منابع

۱- کتاب تحلیل و طراحی مدارهای تکنیک پالس؛ مؤلف: دیوید بل ، مترجم: محمود دیانی.

۲- اصول و مبانی تکنیک پالس؛ مؤلف: دکتر سید احمد معتمدی.

۳- تکنیک پالس و مدارات دیجیتال؛ مؤلف: دکتر محمود تابنده.

۴- مدارهای میکروالکترونیک؛ مؤلف: عادل شفیق سدرة ، مترجم: محمود دیانی.

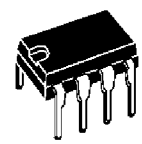
۵- جزوات تدریس شده در کلاس اساتید محترم: دکتر حسین شمسی، دکتر حمید ابریشمی مقدم.

۶- فایلهای مرتبط با درس تکنیک پالس از اینترنت.

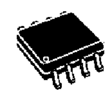
NE555
SA555 - SE555

GENERAL PURPOSE SINGLE BIPOLAR TIMERS

- LOW TURN OFF TIME
- MAXIMUM OPERATING FREQUENCY GREATER THAN 500kHz
- TIMING FROM MICROSECONDS TO HOURS
- OPERATES IN BOTH ASTABLE AND MONOSTABLE MODES
- HIGH OUTPUT CURRENT CAN SOURCE OR SINK 200mA
- ADJUSTABLE DUTY CYCLE
- TTL COMPATIBLE
- TEMPERATURE STABILITY OF 0.005% PER^{o}C



N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)

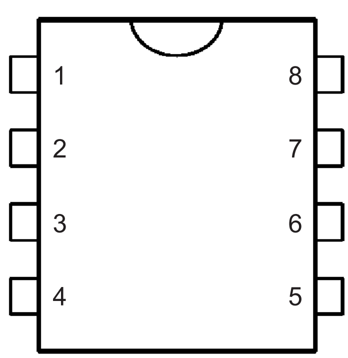
DESCRIPTION

The NE555 monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For a stable operation as an oscillator, the free running frequency and the duty cycle are both accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on falling waveforms, and the output structure can source or sink up to 200mA. The NE555 is available in plastic and ceramic minidip package and in a 8-lead micropackage and in metal can package version.

ORDER CODES

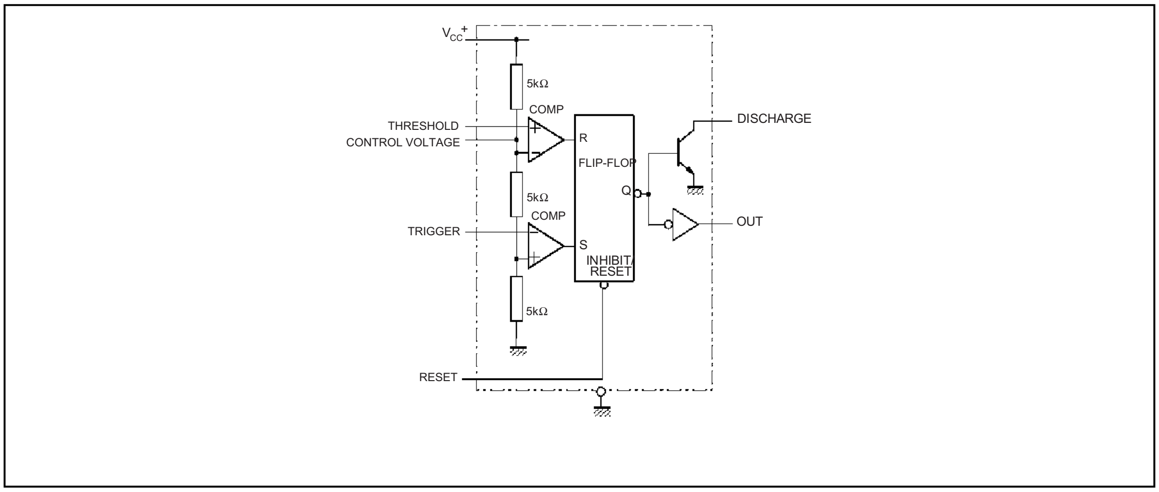
Part Number	Temperature Range	Package	
		N	D
NE555	0^{o}C, 70^{o}C	•	•
SA555	–40^{o}C, 105^{o}C	•	•
SE555	–55^{o}C, 125^{o}C	•	•

PIN CONNECTIONS (top view)

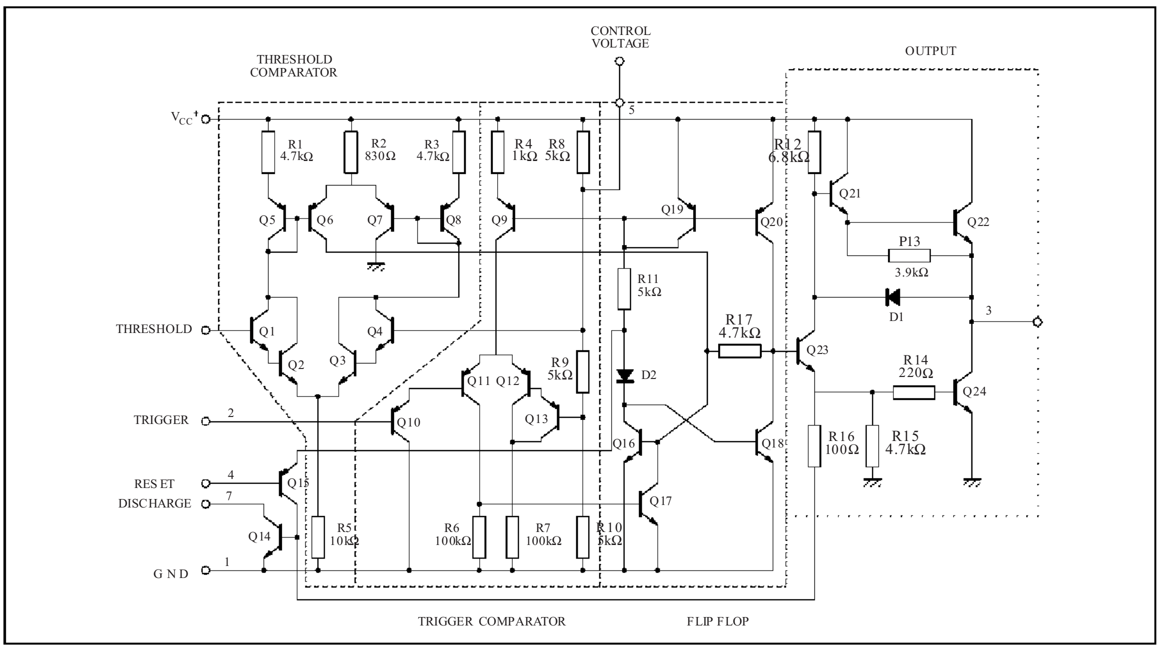


1 - GND
2 - Trigger
3 - Output
4 - Reset
5 - Control voltage
6 - Threshold
7 - Discharge
8 - V_{CC}

BLOCK DIAGRAM



SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{cc}	Supply Voltage		18	V
T_{oper}	Operating Free Air Temperature Range	for NE555 for SA555 for SE555	0 to 70 –40 to 105 –55 to 125	°C
T_j	Junction Temperature		150	°C
T_{stg}	Storage Temperature Range		–65 to 150	°C

OPERATING CONDITIONS

Symbol	Parameter	SE555	NE555 - SA555	Unit
V_{CC}	Supply Voltage	4.5 to 18	4.5 to 18	V
V_{th}, V_{trig}, V_{cl}, V_{reset}	Maximum Input Voltage	V_{CC}	V_{CC}	V

ELECTRICAL CHARACTERISTICS

T_{amb} = +25°C, V_{CC} = +5V to +15V (unless otherwise specified)

