CoolMOS™ CE series for lighting applications

October 2016

Agenda

1. The LED evolution and lighting trends
2. LED retrofits
3. LED drivers for indoor applications
4. Success stories

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There is a way to do it better, find it

What if Thomas Edison would have had a LED lamp?

What if Thomas Edison would have been told about CoolMOS™ CE?

If I only had a SJ MOSFET to switch on my lamp!

Let's take a look at the real LED lighting evolution!

The LED lighting evolution

Let's take a look at today's lighting market trends!

..

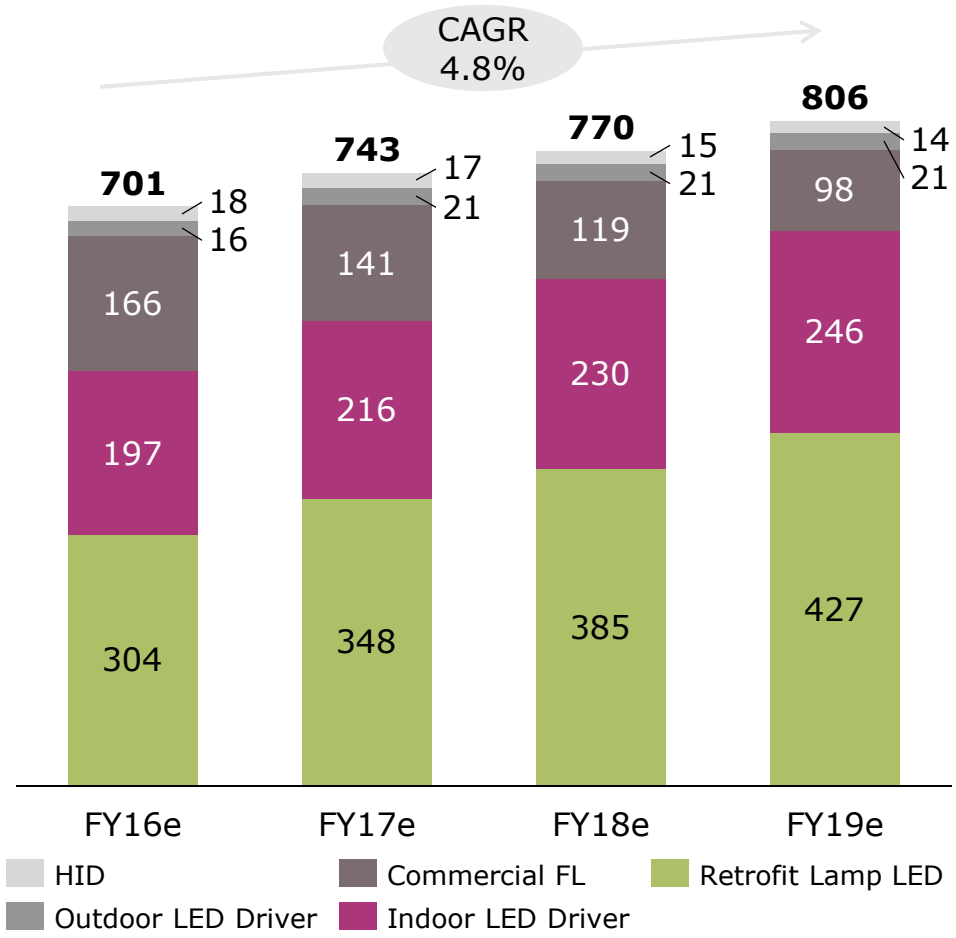
1879 1889 1911 1938 1959 1980 1995 2008

Development of first LED filament light bulb

Lighting trends today

Lighting trends today

Market development [Mio.€]

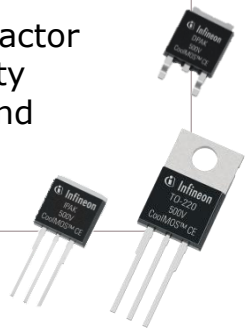


LED retrofits

- Very cost driven segment
- Request for small form factor
- Relaxed lifetime expectation
- Ease of use
- CAGR: 9%

Indoor LED driver

- Remaining high standards for quality and lifetime
- Request for small form factor
- Increasing cost sensitivity
- Thermal management and efficiency
- CAGR: 7%



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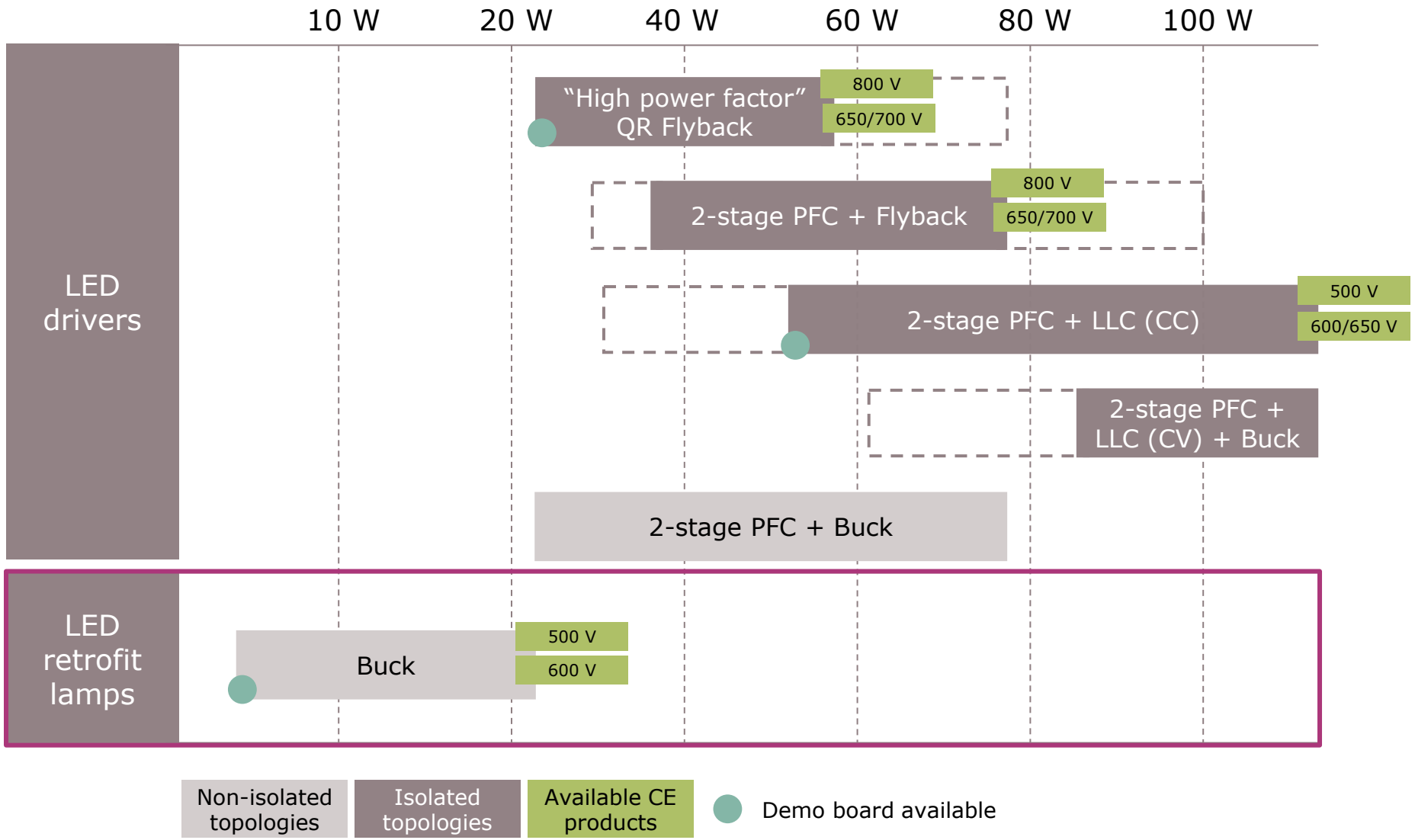
1. The LED evolution and lighting trends
2. LED retrofits
   - Common topologies used for LED retrofits
   - Package innovation CoolMOS™ CE in SOT-223
   - Application tests & benchmarking

Common topologies in LED lighting



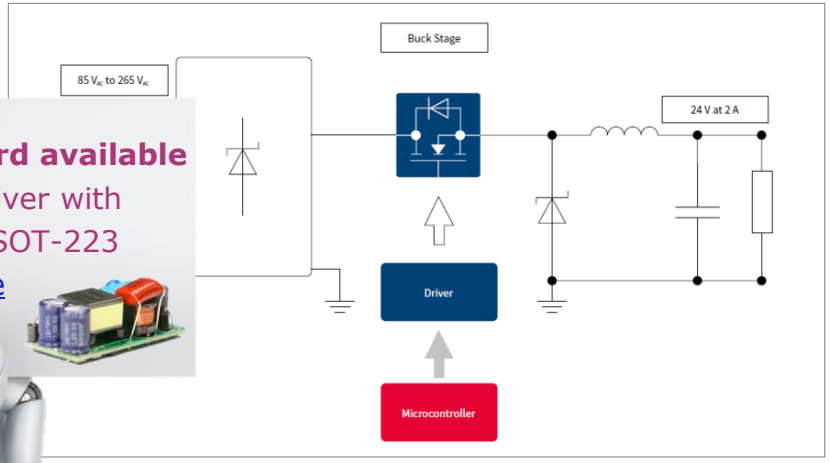
Non-isolated buck topology For LED retrofits

Functionality, end application & benefits

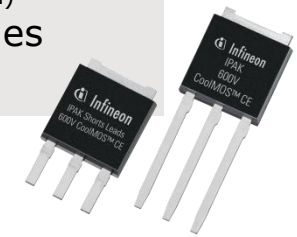
- Steps down voltage from high input voltage (AC) to low output voltage (DC)
- Typically used in LED retrofit lam… for fluorescent lamp (FL) replace… (e.g. T8 lamp)
- Provides low BOM, easy design, h… power factor and greater efficiency than linear regulators

