NE/SA/SE556/NE/SA/SE556-1/SE556-1C
Dual Timer

Product Specification

DESCRIPTION

Both the 556 and 556-1 Dual Monolithic timing circuits are highly stable controllers capable of producing accurate time delays or oscillation. The 556 and 556-1 are a dual 555. Timing is provided by an external resistor and capacitor for each timing function. The two timers operate independently of each other, sharing only V_{CC} and ground. The circuits may be triggered and reset on falling waveforms. The output structures may sink or source 200mA.

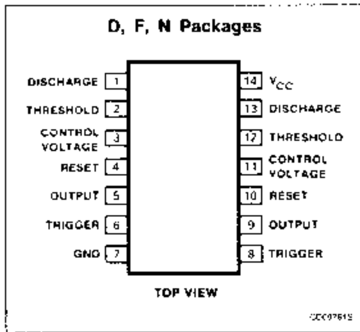
FEATURES

- **Turn-off time less than 2μs (556-1, 1C)**
- **Maximum operating frequency > 500kHz (556-1, 1C)**
- **Timing from microseconds to hours**
- **Replaces two 555 timers**
- **Operates in both astable and monostable modes**
- **High output current**
- **Adjustable duty cycle**
- **TTL compatible**
- **Temperature stability of 0.005%/°C**
- **SE556-1 compliant to MIL-STD or JAN available from Signetics' Military Division**

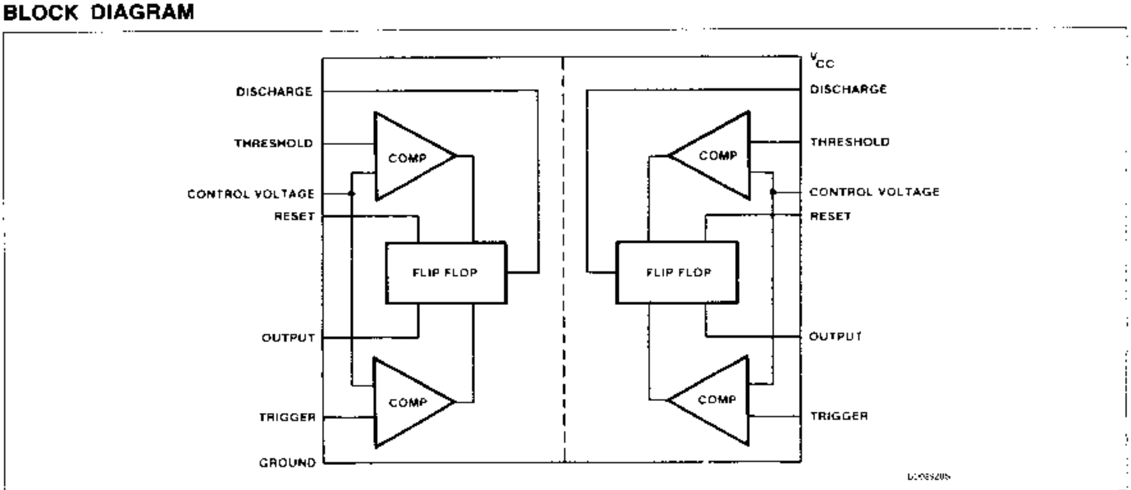
APPLICATIONS

- **Precision timing**
- **Sequential timing**
- **Pulse shaping**
- **Pulse generator**
- **Missing pulse detector**
- **Tone burst generator**
- **Pulse width modulation**
- **Time delay generator**
- **Frequency division**
- **Industrial controls**
- **Pulse position modulation**
- **Appliance timing**
- **Traffic light control**
- **Touch-Tone® encoder**

