



**Texas Instruments**

**PMP4432 Test Procedure**

**China Power Reference Design**

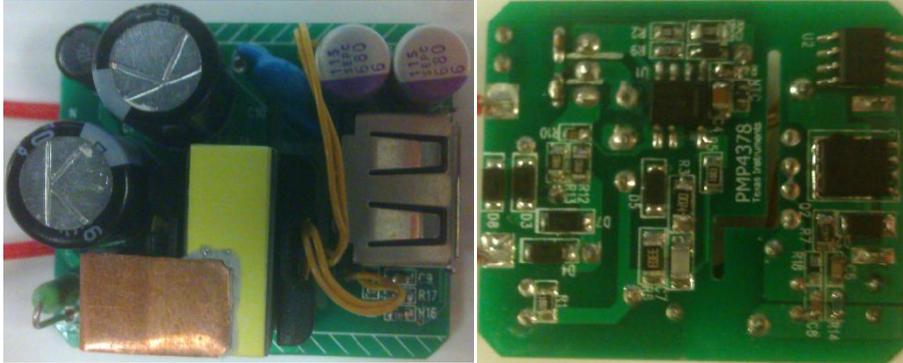
**REV A**

**7/25/2014**

# **1 GENERAL**

## **1.1 PURPOSE**

To provide detailed data for evaluating and verifying the PMP4432, which uses TI new Primary Side Controller UCC28713 5V2A adapter with size 37mmx31mmx15mm. The below photo shows this demo board.



## **1.2 REFERENCE DOCUMENTATION**

Schematic PMP4432\_SCH.PDF  
Assembly PMP4432\_PCB.PDF  
BOM  
Promotion tools

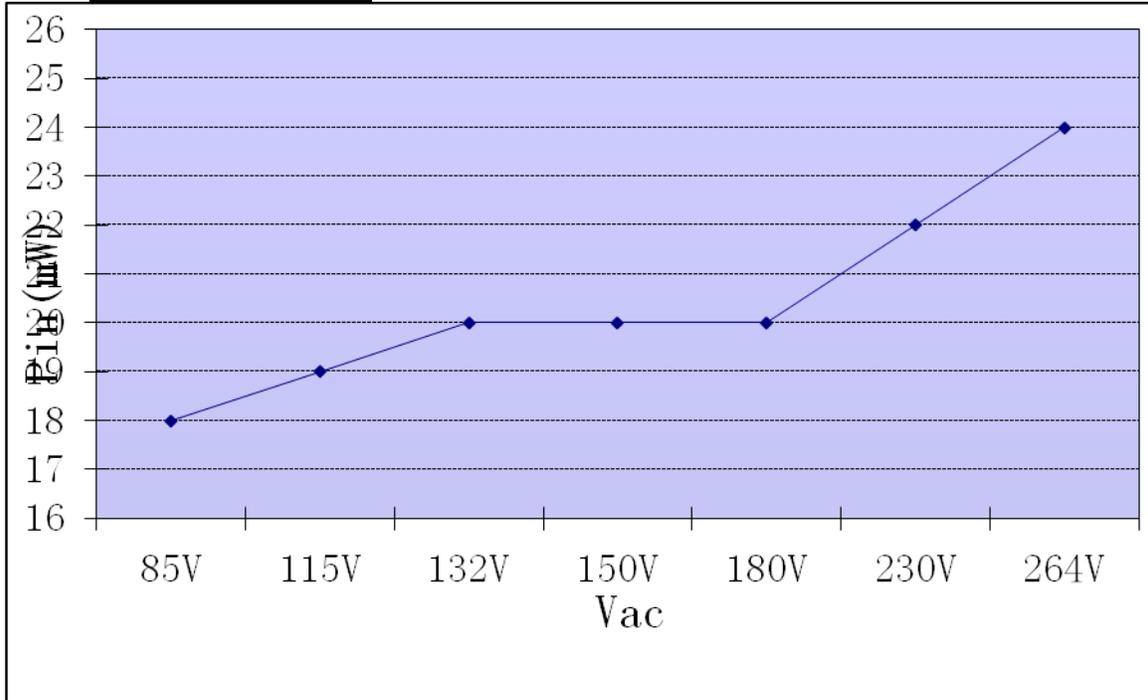
## **1.3 TEST EQUIPMENTS**

Power-meter: YOKOGAWA WT210  
Multi-meter(current): Fluke 8845A  
Multi-meter(voltage): Fluke 187  
AC Source: Chroma 61530  
Electronic load: Chroma 63105A module  
Testing demoboard

# **2 INPUT CHARACTERISTICS**

Efficiency is tested on USB-end  
**Otherwise Specified, the test is under the condition with  
100cm cable**

## 2.1 STANDBY POWER



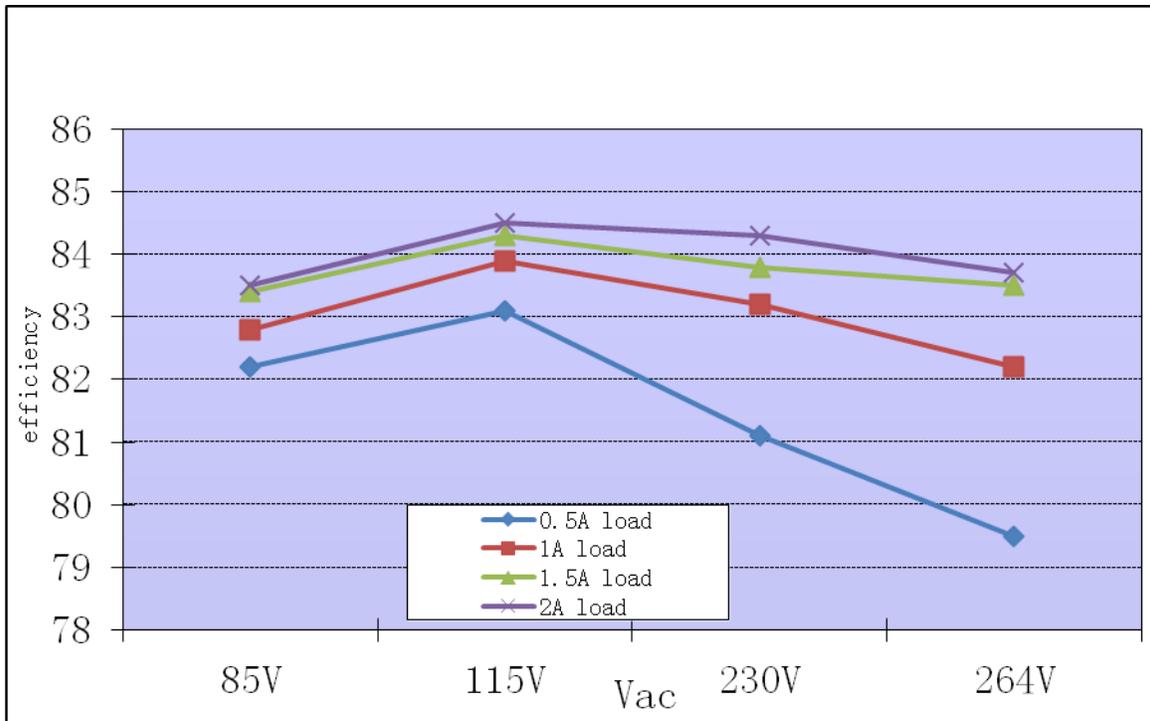
## 2.2 EFFICIENCY DATA

Notes: efficiency test is based USB port

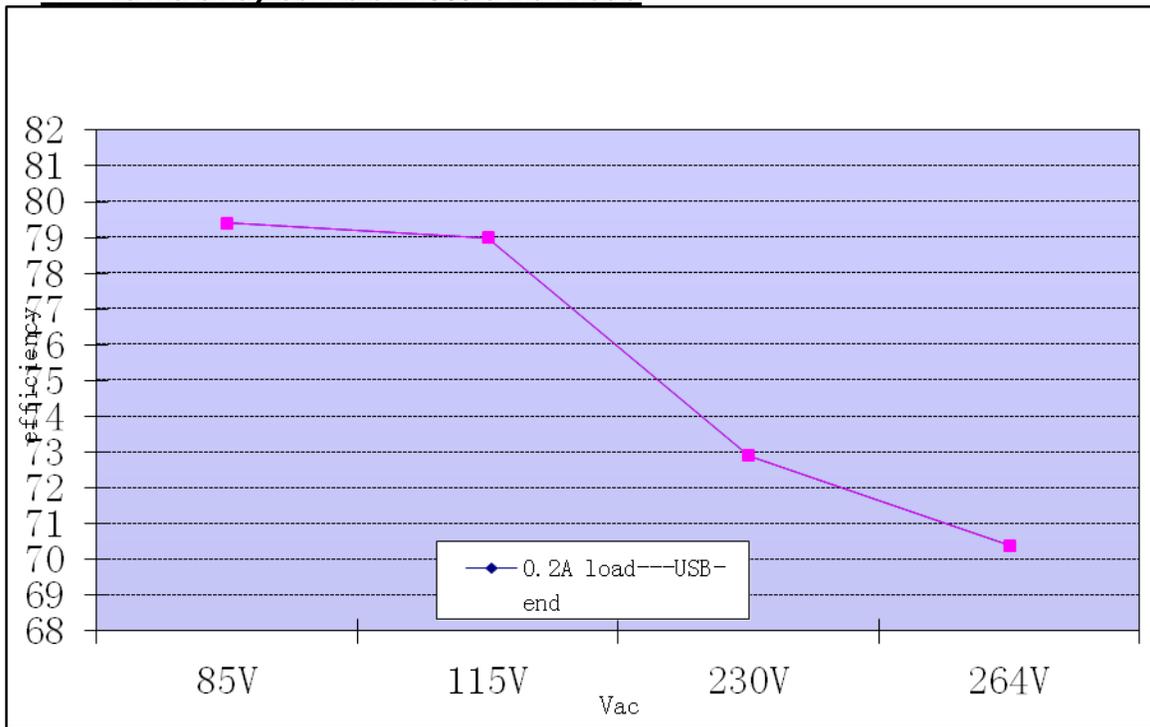
85v			
Pi (w)	Io(A)	Vo(V)	efficiency
1.264	0.2	5.019	0.794
3.077	0.5	5.056	0.822
6.207	1	5.127	0.826
9.35	1.5	5.2	0.834
12.62	2	5.272	0.835
230v			
Pi (w)	Io(A)	Vo(V)	efficiency
1.375	0.2	5.011	0.729
3.108	0.5	5.04	0.811
6.153	1	5.119	0.832
9.286	1.5	5.186	0.838
12.49	2	5.262	0.843

