

# **LED Driver Design with iW1810** **(AC input 90V~264Vac, Output 3 LEDs)** **EBC880**

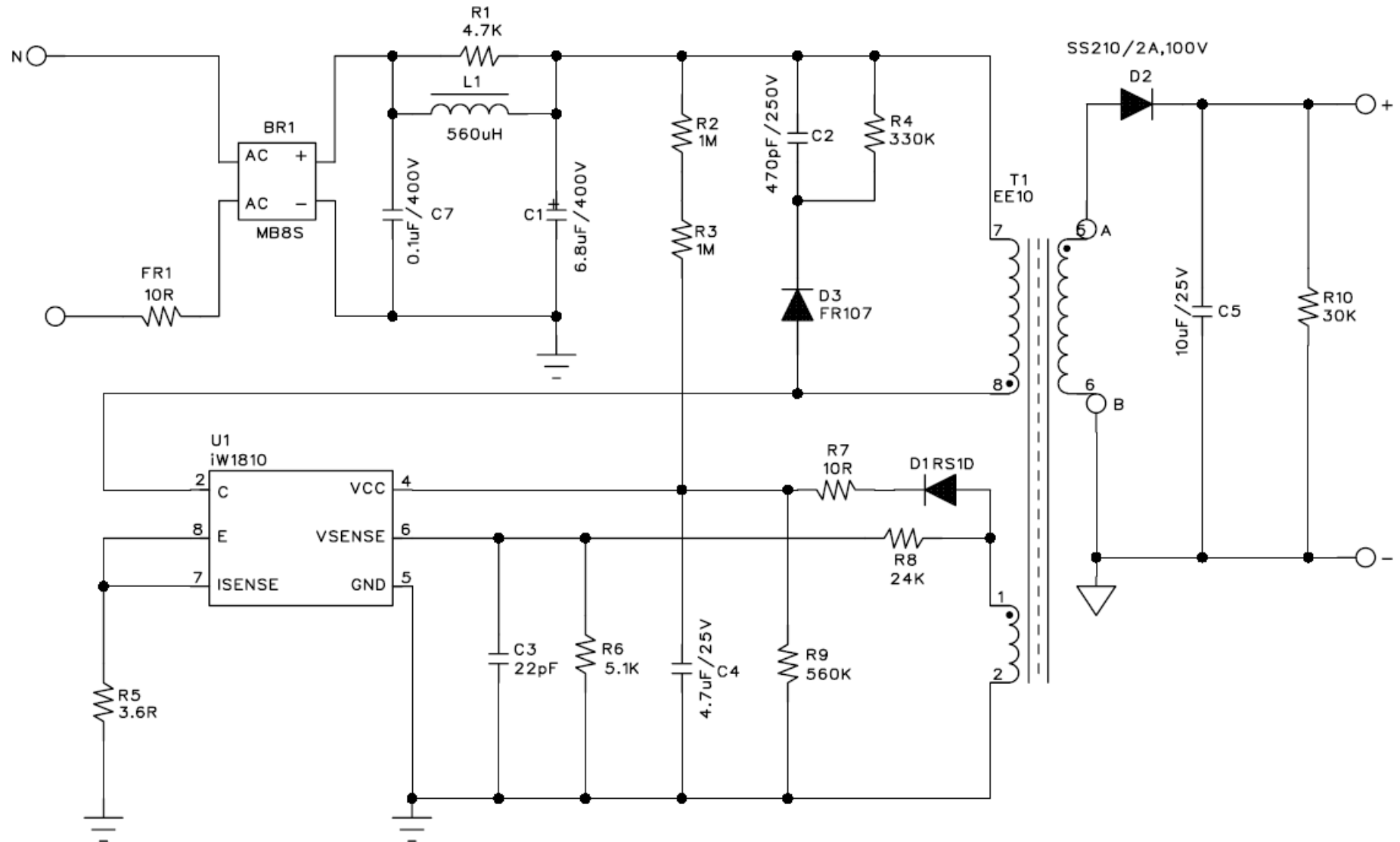
## Summary and Features :

1. LED driver, 10V, CC@0.35A ; Wide range AC input range @90-264Vac
- 2 For isolated Applications
3. Minimum Parts count
4. Meet EMI EN55015B-QP limits

# 1. Specification

Description		Symbol	Min	Typ	Max	Units	Comment
Input							
Voltage		$V_{IN}$	90	230	264	V <sub>AC</sub>	2 Wire
Frequency		$f_{LINE}$			50	Hz	
Open-load Input Power (264V <sub>AC</sub> )						W	
Output							
Const Voltage	Output Voltage	$V_{OUT\_CV}$		10		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	$I_{OUT\_CV}$	300	320	350	mA	
Total Output Power							
Continuous Output Power		$P_{OUT}$		3		W	
Over Current Protection		$I_{OUT\_MAX}$				A	Auto-restart
Efficiency		$\eta$	75			%	Measured at end of PCB
Power Fact		$PF$		0.5			Harmonic meet IEC61000-3-2
Turn on Delay Time						Sec	
Conducted EMI			Meets EN55015B				
Hi-pot test				3		KV	
Operation temperature		$T_{opr}$		40		° C	Free convection, sea level

