COS/MOS INTEGRATED CIRCUIT

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: **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

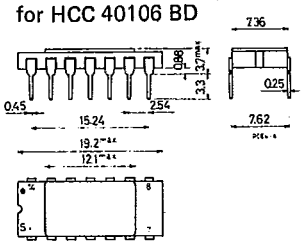
* All voltage values are referred to V_{SS} pin voltage

ORDERING NUMBERS:

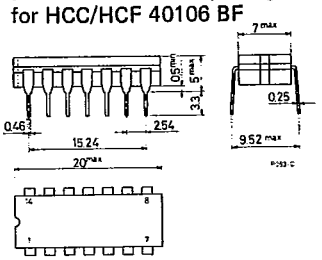
HCC 40106 BD for dual in-line ceramic package
HCC 40106 BF for dual in-line ceramic package, frit seal
HCC 40106 BK for ceramic flat package
HCF 40106 BE for dual in-line plastic package
HCF 40106 BF for dual in-line ceramic package, frit seal
HCF 40106 BM for plastic micropackage

MECHANICAL DATA (dimensions in mm)

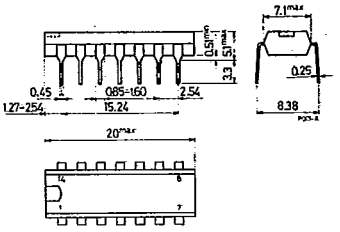
Dual in-line ceramic package for HCC 40106 BD



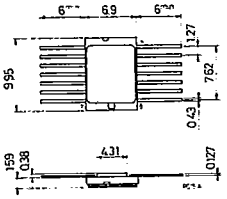
Dual in-line ceramic package for HCC/HCF 40106 BF



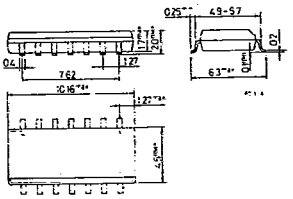
Dual in-line plastic package for HCF 40106 BE



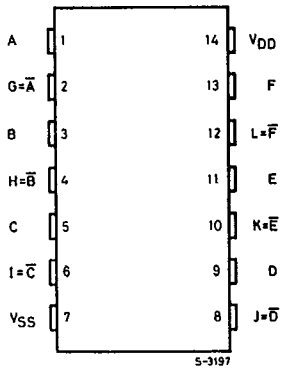
Ceramic flat package for HCC 40106 BK



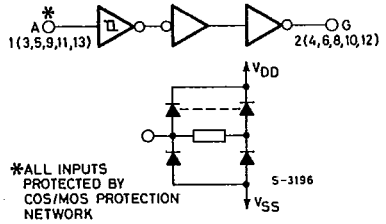
Plastic micropackage for HCF 40106 BM



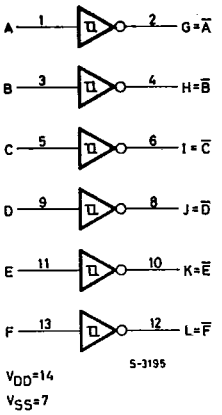
PIN CONNECTIONS



LOGIC DIAGRAM



FUNCTIONAL DIAGRAM



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		5/10		< 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_P	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_N	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_H	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_{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		2.9		
I_{IH},I_{IL}**	Input leakage current	HCC types	0/18	Any input		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			Any input						5	7.5			pF

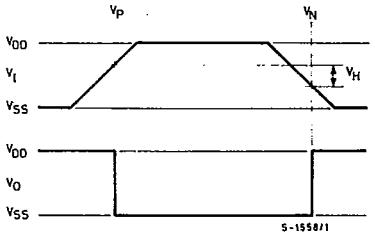
* T_{Low} = −55°C for **HCC** device: −40°C for **HCF** device.
* T_{High} = +125°C for **HCC** device; +85°C for **HCF** device.

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 time = 20 ns)

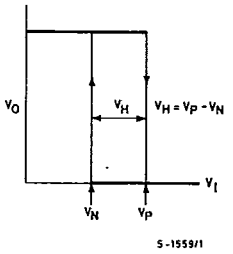
Parameter		Test conditions	Values			Unit
		V_{DD}(V)	Min.	Typ.	Max.	
t_{PLH}, t_{PHL}	Propagation delay time	5		140	280	ns
		10		70	140	
		15		60	120	
t_{THL}, t_{TLH}	Transition time	5		100	200	ns
		10		50	100	
		15		40	80	

