

Overlander 'Poly-Pro 1800 XXHD Gold' 3S

The Overlander 'Poly-Pro 1800 XXHD Gold' 3S pack came with a standard 'PolyQuest' type tap connector, with what looks like 12 AWG silicone leads, and a PCB terminating the cells (to provide large tab area contact) but no power connector fitted. The silicone leads were subsequently terminated in a Deans Ultra.

These packs are assembled by Enerland at their factory to the Overlander specifications; 2mm cell spacing, ventilated heat shrink and 'Polyquest' type tap leads and connector. Good protection of the cell ends was apparent with PCB's at each end. The whole pack housed in a durable black shrink-wrap, with air-ventilation holes down the side.

NOTE: this cell is an Enerland 'XP' type pack assembled by Enerland to Overlanders specification.

Key Information

- Pack capacity: 1800 mAh
- Pack configuration: 3S
- Dimensions: 23.5 (D) x 37 (W) x 104 mm (L)
- Mass: 147 g (with Deans Ultra)
- Max Cont. Discharge: 20C (36A)

On discharge rates Overlander recommend: *'Packs are capable of 20C and holding 10V+, but cyclic life will decay very quickly, cells used around 16-17C will maintain higher capacity and discharge rates for much longer, even better at 15C'*



Testing

All testing was carried out using:

- Charging with a Hyperion EOS7i charger and LBA6 balancer at 1C.
- Camlight High Power CC discharger with National Instruments DAQ running LabView to measure a calibrated J-type thermocouple and record individual cell voltages at 1, 3, 6, 9, 12 and 15C
- 'Burst' profile of 8 seconds at 11.2 A (6.2C) / 2 seconds at 36A (20C) for a mean current of 16.16 A (8.98C).
- 'Burst' profile of 8 seconds at 12.4 A (6.89C) / 2 seconds 40 (22.2C) for a mean current of 17.92 A (9.96C). This is for easy comparison with other '2000' class LiPo.
- Recommended pack cut-off voltage of 9V applied (3.0V x 3 cells)

Prior to testing the individual cell voltages were measured in the 'as shipped' condition.

These voltages were:

Cell 1: 3.811 V

Cell 2: 3.802 V

Cell 3: 3.812 V

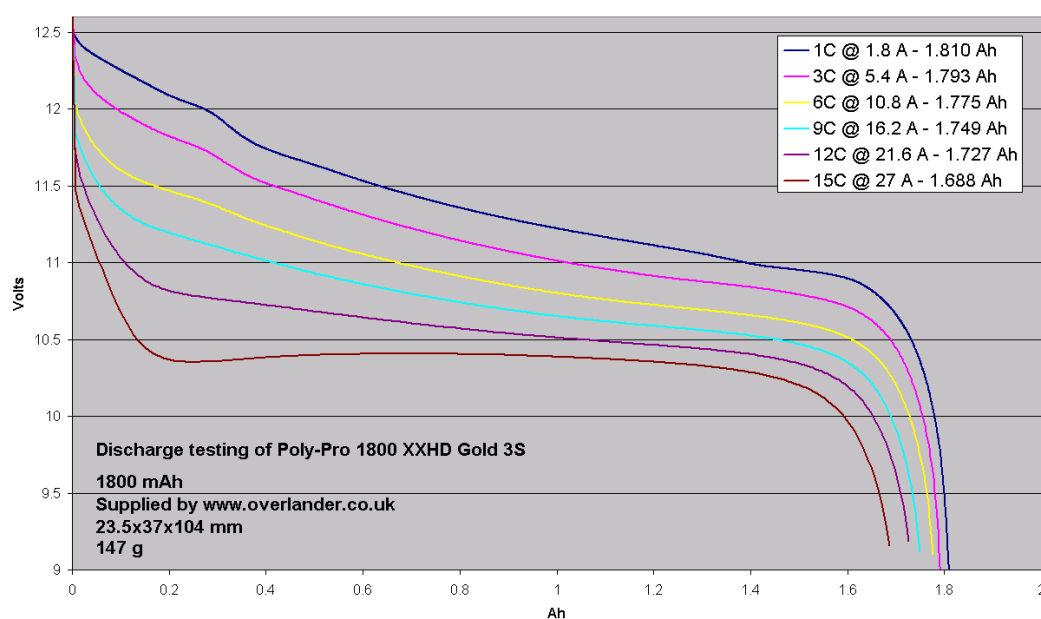
Which shows the pack was relatively well in-balance.

