



LED Driver Design with iW3620

Summary and Features :

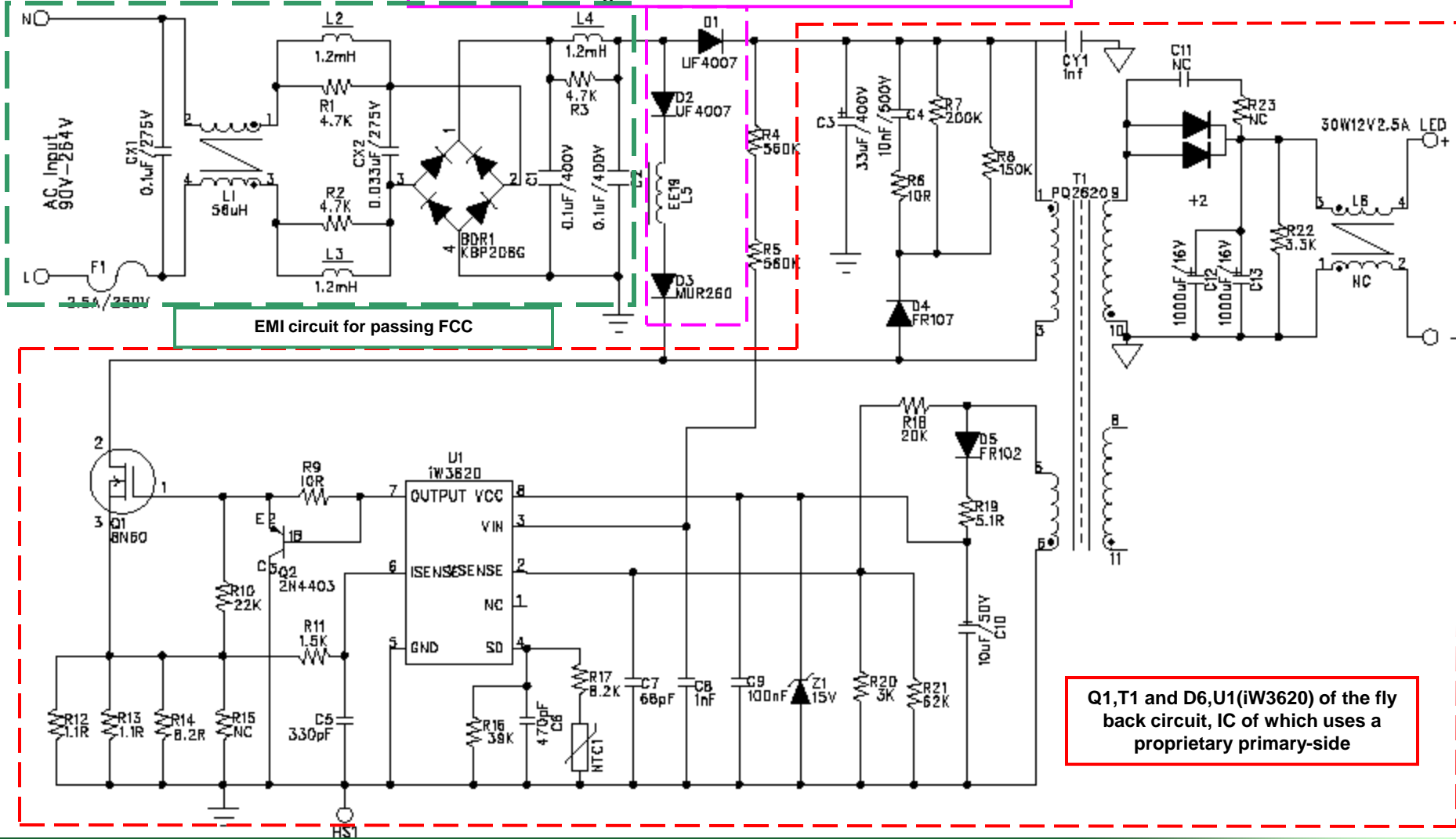
1. LED driver, 12V, 2.5A ; Wide AC input range: 90Vac-264Vac
2. For Isolated Applications
3. High Efficiency and Least Parts Solution
4. Meet EMI Requirement (EN55015BQP&AV scan)
5. Fully Protection Against AC input UV/OV,O/P Short &Open, Component single fault

1. Specification

Description		Symbol	Min	Typ	Max	Units	Comment
Input							
Voltage		V_{IN}	90	110/230	264	V _{AC}	2 Wire
Frequency		f_{LINE}	47	50/60	63	Hz	
Open-load Input Power (264V _{AC})						W	
Output							
Const Voltage	Output Voltage	V_{OUT_CV}		12		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}		2.5		A	
Total Output Power							
Continuous Output Power		P_{OUT}		30		W	
Over Current Protection		I_{OUT_MAX}				A	Auto-restart
Efficiency		η	80			%	Measured at end of PCB, 100 and 230Vac input voltage (T _A = 25 °C)
Power Fact		PF		0.9			Harmonic meet IEC61000-3-2
Turn on Delay Time						Sec	Vin=230Vac
Conducted EMI			Meets EN55015B				
Hi-pot test				4		KV	
Operation Temperature		T_{opr}		40		° C	Free convection, sea level

