C3 Board Functional Description

Rev 2.0

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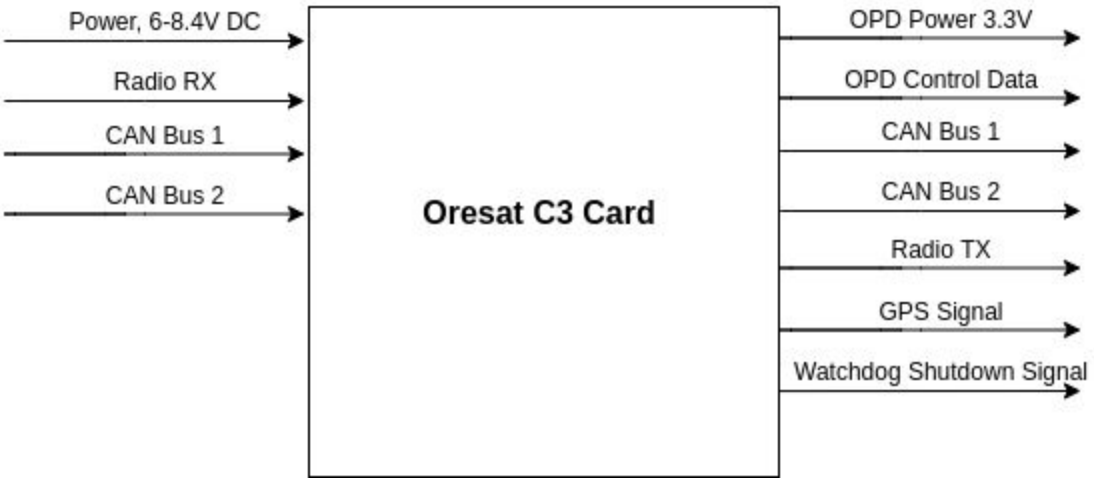
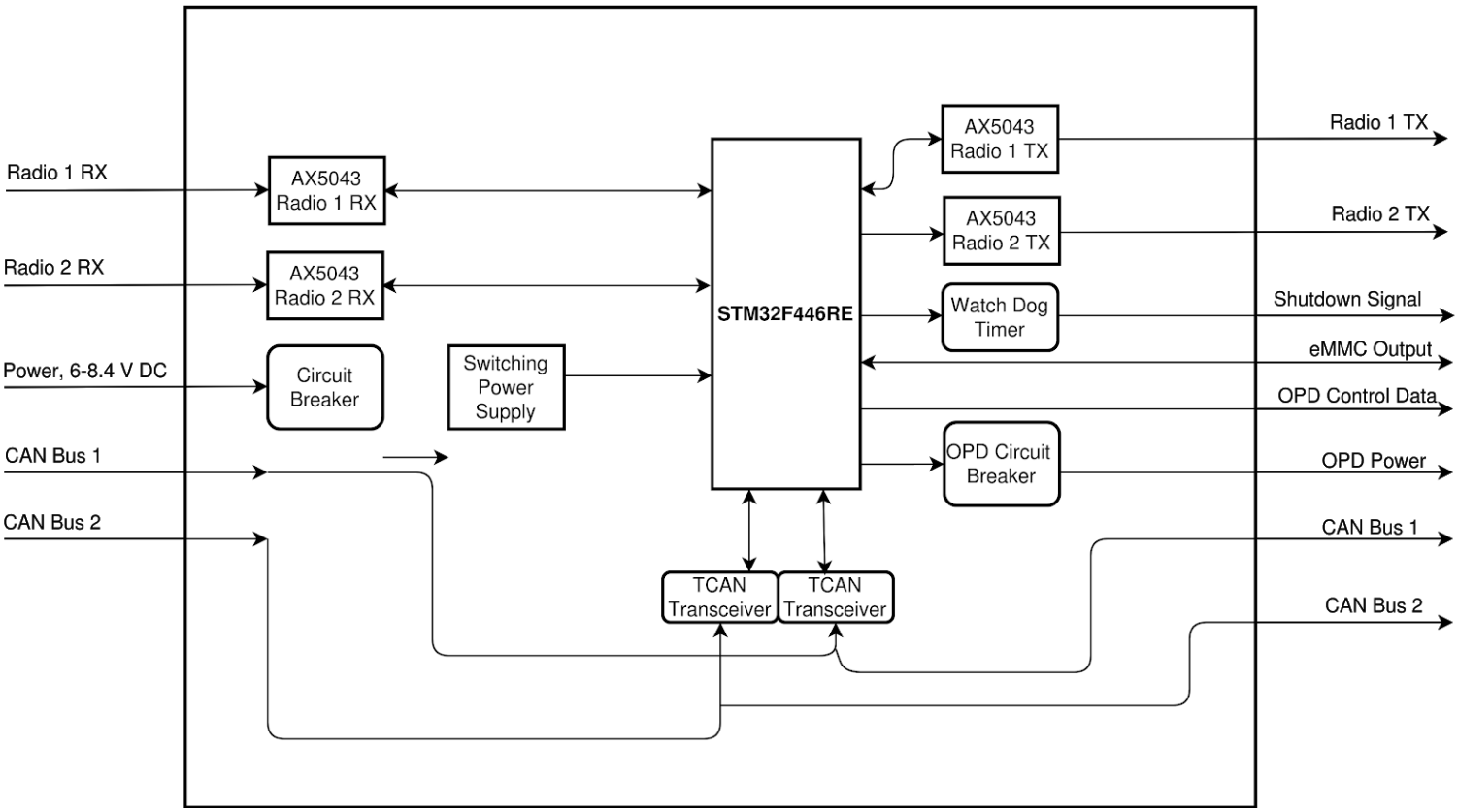
OreSat C3 Board: Level 0



