

PMP5291 Test report:

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Regulation / losses: Done with resistive load model t2: Chokes 2x 4.7uHy 1mm high

<b>Vin Volts</b>	<b>Iin mA</b>	<b>Vout1 Volts</b>	<b>Iout1 mA</b>	<b>Load resistance</b>	<b>Losses in mW**</b>	<b>Efficiency %</b>
11.01	191.5	3.116	491.5	6 ohms	577	72.6
11.01	214	3.598	491.5	7 ohms	588	75.1
11.01	236	4.095	491	8 ohms	588	77.4
11.01	222	4.202	452.5	9 ohms	543	77.8
11.01	172	4.206	345	12 ohms	443	76.6
11.02	129	4.206	245	17 ohms	391	72.5
11.02	91	4.206	153	27 ohms	359	64.2
11.02	67.5	4.206	101	41 ohms	319	57.1
11.02	48	4.206	53	79 ohms	306	42.1
11.02	61.5	0 to 0.26	48	0 to 5 ohm	Up to 677	Pre-charge
5.01	384.5	3.113	492	6 ohms	395	79.5
5.01	432.5	3.589	492	7 ohms	401	81.5
5.00	477	4.078	491	8 ohms	383	84.0
5.01	444	4.2025	453	9 ohms	321	85.6
5.01	337	4.206	345	12 ohms	237	85.9
5.02	239	4.206	245	17 ohms	169	85.9
5.03	153	4.206	153	27 ohms	126	83.6
5.03	106	4.206	101	41 ohms	108	79.7
5.03	63	4.206	53	79 ohms	94	70.3
5.03	55 to 56	0 to 0.25	46	0 to 5 ohm	Up to 282	Pre-charge

When current reached 50mA at 4.206 Vout at both 5Vin and 11Vin charging stopped.

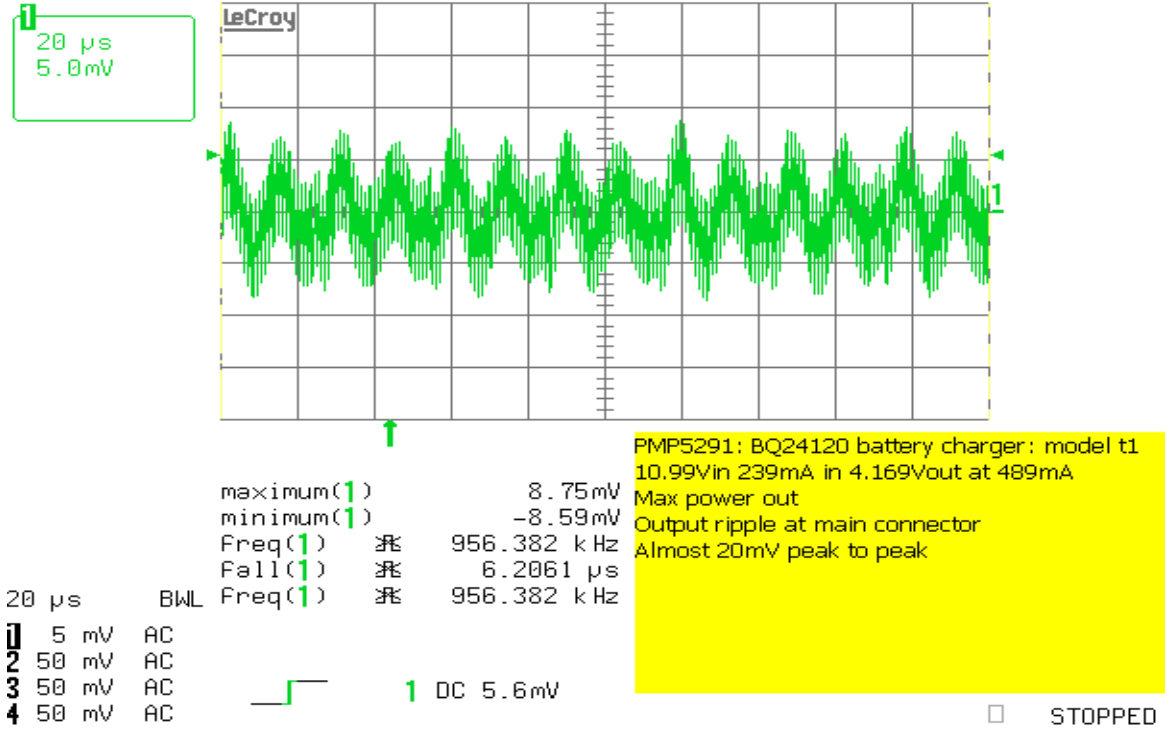
Regulation / losses: Done with battery pack model t2: Chokes 2x 4.7uHy 1mm high

