

# LM556

## Dual Timer

### General Description

The LM556 Dual timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. The 556 is 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.

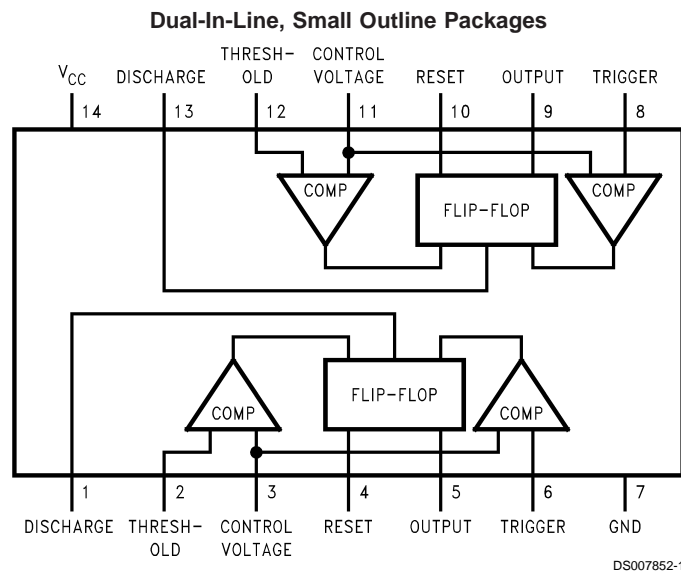
### Features

- Direct replacement for SE556/NE556
- Timing from microseconds through hours
- Operates in both astable and monostable modes
- Replaces two 555 timers
- Adjustable duty cycle
- Output can source or sink 200mA
- Output and supply TTL compatible
- Temperature stability better than 0.005% per °C
- Normally on and normally off output

### Applications

- Precision timing
- Pulse generation
- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Linear ramp generator