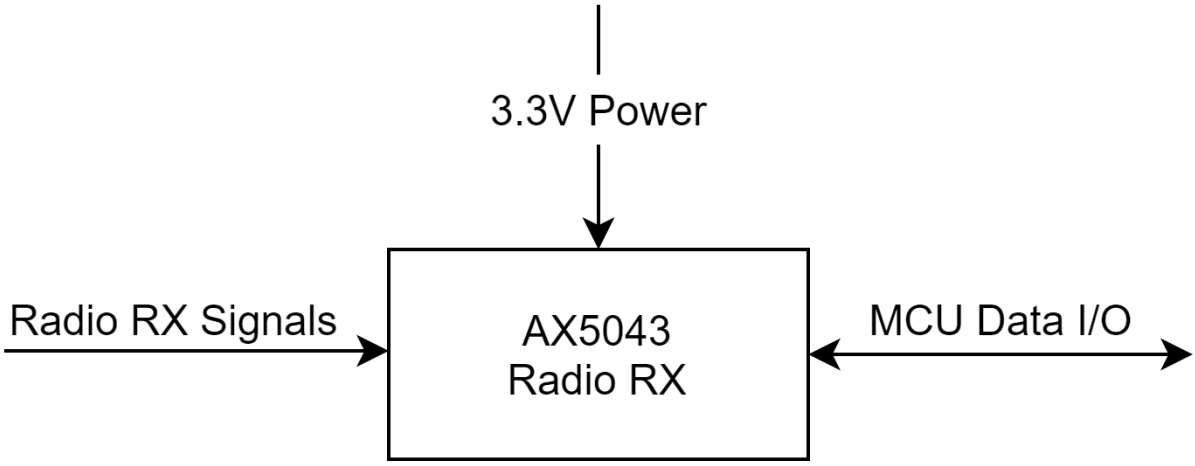
Module:	Oresat C3 Card
Inputs:	Power (6-8.4 V DC) Radio RX signal(L Band and UHF Band) CAN Bus 1 CAN Bus 2 eMMC Input GPS Signal
Outputs:	Output Power (3.3 V, 200mA max) OPD Control Data (I2C) CAN Bus 1 CAN Bus 2 Radio TX(L Band and UHF Band) eMMC Output Shutdown Signal GPS Signal
Functionality:	Receive 6-8.4 V power from solar array and batteries. Receive commands from ground station via Radio RX signal. Step down power to 3.3 V current limited power supply for OPD subsystem. Control Power to each subsystem via OPD Control Data. Communicate with critical mission subsystems via CAN 1. Communicate with mission subsystems via CAN 2. Transmit mission data via Radio TX signal. Shutdown power to transmit power amplifier in case of a rogue transmitter. Store mission data in eMMC. Shutdown entire system power in case of MCU single event latchup via Shutdown Signal.

