

LED Driver Design with iW3620

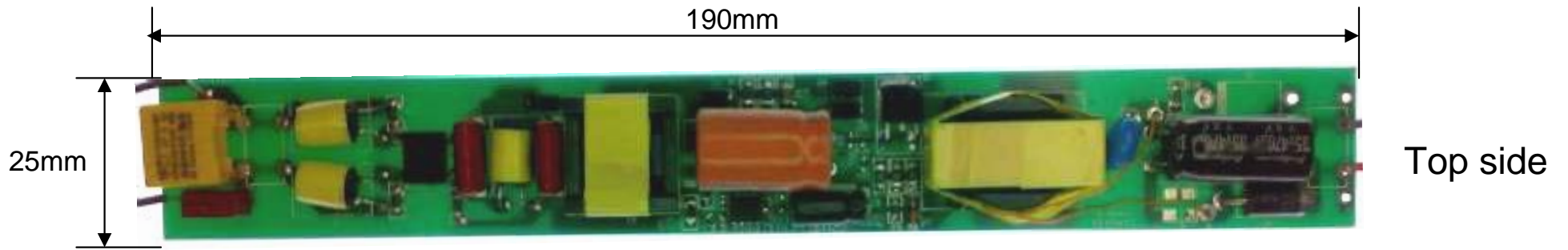
Summary and Features :

1. LED driver, 28V, 500mA ; Wide AC input range: 90Vac-264Vac
2. For Isolated Applications
3. High Efficiency, High Power Factor and Least Parts Solution
4. Meet EMI Requirement (EN55015BQP&AV scan)
5. Fully Protection Against AC input UV/OV,O/P Short &Open, Component single fault

1. Specification

Description		Symbol	Min	Typ	Max	Units	Comment
Input							
Voltage		V_{IN}	90		264	V _{AC}	2 Wire
Frequency		f_{LINE}	47	50	63	Hz	
Open-load Input Power (264V _{AC})						W	
Output							
Const Voltage	Output Voltage	V_{OUT_CV}		28		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}		0.5		A	
Total Output Power							
Continuous Output Power		P_{OUT}		14		W	
Over Current Protection		I_{OUT_MAX}				A	Auto-restart
Efficiency		η		83		%	Measured at end of PCB
Power Fact		PF		0.9			Harmonic meet IEC61000-3-2
Turn on Delay Time						Sec	
Conducted EMI			Meets EN55015B				
Hi-pot test				3		KV	
Operation temperature		T_{opr}		40		° C	Free convection, sea level

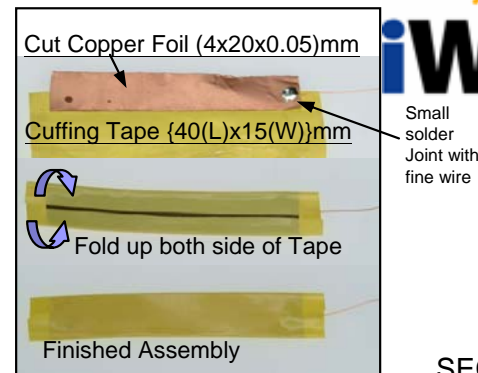
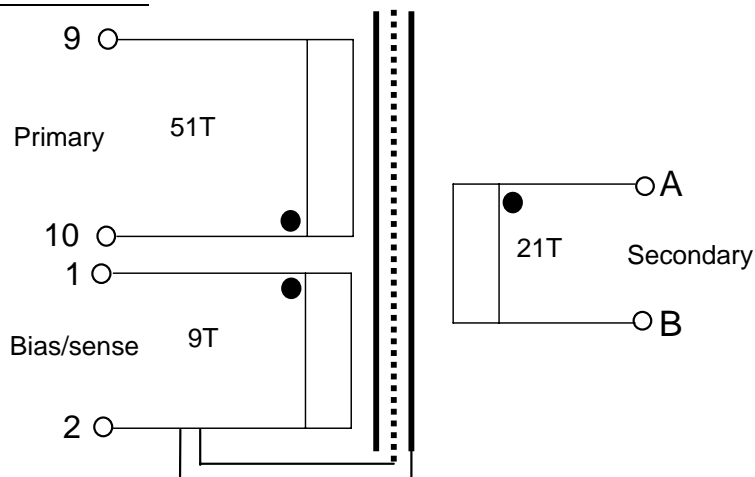
3.Circuit Board Photograph





4. Transformer Design 28V500mA

SCHEMATIC



ELECTRICAL SPECIFICATIONS:

