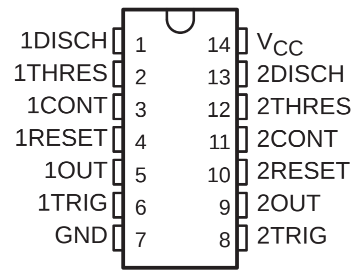
DUAL PRECISION TIMERS

- **Two Precision Timing Circuits per Package**
- **Astable or Monostable Operation**
- **TTL-Compatible Output Can Sink or Source Up to 150 mA**
- **Active Pullup or Pulldown**
- **Designed to be Interchangeable With Signetics NE556, SA556, and SE556**
- **Applications Include:**
  - **Precision Timers From Microseconds to Hours**
  - **Pulse-Shaping CIrcuits**
  - **Missing-Pulse Detectors**
  - **Tone-Burst Generators**
  - **Pulse-Width Modulators**
  - **Pulse-Position Modulators**
  - **Sequential Timers**
  - **Pulse Generators**
  - **Frequency Dividers**
  - **Application Timers**
  - **Industrial Controls**
  - **Touch-Tone Encoders**

NE556, SA556 . . . D, OR N PACKAGE
SE556 . . . J PACKAGE
(TOP VIEW)



description

These devices provide two independent timing circuits of the NE555, SA555, or SE555 type in each package. These circuits can be operated in the astable or the monostable mode with external resistor-capacitor (RC) timing control. The basic timing provided by the RC time constant can be controlled actively by modulating the bias of the control-voltage input.

The threshold (THRES) and trigger (TRIG) levels are normally two-thirds and one-third, respectively, of V_{CC}. These levels can be altered by using the control-voltage (CONT) terminal. When the trigger input falls below trigger level, the flip-flop is set and the output goes high. If the trigger input is above the trigger level and the threshold input is above the threshold level, the flip-flop is reset and the output is low. The reset (RESET) input can override all other inputs and can be used to initiate a new timing cycle. When the reset input goes low, the flip-flop is reset and the output goes low. When the output is low, a low-impedance path is provided between the discharge (DISCH) terminal and ground (GND).

The NE556 is characterized for operation from 0°C to 70°C. The SA556 is characterized for operation from –40°C to 85°C, and the SE556 is characterized for operation over the full military range of –55°C to 125°C.

AVAILABLE OPTIONS

T_A	V_T (MAX) V_{CC} = 15 V	PACKAGED DEVICES		
		SMALL OUTLINE (D)	CERAMIC DIP (J)	PLASTIC DIP (N)
0°C to 70°C	11.2 V	NE556D	–	NE556N
–40°C to 85°C	11.2 V	SA556D	–	SA556N
–55°C to 125°C	10.6 V	–	SE556J	–

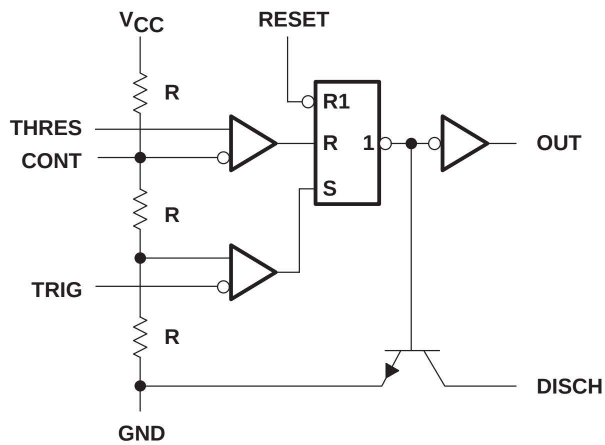
The D package is available taped and reeled. Add the suffix R to the device type (e.g., NE556DR).

