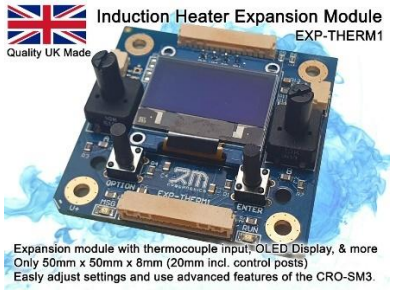
Expansion Board & UI for CRO-SM3

EXP-THERM1

OLED Display, buttons, analogue controls, & thermocouple amplifier



** CRO-SM3-PRO version required for some advanced features.*
*** Approximately*

Features and Specifications

- Add-on interface for the CRO-SM3 & CRO-SM3-PRO*
- Adds menu-based controls for automated features
- Integrated Type-K thermocouple amplifier (0-1000°C)**
- Powered from the CRO-SM3 internal 5V rail, no additional power needed.

Example Applications

- Automated Heating
- Remote Control
- Temperature monitoring & regulation
- Frequency monitoring
- Power monitoring & control

Typical Usage

The EXP-THERM1 adds a whole range of features to the CRO-SM3-PRO induction heater module when used together.

Enables easy access to the advanced operating modes and power information.

The EXP-THERM1 expansion board allows for easy access to a wide range of integrated features through the simple GUI on a small OLED display. This module is powered via the 15-way connector and can be mounted on top of other modules in a stack, or mounted separately as a remote control. Also included is a type-k thermocouple amplifier for easy setup of temperature measurement and regulation up to 1000°C. When used with a CRO-SM3-PRO, thermocouple readings can be viewed on the onboard display or accessed through the 5 V logic-level UART serial interface.

The EXP-THERM1 is a reference expansion/control board showing how custom user interfaces can be built for the CRO-SM3 range. A functional diagram is provided as a reference for users developing their own compatible control circuits. The 5V supply from the CRO-SM3 is intended for low-current interface circuitry only. Do not use it to power external loads.

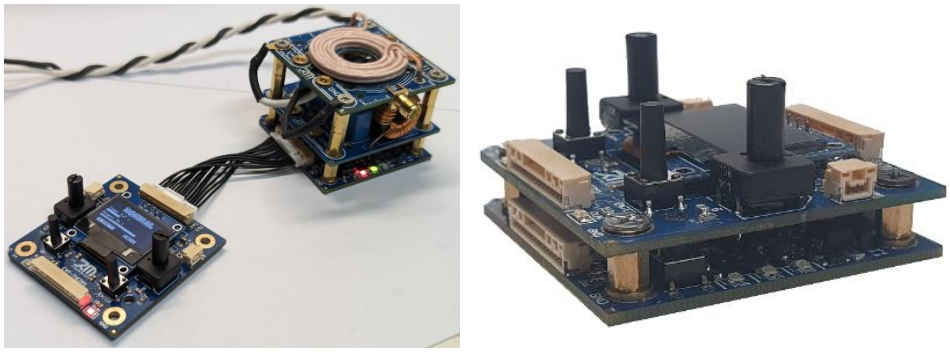


Figure 1: Example connections between modules

Specifications

Parameter	Value
Supply Voltage	5 V (from CRO-SM3 expansion port)
Logic Level	5 V
Display	128 x 64 I²C OLED (addr. 0x3C) [SSD1306]
Controls	2x Push Button, 2x potentiometer
Thermocouple Input	Type-K (0-1000°C)
Thermocouple Amplifier	AD8495
Main connector	15-way JST GH
Therm/AUX connectors	2-way JST GH

Table 1: System spec

Connections

The main connections are made via the 15-way connector at the edge of the PCB (cables sold separately). Either of the 15-way connectors can be used, and the one not connected to the CRO-SM3 is then available for your own custom connections such as serial and other control signals.

The diagram below shows the main components of the EXP-THERM1. For simplicity most additional parts like resistors and filter caps are not shown. Resistors R9 and R10 are not placed on the PCB and are left so that optional biasing components can be fitted if required.

