March 2000

National Semiconductor

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

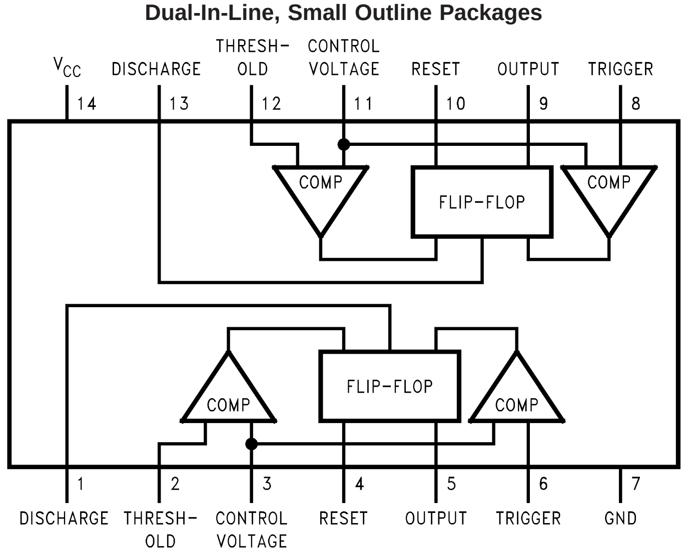
- Direct replacement for SE556/NE556
- Timing from microseconds through hours
- Operates in both astable and monostable modes
- Replaces two 555 timers
- Adjustable duty cycle
- Output can source or sink 200mA
- Output and supply TTL compatible
- Temperature stability better than 0.005% per ˚C
- Normally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