The results from these tests follow:

Discharged capacity, voltage and power

Discharge Rate (C)	Current (A)	Capacity (Ah)	Mean Voltage	Mean Power (W)
1	1.8	1.810	11.363	20.5
3	5.4	1.793	11.155	60.2
6	10.8	1.775	10.919	117.9
9	16.2	1.749	10.751	174.2
12	21.6	1.727	10.564	228.2
15	27	1.688	10.368	279.9

Discharge testing of Poly-Pro 1800 XXHD Gold 3S



Temperature: Celsius

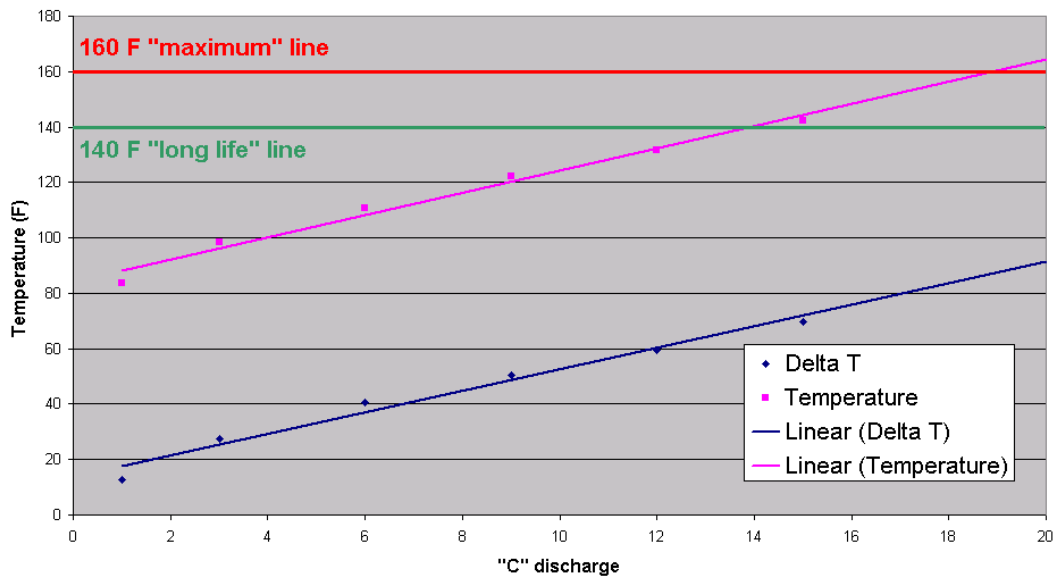
Discharge Rate (C)	Current (A)	Start Temp. (C)	Finish Temp. (C)	Delta Temp. (C)
1	1.8	21.8	28.7	7.0
3	5.4	21.6	36.8	15.2
6	10.8	21.2	43.7	22.6
9	16.2	22.1	50.2	28.1
12	21.6	22.3	55.4	33.1
15	27	22.6	61.2	38.7

Temperature: Fahrenheit

Discharge Rate (C)	Current (A)	Start Temp. (F)	Finish Temp. (F)	Delta Temp. (F)
1	1.8	71	84	13
3	5.4	71	98	27
6	10.8	70	111	41
9	16.2	72	122	51
12	21.6	72	132	60
15	27	73	142	70

Pack temperature with discharge, using a linear fit (worst case).

Discharge testing of Poly-Pro 1800 XXHD Gold 3S



Balance during discharge: individual cells

Cut-off level - 3.0V

Discharge Rate (C)	Current (A)	Capacity (Ah)	Cell 1 Term (V)	Cell 2 Term (V)	Cell 3 Term (V)	Imbalance (V)
1	1.8	1.810	2.571	3.132	3.294	0.723
3	5.4	1.793	2.554	3.129	3.226	0.672
6	10.8	1.775	2.751	3.140	3.210	0.459
9	16.2	1.749	2.805	3.139	3.176	0.371
12	21.6	1.727	2.900	3.154	3.130	0.254
15	27	1.688	2.908	3.150	3.099	0.242

Likely effects of higher LVC setting: individual cells

Alternate Cut-off levels - 3.1V

Discharge Rate (C)	Current (A)	Capacity (Ah)	Cell 1 Term (V)	Cell 2 Term (V)	Cell 3 Term (V)	Imbalance (V)
1	1.8	1.804	2.806	3.190	3.327	0.521
3	5.4	1.785	2.872	3.194	3.273	0.401
6	10.8	1.769	2.916	3.182	3.240	0.324
9	16.2	1.740	2.971	3.191	3.219	0.248
12	21.6	1.721	2.974	3.183	3.159	0.209
15	27	1.672	3.037	3.208	3.162	0.171

Alternate Cut-off levels - 3.2V

Discharge Rate (C)	Current (A)	Capacity (Ah)	Cell 1 Term (V)	Cell 2 Term (V)	Cell 3 Term (V)	Imbalance (V)
1	1.8	1.797	2.997	3.247	3.364	0.367
3	5.4	1.776	3.062	3.256	3.319	0.257
6	10.8	1.757	3.085	3.249	3.290	0.205
9	16.2	1.726	3.100	3.253	3.270	0.170
12	21.6	1.697	3.143	3.271	3.246	0.128
15	27	1.650	3.154	3.271	3.230	0.117

Closing notes:

The temperature of the pack reached ~140F with a 15C discharge (27A) – this is the limit of the ‘comfort zone’ that I usually apply when looking for long cyclic life. At 15C the pack delivered a mean voltage and power of 10.37 Volts and 280 Watts.