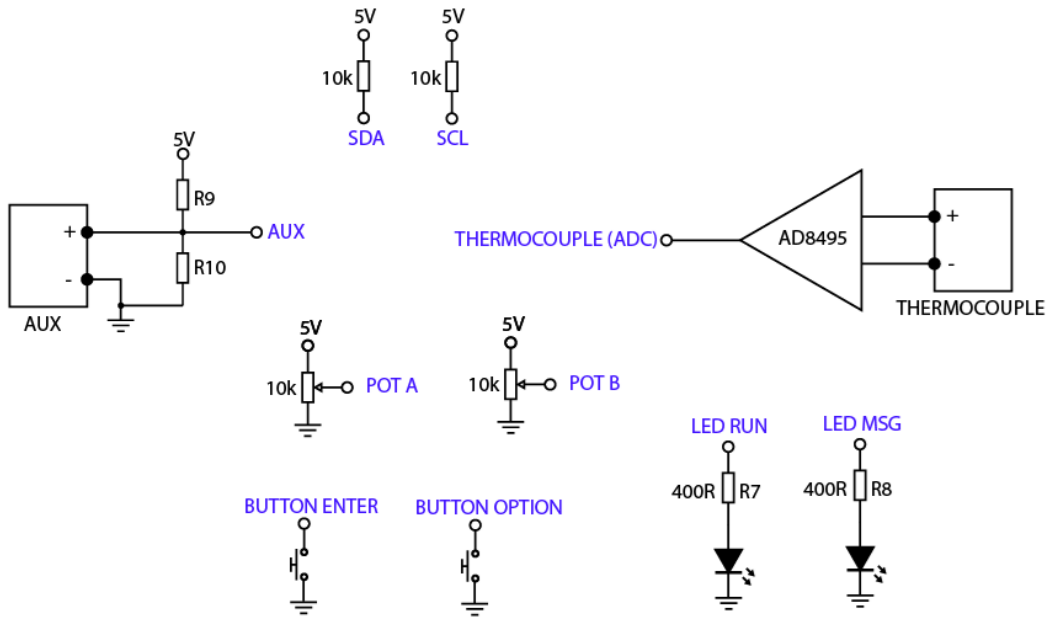


Figure 2: EXP-THERM1 Functional Diagram

There are also two 2-way connectors that can be used in multiple ways. The rightmost connector (THERM) is for directly connecting a type-k thermocouple, while the left connector (AUX) is for devices which will operate in different ways depending on the settings used. This can be a digital input/output, or an analogue input. See the CRO-SM3-PRO datasheet for full details.

The 15-way JST GH connector allows for simple interfacing with other devices and sensors. All logic levels are 5V, so only connect devices that are 5V tolerant.

