

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

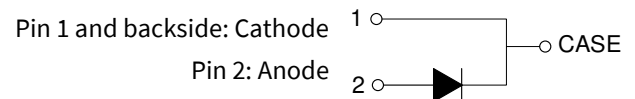
## SiC Diode

### Features

- Revolutionary semiconductor material - Silicon Carbide
- No reverse recovery current / no forward recovery
- Temperature independent switching behaviour
- Low forward voltage even at high operating temperature
- Tight forward voltage distribution
- Excellent thermal performance
- Extended surge current capability
- Specified dv/dt ruggedness
- Pb-free lead plating; RoHS compliant



#### Pin definition



### Potential applications

- Drives
- Industrial power supplies: Industrial UPS
- Solar central inverters and Solar string inverter

### 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	$V_{DC}$	$I_F$	$Q_C$	$T_{vj,max}$	Marking	Package
IDK20G120C5	1200 V	20 A	82nC	175°C	D2012C5	PG-TO263-2



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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 $R_{th(j-c,max)}$ $T_C = 145^\circ\text{C}, D=1$ $T_C = 135^\circ\text{C}, D=1$ $T_C = 25^\circ\text{C}, D=1$	$I_F$	20 27 56	A
Surge repetitive forward current, sine halfwave <sup>1</sup> $T_C=25^\circ\text{C}, t_p=10\text{ms}$ $T_C=100^\circ\text{C}, t_p=10\text{ms}$	$I_{F,RM}$	80 60	A
Surge non-repetitive forward current, sine halfwave $T_C=25^\circ\text{C}, t_p=10\text{ms}$ $T_C=150^\circ\text{C}, t_p=10\text{ms}$	$I_{F,SM}$	198 168	A
Non-repetitive peak forward current $T_C = 25^\circ\text{C}, t_p=10 \mu\text{s}$	$I_{F,max}$	1200	A
$i^2t$ value $T_C = 25^\circ\text{C}, t_p=10 \text{ms}$ $T_C = 150^\circ\text{C}, t_p=10 \text{ms}$	$\int i^2 dt$	195 140	$\text{A}^2\text{s}$
Diode $dv/dt$ ruggedness $V_R=0\dots960 \text{V}$	$dv/dt$	150	V/ns
Power dissipation for $R_{th(j-c,max)}$ $T_C = 25^\circ\text{C}$	$P_{tot}$	330	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, reflow soldering (MSL1 according to JEDEC J-STD-020)	$T_{sold}$	260	°C

Thermal resistances

## 2 Thermal resistances

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Characteristic</b>						
Diode thermal resistance, junction – case	$R_{th(j-c)}$		-	0.35	0.46	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	$V_{DC}$	$T_{vj} = 25^{\circ}\text{C}$ , $I_R=50\mu\text{A}$	1200	-	-	V
Diode forward voltage	$V_F$	$I_F=20\text{A}$ , $T_{vj}=25^{\circ}\text{C}$	-	1.5	1.8	V
		$I_F=20\text{A}$ , $T_{vj}=150^{\circ}\text{C}$	-	2.0	-	
Reverse current	$I_R$	$V_R=1200\text{V}$ , $T_{vj}=25^{\circ}\text{C}$	-	8.5	123	$\mu\text{A}$
		$V_R=1200\text{V}$ , $T_{vj}=150^{\circ}\text{C}$	-	44	-	

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

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Total capacitive charge	$Q_C$	$V_R=800\text{V}$ , $T_{vj}=150^{\circ}\text{C}$	-	82	-	nC
		$Q_C = \int_0^{V_R} C(V)dV$				
Total Capacitance	C	$V_R=1\text{V}$ , $f=1\text{MHz}$	-	1050	-	pF
		$V_R=400\text{V}$ , $f=1\text{MHz}$	-	74	-	
		$V_R=800\text{V}$ , $f=1\text{MHz}$	-	59	-	

