恩智浦LED 绿色照明解决方案

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恩智浦半导体

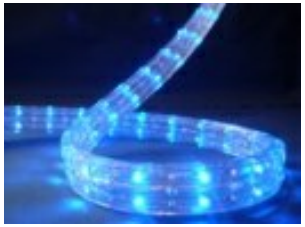
- 成立于2006年，由飞利浦创建的独立半导体公司
- 总部位于荷兰埃因霍温
- 2007年营业额63.2亿美元*
- 全球31,000名员工，其中工程师6,000名
- 每年14亿美元的研发投资*
- 5,700多项专利
- 在12个国家拥有超过26个研发中心
- 通过增大规模和加强研发投入引领半导体行业发展趋势
  - ST-NXP Wireless
  - 并购科胜讯机顶盒业务

（*处的数据包括手机及个人移动通信业务。自2008年8月2日起，大部分手机及个人移动通信业务已经属于ST–NXP Wireless合资公司）

LED 通用照明市场和
恩智浦LED电源重点产品的介绍

恩智浦照明电源产品



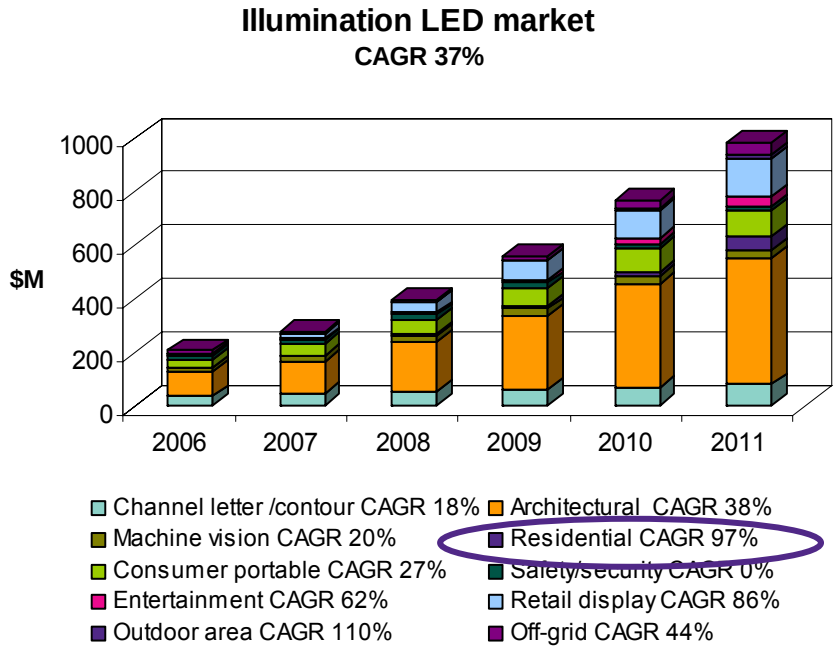
NXP semiconductors has strong positions in the application markets it targets






通用LED照明应用领域

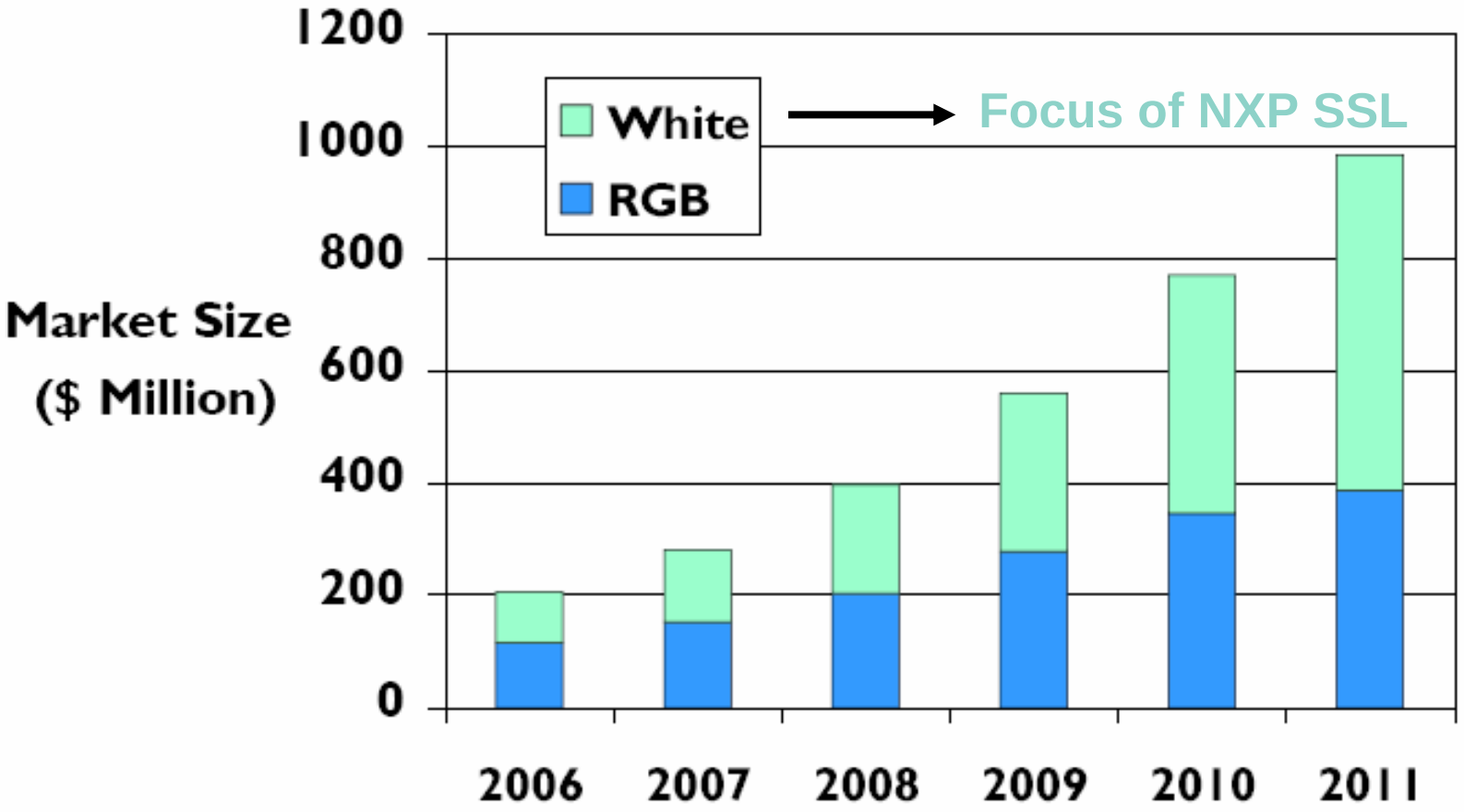
- Architectural
  - Lumen output and fixture efficiency
  - Main market – 48% of HB LEDs 2011
- Retail display
  - Design flexibility, long life, energy-efficiency for freezer lights
- Residential lighting
  - Most price sensitive segment
- Entertainment
  - color changing
- Other
  - Channel Letter/contour lighting
  - Machine vision: established market for LEDs
  - Consumer portable light: extend battery life
  - Safety & security: energy saving
  - Outdoor area lighting: highest growth
  - Off grid: large potential



