

CoolSiC™ Automotive Schottky Diode 650V G5

650V/12A Silicon Carbide Schottky Diode in D2PAK (Real 2 Pins)

Features

- Revolutionary semiconductor material - Silicon Carbide
- Benchmark switching behavior
- No reverse recovery/ No forward recovery
- Temperature independent switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Junction Temperature range from -40°C to 175°C
- System efficiency improvement over Si diodes
- System cost / size savings due to reduced cooling requirements
- Enabling higher frequency / increased power density solutions
- Higher system reliability due to lower operating temperatures
- Reduced EMI



Potential Applications

- Traction inverter
- Booster / DCDC Converter
- On board Charger / PFC



Product Validation

“Qualified for Automotive Applications. Product Validation according to AEC-Q100/101”

Description

The 5th Generation CoolSiC™ Automotive Schottky Diode represents Infineon leading edge technology for Silicon Carbide Schottky Barrier diodes. Thanks to a compact design and a technology based on thin wafers, this family of products shows improved efficiency over all load conditions resulting from both its thermal characteristics and low figure of merit ($Q_C \times V_f$). This product family has been designed to complement Infineon's IGBT and CoolMOS™ portfolio. This ensures meeting the most stringent application requirements in the 650V voltage class.

Product Information	
Ordering Code	AIDK12S65C5
Marking	AD1265C5
Package	PG-TO263-2-1
SP Number	SP001725244

Parameter	Value/Unit
$V_{DC,max}$	650 V
$I_F; T_C < 124^\circ C$	12 A
$Q_C; V_R = 400 V$	18 nC
$E_C; V_R = 400 V$	4.1 μJ
$T_{j,max}$	175 $^\circ C$

Pin	Definition
Pin 1, case	Cathode
Pin 2	Anode



Table of Contents

Table of Contents

Features..... 1

Potential Applications..... 1

Product Validation..... 1

Description..... 1

Table of Contents..... 2

1 Maximum Ratings..... 3

2 Thermal Characteristics..... 4

3 Electrical Characteristics..... 5

4 Electrical Characteristics Diagrams..... 6

5 Package Outlines..... 9

Revision History..... 10

CoolSiC™ Automotive Schottky Diode 650V G5
650V/12A Silicon Carbide Schottky Diode in D2PAK (Real 2 Pins)

Maximum Ratings

1 Maximum Ratings

Table 1 Maximum ratings¹

Parameter	Symbol	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	650	V
Continuous forward current for $R_{thJC,max}$ $T_C = 124\text{ }^{\circ}\text{C}$, $D=1$	I_F	12	A
Surge non-repetitive forward current, sine halfwave $T_C = 25\text{ }^{\circ}\text{C}$, $t_p=10\text{ms}$ $T_C = 150\text{ }^{\circ}\text{C}$, $t_p=10\text{ms}$	$I_{F,SM}$	50 40	A
Non-repetitive peak forward current $T_C = 25\text{ }^{\circ}\text{C}$, $t_p=10\mu\text{s}$	$I_{F,max}$	505	A
i^2t value $T_C = 25\text{ }^{\circ}\text{C}$, $t_p=10\text{ms}$ $T_C = 150\text{ }^{\circ}\text{C}$, $t_p=10\text{ms}$	$\int i^2 dt$	12 8	A^2s
Diode dv/dt ruggedness $V_R=0\ldots 480\text{V}$	dv/dt	100	V/ns
Power dissipation $T_C = 25\text{ }^{\circ}\text{C}$	P_{tot}	62	W
Operating temperature	T_j	$-40\ldots 175$	$^{\circ}\text{C}$
Storage temperature	T_{stg}	$-55\ldots 150$	$^{\circ}\text{C}$
ESD			
Human body model, $R=1.5\text{ k}\Omega$, $C=100\text{ pF}$		8	kV
Charged device model		2	



Thermal Characteristics

2 Thermal Characteristics

Table 2 Thermal Characteristics¹

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction–case ²	R _{thJC}	-	1.9	2.4	K/W	
Thermal resistance, junction-ambient ²	R _{thJA}	-	-	62	K/W	

