Texas Instruments

PMP4320A Test Report

China Power Reference Design

REVA

03/03/2014

1 General

1.1 PURPOSE

Provide the detailed data for evaluating and verifying the PMP4320A.
The PMP4320A is a single output DC-DC converter with standard half-brick outline and full digital controlling configuration (UCD3138). It could deliver 50A output current with 12V output voltage. The converter could provide high efficiency and good performance, which makes it an ideal choice for bus converter. For testing applications, a heat sink and sufficient airflow cooling is required.

1.2 REFERENCE DOCUMENTATION

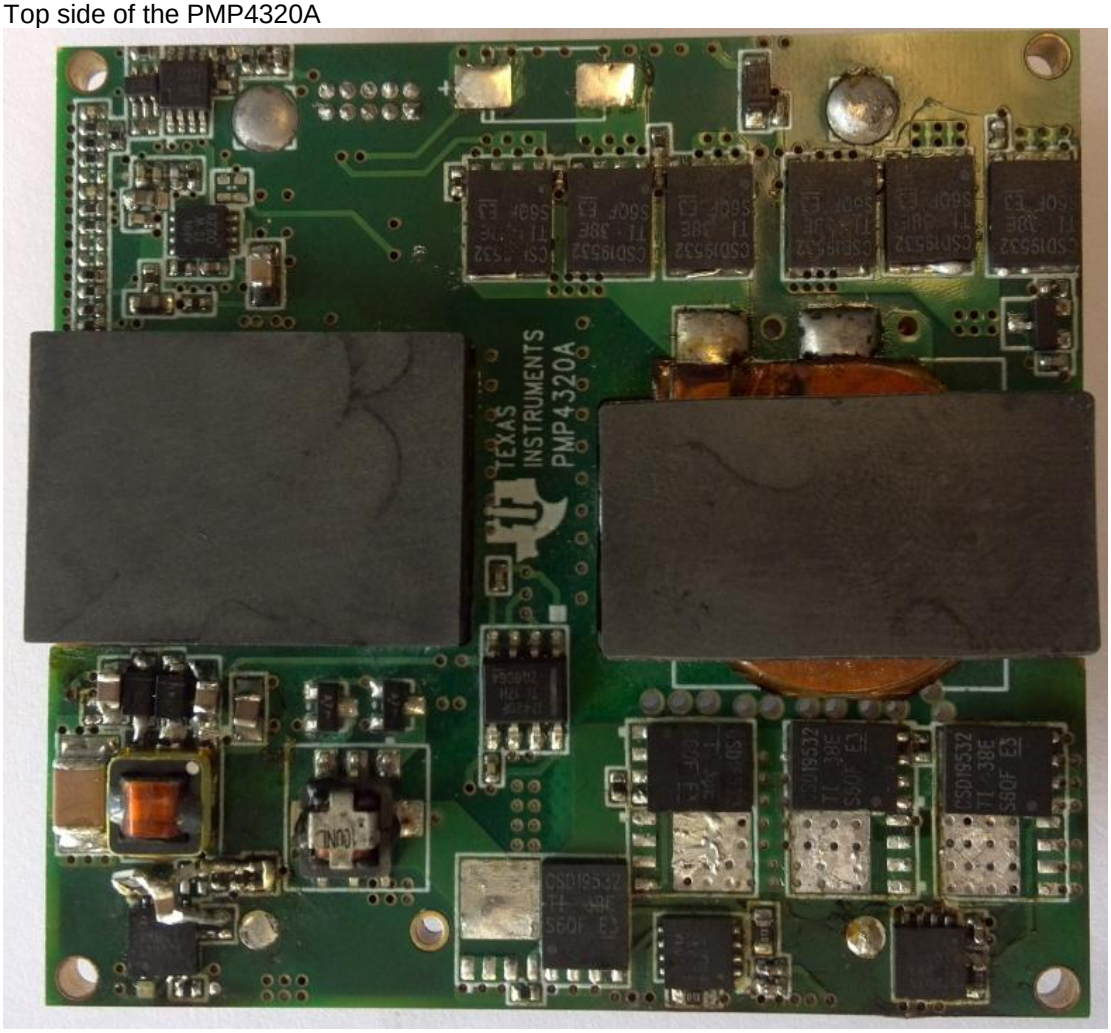
Schematics: PMP4320A_SCH_Final.pdf
PCB Layout: PMP4320A_PCB_Final.pdf

1.3 TEST EQUIPMENTS

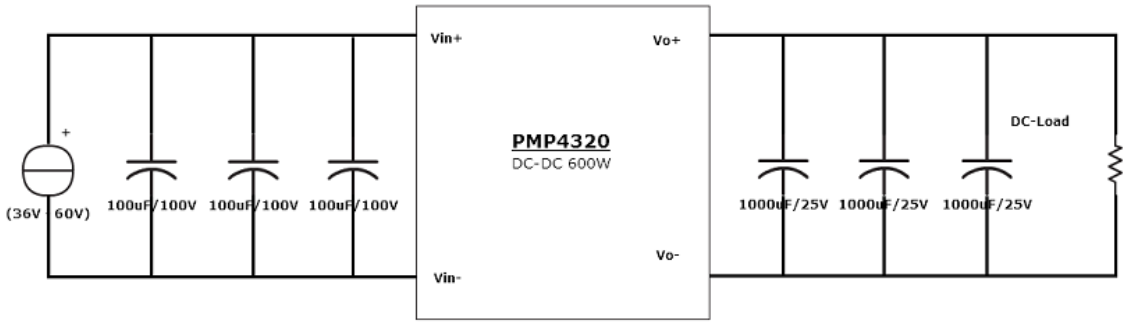
Multi-meter: Fluke 187
DC Source: LAMBDA
E-Load: Chroma 6314A
Ambient Temperature at 25DegC