Assumptions:
- –Luminous efficacy improve
- –LED price erosion
- –LED lighting fixture price decrease
- –Development of standards
- –Energy prices continue to increase

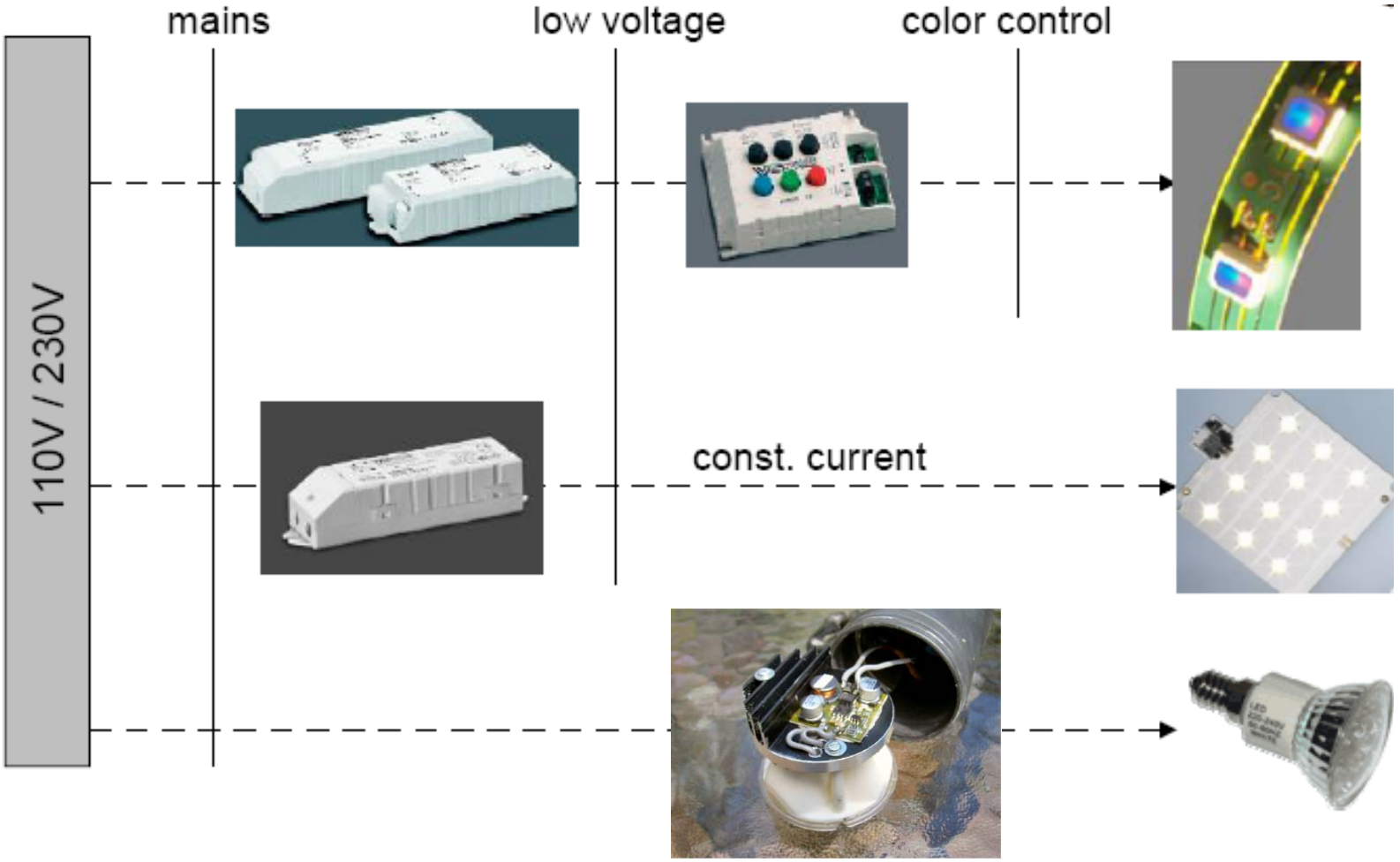
Source: Strategies Unlimited, August 2007

