

# 6<sup>th</sup> Generation CoolSiC™

## 650V SiC Schottky Diode

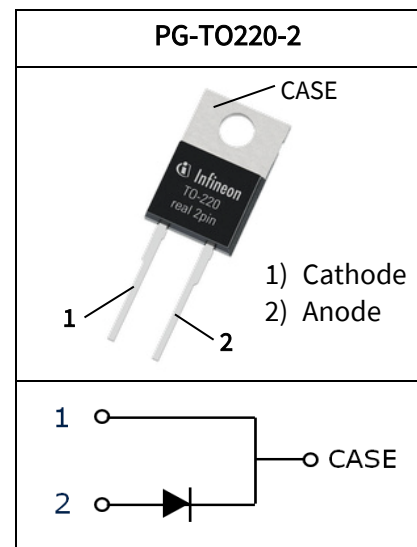
The CoolSiC™ Generation 6 is the leading edge technology from Infineon for the SiC Schottky Barrier diodes. The Infineon proprietary diffusion soldering process is combined with a more compact design, thin-wafer technology and a novel Schottky metal system. The result is a family of products with improved efficiency over all load conditions, resulting from a lower figure of merit ( $Q_c \times V_F$ ). CoolSiC™ Generation 6 has been designed to complement our 600V and 650V 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
$Q_C (V_R = 400 \text{ V})$	17.1	nC
$E_C (V_R = 400 \text{ V})$	3.2	$\mu\text{J}$
$I_F (T_C \leq 140 \text{ }^\circ\text{C}, D = 1)$	12	A
$V_F (I_F = 12 \text{ A}, T_j = 25 \text{ }^\circ\text{C})$	1.25	V

**Table 2** Package information

Type / ordering Code	Package	Marking
IDH12G65C6	PG-TO220-2	D1265C6



### 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	$I_F$	-	-	12	A	$T_C \leq 140\text{ °C}, D = 1$
		-	-	15		$T_C \leq 125\text{ °C}, D = 1$
		-	-	27		$T_C \leq 25\text{ °C}, D = 1$
Surge-repetitive forward current, sine halfwave <sup>1</sup>	$I_{F,RM}$	-	-	53		$T_C = 25\text{ °C}, t_p = 10\text{ ms}$
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	-	-	64		$T_C = 25\text{ °C}, t_p = 10\text{ ms}$
		-	-	51		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$
Non-repetitive peak forward current	$I_{F,max}$	-	-	630	$T_C = 25\text{ °C}, t_p = 10\text{ }\mu\text{s}$	
$i^2t$ value	$\int i^2 dt$	-	-	21	A <sup>2</sup> s	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$
		-	-	13		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$
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	$P_{tot}$	-	-	81	W	$T_C = 25\text{ °C}, R_{thJC,max}$
Operating and storage temperature	$T_j$	-55	-	175	°C	-
	$T_{stg}$					
Mounting torque	-	-	-	70	Ncm	M3 screw

## 2 Thermal characteristics

Table 4 Thermal characteristics (PG-TO-220-2)

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case	$R_{thJC}$	-	1.1	1.9	K/W	-
Thermal resistance, junction-ambient	$R_{thJA}$	-	-	62		leaded
Soldering temperature, wavesoldering only allowed at leads	$T_{sold}$	-	-	260	°C	1.6 mm (0.063 in.) from case for 10 s

<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		$I_F = 12\text{ A}, T_j = 25\text{ °C}$
		–	1.5	–		$I_F = 12\text{ A}, T_j = 150\text{ °C}$
Reverse current	$I_R$	–	1.2	40	$\mu\text{A}$	$V_R = 420\text{ V}, T_j = 25\text{ °C}$
		–	40	–		$V_R = 420\text{ V}, T_j = 125\text{ °C}$
		–	92	–		$V_R = 420\text{ V}, T_j = 150\text{ °C}$

#### 3.2 AC characteristics

Table 6 AC characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	$Q_C$	–	17.1	–	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	–	594	–	pF	$V_R = 1\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$
		–	35	–		$V_R = 300\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$
		–	34	–		$V_R = 600\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$

