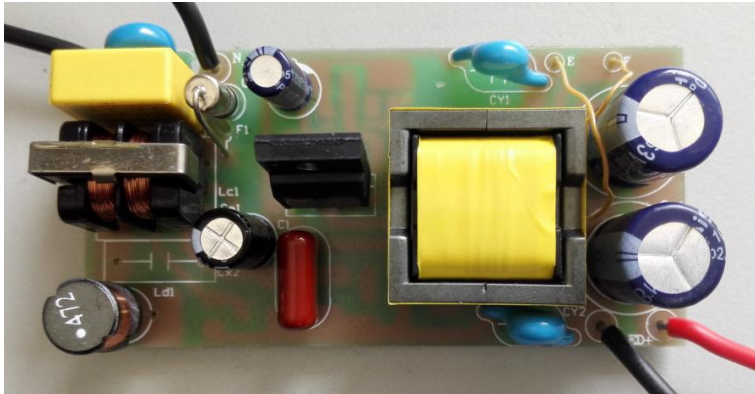




18W LED Driver Module Using UCL2310



Subject

UCL2310 Isolated LED Driver_18W_0.35A_Demo Board Manual

Key features:

- AC Input Range 90Vac~264Vac
 - High Efficiency(86% @220Vac)
 - High PF(0.960 @220Vac)
 - Excellent line voltage regulation and load regulation(<math>< \pm 3\%</math>)
 - Multiple protection functions and high reliability
-

Revision History

Revise Date	Version	Reason/Issue
2016/12/7	A	First Issue



18W LED Driver Module Using UCL2310

Contents Index		Page
1	LED Demo Board Specification	3
1.1	Input Characteristics	3
1.2	Output Characteristics	3
1.3	Performance Specifications	3
1.4	Protection Function	3
1.5	Environment	3
2	LED Demo Board Information	4
2.1	Schematic	4
2.2	BOM	4
2.3	TR Design	5
2.4	Demo Board Snapshot	5
3	Performance Evaluation	6
3.1	Input Current	6
3.2	PF	6
3.3	THD	7
3.4	Efficiency	7
3.5	Line Regulation&Load Regulation	8
3.6	Temperature	8
4	Waveforms	9
4.1	VCC&IO startup waveform@85Vac FULL LOAD	9
4.2	VDS&VCS waveform@85Vac FULL LOAD	9
4.3	VDS&VCS waveform@264Vac FULL LOAD	10
4.4	VD9 waveform@264Vac FULL LOAD	11
5	EMI	12
5.1	Live Conduction	12
5.2	Netural Conduction	12
5.3	Vertical Radiated	12



18W LED Driver Module Using UCL2310

1. LED Demo Board Specification

1.1. Input Characteristics

- AC input voltage rating 100Vac ~ 240Vac
- AC input frequency range 90Vac~264Vac
- AC input frequency range 47Hz ~ 63Hz

1.2. Output Characteristics

- Output Voltage 30Vdc~48Vdc
- Typical output current 350mA

1.3. Performance Specifications

- Maximum Output Power 18W

1.4. Protection Function

- Short Circuit Protection Shut down and auto recovery
- Open Loop Protection Shut down and auto recovery
- VCC OVP&UVLO Shut down and auto recovery
- OTP Reduce the output current till shutdown

1.5. Environment

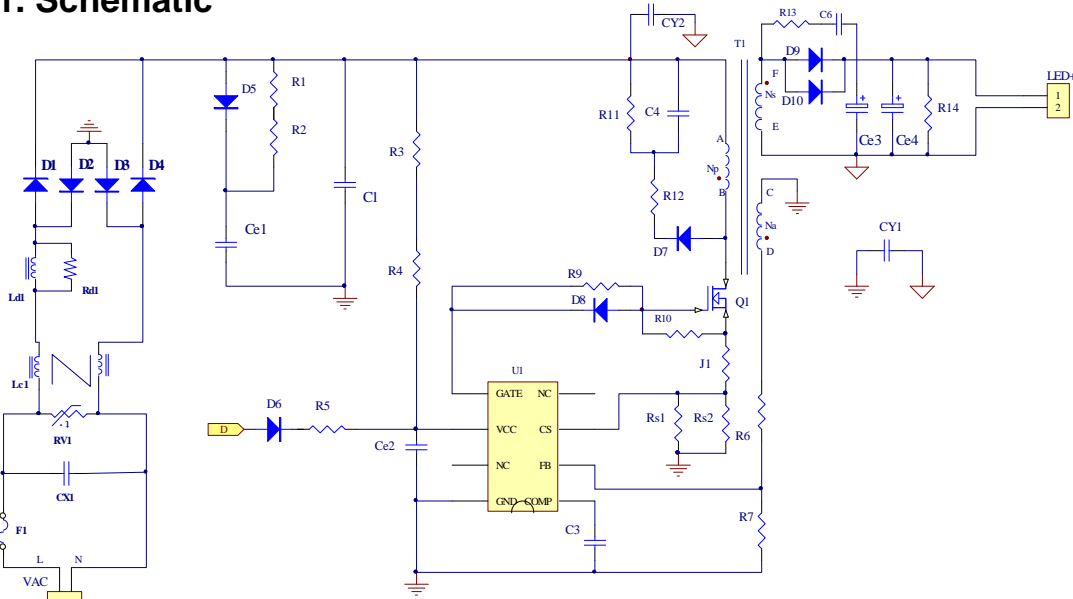
- Operation Temperature 0°C to 40 °C
- Operation Humidity 20% to 90% R.H
- Storage Temperature -40°C to 60 °C
- Storage Humidity 0% to 90% R.H



