TOP ONE SEMI CONDUCTOR

NE556

GENERAL PURPOSE DUAL BIPOLAR TIMERS

DESCRIPTION

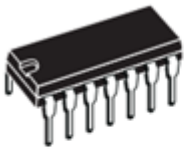
The NE556 dual monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For a stable operation as an oscillator, the free running frequency and the duty cycle are both accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on falling waveforms, and the output structure can source or sink up to 200mA.

FEATURES

- 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

ORDER CODES

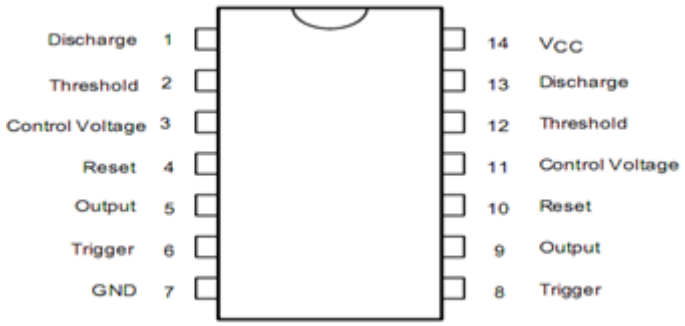
Part Number	Temperature Range	Pakcage	
		N	D
NE556	0^{o}C—70^{o}C	•	•



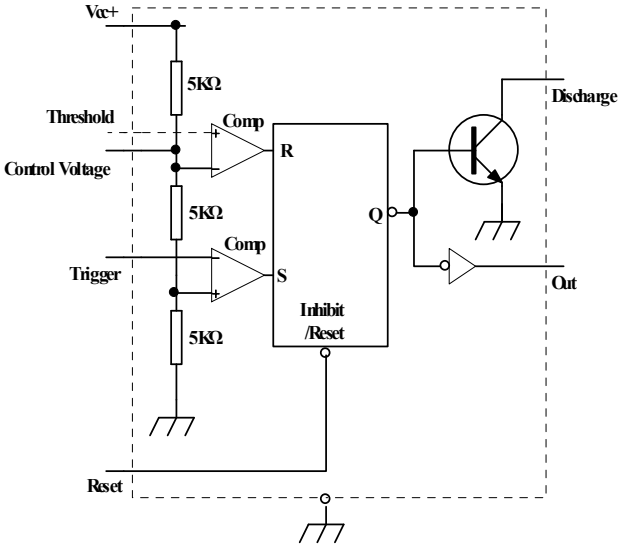
N
DIP14
(Plastic Package)

D
SO14
(Plastic Micropackage)