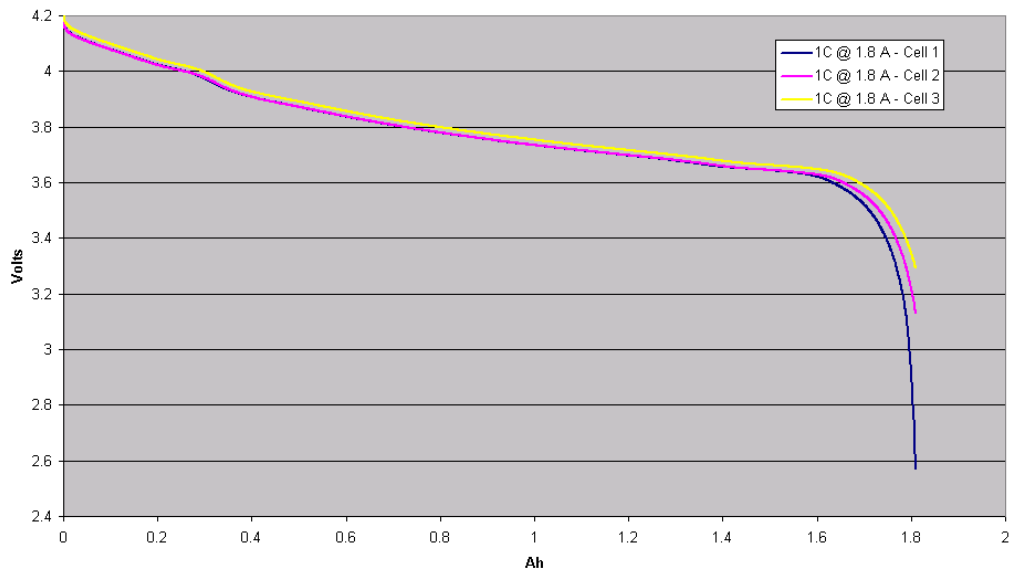
The cells appeared to be quite closely matched, and tracked within 10’s of mV right up to the ‘knee’ in the discharge curve. The measured difference in individual cell capacities was less than 20 mAh for this 3S 1800 mAh pack.

I would recommend utilising a balance charging technique with this pack, backed up by utilising a 3.1 or 3.2 V LVC or cell discharge protection: although the cells were quite closely matched, the characteristic shape of the Enerland discharge curve (sharp voltage drop towards discharged state) could produce an over-discharged cell when using a 3.0V cut-off.

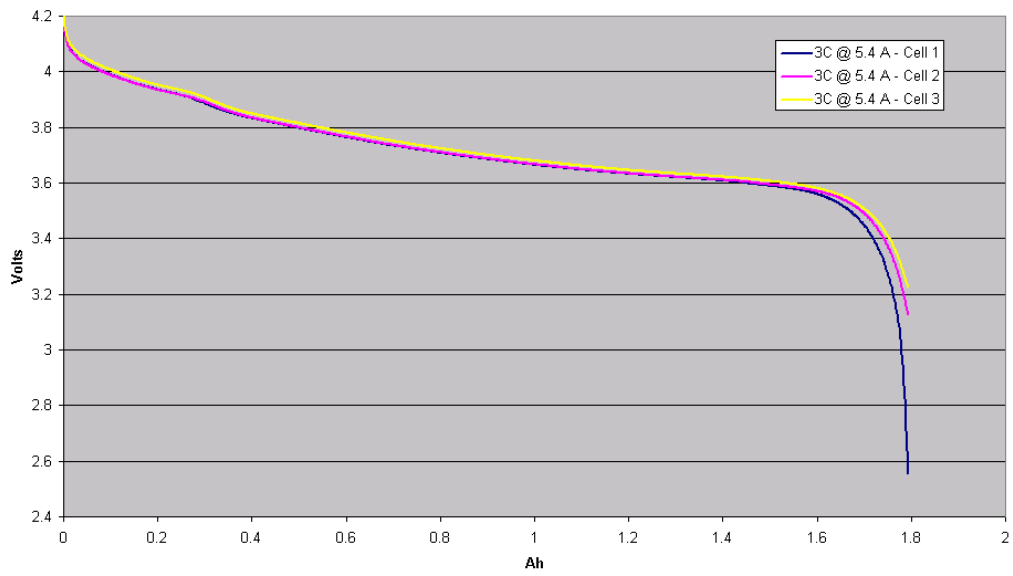
This pack is fabricated by Enerland to the Overlander specification using ‘XP’ type cells. The pack shows a slightly higher voltage retention during discharge than the previous ‘XP’ cells tested, and is in-line with the assertion from Enerland that they have made improvements to the cells in the ‘XP’ range recently. The silicone power leads are thicker than some competitors (12 AWG as opposed to 14 AWG) which is more suitable for high current loads. The temperature behaviour is very similar to that measured for a single Enerland ‘XP’ cell previously tested, and would seem logical that the temperature performance across the range will be similar to other Enerland ‘XP’ packs.

