

# 6<sup>th</sup> Generation CoolSiC™

## 650V SiC Schottky Diode

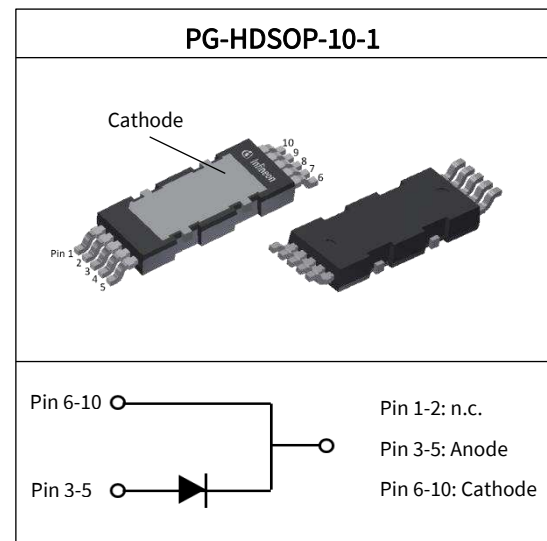
The CoolSiC™ generation 6 (G6) is the leading edge technology from Infineon for the SiC Schottky barrier diodes. The Infineon proprietary innovative G5 technology was enhanced in G6 by introducing further advancements like a novel Schottky metal system. The result is a family of products with improved efficiency over all load conditions, resulting from a lower figure of merit ( $Q_c \times V_F$ ). 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
$I_F$ ( $T_C \leq 155$ °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



### Features

- Best in class forward voltage (1.25 V)
- Best in class figure of merit ( $Q_c \times V_F$ )
- 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)



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## 1 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Continuous forward current	$I_F$	-	-	4	A	$T_C \leq 155\text{ °C}, D = 1$
		-	-	7		$T_C \leq 125\text{ °C}, D = 1$
		-	-	13		$T_C \leq 25\text{ °C}, D = 1$
Surge-repetitive forward current, sine halfwave <sup>1</sup>	$I_{F,RM}$	-	-	18		$T_C = 25\text{ °C}, t_p = 10\text{ ms}$
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	-	-	29		$T_C = 25\text{ °C}, t_p = 10\text{ ms}$
		-	-	23		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$
Non-repetitive peak forward current	$I_{F,max}$	-	-	250	$T_C = 25\text{ °C}, t_p = 10\text{ }\mu\text{s}$	
$i^2t$ value	$\int i^2 dt$	-	-	4.3	A <sup>2</sup> s	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$
		-	-	2.7		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$
Repetitive peak reverse voltage	$V_{RRM}$	-	-	650	V	$T_C = 25\text{ °C}$
Diode dv/dt ruggedness	$dv/dt$	-	-	150	V/ns	$V_R = 0..480\text{ V}$
Power dissipation	$P_{tot}$	-	-	56	W	$T_C = 25\text{ °C}, R_{thJC,max}$
Operating and storage temperature	$T_j$	-55	-	175	°C	-
	$T_{stg}$					

## 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 $\mu\text{m}$ thickness) with 6 $\text{cm}^2$ copper for cathode connection and cooling, PCB vertically placed without air stream cooling
Soldering temperature	$T_{sold}$	-	-	260	°C	Allowed only reflow soldering

<sup>1</sup> 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	$T_j = 25\text{ °C}$
Diode forward voltage	$V_F$	–	1.25	1.35		$I_F = 4\text{ A}, T_j = 25\text{ °C}$
		–	1.5	–	$I_F = 4\text{ A}, T_j = 150\text{ °C}$	
Reverse current	$I_R$	–	0.4	14	$\mu\text{A}$	$V_R = 420\text{ V}, T_j = 25\text{ °C}$
		–	13	–		$V_R = 420\text{ V}, T_j = 125\text{ °C}$
		–	31	–		$V_R = 420\text{ V}, T_j = 150\text{ °C}$

