

How does a Wall Rocker(Switch) work without external power source or battery?

Introduction

Wireless lighting is very popular nowadays especially it can link to IoT(internet of things) or M2M (machine to machine) where there are lots of killer applications in the near future. User could use their personal device to control the light creating a customized atmosphere for living environment. Despite the modern control by mobile, people always need the conventional rocker or Switch on the wall in case emergency e.g. mobile device out of battery or missing the device. The issue is that the location of legacy rocker is already limited by the existing building. The existing wire behind the wall is also fixed and not easy to replace. Currently there is a solution for it: the remote control which uses radio frequency (RF) to transmit the control or dimming signal to the LED lamps. The main drawback is the remote control needs a battery to be powered which mean it needs a regular maintenance. A batteryless rocker (switch) is the solution to resolve issues from above. This article explain how it works and demonstrates it actually emitting less RF radiation interference compared to the conventional rocker or mobile device.

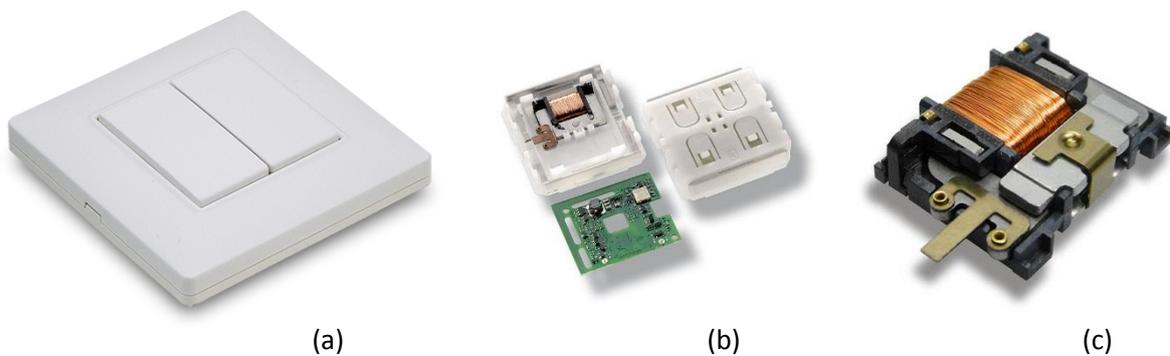


Figure 1. A batteryless rocker switch(a); Inside of rocker(b); Energy harvesting element(c)

The working principle

The batteryless rocker shown in Figure 1(a) looks like the legacy one from the appearance but it actually has built-in electronics. The implementation of self-powering mechanism in Figure 1(b) is reducing the energy demand of the rocker by the use of energy harvesting method in Figure 1(c). The kinetic force i.e. pressing by human finger is converted into electricity which is enough to power the RF IC and related components in order to emit the RF dimming command into the air. The illustration and block diagram can be found in Figure 2.

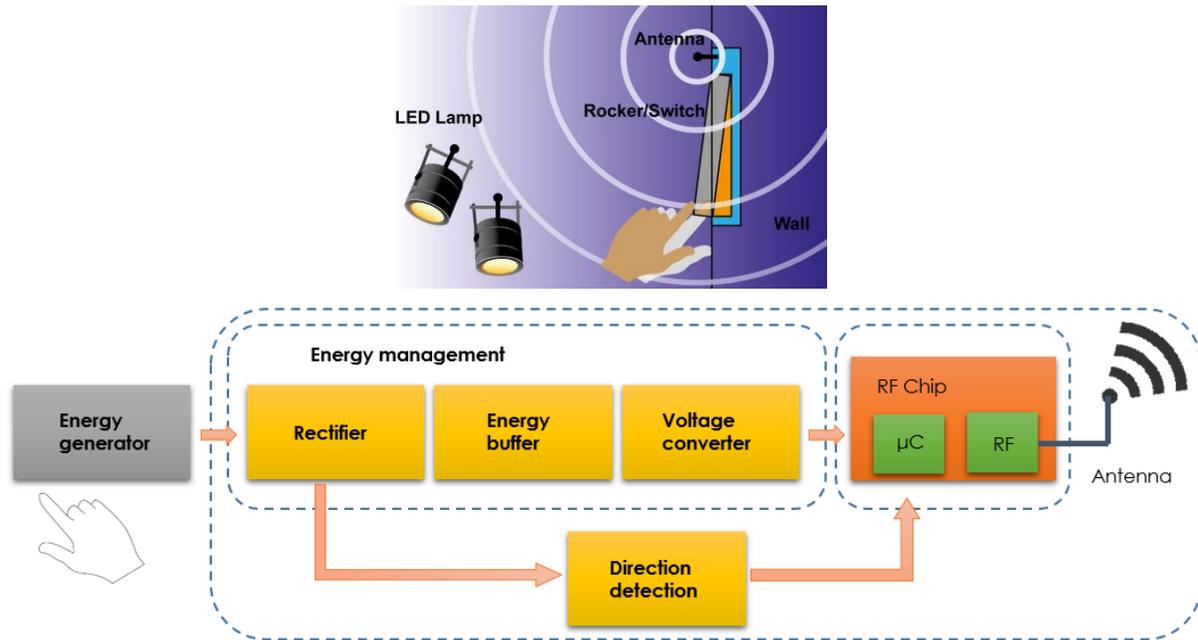


Figure 2. Illustration of how to generating RF signal by energy harvesting using kinetic(a); Block diagram(b)

The pollution of RF electromagnetic field

As the batteryless rocker has a built-in RF electronics, it is interesting to study how much electromagnetic field is emitted with respect to other existing equipment. The table in below shows the rocker generates very less electromagnetic field in which it means the less possible adverse effects on a neutral body.

| Device / System | Power density (W / m ²) | Distance (m) | Duration |
|-----------------------|-------------------------------------|------------------|----------------------|
| Batteryless rocker | 0,000013 | 1 | few ms when operated |
| Conventional rocker | 0,0013 | 1 | few ms when operated |
| WLAN Access Point | 0,001 | 2 | while data exchange |
| Wireless network card | 0,1 | 0,5 | while data exchange |
| DECT Telephone | 1 | 0,1 | during call |
| Mobile phone | 12-42 | 0,1 | during call |
| Mobile base station | 0,00001 - 0,1 | Can be different | permanent |

*All data in this table is reference from EnOcean.

Conclusion

The batteryless rocker using energy harvesting has benefits in terms of reducing costs, maintenance and makes a significant contribution to the world by avoiding waste over the limited life time of a battery powered product. Moreover, this invention generates much less RF electromagnetic field compared to the conventional existing rocker (switch) on the wall. More information about the batteryless rocker can be found in the product page of MW website: WPD-06SWT

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