<b>Vin Volts</b>	<b>Iin mA</b>	<b>Vout1 Volts</b>	<b>Iout1 mA</b>	<b>Model</b>	<b>Losses in mW**</b>	<b>Efficiency %</b>
11.03	217	3.640	493	t2	599	75.0
11.03	218	3.675	492	t2	596	75.2
11.03	222	3.753	492	t2	602	75.4
11.03	224	3.799	492	t2	602	75.7
11.03	224	3.807	491.5	t2	600	75.7
5.00	461	3.878	492.5	t2	395	82.9
11.07	225	3.880	492	t2	582	76.6
5.015	470	3.982	492	t2	398	83.1
11.07	230	3.981	491	t2	591	76.8
5.01	474	4.027	492	t2	393	83.4
11.01	233	4.027	492	t2	584	77.2
5.02	476	4.074	492	t2	385	83.9
11.01	235	4.073	491	t2	588	77.3
10.99	237	4.184	483	t1	584	77.6
10.99	239	4.169	489	t1	588	77.6
10.99	124	4.204	230	t1	396	71.0

Hot spot: The chokes at 55 degrees C for 11Vin and 483mA load at 4.184Vout.  
Ambient was at about 23-25 degrees Celsius and there was no added airflow.  
Same hot spot and 55 degrees C seen in both models t1 and t2.

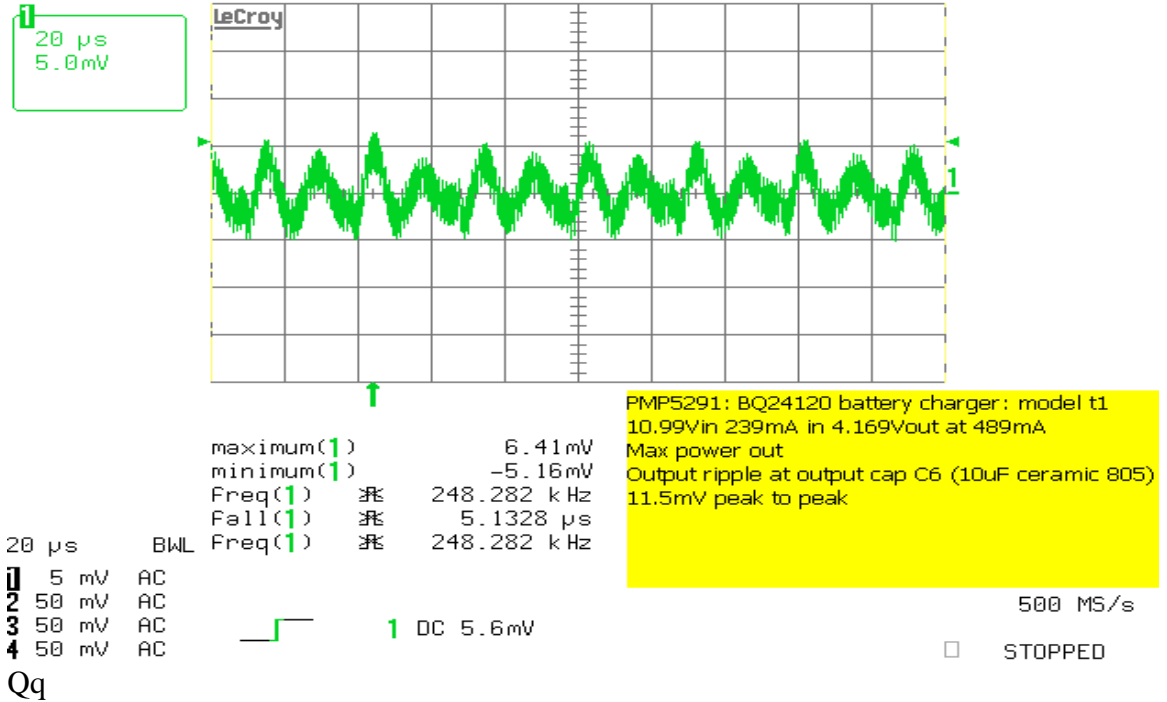
Ripple out at main connector: 11Vin and max power out:

27-Jan-10  
19:56:15



Same input and output, but ripple measured at output cap C6:

27-Jan-10  
19:57:11

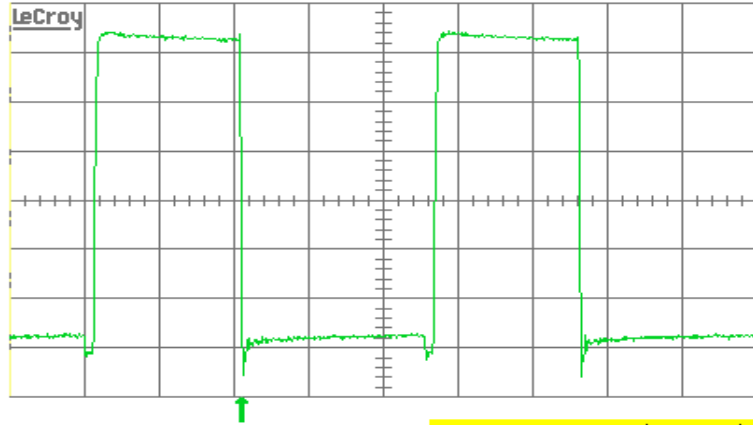


Qq

Major waveform: 11Vin max Charging power out:

27-Jan-10  
19:29:18

.2  $\mu$ s  
2.00 V



maximum(1) 11.88 V  
minimum(1) -2.19 V  
Freq(1) 1.09799 MHz  
Fall(1)  $\mu$ s 5.1 ns  
Freq(1) 1.09799 MHz

PMP5291: BQ24120 battery charger: model t1  
10.99Vin 238mA in 4.177Vout at 486mA  
Max power out  
main switching waveform:  
1.098MHz; no visible overshoot  
2V undershoot

.2  $\mu$ s

- 1 .2 V DC  $\times$
- 2 50 mV AC
- 3 50 mV AC
- 4 50 mV AC

1 AC 0.00 V

1 GS/s

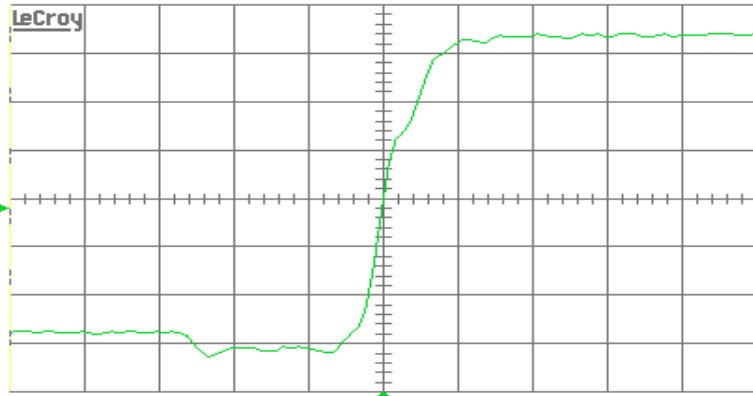
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Qq

Rising waveform for same shown:

27-Jan-10  
19:31:53

10 ns  
2.00 V



maximum(1) 11.81 V  
minimum(1) -1.50 V  
Freq(1) - - -  
Fall(1) - - -  
Freq(1) - - -

PMP5291: BQ24120 battery charger: model t1  
10.99Vin 238mA in 4.177Vout at 486mA  
Max power out  
main switching waveform expanded to show rising  
Rise time: 16 nsec  
No visible overshoot  
Note: Low side "rides" on clamp diode for about  
20nsec before rising