Symbol	Parameter	SE555			NE555 - SA555			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
I_{CC}	Supply Current (R_L ∞) (- note 1) Low State V_{CC} = +5V V_{CC} = +15V High State V_{CC} = 5V		 3 10 2	 5 12		 3 10 2	 6 15	mA
	Timing Error (monostable) (R_A = 2k to 100kΩ, C = 0.1μF) Initial Accuracy - (note 2) Drift with Temperature Drift with Supply Voltage		 0.5 30 0.05	 2 100 0.2		 1 50 0.1	 3 0.5	 % ppm/°C %/V
	Timing Error (astable) (R_A, R_B = 1kΩ to 100kΩ, C = 0.1μF, V_{CC} = +15V) Initial Accuracy - (note 2) Drift with Temperature Drift with Supply Voltage		 1.5 90 0.15			 2.25 150 0.3		 % ppm/°C %/V
V_{CL}	Control Voltage level V_{CC} = +15V V_{CC} = +5V	 9.6 2.9	 10 3.33	 10.4 3.8	 9 2.6	 10 3.33	 11 4	V
V_{th}	Threshold Voltage V_{CC} = +15V V_{CC} = +5V	 9.4 2.7	 10 3.33	 10.6 4	 8.8 2.4	 10 3.33	 11.2 4.2	V
I_{th}	Threshold Current - (note 3)		0.1	0.25		0.1	0.25	μA
V_{trig}	Trigger Voltage V_{CC} = +15V V_{CC} = +5V	 4.8 1.45	 5 1.67	 5.2 1.9	 4.5 1.1	 5 1.67	 5.6 2.2	V
I_{trig}	Trigger Current (V_{trig} = 0V)		0.5	0.9		0.5	2.0	μA
V_{reset}	Reset Voltage - (note 4)	0.4	0.7	1	0.4	0.7	1	V
I_{reset}	Reset Current V_{reset} = +0.4V V_{reset} = 0V		 0.1 0.4	 0.4 1		 0.1 0.4	 0.4 1.5	mA
V_{OL}	Low Level Output Voltage V_{CC} = +15V, $I_{O(sink)}$ = 10mA $I_{O(sink)}$ = 50mA $I_{O(sink)}$ = 100mA $I_{O(sink)}$ = 200mA V_{CC} = +5V, $I_{O(sink)}$ = 8mA $I_{O(sink)}$ = 5mA		 0.1 0.4 2 2.5 0.1 0.05	 0.15 0.5 2.2 0.25 0.2		 0.1 0.4 2 2.5 0.3 0.25	 0.25 0.75 2.5 0.4 0.35	V
V_{OH}	High Level Output Voltage V_{CC} = +15V, $I_{O(source)}$ = 200mA $I_{O(source)}$ = 100mA V_{CC} = +5V, $I_{O(source)}$ = 100mA	 13 3	 12.5 13.3 3.3		 12.75 2.75	 12.5 13.3 3.3		V

Notes :
1. Supply current when output is high is typically 1mA less.
2. Tested at V_{CC} = +5V and V_{CC} = +15V.
3. This will determine the maximum value of $R_A + R_B$ for +15V operation the max total is R = 20MΩ and for 5V operation the max total R = 3.5MΩ.

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	SE555			NE555 - SA555			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{dis(off)}$	Discharge Pin Leakage Current (output high) (V_{dis} = 10V)		20	100		20	100	nA
$V_{dis(sat)}$	Discharge pin Saturation Voltage (output low) - (note 5) V_{CC} = +15V, I_{dis} = 15mA V_{CC} = +5V, I_{dis} = 4.5mA		 180 80	 480 200		 180 80	 480 200	mV
t_r t_f	Output Rise Time Output Fall Time		100 100	200 200		100 100	300 300	ns
t_{off}	Turn off Time - (note 6) (V_{reset} = V_{CC})		0.5			0.5		µs

Notes : 5. No protection against excessive Pin 7 current is necessary, providing the package dissipation rating will not be exceeded.
6. Time mesaured from a positive going input pulse from 0 to 0.8x V_{CC} into the threshold to the drop from high to low of the output trigger is tied to treshold.

Figure 1 : Minimum Pulse Width Required for Trigering

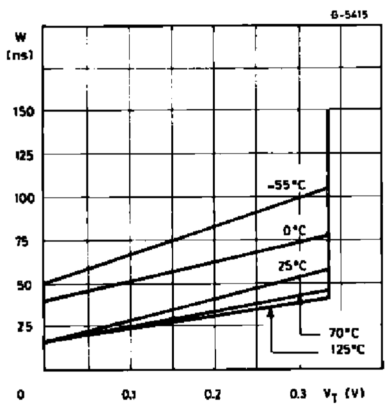


Figure 2 : Supply Current versus Supply Voltage

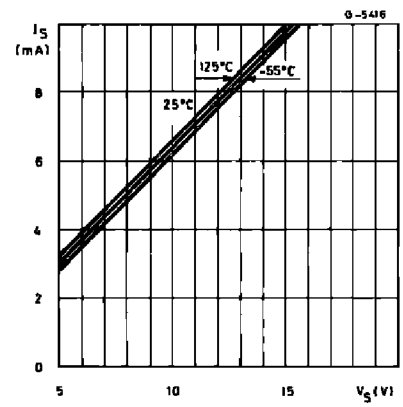


Figure 3 : Delay Time versus Temperature

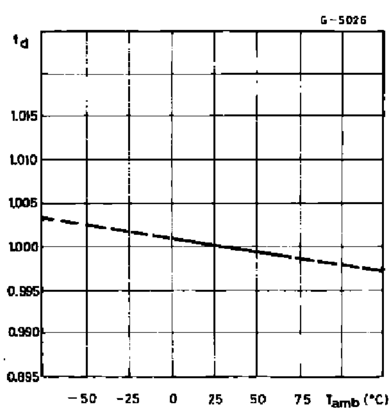


Figure 4 : Low Output Voltage versus Output Sink Current

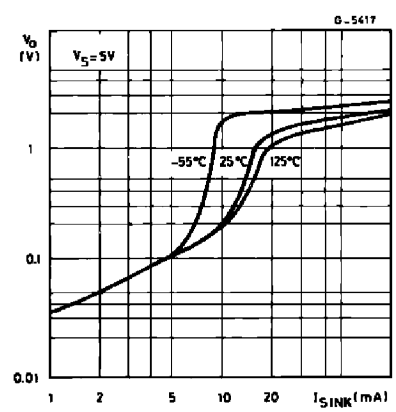


Figure 5 : Low Output Voltage versus Output Sink Current

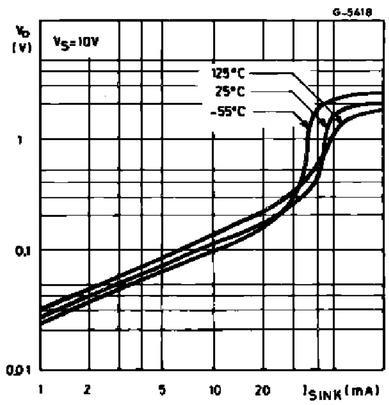


Figure 6 : Low Output Voltage versus Output Sink Current

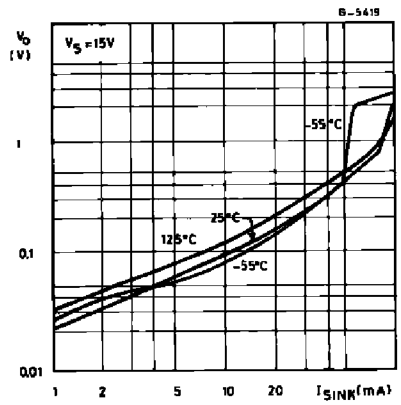


Figure 7 : High Output Voltage Drop versus Output

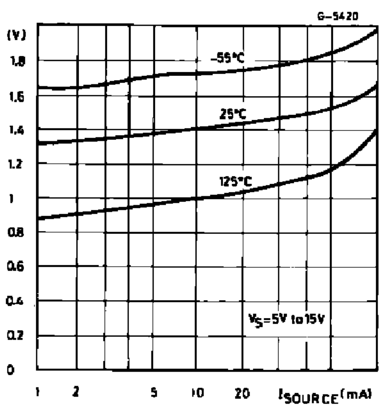


Figure 8 : Delay Time versus Supply Voltage

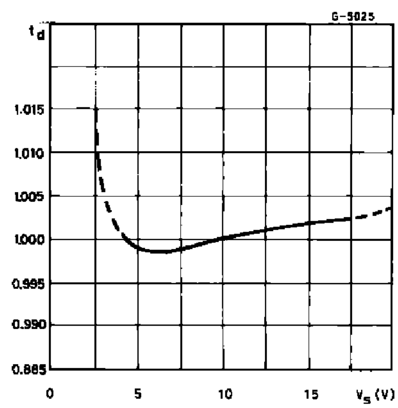
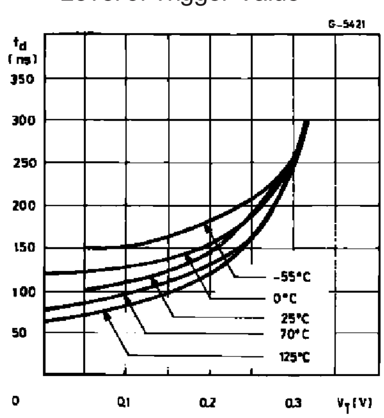


