PMP20023 TPS544C25 600mV Voltage Mode Test Report:

TPS544C25 version built on PCB PMP10364B tested on model t2

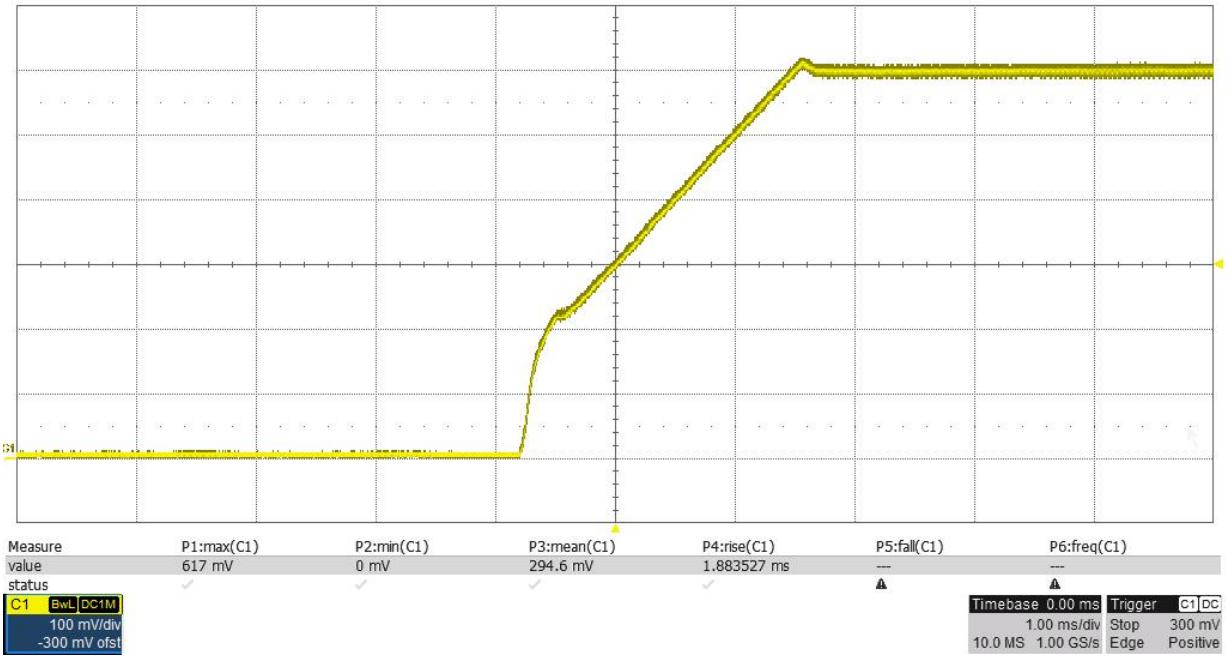
VOUT COMMAND mode Vout set to 600mV

Unless otherwise stated: Vin is 12V

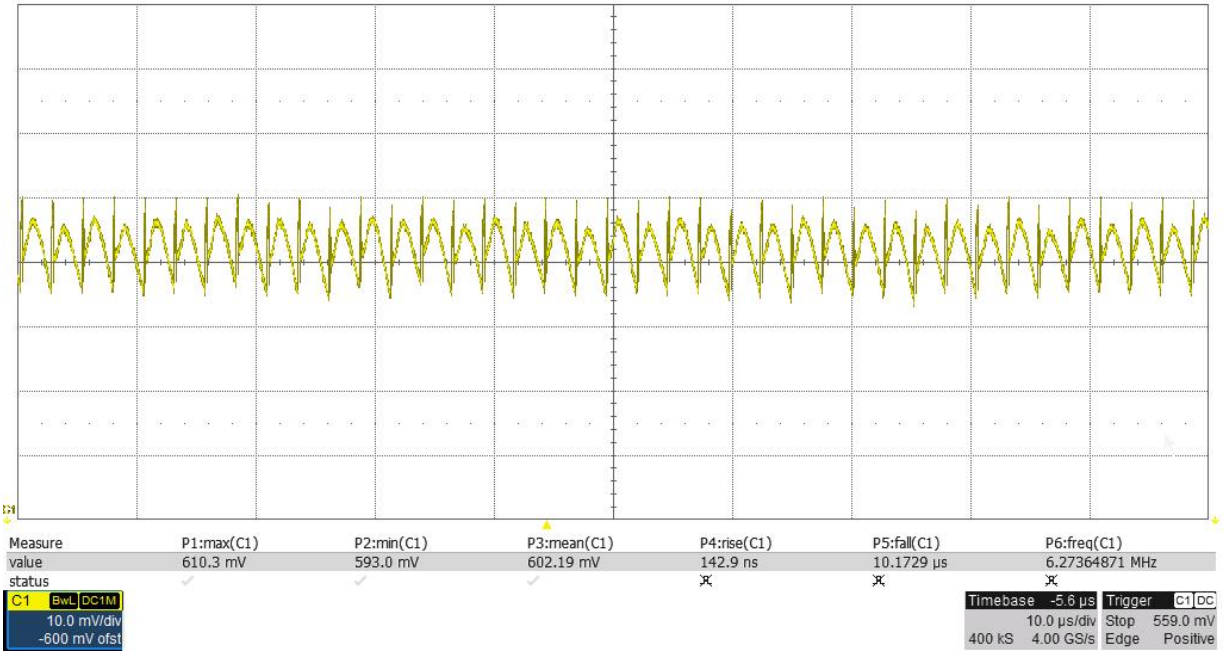
GUI readings: 600mVout and 12Vin:
30.0A on load and 31.3A on GUI
25.0A on load and 25.8A on GUI
Readings 3 – 4% high

