DC-DC Converter Measurements
M9OMS VLDO V2

By Stan Dye KC7XE, June 2026

Here are some measurements and characterization and observations I have completed on the M9OMS VLDO V2 board which Omar provided to me. I have done these in a similar way as I did the measurements on his first prototype VLDO, which performed very well. The V2 VLDO shows even better performance in all respects.

And the VLDO V2 is much smaller; a very compact unit.

First some notes on my measurement method:

1. All voltage measurements are made at the terminals of the VLDO board. This eliminates effects of voltage drop in the supply leads at higher currents, which can be substantial, and depend on the gauge of the wires used and the regulation of whatever voltage source is used. To keep the voltage level at the VLDO input terminals constant across the different load levels, I had to adjust the supply voltage up as load increased. I make this statement up front, because if you try to repeat my results without considering the input voltage drop, your results may not look correct.
2. While I measured load levels in steps from 0 to 4A, my main focus was on use of this VLDO for QMX/QMX+, which has a receive current of circa 100mA, and a transmit current of circa 1A. So temperature measurements were done primarily for this range.

Initial setup: The V2 VLDO is designed for 3 set voltages, 9V, 12V, and 13.8V, jumper-selectable, with a trimmer pot to make fine adjustments of the voltage value. With the jumper set for 9V operation, I adjusted the trimmer to produce 9.00V at 100mA load, with the input voltage about 1V higher. This results in very close, but not perfect voltages at the 12V and 13.8V settings:

Jumper setting: 9V adjusted to 9.00V at 100mA
Jumper setting: 12V gives 12.04V at 100mA
Jumper setting: 13.8V gives 13.79V at 100mA

Since these were so close, I did not do any additional adjustment of the trimmer for the 12V and 13.8V settings and measurements.

Summary of DC performance

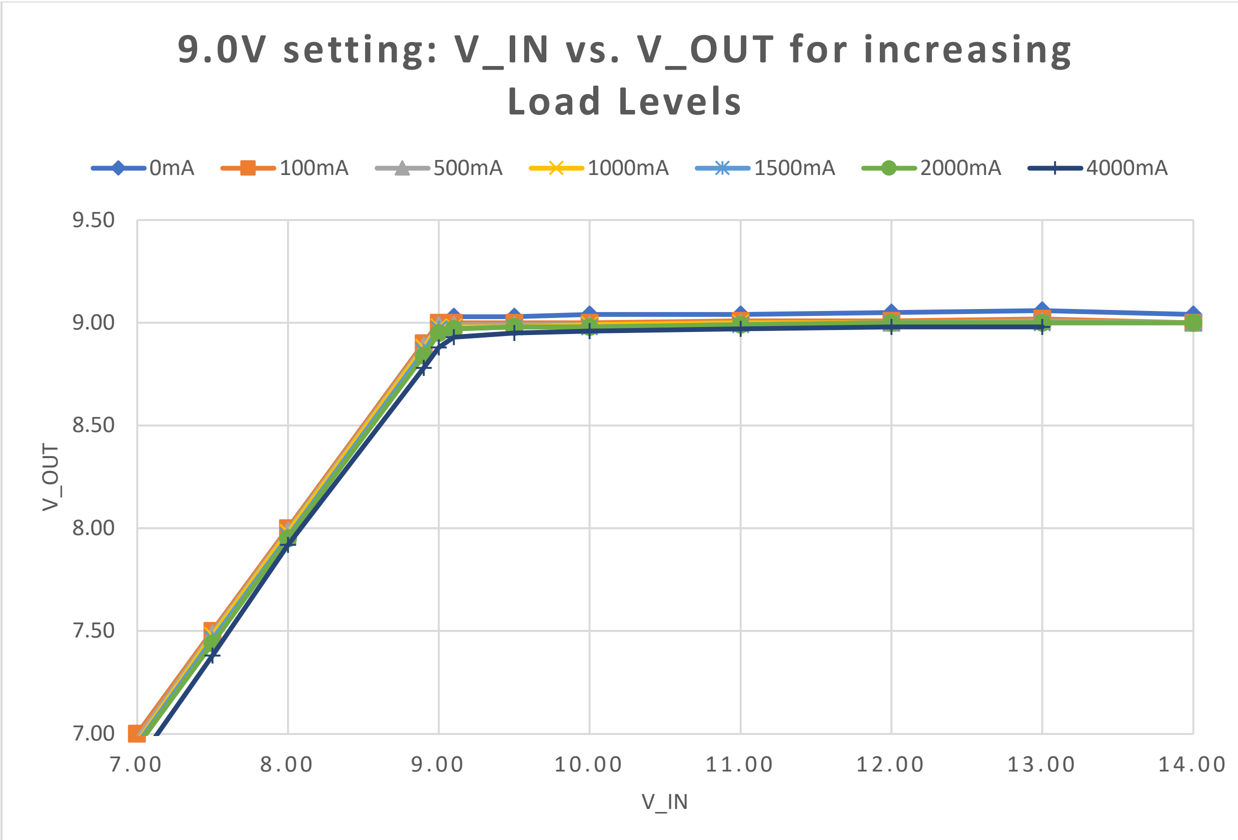
- Excellent line and load regulation performance. With Vin starting only 0.2V above the selected output voltage, the VLDO regulates the DC output within 30mV of the target voltage for loads from 100mA to 2A – and typically is within 10mV.
- Excellent performance when Vin drops below the target voltage: typically less than 30mV Vin-Vout delta for loads to 1A, and less than 60mV for loads up to 2A.
- Wide Vin operational range from 7V* to at least Vout +5V
- Temperature performance with included heat sink very good, can operate QMX/QMX+ continuous FT8 (15sec/50%) with Vin-Vout up to 3V (e.g. 15Vin/12Vout) in 20C ambient. Can supply additional heat sink for wider Vin-Vout or high ambient temp.
- The very low Vin-Vout differential as a battery source discharges puts almost all of the energy into the load, maximizing battery operated performance.