Figure 9 : Propagation Delay versus Voltage Level of Trigger Value

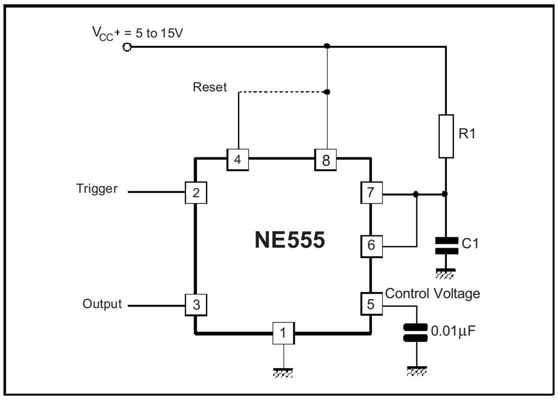


APPLICATION INFORMATION

MONOSTABLE OPERATION

In the monostable mode, the timer functions as a one-shot. Referring to figure 10 the external capacitor is initially held discharged by a transistor inside the timer.

Figure 10



The circuit triggers on a negative-going input signal when the level reaches 1/3 Vcc. Once triggered, the circuit remains in this state until the set time has elapsed, even if it is triggered again during this interval. The duration of the output HIGH state is given by t = 1.1 R_1C_1 and is easily determined by figure 12.

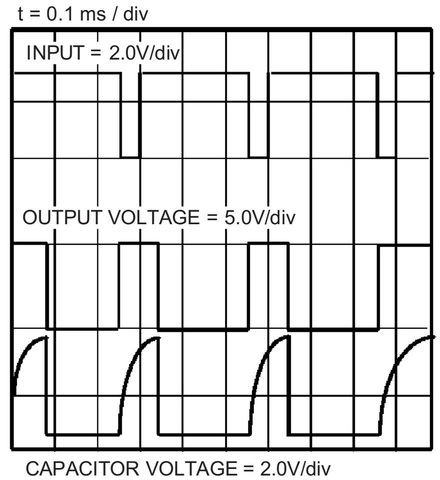
Notice that since the charge rate and the threshold level of the comparator are both directly proportional to supply voltage, the timing interval is independent of supply. Applying a negative pulse simultaneously to the reset terminal (pin 4) and the trigger terminal (pin 2) during the timing cycle discharges the external capacitor and causes the cycle to start over. The timing cycle now starts on the positive edge of the reset pulse. During the time the reset pulse in applied, the output is driven to its LOW state.

When a negative trigger pulse is applied to pin 2, the flip-flop is set, releasing the short circuit across the external capacitor and driving the output HIGH. The voltage across the capacitor increases exponentially with the time constant $\tau = R_1C_1$. When the voltage across the capacitor equals 2/3 V_{cc}, the comparator resets the flip-flop which then discharge the capacitor rapidly and drivers the output to its LOW state.

Figure 11 shows the actual waveforms generated in this mode of operation.

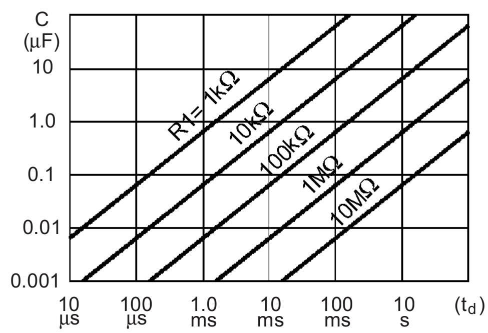
When Reset is not used, it should be tied high to avoid any possibly or false triggering.

Figure 11



R1 = 9.1kΩ, C1 = 0.01µF, R_L = 1kΩ

Figure 12



ASTABLE OPERATION

When the circuit is connected as shown in figure 13 (pin 2 and 6 connected) it triggers itself and free runs as a multivibrator. The external capacitor charges through R_1 and R_2 and discharges through R_2 only. Thus the duty cycle may be precisely set by the ratio of these two resistors.

In the astable mode of operation, C_1 charges and discharges between 1/3 V_{cc} and 2/3 Vcc. As in the triggered mode, the charge and discharge times and therefore frequency are independent of the supply voltage.

Figure 13

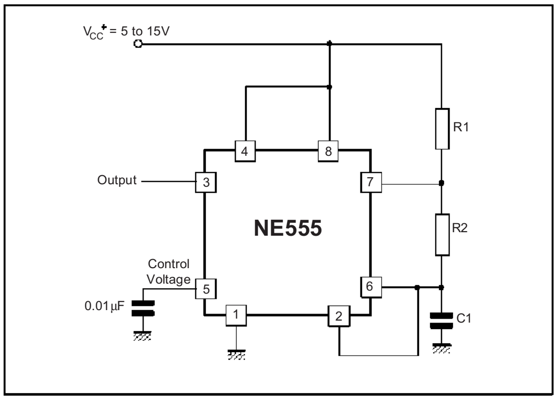


Figure 14 shows actual waveforms generated in this mode of operation.

The charge time (output HIGH) is given by :

$t_1 = 0.693\ (R_1 + R_2)\ C_1$

and the discharge time (output LOW) by :

$t_2 = 0.693\ (R_2)\ C_1$

Thus the total period T is given by :

$T = t_1 + t_2 = 0.693\ (R_1 + 2R_2)\ C_1$

The frequency ofoscillation is them :

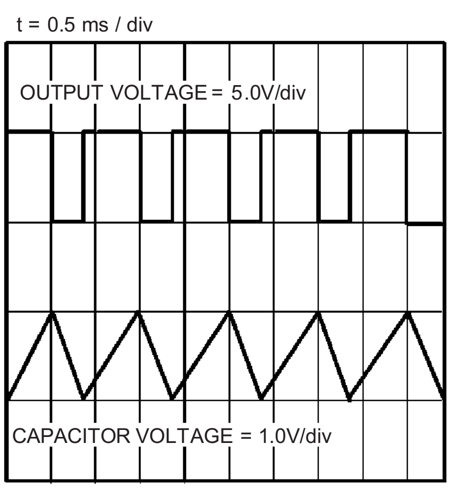
$$f = \frac{1}{T} = \frac{1.44}{(R_1 + 2R_2)\ C_1}$$

and may be easily found by figure 15.

The duty cycle is given by :

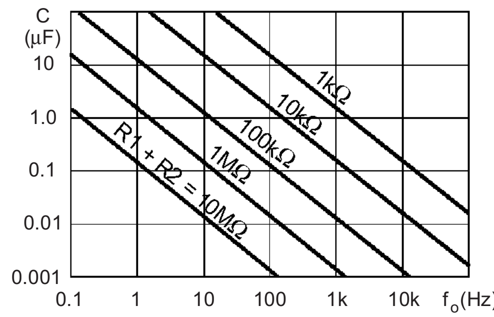
$$D = \frac{R_2}{R_1 + 2R_2}$$

Figure 14



R1 = R2 = 4.8kΩ, C1= 0.1µF, R_L = 1kΩ

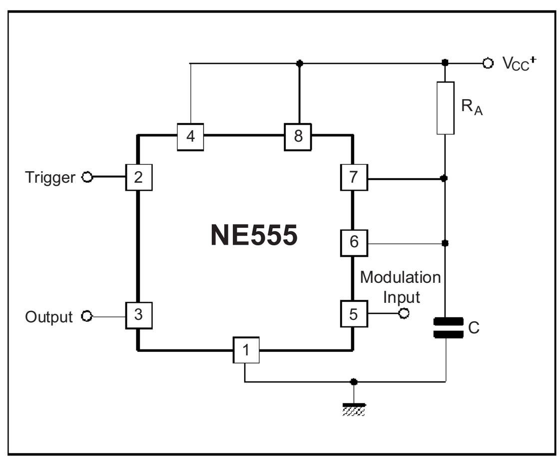
Figure 15 : Free Running Frequency versus R_1, R_2 and C_1



PULSE WIDTH MODULATOR

When the timer is connected in the monostable mode and triggered with a continuous pulse train, the output pulse width can be modulated by a signal applied to pin 5. Figure 16 shows the circuit.

