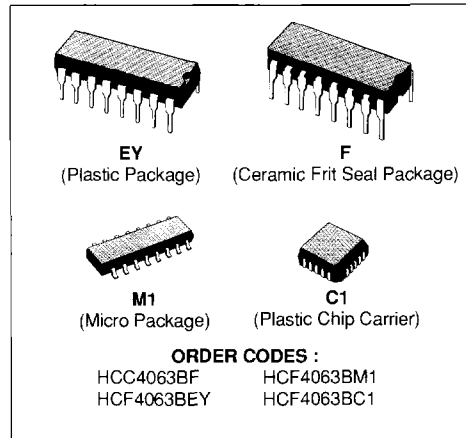


4-BIT MAGNITUDE COMPARATOR

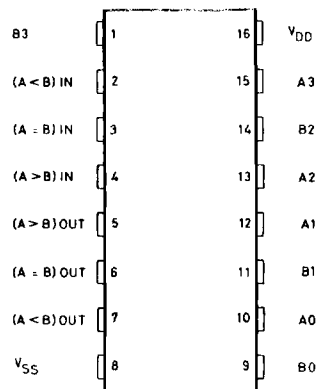
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- STANDARD B-SERIES OUTPUT DRIVE
- EXPANSION TO 8-16V...4 N BITS BY CASCA-
DING UNITS
- MEDIUM SPEED OPERATION : COMPARES
TWO 4-BIT WORDS IN 250ns (typ.) AT 10V
- INPUT CURRENT OF 100nA AT 18V AND 25°C
FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TEN-
TATIVE STANDARD N° 13A, "STANDARD SPE-
CIFICATIONS FOR DESCRIPTION OF "B"
SERIES CMOS DEVICES"


DESCRIPTION

The **HCC4063B** (extended temperature range) and **HCF4063B** (intermediate temperature range) are available in 16-lead dual in-line plastic or ceramic package and plastic micro package. The **HCC/HCF4063B** is a low-power 4-bit magnitude comparator designed for use in computer and logic applications that require the comparison of two 4-bit words. This logic circuit determines whether one 4-bit word (Binary or BCD) is "less than", "equal to" or "greater than" a second 4-bit word. The **HCC/HCF4063B** has eight comparing inputs (A3, B3, through A0, B0), three outputs (A < B, A = B, A > B) and three cascading inputs (A < B, A = B, A > B) that permit systems designers to expand the comparator function to 8, 12, 16...4 N bits. When a single **HCC/HCF4063B** is used, the cascading inputs are connected as follows :

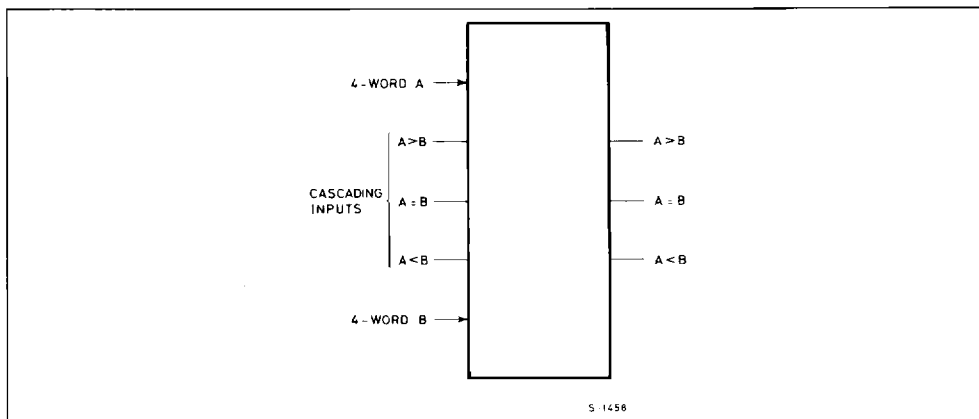
(A < B) = low, (A = B) = high, (A > B) = low.