Things to Test:	1. Power (TP9 VBUS) from solar array is in the range of 6-8.4V 2. Step down power (TP17 3.3V) is 3.3V ± 0.5V 3. When Watchdog Shutdown Signal (active low) then Fill in blank

Oresat C3 Board: Level 1

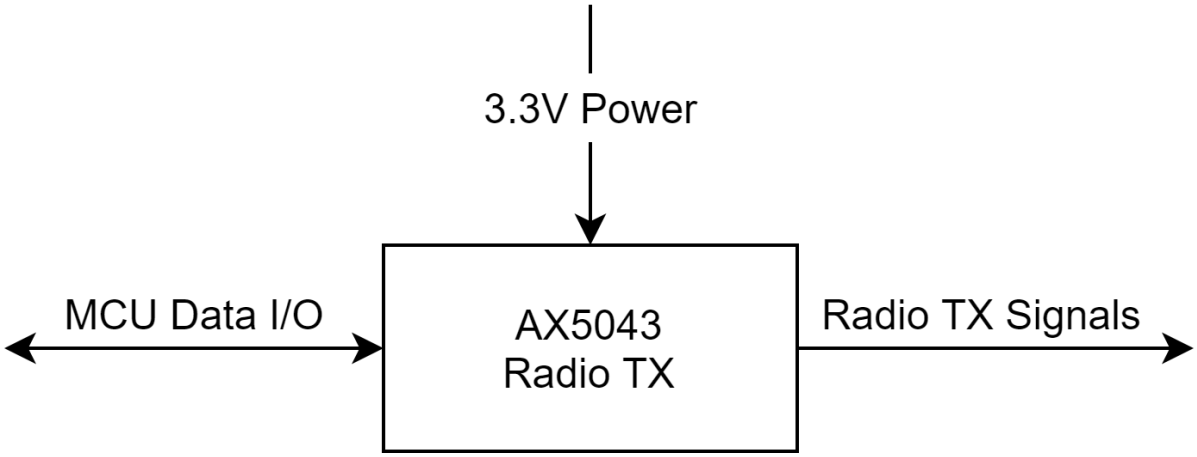


AX5043 Radio RX: Level 1



Module:	AX5043 Radio RX
Inputs:	Radio RX Signals(L Band, UHF Band) Microcontroller Data 3.3 V Power
Outputs:	Microcontroller Data
Functionality:	Receive L Band and UHF signals from ground station. Convert analog RF signals into SPI output for Microcontroller. Receive SPI data from Microcontroller. Gives ground station commands to microcontroller.
Things to Test:	1. Analog RF to SPI output. 2. Receive SPI data from MCU. 3. 3.3V power in.

AX5043 Radio TX: Level 1

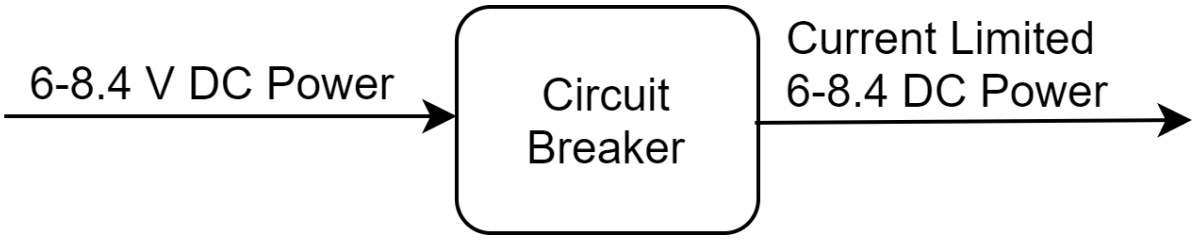


Module:	AX5043 Radio TX
Inputs:	Microcontroller Data 3.3 V Power
Outputs:	Radio TX Signals(L Band, UHF Band) Microcontroller Data
Functionality:	Receive SPI data from Microcontroller. Transmit system health and mission data to ground stations(L Band, UHF band)
Things to Test:	1. Analog RF to SPI output. 2. Receive SPI data from MCU. 3. 3.3V Power in.