### Connection Diagram

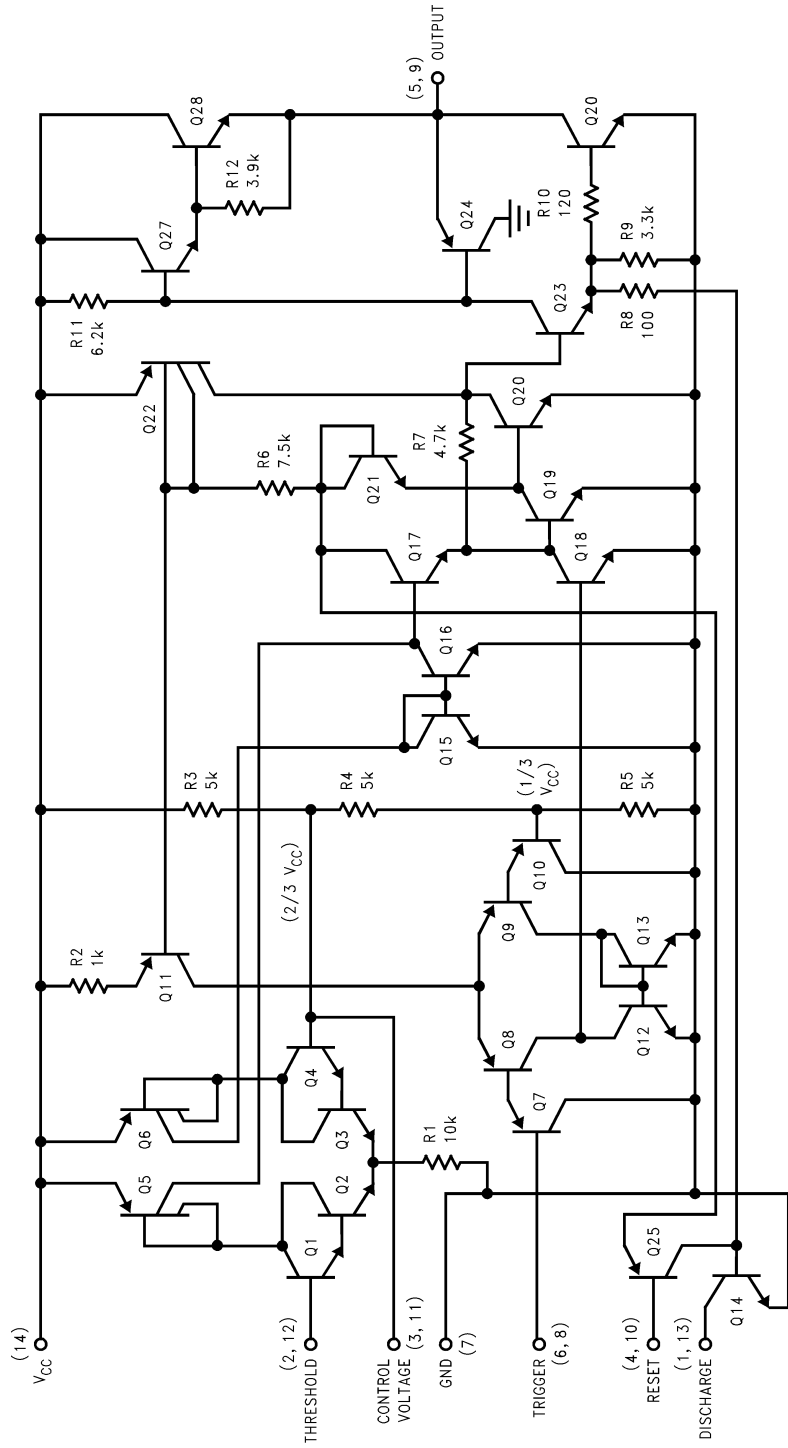


Top View

### Ordering Information

Package	Part Number	Package Marking	Media Transport	NSC Drawing
14-Pin SOIC	LM556CM	LM556CM	Rails	M14A
	LM556CMX	LM556CM	2.5k Units Tape and Reel	
14-Pin MDIP	LM556CN	LM556CN	Rails	N14a

# Schematic Diagram



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**Absolute Maximum Ratings** (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	+18V
Power Dissipation (Note 2)	
LM556CM	410 mW
LM556CN	1620 mW
Operating Temperature Ranges	
LM556C	0°C to +70°C

Storage Temperature Range –65°C to +150°C

## Soldering Information

Dual-In-Line Package	
Soldering (10 Seconds)	260°C
Small Outline Packages	
Vapor Phase (60 Seconds)	215°C
Infrared (15 Seconds)	220°C

See AN-450 "Surface Mounting Methods and Their Effect on Product Reliability" for other methods of soldering surface mount devices.

**Electrical Characteristics**

( $T_A = 25^\circ\text{C}$ ,  $V_{CC} = +5\text{V}$  to +15V, unless otherwise specified)

