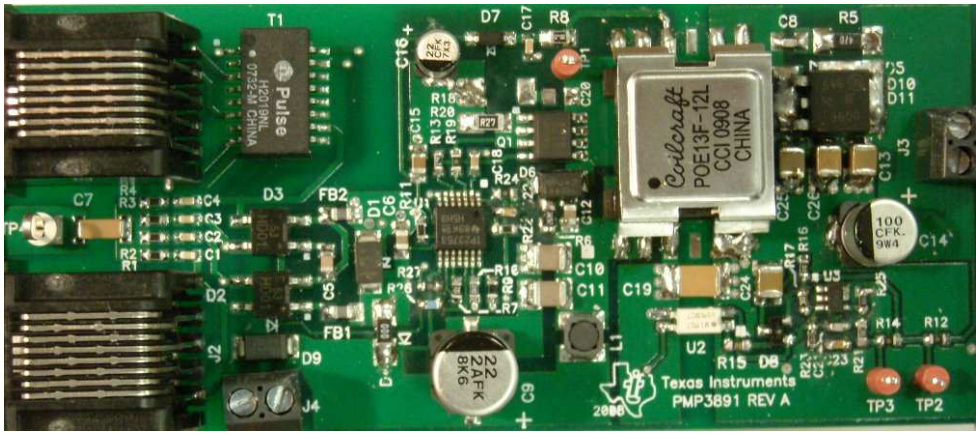
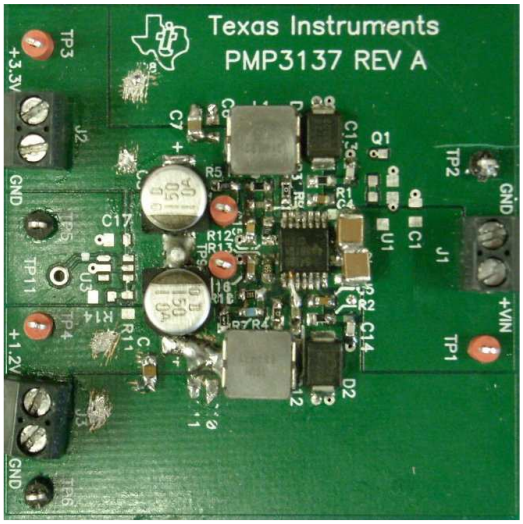
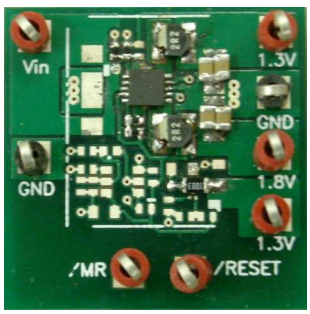
1 Pictures of the Converters

Boards have been assembled accordingly with SCH and BOM PMP46479 Rev.C.
PCBs from the following PMPs:

- PMP3891 RevA (PoE),
- PMP3137 RevA (12V down to 3.3V and 4.2V),
- PR748 RevE1 (3.3 down to 1.2V and 1.8V).







2 Main Waveforms

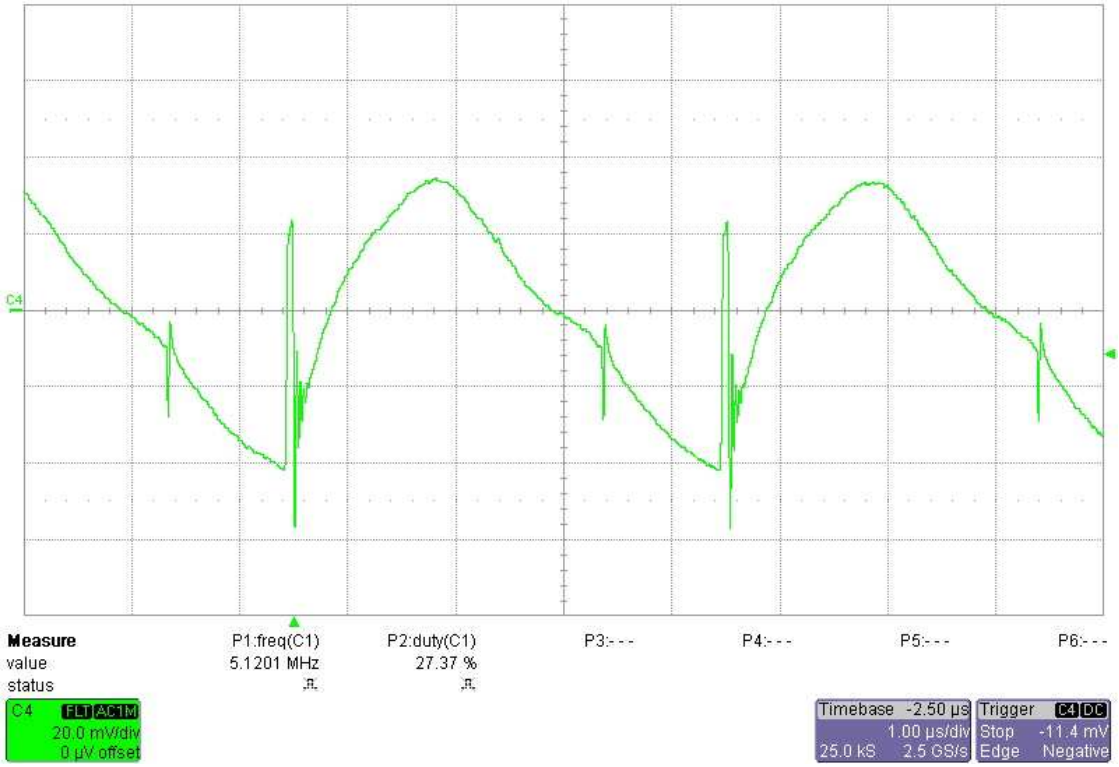


Fig. 1 Ouput Ripple of the PoE (Vout=12V) @ 0.9A output

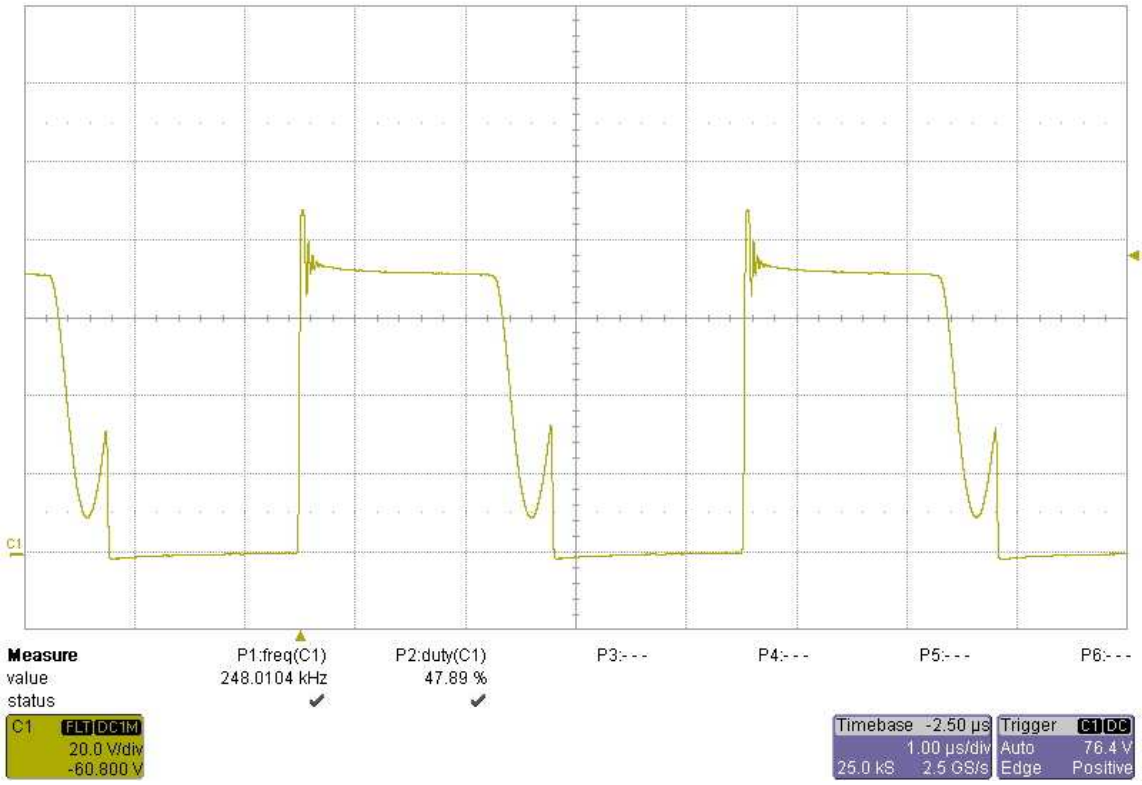
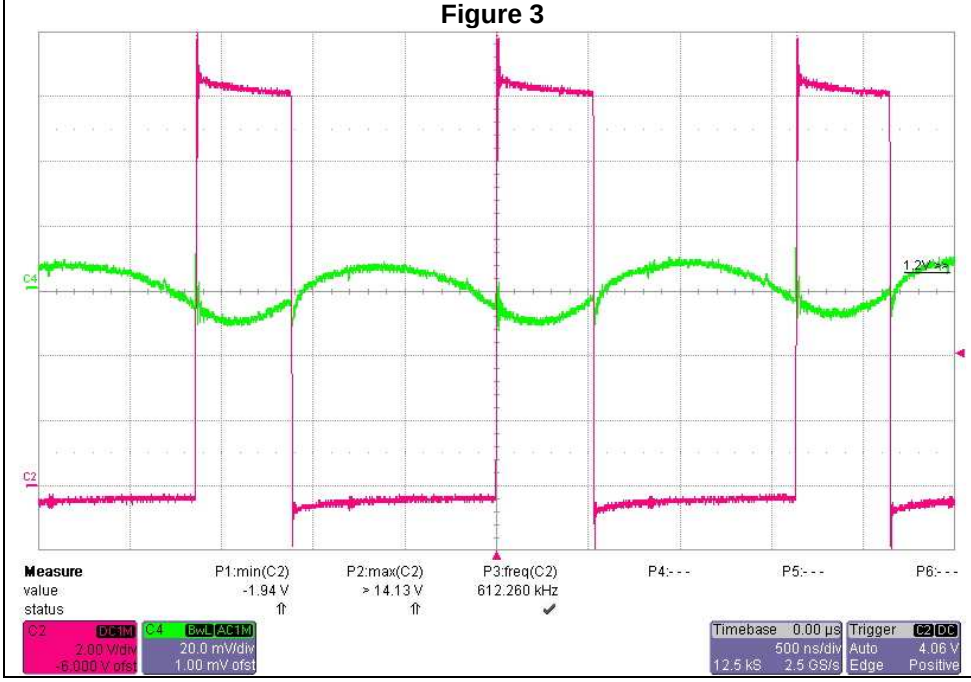