## 2. Schematic circuit

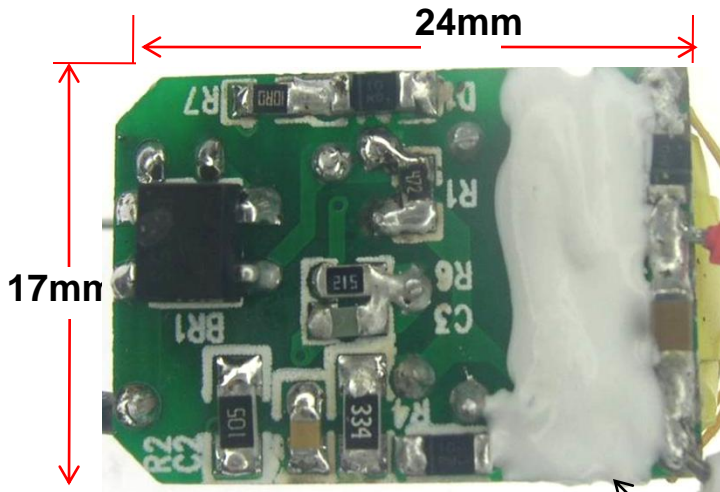


# 3. Bill of Material

Item	Qty.	Ref.	Description
1	1	C7	0.1uF,400V,CBB
2	1	C1	6.8uF,400V E-CAP,105°C
3	1	C3	22pF,50V,SMD-0603
4	1	C4	4.7uF,25V,SMD-1206
5	1	C5	10uF,25V,1206
6	1	D1	FR102,1A,100V,SMD,
7	1	D2	SS210;2A/100V;SMD
8	1	R1	4.7K $\Omega$ +/-5%,SMD-0805
9	2	R2,R3	1M $\Omega$ +/-5%,SMD-1206
10	1	FR1	10 $\Omega$ FUSE Resistor-1W
11	1	R4	330K $\Omega$ +/-5%,SMD-1206
12	1	R5	3.6 $\Omega$ +/-1%,SMD-0805
13	1	R6	5.1K $\Omega$ +/-1%,SMD-0805
14	1	R7	10 $\Omega$ +/-5%,SMD-0805
15	1	R8	24K $\Omega$ +/-1%,SMD-0805
16	1	R10	30K $\Omega$ +/-5%,SMD-0805
17	1	L1	560uH ,1/2W
18	1	U1	iw1810-00, SO-8
19	1	T1	EE10, Transformer
21	1	BR1	ABS8

