



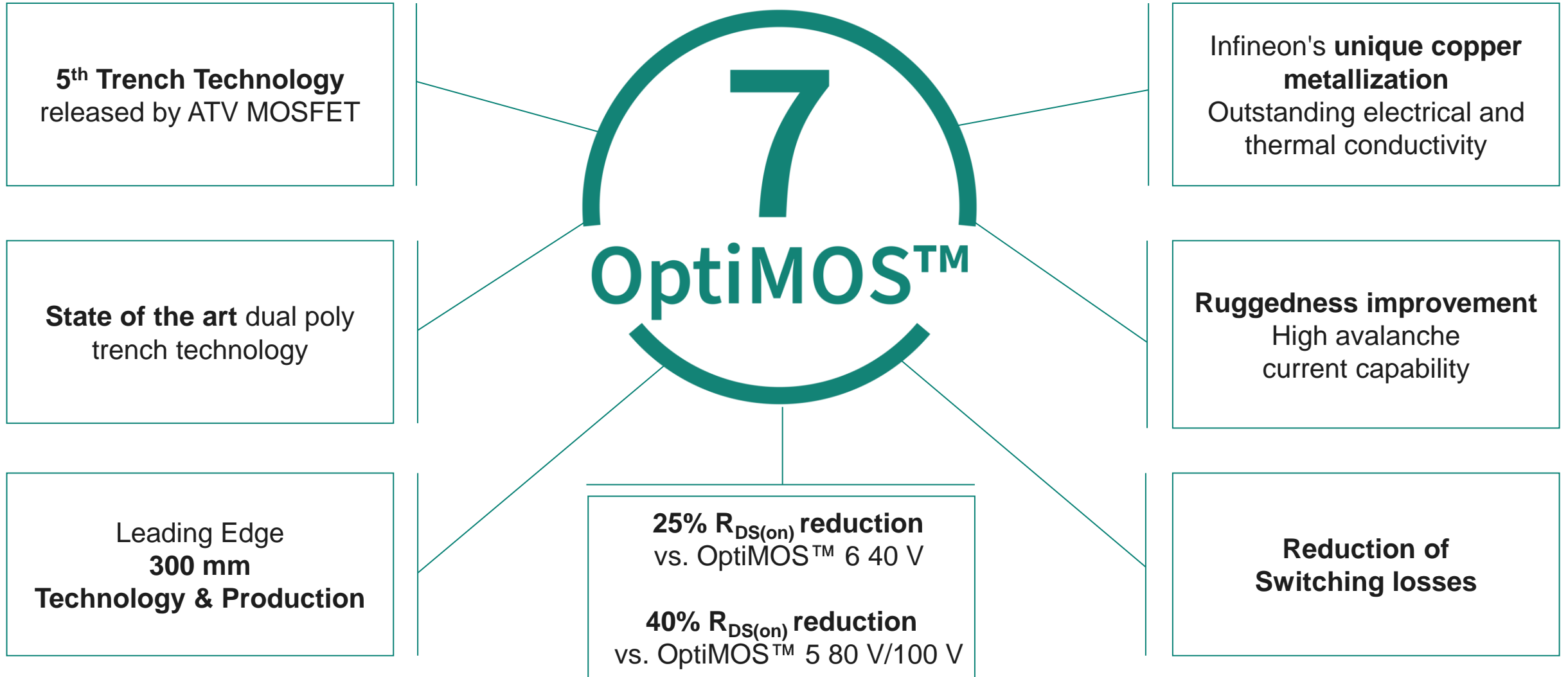
# OptiMOS™ 7 Overview

ATV MOS  
January 2025



# OptiMOS™ 7 Overview

## IFX's next leading edge Automotive MOSFET Technology



# OptiMOS™ 7 Overview

## Features, Benefits & Advantages



### Key features

- Very low  $R_{DS(on)}$
- Fast switching times (turn on/off)
- High avalanche capability
- High SOA ruggedness
- Tight  $V_{GS(th)}$  voltage threshold range
- Leadless Packages w/ Cu-Clip
- Leading thin wafer Cu-technology
- Leading 300 mm in-house production
- Extended qualification beyond AEC-Q101
- Infineon automotive design and quality
- New top-side cooled package offering

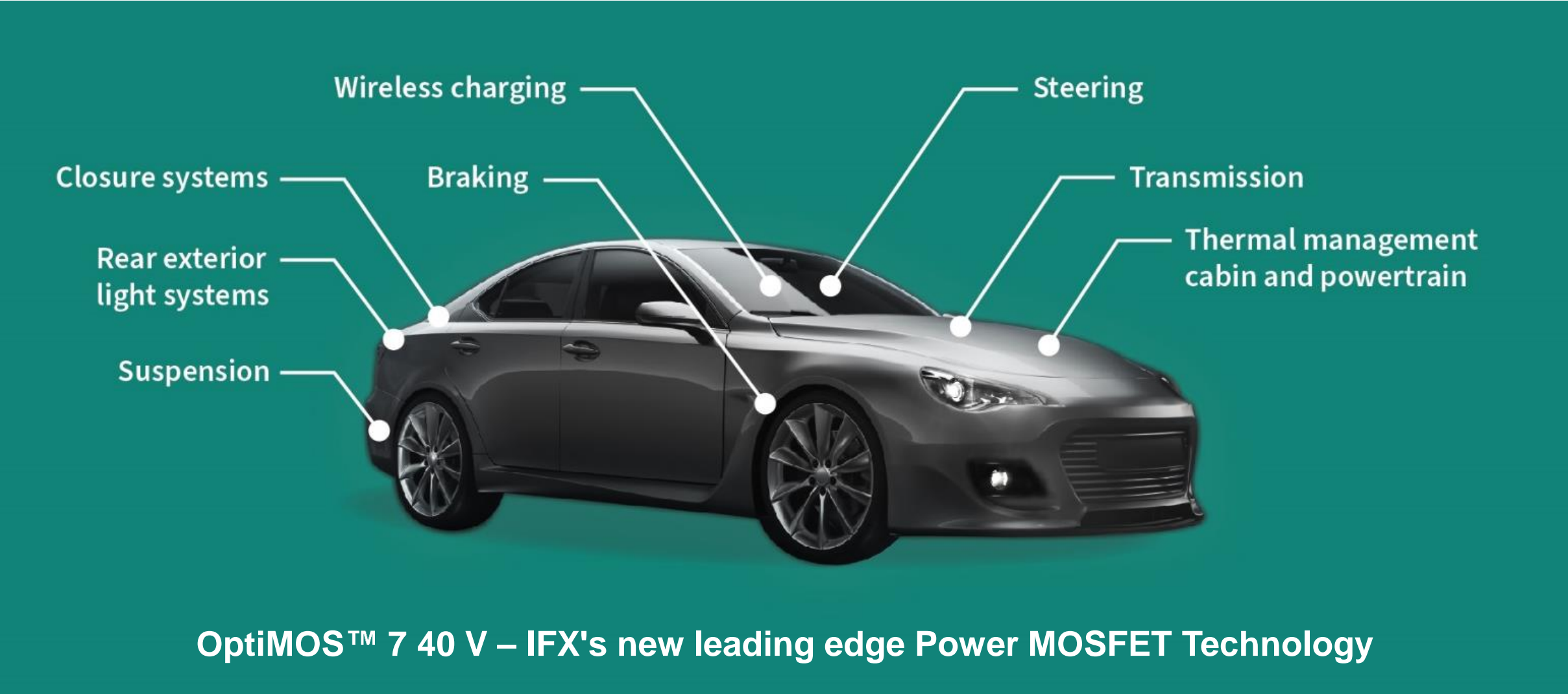
### Key benefits

- Minimized conduction losses
- Superior switching performance
- High power density & efficiency
- Increased current capability
- Improved design ruggedness
- Well-suited for parallel placement
- High automotive quality production
- Small footprint & efficient cooling
- Automotive quality product design
- Many product choices in each package

### Key advantages

- $R_{DS(on)}$  reduced >40% from prior gen
- $I_D$  current increased from prior gen
- Industry's best  $R_{DS(on)}$  in most package classes
- Industry's best FoM ( $R_{DS(on)} \times Q_g$ ) in most package classes

# OptiMOS™ 7 40 V



# OptiMOS™ 7 40 V Overview



## Automotive Packages: Innovative & Robust Quality

### OptiMOS™ 7 40 V – IFX's new leading edge Power MOSFET Technology

IFX's industry benchmark in  $R_{DS(on)} * A$ , power-density, current capability, switching performance, chip ruggedness

Available in IFX's famous robust package portfolio of 3x3, 5x6, 5x6 Dual, 5x6 Half-Bridge, 7x8, 8x8, and 10x12 packages and extended by top-side cooling 5x8 packages for most efficient Automotive designs

Infineon Automotive Package Portfolio Innovative & Robust Quality							
S308 Single (TSDSON-8) 3x3	SS08 Dual (TDSON-8) 5x6	SS08 Half-Bridge (TDSON-8) 5x6	SS08 Single (TDSON-8) 5x6	SS010T Single TSC (LHDSO-10) 5x8	sTOLL Single (HSOF-5) 7x8	mTOLG Single (HSOG-4) 8x8	TOLL Single (HSOF-8) 10x12
OptiMOS™ 7 40V							

[https://www.infineon.com/cms/en/product/promopages/OptiMOS7\\_40V/](https://www.infineon.com/cms/en/product/promopages/OptiMOS7_40V/)

<https://www.infineon.com/SSO10T/>

# OptiMOS™ 7 40 V Overview

## Focus Applications & Packages



Electric power steering



BMS



DC-DC



Fuse Box



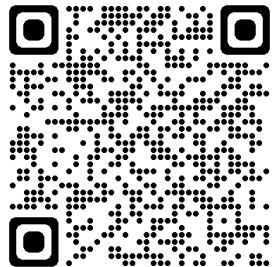
Electric parking brake



Battery disconnect



Zone control unit



Application / Packages	Drives	Power Distribution Safety Switches	Power Conversion
S3O8 (3x3)	X		X
Dual and Half-Bridge SSO8 (5x6)	X		X
Single SSO8 (5x6)	X	X	X
SSO10T (5x8)	X	X	X
sTOLL (7x8)	X	X	X
mTOLG (8x8)	X		
TOLL (10x12)	X	X	X

[https://www.infineon.com/cms/en/product/promopages/OptiMOS7\\_40V/](https://www.infineon.com/cms/en/product/promopages/OptiMOS7_40V/)

