节 电 王

www.onsemi.cn

安森美半导体
ON Semiconductor®

高能效电源及LED照明方案概览

Overview of Energy-Efficient Power Supply & LED Lighting Solutions

议程 Agenda

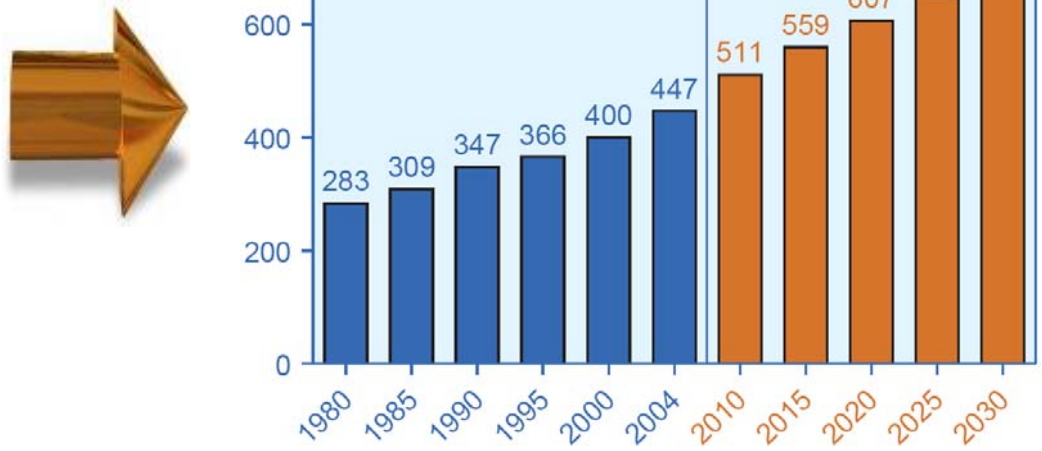
- 最新能效规范标准概览 Update on energy efficiency regulations
- 安森美半导体与高能效 ON Semiconductor and energy efficiency
- 安森美半导体针对高能效应用的产品及方案
  ON Semiconductor's products and solutions for energy-efficient applications
- 总结 Summary

能效问题 The Case for Energy Efficiency

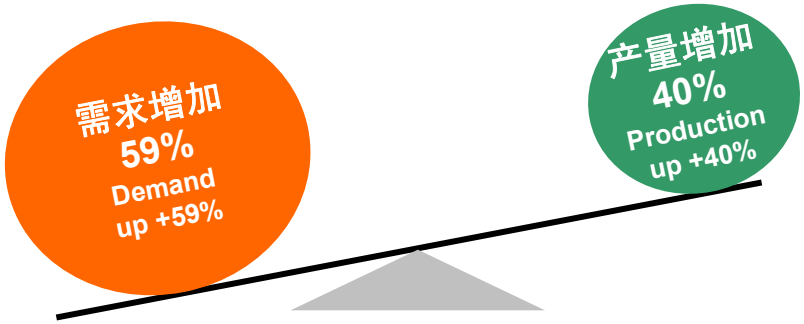
Representative Countries & Energy Consumption

Country	Population in millions (2005)	Consumption in quads (2003)
China	1304	45.5
India	1104	14.0
United States	296	98.8
Indonesia	222	4.7
Brazil	184	8.8
Pakistan	162	1.9
Russia	144	29.1
Bangladesh	144	0.6
Nigeria	132	1.0
Japan	128	22.4
Mexico	107	6.8
Germany	82	14.2
Iran	70	6.0
Thailand	65	3.1
France	61	11.2
United Kingdom	60	9.8
Italy	59	8.0
South Africa	50	4.9
South Korea	48	8.6
Canada	32	13.5
Saudi Arabia	25	5.7
Taiwan	23	4.2
Australia	20	6.1

Quad = Quadrillion Btu



能源统计 Energy Statistic 1990–2005



Source: Energy Information Administration

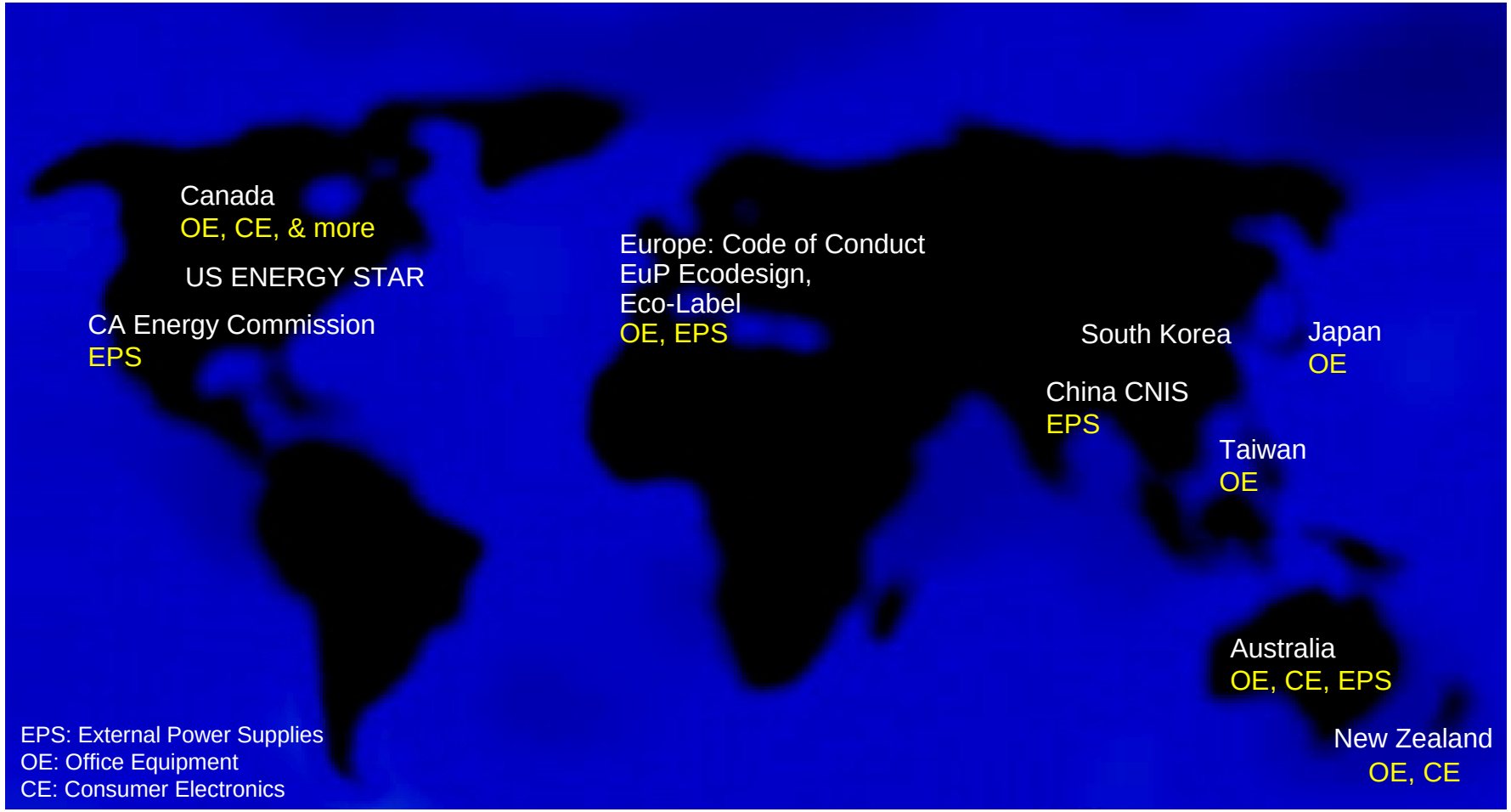
怎么办？
OPTIONS?

