

# DATA SHEET

**74F148**

8-input priority encoder

Product specification

1990 Mar 01

IC15 Data Handbook



**PHILIPS**

## 8-input priority encoder

74F148

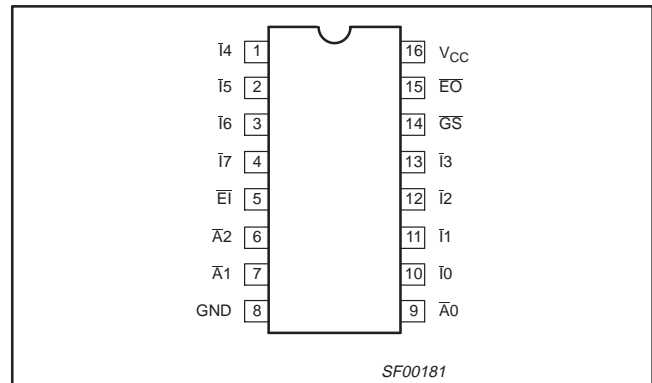
## FEATURES

- 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

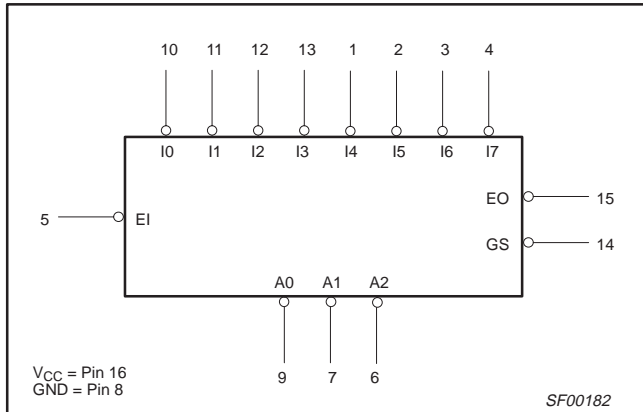
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
$\bar{I}1 - \bar{I}7$	Priority inputs (active Low)	1.0/2.0	20 $\mu$ A/1.2mA
$\bar{I}0$	Priority input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
$\bar{E}I$	Enable input (active Low)	1.0/2.0	20 $\mu$ A/1.2mA
$\bar{E}O$	Enable output (active Low)	50/33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

