

1200 V G5 CoolSiC™ Schottky Diode

New level of system efficiency and reliability



New

TO-247-2



New

TO-263-2 (D²PAK-2)

CoolSiC™

Aug. 2019



Agenda

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Benefits of CoolSiC™ diode

2

Target applications

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1200 V G5 CoolSiC™ Schottky Diode portfolio

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Additional information and support channels

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Summary

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Benefits of CoolSiC™ diode

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1200 V G5 CoolSiC™ Schottky Diode portfolio

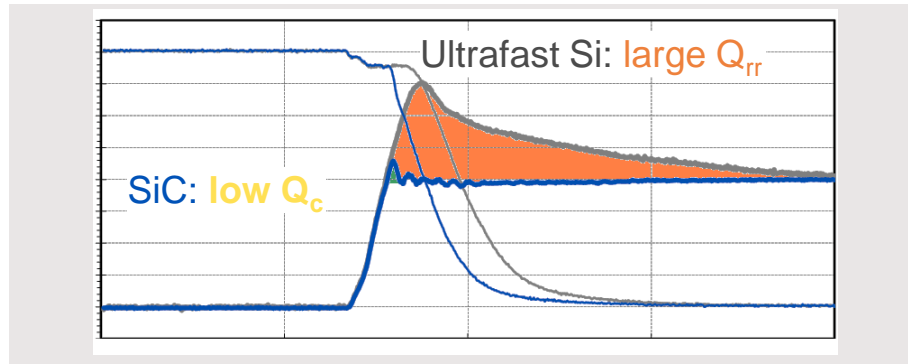
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Summary

SiC diode benefit - less leads to more



Features

- › No reverse recovery charge
- › No forward recovery
- › Purely capacitive switching

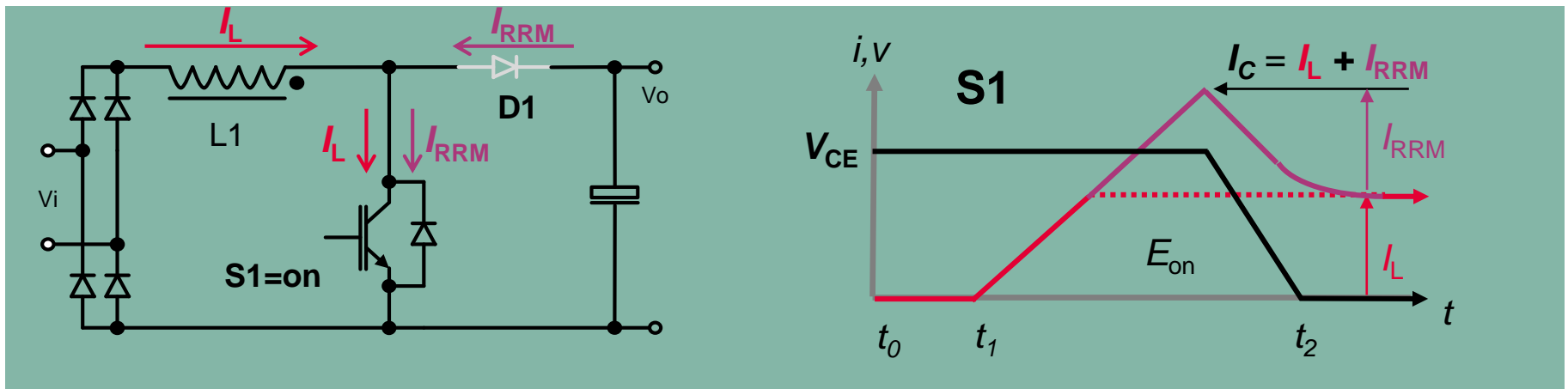
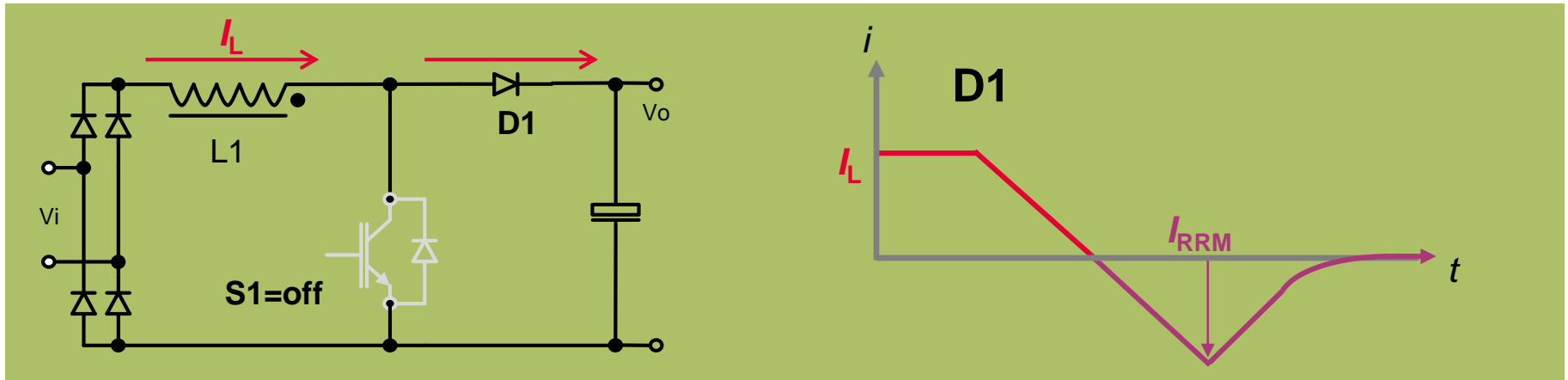
Technical benefits

