![CISSOID logo] **CISSOID**

The Leader in High Temperature Semiconductor Solutions

CMT-555 DATASHEET

HIGH TEMPERATURE RANGE 555 TIMER

General Description

The CMT-555 is an extended temperature range, low-power, highly stable device for generating accurate time delays or oscillation, with enhanced capabilities compared to the well known 555 timer. It can be used as a direct replacement of the standard 555 in applications working from -55°C to +175°C or it can be used in a larger package in order to make use of the enhanced capabilities. These capabilities include the presence of a pin that provides a voltage decreasing linearly with the die temperature as well as a bank of four binary-weighted capacitors from 20pF to 160pF. Because of its high input impedance, this device allows the use of smaller capacitors than those used by the standard 555, then providing more accurate time delays and oscillations, as well as cheaper BOM. The CMT-555 can be used throughout the -55°C to +175°C temperature range.

Features

- Supply voltage 5V +/-10%
- Low supply current
- Timing from microseconds to hours
- Operates in both monostable and astable modes
- Highly stable timing characteristics with temperature and supply voltage
- On-chip temperature sensor -1.47mV/°C
- Validated at 175°C for 30000 hours (and still on-going)
- Available in several standard packages

Applications

- Well logging, Automotive, Aeronautics & Aerospace
- Precision timing
- Pulse generation
- Pulse width and pulse position modulation

Packaging and Pin Description

PSOIC8

VSS	VDD
/TRIGGER	DISCHARGE
OUTPUT	THRESHOLD
/RESET	CNTRL_V
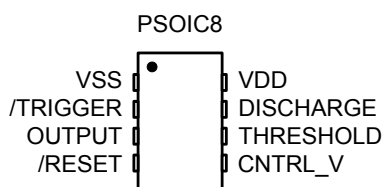
Pin #	Pin Name	Pin Description
1	**VSS**	Ground terminal.
2	**/TRIGGER**	Sets the output with a falling edge.
3	**OUTPUT**	Main output.
4	**/RESET**	Main reset. When LOW, inhibits response from all other inputs.
5	**CNTRL_V**	It can be forced to a given voltage to change the triggering thresholds.
6	**THRESHOLD**	Resets the output with a rising edge.
7	**DISCHARGE**	Open drain N-type output. Active when OUTPUT = LOW.
8	**VDD**	Power supply terminal.