Electrical Characteristics

3 Electrical Characteristics

Table 3 Static Characteristics

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
DC blocking voltage	V_{DC}	650	-	-		$T_j = 25^\circ\text{C}$, $I_R = 0.07\text{ mA}$
Diode forward voltage ³	V_F	-	1.5	1.7	V	$T_j = 25^\circ\text{C}$, $I_F = 12\text{ A}$
		-	1.8	2.1		$T_j = 150^\circ\text{C}$, $I_F = 12\text{ A}$
Reverse current	I_R	-	2	70	μA	$V_R = 650\text{ V}$, $T_j = 25^\circ\text{C}$
		-	14	-		$V_R = 650\text{ V}$, $T_j = 150^\circ\text{C}$

Table 4 Dynamic Characteristics at $T_j=25^\circ\text{C}$ unless noted otherwise

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_C	-	18	-	nC	$V_R = 400\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$, $I_F \leq I_{F,MAX}$, $T_j = 150^\circ\text{C}$
Total capacitance	C	-	363	-	pF	$V_R = 1\text{ V}$, $f = 1\text{ MHz}$
		-	47	-		$V_R = 300\text{ V}$, $f = 1\text{ MHz}$
		-	46	-		$V_R = 600\text{ V}$, $f = 1\text{ MHz}$

Footnotes:

¹ The parameter is not subject to production test- verified by design/characterization.

² $R_{th,JC}$ defined as per JESD-51-14. $R_{th,JA}$ defined as per JESD-51-5/7.

³ Only the value at 25°C is subject to production test. The value at 150°C is only verified by design/characterization.