115v			
Pi (w)	Io(A)	Vo(V)	efficiency
1.268	0.2	5.011	0.79
3.033	0.5	5.043	0.831
6.104	1	5.12	0.839
9.25	1.5	5.199	0.843
12.48	2	5.27	0.845
264v			
Pi (w)	Io(A)	Vo(V)	efficiency
1.422	0.2	5.005	0.704
3.165	0.5	5.033	0.795
6.171	1	5.112	0.828
9.314	1.5	5.183	0.835
12.56	2	5.258	0.837

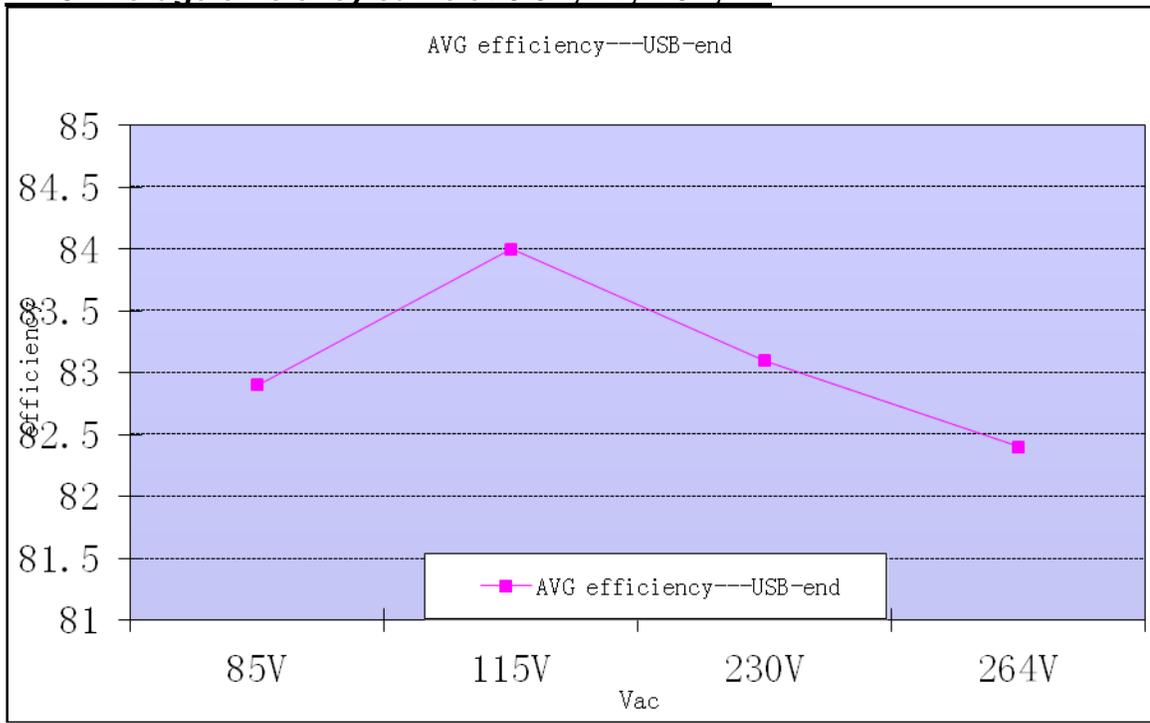
### 2.2.1 Load and input voltage Vs efficiency curve tested at USB-end



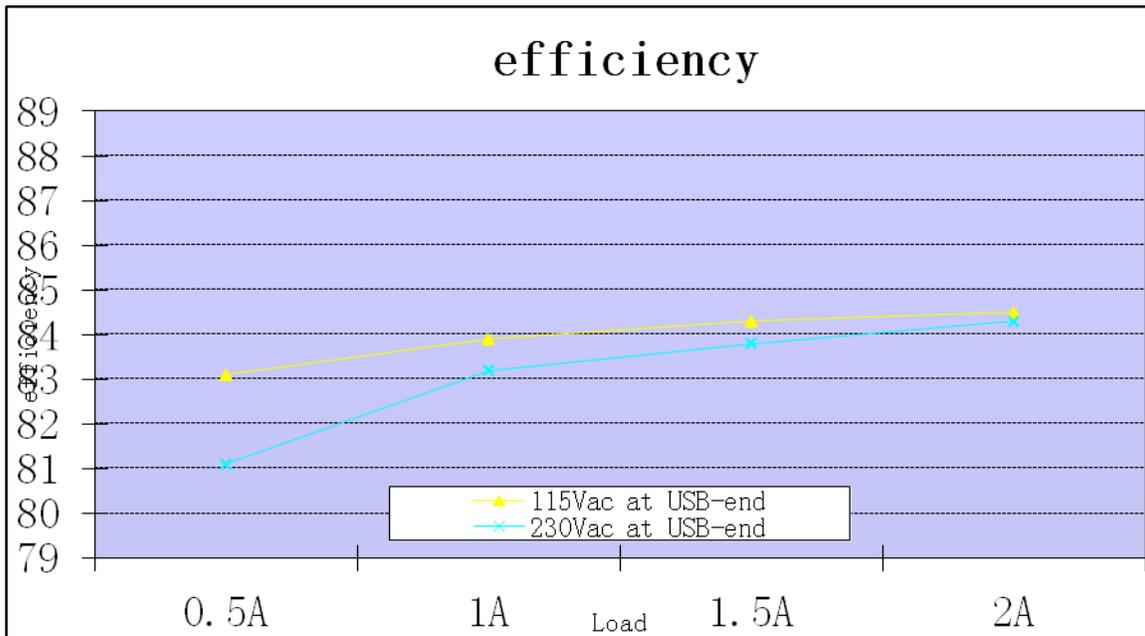
### 2.2.2 efficiency curve at 10% of full load



