9002 • 9003 • 9004
9007 • 9012
9016 • 9017

NAND GATES/HEX INVERTERS

DESCRIPTION — The 9002, 9003, 9004, 9007, and 9012 are active LOW level output AND gates commonly know as NAND gates. The 9016 and 9017 are hex inverters with input and output characteristics identical to a NAND gate.

ORDERING CODE: See Section 9

PKGS	PIN OUT	COMMERCIAL GRADE V_{CC} = +5.0 V ±5%, T_A = 0°C to +75°C	MILITARY GRADE V_{CC} = +5.0 V ±10%, T_A = -55°C to +125°C	PKG TYPE
Ceramic DIP (D)	A	9002DC, 9012DC	9002DM, 9012DM	6A
	B	9003DC	9003DM	
	C	9004DC	9004DM	
	D	9007DC	9007DM	
	E	9016DC, 9017DC	9016DM, 9017DM	
Flatpak (F)	A	9002FC, 9012FC	9002FM, 9012FM	3I
	B	9003FC	9003FM	
	C	9004FC	9004FM	
	D	9007FC	9007FM	
	E	9016FC, 9017FC	9016FM, 9017FM	

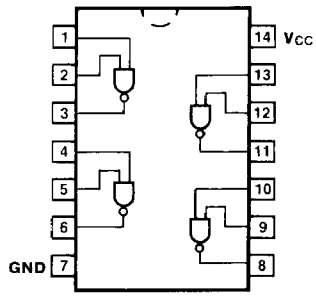
INPUT LOADING/FAN-OUT: See Section 3 for U.L. definitions

PINS	9XXX (U.L.) HIGH/LOW
Inputs	1.5/1.0
Outputs	30*/8.8

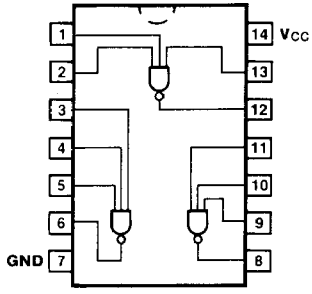
*9012 and 9017 have open-collector outputs