高速增长的通用LED照明市场

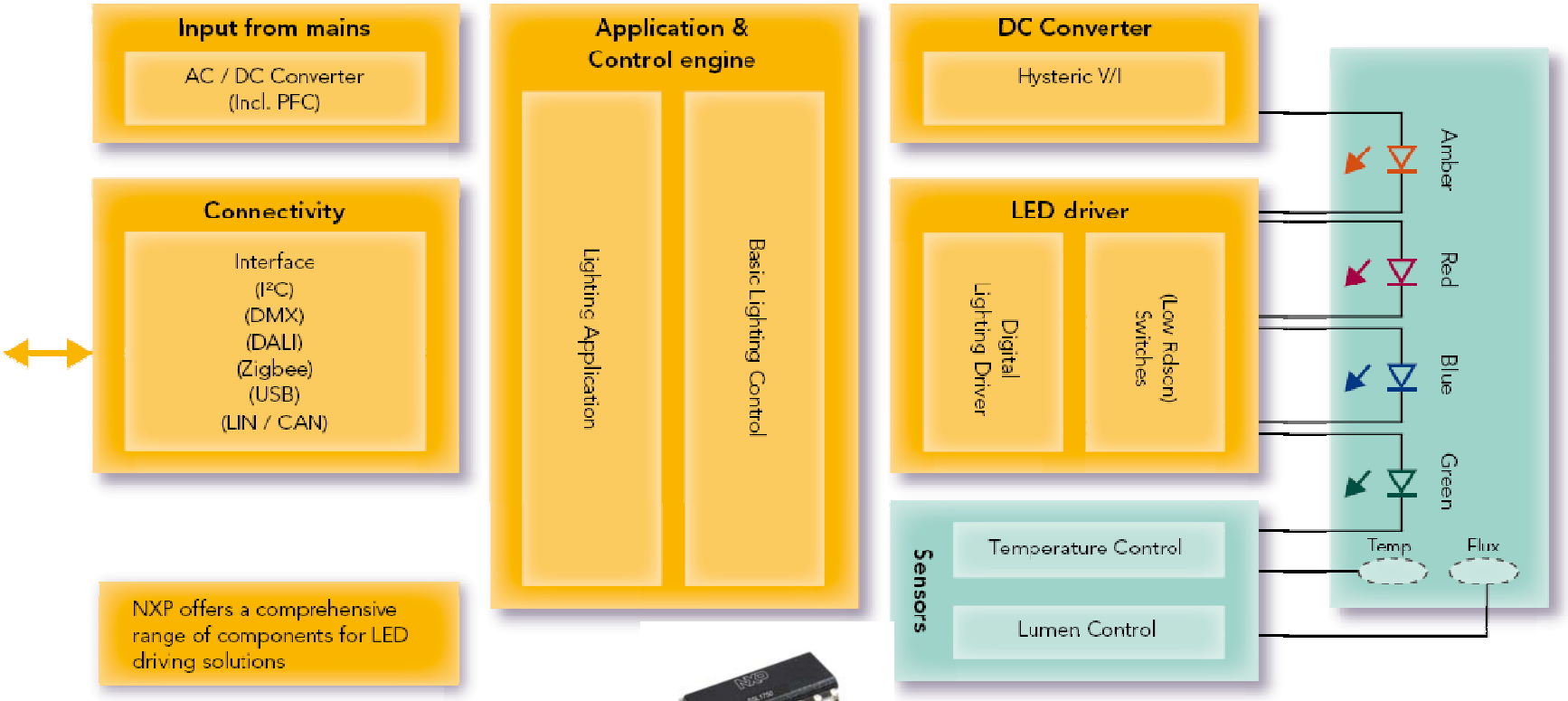


Source: Strategies Unlimited, April 2007

驱动LED的不同方式



通用LED照明驱动架构



LCP24xx chip shot

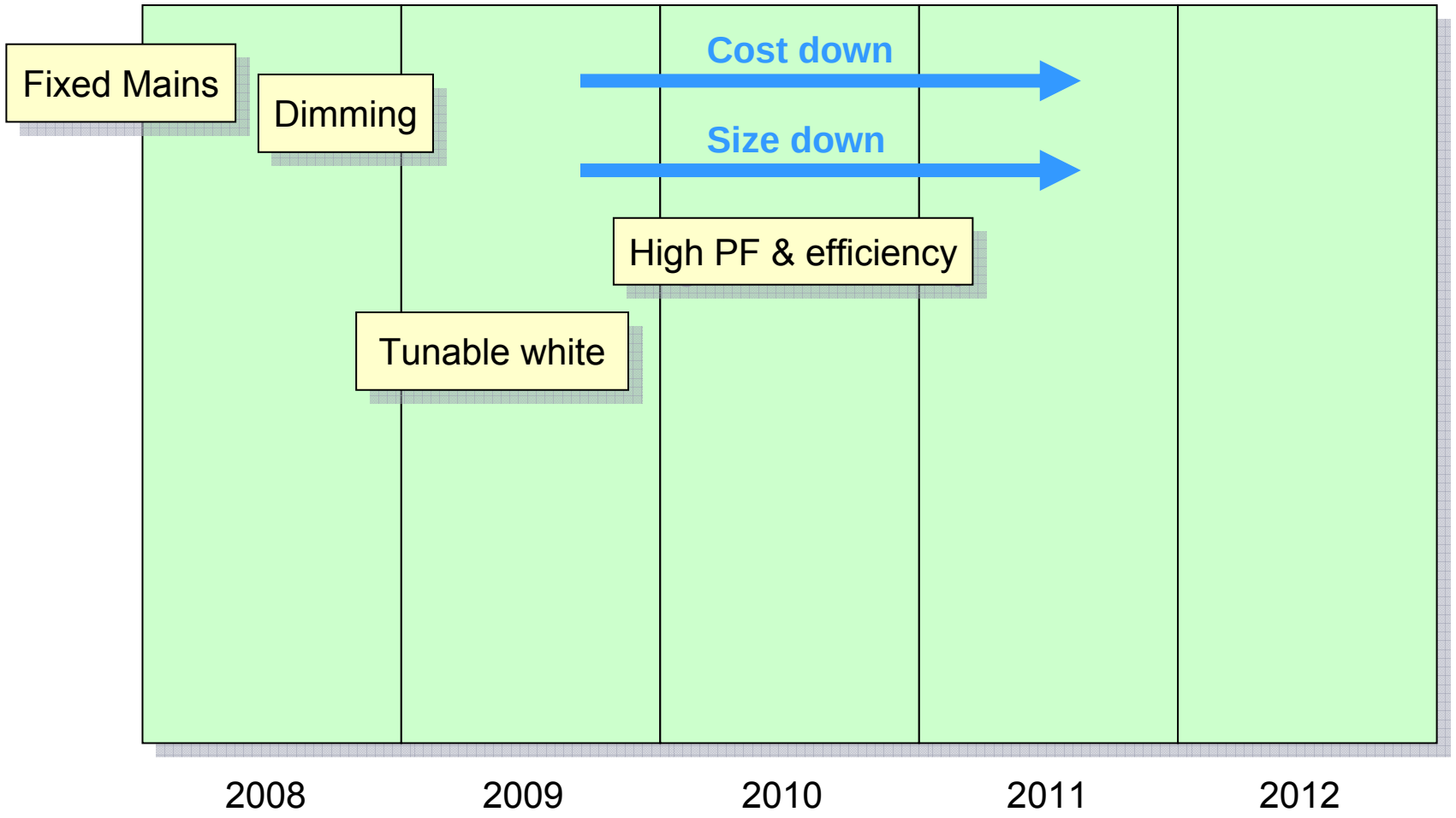
AC/DC LED drivers
Microcontrollers
Power Discretes

DC/DC LED drivers
Connectivity – Interface products
Low Power Discretes

恩智浦产品在LED照明中的运用

SEGMENT	SUBSEGMENT	SSL152x	SSL1623	SSL1750	SSL2311	UBA 3070	PCA 926x	PCA 9633
General lighting	Architectural	X	X	X	X		X	
	Retail display		X	X	X			
	Street Lighting			X		X		
	Residential	X	X	X	X			
	Spot - Down Lights	X	X	X	X			
	Channel / Contour			X	X	X		
Signal	Traffic Lighting	X		X		X		
	Safety Security	X	X					
Special lighting	Entertainment		X	X				
	LED-screen			X			X	X
Gaming console	Dimmer/Blinker							X

LED灯具市场发展趋势



DoE 能源之星标准

- Will be valid from September 30, 2008
- Power Factor:
  - residential > 0.7
  - commercial or above 25W > 0.9
- Standby power: < 0.5W
- Lifetime:
  - residential > 25.000 hours
  - commercial and all outdoor > 35.000 hours
- Efficacy (Light output / Watt)
- CRI (Color Rendering Index)
- Degradation during lifetime
- Visible flicker

照明产品的可靠性和寿命

High end product: expected to be reliable

- No malfunctions
- Long lifetime
  - incandescent: 1000 hours
  - Halogen: 3000 hours
  - CFL: 8000 hours
  - LED: > 20000 hours

→ There is still little experience with the combination long lifetime and high operating temperature.

