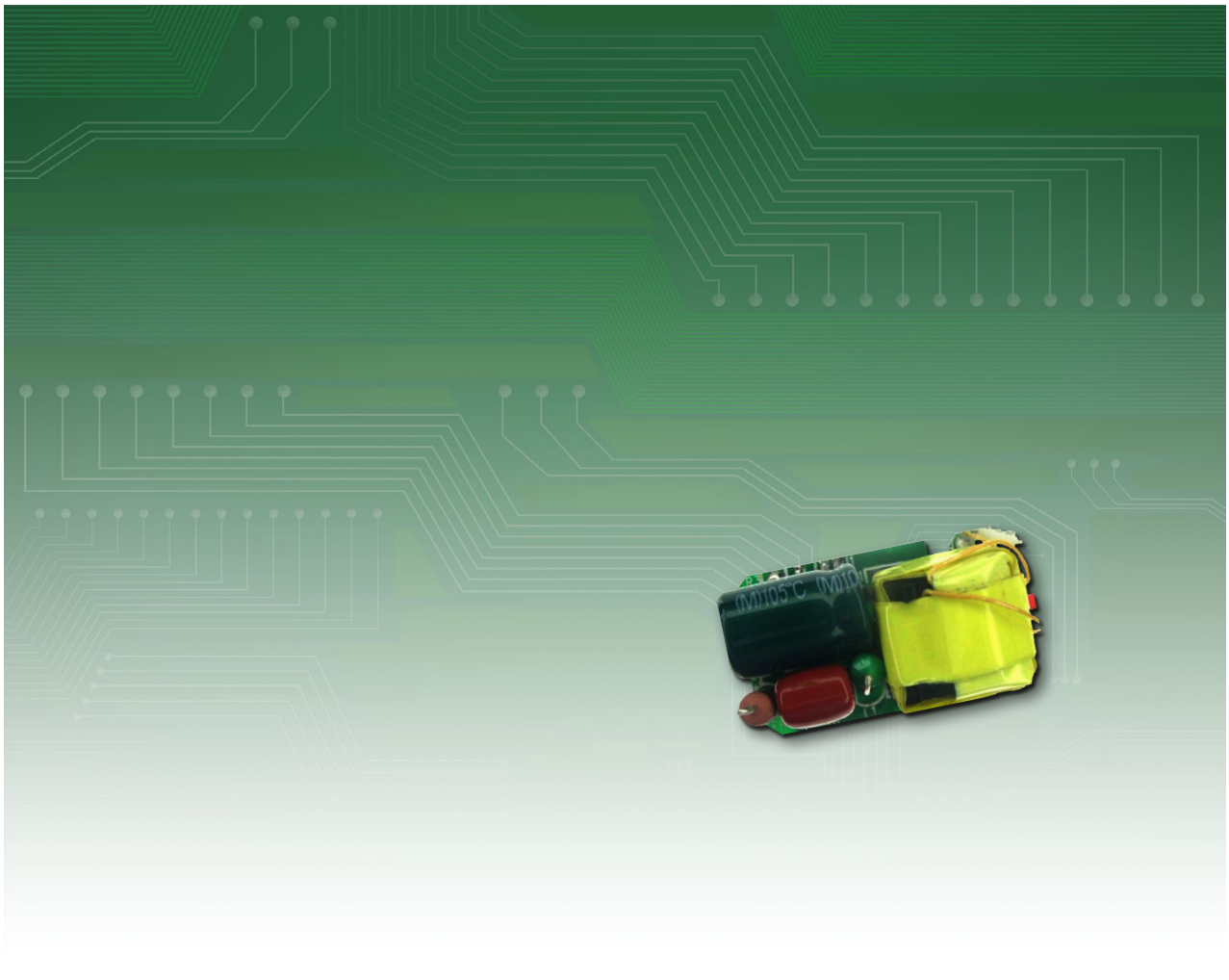
Reference Design

EBC880

iWatt
Power Management Simplified Digitally™



LED Driver Design with iW1810

(AC Input 90V–264V_{AC}, Output 3 LEDs)

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1.0 Introduction

This reference design describes a 3 LEDs output, universal input (90–264V_{AC}) power supply for non-dimmable LED applications. For this design the iW1810 is used. This document contains the complete specification of the LED driver, a detailed circuit diagram, an entire bill of materials required to build the LED driver, a drawing of the power transformer, and test data covering the most important performance.