(The cell voltage and ‘burst’ graphs follow)

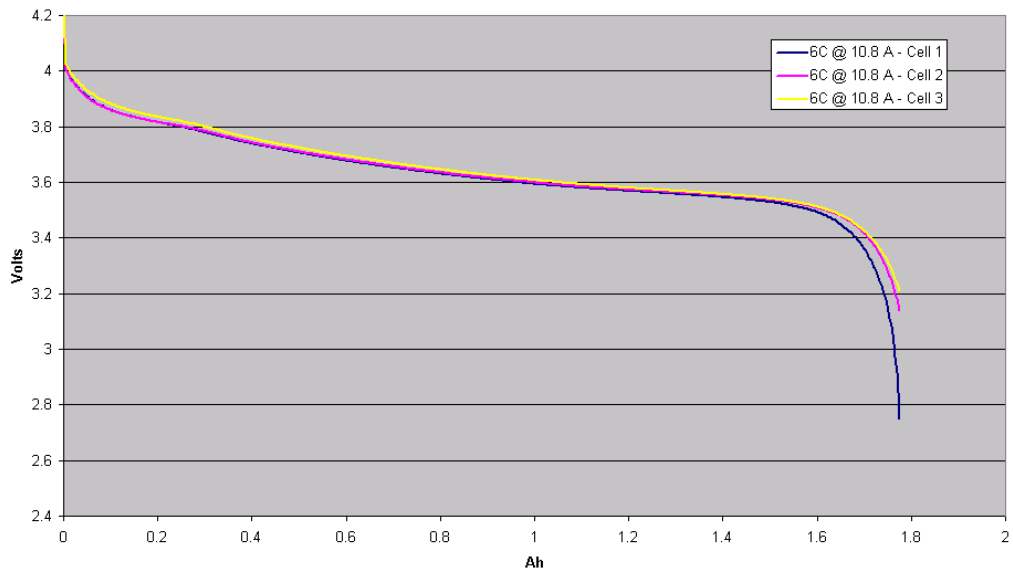
Discharge testing of Poly-Pro 1800 XXHD Gold 3S