# OptiMOS™ 7 40 V – Leading Technology for Drives + Power Distribution + Power Conversion



- Highest Avalanche capability ever in a Trench FET
- Lowest Ron in portfolio available
- Small Qg for higher efficiency and less switching losses



	IPC100N04S4-02	IPC100N04S5-1R2	IAUC120N04S6N006	<b>IAUCN04S7N004</b>
$R_{DS(on)}$ max. 10 V	2.4 m Ohm (82%)	1.2 mOhm (63%)	0.6 mOhm (26%)	<b>0.44 mOhm</b>
Drain current	100 A	100 A	120 A	<b>175 A</b>
$I_{AS}$	100 A (175%)	100 A (175%)	120 A (146%)	<b>175 A</b>
$E_{AS}$ @ 50 A	315 mJ (285%)	480 mJ (188%)	900 mJ (0%)	<b>900 mJ</b>
$I_{D,PULSE}$	400 A (438%)	400 A (438%)	1500 A	<b>1750 A</b>
$V_{GS(th)}$ Deviation	2.0 V	1.2 V	0.8 V	<b>0.8 V</b>

# OptiMOS™ 7 40 V – Highest Avalanche Current Rating + Lowest $R_{DS(on)}$ – Perfect Fit for Safety Switches and Power Distribution



- Highest avalanche current rating in portfolio (also at same  $R_{DS(ON)}$ )
- Perfect fit for Safety Switches / Power Distribution applications
- Easy replacement for OptiMOS™ 5 & 6
- More compact design for Power Distribution ECUs
- Low deviation in VGSTH – low parameter spread (good for MOSFET paralleling)



Battery disconnect



Zonal Power Distribution

Type	Package	Marking
IAUC120N04S6N006	PG-TDSON-8-53	6N04N006

Maximum ratings, at  $T_j=25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Drain current	$I_D$	$V_{GS}=10\text{V}$ , Chip Limitation <sup>1,2)</sup>	405	A
		$V_{GS}=10\text{V}$ , DC current <sup>3)</sup>	120	
		$T_a=85^\circ\text{C}$ , $V_{GS}=10\text{V}$ , $R_{\theta JA}$ on 2s2p <sup>4,5)</sup>	55	
Pulsed drain current <sup>5)</sup>	$I_{D,pulse}$	$T_c=25^\circ\text{C}$ , $t_p=100\mu\text{s}$	1500	
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	$I_D=60\text{A}$ , $R_G=25\Omega$	750	mJ
Avalanche current, single pulse	$I_{AS}$	$R_G=25\Omega$	120	A

## OptiMOS™ 7 Automotive Power MOSFET, 40 V

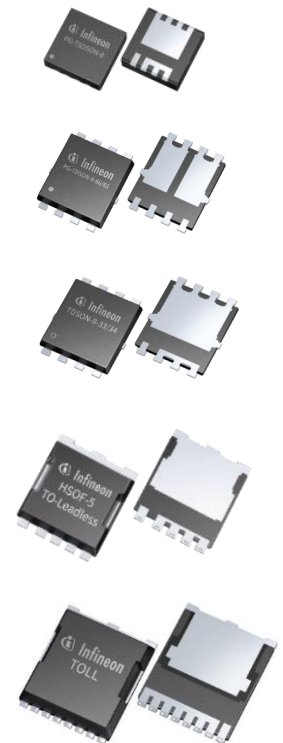
IAUCN04S7N006



### Maximum ratings

at  $T_j=25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$V_{GS}=10\text{V}$ , Chip limitation <sup>1,2)</sup>	410	A
		$V_{GS}=10\text{V}$ , DC current <sup>4)</sup>	175	
		$T_a=85^\circ\text{C}$ , $V_{GS}=10\text{V}$ , $R_{\theta JA}$ on 2s2p <sup>2,3)</sup>	60	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_c=25^\circ\text{C}$ , $t_p=100\mu\text{s}$	1500	
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	$I_D=75\text{A}$	358	mJ
Avalanche current, single pulse	$I_{AS}$	-	150	A
Gate source voltage	$V_{GS}$	-	$\pm 20$	V
Power dissipation	$P_{tot}$	$T_c=25^\circ\text{C}$	164	W
Operating and storage temperature	$T_j, T_{stg}$	-	-55 ... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1	-	-	55/175/56	



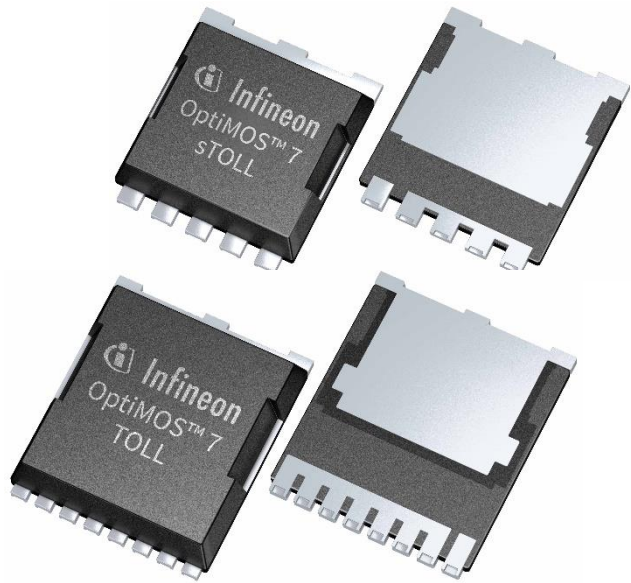


# OptiMOS™ 7 40 V with 25% better SOA ruggedness

## Perfect Fit for Power Distribution & Safety Switches



- Average 25% and up to 35% SOA improvement vs. OptiMOS™ 6
- Perfect fit to reduce steady on losses or enable higher currents



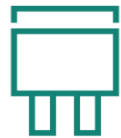
BMS



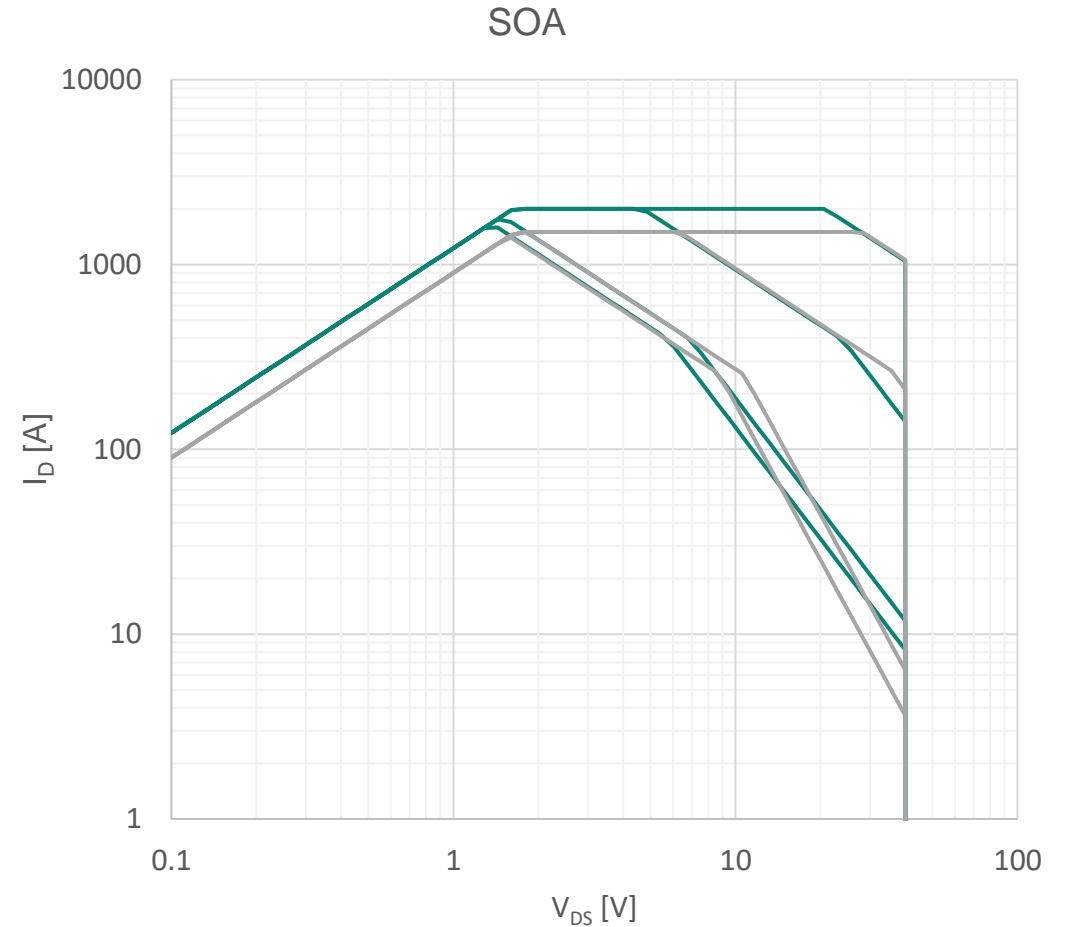
Battery  
disconnect



Zonal  
architecture



Fuse Box



# OptiMOS™ 7 40 V – Low Gate Charge for high Frequency Switching – Perfect Fit for efficient Drives and Power Conversion



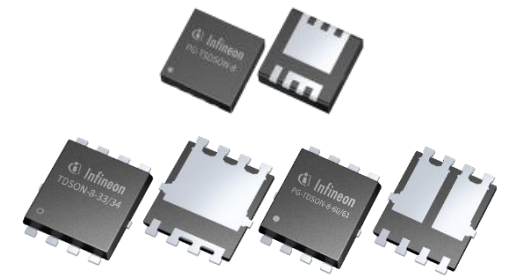
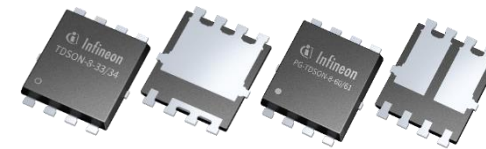
- Small gate charge for lowest gate drive currents
- Optimized for current source gate drivers with low R<sub>g</sub>
- Small Q<sub>g</sub> for higher efficiency and less switching losses



Electric power steering



DC-DC



	IPC80N04S4-03	IPC100N04S5-2R8	IAUC100N04S6N028	<b>IAUZN04S7N028 IAUCN04S7N030(D)</b>
Q <sub>gtot</sub>	71 nC	45 nC	29 nC	<b>26 nC</b>
Q <sub>gs</sub>	32 nC	12 nC	8 nC	<b>5 nC</b>
Q <sub>gd</sub>	18 nC	11 nC	7.4 nC	<b>6 nC</b>
FOM	213	126	81.2	<b>72.8</b>
R <sub>g</sub>	1.4	2.18	3.2	<b>1.5</b>
T (Tau) V <sub>GS</sub> = 10 V	10 ns	9.8 ns	9.3 ns	<b>3.9 ns</b>