10 ns

- 1 .2 V DC  $\times$
- 2 50 mV AC
- 3 50 mV AC
- 4 50 mV AC

1 DC 4.68 V

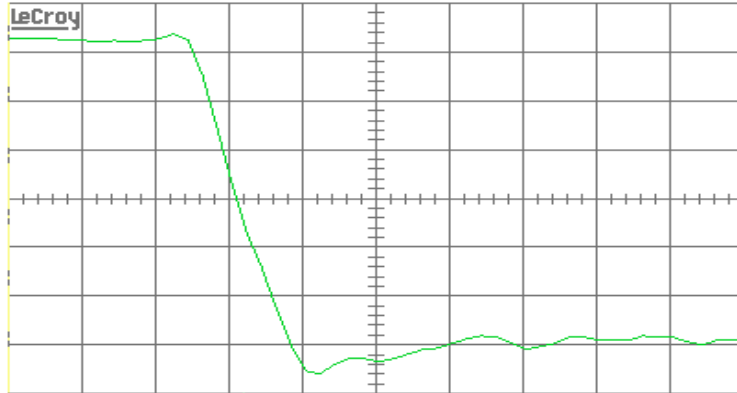
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Major waveform: 5Vin before snubber added:

Falling waveform detail for same: 11Vin, max power out:

27-Jan-10  
19:30:05

5 ns  
2.00 V



maximum(1) 11.75 V  
minimum(1) -2.13 V  
Freq(1) - - -  
Fall(1) 5.2 ns  
Freq(1) - - -

PMP5291: BQ24120 battery charger: model t1  
10.99Vin 238mA in 4.177Vout at 486mA  
Max power out  
main switching waveform expanded to show falling:  
Fall time: 10 nsec  
1.098MHz: >2V undershoot

5 ns  
1 .2 V DC  $\times$   
2 50 mV AC  
3 50 mV AC  
4 50 mV AC

1 AC 0.00 V

1 GS/s

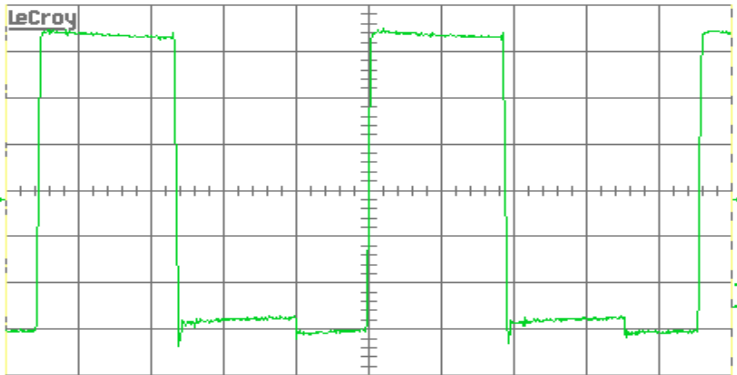
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Qq

Major waveform at load about half the max:

27-Jan-10  
19:32:57

.2  $\mu$ s  
2.00 V



maximum(1) 12.00 V  
minimum(1) -1.75 V  
Freq(1)  $\square\square$  1.09737 MHz  
Fall(1)  $\square\square$  9.5 ns  
Freq(1)  $\square\square$  1.09737 MHz

PMP5291: BQ24120 battery charger: model t1  
10.99Vin 124mA in 4.204Vout at 230mA  
About half power out: 2x 4.7uHy chokes  
main switching waveform:  
same 1.098MHz  
Low side FET turns off during conduction and choke current flows thru "clamp diode" for last 200nsec  
This is a feature in BQ24120 to shut off low side FET at light loads