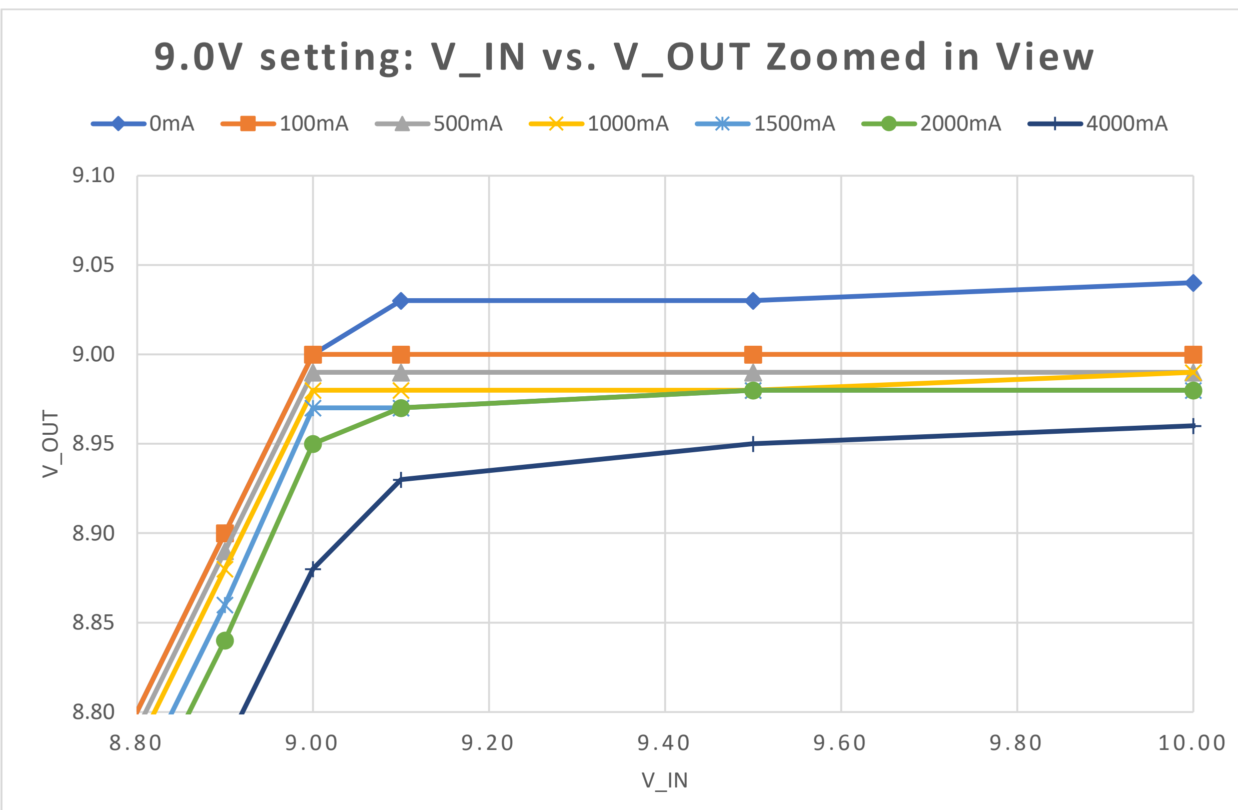
Measurement Details: Vin vs Vout at various load levels

