



LM5022 Boost Converter

TI reference design number: PMP20070 Rev A

Input: 8V to 32V

Output: 65V @ 420mA

DC – DC Test Results

Table of Contents

1	Circuit Description.....	3
2	Photos	3
2.1	Board Photos.....	3
3	Efficiency	5
3.1	Efficiency Results	5
4	Thermal Tests.....	7
4.1	Thermal Images.....	7
5	Startup and Shutdown Behavior	9
5.1	Turn-on from Vin.....	9
5.2	Turn-on and Turn-off from SD	10
6	Switching and Ripple	12
6.1	Switching and Ripple	12
7	Load Transient Response.....	14
7.1	Load Transient Response.....	14
8	Frequency Response.....	15
8.1	Frequency Response	15

1 Circuit Description

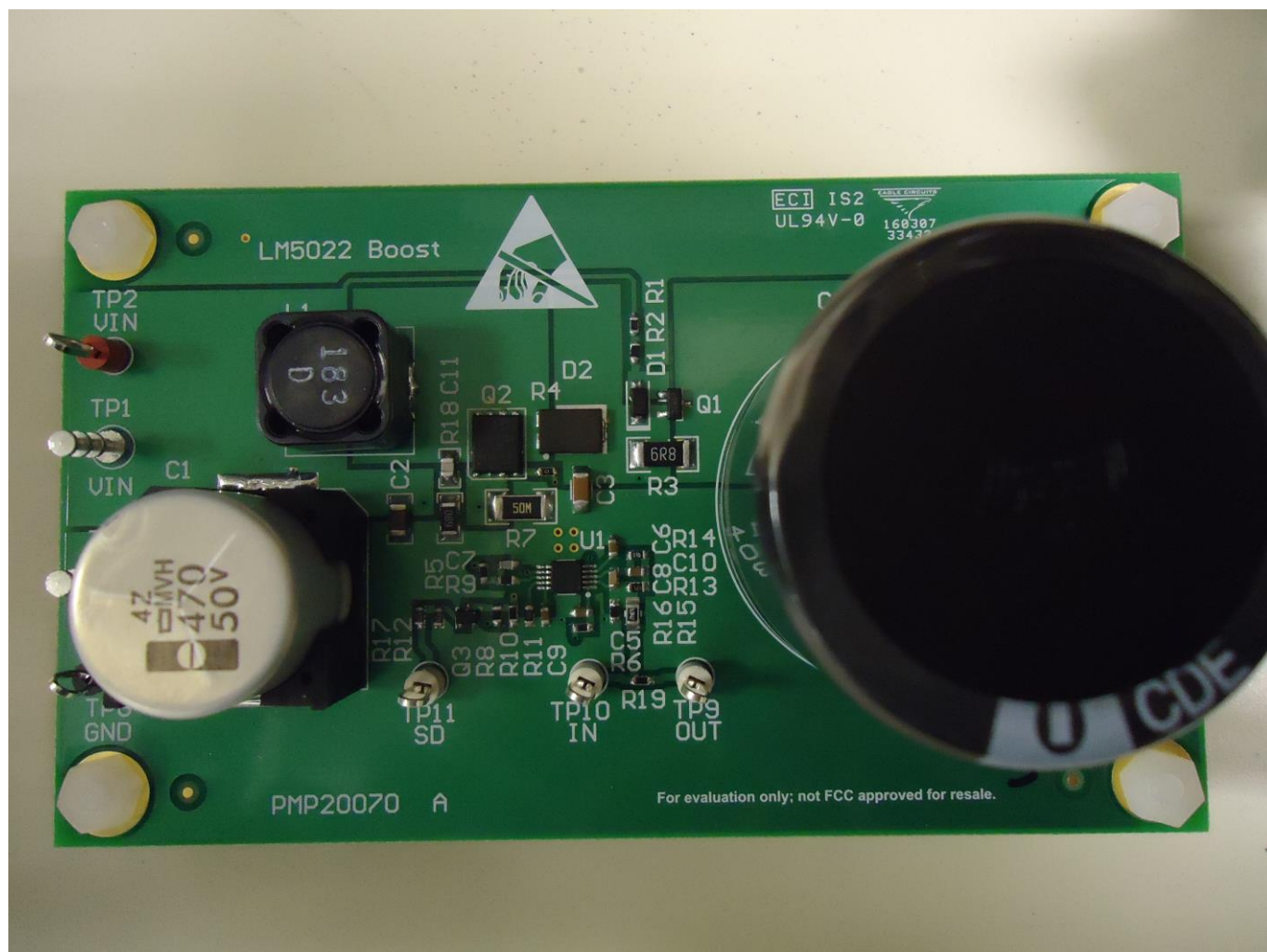
PMP20070 is a boost converter designed for high pulse current applications. It delivers 65V output at 420mA average, from a nominal input voltage of either 12V or 24V. This design uses the LM5022 boost controller at a switching frequency of 650 kHz. A resistor and P-channel MOSFET load switch is used to limit the startup current. Pulse load characterization was done at 30A for 2.5 ms.

All tests were performed at room temperature on an open bench.