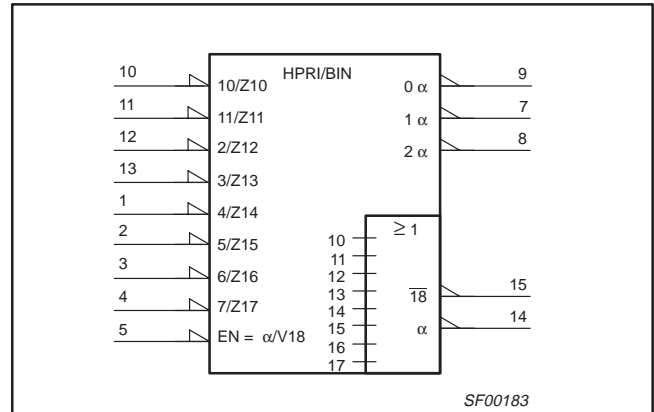
# 8-input priority encoder

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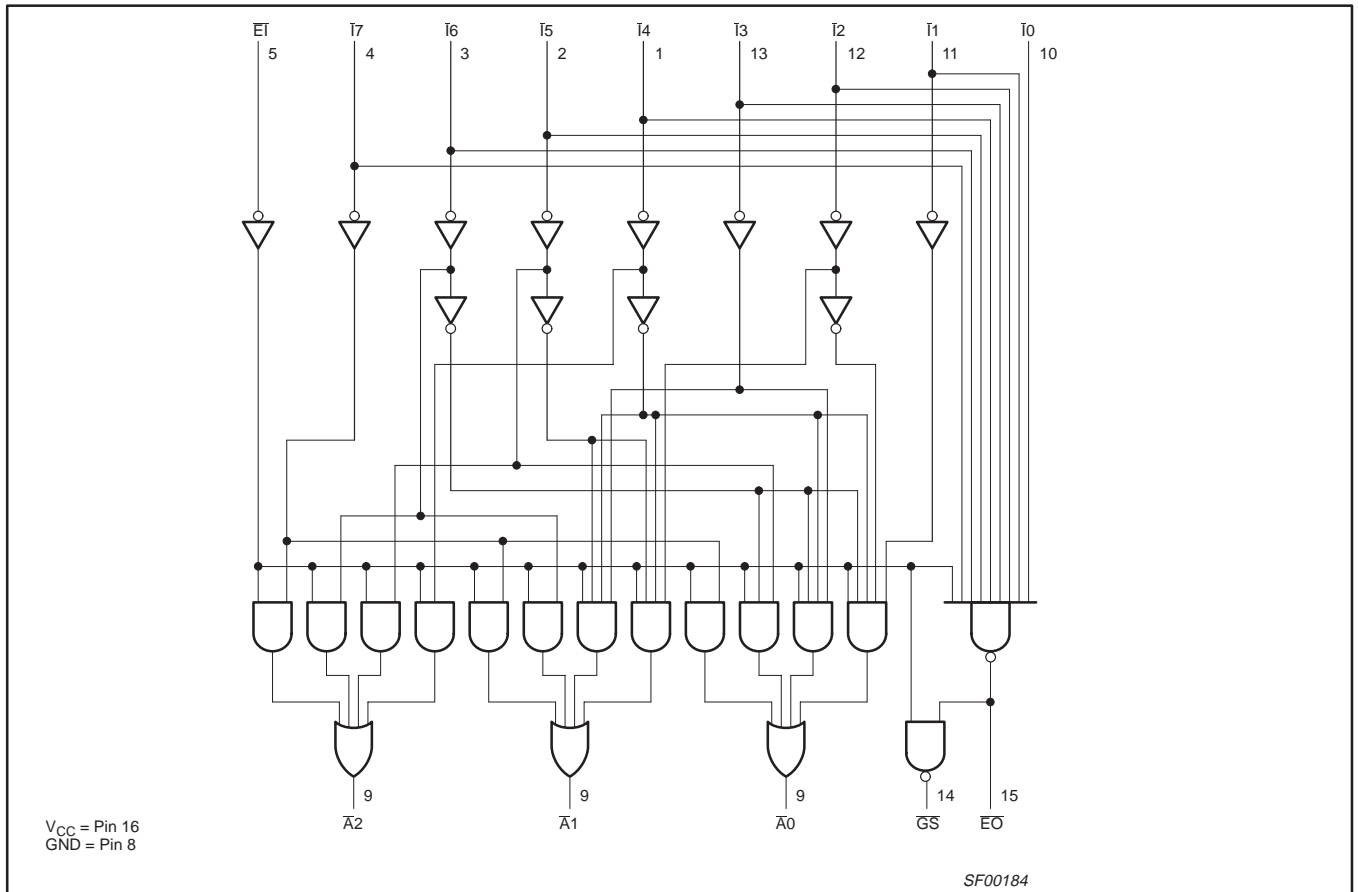
## LOGIC SYMBOL



