Test Data
For PMP10666
08/011/2015

Table of Contents

1. Design Specifications 3
2. Circuit Description 3
3. PMP10666 Board Photos 4
4. Thermal Data 5
5. Test results 6
   5.1 Efficiency Chart 6
   5.2 Efficiency Data 7
6. Test results 8
   6.1 Startup 8
   6.2 Output Voltage Ripple and Switch Node Voltage 12
7. Frequency Response 14

1. Design Specifications

Vin Minimum	**4V- Full Load** **3.3V Start up at 50% Load**
Vin Maximum	**5.5V**
Vin Nominal	**5V**
Vout	**120V**
Iout	**100mA**
Switching Frequency(SMPS)	**130 KHz**
Isolation	**2KVAC**

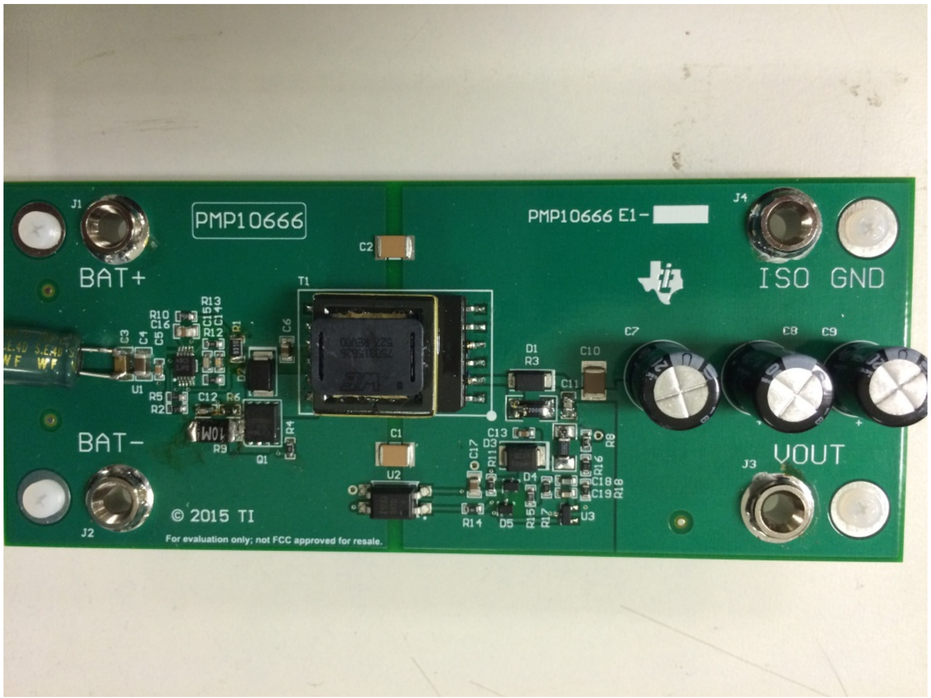
2. Circuit Description

PMP10666 is a 12W isolated flyback design that supports very low Vin of 3.3V-6V and is capable of delivering 100mA at 120V output. The design uses LM3481 Boost controller IC which works on current mode operation and can be synchronized to any frequency between 100KHz to 1 MHz.

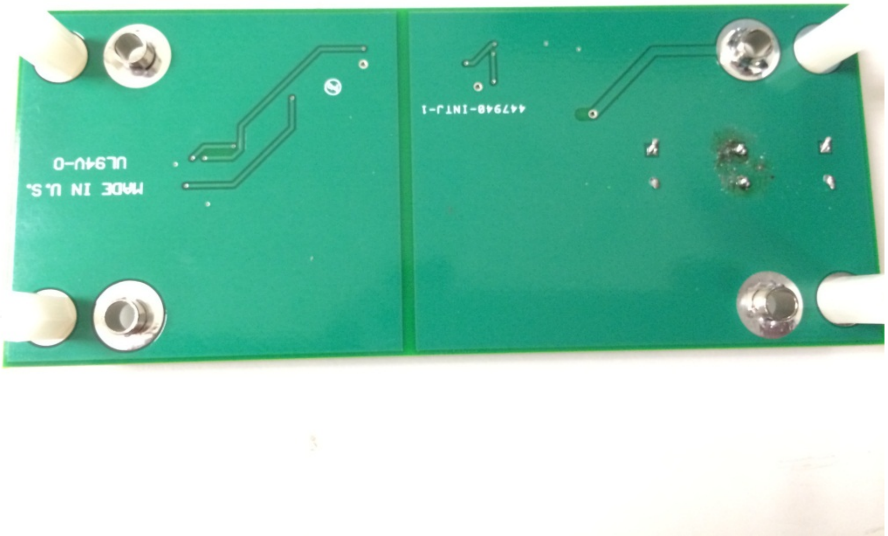
This design was built on a 2 layer board and is a simple, low-BOM-count, and low-cost design providing an isolated output.