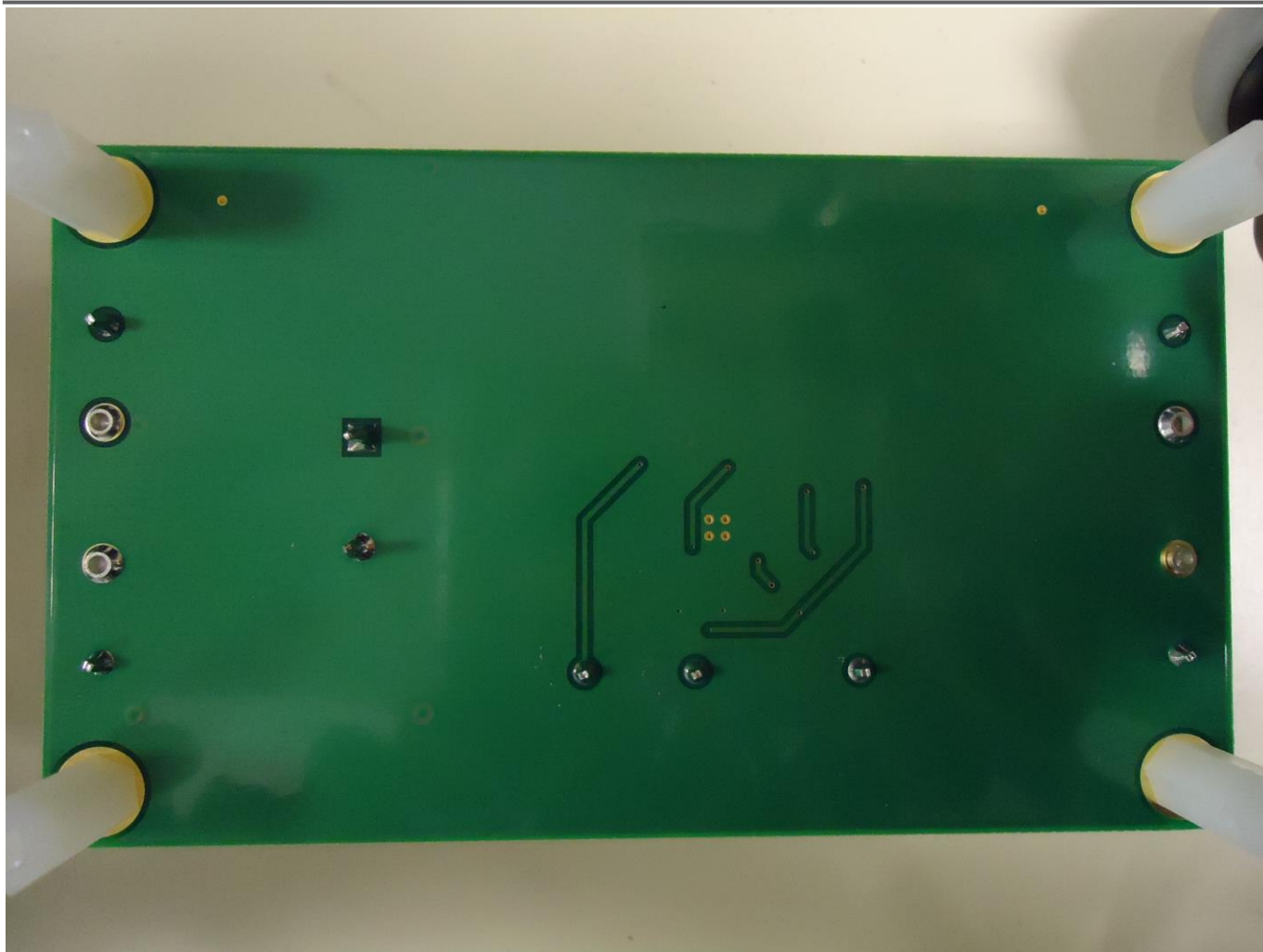
2 Photos

The photographs below show the PMP20070 Rev A printed circuit board assembly. This is a 2 layer board using 1 ounce copper. The overall board dimensions are 2.5" x 4.3".

2.1 Board Photos



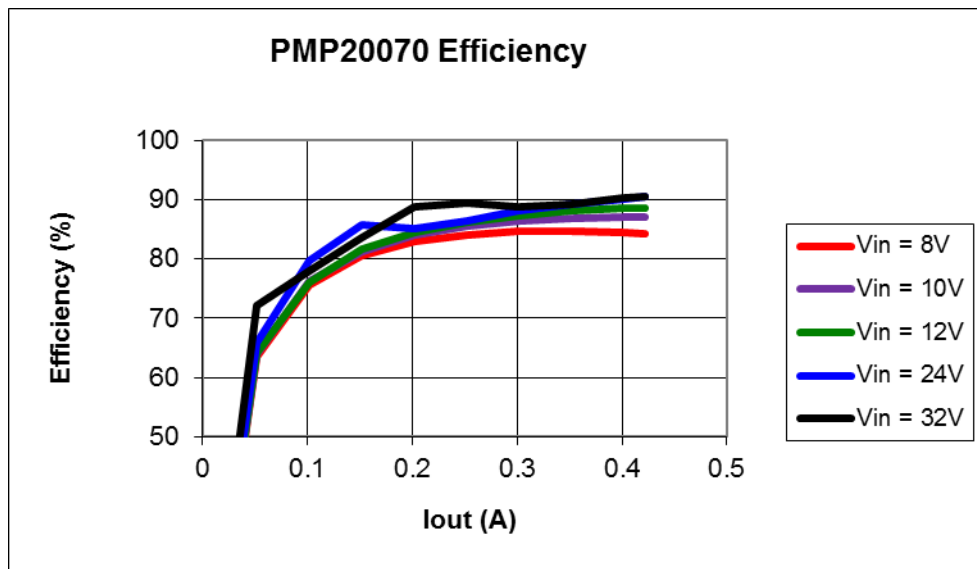
PMP20070 Rev A Test Results



3 Efficiency

Efficiency data is shown in the tables and graph below.

3.1 Efficiency Results



Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Losses (W)	Efficiency (%)
8.0025	0.2276	65.1247	0.0002	1.821	0.013	1.808	0.72
8.0023	0.6624	65.1223	0.0516	5.301	3.360	1.940	63.39
8.0023	1.0933	65.1186	0.1016	8.749	6.616	2.133	75.62
8.0022	1.5327	65.1138	0.1516	12.265	9.871	2.394	80.48
8.0021	1.9802	65.1091	0.2017	15.846	13.133	2.713	82.88
8.0019	2.4362	65.1042	0.2516	19.494	16.380	3.114	84.03
8.0016	2.9012	65.1003	0.3016	23.214	19.634	3.580	84.58
8.0014	3.3781	65.0956	0.3517	27.030	22.894	4.135	84.70
8.0013	3.8662	65.0925	0.4015	30.934	26.135	4.800	84.48
8.0012	4.0665	65.0931	0.4215	32.537	27.437	5.100	84.33
10.0051	0.0997	65.1691	0.0002	0.998	0.013	0.984	1.31
10.0048	0.5261	65.1618	0.0516	5.264	3.362	1.901	63.88
10.0048	0.8689	65.1580	0.1016	8.693	6.620	2.073	76.15
10.0049	1.2147	65.1539	0.1516	12.153	9.877	2.276	81.28
10.0047	1.5639	65.1480	0.2017	15.646	13.140	2.506	83.98
10.0048	1.9170	65.1421	0.2517	19.179	16.396	2.783	85.49
10.0048	2.2740	65.1366	0.3017	22.751	19.652	3.099	86.38
10.0044	2.6356	65.1308	0.3516	26.368	22.900	3.468	86.85
10.0044	3.0020	65.1259	0.4016	30.033	26.155	3.879	87.09

