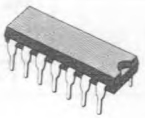
SGS-THOMSON MICROELECTRONICS

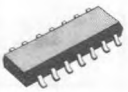
NE556 - SA556 SE556

PRECISION DUAL TIMERS

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



N
DIP14
(Plastic Package)



D
SO-14
(Plastic Micropackage)

J
CERDIP14
(Cerdip Package)

DESCRIPTION

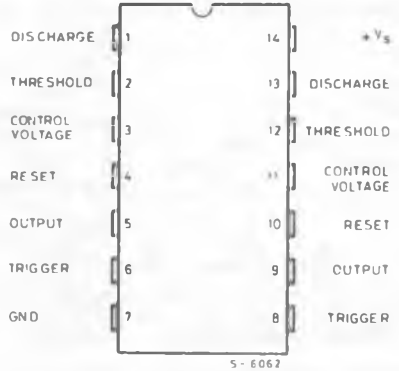
The JNE556 dual monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For a stable operation as an oscillator, the free running frequency and the duty cycle are both accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on failling waveforms, and the output structure can source or sink up to 200mA.

ORDER CODES

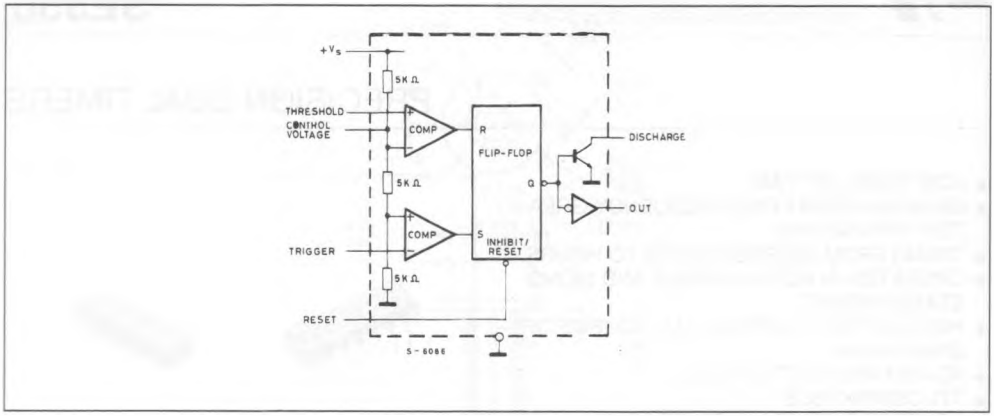
Part Number	Temperature Range	Package		
		N	J	D
NE556	0°C to + 70°C	•	•	•
SA556	– 40°C to + 105°C	•	•	•
SE556	– 55°C to + 125°C		•	

PIN CONNECTION (top views)

DIP 14 – CERDIP 14 – SO 14



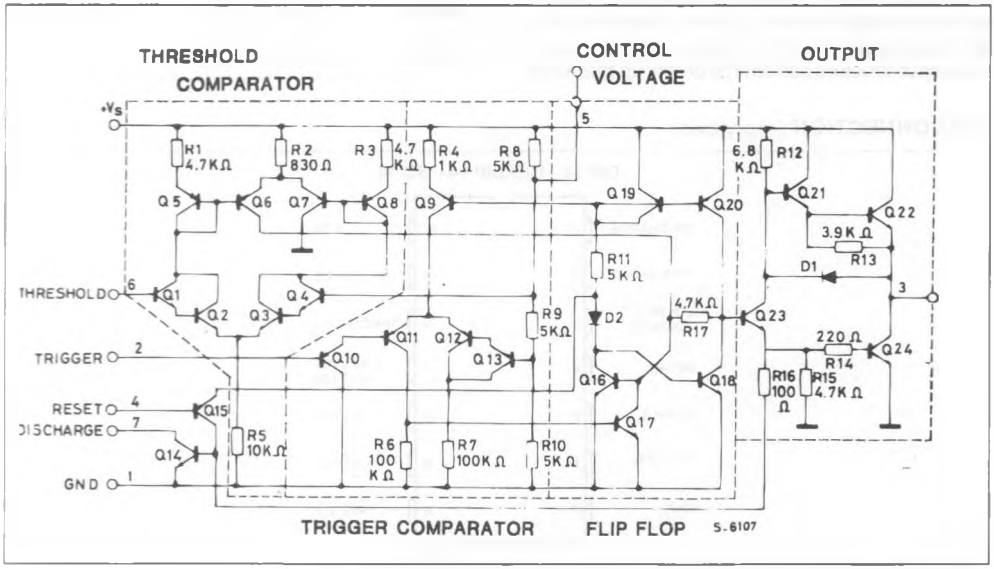
BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_s	Supply Voltage for **SE556** for **NE556**	18 16	V
T_{op}	Operating Temperature Range for **NE556** for **SA556** for **SE556**	0 to 70 – 40 to 105 – 55 to 125	°C
T_{stg}	Storage Temperature Range	– 65 to 150	°C
T_j	Junction Temperature	150	°C