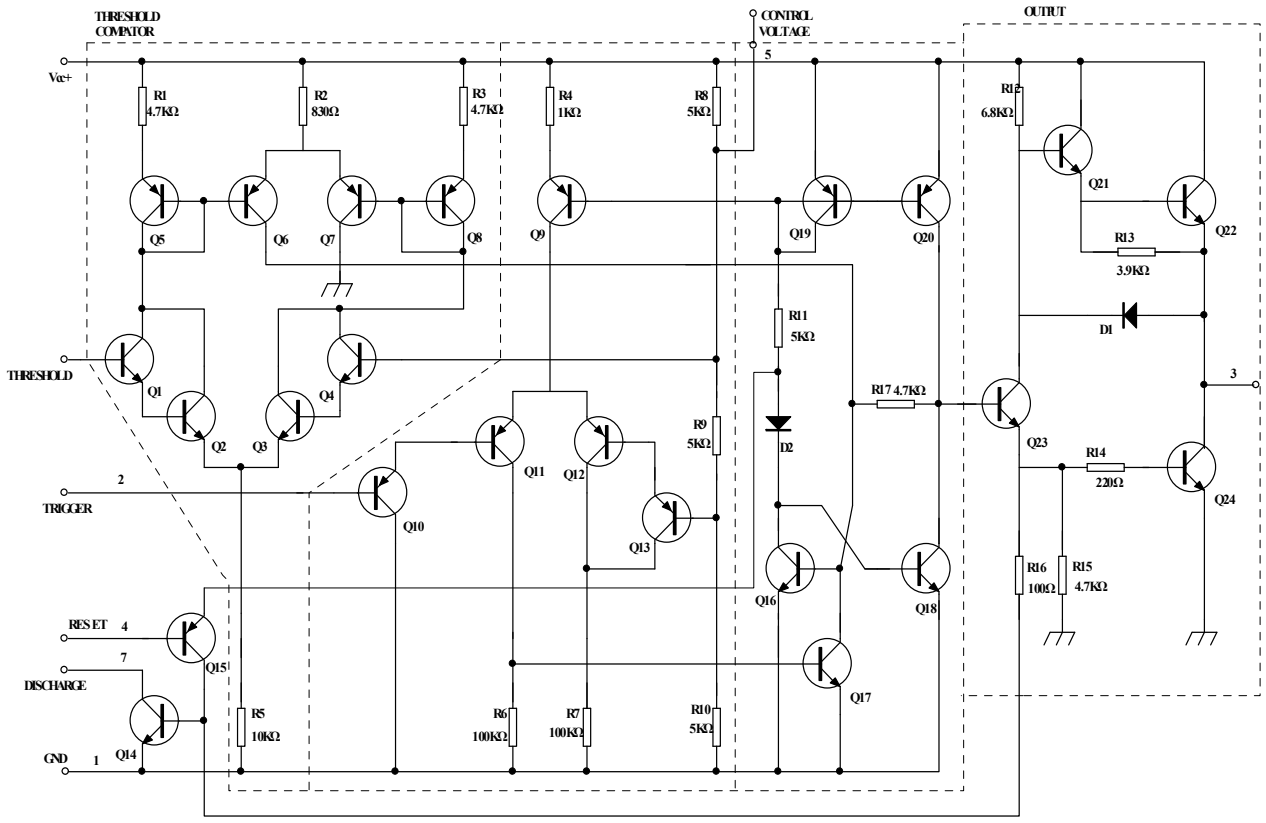
PIN DESCRIPTIONS



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 NE556	0 to 70	° C
T_j	Junction Temperature	150	° C
T_{stg}	Storage Temperature Range	– 65 to 150	° C

OPERATING CONDITIONS

Symbol	Parameter	SE556	NE556 - A556	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} = +25oC, V_{CC} = +5V to +15V (unless otherwise specified)

Symbol	Parameter	NE556			Unit
		Min.	Typ.	Max.	
Icc	Supply Current (RL ∞) (- note 1) - (2 timers) Low State V_{CC} = +5V	--	1	2	mA
	V_{CC} = +15V	--	3	6	mA
	High State V_{CC} = 5V	--	4	--	mA
	Timing Error (monostable) (RA = 2k to 100kΩ,C = 0.1uF)	--	1	3	%
	Initial Accuracy – (note 2)	--	50	--	ppm/℃
	Drift with Temperature	--	0.1	0.5	%/V
	Timing Error (astable) (RA, RB = 1kΩ to100kΩ, C = 0.1uF,Vcc = + 15V)	--	2.25	--	%
	Initial Accuracy – (note 2)	--	150	--	ppm/℃
	Drift with Temperature	--	0.3	--	%/V