- › E_{rec} close to zero
- › 40-50% reduction in IGBT turn-on loss
- › No voltage overshoots
- › Switching losses independent from load current, switching speed and temperature

Customer benefits

- › 20-30% higher output power in same form factor
- › Reduced EMI
- › No need for snubber circuitry, reduced parts count
- › High system reliability

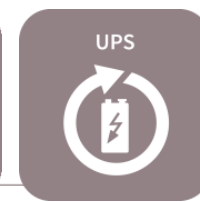
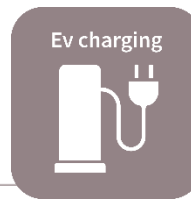
Great system impact thanks to the also reduced IGBT turn-on losses by SiC's low recovery losses



Up to 40-50% reduction in IGBT turn-on loss

- Decreased I_{RRM} means decreased S1 (IGBT) turn-on losses

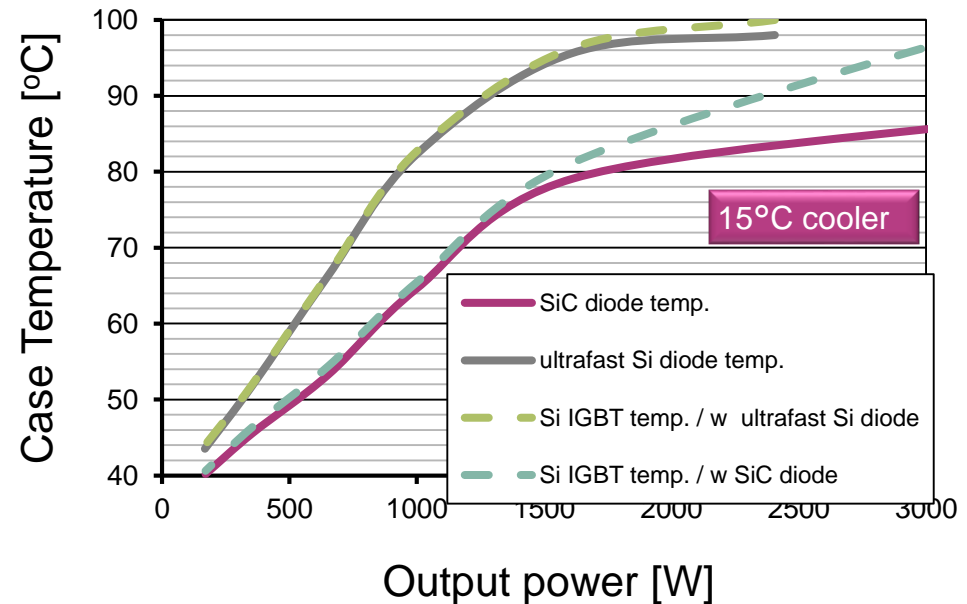
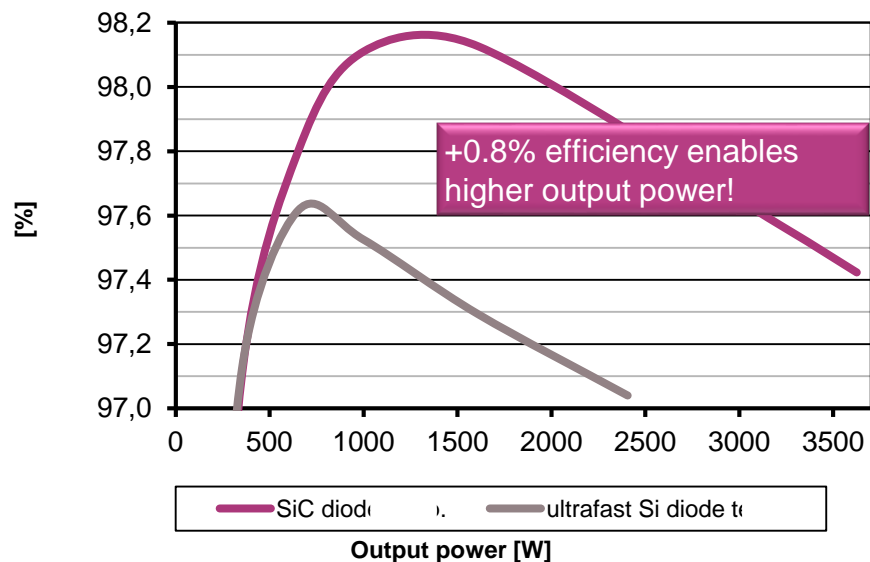
$$E_{on} = \int_{t_1}^{t_2} V_O \cdot I_C \cdot dt$$



