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.

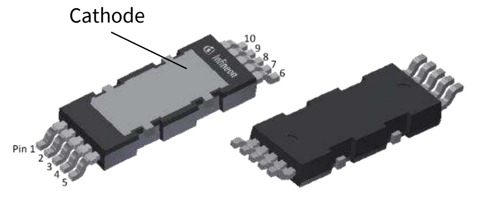
Table 1 Key performance parameters

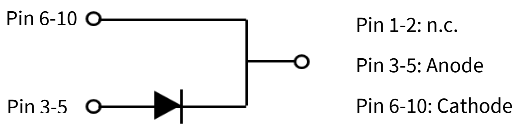
Parameter	Value	Unit
V_{RRM}	650	V
Q_C (V_R = 400 V)	6.9	nC
E_C (V_R = 400 V)	1.1	µJ
I_F (T_C ≤ 155 °C, D = 1)	4	A
V_F (I_F = 4 A, T_j = 25 °C)	1.25	V

Table 2 Package information

Type / ordering Code	Package	Marking
IDDD04G65C6	PG-HDSOP-10-1	D0465C6

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

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Continuous forward current	I_F	–	–	4	A	$T_C \le 155$ °C, $D = 1$
		–	–	7		$T_C \le 125$ °C, $D = 1$
		–	–	13		$T_C \le 25$ °C, $D = 1$
Surge-repetitive forward current, sine halfwave[1]	$I_{F,RM}$	–	–	18		$T_C = 25$ °C, $t_p = 10$ ms
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	–	–	29		$T_C = 25$ °C, $t_p = 10$ ms
		–	–	23		$T_C = 150$ °C, $t_p = 10$ ms
Non-repetitive peak forward current	$I_{F,max}$	–	–	250		$T_C = 25$ °C, $t_p = 10$ µs
i²t value	$\int i^2 dt$	–	–	4.3	A²s	$T_C = 25$ °C, $t_p = 10$ ms
		–	–	2.7		$T_C = 150$ °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}	–	–	56	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}	–	1.6	2.6	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 cm² 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

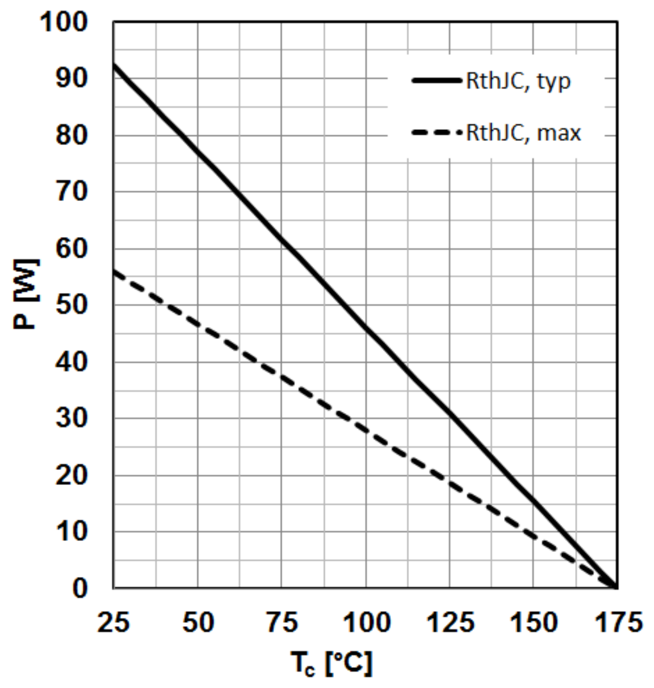
Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
DC blocking voltage	V_{DC}	650	–	–	V	T_j = 25 °C
Diode forward voltage	V_F	–	1.25	1.35		I_F = 4 A, T_j = 25 °C
		–	1.5	–		I_F = 4 A, T_j = 150 °C
Reverse current	I_R	–	0.4	14	µA	V_R = 420 V, T_j = 25 °C
		–	13	–		V_R = 420 V, T_j = 125 °C
		–	31	–		V_R = 420 V, T_j = 150 °C