CONNECTION DIAGRAMS

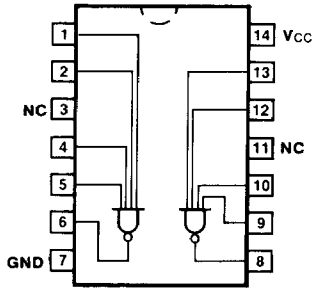
PINOUT A



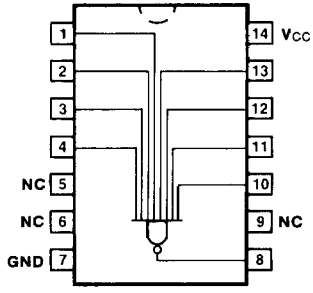
PINOUT B



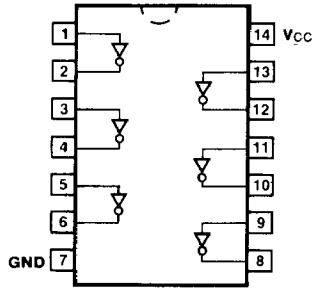
PINOUT C



PINOUT D



PINOUT E



DC AND AC CHARACTERISTICS OVER COMMERCIAL TEMPERATURE RANGE: V_{CC} = +5.0 V ±5%

SYMBOL	PARAMETER		0°C Min	0°C Max	25°C Min	25°C Max	75°C Min	75°C Max	UNITS	CONDITIONS
V_{IH}	Input HIGH Voltage		1.9		1.8		1.6		V	Guaranteed Input HIGH Threshold
V_{IL}	Input LOW Voltage			0.85		0.85		0.85	V	Guaranteed Input LOW Threshold
V_{OH}	Output HIGH Voltage (except 9012, 9017)		2.4		2.4		2.4		V	V_{CC} = 4.75 V, I_{OH} = -1.2 mA, Inputs at V_{IL}
V_{OL}	Output LOW Voltage			0.45		0.45		0.45	V	V_{CC} = 5.25 V, I_{OL} = 16 mA, V_{IN} = 5.25 V
				0.45		0.45		0.45		V_{CC} = 4.75 V, I_{OL} = 14.1 mA, Inputs at V_{IH}
I_{IH}	Input HIGH Current					60		60	µA	V_{CC} = 5.25 V, V_{IN} = 4.5 V Gnd on Other Inputs
I_{IL}	Input LOW Current			-1.6		-1.6		-1.6	mA	V_{CC} = 5.25 V V_{IN} = 0.45 V, 5.25 V on Other Inputs
				-1.41		-1.41		-1.41		V_{CC} = 4.75 V V_{IN} = 0.45 V, 5.25 V on Other Inputs
I_{OH}	Output HIGH Current 9012, 9017					250		250	µA	V_{CC} = 4.75 V, V_{IN} = V_{IL}, V_{OUT} = 5.5 V
I_{CC}	Power Supply Current, each gate	ON		6.1		6.1		6.1	mA	V_{IN} = Open
		OFF		1.7		1.7		1.7		V_{IN} = Gnd
t_{PLH}	Propagation Delay Input to Output				3.0	13			ns	C_L = 15 pF, Fig. 3-4
		9012, 9017			3.0	45				R_L = 4.0 kΩ C_L = 15 pF, Fig. 3-4
t_{PHL}	Propagation Delay Input to Output				3.0	15			ns	C_L = 15 pF, Fig. 3-4
		9012, 9017			3.0	15				R_L = 400 Ω C_L = 15 pF, Fig. 3-4

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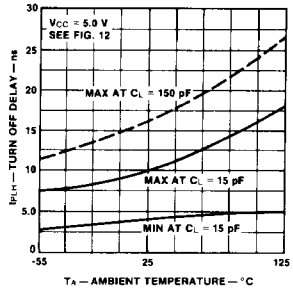
DC AND AC CHARACTERISITICS OVER MILITARY TEMPERATURE RANGE: V_{CC} = +5.0 V ±10%

SYMBOL	PARAMETER		-55°C Min	-55°C Max	25°C Min	25°C Max	125°C Min	125°C Max	UNITS	CONDITIONS
V_{IH}	Input HIGH Voltage		2.0		1.7		1.4		V	Guaranteed Input HIGH Threshold
V_{IL}	Input LOW Voltage			0.8		0.9		0.8	V	Guaranteed Input LOW Threshold
V_{OH}	Output HIGH Voltage (except 9012, 9017)		2.4		2.4		2.4		V	V_{CC} = 4.5 V, I_{OH} = -1.32 mA, Inputs at V_{IL}
V_{OL}	Output LOW Voltage			0.4		0.4		0.4	V	V_{CC} = 5.5 V, I_{OL} = 17.6 mA, V_{IN} = 5.5 V
				0.4		0.4		0.4		V_{CC} = 4.5 V, I_{OL} = 13.6 mA, Inputs at V_{IH}
I_{IH}	Input HIGH Current					60		60	µA	V_{CC} = 5.5 V, V_{IN} = 4.5 V Gnd on Other Inputs
I_{IL}	Input LOW Current			-1.6		-1.6		-1.6	mA	V_{CC} = 5.5 V, V_{IN} = 0.4 V 5.5 V on Other Inputs
				-1.24		-1.24		-1.24		V_{CC} = 4.5 V, V_{IN} = 0.4 V 5.5 V on Other Inputs
I_{OH}	Output HIGH Current 9012, 9017					250		250	µA	V_{CC} = 4.5, V_{IN} = V_{IL}, V_{OUT} = 5.5 V
I_{CC}	Power Supply Current, each gate	ON		5.5		5.5		5.5	mA	V_{IN} = Open
		OFF		1.6		1.6		1.6		V_{IN} = Gnd
t_{PLH}	Propagation Delay Input to Output				3.0	10			ns	C_L = 15 pF, Fig. 3-4
		9012, 9017			3.0	45				R_L = 4.0 kΩ, C_L = 15 pF, Fig. 3-4
t_{PHL}	Propagation Delay Input to Output				3.0	12			ns	C_L = 15 pF, Fig. 3-4
		9012,9017			3.0	15				R_L = 400 Ω, C_L = 15 pF, Fig. 3-4

WORST CASE TURN OFF DELAY VERSUS AMBIENT TEMPERATURE



WORST CASE TURN ON DELAY VERSUS AMBIENT TEMPERATURE