SCHEMATIC DIAGRAM



THERMAL DATA

			Ceramic DIP14	SO14	Plastic DIP14
$Rth_{j\text{-}amb}$	Thermal Resistance Junction-ambient	max.	150°C/W	165°C/W	200°C/W

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	SE556			SA556			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{CC}	Supply Voltage	4.5		18	4.5		16	V
I_S	Supply Current (R_L ∞) Note 1							mA
	Low State V_{CC} = + 5V		6	10		6	12	
	V_{CC} = + 15V		20	24		20	30	
	High State V_{CC} = 5V		4			4		
	Timing Error (monostable)							
	(R_A = 2 to 100kΩ, C = 0.1µF)							
	Initial Accuracy (note 2)		0.5	2		1	3	%
	Drift with Temperature		30	100		50		ppm/°C
	Drift with Supply Voltage		0.05	0.2		0.1	0.5	%/V
	Timing Error (astable)							
	(R_A, R_B = 1kΩ to 100kΩ, C = 0.1µF,							
	V_{CC} = + 15V) initial Accuracy (note 2)		1.5			2.25		%
	Drift with Temperature		90			150		ppm/°C
	Drift with Voltage		0.15			0.3		%/V
V_{CL}	Control Voltage level							V
	V_{CC} = + 15V	9.6	10	10.4	9	10	11	
	V_{CC} = + 5V	2.9	3.33	3.8	2.6	3.33	4	
V_{th}	Threshold Voltage							V
	V_{CC} = + 15V	9.4	10	10.6	8.8	10	11.2	
	V_{CC} = + 5V	2.7	3.33	4	2.4	3.33	4.2	
I_{th}	Threshold Current (note 3)		0.1	0.25		0.1	0.25	µA
V_{trig}	Trigger Voltage							V
	V_{CC} = + 15V	4.8	5	5.2	4.5	5	5.6	
	V_{CC} = + 5V	1.45	1.67	1.9	1.1	1.67	2.2	
I_{trig}	Trigger Current (V_{trig} = 0V)		0.5	0.9		0.5	2	µA
V_{reset}	Reset Voltage (note 4)	0.4	0.7	1	0.4	0.7	1	V
I_{reset}	Reset Current							mA
	V_{reset} = + 0.4V		0.1	0.4		0.1	0.4	
	V_{reset} = 0V		0.4	1		0.4	1.5	
V_{OL}	Low Level Output Voltage							V
	V_{CC} = + 15V, $I_{O(sink)}$ = 10mA		0.1	0.15		0.1	0.25	
	$I_{O(sink)}$ = 50mA		0.4	0.5		0.4	0.75	
	$I_{O(sink)}$ = 100mA		2	2.2		2	2.5	
	$I_{O(sink)}$ = 200mA		2.5			2.5		
	V_{CC} = + 5V, $I_{O(sink)}$ = 8mA		0.1	0.25		0.3	0.4	
	$I_{O(sink)}$ = 5mA		0.05	0.2		0.25	0.35	
V_{OH}	High Level Output Voltage							V
	V_{CC} = + 15V, $I_{O(source)}$ = 200mA		12.5			12.5		
	$I_{O(source)}$ = 100mA	13	13.3		12.75	13.3		
	V_{CC} = + 5V, $I_{O(source)}$ = 100mA	3	3.3		2.75	3.3		

ELECTRICAL CHARACTERISTICS(continued)

Symbol	Parameter	SE556			SA556			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_{dis(off)}$	Discharge Pin Leakage Current (output high)		20	100		20	100	nA
$V_{dis(sat)}$	Discharge pin Saturation Voltage (output low) (note 5)							mV
	V_{CC} = + 15V, I_{dis} = 15mA		180	480		180	480	
	V_{CC} = + 5V, I_{dis} = 4.5mA		80	200		80	200	
t_r	Output Rise Time		100	200		100	300	ns
t_f	Output Fall Time		100	200		100	300	
t_{off}	Turn off Time (note 6), V_{reset} = V_S		0.5			0.5		µs

Notes : 1. Supply current when output is high is typically 1mA less.
2. Tested at V_S = + 5V and V_S = +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.
4. Specified with trigger input high.
5. No protection against excessive pin 7 current is necessary, providing the package dissipation rating will not be exceeded.
6. Time measurement from a positive going input pulse from 0 to 0.8xV_S into the threshold to the drop from high to low of the output trigger is tied to threshold.

