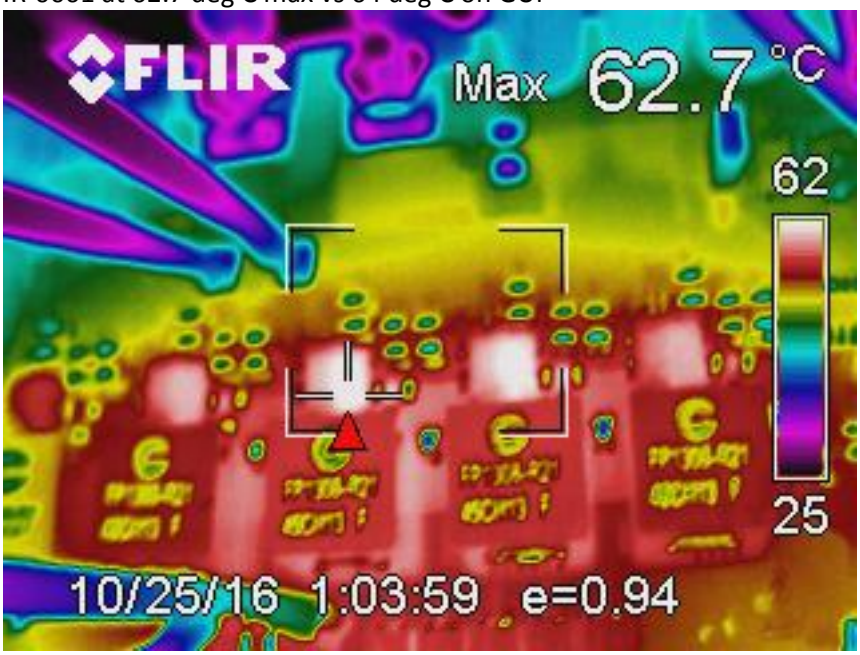
PMP20489 Test Report

PMP20489 TPS53679 five phase (CSD95490) plus two phase Test Report:

Built with 5x FP1308-R21 main inductors for 5 phase main 800mV channel with Fsw per phase set at 300kHz

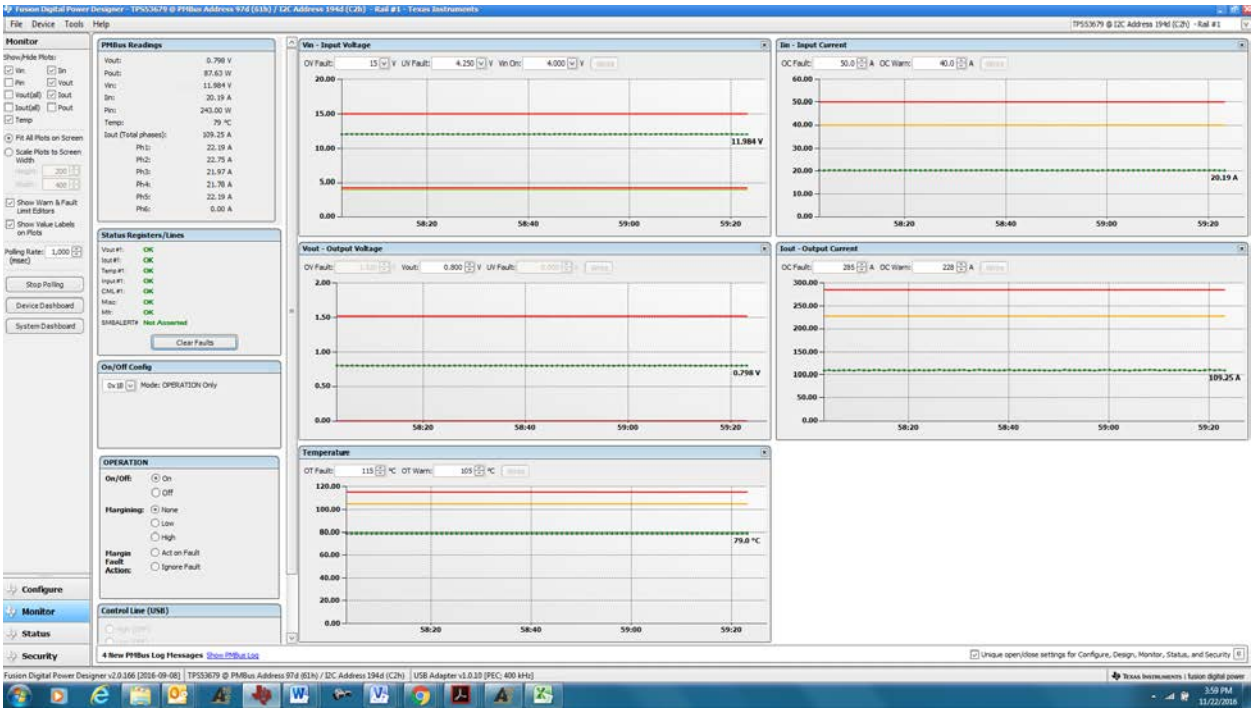
Run at 12.0Vin 810mV out at 100A with no fan

