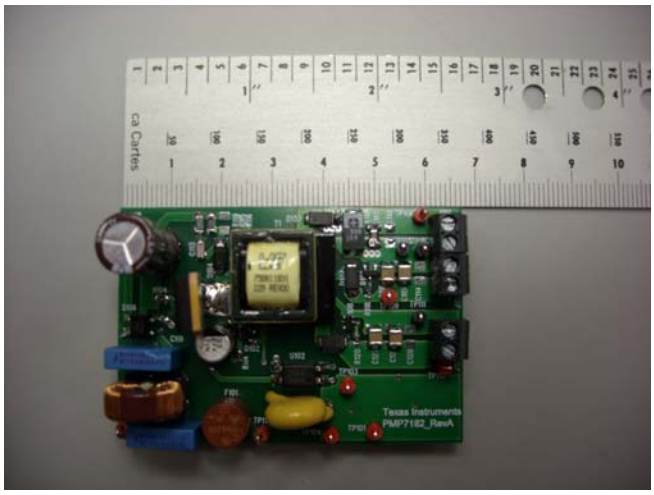
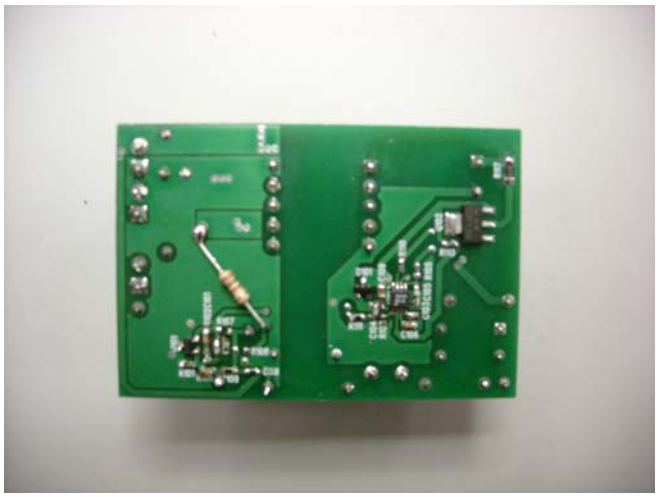
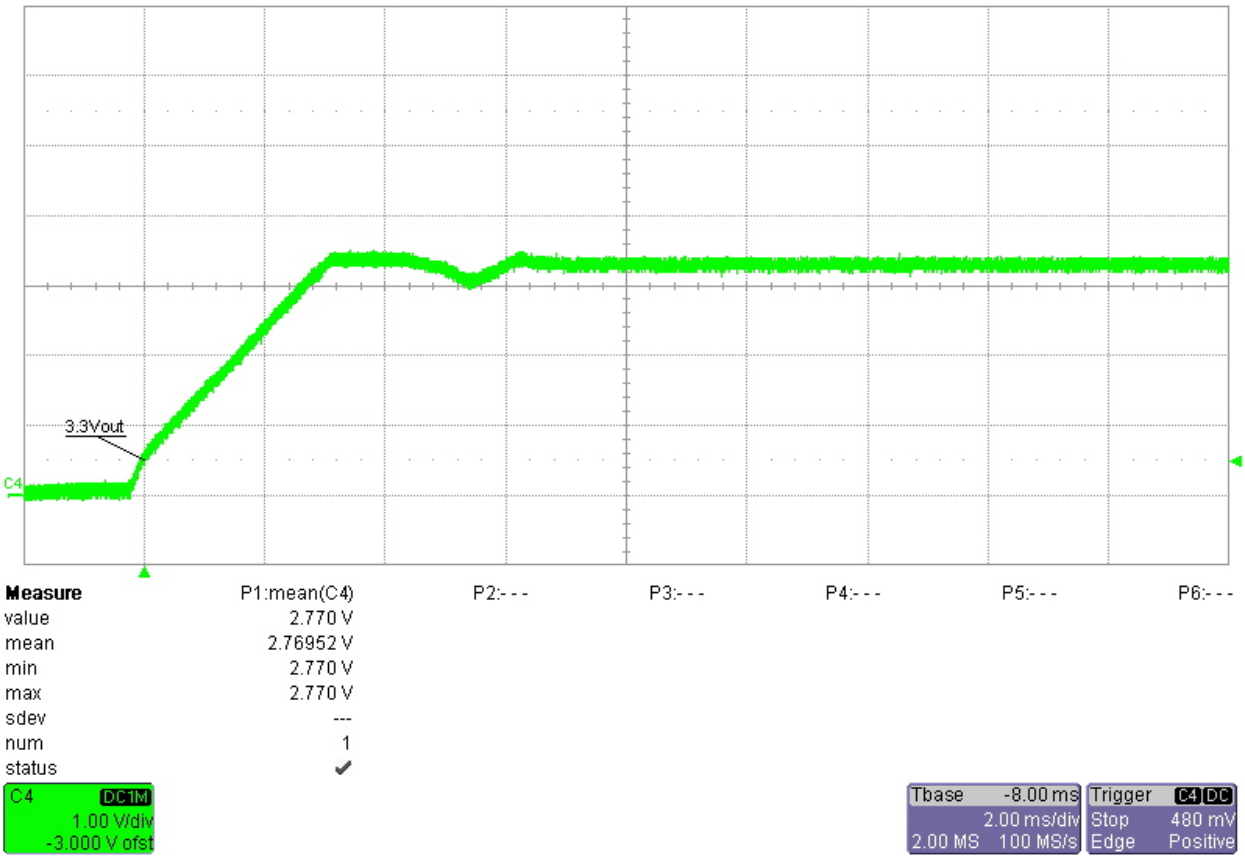


