# CMT-555 DATASHEET

*Version: 1.8*
*20-Dec-23*
*(Last Modification Date)*

# 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.

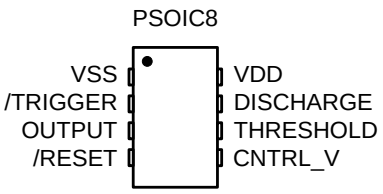
## Features

- 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

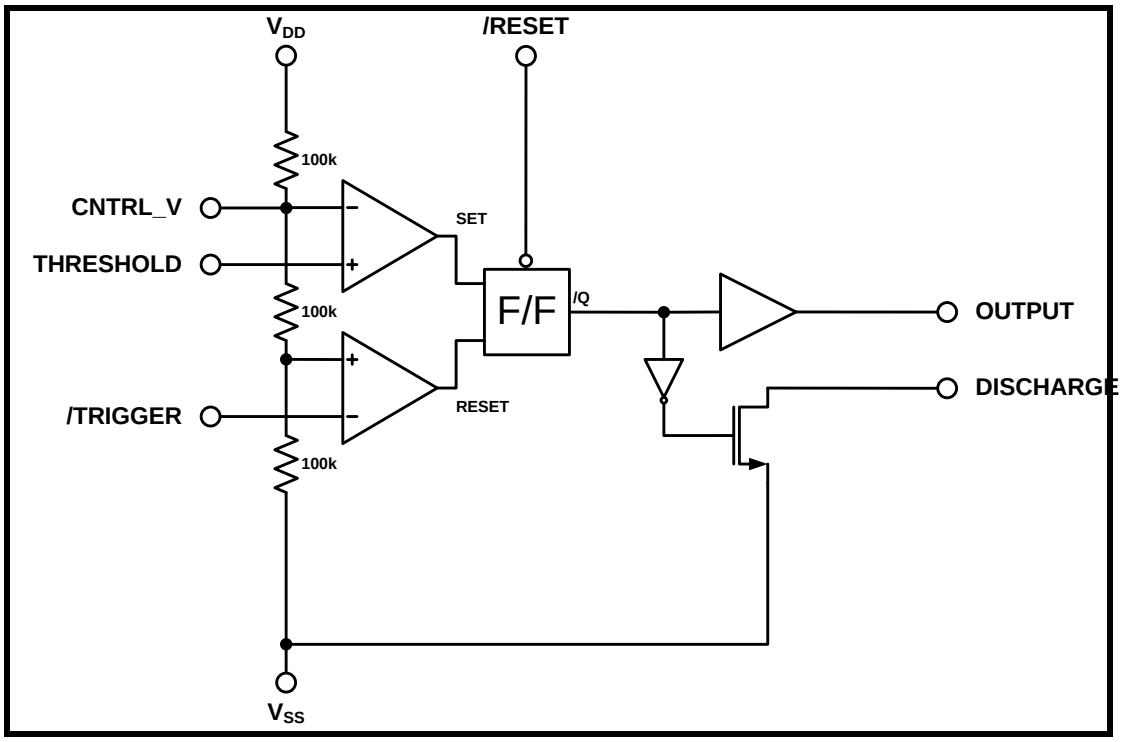
- Well logging, Automotive, Aeronautics & Aerospace
- Precision timing
- Pulse generation
- Pulse width and pulse position modulation

