bq33100 Supercapacitor Manager, TI Design

The bq33100 supercapacitor manager was tested for (1) voltage accuracy, (2) current accuracy, (3) capacitance measurement accuracy, (4) ESR measurement accuracy, and (5) cell balancing accuracy using recently calibrated DMM, electronic load, and oscilloscope.

1. Voltage Measurement Accuracy

The device was first calibrated at nominal supercapacitor voltages, and then the capacitors were severely discharged in order to check the measurement accuracy near the midpoint.

Error following calibration.

Node	Reported mV	Actual mV	Error mV
Cell 1	2167	2166	1
Cell 1 + 2	4334	4333	1
Cell 1 + 2 + 3	6502	6501	1
Cell 1 + 2 + 3 + 4	8669	8668	1
Cell 1 + 2 + 3 + 4 + 5	10836	10835	1

Accuracy at lower voltage

Node	Reported mV	Actual mV	Error mV
Cell 1	1148	1157	-9
Cell 1 + 2	2258	2258	0
Cell 1 + 2 + 3	3421	3421	0
Cell 1 + 2 + 3 + 4	4544	4546	-2
Cell 1 + 2 + 3 + 4 + 5	5693	5692	1

2. Current Measurement Accuracy

The device was calibrated at 1000 mA, and then checked at 500 mA.

Calibrated Report	Linearity Report	Error
1000 mA	500 mA	0 mA

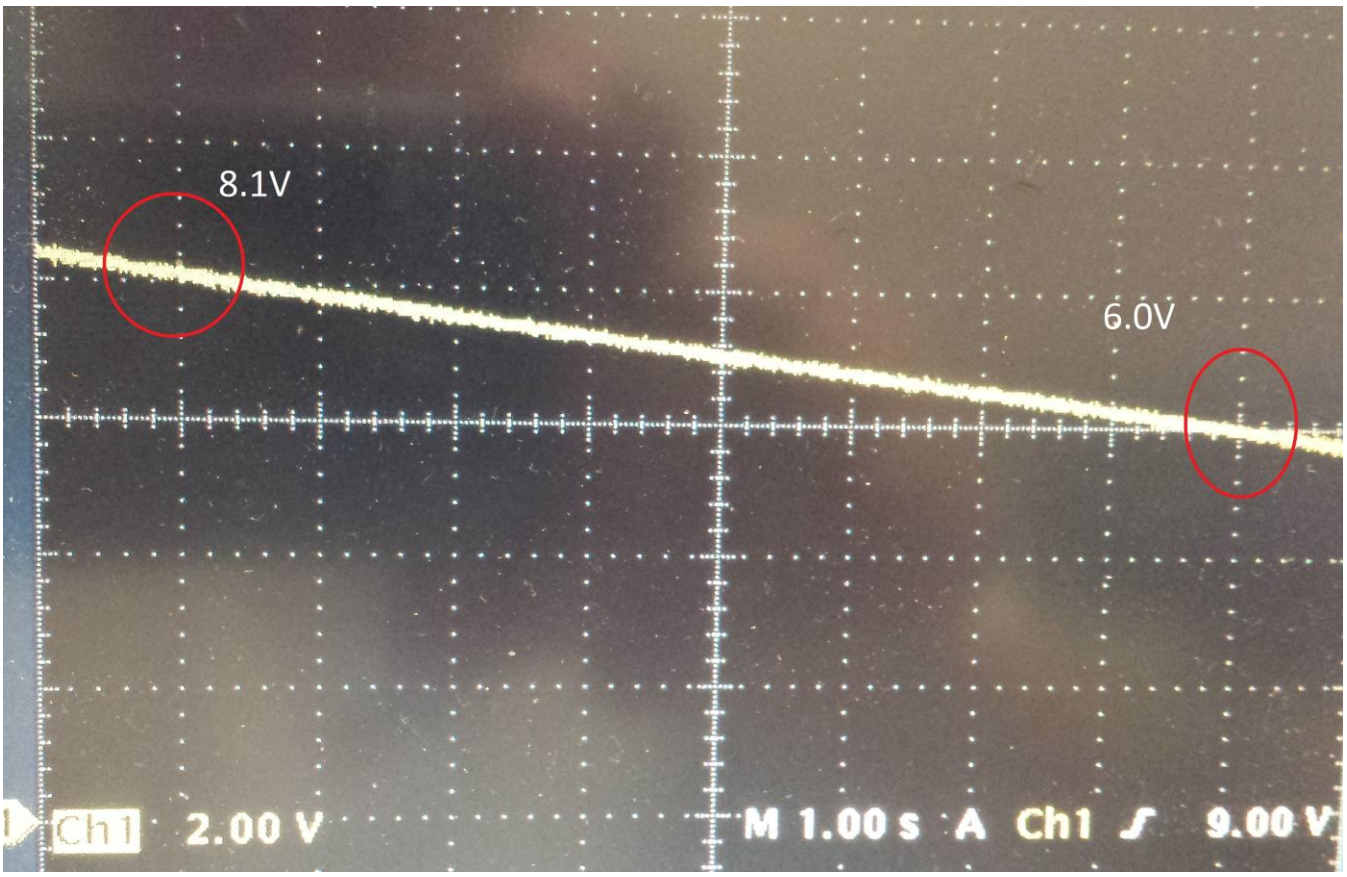
3. Capacitance Measurement Accuracy

Capacitance measurement of the device is compared to a manual check with a recently calibrated oscilloscope using a calibrated 1.0 Ampere electronic load.

