

FOR ENERGY EFFICIENT INNOVATIONS

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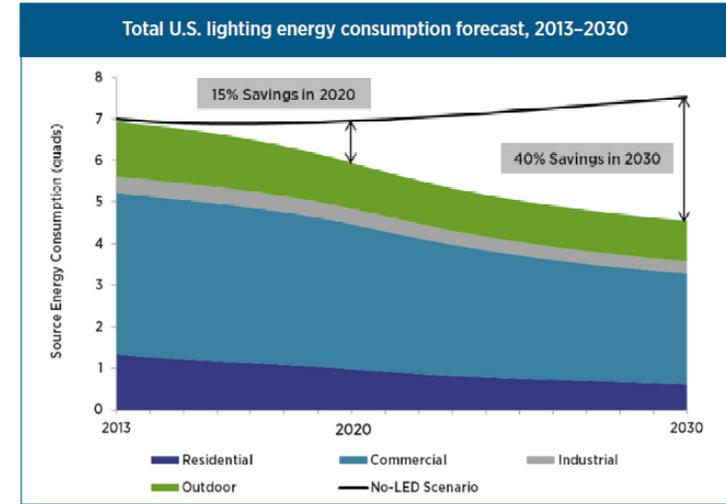
LED Lighting Driver Solution

Public Information



Why LED Lighting ?

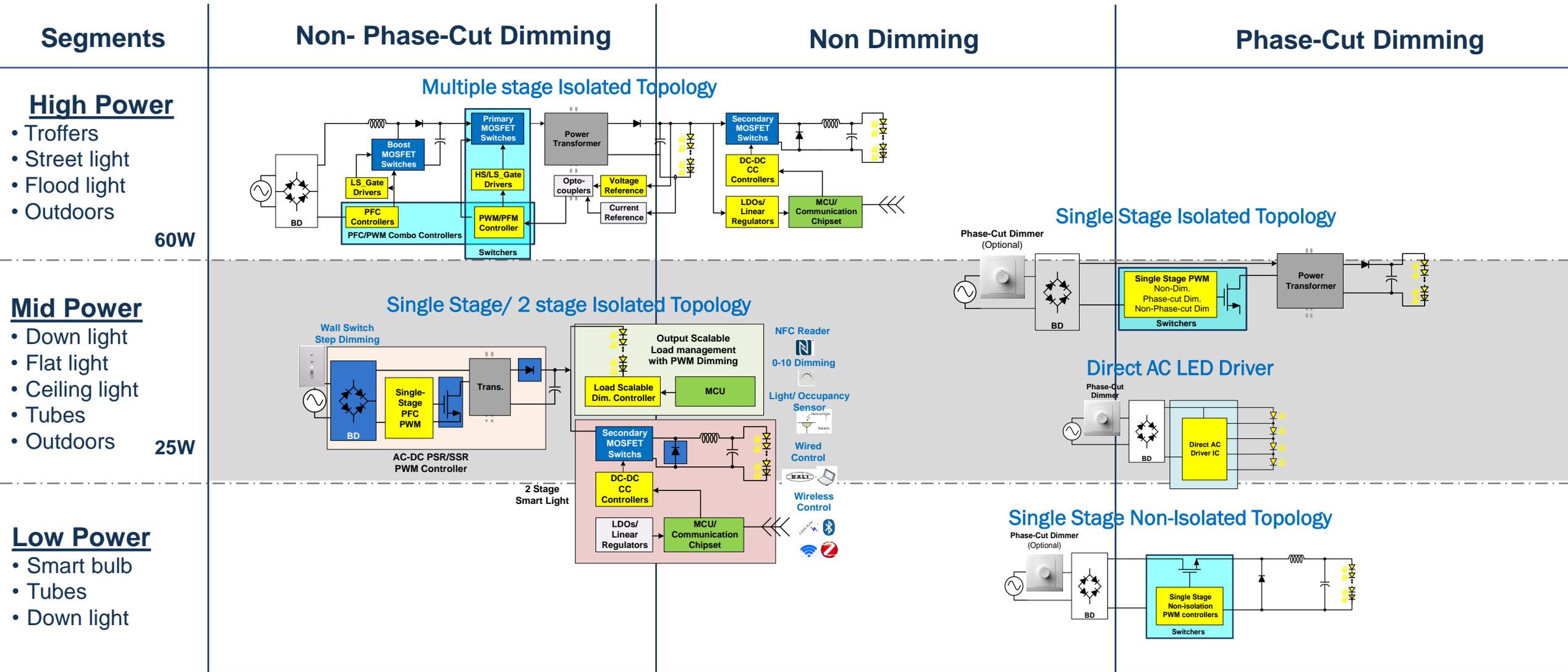
- 20% of Global Energy is used for Electricity Generation
- Over 25% of a Building Energy Consumption is used for Lighting
- With LED Lighting adoption can save 40% of lighting electricity in 2030



LED Lighting App./Market

Segments	Non- Phase-Cut Dimming	Non Dimming	Phase-Cut Dimming
<p>High Power</p> <ul style="list-style-type: none"> • Troffers • Street light • Flood light • Outdoors <p>60W</p>			
<p>Mid Power</p> <ul style="list-style-type: none"> • Down light • Flat light • Ceiling light • Tubes • Outdoors <p>25W</p>			
<p>Low Power</p> <ul style="list-style-type: none"> • Smart bulb • Tubes • Down light 			

LED Lighting Power Topology Solution



Direct AC LED Driver Solution

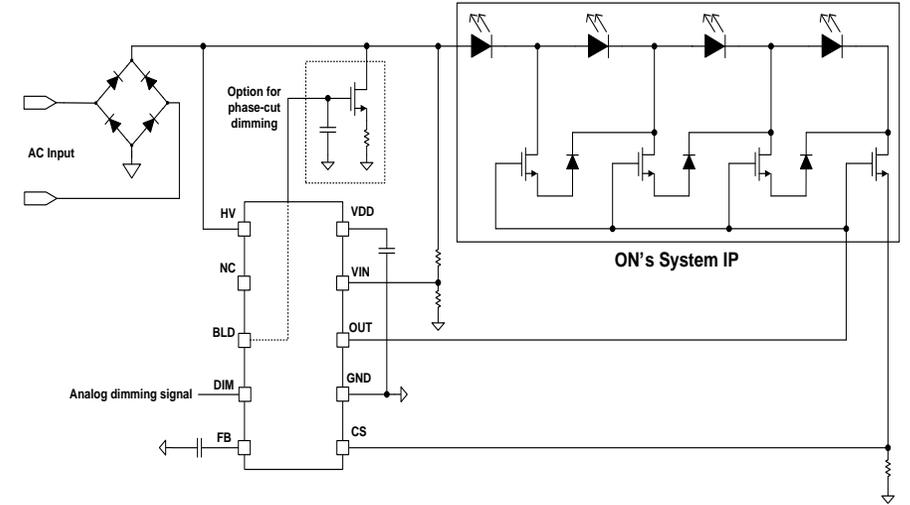
NCL30170 Power scalable/Wide Dimmable AC LED driver IC

Key Features

- Accurate **LED CC regulation: $<\pm 1\%$**
- Workable for **Constant Power** regulation
- **Selectable LED Channel counts**
- High PF & Low THD : **$>0.99 / <10\%$**
- Proprietary Active PC Dimmer Control Tech.
- Wide **Analog Dimming** range: **5~100%**
- HV Startup Current Source
- Protections
 - Input Over Voltage Protection
 - R_{CS} Short Protection
 - Thermal Shutdown

Benefits

- Excellent Light Uniformity
- High Design Flexibility
- Easy **Power Scalability** 5~300 W
- Overpass global standard
- **Excellent Phase-cut dimmer** Compatibility
- Flexible Smart Lighting Design
- Fast start up & Low eBOM
- High System Reliability

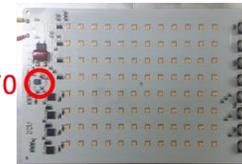


NCL30170



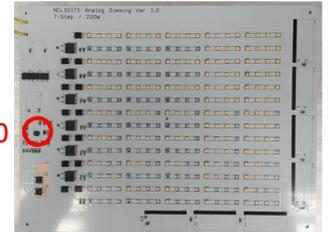
20 W – 3Ch. SOT223

NCL30170



60 W – 4Ch. DPAK

NCL30170



200 W – 7Ch. D2PAK

Market & Applications

- LED Light - PAR, Down, Tube, Flat, Ceiling, Flood, High Bay, Street Light
 - Non-Dimming, Phase-Cut Dimming
 - Analog Dimming (0-10)

Ordering & Package Information

NCL30170ADR2G	VDIM: 0 - 3V	10 SOIC
NCL30170BDR2G	VDIM: 0 - 1.5V	10 SOIC

Phase-Cut Dimming Solution

FL7734 Universal Input Phase-Cut Dimming Single Stage PSR Controller

Key Features

- Universal Input Φ -cut Dim.
- Controllable IIN min.
- Controllable Dimming curve
- $<\pm 1\%$ Line regulation PSR Control
- RCS short and open protec.

Benefits

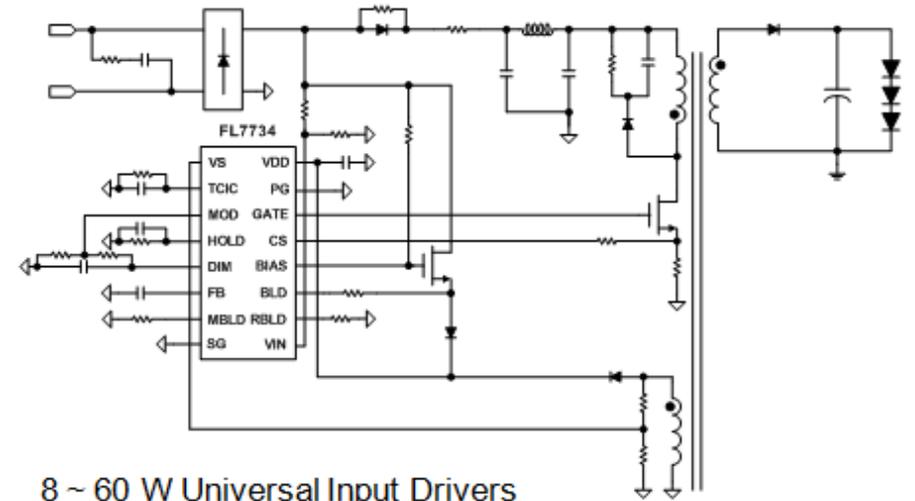
- Universal input design
- Meet SSL7A & EnergyStar
- Good light uniformity and Low BOM
- High system liability

Other Features

- High PF, Low THD : $>0.9 / <20$
- Fast < 0.3 s Start-up (@ Small phase angle)
- LED Short Protection (SCP)
- LED Open Protection (OVP-VS, OVP-VDD)
- Output Diode Short Protection (OCP)
- Over Temperature Protection (TSD)

Market & Applications

- Phase-Cut Dimming LED Light
 - A19, PAR30/38, Down Light
 - Indoor Flat, Ceiling light



8 ~ 60 W Universal Input Drivers



Evaluation Boards and Design Tools Available

Ordering & Package Information

Ordering Part Number	Package
FL7734MX	16SOIC

Step Dimming Driver with Mechanical Wall Switch

NCL30185 Step Dimmable QR PSR Current Mode Controller for LED Lighting

Key Features

- Precise current regulation accuracy ($\pm 2\%$ typical)
- Quasi-resonant control
- Adjustable thermal foldback
- 3 Step Dimmable (70/25/5%)
- Programmable OVP

Benefits

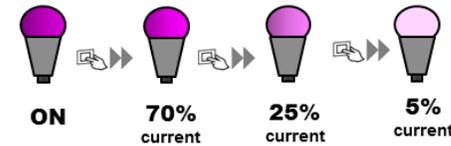
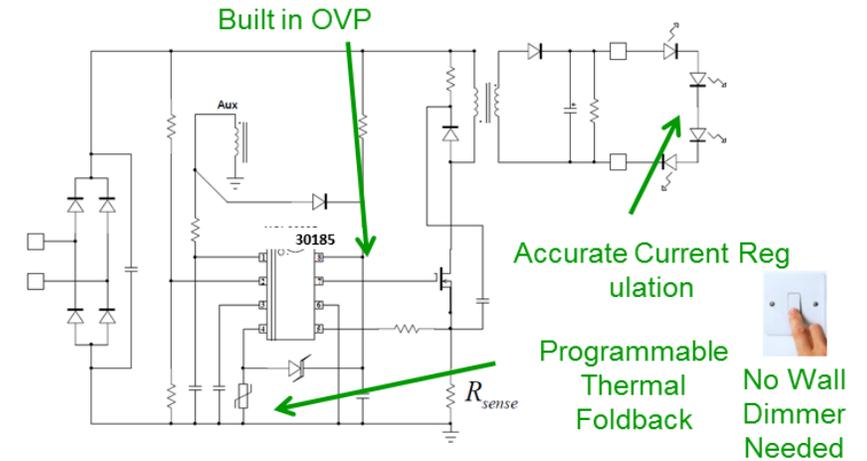
- Avoids over specifying LEDs to achieve lumen output
- Higher efficiency
- Improved driver reliability
- Triac Dimmer Not Required
- User can set over voltage protection level

Other Features

- Current control insensitive to normal transformer variation
- Wide Vcc range (9.4-26 Vdc) to support extend VF range
- Output diode and shorted winding protection
- Cycle-by-cycle current limiting
- Open LED and shorted output protection
- Built-in Vcc overvoltage protection

Market & Applications

- LED Bulbs and tubes
- LED Drivers
- LED Luminaires



10 ~ 20W Step Dim Driver



Ordering & Package Information

Ordering Part Number	Protections	Package
NCL30185ADR2G	Latched Fault	8 SOIC
NCL30188BDR2G	Auto Recoverable	8 SOIC



Non-Phase-Cut Dimming Single Stage Solution

NCL30486 Smart-Dimmable CC/CV PSR Controller

Key Features

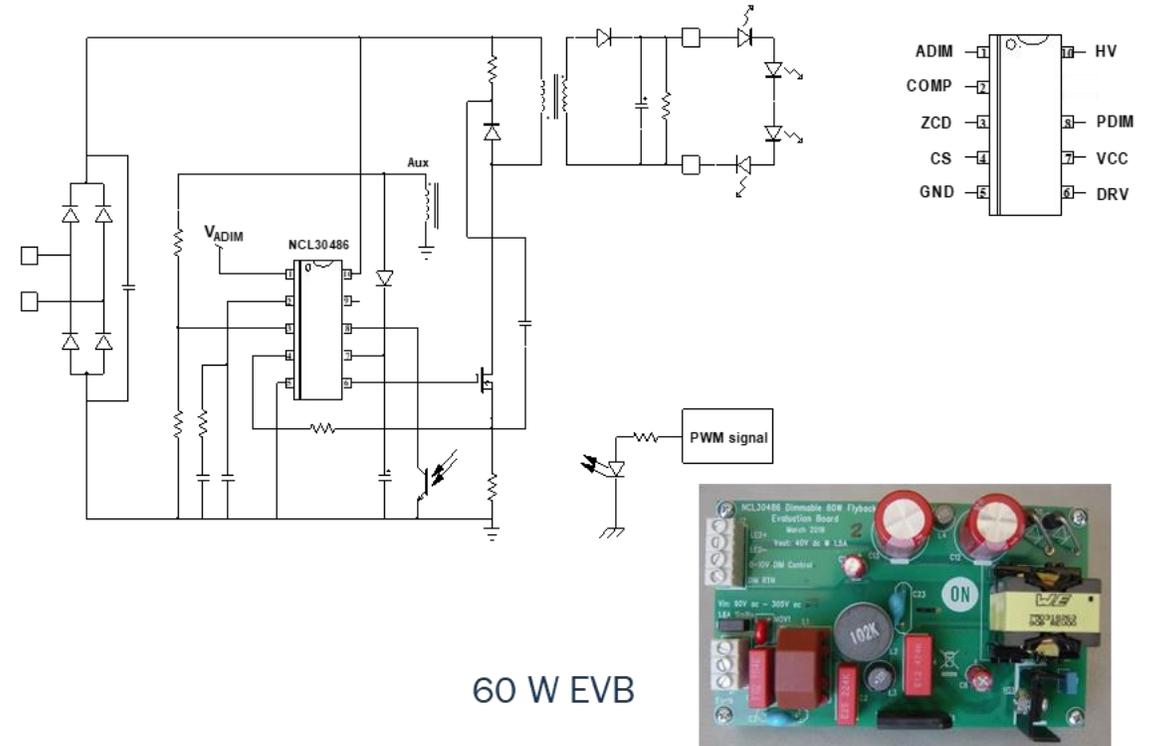
- Integrated **700 V HV Startup**
- Precise **current regulation** accuracy ($< \pm 2\%$ typical)
- Precise **voltage regulation** accuracy ($< \pm 1\%$ typical)
- **PF(>0.95)/THD(<10%)** @ Univ.
- **Quasi-resonant** control
- Standby Mode
- Optional **PSR/SSR** mode
- Excellent **Dimming features**
 - Dimming **curve**: Linear/Quadratic
 - **ADIM**: Analog I_{OUT} with V_{DC}
PWM I_{OUT} with V_{PWM}
 - **PDIM**: Analog I_{OUT} with V_{PWM}
 - Optional Min. Dim. Clamping(0/1/5/8%)
 - DIM CV Mode
- Protections
 - BO/ Line OVP/ V_{CC} OVP
 - LED Open/ short protection
 - Winding / Diode short protection
 - TSD

Market & Applications

- Analog/PWM Dimmable LED Driver

Benefits

- Fast startup, low Pstdby
- Constant brightness
- Aux. power supply for MCU & cold start up
- Exceeds global standards
- Higher efficiency
- $P_{IN} < 150 \text{ mW}$
- Design flexibility
- Design flexibility
- Supports "Smart" Lighting
- Use opto. Instead of pulse trans.
- Deep dimming features
- Vcc supply for Smart lighting MCU
- High system reliability



Ordering Part Number	Features	Package
NCL30486A2DR2G	1% Dim clamp	9 SOIC

Non-Dimming Single Stage Solution

NCL30488 Single Stage CC/CV PSR controller

Key Features

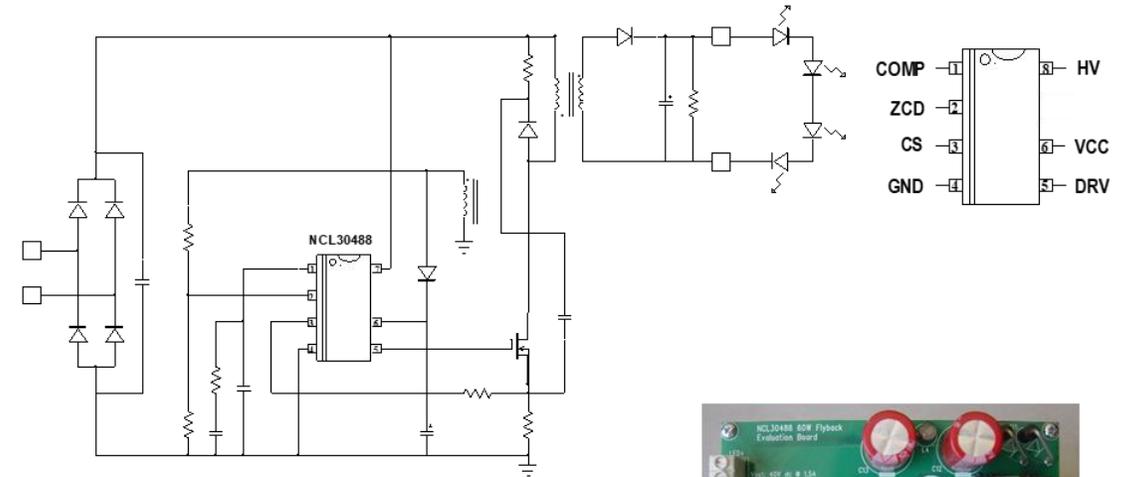
- Integrated **700 V HV Startup**
- Precise **current regulation** accuracy ($< \pm 2\%$ typical)
- Precise **voltage regulation** accuracy ($< \pm 2\%$ typical)
- **PF(>0.95)/THD(<10%)** @ Univ.
- **Quasi-resonant** control
- Standby Mode
- Optional **PSR/SSR** mode
- Protections
 - BO/ Line OVP/ V_{CC} OVP
 - LED Open/ short protection
 - Winding / Diode short protection
 - TSD

Market & Applications

- Non Dimming LED Light

Benefits

- Fast startup, low Pstdby
- Constant brightness
- Aux. power supply for MCU & cold start up
- Exceeds global standards
- Higher efficiency
- $P_{IN} < 150$ mW
- Design flexibility
- High system reliability



60 W EVB



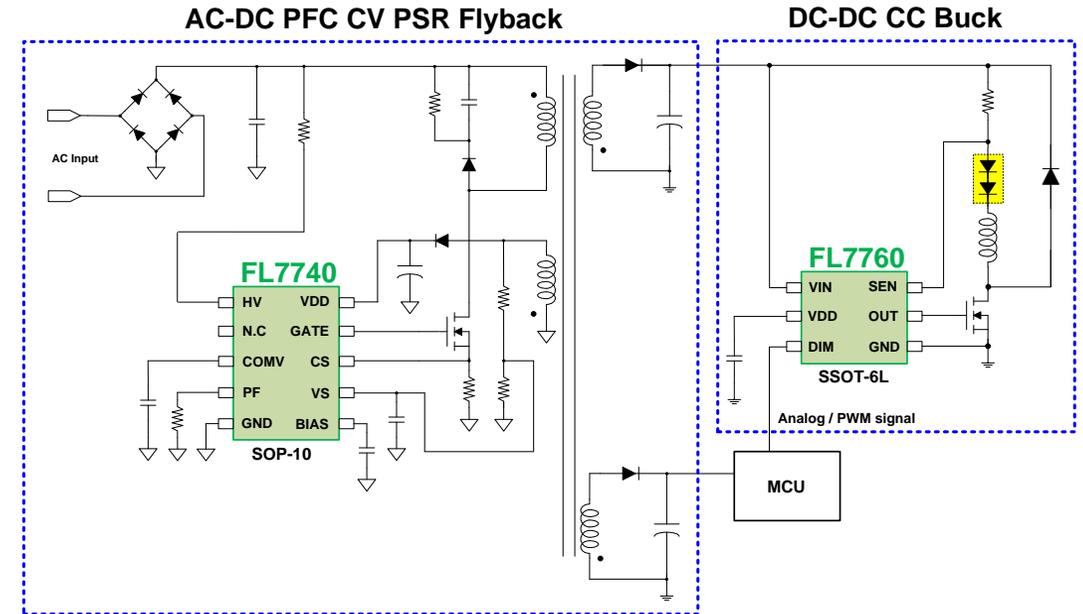
Ordering & Package Information

Ordering Part Number	Features	Package
NCL30488A2DR2G	BO: 138 V	7 SOIC
NCL30488A3DR2G	BO: 108 V	7 SOIC

Multiple Power Stage Solution – Flyback+Buck

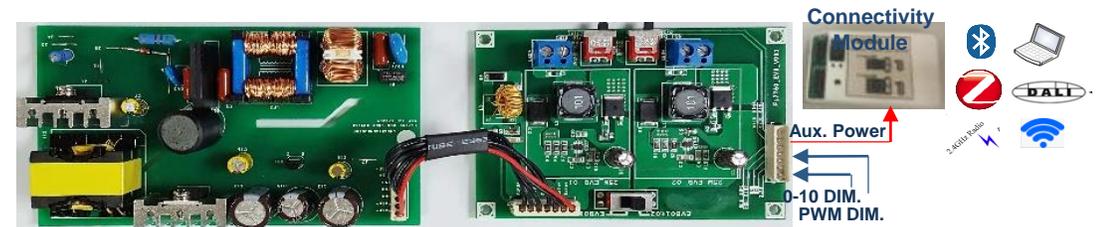
FL7740 (Single Stage CV PSR PWM IC) + FL7760 (Wide ADIM Buck PWM IC)

- **FL7740 Single Stage CV PSR Controller**
 - Precise CV regulation: $<\pm 2\%$.
 - Fast line/load transient response: $<\pm 10\%$.
 - Low Standby Power consumption: $<0.15\text{W}$ at no-load.
 - >0.9 PF at Half load & 305V_{AC} condition
- **FL7760 70 V CCM Dimmable Buck Controller**
 - Input voltage range: $8\text{V}_{\text{DC}} \sim 60\text{V}_{\text{DC}}$
 - Wide Dimming Range
 - Analog: 5~100%.
 - PWM: 1~100% (@2KHz)



Market & Applications

- Smart Luminaries
- Low profile Power Supply



50 W – 2Ch. Buck EVB Available



Multiple Power Stage Solution – Boost PFC + LLC HB

NCL2801 (Ultra low THD CrM Boost) + NCP13992 (Current Mode LLC controller)

- **NCL2801 CrM PFC Controller**

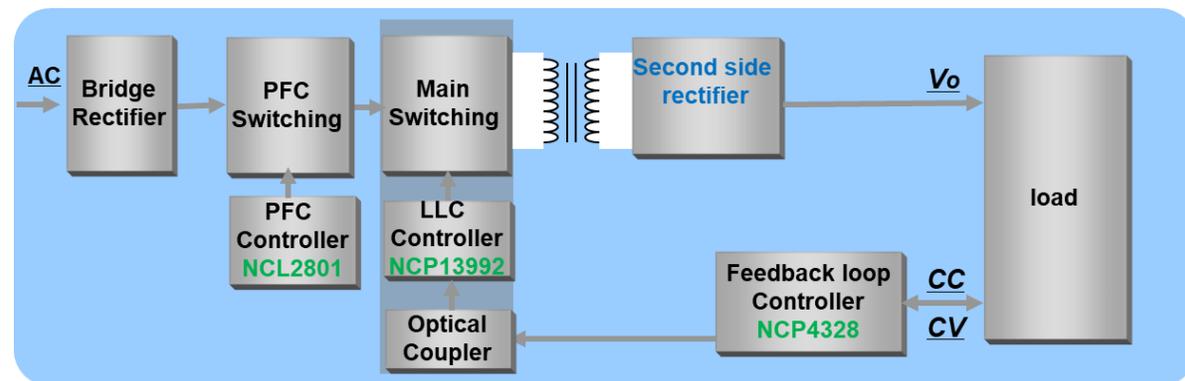
- Valley Count Frequency Foldback for high efficiency
- Daynamic Response Enhancer for lower undershoot
- Soft/Fast OVP for lower overshoot
- THD Enhancer for < 10% THD

- **NCP13992 Current Mode LLC half bridge controller**

- Built-in 600V/1A H/B driver
- High Frequency 50 KHz to 750 KHz
- Light Load Mode for standby power
 - < 30 mW off-mode
 - < 100 mW No Load
- Quiet Skip Mode for less audible noise

- **Market & Applications**

- Smart Luminaries
- Non-Dimmable LED driver



150 W EVB