Fig. 2 Switch node of the PoE at minimum input voltage Vin=36V @ full load

The output ripple voltages for the TPS54286 converter are shown in Figure 3 and 4. The images were taken with a 1.6A load and 12V at the input.

Figure 3



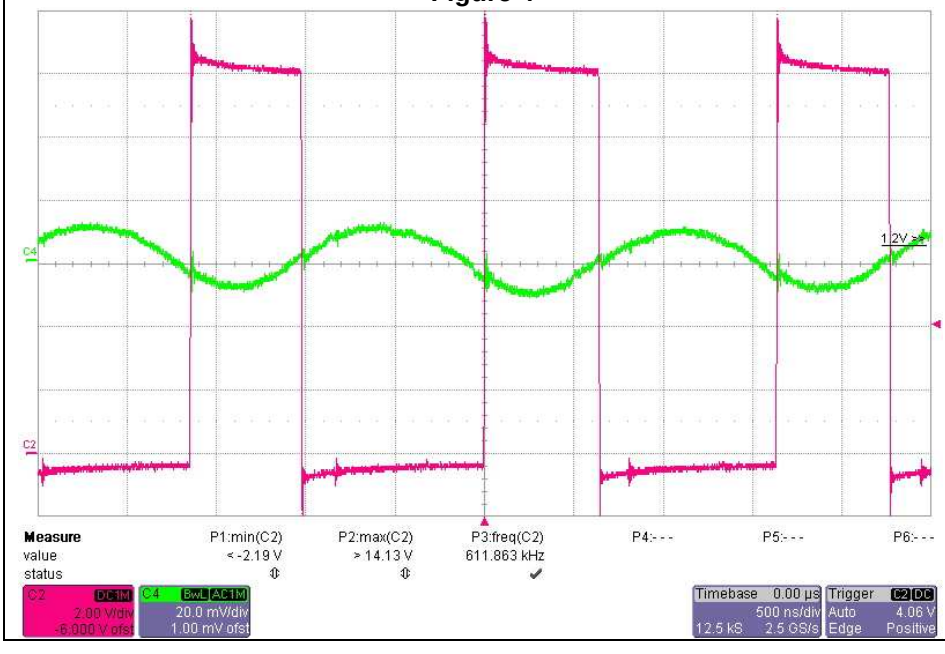
CH4:

3.3V output

CH2:

Switch Node

Figure 4



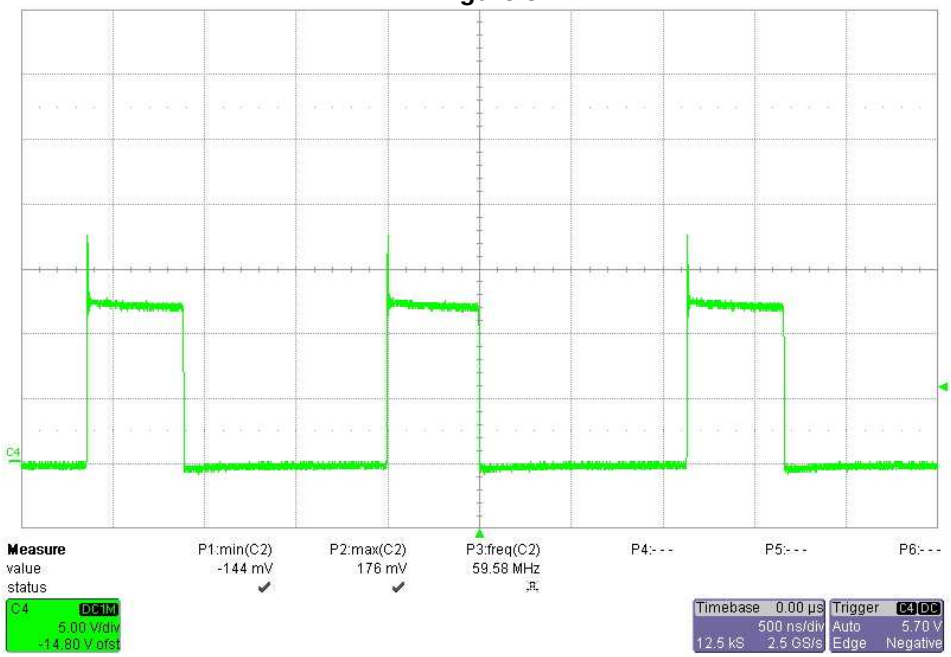
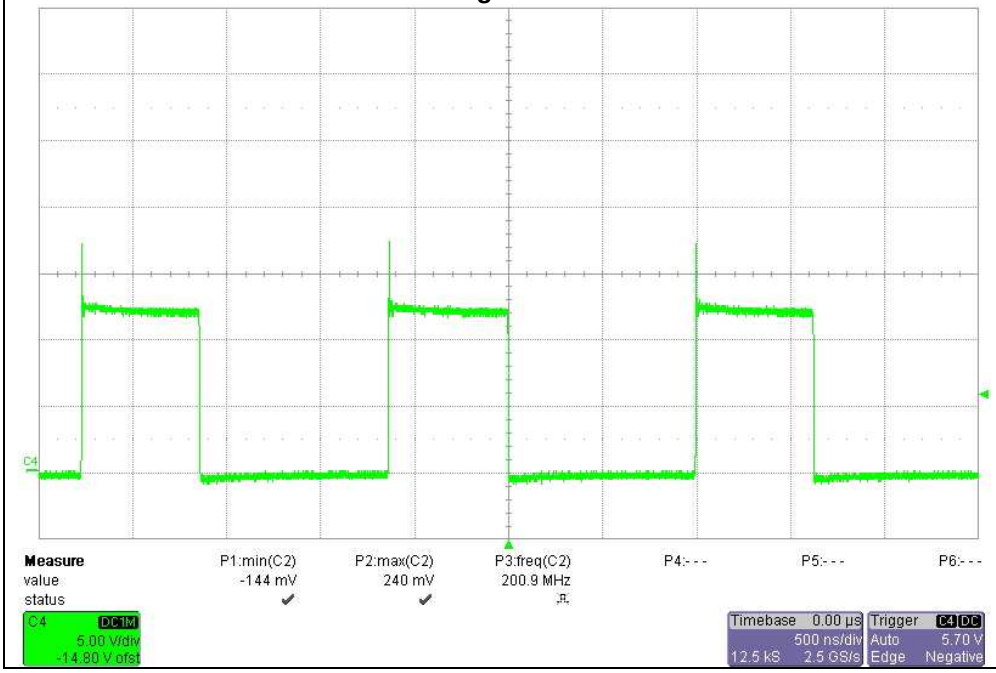
CH4:

4.2V output

CH2:

Switch Node

The switch-nodes of the TPS54286 converter is showed in Fig.5 and 6. Input voltage is set to 12V and output current to 1.6A.

