



Iw3614-00 for 24V440mA LED Driver

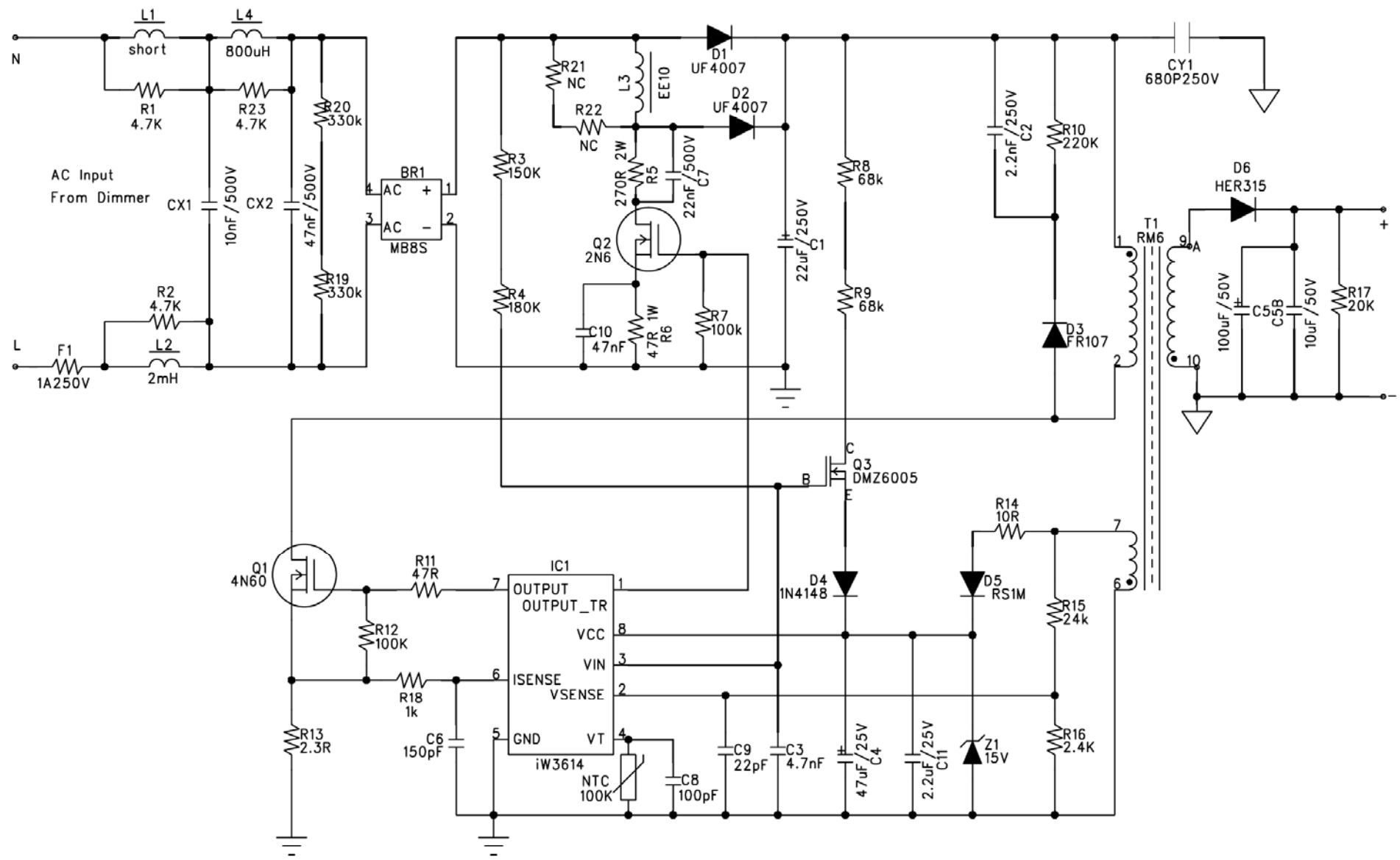
General Design Specification:

1. AC Input Range 90-135Vac
2. DC Output 24V, 440mA(Constant Current)
3. Isolated High efficiency ,High PF

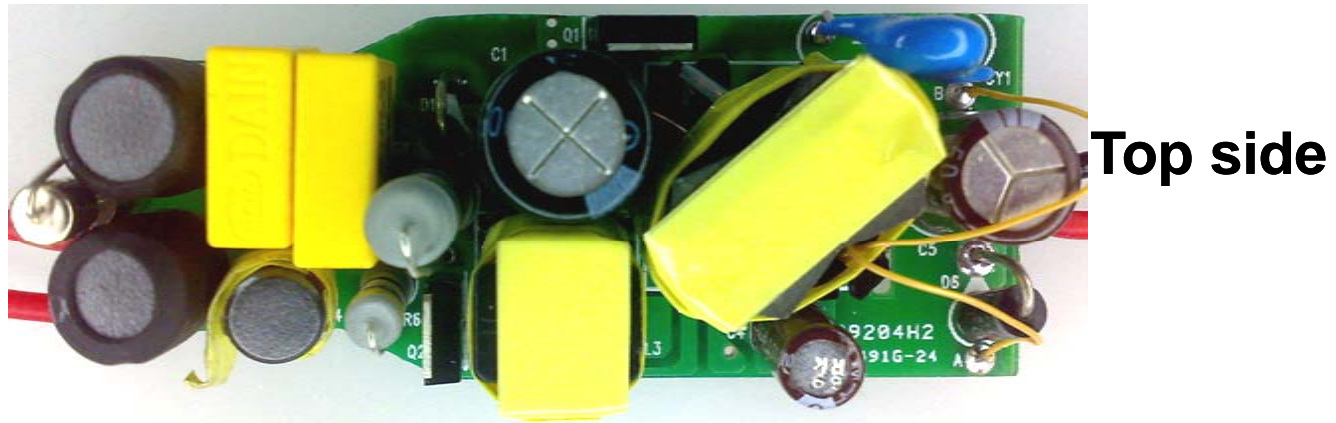
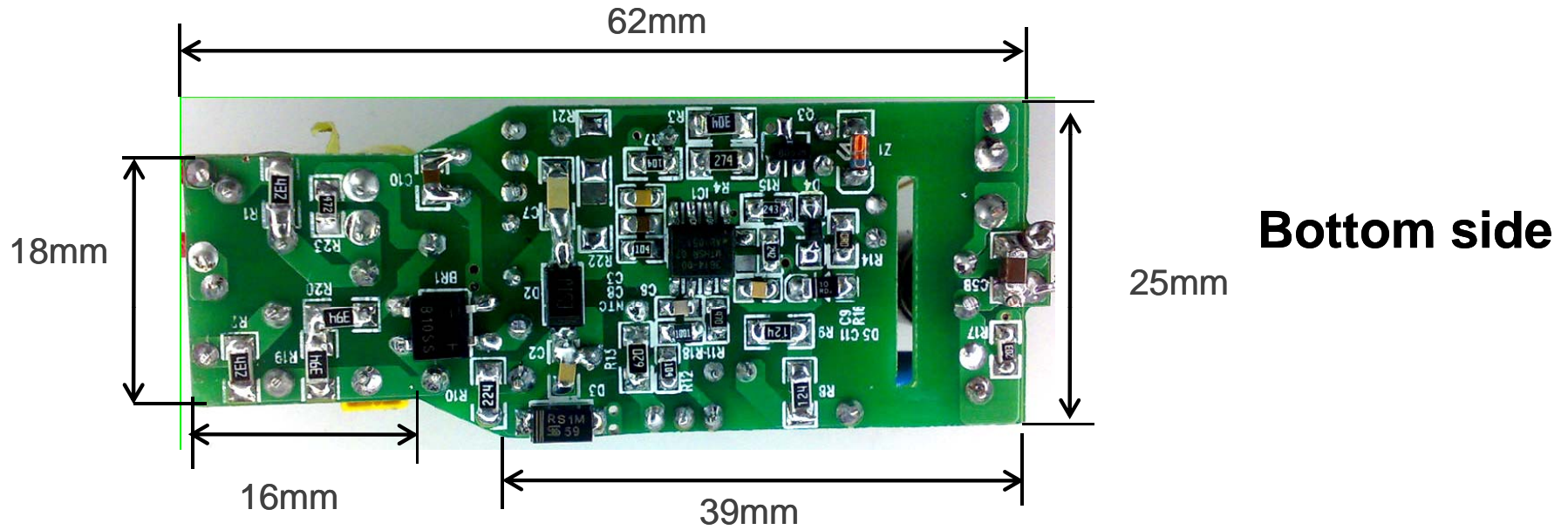
1. Specification

Description		Symbol	Min	Typ	Max	Units	Comment	
Input								
Voltage		V_{IN}	90		135	V _{AC}	2 Wire	
Frequency		f_{LINE}	57	60	63	Hz		
Open-load Input Power (264V _{AC})						W		
Output								
Const Voltage	Output Voltage	V_{OUT_CV}		24		V	Measured at the PCB connector	
	Output Current	I_{OUT_CV}				A		
Const Current	Output Voltage	V_{OUT_CV}				V	Min Vout is depend on Vcc	
	Output Current	I_{OUT_CV}		440		mA		
Total Output Power								
Continuous Output Power		P_{OUT}		12		W		
Over Current Protection		I_{OUT_MAX}				A	Auto-restart	
Efficiency		η	80			%	Measured at end of PCB@230	
Power Fact		PF		0.96			Harmonic meet IEC61000-3-2	
Turn on Delay Time						Sec		
Conducted EMI			Meets EN55015B					
Hi-pot test						KV		
Operation temperature		T_{opr}		40		° C	Free convection, sea level	