# OptiMOS™ 7 40 V with optimized Turn On / Off Switching

## Perfect Fit for efficient Drives and Power Conversion



Up to 20% faster switching times

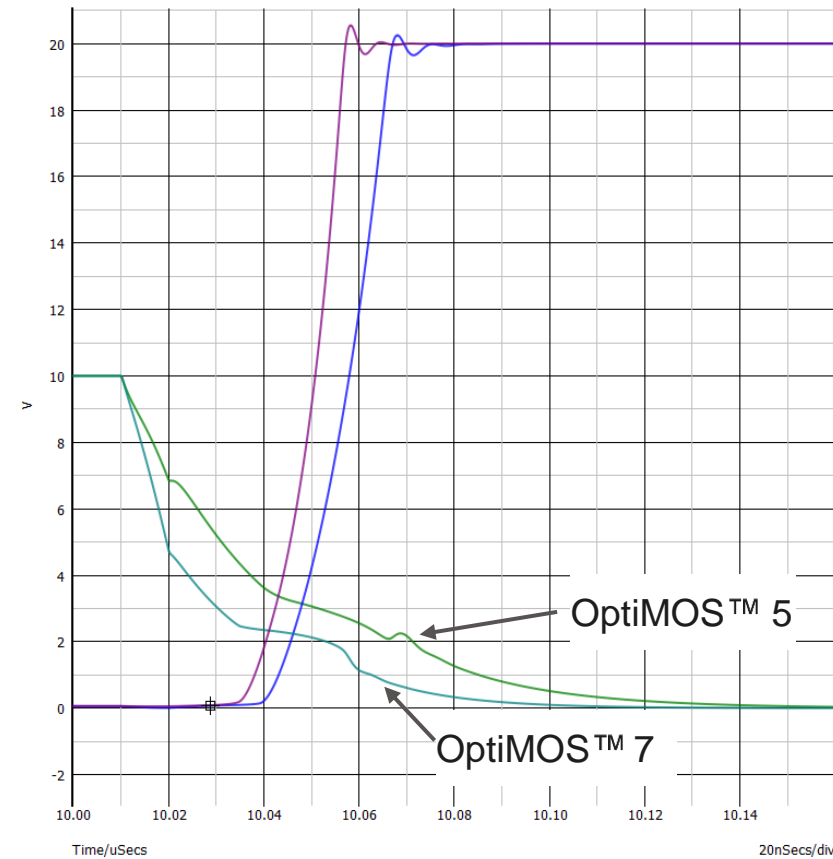
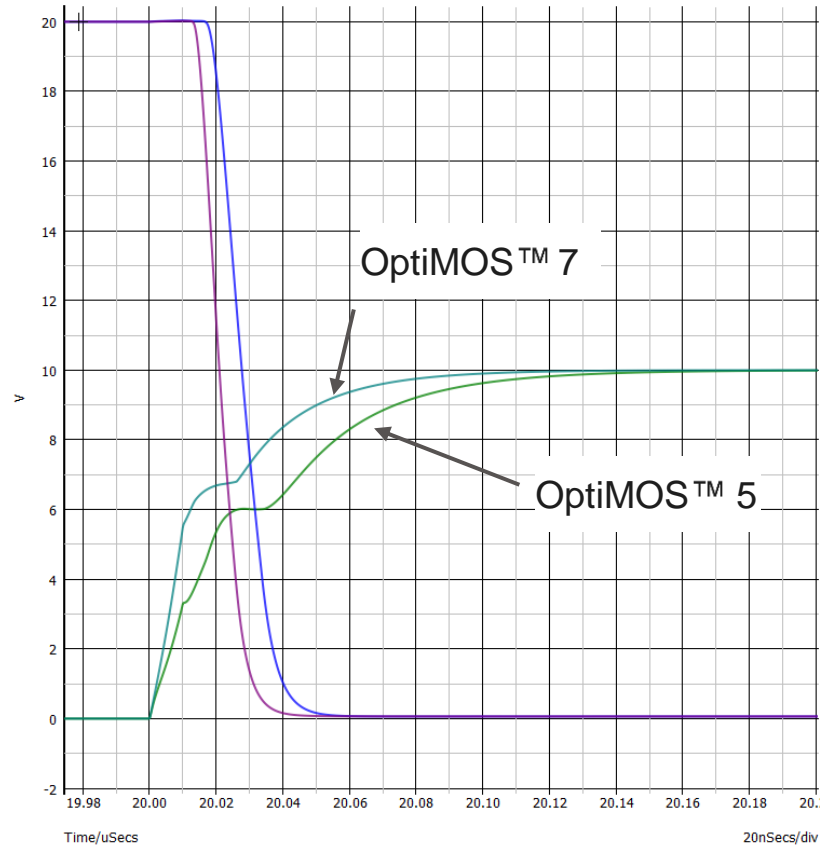
- enables higher frequency for DCDCs
- Higher duty cycle by achieving lower deadtimes



Electric power steering



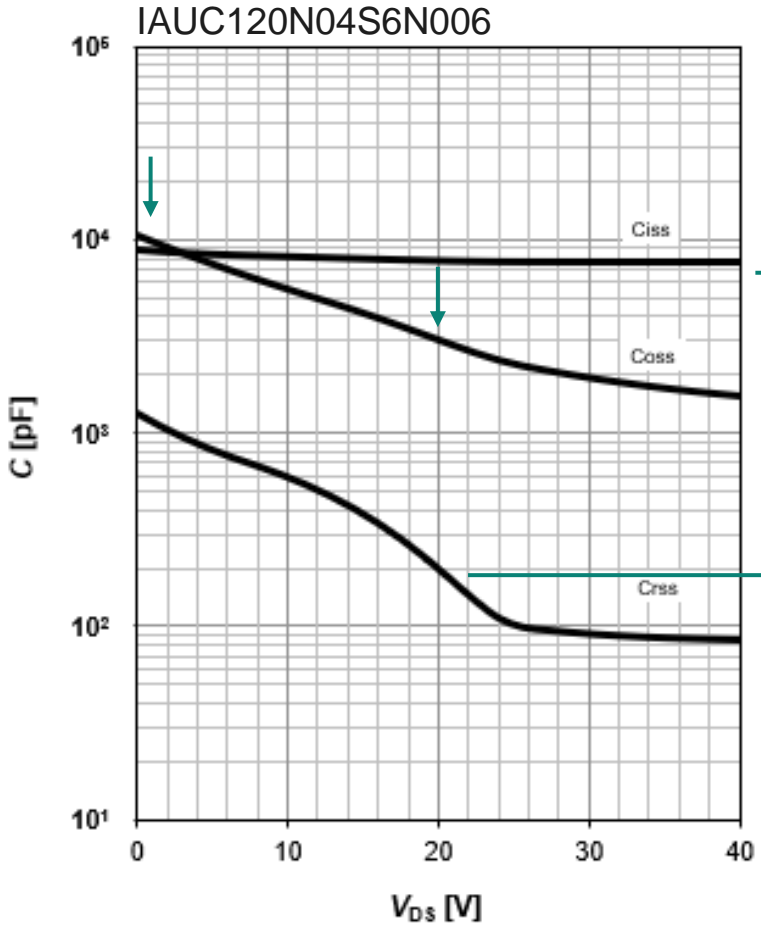
DC-DC



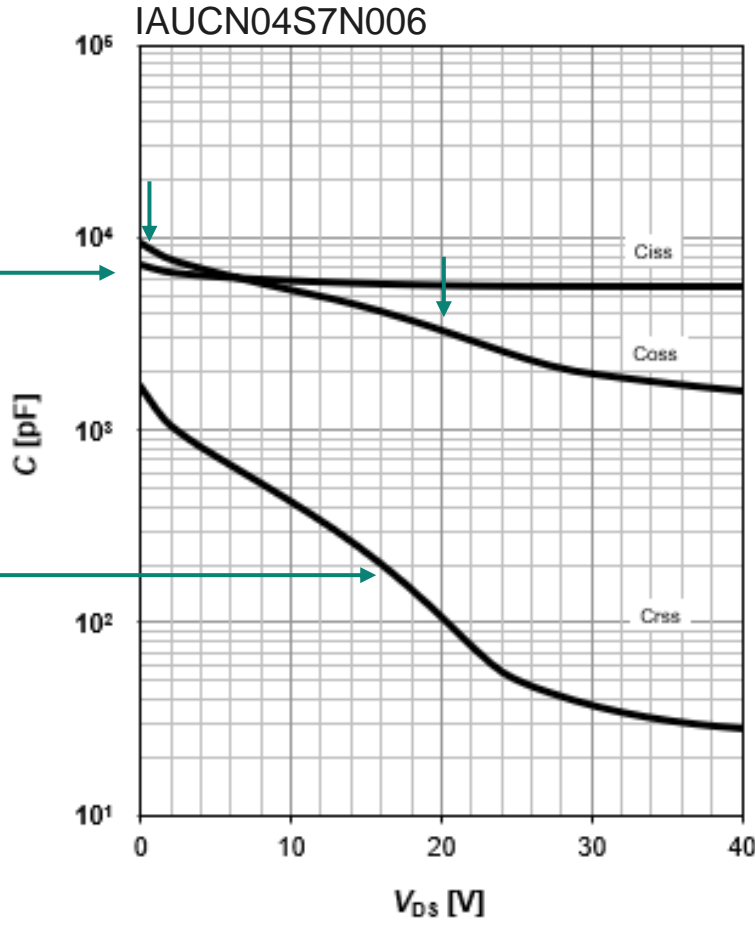
# OptiMOS™ 7 40 V with optimized input & output capacitances

