

# 5<sup>th</sup> Generation CoolSiC™ 1200V Schottky Diode

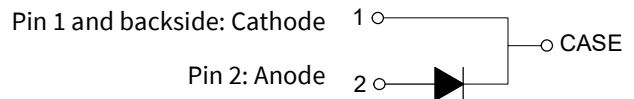
## SiC Diode

### Features

- No reverse recovery current / no forward recovery
- High surge current capability
- Temperature independent switching behaviour
- Low forward voltage even at high operating temperature
- Tight forward voltage distribution
- Specified dv/dt ruggedness
- Pb-free lead plating; RoHS compliant



### Pin definition



### Potential applications

- Industrial power supplies: Industrial UPS
- Infrastructure-Charge: Charger
- Metal treatment: Welding
- Solar central inverters, Solar string inverter and Solar optimizer

### Product validation

Qualified for industrial applications according to the relevant tests of JEDEC 47/20/22

### Description

- System efficiency improvement over Si diodes
- Enabling higher frequency / increased power density solutions
- System size/cost savings due to reduced heatsink requirements and smaller magnetics
- Reduced EMI
- Highest efficiency across the entire load range
- Robust diode operation during surge events
- High reliability
- Related Links: [www.infineon.com/SiC](http://www.infineon.com/SiC)



### Key performance parameters

Type	V <sub>DC</sub>	I <sub>F</sub>	Q <sub>c</sub>	T <sub>vj,max</sub>	Marking	Package
IDWD40G120C5	1200 V	40 A	202nC	175°C	D4012C5	PG-TO247-2



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## Maximum ratings

## 1 Maximum ratings

Note: For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

Parameter	Symbol	Value	Unit
Repetitive peak reverse voltage $T_C \geq 25^\circ\text{C}$	$V_{RRM}$	1200	V
Continuous forward current for $R_{th(j-c,max)}$ $T_C = 156^\circ\text{C}, D=1$ $T_C = 135^\circ\text{C}, D=1$ $T_C = 25^\circ\text{C}, D=1$	$I_F$	40 51 110	A
Surge repetitive forward current, sine halfwave <sup>1</sup> $T_C=25^\circ\text{C}, t_p=10\text{ms}$ $T_C=100^\circ\text{C}, t_p=10\text{ms}$	$I_{F,RM}$	160 120	A
Surge non-repetitive forward current, sine halfwave $T_C=25^\circ\text{C}, t_p=10\text{ms}$ $T_C=150^\circ\text{C}, t_p=10\text{ms}$	$I_{F,SM}$	290 280	A
Non-repetitive peak forward current $T_C = 25^\circ\text{C}, t_p=10 \mu\text{s}$	$I_{F,max}$	3150	A
$i^2t$ value $T_C = 25^\circ\text{C}, t_p=10 \text{ms}$ $T_C = 150^\circ\text{C}, t_p=10 \text{ms}$	$\int i^2 dt$	420 392	A <sup>2</sup> s
Diode $dv/dt$ ruggedness $V_R=0\dots960 \text{V}$	$dv/dt$	80	V/ns
Power dissipation for $R_{th(j-c,max)}$ $T_C = 25^\circ\text{C}$	$P_{tot}$	402	W

<sup>1</sup> Not subject to production test. The test was performed with 20000 pulses (two consecutive half-wave rectified sines with 10 ms period).

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## SiC Diode



### Maximum ratings

Operating temperature	$T_{vj}$	-55...175	°C
Storage temperature	$T_{stg}$	-55...150	°C
Soldering temperature, wave soldering only allowed at leads 1.6mm (0.063 in.) from case for 10 s	$T_{sold}$	260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	$M$	0.6	Nm

## 2 Thermal resistances

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Characteristic</b>						
Diode thermal resistance, junction – case	$R_{th(j-c)}$		-	0.3	0.4	K/W
Thermal resistance, junction – ambient	$R_{th(j-a)}$	leaded	-	-	62	K/W