2 Schematic

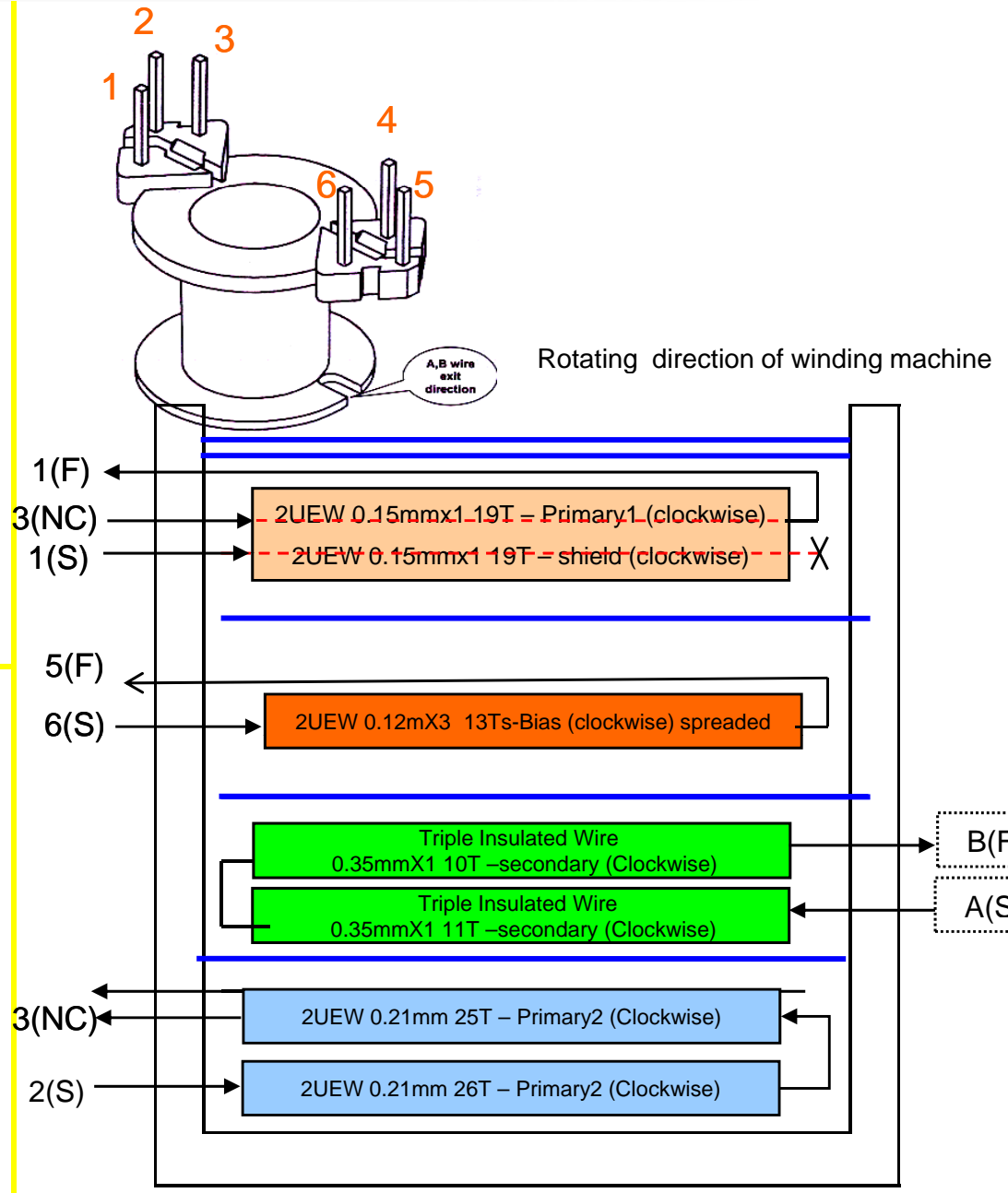
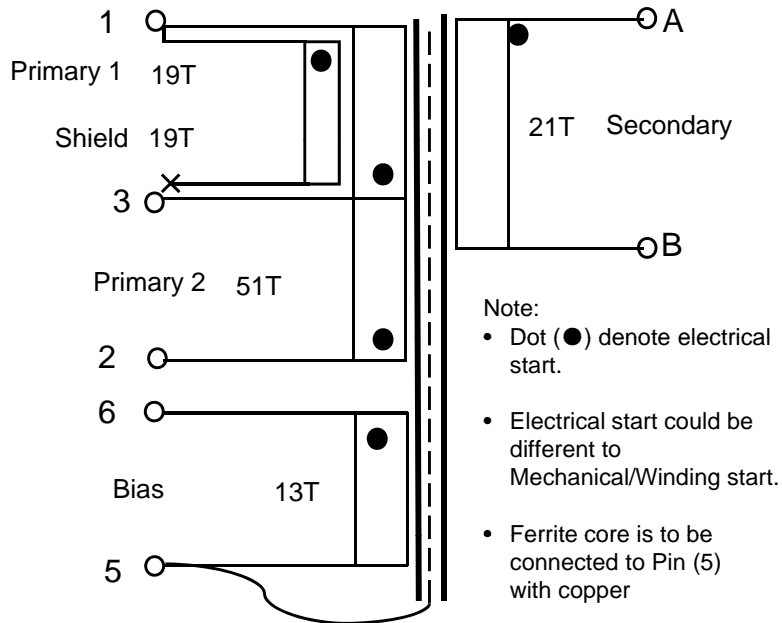


