

6th Generation CoolSiC™

650V SiC Schottky Diode

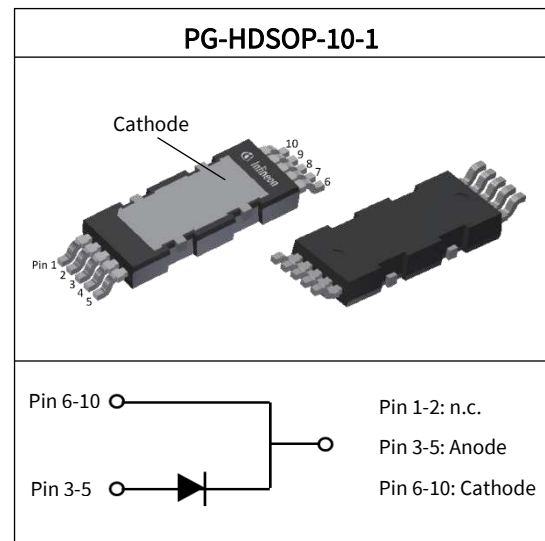
The CoolSiC™ generation 6 (G6) is the leading edge technology from Infineon for the SiC Schottky barrier diodes. The Infineon proprietary innovative G5 technology was enhanced in G6 by introducing further advancements like a novel Schottky metal system. The result is a family of products with improved efficiency over all load conditions, resulting from a lower figure of merit ($Q_C \times V_F$). 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) | 12.2 | nC |
| E_C ($V_R = 400$ V) | 2.2 | μJ |
| I_F ($T_C \leq 150$ °C, $D = 1$) | 8 | A |
| V_F ($I_F = 8$ A, $T_j = 25$ °C) | 1.25 | V |

Table 2 Package information

| Type / ordering Code | Package | Marking |
|----------------------|---------------|---------|
| IDDD08G65C6 | PG-HDSOP-10-1 | D0865C6 |



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 | - | - | 8 | A | $T_C \leq 150\text{ °C}, D = 1$ |
| | | - | - | 13 | | $T_C \leq 125\text{ °C}, D = 1$ |
| | | - | - | 24 | | $T_C \leq 25\text{ °C}, D = 1$ |
| Surge-repetitive forward current, sine halfwave ¹ | $I_{F,RM}$ | - | - | 35 | | $T_C = 25\text{ °C}, t_p = 10\text{ ms}$ |
| Surge non-repetitive forward current, sine halfwave | $I_{F,SM}$ | - | - | 47 | | $T_C = 25\text{ °C}, t_p = 10\text{ ms}$ |
| | | - | - | 37 | | $T_C = 150\text{ °C}, t_p = 10\text{ ms}$ |
| Non-repetitive peak forward current | $I_{F,max}$ | - | - | 530 | $T_C = 25\text{ °C}, t_p = 10\text{ }\mu\text{s}$ | |
| i^2t value | $\int i^2 dt$ | - | - | 11 | A ² s | $T_C = 25\text{ °C}, t_p = 10\text{ ms}$ |
| | | - | - | 6.9 | | $T_C = 150\text{ °C}, t_p = 10\text{ ms}$ |
| 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} | - | - | 90 | 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} | - | 1.0 | 1.6 | 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 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 | $T_j = 25\text{ °C}$ |
| Diode forward voltage | V_F | – | 1.25 | 1.35 | | $I_F = 8\text{ A}, T_j = 25\text{ °C}$ |
| | | – | 1.5 | – | | $I_F = 8\text{ A}, T_j = 150\text{ °C}$ |
| Reverse current | I_R | – | 0.8 | 27 | μA | $V_R = 420\text{ V}, T_j = 25\text{ °C}$ |
| | | – | 27 | – | | $V_R = 420\text{ V}, T_j = 125\text{ °C}$ |
| | | – | 62 | – | | $V_R = 420\text{ V}, T_j = 150\text{ °C}$ |

3.2 AC characteristics

Table 6 AC characteristics

| Parameter | Symbol | Values | | | Unit | Note/Test Condition |
|-------------------------|--------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Total capacitive charge | Q_C | – | 12.2 | – | 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 | – | 401 | – | pF | $V_R = 1\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$ |
| | | – | 24 | – | | $V_R = 300\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$ |
| | | – | 23 | – | | $V_R = 600\text{ V}, f = 1\text{ MHz},$ $T_j = 25\text{ °C}$ |