Figure 16 : Pulse Width Modulator.



LINEAR RAMP

When the pullup resistor, R_A, in the monostable circuit is replaced by a constant current source, a linear ramp is generated. Figure 17 shows a circuit configuration that will perform this function.

Figure 17.

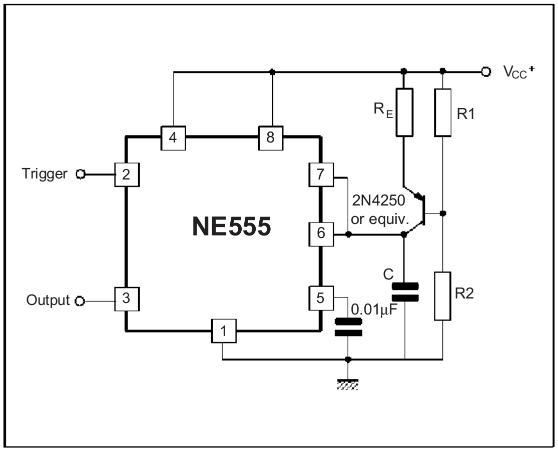
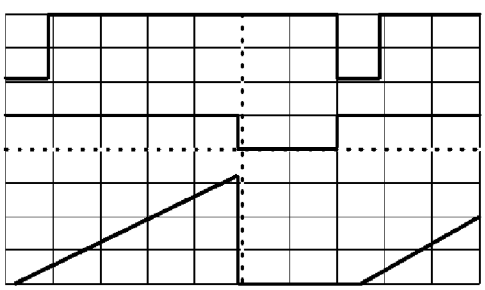


Figure 18 shows waveforms generator by the linear ramp.

The time interval is given by :

$$T = \frac{(2/3\ V_{CC}\ R_E\ (R_1 + R_2)\ C}{R_1\ V_{CC} - V_{BE}\ (R_1 + R_2)}\quad V_{BE} = 0.6V$$

Figure 18 : Linear Ramp.



V_{CC} = 5V
Time = 20µs/DIV
R_1 = 47kΩ
R_2 = 100kΩ
R_E = 2.7kΩ
C = 0.01µF

Top trace : input 3V/DIV
Middle trace : output 5V/DIV
Bottom trace : output 5V/DIV
Bottom trace : capacitor voltage 1V/DIV

50% DUTY CYCLE OSCILLATOR

For a 50% duty cycle the resistors R_A and R_E may be connected as in figure 19. The time preriod for the output high is the same as previous,

$t_1 = 0.693\ R_A\ C$.

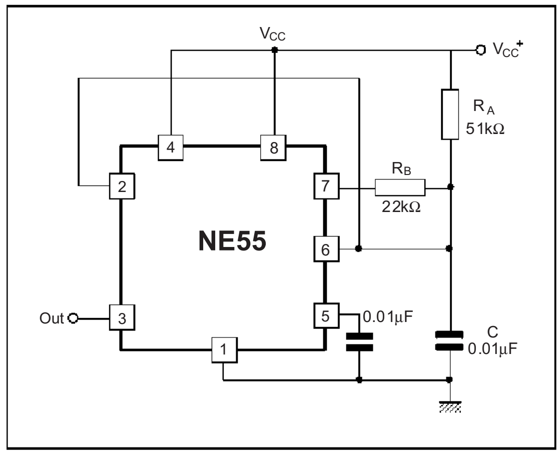
For the output low it is $t_2 =$

$$[(R_A R_B)/(R_A + R_B)]\ CLn\left[\frac{R_B - 2R_A}{2R_B - R_A}\right]$$

Thus the frequency of oscillation is $f = \frac{1}{t_1 + t_2}$

Note that this circuit will not oscillate if R_B is greater than 1/2 R_A because the junction of R_A and R_B cannot bring pin 2 down to 1/3 V_{CC} and trigger the lower comparator.

Figure 19 : 50% Duty Cycle Oscillator.

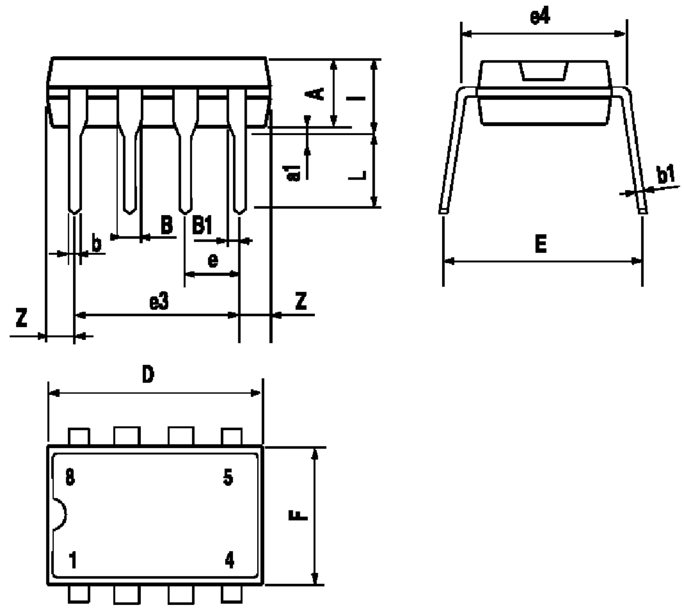


ADDITIONAL INFORMATION

Adequate power supply bypassing is necessary to protect associated circuitry. Minimum recommended is 0.1µF in parallel with 1µF electrolytic.

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP



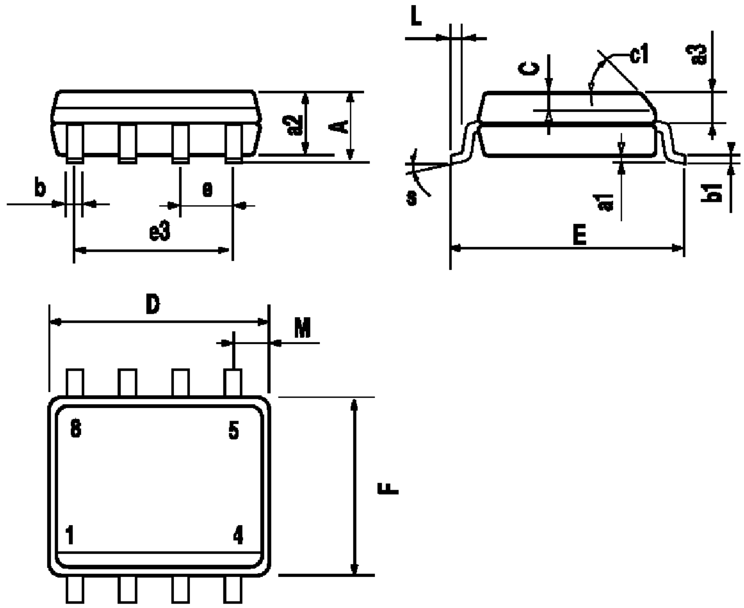
PM-DIP8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

DIP8.TBL

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



PM-SO8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

SO8.TBL

ORDER CODE :

Rapid DATA SHEET

Logic

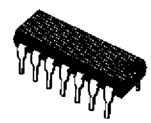
Order code	Manufacturer code	Description
83-0420	HCF4093BEY	4093B QUAD 2 INPUT NAND SCHMITT TRIG RC

