DiscBoards Starter Kit

Reference Manual

Revision 0.1

October 6th 2015

DiscBoards.org Overview

DiscBoards.org is a free and open community focused on Renesas Synergy based processors, software, and applications. Anyone can join and anyone can contribute hardware and software. Anyone can sell any boards they develop. No licenses are taken by Discboards.org. Everyone is encouraged to make their Hardware and Software Open Source.

There is a DiscBoards specification. The hardware is comprised of three modules.

- **Processor Module (PM)-** Specification will support all of the Synergy processors. All processors are interchangeable on any of the application modules. Some functions will be lost between the different processor based on reduced pin count to supported features.
- **Application Module (AM)-** This module supports application specific interfaces as required by the AM creator. The use of each pin on the PM is determined by the designer and their choice of hardware to be added.
- **Expansion Modules (AM**)- The AM can be used to further extend the AM. Not all AM will have the connectors and not all connectors need to be the same. EM capability is based on a specific AM design.

A full specification will be available for download on the Discboards.org website at a later date.

StarterKit Overview

The DiscBoards.org Starter Kit (SK) is intended as an entry level start for those wanting to participate in the DiscBoards.org community. This allows the user to get experience with the Renesas development system. Nothing else is needed to allow the user to write programs, download them to the SK , set breakpoints and step through their program. By adding various expansion boards, with all sorts of different interfaces, the user is free to experiment with different application scenarios. The SK is made up of two boards, the Processor Module (PM) and the application Module (AM).

Processor Module

The PM is equipped with a Synergy S7 part number R7F5A00Z03CFP. Future modules are planned with other processors on them. The feature of the PM are listed below.

Feature	Specification	Comments
Processor	Synergy R7F5A00Z03CFP	
Connectors	(3) Application Module connectors	
LED	(1) Under Processor control	
RTC Battery	Connector provided but not installed	
Crystal	24MHz	
External JTAG Header	10 pin	
Boot mode strap	pin not installed	

Application Module (AM)

The feature of the AM are listed below.

Feature	Specification	Comments
USB 2.0 Interface	microUSB	Cable provided
Processor USB	Yes	
USB Power	Yes	
External Power	5V over micro USB cable	
AM Module Connector's	Yes (3)	
LEDs	1-Power, 2-User	
Buttons	1-Reset 1-User	
SWD Interface	Onboard	With disable jumper-not installed
PMOD Connector	12 pin	
Micro Bus Connector	Yes	
Expansion Connectors	Yes	

Expansion Options

There are the ways to expand the Starter Kit:

- Addition of Pmod^{TM} expansion boards allows the user to experiment with numerous expansion boards available for all sorts of interfaces.
- Addition of MikroBUS^{TM} Adapters. There ae close to 200 different modules available.
- Create your own Pmod^{TM} or MikroBUS^{TM} or you can design your own custom module for use of the expansion headers on the Application module.

Quick Start Guide

This section provides information on how to install the IDE Software drivers and get the board up and running.
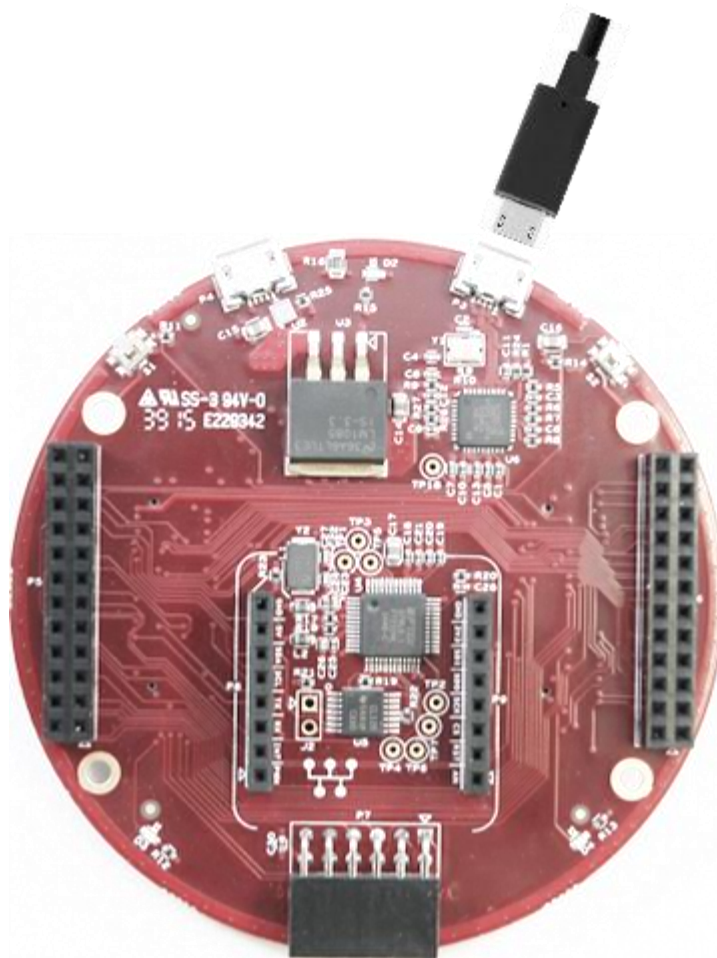
Driver Installation

Unpacking the Boards

Separating the Boards

Connections

For connection to a PC for power and communications, connect the microUSB cable as shown.