PMP20070 Rev A Test Results

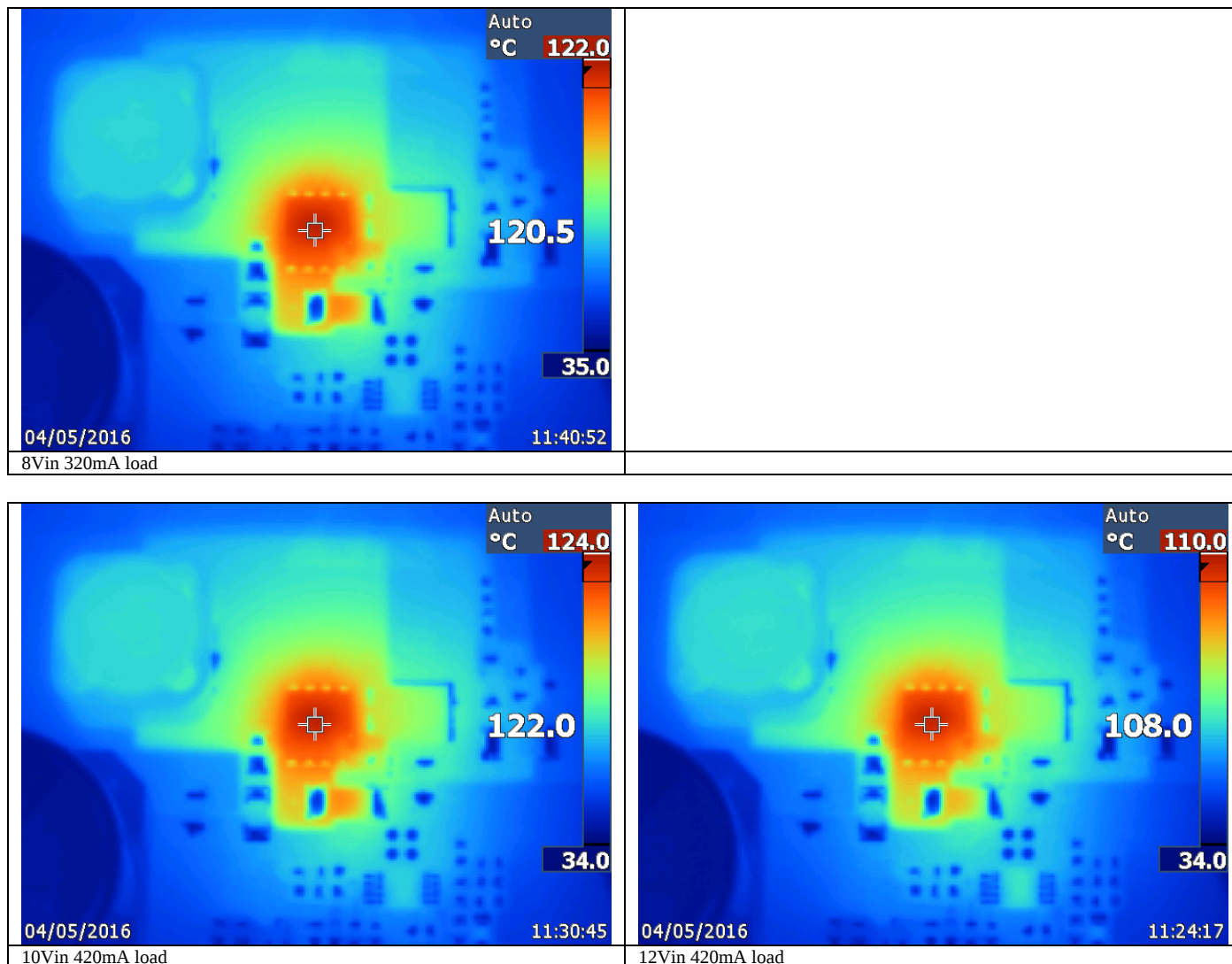


10.0043	3.1503	65.1255	0.4215	31.517	27.450	4.066	87.10
12.0049	0.0799	65.2333	0.0002	0.959	0.013	0.946	1.36
12.0048	0.4376	65.1857	0.0516	5.253	3.364	1.890	64.03
12.0048	0.7246	65.1802	0.1016	8.699	6.622	2.076	76.13
12.0046	1.0092	65.1749	0.1516	12.115	9.881	2.235	81.56
12.0048	1.2957	65.1689	0.2017	15.555	13.145	2.410	84.51
12.0045	1.5839	65.1621	0.2517	19.014	16.401	2.613	86.26
12.0045	1.8740	65.1564	0.3016	22.496	19.651	2.845	87.35
12.0043	2.1665	65.1507	0.3516	26.007	22.907	3.100	88.08
12.0041	2.4614	65.1438	0.4016	29.547	26.162	3.385	88.54
12.0044	2.5802	65.1420	0.4216	30.974	27.464	3.510	88.67
24.0130	0.0437	65.2961	0.0002	1.049	0.013	1.036	1.24
24.0129	0.2127	65.2557	0.0516	5.108	3.367	1.740	65.93
24.0130	0.3463	65.2460	0.1016	8.316	6.629	1.687	79.72
24.0128	0.4800	65.2212	0.1516	11.526	9.888	1.639	85.78
24.0125	0.6440	65.2149	0.2017	15.464	13.154	2.310	85.06
24.0128	0.7907	65.2099	0.2517	18.987	16.413	2.574	86.45
24.0128	0.9301	65.2050	0.3016	22.334	19.666	2.668	88.05
24.0129	1.0695	65.1992	0.3516	25.682	22.924	2.758	89.26
24.0127	1.2088	65.1930	0.4015	29.027	26.175	2.852	90.18
24.0129	1.2648	65.1902	0.4215	30.372	27.478	2.894	90.47
32.0118	0.0219	65.2962	0.0002	0.701	0.013	0.688	1.86
32.0120	0.1459	65.2819	0.0516	4.671	3.369	1.302	72.12
32.0115	0.2660	65.2717	0.1016	8.515	6.632	1.883	77.88
32.0115	0.3694	65.2634	0.1516	11.825	9.894	1.931	83.67
32.0117	0.4633	65.2522	0.2016	14.831	13.155	1.676	88.70
32.0116	0.5727	65.2366	0.2516	18.333	16.414	1.920	89.53
32.0115	0.6917	65.2308	0.3016	22.142	19.674	2.469	88.85
32.0118	0.8025	65.2248	0.3516	25.690	22.933	2.756	89.27
32.0117	0.9071	65.2190	0.4016	29.038	26.192	2.846	90.20
32.0117	0.9486	65.2175	0.4215	30.366	27.489	2.877	90.53

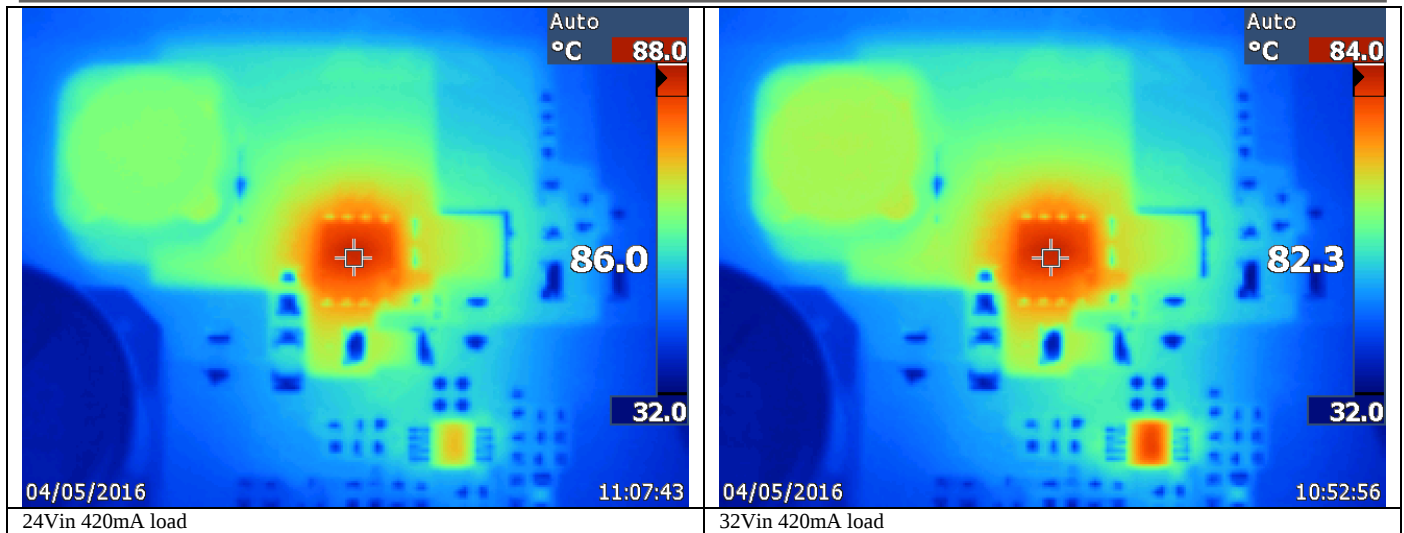
4 Thermal Tests

All tests were performed at room temperature on an open bench.

