



## LED Driver Design with iW3620\_38V280mA

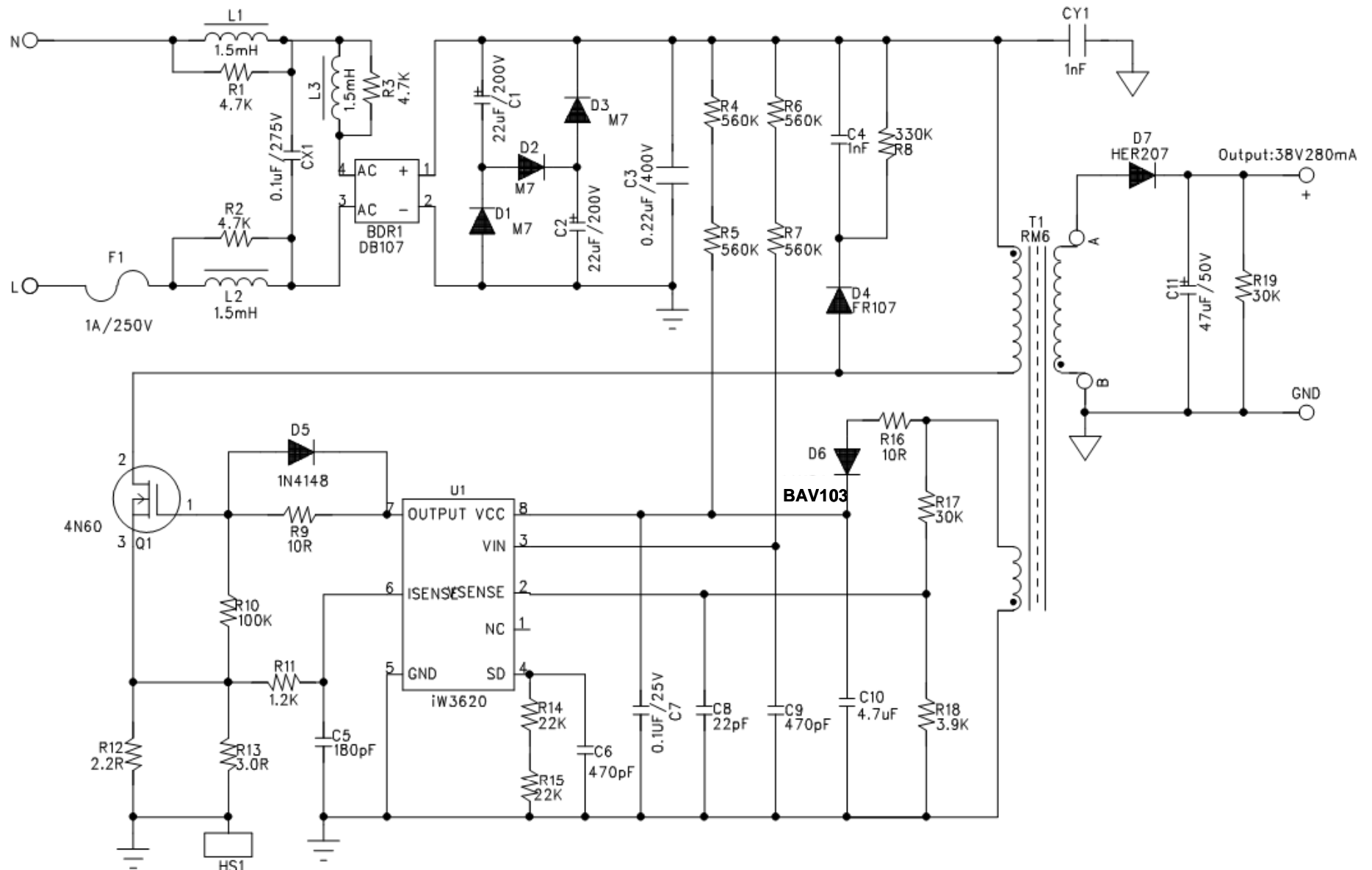
### **Summary and Features :**

- 1. LED driver, 38V, CC@280mA ; Wide AC input range @90Vac- 264Vac**
- 2 For Isolated Applications**
- 3. High Efficiency and Minimum Parts count**
- 4. Meet EMI EN55015B-QP & AV limits**
- 5. Fully protected against AC input UV, OV, O/P Short/Open, meet single point failure test.**