## Packaging and Pin Description




| 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 |

## 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 ($\Theta_{JA}$) | | | 85 | | °C/W |

## Electrical Characteristics

Unless otherwise stated: $V_{DD}$=5V, $T_j$=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 | $R_L$ = ∞<br>$V_{THRESHOLD}$ < 2$V_{DD}$/3<br>$V_{THRESHOLD}$ > 2$V_{DD}$/3 | | 280<br>350 | **360**<br>**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<br>**3.5** | | % |
| Drift with Temperature | $R_a$ = 1k to 100kΩ, C = 10nF<br>$R_a$ = 1MEGΩ, C = 10nF | | 7<br>**67** | | ppm/°C |
| Drift with Supply Voltage | $R_a$ = 10k to 1MEGΩ, C = 10nF<br>$R_a$ = 1kΩ, C = 10nF | | 0.05<br>**0.2** | | %/V |
| Timing Error: Astable[3] (see Figure 5 and Figure 6) | | | | | |
| Initial accuracy | $R_a$, $R_b$ = 10k to 1MEGΩ, C = 10nF<br>$R_a$, $R_b$ = 1kΩ, C = 10nF | | 3<br>**5** | | % |
| Drift with Temperature | $R_a$, $R_b$ = 1k to 100kΩ, C = 10nF<br>$R_a$, $R_b$ = 1MEGΩ, C = 10nF | | 20<br>**100** | | ppm/°C |
| Drift with Supply Voltage | $R_a$, $R_b$ = 10k to 1MEGΩ, C = 10nF<br>$R_a$, $R_b$ = 1kΩ, C = 10nF | | 0.2<br>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<br>$T_j$ = 25°C<br>$T_j$ = 175°C | | 14 | 18<br>**25** | mV |
| | $I_{DISCH}$ = 5mA<br>$T_j$ = 25°C<br>$T_j$ = 175°C | | 60 | 80<br>**110** | mV |
| Discharge switch off-state leakage current | $V_{DISCH}$ = $V_{DD}$<br>$T_j$ = 25°C<br>$T_j$ = 175°C | | 4 | 6<br>**80** | nA |

[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**

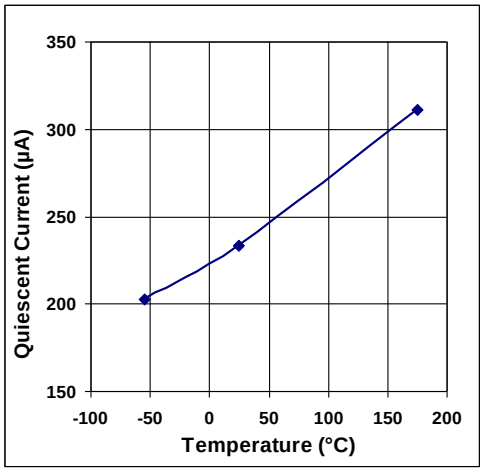
| Parameter | Condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Temperature sense | | | | | |
| Accuracy | | 750 | | 790 | mV |
| Linear Sensitivity | Between -55°C and 175°C | -1.69 | | -1.55 | mV/°C |
| Sensitivity | | | | | |
| A | $V_{TEMP} = A + B\,T\,(°C) + C\,T(°C)^2$ | 745 | | 789 | mV |
| B | | -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 | $C(T)=C(T_0)\,[1+TC1.(T-T_0)+TC2.(T-T_0)^2]$ | | 0.023 | | $10^{-3}$/K |
| TC2 | | | 0.013 | | $10^{-6}$/K$^2$ |

## AC Electrical Characteristics

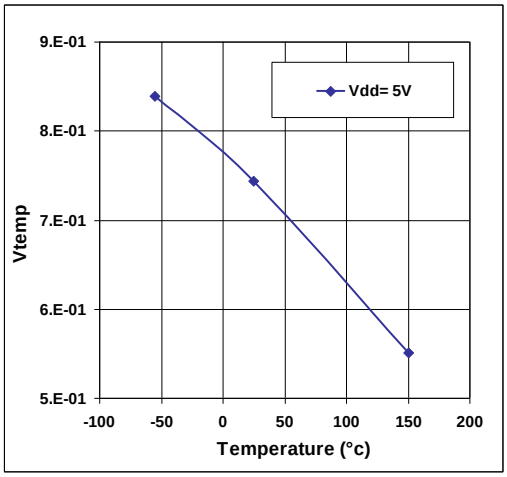
Unless otherwise stated: $V_{DD}$=5V, $T_j$=25°C. **Bold underlined** values indicate values over the whole temperature range (-55°C < T j < +175°C).

| 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<br>**14** | | ns |
| Ouput pulse fall time | | | 3<br>**14** | | ns |

