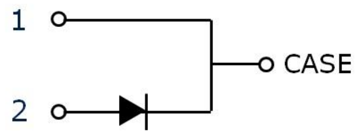
CoolSiC™ Automotive Schottky Diode 650V G5

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 (Qc x Vf). 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 °C	12 A
Q_C; V_R= 400 V	18 nC
E_C; V_R= 400 V	4.1 µJ
$T_{j,max}$	175 °C

Pin	Definition
Pin 1,case	Cathode
Pin 2	Anode

Table of Contents

1 Maximum Ratings

Table 1 Maximum ratings[1]

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

2 Thermal Characteristics

Table 2 Thermal Characteristics[1]

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	

3 Electrical Characteristics

Table 3 Static Characteristics

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

Table 4 Dynamic Characteristics at Tj=25°C unless noted otherwise

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

Footnotes:

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

2 Rth,JC defined as per JESD-51-14. Rth,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.

4 Electrical Characteristics Diagrams

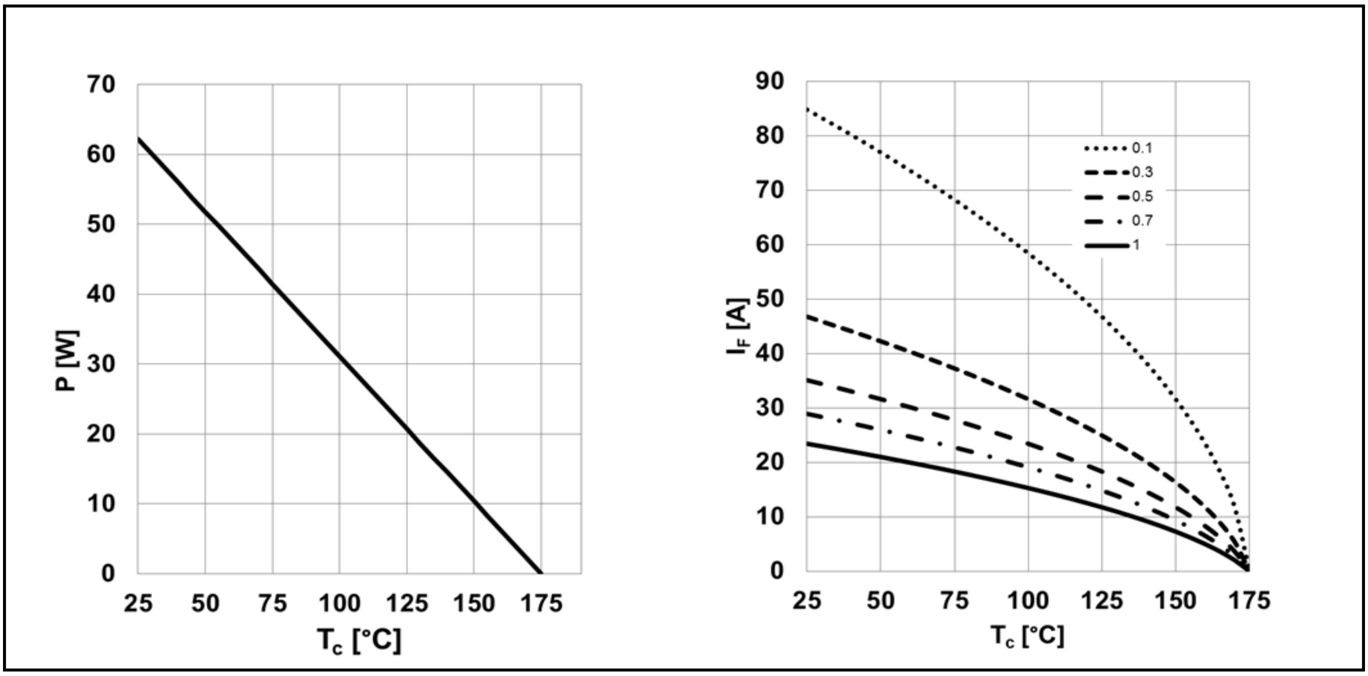


Figure 1 (LEFT) Power dissipation; P_{tot}= f(T_C); $R_{thJC,max}$
(RIGHT) Diode forward current; I_F= f(T_C); T_j≤ 175 °C; $R_{thJC,max}$; parameter: D=duty cycle

