Table of Contents: 1.2V output

Updates in Test:

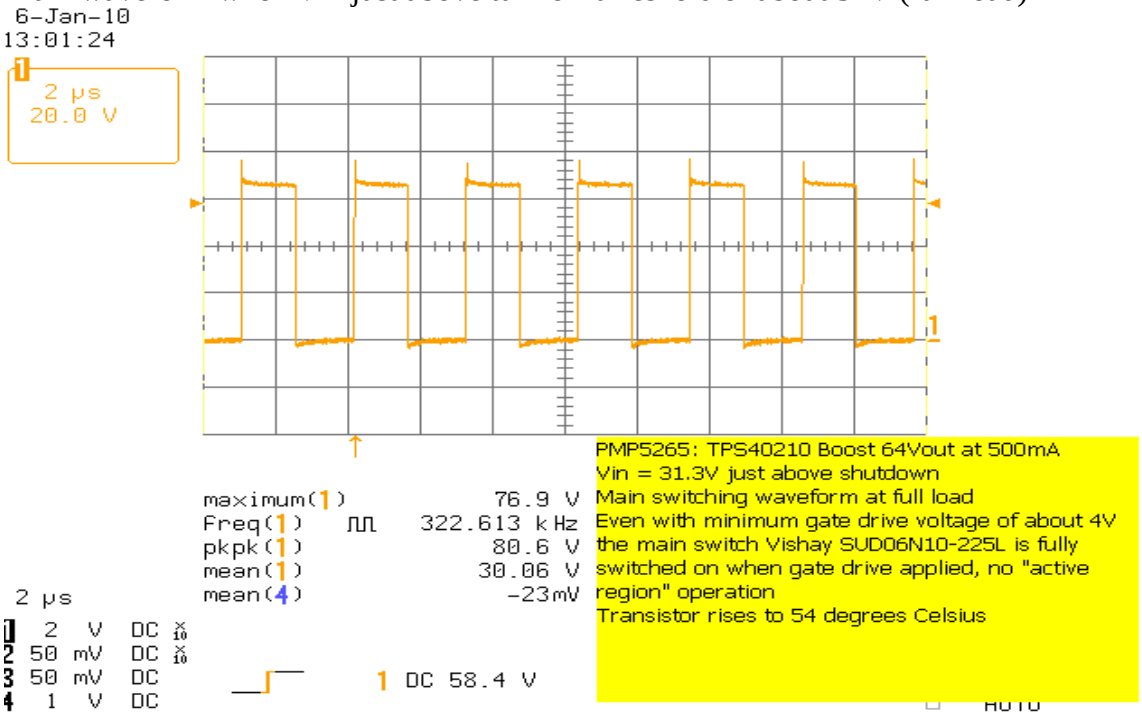
Main choke was Coilcraft DO3308P-473 which was supposed to have about 300mW losses and less than 40 degrees C rise at room ambient and full load off 40Vin per Coilcraft loss calculator. However, about a 60 degrees C rise was seen in test. It was replaced with Sumida CDRH104R with same 47uHy value. Based upon input power measurements, losses were reduced by about 150mW and temperature rise reduced to 35 degrees Celsius at same load and Vin.

Main switch Q1 was FDS3692, but went into linear mode with Vin about 32V and gate drive about 4V and blew up.
For reliable operation with Vin below 40V:
Q1 must be fully on before Vgs reaches 4V which is turn on threshold of TPS40210
Vishay SUD06N10-225L is fully on before Vgs=3V.
Replacing Q1 with this part allowed continuous full load operation with Vin just above shutdown threshold of 31V with a clean switching waveform (see page 3) and the Sumida choke only reaching 66 degrees Celsius and Q1 reaching 54 degrees Celsius.