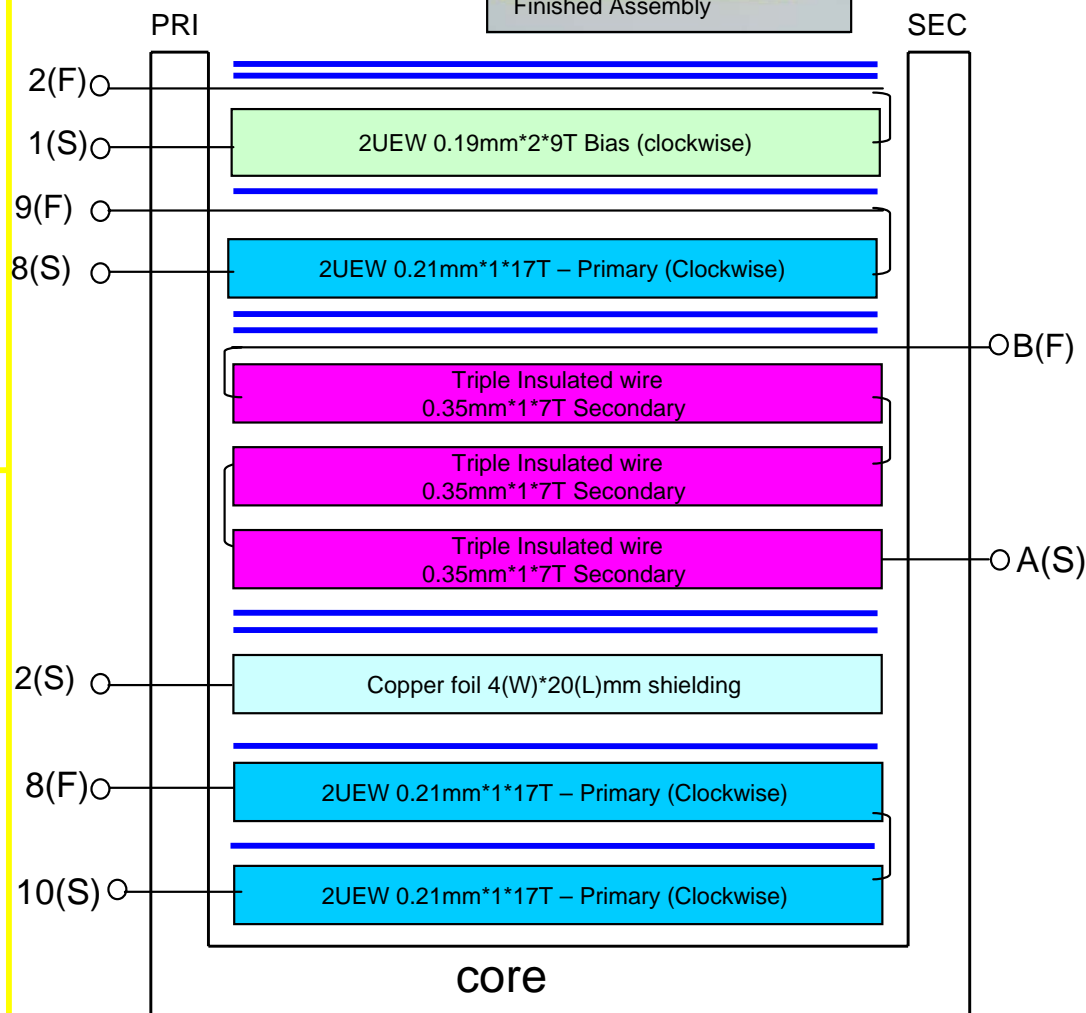
1. Primary Inductance (L_p) = 1.15mH @10KHz
2. Primary Leakage Inductance (L_k) <= 30uH @10KHz
3. Electrical Strength = 3KV, 50/60Hz, 1Min

MATERIALS:

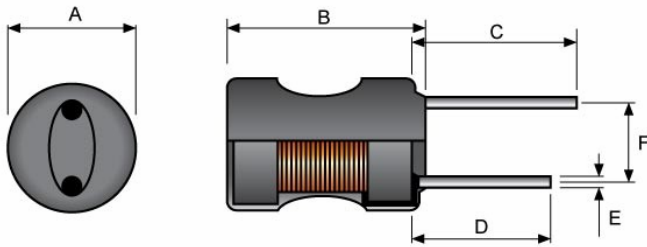
1. Core : EC28(Ferrite Material TDK PC40 or equivalent)
2. Bobbin :EC28. Primary=5, Secondary=5
3. Magnet Wires (Pri) : Type 2-UEW
4. Magnet Wire (Sec) : Triple Insulated Wires
5. Layer Insulation Tape :3M1298 or equivalent.

FINISHED :

1. Cut remained of Pin after wires termination
2. Core is connected to PRI-GND **pin2**.
3. Varnish the complete assembly



5. Differential Mode Inductor L2,L3



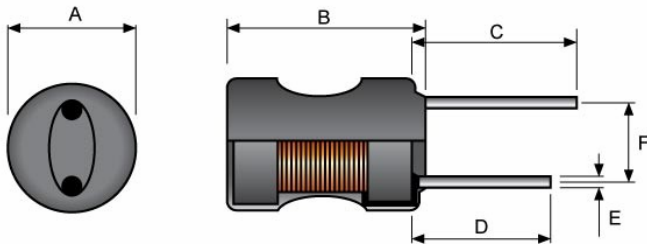
Ferrite core size : AxB 8x10mm

Wire gauge: 0.26mm, 160 Turns

Inductance @10kHz, 1V: 820uH +/-20%

ICR: 0.8 OHM +/-20%

Differential Mode Inductor L6



Ferrite core size : AxB 8x10mm

Wire gauge: 0.3mm, 110 Turns

Inductance @10kHz, 1V: 330H +/-20%

ICR: 0.5 OHM +/-20%

Common Choke L1 for EMI



Ferrite core : DT44-18(DMEGC)