## 4 Electrical Characteristics Diagrams

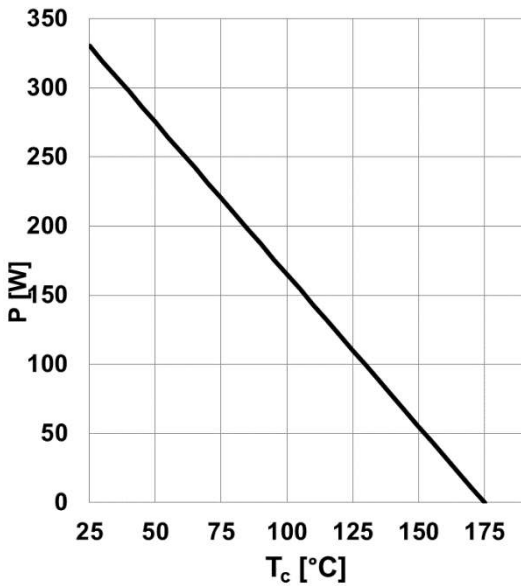


Figure 1. Power dissipation as function of case temperature,  $P_{tot}=f(T_c)$ ,  $R_{th(j-c),max}$

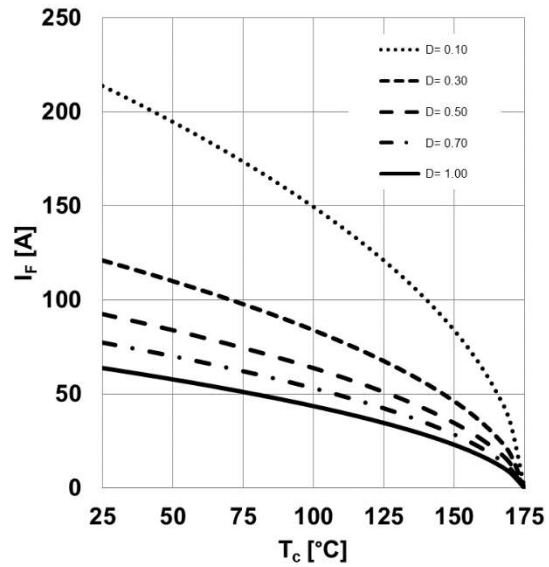


Figure 2. Diode forward current as function of temperature, parameter:  $T_{vj} \leq 175^\circ\text{C}$ ,  $R_{th(j-c),max}$ ,  $D$ =duty cycle,  $V_{th}$ ,  $R_{diff}$  @  $T_{vj}=175^\circ\text{C}$

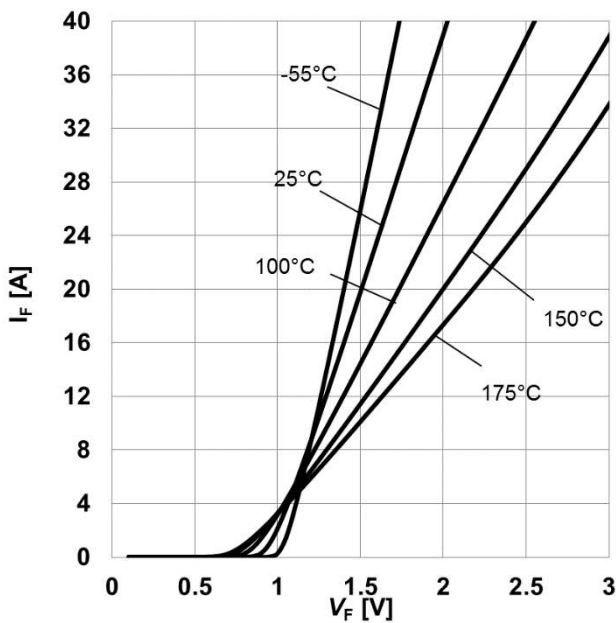


Figure 3. Typical forward characteristics,  $I_F=f(V_F)$ ,  $t_p=10 \mu\text{s}$ , parameter:  $T_{vj}$