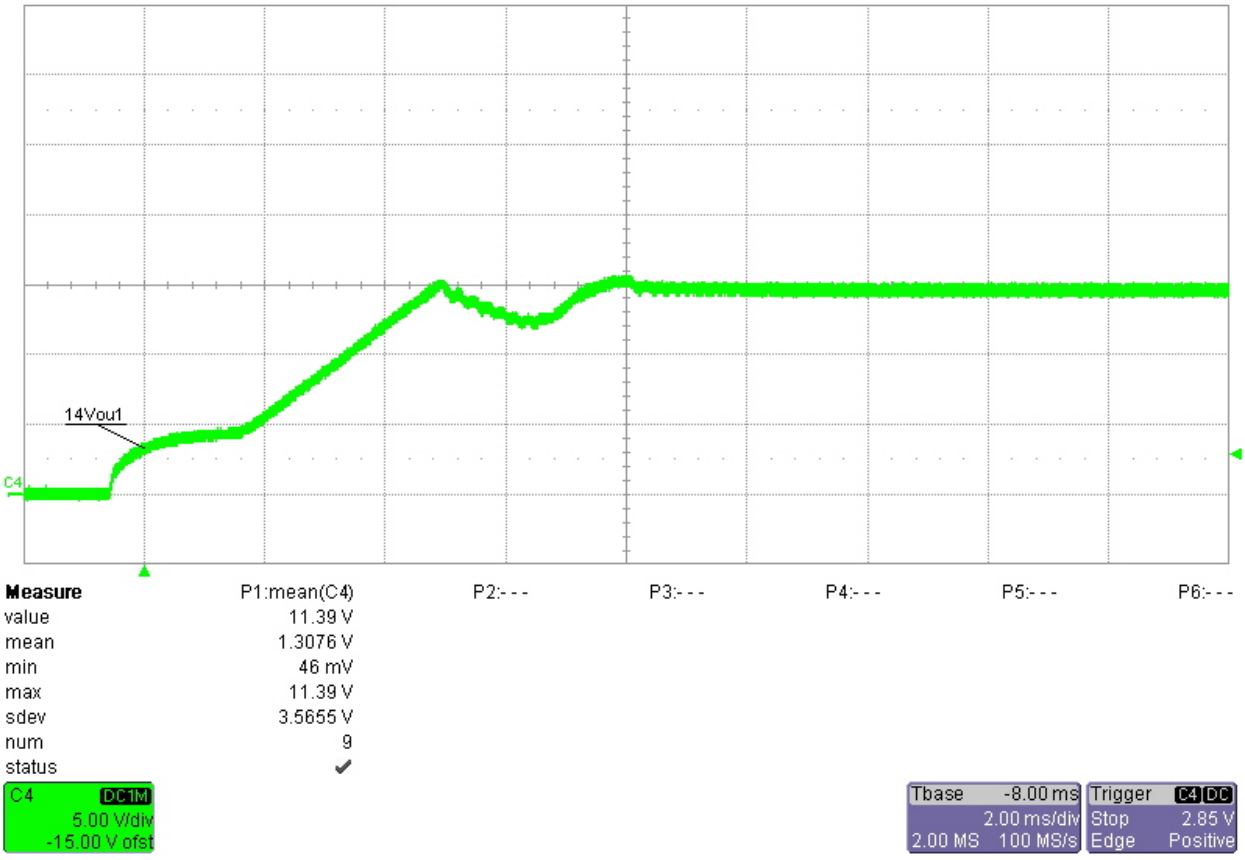


1 Startup

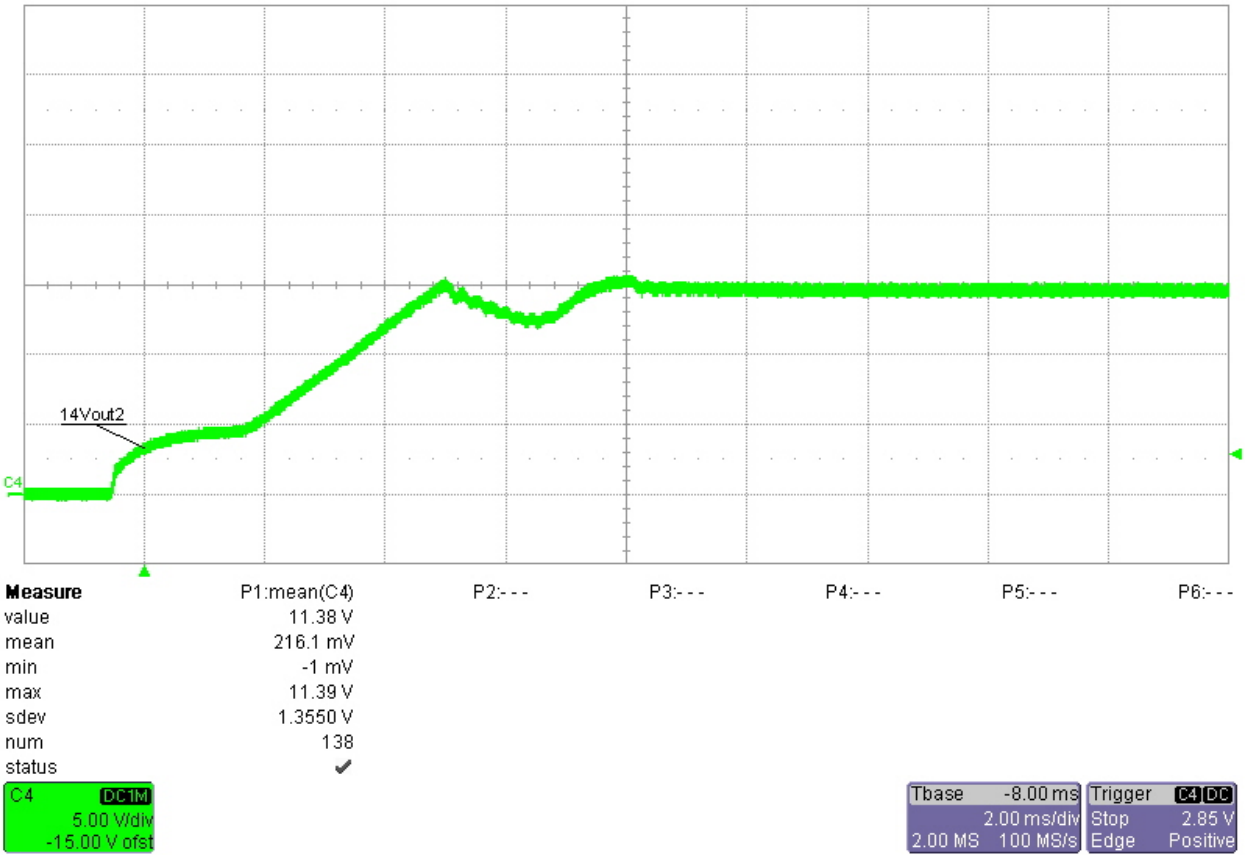
3.3V output
Input voltage = 325VDC
Load current = 0.2A



