4000B
4001B
4002B
4025B

NOR GATES: DUAL 3 INPUT PLUS INVERTER HCC/HCF 4000B
QUAD 2 INPUT HCC/HCF 4001B
DUAL 4 INPUT HCC/HCF 4002B
TRIPLE 3 INPUT HCC/HCF 4025B

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

The **HCC 4000B, HCC 4001B, HCC 4002B** and **HCC 4025B** (extended temperature range) and **HCF 4000B, HCF 4001B, HCF 4002B** and **HCF 4025B** (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 4000B, HCC/HCF 4001B, HCC/HCF 4002B** and **HCC/HCF 4025B** NOR gates provide the system designer with direct implementation of the NOR function and supplement the existing family of CMOS/MOS gates. All inputs and outputs are buffered.

ABSOLUTE MAXIMUM RATINGS

R7

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

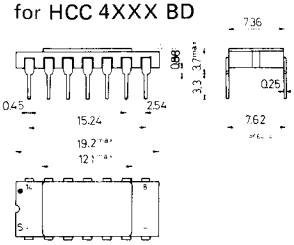
* All voltage values are referred to V_{SS} pin voltage

ORDERING NUMBERS:

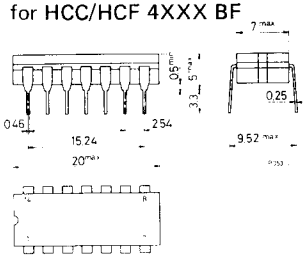
HCC 4XXX BD for dual in-line ceramic package
HCC 4XXX BF for dual in-line ceramic package, frit seal
HCC 4XXX BK for ceramic flat package
HCF 4XXX BE for dual in-line plastic package
HCF 4XXX BF for dual in-line ceramic package, frit seal
HCF 4XXX BM for plastic micropackage

MECHANICAL DATA (dimensions in mm)

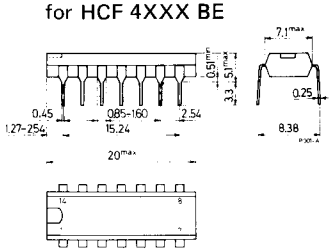
Dual in-line ceramic package for HCC 4XXX BD



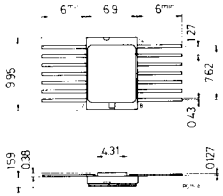
Dual in-line ceramic package for HCC/HCF 4XXX BF



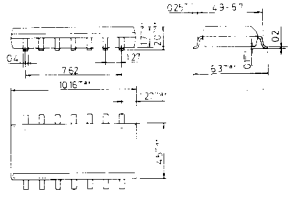
Dual in-line plastic package for HCF 4XXX BE