Electrical Characteristics Diagrams

4 Electrical Characteristics Diagrams

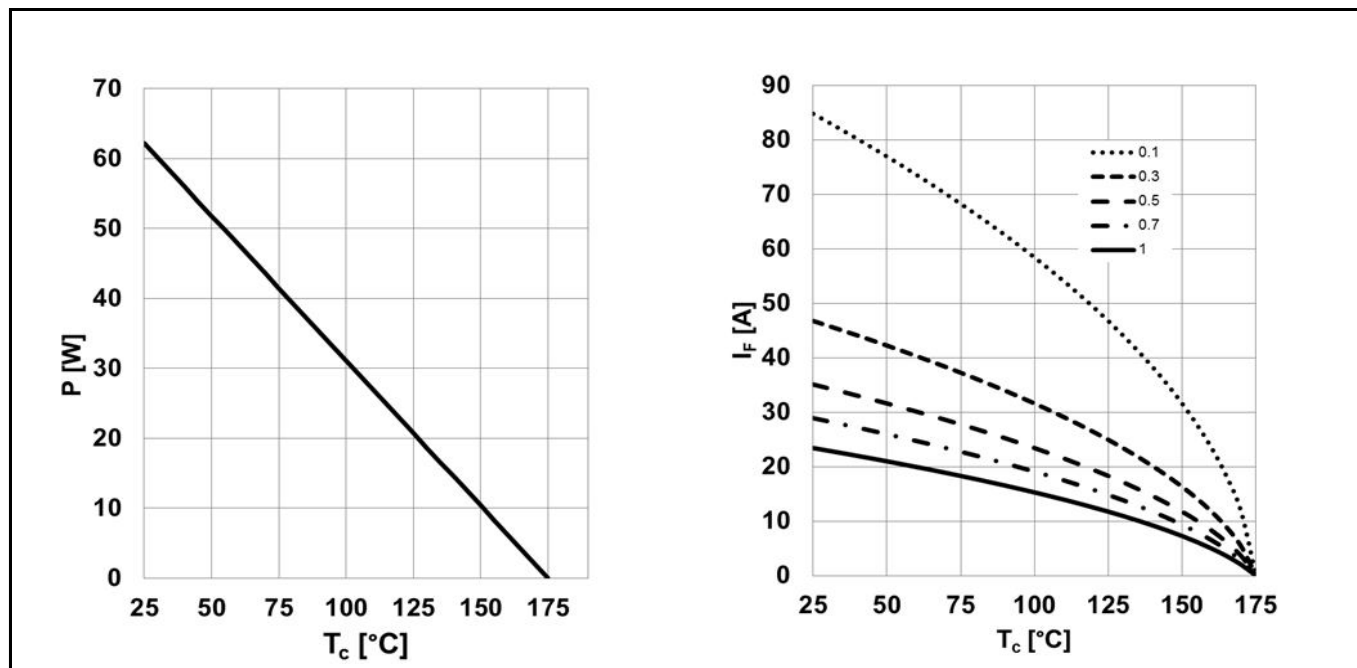


Figure 1 (LEFT) Power dissipation; $P_{\text{tot}} = f(T_c)$; $R_{\text{thJC,max}}$
(RIGHT) Diode forward current; $I_F = f(T_c)$; $T_j \leq 175$ °C; $R_{\text{thJC,max}}$; parameter: D =duty cycle

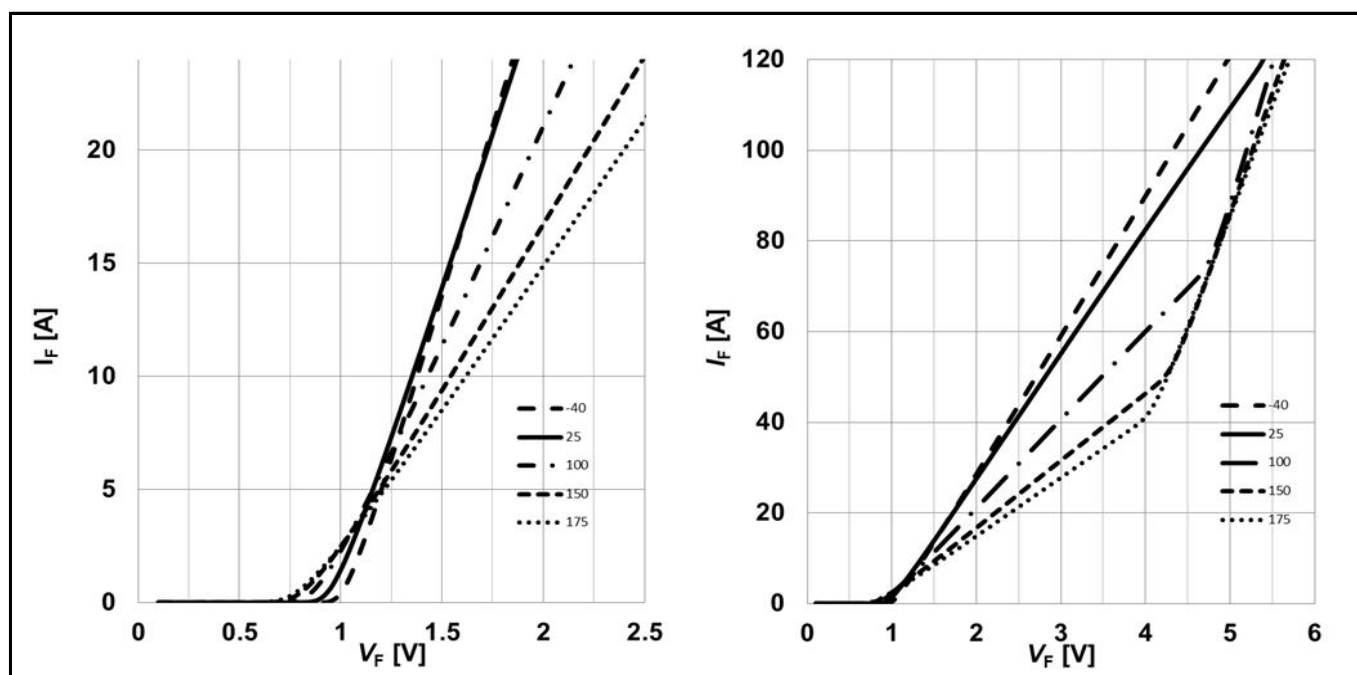


Figure 2 (LEFT) Typical forward characteristic; $I_F = f(V_F)$; $t_p = 20$ μs; parameter: T_j
(RIGHT) Typical forward characteristics in surge current; $I_F = f(V_F)$; $t_p = 20$ μs; parameter: T_j