更多发电厂，及…污染
More power plants and … pollution

节约： *行为改变，使用能源减少*
Conservation: *Behavior change which results in the use of less energy*

提升能效： *利用技术以更少电能执行相同任务* **Energy Efficiency:** *use of technology to use less energy to perform the same task*

世界各地的能效规范 Worldwide Energy Efficiency Regulations



China CNIS,
China CSC (ex-CECP)

Japan Top Runner

Japan
Eco Mark

Australian
Greenhouse Office

California Energy
Commission

Korea e-Standby

Europe
Code of Conduct,
EuP Ecodesign,
Eco-Label

ENERGY
STAR®

Source: Energy Star

高能效规范最新进展 Update on Energy Efficiency Regulations

适配器/外部电源 Adapters/External Power Supplies

- ENERGY STAR® 2.0 effective on Nov. 1, 2008
- Europe Code of Conduct version 4 effective Apr. 27, 2009
- Europe EuP Ecodesign Directive 2005/32/EC Regulation (EC) No 642/2009 Phase 1 effective April 2010, Phase 2 effective April 2011
- Energy Independence and Security Act of 2007 (EISA 2007) signed into law on Dec. 19, 2007

电视机 TV Sets

- ENERGY STAR® 3.0 effective on Nov. 1, 2008
  - Standard is technology (PDP, LCD, RPTV) neutral and based only on screen size and resolution
  - Standby power: ≤ 1 W
- ENERGY STAR® 4.0 & 5.0 to be effective in May 2010 & May 2012
  - Max power for 42" TV = 81 W
- Europe EuP Ecodesign Directive 2005/32/EC Regulation (EC) No 642/2009
  - Standard is technology (PDP, LCD, RPTV) neutral and based only on screen size and resolution

	Europe EuP Ecodesign Directive	Energy Star
外部电源 **External Power Supplies**	• Directive 2005/32/EC REGULATION (EC) No 278/2009	• EPS version 2.0
	• Phase 1, effective Apr. 2010 • Phase 2, effective Apr. 2011	• Effective Nov. 1, 2008

	• Phase 1:
	  • Efficiency: ≥ 85% @ P_{out} > 51 W
	  • No load power: ≤ 500 mW
	• Phase 2:
	  • Efficiency: ≥ 87% @ P_{out} > 51 W
	  • No load power: ≤ 500 mW
		• P_{out} > 49 W
		  • Efficiency: ≥ 87%
		  • No load power: ≤ 500 mW
		• PF ≥ 0.9 @ V_{in} = 115 Vac & P_{in} ≥ 100 W

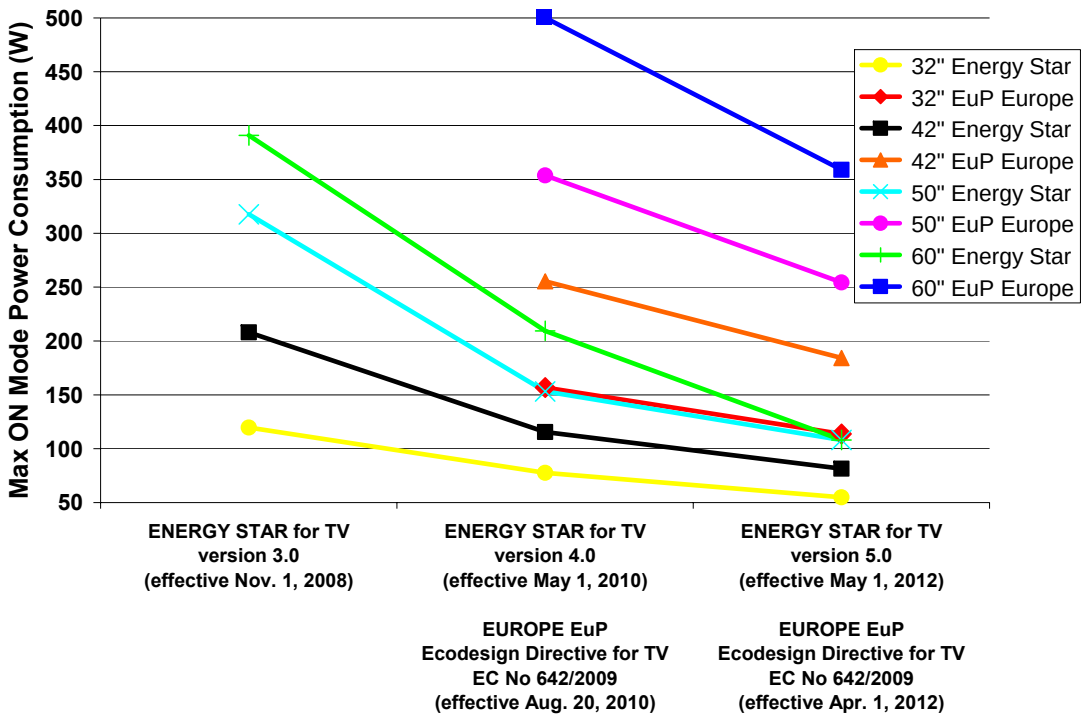
电气设备待机及关闭能耗 **Standby and off mode electric power consumption of electrical and electronic household and office equipment**	• Directive 2005/32/EC REGULATION (EC) No 1275/2008 • Phase 1, effective Dec. 2009 Off-mode < 1 W • Phase 2, effective Dec. 2012 Off-mode < 0.5 W	
电视机 **Televisions**	• Directive 2005/32/EC REGULATION (EC) No 642/2009	• EPS version 4.0 & 5.0
	• Phase 1, effective Aug. 20, 2009 Off-mode < 1 W • Phase 2, effective Apr. 1, 2012 Off-mode < 0.5 W	• Version 4, effective May 1, 2010 Sleep-mode < 1 W • Version 5, effective May 1, 2012 Sleep-mode < 1 W

更详尽及最新规范机构及规范信息请访问www.psma，检索PSMA能效数据库

For exhaustive and up-to-date information on agencies and regulations, check the PSMA energy efficiency data base at: www.psma.com

电视机工作模式能效规范要求
TV Active Mode Efficiency Regulatory Requirements

典型屏幕尺寸的功率电平等级
Power Levels Rates for Typical Screen Sizes



将液晶电视能效提至最高
Maximizing LCD TV Efficiency

- •转变至LED背光 Transition to LED backlighting
- •CCFL背光 CCFL Backlighting:
  - 同等初始光输出条件下减少灯数量及能耗 Reduction of number of lamps and consumption for the same initial light output
  - 仅用一个转换段的新逆变器驱动器方案(LIPS) New inverter driver solution (LIPS) with only 1 conversion stage
- •降低待机能耗 Reduction of standby power consumption:
  - 当前 Now ≤ 1 W
  - 未来 Future ≤ 0.3 W → ≤ 0.1 W