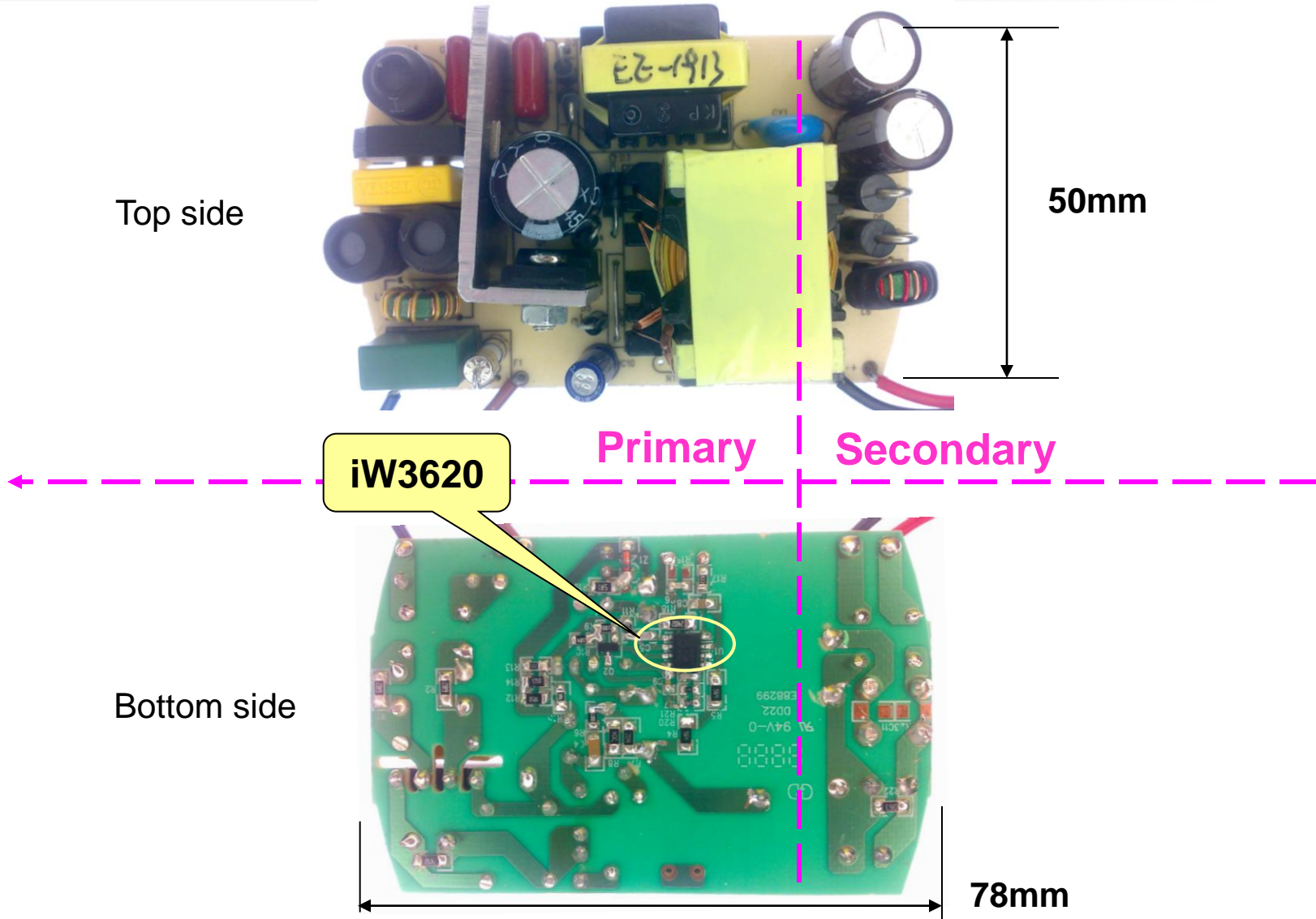
2. Schematic

D1,D2,D3 and L5 (EE19) as boost inductor Of PFC circuit, which uses the main switch to control the turn on time of the input current in order to obtain the high PF value and the small harmonic current