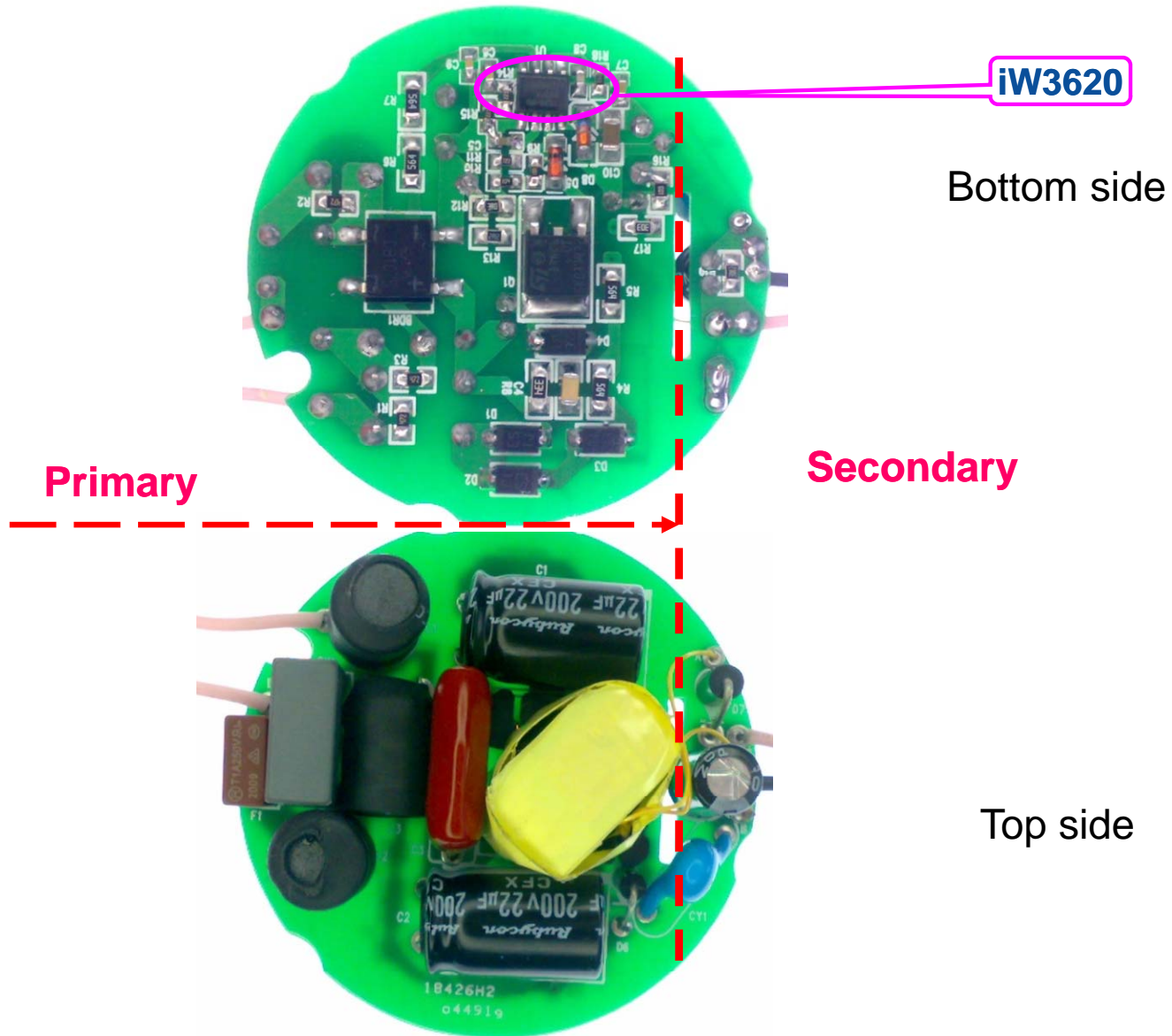
# 1. Specification

Description		Symbol	Min	Typ	Max	Units	Comment
Input							
Voltage		$V_{IN}$	90	100/230	264	V <sub>AC</sub>	2 Wire
Frequency		$f_{LINE}$	47	50	63	Hz	
Open-load Input Power (264V <sub>AC</sub> )						W	
Output							
Const Voltage	Output Voltage	$V_{OUT\_CV}$		38		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	$I_{OUT\_CV}$		280		mA	
Total Output Power							
Continuous Output Power		$P_{OUT}$		12		W	
Over Current Protection		$I_{OUT\_MAX}$				mA	Auto-restart
Efficiency		$\eta$		87		%	
Power Fact		$PF$		0.75			Harmonic meet IEC61000-3-2
Turn on Delay Time						Sec	Vin=230Vac
Conducted EMI			Meets EN55015B				
Hi-pot test				3		KV	
Operation temperature		$T_{opr}$		40		° C	Free convection, sea level

# 2.Schematic circuit

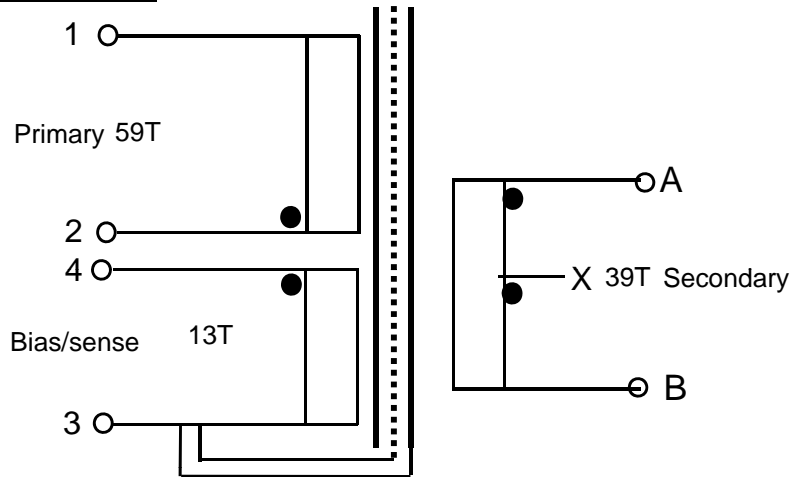


# 3.Circuit Board Photograph



# 4. Transformer Design 38V280mA(Bmax=0.26MAX)

## SCHEMATIC



## ELECTRICAL SPECIFICATIONS:

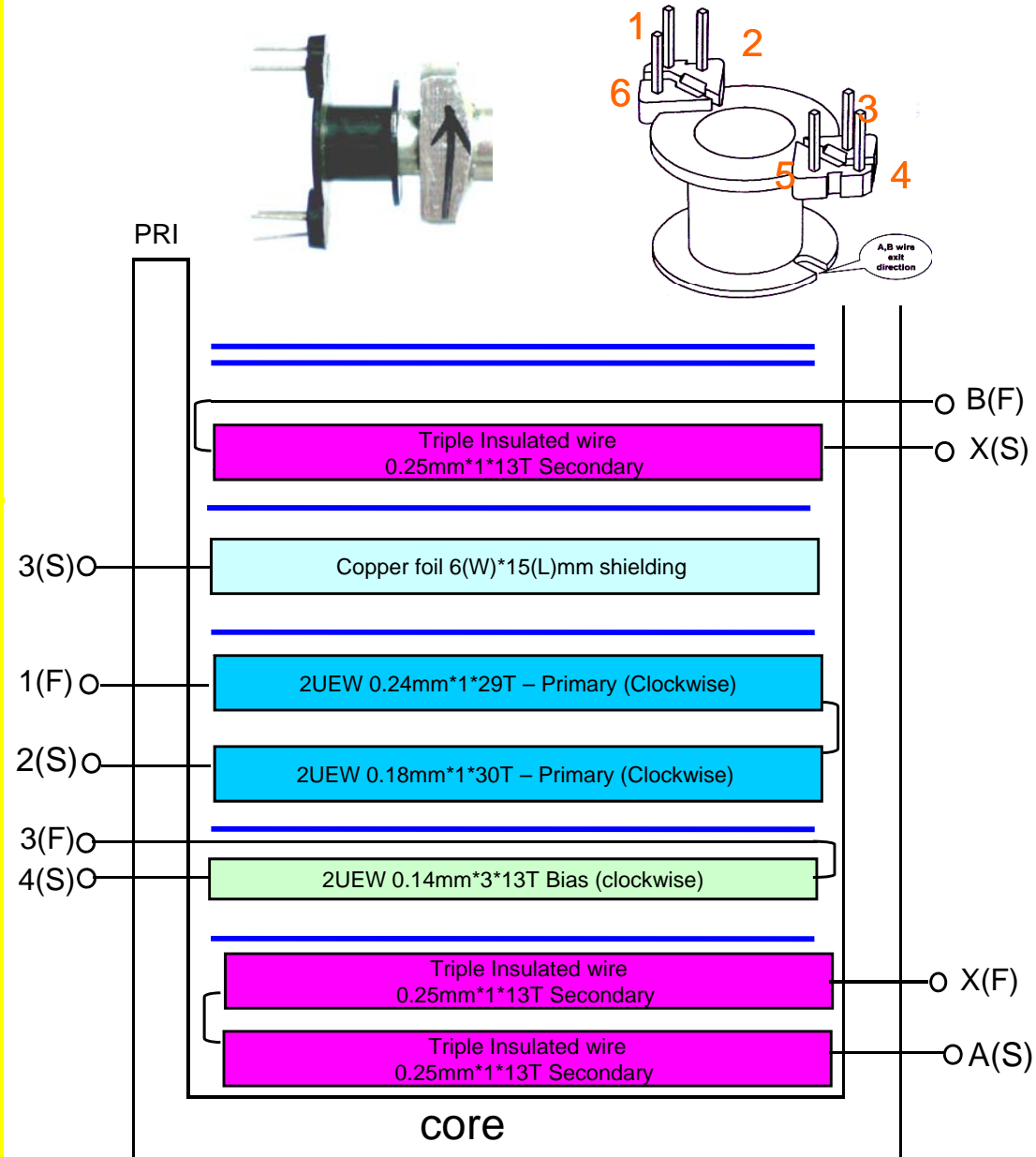
1. Primary Inductance ( $L_p$ ) = 0.7mH @10KHz
2. Primary Leakage Inductance ( $L_k$ ) <= 10uH @10KHz
3. Electrical Strength = 3KV, 50/60Hz, 1Min

