6th Generation CoolSiC™

650V SiC Schottky Diode

The CoolSiC™ generation 6 (G6) is the leading edge technology from Infineon for the SiC Schottky barrier diodes. The Infineon proprietary innovative G5 technology was enhanced in G6 by introducing further advancements like a novel Schottky metal system. The result is a family of products with improved efficiency over all load conditions, resulting from a lower figure of merit (Q_c x V_F). The CoolSiC™ Schottky diode 650 V G6 has been designed to complement our 600 V and 650 V CoolMOS™ 7 families, meeting the most stringent application requirements in this voltage range.

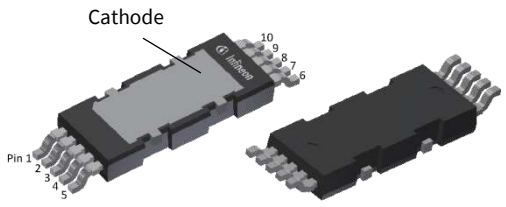
Table 1 Key performance parameters

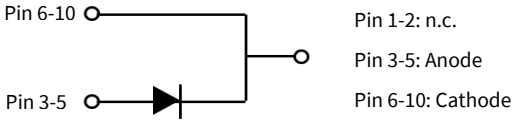
Parameter	Value	Unit
V_{RRM}	650	V
Q_C (V_R = 400 V)	14.7	nC
E_C (V_R = 400 V)	2.7	µJ
I_F (T_C ≤ 150 °C, D = 1)	10	A
V_F (I_F = 10 A, T_j = 25 °C)	1.25	V

Table 2 Package information

Type / ordering Code	Package	Marking
IDDD10G65C6	PG-HDSOP-10-1	D1065C6

PG-HDSOP-10-1





Features

- Best in class forward voltage (1.25 V)
- Best in class figure of merit (Q_c x V_F)
- High dv/dt ruggedness (150 V/ns)

Benefits

- System efficiency improvement
- System cost and size savings due to the reduced cooling requirements
- Enabling higher frequency and increased power density

Potential Applications

- Power factor correction in SMPS
- Solar inverter
- Uninterruptible power supply

Product Validation

- Qualified for industrial applications according to the relevant tests of JEDEC (J-STD20 and JESD22)

Table of Content

1 Maximum ratings 3
2 Thermal characteristics 3
3 Electrical characteristics 4
3.1 Static characteristics 4
3.2 AC characteristics 4
4 Diagrams 5
5 Simplified forward characteristic 7
6 Package outlines 8

1 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Continuous forward current	I_F	–	–	10	A	$T_C \le 150$ °C, $D = 1$
		–	–	15		$T_C \le 125$ °C, $D = 1$
		–	–	29		$T_C \le 25$ °C, $D = 1$
Surge-repetitive forward current, sine halfwave[1]	$I_{F,RM}$	–	–	44		$T_C = 25$ °C, $t_p = 10$ ms
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	–	–	55		$T_C = 25$ °C, $t_p = 10$ ms
		–	–	44		$T_C = 150$ °C, $t_p = 10$ ms
Non-repetitive peak forward current	$I_{F,max}$	–	–	600		$T_C = 25$ °C, $t_p = 10$ µs
i^2t value	$\int i^2dt$	–	–	15	A^2s	$T_C = 25$ °C, $t_p = 10$ ms
		–	–	10		$T_C = 150$ °C, $t_p = 10$ ms
Repetitive peak reverse voltage	V_{RRM}	–	–	650	V	$T_C = 25$ °C
Diode dv/dt ruggedness	dv/dt	–	–	150	V/ns	$V_R = 0..480$ V
Power dissipation	P_{tot}	–	–	105	W	$T_C = 25$°C, $R_{thJC,max}$
Operating and storage temperature	T_j T_{stg}	-55	–	175	°C	–

2 Thermal characteristics

Table 4 Thermal characteristics

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case	R_{thJC}	–	0.9	1.4	K/W	–
Thermal resistance, junction-ambient	R_{thJA}	–	–	62		Device on PCB, minimal footprint
Thermal resistance, junction-ambient for SMD version	R_{thJA}	–	35	45		Device on 40*40*1.5 mm epoxy PCB FR4 (one layer, 70 µm thickness) with 6 cm^2 copper for cathode connection and cooling, PCB vertically placed without air stream cooling
Soldering temperature	T_{sold}	–	–	260	°C	Allowed only reflow soldering

[1] The surge-repetitive forward current test was performed with 1000 pulses (half-wave rectified sine with the 10 ms period).

