



# TC1 Measurement & Simulation Modules Thermocouple and RTD Measurement Function Modules

## 8 Channels Thermocouple, Independent 24-bit Sigma-Delta type

A thermocouple is a temperature-measuring device typically consisting of two dissimilar conductors that contact each other at one or more spots. It produces a voltage when the temperature of one of the spots differs from the reference temperature on other parts of the circuit. Thermocouple temperature sensors are widely used for measurement and control, and can also convert a temperature gradient into electricity.

In contrast to most other methods of temperature measurement, thermocouple modules are self-powered and require no external form of excitation. The biggest limitation with the thermocouple is accuracy; system errors of less than 1° C can be difficult to achieve. Thermocouples are suitable for measuring over a large temperature range, up to 2300° C. Applications include temperature measurement for rocket and/or jet engines, gas turbine exhaust, diesel engines, and other MIL/AERO/INDUSTRIAL embedded or test processes. They are arguably less suitable for applications where smaller temperature differences need to be measured with high accuracy (i.e., the range 0 – 100° C with 0.1° C accuracy). For such applications resistance temperature detectors may be more suitable.

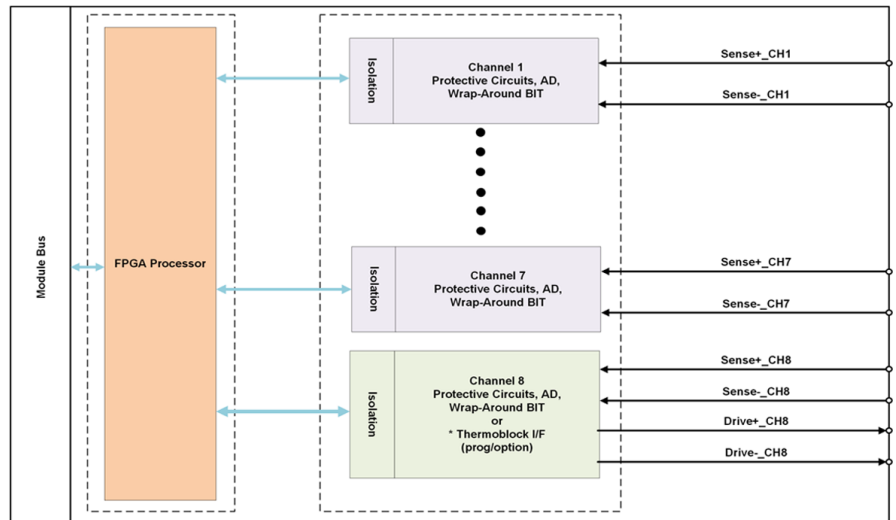
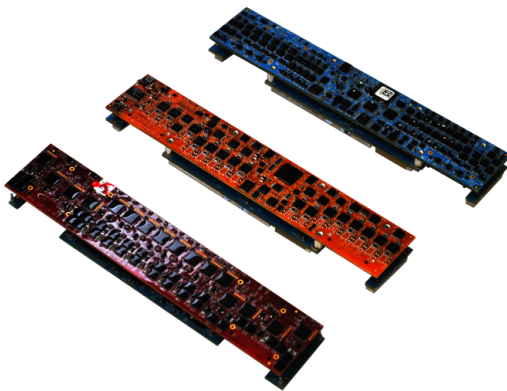
### External Thermo-block Interface

[View ACC-ISO-THERM-BLK2 Datasheet](#)

Equipped with an externally mounted (~3.0" x 1.75" x 0.75") iso-thermal interface/terminal block (optional accessory) for housing a cold-junction-compensation temperature sensor, the TC1 has a direct interface and automatically provides compensated measurements at accuracies up to ±0.2° C. As an option for certain rugged embedded systems and applications, the junction temperature offsets may be directly programmed for standalone operation or via ambient/junction temperature measurement by other means including internal temperature sensor.

The fundamental design is based on independent 24-bit Sigma-Delta A/D converters for each channel; therefore, the TC1 can be alternatively programmed and used for direct precision, low voltage measurements (±100 mV) in other low-voltage range A/D applications (i.e., shunt resistor voltage/current sense measurements).

The TC1 is designed for rugged, embedded “on-the-move” or laboratory-grade environments, and provides continuous Background Built-in-Test (BIT) capabilities for accuracy and “open” detection monitoring and flagging.



\* CH8: Programmable as TC channel 8 or optional Thermoblock Accessory I/F

### Specifications

Number of Channels	Eight for thermocouple measurement
Input Interface	Independent differential input channels
A/D Converter	Independent 24-bit Sigma-Delta type (one for each channel)
Temperature Range	NIST temperature range (J, K, T, E, N, B, R, S thermocouple types)
Voltage Measurement Range	±78.125 mV to an accuracy of ± 25 µV over operational temperature of -40 to 85° C
Overvoltage Input Tolerance	±4 V continuous, ±50 V momentary duration limited to 100 ms (applied at signal input)
50/60 Hz Noise Rejection	> 70 dB
CMR	85 dB (minimum)
Differential Input Impedance	>10 KΩ
Digital Output	IEEE 754-2008 (binary32) programmable for ° C, ° F (programmed for temperature), 24-bit (signed), based on % FSR (±78 mV) (programmed for A/D)
Accuracy	Based on minimum update rate and w/thermocouple block I/F compensation; ±0.2° C (Type J/N), ±0.3° C (Type K), ±0.3° C (Type T/E), ±0.3° C (Type R/S), ±0.9° C (Type B), ± 0.2% FSR (programmed for raw A/D digital output)
Resolution	0.01° (programmed for temperature)
Sample Rate	Programmable between 3-4800 Hz
Thermo-Block Interface	Optional thermocouple interface for connection of up to 7 thermocouple sensors. Pt100 RTD sensor for cold junction compensation temperature.
BIT (Built-In-Test)	Continuous background 'online' accuracy, OPEN detection capability.
ESD Protection	Designed to meet the testing requirements of IEC 801-2 Level 2. (4 kV transient with a peak current of 7.5 A and a Tc of approximately 60 ns)
Power	+5 VDC @ 480 mA typ.
Ground	Independent channels (common internal return), isolated from system ground.
Weight	1.5 oz. (42 g)

### Architected for Versatility

NAI's Configurable Open Systems Architecture™ (COSA®) offers a choice of over 100 smart I/O, communications, or Ethernet switch functions, providing the highest packaging density and greatest flexibility of ruggedized embedded product solutions in the industry. Preexisting, fully-tested functions can be combined in an unlimited number of ways quickly and easily.

### One-Source Efficiencies

Eliminate man-months of integration with a configured, field-proven system from NAI. Specification to deployment is a seamless experience as all design, state-of-the-art manufacturing, assembly and test are performed - by one trusted source. All facilities are located within the U.S. and optimized for high-mix/low volume production runs and extended lifecycle support.

### Product Lifecycle Management

From design to production and beyond, NAI's product lifecycle management strategy ensures the long-term availability of COTS products through configuration management, technology refresh and obsolescence component purchase and storage.

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