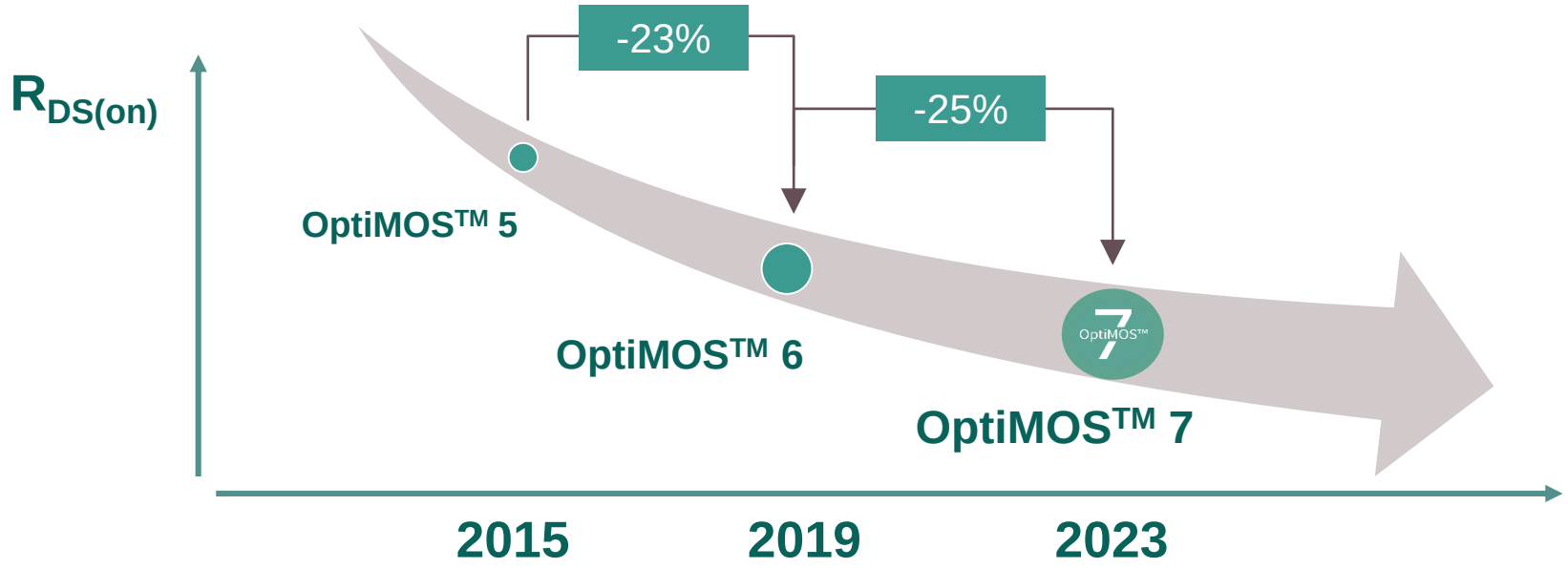
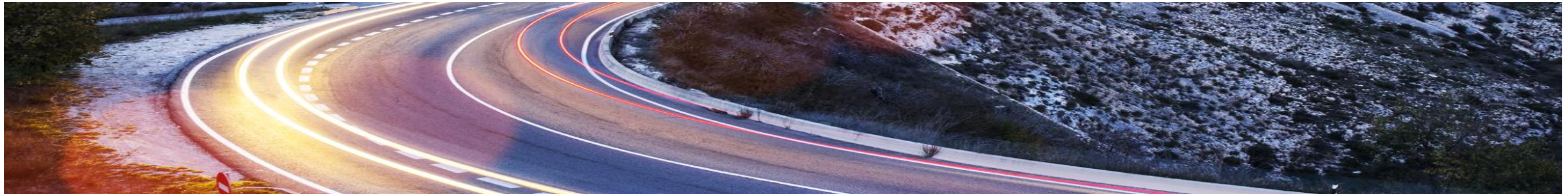
OptiMOS™ 7 40V
Leading edge MOSFET Technology for tomorrow's Automotive Applications

Infineon Automotive MOSFET

July 2023

OptiMOS™ 7 40V Overview
The next leading MOSFET Technology with BIC Ron*A on its way





OptiMOS™ 7 40V Overview
IFX's next leading edge Automotive MOSFET Technology

5th Trench Technology
released by ATV MOSFET

State of the art dual poly trench technology

Leading Edge
300mm
Technology & Production

25% RDS(on) reduction
vs. OptiMOS™ 6 40V

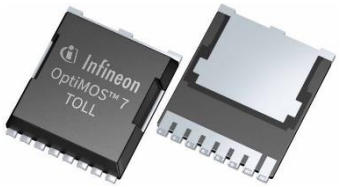
Infineon's **unique copper metallization**
Outstanding electrical and thermal conductivity

Ruggedness improvement
High avalanche current capability

Reduction of Switching losses

OptiMOS™ 7 40V Overview
Automotive Packages: Innovative & Robust Quality

Infineon Automotive Packages
Innovative & Robust

S3O8 Single (TSDSON-8) 3x3	SSO8 Dual (TDSON-8) 5x6	SSO8 Single (TDSON-8) 5x6	sTOLL Single (HSOF-5) 7x8	TOLL Single (HSOF-8) 10x12
				

OptiMOS™ 7 40V

OptiMOS™ 7 40V Overview
IFX's next leading edge Automotive MOSFET Products

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

Setting industry benchmark in Rdson*A, power-density, current capability, switching performance, chip ruggedness

Available in IFX's famous robust package portfolio of 3x3, 5x6, 5x6 Dual, 7x8, 10x12 packages

and extended by top-side cooling packages for most efficient Automotive designs

OptiMOS™ 7 40V Overview
Features, Benefits & Applications

Key features

- Very low $R_{DS(on)}$
- High Avalanche capability
- High SOA ruggedness
- Fast switching times (turn on/off)
- Leadless Packages w/ Cu-Clip
- Leading thin wafer Cu-technology
- Leading 300mm in-house production

Key benefits

- High power density & efficiency
- Increased current capability
- Improved design ruggedness
- Superior switching performance
- Small footprint & efficient cooling
- Automotive quality product design
- High automotive quality production

Key applications

- Electric power steering
- Power disconnect switches
- Zone control units & E-fuse box
- DC/DC
- USB-Charging & Braking
- All automotive applications
- BLDC drives in a wide variety

OptiMOS™ 7 40V Overview
Focus Applications & Packages


Electric power steering


BLDC motor

Automotive DC-DC


Power distribution


Electric parking brake


Battery disconnect

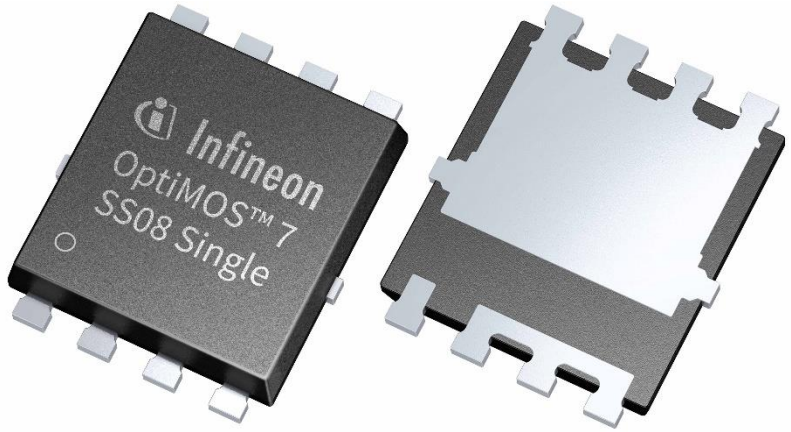

Zonal architecture

Application / Packages	Drives	Power Distribution Safety Switches	Power Conversion
S3O8 (3x3)	x		x
SSO8 (5x6 Dual)	x		x
SSO8 (5x6 Single)	x	x	x
sTOLL (7x8)	x	x	x
TOLL (10x12)	x	x	x

https://www.infineon.com/cms/en/product/promopages/OptiMOS7_40V/

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

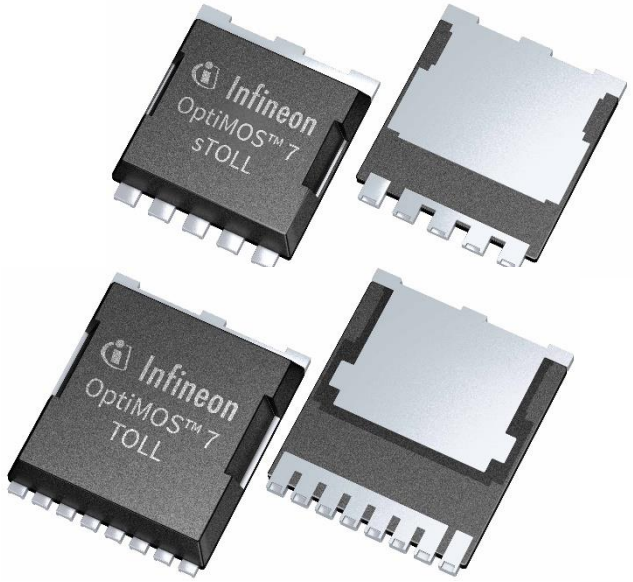
- Highest Avalanche capability ever in a Trench FET
- Lowest Ron in portfolio available
- Small Qg for higher efficiency and less switching losses

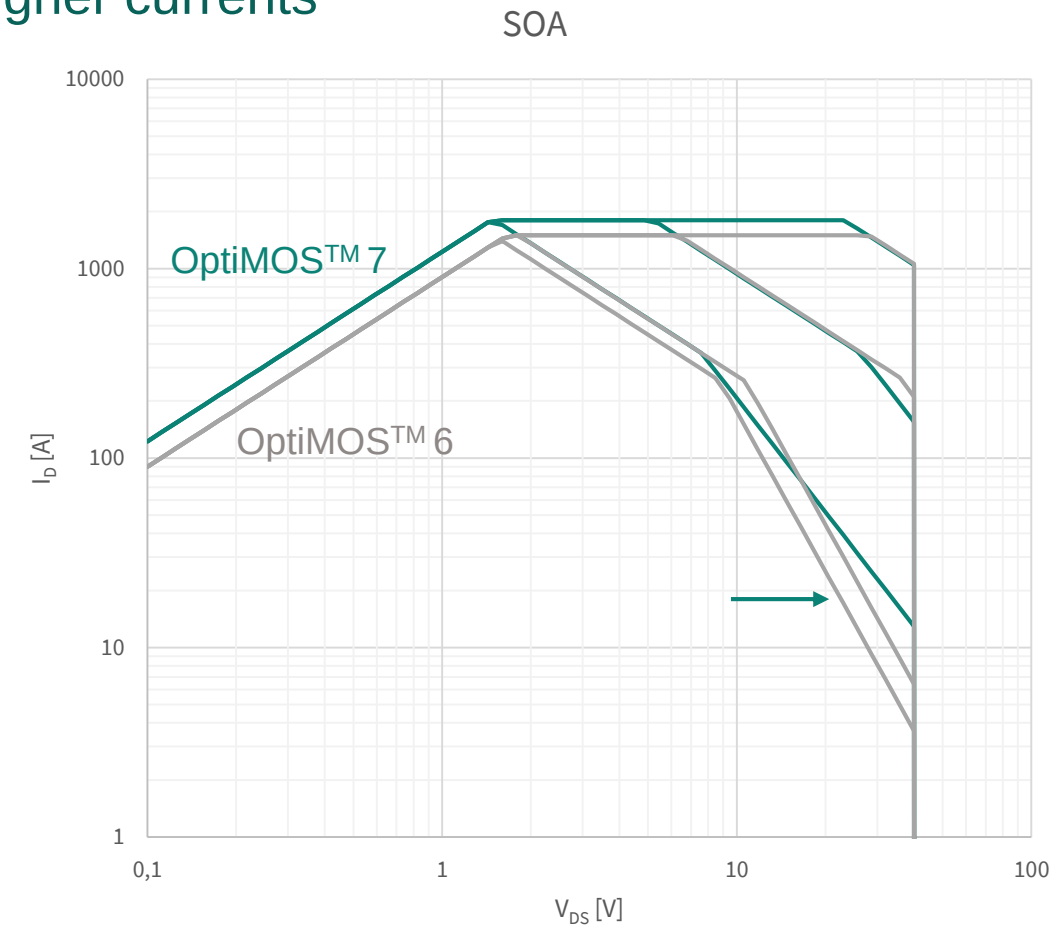


	IPC100N04S4-02	IPC100N04S5-1R2	IAUC120N04S6N006	IAUCN04S7N004
RDSON max. 10V	2.4mOhm (82%)	1.2mOhm (63%)	0.6mOhm (26%)	0.44mOhm
Drain current	100A	100A	120A	175A
I_{AS}	100A (175%)	100A (175%)	120A (146%)	175A
E_{AS} @ 50A	315mJ (285%)	480mJ (188%)	900mJ (0%)	900mJ
ID,PULSE	400A (450%)	400A (450%)	1500A (120%)	1800A
$V_{GS(th)}$ Deviation	2.0V	1.2V	0.8V	0.8V

OptiMOS™ 7 40V with up to 35% better SOA ruggedness
Perfect Fit for Power Distribution & Safety Switches

- Average 10% and up to 35% SOA improvement vs. OptiMOS™ 6
- Perfect fit to reduce steady on losses or enable higher currents





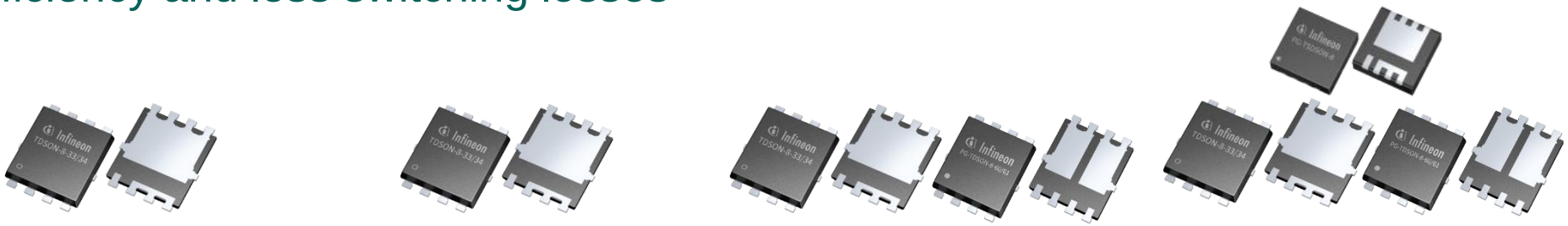
OptiMOS™ 7 40V - Low Gate Charge for high Frequency Switching
Perfect Fit for efficient Drives and Power Conversion

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

Electric power steering

Automotive DC-DC

BLDC motor



	IPC80N04S4-03	IPC100N04S5-2R8	IAUC100N04S6N028	IAUZN04S7N028 IAUCN04S7N030(D)
Q_{gtot}	71 nC	45 nC	29 nC	26 nC
Q_{gs}	32 nC	12 nC	8 nC	5 nC
Q_{gd}	18 nC	11 nC	7.4 nC	6 nC
FOM	213	126	81.2	72.8
Rg	1.4	2.18	3.2	1.5
T (Tau) V_{GS} = 10V	10 ns	9.8 ns	9.3 ns	3.9 ns

OptiMOS™ 7 40V with optimized Turn On / Off Switching
Perfect Fit for efficient Drives and Power Conversion

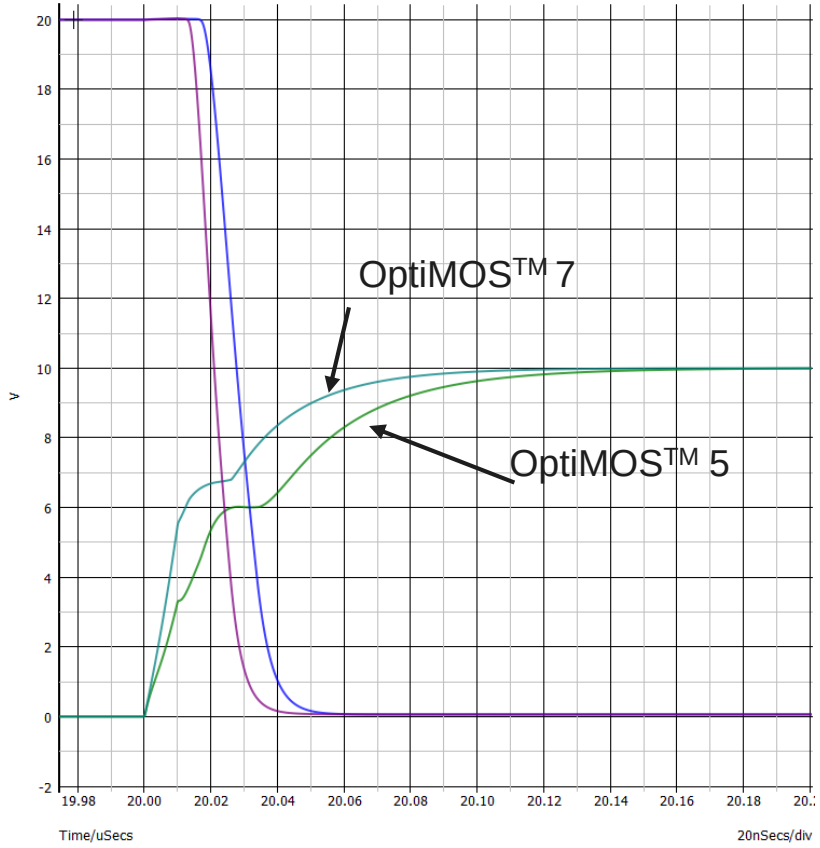
Up to 20% faster switching times

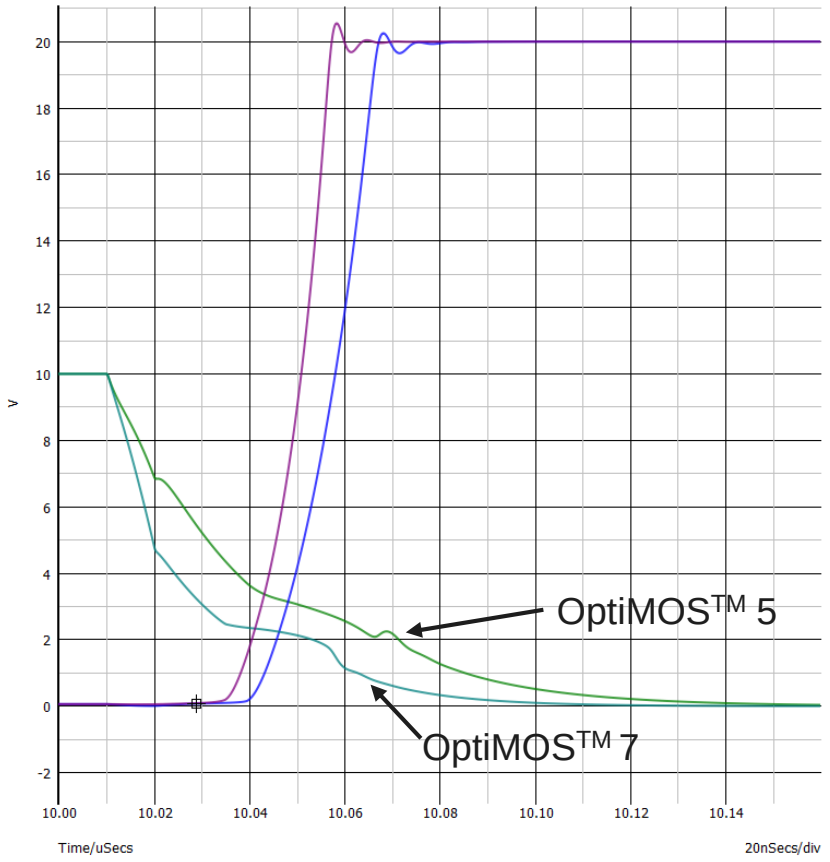
- enables higher frequency for DCDCs
- Higher duty cycle by achieving lower deadtimes

Electric power steering

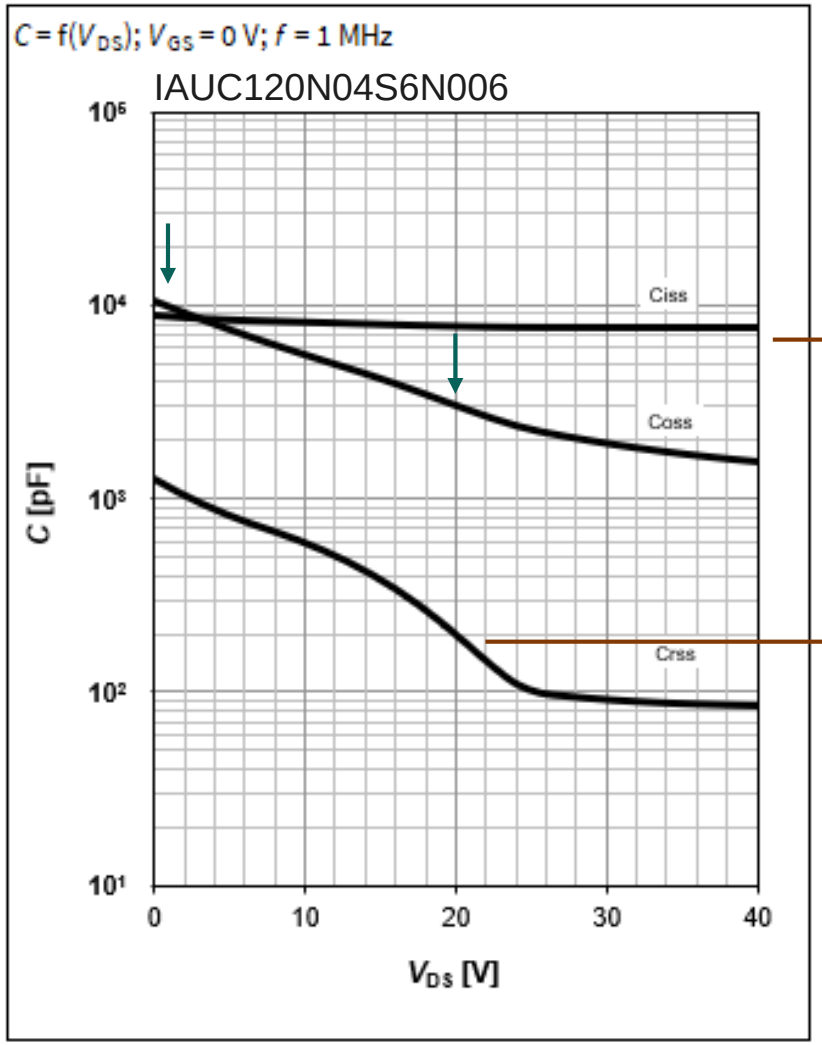
Automotive DC-DC

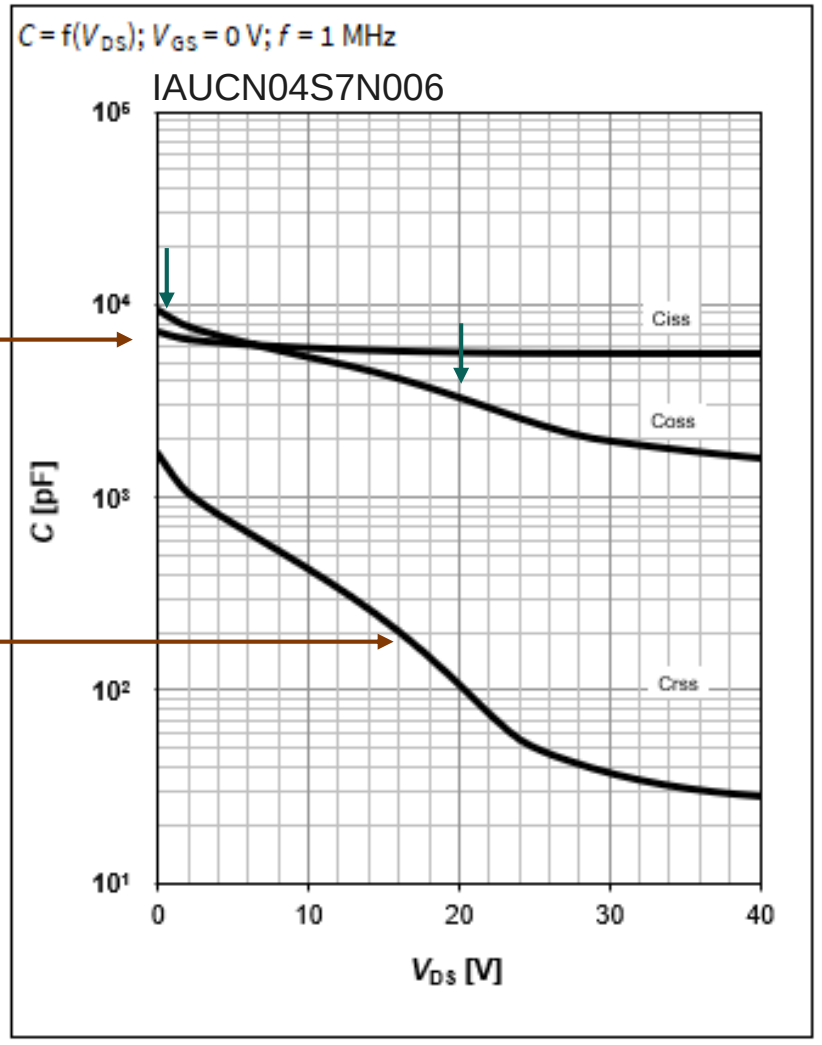
BLDC motor





OptiMOS™ 7 40V with optimized input & output capacitances
Lower values & better linearity for overall improved switching behavior





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 40V with optimized input & output capacitances
New specification condition hides improvements

IAUC120N04S6N006

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics[2]						
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	7607	10117	pF
Output capacitance	C_{oss}		-	2249	2991	
Reverse transfer capacitance	C_{rss}		-	100	150	

OptiMOS™ 7 Automotive Power MOSFET, 40 V

IAUCN04S7N006

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics[2]						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=20 V, f=1 MHz	–	5653	7349	pF
Output capacitance	C_{oss}		–	3286	4270	
Reverse transfer capacitance	C_{rss}		–	107	160	

OptiMOS™ 7 40V Gate Driver
Matching parts at 100nC total gate charge

TLE986/7/8/9x & TLE956x smallest possible R_{DSON} per Technology

OptiMOS™ 5	OptiMOS™ 6	OptiMOS™ 7
IPZ40N04S5-3R1	-	IAUZN04S7N/L013
IPC100N04S5L-1R5	IAUC120N04S6N010	IAUCN04S7N/L006
IAUA180N04S5N012	IAUA250N04S6N008	IAUAN04S7N007

OptiMOS™ 7 40V Internet Links
Further information & technical support pages

- OptiMOS™ 7 Promopage
- Reference kit with TLE9893 and BIC SSO8 DUAL
- Generic Power Board Design
- SPICE, LTSPICE & Matlab Models
- Thermal Models for IcePAK
- Thermal Models for Flowtherm as well as 3D Step Model

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TOLL (10x12)	x	x	x

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