New demo board available
16 W LED Driver with CoolMOS™ SOT-223
More

Block diagram



Choose your **CoolMOS™ CE** from
4 different $R_{DS(on)}$
4 different packages



Output Power [W]	Device options
25	IPx60R1K0CE
20	IPx60R1K5CE
15	IPx60R2K1CE
10	IPx60R3K4CE

IP**X** .. package placeholder, see backup

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1. The LED evolution and lighting trends
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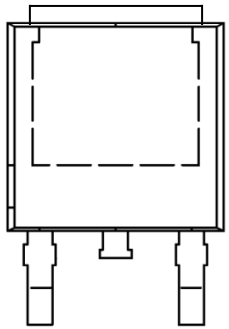
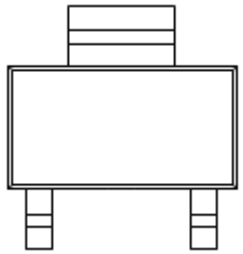
   - Package innovation CoolMOS™ CE in SOT-223
   - Application tests & benchmarking

SOT-223 package is made to address decreasing power requirements of LED lighting



1.400 mΩ



2.100 – 3.300 mΩ

Smaller form factor • Reduced cost • Higher efficiency

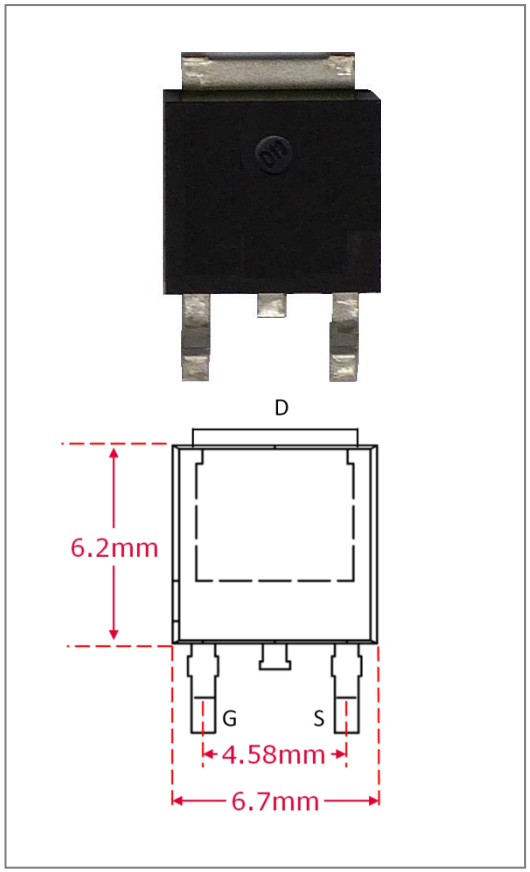
Value proposition

SOT-223

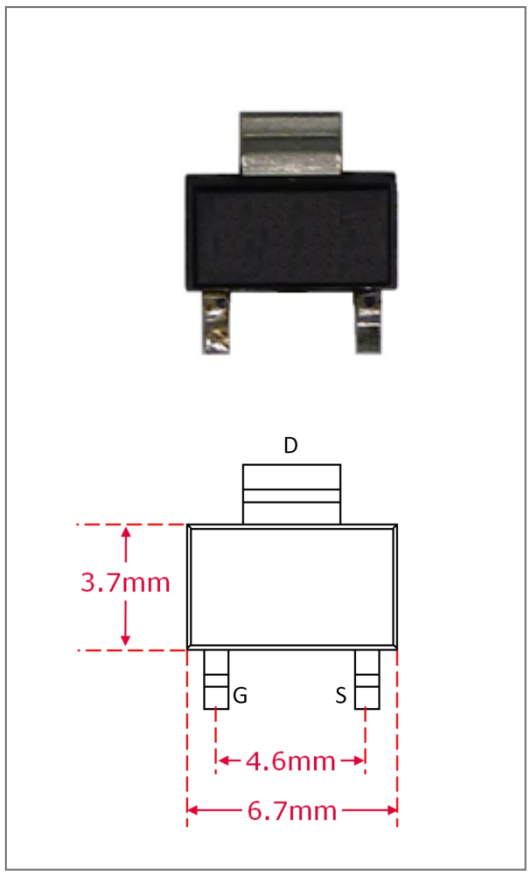
- Lower cost
- Smaller footprint while DPAK pin-to-pin compatible
- No major disadvantage in thermals

SOT-223 offers smaller footprint while being pin-to-pin compatible with DPAK

DPAK



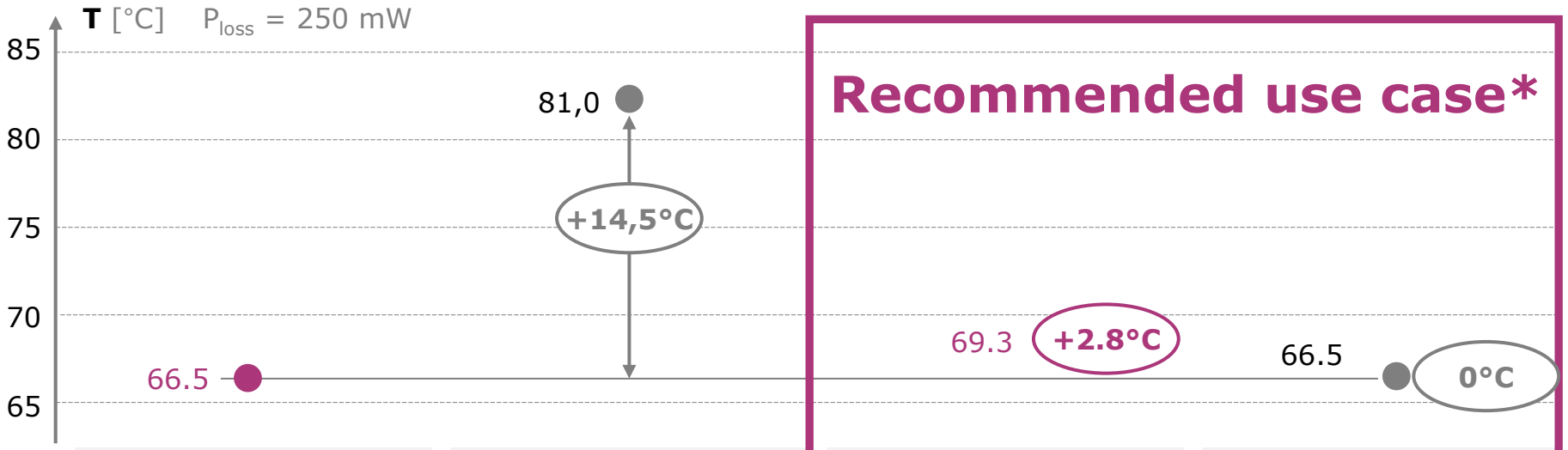
SOT-223



Use cases for SOT-223

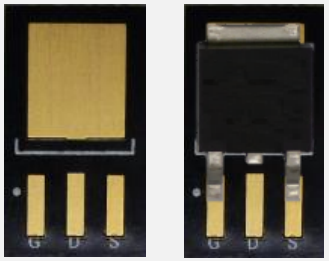
- **One-on-one DPAK replace-ment** for reducing cost
- **Space savings** in compact designs (thermal limitations, please see next pages)

Only slight increase in temperature – add. offer area around footprint is essential

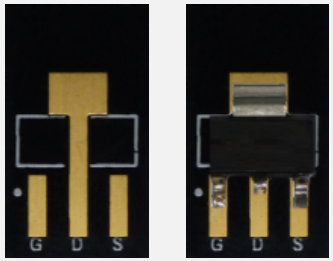


Recommended use case*

DPAK on DPAK footprint (reference)

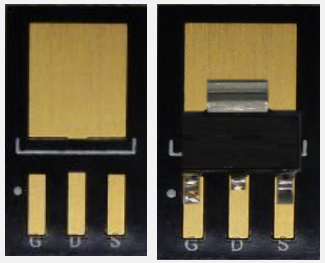


SOT-223 on SOT-223 footprint



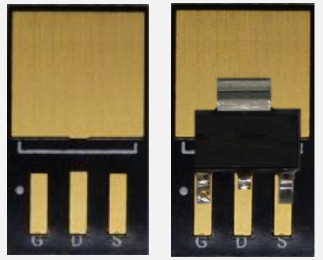
- Good for **low power levels**
- Footprint savings vs DPAK

SOT-223 on DPAK footprint



- Drop-in replace-ment for DPAK
- Good for **designs with thermal margin**

SOT-223 on Foot-print of DPAK + 20 mm² Cu



- Replacement for DPAK
- Good for **designs with sufficient cooling area**

*Measurements based on IFX 18 W evaluation board with ICL8201

CoolMOS™ SOT-223 portfolio

$R_{DS(on)}$ [mΩ]	500 V	600 V	650 V	700 V
3400		IPN60R3K4CE		
3000	IPN50R3K0CE			
2000 / 2100	IPN50R2K0CE	IPN60R2K1CE		
1400 / 1500	IPN50R1K4CE	IPN60R1K5CE	IPN65R1K5CE	IPN70R1K5CE
950 / 1000	IPN50R950CE	IPN60R1K0CE		IPN70R1K0CE
800	IPN50R800CE			
650	IPN50R650CE			

Lighting

Sample Kit available
SP001607226

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   - Common topologies used for LED retrofits
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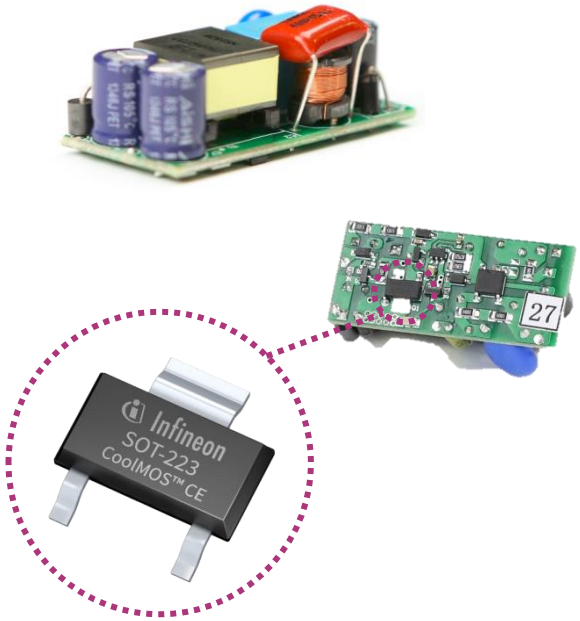
Application tests & benchmarking
Example 1 - 16 W LED tube with SOT-223

