instrumentos de medida

DT9805 and DT9806

USB Thermocouple Measurement Modules

The DT9805 and DT9806 **low-cost, isolated, USB data acquisition (DAQ) modules** feature integrated signal conditioning designed specifically for **thermocouple measurements**.

Key Features:

- **±500V galvanic isolation...**protects signal integrity
- **Built-in CJC** (cold-junction compensation)
- **High accuracy:** 0.20° C
- **Compatible** with B, E, J, K, N, R, S, T thermocouple types
- **16SE/8DI analog inputs,** 16-bit resolution
- **Up to 50kHz** sampling
- **16 DIO**, 2 C/T
- **Optional analog outputs:** 16-bits
- **Compatible** with LabVIEW and MATLAB
- **Includes free QuickDAQ software**...get up and running quickly

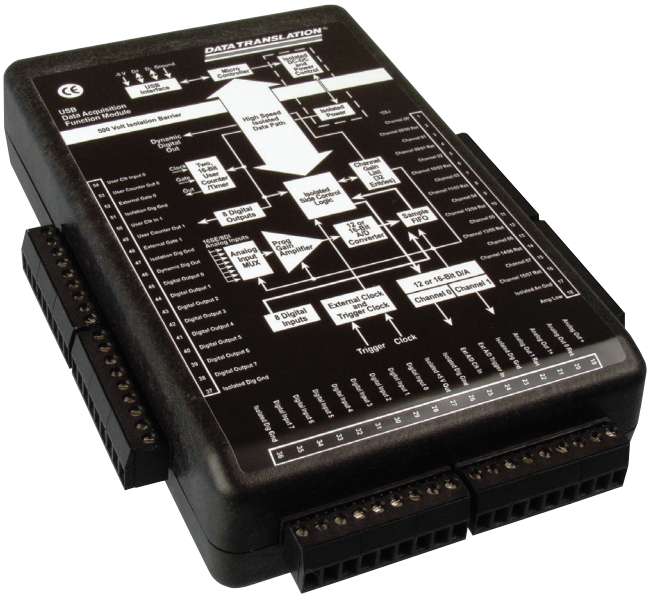

Figure 1. The DT9805 and DT9806 modules are ideally suited for plug-and-play thermocouple measurements. Pluggable screw terminal blocks allow you to connect thermocouples and other sensor types directly to the module.

Overview

The DT9805 and DT9806 bring true plug-and-play temperature measurements to PCs with USB 2.0 or 1.1 ports. Simply attach the DT9805 or DT9806 module to the PC using the supplied USB cable, directly connect up to 7 thermocouples to the screw terminals on the module, and run the free DT Thermocouple Measurement application. Linearized temperature data is returned in degrees C, F, or K. You don't have to open your computer or do any programming. It's that simple. All power is provided from the USB cable to the PC.

The DT9805 and DT9806 modules both feature a Cold Junction Compensation (CJC) channel, 7 differential analog input channels, 8 digital input lines, 9 digital output lines, and 2 counter/timer channels. In addition, the DT9806 provides 2 analog output channels for high-resolution, single-value output operations. To add more channels (up to 889 thermocouples), simply add more modules to your system using one or more USB hubs.

Specialized Analog Input Design

The DT9805 and DT9806 provide a CJC channel on analog input channel 0 that provides 10 mV/° C with an accuracy of 1° (from 5° to 45° C). Seven differential analog input channels are available for connecting B, E, J, K, N, R, S, or T thermocouple inputs. Thermocouple break detection is also provided to set the value to full-scale if an open circuit is detected at the input.