3.2 AC characteristics

Table 6 AC characteristics

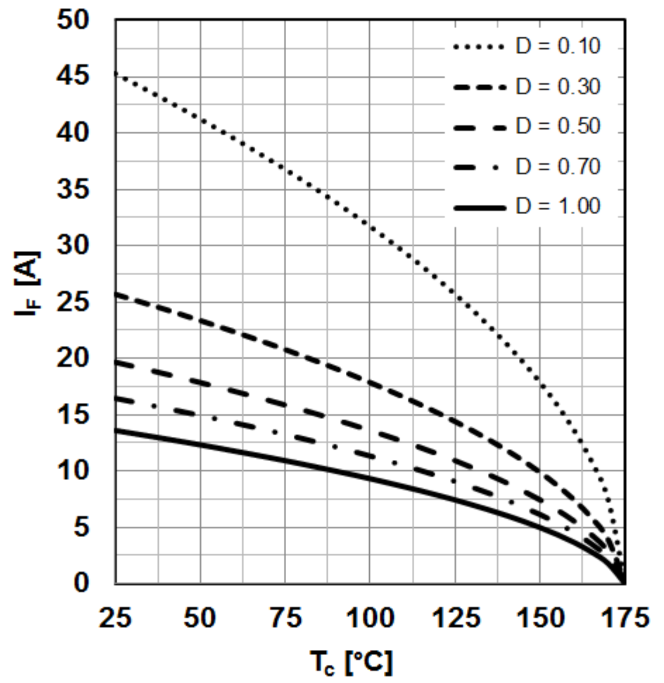
Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_c	–	6.9	–	nC	V_R = 400 V, T_j = 150 °C, di/dt = 200 A/µs, $I_F \leq I_{F,MAX}$
Total capacitance	C	–	205	–	pF	V_R = 1 V, f = 1 MHz, T_j = 25 °C
		–	12	–		V_R = 300 V, f = 1 MHz, T_j = 25 °C
		–	12	–		V_R = 600 V, f = 1 MHz, T_j = 25 °C

