Integration of Drivers and Luminaires

Alireza Safaee | Feb. 01 2017 | Long Beach, CA

DOE SSL R&D WORKSHOP

OSRAM

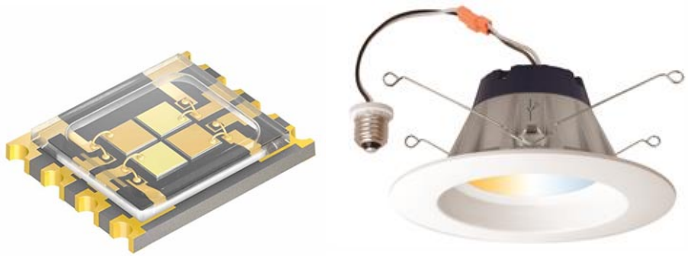
SSL : Beyond Energy Saving and Retrofitting

Remarkable Performances

Bright

Compact

Efficient



State-of-the-art Technology

Connected

Instant

Reliable

Opening New Horizons

Smart

Adaptable

Intuitive

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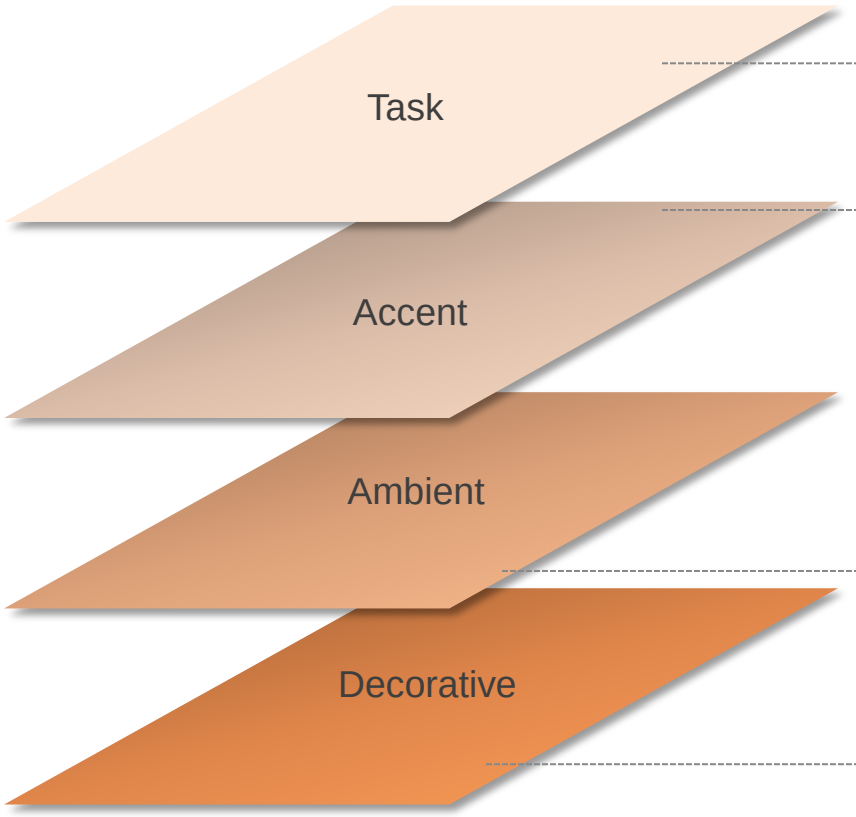
Lighting Design in Layers for Applications



Specific lighting distribution in the desired direction, Intensity and pattern

Applications

General
Office
Industrial

Retail
Hospitality
Museum
Conventions
Mall

Uniform Lighting, Tends to establish mood and provide general illumination

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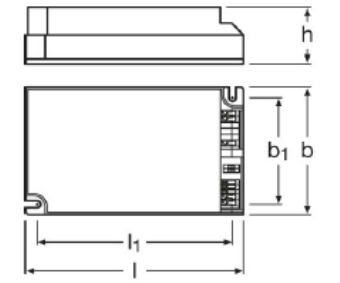
Integration of Drivers and Luminaires