3 Electrical characteristics

3.1 Static characteristics

Table 5 Static characteristics

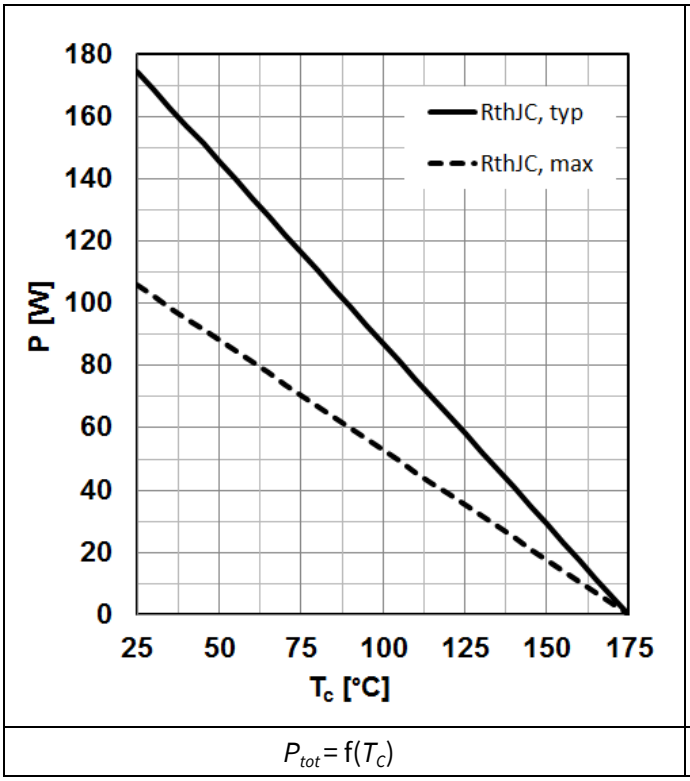
Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
DC blocking voltage	V_{DC}	650	–	–	V	T_j = 25 °C
Diode forward voltage	V_F	–	1.25	1.35		I_F = 10 A, T_j = 25 °C
		–	1.5	–		I_F = 10 A, T_j = 150 °C
Reverse current	I_R	–	1.0	33	µA	V_R = 420 V, T_j = 25 °C
		–	33	–		V_R = 420 V, T_j = 125 °C
		–	77	–		V_R = 420 V, T_j = 150 °C

3.2 AC characteristics

Table 6 AC characteristics

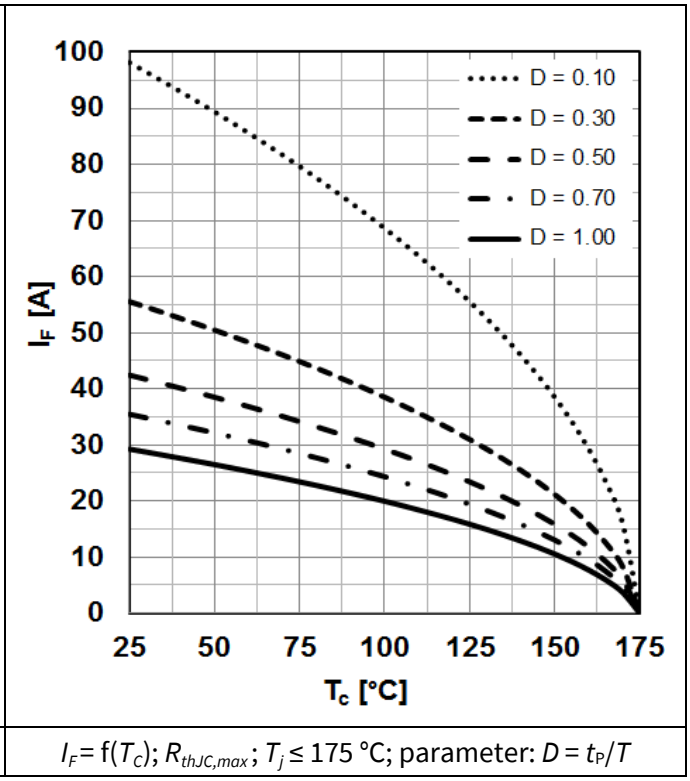
Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_c	–	14.7	–	nC	V_R = 400 V, T_j = 150 °C, di/dt = 200 A/µs, $I_F \leq I_{F,MAX}$
Total capacitance	C	–	495	–	pF	V_R = 1 V, f = 1 MHz, T_j = 25 °C
		–	29	–		V_R = 300 V, f = 1 MHz, T_j = 25 °C
		–	28	–		V_R = 600 V, f = 1 MHz, T_j = 25 °C

