## Overview

The MTM-PM-1 module is part of Acroname's MTM series series. It provides low voltage, highly stable DC power across a range of 1.8VDC to 5.0VDC with software controllable voltage and current limiting optimized for cellular device testing.

## Manufacturing Test Module System

The MTM-PM-1 module 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. As a BrainStem™ Spindle, the MTM-PM-1 module can utilize any BrainStem link module 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.

## Features

- Single software-controllable power output channel
- Software-controlled voltage and current limit
- Output voltage controllable from 1.8 to 5.0VDC
- Up to 3A continuous current handling
- Output voltage better than 1% precision
- Current limit to 1% precision
- Current measurement at micro-amp (uA) resolution from 0 to 3.3A
- Software-controlled fully-linear or SMPS-to-linear operation
- Automatic thermal fail-over or shutdown
- Input voltage from 6.0 to 12.0VDC
- Kelvin sensing ("3-wire") feedback input to control circuitry
- On-board thermal measurement at the linear regulation stage
- Analog current indication output for 3rd party applications or sensing
- Output voltage rail status output for 3rd party applications
- Software-controlled switched unregulated voltage for downstream applications
- K-Type thermocouple measurement interface (thermocouple must be provided)
- Exceeds 3GPP specification for battery emulator for cellular radio testing

## Description

The MTM-PM-1 module , part of Acroname's Manufacturing Test Module (MTM) system, is a modular power supply designed powering devices during manufacturing or R&D testing. The MTM-PM-1 module is a one-channel software controlled, voltage and current limiting power supply. While it can provide stable, consistent and robust power to a wide range of devices, it is optimized for devices using LiPo or similar batteries; in particular devices with cellular radios (GSM, UMTS, LTE, CDMA, etc.). Accurate voltage, temperature and current measurements can be made through the BrainStem API. For noise sensitive applications, the MTM-PM-1 module features a fully linear power supply: no potentially RF-noisy switchers. When thermal and efficient considerations are more important, the MTM-PM-1 module can use its first-stage, pre-conditioning switch mode power supply (SMPS) followed by the high-accuracy, fast-response. linear stage. Regardless of the application requirements, the MTM-PM-1 module provides stable and accurate power, even under transient loads up to 3A, and line transients within its operating input voltage range. The MTM-PM-1 module also has a K-type thermocouple interface, allowing for remote temperature measurements from -25° C to +400° C. It also has an on-board temperature sensor, so automated tests can monitor the device under test, as well as the test equipment itself.

## 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) | | 6.0 | - | 12.0 | V |
| Input Current (Isupply) | | 0.0 | - | 3200.0 | mA |
| Operating Temperature | | 0.0 | 25.0 | 70.0 | C |

## Recommended Operating Ratings

The values presented apply over the full operating temperature, otherwise specifications are at $T_A$ = 25 °C.

| Parameter | Conditions | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|---|
| Input Voltage (Vsupply) | | 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 |
| Thermocouple Measurement Range | K-Type only | -25.0 | | 400.0 | C |
| Rail 0 Output Voltage | | 1.8 | - | 5.0 | V |
| Rail 0 Output Current | | 0.0 | - | 3000.0 | mA |
| Rail 1 Output Voltage | | 1.8 | Vsupply | 12.0 | V |

## Block Diagram

The MTM 1-Channel Power Module is composed of a many different subsystems carefully linked together.