18W LED Driver Module Using UCL2310

2. LED Demo Board Information

2.1. Schematic



2.2. BOM

No.	Position	Description	Quantity
1	Rs1	RES-SMD-1206-001. 20R-1%-0. 250W	1
2	Rs2	RES-SMD-1206-001. 60R-1%-0. 250W	1
3	J1	RES-SMD-1206-000. 00R-5%-0. 250W	1
4	R1, R2	RES-SMD-1206-470. 00K-5%-0. 250W	2
5	R13	RES-SMD-1206-100. 00R-5%-0. 250W	1
6	R3, R4, R11	RES-SMD-1206-200. 00K-5%-0. 250W	3
7	R5	RES-SMD-0805-33. 00R-5%-0. 125W	1
8	R9, R12	RES-SMD-0805-330. 00R-5%-0. 125W	2
9	Rd1	RES-SMD-1206-005. 10K-5%-0. 250W	1
10	R14	RES-SMD-1206-047. 00K-5%-0. 250W	1
11	R7	RES-SMD-0805-018. 00K-5%-0. 125W	1
12	R10	RES-SMD-0805-100. 00K-5%-0. 125W	1
13	R6	RES-SMD-0805-240. 00K-5%-0. 125W	1
14	Ce1	CAP_ELE-2. 2uF-400V_ Φ6. 3*11	1
15	Ce2	CAP_ELE-22uF-50V_ Φ5*11	1
16	Ce3, Ce4	CAP_ELE-180uF-63V_ Φ10*16	2
17	C3	CAP-SMD-0805-X7R-1uF-10%-25V	1
18	C6	CAP-SMD-1206-X7R-330pF-10%-1000V	1
19	C4	CAP-SMD-1206-X7R-1nF-10%-1000V	1
20	C1	CAP-MPP-150nF-400V_P10	1
21	CX1	CAP-X2-100nF-275Vac_P10	1
22	CY1, CY2	CAP-Y1-1nF-400V_P10	2
23	D8	UTC SOD-123-LL4148 (0. 15A-75V)	1
24	D1, D2, D3, D4, D5	UTC SMA-M7 (1A-1000V)	5



UNISONIC TECHNOLOGIES CO., LTD

www.unisonic.com.tw

18W LED Driver Module Using UCL2310

25	D9	UTC SMB-ES2G(2A-400V)	1
26	U1	UTC-UCL2310- SOP8	1
27	D6, D7	UTC SMA-RS1M(1A-1000V)	2
28	Q1	UTC MOS-N沟道-7N70(TO-220F)	1
29	RV1	VAR-Φ7-470V-7D471K	1
30	F1	FUS-AXI-SB-3A-250V-3.6mm*10mm	1
31	Ld1	LD-G8*10/4.7mH	1
32	Lc1	Lc-UU9.8-45mH	1
33	T1	EFD20-1mH	1
34	L, N	22AWG-UL3239-3kV-150°C 白色 长100mm	2
35	LED+	22AWG-UL3239-3kV-150°C 红色 长100mm	1
36	LED-	22AWG-UL3239-3kV-150°C 黑色 长100mm	1