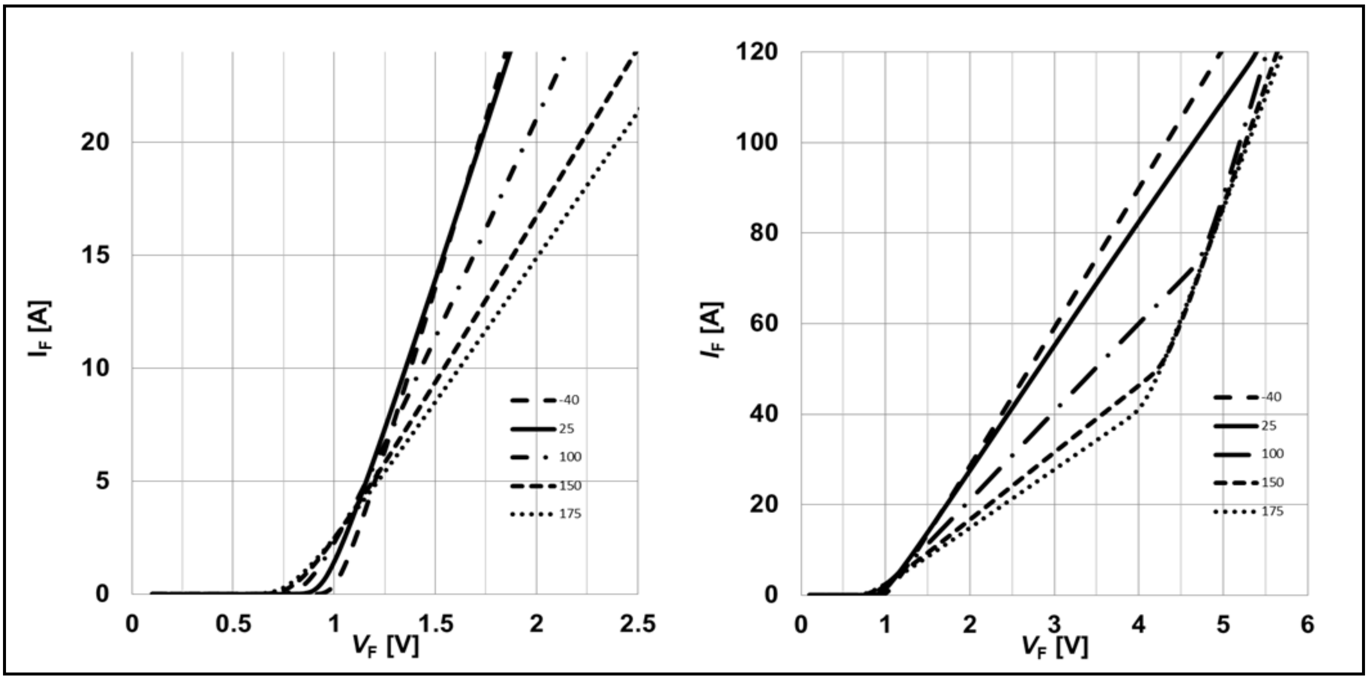


Figure 2 (LEFT) Typical forward characteristic; I_F= f(V_F); t_P=20 µs; parameter:T_j
(RIGHT) Typical forward characteristics in surge current; I_F= f(V_F); t_P=20 µs; parameter:T_j