Sales: 01206 751166 **Technical: 01206 835555** **Fax: 01206 751188**
Sales@rapidelec.co.uk **Tech@rapidelec.co.uk** **www.rapidonline.com**

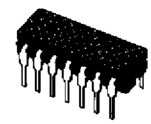
HCC/HCF4093B

QUAD 2-INPUT NAND SCHMIDT TRIGGERS

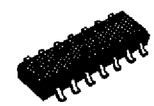
- SCHMITT-TRIGGER ACTION ON EACH INPUT WITH NO EXTERNAL COMPONENTS
- HYSTERESIS VOLTAGE TYPICALLY 0.9V AT V_{DD} = 5V AND 2.3V AT V_{DD} = 10V
- NOISE IMMUNITY GREATER THAN 50% OF V_{DD} (typ.)
- NO LIMIT ON INPUT RISE AND FALL TIMES
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 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"



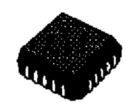
EY
(Plastic Package)



F
(Ceramic Frit Seal Package)



M1
(Micro Package)

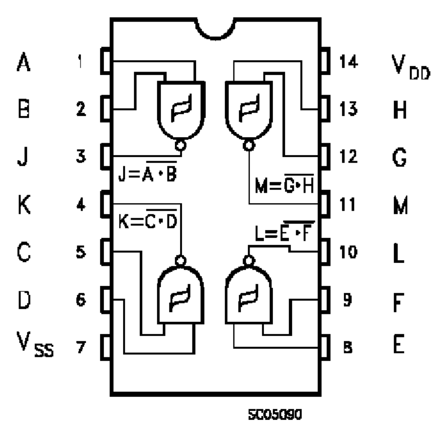


C1
(Plastic Chip Carrier)

ORDER CODES :

HCC4093BF	HCF4093BM1
HCF4093BEY	HCF4093BC1

PIN CONNECTIONS



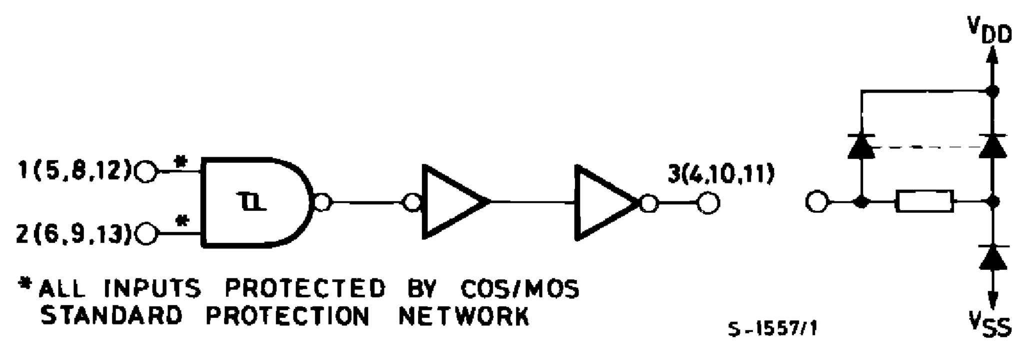
DESCRIPTION

The **HCC4093B** (extended temperature range) and **HCF4093B** (intermediate temperature range) are available in 14-lead dual in-line plastic or ceramic package and plastic micropackage. The **HCC/HCF4093B** consists of four Schmitt-trigger circuits. Each circuit functions as a two-input NAND gate with Schmitt-trigger action on both inputs. The gate switches at different points for positive and negative-going signals.

The difference between the positive voltage (V_P) and the negative voltage (V_N) is defined as hysteresis voltage (V_H) (see fig. 1).

FUNCTIONAL DIAGRAM

1 of 4 Schmitt triggers



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 T_{op} = Full Package-temperature Range	200 100	mW mW
T_{op}	Operating Temperature : **HCC** Types **HCF** Types	– 55 to + 125 – 40 to + 85	°C °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 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	°C °C

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		Test Conditions				Value							Unit
			V_I (V)	V_O (V)	$\lvert I_O \rvert$ (μA)	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		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_P	Positive Trigger Threshold Voltage		a			5	2.2	3.6	2.2	2.9	3.6	2.2	3.6	V
			a			10	4.6	7.1	4.6	5.9	7.1	4.6	7.1	
			a			15	6.8	10.8	6.8	8.8	10.8	6.8	10.8	
			b			5	2.6	4	2.6	3.3	4	2.6	4	
			b			10	5.6	8.2	5.6	7	8.2	5.6	8.2	
			b			15	6.3	12.7	6.3	9.4	12.7	6.3	12.7	
V_N	Negative Trigger Threshold Voltage		a			5	0.9	2.8	0.9	1.9	2.8	0.9	2.8	V
			a			10	2.5	5.2	2.5	3.9	5.2	2.5	5.2	
			a			15	4	7.4	4	5.8	7.4	4	7.4	
			b			5	1.4	3.2	1.4	2.3	3.2	1.4	3.2	
			b			10	3.4	6.6	3.4	5.1	6.6	3.4	6.6	
			b			15	4.8	9.6	4.8	7.3	9.6	4.8	9.6	
V_H	Hysteresis Voltage		a			5	0.3	1.6	0.3	0.9	1.6	0.3	1.6	V
			a			10	1.2	3.4	1.2	2.3	3.4	1.2	3.4	
			a			15	1.6	5	1.6	3.5	5	1.6	5	
			b			5	0.3	1.6	0.3	0.9	1.6	0.3	1.6	
			b			10	1.2	3.4	1.2	2.3	3.4	1.2	3.4	
			b			15	1.6	5	1.6	3.5	5	1.6	5	
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	
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		

a : input on terminals 1, 5, 8, 12 or 2, 6, 9, 13 ; other inputs to V_{DD}.
b : input on terminals 1 and 2, 5 and 6, 8 and 9, or 12 and 13 ; other inputs to V_{DD}.
* T_{Low} = –55°C for **HCC** device : -40°C for **HCF** device.
* T_{High} = +125°C for **HCC** device : +85°C for **HCF** device.

STATIC ELECTRICAL CHARACTERISTICS (continued)

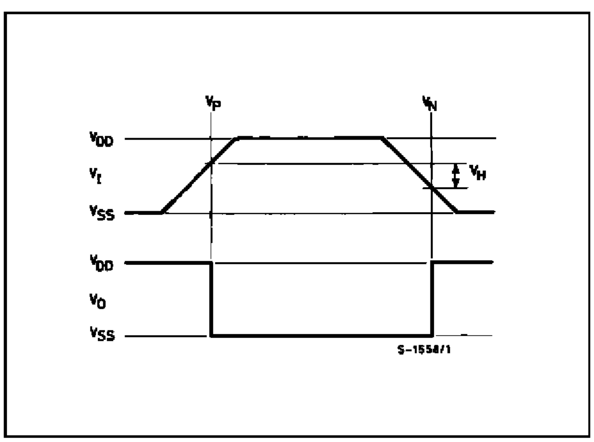
Symbol	Parameter		Test Conditions				Value							Unit
			V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	T_{Low}* Min.	T_{Low}* Max.	25°C Min.	25°C Typ.	25°C Max.	T_{High}* Min.	T_{High}* Max.	
I_{OL}	Output Sink Current		0/ 5	0.4		5	0.64		0.51	1		0.36		mA
			0/10	0.5		10	1.6		1.3	2.6		0.9		
			0/15	1.5		15	4.2		3.4	6.8		2.4		
			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	Any Input		15		± 0.3		$\pm 10^{-5}$	± 0.3		± 1	
C_I	Input Capacitance			Any Input						5	7.5			pF

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

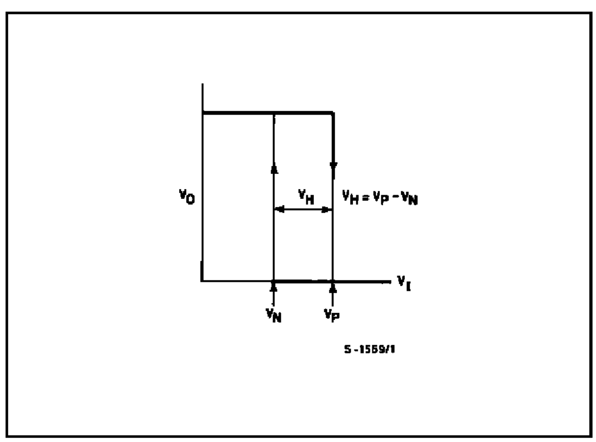
Symbol	Parameter	Test Conditions		Value			Unit
			V_{DD} (V)	Min.	Typ.	Max.	
t_{PLH}, t_{PHL}	Propagation Delay Time		5		190	380	ns
			10		90	180	
			15		65	130	
t_{TLH}, t_{THL}	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

Figure1 : Hysteresis Definition, Characteristics and Test Setup.

