

COS/MOS INTEGRATED CIRCUITS

4049UB
4050B

HCC/HCF 4049UB
HCC/HCF 4050B

PRELIMINARY DATA

HEX BUFFER/CONVERTERS: HCC/HCF 4049UB - INVERTING TYPE HCC/HCF 4050B - NON-INVERTING TYPE

- HIGH SINK CURRENT FOR DRIVING 2 TTL LOADS
- HIGH-TO-LOW LEVEL LOGIC CONVERSION
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- HIGH "SINK" AND "SOURCE" CURRENT CAPABILITY
- 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 4049UB/4050B** (extended temperature range) and the **HCF 4049UB/4050B** (intermediate temperature range) are monolithic integrated circuits available in 16-lead dual in-line plastic or ceramic package, ceramic flat package and plastic micropackage.

The **HCC/HCF 4049UB/4050B** are inverting and non-inverting hex buffers, respectively, and feature logic-level conversion using only one supply voltage (V_{DD}). The input-signal high level (V_{IH}) can exceed the V_{DD} supply voltage when these devices are used for logic level conversions. These devices are intended for use as COS/MOS to DTL/TTL converters and can drive directly two DTL/TTL loads ($V_{DD}=5V$, $V_{OL} \leq 0.4V$, and $I_{OL} \geq 3.2mA$).

ABSOLUTE MAXIMUM RATINGS

V_{DD}^*	Supply voltage: HCC types HCF types	-0.5 to 20 -0.5 to 18	V 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 HCF types	-55 to 125 -40 to 85	°C °C
T_{stg}	Storage temperature	-65 to 150	°C

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

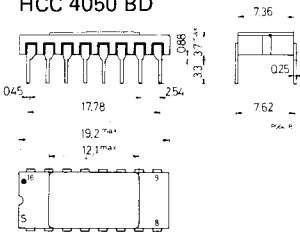
ORDERING NUMBERS:

HCC 4049 UBD	for dual in-line ceramic package
HCC 4049 UBF	for dual in-line ceramic package, frit seal
HCC 4049 UBK	for ceramic flat package
HCF 4049 UBE	for dual in-line plastic package
HCF 4049 UBF	for dual in-line ceramic package, frit seal
HCF 4049 UBM	for plastic micropackage
HCC 4050 BD	for dual in-line ceramic package
HCC 4050 BF	for dual in-line ceramic package, frit seal
HCC 4050 BK	for ceramic flat package
HCF 4050 BE	for dual in-line plastic package
HCF 4050 BF	for dual in-line ceramic package, frit seal
HCF 4050 BM	for plastic micropackage

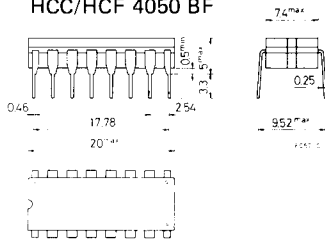
HCC/HCF 4049 UB UCC/HCF 4050 B

MECHANICAL DATA (dimensions in mm)

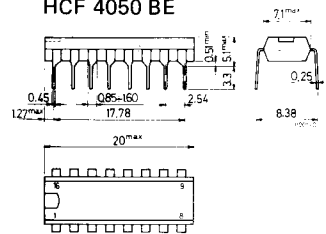
Dual in-line ceramic package
for HCC 4049 UBD and
HCC 4050 BD



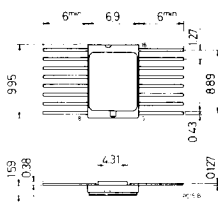
Dual in-line ceramic package
for HCC/HCF 4049 UBF and
HCC/HCF 4050 BF



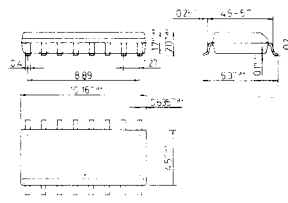
Dual in-line plastic package
for HCF 4049 UBE and
HCF 4050 BE