3. Circuit Board Photograph



4. Transformer Design

SCHEMATIC



ELECTRICAL SPECIFICATIONS:

1. Primary Inductance (L_p) = 1.2mH @10KHz
2. Primary Leakage Inductance (L_k) <= 50uH @10KHz
3. Electrical Strength = 3KV, 50/60Hz, 1Min

MATERIALS:

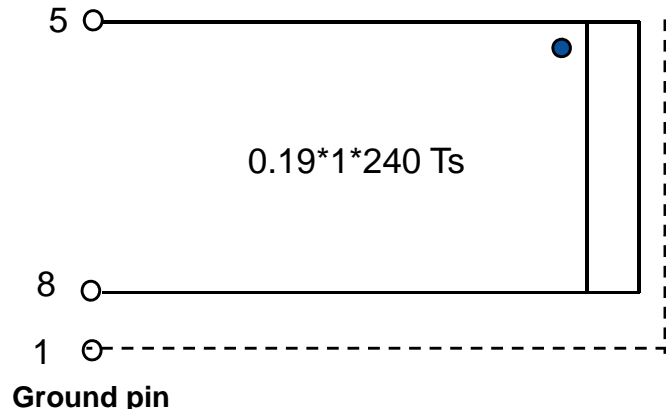
1. Core : RM6 (Ferrite Material TDK PC40 or equivalent)
2. Bobbin : RM6 Horizontal. Primary=3, Secondary=3
3. Magnet Wires (Pri) : Type 2-UEW
4. Magnet Wire (Sec) : Triple Insulated Wires
5. Layer Insulation Tape : 3M1298 or equivalent.

FINISHED :

1. Cut remained of Pin after wires termination
2. Core is connected to PRI-GND pin5.
3. Varnish the complete assembly

5.PFC choke and EMI Inductor__ For input 115Vac

L3 SCHEMATIC



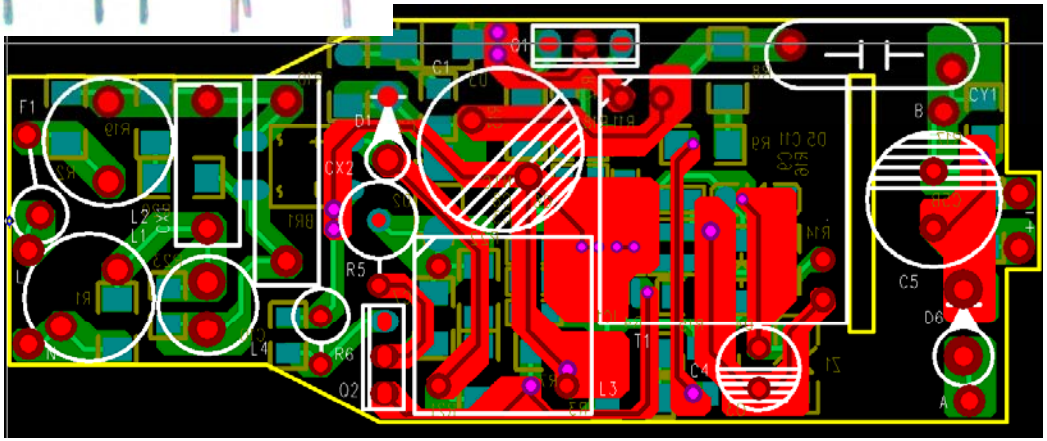
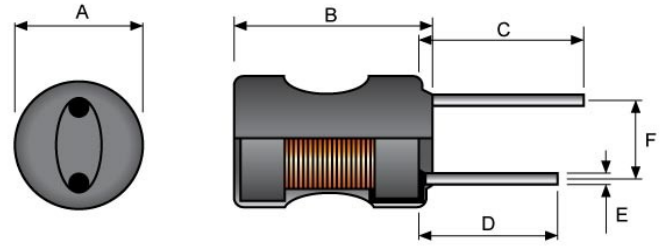
ELECTRICAL SPECIFICATIONS:

1. Inductance (L_p) = 1.2mH @10KHz
2. Core : EE10 (Ferrite Material TDK PC40 or equivalent)
3. Bobbin : EE10 Horizontal
4. Ferrite core is connected to Pin 1 after assembling
5. Cut Pin 2 ,3,4,6,7 after wires termination
6. Varnish the complete assembly