Regulation, losses and efficiency: 40Vin and 55Vin with no external airflow:

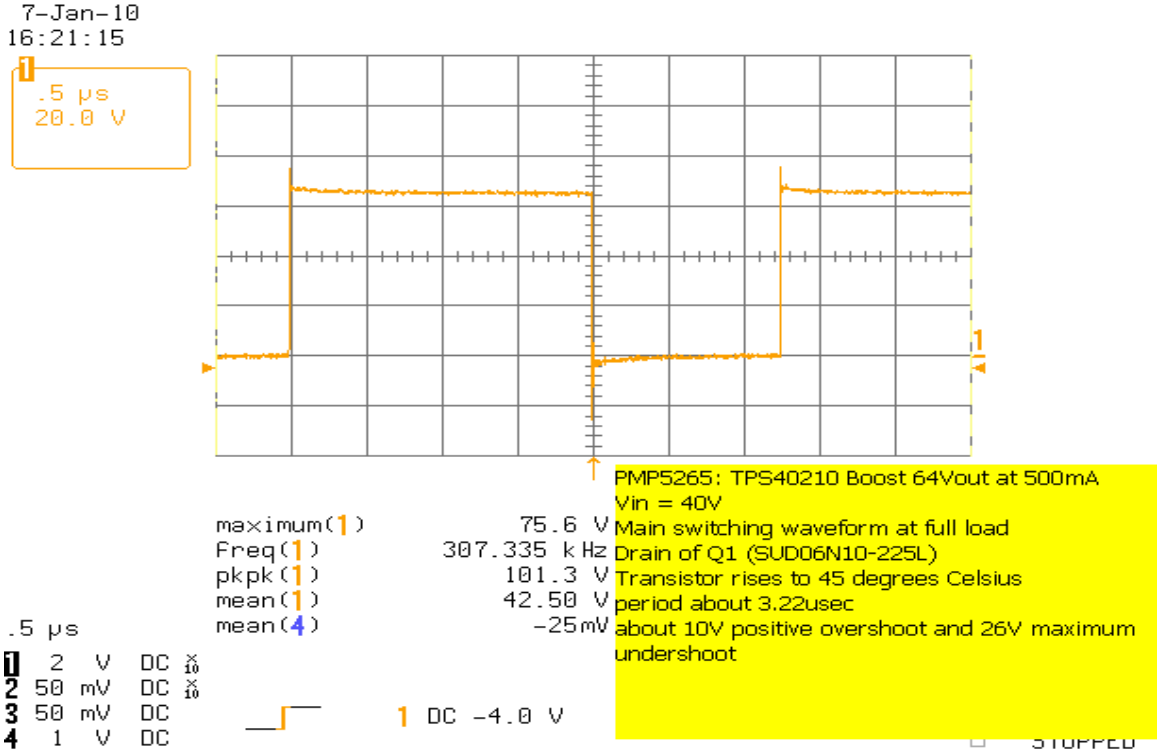
Vin Volts	Iin mA	Vout1 Volts	Iout1 mA	Losses in mW	Efficiency %
40.1	843	63.98	509	1238	96.3
Q1 at 45degC	L1 at 58degC	D1 at 45degC	Ambient: 23-25		
40.0	632	63.97	379	1035	95.9
40.0	425	64.19	252	824	95.2
40.0	209	64.20	121	592	92.9
40.0	101	64.15	56.5	416	89.7
40.0	3	64.34	0	120	
55.0	609	64.01	509.5	882	97.4
55.1	454	64.01	379	756	97.0
55.1	305	64.03	252	670	96.0
55.0	151	64.15	121	543	93.5
55.0	73	64.14	56.5	391	90.3
55.0	3	64.36	0	165	
Just	Above	Continuous	conduction	308-9kHz	
40.0	507	64.09	301.5	957	95.3
55.0	269.5	64.15	221	645	95.6
Just	Before	Turn off	Due to	Low Vin	
31.32	1103	64.54	510	1631	95.3
Q1 at 54degC	L1 at 66degC	Ambient: 23-25			

Main waveform when Vin just above turn off threshold of about 31V (full load)