Functional Block Diagram
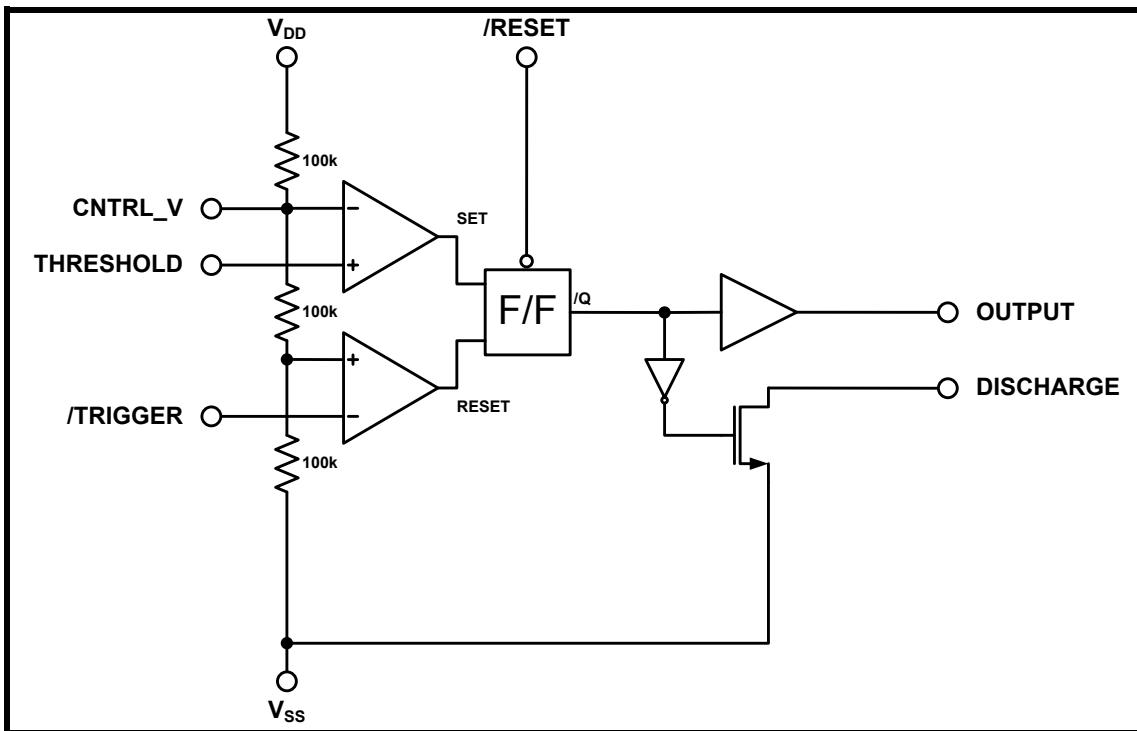
Function Table

/RESET	THRESHOLD	/TRIGGER	OUTPUT	DISCHARGE
L	X	X	L	ON
H	> 2/3V_{DD}	> 1/3V_{DD}	L	ON
H	< 2/3V_{DD}	< 1/3V_{DD}	H	OFF
H	< 2/3V_{DD}	> 1/3V_{DD}	Previous state	Previous state
H	> 2/3V_{DD}	< 1/3V_{DD}	L	ON

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Absolute Maximum Ratings

Supply Voltage V_{DD} to GND   -0.5 to 6.0V
Voltage on any Pin to GND   -0.5 to V_{DD}+0.3V

ESD Rating (expected)
Human Body Model   1kV

Operating Conditions

Supply Voltage V_{DD} to GND   5V ± 10%
Junction temperature   -55°C to +175°C

Thermal Characteristics

Parameter	Condition	Min	Typ	Max	Units
Thermal resistance Junction2Air (Θ_{JA})			85		°C/W

Electrical Characteristics

Unless otherwise stated: V_{DD}=5V, $\underline{T_j=25°C}$. **Bold underlined** values indicate values over the whole temperature range (-55°C < T j < +175°C).

Parameter	Condition	Min	Typ	Max	Units
Supply voltage		4.5		5.5	V
Current consumption	$R_L = \infty$ $V_{THRESHOLD} < 2V_{DD}/3$ $V_{THRESHOLD} > 2V_{DD}/3$		280 350	**360** **480**	µA
OUTPUT Minimum HIGH level output voltage **V$_{OH}$**	I_{OH}<8mA (source)	**4.75**	4.8		V
OUTPUT Maximum LOW level output voltage **V$_{OL}$**	I_{OL}<8mA (sink)		0.25	**0.3**	V
Timing Error: Monostable[1,2] (see Figure 1 and Figure 2)					
Initial accuracy	R_a = 1k to 1MEGΩ, C = 10nF		2.5 **3.5**		%
Drift with Temperature	R_a = 1k to 100kΩ, C = 10nF R_a = 1MEGΩ, C = 10nF		7 **67**		ppm/°C
Drift with Supply Voltage	R_a = 10k to 1MEGΩ, C = 10nF R_a = 1kΩ, C = 10nF		0.05 **0.2**		%/V
Timing Error: Astable[3] (see Figure 5 and Figure 6)					
Initial accuracy	R_a, R_b = 10k to 1MEGΩ, C = 10nF R_a, R_b = 1kΩ, C = 10nF		3 **5**		%
Drift with Temperature	R_a, R_b = 1k to 100kΩ, C = 10nF R_a, R_b = 1MEGΩ, C = 10nF		20 **100**		ppm/°C
Drift with Supply Voltage	R_a, R_b = 10k to 1MEGΩ, C = 10nF R_a, R_b = 1kΩ, C = 10nF		0.2 0.3		%/V
Threshold Voltage		**0.660**	**0.666**	**0.670**	x V$_{DD}$
Trigger Voltage		**0.330**	**0.335**	**0.339**	x V$_{DD}$
Control Voltage		**0.660**	**0.667**	**0.671**	x V$_{DD}$
Discharge switch on-state voltage	I_{DISCH} = 1mA T_j = 25°C T_j = 175°C		14	18 **25**	mV
	I_{DISCH} = 5mA T_j = 25°C T_j = 175°C		60	80 **110**	mV
Discharge switch off-state leakage current	V_{DISCH} = V$_{DD}$ T_j = 25°C T_j = 175°C		4	6 **80**	nA

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[1] The timing accuracy, drift with temperature and supply voltage in monostable as in astable configurations are computed supposing passive components are error free and have no drift with temperature. Accuracy and drift values shown are due to the CMT-555 only.
[2] In the monostable configuration t_{pulse} = 1.1 R_a C. Assign the accuracy and drift errors to the "1.1" factor.
[3] In the astable configuration f_{oscill} = 1.44 / [(R_a + 2 R_b) C]. Assign the accuracy and drift errors to the "1.44" factor.

