COS/MOS INTEGRATED CIRCUITS

HCC/HCF 4070B HCC/HCF 4077B

4070B - QUAD EXCLUSIVE-OR GATE
4077B - QUAD EXCLUSIVE-NOR GATE

- MEDIUM-SPEED OPERATION $t_{PHL} = t_{PLH} = 70$ ns (TYP.) AT $V_{CC} = 10V$, $C_L = 50$ pF
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V AND 15V PARAMETRIC RATING
- 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 4070B/4077B** (extended temperature range) and **HCF 4070B/4077B** (intermediate temperature range) are monolithic integrated circuits, available in 14-lead dual in-line plastic or ceramic package, ceramic flat package and plastic micropackage.

The **HCC/HCF 4070B** contains four independent exclusive-OR gates.

The **HCC/HCF 4077B** contains four independent exclusive-NOR gates.

The **HCC/HCF 4070B** and **HCC/HCF 4077B** provide the system designer with a means for direct implementation of the exclusive-OR and exclusive-NOR function, respectively. For applications as Logical comparators, Adders/subtractors, Parity generators and checkers.

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:

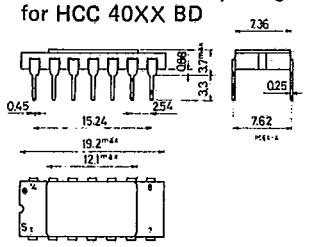
HCC 40XX BD for dual in-line ceramic package
HCC 40XX BF for dual in-line ceramic package, frit seal
HCC 40XX BK for ceramic flat package
HCF 40XX BE for dual in-line plastic package
HCF 40XX BF for dual in-line ceramic package, frit seal
HCF 40XX BM for plastic micropackage

HCC/HCF 4070B
HCC/HCF 4077B

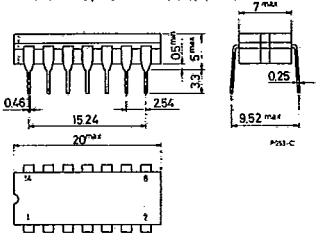
41C 08873 D T-43-21

MECHANICAL DATA (dimensions in mm)

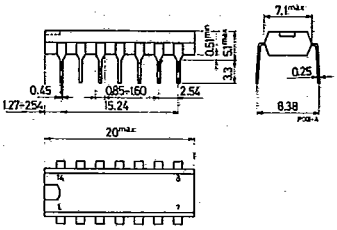
Dual in-line ceramic package for HCC 40XX BD



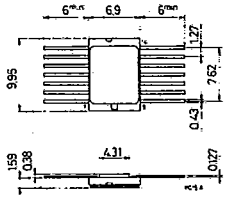
Dual in-line ceramic package for HCC/HCF 40XX BF



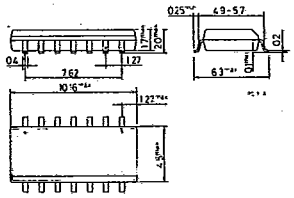
Dual in-line plastic package for HCF 40XX BE



Ceramic flat package for HCC 40XX BK

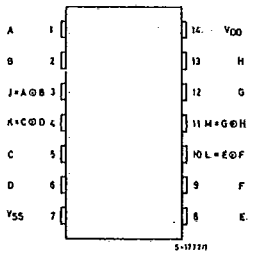


Plastic micropackage for HCF 40XX BM

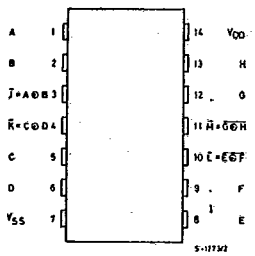


CONNECTION DIAGRAMS

for **4070B**



for **4077B**



TRUTH TABLES (1 of 4 gates)

for **4070B**

A	B	J
0	0	0
1	0	1
0	1	1
1	1	0

Where 1 = High level
0 = Low level
$J = A \oplus B$

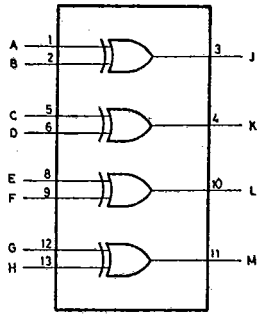
for **4077B**

A	B	$\overline{J}$
0	0	1
1	0	0
0	1	0
1	1	1

Where 1 = High level
0 = Low level
$\overline{J} = \overline{A \oplus B}$

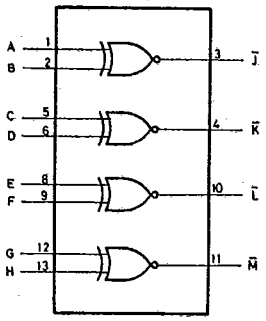
FUNCTIONAL DIAGRAMS

for **4070B**

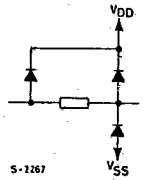


$J = A \oplus B$, $K = C \oplus D$, $L = E \oplus F$, $M = G \oplus H$
$V_{SS} = 7$, $V_{DD} = 14$ S-1770/1