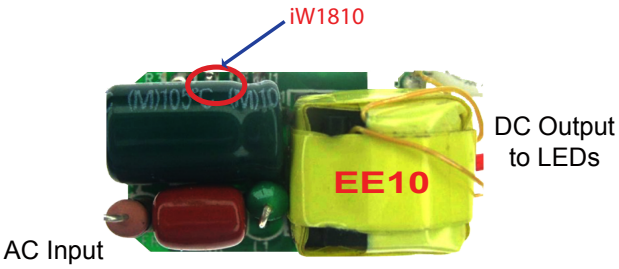


Figure 1.1 PCB Top View

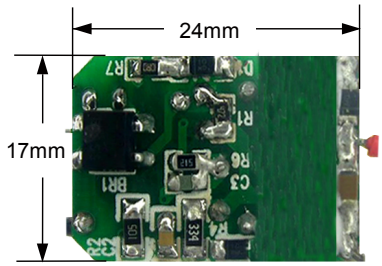


Figure 1.2 PCB Bottom View

2.0 Design Features

- For candle LED lamps
- AC input range 90-264V_{AC}
- Output 3 LEDs at 350mA
- Isolated / non-isolated applications
- High efficiency and minimum parts count
- Meets EMI EN55015B-QP & AV limits
- AccuSwitch™ technology: integrated 800V bipolar junction transistor (BJT)
- PrimAccurate™ Primary-only sensing eliminates opto-isolator feedback and simplifies design

3.0 Design Specification

The information in the table below represents the minimum acceptable performance of the design.

Description	Symbol	Min	Typ	Max	Units	Comment
Input						
Voltage	V_{IN}	90	230	264	V_{AC}	2 wire
Frequency	f_{LINE}		50		Hz	
Open-load input power					W	
Output						
Constant output voltage	V_{OUT_CV}		10		V	Measured at end of PCB
Constant output current	I_{OUT_CV}	300	320	350	mA	Measured at the LED load
Total Output Power						
Continuous output power	P_{OUT}		3		W	
Output short circuit test	I_{OUT_MAX}				A	Auto-restart
Efficiency	η		75		%	Measured at end of PCB
Power factor	PF		0.5			Harmonic meets IEC61000-3-2
Turn on delay time					Sec	At rated input voltage 115V_{AC}
Inrush current						
Hi-pot test			3		KV	Isolated
Environmental						
Conducted EMI			Meets EN55015B			
Surge test						
Operation temperature	T_{OPR}		40		°C	Free convection, sea level