## Extended Functionality Characteristics

Parameter	Condition	Min	Typ	Max	Units
Temperature sense					
Accuracy		750		790	mV
Linear Sensitivity	Between -55°C and 175°C	-1.69		-1.55	mV/°C
Sensitivity					
A		745		789	mV
B	$V_{TEMP} = A + B\,T\,(°C) + C\,T(°C)^2$	-1.63		-1.47	mV/°C
C		-433		-0.430	nV/°C^2
Internal capacitors					
Initial accuracy		-17		+17	%
Voltage dependence					
VC1	$C(V)=C_0\,(1+VC1.V+VC2.V^2)$		-0.475		10^{-3}/V
VC2			-4.30		10^{-6}/V^2
Temperature dependence					
TC1	$C(T)=C(T_0)\quad[1+TC1.(T-T_0)+TC2.(T-T_0)^2]$		0.023		10^{-3}/K
TC2			0.013		10^{-6}/K^2

AC Electrical Characteristics

Unless otherwise stated: V_{DD}=5V, $\underline{T_j}$=25°C. **Bold underlined** values indicate values over the whole temperature range (-55°C < T j < +175°C).

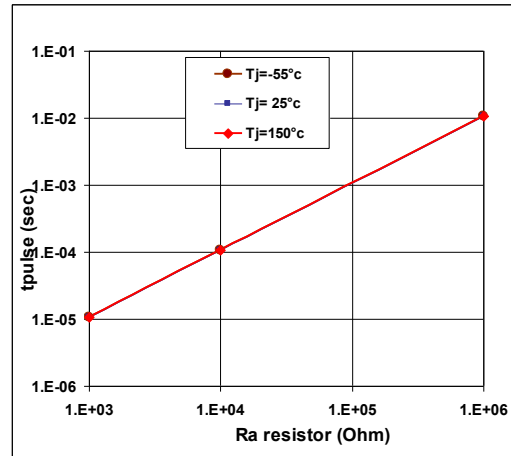| Parameter	Condition	Min	Typ	Max	Units
Maximum frequency in astable mode.			4.2		MHz
Ouput pulse rise time	R_A = 1k to 1MEGΩ, C = 10nF		2.2 **<u>14</u>**		ns
Ouput pulse fall time			3 **<u>14</u>**		ns