Copper shielding is connected to pin 1

EMI Inductor L1,L2



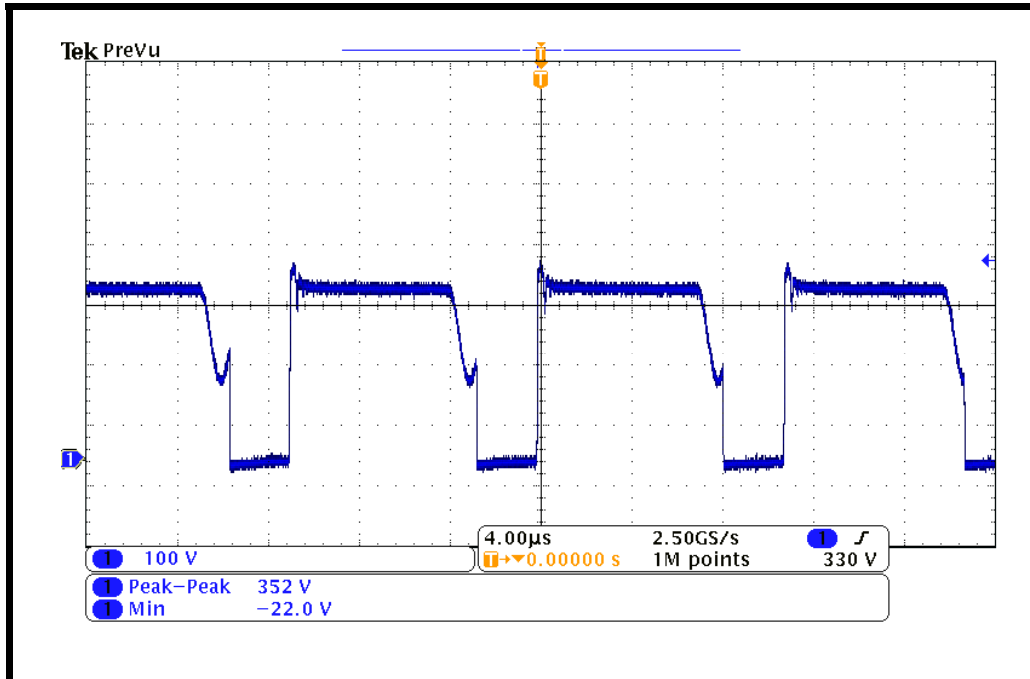
Ferrite core size : Ax B 8x10mm 0.21*240T
 Inductance @10kHz, 1V: 900uH +/-20%
 DCR: 3OHM +/-20%

6.Constant Current and Efficiency __No Dimmer

(AC input 90~135Vac,Output 7 LEDs)

#of LEDs	Vin	Pin	Vout	Iout	ripple current(mA)	efficiency	PF
	(V)	(W)	(V)	(A)			
7LEDs	90	14.16	24.64	0.441	68	76.74%	0.950
	100	13.75	24.62	0.440	64	78.77%	0.961
	110	13.47	24.49	0.439	64	79.85%	0.977
	115	13.35	24.57	0.439	64	80.78%	0.982
	120	13.26	24.55	0.439	64	81.20%	0.985
	130	13.16	24.54	0.438	64	81.71%	0.984
	135	13.06	24.52	0.438	68	82.18%	0.982

7. V_{ds} waveform



Test Condition:

$V_{IN}=135VAC$, CV:24V

Result:

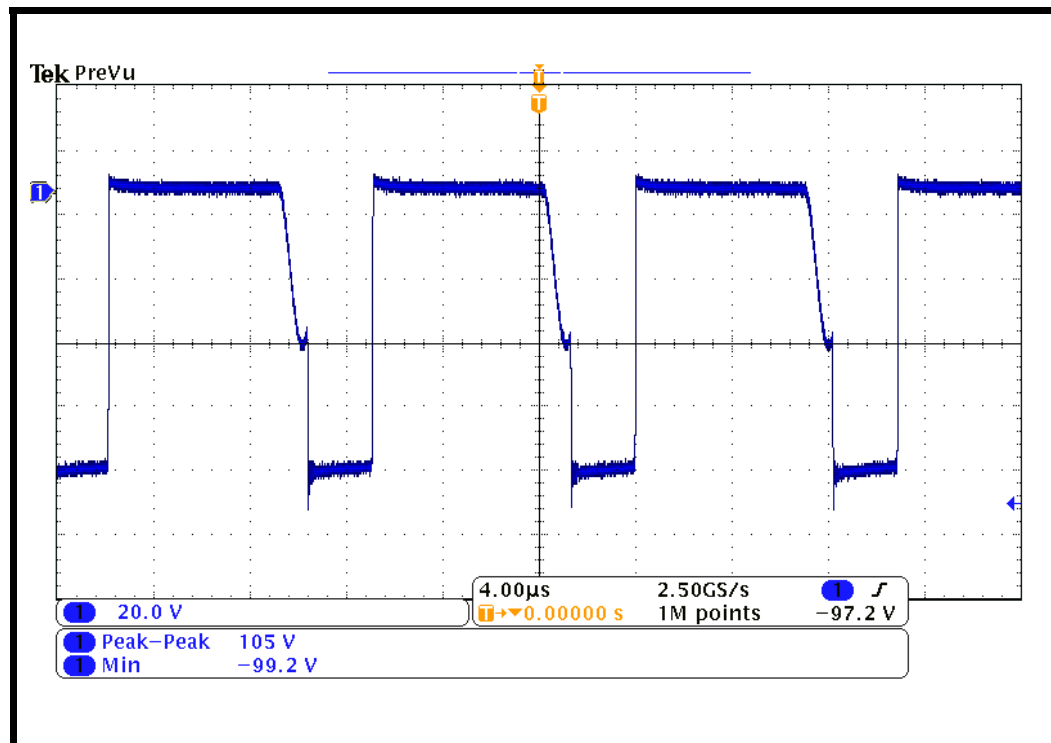
V_R (pk—pk)=352V

Q2: SPD02N60C3/A04N60C3 (INFINEON)