3. PMP10666 Board Photos

Board Dimensions: 2125 mil *5150 mil

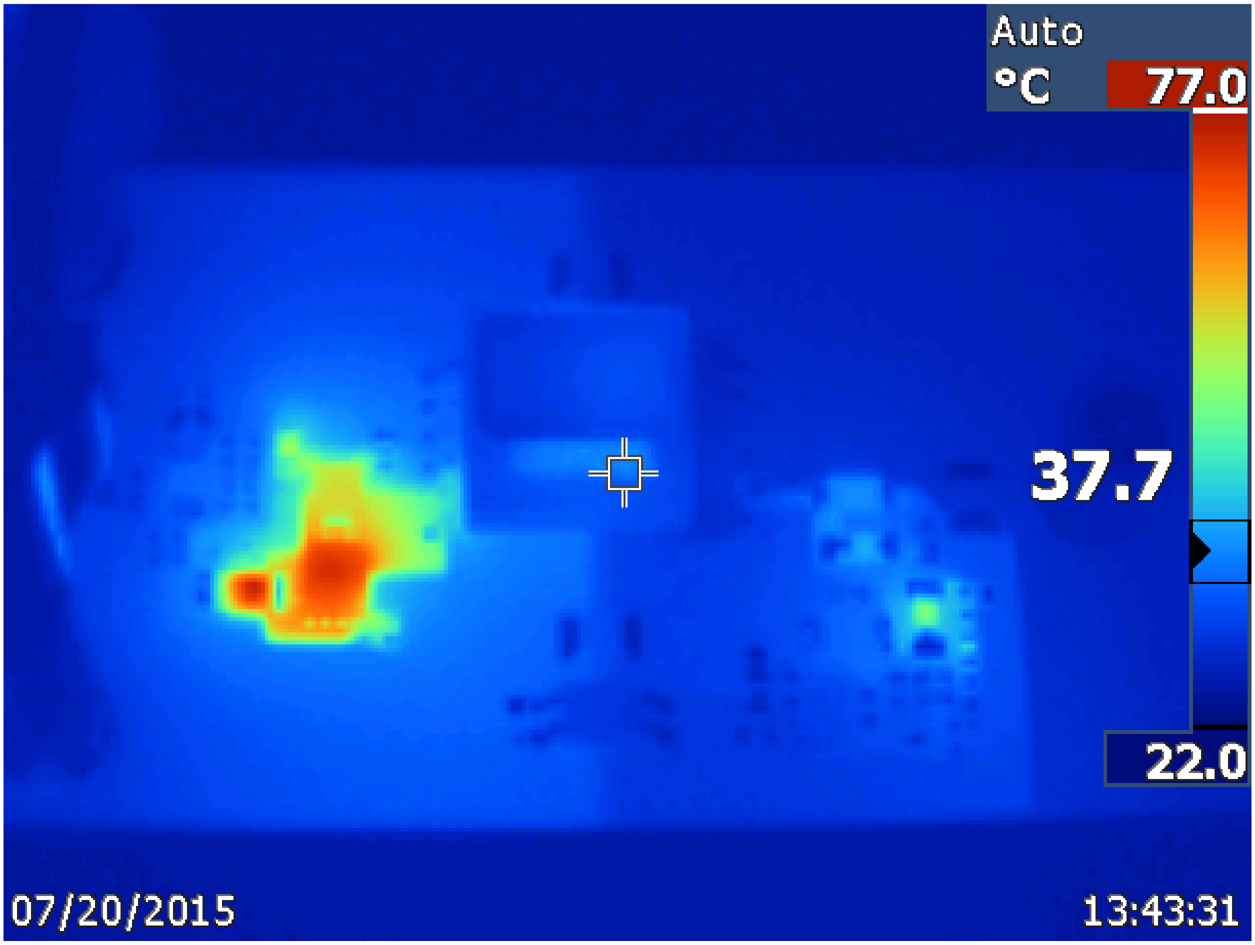


Board Photo (Top)



Board Photo (Bottom)