### 2.2.3 Average efficiency curve at 0.5A, 1A, 1.5A, 2A



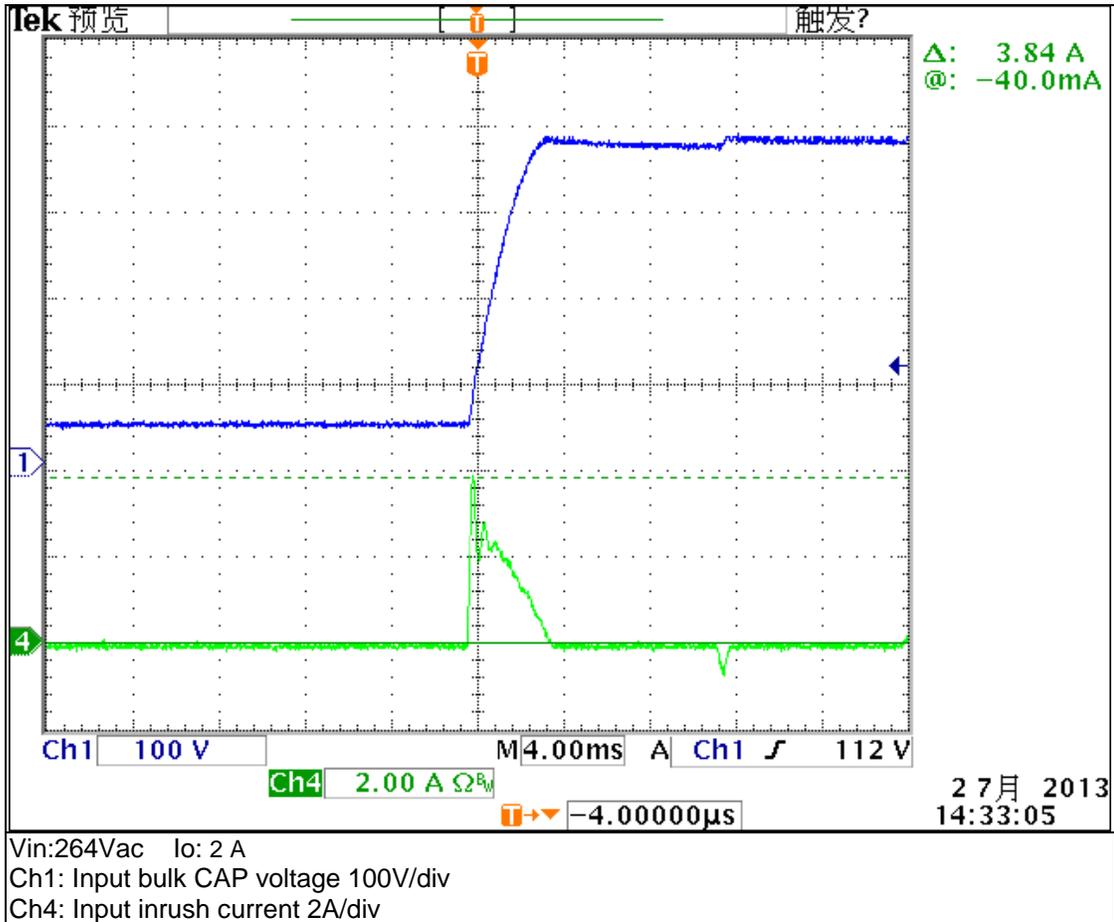
### 2.2.4 Efficiency Vs load curve



## 2.3 INPUT CURRENT

Vin(Vac)	Freq(Hz)	Iin(Arms)	Pass/Fail
85	60	<b>0.28</b>	

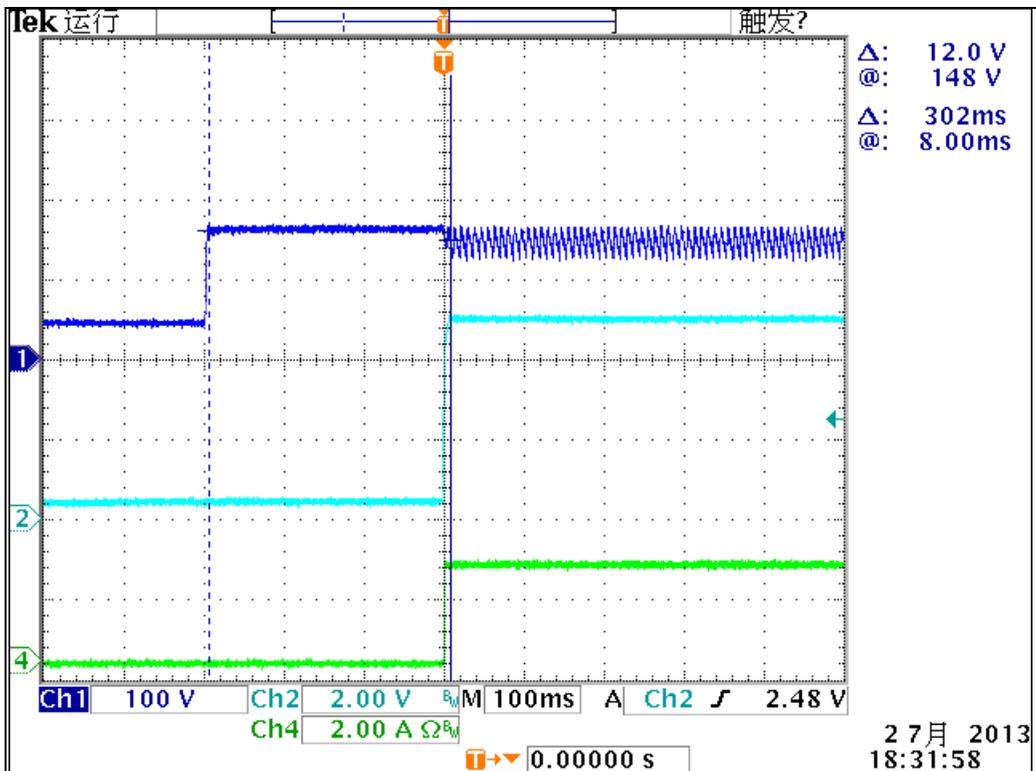
## 2.4 INPUT INRUSH CURRENT



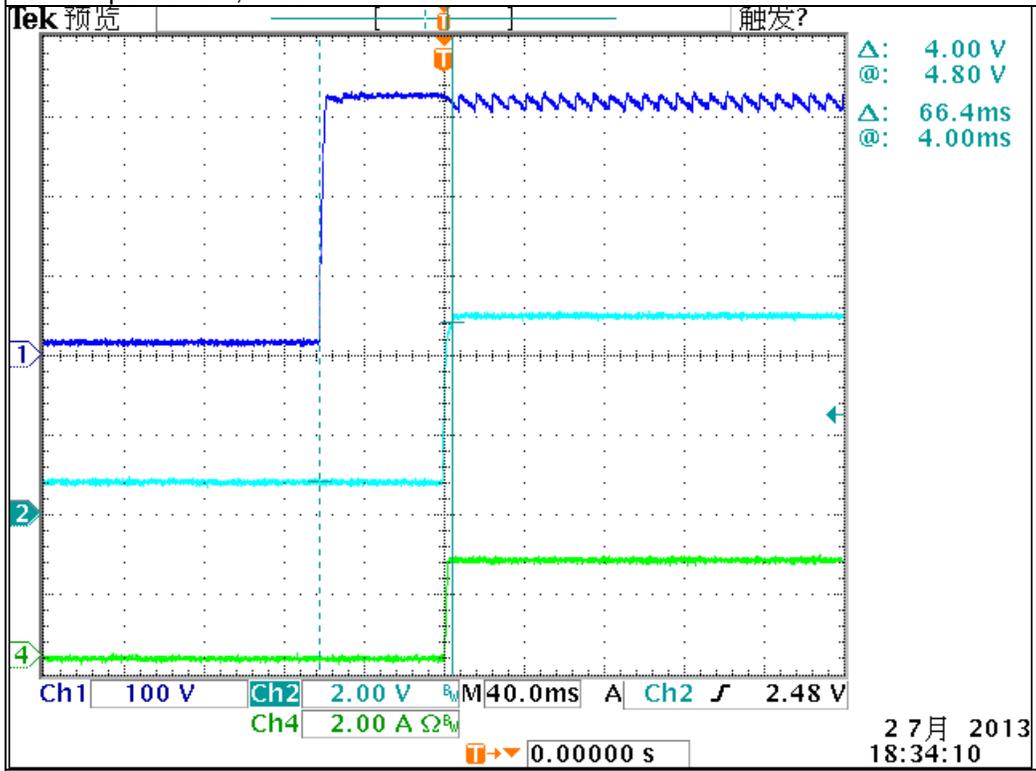
## 3 OUTPUT CHARACTERISTICS

### 3.1 STARTUP TIME

Input voltage	Output current	Startup time	Pass/Fail
115Vac	2A	<b>302mS</b>	
230Vac	2A	<b>66.4mS</b>	



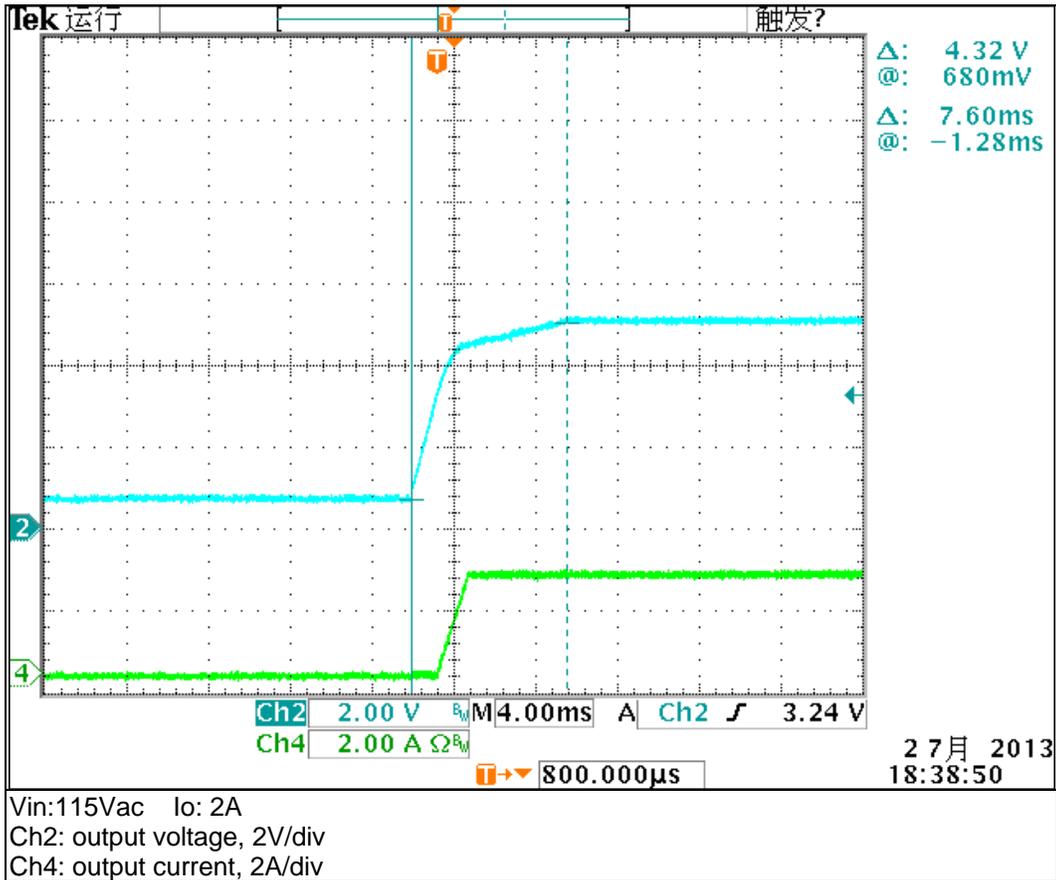
Vin:115Vac Io: 2A  
 Ch1: MOSFET's drain voltage, 100V/div Ch2: output voltage, 2V/div  
 Ch4: output current, 2A/div

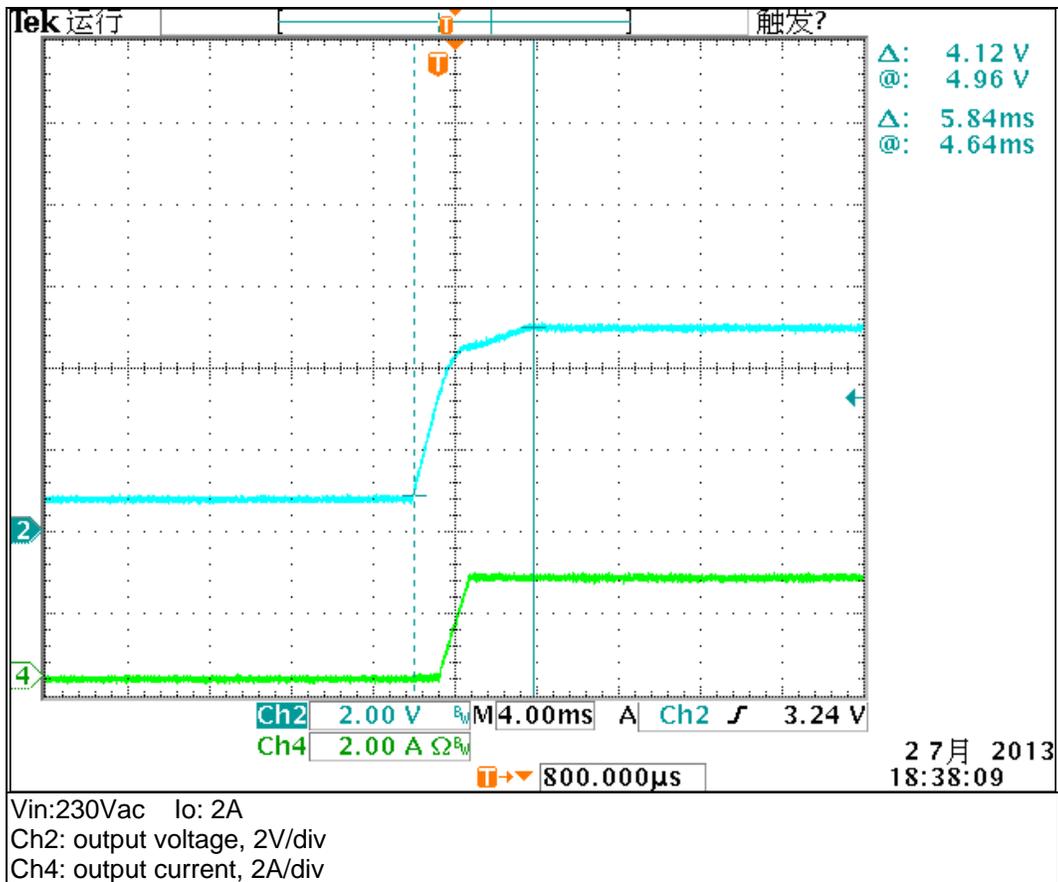


Vin:230Vac Io: 2A  
 Ch1: MOSFET's drain voltage, 100V/div Ch2: output voltage, 2V/div  
 Ch4: output current, 2A/div

