

# Am556

## Dual Precision Timer

### Distinctive Characteristics

Timing from microseconds through hours  
 200mA output sink current  
 Variable duty cycle

- TTL output compatibility
- Temperature stability of 0.005%/°C
- Replaces two Am555's
- 100% reliability assurance testing in compliance with MIL-STD-883.

### FUNCTIONAL DESCRIPTION

The Am556 is a dual highly stable timing device used to provide accurate time delays or to build precision oscillators. The Am556 is a dual Am555, where the two timers operate independently of each other sharing only  $V_{CC}$  and GND. When either timer is used as a monostable, the time is precisely controlled using one external resistor and one external capacitor. When the timer is used as a precision oscillator, the frequency and duty cycle are controlled by two external resistors and one external capacitor.

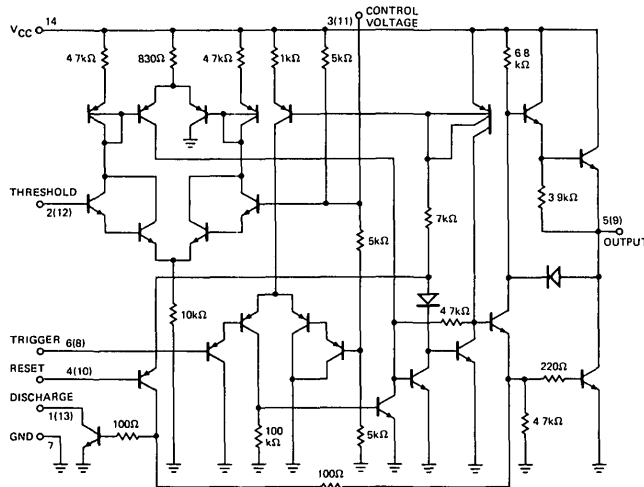
For monostable operation, a HIGH-to-LOW transition is applied to the trigger input. The device is triggered when the input trigger voltage reaches  $1/3 V_{CC}$ . Once the circuit

is triggered, it will remain in the triggered state until the set time has elapsed, even if it is triggered again. The output pulse width is equal to  $1.1 R_A C$ .

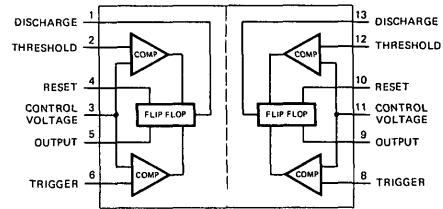
For continuous oscillation, two external resistors are used such that the external capacitor charges and discharges between  $1/3 V_{CC}$  and  $2/3 V_{CC}$ . The charge time is given by  $t_{charge} = 0.693 (R_A + R_B)C$  while the discharge time is  $t_{discharge} = 0.693 R_B C$  (See Fig 3)

Each timer also features a direct reset that overrides all other inputs. When the reset is LOW the output is LOW regardless of the other inputs.

### SCHEMATIC DIAGRAM (One Timer Shown)



### LOGIC SYMBOL

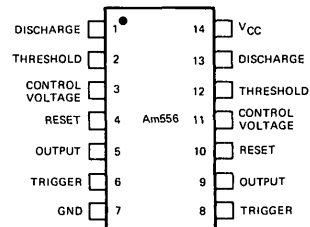


$V_{CC} = \text{Pin } 14$   
 $GND = \text{Pin } 7$

### ORDERING INFORMATION

Package Type	Temperature Range	Order Number
Molded DIP	0°C to +70°C	NE556A ✓
Hermetic DIP	0°C to +70°C	NE556F
Dice	0°C to +70°C	AM556XC
Hermetic DIP	-55°C to +125°C	SE556F
Dice	-55°C to +125°C	AM556XM

### CONNECTION DIAGRAM Top View



Note Pin 1 is marked for orientation

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Am 556

MAXIMUM RATINGS (Above which the useful life may be impaired)