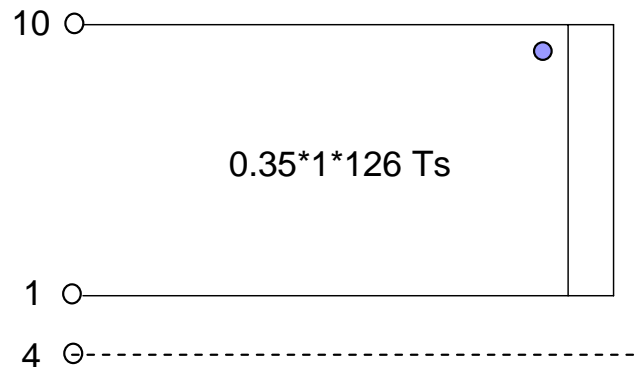
Wire gauge: 0.4mm, 10 Turns

Inductance @10kHz, 1V: 35uH +/-20%

ICR: 0.1 OHM +/-20%

PFC Inductor L4 Design

SCHEMATIC



ELECTRICAL SPECIFICATIONS:

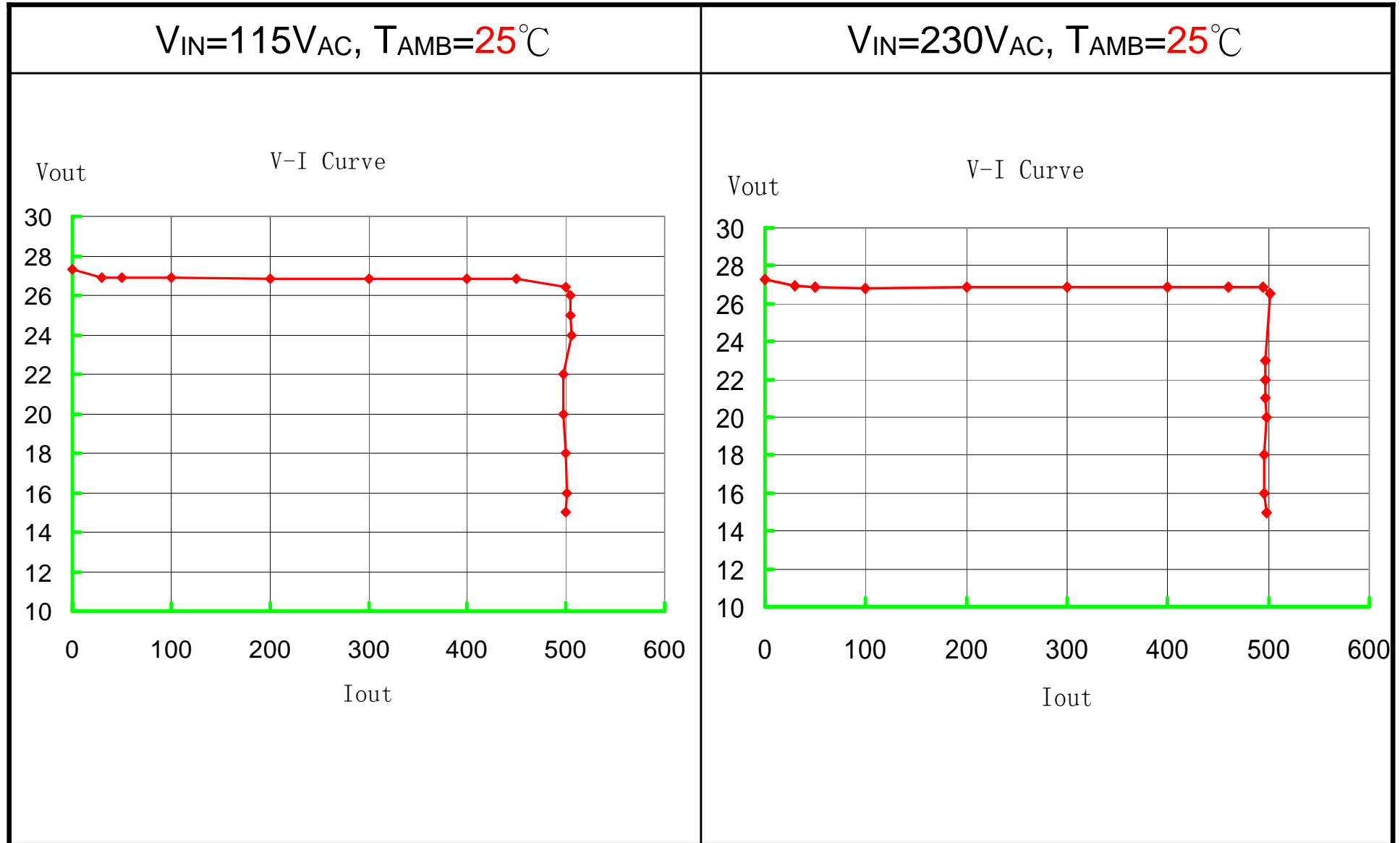
1. Inductance (L_p) = 1.2mH @10KHz
2. Core : EPC17 (Ferrite Material TDK PC40 or equivalent)
3. Bobbin : EPC17
4. Ferrite core is connected to Pin 10 after assembling
5. Cut remained of Pin2,3,4,5,6,7,8 after wires termination
6. Varnish the complete assembly