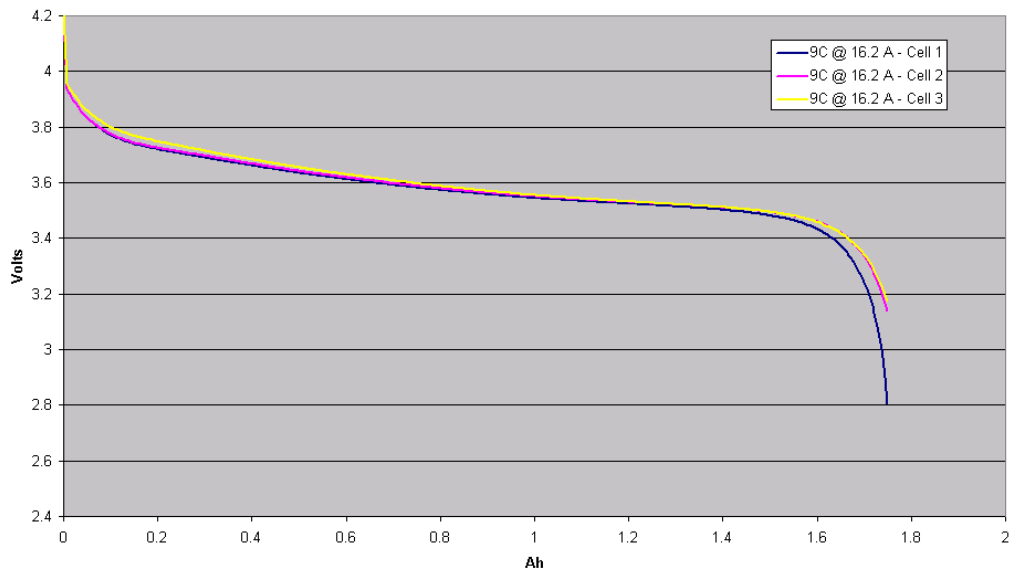
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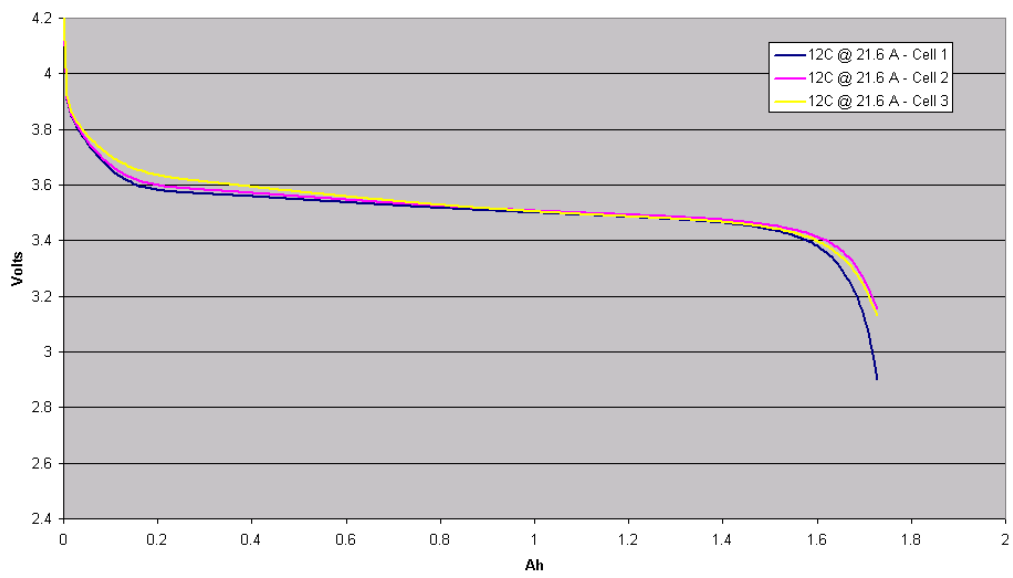
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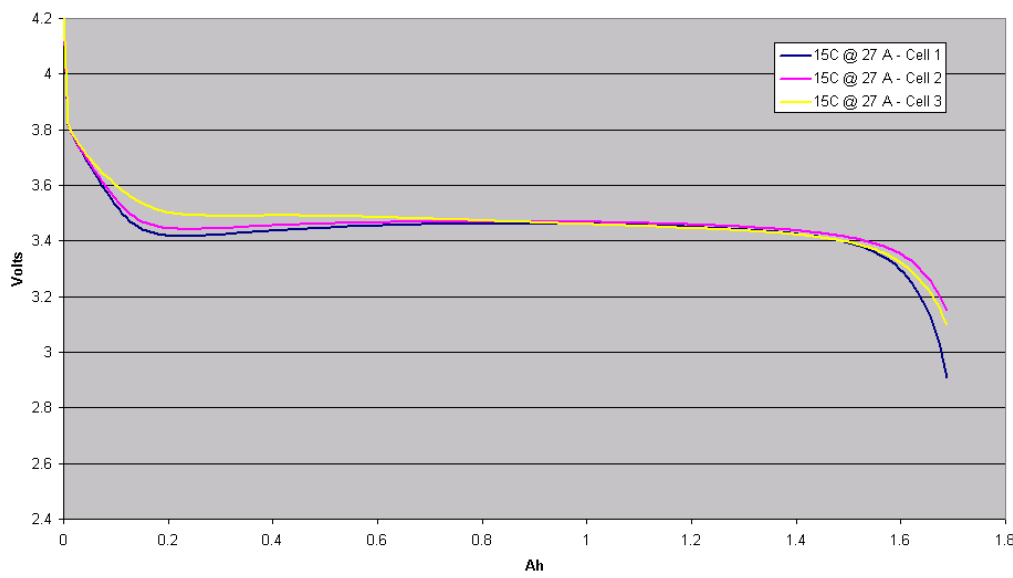
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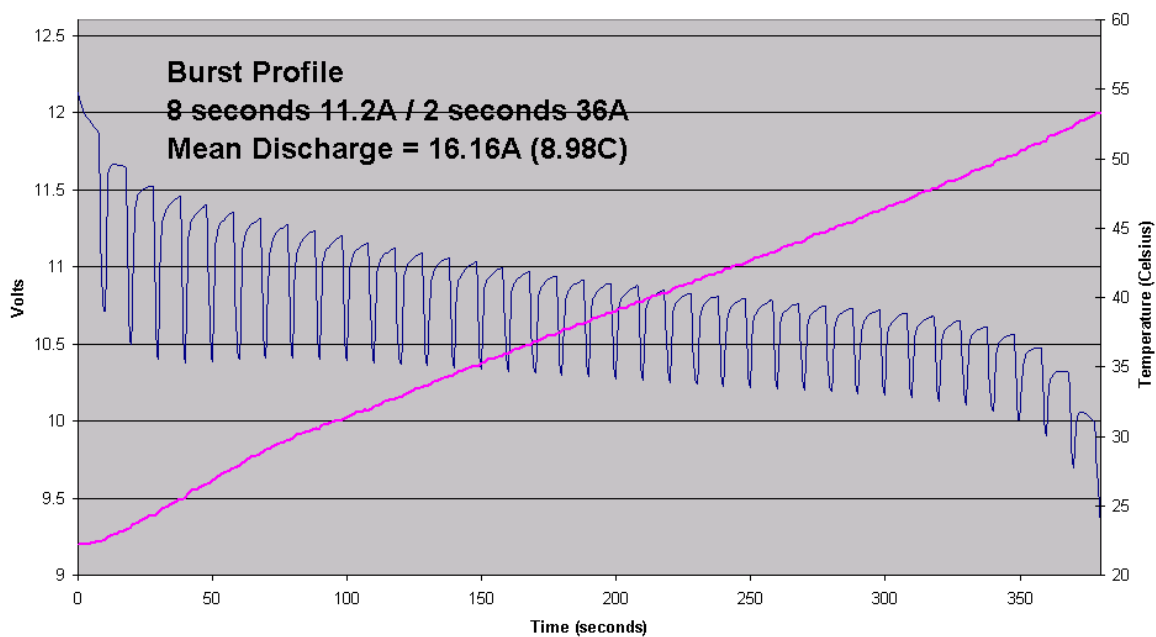


