

# MITSUBISHI LSTTLs M74LS147P

## 10-LINE DECIMAL TO 4-LINE BCD PRIORITY ENCODER

### DESCRIPTION

The M74LS147P is a semiconductor integrated circuit containing a 10-line BCD encoder with a priority function.

### FEATURES

- Priority decoding of the data inputs
- Data inputs and outputs both active-low
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ\text{C}$ )

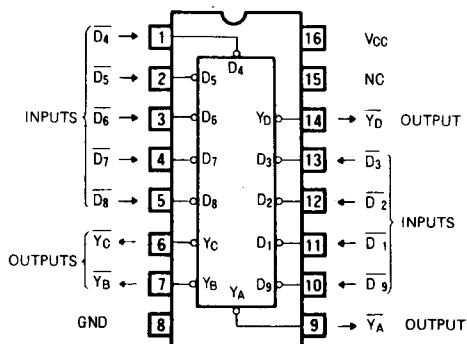
### APPLICATION

General purpose, for use in industrial and consumer equipment

### FUNCTIONAL DESCRIPTION

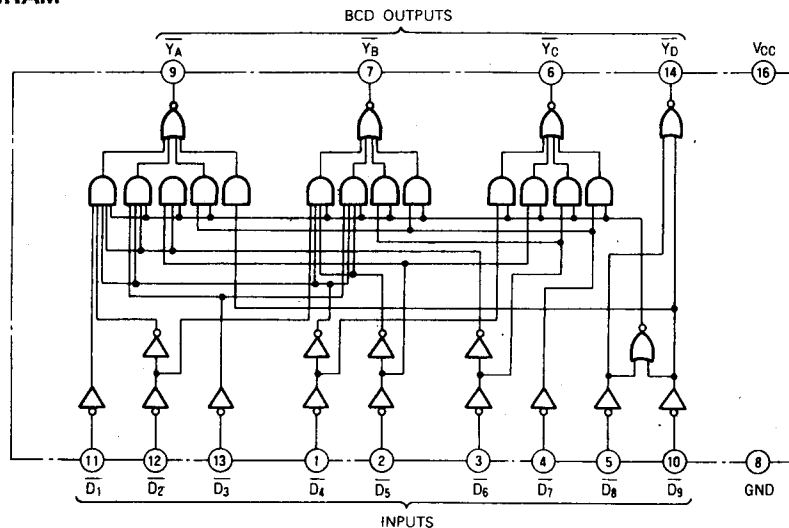
This device functions to encode a pulse entered through one of the nine input pins ( $\overline{D}_1 \sim \overline{D}_9$ ) into a BCD code by producing an inverted signal (based on input) at output  $\overline{Y}_A \sim \overline{Y}_D$ . The encoder handles all inputs in a priority sequence, so that when two or more are present at input at the same time, the signal present at the highest priority pin will be encoded.  $\overline{D}_0$  does not exist as an input, and when all inputs are at high-level, all outputs will also be high-level, yielding a 0 output. Ideally suited for use as a keyboard encoder or range selector.

### PIN CONFIGURATION (TOP VIEW)



Outline 16P4 NC: NO CONNECTION

### BLOCK DIAGRAM



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FUNCTION TABLE (Note 1)

D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	D <sub>7</sub>	D <sub>8</sub>	D <sub>9</sub>	Y <sub>D</sub>	Y <sub>C</sub>	Y <sub>B</sub>	Y <sub>A</sub>
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	H	H	L
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	L	H	H	H	H	H	L	H	L
X	X	X	L	H	H	H	H	H	H	L	H	H
X	X	L	H	H	H	H	H	H	H	H	L	L
X	L	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

Note 1. X : Irrelevant

ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub> = -20 ~ +75°C, unless otherwise noted)

Symbol	Parameter	Conditions	Limits	Unit
V <sub>CC</sub>	Supply voltage		-0.5 ~ +7	V
V <sub>I</sub>	Input voltage		-0.5 ~ +15	V
V <sub>O</sub>	Output voltage	High-level output	-0.5 ~ V <sub>CC</sub>	V
T <sub>opr</sub>	Operating free-air ambient temperature range		-20 ~ +75	°C
T <sub>stg</sub>	Storage temperature range		-65 ~ +150	°C

RECOMMENDED OPERATING CONDITIONS (T<sub>a</sub> = -20 ~ +75°C, unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min	Typ	Max	
V <sub>CC</sub>	Supply voltage	4.75	5	5.25	V
I <sub>OH</sub>	High-level output current	V <sub>OH</sub> ≥ 2.7V	0	-400	μA
I <sub>OL</sub>	Low-level output current	V <sub>OL</sub> ≤ 0.4V	0	4	mA
		V <sub>OL</sub> ≤ 0.5V	0	8	mA

ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = -20 ~ +75°C, unless otherwise noted)

Symbol	Parameter	Test Conditions	Limits			Unit
			Min	Typ *	Max	
V <sub>IH</sub>	High-level input voltage		2			V
V <sub>IL</sub>	Low-level input voltage				0.8	V
V <sub>IC</sub>	Input clamp voltage	V <sub>CC</sub> = 4.75V, I <sub>IC</sub> = -18mA			-1.5	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = 4.75V, V <sub>I</sub> = 0.8V V <sub>I</sub> = 2V, I <sub>OH</sub> = -400μA	2.7	3.4		V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = 4.75V		0.25	0.4	V
		V <sub>I</sub> = 0.8V, V <sub>I</sub> = 2V		0.35	0.5	V
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> = 5.25V, V <sub>I</sub> = 2.7V			20	μA
		V <sub>CC</sub> = 5.25V, V <sub>I</sub> = 10V			0.1	mA
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = 5.25V, V <sub>I</sub> = 0.4V			-0.4	mA
I <sub>OS</sub>	Short-circuit output current (Note 2)	V <sub>CC</sub> = 5.25V, V <sub>O</sub> = 0V	-20		-100	mA
I <sub>CC1</sub>	Supply current	V <sub>CC</sub> = 5.25V (Note 3)		12	20	mA
I <sub>CC2</sub>	Supply current	V <sub>CC</sub> = 5.25V (Note 4)		10	17	mA

\* : All typical values are at V<sub>CC</sub> = 5V, T<sub>a</sub> = 25°C.

