

# MITSUBISHI LSTTLs M74LS51P

## DUAL 2-WIDE 2-INPUT/3-INPUT AND-OR-INVERT GATE

### DESCRIPTION

The M74LS51P is a semiconductor integrated circuit containing dual 2-wide 2-input/3-input AND-OR-INVERT gates.

### FEATURES

- High breakdown input voltage ( $V_i \geq 15V$ )
- Low power dissipation ( $P_d=5.5mW$  typical)
- High speed ( $t_{pd}=7ns$  typical)
- Low output impedance
- Wide operating temperature range ( $T_a=-20\sim+75^\circ C$ )

### APPLICATION

General purpose, for use in industrial and consumer equipment.

### FUNCTIONAL DESCRIPTION

Schottky TTL technology enables input high breakdown voltage, high speed, low power dissipation and high fan-out.

This device consists of a NOR gate with two 2-input AND gates as the inputs and a NOR gate with two 3-input AND gates as the inputs, and the following logical expressions are yielded:

$$1Y = \overline{1A \cdot 1B \cdot 1C + 1D \cdot 1E \cdot 1F}$$

$$2Y = \overline{2A \cdot 2B + 2C \cdot 2D}$$

### FUNCTION TABLE

M	N	Y
L	L	H
H	L	L
L	H	L
H	H	L

$$M = 1A \cdot 1B \cdot 1C$$

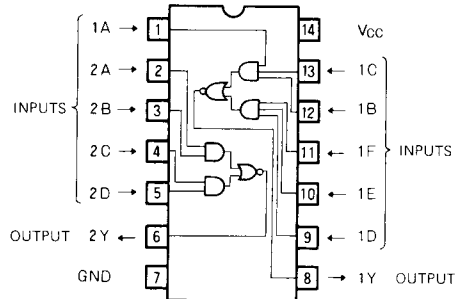
$$N = 1D \cdot 1E \cdot 1F$$

AND-OR

$$M = 2A \cdot 2B$$

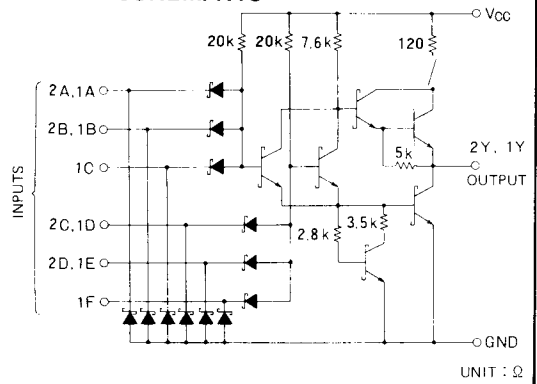
$$N = 2C \cdot 2D$$

### PIN CONFIGURATION (TOP VIEW)



Outline 14P4

### CIRCUIT SCHEMATIC



### ABSOLUTE MAXIMUM RATINGS ( $T_a = -20 \sim +75^\circ C$ , 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		$-20 \sim +75$	$^\circ C$
$T_{stg}$	Storage temperature range		$-65 \sim +150$	$^\circ C$

**DUAL 2-WIDE 2-INPUT/3-INPUT AND-OR-INVERT GATE**

**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	$V_{CC} = 4.75\text{V}$ , $V_I = 0.8\text{V}$ $I_{OH} = -400\mu\text{A}$	2.7	3.4		V	
$V_{OL}$	Low-level output voltage	$V_{CC} = 4.75\text{V}$ $V_I = 2\text{V}$		$I_{OL} = 4\text{mA}$	0.25	0.4	V
				$I_{OL} = 8\text{mA}$	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 1)	$V_{CC} = 5.25\text{V}$ , $V_O = 0\text{V}$	-20			-100	mA
$I_{CCH}$	Supply current, all outputs high	$V_{CC} = 5.25\text{V}$ , $V_I = 0\text{V}$		0.8	1.6	mA	
$I_{CCL}$	Supply current, all outputs low	$V_{CC} = 5.25\text{V}$ , $V_I = 4.5\text{V}$		1.4	2.8	mA	

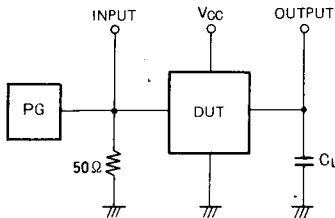
\* : All typical values are at  $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ .

Note 1: All measurements must be done quickly and not more than one output should be shorted at a time.

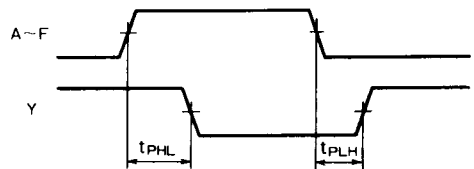
**SWITCHING CHARACTERISTICS** ( $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{PLH}$	Low-to-high-level output propagation time	$C_L = 15\text{pF}$ (Note 2)		6	20	ns
$t_{PHL}$	High-to-low-level output propagation time			8	20	ns

Note 2: Measurement circuit



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

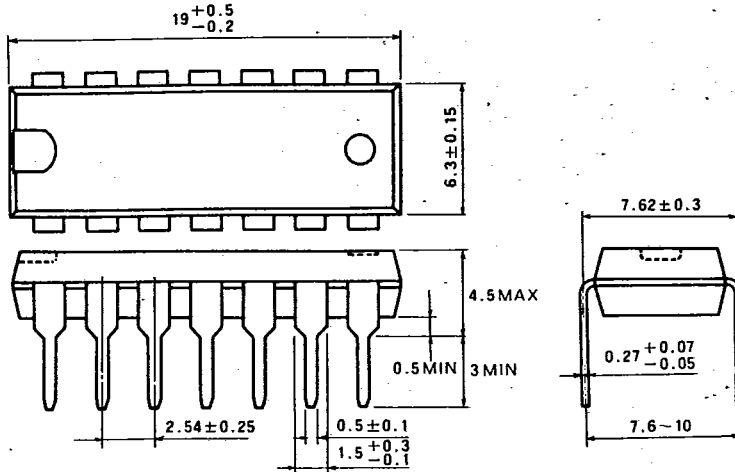


- (1) The pulse generator (PG) has the following characteristics:  
PRR=1MHz,  $t_r=6\text{ns}$ ,  $t_f=6\text{ns}$ ,  $t_w=500\text{ns}$ ,  $V_p = 3V_{p,p}$ ,  $Z_0 = 50\Omega$ .
- (2)  $C_L$  includes probe and jig capacitance.

T-90-20

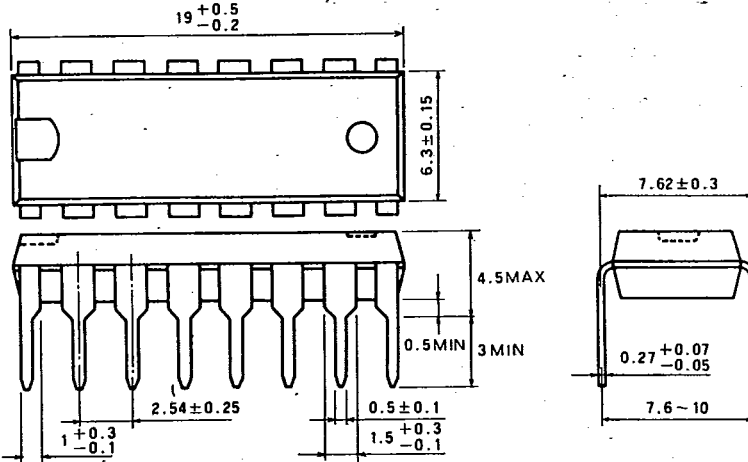
**TYPE 14P4 14-PIN MOLDED PLASTIC DIL**

Dimension in mm



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

Dimension in mm



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

Dimension in mm