Powering Up
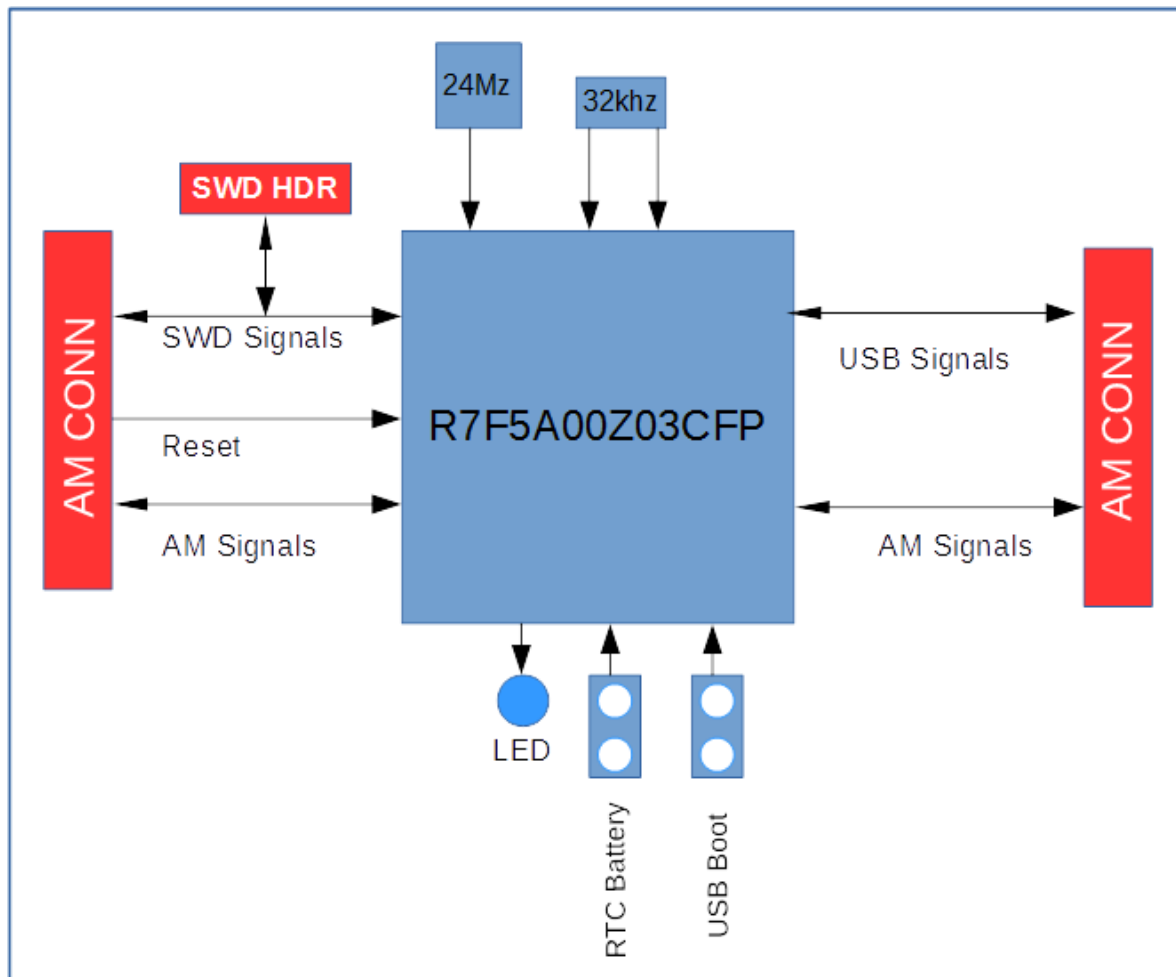
Initial Checkout

Adding a Pmod Board

Adding a Click Board

Processor Module (PM) Design Description

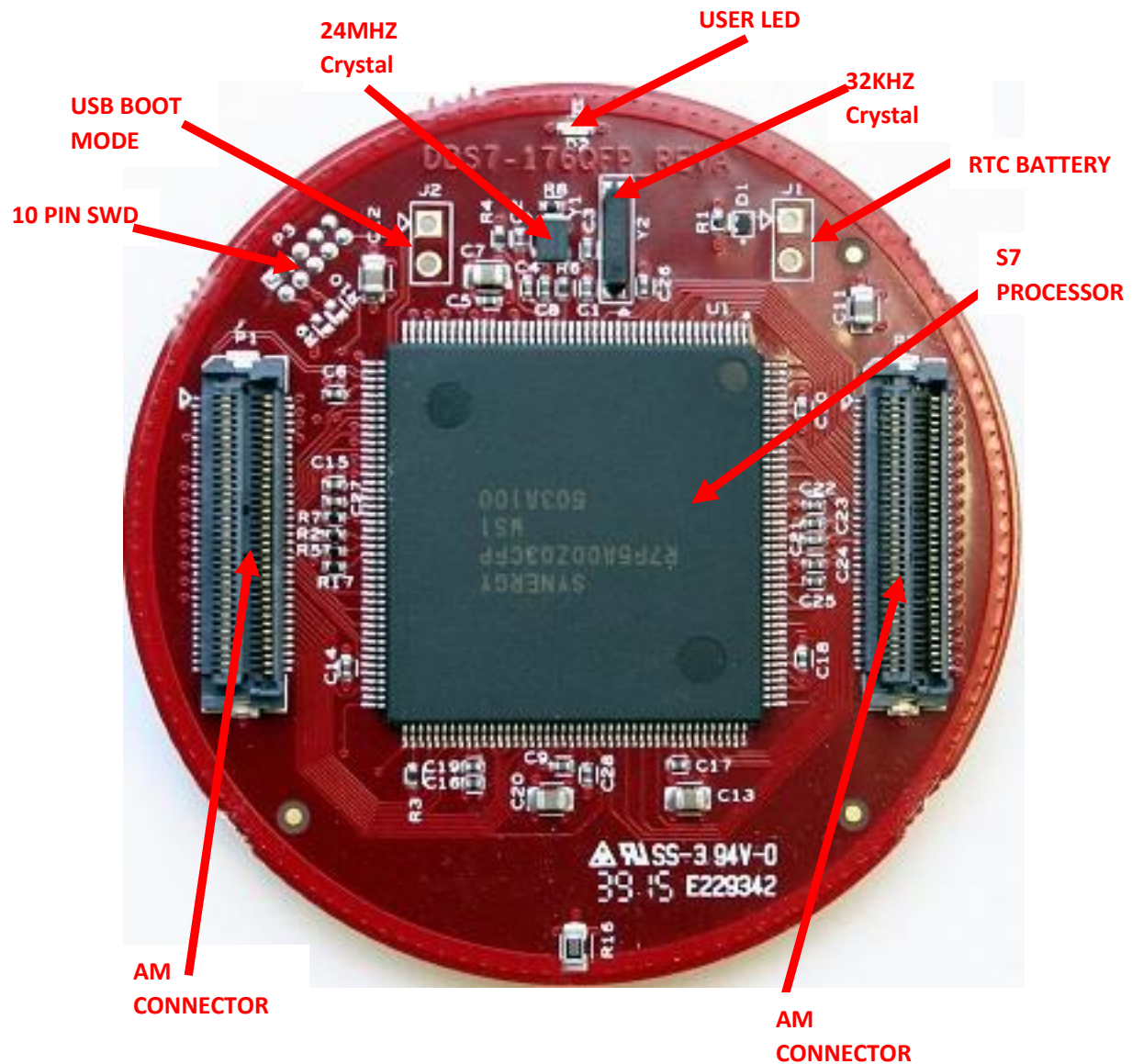This section