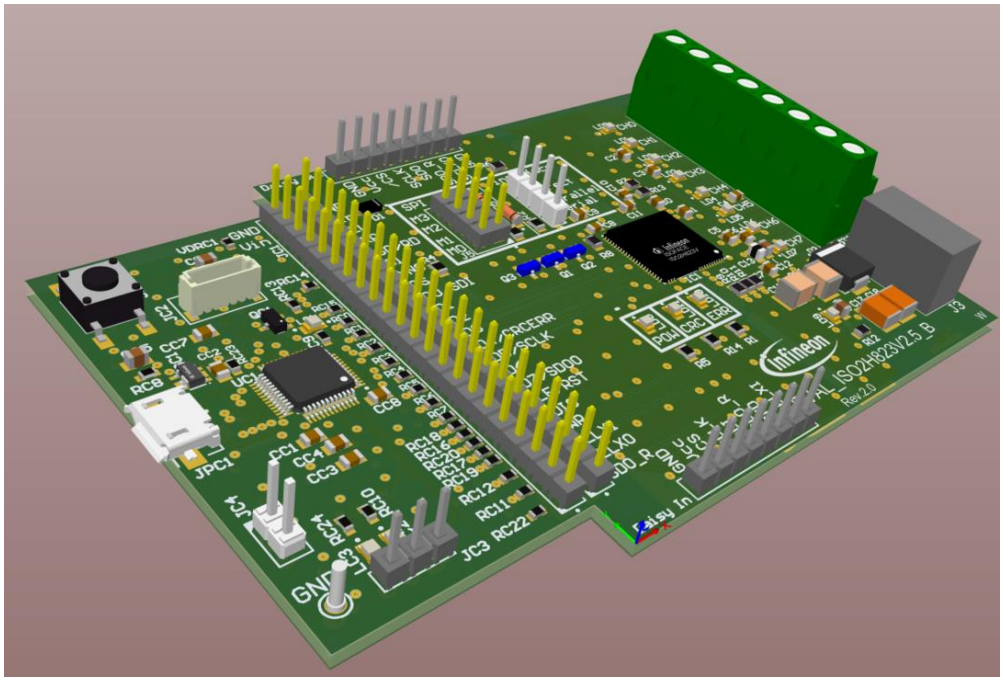
ISOFACE™ digital output evaluation board manual

EVAL_ISO2H823V2.5_B rev. 2.0

About this document

Scope and purpose

This document is the user manual of the ISO2H823V2.5 product evaluation board version B. The board is provided for evaluation purposes only. The evaluation board must not be used in continuous operation, because it is not designed for this.



Intended audience

The operation and use of the evaluation board is restricted to engineers and technicians in a laboratory environment, following appropriate safety measures.

For any questions, you can contact the author at ISOFACE@infineon.com.

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1 Board description and data