## 4 Diagrams

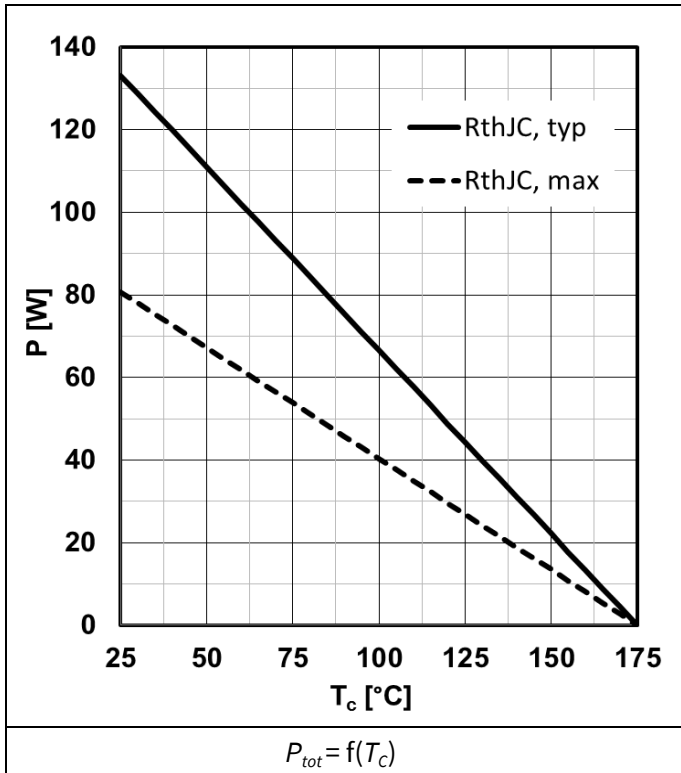


Figure 1 Power dissipation

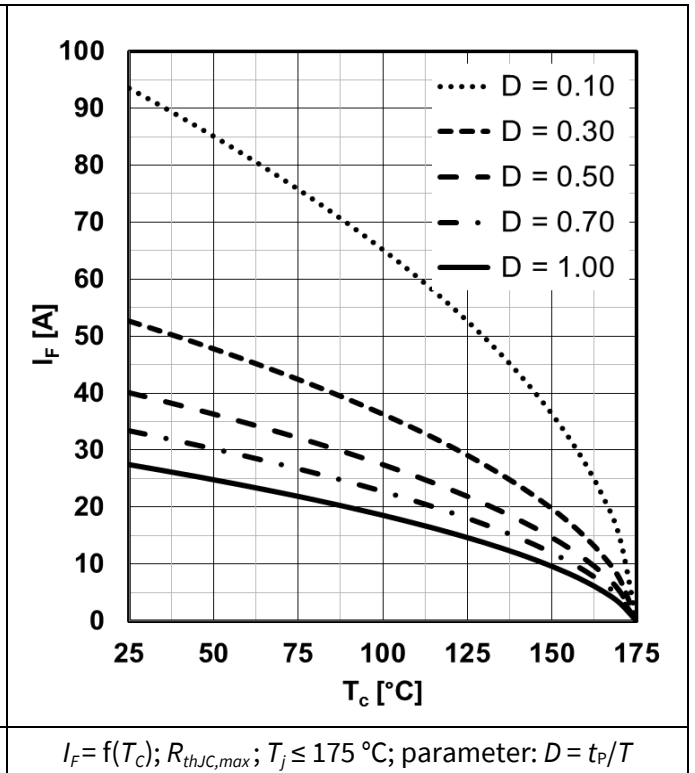


Figure 2 Max. forward current

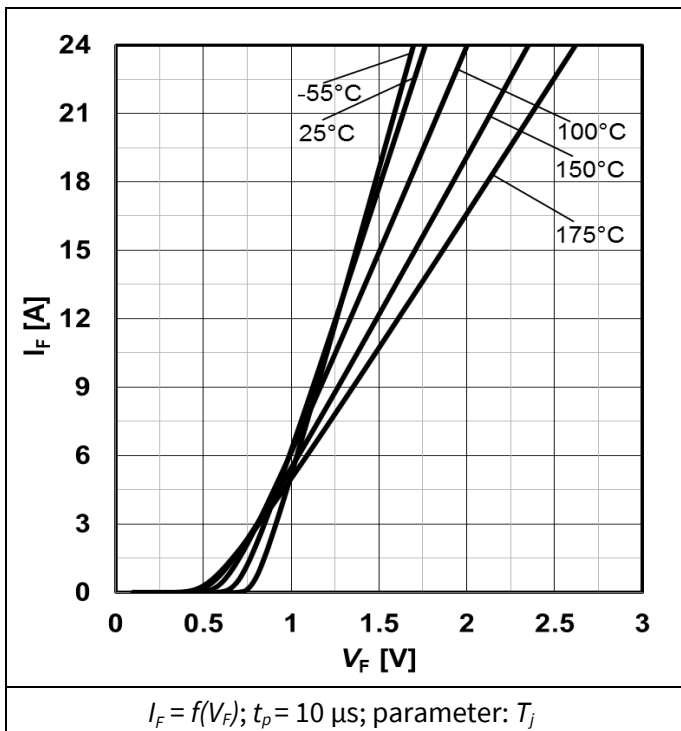


Figure 3 Typ. forward characteristics

