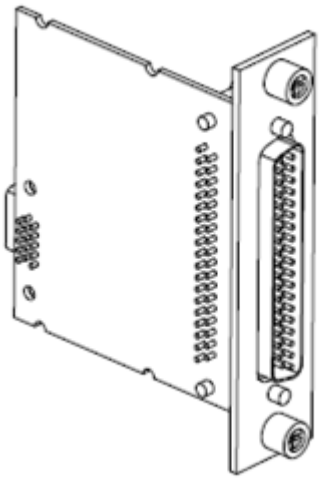
DATASHEET

MT E743

4 AI, ±25 mV/V, 24 Bit, 50 kS/s/ch Simultaneous, Bridge Completion



- 4 channels, 50kS/s per channel simultaneous AI
- ±25 mV/V input range, 24-bit resolution
- Programable half-and full-bridge completion with up to 10V internal excitation
- 60 VDC, Category I bank isolation
- D-SUB connectivity
- -40 °C to 70 °C operating range, 5g vibration, 50g shock

The MT E743 simultaneous bridge module for use with RobustRIO and FlexDAQ contains all the signal conditioning required to power and measure up to four bridge-based sensors simultaneously. The high sampling rate and bandwidth of the E743 offer a high-quality, high-speed strain or load measurement system with zero interchannel phase delay. With 60 VDC isolation and 1,000 Vrms transient isolation, the E743 has high-commom-mode noise rejection and increased safety for both the operator and test system. The E743 can perform offset/null as well as shunt calibration and remote sense, making the module the best choice for strain and bridge measurement.

MANGOTREE

MT E Series Overview

MT provides more than 20 E Series modules for measurement, control, and communication applications. E Series modules can connect to any sensor or bus and allow for high-accuracy measurements that meet the demands of advanced data acquisition and control applications.

- Measurement-specific signal conditioning that connects to an array of sensors and signals
- Isolation options such as bank-to-bank, channel-to-channel, and channel-to-earth ground
- -40 °C to 70 °C temperature range to meet a variety of application and environmental needs
- Hot-swappable

The majority of E Series modules are supported in both RobustRIO and FlexDAQ platforms and you can move modules from one platform to the other with no modification.

RobustRIO

RobustRIO combines an open-embedded architecture with small size, extreme ruggedness, and E Series modules in a platform powered by the Redefinable I/O (RIO) architecture. Each system contains an FPGA for custom timing, triggering, and processing with a wide array of available modular I/O to meet any embedded application requirement.

FlexDAQ

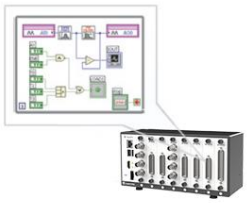
FlexDAQ is a portable, rugged data acquisition platform that integrates connectivity, data acquisition, and signal conditioning into modular I/O for directly interfacing to any sensor or signal. Using FlexDAQ with LabVIEW, you can easily customize how you acquire, analyze, visualize, and manage your measurement data.

Software

LabVIEW Professional Development System for Windows

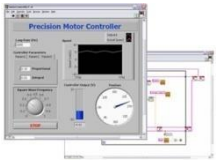
- Use advanced software tools for large project development
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables, and MSI installers

LabVIEW FPGA Module



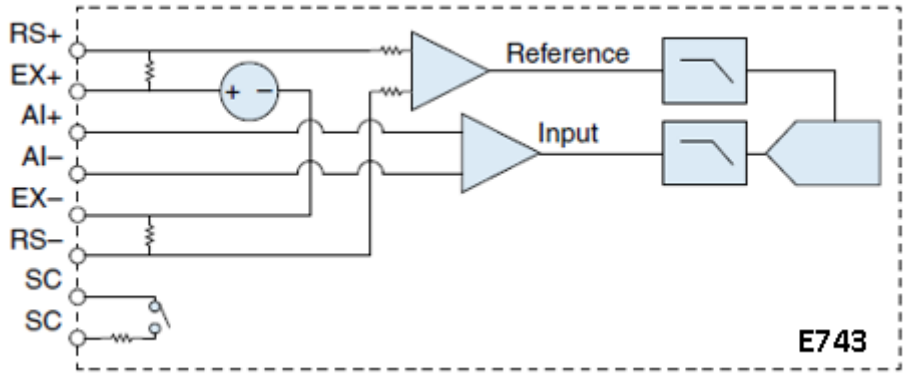
- Design FPGA applications for MT RIO hardware
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx IP generator functions