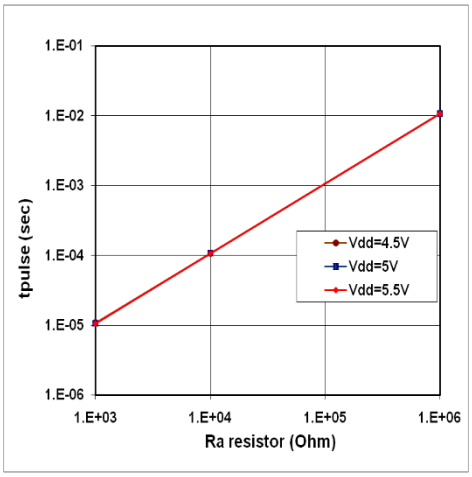
## Typical Performance Characteristics



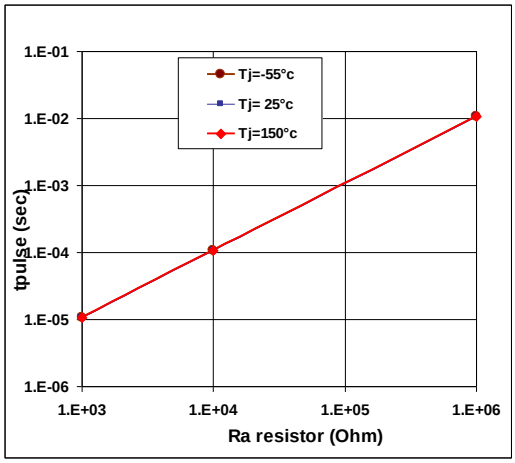

Current consumption, $V_{DD}$ = 5V



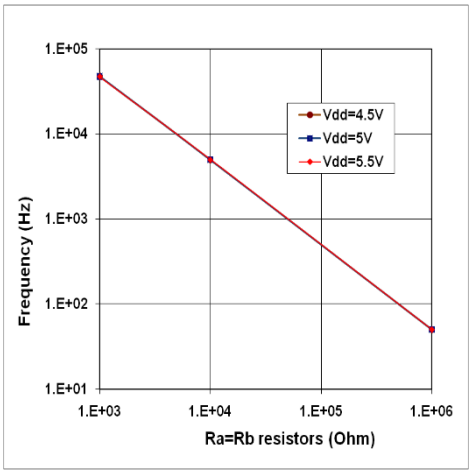

Vtemp, $V_{DD}$ = 5V



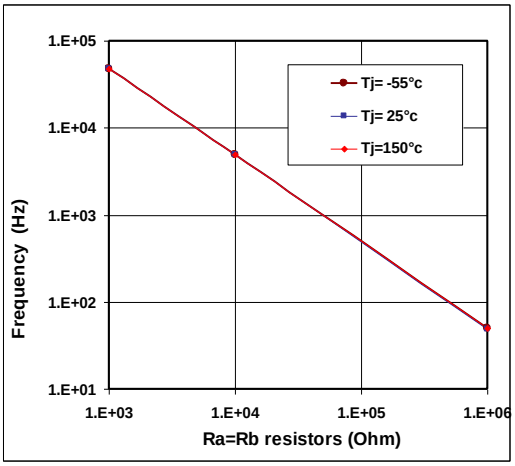