1.3 TEST Setup Photos

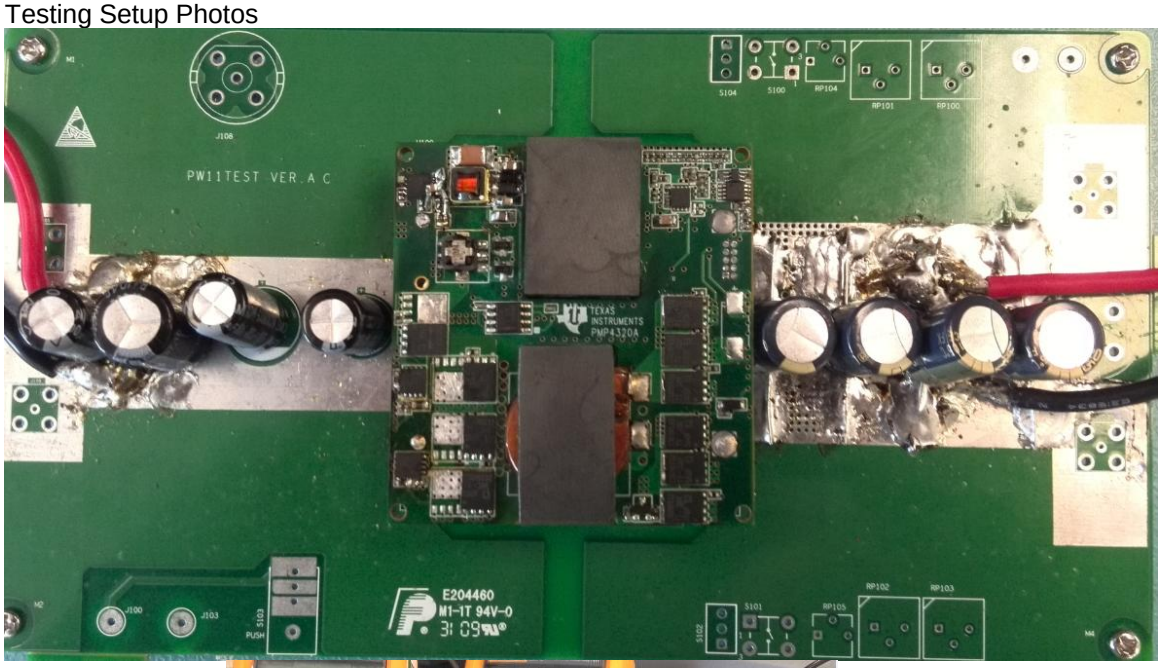
Top side of the PMP4320A

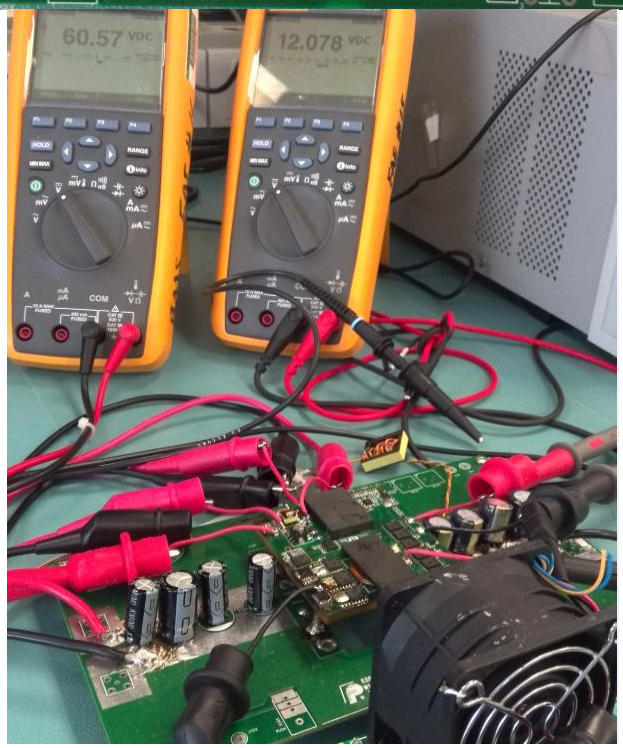


Input Ripple & Output Ripple & Noise Test Configuration



Testing Setup Photos



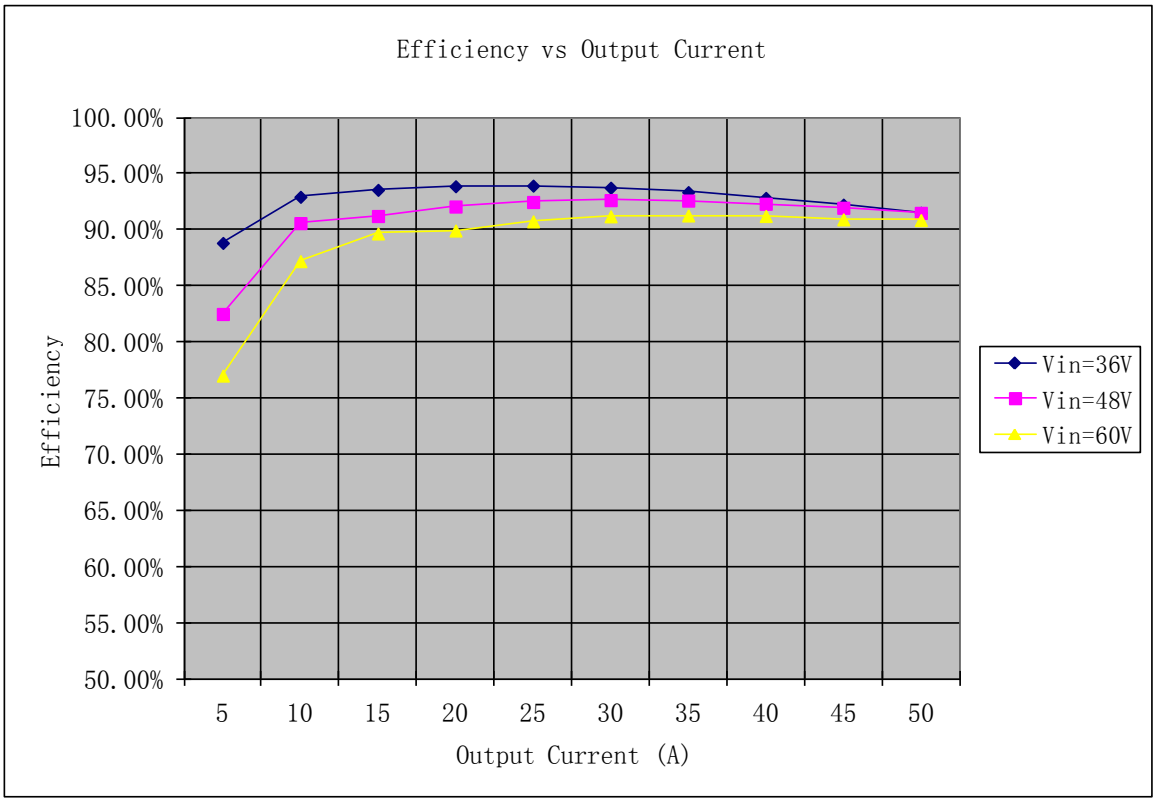


2 INPUT & OUTPUT CHARACTERISTICS

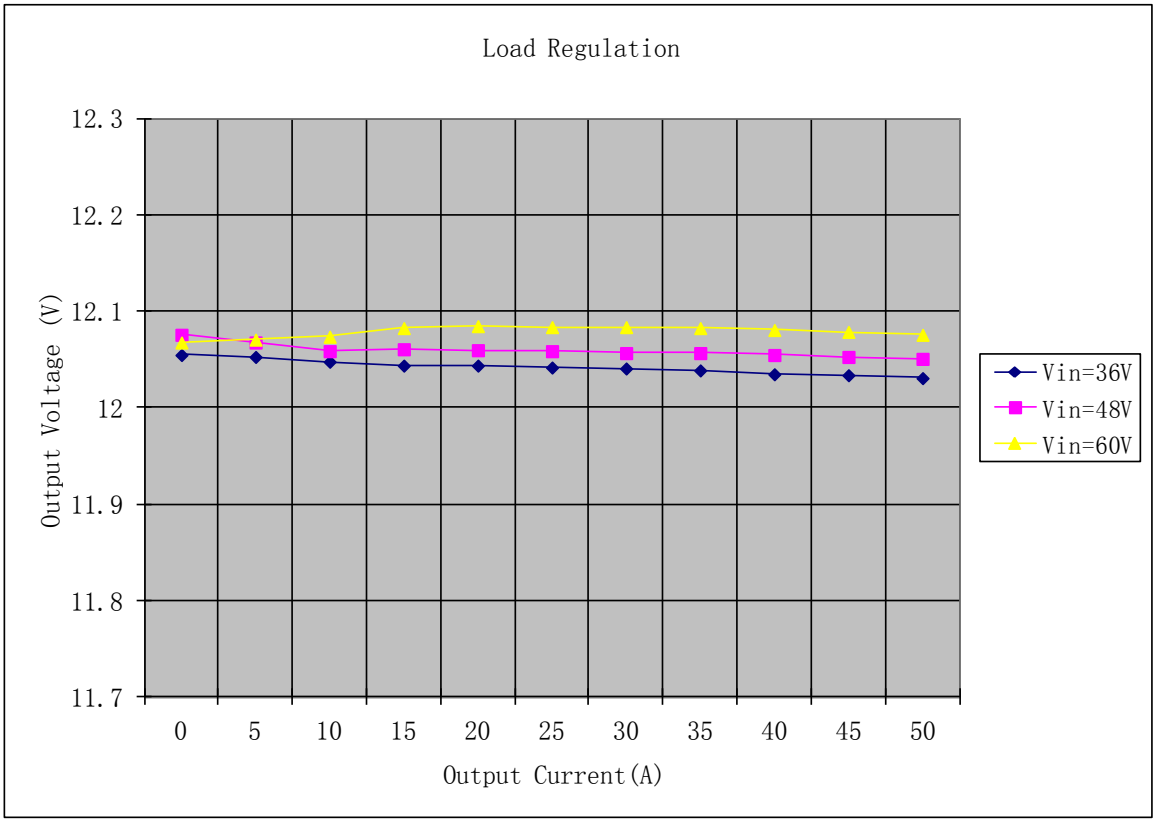
2.1 Efficiency & Regulation

36V Input					
Vin (V)	**Iin (A)**	**Vout (V)**	**Iout (A)**	**Eff. (%)**	**Pass/Fail**
36.525	0.21	12.055	0	0.00%	
36.473	1.86	12.053	5	88.83%	
36.412	3.56	12.048	10	92.94%	
36.363	5.31	12.044	15	93.56%	
36.342	7.06	12.044	20	93.88%	
36.294	8.83	12.042	25	93.94%	
36.245	10.63	12.041	30	93.76%	
36.192	12.47	12.039	35	93.36%	
36.08	14.37	12.035	40	92.85%	
36.037	16.29	12.034	45	92.25%	
35.994	18.26	12.031	50	91.53%	

48V Input					
Vin (V)	**Iin (A)**	**Vout (V)**	**Iout (A)**	**Eff. (%)**	**Pass/Fail**
48.469	0.26	12.076	0	0.00%	
48.435	1.51	12.068	5	82.50%	
48.401	2.75	12.059	10	90.60%	
48.366	4.1	12.061	15	91.23%	
48.33	5.42	12.06	20	92.08%	
48.294	6.75	12.059	25	92.48%	
48.257	8.09	12.057	30	92.65%	
48.22	9.45	12.057	35	92.61%	
48.182	10.84	12.055	40	92.32%	
48.143	12.25	12.053	45	91.97%	
48.096	13.69	12.051	50	91.51%	
60V Input					
Vin (V)	**Iin (A)**	**Vout (V)**	**Iout (A)**	**Eff. (%)**	**Pass/Fail**
60.78	0.3	12.068	0	0.00%	
60.75	1.29	12.071	5	77.02%	
60.72	2.28	12.074	10	87.21%	
60.69	3.33	12.083	15	89.68%	
60.66	4.43	12.085	20	89.94%	
60.63	5.49	12.084	25	90.76%	
60.59	6.56	12.084	30	91.21%	
60.56	7.65	12.083	35	91.28%	
60.53	8.75	12.081	40	91.24%	
60.56	9.87	12.079	45	90.94%	
60.46	10.99	12.076	50	90.87%	