Figure 1 : Minimum Pulse Width Required for Triggering.

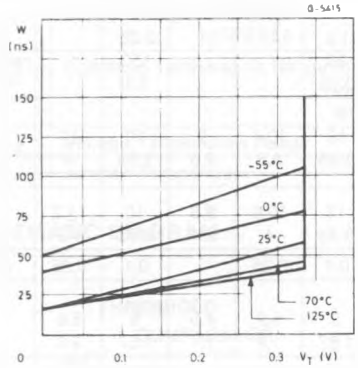


Figure 2 : Supply Current vs. Supply Voltage.

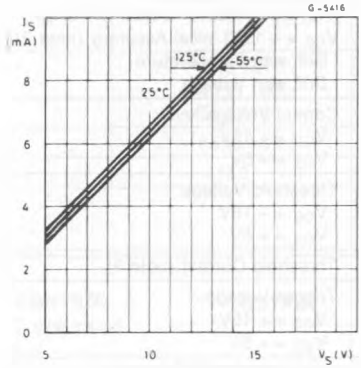


Figure 3 : Delay Time Vs. Temperature.

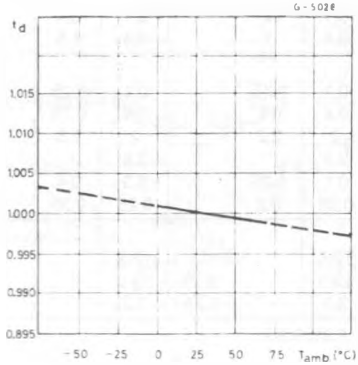


Figure 4 : Low Output Voltage Vs. Output Sink Current.

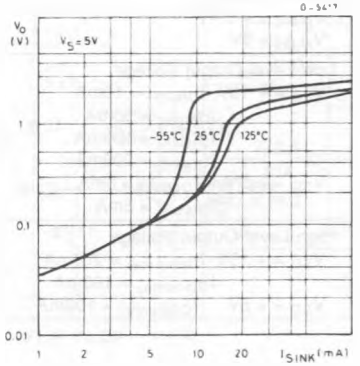


Figure 5 : Low Output Voltage Vs. Output Sink Current.

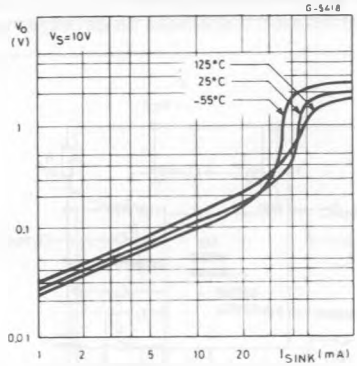


Figure 6 : Low Output Voltage Vs. Output Sink Current.

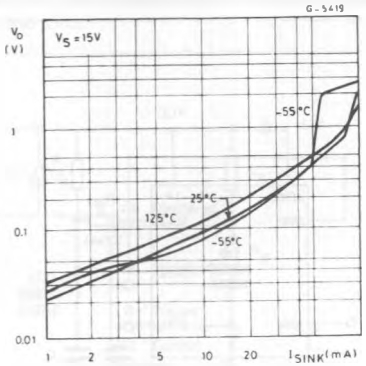


Figure 7 : High Output Voltage Drop Vs. Output Source Current.

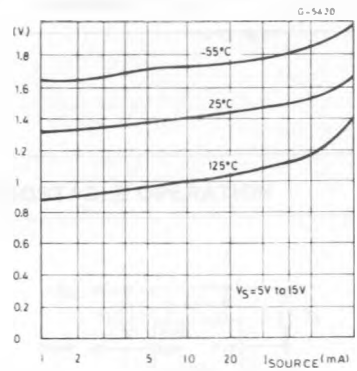


Figure 8 : Delay Time Vs. Supply Voltage.