VOUT set to 1.0V

Start up no load: except for ~10 mV overshoot, rise is monotonic in 2.4 msec



Ripple out 600mV 25A load: 17 mV p-p



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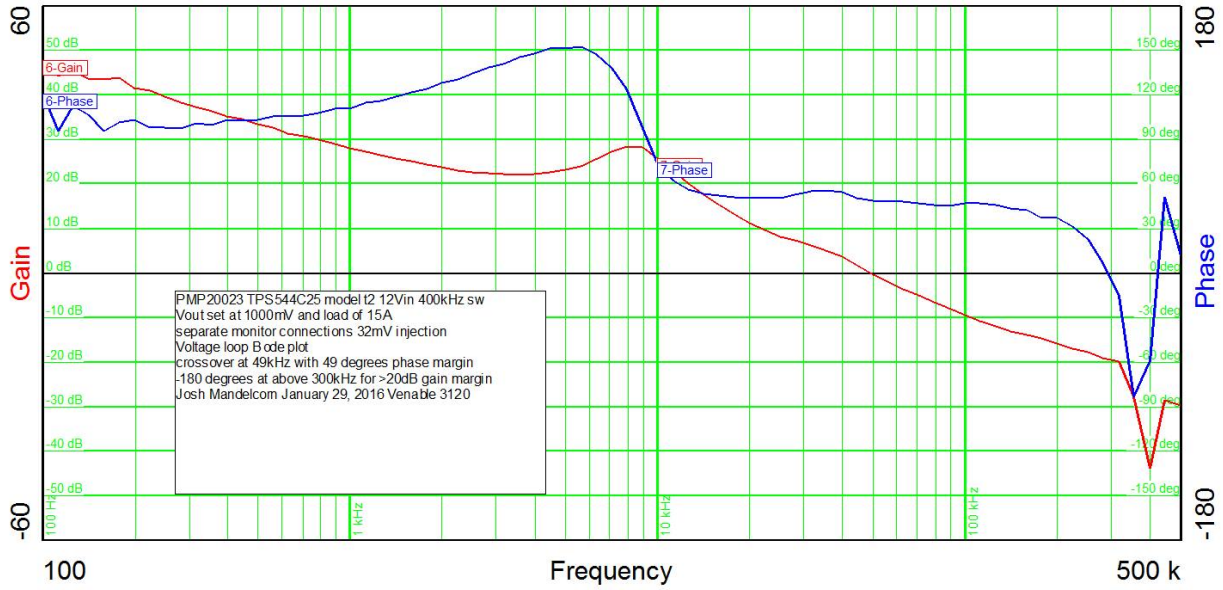
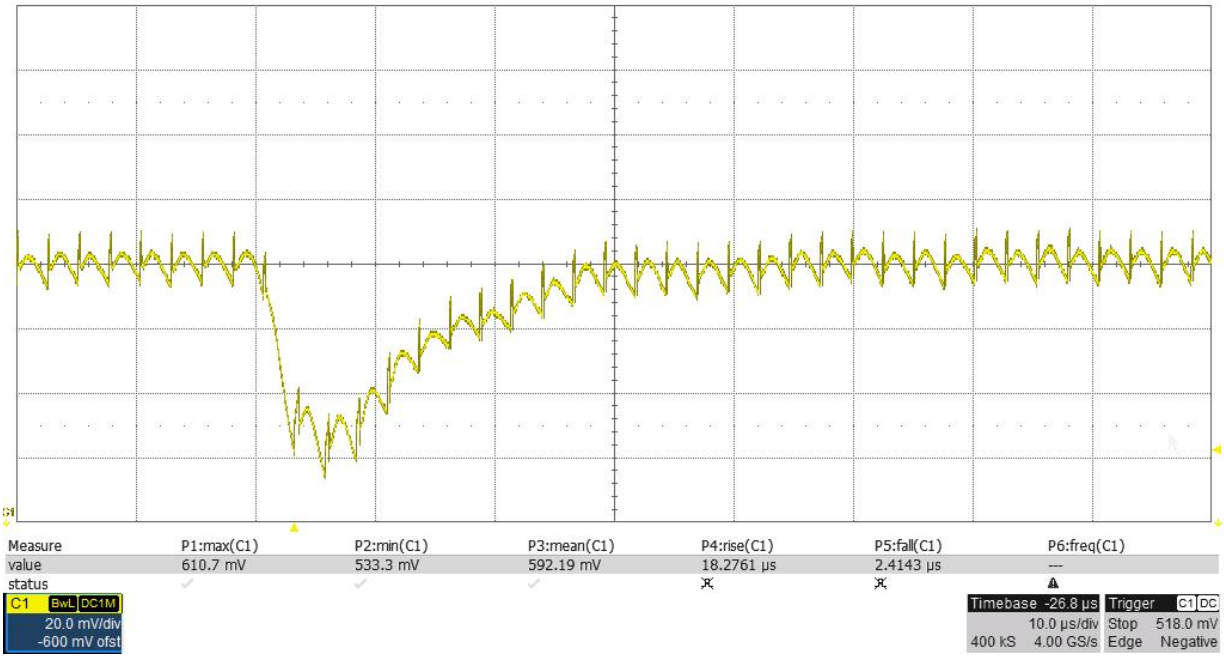
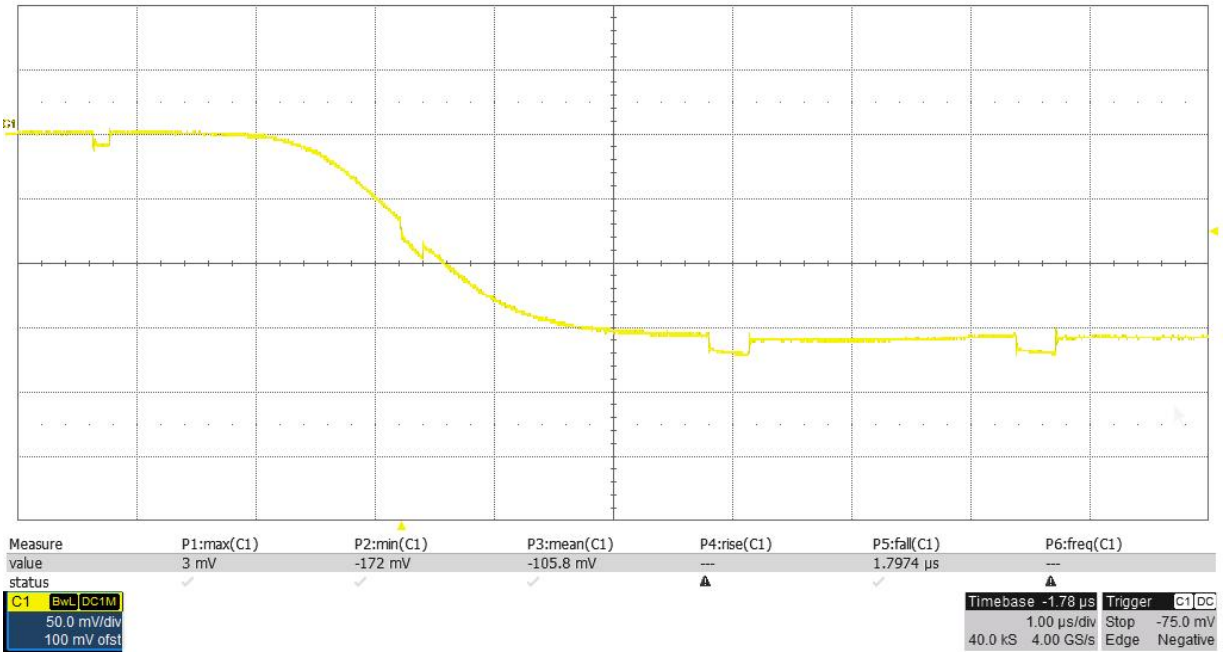
Bode plot:
Vout 600mV 15A load: 49 kHz crossover with 49 degrees Phase margin



Step load response: from 5A static load to 21A at 8A/usec: about 55 mV undershoot



Detail of load step across 10 mOhms tied to Vout: 160mV in all for 16A; peak rate 8A/usec



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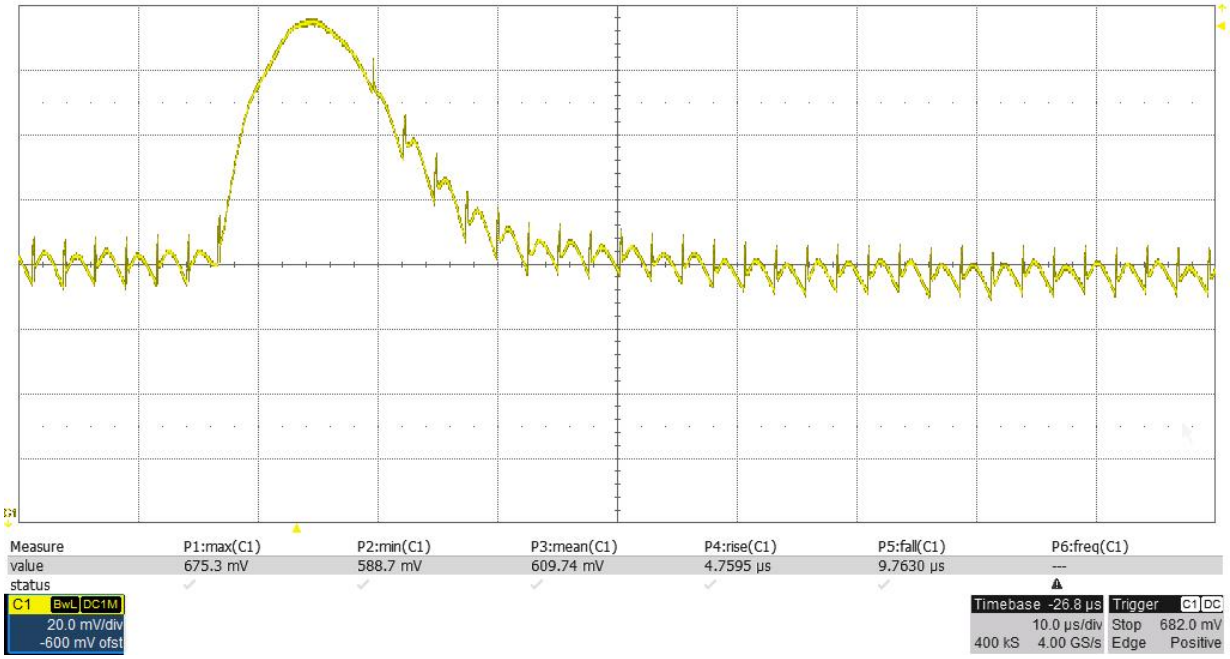
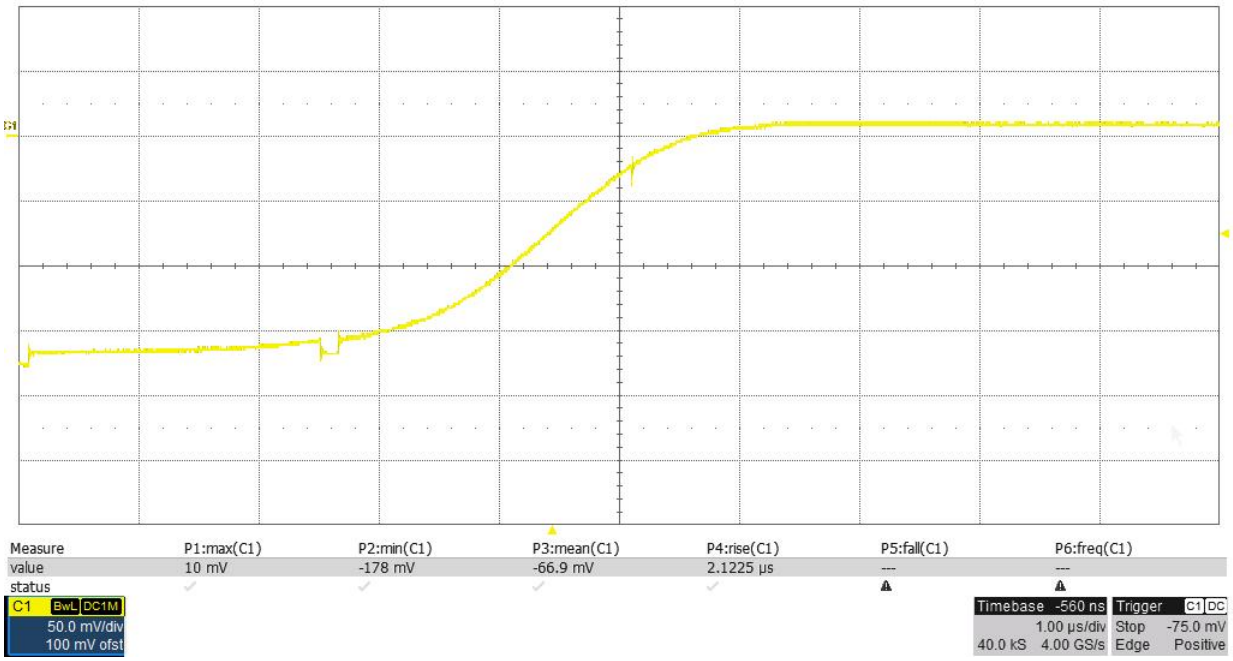
Load dump response: 21A to 5A: 70 mV overshoot



