COS/MOS INTEGRATED CIRCUITS

7929225 S G S SEMICONDUCTOR CORP

HCC/HCF 4011B
HCC/HCF 4012B
HCC/HCF 4023B

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} = 10V
- 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	-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	°C
	HCF types	-40 to 85	°C
T_{stg}	Storage temperature	-65 to 150	°C

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

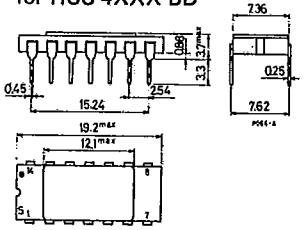
ORDERING NUMBERS:

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

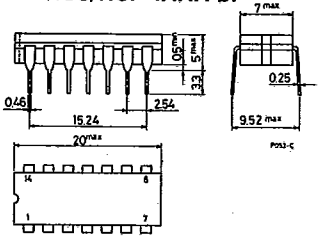
HCC/HCF 4011B
HCC/HCF 4012B
HCC/HCF 4023B

MECHANICAL DATA (dimensions in mm)

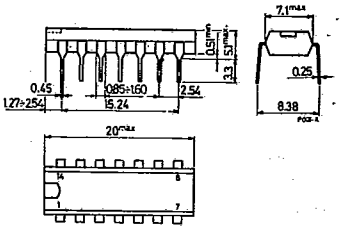
Dual in-line ceramic package for HCC 4XXX BD



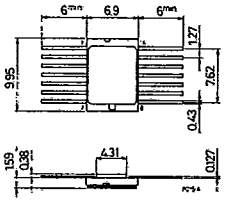
Dual in-line ceramic package for HCC/HCF 4XXX BF



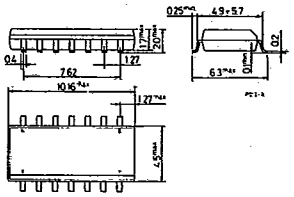
Dual in-line plastic package for HCF 4XXX BE



Ceramic flat package for HCC 4XXX BK

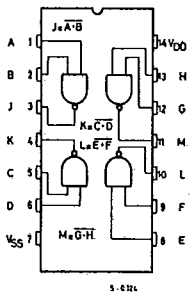


Plastic micropackage for HCF 4XXX BM

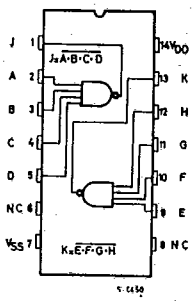


CONNECTION DIAGRAMS

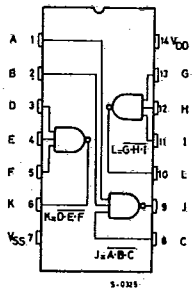
for **4011B**



for **4012B**



for **4023B**



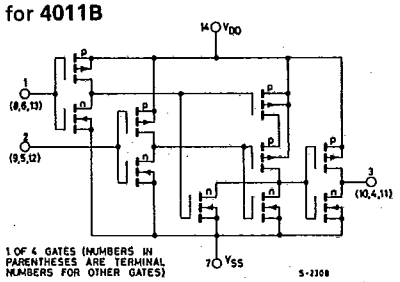
RECOMMENDED OPERATING CONDITIONS

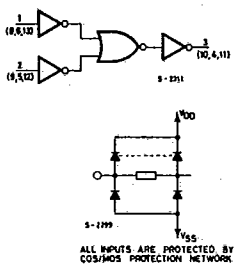
V_{DD}	Supply voltage:	HCC types	3 to 18	V
		HCF types	3 to 15	V
V_I	Input voltage		0 to V_{DD}	V
T_{op}	Operating temperature:	HCC types	-55 to 125	°C
		HCF types	-40 to 85	°C

HCC/HCF 4011B
HCC/HCF 4012B
HCC/HCF 4023B

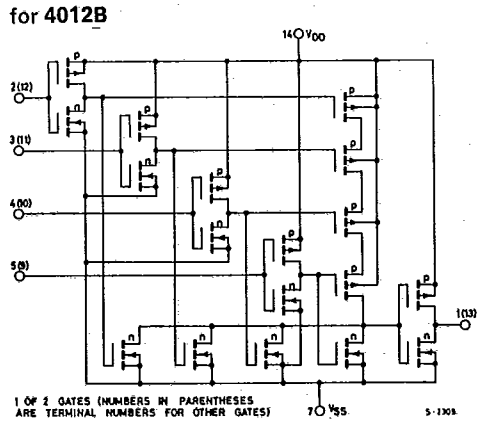
SCHEMATIC AND LOGIC DIAGRAMS

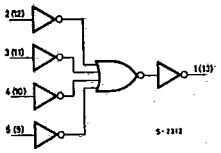
for **4011B**

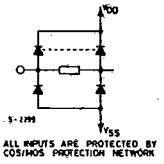




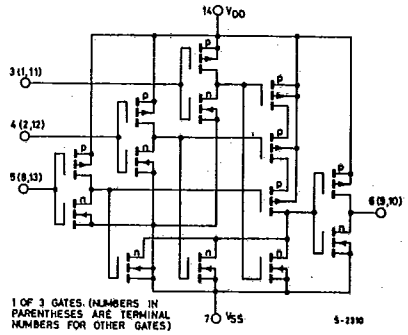
for **4012B**

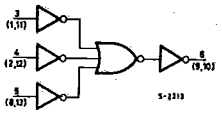


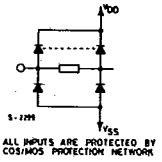




for **4023B**







HCC/HCF 4011B
HCC/HCF 4012B
HCC/HCF 4023B

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}* Min.	T_{Low}* Max.	25°C Min.	25°C Typ.	25°C Max.	T_{High}* Min.	T_{High}* 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		5		0.02	5		150	
		HCF types	0/ 5			5		1		0.01	1		7.5	
			0/10			10		2		0.01	2		15	
			0/15			15		4		0.01	4		30	
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		$±10^{-5}$	±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