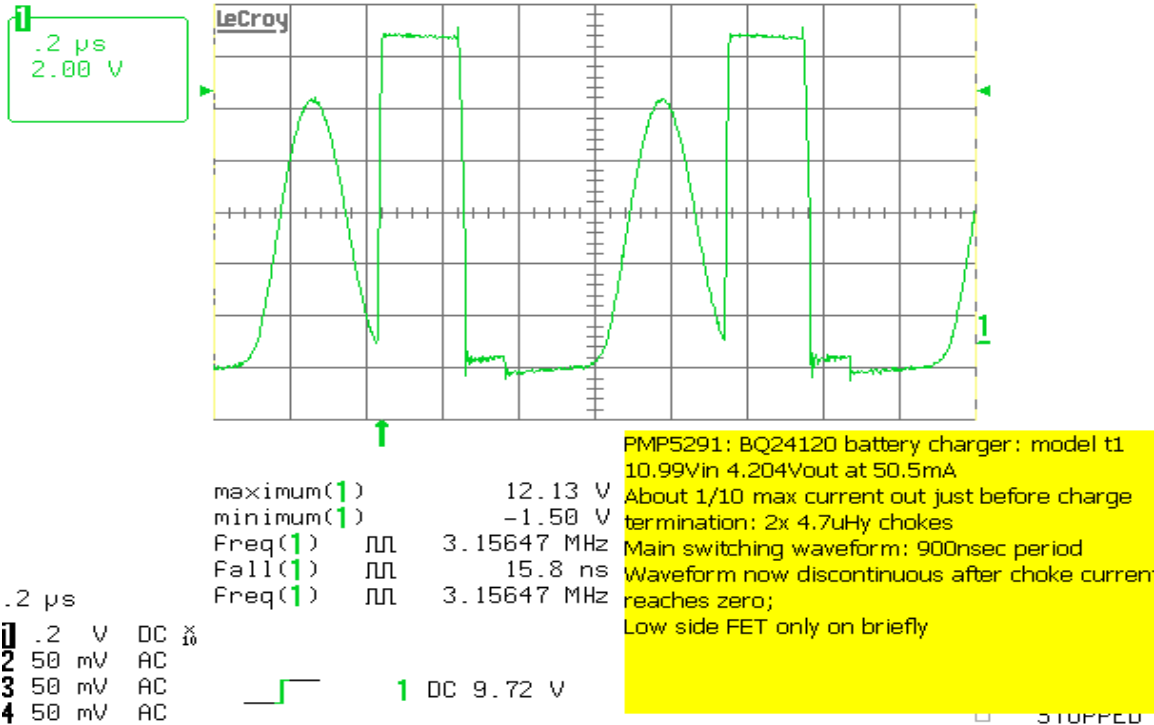
.2  $\mu$ s  
1 .2 V DC  $\times$   
2 50 mV AC  
3 50 mV AC  
4 50 mV AC

1 DC 4.68 V

STOPPED

Finally, main waveform at load just before charging terminates:

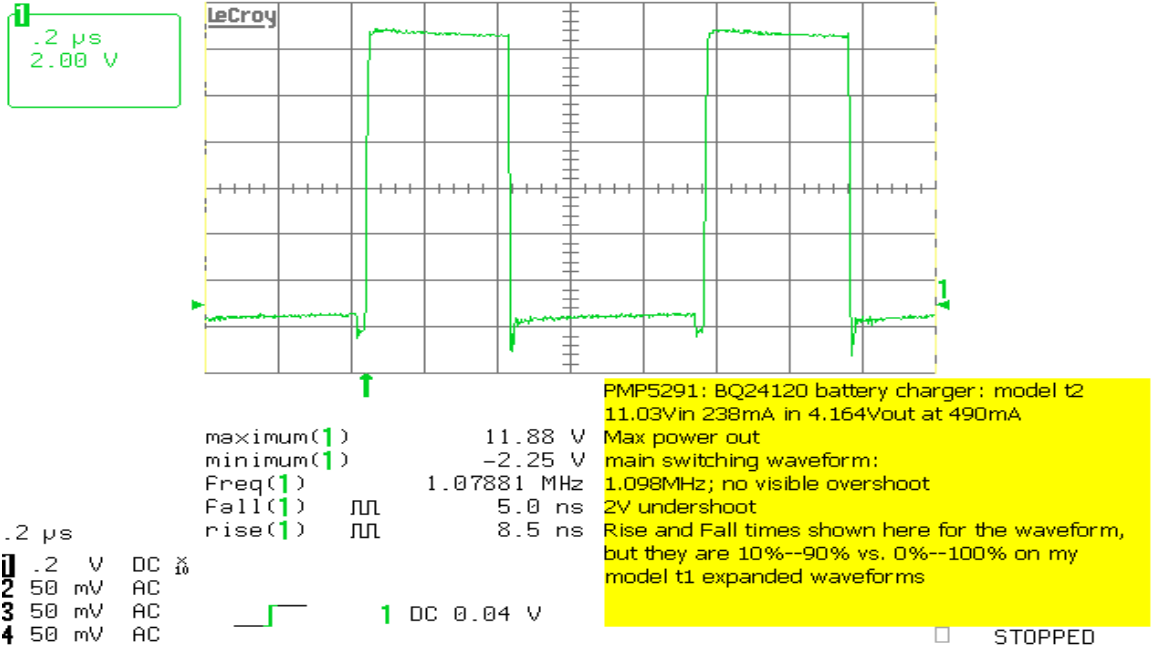
27-Jan-10  
19:48:08



Qq

Model t2 major waveform as model t1 shipped quickly:

28-Jan-10  
12:59:01



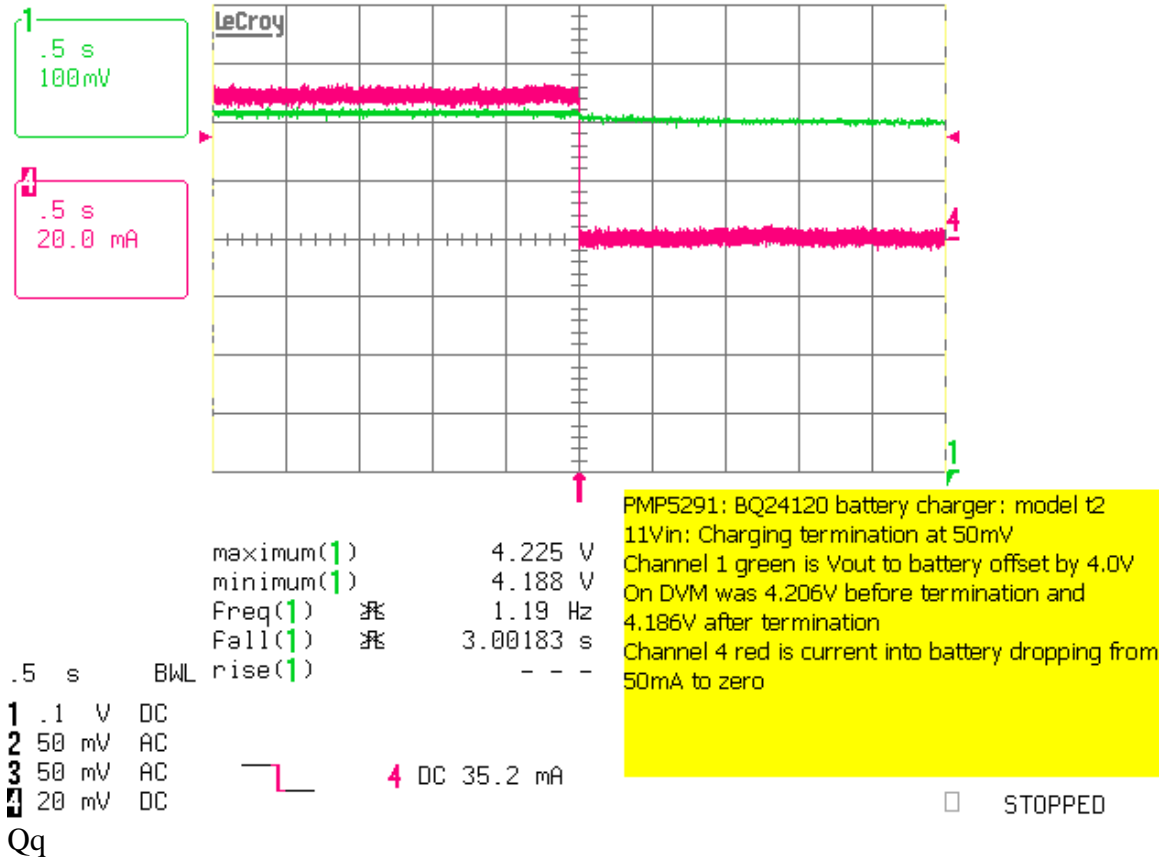
Qq

Main waveform notes: critical conduction current with 11Vin, Fsw=1.098MHz, 2x4.7uHy chokes was about 130mA at 4.204Vout

At Vin going below 4.71V and Vout at 4.18V and current at 488mA; duty cycle reaches 100%. Drop across Hi side FET about 150mV, across sense resistor 100mV, and across the two 4.7uHy chokes the remaining 270mV.