No more pain with dynamic losses

Example:

1200 V Si IGBT + SiC diode in a boost stage topology ($f_{sw}=20$ kHz); used in e.g. EV DC charging/UPS...



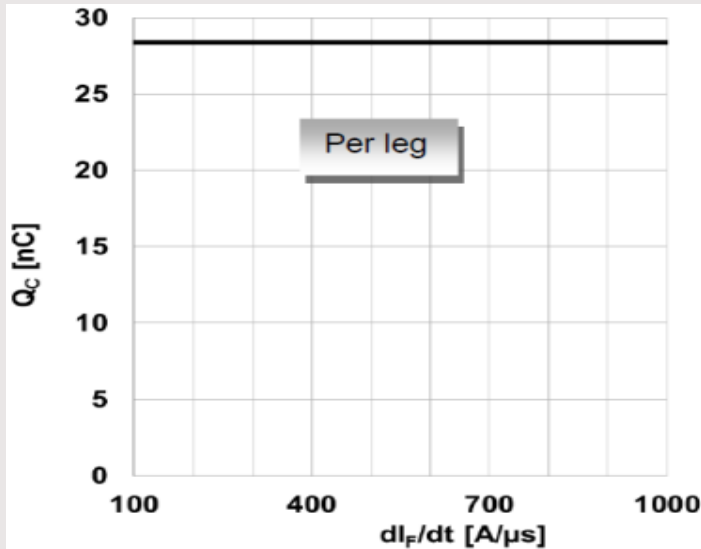
SiC diode compared to Si diode, has ...

- ... higher system efficiency,
- ... lower device thermals, for
- ... increased power density and reliability!

