# 10D-xTC

## Linearized Thermocouple Input, Analog-Sensor-to-Digital Front End Signal Conditioner

## DESCRIPTION

10D-xTC linearized thermocouple input modules are designed to interface with a wide range of standard thermocouple types commonly used in industrial test and measurement applications. Supported thermocouple types include J, K, T, R, and S.

Each module provides a single channel of differential analog input which is filtered, amplified, and converted to 24-bit digital data for precise measurement of sensor signals.

The module features industry-leading built-in cold junction compensation and delivers instrument class measurement accuracy across the entire industrial temperature range of –40°C to +85°C. For applications where sensor connection is made more than 1" away from the module, the module can be configured to use an external sensor.

Discrete output pins can be mapped to configurable low and high alarms to provide essential monitoring and warning functions to ensure optimum process flow and fail-safe operation.

Input-to-digital isolation is rated at a robust 1500Vrms and all field-side inputs are protected against accidental power-line connections up to 240Vrms. These features safeguard measurement and control equipment from the harmful effects of signal noise, transient surges, ground loops, and other industrial hazards.

Over-range and under-range up to 10% beyond specified input values are supported with accuracy guaranteed to ±full-scale. All 10D modules are housed in rugged thermoplastic packages.

## FEATURES

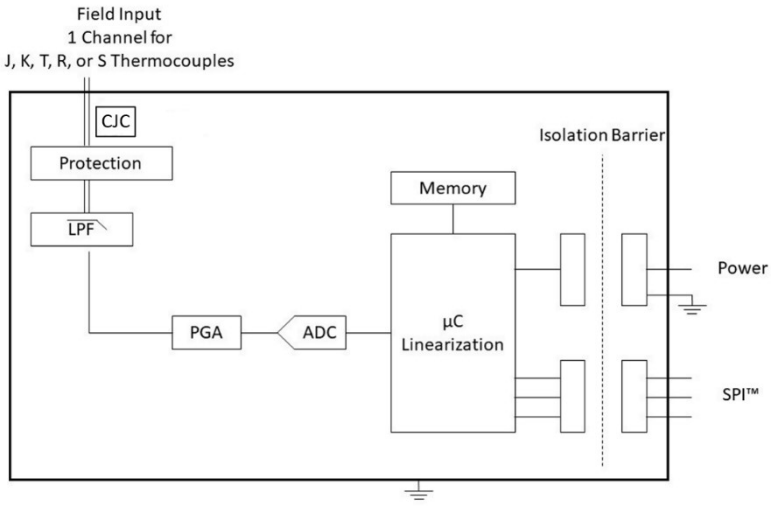
- Interface to Thermocouple Types: J, K, T, R, and S
- 1 Input Channel
- Configurable for Alarms and Averaging
- 1500Vrms Input-to-Digital Isolation
- Input Protected up to 240Vrms
- CE Compliant
- 24-Bit Resolution
- Operating Temperature: –40°C to +85°C

## BENEFITS

- Small Footprint
- Simplifies Sensor Interface and Signal Conditioning Design
- Reduces System BOM
- Provides Isolation of External Sensors
- Protects Sensitive System Components
- Breaks Ground Loops
- Reduces EMC Concerns

## APPLICATIONS

- Signal Conditioning
- Signal Isolation
- Signal Filtering
- Industrial Process Control
- Test and Measurement
- System and Signal Monitoring