6. Bill of Material

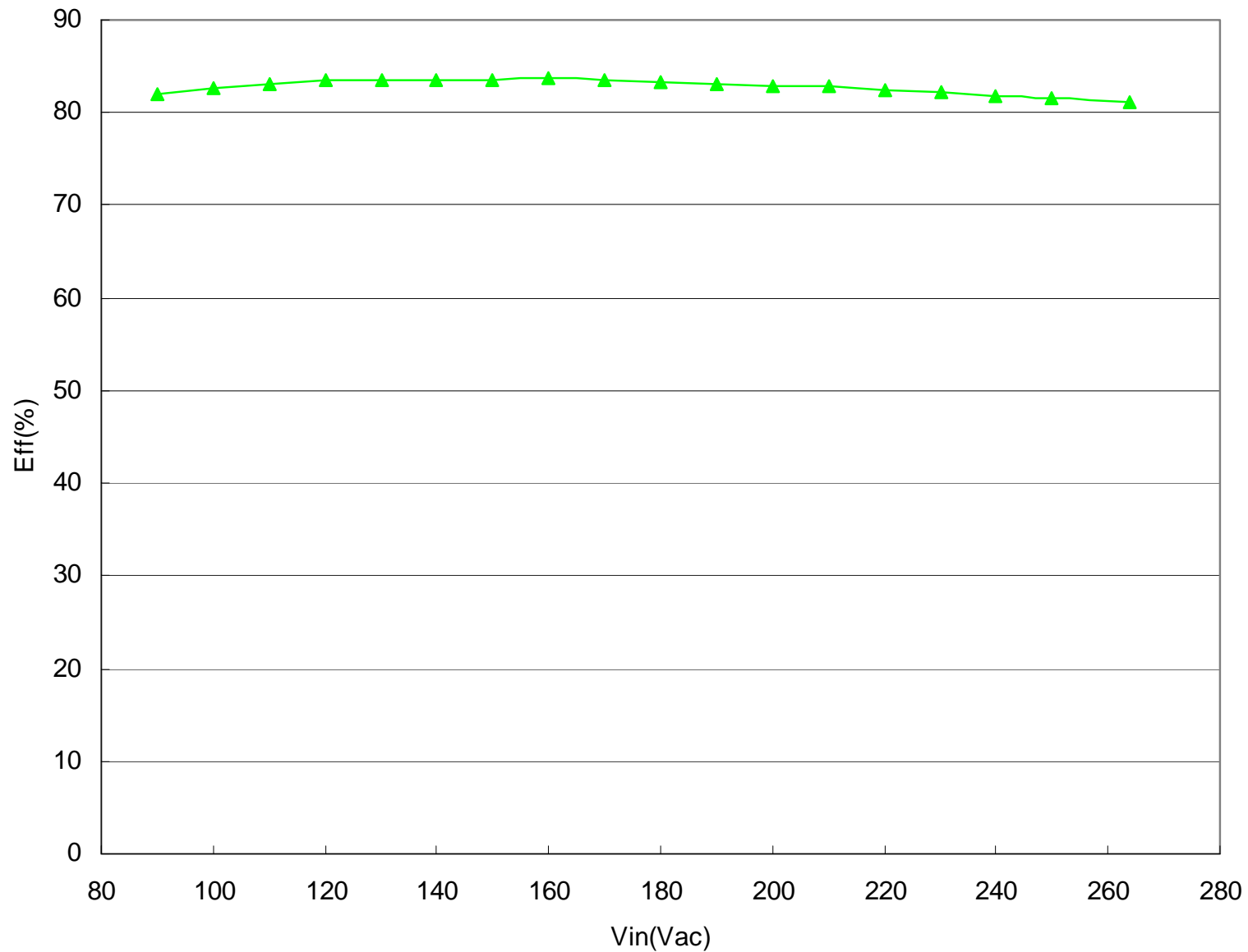
Item	Qty.	Ref.	Description	U/P (RMB)
1	1	F1	1.25A/250Vac Fuse	
2	1	CX1	0.1uF/250V X Capacitor	
3	2	C1,C2	MPE 0.1uF,400V	
4	1	C3	15uF/400V,E-CAP,1050C	
5	1	C4	2.2nF,1KV	
6	1	C5	390pF,50V,NPO,SMD-0603	
7	1	C6	0.1uF,50V,NPO,SMD-0603	
8	1	C7	68pF,50V,NPO,SMD-0603	
9	1	C8	1nF,50V,SMD-0603	
10	1	C9	4.7uF,50V,E-CAP,1050C	
11	1	C10	470uF,35V,E-CAP,1050C	
12	1	C11	NC	
13	1	L1	35uH	
14	2	L2,L3	820uH(8*10)	
15	1	L4	EPC17 Transformer	
16	1	L5	NC	
17	1	L6	330uH(8*10)	
18	1	DBR1	DBR107	
19	1	D1	1N4007 1A/1KV	
20	2	D2,D3	HER107	
21	1	D4	FR107	
22	1	D5	1N4148,SMD	
23	2	D6,D7	HER304	
24	1	U1	IW3620,Off-line digital PWM controller,SOT-8	
25	1	Q1	4N60	
26	1	T1	EC28	
27	3	R1,R2,R3	4.7K Ω +/-5%,SMD-1206	
28	1	R4,R5	560K Ω +/-5%,SMD-1206	
29	2	R6,R7	200K Ω +/-5%,SMD-1206	
30	1	R8	10 Ω +/-5%,SMD-0603	
31	1	R9	100K Ω +/-5%,SMD-0603	
32	1	R10	1.2K Ω +/-5%,SMD-0805	
33	3	R11,R12,R13	3 Ω +/-1%,SMD-1206	
34	1	R14	22K Ω +/-5%,SMD-0603	
35	1	R15	1K Ω +/-5%,SMD-0603	
36	1	R16	10 Ω +/-5%,SMD-0805	
37	1	R17	11K Ω +/-1%,SMD-0805	
38	1	R18	12K Ω +/-1%,SMD-0805	
39	1	R19	3.3K Ω +/-1%,SMD-0603	
40	1	R20	27K Ω +/-5%,SMD-1206	
41	1	R21	NC	