多路输出台式机ATX电源能效目标
Efficiency Targets for Multi-output Desktop ATX Power Supplies

Multi-Output ATX Power Supplies	Levels	Specification	Efficiency (%) 20% of rated output power	50% of rated output power	100% of rated output power	Effective Date
	80 PLUS — CSCI Base — ENERGY STAR rev 4.0	• Multiple-Output • Non-Redundant • PFC 0.9 at 100% of rated output	80%	80%	80%	**Effective date: July 2007**
	80 PLUS BRONZE — CSCI Bronze — ENERGY STAR rev 5.0	• Multiple-Output • Non-Redundant • PFC 0.9 at 50% of rated output	82%	85%	82%	**ENERGY STAR rev. 5.0 (Effect. date: July 2009) & CSCI Bronze (Start July 2008)**
	80 PLUS SILVER — CSCI Silver	• Multiple-Output • Non-Redundant • PFC 0.9 at 50% of rated output	85%	88%	85%	**Start July 2009**
	80 PLUS GOLD — CSCI Gold	• Multiple-Output • Non-Redundant • PFC 0.9 at 50% of rated output	87%	90%	87%	**Start July 2010**

Sources:
- 80 PLUS® : http://www.80plus.org/
- Climate Savers® Computing Initiative: http://www.climatesaverscomputing.org/
- ENERGY STAR®: http://www.energystar.gov/index.cfm?c=revisions.computer_spec

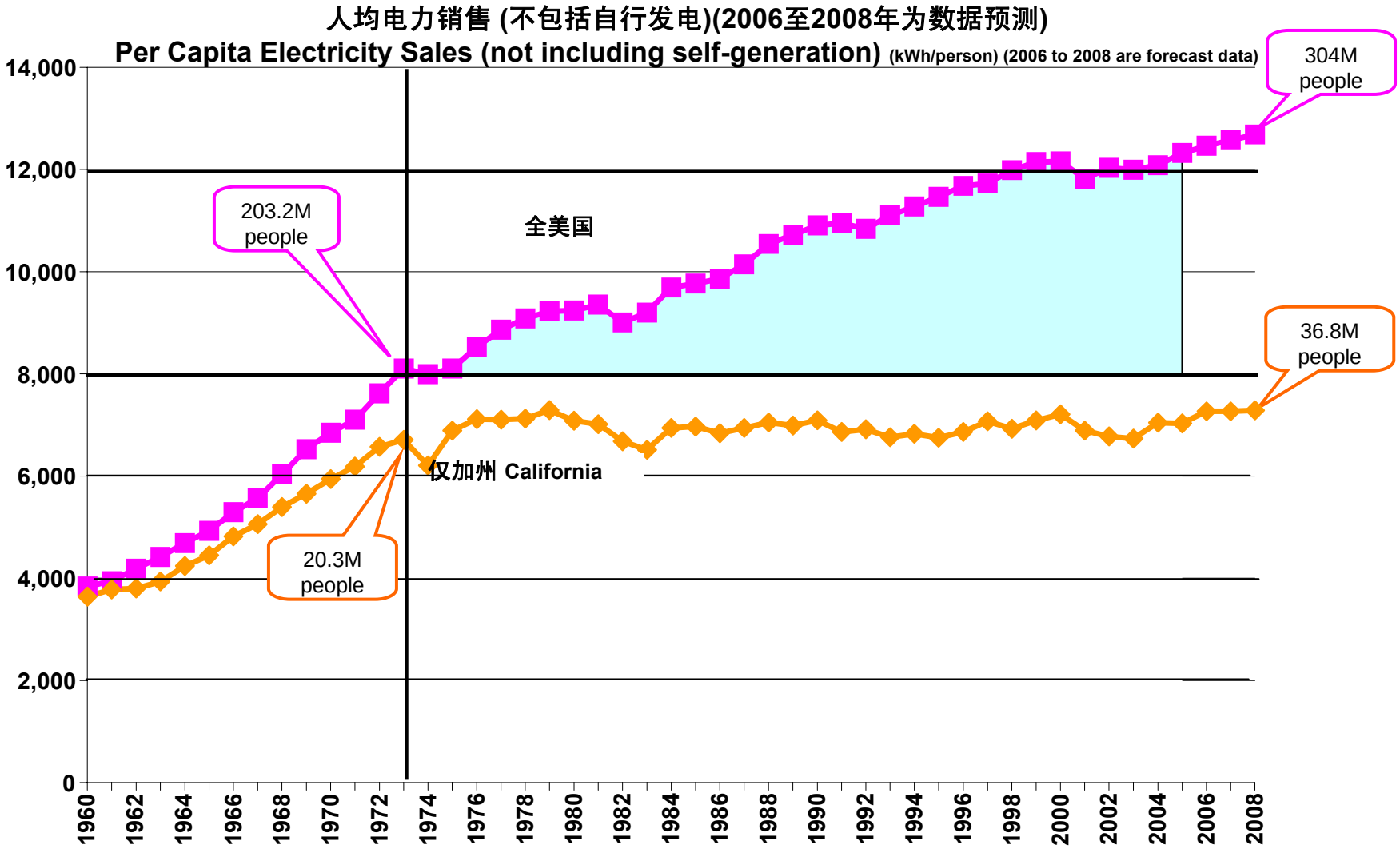
单路输出计算机电源能效目标(服务器、刀片式服务器及一体机)
Efficiency Targets for Single-output Computing Power Supplies (Servers, Blades, All-in-1)

	Levels	Specification	Efficiency (%) 20% of rated output power	50% of rated output power	100% of rated output power	Effective Date
Single-Output	80 PLUS BRONZE — CSCI Bronze	• Single-Output • Non-Redundant • PFC 0.9 at 50%	81%	85%	81%	Start June 2007
	80 PLUS SILVER — CSCI Silver	• Single-Output • Non-Redundant • PFC 0.9 at 50%	85%	89%	85%	Start June 2008
	80 PLUS GOLD — CSCI Gold	• Single-Output • Non-Redundant • PFC 0.9 at 50%	88%	92%	88%	Start June 2010
	CSCI Platinum	• Single-Output • Non-Redundant • PFC 0.9 at 50%	90%	94%	91%	Target

All in 1 PC

Sources:
- 80 PLUS® : http://www.80plus.org/
- Climate Savers® Computing Initiative: http://www.climatesaverscomputing.org/
- ENERGY STAR®: http://www.energystar.gov/index.cfm?c=revisions.computer_spec

美国加州实现高能效的实例
Energy Efficiency Works: California Example



Sources: California Energy Commission, U.S. Census Bureau

安森美半导体与高能效
ON Semiconductor and Energy Efficiency

安森美半导体藉提供电源管理及LED照明方案来节能，帮助客户满足并超越世界各地的电源规范标准(工作能效、待机能耗 、低静态电流及功率因数校正等)，成本平价或比传统方案更低

ON Semiconductor's purpose is to Save Energy by providing power management & LED lighting solutions enabling our customers to meet and exceed worldwide power management regulations (efficiency, standby power, low quiescent current, PFC…) at cost parity or lower when compared to conventional solutions.

安森美半导体现有构建高能效电源
及LED照明应用的技术及产品。

ON Semiconductor has TODAY in production the technologies and products to enable efficient power supplies & LED lighting applications.