4.1 Thermal Images



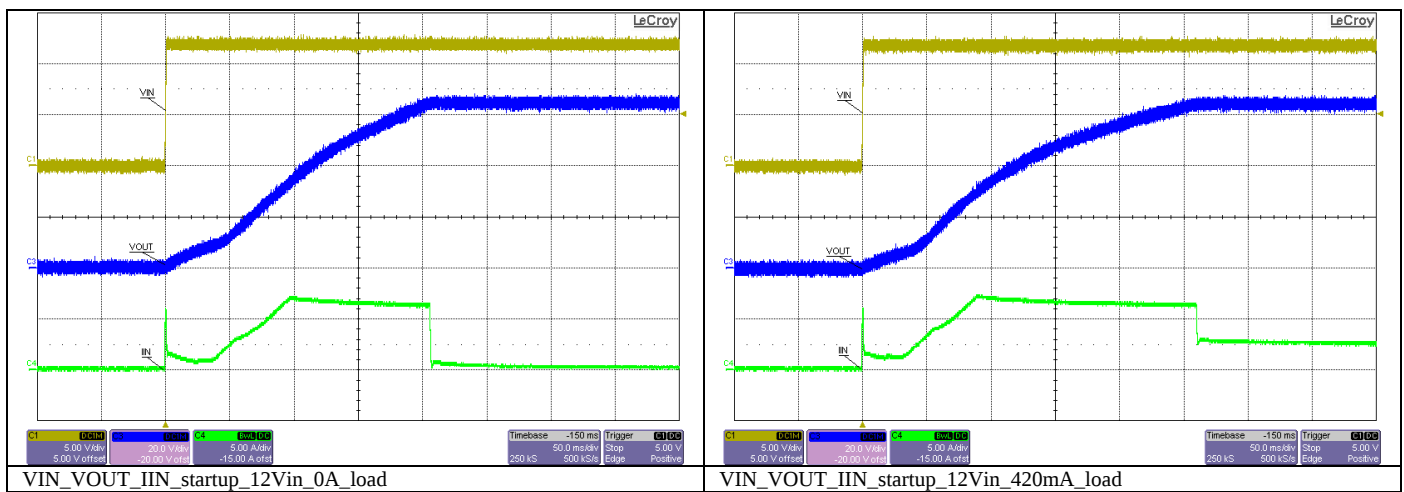
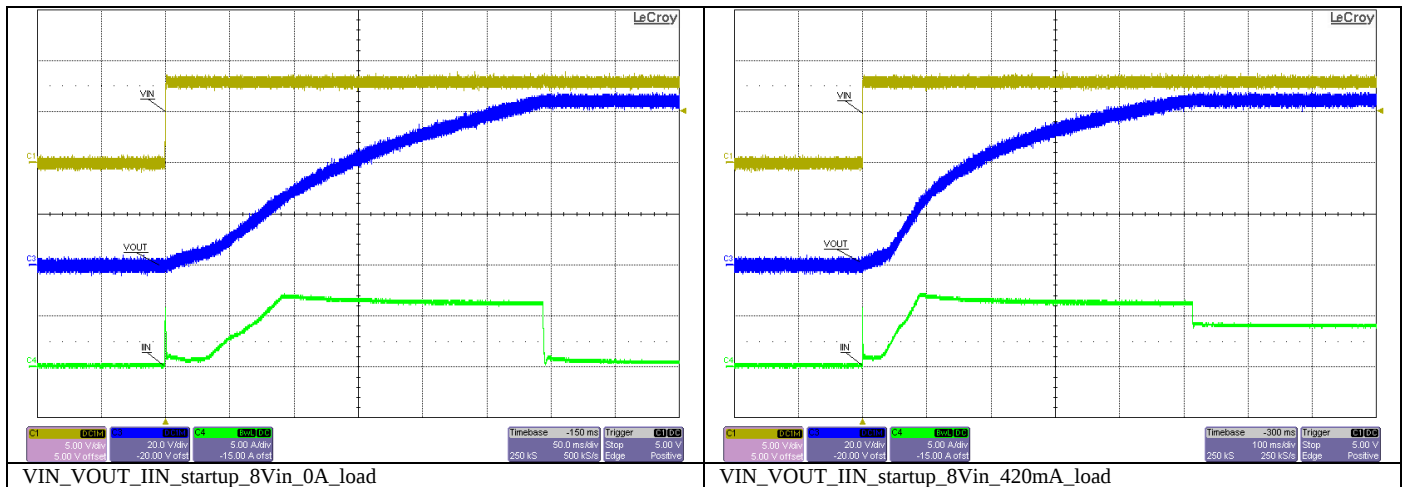
PMP20070 Rev A Test Results



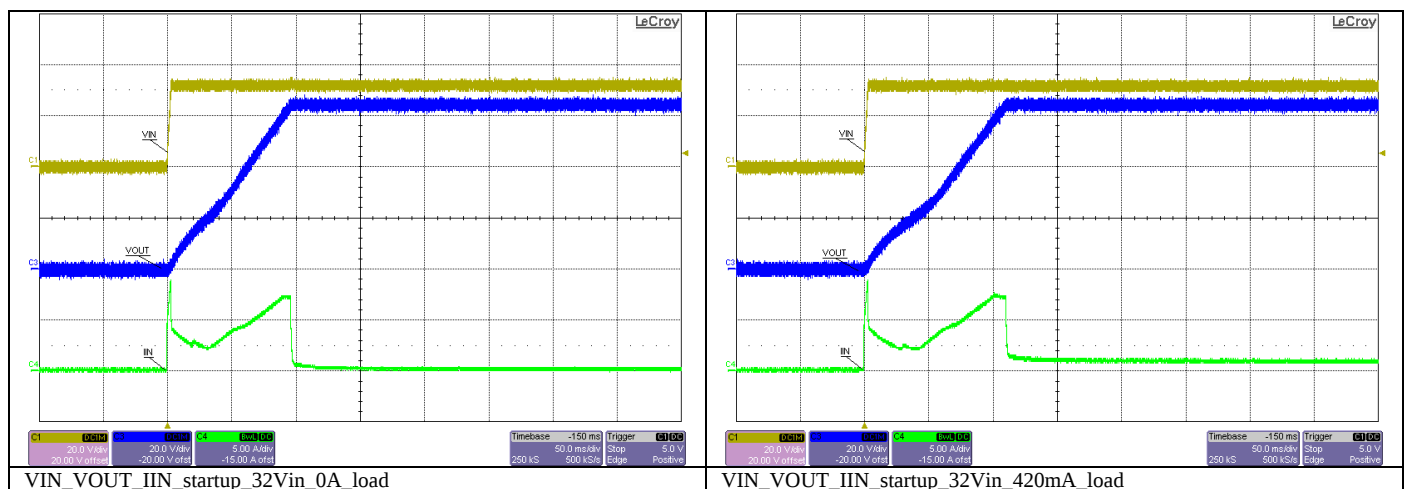
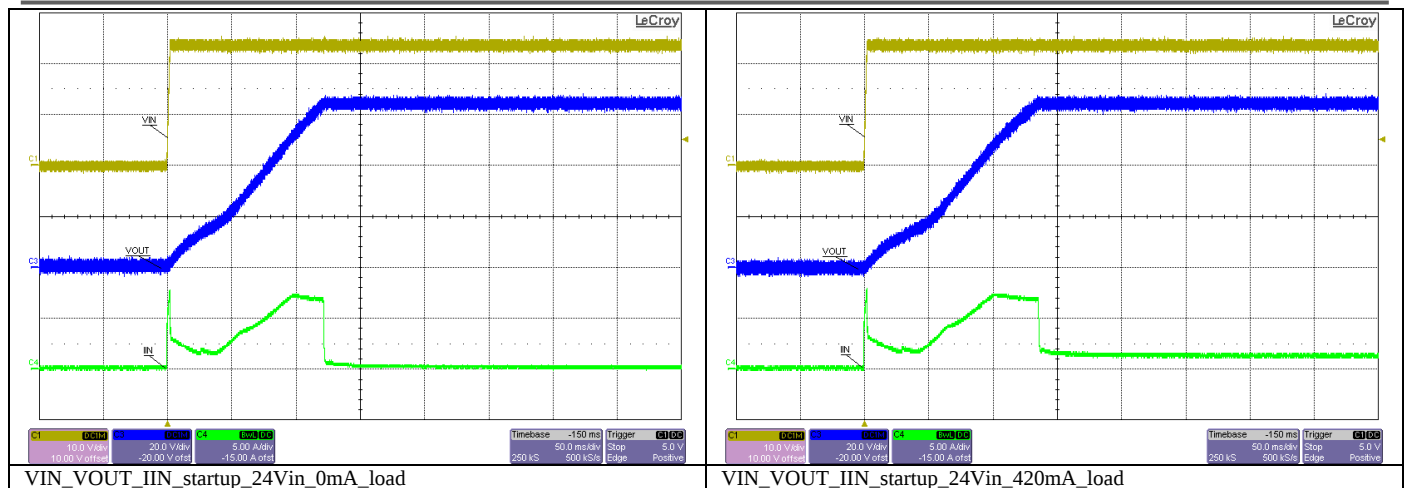
5 Startup and Shutdown Behavior