Capacitance measured by the bq33100 is 4.1 F

Name	Value	Unit	Log	Scan
ESR	210	mohm	☐	☑
Relative State of Charge	100	%	☐	☑
Health	100	%	☐	☑
Capacitance	4.1	F	☐	☑

Capacitance measured on the oscilloscope is 8 Seconds * 1.0 Ampere / 1.9 V = 4.2 F



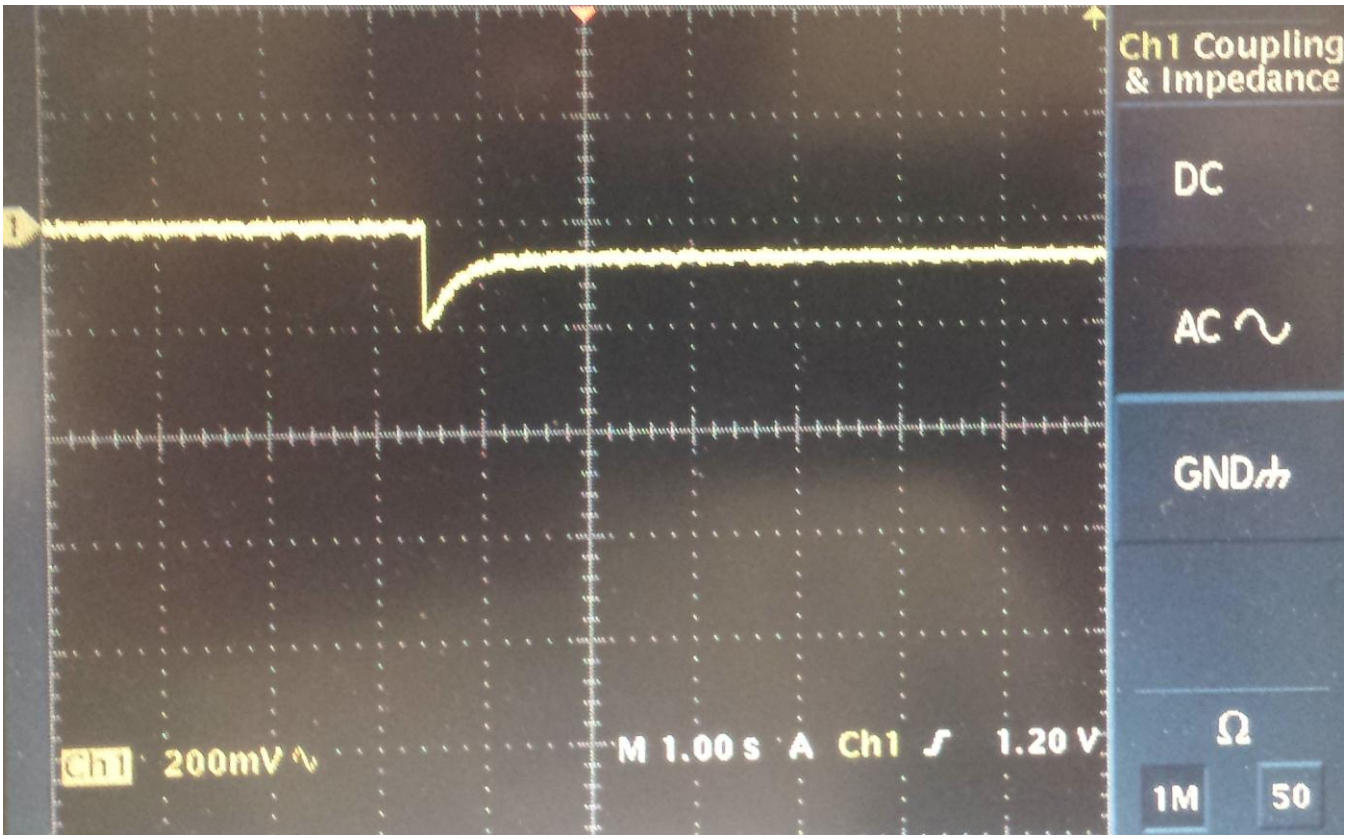
4. ESR Measurement Accuracy

ESR measurement of the device is compared to a manual check with a recently calibrated oscilloscope and calibrated 1.0 Ampere electronic load.

ESR measured by the bq33100 is 210 milliOhms

Name	Value	Unit	Log	Scan
ESR	210	mohm	☐	☑
Relative State of Charge	100	%	☐	☑
Health	100	%	☐	☑
Capacitance	4.1	F	☐	☑

ESR measured on the oscilloscope is 200 mV / 1 Ampere = 200 milliOhms



5. Cell Balancing Accuracy

Cell balancing accuracy was tested by observing unbalanced cells during initial charge and comparing those readings to cell voltage measurements 5 minutes following the initial charge.

Initially we see a significant imbalance totaling 45 mV between the 5 capacitor cells

Name	Value	Unit	Log	Scan
Charging Current	500	mA	☐	☑
Charging Voltage	10500	mV	☐	☑
Capacitor Voltage 5	2133	mV	☐	☑
Capacitor Voltage 4	2142	mV	☐	☑

Name	Value	Unit	Log	Scan
Capacitor Voltage 3	2098	mV	☐	☑
Capacitor Voltage 2	2115	mV	☐	☑
Capacitor Voltage 1	2097	mV	☐	☑
Operation Status	0904	hex	☐	☑

After 5 minutes of balancing by the bq33100, the cell voltages are all within 1 mV

Name	Value	Unit	Log	Scan
Charging Current	500	mA	☐	☑
Charging Voltage	10500	mV	☐	☑
Capacitor Voltage 5	2115	mV	☐	☑
Capacitor Voltage 4	2115	mV	☐	☑

Name	Value	Unit	Log	Scan
Capacitor Voltage 3	2115	mV	☐	☑
Capacitor Voltage 2	2114	mV	☐	☑
Capacitor Voltage 1	2115	mV	☐	☑
Operation Status	1804	hex	☐	☑

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