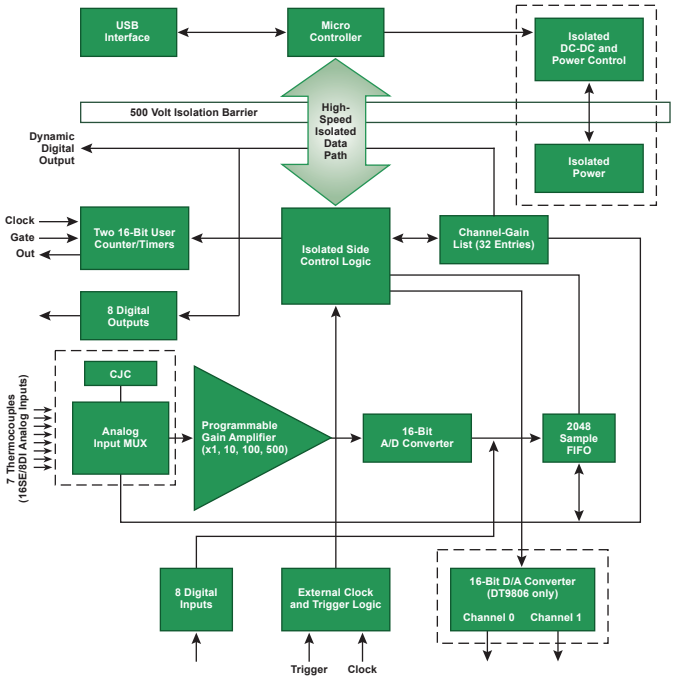

Figure 3. This block diagram shows all the subsystems and user-accessible signals of the DT9805 and DT9806 modules.

All analog inputs are multiplexed to a single 16-bit analog-to-digital (A/D) converter.

Four programmable gains (1, 10, 100, and 500) are provided to support input signal ranges of ±10 V, ±1 V, ±0.10 V, and ±0.020 V. For thermocouple inputs, which are typically in the range of 20 mV, DT9805 and DT9806 modules provide a dynamic range of 100,000:1 (100 db) to ensure that the input signals are amplified to the full ±10 V range of the A/D converter and digitized to 16 bits for maximum accuracy. Each channel is configurable, allowing you to mix and match input signals according to your needs. In addition, DT9805 and DT9806 modules support autoranging, where the software can determine the appropriate gain based on the input range you specify (in single-value mode).

The maximum sampling rate depends on the gain that is used: 50 kSamples/s when the gain is 1 or 10, 10 kSamples/s when the gain is 100, and 2 kSamples/s when the gain is 500. The minimum sampling rate is 0.75 Hz.

Flexible Acquisition Modes

Using the DT9805 or DT9806, you can acquire a single sample from a single analog input channel or multiple samples from multiple analog input channels. A 32-location channel-gain list gives you the flexibility to sample non-sequential analog input channels, analog input channels with different gains, and digital inputs with the analog input channels you want at the A/D sample rate.

The DT9805 and DT9806 provide two ways to cycle through the channel-gain list:

- **Continuous scan mode** – Choose this mode if you want to accurately control the period between conversions of individual channels in a channel-gain list.
- **Triggered scan mode** – Choose this mode if you want to accurately control both the period between conversions of individual channels in a channel-gain list and the period between each scan, or cycle, through the channel-gain list. This mode is useful when synchronizing or controlling external equipment or when acquiring a buffer of data on each trigger or retrigger.

High-Resolution Analog Outputs

The DT9806 module provide two DC-level analog output channels for single-value operations. A 16-bit digital-to-analog converter provides high-resolution output values with an output range of ±10 V.

Flexible Digital I/O Lines

The DT9805 and DT9806 modules feature 8 digital input lines for single-value operations. You can also read all the digital input lines simultaneously with the analog input channels at the A/D clocked rate. The digital input lines can be clock separately as the only channel in the channel-gain list at up to 50 kSamples/second.

Eight digital outputs are provided for single-value operations. A dynamic digital output line is also provided for synchronizing external devices. You can program the value of this line to change state as an analog input channel is read.