14V output 1
Input voltage = 325VDC
Load current = 0.1A

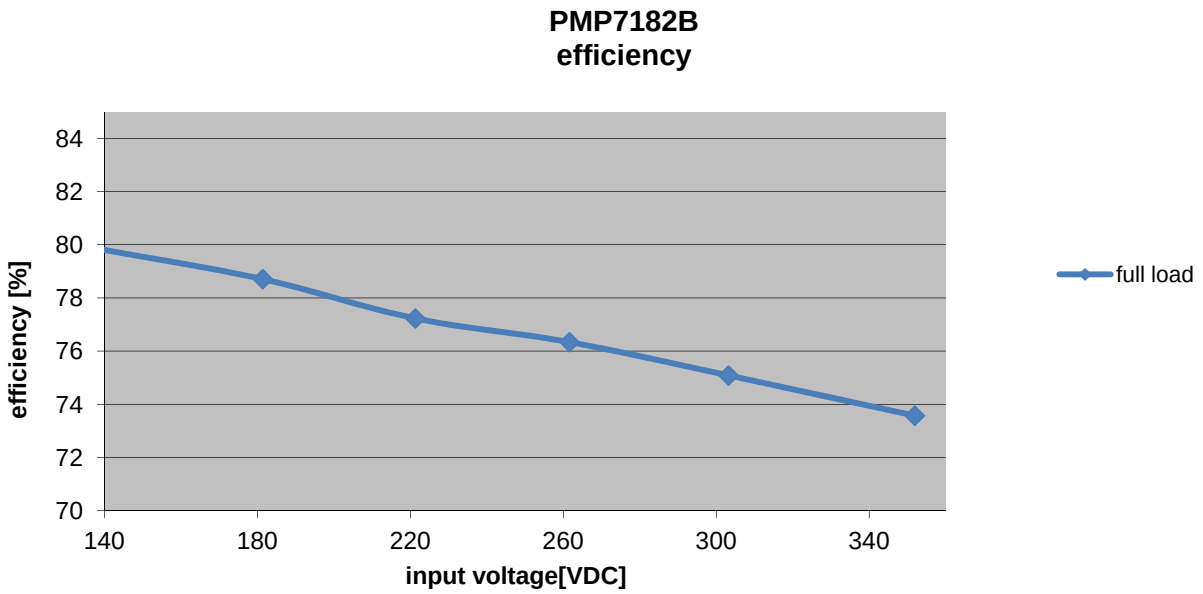


14V output 2
Input voltage = 325VDC
Load current = 0.1A



2 Efficiency

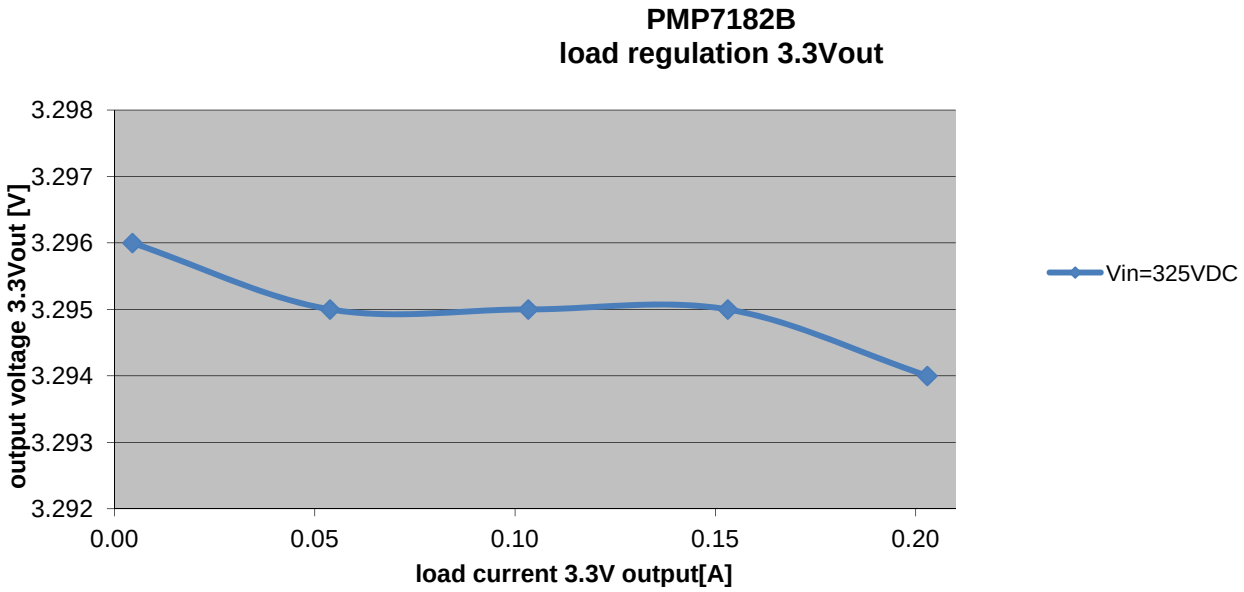
Efficiency for DC input voltage



input		output 3.3V		output1 14V		output2 14V		efficieny
voltage [V]	current [A]	3.3Vout [V]	I[A]	14Vout1 [V]	I[A]	14Vout2 [V]	I[A]	
139.700	0.0323	3.2940	0.2027	14.5000	0.1009	14.4900	0.1015	79.8
181.400	0.0252	3.2940	0.2027	14.4900	0.1011	14.4800	0.1012	78.7
221.300	0.0210	3.2930	0.2026	14.4600	0.1012	14.4400	0.1010	77.2
261.600	0.0180	3.2930	0.2027	14.4600	0.1013	14.4500	0.1012	76.3
303.200	0.0158	3.2940	0.2027	14.4700	0.1013	14.4600	0.1012	75.1
351.900	0.0139	3.2940	0.2028	14.4700	0.1013	14.4600	0.1013	73.6

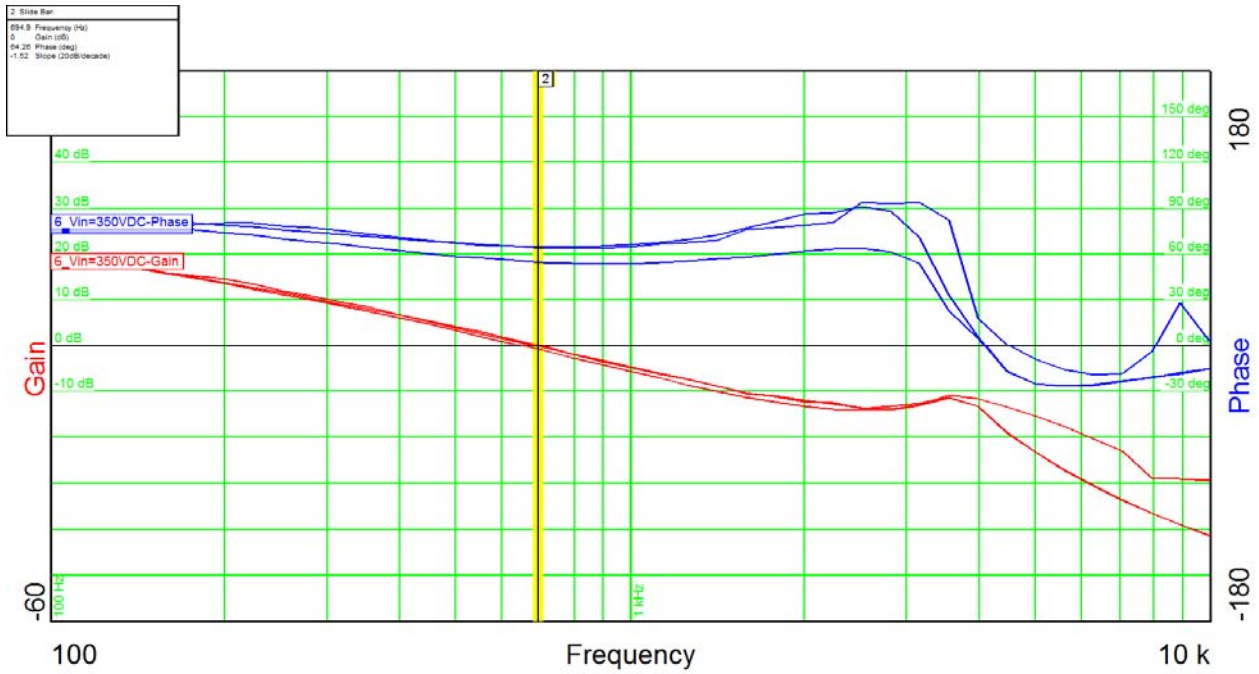
3 Load regulation 3.3V output

Load current 14Vout1 = 0.1A
Load current 14Vout2 = 0.1A



input		output 3.3V		output1 14V		output2 14V		efficieny
voltage [V]	current [A]	3.3Vout [V]	I[A]	14Vout1 [V]	I[A]	14Vout2 [V]	I[A]	
325.200	0.0105	3.2960	0.0045	13.3000	0.1011	13.3000	0.0931	76.1
325.200	0.0122	3.2950	0.0538	13.9700	0.1012	13.9700	0.0978	74.5
325.200	0.0132	3.2950	0.1033	14.1900	0.1013	14.1800	0.0993	74.2
325.200	0.0141	3.2950	0.1531	14.3500	0.1013	14.3400	0.1004	74.1
325.200	0.0149	3.2940	0.2029	14.4700	0.1030	14.4600	0.1012	74.8

