PMP11196 Test Results

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PMP11196 Model t1: Efficiency / losses

300 kHz / 1-2 Meters per second airflow 21 deg. C ambient

Vin V	Iin A	Vout	Iout A	eff %	loss W
11.999	0.262	1.001	2.010	64.096	1.127
11.999	0.433	1.001	4.010	77.312	1.178
11.999	0.608	1.001	6.010	82.465	1.280
11.999	0.787	1.002	8.010	85.011	1.415
11.999	0.965	1.002	10.011	86.640	1.547
11.999	1.146	1.002	12.012	87.562	1.710
11.999	1.325	1.003	14.015	88.346	1.854
11.999	1.506	1.003	16.019	88.910	2.004
11.999	1.687	1.003	18.021	89.306	2.165
11.999	1.870	1.004	20.023	89.567	2.341
11.999	2.054	1.004	22.025	89.733	2.530
11.999	2.239	1.004	24.028	89.822	2.734
11.999	2.425	1.005	26.029	89.839	2.957
11.999	2.614	1.005	28.032	89.799	3.200
11.999	2.804	1.005	30.034	89.728	3.456
11.999	2.995	1.005	32.036	89.627	3.728
11.999	3.189	1.006	34.042	89.484	4.024
11.999	3.384	1.006	36.046	89.326	4.334
11.999	3.580	1.006	38.050	89.146	4.663
11.999	3.778	1.007	40.053	88.948	5.010
11.999	3.978	1.007	42.057	88.732	5.379
11.999	4.180	1.007	44.060	88.508	5.764
11.999	4.384	1.008	46.064	88.262	6.174
11.999	4.589	1.008	48.069	88.007	6.604
11.999	4.797	1.009	50.076	87.733	7.061

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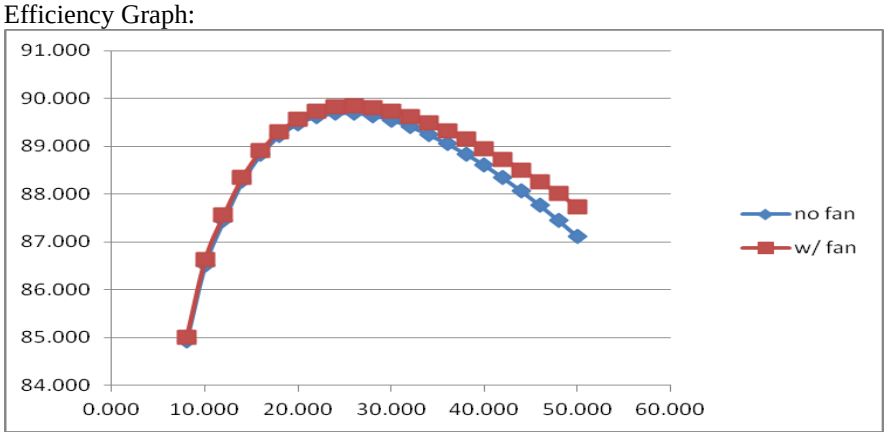
PMP11196 Model t1: Efficiency / losses (cont.)

Efficiency with no fan: 12Vin 1 Vout 300kHz per phase model t1

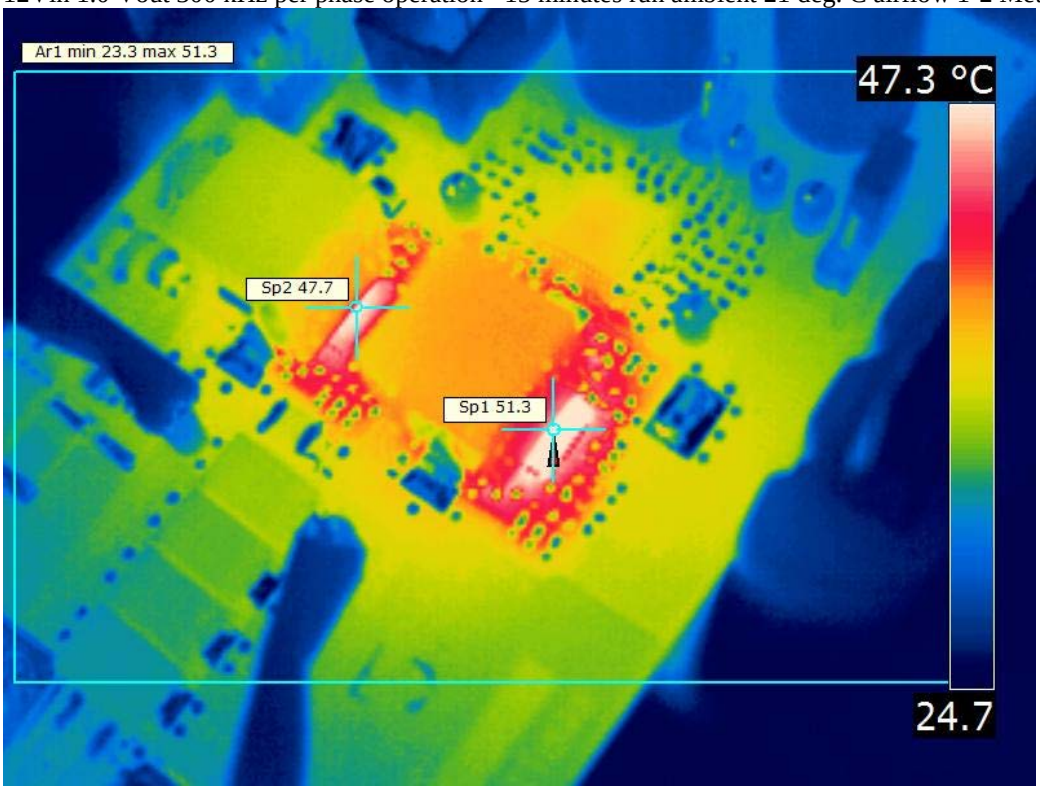
Vin V	Iin A	Vout	Iout A	eff %	loss W
11.999	0.093	1.000	0.000	0.000	1.121
11.999	0.261	1.001	1.998	63.866	1.131
11.999	0.433	1.001	4.001	77.178	1.184
11.999	0.608	1.001	6.003	82.391	1.285
11.999	0.786	1.002	8.003	84.939	1.421
11.999	0.966	1.002	10.005	86.523	1.561
11.999	1.147	1.002	12.006	87.455	1.726
11.999	1.326	1.003	14.009	88.266	1.867
11.999	1.506	1.003	16.012	88.836	2.018
11.999	1.688	1.003	18.015	89.227	2.182
11.999	1.871	1.004	20.016	89.477	2.362
11.999	2.055	1.004	22.019	89.626	2.559
11.999	2.241	1.004	24.021	89.687	2.774
11.999	2.429	1.004	26.023	89.694	3.004
11.999	2.618	1.005	28.026	89.647	3.252
11.999	2.809	1.005	30.029	89.551	3.522
11.999	3.002	1.006	32.030	89.416	3.812
11.999	3.197	1.006	34.037	89.248	4.125
11.999	3.394	1.006	36.041	89.056	4.456
11.999	3.593	1.007	38.045	88.840	4.811
11.999	3.793	1.007	40.050	88.606	5.186
11.999	3.997	1.007	42.055	88.340	5.592
11.999	4.202	1.008	44.060	88.061	6.019
11.999	4.410	1.008	46.066	87.761	6.476
11.999	4.620	1.008	48.072	87.446	6.960
11.999	4.834	1.009	50.080	87.110	7.476