Ceramic flat package for HCC 4XXX BK

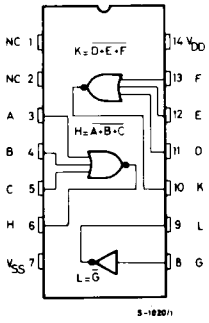


Plastic micropackage for HCF 4XXX BM

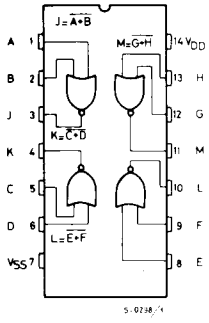


CONNECTION DIAGRAMS

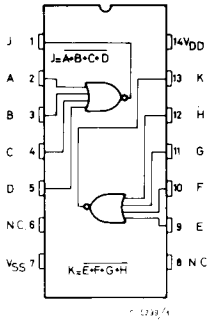
for **4000B**



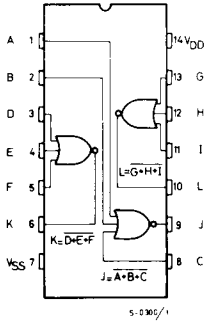
for **4001B**



for **4002B**



for **4025B**

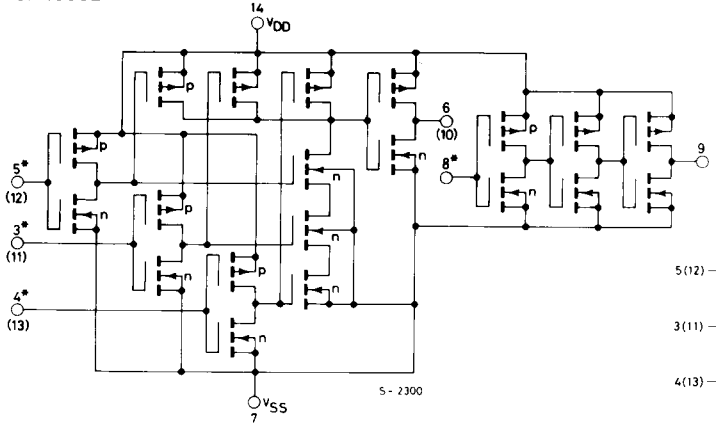


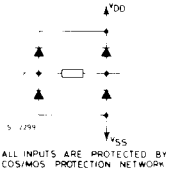
RECOMMENDED OPERATING CONDITIONS

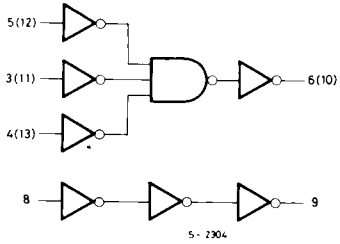
V_{DD}	Supply voltage: **HCC** types	3 to 18	V
	HCF types	3 to 15	V
V_I	Input voltage	0 to V_{DD}	V
T_{op}	Operating temperature: **HCC** types	-55 to 125	°C
	HCF types	-40 to 85	°C

SCHEMATIC AND LOGIC DIAGRAMS

for **4000B**

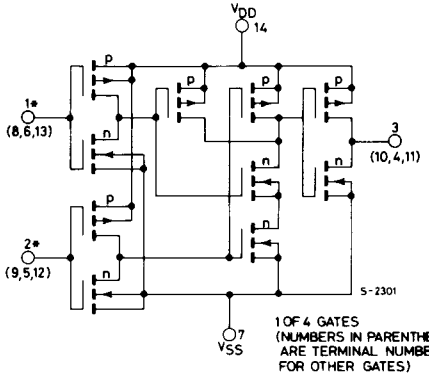




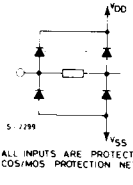


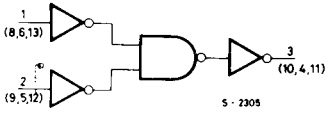
INVERTER AND 1 OF 2 GATES (NUMBERS IN PARENTHESES ARE THERMINAL NUMBERS FOR SECOND GATE)

for **4001B**



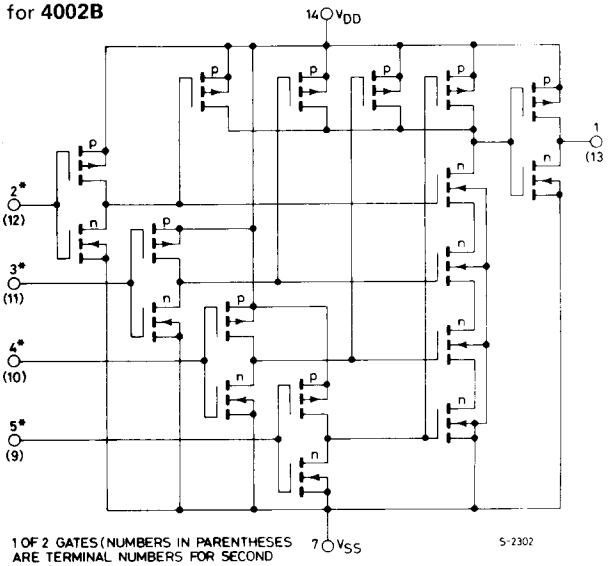
1 OF 4 GATES
(NUMBERS IN PARENTHESES ARE TERMINAL NUMBERS FOR OTHER GATES)



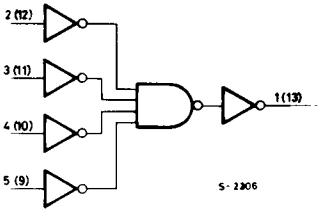


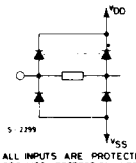
SCHEMATIC AND LOGIC DIAGRAMS (continued)

for **4002B**



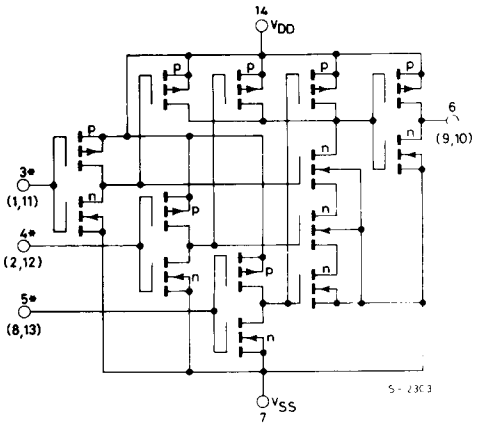
1 OF 2 GATES (NUMBERS IN PARENTHESES ARE TERMINAL NUMBERS FOR SECOND GATE)



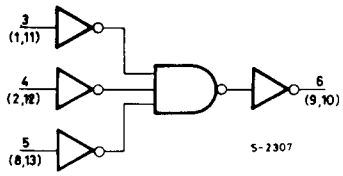


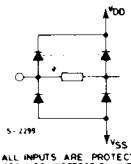
ALL INPUTS ARE PROTECTED BY COS/MOS PROTECTION NETWORK

for **4025B**



INVERTER AND 1 OF 3 GATES (NUMBERS IN PARENTHESES ARE THERMINAL NUMBERS FOR SECOND GATE)