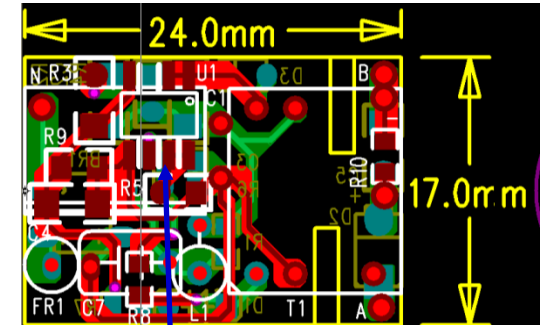
# 4. PCB Layout

AC Input

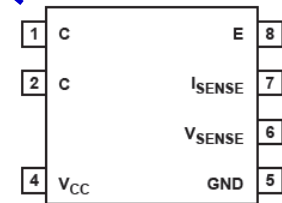


RTV for insulation and Hi-pot test

DC output



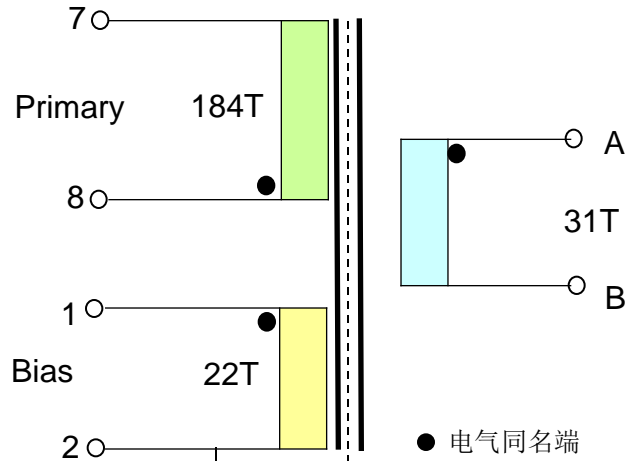
**iw1810**  
iw1810



7-Lead SOIC Package

# 5. Transformer Design

## SCHEMATIC



## ELECTRICAL SPECIFICATIONS:

1. Primary Inductance ( $L_p$ ) = 2.5mH @10KHz
2. Primary Leakage Inductance ( $L_k$ ) ≤ 150uH @10KHz

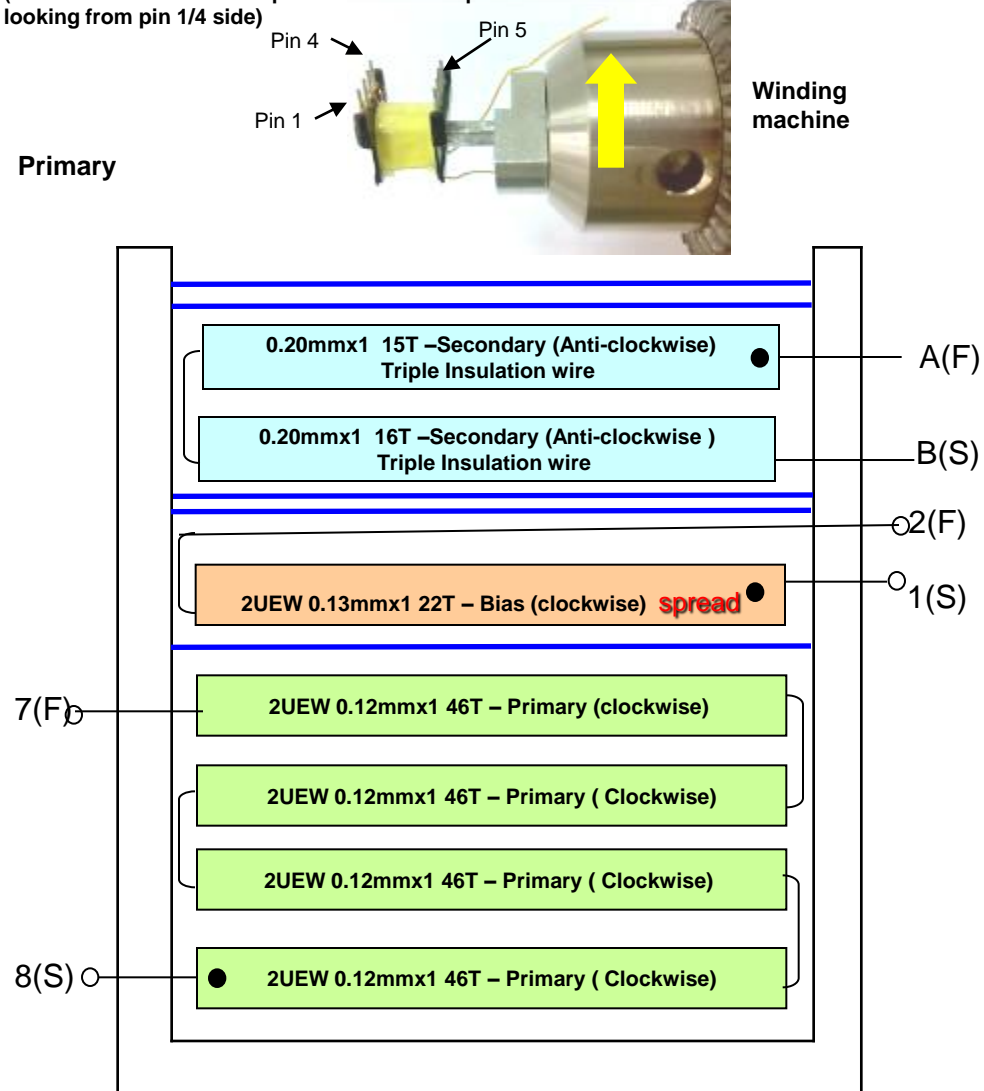
## MATERIALS:

1. Core : EE10(Ferrite Material TDK PC40 or equivalent)
2. Bobbin : EE10Horizontal. Primary=4, Secondary=4
3. Magnet Wires : Type 2-UEW
4. Layer Insulation Tape : 3M1298 or equivalent.