Efficiency Graph:

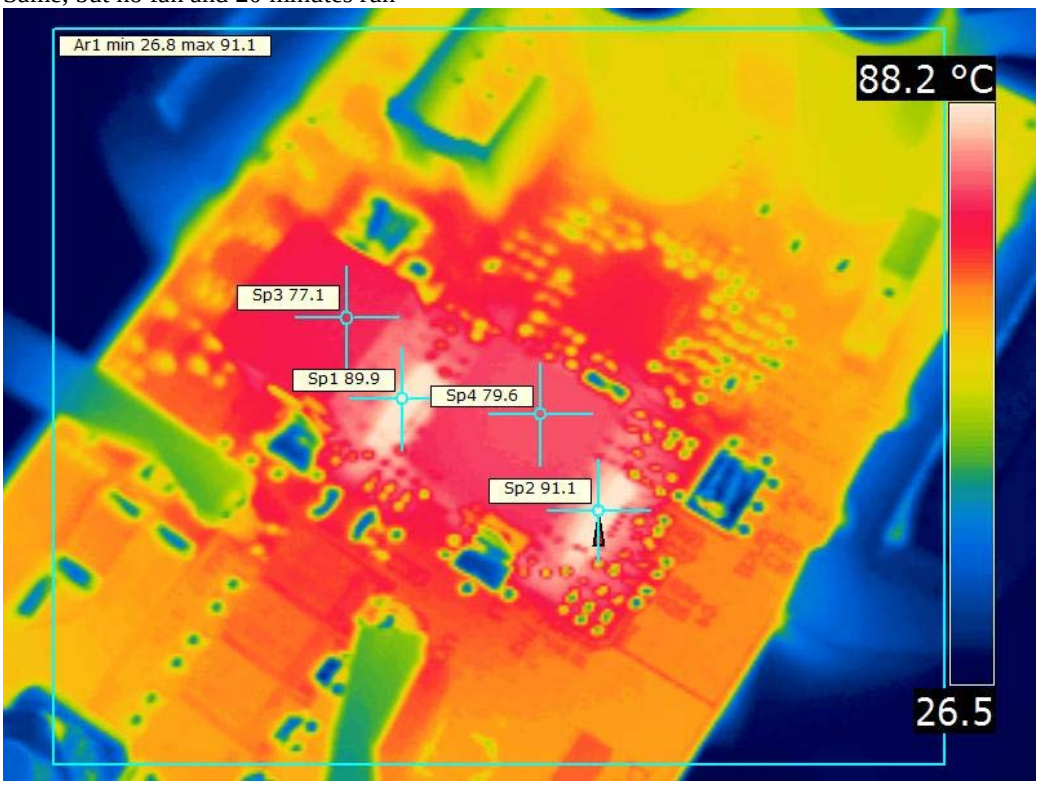


Thermal image at 50A load:

12Vin 1.0 Vout 300 kHz per phase operation >15 minutes run ambient 21 deg. C airflow 1-2 Meter per second model t1