Surge Protector: Level 1

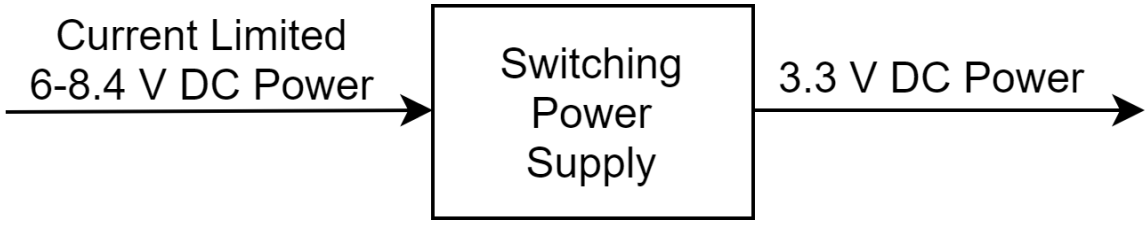
Module:	Surge Protector
Inputs:	Radio TX Signals, EMI
Outputs:	Radio TX Signals
Functionality:	Limits Voltage/Current from exceeding the AX5043 IC's maximum input voltage of 5.5 V. Protects the AX5043 from voltages induced by EMI.
Things to Test:	1. Input voltage limited to 5.5V. 2. Signal integrity (Look at signal on input vs output)

Circuit Breaker: Level 1



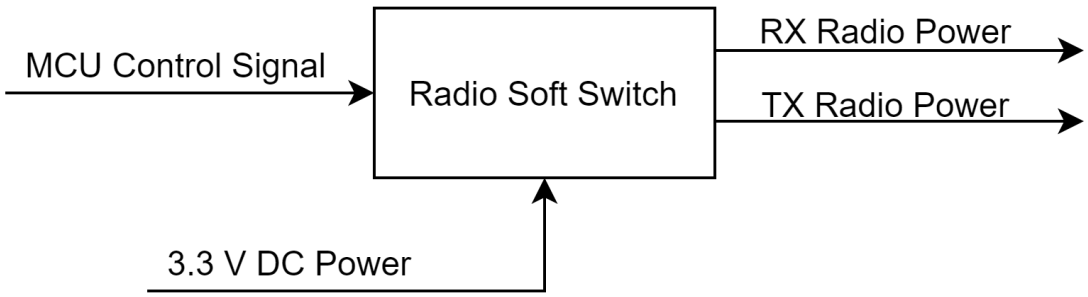
Module:	Circuit Breaker
Inputs:	6-8.4 V DC Power
Outputs:	Current Limited 6-8.4 V DC Power
Functionality:	Limit current to protect downstream systems from overcurrent damage. Break circuit if current threshold is reached.
Things to Test:	1. Input is 6-8.4V 2. Output has limited current.

Switching Power Supply: Level 1



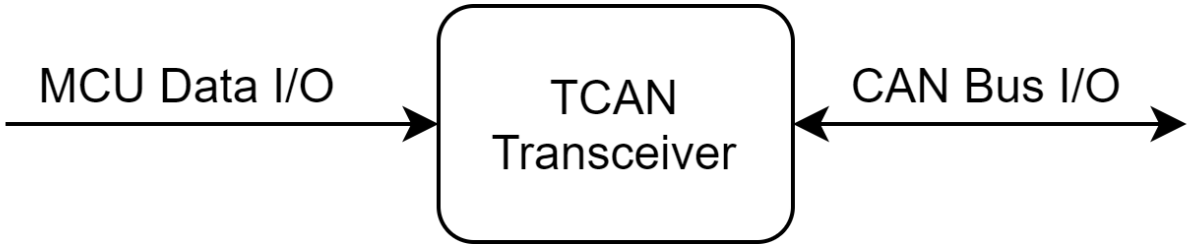
Module:	Switching Power Supply
Inputs:	Current Limited 6 - 8.4 V DC Power
Outputs:	3.3 V DC Power
Functionality:	Step down current-limited power supply from 6-8.4 V DC down to 3.3 V DC for use by all subsystems.
Things to Test:	1. Input is between 6-8.4 V DC. 2. Output is regulated to 3.3 V DC.

Radio Soft Switch: Level 1



Module:	Radio Soft Switch
Inputs:	Microcontroller Control Signal 3.3 V DC Power
Outputs:	RX Radio Power (3.3 V DC) TX Radio Power(3.3 V DC)
Functionality:	Receives control signal from microcontroller, determines whether or not to provide power to RX Radio or TX Radio individually.
Things to Test:	1. 3.3V DC input. 2. Output of Soft Switch based on MCU Control Signal Input.