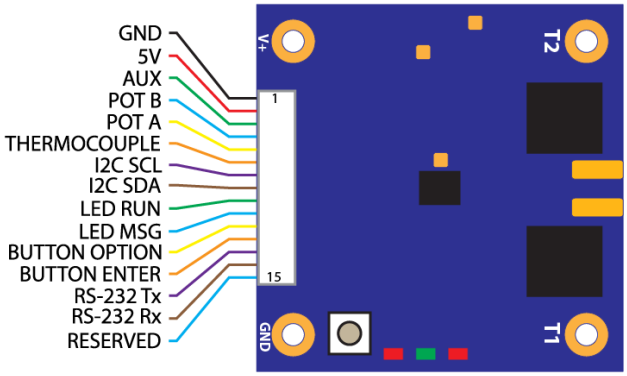


Figure 3: CRO-SM3 port pinout

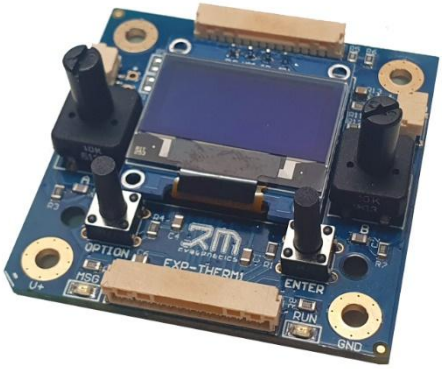
Pin	Function
1	***GND*** Common connection to ground / 0V
2	***5 V*** Connects to internal 5V rail via 10R resistor
3	***AUX*** ***(PRO only)*** Multifunctional I/O
4	***POT B*** ***(PRO only)*** ADC input for potentiometer on external control module (analogue 0 - 5V)
5	***POT A*** ***(PRO only)*** ADC input for potentiometer on external control module (analogue 0 - 5V)
6	***THERMOCOUPLE*** ***(PRO only)*** ADC input from thermocouple amplifier on external control module
7	***I²C SCL*** Connection for external 128 x 64 OLED display.
8	***I²C SDA*** Connection for external 128 x 64 OLED display.
9	***LED-RUN*** Signal for RUN LED on external control module (high when system is on)
10	***LED-MSG*** Signal for MSG LED on external control module (pulses high to indicate errors, changes, or serial activity)
11	***BUTTON-OPTION*** ***(PRO only)*** Input for OPTION button. Active Low with internal pullup enabled
12	***BUTTON-ENTER*** Input for ENTER button. Active Low with internal pullup enabled
13	***Serial Tx*** ***(PRO only)*** Serial interface for remote control. Connect this to Rx on your controlling device
14	***Serial Rx*** ***(PRO only)*** Serial interface for remote control. Connect this to Tx on your controlling device
15	***Factory Use Only***

Table 2: Pinout for 15-way connector

The 15-way female socket on the CRO-SM3 is a JST “SM15B-GHS-TB”. The male plug housing to fit this is JST part number “GHR-15V-S” which uses crimp terminals “SSHL-002T-P0.2” The 2-way connector housing is “SM2B-GHS-TB”. A selection of ready-made cables are available on our website.

When the CRO-SM3 is powered on, it will automatically detect the EXP-THERM1 and then adjust its operation accordingly. Detection of the module is based on detecting the pullup resistors used for the I²C OLED display. When detected, the CRO-SM3 will default to using the display and controls on the EXP-THERM1. The controls can be disabled or settings manually adjusted via serial. If building your own controller and wish for it to be auto detected in the same way, ensure you include pullup resistors between the I2C pins and the internal 5V rail. These resistors should be between 4.7 kΩ and 10 kΩ.

Controls & Display



Onboard controls include two push buttons and two potentiometers. The function of each will depend on the currently operating mode of the CRO-SM3-PRO. Typically, the left “OPTION” key is used to select different modes. The “ENTER” key is typically used in place of the on/off button the CRO-SM3 and will perform the same function. Pressing it once will toggle on/off the output power

Most operating modes will follow a standard layout for the display. In the lower left corner, the measured resonant frequency is shown, while in the lower right, the measured power or other relevant parameter is displayed. Numbers and bar graphs are used to show the main settings used by the pots. These could be parameters such as heating time and heating power or temperature.

Control	Function
Option Button	Short Press: Toggle between main display and diagnostic info Long Press: Select next operating mode
Enter Button	Toggle on/off the system
Pot A	Varies with operating mode. Usually sets output PWM duty
Pot B	Varies with operating mode.

Table 3: Controls and their function
NB: Additional operating modes require CRO-SM3-PRO.

Full details of operating modes are available in the CRO-SM3-Pro Datasheet

Related Products

Micro Induction Heater	CRO-SM3
Modular MMC Tank Capacitors	DT-200
Induction Expansion Module	EXP-THERM1
Induction Coil Mount	IHC-50
Micro JST Cables	CAB-JSTGH
Custom Induction Coils	IHC-CUST
Litz Wire	LITZ
Ferrite Powders	FP-NIZNMNZN
Non-magnetic Mounting Kit	NMMK-M3
100uH 15A Choke	CHK-15A

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