Details of load dump response across 10 mOhms tied to Vout: 160mV of 16A with peak slew rate ~6A per usec



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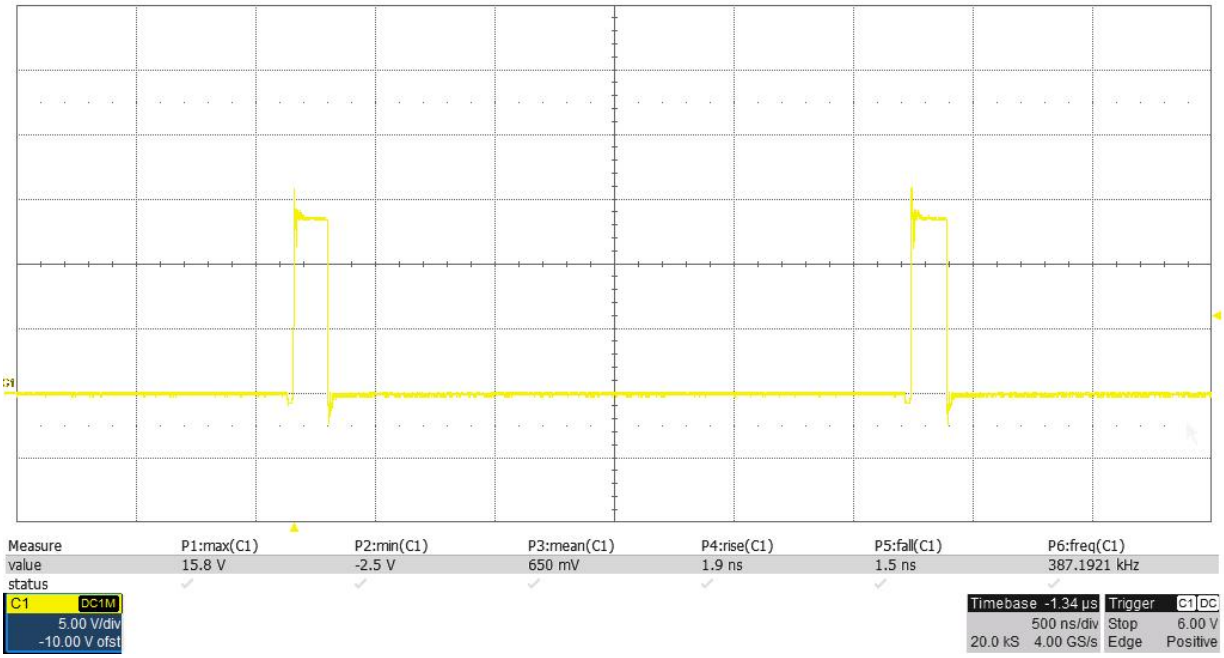
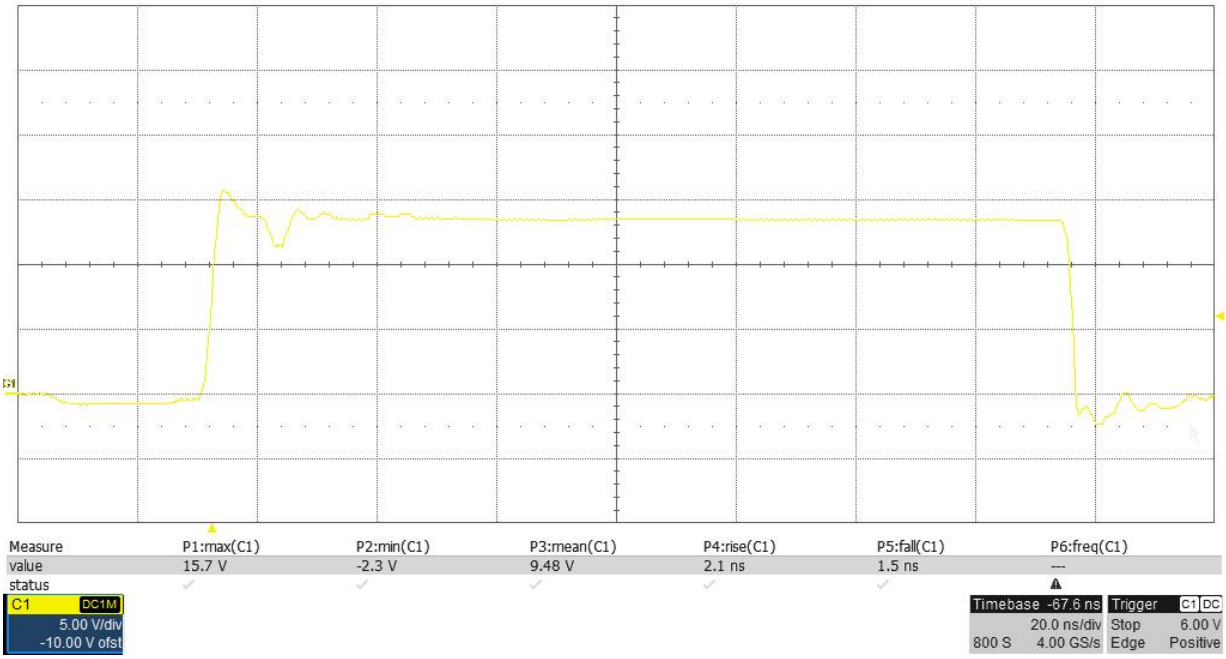
Main switching waveform: Full 30A load: 13.2Vin 600mV out



