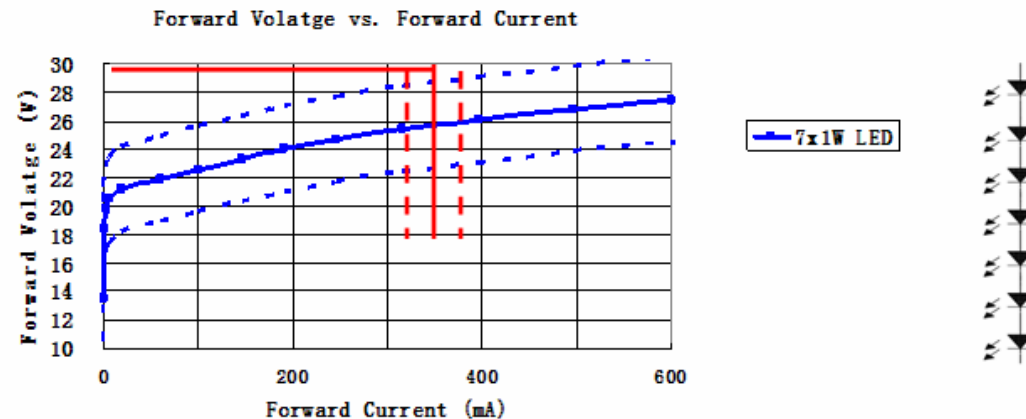




Introduce iWatt Digital Power Control Technology For HB LED

- **Tight CC Regulation – Accuracy between +/- 5%**

Typical and Maximum / Minimum V-I Characteristic of 7 X1W LED



- **High Efficiency**
- **Protections – Line UV, OV, Output Short / Open, OTP**
- **Hi power density**

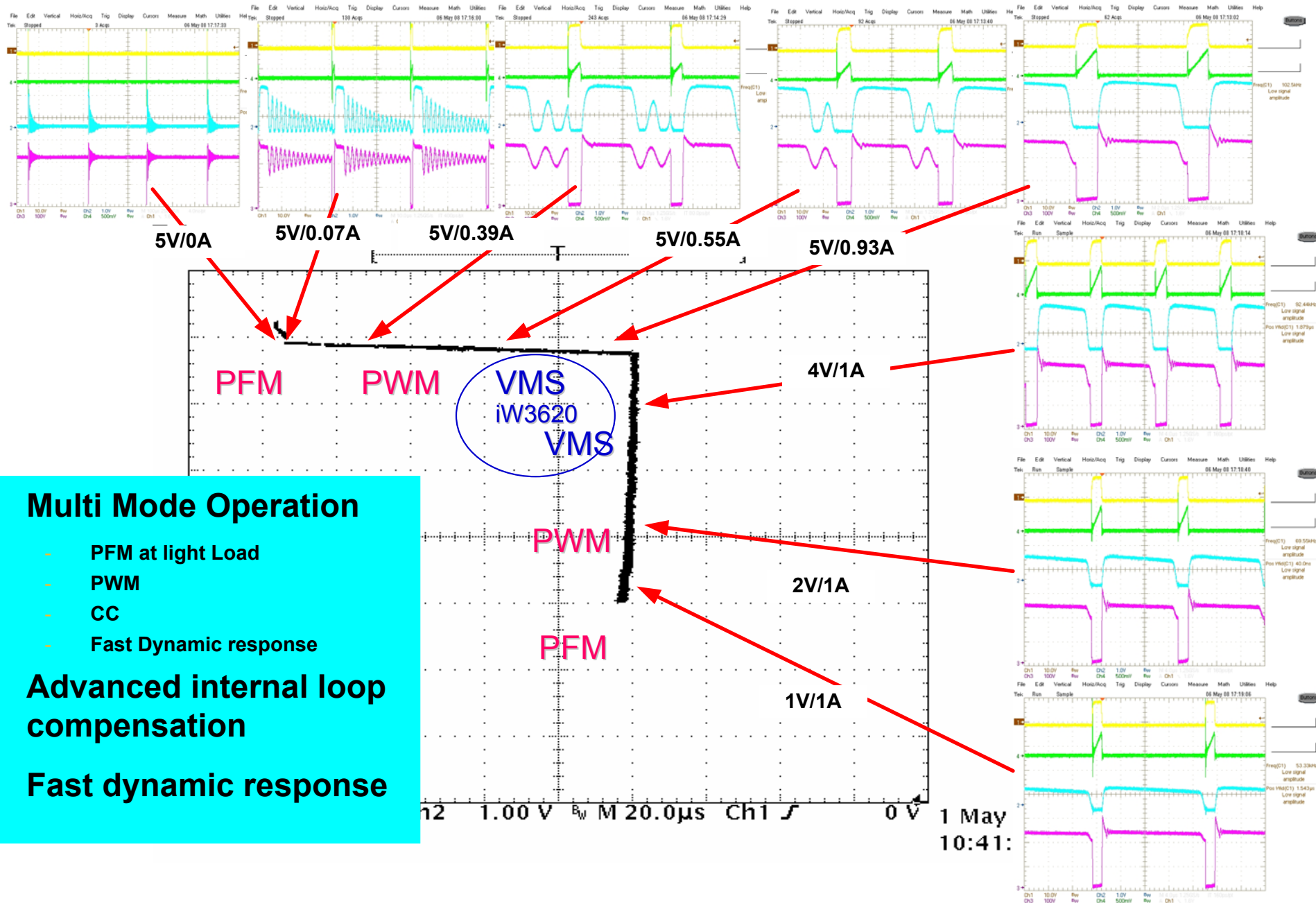
- **Line isolation & Hi-pot test – Meet IEC60968&IEC61347**
- **EMC requirement – Meet EN55015B (QP & AV scan)**
- **PF and Harmonic current**
- **Reliability & High MTBF**

iWatt Digital Power Solutions for PSU with CC CV Mode



- The first company to release Digital Power Control IC for ac/dc offline
 - *iW1689, iW1692, iW1690, iW1696, iW1691 iW1710, iW3620 , 3610*
- Provide Total-System-Solution for low-power adapter charger at low-cost high-performance
 - Patented digitally primary-feedback control technology with Tight CV regulation
 - Patented CC regulation with primary-feedback
 - No Opto, No TL431, No current sensor, No secondary control circuits
- Multi-layer advanced protection features
 - Isense short protection and other single-point fault protections
 - Brown-out / recovery
 - OVP, UVP, short circuit

Intelligent Multi-Mode Operation



- **Multi Mode Operation**
 - PFM at light Load
 - PWM
 - CC
 - Fast Dynamic response
- **Advanced internal loop compensation**
- **Fast dynamic response**

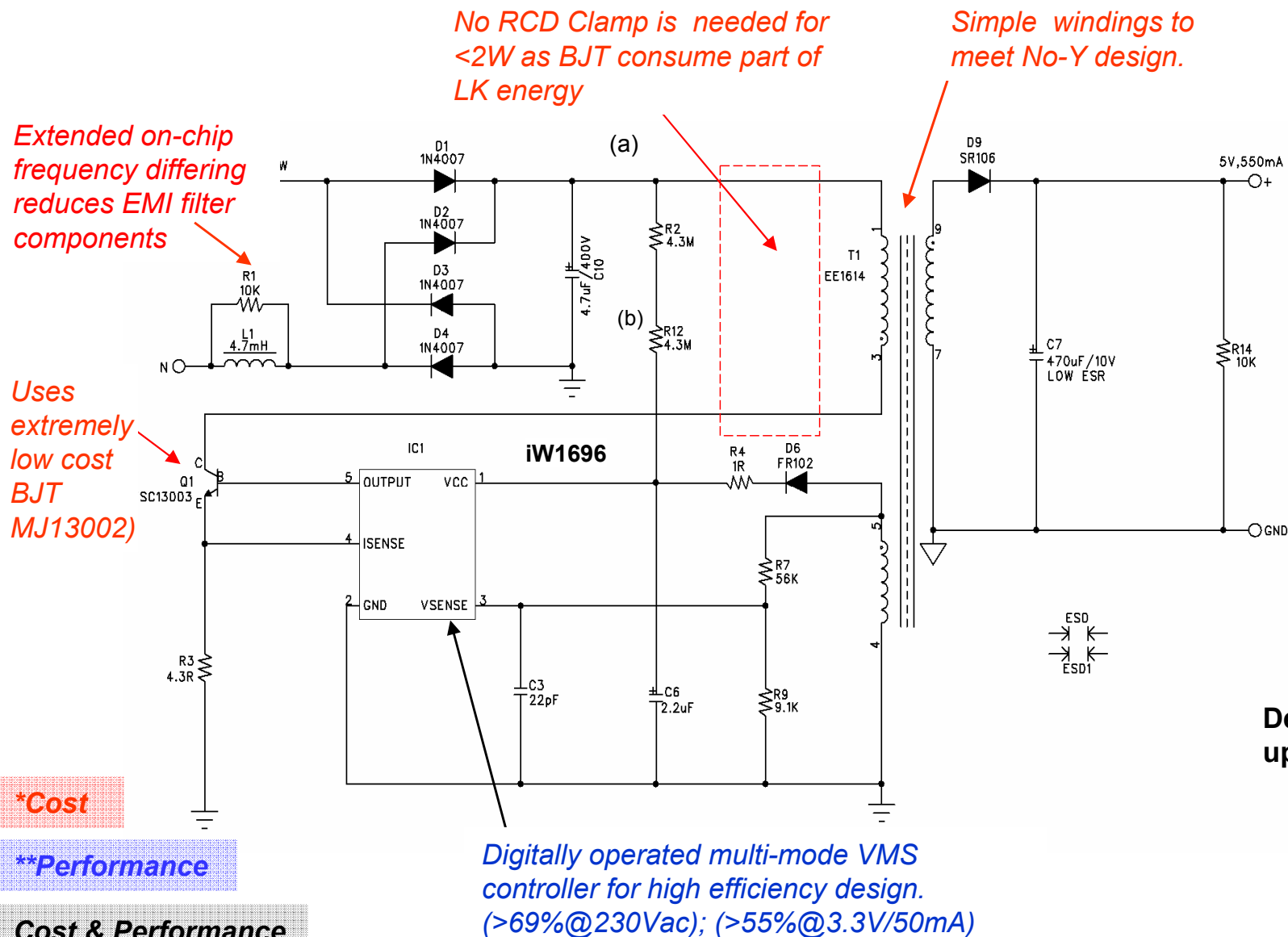
What's the benefit to you?