Electrical Characteristics Diagrams

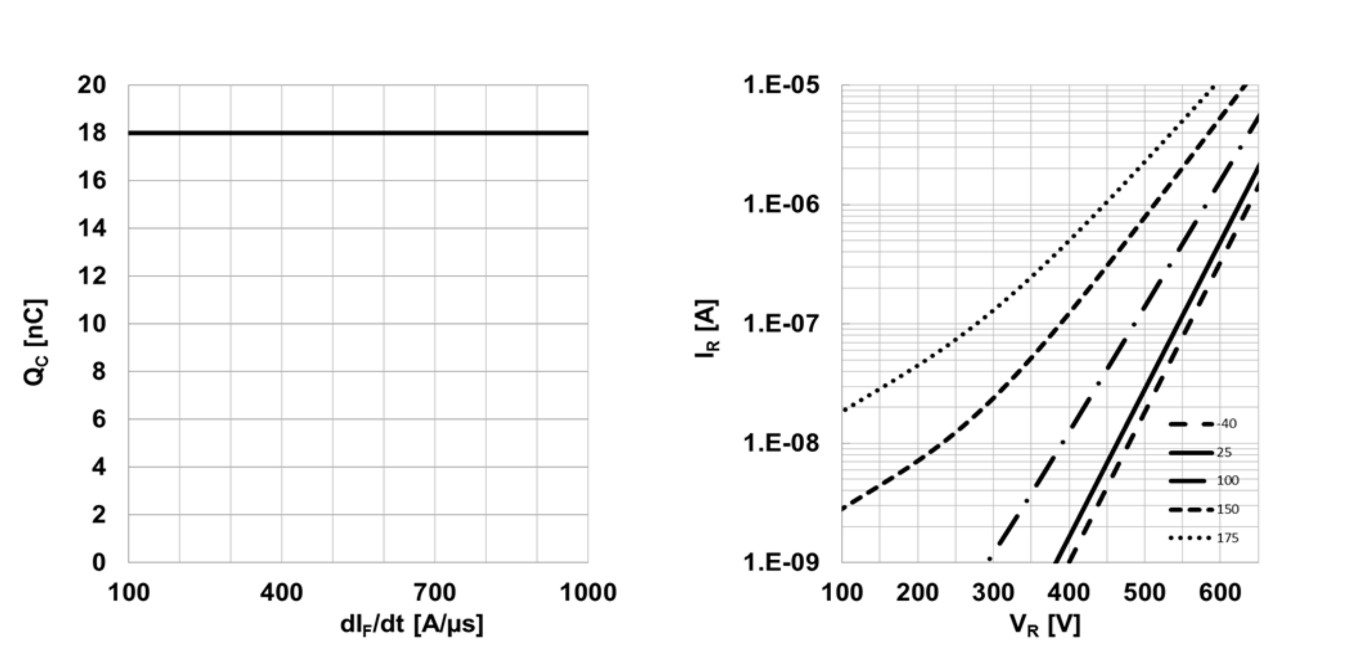
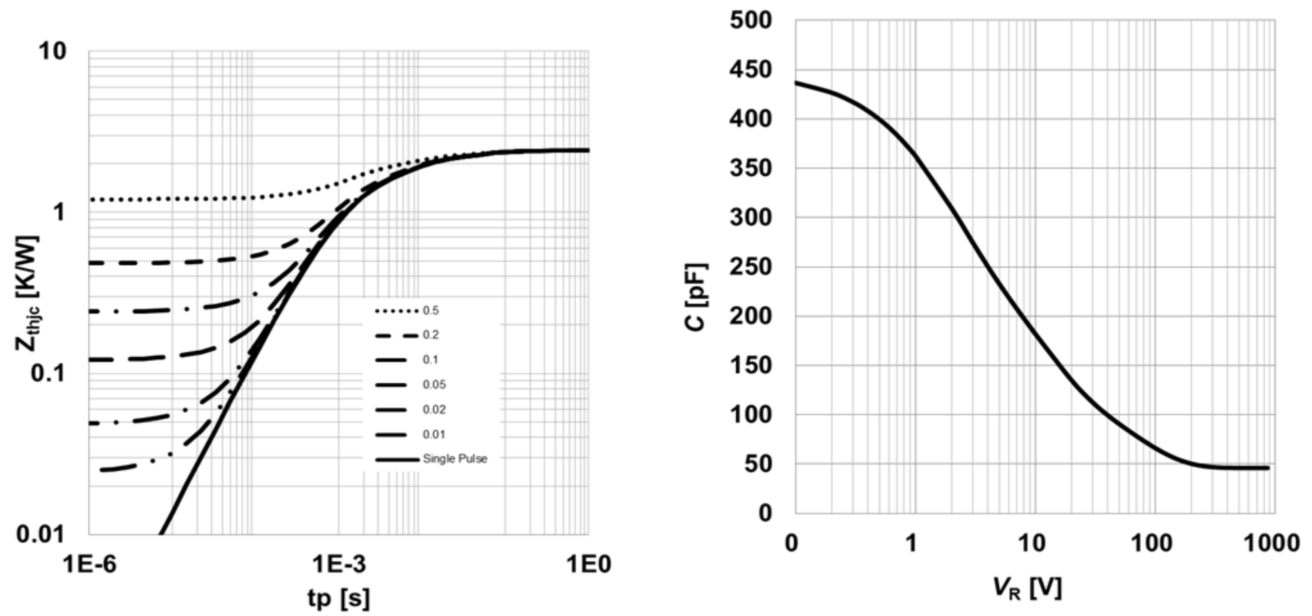


