



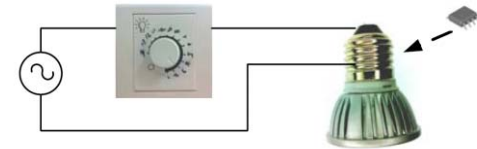
Dimmable LED Driver with iW3614 (Input 180~264Vac Output 40V350mA)

General Design Specification:

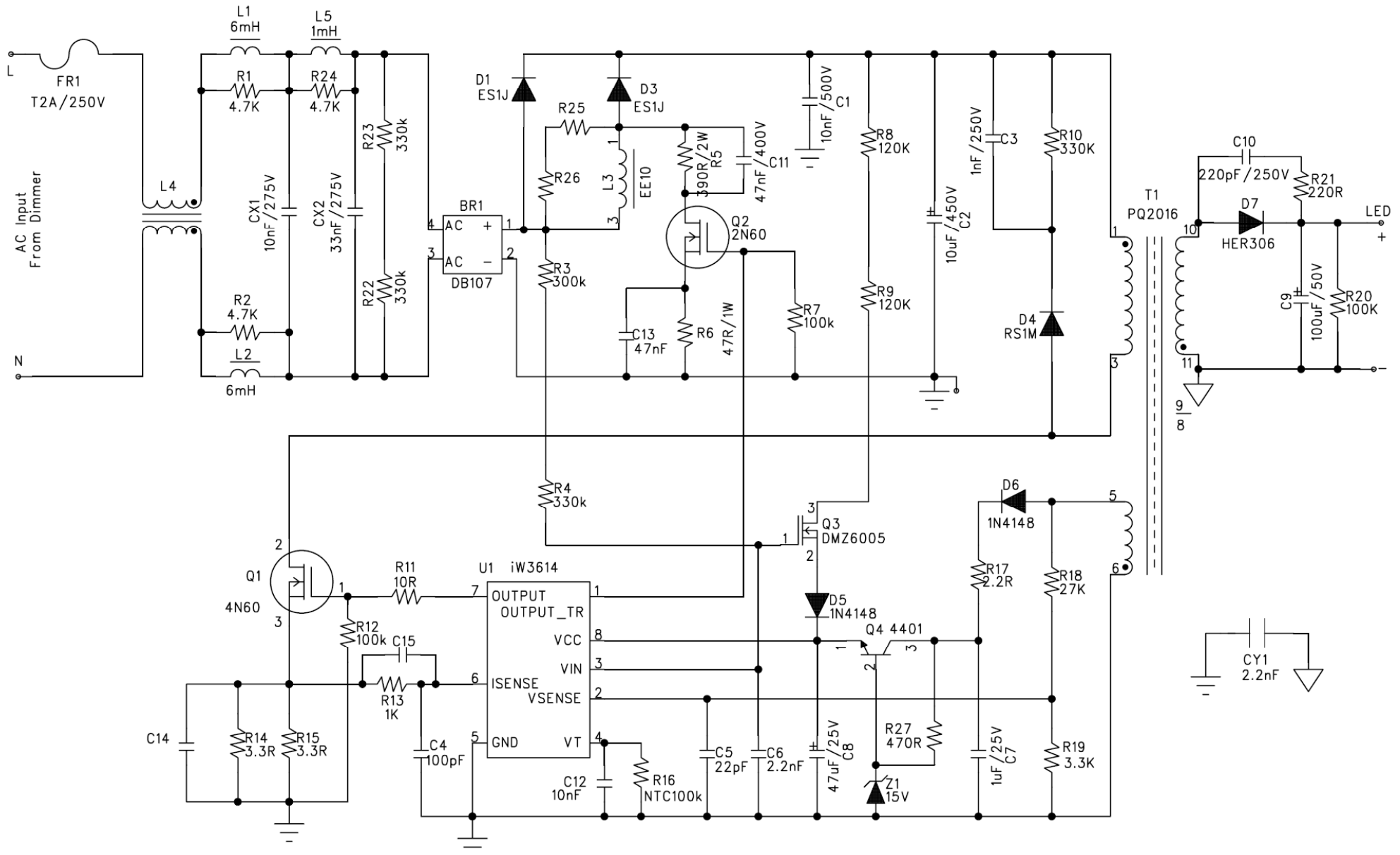
1. AC Input Range 180~264Vac
2. DC Output 40V, 350mA(Constant Current)
3. Non-isolated High efficiency