4 Diagrams



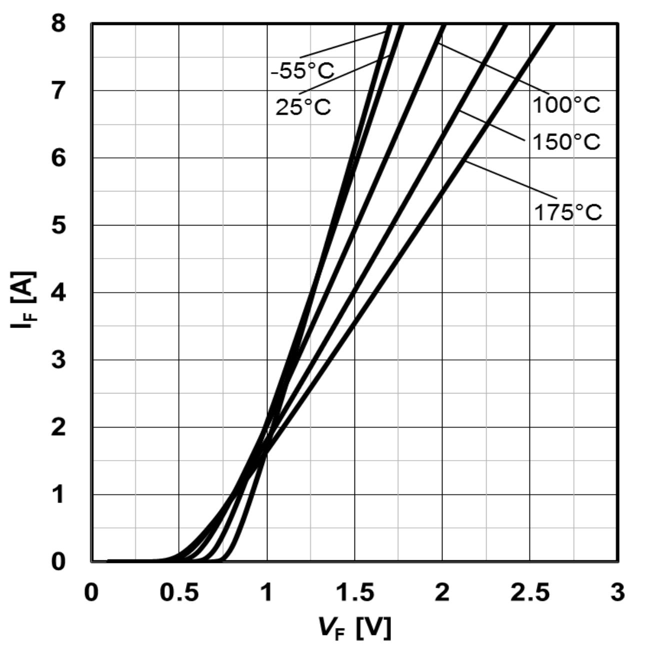
$P_{tot} = f(T_C)$

Figure 1 Power dissipation



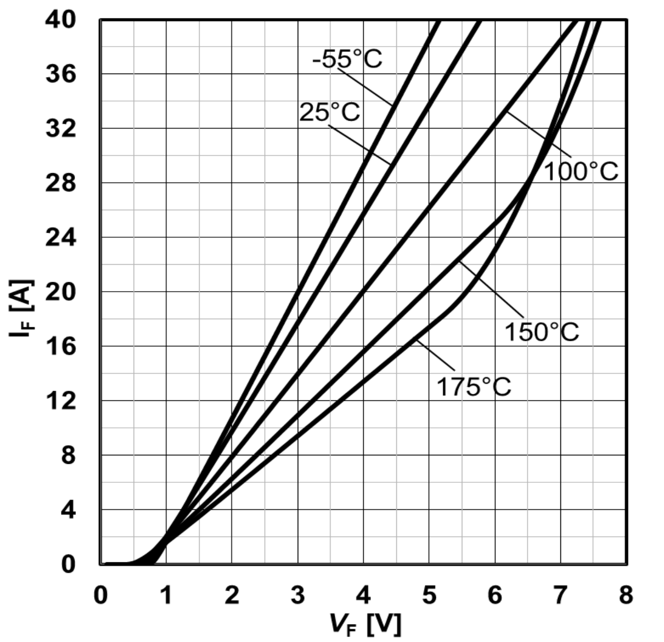
$I_F = f(T_C)$; $R_{thJC,max}$; $T_j \leq 175$ °C; parameter: $D = t_P/T$

Figure 2 Max. forward current



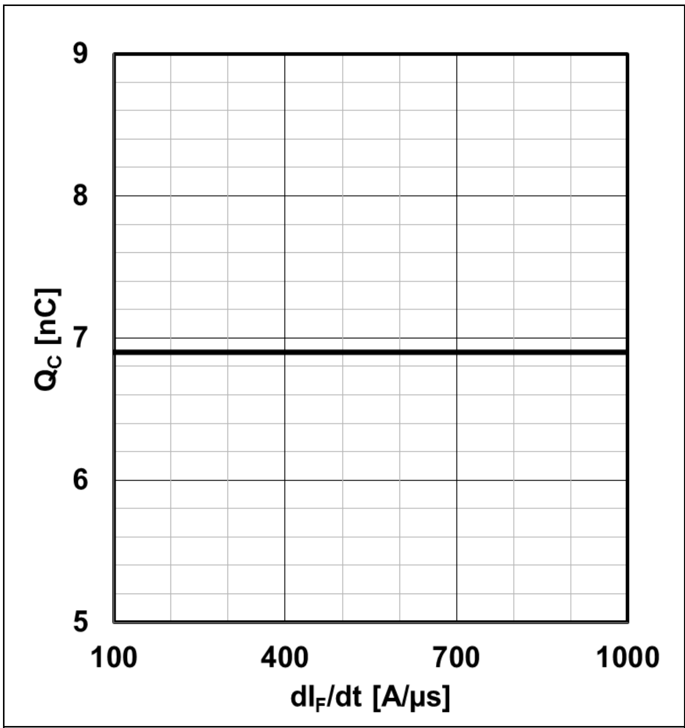
$I_F = f(V_F)$; $t_p = 10$ µs; parameter: T_j