10D-xTC Block Diagram

## Specifications

Typical* at $T_A$ = +25°C and +3.3VDC power

| Module | 10D-xTC-xxx-xx |
|---|---|
| 10D-xTC-xxx-xx | 1-channel Thermocouple Input |
| Input Range | See Ordering Information |
| Input Protection<br>Continuous<br>Transient | <br>240Vrms (max)<br>EN61000-6-2 |
| CMV<br>Input-to-Digital<br>Transient<br>CMR (50Hz or 60Hz)<br>NMR | <br>1500Vrms (max)<br>EN61000-6-2<br>120dB<br>40dB/decade |
| Accuracy | See Ordering Information |
| Stability<br>Offset<br>Gain | <br>±10ppm/°C<br>±50ppm/°C |
| Bandwidth, -3dB<br>Sampling Rate<br>Alarms<br>Open Input Response | 3Hz<br>1500 S/s<br>Low, High<br>Upscale |
| ADC Resolution<br>Discrete Inputs<br>Discrete Outputs<br>Discrete Output Drive Current<br>CJC<br>CJC Resolution | 24-bit<br>1<br>2<br>4mA<br>Local or Remote(3)<br>12-bit |
| Interface<br>Clock Input<br>SPI Mode<br>Bit Order | SPI(4)<br>1MHz (max)<br>1<br>MSB First |
| Power Supply Voltage<br>Power Supply Current | +3.0 to +5.25VDC<br>46mA |
| Mechanical Dimensions (h)(w)(d) | 0.350" x 2.00" x 1.00"<br>(8.89mm x 50.8mm x 25.4mm) |
| Environmental<br>Operating Temp. Range<br>Storage Temp. Range<br>Relative Humidity<br>Emissions EN61000-6-4<br>Radiated, Conducted<br>Immunity EN61000-6-2<br>RF<br>ESD, EFT | <br>–40°C to +85°C<br>–40°C to +85°C<br>0 to 95% Noncondensing<br>ISM, Group 1<br>Class A<br>ISM, Group 1<br>Performance A ±0.5% Span Error<br>Performance B |

## Ordering Information

| Model | TC Type‡ | Input Range | Output | Accuracy(2) | |
|---|---|---|---|---|---|
| 10D-JTC-1H1-01 | J | -100°C to +760°C | SPI | ±0.03% | ±0.26°C |
| 10D-JTC-1H1-02 | J | -100°C to +375°C | SPI | ±0.03% | ±0.14°C |
| 10D-JTC-1H1-03 | J | -100°C to +173°C | SPI | ±0.03% | ±0.08°C |
| 10D-JTC-1H1-04 | J | -23°C to +70°C | SPI | ±0.06% | ±0.06°C |
| 10D-KTC-1H1-01 | K | -100°C to +1350°C | SPI | ±0.03% | ±0.44°C |
| 10D-KTC-1H1-02 | K | -100°C to +633°C | SPI | ±0.03% | ±0.22°C |
| 10D-KTC-1H1-03 | K | -100°C to +304°C | SPI | ±0.03% | ±0.12°C |
| 10D-TTC-1H1-02 | T | -100°C to +400°C | SPI | ±0.03% | ±0.15°C |
| 10D-TTC-1H1-03 | T | -100°C to +209°C | SPI | ±0.04% | ±0.12°C |
| 10D-TTC-1H1-04 | T | -56°C to +97°C | SPI | ±0.06% | ±0.09°C |
| 10D-RTC-1H1-02 | R | 0°C to +1768°C | SPI | ±0.03% | ±0.53°C |
| 10D-RTC-1H1-03 | R | 0°C to +1040°C | SPI | ±0.05% | ±0.52°C |
| 10D-STC-1H1-02 | S | 0°C to +1768°C | SPI | ±0.04% | ±0.71°C |
| 10D-STC-1H1-03 | S | 0°C to +1123°C | SPI | ±0.05% | ±0.56°C |

## ‡Thermocouple Alloy Combinations

Standards: DIN IEC 548, ANSI MC96-1-82, JIS C 1602-1981

| Type | Material |
|---|---|
| J | Iron vs. Copper-Nickel |
| K | Nickel-Chromium vs. Nickel-Aluminum |
| T | Copper vs. Copper-Nickel |
| R | Platinum-13% Rhodium vs. Platinum |
| S | Platinum-10% Rhodium vs. Platinum |

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
(1) 240Vrms between +IN and -IN pins.
(2) Includes conformity, hysteresis and repeatability. Does not include CJC accuracy.
(3) Remote sense using 2N3906 PNP transistor.
(4) Refer to timing diagram in user manual.