IR-0061 at 62.7 deg C max vs 64 deg C on GUI

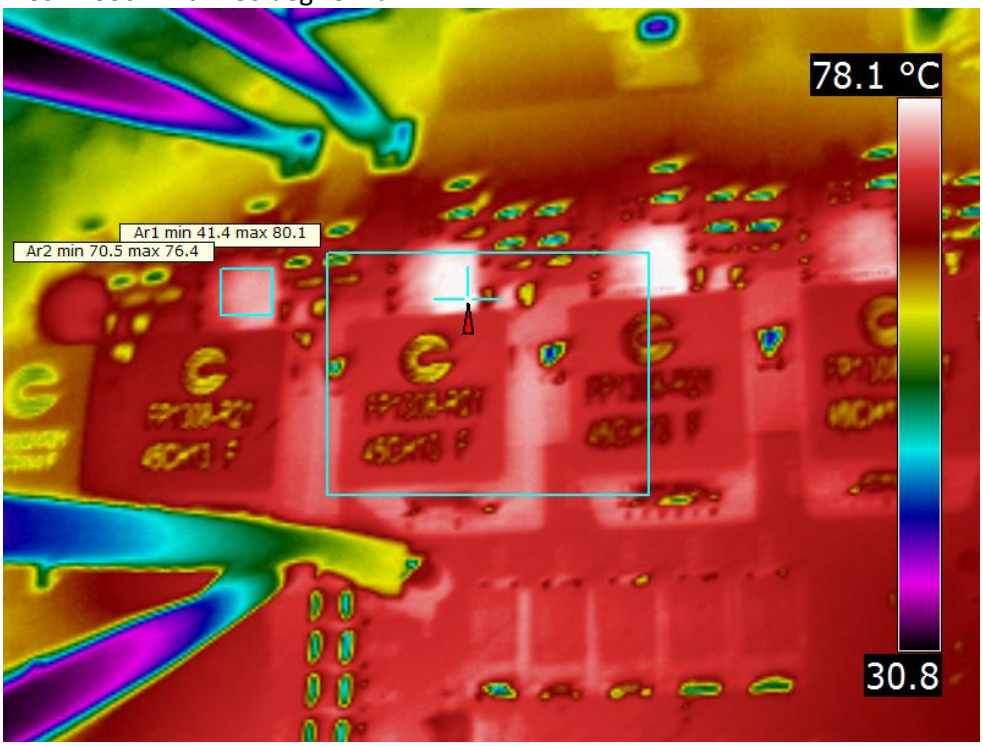


Q

Now to 120A off 12.0Vin at 813mV out at inductors 300kHz

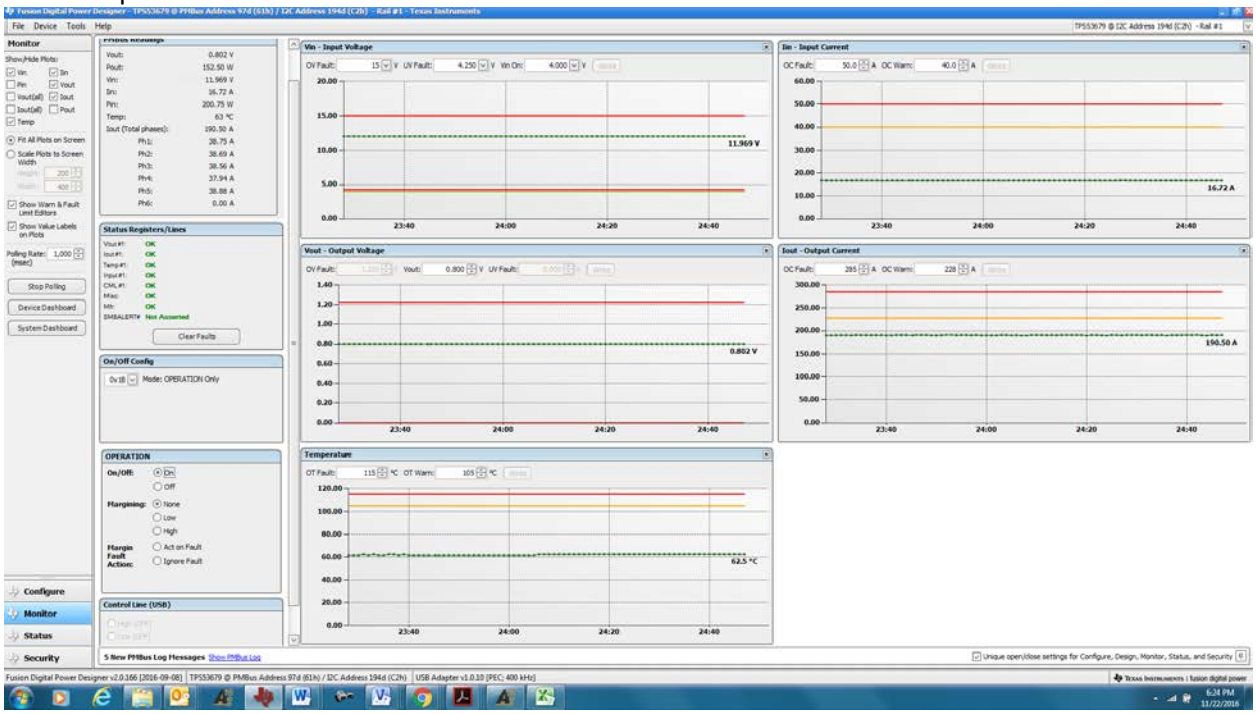


Alos IR-0062 with ~80 degr C max

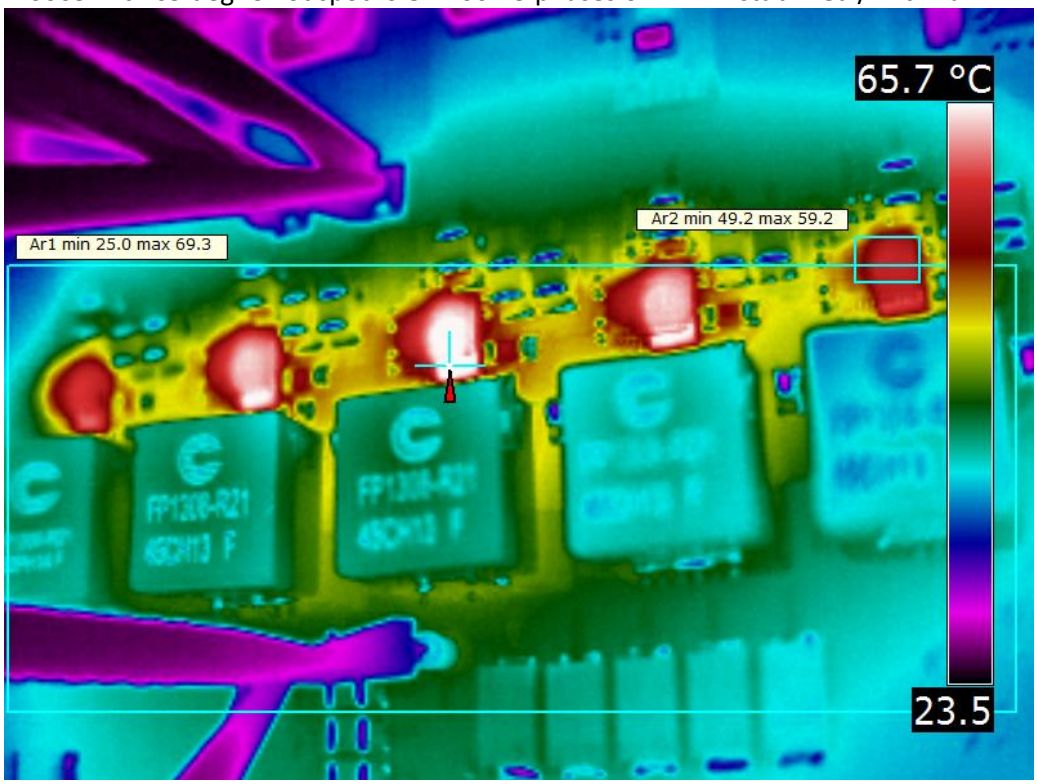


FETs left to right in deg. C: 70.5; 76.4; 78.3, 78.5, 75.7; hot spot is PCB near middle FET

Main channel with fan 5 phases at 200A 816mV out of inductors, 15.70A on source meter
2 Meters per second airflow



IR0065 with 69 deg. C hot spot: 0.8V 200A 5 phases off 12Vin stabilized / with Fan

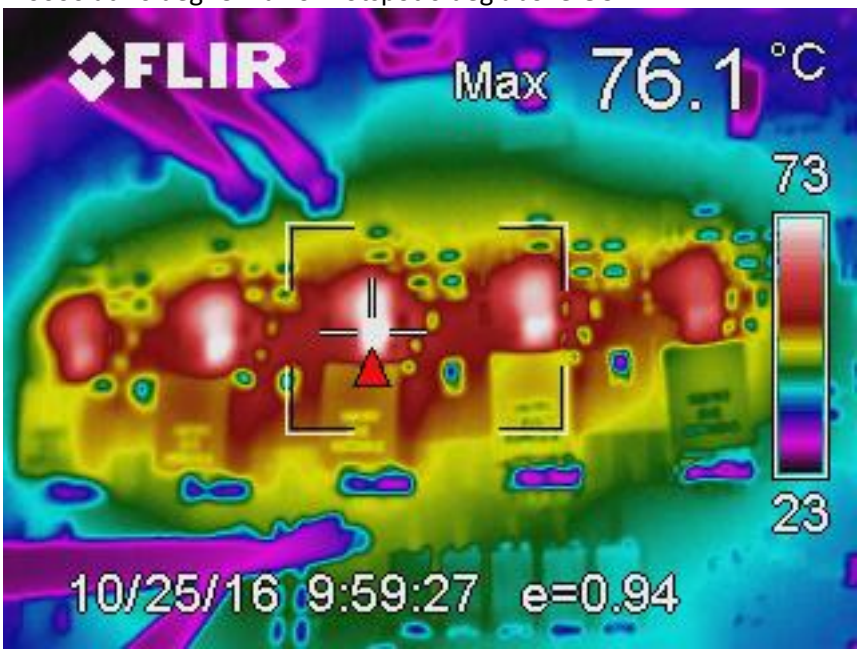


FETs Left to Right 61, 65, 66.5,65, 59 all in deg. C; 69 hot spot is PCB near middle FET

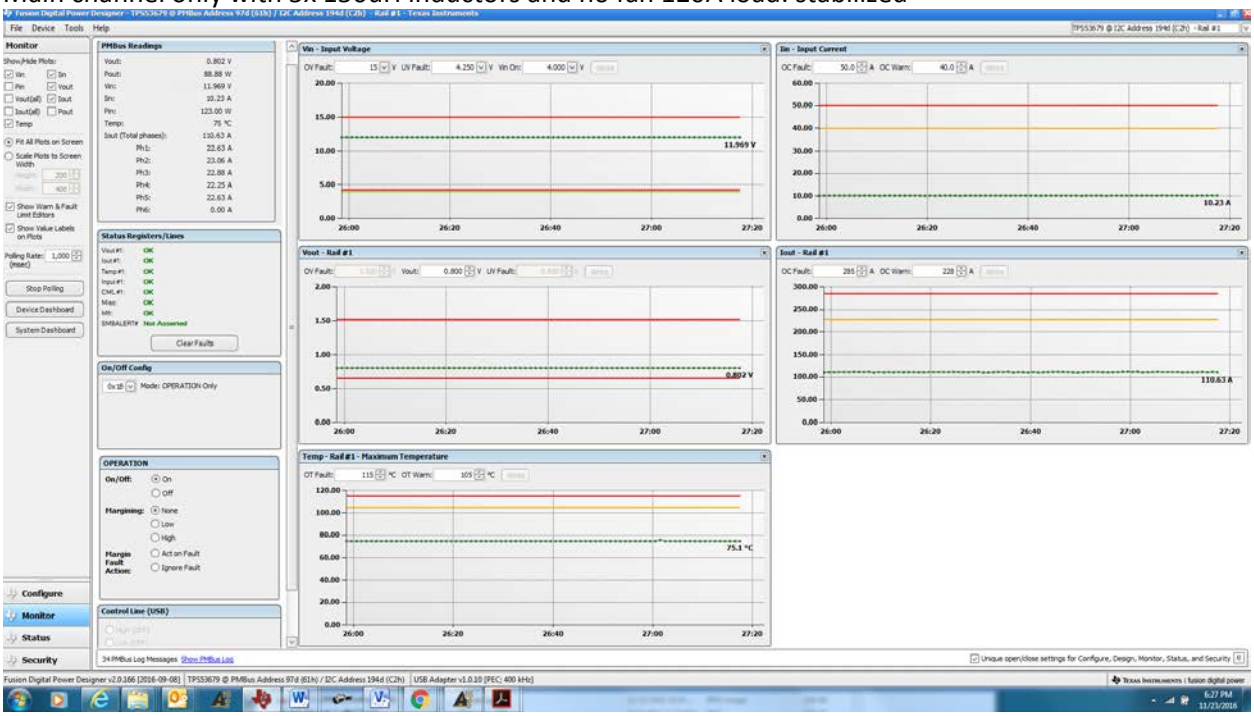
Main channel now with 150nH inductors full 200A with fan ripple out lecroy623 13mV p-p

Q

main channel with 150nH inductors 200A and with fan ~2 M/S airflow
IR0066 at 76 deg. C max or hotspot 6 deg above GUI



Main channel only with 5x 150uH inductors and no fan 120A load: stabilized



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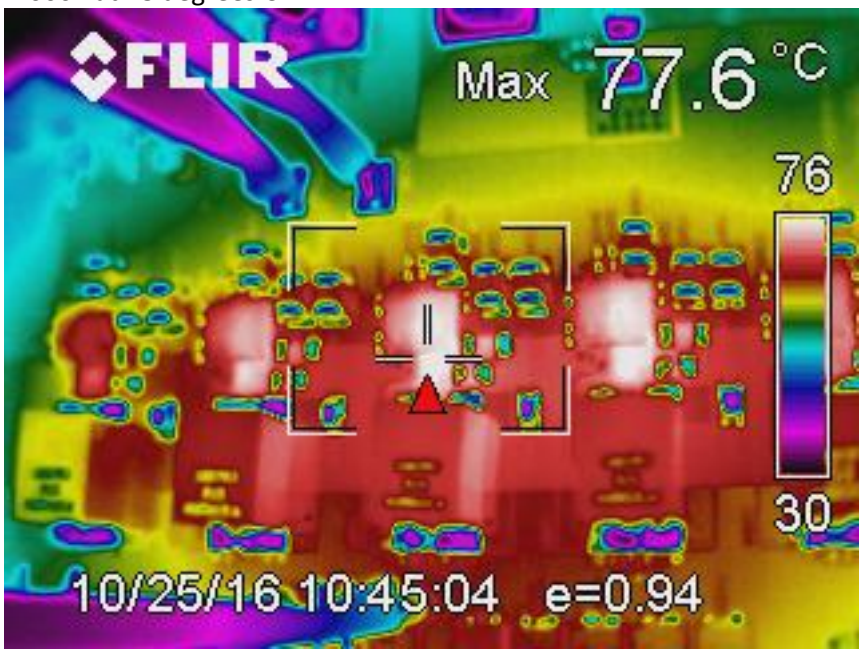
IR0067 at 78 degrees C



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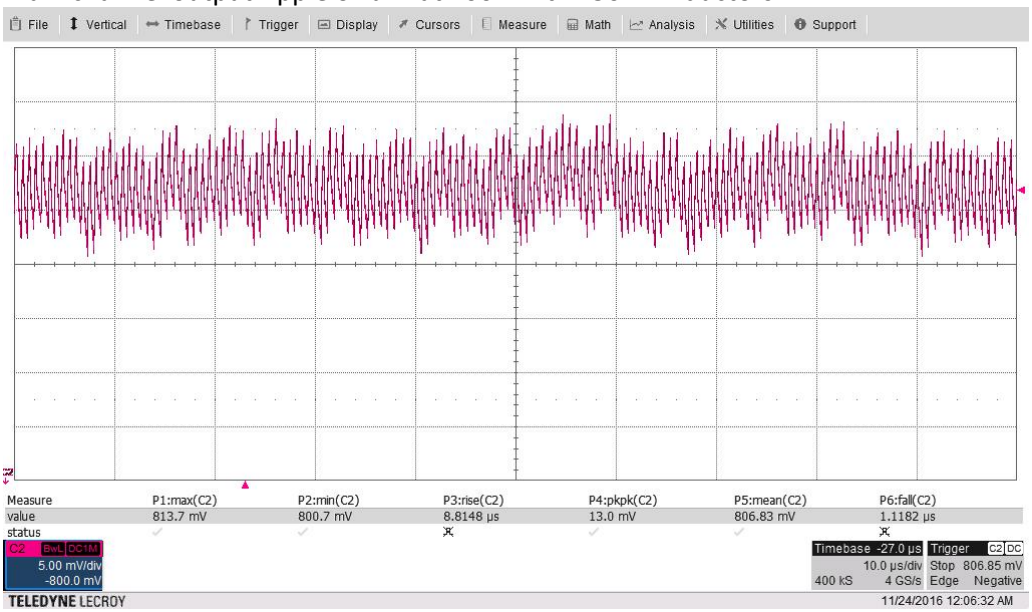
Main channel output ripple on J77 at 200A with 150nH inductors