tpulse Vs Resistor in monostable mode, C=10nF, Vdd=4.5 to 5.5V




tpulse 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

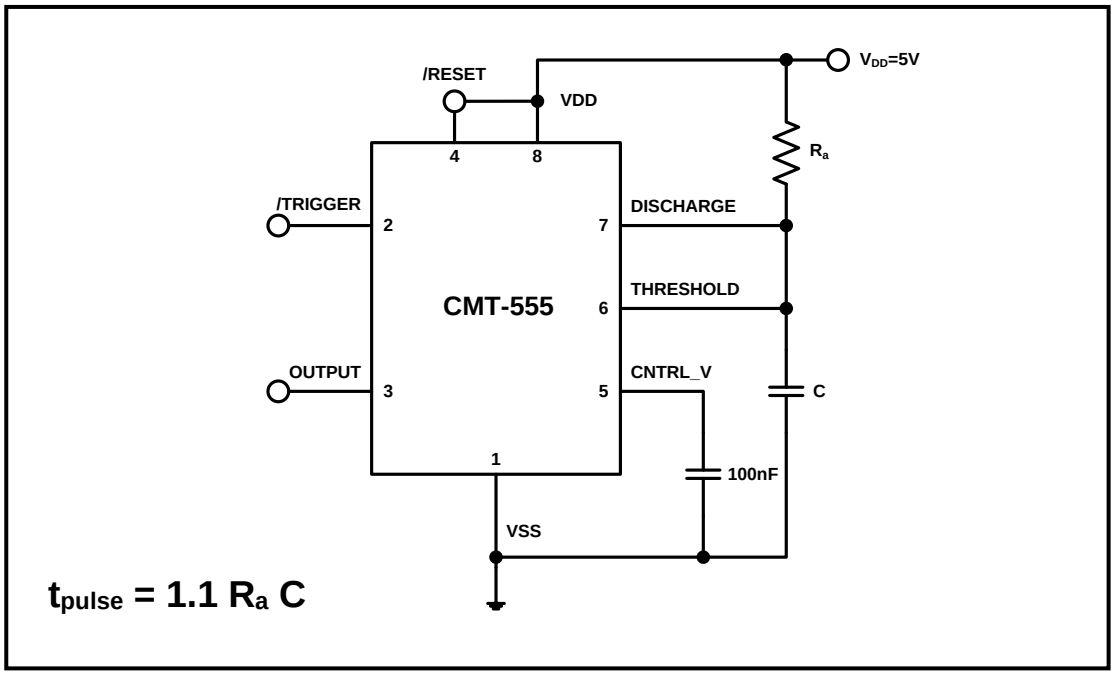



**Figure 1. Monostable configuration.**

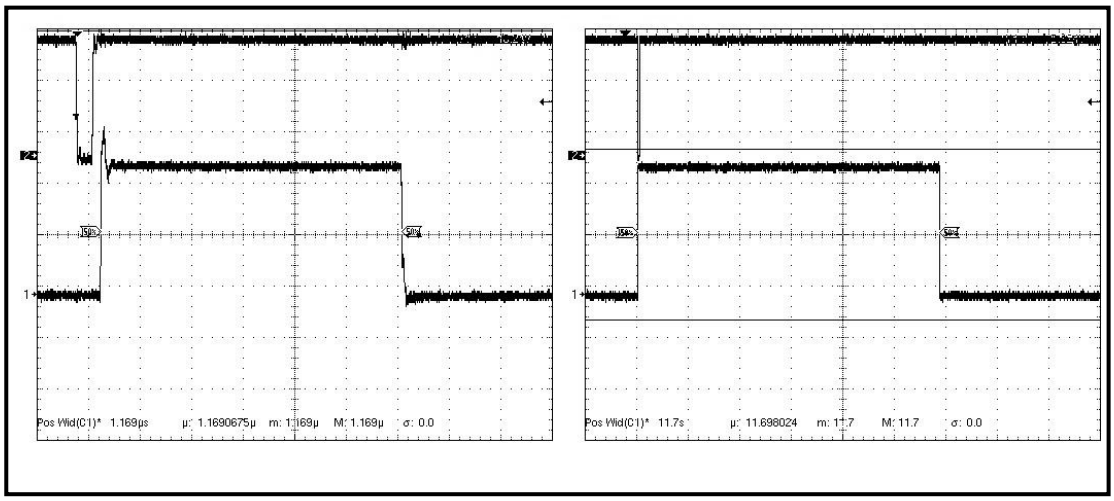



**Figure 2. Monostable output waveforms: 1.17µsec (left) and 11.7sec (right).