## MATERIALS:

1. Core : RM6 (Ferrite Material TDK PC40 or equivalent)
2. Bobbin : RM6. 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 **pin3**.
3. Varnish the complete assembly



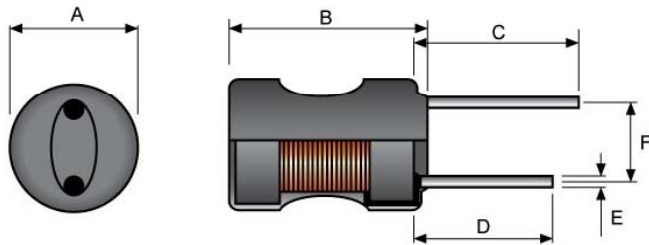
# 5. Bill of Material

Item	Qty.	Ref.	Description
1	2	C1,C2	22uF,200V,E-CAP,105°C
2	1	C3	0.22uF,400V
3	1	C4	1nF,1KV,Capacitor
4	1	C5	180pF,50V,NPO,SMD-0603
5	1	C6	470pF,50V,X7R,SMD-0805
6	1	C7	0.1uF,50V,NPO,SMD-0805
7	1	C8	22pF,50V,SMD-0603
8	1	C9	470pF,50V, SMD-0805
9	1	C10	4.7uF,50V,SMD-1206
10	1	C11	47uF,50V ,E-CAP,105°C
11	1	CX1	0.1uF/275V X Capacitor
12	1	CY1	Y-CAP1nF 250V
13	3	D1,D2,D3	M7/ES1J
14	1	D4	FR107,Rectifier Diode,DO-41
15	1	D5	1N4148
16	1	D6	BAV103
17	1	D7	HER207
18	1	F1	1A/250Vac Fuse
19	1	BDR1	DB107

Item	Qty.	Ref.	Description	U/P (RMB)
19	3	L1,L2,L3	1.5mH(8*10) (0.20*1 214T)	
20	1	Q1	4N60	
21	3	R1,R2,R3	4.7K,SMD-0805	
22	2	R4.R5.R6,R7	560K $\Omega$ +/-5%,SMD-1206	
23	1	R8	330K $\Omega$ +/-5%,SMD-1206	
24	1	R9	10 $\Omega$ +/-5%,SMD-0603	
25	1	R10	100K $\Omega$ +/-5%,SMD-0603	
26	1	R11	1.2K $\Omega$ +/-5%,SMD-0603	
27	1	R12	2.2 $\Omega$ +/-1%,SMD-0805	
28	1	R13	30 $\Omega$ +/-1%,SMD-0805	
29	1	R14	22K $\Omega$ +/-5%,SMD-0603	
30	1	R15	22K $\Omega$ +/-5%,SMD-0603	
31	1	R16	10 $\Omega$ +/-5%,SMD-0805	
32	1	R17	30K $\Omega$ +/-1%,SMD-0805	
33	1	R18	3.9K $\Omega$ +/-1%,SMD-0603	
34	1	R19	30K $\Omega$ +/-5%,SMD-0805	
35	1	T1	RM6 Transformer	
36	1	U1	lw3620,Off-line digital PWM controller,SOT-8	