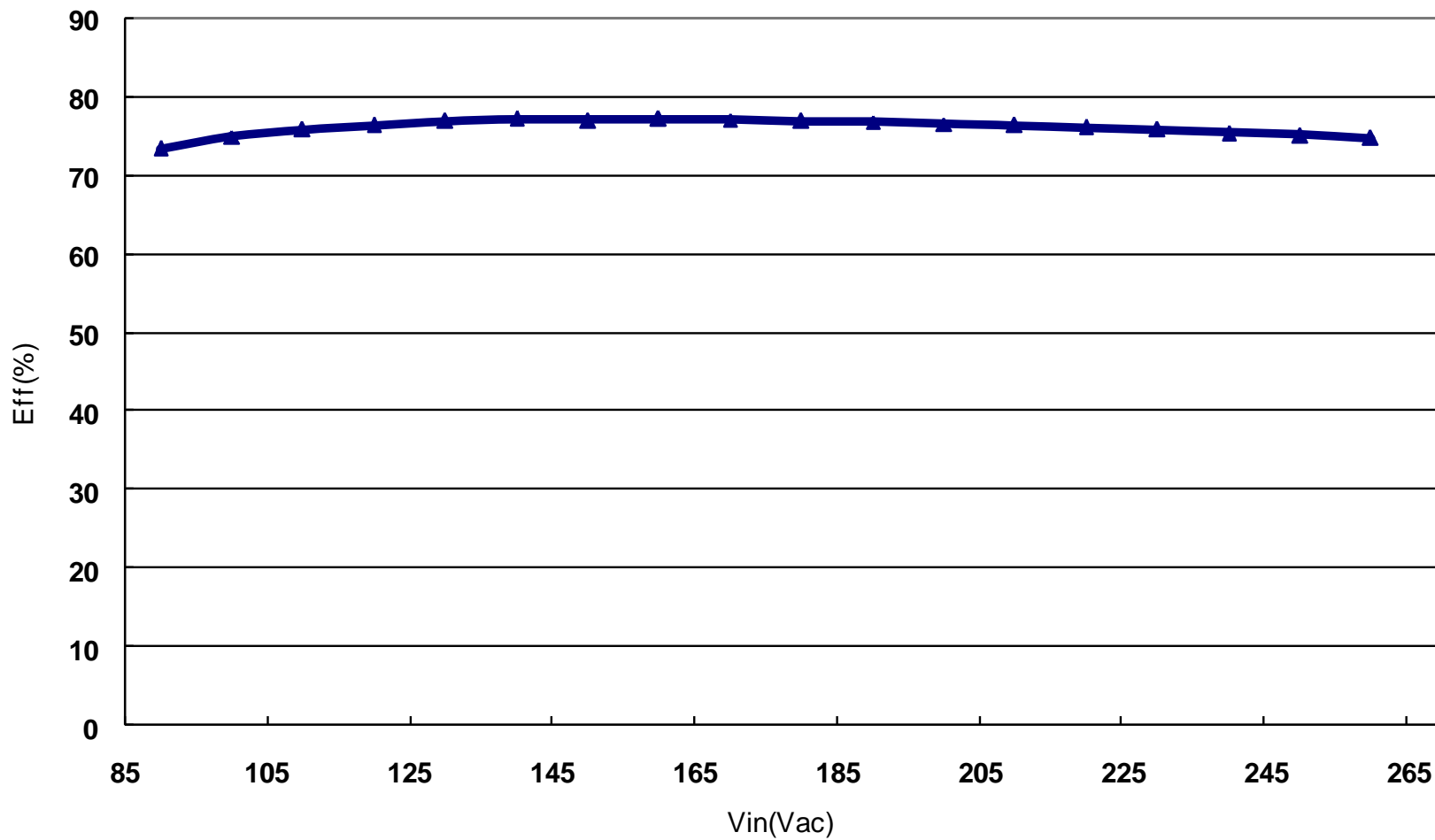
## FINISHED :

1. Varnish the complete assembly
2. Core is connected to pin2 ( primary ground )

- Bobbin to be “rotated” in Anti-clockwise direct looking from pin 1/4 side.
- (Wire to be “started” from pin-4 & “ended” at pin-3 in a Clockwise direction when looking from pin 1/4 side)