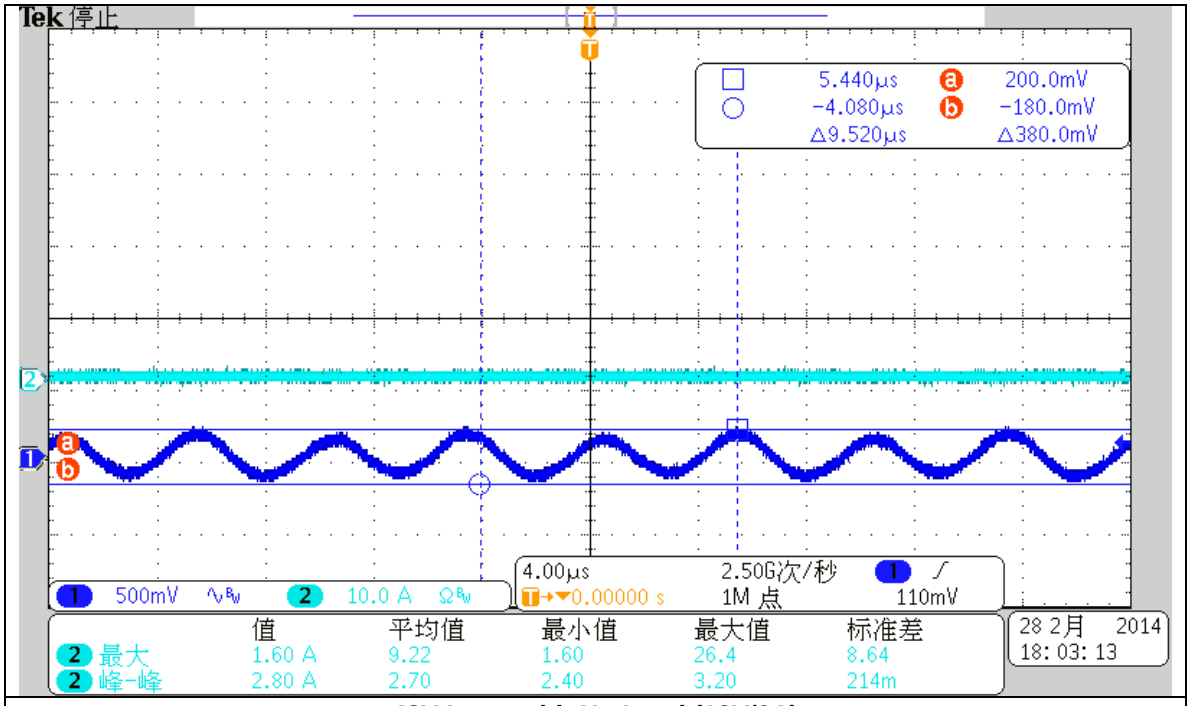


Efficiency vs Output Current

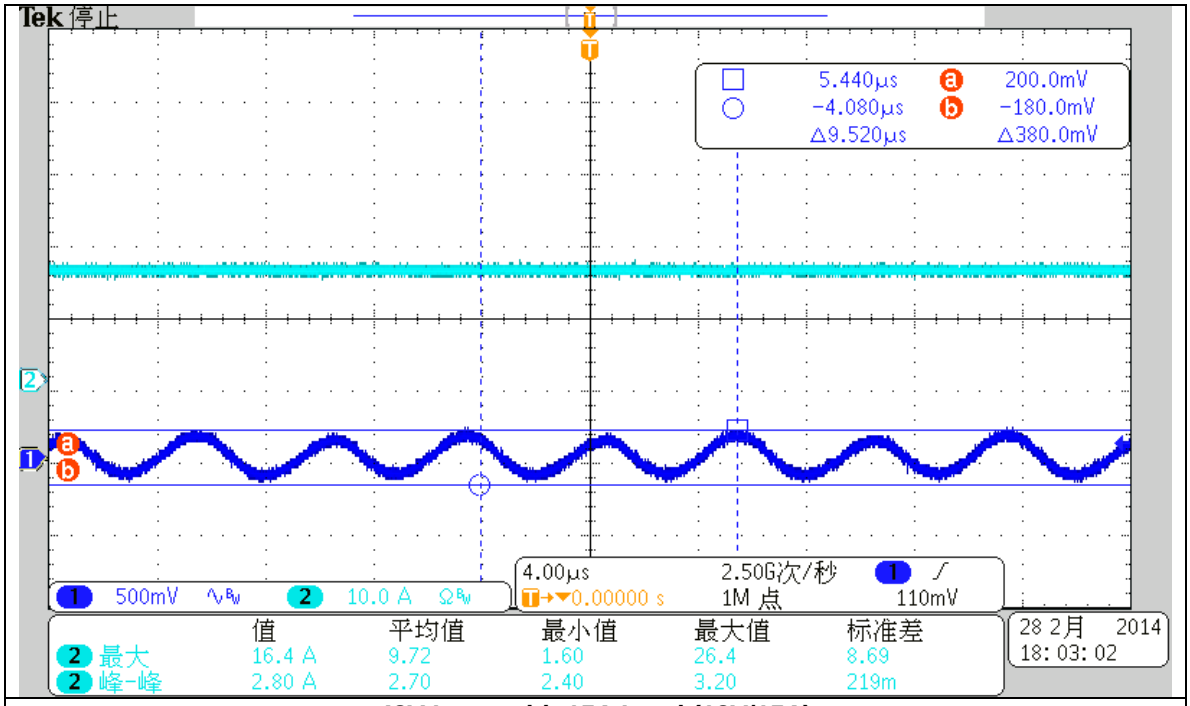


Load Regulation

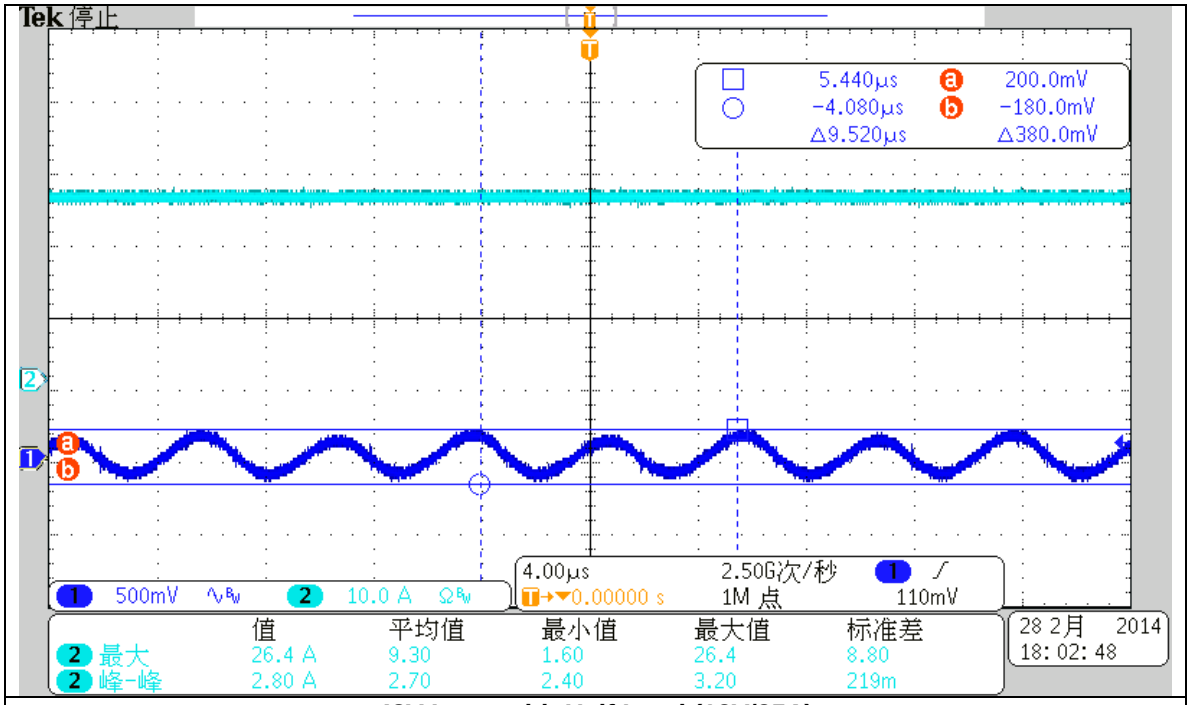
2.2 Ripple & Noise



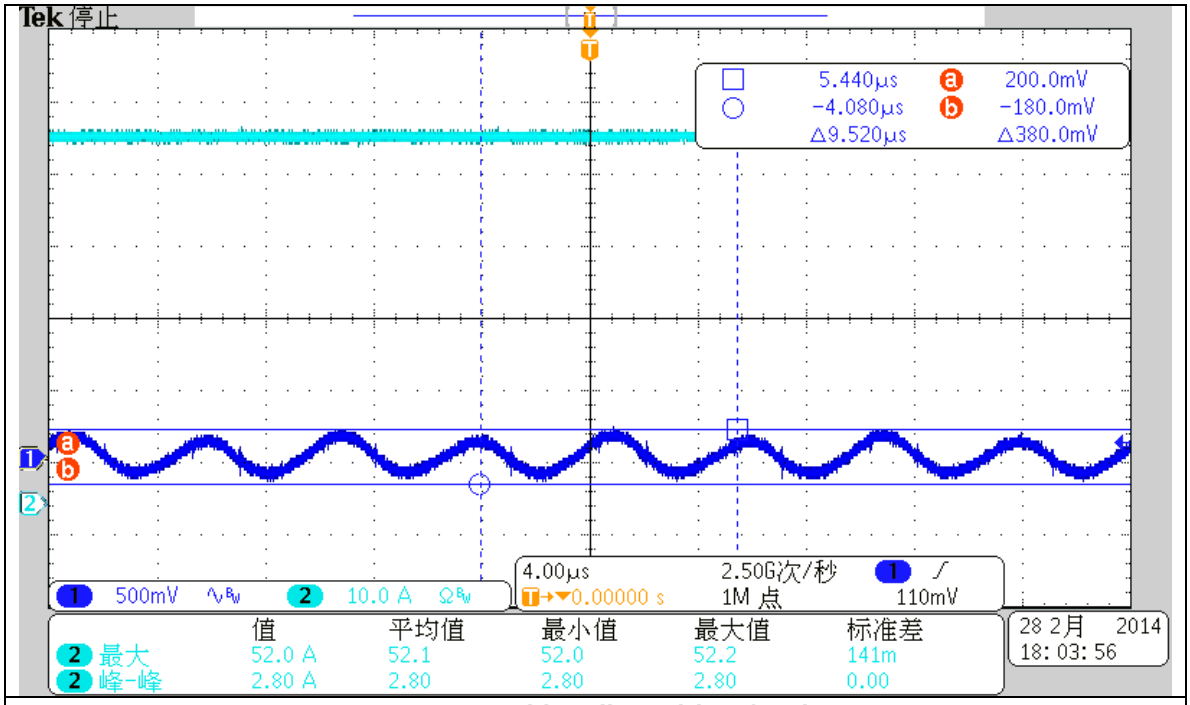
48V Input with No Load (12V/0A)



48V Input with 15A Load (12V/15A)