4 Diagrams



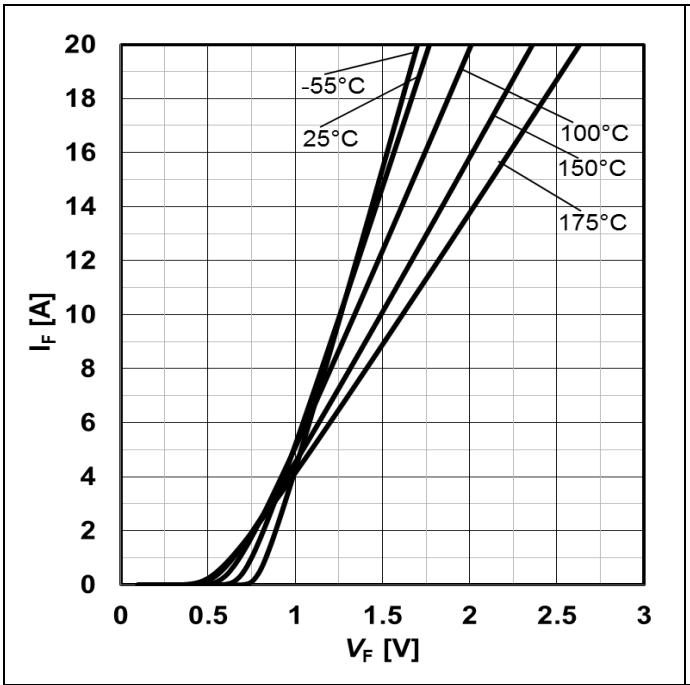
$P_{tot} = f(T_C)$

Figure 1 Power dissipation



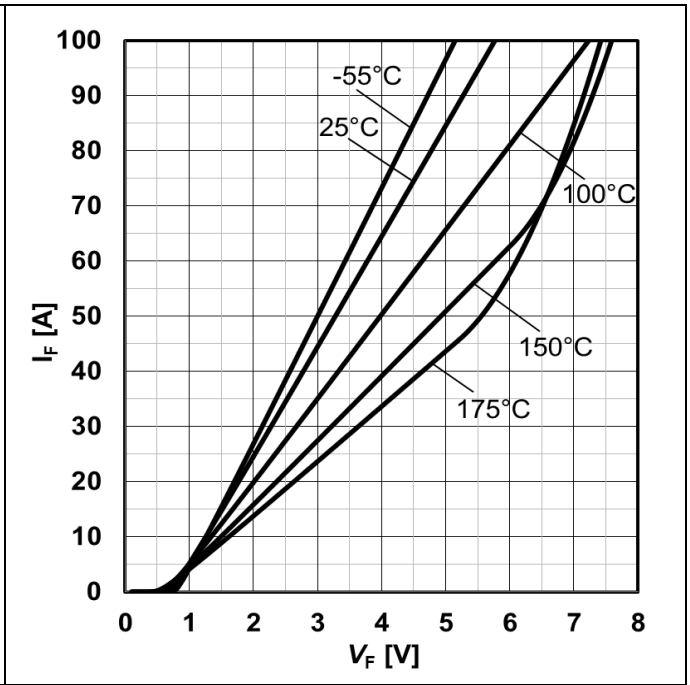
$I_F = f(T_C)$; $R_{thJC,max}$; $T_j \leq 175$ °C; parameter: $D = t_P/T$