Parameter	Conditions	Limits			Units
		LM556C			
		Min	Typ	Max	
Supply Voltage		4.5		16	V
Supply Current (Each Timer Section)	$V_{CC} = 5\text{V}$ , $R_L = \infty$ $V_{CC} = 15\text{V}$ , $R_L = \infty$ (Low State) (Note 3)		3 10	6 14	mA
Timing Error, Monostable					
Initial Accuracy			0.75		%
Drift with Temperature	$R_A = 1\text{k}$ to 100k $\Omega$ , $C = 0.1\mu\text{F}$ , (Note 4)		50		ppm/°C
Accuracy over Temperature			1.5		%
Drift with Supply			0.1		%/V
Timing Error, Astable					
Initial Accuracy			2.25		%
Drift with Temperature	$R_A$ , $R_B = 1\text{k}$ to 100k $\Omega$ , $C = 0.1\mu\text{F}$ , (Note 4)		150		ppm/°C
Accuracy over Temperature			3.0		%
Drift with Supply			0.30		%/V
Trigger Voltage	$V_{CC} = 15\text{V}$ $V_{CC} = 5\text{V}$	4.5 1.25	5 1.67	5.5 2.0	V V
Trigger Current			0.2	1.0	$\mu\text{A}$
Reset Voltage		0.4	0.5	1	V
Reset Current			0.1	0.6	mA
Threshold Current	$V_{TH} = V$ -Control (Note 6) $V_{TH} = 11.2\text{V}$		0.03	0.1 250	$\mu\text{A}$ nA
Control Voltage Level and Threshold Voltage	$V_{CC} = 15\text{V}$ $V_{CC} = 5\text{V}$	9 2.6	10 3.33	11 4	V
Pin 1, 13 Leakage Output High			1	100	nA
Pin 1, 13 Sat	(Note 7)				
Output Low	$V_{CC} = 15\text{V}$ , $I = 15\text{mA}$		180	300	mV
Output Low	$V_{CC} = 4.5\text{V}$ , $I = 4.5\text{mA}$		80	200	mV
Output Voltage Drop (Low)	$V_{CC} = 15\text{V}$ $I_{SINK} = 10\text{mA}$ $I_{SINK} = 50\text{mA}$ $I_{SINK} = 100\text{mA}$ $I_{SINK} = 200\text{mA}$ $V_{CC} = 5\text{V}$ $I_{SINK} = 8\text{mA}$ $I_{SINK} = 5\text{mA}$		0.1 0.4 2 2.5	0.25 0.75 2.75	V V V V
			0.25	0.35	V

## Electrical Characteristics (Continued)

( $T_A = 25^\circ\text{C}$ ,  $V_{CC} = +5\text{V}$  to  $+15\text{V}$ , unless otherwise specified)

Parameter	Conditions	Limits			Units
		LM556C			
		Min	Typ	Max	
Output Voltage Drop (High)	$I_{\text{SOURCE}} = 200\text{mA}$ , $V_{CC} = 15\text{V}$		12.5		V
	$I_{\text{SOURCE}} = 100\text{mA}$ , $V_{CC} = 15\text{V}$	12.75	13.3		V
	$V_{CC} = 5\text{V}$	2.75	3.3		V
Rise Time of Output			100		ns
Fall Time of Output			100		ns
Matching Characteristics	(Note 8)				
Initial Timing Accuracy			0.1	2.0	%
Timing Drift with Temperature			$\pm 10$		ppm/ $^\circ\text{C}$
Drift with Supply Voltage			0.2	0.5	%/V

**Note 1:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur.

**Note 2:** For operating at elevated temperatures the device must be derated based on a  $+150^\circ\text{C}$  maximum junction temperature and a thermal resistance of  $77^\circ\text{C/W}$  (Plastic Dip), and  $110^\circ\text{C/W}$  (SO-14 Narrow).

**Note 3:** Supply current when output high typically 1mA less at  $V_{CC} = 5\text{V}$ .

**Note 4:** Tested at  $V_{CC} = 5\text{V}$  and  $V_{CC} = 15\text{V}$ .

**Note 5:** As reset voltage lowers, timing is inhibited and then the output goes low.

**Note 6:** This will determine the maximum value of  $R_A + R_B$  for 15V operation. The maximum total ( $R_A + R_B$ ) is 20 M $\Omega$ .

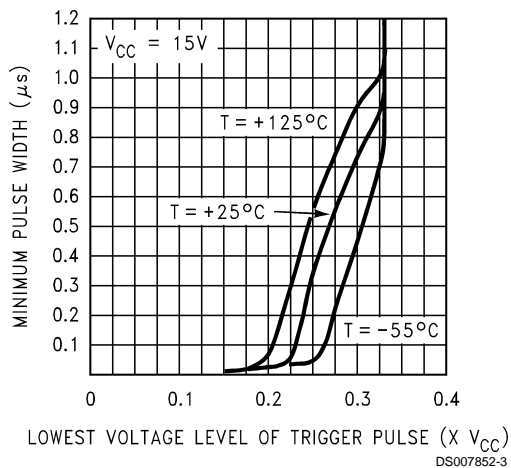
**Note 7:** No protection against excessive pin 1, 13 current is necessary providing the package dissipation rating will not be exceeded.