Objective : Plug&Play replacement with CoolMOS™ CE in SOT-223

Board specification :

Description	Origin specification
Input voltage & frequency	170 – 277 V_{AC} / 50 Hz
Output voltage, current & power	61 V / 270 mA / 16 W
Power factor	> 0.95
Efficiency	> 90%
Topology	Flyback
Primary controller	ICL8201
MOSFET	**IPN70R1K5CE**
Board dimension L x W x H [mm]	42 x 20 x 15

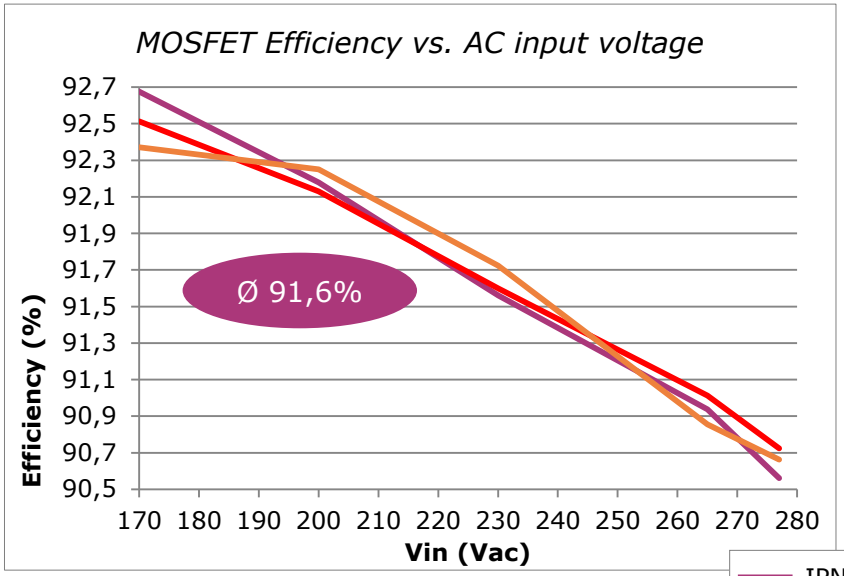


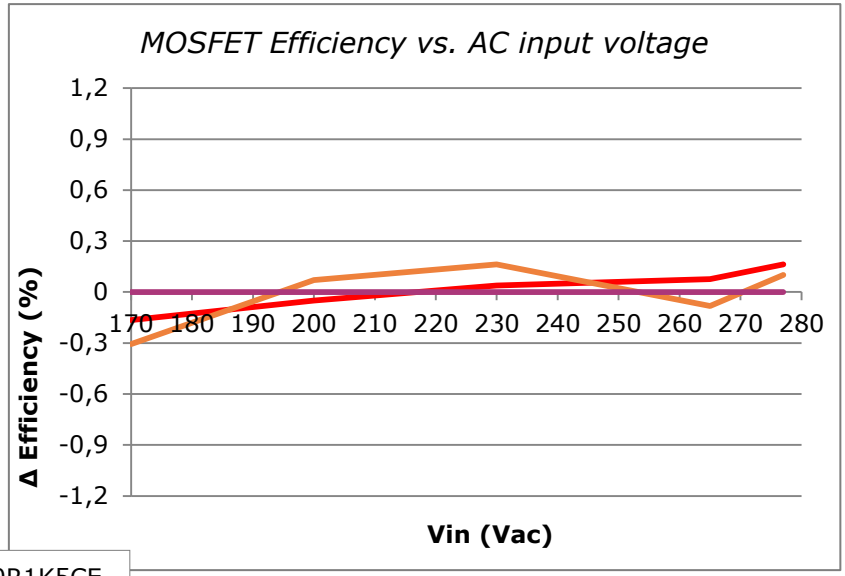
Test methodology : Performing MOSFET related measurements listed as follows

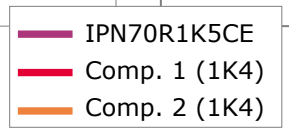
Test	Classification / Initiative
Efficiency measurement	Automated measurement; only changing MOSFET; plug&play
Thermal test for critical components	FLIR Thermal camera & thermo couples

Application tests & benchmarking
Example 1 - 16 W LED tube with SOT-223

Efficiency Measurement *@60 V, 275 mA load*





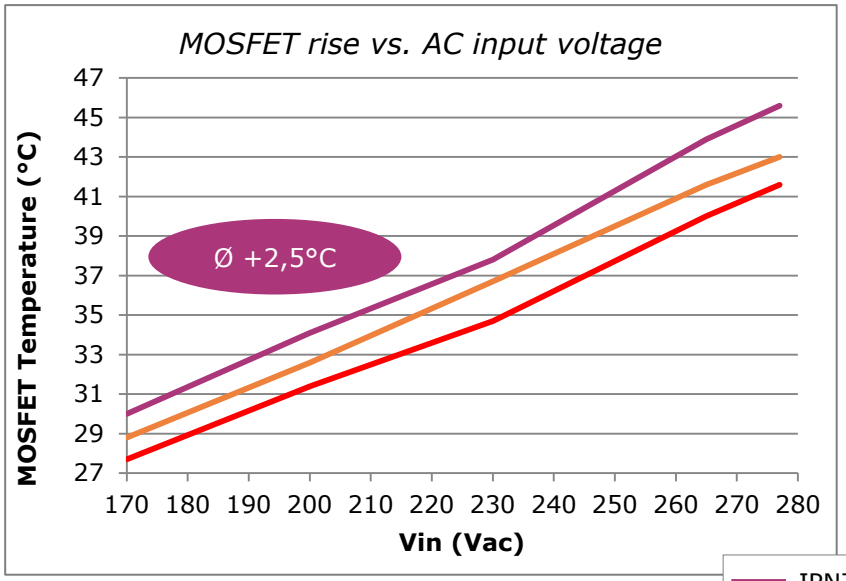


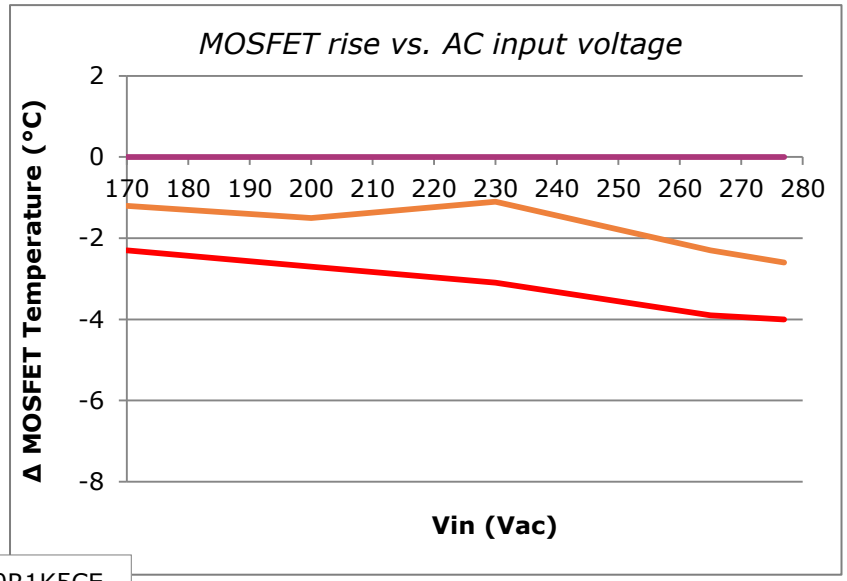
Hint: +/- 0.1% measurement tolerance

IPN70R1K5CE matches the competitors' performance in terms of efficiency.

Application tests & benchmarking
Example 1 - 16 W LED tube with SOT-223

Thermal Measurement *@60 V, 275 mA load*





IPN70R1K5CE
Comp. 1 (1K4)
Comp. 2 (1K4)

Hint: +/- 1°C measurement tolerance

Attention: Competitors' lower $R_{(DS)ON}$ lead to slightly better thermal performance at full load.

IPN70R1K5CE shows similar thermal behavior as the competitors' parts.

Application tests & benchmarking
Example 1 - 16 W LED tube with SOT-223

SUMMARY

- Measurement results demonstrate an excellent performance of CoolMOS™ CE in the SOT-223 package for lighting applications
- SOT-223 package enables further cost ratio compared to DPAK while not sacrificing pin-to-pin compatibility
- Innovative SOT-223 package leads to height reduction and offers improved form factor
- Add-on benefit given by increased creepage distance between Gate and Source pins compared to DPAK due to removing the middle drain pin
- CoolMOS™ CE is on par with competition despite its lower $R_{DS(ON)}$

These benefits for lighting applications make CoolMOS™ CE in the SOT-223 package an **ideal fit for cost sensitive lighting applications**.

