



Signify Ultra Efficient Bulbs

EU EcoDesign Class A (210 lm/W)



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DOE R&D Conference

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Our most energy efficient LED bulb yet

Lasts for 50 years**
You save money, we reduce waste

**50,000 hour lifetime, based on 3 hours/day usage

60%
less energy

*comparing with standard
Philips LED bulb

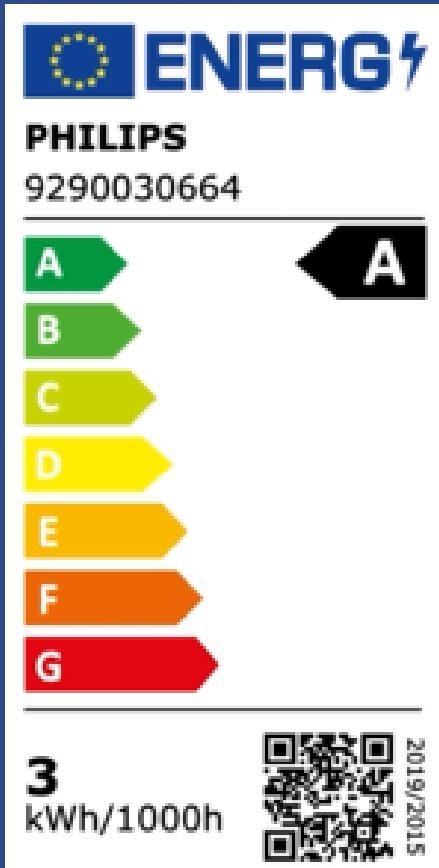
A



Looking for the ultimate energy-saving LED bulb? Look no further. For the first time ever, Philips has developed the Ultra-Energy Saving bulb that uses new technology to cut carbon emissions, reduce material waste, and lower energy usage. With an amazing 50,000 hour lifetime it lasts more than 3 times longer than regular LED bulbs — and uses a miniscule one-third of the energy. Just what is needed for a more sustainable planet.



Product Goal: Meet EU EcoDesign Class A Efficacy



Class	Efficacy (lm/W)
A	$210 \leq \eta_{TM}$
B	$185 \leq \eta_{TM} \leq 210$
C	$160 \leq \eta_{TM} \leq 185$
D	$135 \leq \eta_{TM} \leq 160$
E	$110 \leq \eta_{TM} \leq 135$
F	$85 \leq \eta_{TM} \leq 110$
G	$\eta_{TM} \leq 85$

Four A19 lamps:

- 2.3 & 4W / 485 & 840 lm / 40W & 60W equivalence
- 3000K and 4000K
- 50,000-hour life
- 500,000 switching cycles

Launched September 2021



Technical Design Aspects

A

New Label	
Class	Lm/W
A	210
B	185
C	160
D	135
E	110
F	85
G	0



Ultra-Efficient Lighting

Optics Design

- Filaments face outward to maximize light output
- No crossing/tilting of filaments

Thermal Design

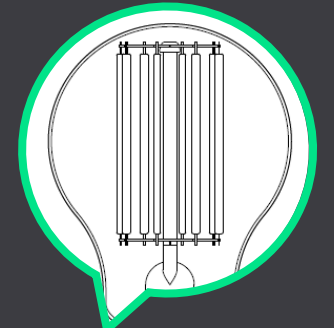
- Filament approach - distributed light source
- Filament positioning optimized for thermal control
- Helium/O₂ fill gas
- Thermally isolated LEDs and Driver

LED Design

- High efficacy phosphor
- Color point selected to maximize efficacy and maintain CRI 80 (TM30 R_f 85/R_g 93)
- Lowest chip V_F;
- Low drive current density – increase LED chip efficacy, reduce temperature, droop effects
- Chip quantity increased to reach desired light output

Driver Design

- High efficiency topology – every parameter examined. E.g.:
- Optimized inductor design, balance between core/winding loss
- Optimized switching, lower switching loss
- EMI improvements without dissipative components
- Miniaturized to fit into E27-cap