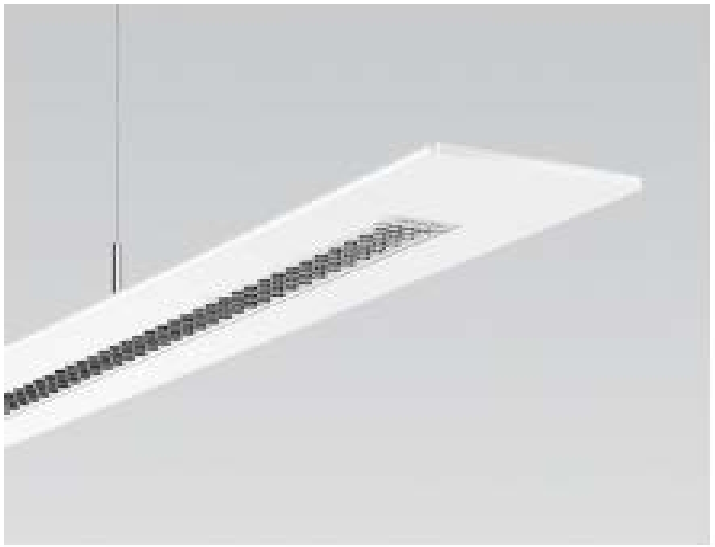
Low Profile is Key

OT 35/220...240/700 LTCS

CC Power supplies with LEDset



Product line drawing



Brick type drivers are hard to integrate into recessed and pendant indoor luminaires.

Length	123.0 mm
Width	79.0 mm
Mounting hole spacing, length	111.0 mm
~~**Mounting hole spacing, width**~~	~~67.0 mm~~
Height	33.0 mm
Product weight	220.00 g
Cable cross-section, input side	0.2...1.5 mm² 1)
Cable cross-section, output side	0.2...1.5 mm² 2)
Wire preparation length, input side	8.5...9.5 mm

Target height < 9 mm

Power density = 3-5 W/inch^3

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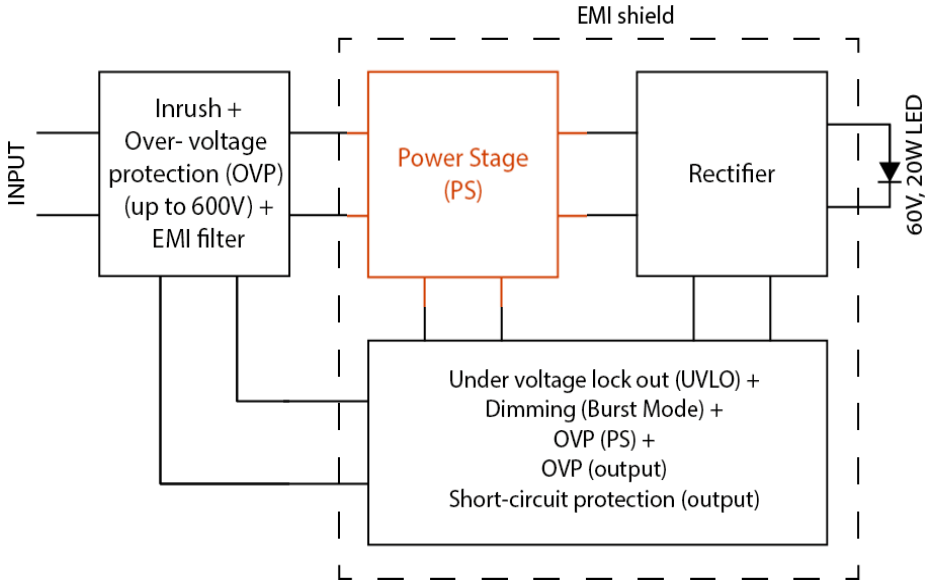
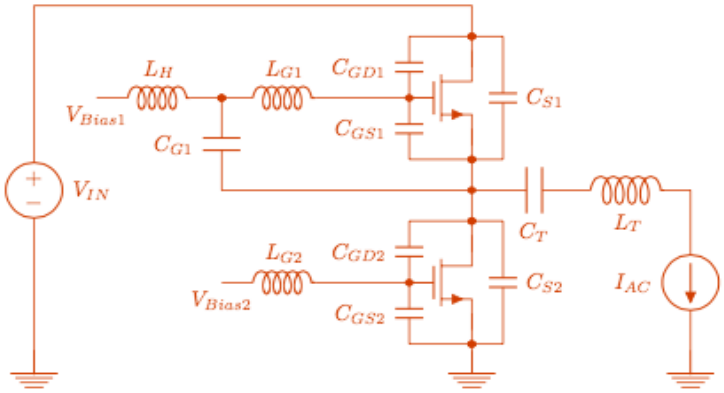
Integration of Drivers and Luminaires