Remark acc. to EMI: Pls reference to Infineon's App Note „Optimizing CoolMOS™ CE based power supplies for meeting EMI requirements"

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   - Common topologies used for indoor LED drivers
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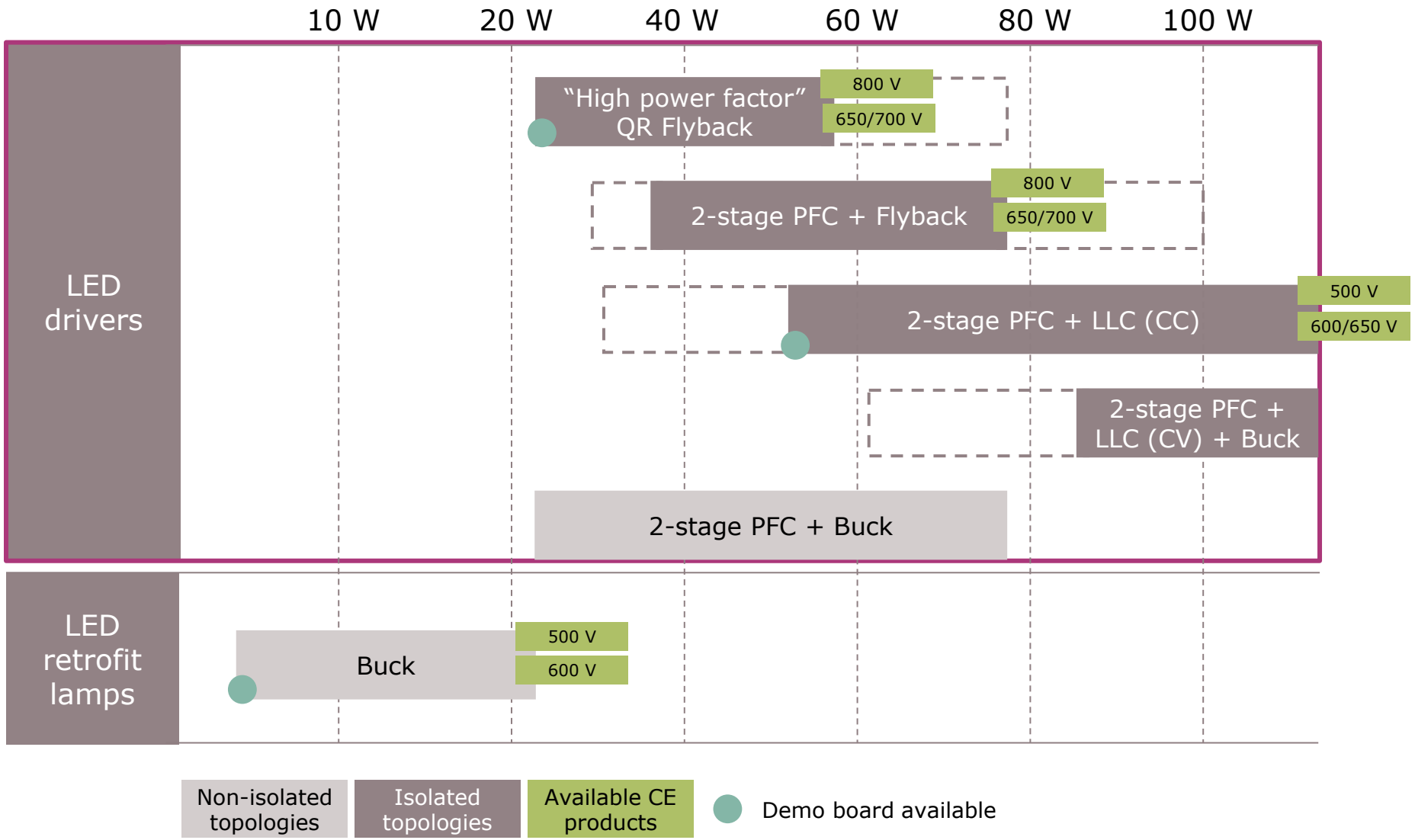
Common topologies in LED lighting

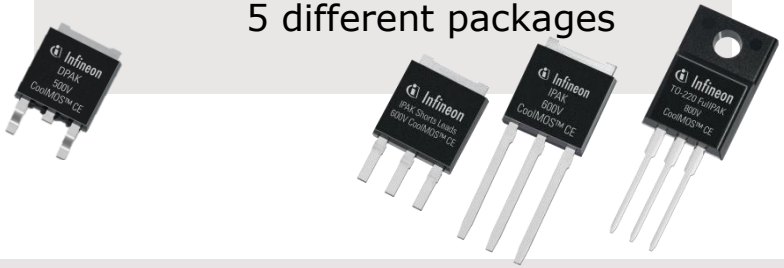


“High power factor” quasi-resonant flyback topology - for LED luminaires

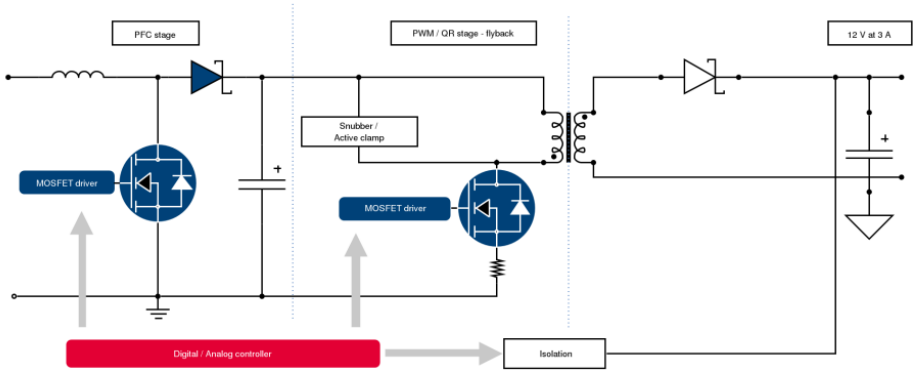
Functionality, end application & benefits

- Steps down voltage from high input voltage (AC) to low output voltage (DC)
  - <65 W: single stage topology
  - >65 W: dual stage topology
- Typically used in LED drivers for luminaires
- Provides very low BOM, easy control and design possibilities as well as high ruggedness in overload conditions

Choose your **CoolMOS™ CE** from
10 different $R_{DS(on)}$
5 different packages



Block diagram



Input voltage[V_{AC}]	Device options
195 – 265 (Indoor)	IPx50R380CE-950CE
195 – 265 (Outdoor) 90 – 305 (Indoor)	IPx60R400CE-1K0CE / IPAW60R190CE-380CE
90 – 305 (Outdoor)	IPx65R400CE – IPx65R650CE

PFC

Bus voltage[V_{DC}]	Device options
410 - 450	IPx80R310CE - 1K4CE

FLB

Bus voltage[V_{AC}]	Device options
90 - 305	IPx80R310CE – 2K8CE

PFC FLB

Input voltage [V_{IN}]: 85-305

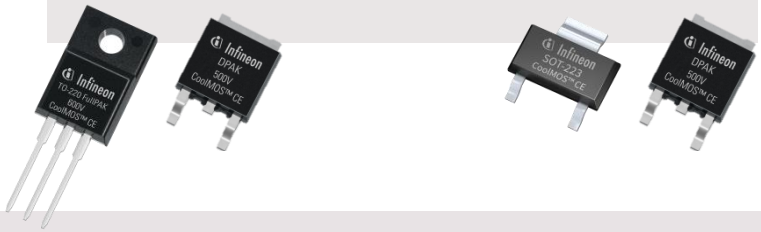
IP**X** .. package placeholder, see backup

Dual-stage PFC + LLC topology
For high power/efficiency LED drivers

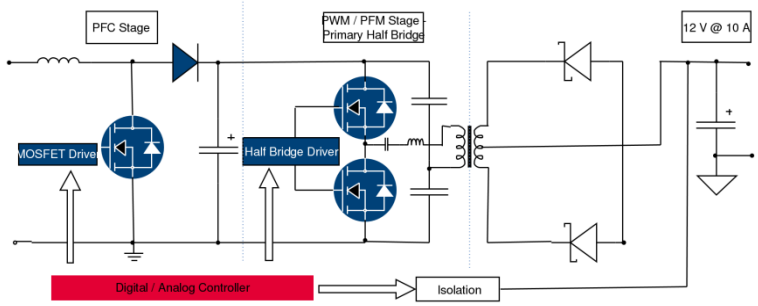
Functionality, end application & benefits

- Steps down voltage from high input voltage (AC) to low output voltage (DC)
- Typically used for in/outdoor high power and efficiency LED drivers
- Provides space and BOM cost savings, highest efficiency, high power factor and level of integration via extended protection features

Choose your **CoolMOS™ CE** from
11 different $R_{DS(on)}$
7 different packages



Block diagram



Input voltage[V_{AC}]	Device options
195 – 265 (Indoor)	IPx50R380CE-950CE
195 – 265 (Outdoor) 90 – 305 (Indoor)	IPx60R400CE-1K0CE / IPAW60R190CE-380CE
90 – 305 (Outdoor)	IPx65R400CE – IPx65R650CE

PFC

Bus voltage[V_{DC}]	Device options
380 - 410 (Indoor)	IPx50R380CE-1K4CE
380 - 410 (Outdoor) 430 - 450 (Indoor)	IPx50R380CE-1K4CE IPx60R400CE-1K4CE
430 - 450 (Outdoor)	IPx60R400CE-1K4CE

LLC

IP**X** .. package placeholder, see backup

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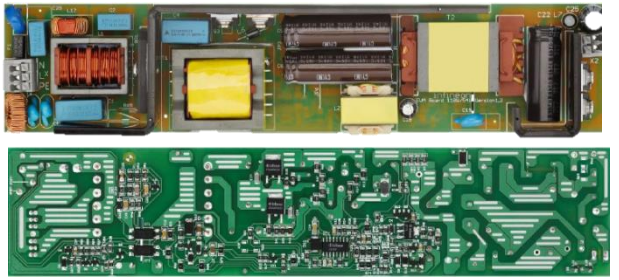
Application tests & benchmarking
Example 2 - 110 W LED driver

Objective: Competitor analysis on 110 W LED driver

Board specification:

Description	Origin specification
Input	85-305 V_{AC}
Output	54 V_{DC} / 2026 mA / 110 W
Topology	PFC & LLC
Input Voltage Frequency	47 - 63 Hz
Primary MOSFET	1* IPP60R125C6
Primary Controller	ICL5101
Secondary MOSFET	**2* IPD60R450E6**
Board Dimension L x W x H [mm]	247.3 x 48.25 x 34.2
Remark	Infineon internal demo board (ISaR)



Test Setup	Parameter
Input voltage	120 V / 60 Hz 230 V / 50 Hz
Output voltage	54 V
Output current	0.4 - 2.06 A

Test methodology: Performing MOSFET related measurements in LLC - stage listed as follows