4 Control Loop Frequency Response



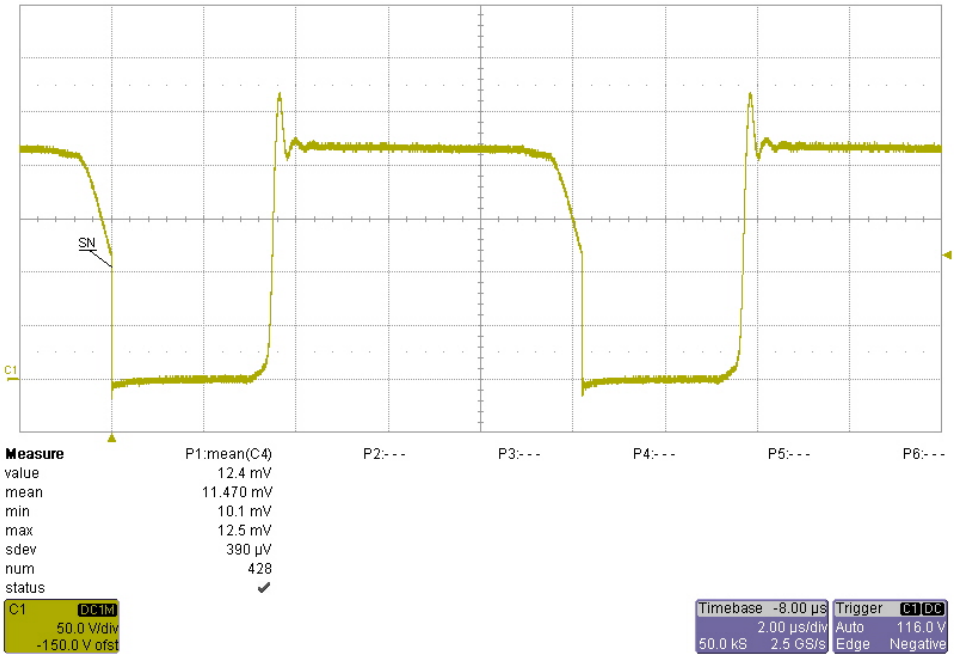
Input voltage = 140VDC
Phase margin = 56°
Bandwidth = 0.65 kHz

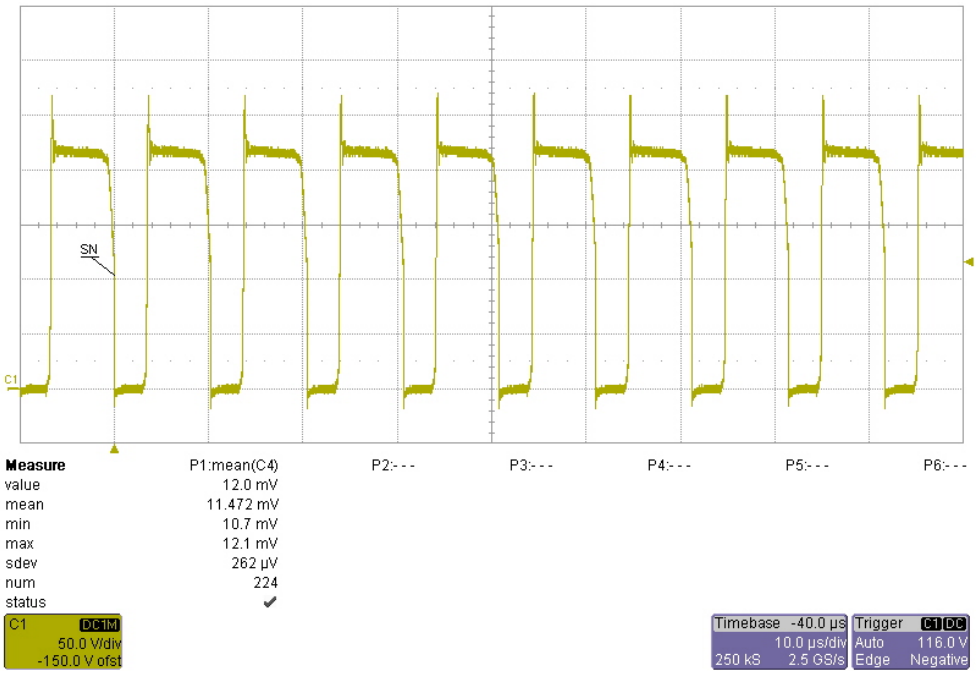
Input voltage = 240VDC
Phase margin = 64°
Bandwidth = 0.7 kHz