- Lower cost, Lower component count
- Smaller Size
- Better Performance
- More Reliability
 - Multi-layer single fault protection
 - Active OVP
 - Active short circuit
- More Green
 - High Efficiency > 83% (5W LED Driver)
- Easy to manufacture

iWatt Digital Power LED Lighting Driver Selection Guide

	Non-Dimmable			Dimmable
Applications	<3W	<10W	Up to 45W	Up to 25W
	Low-power Low-cost Small-size	Low-cost	High-power High-density High PF	High-Power Dimmable High-h
	MR16, GU10	PAR20, T8, T12	PAR38, T12	PAR20, PAR38
Part Numbers	iW1696	iW1692	iW3620	iW3610
Features				
Switching Frequency	45kHz	40kHz	up to 130kHz	up to 200kHz
Package	SOT23-5	SOT-23-6	SOIC8	SOIC8
Efficiency	>65%	>65%	>85%	> 85%
Power Factor		>0.85, SEPIC	>0.85,SEPIC	>0.8
Isolated	Yes	Yes	Yes	Yes
Primary-feedback, No-opto	Yes	Yes	Yes	Yes
Dimming Features				
Dimmer type				Leading Trailing No-dimmer unsupport dimmer
Dimming scheme				Hybrid
Dimming range				1% ~100%
Product Status	MP	MP	MP	MP

iW1696 (NEW) for 1-3W LED ---- Probably lowest cost available..



Output Performance :

Better than $\pm 1.5\%$ load and line regulation.

*Non Line voltages
dependence OCP
protection.*

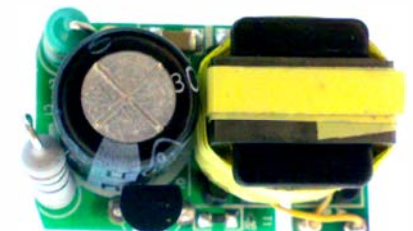
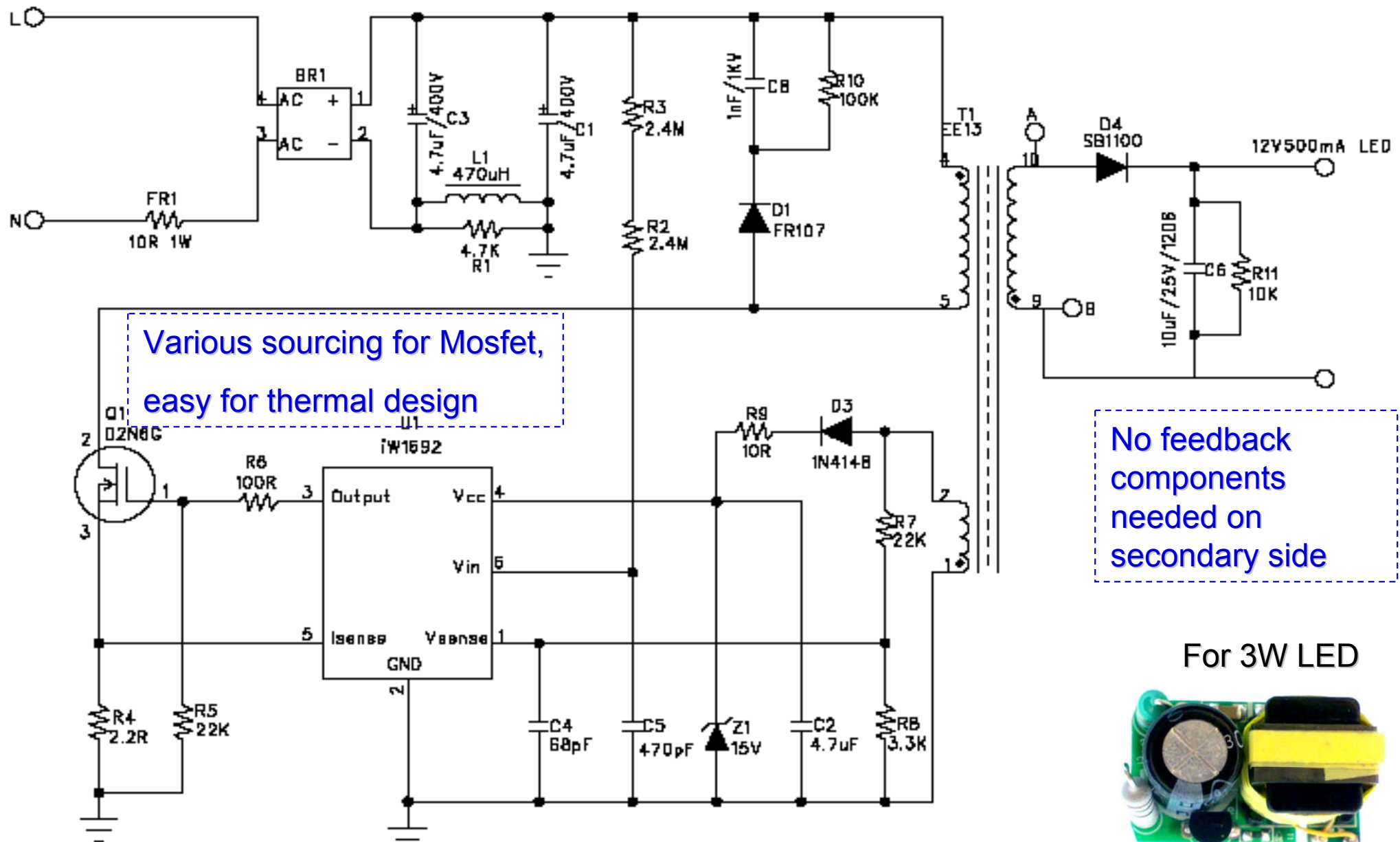
*Embedded Secondary
real-time OVP protection
eliminate external Zener
and voltage margin
needed for O/P cap.*

**Demo-Board available
upon request (1-2W)**



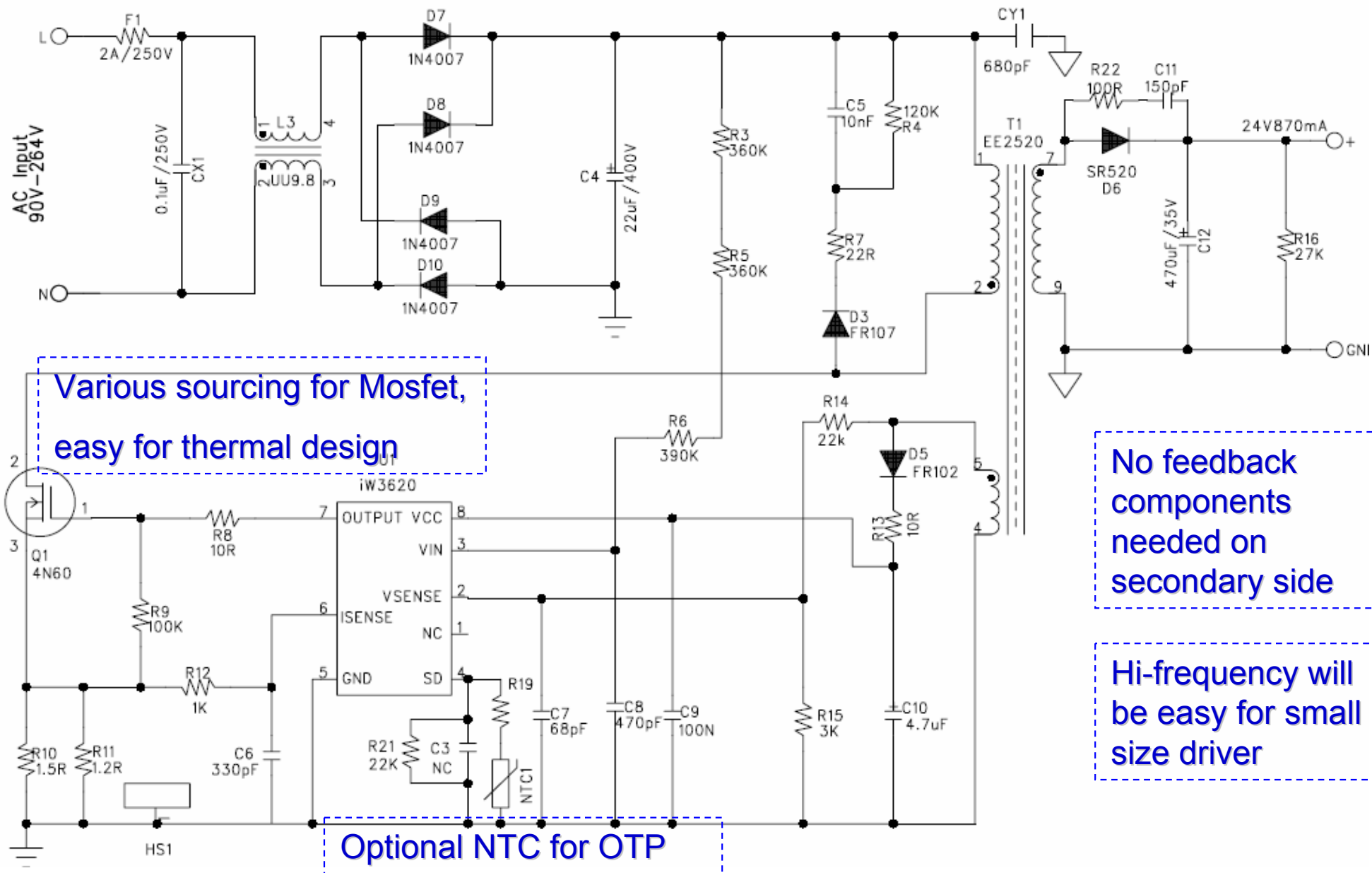
iW1692 for 1-15W HB LED **Compact** solution