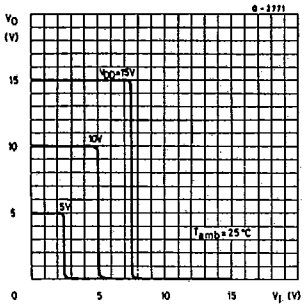
* T_{Low} = - 55°C for **HCC** device: -40°C for **HCF** device.
* T_{High} = +125°C for **HCC** device: +85°C for **HCF** device.
The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}= 5V
2V min. with V_{DD}= 10V
2.5V min. with V_{DD}= 15V

HCC/HCF 4011B
HCC/HCF 4012B
HCC/HCF 4023B

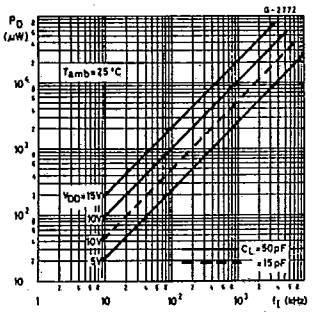
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb}= 25°C, C_L= 50 pF, R_L= 200 kΩ, typical temperature coefficient for all V_{DD} values is 0.3%/°C, all input rise and fall times = 20 ns)

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	

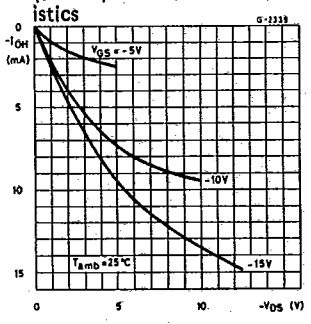
Typical voltage transfer characteristics



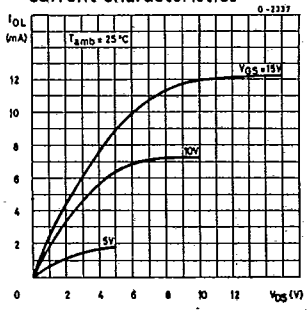
Typical power dissipation/ gate vs. frequency



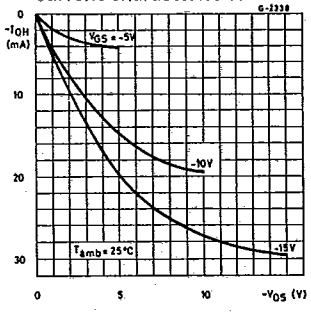
Minimum output high (source) current characteristics



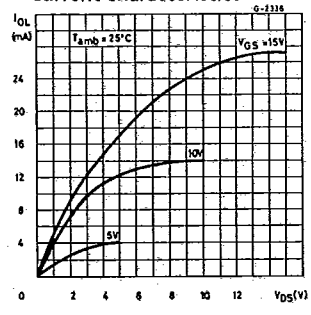
Minimum output low (sink) current characteristics



Typical output high (source) current characteristics



Typical output low (sink) current characteristics



HCC/HCF 4011B
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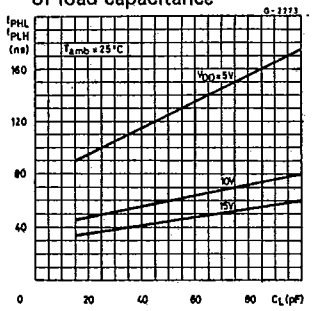
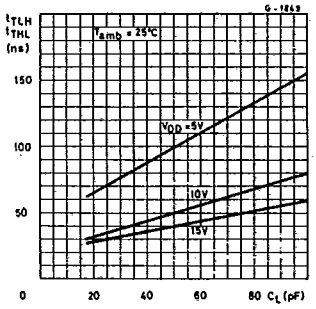
Typical propagation delay time per gate as a function of load capacitance

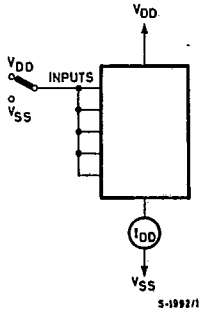


Typical transition time vs. load capacitance

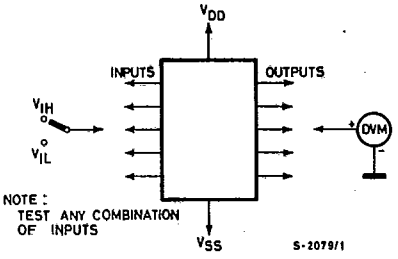


TEST CIRCUITS

Quiescent device current



Noise immunity



Input leakage current