COS/MOS INTEGRATED CIRCUIT

4538B

HCC/HCF 4538B

PRELIMINARY DATA

DUAL MONOSTABLE MULTIVIBRATOR

- RETRIGGERABLE/RESETTABLE CAPABILITY
- TRIGGER AND RESET PROPAGATION DELAYS INDEPENDENT OF R_X, C_X
- TRIGGERING FROM LEADING OR TRAILING EDGE
- Q AND $\overline{Q}$ BUFFERED OUTPUTS AVAILABLE
- SEPARATE RESETS
- WIDE RANGE OF OUTPUT-PULSE WIDTHS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- SCHMITT TRIGGER INPUT ALLOWS UNLIMITER RISE AND FALL TIMES ON +TR AND -TR INPUTS
- 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 4538B** (extended temperature range) and **HCF 4538B** (intermediate temperature range) are monolithic integrated circuit, available in 16-lead dual in-line plastic or-ceramic package and ceramic flat package. The **HCC/HCF 4538B** dual precision monostable multivibrator provides stable retriggerable/resettable one-shot operation for any fixed-voltage timing application. An external resistor (R_X) and an external capacitor (C_X) control the timing and accuracy for the circuit. Adjustment of R_X and C_X provides a wide range of output pulse widths from the Q and $\overline{Q}$ terminals. The time delay from trigger input to output transition (trigger propagation delay) and the time delay from reset input to output transition (reset propagation delay) are independent of R_X and C_X. Precision control of output pulse widths is achieved through linear CMOS techniques. Leading-edge-triggering (+ TR) and trailing-edge-triggering (— TR) inputs are provided for triggering from either edge of an input pulse. An unused + TR input should be tied to V_{SS}. An unused —TR input should be tied to V_{DD}. A RESET (on low level) is provided for immediate termination of the output pulse or to prevent output pulses when power is turned on. An unused RESET input should be tied to V_{DD}. However, if an entire section of the **HCC/HCF 4538B** is not used, its inputs must be tied to either V_{DD} or V_{SS} (See table 1). In normal operation the circuit triggers (extends the output pulse one period) on the application of each new trigger pulse. For operation in the non-retriggerable mode, $\overline{Q}$ is connected to —TR when leading-edge triggering (+ TR) is used or Q is connected to +TR when trailingedge triggering (— TR) is used. The time period (T) for this multivibrator can be calculated by: $T = R_X C_X$. The min. value of external resistance, R_X, is 4KΩ. The max. and min. values of external capacitance, C_X, are 100 μF and 5 nF, respectively.

ABSOLUTE MAXIMUM RATINGS

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

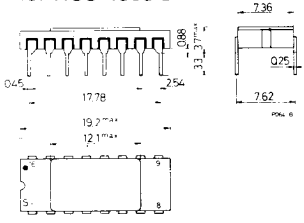
* All voltage are with respect to V_{SS} (GND).

ORDERING NUMBERS:

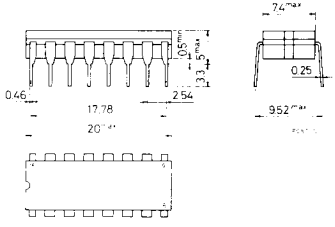
HCC 4538 BD for dual in-line ceramic package
HCC 4538 BF for dual in-line ceramic package, frit seal
HCC 4538 BK for ceramic flat package
HCF 4538 BE for dual in-line plastic package
HCF 4538 BF for dual in-line ceramic package, frit seal

MECHANICAL DATA (dimensions in mm)

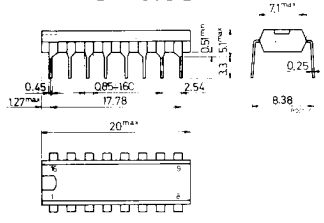
Dual in-line ceramic package for HCC 4538 BD



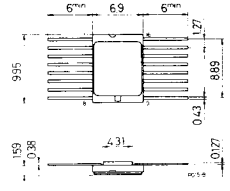
Dual in-line ceramic package for HCC/HCF 4538 BF



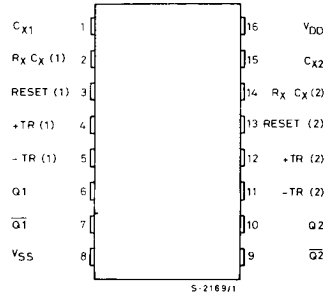
Dual in-line plastic package for HCF 4538 BE



Ceramic flat package for HCC 4538 BK

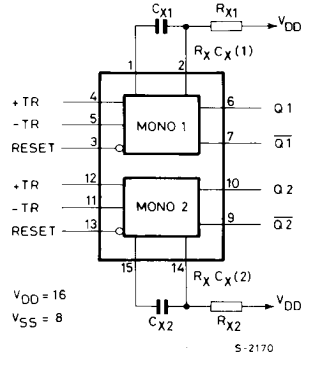


PIN CONNECTIONS



TERMINALS 1,8,15, ARE ELECTRICALLY CONNECTED INTERNALLY

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

LOGIC DIAGRAM (1/2 of device shown)