Electrical Characteristics, at $T_J=25^\circ C$ unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=0.25mA$	600	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	$V_{GS}=0V, I_D=0.25A$	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	$I_D=80\mu A, V_{GS}=V_{DS}$	2.1	3	3.9	

8. V_R waveform



Test Condition:

$V_{IN}=135VAC$, $CV:24V$

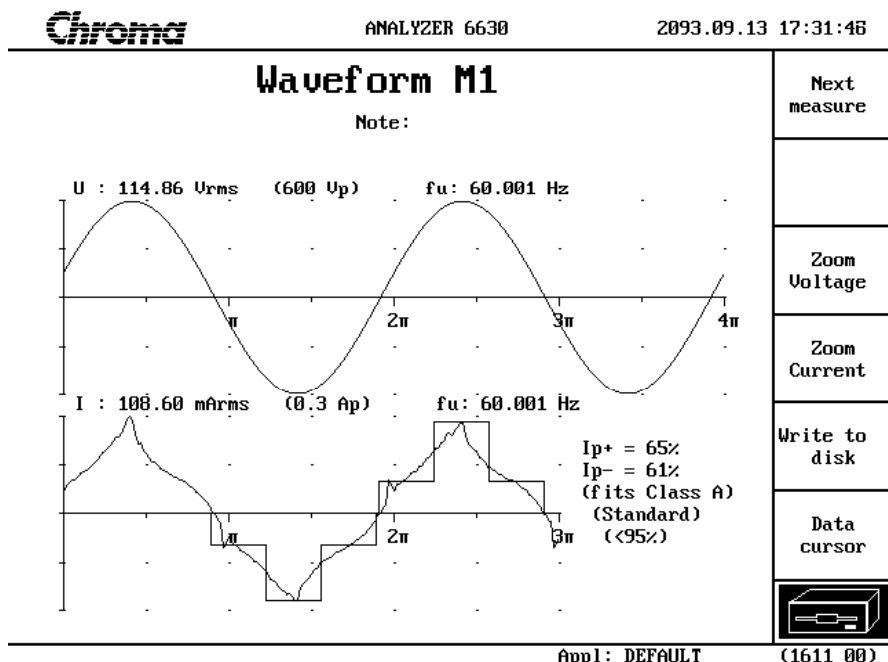
Result:

V_R (pk—pk)=105V

Output rectifier diode: HER315(3A 150V)

Characteristic	Symbol	HER 201	HER 202	HER 203	HER 204	HER 205	HER 206	HER 207	HER 208	Unit
Peak Repetitive Reverse Voltage	V_{RRM}									
Working Peak Reverse Voltage	V_{RWM}	50	100	200	300	400	600	800	1000	V
DC Blocking Voltage	V_R									
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	140	210	280	420	560	700	V
Average Rectified Output Current (Note 1) @ $T_A = 55^\circ C$	I_o	2.0								A

9 . Harmonic and current waveform 3614-00



Harmonics current @115Vac

Meet IEC61000-3-2 requirement

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Current Harmonics

Setup: CLASS_C Live Module: M1

Gen setting: 1(1) U : 114.06 V fu: 60.001 Hz
Analysed periods: 4 I : 123.6 mA P: 14.0 W
Limit: Class C (Standard) I1: 122.1 mA

Note:
THD=15.11 % (PF=0.984) PASSED P < 25 W

No	mA	Lim mA	No	mA	Lim mA	No	mA	Lim mA
1	122.1		15	1.6		29	1.3	
2	0.2		16	0.2		30	0.2	
3	11.1		17	0.7		31	1.2	
4	0.2		18	0.3		32	0.3	
5	13.0		19	1.7		33	1.1	
6	0.2		20	0.2		34	0.0	
7	2.7		21	0.8		35	1.1	
8	0.2		22	0.2		36	0.2	
9	3.7		23	1.5		37	1.1	
10	0.1		24	0.2		38	0.1	
11	1.9		25	1.0		39	0.9	
12	0.2		26	0.2		40	0.2	
13	1.5		27	1.3				
14	0.4		28	0.1				