Lower values & better linearity for overall improved switching behavior

$C = f(V_{DS}); V_{GS} = 0\text{ V}; f = 1\text{ MHz}$



$C = f(V_{DS}); V_{GS} = 0\text{ V}; f = 1\text{ MHz}$



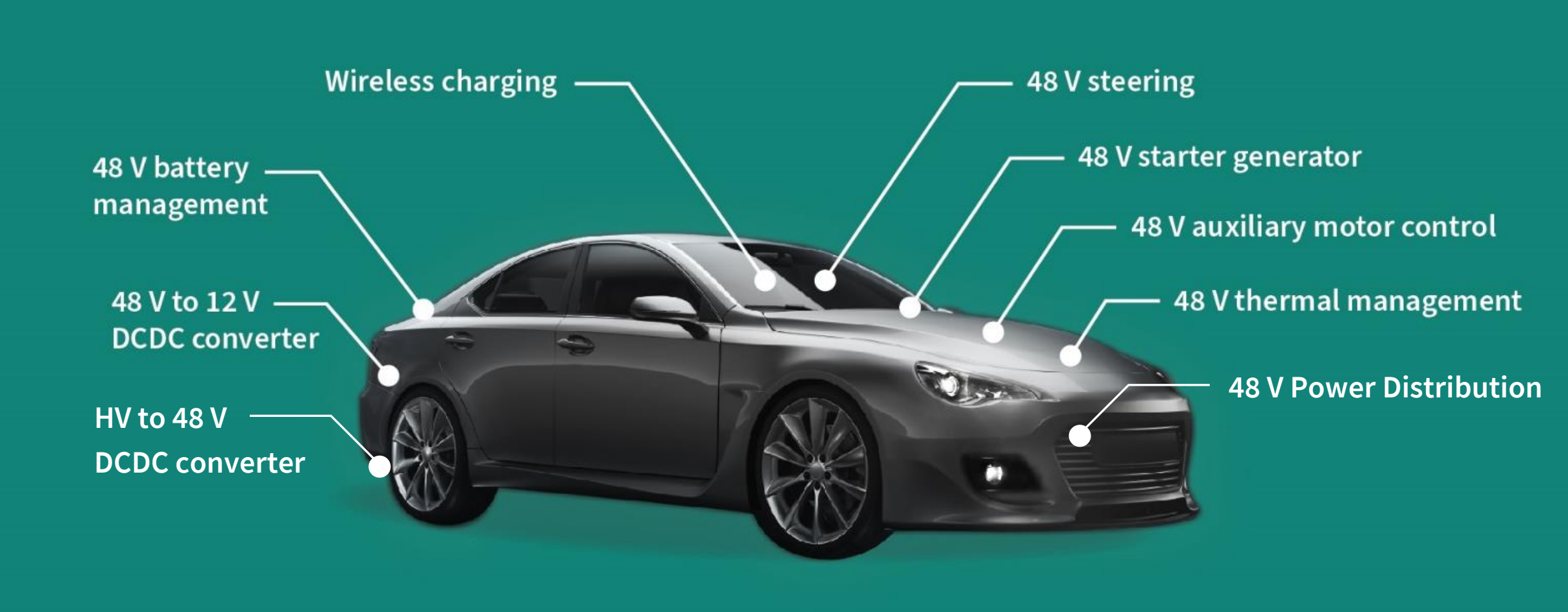
15% lower input capacitance ( $C_{iss}$ )

10% lower output capacitance ( $C_{oss}$ )

6% more stable output capacitance ( $C_{oss}$ )

Up to 45% less reverse transfer capacitance ( $C_{rss}$ )

# OptiMOS™ 7 80 V and 100 V



















For 80 V & 100 V: OptiMOS™ 7 products expand and complement the OptiMOS™ 5 portfolio

# Infineon's 80 V & 100 V Automotive MOSFETs

## Applications Overview: Automotive



Automotive

Powertrain (Vehicle Motion)	Safety (Vehicle Automation) (Chassis)	Body (User Experience) (Electrical/Electronic Architecture)
 48 V Starter Generator	 48 V Suspension	 DC / DC (HV-48 V)
 Fuel Injection	 48 V EPS	 DC / DC (48 V-12 V)
 48 V – 96 V Traction Inverter	 48 V Braking	 48 V Power Distribution
 48 V Pumps (Water, Oil, Fuel)		 48 V Battery Main Switch
 48 V eBooster, eTurbo		 Wireless Charging
 48 V Engine Cooling Fan		 48 V eClimate Compressor
		 LED Front / Rear Lighting

### More Transportation Applications



eMotorcycle



Truck



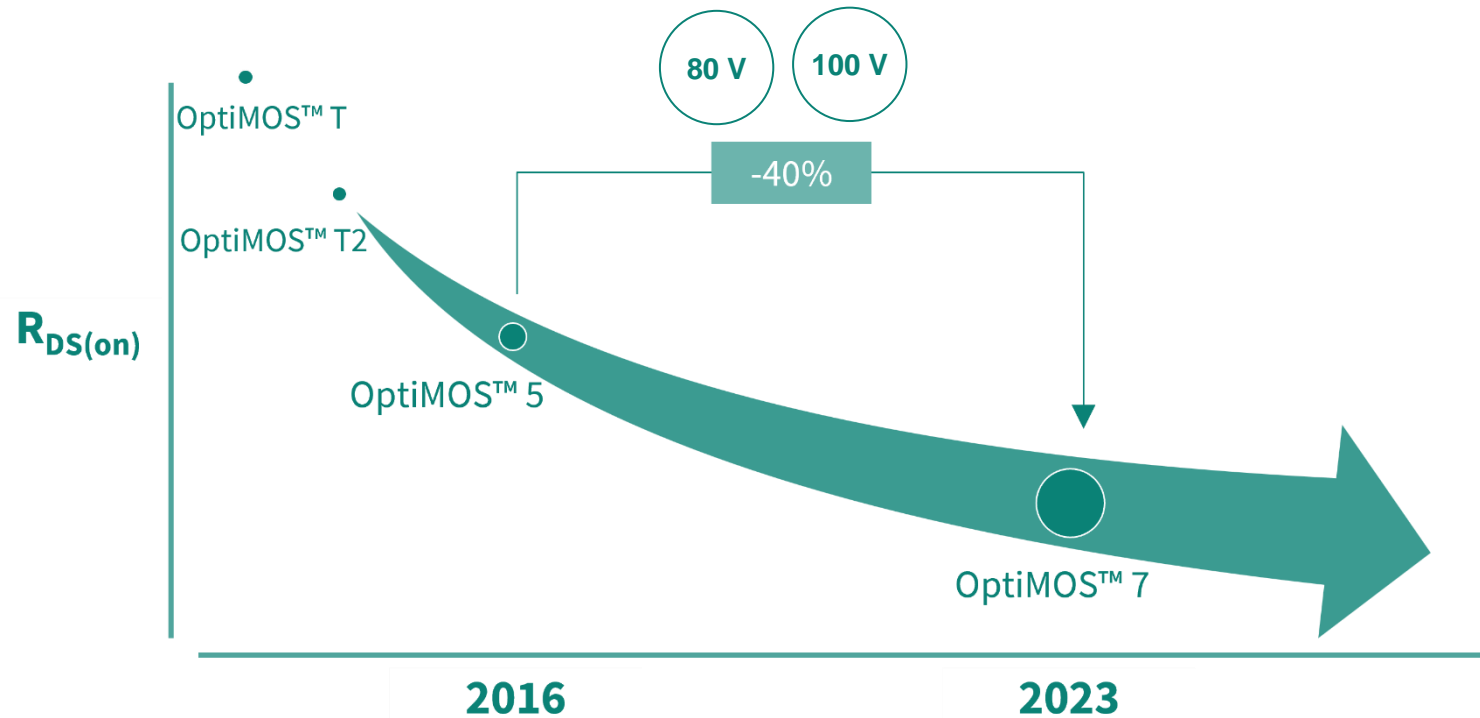
CAV

# Infineon's OptiMOS™ 7 80 V and 100 V Automotive MOSFETs

## The next power semiconductor technology is here: OptiMOS™ 7



$R_{DS(on)}$  improvement over time / technology



# OptiMOS™ 7 is complementing the existing portfolios of OptiMOS™ 5 80 V and 100 V MOSFET products



Infineon Automotive MOSFET Latest available technology									
	S308 Single 3x3 mm <sup>2</sup>	SS08 Half-Bridge 5x6 mm <sup>2</sup>	SS08 Dual 5x6 mm <sup>2</sup>	SS08 Single 5x6 mm <sup>2</sup>	SS010T 5x8 mm <sup>2</sup>	sTOLL 7x8 mm <sup>2</sup>	mTOLG 8x8 mm <sup>2</sup>	TOLL 10x12 mm <sup>2</sup>	TOLG 10x12 TOLT 10x15
80 V	OptiMOS™ 5    OptiMOS™ 7			OptiMOS™ 5    OptiMOS™ 7	OptiMOS™ 5    OptiMOS™ 7	OptiMOS™ 5	OptiMOS™ 5	OptiMOS™ 5    OptiMOS™ 7	OptiMOS™ 5
100 V	OptiMOS™ 5    OptiMOS™ 7		OptiMOS™ 5	OptiMOS™ 5    OptiMOS™ 7	OptiMOS™ 5    OptiMOS™ 7	OptiMOS™ 5	OptiMOS™ 5	OptiMOS™ 5    OptiMOS™ 7	OptiMOS™ 5