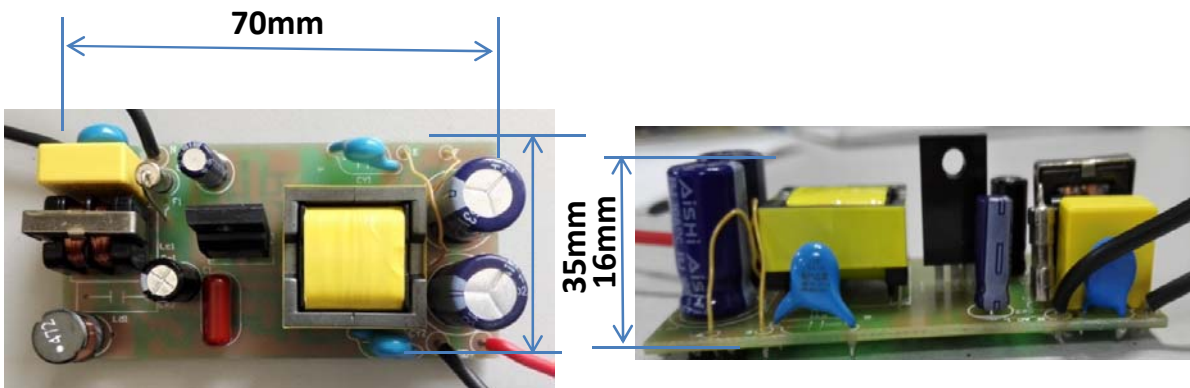
2.3. TR Design

- 1) Bobbin: EE20 5+5
- 2) Core material: PC40(TDK or equivalent)
- 3) Lp 2-1: 1.0mH ±5% (10KHz/1.0V)

Transformer Winding Data

Layer No.	Winding	Material	Start	Turns	Finish
1	N1	0.27Φ 2 UEW	3	88	2
2	Tape	Tape		2	
3	N2	0.16Φ 2 UEW	1	19	4
4	Tape	Tape		2	
5	N3	Triple Insulated Wire 0.3Φ	A	52	B
6	Tape	Tape		2	
7	N4	0.27Φ 2 UEW	2	39	5
8	Tape	Tape		2	

2.4. Demo Board Snapshot



UNISONIC TECHNOLOGIES CO., LTD

www.unisonic.com.tw

18W LED Driver Module Using UCL2310

3. Performance Evaluation

This document presented here is to describe the LED Driver Module performance.
The measuring data are tested at the PCB end, unless otherwise specified.

The Summarized Result :

Item	Test result
1. Input Characteristics	
Input Voltage rating	100Vac ~ 240Vac
Input Current (@Vin=90Vac, full load)	215mA
2. Output characteristics	
Maximum Output Power	18W
Output Typical Voltage	30Vdc~48Vdc
Output Typical Current	350mA
3. Protection	
Short Circuit Protection	Auto Recovery
Open Loop Protection	Auto Recovery

Test Equipment:

Item	Vendor	Model No:
1.AC Source	GW INSTRON	APS-9501
2.Digital Power meter	DECTECH	3330S
3.Electronic Load	PRODIGIT	3302C
4.Digital Oscilloscope	Tektronics	DPO3012
5.Multi-meter	Keithley	2000

3.1 Input Current

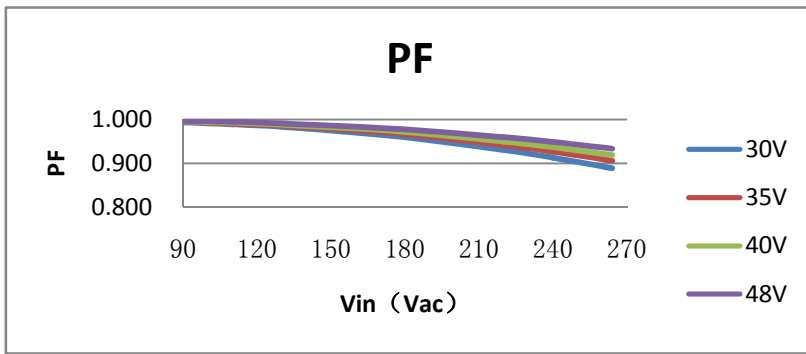
Input Voltage	Irms (mA)	SPEC	RESULT
90Vac/60Hz	214.9	N/A	N/A
110Vac/60Hz	171.9		
220Vac/50Hz	91.5		
264Vac/50Hz	81.5		

3.2 PF

Vin (Vac) load (V)	90	110	132	176	220	240	264
48	0.997	0.995	0.991	0.979	0.960	0.949	0.934
40	0.996	0.993	0.988	0.974	0.950	0.937	0.919
35	0.995	0.991	0.986	0.969	0.942	0.927	0.906
30	0.994	0.989	0.983	0.962	0.931	0.913	0.889

