FT831B 5W16V0.35A LED Driver Design Example Report

Index

1 SUMMARY AND FEATURES

- Input: 90VAC-264VAC
- Output: 16V, CC@ 350mA
- Efficiency >76%
- Accurate primary-side constant voltage/constant current (CV/CC) controller eliminates secondary side control and opto coupler
- ±5% output voltage and ±5% output current accuracy including line, load, temperature and component tolerance
- Auto-restart output short circuit and open-loop protection
- No-load consumption <300 mW
- Easy compliance to EN55015 Class B EMI

2 INTRODUCTION

This engineering report describes the design for a universal input, 16V, 350 mA CV/CC power supply for LED driver applications. This power supply utilizes the FT831B.

This report contains the power supply and transformer specifications, schematics, bill of materials, and typical performance characteristics pertaining to this power supply.

3 PROTOTYPE PHOTO

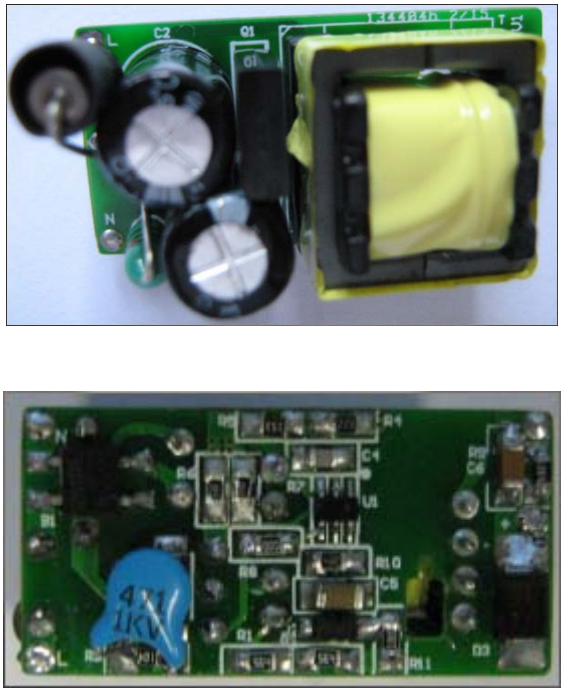


Figure 1: Prototype Photo

4 POWER SUPPLY SPECIFICATION

Description	Min	Typ	Max	Units
Input				
Voltage	90		265	VAC
Frequency	47	50/60	63	Hz
No-load Input Power				mW
Output				
Output Voltage		16		V
Output Ripple Voltage				mV
Output Current	330	350	370	mA
Total Output Power				
Continuous Output Power		5.6		W
Efficiency				
Full Load		78		%
Environmental				
Conducted EMI		Meets EN55015B		
Ambient Temperature	-10		40	℃