FUNCTION TABLE
(each timer)

RESET	TRIGGER VOLTAGE†	THRESHOLD VOLTAGE†	OUTPUT	DISCHARGE SWITCH
Low	Irrelevant	Irrelevant	Low	On
High	< 1/3 V_{DD}	Irrelevant	High	Off
High	> 1/3 V_{DD}	> 2/3 V_{DD}	Low	On
High	> 1/3 V_{DD}	> 2/3 V_{DD}	As previously established	

† Voltage levels shown are nominal.

functional block diagram, each timer



RESET can override TRIG, which can override THRES.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage, V_{CC} (see Note 1) . . . . 18 V
Input voltage (CONT, RESET, THRES, and TRIG) . . . . V_{CC}
Output current . . . . ±225 mA
Continuous total dissipation . . . . See Dissipation Rating Table
Package thermal impedance, θ_{JA} (see Note 2): D package . . . . 86°C/W
N package . . . . 80°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package . . . . 300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package . . . . 260°C
Storage temperature range, T_{stg} . . . . –65°C to 150°C

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values are with respect to network ground terminal.
2. The package thermal impedance is calculated in accordance with JESD 51.

DISSIPATION RATING TABLE

PACKAGE	TA ≤ 25°C POWER RATING	DERATING FACTOR ABOVE T_A = 25°C	T_A = 70°C POWER RATING	T_A = 85°C POWER RATING	T_A = 125°C POWER RATING
J	1375 mW	11.0 mW/°C	880 mW	715 mW	275 mW

recommended operating conditions

		MIN	MAX	UNIT
Supply voltage, V_{CC}	NE556, SA556	4.5	16	V
	SE556	4.5	18	
Input voltage (CONT, RESET, THRES, and TRIG), V_I			V_{CC}	V
Output current, I_O			±200	mA
Operating free-air temperature, T_A	NE556	0	70	°C
	SA556	–40	85	
	SE556	–55	125	

electrical characteristics, V_{CC} = 5 V to 15 V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS		NE556, SA556			SE556			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_T	Threshold voltage level	V_{CC} = 15 V		8.8	10	11.2	9.4	10	10.6	V
		V_{CC} = 5 V		2.4	3.3	4.2	2.7	3.3	4	
I_T	Threshold current (see Note 3)				30	250		30	250	nA
V_{TRIG}	Trigger voltage level	V_{CC} = 15 V		4.5	5	5.6	4.8	5	5.2	V
		V_{CC} = 5 V		1.1	1.67	2.2	1.45	1.67	1.9	
I_{TRIG}	Trigger current	TRIG at 0 V			0.5	2		0.5	0.9	µA
V_{RESET}	Reset voltage level			0.3	0.7	1	0.3	0.7	1	V
I_{RESET}	Reset current	RESET at V_{CC}			0.1	0.4		0.1	0.4	mA
		RESET at 0 V			–0.4	1.5		–0.4	–1	
I_{DISCH}	Discharge switch off-state current				20	100		20	100	nA
V_{CONT}	Control voltage (open circuit)	V_{CC} = 15 V		9	10	11	9.6	10	10.4	V
		V_{CC} = 5 V		2.6	3.3	4	2.9	3.3	3.8	
V_{OL}	Low-level output voltage	V_{CC} = 15 V	I_{OL} = 10 mA		0.1	0.25		0.1	0.15	V
			I_{OL} = 50 mA		0.4	0.75		0.4	0.5	
			I_{OL} = 100 mA		2	2.5		2	2.2	
			I_{OL} = 200 mA		2.5			2.5		
		V_{CC} = 5 V	I_{OL} = 5 mA		0.1	0.25		0.1	0.15	
			I_{OL} = 8 mA		0.15	0.3		0.15	0.25	
V_{OH}	High-level output voltage	V_{CC} = 15 V	I_{OH} = –100 mA	12.75	13.3		13	13.3		V
			I_{OH} = –200 mA		12.5			12.5		
		V_{CC} = 5 V	I_{OH} = –100 mA	2.75	3.3		3	3.3		
I_{CC}	Supply current	Output low, No Load	V_{CC} = 15 V		20	30		20	24	mA
			V_{CC} = 5 V		6	12		6	10	
		Output high, No load	V_{CC} = 15 V		18	26		18	20	nA
			V_{CC} = 5 V		4	10		4	8	

