

T-43-21

**KS54HCTLS 00**  
**KS74HCTLS**

**Quad 2-Input NAND Gates**

**FEATURES**

- Function, pin-out, speed and drive compatibility with 54/74LS logic family
- Low power consumption characteristic of CMOS
- High-Drive-Current outputs:  
 $I_{OL} = 8mA @ V_{OL} = 0.5V$
- Inputs and outputs interface directly with TTL, NMOS and CMOS devices
- Wide operating voltage range: 4.5V to 5.5V
- Characterized for operation over industrial and military temperature ranges:  
KS74HCTLS:  $-40^{\circ}C$  to  $+85^{\circ}C$   
KS54HCTLS:  $-55^{\circ}C$  to  $+125^{\circ}C$
- Package options include plastic "small outline" packages, standard plastic and ceramic 300-mil DIPs

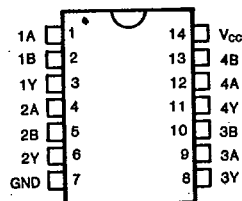
**DESCRIPTION**

These devices contain four independent 2-input NAND gates that perform the Boolean functions  $Y = \overline{A \cdot B}$  or  $Y = \overline{A + B}$ .

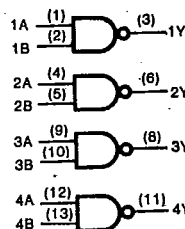
These devices provide speeds and drive capability equivalent to their LSTTL counterparts and yet maintain CMOS power levels. The input and output voltage levels allow direct interface with TTL, NMOS and CMOS devices without any external components.

All inputs and outputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

**PIN CONFIGURATION**



**LOGIC DIAGRAM**



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**FUNCTION TABLE**

(Each Gate)

Inputs		Output
A	B	Y
H	H	L
L	X	H
X	L	H



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**Quad 2-Input NAND Gates**

**Absolute Maximum Ratings\***

Supply Voltage Range  $V_{CC}$  . . . . .  $-0.5V$  to  $+7V$   
 DC Input Diode Current,  $I_{IK}$   
 ( $V_I < -0.5V$  or  $V_I > V_{CC} + 0.5V$ ) . . . . .  $\pm 20$  mA  
 DC Output Diode Current,  $I_{OK}$   
 ( $V_O < -0.5V$  or  $V_O > V_{CC} + 0.5V$ ) . . . . .  $\pm 20$  mA  
 Continuous Output Current Per Pin,  $I_O$   
 ( $-0.5V < V_O < V_{CC} + 0.5V$ ) . . . . .  $\pm 35$  mA  
 Continuous Current Through  
 $V_{CC}$  or GND pins . . . . .  $\pm 125$  mA  
 Storage Temperature Range,  $T_{stg}$  . . . . .  $-65^\circ C$  to  $+150^\circ C$   
 Power Dissipation Per Package,  $P_d$ † . . . . . 500 mW

\* Absolute Maximum Ratings are those values beyond which permanent damage to the device may occur. These are stress ratings only and functional operation of the device at or beyond them is not implied. Long exposure to these conditions may affect device reliability.

† Power Dissipation temperature derating:  
 Plastic Package (N):  $-12mW/^\circ C$  from  $65^\circ C$  to  $85^\circ C$   
 Ceramic Package (J):  $-12mW/^\circ C$  from  $100^\circ C$  to  $125^\circ C$

**Recommended Operating Conditions**

Supply Voltage,  $V_{CC}$  . . . . . 4.5V to 5.5V  
 DC Input & Output Voltages\*,  $V_{IN}, V_{OUT}$  . . 0V to  $V_{CC}$   
 Operating Temperature  
 Range KS74HCTLS:  $-40^\circ C$  to  $+85^\circ C$   
 KS54HCTLS:  $-55^\circ C$  to  $+125^\circ C$   
 Input Rise & Fall Times,  $t_r, t_f$  . . . . . Max 500 ns  
 \* Unused inputs must always be tied to an appropriate logic voltage level (either  $V_{CC}$  or GND)