Typical Performance Characteristics
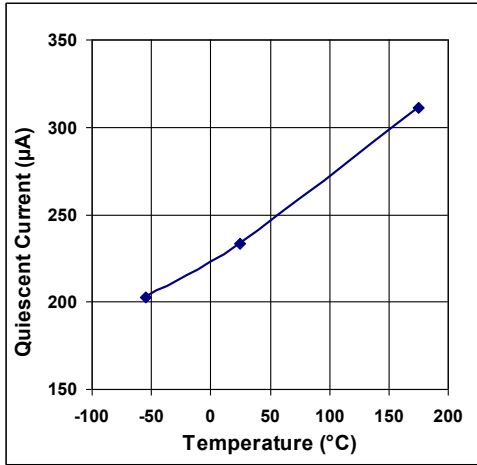
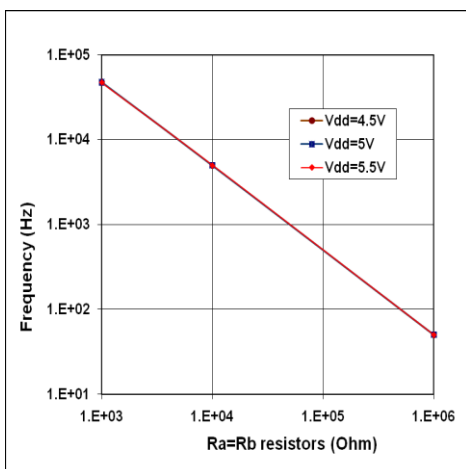Current consumption, V_{DD} = 5V
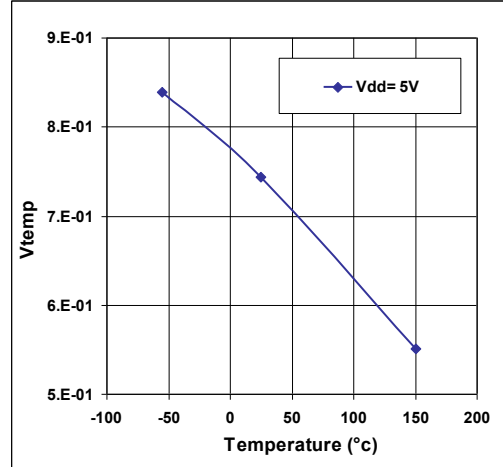
Vtemp, V_{DD} = 5V
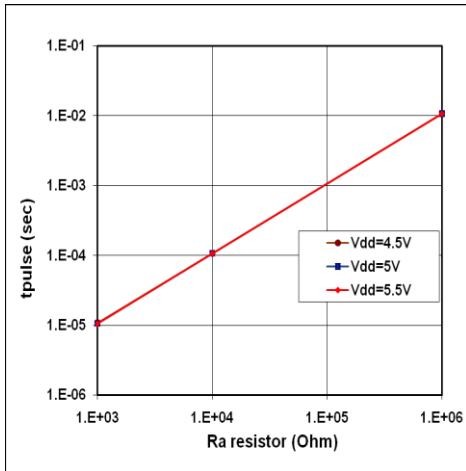
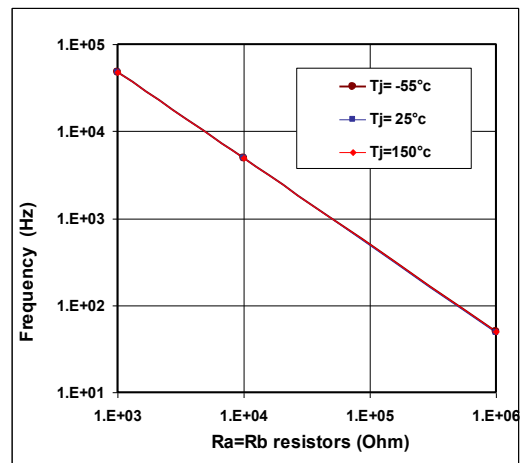t_{pulse} Vs Resistor in monostable mode,
C=10nF, Vdd=4.5 to 5.5V

t_{pulse} Vs Resistor in monostable mode,
C=10nF, T_j=-55 to +150°C

Frequency Vs Resistors in astable mode,
C=10nF, Vdd=4.5 to 5.5V

Frequency Vs Resistors in astable mode,
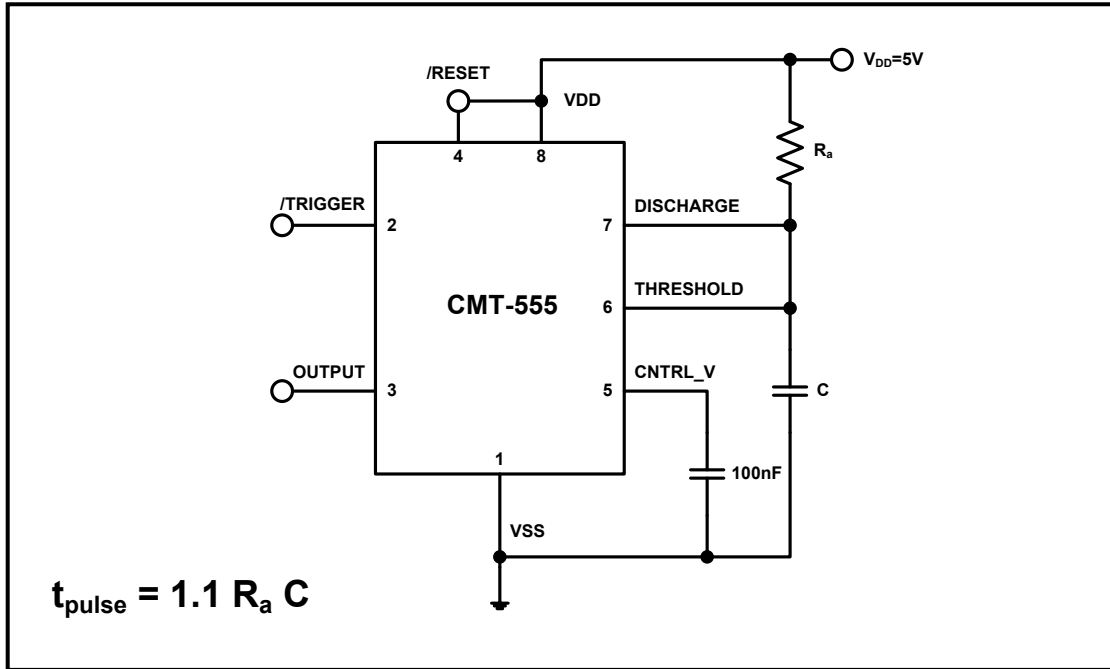C=10nF, T_j=-55 to +150°C