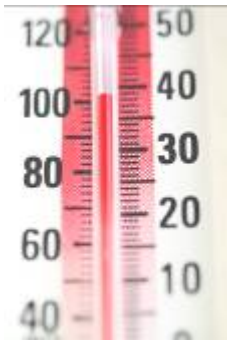
重点电源应用 Power Supply Focus Applications

- 台式计算机 Desktop PC
- 适配器(笔记本，打印机，游戏机)：市场份额第1
  Adapters (Notebooks, Printers, Gaming): #1 MARKET SHARE
- 平板电视 Flat TVs
- 固态照明(LED) Solid State Lighting (LED)
- 智能电网(智能仪表) Smart Grid (Smart Meters)
- 数字消费(机顶盒/DVD)
  Digital Consumer (STB/DVD)
- 白家电 White Goods

Vincent Thomas Bridge,
San Pedro (near Long Beach), CA
(each blue light is a string of 7 blue LEDs powered by NCP1216)

电源及LED通用照明应用的挑战

Challenges for Power Supplies and LED General Lighting Applications



T_J

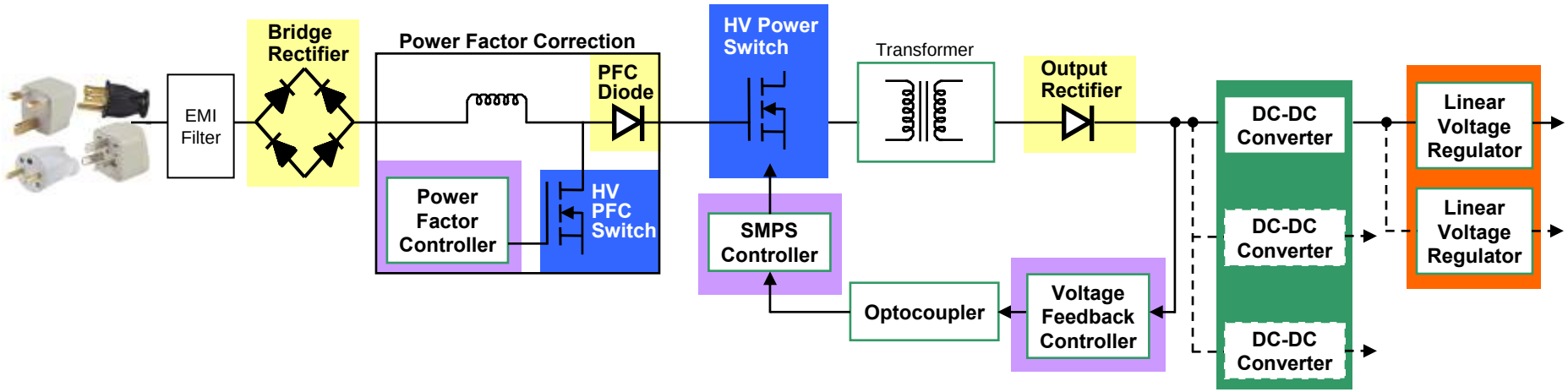
可靠性
Reliability

电源及LED通用照明应用面对相同的挑战

Same challenges faced in power supplies and in LED General Lighting applications

- 因总体能效要求及散热限制，能效很重要，即使是低功率应用 Efficiency is important, even at low power due to overall efficacy requirements and thermal constraints
- 很多情况下，在相对较低的功率也要求功率因数校正(PFC) In many cases power factor correction is required at relatively low power
- 空间受限，特别是在灯泡替代应用中 Space is limited, especially in bulb replacement
- 总体电源可靠性很重要 Overall supply reliability is important
- 更宽输入电源范围，支持高达277 Vac Wider range of input power range including 277 Vac
- 照明特定要求如TRIAC调光Lighting specific requirements like triac dimming
- 标准及安全规则仍在演进 Standards and safety rules are still evolving

高能效电源方案 Efficient Power Supply Solutions



领先的产品 Leadership Products

- PFC控制器 PFC Controllers
- AC-DC控制器 AC-DC Controllers
- 高压MOSFET HV MOSFETs
- LED驱动器 LED Drivers
- 整流器 Rectifiers
- 次级同步整流控制器 Secondary SR Controllers
- DC-DC开关稳压器 DC-DC Switching Regulators
- 低压降(LDO)稳压器LDO voltage regulators

领先的方案 Leadership Solutions

高能效 Energy Efficiency

- 计算机电源 Computing Power Supplies
- 适配器(打印机、游戏机、笔记本、手机等) Adapters (Printers, Game consoles, Notebooks, cell phones, etc…)
- 数字平板电视 Digital Flat TV
- 固态照明(LED) Solid State Lighting

GreenPoint® From ON Semiconductor 参考设计 Reference Designs

ATX高能效参考设计 ATX high efficiency reference design

- 80+ Compliant 300 W, ATX Reference Design Documentation: TND313/D
- >85% Efficient, 255 W Power Supply Reference Design for ATX Desktop PC : TND359/D

电视电源参考设计 TV power supply reference design

- 160 W CRT TV Power Supply Reference Design Documentation: TND315/D
- 220 W LCD TV 2nd Generation Power Supply Reference Design Documentation : TND316/D featuring NCP1396 and NCP1605 (should have a new 1397 version?)
- 220 W LCD TV Power Supply Reference Design : TND321/D featuring NCP1395, NCP5181 and NCP1653
- Up to 180 W High Voltage LCD TV Power and Integrated Inverter Supply (LIPS): TND360/D

适配器(笔记本及打印机电源) Adapter (Notebook & Printer PSU)

- 90 W Notebook AC-DC Adapter Reference Design Documentation: TND317/D
- 60 W Notebook AC-DC Adapter Reference Design Documentation: TND318/D
- 40 W Printer Power Supply Reference Design Documentation: TND320/D

其它(游戏机、机顶盒、手机充电器等) Others (Game console, STB, Phone charger, etc)

- 5W CCCV Cell Phone Charger: TND329/D
- 16 W xDSL Modem AC-DC Adapter: TND330/D
- 8 W, ENERGY STAR-compliant, 3-output quasi-resonant flyback converter for ASTC DTA (Digital To Analog converter): TND332/D
- 50 W Set-Top Box Power Supply Reference Design: TND334/D
- 200 W Game Console AC-DC Adapter Reference Design: TND331/D

固态照明(LED照明) Solid State Lighting (LED Lighting)

- Offline LED Driver Reference Design for ENERGY STAR® Residential LED Luminaire Applications: TND371/D
- LED Driver Reference Design for 1 to 5 W MR16 LED Bulb: TND373/D