**Note 8:** Matching characteristics refer to the difference between performance characteristics of each timer section.

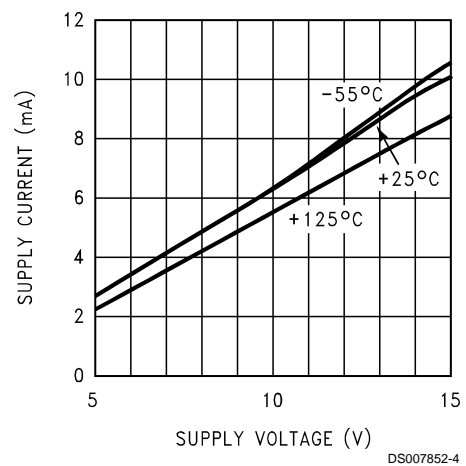
**Note 9:** Refer to RETS556X drawing of military LM556J versions.

## Typical Performance Characteristics

### Minimum Pulse Width Required for Triggering

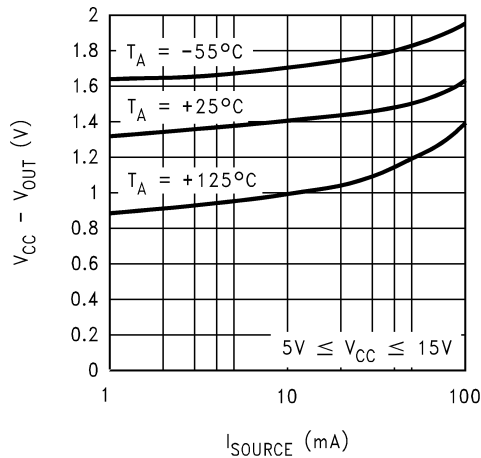


### Supply Current vs. Supply Voltage (Each Section)



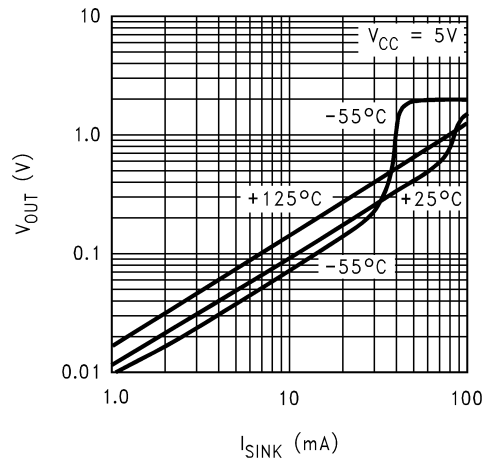
# Typical Performance Characteristics (Continued)

High Output Voltage vs. Output Source Current



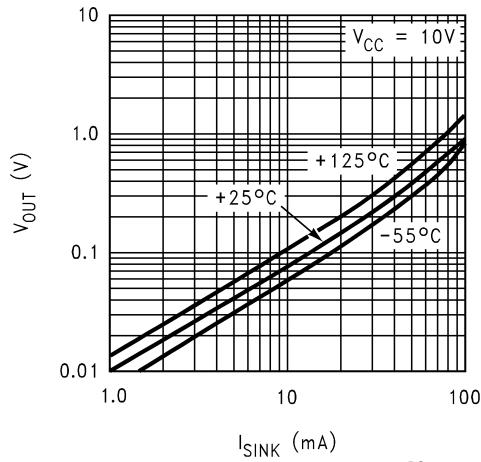
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Low Output Voltage vs. Output Sink Current