7. V-I Curve

* Note: Output voltage measured at PCB end, $T_{AMB}=25\text{ }^{\circ}\text{C}$

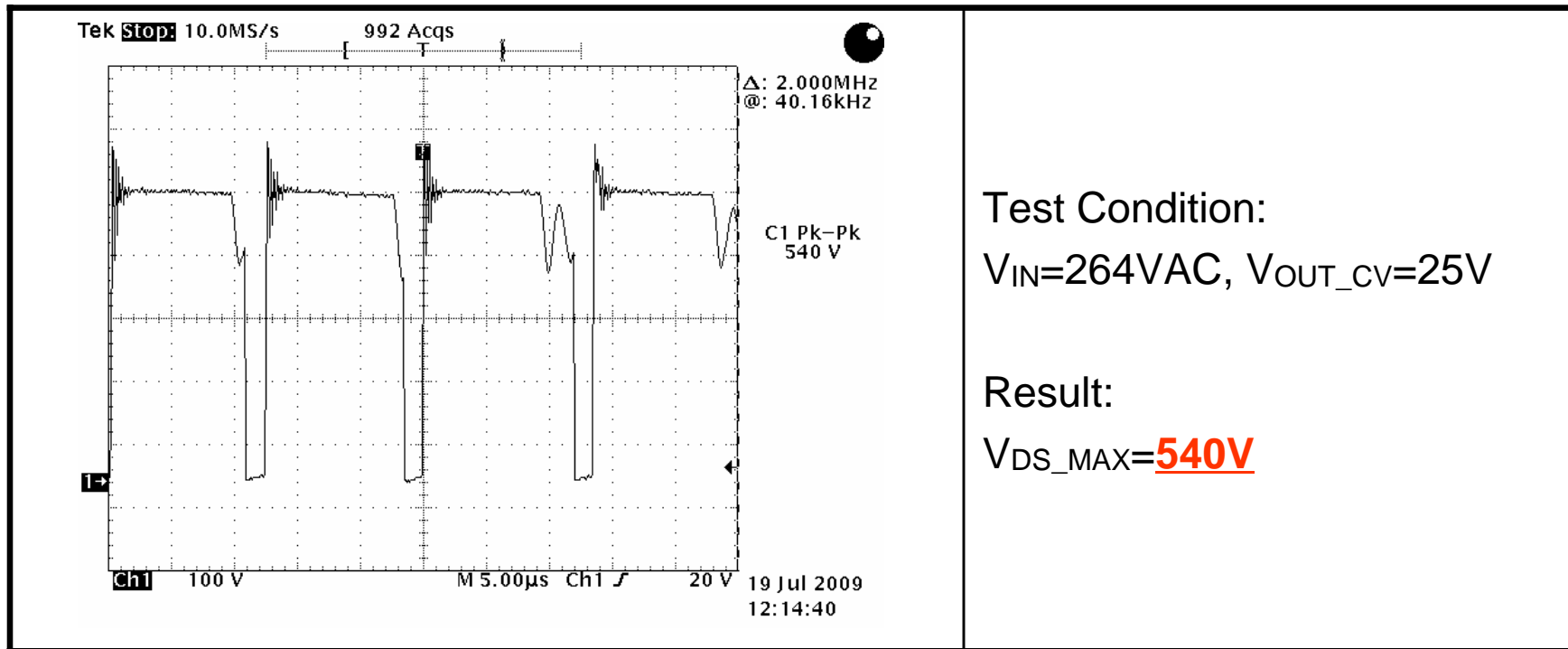


8. Efficiency Measurement



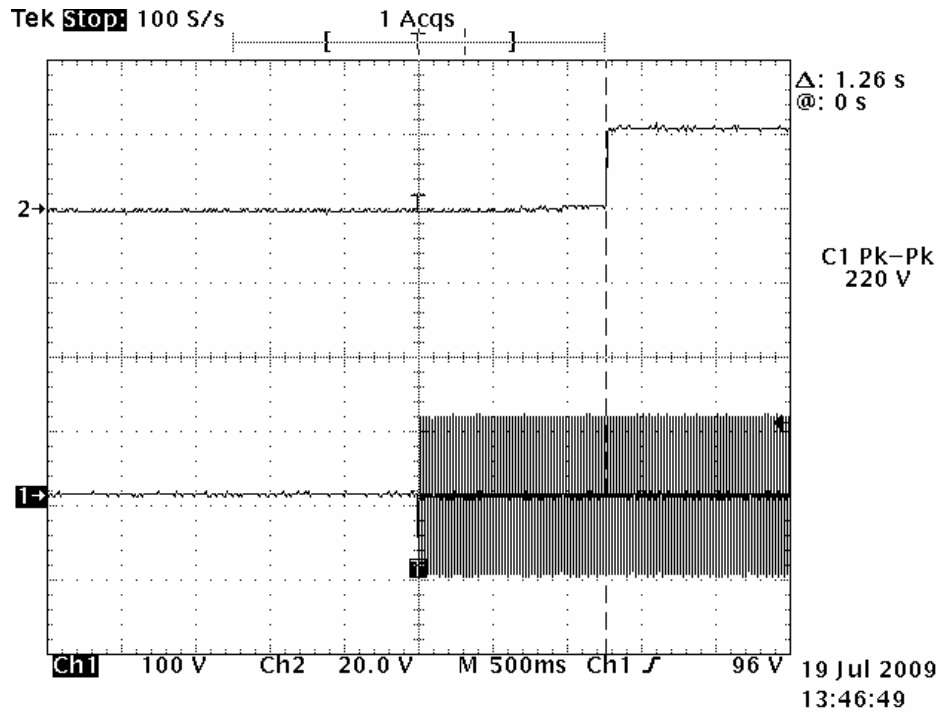
*** Note: Output voltage measured at end of PCB.**