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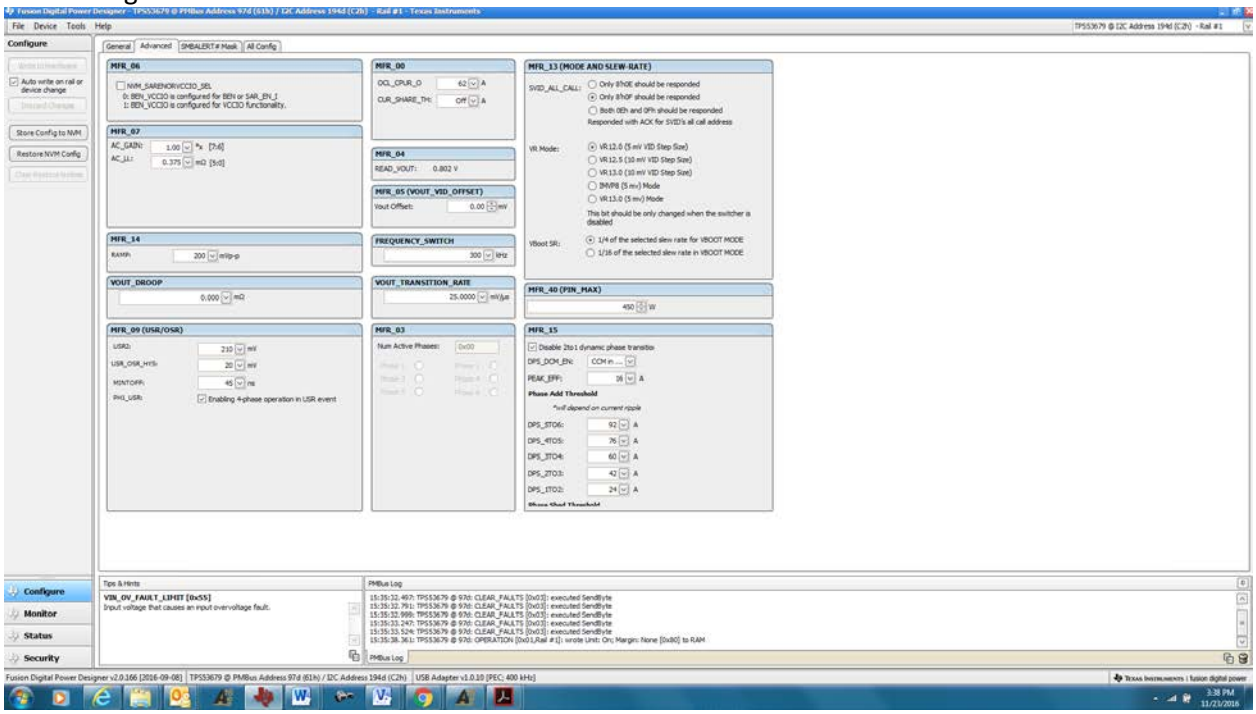
Dynamic Load Response:
Output inductors now 150 nH FP1007R3-R15
GUI settings



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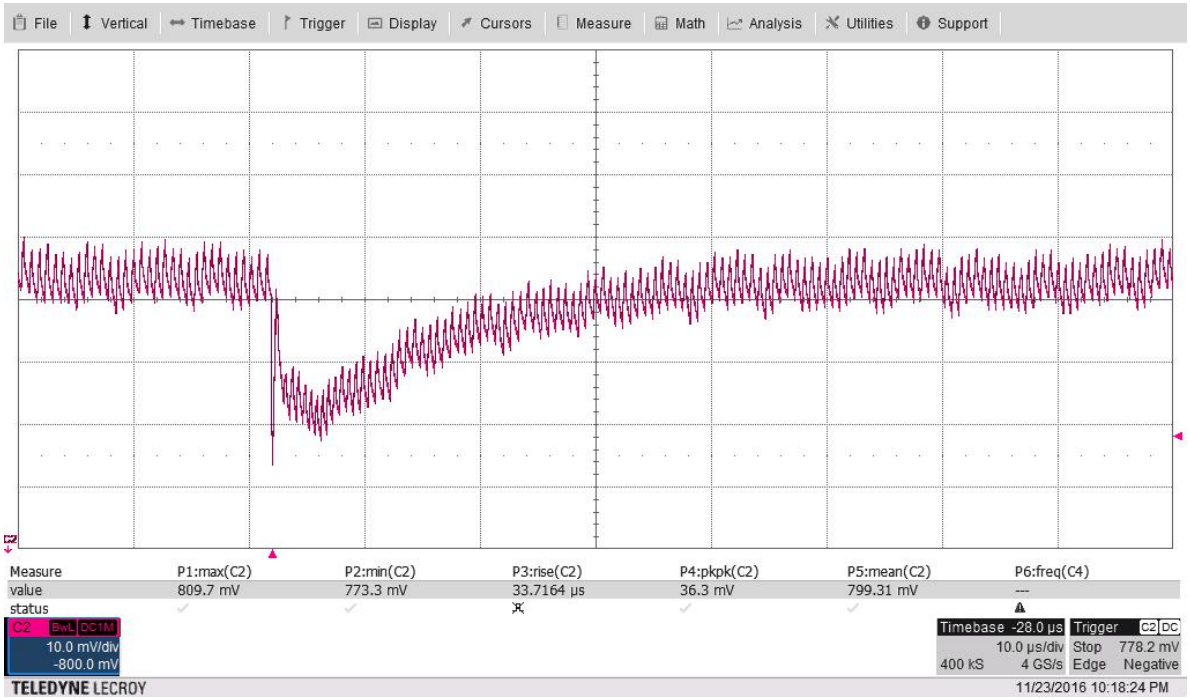
12.0Vin 800mV setting 75ADC static load and 75A step load ~240A/usec
Lecroy522 773mV min on board 22x 150mOhm driven by 2 CSD16408 75ohm ch 249ohm discharge each csd16408



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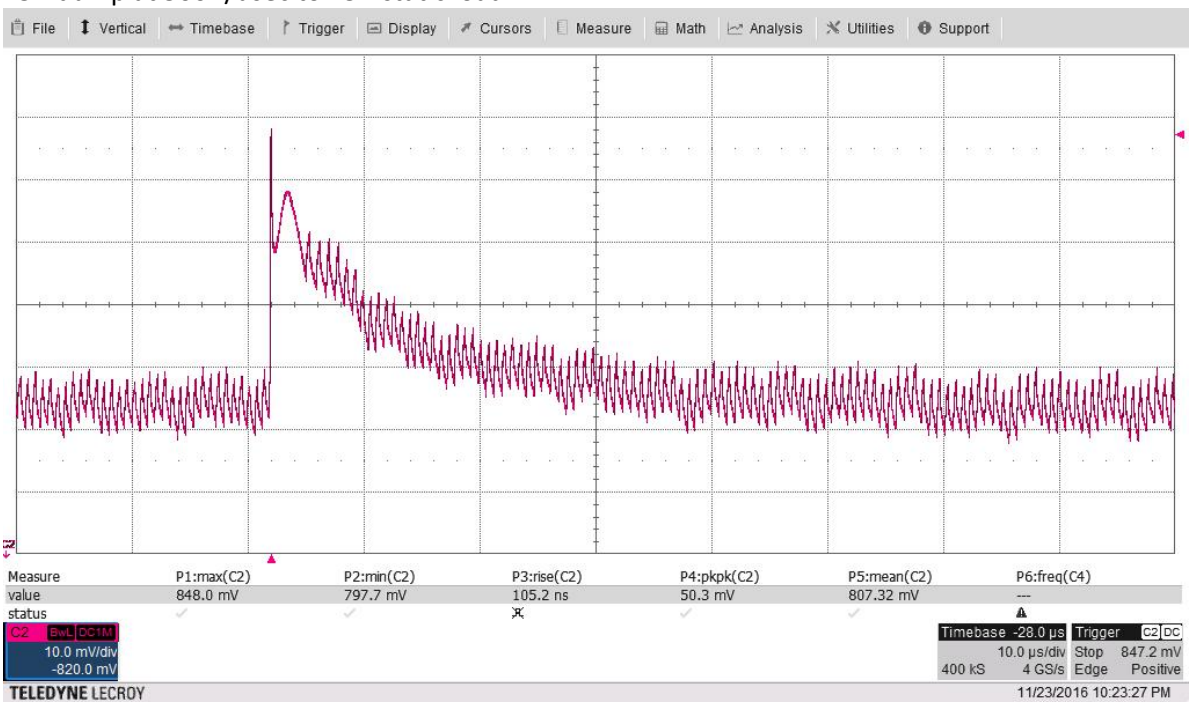
Dump LeCroy605 30mV above static ripple band excluding initial di/dt spike
75A dump at 500A/usec to 75A static load