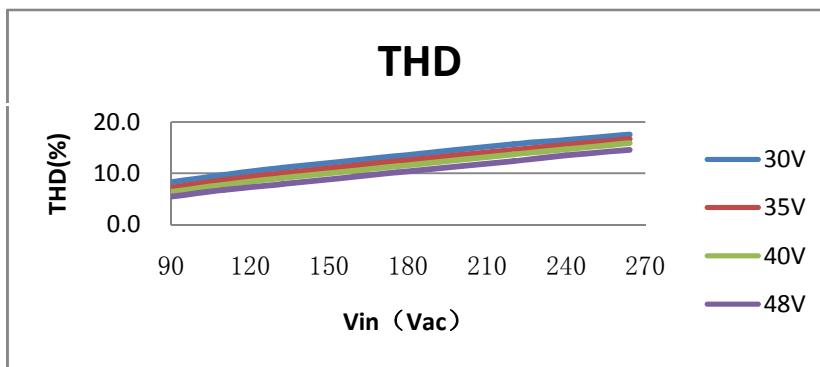


18W LED Driver Module Using UCL2310



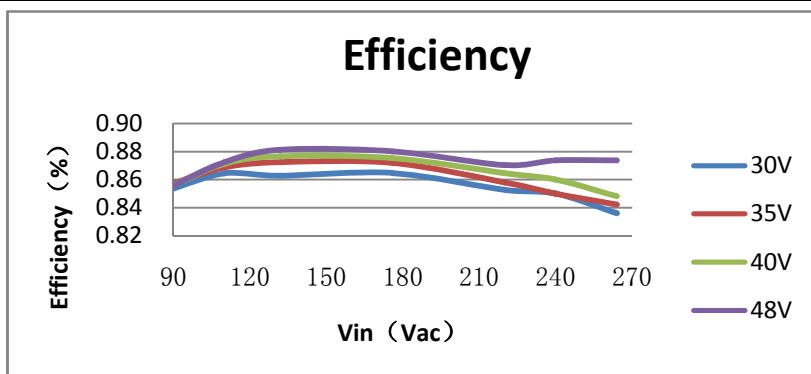
3.3 THD

load (V) \ Vin (Vac)	90	110	132	176	220	240	264
48	5.5	6.8	7.9	10.2	12.4	13.5	14.6
40	6.4	7.8	9.1	11.4	13.7	14.7	15.9
35	7.2	8.7	10.0	12.4	14.6	15.6	16.7
30	8.3	9.7	11.1	13.4	15.7	16.5	17.6



3.4 Efficiency

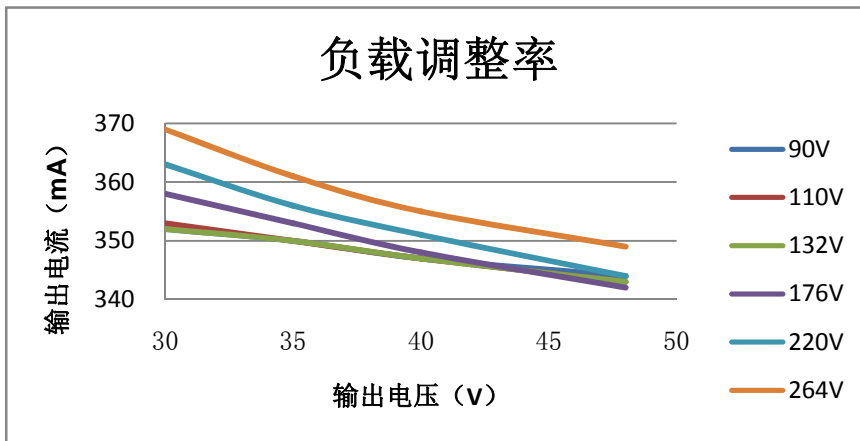
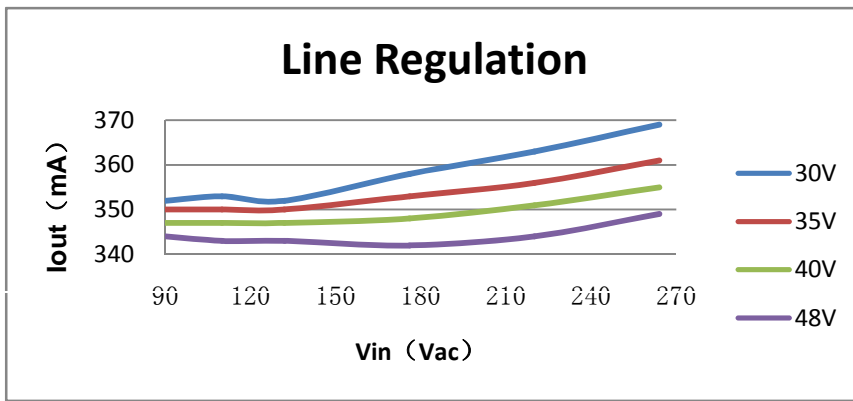
load (V) \ Vin (Vac)	90	110	132	176	220	240	264
30	0.85	0.86	0.86	0.86	0.85	0.85	0.84
35	0.86	0.87	0.87	0.87	0.86	0.85	0.84
40	0.86	0.87	0.88	0.88	0.86	0.86	0.85
48	0.86	0.87	0.88	0.88	0.87	0.87	0.87