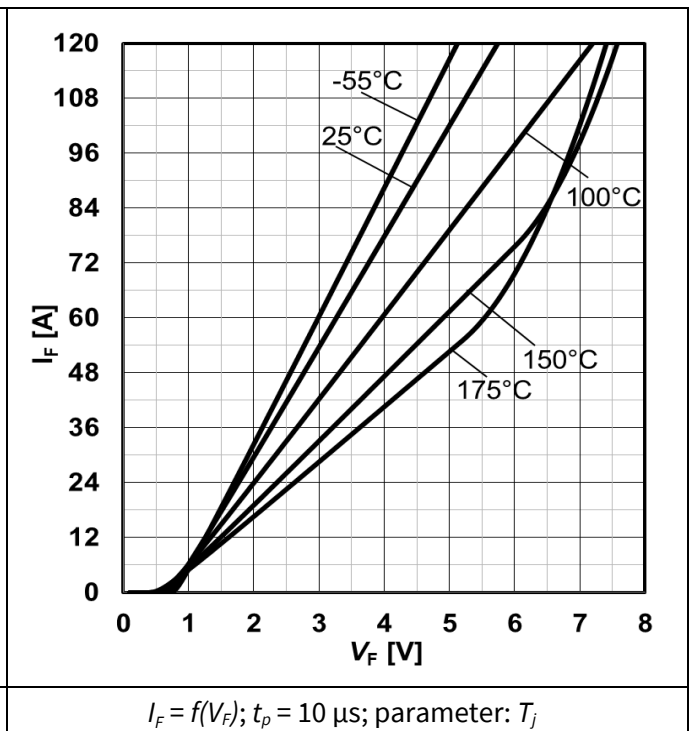


Figure 4 Typ. forward characteristics in surge current

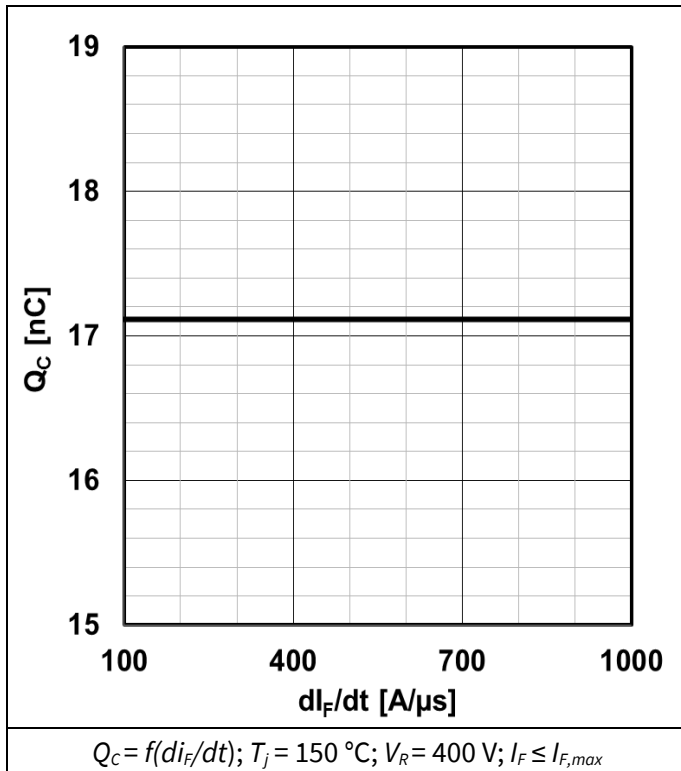


Figure 5 Typ. cap. charge vs. current slope