User Connections

Pin	Signal Description	Pin	Signal Description
1	Analog Input 00/CJC Circuit	28	Digital Input 0
2	Analog Input 08/00 Return	29	Digital Input 1
3	Analog Input 01	30	Digital Input 2
4	Analog Input 09/01 Return	31	Digital Input 3
5	Analog Input 02	32	Digital Input 4
6	Analog Input 10/02 Return	33	Digital Input 5
7	Analog Input 03	34	Digital Input 6
8	Analog Input 11/03 Return	35	Digital Input 7
9	Analog Input 04	36	Isolated Digital Ground
10	Analog Input 12/04 Return	37	Isolated Digital Ground
11	Analog Input 05	38	Digital Output 7
12	Analog Input 13/05 Return	39	Digital Output 6
13	Analog Input 06	40	Digital Output 5
14	Analog Input 14/06 Return	41	Digital Output 4
15	Analog Input 07	42	Digital Output 3
16	Analog Input 15/07 Return	43	Digital Output 2
17	Isolated Analog Ground	44	Digital Output 1
18	Amp Low	45	Digital Output 0
19	Analog Output 0+	46	Dynamic Digital Output
20	Analog Output 0 Return	47	Isolated Digital Ground
21	Analog Output 1+	48	External Gate 1
22	Analog Output 1 Return	49	User Counter Output 1
23	Isolated Digital Ground	50	User Clock Input 1
24	External A/D Trigger	51	Isolated Digital Ground
25	External A/D Sample Clock In	52	External Gate 0
26	Isolated Digital Ground	53	User Counter Output 0
27	Isolated +5V Out	54	User Clock Input 0

Programmable Clocks and Triggers

For starting analog input measurements, you can select either an internal or external trigger source. Select the internal trigger to start the operation based on a software command. Select an external trigger to start the acquisition based on an external event. To use the external trigger, connect a TTL-level signal to the screw terminal of the module labeled External A/D Trigger. The trigger occurs on the rising edge of this signal.

For pacing analog input measurements, you can select either the internal clock source provided by the module or an external clock source. An external clock is useful when you want to pace acquisitions at rates not available with the internal clock or when you want to pace at uneven intervals. To use an external clock, connect a TTL-level signal to the screw terminal of the module labeled External A/D Sample Clock In. Conversions start on the rising edge of this signal.

Multifunction Counter/Timers

DT9805 and DT9806 modules feature two 32-bit user counter/timers that you can use for event counting, frequency generation (continuous pulse output), one-shot, and repetitive one-shot operations. You can connect or cascade counters together either in software or by external connections to the screw terminals of the module. Programmable gates, clocks, and output signals are also supported.

±500V Galvanic Isolation Protects Your Data

Computers are susceptible to ground-spikes through any external port. These spikes can cause system crashes and may even cause permanent damage to your computer. DT9805 and DT9806 modules feature 500 Volts of galvanic isolation to protect your computer from ground-spikes and to ensure a reliable stream of data.

User Connections

The DT9805 and DT9806 modules provide pluggable screw terminal blocks for connecting all signals. You can remove these screw terminal blocks for easy wiring. Pin assignments are clearly marked on the module for quick setup.

Power

All power is provided through the USB cable to the module. No external power supply or battery is required.

QuickDAQ

QuickDAQ allows you to acquire and display from all Data Translation USB and Ethernet data acquisition devices that support analog input streaming. Combine QuickDAQ with Data Translation hardware to acquire data, record data to disk, display the results in both a plot and digital display, and read a recorded data file. Be productive right out of the box with this powerful data logging software. Data can be exported to other applications like Microsoft Excel® and The Mathworks MATLAB® for more advanced analysis. Two additional options can be purchased to add FFT analysis capabilities to the base package.

