M74LS148P

8-LINE TO 3-LINE PRIORITY ENCODER

DESCRIPTION

The M74LS148P is a semiconductor integrated circuit provided with an 8-line to 3-line priority encoder function and priority sequence function.

FEATURES

- Priority decoding of the data input
- Easy expansion of the number of input bit
- Wide operating temperature range (T_a=−20~+75°C)

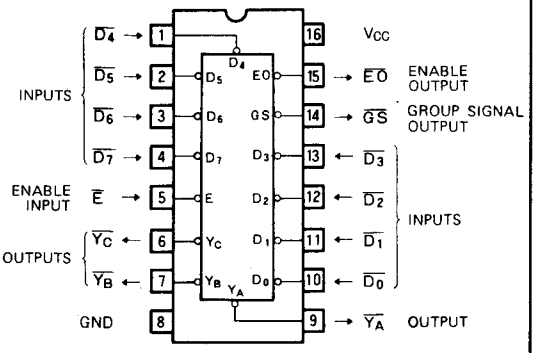
APPLICATION

General purpose, for use in industrial and consumer equipment.

FUNCTIONAL DESCRIPTION

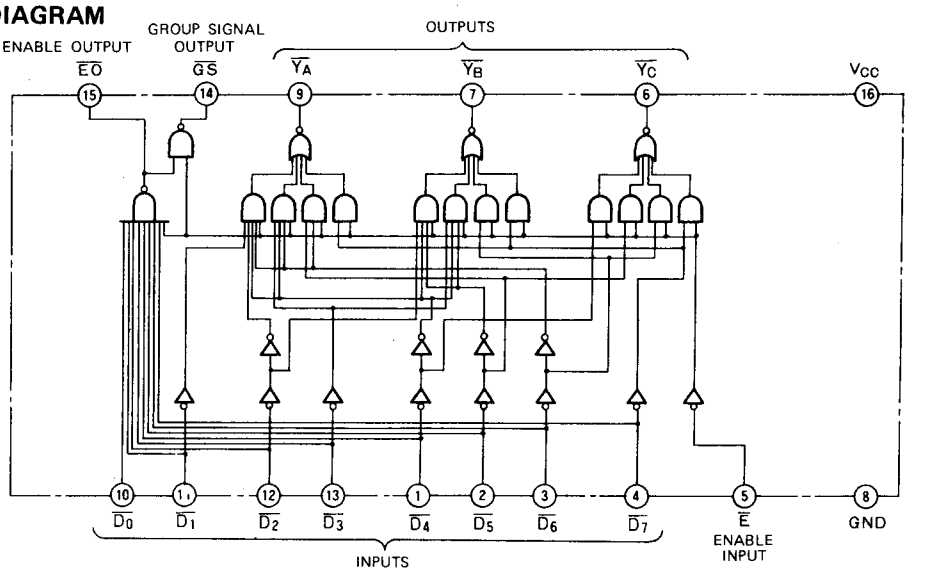
When signals are applied to one of this encoder's eight inputs $\overline{D_0}$~$\overline{D_7}$, the 3-bit binary number corresponding to the input pin appears at outputs $\overline{Y_A}$~$\overline{Y_C}$. Since priority is given to each input, the highest-level input pin signal is encoded when more than one signals are applied simultaneously. The number of input data can easily be increased as shown in the application example using the enable input $\overline{E}$, enable output $\overline{EO}$ and group signal output $\overline{GS}$. This device is suitable for use as a keyboard encoder or for range selection.

PIN CONFIGURATION (TOP VIEW)



Outline 16P4

BLOCK DIAGRAM



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8-LINE TO 3-LINE PRIORITY ENCODER

FUNCTION TABLE (Note 1)

$\overline{E}$	$\overline{D_0}$	$\overline{D_1}$	$\overline{D_2}$	$\overline{D_3}$	$\overline{D_4}$	$\overline{D_5}$	$\overline{D_6}$	$\overline{D_7}$	$\overline{Y_C}$	$\overline{Y_B}$	$\overline{Y_A}$	$\overline{GS}$	$\overline{EO}$
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	L	H	L	H
L	X	X	X	X	X	L	H	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	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

Note 1 X : Irrelevant

ABSOLUTE MAXIMUM RATINGS ($T_a = -20 \sim +75°C$, unless otherwise noted)

Symbol	Parameter	Conditions	Limits	Unit
V_{CC}	Supply voltage		$-0.5 \sim +7$	V
V_I	Input voltage		$-0.5 \sim +15$	V
V_O	Qutput voltage	High-level state	$-0.5 \sim V_{CC}$	V
Topr	Operating free-air ambient temperature range		$-20 \sim +75$	°C
Tstg	Storage temperature range		$-65 \sim +150$	°C

RECOMMENDED OPERATING CONDITIONS ($T_a = -20 \sim +75°C$, unless otherwise noted)