Electrical Characteristics Diagrams

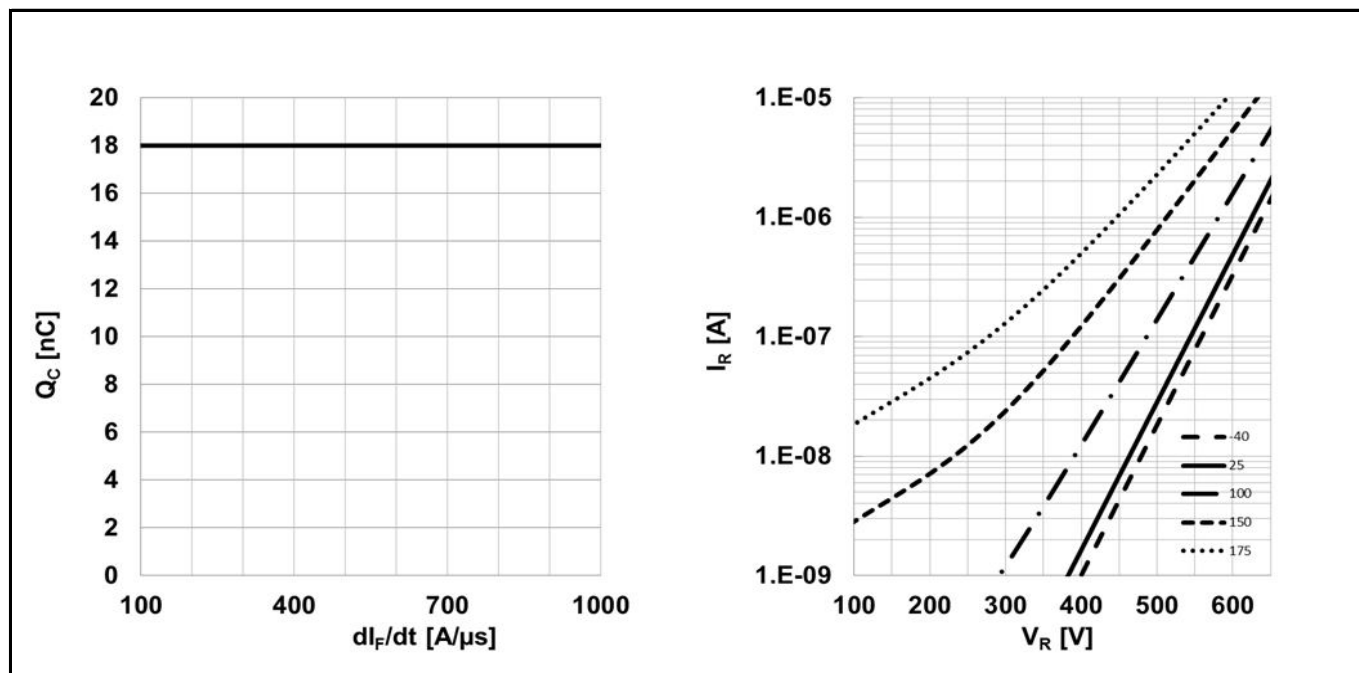


Figure 3 (LEFT) Typical capacitive charge versus current slope (only capacitive charge, guaranteed by design); $Q_C = f(di_F/dt)$; $T_j = 150^\circ\text{C}$; $V_R = 400\text{V}$; $I_F \leq I_{F,\text{max}}$
(RIGHT) Typical reverse current versus reverse voltage; $I_R = f(V_R)$; parameter: T_j