5.1 Turn-on from Vin

The output voltage is well controlled at turn-on, showing no evidence of over-shoot.

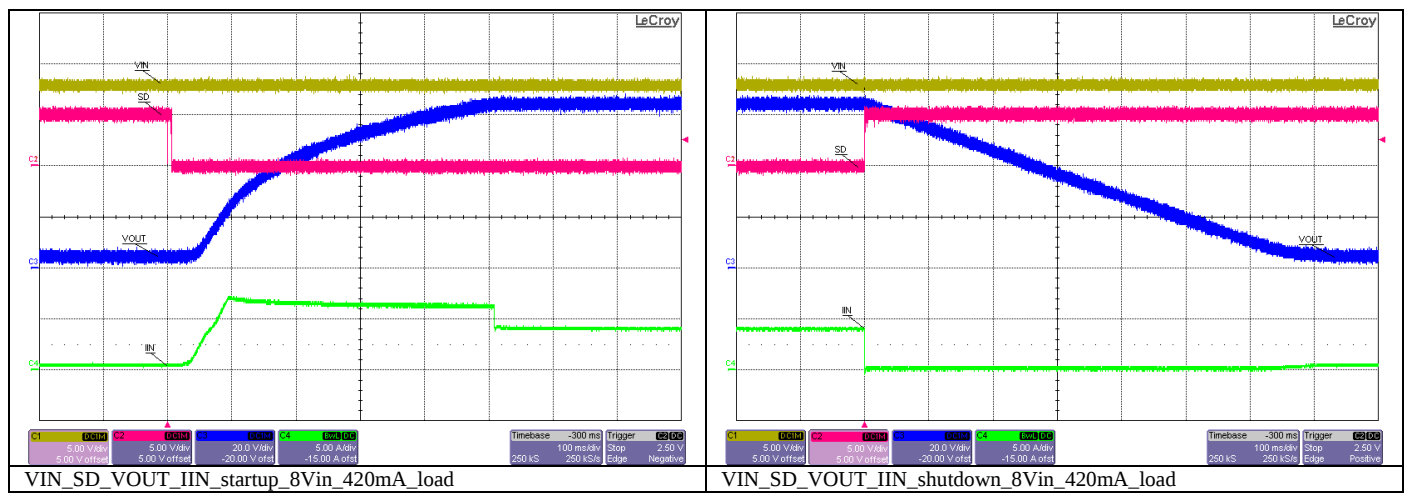


PMP20070 Rev A Test Results

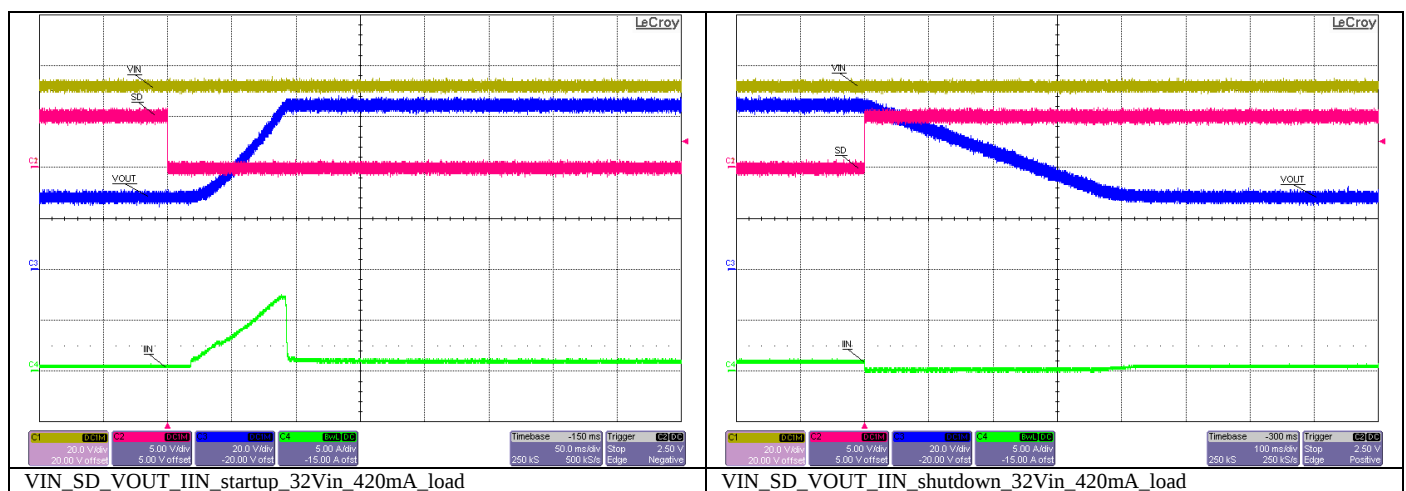
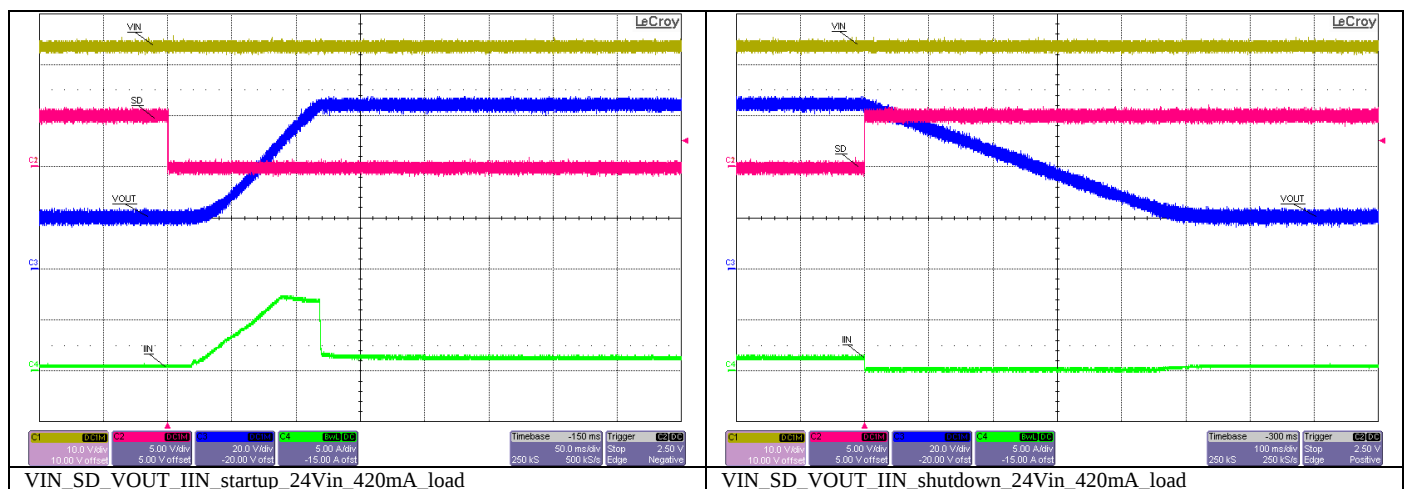