will describe the design of the Processor Module used in the DiscBoards Starter Kit.

Processor Module Block Diagram

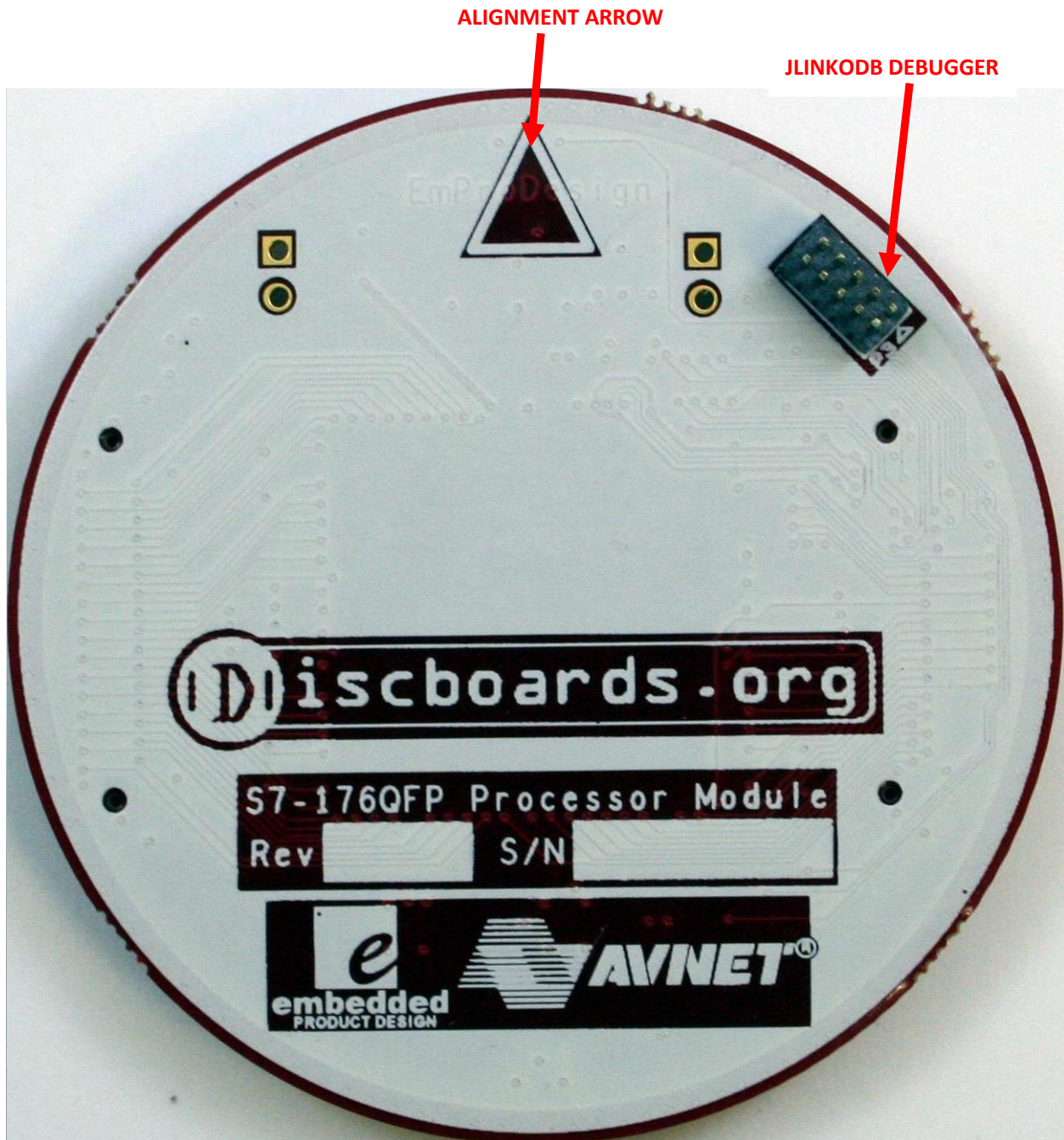The following figure is the block diagram of the PM.