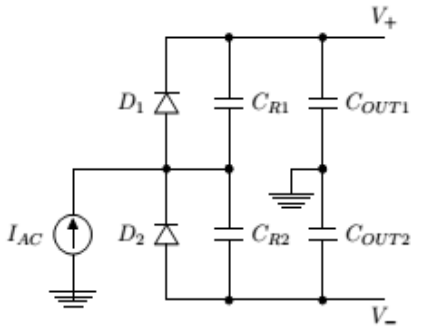
Low Profile is Key

NPC008P-0215

Nordic Power Converters







Operation Frequency **27MHz** → Smaller passive components

Self-sustained oscillation principle → Very stable, Robust

No high voltage or current stress → Low failure rate

Low component count → High reliability, Low cost

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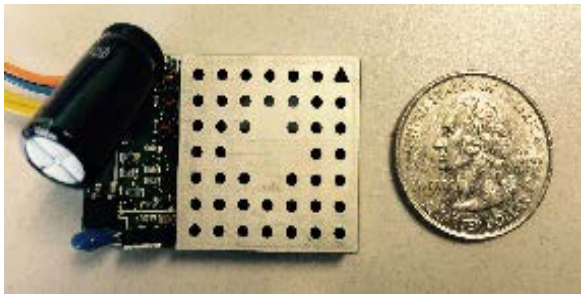
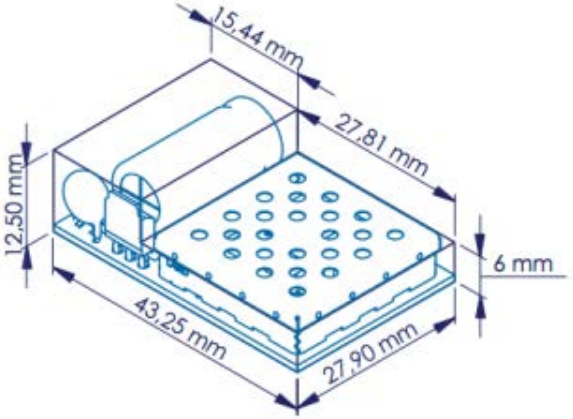
Integration of Drivers and Luminaires

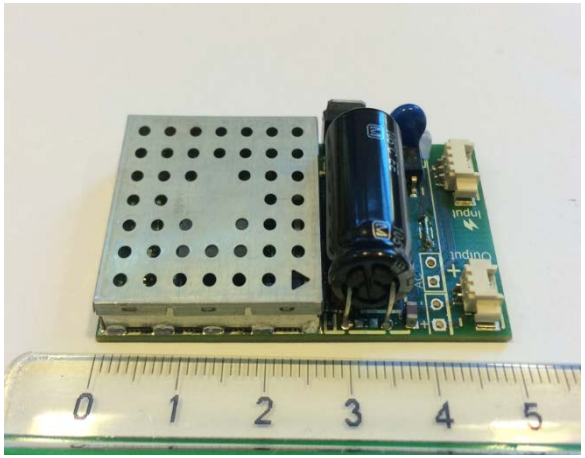
Low Profile is Key

NPC008P-0215

Nordic Power Converters







	NPC008P-0215
Power	21 W
Efficiency	89.6%
Current ripple	15%
Power density	2.1 W/cm^3
Dimmable	Down to 1%
Isolated	No
Input voltage	120 ±10%
Output current	350mA
Power factor	0.54