iWatt



iW3620 for 5-30W HB LED__Hi-efficiency

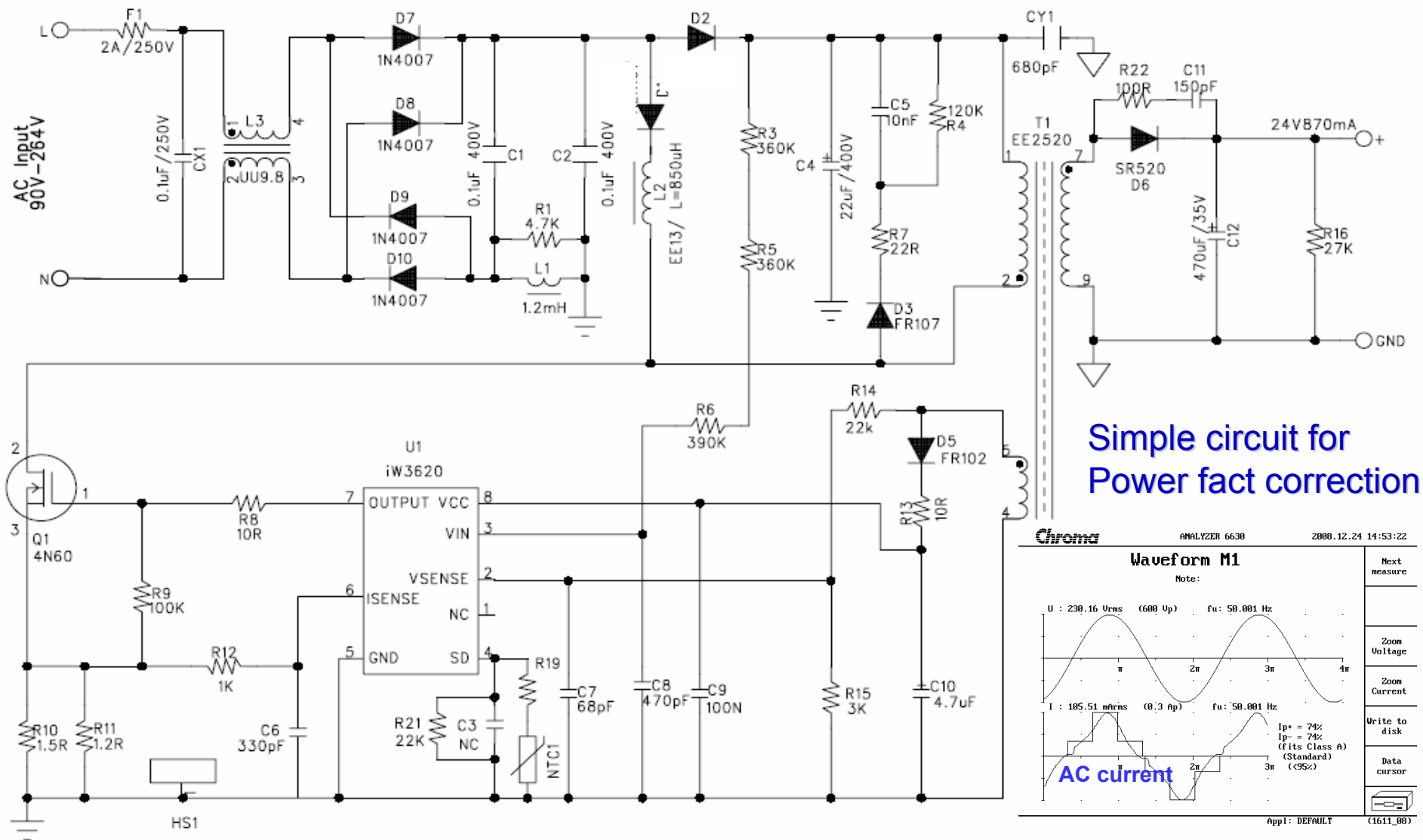
iWatt



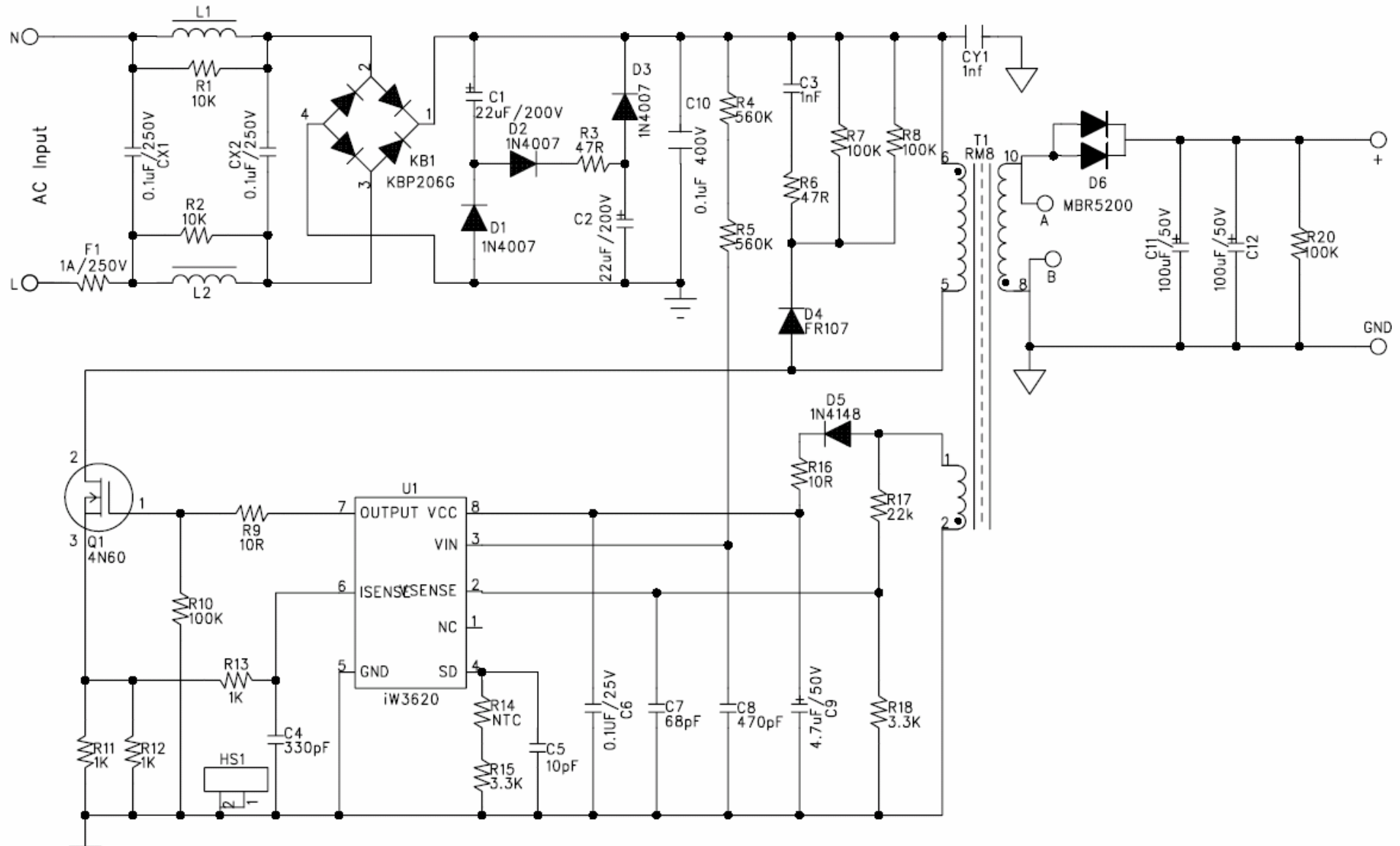
iW3620 for 5-20W LED driver Hi-Power Fact

iWatt

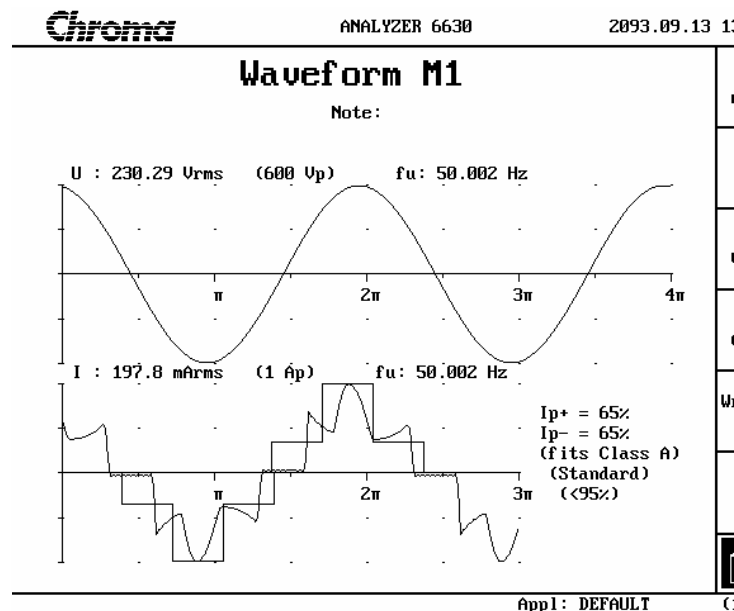
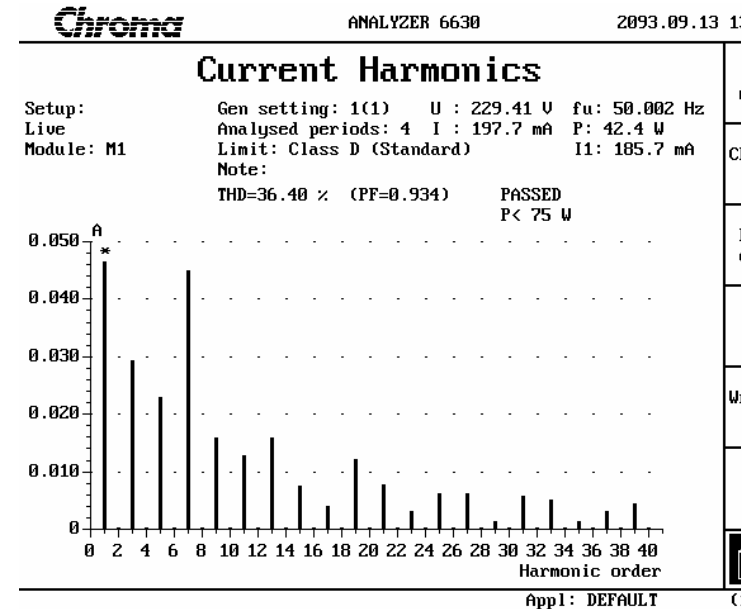
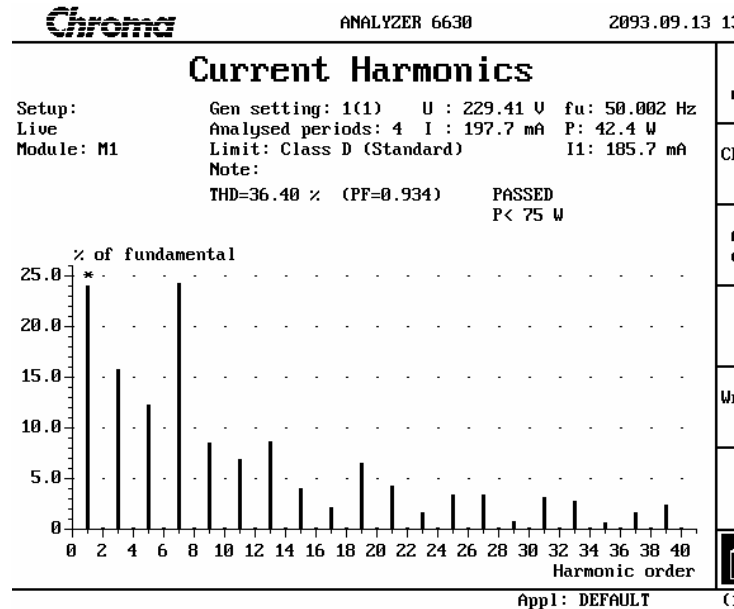
■ Active PFC with iW3620