Symbol	Parameter		Limits			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage		4.75	5	5.25	V
I_{OH}	High-level output current	$V_{OH} \geqq 2.7V$	0		-400	μA
I_{OL}	Low-level output current	$V_{OL} \leqq 0.4V$	0		4	mA
		$V_{OL} \leqq 0.5V$	0		8	mA

ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75°C$, unless otherwise noted)

Symbol	Parameter		Test conditions		Limits			Unit
					Min	Typ *	Max	
V_{IH}	High-level input voltage				2			V
V_{IL}	Low-level input voltage						0.8	V
V_{IC}	Input clamp voltage		$V_{CC}=4.75V$, $I_{IC}=-18mA$				-1.5	V
V_{OH}	High-level output voltage		$V_{CC}=4.75V$, $V_I=0.8V$ $V_I=2V$, $I_{OH}=-400\mu A$		2.7	3.4		V
V_{OL}	Low-level output voltage		$V_{CC}=4.75V$	I_{OL} 4mA		0.25	0.4	V
			$V_I=0.8V$, $V_I=2V$	I_{OL} 8mA		0.35	0.5	V
I_{IH}	High-level input current	$\overline{D_0}$, $\overline{E}$	$V_{CC}=5.25V$, $V_I=2.7V$				20	μA
		$\overline{D_1} \sim \overline{D_7}$					40	
		$\overline{D_0}$, $\overline{E}$	$V_{CC}=5.25V$, $V_I=10V$				0.1	mA
		$\overline{D_1} \sim \overline{D_7}$					0.2	
I_{IL}	Low-level input current	$\overline{D_0}$, $\overline{E}$	$V_{CC}=5.25V$, $V_I=0.4V$				-0.4	mA
		$\overline{D_1} \sim \overline{D_7}$					-0.8	
I_{OS}	Short-circuit output current (Note 2)		$V_{CC}=5.25V$, $V_O=0V$		-20		-100	mA
I_{CC1}	Supply current		$V_{CC}=5.25V$ (Note 3)			12	20	mA
I_{CC2}	Supply current		$V_{CC}=5.25V$ (Note 4)			10	17	mA

* : All typical values are at $V_{CC}=5V$, $T_a=25°C$.

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

Note 3: I_{CC1} is measured with $\overline{D_7}$ and $\overline{E}$ at 0V and with all other inputs open.

Note 4: I_{CC2} is measured with all inputs open.

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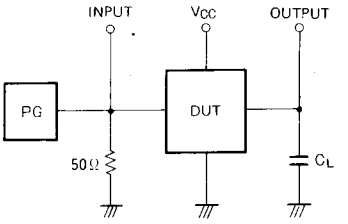
SWITCHING CHARACTERISTICS (V_{CC}=5V, Ta=25°C, unless otherwise noted)

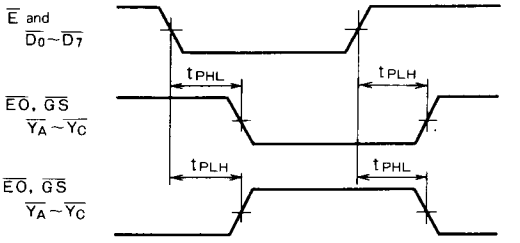
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from inputs $\overline{D_1}$ ~ $\overline{D_7}$ to outputs $\overline{Y_A}$~$\overline{Y_C}$ (levels of delay 2)	C_L=15pF (Note 5)		11	18	ns
t_{PHL}				14	25	ns
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from inputs $\overline{D_1}$ ~ $\overline{D_7}$ to outputs $\overline{Y_A}$~$\overline{Y_C}$ (levels of delay 3)			15	36	ns
t_{PHL}				18	29	ns
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from inputs $\overline{D_0}$ ~ $\overline{D_7}$ to output $\overline{EO}$ (levels of delay 3)			7	18	ns
t_{PHL}				24	40	ns
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from inputs $\overline{D_0}$ ~ $\overline{D_7}$ to output $\overline{GS}$ (levels of delay 2)			31	55	ns
t_{PHL}				8	21	ns
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from input $\overline{E}$ to outputs $\overline{Y_A}$~$\overline{Y_C}$ (levels of delay 2)			11	25	ns
t_{PHL}				14	25	ns
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from input $\overline{E}$ to output $\overline{GS}$ (levels of delay 2)			8	17	ns
t_{PHL}				13	36	ns
t_{PLH}	Low-to-high-level, high-to-low-level output propagation time, from input $\overline{E}$ to output $\overline{EO}$ (levels of delay 2)			11	21	ns
t_{PHL}				27	35	ns