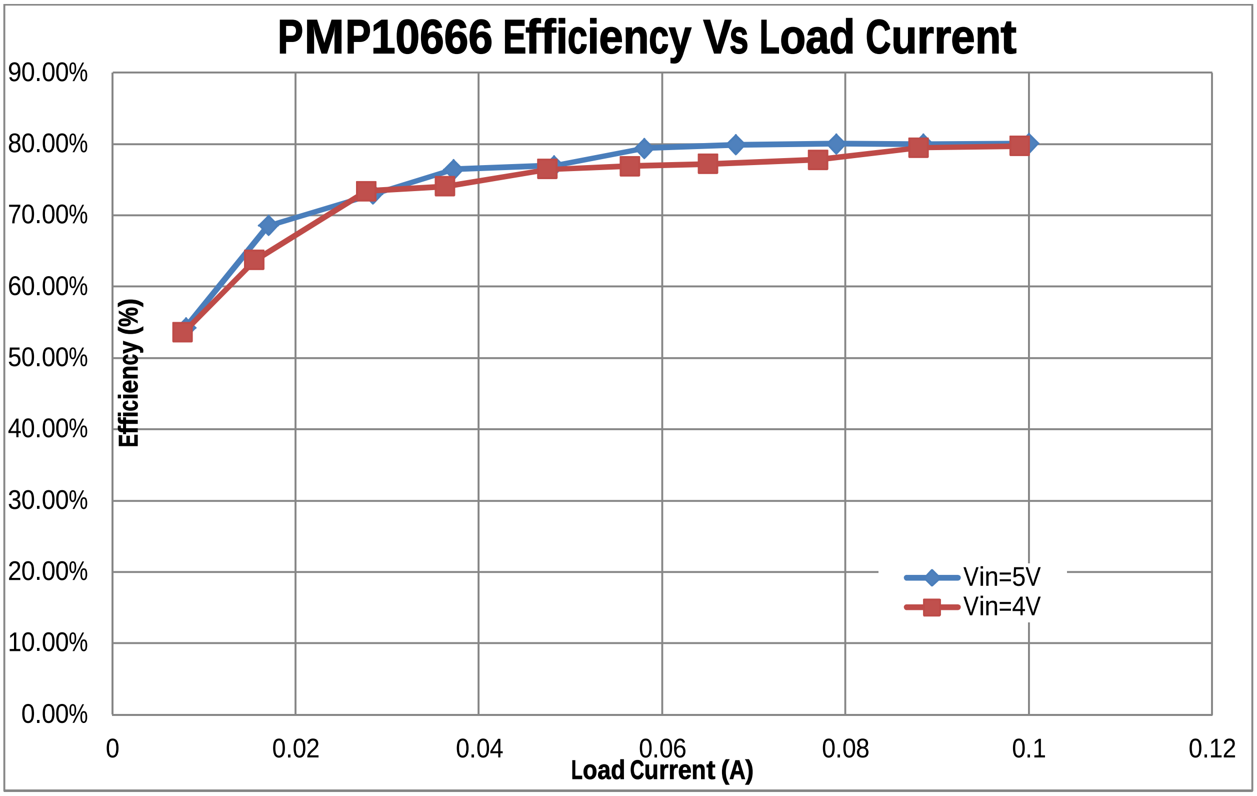
4. Thermal Data



IR thermal image taken at steady state with 4 Vin and 120V@100mA output

5. Test results

5.1 Efficiency Chart

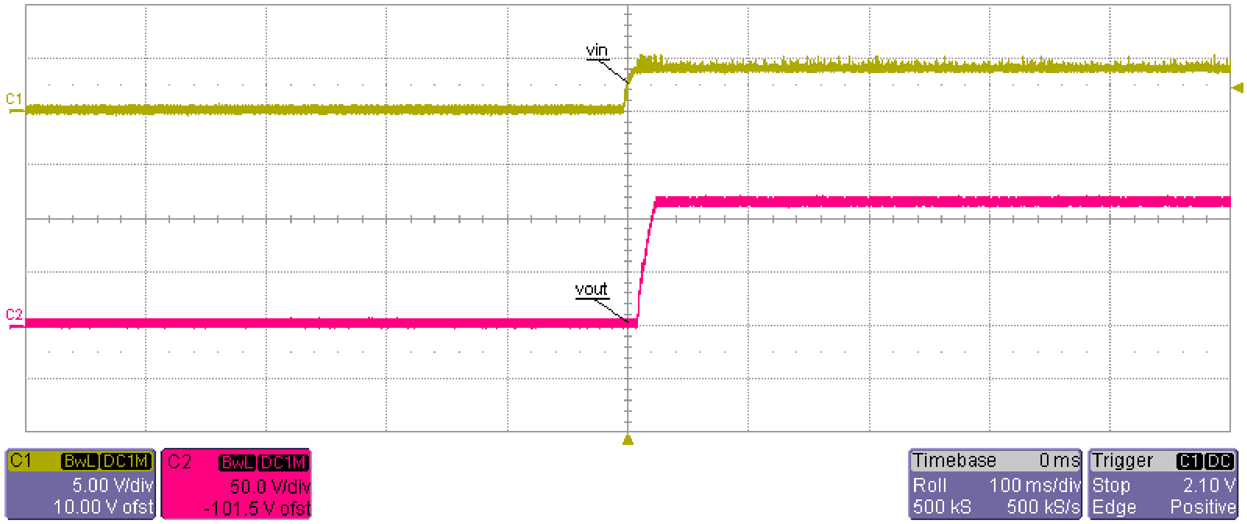


5.2 Efficiency Data

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
5.21	0.332	117.3	0.008	1.72972	0.9384	54.25%
5.19	0.56	117.3	0.017	2.9064	1.9941	68.61%
5.17	0.883	117.3	0.0284	4.56511	3.33132	72.97%
5.15	1.108	117.3	0.0372	5.7062	4.36356	76.47%
5.12	1.434	117.3	0.0482	7.34208	5.65386	77.01%
5.1	1.68	117.3	0.058	8.568	6.8034	79.40%
5.08	1.965	117.3	0.068	9.9822	7.9764	79.91%
5.05	2.2919	117.3	0.079	11.5741	9.2667	80.06%
5.03	2.58	117.3	0.0885	12.9774	10.38105	79.99%
5	2.93	117.3	0.1	14.65	11.73	80.07%