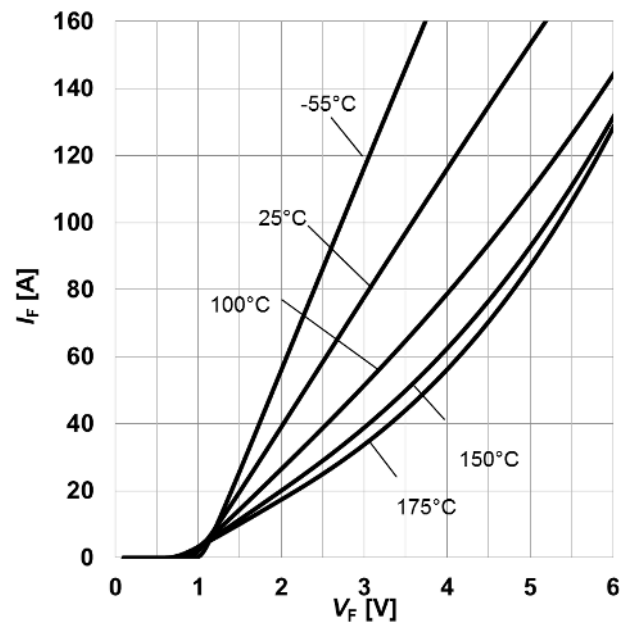


Figure 4. Typical forward characteristics in surge current,  $I_F=f(V_F)$ ,  $t_p=10 \mu\text{s}$ , parameter:  $T_{vj}$

Electrical Characteristics Diagrams

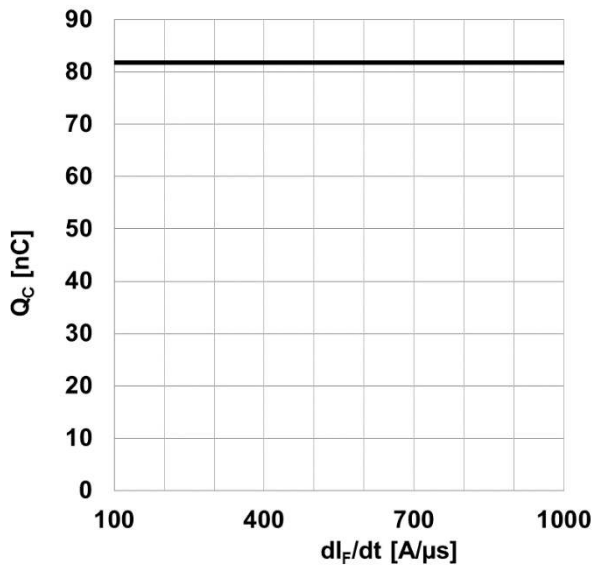


Figure 5. Typical capacitive charge as function of current slope,  $Q_c=f(diF/dt)$ ,  $T_{vj}=150^{\circ}C$

