



# Innovative Semiconductor Solutions for Smart Lighting Applications

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Greater China & South Asia Region  
STMicroelectronics

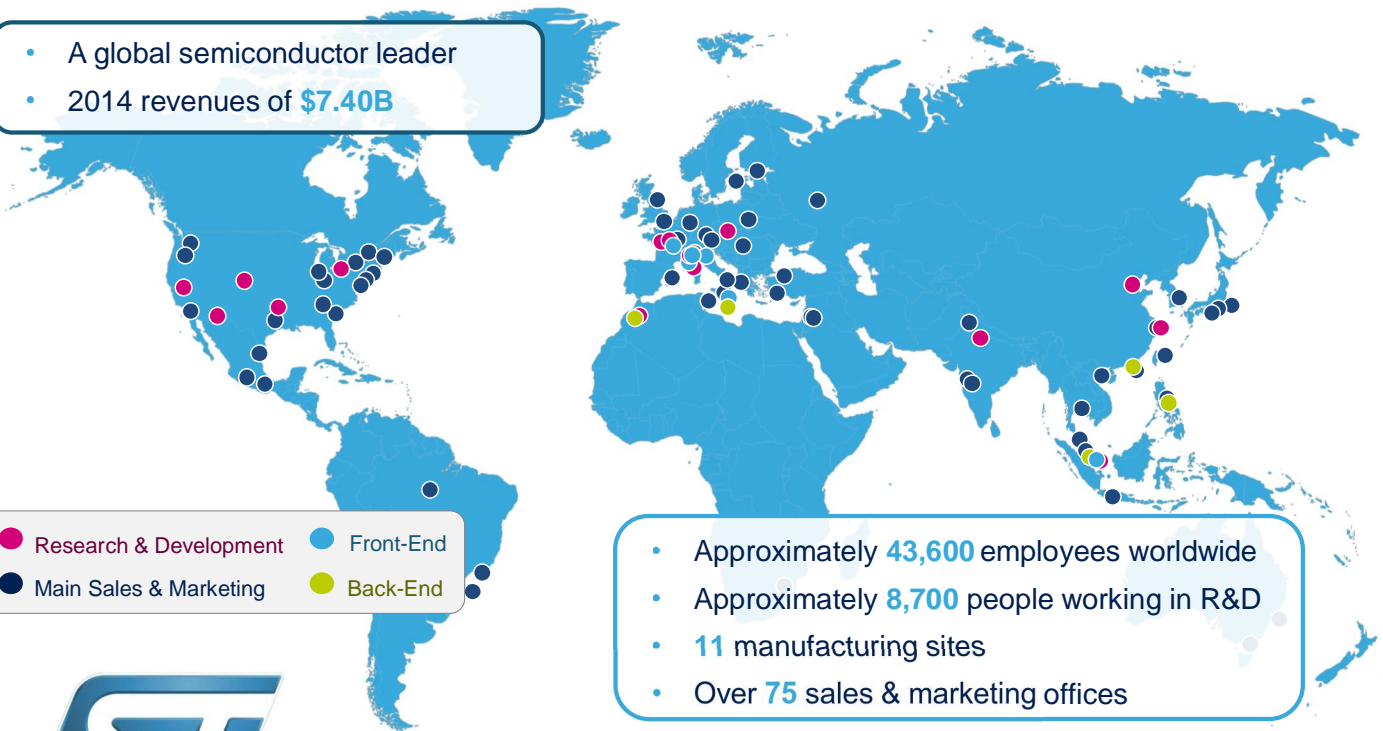
LED Forum, Taipei October 23<sup>th</sup>, 2015



## Agenda 2

- Who we are
- STMicroelectronics: One Stop Solution For Lighting
- Residential, Indoor & Street Lighting
- Dedicated Products: HVLED Family
- From Analog to Digital: STLUX, the Smart Platform
- The Architecture
- LED: Display & Signage: The array Drivers
- Conclusions / Q&A

- A global semiconductor leader
- 2014 revenues of **\$7.40B**



- Approximately **43,600** employees worldwide
- Approximately **8,700** people working in R&D
- **11** manufacturing sites
- Over **75** sales & marketing offices



Listed on New York Stock Exchange, Euronext Paris and Borsa Italiana, Milano



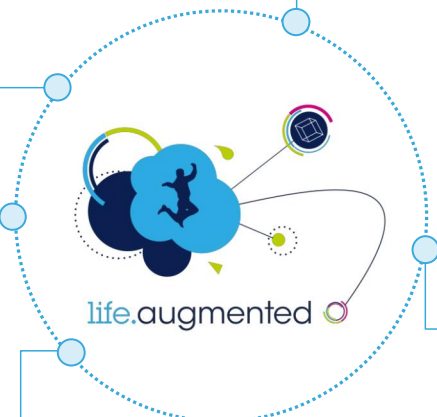
**Our MEMS & Sensors** are augmenting the consumer experience