## 6. Differential Mode Inductor

### Differential mode inductor L1,L2,L3



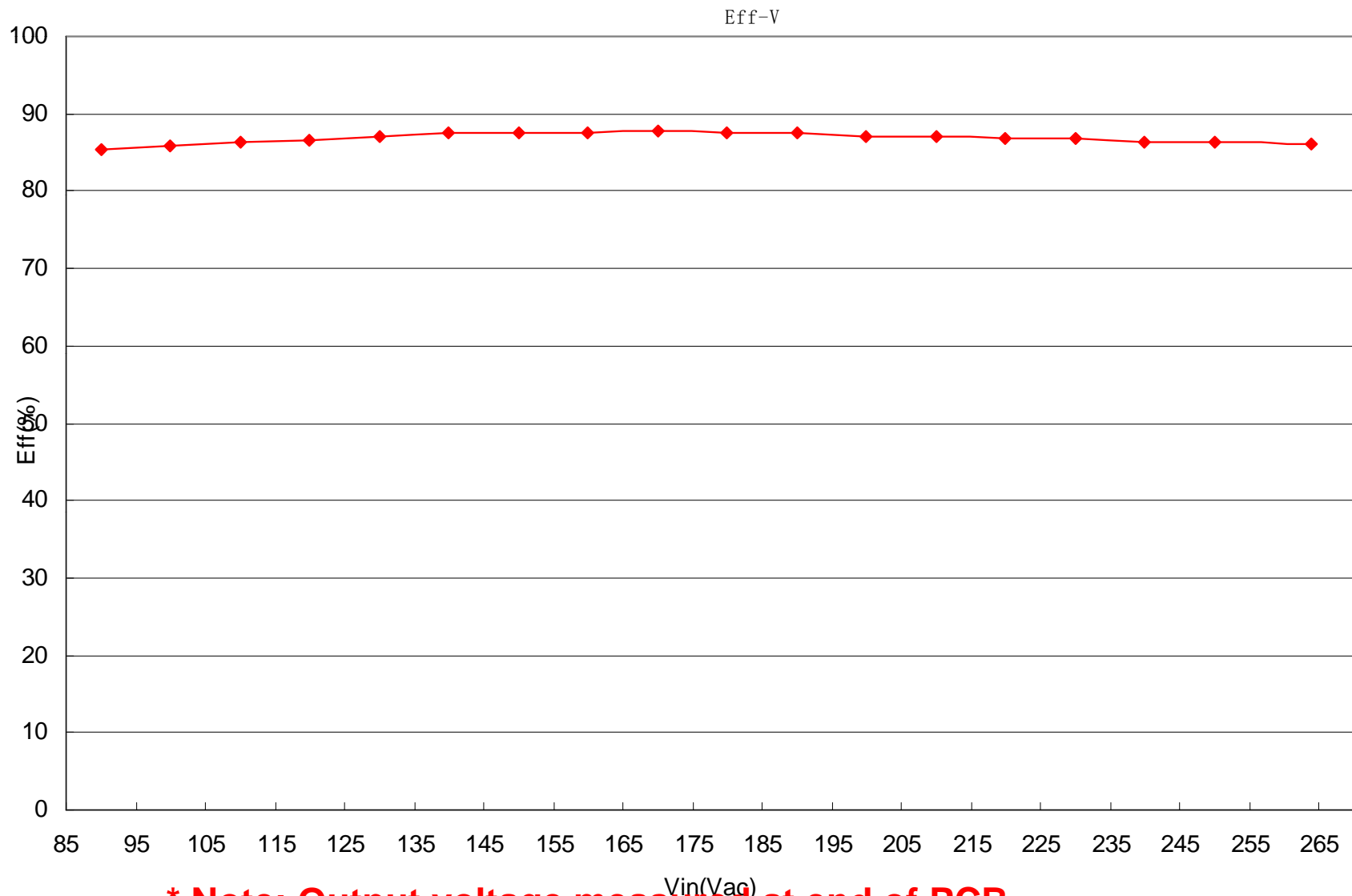
Ferrite core size : Ax B 8x10mm

Wire gauge: 0.20mm, 214 Turns

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

ICR: xxx OHM +/-20%