Figure 2 Max. forward current



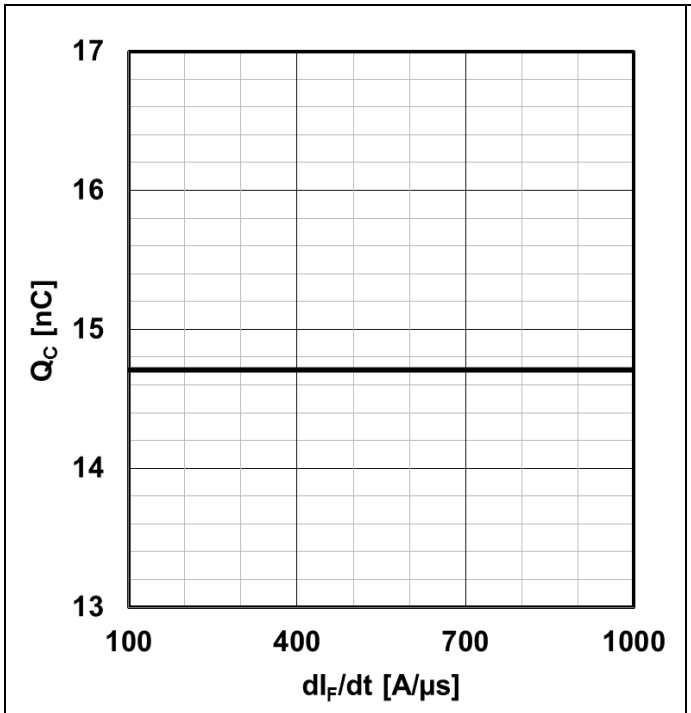
$I_F = f(V_F)$; $t_p = 10$ µs; parameter: T_j

Figure 3 Typ. forward characteristics



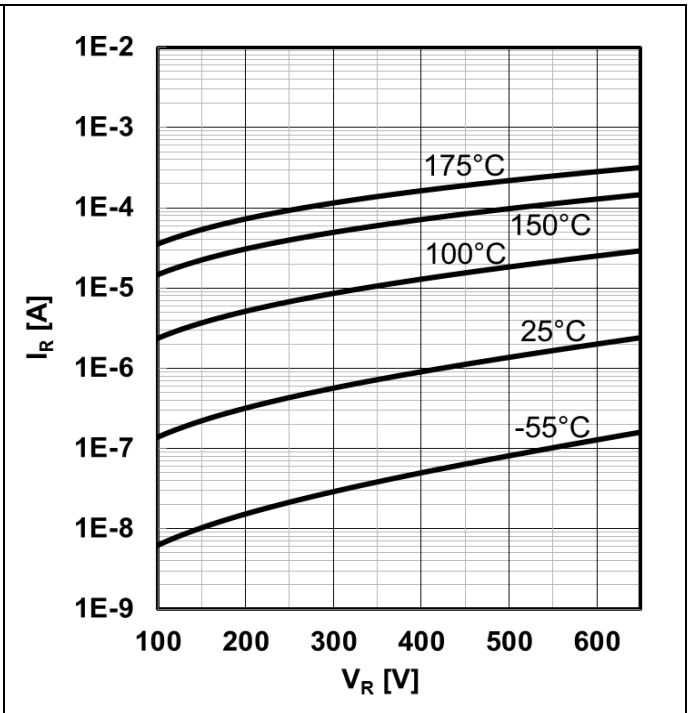
$I_F = f(V_F)$; $t_p = 10$ µs; parameter: T_j