__Filling-valley PFC



___Filling-valley PFC



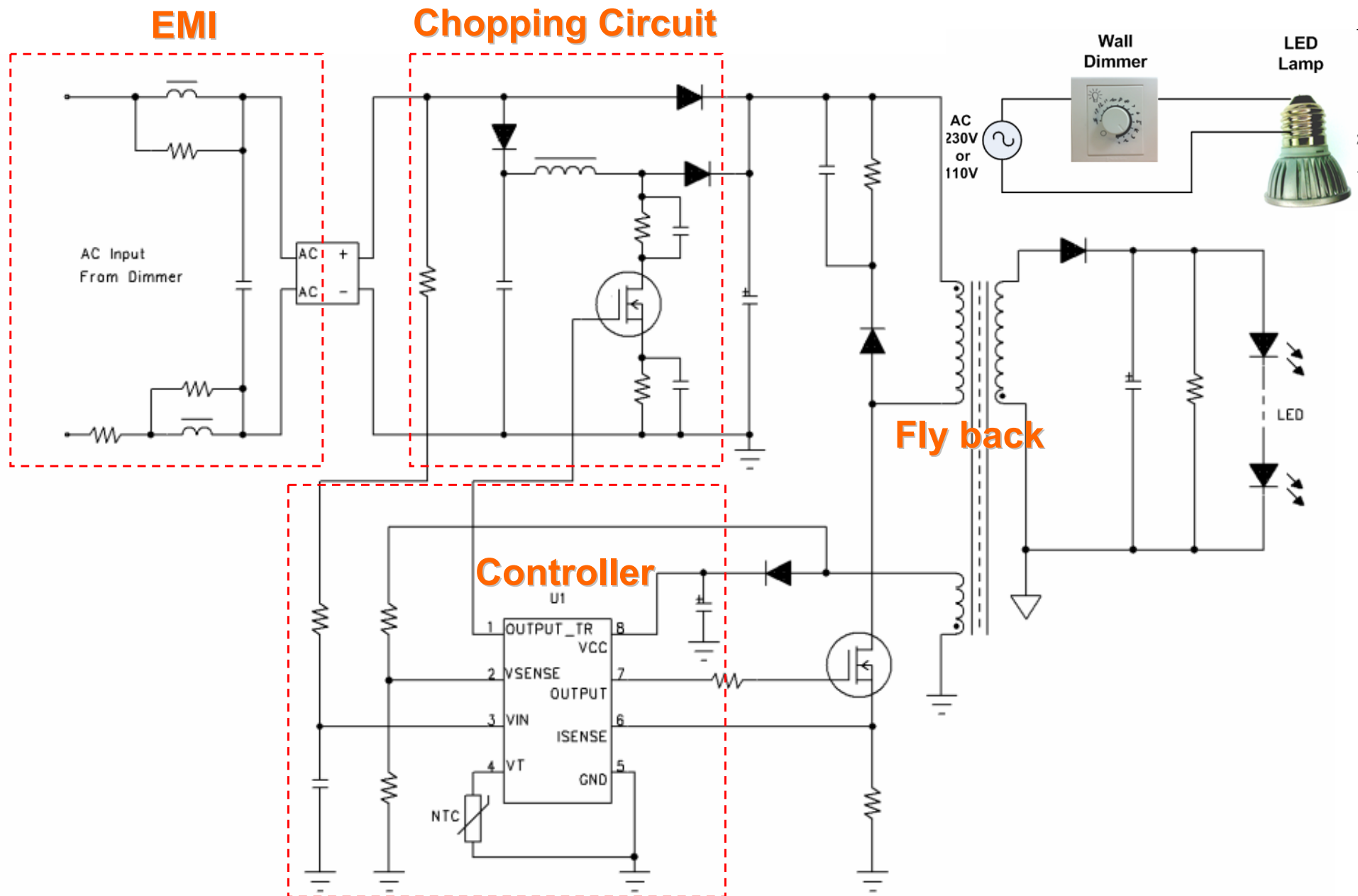
Vin_230V PF=0.93

Harmonic_3rd 15% 5th 25%

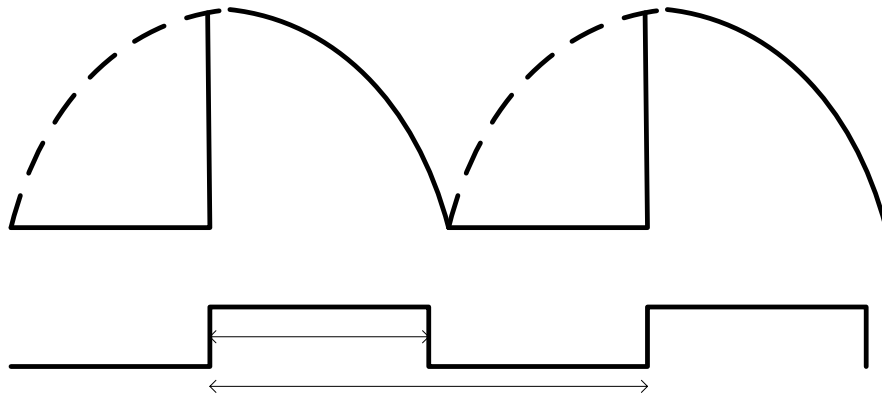
___IEC61000-3-2 requirement---- 3rd <86% 5th <61%

Overview iW3610 Simplified Schematic

iWatt



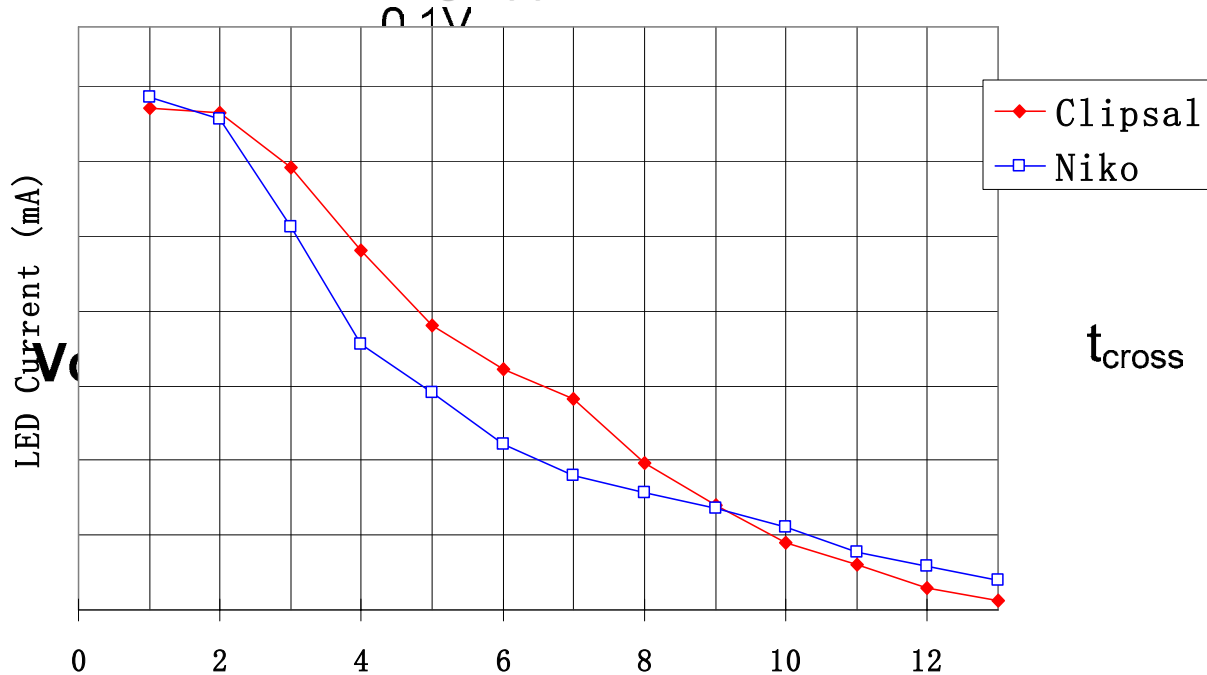
Dimmer Phase measurement and Mapping out



$$\text{Dimmer_phase} = \frac{T_{\text{cross}}}{T_{\text{period}}}$$

$$D_ratio = \text{Dimmer_phase} \times K1 - K2$$

Dimming Applications lines



Adjust the Amplitude of Peak Current Sense voltage

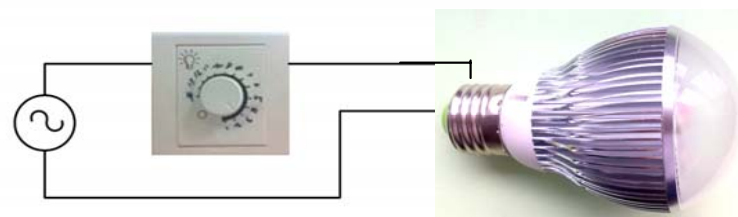
LED Current

iWatt Production Ready Driver List – Dimmable (Sep'09)



iWatt Demo	iWatt Device used	Lamp type	AC Input (Vac)	Output power (no. of LED)	Isolated	CC range and Tolerance (+/-%)	No-load Vout	PF or Harmonic Current	Transformer & Form factors (LxWxH) mm	Detail (pg)
E27 Bulb & PAR lamp - Dimmable										
EBC861	iW3610	E27 Bulb	100-120	1W x4	YES	400mA@5%	14V	Meet Harmonic	EE13 (51x25x17)	
EBC862	iW3610	E27 Bulb	220-240	1W x4	YES	400mA@5%	14V	Meet Harmonic	EE13 (51x25x17)	
EBC863	iW3610	E27 Bulb	100-120	1W x5-6	YES	350mA@5%	18V	Meet Harmonic	RM6 (56x25x17)	
EBC864	iW3610	E27 Bulb	220-240	1W x5-6	YES	350mA@5%	18V	Meet Harmonic	RM6 (56x25x17)	
EBC865	iW3610	E27 PAR	100-120	3W x6	YES	700mA@5%	21V	Meet Harmonic	PQ2016(75x30x20)	
EBC866	iW3610	E27 PAR	220-240	3W x6	YES	700mA@5%	21V	Meet Harmonic	PQ2016(75x30x20)	
EBC867	iW3610	E27 PAR	100-120	1W x10	YES	350mA@5%	38V	Meet Harmonic	PQ2016(75x30x20)	
EBC868	iW3610	E27 PAR	220-240	1W x10	YES	350mA@5%	38V	Meet Harmonic	PQ2016(75x30x20)	

Dimmable LED driver for Bulb lighting_iW3610



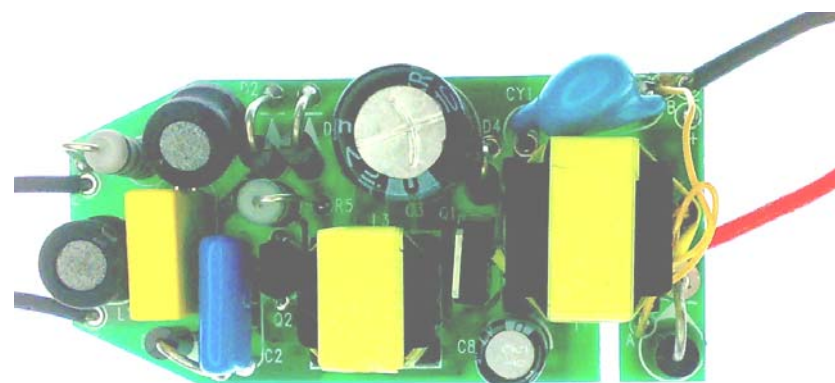
EBC861: LED 4X1W (iW3610)

