

## 54LS20, 54S20 Gates

Dual Four-Input NAND Gates

Product Specification

Military Logic Products

### FUNCTION TABLE

INPUTS				OUTPUT
A	B	C	D	Y
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H
H	H	H	H	L

H = High voltage level  
L = Low voltage level  
X = Don't care

### ORDERING INFORMATION

DESCRIPTION	ORDER CODE
Ceramic DIP	54LS20/BCA, 54S20/BCA
Ceramic Flat Pack	54LS20/BDA, 54S20/BDA
Ceramic LLCC	54LS20/B2A, 54S20/B2A

### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

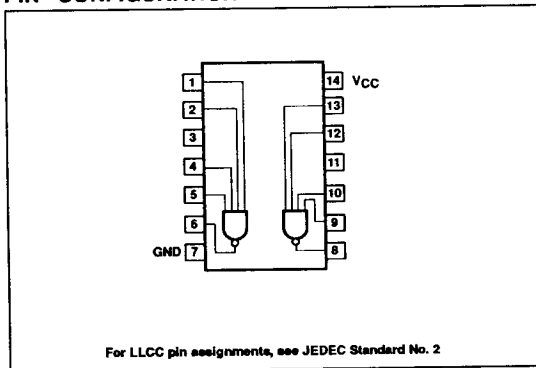
PINS	DESCRIPTION	54S	54LS
A - D	Inputs	1SUL	1LSUL
Y	Output	10SUL	10LSUL

NOTE: Where a 54S Unit Load (SUL) is  $50\mu\text{A } I_{IH}$  and  $-2.0\text{mA } I_{IL}$ , and a 54LS Unit Load (LSUL) is  $20\mu\text{A } I_{IH}$  and  $-0.4\text{mA } I_{IL}$ .

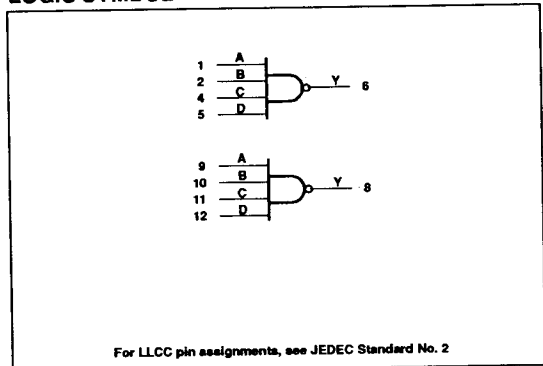
### ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	54LS	54S	UNIT
$V_{CC}$	Supply voltage	7.0	7.0	V
$V_I$	Input voltage range	-0.5 to +7.0	-0.5 to +5.5	V
$I_I$	Input current range	-30 to +1	-30 to +5	mA
$V_O$	Voltage applied to output in High output state range	-0.5 to $+V_{CC}$	-0.5 to $+V_{CC}$	V
$T_{STG}$	Storage temperature range	-65 to +150	-65 to +150	$^{\circ}\text{C}$

### PIN CONFIGURATION



### LOGIC SYMBOL



## Gates

## 54LS20, 54S20

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	54LS			54S			UNIT
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage	2.0			2.0			V
V <sub>IL</sub>	Low-level input voltage			+0.7			+0.8	V
			+125°C	+0.7			+0.7	V
I <sub>IK</sub>	Input clamp current			-18			-18	mA
I <sub>OH</sub>	High-level output current			-400			-1000	μA
I <sub>OL</sub>	Low-level output current			4			20	mA
T <sub>A</sub>	Operating free-air temperature range	-55		+125	-55		+125	°C

## DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	54LS20			54S20			UNIT
			Min	Typ <sup>2</sup>	Max	Min	Typ <sup>2</sup>	Max	
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = Min, V <sub>IL</sub> = Max, V <sub>IH</sub> = Min, I <sub>OH</sub> = Max	2.5	3.4		2.5	3.4		V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = Min, V <sub>IH</sub> = Min, V <sub>IL</sub> = Max, I <sub>OL</sub> = Max		0.25	0.4			0.5	V
			+125°C			0.4			0.4
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = I <sub>IK</sub>			-1.5			-1.2	V
I <sub>IH2</sub>	Input current at maximum input voltage	V <sub>CC</sub> = Max	V <sub>I</sub> = 5.5V					1.0	mA
			V <sub>I</sub> = 7.0V			0.1			
I <sub>IH1</sub>	High-level input current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			20			50	μA
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = Max	V <sub>I</sub> = 0.4V		-0.4				mA
			V <sub>I</sub> = 0.5V					-2.0	mA
I <sub>OS</sub>	Short-circuit output current <sup>3</sup>	V <sub>CC</sub> = Max	-20		-100	-40		-110	mA
I <sub>CC</sub>	Supply current (total)	V <sub>CC</sub> = Max	I <sub>CCH</sub> Outputs High	0.4	0.8		5	8	mA
			I <sub>CCL</sub> Outputs Low	1.2	2.2		10	18	mA

AC ELECTRICAL CHARACTERISTICS T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0V<sup>4</sup>

SYMBOL	PARAMETER	TEST CONDITIONS	54LS		54S		UNIT
			C <sub>L</sub> = 15pF		C <sub>L</sub> = 15pF		
			Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay	Waveform 1		15		4.5	ns
				15		5.0	ns

AC ELECTRICAL CHARACTERISTICS T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0V

SYMBOL	PARAMETER	TEST CONDITIONS	54LS		54S		UNIT
			C <sub>L</sub> = 50pF		C <sub>L</sub> = 50pF		
			Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay	Waveform 1		20		7.0	ns
				20		7.5	ns

# Gates

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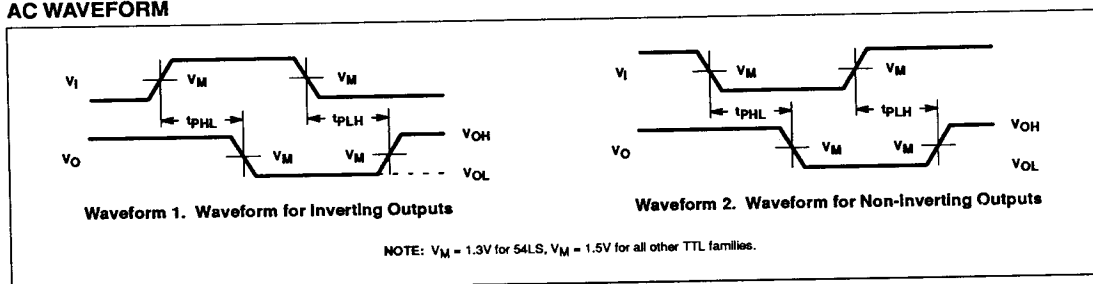
### AC ELECTRICAL CHARACTERISTICS $T_A = -55^\circ\text{C}$ and $+125^\circ\text{C}$ , $V_{CC} = 5.0\text{V}^4$

SYMBOL	PARAMETER	TEST CONDITIONS	54LS		54S		UNIT
			$C_L = 50\text{pF}$		$C_L = 50\text{pF}$		
			Min	Max	Min	Max	
$t_{PLH}$ $t_{PHL}$	Propagation delay	Waveform 1		26 26	9.0 9.0	ns ns	

**NOTES:**

- For conditions shown as Min or Max, use the appropriate value specified under recommended operating conditions for the applicable type and function table operating mode.
- 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 and duration of the short circuit should not exceed one second.
- These parameters are guaranteed, but not tested.

### AC WAVEFORM



### TEST CIRCUIT AND WAVEFORM