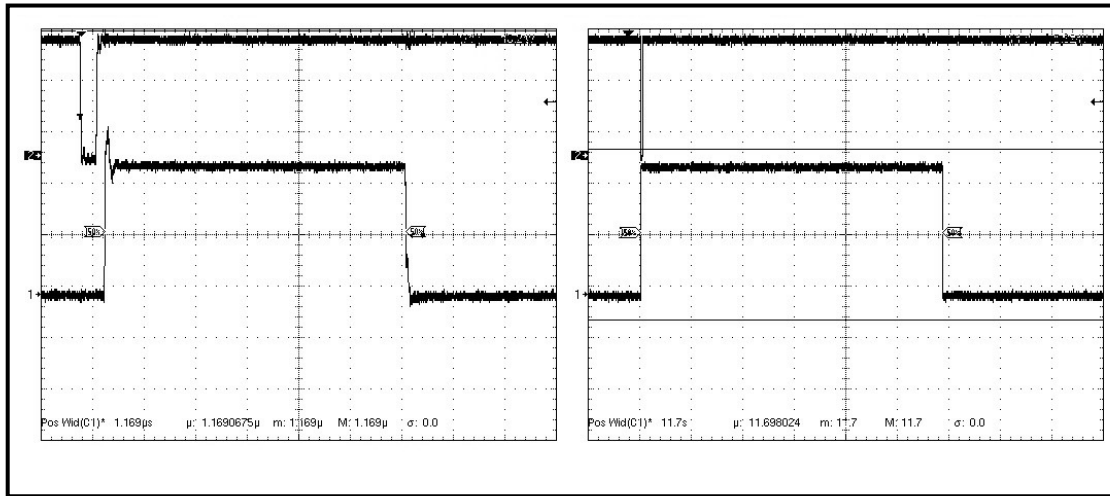## Typical Applications

Figure 1. Monostable configuration.

Inside the figure:

/RESET

VDD

/TRIGGER — 2

CMT-555

OUTPUT — 3

4

8

7 — DISCHARGE

6 — THRESHOLD

5 — CNTRL_V

1

VSS

V_{DD}=5V

R_a

C

100nF

$$t_{pulse} = 1.1\ R_a\ C$$

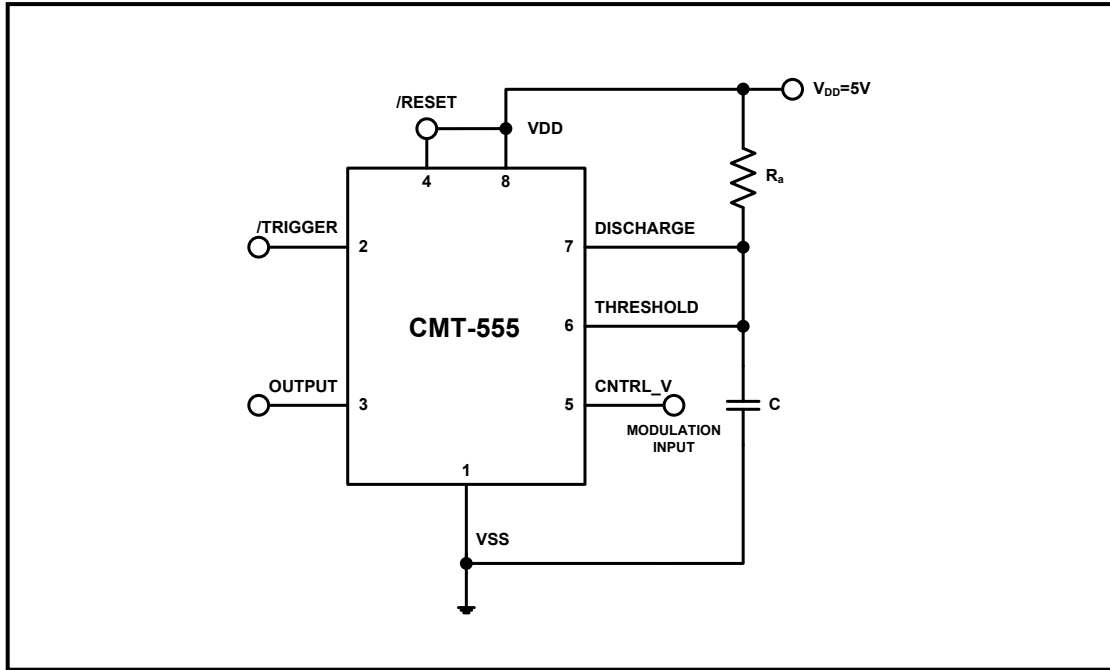**Figure 2. Monostable output waveforms: 1.17μsec (left) and 11.7sec (right).**
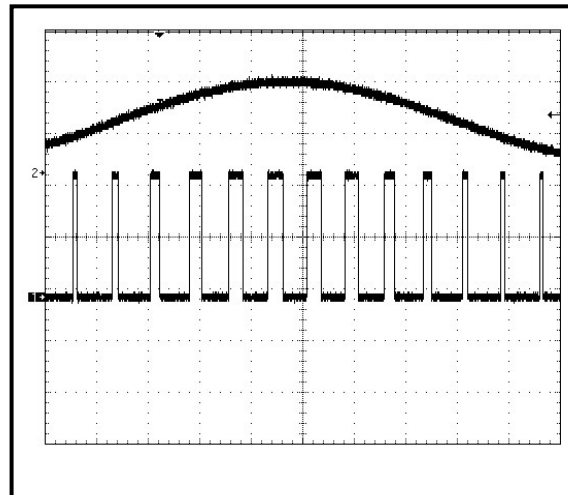
Figure 3. Pulse width modulator configuration.

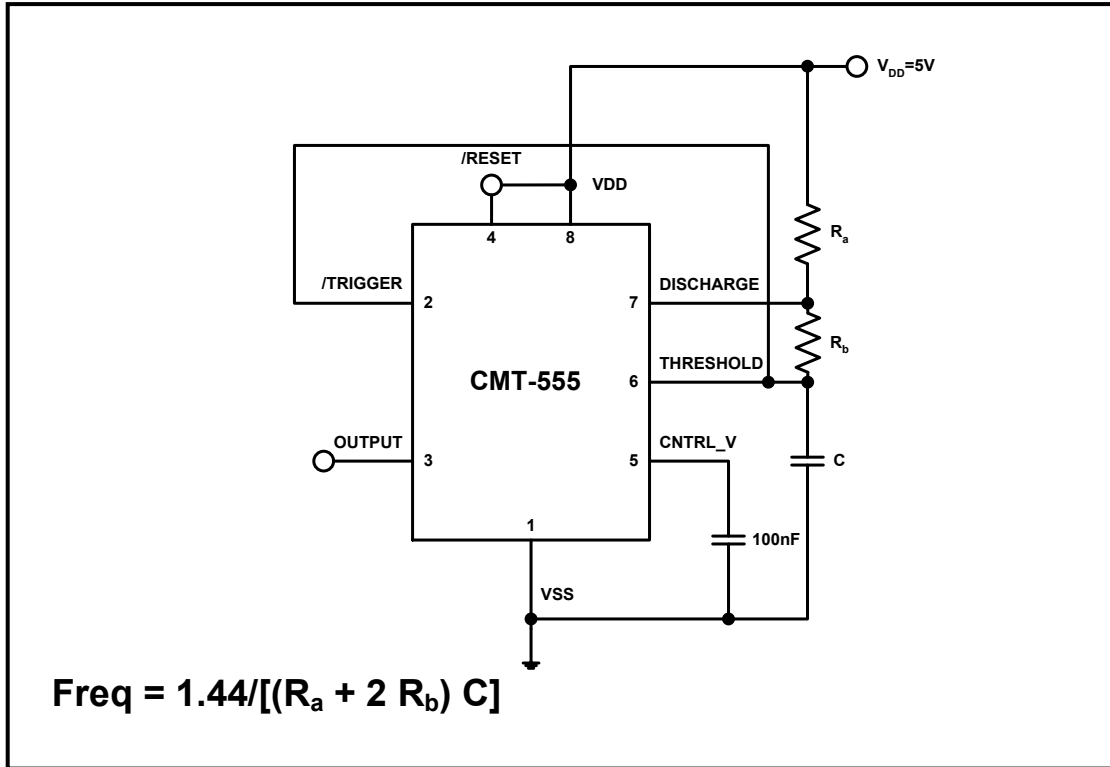**Figure 4. Pulse width modulator output waveforms: modulating signal (above) and output signal (below).**