Figure 3 Typ. forward characteristics

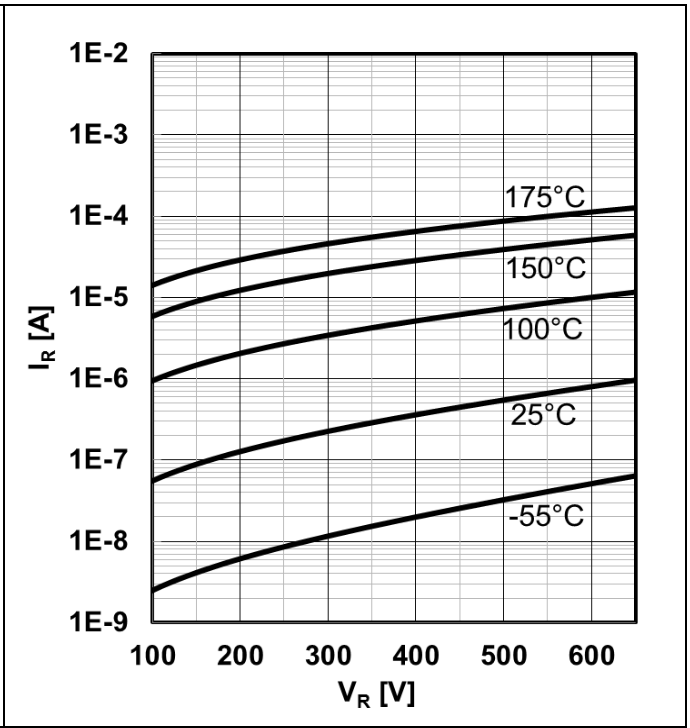


$I_F = f(V_F)$; $t_p = 10$ µs; parameter: T_j

Figure 4 Typ. forward characteristics in surge current



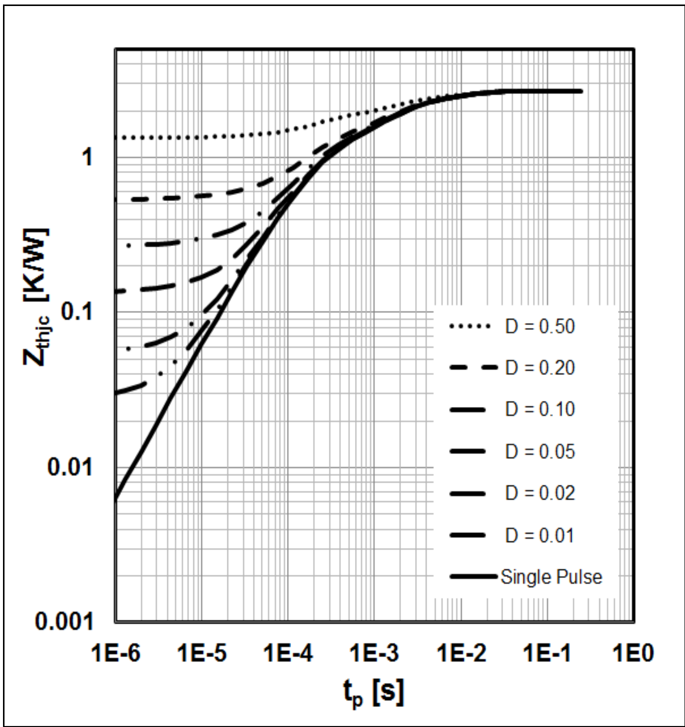
$Q_C = f(di_F/dt)$; $T_j = 150$ °C; $V_R = 400$ V; $I_F \leq I_{F,max}$