Table 1

5 SCHEMATIC

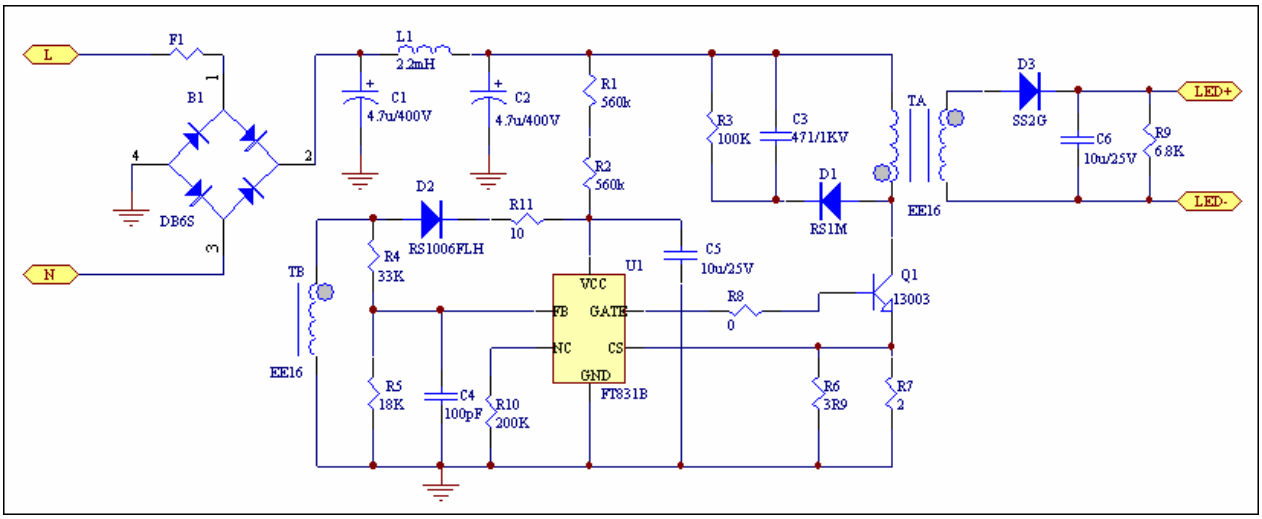


Figure 2

6 PCB LAYOUT

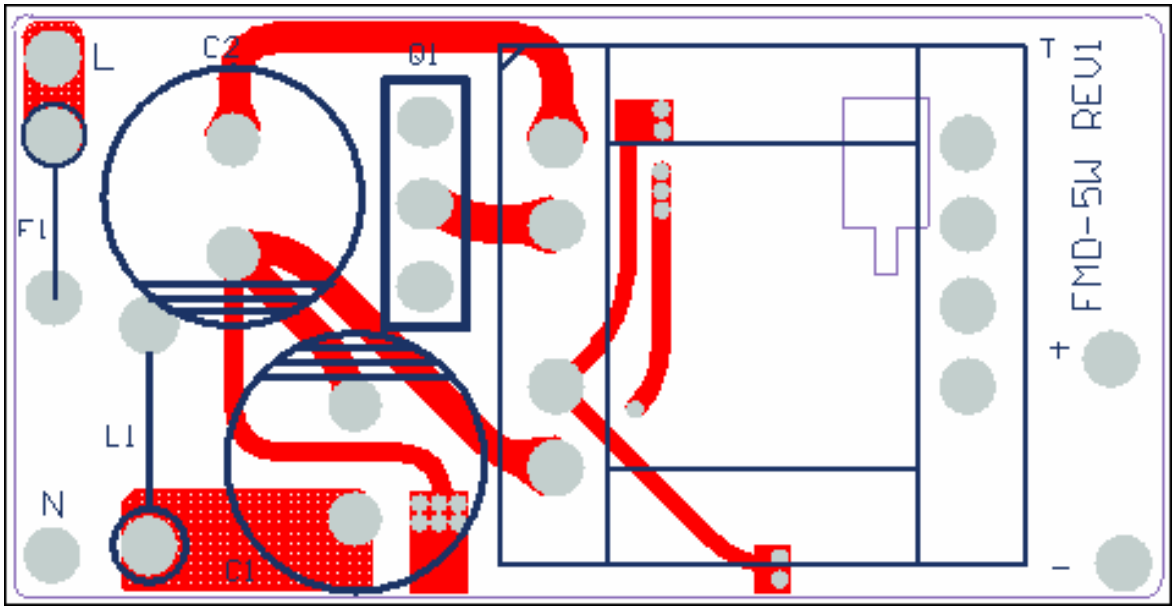


Figure 3: Top View

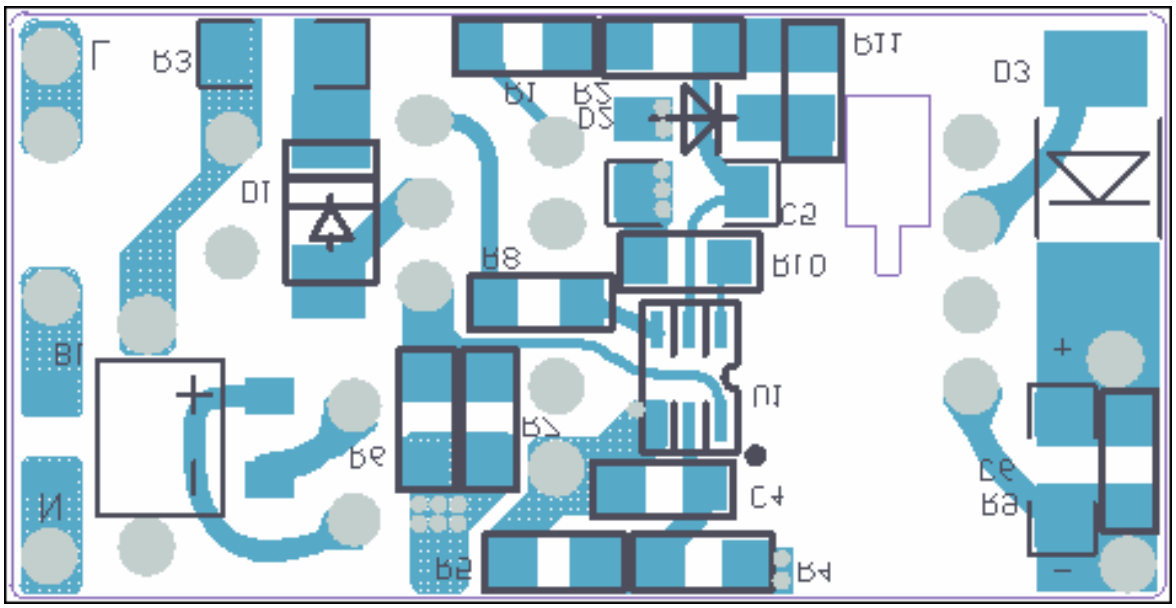


Figure 4: Bottom View

7 BILL OF MATERIALS

Ref Des	Description	Package	Part Num	QTY
U1	IC	SOT23-6	FT831B	1
F1	0.5A250Vac,Fuse	3.6×10mm		1
B1	0.5A600V,Bridge	SOIC-4	DB6S	1
L1	2.2mH, Inductor	4×10mm		1
Q1	1.5A700V,NPN	TO-126	13003	1
T	Transformer	EE16		1
C1，C2	4.7uF400V,Electrolytic	8×12.5mm		2
C3	470pF1kv,Disc Ceramic			1
C4	100pF25V,1%,Ceramic,X7R	0805		1
C5，C6	10uF25V,5%,Ceramic,X7R	1206		2
D1	1A1000V,Fast Recovery Rectifier	DO-214AC	RS1M	1
D2	1A600V,Fast Recovery Rectifier	DO-219AB	RS1006FLH	1
D3	2A400V,Super Fast Recovery Rectifier	DO-214AA	SS2G	1
R1,R2	560k,1/8W,5%,Metal Film	0805		2
R3	100k,1/4W,5%,Metal Film	1206		1
R4	33k,1/8W,5%,Metal Film	0805		1
R5	18k,1/8W,5%,Metal Film	0805		1
R6	3R9,1/8W,1%,Metal Film	0805		1
R7	2,1/8W,1%,Metal Film	0805		1
R8	0,1/8W,5%,Metal Film	0805		1
R9	6k8,1/8W,5%,Metal Film	0805		1
R10	200k,1/8W,5%,Metal Film	0805		1
R11	10,1/8W,5%,Metal Film	0805		1