18W LED Driver Module Using UCL2310

3.5 Line Regulation & Load Regulation

Input Voltage (Vac)	Pin (W) & Iout (mA)								Load Regulation
	Vout=30V		Vout=35V		Vout=40V		Vout=48V		
90	12.37	352	14.29	350	16.21	347	19.29	344	±1.14
110	12.25	353	14.10	350	15.93	347	18.87	343	±1.43
132	12.24	352	14.04	350	15.83	347	18.68	343	±1.28
176	12.42	358	14.17	353	15.90	348	18.65	342	±2.28
220	12.77	363	14.52	356	16.24	351	18.97	344	±2.71
264	13.24	369	15.00	361	16.74	355	19.17	349	±2.86
Line Regulation (%)	±2.43		±1.57		±1.14		±1		\



3.6 Temperature

Test@FULL LOAD Ambient 30°C

input voltage	90Vac	264Vac
IC1(#1)	59.2	56.3
TR Core	75.2	73.5
TR Wire	71.2	73.5
Diode(ES2G)	70.2	69.1
MOSFET	66.1	64.2



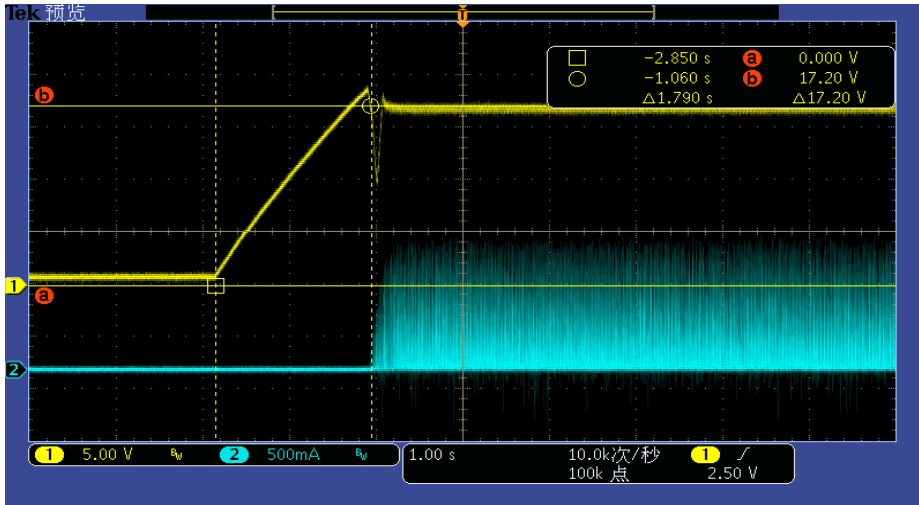
UNISONIC TECHNOLOGIES CO., LTD

www.unisonic.com.tw

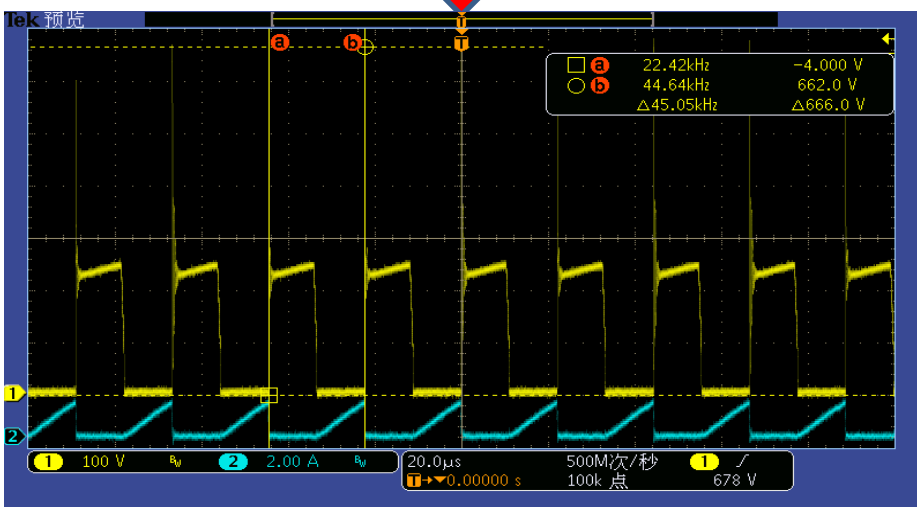
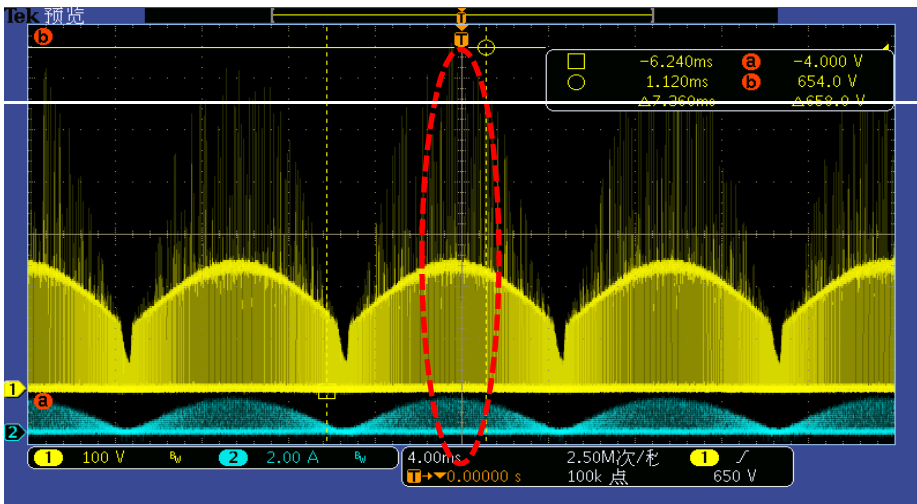
18W LED Driver Module Using UCL2310

4 Waveforms

4.1 VCC&IO startup waveform@85Vac FULL LOAD



4.2 VDS&VCS waveform@85Vac FULL LOAD

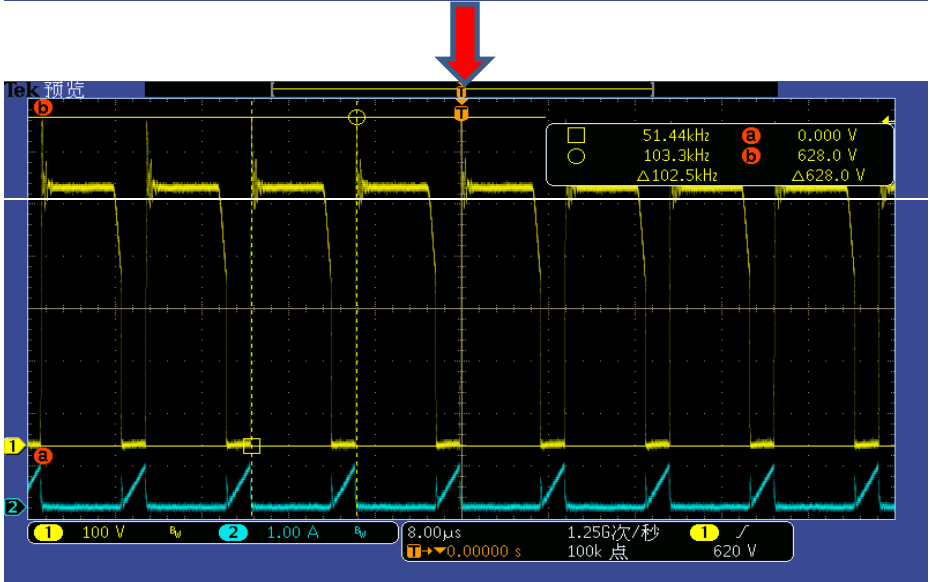
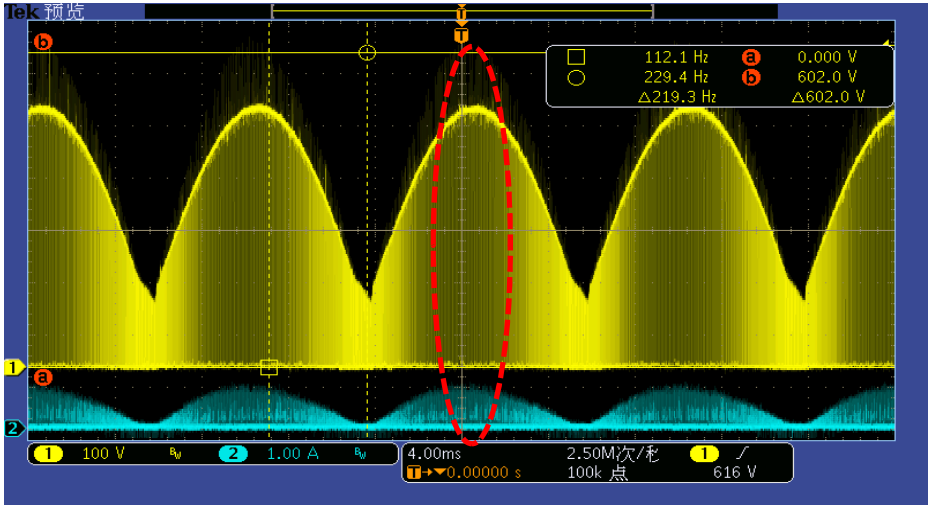