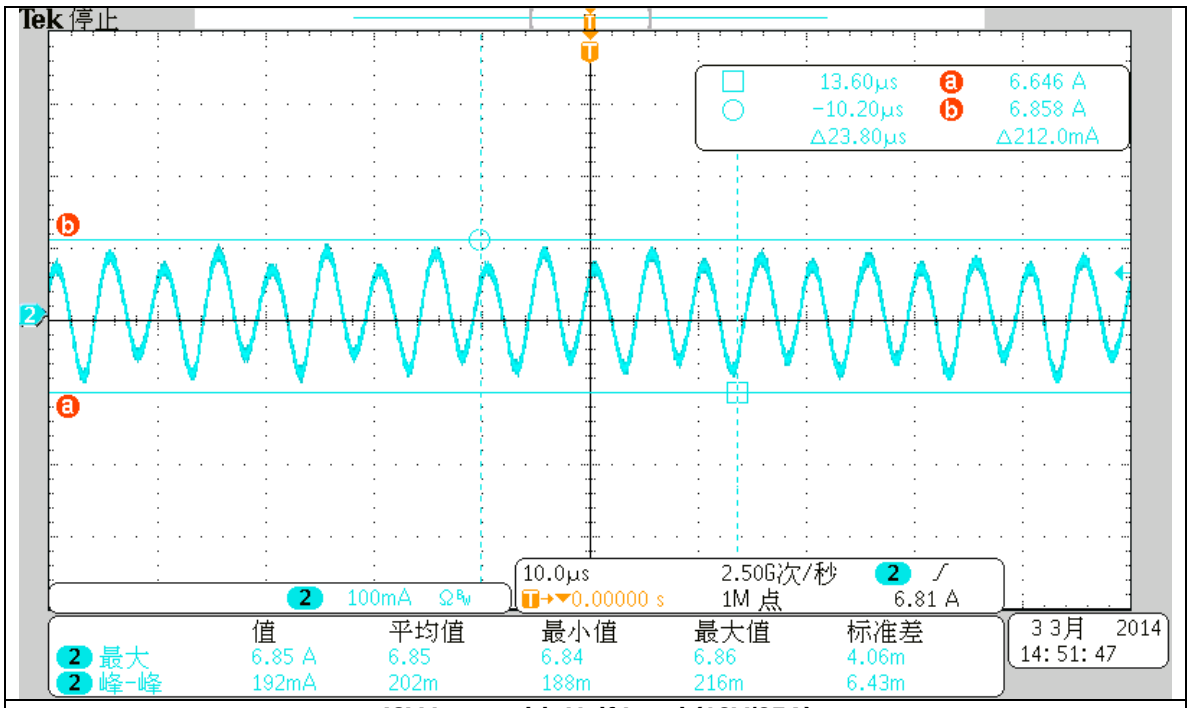


48V Input with Half Load (12V/25A)

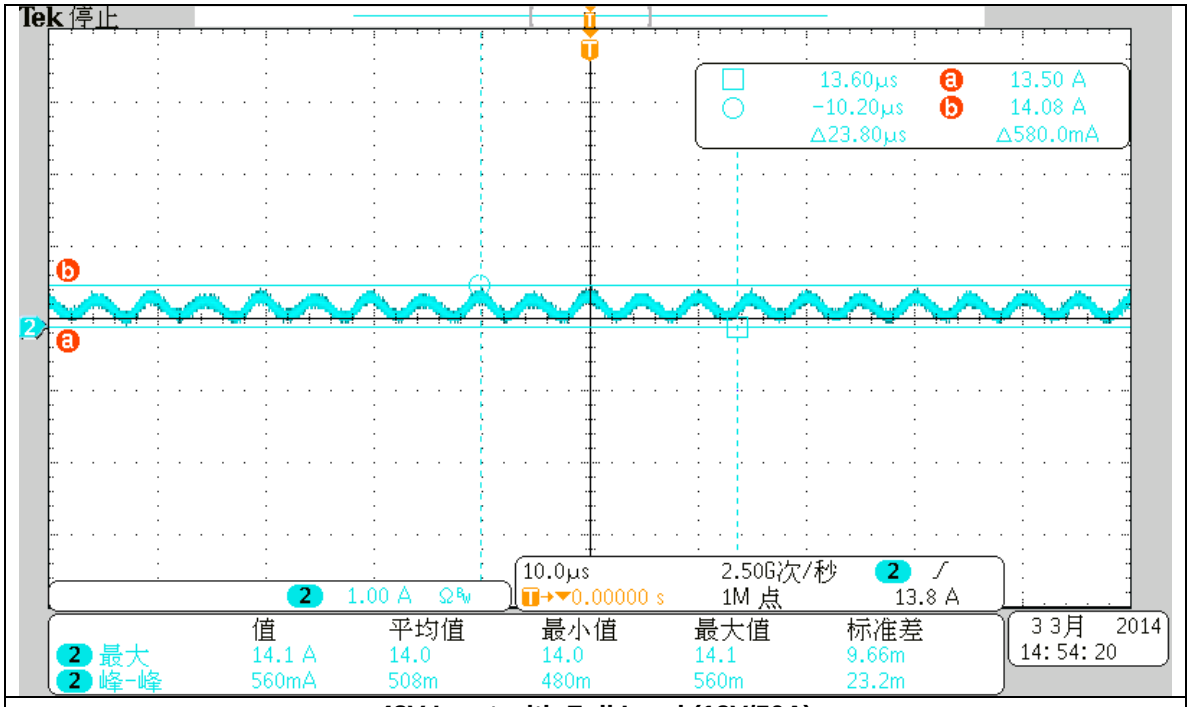


48V Input with Full Load (12V/50A)

2.3 Input Reflected Current



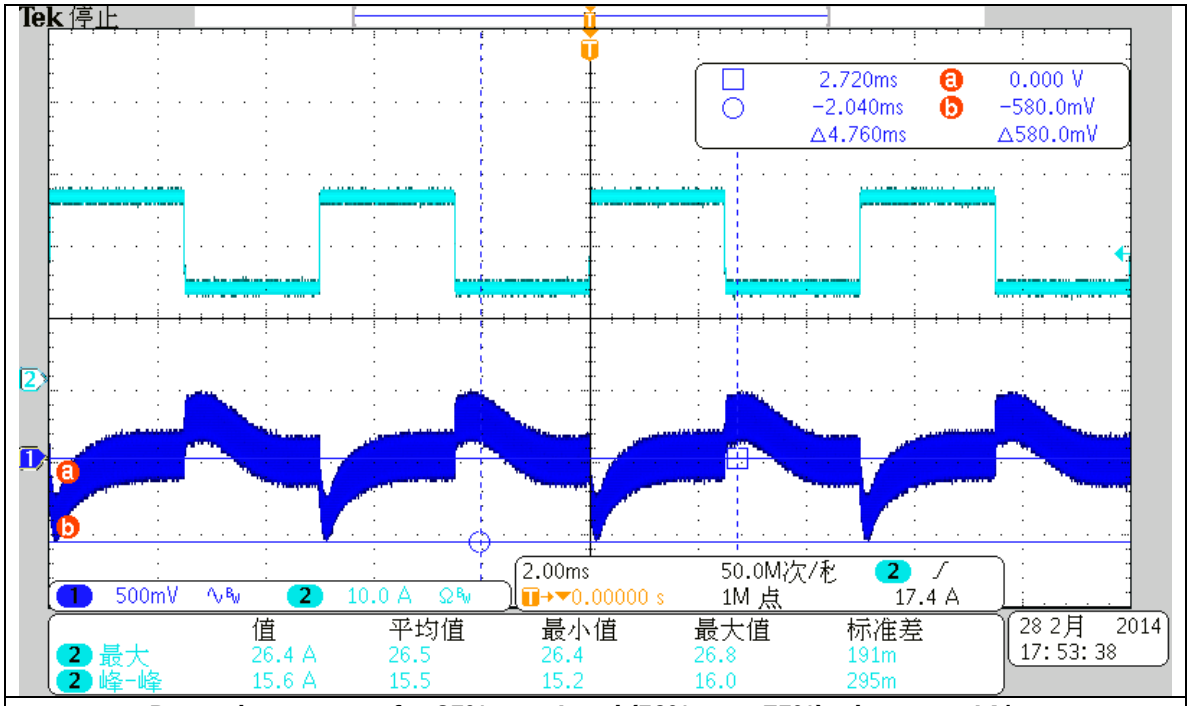
48V Input with Half Load (12V/25A)



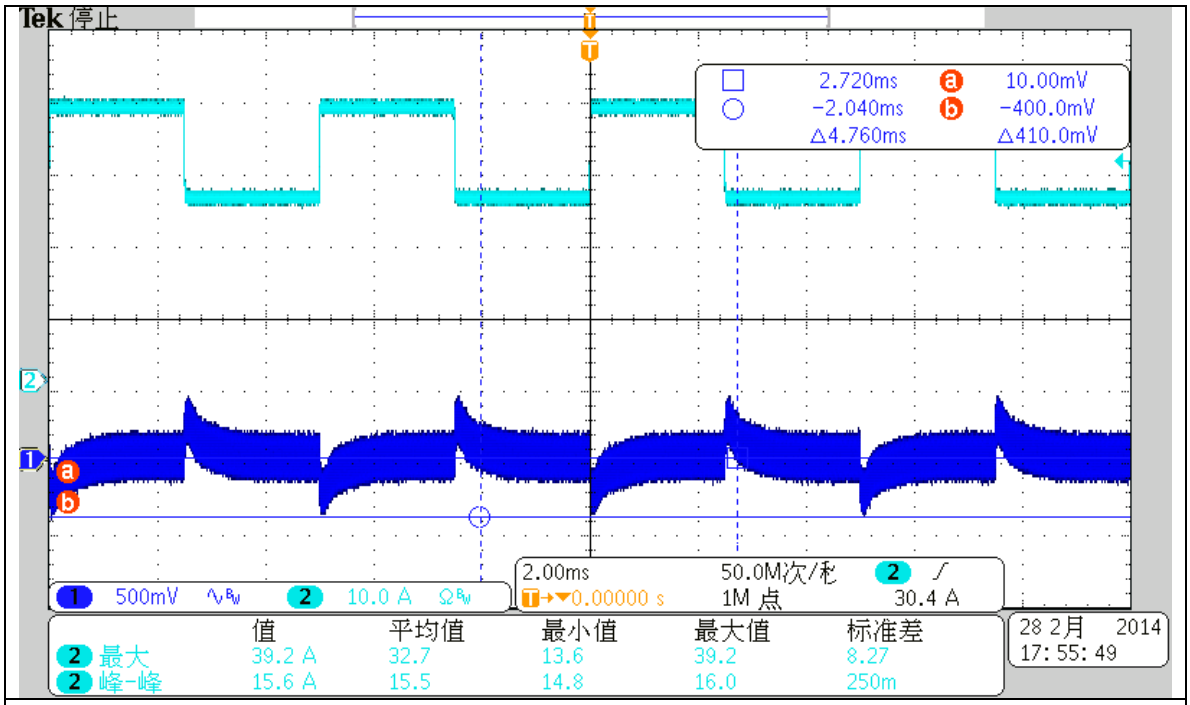
48V Input with Full Load (12V/50A)

Test point is between the DC Power Supply and the input capacitors.