Same, but detail of 1 pulse



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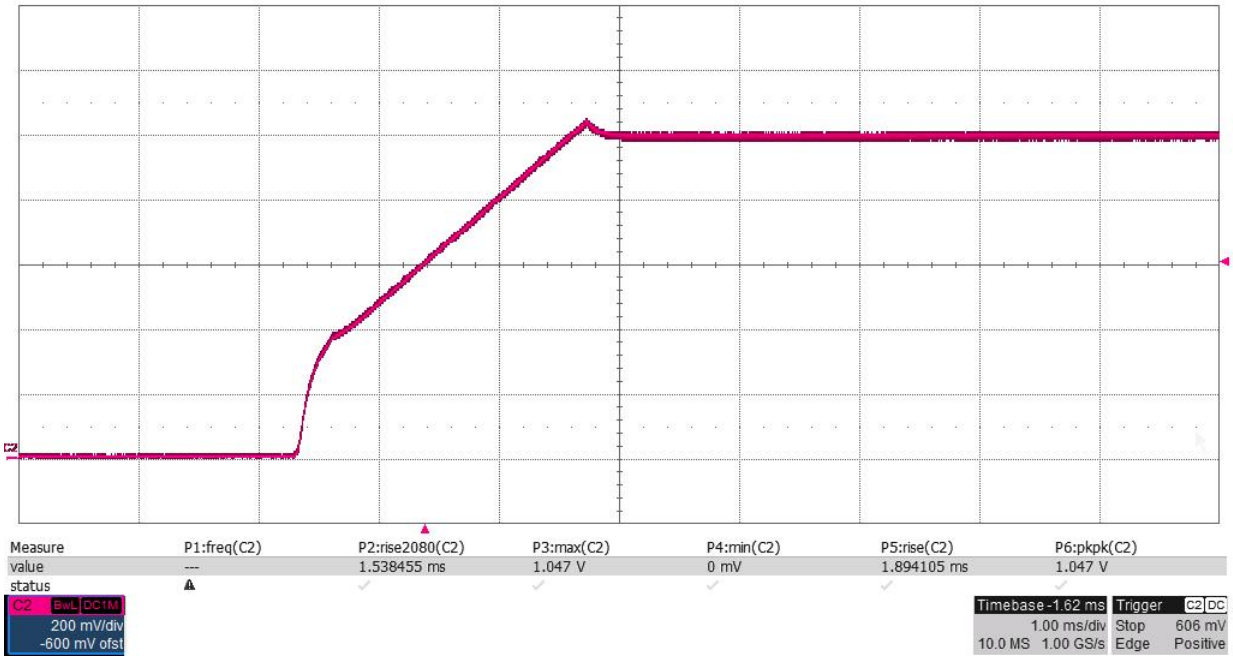
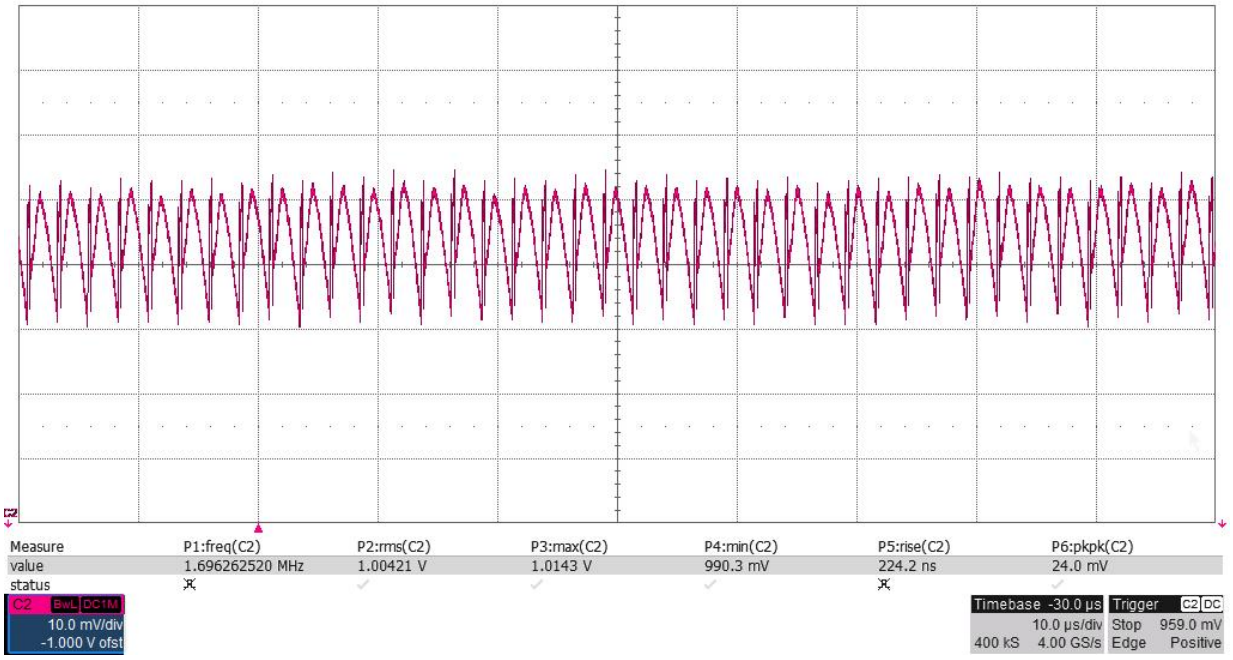
1.0Vout testing on model t3:
Start up no load: except for ~35 mV overshoot, rise is monotonic in 2.4 msec
Steady state is 20mV ripple from 992mV to 1.012V with peak on turn on at 1.047V or 35mV higher



Ripple out 1.0V 30A load: 24 mV p-p



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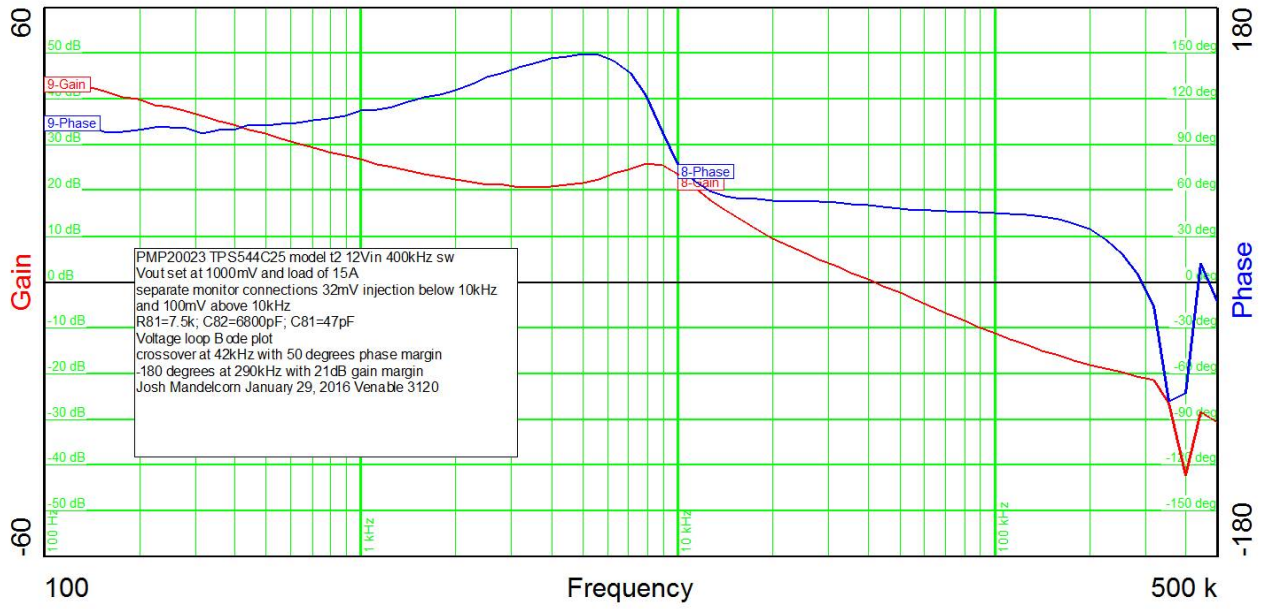
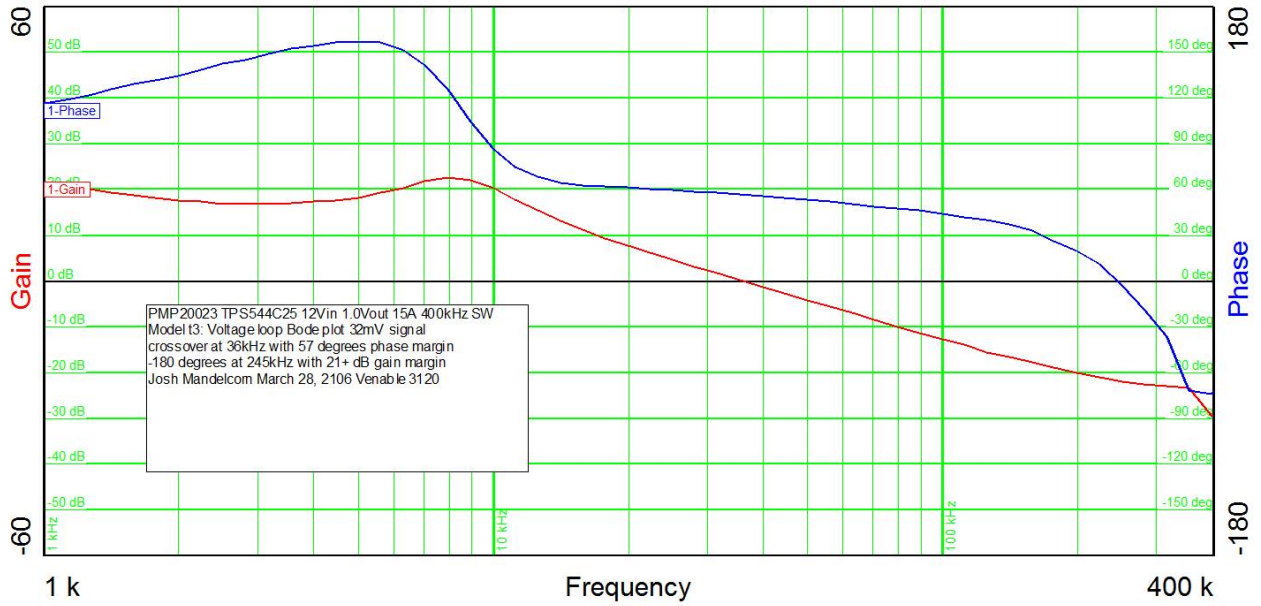
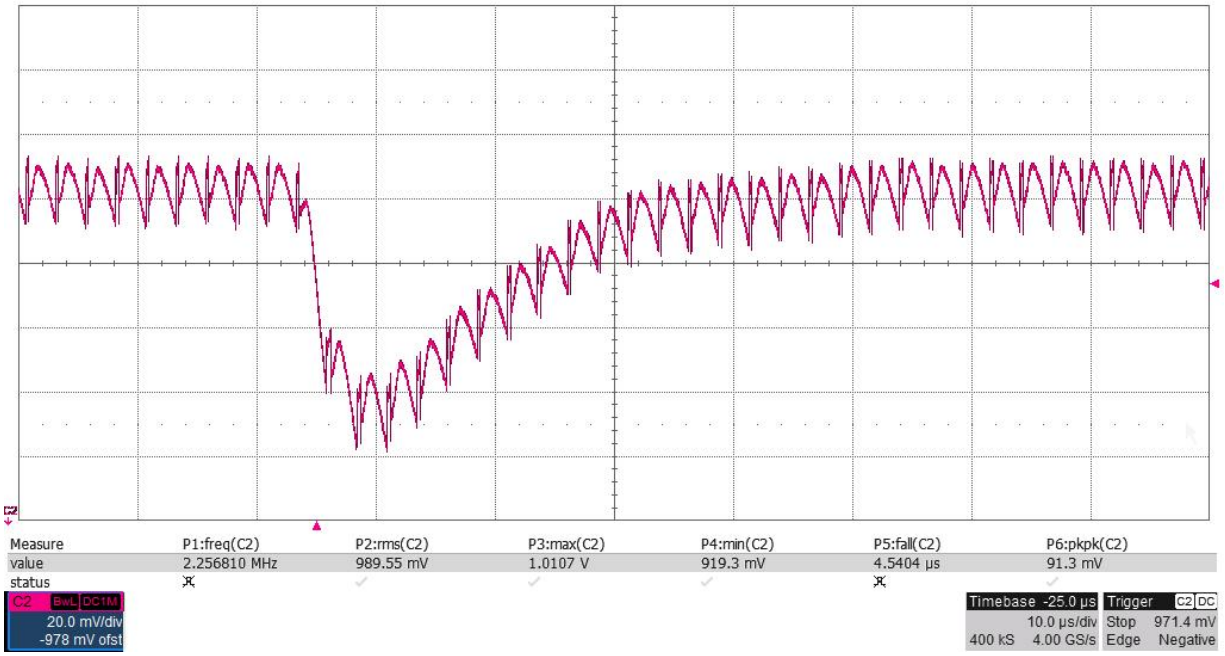
Bode plot: Vout 1.0V 15A load: 42 kHz crossover 50 degrees Phase margin model t2