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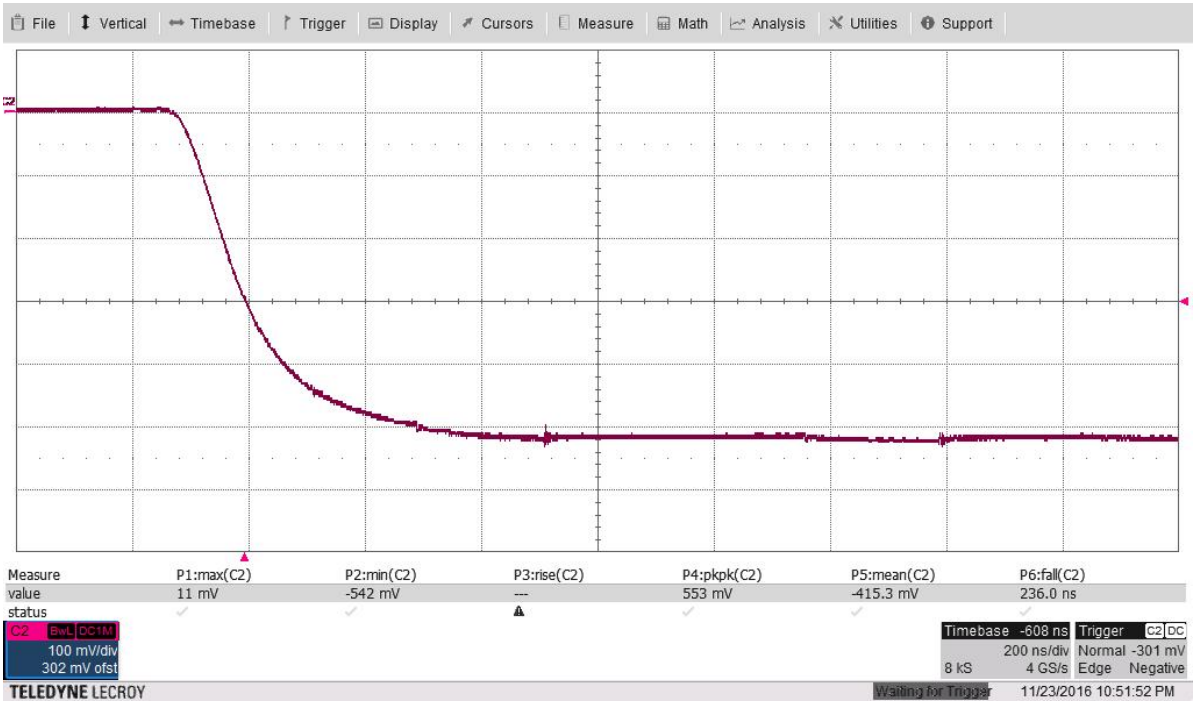
Step:lecroy610 is r553; lecroy611 is r507; lecroy612 is r535; lecroy613 is R529 which is shown
510mV/150mOhm times 22 resistors for 74.8A slew rate about 240A/usec



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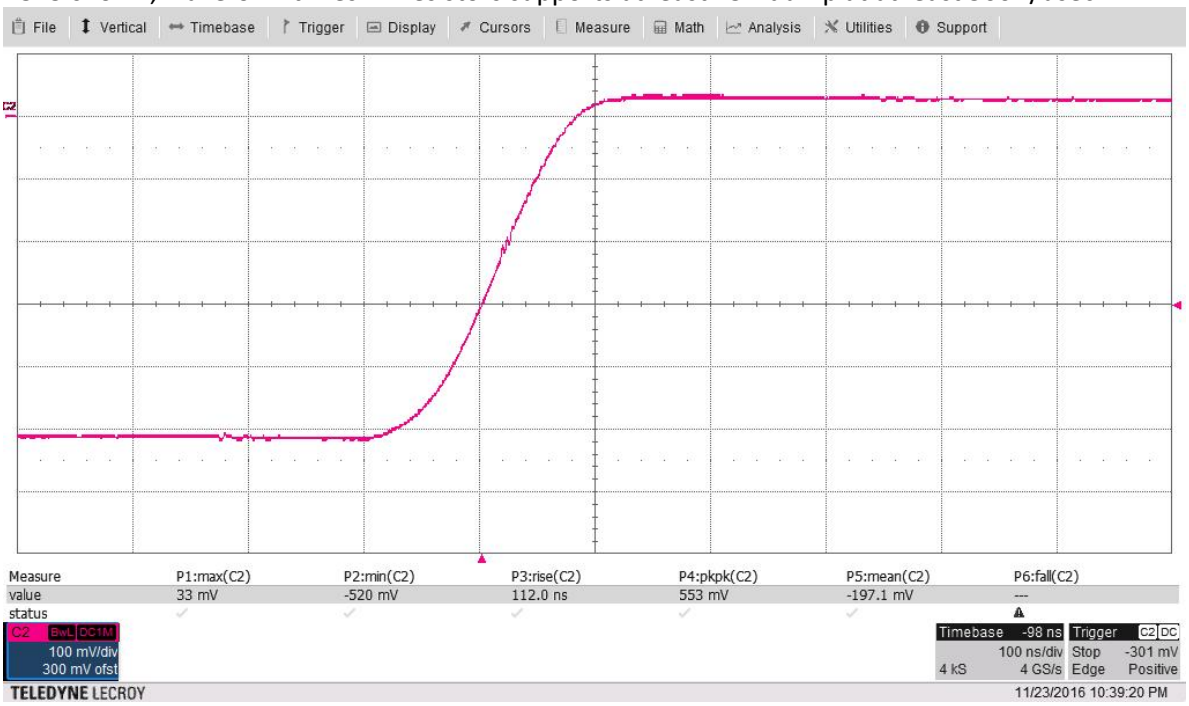
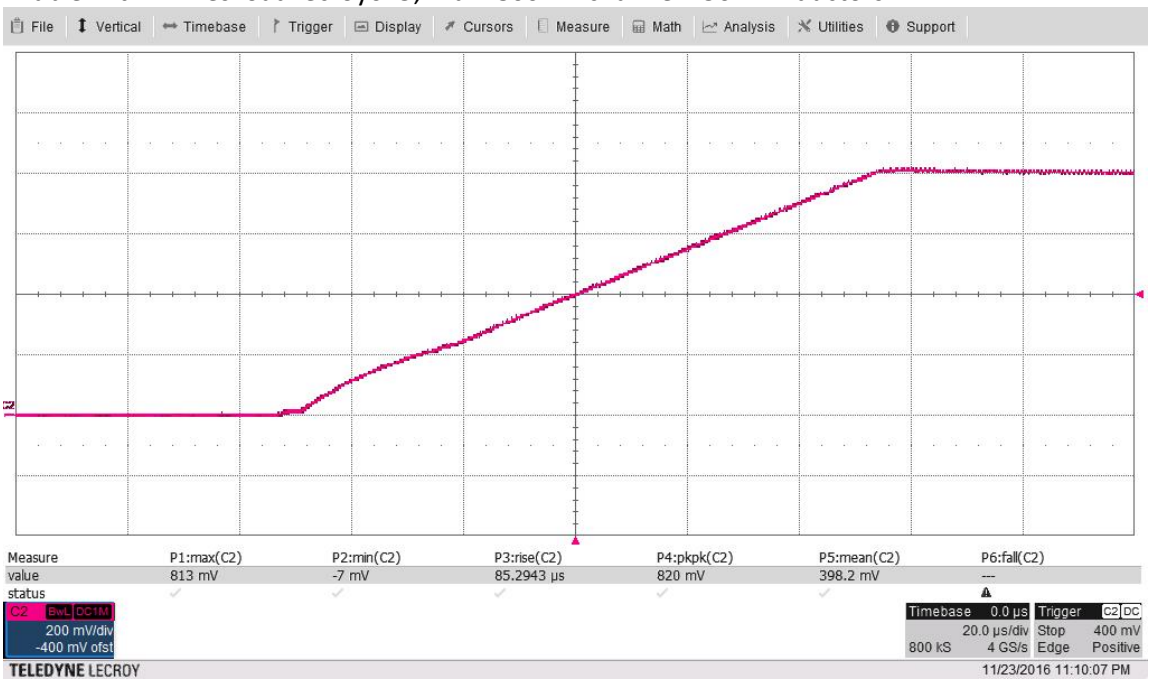
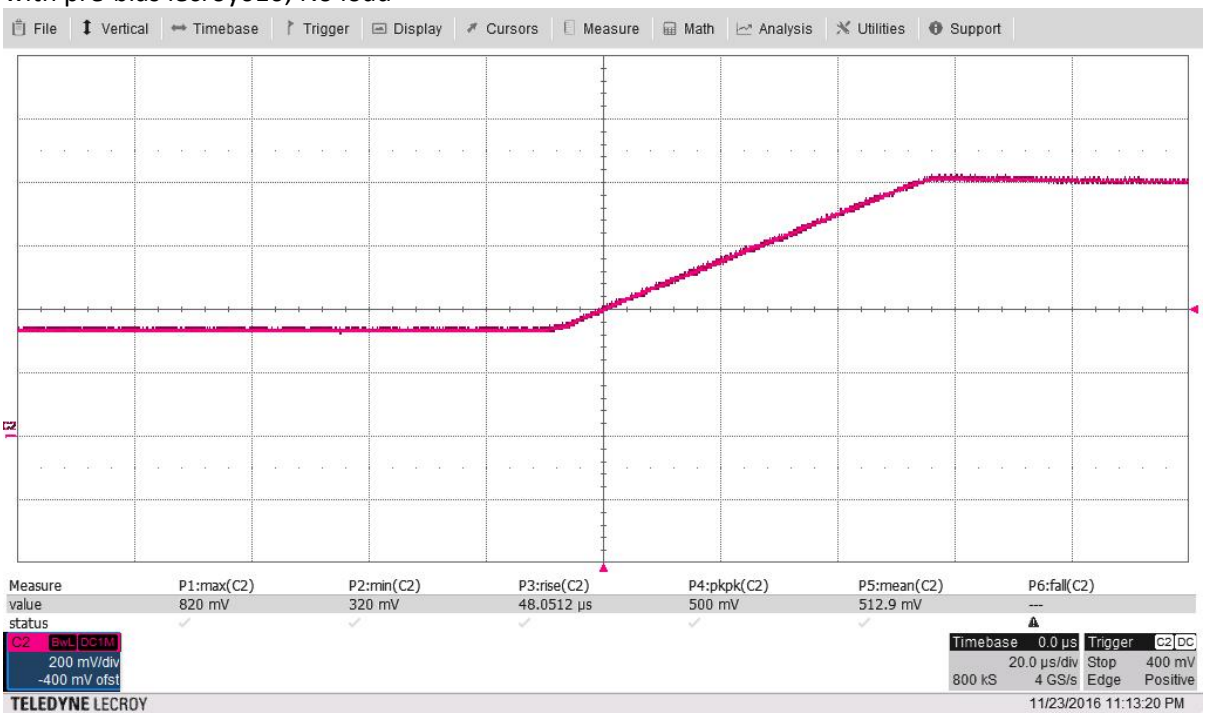
R553 dump LeCroy606; R507 leCroy607; lecroy608 is r529; lecroy609 is r535
R529 shown; waveform times 22 resistors supports at least 75A dump at at least 500A/usec