恩智浦LED电源驱动芯片方案

恩智浦电源芯片产品在LED照明中的应用

SEGMENT	SUBSEGMENT	SSL152x	SSL1623	SSL1750
General lighting	Architectural	X	X	X
	Retail display		X	X
	Street Lighting			X
	Residential	X	X	X
	Spot - Down Lights	X	X	X
	Channel / Contour			X
Signal	Traffic Lighting	X		X
	Safety Security	X	X	
Special lighting	Entertainment		X	X
	LED-screen			X

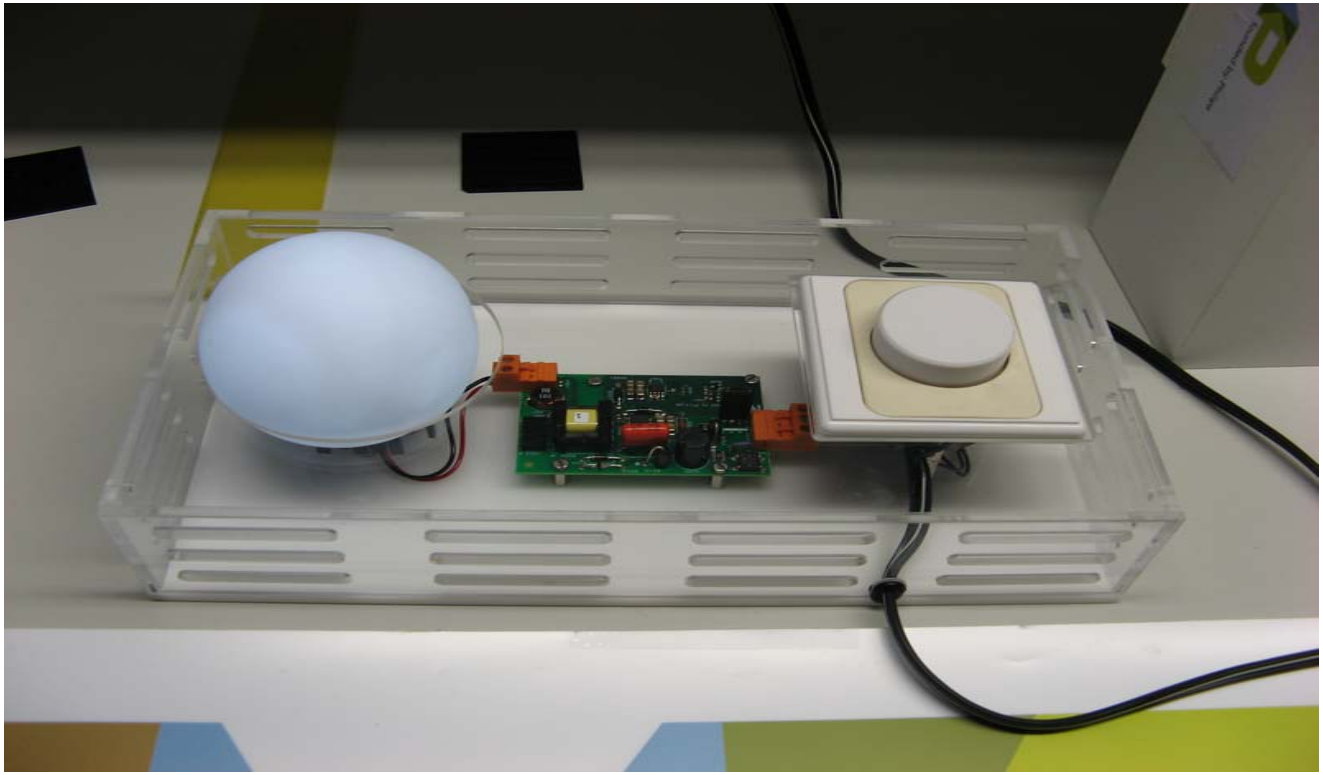
恩智浦现有LED驱动芯片

- **SSL Mains LED driver product range**

SSL1522T/N2	**Order code**	**9352 863 31518**
SSL1523P/N2	**Order code**	**9352 863 32112**
SSL1623PH/N1	**Order code**	**9352 863 33112**
SSL1750T/N1	**Order code**	**9352 863 34518**

- **Key differentiators NXP Lighting IC's**
  - Dimming
  - Integration → low external component count

恩智浦LED交流相位调光驱动方案



What if you could dim your LED lighting products via the existing dimming infrastructure?

*Based on 0.51 kg / CO_2 kWh

恩智浦交流相位调光驱动方案的应用

Key applications

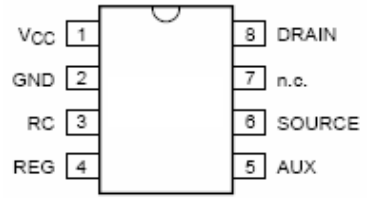
- Retro-fit LED lamps
- LED ballasts
- Signage
- Contour lighting
- Commercial lighting e.g. cabinet or freezer lights
- Other lighting applications

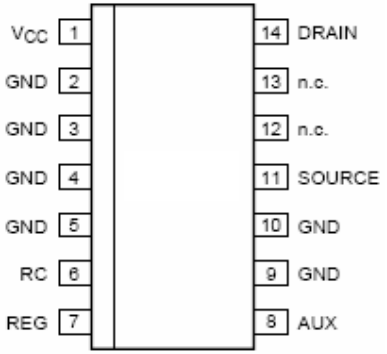
Key features

- High Brightness LED's dimmable via standard TRIAC (and transistor) dimmer
- Switch Mode Power Supply (SMPS) IC for mains LED drivers below 15W
- High energy efficiency (at ca. 15W and 120VAC reaching efficiency of 85%)