(a) Definition of V_P, V_N and V_H



(b) Transfer characteristics of 1 of 4 gates



(c) Test setup

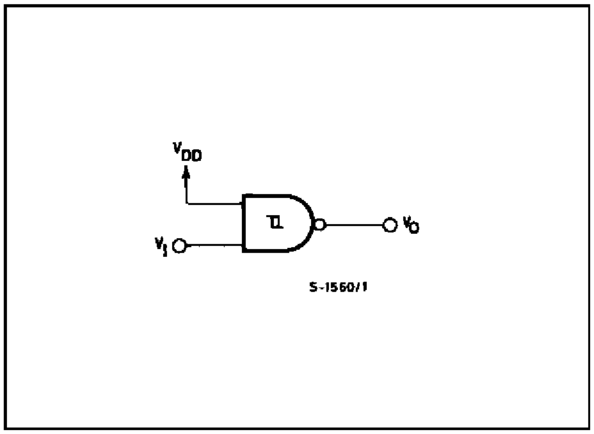


Figure 2 : Input and Output Characteristics.

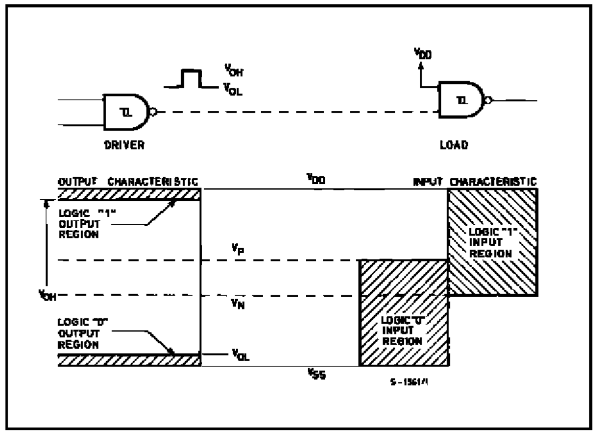
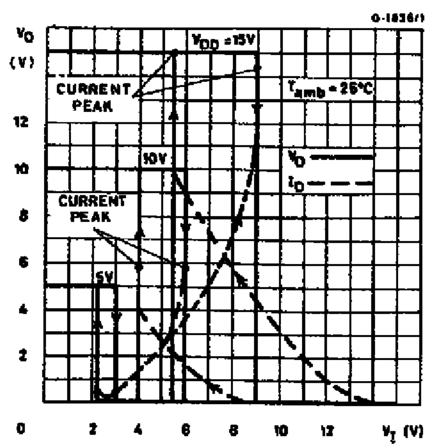


Figure 3 : Typical Current and Voltage Transfer Characteristics.



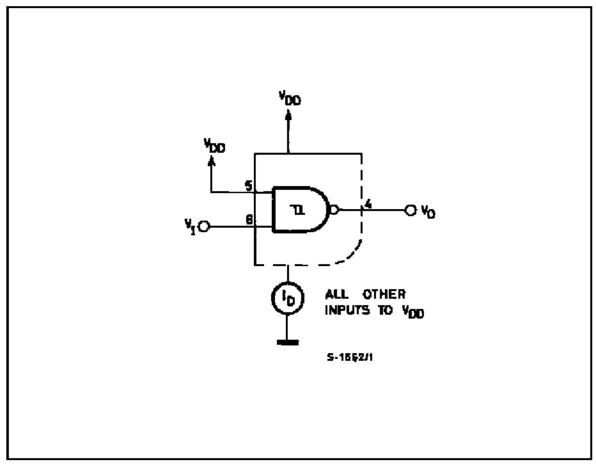
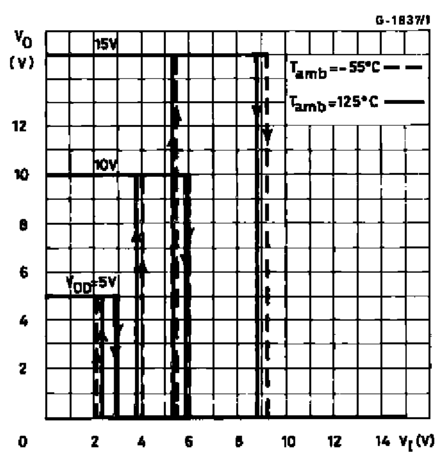


Figure 4 : Typical Voltage Transfer Characteristics as a Function of Temperature, and Test Circuit.



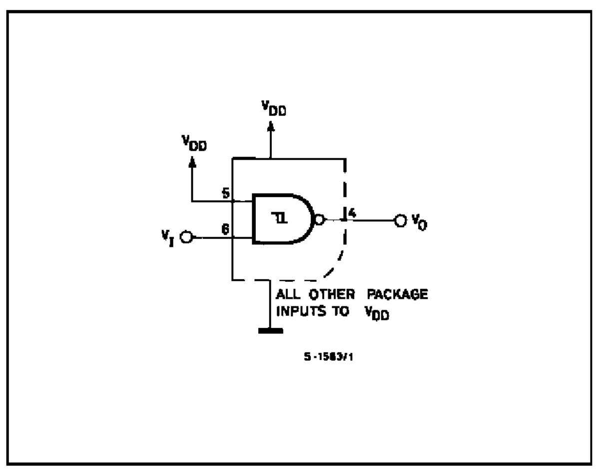


Figure 5 : Typical Output Low (sink) Current Characteristics.

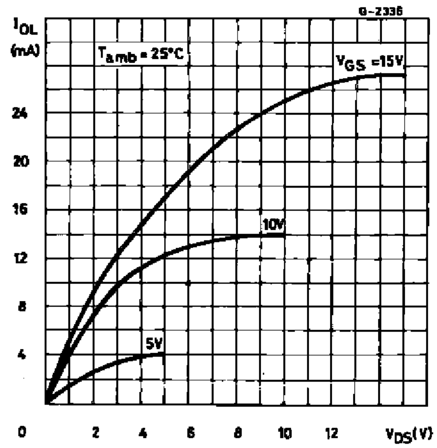


Figure 6 : Minimum Output Low (sink) Current Characteristics.

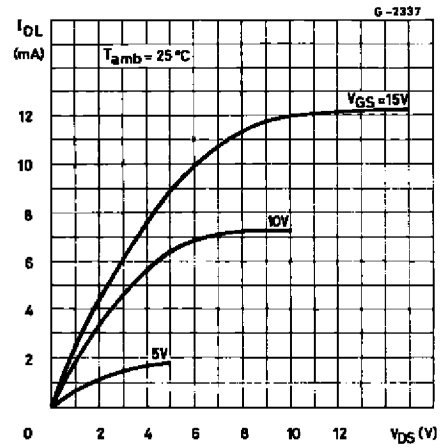


Figure 7 : Typical Output High (source) Current Characteristic.

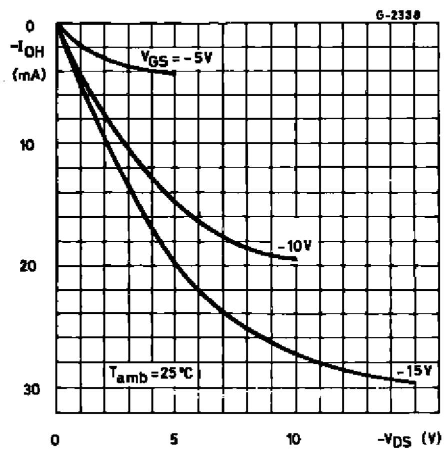


Figure 8 : Minimum Output High Current Characteristics.