Ceramic flat package
for HCC 4049 UBK and
HCC 4050 BK

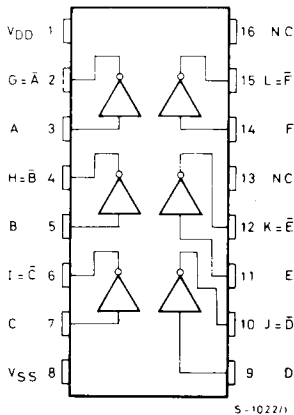


Plastic micropackage
for HCF 4049 UBM and
HCF 4050 BM

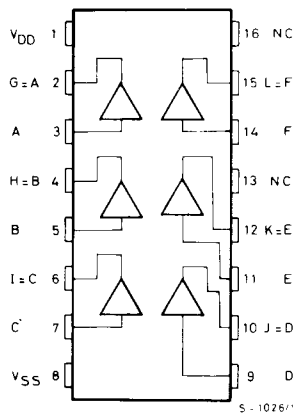


CONNECTION DIAGRAMS

For 4049 UB



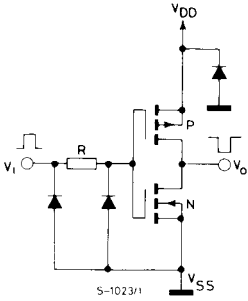
For 4050 B



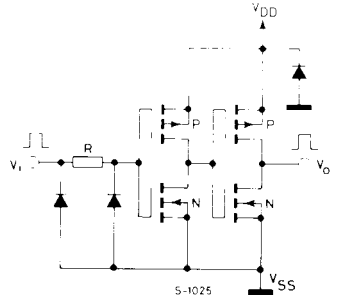
SCHEMATIC DIAGRAMS

1 of 6 identical units

For **4049 UB**

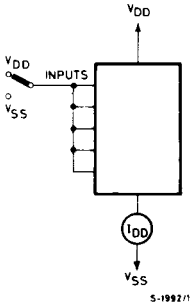


For **4050 B**

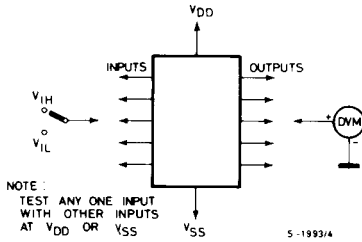


TEST CIRCUITS

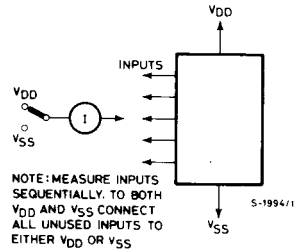
Quiescent device current



Input voltage



Input current



RECOMMENDED OPERATING CONDITIONS

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

* The 4049 and 4050 have high-to-low-level voltage conversion capability but not low-to-high-level; therefore it is recommended that $V_{IN} \geq V_{DD}$.

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Parameter		Test conditions			Values						Unit		
		V _I (V)	V _O (V)	V _{DD} (V)	T _{Low} *		25°C			T _{High} *			
					Min.	Max.	Min.	Typ.	Max.	Min.		Max.	
I _L	Quiescent supply 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		5	4.95		4.95			4.95		V	
		0/10		10	9.95		9.95			9.95			
		0/15		15	14.95		14.95			14.95			
V _{OL}	Output low voltage	5/0		5		0.05			0.05		0.05	V	
		10/0		10		0.05			0.05		0.05		
		15/0		15		0.05			0.05		0.05		
V _{IH}	Input high voltage (4049 UB)		0.5	5	4		4			4		V	
			1	10	8		8			8			
			2	15	12		12			12			
V _{IH}	Input high voltage (4050B)		4.5	5	3.5		3.5			3.5		V	
			9	10	7		7			7			
			13.5	16	11		11			11			
V _{IL}	Input low voltage (4049 UB)		4.5	5		1			1		1	V	
			9	10		2			2		2		
			13	15		3			3		3		
V _{IL}	Input low voltage (4050 B)		0.5	5		1.5			1.5		1.5	V	
			1	10		3			3		3		
			1.5	15		4			4		4		
I _{OH}	Output drive current	HCC types	0/ 5	2.5	5	1.6		-1.25	-6.4		-0.9	mA	
			0/ 5	4.6	5	0.64		-0.51	-1.6		-0.36		
			0/10	9.5	10	1.6		-1.30	-3.6		-0.9		
		0/15	13.5	15	4.7		-3.75	-12		-2.7			
		HCF types	0/ 5	2.5	5	1.5		-1.25	-6.4		-1		
			0/ 5	4.6	5	0.61		-0.51	-1.6		-0.42		
			0/10	9.5	10	1.5		-1.25	-3.6		-1		
		0/15	13.5	15	4.5		-3.75	-12		-3			
		I _{OL}	Output sink current	HCC types	0/ 5	0.4	5	3.75		3.2	6.4		
0/10	0.5				10	10		8	16		5.6		
0/15	1.5				15	30		24	48		17		
HCF types	0/ 5			0.4	5	3.6		3.2	6.4		2.6		
	0/10			0.5	10	9.6		8	16		6.6		
	0/15			1.5	15	28		24	48		19		
I _{IH} , I _{IL}	Input leakage current	HCC types	0/18		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	4049UB 4050B	Any input					15 5	22.5 7.5				

* T_{Low} = - 55°C for HCC device; -40°C for HCF device.

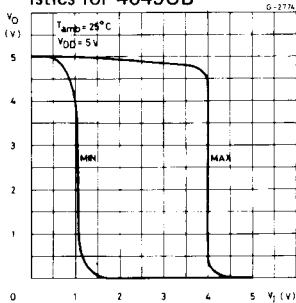
* T_{High} = +125°C for HCC device; +85°C for HCF device.