Processor Module Component Locations

The figure below shows the top side locations of the components on the PM.

The figure below is the bottom side locations of the components on the PM. Only P3 is mounted from the back side of the board.

ALIGNMENT ARROW

JLINKODB DEBUGGER

Processor

The Processor Module uses the 176 pin QFP package of the S7 processor. The part number is R7F5A00Z03CFP.

LED

The LED is controlled by the processor by toggling GPIO pin P109. A low signal turns on the LED.

Optional RTC Header

J1 Is not populated but it can be used to apply a backup battery for the internal real Time Clock. Pin1 is the positive lead for the battery. Future plans include a battery board for the system that can be used to connect to J1.

USB Boot

When shorted, J2 places the processor in the USB boot mod, where the code is loaded over the USB port into the processor.
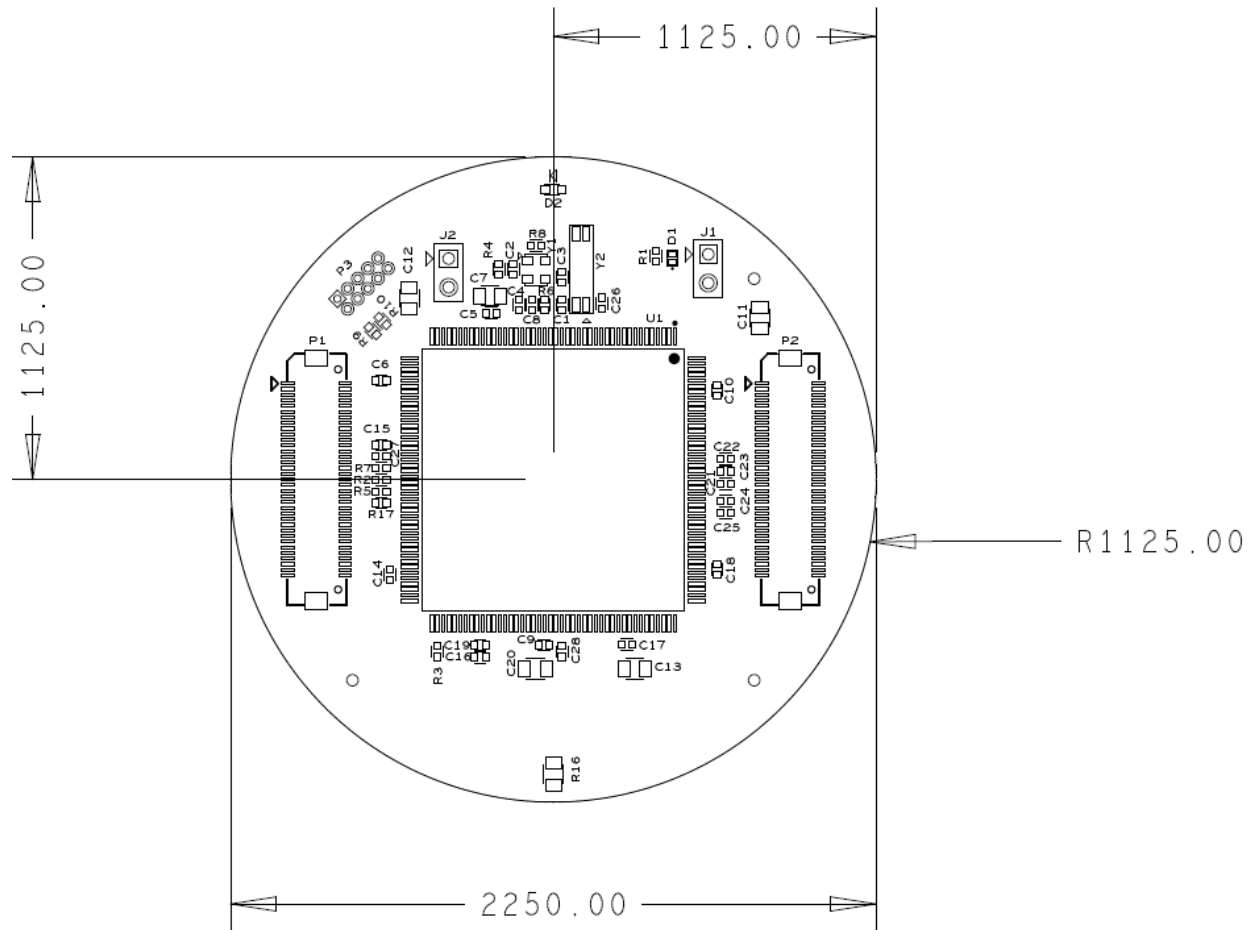
NOTE: CURRENTLY THIS FEATURE IS NOT SUPPORTED BY RENESAS.

