

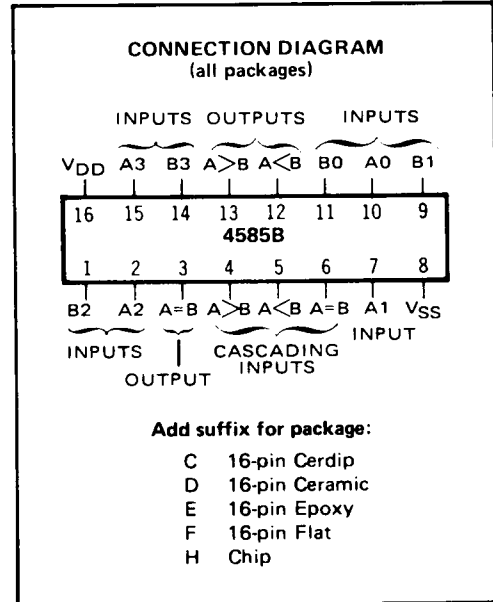
# CMOS 4-BIT MAGNITUDE COMPARATOR

**FEATURES**

- ◆ Binary or BCD Comparison
- ◆ Expandable
- ◆  $A < B$ ,  $A = B$ ,  $A > B$  Outputs Available

**DESCRIPTION**

This 4-Bit Magnitude Comparator performs comparison of straight binary and straight BCD (8-4-2-1) codes. Three decisions about two 4-bit words (A, B) are made and are externally available at three outputs. These devices are fully expandable to any number of bits without external gates. Words of greater length may be compared by connecting comparators in cascade. The  $A < B$  and  $A = B$  outputs of a stage handling less-significant bits are connected to the corresponding  $A < B$  and  $A = B$  inputs of the next stage handling more-significant bits. The  $A > B$  cascading input is connected to a high level. The stage handling the least-significant bits must have a high-level voltage applied to the  $A = B$  and  $A > B$  inputs. An alternate method of cascading which reduces the comparison time is shown under Applications Information.



**RECOMMENDED OPERATING CONDITIONS**

For maximum reliability:

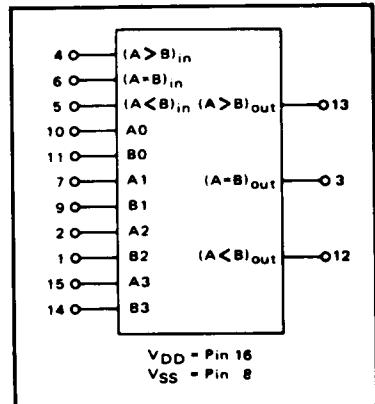
DC Supply Voltage	$V_{DD} - V_{SS}$	3 to 15	Vdc
Operating Temperature	$T_A$	-55 to +125	°C
	C, D, F, H Device	-40 to +85	°C
	E Device		

**TRUTH TABLE**

Inputs				Cascading			Outputs		
Comparing				$A < B$	$A = B$	$A > B$	$A < B$	$A = B$	$A > B$
A3, B3	A2, B2	A1, B1	A0, B0	$A < B$	$A = B$	$A > B$	$A < B$	$A = B$	$A > B$
$A3 > B3$	X	X	X	X	X	1	0	0	1
$A3 = B3$	$A2 > B2$	X	X	X	X	1	0	0	1
$A3 = B3$	$A2 = B2$	$A1 > B1$	X	X	X	1	0	0	1
$A3 = B3$	$A2 = B2$	$A1 = B1$	$A0 > B0$	X	X	1	0	0	1
$A3 = B3$	$A2 = B2$	$A1 = B1$	$A0 = B0$	0	0	1	0	0	1
$A3 = B3$	$A2 = B2$	$A1 = B1$	$A0 = B0$	0	1	X	0	1	0
$A3 = B3$	$A2 = B2$	$A1 = B1$	$A0 = B0$	1	0	X	1	0	0
$A3 = B3$	$A2 = B2$	$A1 = B1$	$A0 < B0$	X	X	X	1	0	0
$A3 = B3$	$A2 = B2$	X	X	X	X	X	1	0	0
$A3 = B3$	$A2 < B2$	X	X	X	X	X	1	0	0
$A3 < B3$	X	X	X	X	X	X	1	0	0
X	X	X	X	X	X	0	—	—	0