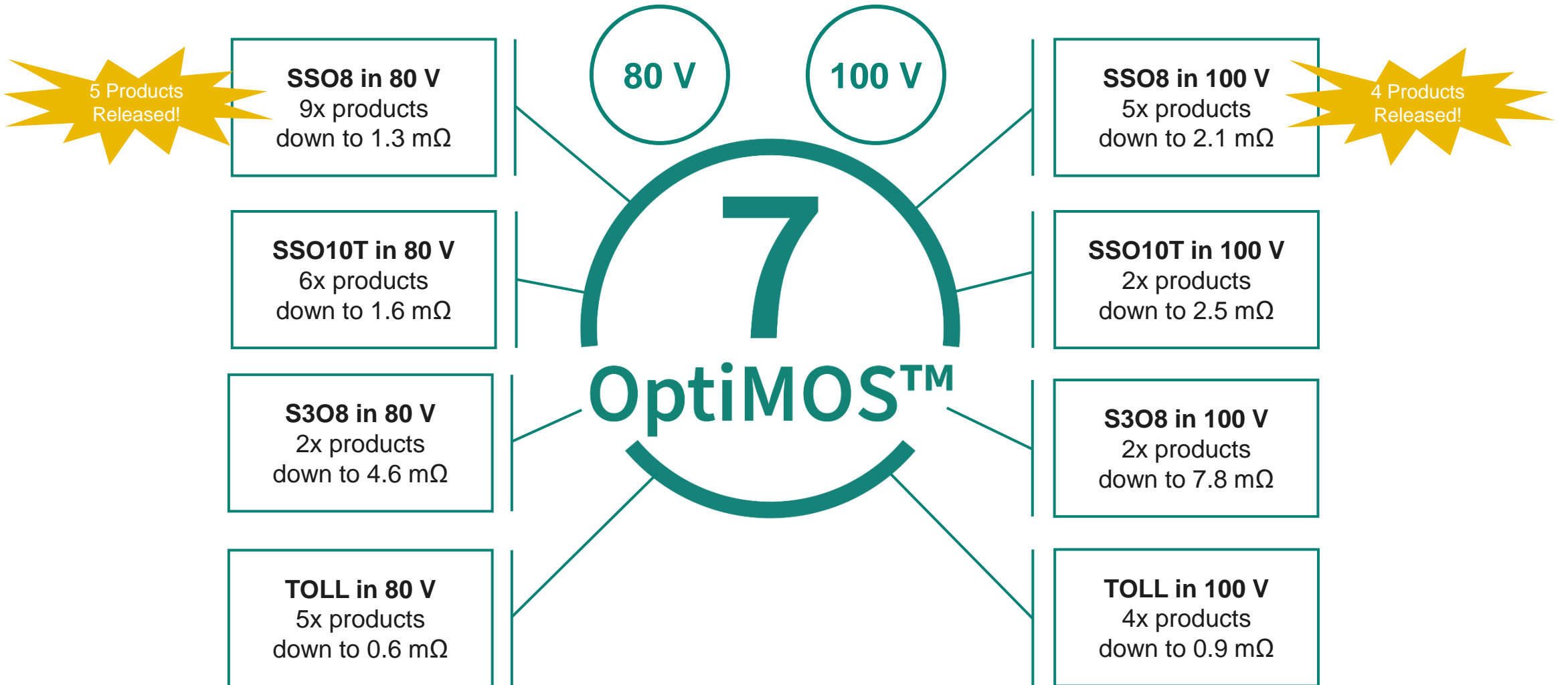


# Infineon's OptiMOS™ 7 80 V and 100 V Automotive MOSFETs

## 35 new products for 80 V & 100 V in S3O8, SSO8, SSO10T and TOLL



**First products released! More coming soon.**



# OptiMOS™ 7 80V and 100V Automotive MOSFETs

## Best-in-class products planned by package



Name	S308 (TSDSON-8)	SS08 (TDSON-8)	TOLL (HSOF-8)	SSO10T (LHDSO-10)
3D View				
Footprint	3x3 mm <sup>2</sup>	5x6 mm <sup>2</sup>	10x12 mm <sup>2</sup>	5x7 mm <sup>2</sup>
Configuration	Single	Single	Single	Single
Cooling method	PCB (bottom) cooled	PCB (bottom) cooled	PCB (bottom) cooled	Top-side cooled
80 V - R <sub>DS(on)</sub> max.	4.6 mΩ <i>in development</i>	1.3 mΩ <b>in production</b>	0.6 mΩ <i>in development</i>	1.6 mΩ <i>in development</i>
100 V - R <sub>DS(on)</sub> max.	7.8 mΩ <i>in development</i>	2.1 mΩ <b>in production</b>	0.9 mΩ <i>in development</i>	2.5 mΩ <i>in development</i>

Preliminary Information. Subject to change.

# OptiMOS™ 7 80V and 100V SSO8 (5x6mm) Products

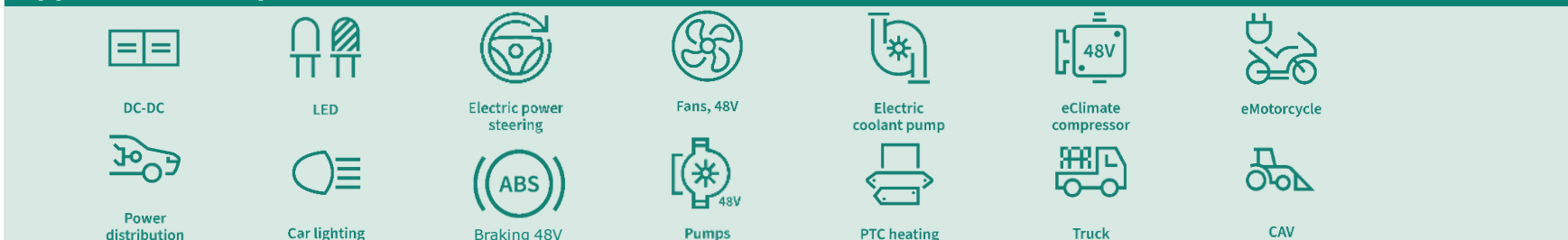
## Features, benefits, and advantages



- Best 80V 5x6 mm package MOSFET on the market! Only 1.3 mΩ max.  $R_{DS(on)}$  !
- Best 100V 5x6mm package MOSFET on the market! Only 2.1 mΩ max.  $R_{DS(on)}$  !
- OptiMOS™ 7  $R_{DS(on)}$  ca. 50% less than previous generation OptiMOS™ 5 BiC products → Reduced conduction losses!
- Optimized capacitance  $C_{xxx}$  and charge  $Q_{xx}$  values also → Reduced switching losses! Higher efficiency. Less heat.
- High power density in 5x6 mm → Good for medium to low power motor drive, power conversion, and switch circuits
- Tight  $V_{GS(th)}$  range → Well-suited for parallel MOSFET placement
- OptiMOS™ 7  $I_D$  increased by 75% versus previous generation OptiMOS™ 5 BiC products → Higher power density!
- Unique fused source pins → Reduced risk of hot spots. Lower current density into Source. Better solder joint reliability.
- Takes only half of the PCB area of DPAK → Can shrink PCB for cost savings or use more Cu on PCB for cooling
- JEDEC listed package. Pin-to-pin and footprint compatible to other 5x6 packages → second source possible



### Application examples:

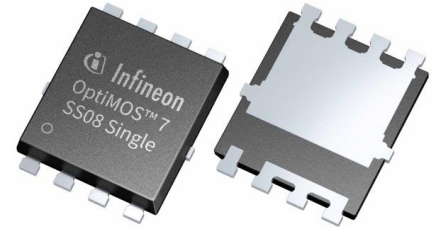


Preliminary Information. Subject to change.

# OptiMOS™ 7 80 V Technology evolution in 5x6 mm<sup>2</sup> SSO8 package

## Comparison of best $R_{DS(on)}$ products in each technology

- Great improvement in  $R_{DS(on)}$ 
  - Best  $R_{DS(on)}$  available on the market
- Major increase in continuous Drain current
- Highest single avalanche capability ever in a Trench FET
- Tighter  $V_{GS(th)}$  range



	AUIRFN7107TR *	IAUC100N08S5N031	IAUCN08S7N013
Si Technology	Gen10.7 75 V (-6%)	OptiMOS™ 5 80 V	OptiMOS™ 7 80 V
$R_{DS(on)}$ max. @ 10V	8.5 mΩ (+554%)	3.1 mΩ (+138%)	1.3 mΩ
Drain current @ 25°C	75 A (-57%)	100 A (-43%)	175 A
$I_{AS}$	45 A (-65%)	100 A (-23%)	130 A
$E_{AS}$	123 mJ @ 45A (-76%)	250 mJ @ 50A (-52%)	522 mJ @ 65A
$I_{D,pulse}$	300 A (-66%)	400 A (-55%)	894 A
$V_{GS(th)}$ min.-max. range	2.0 V (+122%)	1.6 V (+78%)	0.9 V

\* product is discontinued

# OptiMOS™ 7 80 V - Low Gate Charge for high Frequency Switching

## Comparison of similar $R_{DS(on)}$ products in each technology



- Small gate charge for lowest gate drive currents
- Optimized for current source gate drivers with low  $R_g$
- Small  $Q_g$  for higher efficiency and less switching losses



	IPB160N08S4-03 *	IAUC100N04S5N034	IAUCN08S7N034
Si Technology	OptiMOS™ T2 80 V	OptiMOS™ 5 80 V	OptiMOS™ 7 80 V
$R_{DS(on)}$ max. @ 10V	3.2 mΩ	3.4 mΩ	3.4 mΩ
$Q_{gtot}$	86 nC	51 nC	35 nC
$Q_{gs}$	31 nC	17 nC	11 nC
$Q_{gd}$	19 nC	12 nC	7 nC
FOM	275 nC*mΩ	173 nC*mΩ	119 nC*mΩ
$R_g$	2 Ω	1.5 Ω	1.1 Ω
T (Tau) $V_{GS} = 10V$	12 ns	5.3 ns	2.6 ns