Tests executed	Classification / Initiative
Efficiency measurement	Automated setup, change HighSide and LowSide MOSFET (orig. E6)
Thermal test for critical components	FLIR Thermal camera
Conducted EMI	FH EMI chamber Villach
Radiated EMI	FH EMI chamber Villach

Application tests & benchmarking
Example 2 - 110 W LED driver

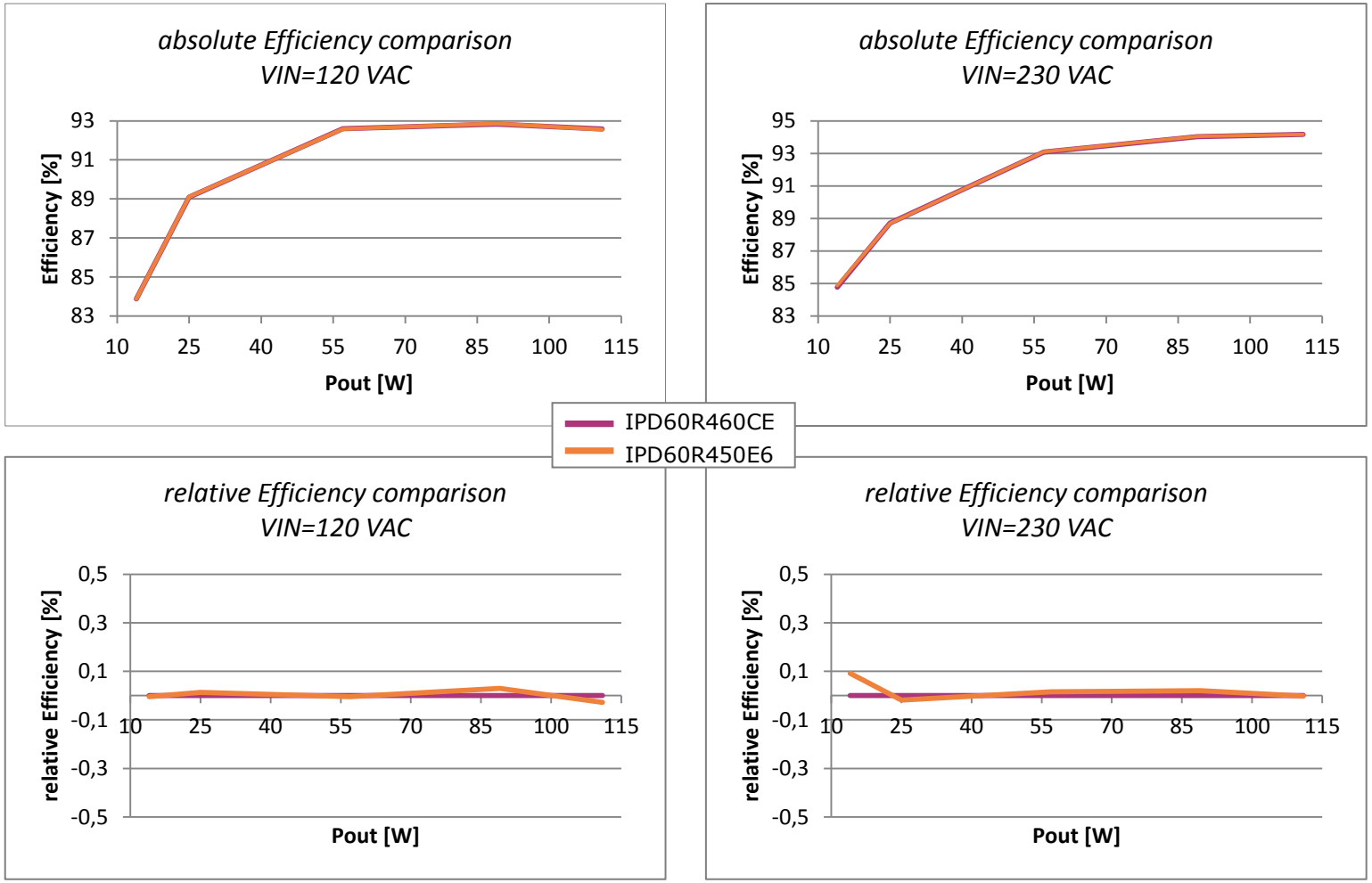
DUT : Common used MOSFET devices, available on the market

Device	Technology	Package	$V_{(BR)DSS}$ [V]	$R_{DS(on)}$ **max.** [mΩ]	R_G [Ω]	E_{oss} @400V [uJ]	Q_g [nC]	$V_{GS(th)}$ [V]
IPD60R450E6 LLC	**SJ**	**DPAK**	**600V**	**450**	**8.5**	**2.50**	**28**	**3**
IPD60R460CE LLC	SJ	DPAK	600V	460	8.5	2.50	28	3
Competitor 3	SJ	DPAK	600V	450	7.0	2.30	16	3
Competitor 4 (slightly lower $R_{DS(on)}$)	SJ	DPAK	600V	**385**	2.6	-	22	4

● Original part ● Replacement parts for LLC-stage

Application tests & benchmarking
Example 2 - 110 W LED driver

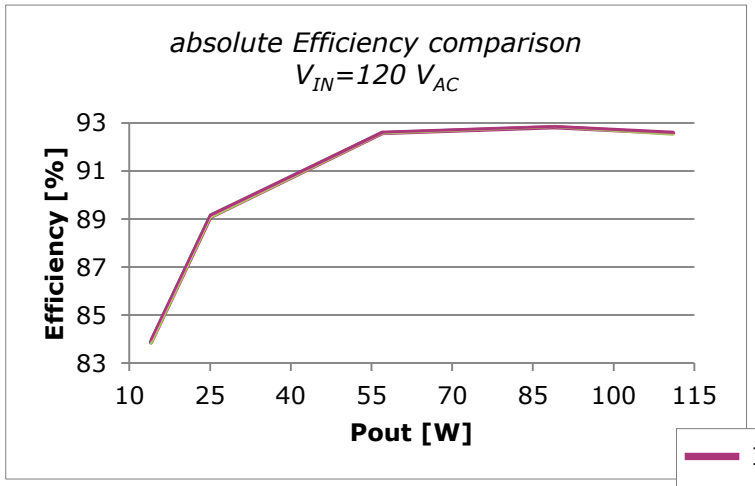
Efficiency Measurement

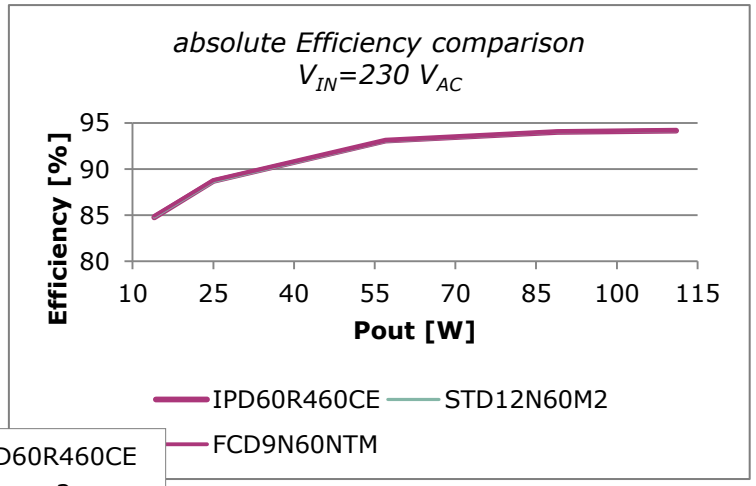


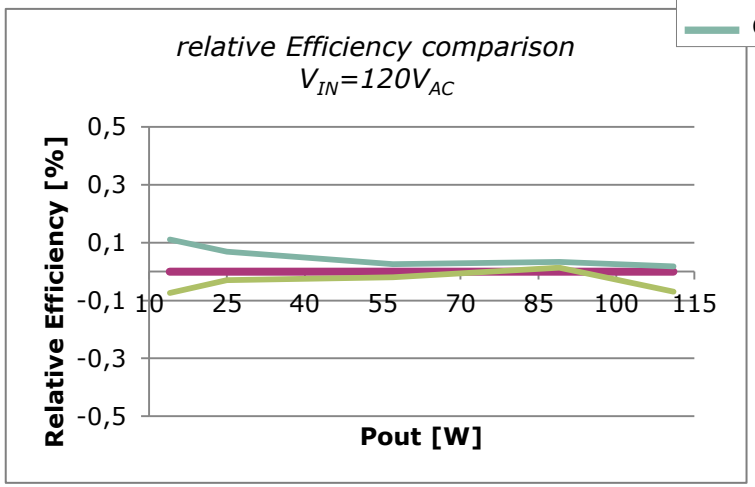
IPD60R460CE shows the same performance as the original IPD60R450E6.

