



Overview

The [MTM USBStem](#) is a BrainStem™ link module and part of Acroname's Manufacturing Test Module (MTM) system. It allows a USB connection to a host PC which may be used for test direction, control and data collection. It may also be used to load reflex programs to MTM or BrainStem modules for PC-free operation.

This module provides a USB link to a host PC or network for test automation control and data collection. Using this link and the BrainStem API, any host based application can interact with a device under test, other MTM module(s), test station hardware and custom peripherals, as well as log and store data from a test. The MTM-USBStem module features general purpose digital inputs and outputs, 12-bit analog inputs (A2D/ADC), a 10-bit digital to analog converter (DAC), serial UART ports, a BrainStem I²C FM+ (1Mbit) bus and a peripheral I²C FM (400kbit) bus.

With the upstream USB connection on it's industry-standard edge connector, the MTM USBStem is designed to allow even complex and dense test stations to connect to a PC with just one cable by daisy-chaining together as many MTM modules as needed. This simple test station cabling makes for rapid and error free station bring-up.

Features

- Cross-platform driver support (Mac OS X, Linux and Windows)
- 3 analog to digital input at 12-bit resolution
- 1 digital to analog output at 10-bit resolution
- 15 general purpose digital inputs/outputs
- 1 I²C Fast Mode Plus (1 Mbps) (used as the BrainStem bus)
- 1 I²C Fast Mode (400 kbps)
- User, link, power and heartbeat LEDs
- 2 UART serial ports
- 1 upstream USB connection on PCI connector
- 1 upstream mini-B type USB connector
- μSDslot for additional storage
- Bridge from USB to I²C bus transactions
- Realtime clock
- Bulk capture mode for analog inputs
- 6V to 12V DC input power
- 3.3V input/output voltage
- All input/outputs protected up to 12V input
- 0 to 70°C ambient operating temperature

Description

The MTM USBStem is part of [Acroname's Manufacturing Test Module \(MTM\)](#) system. Each module in the MTM series is ruggedized and designed to survive the rigors of CM or OEM manufacturing environments around the world. Pin interfaces are protected against reverse polarity and over voltage connections are designed to operate from 0°C to 70°C ambient, with no external cooling or fans. The MTM USBStem module provides a BrainStem link to connect to a host PC or network. It can also operate independently by running embedded, user-defined programs based on the BrainStem reflex language.

Every MTM module utilizes the BrainStem API for C++ host-based applications and the BrainStem reflex API which closely emulates the C++ API. Each module also features a self-discovery and notification system, allowing embedded and host based applications to determine the module's capabilities and programmatically control and direct communication between modules on the BrainStem network.



Absolute Maximum Ratings

Stresses beyond those listed under ABSOLUTE MAXIMUM RATINGS cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under RECOMMENDED OPERATING CONDITIONS is not implied. Exposure to absolute-maximum-rated conditions for extended periods affects device reliability.

Parameter	Conditions	Minimum	Typical	Maximum	Units
Input Voltage (Vsupply)		-14.0	-	14.0	V
Input Current (Isupply)		0.0	-	3200.0	mA
Operating Temperature		0.0	25.0	70.0	C
I2C SDA, SCL		-0.5	3.3	5.5	V
GPIO Input Voltage		-0.5	-	14.0	V
ADC Input Voltage		-0.5	-	14.0	V
DAC Input Voltage		-0.5	-	14.0	V



Recommended Operating Ratings

The values presented apply over the full operating temperature, otherwise specifications are at $T_A = 25\text{ }^\circ\text{C}$.

Parameter	Conditions	Minimum	Typical	Maximum	Units
Input Voltage (V_{supply})		6.0	-	12.0	V
Reset Voltage	Logic low asserts system reset	0.0	-	3.3	V
Current Draw		10.0	50.0	100.0	mA
UART Tx/Rx Logic Level High		2.3	3.3	3.5	V
UART Tx/Rx Logic Level Low		0.0	-	0.9	V
Analog Usable Input Voltage Range		0.0	-	3.3	V
DAC Voltage Output		0.0	-	3.3	V
GPIO Current, per pin		8.0	10.0	12.0	mA
GPIO Input Logic Low Threshold		-	-	1.0	V
GPIO Input Logic High Threshold		2.3	-	-	V
GPIO Output Voltage		0.0	-	3.3	V
Operating Temperature		0.0	-	80.0	C



Pin Functionality

Some edge connector pin designators may be omitted if no functionality is present.

