

LIGHT SENSOR – RoHS Compliant Indoor Illumination Sensor

Indoor Light Sensor based on STM 110(C) respectively STM300(C)

This Application Note shows a possible realization of an EnOcean Light Sensor based on STM devices with a cyclic sign of life signal and illumination measurement (natural or artificial light).

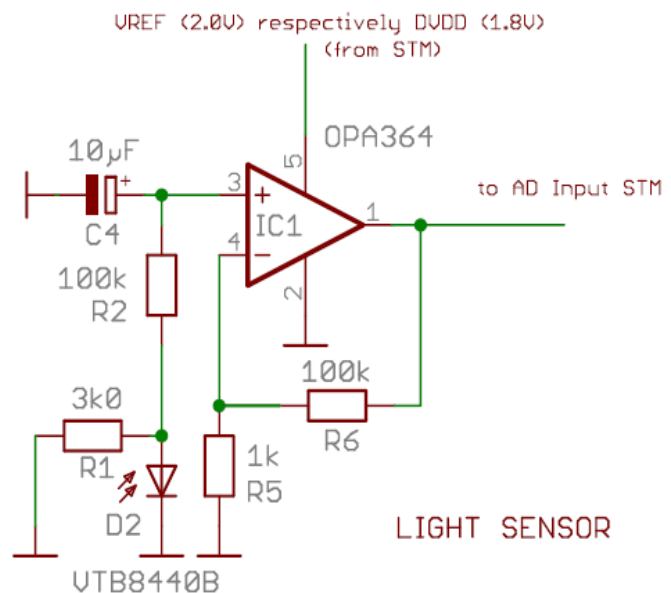
Challenge

Even if not recognized by the human eye, artificial indoor light flickers with a cycle time of about 10 ms due to the 50/60Hz frequency of the AC mains power. For energy saving reasons the STM 100 operating and measurement time is about 2ms. This could result in permanently different measurement values depending on the sampling time within the mains period.

A very simple and usual method for avoidance is measuring via a CdS based photo resistor. Due to its inertial behavior this passive component averages the light fluctuations (response time > 50 ms). Unfortunately CdS photo resistors are not RoHS compliant. That's why a silicon based photo diode has to be used. Standard photo sensors are RoHS compliant but unfortunately they are too fast for this application (response time range ns to μ s).

Solution

The circuitry concept showed in the figure uses D2 (VTB8440B) operated in photovoltaic mode, near 0 V (here up to 15 mV). The light induced photocurrent (about 5 nA/lux) generates a light dependent voltage on the R1 which is continuously available at the input of the STM module. Its 50/60 Hz fluctuations can be simply averaged by a RC element (R2, C4). This voltage will be further conditioned for the STM by the OPA364. Its gain, about 100 and the R1 value depend on the photodiode type and desired brightness ratio. For the exemplified concept results about 1.5 V for 1000 lx (1.5 mV/ lx). The amplifier must be a low power, low offset Rail to Rail I/O type, operating at 1.8 V with a quiescent current < 1 mA and a GBW > 100 kHz. (Settle time < 1 ms).



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