### 3 Electrical Characteristics

#### Static Characteristics, at $T_{vj}=25^{\circ}\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
DC blocking voltage	$V_{DC}$	$T_{vj}=25^{\circ}\text{C}$ , $I_R=500\mu\text{A}$	1200	-	-	V
Diode forward voltage	$V_F$	$I_F=40\text{A}$ , $T_{vj}=25^{\circ}\text{C}$	-	1.4	1.65	V
		$I_F=40\text{A}$ , $T_{vj}=150^{\circ}\text{C}$	-	1.7	-	
Reverse current	$I_R$	$V_R=1200\text{V}$ , $T_{vj}=25^{\circ}\text{C}$	-	23	332	$\mu\text{A}$
		$V_R=1200\text{V}$ , $T_{vj}=150^{\circ}\text{C}$	-	118	-	

#### Dynamic Characteristics, at $T_{vj}=25^{\circ}\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Total capacitive charge	$Q_C$	$V_R=800\text{V}$ , $T_{vj}=150^{\circ}\text{C}$ & $25^{\circ}\text{C}$ $Q_C = \int_0^{V_R} C(V)dV$	-	202	-	nC
Total Capacitance	C	$V_R=1\text{V}$ , $f=1\text{MHz}$	-	2592	-	pF
		$V_R=400\text{V}$ , $f=1\text{MHz}$	-	183	-	
		$V_R=800\text{V}$ , $f=1\text{MHz}$	-	146	-	

## 4 Electrical Characteristics Diagrams

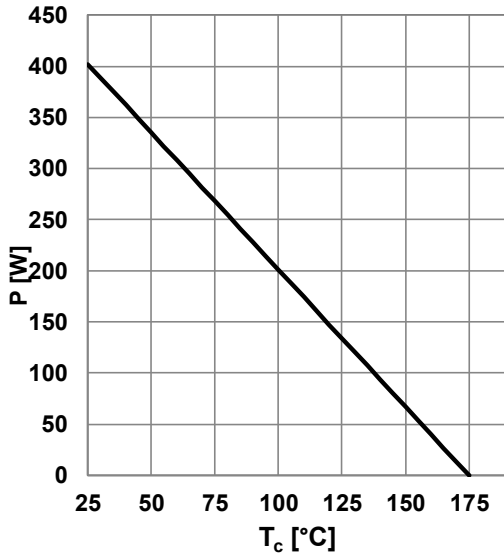


Figure 1. Power dissipation as function of case temperature,  $P_{tot}=f(T_C)$ ,  $R_{th(j-c),max}$

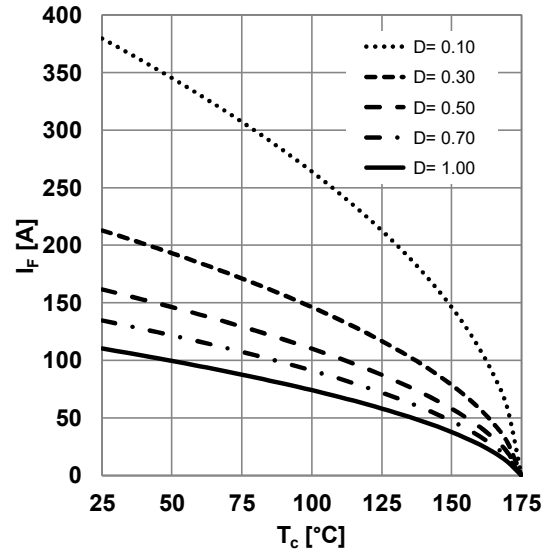


Figure 2. Diode forward current as function of temperature, parameter:  $T_{vj} \leq 175^\circ\text{C}$ ,  $R_{th(j-c),max}$ ,  $D$ =duty cycle,  $V_{th}$ ,  $R_{diff}$  @  $T_{vj}=175^\circ\text{C}$

