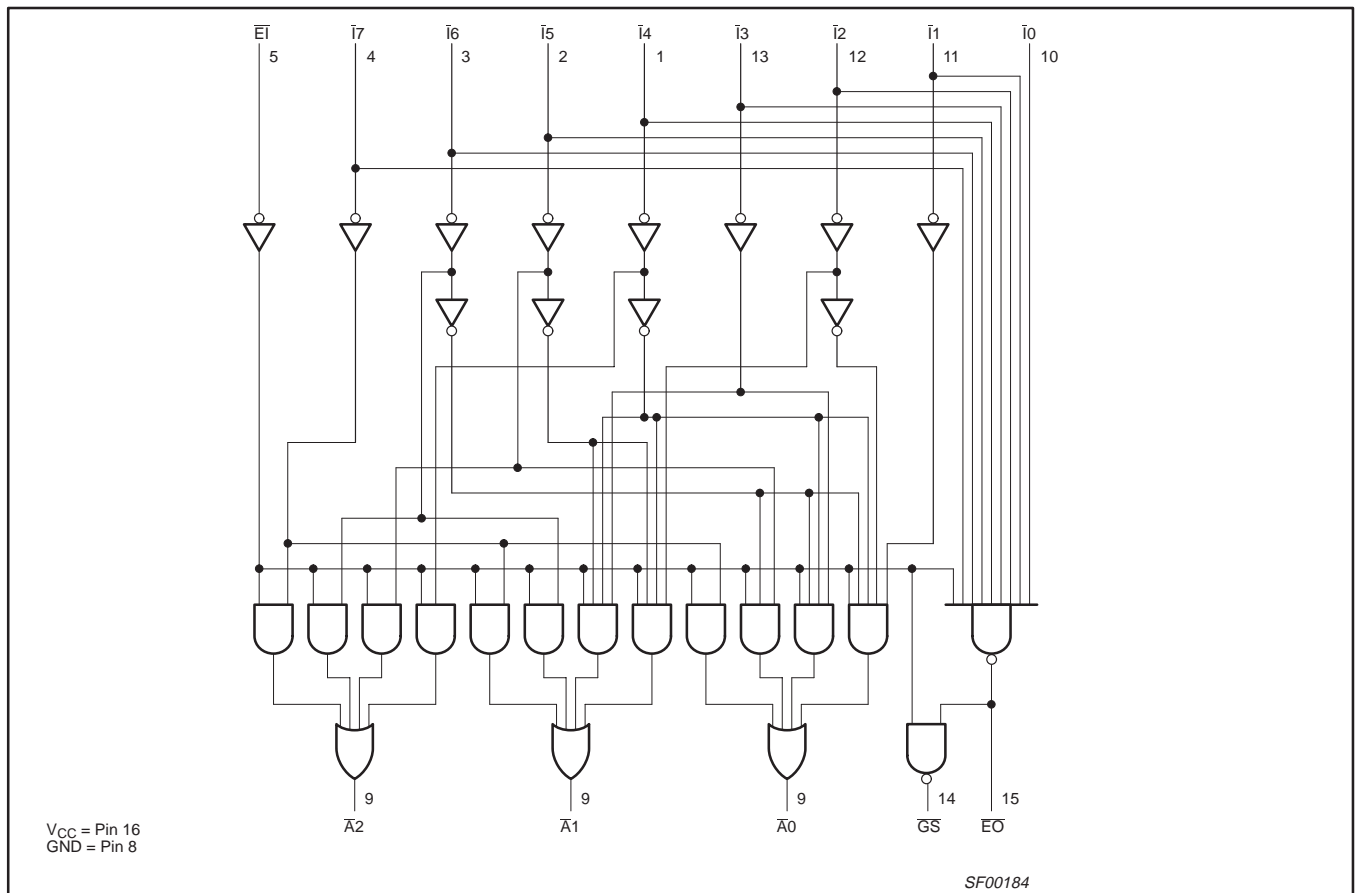
### LOGIC SYMBOL



### IEC/IEEE SYMBOL



### LOGIC DIAGRAM



# 8-input priority encoder

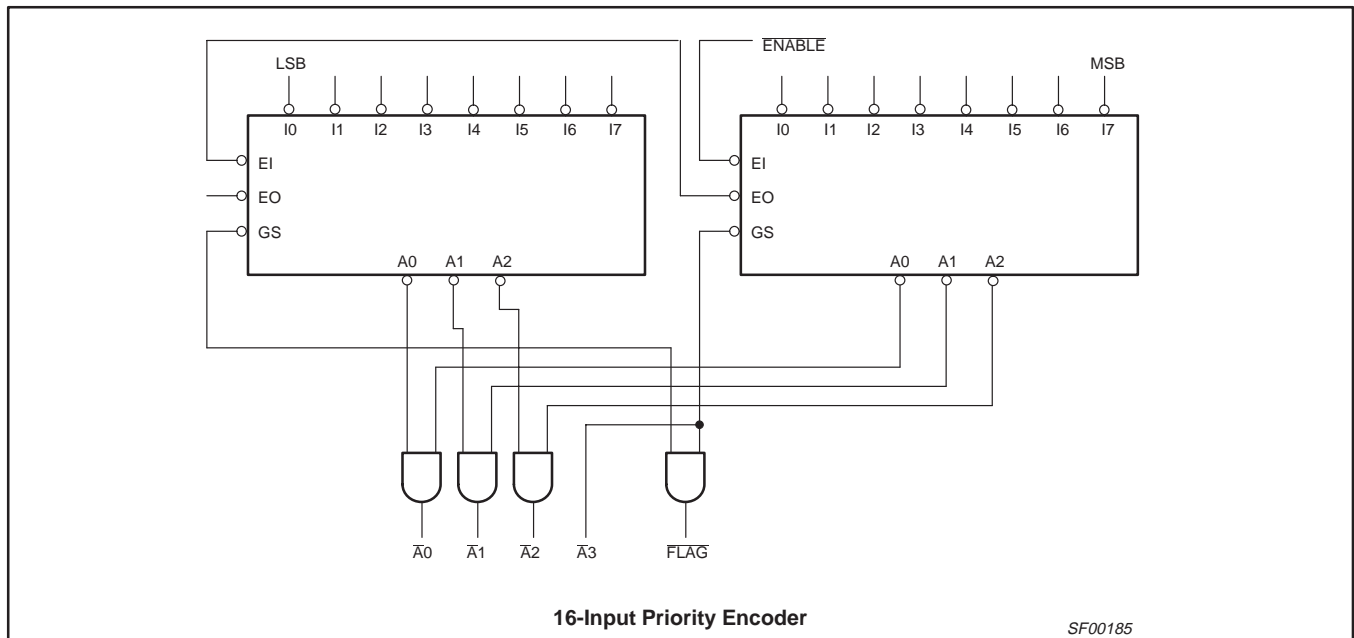
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## FUNCTION TABLE

INPUTS									OUTPUTS				
E $\bar{I}$	I $\bar{0}$	I $\bar{1}$	I $\bar{2}$	I $\bar{3}$	I $\bar{4}$	I $\bar{5}$	I $\bar{6}$	I $\bar{7}$	GS	A $\bar{0}$	A $\bar{1}$	A $\bar{2}$	E $\bar{O}$
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	X	L	H	L	H	L	L	H
L	X	X	X	X	L	H	H	H	L	L	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

## APPLICATION



## 8-input priority encoder

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**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 <sub>CC</sub>	Supply voltage	-0.5 to +7.0	V
V <sub>IN</sub>	Input voltage	-0.5 to +7.0	V
I <sub>IN</sub>	Input current	-30 to +5	mA
V <sub>OUT</sub>	Voltage applied to output in High output state	-0.5 to V <sub>CC</sub>	V
I <sub>OUT</sub>	Current applied to output in Low output state	40	mA
T <sub>amb</sub>	Operating free-air temperature range	0 to +70	°C
T <sub>stg</sub>	Storage temperature range	-65 to +150	°C

