

# 9XXX Series

*011065*  
**9002 • 9003 • 9004**  
*010116* **9007 • 9012** *011580*  
*010560* **9016 • 9017** *010566*

## NAND GATES/HEX INVERTERS

**DESCRIPTION** — The 9002, 9003, 9004, 9007, and 9012 are active LOW level output AND gates commonly known 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

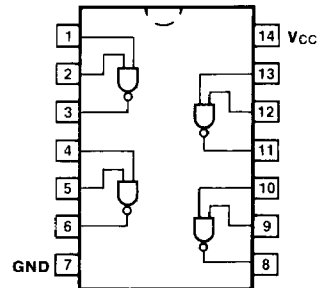
PKGS	PIN OUT	COMMERCIAL GRADE	MILITARY GRADE	PKG TYPE
		V <sub>CC</sub> = +5.0 V ±5%, T <sub>A</sub> = 0°C to +75°C	V <sub>CC</sub> = +5.0 V ±10%, T <sub>A</sub> = -55°C to +125°C	
Ceramic DIP (D)	A	9002DC, 9012DC	9002DM, 9012DM	6A
	B	9003DC	9003DM	
	C	9004DC	9004DM	
	D	9007DC	9007DM	
	E	9016DC, 9017DC	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

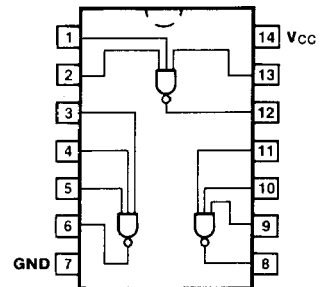
PINS	9XXX (U.L.) HIGH/LOW
Inputs	1.5/1.0
Outputs	30*/8.8

\*9012 and 9017 have open-collector outputs

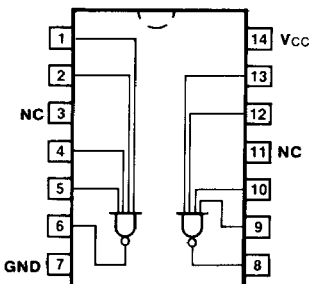
### CONNECTION DIAGRAMS PINOUT A



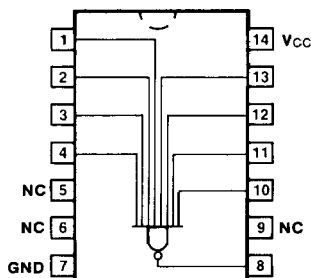
### PINOUT B



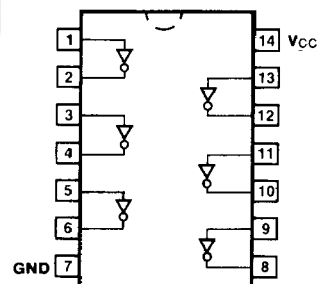
### PINOUT C



### PINOUT D



### PINOUT E



# 9XXX Series

## DC AND AC CHARACTERISTICS OVER COMMERCIAL TEMPERATURE RANGE: $V_{CC} = +5.0 \text{ V} \pm 5\%$

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

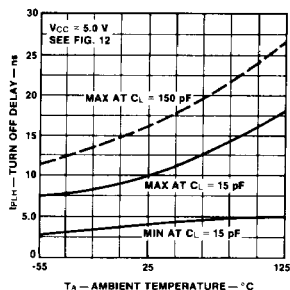
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# 9XXX Series

## DC AND AC CHARACTERISTICS OVER MILITARY TEMPERATURE RANGE: $V_{CC} = +5.0 \text{ V} \pm 10\%$

SYMBOL	PARAMETER	-55°C		25°C		125°C		UNITS	CONDITIONS
		Min	Max	Min	Max	Min	Max		
$V_{IH}$	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	$V_{CC} = 4.5 \text{ V}$ , $I_{OH} = -1.32 \text{ mA}$ , Inputs at $V_{IL}$
$V_{OL}$	Output LOW Voltage		0.4		0.4		0.4	V	$V_{CC} = 5.5 \text{ V}$ , $I_{OL} = 17.6 \text{ mA}$ , $V_{IN} = 5.5 \text{ V}$
			0.4		0.4		0.4		$V_{CC} = 4.5 \text{ V}$ , $I_{OL} = 13.6 \text{ mA}$ , Inputs at $V_{IH}$
$I_{IH}$	Input HIGH Current			60		60		$\mu\text{A}$	$V_{CC} = 5.5 \text{ V}$ , $V_{IN} = 4.5 \text{ V}$ Gnd on Other Inputs
$I_{IL}$	Input LOW Current		-1.6		-1.6		-1.6	mA	$V_{CC} = 5.5 \text{ V}$ $V_{IN} = 0.4 \text{ V}$ 5.5 V on Other Inputs
			-1.24		-1.24		-1.24		$V_{CC} = 4.5 \text{ V}$ $V_{IN} = 0.4 \text{ V}$ 5.5 V on Other Inputs
$I_{OH}$	Output HIGH Current 9012, 9017			250		250		$\mu\text{A}$	$V_{CC} = 4.5$ , $V_{IN} = V_{IL}$ $V_{OUT} = 5.5 \text{ V}$
$I_{CC}$	Power Supply Current, each gate	ON	5.5	5.5	5.5	5.5		mA	$V_{IN} = \text{Open}$
		OFF	1.6	1.6	1.6	1.6			$V_{IN} = \text{Gnd}$
$t_{PLH}$	Propagation Delay Input to Output	9012, 9017		3.0	10			ns	$C_L = 15 \text{ pF}$ , Fig. 3-4 $R_L = 4.0 \text{ k}\Omega$ $C_L = 15 \text{ pF}$ , Fig. 3-4
				3.0	45				
$t_{PHL}$	Propagation Delay Input to Output	9012, 9017		3.0	12			ns	$C_L = 15 \text{ pF}$ , Fig. 3-4 $R_L = 400 \Omega$ $C_L = 15 \text{ pF}$ , Fig. 3-4
				3.0	15				

**WORST CASE TURN OFF DELAY  
VERSUS  
AMBIENT TEMPERATURE**



**WORST CASE TURN ON DELAY  
VERSUS  
AMBIENT TEMPERATURE**