2.4 Dynamic Load

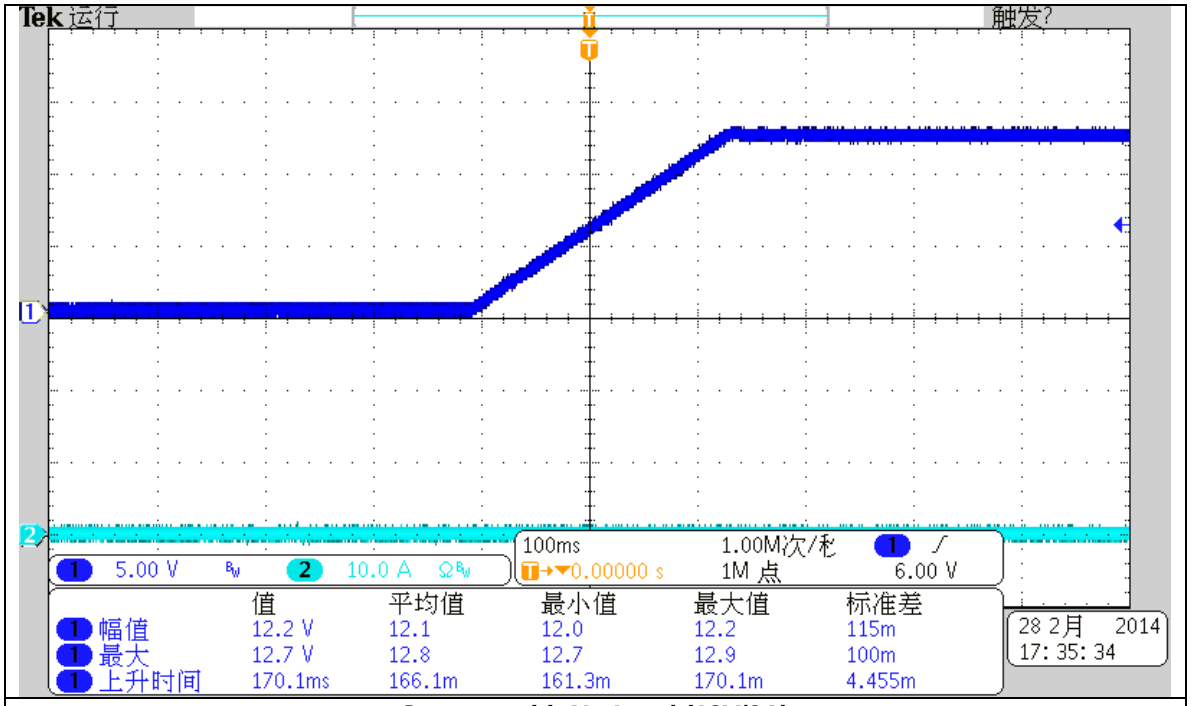


Dynamic response for 25% step Load (50% <---> 75%), slew rate: 1A/us
CH1: Output Voltage CH2: Output Step Current

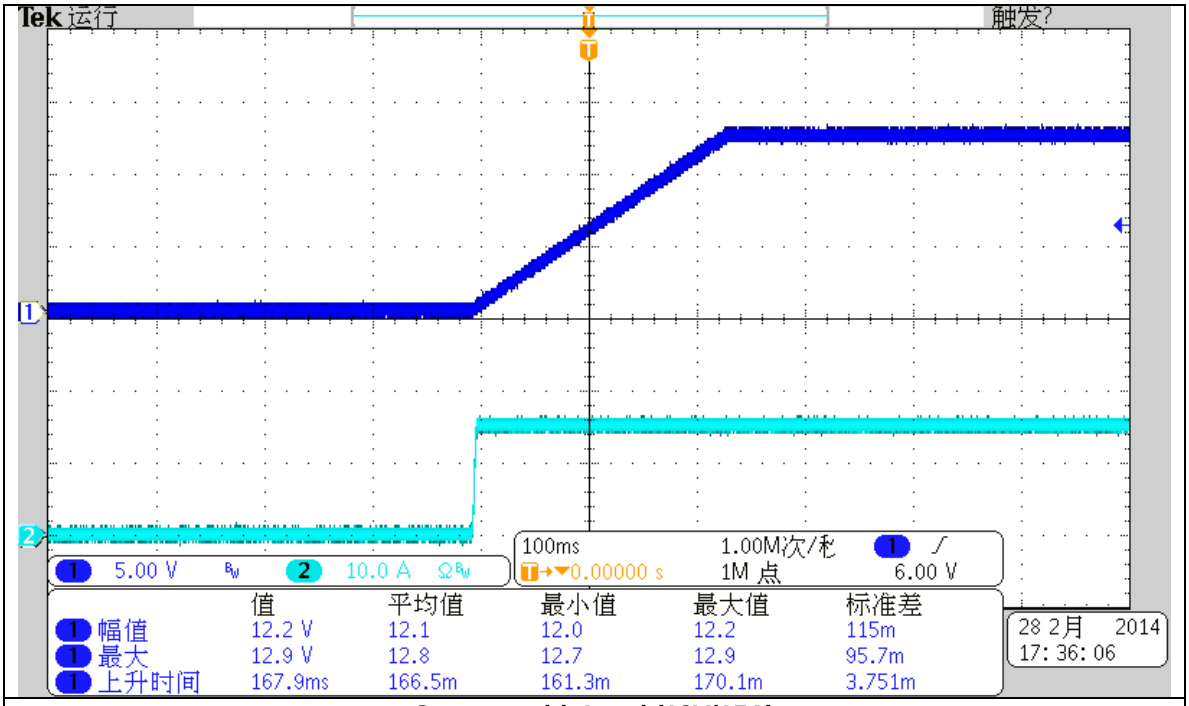


Dynamic response for 25% step Load (50% <---> 75%), slew rate: 1A/us
CH1: Output Voltage CH2: Output Step Current