## IEC/IEEE SYMBOL



## LOGIC DIAGRAM



# 8-input priority encoder

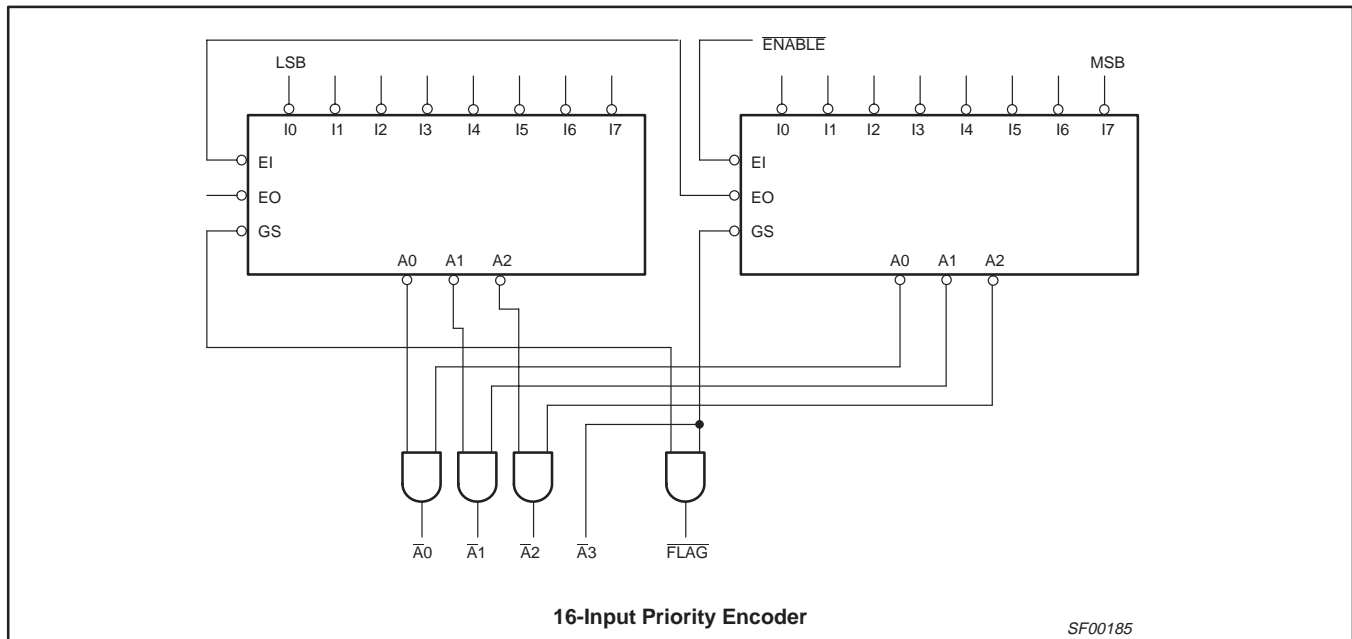
74F148

## FUNCTION TABLE

INPUTS									OUTPUTS				
EI	I0	I1	I2	I3	I4	I5	I6	I7	GS	A0	A1	A2	EO
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	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

## 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
$V_{CC}$	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
$T_{amb}$	Operating free-air temperature range	0 to +70	°C
$T_{stg}$	Storage temperature range	-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
$V_{IH}$	High-level input voltage	2.0			V
$V_{IL}$	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
$T_{amb}$	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	
$V_{OH}$	High-level output voltage	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}$	$\pm 10\%V_{CC}$	2.5		V
		$V_{IH} = \text{MIN}, I_{OH} = \text{MAX}$	$\pm 5\%V_{CC}$	2.7	3.4	
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}$	$\pm 10\%V_{CC}$		0.30	V
		$V_{IH} = \text{MIN}, I_{OL} = \text{MAX}$	$\pm 5\%V_{CC}$		0.30	
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$		-0.73	-1.2	V
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7.0V$			100	$\mu A$
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7V$			20	$\mu A$
$I_{IL}$	Low-level input current	$\bar{I}_0$	$V_{CC} = \text{MAX}, V_I = 0.5V$		-0.6	mA
		$\bar{I}_1 - \bar{I}_7, \bar{E}_I$			-1.2	mA
$I_{OS}$	Short-circuit output current <sup>3</sup>	$V_{CC} = \text{MAX}$		-60	-150	mA
$I_{CC}$	Supply current (total) <sup>4</sup>	$V_{CC} = \text{MAX}$		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  $V_{CC} = 5V, T_{amb} = 25^\circ C$ .
- 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.

# 8-input priority encoder

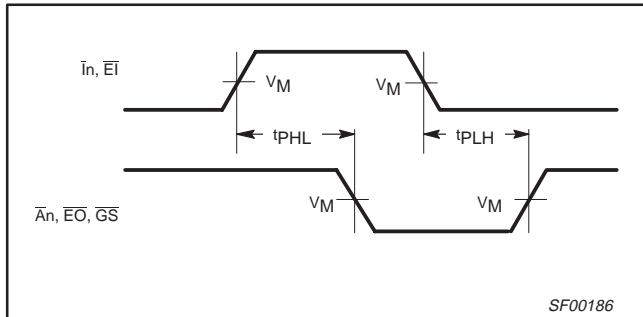
74F148

## AC ELECTRICAL CHARACTERISTICS

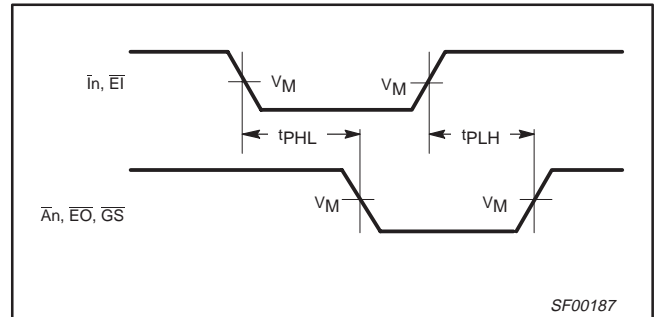
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			V <sub>CC</sub> = +5.0V T <sub>amb</sub> = +25°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			V <sub>CC</sub> = +5.0V ± 10% T <sub>amb</sub> = 0°C to +70°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay I <sub>n</sub> 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 I <sub>n</sub> to $\bar{E}O$	Waveform 1	1.5 1.5	3.0 2.5	6.5 6.5	1.5 1.5	7.5 7.5	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay I <sub>n</sub> 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 $\bar{E}O$	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