Design Purpose and Feature

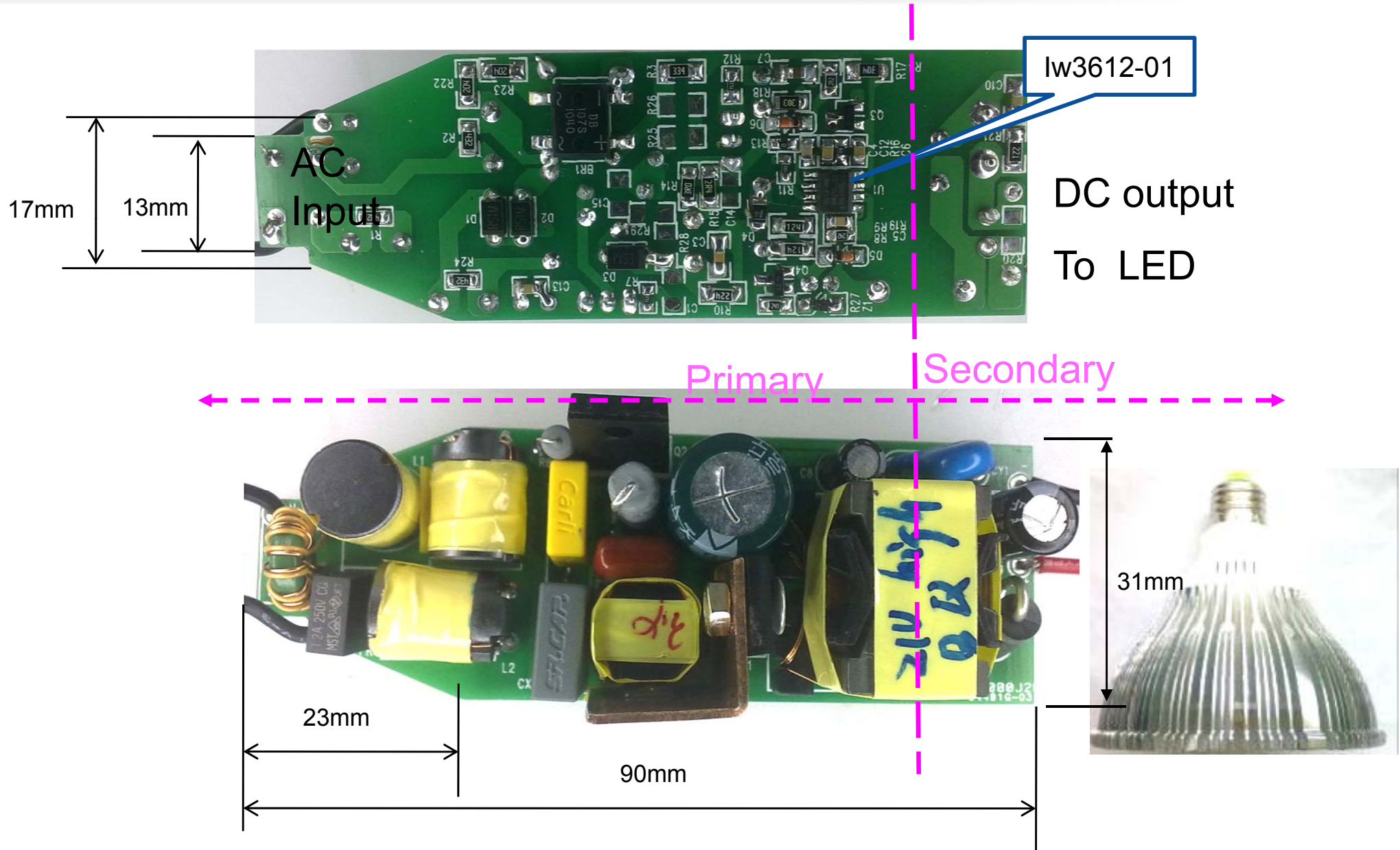
- Isolated ac-dc offline Input 230Vac, Output 12LEDs 350mA
- Intelligent wall dimmer detections
 - Leading-edge dimmer , Trailing-edge dimmer , No-dimmer
- Multiple dimming control scheme
 - Hybrid dimming scheme
 - PWM dimming scheme,900Hz
 - Amplitude dimming scheme
- Wide dimming range from 1% up to 100%
- No visible flicker
- Resonant control to achieve high efficiency
- High Power Factor, 0.9~ 0.98 without dimmer(@ $V_{IN}=115Vac$)
- Temperature degrade control to adjust the LED
- Primary-only Sensing eliminates opto-isolator feedback and simplifies design



1.Schematics _Nominal Input at 230Vac_ 40V350mA

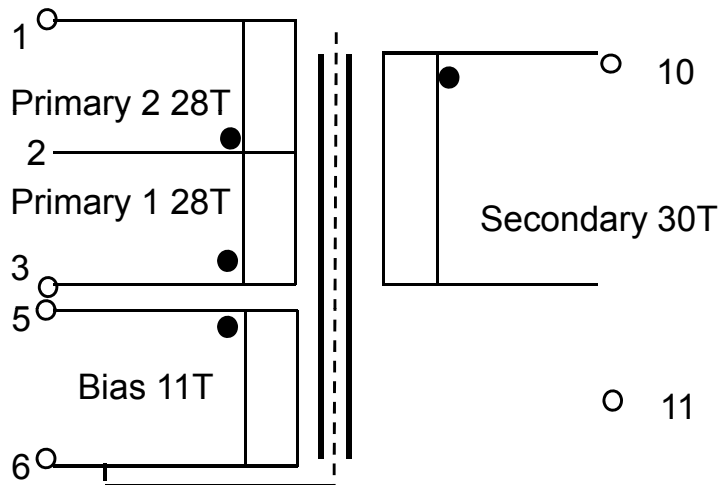


2.PCB Layout



3. Transformer Design

SCHEMATIC



ELECTRICAL SPECIFICATIONS:

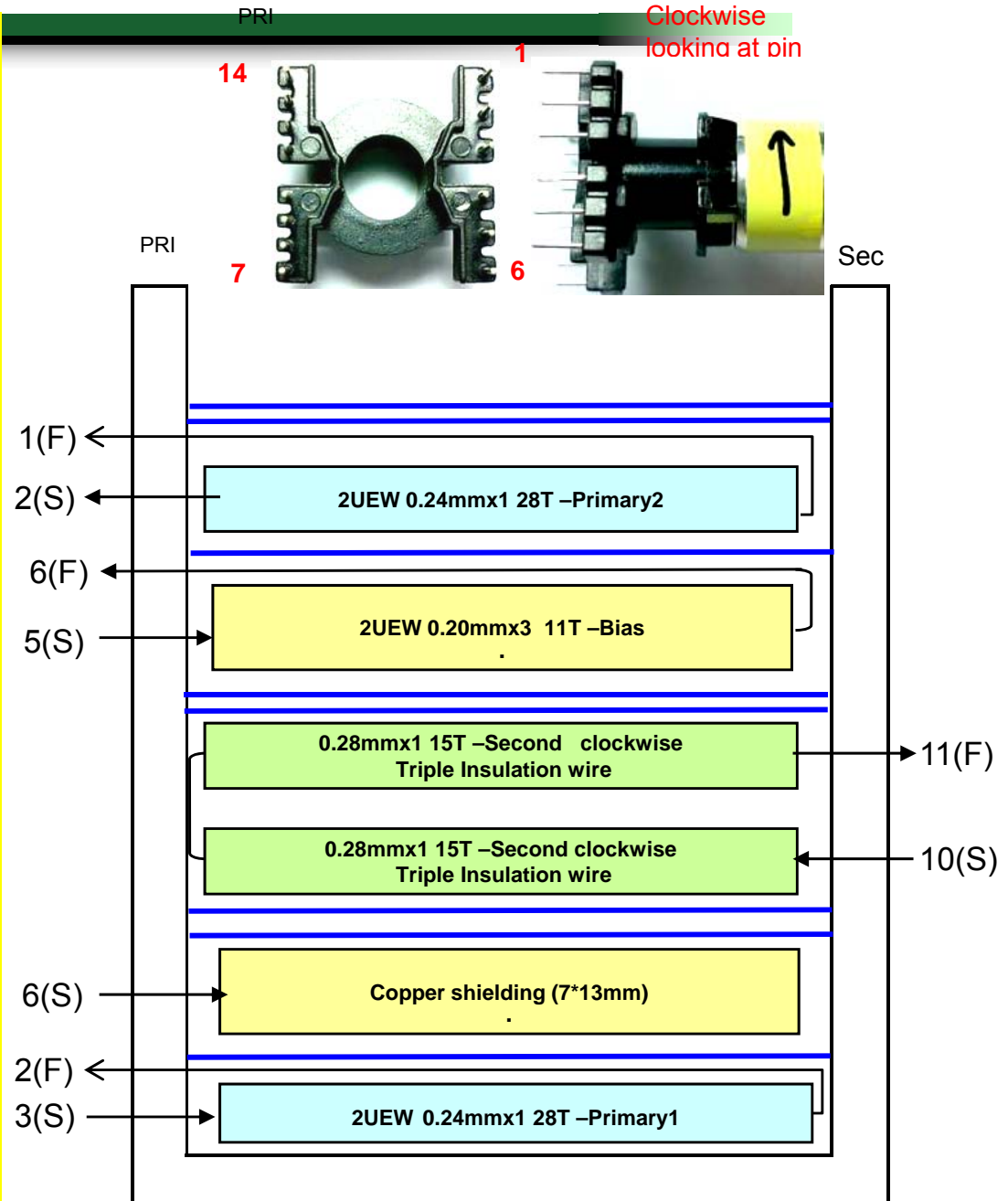
1. Primary Inductance (L_p) = 1.3mH @10KHz
2. Primary Leakage Inductance (L_k) ≤ 70uH@10KHz

MATERIALS:

1. Core : PQ2016 (Ferrite Material TDK PC40 or equivalent)
2. Bobbin : PQ2016
3. Magnet Wires (Pri) : Type 2-UEW
4. Magnet Wire (Sec) : Triple Insulated Wires
5. Layer Insulation Tape :3M1298 or equivalent.