**Our digital consumer products** are powering the augmented digital lifestyle



**Our automotive products** are making driving safer, greener and more entertaining



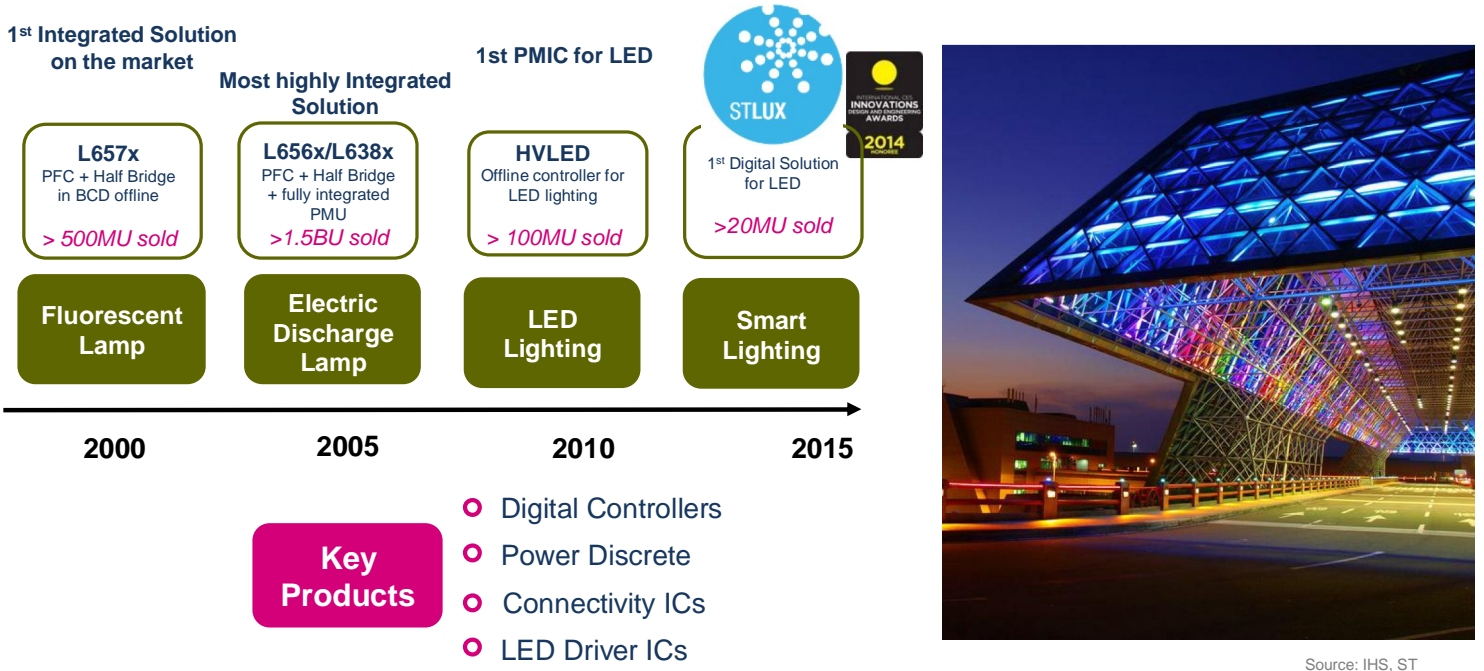
**Our Microcontrollers** are everywhere making everything smarter and more secure



**Our smart power products** are allowing our mobile products to operate longer and making more of our energy resources

# Driving the Evolution of Lighting

## Mastering all lighting Technologies since the Beginning



# General Lighting Solution for Solid-State Lighting



>75W  
Street-lighting, High-Bay, industrial applications



15-75W  
Residential, office, shop and street-lighting



<15W  
Bulb and spotlight for home



DC Powered LED drivers

Different applications = Different power levels = Different topologies = Different ICs



## Residential, indoor lighting and street lighting



## Dedicated products

3W – 15W  
HPF Flyback

### Controller + MOS

- HVLED805 5W
- HVLED807PF 7W
- HVLED815PF 15W

### Controller

- HVLED001
- HVLED003D
- HVLED005

15W – 75W  
Single/Two stage Flyback

### Controller

- HVLED001
- HVLED003D
- HVLED005
- STLUX385A
- STLUX325A
- STLUX285A
- PM8841D
- PM8851D

> 75W  
PFC+Resonant Controller

### Smart Controller

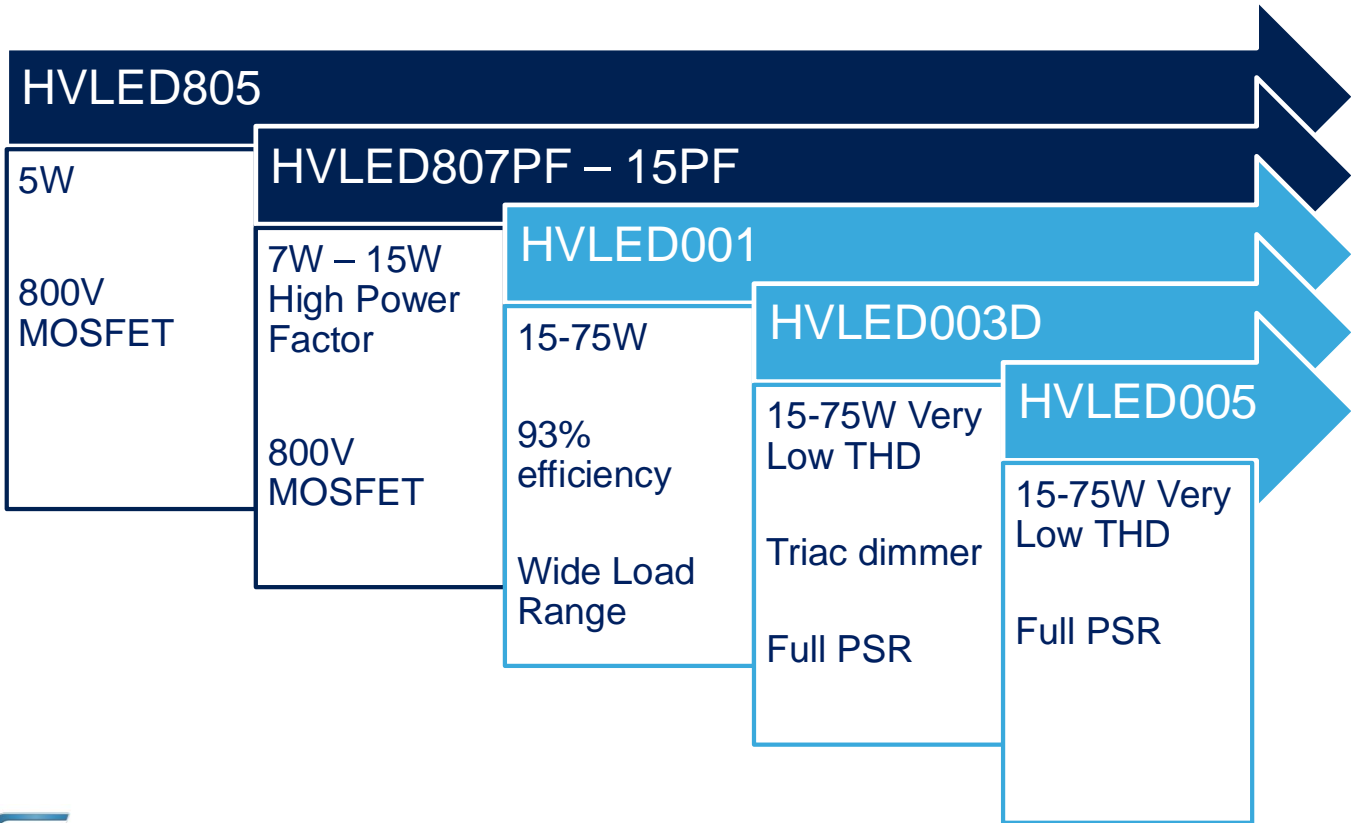
- STLUX385A
- STLUX325A
- STLUX285A
- PM8841D
- PM8851D