X = Don't Care

**BLOCK DIAGRAM**



# ELECTRICAL CHARACTERISTICS

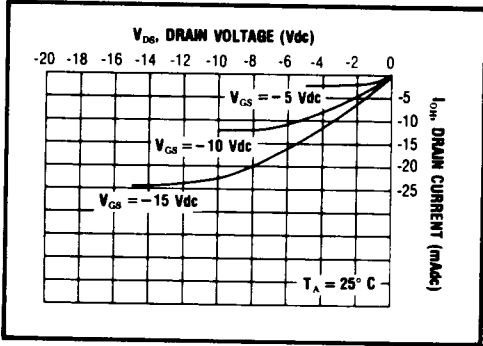
## STATIC CHARACTERISTICS<sup>1</sup>

PARAMETER	V <sub>DD</sub> (Vdc)	CONDITIONS	T <sub>LOW</sub> <sup>2</sup>		+25°C			T <sub>HIGH</sub> <sup>2</sup>		Units
			Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
QUIESCENT DEVICE CURRENT	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>SS</sub> or V <sub>DD</sub> All valid input combinations	—	5	—	0.05	5	—	150	μAdc
			—	10	—	0.1	10	—	300	
			—	20	—	0.2	20	—	600	

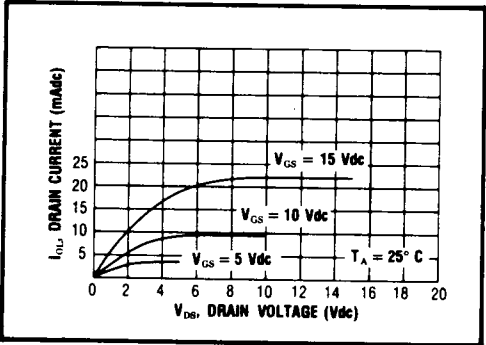
NOTES: <sup>1</sup> Remaining Static Electrical Characteristics are listed under "4000B Series Family Specifications".  
<sup>2</sup> T<sub>LOW</sub> = -55°C for C, D, F, H device.  
 = -40°C for E device.  
 T<sub>HIGH</sub> = +125°C for C, D, F, H device.  
 = + 85°C for E device.

## DYNAMIC CHARACTERISTICS (C<sub>L</sub> = 50pF, T<sub>A</sub> = 25°C)

PARAMETER		V <sub>DD</sub> (Vdc)	Min.	Typ.	Max.	Units
PROPAGATION DELAY TIME	t <sub>PLH</sub> , t <sub>PHL</sub>	5	—	300	600	ns
		10	—	125	250	
		15	—	80	160	
OUTPUT TRANSITION TIME	t <sub>TLH</sub> , t <sub>THL</sub>	5	—	100	200	ns
		10	—	50	100	
		15	—	40	80	

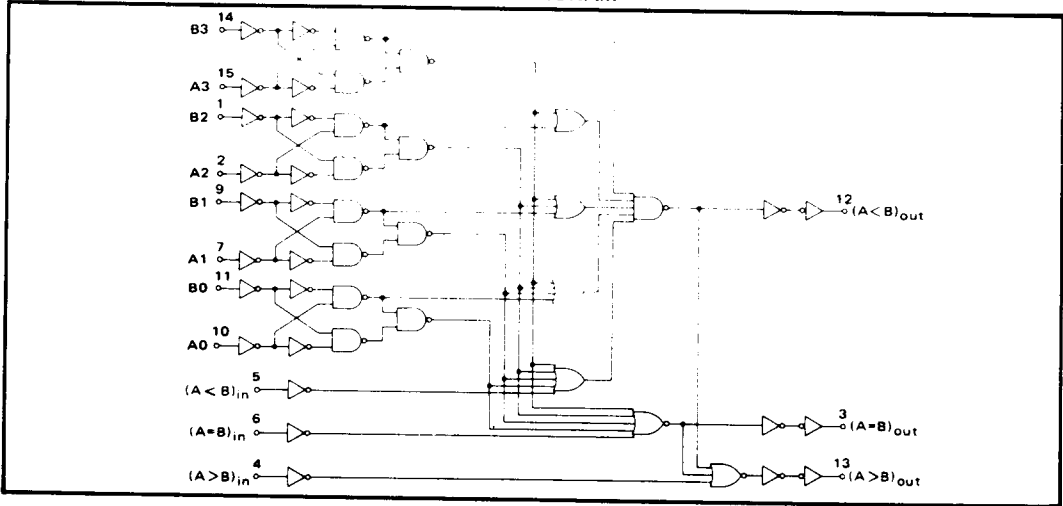


Typical P-Channel Source Current Characteristics



Typical N-Channel Sink Current Characteristics

## LOGIC DIAGRAM



## APPLICATIONS INFORMATION

### COMPARISON OF TWO N-BIT WORDS