4.0 Schematic

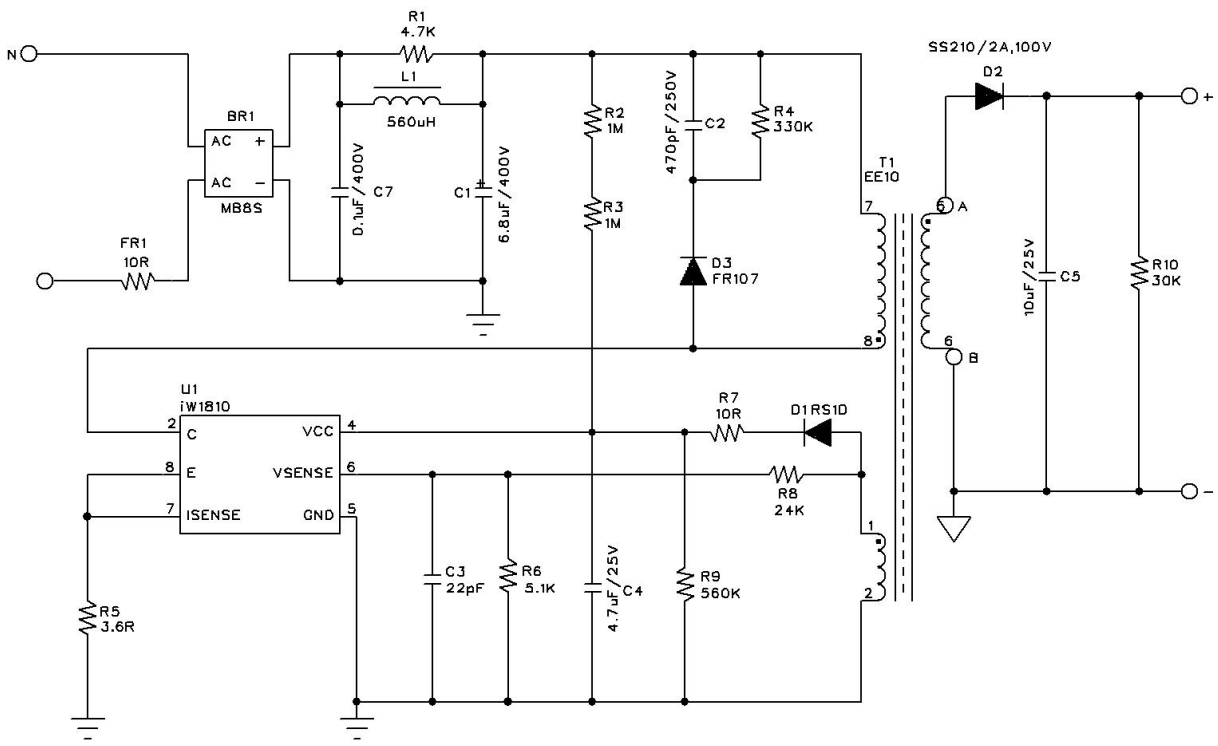
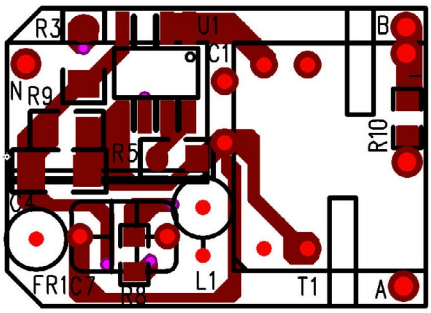
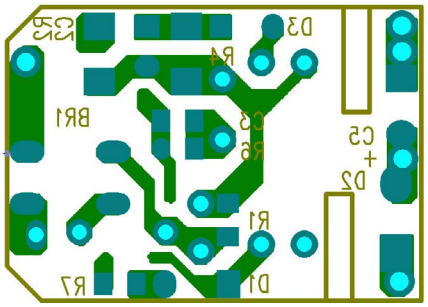