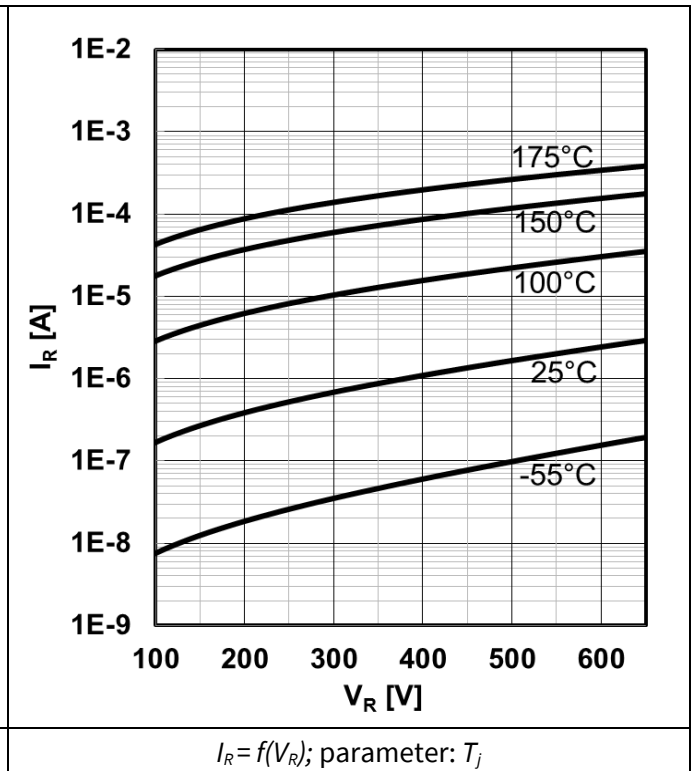


Figure 6 Typ. reverse current vs. reverse voltage

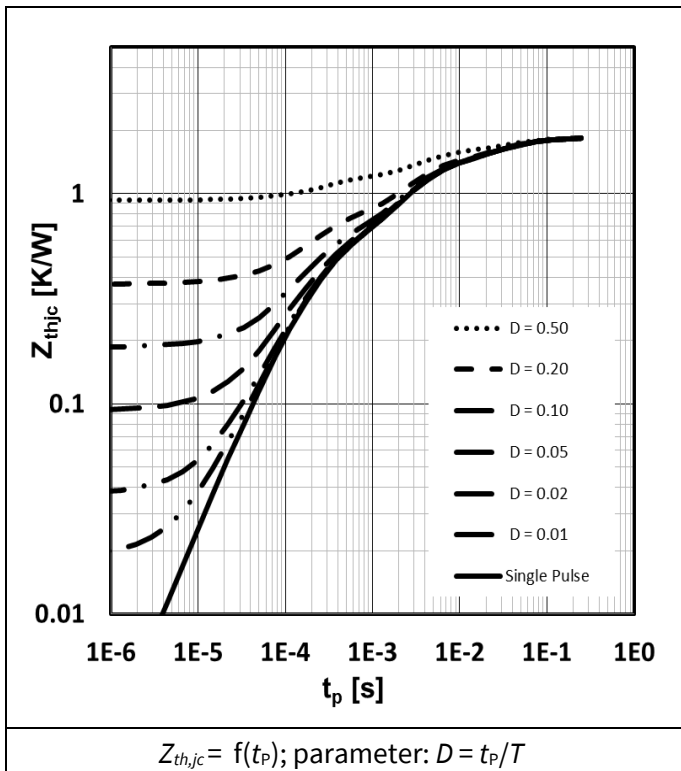


Figure 7 Max. transient thermal impedance

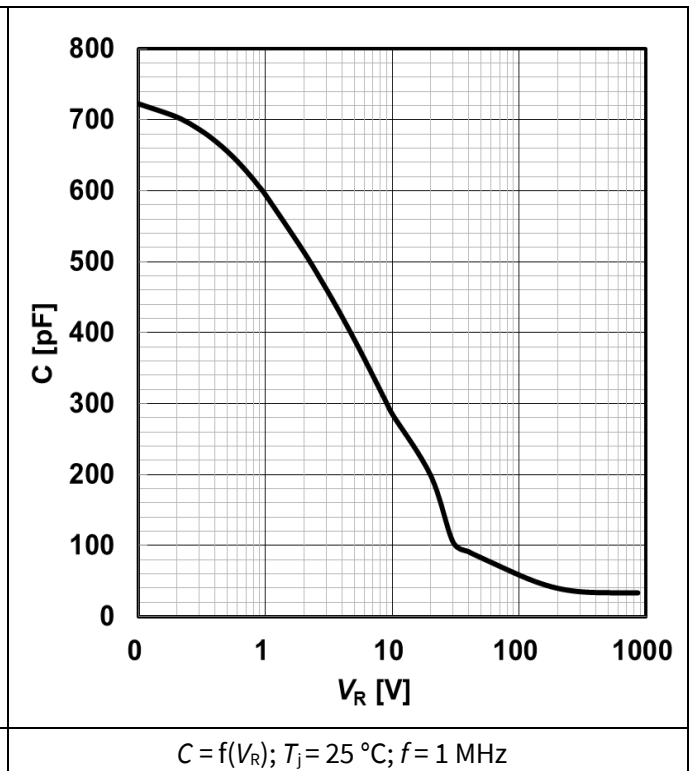


