National Semiconductor

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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

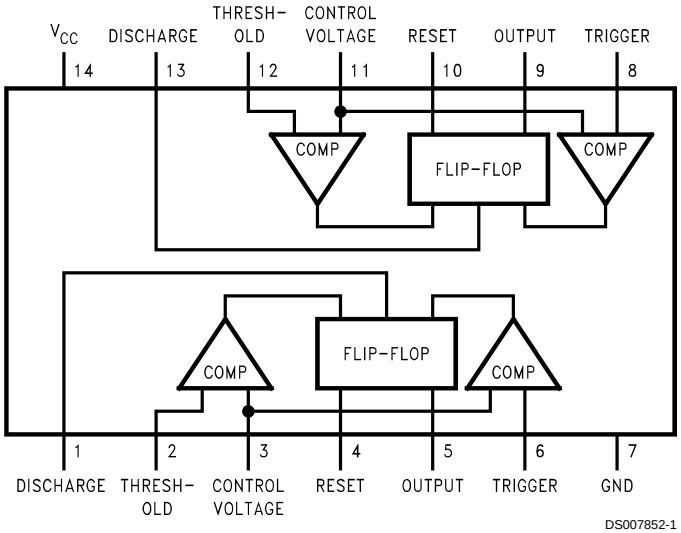
- Direct replacement for SE556/NE556
- Timing from microseconds through hours
- Operates in both astable and monostable modes
- Replaces two 555 timers
- Adjustable duty cycle
- Output can source or sink 200mA
- Output and supply TTL compatible
- Temperature stability better than 0.005% per ˚C
- Normally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