Input: 90V-132V; Output: 15V, CC@ 400mA

EE13 transformer, CC tolerance +/-5%

Efficiency 80%; Isolated ; meet EMI

PF: 0.7-0.9 , harmonic meet IEC61000-3-2 Class C



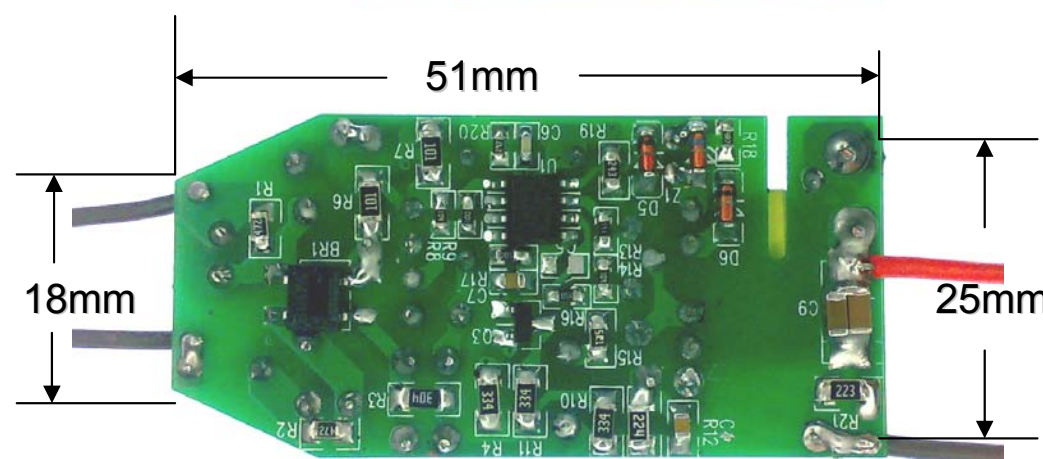
EBC862: LED 4X1W (iW3610)

Input: 185V-264V; Output: 15V, CC@ 400mA

EE13 transformer, CC tolerance +/-5%

Efficiency 80%; Isolated ; meet EMI

PF 0.7-0.9 , harmonic meet IEC61000-3-2 Class C



Dimmable LED driver for Bulb lighting_iW3610

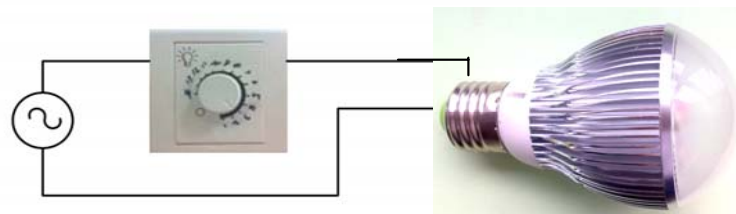
EBC863: LED 6X1W (iW3610)

Input: 90V-132V; Output: 18V, CC@ 350mA

RM6 transformer, CC tolerance +/-5%

Efficiency 81%; Isolated ; meet EMI

PF: 0.7-0.9 , harmonic meet IEC61000-3-2 Class C



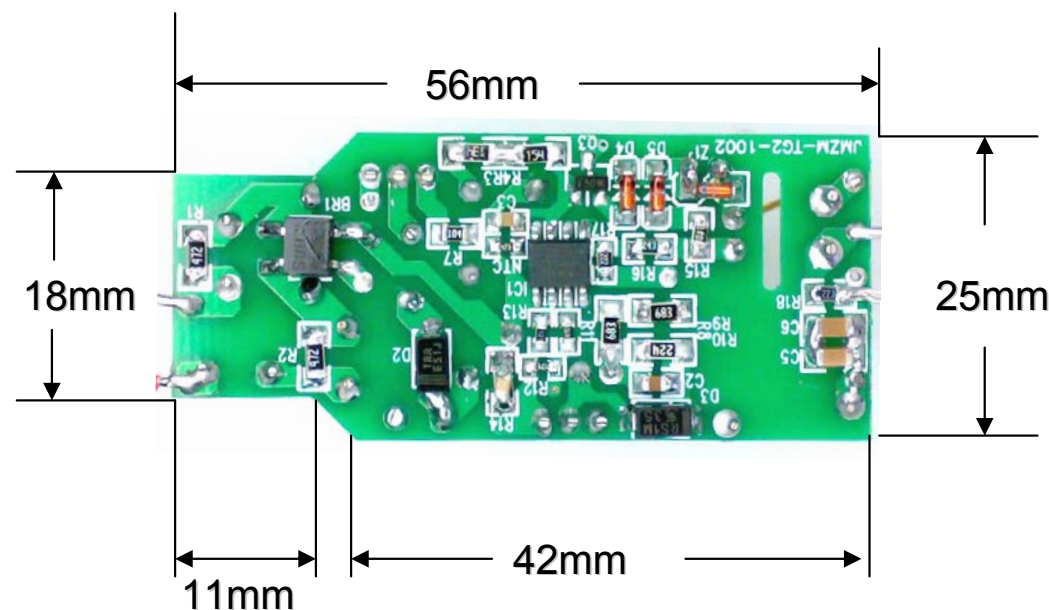
EBC864: LED 6X1W (iW3610)

Input: 185V-264V; Output: 21V, CC@ 350mA

RM6 transformer, CC tolerance +/-5%

Efficiency 81%; Isolated ; meet EMI

PF 0.7-0.9 , harmonic meet IEC61000-3-2 Class C



Dimmable LED driver for PAR38_iW3610

EBC865: LED 6X3W (iW3610)

Input: 90V-132V; Output: 21V, CC@ 700mA

PQ2016 transformer, CC tolerance +/-5%

Efficiency 83%; Isolated ; meet EMI

PF>0.7 , harmonic meet IEC61000-3-2 Class C

EBC866: LED 6X3W (iW3610)

Input: 185V-264V; Output: 21V, CC@ 700mA

PQ2016 transformer, CC tolerance +/-5%

Efficiency 83%; Isolated ; meet EMI

PF>0.7 , harmonic meet IEC61000-3-2 Class C

EBC867: LED 12X1W (iW3610)

Input: 90V-132V; Output: 40V, CC@ 350mA

PQ2016 transformer, CC tolerance +/-5%

Efficiency 85%; Isolated ; meet EMI

PF>0.7 , harmonic meet IEC61000-3-2 Class C

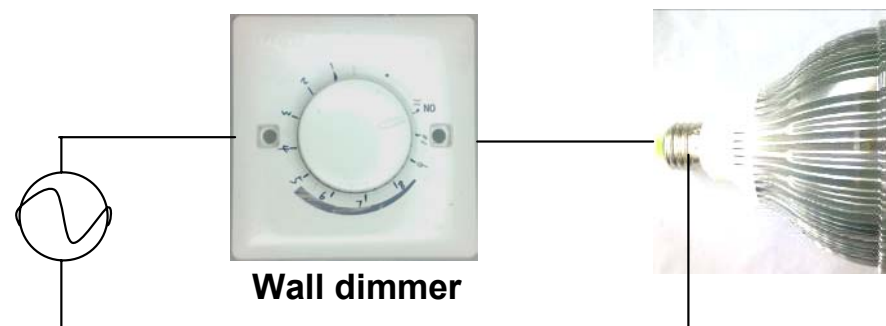
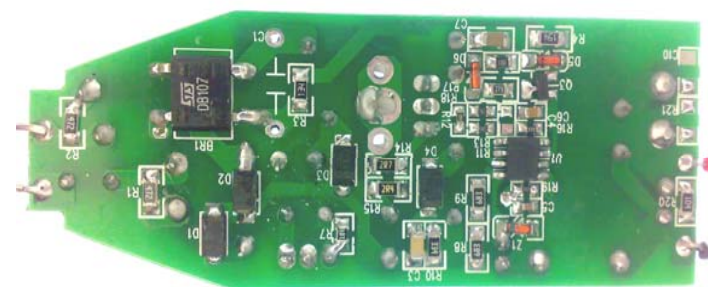
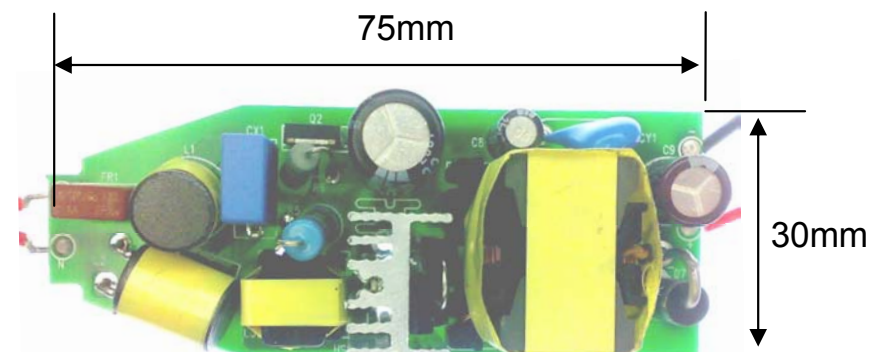
EBC868: LED 12X1W (iW3610)

Input: 185V-264V; Output: 40V, CC@ 350mA

PQ2016 transformer, CC tolerance +/-5%

Efficiency 83%; Isolated ; meet EMI

PF>0.7 , harmonic meet IEC61000-3-2 Class C



iWatt Production Ready Driver List – Non Dimmable (Sep'09)



iWatt Demo	iWatt Device used	Lamp type	AC Input (Vac)	Output power (no. of LED)	Isolated	CC range and Tolerance (+/-%)	No-load output voltage	PF or Harmonic Current	Transformer & Form factors (LxWxH) mm	Detail (pg)
General mounting - non dimmable										
EBC830	iW1696-00	E26 GU10	90-264	3W x1	YES	700mA@5%	5V	No	EE13 (25x16x17)	
EBC831	iW1696-00	E26 GU10	90-264	1W x3	YES	350mA@5%	12V	No	EE13 (25x16x17)	
EBC832	iW1696-00	E14 GU10	90-264	3W x1	YES	700mA@5%	5V	No	EPC13 (24x15x13)	
EBC833	iW1696-00	E14 GU10	90-264	1W x3	YES	350mA@5%	12V	No	EPC13 (24x15x13)	
EBC839	iW1696-00	External case	90-264	3W x1	YES	700mA@5%	5V	No	EE13 (25x25x17)	
EBC840	iW1696-00	External case	90-264	3W x1	YES	700mA@5%	5V	No	EE13 (25x25x17)	
EBC834	iW3620	PAR Lamp	90-264	2W x3	YES	500mA@5%	12V	No	EFD15 (D355, H13)	
EBC835	iW3620	PAR Lamp	90-264	5W x1	YES	350mA@5%	18V	No	EFD15 (D35, H13)	
EBC836	iW3620	External case	90-264	3W x7	YES	870mA@5%	24V	Meet Harmonic	PQ2620(132X34x25)	
EBC837	iW3620	PAR Lamp	90-264	1W x7	YES	350mA@5%	24V	No	EE1916 (48X35X25)	
EBC838	iW3620	PAR Lamp	90-264	3W x3	YES	700mA@5%	12V	No	EE1916 (48X35X25)	
EBC841	iW3620	PAR Lamp	90-264	3W x10	YES	700mA@5%	42V	Meet Harmonic	RM8 (55x22x25)	
EBC842	iW3620	PAR Lamp	90-264	1W x15	YES	350mA@5%	55V	Meet Harmonic	RM8 (55x22x25)	
EBC845	iW3620	PAR Lamp	90-264	3W x7	YES	700mA@5%	24V	No	EE2520(126x34x25)	
EBC847	iW3620	External case	90-264	1W x6	YES	350mA@5%	21V	No	EE1614(36X20X18)	
EBC848	iW3620	External case	90-264	2W x10	YES	500mA@5%	36V	Meet Harmonic	PQ2620(78x50x25)	
Tube Lamp - non dimmable										
EBC843	iW3620	T8 & T10	90-264	12W	YES	550mA@5%	21V	No	EE1916	
EBC844	iW3620	T8 & T10	90-264	10W	YES	350mA@5%	35V	Passive PFC	EPC17 or ER2510	
EBC846	iW3620	T8 & T10	90-264	16W	YES	450mA@5%	35V	Active PFC	EC26 or ER2510(230X19X12)	