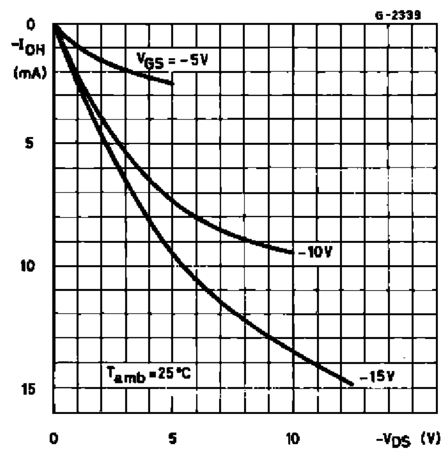


Figure 9 : Typical Propagation Delay Time vs. Supply Voltage.

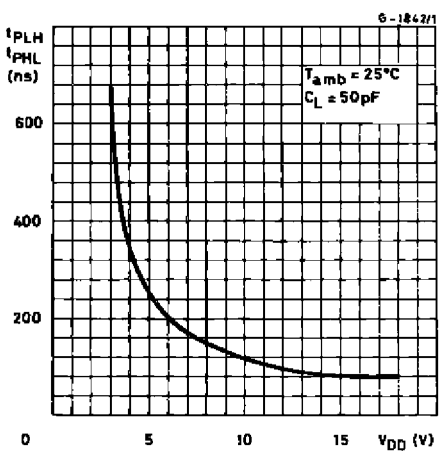
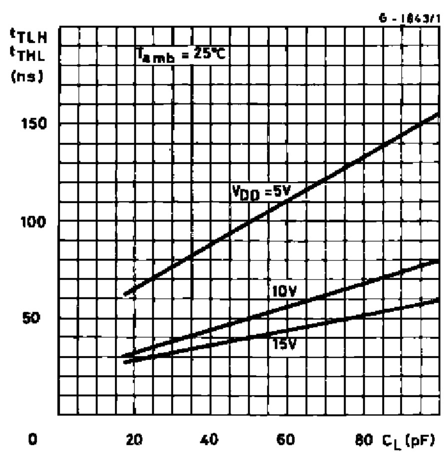


Figure 10 : Typical Transition Time vs. Load Capacitance.



SGS-THOMSON MICROELECTRONICS

Figure 11 : Typical Trigger Threshold Voltage vs.V_{DD}

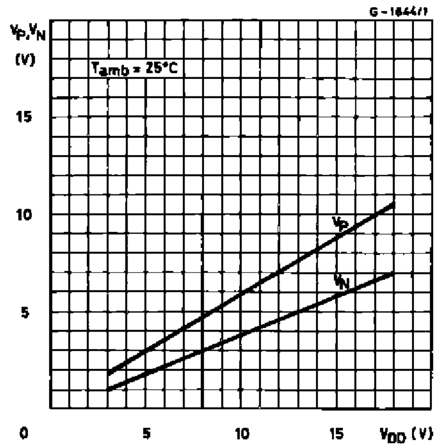


Figure 12 : Typical per cent Hysteresis vs. Supply Voltage.

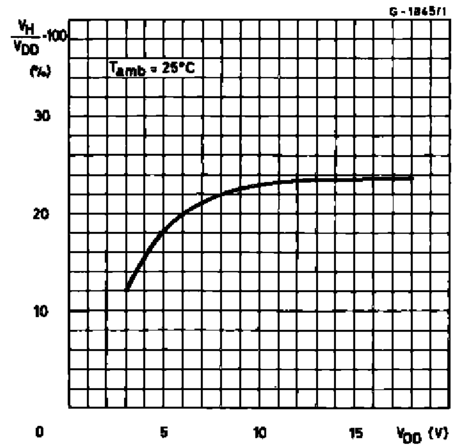


Figure 13 : Typical Dissipation Characteristics.

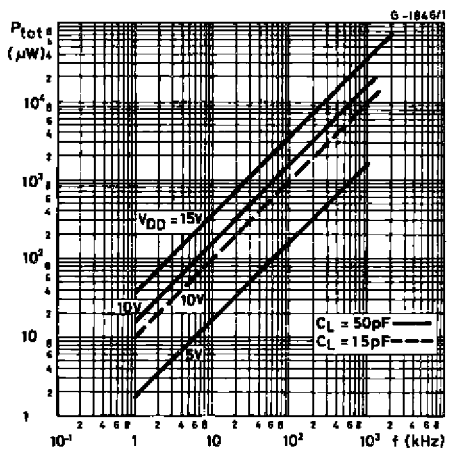
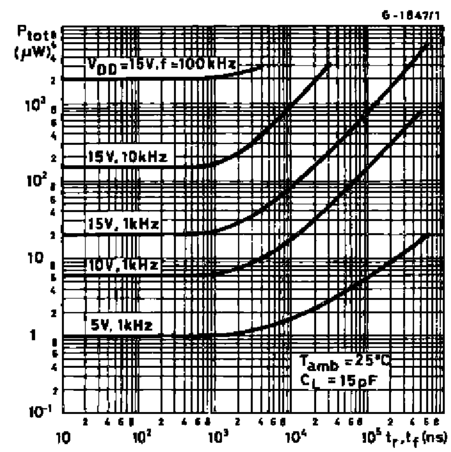


Figure 14 : Power Dissipation vs. Rise and Fall Times.



APPLICATIONS

Figure 15 : Wave Shaper.

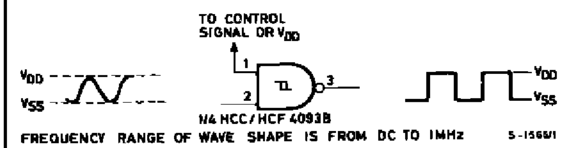


Figure 16 : Monostable Multivibrator.

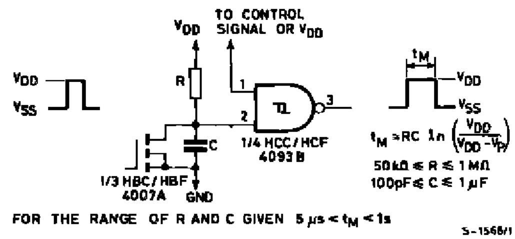
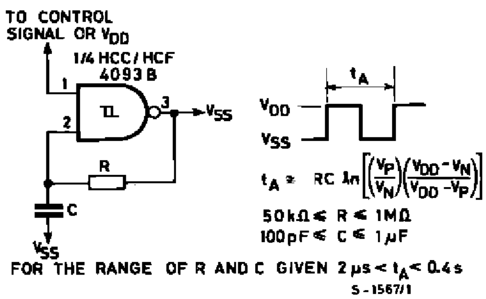


Figure17 : Astable Multivibrator.



TEST CIRCUITS

Figure18 : Quiescent Device Current.