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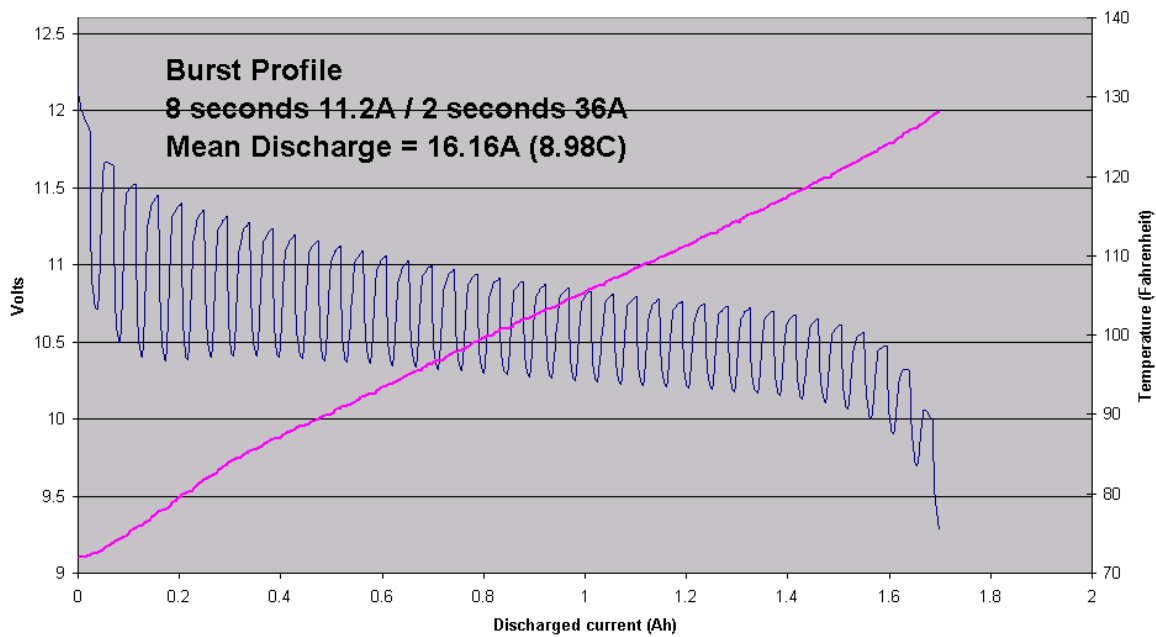
Burst Profile: Volts / Temperature against Time (6.2C/20C)

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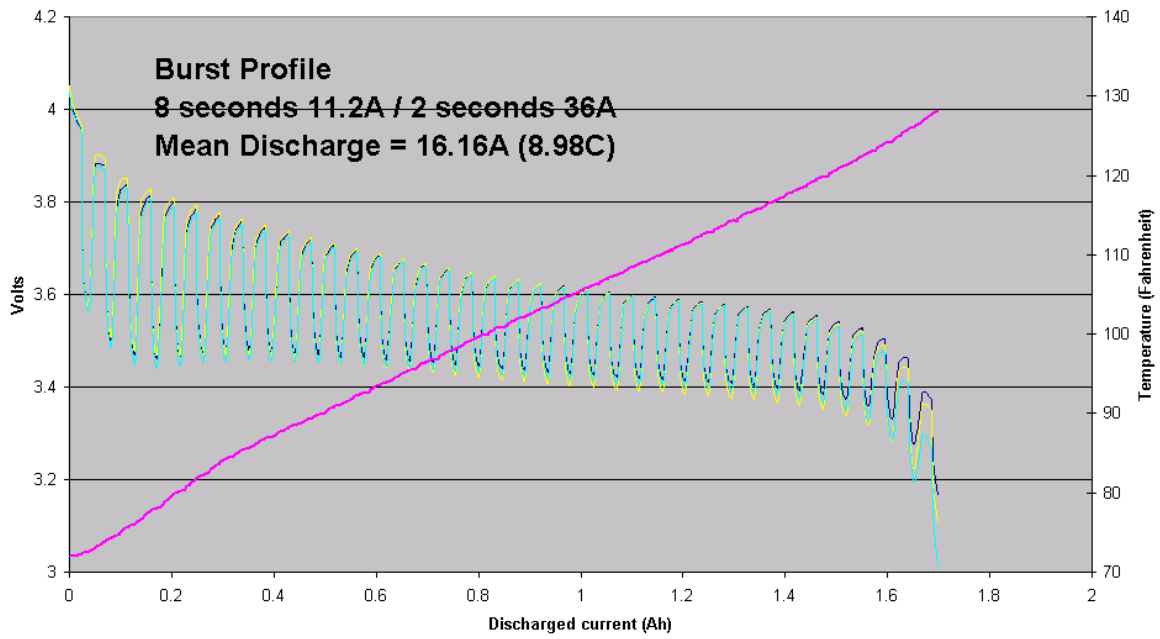
Burst Profile: Volts / Temperature against discharged current (6.2C/20C)