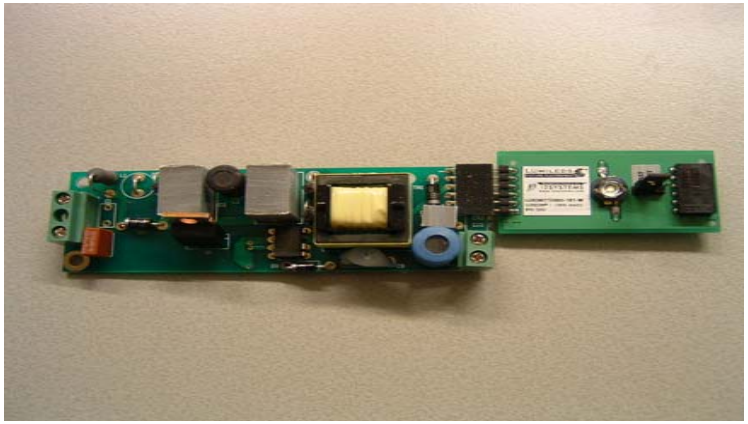
SSL152x & SSL1623PH

- SMPS controller IC
- Integrated switch, on-resistance: 6.5Ω
- Operates directly from mains 80-277 V_{ac} (industrial mains also)
- Suitable for multiple topologies (e.g. flyback, buck)
- Green features
  - Valley/zero voltage switching for minimum switching losses
  - Frequency limitation to reduce switching losses
- On-chip startup current source
- Adjustable frequency for flexible design
- Protections
  - Over current protection
  - Short winding protection
  - Over temperature protection
- Available in multiple packages DIP8, SO14 (thermal DIP16)





SSL1523交流相位调光驱动演示板

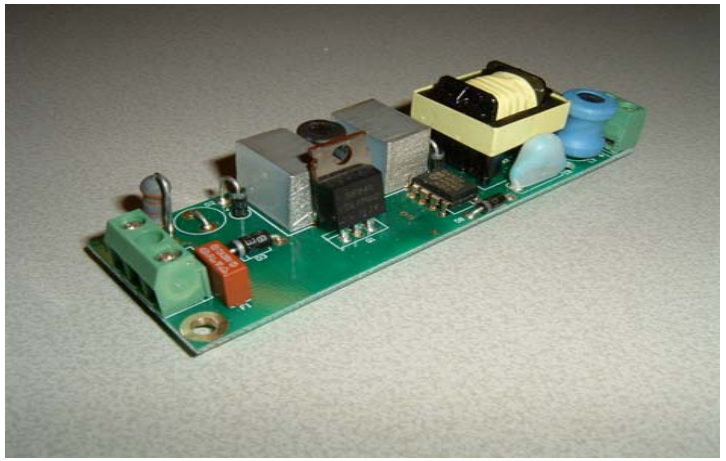


Dimmable Mains LED Driver

SSL1523 Evaluation Boards:
- **Version 230VAC (Europe/APR)**
- **Version 120VAC (USA/Canada)**

Application Note available

Providing details on:
- **Connecting the boards**
- **Dimmers**
- **Schematics**
- **System optimization (e.g changing LED current)**



SSL1523交流相位调光驱动演示板参数指标

Output voltage (LED voltage)	3.5 – 15 VDC	Reference board has been optimized for 3.5 VDC
Output current (LED current)	20mA – 1000 mA	Reference board has been optimized for 1000mA
Output current accuracy	5% -10%	Based on 1000mA and 3W.
Maximum output power (LED power)	3.5W	
Driver Efficiency	54% 60%	Using 1x 3W LED 230VAC Using 4x 1W LED 230VAC
Power Factor	120VAC 0.69 230VAC 0.70	At 3W output power

SSL1623PH 交流相位调光驱动演示板

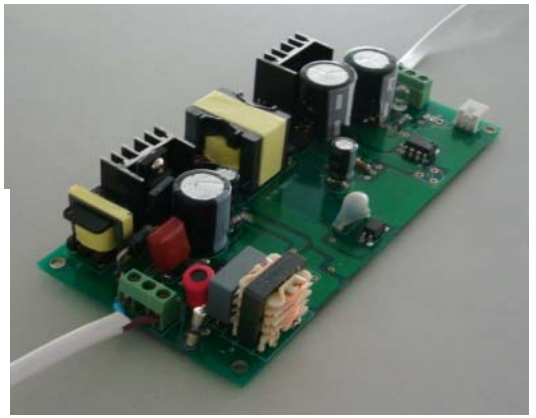
- Dimmable Mains LED Driver 24W SSL1623PH

- Output 700mA (current regulated)
  5..32 VDC
  Input 120 VAC mains ± 10%

- Conventional dimmer capable (transistor and TRIAC dimmable), this demo board is tuned to TRIAC dimmers

- Power Factor > 0.7
- Efficiency 70%

SSL1750 可调光驱动演示板



Key benefits

- Efficient power conversion from mains
- Accurately controlled current through the LED's plus dimming
- Meets regulations
  - Isolated for safety
  - Power Factor Correction above 25W

Fly-back control IC SSL1750

- Operates from universal mains supply (70-276 VAC)
- High-voltage start-up
- Power requirements between 25W and ca. 250W (PFC needed)
- High efficiency
- Integrated Power Factor Correction
- Very low external component count

SSL1750特性介绍

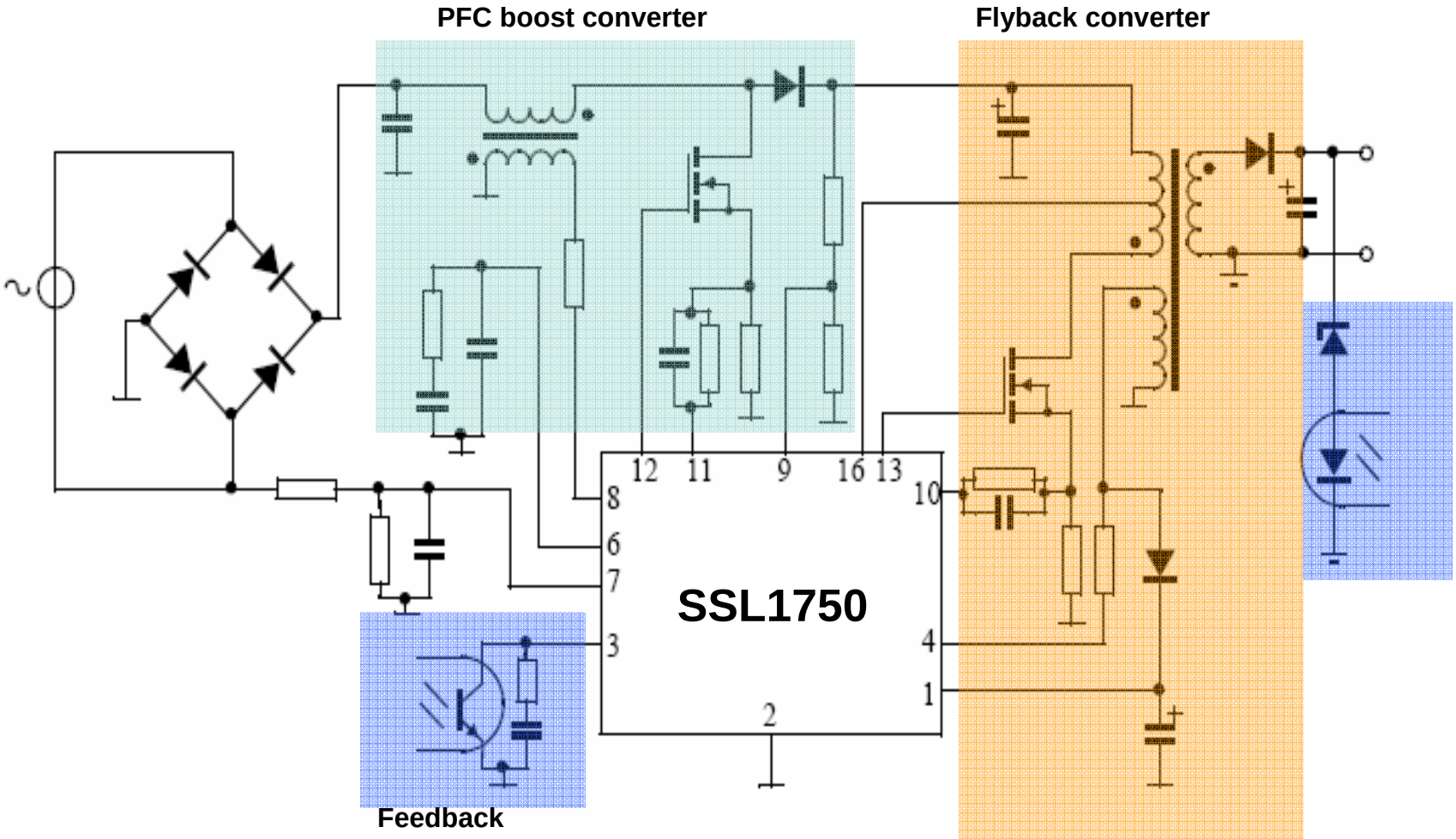
- **Distinctive features**
  - Integrated PFC and flyback controller
  - Universal mains supply operation (70 V to 276 VAC)
  - High level of integration, resulting in a very low external component count and a cost effective design.
- **Green features**
  - On-chip start-up current source.
- **Green features PFC part**
  - Valley/zero voltage switching for minimum switching losses (patented)
  - Frequency limitation to reduce switching losses
  - Burst mode operation if a low load is detected at the flyback output (patented)
- **Green features flyback part**
  - Valley switching for minimum switching losses (patented)
  - Frequency reduction with fixed minimum peak current at low power operation to maintain high efficiency at low output power levels