SWD Header

P1 is mounted from the bottom side of the board and is used to connect a SWD debugger to the board. A jumper on the AM needs to be installed to disable the OCD onboard debugger on the AM board before this can be used.

PM Board Dimensions

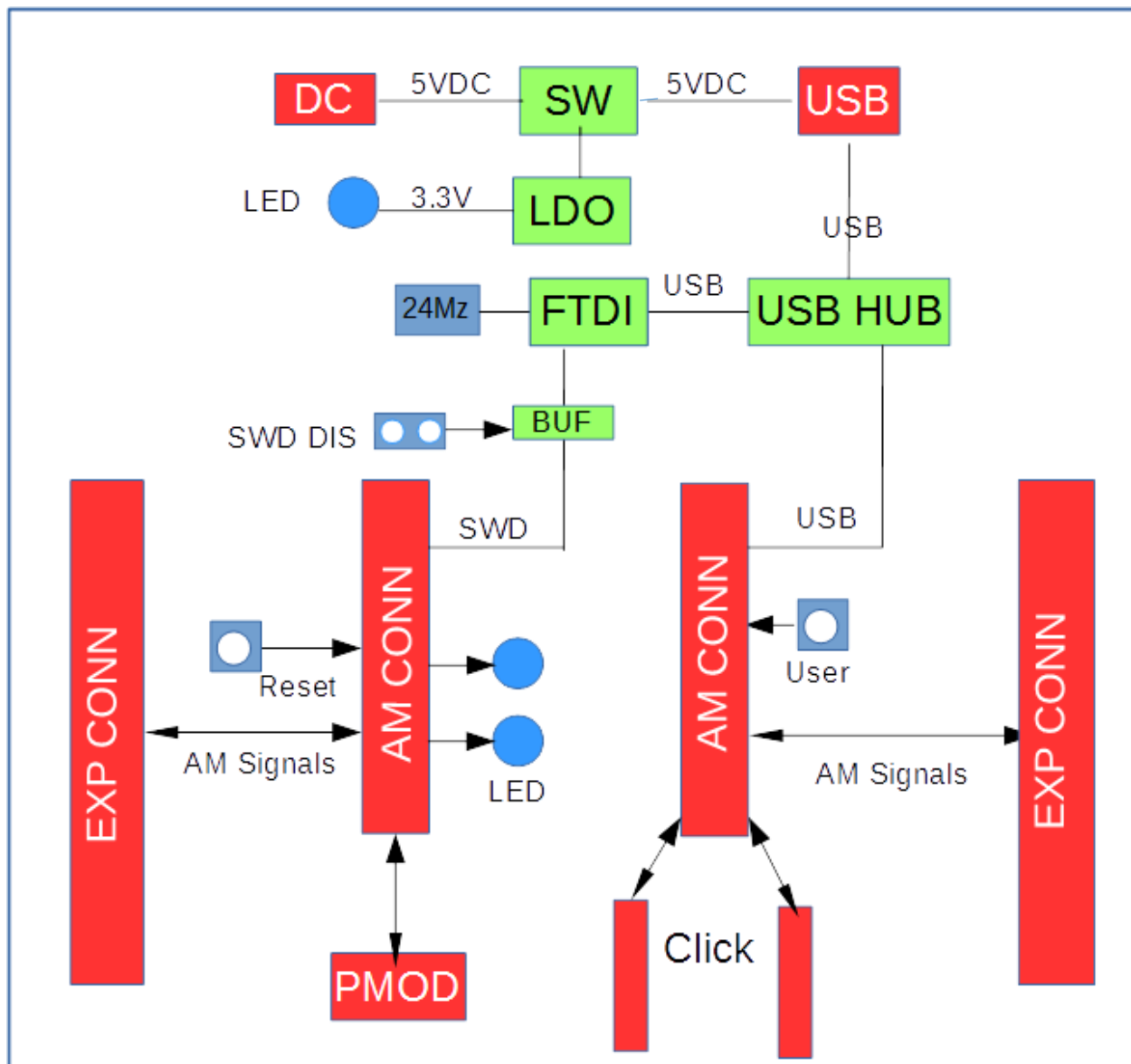Following are the dimensions of the Processor module.

