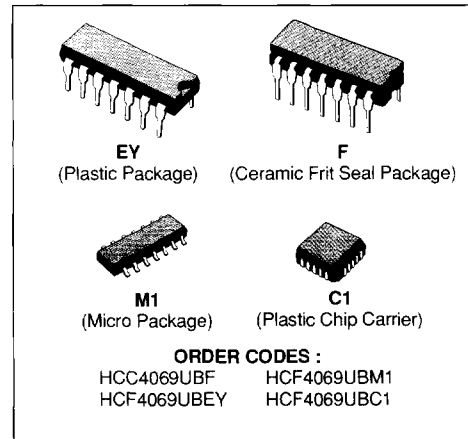


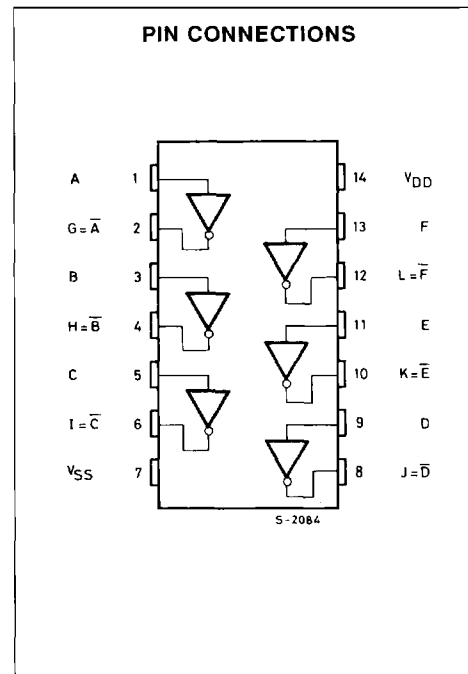
HEX INVERTER

- MEDIUM-SPEED OPERATION
 – t_{PHL} , t_{PLH} = 30ns (typ.) AT 10V
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

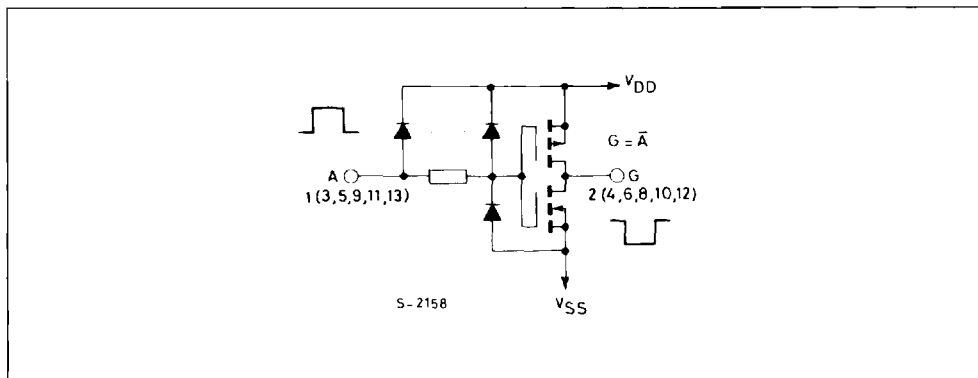

DESCRIPTION

The **HCC4069UB** (extended temperature range) and **HCF4069UB** (intermediate temperature range) are monolithic integrated circuit, available in 14-lead dual in-line plastic or ceramic package and plastic micro package.

The **HCC/HCF4069UB** consists of six COS/MOS inverter circuits. This device is intended for all general-purpose inverter applications where the medium-power TTL-drive and logic-level-conversion capabilities of circuits such as **HCC/HCF4049B** Hex Inverter/Buffers are not required.



SCHEMATIC DIAGRAM OF ONE OF SIX IDENTICAL INVERTERS.