# 7. Regulation, Efficiency Measurement

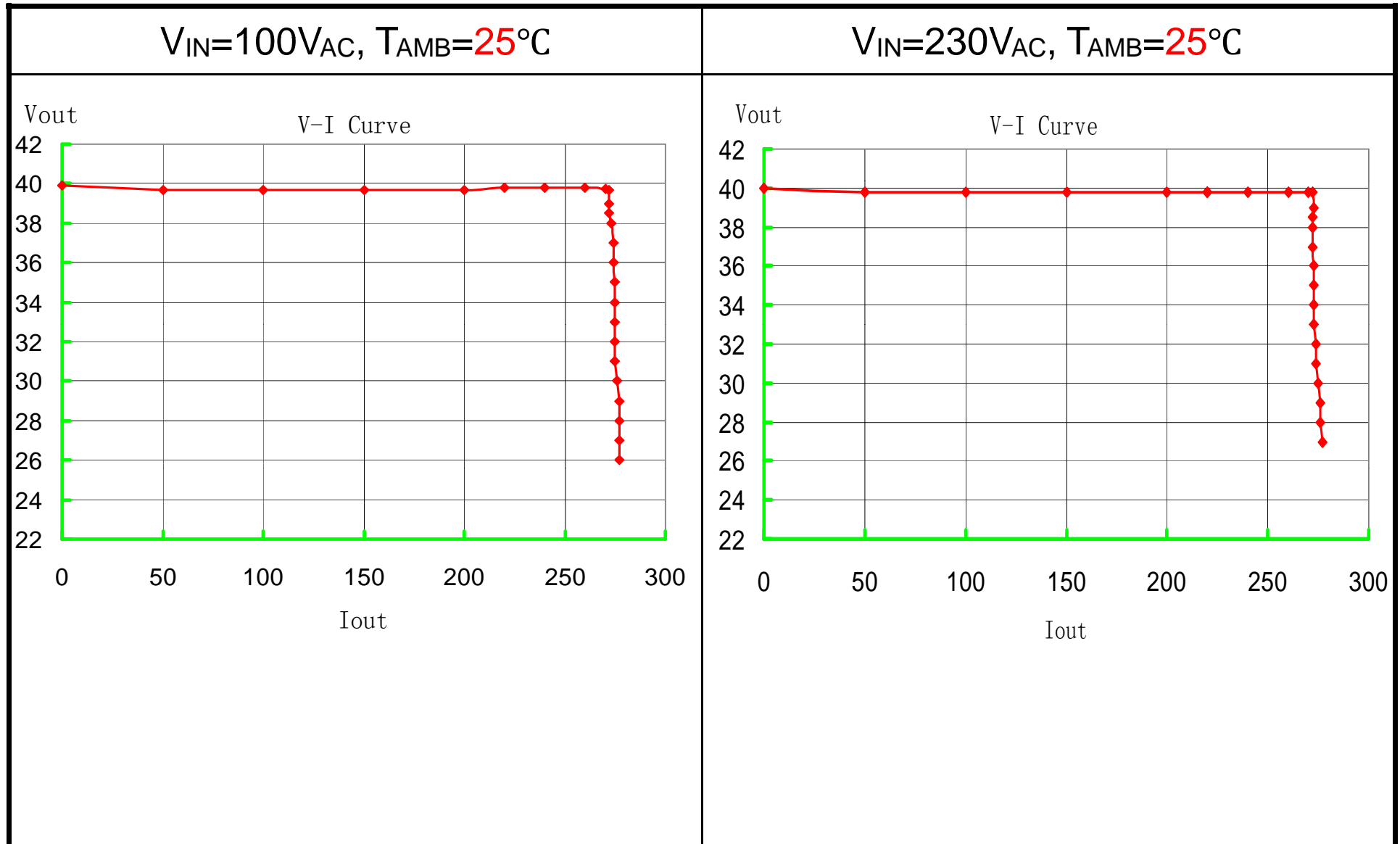


**\* Note: Output voltage measured at end of PCB.**

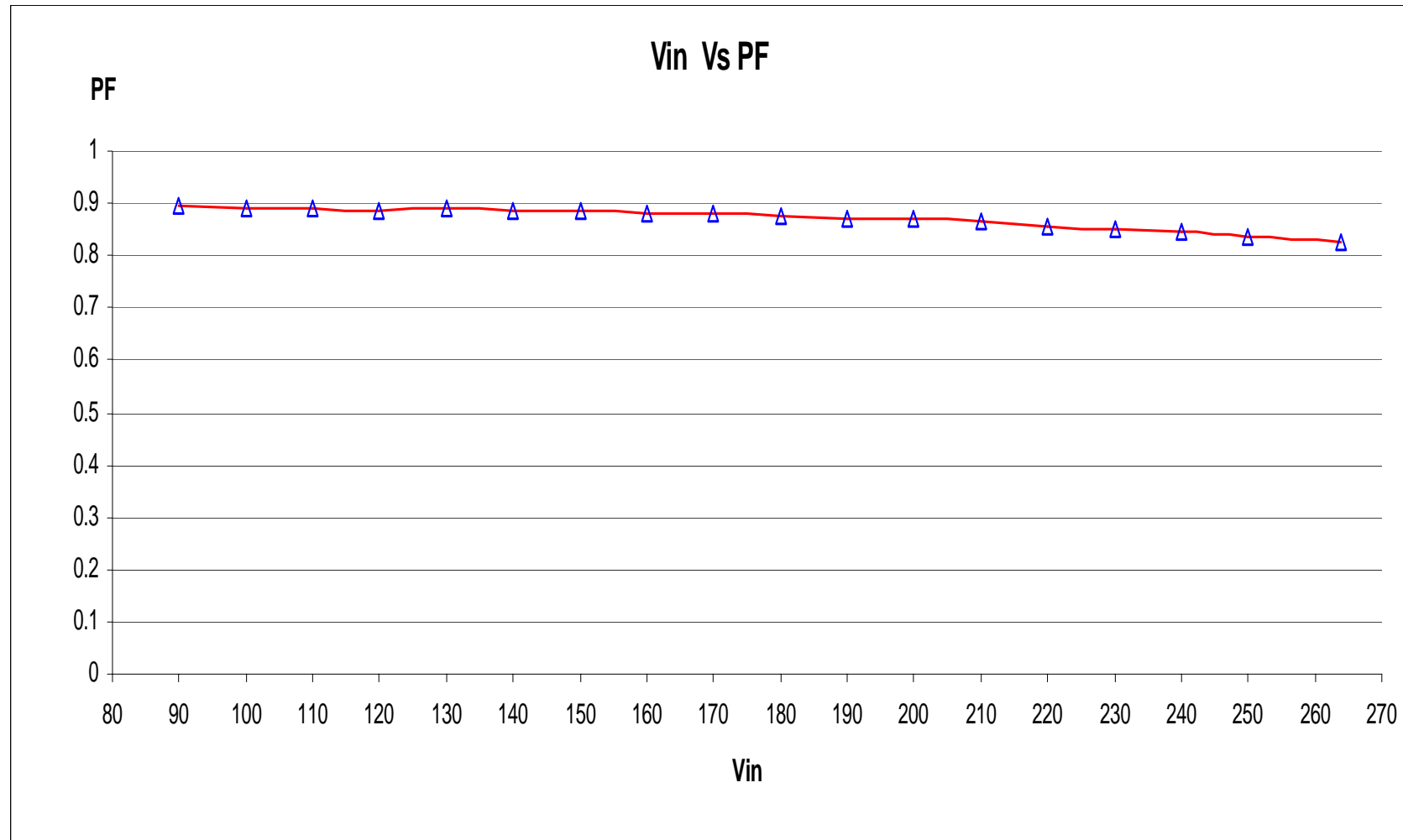


## 8. Output VI Characteristics

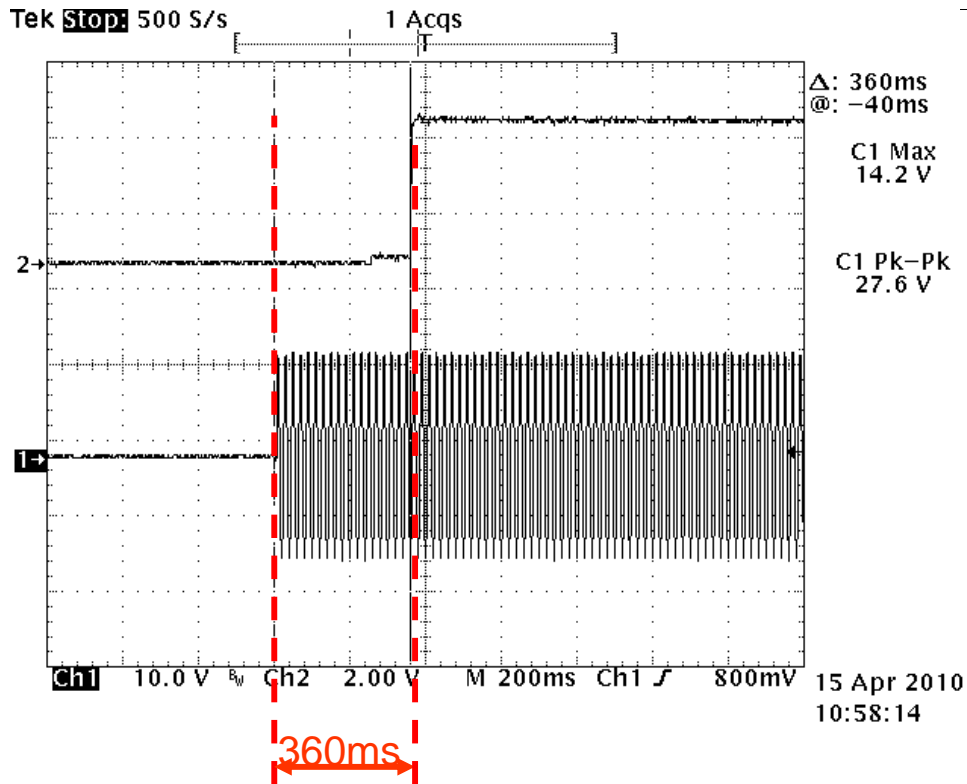
\* Note: Output voltage measured at PCB end,  $T_{AMB}=25\text{ }^{\circ}\text{C}$