PIN CONFIGURATION



BLOCK DIAGRAM



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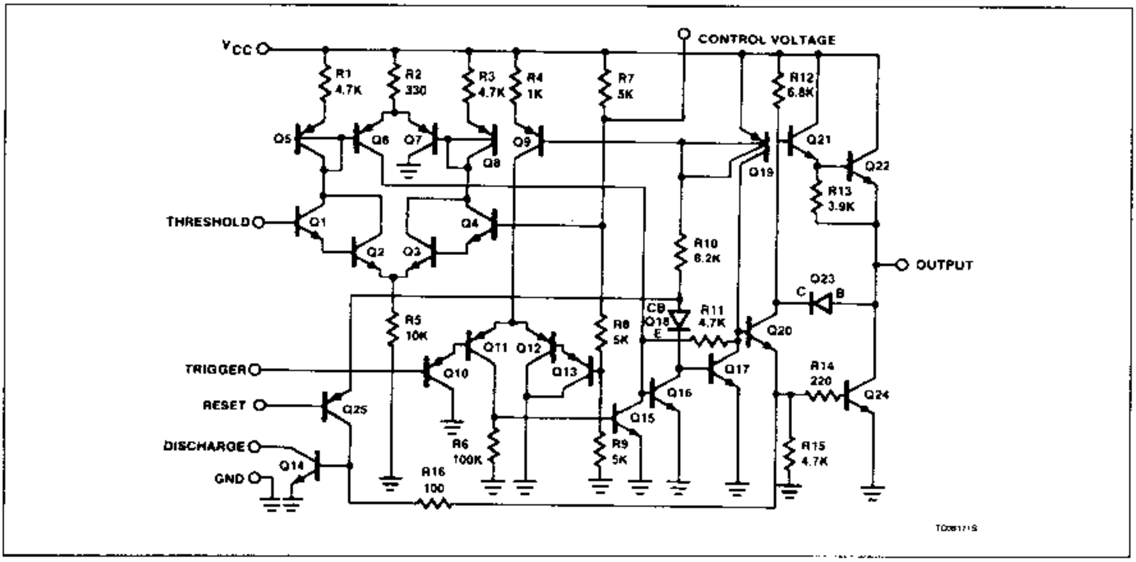
EQUIVALENT SCHEMATIC (Shown for one circuit only)



ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
14-Pin Plastic SO	0 to +70°C	NE556D
14-Pin Cerdip	0 to +70°C	NE556F
14-Pin Plastic DIP	0 to +70°C	NE556N
14-Pin Cerdip	0 to +70°C	NE556-1F
14-Pin Plastic DIP	0 to +70°C	NE556-1N
14-Pin Plastic DIP	−40°C to +85°C	SA556N
14-Pin Cerdip	−40°C to +85°C	SA556-1F
14-Pin Plastic DIP	−40°C to +85°C	SA556-1N
14-Pin Cerdip	−55°C to +125°C	SE556F
14-Pin Plastic DIP	−55°C to +125°C	SE556N
14-Pin Plastic DIP	−55°C to +125°C	SE556CN
14-Pin Cerdip	−55°C to +125°C	SE556-1F
14-Pin Plastic DIP	−55°C to +125°C	SE556-1N
14-Pin Cerdip	−55°C to +125°C	SE556-1CF
14-Pin Plastic DIP	−55°C to +125°C	SE556-1CN

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage NE/SA556, 556-1, SE556C, SE556-1C SE556-1, SE556	 +16 +18	 V V
P_D	Maximum allowable power dissipation[1]	800	mW
T_A	Operating temperature range NE556-1, NE556 SA556-1, SA556 SE556-1, SE556-1C, SE556, SE556C	 0 to +70 −40 to +85 −55 to +125	 °C °C °C
T_{STG}	Storage temperature range	−65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	+300	°C

NOTE:
1. The junction temperature must be kept below 125°C for the D package and below 150°C for the N and F packages. At ambient temperatures above 25°C, where this limit would be exceeded, the Maximum Allowable Power Dissipation must be derated by the following:
   D package 115 °C/W
   N package 80 °C/W
   F package 100 °C/W

ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_{CC} = +5V$ to $+15V$, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	SE556/556-1			NE/SA556/SE556C NE556-1/SE556-1C			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	Supply voltage		4.5		18	4.5		16	V
I_{CC}	Supply current (low state)[1]	$V_{CC} = 5V$, $R_L = \infty$ $V_{CC} = 15V$, $R_L = \infty$		6 20	10 24		6 20	12 30	mA mA
 t_M $\Delta t_M/\Delta T$ $\Delta t_M/\Delta V_S$	Timing error (monostable) Initial accuracy[2] Drift with temperature Drift with supply voltage	$R_A = 2k\Omega$ to $100k\Omega$ $C = 0.1\mu F$ $T = 1.1\ RC$		 0.5 30 0.05	 100 0.2		 0.75 50 0.1	 3.0 150 0.5	 % ppm/°C %/V
 t_A $\Delta t_A/\Delta T$ $\Delta t_A/\Delta V_S$	Timing error (astable) Initial accuracy[2] Drift with temperature Drift with supply voltage	R_A, $R_B = 1k\Omega$ to $100k\Omega$ $C = 0.\mu F$ $V_{CC} = 15V$		 4 400 0.15	 6 500 0.6		 5 400 0.3	 13 500 1	 % ppm/°C %/V
V_C	Control voltage level	$V_{CC} = 15V$ $V_{CC} = 5V$	9.6 2.9	10.0 3.33	10.4 3.8	9.0 2.6	10.0 3.33	11.0 4.0	V V
V_{TH}	Threshold voltage	$V_{CC} = 15V$ $V_{CC} = 5V$	9.4 2.7	10.0 3.33	10.6 4.0	8.8 2.4	10.0 3.33	11.2 4.2	V V
I_{TH}	Threshold current[3]			30	250		30	250	nA
V_{TRIG}	Trigger voltage	$V_{CC} = 15V$ $V_{CC} = 5V$	4.8 1.45	5.0 1.67	5.2 1.9	4.5 1.1	5.0 1.67	5.6 2.2	V V
I_{TRIG}	Trigger current	$V_{TRIG} = 0V$		0.5	0.9		0.5	2.0	μA
V_{RESET}	Reset voltage[5]		0.4	0.7	1.0	0.4	0.7	1.0	V
I_{RESET}	Reset current Reset current	$V_{RESET} = 0.4V$ $V_{RESET} = 0V$	0.4	0.1 0.4	0.4 1.0	0.4	0.1 0.4	0.6 1.5	mA mA
V_{OL}	Output voltage (low)	$V_{CC} = 15V$ $I_{SINK} = 10mA$ $I_{SINK} = 50mA$		 0.1 0.4	 0.15 0.5		 0.1 0.4	 0.25 0.75	 V V
	SE556 SE556-1 NE/SA556/SE556C NE556-1/SE556-1C	$I_{SINK} = 100mA$		2.0 0.8	2.25 1.2		 2.0 2.0	 3.2 2.5	V V V V

ELECTRICAL CHARACTERISTICS (Continued) $T_A = 25°C$, $V_{CC} = +5V$ to $+15V$, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	SE556/556-1			NE/SA556/SE556C NE556-1/SE556-1C			UNIT
			Min	Typ	Max	Min	Typ	Max	
		$I_{SINK} = 200mA$		2.5			2.5		V
		$V_{CC} = 5V$							
		$I_{SINK} = 8mA$		0.1	0.2		0.25	0.3	V
		$I_{SINK} = 5mA$		0.05	0.15		0.15	0.25	V
V_{OH}	Output voltage (high)	$V_{CC} = 15V$							
		$I_{SOURCE} = 200mA$		12.5			12.5		V
		$I_{SOURCE} = 100mA$	13.0	13.3		12.75	13.3		V
		$V_{CC} = 5V$							
		$I_{SOURCE} = 100mA$	3.0	3.3		2.75	3.3		V
t_{OFF}	Turn-off time[6] NE556-1/SE556-1/SE556-1C	$V_{RESET} = V_{CC}$		0.5	2.0		0.5		μs
t_R	Rise time of output			100	200		100	300	ns
t_F	Fall time of output			100	200		100	300	ns
	Discharge leakage current			20	100		20	100	nA
	Matching characteristics[4]								
	Initial accuracy[2]			0.5	1.0		1.0	2.0	%
	Drift with temperature			10			± 10		ppm/°C
	Drift with supply voltage			0.1	0.2		0.2	0.5	%/V

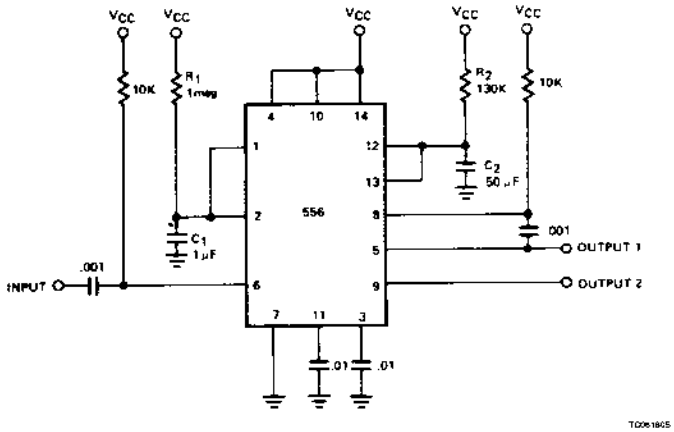
NOTES:

1. Supply current when output is high is typically 1.0mA less.
2. Tested at $V_{CC} = 5V$ and $V_{CC} = 15V$.
3. This will determine maximum value of $R_A + R_B$. For 15V operation, the max total R = 10MΩ, and for 5V operation, the maximum total R = 3.4MΩ.
4. Matching characteristics refer to the difference between performance characteristics for each timer section in the monostable mode.
5. Specified with trigger input high. In order to guarantee reset the voltage at reset pin must be less than or equal to 0.4V. To disable reset function, the voltage at reset pin has to be greater than 1V.
6. Time measured from a positive-going input pulse from 0 to 0.4 V_{CC} into the threshold to the drop from high to low of the output. Trigger is tied to threshold.

