Wireless Relay Module

Overview:
TSR LED Lighting, LLC (TSR) is an LED lighting engineering, manufacturing and software solutions company specializing in the Internet of Things (IoT) for connected lighting in commercial buildings and industries. TSR is a pioneer in the connected lighting field whose interest and demand is now just starting to take on a global reach. Products containing embedded sensors for IoT in lighting and all things connected to the internet, will grow to billions of devices by 2020.
TSR has many developments that need to be undertaken in the next few years. One such key smart device is a wireless relay to interface and wirelessly enable new and existing lighting fixtures. This sensor/relay will be a key component to many IoT solutions (in the millions).
The wireless relay is based on the ZigBee HA1.2 and 3.0 communications protocol. It contains a module within it that could be replaced (at a factory level) with a Bluetooth BLE module so as to be usable with other wireless communication for different system and application requirements.
The wireless relay prime function will be to control a lighting fixture power for “on” or “off” conditions with a 10A contact to interrupt power to a single fixture or groups of fixtures. It will also contain a 0-10V adjustable dimming signal, used to dim LED drivers of these LED fixtures that themselves are controllable (dimmable) by this signal dimming method.
TSR has prototypes of various designs that have proven this functionality. The goal is to industrialize the design with fully developed software applications, tested firmware and security software for the wireless interface as well as productize the 0-10V and relay contact in the module as shown in Figure 1.

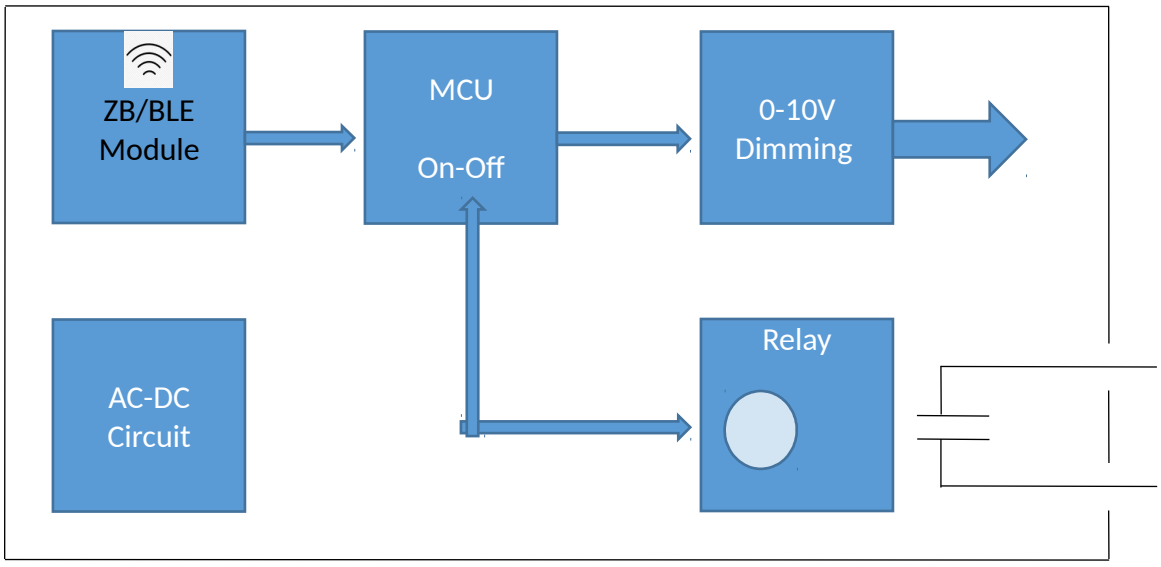

Fig. 1 Function Diagram

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Team description:
Two electrical engineers and two computer engineer. Ability to work collaboratively as a team and provide individual initiatives on assignments/tasks.
Circuit design for electronics and RFI, PCB board layout and signal isolation for FCC requirements. WiFi, ZigBee and BLE firmware, security and programing design. May use standard language (C, C++, Java, Python etc). Prototype, test and documentation experience.

Deliverables:
Detailed electrical specification including mechanical packaging to meet IP67 installations.
PCB layout and adherence to FCC guidelines for RF products.
BOM for all components and off the shelf devices.
Firmware for testing and commissioning module.
Final report on goal achieved and next steps for extensions.
Proof of concept design for beta testing.

Division of Labor:
EE#1: Functional description based on existing prototypes and TSR engineering input
Responsible for evaluation of wireless modules from CEL, SIL, NXP for both ZigBee HA1.2 and 3.0 and Bluetooth BLE, software stacks for ZigBee are first priority
Work with TSR staff to fully understand the desired goals for product function and operations
Develop circuitry for relay module and 0-10V analog dimming module.
Work in unison with EE#2, CE#1 and TSR team.

EE#2: Develop mechanical, electronic and electrical layout of PCB and enclosure for all modules/sub components on the 0-10V analog dimming module and relay module. EE#2 will research and design in a suitable electronic relay that can deliver up to 10A isolated current capacity at 120 to 270VAC to drivers on lighting fixtures. Attention to UL requirements and IP67 ambient protection should be designed in. Most of the design is available in existing prototype units that need to be industrialized with commercially available components. A working example will be required that has been fully debugged for beta test sites.
Work in unison with EE#1, CE#1 and TSR team.

CE#1: Develop a clear understanding for ZigBee HA1.2 and 3.0 module for function, FCC and API calls to operate, test and debug for cloud and local gateway control and monitoring software. There will be a need to understand and utilize existing APIs and application software modules in order to develop scripted rules and routines for mobile device interface development for beta test site use. Work with EE#1, EE#2 and TSR team to develop and document all hardware and software to a reusable end user experience.
Work in unison with CE#!, CE#2 and TSR team.

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IoT is a stepping stone for the future and Neil Armstrong said it best:
"That's one small step for man, one giant leap for mankind."

We welcome any questions about this project, how it fits into the bigger picture of IoT and the future growth opportunities.
Contact: Gary Arnold, 401-388-0533, gary@thermsource.ccom