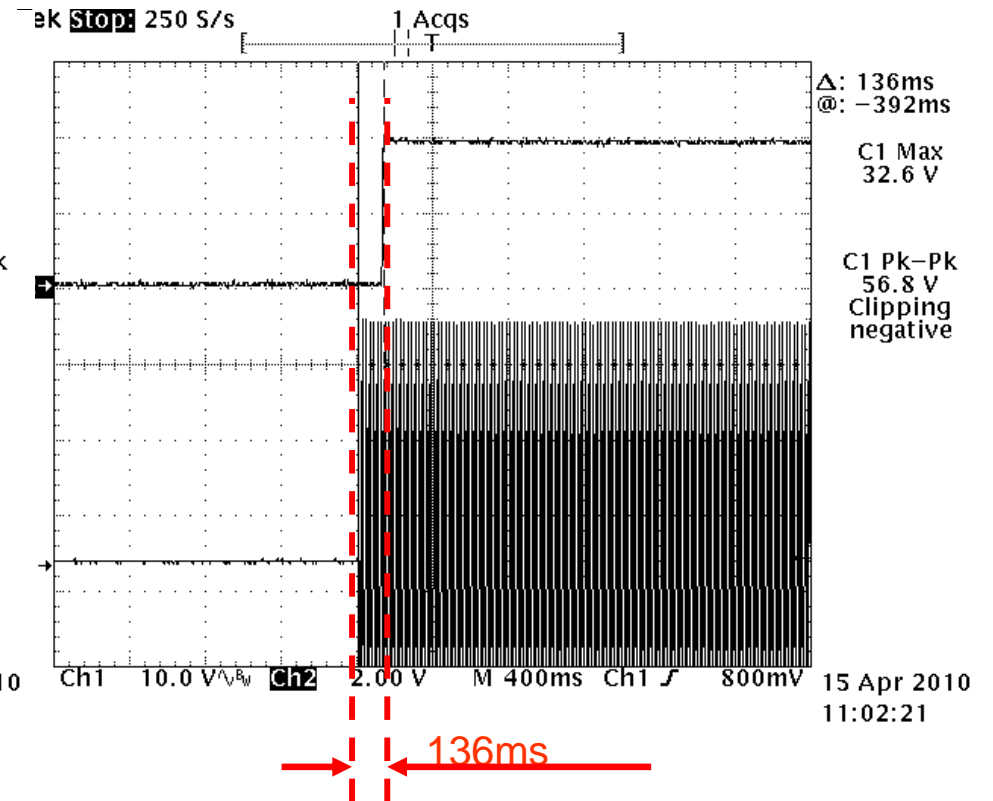
## 9. Input voltage VS Power Fact curve



# 10. Start up time

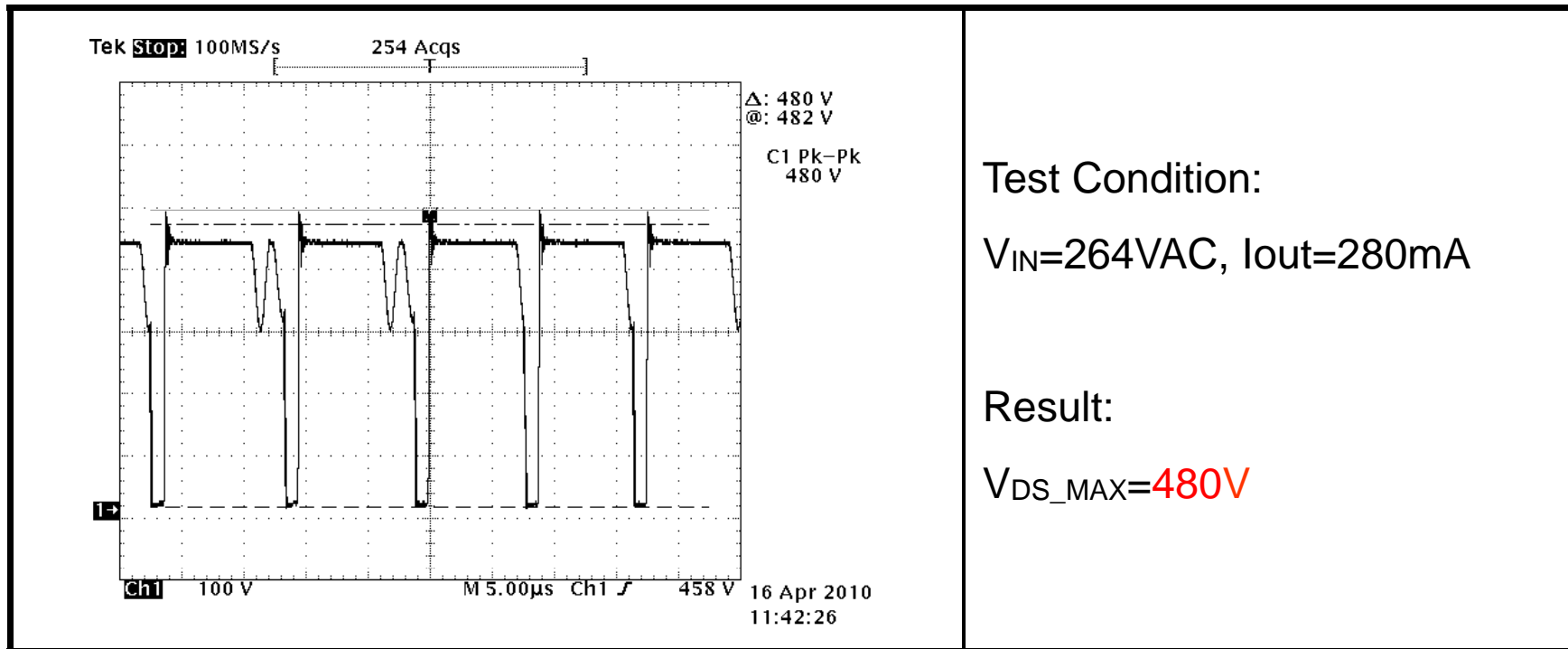


INPUT=100VAC



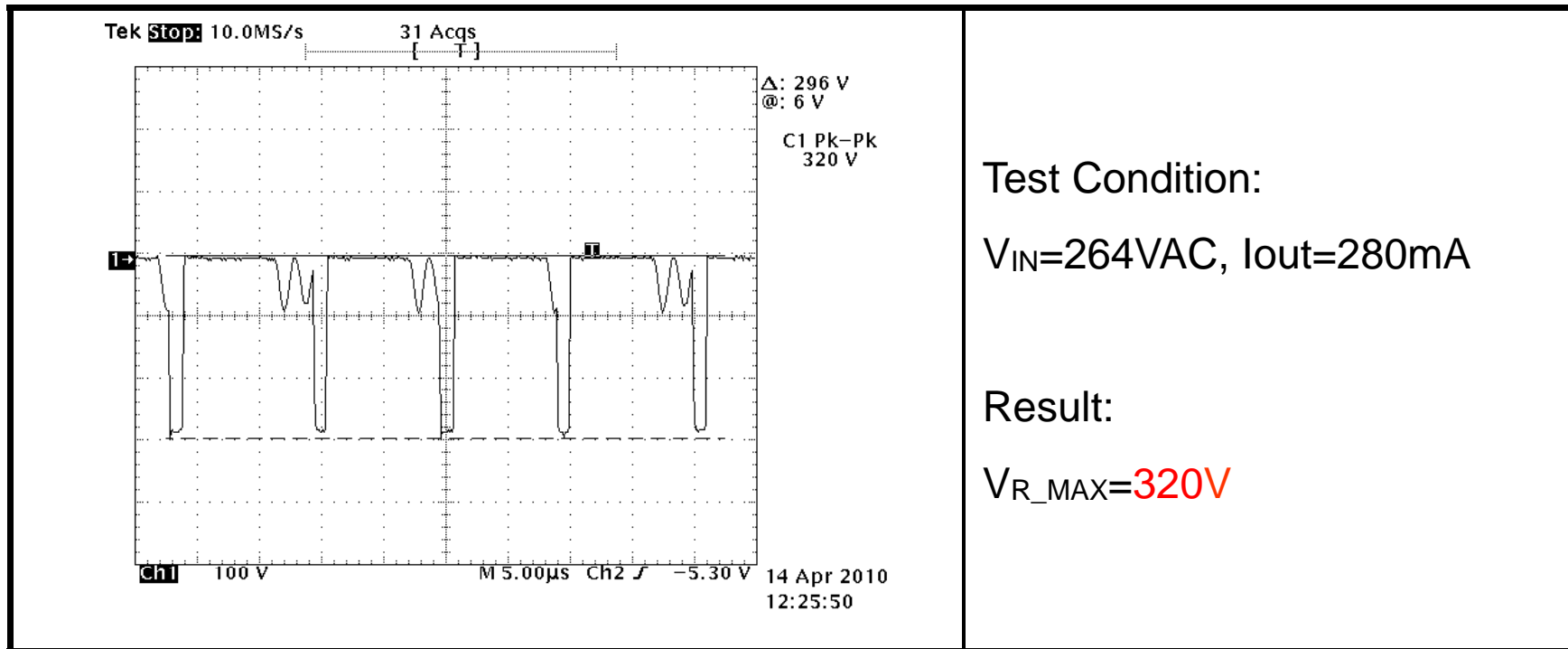
INPUT=230VAC