HVLED

STLUX™

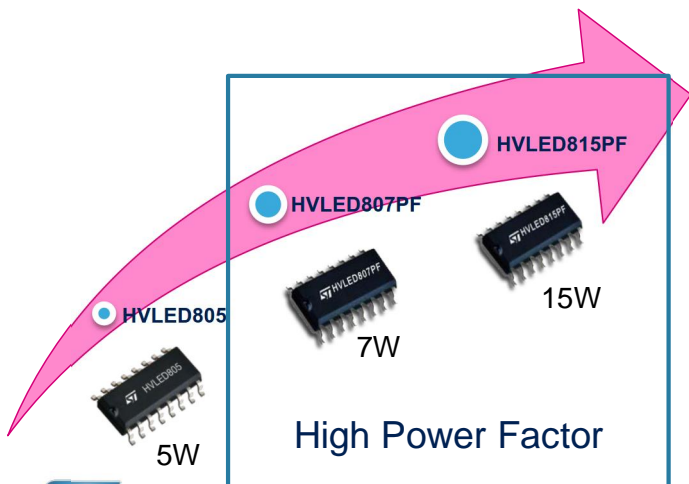




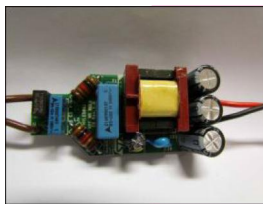


## HVLED805/807PF/815PF

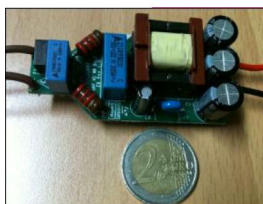
- Controller + 800V MOSFET
- Primary side voltage and current control
- High Power Factor + low THD
- Fault management



### Evaluation Boards



**EVLHVLED815W10F**  
 10W HPF Constant Current LED Driver (22V/455mA)  
 Wide Range Isolated (Flyback)



**EVLHVLED815W10A**  
 10W HPF Constant Current LED Driver (70V/140mA)  
 Wide Range Not-Isolated (Buck-Boost)



**EVLHVLED815W8CV**  
 8W HPF Constant Voltage LED Driver (25V)  
 European Range Isolated (Flyback)



# HVLED Controller: HVLED001 /003D / 005

High Performance Single Stage LED Power Supply for Lighting (15-75W)



## High Power Factor Flyback Controller

HVLED001

>90% efficiency  
50-100% LED current  
High voltage components integrated  
Dimmable:  
0-10 and PWM



## Dimmable HPF Flyback Controller

HVLED003D

Dimmable:  
Triac/0-10/PWM  
Current and voltage primary side controlled  
High PF & Low THD



## Full PSR HPF Flyback Controller

HVLED005

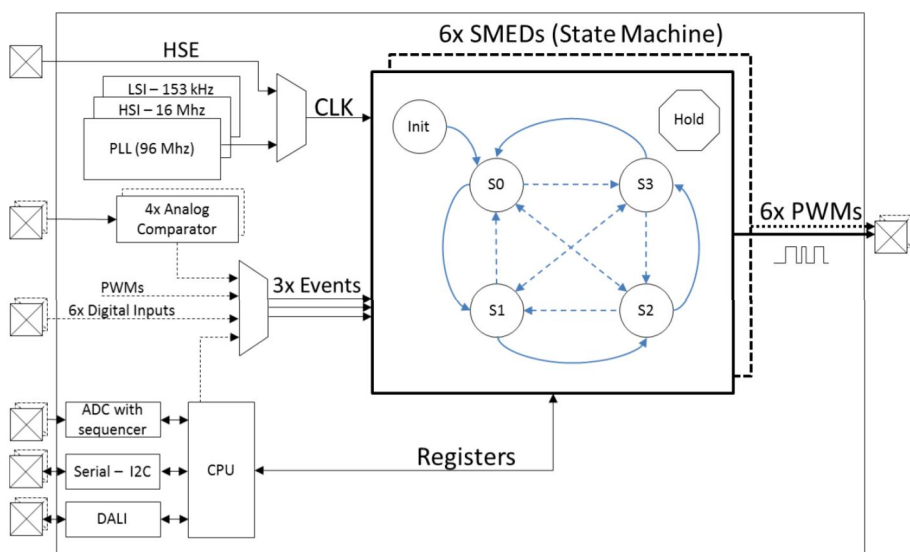
Current and voltage primary side controlled  
High PF & Low THD  
The smallest list of external component