### 3.2 OUTPUT VOLTAGE RISE TIME

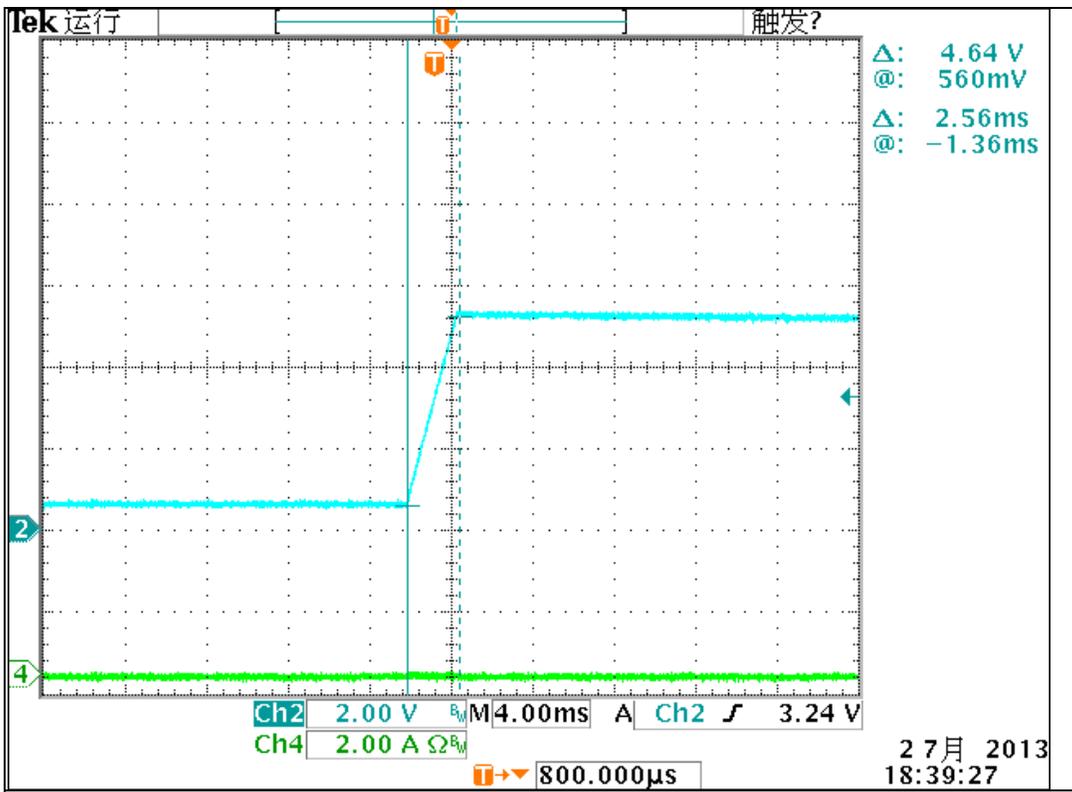
Input voltage	Output current	Startup time	Pass/Fail
115Vac	2A	<b>7.6mS</b>	
230Vac	2A	<b>5.84mS</b>	



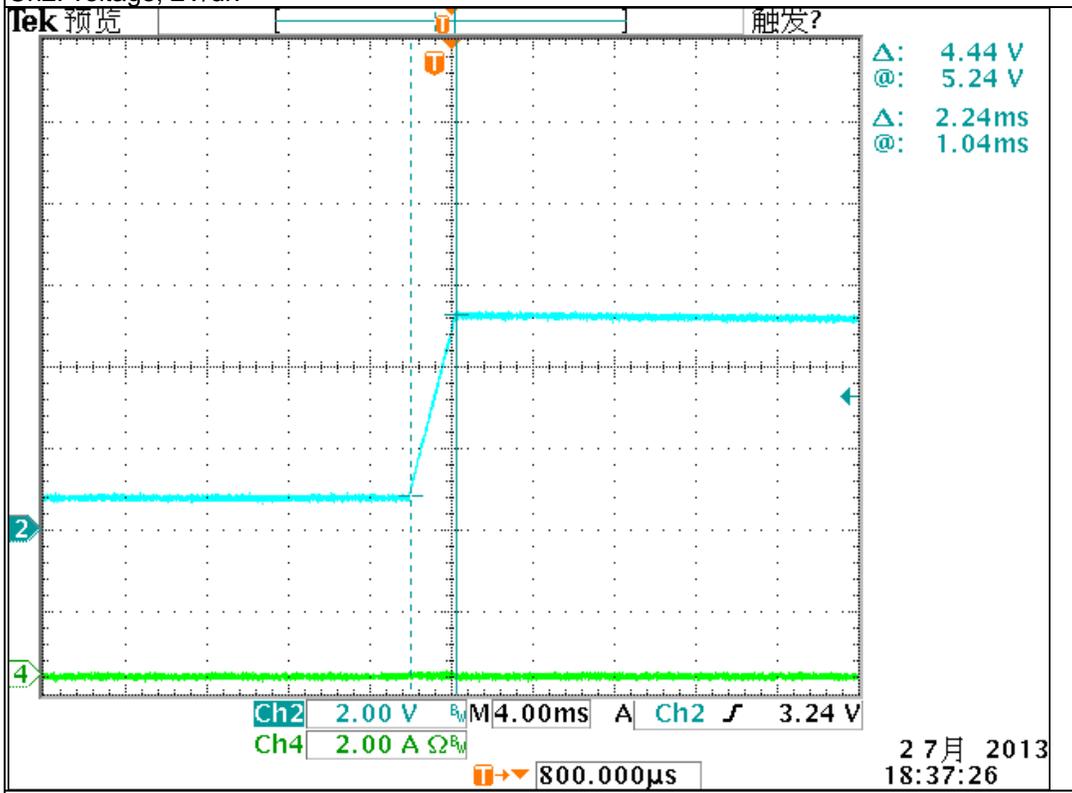


### 3.3 OUTPUT VOLTAGE OVERSHOOT

Input voltage	Output current	overshoot voltage	Pass/Fail
115Vac	0A	<1%	
230Vac	0A	<1%	