Figure 5 	CH4: 3.3V output
Figure 6 	CH4: 4.2V output

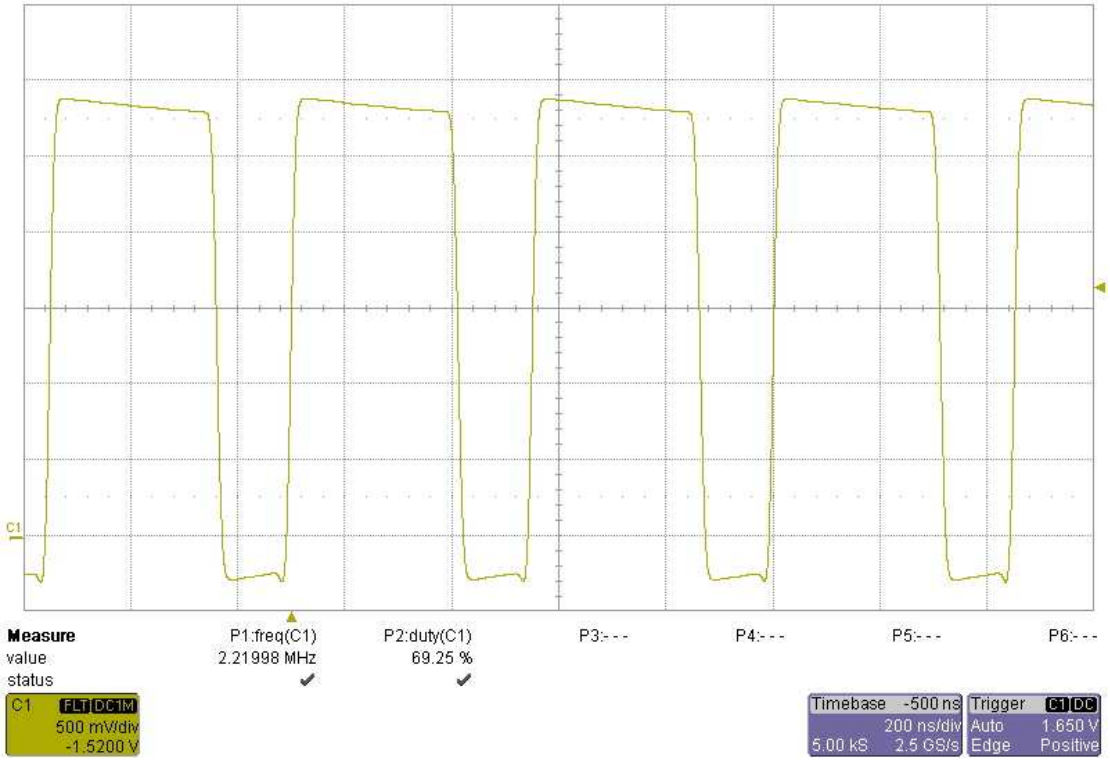


Fig. 7 Switch node of the 1.8V output for the TPS62410 converter with Vin=3.3V and full load on both ouputs

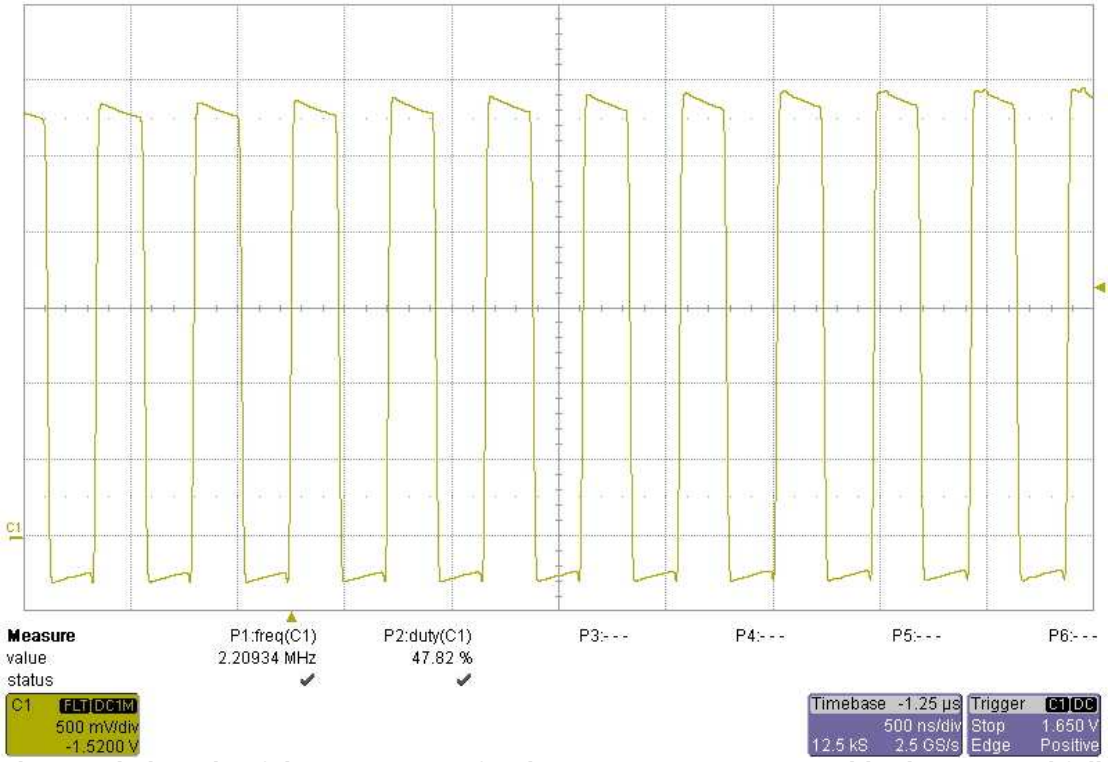


Fig. 8 Switch node of the 1.2V output for the TPS62410 converter with Vin=3.3V and full load on both ouputs