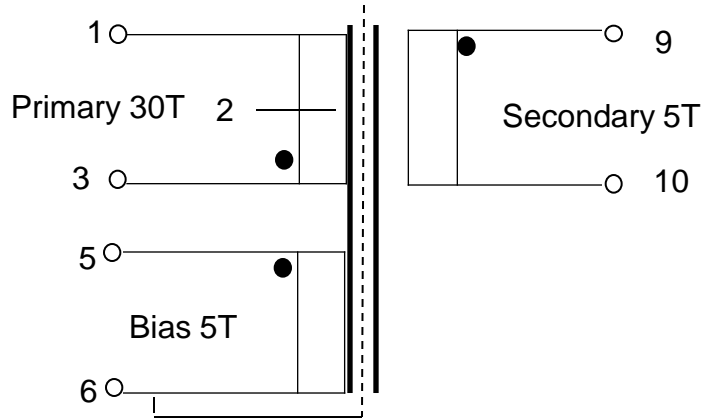
Q1,T1 and D6,U1(iW3620) of the fly back circuit, IC of which uses a proprietary primary-side

3.Circuit Board Photograph



4. Transformer Design

SCHEMATIC



ELECTRICAL SPECIFICATIONS:

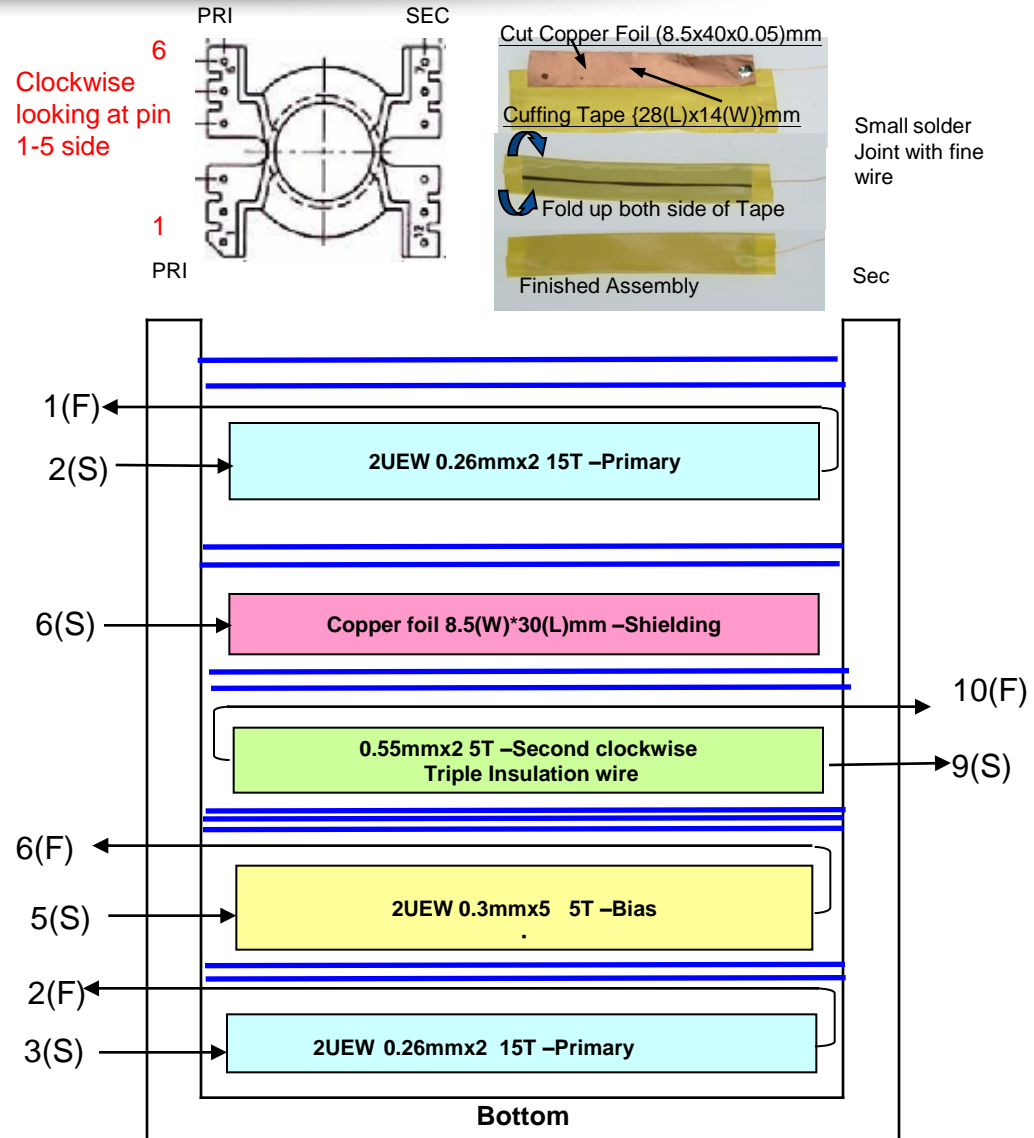
1. Primary Inductance (L_p) = 410uH @ 10KHz
2. Primary Leakage Inductance (L_k) ≤ 20uH @ 10KHz

MATERIALS:

1. Core : PQ2620 (Ferrite Material TDK PC40 or equivalent)
2. Bobbin : PQ2620
3. Magnet Wires : Type 2-U EW
4. Layer Insulation Tape : 3M1298 or equivalent.

