

LED Driver with IW3626

(AC input 90-264 Vac , Output 22V350mA)

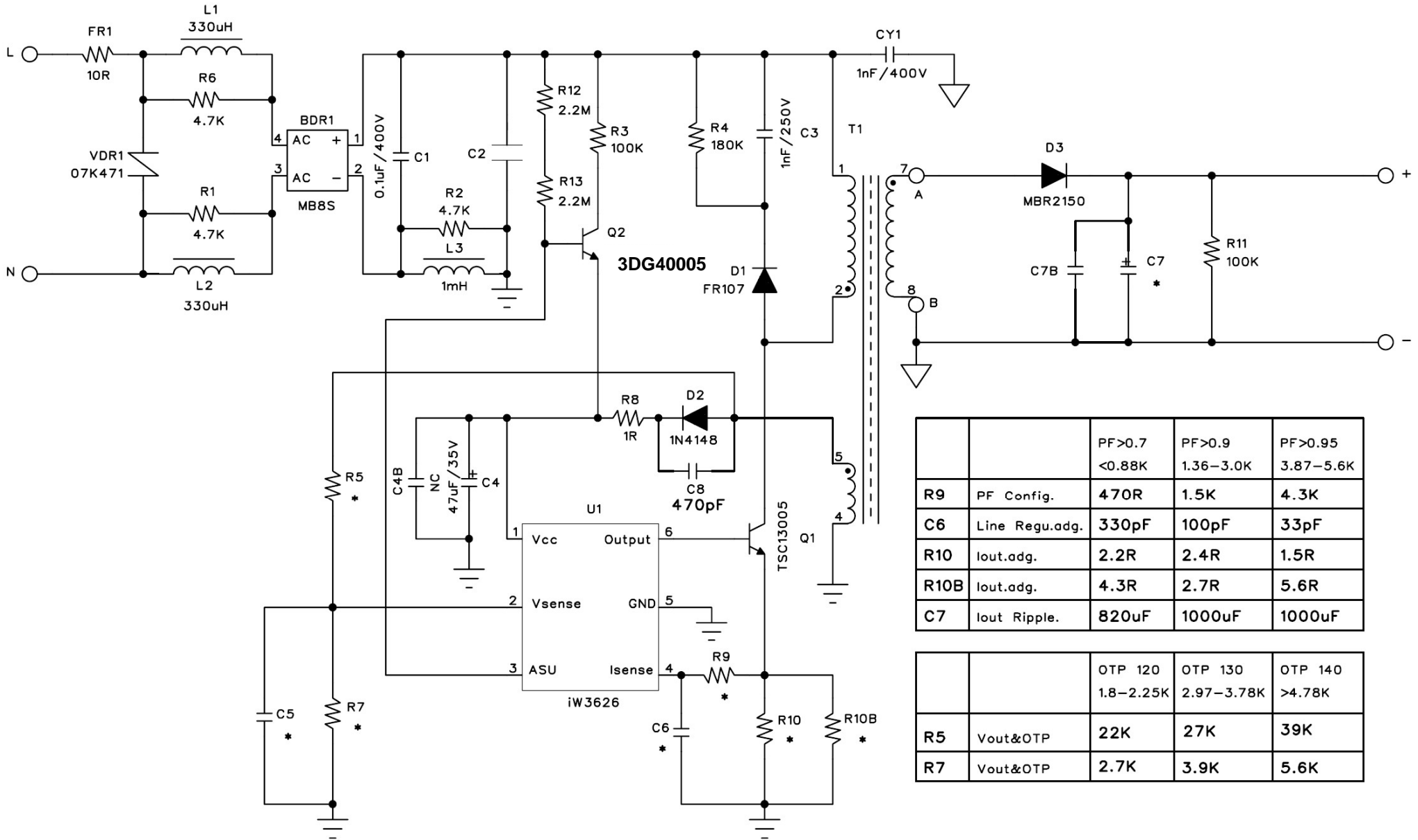
General Design Specification:

1. AC Input Range 90~264Vac
2. DC Output 22V, 350mA(Constant Current)
3. isolated High efficiency
4. Single stage High PF

1. Specification

Description		Symbol	Min	Typ	Max	Units	Comment
Input							
Voltage		V	90	230	264	V _{AC}	2 Wire
Frequency		f_{LINE}		50		Hz	
Open-load Input Power (264V _{AC})				0.15		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}		0.35		A	
Total Output Power							
Continuous Output Power		P_{OUT}		8		W	
Over Current Protection		I_{OUT_MAX}				A	Auto-restart
Efficiency		η	83			%	Measured at end of PCB@100Vac
Power Fact		PF	0.7				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 circuit __22V350mA__90-264Vac



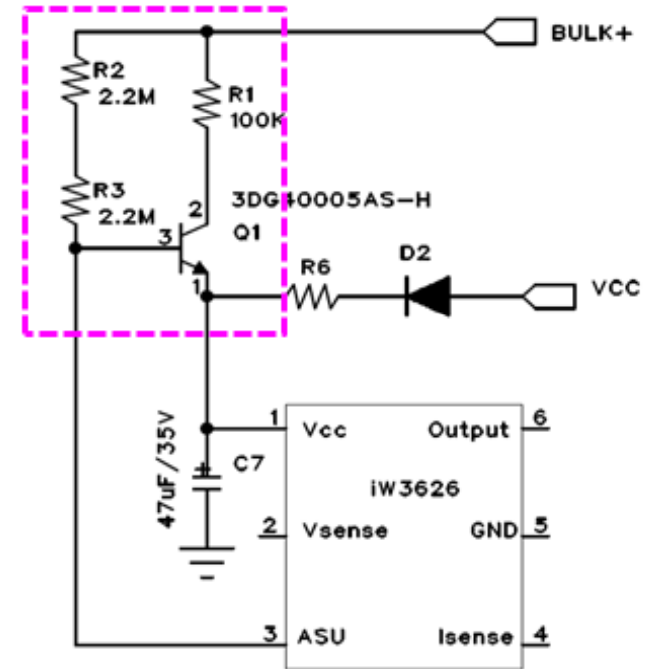
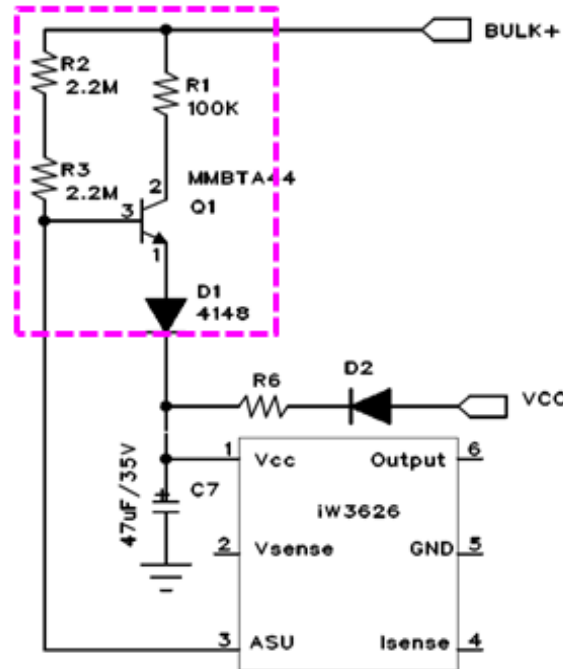
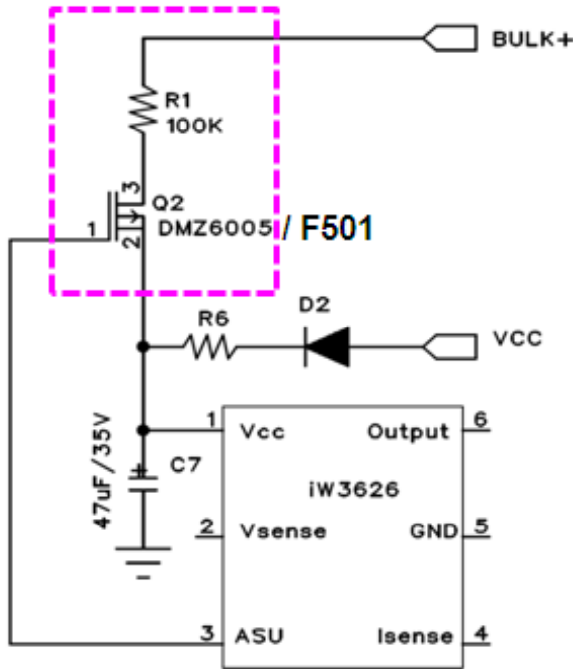
		PF>0.7 <0.88K	PF>0.9 1.36-3.0K	PF>0.95 3.87-5.6K
R9	PF Config.	470R	1.5K	4.3K
C6	Line Regu.adg.	330pF	100pF	33pF
R10	lout.adg.	2.2R	2.4R	1.5R
R10B	lout.adg.	4.3R	2.7R	5.6R
C7	lout Ripple.	820uF	1000uF	1000uF

		OTP 120 1.8-2.25K	OTP 130 2.97-3.78K	OTP 140 >4.78K
R5	Vout&OTP	22K	27K	39K
R7	Vout&OTP	2.7K	3.9K	5.6K

3. Bill of Material

Item	Qty.	Description	Ref.	Cost (US Cent) / unit	Sub-Total (Cent)
U1	1	iW3626			
C1	1	0.1uF, 400V, CBB PIN=7.5mm	AF104J2G079L250D9R		
C2	1	0.22uF, 400V, CBB PIN=10mm	AF224J2G109L250D9R		
C4	1	47uF/25V 5X11MM	47uFLK25V		
C7	1	1000UF/35V, ECAP 13X20MM	1000UFLK35V		
C3	1	1nF/250V X7R, SMD-0805	251R15W102KV4E		
C5	1	22PF/50V NPO, SMD-0603	CL10C220JB8NNNC		
C6	1	33PF/50V NPO, SMD-0603	CL10C330JB8NNNC		
C8	1	470PF/50V X7R, SMD-0805	CL21C471KB8NNNC		
L1 ,L2	2	330uH 0510			
L3	1	6x8MM 1.0mH			
BR1	1	B8S	B8S		
D1	1	FR107, 1A/1000V or RS1M SMA	RS1MW		
D2	1	IN4148 LL34	IN4148		
D3	1	MBR2150 SMA	MBR2150		
R1, R2, R6	3	4.7K Ω \pm 5%, SMD-0805	RC0805JR-074K7L		
R3	1	100K Ω , \pm 5%, SMD-1206	RC1206JR-07100KL		
R4	1	180K Ω , \pm 5%, SMD-1206	RC1206JR-07180KL		
R5	1	39K Ω , \pm 5%, SMD-0805	RC0805JR-0739KL		
R7	1	5.6K Ω \pm 1%, SMD-0603	RC0603FR-075K6L		
R8	1	1 Ω \pm 5%, SMD-0603	RC0603JR-071RL		
R9	1	4.3K Ω \pm 1%, SMD-0603	RC0603FR-074K3L		
R10	1	1.5 Ω \pm 1%, SMD-0805	RC0805FR-071R5L		
R10B	1	5.6 Ω \pm 1%, SMD-0805	RC0805FR-075R6L		
R11	1	100K \pm 5%, SMD-0805	RC0805JR-07100KL		
R12 ,R13	2	2.2M Ω \pm 5% SMD 1206	RC1206JR-072M2L		
CY1	1	1nF/400V	1nF/250V		
VDR1	1	VDR 07D471			
FR1	1	10R 1W fusible resistor 绕线电阻	KNP1WST-52-J-10R		
Q2	1	33DG40005			
Q1	1	BTR13005GD T0-126	BTR13005GD		
"L, N, +"	3	UL3239/24AWG, L=60mm,两头剥镀3mm, 红色			
"-"	1	UL3239/24AWG, L=60mm,两头剥镀3mm, 黑色			
PCB	1	FR-4单面板,60*23*1.5mm,1OZ			
Transformer	1	EE13加宽变压器			

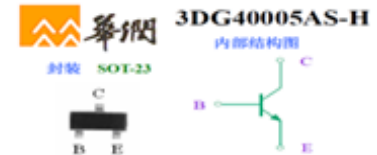
4. Active fast start up__ Optional with BJT and D-FET



Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DS}	Drain-Source Breakdown Voltage	600V			V	
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	700			Ω	
$I_{DSS,min}$	Saturated Drain Current	5		25	mA	$V_{GS}=0V, V_{DS}=25V$