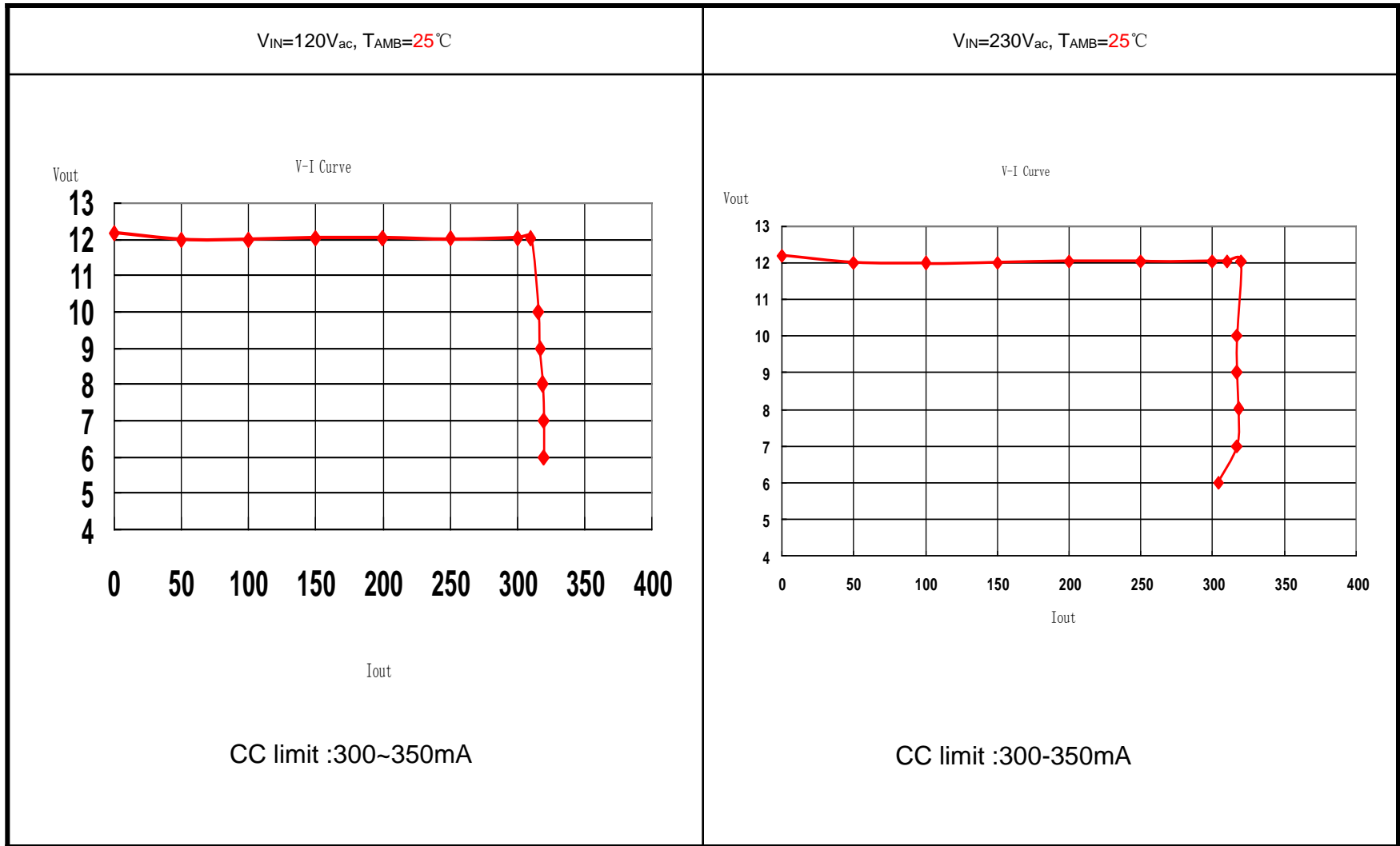


## 6. Efficiency and V-I Curve



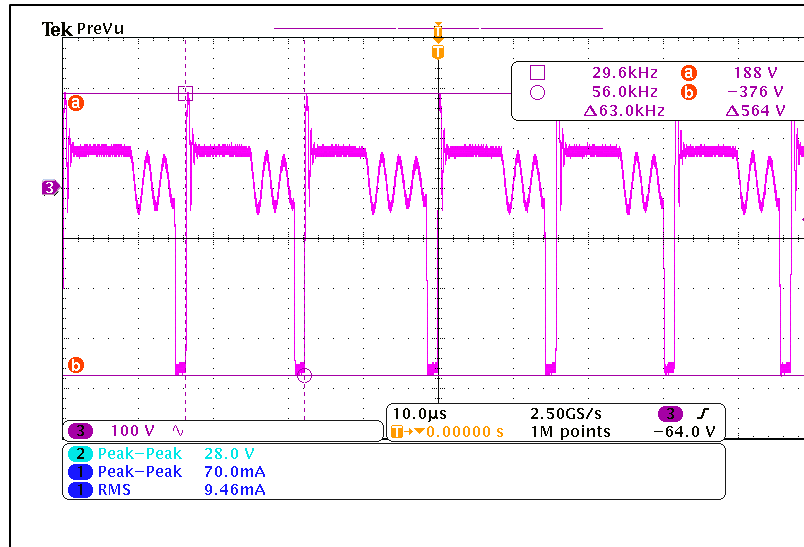
# 7. Output VI Characteristics

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





# 8. $V_{ce}$ Waveform



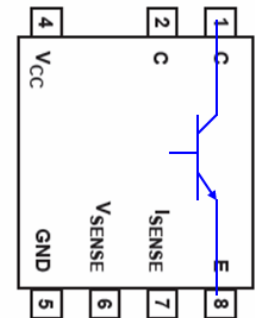
Test Condition:

$V_{in}=264V_{ac}$ ,  $I_{OUT}=0.32A$

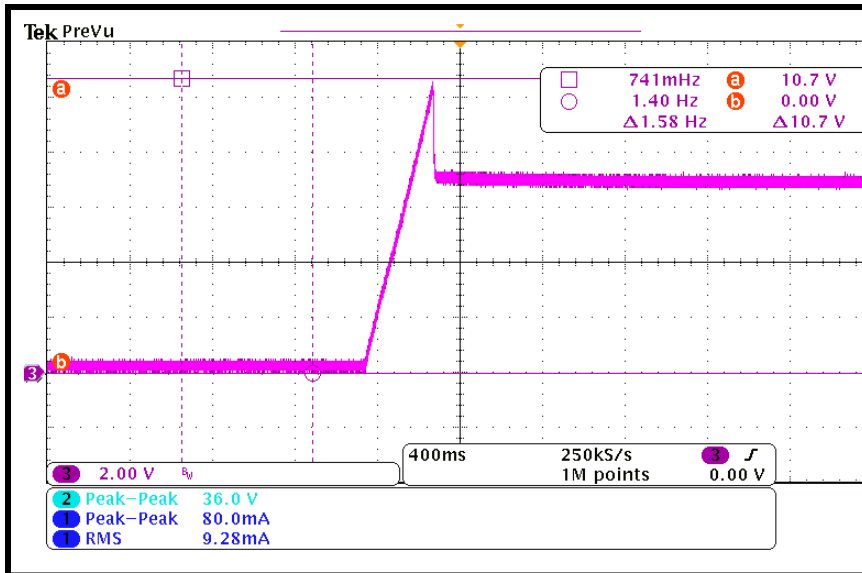
Result:

$V_{CE\_MAX}=564V$

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>BJT Section (Pin 1, Pin 2, and Pin 8)</b>						
Collector cutoff current	$I_{CB0}$	$V_{CB} = 800 V, I_E = 0 A$			0.01	mA
Collector-Emitter cutoff current	$I_{CES}$	$V_{CE} = 800 V, R_{EB} = 0 \Omega$ $T_A = 25 \text{ }^\circ\text{C}$			0.01	mA
		$V_{CE} = 800 V, R_{EB} = 0 \Omega$ $T_A = 100 \text{ }^\circ\text{C}$			0.02	
		$V_{CE} = 500 V, R_{EB} = 0 \Omega$ $T_A = 25 \text{ }^\circ\text{C}$			0.005	



# 9. V<sub>CC</sub> waveform



Test Condition:

V<sub>IN</sub>=264VAC, I<sub>out</sub>=320mA

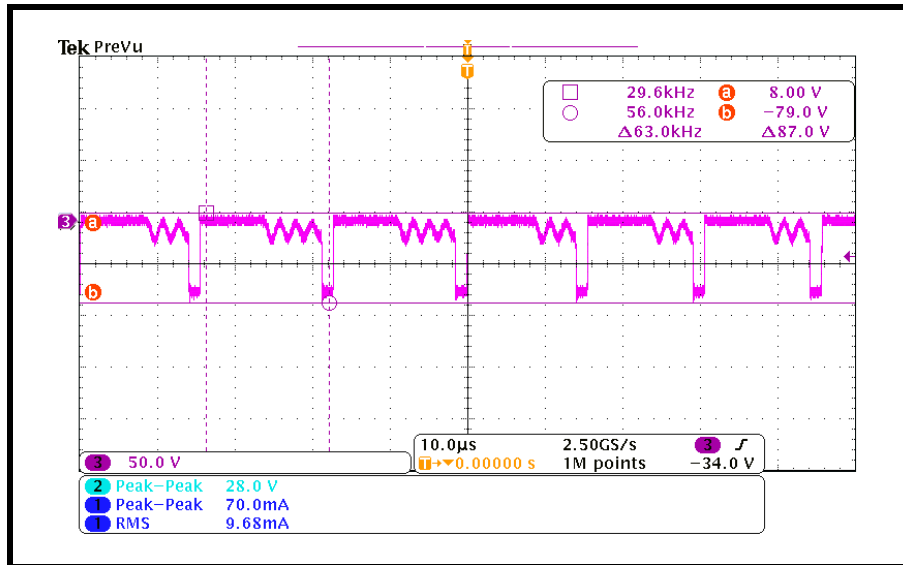
Result:

V<sub>CC</sub> MAX=10.2Vdc,

IW1810, V<sub>CC</sub> MAX=16.0Vdc.  
Min=4.1Vdc

V <sub>CC</sub> SECTION (Pin 4)						
Maximum operating voltage (Note 1)	V <sub>CC(MAX)</sub>				16	V
Start-up threshold	V <sub>CC(ST)</sub>	V <sub>CC</sub> rising	9.5	10.5	11.5	V
Undervoltage lockout threshold	V <sub>CC(UVL)</sub>	V <sub>CC</sub> falling	3.9	4.1	4.3	V
Start-up Current	I <sub>IN(ST)</sub>	V <sub>CC</sub> = 10 V		8	15	μA
Quiescent current	I <sub>CCQ</sub>	No I <sub>B</sub> current		2.5	3.5	mA
Zener breakdown voltage	V <sub>ZB</sub>	Zener current = 5 mA T <sub>A</sub> =25°C	18	19	20.5	V

