

Subject

**OB3672 Demo Board Manual**

Board Model: LD40V1A3672 1525

Doc. No.: OB\_DOC\_DBM\_A\_367200

**Key Features**

- High PF without low Frequency current Ripple
- High efficiency isolated application
- High precision output current regulation and Line current regulation
- Short circuit protection, over voltage protection and over temperature protection

**Revision History**

Revise Date	Version	Reason/Issue
2015-6-30	00	First issue (NO EMI)

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# 1 LED Lighting Specification

## 1.1 Input Characteristics

- AC input voltage range 90Vac ~ 264Vac
- AC input frequency range 47Hz ~ 53Hz

## 1.2 Output Characteristics

- Output Current 1A
- Output Voltage 40V

## 1.3 Performance Specifications

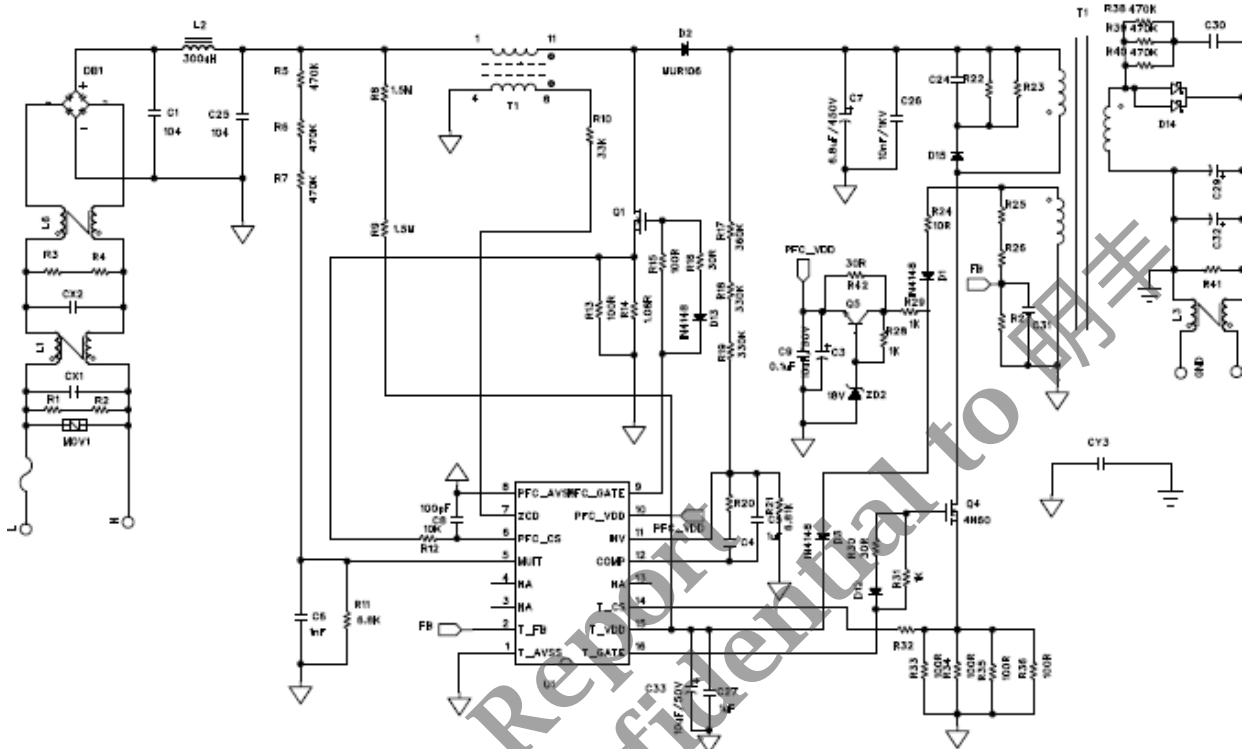
- Max. Output Power 40W
- Efficiency >88% @ Max. Output Power and  $V_{in}=230V_{ac}$
- Turn on Delay Time 1Sec. Max. @90Vac with full load

## 1.4 Protection Features

- Short Circuit Protection Output shut down with auto-recovery
- Over Voltage Protection Output shut down with auto-recovery
- Over Temperature Protection Output shut down with auto-recovery when temperature fall down