Vin (V)	**Iin (A)**	**Vout (V)**	**Iout (A)**	**Pin (W)**	**Pout (W)**	**Efficiency (%)**
4.1	0.411	117.3	0.0077	1.6851	0.90321	53.60%
4.08	0.699	117.3	0.0155	2.85192	1.81815	63.75%
4.04	1.096	117.3	0.0277	4.42784	3.24921	73.38%
4.02	1.43	117.3	0.0363	5.7486	4.25799	74.07%
3.98	1.83	117.3	0.0475	7.2834	5.57175	76.50%
3.98	2.165	117.3	0.0565	8.6167	6.62745	76.91%
3.95	2.5	117.3	0.065	9.875	7.6245	77.21%
3.91	2.97	117.3	0.077	11.6127	9.0321	77.78%
4.02	3.23	117.3	0.088	12.9846	10.3224	79.50%
3.99	3.65	117.3	0.099	14.5635	11.6127	79.74%

6. Test results

6.1 Startup



C1 BwL DC1M
5.00 V/div
10.00 V ofst

C2 BwL DC1M
50.0 V/div
-101.5 V ofst

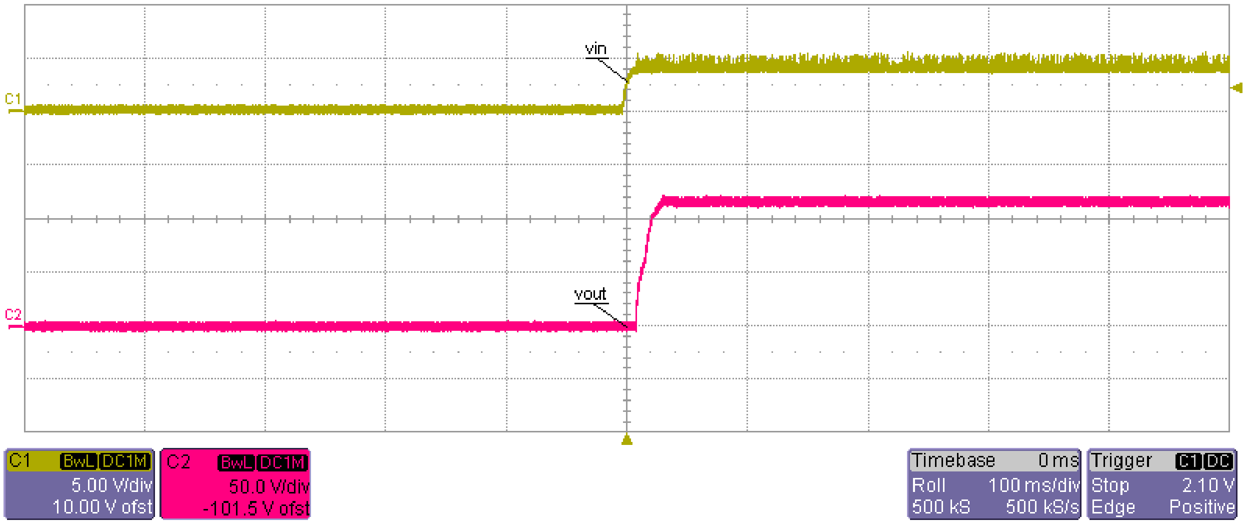
Timebase 0 ms
Roll 100 ms/div
500 kS 500 kS/s