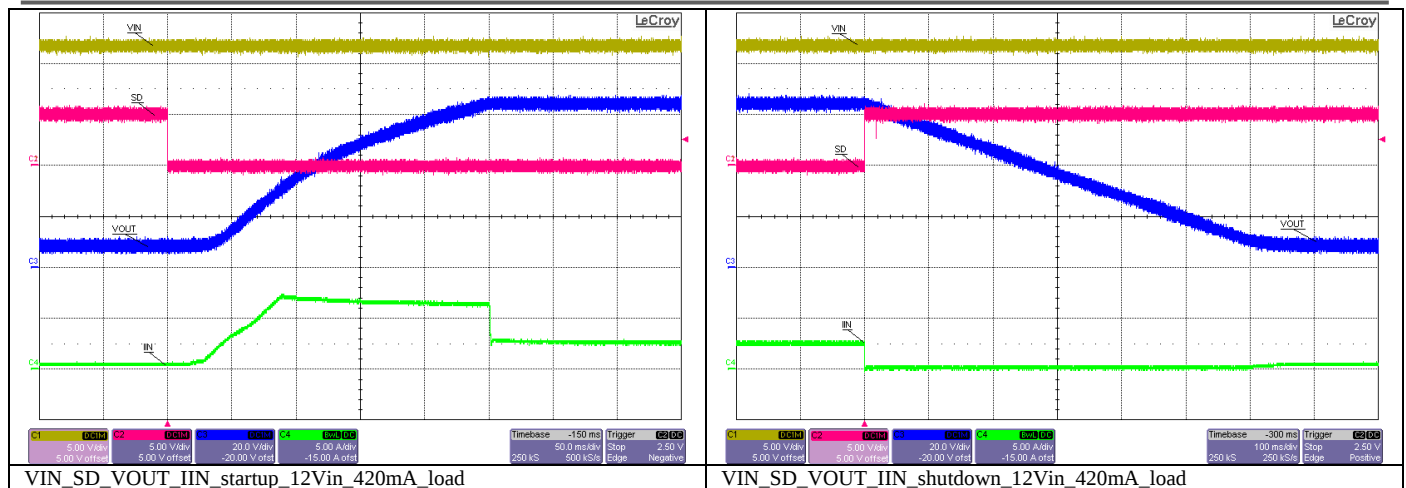


5.2 Turn-on and Turn-off from SD

The output voltage is well controlled at turn-on, showing no evidence of over-shoot.

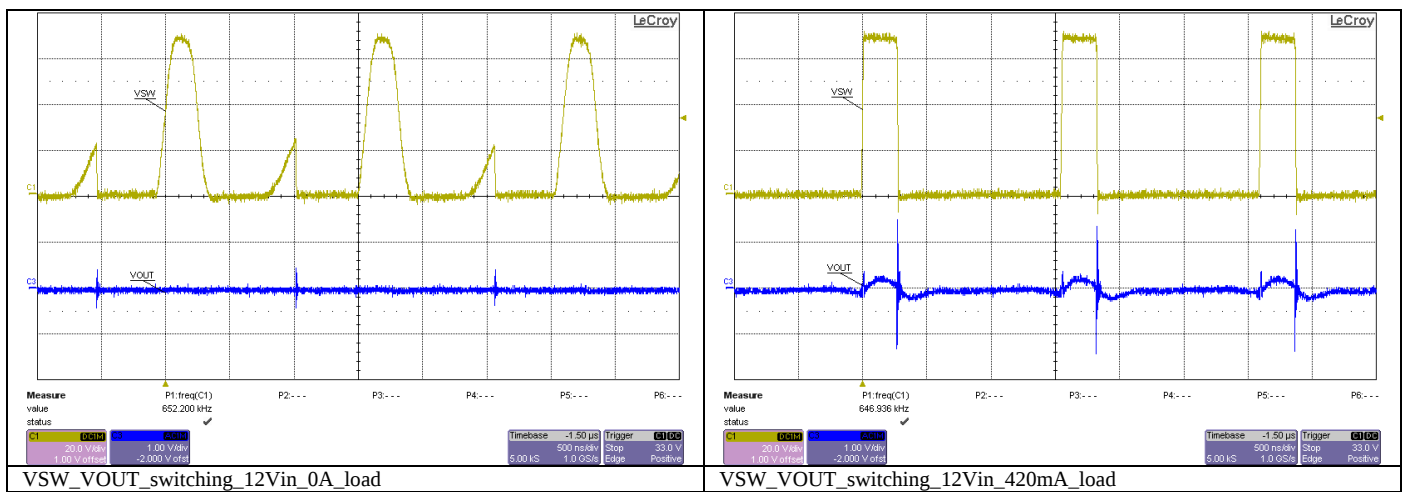
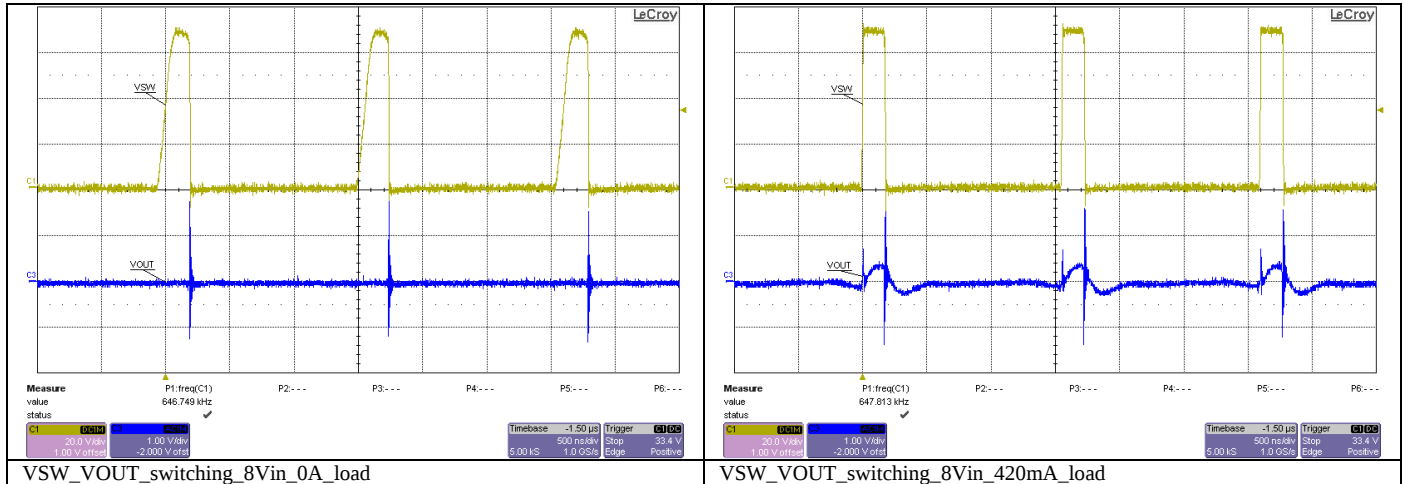