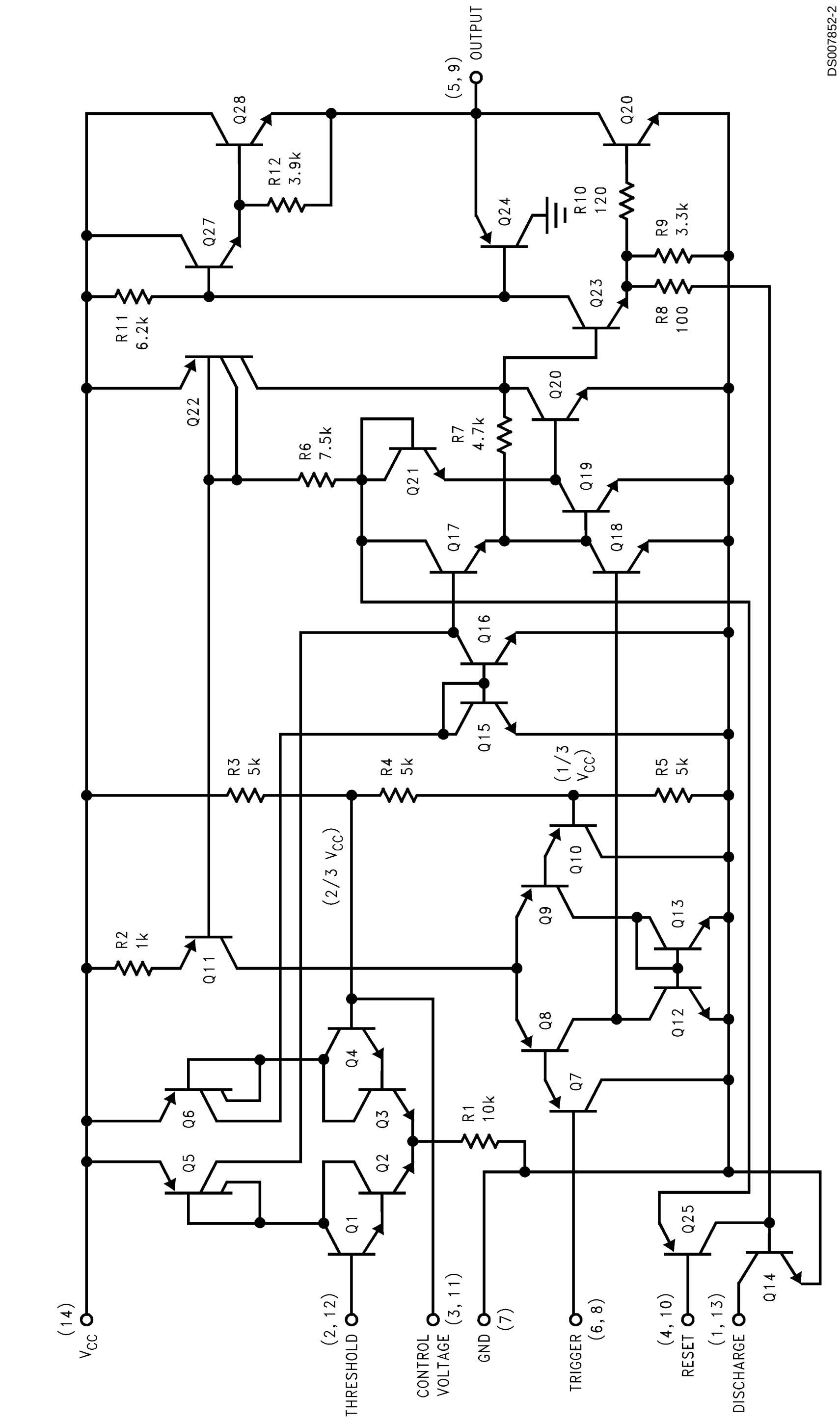


Top View

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 (Each Timer Section)	V_{CC} = 5V, R_L = ∞ V_{CC} = 15V, R_L = ∞ (Low State) (Note 3)		3 10	6 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,		150		ppm/˚C
Accuracy over Temperature	C = 0.1µF, (Note 4)		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) V_{TH} = 11.2V		0.03	0.1 250	µA nA
Control Voltage Level and Threshold Voltage	V_{CC} = 15V V_{CC} = 5V	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} = 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.

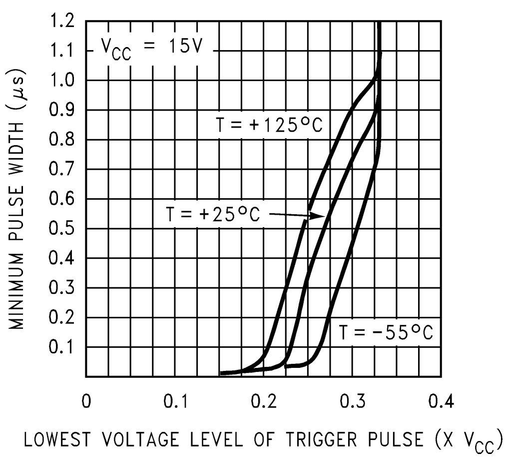
Note 7: No protection against excessive pin 1, 13 current is necessary providing the package dissipation rating will not be exceeded.

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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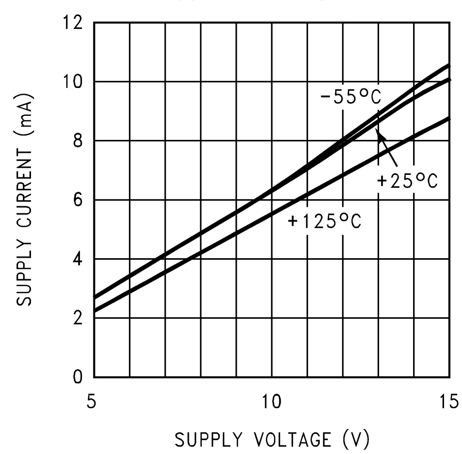
Supply Current vs. Supply Voltage (Each Section)



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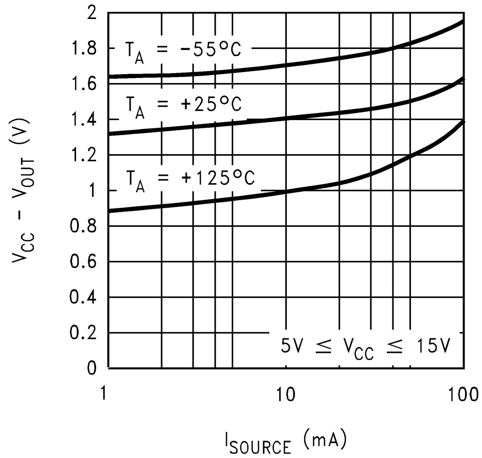
Typical Performance Characteristics (Continued)

High Output Voltage vs. Output Source Current



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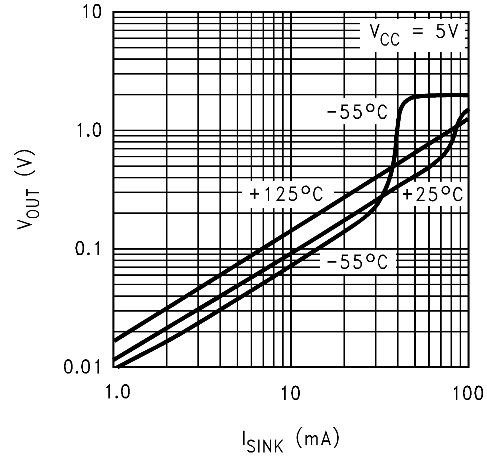
Low Output Voltage vs. Output Sink Current