For words longer than 4 bits, **HCC/HCF4063B** devices may be cascaded by connecting the outputs of the less-significant comparator to the corresponding cascading inputs of the more-significant comparator. Cascading inputs (A < B, A = B, and A > B) on the least significant comparator are connected to a low, a high, and a low level, respectively.

PIN CONNECTIONS


S-1488/1

FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}^*	Supply Voltage : HCC Types	- 0.5 to + 20	V
	HCF Types	- 0.5 to + 18	V
V_i	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
I_i	DC Input Current (any one input)	± 10	mA
P_{tot}	Total Power Dissipation (per package)	200	mW
	Dissipation per Output Transistor for T_{op} = Full Package-temperature Range	100	mW
T_{op}	Operating Temperature : HCC Types	- 55 to + 125	$^{\circ}$ C
	HCF Types	- 40 to + 85	$^{\circ}$ C
T_{stg}	Storage Temperature	- 65 to + 150	$^{\circ}$ C

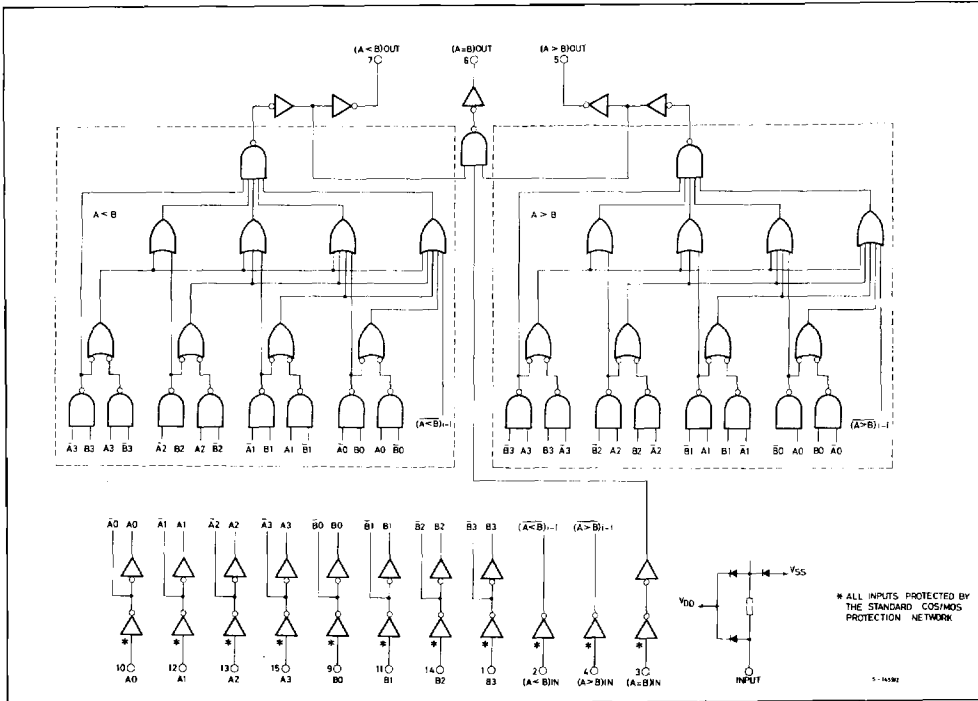
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

* All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage : HCC Types	3 to 18	V
	HCF Types	3 to 15	V
V_i	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature : HCC Types	- 55 to + 125	$^{\circ}$ C
	HCF Types	- 40 to + 85	$^{\circ}$ C

LOGIC DIAGRAM



TRUTH TABLE

Inputs							Outputs		
Comparing				Cascading			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	X	0	0	1
A3 = B3	A2 > B2	X	X	X	X	X	0	0	1
A3 = B3	A2 = B2	A1 > B1	X	X	X	X	0	0	1
A3 = B3	A2 = B2	A1 = B1	A0 > B0	X	X	X	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	0	0	1	0
A3 = B3	A2 = B2	A1 = B1	A0 = B0	1	0	0	0	1	0
A3 = B3	A2 = B2	A1 = B1	A0 < B0	X	X	X	1	0	0
A3 = B3	A2 = B2	A1 < B1	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 = Don't care

1 = High state

0 = Low state.