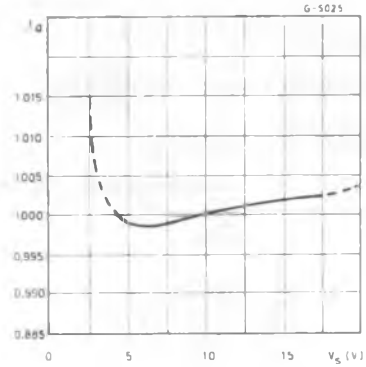
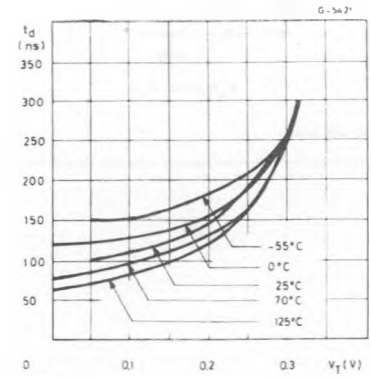
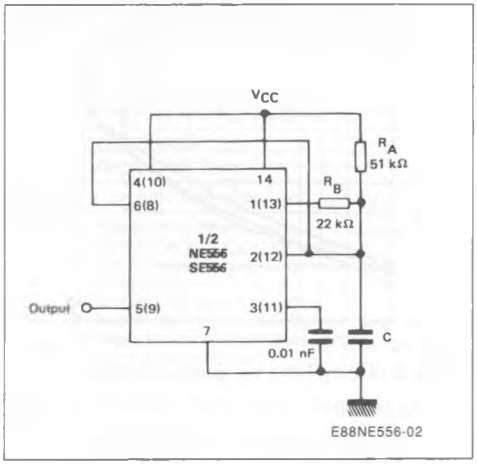


Figure 9 : Propagation Delay Vs. Voltage Level of Trigger Value.



TYPICAL APPLICATION

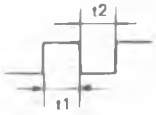
50% DUTY CYCLE OSCILLATOR



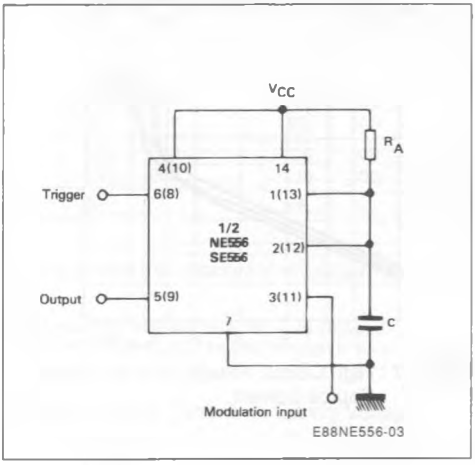
$t1 = 0.693\ R_A.C$

$t2 = [(R_A\ R_B)/(R_A + R_B)]C \quad \ln\left[\frac{R_B - 2R_A}{2R_B - R_A}\right]$