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

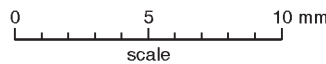
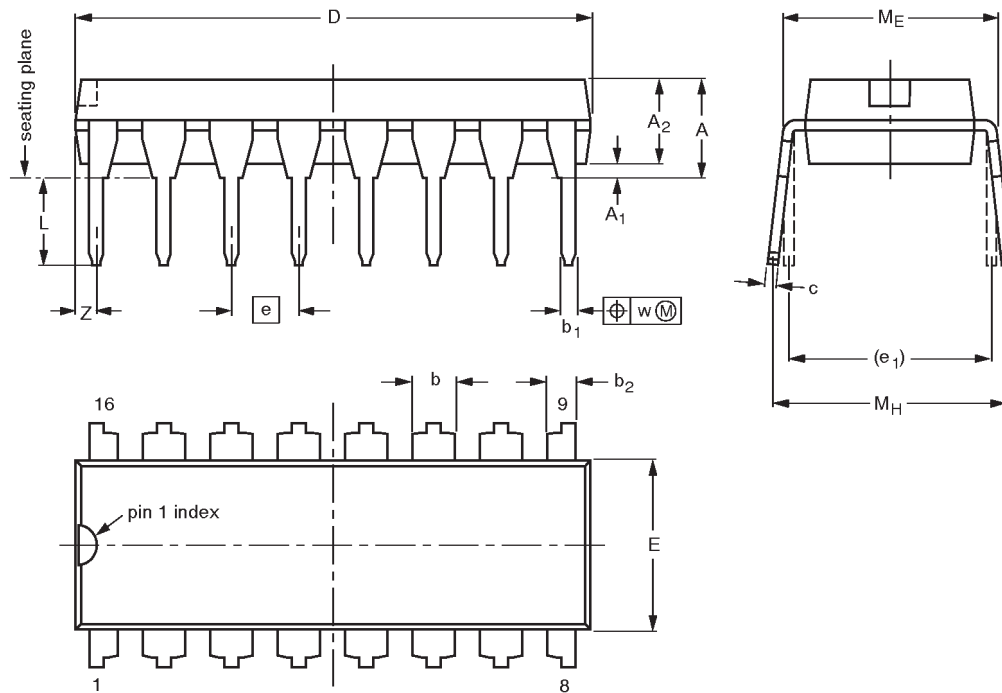
SF00006

8-input priority encoder

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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.

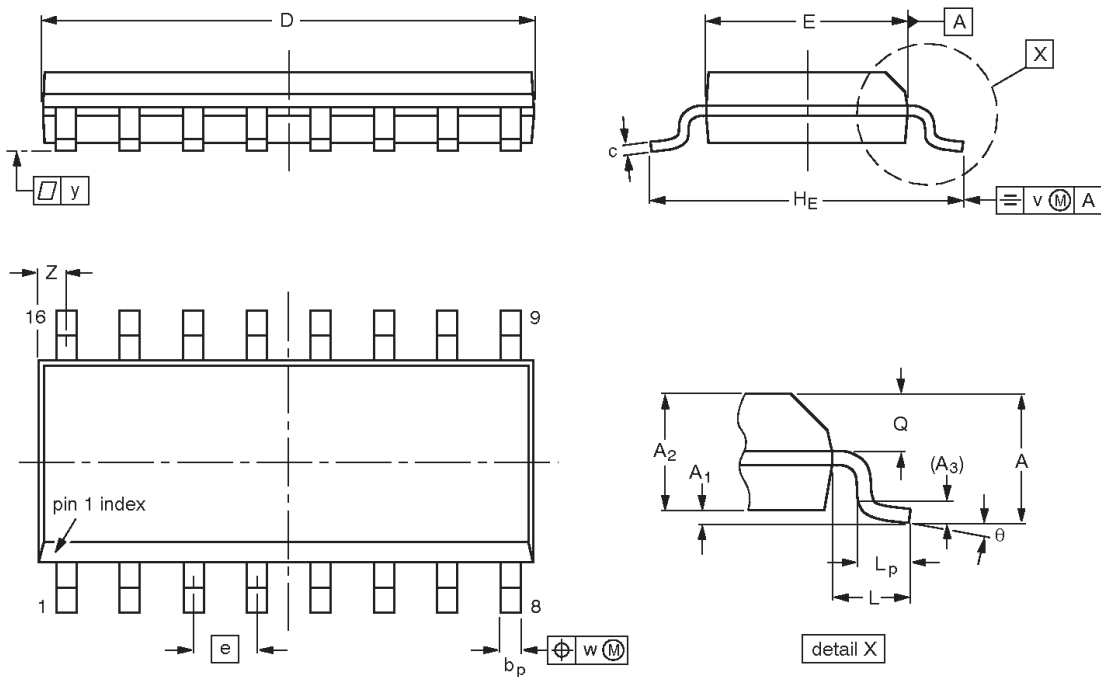
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

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>	θ
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 <sup>[1]</sup>
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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Philips Semiconductors  
811 East Arques Avenue  
P.O. Box 3409  
Sunnyvale, California 94088-3409  
Telephone 800-234-7381

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