Figure 4 Typ. forward characteristics in surge current



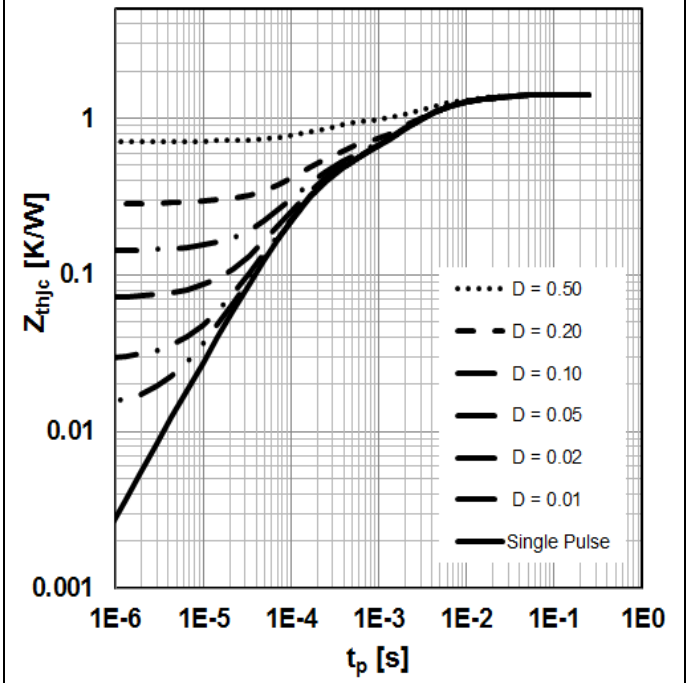
$Q_C = f(di_F/dt)$; T_j = 150 °C; V_R = 400 V; $I_F \leq I_{F,max}$

Figure 5 Typ. cap. charge vs. current slope



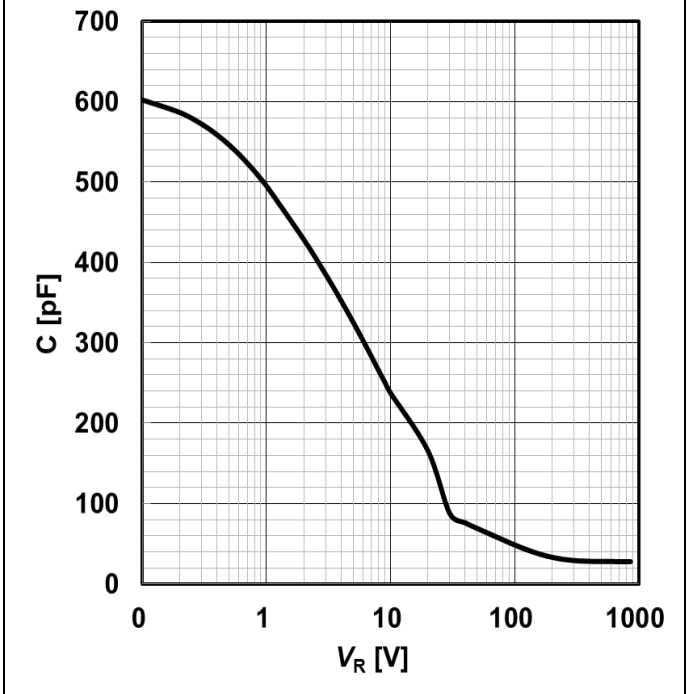
$I_R = f(V_R)$; parameter: T_j

Figure 6 Typ. reverse current vs. reverse voltage



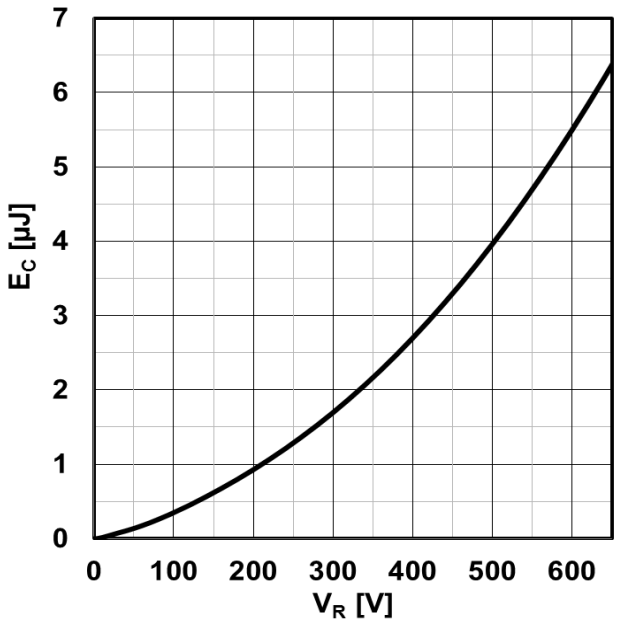
$Z_{th,jc}$ = f(t_P); parameter: $D = t_P/T$