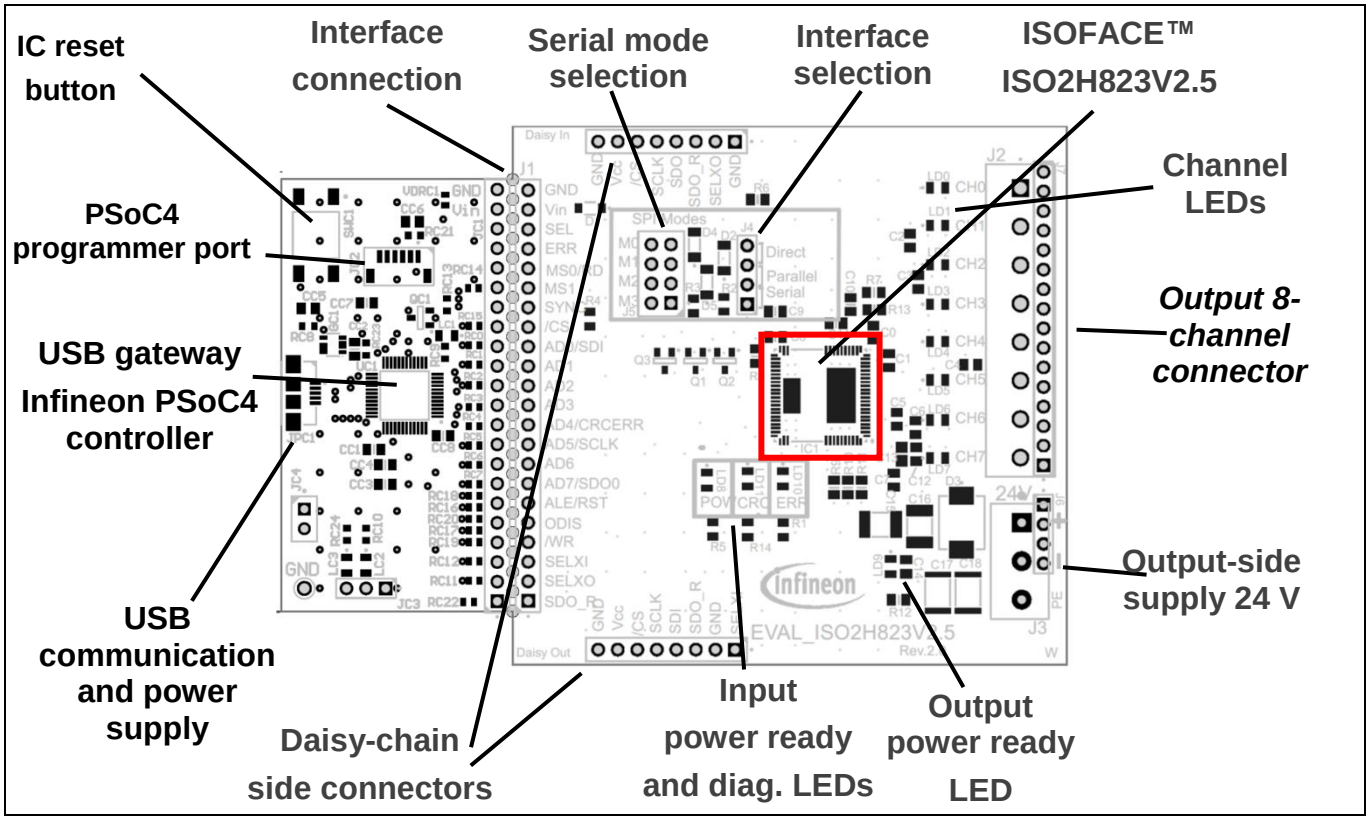

Figure 1 Evaluation board components

The IC ISO2H823V2.5 in this evaluation board is a digital output IC providing eight-channel 24 V with 0.5 A nominal current output. Each output channel is compatible with resistive, inductive and capacitive loads, with the limits described in the **datasheet**.

For further safety information please refer to the safety limits **application note**.

Table 1 Board electrical data

	Min.	Typ.	Max.
Supply voltage input side V_{IN}[1]	2.75 V	3.3 V	3.6 V
Supply current input side	–	–	10 mA
Supply voltage output side	11 V	–	30 V
Supply current output side	15 mA	–	Output current + 15 mA
Output current per channel	–	–	0.65 A
Maximum output power		100 W	Maximum power depends on working temperature; consult the application note safety limits linked to above for details

[1] Supply at V_{IN} pin is not needed if USB is connected, because the board is supplied from the USB port.

2 Board functionality

The EVAL_ISO2H823V2.5_B includes the IC and all the external components needed to set up a full digital output application that can manage eight output channels at 24 V 0.5 A nominal.

With this board it is possible to test all IC functions, from the eight output channels' turn-on/-off, to the controller interface selection, and the diagnostics status. The IC register can be accessed by serial or parallel interface for read and write, controlling all the information about IC status and configuration.

An Infineon PSoC4 controller is mounted on this evaluation board, acting as a gateway to the USB port in order to read and control the IC from a PC. With a proper graphical user interface (GUI) it is possible to visualize the register status on the PC monitor.

2.1 The eight output channels connector

The primary function of the ISO2H823V2.5 is to control the eight output channels, with 0.5 A current capability at 24 V. The output control is performed by accessing the IC register named "DRIVE" and writing the desired 8-bit configuration ("1" – for channel "ON", "0" – for channel "OFF"). The datasheet contains a full description of all registers and the functionality to access them for reading or writing.

At the output, the eight output channels connector can be wired for different resistive, inductive, or capacitive loads. For IC maximum load capability please check the datasheet as well as the safety limits document linked to in Chapter 1 of this manual.