Note 2. All measurements should be done quickly, and not more than one output should be shorted at a time.

3. I<sub>CC1</sub> is measured with D<sub>7</sub> at 0V, and all other inputs open.

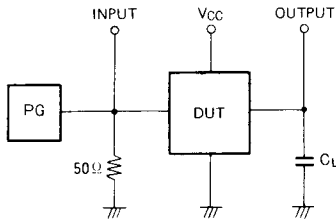
4. I<sub>CC2</sub> is measured with all inputs open.

**10-LINE DECIMAL TO 4-LINE BCD PRIORITY ENCODER**

**SWITCHING CHARACTERISTICS** ( $V_{CC}=5V$ ,  $T_a=25^\circ C$ , unless otherwise noted)

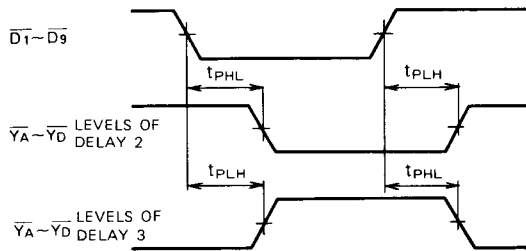
Symbol	Parameter	Test Conditions	Limits			Unit
			Min	Typ	Max	
$t_{PLH}$	Low-to-high-level, high-to-low-level output propagation time, from input $\overline{D}_1 \sim \overline{D}_9$ to output $\overline{Y}_A \sim \overline{Y}_D$ (levels of delay 2)	$C_L = 15pF$ (Note 5)		9	18	ns
$t_{PHL}$				14	18	ns
$t_{PLH}$	Low-to-high-level, high-to-low-level output propagation time, from input $\overline{D}_1 \sim \overline{D}_9$ to output $\overline{Y}_A \sim \overline{Y}_D$ (levels of delay 3)			25	33	ns
$t_{PHL}$				15	23	ns

Note 5. Measurement Circuit



- (1) The pulse generator (PG) has the following characteristics:  
PRR = 1MHz,  $t_r = 6ns$ ,  $t_f = 6ns$ ,  $t_w = 500ns$ ,  $V_p = 3V_{p.p.}$ ,  
 $Z_o = 50\Omega$ .
- (2)  $C_L$  includes probe and jig capacitance.

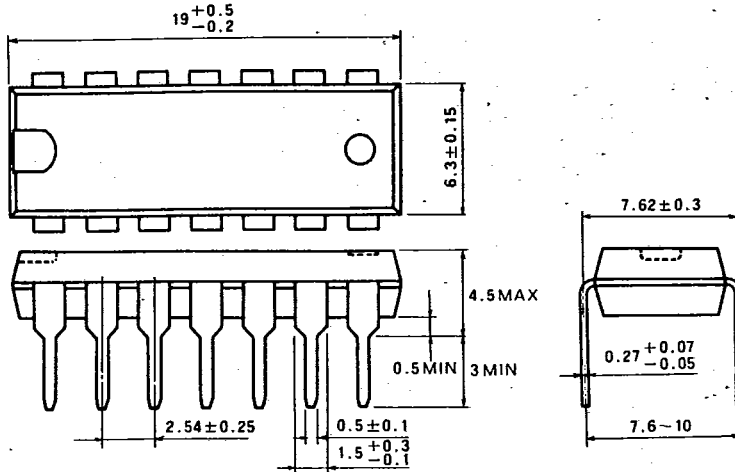
**TIMING DIAGRAM (Reference level = 1.3V)**



T-90-20

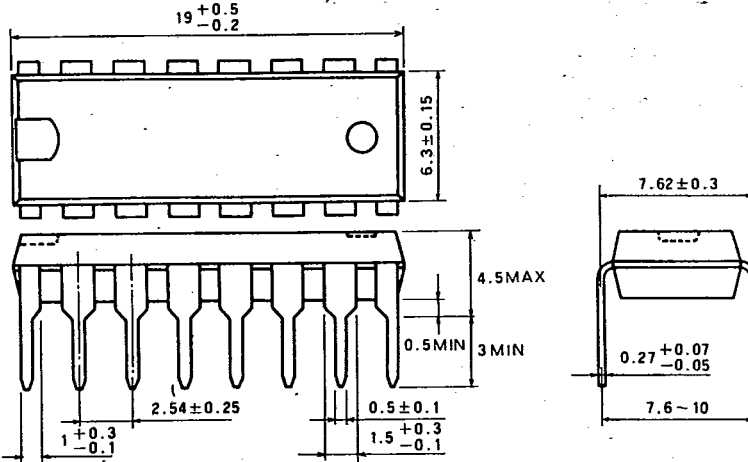
**TYPE 14P4 14-PIN MOLDED PLASTIC DIL**

Dimension in mm



**TYPE 16P4 16-PIN MOLDED PLASTIC DIL**

Dimension in mm



**TYPE 20P4 20-PIN MOLDED PLASTIC DIL**

Dimension in mm