DC-DC



Pumps



Electric power steering

# OptiMOS™ 7 80 V with optimized Turn On / Off Switching

## Perfect fit for efficient 48 V drives and power conversion



Up to 25% faster switching times

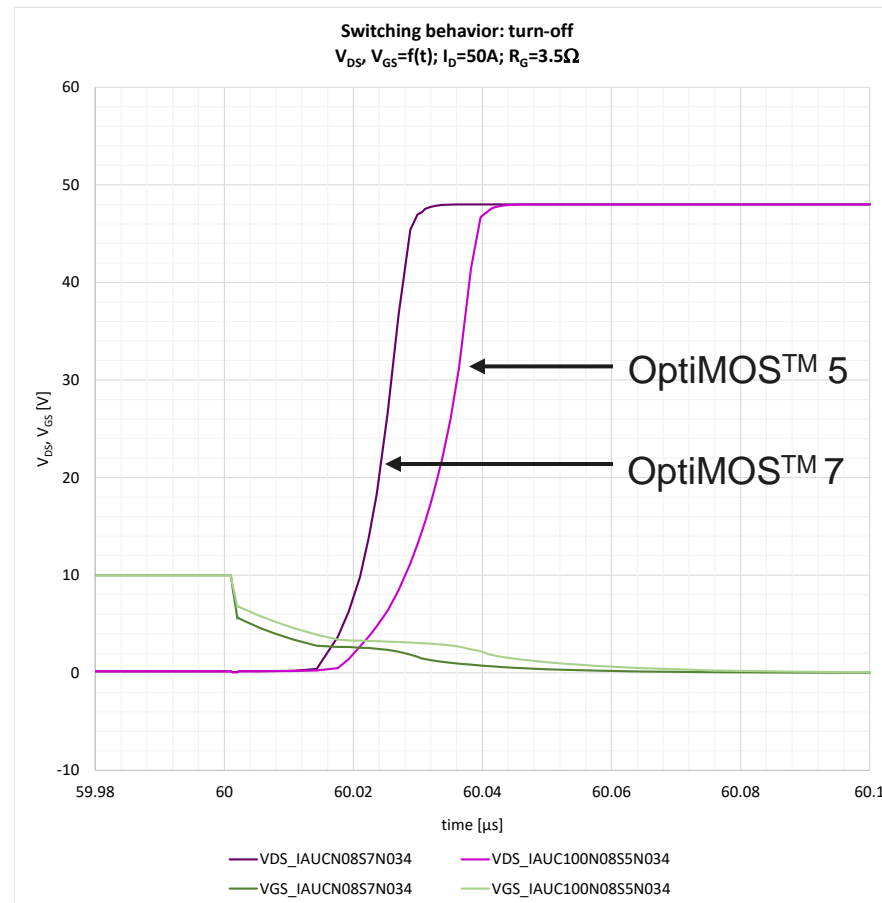
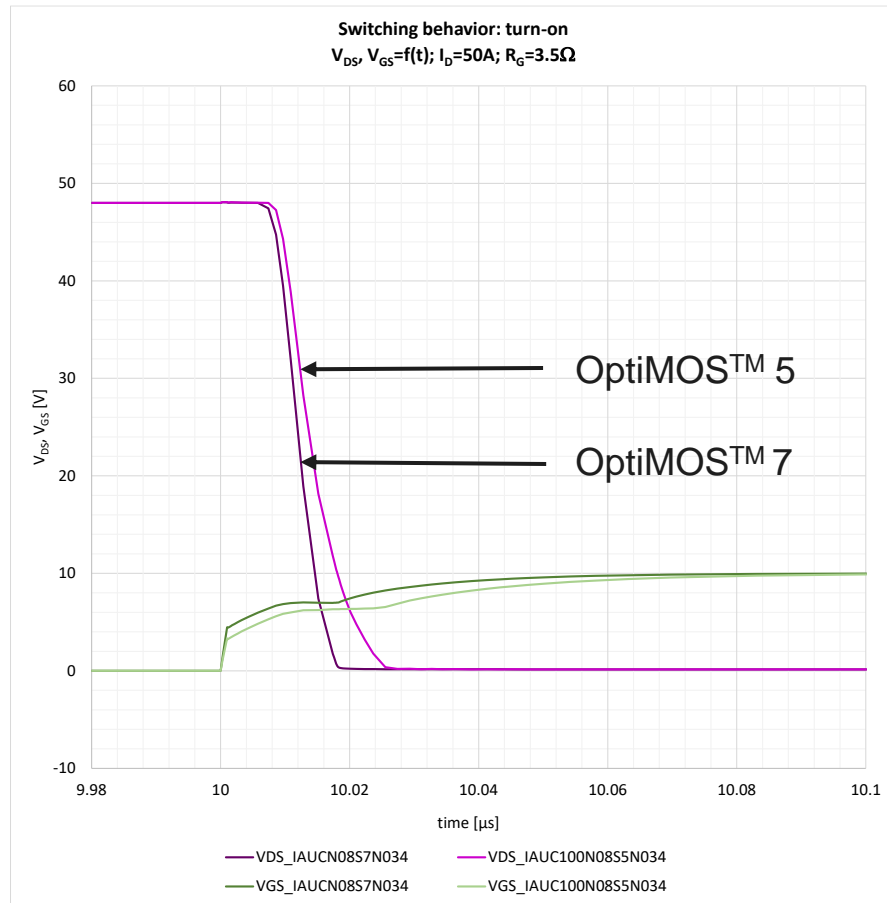
- Enables higher frequency for DCDCs
- Higher duty cycle by achieving lower deadtimes



DC-DC

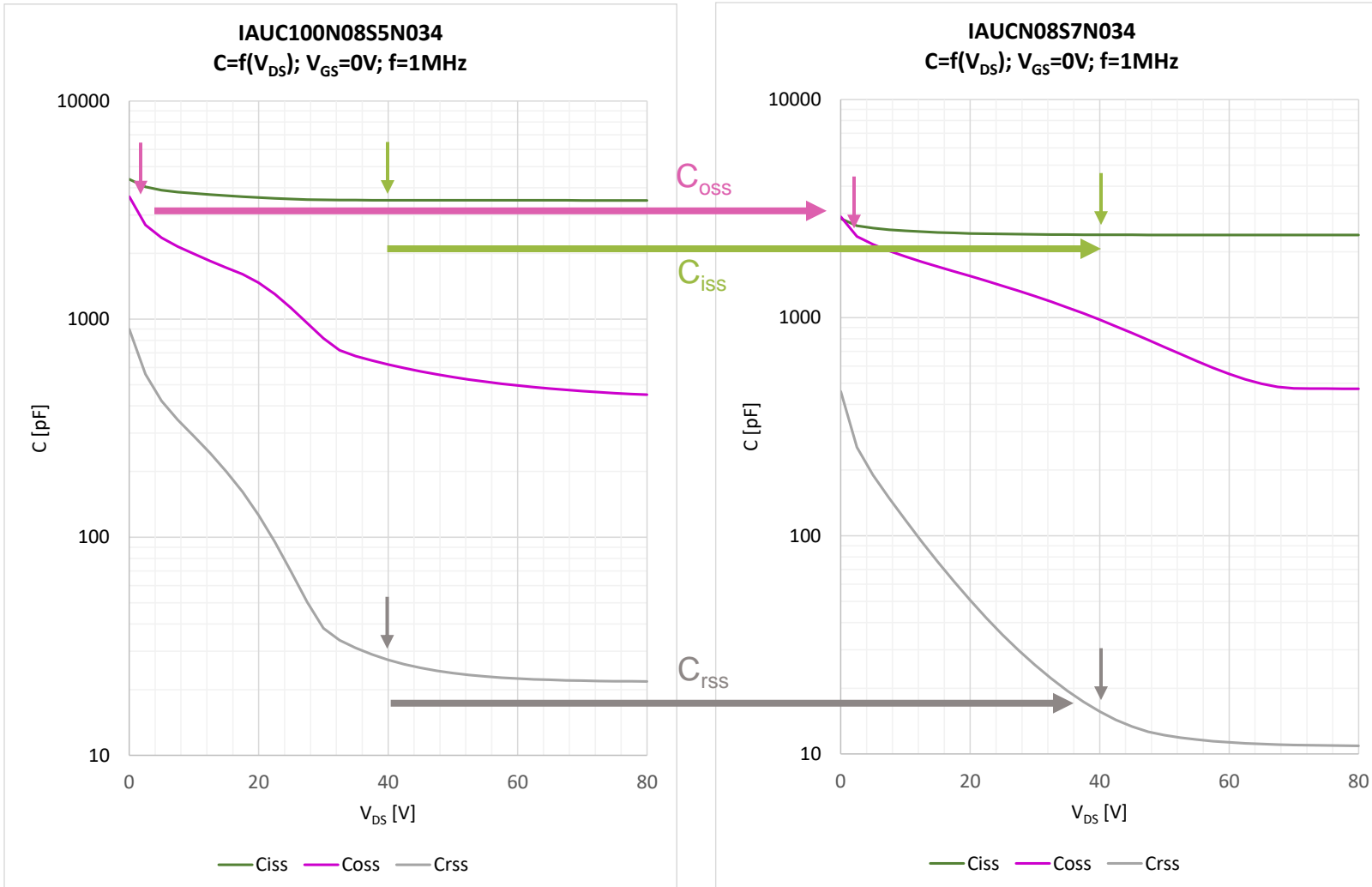


Electric power steering



# OptiMOS™ 7 80 V with optimized input & output capacitances

Lower values & better linearity for overall improved switching behavior



**32 % lower input capacitance ( $C_{iss}$ )**

**20 % lower output capacitance ( $C_{oss}$ )**

**24 % more stable output capacitance ( $C_{oss}$ )**

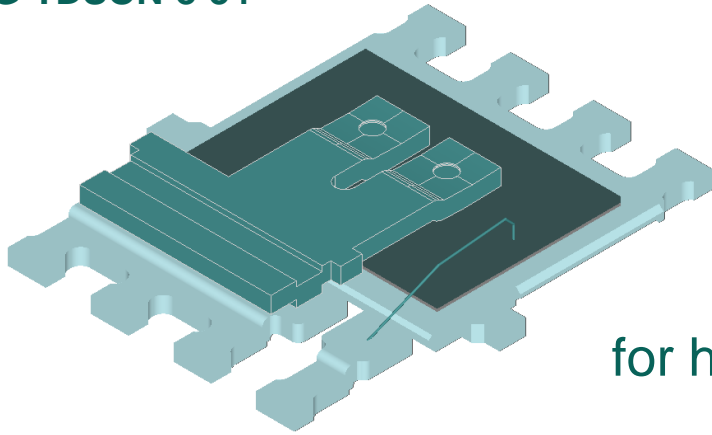
**Up to 43 % less reverse transfer capacitance ( $C_{rss}$ )**

# OptiMOS™ 7 80 V Single SSO8 5x6 with Cu-clip

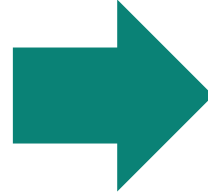
For enhanced electrical and thermal performance



PG-TDSON-8-34

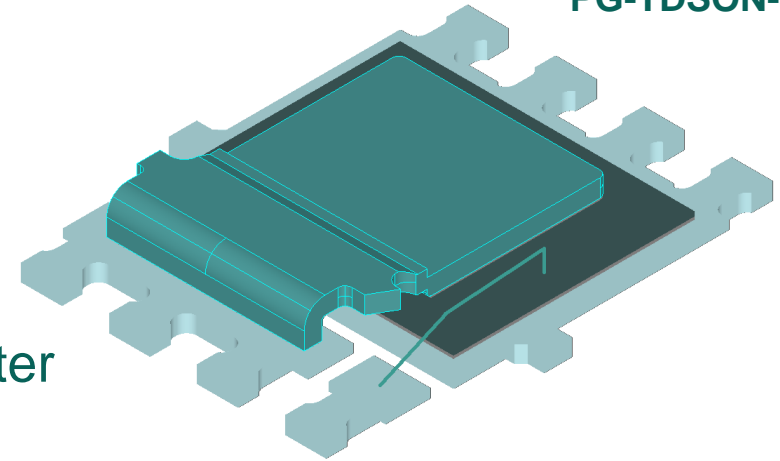


Improved package design

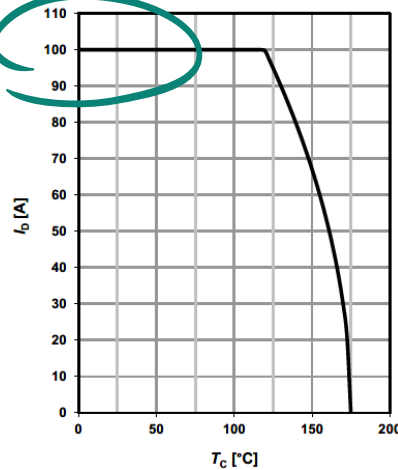


larger die size & larger clips  
for higher current capability and better thermal performance!