Simplified outline Symbol

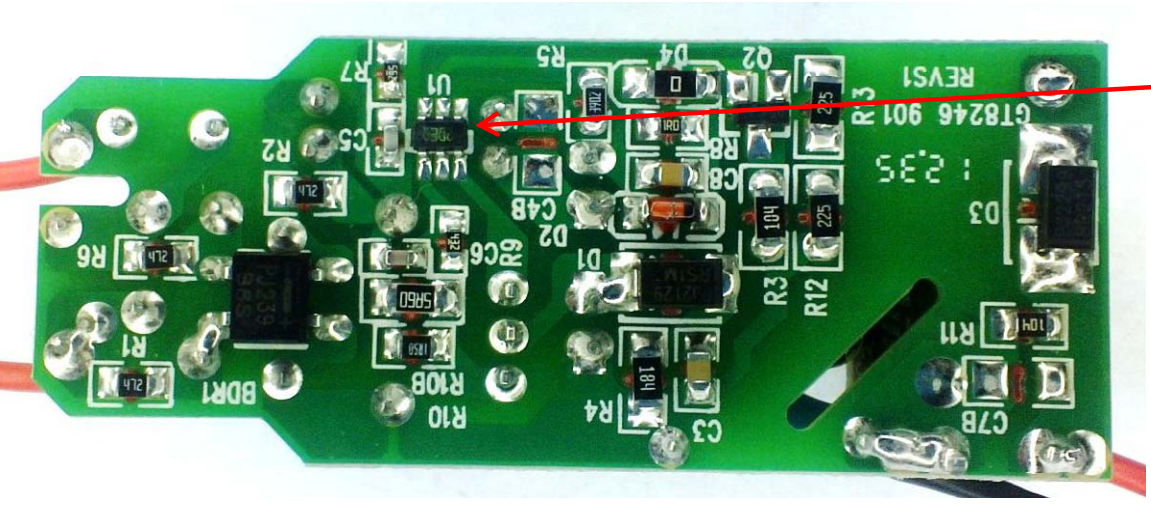
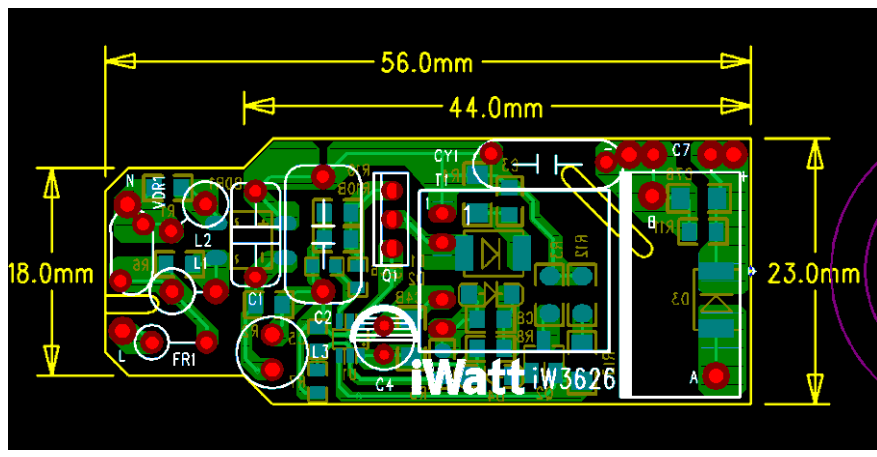
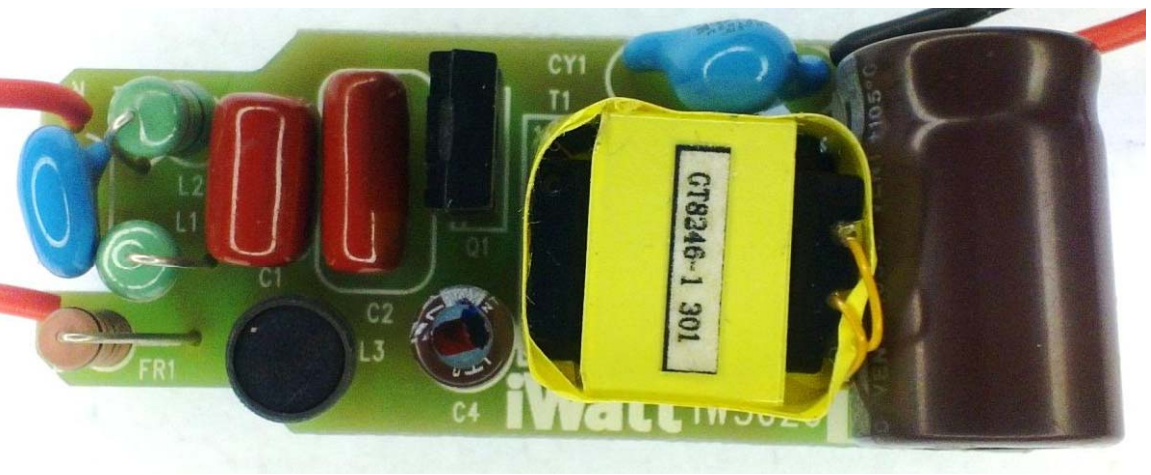


Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
I_{DSS}	Saturated Drain-to-Source Current	5	--	25	mA	$V_{GS}=0V, V_{DS}=25V$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	500	700	Ω	$V_{GS}=0V, I_D=3mA$ [4]
$V_{GS(ON)}$	Gate-to-Source Cut-off Voltage	-3.0	--	-1.8	V	$V_{DS}=3V, I_D=8\mu A$
gfs	Forward Transconductance	--	15.4	--	mS	$V_{DS}=10V, I_D=5mA$

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	500	V
V_{CEO}	collector-emitter voltage	open base	-	400	V
V_{EBO}	emitter-base voltage	open collector	-	6	V
I_C	collector current		-	300	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1ms$	-	300	mA
I_{BM}	peak base current	single pulse; $t_p \leq 1ms$	-	100	mA
P_{TOT}	total power dissipation	$T_{amb} \leq 25^\circ C$		250	mW

参数名称	符号	额定值	单位
集电极-基极电压	V_{CBO}	500	V
集电极-发射极电压	V_{CEO}	400	V
发射极-基极电压	V_{EBO}	20	V
集电极直流电流	I_C	50	mA
集电极脉冲电流 ($t_p < 5ms$)	I_{CM}	0.1	A
基极直流电流	I_B	25	mA
基极脉冲电流 ($t_p < 5ms$)	I_{BM}	50	mA
耗散功率	P_{TOT}	0.3	W
结温	T_J	150	$^\circ C$

5. Circuit Board Photograph



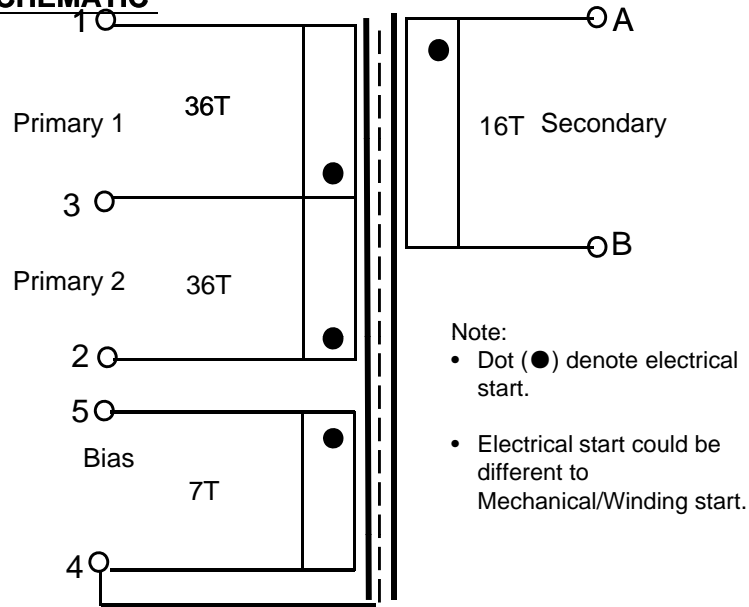
iW3626



Shenzhen Boguan A19

6. Transformer Design

SCHEMATIC



ELECTRICAL SPECIFICATIONS:

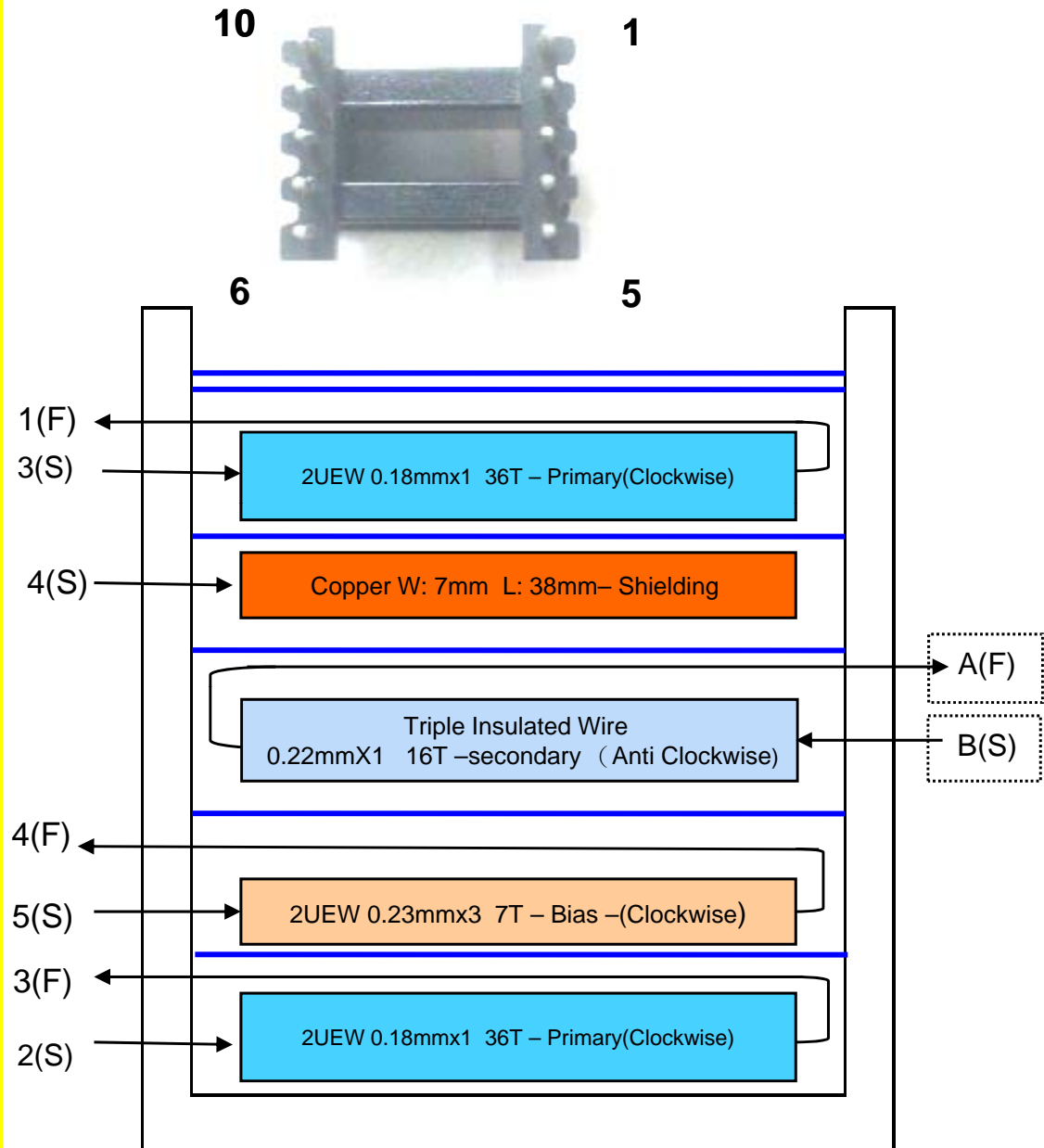
1. Primary Inductance (L_p) = 900uH +5% @10KHz
2. Primary Leakage Inductance (L_k) <= 100uH @10KHz
3. Electrical Strength = 3KV, 50/60Hz, 1Min

MATERIALS:

1. Core : EE-13W (Ferrite Material TDK PC40 or equivalent)
2. Bobbin :EE-13W Horizontal. Primary=5, Secondary=5
3. Magnet Wires (Pri) : Type 2-U EW
4. Magnet Wire (Sec) : Triple Insulated Wires
5. Layer Insulation Tape :3M1298 or equivalent.