# 11. $V_{DS}$ waveform



Remark: Mosfet Spec\_\_4A 600V

# 12. $V_R$ waveform



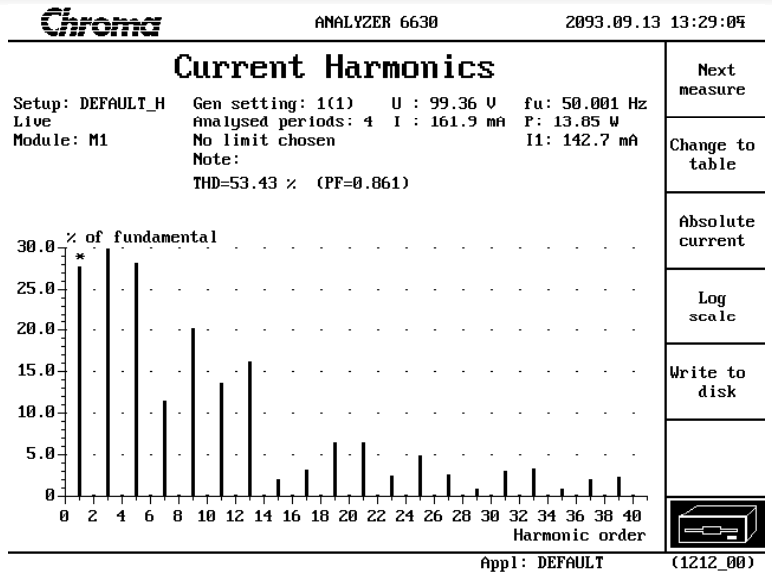
Test Condition:

$V_{IN}=264VAC$ ,  $I_{out}=280mA$

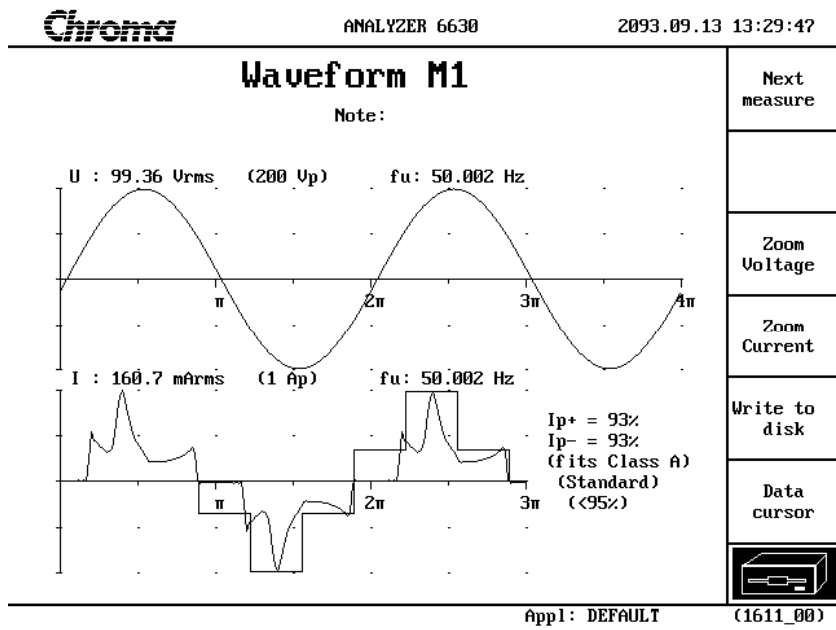
Result:

$V_{R\_MAX}=320V$

# 13 . Harmonic and current waveform\_3620

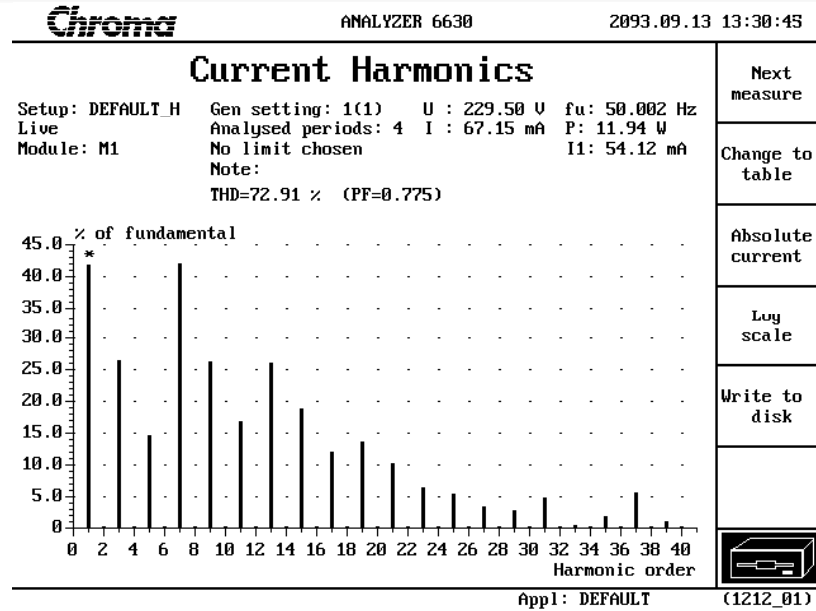


Harmonics current @100Vac  
Meet IEC61000-3-2 requirement

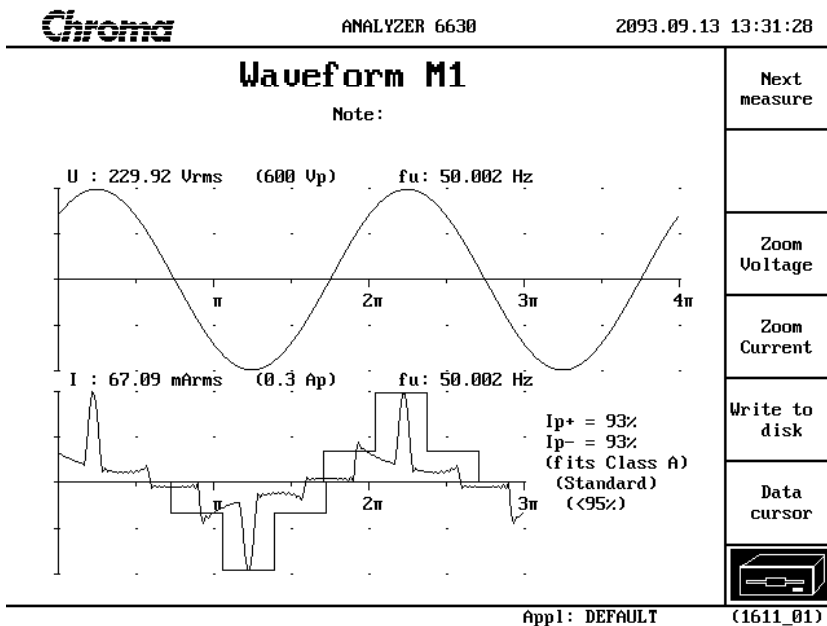


Ac current waveform @100Vac  
PF=0.861

# 14 . Harmonic and current waveform\_\_3620



Harmonics current @230Vac  
Meet IEC61000-3-2 requirement

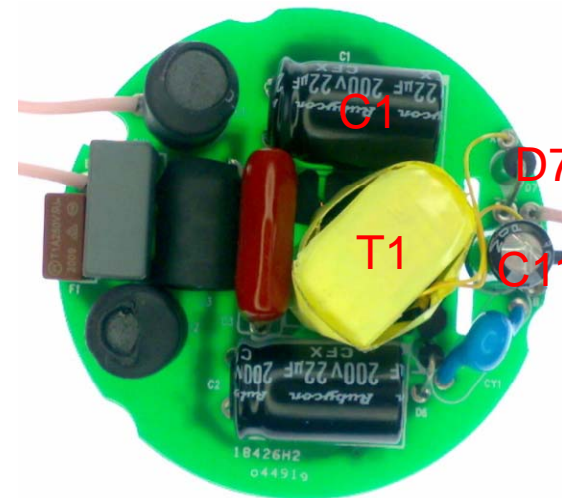
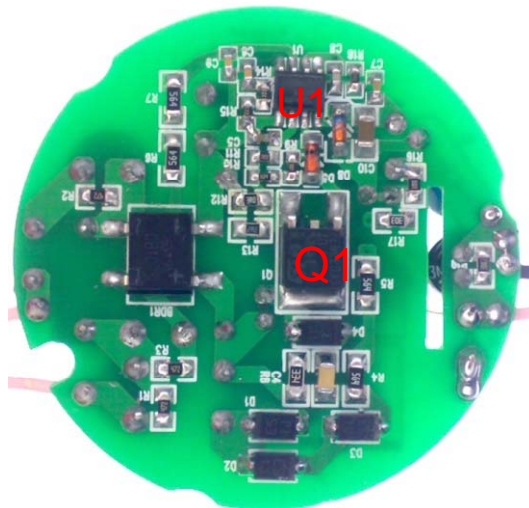


Ac current waveform @230Vac  
PF=0.775

# 15. Temperature Rise Test

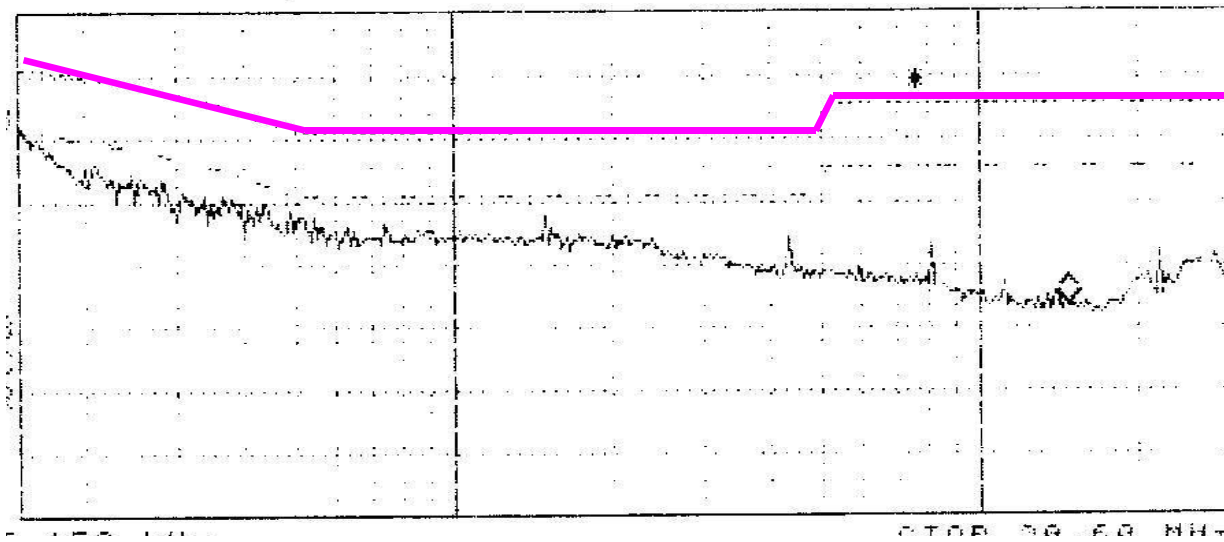
Circuit code	90VAC		230VAC	
	Temperature	Temperature rise	Temperature	Temperature rise
Transformer (Core)	81.5	59.4	81.1	59
Transformer (wire)	80.3	58.2	79.9	57.8
IC (U1 3620)	72.8	50.7	71.4	49.3
Output diode(D7)	86.9	64.8	87.5	65.4
Input Capacitor(C1)	70.3	48.2	67.7	45.6
output Capacitor (C11)	72.8	50.7	72.8	50.7
Mosfet (Q1)4N60	78.7	56.6	72.3	50.2
Inside lampshade wall	50.3	28.2	48.8	26.7
outside lampshade wall	41.8	19.7	41.8	19.7
Ambient temperature	25.1 ° C		25 ° C	

\* Put the driver in plastic housing and measure the temperature



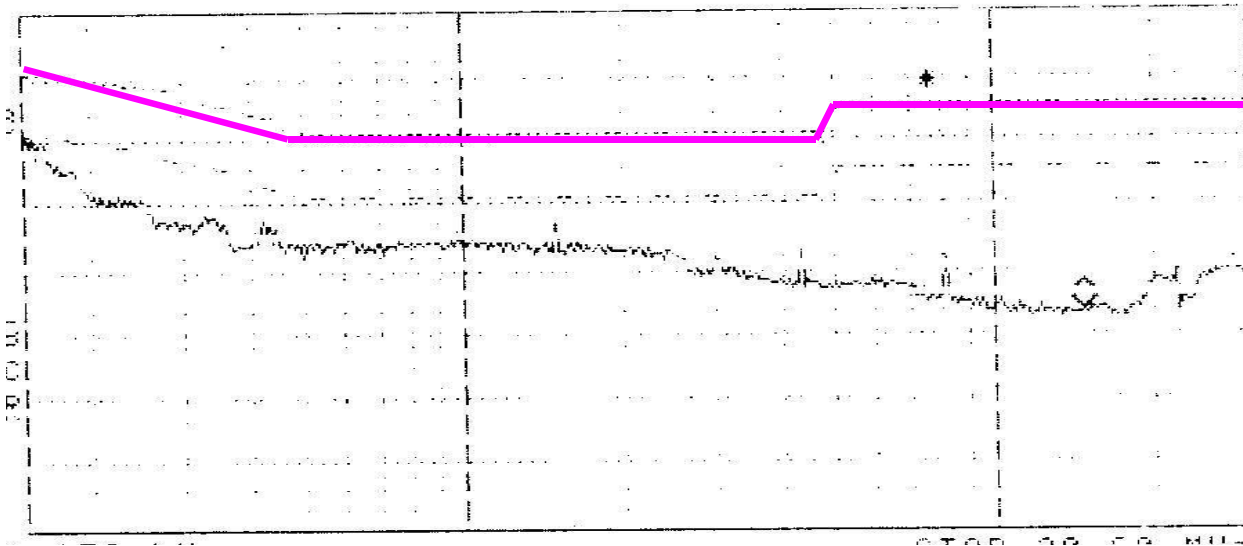


# 16. Conducted EMI (Full Load, output floating )



Peak Scan  
QP Limit line

Input=230VAC  
N line PK scan



Peak Scan  
QP Limit line

Input=230VAC  
L line PK scan