## 2 LED Lighting Information

### 2.1 Schematic



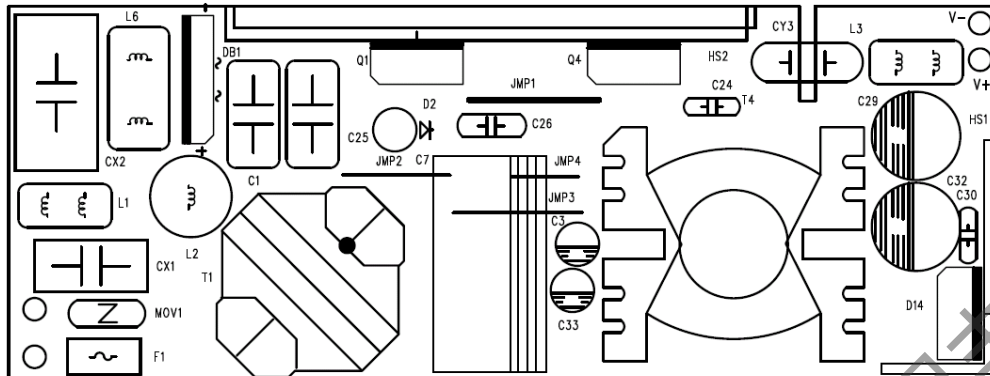
## 2.2 Bill of material

No.	Position	Description	Quantity	Remark
1	R1,R2	NC		
2	R3,R4	NC		
3	R5,R6,R7,R17,R18	RES SMD 1206 470K±5%	5	
4	R8, R9	RES SMD 1206 750K ±5%	2	
5	R9	RES SMD 1206 10R ±5%	1	
6	R10	RES SMD 0805 43K ±5%	1	
7	R11	RES SMD 0805 9.1K±5%	1	
8	R12,R32	RES SMD 0805 0R±5%	2	
9	R13	RES SMD 0805 2.4R±1%	1	
10	R14	RES SMD 0805 1.2R±1%	1	
11	R15,R31	RES SMD 1206 100R ±5%	2	
12	R16,R30	RES SMD 1206 10R ±5%	2	
13	R19	RES SMD 0805 360K±1%	1	
13	R20	NC		
14	R21	RES SMD 1206 8.2K±5%	1	
15	R22,R23	RES SMD 1206 200K±5%	2	
16	R24	RES SMD 1206 10R±1%	1	
17	R25,R26	RES SMD 0805 180K±5%	2	
18	R27	RES SMD 0805 18K ±5%	1	
19	R28,R40	NC		
20	R29	RES SMD 0805 10R ±5%	1	
21	R33	RES SMD 1206 4R3 ±1%	1	
22	R34,R35,R36	RES SMD 1206 1R ±1%	3	
23	R37	RES SMD 1206 0R ±5%	1	
24	R38,R39	RES SMD 1206 30R ±5%	2	
25	R41	RES SMD 1206 47K ±5%	1	
26	R42	RES SMD 1206 0R ±5%	1	
27	RJ1,RJ2	RES SMD 0805 0R ±5%	2	
28	C1	MPP 220nF/400V	1	
29	C25	CBB 470nF/400V	1	
30	C3	EC 2.2uF/50V	1	
31	C4,C8,C26	NC		
32	C5	SMD 1uF/50V 0805	1	
33	C6	SMD 10nF/50V 0805	1	
34	C7	EC 22uF/450V	1	
35	C9,C27	SMD 100nF/50V 0805	2	
36	C24	C.C 2.2nF/1KV DIP	1	
37	C29,C32	EC 220uF/63V	2	
38	C30	C.C 470pF/1KV DIP	1	
39	C31	SMD 22pF/50V 0805	1	
40	C33	EC 6.8uF/50V	1	
41	CX1	NC		