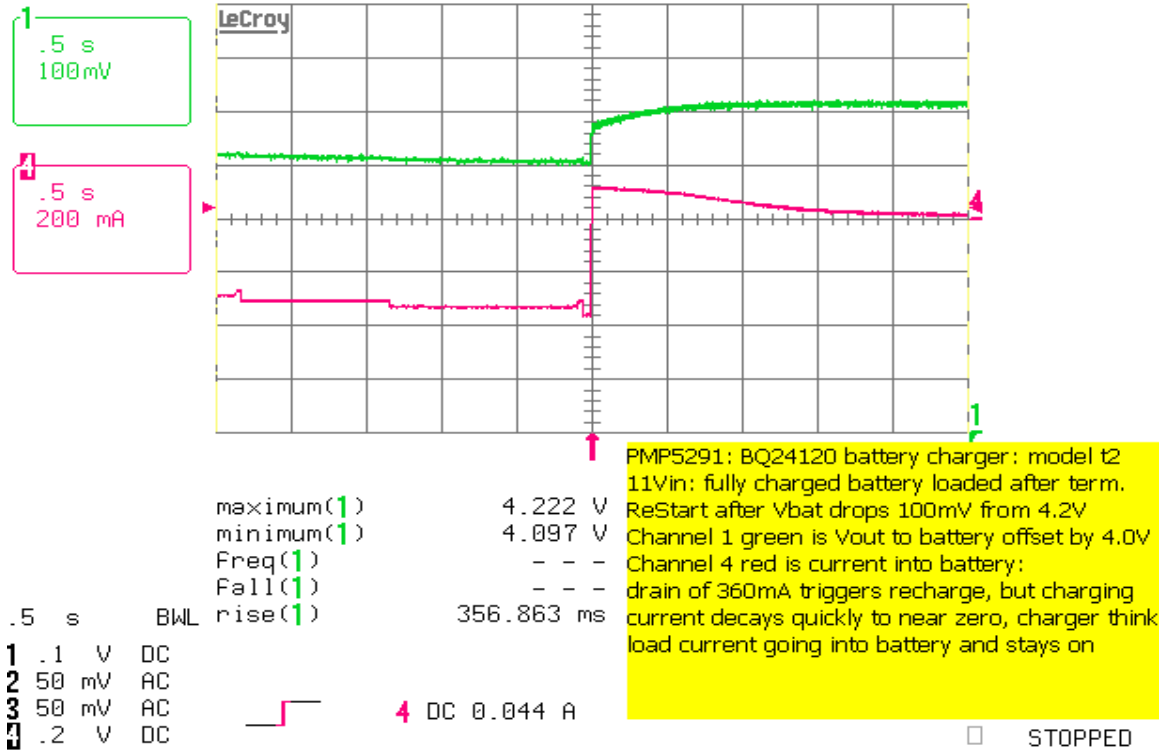
Charge terminates very close to target 50mA both on models t1 and t2 as shown here:

28-Jan-10  
16:07:04



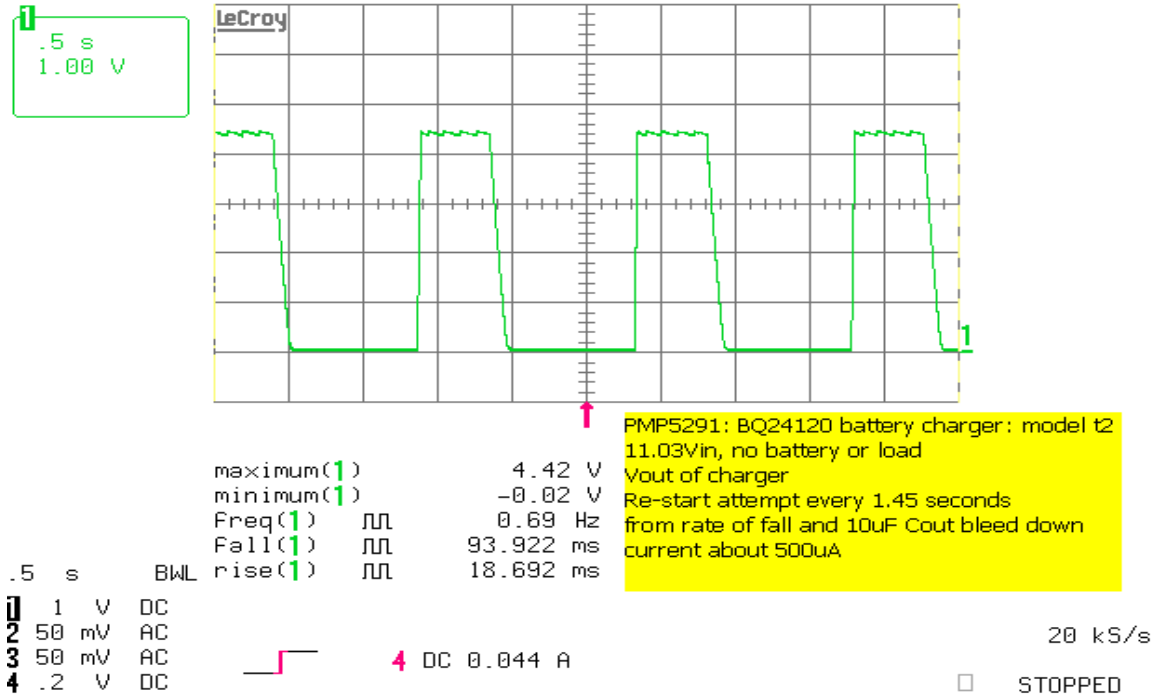
ReStart after battery voltage drops about 100mV due to 360mA load across battery:

28-Jan-10  
16:09:43



Charger output with no battery: Pulses on and off until it detects an actual battery:

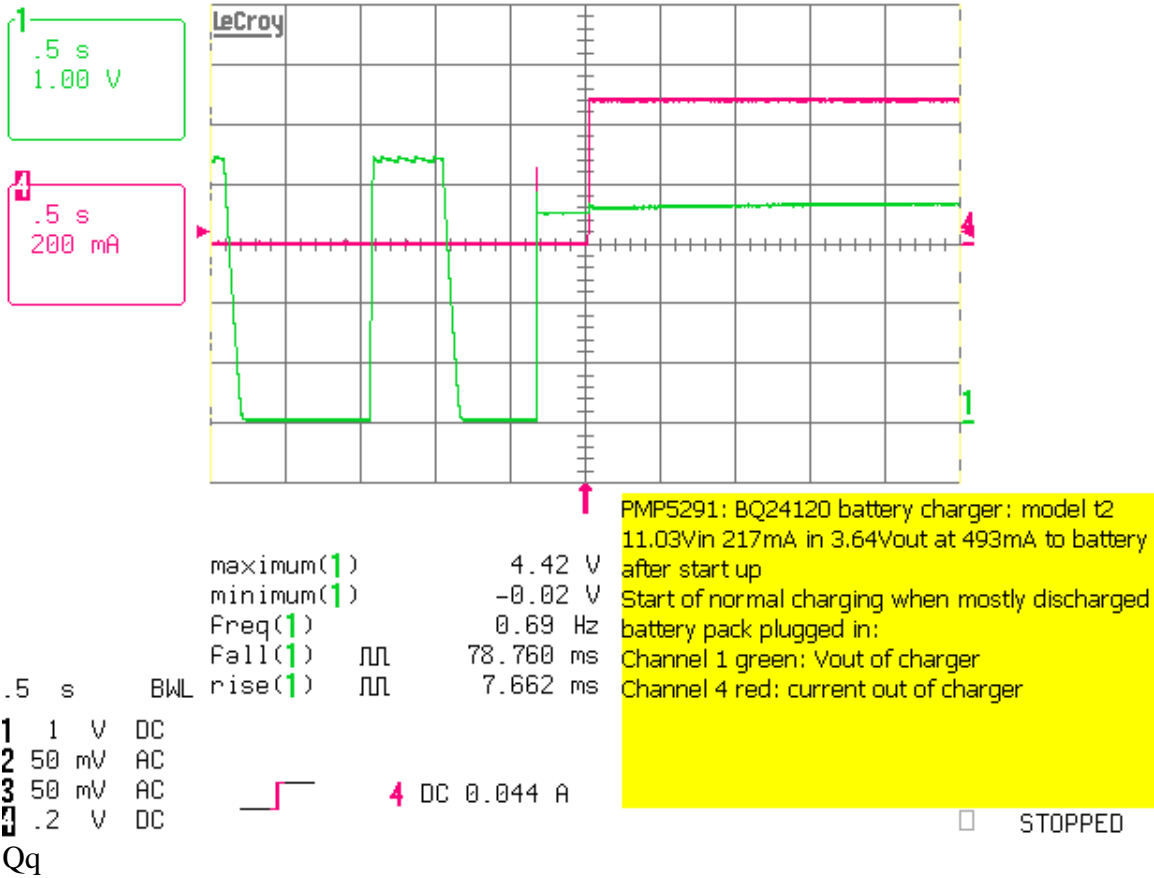
28-Jan-10  
16:13:17



Qq



Start of normal full charged when mostly discharged battery pack plugged into charger:  
 28-Jan-10 Reading Floppy Disk Drive  
 19:54:01



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