Dual-In-Line, Small Outline Packages

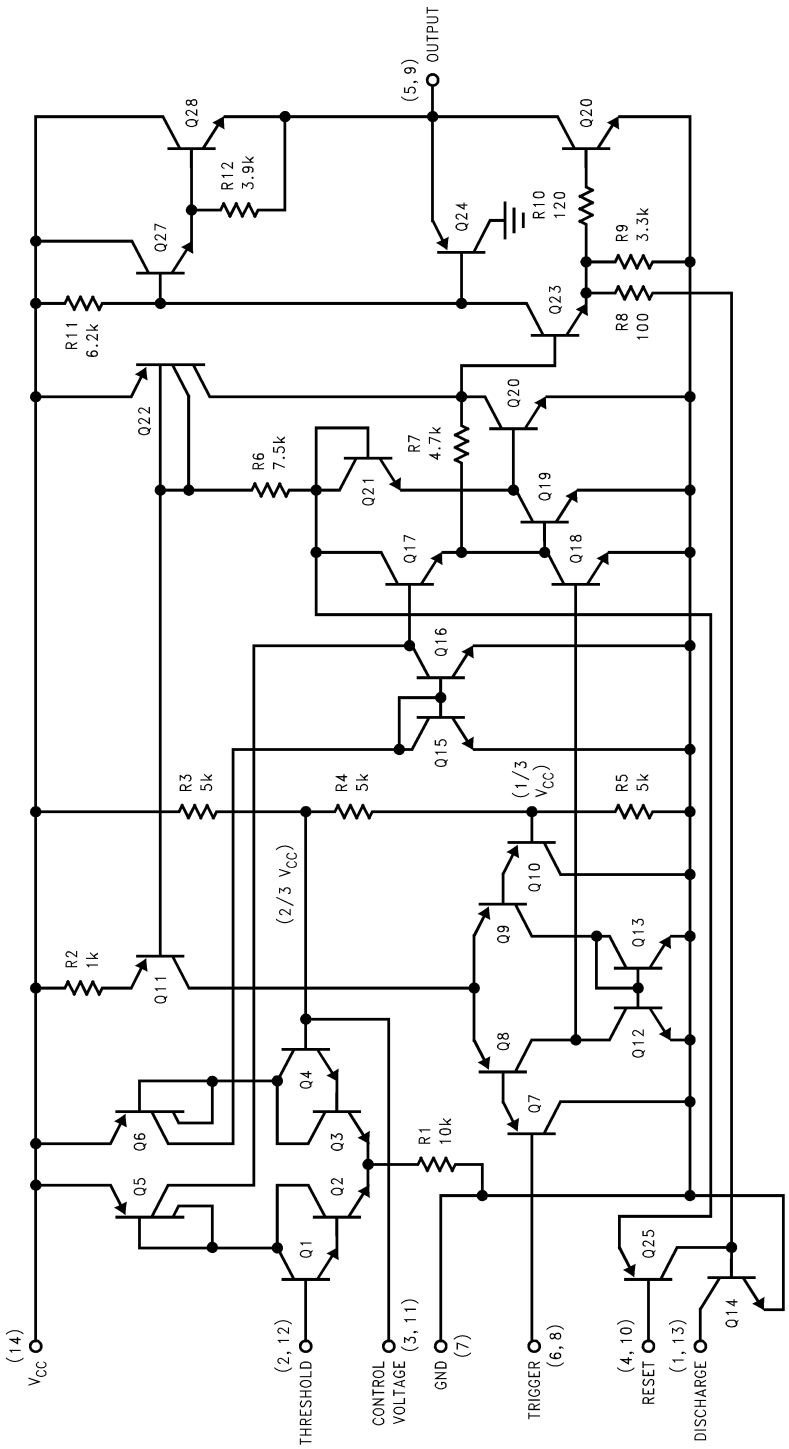


Top View

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



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˚C, V_{CC} = +5V to +15V, unless otherwise specified)

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

Electrical Characteristics (Continued)

(T_A = 25˚C, V_{CC} = +5V to +15V, unless otherwise specified)

Parameter	Conditions	Limits			Units
		LM556C			
		Min	Typ	Max	
Output Voltage Drop (High)	I_{SOURCE} = 200mA, V_{CC} = 15V		12.5		V
	I_{SOURCE} = 100mA, V_{CC} = 15V	12.75	13.3		V
	V_{CC} = 5V	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			±10		ppm/˚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˚C maximum junction temperature and a thermal resistance of 77˚C/W (Plastic Dip), and 110˚C/W (SO-14 Narrow).

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

Note 4: Tested at V_{CC} = 5V and V_{CC} = 15V.

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 MΩ.

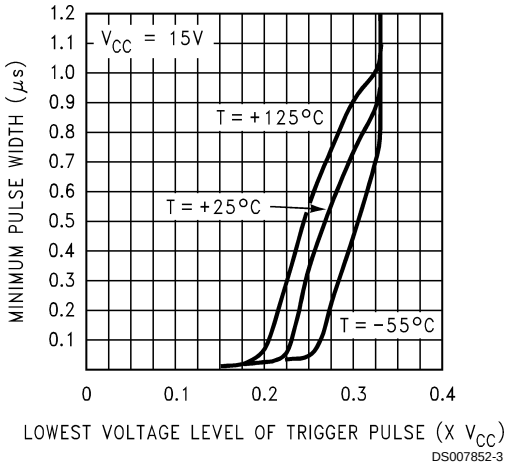
Note 7: No protection against excessive pin 1, 13 current is necessary providing the package dissipation rating will not be exceeded.

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



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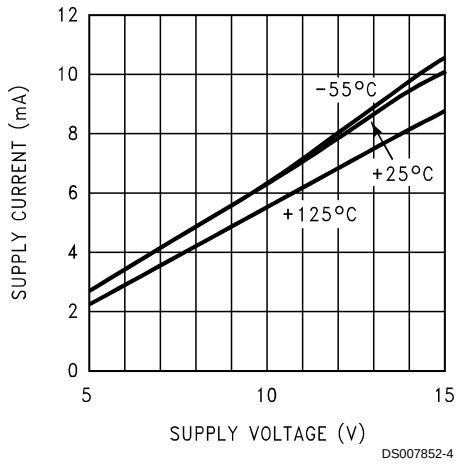
Supply Current vs. Supply Voltage (Each Section)