2.2 The output-side supply 24 V nominal

A nominal voltage of 24 V is needed at the output-side supply 24 V connector. This connector supplies the IC output side and sources all eight output channels. Therefore, the total current supply capability must be at least the sum of all eight applied output loads plus 15 mA to supply the IC.

2.3 Isolation barrier

The IC has an integrated galvanic basic isolation rated 2.5 kV_{rms} that isolates the 3.3 V control side of the IC from the 24 V output side. The isolation is requested, in an industrial automation application, to protect the low-voltage controllers from the harsh floor environment (Standard IEC61131-2).

Being galvanically separated, all the voltages at the input side are referred to GND and all the voltages at the output side are referred to output-side supply negative (GND_{BB} on the IC datasheet).

2.4 The input-side 3.3 V or controller side

The control of the eight output channels is located at the input side, which is powered with nominal 3.3 V. If connected, the USB 5 V supplies power to the board, and in this case no other supply is needed for the input side. The interface type can be selected by moving the jumper at the interface selection connector between SPI serial mode, parallel mode and direct mode. For SPI it is possible to select one of the four serial modes at 8, 16, or 24 bits, with a second jumper connector at the serial mode selection connector. All the interfaces are described in detail in the datasheet.

2.5 Diagnostics

Full channel diagnostics are integrated into the IC, allowing detection of short-circuits to GND or to V_{BB} supply but also channel open-load conditions. The diagnostic information is transferred across the isolation and can be retrieved from the 3.3 V side by reading the corresponding IC register contents.

2.6 Side connectors for daisy chain

The IC supports SPI serial daisy chain in SPI serial modes 0 and 1. This feature allows the user to control multiple boards with a single controller without the need for additional controller GPIOs. There are plans to support this functionality with firmware on the PSoC4 controller, but the current version of the evaluation board firmware does not yet support this functionality. However, the hardware is ready to support this functionality through the daisy-chain side connectors, and this can be implemented with custom software.

2.7 The PSoC4 controller

The controller and the IC exchange information through protocols described in the datasheet. The data exchanged can be monitored by probing the pads in **Figure 1** labeled as interface connection in order to better understand the protocol functionalities and timings.

The controller is preloaded with firmware that has only gateway functionality between the IC and the USB. The user can overwrite the firmware via the PSoC4 programmer port connector using the **Infineon Miniprog programmer tool**.

The PSoC4 controller board can be separated by breaking it across the holes aligned parallel to the interface connection. This allows the user to apply a different microcontroller by wiring the new controller GPIOs to the interface connection on the IC board edge. The I/O pin functionalities are described in detail in the IC datasheet. When the two parts of the boards are separated, a dedicated 3.3 V supply is needed at pin V_{IN} of the interface connection with reference to GND.

Setting the interface selection to “direct”, the IC works in eight-channel optocoupler emulation. The microcontroller is idle and the outputs can be controlled by directly applying 3.3 V to pins AD0 to AD7. The states of the eight output channels follow continuously the signals applied to AD0 to AD7. Channel diagnostics are inactive in this mode, and only the 24 V supply diagnostics are indicated by the ERR LED when insufficient. A USB cable connection is needed to supply the 3.3 V at the IC, or alternatively the voltage can be applied directly to the pin V_{IN}.

Important notes:

- Don’t invert the supply polarity at the output-side supply 24 V connector because the board is not protected against reverse polarity.
- At the output eight-channel connector don’t apply a voltage higher than supply voltage at the output-side supply 24 V connector, as this leads to an inverse current condition, which may cause excessive or even destructive power dissipation due to conduction over the body diodes.
- The interface selection connector is read at start-up to configure the IC. To switch between parallel and serial SPI or direct, change the jumper position and press the reset button to reinitialize the IC.
- The serial mode selection connector can be changed while the IC is active.
- When the interface selection connector is set to “parallel” or “direct”, the serial mode selection connector must have no jumper mounted in order to not interfere with the signal exchanged in parallel mode.

2.8 ISOFACE™ GUI

A GUI is available for this evaluation board. The GUI will be available for download from the Infineon developer center. The controller mounted on the evaluation board has a preloaded USB firmware that is automatically recognized as a USB-standard HID profile device without the need for any driver installation. It is immediately recognized by the GUI when connected.