Table 2

8 TRANSFORMER SPECIFICATION

A) Electrical diagram

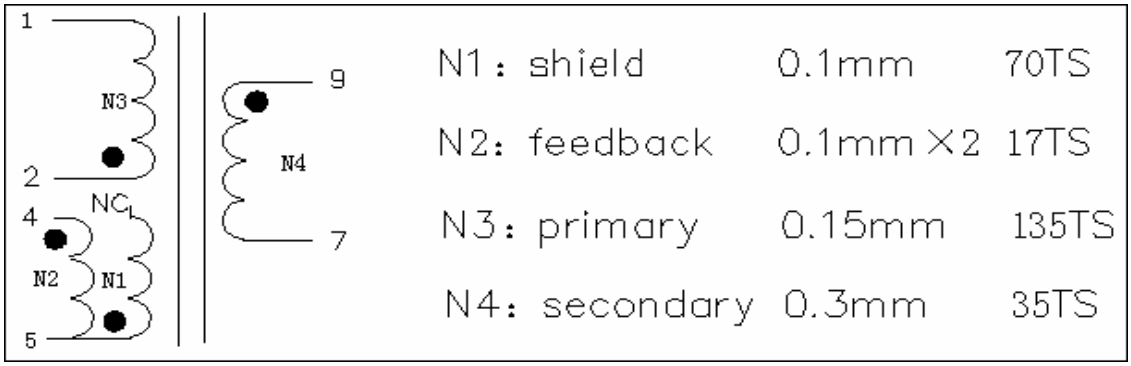


Figure 5

B) Electrical Specifications

(1)Primary Inductance：L=1700±200uH(1KHZ, 0.25V, SER)

(2)HI-POT: N1/N2/N3-N4: 3KVAC, 5mA, 3Sec

(3)Primary Leakage Inductance：L2<350uH(1KHZ, 0.25V, SER)

C) Meterials

(1) Core: PC40;

(2) Bobbin: Horizontal 10 pin EE16;

D) Transformer Build Diagram

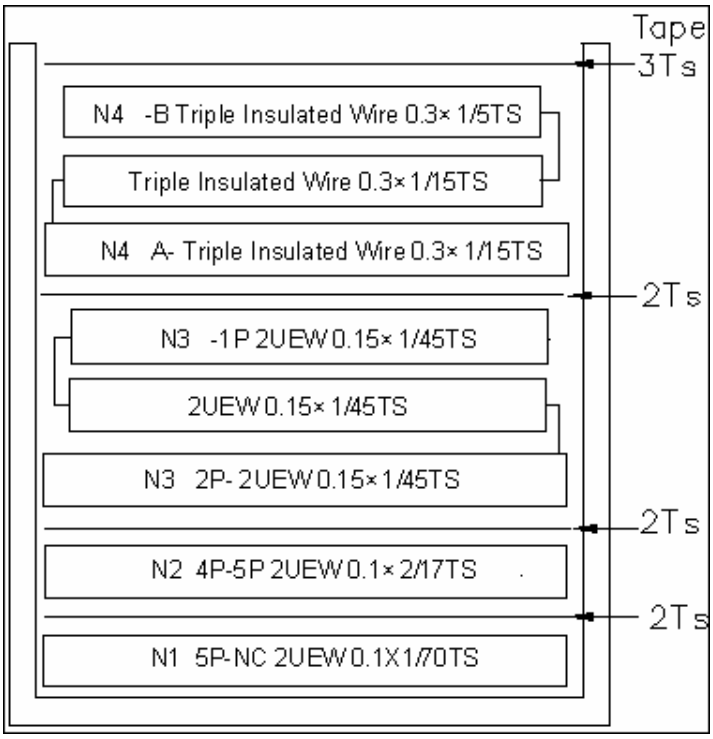


Figure 6

9 PERFORMANCE DATA

All measurements were taken at room temperature, 50 Hz input frequency.

A) Efficiency with LED Load – Full Load

This data was taken using three 350 mA, 3.2 V LEDs connected in a series string.