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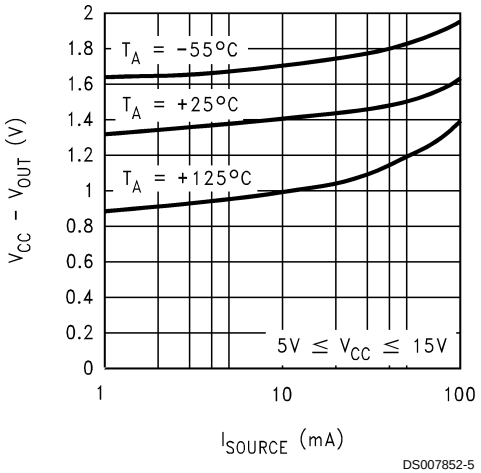
Typical Performance Characteristics (Continued)

High Output Voltage vs. Output Source Current



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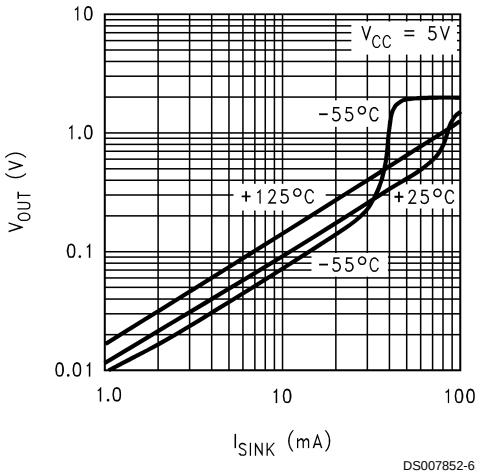
Low Output Voltage vs. Output Sink Current



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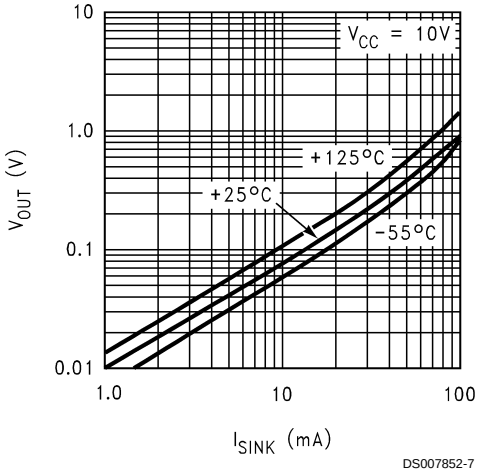
Low Output Voltage vs. Output Sink Current



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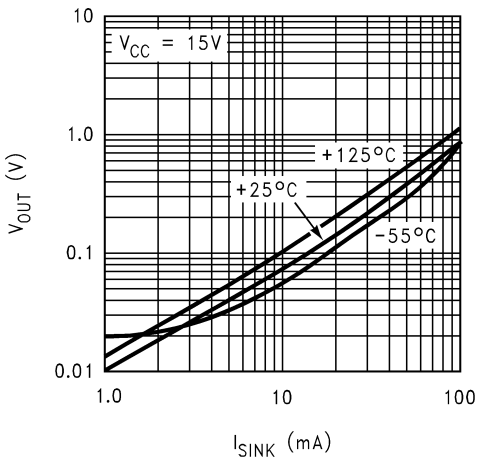
Low Output Voltage vs. Output Sink Current