VcL	Control Voltage Level Vcc = + 15V	9	10	11	V
	Vcc = + 5V	2.6	3.33	4	V
Vth	Threshold Voltage Vcc = + 15V	8.8	10	11.2	V
	Vcc = + 5V	2.4	3.33	4.2	V
Ith	Threshold Current – (note 3)	--	0.1	0.25	uA
Vtrig	Threshold Voltage Vcc = + 15V	4.5	5	5.6	V
	Vcc = + 5V	1.1	1.67	2.2	V
Itrig	Threshold Current (Vtig = 0V)	--	0.5	2.0	uA
Vreset	Reset Voltage – (note 4)	--	2.5	--	V
Ireset	Reset Current Vreset = + 0.4V	--	0.1	0.4	mA
	Vreset = 0V	--	0.4	1.5	mA
VoL	Low Level Output Voltage VCC = +15V, Io(sink) = 10mA	--	0.1	0.25	V
	Io(sink) = 50mA	--	0.4	0.75	V
	Io(sink) = 100mA	--	2	2.5	V
	Io(sink) = 200mA	--	2.5	--	V
	VCC = +5V, Io(sink) = 8mA	--	0.2	0.4	V
	Io (sink) = 5mA	--	0.15	0.25	V
VOH	High Level Output Voltage Vcc = + 15v, IO(source) = 200mA	--	12.5	--	V
	IO(source) = 100mA	12.75	13.3	--	V
	Vcc = + 5v, IO(source) = 100mA	2.75	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.
4. Specified with trigger input high.

