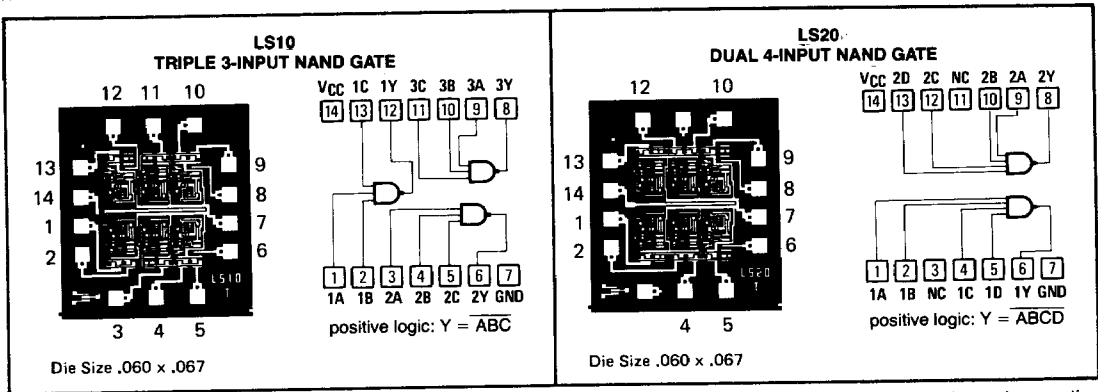
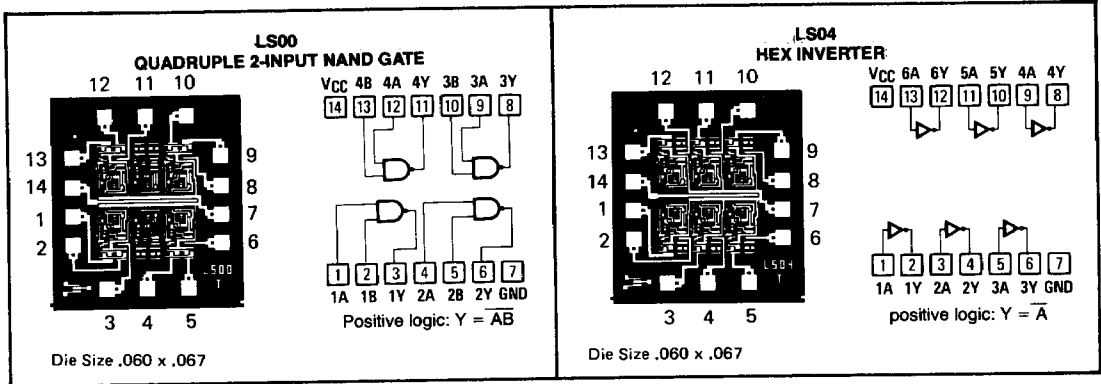
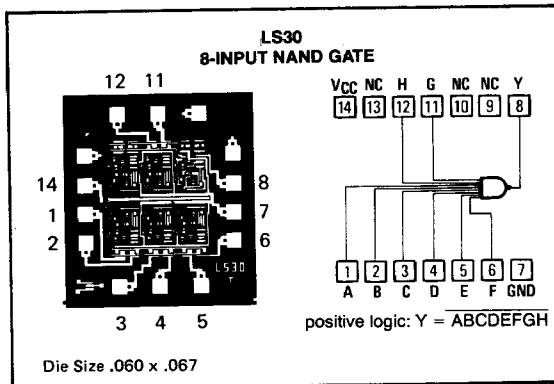


## PIN-OUT AND LOGIC DIAGRAMS



NC — No internal connection



# Positive-NAND Gates, Hex Inverters

## Recommended Operating Conditions

	9LS/54LS			9LS/74LS			Unit
	Min	Nom	Max	Min	Nom	Max	
Supply voltage, $V_{CC}$	4.5	5	5.5	4.75	5	5.25	V
Normalized fan-out from each output, N	High logic level		20			20	
	Low logic level		10			20	
Operating free-air temperature, $T_A$	-55		125	0		70	°C

## Electrical Characteristics Over Recommended Free-Air Temperature Range (Unless Otherwise Noted)

Parameter	Test Conditions*	9LS/54LS			9LS/74LS			Unit
		Min	Typ**	Max	Min	Typ**	Max	
$V_{IH}$		2			2			V
$V_{IL}$				0.7			0.8	V
$V_I$	$V_{CC}=\text{MIN}, I_I=-18\text{mA}$			-1.5			-1.5	V
$V_{OH}$	$V_{CC}=\text{MIN}, V_{IL}=V_{IL\text{max}}, I_{OH}=-400\mu\text{A}, V_{IL}=0.7\text{V}$	2.5	3.4		2.7	3.4		V
$V_{OL}$	$V_{CC}=\text{MIN}, V_{IH}=2\text{V}$	$I_{OL}=4\text{mA}$		0.25	0.4	0.25	0.4	V
		$I_{OL}=8\text{mA}$				0.3	0.45	V
$I_I$	$V_{CC}=\text{MAX}, V_I=7.0\text{V}$			0.1		0.1	mA	
$I_{IH}$	$V_{CC}=\text{MAX}, V_I=2.7\text{V}$			20		20	$\mu\text{A}$	
$I_{IL}$	$V_{CC}=\text{MAX}, V_I=0.4\text{V}$			-0.4		-0.4	mA	
$I_{OS}$	$V_{CC}=\text{MAX}$	-15		-100	-15	-100	mA	
$I_{CCH}$	$V_{CC}=\text{MAX}$ , All inputs at 0V (Per Gate)	LS00,04,10,20	0.2	0.4	0.2	0.4	mA	
		LS30	0.35	0.5	0.35	0.5	mA	
$I_{CCL}$	$V_{CC}=\text{MAX}$ , All inputs at 4.5 (Per Gate)		0.6	1.1	0.6	1.1	mA	

\*For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.

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

†Not more than one output should be shorted at a time.

## Switching Characteristics, $V_{CC} = 5\text{V}$ Over Recommended Free-Air Temperature Range

Parameter		-55°C			+25°C			+125°C			Unit	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
Test Conditions: $C_L = 15\text{pF}, R_L = 2\text{k}\Omega$ (See Fig. A, page 2-174)												
$t_{PLH}$	LS00,04,10,20		6	12	3.0	5.0	10		7	12	ns	
		LS30		7	11	4.0	6	11		9		15
$t_{PHL}$	LS00,04,10,20		9	15	3.0	5.0	10		8	14	ns	
		LS20		10	16	4.0	8.0	12		10		16
		LS30		18	25	6.0	15	20		10		17
Test Conditions: $C_L = 50\text{pF}, R_L = 2\text{k}\Omega$ (See Fig. A, page 2-174)												
$t_{PLH}$	LS00,04,10,20		9	15		9	15		10	16	ns	
		LS30		8	13		8	13		12		18
$t_{PHL}$	LS00,04,10,20		11	17		10	16		10	16	ns	
		LS20		12	16		12	16		12		18
		LS30		27	35		21	28		16		23

Note: AC specification shown under  $-55^\circ\text{C}$  and  $+125^\circ\text{C}$  are for 9LS devices only. All 50pF specifications are for 9LS devices only.