**

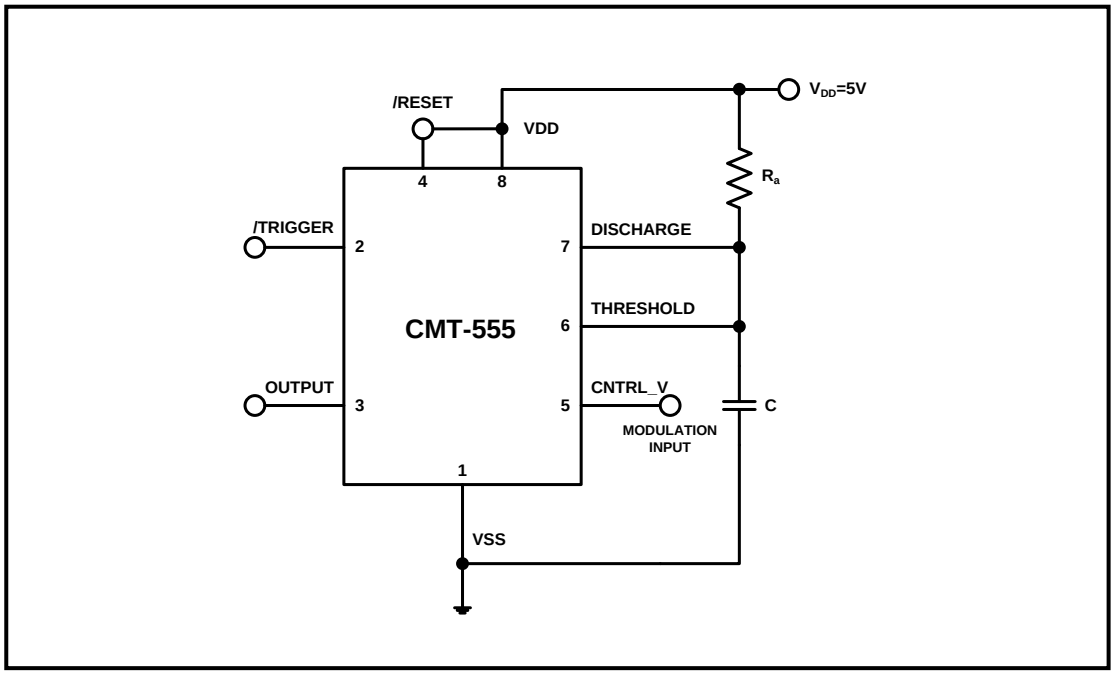



**Figure 3. Pulse width modulator configuration.**

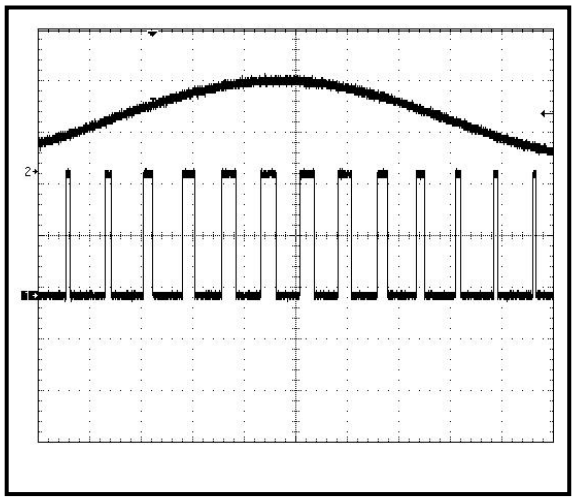


**Figure 4. Pulse width modulator output waveforms: modulating signal (above) and output signal (below).**

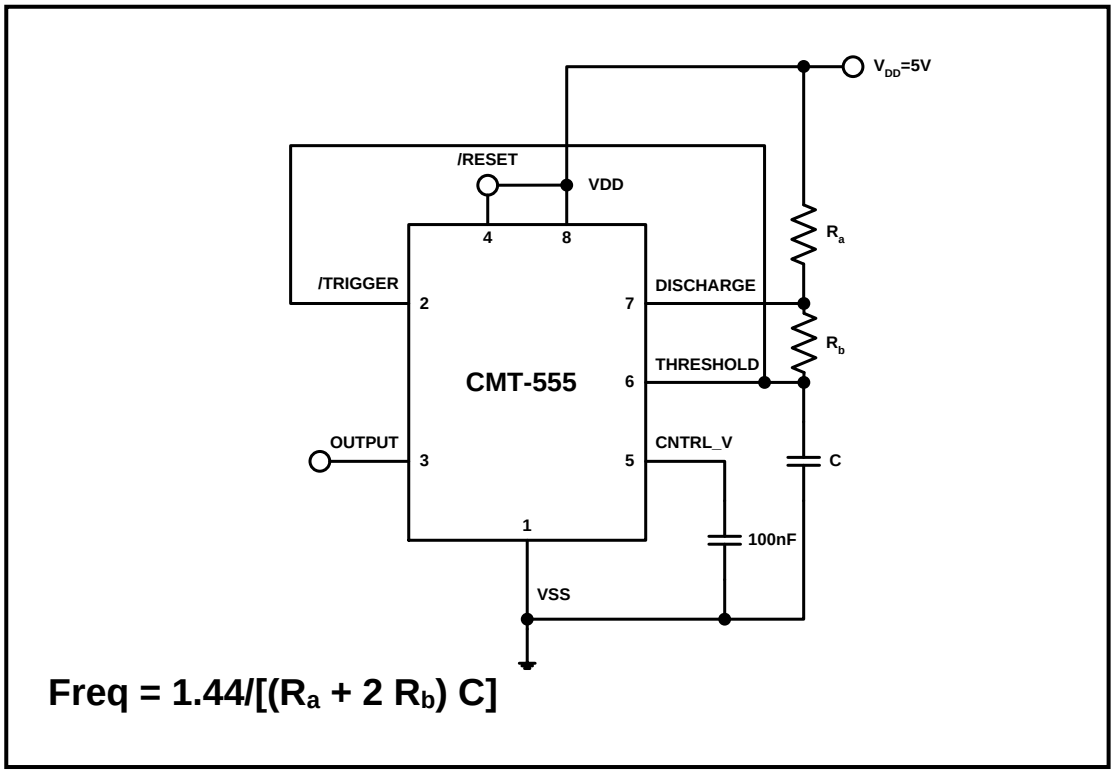



