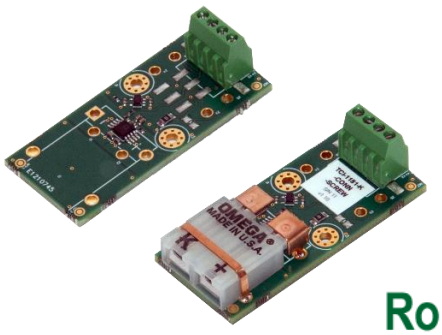
Thermocouple Interface Board



RoHS COMPLIANT

General Description:

The TCI-1181 is a very small thermocouple readout circuit, which amplifies and linearizes the thermocouple output. It's designed to work in conjunction with our TEC Controller products configured with a -VIN1 input, thus extending the palette of sensor types available to users of our TEC Controllers.

Product Highlights:

- Easy to use, minimal setup required.
- Provides a way to easily interface our TEC Controllers with thermocouple sensors for many typical applications.
- Very small dimensions.
- Compatible with all -VIN1 controllers.

Applications:

- Interfacing thermocouple sensors with Meerstetter TEC Controllers configured with -VIN1 input.
- Analog readout of thermocouple sensors.

Features

Main Features:

- Power supply can be provided directly by a TEC Controller in -VIN1 configuration, so a very compact setup is possible.
- Only a few software settings need to be adapted, so it's compatible with existing -VIN1 TEC Controllers.

Special Requirements / More Information:

- Please contact us for additional information or customization.

Absolute Maximum Ratings	
Supply voltage (DC)	5.5 V

Operating Ratings	
Board Temperature	0 – 50°C
Humidity	5 – 95%, non-condensing

Electrical Characteristics

Unless otherwise noted: T_A = 25 °C, V_{IN} = 5 V

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Units
DC Power Supply:						
V_{PWR}	Supply Voltage	Single Supply	2.7		5.5	V
Thermocouple Input:						
	Voltage Range		-0.2		$V_{PWR} - 1.6$	V
Output:						
V_{out}	Voltage Range		0.025		$V_{PWR} - 0.1$	V

Temperature Measurement Characteristics (-K option)

Range specifications valid with isolated TC only. T_{MJ} = temperature at the measurement junction.

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Units
	Operating Temperature	For specified performance, beyond this temperature the linearization error is not specified	0		50	°C
	Measurable Temperature	$V_{PWR} = 4.5V$	-195		700	°C
	Ambient Temperature Rejection	0-50°C Change in measurement output for given change in board temperature.			0.05	°C
	Temperature Offset/Initial Accuracy	$< 3°C$ by design (excl. sensor's offset), all junctions at 25°C, actual accuracy can be greatly improved by one-point calibration			3	°C
	Linearization Error	$T_{MJ} = 0°C \ldots 40°C$			± 0.4	°C
	Linearization Error	$T_{MJ} = -25°C \ldots 400°C$			± 2	°C
G_{err}	Gain Error	Error = $G_{err} \times (T_{MJ} - 25°C)$			0.3%	°C°/C
$CnvF_{nom}$	Nominal Conversion Factor	Nominal differential output voltage $V_{out} = T_{MJ} \times CnvF_{nom}$		5		mV/°C

Ranges when used in combination with TEC Controllers (voltage input configuration):

TEC Model	ADC Chip	ADC Supply (AVDD)	Min	Max	Units
TEC-1089	ADS1247	3.3 V	-195	320	°C
TEC-1090					
TEC-1122					
TEC-1123					
TEC-1091	ADS1220	5 V	-195	400	°C
TEC-1092					
TEC-1161					

Characteristics when used in combination with TEC Controllers:

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Units
$T_{OBJ,NOISE}$	Peak-to-Peak Noise	Example measurement with ADS1220, 400 mm cable to TCI-1181-K, 1500 mm cable to junction.		**0.014**		K

Temperature Measurement Characteristics (-KH option)

Note: temperature ranges are nominal, the linearization error grows greatly beyond 400°C. Calibration at the desired setpoint for a limited range might be needed for reasonable accuracy.