Figure 7 Max. transient thermal impedance



$C = f(V_R)$; T_j = 25 °C; f = 1 MHz

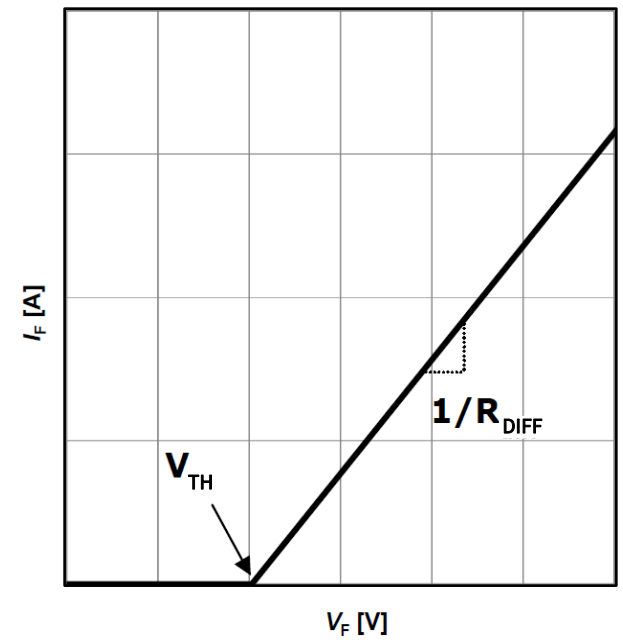
Figure 8 Typ. capacitance vs. reverse voltage



$E_C = f(V_R)$

Figure 9 Typ. capacitance stored energy

5 Simplified forward characteristic



$V_F = f(I_F)$

Figure 10 Equivalent forward current curve

$$V_F = V_{TH} + R_{DIFF} \times I_F$$

Treshold voltage (V_{TH}):

$$V_{TH}(T_j) = -0.001 \times T_j + 0.766 \ [\mathrm{V}]$$

Differential resistance (R_{DIFF}):