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage	2.0			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
I <sub>IK</sub>	Input clamp current			-18	mA
I <sub>OH</sub>	High-level output current			-1	mA
I <sub>OL</sub>	Low-level output current			20	mA
T <sub>amb</sub>	Operating free-air temperature range	0		+70	°C

**DC ELECTRICAL CHARACTERISTICS**

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

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	LIMITS			UNIT
			MIN	TYP <sup>2</sup>	MAX	
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX	±10%V <sub>CC</sub>	2.5		V
		V <sub>IH</sub> = MIN, I <sub>OH</sub> = MAX	±5%V <sub>CC</sub>	2.7	3.4	
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX	±10%V <sub>CC</sub>		0.30	V
		V <sub>IH</sub> = MIN, I <sub>OL</sub> = MAX	±5%V <sub>CC</sub>		0.30	
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>		-0.73	-1.2	V
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7.0V			100	μA
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low-level input current	I <sub>0</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5V		-0.6	mA
		I <sub>1</sub> - I <sub>7</sub> , E <sub>I</sub>			-1.2	mA
I <sub>OS</sub>	Short-circuit output current <sup>3</sup>	V <sub>CC</sub> = MAX		-60	-150	mA
I <sub>CC</sub>	Supply current (total) <sup>4</sup>	V <sub>CC</sub> = 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<sub>CC</sub> = 5V, T<sub>amb</sub> = 25°C.
- Not more than one output should be shorted at a time. For testing I<sub>OS</sub>, 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<sub>OS</sub> tests should be performed last.
- To measure I<sub>CC</sub>, outputs must be open, V<sub>IN</sub> on all inputs = 4.5V.

# 8-input priority encoder

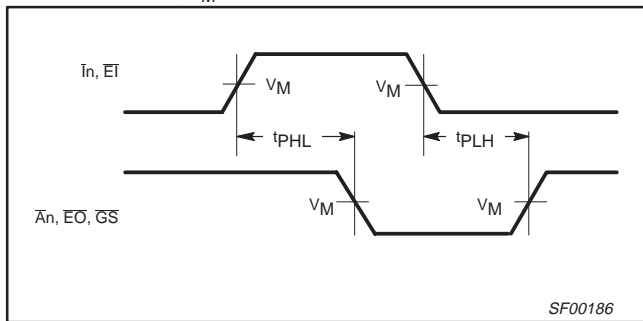
74F148

## AC ELECTRICAL CHARACTERISTICS

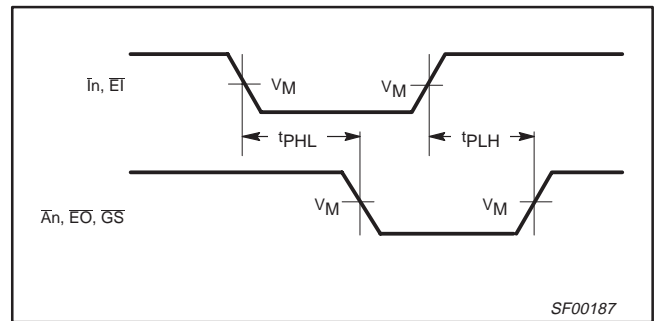
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			V <sub>CC</sub> = +5.0V T <sub>amb</sub> = +25°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			V <sub>CC</sub> = +5.0V ± 10% T <sub>amb</sub> = 0°C to +70°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay In to $\bar{A}n$	Waveform 2	3.5 3.5	6.0 6.0	9.0 9.0	3.5 3.5	10.0 10.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay In to EO	Waveform 1	1.5 1.5	3.0 2.5	6.5 6.5	1.5 1.5	7.5 7.5	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay In to $\bar{G}S$	Waveform 2	2.0 2.0	4.0 4.0	8.0 8.0	2.0 2.0	9.0 9.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay $\bar{E}I$ to $\bar{A}n$	Waveform 2	3.5 3.0	6.0 5.5	8.5 8.0	3.5 3.0	9.5 9.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay $\bar{E}I$ to $\bar{G}S$	Waveform 2	2.5 3.0	4.5 5.5	7.0 7.5	2.5 3.0	8.0 8.5	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay $\bar{E}I$ to EO	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

For all waveforms, V<sub>M</sub> = 1.5V.