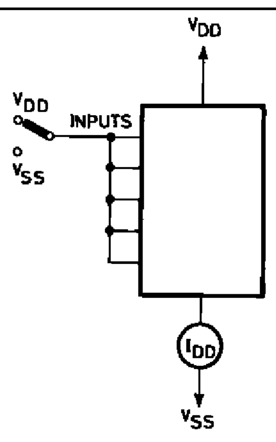
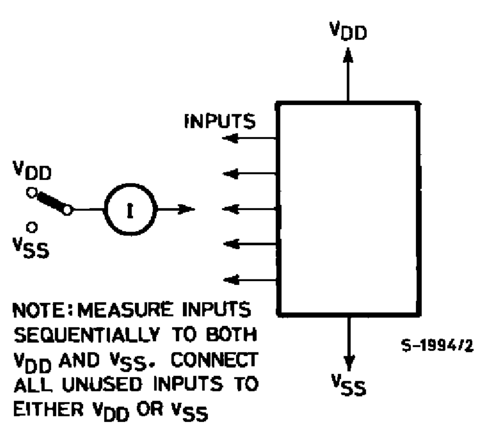
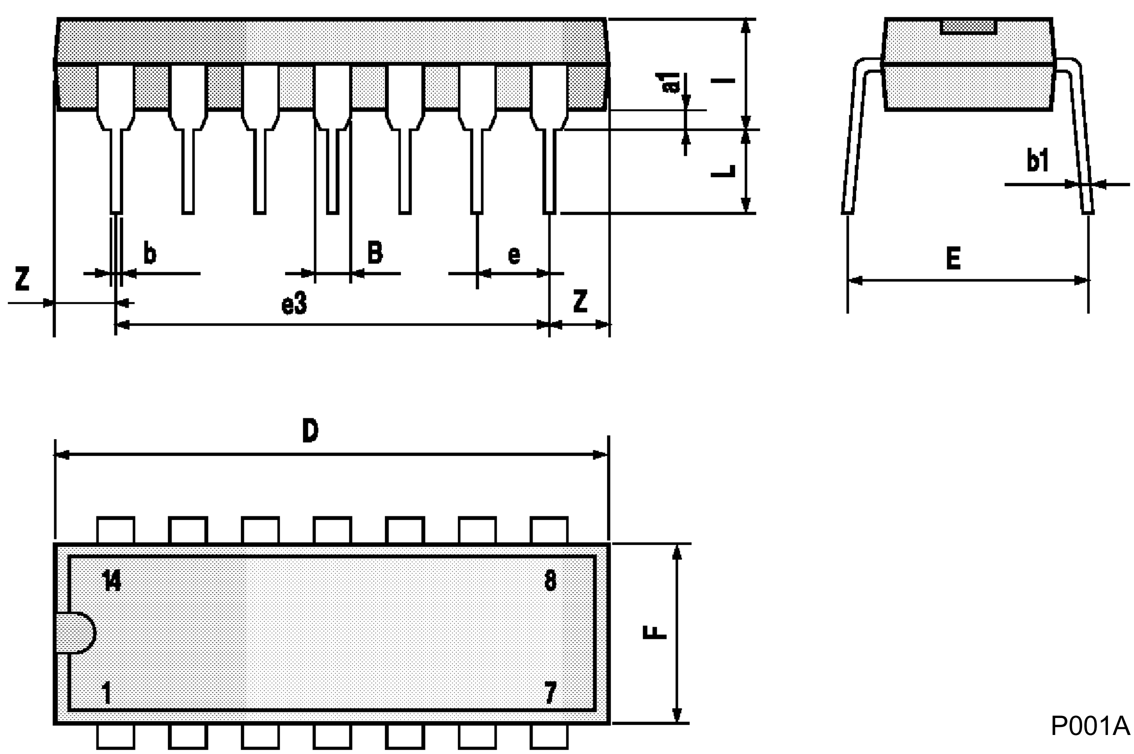


Figure 19 : Input Leakage Current.



Plastic DIP14 MECHANICAL DATA

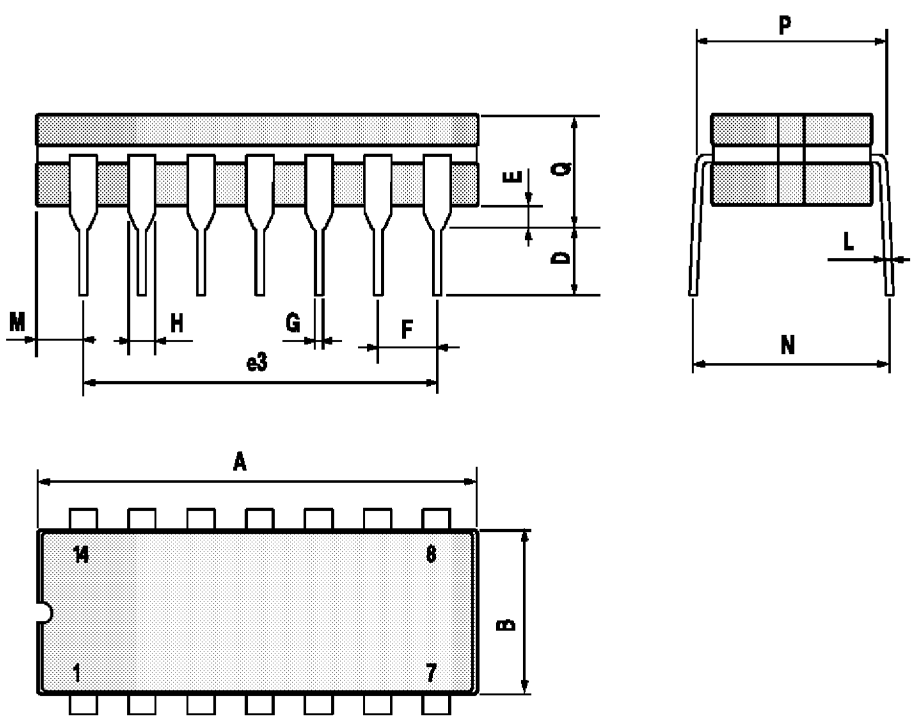
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



P001A

Ceramic DIP14/1 MECHANICAL DATA

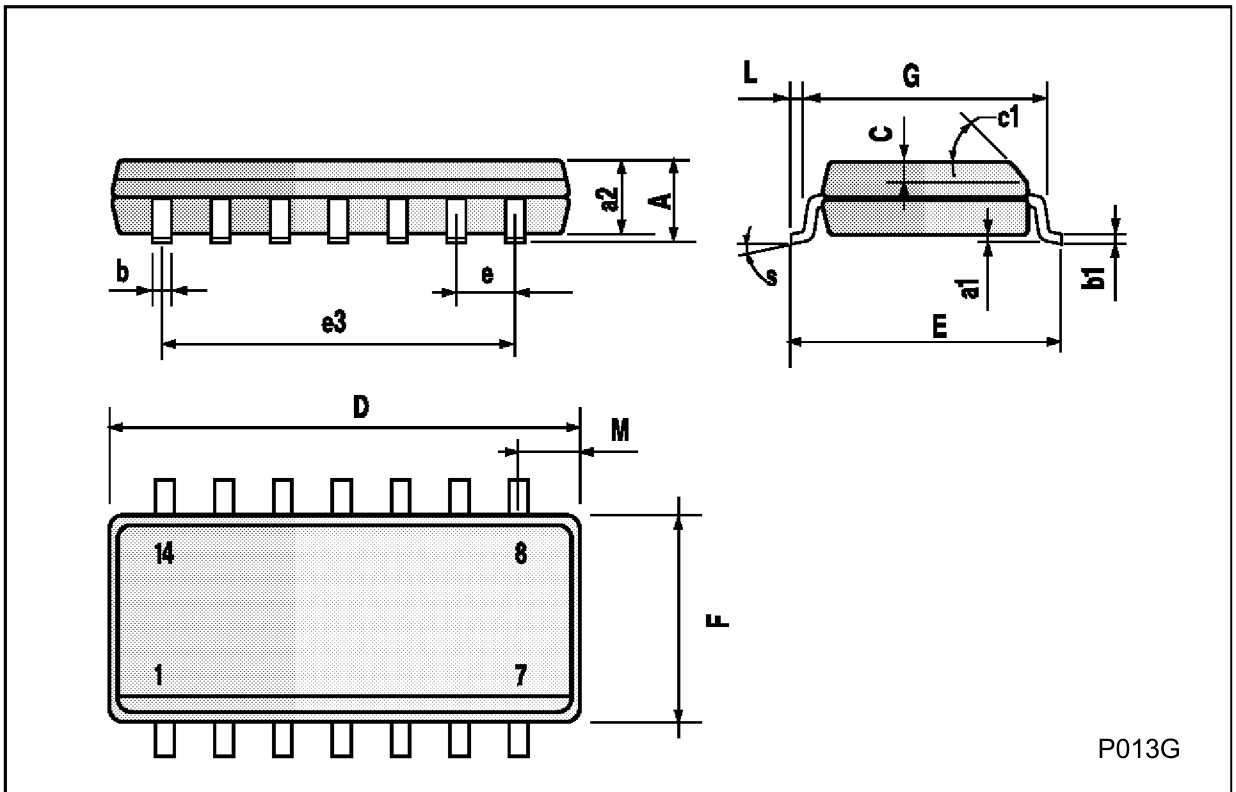
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



P053C

SO14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



PLCC20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045