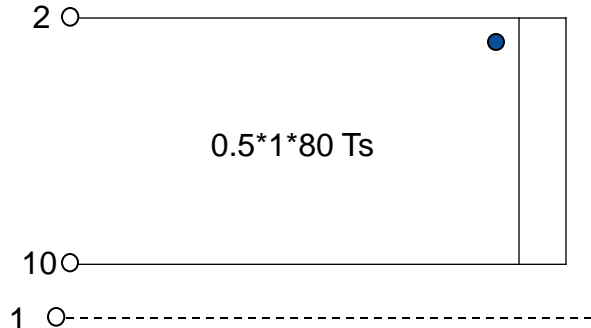
FINISHED :

1. Cut remained of Pin2,4,7,8,11,12 after wires termination
2. Varnish the complete assembly
3. Core is connected to primary pin4



5. PFC Inductor L5 Design

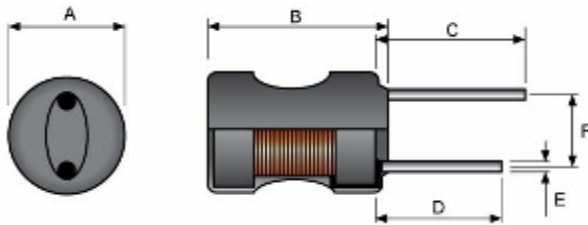
SCHEMATIC



ELECTRICAL SPECIFICATIONS:

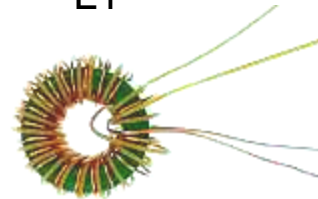
1. Inductance (L_p) = 480uH @10KHz
2. Core : EE19 (Ferrite Material TDK PC40 or equivalent)
3. Bobbin : EE19 Vertical
4. Use copper(7mm*1.1T) to encircle the ferrite core is connected to Pin 6 after assembling.
5. Cut remained of Pin3 , 4 , 5 , 6 , 9, after wires termination
6. Varnish the complete assembly

5. Differential Mode Inductor L2,L3,L4 Common Choke L1 for EMI



Ferrite core size : Ax B 8x10mm
 Wire gauge: 0.25mm, 190 Turns
 Inductance @10kHz, 1V: 1.2mH +/-20%
 ICR: 1.5 OHM +/-20%