Hysteresis definition, characteristic and test setup

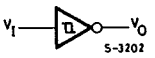
(a) Definition of V_P, V_N and V_H



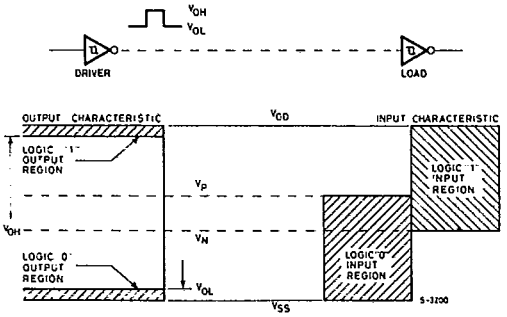
(b) Transfer characteristic of 1 of 6 gates



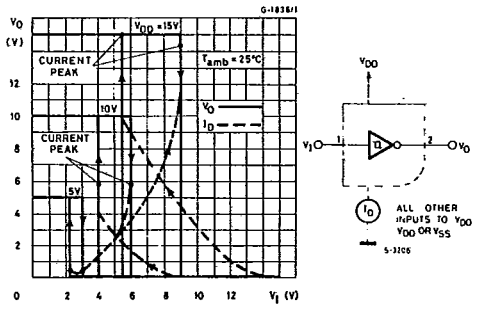
(c) Test setup



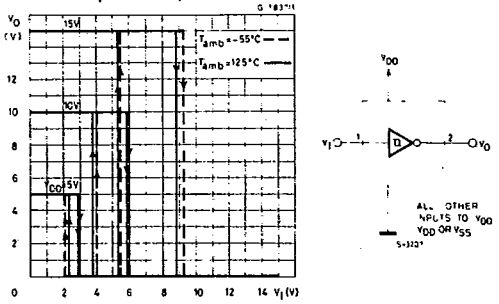
Input and output characteristics



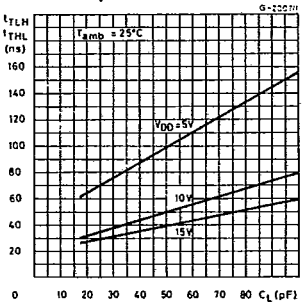
Typical current voltage transfer characteristics, and test circuit



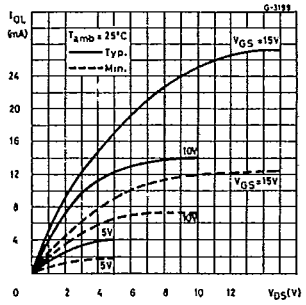
Typical voltage transfer characteristics vs. temperature, and test circuit



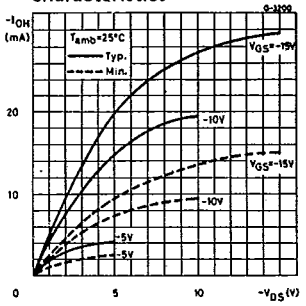
Typical transition time vs. load capacitance



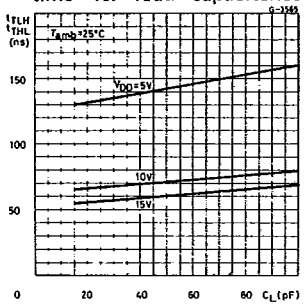
Output low (sink) current characteristics



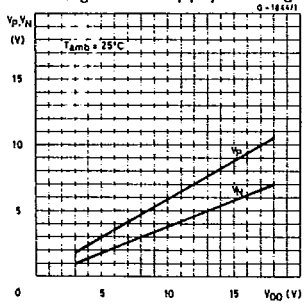
Output high (source) current characteristics



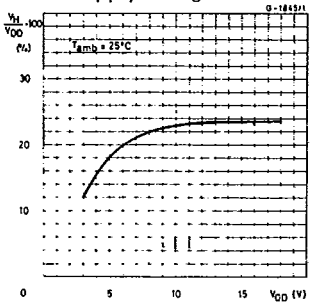
Typical propagation delay time vs. load capacitance



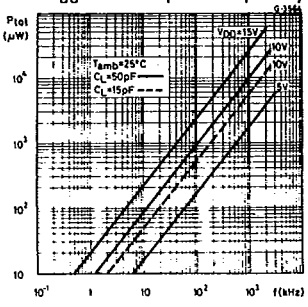
Typical trigger threshold voltage vs. supply voltage