#### 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	$V_R = 400\text{ V}, T_j = 150\text{ °C},$ $di/dt = 200\text{ A}/\mu\text{s}, I_F \leq I_{F,MAX}$
Total capacitance	C	–	205	–	pF	$V_R = 1\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$
		–	12	–		$V_R = 300\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$
		–	12	–		$V_R = 600\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$

## 4 Diagrams

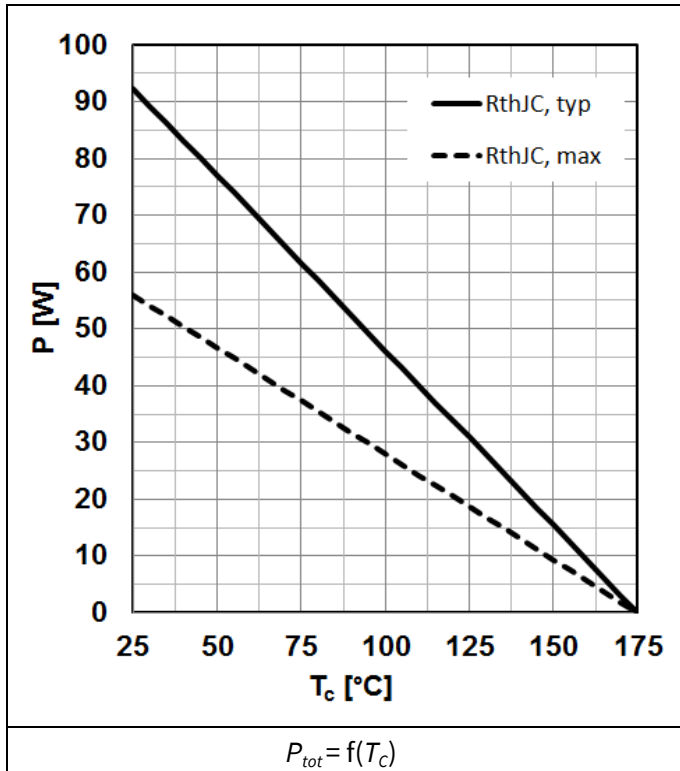


Figure 1 Power dissipation

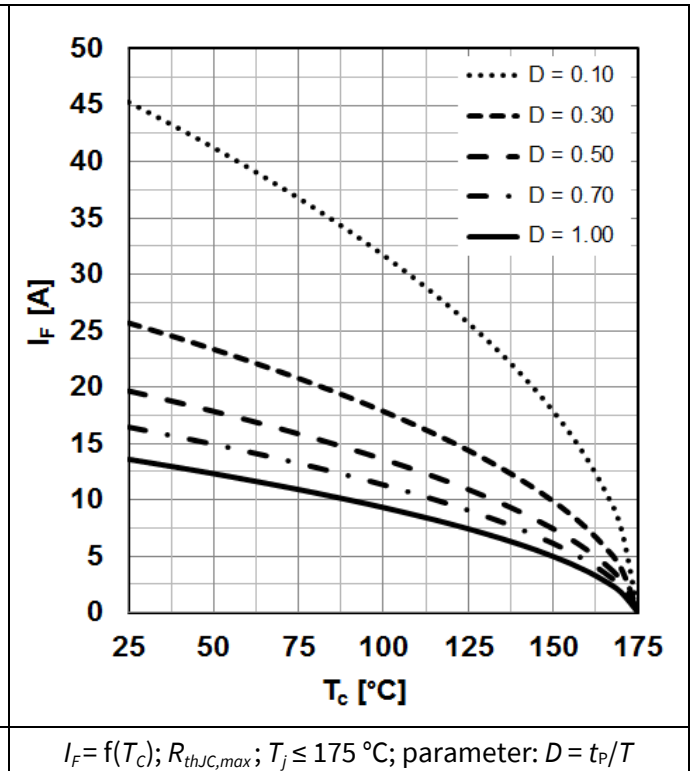


Figure 2 Max. forward current

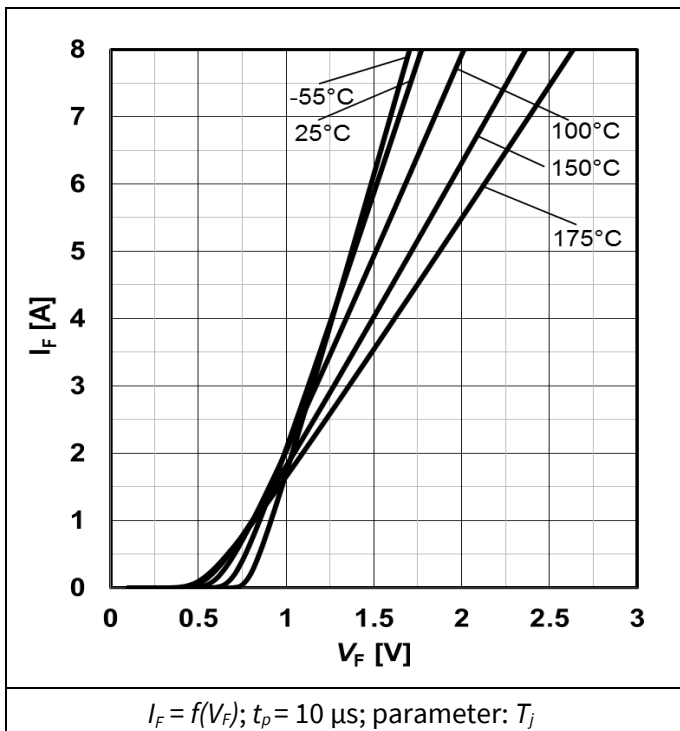


Figure 3 Typ. forward characteristics

