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, $V_{OL} \leqslant 0.4V$, and $I_{OL} \geqslant 3.2$ mA).

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

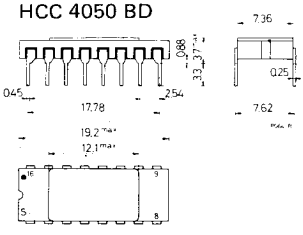
* All voltage values are referred to V_{SS} pin voltage

ORDERING NUMBERS:

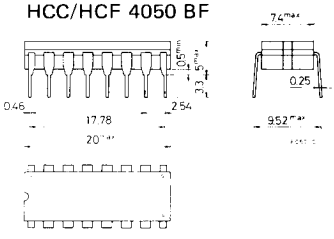
HCC 4049 UBD for dual in-line ceramic package
HCC 4049 UBF for dual in-line ceramic package, frit seal
HCC 4049 UBK for ceramic flat package
HCF 4049 UBE for dual in-line plastic package
HCF 4049 UBF for dual in-line ceramic package, frit seal
HCF 4049 UBM for plastic micropackage
HCC 4050 BD for dual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

MECHANICAL DATA (dimensions in mm)

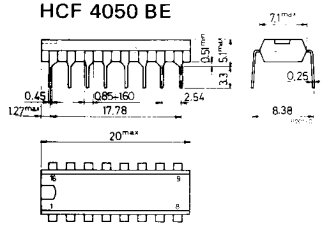
Dual in-line ceramic package for HCC 4049 UBD and HCC 4050 BD



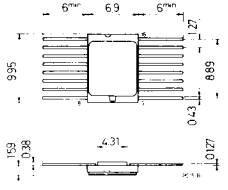
Dual in-line ceramic package for HCC/HCF 4049 UBF and HCC/HCF 4050 BF



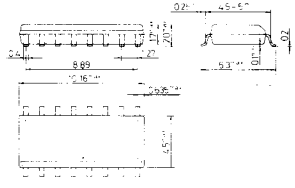
Dual in-line plastic package for HCF 4049 UBE and HCF 4050 BE



Ceramic flat package for HCC 4049 UBK and HCC 4050 BK

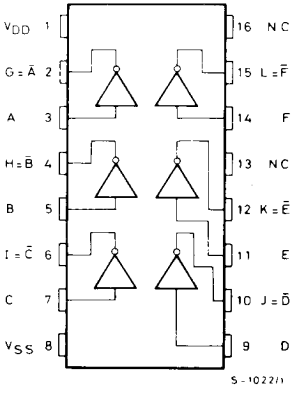


Plastic micropackage for HCF 4049 UBM and HCF 4050 BM

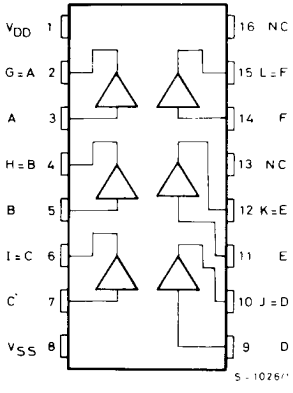


CONNECTION DIAGRAMS

For **4049 UB**



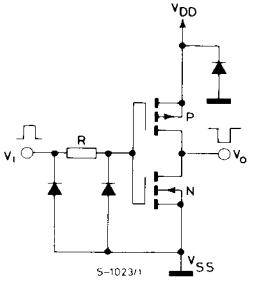
For **4050 B**



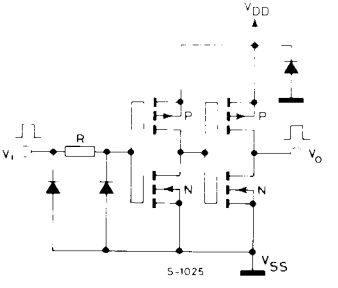
SCHEMATIC DIAGRAMS

1 of 6 identical units

For **4049 UB**

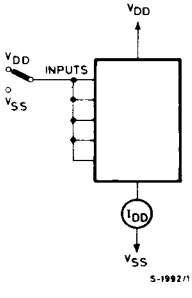


For **4050 B**

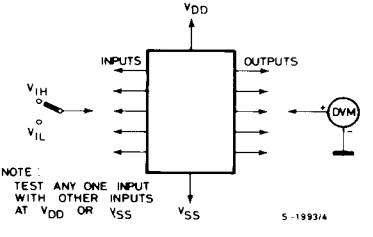


TEST CIRCUITS

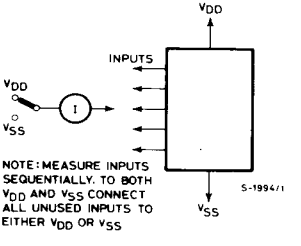
Quiescent device current



Input voltage



Input current



RECOMMENDED OPERATING CONDITIONS

V_{DD}	Supply voltage: **HCC** types	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

* 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)