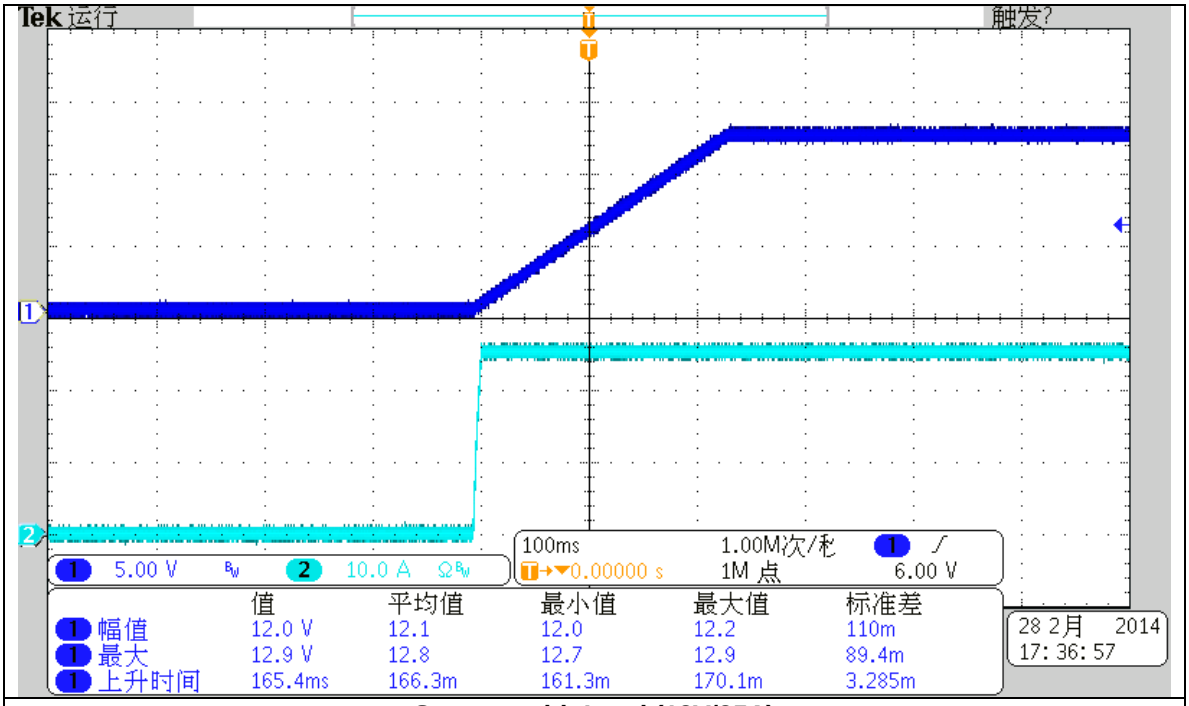
2.5 Start-up Curve



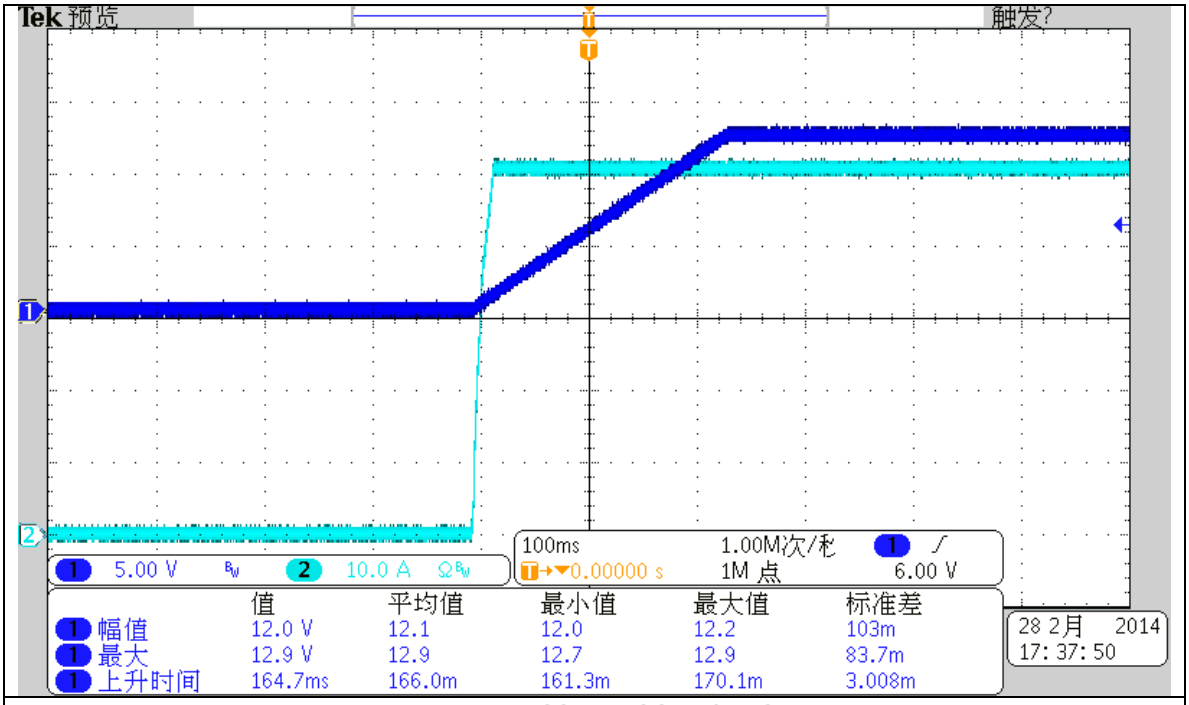
Start-up with No Load (12V/0A)
CH1: Output Voltage CH2: Output Current



Start-up with Load (12V/15A)
CH1: Output Voltage CH2: Output Current



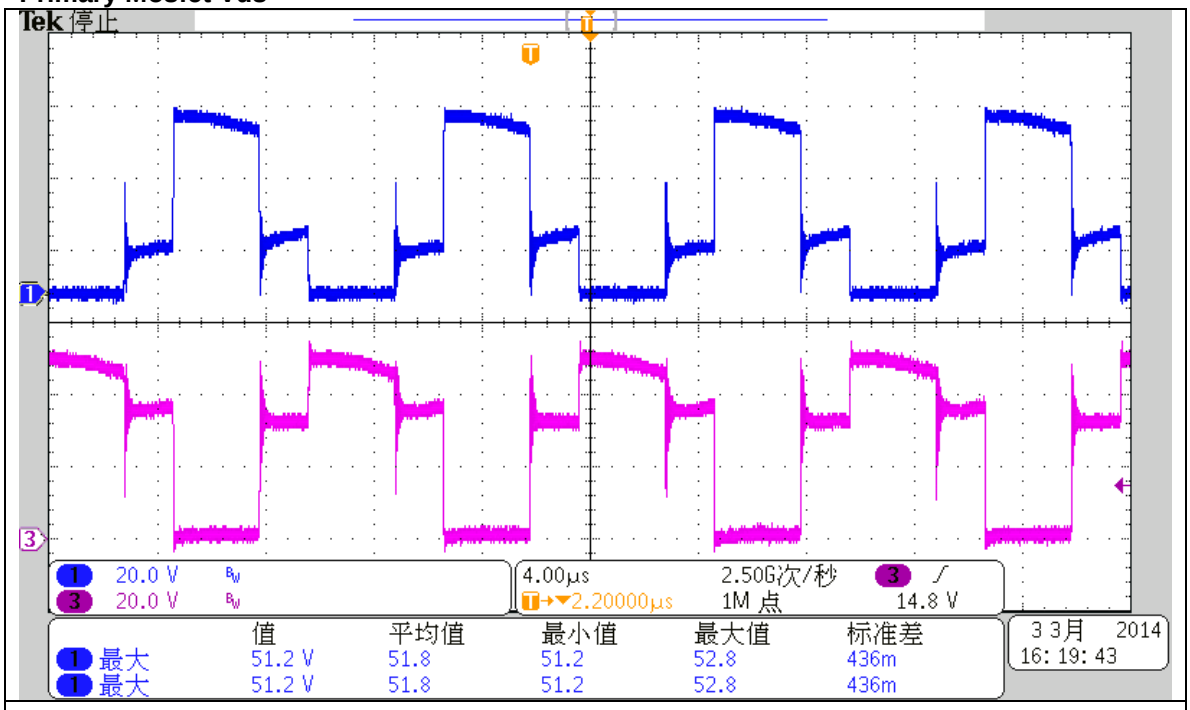
Start-up with Load (12V/25A)
CH1: Output Voltage CH2: Output Current



Start-up with Load (12V/50A)
CH1: Output Voltage CH2: Output Current

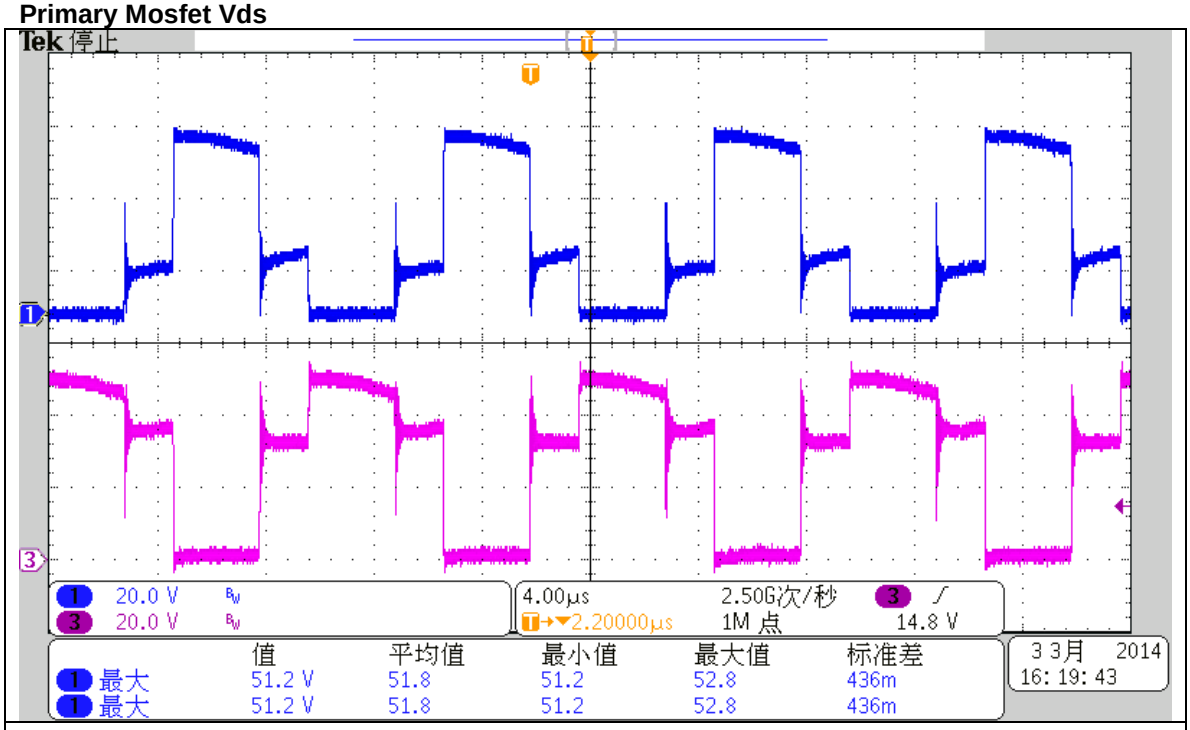
2.6 Key Components Stress (48V Input)