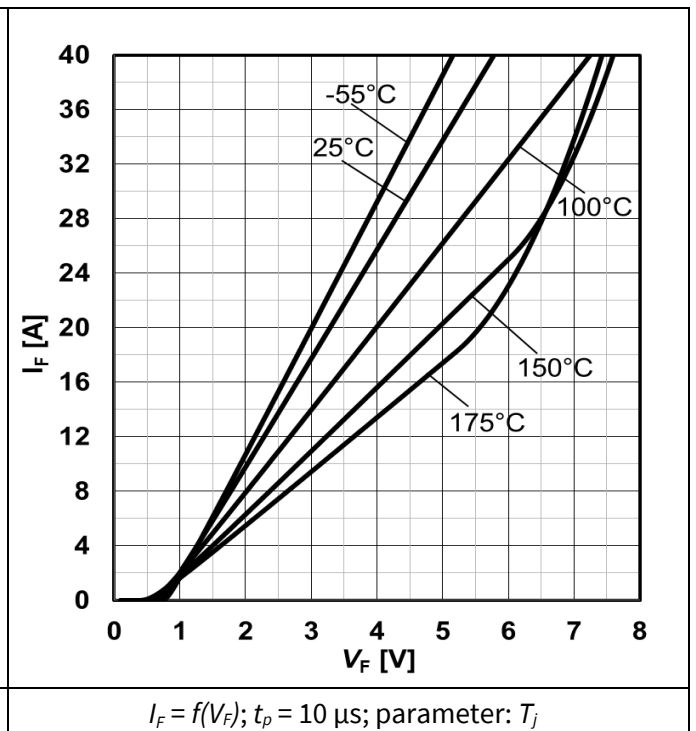
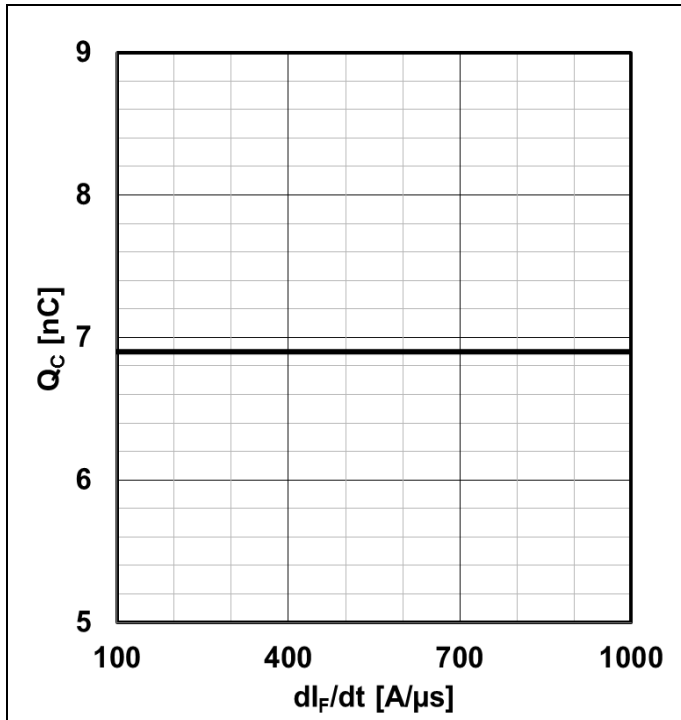
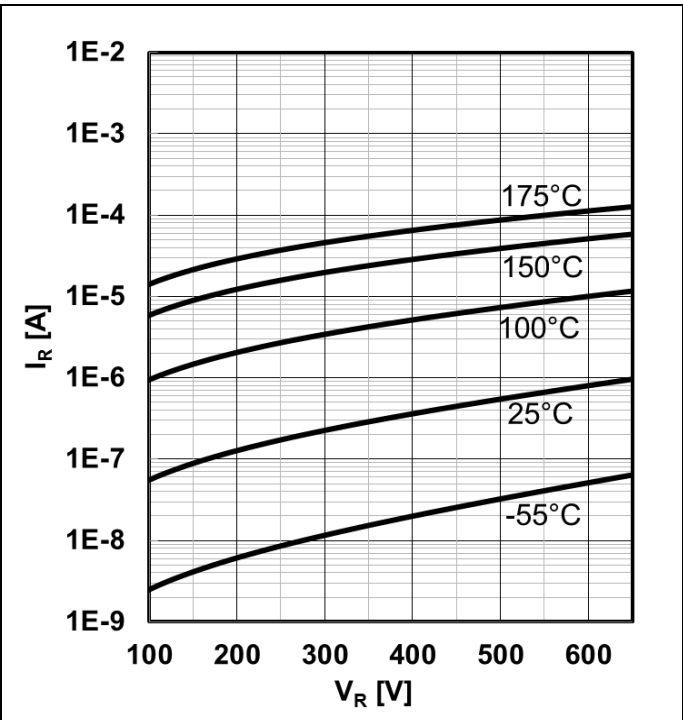


Figure 4 Typ. forward characteristics in surge current



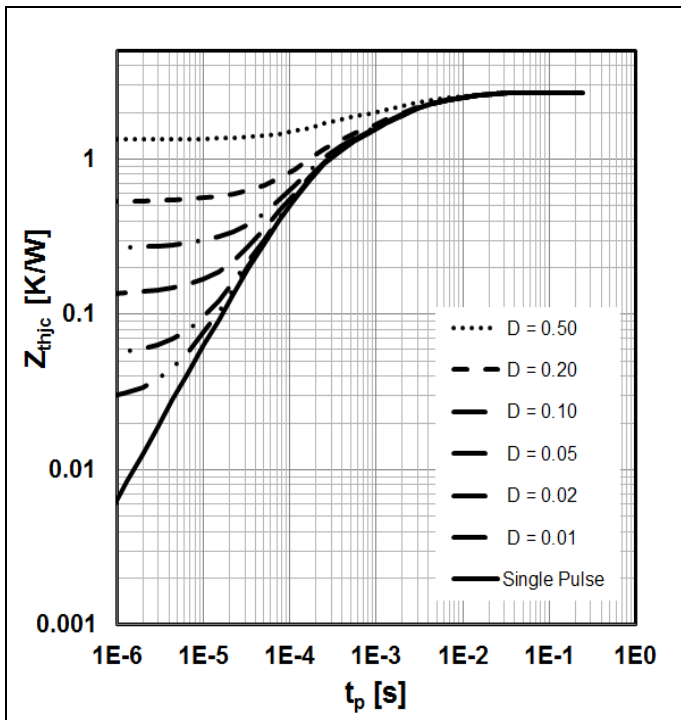
$Q_c = f(di_F/dt); T_j = 150\text{ °C}; V_R = 400\text{ V}; I_F \leq I_{F,max}$