FINISHED :

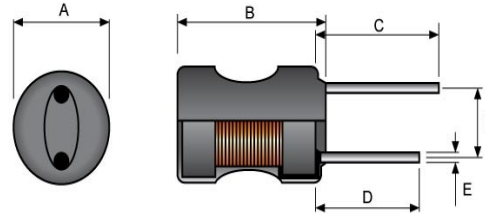
1. Cut remained of Pin after wires termination
2. Varnish the complete assembly



7. EMI choke

Differential Mode Inductor L1

SCHEMATIC



Ferrite core size : Ax B 6x8mm

Wire gauge: 0.15mm, 195Turns

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

DCR: 2 OHM +/-20%

PROPERTY	UNIT	B29
INITIAL PERMEABILITY μ_i (初始導磁率)		800 +/-25%
SATURATION FLUX DENSITY B_s (飽和磁通密度)	Gauss	at 25°C 15 oe 2900
COERCIVE FORCE H_c (矯頑力)	Oe	0.3
RESIDUAL FLUX DENSITY B_r (剩餘磁通密度)	Gauss	1420
CURIE TEMPERATURE T_c (居里溫度)	°C	150
VOLUME RESISTIVITY ρ (電阻率)	Ωcm	10^{-7}
WORKING FREQUENCY (工作頻率)	MHz	0.1~0.7
TEMPERATURE FACTOR OF μ 20°C to 60°C (溫度系數)	$\times 10^{-6}/^\circ\text{C}$	25~45

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8.1 Constant Current and Efficiency

(AC input 90~264Vac, Output 7 LEDs) __ PF configuration R=1.3K/C=100pF

#of LEDs	Vin	Pin	Vout	Iout	efficiency	Ripple	PF
	(V)	(W)	(V)	(mA)		(mA)	
7	90	9.310	22.29	345.0	82.60%	160	0.96
	100	9.400	22.34	351.0	83.42%	155	0.95
	110	9.360	22.33	352.0	83.98%	155	0.95
	120	9.280	22.33	351.0	84.46%	152	0.95
	135	9.150	22.31	349.0	85.09%	152	0.94
	150	9.140	22.32	349.0	85.23%	152	0.94
	160	9.130	22.31	351.0	85.77%	152	0.94
	170	9.060	22.29	350.0	86.11%	152	0.93
	180	8.990	22.26	349.0	86.42%	144	0.93
	190	8.990	22.26	347.0	85.92%	144	0.93
	200	8.990	22.26	347.0	85.92%	144	0.92
	210	9.010	22.27	347.0	85.77%	144	0.92
	220	9.030	22.27	348.0	85.82%	144	0.91
	230	9.030	22.27	348.0	85.82%	144	0.91
	240	9.000	22.26	347.0	85.82%	144	0.9
	250	9.000	22.26	347.0	85.82%	144	0.89
264	9.000	22.25	346.0	85.54%	144	0.88	

8.2 Constant Current and Efficiency

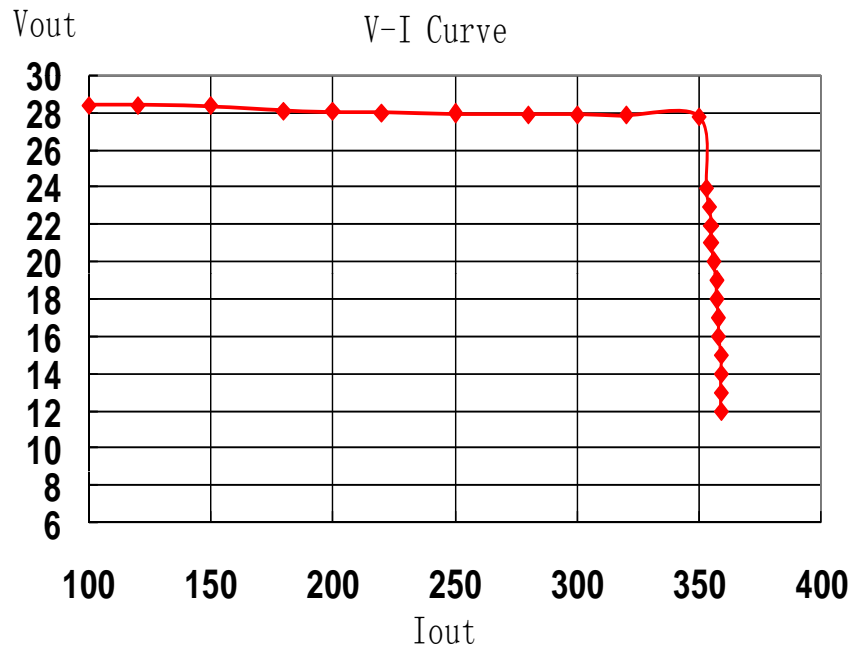
(AC input 90~264Vac, Output 7 LEDs) __ PF configuration R=390R/C=330pF

#of LEDs	Vin	Pin	Vout	Iout	efficiency	Ripple	PF
	(V)	(W)	(V)	(mA)		(mA)	
7	90	9.860	22.39	351.0	79.70%	136	0.8
	100	9.830	22.35	356.0	80.94%	128	0.78
	110	9.700	22.37	357.0	82.33%	128	0.78
	120	9.640	22.36	357.0	82.81%	128	0.78
	135	9.540	22.35	357.0	83.64%	128	0.79
	150	9.500	22.36	357.0	84.03%	128	0.78
	160	9.480	22.34	358.0	84.36%	128	0.78
	170	9.440	22.36	358.0	84.80%	128	0.78
	180	9.430	22.33	356.0	84.30%	128	0.77
	190	9.360	22.3	355.0	84.58%	128	0.77
	200	9.280	22.29	354.0	85.03%	128	0.78
	210	9.250	22.29	353.0	85.06%	128	0.78
	220	9.230	22.28	353.0	85.21%	128	0.77
	230	9.200	22.29	353.0	85.53%	128	0.77
	240	9.200	22.28	353.0	85.49%	128	0.76
	250	9.170	22.27	352.0	85.49%	128	0.75
264	9.150	22.26	351.0	85.39%	128	0.75	

9.Constant Current and loading regulation

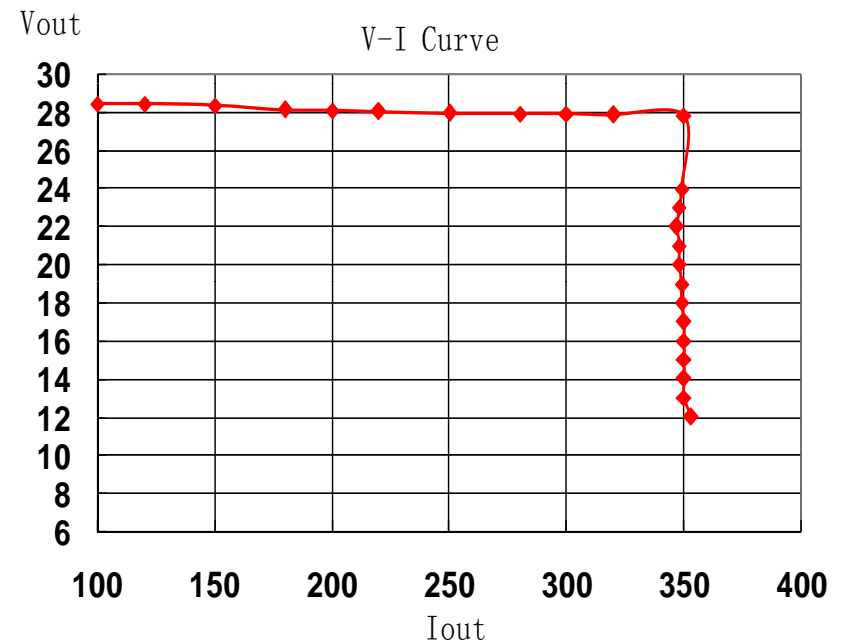
* Note: Output voltage measured at PCB end, $T_{AMB}=25\text{ }^{\circ}\text{C}$

$V_{IN}=115V_{ac}$, $T_{AMB}=25^{\circ}\text{C}$



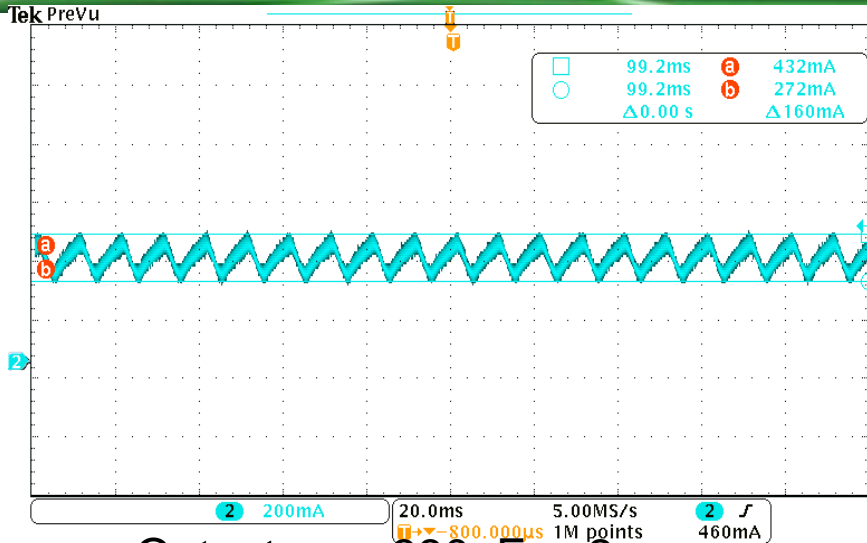
CC limit :340-360mA

$V_{IN}=230V_{ac}$, $T_{AMB}=25^{\circ}\text{C}$

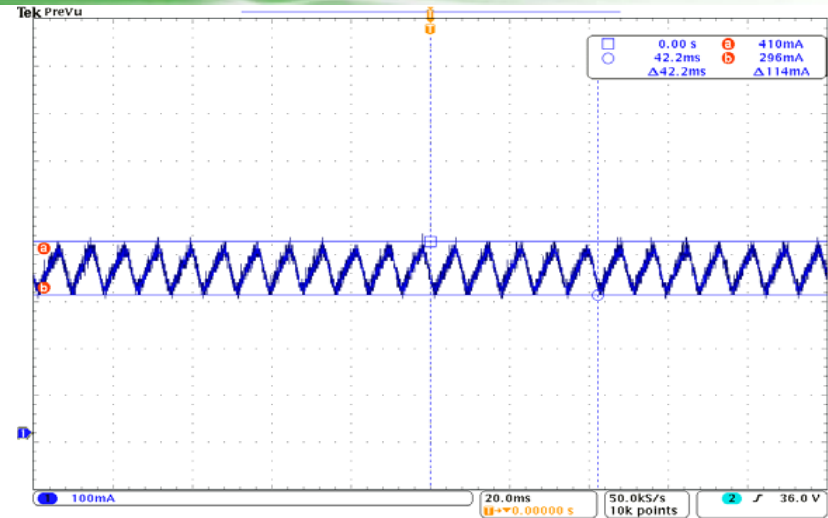


CC limit :340-360mA

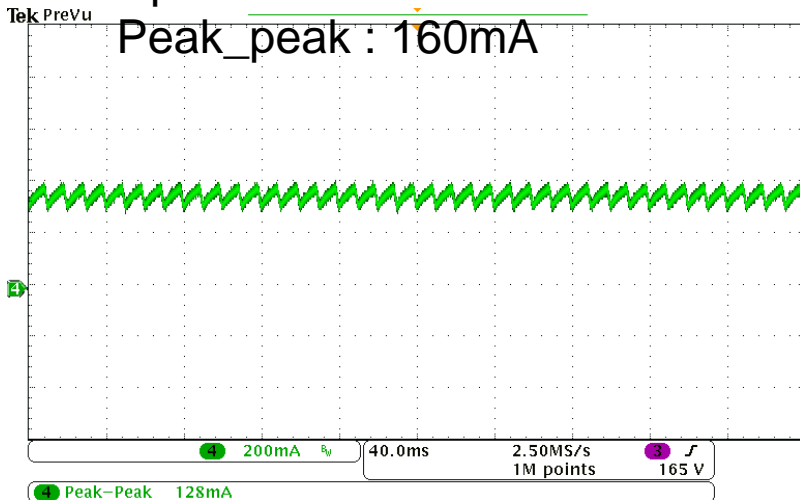
10. Output ripple current



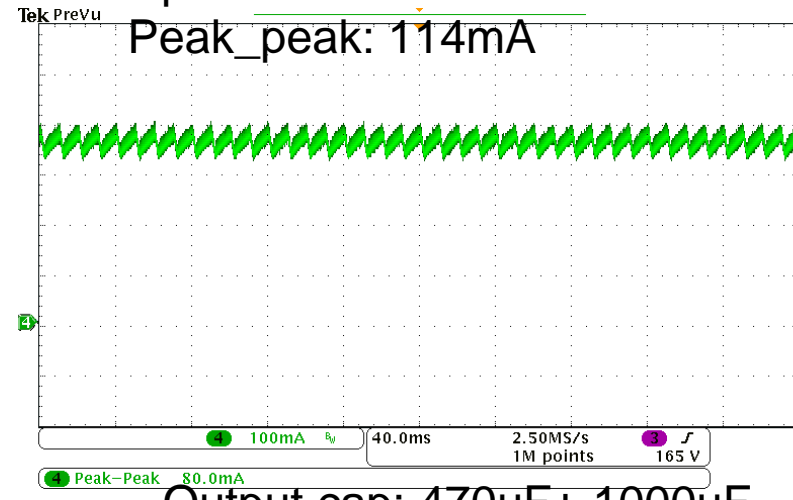
Output cap: 330uF x 2pcs
 Rpf=1.3K PF>0.9
 Peak_peak : 160mA