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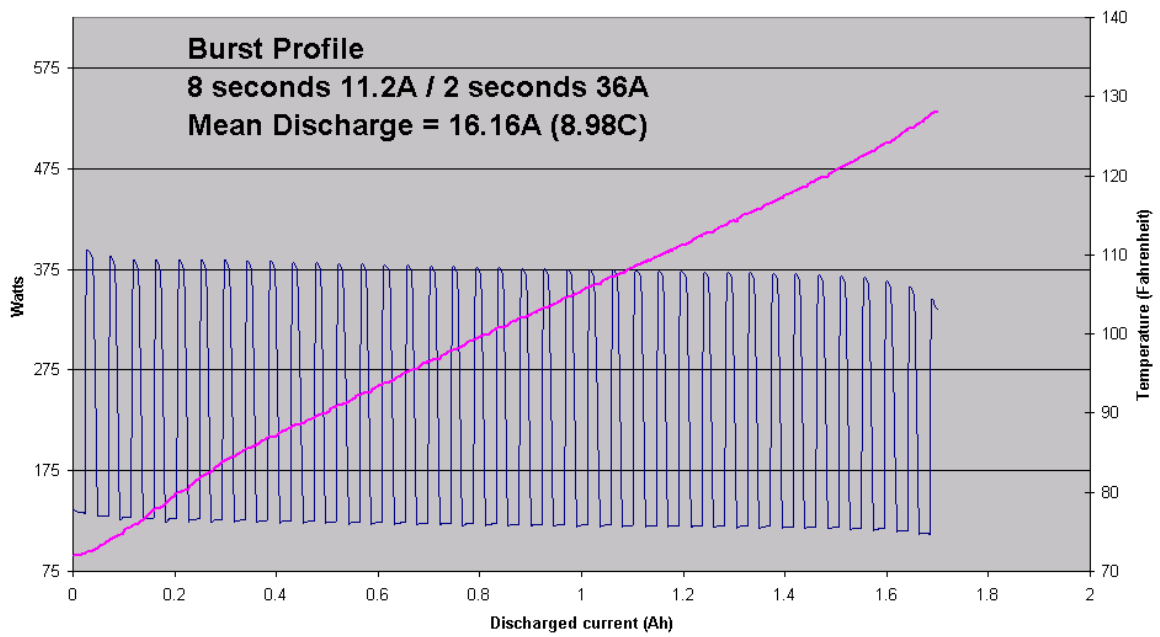
Burst Profile: Volts / Temperature against discharged current – each cell (6.2C/20C)

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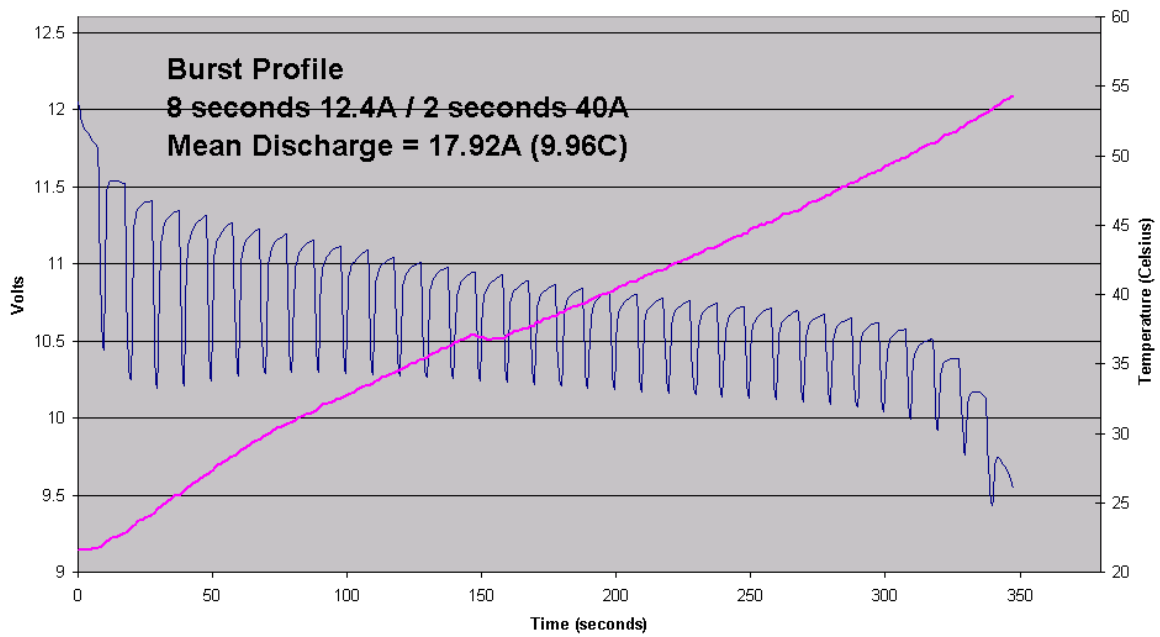
Burst Profile: Watts / Temperature against discharged current (6.2C/20C)