Efficiency > 92%

Power density > 30 W/inch^3

- Electrolytic Capacitor
- Power Density

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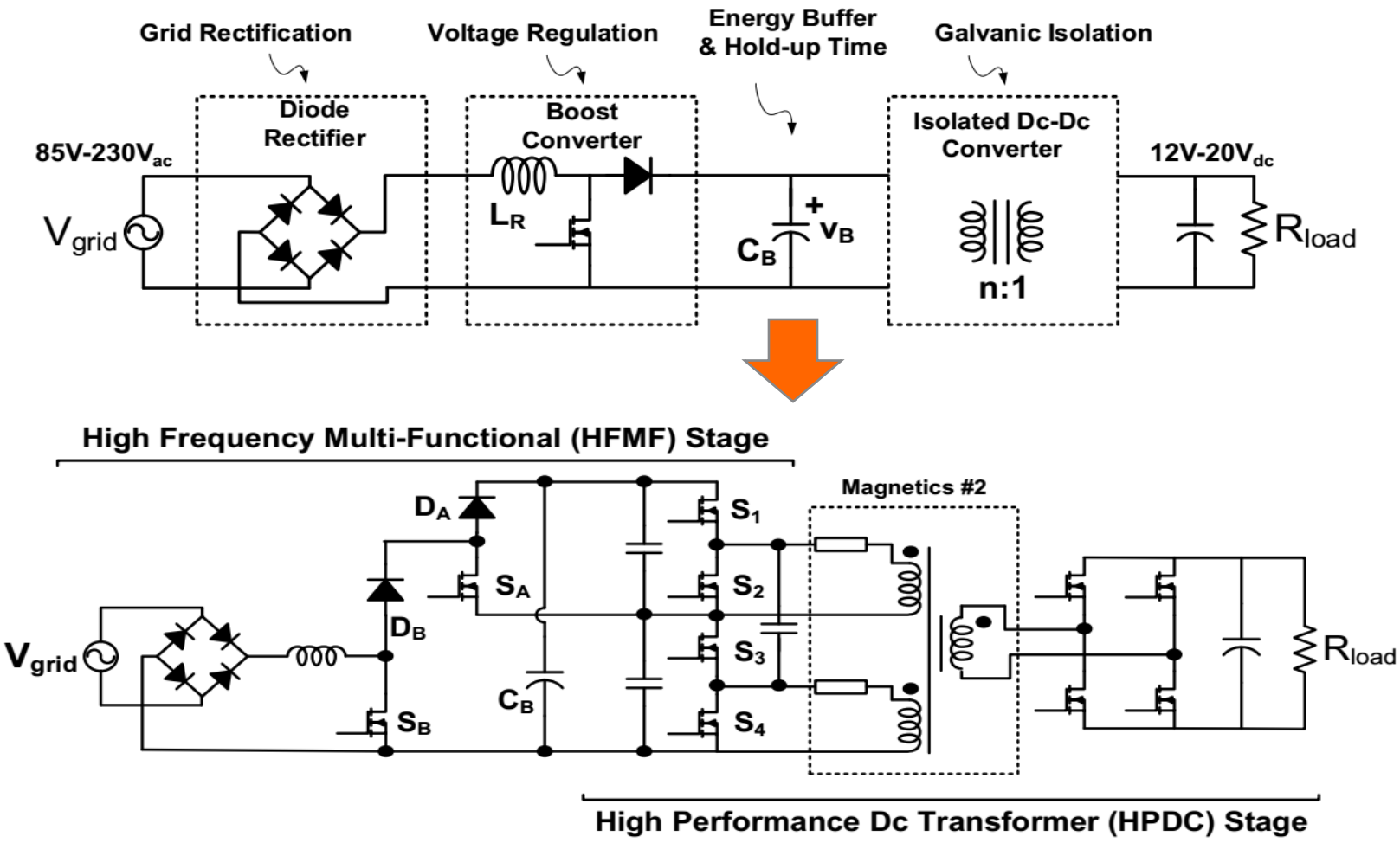
Integration of Drivers and Luminaires