Output cap: 470uF + 1000uF
 Rpf=1.3k PF > 0.9
 Peak_peak: 114mA

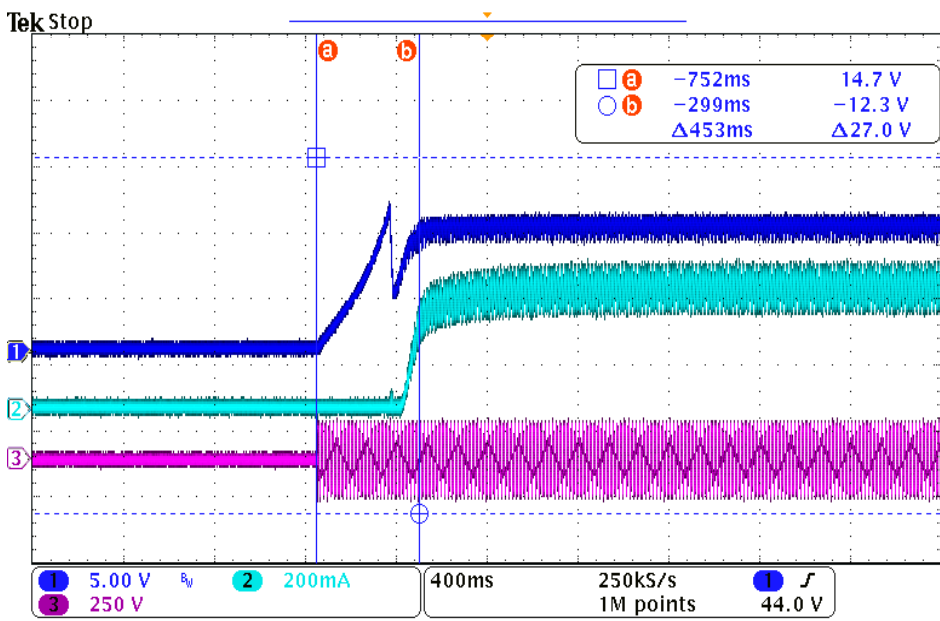


Output cap: 330uF x 2pcs
 Rpf= 390R PF>0.7
 Peak_peak : 128mA

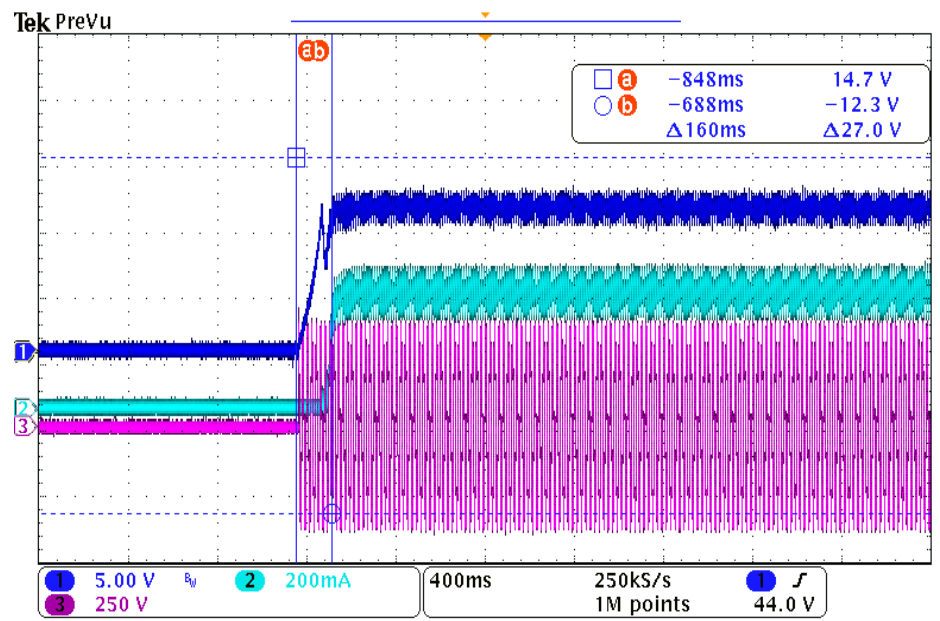


Output cap: 470uF+ 1000uF
 Rpf=390R PF > 0.7
 Peak_peak: 96 mA

11. Start up and turn on delay time

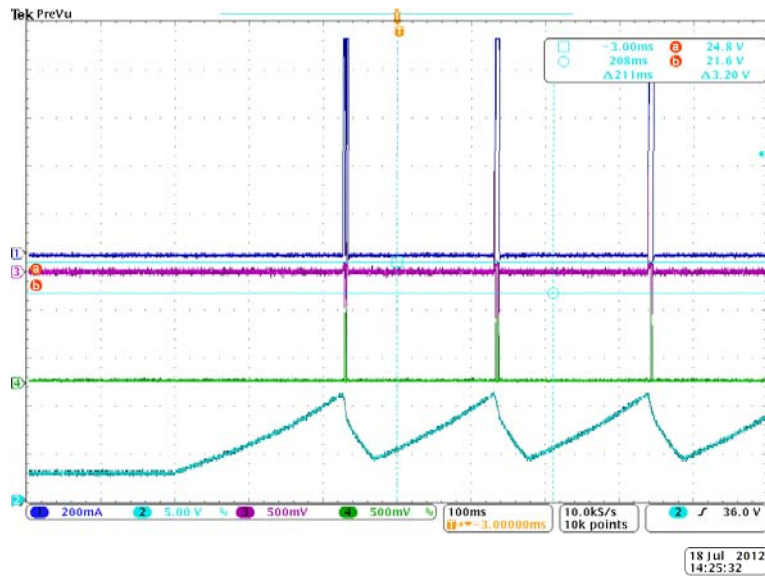


90V_{AC}, Full Load
 ASU resistor 100k Vcc cap 68uF
 T_{ST_DELAY}= 453mS

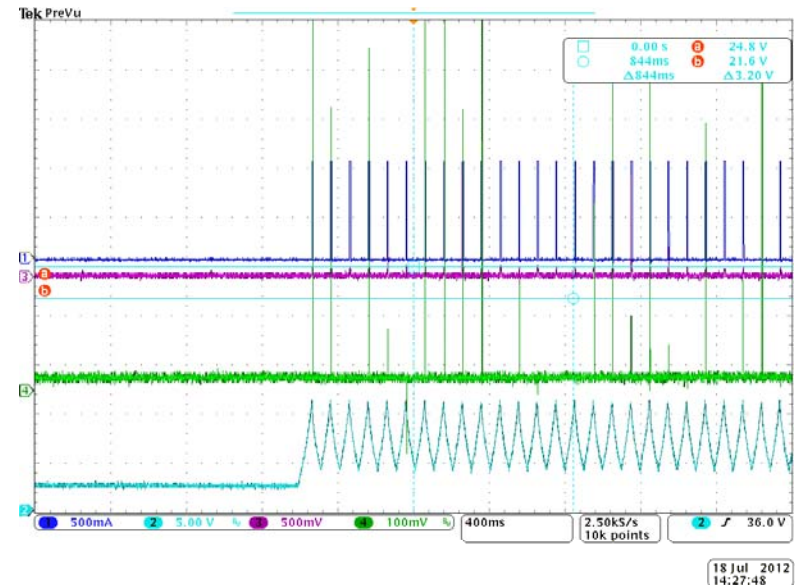
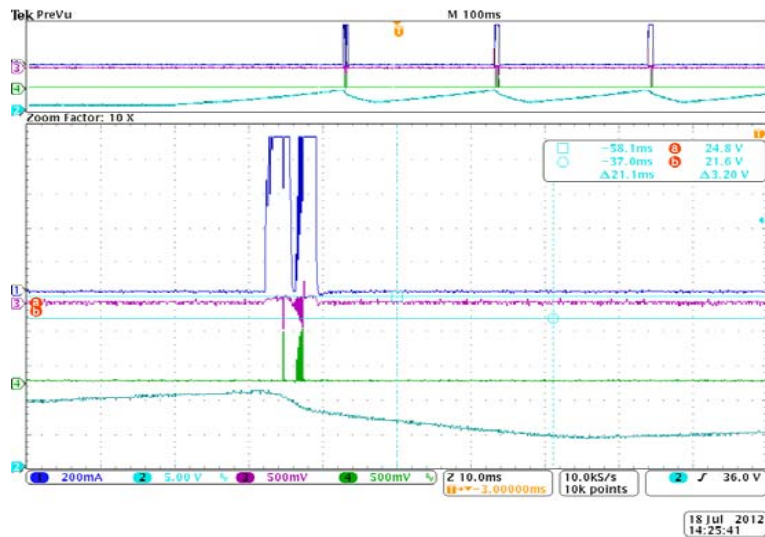


264V_{AC}, Full Load
 ASU resistor 100K, Vcc cap 68uF
 T_{ST_DELAY}= 160mS

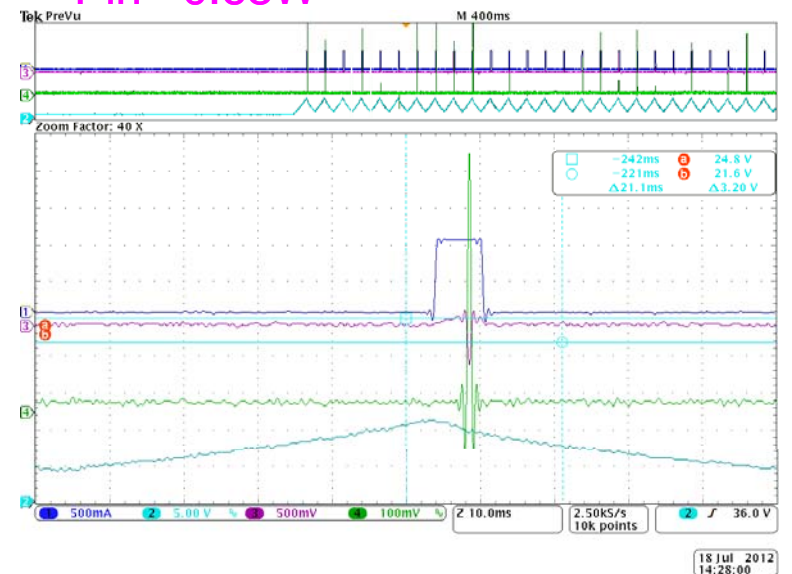
12. Output short circuit test



Vin 90V, output Short circuit
Pin = 0.25W

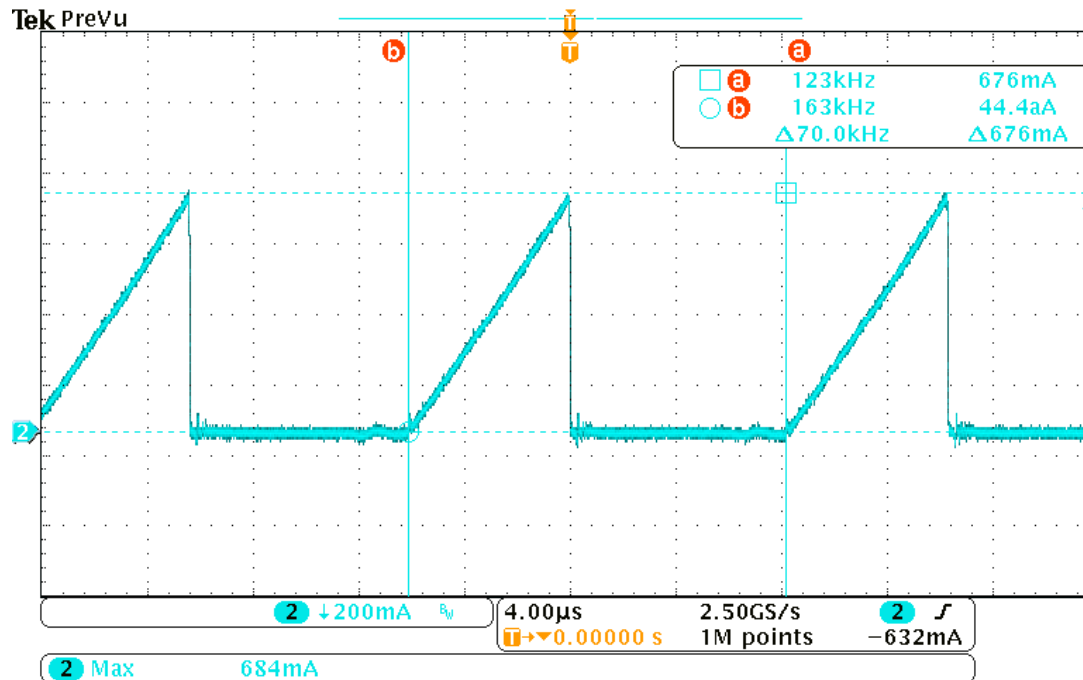


Vin 264V, output Short circuit
Pin = 0.68W



13. Transformer Flux Density

($N_p=72T_s$, $L_m=1000\mu H$, $A_e=34mm^2$ -EE13W)