Figure 5 Typ. cap. charge vs. current slope



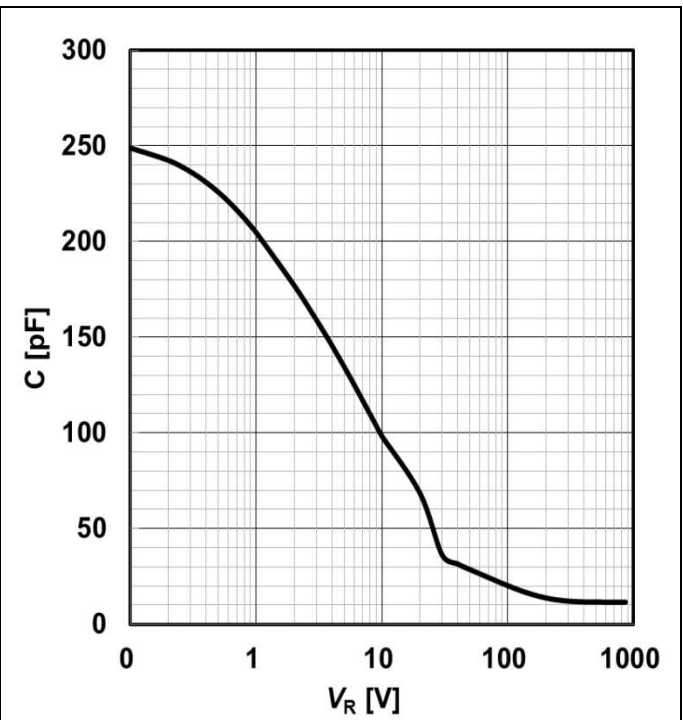
$I_R = f(V_R); \text{parameter: } T_j$

Figure 6 Typ. reverse current vs. reverse voltage



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

Figure 7 Max. transient thermal impedance