L1

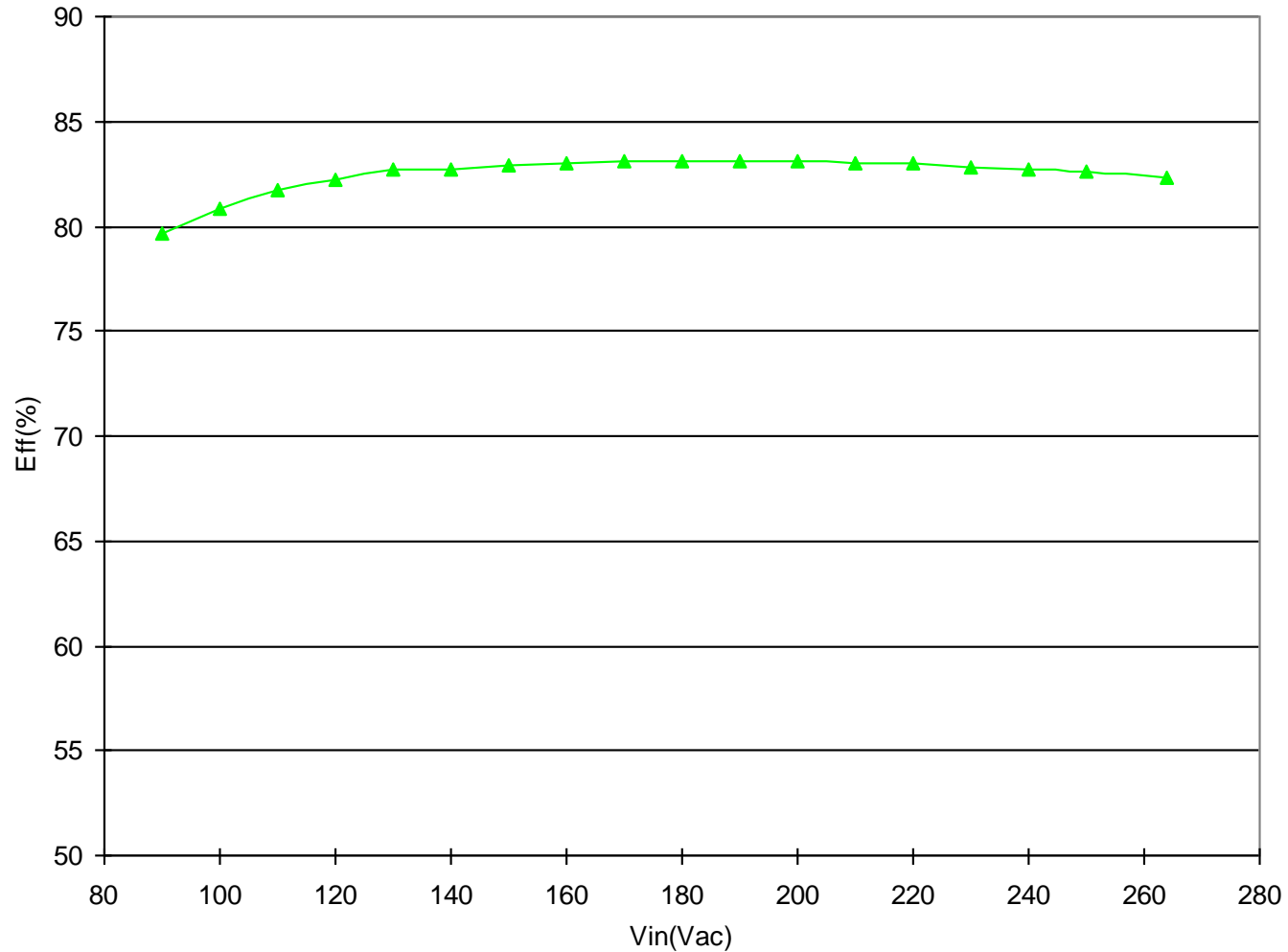


Wire gauge: 0.3mm*2, 12 Turns
 (0.3mm*1(Insulation)+0.3mm*1(2UEW))*12T
 Inductance @10kHz, 1V: 56uH +/-20%

6. Bill of Material

Item	Qty.	Ref.	Description	Cost (US Cent) / unit
1	1	U1	iW3620, Off-line digital PWM Controller, SO-8	
2	1	CX1	0.1uF, 250V, X-cap	
3	1	CX2	0.033uF, 250V, X-cap	
4	2	C1,C2	0.1uF, 400V,	
5	1	C3	33uF, 400V, E-CAP, 105°C	
6	1	C4	10nF, 500V, SMD-1206	
7	1	C5	330pF, 50V, SMD-0805	
8	1	C6	470pF, 50V, SMD-0805	
9	1	C7	27pF, 50V, SMD-0805	
10	1	C8	1nF, 50V, SMD-0805	
11	1	C9	100nF, 50V, SMD-0805	
12	1	C10	10uF, 50V, E-CAP, 105°C Low ESR	
13	1	C12,13	1000uF, 16V, E-CAP, 105°C Low ESR	
14	2	R1,R2	4.7KΩ ±5%, SMD-1206	
15	1	R3	4.7KΩ ±5%, SMD-1206	
16	2	R4,R5	560KΩ ±5%, SMD-1206	
17	1	R6	10Ω ±5%, SMD-0805	
18	1	R7	200KΩ ±5%, SMD-1206	
19	1	R8	150KΩ ±5%, SMD-1206	
20	1	R9	10Ω ±5%, SMD-0603	
21	1	R10	100KΩ ±5%, SMD-0603	
22	1	R11	1.3KΩ ±1%, SMD-1206	
23	1	R14	8.2R, ±1%, SMD-1206	
24	2	R12,13R	1.1Ω, ±1%, SMD-1206	
25	1	R15	NC	
26	1	R17	8.2kΩ ±1%, SMD-1206	
27	1	R18	20kΩ ±1%, SMD-1206	
28	1	R19	5.1Ω ±5%, SMD-1206	
29	1	R20	3KΩ ±5%, SMD-1206	
30	1	R21	62KΩ ±5%, SMD-1206	
31	1	R22	3.3KΩ ±5%, SMD-1206	
32	2	D1,D2	UF4007, Rectifier Diode, DO-41	
33	1	D3	MUR260, Rectifier Diode, DO-41	
34	1	D4	FR107, Rectifier Diode, DO-41	
35	1	Q2	2N4403 SMD	
36	1	D5	FR102	
37	1	D6	MBR20100CT	
38	1	Z1	15V ZINNER DIODE SMD	
39	1	F1	2A, 250V	
40	1	L1	Common choke, Ferrite 8*3.5*3, ϕ0.30*2*12Ts 56uH	
41	3	L2,3,4	Different Inductor, core ϕ8*12, ϕ0.25*1*180Ts	
42	1	L6	Common choke, Ferrite 10*5*5, ϕ0.7*2*9Ts	
43	1	L5	EE19 410uH, ϕ0.5*1*80Ts	
44	1	Q1	8N60, TO-220	
45	1	T1	PQ2620 Transformer,	
46	1	CY1	1nF, 250V, Y-cap	
47	1	HS	Heatsink	