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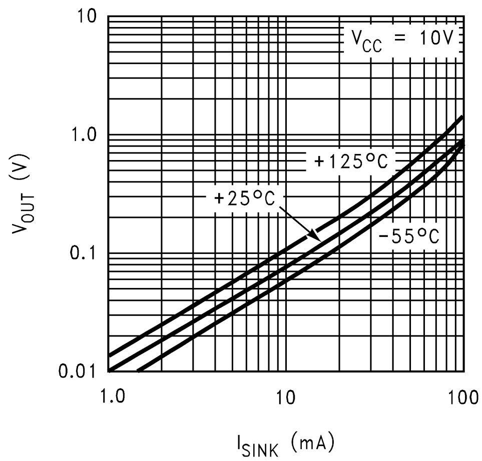
Low Output Voltage vs. Output Sink Current



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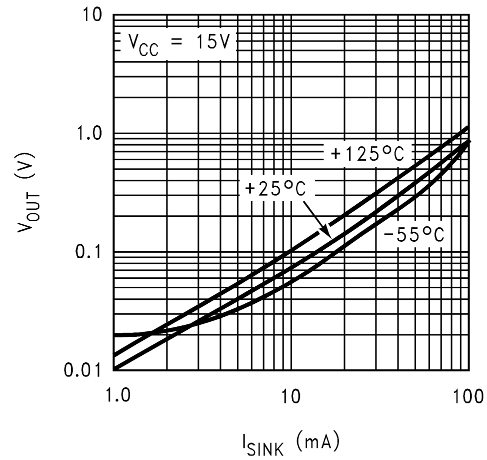
Low Output Voltage vs. Output Sink Current



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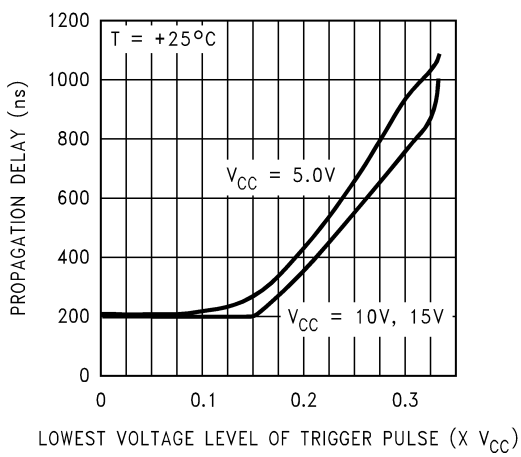
Output Propagation Delay vs. Voltage Level of Trigger Pulse



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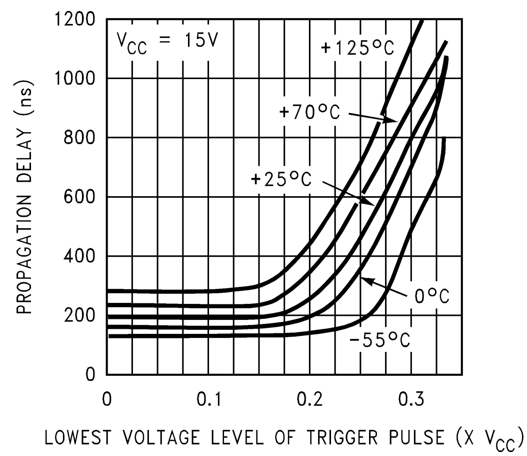
Output Propagation Delay vs. Voltage Level of Trigger Pulse



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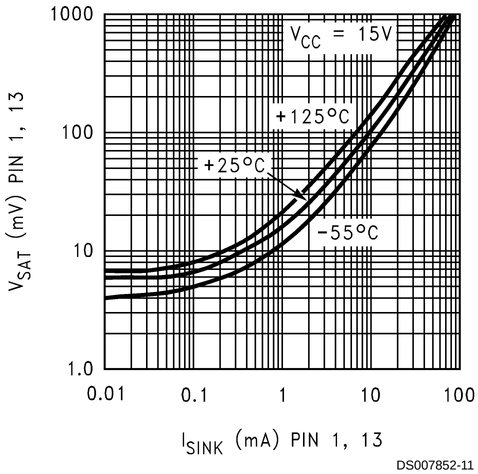
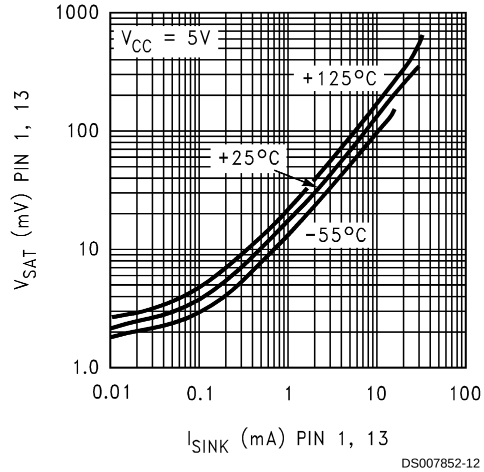
Typical Performance Characteristics (Continued)