$C = f(V_R); T_j = 25\text{ °C}; f = 1\text{ MHz}$

Figure 8 Typ. capacitance vs. reverse voltage

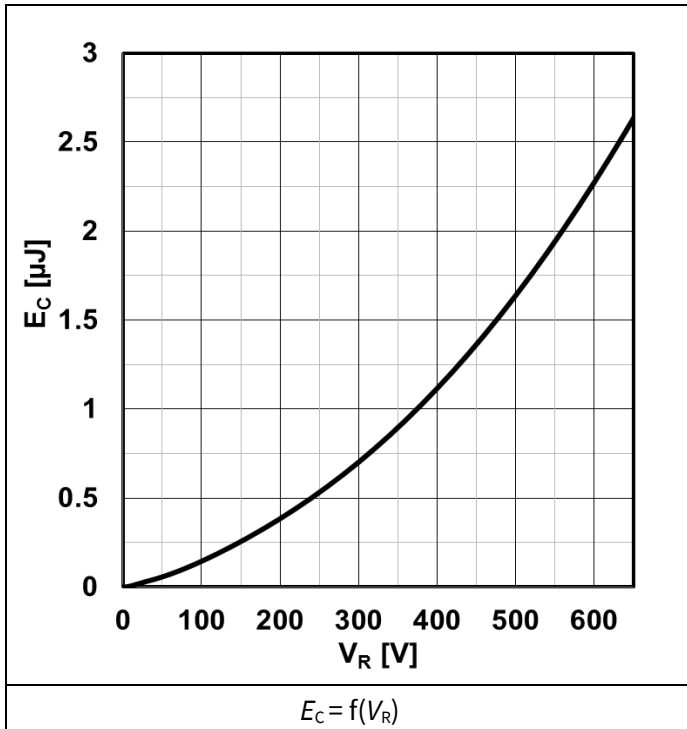


Figure 9 Typ. capacitance stored energy

## 5 Simplified forward characteristic

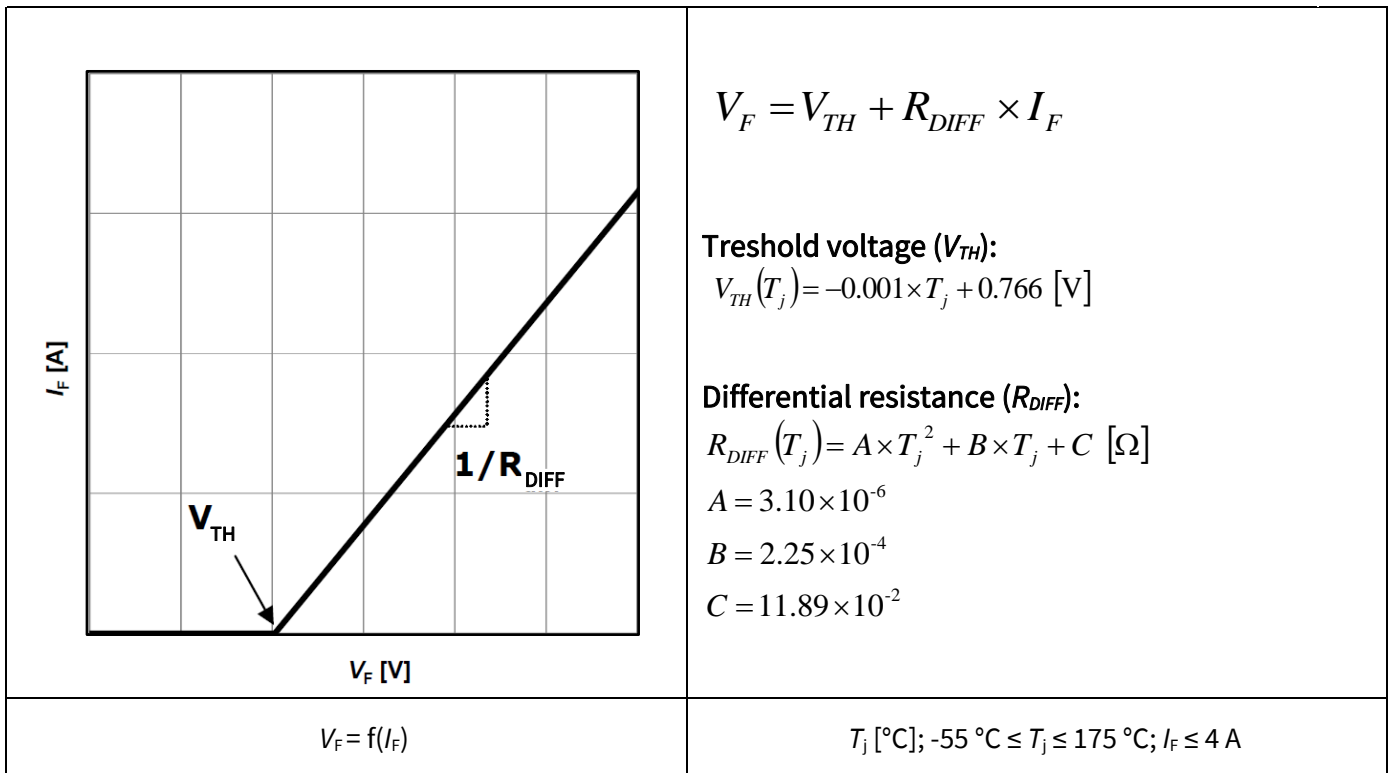


Figure 10 Equivalent forward current curve