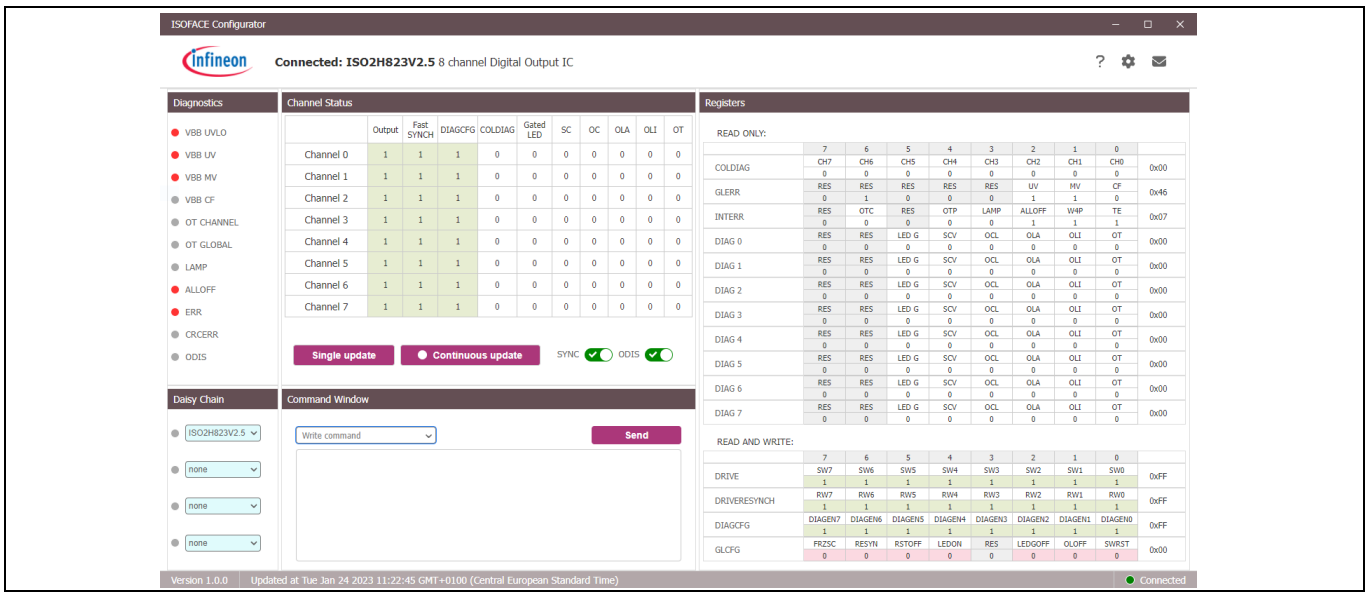

Figure 2 ISOFACE™ GUI layout

2.8.1 GUI setup

Once the installation file has been obtained, launch the executable and the GUI will appear on the screen. If a board is connected through the USB, it is automatically recognized and the name of the IC and the status will be displayed.

2.8.2 GUI description

The GUI consists of the following separate panels, as described below:

- Register panel (right side)
- Chanel status panel (center top)
- Diagnostic tab
- Command window

2.8.2.1 Register panel (right side)

The GUI shows the full register memory on the right side:

- Gray background bits: unavailable bits, reserved for the system
- White background bits: read-only bits, updated by the evaluation board
- Colored background bits: read–write clickable bits to change the status from 0 to 1 and vice versa

Every bit contains information about the channel and the diagnostics. They are described in detail in the datasheet.

2.8.2.2 Channel status panel (center top)

The information describing the channel's status shown in the registers panel is replicated in a more reader-friendly manner in this panel, referring to the channel and with an abbreviation that describes the status of the channel or diagnostics:

- Output: status of the output channel
- FAST synch: fast resynchronization of the channel
- DIAGCFG: configuration of channel diagnostics (1 – active/0 – inactive)
- COLDIAG: channel collective diagnostics
- Gate LED: channel LED in abnormal condition
- SC: short-circuit on channel
- OC: channel in overcurrent
- OLA: channel is active, but open/no load is detected
- OLI: channel is inactive, and no load is detected
- OT: channel in overtemperature shutdown

At the bottom of this panel there are two buttons:

- Single update button: acquires the full IC status once and refreshes the visual layout
- Continuous update button: acquires the full IC status and refreshes the visual layout continuously

There are also two toggles:

- ODIS: disables and turns off all channels
- SYNC: synchronizes all channels at the DRIVE register status (that is, functions in the IC to synchronize more than eight channels and multiple ICs are in the same application)

The same logic applies to the register tab: white items are only read; colored items are clickable to control the IC registers.

