

MPPT Rev 2.1 | SN5

Tuesday, April 12, 2016 10:41 PM

- Testing with the solar simulator (LM713) I need to set the voltage at the solar cell (open circuit) to the MPPV + Vrslope which compensates for the resistance in the LM723 circuit. This means that at the MPP current I've dropped exactly enough voltage to actually be operating at the MPPV. While This isn't causing the MPPT to operate it does effectively simulate the correct amount of power through my board.
- ★ • ALL TESTS PERFORMED WITH THE BOTTOM SEMTEC BUS CONNECTOR CONNECTED TO MOTHERBOARD UNLESS OTHERWISE SPECIFIED, TOP BUS CONNECTOR NOT VERIFIED OTHERWISE

+X MPPT

✓ -60C Voltage Regulation Check

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrttd = 76mV +- 1mV
- Vload = 50mA

Vout	4.290	✓ 4.3V
Vrttd	.0761	✓
Vtemp	1.404	✓ $0.0761 * (-8.14228) + 2.0523 = 1.43$, low but OK
Vref	2.474	✓ Low but OK

✓ -60C MPPT Check

PASS

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrttd = 76mV +- 1mV
- Vout Supercapacitor = 3.3V

Vpanel	5.76	✓ 5.8V
Iin	~0.440	✓ 440mA
Vtemp	1.404	

★ Some sagging of Vtemp when in MPPT

✓ +60C Voltage Regulation Check

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrttd = 124mV
- Vload = 50mA

Vout	4.29	✓ 4.3V
Vrttd	0.1237	✓
Vtemp	1.02	✓ $0.1237 * (-8.14228) + 2.0523 = 1.0451$ Low but seems OK
Vref	2.474	✓ Low but OK

✓ +60C MPPT Check

PASS

- +60C Panel Simulator setting
- VOC = 5.27V
- V_{rtd} = 124mV
- V_{out} Supercapacitor = 3.5V

V _{panel}	4.11	✓ 4.3... Hmm pretty low
I _{in}	~0.44	✓ 440mA

✓ MISC Checks

VREF		✓
MPPT ISOLATION		✓
TL1251 F _{sw} -60C	480.7KHz	✓
TL1451F _{sw} 60C	502.9 KHz	✓
Scope Capture -60C	Oscillator MPPT	✓ Quickprint2
Scope Capture -60C	SW Node MPPT	✓ Quickprint1
Scope Capture +60C	SWNode MPPT	✓ Quickprint 3

-X MPPT

✓ -60C Voltage Regulation Check

- -60C Panel Simulator setting
- VOC = 6.83V
- V_{rtd} = 76mV +- 1mV
- V_{load} = 50mA

V _{out}	4.29	✓ 4.3V
V _{rtd}	0.0764	✓
V _{temp}	1.407	✓ $0.0764 * (-8.14228) + 2.0523 = 1.43023$, low but OK
V _{ref}	2.472	✓ Low but OK

✓ -60C MPPT Check

PASS

- -60C Panel Simulator setting
- VOC = 6.83V
- V_{rtd} = 76mV +- 1mV
- V_{out} Supercapacitor = 3.3V

V _{panel}	5.75	✓ 5.8V
I _{in}	~0.44	✓ 440mA
V _{temp}	1.402	



Some sagging of V_{temp} when in MPPT

✓ +60C Voltage Regulation Check

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrtd = 124mV
- No Supercapacitor, Vload = 50mA

Vout	4.29	✓ 4.3V (at Cout)
Vrtd	124.2	✓
Vtemp	1.022	✓ $0.1242 * (-8.14228) + 2.0523 = 1.04103$ Low but seems OK
Vref	2.472	✓ Low but OK

✓ +60C MPPT Check

PASS

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrtd = 124mV
- Vout Supercapacitor = 3.5V

Vpanel	4.18	✓ 4.3... Hmm low
Iin	~0.440	✓ 440mA

✓ MISC Checks

VREF		✓
MPPT ISOLATION		✓
TL1251 Fsw -60C	467.0KHz	✓
TL1451Fsw 60C	467.7 KHz	✓
Scope Capture -60C	Oscillator MPPT	✓ Quickprint7
Scope Capture -60C	SW Node MPPT	✓ Quickprint6
Scope Capture +60C	SWNode MPPT	✓ Quickprint5