Trigger C1 DC
Stop 2.10 V
Edge Positive

Startup into No Load at 4 Vin

C1- Vin

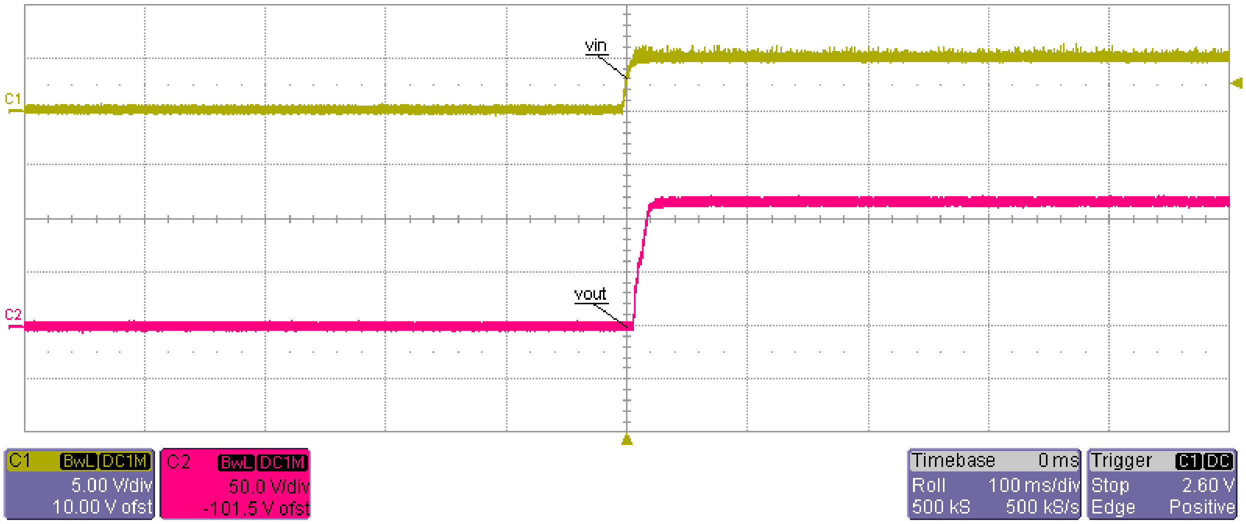
C2-Vout



Startup into Full Load(100mA) at 4 Vin

C1- Vin

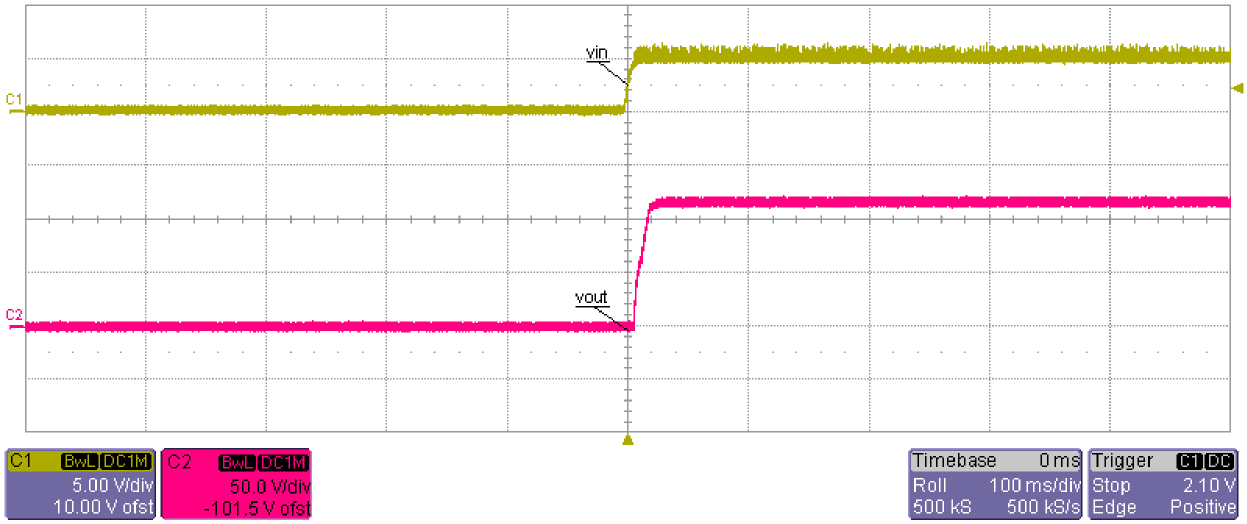
C2-Vout



Startup into No Load at 5 Vin

C1- Vin

C2-Vout

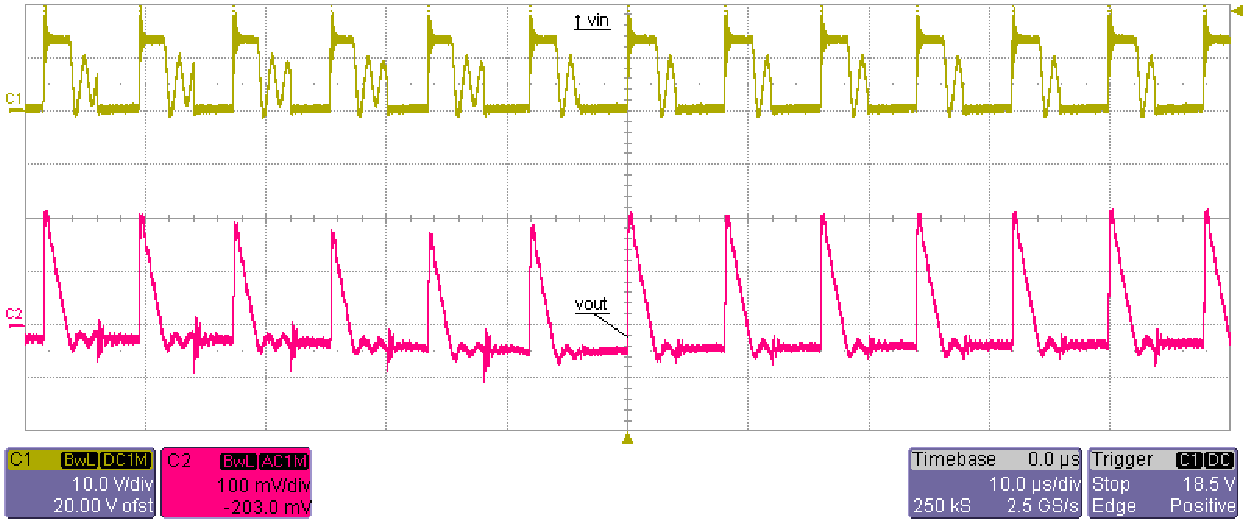


Startup into Full Load(100mA) at 5 Vin

C1- Vin

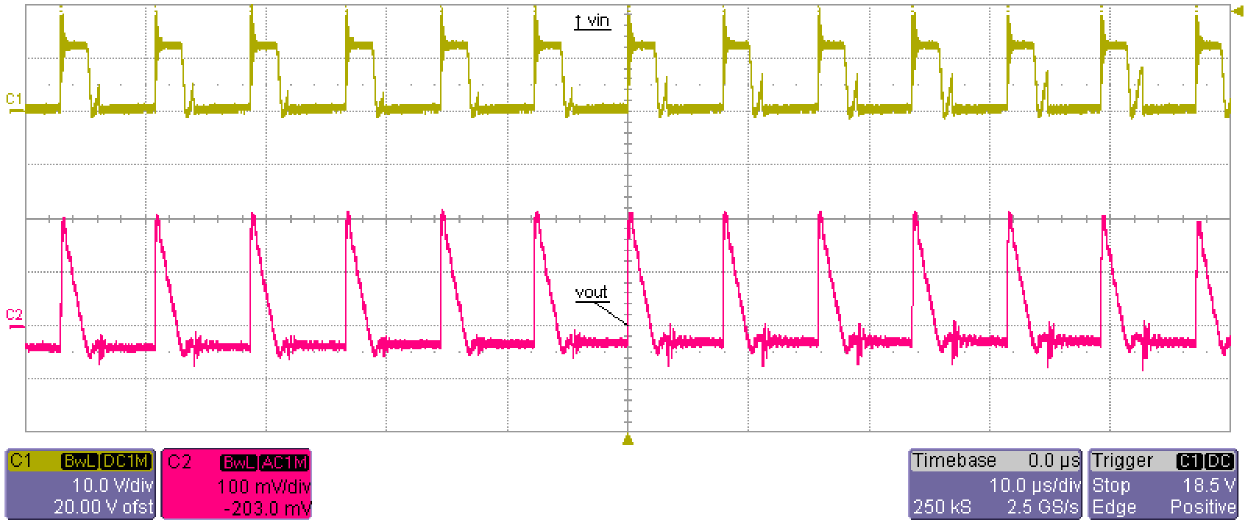
C2-Vout

6.2 Output Voltage Ripple and Switch Node Voltage



Ch1 - Switch Node Voltage

Ch2-Output Voltage Ripple at 5Vin @ 100mA output

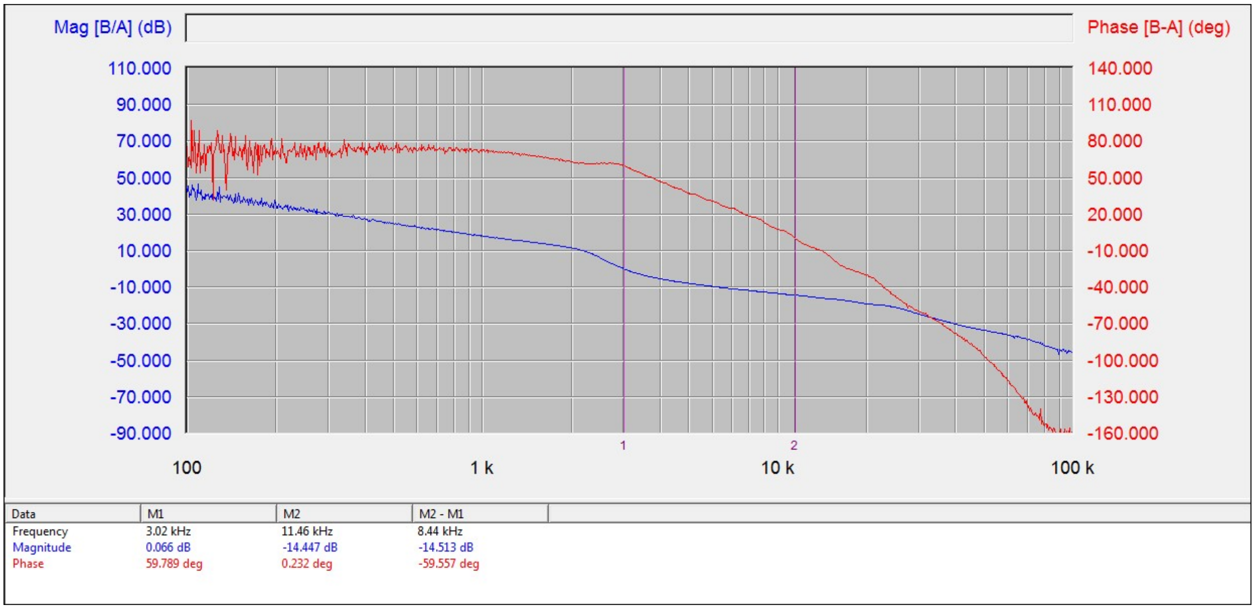


Ch1 - Switch Node Voltage

Ch2-Output Voltage Ripple at 4Vin @ 100mA output

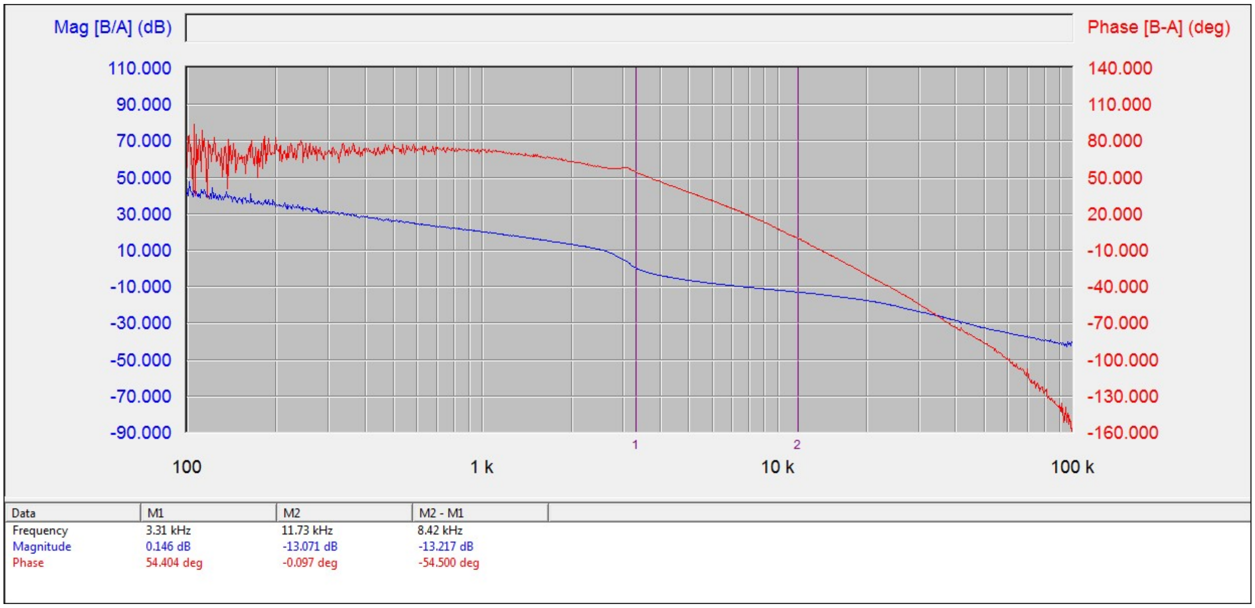
7. Frequency Response

The output was loaded with full load 100mA .For gain/phase plot 1 , the input was 3.7V and for gain/phase plot 2 , the input was 4.7V



Data	M1	M2	M2 - M1
Frequency	3.02 kHz	11.46 kHz	8.44 kHz
Magnitude	0.066 dB	-14.447 dB	-14.513 dB
Phase	59.789 deg	0.232 deg	-59.557 deg

Gain/Phase plot 1 at Vin =3.7V ,Vout =120V@100mA