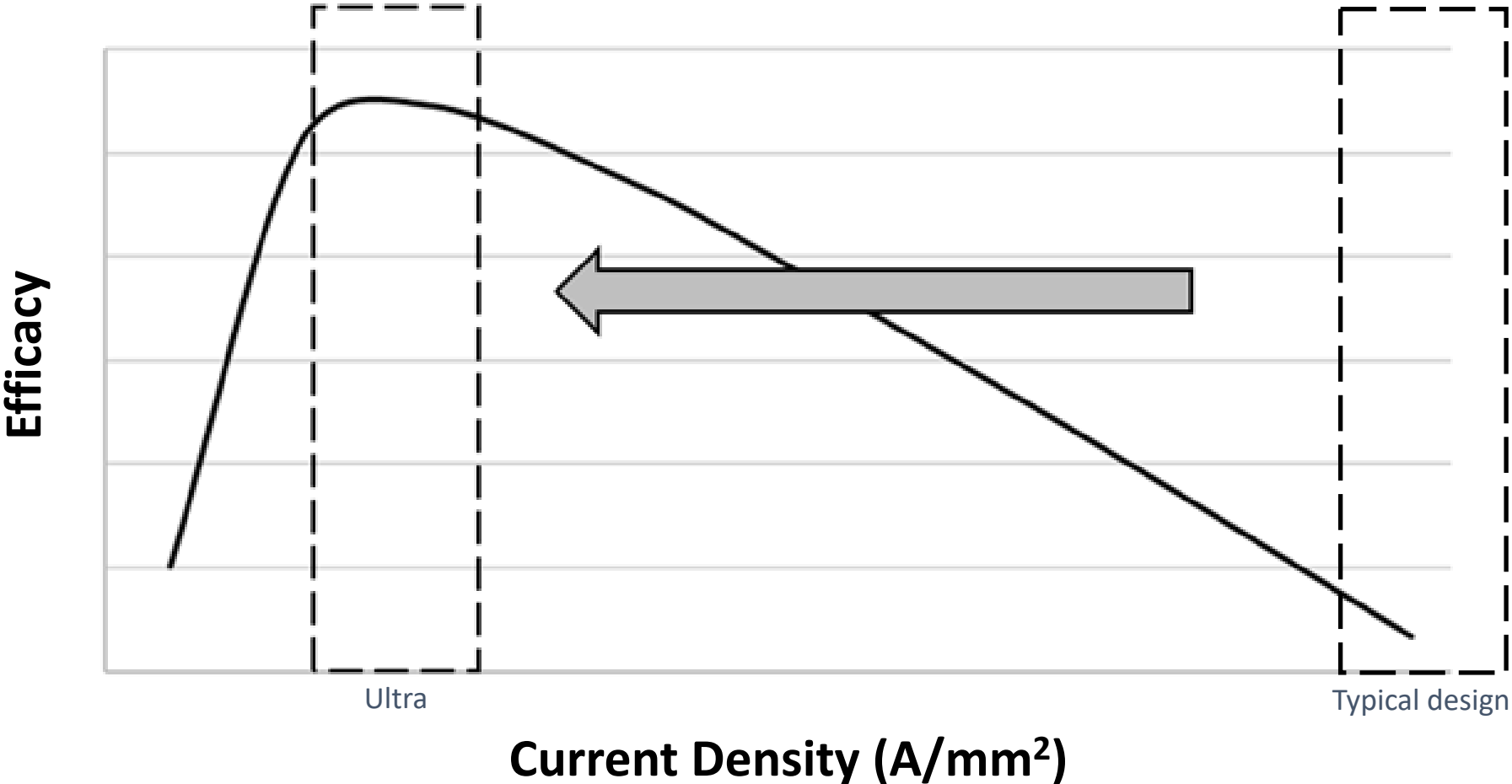


Filament Layout



Driver Assembly

Design Choices – LED Current Density



Performance Consequences

Peak Design – Products meet all specifications in EU EcoDesign regulation.

Design parameters/trade offs to maximize efficacy:

Dimmability, CCT, CRI, power quality, mains voltage, stroboscopic effect, light distribution, spectrum, cost

The choices we made for Ultra Efficient bulbs means they cannot meet Class A (210 lm/W) AND simultaneously be:

- Dimmable
- CRI 90+
- 110V
- Directional or small volume lamps
- Connected
- Energy Star
- Title 20

The general design approach may be used to meet stricter specifications and yield higher efficacy, but efficacy will differ from 210 lm/W.



Summary

Flagship A lamp products

- Optimized to meet specific efficacy goal (EU EcoDesign Class A).
- Peak design. Trade offs to maximize efficacy have consequences to performance and cost.

Existing US certification/regulatory requirements do not presently allow A lamps with 200+ lm/W performance.

To fight effects of climate change – do we need to elevate the importance of efficacy and reconsider US specifications and design requirements to enable Ultra Efficient products like this?



Signify