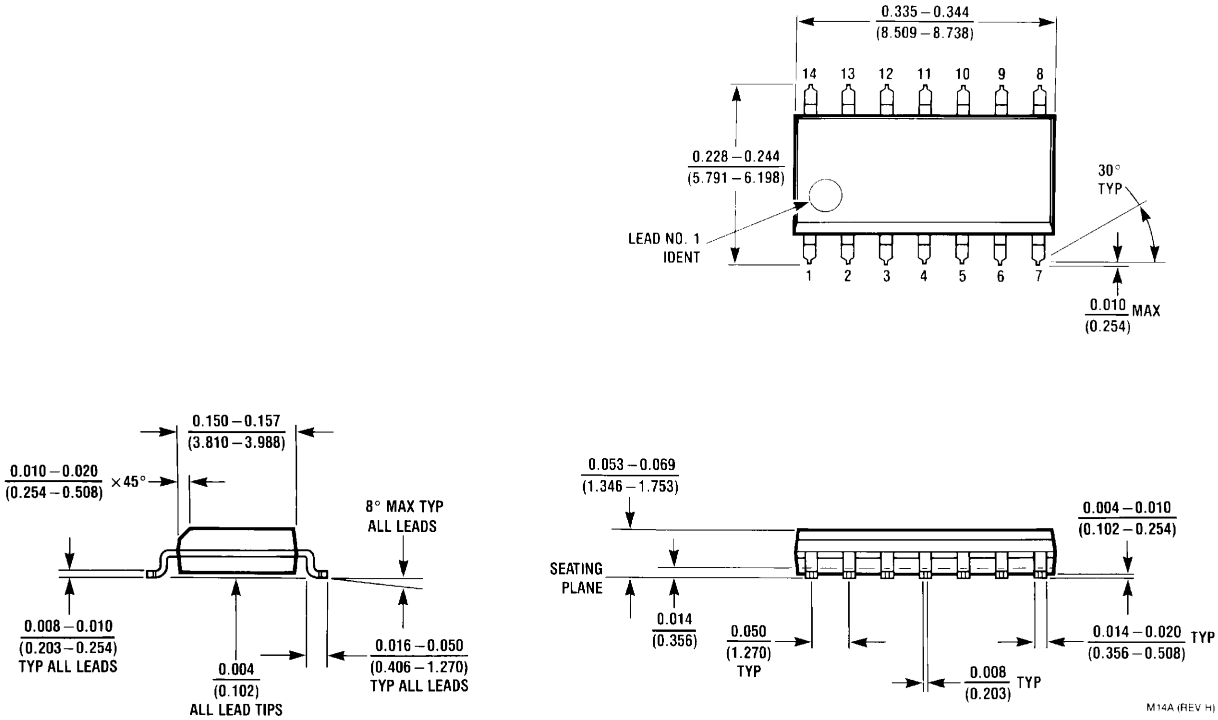
Discharge Transistor (Pin 1, 13) Voltage vs. Sink Current



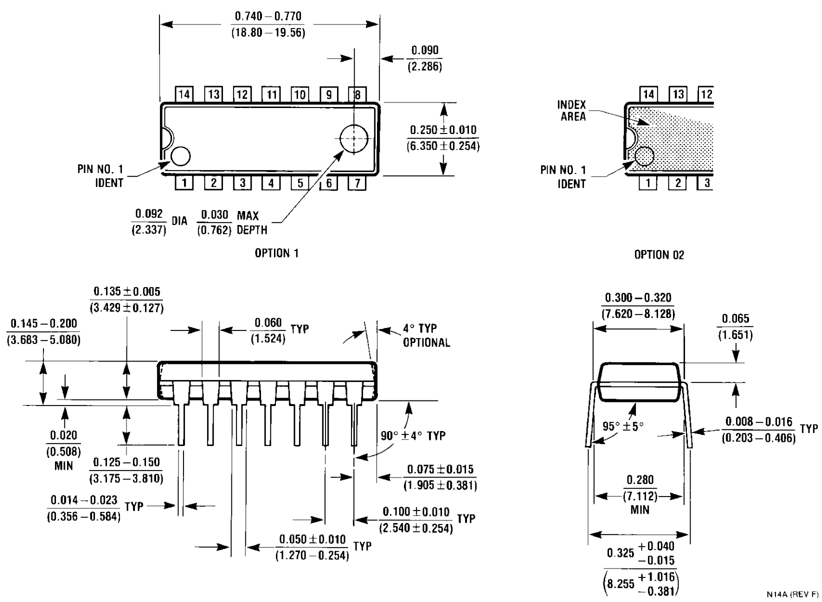
Discharge Transistor (Pin 1, 13) Voltage vs. Sink Current



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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