2.8.2.3 Diagnostic tab

The information reflecting the IC global diagnostics in the registers panel is replicated in a more reader-friendly manner in this panel, with the following details:

- V_{BB} UVLO: no voltage is provided at output-side supply connection
- V_{BB} UV: output-side voltage supply is relatively lower than normal range
- V_{BB} MV: output-side voltage supply is critically lower than normal range
- V_{BB} CF: at least one channel is interested by one diagnostic event
- OT channel: at least one channel is interested by a thermal diagnostic event
- OT global: the IC is in overtemperature
- LAMP: warning for one incandescent lamp detected at one channel
- ALLOFF: all channels are in off status
- ERR: at least one diagnostic event is present
- CRCERR: the last communication between the IC and controller has been disturbed
- ODIS: channel disable is active

This tab is for display only; no item is clickable.

2.8.2.4 Command window

This panel contains a serial terminal interface emulator to provide a script command to read or write one single register or the status of the IC.

Available commands:

- *READ(xxxx)* with xxxx as the name of the register (referring to the IC datasheet): reads the register content
- *WRITE(xxxx,yy)* xxxx:register name: writes the register with yy hexadecimal content
- *IC?*: gets the ISOFACE™ product connected
- *MODE?*: gets the selected interface
- *SW?*: gets the firmware version
- *FLAGS?*: gets the IC pin status

Important notes:

Be aware that interaction with the PC can apply 24 V to the output connection. Make sure to work in a safe and reliable way, because there are electrical and thermal dangers associated with loads attached to the evaluation board. Please be safe.