I_{PRI} is monitored at 90Vac and 350mA load

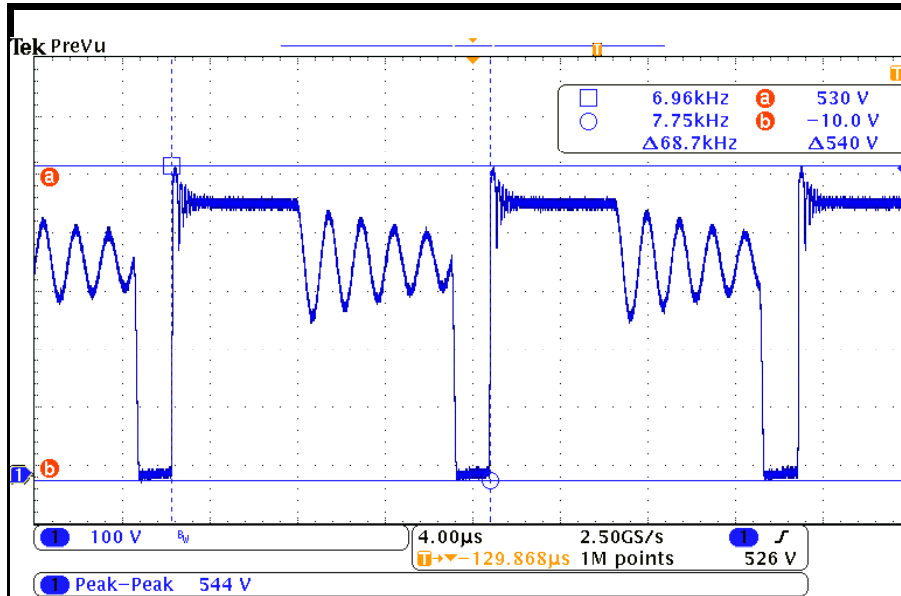
$I_{PRI}=684mA$

$$B_{MAX} = I_{PRI} * L_{PRI} / (N_P * A_e)$$

$$=(684 * 1) / (72 * 34)$$

$$=0.279Tesla$$

14. V_{CE} Waveform



Test Condition:

$$V_{IN}=264V_{AC}, I_{OUT_CV}=350mA$$

Result:

$$V_{CE_MAX}=544V$$

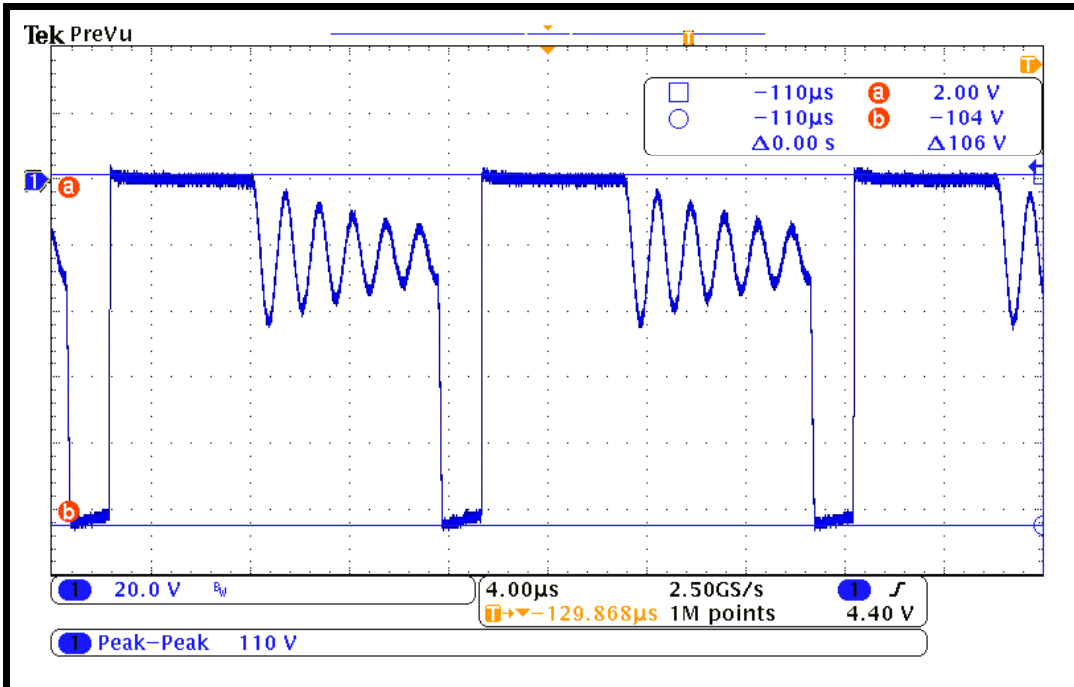
Appendix – Simple Specification for used Transistor(E13005)

NPN Silicon Transistor

Absolute Maximum Ratings $T_C=25^{\circ}C$ unless otherwise noted

Symbol	Parameter	Value	Units
V _{CBO}	Collector-Base Voltage	: MJE13004	600
		: MJE13005	700
V _{CEO}	Collector-Emmitter Voltage	: MJE13004	300
		: MJE13005	400
V _{EBO}	Emitter-Base Voltage	9	V
I _C	Collector Current (DC)	4	A
I _{CP}	Collector Current (Pulse)	8	A
I _B	Base Current	2	A
P _C	Collector Dissipation ($T_C=25^{\circ}C$)	75	W
T _J	Junction Temperature	150	°C
T _{STG}	Storage Temperature	- 65 ~ 150	°C

15. Output rectifier waveform



Test Condition:

$V_{IN}=264VAC, I_{out}=0.35A$

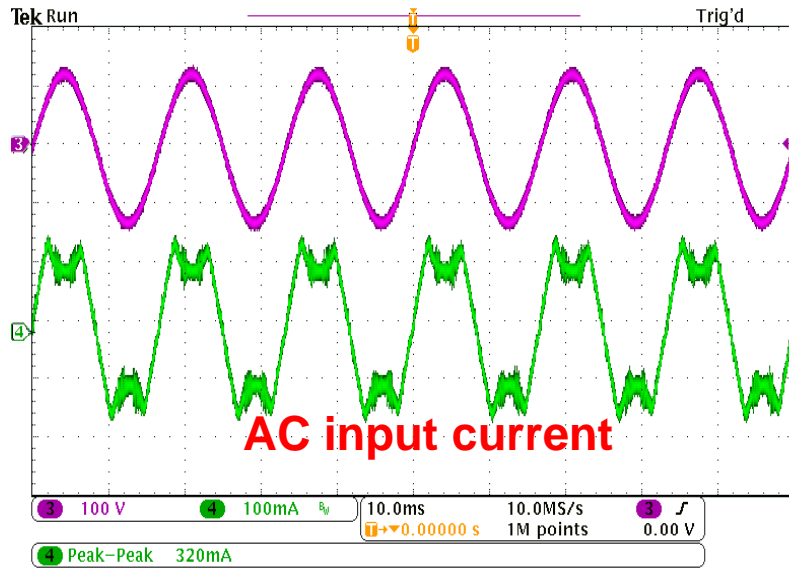
Result:

$V_R (pk-pk)=110V$

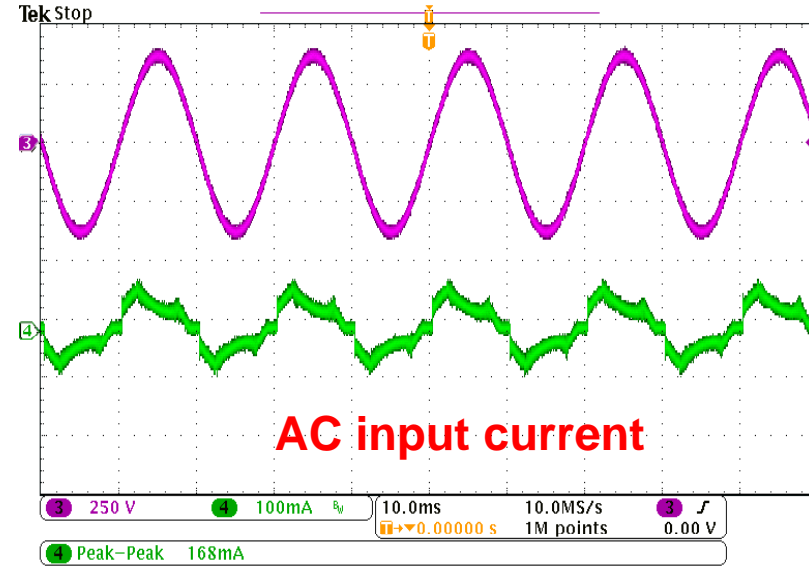
Output rectifier diode: MBR2150

PARAMETER	SYMBOL	MBR240	MBR245	MBR250	MBR260	MBR280	MBR290	MBR2100	MBR2150	MBR2200	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	40	45	50	60	80	90	100	150	200	V
Maximum RMS Voltage	V_{RMS}	28	31.5	35	42	56	63	70	105	140	V
Maximum DC Blocking Voltage	V_{DC}	40	45	50	60	80	90	100	150	200	V
Maximum Average Forward Rectified Current .375"(9.5mm) lead length (see fig1)	$I_{F(AV)}$	2.0									A
Peak Forward Surge Current : 8.3ms single half sine-wave superimposed on rated load(JEDEC method)	I_{FSM}	50									A
Typical Thermal Resistance (Note 2)	$R_{\theta JA}$	35									°C / W
Maximum Forward Voltage at 2.0A (Note 1)	V_F	0.7		0.74		0.8		0.9			V
Maximum DC Reverse Current at $T_J=25^{\circ}C$ Rated DC Blocking Voltage $T_J=100^{\circ}C$	I_R	0.05 20									mA
Operating Junction and Storage Temperature Rang	T_J, T_{STG}	-55 to +150			-65 to +175						°C

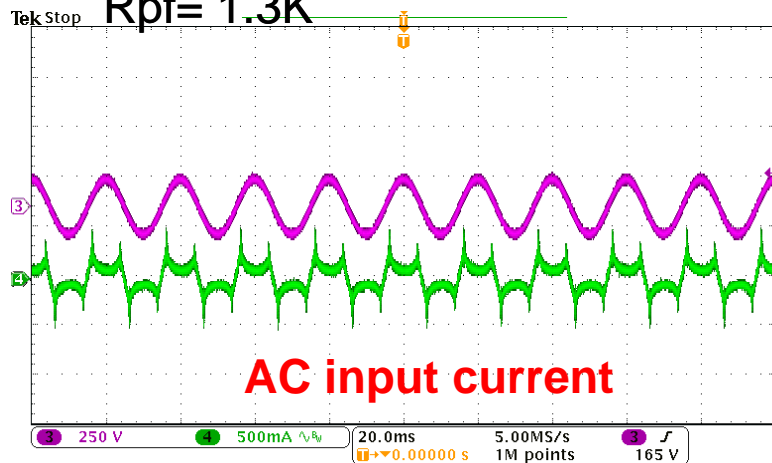
16. AC input waveform



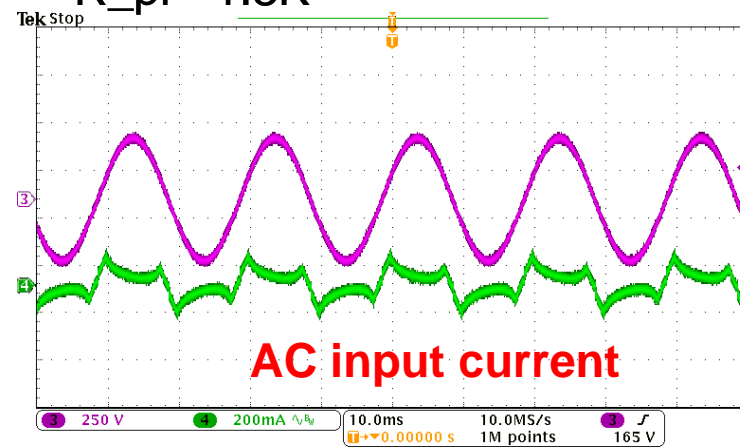
Vin 100V, 22V350mA PF:0.95
R_{pf}= 1.3K



Vin 230V, 22V350mA PF:0.91
R_{pf}= 1.3K



Vin 100V, 22V350mA PF:0.8
R_{pf}= 390R



Vin 230V, 22V350mA PF:0.76
R_{pf}= 390R

17.1 Harmonic and THD_IEC61000-3-2

Current Harmonics

Setup: CLASS_C
Live
Module: M1

Gen setting: 1(1) U : 99.80 V fu: 50.001 Hz
Analysed periods: 4 I : 113.73 mA P: 9.00 W
Limit: Class C (Standard) I1: 90.34 mA
Note:
THD=76.46 % (PF=0.793) PASSED
P < 25 W

No	%	Lim %	No	%	Lim %	No	%	Lim %
1	100.00		15	3.90		29	1.63	
2	0.03		16	0.05		30	0.04	
3	66.19		17	0.47		31	0.94	
4	0.06		18	0.05		32	0.06	
5	34.30		19	1.42		33	0.48	
6	0.06		20	0.01		34	0.03	
7	10.26		21	1.43		35	0.50	
8	0.01		22	0.03		36	0.06	
9	4.03		23	0.26		37	0.63	
10	0.04		24	0.05		38	0.04	
11	0.91		25	0.97		39	0.64	
12	0.03		26	0.04		40	0.02	
13	7.68		27	1.72				
14	0.02		28	0.06				

Current range: 0.3 Ap

Configuration: PF>0.7

Vin 100V, 22V350mA
C1+C2 = 0.1uF+0.1uF
PF: 0.793
THD: 76%
3rd : 66.19
5th: 34.3
7th: 10.26

Current Harmonics

Setup: CLASS_C
Live
Module: M1

Gen setting: 1(1) U : 229.76 V fu: 50.001 Hz
Analysed periods: 4 I : 49.59 mA P: 8.69 W
Limit: Class C (Standard) I1: 40.04 mA
Note:
THD=72.98 % (PF=0.762) PASSED
P < 25 W

No	%	Lim %	No	%	Lim %	No	%	Lim %
1	100.00		15	2.88		29	0.71	
2	0.00		16	0.03		30	0.03	
3	62.15		17	0.70		31	0.87	
4	0.02		18	0.05		32	0.00	
5	34.40		19	2.38		33	0.95	
6	0.03		20	0.01		34	0.02	
7	13.39		21	3.02		35	1.13	
8	0.02		22	0.04		36	0.09	
9	1.24		23	2.55		37	1.24	
10	0.02		24	0.04		38	0.05	
11	5.36		25	1.62		39	1.12	
12	0.03		26	0.03		40	0.06	
13	5.60		27	0.89				
14	0.02		28	0.06				

Current range: 0.1 Ap

Vin 230V, 22V350mA
C1+C2 = 0.1uF+0.1uF
PF:0.762
THD: 72.98%
3rd : 62.15
5th: 34.4
7th: 13.39

17. 2 Harmonic and THD_IEC61000-3-2

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Current Harmonics

Setup: CLASS_C Live Module: M1
 Gen setting: 1(1) U : 99.79 V fu: 50.001 Hz
 Analysed periods: 4 I : 97.58 mA P: 9.31 W
 Limit: Class C (Standard) I1: 93.43 mA
 Note: THD=30.10 % (PF=0.956) PASSED P< 25 W