9. V_{DS} waveform



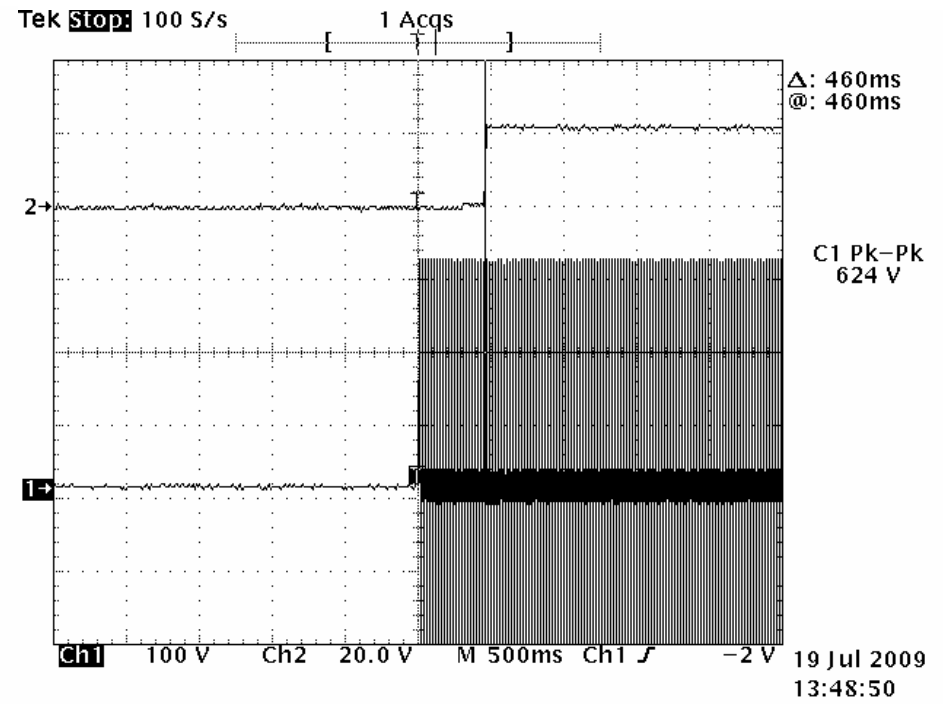
Remark: Mosfet Spec__4A 600V

10. Start up and turn on delay time



90V_{AC}, Full Load

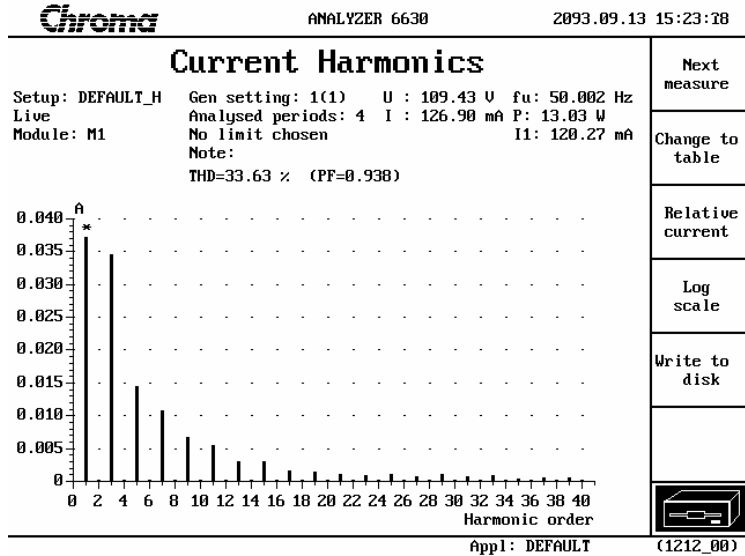
$T_{ST_DELAY}=1.26\text{S}$



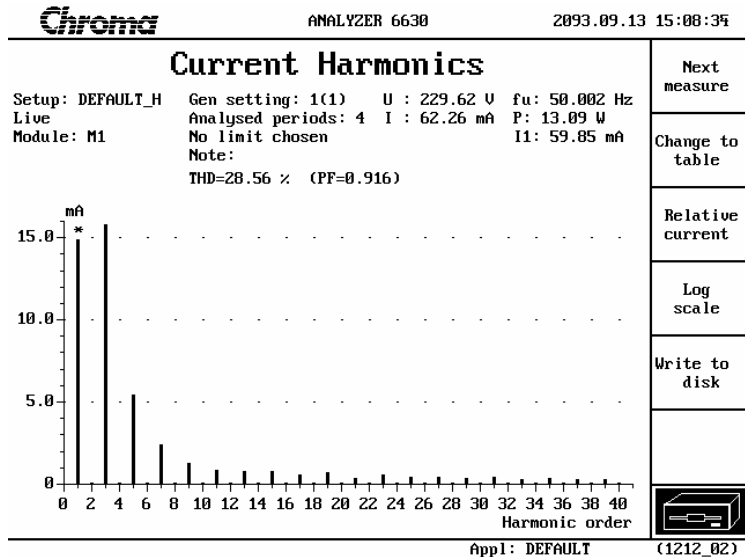
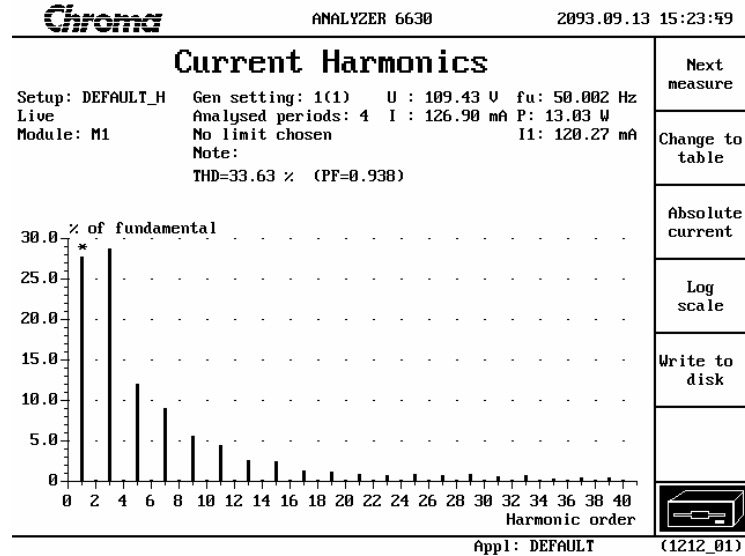