I did measurements at each of the output voltage jumper settings: 9V, 12V and 13.8V, noting similarly excellent performance for each. For each of these, there is a data table showing the measurements made, followed by two graphs of that data. The first graph shows the full data set; the second graph "zooms in" to show detail around the knee of the regulation curve.

First, 9V measurements (i.e. jumper set for 9V output, trimmer adjusted to 9.00 at 100mA):

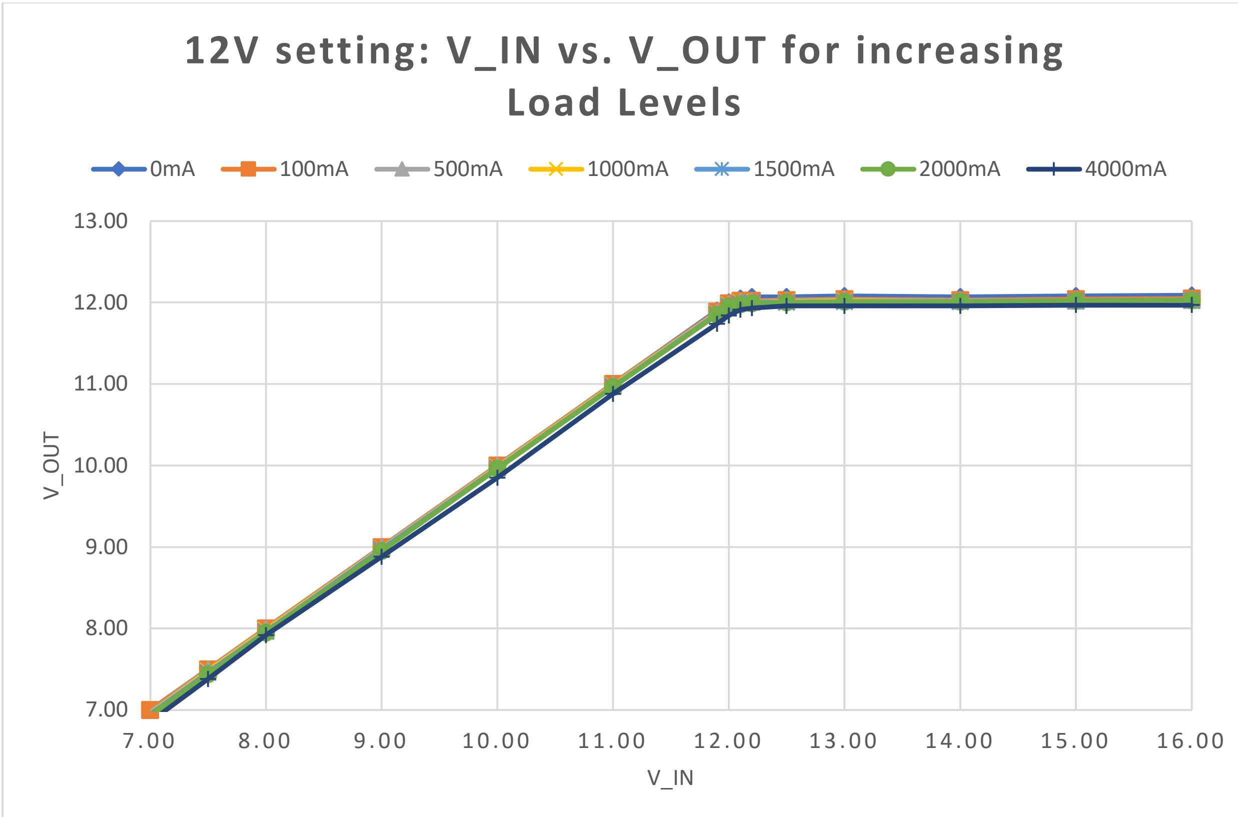
Vin vs Vout increasing load levels: Jumper set for 9V							
Vin	**0mA**	**100mA**	**500mA**	**1000mA**	**1500mA**	**2000mA**	**4000mA**
6.50	6.50	6.49	6.44	2.50	0.00	0.00	
7.00	7.00	7.00	6.98	6.96	6.95	6.94	6.86
7.50	7.50	7.50	7.49	7.48	7.46	7.44	7.38
8.00	8.00	8.00	7.99	7.98	7.96	7.95	7.92
8.90	8.90	8.90	8.89	8.88	8.86	8.84	8.78
9.00	9.00	9.00	8.99	8.98	8.97	8.95	8.88
9.10	9.03	9.00	8.99	8.98	8.97	8.97	8.93
9.50	9.03	9.00	8.99	8.98	8.98	8.98	8.95
10.00	9.04	9.00	8.99	8.99	8.98	8.98	8.96
11.00	9.04	9.01	9.00	9.00	8.99	8.99	8.97
12.00	9.05	9.01	9.00	9.00	9.00	9.00	8.98
13.00	9.06	9.02	9.01	9.00	9.00	9.00	8.98
14.00	9.04	9.00	9.00	9.00	9.00	9.00	