No	%	Lim %	No	%	Lim %	No	%	Lim %
1	100.00		15	1.72		29	0.54	
2	0.03		16	0.01		30	0.04	
3	29.35		17	0.56		31	0.11	
4	0.01		18	0.03		32	0.06	
5	3.22		19	1.03		33	0.24	
6	0.02		20	0.01		34	0.02	
7	4.17		21	0.42		35	0.38	
8	0.03		22	0.03		36	0.04	
9	2.12		23	0.34		37	0.31	
10	0.01		24	0.02		38	0.05	
11	2.01		25	0.26		39	0.22	
12	0.03		26	0.03		40	0.05	
13	1.64		27	0.68				
14	0.03		28	0.02				

Current range: 0.3 Ap
App1: DEFAULT 1 2 1 2

Configuration: PF>0.9

Vin 100V, 22V350mA
 C1+C2 = 0.1uF+0.1uF
 PF:0.956
 THD:30.1%
 3rd : 29.35
 5th: 3.22
 7th: 4.17

Current Harmonics

Setup: CLASS_C Live Module: M1
 Gen setting: 1(1) U : 229.75 V fu: 50.001 Hz
 Analysed periods: 4 I : 43.07 mA P: 0.98 W
 Limit: Class C (Standard) I1: 41.05 mA
 Note: THD=31.71 % (PF=0.907) PASSED P< 25 W

No	%	Lim %	No	%	Lim %	No	%	Lim %
1	100.00		15	2.27		29	1.23	
2	0.01		16	0.01		30	0.04	
3	29.99		17	2.10		31	1.24	
4	0.01		18	0.01		32	0.03	
5	3.00		19	2.16		33	0.65	
6	0.01		20	0.02		34	0.03	
7	5.29		21	1.62		35	0.54	
8	0.03		22	0.01		36	0.04	
9	3.50		23	1.19		37	0.66	
10	0.02		24	0.02		38	0.01	
11	4.23		25	1.04		39	1.11	
12	0.01		26	0.02		40	0.02	
13	2.62		27	1.03				
14	0.03		28	0.06				

Current range: 0.1 Ap
App1: DEFAULT 1 2 1 2

Vin 230V, 22V350mA
 C1+C2 = 0.1uF+0.1uF
 PF:0.907
 THD:31.7%
 3rd : 29.99
 5th: 3.0
 7th: 5.29

17.3 Harmonic and THD_IEC61000-3-2



Current Harmonics

Setup: CLASS_C
Live
Module: M1

Gen setting: 1(1) U : 99.79 V fu: 50.001 Hz
Analysed periods: 4 I : 87.40 mA P: 8.56 W
Limit: Class C (Standard) I1: 85.93 mA
Note:
THD=18.55 % (PF=0.981) PASSED
P < 25 W

No	%	Lim %	No	%	Lim %	No	%	Lim %
1	100.00		15	0.52		29	0.73	
2	0.03		16	0.01		30	0.03	
3	17.40		17	0.45		31	0.39	
4	0.01		18	0.02		32	0.02	
5	5.43		19	0.31		33	0.15	
6	0.02		20	0.01		34	0.04	
7	0.78		21	1.17		35	0.26	
8	0.02		22	0.02		36	0.02	
9	2.65		23	0.65		37	0.53	
10	0.01		24	0.01		38	0.01	
11	0.15		25	0.61		39	0.29	
12	0.03		26	0.03		40	0.04	
13	0.30		27	0.29				
14	0.01		28	0.01				

Current range: 0.3 Ap

Configuration: PF>0.95

Vin 100V, 22V350mA
C1+C2 = 0.1uF+0.1uF
PF:0.981
THD:18.55%
3rd : 17.41
5th: 5.43
7th: 0.78

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Current Harmonics

Setup: CLASS_C
Live
Module: M1

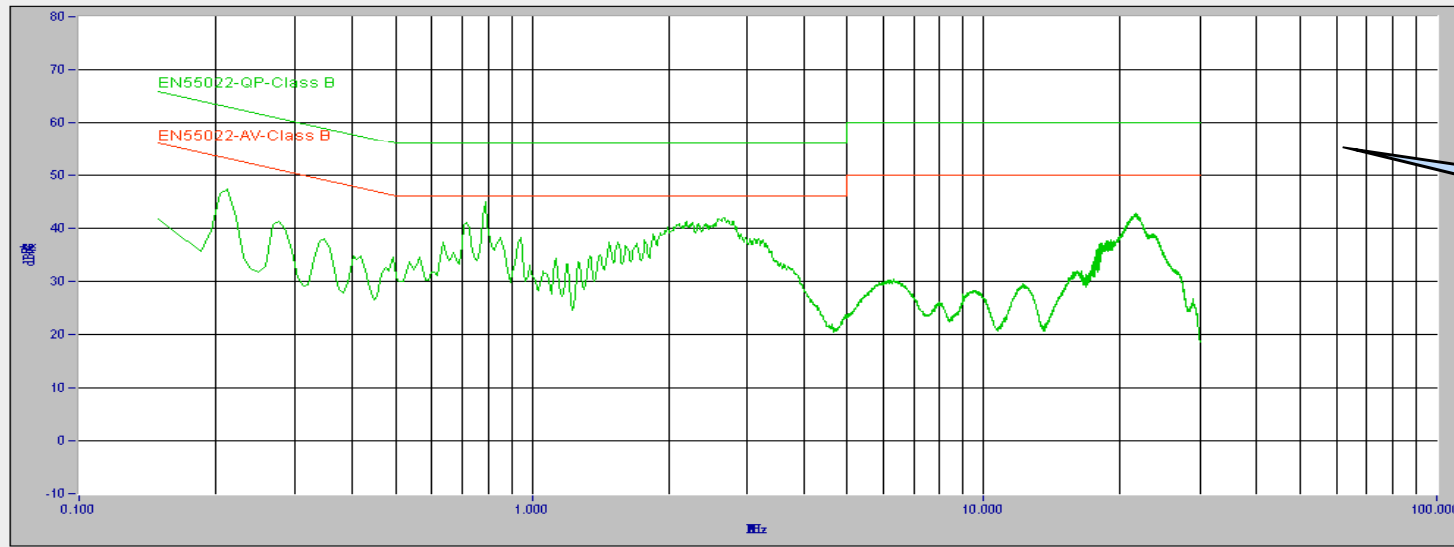
Gen setting: 1(1) U : 229.73 V fu: 50.001 Hz
Analysed periods: 4 I : 40.26 mA P: 8.57 W
Limit: Class C (Standard) I1: 39.29 mA
Note:
THD=22.22 % (PF=0.927) PASSED
P < 25 W

No	%	Lim %	No	%	Lim %	No	%	Lim %
1	100.00		15	2.75		29	0.75	
2	0.01		16	0.07		30	0.03	
3	19.18		17	2.12		31	1.14	
4	0.02		18	0.04		32	0.04	
5	6.00		19	1.53		33	1.36	
6	0.01		20	0.08		34	0.03	
7	4.07		21	1.49		35	0.90	
8	0.05		22	0.04		36	0.02	
9	5.29		23	1.54		37	0.71	
10	0.03		24	0.07		38	0.02	
11	3.23		25	1.27		39	0.95	
12	0.03		26	0.01		40	0.02	
13	2.72		27	0.86				
14	0.02		28	0.03				

Current range: 0.1 Ap

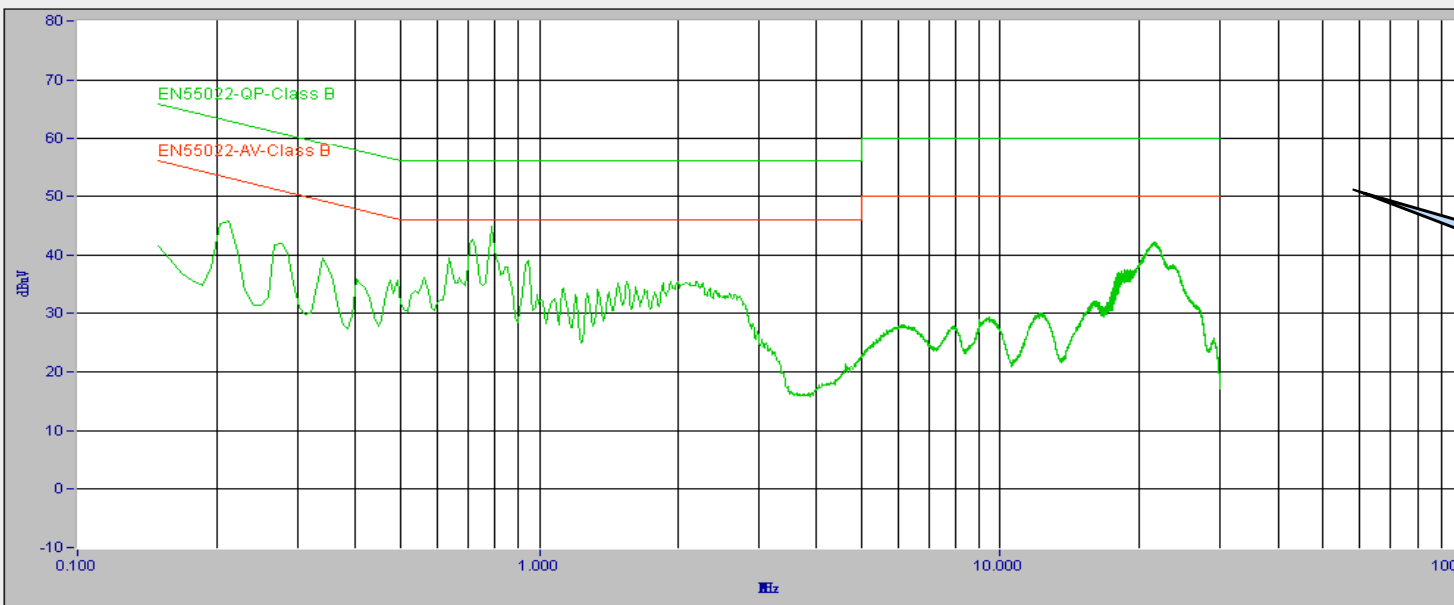
Vin 230V, 22V350mA
C1+C2 = 0.1uF+0.1uF
PF:0.927
THD:22.22%
3rd : 19.18
5th: 6.00
7th: 4.07