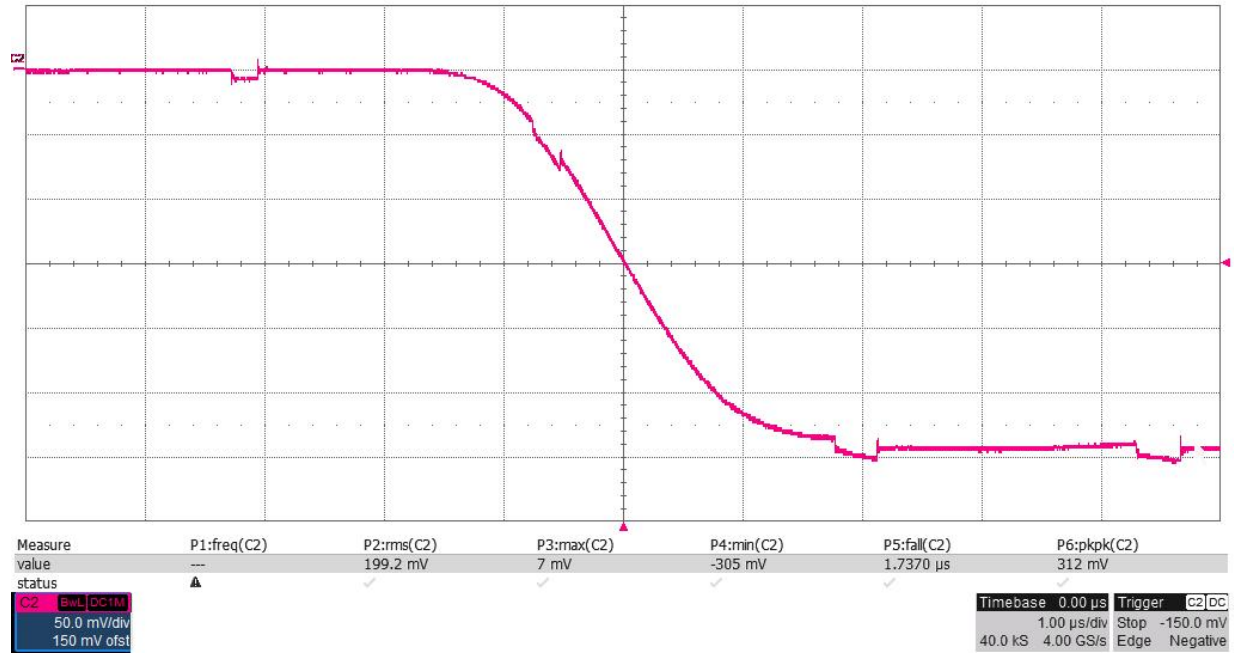
Same, but model t3:



Step load response: from 12A static load to 26.7A at 7A/usec: about 70 mV undershoot
Model t3 used, the slower one



Detail of load step across 20 mOhms tied to Vout: 294mV in all for 14.7A; peak rate ~7A/usec



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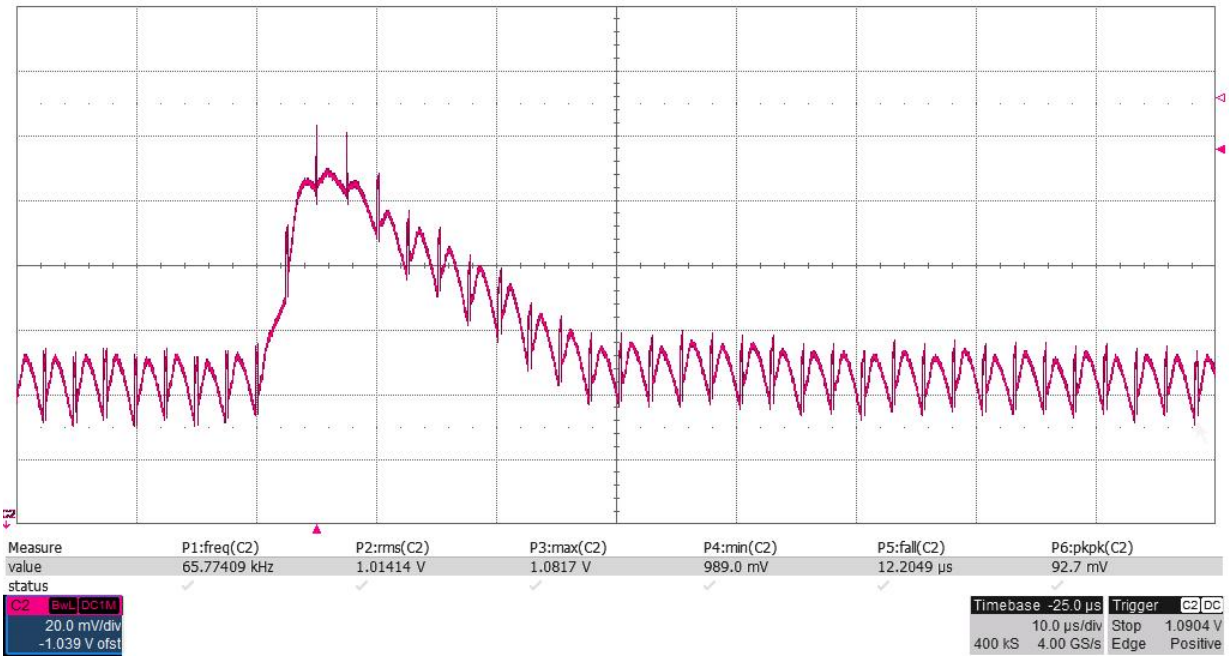
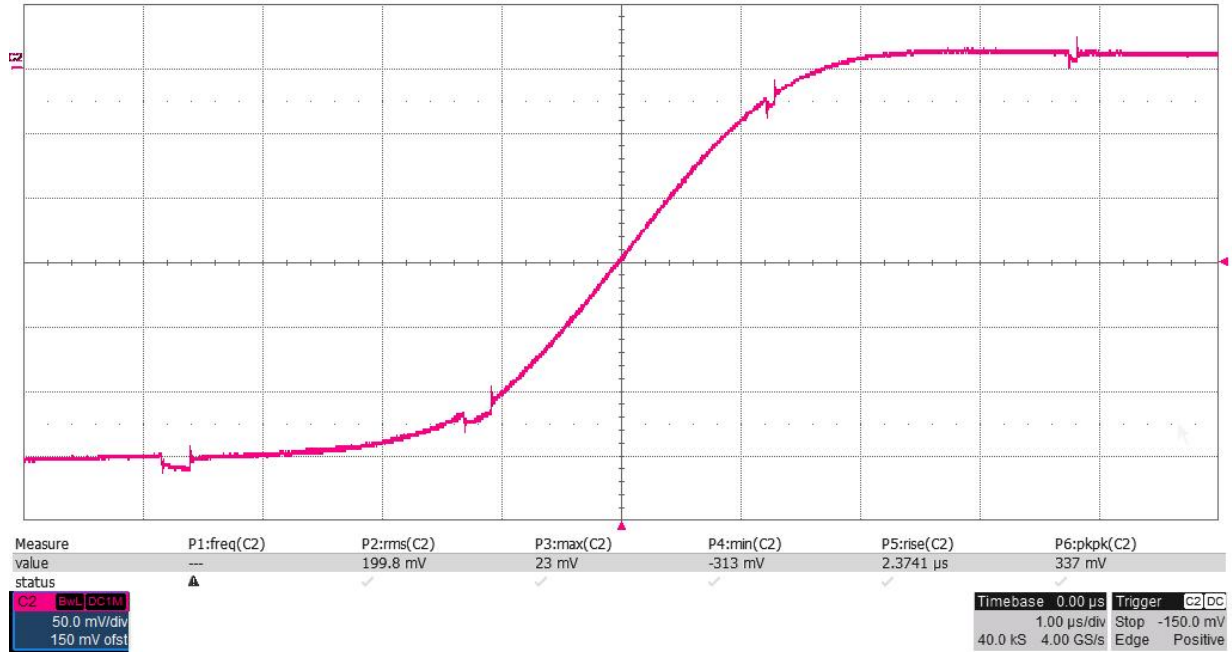
Load dump response: 27.5A to 12A: ~70 mV overshoot including “spikes”
Model t3 used, the slower one