Input voltage = 350VDC
Phase margin = 65°
Bandwidth = 0.68 kHz

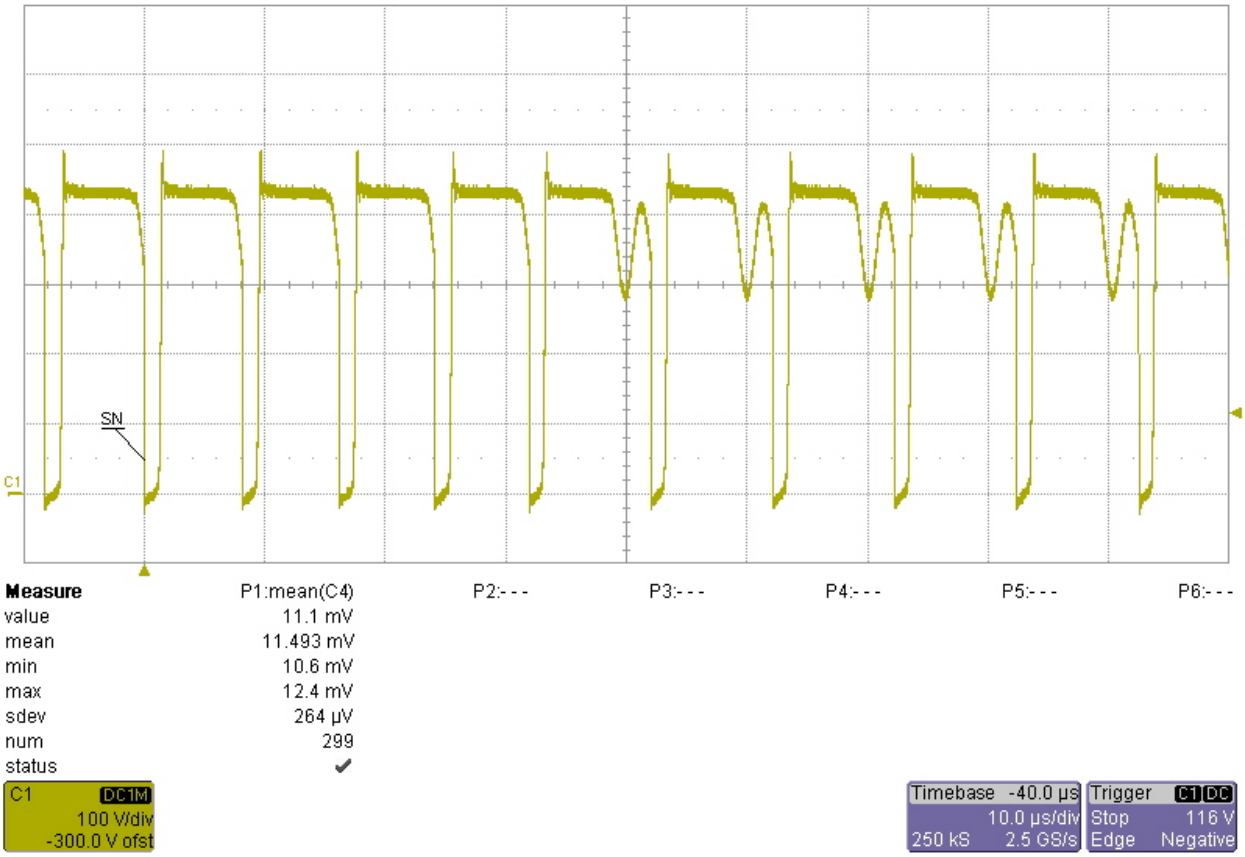
5 Switch node Waveform

Input voltage = 140VDC
Load current = full load





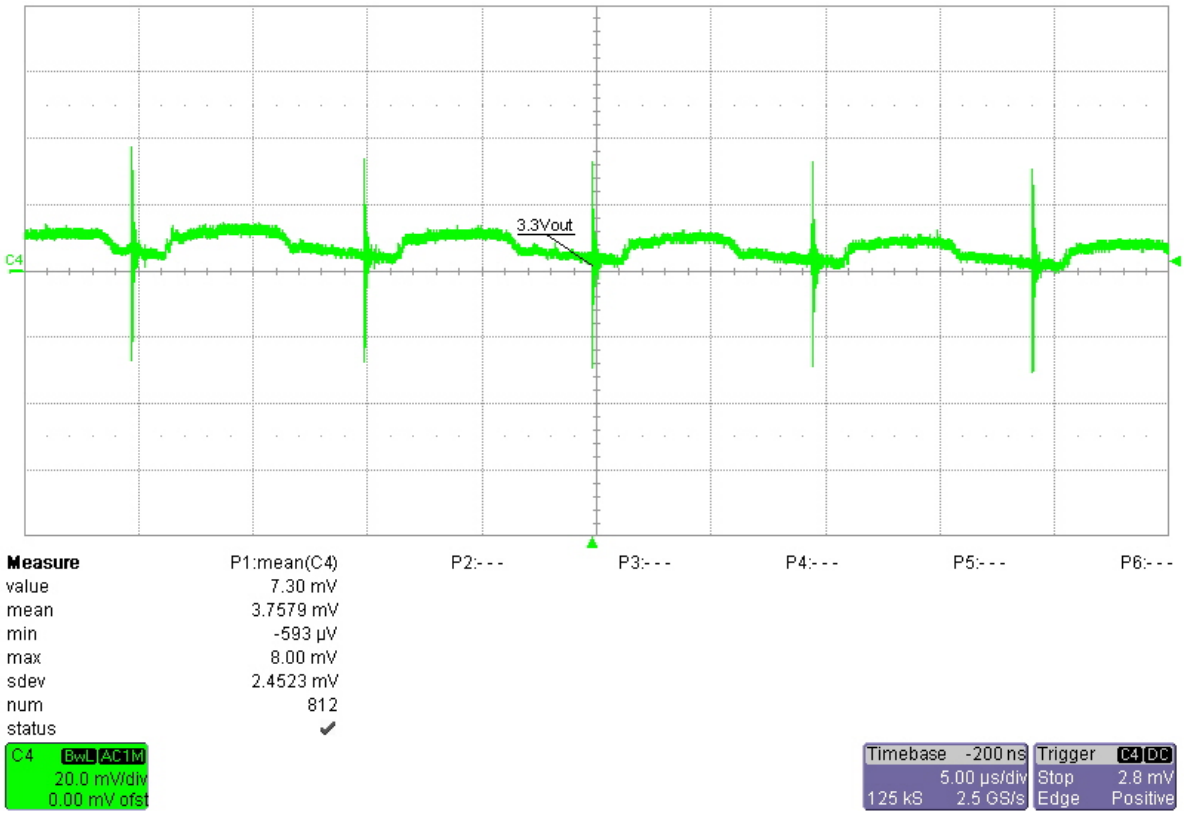
Input voltage = 350VDC
Load current = full load

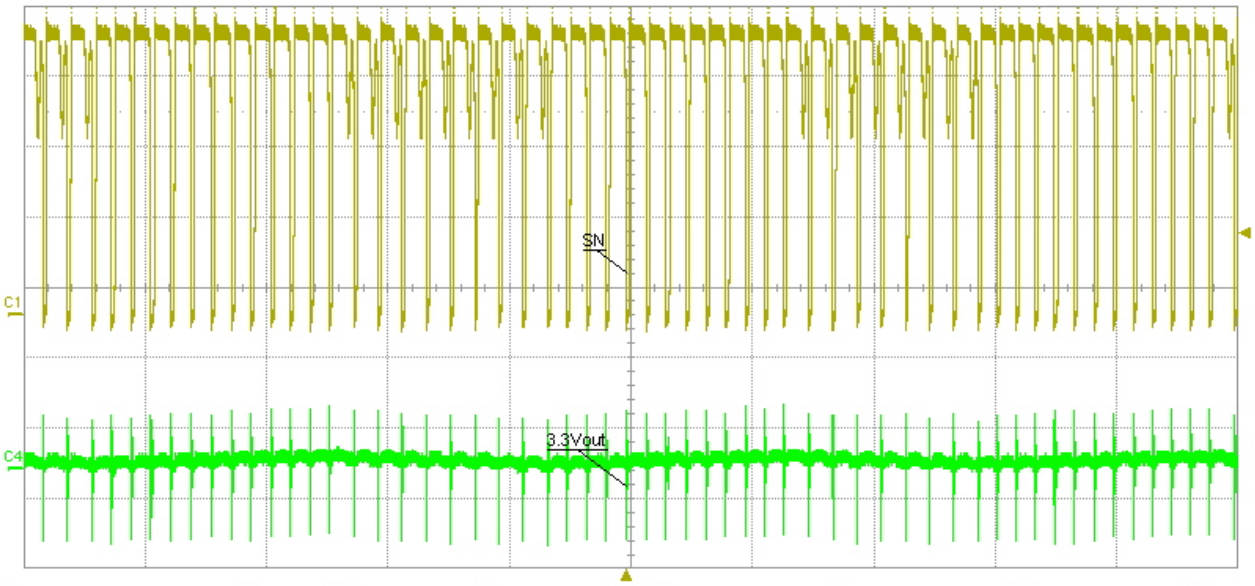


6 Output ripple voltage

6.1 3.3V output

Input voltage = 325VDC
Load current 3.3Vout = 0.2A
Load current 14Vout1 = 0.1A
Load current 14Vout2 = 0.1A