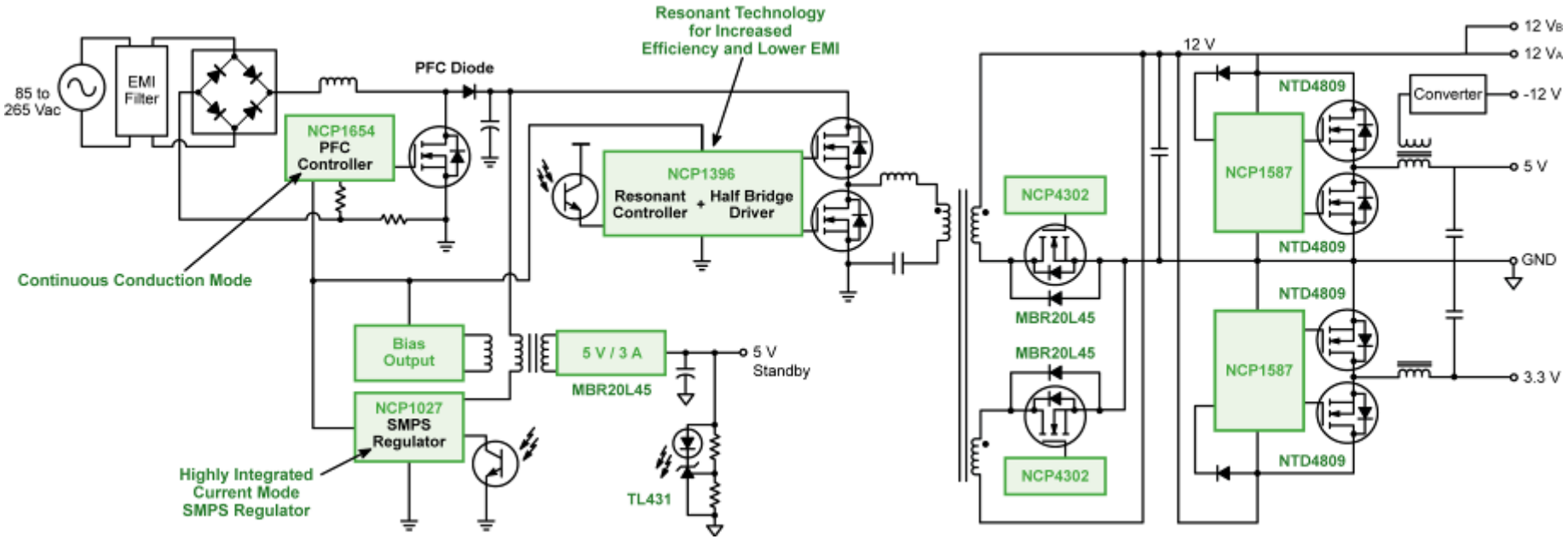
GreenPoint®
From ON Semiconductor

GreenPoint®是安森美半导体
符合现有或未来新兴能效标准的
高能效电源参考设计系列

GreenPoint® is ON Semiconductor's family of high-efficiency power supply reference designs that meet existing or emerging energy efficiency standards

用于ATX台式机的能效高于85%的255 W电源参考设计

>85% Efficient, 255 W Power Supply Reference Design for ATX Desktop PC



GreenPoint® From ON Semiconductor

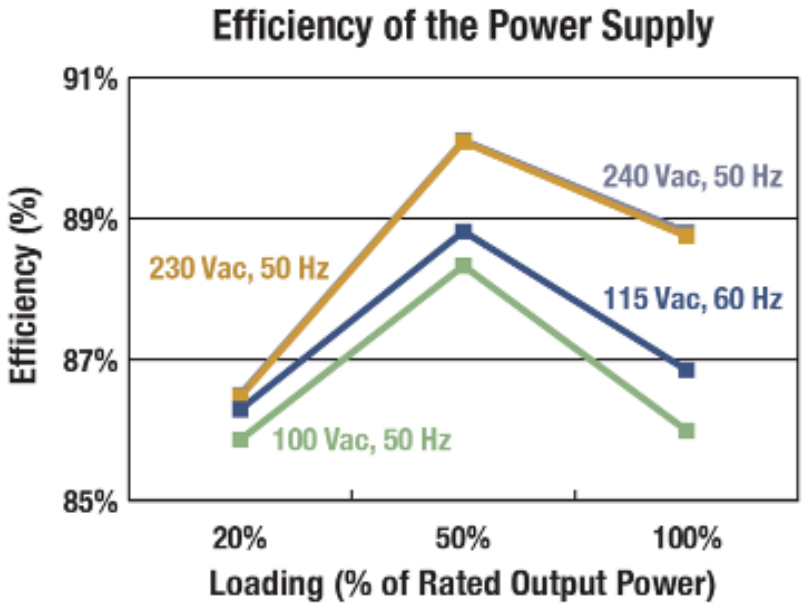
Specification	20% load	50% load	100% load
• Multiple-Output • Non-Redundant • PFC 0.9 at 50%	85%	88%	85%

80 PLUS® SILVER
Climate Savers 3

参考设计文档： ***Reference Design Documentation:*** ***TND359/D***

用于ATX台式机的能效高于85%的255 W电源参考设计

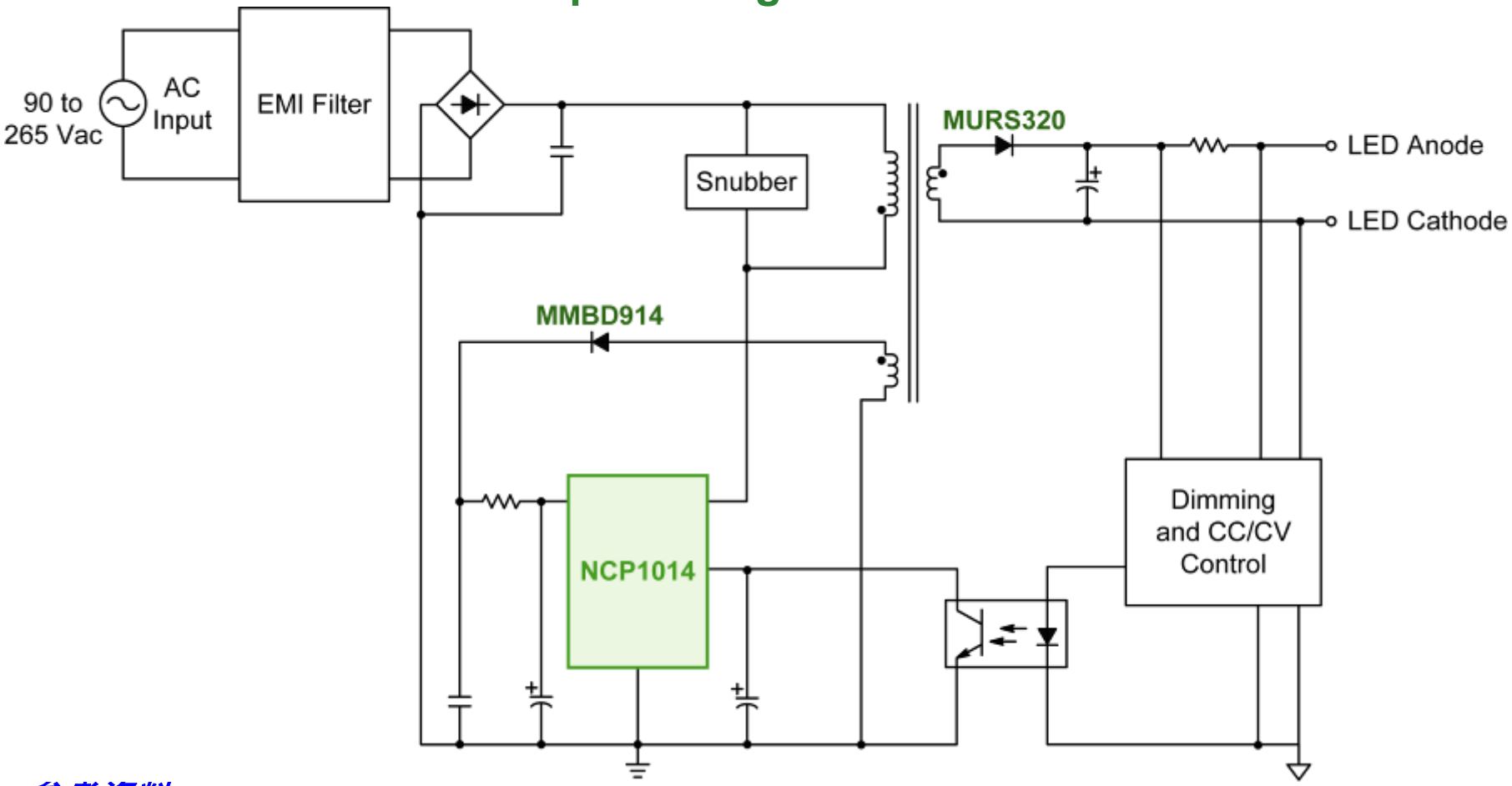
>85% Efficient, 255 W Power Supply Reference Design for ATX Desktop PC



- 符合“能源之星”5.0版及计算产业气候拯救行动(CSCI)第三阶段规范 Compliant with ENERGY STAR® 5.0 and Climate Savers Computing Initiative Step #3
- 通过80 PLUS银级能效规范 Certified 80 PLUS Silver level
- 能效高于85% Efficiency > 85%
  - at 100, 115, 230 and 240 Vac
  - at 25%, 50%, and 100% of rated output power
- 符合IEC61000-3-2功率因数要求。功率因数在100、115、230及240 Vac条件下高于0.95 Meets IEC61000-3-2 for Power Factor. PF > 0.95 at 100, 115, 230 and 240 Vac
- 所有测试数据均在41厘米长线缆末端获得 All measurements obtained at the end of a 41 cm (16 inch)-long cable
- 可投产型设计：经过完全测试，强固，高性价比 Production ready design: fully tested, robust and cost effective.