$f = \frac{1}{t1+t2} \quad R_B < \frac{1}{2} R_A$

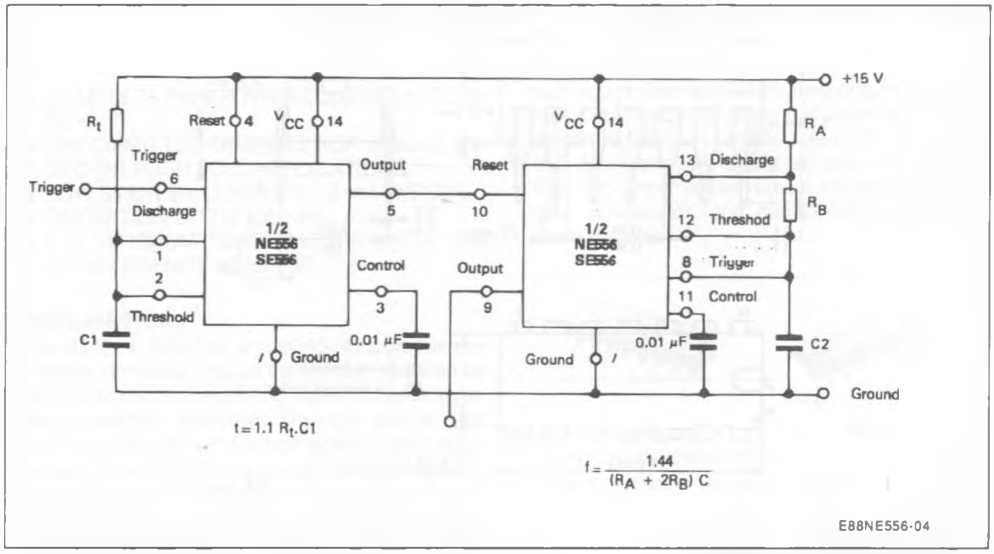


PULSE WIDTH MODULATOR

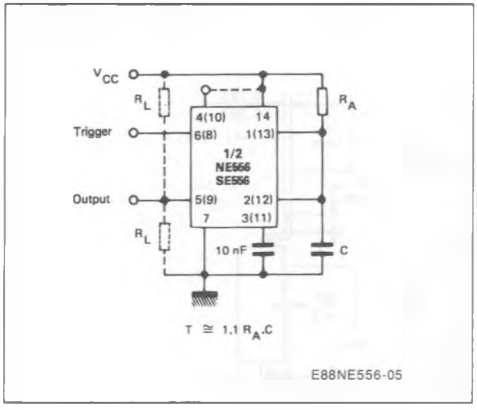


TONE BURST GENERATOR

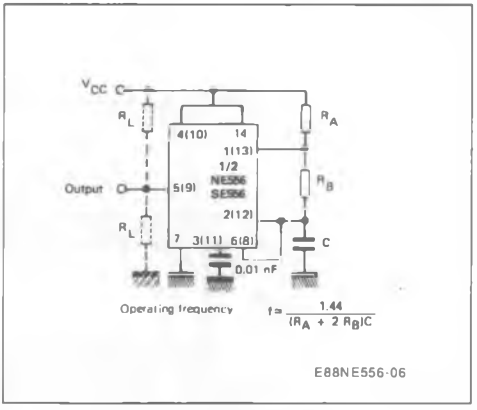
For a tone burst generator the first timer is used as a monostable and determines the tone duration when triggered by a positive pulse at pin 6. The second timer is enabled by the high output of the monostable. It is connected as an astable and determines the frequency of the tone.



MONOSTABLE OPERATION

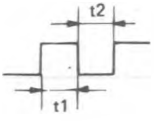


ASTABLE OPERATION



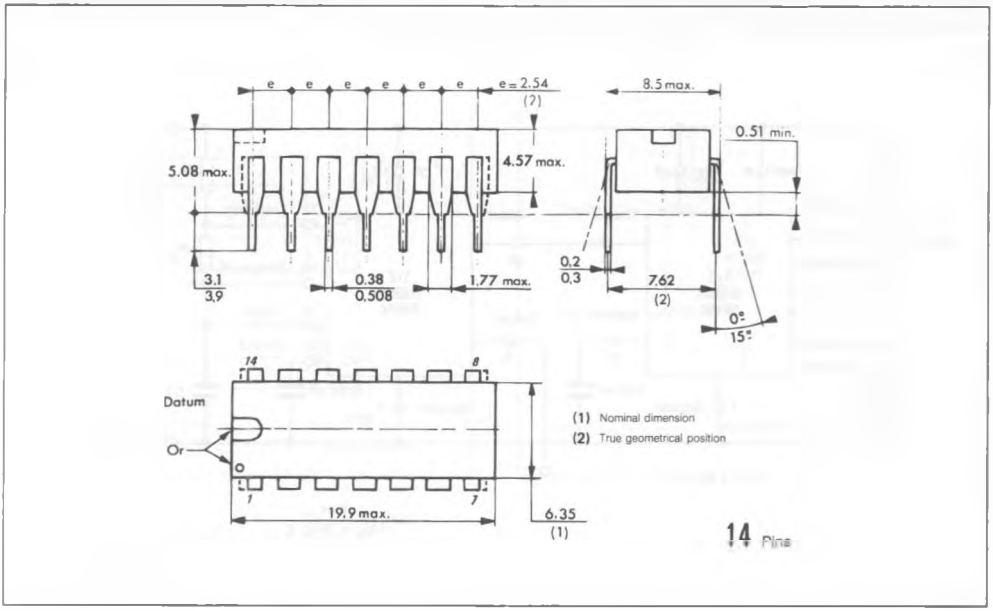
t1 = 0.693 (R_A + R_B)C Output High

t2 =0.693 R_BC Output Low



PACKAGE MECHANICAL DATA

14 PINS – PLASTIC DIP OR CERDIP



14 PINS – PLASTIC MICROPACKAGE (SO)