**Figure 5. Astable configuration.**

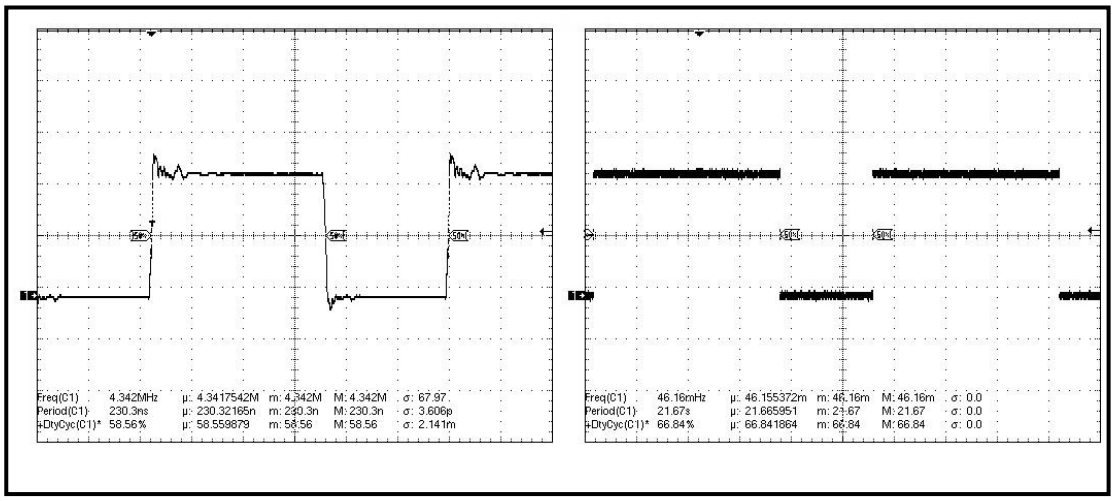



**Figure 6. Astable output waveforms: 4.32MHz (left) and 46.2mHz (right).**

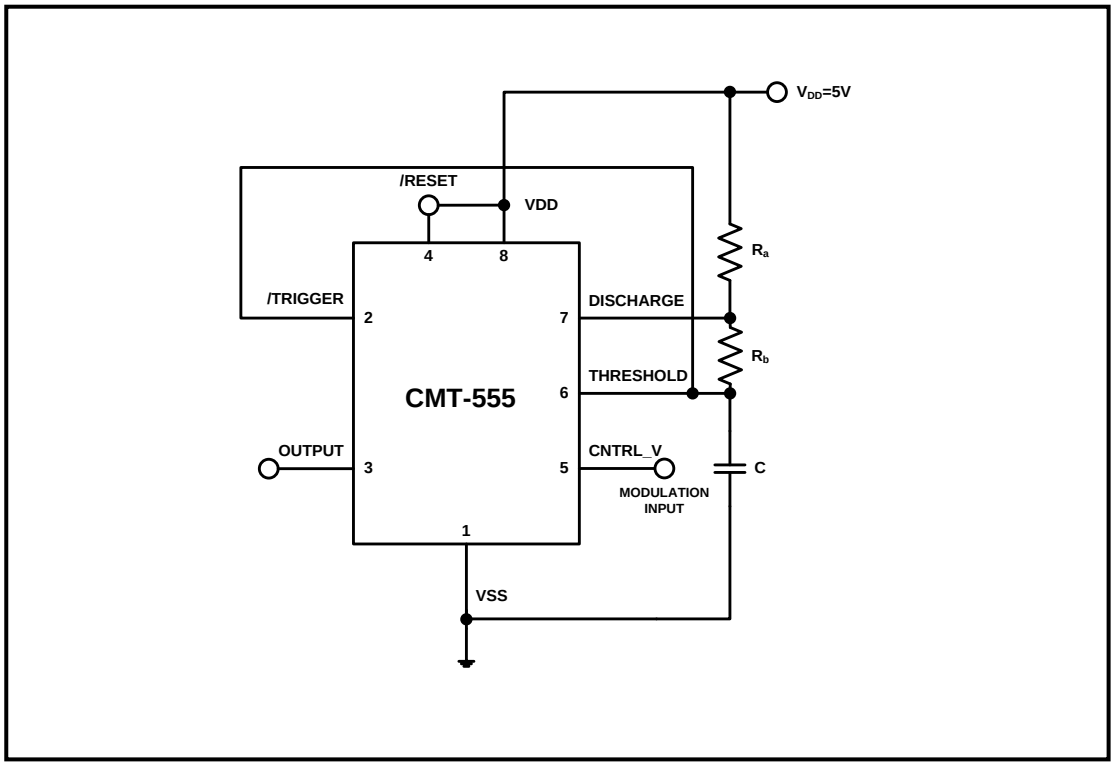



**Figure 7. Pulse position modulator configuration.**

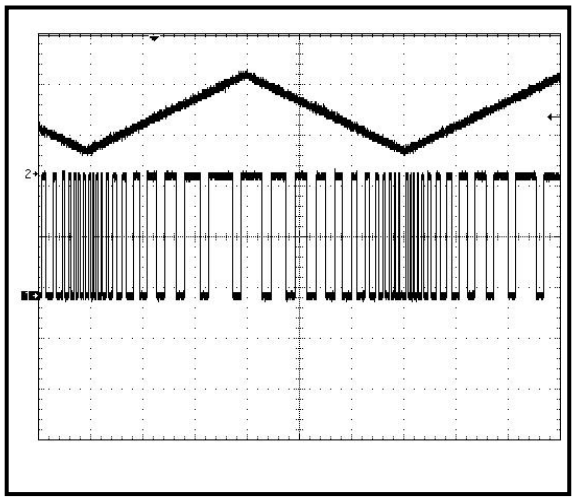