Switching losses, P_{sw} , in SiC and Si diodes

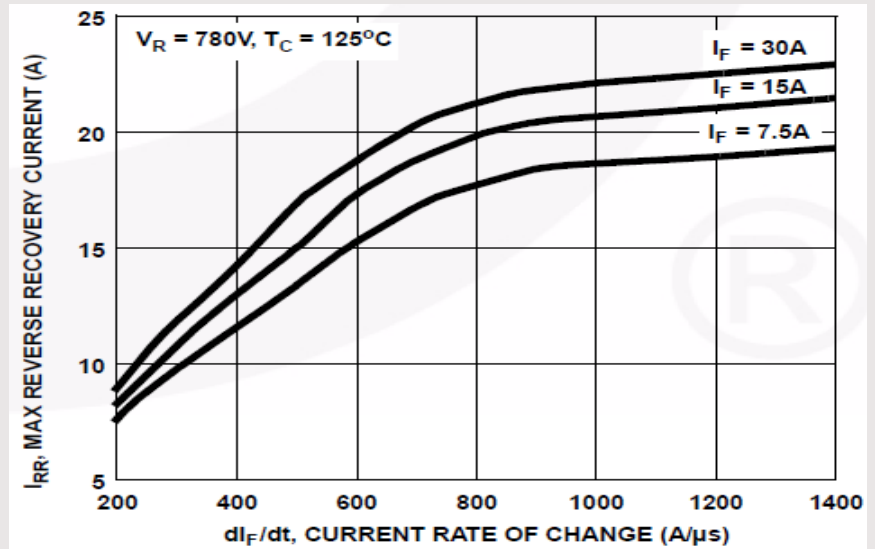
SiC diode

$$P_{sw} = 0.5 \cdot V_o \cdot f \cdot Q_C$$



Si diode

$$P_{sw} = 0.5 \cdot V_o \cdot f \cdot I_{RRM} \cdot t_B$$



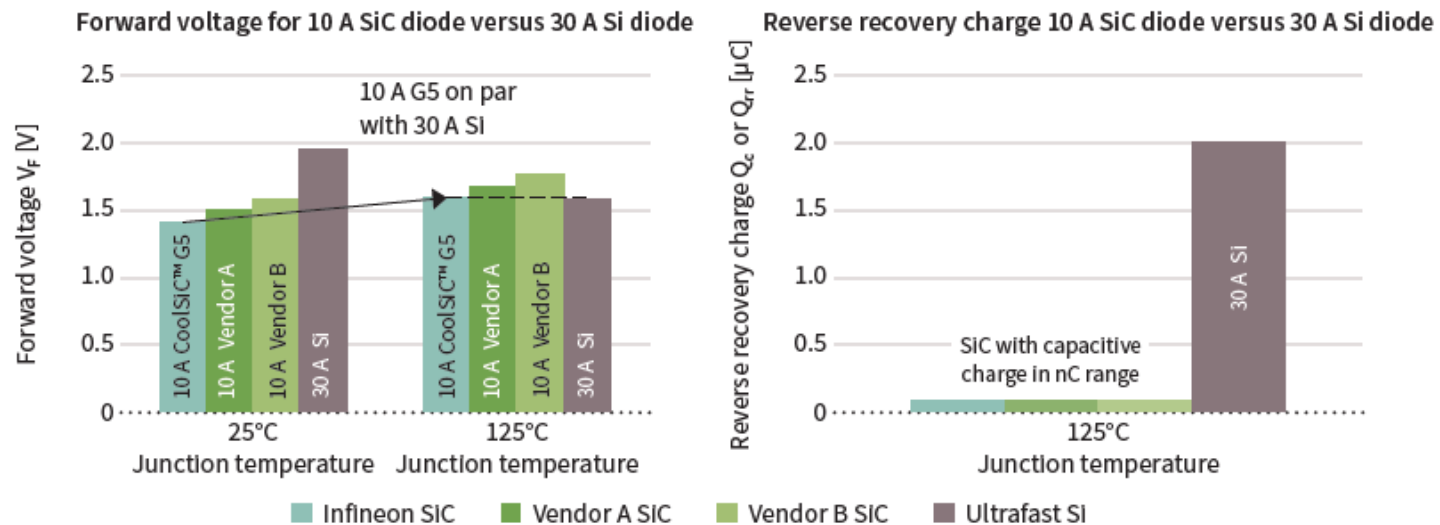
SiC switching loss is very low compared to Si:

- Si shows 7-20 x higher P_{sw} than SiC due to I_{RRM}
- I_{RRM} and t_B values depends on diode forward current, di_F/dt and diode junction temperature

Specific product information

1200 V CoolSiC™ Schottky diode generation 5:

- › **Low V_F with low temperature dependency** give low static losses over entire load range
- › **Zero reverse recovery charge**
- › **10 A CoolSiC™ diode matches V_F of 30 A rated Si ultrafast diode** thanks to its superior efficiency
- › **Up to 40 A diode rating**



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1200 V G5 CoolSiC™ Schottky Diode portfolio

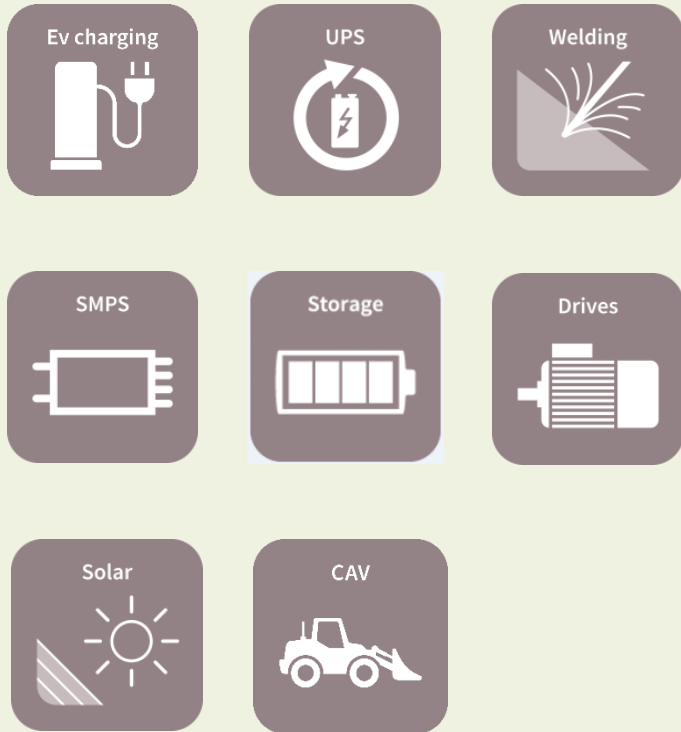
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Summary

The enabler: 1200 V G5 CoolSiC™ Schottky diode



System improvements?

- > Reach new efficiency targets
 - > Higher power density
 - > Upgrade designs towards higher output power
- ...while maintaining reliable system!



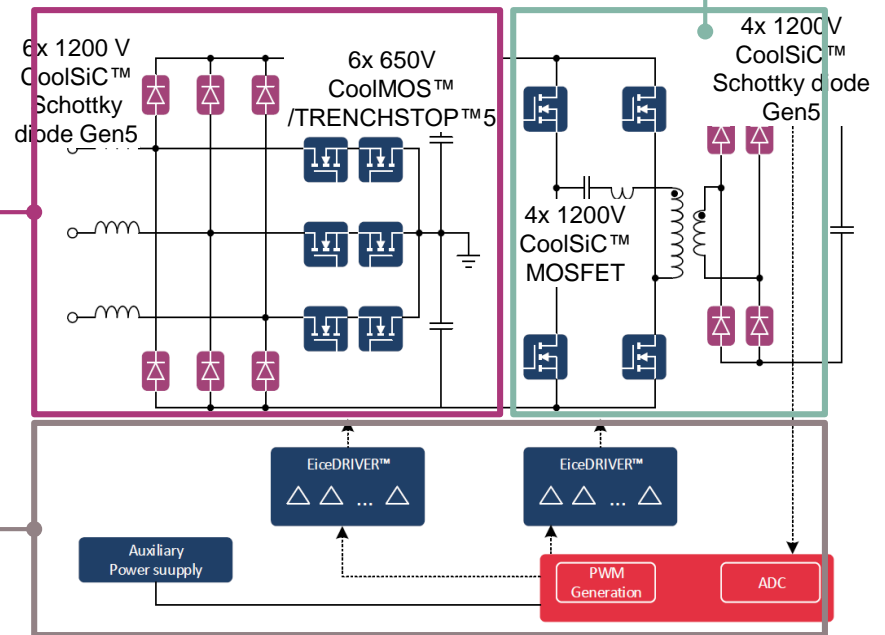
**Easily enabled by
CoolSiC™ Schottky diodes**

Our components are a perfect match with customer system needs

Vienna rectifier	
SiC Schottky diode	> CoolSiC™ Schottky diode 1200 V G5
High voltage MOSFET	> CoolMOS™ 650 V
IGBT	> TRENCHSTOP™ 5 650 V

Full-bridge LLC	
SiC MOSFET	> CoolSiC™ MOSFET 1200 V
SiC Schottky diode	> CoolSiC™ Schottky diode 1200 V G5

Drive and control unit	
Gate driver	> EiceDRIVER™
μController	> XMC1000 > XMC4000



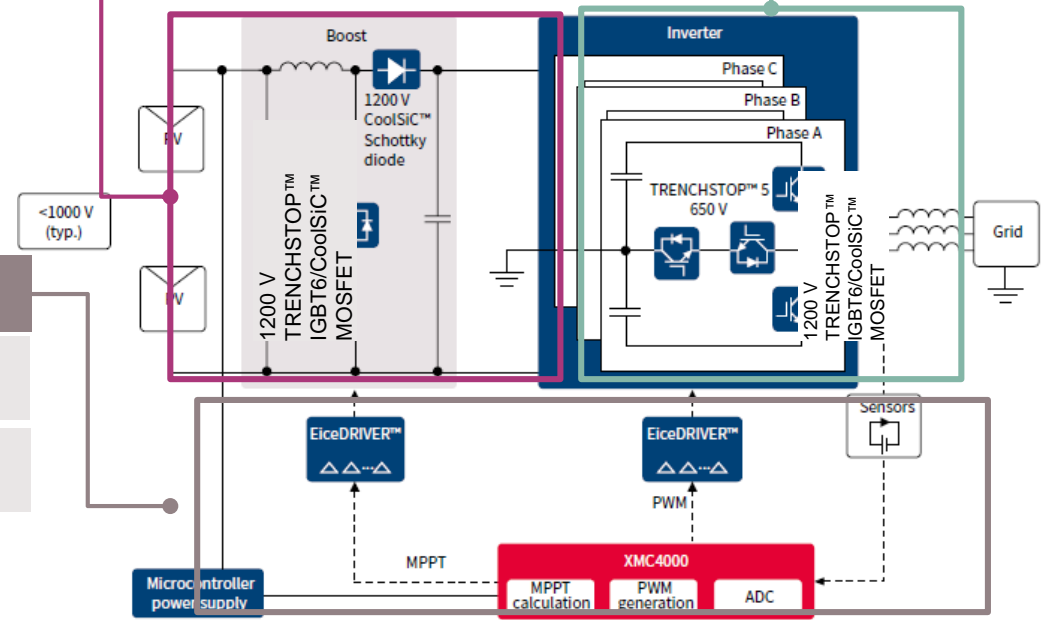
Application example: EV DC charging

Our components are a perfect match with customer system needs

MPPT	
SiC Schottky diode	<ul style="list-style-type: none"> > CoolSiC™ Schottky diode 1200 V G5
SiC MOSFET	<ul style="list-style-type: none"> > CoolSiC™ MOSFET 1200 V
IGBT	<ul style="list-style-type: none"> > TRENCHSTOP™ IGBT6 1200 V

3-Level T-type inverter	
SiC MOSFET	<ul style="list-style-type: none"> > CoolSiC™ MOSFET 1200 V
IGBT	<ul style="list-style-type: none"> > TRENCHSTOP™ IGBT6 1200 V > TRENCHSTOP™ 5 650 V

Drive and control unit	
Gate driver	<ul style="list-style-type: none"> > 2EDN EiceDRIVER™ > 1EDN EiceDRIVER™
µController	<ul style="list-style-type: none"> > XMC4000



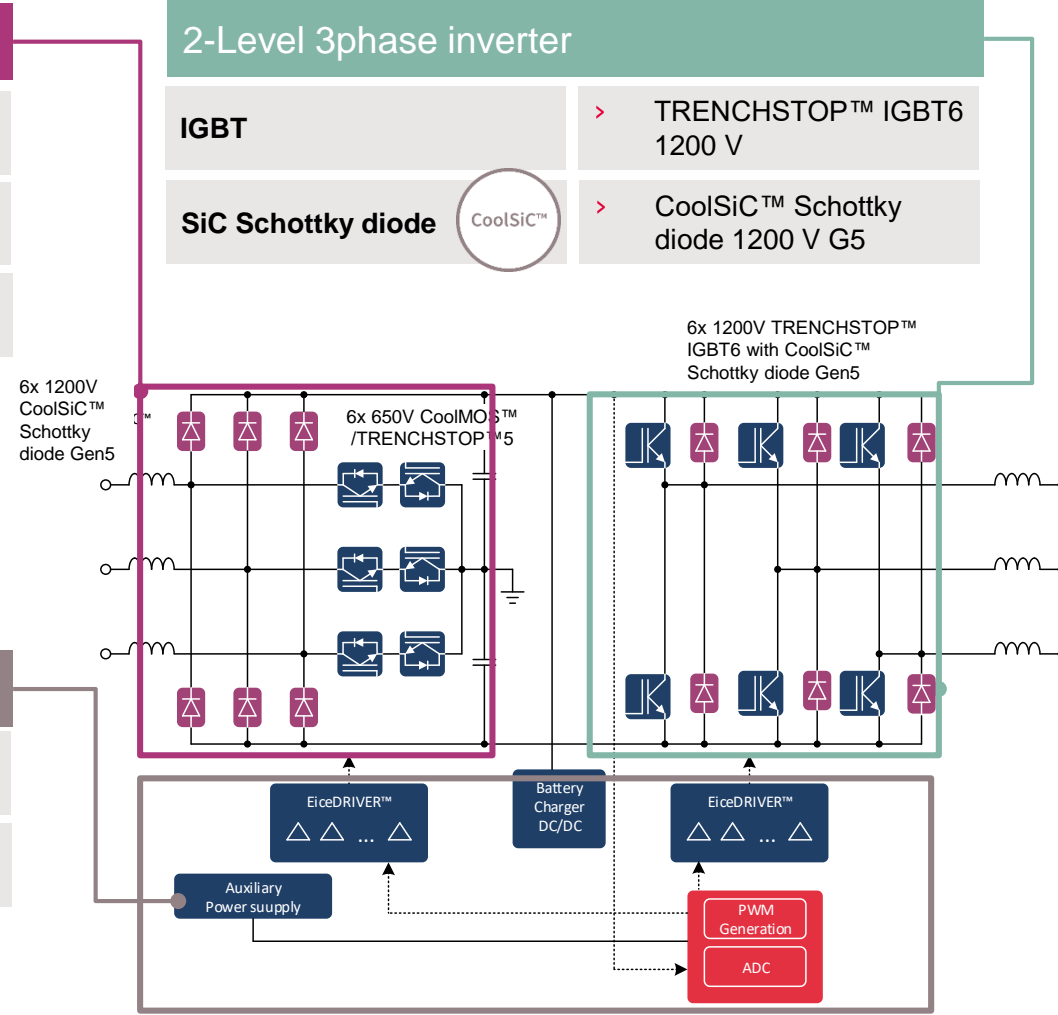
Application example: solar string inverters

Our components are a perfect match with customer system needs

Vienna rectifier	
SiC Schottky diode	> CoolSiC™ Schottky diode 1200 V G5
High voltage MOSFET	> CoolMOS™ 650 V
IGBT	> TRENCHSTOP™ 5 650 V

2-Level 3phase inverter	
IGBT	> TRENCHSTOP™ IGBT6 1200 V
SiC Schottky diode	> CoolSiC™ Schottky diode 1200 V G5

Drive and control unit	
Gate driver	> EiceDRIVER™
μController	> XMC1000 > XMC4000



Application example: UPS

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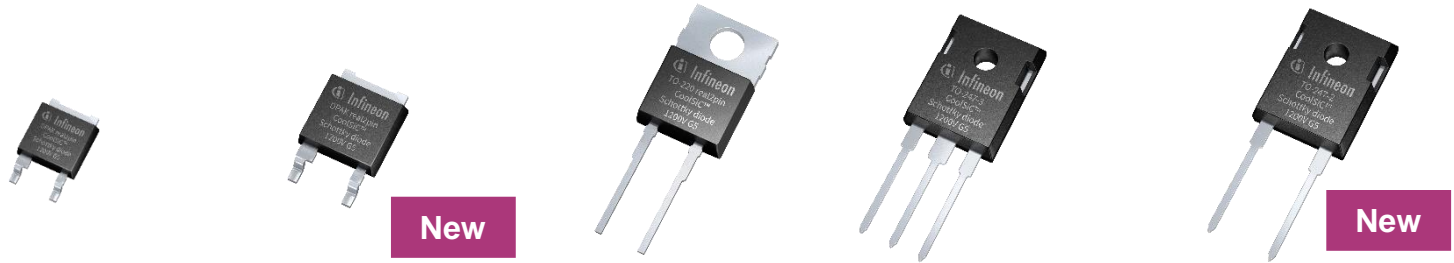
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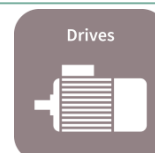
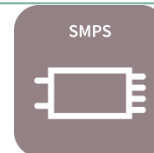
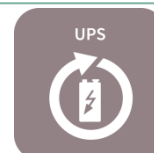
Summary

1200 V CoolSiC™ G5 Schottky Diode

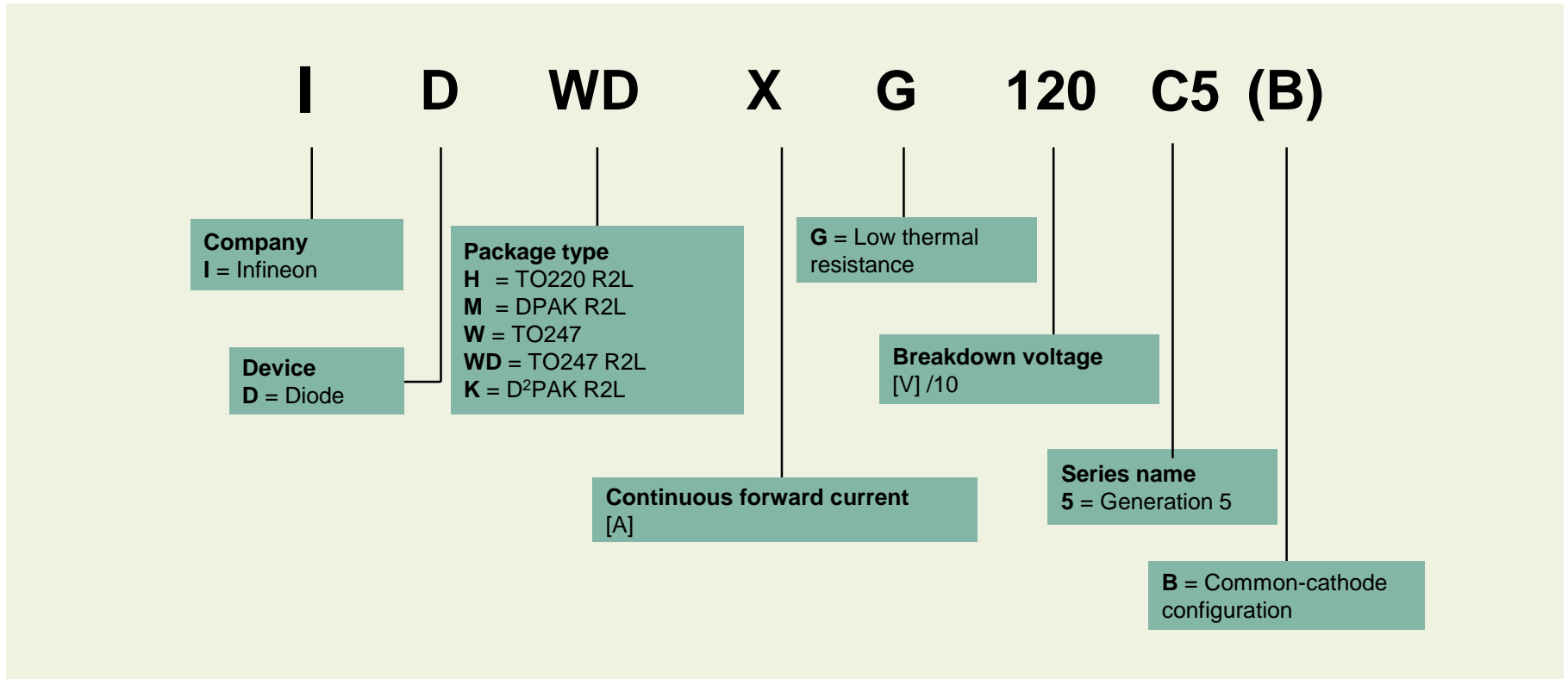


Continuous Forward Current, I_F [A]	TO-252-2 (DPAK real 2-leg)	TO-263-2 (D ² PAK real 2-leg)	TO-220-2 (real 2-leg)	TO-247-3	TO-247-2
2	IDM02G120C5	IDK02G120C5	IDH02G120C5		
5	IDM05G120C5	IDK05G120C5	IDH05G120C5		
8	IDM08G120C5	IDK08G120C5	IDH08G120C5		
10	IDM10G120C5	IDK10G120C5	IDH10G120C5	IDW10G120C5B ¹⁾	IDWD10G120C5
15-16		IDK16G120C5	IDH16G120C5	IDW15G120C5B ¹⁾	IDWD15G120C5
20		IDK20G120C5	IDH20G120C5	IDW20G120C5B ¹⁾	IDWD20G120C5
30				IDW30G120C5B ¹⁾	IDWD30G120C5
40				IDW40G120C5B ¹⁾	IDWD40G120C5

1) „B“ = common-cathode configuration



Nomenclature



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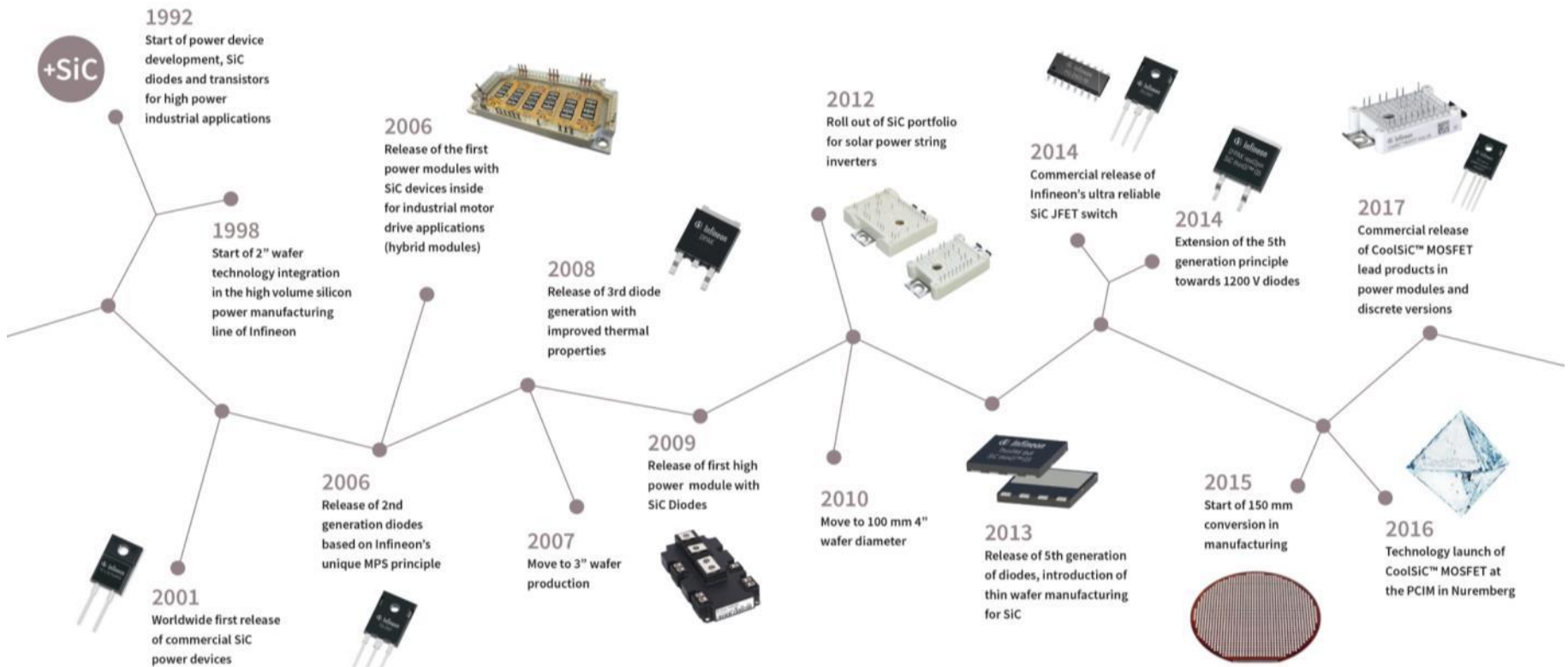
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Summary

Infinion has more than 15 years of field experience in SiC



Support

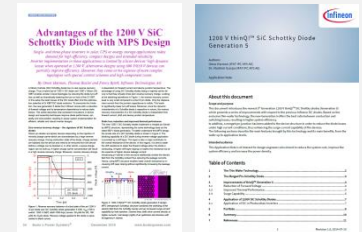
Collaterals and brochures

- > Product briefs
- > Selection guides
- > Application brochures
- > Presentations
- > Press releases, Ads



Technical material

- > Application notes
- > Technical articles
- > Simulation models
- > Datasheets



Support & tools

- > PCB design data
- > Simulation models

Videos

- > Technical videos
- > Product information videos



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Support



www.infineon.com/sicdiodes1200v

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Summary – Key take aways

- › By using SiC diodes, designers for solar inverters, UPS, motor drives and other industrial applications can design in a new level of system efficiency, higher power density and reliability compared with Si based solution. 1200 V CoolSiC™ Schottky diode generation 5 supports this by low-loss turn-off, low static losses and increased surge current capability.
- › Infineon is in mass production for SiC diodes since the year 2001 with proven high volume capability.



New
TO-247-2
(10A to 40A)



New
TO-263-2 (D²PAK-2)
(2A to 20A)



Part of your life. Part of tomorrow.