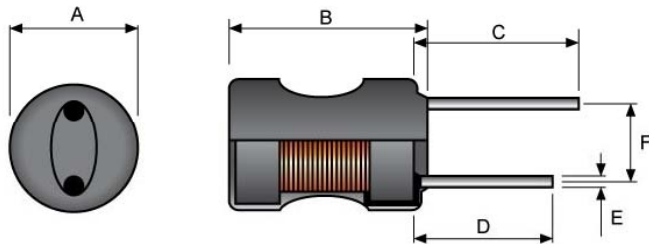
FINISHED :

1. Cut remained of Pin2,4,7,8,9,12,13,14 after wires termination
2. Varnish the complete assembly
3. Core is connected to primary pin6



4. Differential Mode Inductor L1,L2 ,L5

4.1 Differential Mode Inductor L1,L2



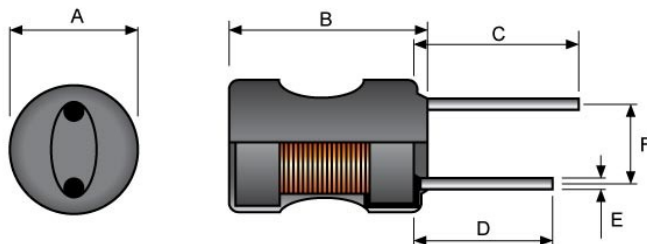
Ferrite core size : Ax B 10x12mm

Wire gauge: 0.20mm, 400 Turns

Inductance @10kHz, 1V: 6mH +/-20%

ICR: 5 OHM +/-20%

4.2 Differential Mode Inductor L5



Ferrite core size : Ax B 10x12mm

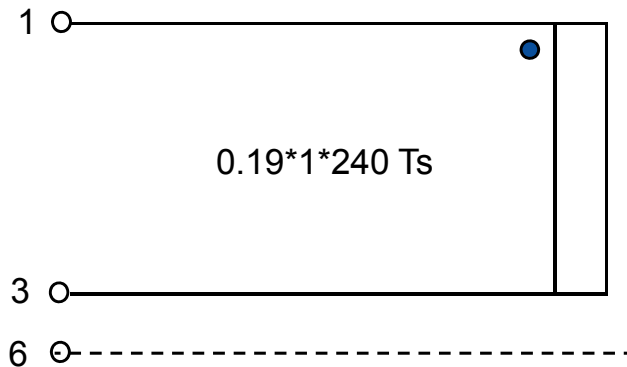
Wire gauge: 0.32mm, 160 Turns

Inductance @10kHz, 1V: 1mH +/-20%

ICR: 1 OHM +/-20%

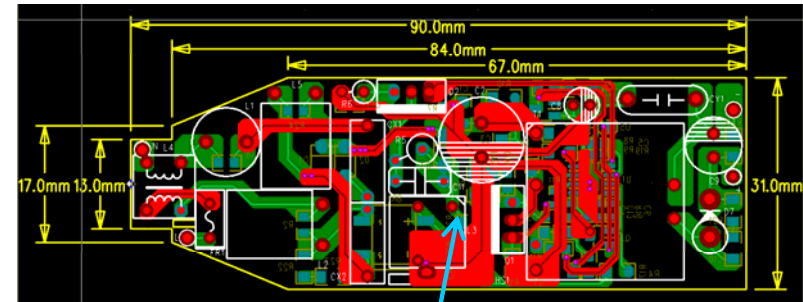
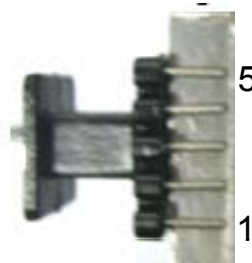
5.PFC Inductor L3 Design

SCHEMATIC



ELECTRICAL SPECIFICATIONS:

1. Inductance (L_p) = 3.6mH @10KHz
2. Core : EE10 (Ferrite Material TDK PC40 or equivalent)
3. Bobbin : EE10 Vertical
4. Ferrite core is connected to Pin 6 after assembling
5. Cut remained of Pin=2,4,5,7,8 after wires termination
6. Varnish the complete assembly



Pin 1

core size:T8*4*3

Wire gauge: 0.3mm*2(Insulation& 2-UEW wire)