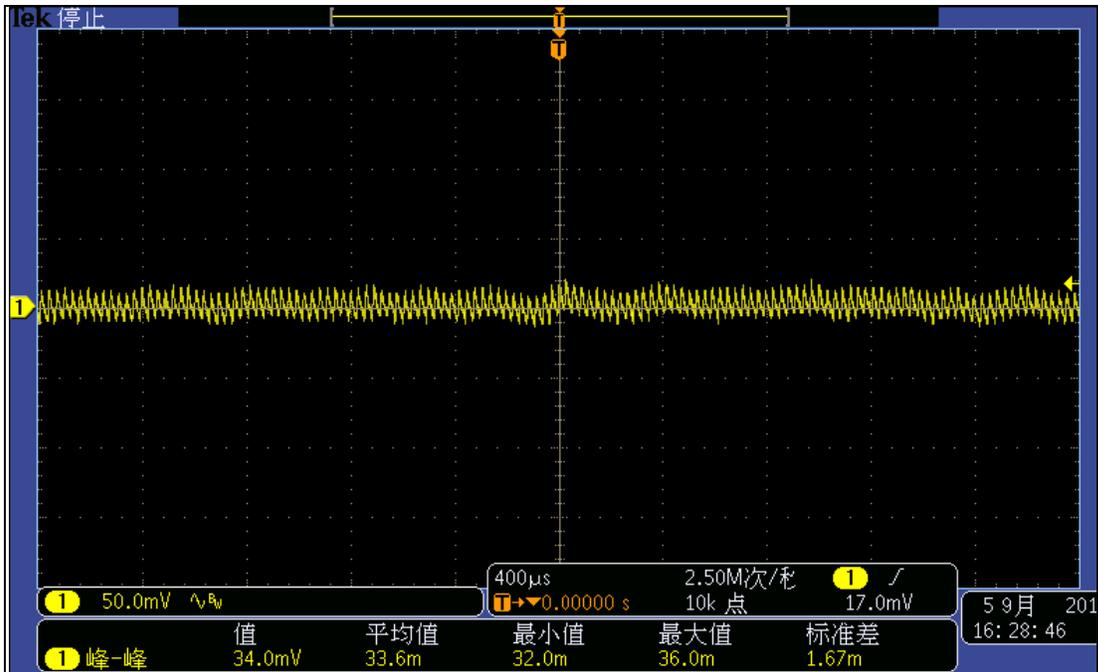


Vin:115Vac Io: 0A  
Ch2: voltage, 2V/div

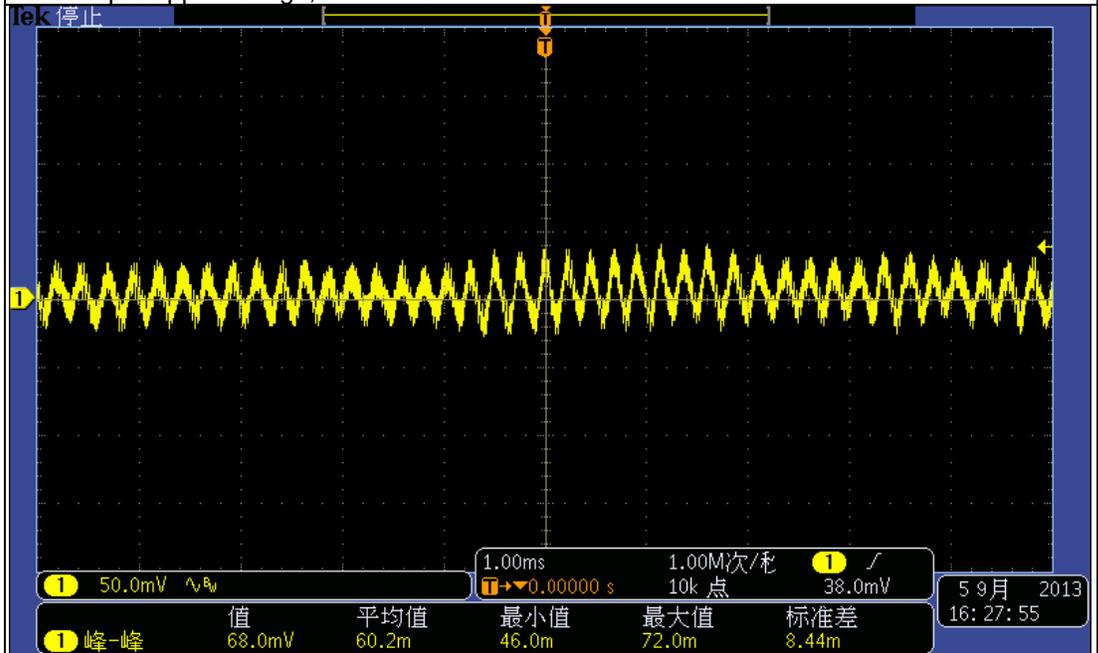


Vin:230Vac Io: 0A  
Ch2: output voltage, 2V/div

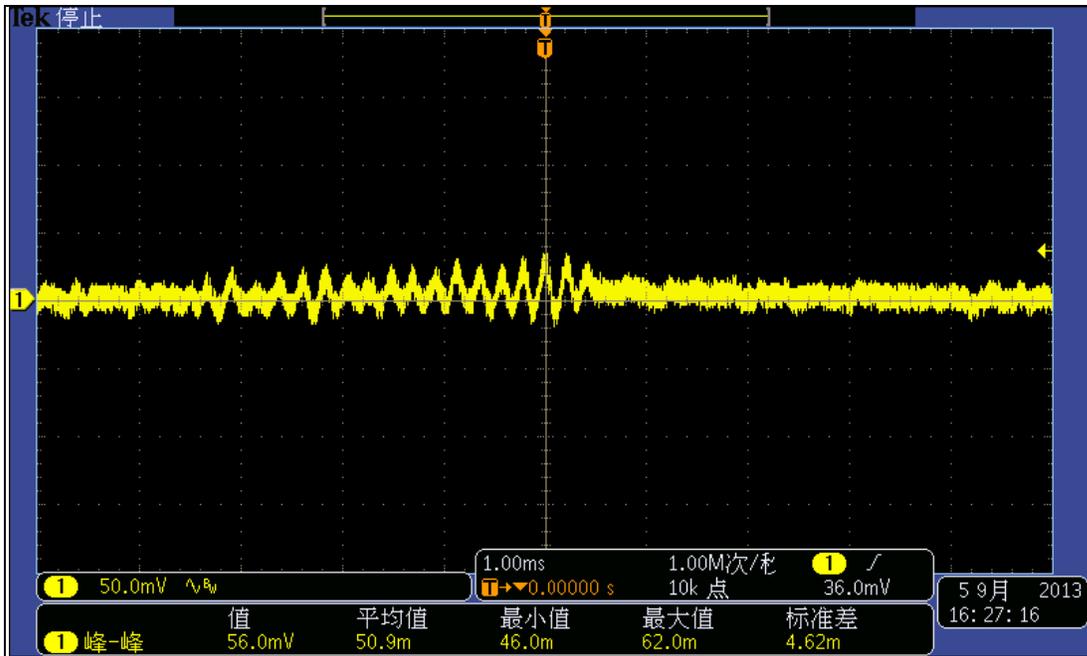




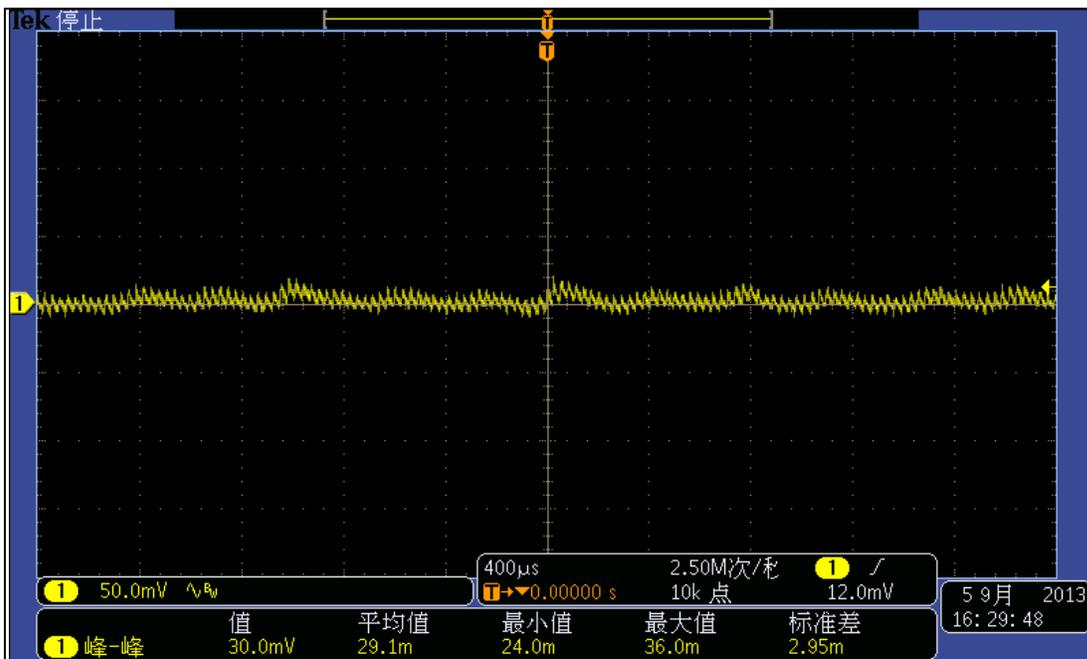
Vin:115Vac Io: 1A  
 Ch1: output ripple voltage, 50mV/div



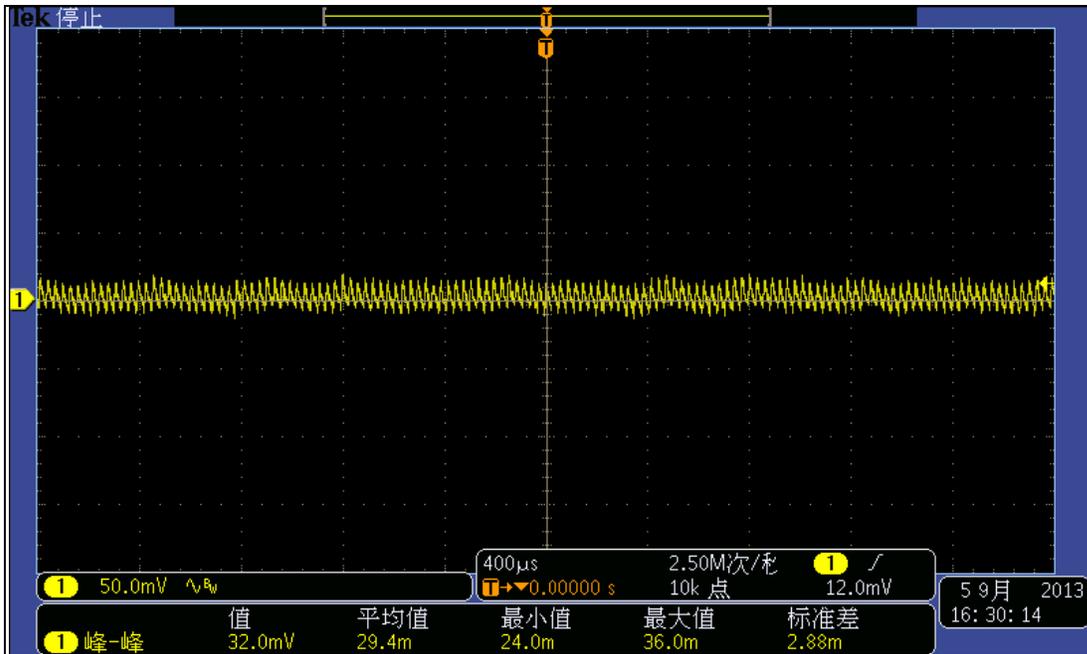
Vin:115Vac Io: 1.5A  
 Ch1: output ripple voltage, 50mV/div



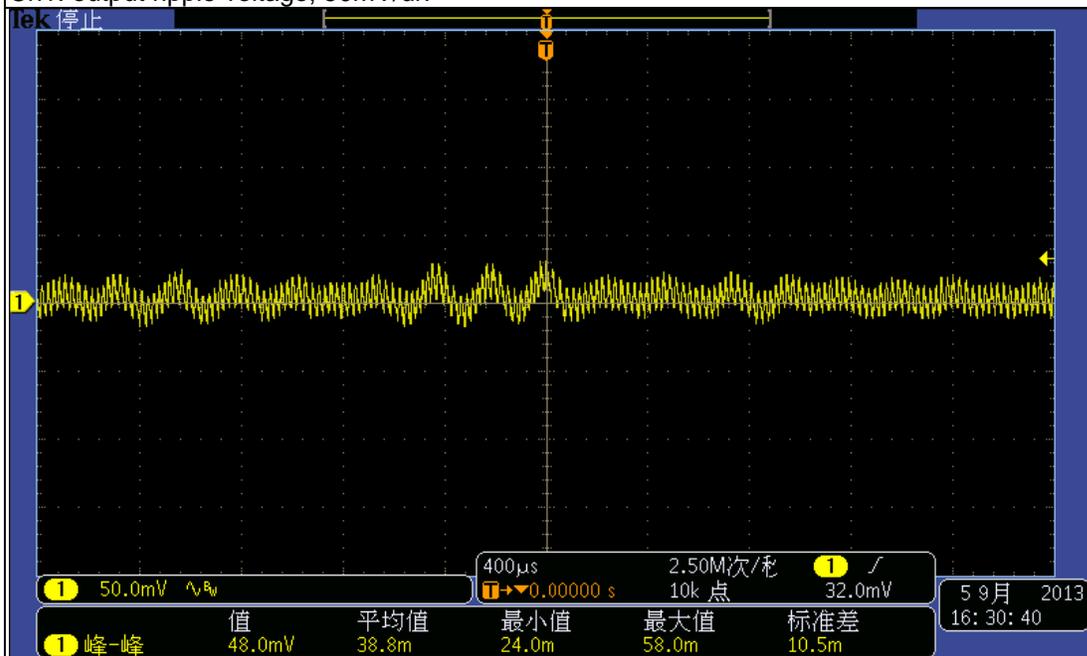
Vin:115Vac Io: 2A  
 Ch1: output ripple voltage, 50mV/div