264V_{AC}, Full Load

$T_{ST_DELAY}=460\text{mS}$

11. PF and harmonic current

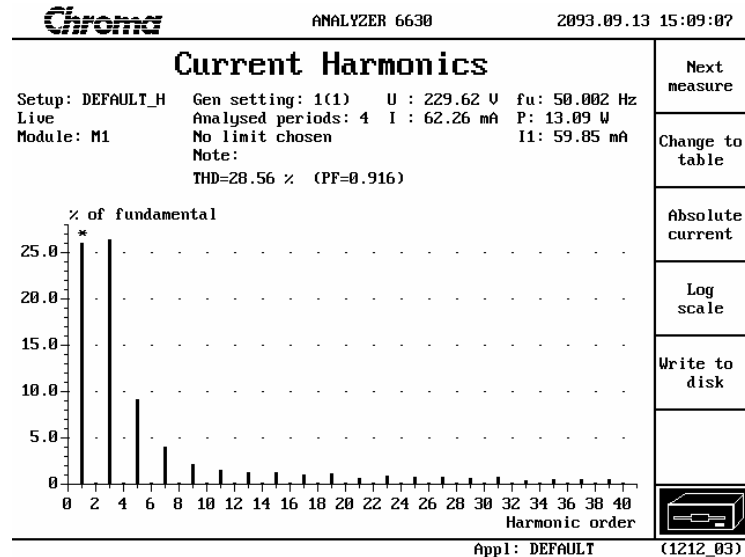


Vin_110V PF=0.938 3rd <28% 5th_<13%



Vin_230V PF=0.916 3rd <27% 5th_<9%

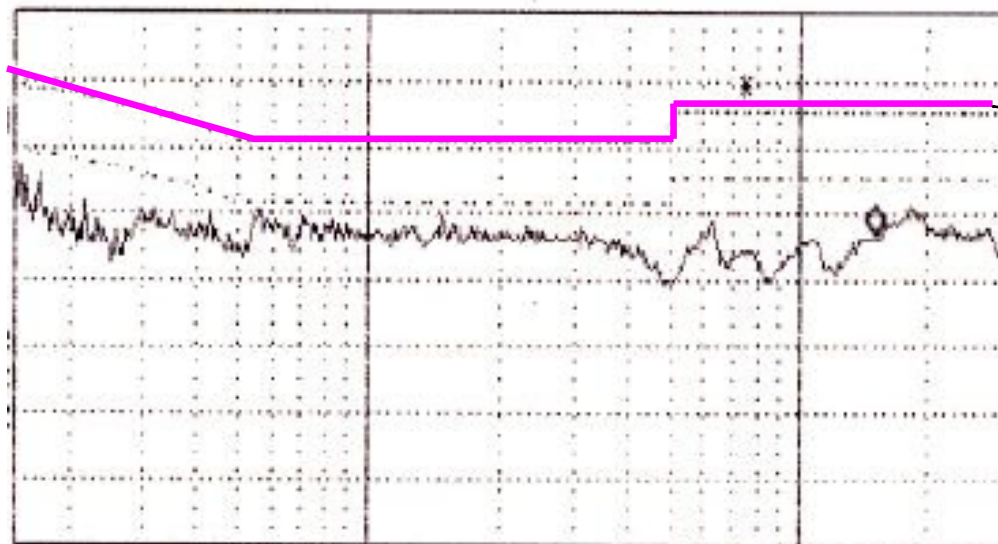
IEC61000-3-2 requirement---- 3rd <86% 5th_<61%