2 Control Loop Frequency Responses

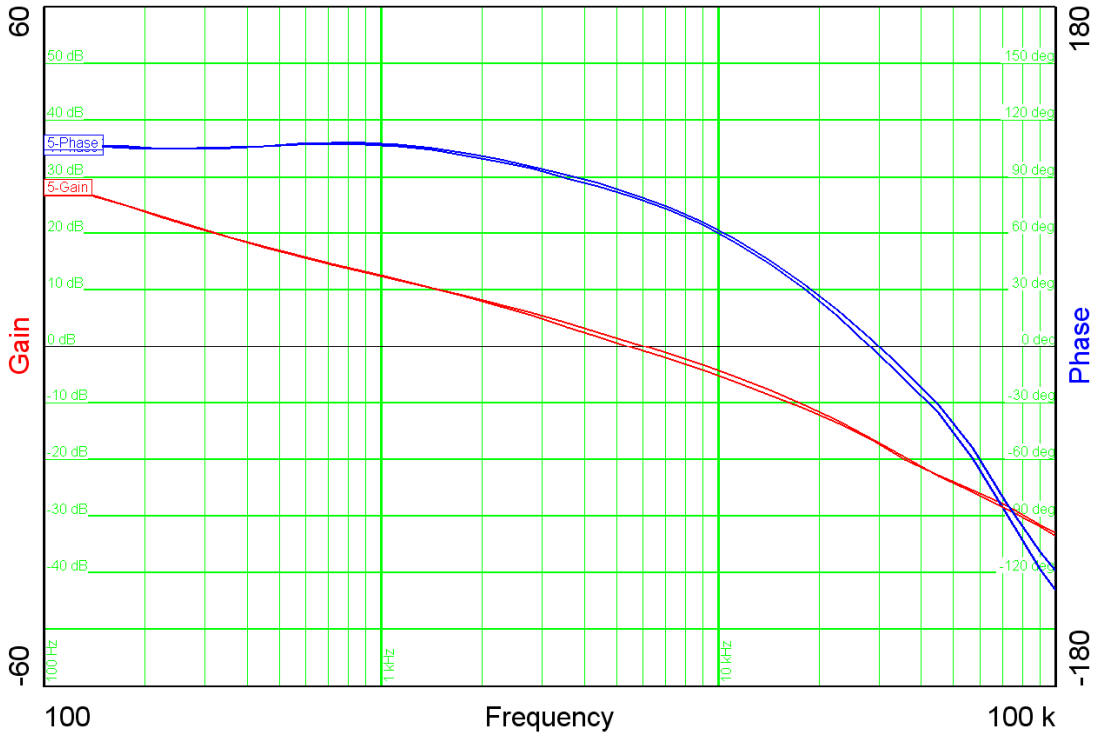


Fig. 9 Open Loop response of the PoE stage, Vin=36V and Vin=57V @ Iout=0.9A

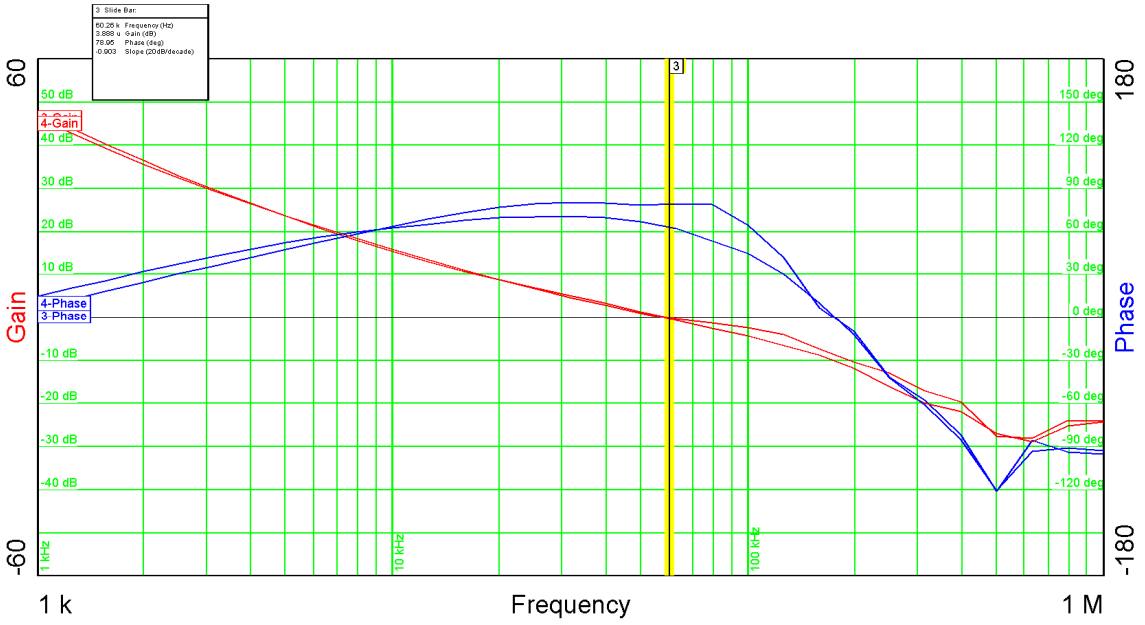


Fig. 10 Open Loop response of the TPS54286 stage, Vout =3.3V, Vout=4.2V

3 Load Transients

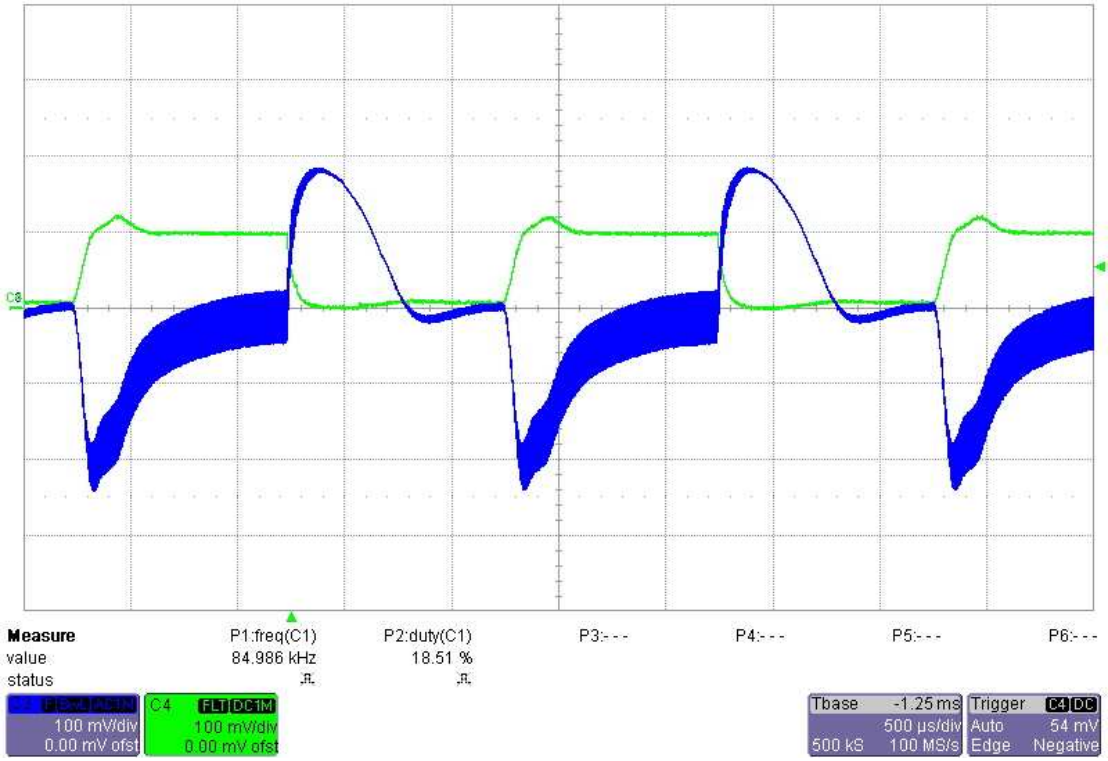


Fig. 11 PoE Ouput Voltage Variation with a Step-Load change from 0A to 1A and viceversa

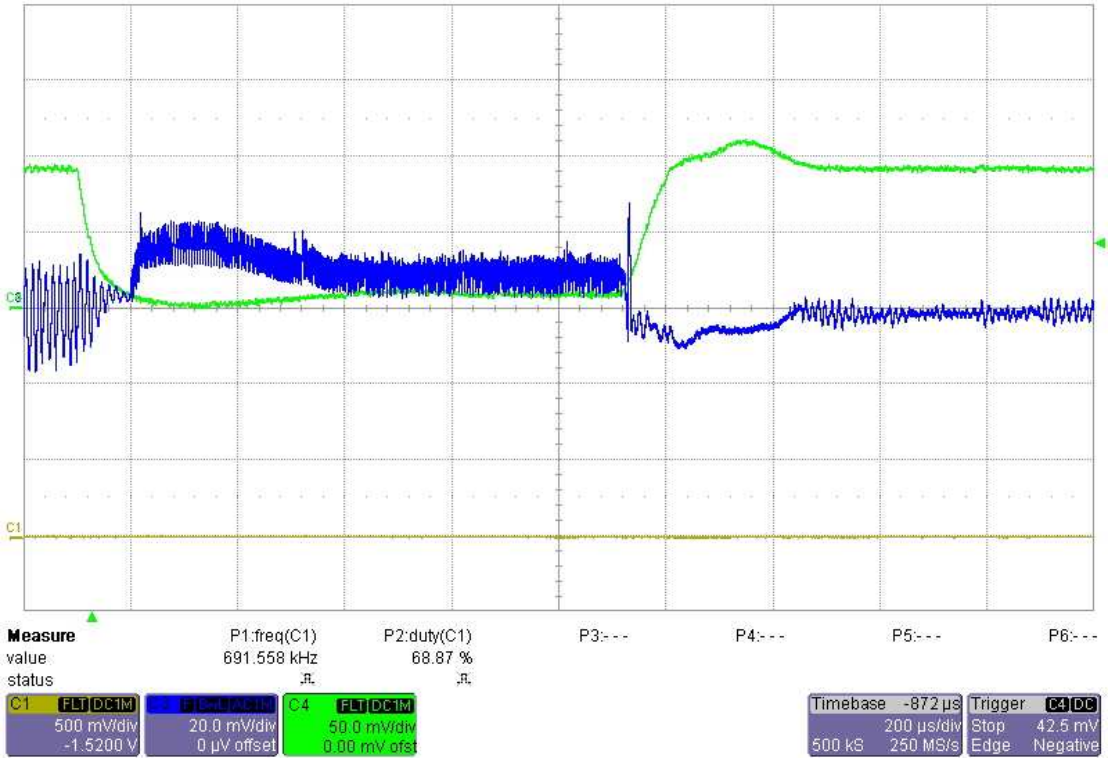
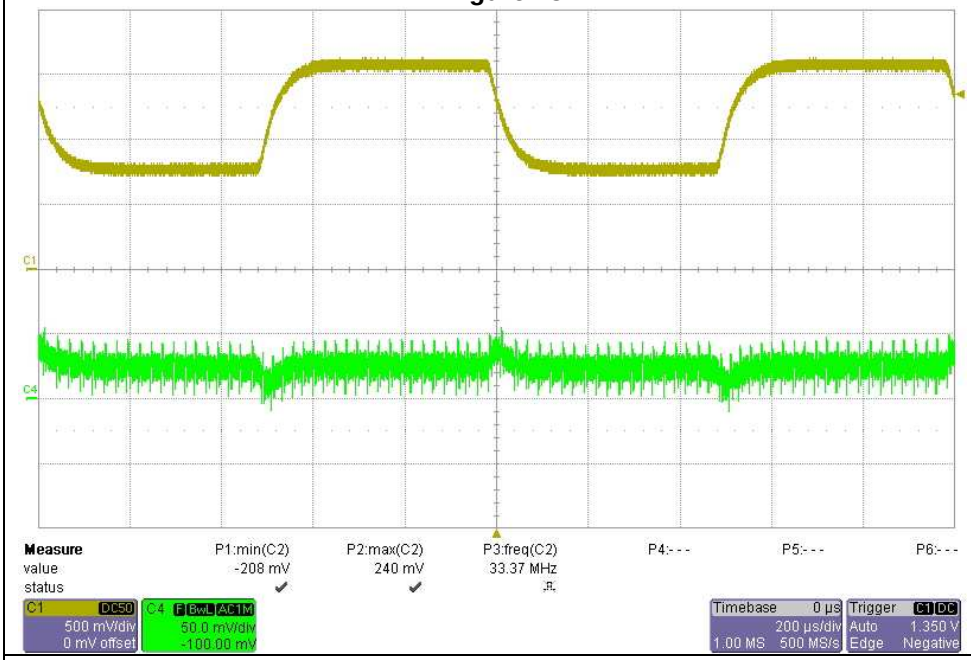