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	NE556			Unit
		Min.	Typ.	Max.	
Idis (off)	Discharge Pin Leakage Current (output high) (Vdis = 10V)	--	20	100	nA
Vdis (sat)	Discharge pin Saturation Voltage (output low) – (note 5) Vcc = + 15V, Idis = 15mA	--	180	480	mA
	Vcc = + 5V, Idis = 4.5mA	--	80	200	mA
t_r	Output Rise Time	--	100	300	Ns
t_r	Output Fall Time	--	100	300	Ns
T_{off}	Turn off Time – (note 6) (Vreset = Vcc)	--	0.5	--	us

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

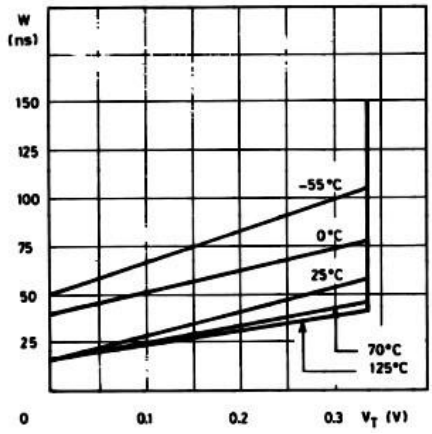


Figure 2 : Supply Current versus Supply Voltage

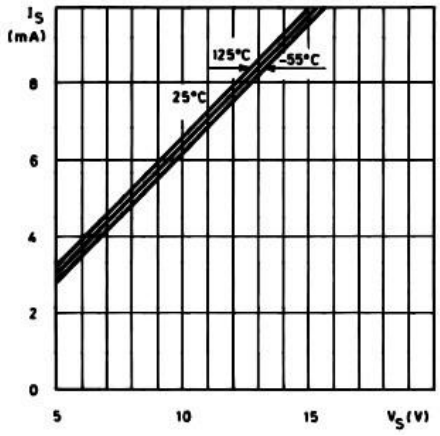


Figure 5 : Low Output Voltage versus Output Sink Current

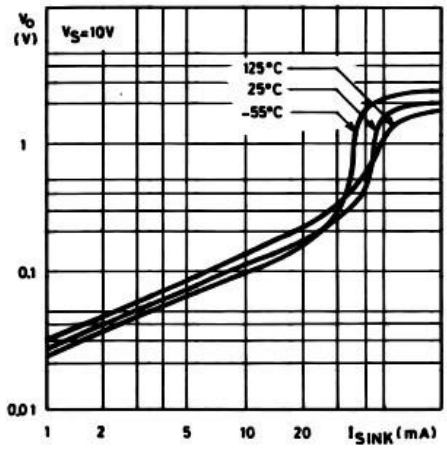


Figure 6 : Low Output Voltage versus Output Sink Current

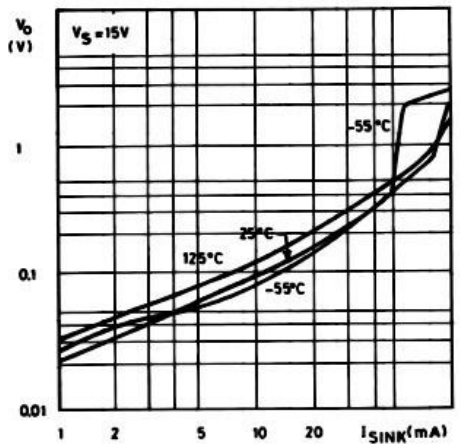


Figure 7 : High Output Voltage Drop versus Output

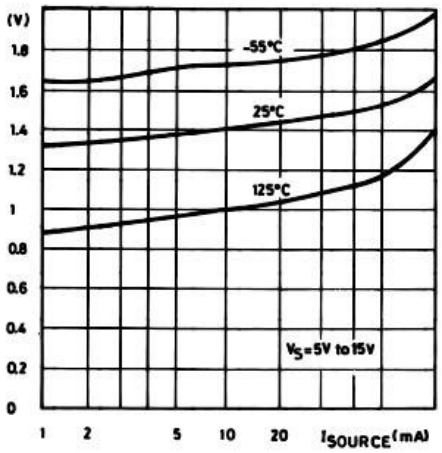


Figure 8 : Delay Time versus Supply Voltage

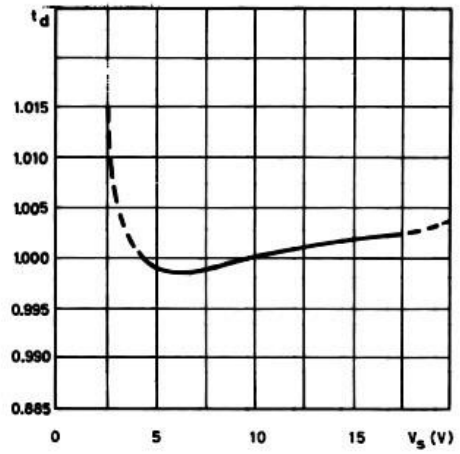
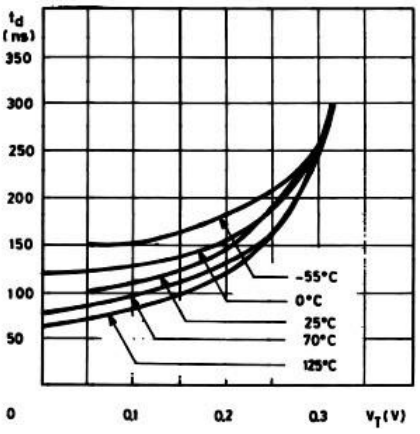