UNISONIC TECHNOLOGIES CO., LTD

www.unisonic.com.tw

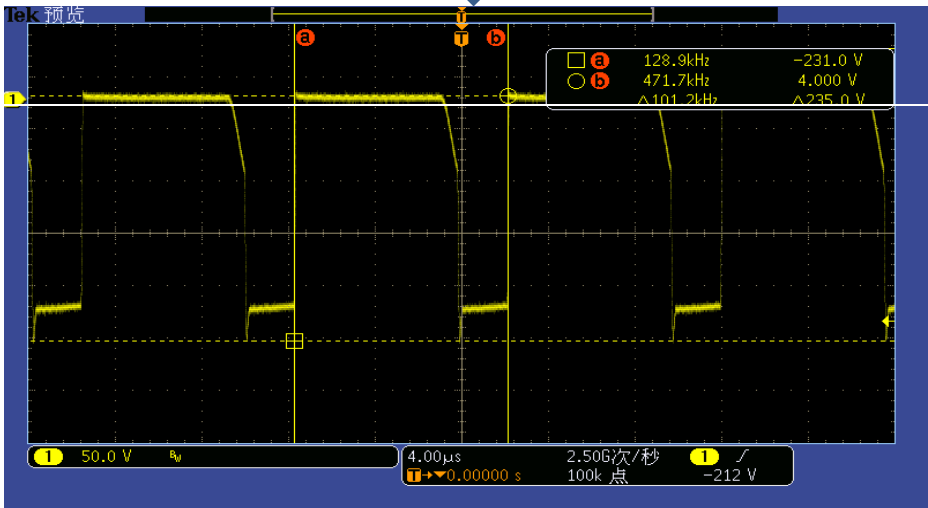
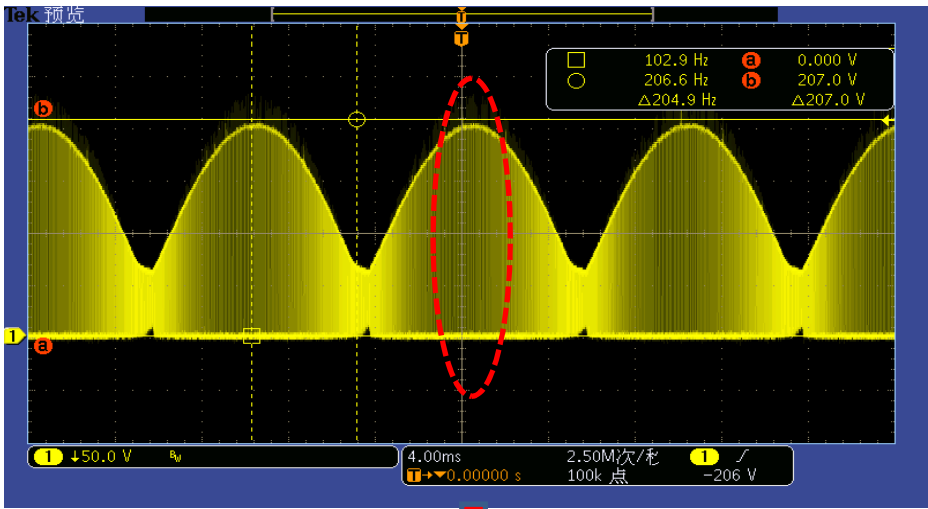
18W LED Driver Module Using UCL2310