Fig. 12 TPS62410 1.8V Ouput Voltage Variation with a Step-Load change from 0.2A to 0.8A and viceversa

Figures 13 and 14 show the response to load transients of the TPS54286 converter. The load is switching from 0.8A to 1.6A.

Figure 13



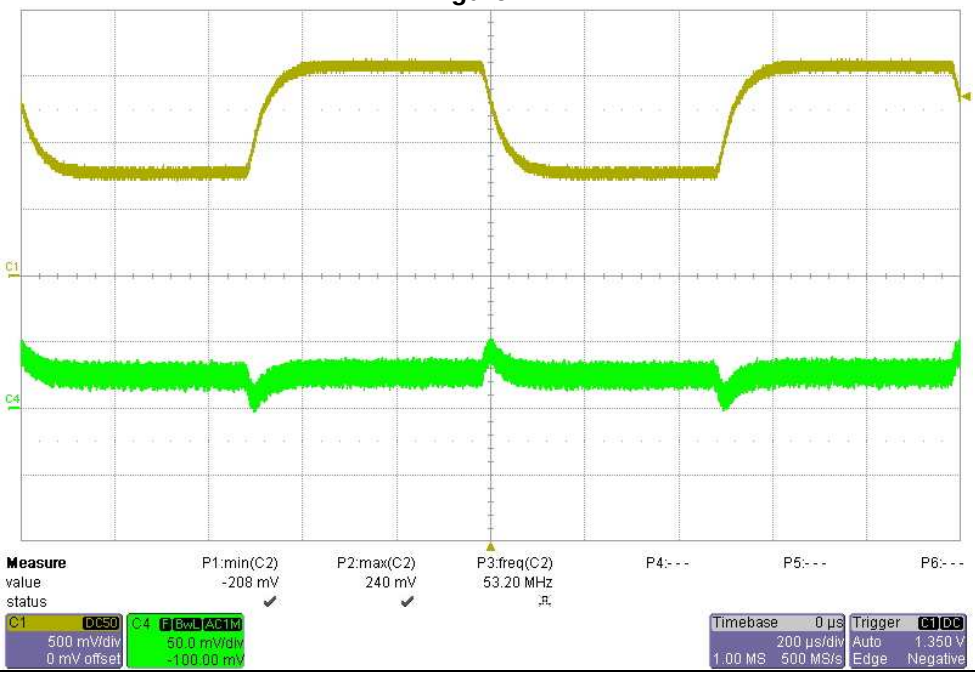
CH4:

3.3V output

CH1:

load current 1V->1A

Figure 14



CH4:

4.2V output

CH1:

load current 1V->1A

4 Start-up

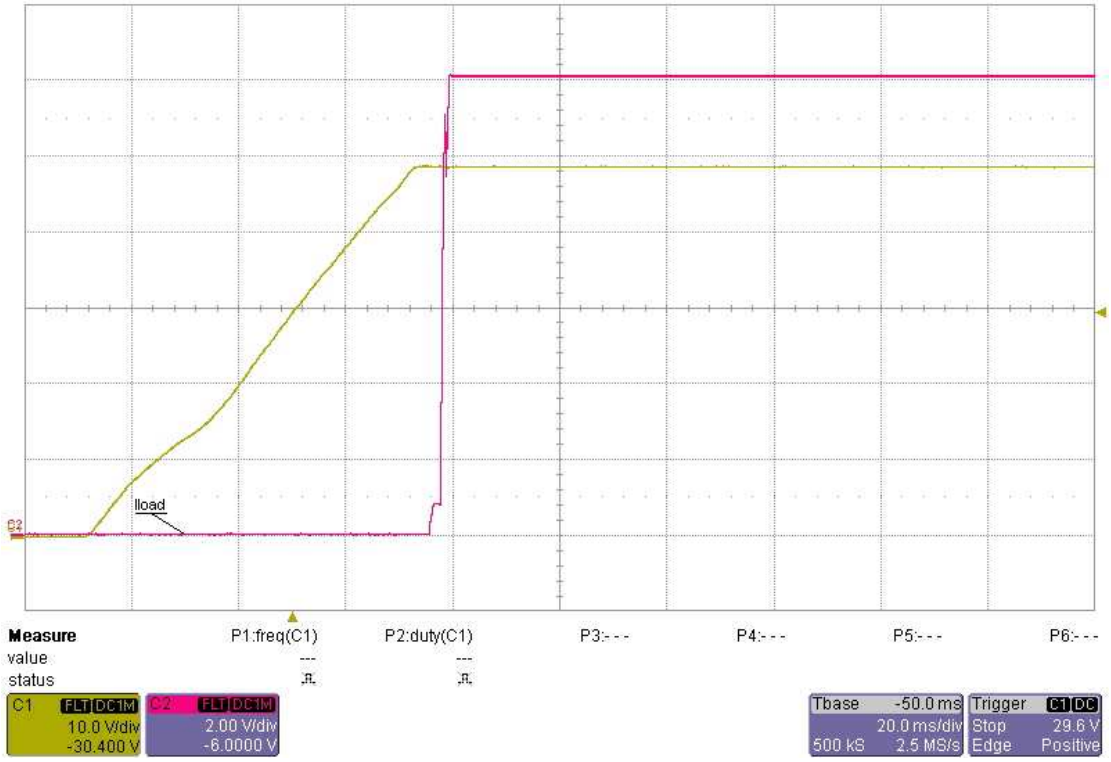


Fig. 15 PoE Input and Ouput Voltage Start-up waveforms

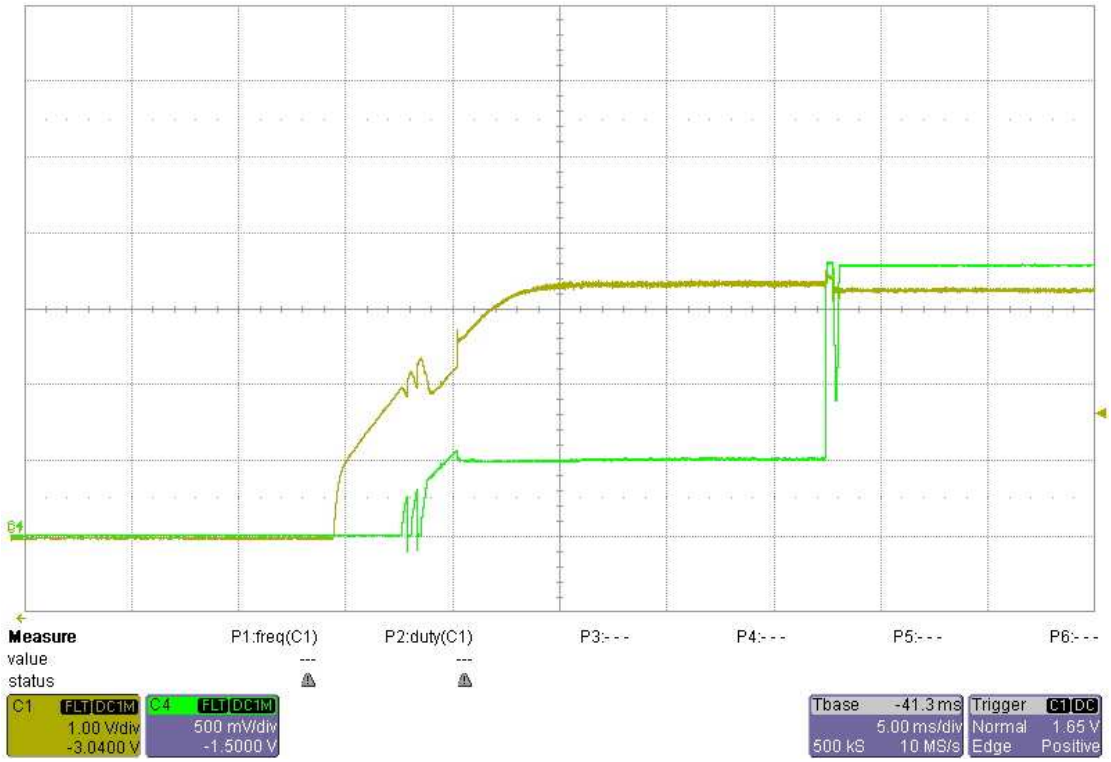


Fig. 16 TPS62410 Converter Input and 1.8V Ouput Voltage Start-up waveforms

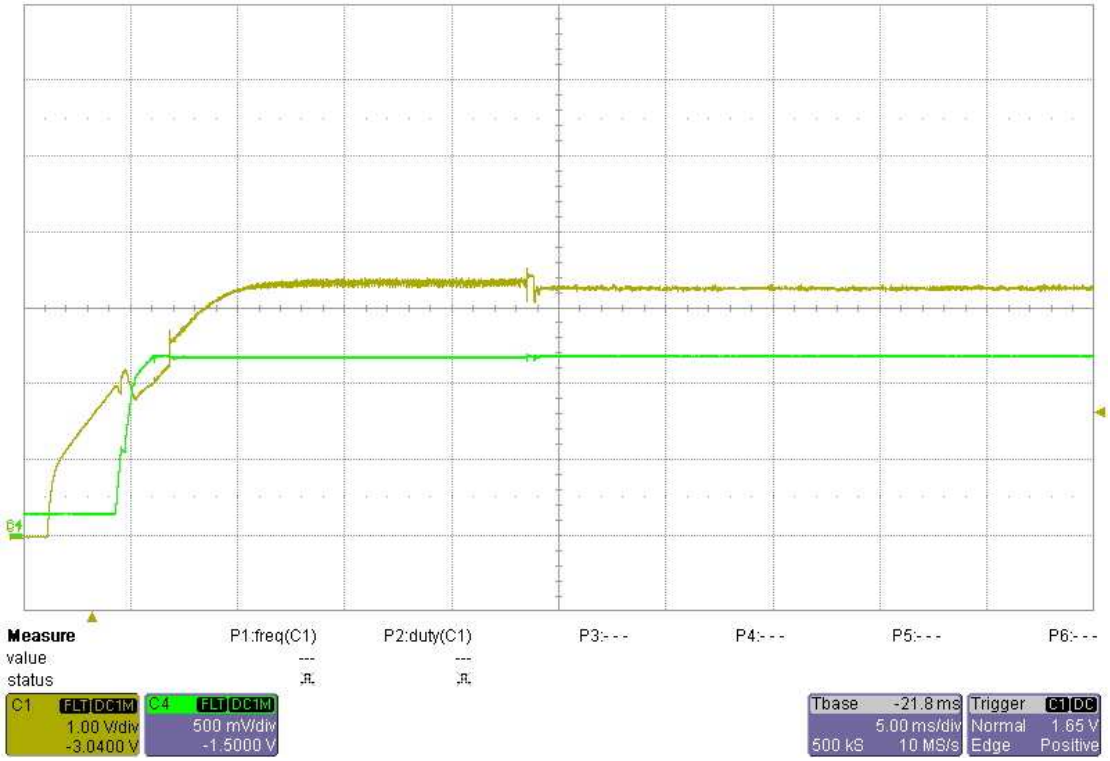


Fig. 17 TPS62410 Converter Input and 1.2V Ouput Voltage Start-up waveforms

5 Efficiency

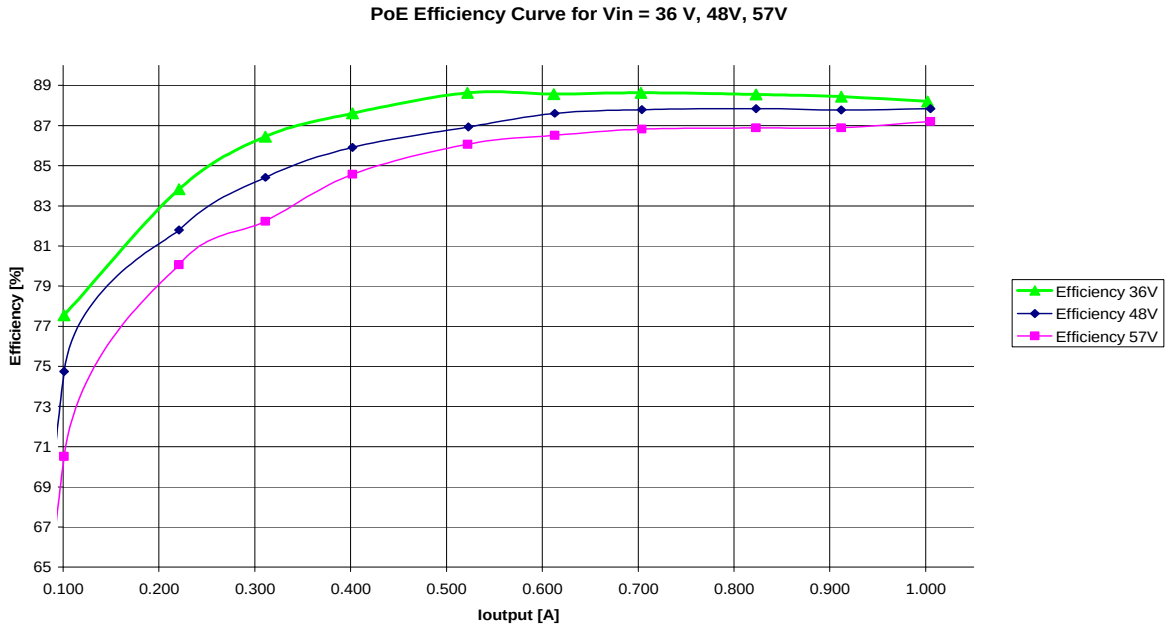


Fig. 18 Efficiency of the PoE stage with Vin=36V, 48V, 57V

Details of measured values are in the following tables.

Vin[V]	Iin[A]	Vout1[V]	Iout1[A]	Pin[W]	Pout2[W]	η%
36	0.0133	12.12	**0.000**	0.479	0.000	**0.0**
37.148	0.049	12.11	**0.101**	1.820	1.223	**67.2**
37.158	0.0934	12.1	**0.221**	3.471	2.674	**77.1**
37.152	0.1274	12.1	**0.311**	4.733	3.763	**79.5**
37.144	0.1604	12.1	**0.402**	5.958	4.864	**81.6**
37.135	0.2075	12.1	**0.523**	7.706	6.328	**82.1**
37.122	0.2406	12.1	**0.613**	8.932	7.417	**83.0**
37.118	0.274	12.1	**0.704**	10.170	8.518	**83.8**
37.115	0.3214	12.1	**0.823**	11.929	9.958	**83.5**
37.099	0.3551	12.1	**0.912**	13.174	11.035	**83.8**
37.083	0.3877	12.1	**1.002**	14.377	12.124	**84.3**

Vin[V]	Iin[A]	Vout1[V]	Iout1[A]	Pin[W]	Pout2[W]	η%
48	0.0113	12.12	**0.000**	0.542	0.000	**0.0**
49.098	0.038	12.11	**0.101**	1.866	1.223	**65.6**
49.088	0.071	12.11	**0.221**	3.485	2.676	**76.8**
49.082	0.0963	12.11	**0.311**	4.727	3.766	**79.7**
49.084	0.122	12.11	**0.402**	5.988	4.868	**81.3**
49.075	0.155	12.11	**0.523**	7.607	6.334	**83.3**
49.062	0.181	12.11	**0.613**	8.880	7.423	**83.6**
49.058	0.207	12.1	**0.704**	10.155	8.518	**83.9**
49.055	0.2398	12.1	**0.823**	11.763	9.958	**84.7**
49.049	0.264	12.1	**0.912**	12.949	11.035	**85.2**
49.033	0.291	12.1	**1.005**	14.269	12.161	**85.2**