High performance everywhere



# General Lighting Solution: STLUX385A

Digital ASIC for LED Power Supply



Due to its programmable SMED, STLUX™ is the most flexible ASIC in the market for lighting and power conversion



Enhances every lighting applications





# The Smart Lighting STLUX™ platform

## Smart lighting

LED, HID, fluorescent applications  
Dimming capability (PWM and/or LINEAR)  
and integration with sensors

## Digital power supply

PFC control, LLC, Asymmetrical Half Bridge,  
Fly-back, Full Bridge topologies and Buck/Boost  
single/multi channel synchronous rectification

## Wired or wireless communications

simplifying the installation in large indoor and outdoor area,  
reducing maintenance costs



# STLUX Platform



### STLUX385A/STLUX383 A

- 6 PWM
- DALI / I2C Interface
- 32kB Flash
- Wide -40°C ÷ +105°C range
- TSSOP38



### STLUX325A

- 5 PWM
- DALI / I2C Interface
- 16kB Flash
- Wide -40°C ÷ +105°C range
- QFN32L



### STLUX285A

- 4 PWM
- DALI / I2C Interface
- 16kB Flash
- Wide -40°C ÷ +105°C range
- TSSOP28



Resources	STLUX385A	STLUX383A	STLUX325A	STLUX285A
PWM	6	6	5	4
DIGIN	6	6	6	3
ADCIN	8	8	6	8
CMP	4	4	4	2
GPIO	6	6	4	4
Flash memory	32KB	32KB	16KB	16KB
E <sup>2</sup> Prom memory	1KB	1KB	1KB	1KB
SRam memory	2KB	2KB	2KB	2KB
ADC gain	x1/x4	x1	x1	x1/x4
DALI - I2C - UART	Y	Y	Y	Y
Package	TSSOP38	TSSOP38	VFQFPN32	TSSOP28



From state	1	To state	2
Idle	S0	Start	
S0	S1	0.0417 µs	
S1	S2	0.25 µs	
S2	S3	insign1	
S3	S0	682.6354 µs	1 µs

Item	Status
Product	<b>STLUX385A</b>
Board	<b>STEVAL-ILL068V1</b>
SMED configurator GUI & documentation	<a href="#">Online (STSW-STLUXSMED01) UM1760</a>
STLUX385A peripheral libraries & user manual	<a href="#">Available online UM1753</a>
5x application examples & user manual	<a href="#">Available on request</a>



## 200W LED Multi Output Lighting

- Applications: Street lighting, Architectural lighting
- Products highlighted: STLUX385A digital controller

### User benefits

- A single STLUX385A digital controller drives 4 independent LED channels
- Each channel is dimmable and can support different voltage ratings
- Analog and/or digital dimming
- Native DALI and 0-10V interface
- Support for PLM / Wireless modules





# 100W Constant Current LED Driver

- Applications: Street lighting, Area lighting
- Products highlighted: STLUX385A digital controller

## User benefits

- 92% High Efficiency
- All primary side regulation (PSR)
- Analog and/or digital dimming
- 10mA steps, 2% precision
- Native DALI and 0-10V interface
- Support for PLM / Wireless modules
- Easily scalable to efficiently support higher and lower power rates



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# HVLED001+STLUX385A+3PM8841

## 60W 2-stage system

3 independent LED channel for warm white & color lighting



**HVLED001+STLUX**  
60W Plug n Play  
Lighting system



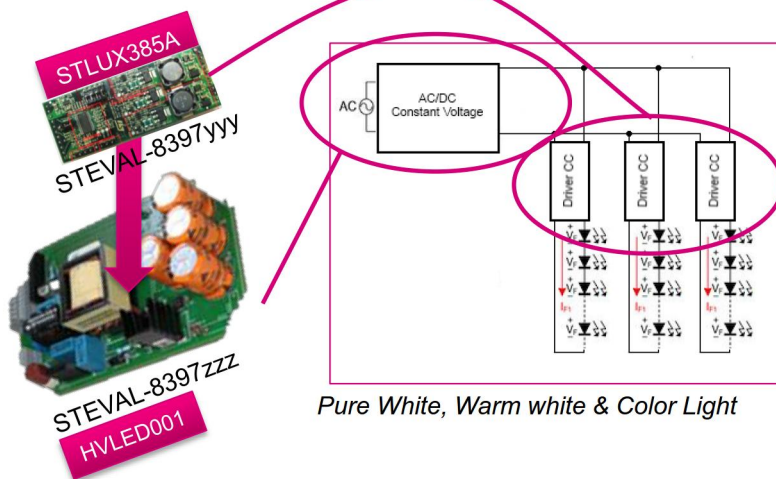
**Dimming**  
PWM, 0-10, DALI.  
Linear + PWM  
2-100% Capability