TYPICAL APPLICATIONS

One feature of the dual timer is that by utilizing both halves it is possible to obtain sequential timing. By connecting the output of the first half to the input of the second half via a 0.001μF coupling capacitor sequential timing may be obtained. Delay t_1 is determined by the first half and t_2 by the second half delay.

The first half of the timer is started by momentarily connecting Pin 6 to ground. When it is timed out (determined by $1.1R_1C_1$) the second half begins. Its duration is determined by $1.1R_2C_2$.

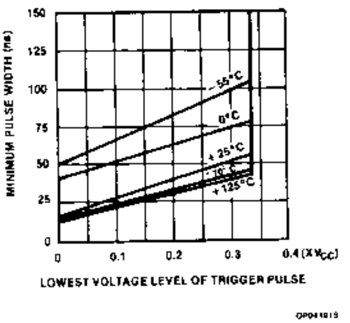


NOTE:
All resistor values are in Ω.

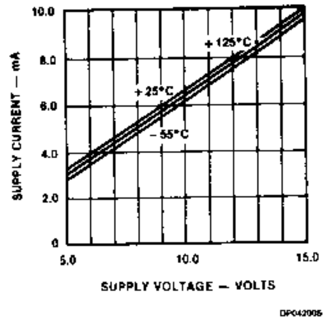
Sequential Timer

TYPICAL PERFORMANCE CHARACTERISTICS

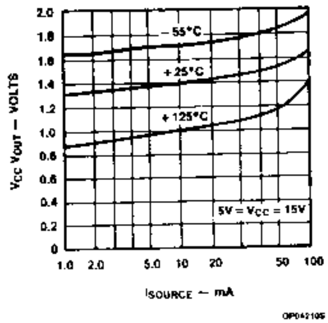
Minimum Pulse Width Required for Triggering



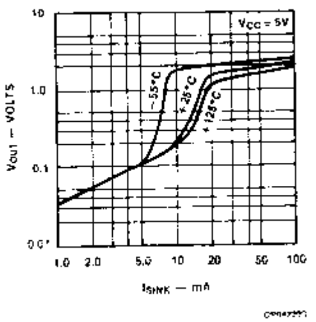
Supply Current vs Supply Voltage



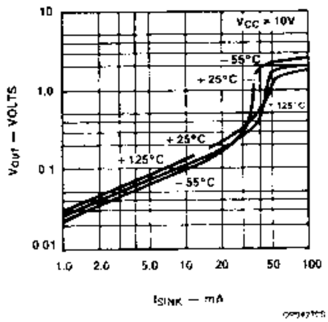
High Output Voltage Drop vs Output Source Current



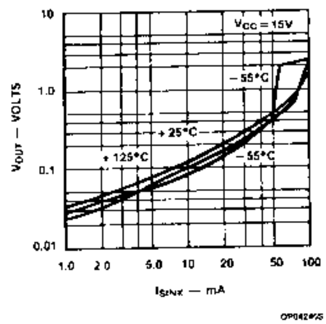
Low Output Voltage vs Output Sink Current



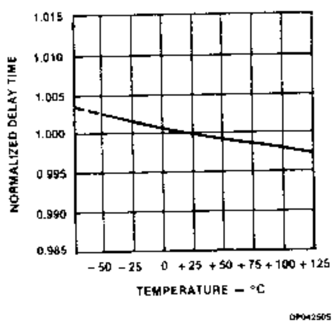
Low Output Voltage vs Output Sink Current



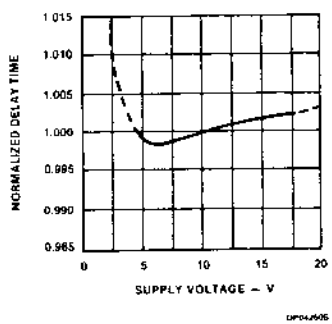
Low Output Voltage vs Output Sink Current



Delay Time vs Temperature



Delay Time vs Supply Voltage



Propagation Delay vs Voltage Level of Trigger Pulse