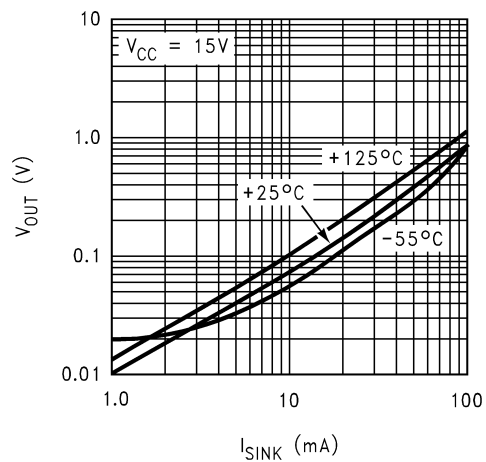
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Low Output Voltage vs. Output Sink Current



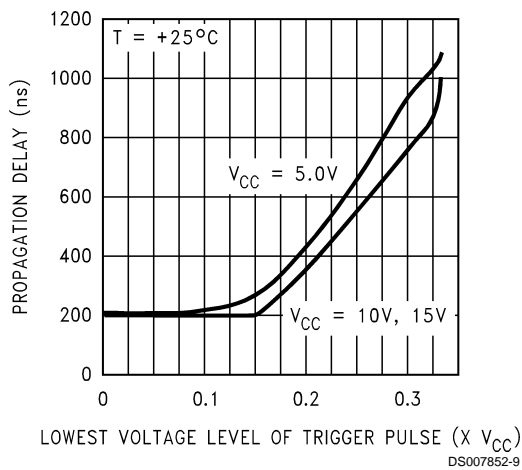
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Low Output Voltage vs. Output Sink Current



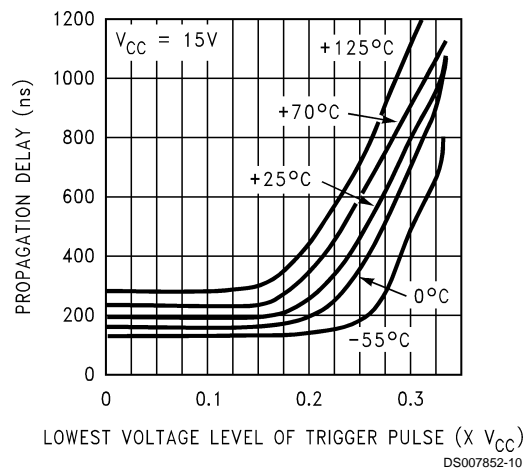
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Output Propagation Delay vs. Voltage Level of Trigger Pulse



DS007852-9

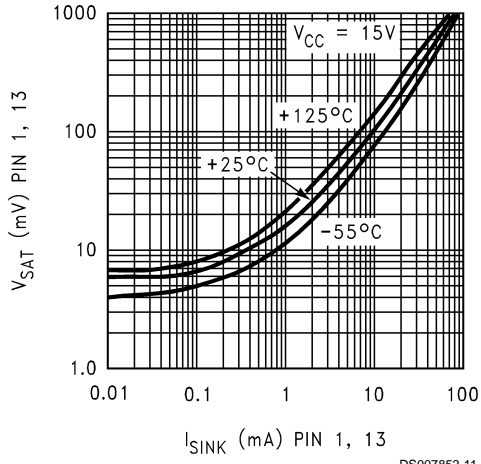
Output Propagation Delay vs. Voltage Level of Trigger Pulse



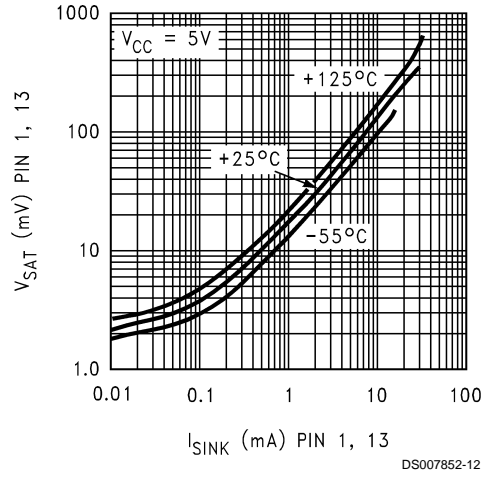
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# Typical Performance Characteristics (Continued)