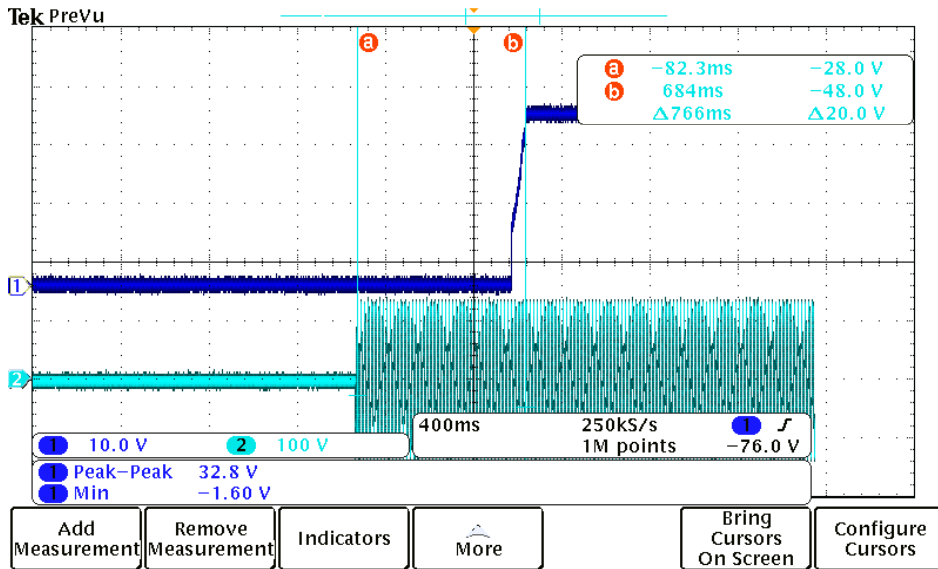
Current range: 1 Ap

App: DEFAULT (1212_01)