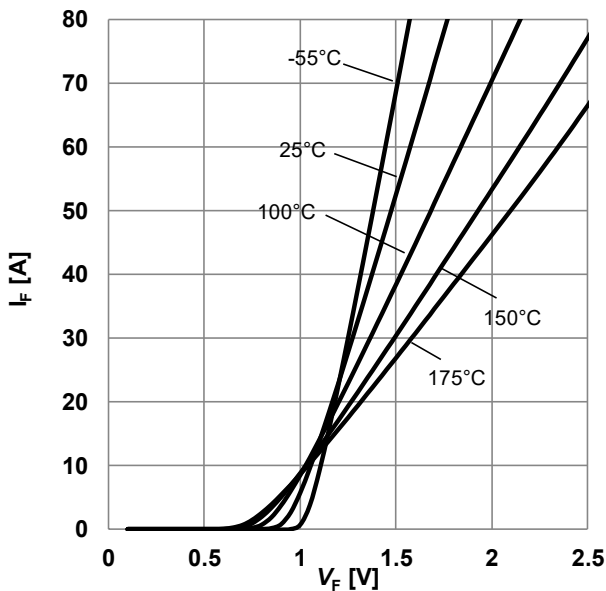


Figure 3. Typical forward characteristics,  $I_F=f(V_F)$ ,  $t_p=10 \mu\text{s}$ , parameter:  $T_{vj}$

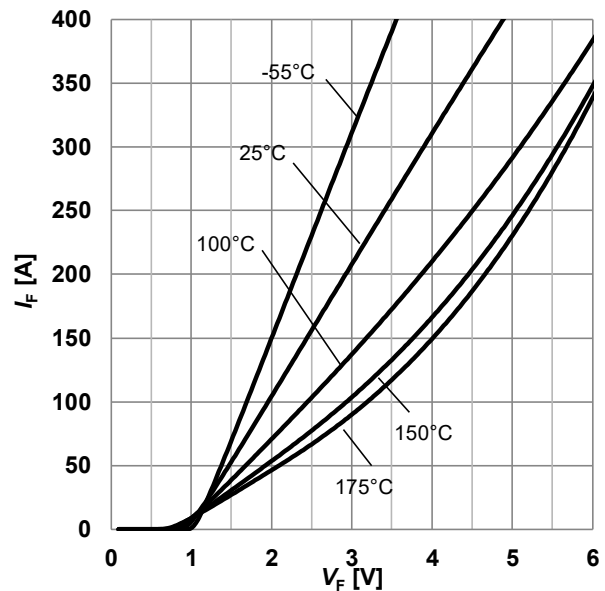


Figure 4. Typical forward characteristics in surge current,  $I_F=f(V_F)$ ,  $t_p=10 \mu\text{s}$ , parameter:  $T_{vj}$

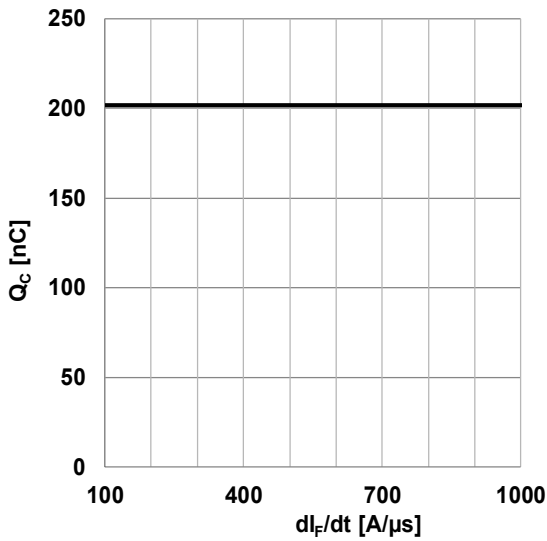


Figure 5. Typical capacitive charge as function of current slope<sup>2</sup>,  $Q_C=f(dI_F/dt)$ ,  $T_{vj}=150^{\circ}C$