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
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) Dissipation per Output Transistor for Top = Full Package-temperature Range	200 100	mW mW
T_{op}	Operating Temperature : HCC Types HCF Types	- 55 to + 125 - 40 to + 85	$^{\circ}C$ $^{\circ}C$
T_{stg}	Storage Temperature	- 65 to + 150	$^{\circ}C$

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

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

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage : HCC Types HCF Types	3 to 18 3 to 15	V V
V_i	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature : HCC Types HCF Types	- 55 to + 125 - 40 to + 85	$^{\circ}C$ $^{\circ}C$

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

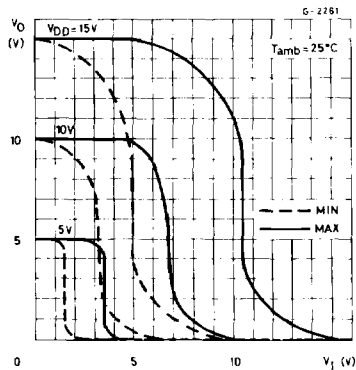
Symbol	Parameter		Test Conditions				Value						Unit	
			V _I (V)	V _O (V)	I _O (μ A)	V _{DD} (V)	T _{Low} *		25°C			T _{High} *		
							Min.	Max.	Min.	Typ.	Max.	Min.		Max.
I _L	Quiescent Current	HCC Types	0/5			5		0.25		0.01	0.25		7.5	μ A
			0/10			10		0.5		0.01	0.5		15	
			0/15			15		1		0.01	1		30	
			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	
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	4		4			4	V	
			1/9		< 1	10	8		8			8		
			1.5/13.5		< 1	15	12.5		12.5			12.5		
V _{IL}	Input Low Voltage		4.5/0.5		< 1	5		1			1	1	V	
			9/1		< 1	10		2			2	2		
			13.5/1.5		< 1	15		2.5			2.5	2.5		
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		
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	μ A
		HCF Types	0/15											
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.

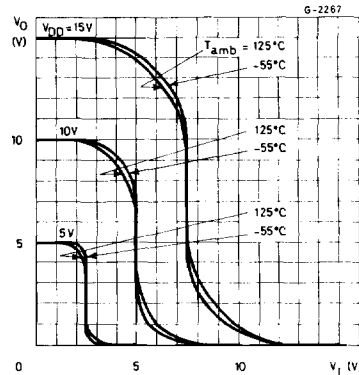
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$, typical temperature coefficient for all $V_{DD} = 0.3\%/^{\circ}\text{C}$ values, all input rise and fall time = 20ns)

Symbol	Parameter	Test Conditions	Value			Unit	
			V_{DD} (V)	Min.	Typ.		Max.
t_{PLH} , t_{PHL}	Propagation Delay Time		5		55	110	ns
			10		30	60	
			15		25	50	
t_{TLH} , t_{THL}	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

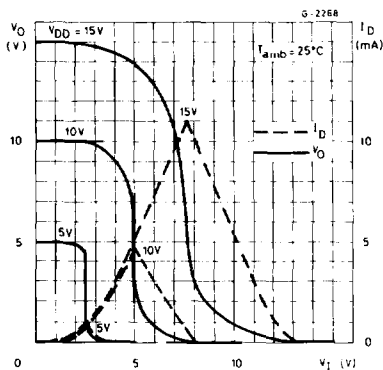
Minimum and Maximum Voltage Transfer Characteristics.



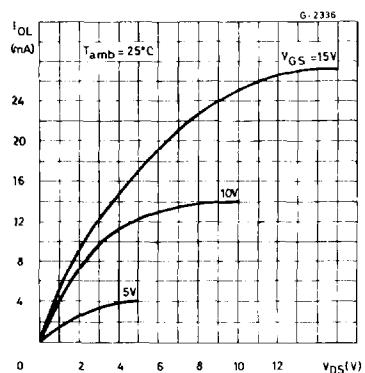
Typical Voltage Transfer Characteristics as a Function of Temperature.



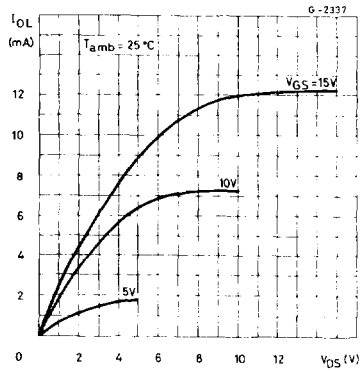
Typical Current and Voltage Transfer Characteristics.



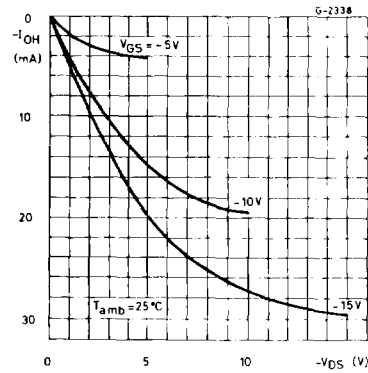
Typical Output Low (sink) Current Characteristics.



