Test Plan for the THUNDER BUDDIES

2024-12-02

Team #4

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Unit tests:

Power supply

- Test that power supply provides 3.3V with direct voltage
- Test that battery connection provides 3.3V
- Test that power headers are providing 3.3V

RF Detector

- Show that RF receiver output voltage changes when RF spike is present
- Show that RF receiver output voltage does not spike with background noise

Microcontroller

- Show that firmware loads onto board
- Test that ADC receives input voltage
- Test that Buzzer sounds with code snippet
- Test that TX pin outputs data

RF Transceiver

- **cannot unit test due to chip configuration requirements**

Verification tests:

- ADC input triggers Buzzer
- ADC input triggers transmission
- TX pin output matches expected Manchester encoded data
- RF pulse exceeds ADC threshold
- RF noise does not exceed ADC threshold
- RF pulse only triggers a single transmission
- RF transceiver receives configuration words over SPI
- RF transceiver sends transmission packet
- RF transmission sends over correct frequency band

Validation tests:

- Device functions correctly with batteries.
- The device sends a lightning detection notification over radio when lightning is detected.
- The device buzzes when lightning is detected.
- Spurious background emissions should not cause buzzing or detection notifications.
- Lightning detection notifications contain the current time.

Test Author: Hector Cardenas						
	Test Case Name:	SPI to RF Transceiver Test #1			**Test ID #:**	SPI-to-RF-01
	Description:	Send SPI signals from microcontroller to RF board; SCLK, SDATA, SEN Verifies that RF board can receive expected configuration word			**Type:**	☑ white box □ black box □ _____
Tester Information						
	Name of Testers:	Nathan Fraly, Riley Cox			**Date:**	2024-12-02
	HW/SW Version:	SW: rev0.8, HW: rev0.2			**Time:**	15:00
	Setup:	Software compiled in debug mode to loop SPI communication				

STEP	**Action**	**Expected Result**	**PASS**	**FAIL**	**N/A**	**Comments**
1	Probe power at PCB header	Output of 3.3V and 0V at **3V3(OUT)** and **GND** pin, respectively	X			
2	Probe SCLK at PCB header	Output of 1MHz 3.3V square wave clock at **SPI0 SCK**	X			
3	Analyze SDATA at PCB header	Output of test control word at **SPI0 TX**	X			
4	Probe SEN at PCB header	Output of a 1ms 3.3V strobe after each control word at **SPI0 CSn**	X			
5	Jump power and probe at RF board header	3.3V and 0V seen at RF **V_{DD}** and RF **GND**, respectively	X			
6	Jump SCLK and probe at RF board header	1MHz 3.3V square wave clock seen at RF **SCLK**		X		Constant high signal seen at RF CLK
7	Jump SDATA and analyze at RF board header	Test control word seen at RF **SDATA**			X	Could not test due to failure at *A6*
8	Jump SEN and probe at RF board header	1ms 3.3V strobe after each control word at RF **SLE**			X	Could not test due to failure at *A6*
9	Connect daughter board to Pico headers and analyze logic sent	All signals from *A5-A8* should be seen at RF headers			X	Could not test due to failure at *A6*
	Overall test result:			X		Header for **3V3(OUT)** mistaken for **GND** on PCB headers; board likely dead as a result of reverse voltage

Example Matrix Test (for varying parameters)

Test Author: Ishaan Agrawal				
	Test Case Name:	Power System Test	**Test ID #:**	PWR-01
	Description:	Test that the boost converter correctly functions at a variety of power input levels. The power system should operate from a single battery in the 3.0 - 4.3V range and output a steady 5V with +/- 0.5V output tolerance.	**Type:**	□ white box ☑ black box □ _____
Tester Information				
	Name of Tester:	Ishaan Agrawal	**Date:**	2024-12-04
	HW/SW Version:	1.0	**Time:**	
	Setup:	Use a DC Power supply as a battery and sweep the input voltage in the expected range.		

TEST	**INPUT VOLTAGE**	**EXPECTED OUTPUTS**	**PASS**	**FAIL**	**N/A**	**Comments**
1	Apply 2.5V to BATT Header	See 5.0V on 5V rail				
2	3.0V	See 5.0V on 5V rail				
3	3.3V	See 5.0V on 5V rail				
4	3.6V	See 5.0V on 5V rail				
5	3.7V	See 5.0V on 5V rail				
6	4.0V	See 5.0V on 5V rail				
7	4.3V	See 5.0V on 5V rail				
	Overall test result:					