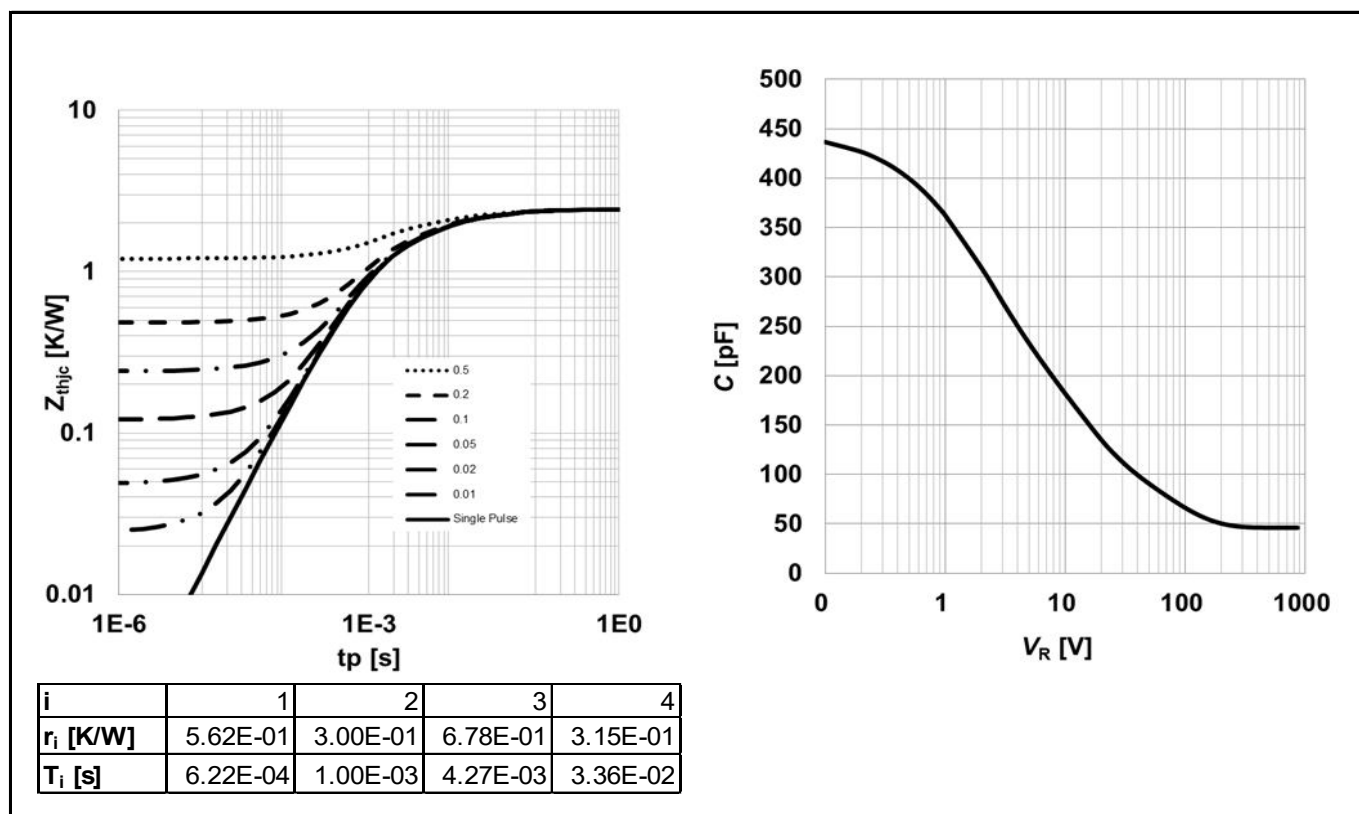


Figure 4 (LEFT) Max. Transient thermal impedance; $Z_{thJC} = f(t_p)$; parameter: $D = t_p/T$
(RIGHT) Typ. Capacitance vs. Reverse voltage; $C = f(V_R)$; $T_j = 25^\circ\text{C}$; $f = 1\text{ MHz}$