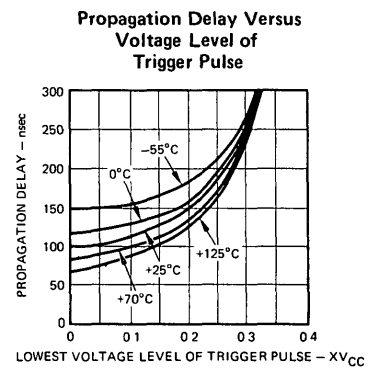
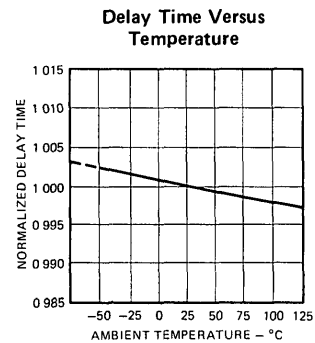
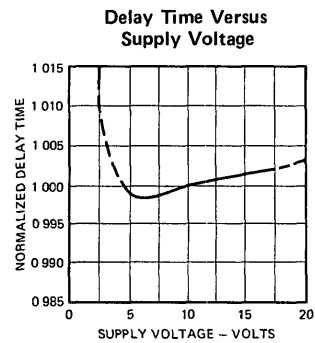
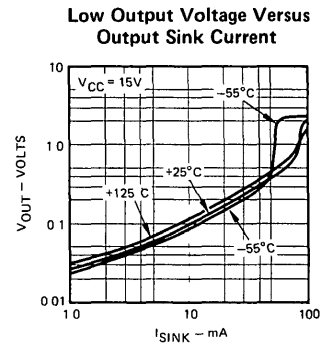
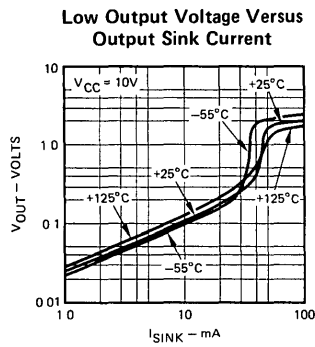
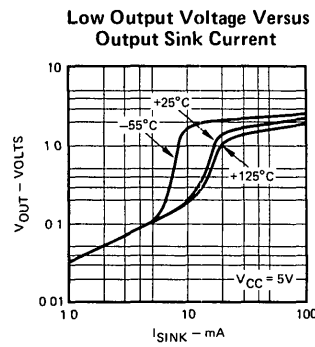
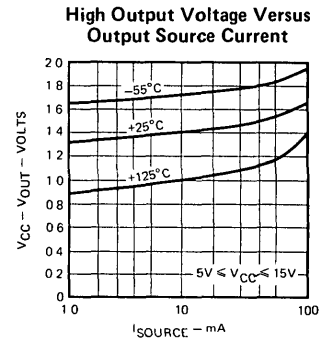
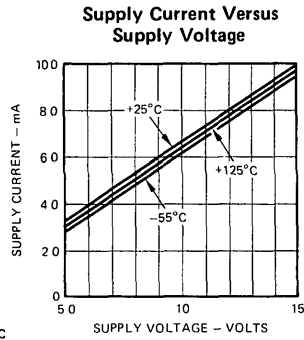
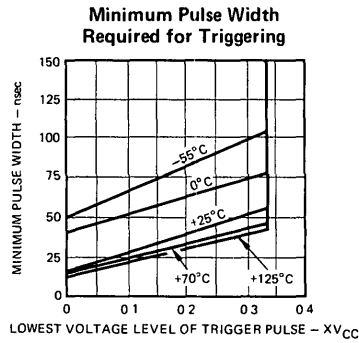
Storage Temperature	-65°C to +150°C
Temperature (Ambient) Under Bias	
Military Grade	-55°C to +125°C
Commercial Grade	0°C to +70°C
Supply Voltage to Ground Potential	+18V
Power Dissipation	600mW
Lead Temperature (Soldering, 60 Seconds)	+300°C

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5V to 15V Unless Otherwise Specified)