# 10. $V_{diode}$ \_Output rectifier waveform



Test Condition:

$V_{IN}=264VAC$ ,  $I_{out}=320mA$

Result:

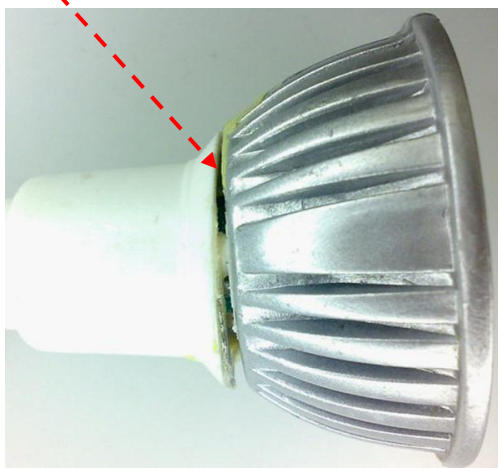
$V_R (pk-pk)=87V$

Output rectifier diode: SS210, 2A, 100V

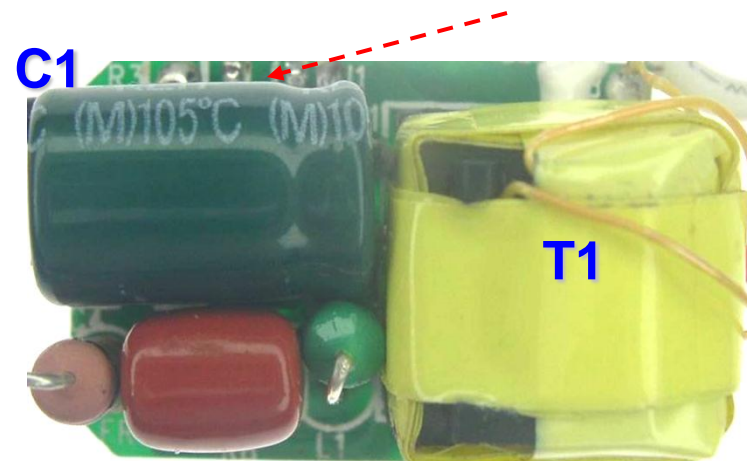
# 11. Thermal test

Component s	Input 90Vac	Tem_Rise	Input 264Vac	Tem_Rise
IC IW1810	88.2 °C	65.1	91.1 °C	66.9
C1 , 6.8uF/400V	73.4°C	50.3	76.6 °C	52.4
C7, Film cap	72.2°C	49.1	75.2°C	51.0
D2, Output diode	93.2°C	70.1	97.3°C	73.1
BD1, MB8S	62.5°C	39,4	67.2°C	43.0
T1 , EE10	85.3 °C	62.2	88.2 °C	64
Heat sink	51.2°C	28.1	51.2°C	27
Ambient	23.1 °C		24.2 °C	