Turns10.5T

Inductance @10kHz, 1V: 30uH +/-20%

6. Common Mode Inductor L4



6.BOM __Input 230Vac __21V700mA

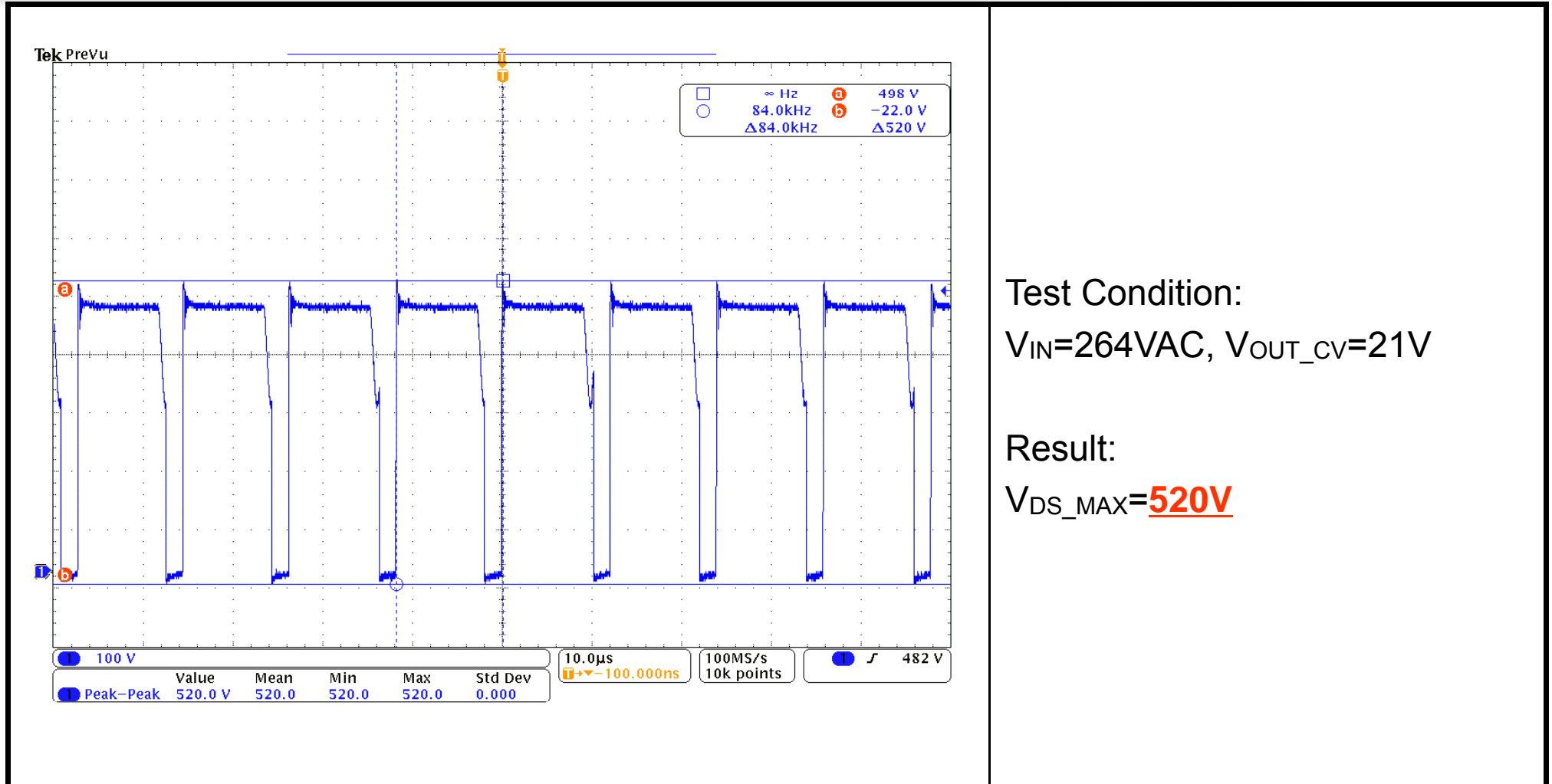
Ref.	Description	Qty	Ref.	Description	Qty
U1	iW364-00, Digital PWM Controller,Dimmable, SO-8	1	R22,R23	330kΩ,±5%, SMD-1206	2
CX1	0.01uF,275V, X2	1	R27	470Ω±5%, SMD-0805	1
CX2	0.033uF,275V, X2	1	R16	100KΩ ±5%, SMD-0603 (100K NTC)	1
C11	47nF/250V, SMD 1206	1	R11	10Ω ±5%, SMD-0805	1
C2	10uF, 450V, E-CAP, 105°C	1	R18	27KΩ ±1%, SMD-0805	1
C3	1nF, 250V, X7R, SMD1206	1	R19	3.3KΩ ±1%, SMD-0603	1
C4	100pF,25V, X7R, SMD 0603	1	C13	47nF,50V, X7R, SMD 0805	1
C5	22pF,50V, X7R, SMD 0603	1	R20	100KΩ ±5%, SMD-1206	1
C6	2.2nF,50V, X7R, SMD 0603	1	R21	220Ω,±5%, SMD-1206	1
C7	1uF, 25V, X7R, SMD 1206	1	F1	T2A250V	1
C8	47uF, 25V, E-CAP	1	BR1	DB107S, SMD	1
C9	100uF,50V,E-CAP	1	D1,D4	RS1M, SMD	2
R1, R2,R24	4.7KΩ ±5%, SMD-1206	3	D3	ES1J, SMD	1
R3	330KΩ,±1%, SMD-1206	1	D5,D6	1N4148 0.1A/100V, SMD	2
R4	300KΩ,±1%, SMD-1206	2	C10	220pF, 250V, X7R, SMD1206	1
R5	390Ω,±5%, 2W	1	D7	HER306 3A/600V D0-201AD	1
R6	47Ω, ±5%, 1W	1	Z1	Zener, 15V, SMD	1
R10	330KΩ,±5%, SMD-1206	1	CY1	Y1,2.2nF250V	1
R7,R12	100KΩ±5%, SMD-0805	2	L4	Common Mode Inductor T8*4*3 30uH	1
R8,R9	120KΩ,±5%, SMD-1206	2	Q1	4N60, TO-220F	1
R13	1KΩ ±1%, SMD-0603	1	Q2	2N60, TO-220F	1
R14	3.3Ω ±1%, SMD-1206	1	Q3	DMZ6005, N-Depletion, 600V, SOT-23	1
R15	3.3Ω ±1%, SMD-1206	1	L1,L2	6mH, Drum choke, 10X12mm, 0.20mm,400Ts	2
L3	3.6mH, EE10	1	L5	900uH, Drum choke, 10X12mm, 0.35mm 140Ts	1
T1	PQ2016, Transformer	1	C12	10nF,50V, X7R, SMD 0603	1