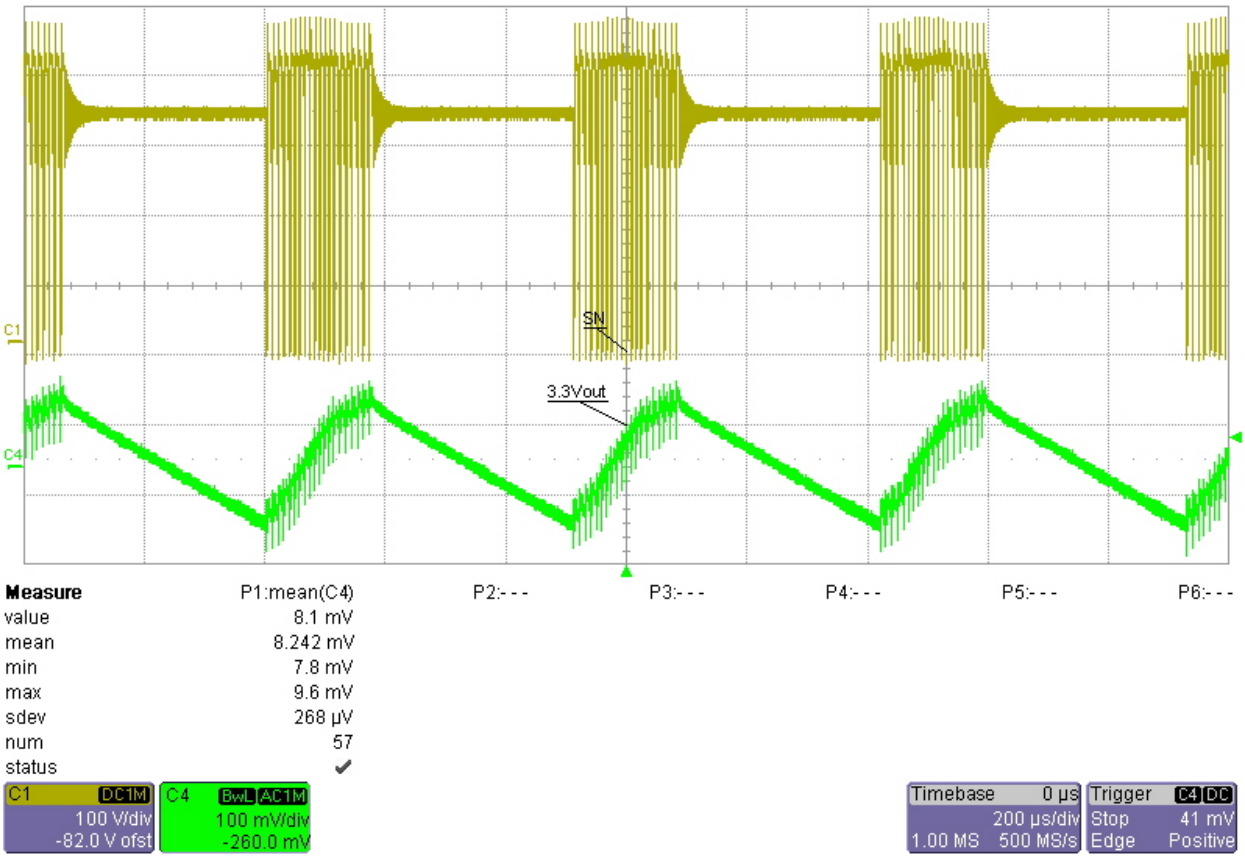




Measure	P1:mean(C4)	P2:- - -	P3:- - -	P4:- - -	P5:- - -	P6:- - -
value	10.5 mV					
mean	< 10.809 mV					
min	< 9.6 mV					
max	< 52.8 mV					
sdev	< 2.668 mV					
num	283					
status	✔					

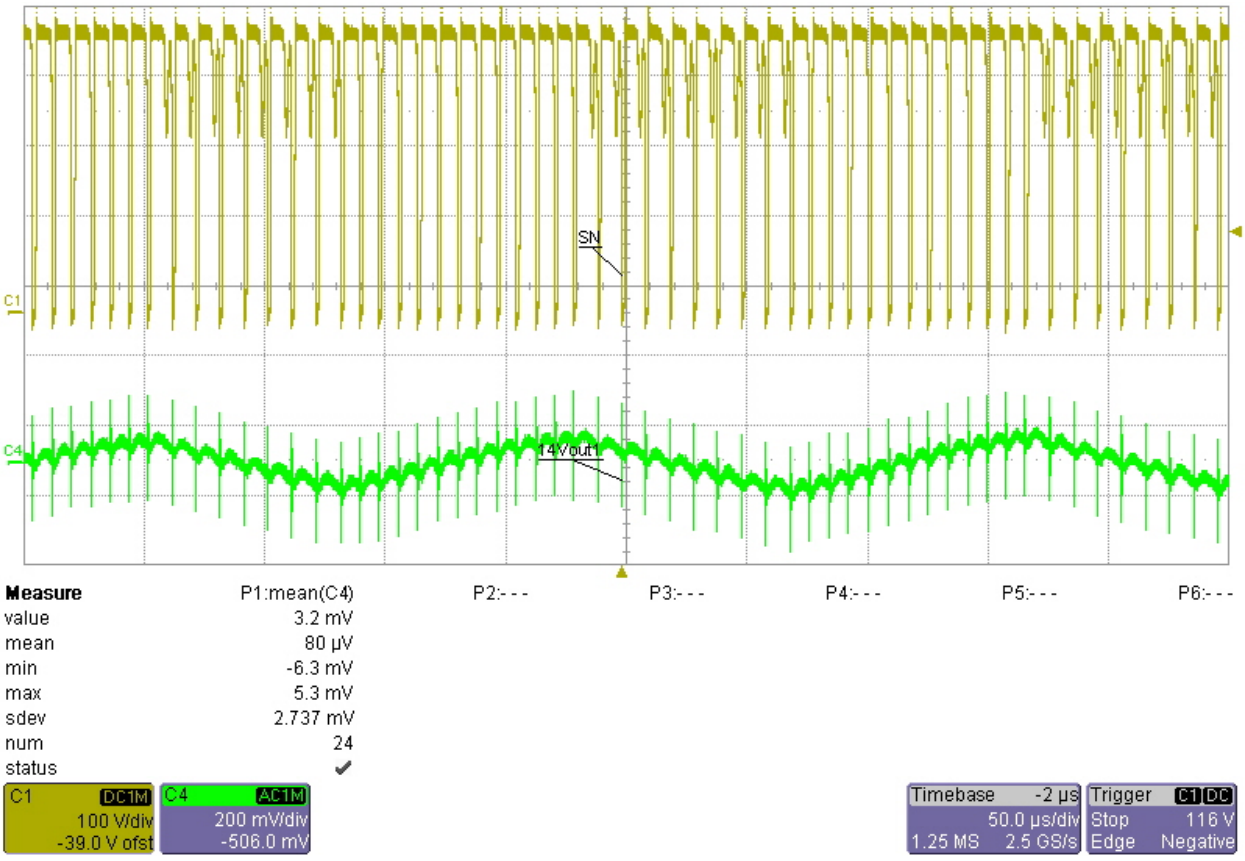
C1 DC1M 100 V/div -39.0 V ofst | C4 ACTM 100 mV/div -257.0 mV | Timebase -2 µs 50.0 µs/div 1.25 MS 2.5 GS/s | Trigger C1 DC Stop 116 V Edge Negative

Input voltage = 325VDC
Load current 3.3Vout = 0.2A
Load current 14Vout1 = 0A
Load current 14Vout2 = 0A