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

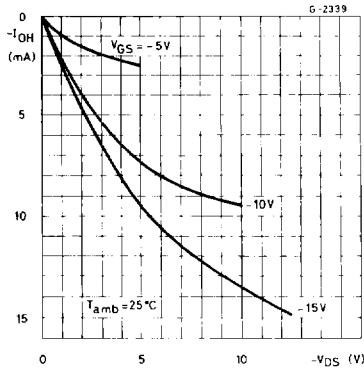
Symbol	Parameter		Test Conditions				Value						Unit	
			V _I (V)	V _O (V)	I _O (μ A)	V _{DD} (V)	T _{Low} *		25°C			T _{High} *		
							Min.	Max.	Min.	Typ.	Max.	Min.		Max.
I _L	Quiescent Current	HCC Types	0/5			5		5		0.04	5		150	μ A
			0/10			10		10		0.04	10		300	
			0/15			15		20		0.04	20		600	
			0/20			20		100		0.08	100		3000	
		HCF Types	0/5			5		20		0.04	20		150	
			0/10			10		40		0.04	40		300	
0/15				15		80		0.04	80		600			
V _{OH}	Output High Voltage	0/5		< 1	5	4.95		4.95			4.95		V	
		0/10		< 1	10	9.95		9.95			9.95			
		0/15		< 1	15	14.95		14.95			14.95			
V _{OL}	Output Low Voltage	5/0		< 1	5		0.05			0.05		0.05	V	
		10/0		< 1	10		0.05			0.05		0.05		
		15/0		< 1	15		0.05			0.05		0.05		
V _{IH}	Input High Voltage		0.5/4.5	< 1	5	3.5		3.5			3.5		V	
			1/9	< 1	10	7		7			7			
			1.5/13.5	< 1	15	11		11			11			
V _{IL}	Input Low Voltage		4.5/0.5	< 1	5		1.5			1.5		1.5	V	
			9/1	< 1	10		3			3		3		
			13.5/1.5	< 1	15		4			4		4		
I _{OH}	Output Drive Current	HCC Types	0/5	2.5		5	-2		-1.6	-3.2		-1.15	mA	
			0/5	4.6		5	-0.64		-0.51	-1		-0.36		
			0/10	9.5		10	-1.6		-1.3	-2.6		-0.9		
			0/15	13.5		15	-4.2		-3.4	-6.8		-2.4		
		HCF Types	0/5	2.5		5	-1.53		-1.36	-3.2		-1.1		
			0/5	4.6		5	-0.52		-0.44	-1		-0.36		
0/10	9.5			10	-1.3		-1.1	-2.6		-0.9				
0/15	13.5		15	-3.6		-3.0	-6.8		-2.4					
I _{OL}	Output Sink Current	HCC Types	0/5	0.4		5	0.64		0.51	1		0.36	mA	
			0/10	0.5		10	1.6		1.3	2.6		0.9		
			0/15	1.5		15	4.2		3.4	6.8		2.4		
		HCF Types	0/5	0.4		5	0.52		0.44	1		0.36		
			0/10	0.5		10	1.3		1.1	2.6		0.9		
			0/15	1.5		15	3.6		3.0	6.8		2.4		
I _{IH} , I _{IL}	Input leakage Current	HCC Types	0/18	Any Input	18		± 0.1		$\pm 10^{-5}$	± 0.1		± 1	μ A	
		HCF Types	0/15		15		± 0.3		$\pm 10^{-5}$	± 0.3		± 1		
C _I	Input Capacitance		Any Input						5	7.5		pF		

* T_{Low} = -55°C for HCC device ; -40°C for HCF device.* T_{High} = +125°C for HCC device ; +85°C for HCF device.The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V.