SSL1750 可调光驱动演示板测试结果

	output current	output voltage	Typical
Current output:700mA	708mA	32V~40V	10LEDs 3.4V@700mA
Items	AC input voltage(Dimming max)		
	90V	110V	240V
Input power	31.1	30.5	30.1
Output Voltage	36.1	36.2	36.2
Output current	708mA	708mA	708mA
Output power	25.4	25.5	25.5
PF	0.997	0.994	0.962
Power efficiency	82%	84%	85%
Vdsmax			700V
Vbr(output diode)			92V
PFC MOS max			470V

Efficient power conversion from mains via SMPS IC SSL1750 → at ca. 25W - 120VAC reaching efficiency of 85% with PF of 0.99

SSL1750 应用线路图

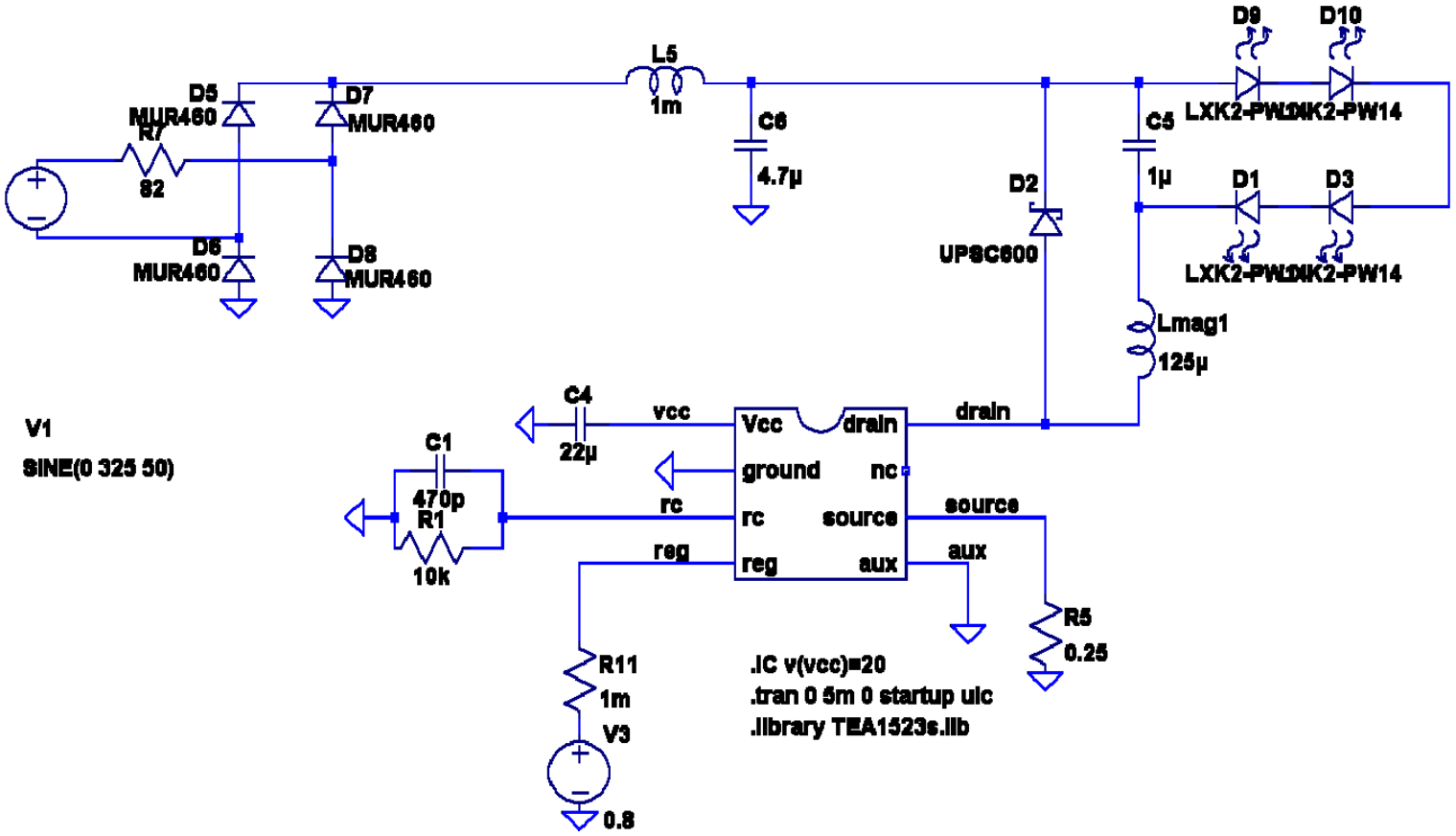


75W SSL1750交流相位调光驱动演示板

Current output:	24 LEDS * 3 strings @350mA/string = 1050 mA	
Input Voltage	210V	230 V
Input Current	0.46 A	0.43 A
Input Power	92.8 W	94 W
Output Power	75 W	77 W
Power Factor	0.96	0.95
Efficiency	81%	82 %

Note: Experimental setup with non-optimized transformer and PFC coil.