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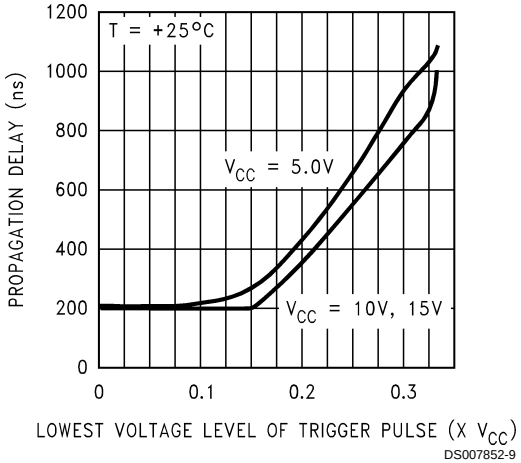
Output Propagation Delay vs. Voltage Level of Trigger Pulse



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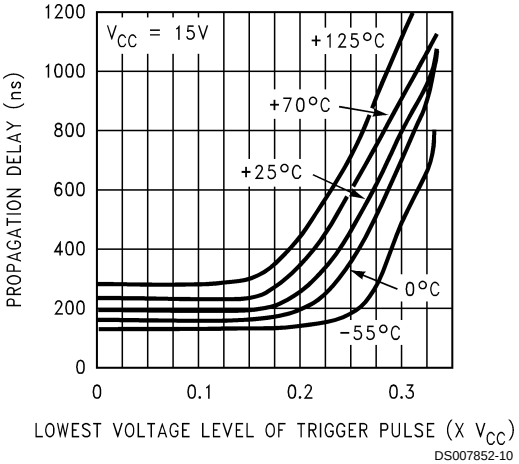
Output Propagation Delay vs. Voltage Level of Trigger Pulse



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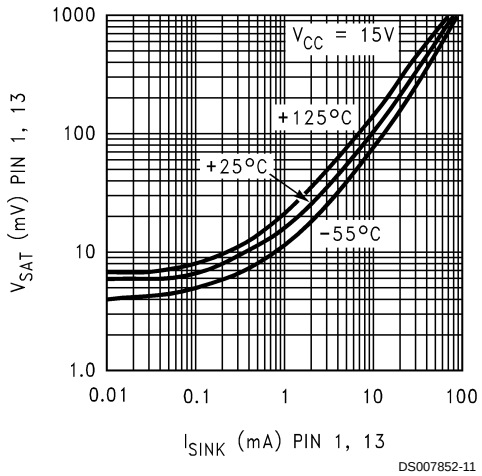
Typical Performance Characteristics (Continued)

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



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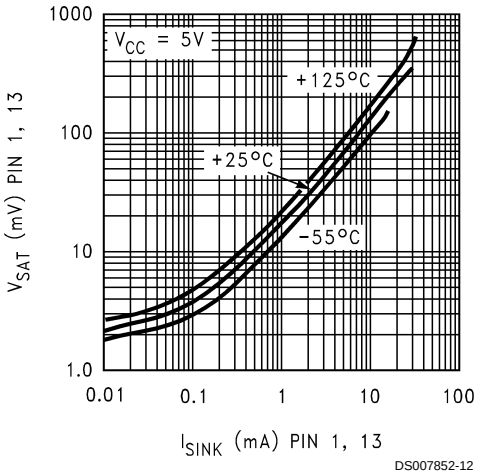
Discharge Transistor (Pin 1, 13) Voltage vs. Sink Current