Demo solution_ iW1696 for GU10 E27

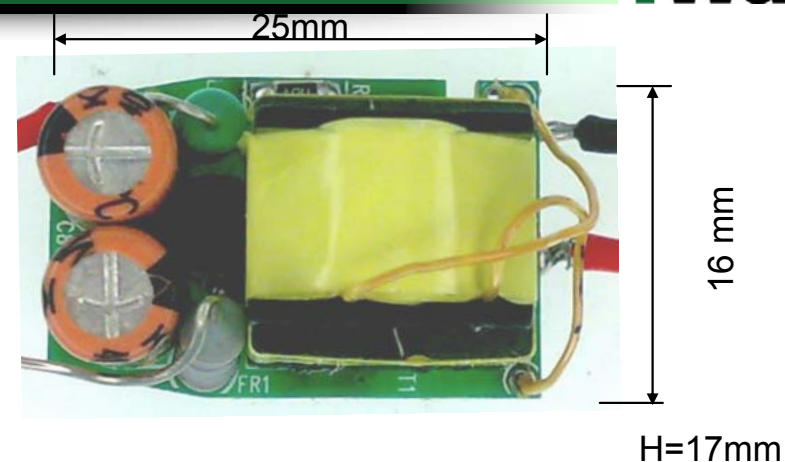
iWatt

EBC830: LED 1X3W (iW1696-00)

Input: 90V-264V; Output: 5V, CC@ 700mA

EE13 transformer, CC tolerance +/-5%

Efficiency 68%; Isolated ; meet EMI

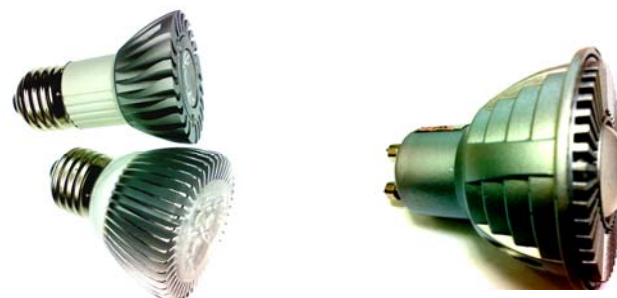


EBC831: LED 3X1W (iW1696-00)

Input: 90V-264V; Output: 12V, CC@ 350mA

EE13 transformer, CC tolerance +/-5%

Efficiency 75%; Isolated ; meet EMI



Demo solution_ iW1696 for GU10 E27

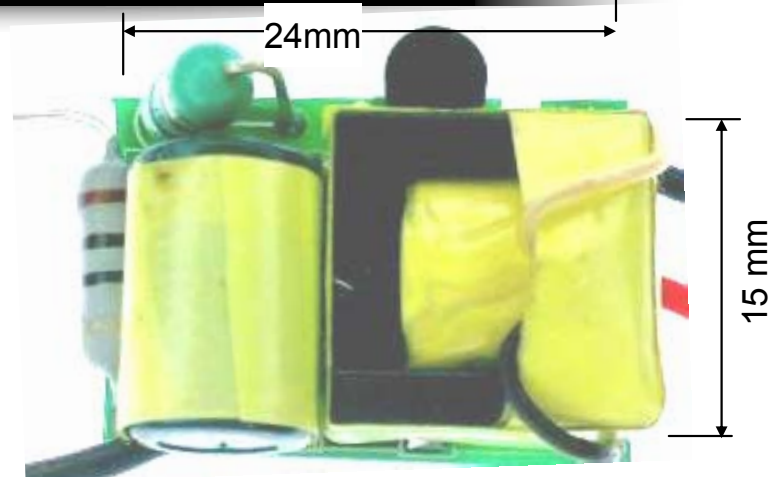
iWatt

EBC832: LED 1X3W (iW1696-00)

Input: 90V-264V; Output: 5V, CC@ 700mA

EPC13 transformer, CC tolerance +/-5%

Efficiency 65%; Isolated ; meet EMI



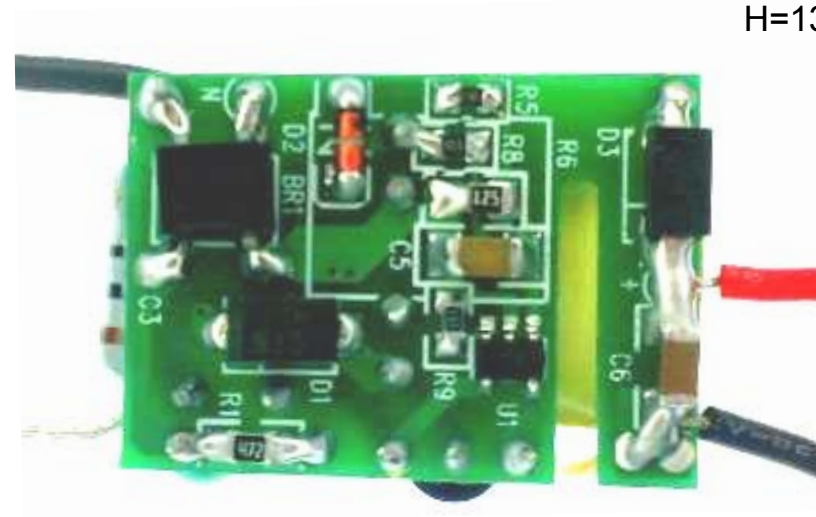
H=13mm

EBC833: LED 3X1W (iW1696-00)

Input: 90V-264V; Output: 12V, CC@ 350mA

EPC13 transformer, CC tolerance +/-5%

Efficiency 72%; Isolated ; meet EMI



GU10

E14



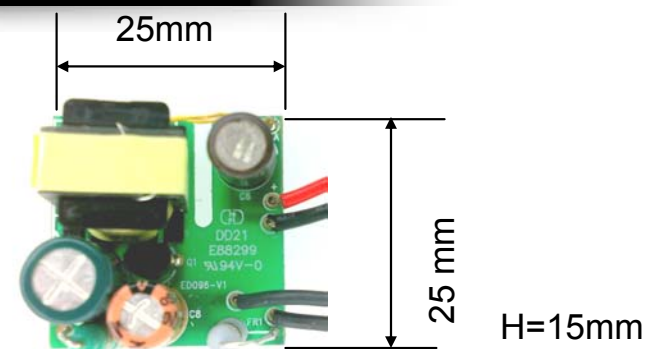
Demo solution for external LED driver

EBC839: LED 1X3W ([iW1696-00](#))

Input: 90V-264V; Output: 5V, CC@ 700mA

EE13 transformer, CC tolerance +/-5%

Efficiency 68%; Isolated ; meet EMI



EBC840: LED 3X1W ([iW1696-00](#))

Input: 90V-264V; Output: 12V, CC@ 350mA

EE13 transformer, CC tolerance +/-5%

Efficiency 75%; Isolated ; meet EMI

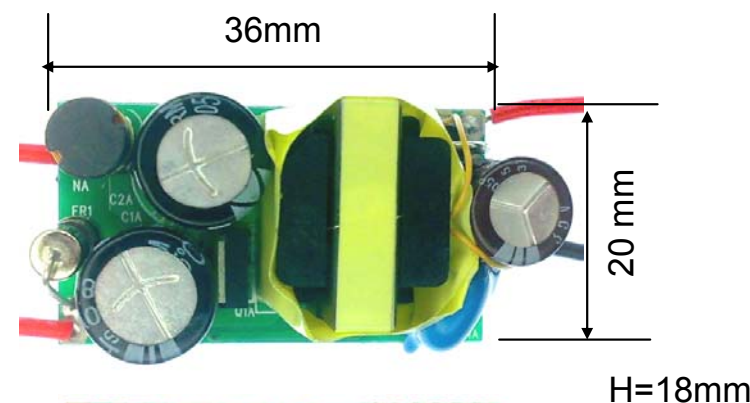


EBC847: LED 6X1W ([iW3620](#))

Input: 90V-264V; Output: 21V, CC@ 350mA

EE1614 transformer, CC tolerance +/-5%

Efficiency 80%; Isolated ; meet EMI

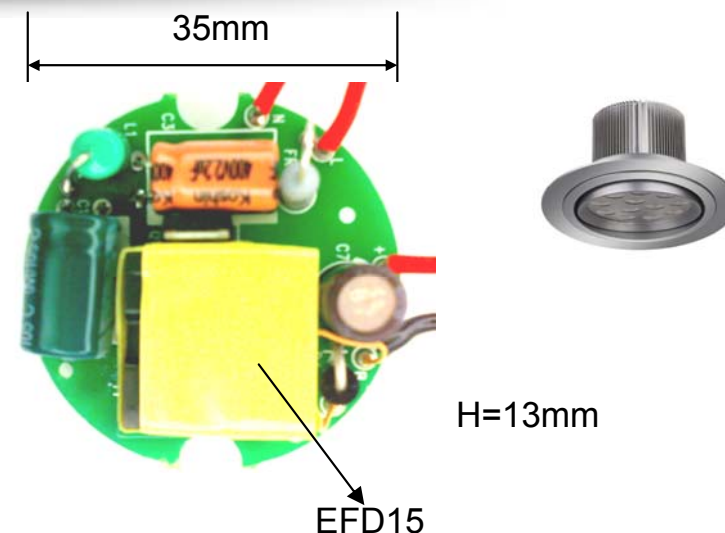


Demo solution_ iW3620 for Down light

EBC834: LED 3X2W (iW3620)

Input: 90V-264V; Output: 12V, CC@ 500mA

**EFD15 transformer, CC tolerance +/-5%
Efficiency 81%; Isolated ; meet EMI**



EBC835: LED 5X1W (iW3620)