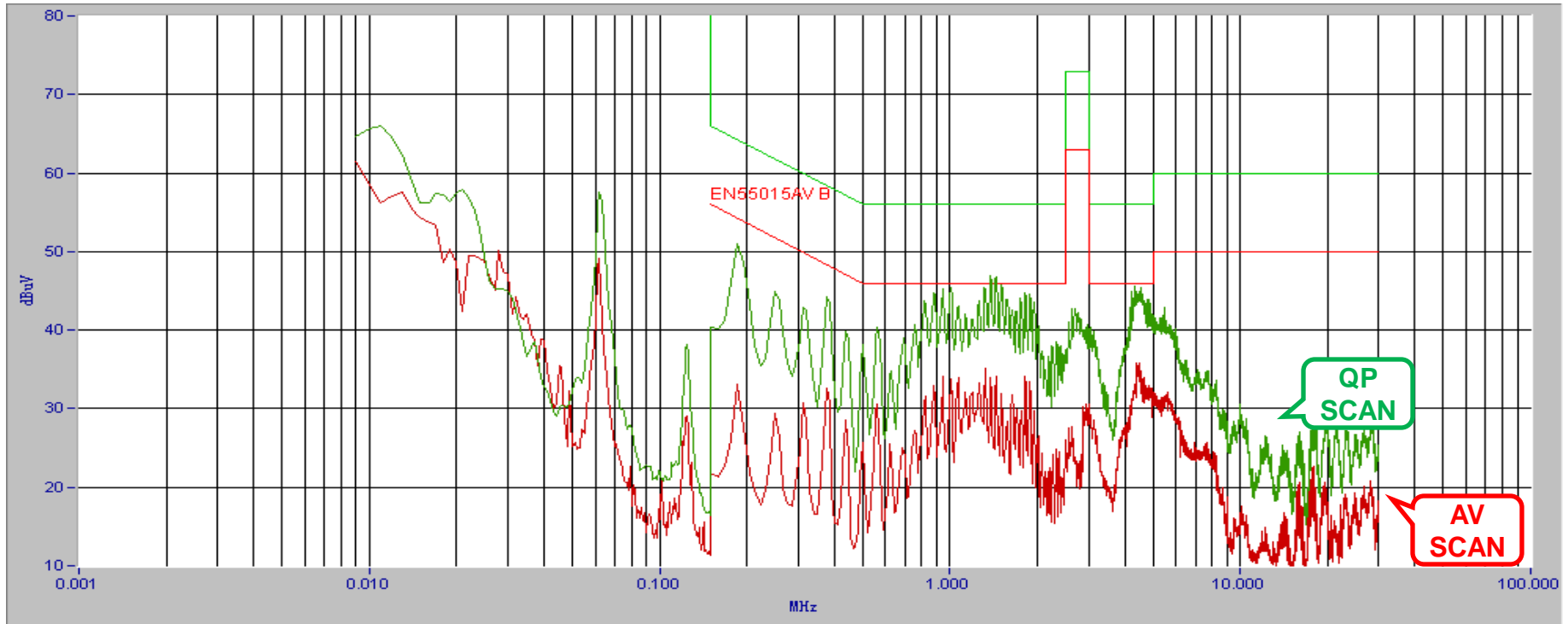
Put LED drive inside the case



1810 is under the E-cap with thermal silica on the case

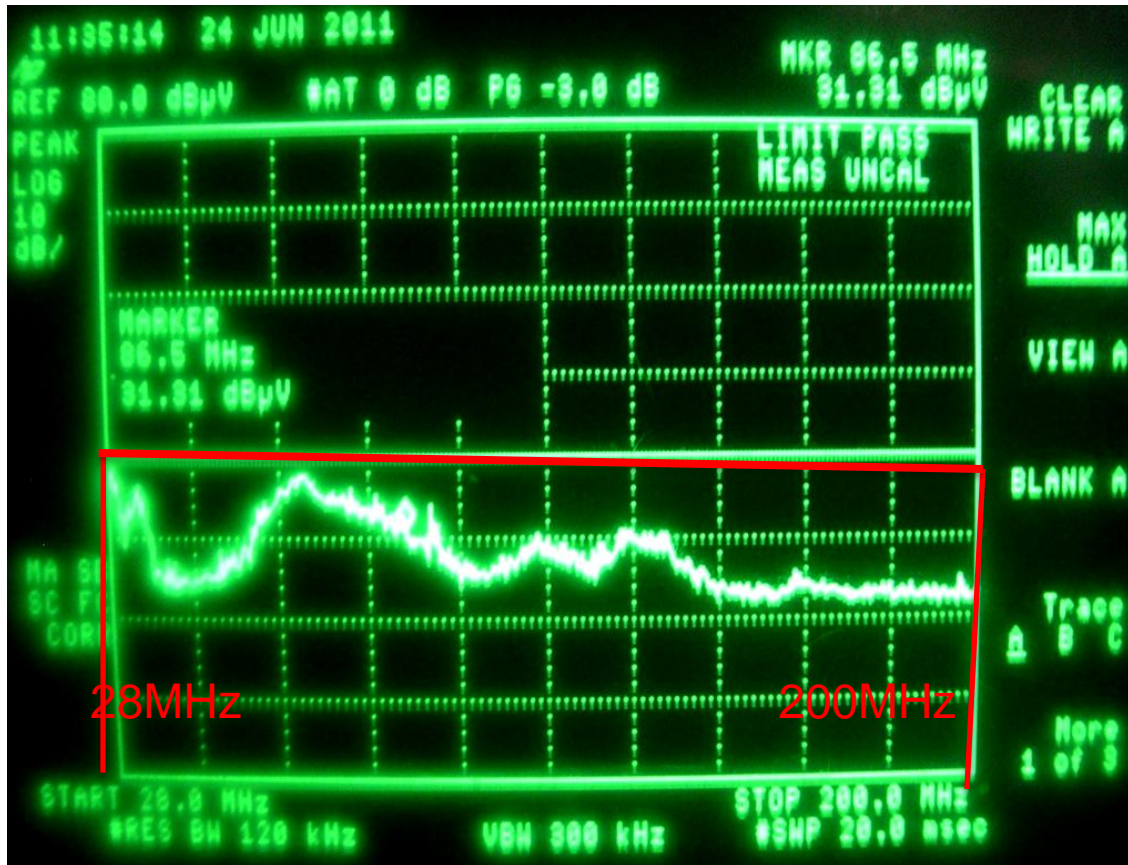


# 13. Conducted EMI (EN55015 Input 230V)



230V/50Hz,3LEDS,320mA scan L

## 12. Radiated EMI ( Input 230Vac)



Input 230vac 50Hz  
3LEDS,320mA