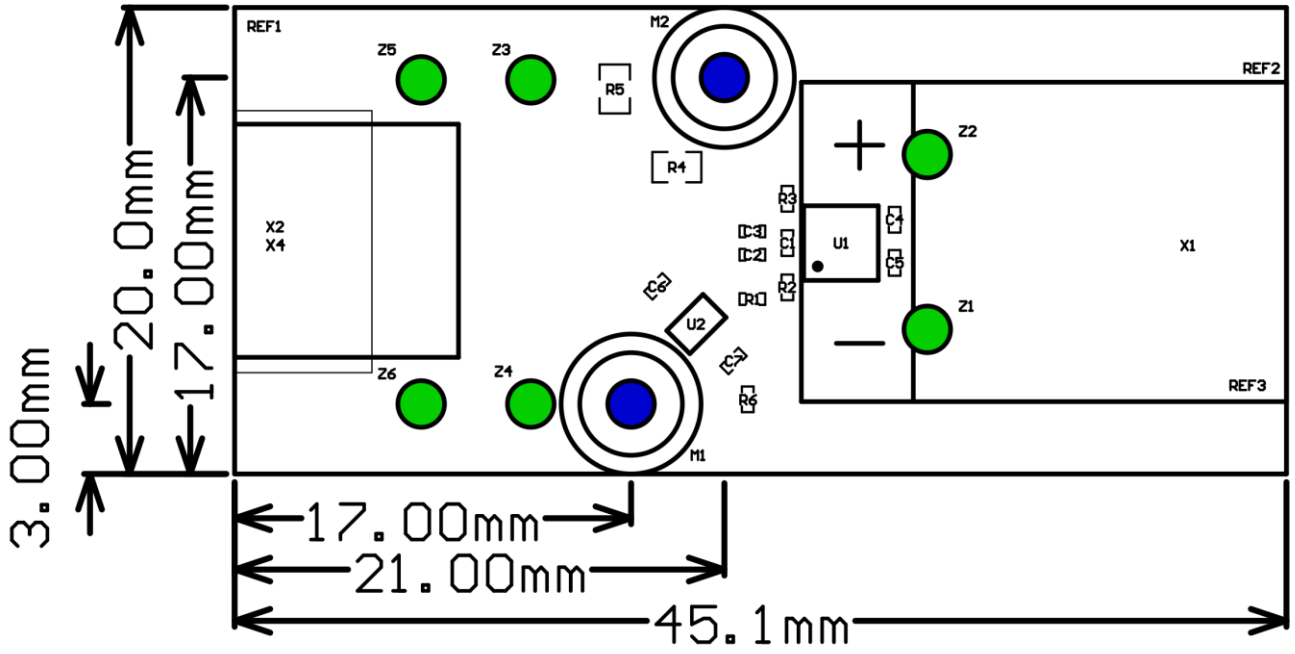
Range specifications valid with isolated TC only. T_{MJ} = temperature at the measurement junction.

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Units
	Operating Temperature	For specified performance, beyond this temperature the linearization error is not specified	0		50	°C
	Measurable Temperature	$V_{PWR} = 4.7V$	5		920	°C
	Ambient Temperature Rejection	0-50°C Change in measurement output for given change in board temperature.			0.05	°C
	Temperature Offset/Initial Accuracy	$< 3°C$ by design (excl. sensor's offset), all junctions at 25°C, actual accuracy can be greatly improved by one-point calibration			3	°C
	Linearization Error	$T_{MJ} = 0°C \ldots 40°C$			± 0.4	°C
	Linearization Error	$T_{MJ} = -25°C \ldots 400°C$			± 2	°C
G_{err}	Gain Error	Error $= G_{err} \times (T_{MJ} - 25°C)$			0.3%	°C/°C
G_{err2}	Additional Gain Error	Error $= G_{err} \times T_{MJ}$	0%		1.13%	°C/°C
$CnvF_{nom}$	Nominal Conversion Factor	Nominal differential output voltage $V_{out} = T_{MJ} \times CnvF_{nom}$		2.17105		mV/°C

Ranges when used in combination with TEC Controllers (voltage input configuration):

TEC Model	ADC Chip	ADC Supply (AVDD)	Min	Max	Units
TEC-1089	ADS1247	3.3 V	5	540	°C
TEC-1090					
TEC-1122					
TEC-1123					
TEC-1091	ADS1220	5 V	5	760	°C
TEC-1092					
TEC-1161					

Pin Configuration and Mechanical Data



Top view of the board.

- The PCB can be mounted with the mounting holes (shown in blue, distances shown in picture) with M2 screws and spacers. The bottom of the board has no components.
- X1 Thermocouple connector (optional): Omega PCC-SMP-K
  Miniature Thermocouple Connector, mates with common thermocouples
  Farnell P/N 2810611
  No Connector version: solder the negative terminal to hole Z1 and the positive terminal to hole Z2.
- X4 Device connector: screw header. Alternate connector available on request.

Pinout (pin 1 is at the bottom in the above picture):

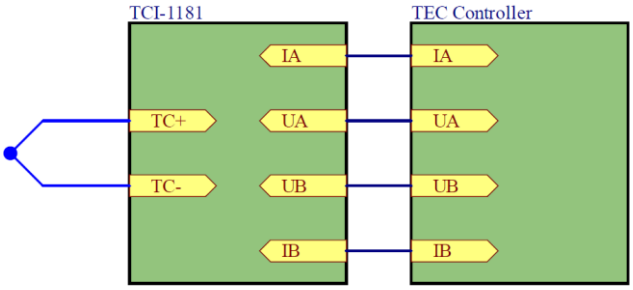
Pin	Pin Name	Function	Connect to TEC Controller Pin
4	TOIA	Positive Supply	IA
3	TOIB	GND	IB
2	TOUA	Positive Output Terminal	UA
1	TOUB	Negative Output Terminal	UB

Direct wire soldering (compatible with connectors):

Hole	Pin Name	Function	Connect to TEC Controller Pin
Z3	TOIA	Positive Supply	IA
Z4	TOIB	GND	IB
Z5	TOUA	Positive Output Terminal	UA
Z6	TOUB	Negative Output Terminal	UB

Operation-Modes / Theory of Operation

The device provides a nominally linear temperature-to-voltage conversion, by linearizing the TC curve. The linearization is optimized for a limited measurement range. This allows to connect K-type TC sensors to TEC Controllers with a -VIN1 configuration, by setting the appropriate voltage-to-temperature conversion factor (0.005 V/°C) and offset (0 if no calibration data is available) in the TEC Controller.



Typical application

TCI-1181 Ordering Information, Hardware Configuration

Example Configuration: **TCI-1181-K-NC-SCREW**

Thermocouple Connector:
- NC (no connector)
- MC (standard mini socket)

Board Connector:
- NC (no connector)
- SCREW (screw header)

TC Type:
- K (K-Type, standard temperature range)
- KH (K-Type, high temperature range)

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