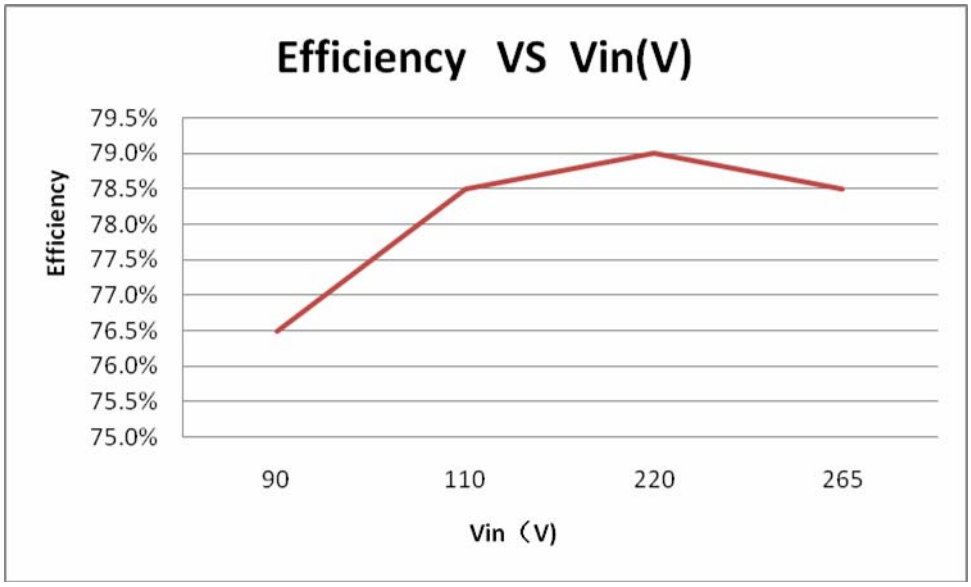


Figure 7

B) Line Regulation

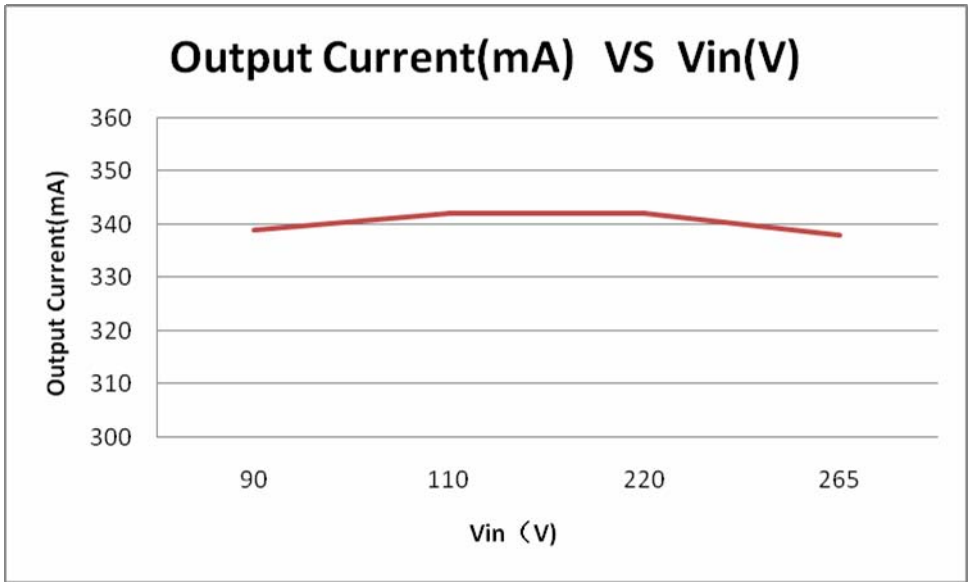


Figure 8

10 WAVEFORMS

A) Output Voltage Ripple

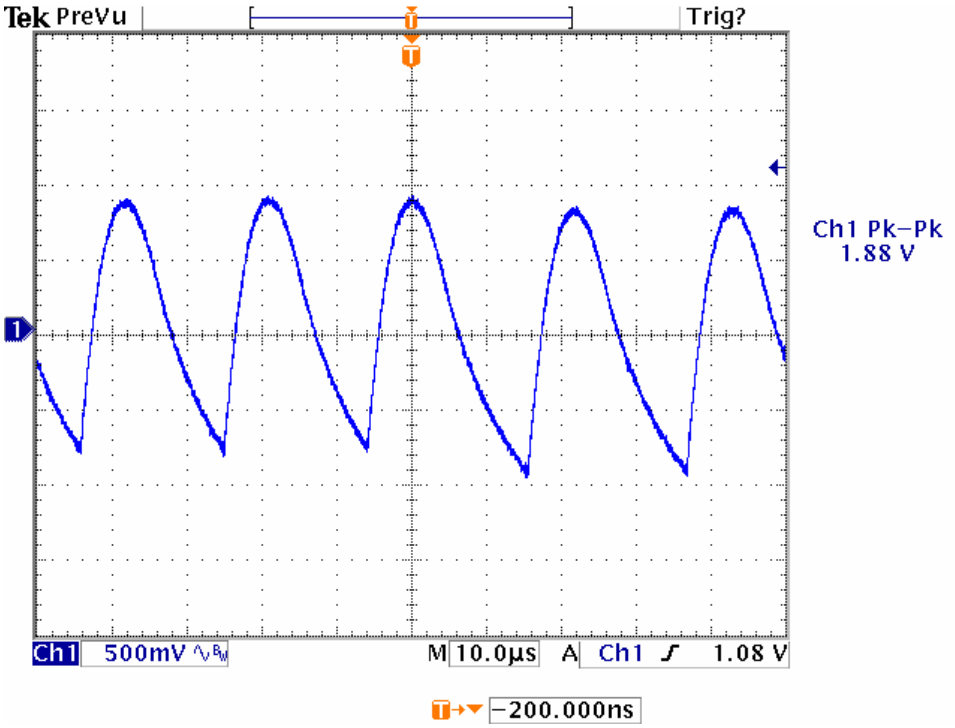


Figure 9: Output Ripple and Noise at 85Vac Input and Full Load

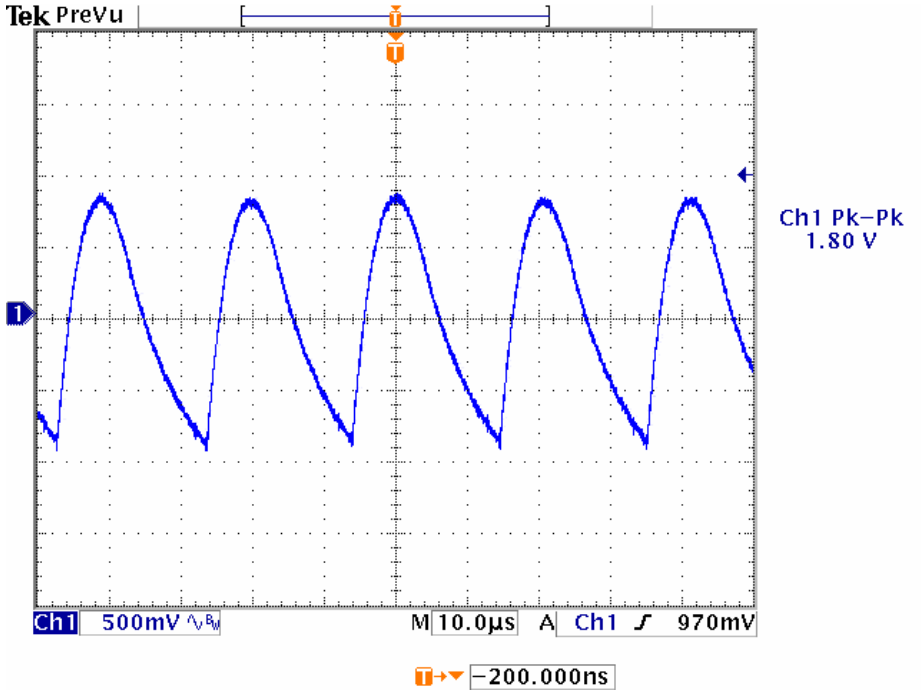


Figure 10: Output Ripple and Noise at 264Vac Input and Full Load