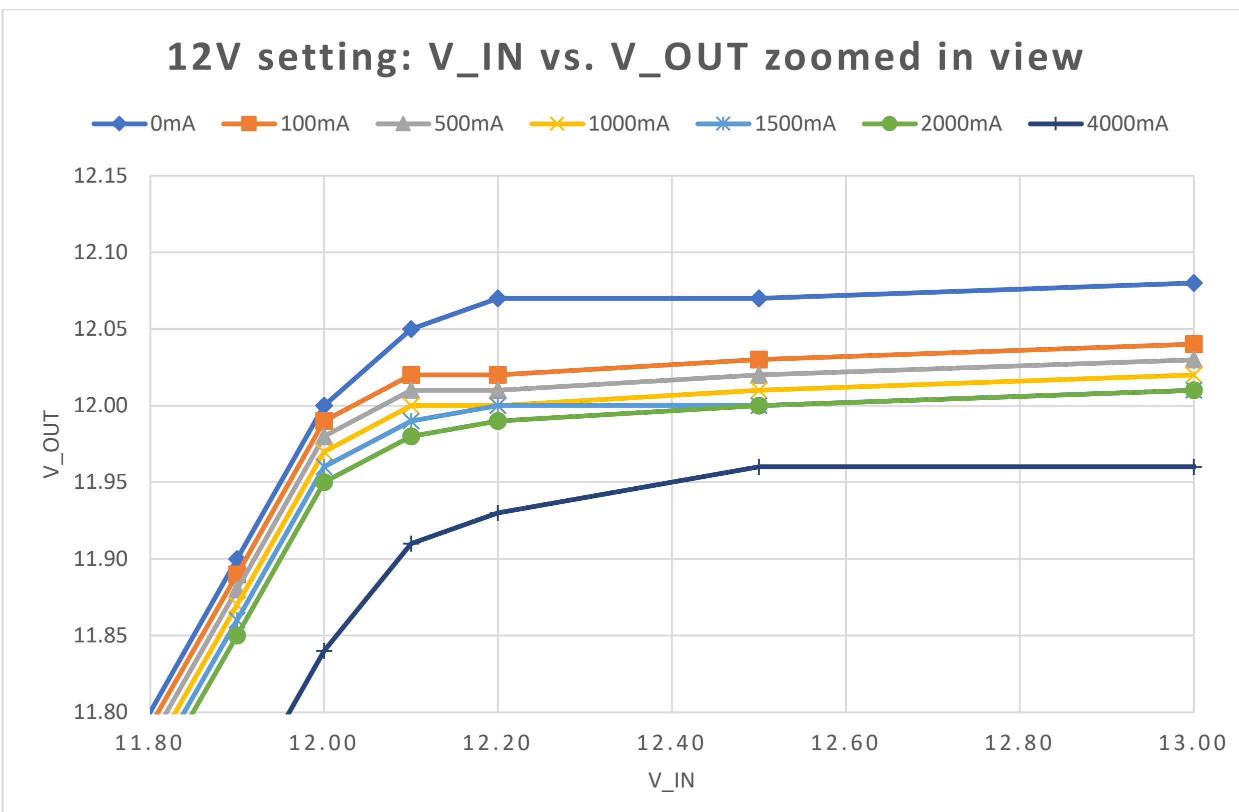

9.0V setting: V_IN vs. V_OUT for increasing Load Levels
0mA
100mA
500mA
1000mA
1500mA
2000mA
4000mA
9.50
9.00
8.50
8.00
7.50
7.00
V_OUT
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
V_IN


9.0V setting: V_IN vs. V_OUT Zoomed in View
0mA
100mA
500mA
1000mA
1500mA
2000mA
4000mA
9.10
9.05
9.00
8.95
8.90
8.85
8.80
V_OUT
8.80
9.00
9.20
9.40
9.60
9.80
10.00
V_IN

Next, 12V measurements: (i.e. jumper set for 12V output, trimmer NOT re-adjusted for exactly 12.00V, so 12.03V is the 100mA baseline)

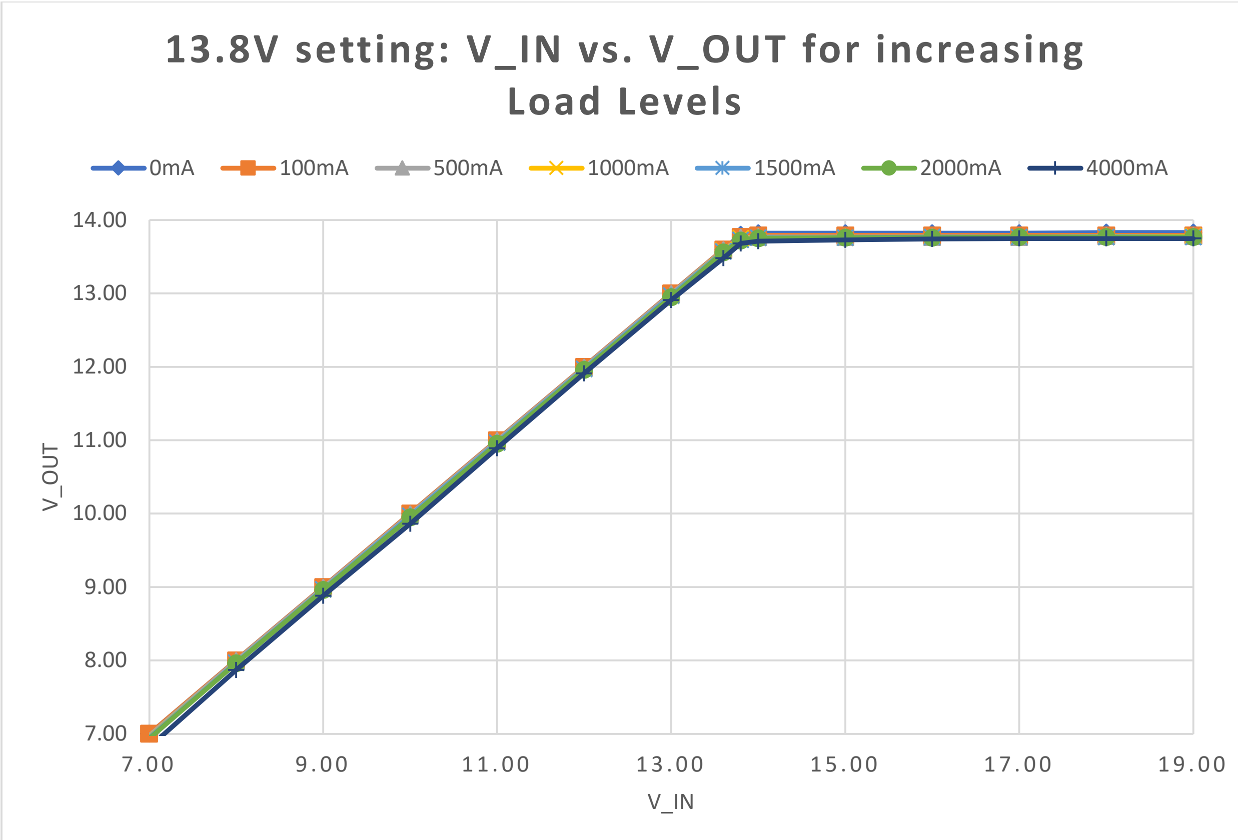
Vin vs Vout increasing load levels: Jumper set for 12V							
Vin	**0mA**	**100mA**	**500mA**	**1000mA**	**1500mA**	**2000mA**	**4000mA**
6.50	6.50	6.49	6.44	2.50	0.00	0.00	
7.00	7.00	7.00	6.98	6.96	6.95	6.94	6.86
7.50	7.50	7.50	7.49	7.48	7.46	7.44	7.38
8.00	8.00	8.00	7.99	7.98	7.96	7.95	7.92
9.00	9.00	9.00	8.99	8.98	8.97	8.95	8.88
10.00	10.00	10.00	9.99	9.98	9.97	9.96	9.85
11.00	11.00	11.00	10.99	10.98	10.97	10.96	10.88
11.90	11.90	11.89	11.88	11.87	11.86	11.85	11.74
12.00	12.00	11.99	11.98	11.97	11.96	11.95	11.84
12.10	12.05	12.02	12.01	12.00	11.99	11.98	11.91
12.20	12.07	12.02	12.01	12.00	12.00	11.99	11.93
12.50	12.07	12.03	12.02	12.01	12.00	12.00	11.96
13.00	12.08	12.04	12.03	12.02	12.01	12.01	11.96
14.00	12.07	12.03	12.02	12.01	12.01	12.01	11.96
15.00	12.08	12.04	12.02	12.02	12.02	12.02	11.97
16.00	12.09	12.05	12.03	12.03	12.03	12.03	11.97