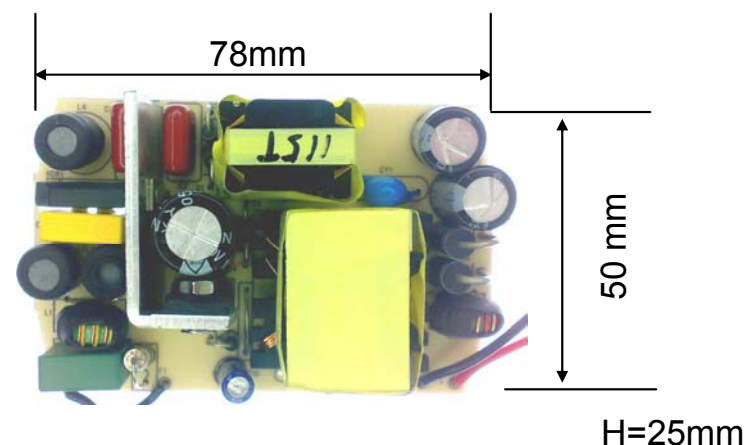
Input: 90V-264V; Output: 18V, CC@ 350mA

**EFD15 transformer, CC tolerance +/-5%
Efficiency 83%; Isolated ; meet EMI**

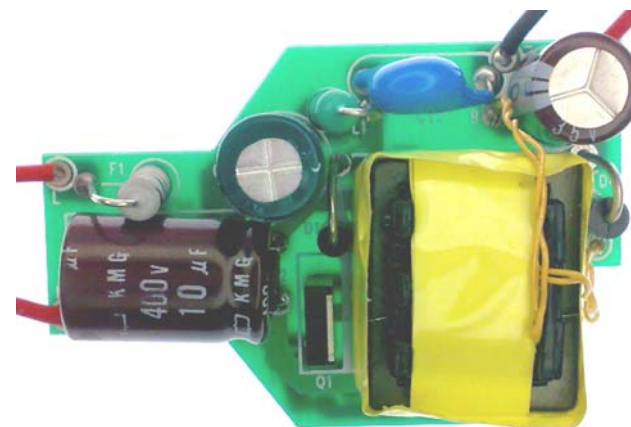
EBC848: LED 10X2W (iW3620)

Input: 90V-264V; Output: 36V, CC@ 500mA

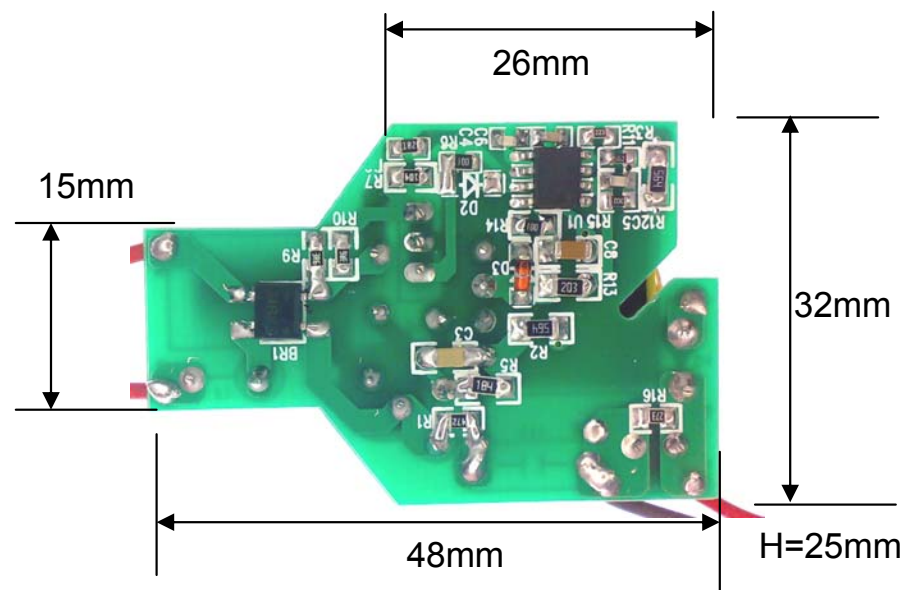
**PQ2620 transformer, CC tolerance +/-5%
Efficiency 85%; Isolated ; meet EMI
Hi PF and low harmonic**



EBC837: LED 7X1W (iW3620)
Input: 90V-264V; Output: 24V, CC@ 350mA
EE1916 transformer, CC tolerance +/-5%
Efficiency 82%; Isolated ; meet EMI



EBC838: LED 3X3W (iW3620)
Input: 90V-264V; Output: 12V, CC@ 700mA
EE1916 transformer, CC tolerance +/-5%
Efficiency 80%; Isolated ; meet EMI



PAR 30

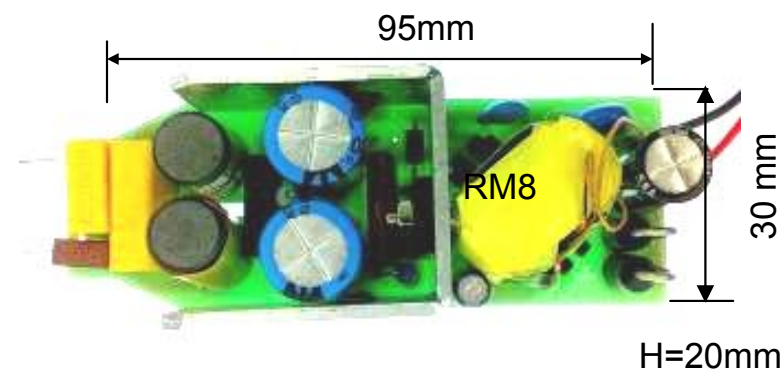
EBC841: LED 10X3W (iW3620)

Input: 90V-264V; Output: 45V, CC@ 700mA

RM8 transformer, CC tolerance +/-5%

Efficiency 88%@230Vac ; Isolated ; meet EMI

Passive PFC ,0.85, low harmonic



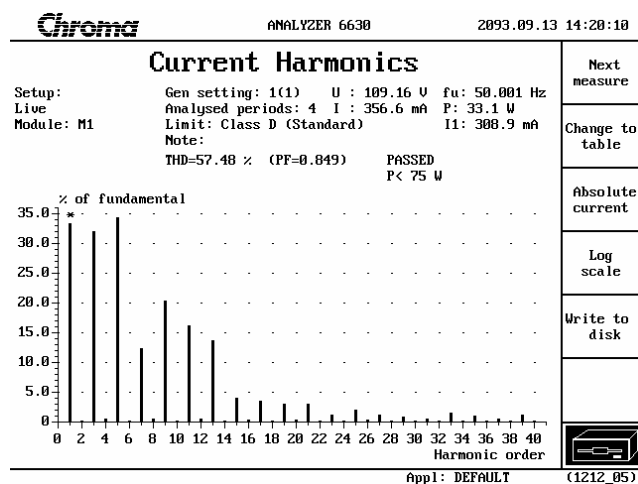
EBC842: LED 15X1W (iW3620)