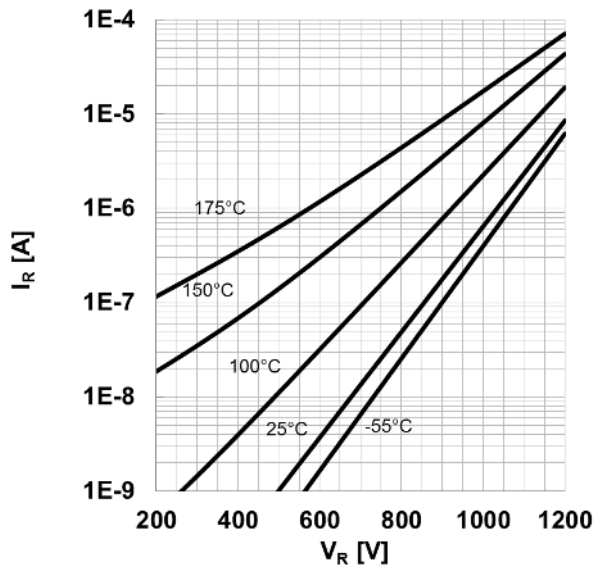


Figure 6. Typical reverse characteristics,  $I_R=f(V_R)$ , parameter:  $T_{vj}$

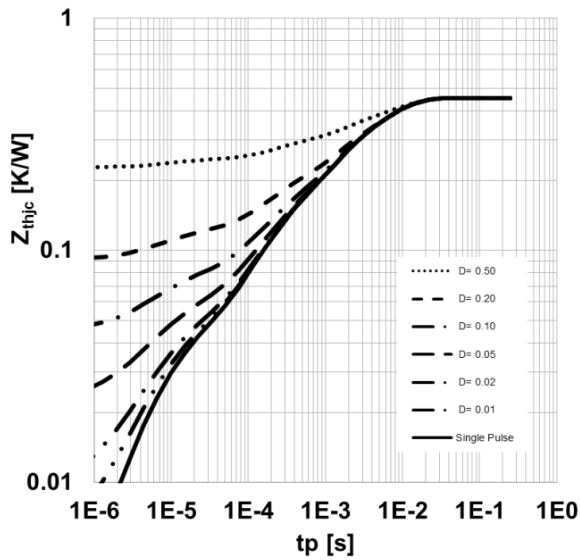


Figure 7. Max. transient thermal impedance,  $Z_{th,j-c}=f(t_p)$ , parameter:  $D=t_p/T$

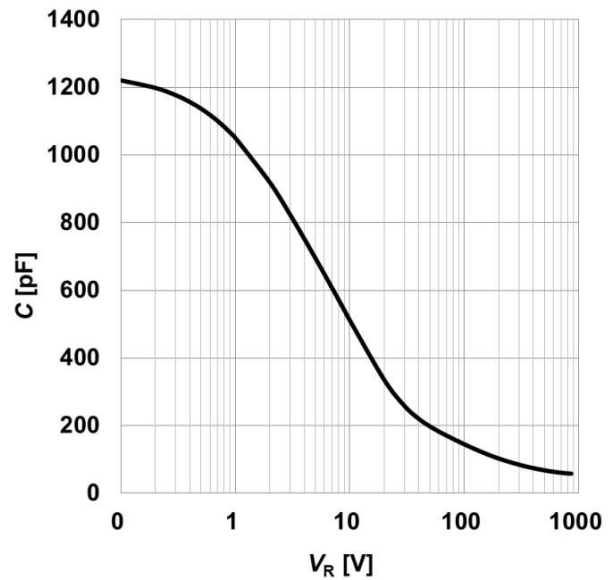
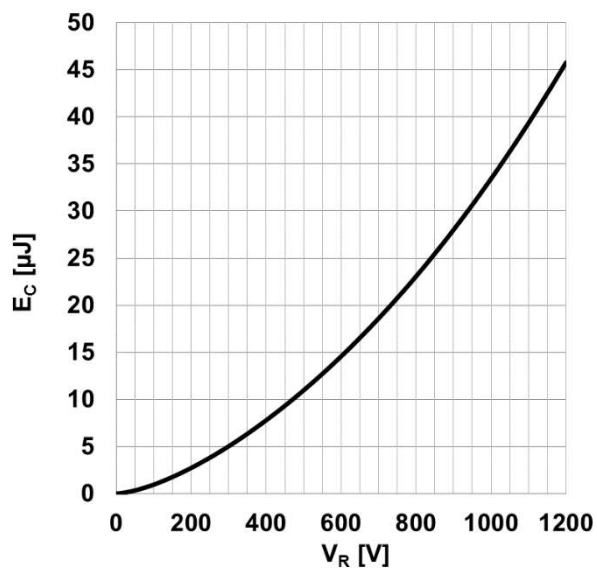