Parameter	Test Conditions	Military			Commercial			Units	
		Min	Typ.	Max.	Min.	Typ.	Max.		
Supply Voltage		4.5		18	4.5		16	V	
Supply Current	V <sub>CC</sub> = 5V, R <sub>L</sub> = ∞		3	5		3	6	mA	
LOW State (Per Timer)	V <sub>CC</sub> = 15V, R <sub>L</sub> = ∞		10	11		10	14	mA	
Threshold Voltage			2/3			2/3		XV <sub>CC</sub>	
Threshold Current	Note 3		30	100		30	100	nA	
Trigger Voltage	V <sub>CC</sub> = 15V	4.8	5	5.2		5		V	
	V <sub>CC</sub> = 5V	1.45	1.67	1.9		1.67		V	
Trigger Current			0.5			0.5		μA	
Reset Voltage		0.4	0.7	1.0	0.4	0.7	1.0	V	
Reset Current			0.1			0.1		mA	
Control Voltage Level	V <sub>CC</sub> = 15V	9.6	10	10.4	9.0	10	11	V	
	V <sub>CC</sub> = 5V	2.9	3.33	3.8	2.6	3.33	4	V	
Output Voltage (LOW)	V <sub>CC</sub> = 15V	I <sub>SINK</sub> = 10mA		0.1	0.15		0.1	0.25	V
		I <sub>SINK</sub> = 50mA		0.4	0.5		0.4	0.75	V
		I <sub>SINK</sub> = 100mA		2.0	2.25		2.0	2.75	V
		I <sub>SINK</sub> = 200mA		2.5			2.5		V
	V <sub>CC</sub> = 5V	I <sub>SINK</sub> = 8mA		0.1	0.25				V
		I <sub>SINK</sub> = 5mA					0.25	0.35	V
Output Voltage (HIGH)	V <sub>CC</sub> = 15V					12.5		V	
	V <sub>CC</sub> = 15V	I <sub>SOURCE</sub> = -100mA	13.0	13.3		12.75	13.3	V	
			3.0	3.3		2.75	3.3	V	
V <sub>CC</sub> = 5V							V		
Rise Time of Output			100			100		ns	
Fall Time of Output			100			100		ns	
Timing Error (Monostable)									
Initial Accuracy	R <sub>A</sub> = 2K to 100K C = 0.1μF (Note 2)		0.5	1.5		0.75		%	
Drift with Temperature			30	100		50		ppm/°C	
Drift with Supply Voltage			0.05	0.2		0.1		%/Volt	
Timing Error (Astable)									
Initial Accuracy	R <sub>A</sub> , R <sub>B</sub> = 2K to 100K C = 0.1μF (Note 2)		1.5			2.25		%	
Drift with Temperature			90			150		ppm/°C	
Drift with Supply Voltage			0.15			0.3		%/Volt	
Discharge Leakage Current			20	100		20	100	nA	
Matching Characteristics (Note 4)									
Initial Timing Accuracy			0.05	0.1		0.1	0.2	%	
Timing Drift with Temperature			+10			+10		ppm/°C	
Drift with Supply Voltage			0.1	0.2		0.2	0.5	%/Volt	

- Notes: 1 Supply current when output is high is typically 1.0mA less  
 2 Tested at V<sub>CC</sub> = 5V and V<sub>CC</sub> = 15V  
 3 This will determine maximum value of R<sub>A</sub> + R<sub>B</sub> for 15V operation. The max total R = 20 Meg Ω  
 4 Matching characteristics refer to the differences between performance characteristics of each timer section

TYPICAL CHARACTERISTICS



**APPLICATIONS**

**MONOSTABLE OPERATION**

When the timer is operated as a monostable multivibrator, one external capacitor, C, and one external resistor, R<sub>A</sub>, are used as shown in Figure 1. When the trigger input is reduced below 1/3 V<sub>CC</sub>, the timer internal flip-flop is set. This releases the short circuit across the external capacitor as the Q output goes HIGH. The voltage across the capacitor begins to rise exponentially with the time constant R<sub>A</sub>C. When the capacitor voltage reaches 2/3 V<sub>CC</sub>, the internal comparator resets the internal flip-flop and discharges the external capacitor, C, very rapidly. The output is now in LOW state and a new timing state may be initiated. The time that the output is in the HIGH state is given by 1.1 R<sub>A</sub>C or can be taken directly from Figure 2. Both the charge rate and internal threshold are directly proportional to the V<sub>CC</sub> supply voltage. Thus, the timer output pulse width is independent of the power supply voltage. If a LOW is applied to the reset input, the output is forced LOW and the external capacitor discharged regardless of the other inputs.