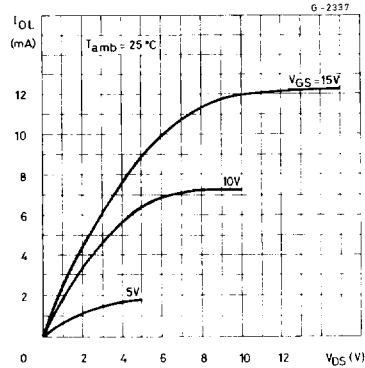
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$, typical temperature coefficient for all V_{DD} values is $0.3\%/^{\circ}\text{C}$, all input rise and fall times = 20ns)

Symbol	Parameter	Test Conditions	Value			Unit	
			V_{DD} (V)	Min.	Typ.		Max.
t_{PLH} , t_{PHL}	Propagation Delay Time	Comparing Inputs to Outputs	5		625	1250	ns
			10		250	500	
			15		175	350	
		Cascading Inputs to Outputs	5		500	1000	
			10		200	400	
			15		140	280	
t_{TLH} , t_{THL}	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

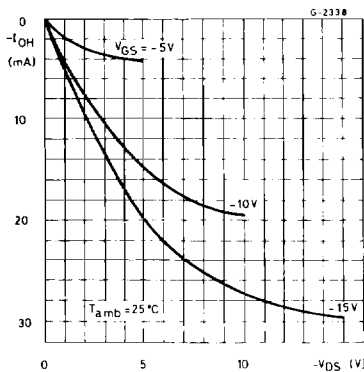
Minimum Output High (source) Current Characteristics.



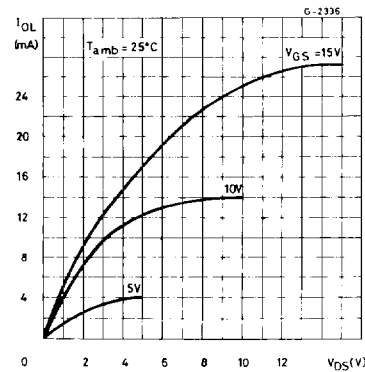
Minimum Output Low (sink) Current Characteristics.



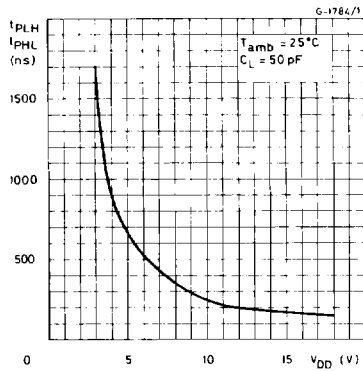
Typical Output High (source) Current Characteristics.



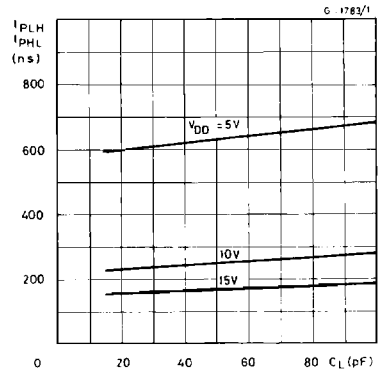
Typical Output Low (sink) Current Characteristics.



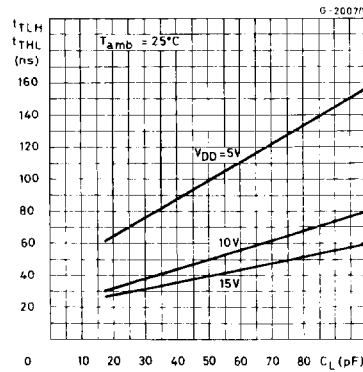
Typical Propagation Delay Time vs. V_{DD} .



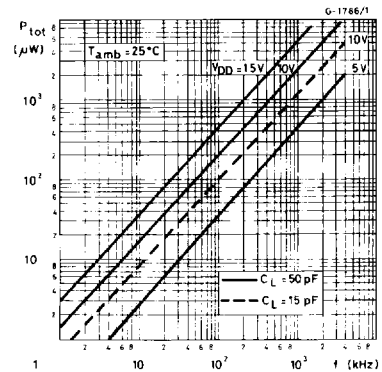
Typical Propagation Delay Time vs. C_L .