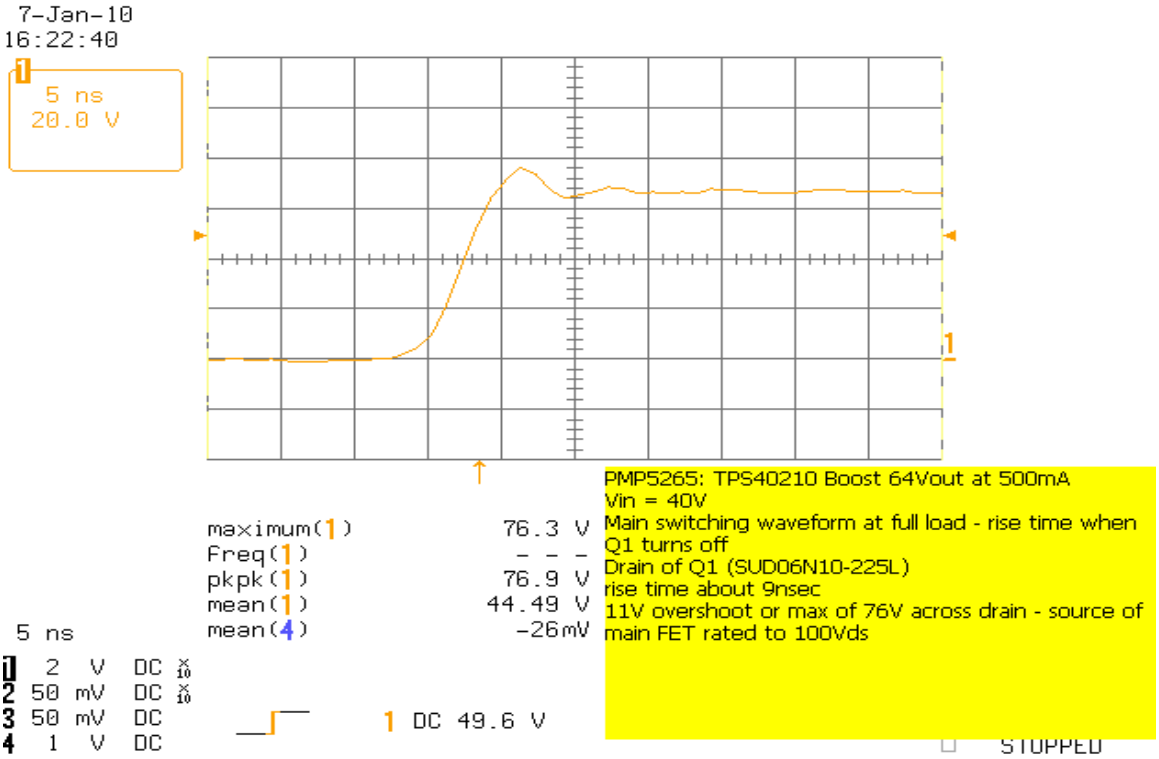


Qq

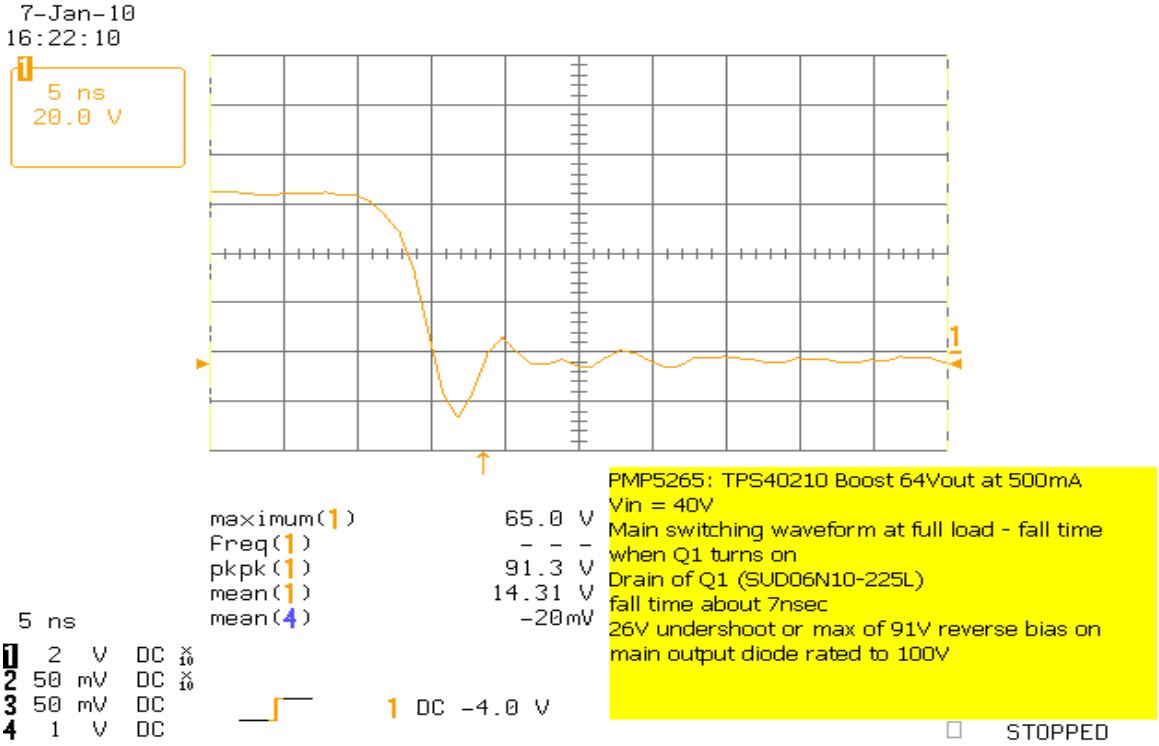
Now Vin at 40V :