4.3 VDS&VCS waveform@264Vac FULL LOAD



18W LED Driver Module Using UCL2310

4.4 VD9 waveform @264Vac FULL LOAD

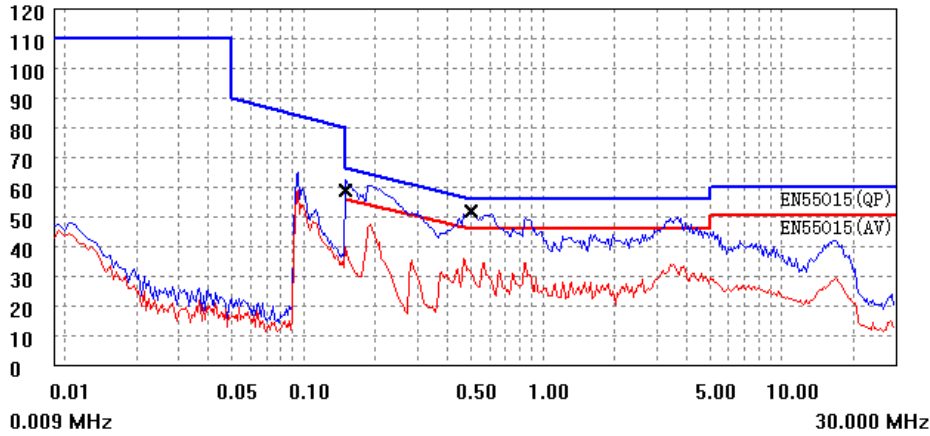


18W LED Driver Module Using UCL2310

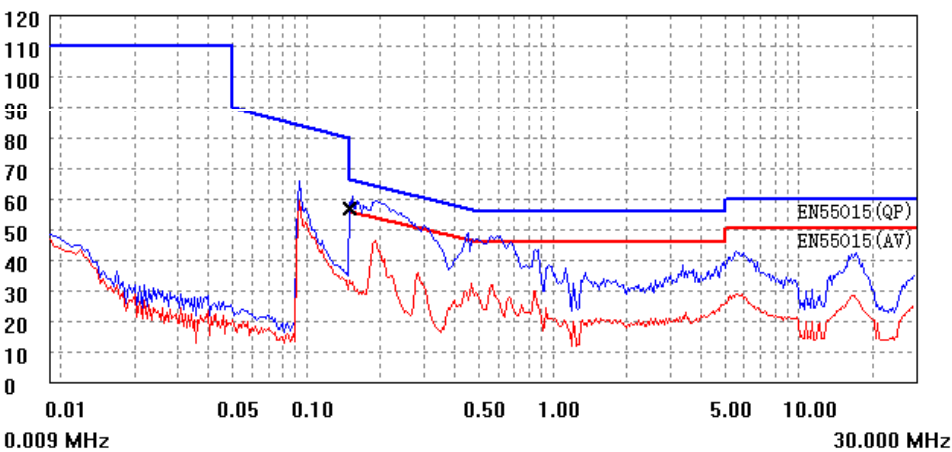
5 EMI

(Test @Vin=230Vac/50Hz, FULL Load)

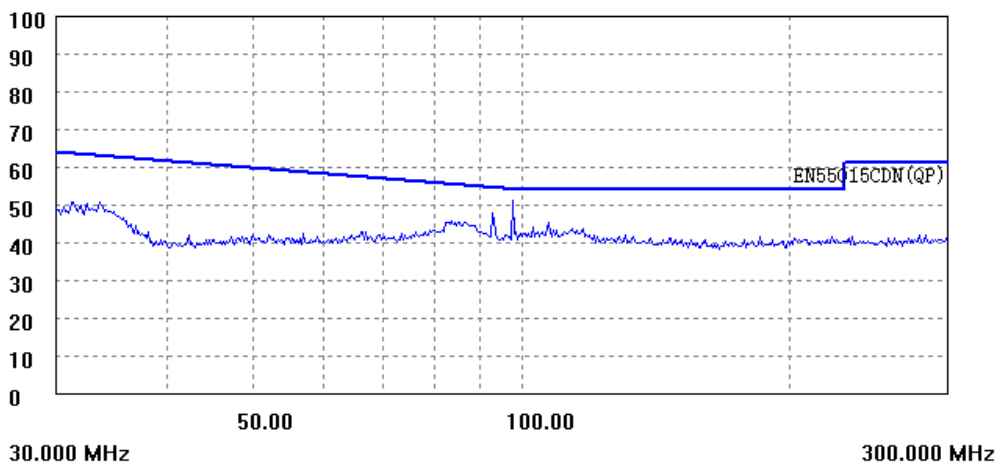
5.1 Live Conduction



5.2 Netural Conduction



5.2 Vertical Radiated



UNISONIC TECHNOLOGIES CO., LTD

www.unisonic.com.tw