PG-TDSON-8-53



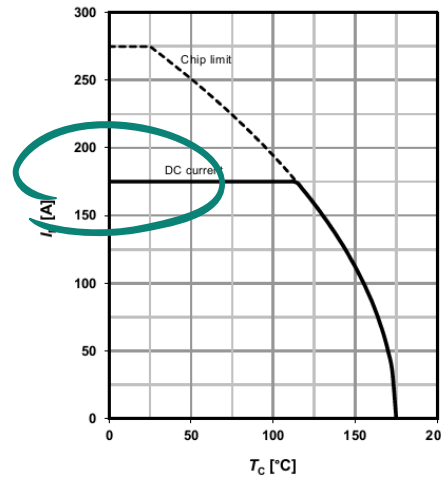
2 Drain current  
 $I_D = f(T_C); V_{GS} \geq 6\text{ V}$



IAUC100N08S5N031

Product Summary

$V_{DS}$	80	V
$R_{DS(on)}$	2.1	mΩ
$I_D$	100	A



2 Drain current

$I_D = f(T_C); V_{GS} \geq 6\text{ V}$

IAUCN08S7N013

Automotive MOSFET

OptiMOS™ 7 Power-Transistor



Maximum ratings

at  $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$V_{GS} = 10\text{ V}$ , Chip limitation <sup>1,2)</sup>	274	A
		$V_{GS} = 10\text{ V}$ , DC current	175	



OptiMOS™-5 Power-Transistor





# OptiMOS™ 7 100 V Technology evolution in 5x6 mm<sup>2</sup> SSO8 package

## Comparison of best $R_{DS(on)}$ products in each technology

- Great improvement in  $R_{DS(on)}$ 
  - Best  $R_{DS(on)}$  available on the market
- Major increase in continuous Drain current
- Highest single avalanche capability ever in a Trench FET
- Tighter  $V_{GS(th)}$  range



	AUIRFN7110TR *	IAUC100N10S5N040	IAUCN10S7N021
Si Technology	Gen10.7 100 V	OptiMOS™ 5 100 V	OptiMOS™ 7 100 V
$R_{DS(on)}$ max. @ 10V	14.5 mΩ (+590%)	4.0 mΩ (+90%)	2.1 mΩ
Drain current @ 25°C	58 A (-67%)	100 A (-43%)	175 A
$I_{AS}$	60 A (-54%)	100 A (-23%)	130 A
$E_{AS}$	133 mJ @ 35A (-54%)	234 mJ @ 50A (-19%)	288 mJ @ 65A
$I_{D,pulse}$	232 A (-70%)	400 A (-49%)	779 A
$V_{GS(th)}$ min.-max. range	2.0 V (+122%)	1.6 V (+78%)	0.9 V

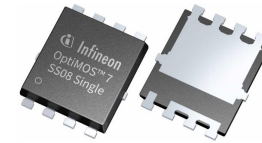
\* product is discontinued

# OptiMOS™ 7 100 V - Low Gate Charge for high Frequency Switching

## Comparison of similar $R_{DS(on)}$ products in each technology



- Small gate charge for lowest gate drive currents
- Optimized for current source gate drivers with low  $R_g$
- Small  $Q_g$  for higher efficiency and less switching losses



	IPB120N10S4-03	IAUC100N10S5N040	IAUCN10S7N040
Si Technology	OptiMOS™ T2 100 V	OptiMOS™ 5 100 V	OptiMOS™ 7 100 V
$R_{DS(on)}$ max. @ 10V	3.2 m $\Omega$	4.0 m $\Omega$	4.0 m $\Omega$
$Q_{gtot}$	108 nC	60 nC	39.3 nC
$Q_{gs}$	36 nC	20 nC	13.2 nC
$Q_{gd}$	21 nC	13 nC	6.7 nC
FOM	346 nC*m $\Omega$	240 nC*m $\Omega$	157 nC*m $\Omega$
$R_g$	1.4 $\Omega$	1.3 $\Omega$	1.3 $\Omega$
T (Tau) $V_{GS} = 10V$	11 ns	5.2 ns	3.7 ns



DC-DC



Pumps



Electric power steering

# OptiMOS™ 7 100 V with optimized Turn On / Off Switching

## Perfect fit for efficient 48 V drives and power conversion



Up to 25% faster switching times

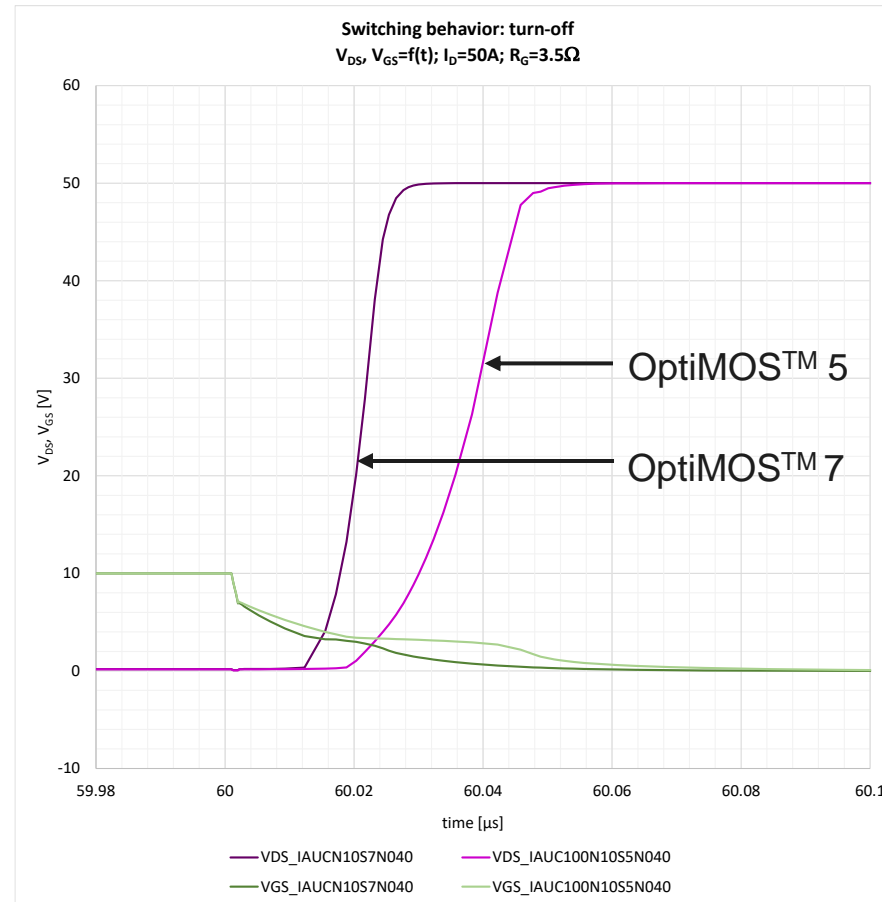
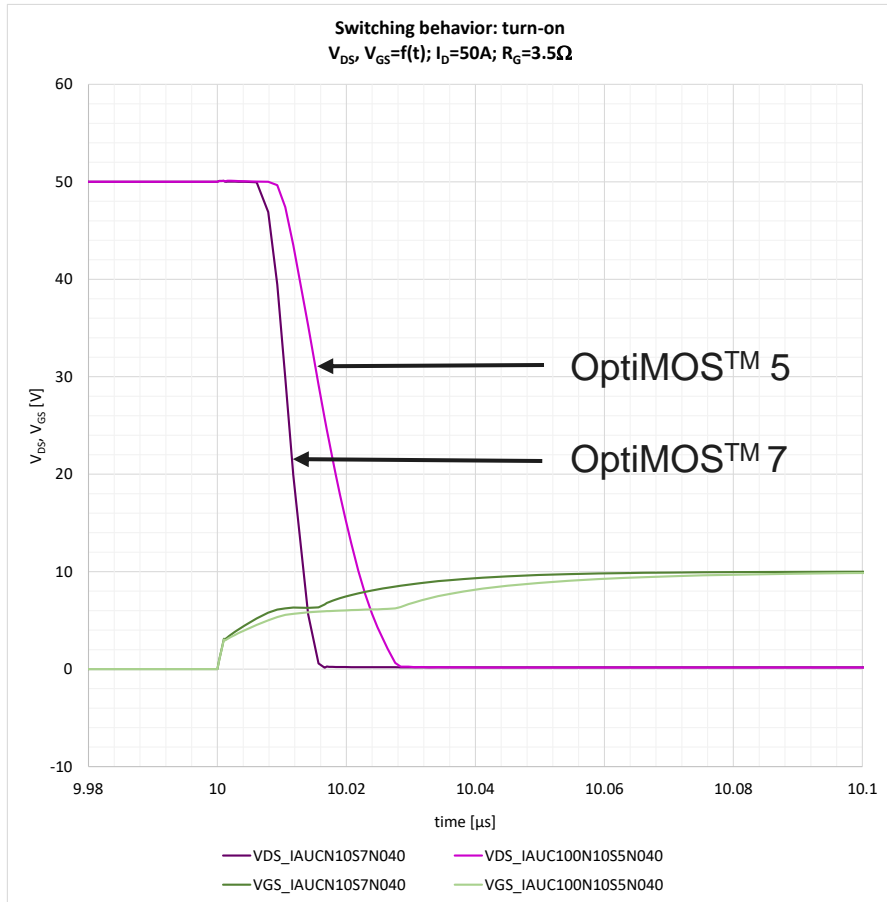
- Enables higher frequency for DCDCs
- Higher duty cycle by achieving lower deadtimes