Application Module (AM) Design Description

This section describes the Application module used on the Starter Kit.
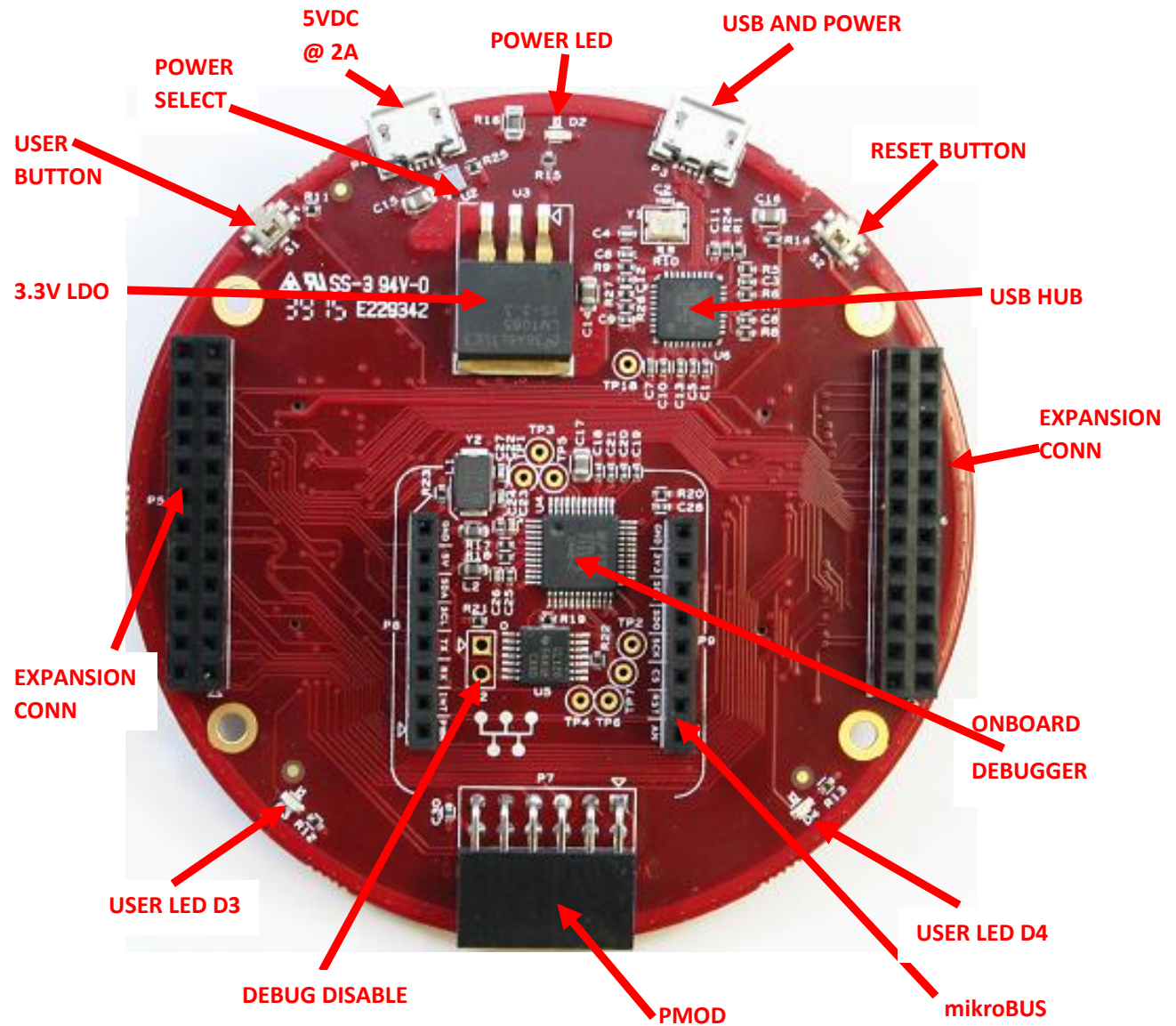
Application Module Block Diagram

The figure below is the block diagram of the AM.

Application Module Component Locations

Following are the component locations on the front side of the Application Modules.