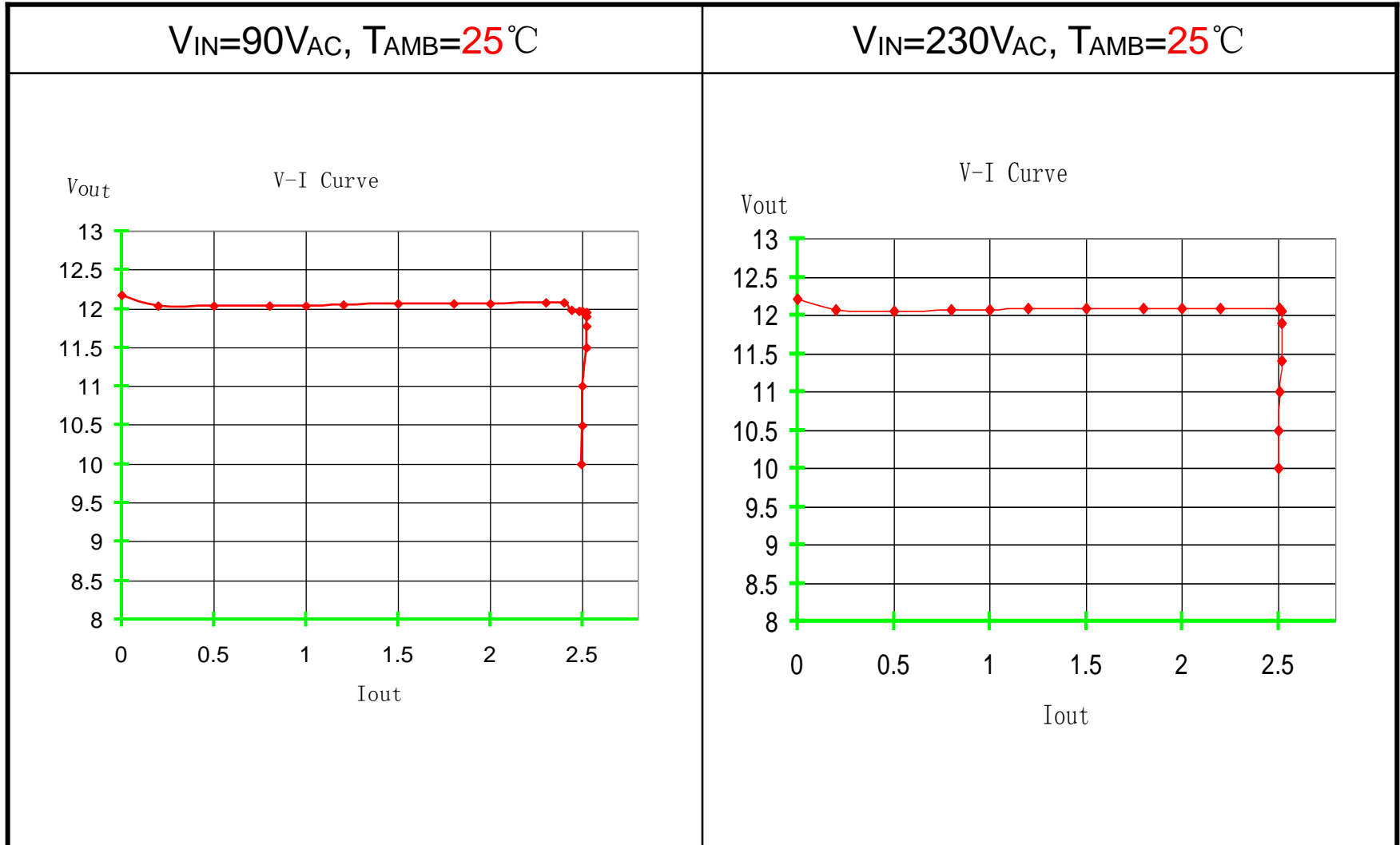
7. Efficiency Measurement curve



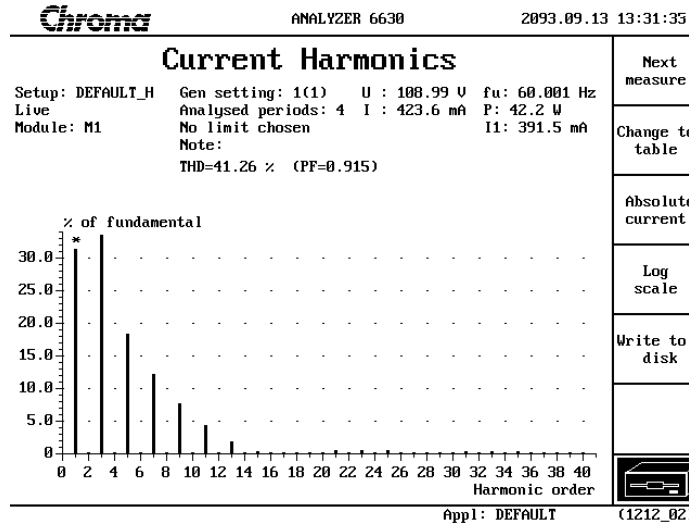
*** Note: Output voltage measured at end of PCB.**

