
SX8122

Application Note

From 555 to SX8122

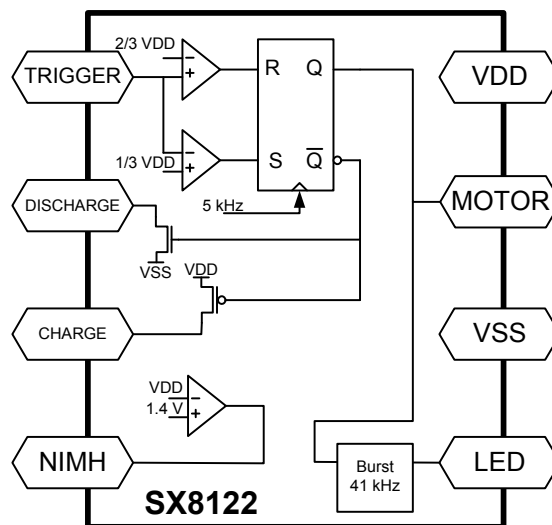
1. Introduction

The SX8122 is a new kind of timer based on a precise clock and an analog to digital converter. Its simple architecture is making possible to have very predictable results even when operating at extremely low supply voltages. It can be compared to the 555 timer in the sense that it compares one input voltage to two present threshold voltages to set or reset an internal memory cell that controls a digital output and an open drain discharge pin. In addition to this old timer, the SX8122 controls a charge pin and has a burst output that can be used to generate higher voltages.

To reduce the size, weight and cost of small appliances, the SX8122 is made to operate from a single AA or AAA cell. It monitors the supply voltage and indicates when it is above 1.4V, allowing for very simple NiMH or NiCd rechargeable devices.

2. Description

The main element of the SX8122 is an 8-bit ADC with a fixed LSB of 7 mV. The SX8122 acquires the TRIGGER and VDD in a cyclic way with periodicity of 200 μ s. If VDD voltage is above 1.8V, the acquisition is saturated to 1.8V. The result of the TRIGGER acquisition is compared with the VDD acquisition and if $TRIGGER < VDD/3$ then the SX8122 is set in "charge" mode, if $TRIGGER > 2 \cdot VDD/3$ then the SX8122 is reset in "discharge" mode.



In "charge" mode, the DISCHARGE pin is open while the CHARGE and the MOTOR pins are connected to VDD.

In "discharge" mode, the CHARGE pin is open while the DISCHARGE and the MOTOR pins are connected to VSS.

The LED pin is generating a 41 kHz square wave signal during the "charge" mode. This signal is "on" for 2 μ s and "off" for 21 μ s, thus has a total cycle time of 23 μ s. It is connected to VSS during the "discharge" mode.

The NiMH pin is connected to VDD when the VDD voltage is below 1.4 V, it is connected to VSS when the VDD voltage is above 1.4 V. It has a 25 - 30 mV hysteresis around this threshold.

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2.1. Monostable (One Shot) and Sawtooth Operation

In monostable and sawtooth operation, SX8122 operates very similar to 555. Same resistor and capacitor values will give the same results.

On the 555, the Trigger pin is used to start the cycle. The Threshold pin is used to read the transition level. The Discharge pin is used to discharge the R*C element.

On the SX8122, the switch directly resets the R*C element. The Trigger pin is the one used to read the transition level.

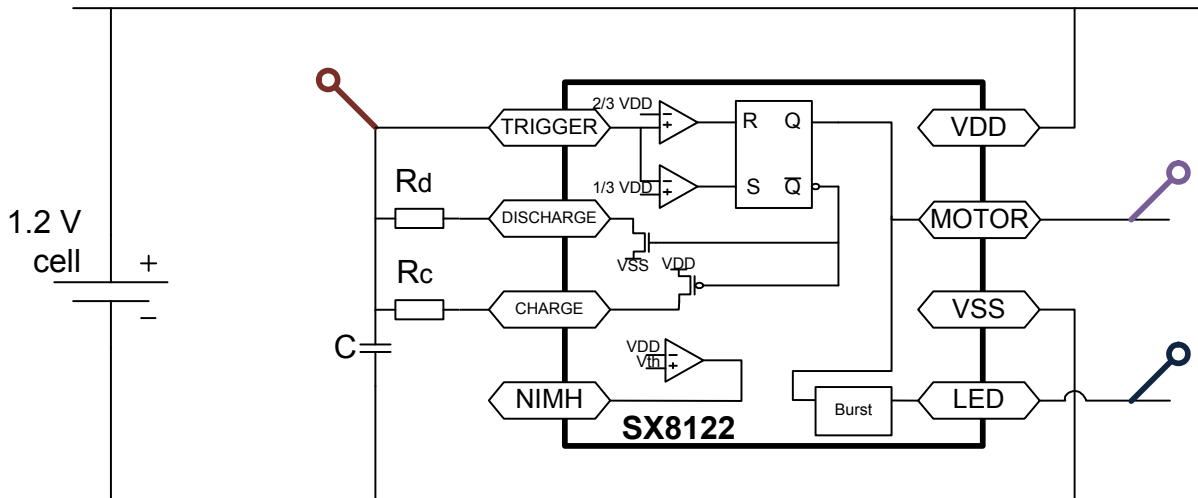
$$t_{ramp} = 1.1 \cdot R \cdot C$$

Example:

With R = 10 kOhm and C = 1 uF, one get a t_{ramp} of 11 ms.

2.2. Astable Operation with Programmable Duty Cycle

The astable operation of the SX8122 is more flexible than the one of the 555 as the SX8122 has separate charge/discharge pins. SX8122 can easily have 50% duty cycles that are not achievable with simple settings on the 555.



$$t_{charge} = 0.66 \cdot (Rc) \cdot C$$

$$t_{discharge} = 0.66 \cdot (Rd) \cdot C$$

$$t_{period} = 0.66 \cdot (Rd + Rc) \cdot C$$

Example:

With Rc = 5 kOhm, Rd = 10kOhm and C = 15 uF, one get a t_{rampup} of 50 ms, a $t_{rampdown}$ of 100 ms and a full cycle period of 150 ms.

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