Primary Mosfet Vds



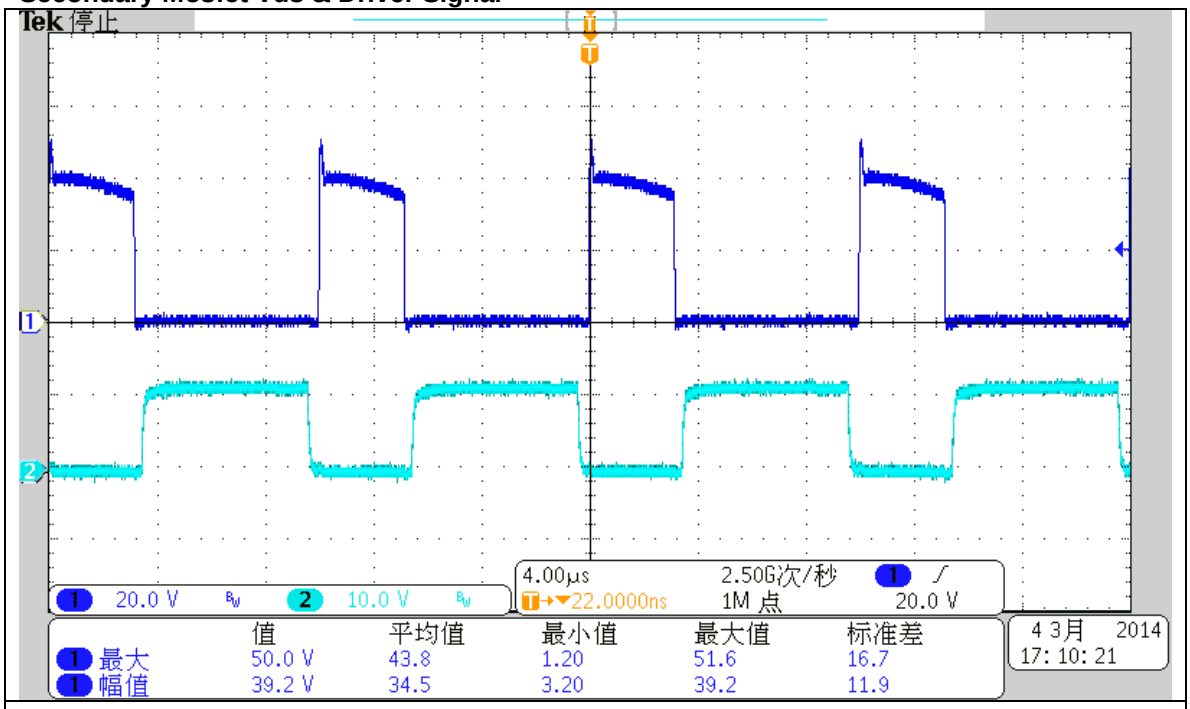
Primary Mosfet Vds with Half Load (12V/25A)

Primary Mosfet Vds



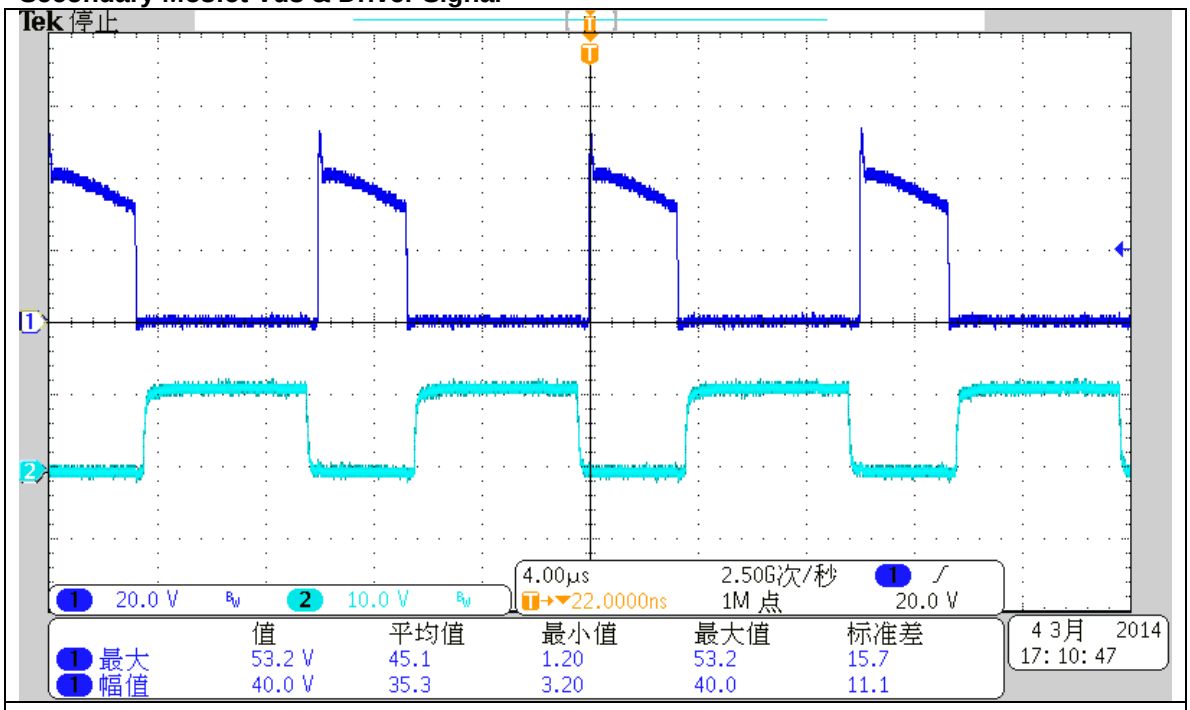
Primary Mosfet Vds with Full Load (12V/50A)

Secondary Mosfet Vds & Driver Signal



Secondary Mosfet Vds & Driver with Half Load (12V/25A)

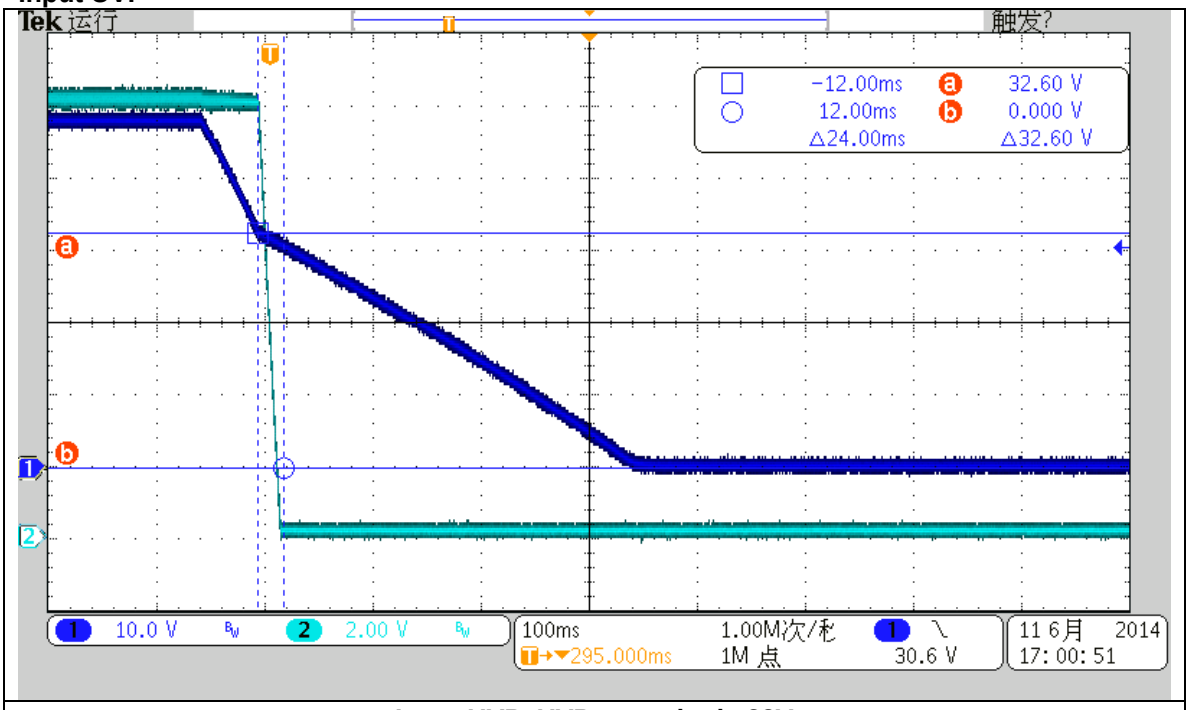
Secondary Mosfet Vds & Driver Signal



Secondary Mosfet Vds & Driver with Full Load (12V/50A)

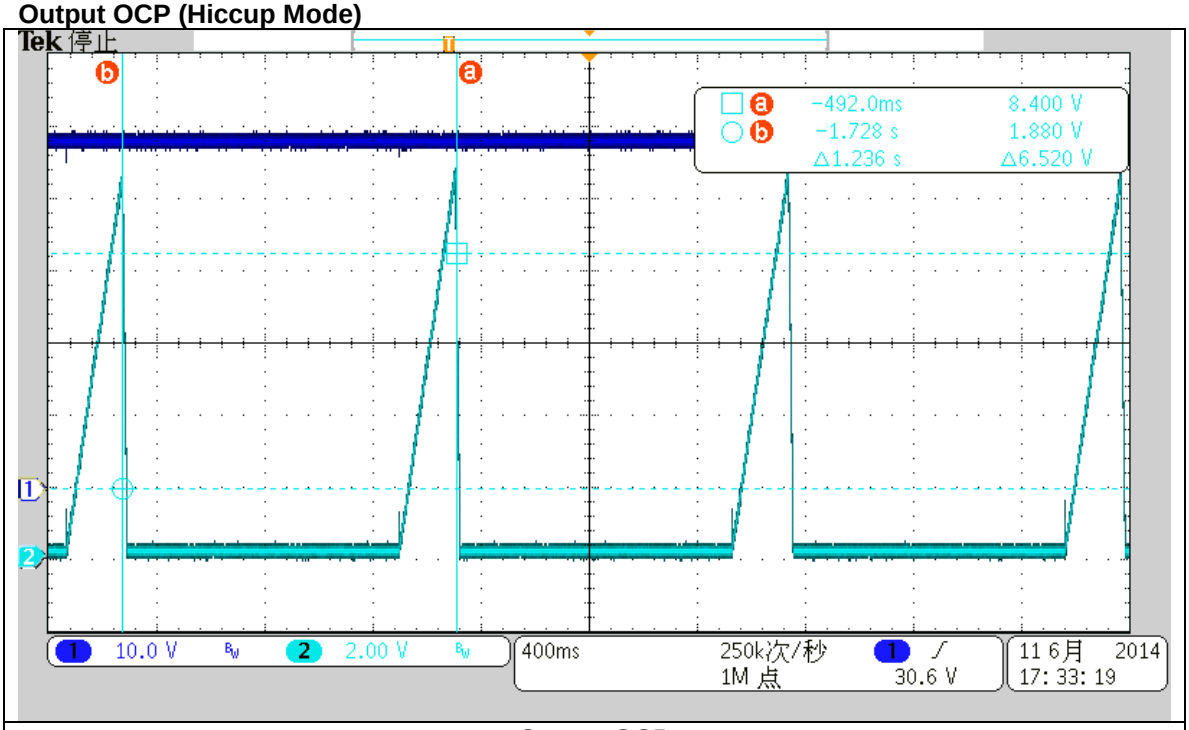
2.7 Protection (48V Input)