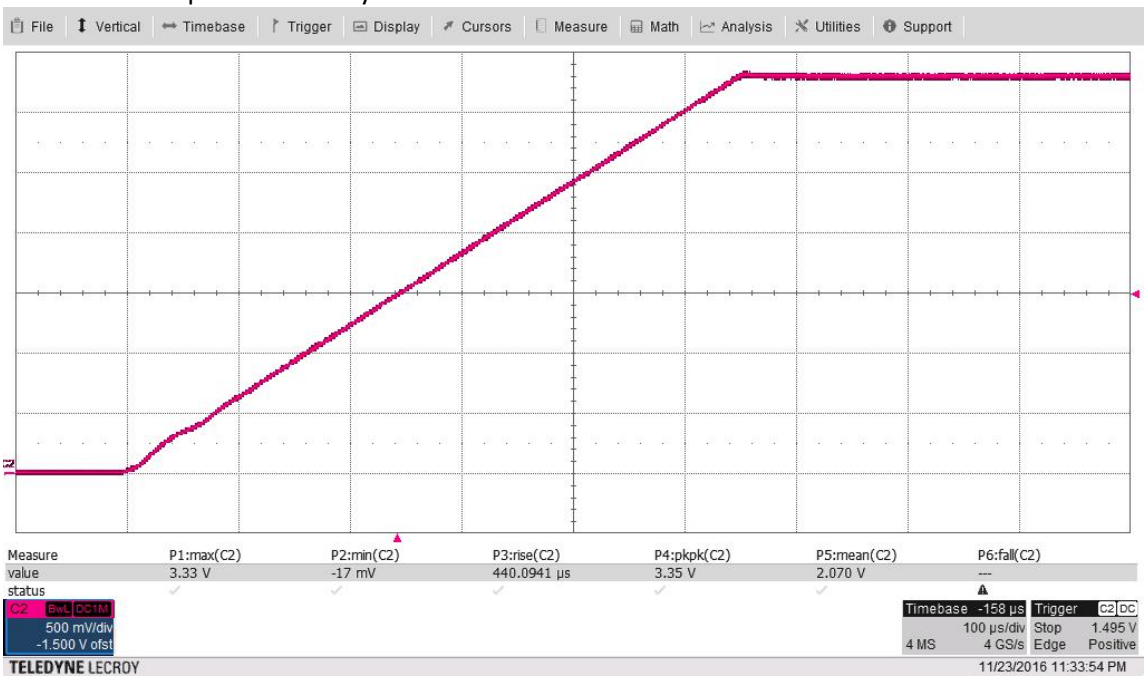
Enable with 4 A res load lecroy615; Main 800mV channel 150nH inductors



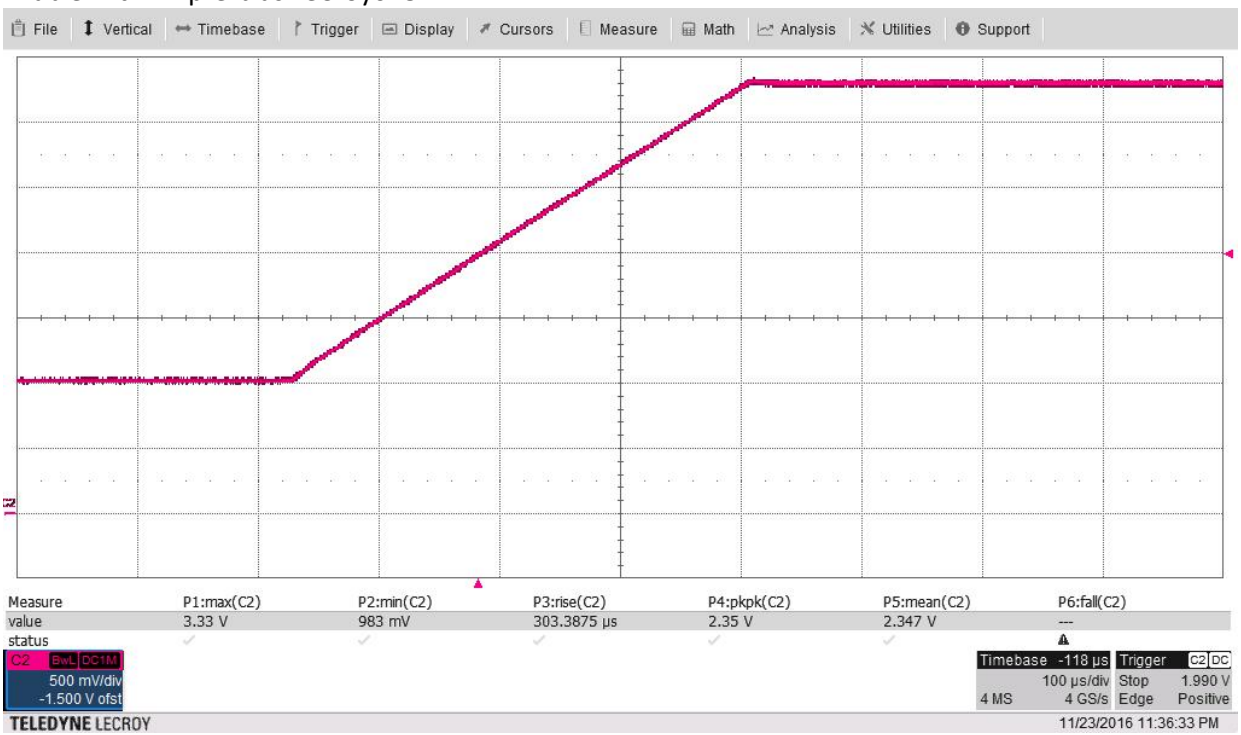
with pre-bias lecroy616; No load



Now looking at 3.3V channel
Enable with no pre-bias LeCroy617



Enable with 1V pre-bias LeCroy618



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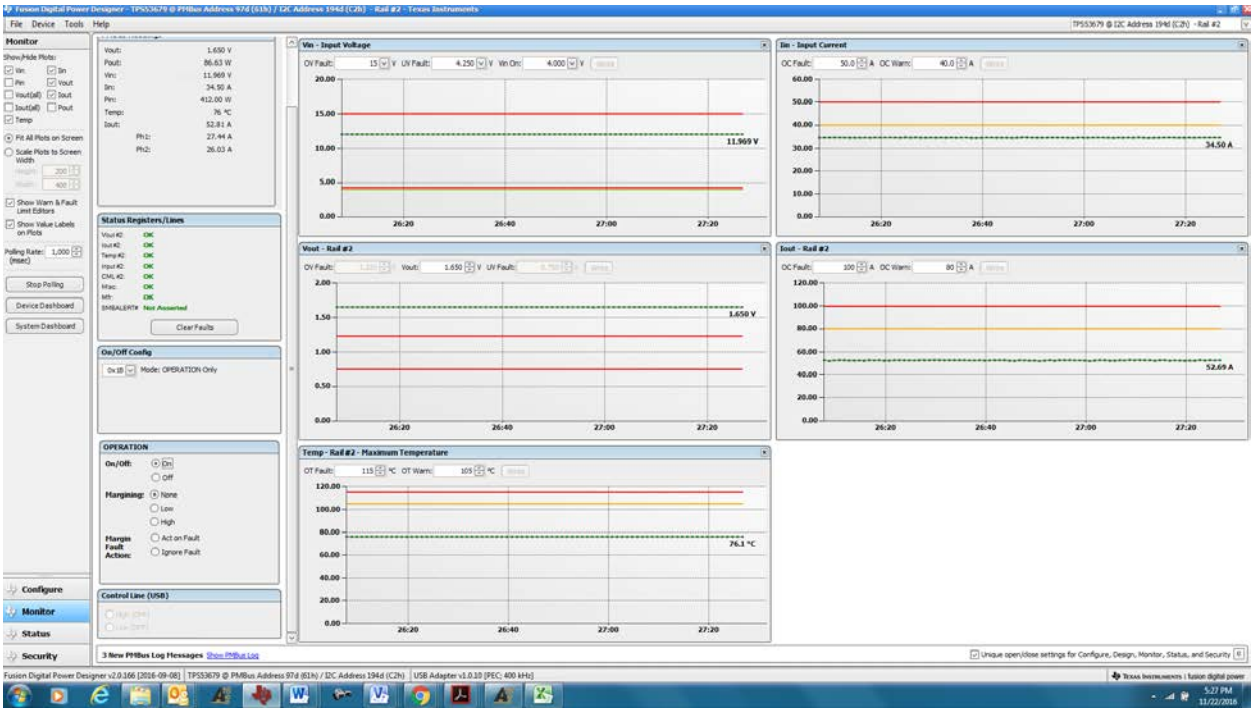
Now 3.3V channel at 55A 3.331V 16.08Ain thermal run no fan



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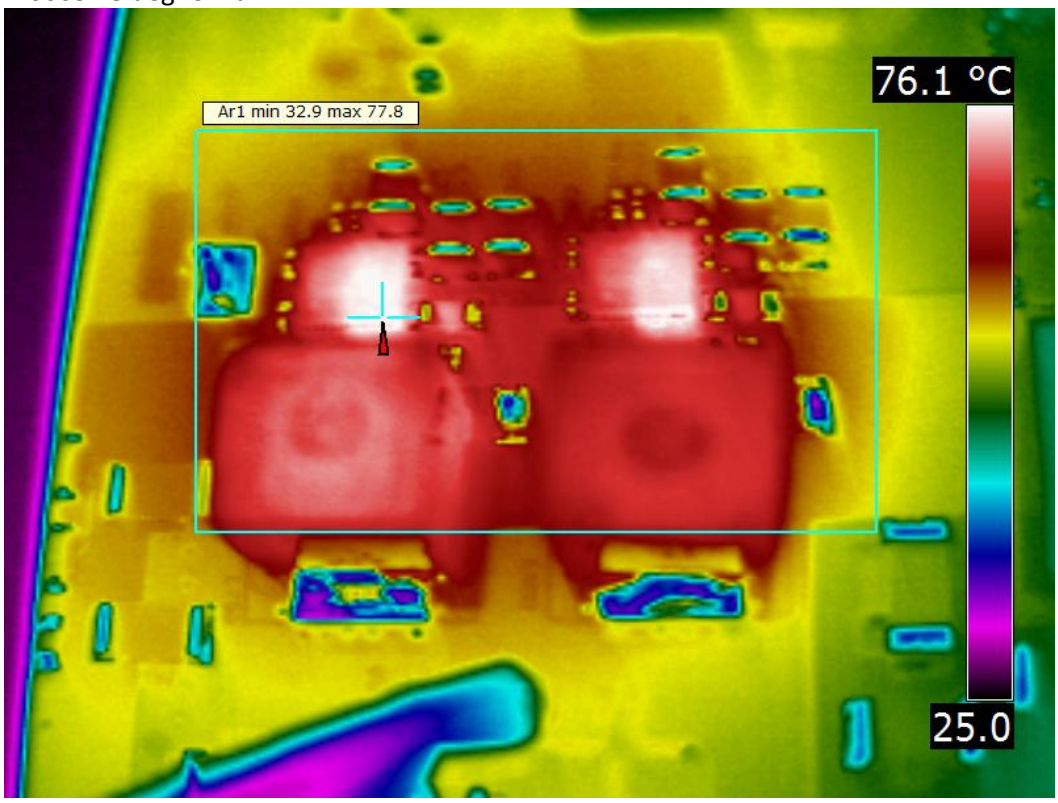
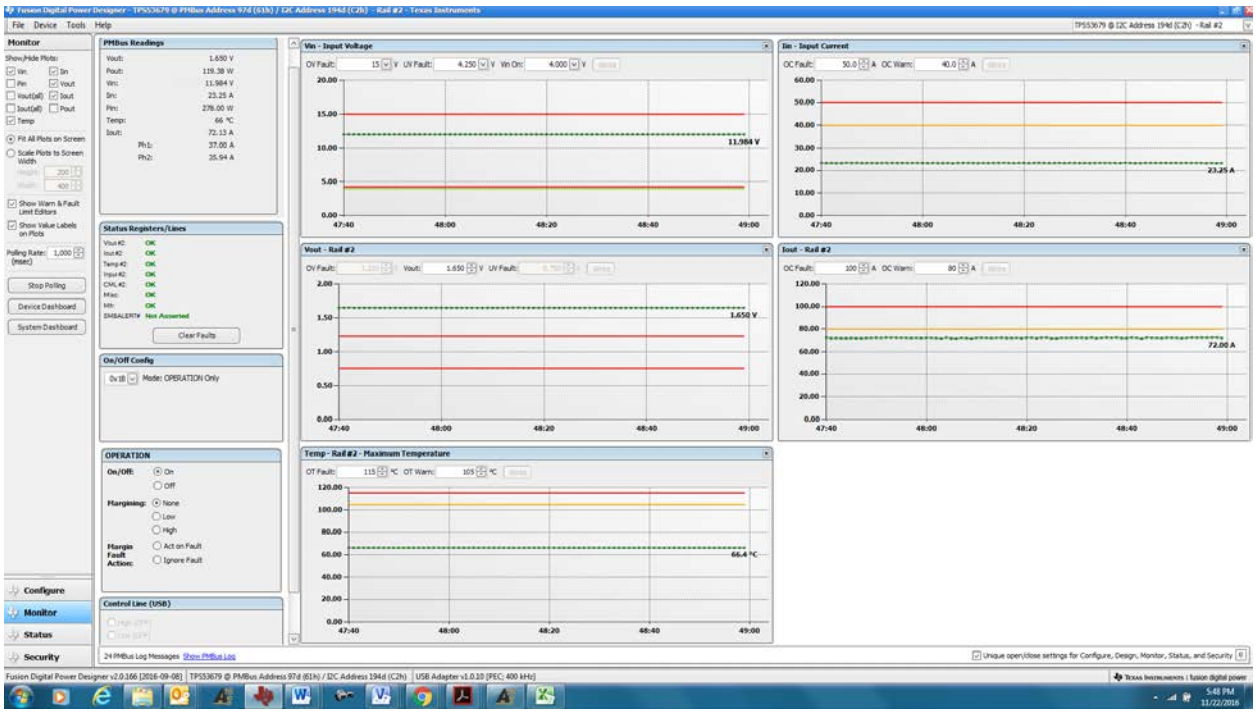
IR0063 78 deg. C max