Side A	Description	Notes	Side B	Description	Notes
A1	Ground		B1	Input Voltage	
A2	Ground		B2	Input Voltage	
A3	Ground		B3	Input Voltage	
A4	Ground		B4	Input Voltage	
A5	Ground		B5	Input Voltage	
A6	Ground		B6	Reserved	Do not connect
A7	Ground		B7	Reserved	Do not connect
A8	I2C0 SDA (Brain-Stem bus)	Module includes a 330 kohm pull up resistor	B8	Ground	
A9	I2C0 SCL (Brain-Stem bus)	Module includes a 330 kohm pull up resistor	B9	Ground	
A10	Ground		B10	UART0 Tx	
A11	Ground		B11	UART0 Rx	
A12	Module Offset 0	Pull to Ground to set	B12	Module Offset 2	Pull to Ground to set
A13	Module Offset 1	Pull to Ground to set	B13	Module Offset 3	Pull to Ground to set

Table 1: Pin Mappings common to all MTM link modules

Side A	Description	Notes	Side B	Description	Notes
A14	Reserved	Do not connect	B14		
A15			B15		
A16			B16	UART1 Tx	
A17	I2C1 SCL	Module includes a 1kohm pull up resistor	B17	UART1 Rx	
A18	I2C1 SDA	Module includes a 1kohm pull up resistor	B18	DIO 0	
A19			B19	DIO 1	
A20			B20	DIO 2	
A21			B21	DIO 3	
A22			B22	DIO 4	
A23			B23	DIO 5	
A24	ADC0	Analog measurement only	B24	DIO 6	
A25	ADC1	Analog measurement only	B25	DIO 7	
A26			B26	DIO 8	
A27			B27	DIO 9	
A28			B28	DIO 10	
A29			B29	DIO 11	
A30			B30	DIO 12	
A31	ADC2	Analog measurement only	B31	DIO 13	
A32	ADC3	DAC output only	B32	DIO 14	

Table 2: Pin Mapping definitions unique to MTM-USBStem module



Block Diagram

The MTM USBStem is composed of a many different subsystems carefully linked together.

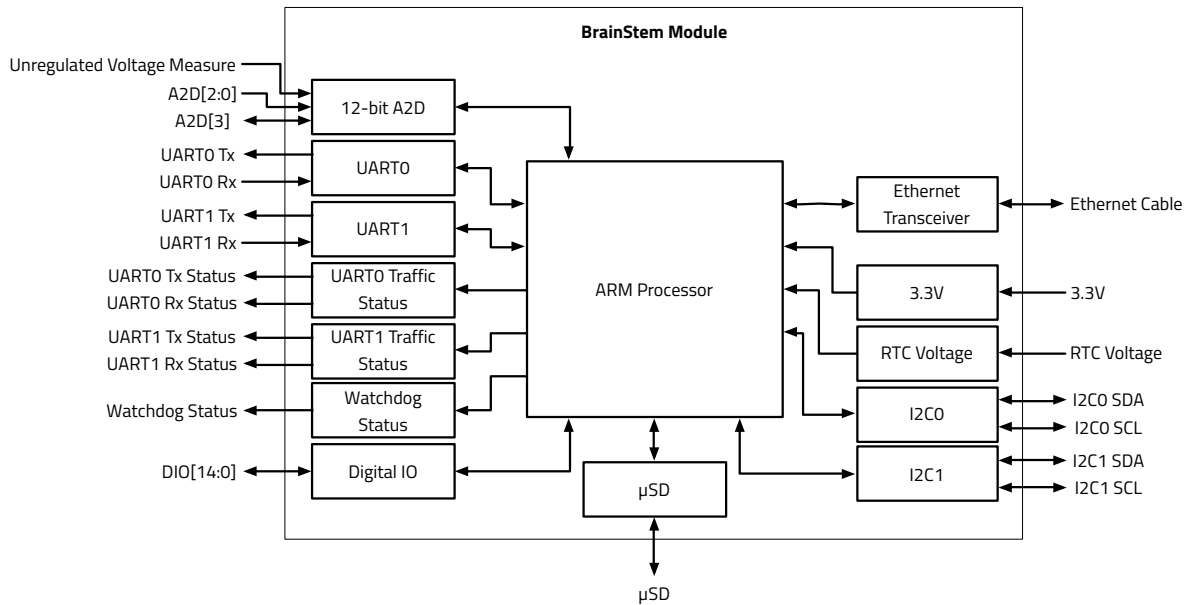


Figure 1: System block diagram



Document Revision History

All major documentation changes will be marked with a dated revision code.

Revision	Date	Engineer	Description
1.0	July 7, 2014	MJK	Initial revision
1.1	August 27, 2014	ECM	Updated pin mapping, absolute and recommend rating tables