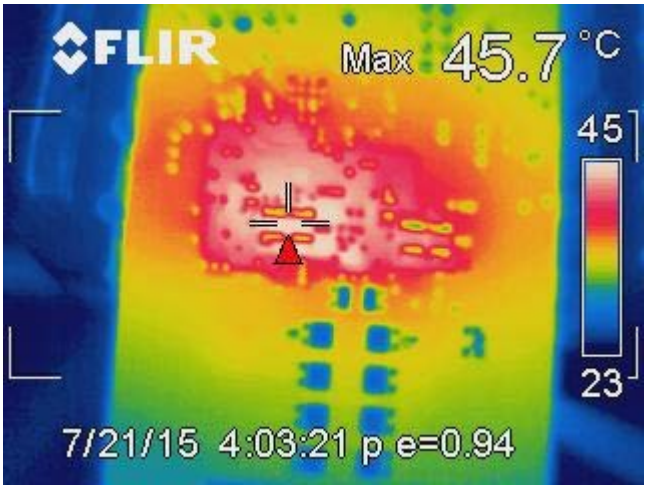
Same, but no fan and 20 minutes run



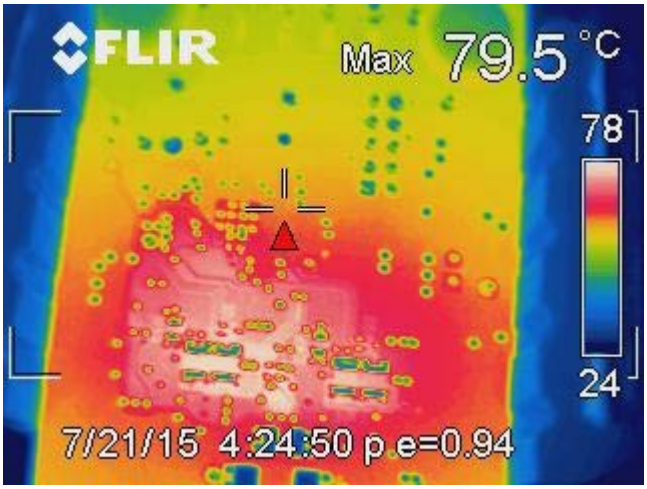
More thermal images: same full 50A off 1.0Vout and 12 Vin:

Thermal image at 50A load: (cont.)

Bottom side with fan: model t3



Bottom side with no fan model t3



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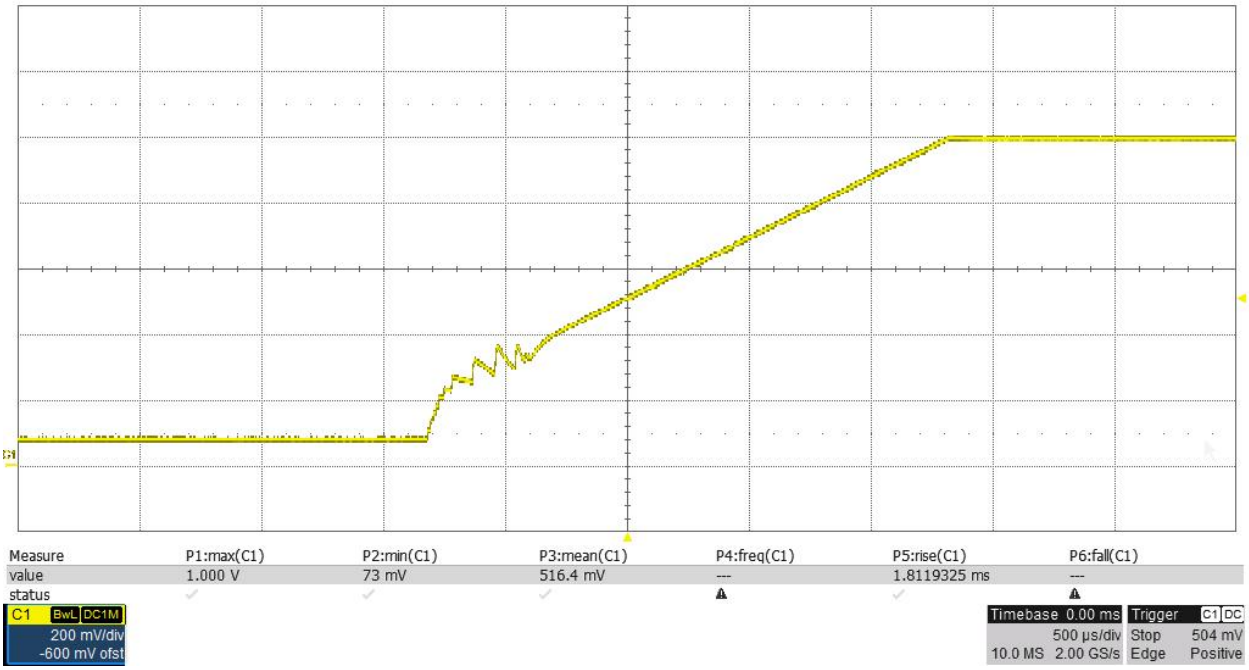
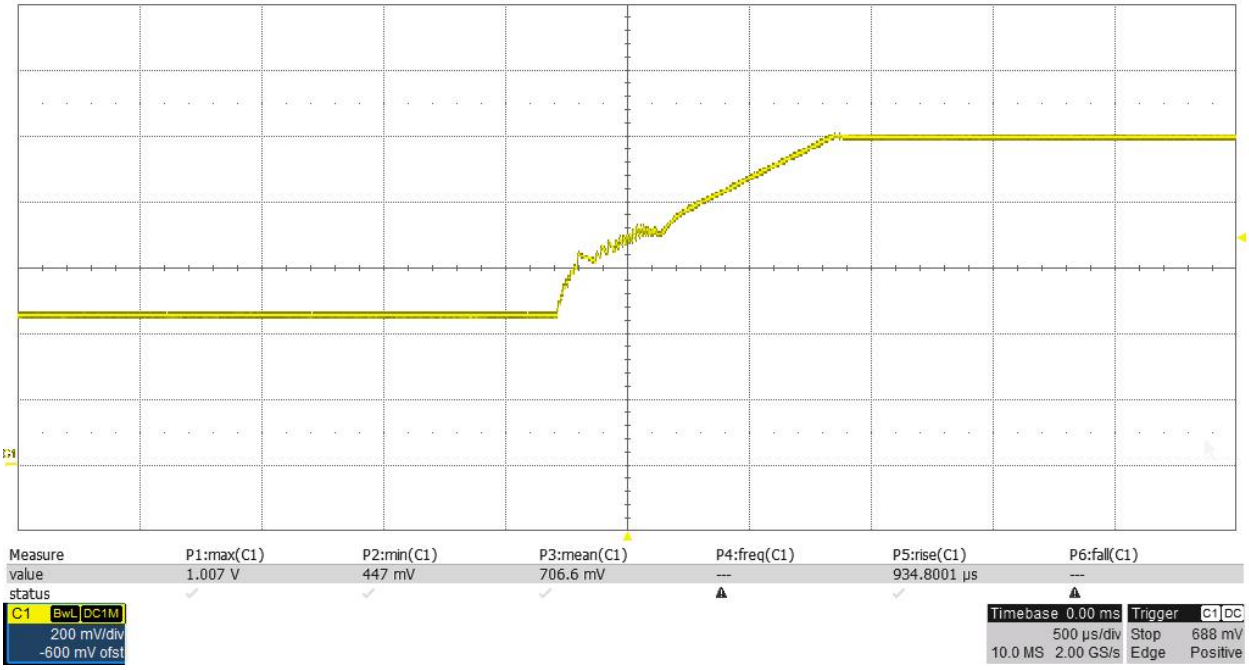
Start up:

12Vin enabled with no load and 80mV pre-bias: No Overshoot seen



Same, but with 450 mV pre-bias on output: 7 mV max overshoot, no dip when conversion started



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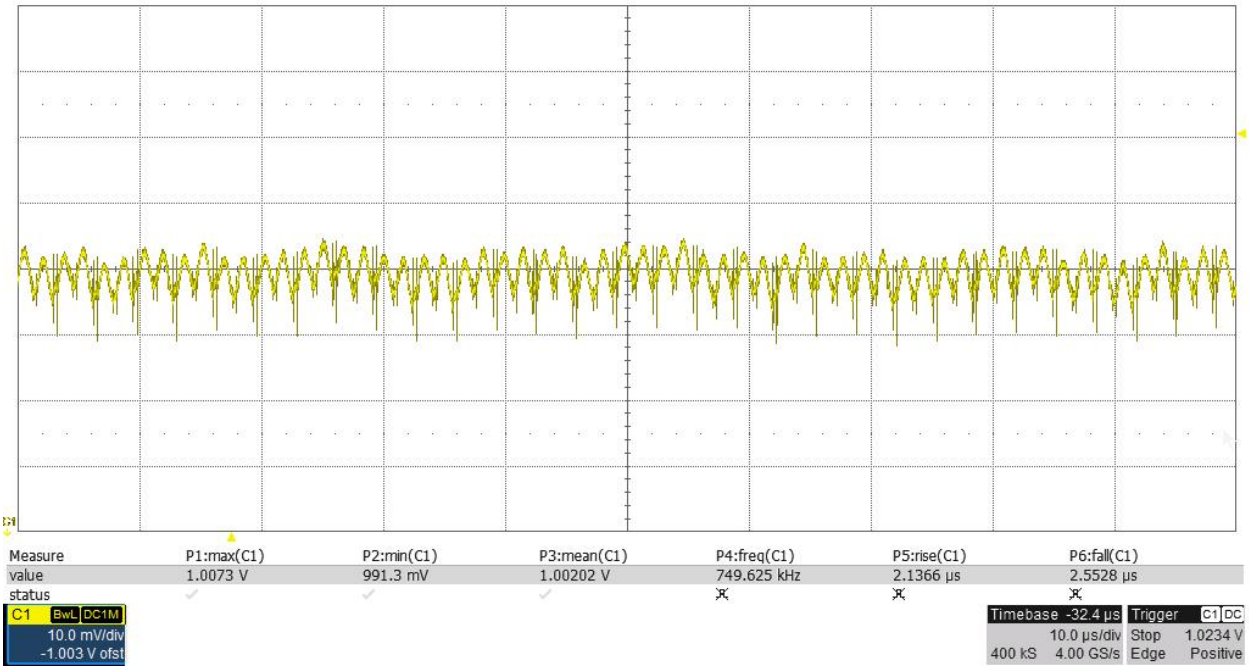
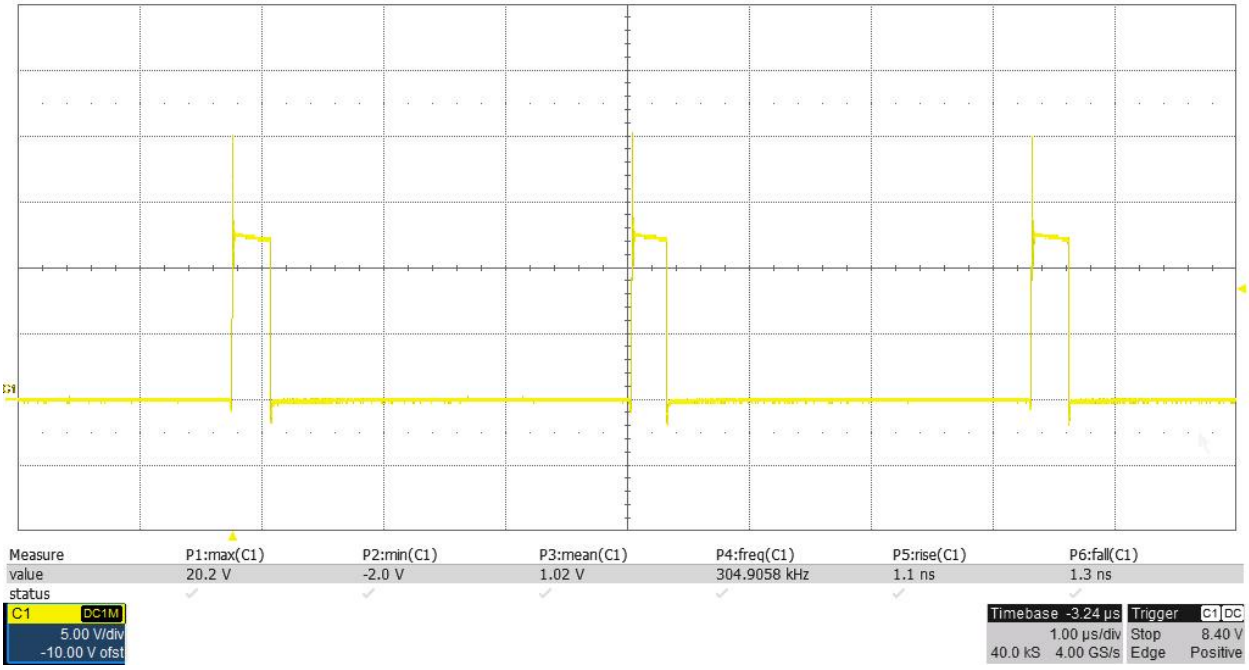
Output ripple