Input: 90V-264V; Output: 55V, CC@ 350mA

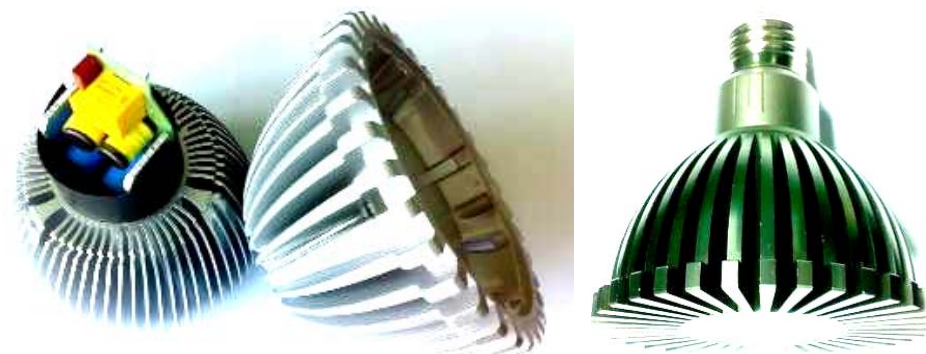
RM8 transformer, CC tolerance +/-5%

Efficiency 88%; Isolated ; meet EMI

Passive PFC ,0.85, low harmonic



PAR 38



Demo solution_ iW3620 for Tube light power supply

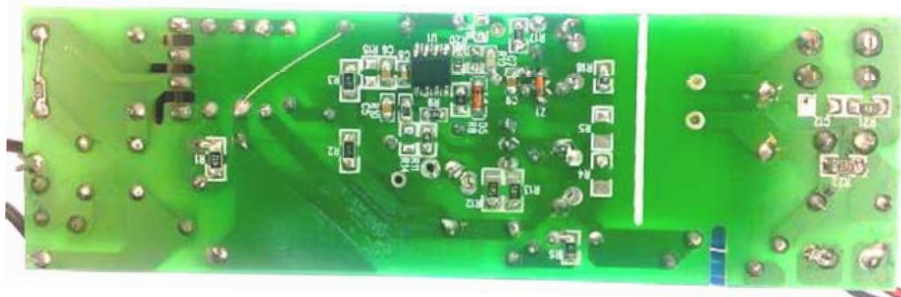
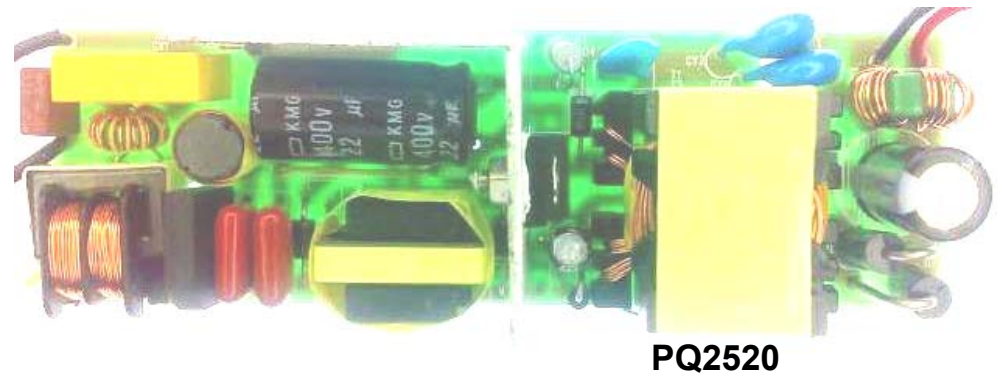
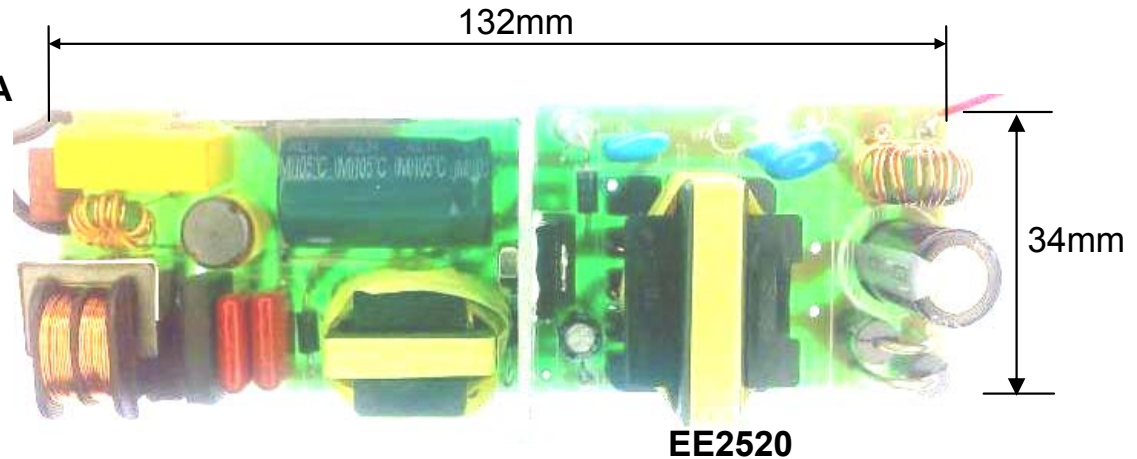
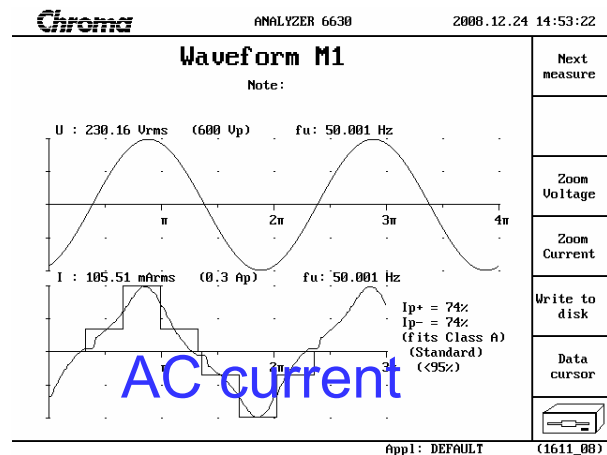
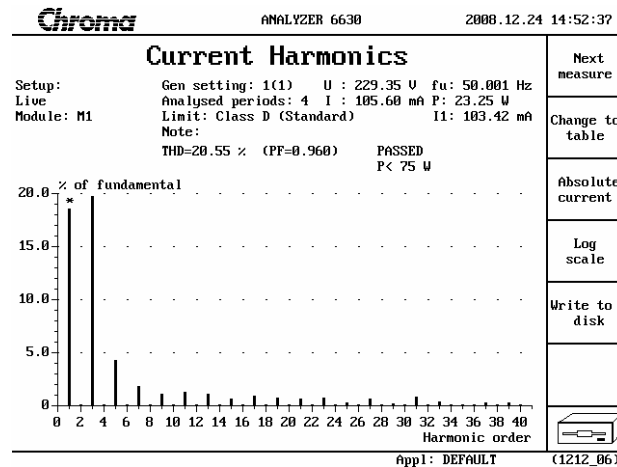
iWatt

EBC836: LED 7X3W (iW3620)

Input: 90V-264V; Output: 24V, CC@ 700mA

**EE2520/PQ2620 transformer,
CC tolerance +/-5% Efficiency 83%;
Isolated ; meet EMI**

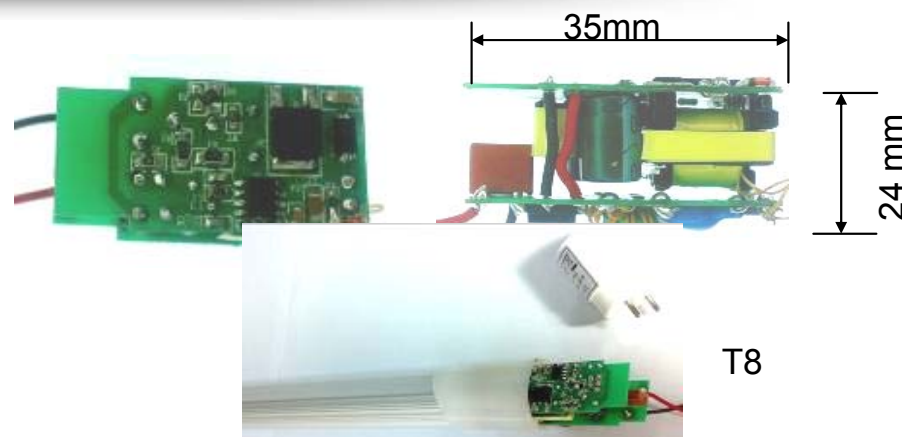
Hi PF and low harmonic



Demo solution for T8 T10 LED light

iWatt

EBC843: LED 12W (iW3620)
Input: 90V-264V; Output: 22V, CC@ 550mA
EE1916 transformer, CC tolerance +/-5%
Efficiency 83%; Isolated ; meet EMI



EBC844: LED 10W (iW3620)
Input: 90V-264V; Output: 35V, CC@ 350mA
EPC17 transformer, CC tolerance +/-5%
Efficiency 84%; Isolated ; meet EMI
Passive PFC, 0.82



EBC846: LED 18W (iW3620)
Input: 90V-264V; Output: 35V, CC@450mA
Options transformer design for 28V, CC@ 500mA
Options transformer design for 63V, CC@ 320mA
EC26 (ER2510)transformer,
CC tolerance +/-5% Efficiency 83%;
Isolated ; meet EMI
Active PFC, 0.9, Low harmonic



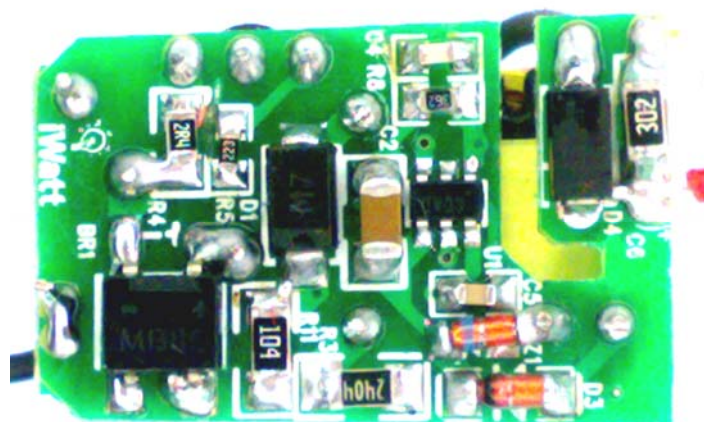
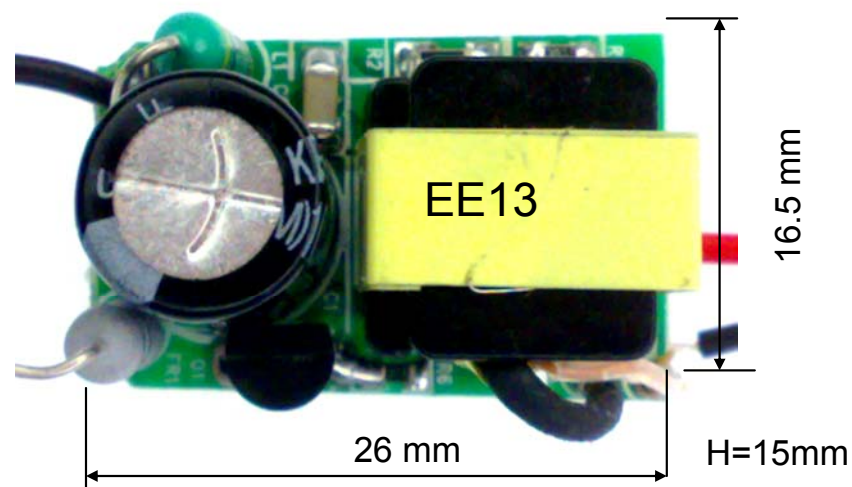
L x W x H: 230 x 19 x 13 mm

Demo solution for GU10

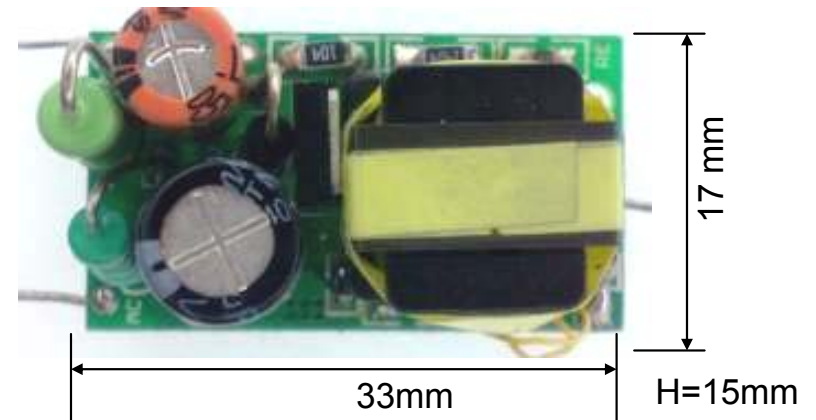
EBC804: LED (iW1692-00)
Input: 90V-264V; Output: 3.5V, CC@ 350mA
EE13 transformer, CC tolerance +/-5%
Efficiency 65%; Isolated ; meet EMI

EBC805: LED (iW1692-00)
Input: 90V-264V; Output: 3.5V, CC@ 700mA
EE13 transformer, CC tolerance +/-5%
Efficiency 65%; Isolated ; meet EMI

EBC806: LED (iW1692-00)
Input: 90V-264V; Output: 10V, CC@ 350mA
EE13 transformer, CC tolerance +/-5%
Efficiency 72%; Isolated ; meet EMI



EBC813: LED 5X1W (iW1692-00)
Input: 90V-264V; Output: 16V, CC@ 350mA
EE13 transformer, CC tolerance +/-5%
Efficiency 78%; Isolated ; meet EMI



EBC814: LED 3X2W (iW1692-00)
Input: 90V-264V; Output: 12V, CC@ 450mA
EE13 transformer, CC tolerance +/-5%
Efficiency 75%; Isolated ; meet EMI



Demo solution for PAR Lamp

EBC815: LED 7X1W (iW1692-00)
Input: 90V-264V; Output: 24.5V, CC@ 350mA
EE19 transformer, CC tolerance +/-5%
PAR30 Efficiency 82%; Isolated ; meet EMI

EBC816: LED 3X2W (iW1692-00)
Input: 90V-264V; Output: 11V, CC@ 600mA
EE19V transformer, CC tolerance +/-5%
PAR30 Efficiency 78%; Isolated ; meet EMI

EBC817: LED 7X1W (iW1692-00)
Input: 90V-264V; Output: 24.5V, CC@ 350mA
EE19 transformer, CC tolerance +/-5%
PAR30 Efficiency 82%; Isolated ; meet EMI

EBC818: LED 3X2W (iW1692-00)
Input: 90V-264V; Output: 12V, CC@ 700mA
EE19 V transformer, CC tolerance +/-5%
PAR30 Efficiency 80%; Isolated ; meet EMI