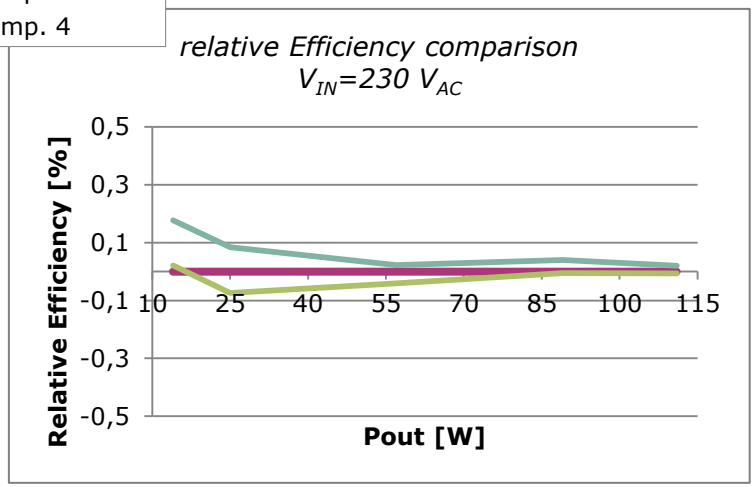
Application tests & benchmarking
Example 2 - 110 W LED driver

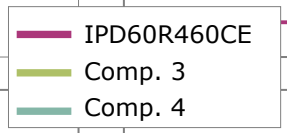
Efficiency Measurement







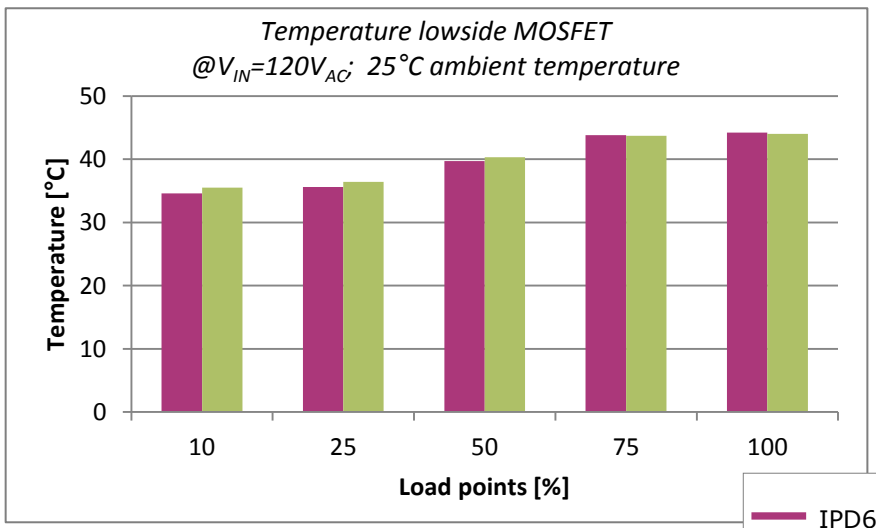


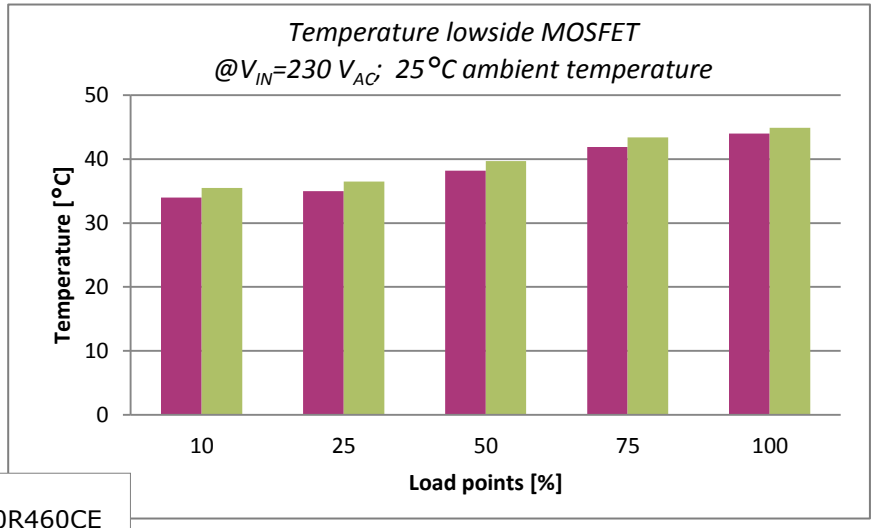


All tested devices show the same performance.

Application tests & benchmarking
Example 2 - 110 W LED driver

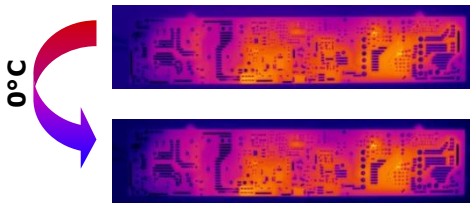
Thermal Measurement





IPD60R460CE
Comp. 3

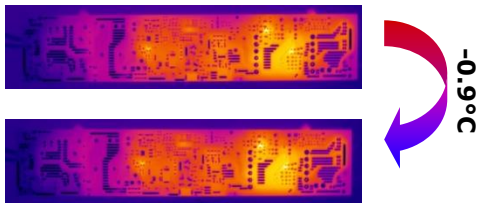
Test condition
V_{in}: 120V_{AC} / Output: 54 V/2.06 A / 25°C



Comp. 3

IPD60R460CE

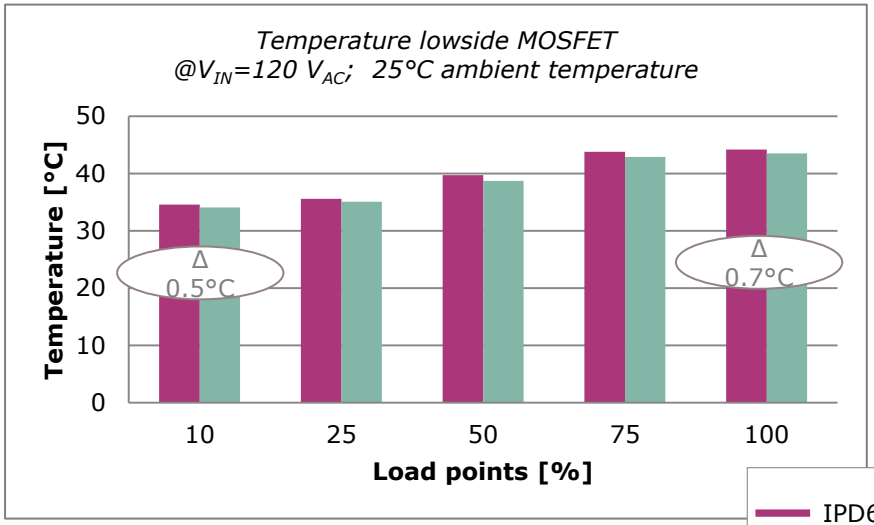
Test condition
V_{in}: 230 V_{AC} / Output: 54 V / 2.06 A / 25°C

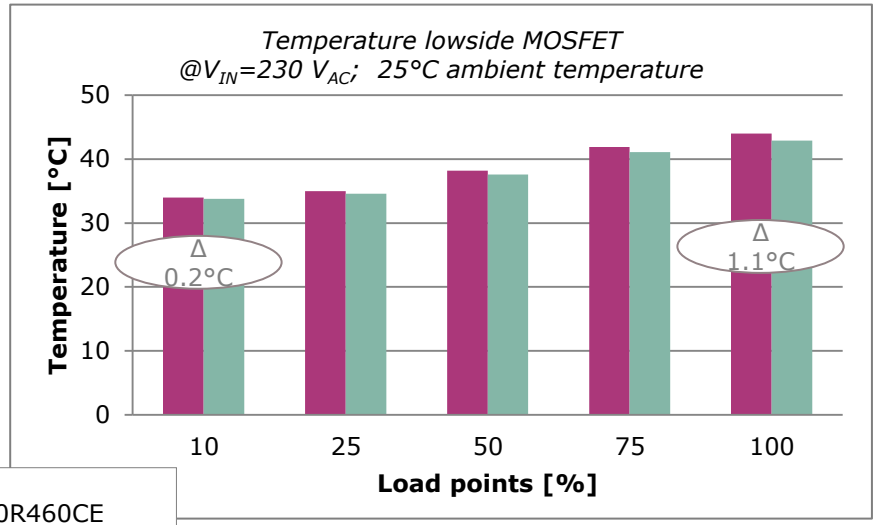


IPD60R460CE shows slightly better thermal performance than competitor 3.

Application tests & benchmarking
Example 2 - 110 W LED driver

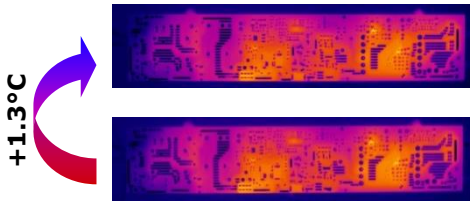
Thermal Measurement





IPD60R460CE
Comp. 4 (385mΩ)

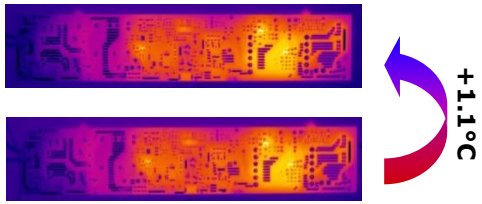
Test condition
V_{in}: 120 V_{AC} / Output: 54 V/2.06 A / 25°C



IPD60R460CE

Comp. 4

Test condition
V_{in}: 230 V_{AC} / Output: 54 V / 2.06 A / 25°C

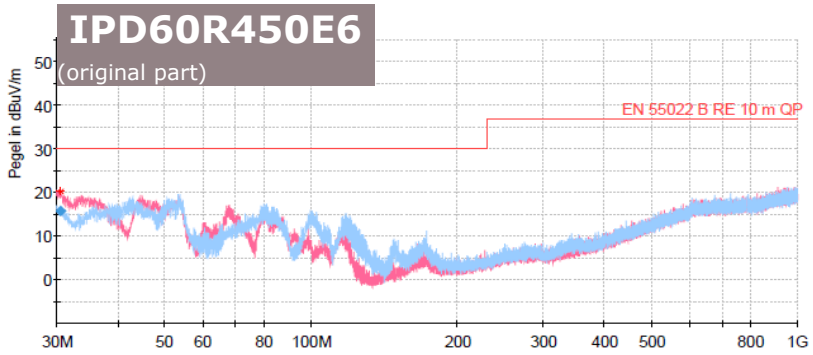


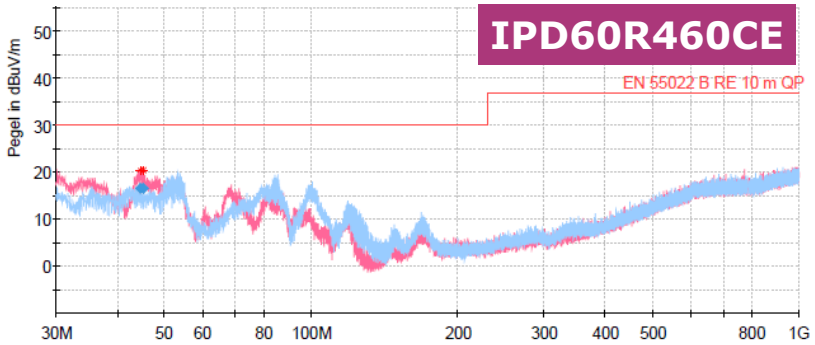
Attention: Comp. 4's lower $R_{(DS)ON}$ leads to slightly better thermal performance

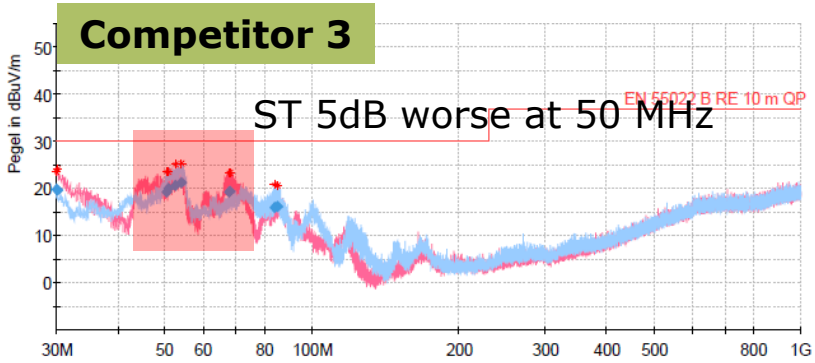
IPD60R460CE shows similar thermal performance as competitor 4.