Details of load dump response across 20 mOhms tied to Vout: 310mV or 15.5A with peak slew rate ~5A per usec



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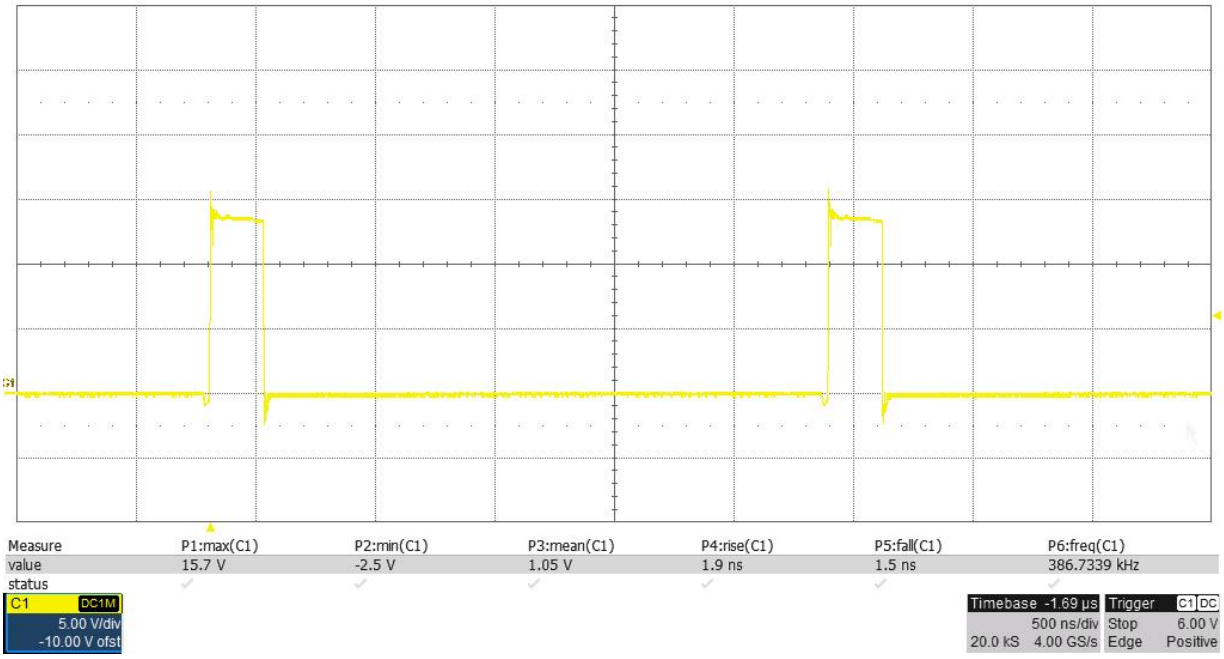
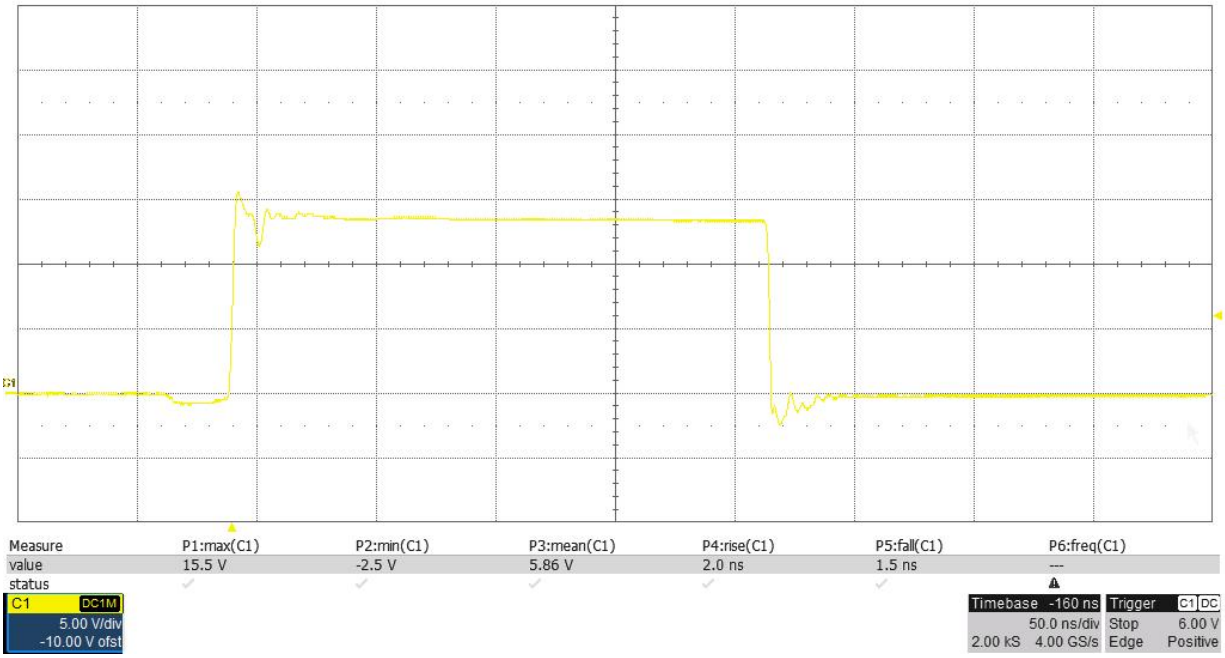
Main switching waveform: Full 30A load: 13.2Vin 1.0 V out model t2



