

**DUAL 2-LINE TO 4-LINE DECODER/DEMULTIPLEXER**

**DESCRIPTION**

The M74LS139P is a semiconductor integrated circuit containing two 2-bit 2-line-to-4-line decoders/demultiplexers with separate enable inputs.

**FEATURES**

- Enable inputs provided
- Two circuits completely separate
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ\text{C}$ )

**APPLICATION**

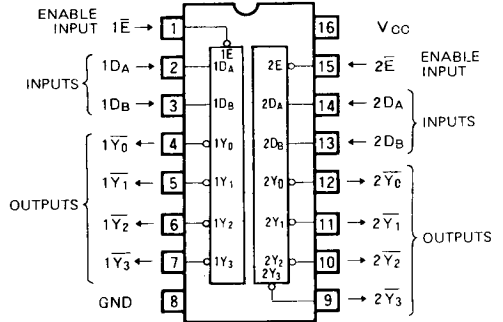
General purpose, for use in industrial and consumer equipment.

**FUNCTIONAL DESCRIPTION**

For use as a decoder, when inputs  $D_A$  and  $D_B$  are specified in 2-bit binary code, the output corresponding to the number among  $\bar{Y}_0 \sim \bar{Y}_3$  is set low and all the other 3 outputs are set high. The enable inputs  $\bar{E}$  are kept low. When inputs  $\bar{E}$  are high, all the outputs are set high irrespective of the status of  $D_A$  and  $D_B$ .

For use as a 1-line-4-line demultiplexer, make inputs  $\bar{E}$  the data inputs and  $D_A$  and  $D_B$  the selection inputs.

**PIN CONFIGURATION (TOP VIEW)**



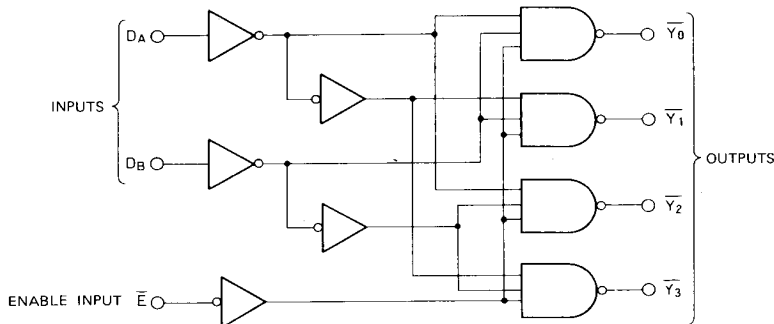
Outline 16P4

**FUNCTION TABLE (Note 1)**

$\bar{E}$	$D_B$	$D_A$	$\bar{Y}_0$	$\bar{Y}_1$	$\bar{Y}_2$	$\bar{Y}_3$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

Note 1: X : Irrelevant

**BLOCK DIAGRAM (EACH DECODER)**



**DUAL 2-LINE TO 4-LINE DECODER/DEMULTIPLEXER**

**ABSOLUTE MAXIMUM RATINGS** ( $T_a = -20 \sim +75^\circ\text{C}$ , 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
$V_O$	Output voltage	High-level state	$-0.5 \sim V_{CC}$	V
$T_{opr}$	Operating free-air ambient temperature range		$-20 \sim +75$	$^\circ\text{C}$
$T_{stg}$	Storage temperature range		$-65 \sim +150$	$^\circ\text{C}$

**RECOMMENDED OPERATING CONDITIONS** ( $T_a = -20 \sim +75^\circ\text{C}$ , 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	$V_{OH} \geq 2.7\text{V}$	0	-400	$\mu\text{A}$
$I_{OL}$	Low-level output current	$V_{OL} \leq 0.4\text{V}$	0	4	mA
		$V_{OL} \leq 0.5\text{V}$	0	8	mA

**ELECTRICAL CHARACTERISTICS** ( $T_a = -20 \sim +75^\circ\text{C}$ , 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	$V_{CC} = 4.75\text{V}$ , $I_{IC} = -18\text{mA}$			-1.5	V
$V_{OH}$	High-level output voltage	$V_{CC} = 4.75\text{V}$ , $V_I = 0.8\text{V}$ $V_I = 2\text{V}$ , $I_{OH} = -400\mu\text{A}$	2.7	3.4		V
$V_{OL}$	Low-level output voltage	$V_{CC} = 4.75\text{V}$		0.25	0.4	V
		$V_I = 0.8\text{V}$ , $V_I = 2\text{V}$		0.35	0.5	V
$I_{IH}$	High-level input current	$V_{CC} = 5.25\text{V}$ , $V_I = 2.7\text{V}$			20	$\mu\text{A}$
		$V_{CC} = 5.25\text{V}$ , $V_I = 10\text{V}$			0.1	mA
$I_{IL}$	Low-level input current	$V_{CC} = 5.25\text{V}$ , $V_I = 0.4\text{V}$			-0.4	mA
$I_{OS}$	Short-circuit output current (Note 2)	$V_{CC} = 5.25\text{V}$ , $V_O = 0\text{V}$	-20		-100	mA
$I_{CC}$	Supply current	$V_{CC} = 5.25\text{V}$ (Note 3)		6.8	11	mA

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

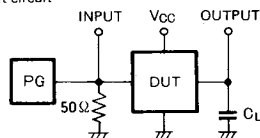
Note 2: All measurements should be done quickly and not more than one output should be shorted at a time.

Note 3:  $I_{CC}$  is measured with the outputs in the enable state.

**SWITCHING CHARACTERISTICS** ( $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , 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 $D_A, D_B$ to outputs $\bar{Y}_0 - \bar{Y}_7$	$C_L = 15\text{pF}$ (Note 4)		8	20	ns
$t_{PHL}$				15	33	ns
$t_{PLH}$				10	29	ns
$t_{PHL}$				15	38	ns
$t_{PLH}$	Low-to-high-level, high-to-low-level output propagation time, from input $\bar{E}$ to outputs $\bar{Y}_0 - \bar{Y}_7$	$C_L = 15\text{pF}$ (Note 4)		8	24	ns
$t_{PHL}$				12	32	ns

Note 4: Measurement circuit



- The pulse generator (PG) has the following characteristics:  
PRR=1MHz,  $t_r=6\text{ns}$ ,  $t_f=6\text{ns}$ ,  $t_w=500\text{ns}$ ,  $V_p=3\text{V}_{p.p.}$ ,  $Z_0=50\Omega$ .
- $C_L$  includes probe and jig capacitance

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