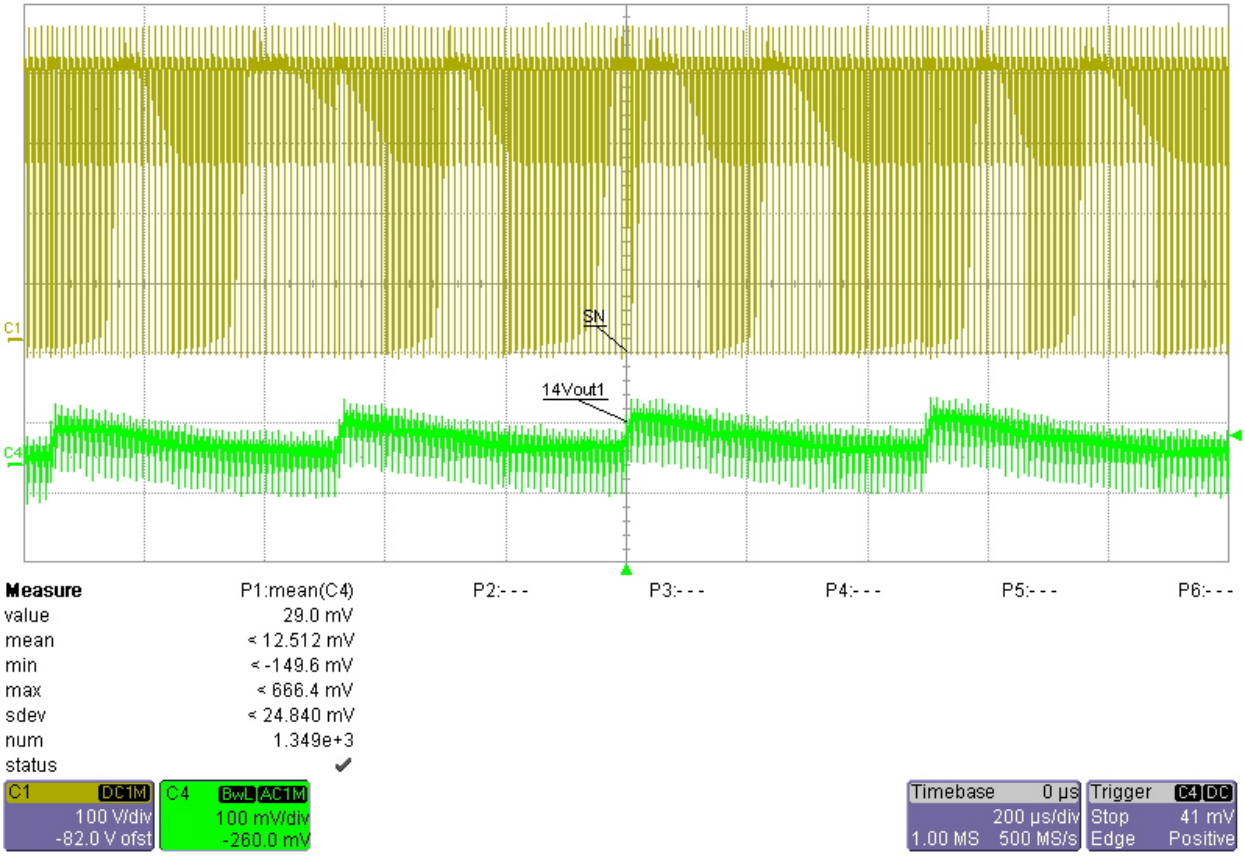


6.2 14V output1

Input voltage = 325VDC
Load current 3.3Vout = 0.2A
Load current 14Vout1 = 0.1A
Load current 14Vout2 = 0.1A

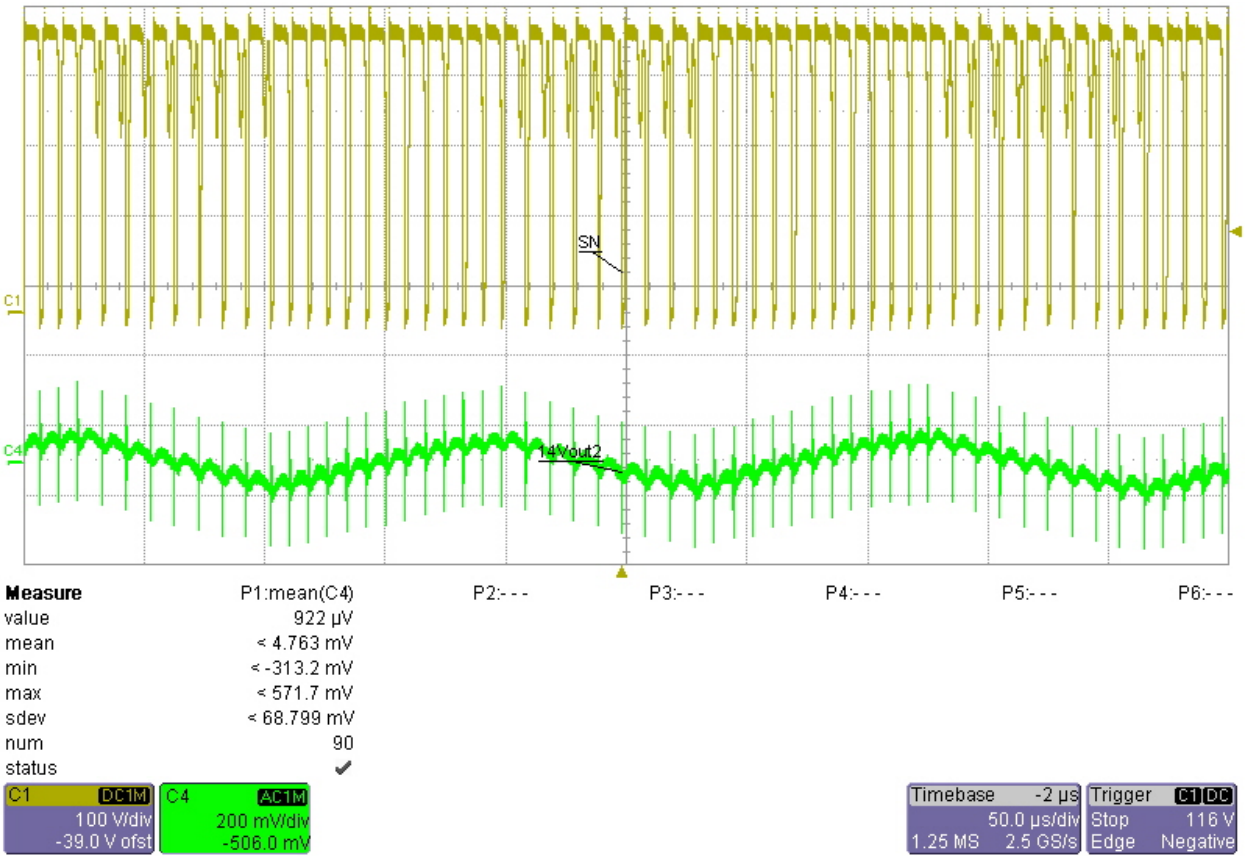


Input voltage = 325VDC
Load current 3.3Vout = 0A
Load current 14Vout1 = 0.1A
Load current 14Vout2 = 0.1A