for **4077B**



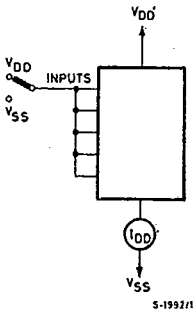
$\bar{J} = A \oplus B$, $\bar{K} = C \oplus D$, $\bar{L} = E \oplus F$, $\bar{M} = G \oplus H$
$V_{SS} = 7$, $V_{DD} = 14$ S-1771/1



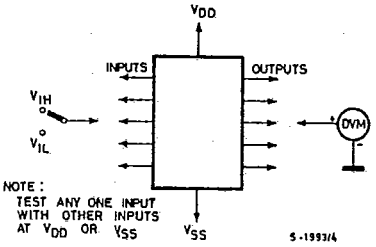
ALL INPUTS PROTECTED BY COS/MOS PROTECTION NETWORK

TEST CIRCUIT

Quiscent device current

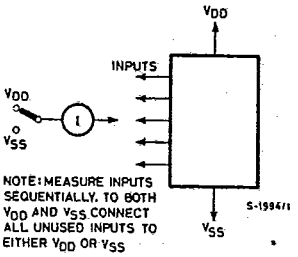


Input voltage



NOTE : TEST ANY ONE INPUT WITH OTHER INPUTS AT V_{DD} OR V_{SS}

Input leakage current



NOTE: MEASURE INPUTS SEQUENTIALLY. TO BOTH V_{DD} AND V_{SS} CONNECT ALL UNUSED INPUTS TO EITHER V_{DD} OR V_{SS}

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

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

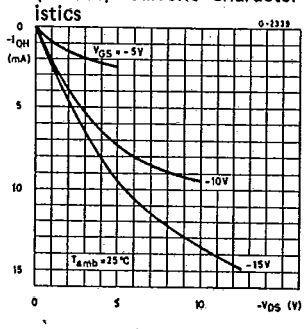
Parameter			Test conditions				Values							Unit
			V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	T_{Low}* Min.	T_{Low}* Max.	25°C Min.	25°C Typ.	25°C Max.	T_{High}* Min.	T_{High}* Max.	
I_L	Quiescent current	HCC types	0/ 5			5		1		0.02	1		30	μA
			0/10			10		2		0.02	2		60	
			0/15			15		4		0.02	4		120	
			0/20			20		20		0.04	20		600	
		HCF types	0/ 5			5		4		0.02	4		30	
			0/10			10		8		0.02	8		60	
			0/15			15		16		0.02	16		120	
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

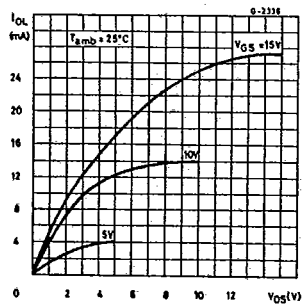
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb}= 25°C, C_L= 50 pF, R_L= 200 kΩ, typical temperature coefficient for all V_{DD} values is 0.3%/°C, all input rise and fall times = 20 ns)

Parameter	Test conditions	Values				Unit
		V_{CC}(V)	Min.	Typ.	Max.	
t_{PHL}, t_{PLH} Propagation delay time		5		140	280	ns
		10		65	130	
		15		50	100	
t_{THL}, t_{TLH} Transition time		5		100	200	ns
		10		50	100	
		15		40	80	

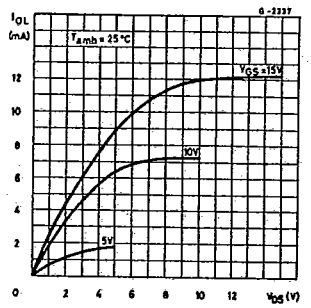
Minimum output high (source) current characteristics



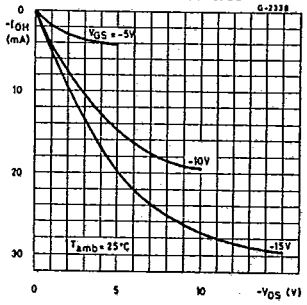
Typical output low (sink) current



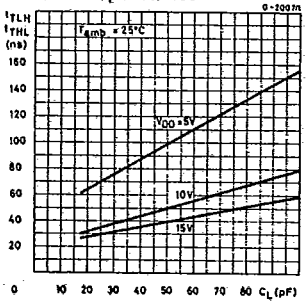
Minimum output low (sink) current characteristics