Same, but detail of 1 pulse



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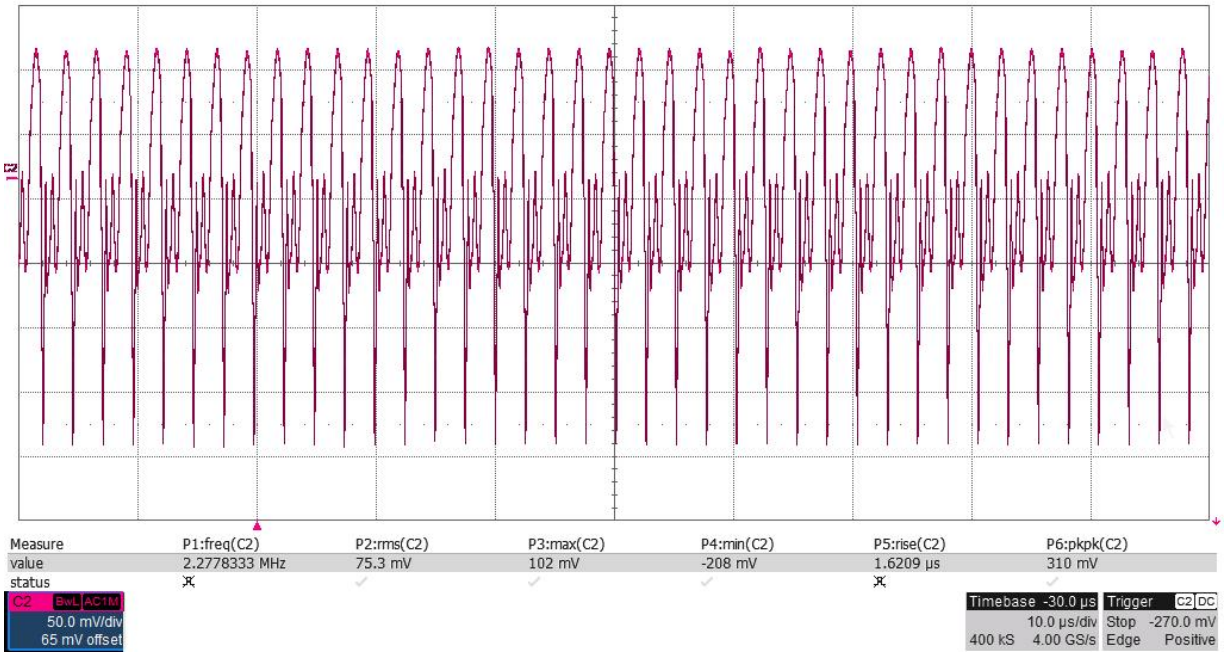
Full load input ripple on C14: 12Vin 1V 30a out: 310mv p-p and 75mV RMS model t3



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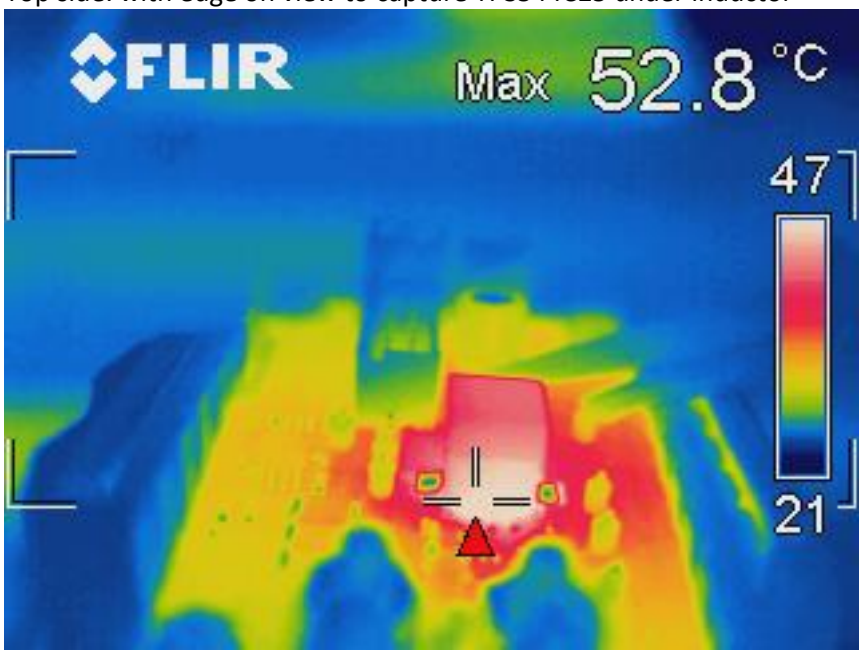
Full load thermal images: ~1 to 1.5 meter per second airflow: 12Vin 1V 30A out model t3
Top side: with edge on view to capture TPS544C25 under inductor



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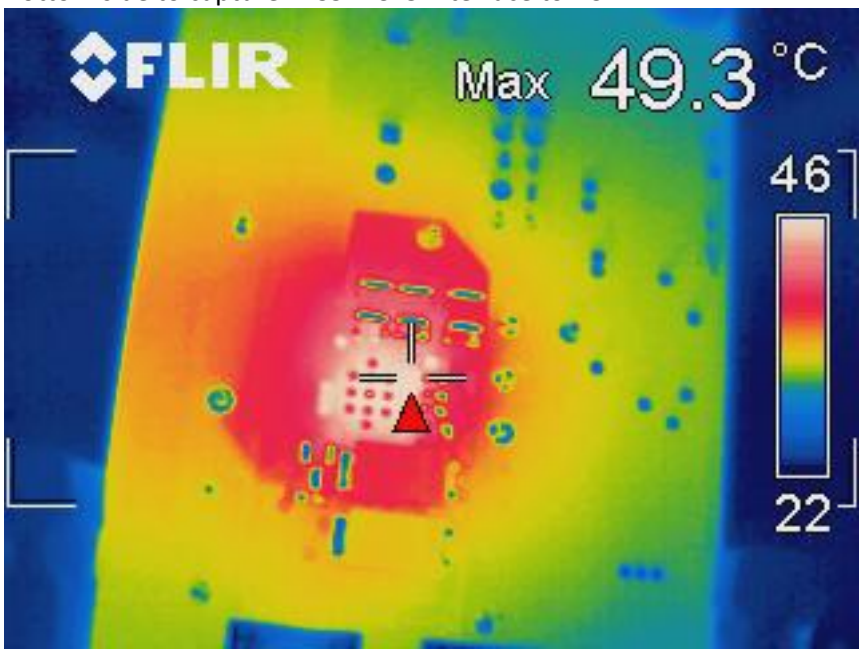
Bottom side to capture TPS544C25 interface to PCB:



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Efficiency data: (Model t3)

Nominal 12V input with ~1 Meter per second airflow

Vin V	Iin A	Vout	Iout A	eff %	loss W
12.002	0.044	1.002	0.000	N/A	0.530
12.002	0.125	1.002	0.975	64.994	0.526
12.002	0.212	1.002	1.974	77.820	0.564
12.002	0.303	1.002	2.973	81.828	0.662
12.002	0.395	1.003	3.972	83.963	0.761
12.002	0.484	1.003	4.971	85.727	0.830
12.002	0.575	1.003	5.970	86.815	0.909
12.002	0.665	1.003	6.967	87.525	0.996
12.002	0.757	1.003	7.967	87.989	1.091
12.001	0.849	1.003	8.969	88.296	1.192
12.001	0.942	1.003	9.967	88.462	1.304
12.001	1.036	1.003	10.968	88.528	1.426
12.001	1.130	1.003	11.965	88.530	1.555
12.001	1.225	1.004	12.965	88.465	1.696
12.001	1.322	1.004	13.964	88.355	1.847
12.001	1.419	1.004	14.964	88.204	2.009
12.001	1.517	1.004	15.963	88.021	2.181
12.001	1.616	1.004	16.962	87.808	2.365
12.001	1.716	1.004	17.962	87.574	2.559
12.001	1.817	1.004	18.960	87.319	2.765
12.001	1.919	1.004	19.961	87.049	2.983
12.001	2.022	1.004	20.959	86.756	3.214
12.001	2.126	1.005	21.961	86.454	3.457
12.002	2.231	1.005	22.959	86.136	3.713
12.002	2.338	1.005	23.961	85.793	3.987
12.002	2.446	1.005	24.960	85.446	4.272
12.002	2.555	1.005	25.957	85.085	4.573
12.002	2.665	1.005	26.958	84.715	4.889
12.002	2.777	1.005	27.957	84.331	5.221
12.002	2.890	1.005	28.958	83.937	5.571
12.002	3.004	1.005	29.956	83.538	5.935
12.002	3.120	1.005	30.956	83.120	6.321
12.002	3.237	1.005	31.955	82.693	6.725
12.001	3.357	1.006	32.957	82.251	7.151

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Efficiency data (cont.) (model t3)