LabVIEW Real-Time Module



- Design deterministic real-time applications with LabVIEW graphical programming
- Take advantage of built-in PID control, signal processing, and analysis functions
- Automatically take advantage of multicore CPUs or set processor affinity manually
- Take advantage of real-time OS, development and debugging support, and board support

MT E743 Circuitry



Each channel on the MT E743 has an independent 24-bit ADC and an input amplifier that enable you to sample signals from all four channels simultaneously

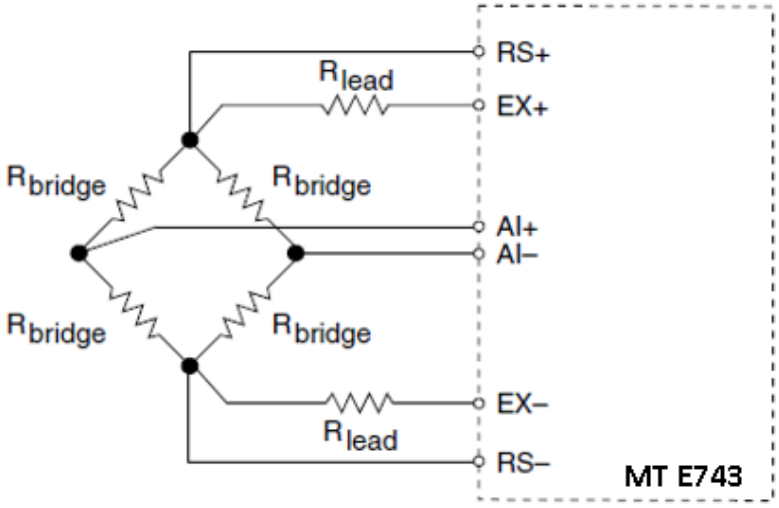
Connection Options to Correct for Resistance Erros

Wiring resistance can create errors in bridge circuits. The MT E743 provides two mechanisms to correct for these erroes: remote sensing and shunt calibration.

Remote Sensing

Remote sensing continuously and automatically corrects for errors in exciation leads, and generally is most appropriate for half-and full-bridge sensors.

Long wire and small gauge wire have greater resistance, which can result in gain errors. The resistance in the wires thatr connect the exciation voltage to the bridge cause a voltage drop, which is a source of gain error. The MT E743 includes remote sensing to compensate for this gain error.Connect remote sense wires to the points where the exciation voltage wires connect to the bridge circuit. Refer to the following figure for an illustration of how to connect remote sense wires to the MT E743.



Shunt Calibration

Shunt calibration can correct for errors from the resistance of both the excitation wiring and wiring in the individual resistors of the bridge. Remote sensing corrects for resistances from the EX pins on the MT E743 to the sensor, and shunt calibration corrects for these errors and for errors caused by wire resistance within an arm of the bridge. Shunt calibration is most useful with quarter-bridge sensors because there may be significant resistance in the wiring to the active resistor in the bridge

Excitation Voltages

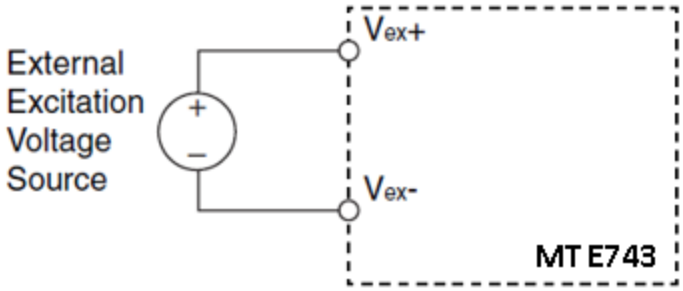
You can program the MT E743 to supply 2.5 V, 3.3 V, 5 V, or 10 V of excitation voltage. The maximum excitation power for internal excitation is 150 mW.