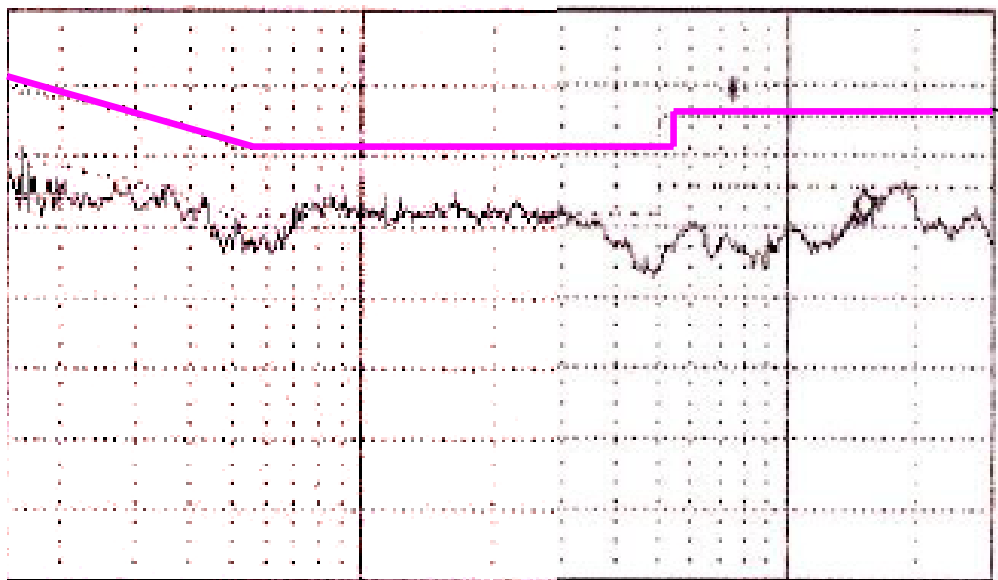
12. Conducted EMI (Input 115Vac Full Load, output floating)

iWatt



Peak Scan
QP Limit line

Peak scan N



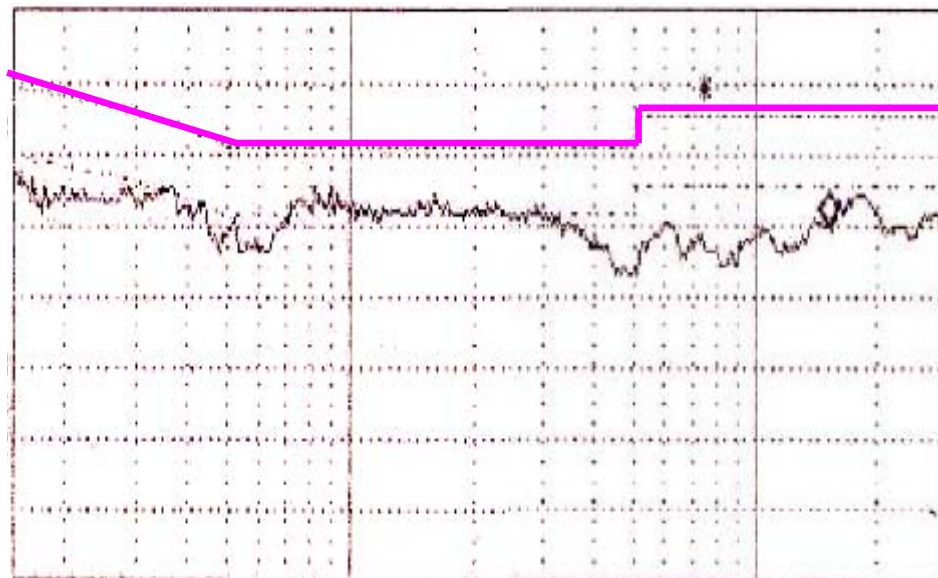
Peak Scan
QP Limit line

Peak scan L



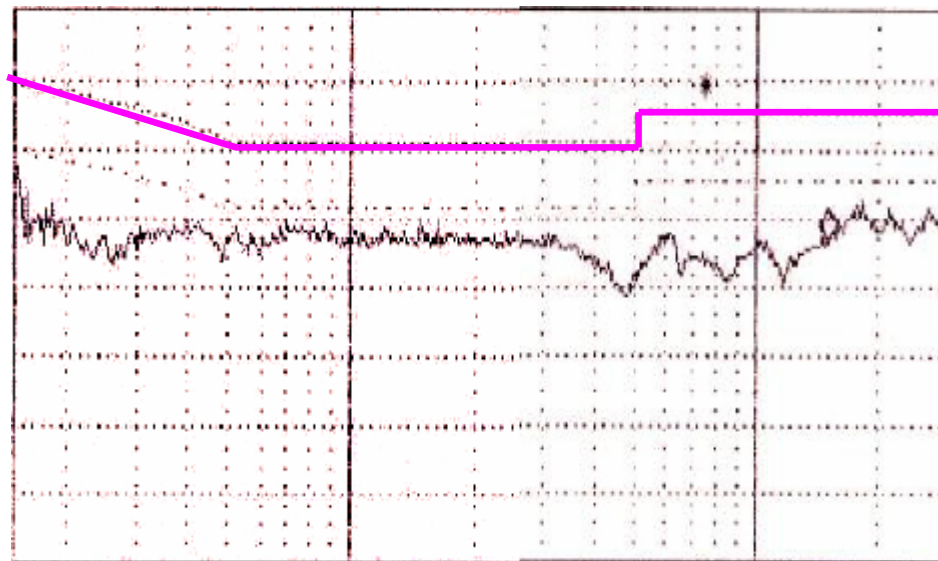
12. Conducted EMI (Input 230Vac Full Load, output floating)

iWatt



Peak Scan
QP Limit line

Peak scan N



Peak Scan
QP Limit line

Peak scan L