Vin[V]	Iin[A]	Vout1[V]	Iout1[A]	Pin[W]	Pout2[W]	η%
57	0.0094	12.12	**0.000**	0.536	0.000	**0.0**
58.388	0.033	12.11	**0.102**	1.927	1.235	**64.1**
58.368	0.061	12.11	**0.222**	3.560	2.688	**75.5**
58.362	0.082	12.11	**0.311**	4.786	3.766	**78.7**
58.354	0.103	12.11	**0.402**	6.010	4.868	**81.0**
58.355	0.131	12.1	**0.523**	7.645	6.328	**82.8**
58.352	0.152	12.1	**0.613**	8.870	7.417	**83.6**
58.348	0.173	12.1	**0.704**	10.094	8.518	**84.4**
58.345	0.202	12.1	**0.823**	11.786	9.958	**84.5**
58.339	0.223	12.1	**0.912**	13.010	11.035	**84.8**
58.333	0.244	12.1	**1.005**	14.233	12.161	**85.4**

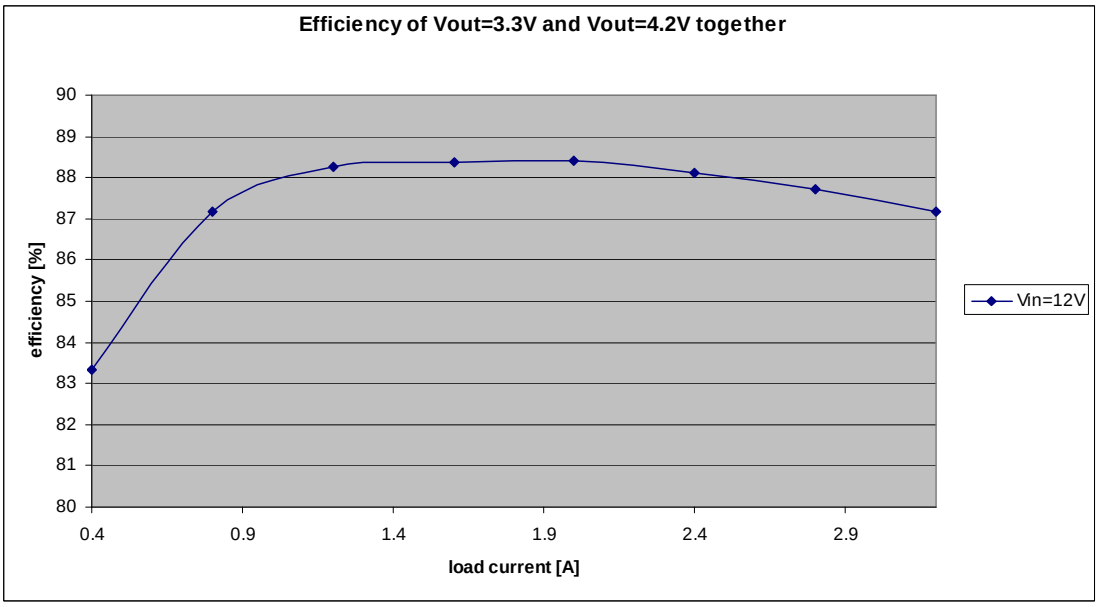


Fig. 19 Efficiency of the TPS54286 converter with Vout1=3.3V and Vout2=4.2V @Vin=12V

Details of measured values are in the following tables.

Output 4.2V			Output 3.3V		
Vout1 [V]	Iout1 [A]	Po1 [W]	Vout2 [V]	Iout2 [A]	Po2 [W]
4.183	**0.210**	0.88	**3.342**	**0.200**	0.67
4.185	**0.410**	1.72	**3.343**	**0.399**	1.33
4.185	**0.610**	2.55	**3.344**	**0.600**	2.01
4.186	**0.810**	3.39	**3.344**	**0.801**	2.68
4.187	**1.010**	4.23	**3.345**	**1.000**	3.35
4.187	**1.210**	5.07	**3.345**	**1.200**	4.01
4.187	**1.410**	5.90	**3.345**	**1.400**	4.68
4.187	**1.610**	6.74	**3.345**	**1.601**	5.36

Vin [V]	Iin [A]	Po [W]	η%
12.00	0.155	1.9	**83.3**
12.01	0.291	3.5	**87.2**
12.01	0.430	5.2	**88.3**

12.00	0.572	6.9	**88.4**
12.01	0.713	8.6	**88.4**
12.01	0.858	10.3	**88.1**
12.00	1.006	12.1	**87.7**
12.00	1.156	13.9	**87.2**

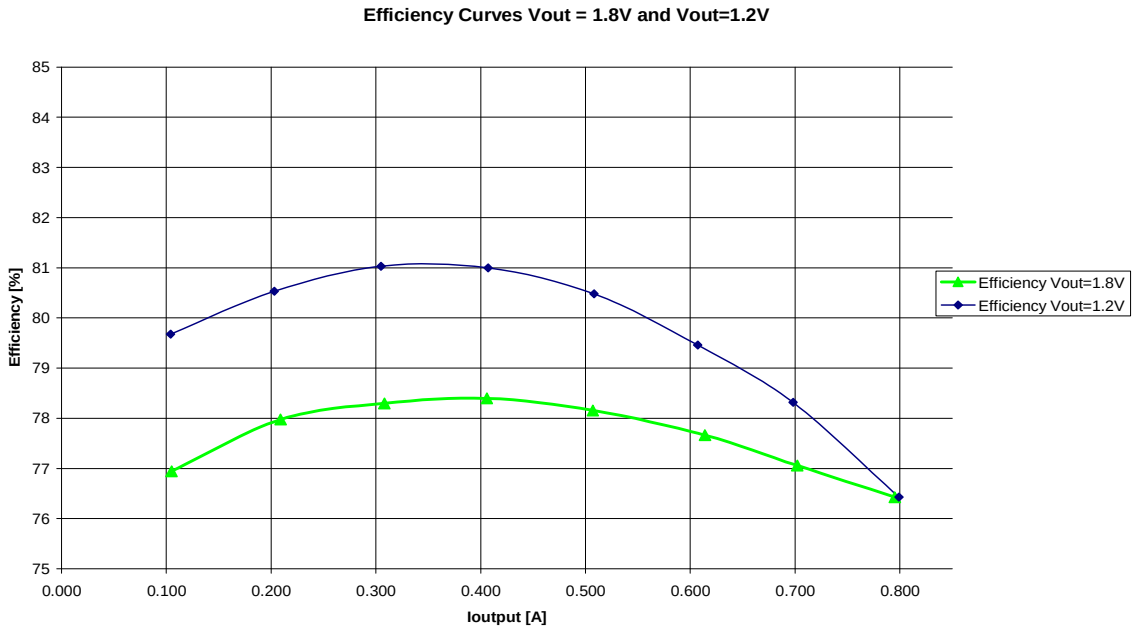


Fig. 20 Efficiency of the TPS62410 converter with Vout1=1.2V, Vout2=1.8V @Vin=3.3V

Details of measured values are in the following tables.

Vin[V]	Iin[A]	Vout1[V]	Iout1[A]	Vout2[V]	Iout2[A]	Pin[W]	Pout[W]	η%
3.336	0.927	1.181	0.799	**1.786**	**0.795**	3.092	2.363	**76.4**
3.343	0.853	1.181	0.799	**1.786**	**0.702**	2.852	2.197	**77.1**
3.355	0.783	1.181	0.799	**1.786**	**0.614**	2.627	2.040	**77.7**
3.375	0.701	1.181	0.799	**1.786**	**0.507**	2.366	1.849	**78.2**
3.409	0.625	1.181	0.799	**1.79**	**0.406**	2.137	1.670	**78.1**
3.423	0.558	1.181	0.799	**1.792**	**0.308**	1.910	1.496	**78.3**
3.444	0.491	1.181	0.799	**1.794**	**0.209**	1.698	1.319	**77.7**
3.47	0.424	1.181	0.799	**1.795**	**0.105**	1.471	1.132	**76.9**
3.321	0.421	1.181	0.799	**1.796**		1.398	0.944	**67.5**