Following are the component locations on the back side of the Application Module.
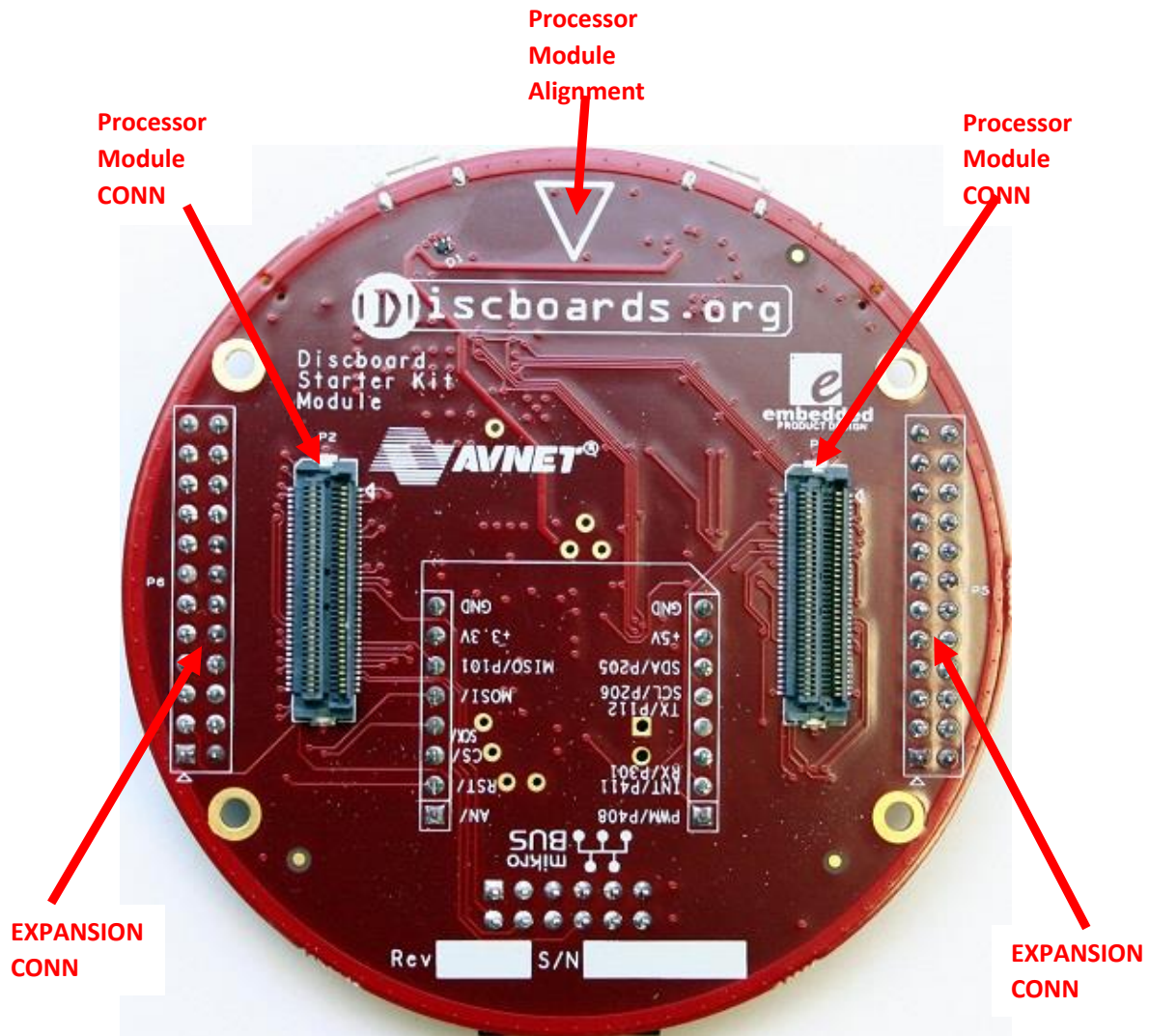
Power

Power can be supplied from two sources:

- From a laptop or PC over the microUSB port. This is limited to 500mA over a USB 2.0 port
- From a 5V 2A power supply with a microUSB connector plugged into the power port. This provides additional power for those applications that need it.

The board will automatically switch to the 5V power supply when it is plugged into the board. U2 is responsible for making the switch. When on 5V DC power, the USB port is still operational.

USB Port

The USB port is a USB2.0 compliant interface used to connect to a PC or laptop. It is used to connect to the IDE for software development.

The HUB connects the USB port to one of two onboard USB ports. One port for the S7 processor and one port for the SWD debugger.

SWD Interface

The SWD debugger is Open OCD compatible and runs on a FT232H USB to serial interface. The interface can be disconnected from the processor by placing a jumper in J2. This allows the 10 pin connector on the PM to be used for debugging.

LEDs

There are three LEDs on the board.

- D2 is the power LED. It is on whenever power is applied to the board.
- D3 is controlled by the software and is connected to P201.
- D4 is controlled by the software and is connected to P402.

All LEDs are active low.

Buttons

There are two buttons on the board.

- S1 can be read by the processor and is connected to port P111. The signal from the switch is normally high and goes low when the button is pressed.
- S2 connects to the reset line and when pressed, the processor is reset.

Expansion Connector

Here are two Expansion Connectors on the Application module, P5 and P6. These connectors can be used to add additional functions to the boards that are of a custom nature. The signals on these pins are dictated by the Processor Module. All the signals listed below are on the Starter Kit. While other PMs can be used, all of these signals may not be present.

SIGNAL	P5		SIGNAL
5V	1	2	GND
P001	2	4	P002
P003	3	6	P004
P005	5	8	P006
P007	7	10	P104
P105	11	12	P107
P106	13	14	P207
P113	15	16	P303
P302	17	18	P415
P600	19	21	P601
PB00	21	23	PB01
3.3V	23	24	GND

SIGNAL	P6		SIGNAL
5V	1	2	DCIN
P008	2	4	P010
P014	3	6	P111
P204	5	8	P203
P403	7	10	P313
P405	11	12	P404
P410	13	14	P409
P413	15	16	P412
P302	17	18	P414
P500	19	21	P501
P502	21	23	P507
3.3V	23	24	DCIN

Most of the signals are self-explanatory as they from the processor. The DCIN pins are connected to the microUSB connector that is dedicated for the 5V 2A DC input. This allows the expansion connectors to be used as an alternate DC input source for such things as a battery or a voltage supply higher than 5V.