2) guaranteed by design

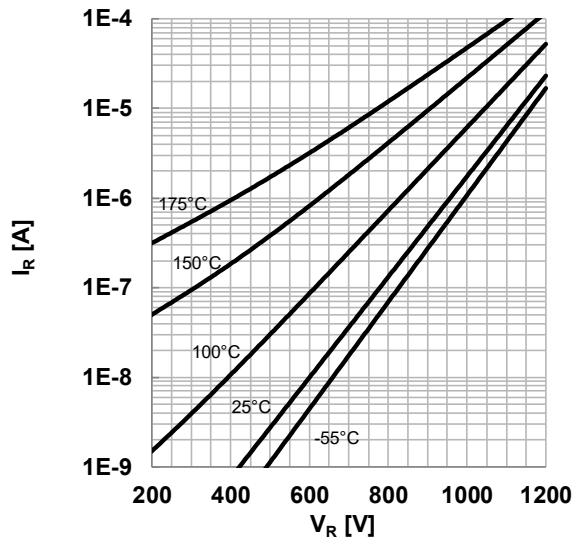


Figure 6. Typical reverse characteristics,  $I_R=f(V_R)$ , parameter:  $T_{vj}$

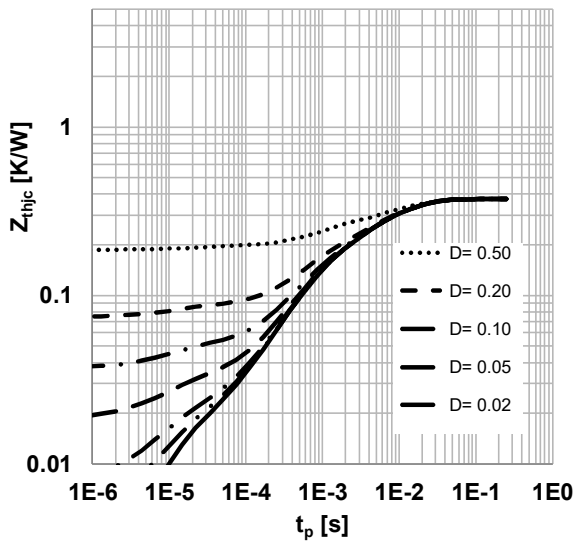


Figure 7. Max. transient thermal impedance,  $Z_{th,j-c}=f(t_p)$ , parameter:  $D=t_p/T$

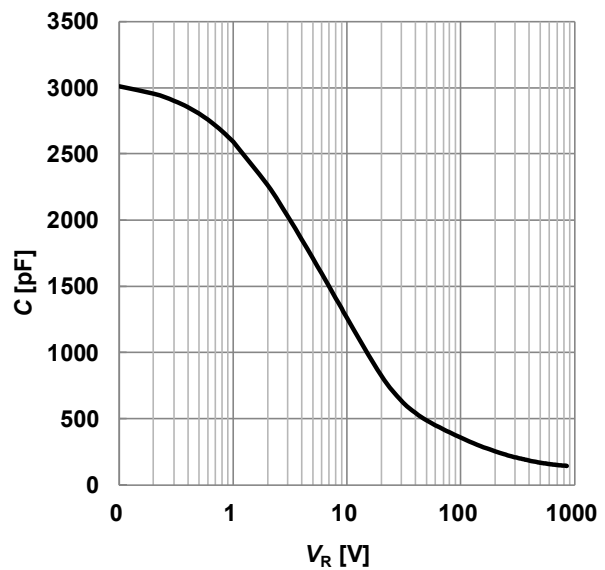
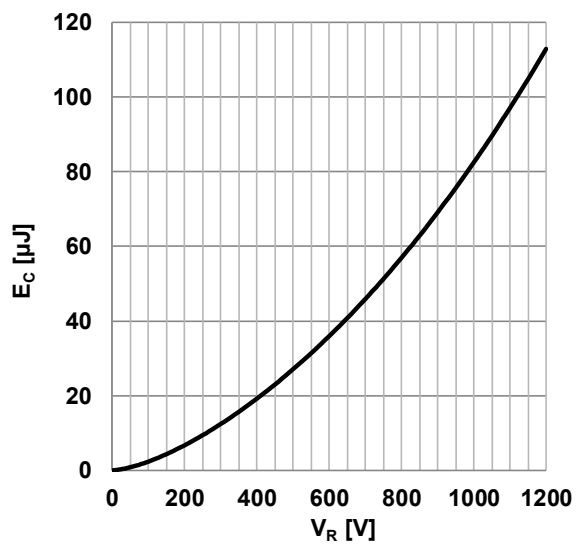


