

COS/MOS
INTEGRATED
CIRCUITS

7929225 S G S SEMICONDUCTOR CORP



NAND GATES: QUAD 2 INPUT HCC/HCF 4011B
DUAL 4 INPUT HCC/HCF 4012B
TRIPLE 3 INPUT HCC/HCF 4023B

- PROPAGATION DELAY TIME = 60 ns (TYP.) AT $C_L = 50$ pF, $V_{DD} = 10$ V
- BUFFERED INPUTS AND OUTPUTS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- INPUT CURRENT OF 100 nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- 5V, 10V AND 15V PARAMETRIC RATINGS
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD NO. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

The **HCC 4011B**, **HCC 4012B** and **HCC 4023B** (extended temperature range) and **HCF 4011B**, **HCF 4012B** and **HCF 4023B** (intermediate temperature range) are monolithic, integrated circuit, available in 14-lead dual in-line plastic or ceramic package, ceramic flat package and plastic micropackage.

The **HCC/HCF 4011B**, **HCC/HCF 4012B** and **HCC/HCF 4023B** NAND gates provide the system designer with direct implementation of the NAND function and supplement the existing family of COS/MOS gates. All inputs and outputs are buffered.

ABSOLUTE MAXIMUM RATINGS

V_{DD}^*	Supply voltage: HCC types HCF types	-0.5 to 20 -0.5 to 18 -0.5 to $V_{DD} + 0.5$	V V V
V_i	Input voltage	± 10	mA
I_i	DC input current (any one input)	200	mW
P_{tot}	Total power dissipation (per package) Dissipation per output transistor for $T_{op} =$ full package-temperature range	100	mW
T_{op}	Operating temperature: HCC types HCF types	-55 to 125 -40 to 85 -65 to 150	°C °C °C
T_{stg}	Storage temperature		

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

ORDERING NUMBERS:

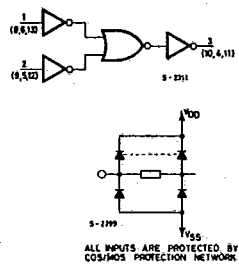
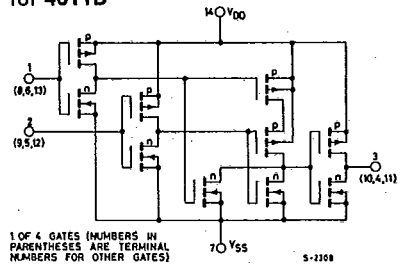
HCC 4XXX BD for dual in-line ceramic package
HCC 4XXX BF for dual in-line ceramic package, frit seal
HCC 4XXX BK for ceramic flat package
HCF 4XXX BE for dual in-line plastic package
HCF 4XXX BF for dual in-line ceramic package, frit seal
HCF 4XXX BM for plastic micropackage



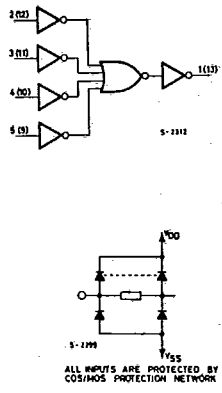
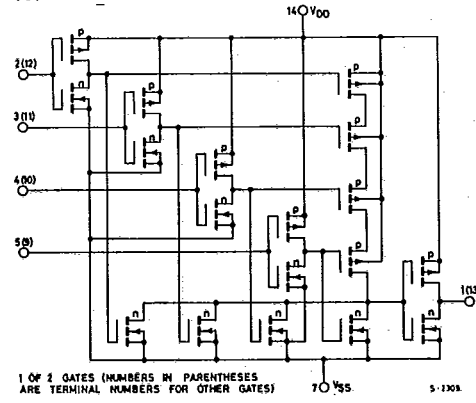
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SCHEMATIC AND LOGIC DIAGRAMS

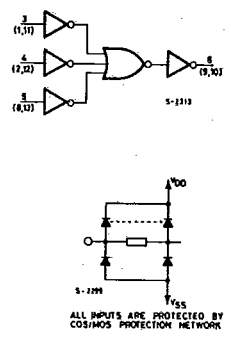
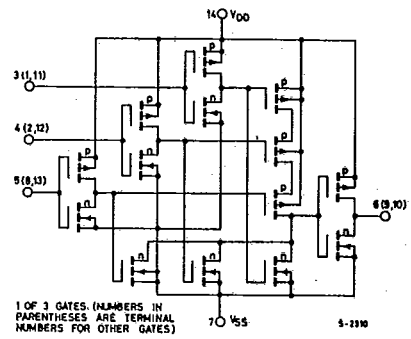
for 4011B



for 4012B



for 4023B





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STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Parameter		Test conditions				Values						Unit		
		V _I (V)	V _O (V)	I _O (μA)	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		0.25		0.01	0.25		7.5	μA
			0/10			10		0.5		0.01	0.5		15	
			0/15			15		1		0.01	1		30	
			0/20			20		1		0.02	5		150	
			0/ 5			5		5		0.01	1		7.5	
			0/10			10		2		0.01	2		15	
V _{OH}	Output high voltage	HCC types	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	HCC types	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	HCC types		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	HCC types		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			
		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			
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		
		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		±10 ⁻⁵	±0.1		± 1	μA
		HCF types	0/15			15		±0.3		±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