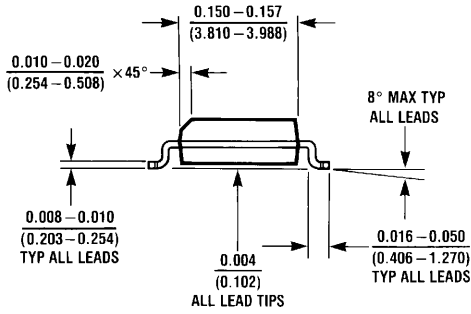
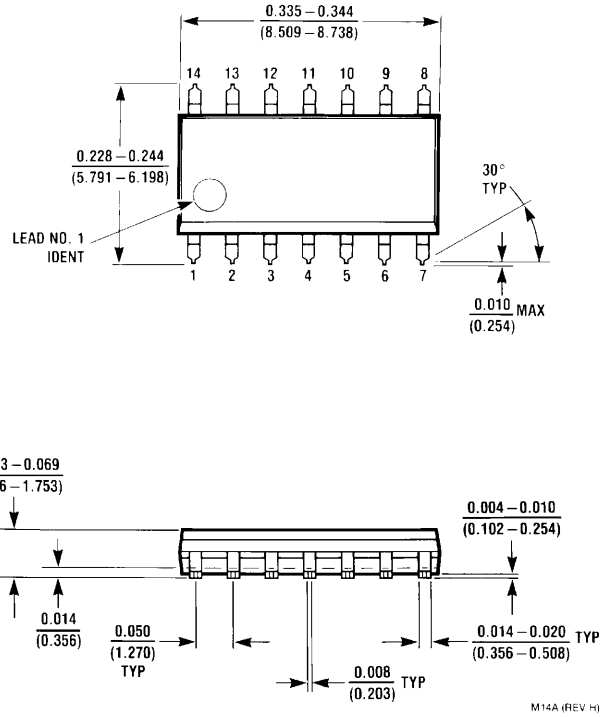
Discharge Transistor (Pin 1, 13) Voltage vs. Sink Current



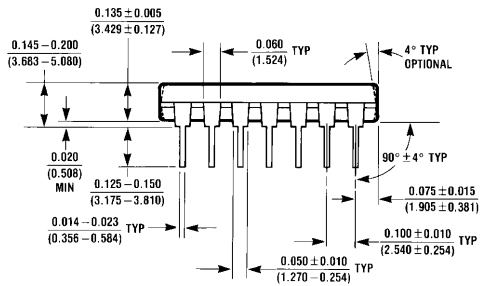
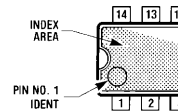
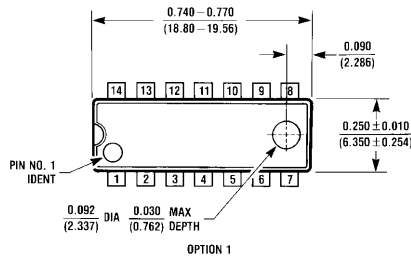
Discharge Transistor (Pin 1, 13) Voltage vs. Sink Current



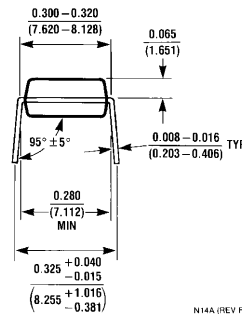
**Physical Dimensions** inches (millimeters) unless otherwise noted



**Small Outline Package (M)  
NS Package Number M14A**



OPTION 02



**14-Lead (0.118" Wide) Molded Mini Small Outline Package  
NS Package Number N14A**

## Notes

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