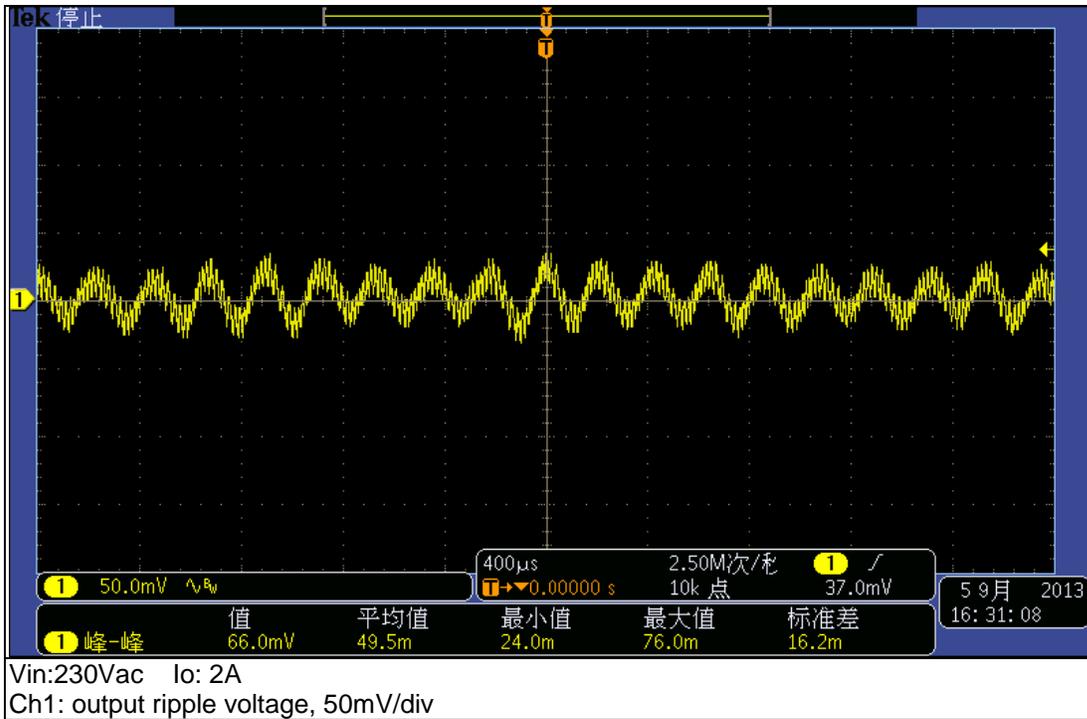
Vin:230Vac Io: 0.5A  
 Ch1: output ripple voltage, 50mV/div



Vin:230Vac Io: 1A  
Ch1: output ripple voltage, 50mV/div

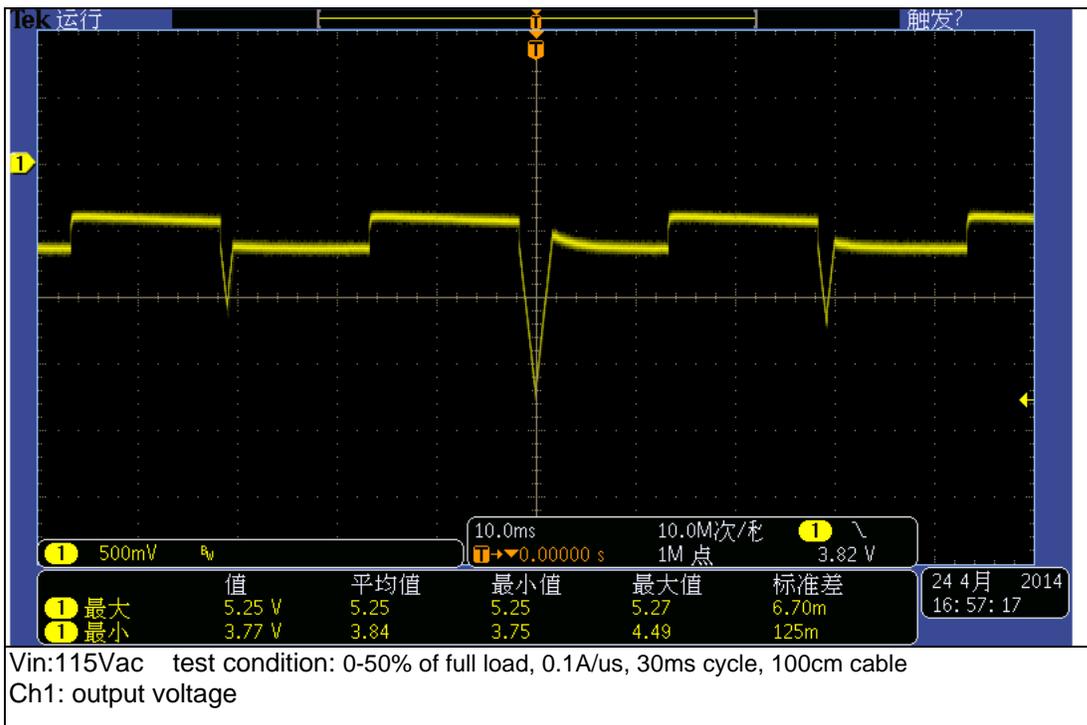


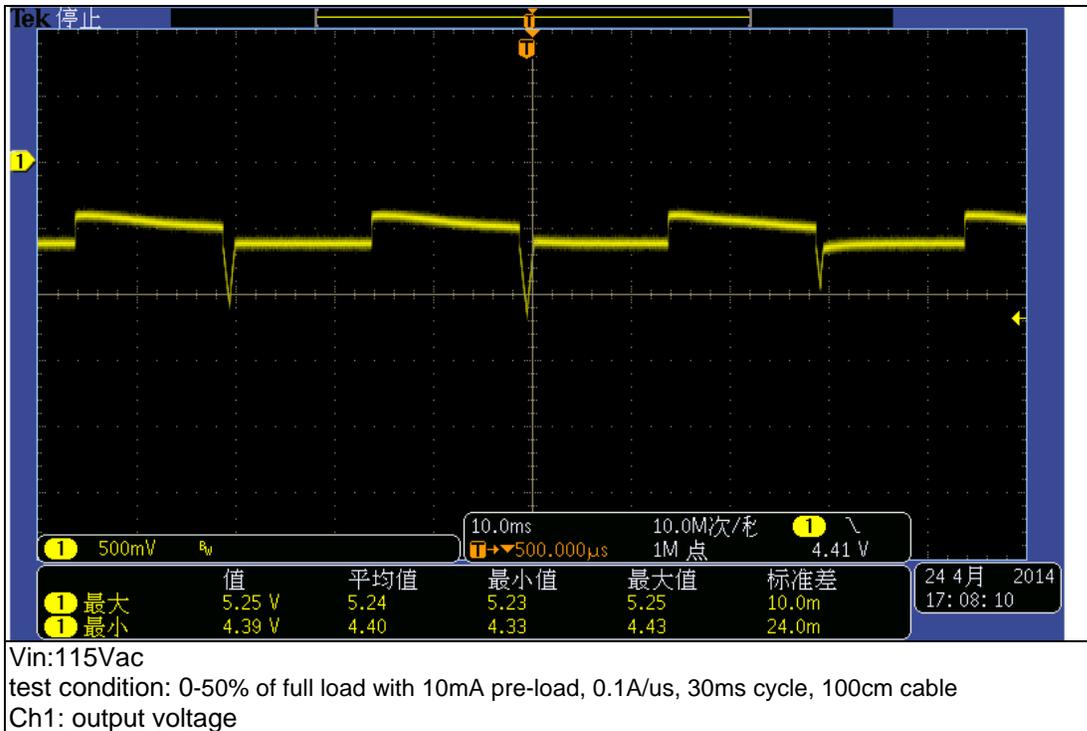
Vin:230Vac Io: 1.5A  
Ch1: output ripple voltage, 50mV/div



### 3.5 DYNAMIC RESPONSE

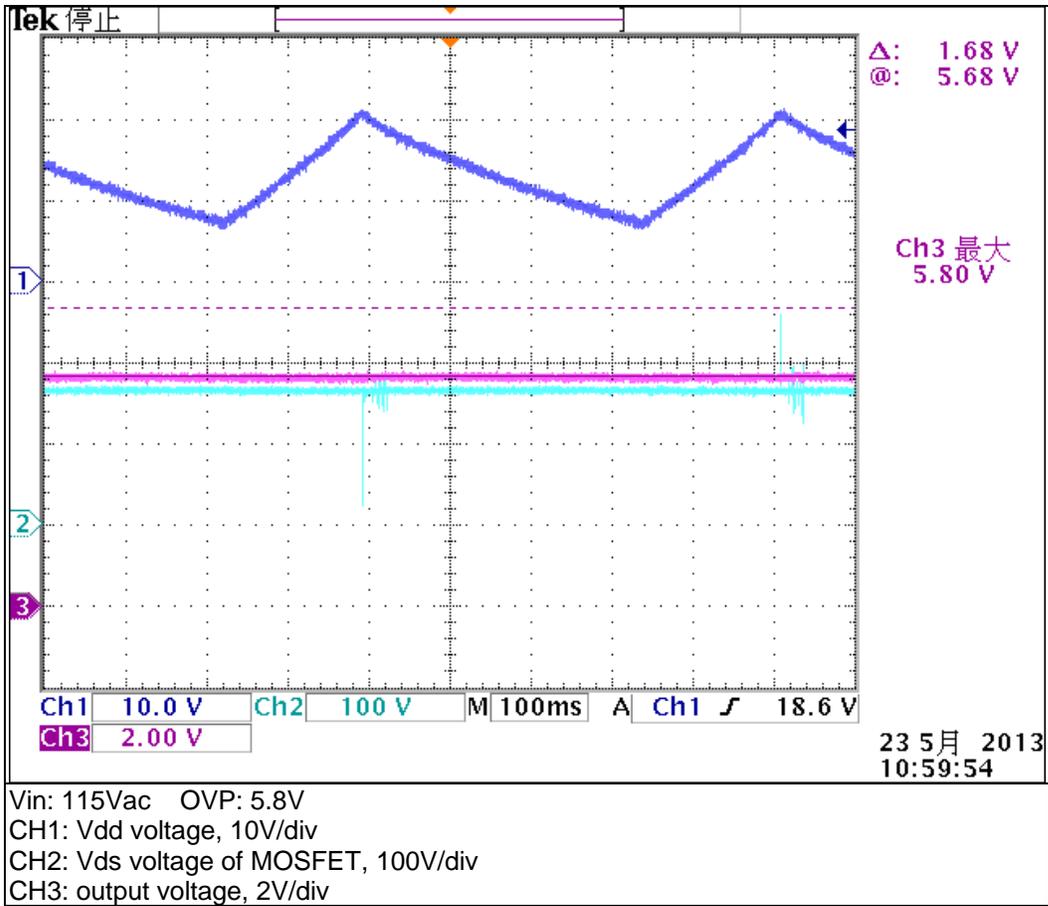
Input voltage	Output current	Max voltage	Min voltage
115Vac	0-50% of full load	<b>5.25V</b>	<b>3.77V</b>
115Vac	0-50% of full load with 10mA pre-load	<b>5.25V</b>	<b>4.39V</b>