3 Board documentation

3.1 Schematics

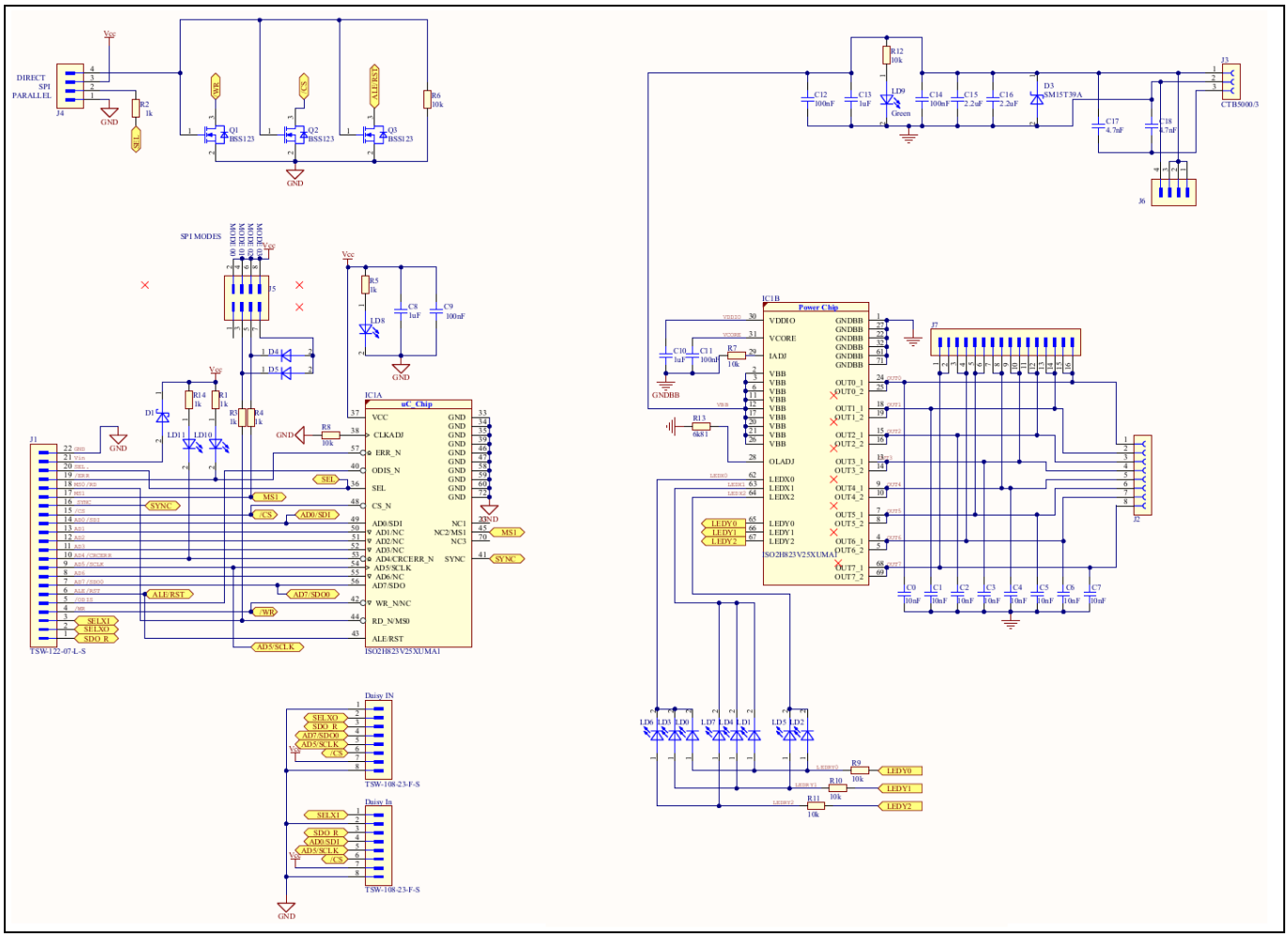

Figure 3 IC board schematics

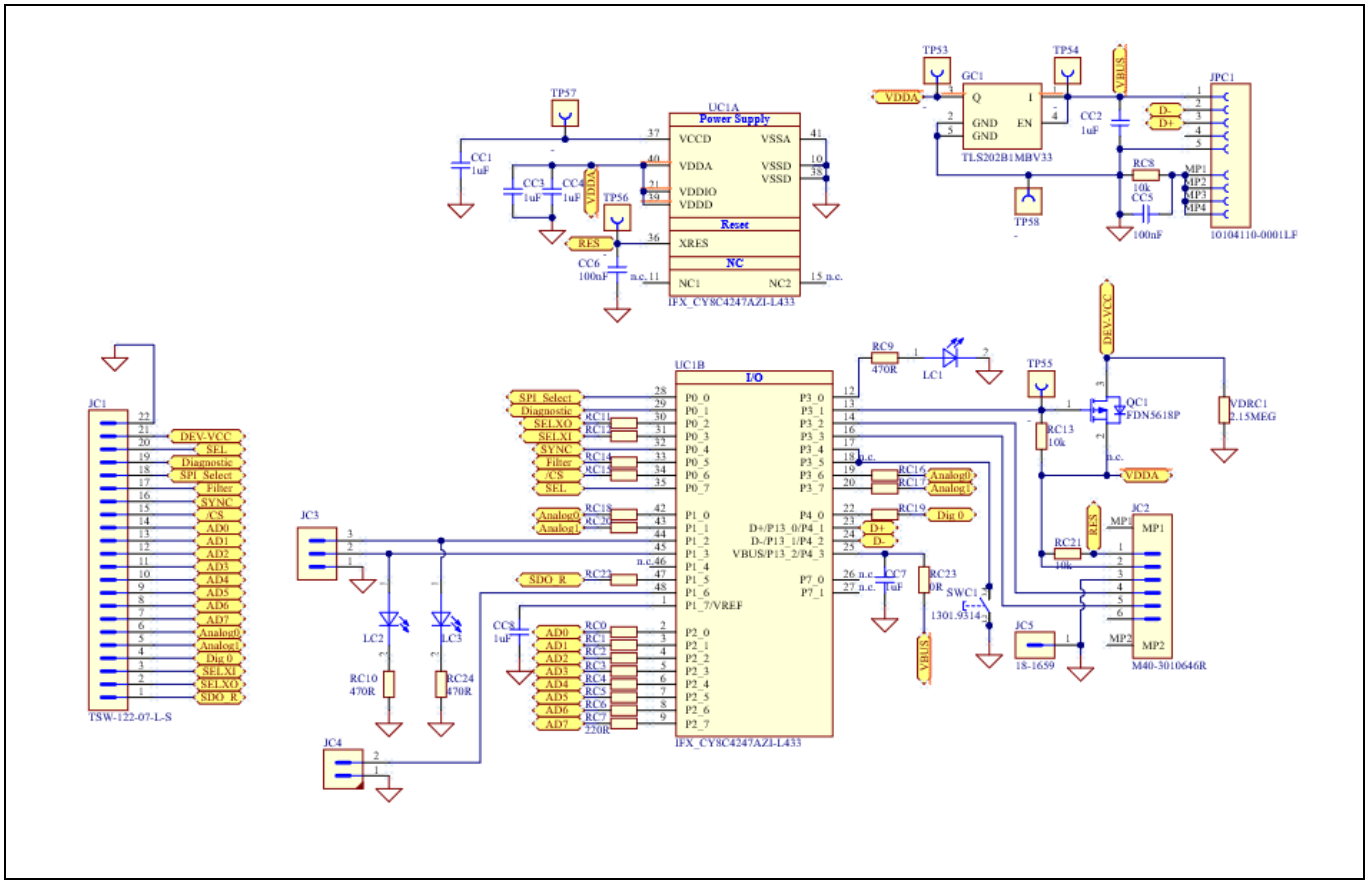

Figure 4 Controller PSoC4 schematics

3.2 Bill of materials

Table 2 IC board bill of materials

Part	Value	Package
R1, R2, R3, R4, R5, R14	1 kΩ	0805
R6, R7, R8, R9, R10, R11, R12	10 kΩ	0805
R13	6.81 kΩ	0805
C0, C1, C2, C3, C4, C5, C6, C7	10 nF 10% 100 V X7R	0805
C8, C10	1 µF 10% X5R 16 V	0805
C9, C11	100 nF 20% X7R 16 V	0805
C12, C14	100 nF 20% X7R 100 V	0805
C13	1 µF 10% 100 V X7S	0805
C15, C16	2.2 µF 10% 100 V X7R	1812
C17, C18	4.7 nF 1 kV 5% U2J	1812
D1	0 Ω resistor	SOD-123FL
D4, D5	BAT165 [or LL4148]	SOD-80
D3	SM15T39A	SMC
LD0, LD1, LD2, LD3, LD4, LD5, LD6, LD7, LD8, LD9	KP-2012CGCK	0805
LD10, LD11	KP-2012SRC-PRV	0805
Q1, Q2, Q3	BSS123	SOT-23
IC1	ISO2H823V2.5	
J1	Header 2.54 mm 22p x 1 row straight	
J2	Not mounted	
J3	Not mounted	
J4, J6	Header 2.54 mm 4p x 1 row straight	
J5	Header 2.54 mm 4p x 2 rows straight	
J7	Header 2.54 mm 16p x 1 row straight	
Daisy in	Header 2.54 mm 8p x 1 row 90 degrees	