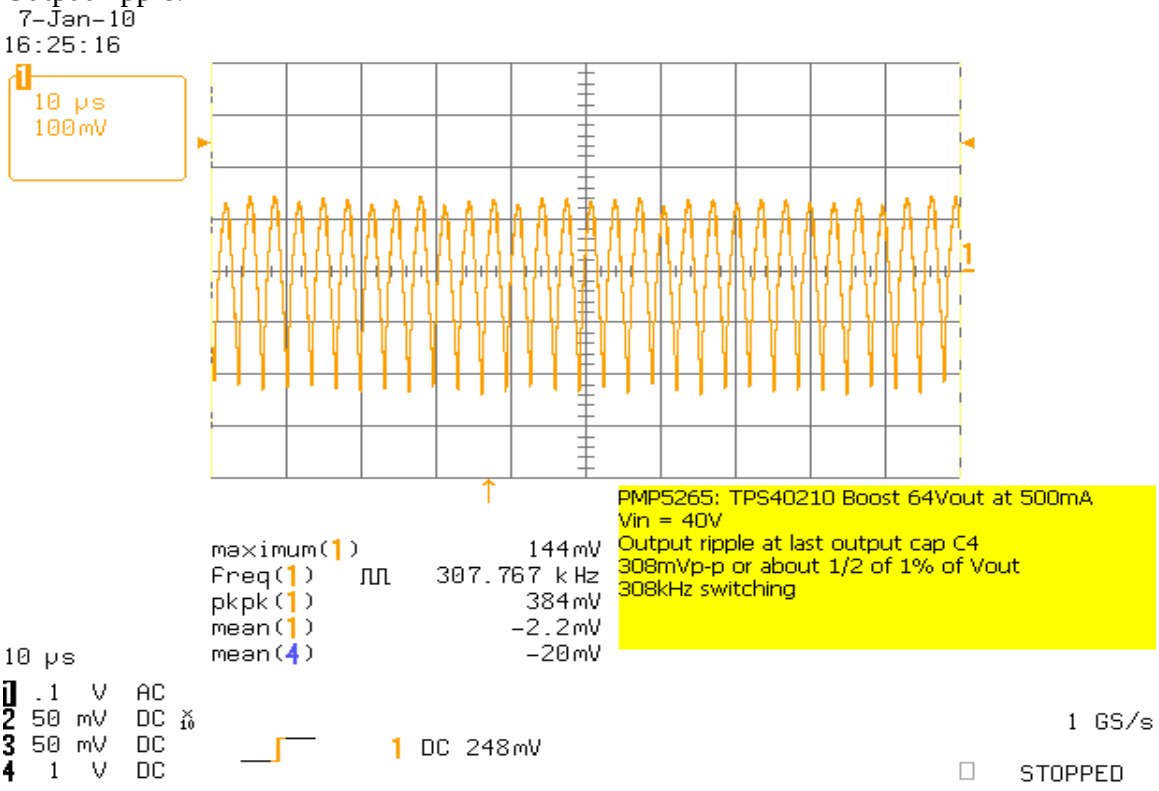
Main waveform rise shown:



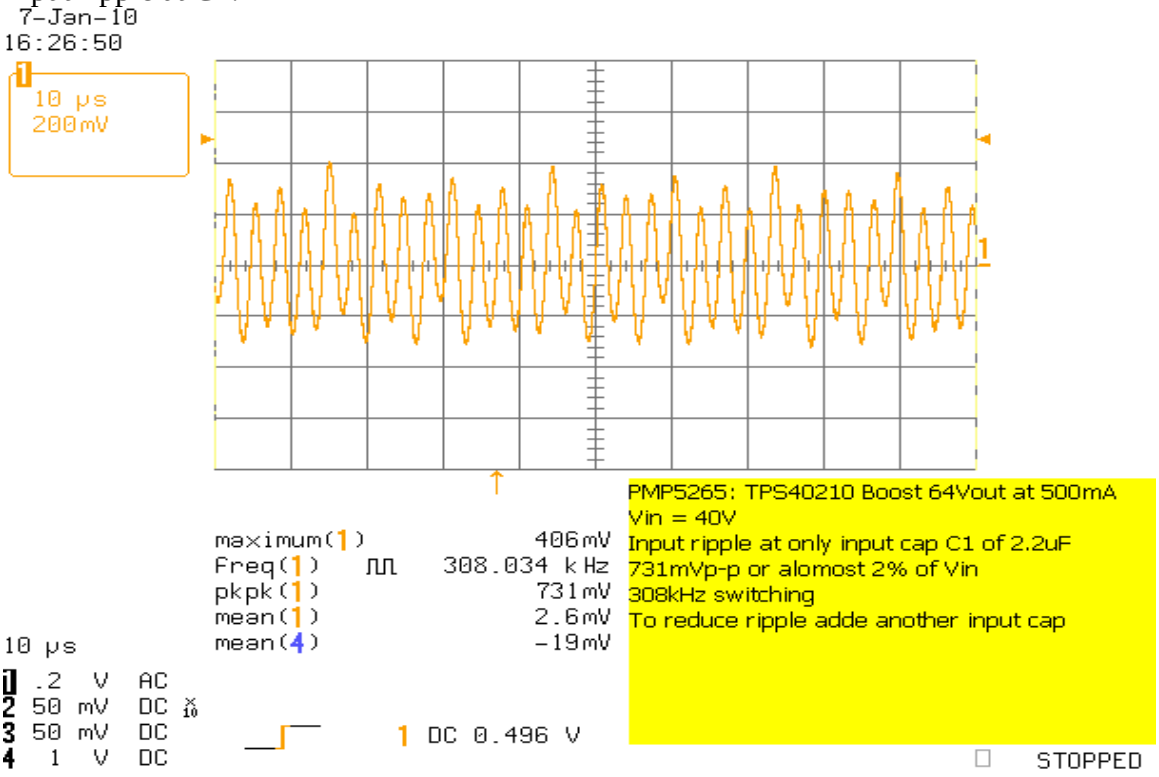
And fall time detail:



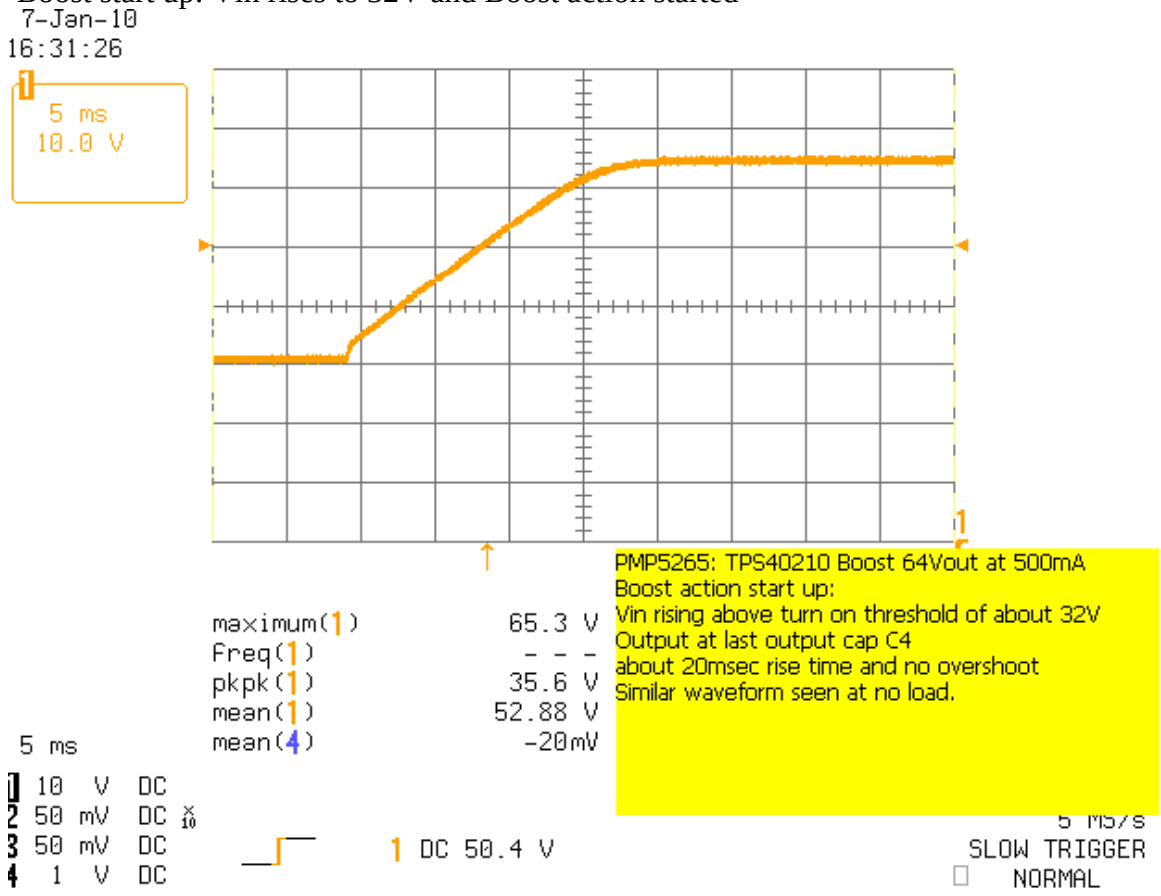
Output ripple:



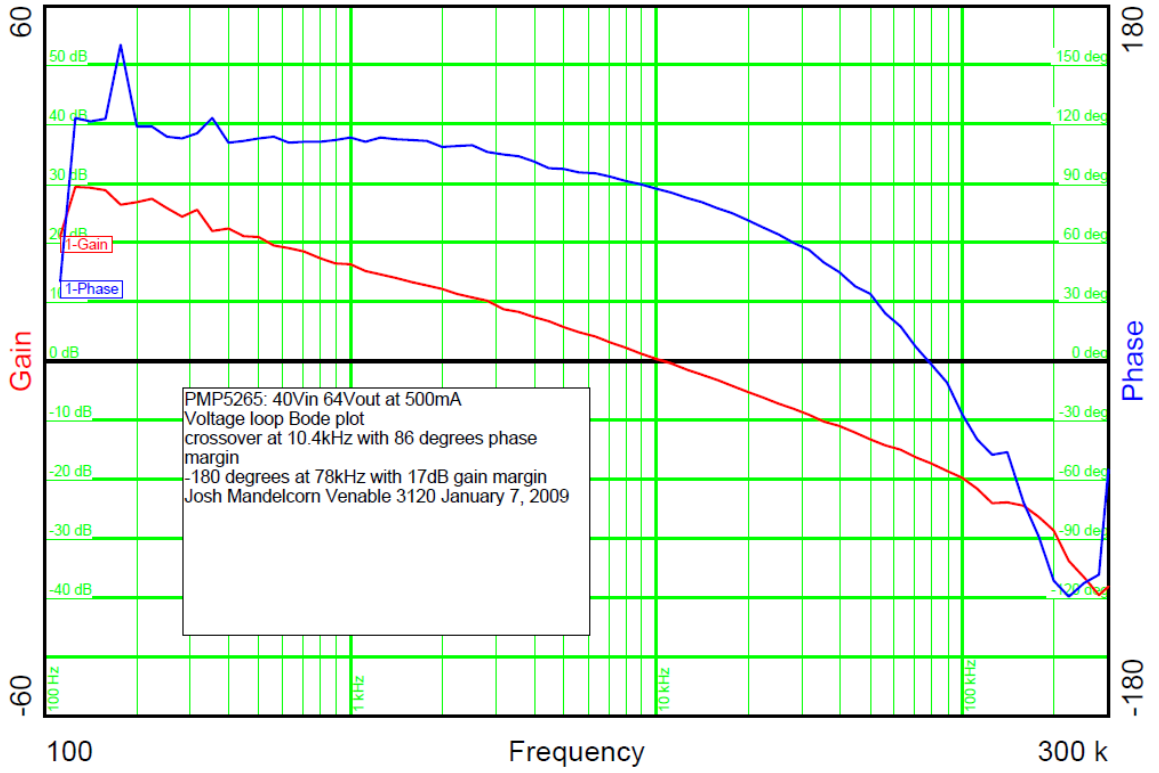
Input ripple at C1:



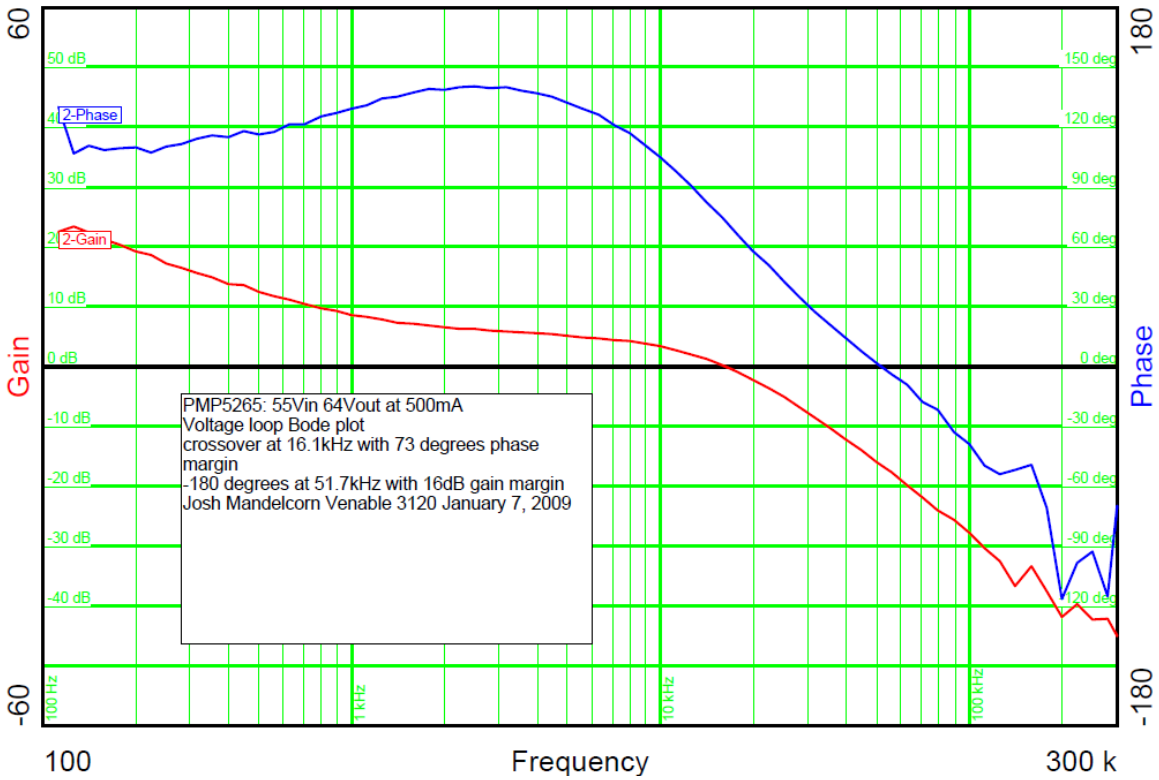
Boost start up: Vin rises to 32V and Boost action started



Bode Plots: First at 40Vin



Then at 55Vin:



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