8. Output VI Characteristics

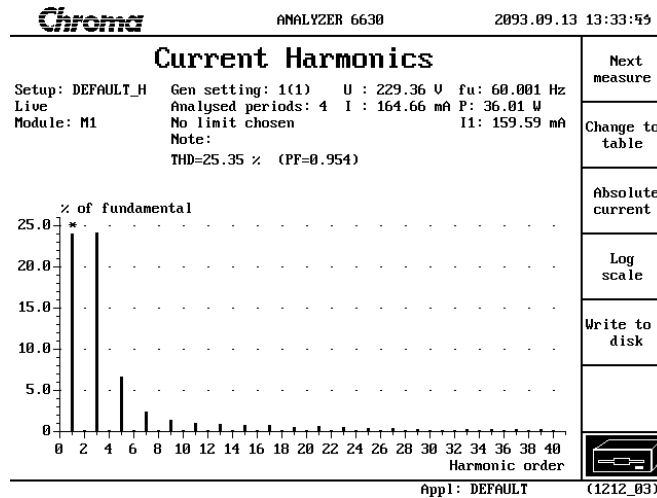
* Note: Output voltage measured at PCB end, $T_{AMB}=25\text{ }^{\circ}\text{C}$



9.PF and harmonic current

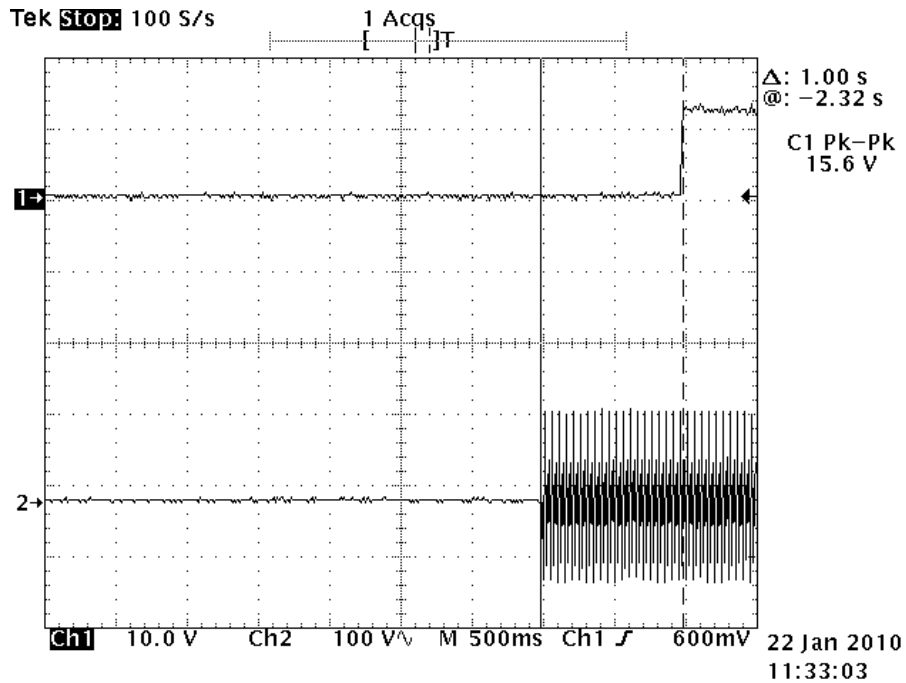


Vin_110V PF=0.915
 Harmonic_3rd 36.88%
 5th 19%



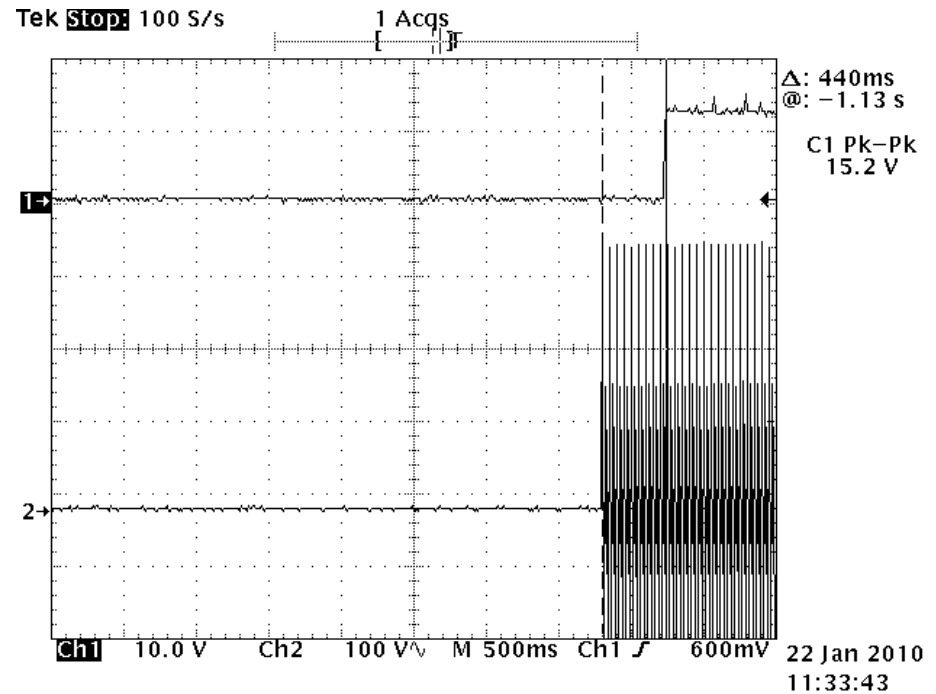