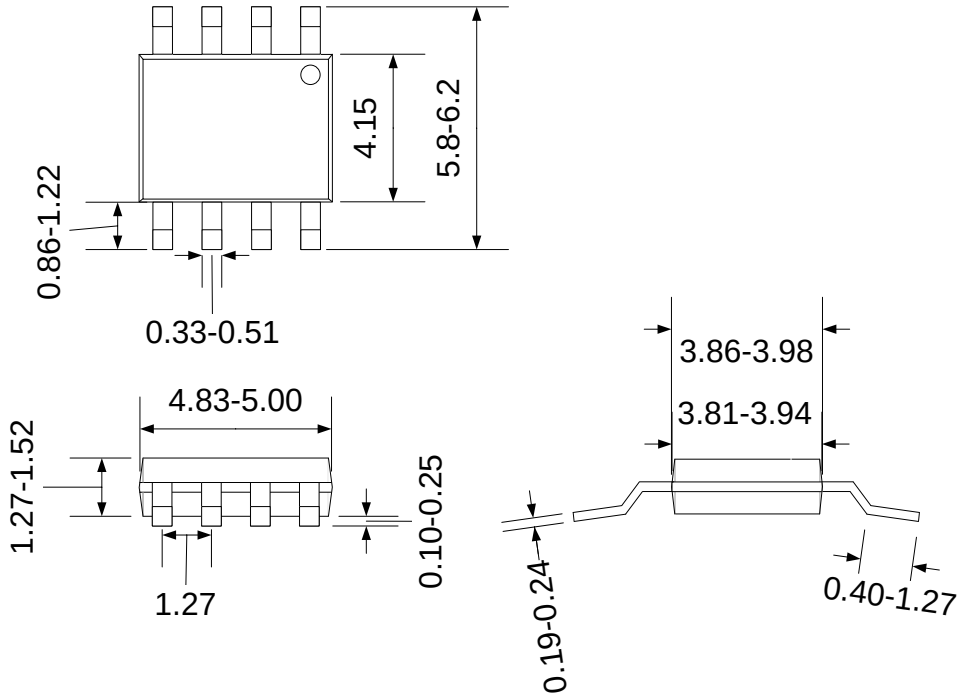


**Figure 8. Pulse position modulator output waveforms: modulating signal (above) and output signal (below).**

## 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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