Input UVP



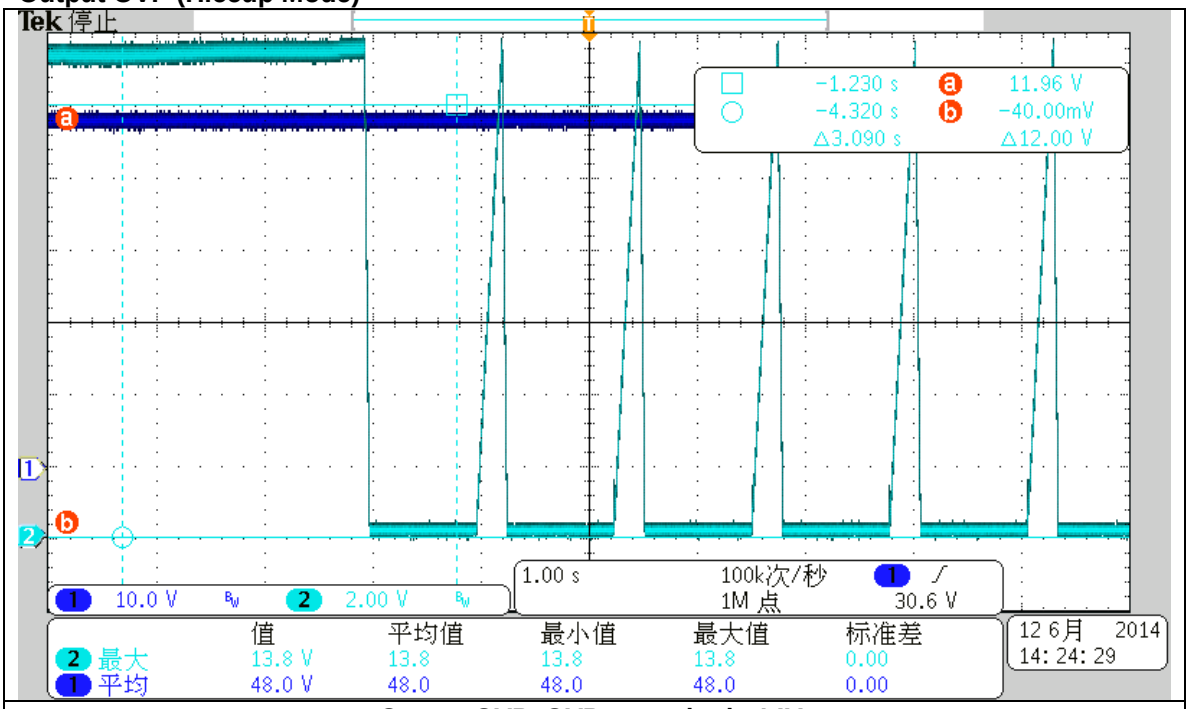
Input UVP, UVP set point is 33V
CH1:Input Voltage 10.0V/Div CH2: Output Voltage 2.0V/Div

Output OCP (Hiccup Mode)



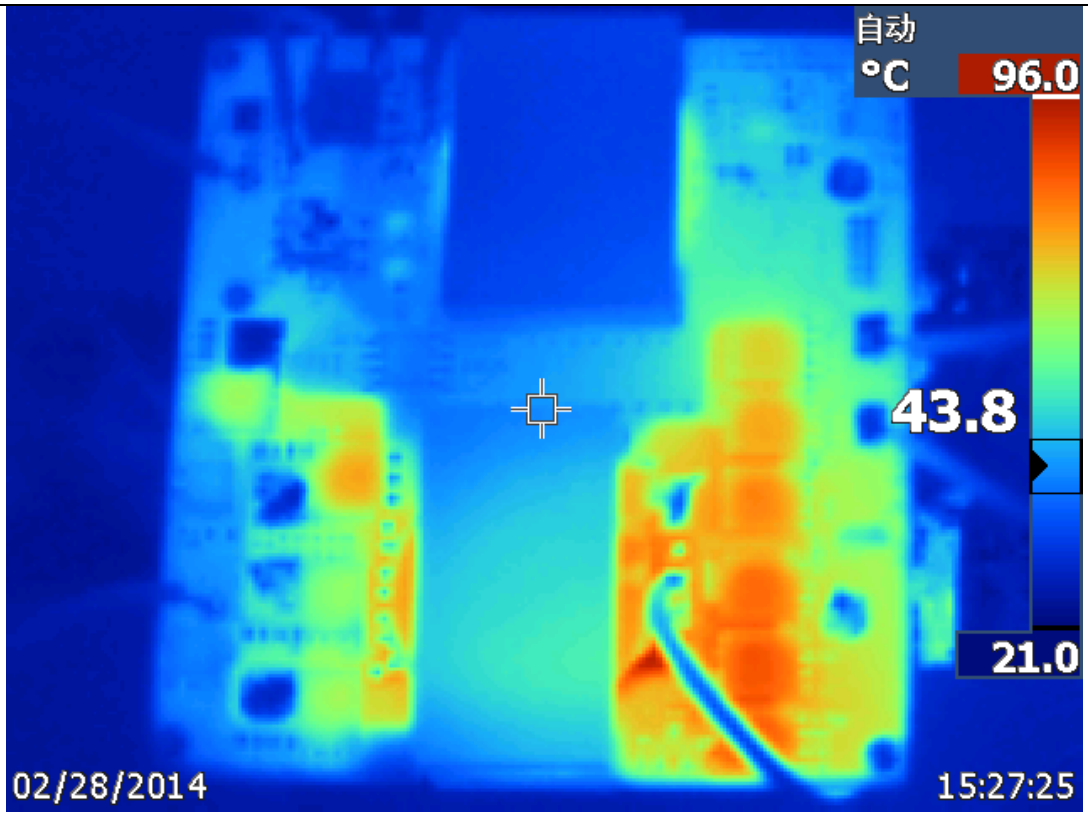
Output OCP
CH1:Input Voltage 10.0V/Div CH2: Output Voltage 2.0V/Div

Output OVP (Hiccup Mode)

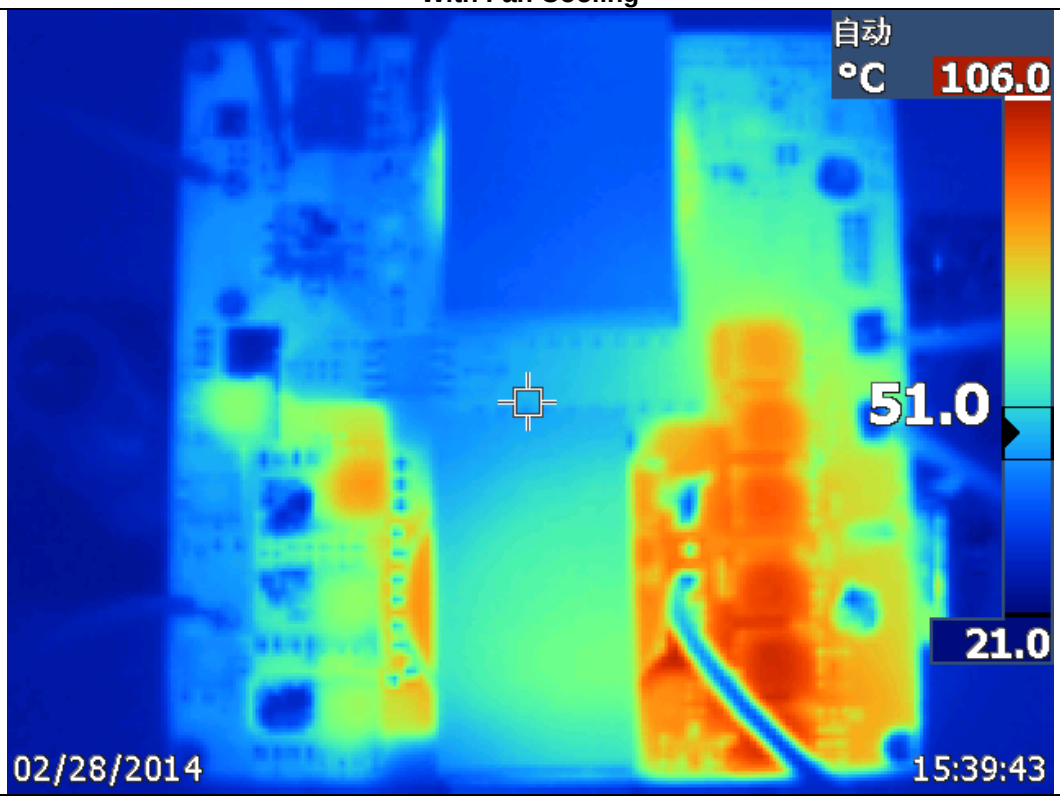


Output OVP, OVP set point is 14V.
Trim the divider resistor to reach the OVP point.
CH1:Input Voltage 10.0V/Div CH2: Output Voltage 2.0V/Div

2.8 Thermal IR Scan



TOP Side IR Scan at Full Load (12V/50A), 48V Input With Fan Cooling



TOP Side IR Scan at Full Load (12V/50A), 60V Input With Fan Cooling With Fan Cooling

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 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.

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