18.1 Conducted EMI__ Input 230Vac



QP Scan
QP Limit line

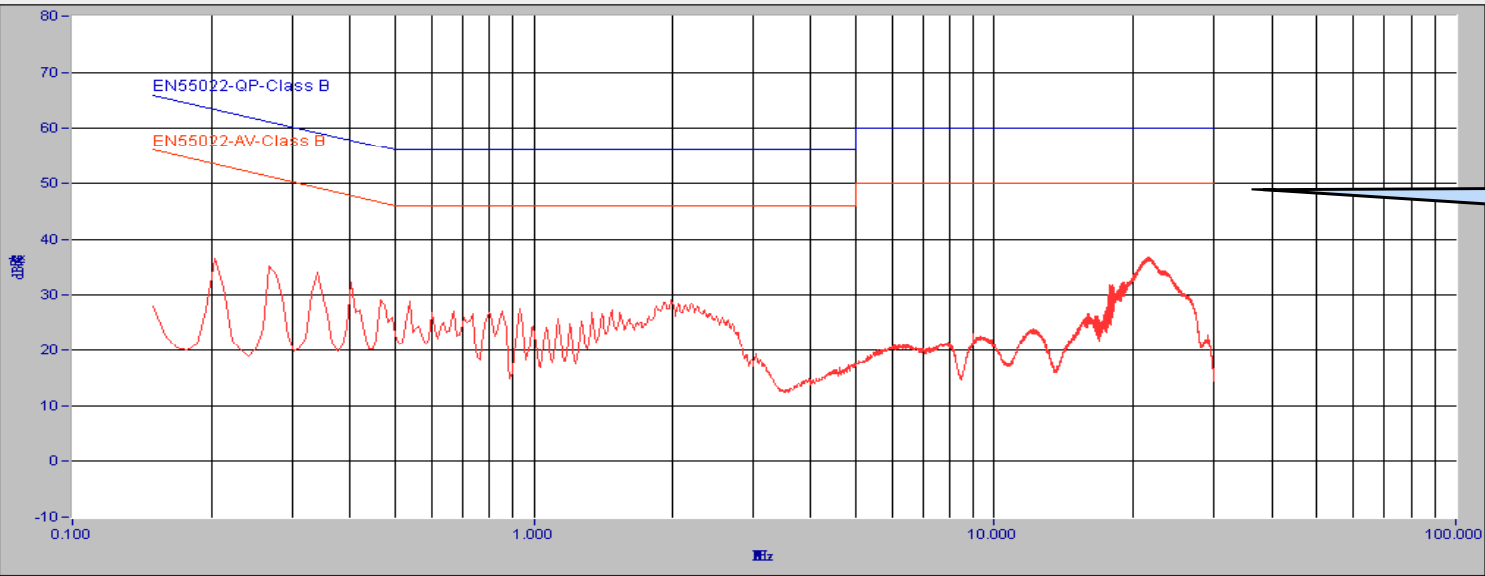
QP scan L



QP Scan
QP Limit line

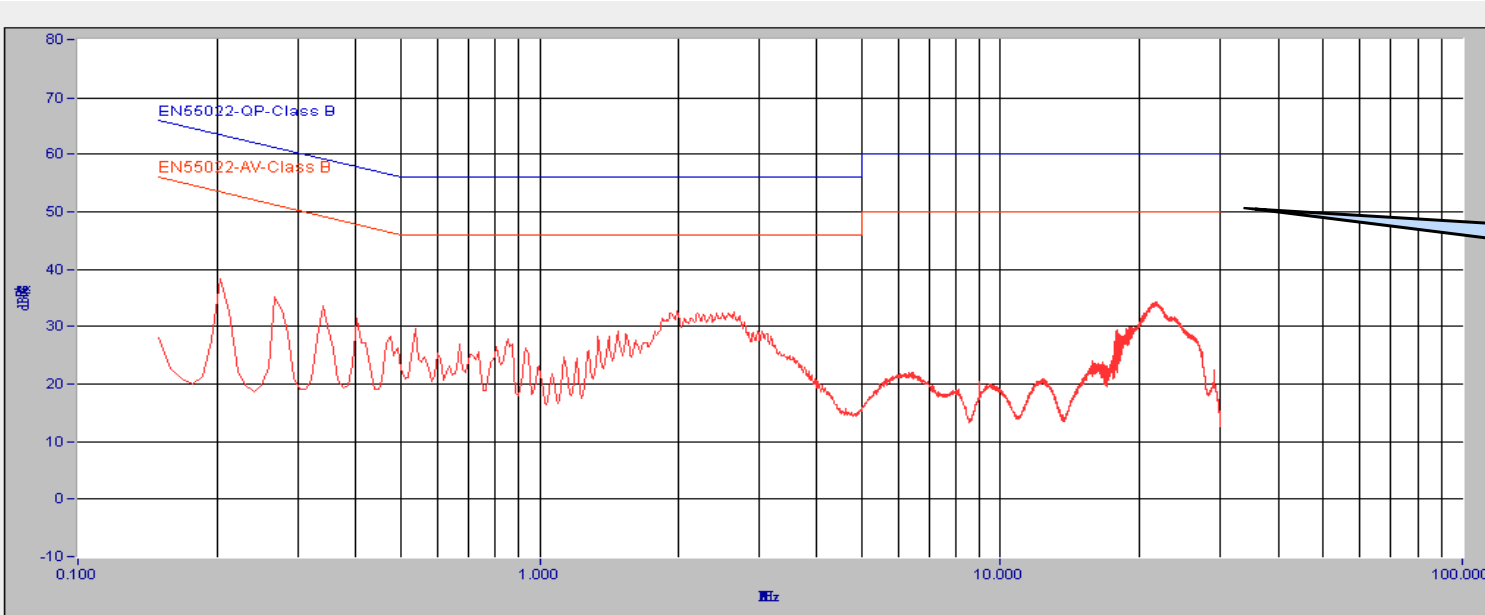
QP scan N

18.2 Conducted EMI__ Input 230Vac



AV Scan
AVLimit line

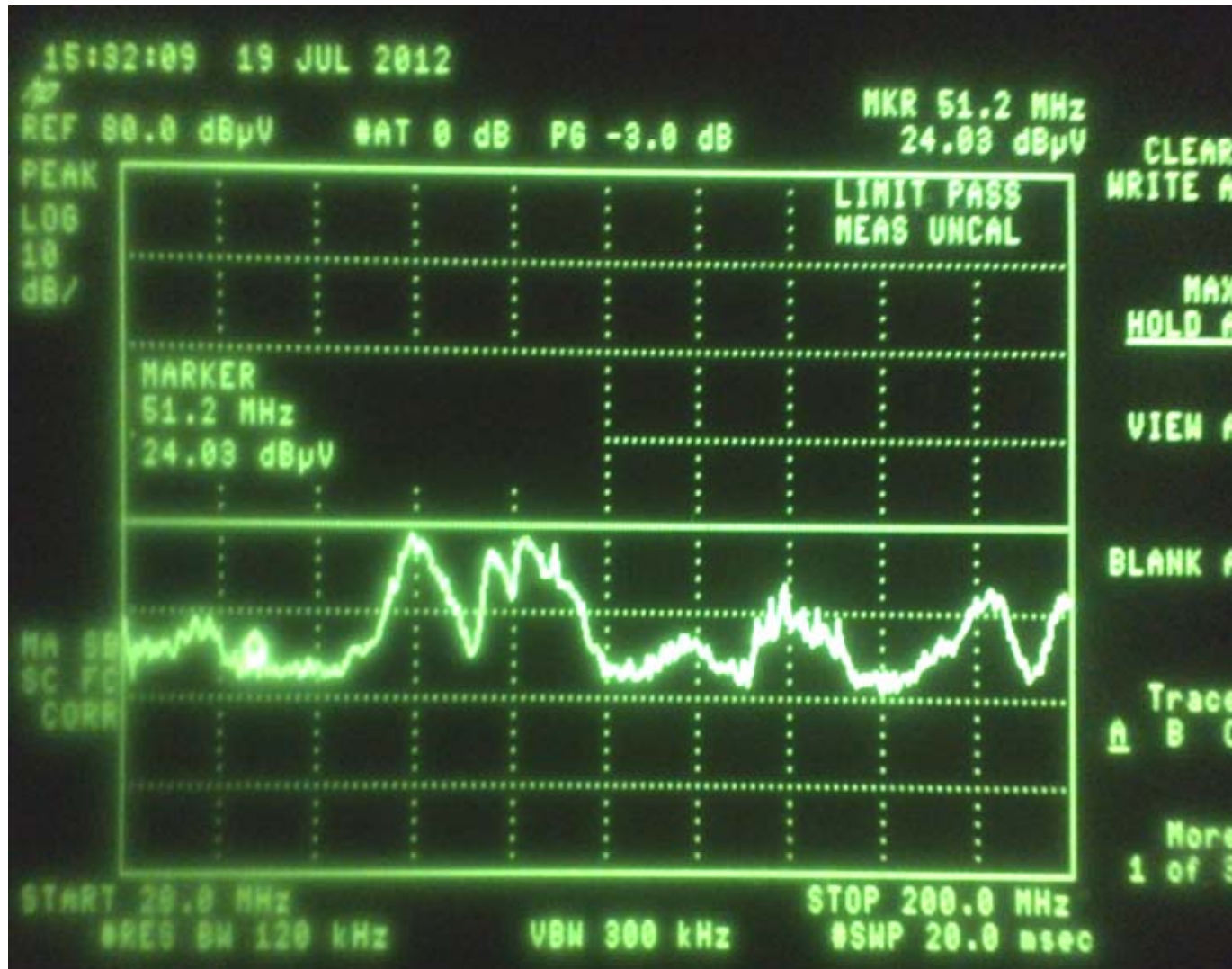
AV scan L



AV Scan
AV Limit line

AV scan N

19. Radiation _Similar test at 230vac input

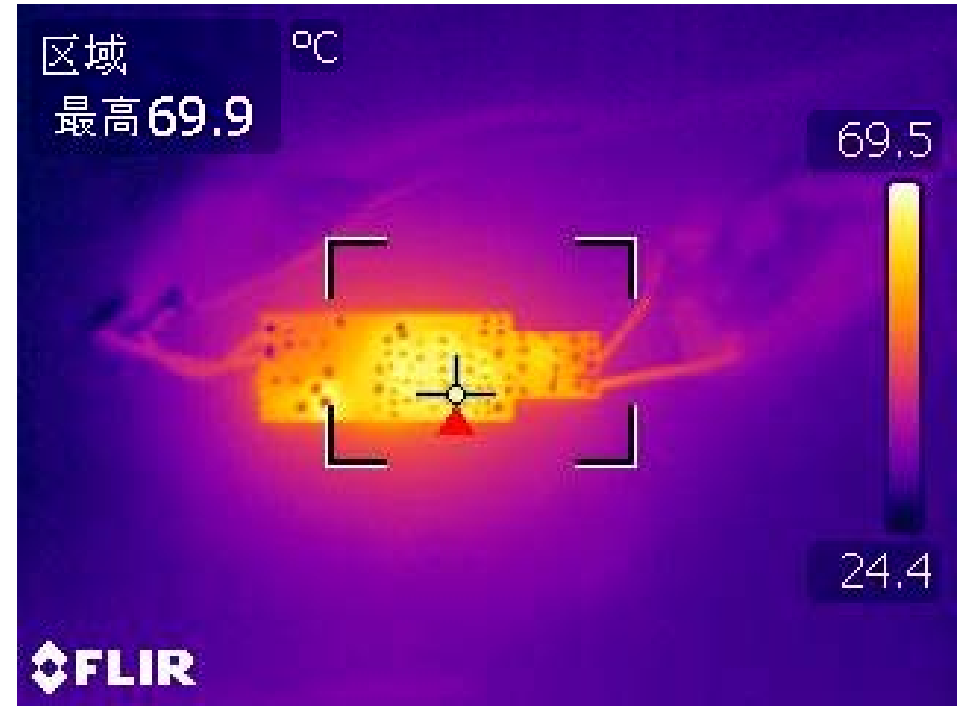
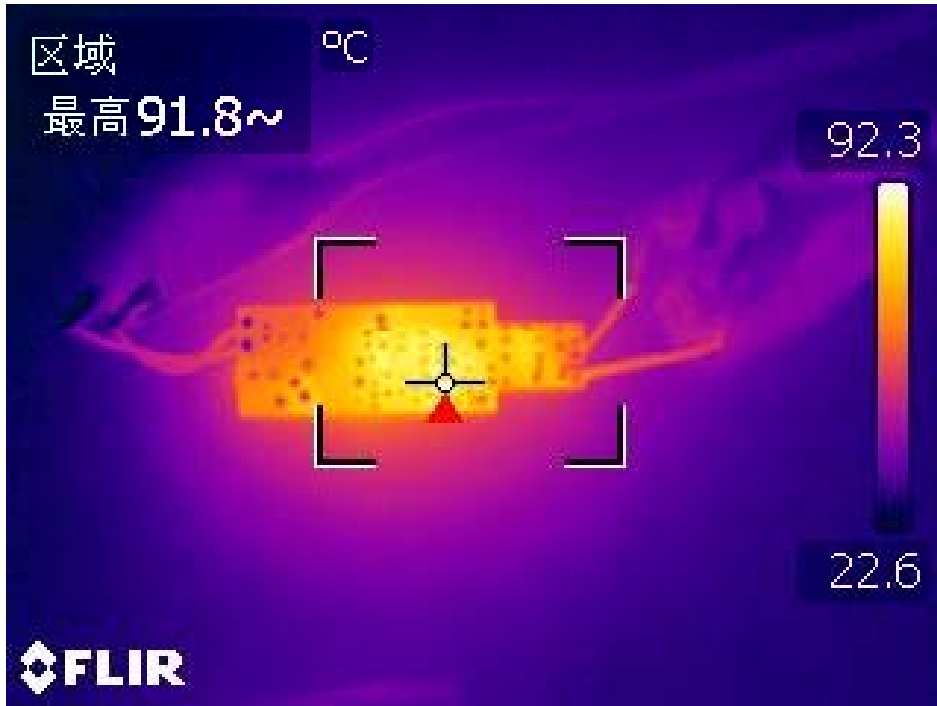


20. Constant current tolerance

Check output current on first batch board, Iout tolerance may meet +/-3%

	Vin	Vout	Iout			Vin	Vout	Iout
	(V)	(V)	(mA)			(V)	(V)	(mA)
NO. 1	90	22.04	340.0		NO. 5	90	22.16	350.0
	100	22.03	339.0			100	22.06	349.0
	230	22.00	338.0			230	22.04	347.0
	264	22.00	338.0			264	22.04	345.0
NO. 2	90	22.07	344.0		NO. 6	90	22.00	341.0
	100	22.10	344.0			100	21.86	341.0
	230	22.09	343.0			230	21.82	339.0
	264	22.14	341.0			264	21.82	339.0
NO. 3	90	22.18	338.0		NO. 7	90	22.00	349.0
	100	22.12	337.0			100	21.97	347.0
	230	22.09	336.0			230	22.09	346.0
	264	22.07	335.0			264	22.07	344.0
NO. 4	90	22.28	347.0		NO. 8	90	22.28	345.0
	100	22.18	346.0			100	22.18	344.0
	230	22.13	343.0			230	22.15	344.0
	264	22.11	343.0			264	22.12	343.0