Figure 8. Typical capacitance as function of reverse voltage,  $C=f(V_R)$ ;  $T_{vj}=25^{\circ}C$ ;  $f=1\text{ MHz}$

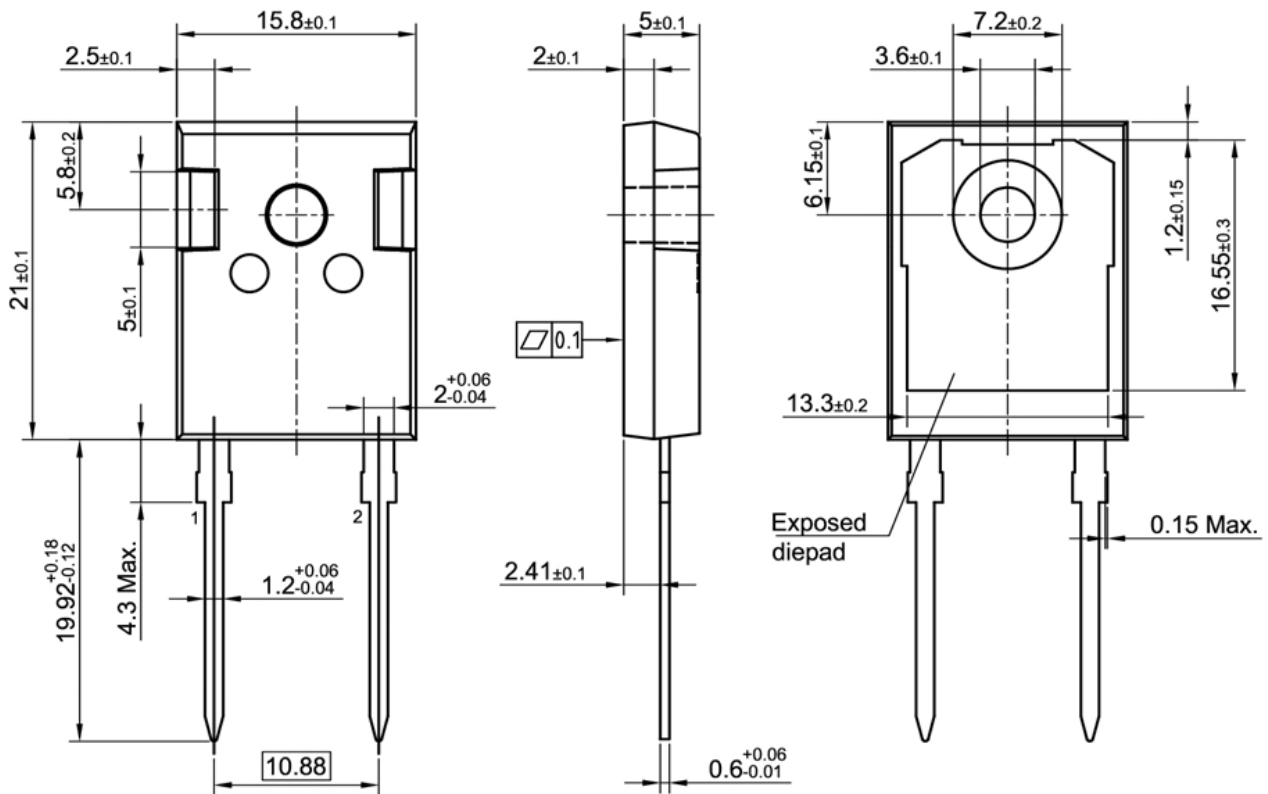




**Figure 9.** Typical capacitively stored energy as function of reverse voltage,  $E_C=f(V_R)$

## 5 Package Drawing

### PG-TO247-2



All dimensions do not include mold flash or protrusions

All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1 [⊥]

### Revision history

### Revision history

Document version	Date of release	Description of changes
V 1.0	2018-12-21	Preliminary Datasheet
V 2.0	2019-01-30	Final Datasheet

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**Email: [erratum@infineon.com](mailto:erratum@infineon.com)**

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