B) Output Current Ripple

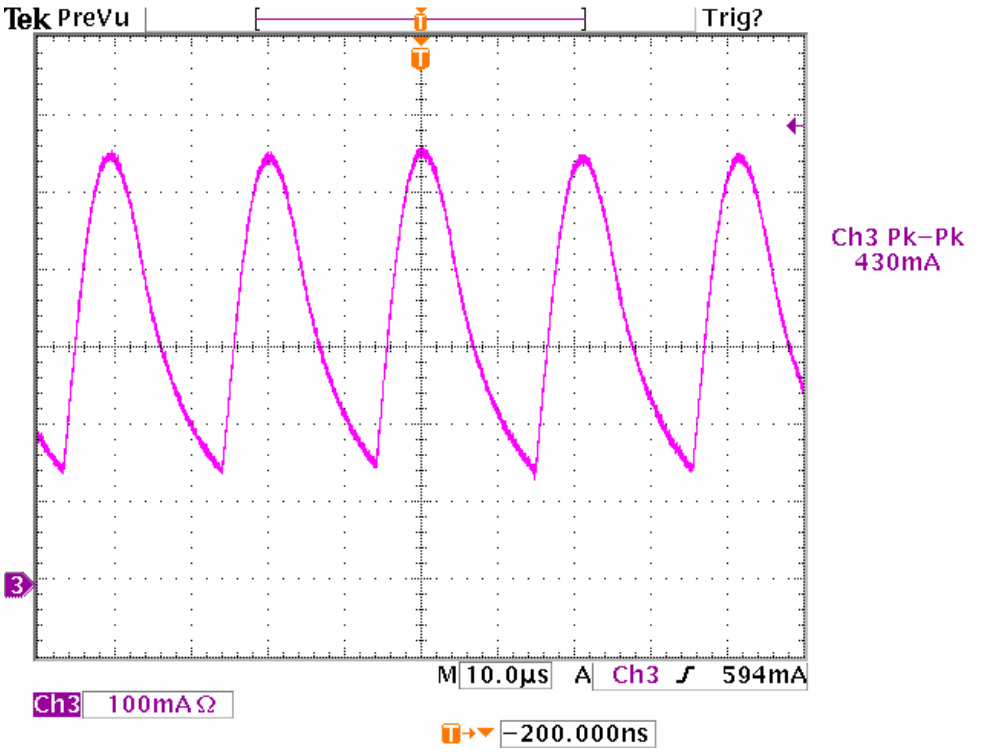


Figure 11: Output Current Ripple at 115Vac and Full Load

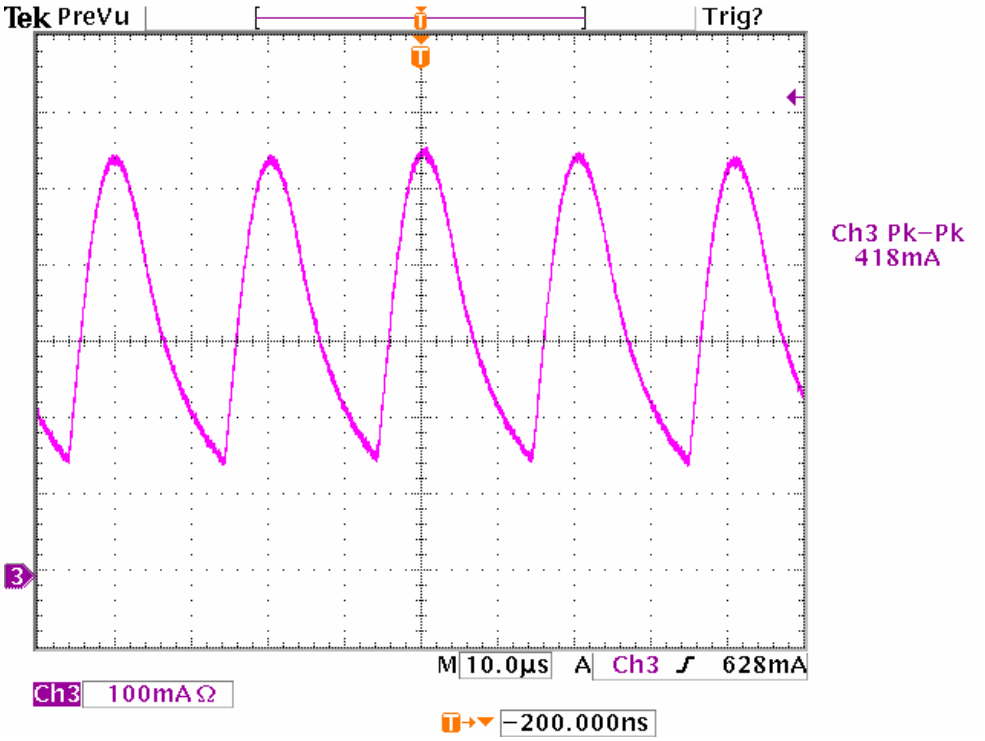


Figure 12: Output Current Ripple at 230Vac and Full Load

C) Output Voltage Startup Profile

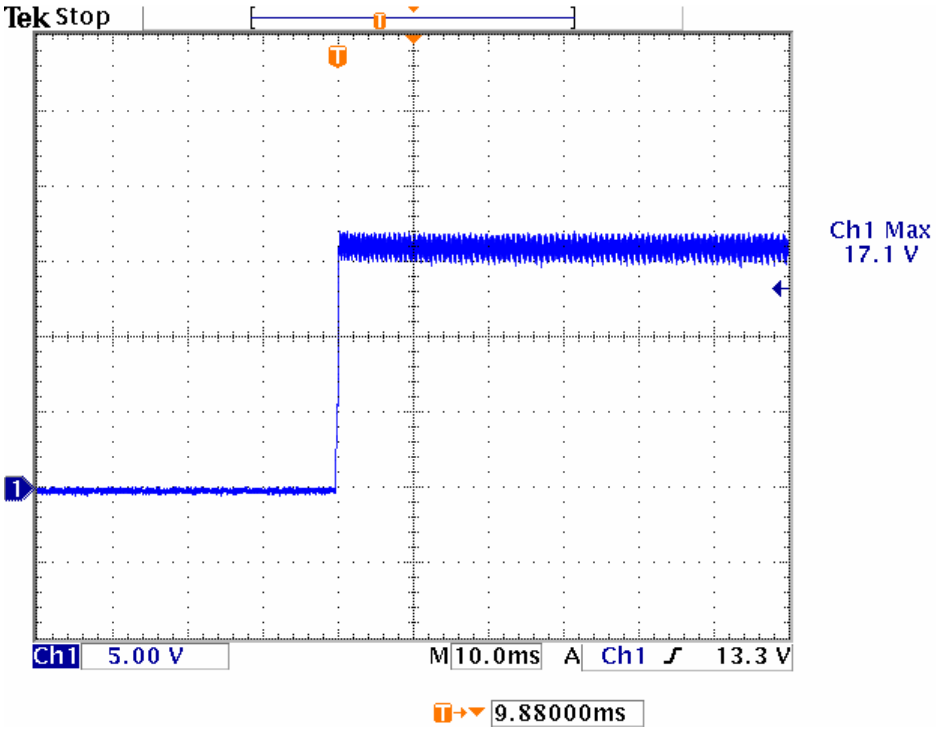


Figure 13: Output Voltage at Startup (115Vac), Full Load