**DC ELECTRICAL CHARACTERISTICS** ( $V_{CC}=5V \pm 10\%$  Unless Otherwise Specified)

Characteristic	Symbol	Test Conditions	$T_a = 25^\circ C$			Unit	
			Typ	KS74HCTLS $T_a = -40^\circ C$ to $+85^\circ C$	KS54HCTLS $T_a = -55^\circ C$ to $+125^\circ C$		
Minimum High-Level Input Voltage	$V_{IH}$		2.0	2.0	2.0	V	
Maximum Low-Level Input Voltage	$V_{IL}$		0.8	0.8	0.8	V	
Minimum High-Level Output Voltage	$V_{OH}$	$V_{IN}=V_{IH}$ or $V_{IL}$ $I_O = -20\mu A$ $I_O = -4mA$	$V_{CC}$ 4.2	$V_{CC} - 0.1$ 3.98	$V_{CC} - 0.1$ 3.84	$V_{CC} - 0.1$ 3.7	V
Maximum Low-Level Output Voltage	$V_{OL}$	$V_{IN}=V_{IH}$ or $V_{IL}$ $I_O = 20\mu A$ $I_O = 4mA$ $I_O = 8mA$	0	0.1 0.26 0.39	0.1 0.33 0.5	0.1 0.4	V
Maximum Input Current	$I_{IN}$	$V_{IN}=V_{CC}$ or GND		$\pm 0.1$	$\pm 1.0$	$\pm 1.0$	$\mu A$
Maximum Quiescent Supply Current	$I_{CC}$	$V_{IN}=V_{CC}$ or GND $I_{OUT}=0\mu A$		2.0	20.0	40.0	$\mu A$
Additional Worst Case Supply Current	$\Delta I_{CC}$	per input pin $V_I = 2.4V$ other inputs: at $V_{CC}$ or GND $I_{OUT}=0\mu A$		2.7	2.9	3.0	mA

**AC ELECTRICAL CHARACTERISTICS** (Input  $t_r, t_f \leq 6$  ns), HCTLS00

Characteristic	Symbol	Conditions†	$T_a = 25^\circ C$ $V_{CC} = 5.0V$			Unit	
			Typ	KS74HCTLS $T_a = -40^\circ C$ to $+85^\circ C$ $V_{CC} = 5.0V \pm 10\%$	KS54HCTLS $T_a = -55^\circ C$ to $+125^\circ C$ $V_{CC} = 5.0V \pm 10\%$		
Maximum Propagation Delay	$t_{PLH}$	$C_L = 50pF$	10	15	18	22	ns
	$t_{PHL}$		10	15	18	22	
Maximum Input Capacitance	$C_{IN}$		5			pF	
Power Dissipation Capacitance*	$C_{PD}$	(per gate)	15			pF	