Each if these connectors are 2.54mm spaced from pin to pin and row to row.

Pmod Expansion Connector

Connector P7 is a 12 pin connector that is Digilent Pmod™ Compatible and supports the Interface Type 2A (expanded SPI) as specified in the [Pmod Specification](#). By adding the various modules, the system can easily be expanded with different peripherals. The table below is the assignments for the Pmod connector.

SIGNAL	PIN	P7		PIN	SIGNAL
SS	P307	1	7	P009	INT
MOSI	P305	2	8	P603	RESET
MISO	P304	3	9	P604	I/O
SCK	P306	4	10	P605	I/O
GND	GND	5	11	GND	GND
VCC	3.3V	6	12	3.3V	VCC

- SS……Slave Select. Active low to enable the Pmod board
- MOSI….Master Out Slave In. Data from the processor to the Pmod board
- MISO…..Master In Slave Out. Data from Pmod board to the processor.
- SCK….Serial clock. Processor provides the clock to shift the data
- INT….Interrupt signal from the Pmod board to the processor
- RESET - Reset signal for processor to the Pmod board.
- I/O…..GPIO pins from the processor.

Only 3.3V Pmod boards can be supported.

MikroBUS^{TM} Add On Board Connectors

The MikroBUS specification is for a series of boards that can be used to add functionality when connected to a MikroBUS connector. The connector supports:

- Analog
- I2C
- SPI
- UART

The AM provides for a single set of connectors for adding these boards. The table below is the pinout of the connector.

PIN	SIGNAL	P8	P9	SIGNAL	PIN
P408	PWM	1	1	ANA	P000
P411	INT	2	2	RESETn	P010
P301	RX	3	3	CSS	P103
P112	TX	4	4	SCK	P102
P206	SCL	5	5	MISO	P100
P205	SDA	6	6	MOSI	P101
	5VDC	7	7	3.3VDC	
	GND	8	8	GND	

Only 3.3V boards are supported.

- PWM……….Pulse Width Modulation
- INT………….Processor Interrupt
- RX…………..UART RX
- TX…………..UART TX
- SCL………..I^{2}C Clock
- SDA………..I^{2}C Data
- ANA……….Analog
- RESETn….Reset line
- CSS………..SPI Chip Select
- MISO……..Processor input and board output
- MOSI……..Board input and processor output

Board Dimensions
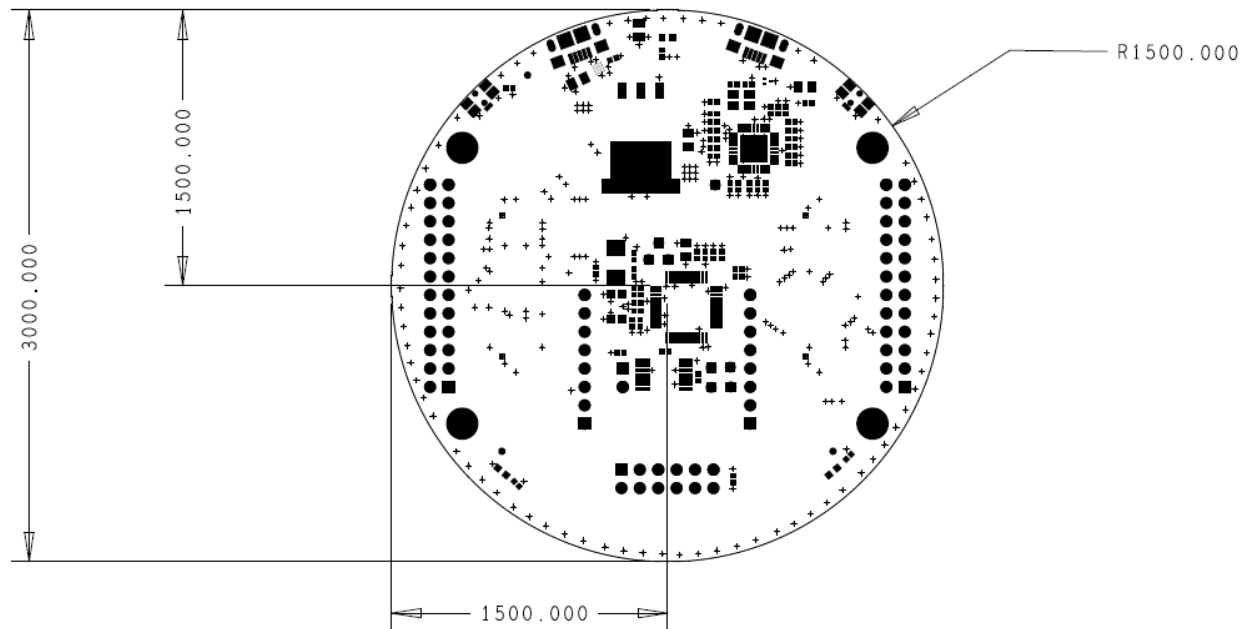
Support

A DiscBoards.org supported Support Wiki is provided to document the different boards. This Wiki is open to everyone that creates boards that are sold to the community. This Wiki can only be modified by those people. The Wiki can be found at www.discboards.org/support