**IOT ready**  
Connectivity through  
UART

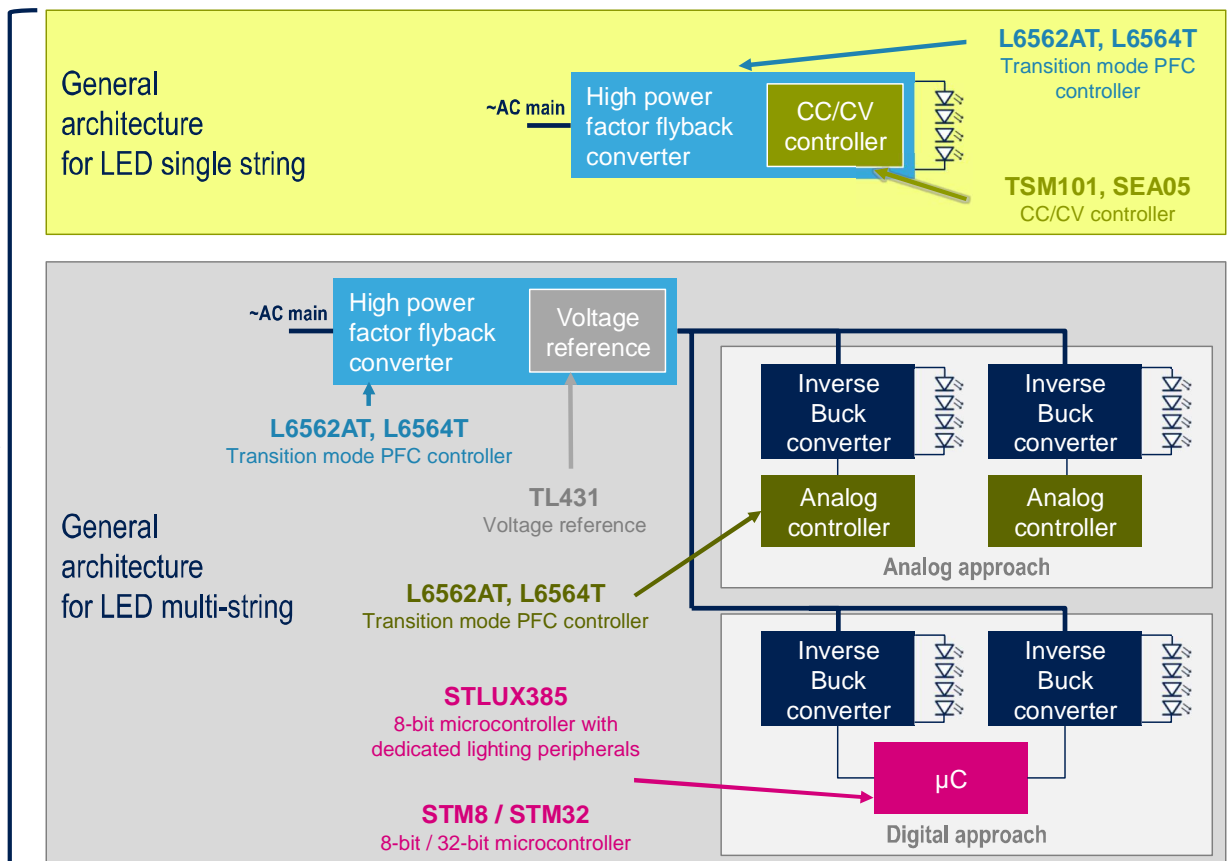
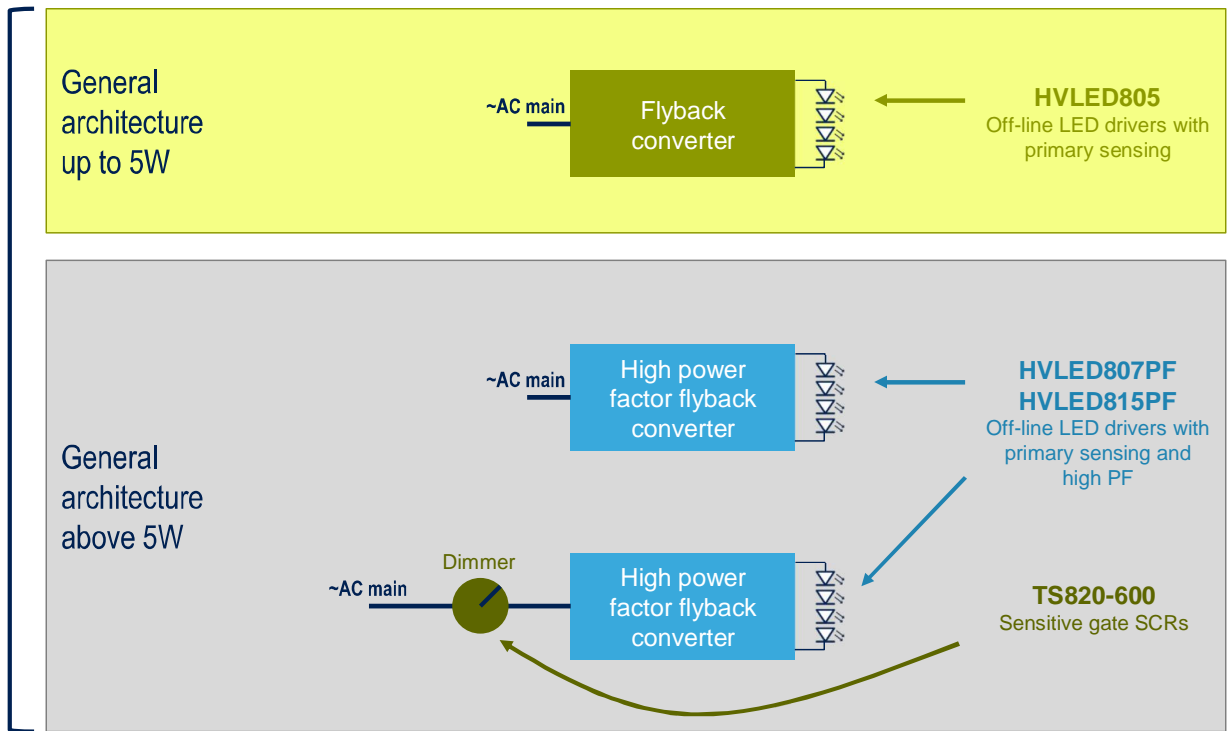
**HVLED001:** First stage Constant Voltage PSU

