Voltage Protective Relay

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Overview

The Programmable System-on-Chip (PSoC) voltage protective relay is a new integrated circuit and smarter device that can receive input data and compare it to a threshold set by the user. If the device detects a bad input level, it will output the waveform via Bluetooth to a mobile device. The user in return can observe the data and set a given threshold level from their mobile device via Bluetooth.

Objectives

- Three phase voltage measurements
- Calculate the magnitude of positive, negative, and zero sequence voltages and compare them with the user-defined thresholds
- Display the graph and data of three phase voltage on a mobile device
- Control the threshold setting with a mobile device via Bluetooth

Impact

- Economical
  Simple hardware design (PSoC) makes the device more compact and reliable
- Global
  This device opens the possibility to monitor a voltage status in residential and industrial regions

Specifications

- 3 Voltage inputs: Va, Vb, Vc
- Range: 300V peak to peak
- Error: 3% ±1V(±3V)
- Sampling Frequency: 720Hz
- Nominal Frequency: 60Hz
- Over/Under Voltage Outputs: Va, Vb, Vc, V1, 3V2,3V0
- Red LED: Above range
- Green LED: In range
- Blue LED: Below range
- Operation time: Less than 20ms
- Board: PSoC 4 BLE, 48-MHz ARM Cortex-M0 CPU
- 128 KB Flash and 16 KB SRAM

Mobile Application

Scans and connects to nearby Bluetooth devices
Receiving data from the PSoC:
- Graphs three phase voltages
- Displays values in a list array
Sending data to the PSoC:
- Modifies threshold levels (over and under voltage)

Future Work

- Improve PCB
- Store data into Flash instead of SRAM
- Improve analog and digital filters
- Add more features to the mobile application

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