PMP20070 Rev A Test Results

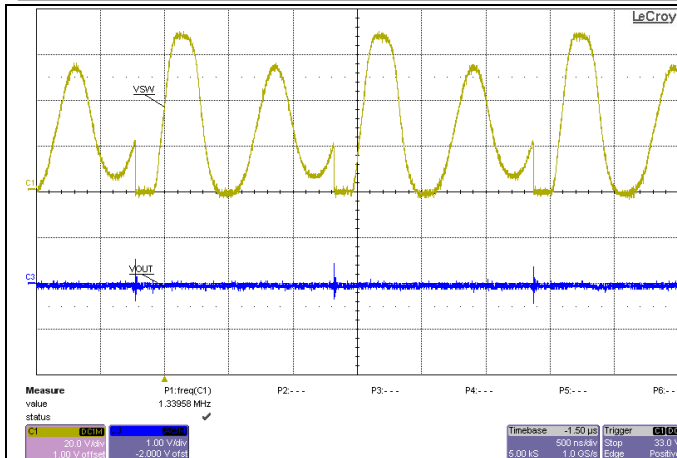


6 Switching and Ripple

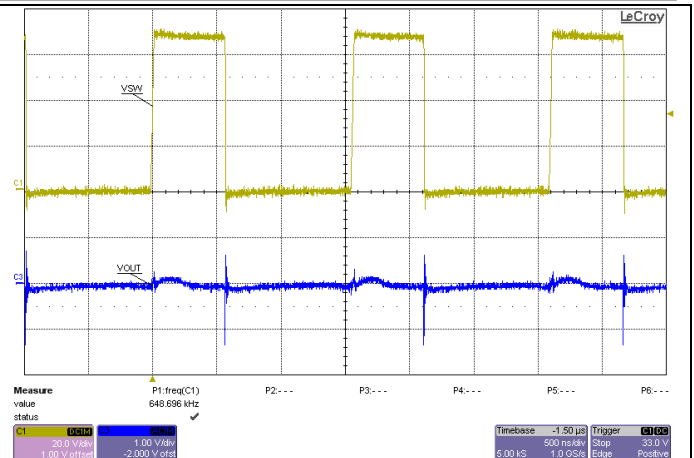
6.1 Switching and Ripple



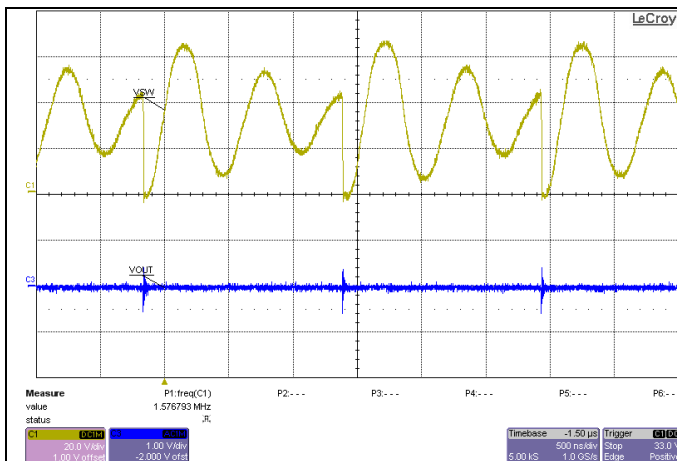
PMP20070 Rev A Test Results



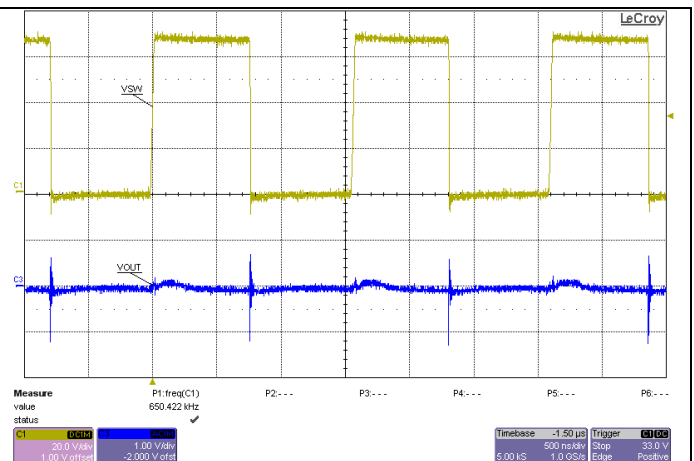
VSW_VOUT_switching_24Vin_0A_load



VSW_VOUT_switching_24Vin_420mA_load



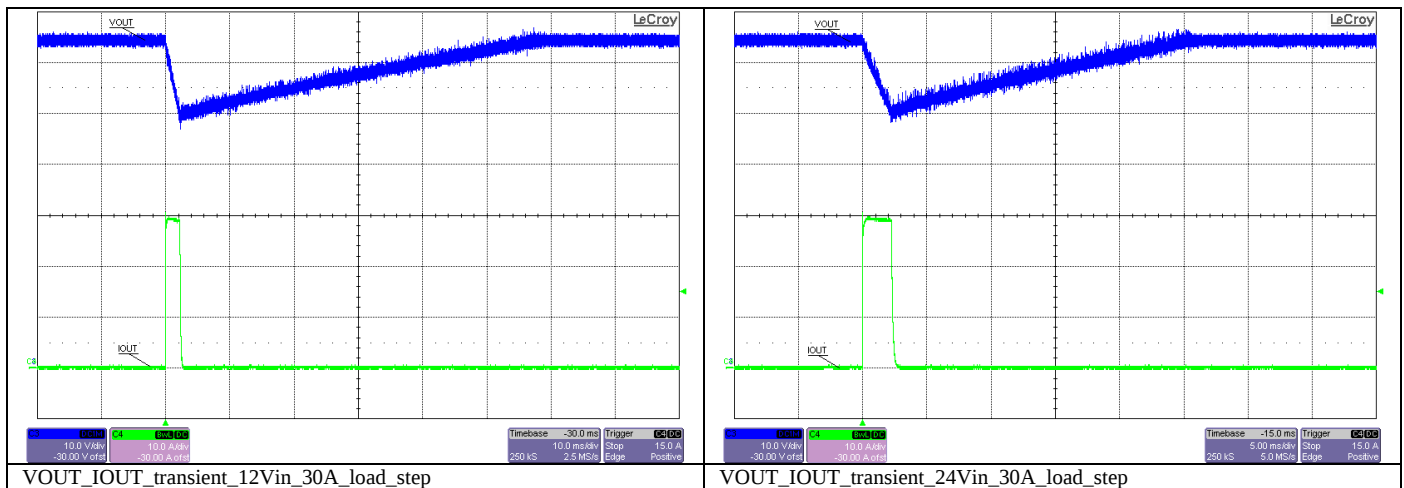
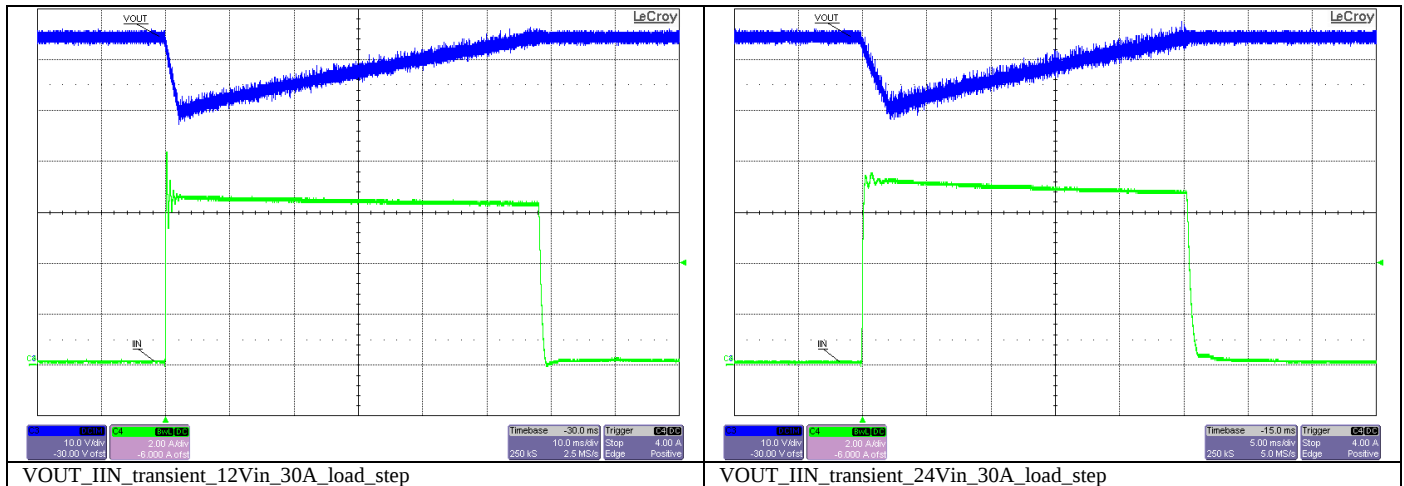