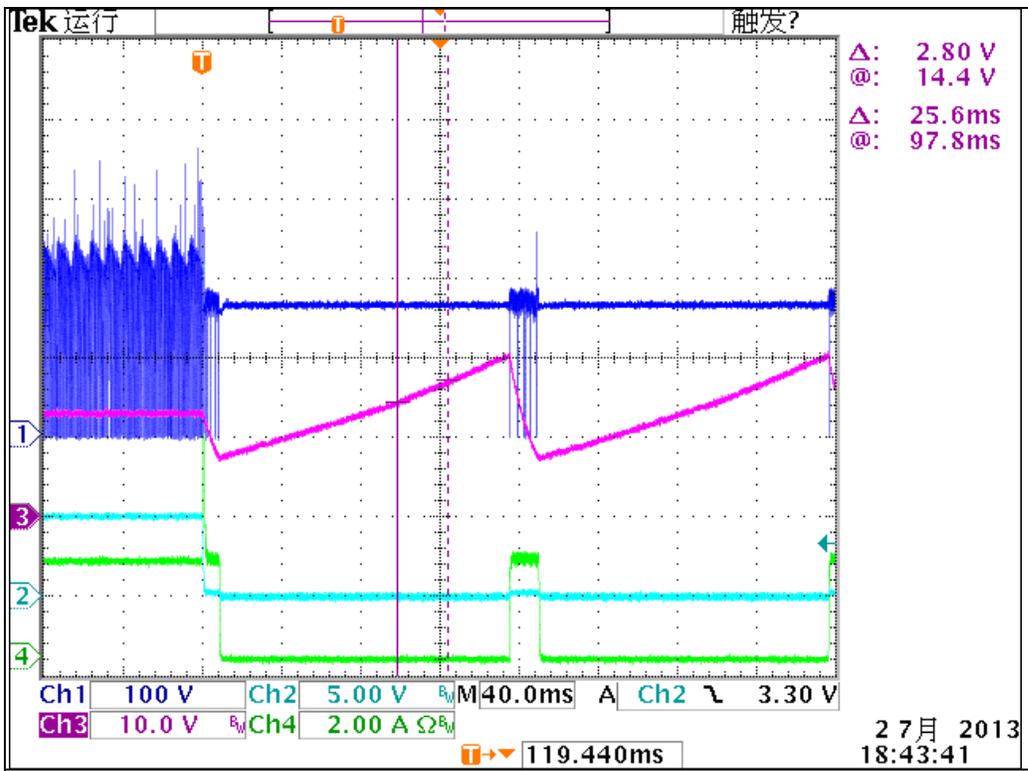
### 3.6 OUTPUT VOLTAGE PROTECTION

CONDITIONS	Protection voltage (V)	Pass/Fail
Vin (Vac)		
115&230	5.8	

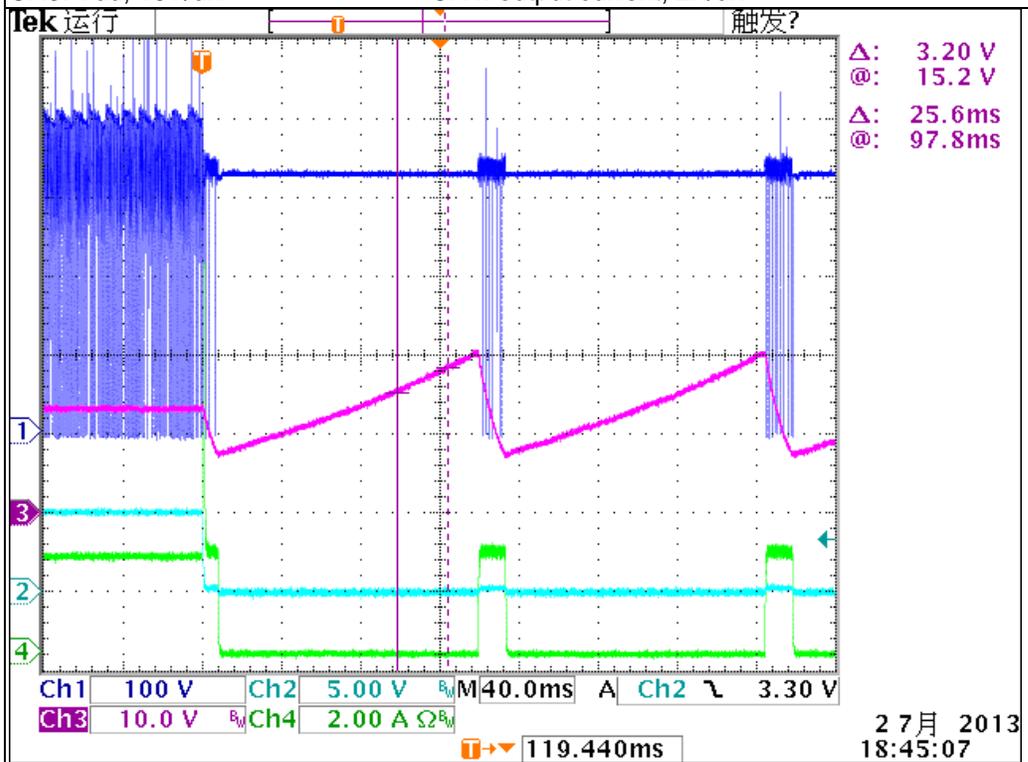


### 3.7 OUTPUT SHORT PROTECTION

Input voltage	Output short protection
115&230Vac	Hiccup up mode

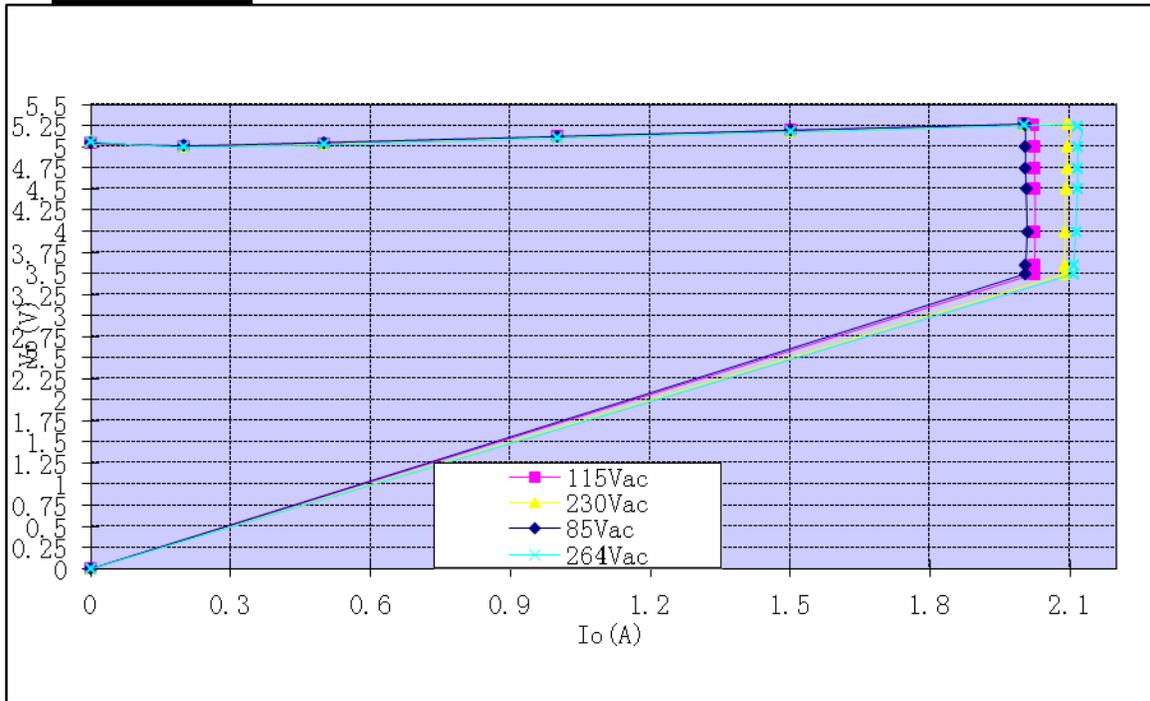


Vin:115Vac  
CH1: Vds of MOSFET, 100V/div CH2: output voltage, 5V/div  
CH3: Vdd, 10V/div CH4: output current, 2A/div



Vin:230Vac  
CH1: Vds of MOSFET, 100V/div CH2: output voltage, 5V/div  
CH3: Vdd, 10V/div CH4: output current, 2A/div