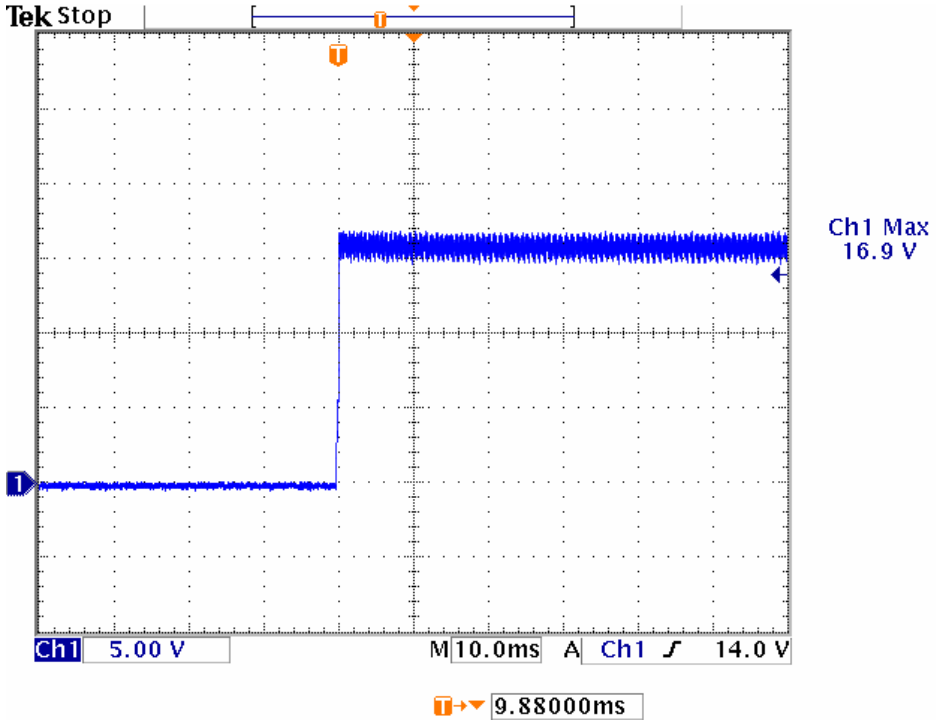


Figure 14: Output Voltage at Startup (230Vac), Full Load

D) Output Current Startup Profile

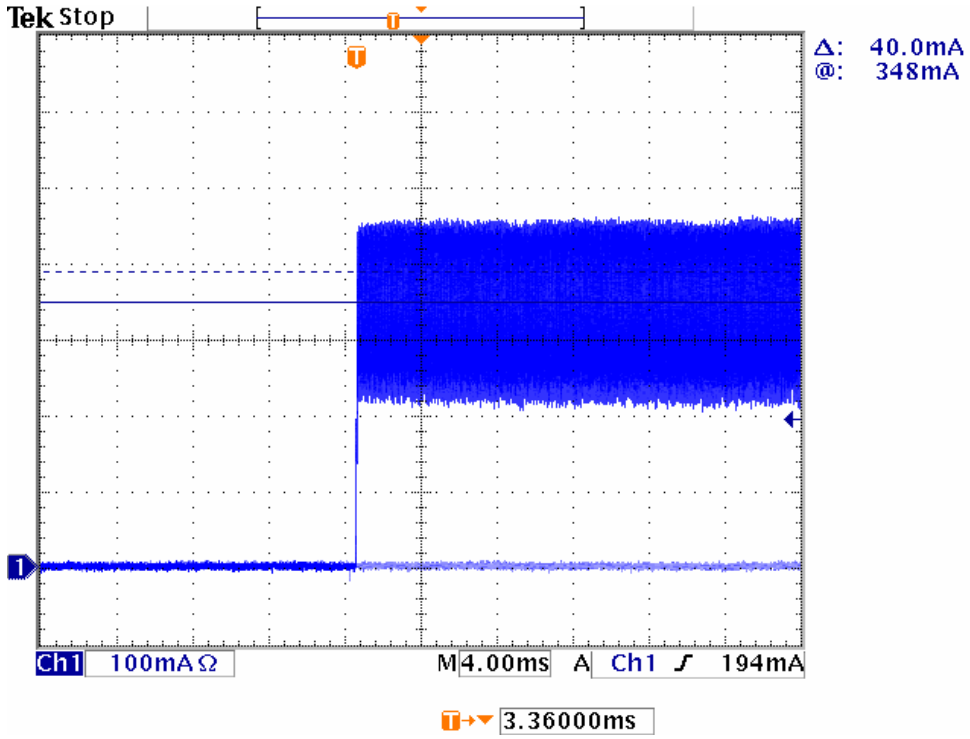


Figure 15: LED Current at 115Vac,Full Load

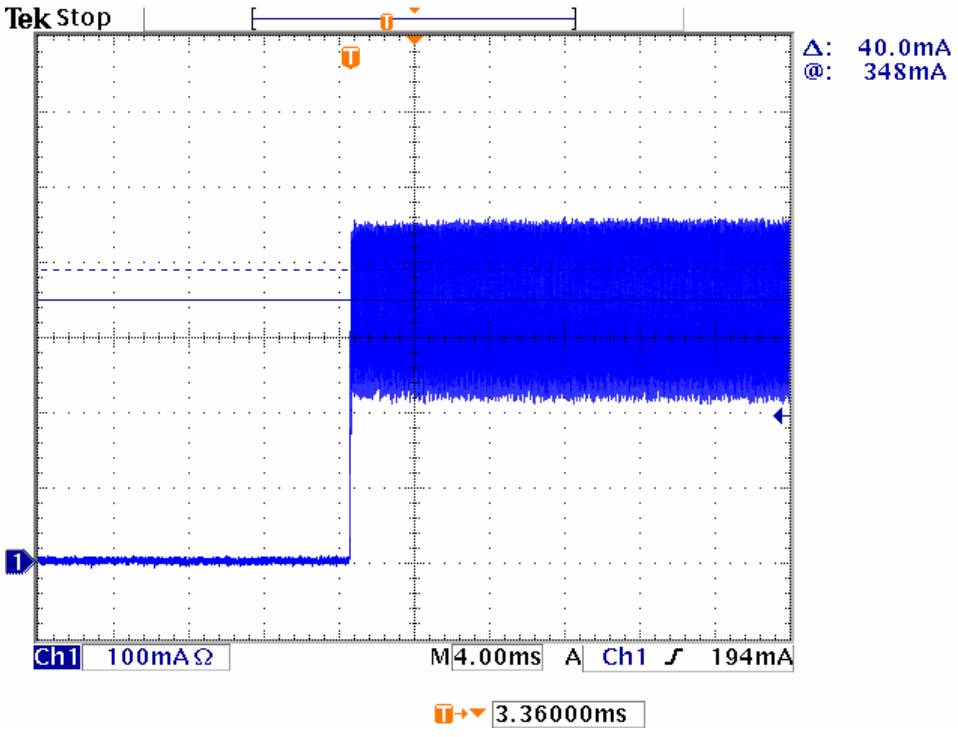


Figure 16: LED Current at 230Vac,Full Load

E) Drain Voltage

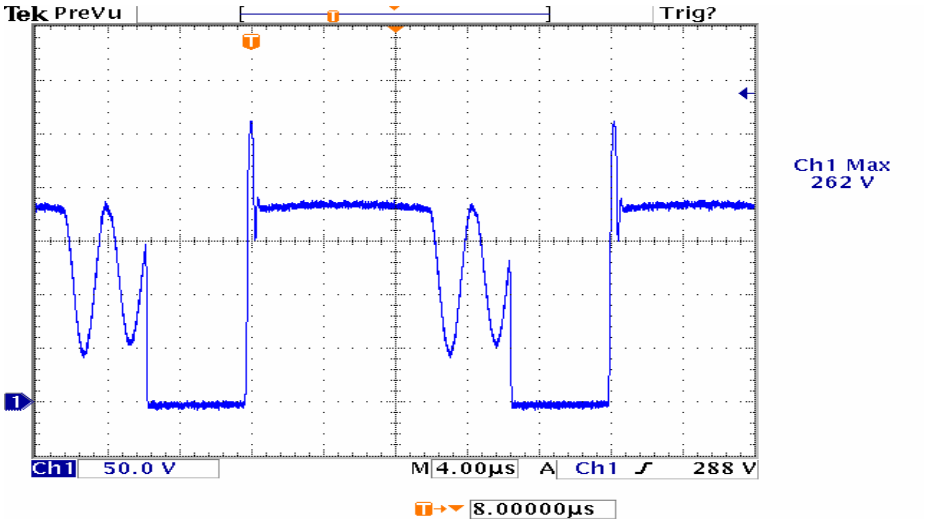