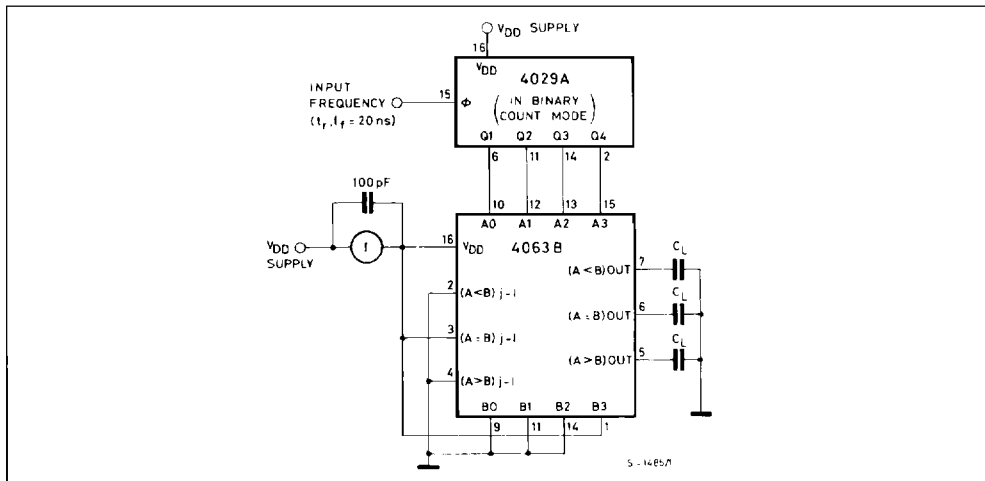
Typical Transition Time vs. Load Capacitance.



Typical Power Dissipation Characteristics.

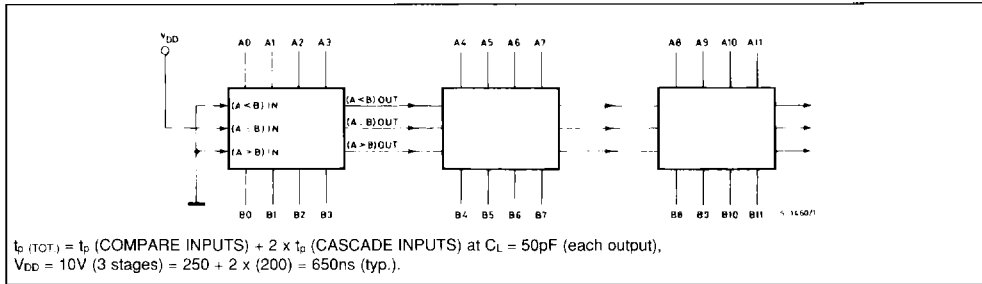


Dynamic Power Dissipation.



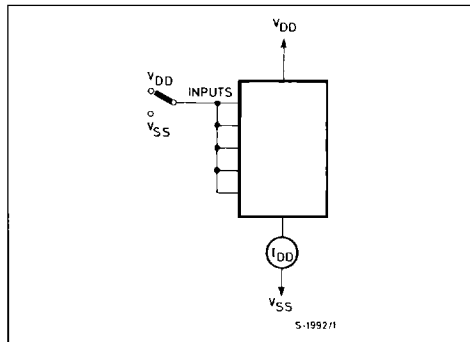
TYPICAL APPLICATION

TYPICAL SPEED CHARACTERISTICS OF A 12-BIT COMPARATOR

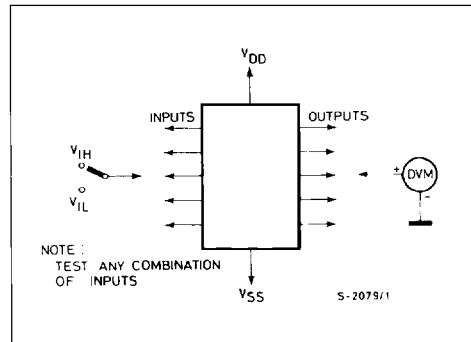


TEST CIRCUITS

Quiescent Device Current.



Noise Immunity.



Input Leakage Current.