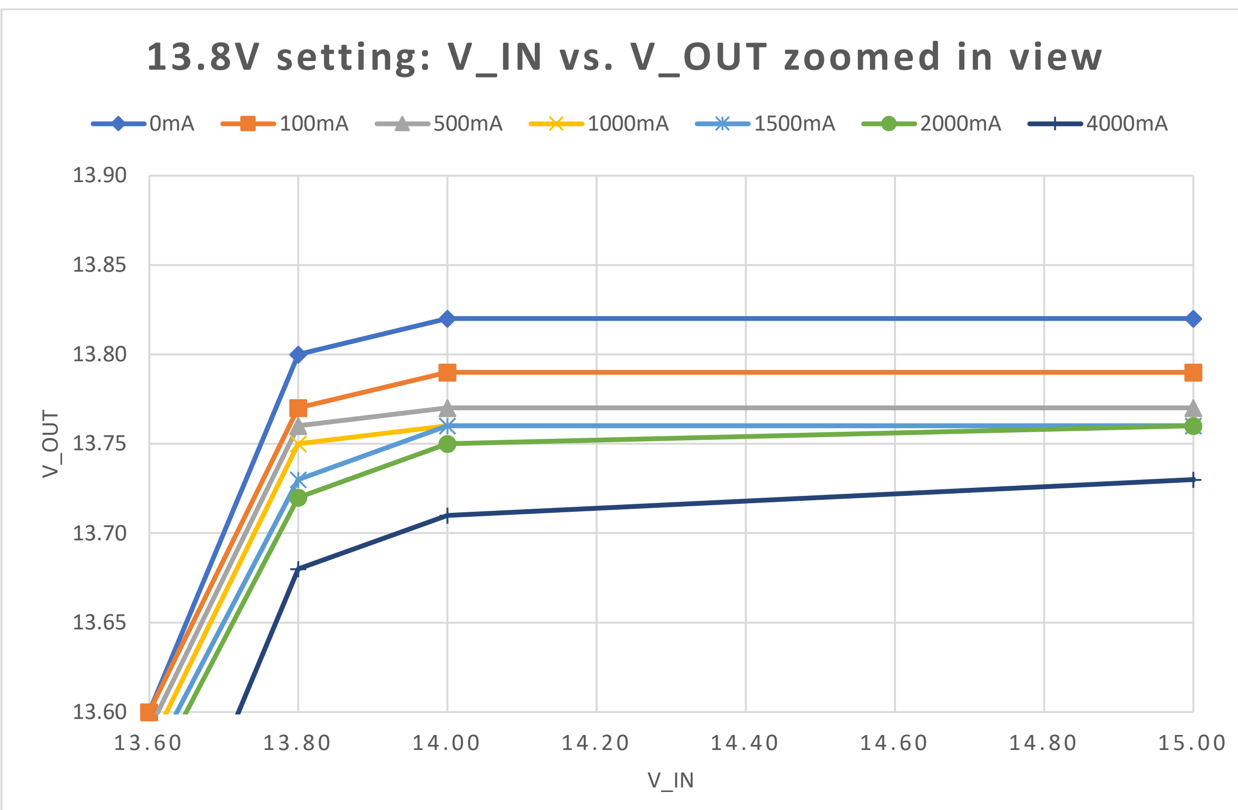

12V setting: V_IN vs. V_OUT for increasing Load Levels
0mA
100mA
500mA
1000mA
1500mA
2000mA
4000mA
13.00
12.00
11.00
10.00
9.00
8.00
7.00
V_OUT
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
16.00
V_IN


12V setting: V_IN vs. V_OUT zoomed in view
0mA
100mA
500mA
1000mA
1500mA
2000mA
4000mA
12.15
12.10
12.05
12.00
11.95
11.90
11.85
11.80
V_OUT
11.80
12.00
12.20
12.40
12.60
12.80
13.00
V_IN

Next, 13.8V measurements: (i.e. jumper set for 13.8V output, trimmer NOT re-adjusted for exactly 13.80V, so 13.79V is the 100mA baseline)

Vin vs Vout increasing load levels: Jumper set for 13.8V							
Vin	**0mA**	**100mA**	**500mA**	**1000mA**	**1500mA**	**2000mA**	**4000mA**
6.50	6.50	6.49	6.34	1.90	0.00	0.00	
7.00	7.00	7.00	6.98	6.96	6.95	6.94	6.82
8.00	8.00	8.00	7.99	7.97	7.97	7.96	7.87
9.00	9.00	9.00	8.99	8.97	8.97	8.96	8.88
10.00	10.00	10.00	9.99	9.97	9.97	9.95	9.86
11.00	11.00	11.00	10.99	10.97	10.97	10.95	10.89
12.00	12.00	12.00	11.99	11.97	11.97	11.96	11.91
13.00	13.00	13.00	12.99	12.97	12.97	12.95	12.91
13.60	13.60	13.60	13.59	13.58	13.57	13.56	13.48
