

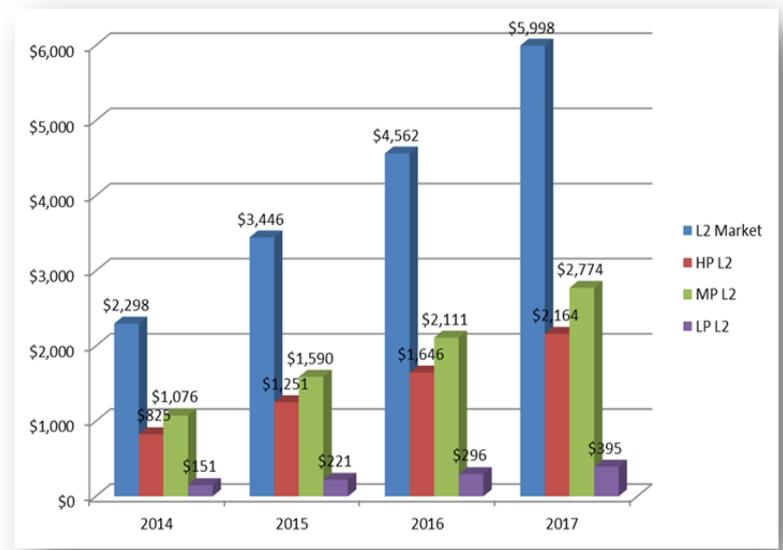
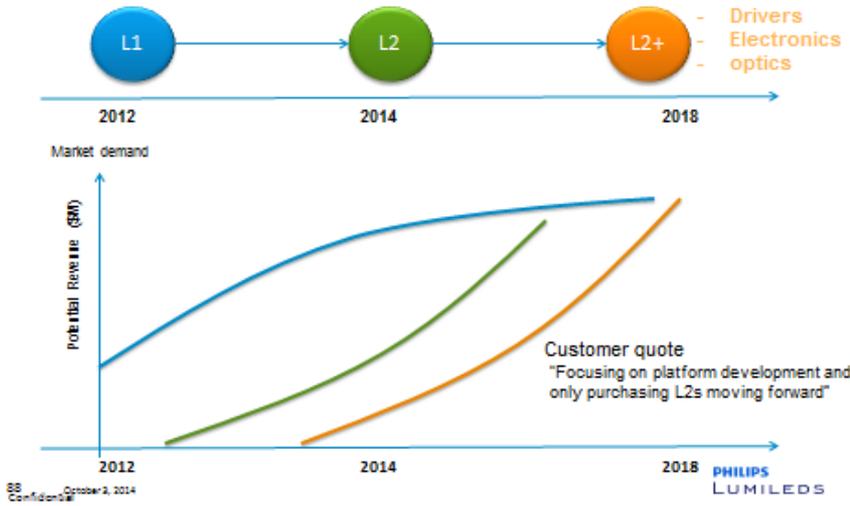
# LED Forward Integration

## LED Engines

Iain Black  
January 2015

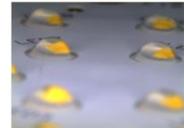
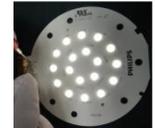
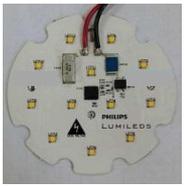
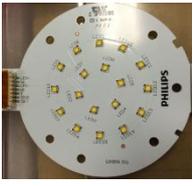