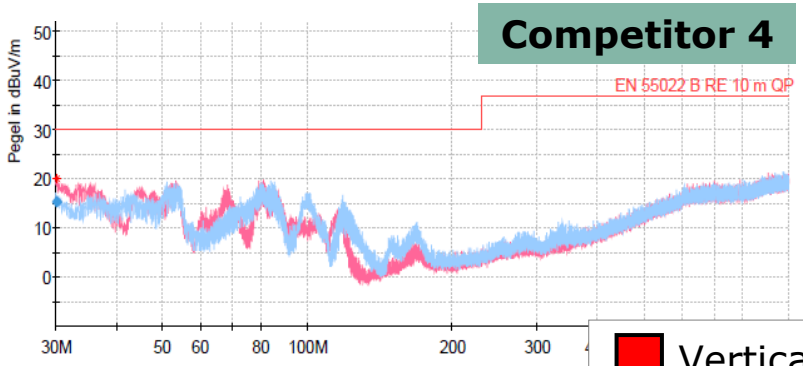
Application tests & benchmarking
Example 2 - 110 W LED driver

Radiated emissions @230 V_{in}, full load









Vertical

Horizontal

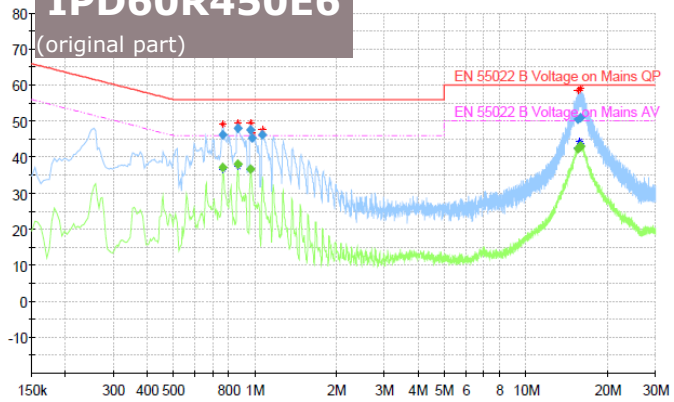
Note:
±3 dB tolerance
on EMI measurements

CoolMOS™ CE passes the radiated EMI limits according to EN55022

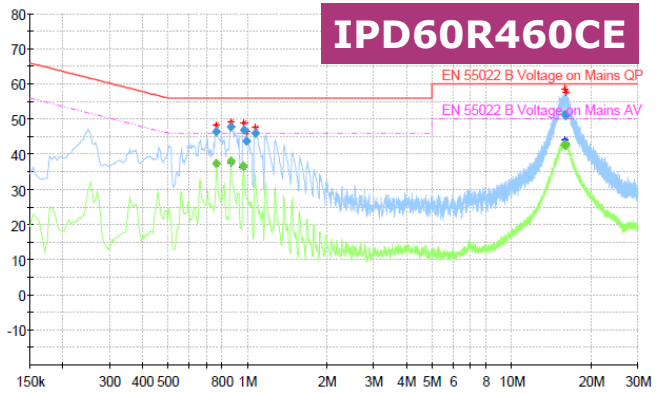
Application tests & benchmarking
Example 2 - 110 W LED driver

Conducted emissions @230 V_{in}, full load

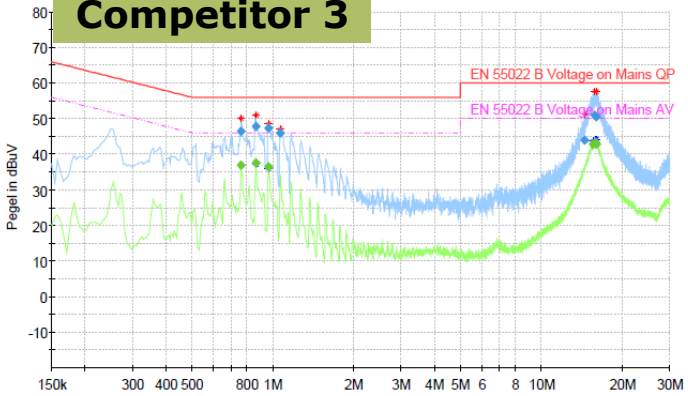
IPD60R450E6
(original part)



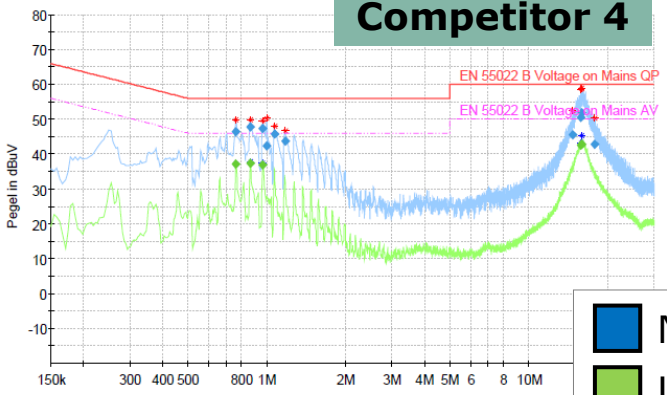
IPD60R460CE



Competitor 3



Competitor 4



Neutral
Line

Note:
±3 dB tolerance
on EMI measurements

CoolMOS™ CE passes the radiated EMI limits according to EN55022

Application tests & benchmarking
Example 2 - 110 W LED driver

S U M M A R Y

- Overall evaluation result is very promising for Infineon's **CoolMOS™ CE series**
- **CoolMOS™ CE series can be used as replacement for C6/E6 products** regarding efficiency and thermal performance over the entire output power range
- **CoolMOS™ CE series** shows **well balanced performance** compared to competition
- **CoolMOS™ CE series** enables **further cost down potential** to our customers

Results can be applied across various topologies

Remark acc. to EMI: Pls reference to Infineon's App Note „Optimizing CoolMOS™ CE based power supplies for meeting EMI requirements"

Agenda

1. The LED evolution and lighting trends
2. LED retrofits
3. LED drivers for indoor applications
4. Success stories

Success story
LED ballasts – 600 V CoolMOS™ CE

Customer:	Leading European lighting customer
Application:	Various lighting ballasts across current customer portfolio
IFX Part numbers:	**600 V CE @ DPAK**
Current Solution:	Mainly Infineon 600 V C6 @ DPAK + IPAK
Competitor:	ST @ DPAK + IPAK
	FCH, Tosh @ DPAK
SOP:	From July 16 onwards customer to fully switch to CE
BW value:	till now 2.5 MUSD

What made us win:

- Huge price pressure in very price sensitive area
- New package offering required cost advantage whilst exactly matching market requirements (standard grade)
- Best fit for target application technology in place (CoolMOS™ CE)
- Excellent teamwork and alignment btw. Sales – RM – PM – QM

To which type of projects can this success story be replicated?

Setting a new trend within lighting market (standard grade)
Addressing all lighting manufacturers, especially within cost sensitive area

Success story
LED bulbs – 500 V CoolMOS™ CE

Customer:	Asian Lighting manufacturers
Application:	9 W / 11.5 W / 14 W (A19 LED bulbs)
Part numbers:	**IPU50R3K0/2K1/1K4CE**
Competitor:	None
BW value:	>300 K EUR/YR potential
SOP:	Already > 100 K pcs orders received

What made us win:

- Demonstrating effective performance by combining Infineon products (ICL8201 and CoolMOS™ CE MOSFETs)
- Socket won with CoolMOS™ CE series on reference solution to guarantee time-to-market for customer
- Offering overall reduced BOM cost to customers
- Customers perceiving Infineon as strongly reliable MOSFET supplier

To which type of projects can this success story be replicated?

Increase promotion efforts for CoolMOS™ CE in IPAK package across Asian lighting market

Success story
LED bulbs – 600 V/650 V CoolMOS™ CE

Customer:	Leading international lighting customer
Application:	90 W LED ECG
Part numbers:	**IPA65R400CE***1 pcs in PFC stage **IPA60R650CE***2 pcs in LLC stage and IDP2301-3*1 pcs
Competitor:	TOSH @ TO-220 in LLC
BW value:	>500 K EUR potential per year for CoolMOS™
SOP:	November 2016

What made us win:

- Early engagement on new platform design opportunity
- Making synergy of Infineon bundle offer (highly efficient controller + MOSFET system)
- Customer perceiving Infineon as high quality and high performance MOSFET supplier
- CoolMOS™ CE outperformed competitors' devices and was offered with highly competitive pricing

To which type of projects can this success story be replicated?