Electrical Characteristics Diagrams

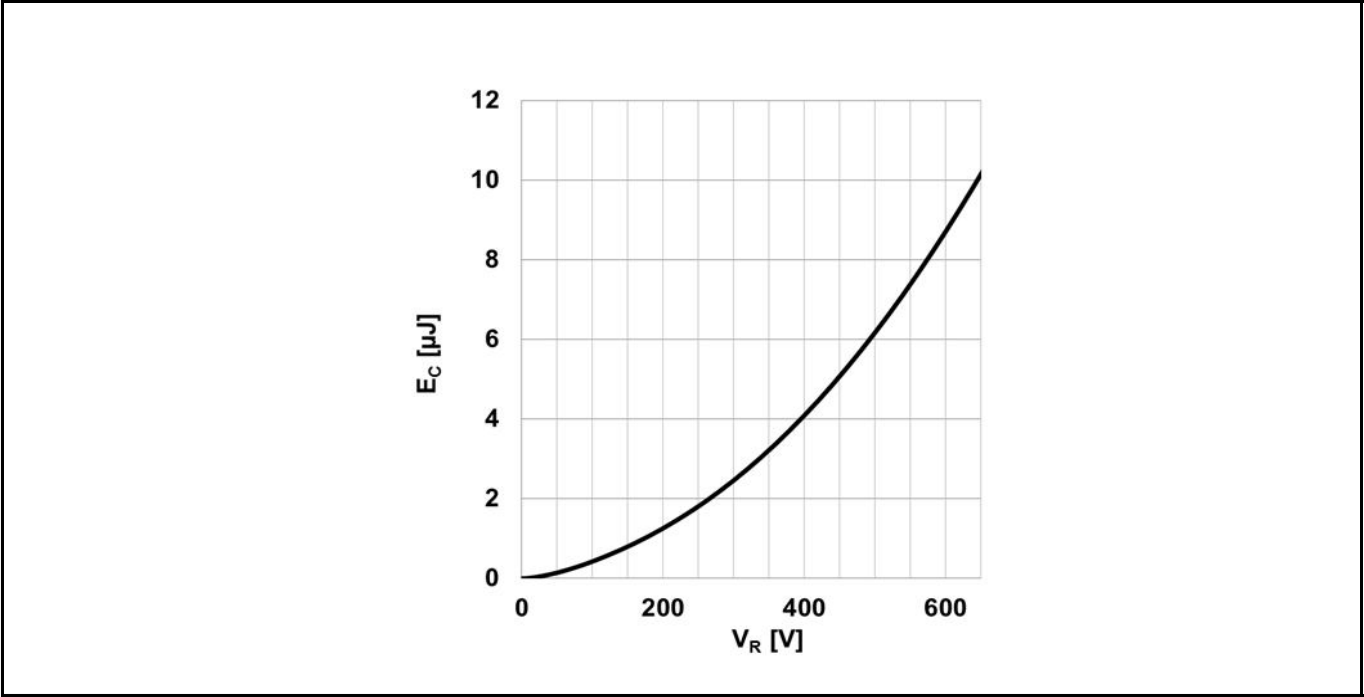


Figure 5 Typical capacitance stored energy; $E_C = f(V_R)$