降压模式 SSL152x LED电源驱动线路图



恩智浦LED照明交流电源产品总结

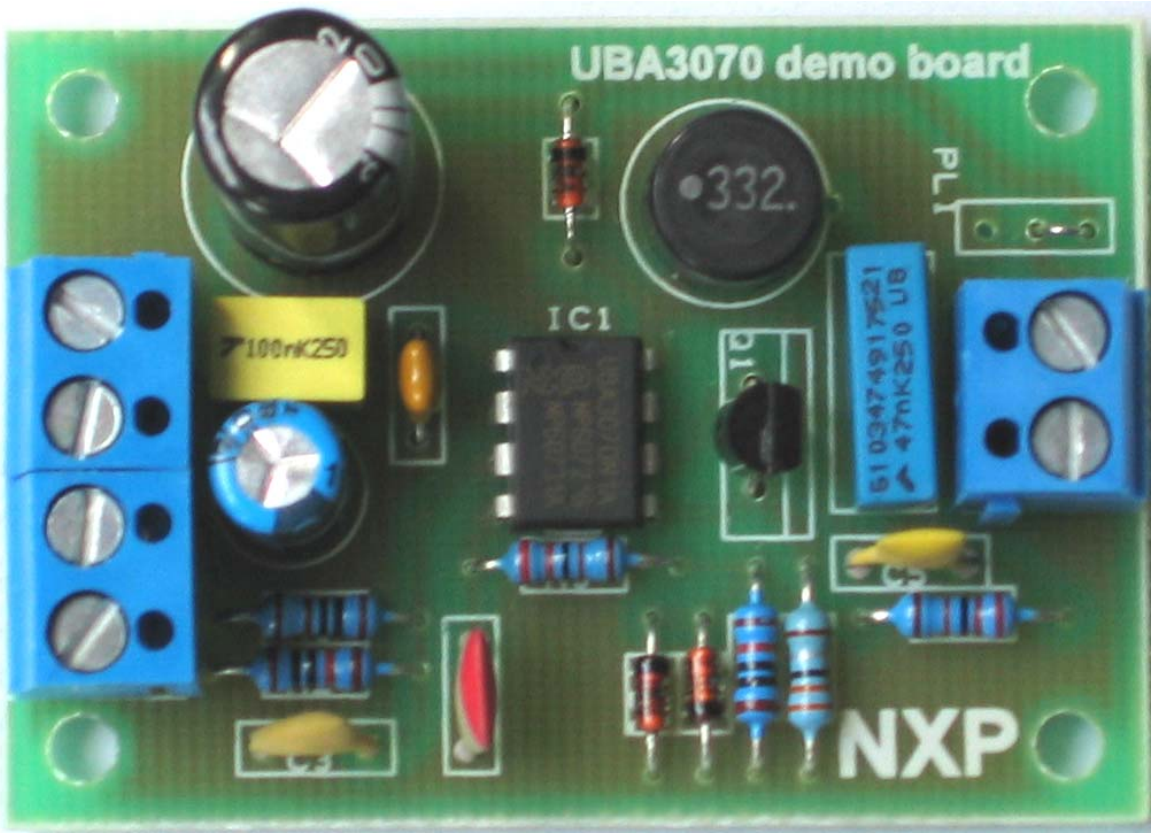
- SSL152x:
  - very suitable as mains voltage LED driver
  - isolation can be achieved via circuit (fly-back) or housing (buck, fly-back)
  - buck topology gives a smaller circuit (no trafo)
  - highly efficient due to green features (e.g. valley switching/ZVS)

- Dimmable retrofit LED lamp requires:
  - additional components to make circuit compatible
  - (preferably) logic to reduce losses by additional components

Conclusion:

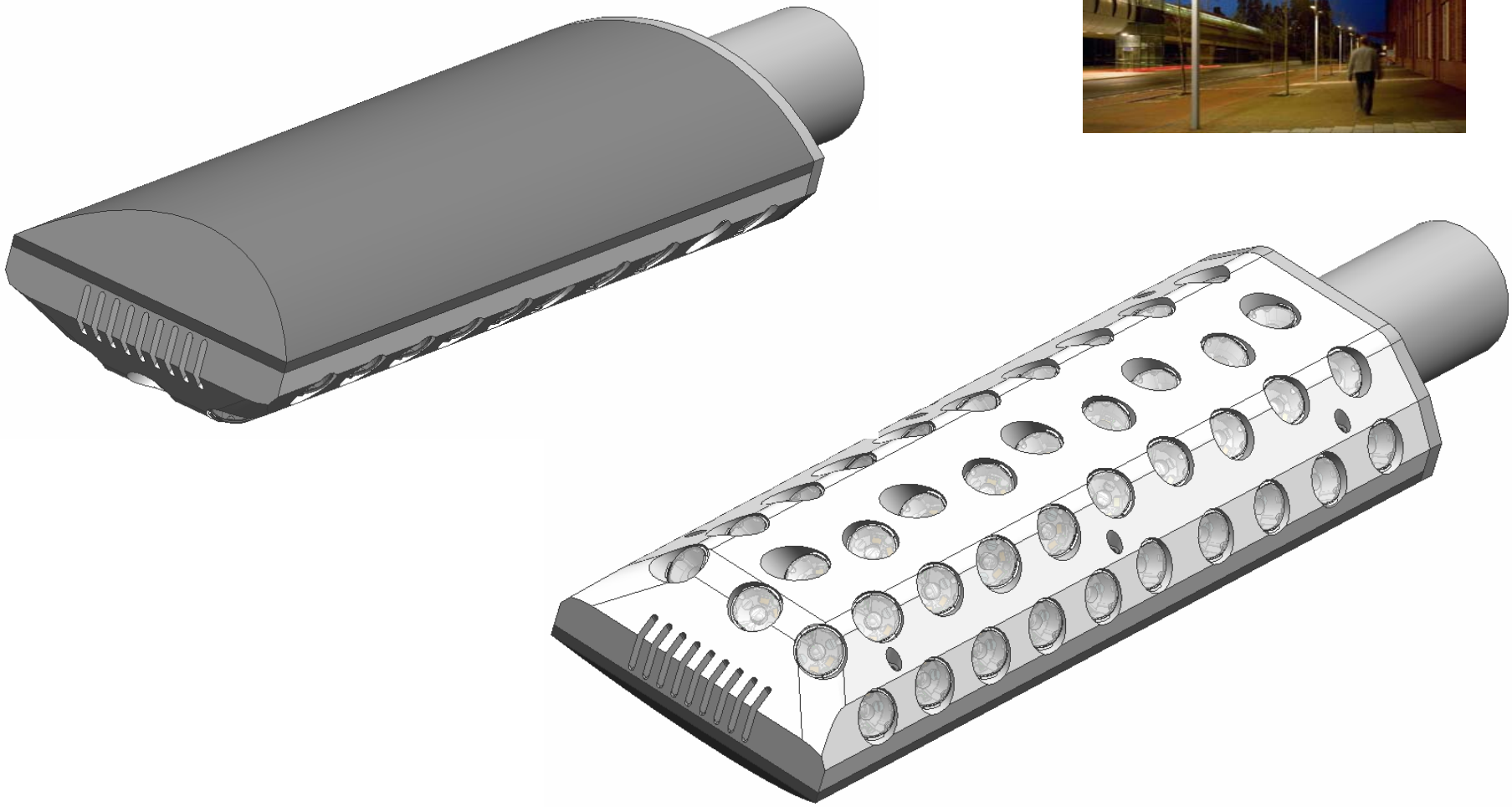
SSL152x family good solution for dimmable LED lamps