High Power Density is Another Key



M. Chen, K. Afridi, S. Chakraborty, and D. Perreault, "MultiTrack Power Conversion Architecture", IEEE Transactions on Power Electronics, 2016

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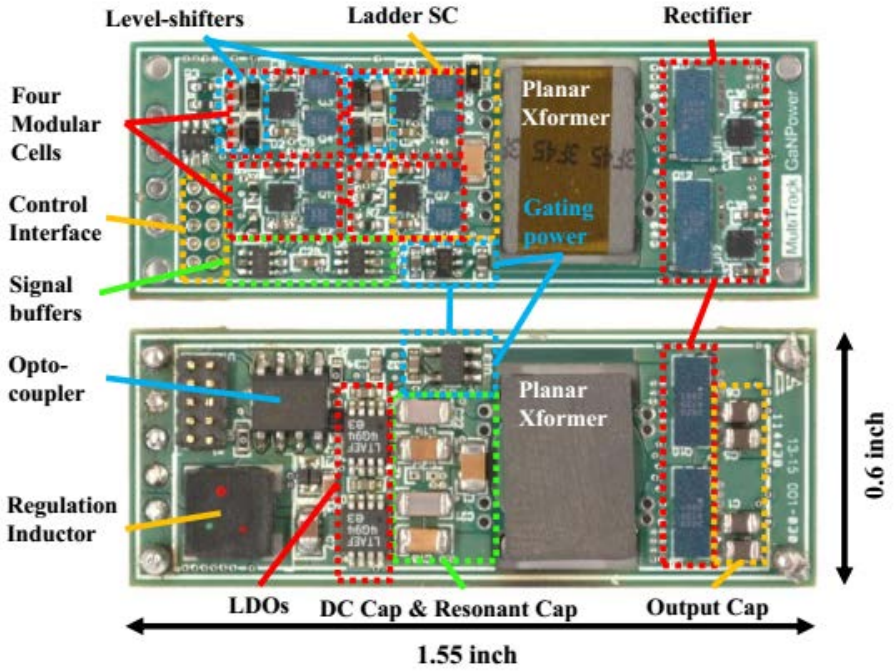
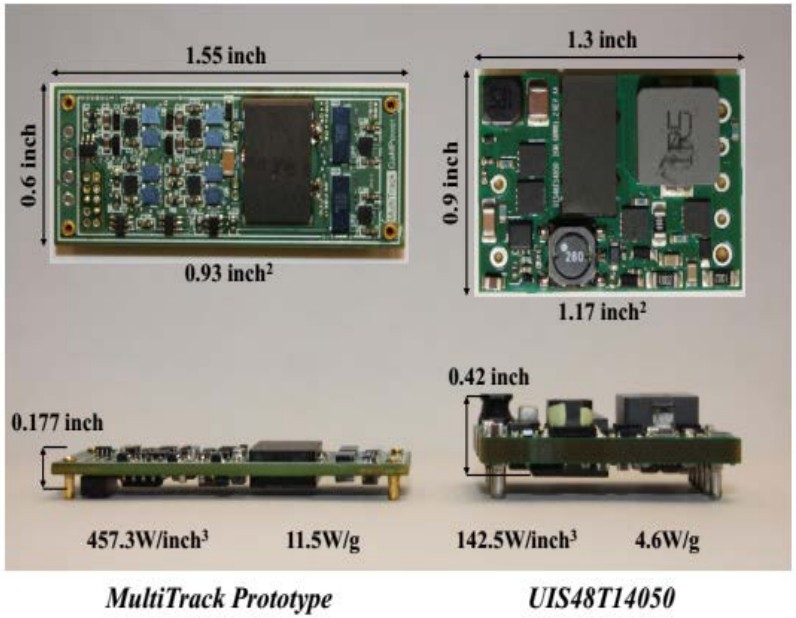
High Power Density is Another Key