Figure 9 : Propagation Delay versus Voltage Level of Trigger Value



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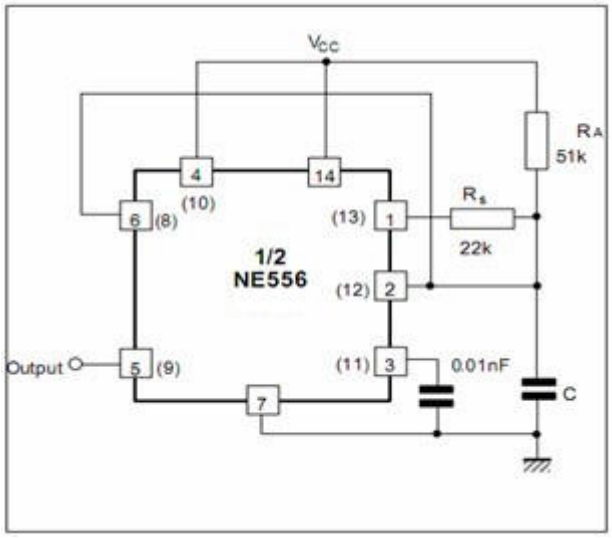
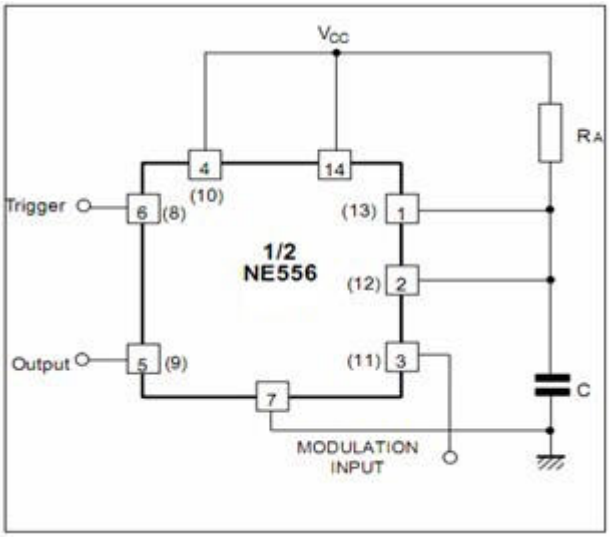
TYPICAL APPLICATION

50% DUTY CYCLE OSCILLATOR



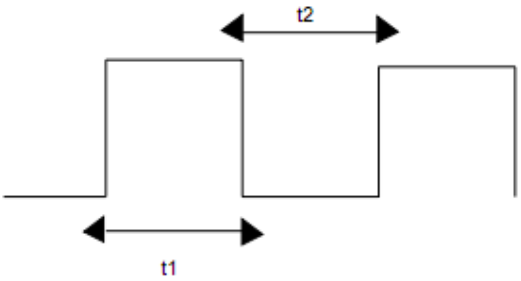
PULSE WIDTH MODULATOR



$$t_1 = 0.693\ R_A.C$$

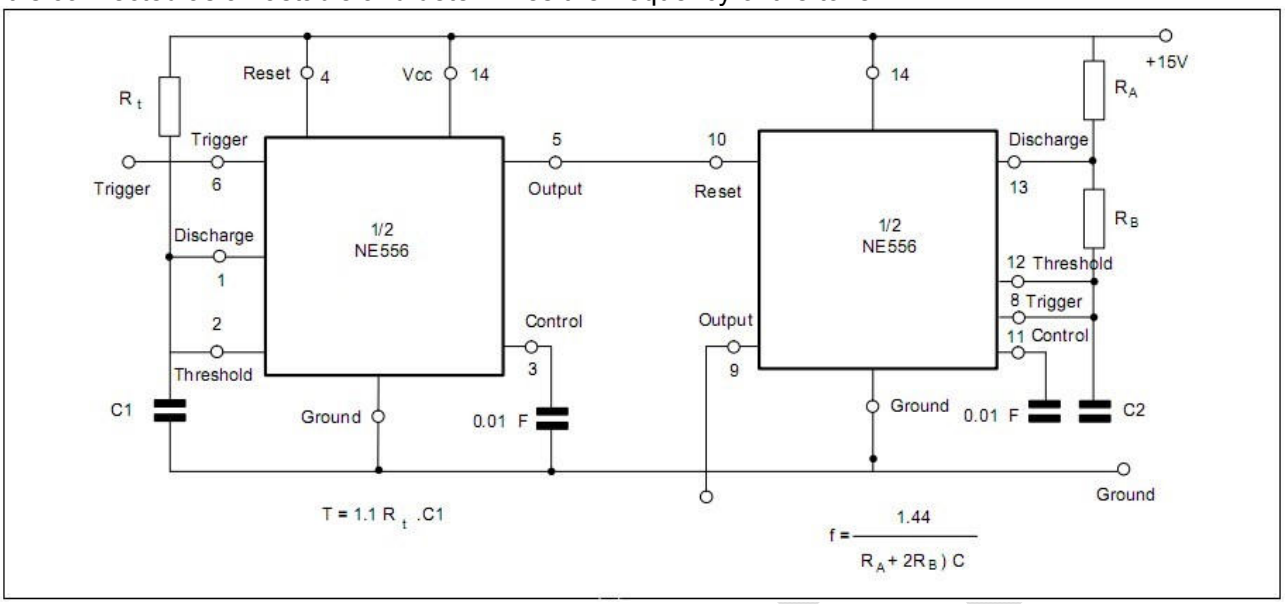
$$t_2 = [(R_A R_B)/(R_A + R_B)]\ C \mathrm{Ln}\left[\frac{R_B - 2R_A}{2R_B - R_A}\right]$$