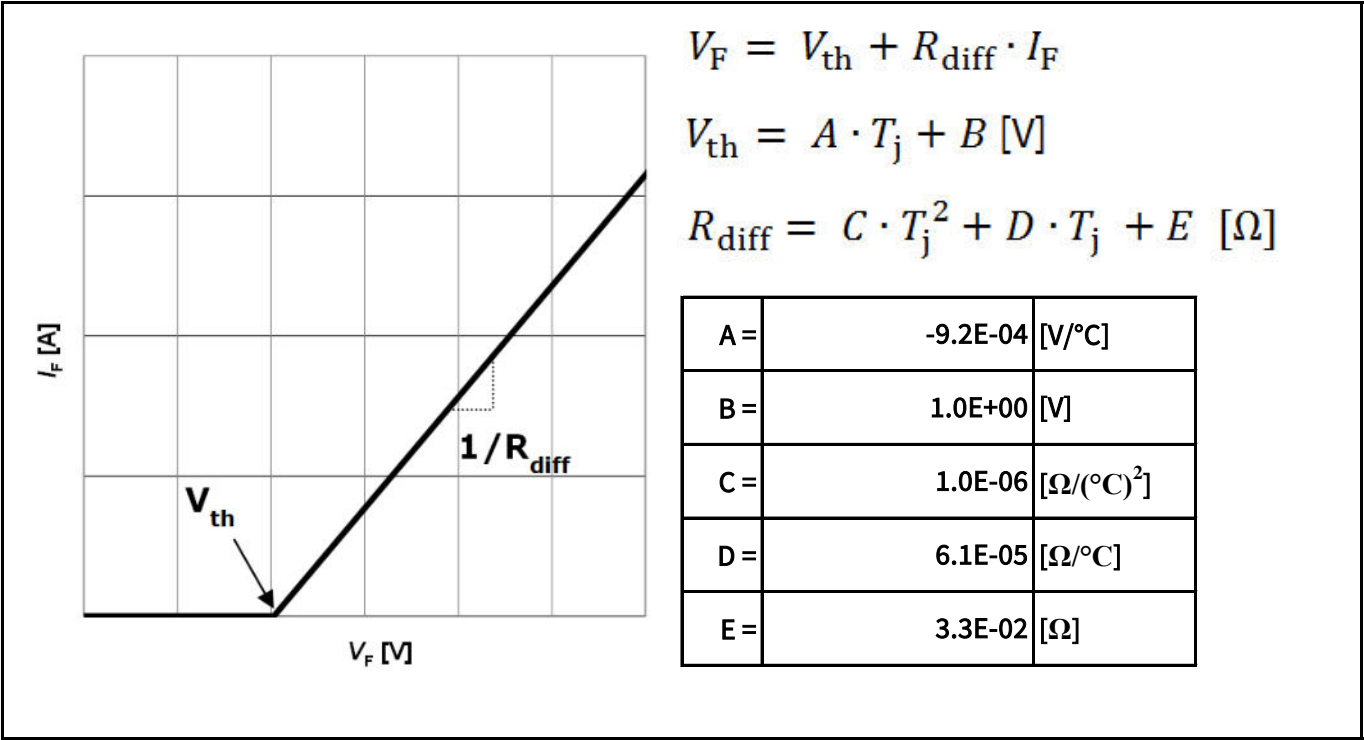


Figure 6 Simplified forward characteristics model $V_F = f(I_F)$;
 $-40^{\circ}\text{C} < T_j < 175^{\circ}\text{C}$; $I_F < 24 \text{ A}$