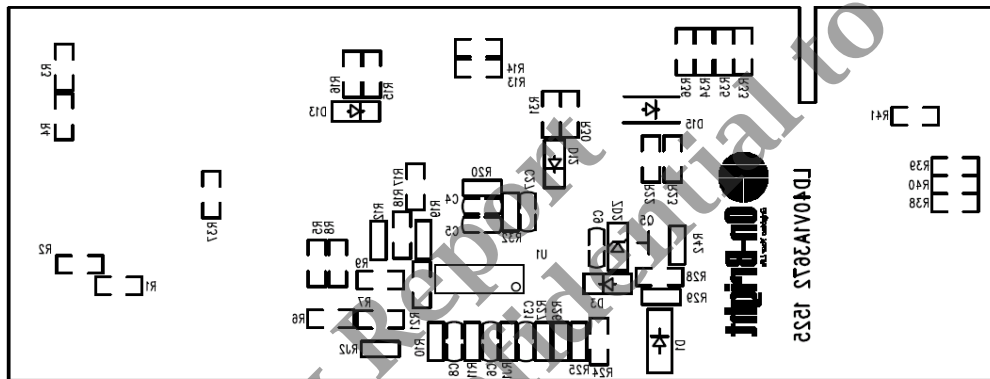
42	CX2	NC		
43	CY3	NC		
44	BD1	KBP308G	1	
45	D1,D15	Diode, US1J ,1A/600V	2	
46	D2	Diode, MUR260 ,2A/600V, DIP	1	
47	D3,D12,D13	Diode,IN4148	3	
48	D14	UF1004FCT,400V	1	
49	ZD2	NC		
50	Q1	NMOS,6N60,TO-220F	1	
51	Q2	NMOS,6N65,TO-220F	1	
52	Q5	NC		
53	L1	NC		
54	L2	NC		
55	L3	NC		
56	L6	NC		
57	MOV1	MOV 7K471	1	
58	F1	Fuse, 2.5A/250V	1	
59	T1	RM8,1.42mH	1	
60	T4	PQ2620,0.85mH	1	
61	U1	OB3672	1	
62	HS1	1.2*10*18mm	1	
63	HS12	4*22*60mm	1	
TOTAL			69	

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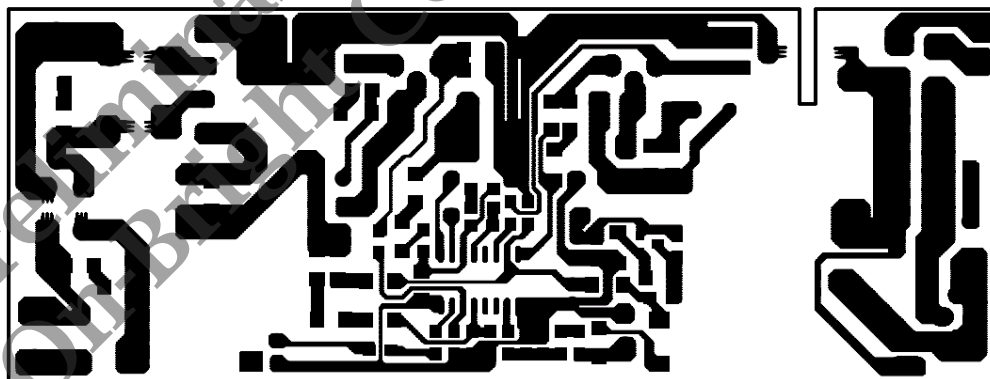
### 2.3 PCB Gerber File



Top Silkscreen



Bottom Silkscreen

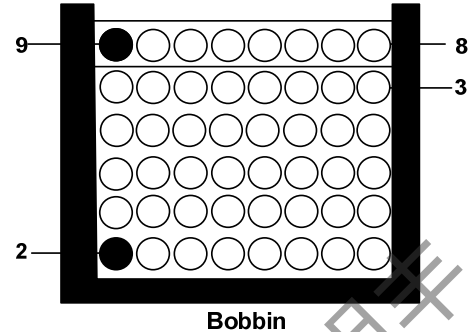
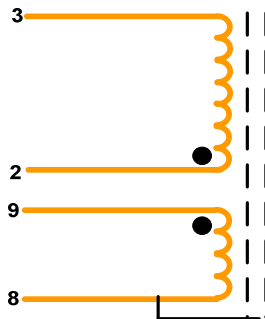


Bottom layer

## 2.4 Transformer Design

### 2.4.1 Manufacture: T1

#### T1: Manufacture



#### Note:

- 1) Bobbin: RM8(12Pin V)
- 2) Core material: PC40
- 3)  $L(2-3) = 1.42\text{mH} \pm 7\%$  (10KHz, 1V, 25°C)