Figure 3 (LEFT) Typical capacitive charge versus current slope (only capacitive charge, guaranteed by design); Q_C= f(di_F/dt); T_j=150°C; V_R=400V; $I_F \leq I_{F,max}$

(RIGHT) Typical reverse current versus reverse voltage; I_R= f(V_R);parameter: T_j



i	1	2	3	4
r_i [K/W]	5.62E-01	3.00E-01	6.78E-01	3.15E-01
T_i [s]	6.22E-04	1.00E-03	4.27E-03	3.36E-02

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°C; f=1 MHz

Electrical Characteristics Diagrams

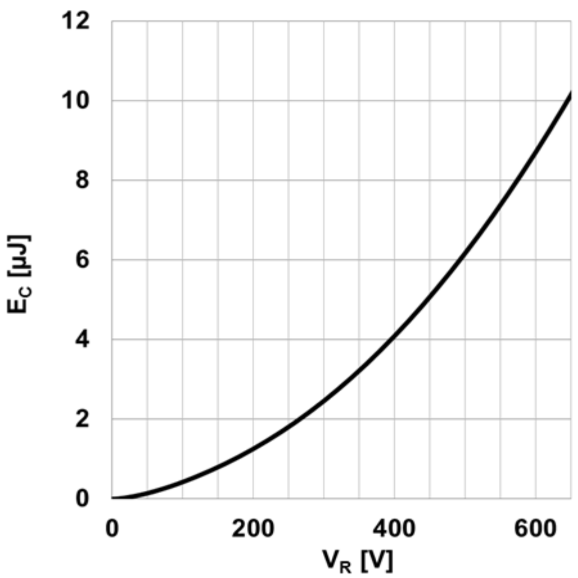
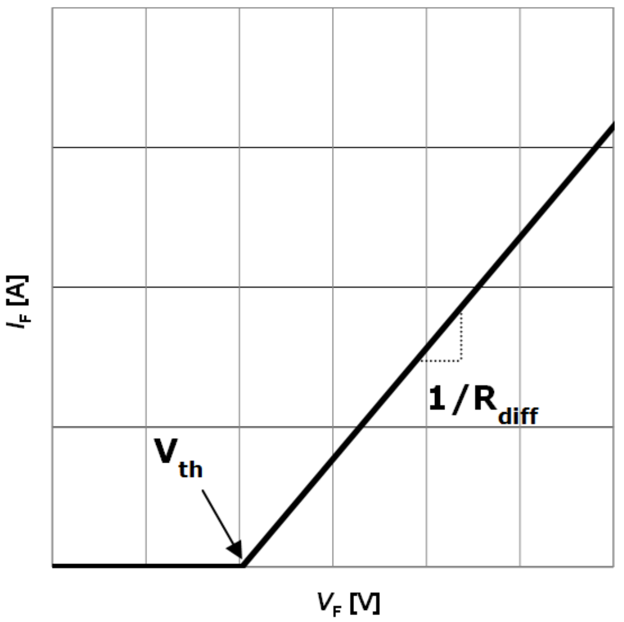