Freq = 1.44/[(R$_a$ + 2 R$_b$) C]
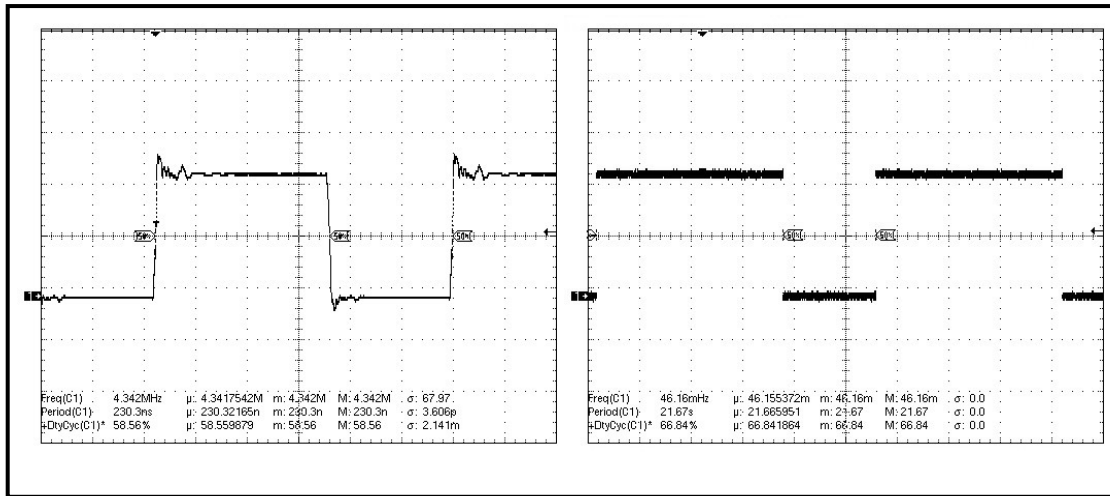
Figure 5. Astable configuration.