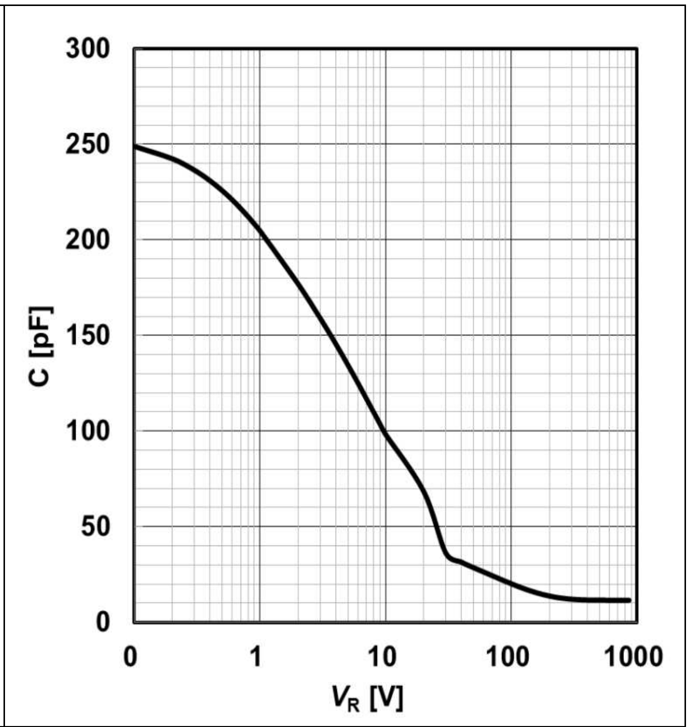
$I_R = f(V_R)$; parameter: T_j

Figure 5 Typ. cap. charge vs. current slope

Figure 6 Typ. reverse current vs. reverse voltage



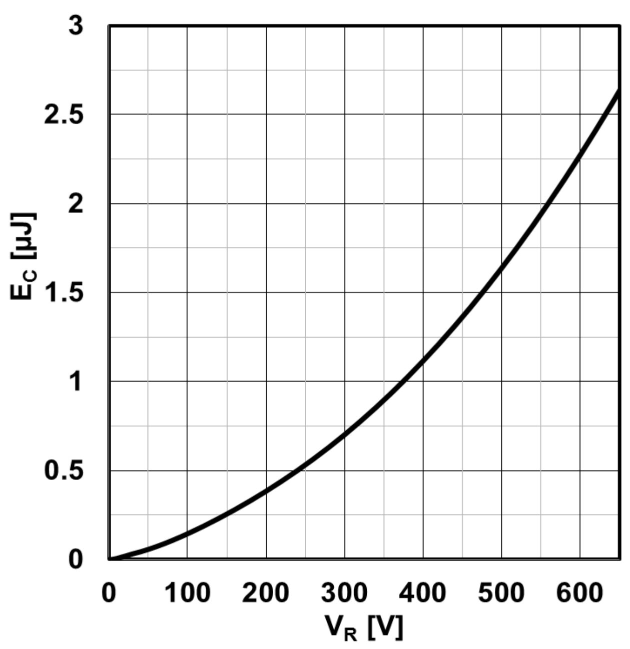
$Z_{th,jc} = f(t_P)$; parameter: $D = t_P/T$



$C = f(V_R)$; $T_j = 25$ °C; $f = 1$ MHz

Figure 7 Max. transient thermal impedance

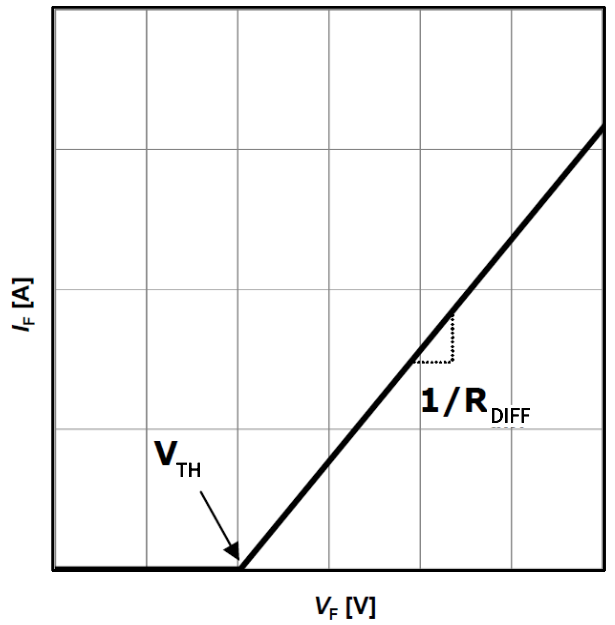
Figure 8 Typ. capacitance vs. reverse voltage



$E_C = f(V_R)$

Figure 9 Typ. capacitance stored energy

5 Simplified forward characteristic



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

Treshold voltage (V_{TH}):

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

Differential resistance (R_{DIFF}):