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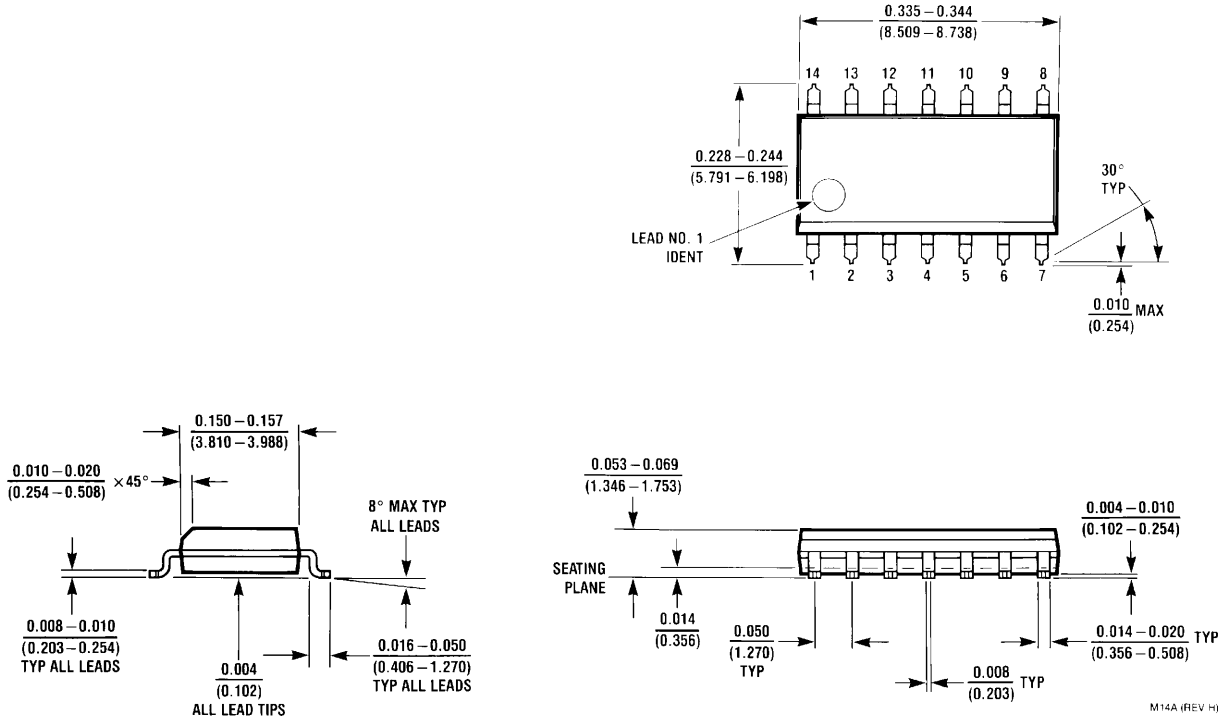
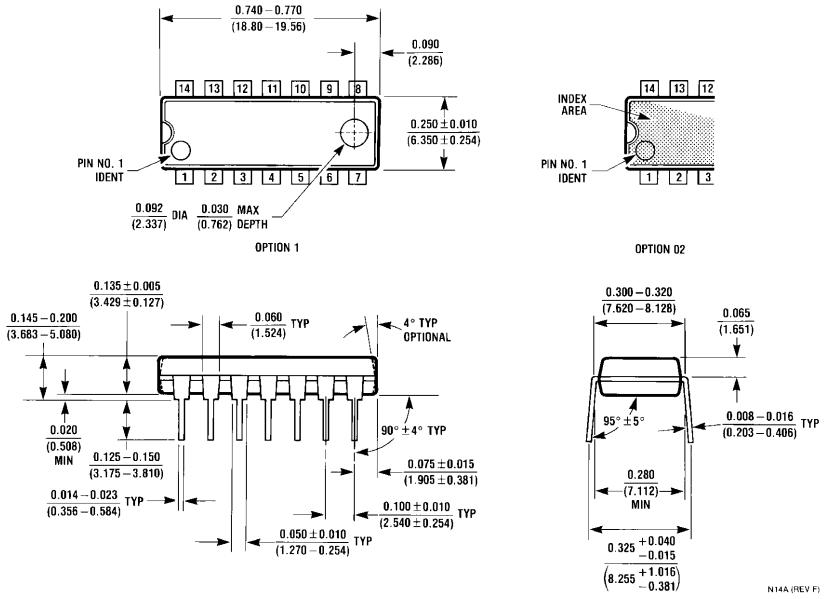
Physical Dimensions inches (millimeters) unless otherwise noted



Small Outline Package (M)
NS Package Number M14A



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

Notes

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