采用LED模块重新设计的台灯

Desk Lamp Redesigned with LED Module



参考资料 References:

- *设计笔记 Design Note:* DN06051/D
- *白皮书 White Paper:* TND358/D
- *GreenPoint®参考设计 GreenPoint® Reference Design:* TND371/D

GreenPoint® From ON Semiconductor

采用LED模块重新设计的台灯
Desk Lamp Redesigned with LED Module

零售商店 Retail Store

- 卤素灯 Halogen bulb
- 无电子电路，仅1个60 Hz变压器 (1.2千克重) No electronics, just a 60 Hz transformer (weight 1.2 kg, 2.4 lbs)

17.8流明/瓦 Lux/Watt

ON Semiconductor

- LED模块 LED module: Cree MC-E (4000 K色温 color temperature)
- 灯底部采用安森美半导体NCP1014构建的8 W电源 8 W power supply in lamp base built around ON Semiconductor's NCP1014

72.9流明/瓦 Lux/Watt

灯类型 Bulb Type	输入功率(W) Input Power (W) @ 120 Vac	流明 Illuminance (Lux)*	功率因数 Power Factor
卤素灯(35 W灯泡) Halogen (35 W bulb)	41.7 W	744	0.961
LED模块 LED module	10.9 W	795	0.857

* Measured at a distance of 0.5 meters

LED灯的光输出高于卤素灯，但能耗仅为1/4 *The LED lamp produces more light than halogen bulb for ¼ of power !!*

卤素台灯转换至LED白皮书 Halogen Desk Lamp Conversion to LEDs White paper: TND358/D
用于"能源之星"住宅LED照明应用的离线LED驱动器：TND371/D
Offline LED Driver for ENERGY STAR® Residential LED Luminaire Applications: TND371/D

高压MOSFET High Voltage MOSFETs

安森美半导体推出高压MOSFET，旨在为电源管理提供"完整系统方案"，并继续致力于成为高质量、高性价比、高性能电源管理方案的首选供应商 ***ON Semiconductor introduces High Voltage MOSFETs in order to offer a "total system solution" to power management and continue our dedication to becoming the premier supplier of quality, cost effective, performance power management solutions.***

- **第一阶段-推出600 V产品系列 Phase 1 – Introduce 600 V Product Family** **2Q09**
  - NDF10N60ZG, NDF06N60ZG, NDF04N60ZG，TO-220FP封装 in TO-220FP
- **第二阶段-扩充高压FET产品阵容 Phase 2 – Expand HVFET Portfolio** **2H09**
  - 扩充600 V系列，推出更多的电压系列：500 V，620 V Expand 600 V family and introduce additional voltage families: 500 V, 620 V
  - 增加更多的封装：DPAK、IPK及TO-220 Add additional package: DPAK, IPK, and TO-220
- **第三阶段-继续扩充高压FET阵容 Phase 3 – Expand HVFET Portfolio** **2010**
  - 推出更多的电压系列：650 V，700 V，800 V，900 V Introduce additional voltage families: 650 V, 700 V, 800 V, 900 V
  - 增加更多的封装：I2PAK，D2PAK，TO30 Add additional packages: I2pak, D2PAK, TO3P
- **第四阶段-高性能高压FET技术 Phase 4 – High-performance HVFET technology** **2011**
  - 推出内部超级结技术 Introduce internal Super-Junction technology
  - 推出更低导通阻抗、更小裸片尺寸的产品 Lower Rdson performances and smaller die sizes

600 V高压MOSFET 600 V High Voltage MOSFETs

特性 Features	优势 Benefits
低导通阻抗 Low on-resistance	→ 提升能效 Improved efficiency
低门电荷 Low gate charge	→ 快速导通 Faster turn-on
快速开关 Fast switching	→ 降低动态功率损耗 Reduced dynamic power losses
齐纳保护门 Zener-protected gate	→ 抵抗ESD应力 Resistance to ESD
无铅 Pb-free	→ 遵从RoHS指令 RoHS compliance
业界标准封装 Industry standard packages	→ 标准占位面积用于直接替换 Standard footprint for direct drop-in

应用 Applications

- 适配器(笔记本，打印机，游戏机) Adapter (notebook, printer, gaming)
- 液晶显示屏面板电源 L…er
- 照明灯具镇流器 Lighting ballasts

市场 Markets

- 消费及工业应用的交流-直流及直流-直流开关电源 AC-DC and DC-DC SMPS for consumer & industrial apps
  - PFC及其它升压转换器 PFC and other boost converter
  - 降压及反激转换器 Buck & flyback converters
  - 半桥 Half bridge
  - 单开关正激和双开关正激 Single and two switch forward

Part Number	V_{DSS} (V)	I_D (A)	Typical $R_{DS(on)}$ (Ω) (25°C, @ 50% I_D)	Package	Samples Availablility Date	Release to Market Date
NDF10N60ZG	600	10	0.65	TO-220FP	Now	✓ 29-Apr-2009
NDF06N60ZG	600	6	1	TO-220FP	Now	✓ 16-Jun-2009
NDF04N60ZG	600	4	1.8	TO-220FP	Now	✓ 16-Jun-2009
NDD04N60ZT4G	600	4	1.8	DPAK	Now	✓ 4-Aug-2009
NDD04N60Z-1G	600	4	1.8	IPAK	Now	✓ 4-Aug-2009

整流器系列 Rectifiers Portfolio

- *业界最宽广的产品系列之一 One of the broadest portfolios in the industry*
- *投资新技术，成为公认的领先高能效输出整流器及PFC二极管供应商*
  Investing in new technologies to become the recognized leader in high efficiency output rectifiers and PFC diodes