10.8V input with ~1 Meter per second airflow

Vin V	Iin A	Vout	Iout A	eff %	loss W
10.804	0.045	1.002	0.000	N/A	0.485
10.803	0.134	1.002	0.964	66.583	0.485
10.803	0.230	1.002	1.965	79.290	0.514
10.803	0.331	1.002	2.963	83.143	0.602
10.803	0.432	1.003	3.966	85.208	0.690
10.803	0.531	1.003	4.964	86.784	0.758
10.803	0.631	1.003	5.963	87.760	0.834
10.803	0.731	1.003	6.962	88.396	0.916
10.803	0.832	1.003	7.961	88.792	1.008
10.803	0.935	1.003	8.963	89.020	1.109
10.803	1.038	1.003	9.961	89.136	1.218
10.803	1.142	1.003	10.962	89.155	1.338
10.803	1.247	1.003	11.960	89.108	1.467
10.803	1.353	1.004	12.961	89.012	1.606
10.803	1.459	1.004	13.959	88.861	1.756
10.803	1.567	1.004	14.960	88.677	1.917
10.803	1.677	1.004	15.961	88.465	2.089
10.803	1.787	1.004	16.959	88.225	2.273
10.803	1.898	1.004	17.960	87.964	2.468
10.803	2.010	1.004	18.958	87.690	2.673
10.803	2.123	1.004	19.959	87.394	2.891
10.803	2.238	1.004	20.956	87.082	3.123
10.803	2.354	1.005	21.958	86.759	3.367
10.803	2.471	1.005	22.957	86.421	3.624
10.803	2.589	1.005	23.958	86.071	3.896
10.803	2.709	1.005	24.957	85.705	4.183
10.803	2.830	1.005	25.955	85.332	4.484
10.803	2.953	1.005	26.957	84.948	4.801
10.803	3.076	1.005	27.956	84.556	5.133
10.803	3.202	1.005	28.958	84.153	5.482
10.803	3.329	1.005	29.955	83.742	5.847
10.803	3.458	1.005	30.954	83.319	6.231
10.803	3.588	1.006	31.952	82.894	6.630
10.803	3.721	1.006	32.954	82.438	7.060

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Efficiency data (cont.) (Model t3)

13.2V input with ~1 Meter per second airflow

Vin V	Iin A	Vout	Iout A	eff %	loss W
13.202	0.044	1.002	0.000	N/A	0.581
13.202	0.117	1.002	0.966	62.459	0.582
13.202	0.197	1.002	1.968	75.892	0.627
13.202	0.281	1.002	2.966	80.242	0.732
13.202	0.365	1.003	3.969	82.561	0.840
13.202	0.446	1.003	4.967	84.511	0.913
13.202	0.529	1.003	5.967	85.740	0.995
13.202	0.611	1.003	6.965	86.551	1.085
13.202	0.695	1.003	7.965	87.113	1.182
13.202	0.779	1.003	8.967	87.467	1.289
13.202	0.863	1.003	9.965	87.701	1.402
13.202	0.949	1.003	10.965	87.813	1.527
13.202	1.035	1.003	11.963	87.850	1.660
13.202	1.122	1.004	12.963	87.832	1.802
13.202	1.209	1.004	13.961	87.761	1.954
13.202	1.298	1.004	14.962	87.640	2.118
13.201	1.387	1.004	15.962	87.479	2.293
13.201	1.478	1.004	16.960	87.285	2.480
13.201	1.569	1.004	17.962	87.079	2.676
13.201	1.661	1.004	18.960	86.846	2.884
13.201	1.754	1.004	19.960	86.595	3.103
13.201	1.847	1.004	20.957	86.322	3.336
13.201	1.942	1.005	21.960	86.035	3.581
13.201	2.038	1.005	22.958	85.734	3.838
13.201	2.135	1.005	23.958	85.407	4.113
13.201	2.233	1.005	24.958	85.074	4.400
13.201	2.332	1.005	25.956	84.722	4.704
13.201	2.433	1.005	26.957	84.364	5.021
13.201	2.534	1.005	27.956	83.991	5.356
13.201	2.637	1.005	28.957	83.610	5.706
13.201	2.741	1.005	29.956	83.220	6.072
13.201	2.847	1.005	30.957	82.813	6.459
13.201	2.954	1.005	31.954	82.397	6.864
13.201	3.063	1.006	32.956	81.961	7.293

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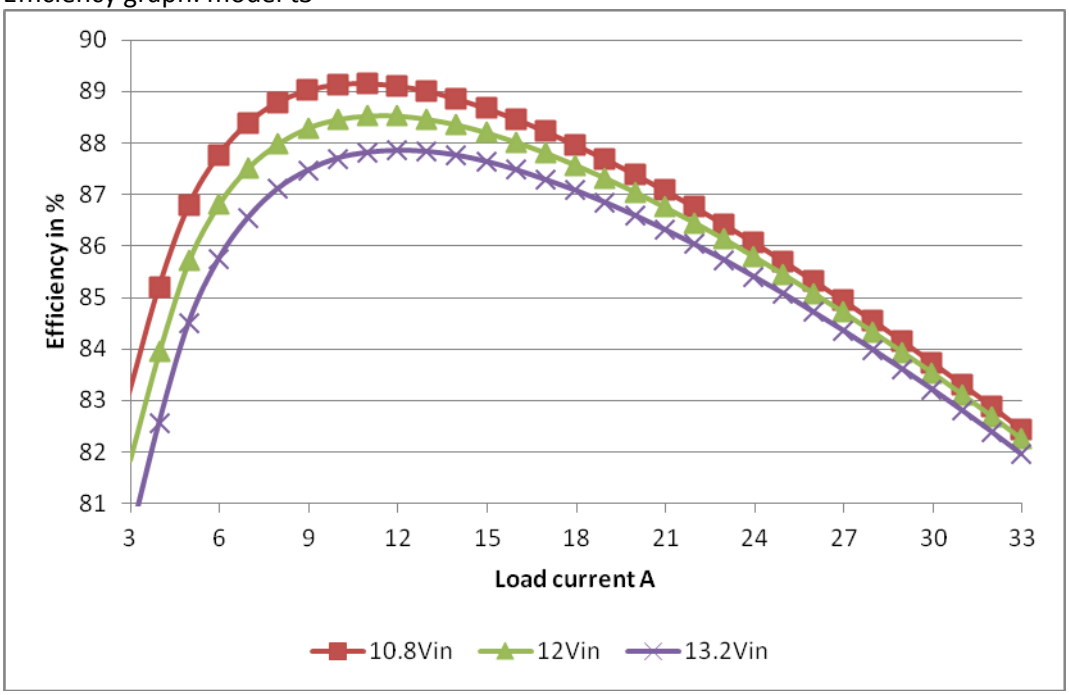
Efficiency graph: model t3



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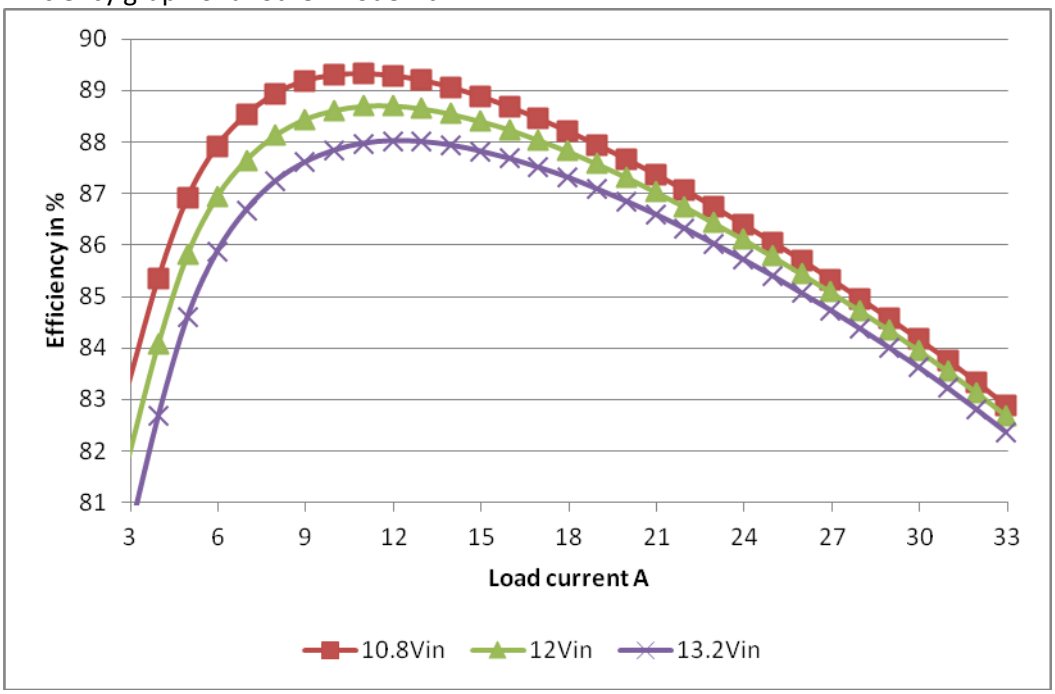
Efficiency graph of another model “t1”



Loss savings of model t1 vs. model t3 follow very much as if the resistance path for the output current is 200uOhms less.

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