Figure 6. Astable output waveforms: 4.32MHz (left) and 46.2mHz (right).
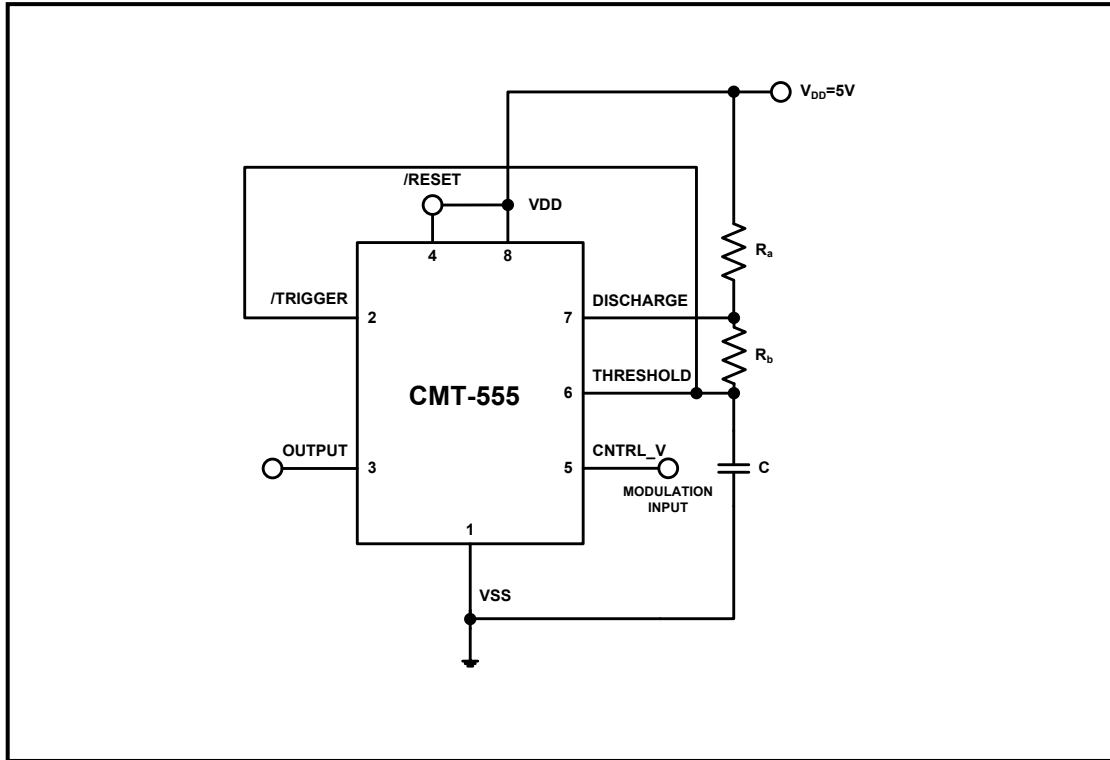
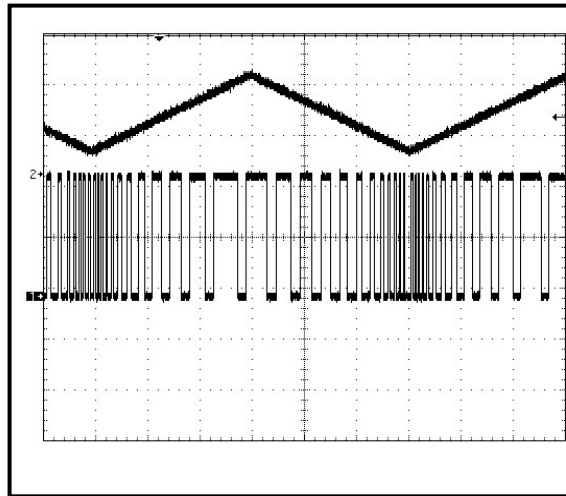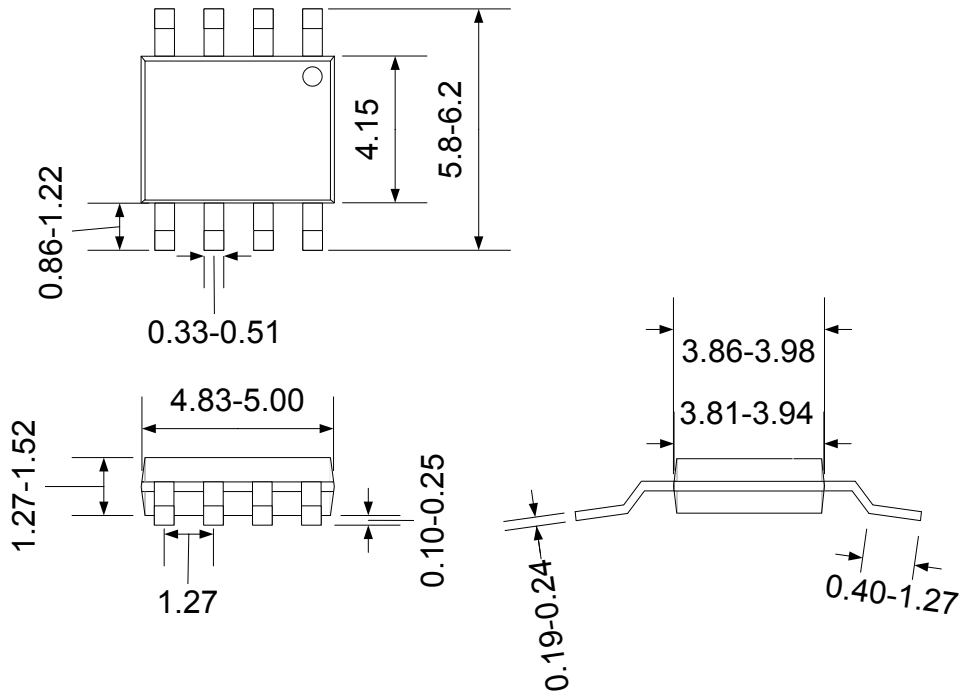**Figure 7. Pulse position modulator configuration.**

Figure 8. Pulse position modulator output waveforms: modulating signal (above) and output signal (below).

Ordering Information

Ordering Reference	Package	Temperature Range	Marking
CMT-555-PSOIC8-T	Plastic SOIC8	-55°C to +175°C	CMT-555

Package Dimensions

Drawing PSOIC8 (mm +/- 10%)

Contact & Ordering

CISSOID S.A.

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