13.80	13.80	13.77	13.76	13.75	13.73	13.72	13.68
14.00	13.82	13.79	13.77	13.76	13.76	13.75	13.71
15.00	13.82	13.79	13.77	13.76	13.76	13.76	13.73
16.00	13.82	13.79	13.77	13.77	13.77	13.76	13.74
17.00	13.82	13.79	13.77	13.77	13.77	13.77	13.75
18.00	13.83	13.79	13.78	13.77	13.77	13.77	13.75
19.00	13.83	13.79	13.78	13.78	13.77	13.77	13.75


13.8V setting: V_IN vs. V_OUT for increasing Load Levels
0mA
100mA
500mA
1000mA
1500mA
2000mA
4000mA
V_OUT
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
7.00
9.00
11.00
13.00
15.00
17.00
19.00
V_IN


13.8V setting: V_IN vs. V_OUT zoomed in view
0mA
100mA
500mA
1000mA
1500mA
2000mA
4000mA
V_OUT
13.90
13.85
13.80
13.75
13.70
13.65
13.60
13.60
13.80
14.00
14.20
14.40
14.60
14.80
15.00
V_IN

No-load float observation: One general note, that is evident in the data: with no load (output open), and Vin > Vout setting, the output voltage floats about 30-40mV higher than when loaded with even a light load (100mA) – so it is best to adjust the trimmer for your desired output voltage with a light load attached. I believe this is inconsequential, and use the light load as the baseline.