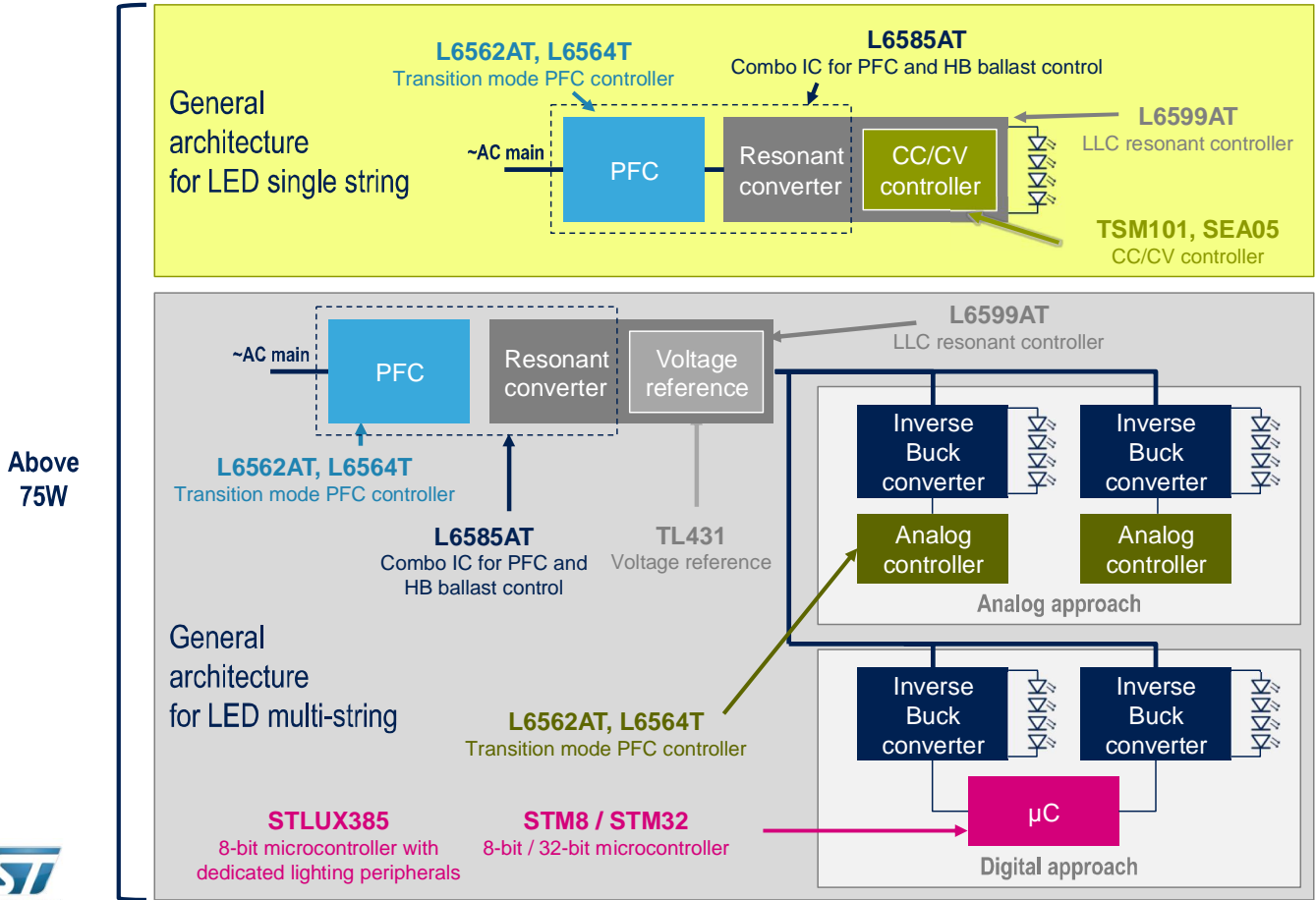
**STLUX:** Second stage 3Ch Constant current



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Improve the light to improve your life





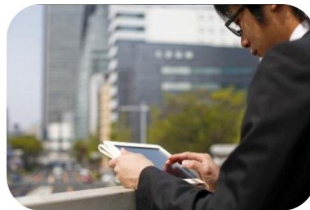
# LED Driver for Signage

Home appliances and DC to DC lighting

Signage



Backlighting



Lighting



## Multi Channel

LED driver with error detection

- STP16xx series
- STP08xx series
- STP04CM05

RGB

- STP24DP05
- LED2472G

Local Dimming

- LED1642GW

## LED multi rows

6-Rows LED driver with Boost regulator

- LED7706
- LED7707

16-Rows LED driver with Boost regulator and local dimming

- LED7708

## High Power LED

Monolithic buck

- ST1CC40
- LED2000/1

Monolithic multi-topology

- LED5000

Multi-topology Controller

- LED6001





## Industrial

- Architectural lighting
- Gambling / Amusement
- LED Backlight(LCD)
- Lighting
- Signage & Signals



## Automotive

- Ambient Lighting
- LED Backlight(LCD)
- Dashboard/Clusters
- Rear/Front Lighting



## Home appliances

- Control panel (UI)
- Segment and indicators
- Appliances interior lighting
- Appliances exterior lighting
- Emerging application



## Consumer Emerging LEDs application



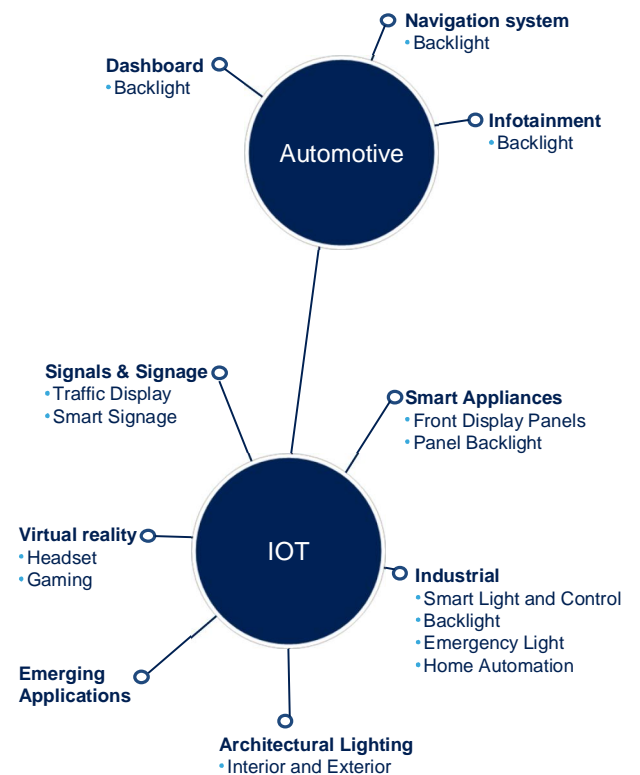
## LED DRIVERS

### DC-DC Powered Single Row LED Drivers

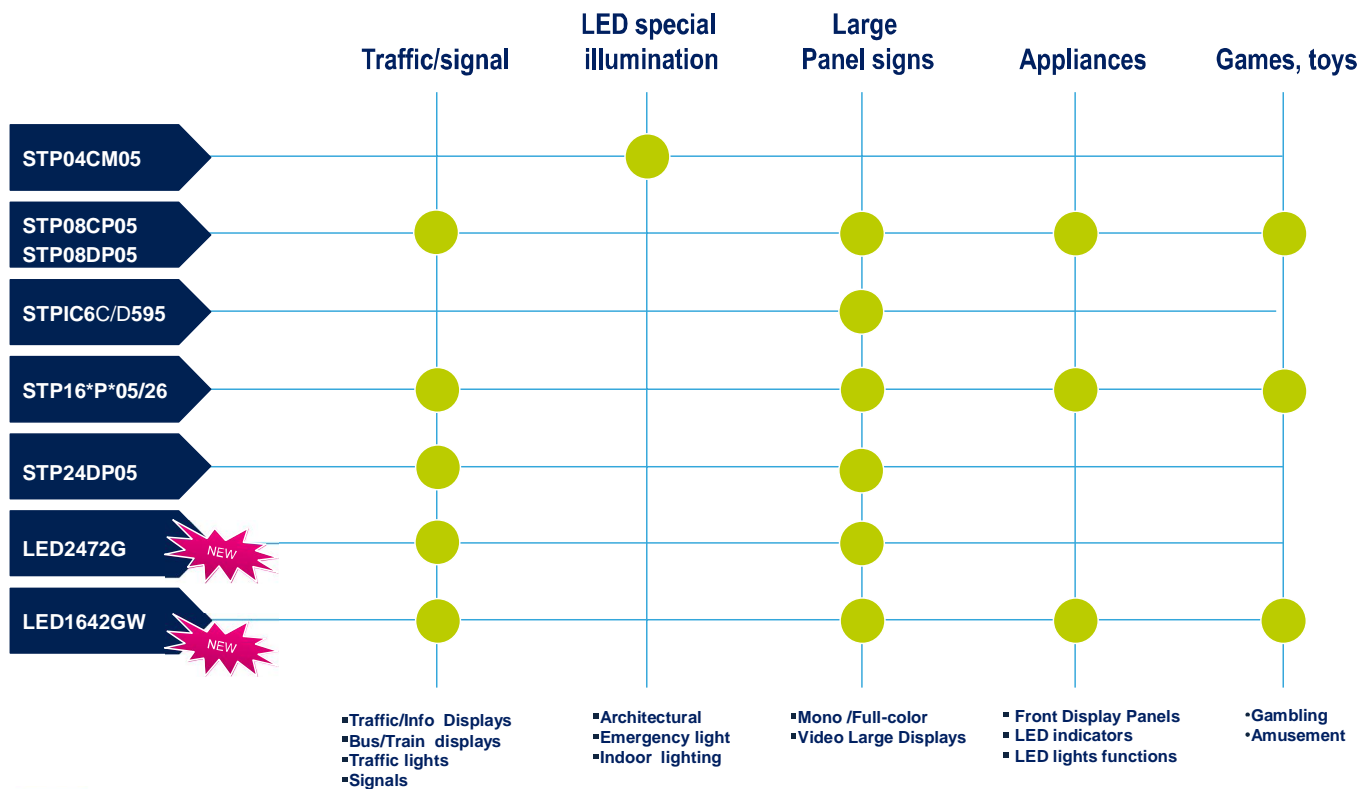
<b>LED2000/1 ST1CC40</b> Synchronous Buck	<ul style="list-style-type: none"> <li>• 18V – 3A and 4A – Synchronous Buck Rectification with dimming pin</li> <li>• <b>Very Low standby Current</b> (~6 µA)</li> </ul>
<b>LED5000-LED6000*</b> Asynchronous Buck	<ul style="list-style-type: none"> <li>• 38V/61V – 3A – Asynchronous Buck Rectification with dimming pin</li> <li>• <b>Low Stand-by Consumption</b></li> </ul>
<b>LED6001</b> Boost Controller with LED Driver	<ul style="list-style-type: none"> <li>• Vin up to 36V –Vout up to 60Vout With Asynchronous Rectification</li> <li>• <b>Analog and PWM dimming</b></li> </ul>

