



Going the extra mile: HybridPACK™ Drive CoolSiC™

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3 May 2021



HybridPACK™ Drive CoolSiC™ MOSFET for rear axle

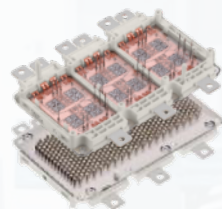
Focus on

Range: **SiC**

Cost

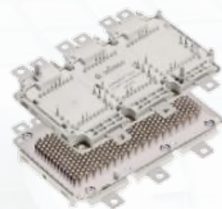
Large battery: **SiC**

Small battery: **IGBT**



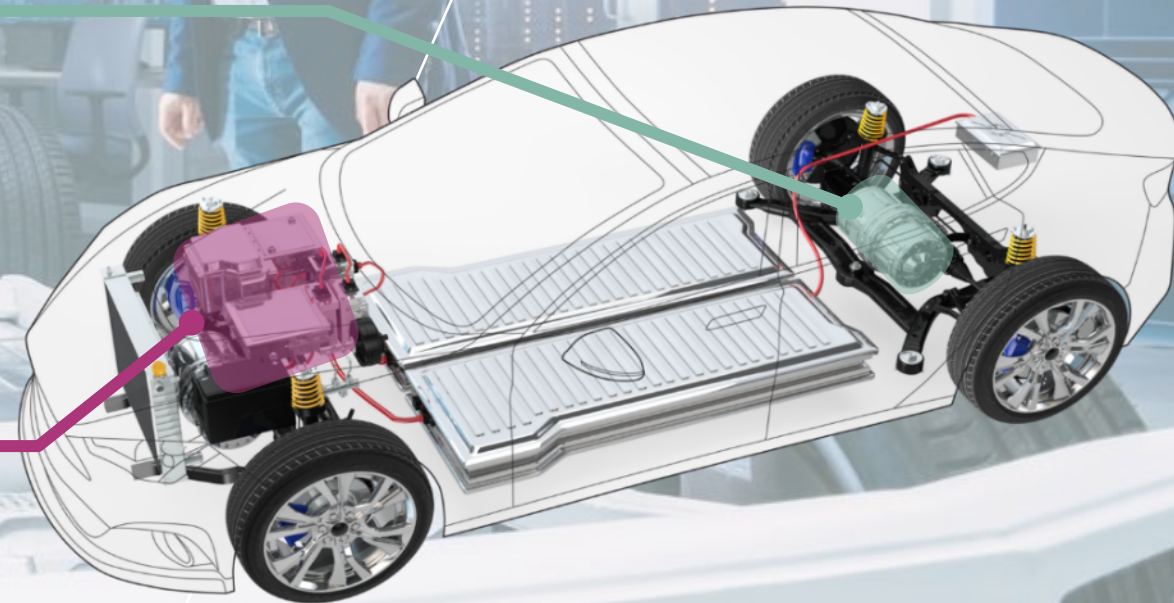
HybridPACK™ Drive IGBT for front axle

Focus on cost : **IGBT**



Optimal choice of
technology for EV
traction inverters

Main Inverter

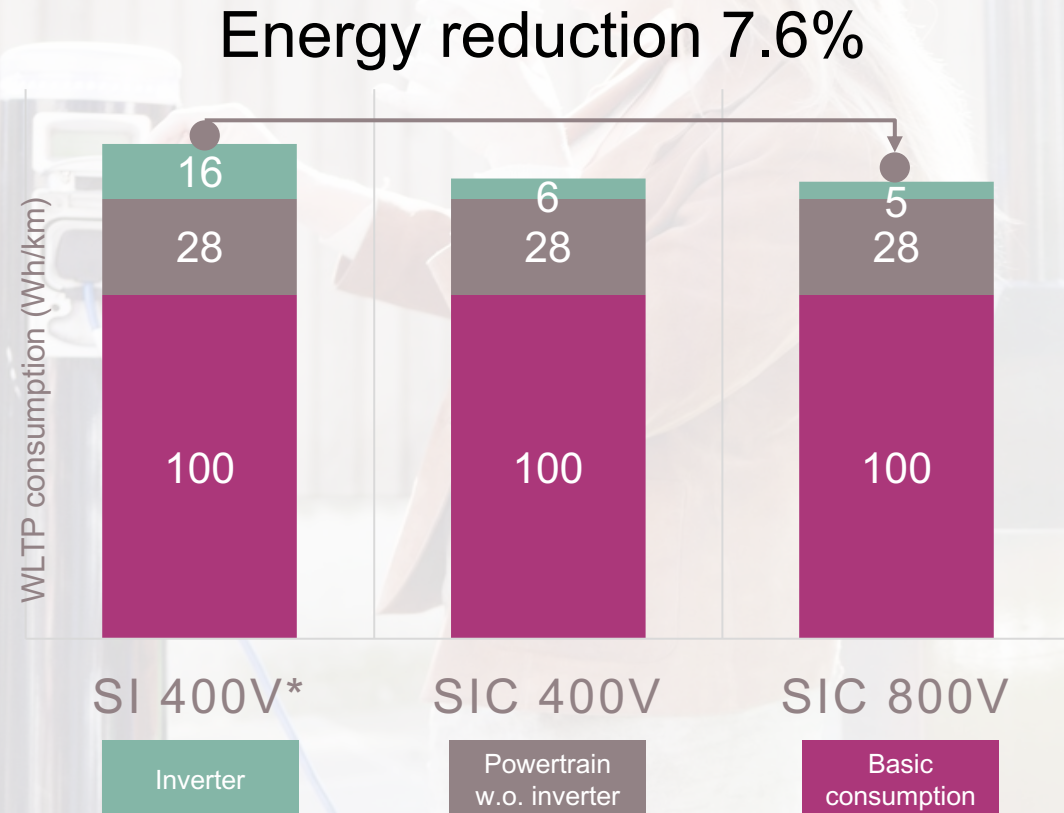
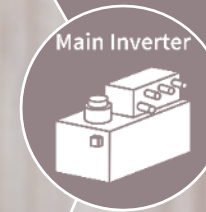


Longer range

Compact size

System cost

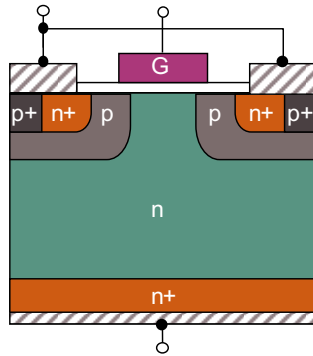
SiC reduces energy
consumption in
main inverter
by 69%



Si: 750V EDT2 IGBT; SiC: 1200V CoolSiC™ MOSFET
Source: 'effect of a SiC TMOSFET in traction inverter of electric drive train', PCIM 2018

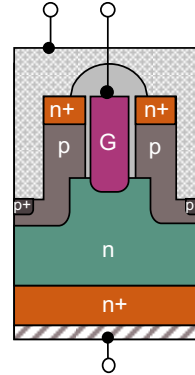
SiC Trench technology out-performs Planar demonstrating more protection vs. traditional Trench

SiC Planar



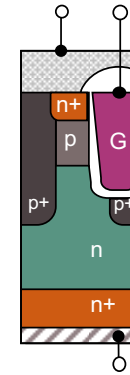
- ✓ Low complexity process
- ✓ Good shielding of oxide possible

SiC Trench



- ✓ Low channel resistance
- ✓ Shrink potential higher than in planar DMOS

Infineon Trench



- ✓ Low channel resistance
- ✓ Shrink potential higher than in planar DMOS
- ✓ Oxide corners shielded by folded double trench
- ✓ Long experience in trench know-how

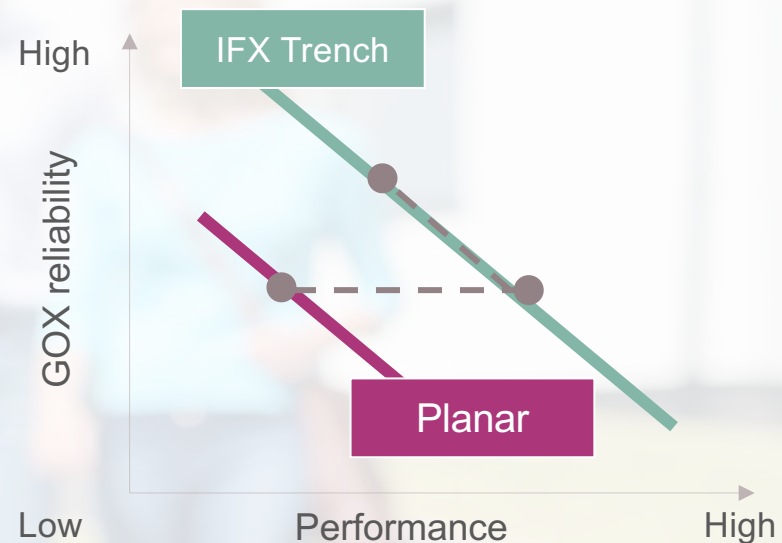
- Sophisticated process know-how needed

- x Very low channel mobility
- x Limited shrink options

- x Protection of oxide corners needed

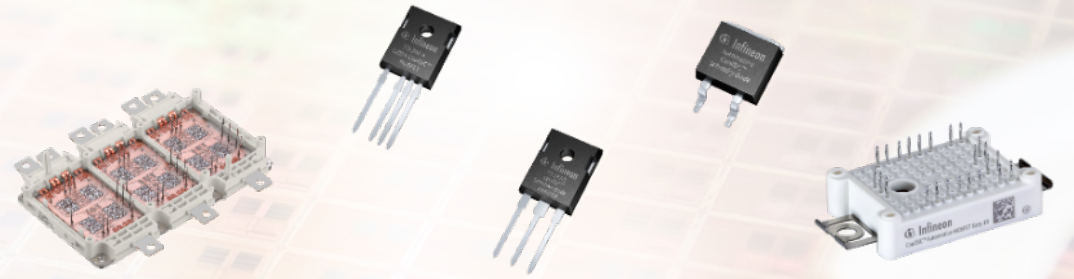
CoolSiC™ optimized
performance and
reliability

Turn performance budget into best reliability



Instead of exploiting full potential of
performance, IFX turns this budget into
much higher reliability

TRENCH
excellence
acknowledged in
the market

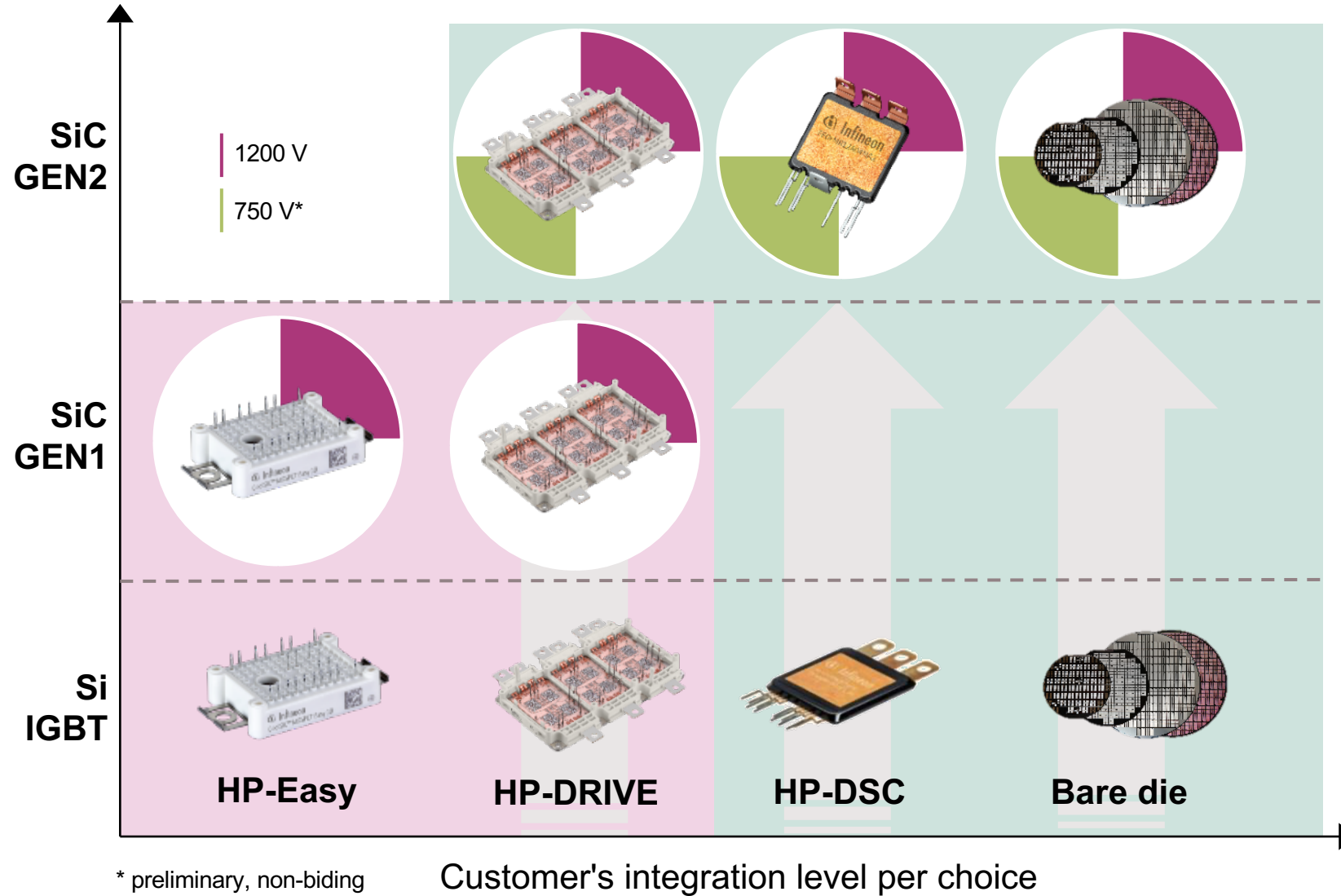


Multiple planar vendors announced TRENCH roadmap 2022+

- › Infineon has accumulated years of expertise in Trench tech already
- › Infineon's refined Trench offers higher reliability vs. other vendors

Main Inverter: scaling from Infineon Si to SiC

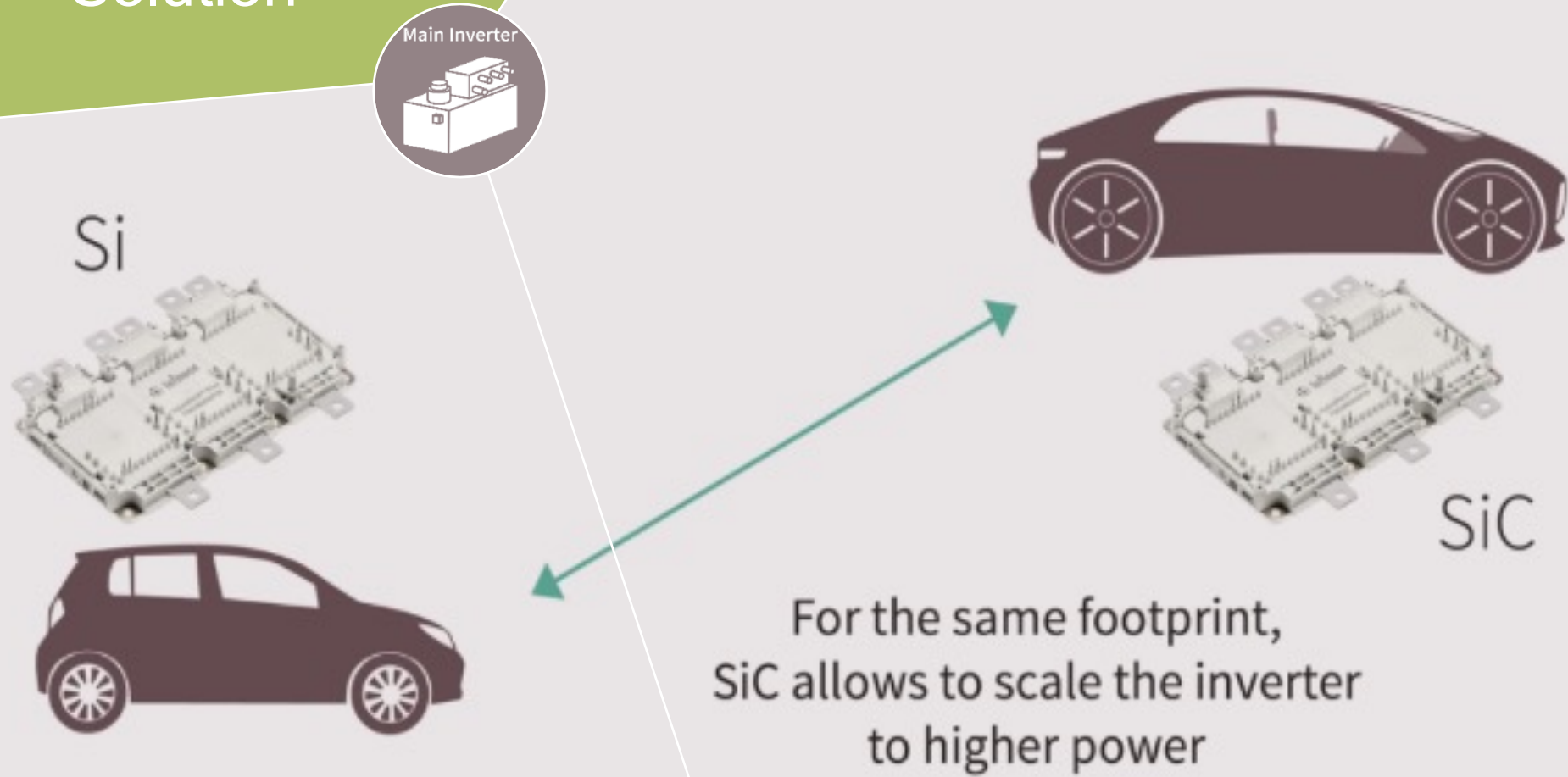
HP-Drive™ CoolSiC™ offers safe migration to shorten T2M



'Develop the best solution for your strategy based on industry's only complete CoolSiC™ power portfolio:

Performance, cost, time to market, support, high volume capability @ Infineon Quality'

Scalable HybridPACK™ Drive CoolSiC™ Solution



Success story of HybridPACK™ Drive

25

years of Experience



EDT2

More than 1 Mio. pcs shipped

- › **25** years of IGBT/Diode Know-how
- › **> 25** successful customer relationships
- › Ramp-up in **> 10** worldwide platforms in next 2 years
- › **>20** BEV platforms with HybridPACK™ Drive in production

>20

platforms

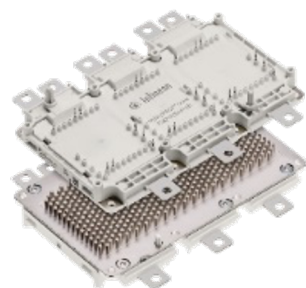


HybridPACK™ Drive

XPeng: P7



Nio: ES8, ES6, EC6



Infineon Power
Technology Inside



Li Auto: LiXiang One



Volkswagen: ID.3 and MEB cars

ID.3



EVs based on
MEB



Infineon is partner in Volkswagen's strategic supplier network FAST

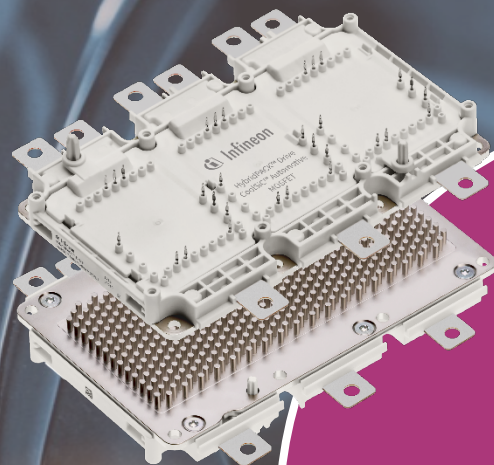
Weltmeister: EX5



First automotive
frame module
in the market

SiC

1st



Hyundai has chosen Infineon's CoolSiC™ products for their next generation EVs



General CoolSiC™ value contribution to customers

Higher mileage with the same battery capacity

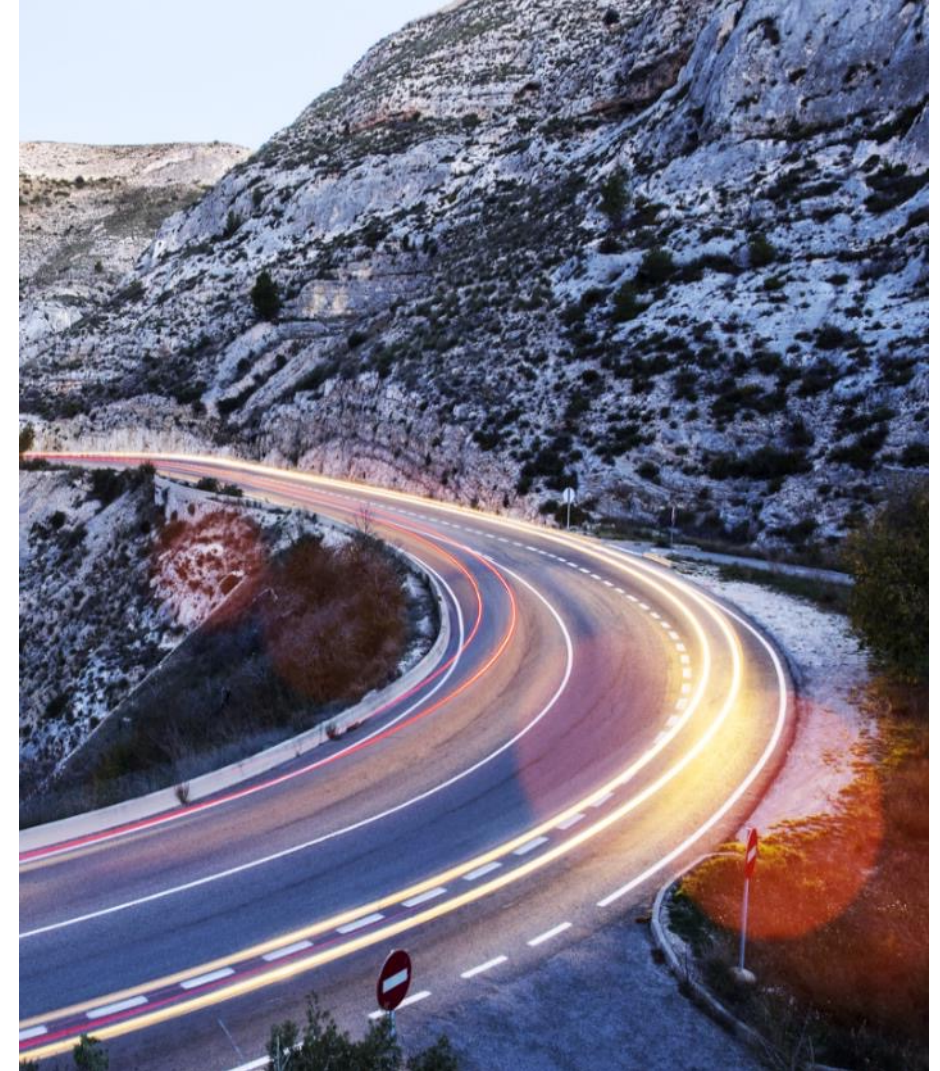
- › Trench based SiC devices increase power efficiency compared to alternative technologies

Easy scalability from IGBT to SiC-based inverters

- › HybridPACK™ CoolSiC™ power modules and EiceDRIVER™ high-voltage drivers allow upgrade from IGBT to SiC in the same footprint

Additional value for Infineon's customers

- › Unique automotive quality and reliability levels
- › High-volume production track record of dedicated electro-mobility products



HybridPACK™ Drive CoolSiC™ MOSFET

1200 V SiC for EV Traction inverter scalable from Si counterpart

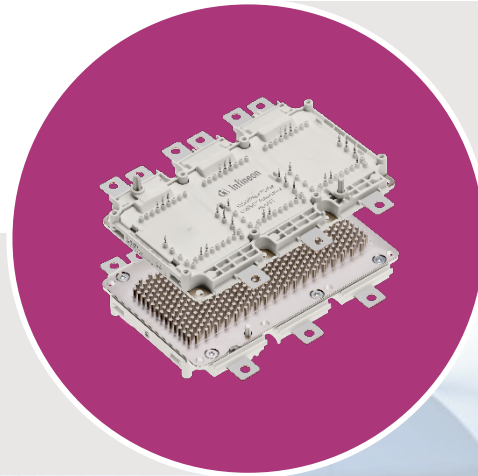


Features

- › B6 **Full-bridge** module
- › $V_{br}=1200\text{ V}$; Output power **scalability** with chip population
- › **Direct Cooled pin-fin base plate**
- › Hybrid-PACK™ Drive: **Same package** as IGBT B6 module

FS03MR12A6MA1B

1200 V / 400A (8 chips per switch)
RDS(ON) typ. 2.75 mΩ



FS05MR12A6MA1B

1200 V / 200A (4 chips per switch)
RDS(ON) typ. 5.5 mΩ

- › Increasing battery utilization by **5-10%**
- › **Higher power density** for system size reductions
- › **Lower conduction losses in light load** condition and lower switching losses compared to Si IGBTs

Benefits

CoolSiC™ EVKIT optimized for both 400 and 800 V

SiC



Q3-2021

M
3~

Galvanic Isolation

Logic Board

AURIX™



PCB connector

Gate Driver Board



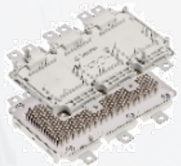
ED-E
Enhanced

EiceDRIVER™-E

PressFIT

Power module

HybridPACK™ Drive
CoolSiC™ MOSFET



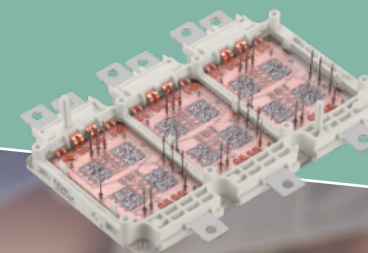
Water Cooling System

12 V
Battery

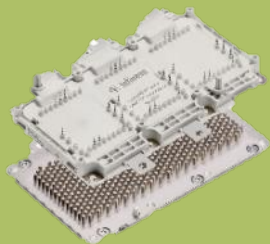
HV
Battery

Technical support
material available

SiC

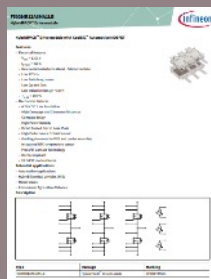


Samples



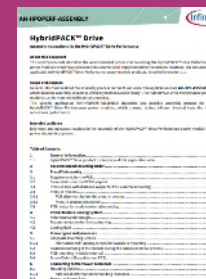
Available

Data sheet



Available

App note



Available

IPOSIM



May 2021



Part of your life. Part of tomorrow.