Typical per cent hysteresis vs. supply voltage

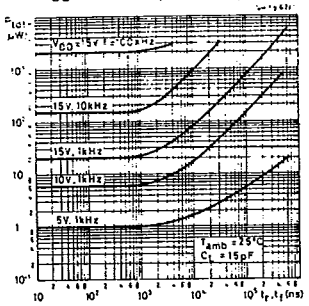


Typical power dissipation per trigger vs. input frequency



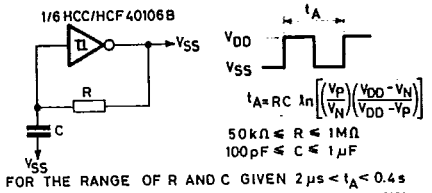
HCC/HCF 40106B

Typical power dissipation per trigger vs. input frequency



TYPICAL APPLICATIONS

Astable multivibrator



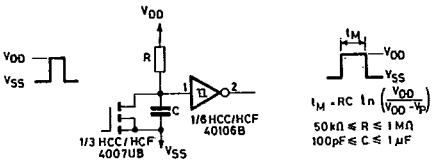
FOR THE RANGE OF R AND C GIVEN $2\,\mu s < t_A < 0.4\,s$

5-3198

Wave shaper

FREQUENCY RANGE OF WAVE SHAPE IS FROM DC TO 1MHz 5-3204

Monostable multivibrator

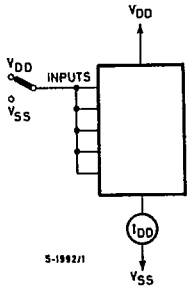


FOR THE RANGE OF R AND C GIVEN $5\,\mu s < t_M < 1\,s$

5-3203

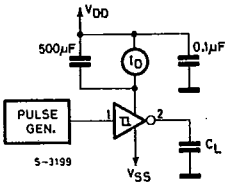
TEST CIRCUITS

Quiescent device current



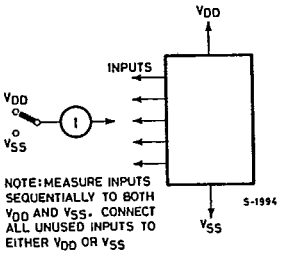
5-1992/1

Dynamic power dissipation



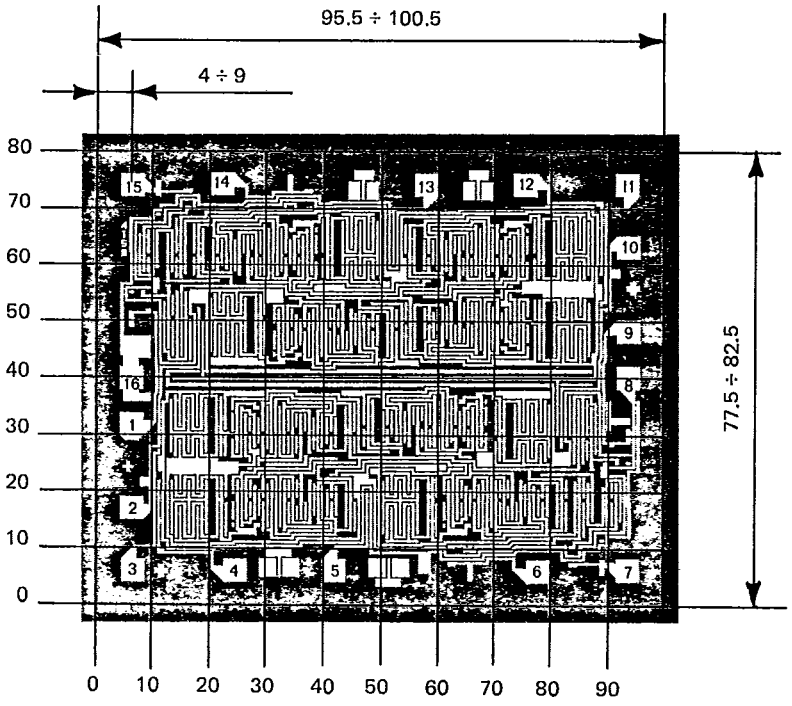
5-3199

Input current

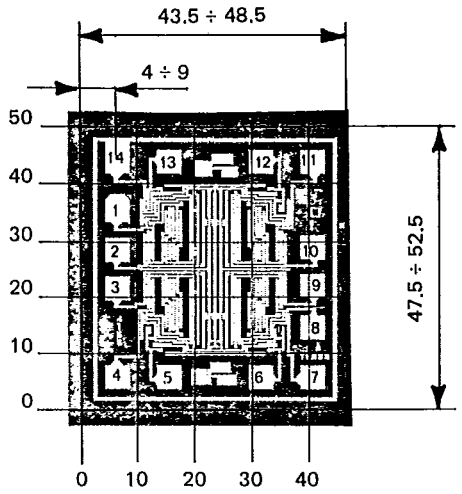


NOTE: MEASURE INPUTS SEQUENTIALLY TO BOTH V_{DD} AND V_{SS}. CONNECT ALL UNUSED INPUTS TO EITHER V_{DD} OR V_{SS}

5-1994


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