+Y MPPT

✓ -60C Voltage Regulation Check

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrtd = 76mV +- 1mV
- Vload = 50mA

Vout	4.29	✓ 4.3V
Vrtd	.0752	✓
Vtemp	1.414	✓ $0.0752 * (-8.14228) + 2.0523 = 1.44$, low but OK
Vref	2.475	✓ Low but OK

✓ -60C MPPT Check

PASS

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrtd = 76mV +- 1mV
- Vout Supercapacitor = 3.3V

Vpanel	5.78	✓ 5.8V
Iin	0.44	✓ 440mA
Vtemp	1.408	

★ Some sagging of Vtemp when in MPPT

✓ +60C Voltage Regulation Check

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrtd = 124mV
- No Supercapacitor, Vload = 50mA

Vout	4.29	✓ 4.3V
Vrtd	.1243	✓
Vtemp	1.018	✓ $0.1243 * (-8.14228) + 2.0523 = 1.04021$ Low but seems OK
Vref	2.475	✓ Low but OK

✓ +60C MPPT Check

PASS

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrtd = 124mV
- Vout Supercapacitor = 3.5V

Vpanel	4.16	✓ 4.3... Hmm pretty low
Iin	~0.44	✓ 440mA

✓ MISC Checks

VREF		✓
MPPT ISOLATION		✓
TL1251 Fsw -60C	475.4KHz	✓
Scope Capture -60C	Oscillator MPPT	✓ Quickprint12
Scope Capture -60C	SW Node MPPT	✓ Quickprint11
Scope Capture +60C	SWNode MPPT	✓ Quickprint10

-Y MPPT

✓ -60C Voltage Regulation Check

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrtd = 76mV +- 1mV
- Vload = 50mA

Vout	4.28	✓ 4.3V
Vrtd	0.0763	✓
Vtemp	1.407	✓ $0.0763 * (-8.14228) + 2.0523 = 1.43$, low but OK
Vref	2.471	✓ Low but OK

✓ -60C MPPT Check

PASS

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrtd = 76mV +- 1mV
- Vout Supercapacitor = 3.3V

Vpanel	5.75	✓ 5.8V
Iin	0.44	✓ 440mA
Vtemp	1.402	

★ Some sagging of Vtemp when in MPPT

✓ +60C Voltage Regulation Check

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrtd = 124mV
- Vload = 50mA

Vout	4.28	✓ 4.3V
Vrtd	0.1234	✓
Vtemp	1.028	✓ $0.1234 * (-8.14228) + 2.0523 = 1.047$ Low but seems OK
Vref	2.471	✓ Low but OK

✓ +60C MPPT Check

PASS

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrtd = 124mV
- Vout Supercapacitor = 3.5V

Vpanel	4.21	✓ 4.3... Hmm low
Iin	~0.440	✓ 440mA

✓ MISC Checks

VREF		<input checked="" type="checkbox"/>
MPPT ISOLATION		<input checked="" type="checkbox"/>
TL1451Fsw 60C	471.1 KHz	<input checked="" type="checkbox"/> Quickprint8
Scope Capture -60C	Oscillator MPPT	<input checked="" type="checkbox"/> Quickprint8
Scope Capture +60C	SWNode MPPT	<input checked="" type="checkbox"/> Quickprint 9

-Z MPPT

☒ -60C Voltage Regulation Check

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrttd = 76mV +- 1mV
- Vload = 50mA

Vout	4.29	<input checked="" type="checkbox"/> 4.3V
Vrttd	.076	<input checked="" type="checkbox"/>
Vtemp	1.416	<input checked="" type="checkbox"/> $0.076*(-8.14228)+2.0523=1.43$, low but OK
Vref	2.474	<input checked="" type="checkbox"/> Low but OK

☒ -60C MPPT Check

PASS

- -60C Panel Simulator setting
- VOC = 6.83V
- Vrttd = 76mV +- 1mV
- Vout Supercapacitor = 3.3V

Vpanel	5.81	<input checked="" type="checkbox"/> 5.8V
Iin	~0.44	<input checked="" type="checkbox"/> 440mA
Vtemp	1.419	