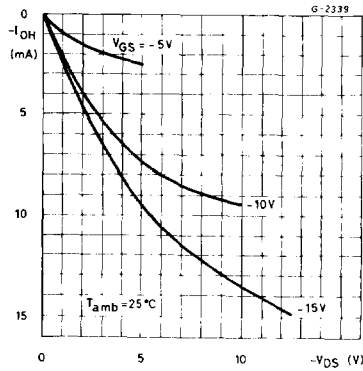
Minimum Output Low (sink) Current Characteristics.



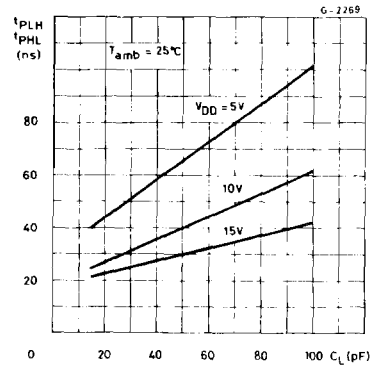
Typical Output High (source) Current Characteristics.



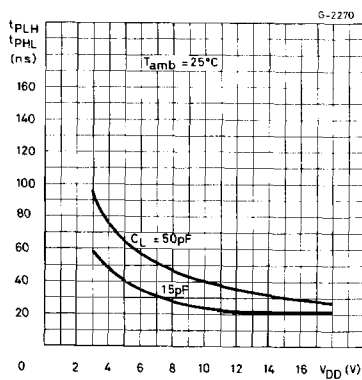
Minimum Output High (source) Current Characteristics.



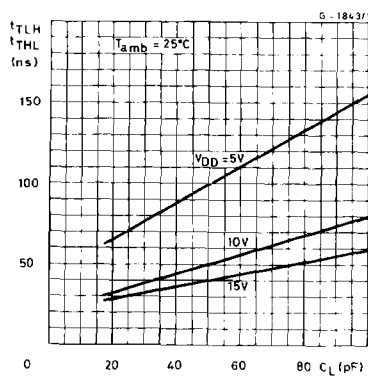
Typical Propagation Delay Time vs. Load Capacitance.



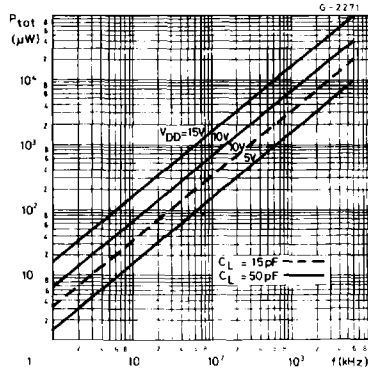
Typical Propagation Delay Time vs. Load Capacitance.



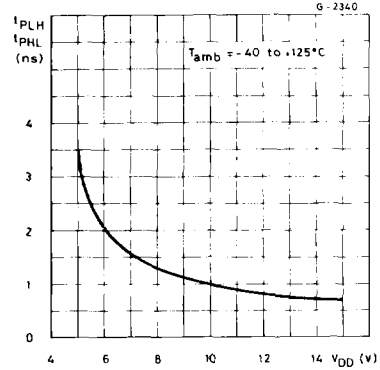
Typical Transition Time vs. Load Capacitance.



Typical Dynamic Power Dissipation/per Inverter vs. Frequency.

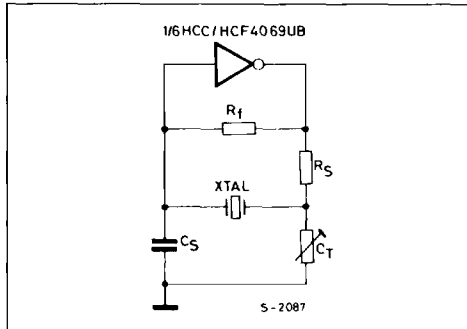


Variation of Normalized Propagation Delay Time (tPHL and tPLH) with Supply Voltage.