Figure 8 Typ. capacitance vs. reverse voltage

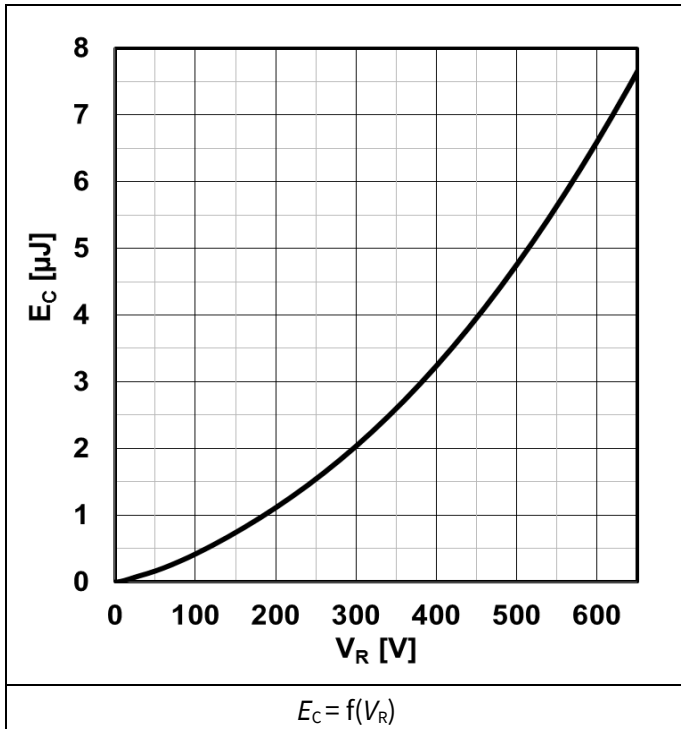


Figure 9 Typ. capacitance stored energy

## 5 Simplified forward characteristic

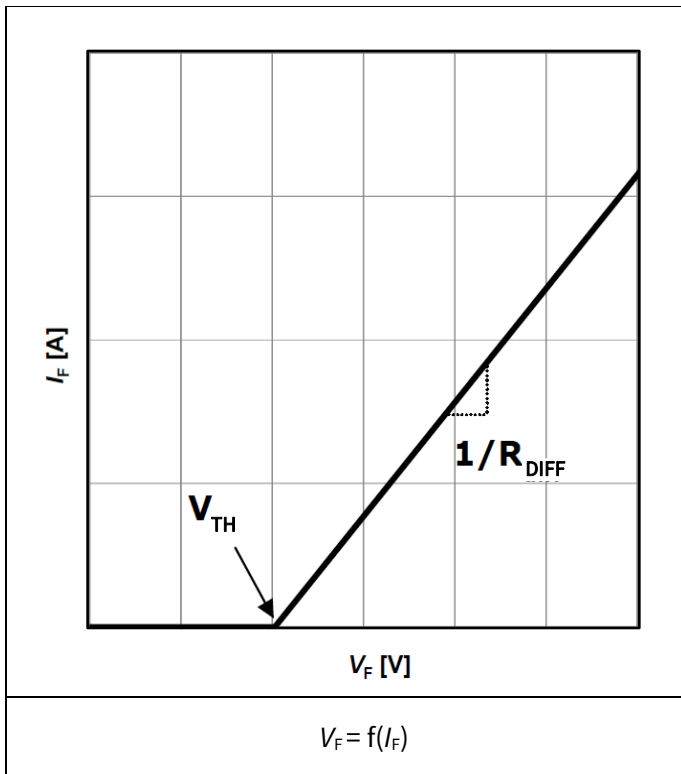


Figure 10 Equivalent forward current curve