Ac current waveform @115Vac

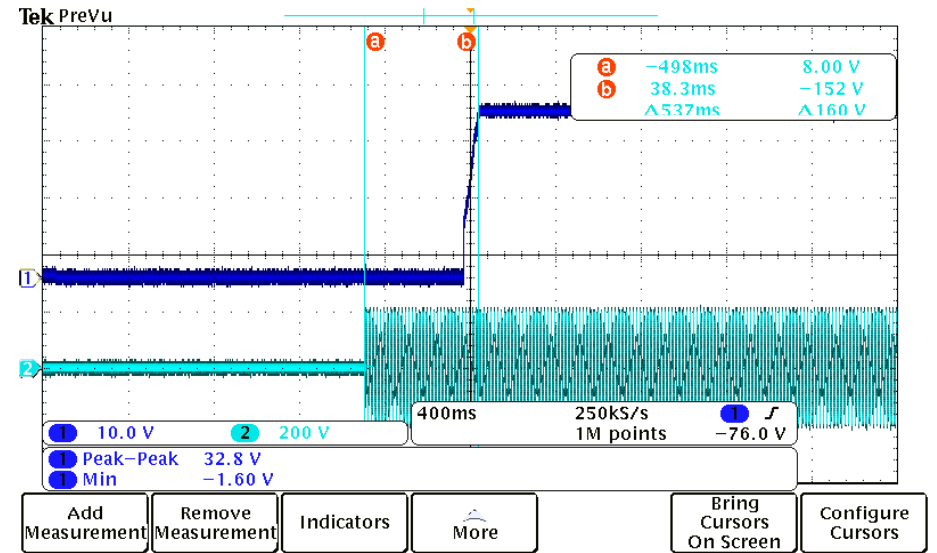
PF=0.984, THD 15.11%

10. Turn On Delay Time



90V_{AC}, Full Load

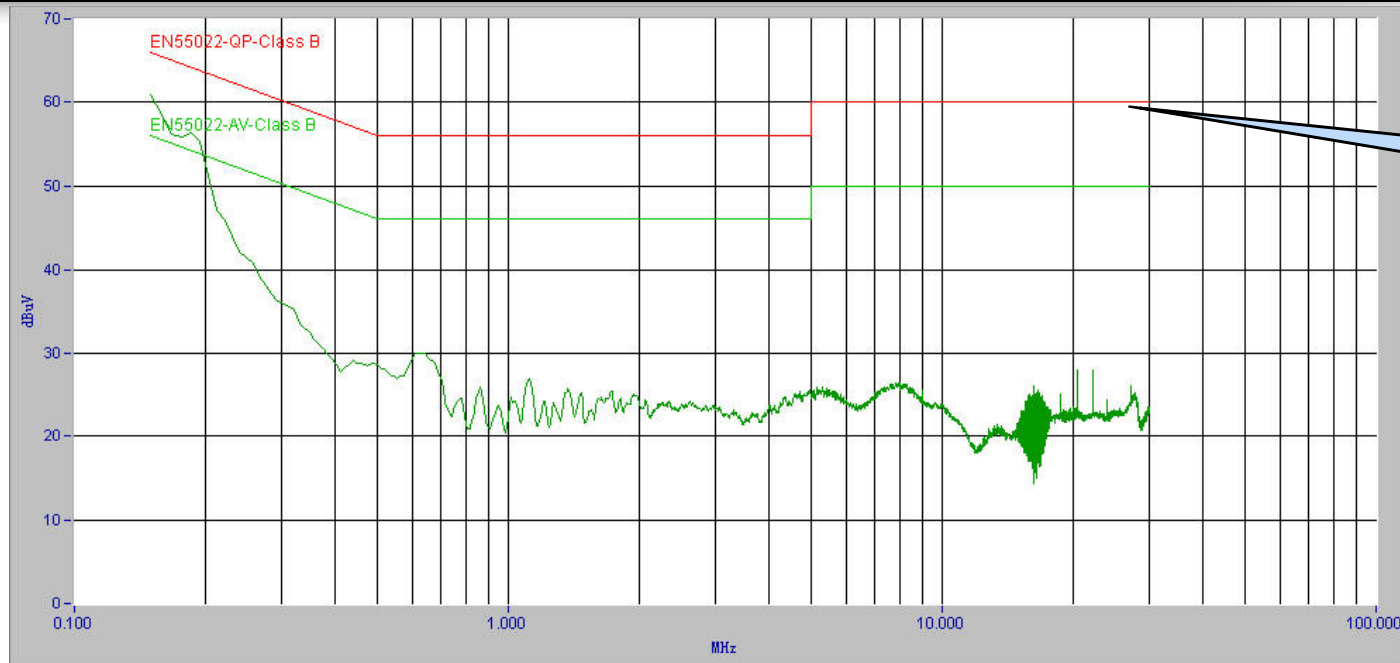
$T_{ST_DELAY} = 766\text{ms}$



135V_{AC}, Full Load

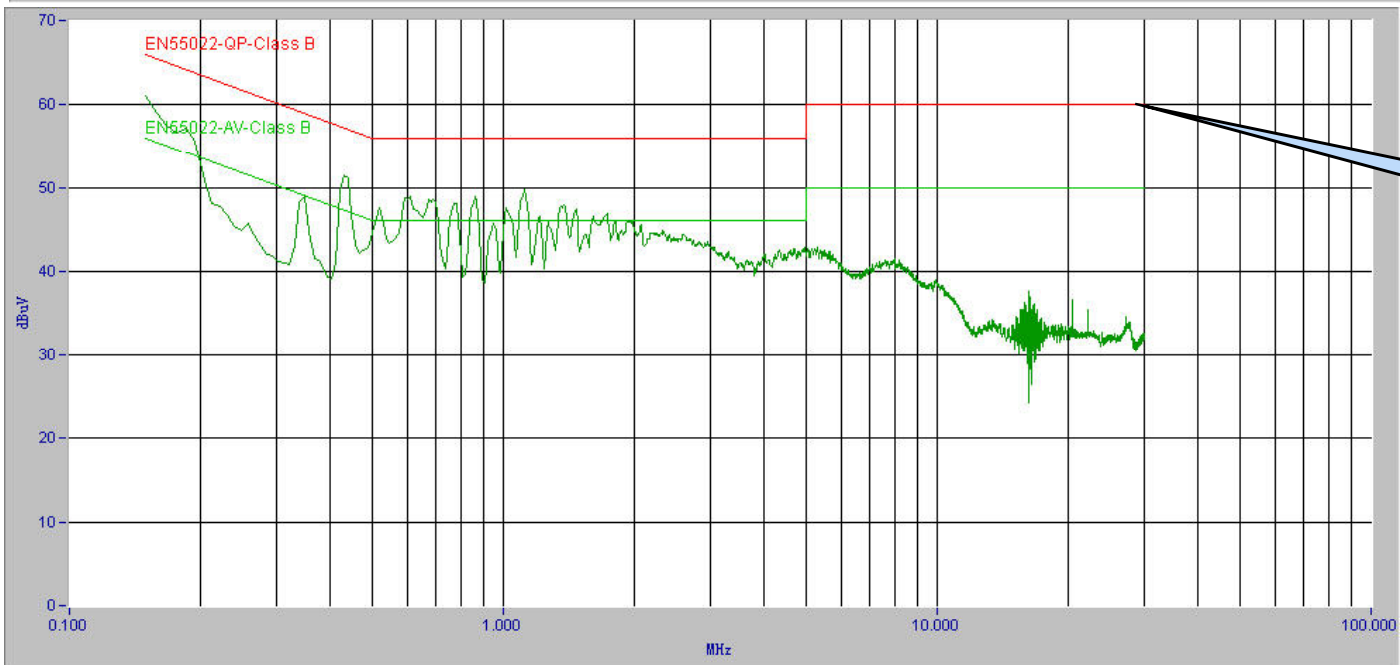
$T_{ST_DELAY} = 537\text{ms}$

11. Conducted EMI



QP Scan
QP Limit line

QP scan L



QP Scan
QP Limit line

QP scan N

12.lw3614驱动板工作后, 首先检查的项目

检查项目	检查内容	判断标准		结论
MOSFET	在输入电压最高的时候的 Vds 值	0.8~0.9*Vds Max.		
输出整流管	反向电压及Trr 的参数范围	低输出电压	肖特基	HER31 5
		较高输出电压	HER	
		高电压小电流	超快恢复	
Vcc 整流管	反向电压及Trr的参数范围	推荐用1N4148或FR102/FR103		1N4148
Vcc 电压	调光最大位置和最小位置时的Vcc	最大亮度/最多灯数	<16V	15
		最小亮度/最小灯数	>8V	9V
变压器	Bmax.			
Vsense	正常工作时的 Vsense电压	最高输出电压时的 Vsense (Knee) 应该低于1.4V, 以确保工作于CC mode(<1.538V)		
OVP	输出开路时 Vsense 电压	OVP 是1.7V,确认 输出开路时 MOSFET Vds是安全的, 输出整流管电压及 Vcc 的值		