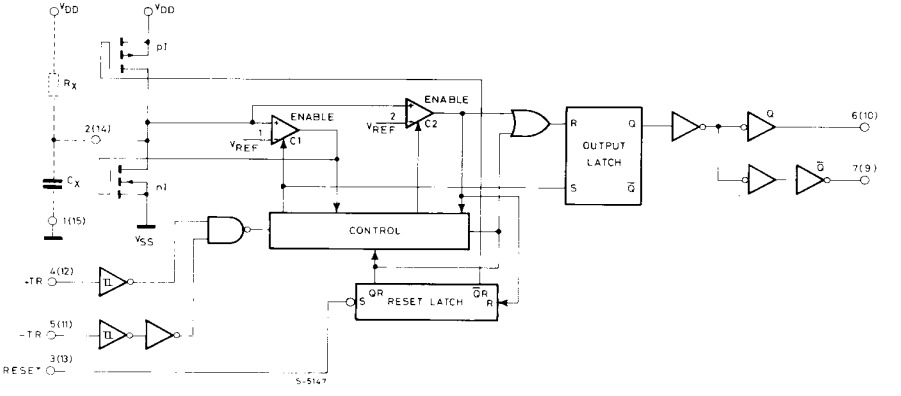
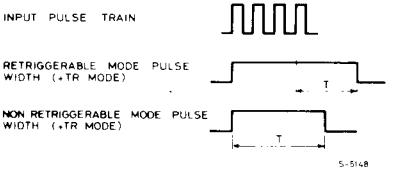


TABLE 1 – Functional terminal connections

FUNCTION	TO V_{DD}		TERMINAL CONNECTIONS TO V_{SS}		INPUT PULSE TO		OTHER CONNECTIONS	
	Mono(1)	Mono(2)	Mono(1)	Mono(2)	Mono(1)	Mono(2)	Mono(1)	Mono(2)
Leading – Edge Trigger/Retriggerable	3, 5	11, 13			4	12		
Leading – Edge Trigger/Non-retriggerable	3	13			4	12	5-7	11-9
Trailing – Edge Trigger/Retriggerable	3	13	4	12	5	11		
Trailing – Edge Trigger/Non-retriggerable	3	13			5	11	4-6	12-10

NOTES: 1) A Retriggerable one-shot multivibrator has an output pulse width which is extended one full time period (T) after application of the last trigger pulse.

2) A Non-retriggerable one-shot multivibrator has a time period (T) referenced from the application of the first trigger pulse.



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		5		0.04	5		150	μA
			0/10			10		10		0.04	10		300	
			0/15			15		20		0.04	20		600	
			0/20			20		100		0.08	100		3000	
		HCF types	0/ 5			5		20		0.04	20		150	
			0/10			10		40		0.04	40		300	
			0/15			15		80		0.04	80		600	
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	3.5		3.5			3.5		V
				1/9	< 1	10	7		7			7		
				1.5/13.5	< 1	15	11		11			11		
V_{IL}	Input low voltage			4.5/0.5	< 1	5		1.5			1.5		1.5	V
				9/1	< 1	10		3			3		3	
				13.5/1.5	< 1	15		4			4		4	
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		2.4		
I_{IH}, I_{IL}	Input leakage current	HCC types	0/18	Any input		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			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°C, C_L = 50 pF, R_L = 200 kΩ, typical temperature coefficient for all V_{DD} values in 0.3%/°C, all input rise and fall time = 20 ns)

Parameter		Test conditions	Values			Unit
		V_{DD} (V)	Min.	Typ.	Max.	
t_{TLH}, t_{THL}	Transition time	5		100		ns
		10		50		
		15		40		
t_{PLH} t_{PHL}	Propagation delay time +TR or −TR to Q or $\overline{Q}$	5		300		ns
		10		150		
		15		100		
	Reset to Q or $\overline{Q}$	5		250		ns
		10		125		
		15		95		
t_{WH} t_{WL}	Pulse width +TR, −TR or Reset	5		35		ns
		10		30		
		15		25		
t_{WT}	Pulse width -Q or $\overline{Q}$; C_X = 0.005 μF, R_X = 10 KΩ	5		58		μs
		10		55		
		15		55		
	C_X = 0.1 μF, R_X = 100 KΩ	5		9,86		ms
		10		10		
		15		10.14		
	C_X = 10 μF, R_X = 100 KΩ	5		0.965		S
		10		0.98		
		15		0.99		
t_W	Pulse width match between circuits in same package: C_X = 0.1 μF, R_X = 100 KΩ $100 \frac{(T1 - T2)}{T1}$	5		± 1		%
		10		± 1		
		15		± 1		