7.Constant Current and Efficiency __No Dimmer

AC input 180~264Vac,Output 12 LEDs

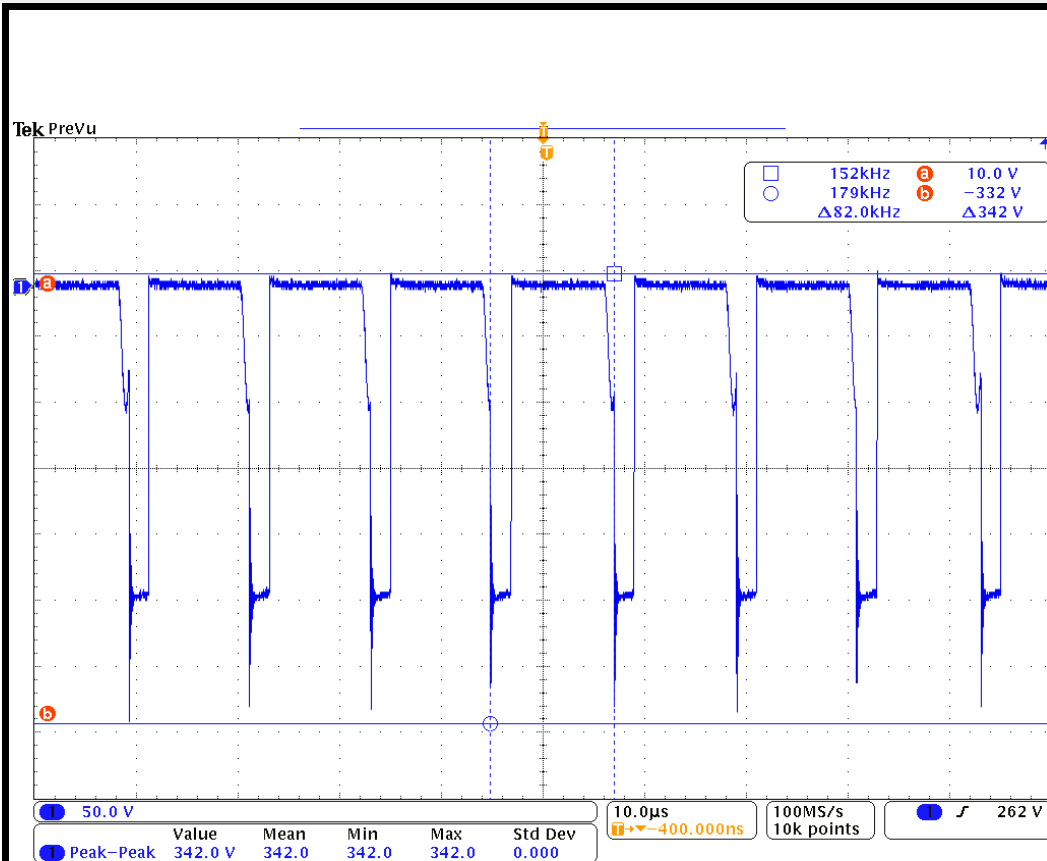
#of LEDs	Vin	Pin	Vout	Iout	efficiency	PF
	(V)	(W)	(V)	(A)		
12LEDS	180	16.82	39.96	0.354	84.10%	0.945
	190	16.65	39.89	0.353	84.57%	0.960
	200	16.64	39.85	0.353	84.54%	0.960
	210	16.50	39.81	0.353	85.17%	0.978
	220	16.52	39.87	0.352	84.95%	0.982
	230	16.40	39.84	0.351	85.27%	0.983
	240	16.37	39.78	0.351	85.29%	0.981
	250	16.30	39.74	0.351	85.58%	0.978
	264	16.27	39.67	0.351	85.58%	0.969

8. V_{ds} waveform



Remark: Mosfet Spec__4A 600V

9. V_R waveform



Test Condition:

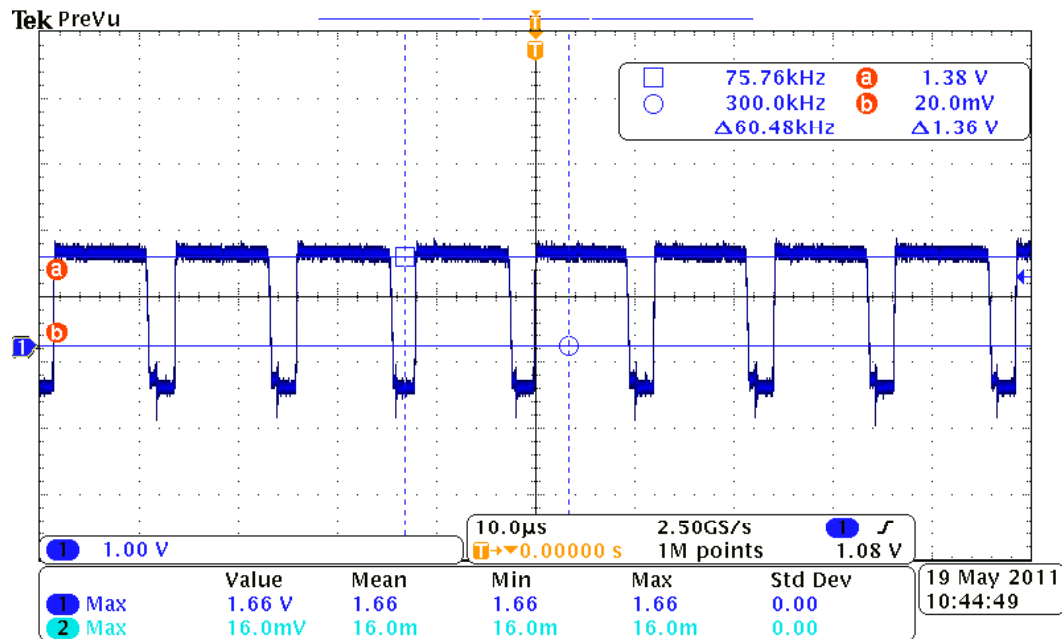
V_{IN} =264VAC, CV 21V load

Result:

V_R (pk—pk)=**342V**

Output rectifier diode: SR306(3A 600V)

10. V_R waveform

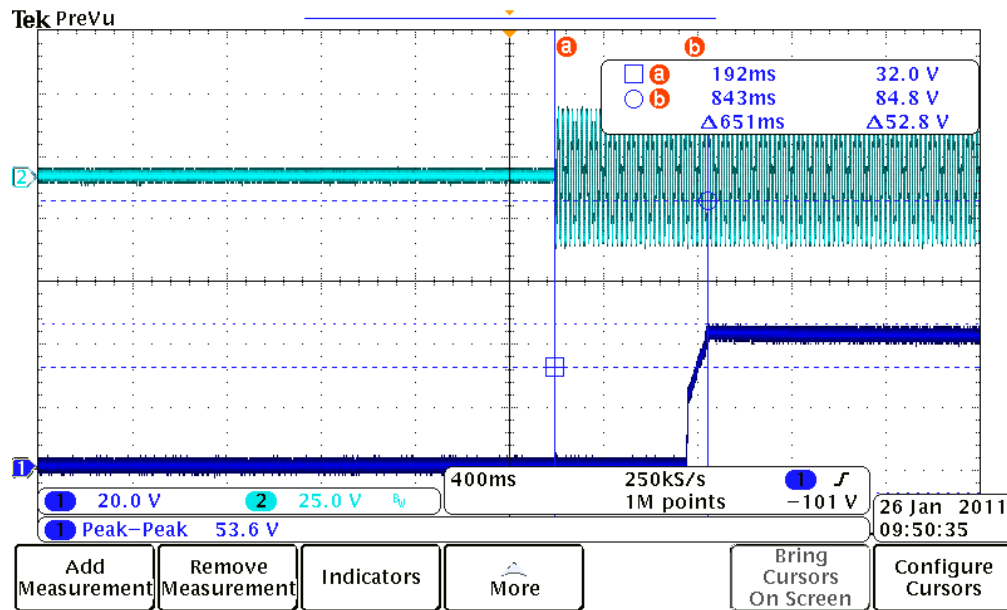


Test Condition:

V_{IN} =230VAC, CV 40V load

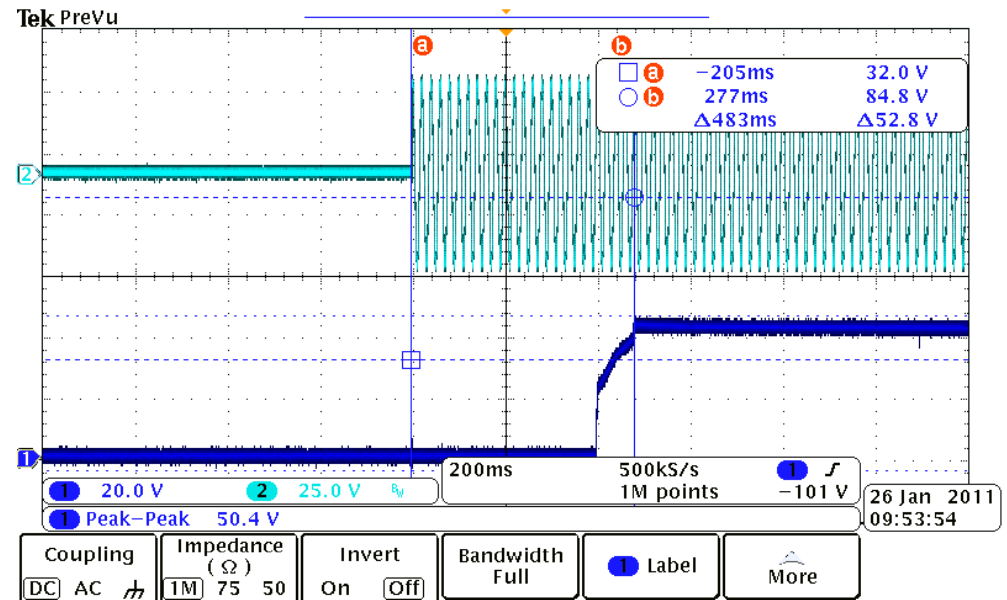
V_{sense} voltage = 1.36V

11. Start up and turn on delay time



180V_{AC}, Full Load

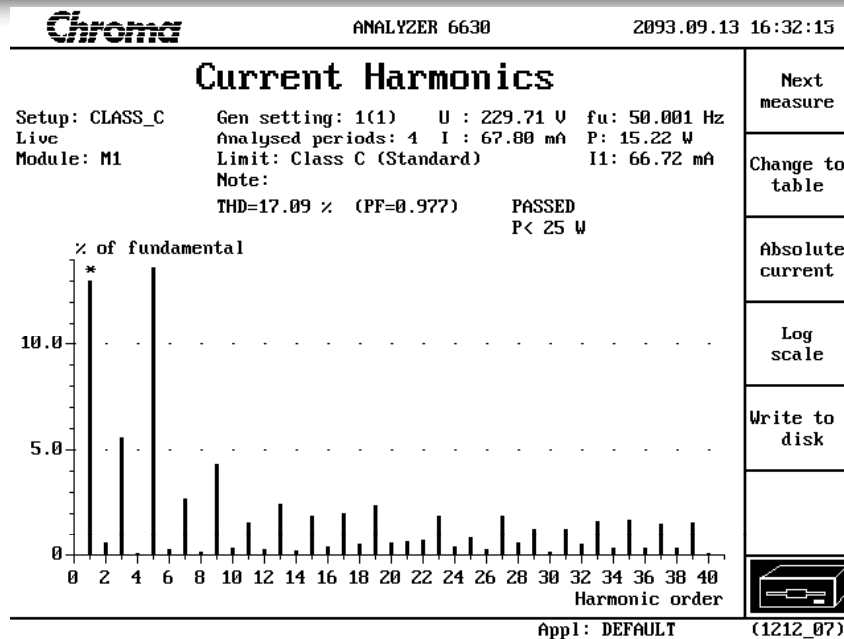
T_{ST_DELAY}=**651mS**



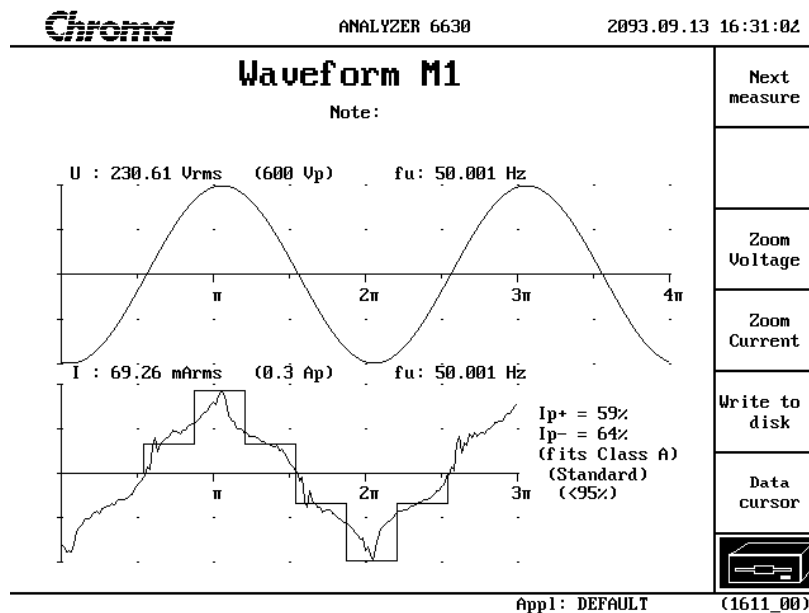
264V_{AC}, Full Load

T_{ST_DELAY}=**483mS**

12.Harmonic and current waveform_ No dimmer



Harmonics current @230Vac
THD=17.09%



Ac current waveform @230Vac
PF=0.977

13. Conducted EMI (230Vac)