Figure 8. Typical capacitance as function of reverse voltage,  $C=f(V_R)$ ;  $T_{vj}=25^{\circ}C$ ;  $f=1\text{ MHz}$

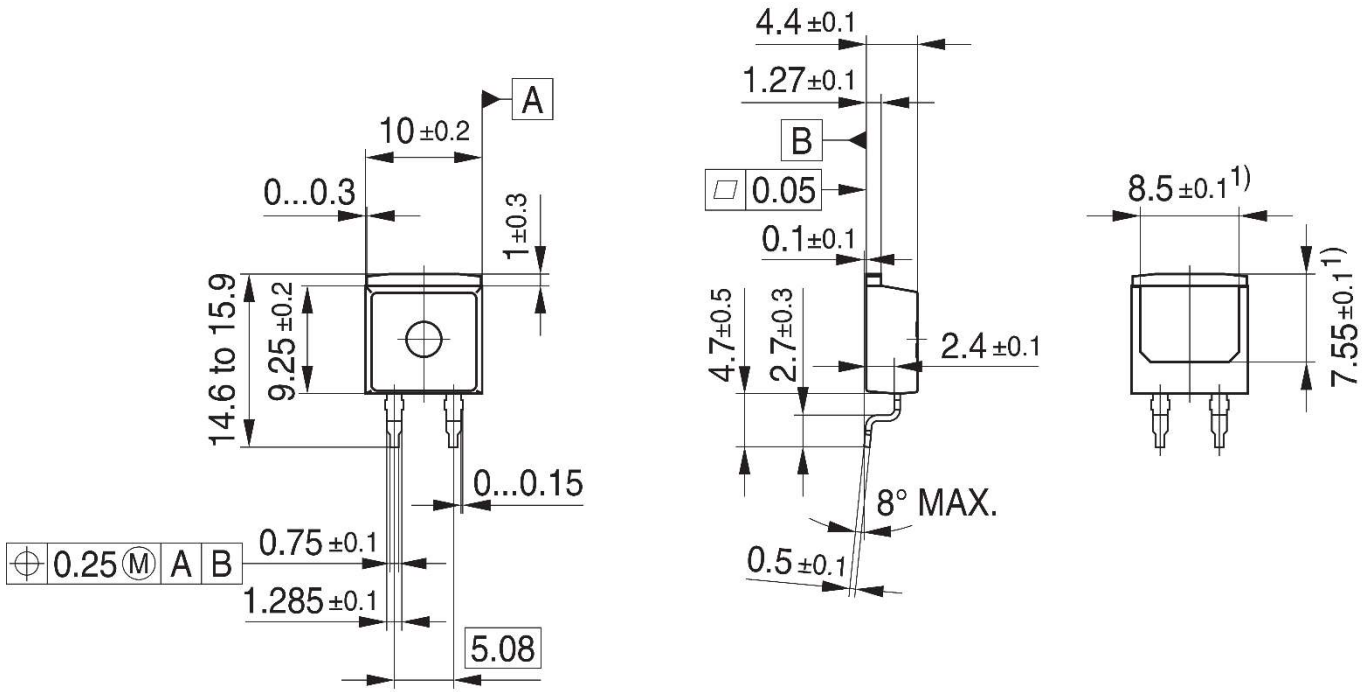




**Figure 9. Typical capacitively stored energy as function of reverse voltage,  $E_C=f(V_R)$**

5 Package Drawing

PG-TO263-2



- 1) Typical  
 Metal surface min.  $X = 7.25$ ,  $y = 6.9$   
 All metal surfaces: tin plated, except area of cut

All dimensions do not include mold flash or protrusions

All dimensions are in units mm

The drawings is in compliance with ISO 128-30, Projection Methode 1 [ ]

### Revision history

### Revision history

Document version	Date of release	Description of changes
V 2.0	2019-10-28	Final Datasheet
V 2.1	2021-07-14	Increased dv/dt ruggedness

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