at 12Vin and 50A load off 1.0V at C32: 20 MHz bandwidth measurement
Vout measured with 10x scope probe at C32 output capacitor: 16 mV p-p



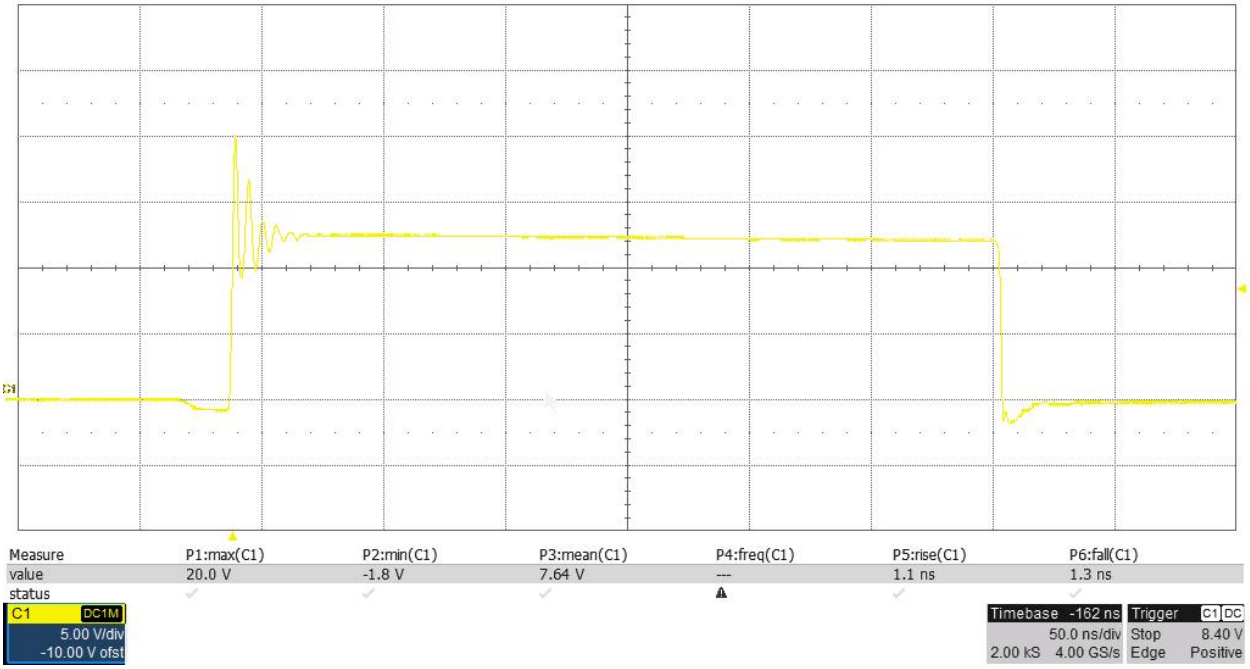
From main waveform actual frequency is 305 kHz per phase (phase 1 shown)



Main waveforms

at 12Vin and full load:

SW pins of UCD74120 U2 (phase 1) full bandwidth one pulse



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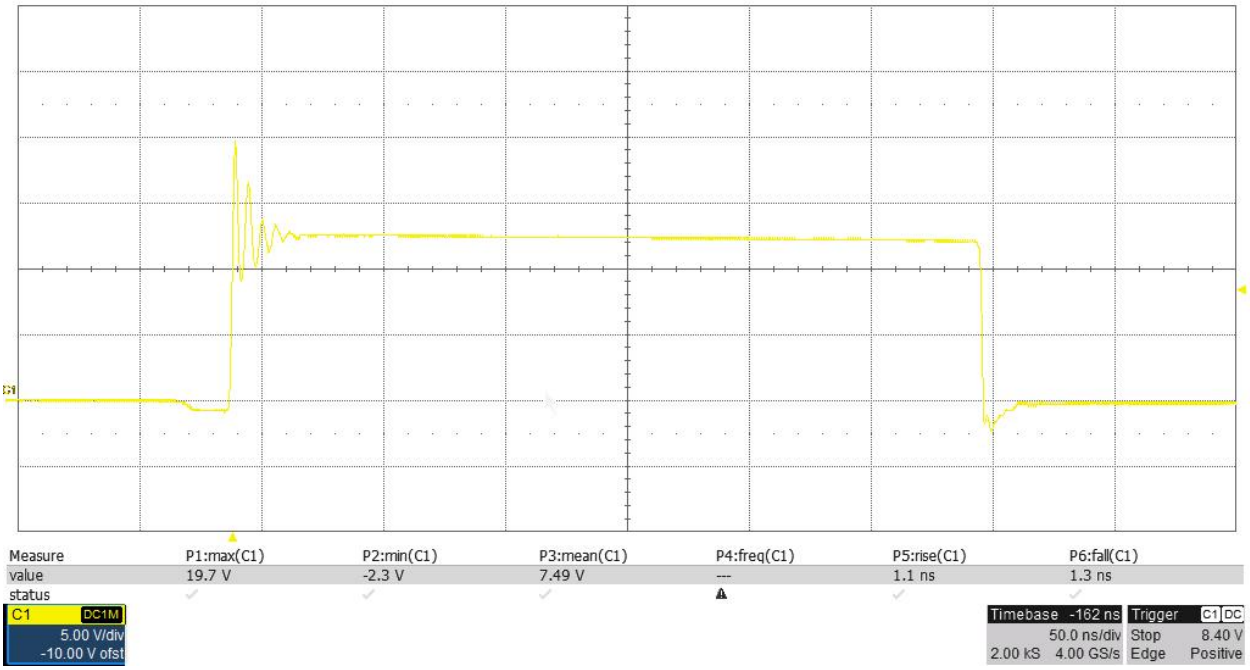
Same but phase 2 at U3 SW pins:



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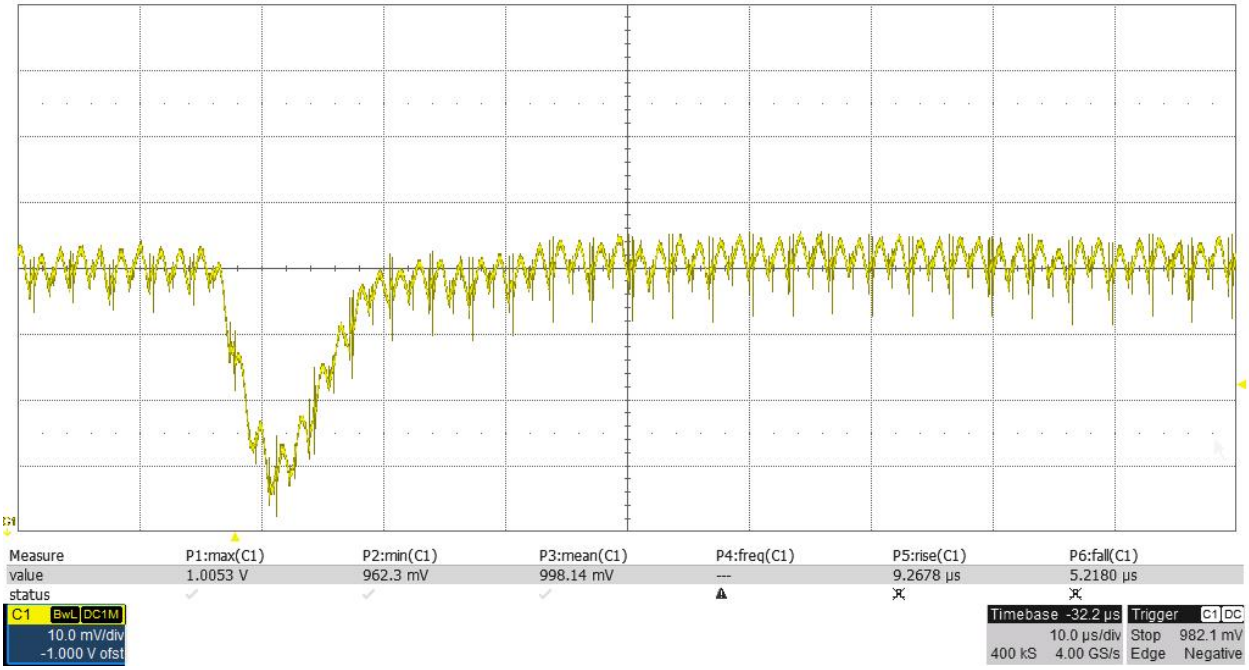
Step load & load dump response:

Step load response: 12Vin 1.0 Vout from 20A to 45A in 7 usec ~33mV undershoot



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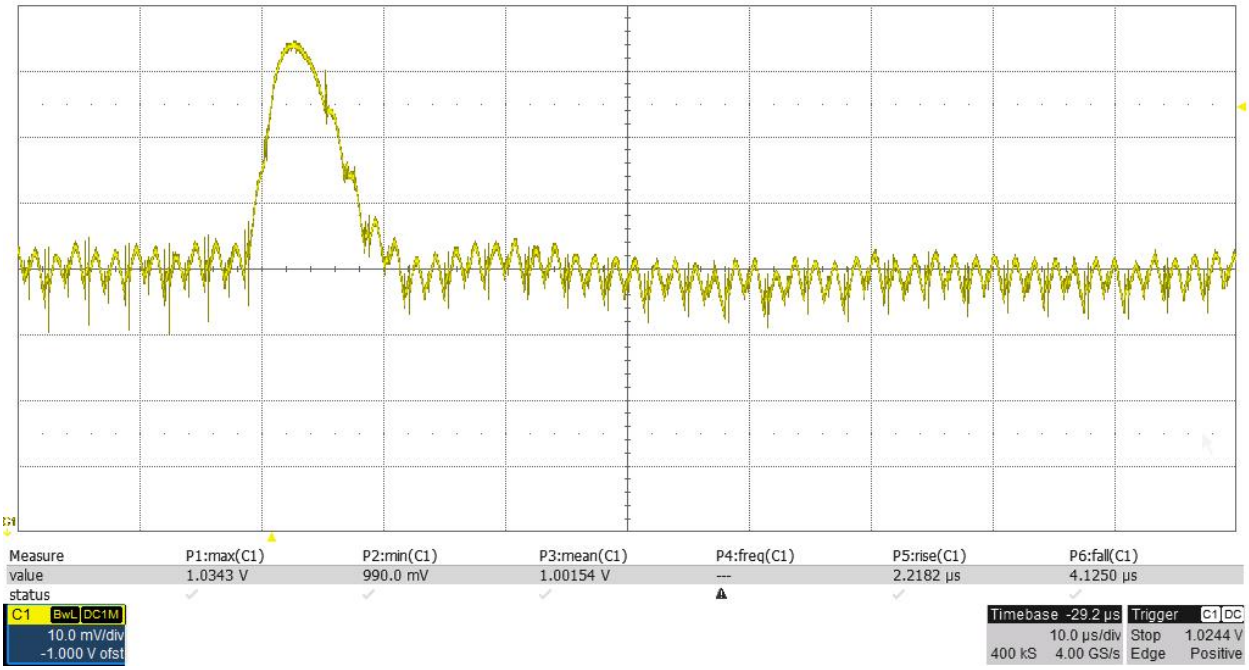
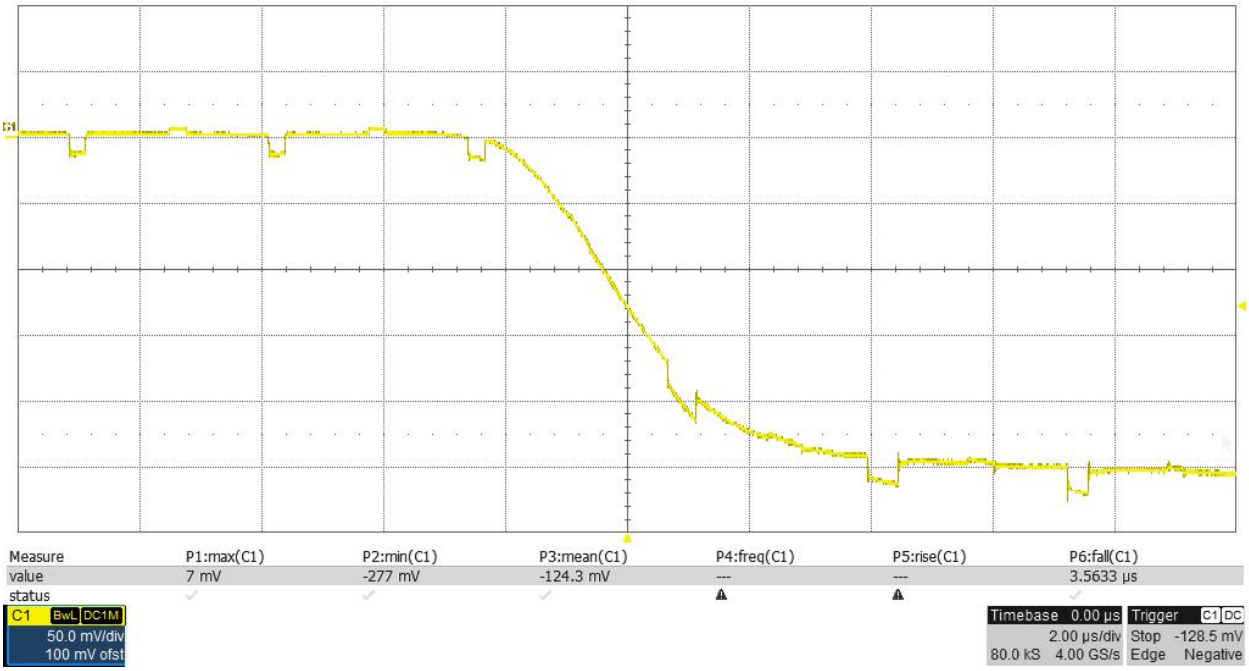
And now from 45A back to 20 A load in 4 usec: about 32mV overshoot



The 20 A static load is external to the board.