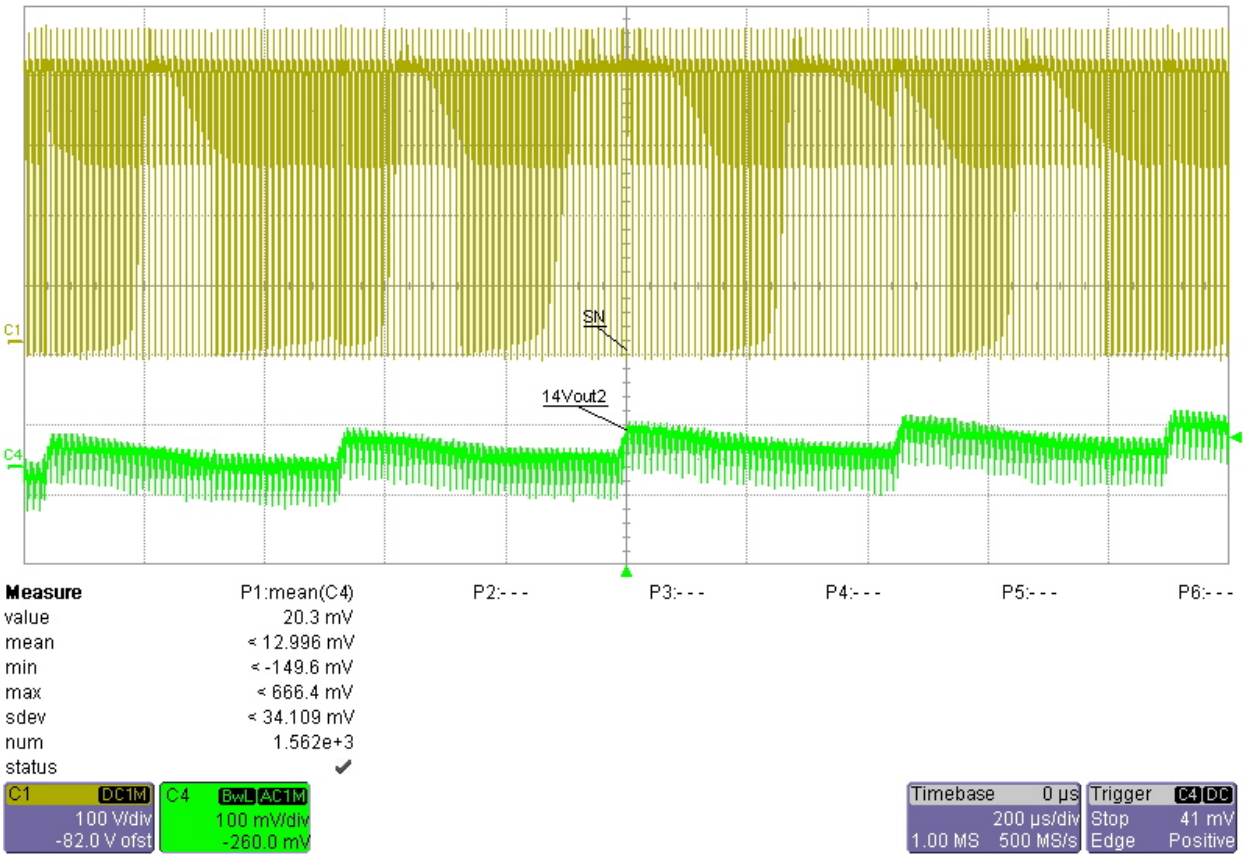


6.3 14V output2

Input voltage = 325VDC
Load current 3.3Vout = 0.2A
Load current 14Vout1 = 0.1A
Load current 14Vout2 = 0.1A

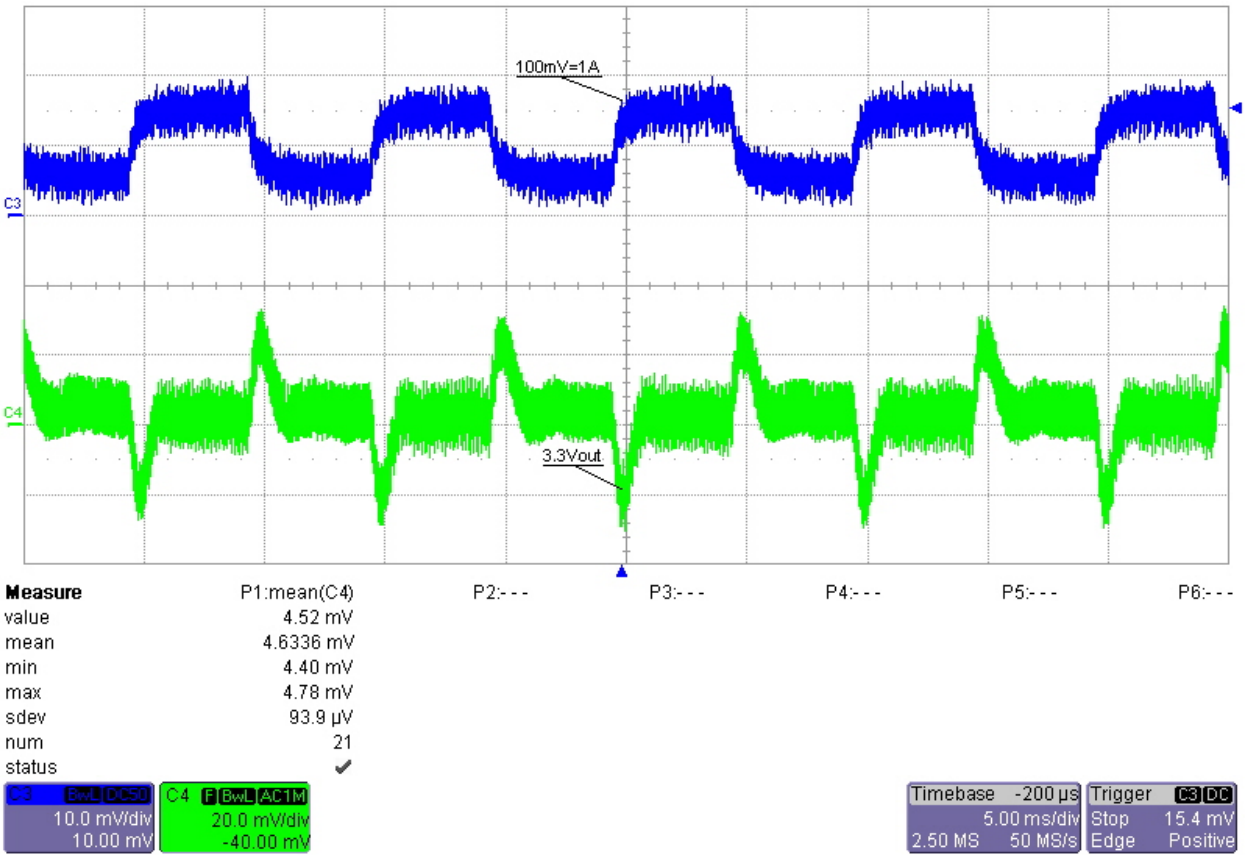


Input voltage = 325VDC
Load current 3.3Vout = 0A
Load current 14Vout1 = 0.1A
Load current 14Vout2 = 0.1A



7 Load Transients

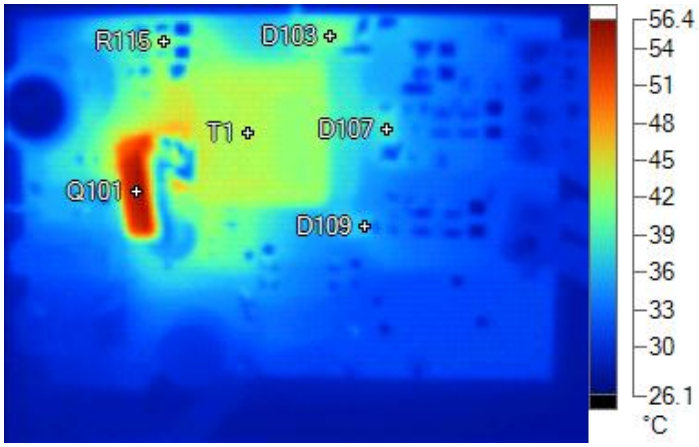
3.3V output
Input voltage = 325VDC
Load current = 0.05A to 0.2A



8 Thermal Analysis

The images below show the infrared images taken from the FlexCam after 15min at full load.

Input voltage = 350VDC
Ambient temperature = 25°C



Name	Temperature	
Q101	54.8°C	
T1	43.4°C	
D103	41.3°C	
D109	36.4°C	
D107	38.4°C	
R115	42.8°C	

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°C 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.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve 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 (also referred to herein as “components”) 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 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.

TI does not warrant or represent that any license, either express or implied, is granted under 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.

Reproduction of significant portions of TI information in TI data books or data sheets 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.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

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 which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm 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 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 a special agreement specifically governing such use.

Only those TI components which 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 which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components which meet ISO/TS16949 requirements, mainly for automotive use. Components which have not been so designated are neither designed nor intended for automotive use; and TI will not be responsible for any failure of such components to meet such requirements.

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265