#### T1:Winding data

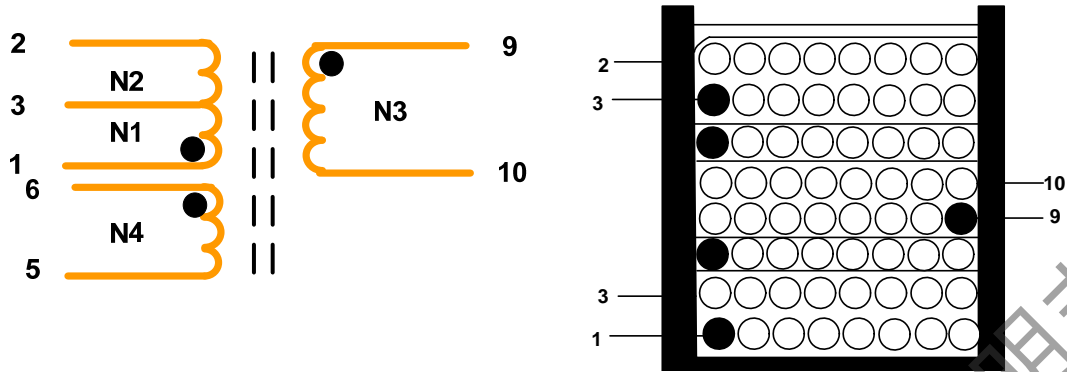
Step	Winging	Material	Start	Turns	Finish	Remark
1	NP	2UEWΦ0.35×1	2	23	- >	
			- >	23	- >	
			- >	23	- >	
			- >	22	- >	
			- >	22	3	
2	TAPE	9.5mm		2		
3	NA	2UEWΦ0.25×2	9	16	8	
4		铜皮5mm包裹磁心一圈，焊线接11pin				
5	TAPE	9.5mm		3		

Note: Black dot is start



## 2.4.2 Manufacture: T4

### T4: Manufacture



#### Note:

- 1) Bobbin: PQ2620(12Pin )
- 2) Core material: PC40
- 3)  $L(1-2) = 0.85\text{mH} \pm 7\%$  (10KHz, 1V, 25°C)

#### T2:Winding data

Step	Winging	Material	Start	Turns	Finish	Remark
1	N1	2UEW $\Phi 0.33\text{mm}$	1	24	3	
2	TAPE	9.5mm		2		
3	N3	$\Phi 0.7\text{mm}$ Triple insulated wire	9	9	→	
		$\Phi 0.7\text{mm}$ Triple insulated wire	→	9	10	
4	TAPE	9.5mm		2		
5	N2	2UEW $\Phi 0.33\text{mm}$	3	24	2	
6	TAPE	13.5mm		3		
7	N4	2UEW $\Phi 0.2\text{mm}$	6	9	5	
8	TAPE	9.5mm		3		

Note: Black dot is start

### 3 Performance Evaluation

#### Characterization Results Summary

Test Item	Test result
<b>1. Input characteristics</b>	
Efficiency (230Vac, Full load)	89.31%
<b>2. Output characteristics</b>	
Current overshoot	None
Output current ripple	56mA
<b>3. Time sequence (90Vac, Full load)</b>	
Turn on delay time	499mS
<b>4. Protections</b>	
Short Circuit protection	OK
Over Voltage protection	OK
Over Temperature protection	OK

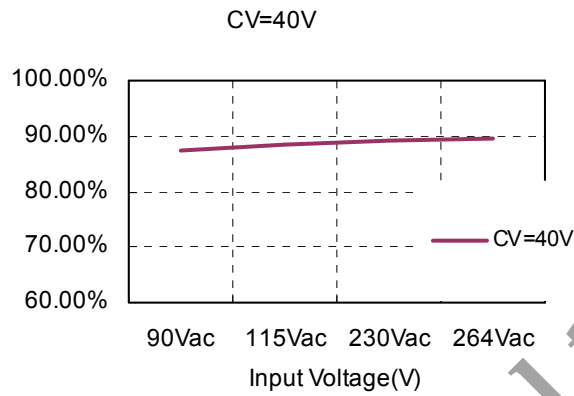
#### Test Equipments

Item	Vender	Module
AC Source	WEST	WEW1010
Digital Power Meter	YOKOGAWA	WT210
Electrical Load	Prodigit	3315C
Oscilloscope	LeCroy	WS424
Multimeter	VICTORY	VC9807A
Thermal	FLUKE	HS2

## 3.1 Input Characteristics

### 3.1.1 Efficiency

$V_o/V_{dc}$	VIN=170Vac	VIN=200Vac	VIN=230Vac	VIN=264Vac	SPEC
<b>40V</b>	87.55%	88.4%	89.31%	89.57%	>85%



