



Self-Powered 802.15.4 Wireless Sensor Module for Light-Tracking

1 Introduction

The CS-WLT-11002 is a low cost - low dimension sensor module for both indoor and outdoor light tracking.

Using the 802.15.4 wireless protocol, makes this sensor the right complement to the CEDAR Solutions CS-D2D-11001 device (DALI-to-DALI wireless bridge interface), in order to implement an highly efficient wireless sensor network for automatic light control.

Four on board solar cells enable light tracking by means of an highly accurate current sensing. Moreover an energy harvester collects energy in a super-capacitor and delivers it to the on-board devices in a regulated and filtered manner

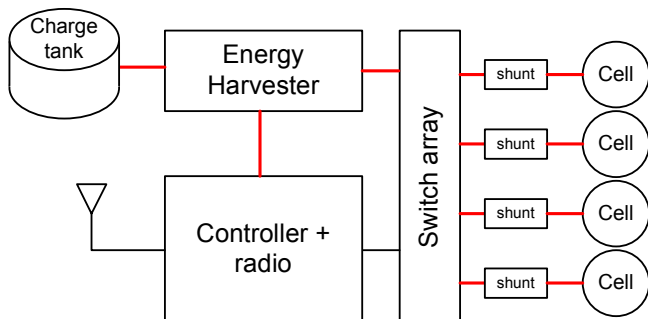


Figure 1. Module architecture

2 Module Architecture

As shown in Figure 1 the self-powered light tracking device for wireless lighting networks consists of the following components:

- Freescale Platform in a Package (PIP) based on 32-bit TDMI - ARM7 processor with 128 kB flash memory, 96 kB RAM, 80 kB ROM, low-power operation and 2.4 GHz

IEEE 802.15.4 RF transceiver with protocol hardware accelerator.

- DC/DC converter, with a step-up topology for energy harvesting, connected to a super capacitor for charge storage and to an analog switch extracting energy from four high efficiency solar cells.
- 100 mF super capacitor.
- Auto-start circuit for setting-up the system or, in general, for recovering start condition in case of complete discharging of the internal storage element when the energy transfer from solar cells doesn't suffice.
- Four-inputs/one-output analog switch, for supervised selection among the four cells of the energy source by the microcontroller. It also allows each cell is activated when the most favourable lighting condition is met.
- Four precision current shunts, high-side connected to the solar cells. The control of each cell supervised by the microcontroller enables to obtain information on light intensity which the solar cell is exposed to and light direction tracking.
- Digital thermal sensor for temperature compensation and monitoring.

The arrangement of the four solar cells has been chosen to obtain a 360° light source tracking angle of view in which the moving light source can be tracked.

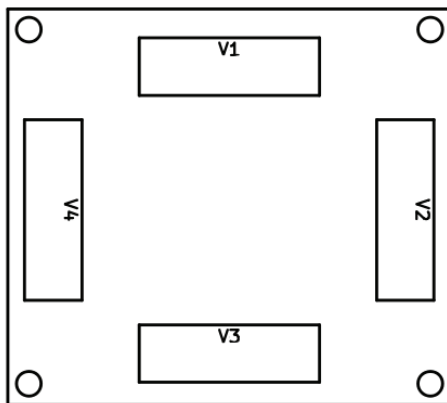


Figure 2. Solar cells arrangement on the module

3 Wireless Interaction with DALI Systems

This self-powered 802.15.4 wireless sensor module for light-tracking can be in particular used in wire-

less DALI systems and interact with them, since it can provide useful data on solar position, indoor illumination levels and illumination faults. This brings to energy savings and faults detection. This interface permits to implement a flexible design of DALI networks without the constraints of the DALI wireline bus routing.

4 Main Features

- Dimensions: 50 × 48 mm.
- Radio link: IEEE 802.15.4 compliant physical layer, 2.4 GHz band.
- Self powered.
- Stand-by consumption: 0.9 mA.
- Stand-by autonomy: 18 hours.