肖特基 Schottky

超快 Ultrafast

超软 Ultrasoft

快速恢复 Fast Recovery

标准恢复 Std Recovery

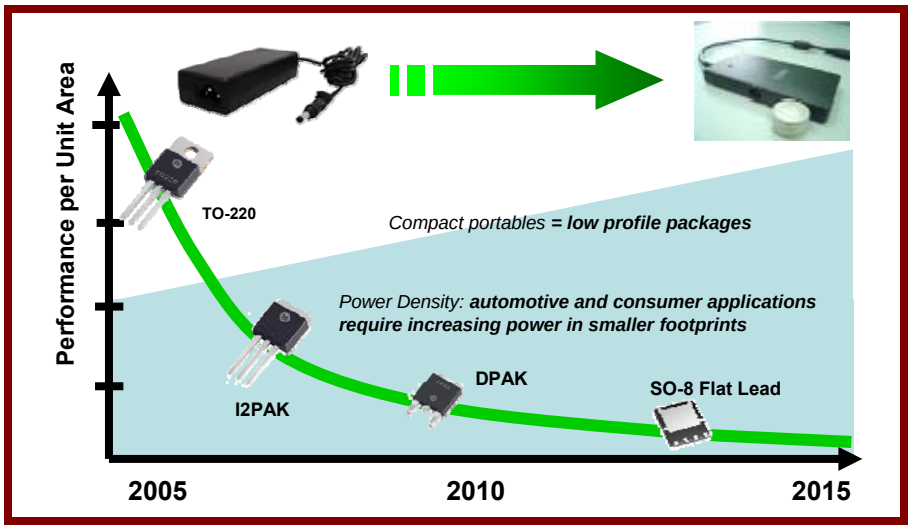
自动浪涌抑制器 Auto Surge Suppressors

2006 Rank	2007 Rank	2008 Rank	Company Name	Market Share
1	1	1	Vishay Intertechnology	14.7%
2	2	2	Shindengen Electric Manufacturing	10.1%
3	3	3	STMicroelectronics	7.4%
4	4	4	ON Semiconductor	6.2%
8	8	11	Fuji Electric Device Technology	3.3%
6	7	7	Sanken Electric Company	4.0%
5	6	9	Nihon Inter Electronics	3.6%
7	5	5	Semikron International	4.5%
12	9	10	Robert Bosch	3.4%
9	9	6	Toshiba	4.2%
10	10	12	Hitachi	3.1%
11	11	8	Lite-On Semiconductor	3.8%

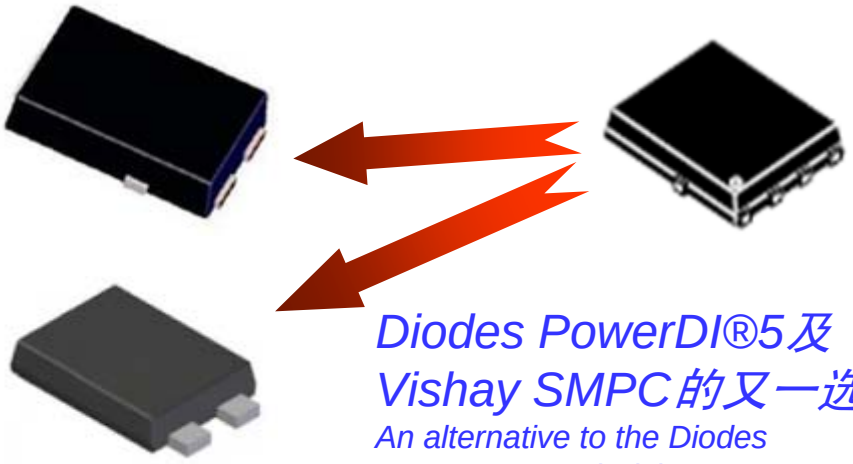
Source: iSuppli

新的整流器封装：SO-8 FL

New Rectifier Package Offering: SO-8 FL

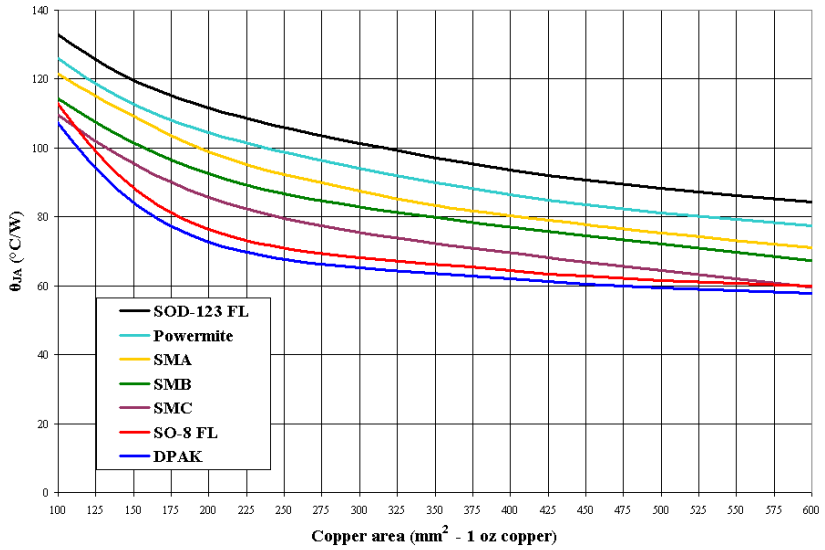


- 我们现能提供SO-8扁平引脚封装的肖特基整流器 We are now able to offer schottky rectifiers in the SO-8 flat lead package
- 热性能几与DPAK小巧封装一样好 Thermal performance almost as good as the DPAK in a compact low profile footprint