Daisy out	Header 2.54 mm 8p x 1 row 90 degrees female	

Table 3 Controller board bill of materials

Part	Value	Package
RC23	Resistor 0 R	0603
RC8, RC13, RC21	Resistor 10k 1%	0603
RC0, RC1, RC2, RC3, RC4, RC5, RC6, RC7, RC11, RC12, RC14, RC15, RC16, RC17, RC18, RC19, RC20, RC22	Resistor 220 R 1%	0603
RC9, RC10, RC24	Resistor 470 R 5%	0603
CC1, CC2, CC3, CC4, CC7, CC8	Ceramic capacitor 1 µF 16 V ±10% X5R	0805
CC5, CC6	Ceramic capacitor 0.1 µF 100 V ±10% X7R	0805
LC1, LC2, LC3	LED red 20 mA, 1.9 V, 640 nm	0805
GC1	TLS202B1MBV33 fixed LDO voltage regulator 3.3 V 150 mA	SCT-595-5
QC1	FDN5618P power MOSFET P-channel 60 V 1.2 A 0.17 Ω	Super SOT
UC1	CY8C4247AZI-L433	TQFP 48
JC1	Header male 22 positions 2.54 mm pitch	
JC2	M40-3010646R programmer connector SIL SMT MALE 6-way	
JC3	Header male 3 positions 2.54 mm pitch	
JC4	Header male 2 positions 2.54 mm pitch	
JC5	Header male 1 positions 2.54 mm pitch	

Revision history

Document version	Date of release	Description of changes
V 1.0	2023-03-14	Initial release

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