Note 5: Measurement circuit



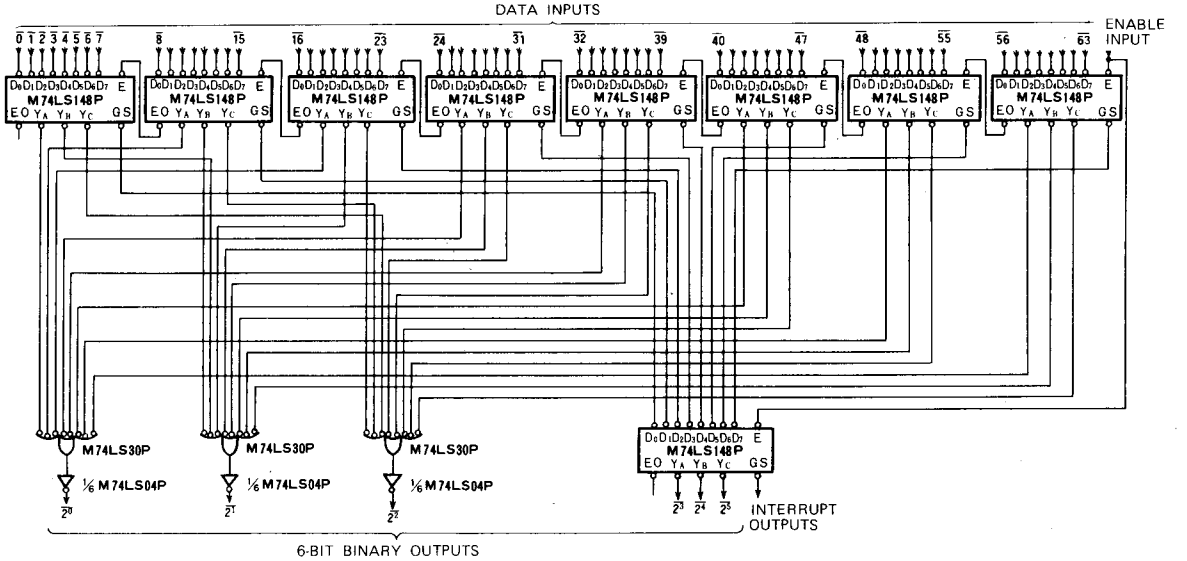
(1) The pulse generator (PG) has the following characteristics:
PRR=1MHz, t_r=6ns, t_f=6ns, t_W=500ns, V_P=3V_{P-P}, Z_O=50Ω.
(2) C_L includes probe and jig capacitance

TIMING DIAGRAM (Reference level = 1.3V)



APPLICATION EXAMPLE

64-line/4-bit binary encoder



Expansion is possible up to 2^n bits in accordance with the above application example.

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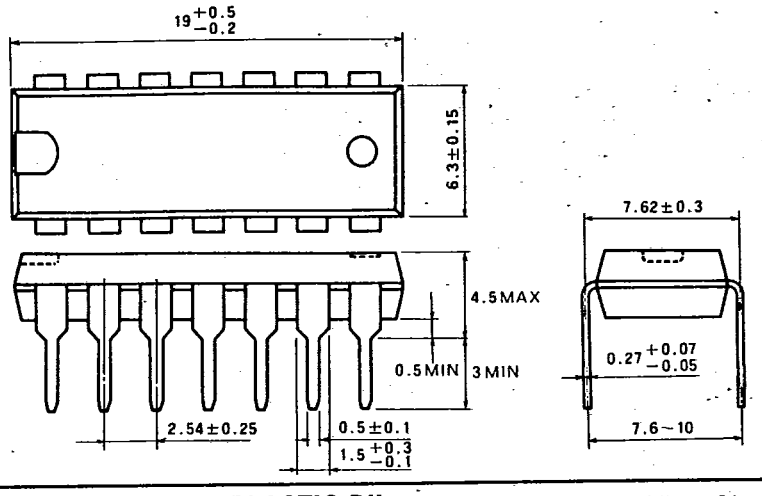
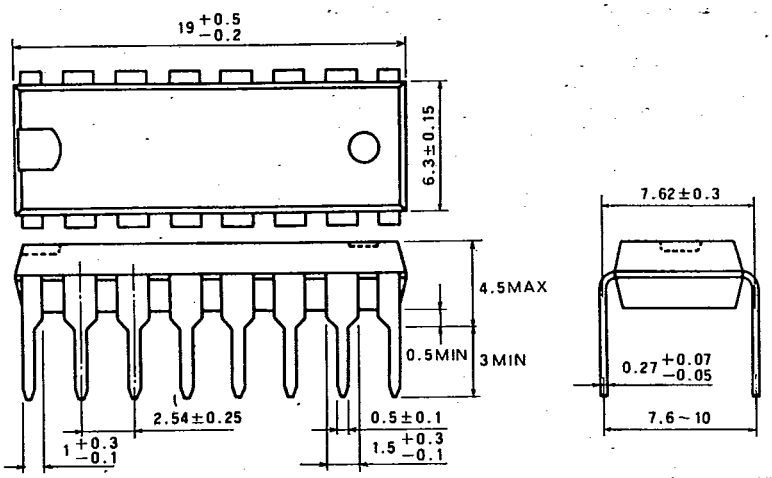
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm