

# COS/MOS INTEGRATED CIRCUIT

40106B

HCC/HCF 40106B

## HEX SCHMITT TRIGGERS

- SCHMITT-TRIGGER ACTION WITH NO EXTERNAL COMPONENTS
- HYSTERESIS VOLTAGE (TYP.) 0.9V at  $V_{DD}=5V$ , 2.3V at  $V_{DD}=10V$  and 3.5V at  $V_{DD}=15V$
- NOISE IMMUNITY GREATER THAN 50%
- NO LIMIT ON INPUT RISE AND FALL TIME
- LOW  $V_{DD}$  TO  $V_{SS}$  CURRENT DURING SLOW INPUT RAMP
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED AT 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 40106B** (extended temperature range) and **HCF 40106B** (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 40106B** consists of six Schmitt-trigger circuits. Each circuit functions as an inverter with Schmitt-trigger action on the input. The trigger switches at different points for positive- and negative-going signals. The difference between the positive-going voltage ( $V_P$ ) and the negative-going voltage ( $V_N$ ) is defined as hysteresis voltage ( $V_H$ ).

## ABSOLUTE MAXIMUM RATINGS

$V_{DD}$ *	Supply voltage: <b>HCC types</b> <b>HCF types</b>	-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)	$\pm 10$	mA
$P_{tot}$	Total power dissipation (per package) Dissipation per output transistor for $T_{op}$ = full package-temperature range	200	mW
$T_{op}$	Operating temperature: <b>HCC types</b> <b>HCF types</b>	-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 40106 BD for dual in-line ceramic package
- HCC 40106 BF for dual in-line ceramic package, frit seal
- HCC 40106 BK for ceramic flat package
- HCF 40106 BE for dual in-line plastic package
- HCF 40106 BF for dual in-line ceramic package, frit seal
- HCF 40106 BM for plastic micropackage



STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Parameter		Test conditions				Values						Unit	
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>O</sub>   ( $\mu$ A)	V <sub>DD</sub> (V)	T <sub>Low</sub> *		25°C			T <sub>High</sub> *		
						Min.	Max.	Min.	Typ.	Max.	Min.		Max.
I <sub>L</sub>	Quiescent current	HCC types	0/ 5			5		1	0.02	1		30	$\mu$ A
			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 <sub>OH</sub>	Output high voltage	0/ 5	< 1		5	495		495			495	V	
		0/10	< 1		10	995		995			995		
		0/15	< 1		15	1495		1495			1495		
V <sub>OL</sub>	Output low voltage	5/10	< 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 <sub>P</sub>	Positive trigger threshold voltage				5	2.2	3.6	2.2	2.9	3.6	2.2	3.6	V
					10	4.6	7.1	4.6	5.9	7.1	4.6	7.1	
					15	6.8	10.8	6.8	8.8	10.8	6.8	10.8	
V <sub>N</sub>	Negative trigger threshold voltage				5	0.9	2.8	0.9	1.9	2.8	0.9	2.8	V
					10	2.5	5.2	2.5	3.9	5.2	2.5	5.2	
					15	4	7.4	4	5.8	7.4	4	7.4	
V <sub>H</sub>	Hysteresis voltage				5	0.3	1.6	0.3	0.9	1.6	0.3	1.6	V
					10	1.2	3.4	1.2	2.3	3.4	1.2	3.4	
					15	1.6	5	1.6	3.5	5	1.6	5	
I <sub>OH</sub>	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			
I <sub>OL</sub>	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		2.9	
I <sub>IH</sub> , I <sub>IL</sub> **	Input leakage current	HCC types	0/18	Any input	18		$\pm$ 0.1		$\pm$ 10 <sup>-5</sup>	$\pm$ 0.1		$\pm$ 1	$\mu$ A
		HCF types	0/15		15		$\pm$ 0.3		$\pm$ 10 <sup>-5</sup>	$\pm$ 0.3		$\pm$ 1	
C <sub>I</sub>	Input capacitance		Any input					5	7.5			pF	

\* T<sub>Low</sub> = -55°C for HCC device; -40°C for HCF device.  
 \* T<sub>High</sub> = +125°C for HCC device; +85°C for HCF device.

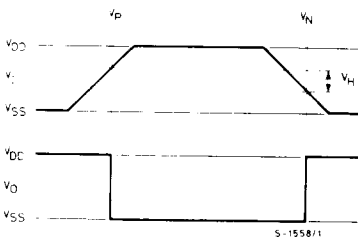
## DYNAMIC ELECTRICAL CHARACTERISTICS

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

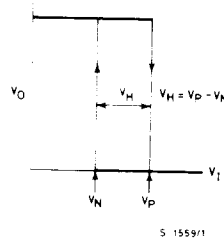
Parameter	Test conditions	Values			Unit	
		$V_{DD}(\text{V})$	Min.	Typ.		Max.
$t_{PLH}$ , $t_{PHL}$	Propagation delay time	5		140	280	ns
		10		70	140	
		15		60	120	
$t_{THL}$ , $t_{TLH}$	Transition time	5		100	200	ns
		10		50	100	
		15		40	80	

### Hysteresis definition, characteristic and test setup

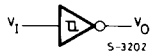
(a) Definition of  $V_P$ ,  $V_N$  and  $V_H$



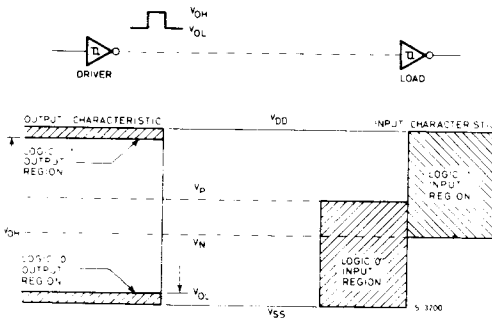
(b) Transfer characteristic of 1 of 6 gates