### Multi-row LED Drivers

<b>LED7706/07</b> 6-ROWS Led driver with Boost Regulator	<ul style="list-style-type: none"> <li>• Vin up to 36V 6-Rows up to 85mA Asynchronous Rectification</li> <li>• <b>PWM dimming</b></li> </ul>
<b>STP04CM05</b> LED ARRAY DRIVERS for Power LEDs	<ul style="list-style-type: none"> <li>• Serial interface, 4-Channels up to 400mA per channel</li> <li>• <b>PWM dimming</b></li> </ul>
<b>STP08/16/24xx - LED2472</b> Error detection and Power Saving	<ul style="list-style-type: none"> <li>• Serial Interface, 8 to 24 Channels up to 100mA per Channel</li> <li>• <b>PWM dimming, Error detection, Power Saving.</b></li> </ul>
<b>LED1642GW</b> Fully Programmable LED ARRAY Driver	<ul style="list-style-type: none"> <li>• Serial Interface, 16-Channels up to 40mA per Channel</li> <li>• <b>PWM local dimming , Analog dimming Error detection, Power Saving.</b></li> </ul>







- Serial Interface LED Drivers
- To drive multiple LED (string) by current-controlled parallel channels
- SPI Interface for  $\mu$ C I/O Minimization
  - individual channel status (ON/OFF) , LEDs error detection report read-back ,etc..
- Full set of feature choice
  - from basic/low cost part numbers...
  - ...to more advanced ones, including:
    - Full Error detection
    - Auto power saving
    - Independent PWM dimming
    - Global current gain
    - Programmable output drivers speed
    - Daisy chain data resynchronization

**LED ARRAY series**

**LED Standard Drivers**

- STP(A)16xx series
- STP(A)08xx series
- STP04CM05
- STPIC6x

**RGB**

- STP24DP05
- LED2472G

**Local Dimming**

- (A)LED1642GW

**Applications**

**Industrial**

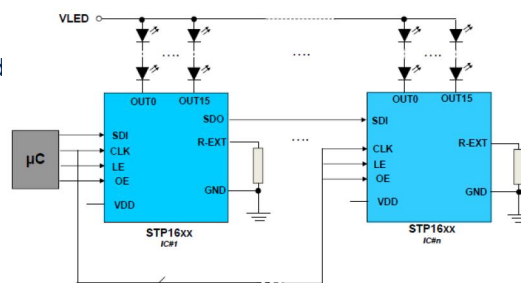
- Signage & Signals
- Gambling

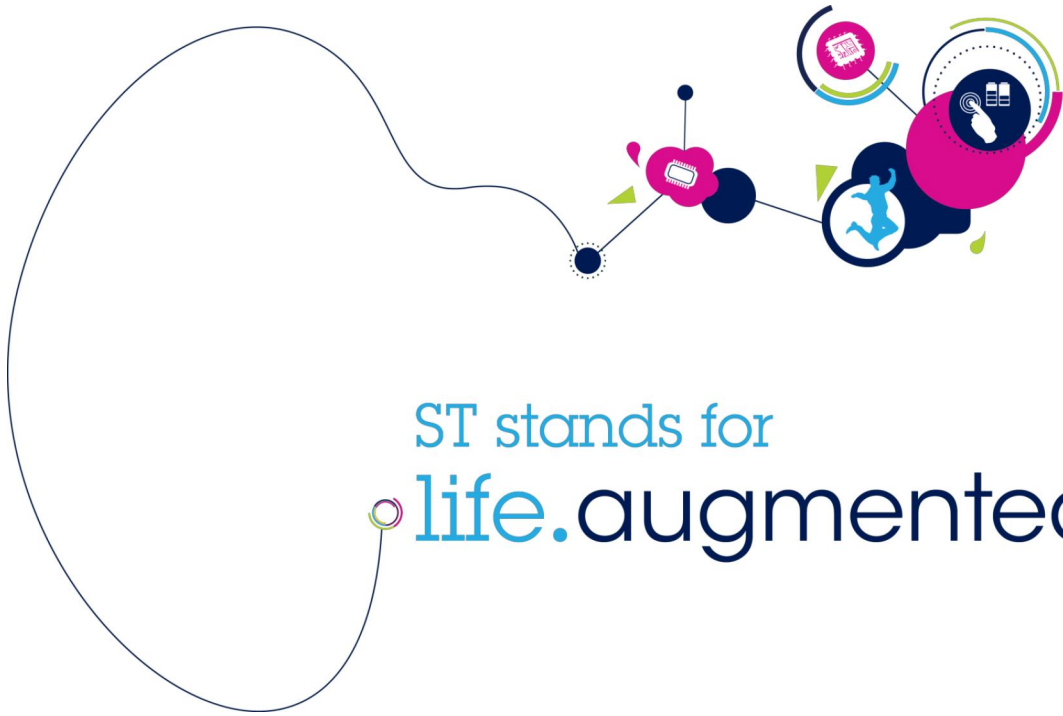
**Home Appliances**

- Control panel
- Segment and Indicators

**Automotive**

- Ambient Lighting
- Dashboard and Clusters
- Rear Lighting





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