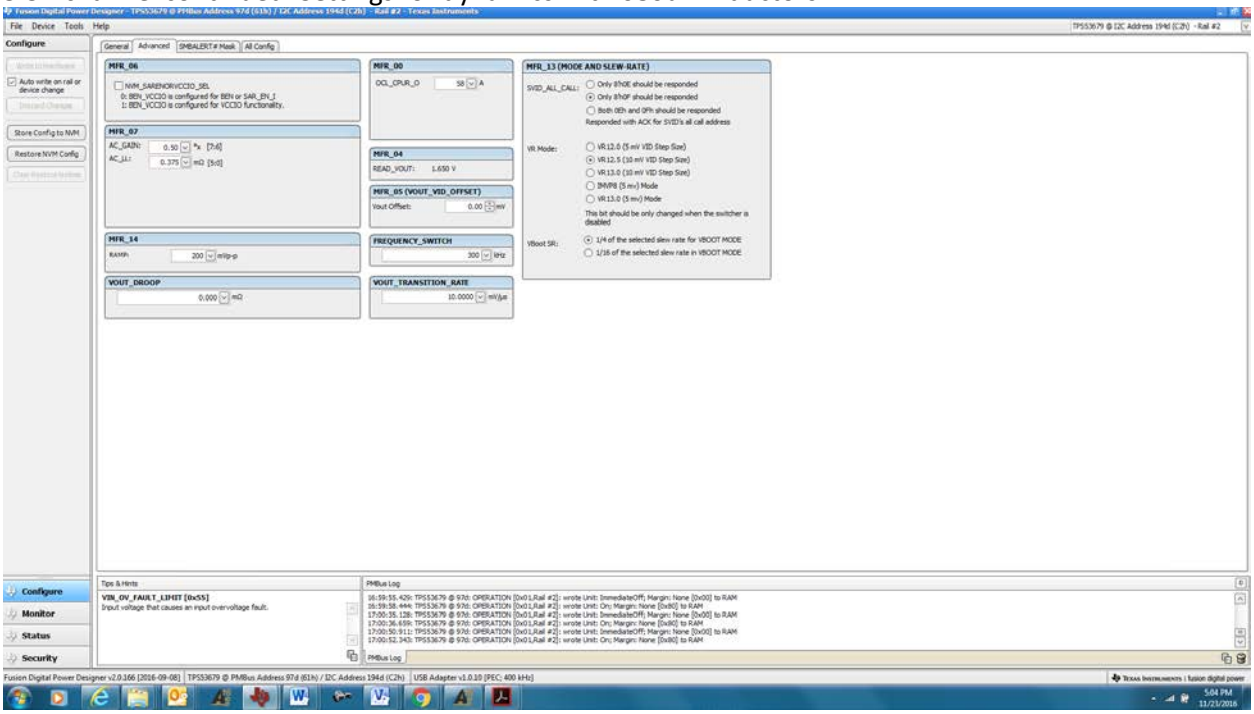


Now 3.3V channel with airflow and corrected input curent calibration factor (was 200% in error)
Now to 75A load withairflow:
Ir0064 with 71 max
GUI



22.1A on lab supply(not calibrated)

3.3V channel continued: Settings for dynamics with 680uH inductors



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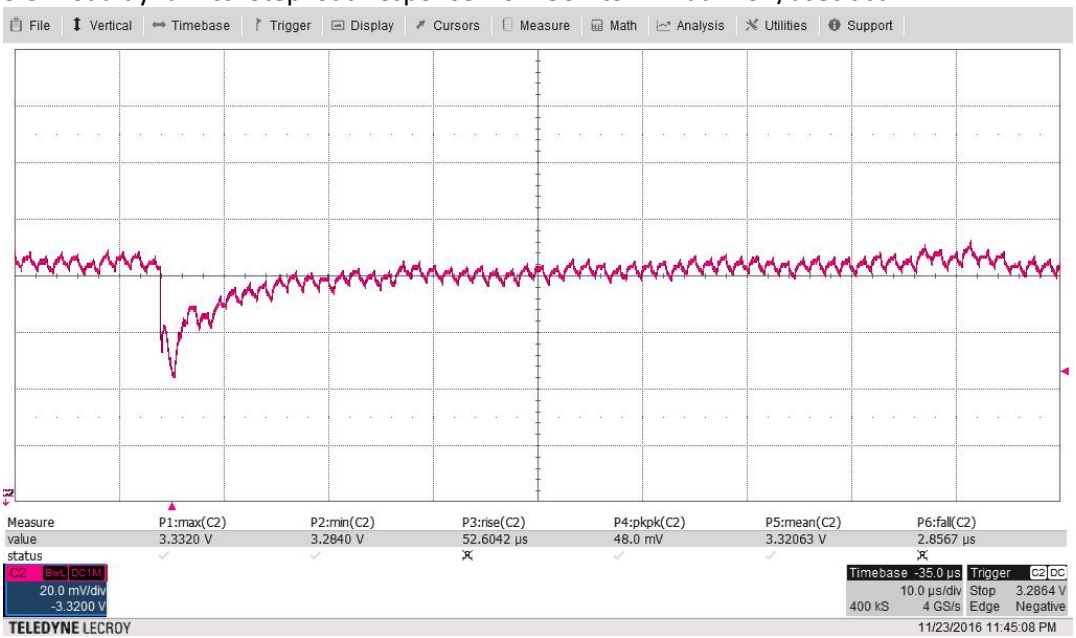
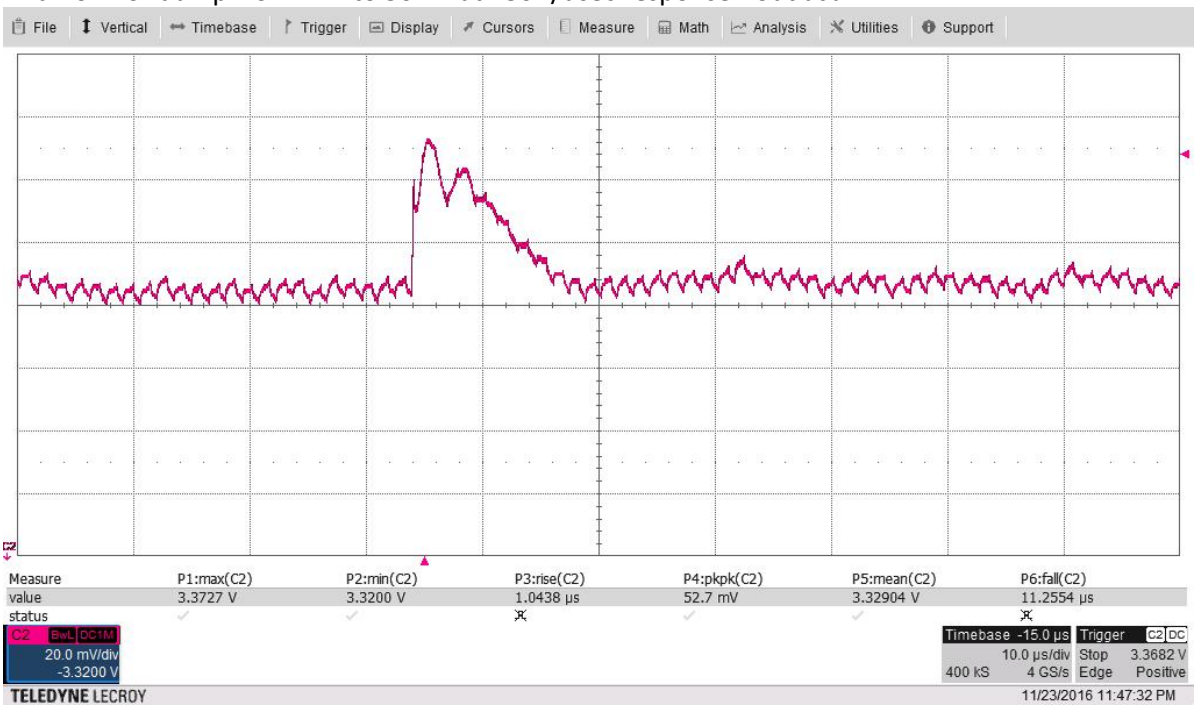
3.3V load dynamics: Step load response from 50A to 74A at 120A/usec at J777



12Vin 50ADC ~22A step lecroy619 almost -40mV dip;