Some sagging of Vtemp when in MPPT

☒ +60C Voltage Regulation Check

- +60C Panel Simulator setting
- VOC = 5.27V
- Vrttd = 124mV
- Vload = 50mA

Vout	4.29	<input checked="" type="checkbox"/> 4.3V
Vrttd	.1245	<input checked="" type="checkbox"/>
Vtemp	1.025	<input checked="" type="checkbox"/> $0.1245*(-8.14228)+2.0523=1.03859$ Low but seems OK
Vref	2.474	<input checked="" type="checkbox"/> Low but OK

✓ +60C MPPT Check

PASS

- +60C Panel Simulator setting
- VOC = 5.27V
- V_{rtd} = 124mV
- V_{out} Supercapacitor = 3.3V

V _{panel}	4.21	✓ 4.3... Hmm pretty low
I _{in}	~0.44	✓ 440mA

✓ MISC Checks

VREF		✓
MPPT ISOLATION		✓
TL1251 F _{sw} -60C	475.4KHz	✓
Scope Capture -60C	Oscillator MPPT	✓ Quickprint13
Scope Capture -60C	SW Node MPPT	✓ Quickprint14
Scope Capture +60C	SWNode MPPT	✓ Quickprint 15

+Z MPPT

✓ -60C Voltage Regulation Check

- -60C Panel Simulator setting
- VOC = 6.83V
- V_{rtd} = 76mV +- 1mV
- V_{load} = 50mA

V _{out}	4.28	✓ 4.3V
V _{rtd}	.077	✓
V _{temp}	1.400	✓ $0.077 * (-8.14228) + 2.0523 = 1.425$, low but OK
V _{ref}	2.47	✓ Low but OK

✓ -60C MPPT Check

PASS

- -60C Panel Simulator setting
- VOC = 6.83V
- V_{rtd} = 76mV +- 1mV
- V_{out} Supercapacitor = 3.3V

V _{panel}	5.74	✓ 5.8V
I _{in}	~0.44	✓ 440mA
V _{temp}	1.400	

✓ +60C Voltage Regulation Check

- +60C Panel Simulator setting
- VOC = 5.27V
- V_{rtd} = 124mV
- V_{load} = 50mA

V _{out}	4.28	✓ 4.3V
V _{rtd}	0.124	✓
V _{temp}	1.020	✓ $0.124 * (-8.14228) + 2.0523 = 1.042$ Low but seems OK
V _{ref}	2.47	✓ Low but OK

✓ +60C MPPT Check

PASS

- +60C Panel Simulator setting
- VOC = 5.27V
- V_{rtd} = 124mV
- V_{out} Supercapacitor = 3.5V

V _{panel}	4.19	✓ 4.3... Hmm pretty low
I _{in}	~0.44	✓ 440mA

✓ MISC Checks

VREF		✓
MPPT ISOLATION		✓
TL1251 F _{sw} 60C	475.8KHz	✓
Scope Capture 60C	Oscillator MPPT	✓ Quickprint18
Scope Capture 60C	SW Node MPPT	✓ Quickprint17
Scope Capture +60C	SWNode MPPT	✓ Quickprint16
Scope Capture -60C	Oscillator MPPT	✓ Quickprint19
Scope Capture -60C	SWNode MPPT	✓ Quickprint20

MPPT Functional Tests

Solar Safe Z+	✓
SolarSafe Z-	✓
SolarSafe X+	✓
SolarSafe X-	✓
SolarSafe Y+	✓
SolarSafe Y-	✓
Connectivity BUS48 -> +Y Deploy Sensor	✓ Only top bus connector
Connectivity BUS50 -> +Y Deploy	✓ Only top bus connector

Connectivity BUS44 -> -Y Deploy Sensor	<input checked="" type="checkbox"/> Only top bus connector
Connectivity BUS46 -> -Y Deploy	<input checked="" type="checkbox"/> Only top bus connector
Current Sense Voltage 0.392A	<input checked="" type="checkbox"/> $0.953V$ $0.392 \times 0.025 \times 100 = 0.98$ My lmeas inaccurate
U7 Pin 5 Current Sense Voltage	<input checked="" type="checkbox"/>
Current Sense Resistor Vdrop @0.392A	<input checked="" type="checkbox"/> $10mV$ $0.01/0.392 = 0.0255$ Ohms

MPPT +X Cout Noise	<input checked="" type="checkbox"/> Quickprint22,Quickprint24
Vbatt	<input checked="" type="checkbox"/> Quickprint25,Quickprint26