Details of step load & load dump across dynamic load resistor:

Details of step load looking at R100 10 mOhms tied to Vout and scope ground tied to Vout:
250 mV in about 7 usec or 250/10 = 25 A in 7 usec or 3.5 A per usec
Q100 dynamic load switch pulls R100 – R101 – R102 resistor string down towards ground. Hence, negative going waveform from scope ground at Vout is positive current.



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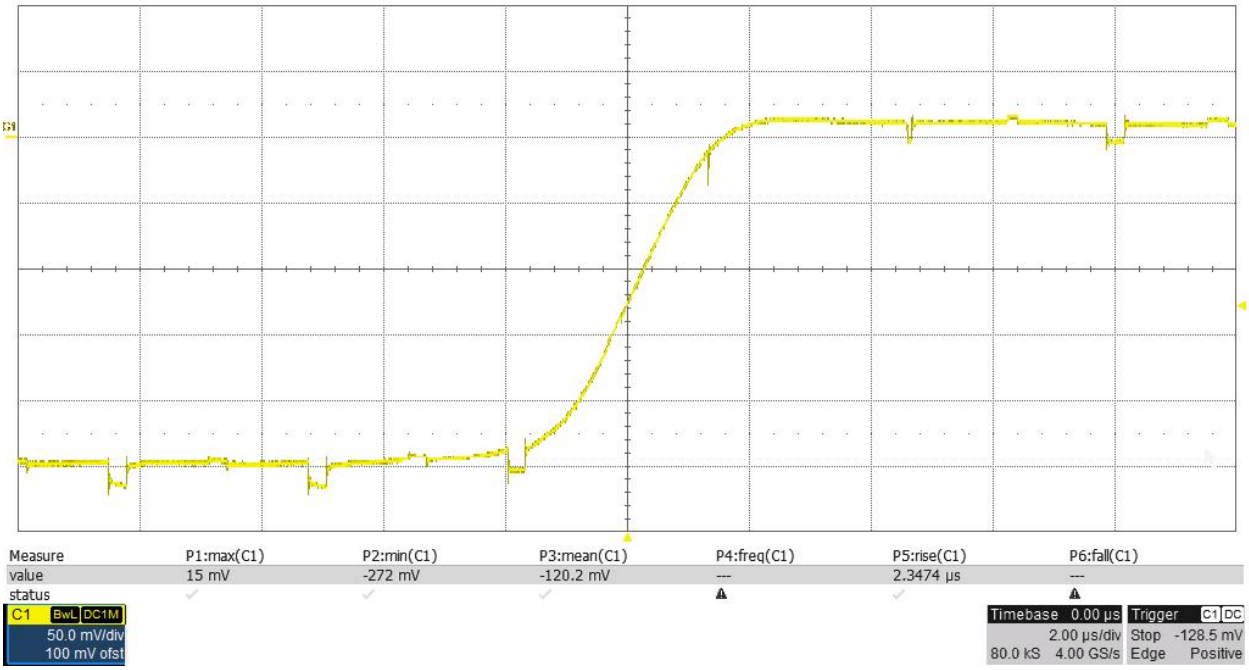
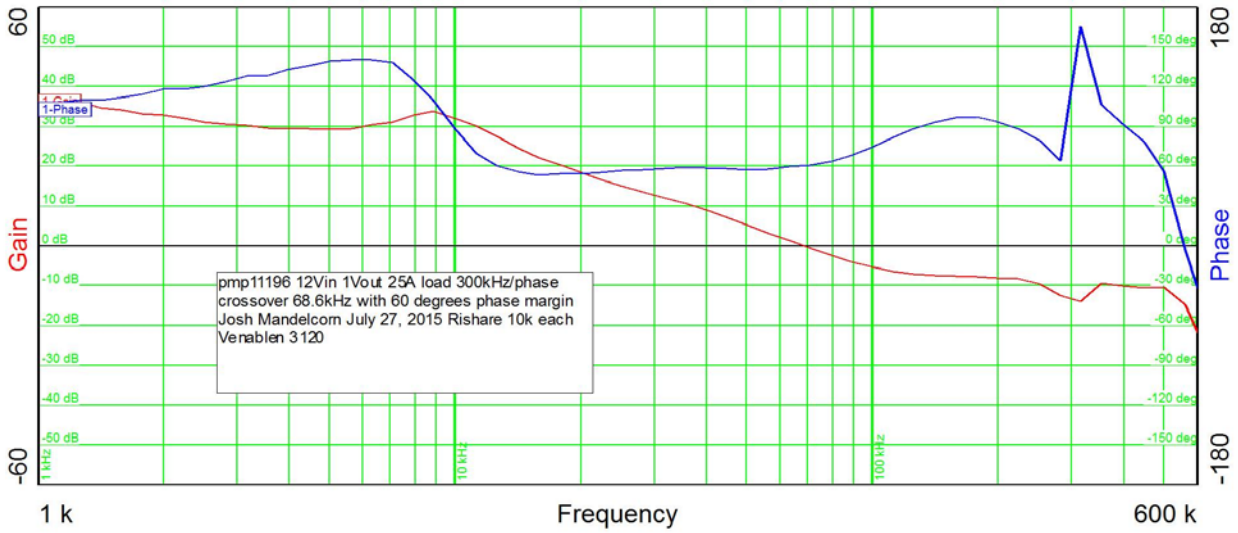
And same for load dump:
~250 mV removed in about 4 usec or 250/10 = 25 A in 4 usec or ~6 A per usec



Bode plot:

12Vin and half load 1.0V at 25A:



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