$$f = \frac{1}{t_{1+}\ t_2} \quad R_B < \frac{1}{2}\ R_A\ \mathrm{ti}$$

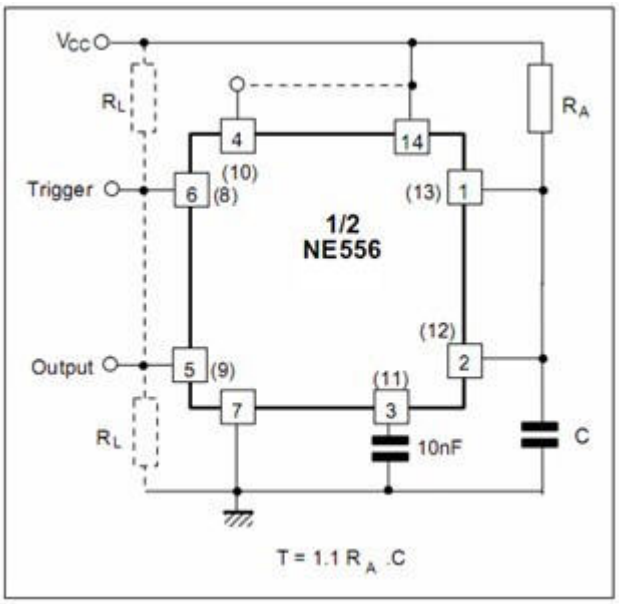


TONE BURST GENERATOR

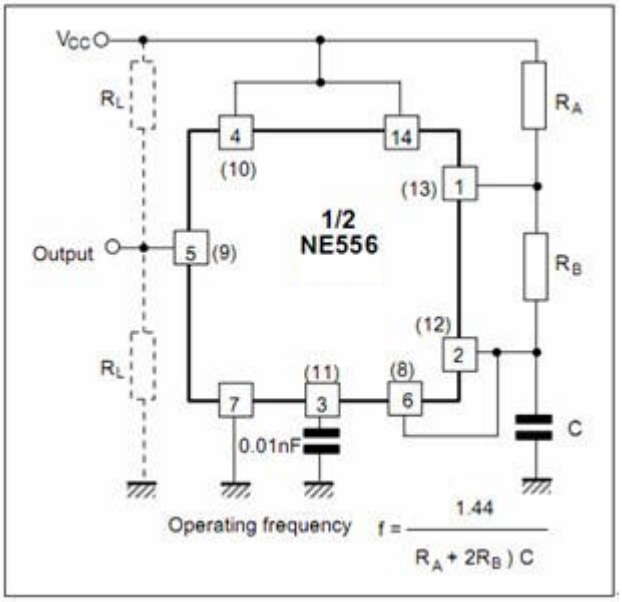
For a tone burst generator the first timer is used as a monostable and determines the tone duration when triggered by a positive pulse at pin 6. The second timer is enabled by the high output os the monostable. It is connected as an astable and determines the frequency of the tone.