ALL INPUTS ARE PROTECTED BY COS/MOS PROTECTION NETWORK

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

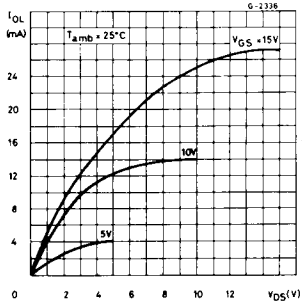
Parameter			Test conditions V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	Values T_{Low}* Min.	T_{Low}* Max.	T_A = 25°C Min.	T_A = 25°C Typ.	T_A = 25°C Max.	T_{High}* Min.	T_{High}* Max.	Unit
I_L	Quiescent current	HCC types	0/ 5			5		0.25		0.01	0.25		7.5	μA
			0/10			10		0.5		0.01	0.5		15	
			0/15			15		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		$\pm 10^{-5}$	±0.1		± 1	μA
		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

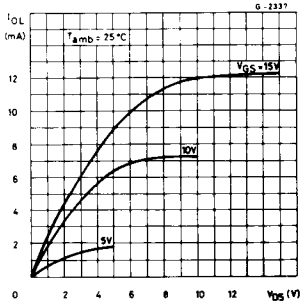
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb}= 25°C, C_L= 50 pF, R_L= 200 kΩ, typical temperature coefficient for all V_{DD} values is 0,3%/°C, all input rise and fall times = 20 ns)

Parameter	Test conditions	Values			Unit
	V_{DD} (V)	Min.	Typ.	Max.	
t_{PHL}, t_{PLH} 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	

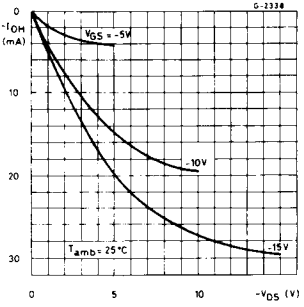
Typical output low (sink) current characteristics



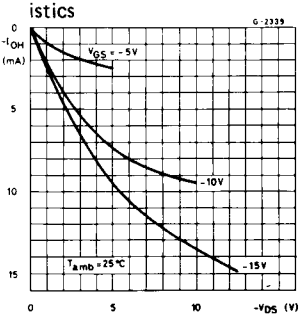
Minimum output low (sink) current characteristics



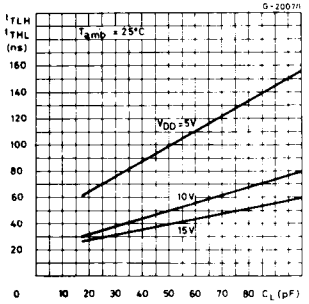
Typical output high (source) current characteristics



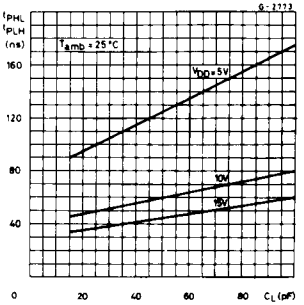
Minimum output high (source) current characteristics



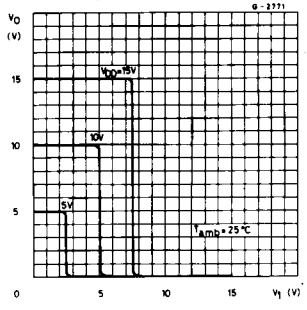
Typical transition time vs. load capacitance



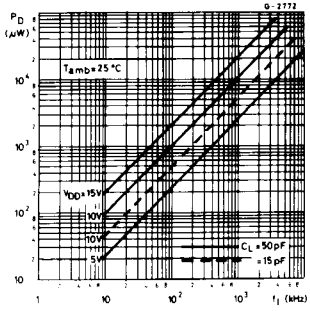
Typical propagation delay time vs. load capacitance



Typical voltage transfer characteristics as a function of temperature

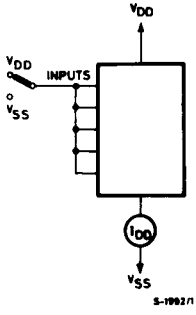


Typical power dissipation per gate vs. frequency

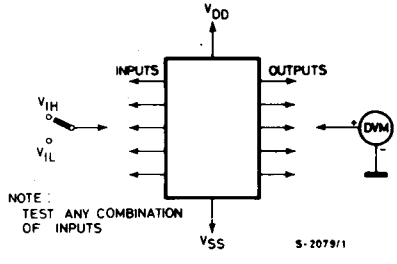


TEST CIRCUITS

Quiescent device current



Input voltage



Input leakage current