TCAN Transceiver: Level 1

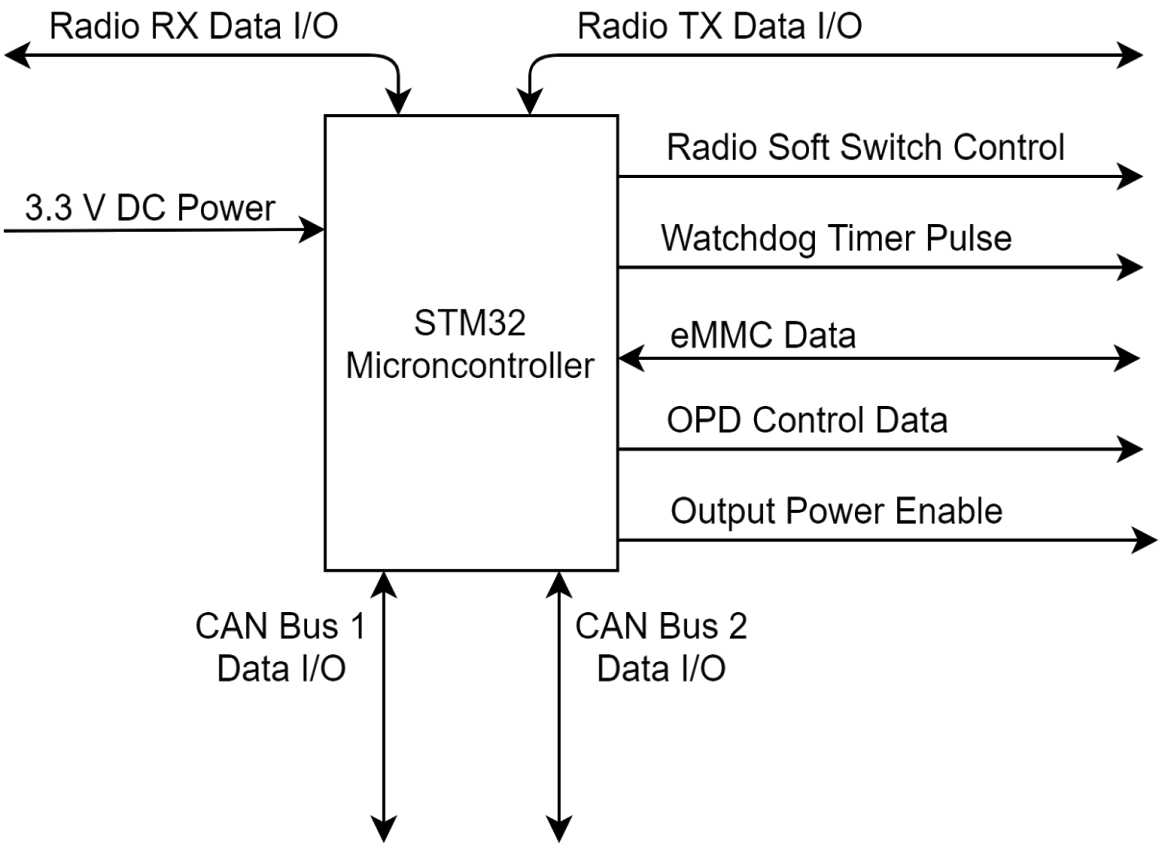


Module:	TCAN Transceiver
Inputs:	Microcontroller Data CAN Bus Data
Outputs:	Microcontroller Data CAN Bus Data
Functionality:	Receives data from microcontroller, sends down CAN bus. Receives data from CAN bus, sends to microcontroller.
Things to Test:	1. MCU data on input. 2. I/O on CAN Bus.

Watchdog Timer: Level 1

Module:	Watchdog Timer
Inputs:	Microcontroller Pulse Signal
Outputs:	Shutdown Signal
Functionality:	Receives pulse in regular timed interval from microcontroller indicating system is in good health. Enables shutdown signal if pulse not received, thereby shutting down power to entire Oresat system and resetting.
Things to Test:	1. MCU Pulse on input. 2. Output Low for reset signal on output.

STM32 Microcontroller: Level 1



Module:	STM32 Microcontroller
Inputs:	3.3 V DC Power CAN Bus 1 Data CAN Bus 2 Data Radio RX Data Radio TX Data eMMC Interface
Outputs:	Radio RX Data Radio TX Data Radio Soft Switch Control Watchdog Timer Pulse eMMC Interface OPD Control Data Output Power CAN Bus 1 CAN Bus 2

Functionality:	Communicates with all critical subsystems through CAN bus 1. Communicates with all mission subsystems through CAN bus 2. Controls power for all subsystems through OPD Control Data line. Reads and writes memory to and from eMMC. Kicks watchdog to indicate system health. Controls power to Radio TX and RX. Receives commands from ground station through Radio RX line. Transmits mission and system health information through Radio TX line.
Things to Test:	