Figure 17: Collector Voltage at 85Vac

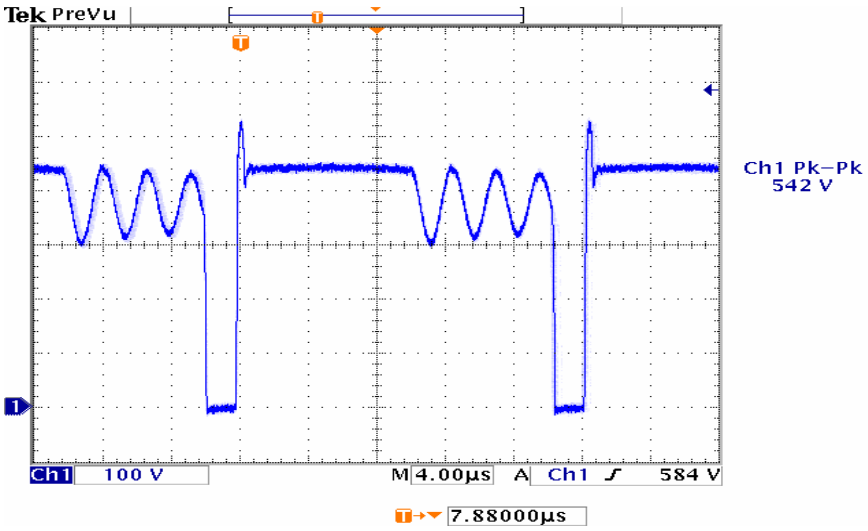


Figure 18: Collector Voltage at 264Vac

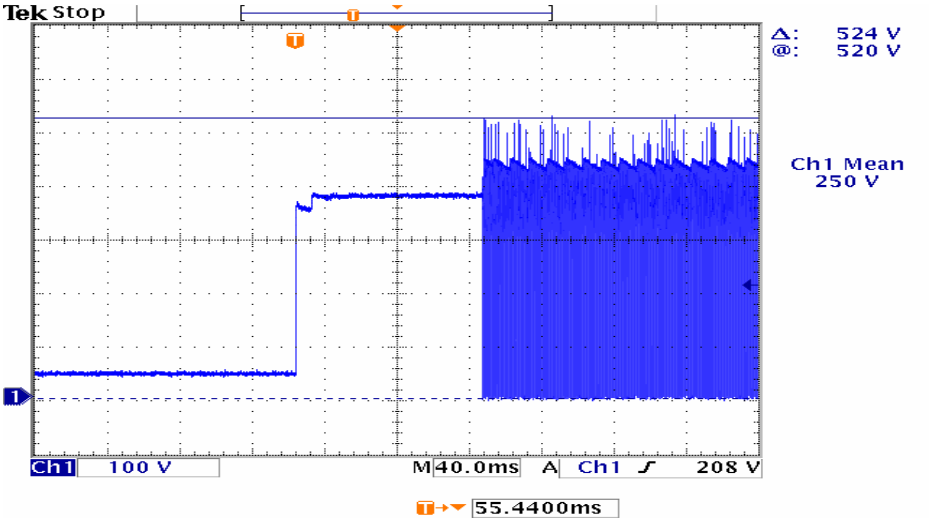


Figure 19: Collector Voltage during startup at 264Vac

11 CONDUCTED EMI

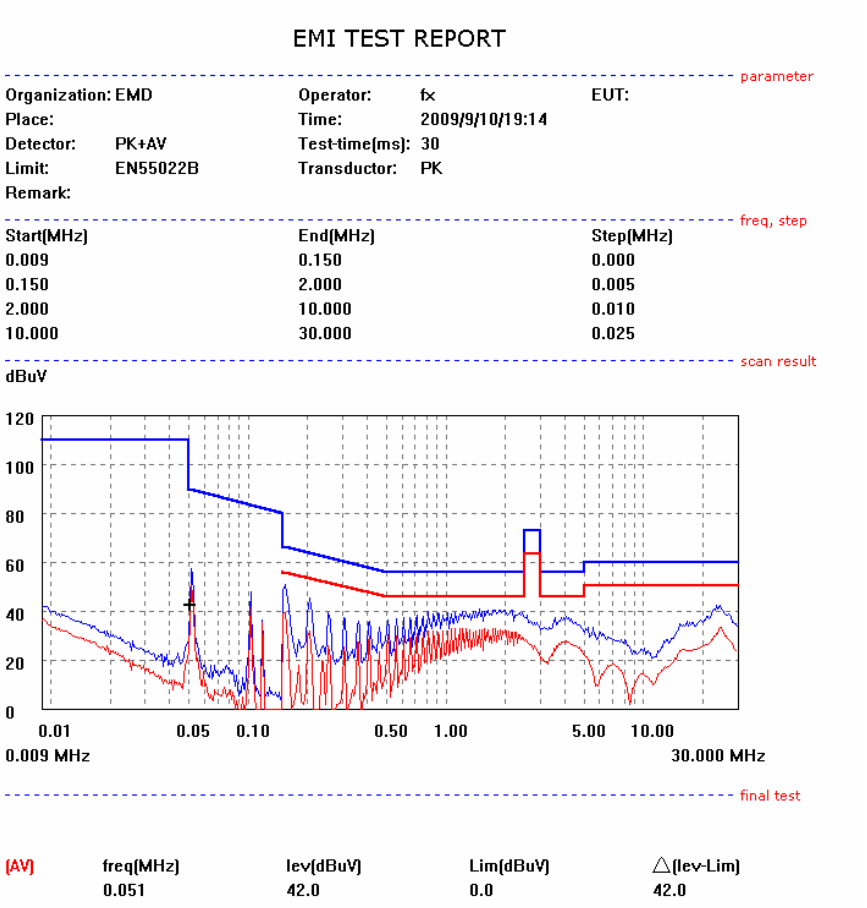


Figure 20: Vin=120V Full Load

EMI TEST REPORT

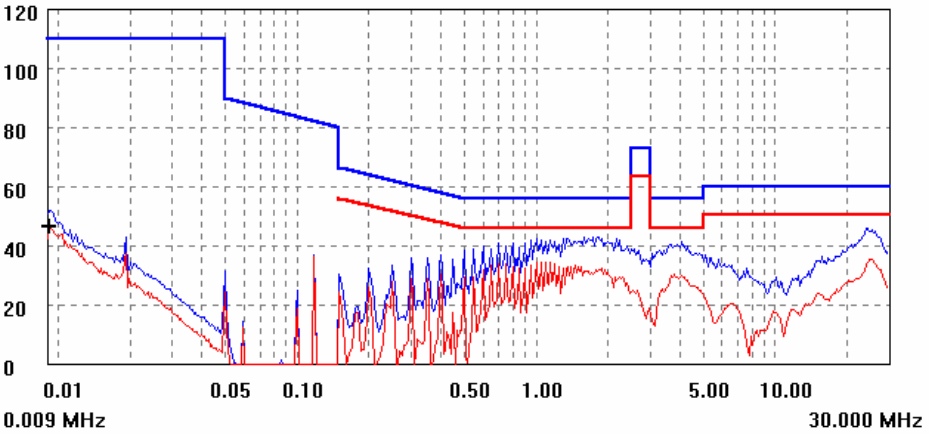
parameter

Organization:	EMD	Operator:	fx	EUT:	
Place:		Time:	2009/9/10/19:37		
Detector:	PK+AV	Test-time(ms):	30		
Limit:	EN55022B	Transductor:	PK		
Remark:					

freq, step

Start(MHz)	End(MHz)	Step(MHz)
0.009	0.150	0.000
0.150	2.000	0.005
2.000	10.000	0.010
10.000	30.000	0.025

scan result



final test

(AV)	freq(MHz)	lev(dBuV)	Lim(dBuV)	△(lev-Lim)
	0.009	46.4	0.0	46.4

Figure 21: Vin=230V Full Load