DC-DC

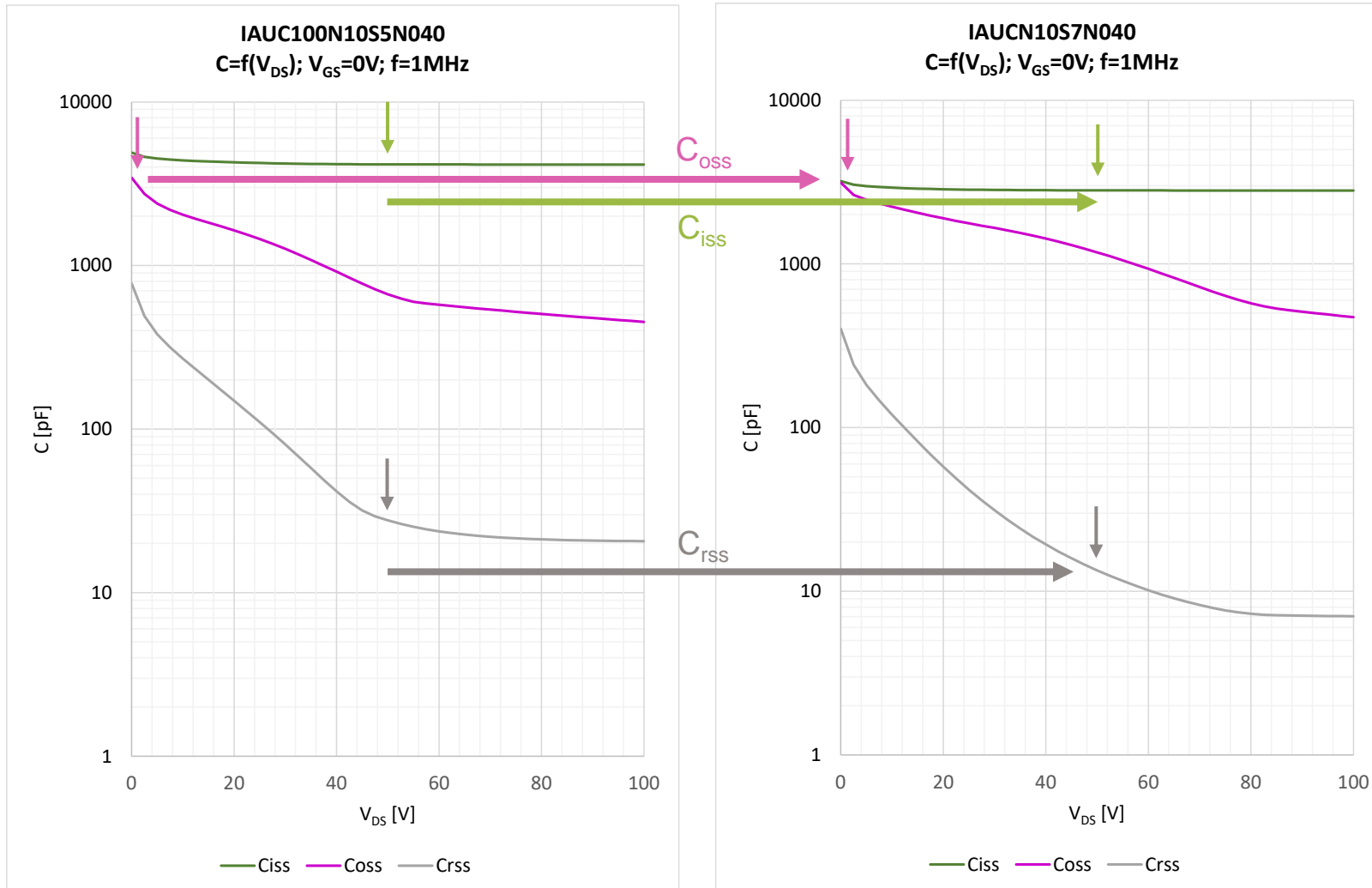


Electric power steering



# OptiMOS™ 7 100 V with optimized input & output capacitances

Lower values & better linearity for overall improved switching behavior



**32 % lower input capacitance ( $C_{iss}$ )**

**9 % lower output capacitance ( $C_{oss}$ )**

**11 % more stable output capacitance ( $C_{oss}$ )**

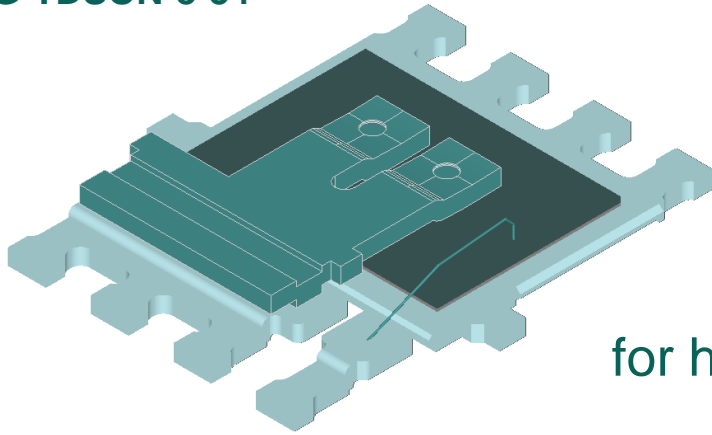
**Up to 52 % less reverse transfer capacitance ( $C_{rss}$ )**

# OptiMOS™ 7 100 V Single SSO8 5x6 with Cu-clip

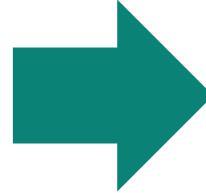
For enhanced electrical and thermal performance



PG-TDSON-8-34

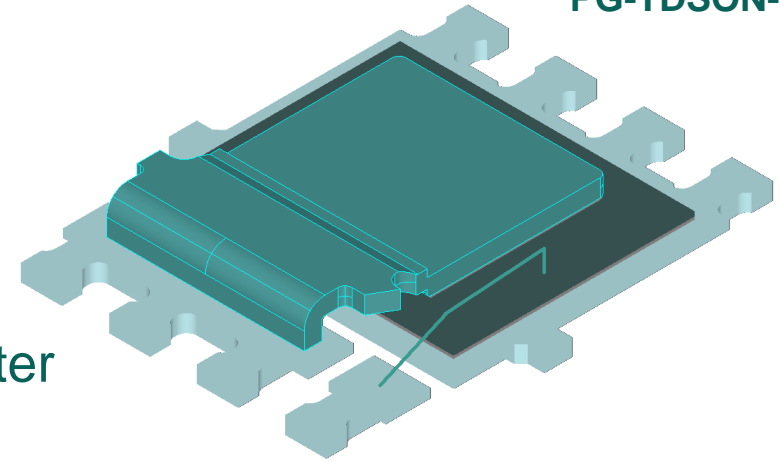


Improved package design



larger die size & larger clips  
for higher current capability and better thermal performance!

PG-TDSON-8-53

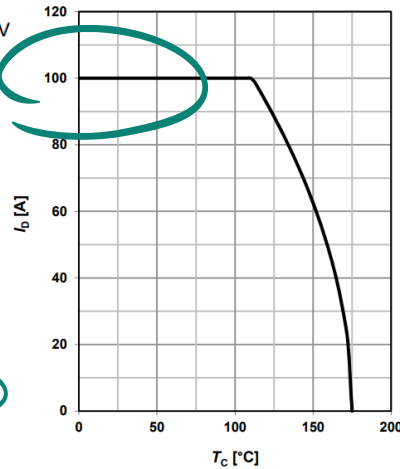


OptiMOS™-5 Power-Transistor



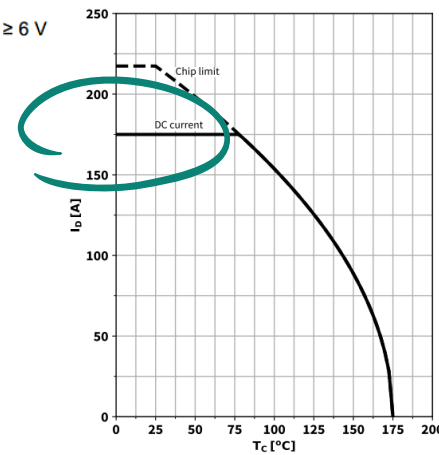
2 Drain current

$$I_D = f(T_C); V_{GS} \geq 6 \text{ V}$$



2 Drain current

$$I_D = f(T_C); V_{GS} \geq 6 \text{ V}$$



IAUC10S7N021



Automotive MOSFET  
OptiMOS™ 7 Power-Transistor



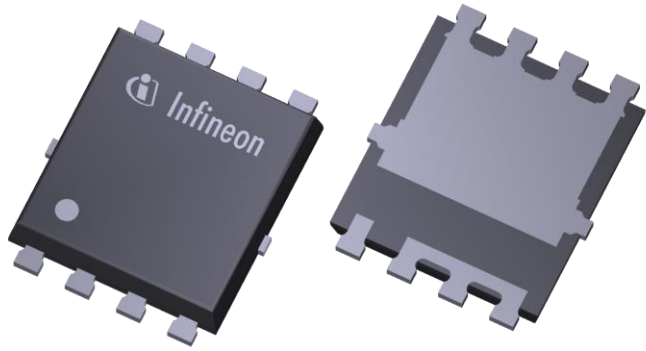
Maximum Ratings

at  $T_J = 25^\circ\text{C}$ , unless otherwise specified

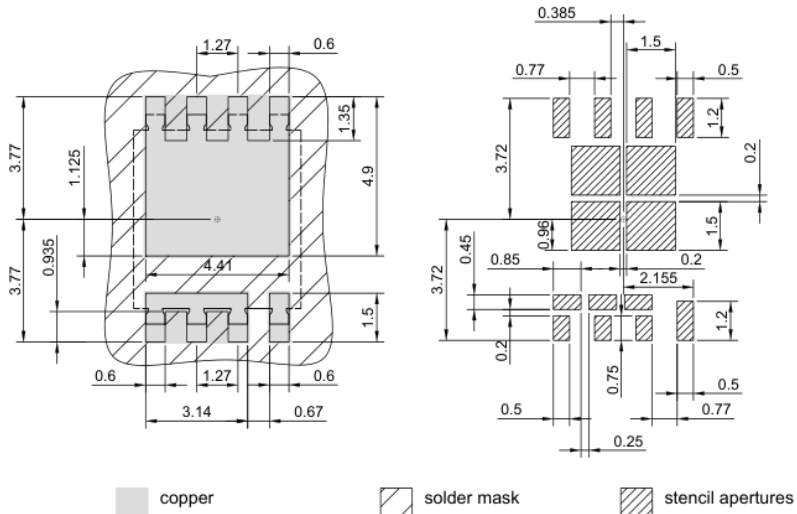
Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$V_{GS} = 10 \text{ V}$ , Chip limitation <sup>1,2)</sup>	220	A
		$V_{GS} = 10 \text{ V}$ , DC current	175	A

# OptiMOS™ 7 80 & 100 V Single SSO8 5x6 with Cu-clip

## Always use Infineon's recommended footprint



Single SSO8  
PG-TDSON  
JEDEC listed  
6.5 x 5.2 x 1.1 mm<sup>3</sup>  
Cu-clip soldered



All dimensions are in units mm