Figure 11 Mathematical Equation

## 6 Package outlines

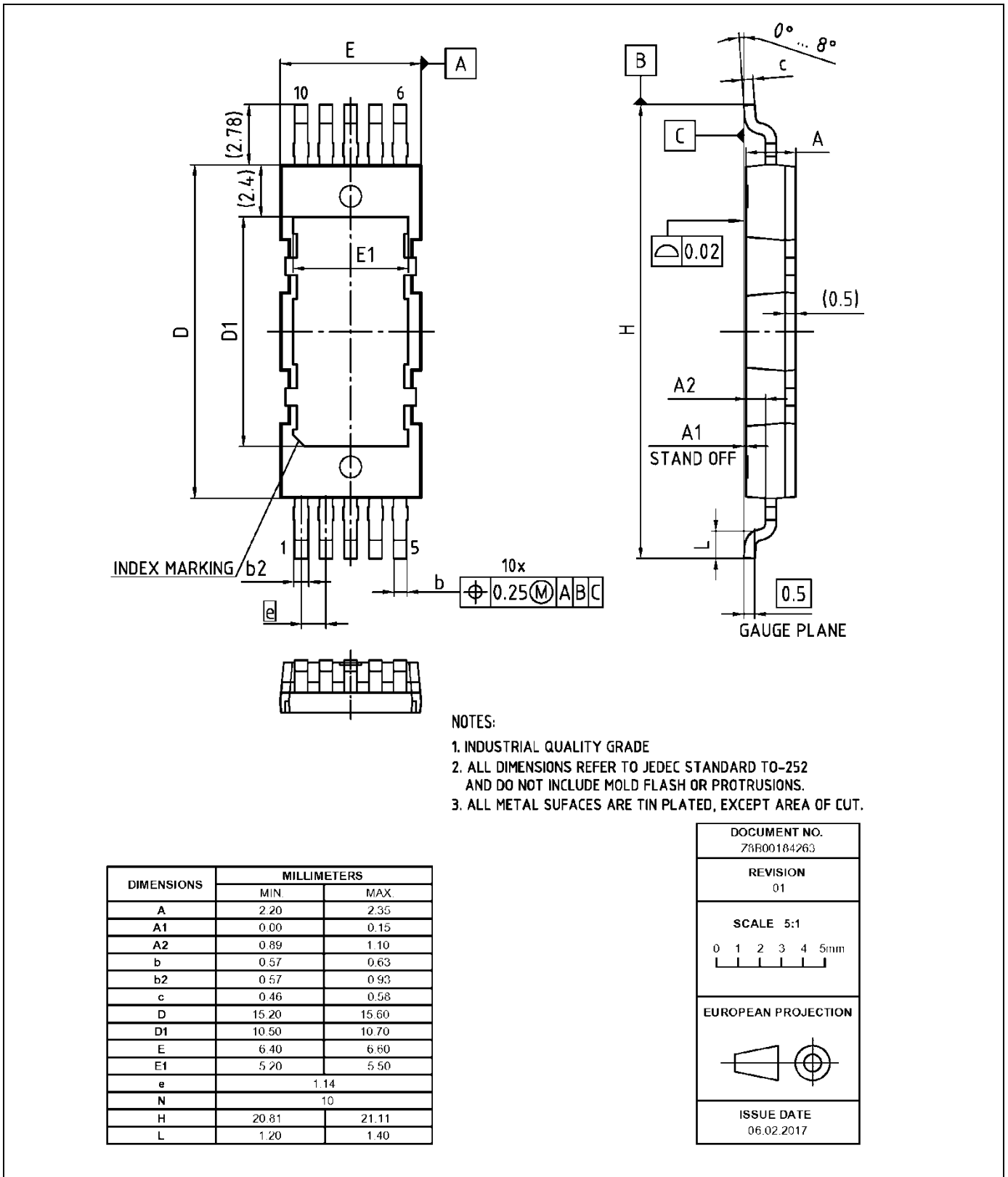


Figure 12 Outlines of the package PG-HDSOP-10-1, dimensions in millimeters



## 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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