## 4 IV CURVE



# 5 EMI Test

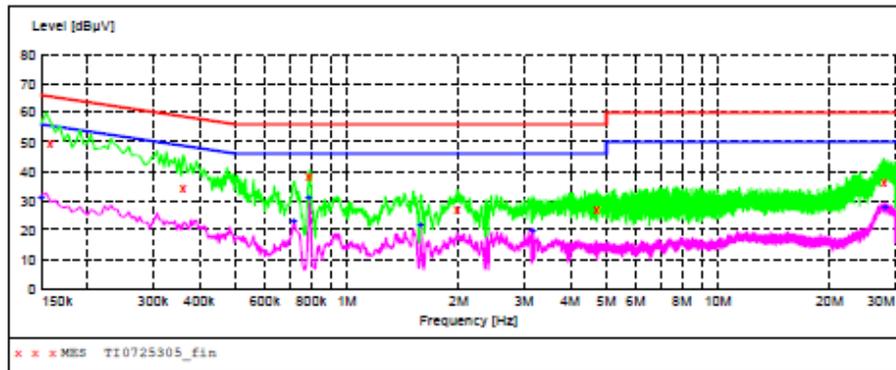
## 5.1 Conduction emission

Shenzhen Huatongwei International Inspection CO.,Ltd

Voltage Mains Test EN 55022 CLASS B

EUT: FMP4378  
 Manufacturer: TI  
 Operating Condition: LOAD  
 Test Site: 3# SHIELDED ROOM  
 Operator: ZHANGBAO.SUN  
 Test Specification: AC 230V/50Hz  
 Comment:  
 Start of Test: 7/25/2013 / 6:41:43PM

SCAN TABLE: "Voltage (9K-30M)FIN"  
 Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "TI0725305\_fin"

7/25/2013 6:44PM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	FE
0.159000	49.60	10.1	66	15.9	QP	L1	GND
0.361500	34.10	10.1	59	24.6	QP	L1	GND
0.789000	38.60	10.1	56	17.4	QP	L1	GND
1.977000	27.20	10.2	56	28.8	QP	L1	GND
4.695000	26.80	10.2	56	29.2	QP	L1	GND
28.018500	36.70	10.9	60	23.3	QP	L1	GND

MEASUREMENT RESULT: "TI0725305\_fin2"

7/25/2013 6:44PM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	FE
0.150000	30.70	10.1	56	25.3	AV	L1	GND
0.717000	22.90	10.1	46	23.1	AV	L1	GND
0.789000	30.80	10.1	46	15.2	AV	L1	GND
1.576500	21.50	10.2	46	24.5	AV	L1	GND
3.160500	19.90	10.2	46	26.1	AV	L1	GND
28.122000	28.00	10.9	50	22.0	AV	L1	GND

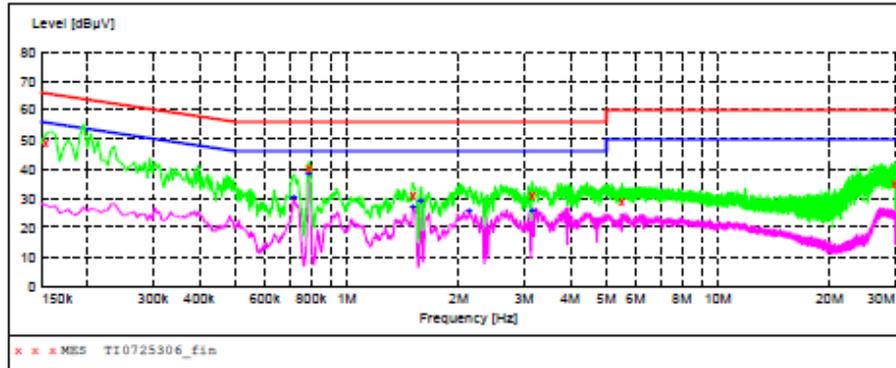
Vin: 230Vac, Line, Io: 2A  
 Test condition: 1.5m cable with 2.5R load resistor

Shenzhen Huatongwei International Inspection CO.,Ltd

Voltage Mains Test EN 55022 CLASS B

EUT: FMP4378  
 Manufacturer: TI  
 Operating Condition: LOAD  
 Test Site: 3# SHIELDED ROOM  
 Operator: ZHANGBAO.SUN  
 Test Specification: AC 230V/50Hz  
 Comment:  
 Start of Test: 7/25/2013 / 6:44:29PM

SCAN TABLE: "Voltage (9K-30M)FIN"  
 Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "TI0725306\_fin"

7/25/2013 6:46PM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	FE
0.154500	48.80	10.1	66	17.0	QP	N	GND
0.789000	40.30	10.1	56	15.7	QP	N	GND
1.504500	30.90	10.2	56	25.1	QP	N	GND
3.156000	31.20	10.2	56	24.8	QP	N	GND
5.514000	29.30	10.2	60	30.7	QP	N	GND
29.881500	35.00	11.0	60	25.0	QP	N	GND

MEASUREMENT RESULT: "TI0725306\_fin2"

7/25/2013 6:46PM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	FE
0.717000	30.10	10.1	46	15.9	AV	N	GND
0.789000	38.60	10.1	46	7.4	AV	N	GND
1.504500	27.10	10.2	46	18.9	AV	N	GND
1.576500	28.70	10.2	46	17.3	AV	N	GND
2.134500	25.80	10.2	46	20.2	AV	N	GND
3.160500	25.90	10.2	46	20.1	AV	N	GND

Vin:230Vac, Neutral, Io: 2A  
 Test condition: 1.5m cable with 2.5R load resistor

## 6.2 Radiated emission

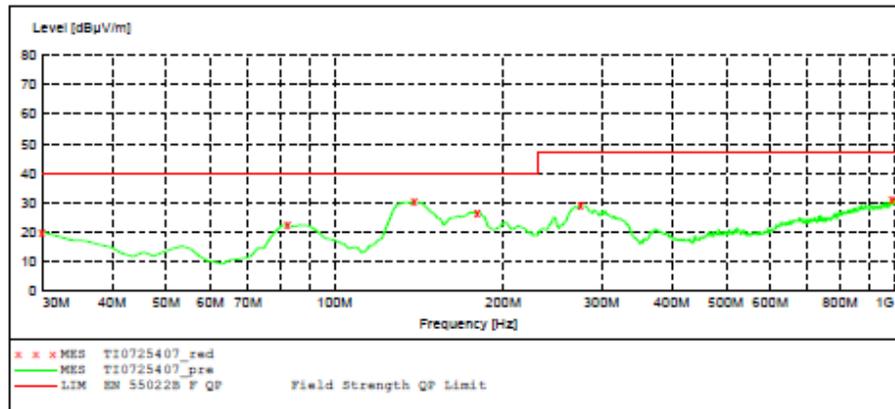
SHENZHEN HUATONGWEI INTERNATIONAL INSPECTION CO.,LTD

### RADIATED EMISSION TEST EN 55022 CLASSB

EUT: FMP4378  
 Manufacturer: TI  
 Operating Condition: LOAD  
 Test Site: 3M CHAMBER  
 Operator: MINGHUA.FAN  
 Test Specification: AC 230V/50Hz  
 Comment:  
 Start of Test: 7/25/2013 / 5:13:25PM

#### SWEEP TABLE: "test (30M-1G)"

Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	120 kHz	HL562 201106



#### MEASUREMENT RESULT: "TI0725407\_red"

7/25/2013 5:15PM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Asimuth deg	Polarization
30.000000	19.90	-10.0	40.0	20.1	---	300.0	76.00	HORIZONTAL
82.484970	22.40	-19.9	40.0	17.6	---	300.0	221.00	HORIZONTAL
138.857715	30.20	-19.8	40.0	9.8	---	300.0	197.00	HORIZONTAL
179.679359	26.70	-20.5	40.0	13.3	---	100.0	358.00	HORIZONTAL
274.929860	29.00	-16.3	47.0	18.0	---	100.0	45.00	HORIZONTAL
990.280561	31.10	-3.1	47.0	15.9	---	100.0	316.00	HORIZONTAL

Vin:230Vac, HORIZONTAL, Io: 2A  
 Test condition: 1.5m cable with 2.5R resistor

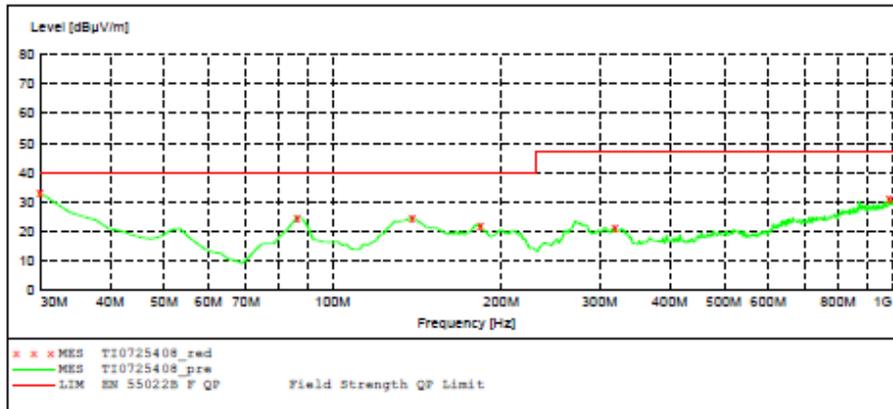
SHENZHEN HUATONGWEI INTERNATIONAL INSPECTION CO.,LTD

RADIATED EMISSION TEST EN 55022 CLASSB

EUT: FMP4378  
 Manufacturer: TI  
 Operating Condition: LOAD  
 Test Site: 3M CHAMBER  
 Operator: MINGHUA.FAN  
 Test Specification: AC 230V/50Hz  
 Comment:  
 Start of Test: 7/25/2013 / 5:15:48PM

SWEEP TABLE: "test (30M-1G)"

Short Description:	Start	Stop	Detector	Meas. Time	Field Strength IF Bandw.	Transducer
	30.0 MHz	1.0 GHz	MaxPeak	Coupled	120 kHz	HL562 201106



MEASUREMENT RESULT: "TI0725408\_red"

7/25/2013 5:17PM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Asimuth deg	Polarisation
30.000000	33.00	-10.0	40.0	7.0	---	100.0	53.00	VERTICAL
86.372745	24.80	-19.4	40.0	15.2	---	100.0	296.00	VERTICAL
138.857715	24.80	-19.8	40.0	15.2	---	100.0	242.00	VERTICAL
183.567134	22.20	-20.5	40.0	17.8	---	100.0	94.00	VERTICAL
319.639279	21.10	-14.6	47.0	25.9	---	100.0	248.00	VERTICAL
989.326673	31.00	-3.1	47.0	16.0	---	100.0	278.00	VERTICAL

Vin:230Vac, VERTICAL, Io: 2A  
 Test condition: 1.5m cable with 2.5R resistor

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