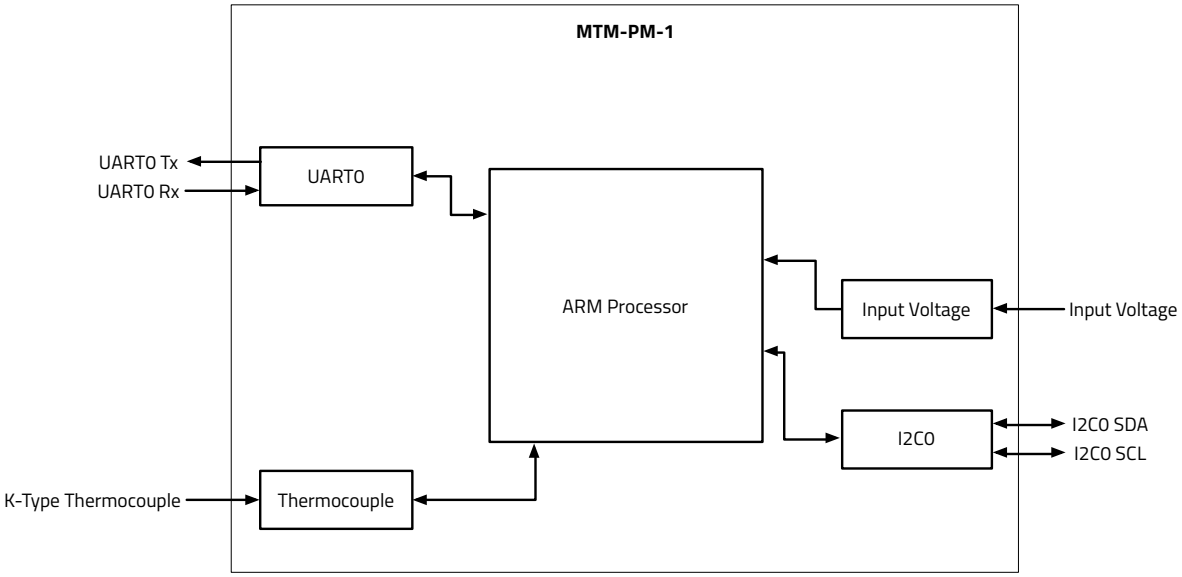


Figure 1: System block diagram

## 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 (BrainStem bus) | External Pull up required | B8 | Ground | |
| A9 | I2C0 SCL (BrainStem bus) | External Pull up required | B9 | Ground | |
| A10 | Ground | | B10 | UART0 Transmit | |
| A11 | Ground | | B11 | UART0 Receive | |
| 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 Spindle MTM modules

| Side A | Description | Notes | Side B | Description | Notes |
|---|---|---|---|---|---|
| A15 | Thermocouple Positive Terminal | | B15 | | |
| A16 | Thermocouple Negative Terminal | | B16 | UART1 Transmit | |
| A17 | | | B17 | UART1 Receive | |
| A18 | | | B18 | | |
| A19 | Channel 0 Rail Ground | | B19 | Channel 0 Rail V+ | Software adjustable rail. See Electrical Characteristics |
| A20 | Channel 0 Rail Ground | | B20 | Channel 0 Rail V+ | Software adjustable rail. See Electrical Characteristics |
| A21 | Channel 0 Rail Ground | | B21 | Channel 0 Rail V+ | Software adjustable rail. See Electrical Characteristics |
| A22 | Channel 0 Rail Ground | | B22 | Channel 0 Rail V+ | Software adjustable rail. See Electrical Characteristics |
| A23 | | | B23 | | |
| A24 | Channel 0 Current Measurement Mirror | | B24 | Channel 0 Status Output | |
| A25 | | | B25 | Channel 1 V+ | Unregulated voltage passthrough |

Table 2: Pin Mapping definitions unique to MTM-PM-1 module

## Mechanical

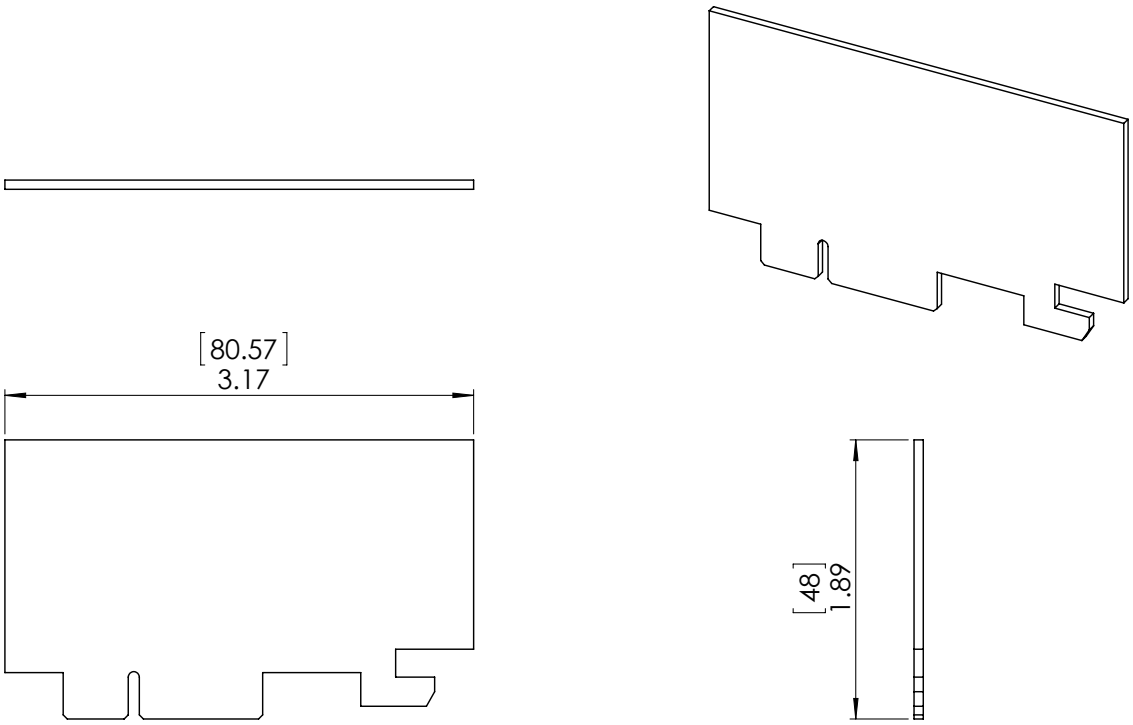


Figure 2: MTM 1-Channel Power Module mechanical dimensions shown in inches [mm].

## 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 |