

# Meeting the Challenge of Low Stand-by and Zero Load Energy Consumption for External adapters

# Move to Reduce Energy Waste is Global

- **No-load EC requirement for external power supplies**
  - <300 mW by 2005
- **Energy Star requirement for cordless phones and answering machines**
  - < 1 W stand-by 2004
- **US Presidential Executive Order**
  - < 1 W stand-by now on all Federal Government purchases
- **Japanese “Top Runner” program**
  - Promotes lowest standby in consumer products
- **Many other standards and programs worldwide**
  - Blue Angel, China Sustainable Energy Program, etc



# Semiconductor Market Response

- **Broad range of products from many companies**
  - Low stand-by and zero load energy consumption requirement has driven innovation
  - $< 300$  mW zero load consumption can be met cost effectively today
  - Further innovation is guaranteed, reducing costs further
- **The cost of these solutions and devices falls annually**
  - as volumes shipped rise, will fall faster
- **Brings many other benefits to end product total cost**
  - see next slides

# Switching Solutions Bring Additional Benefits

- **OEM**
  - **Lower inventory costs**  
Only a single switcher design needed where several linear designs are required to cover global markets
  - **Lower shipping costs**  
Size and weight reduction of a switching supply reduces shipping costs compared to an equivalent linear design
  - **End user appeal**  
Power supply matches high tech product it powers
- **End user**
  - **Convenience**  
Small size and light weight and only covers one electrical outlet
  - **Energy Saving**  
Zero load energy savings alone exceed the cost of the power supply in < 1 year

## Many OEMs already meet < 300 mW no-load

- **Specifications at < 100 mW and < 10 mW common place**
- **Requirement can be met cost effectively**
  - Many end cost sensitive consumer products available now that meet < 300 mW

# Linear vs. Switcher: Summary

PARAMETER	LINEAR	<i>LinkSwitch</i>
Output Specification	2.7 W, 9 V	2.7 W, 9 V
Cost	1 ¢	1 ¢
Input Voltage	98 to 132 VAC	85 to 265 VAC
Full Load Efficiency (115 VAC)	55%	75%
No Load Input Power (115 VAC)	1.6 W	200 mW
Annual Energy Cost (2.7 W load)	\$ 6	\$ 3.8
Annual Energy Cost (no-load)	\$ 1.68	\$ 0.22
Short-circuit Current	2.3 A	50 mA
Short-circuit Protection	One time thermal fuse	Self-restarting
Weight	9.4 oz / 267 g	2 oz / 56 g
Volume	2.45 in <sup>3</sup> / 40 cm <sup>3</sup>	11 in <sup>3</sup> / 176 cm <sup>3</sup>
Shipping Cost by Sea (per unit)	1 ¢ (reference)	0.4 ¢
Shipping Cost by Air (per unit)	10 ¢	5 ¢

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## Next Step minimum efficiency

- **>65% is achievable today with low cost designs**
  - not specific to one manufacturer
- **Silicon technology can recognise a full load and low load condition**
  - different schemes from different manufacturers
- **Reduces energy wastage in all conditions, not just standby**

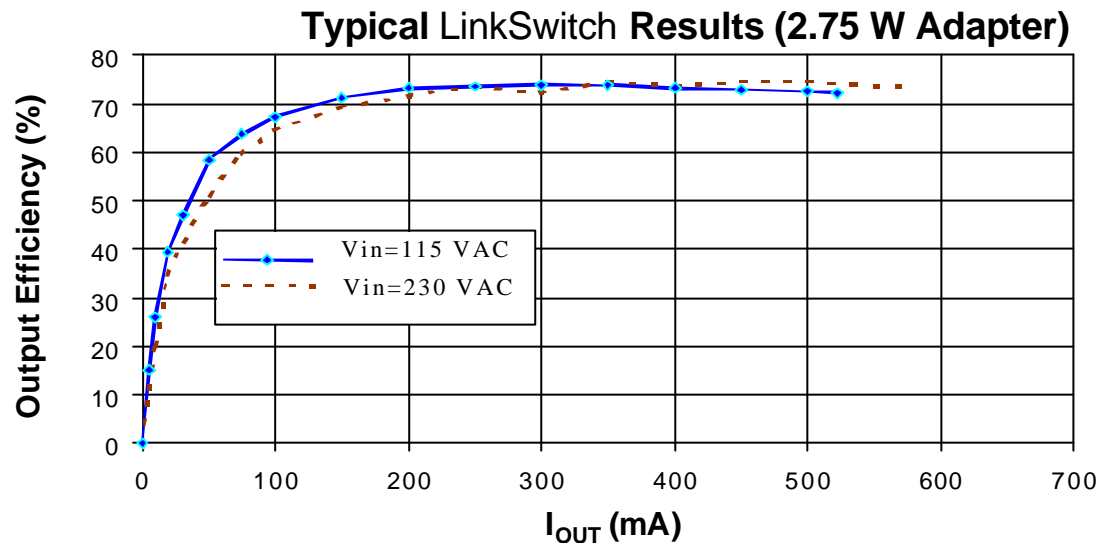


## Solution Example: 2.7 W Linear vs LinkSwitch<sup>®</sup> solution



- **\$ LinkSwitch solution = \$ Unregulated Linears**
- **\$ LinkSwitch solution < \$ Regulated Linear**
- **LinkSwitch solution performance >> Linear Performance**
- **Meets < 300 mW at 265 VAC input**
- **Extremely simple circuit - only 14 components for production worthy design**

# LinkSwitch Efficiency (Full, Standby & No-load)



- **Exhibits high full load efficiency**
  - **>70%** at 85- 265 VAC (Linears: **<40%** depending on model)
- **Simplifies design for standby requirements**
  - **60%** Typical efficiency at 10% load (Linears: **<25%** depending on model)
- **Energy efficient no-load consumption beats EC 2005 requirement**
  - **260 mW** at 265 VAC (Linears: **750- 1000 mW** depending on model)