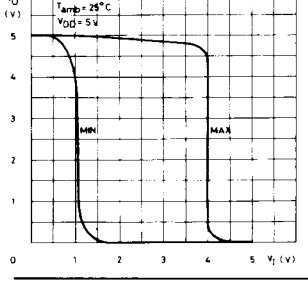
Parameter			Test conditions V_I (V)	V_O (V)	V_{DD} (V)	Values T_{Low}* Min.	T_{Low}* Max.	25°C Min.	25°C Typ.	25°C Max.	T_{High}* Min.	T_{High}* Max.	Unit
I_L	Quiescent supply current	HCC types	0/ 5		5		1		0.02	1		30	μA
			0/10		10		2		0.02	2		60	
			0/15		15		4		0.02	4		120	
			0/20		20		20		0.04	20		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		2.2		μA
			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		$\pm 10^{-5}$	±0.1		± 1	μA
		HCF types	0/15		15		±0,3		$\pm 10^{-5}$	±0.3		± 1	
C_I	Input capacitance	4049UB	Any input						15	22.5			
		4050B							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

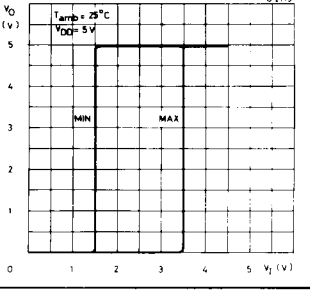
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb}= 25°C, C_L= 50 pF, R_L= 200 kΩ, typical temperature coefficient for all V_{DD} values is 0.3%/°C, all input rise and fall times = 20 ns)

Parameter		Test conditions		Values			Unit
		V_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	
		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	
		10	10		20	40	
		15	15		15	30	

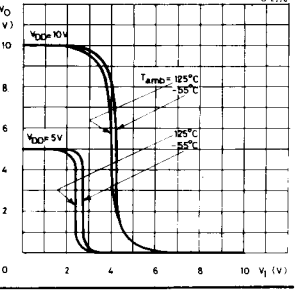
Minimum and maximum voltage transfer characteristics for 4049UB



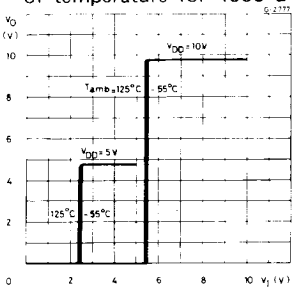
Minimum and maximum voltage transfer characteristics for 4050B



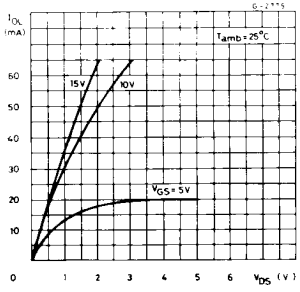
Typical voltage transfer characteristics as a function of temperature for 4049 UB



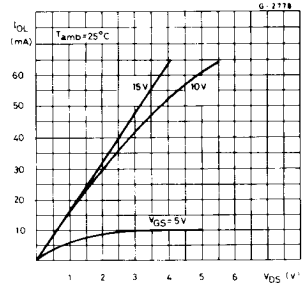
Typical voltage transfer characteristics as a function of temperature for 4050 B



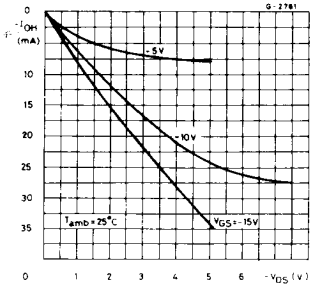
Typical output low (sink) current characteristics



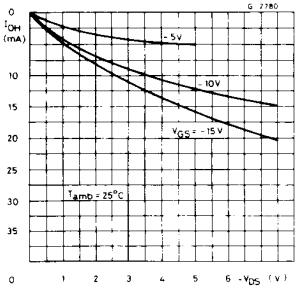
Minimum output low (sink) current drain characteristics



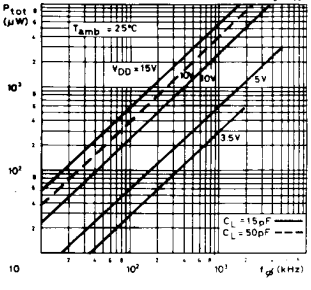
Typical output high (source) current characteristics



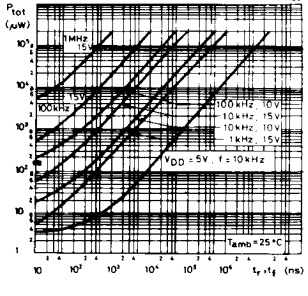
Minimum output high (source) current characteristics



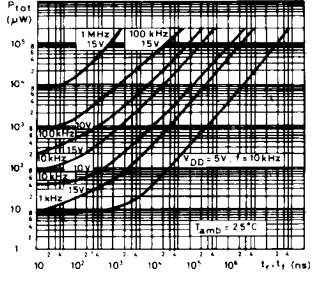
Typical power dissipation per buffer/inverter vs. frequency



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



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



Logic-level conversion application