Data	M1	M2	M2 - M1
Frequency	3.31 kHz	11.73 kHz	8.42 kHz
Magnitude	0.146 dB	-13.071 dB	-13.217 dB
Phase	54.404 deg	-0.097 deg	-54.500 deg

Gain/Phase plot 2 at Vin =4.7 ,Vout =120V@100mA

IMPORTANT NOTICE FOR TI REFERENCE DESIGNS

Texas Instruments Incorporated ("TI") reference designs are solely intended to assist designers (“Buyers”) who are developing systems that incorporate TI semiconductor products (also referred to herein as “components”). Buyer understands and agrees that Buyer remains responsible for using its independent analysis, evaluation and judgment in designing Buyer’s systems and products.

TI reference designs have been created using standard laboratory conditions and engineering practices. **TI has not conducted any testing other than that specifically described in the published documentation for a particular reference design.** TI may make corrections, enhancements, improvements and other changes to its reference designs.

Buyers are authorized to use TI reference designs with the TI component(s) identified in each particular reference design and to modify the reference design in the development of their end products. HOWEVER, NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY THIRD PARTY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT, IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI REFERENCE DESIGNS ARE PROVIDED "AS IS". TI MAKES NO WARRANTIES OR REPRESENTATIONS WITH REGARD TO THE REFERENCE DESIGNS OR USE OF THE REFERENCE DESIGNS, EXPRESS, IMPLIED OR STATUTORY, INCLUDING ACCURACY OR COMPLETENESS. TI DISCLAIMS ANY WARRANTY OF TITLE AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUIET ENJOYMENT, QUIET POSSESSION, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS WITH REGARD TO TI REFERENCE DESIGNS OR USE THEREOF. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY BUYERS AGAINST ANY THIRD PARTY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON A COMBINATION OF COMPONENTS PROVIDED IN A TI REFERENCE DESIGN. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES, HOWEVER CAUSED, ON ANY THEORY OF LIABILITY AND WHETHER OR NOT TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, ARISING IN ANY WAY OUT OF TI REFERENCE DESIGNS OR BUYER’S USE OF TI REFERENCE DESIGNS.

TI reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques for TI components are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

Reproduction of significant portions of TI information in TI data books, data sheets or reference designs is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards that anticipate dangerous failures, monitor failures and their consequences, lessen the likelihood of dangerous failures and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in Buyer’s safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed an agreement specifically governing such use.

Only those TI components that TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components that have ***not*** been so designated is solely at Buyer's risk, and Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2015, Texas Instruments Incorporated