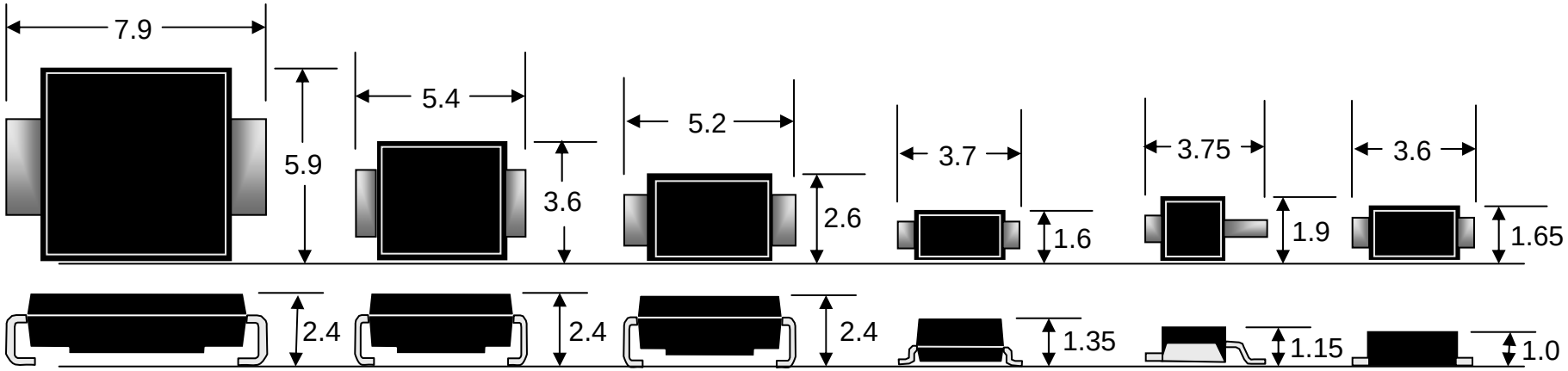


Diodes PowerDI®5及 Vishay SMPC的又一选择

An alternative to the Diodes PowerDI®5 and Vishay SMPC



整流器封装系列 Rectifier Package Offering



SMC SMB SMA SOD-123 POWERMITE SOD-123FL

SO-8 FL

DPAK

IPAK

D2PAK

I2PAK

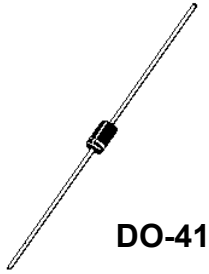
TO-220AB

TO-220AC

Fullpak 3L

Fullpak 2L

TO-247



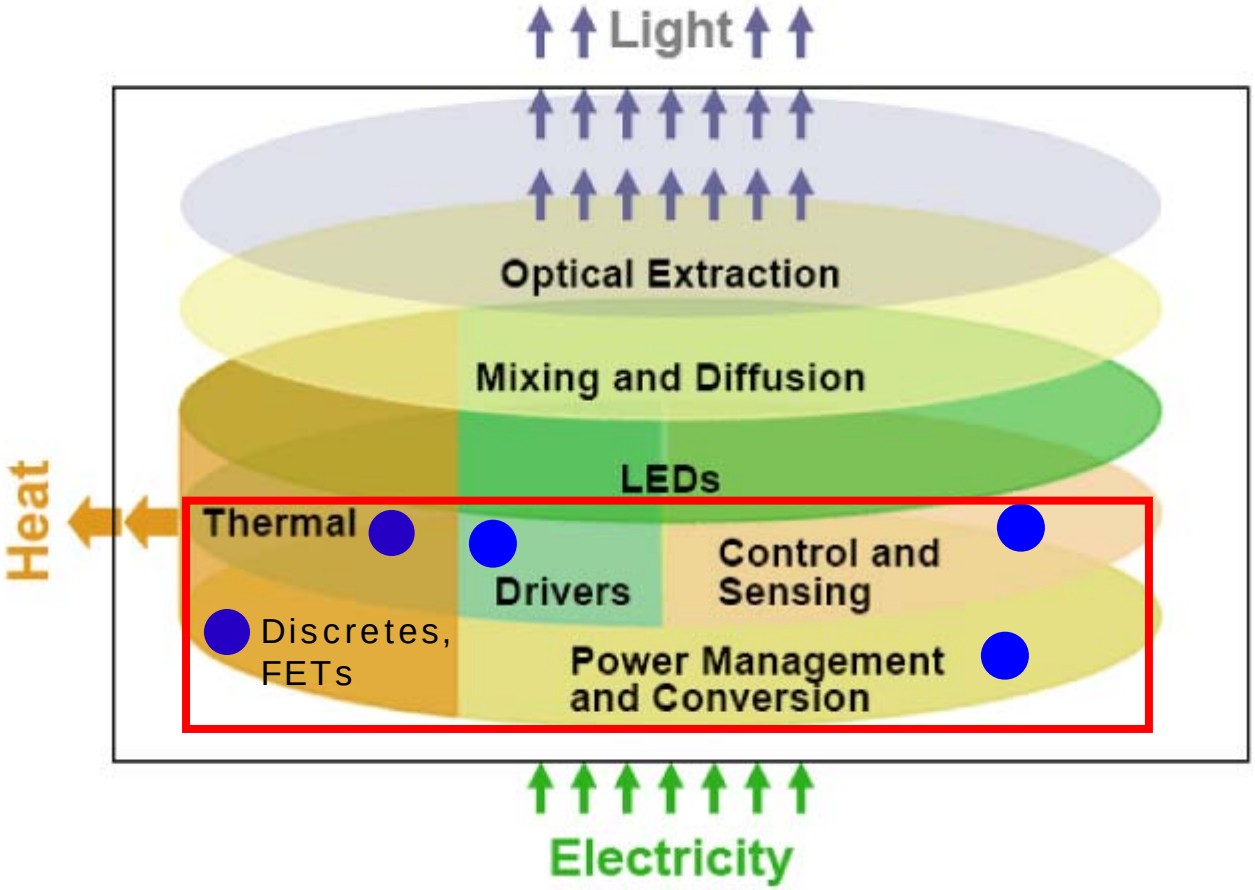
DO-41

DO-201AD

用于宽广范围LED应用的产品 Products for Broad Range of LED Applications

- **大显示屏 Large Display**
  - 建筑物照明 Architectural Lighting
  - 可寻址及视频标志 Addressable and Video Signage
- **通用照明，交流线路供电 General Lighting, AC Line Powered**
- **通用照明，宽直流输入 General Lighting, Wide DC input**
  - 汽车 Automotive
  - 低压交流 Low Voltage AC (12 Vac / 24 Vac)
  - 直流及太阳能供电照明 DC and Solar Powered Lighting
- **便携应用 Portable Applications**
  - 小型LCD背光(手机，数码相机) Small LCD Backlighting (Mobile phones, Digital Cameras)
  - 相机闪光 Camera Flash
  - 手电筒 Torch and Flashlights
  - 有机LED OLEDs
- **中等尺寸LCD背光 Medium Size LCD Backlighting**
- **指示器LED驱动器 Drivers for Indicator LEDs**

典型照明系统 Typical Lighting System



访问安森美半导体网站LED照明专区

Visit ON Semiconductor's LED Website

安森美半导体支持持续发展 Sustainability @ ON Semiconductor

精益运营，高能效方案及战略合作伙伴 Lean Operations, Efficient Solutions and Strategic Partnerships

安森美半导体致力于推进更绿色的世界，降低我们的碳排放量，积极节省资源，并与志同者的客户及业界组织高效合作。安森美半导体内部团队致力于可持续发展，在众多节能项目上都有可观的成果

ON Semiconductor is committed to supporting a greener world by reducing our carbon footprint, actively conserving resources, and effectively partnering with like-minded customers and industry organizations. With an in-house team dedicated to sustainability excellence, ON Semiconductor has achieved marked successes within our many conservation programs

环境 Environment

Expand and improve in-house sustainability **initiatives** to lessen corporate impact on the natural environment.

企业公民 Citizenship

Conduct our business in a **socially responsible** manner to positively contribute to the worldwide communities in which we operate.

客户/伙伴 Customers / Partners

Improve competitiveness with strong customer **relationships** and strategic green business partnerships.

股东 Shareholders

Maximize corporate **value** with efficient business/manufacturing operations and sound economic decisions.

方案 Solutions

Development of energy-efficient solutions and products that enable **customers** to build significantly greener electronics.

总结 Summary

- 近期收购了领先的电源模拟及电源分立元器件供应商AMI和Catalyst，显著扩展我们的产品阵容 Significant product portfolio enhanced by recent acquisitions of AMI and Catalyst: leading suppliers of Power Analog and Power Discrete components
- 安森美半导体现有构建高能效电源及LED照明应用的技术及产品 ON Semiconductor has TODAY in production the technologies and products to build efficient power supplies & LED lighting applications.
- 安森美半导体是完整解决方案供应商，提供高性能、低系统总成本的差异化参考设计 ON Semiconductor is a complete solution provider, offering differentiated reference designs at high performance and lower overall system costs
- 安森美半导体的整体方案ON Semiconductor's holistic approach
  - ↑ 工作能效 Active mode efficiency
  - ↓ 待机能耗 Standby power
  - 功率因数校正 Power Factor Correction
- **我们的 GreenPoint® 参考设计符合世界各地的能效规范要求**(美国"能源之星"，欧盟行为指令，欧盟EuP生态设计指令，欧盟Eco-Label，美国加州能源委员会，中国CNIS，以及其它国际能效机构，如澳大利亚的Greenhouse Office、韩国的e-Standby项目，日本的Top Runner及Eco Mark)
  Our GreenPoint® reference designs meet regulatory requirements around the world (ENERGY STAR®, Europe Code of Conduct, Europe EuP Ecodesign, Europe Eco-Label, California Energy Commission, China CNIS, and other international agencies such as Australia Greenhouse Office, Korea e-Standby program, Japan Top Runner program and Eco Mark program)

For More Information

- View the extensive portfolio of power management products from ON Semiconductor at www.onsemi.com
- View reference designs, design notes, and other material supporting the design of highly efficient power supplies at www.onsemi.com/powersupplies