The 150 mW limit allows you to power half and full bridges as follows:

- Four 350 Ω half bridges at 5.0 V
- Four 350 Ω full bridges at 3.3 V
- Four 120 Ω half bridges at 2.5 V

External Excitation

You can connect an external excitation voltage source to the MT E743 if you need an excitation voltage that causes more than 150 mW to dissipate across all the bridges.



MT E743 Specifications

The following specifications are typical for the range -40 °C to 70 °C unless otherwise noted.

Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

Caution Do not operate the MT E743 in a manner not specified in this document. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to MT for repair.

Input Characteristics

Number of channels	4 analog input channels
Bridge completion	
Half and Full	Internal
Quarter	External
ADC resolution	24 bits
Type of ADC	Delta-Sigma
Sampling mode	Simultaneous
Internal master timebase(*fM*)	
Frequency	12.8 MHz
Accuracy	±105 ppm maximum
Data rate range (fs) using internal master timebase	
Minimum	1.613 kS/s
Maximum	50 kS/s
Data rate range (fs) using external master timebase	
Minimum	391 S/s
Maximum	51.36 kS/s
Data rates (*fs*)	(*fM* ÷ 256)/n, n= 1,2,….31
Typical input range	±25 mV/V
Scaling coefficient	2.9802 nV/V per LSB
Overvoltage protection between any two pins	±30V

Table 1. Accuracy

Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range (Offset Error)
Calibrated	Maximum (-40 °C to 70 °C)	0.25%	±0.28%
	Typical (25 °C ±5 °C)	0.062%	±0.054%

Gain drift	11ppm/°C maximum
Offset drift	
2.5V excitation	0.7 uV/V per °C
3.3V excitation	0.5 uV/V per °C
5V excitation	0.4 uV/V per °C
10V excitation	0.3 uV/V per °C
Half-bridge completion	
Tolerance	±1100 uV/V maximum
Drift	1.7 uV/V per °C
Passband	
Frequency	0.45 * *fs*
Flatness	0.1dB maximum
Stopband	
Frequency	0.55 * *fs*
Rejection	98 dB
Alias-free bandwidth	0.45 * *fs*
Oversample rate	64 * *fs*
SFDR(1kHz, -60 dBFs)	113dB
Total Harmonic Distortion(THD)	
1 kHz, -20 dBFS	-93 dB
8 kHz, -20 dBFS	-93 dB

Excitation	100uVrms
Internal voltage	2.5V, 3.3 V, 5.0 V, 10.0 V
Internal power	153mW maximum
External voltage	2V to 10 V

Power Requirements

Power consumption from chassis:	760 mW maximum
Thermal dissipation (at 70 °C)	760 mW maximum

Safety Voltages

Connect only voltages that are within the following limits:

Between any two pins	±30 V maximum
Isolation Channel-to-channel	None
Isolation Channel-to-earth ground	
Up to 3000m	
Continuous	60 VDC
Withstand	1,000 Vrms
Up to 5000m	
Continuous	60 VDC
Withstand	860 Vrms

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low- voltage sources, and electronics.

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration	
Random (IEC 60068-2-64)	5 g_{rms}, 10 Hz to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 Hz to 500 Hz
Operating shock (IEC 60068-2-27)	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

Environmental

Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Ingress protection	IP40
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing Storage
humidity (IEC 60068-2-78)	5% RH to 95% RH, noncondensing Pollution
Degree	2
Maximum altitude	5000m

Indoors use only.