Figure 5 Typical capacitance stored energy; $E_C = f(V_R)$



$$V_F = V_{th} + R_{diff} \cdot I_F$$

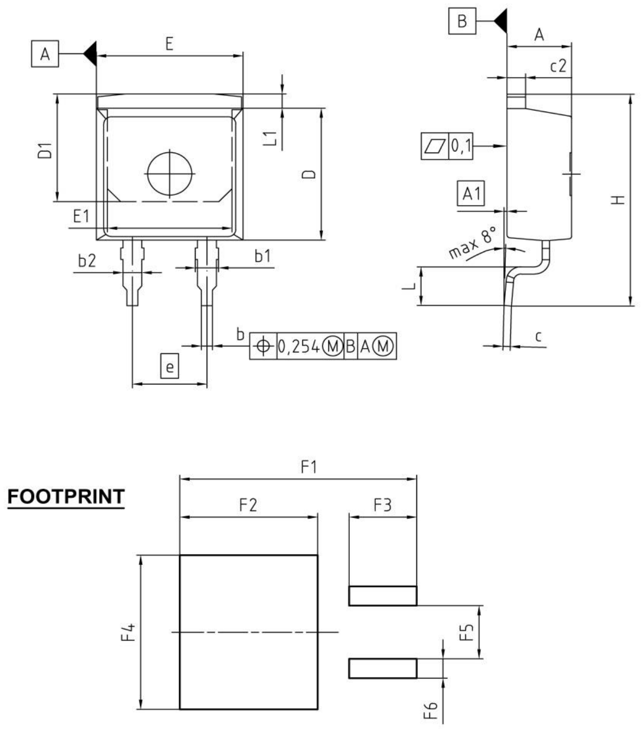
$$V_{th} = A \cdot T_j + B \text{ [V]}$$

$$R_{diff} = C \cdot T_j^2 + D \cdot T_j + E \text{ } [\Omega]$$

A =	-9.2E-04	[V/°C]
B =	1.0E+00	[V]
C =	1.0E-06	[Ω/(°C)²]
D =	6.1E-05	[Ω/°C]
E =	3.3E-02	[Ω]

Figure 6 Simplified forward characteristics model $V_F = f(I_F)$;
-40°C < T_j <175°C; I_F< 24 A

5 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.50	0.169	0.177
A1	0.00	0.25	0.000	0.010
b	0.65	0.85	0.026	0.033
b1	1.19	1.69	0.047	0.066
b2	1.19	1.39	0.047	0.055
c	0.40	0.60	0.016	0.024
c2	1.17	1.37	0.046	0.054
D	9.05	9.45	0.356	0.372
D1	6.90	7.65	0.272	0.301
E	9.80	10.20	0.386	0.402
E1	7.25	8.60	0.285	0.339
e	5.08 (BSC)		0.200 (BSC)	
N	2		2	
H	14.61	15.88	0.575	0.625
L	2.40	3.00	0.094	0.118
L1	0.70	1.30	0.028	0.051
F1	16.15		0.636	
F2	9.40		0.370	
F3	4.60		0.181	
F4	10.80		0.425	
F5	3.73		0.147	
F6	1.35		0.053	

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REVISION
02

Figure 6 Package outline of PG-TO263-2-1 leaded

Revision History

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

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