Package Outlines

5 Package Outlines

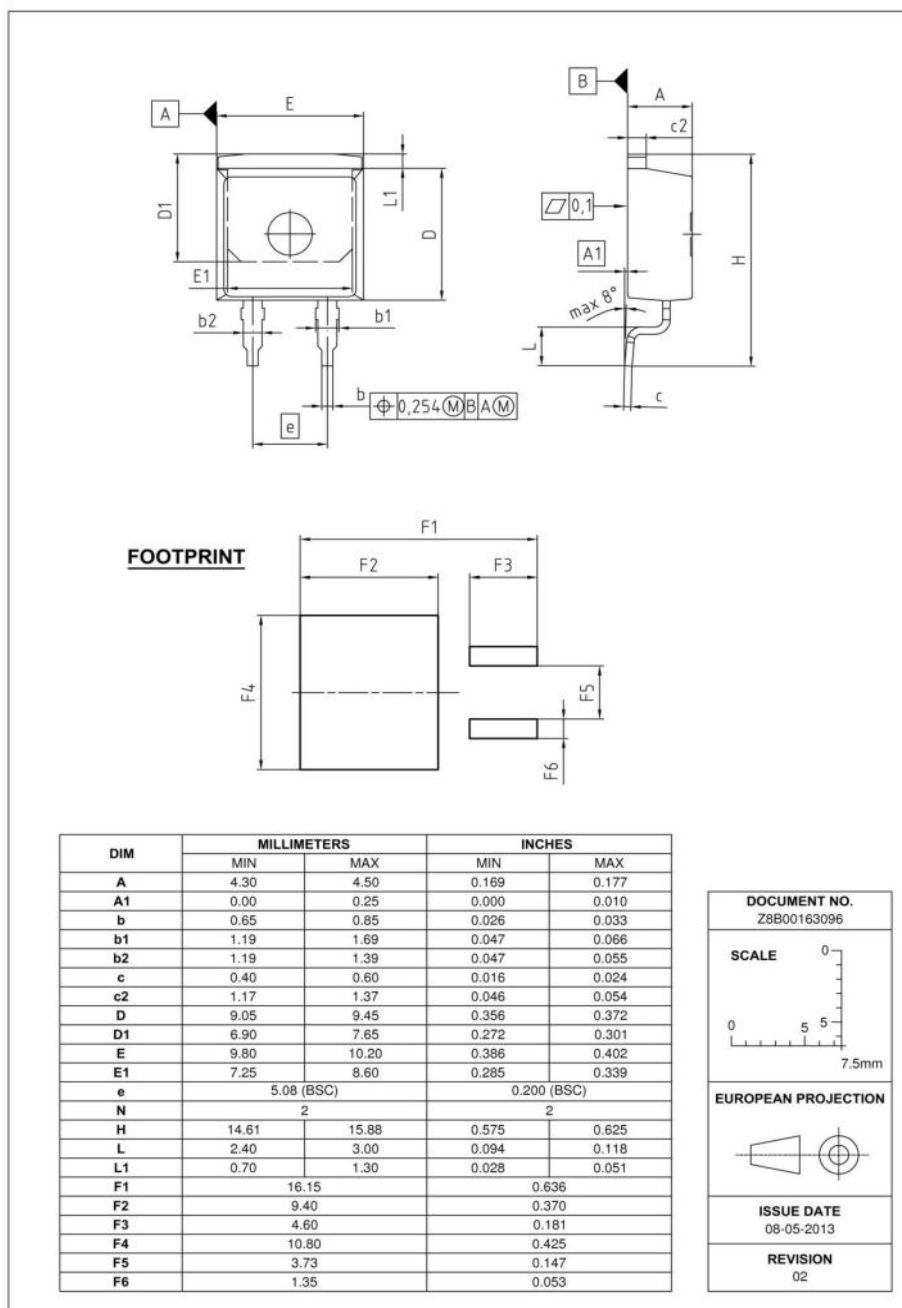


Figure 6 Package outline of PG-T0263-2-1 led



Revision History

Revision History

Document Version	Date of Release	Description of changes
V3.0	11.06.2019	1st release of Data Sheet

CoolSiC™ Automotive Schottky Diode 650V G5

650V/12A Silicon Carbide Schottky Diode in D2PAK (Real 2 Pins)

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

IMPORTANT NOTICE	
Edition 2019-06-11	
Published by Infineon Technologies AG 81726 München, Germany	The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics technology, delivery terms and conditions and ("Beschaffenhheitsgarantie"). prices please contact your nearest Infineon Technologies office (www.infineon.com).
© 2017 Infineon Technologies AG. All Rights Reserved.	With respect to any examples, hints or any typical values stated herein and/or any information regarding the WARNINGS application of the product, Infineon Technologies hereby Due to technical requirements products may disclaims any and all warranties and liabilities of any kind, contain dangerous substances. For information including without limitation warranties of non- on the types in question please contact your infringement of intellectual property rights of any third nearest Infineon Technologies office.
Do you have a question about this document? Email: erratum@infineon.com	party.
Document reference	In addition, any information given in this document is Except as otherwise explicitly approved by subject to customer's compliance with its obligations Infineon Technologies in a written document stated in this document and any applicable legal signed by authorized representatives of Infineon requirements, norms and standards concerning Technologies, Infineon Technologies' products customer's products and any use of the product of may not be used in any applications where a Infineon Technologies in customer's applications. failure of the product or any consequences of the use thereof can reasonably be expected to
	The data contained in this document is exclusively result in personal injury. intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.