

Suggestion for Downsizing of Fire & Smoke Detectors with LED Flash Lightning

1. Overview

The EN54-23 established in Europe in 2014 mandates that Fire Alarm System (VADs: Visual Alarm Devices) equipped with LED flash function have a brightness of over 0.4lux[lumens/m²]. However, Fire and smoke detectors now have a problem that their design is restricted by wiring work from the power supply or large battery. Therefore, Our thin and high capacity battery can contribute to thinness and miniaturization of device. This suggestion can be satisfied with EN 54-23 standard.

2. Features

➤ Simple mechanism design

High brightness flash will be required a large peak load momentarily. If high brightness LED are used as the light source and this load is supported by our high energy density lithium primary battery combined with aluminum electrolytic capacitor or Supercapacitor, the device can be simple without changing the power output performance. There is no need for troublesome power wiring work.

Table-1 shows the capacity comparison and Fig-1 shows Height comparison of "cylinder type manganese dioxide primary battery (CR123, 1400mAh)" vs "Our extended-type coin manganese dioxide primary battery (CR2477X, 1000mAh) and CR3677X (2000mAh)".

PN	Nominal Capacity (mAh)	Diameter (mm)	Height (mm)	Capacity density (mAh/cc)
CR123A	1400	17	34.5	0.18
CR2477X	1000	24	7.7	0.29
CR3677X	2000	36	7.7	0.26

Table-1. Comparison of size and capacity density (mAh/CC): "Cylinder type" vs our "Coin type" of manganese dioxide primary battery

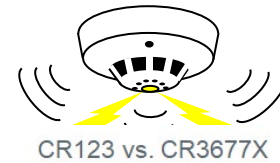


Fig.-1 Comparison of Height: CR123 v CR3677X
Murata's CR battery can contribute to make the fire and Smoke detector low height and small size.

➤ High efficiency and High power

When power is supplied from a power supply, two voltage conversions are required in it's operating circuit. However if CR battery combined with Supercapacitor or aluminum electrolytic capacitor can be used, Fire alarm device can work with a single voltage conversion, which leads to a reduction in power consumption. Therefore, the charge which the battery has can be used at high power without loss. and the number of parts can be also reduced. (Refer to Fig-2 &3)

* High efficiency Boost, Buck/Boost DC/DC Converter introduction

Nisshinbo Micro Devices introduces Boost, Buck/Boost DC/DC Converter that has low power consumption and high efficiency with low load.

Therefore, Nisshinbo Micro Devices's Boost, Buck/Boost DC/DC is suitable for this proposal. Please refer to detailed information next page.

Technical support

Sample : Please contact our local sales office or authorized agent The web page shows more details.

Technical support : If you have any questions, please feel free to contact our sales department or the nearest sales office.

<https://www.murata.com/en-us/contactform?&Product=Battery%20-%20Component>



3. Block image

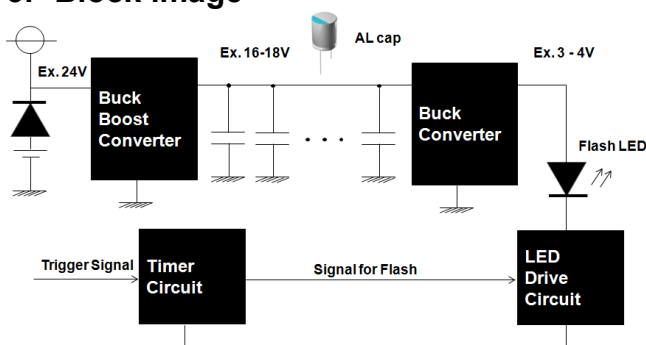


Fig.-2 Block diagram using aluminum electrolytic capacitor

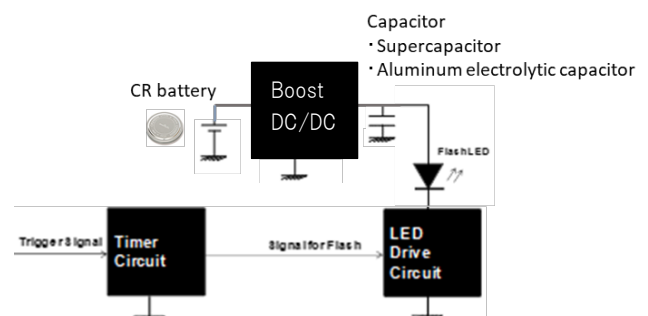


Fig.-3 Block diagram using "Coin type" of manganese dioxide primary battery + Aluminum electrolytic capacitor or electric double layer capacitor

* Introduction of Boost, Buck/Boost DC/DC Converter

Nisshinbo Micro Devices's RP604 series are buck-boost converters with low power consumption and high efficiency at light loads. Since the quiescent current is 0.3uA, the capacity of storage device can be used without waste. With a WLCSP of 1.71 x 2.315 x 0.40 mm and a DFN of 2.70 x 3.00 x 0.6 mm, the package is compact and ideal for coin-type batteries. The RP 605 series is the same size as the RP 604, but has the same step-up and step-down converter performance as the RP 604, and 1/3 and 1/4 of the input voltage divided output functions. The divided voltage output function is realized by an ultra-low consumption of 0.1 uA and the addition of 1 capacitor, and by directly inputting to a low-voltage AD converter such as MCU, ultra-low consumption and high-precision battery voltage monitoring can be realized.