Q

And now for dump from 74A to 50A – at 130A/usec response Vout at J777



dump lecroy620 45mV overshoot

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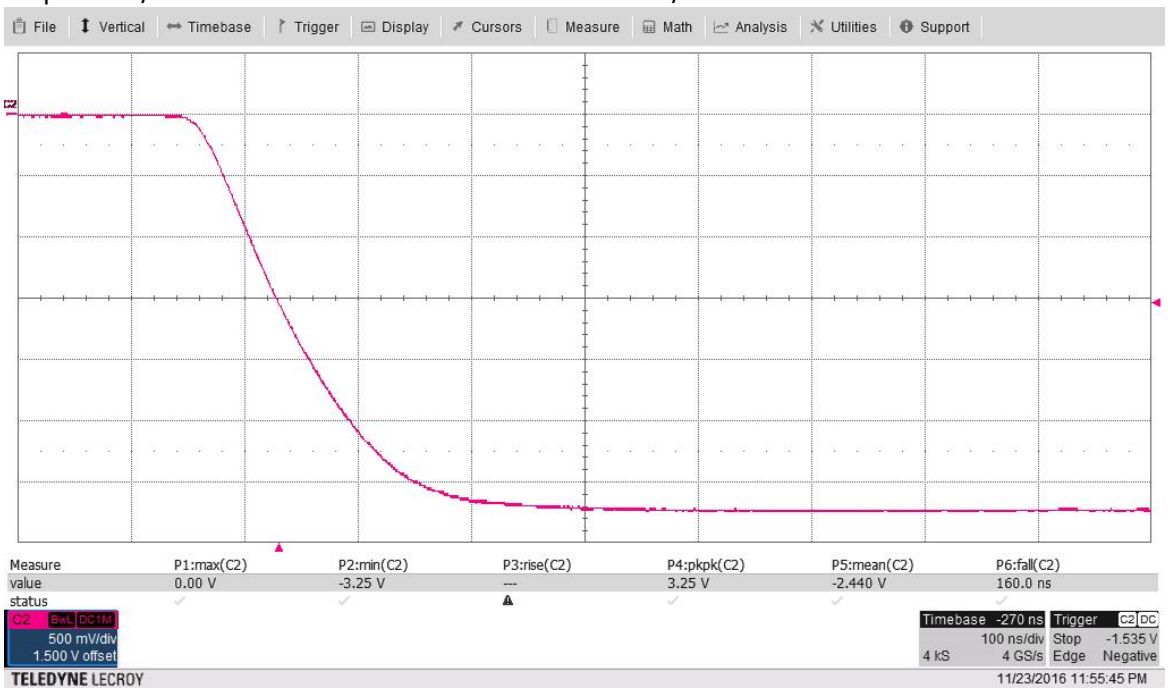
3.3V dynamic load resistor waveforms: Looked at R785 – but others are very similar
Step: 3.25V/1.5ohm time 11 resistors for 23.8A at 120A/usec



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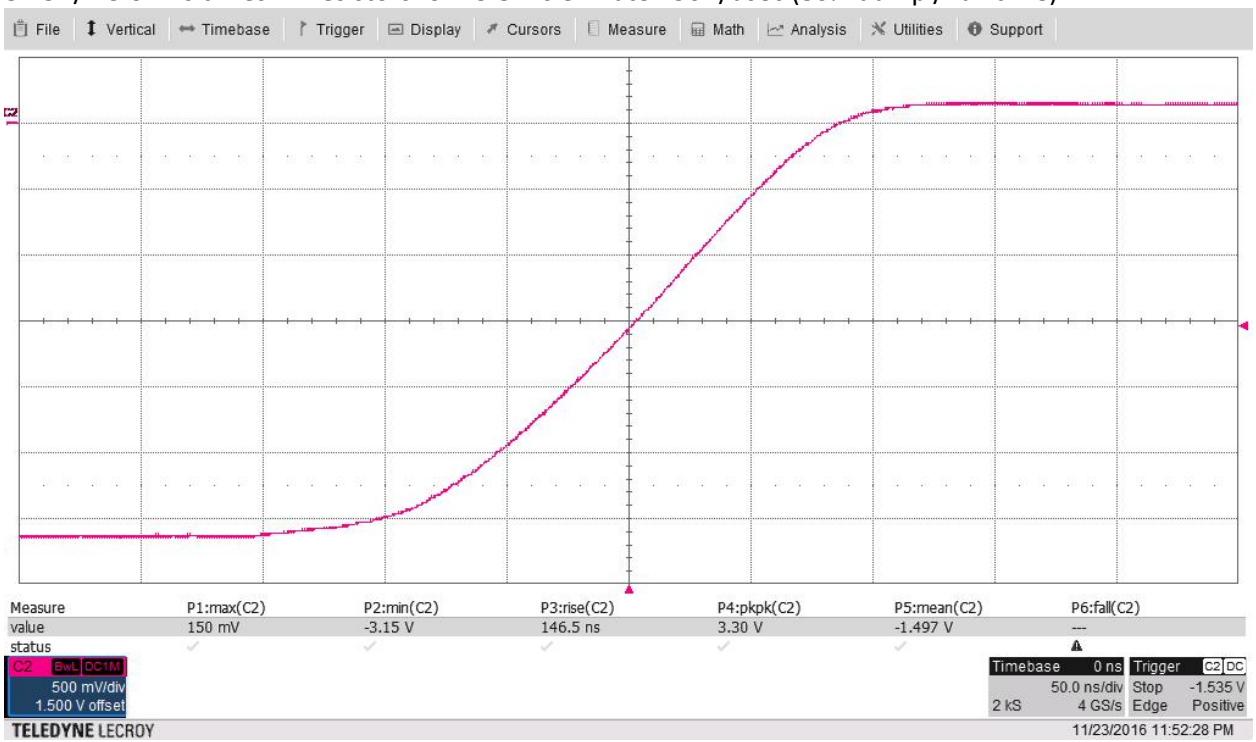
And now the dump on same R785
3.25V/1.5 ohms times 11 resistors for 23.8A slew rate 130A/usec (80% dump / fall time)



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Main channel 800mV 5 phases with 210nH FP1308-R21 inductors – data
October 31, 2016 Vin = 12V, Vout at 800mV 5 phases CSD95490
300kHz/phase
49973 shunt FP1308-R21 for L100-L500

Vin V	Iin A	Vout	Iout A	eff %	loss W
12.003	0.145	0.800	0.000	0.000	1.738
12.003	0.478	0.800	4.961	69.210	1.766
12.003	0.814	0.800	9.960	81.547	1.804
12.003	1.155	0.801	14.961	86.435	1.880
12.003	1.507	0.801	19.961	88.388	2.101
12.003	1.878	0.802	24.962	88.781	2.528
12.003	2.258	0.802	29.960	88.667	3.071
12.003	2.625	0.802	34.962	89.038	3.454
12.003	2.974	0.803	39.963	89.883	3.611
12.003	3.322	0.803	44.963	90.576	3.758
12.003	3.678	0.804	49.965	90.974	3.984
12.002	4.042	0.804	54.966	91.106	4.315
12.003	4.409	0.805	59.968	91.176	4.669
12.002	4.777	0.805	64.970	91.217	5.036
12.002	5.147	0.805	69.974	91.225	5.421
12.002	5.519	0.806	74.978	91.211	5.822
12.002	5.895	0.806	79.980	91.146	6.264
12.002	6.272	0.807	84.985	91.073	6.720
12.002	6.651	0.807	89.992	90.993	7.190
12.002	7.034	0.808	94.997	90.872	7.707
12.002	7.419	0.808	100.004	90.746	8.240
12.002	7.807	0.808	105.010	90.613	8.795
12.002	8.197	0.809	110.018	90.467	9.378
12.002	8.590	0.809	115.027	90.308	9.992
12.002	8.987	0.810	120.033	90.127	10.649
12.002	9.386	0.810	125.044	89.950	11.321
12.002	9.788	0.811	130.049	89.760	12.029
12.001	10.193	0.811	135.057	89.566	12.764
12.001	10.438	0.812	138.062	89.439	13.231

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Main channel 800mV 5 phases with 150nH FP1007-R15 inductors – data
October 31, 2016 Vin = 12V, Vout at 800mV 5 phases CSD95490
300kHz/phase
49973 shunt FP1007R3-R15 for L100-L500 (smaller inductor)

Vin V	Iin A	Vout	Iout A	eff %	loss W
12.003	0.199	0.800	0.000	0.000	2.384
12.003	0.531	0.800	4.979	62.535	2.386
12.003	0.866	0.800	9.975	76.797	2.412
12.003	1.206	0.801	14.973	82.858	2.480
12.003	1.547	0.801	19.973	86.207	2.560
12.003	1.891	0.802	24.973	88.189	2.681
12.003	2.244	0.802	29.970	89.248	2.896
12.003	2.612	0.802	34.972	89.498	3.293
12.003	2.996	0.803	39.973	89.262	3.861
12.003	3.377	0.803	44.971	89.138	4.402
12.002	3.731	0.804	49.975	89.696	4.614
12.002	4.083	0.804	54.975	90.207	4.799
12.002	4.443	0.805	59.978	90.488	5.073
12.002	4.814	0.805	64.980	90.535	5.469
12.002	5.187	0.805	69.983	90.535	5.893
12.002	5.563	0.806	74.988	90.510	6.336
12.002	5.941	0.806	79.990	90.459	6.803
12.002	6.321	0.807	84.995	90.384	7.296
12.002	6.704	0.807	90.001	90.288	7.815
12.002	7.091	0.808	95.007	90.161	8.374
12.002	7.479	0.808	100.014	90.039	8.942
12.002	7.871	0.809	105.020	89.892	9.549
12.002	8.266	0.809	110.027	89.726	10.193
12.002	8.665	0.810	115.037	89.543	10.875
12.002	9.066	0.810	120.042	89.359	11.579
12.001	9.471	0.810	125.053	89.168	12.312
12.001	9.878	0.811	130.061	88.963	13.085
12.001	10.289	0.811	135.068	88.753	13.888
12.001	10.537	0.812	138.074	88.622	14.389