$$R_{DIFF}(T_j) = A \times T_j^{\,2} + B \times T_j + C \ [\Omega]$$

$$A = 1.24 \times 10^{-6}$$

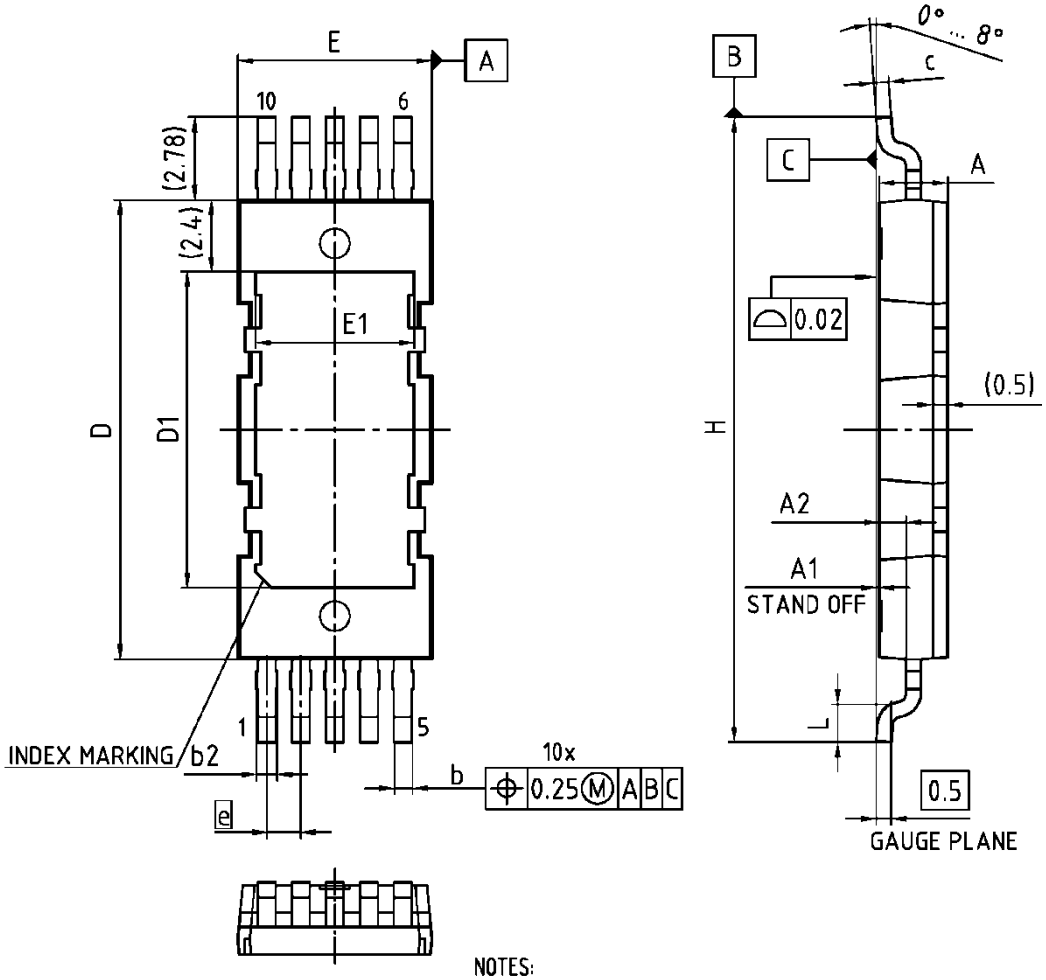
$$B = 8.99 \times 10^{-5}$$

$$C = 4.75 \times 10^{-2}$$

T_j [°C]; -55 °C ≤ T_j ≤ 175 °C; I_F ≤ 10 A

Figure 11 Mathematical Equation

6 Package outlines



NOTES:
1. INDUSTRIAL QUALITY GRADE
2. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 AND DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
3. ALL METAL SUFACES ARE TIN PLATED, EXCEPT AREA OF CUT.

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	2.20	2.35
A1	0.00	0.15
A2	0.89	1.10
b	0.57	0.63
b2	0.57	0.93
c	0.46	0.58
D	15.20	15.60
D1	10.50	10.70
E	6.40	6.60
E1	5.20	5.50
e	1.14	
N	10	
H	20.81	21.11
L	1.20	1.40

DOCUMENT NO. Z8B00184263
REVISION 01
SCALE 5:1 0 1 2 3 4 5mm
EUROPEAN PROJECTION
ISSUE DATE 06.02.2017

Figure 12 Outlines of the package PG-HDSOP-10-1, dimensions in milimeters

Revision History

IDDD10G65C6

Revision: 2018-02-26, Rev. 2.0

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.0	2018-02-26	Release of final version

Trademarks of Infineon Technologies AG

AURIX™, C166™, CanPAK™, CIPOS™, CoolGaN™, CoolMOS™, CoolSET™, CoolSiC™, CORECONTROL™, CROSSAVE™, DAVE™, DI-POL™, DrBlade™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPACK™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, Infineon™, ISOFACE™, IsoPACK™, i-Wafer™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OmniTune™, OPTIGA™, OptiMOS™, ORIGA™, POWERCODE™, PRIMARION™, PrimePACK™, PrimeSTACK™, PROFET™, PRO-SIL™, RASIC™, REAL3™, ReverSave™, SatRIC™, SIEGET™, SIPMOS™, SmartLEWIS™, SOLID FLASH™, SPOC™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™.

Trademarks updated August 2015

Other Trademarks

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

We Listen to Your Comments
Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to:
erratum@infineon.com

Published by
Infineon Technologies AG
81726 München, Germany
© 2018 Infineon Technologies AG
All Rights Reserved.

Legal Disclaimer
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics (“Beschaffenheitsgarantie”) .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.
In addition, any information given in this document is subject to customer’s compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer’s products and any use of the product of Infineon Technologies in customer’s applications.
The data contained in this document is exclusively 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.

Information
For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (**www.infineon.com**).

Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.
The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.