Toward high power density and no electrolytic capacitors





- No electrolytic capacitor
- Much higher power density

Efficiency > 91%
Power density > 400 W/inch^3

M. Chen, K. Afridi, S. Chakraborty, and D. Perreault, "MultiTrack Power Conversion Architecture", IEEE Transactions on Power Electronics, 2016

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Effortless Adjustment of Light Distribution

Multi-Channel Drivers

Concept

An innovative solution (luminaire, driver, and software application) which enables users to instantly and effortlessly shape light output including

- Beam angle
- Direction
- Distribution / Shape
- Intensity

with an easy and intuitive touch-screen, wireless interface

Benefits

Better value:

•Fewer fixtures

•No ladders needed

Enhanced design:

•Enables clean ceiling look

•No moving parts (silent & reliable)

Highest flexibility:

• 60+ individually controlled LEDs

• Infinite distribution options

• Ambient and accent light simultaneously from one luminaire

• Create multiple accents/spots & dynamic sequences

• Reconfigurable or multifunction spaces

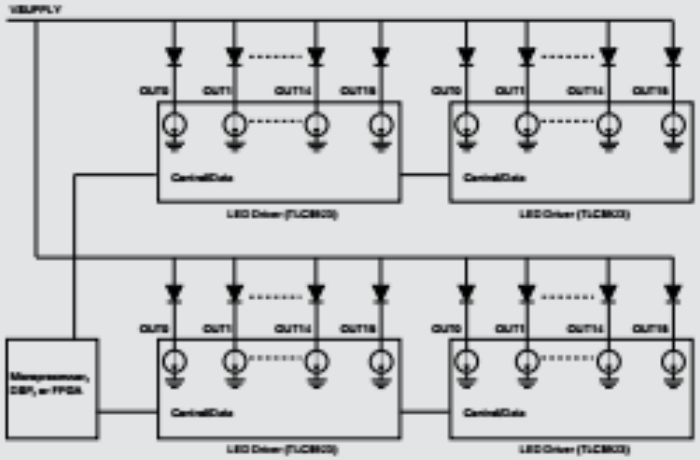
• Live floor plan view via a WiFi camera

Multi-Channel Drivers

Direct driving vs. (Time) Multiplex

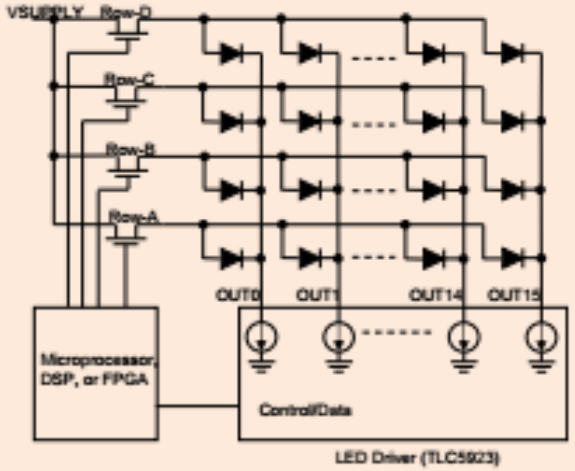
Direct driving

64 LEDs ➔ Four 16-channel LED drivers



Multiplex

64 LEDs ➔ One 16-channel LED driver



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Multi-Channel Drivers

Direct driving vs. (Time) Multiplex

Direct driving	Multiplex
• Max LED brightness can be used	• Reduced number of driver
• Modular design	• Cost saving
• Straightforward calibration	• Fewer wires
• Too many components	• Less connector problems
• Low reliability	• Generates ghosting
• Too many wires	• Reduces max brightness
• Connector problems	• Reverse voltage across LEDs
• Cooling	• More difficult calibration
• Expensive	• Higher EMI

Take-Away Messages

Integration of Driver in Luminaire requires:

- Low profile
- High power density

The solution(s) for economic, efficient, reliable, high power multi-channel drivers yet to be found.

Many Thanks.

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