1 Overview

- 8 $5 \text{kV}_{\text{rms}}$ Isolated Digital Outputs (DO1-8) with Adjustable Output Supply: 3.3V or 5V
- 2 $5 \text{kV}_{\text{rms}}$ Isolated Digital Inputs (DI1 and DI2)
- 2 $3.75 \text{kV}_{\text{rms}}$ Isolated Analog Inputs (AI1 and AI2)
- 2 User Potentiometers (RV1 and RV2)
- Isolated Power Indication LED (D3)

2 Description

- The PSoC 6.131 Shield is designed to fit over a breadboard-mounted PSoC Board and features a DCP020507 isolated DC-DC converter for powering the isolated side of the inputs, and two user-selectable voltage regulators for controlling isolated digital output voltage levels.

- Requires 5V Input from PSoC Board.

- The PSoC Pin connections for the Isolated IOs can be found on the silkscreen and are shown on the right. Each connector features an isolated ground connection.

2.1 Digital Output Isolation

The 8 Digital Output (DO) Isolation circuits each feature a VOH1016AD or H11L1M High-Speed Optocoupler. They all share a user-selectable output voltage rail which may be configured by using a SINGLE jumper on the 3V3 of 5V header pins.

2.2 Digital Input Isolation

Both digital input (DI) isolation circuits also feature a VOH1016AD or H11L1M High-Speed Optocoupler. The current limiting resistor has been chosen so that an input HIGH voltage range of 5-24V is allowable, but speed performance will degrade at higher voltages. Due to the configuration of the optocoupler, the input isolation circuit inverts the input logic (i.e. a logic low input produces a logic high input to the PSoC).

2.3 Analog Input Isolation

Both analog input (AI) isolation circuits feature a LOC110 Linearized Optocoupler and two opamps for linear analog isolation. The input voltage range is restricted to that of the isolated power supply voltage, 7V. The output voltage range in restricted to that of the PSoC, or 0-5V. For low-frequency operation, remaining within this 0-5V range is sufficient for 1-1 analog input isolation. For higher-frequency operation (> 10kHz), input voltages should be restricted to the opamp’s linear working regime of 1-4V.
Figure 1: Isolation Circuitry
PSOC-Side LED Inputs

ProTECTED SIDE

Output Load (Pull-up) Resistors

Selectable Output Voltage Regulators

Unprotected Side

Notes:
- Nominal LED Current @ 5V Input: 2mA
  - Overall: 16mA
- Nominal Output Load Current: 7.5mA
  - Overall: 60mA

MIT
PSOC 6131 Carrier Board
Eric Pance
Rev 1.0
6/15/2020
Dig. Out. Prot
Notes:
- This Circuit Reverses Signal Polarity
- Max LED Current: 80 mA
- Nominal LED Current @ 5V Input: \((5 - 1.4) / 1 = 1.85\text{mA}\)
- Load Resistance for 5V operation: \(R = 5 / 0.015 = 330 \text{ Ohms}\)
Notes:
- \( R9/R10 \) set max diode current: \((5-1.2)/R = 11\text{mA}\)
- \( R7/R8 \) set range, \( R = \text{Vin}_{\text{max}} / (K1 \times I_f) \)
  - \( R = 5 / (0.08 \times 0.11) = 56k \)
- \( R5/R6 \) match input impedance