Waveform 1. For Inverting Outputs



Waveform 2. For Non-Inverting Outputs

## TEST CIRCUIT AND WAVEFORMS

**Test Circuit for Totem-Pole Outputs**

**Input Pulse Definition**

**DEFINITIONS:**

- R<sub>L</sub> = Load resistor; see AC ELECTRICAL CHARACTERISTICS for value.
- C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC ELECTRICAL CHARACTERISTICS for value.
- R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of pulse generators.

family	INPUT PULSE REQUIREMENTS					
	amplitude	V <sub>M</sub>	rep. rate	t <sub>w</sub>	t <sub>TLH</sub>	t <sub>THL</sub>
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

SF00006

# 8-input priority encoder

## 74F148

DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	b <sub>2</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.030

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

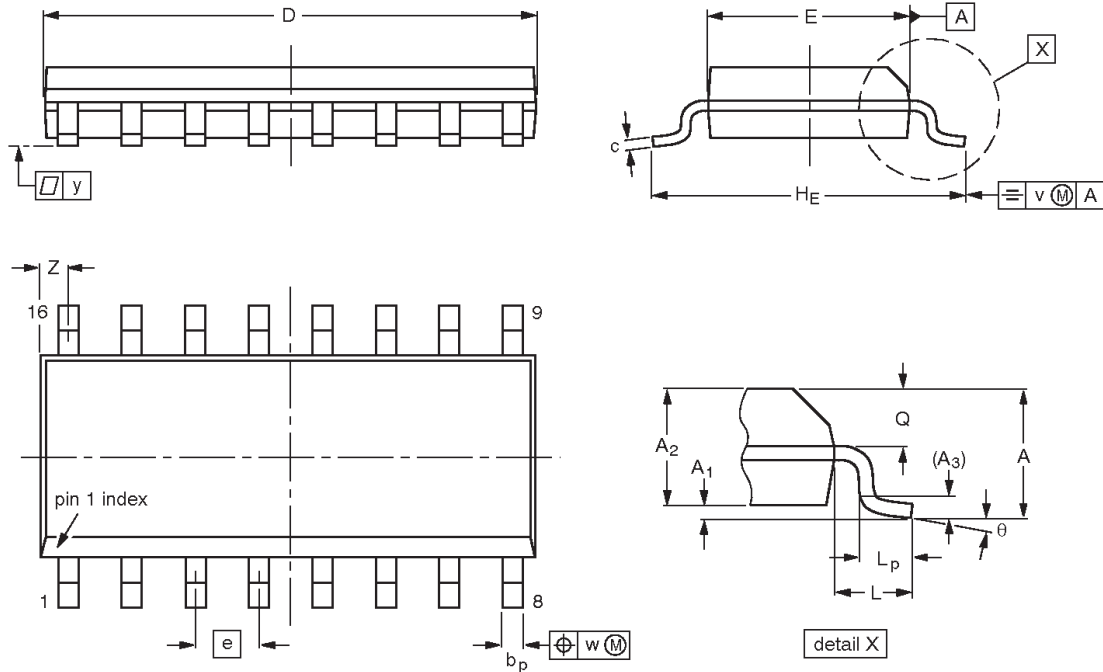
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

# 8-input priority encoder

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SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	$\theta$
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				95-01-23 97-05-22



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8-input priority encoder

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**NOTES**

## 8-input priority encoder

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## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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print code

Date of release: 10-98

Document order number:

9397-750-05078

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