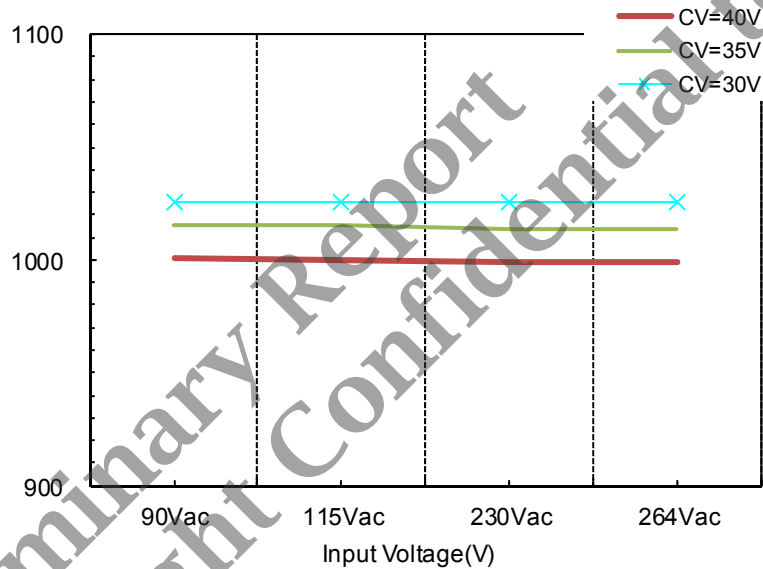
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## 3.2 Output Characteristics

### 3.2.1 LED Current Regulation

Line regulation & Load regulation

Vout/Vdc	Iout (mA)				Precision VS VIN
	90Vac/60HZ	115Vac/60HZ	230Vac/50HZ	264Vac/50HZ	
40V	1001	1000	999	999	±0.1%
35V	1015	1015	1014	1014	±0.05%
30V	1026	1026	1026	1026	±0%
<b>Precision VS Vout</b>	±1.25%	±1.3%	±1.35%	±1.35%	

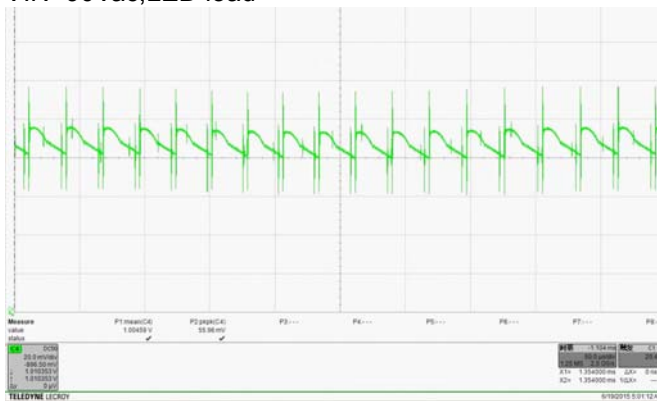


## 3.2.2 Current Ripple

Input Voltage	Current Ripple
90Vac	56mA
264Vac	52.56mA

### Current ripple waveform

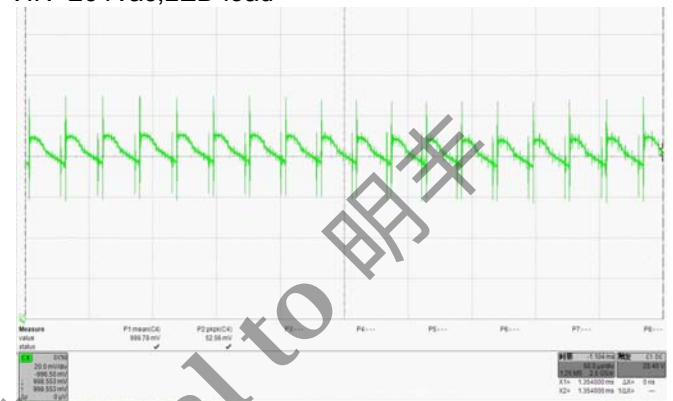
VIN=90Vac,LED load



CH1:  
CH3:

CH2:  
CH4:  $I_{LED}$

VIN=264Vac,LED load



CH1:  
CH3:

CH2:  
CH4:  $I_{LED}$

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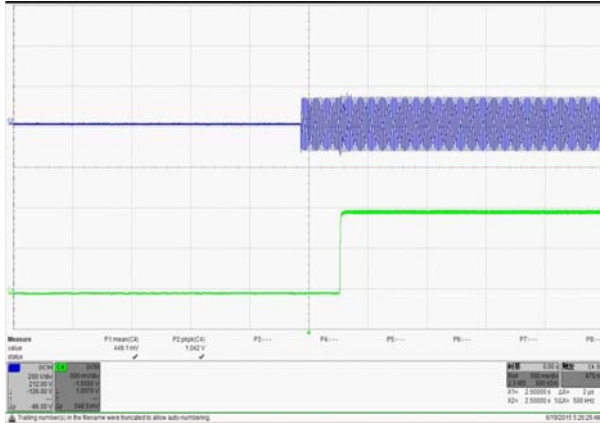
### 3.2.3 Current Overshoot

Current overshoot measurement results

Input Voltage	Current overshoot
90V	0%
264V	0%

Output Voltage and Current overshoot

VIN=90Vac, LED load



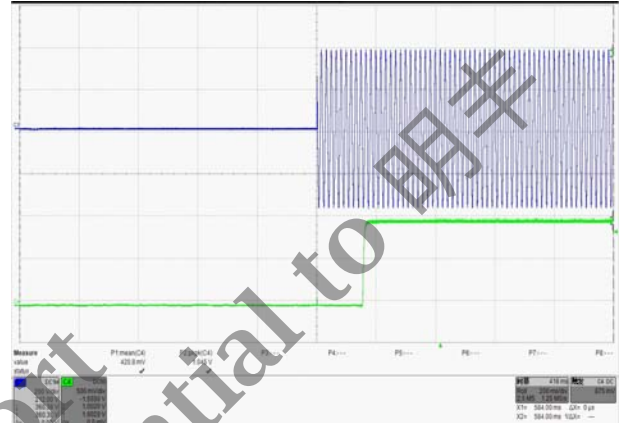
CH1:

CH3:  $V_{ac}$

CH2:

CH4:  $I_{LED}$

VIN=264Vac, LED load



CH1:

CH3:  $V_{ac}$

CH2:

CH4:  $I_{LED}$

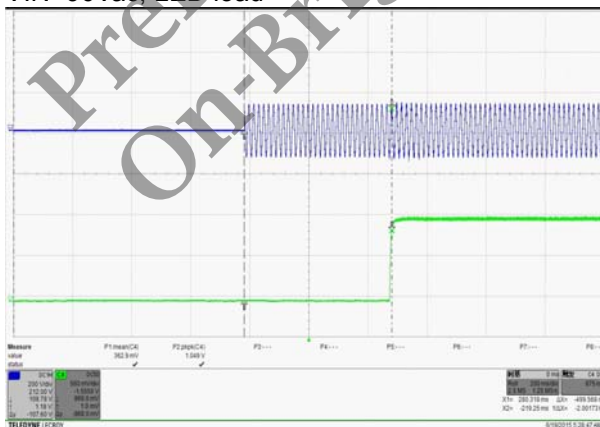
### 3.2.4 Time Sequence

Turn-on delay measurement results

Input voltage	Turn-on delay
90V	499ms
264V	160ms

Turn-on delay

VIN=90Vac, LED load



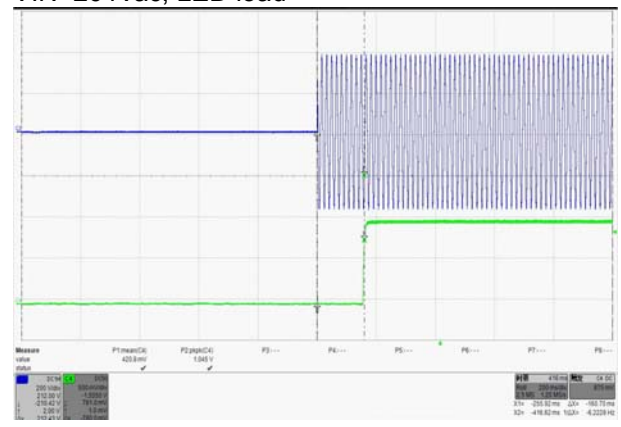
CH1:

CH3:  $V_{ac}$

CH2:

CH4:  $I_{LED}$

VIN=264Vac, LED load



CH1:

CH3:  $V_{ac}$

CH2:

CH4:  $I_{LED}$

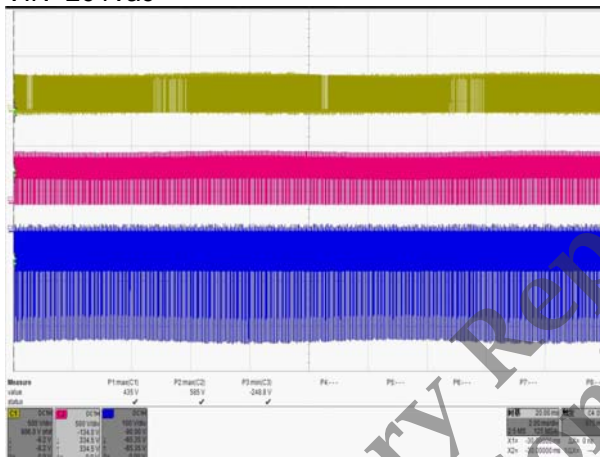
### 3.3 Waveform at normal/ start/output open/output short

#### 3.3.1 MOSFET and Wheel Diode Max Voltage

Input	V <sub>DS_max(V)</sub> (Q1)	V <sub>DS_max(V)</sub> (Q2)	V <sub>D14_max(V)</sub>
264Vac @ Full load	435	585	248
264Vac @ Output open	400	614	249
264Vac @ Output short	387	435	186.4
264Vac @ Start full load	434	602	156

##### Normal

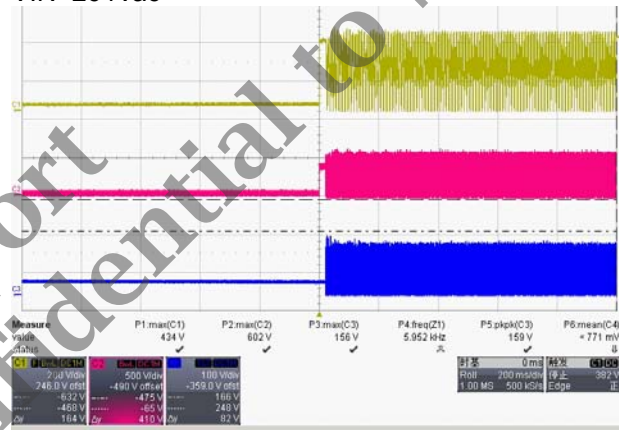
VIN=264Vac


 CH1: V<sub>DSQ1</sub>  
 CH3: V<sub>D14</sub>

 CH2: V<sub>DSQ4</sub>  
 CH4:

##### Startup

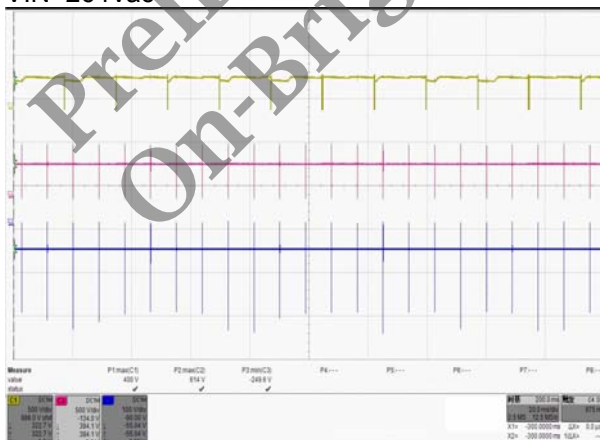
VIN=264Vac


 CH1: V<sub>DSQ1</sub>  
 CH3: V<sub>D14</sub>

 CH2: V<sub>DSQ4</sub>  
 CH4:

##### Output Open

VIN=264Vac


 CH1: V<sub>DSQ1</sub>  
 CH3: V<sub>D14</sub>

 CH2: V<sub>DSQ4</sub>  
 CH4:

##### Output Short

VIN=264Vac


 CH1: V<sub>DSQ1</sub>  
 CH3: V<sub>D14</sub>

 CH2: V<sub>DSQ4</sub>  
 CH4:

## 4 Other Protection Data

*Output voltage @ output open*

Input(Vac)	90	115	132	175	230	264
Vout_max(V)	57.5	57.3	57.5	57.4	57.3	57.5

*Input power @ output short*

Input(Vac)	90	115	132	175	230	264
Pin (W)	0.058	0.0985	0.130	0.202	0.350	0.455

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