Temperature Measurements

I only did temperature measurements at the 12V output setting. I believe the temperature rise is due primarily to the Vin-Vout difference, so this temperature data should be applicable also to the 9V and 13V settings when given the same Vin-Vout delta. [This is a linear design, not a switching one: the extra power due to the Vin – Vout difference is dissipated in the converter.]

This means that while running a QMX (or similar) at 15V in for 12V out may work OK, you cannot run 15V in and 9V out, without substantially more heatsinking. 12V in with 9V out should give the same temperature performance as 15V in and 12V out.

All temperature measurements were done at 20C ambient temperature, still air, using only the heat sink supplied with the kit. The assembled board was open on the benchtop, not in any enclosure. Thermocouple was fixed between the heatsink fins.

			Minutes key-down (constant current)							
Load	Vin	0	1	2	3	4	5	6	7	10
1A	12V	23	23	24	24	24	24	25	25	26
2A	12V	23	26	29	31	32	34	35	35	37
1A	13V	23	31	37	40	44	46	47	48	51
1A	14V	23	37	50	59	65	70	73	76	78
1A	15V	23	47	66	78					
1A/50%*	15V	23	36	45	51	56	60	62	63	65

* simulates 50% QMX FT8 send/receive duty cycle: 15 sec on, 15 sec off
Stabilized after about 20min, going between 66-68C; so continuous FT8 possible at 15Vin, 20C ambient

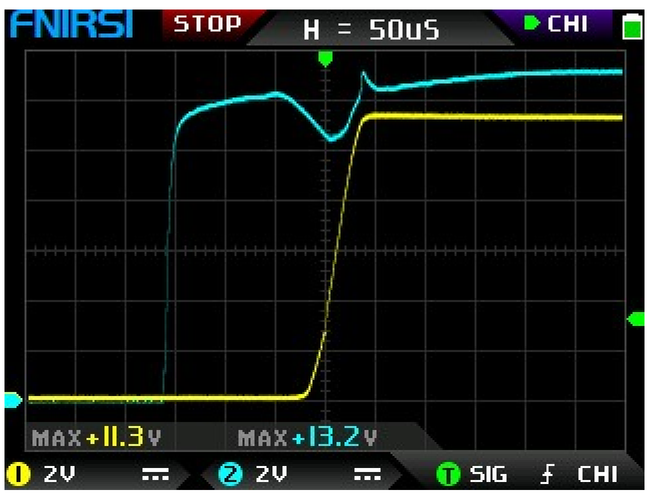
This data shows that for Vin-Vout up to 3V, with 50% duty cycle transmit, the supplied heat sink is sufficient for continuous QMX FT8 in 20C ambient temperature. Since CW and SSB are much lower duty cycle modes, they will be fine in higher ambient temperatures. Or if Vin-Vout is kept closer to 2V, like using a 13.8V supply for 12V out, the temperature performance will be much better.

High temperature voltage drift: In my testing, I did note that the regulated voltage will drift up by about 28mV as the temperature changes from 23C to 80C (temperatures measured on the heatsink as noted above). I did not try any higher temperature; 80C is hot enough… that is a 57C temperature rise. Most applications for this device will operate with a lower temperature rise, and for QMX use this small drift is inconsequential.

Voltage drift with temperature rise: +28mV over 23C - 80C, Vin=14V, 1A load									
23	37	50	59	65	70	73	76	78	80
12.01	12.015	12.020	12.025	12.030	12.032	12.034	12.035	12.037	12.038

Startup Operation

I looked at the startup response of the VLDO, and it was very clean with no detectable overshoot or other anomalous behavior (at least with my inexpensive oscilloscope). In the screenshot below, you can see that with a 13V input, the 12V VLDO takes about 150usec to respond, and it does so with a clean quick ramp (yellow trace). Very clean operation.



The input voltage (blue trace) does show the expected dip and flip as the VLDO capacitors charge up and the VLDO starts – most of this due to the inductance in the rather long leads I was using.

Shutdown operation is similarly clean, but much slower due to the discharge rate of the capacitors.