VSW_VOUT_switching_32Vin_0A_load



VSW_VOUT_switching_32Vin_420mA_load

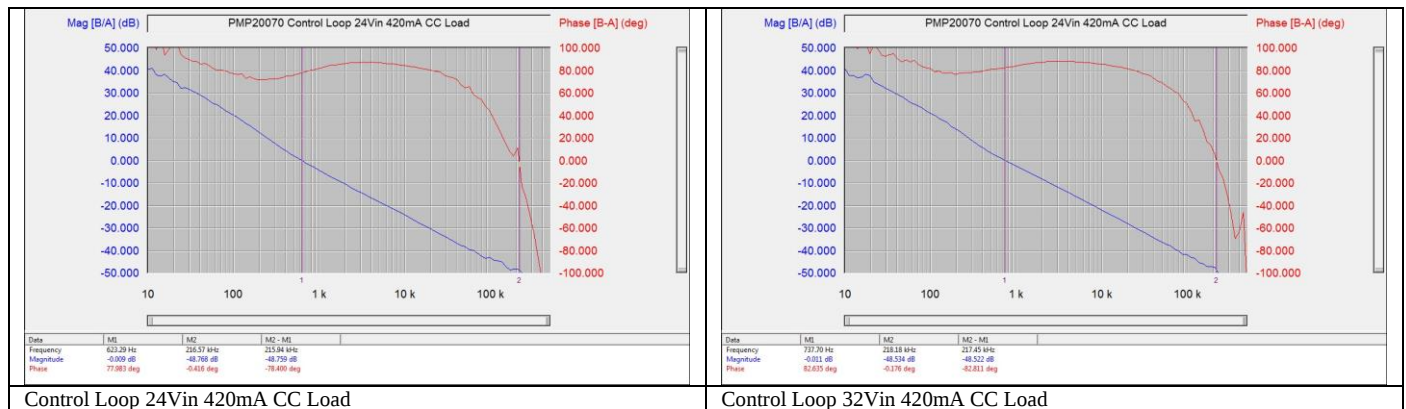
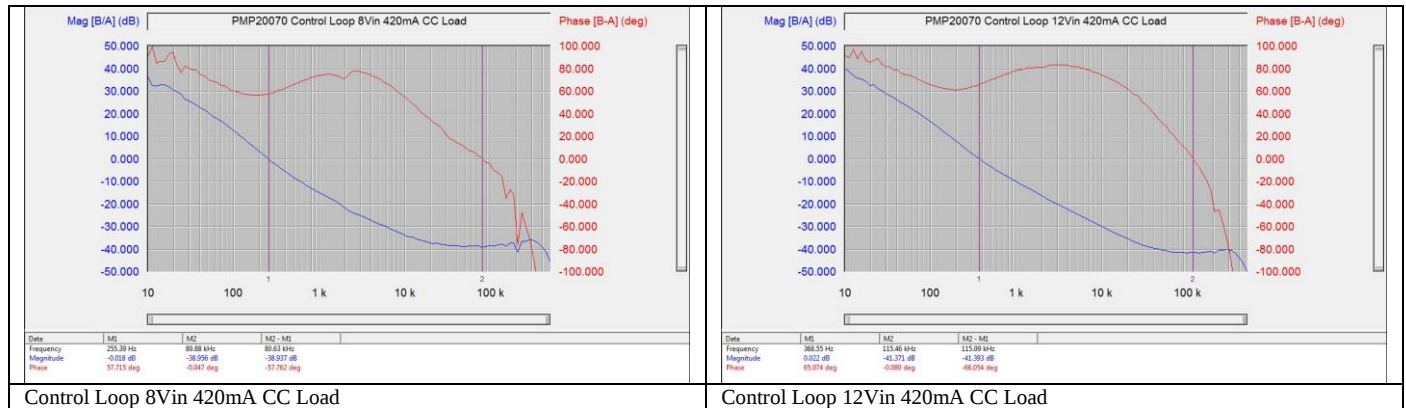
7 Load Transient Response

7.1 Load Transient Response



8 Frequency Response

8.1 Frequency Response



IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (<https://www.ti.com/legal/termsofsale.html>) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2021, Texas Instruments Incorporated