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

$$A = 3.10 \times 10^{-6}$$

$$B = 2.25 \times 10^{-4}$$

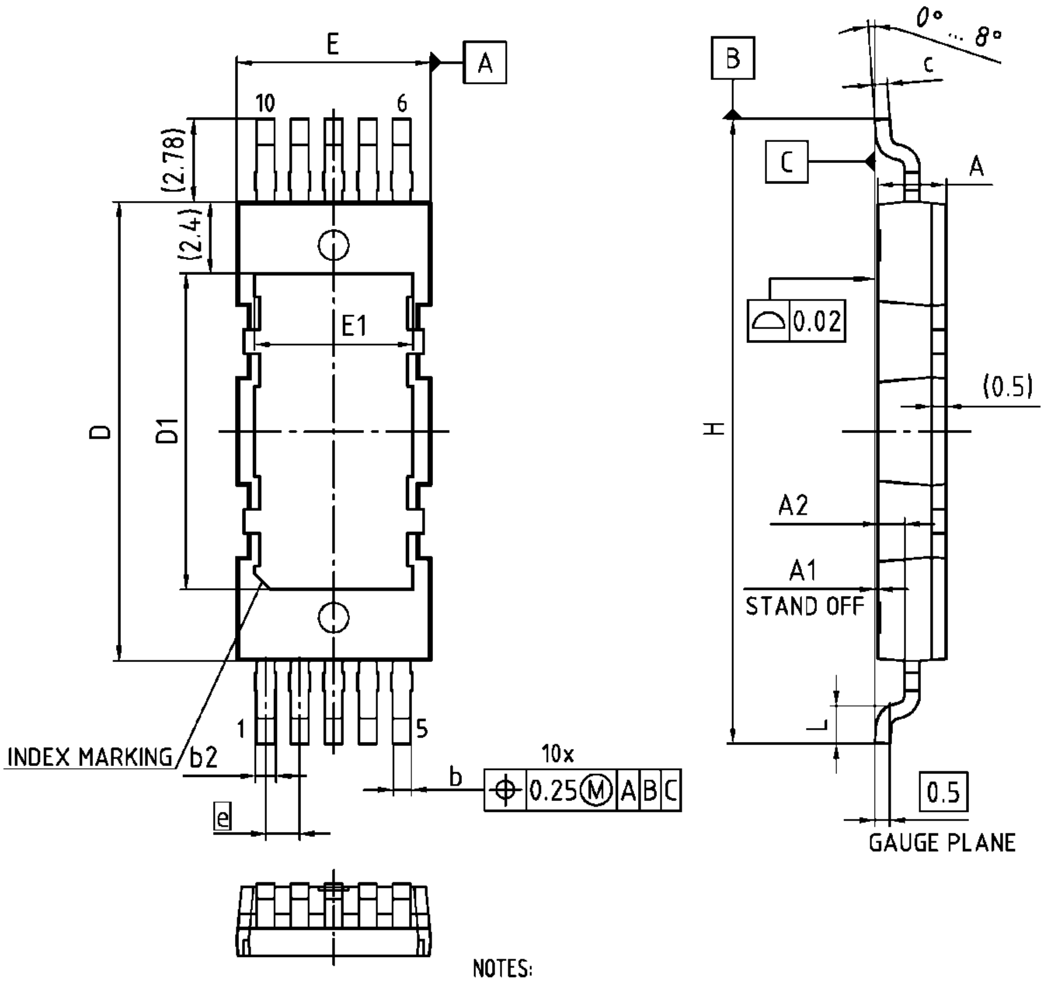
$$C = 11.89 \times 10^{-2}$$

$V_F = f(I_F)$	T_j [°C]; -55 °C ≤ T_j ≤ 175 °C; I_F ≤ 4 A

Figure 10 Equivalent forward current curve

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

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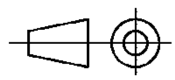
REVISION
01

SCALE 5:1

0 1 2 3 4 5mm

EUROPEAN PROJECTION



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06.02.2017

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

Revision History

IDDD04G65C6

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

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