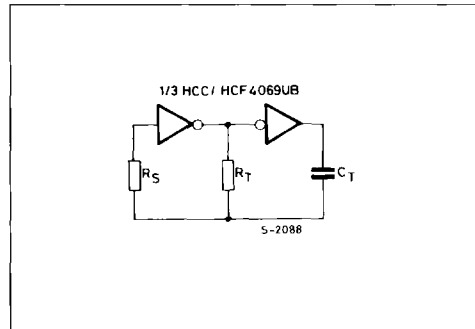


APPLICATIONS

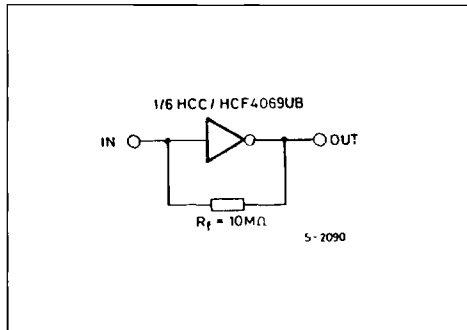
Typical Crystal Oscillator Circuit.



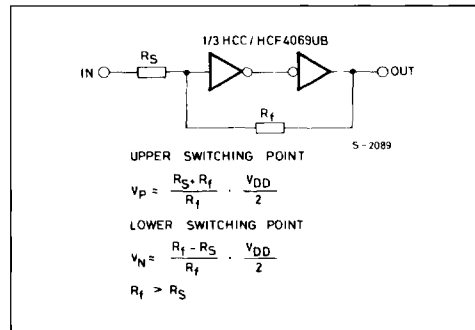
Typical RC Oscillator Circuit.



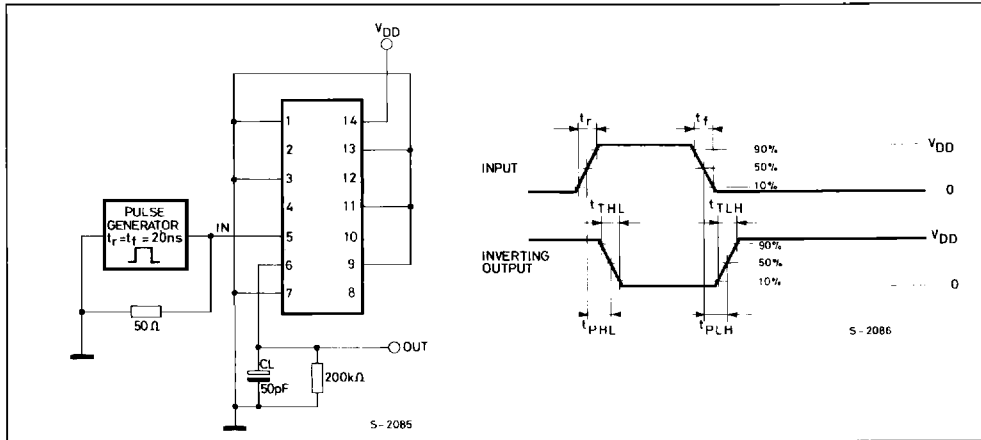
High Input Impedance Amplifier.



Input Pulse Shaping Circuit (schmitt trigger).

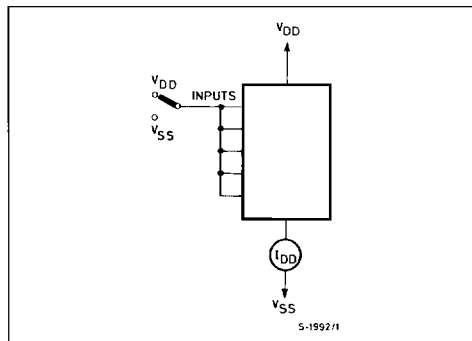


DYNAMIC ELECTRICAL CHARACTERISTICS AND WAVEFORMS

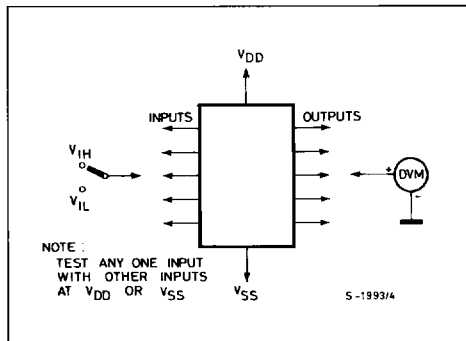


TEST CIRCUITS

Quiescent Device Current.



Noise Immunity.



Input Leakage Current.