Key Features:

- **QuickDAQ Base Package (Free)**
  - Ready-to-measure application software
  - Configure, acquire, log, display, and analyze your data
  - Customize many aspects of the acquisition, display, and recording functions to suit your needs
- **FFT Analysis Option (License Required)**
  - Includes all the features of the QuickDAQ Base Package
  - Perform single-channel FFT operations including:
    - Auto Spectrum
    - Spectrum
    - Power Spectral Density
  - Configure and view dynamic performance statistics
  - Supports Hanning, Hamming, Bartlett, Blackman, Blackman Harris, and Flat Top response windows
- **Advanced FFT Analysis Option (License Required)**
  - Includes all the features of the QuickDAQ Base Package and FFT Analysis Package
  - Perform 2-channel FFT operations including:
    - FRF
    - Cross-Spectrum
    - Cross Power Spectral Density
    - Coherence
    - Coherent Output Power
  - Supports real, imaginary, and Nyquist display functions
  - Additional FFT analysis functions supported: Exponential, Force, Cosiner Taper
  - Save data to .uff file format

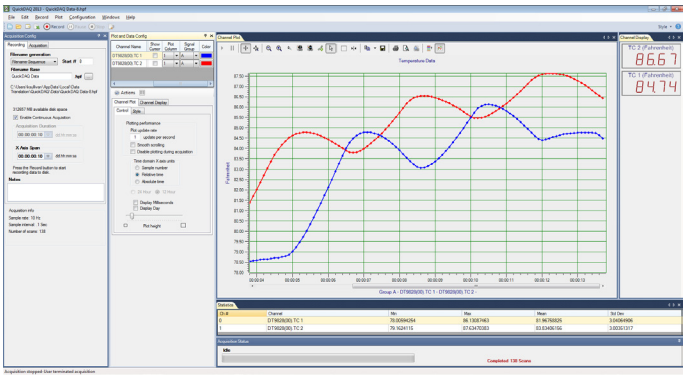

Figure 3: QuickDAQ ships free-of-charge and allows you to get up and running quickly.

Other Software Options

There are many software choices available for application development, from ready-to-measure applications to programming environments.

The following software is available for use with the DT9805 or DT9806 module and is provided on the Data Acquisition Omni CD:

- **Device Driver** –The device driver allows you to use a DT9805 or DT9806 module with any of the supported software packages or utilities.
- **Calibration Utility** – This utility allows you to calibrate features of a DT9805 or DT9806 module.
- **Quick DataAcq** application – The Quick DataAcq application provides a quick way to get up and running. Using this application, verify key features of the module, display data on the screen, and save data to disk.
- **DT-Open Layers® for .NET Class Library** – Use this class library if you want to use Visual C#® or Visual Basic® for .NET to develop application software using Visual Studio® 2003-2012; the class library complies with the DT-Open Layers standard.
- **DataAcq SDK** – Use the Data Acq SDK to use Visual Studio 6.0 and Microsoft® C or C++ to develop application software using Windows® XP/Vista/7/8; the DataAcq SDK complies with the DT-Open Layers standard.
- **DAQ Adaptor for MATLAB** – Data Translation's DAQ Adaptor provides an interface between the MATLAB® Data Acquisition (DAQ) toolbox from The MathWorks™ and Data Translation's DT-Open Layers architecture.
- **LV-Link** – Data Translation's LV-Link is a library of VIs that enable LabVIEW™ programmers to access the data acquisition features of DT-Open Layers compliant USB and PCI devices.

Cross-Series Compatibility

Virtually all Data Translation data acquisition modules are compatible with the DT-Open Layers® software standard. This means any application developed with one of Data Translation's software products can easily be upgrade to a new Data Translation module with little to no reprogramming needed.

Ordering Summary

HARDWARE

- **DT9805** — USB function module with 16-bit, 50 kS/s analog inputs
- **DT9806** — USB function module with 16-bit, 50 kS/s analog inputs and two 16-bit analog outputs

FREE SOFTWARE

- **QuickDAQ**
- **DAQ Adaptor for MATLAB** — Access the analyzation and visualization tools of MATLAB®.
- **LV-Link** — Access the power of Data Translation boards through LabVIEW™.

OPTIONAL SOFTWARE

- **QuickDAQ FFT Analysis Option** (License Required)
- **QuickDAQ Advanced FFT Analysis Option** (License Required)

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