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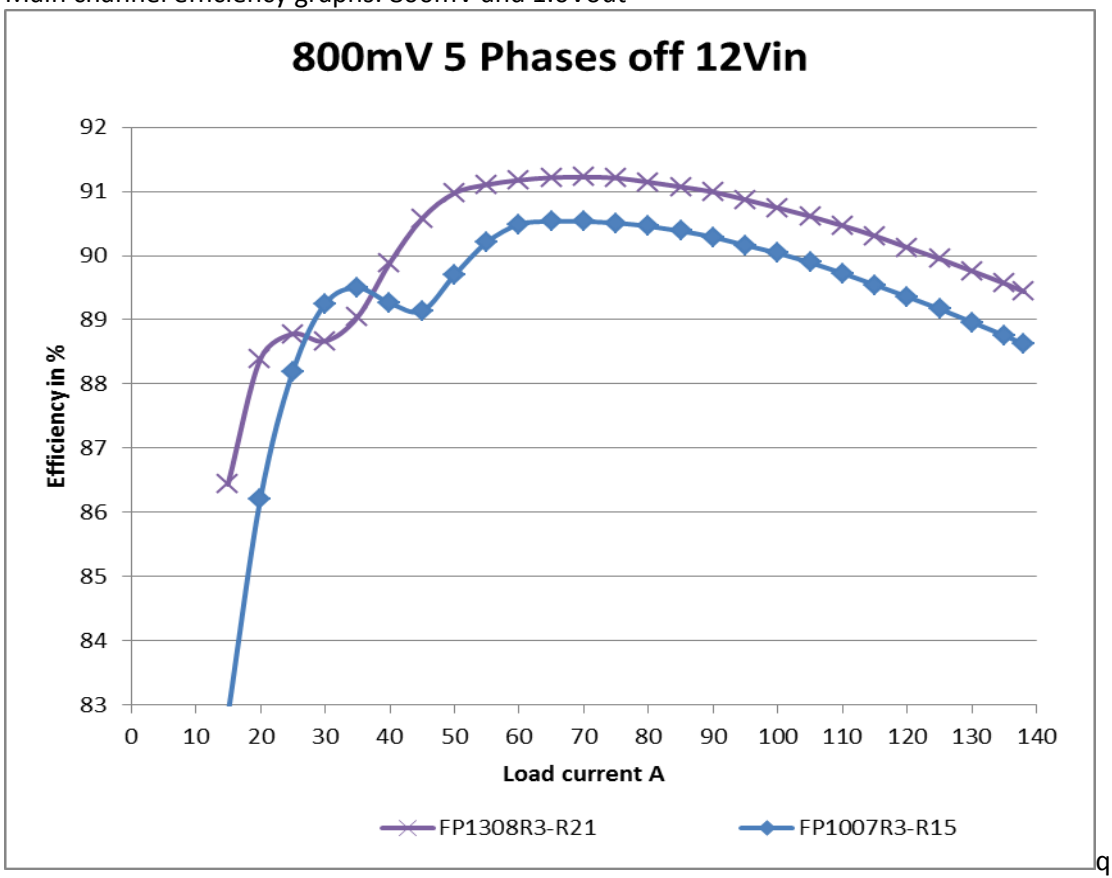
Main channel efficiency graphs: 800mV and 1.0Vout



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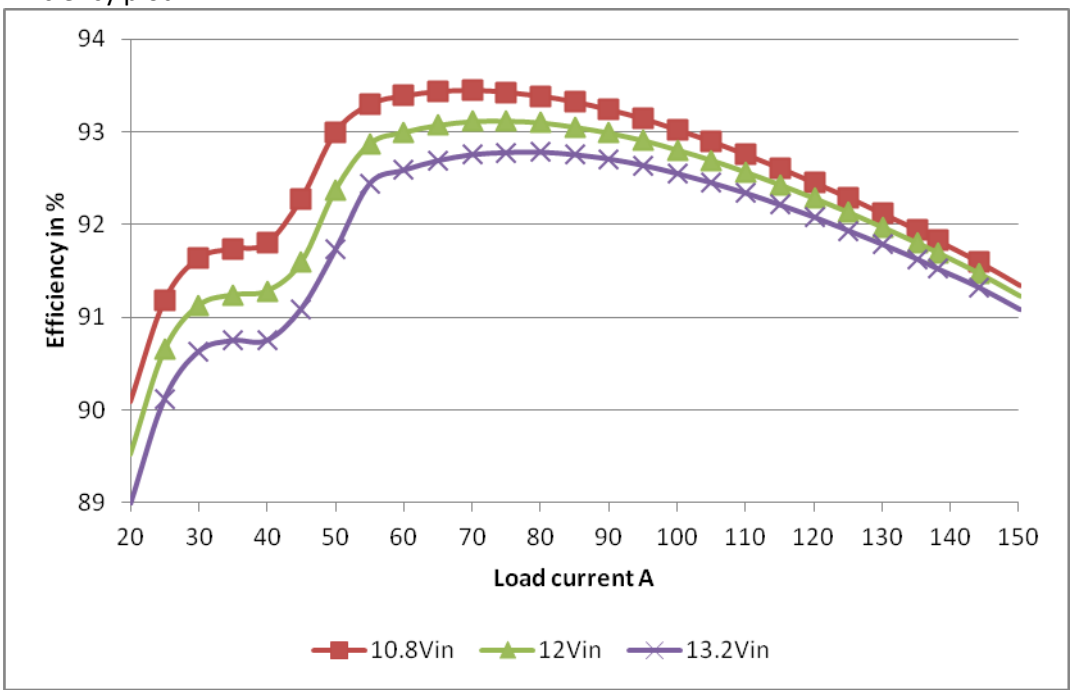
And now 1.0V with FP-1308-R21 inductors
Efficiency plot:



3.3V channel 2 phases efficiency data
November 10, 2016 Vin = 12V, Vout at 3.3V 2 phases CSD95490
300kHz/phase
49973 shunt Coilcraft XAL1010-681 for L600-L700

Vin V	Iin A	Vout	Iout A	eff %	loss W
11.999	0.147	3.326	0.000	0.000	1.761
11.999	0.836	3.326	2.481	82.281	1.777
11.999	1.535	3.326	4.982	89.973	1.847
11.999	2.249	3.327	7.481	92.210	2.103
11.999	2.969	3.327	9.981	93.202	2.422
11.999	3.679	3.328	12.483	94.087	2.611
11.999	4.377	3.328	14.982	94.938	2.659
11.999	5.087	3.328	17.481	95.326	2.853
11.999	5.800	3.329	19.982	95.580	3.076
11.999	6.515	3.329	22.483	95.749	3.323
11.999	7.232	3.330	24.984	95.869	3.585
11.999	7.951	3.330	27.485	95.933	3.880
11.999	8.672	3.330	29.984	95.971	4.192
11.999	9.396	3.331	32.485	95.978	4.534
11.999	10.122	3.331	34.988	95.966	4.900
11.999	10.851	3.332	37.490	95.934	5.293
11.999	11.581	3.332	39.991	95.891	5.710
11.999	12.315	3.333	42.491	95.829	6.163
11.999	13.051	3.333	44.991	95.759	6.642
11.999	13.789	3.333	47.493	95.681	7.147
11.999	14.531	3.334	49.995	95.593	7.684
11.999	15.276	3.334	52.498	95.497	8.254
11.999	16.023	3.335	54.998	95.392	8.860
11.999	16.774	3.335	57.503	95.282	9.496
11.999	17.527	3.336	60.004	95.171	10.156
11.999	18.284	3.336	62.505	95.045	10.871
11.999	19.045	3.337	65.007	94.913	11.624
11.999	19.808	3.337	67.510	94.783	12.400
11.999	20.575	3.338	70.013	94.648	13.213
11.999	21.346	3.338	72.515	94.505	14.074
11.999	22.120	3.338	75.020	94.361	14.967
11.999	22.896	3.339	77.521	94.215	15.892
11.999	23.676	3.339	80.025	94.068	16.852

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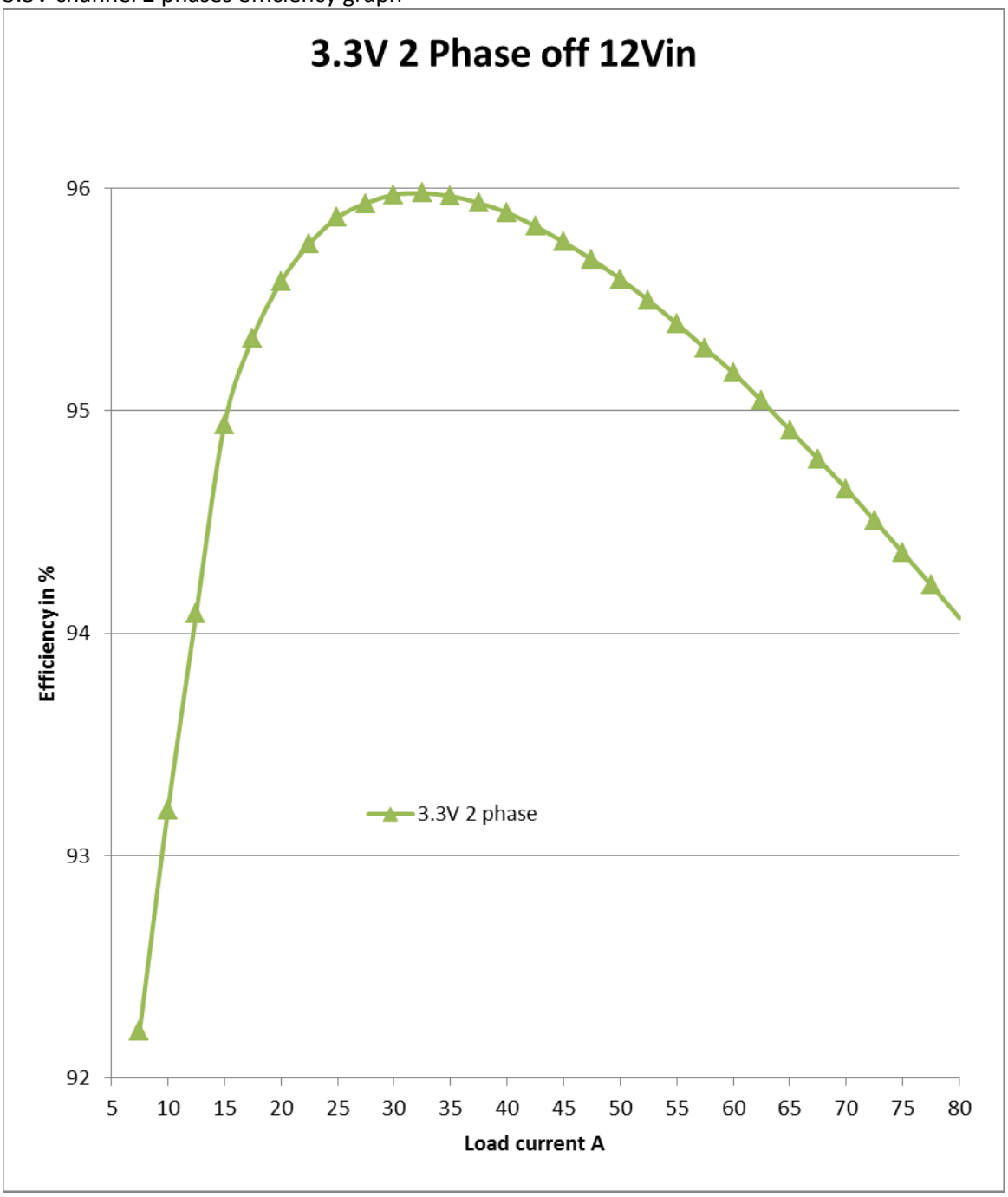
3.3V channel 2 phases efficiency graph



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