Vin[V]	Iin[A]	Vout1[V]	Iout1[A]	Vout2[V]	Iout2[A]	Pin[W]	Pout[W]	η%
3.336	0.927	**1.181**	**0.799**	1.786	0.795	3.092	2.363	**76.4**
3.343	0.858	**1.184**	**0.698**	1.786	0.795	2.868	2.246	**78.3**
3.361	0.801	**1.185**	**0.607**	1.786	0.795	2.692	2.139	**79.5**
3.373	0.745	**1.186**	**0.508**	1.786	0.795	2.513	2.022	**80.5**
3.396	0.692	**1.188**	**0.407**	1.786	0.795	2.350	1.903	**81.0**
3.41	0.645	**1.188**	**0.305**	1.786	0.795	2.199	1.782	**81.0**
3.421	0.603	**1.189**	**0.203**	1.786	0.795	2.063	1.661	**80.5**
3.431	0.565	**1.199**	**0.104**	1.786	0.795	1.939	1.545	**79.7**
3.321	0.513	**1.199**		1.786	0.795	1.704	1.420	**83.3**

6 Thermal Pictures

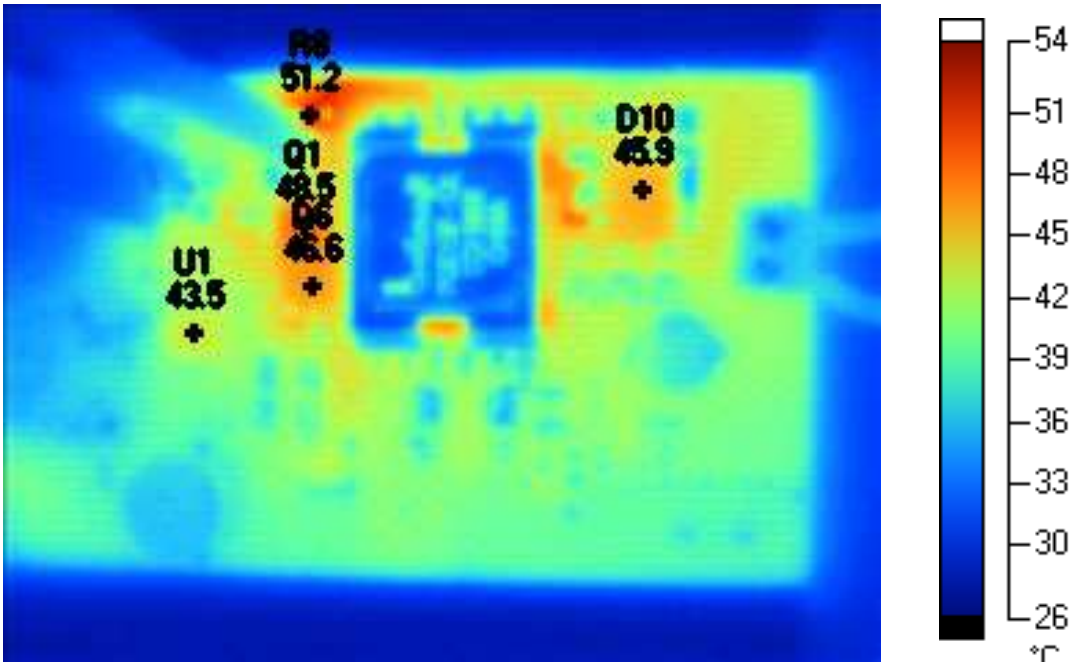


Fig. 21 Thermal picture with hot spots of Board PMP3891_RevA PoE Vout=12V@0.9A

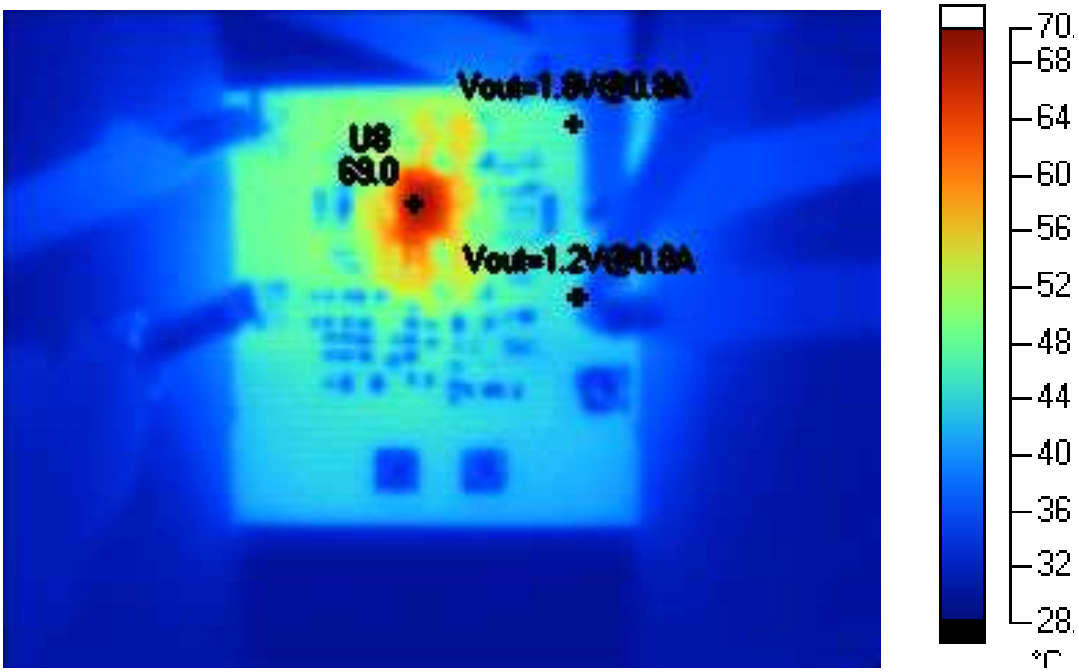


Fig. 22 Thermal picture with hot spots of Board PMP3137_A Iout(3.3V)=1.6A, Iout(4.2V)=1.6A @ Vin=12V

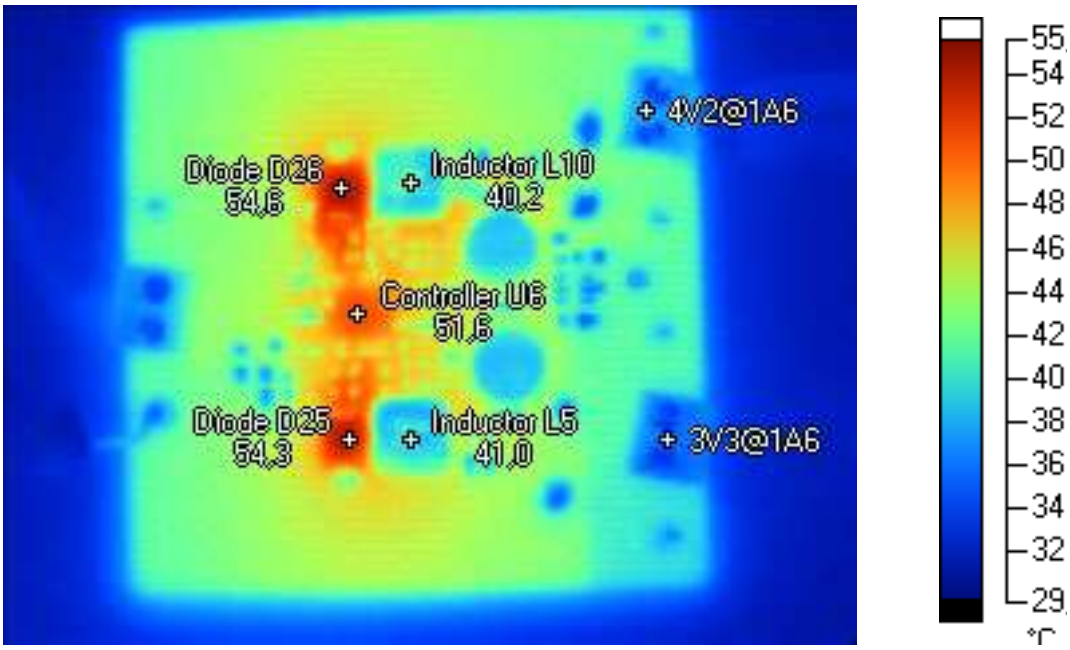


Fig. 23 Thermal picture with hot spots of Board PMP3137_RevA Iout(3.3V)=1.6A, Iout(4.2V)=1.6A @ Vin=12V

7 Warning

For Feasibility Evaluation Only, in Laboratory/Development Environments. The EVM is not a complete product. It is intended solely for use for preliminary feasibility evaluation in laboratory / development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical / mechanical components, systems and subsystems. It should not be used as all or part of a production unit.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.

Certain Instructions. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60℃ as long as the input and output ranges are maintained at nominal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be indentified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of this agreement. This obligation shall apply whether Claims arise under the law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate TI components for possible use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.