The Noise Margin (only HCC/HCF 4050B type) 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

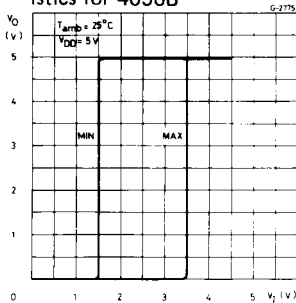
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}\Omega$, typical temperature coefficient for all V_{DD} values is $0.3\%/^{\circ}\text{C}$, all input rise and fall times = 20 ns)

Parameter	Test conditions	Values			Unit	
		V_I (V)	V_{DD} (V)	Min. Typ. Max.		
t_{PLH} Propagation delay time (4049 UB)		5	5	60	120	ns
		10	10	32	65	
		10	5	45	90	
		15	15	25	50	
		15	5	45	90	
t_{PLH} Propagation delay time (4050 B)		5	5	70	140	ns
		10	10	40	80	
		10	5	45	90	
		15	15	30	60	
		15	5	40	80	
t_{PHL} Propagation delay time (4049 UB)		5	5	32	65	ns
		10	10	20	40	
		10	5	15	30	
		15	15	15	30	
		15	5	10	20	
t_{PHL} Propagation delay time (4050B)		5	5	55	110	ns
		10	10	22	55	
		10	5	50	100	
		15	15	15	30	
		15	5	50	100	
t_{TLH} Transition time		5	5	80	160	ns
		10	10	40	80	
		15	15	30	60	
t_{THL} Transition time		5	5	30	60	ns
		10	10	20	40	
		15	15	15	30	

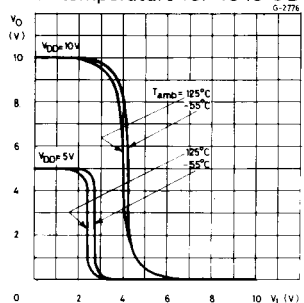
Minimum and maximum voltage transfer characteristics for 4049UB



Minimum and maximum voltage transfer characteristics for 4050B

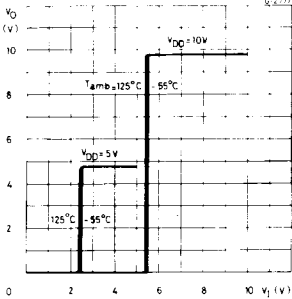


Typical voltage transfer characteristics as a function of temperature for 4049 UB

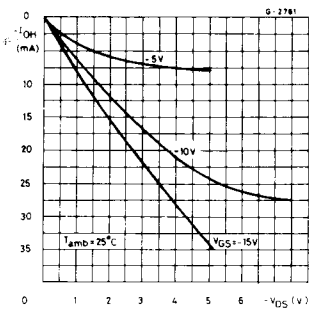


HCC/HC_F 4049 UB UCC/HC_F 4050 B

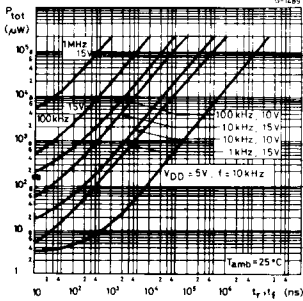
Typical voltage transfer characteristics as a function of temperature for 4050 B



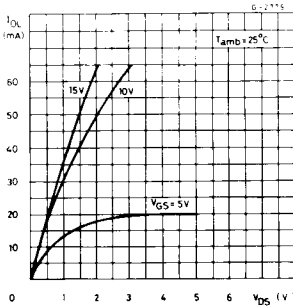
Typical output high (source) current characteristics



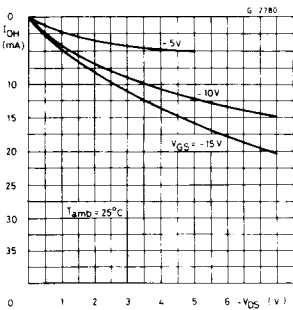
Typical power dissipation vs. input transition time per inverter for 4049 UB



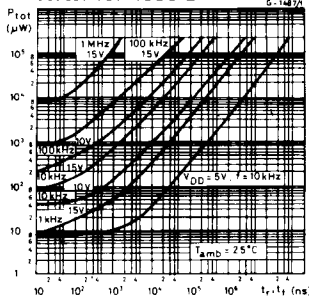
Typical output low (sink) current characteristics



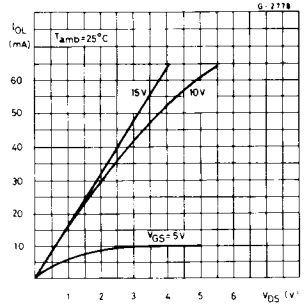
Minimum output high (source) current characteristics



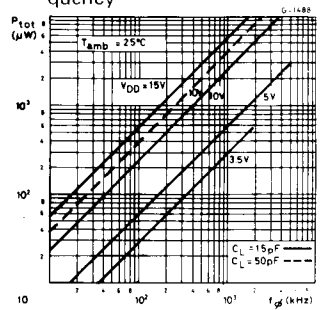
Typical power dissipation vs. input transition time per inverter for 4050 B



Minimum output low (sink) current drain characteristics



Typical power dissipation per buffer/inverter vs. frequency



Logic-level conversion application