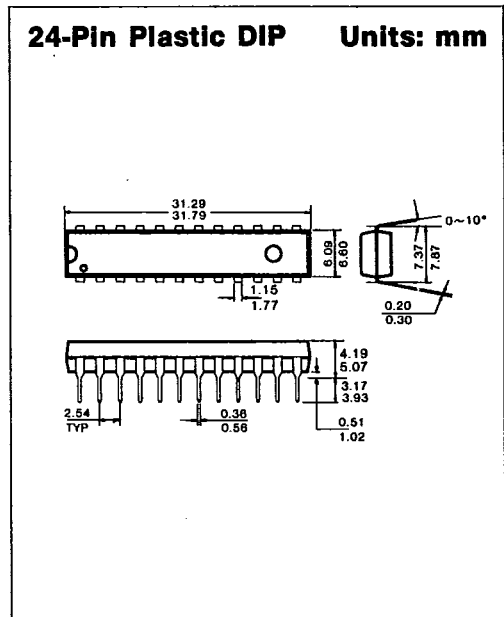
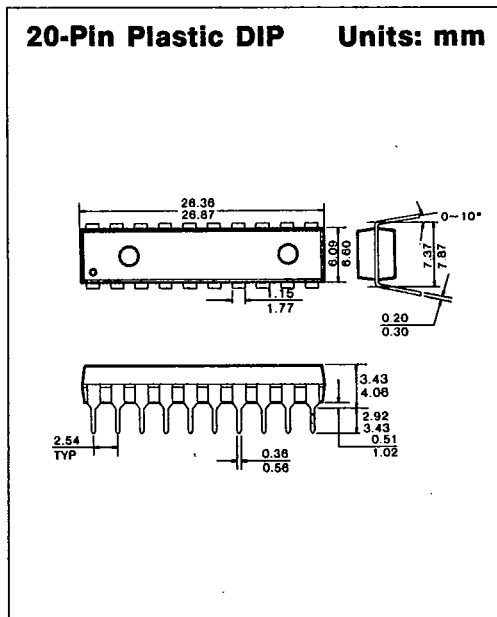
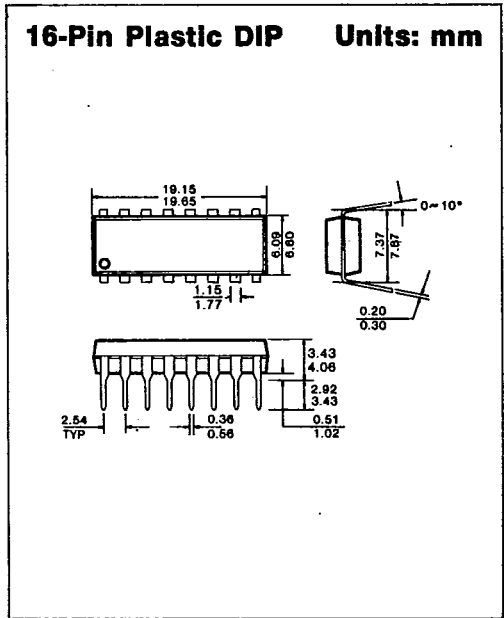
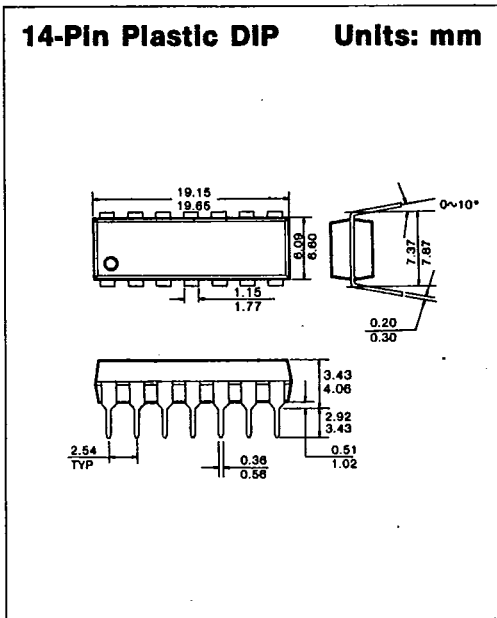
\*  $C_{PD}$  determines the no-load dynamic power dissipation:  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ .

† For AC switching test circuits and timing waveforms see section 2.