Figure 4.1 Design Schematic

5.0 PCB Layout



a) PCB Top



b) PCB Bottom

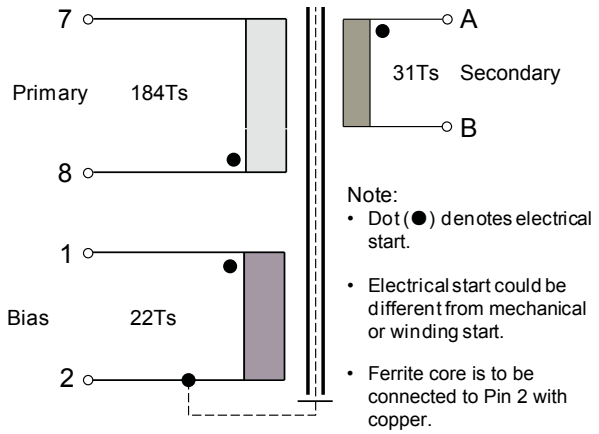
Figure 5.1 PCB Layout 24.0 mm x 17.0 mm

6.0 Bill of Materials

Item	Qty.	Ref.	Description	Manufacturer P/N	Manufacturer
1	1	U1	iW1810, off-line digital PWM controller, SOT-8	iW1810	iWatt, Inc.
2	1	C1	6.8µF, 400V, E-cap, 105°C	PKLH-6.8UF400V	Koshin
3	1	C2	470pF, 250V, ceramic capacitor, SMD-0805	C2012X7R2E471J	TDK Corp.
4	1	C4	4.7µF/25V, SMD-1206	C3612X7R1E475J	TDK Corp.
5	1	C5	10µF/25V, SMD-1206	C3612X7R1E106J	TDK Corp.
6	1	C3	22pF/50V, SMD-0603	C1608X7R1H220J	TDK Corp.
7	1	BR1	B8S	B8S	PANJIT Semiconductor
8	1	D1	RS1D, 1A200V	RS1D	PANJIT Semiconductor
9	1	D2	SS210, 2A100V, SMD	SS110	PANJIT Semiconductor
10	1	D3	FR107, 1A/1000V	FR107	PANJIT Semiconductor
11	1	R1	9.1KΩ, ±5%, SMD-0603	RC0603JR-079K1L	YAGEO
12	2	R2, R3	1MΩ, ±5%, SMD-1206	RC1206JR-071ML	YAGEO
13	1	R4	330KΩ, ±5%, SMD-1206	RC1206JR-07330KL	YAGEO
14	1	R6	5.1KΩ, ±1%, SMD-0805	RC0805JR-075K1L	YAGEO
15	1	R8	24KΩ, ±1%, SMD-0603	RC0603JR-0724KL	YAGEO
16	1	R5	5.6KΩ, ±1%, SMD-0603	RC0603JR-075K6L	YAGEO
17	1	R10	30KΩ, ±5%, SMD-0805	RC0805JR-0730KL	YAGEO
18	1	R9	560KΩ, ±5%, SMD-0805	RC0805JR-07560KL	YAGEO
19	1	R7	10Ω, ±5%, SMD-0603	RC0805JR-0710RL	YAGEO
20	1	FR1	10R, 1W, fuse resistor	KNP1WST-52-J-10R	Shunchi
21	1	L1	560µH, 0410	0410 4.7MH	TDK Corp.
22	1	T1	EE10, transformer	EE10	TDK Corp.

7.0 Transformer Drawing

Schematic:



Electrical Specifications:

1.	Primary inductance (Lp) = 2.5mH @10kHz
2.	Primary leakage inductance (Lk) ≤ 150µH @10kHz

Materials:

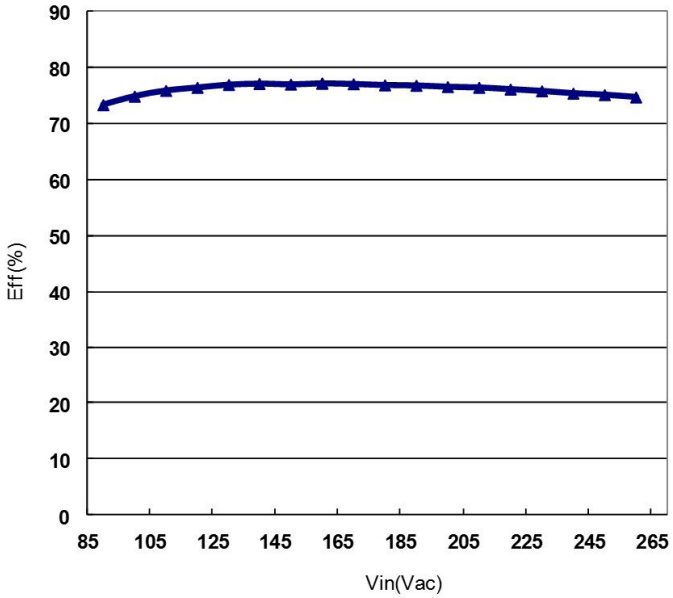
1.	Core: EE10 (ferrite material TDK PC40 or equivalent)
2.	Bobbin: EE10 horizontal. primary=4, secondary=4
3.	Magnet wires (pri): type 2-UEW
4.	Layer insulation tape: 3M1298 or equivalent

Finished:

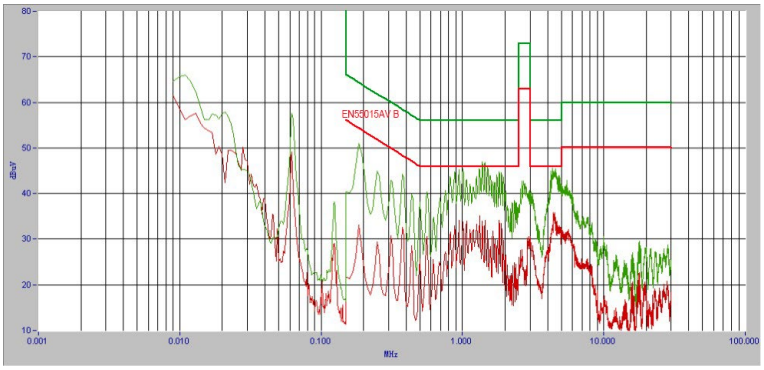
1.	Varnish the complete assembly
2.	Core is connected to pin 2 (primary ground)

8.0 Performance

8.1 Efficiency



8.2 Conducted EMI



a) QP & AV Scan L

Figure 8.2.1 EMI Results

Trademark Information

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