Vin_230V PF=0.954
 Harmonic_3rd 24%
 5th 6%
 IEC61000-3-2 requirement---
 3rd <86% 5th <61%

10. Start up and turn on delay time



100V_{AC}, Full Load

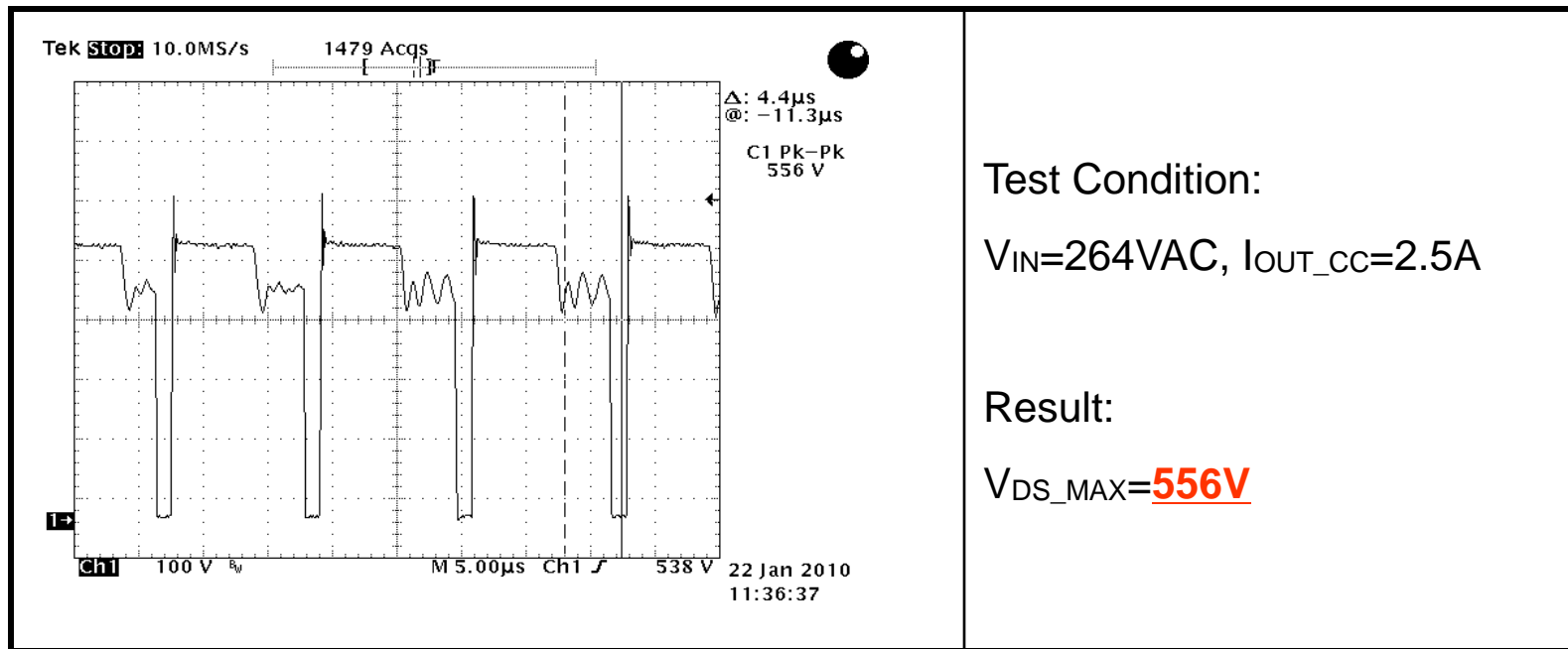
$T_{ST_DELAY} = 1.00S$



230V_{AC}, Full Load

$T_{ST_DELAY} = 440mS$

11. V_{DS} waveform



Remark: Mosfet Spec__8A 600V