Please refer to Nisshinbo Micro Devices-Web site for more detail.

<https://www.nisshinbo-microdevices.co.jp/en/pdf/datasheet/rp604-ea.pdf>
https://www.nisshinbo-microdevices.co.jp/en/applications/iot/monitor_pin.html

Maker	Nisshinbo Micro Devices	
IC PN	RP604 series	RP605 series
Circuit system	Boost/Down Voltage	
Coil	External	
Quiescent current	0.3 μ A (VBAT=VOUT=3.6V)	Boost/Down DCDC:0.3 μ A Battery monitor:0.1 μ A
Output current	300mA (Stepping down)	
Input Voltage	1.8~5.5V	
Output Voltage	1.6~5.2V (0.1V step)	

Nisshinbo Micro Devices's RP401 and 402 series are boost converters with small and high efficiency. Because Quiescent current of RP402 is 21uA, It contribute to consume the battery's consumption.

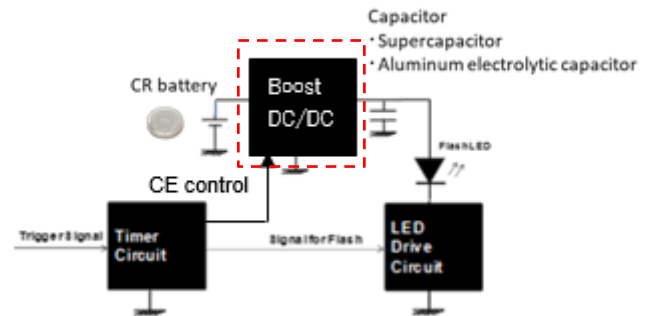
The package size is small DFN=1.8x2.0x0.6(RP401)、
2.0x2.0x0.6(RP402)、SOT23=2.9x2.8x1.1(RP401, RP402)
and Nisshinbo Micro Devices's RP401 and 402 series
suitable for the coin battery

Please refer to Nisshinbo Micro Devices-Web site if you know more detail.

<https://www.nisshinbo-microdevices.co.jp/en/pdf/datasheet/rp401-ea.pdf>
<https://www.nisshinbo-microdevices.co.jp/en/pdf/datasheet/rp402-ea.pdf>

Maker	Nisshinbo Micro Devices	
IC P/N	RP401X series	R402X series
Circuit system	Boost Voltage	Boost Voltage
Switching Control	Diode rectifier	Synchronous rectifier
Quiescent current	130uA (Vin=Vset=5.5V, Vfb=1.0V PWM/VFM auto control)	21uA (Vin=Vset=0.4V, Vout=Vset+0.2V)
Output current	500 mA (Vin=3.3V, Vout=5V)	800mA (Vin=3.6V, Vout=5V)
Input Voltage	0.6~5.5V	0.6~4.8V
Output Voltage	1.8~5.5V (internally Fixed/ 0.1V step) +Adjustable	1.8~5.5V (internally Fixed/ 0.1V step) +Adjustable
PKG	DFN(PLP)1820-6 SOT-23-5	DFN(PLP)2020-6 SOT-23-5

○The merit and select of Boost (Buck/Boost) DC/DC



1. Selection of Boost (Buck/Boost) DC/DC

●Output current : under 200mA⇒suitable for RP604/605
When the LED lighting will be switched on by turning on and off CE control from RP604/605, RP604/605 can contribute to lower the battery's consumption.
In addition, RP604/605 can leave out the CE control design, because of low consumption characteristic of RP604/605.

●Output current : Over 200mA⇒suitable for RP401/402
When the LED light will switch on by turning on and off CE control from boost DC/DC, RP401 and 402 can contribute to the battery's consumption low.

2. The Merit of using Boost (Buck/Boost) DC/DC

The Boost (Buck/Boost) DC/DC can contribute to reduction of the number of capacitors and support the output.
Please refer to Fig.5,6 of the merit with/without Boost (Buck/Boost).

Fig.5 The example without Boost (Buck/Boost) DC/DC

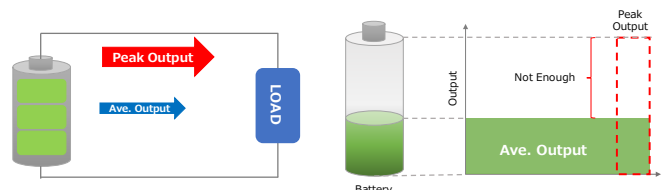


Fig.6 The example with Boost (Buck/Boost) DC/DC