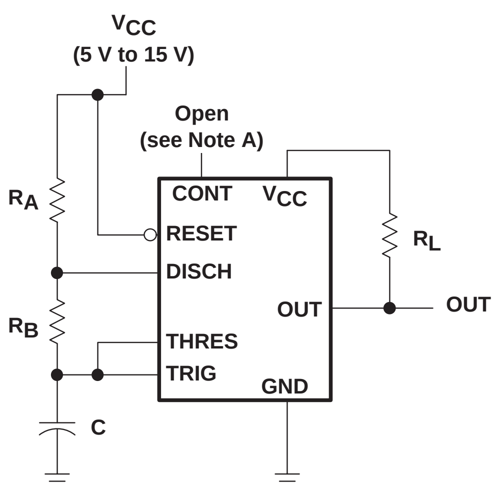
NOTE 3: This parameter influences the maximum value of the timing resistors R_A and R_B in the circuit of Figure 1. For example, when V_{CC} = 5 V, the maximum value is $R = R_A + R_B \approx 3.4$ MΩ, and for V_{CC} = 15 V, the maximum value is ≈ 10 MΩ.

operating characteristics, V_{CC} = 5 V and 15 V

PARAMETER		TEST CONDITIONS†	NE556, SA556			SE556			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Initial error of timing interval‡	Each timer, monostable§	T_A = 25°C		1	3		0.5	1.5	
	Each timer, astable¶			2.25%			1.5%		
	Timer 1 — Timer 2			±1			±0.5		
Temperature coefficient of timing interval	Each timer, monostable§	T_A = MIN to MAX		50			30	100	ppm/°C
	Each timer, astable¶			150			90		
	Timer 1 — Timer 2			±10			±10		
Supply voltage sensitivity of timing interval	Each timer, monostable§	T_A = 25°C		0.1	0.5		0.05	0.2	%/V
	Each timer, astable¶			0.3			0.15		
	Timer 1 — Timer 2			±0.2			±0.1		
Output pulse rise time		C_L = 15 pF, T_A = 25°C		100	300		100	200	ns
Output pulse fall time				100	300		100	200	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ Timing interval error is defined as the difference between the measured value and the average value of a random sample from each process run.
§ Values specified are for a device in a monostable circuit similar to Figure 2, with component values as follow: R_A = 2 kΩ to 100 kΩ, C = 0.1μF.
¶ Values specified are for a device in an astable circuit similar to Figure 1, with component values as follow: R_A = 1 kΩ to 100 kΩ, C = 0.1μF.

APPLICATION INFORMATION



NOTE A: Bypassing the control-voltage input to ground with a capacitor may improve operation. This should be evaluated for individual applications.

Figure 1. Circuit for Astable Operation

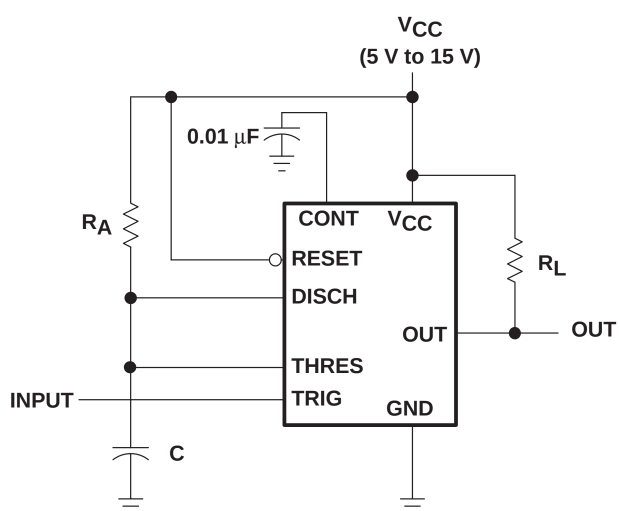


Figure 2. Circuit for Monostable Operation