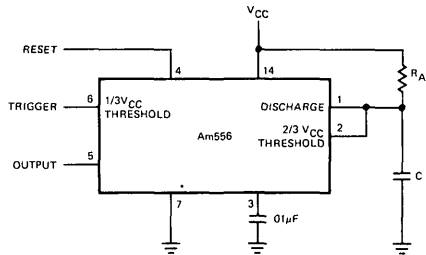


Fig. 1. Monostable Operation of the Am556.

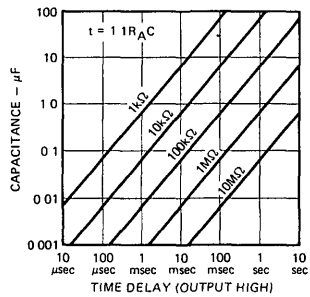


Fig. 2. Monostable Pulse Width Graph.

**ASTABLE OPERATION**

When the timer is operated in the astable mode, two external resistors, R<sub>A</sub> and R<sub>B</sub>, and one external capacitor, C, are used as shown in Figure 3. With this connection scheme, the external capacitor, C, charges and discharges between 1/3 V<sub>CC</sub> and 2/3 V<sub>CC</sub>. The charge time (output HIGH) is

$$t_{AB} = 0.693 (R_A + R_B) C$$

The discharge time (output LOW) is

$$t_B = 0.693 R_B C$$

The total period for one cycle of output HIGH and output LOW is

$$T = t_{AB} + t_B = 0.693 (R_A + 2R_B) C$$

The frequency for this period, T, is

$$f = \frac{1}{T} = \frac{1}{0.693 (R_A + 2R_B) C}$$

The astable free running frequency can also be found from the graph shown in Figure 4. The duty cycle, time the output is LOW divided by the period, is given by

$$D = \frac{t_B}{t_{AB} + t_B} = \frac{R_B}{R_A + 2R_B}$$

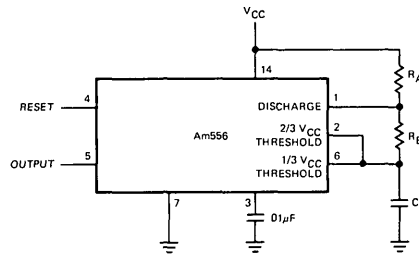


Fig. 3. Astable Operation of the Am556.

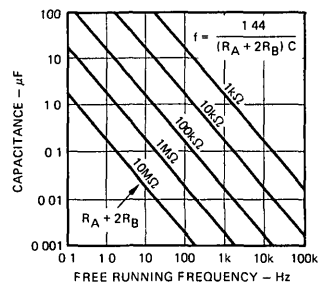
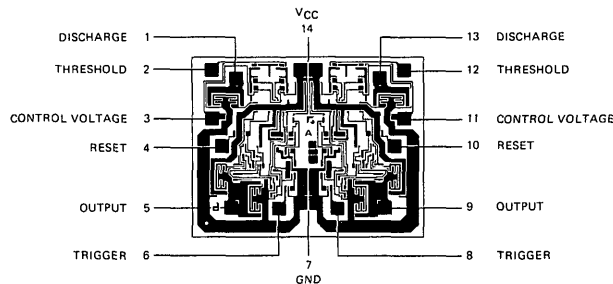


Fig. 4. Astable Free Running Frequency.

**Metalization and Pad Layout**



DIE SIZE 0.060" X 0.074"