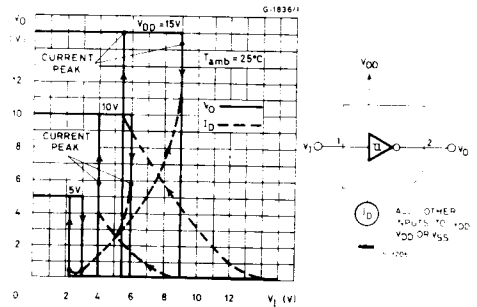
(c) Test setup



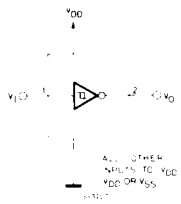
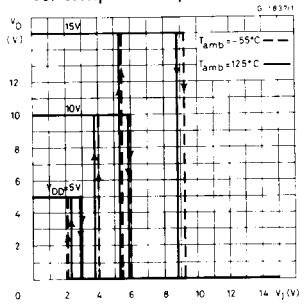
### Input and output characteristics



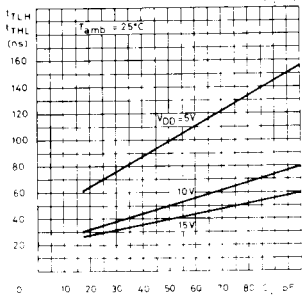
### Typical current voltage transfer characteristics, and test circuit



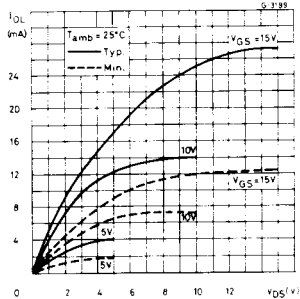
Typical voltage transfer characteristics vs. temperature, and test circuit



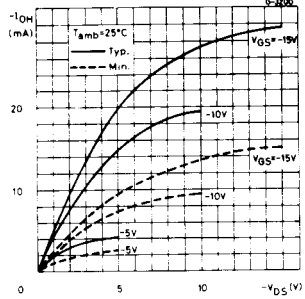
Typical transition time vs. load capacitance



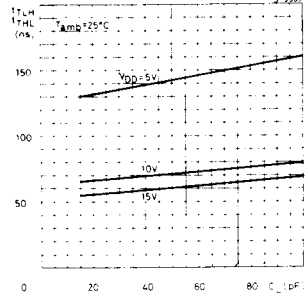
Output low (sink) current characteristics



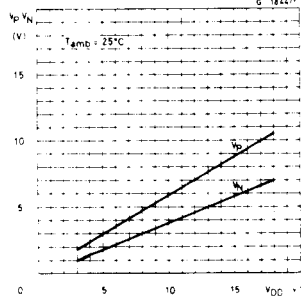
Output high (source) current characteristics



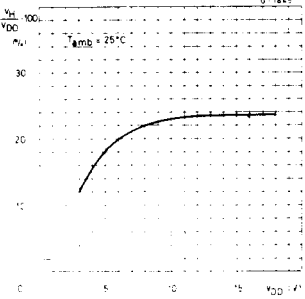
Typical propagation delay time vs. load capacitance



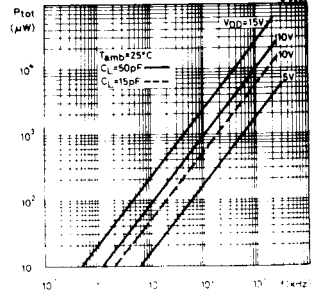
Typical trigger threshold voltage vs. supply voltage



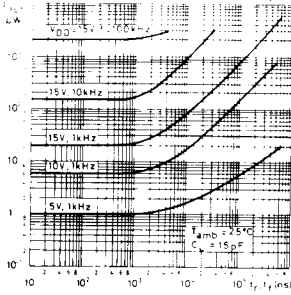
Typical per cent hysteresis vs. supply voltage



Typical power dissipation per trigger vs. input frequency

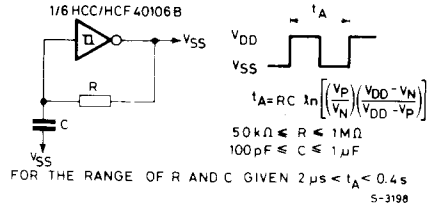


Typical power dissipation per trigger vs. input frequency

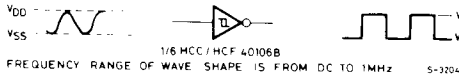


## TYPICAL APPLICATIONS

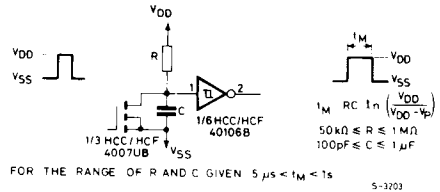
Astable multivibrator



Wave shaper

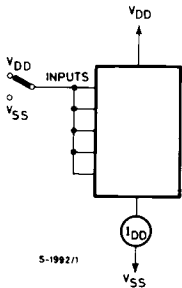


Monostable multivibrator

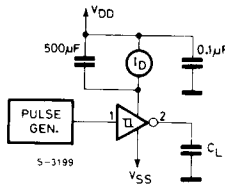


## TEST CIRCUITS

Quiescent device current



Dynamic power dissipation



Input current