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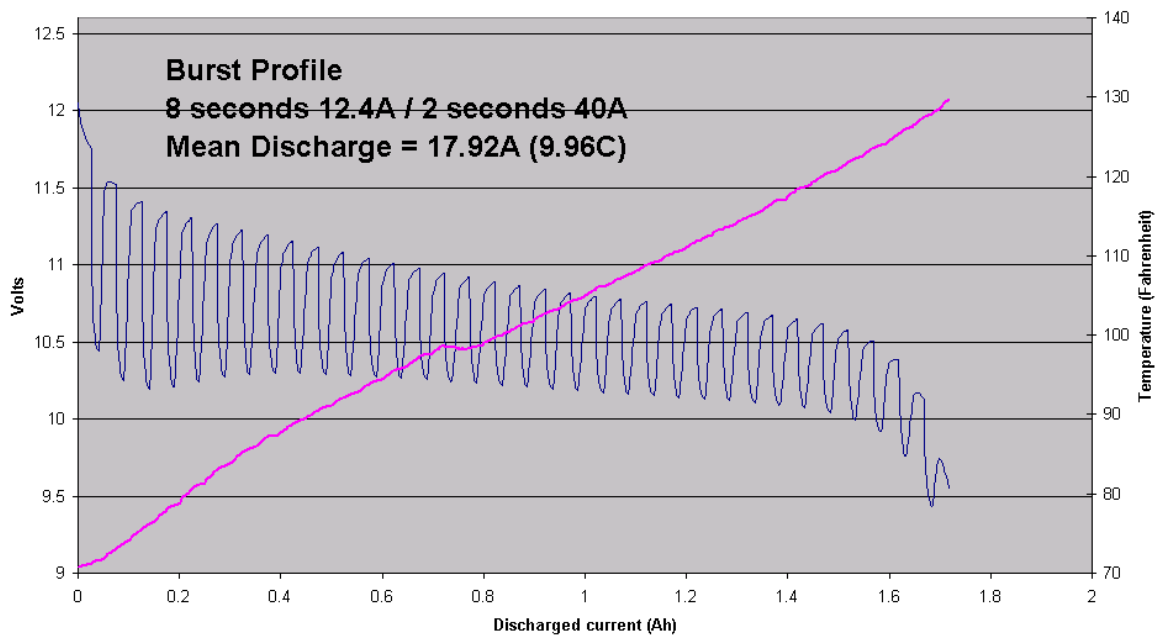
Burst Profile: Volts / Temperature against Time (12.4A/40A)

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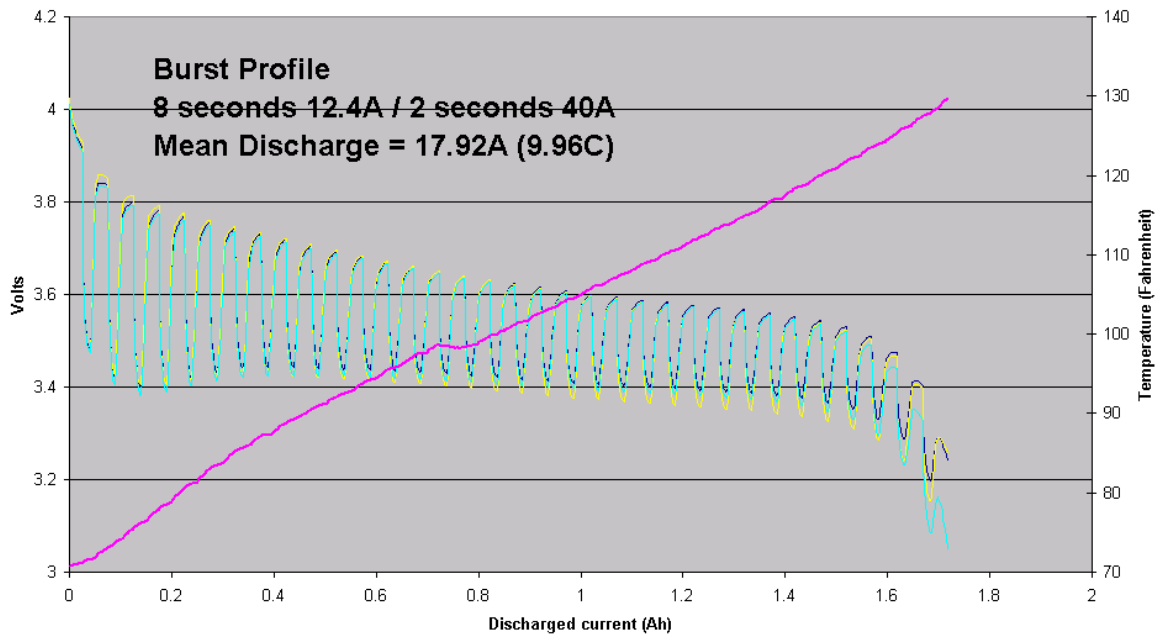
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Burst Profile: Volts / Temperature against discharged current – each cell (12.4A/40A)

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Burst Profile: Watts / Temperature against discharged current (12.4A/40A)

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