Promote CoolMOS™ CE to other customers as PFC+LLC (ICL5101/2) with TO-220 FullPAK package is commonly used design

Success story
LED driver – 600 V CoolMOS™ CE

Customer:	European lighting customer
Application:	13 W LED driver
Part number:	**IPN60R3K4CE**
Competitor:	None
BW value:	~200 K EUR/YR
SOP:	December 2016

What made us win:

- CoolMOS™ CE in SOT-223 is a comfortable one-on-one DPAK replacement, offers high system efficiency and comes with highly competitive pricing
- Possibility of space savings in compact designs
- Good customer relationship as well as early and proactive engagement
- Customer perceiving Infineon as high quality and high performance MOSFET supplier

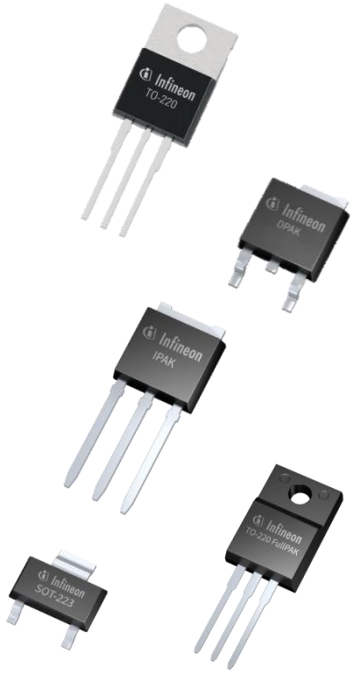
To which type of projects can this success story be replicated?

Extend CoolMOS™ SOT-223 promotion to customer's lighting applications for which PFC LLC topology is used

Switch on your lighting application with CoolMOS™ CE

Key features and benefits

- Price competitiveness
- Portfolio breadth
- High efficiency and improved performance
- Right fit in terms of thermals
- Fulfilling EMI standards*
- Ease-of-use device



Don’t forget, it all comes together with the well known **high quality standard** from Infineon.

Part of your life. Part of tomorrow.

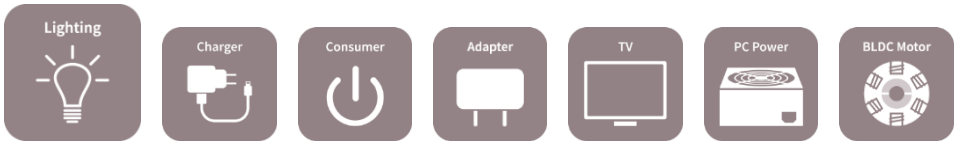
Infineon

500 V CoolMOS™ CE portfolio

$R_{DS(ON)}$ [mΩ]	TO-220	TO-220 FullPAK	TO-220 FullPAK Narrow Lead	TO-252 DPAK	TO-251 IPAK	TO-247	SOT 223
3000				IPD50R3K0CE	IPU50R3K0CE		IPN50R3K0CE
2000				IPD50R2K0CE	IPU50R2K0CE		IPN50R2K0CE
1400				IPD50R1K4CE	IPU50R1K4CE		IPN50R1K4CE
950		IPA50R950CE		IPD50R950CE	IPU50R950CE		IPN50R950CE
800		IPA50R800CE		IPD50R800CE			IPN50R800CE
650		IPA50R650CE		IPD50R650CE			IPN50R650CE
500	IPP50R500CE	IPA50R500CE	IPAN50R500CE	IPD50R500CE			
380	IPP50R380CE	IPA50R380CE		IPD50R380CE			
280	IPP50R280CE	IPA50R280CE		IPD50R280CE		IPW50R280CE	
190	IPP50R190CE	IPA50R190CE				IPW50R190CE	

600 V CoolMOS™ CE portfolio

$R_{DS(ON)}$ [mΩ]	TO-220 FullPAK	TO-220 FullPAK Wide Creepage	TO-220 FullPAK Narrow Lead	TO-252 DPAK	TO-251 IPAK SL	TO-251 IPAK	SOT-223
3300				IPD60R3K4CE	IPS60R3K4CE	IPU60R3K4CE	IPN60R3K4CE
2100				IPD60R2K1CE	IPS60R2K1CE	IPU60R2K1CE	IPN60R2K1CE
1500	IPA60R1K5CE			IPD60R1K5CE	IPS60R1K5CE	IPU60R1K5CE	IPN60R1K5CE
1000	IPA60R1K0CE			IPD60R1K0CE	IPS60R1K0CE	IPU60R1K0CE	IPN60R1K0CE
800	IPA60R800CE		IPAN60R800CE	IPD60R800CE	IPS60R800CE		
650/600	IPA60R650CE	IPAW60R600CE	IPAN60R650CE	IPD60R650CE	IPS60R650CE		
460	IPA60R460CE			IPD60R460CE	IPS60R460CE		
400/380	IPA60R400CE	IPAW60R380CE		IPD60R400CE	IPS60R400CE		
280		IPAW60R280CE					
190		IPAW60R190CE					



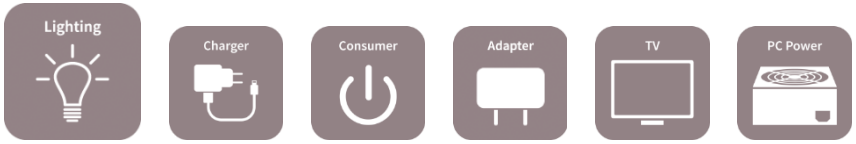
700 V/650 V CoolMOS™ CE portfolio

700 V

$R_{DS(ON)}$ [mΩ]	TO-262 I²PAK	TO-252 DPAK	TO-251 IPAK SL	TO-251 IPAK Short Lead with ISO Standoff	TO-220 FullPAK Wide Creepage	SOT-223	ThinPAK 5x6
2000/2100		IPD70R2K0CE	IPS70R2K0CE	IPSA70R2K0CE			IPL70R2K1CES
1400/1500		IPD70R1K4CE	IPS70R1K4CE	IPSA70R1K4CE		IPN70R1K5CE	
1000						IPN70R1K0CE	
950	IPI70R950CE	IPD70R950CE	IPS70R950CE	IPSA70R950CE	IPAW70R950CE		
600		IPD70R600CE	IPS70R600CE	IPSA70R600CE	IPAW70R600CE		

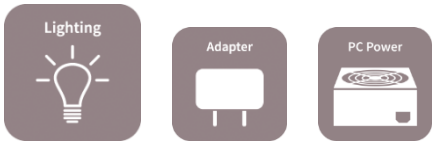
650 V

$R_{DS(ON)}$ [mΩ]	TO-220 FullPAK	TO-220 FullPAK Narrow Lead	TO-251 IPAK SL	TO-252 DPAK	SOT-223
1500	IPA65R1K5CE		IPS65R1K5CE	IPD65R1K5CE	IPN65R1K5CE
1000	IPA65R1K0CE		IPS65R1K0CE	IPD65R1K0CE	
650	IPA65R650CE	IPAN65R650CE	IPS65R650CE	IPD65R650CE	
400	IPA65R400CE		IPS65R400CE	IPD65R400CE	



800 V CoolMOS™ CE portfolio

$R_{DS(ON)}$ [mΩ]	TO-220 FullPAK	TO-252 DPAK	TO-251 IPAK
2800		IPD80R2K8CE	IPU80R2K8CE
1400	IPA80R1K4CE	IPD80R1K4CE	IPU80R1K4CE
1000	IPA80R1K0CE	IPD80R1K0CE	IPU80R1K0CE
650	IPA80R650CE		
460	IPA80R460CE		
310	IPA80R310CE		



CoolMOS™
Nomenclature Power MOSFET „new“ (launched after Oct 2015)

Sales Name

I	P	DD	80	R	190	P7	S

Grp 1:
I : Infineon

Grp 2: Device Type
P : Power MOSFET

Grp 3: Package Type
A : TO-220 FullPAK
B : TO-263 (D^2PAK)
C : Bare Die
D : TO-252 (DPAK)
I : TO-262 (I^2PAK)
L : ThinPAK 8x8
N : SOT223
P : TO-220
Q : TO-247PLUS
S : TO-251 (IPAK short lead)
T : TO Lead Less
U : TO-251 (IPAK)
W : TO-247
Z : TO-247 4-pin
DD : TO-252 (Double DPAK)
AW: TO-220 FullPAK wide creepage
AN : TO-220 FullPAK narrow lead
LS : ThinPAK 5x6
DQ : TO-252 Quadruple DPAK
SA : TO-251 (IPAK SL w/ ISO StandOff)

Grp 4: Blocking Voltage
divided by 10 [V]

Grp 5: $R_{DS(on)}$
used as separator

Grp 6: $R_{DS(on)}$
@ mΩ

Grp 7: Series Name
such as C3, C6, …, C, P7, etc.

Grp 8: Reliability Grade
blank: Industrial
A : Automotive
S : Standard

Marking pattern (presented as well on technical datasheet)

80	R	190	P7

Series Name
see Grp 7

Blocking Voltage
see Grp 4

Reliability Grade
R : Industrial
A : Automotive
S : Standard
C : customized

$R_{DS(on)}$ [mΩ]
see Grp 6

Only exception: CoolMOS™ CE is standard grade although not showing „S“ at the end.
When CE has been launched new nomenclature was under preparation, thus no changes since P/Ns were already known at customers

CoolMOS™
Traceability and production date code

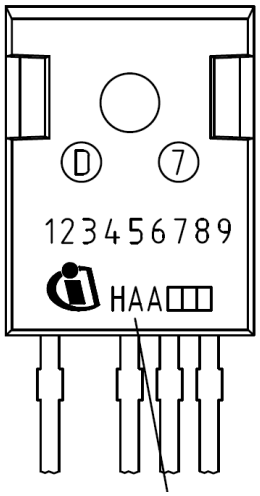
H **AU** **3** **24**

Grp 1: Green product
G: RoHS Compliancy (non HF)
H: RoHS + Halogen Free

Grp 3: Year code
0: 2010
1: 2011
2: 2012
3: 2013
4: 2014
…

Grp 2: Lot identification
AA: Lot #1
AB: Lot #2
AC: Lot #3
…

Grp 4: Calendar week code
01: CW 01
02: CW 02
03: CW 03
…



Code

Based on the above example - HAU324
- Halogen Free Product
- Lot Identification: 21st production lot from CW24/2013
- Date Code: CW 24/2013