## Growth in LEDs coming from Level 2 / L2+ Customers seeing more value in turnkey solutions



Projected overall L2 market  
CAGR ~35%

## Integration Path -



Die+ Optics: L1

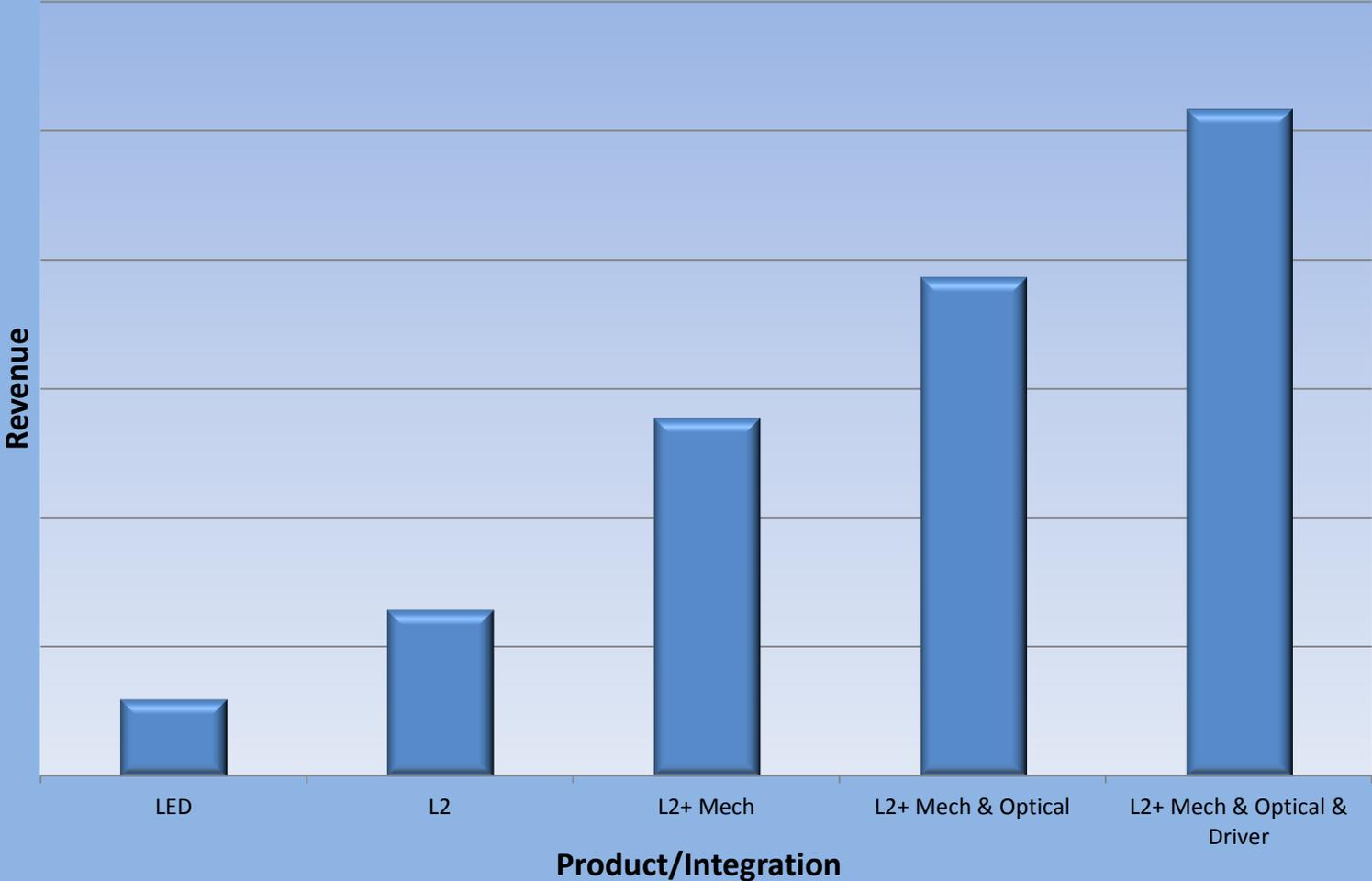
L2 LED board + Driver board

L2+: integrated LED's + Driver

L2+: integrated LED's + Optics

L2+: integrated LED's on heat sink , ceramic or composite materials , active cooling + Optics

# MP LED Luminaire Manufacturing Value Chain



# LED – Light Engines

## Light Engines

### Infinitely configurable LED boards, modules

- Wide ranging, turnkey LED solutions for a variety of applications.
- Custom designs leveraging broad technology portfolio and understanding
- Engineered LED solutions enhance Time to Market for luminaire manufacturers

## Value Proposition for Customers

- In-line application of L1 production data for improved L2 performance
- Seamless adoption of next gen LEDs for cost-down and performance up
- Future cost-down through board-level innovation and technology roadmap
- Expertise in handling LEDs; proven quality and reliability
- Complete set of L2 capabilities
  - Dedicated application support L2 design and add system know-how
  - L2+ Capabilities , Optical, Mechanical and Electronics

## Simplified Value Chain

- Turn key solutions; single point of contact for Light Engine
- No liabilities for LED yield, as L2s offered as complete, yielded products
- No liabilities for LED inventory at EMS, as LED are held by manufacturer

## Level Collapse Opportunities

- L2 + capability enhanced by on board LED customization
- LED solutions delivered to optimize driver efficiencies and costs
- Optical /Thermal system modelling with broad range of substrates and lens capabilities leveraging adjacent markets to Illumination.

# Summary

- Turnkey manufacturing for LED Engines is a rapidly emerging model – this is enhanced by technology driving “level collapse”
- Functional Integration will drive LED Engine development
- Many customers will move from “make” to “buy” decisions as light engine functionality increases, to improve ease of use, access critical technology and enhance time to market
- Opportunity for LED manufacturers to move up the value chain
  - **Enabled by unique capabilities intrinsic to control of LED design and manufacture**
  - **Develop new ways of working including**
    - Joint developments, custom L2 /L2+ solutions and standard off the shelf modules.
  - **Add unique value with customized LED solutions and higher levels of integration**



Thank you