UBA3070直流驱动演示板



恩智浦LED路灯电源方案

LED 路灯

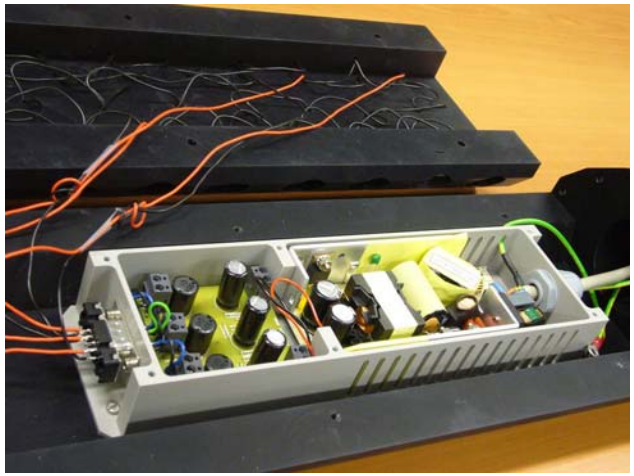


LED路灯电源方案参数

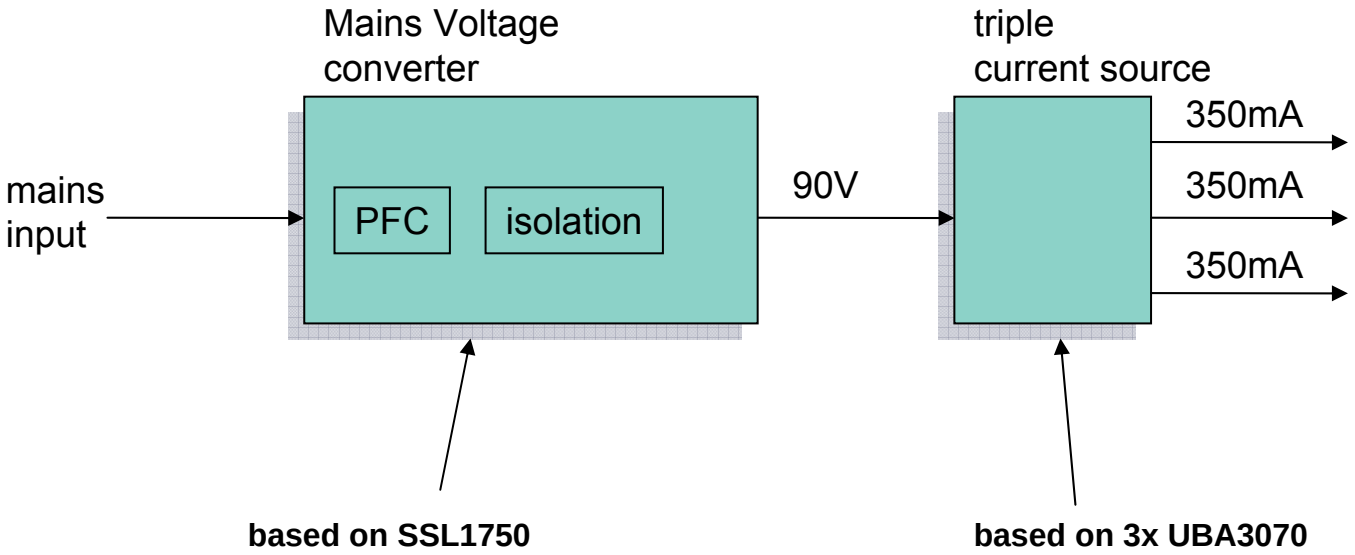
- Outdoor product (air contaminations, >IP23)
- AC mains supply (230V – 275V / safety IEC 60598)
- Danger for lightning strokes (mains spikes and surges / IEC1000-4-5)
- Ambient temperature (-20ºC - +70ºC)
- Mechanical stress (bumps, vibrations / IEC 68-2-Fc)
- Long lifetime (> 30.000hrs)
- Energy consumption (Energy star)
- Material cost
- EMC / CISPR 15 - Standards
- Fault detection and communication.
- Maintenance cost
- Switch on/off procedure/control or Dimming procedure/control.
- Optical / temperature feedback

基于 SSL1750 和 UBA3070的 LED路灯驱动方案

Mains input	90 - 275V
Power factor	>0.9
3 strings of 16/17 LED’s	
50 LED’s	Vf = 52V – 55V
LED current	350 mA +/- 10%
Efficiency	84%
LED power / mains input power	



LED路灯电源方案构架



- Driven from universal mains
- Constant current 350mA ±10% to 50 LED's, divided in 3 strings of 16 or 17 LED's
- Temperature range: -20 .. +50°C, Lifetime: 60.000 hours (95% survivals)
- Comply to: EN61000-4-5 (10kV), EN55015 (CISPR15), IEC 60598-1/2/3,
- Protected against open or shorted output(s)

路灯电源方案总结

- Street lamp with LED's can meet standard regulations for luminance level and uniformity
- Street lamp with LED's have a higher utilization factor since the light can be more effectively directed to the street and therefore less lm is required compared to conventional street lamps
- Street luminaires with LED's can have an efficiency of 50lm/W
- This leads to an energy saving up to 51%
- Long lifetime (50 khours~11years) and lower energy cost leads to much lower TCO compared to conventional street lamps
- NXP SSL has driver solutions based on SSL1750 and UBA3070 for Street Lighting → PWM dimming possible

Thank you