**PACKAGE DIMENSIONS**

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**1. PLASTIC PACKAGES**



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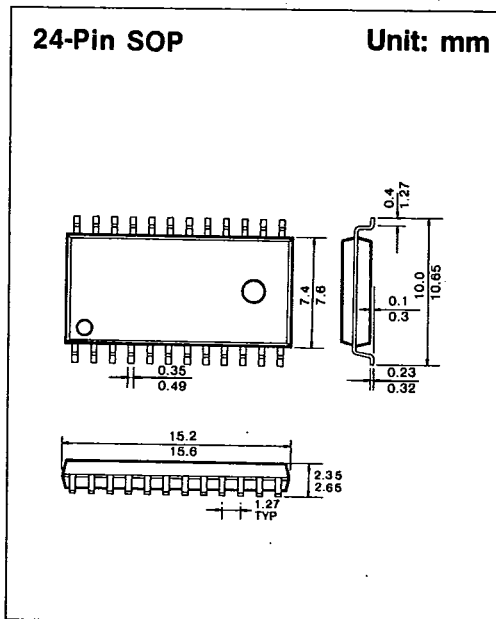
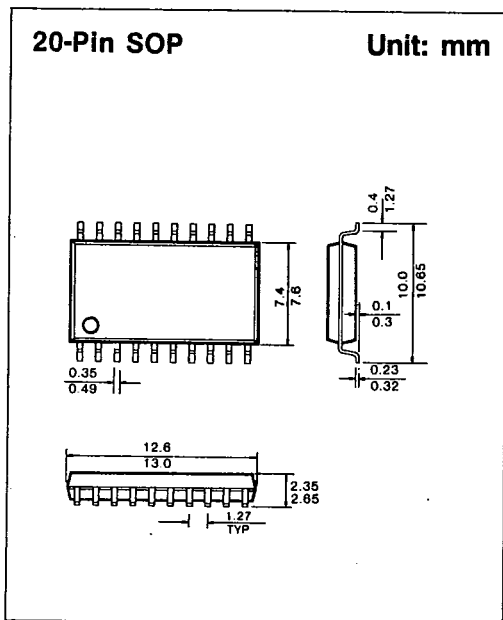
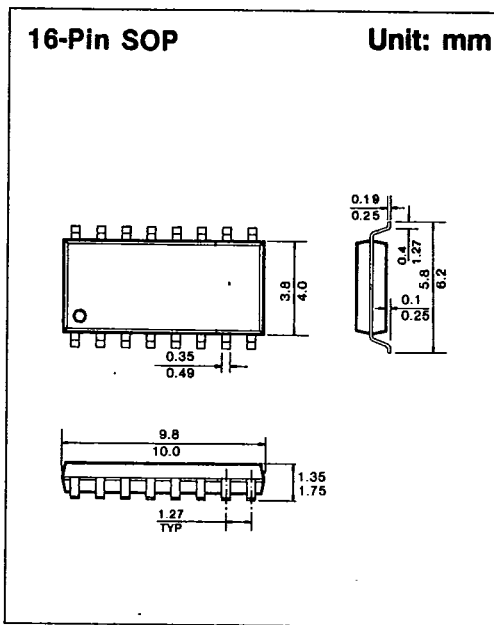
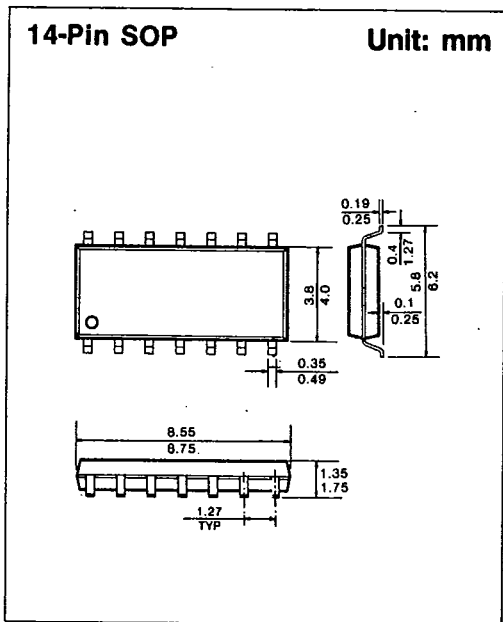
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**PACKAGE DIMENSIONS**

T-90-20



**PACKAGE DIMENSIONS**

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**2. CERAMIC PACKAGES**

**14-Pin Ceramic DIP Units: mm**

Dim	Millimeters	
	Min	Max
A	—	5.08
B	0.38	0.58
B <sub>1</sub>	1.40	1.78
C	0.20	0.38
D	18.16	19.56
E	8.10	7.49
E <sub>1</sub>	7.82	10.03
F	2.54	
L	3.18	4.19
Q	0.51	1.02
S	1.91	2.29

**16-Pin Ceramic DIP Units: mm**

Dim	Millimeters	
	Min	Max
A	—	5.08
B	0.38	0.58
B <sub>1</sub>	1.40	1.78
C	0.20	0.38
D	19.05	19.94
E	8.10	7.49
E <sub>1</sub>	7.82	10.03
F	2.54	
L	3.18	4.19
Q	0.51	1.02
S	0.51	1.14

**20-Pin Ceramic DIP Units: mm**

Dim	Millimeters	
	Min	Max
A	4.06	5.08
B	0.38	0.53
B <sub>1</sub>	1.14	1.52
C	0.20	0.38
D	25.78	26.33
E	8.10	8.60
E <sub>1</sub>	7.77	7.95
F	2.54	
L	3.73	4.01
Q	0.38	0.89
S	0.51	1.14

**24-Pin Ceramic DIP Units: mm**

Dim	Millimeters	
	Min	Max
A	4.06	5.08
B	0.38	0.53
B <sub>1</sub>	1.14	1.52
C	0.20	0.38
D	31.50	32.84
E	7.24	7.75
E <sub>1</sub>	7.77	7.98
F	2.54	
L	3.73	4.01
Q	0.508	1.776
S	1.85	1.93

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