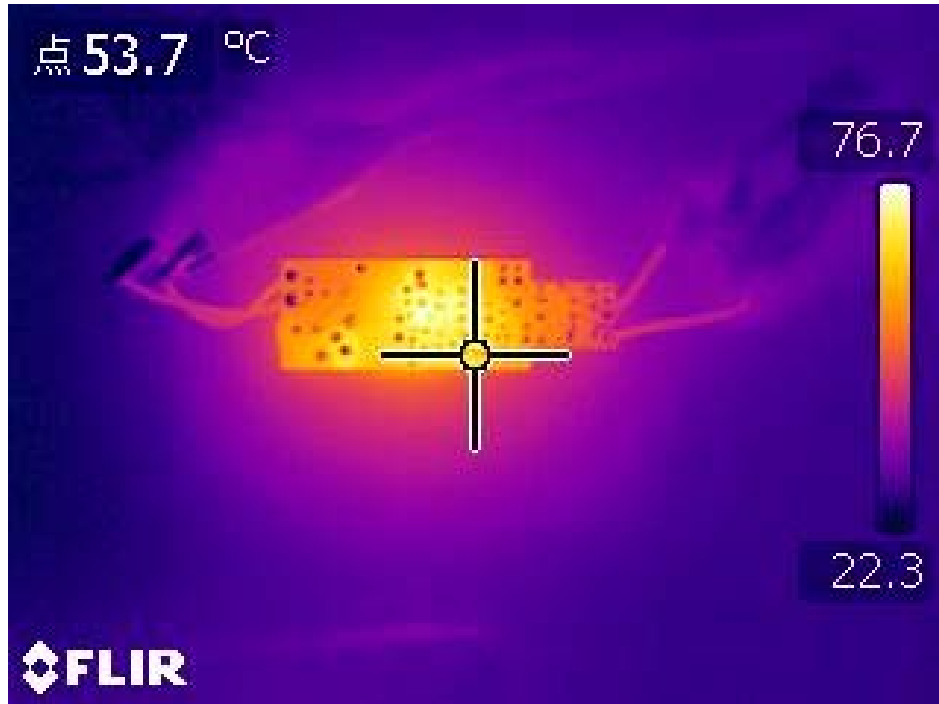
21. 1 iW3626 thermal test_1



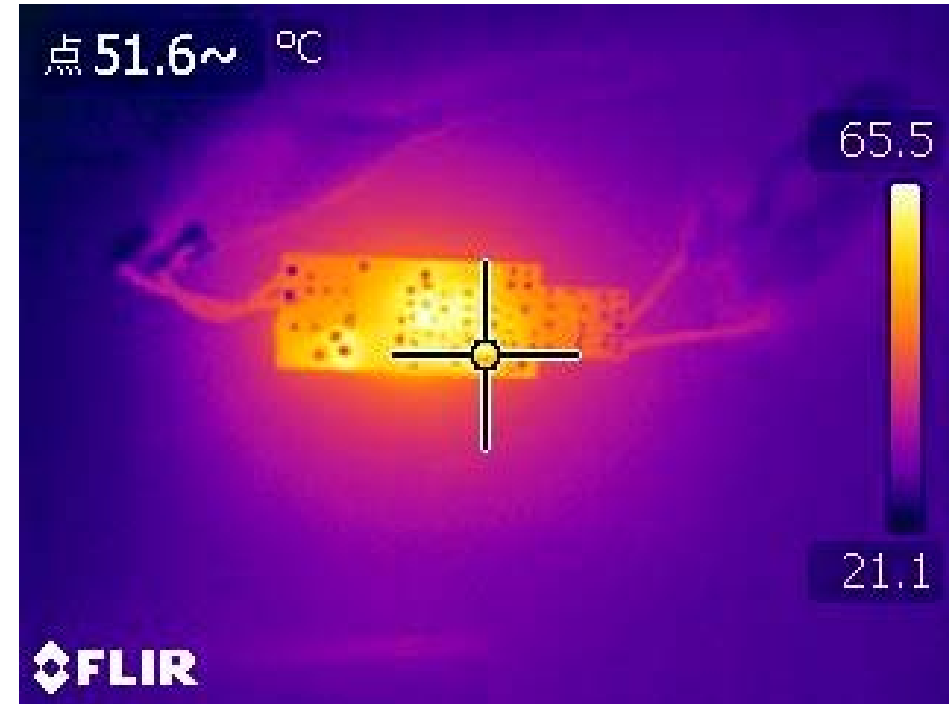
Input : 90VAC
Output : 30V 350MA (**Worst case**)
Vcc@IC: 12V Icc@IC: 19mA
P_loss on IC: 0.228W
IC: 91.8 C
PCB: 60 C
Ambient:25 C

Input: 90VAC
Output : 24V 350MA
Vcc@IC: 10V Icc@IC: 15mA
P_loss on IC: 0.15W
IC: 69.9 C
PCB: 42 C
Ambient:25 C

21.2 iW3626 thermal test_2



Input : 264VAC
Output : 30V 350MA (**Maximum output**)
Vcc@IC: 14.5V Icc@IC: 10mA
P_loss on IC: 0.145W
IC: 53.7 C
PCB: 48 C
Ambient: 25 C



Input : 264VAC
Output : 24V 350MA
Vcc@IC: 10V Icc@IC: 8.5mA
P_loss on IC: 0.085W
IC: 51.6 C
PCB: 40 C
Ambient: 25 C

21.3 iW3626 thermal test_3

Component s	Input 90Vac	Input 100Vac	Input 230Vac	Input 264Vac
IC IW3626	108 °C	107,6°C	97.6°C	96°C
C1 , 0.1uF/400V	92.1°C	92 °C	82.3 °C	81.3°C
Q1, BJT	104°C	104°C	97°C	98°C
T1, EE13W	110.9°C	113°C	113°C	112°C
D2, Output diode	111.5°C	110.7°C	100.4°C	108.4°C
C7, Out Cap.	95.7°C	99.7°C	100.4°C	99.4°C
PCB	100.1°C	99°C	95.8°C	94°C
Heat sink	81.6°C	81.2°C	80°C	79°C
Ambient	35 °C	35 °C	35 °C	35 °C

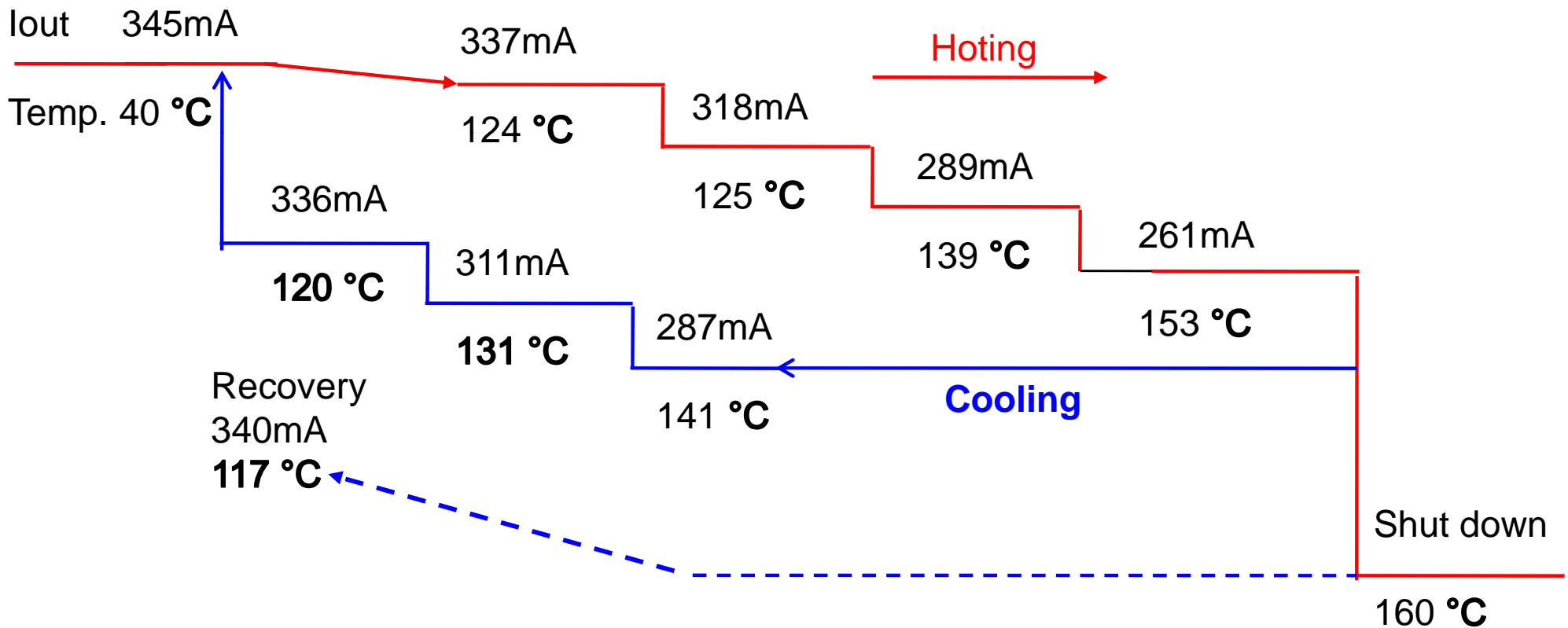


- Assemble the driver as lamp
- Power on the lamp in the chamber
- Monitor the temperature key components

21.4 iW3626 thermal test_ Over temperature protection

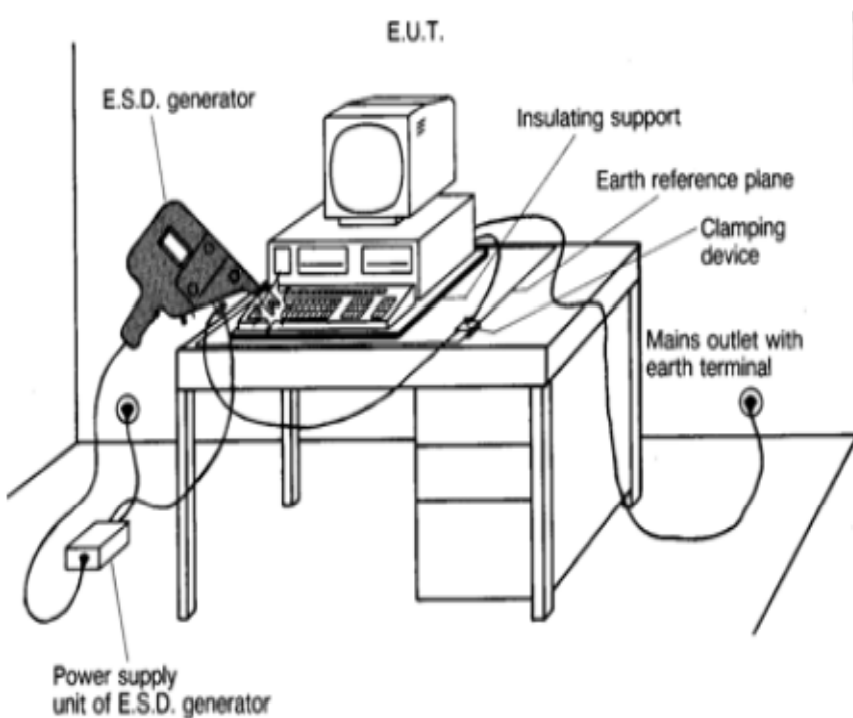
Test Setup:

- Put the driver (Lamp) in chamber, increase the internal ambient
- Vin 230Vac/50Hz, with LED load
- Monitor IC temperature and output current
- **Sense the temperature on Iw3626 GND pin, OTP configuration at (3.67KΩ130 °C)**



22. ESD __IEC61000-4-2

Test Condition:
Vin 230Vac/50Hz, with LED load



Remark:
Driver is damaged at air-discharge
22kV Vcc and ASU pin are damaged

Air-discharge		With LED load	Result
8KV	+	No Flicker	Pass_Class1
	-	No Flicker	Pass_Class1
10KV	+	No Flicker	Pass_Class1
	-	No Flicker	Pass_Class1
12KV	+	LED Flicker	Pass_Class2
	-	LED Flicker	Pass_Class2
14KV	+	LED Flicker	Pass_Class2
	-	LED Flicker	Pass_Class2
15KV	+	LED Flicker	Pass_Class2
	-	LED Flicker	Pass_Class2
16KV	+	LED Flicker	Pass_Class2
	-	LED Flicker	Pass_Class2
18KV	+	LED Flicker	Pass_Class2
	-	LED Flicker	Pass_Class2
20KV	+	LED Flicker	Pass_Class2
	-	LED Flicker	Pass_Class2
22KV	+	Damaged	
	-		

23. Surge test IEC61000-4-5

Test Condition:

Vin 230Vac/50Hz, with LED load, Surge level 1:500V 2 Ohm; 1.2u/50uS – 8u/20us

Filter circuit	Surge voltage/Phase	Result
	500V/90°C and 270 °C	1 PCS Pass
	500V/90°C and 270 °C	3 PCS Fail
	550V/90°C and 270 °C	5 PCS Fail
	Total capacitor on EMI filter is 0.2UF	
	500V/90°C and 270 °C	10 PCS Pass
	550V/90°C and 270 °C	10 PCS Pass
	600V/90°C and 270 °C	1pcs Fail/3pcs Pass
	Total capacitor on EMI filter is 0.32UF	
	It is OK to meet 500V surge test	

24. Input over-range voltage test & Brow out / brow in

Test Condition:

With LED load, Adjust input voltage, monitor input power and LED current

Brow out
Brow in
(Start at 50Vac)



Vin(V)	Pin(W)	Vout(V)	Iout(mA)	PF
20	shut down			
30	7.150	21.30	198.0	0.98
40	9.120	22.10	274.0	0.98
50	9.990	22.18	317.0	0.97
60	9.750	22.20	340.0	0.96
70	9.780	22.21	357.0	0.96
80	9.490	22.21	357.0	0.96
90	9.500	22.21	357.0	0.95
100	9.480	22.22	358.0	0.95
230	9.290	22.22	359.0	0.90
240	9.310	22.21	359.0	0.88
250	9.350	22.22	360.0	0.87
264	9.370	22.22	361.0	0.86
270	9.390	22.21	361.0	0.85
280	9.400	22.22	362.0	0.84
290	9.440	22.22	363.0	0.83
300	9.450	22.22	363.00	0.82
310	/	22.21	364.0	/
320		22.21	366.0	
330		22.21	368.0	
340		22.21	369.0	
350		22.21	370.0	
360		22.21	371.0	
370		22.21	374.0	
380		22.21	377.0	
390		22.21	381.0	
400		Driver burst in 3 minutes		

Conclusion:

The driver is reliable for 300Vac input operation

Over voltage