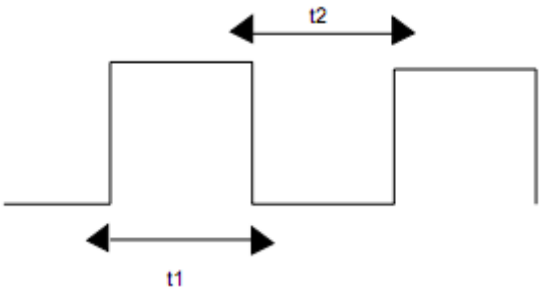
MONOSTABLE OPERATION



ASTABLE OPERATION

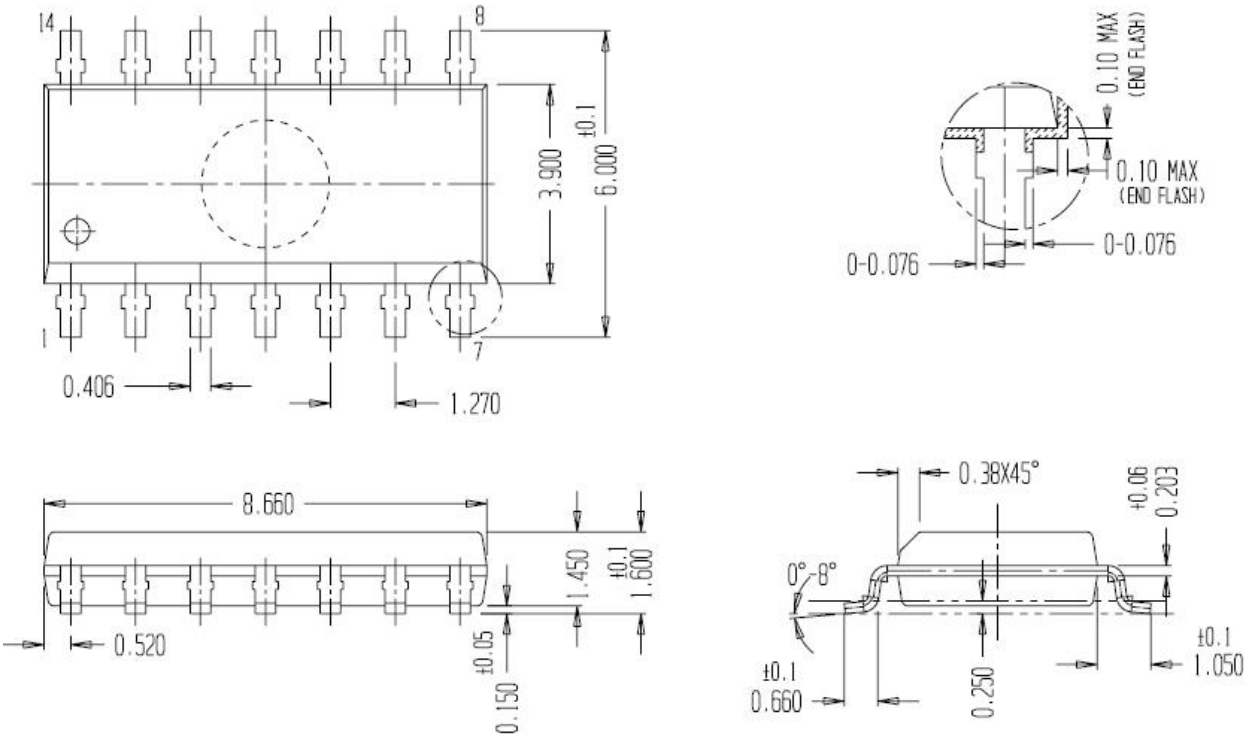


$t_1 = 0.693 (RA + RB) C$ Output High
$t_2 = 0.693 RBC$ Output Low



PACKAGE DESCRIPTION

SOP14 PACKAGE OUTLINE DIMENSIONS



DIP14 PACKAGE OUTLINE DIMENSIONS