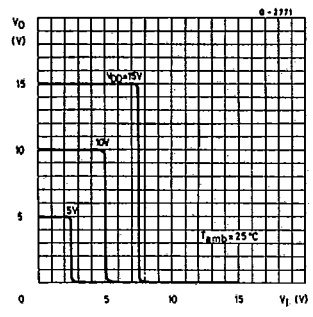


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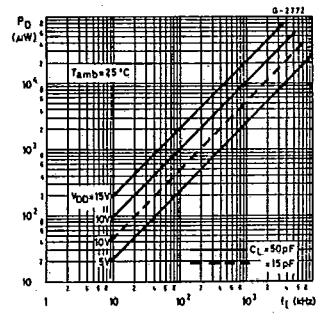
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}C$, $C_L = 50$ pF, $R_L = 200$ k Ω , typical temperature coefficient for all V_{DD} values is 0.3%/ $^{\circ}C$, all input rise and fall times = 20 ns)

Parameter	Test conditions	Values			Unit	
		V_{DD} (V)	Min.	Typ.		Max.
t_{PLH} , t_{PHL} Propagation delay time		5		125	250	ns
		10		60	120	
		15		45	90	
t_{THL} , t_{TLH} Transition time		5		100	200	ns
		10		50	100	
		15		40	80	

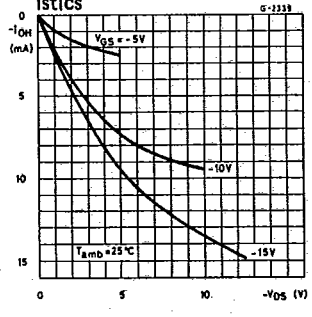
Typical voltage transfer characteristics



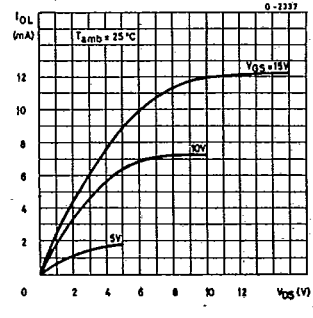
Typical power dissipation/gate vs. frequency



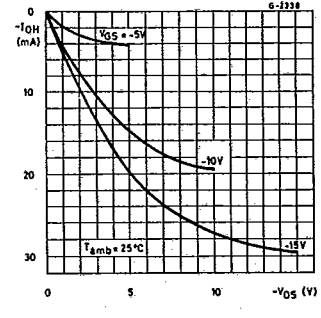
Minimum output high (source) current characteristics



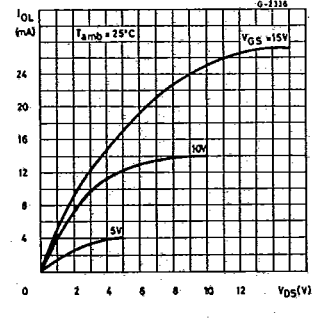
Minimum output low (sink) current characteristics



Typical output high (source) current characteristics

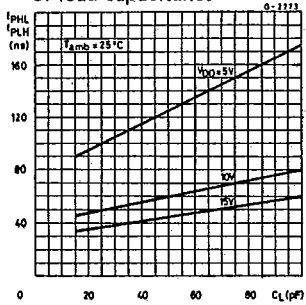


Typical output low (sink) current characteristics

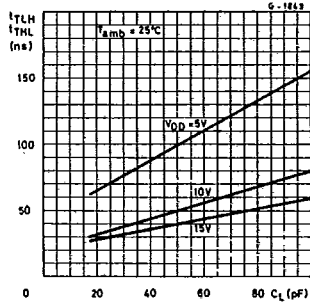




Typical propagation delay time per gate as a function of load capacitance

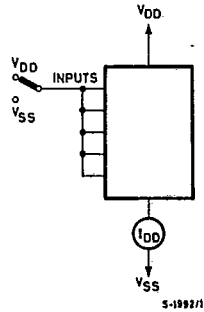


Typical transition time vs. load capacitance

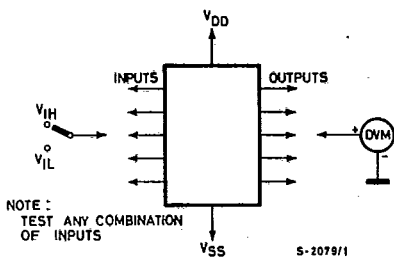


TEST CIRCUITS

Quiescent device current



Noise immunity



Input leakage current