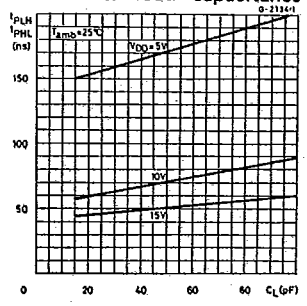
Typical output high (source) current characteristics



Typical transition time vs. load capacitance



Typical propagation delay time vs. load capacitance



HCC/HCF 4070B
HCC/HCF 4077B

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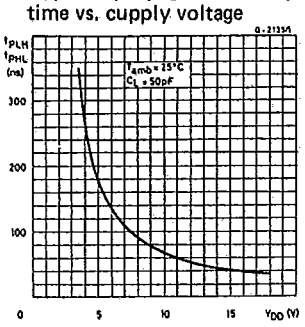
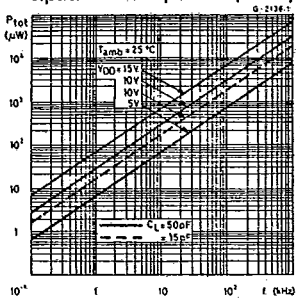
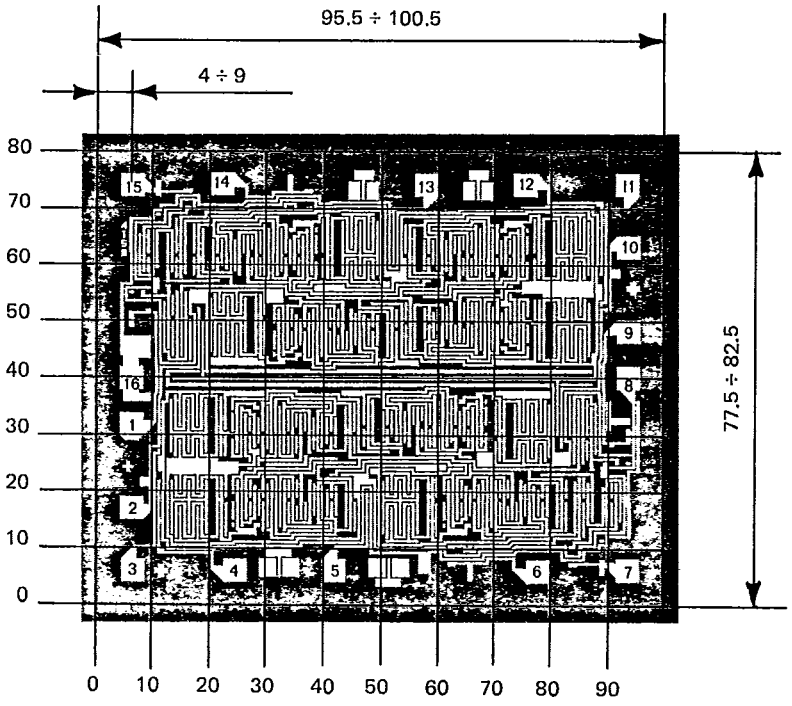
Typical propagation delay time vs. cupply voltage

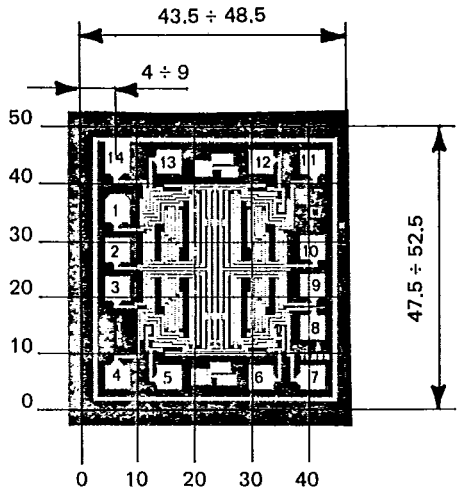


Typical dynamic power dissipation vs. input frequency




95.5 ÷ 100.5
4 ÷ 9
77.5 ÷ 82.5
80
70
60
50
40
30
20
10
0
0 10 20 30 40 50 60 70 80 90
15 14 13 12 11 10 9 8 16 1 2 3 4 5 6 7

4015B


43.5 ÷ 48.5
4 ÷ 9
47.5 ÷ 52.5
50
40
30
20
10
0
0 10 20 30 40
14 13 12 11 1 2 3 10 9 8 4 5 6 7

4016B