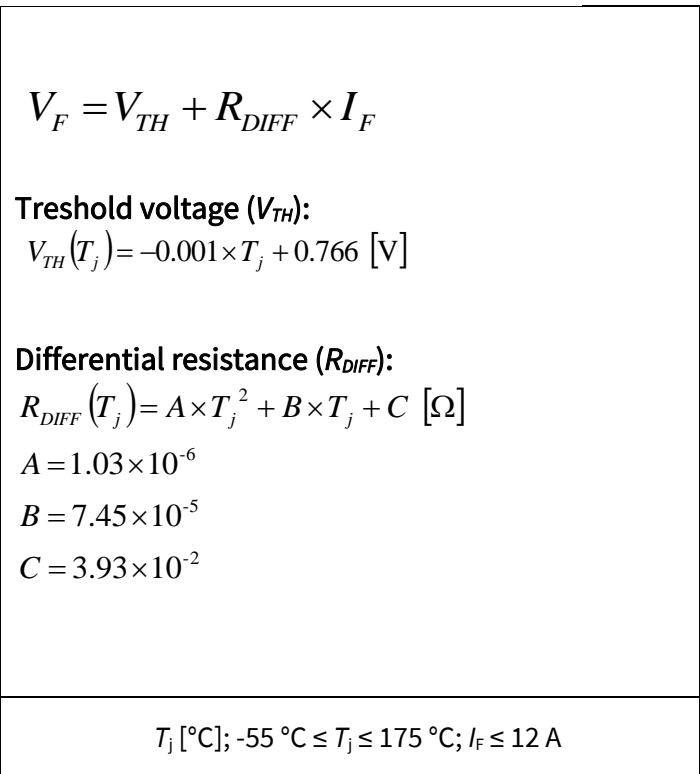


Figure 11 Mathematical Equation

## 6 Package outlines

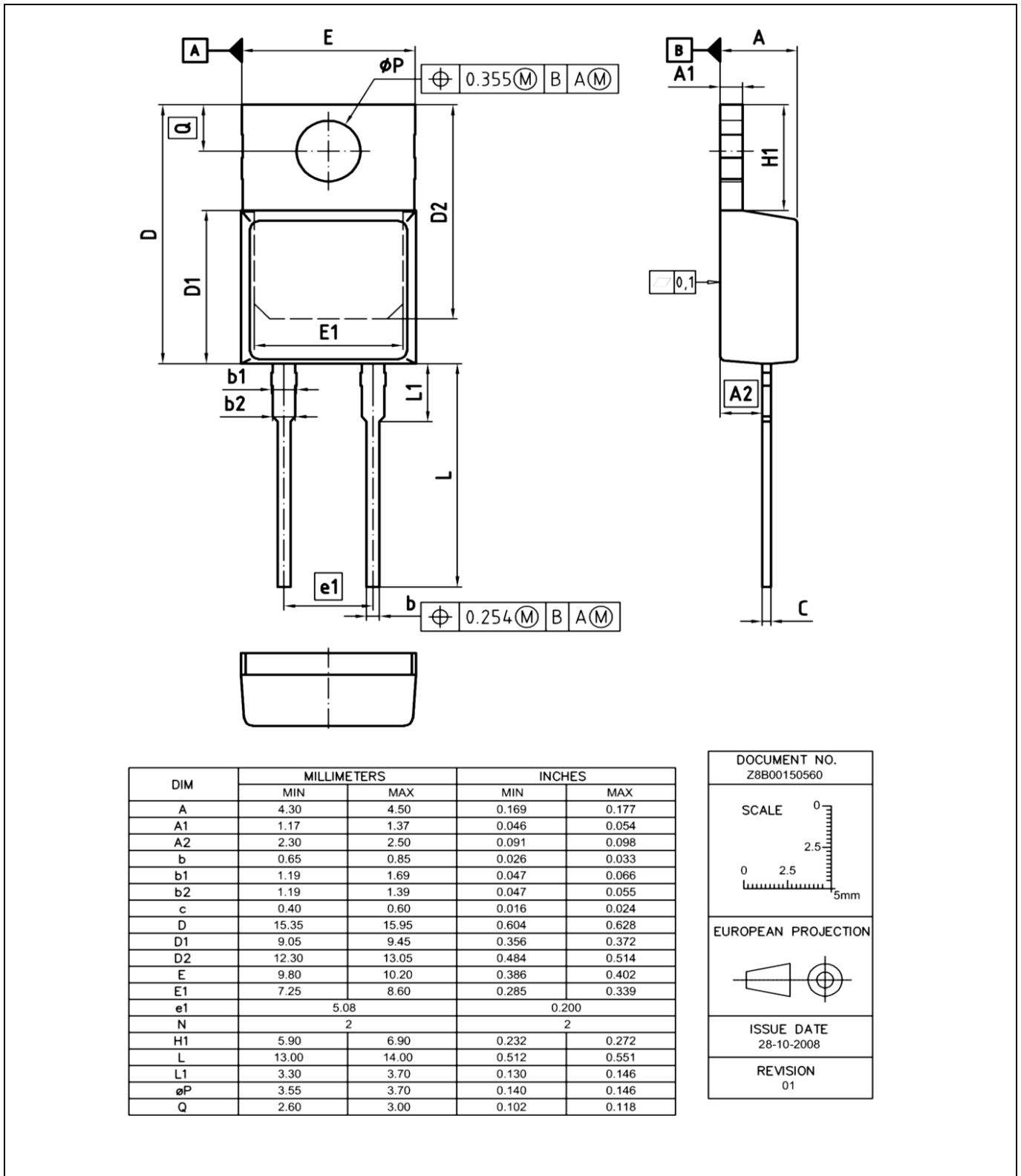


Figure 12 Outlines of the package PG-TO220-2, dimensions in mm/inches



## Revision History

### Major changes since the last revision

Revision	Date	Subject (major changes since last revision)
2.0	2017-05-23	Release of final version

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