4 Diagrams

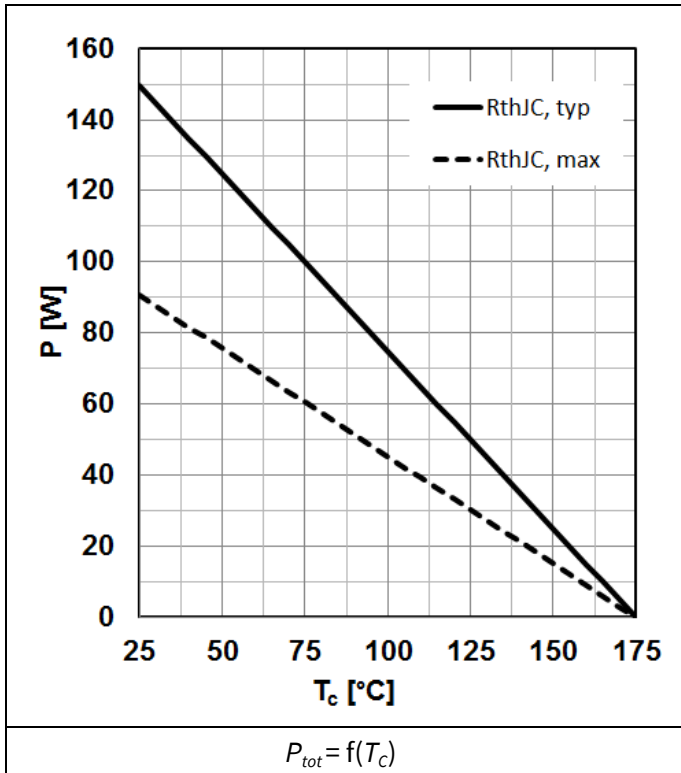


Figure 1 Power dissipation

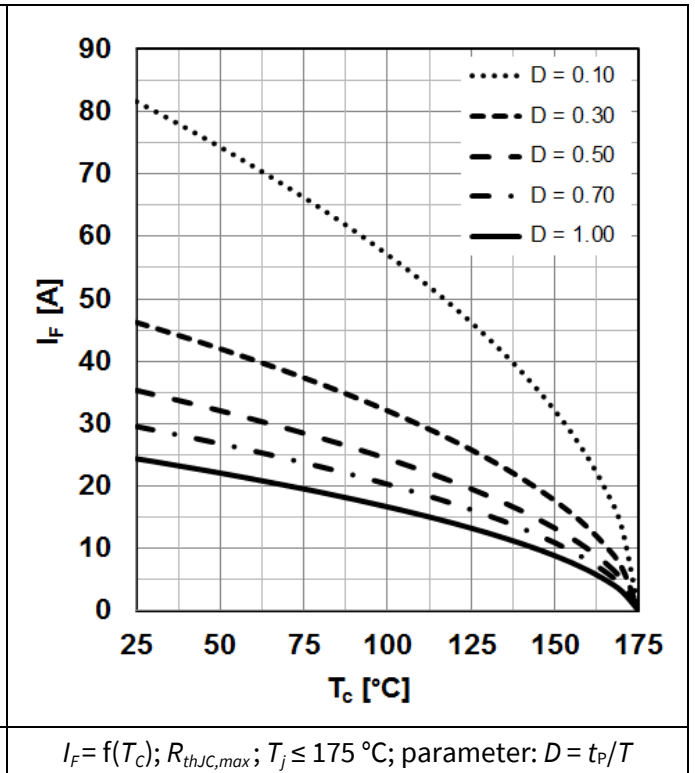


Figure 2 Max. forward current

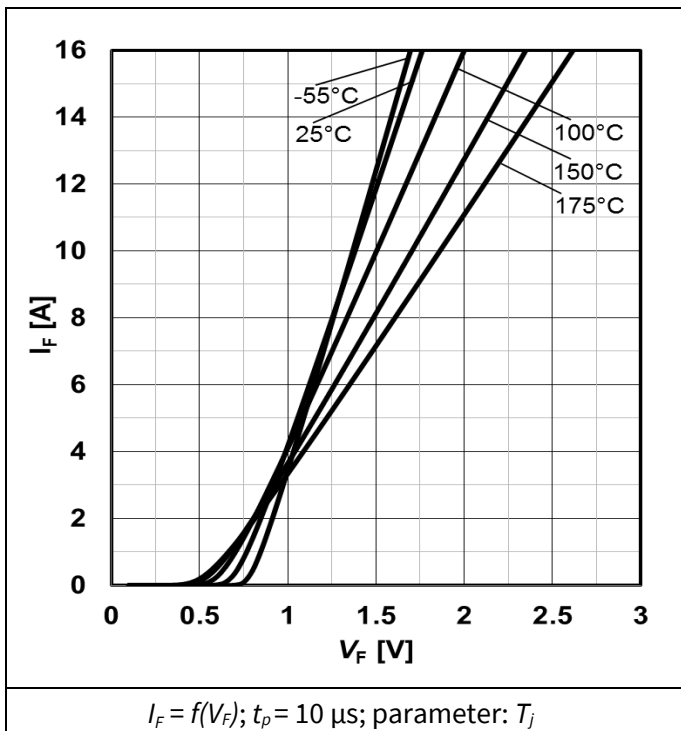


Figure 3 Typ. forward characteristics

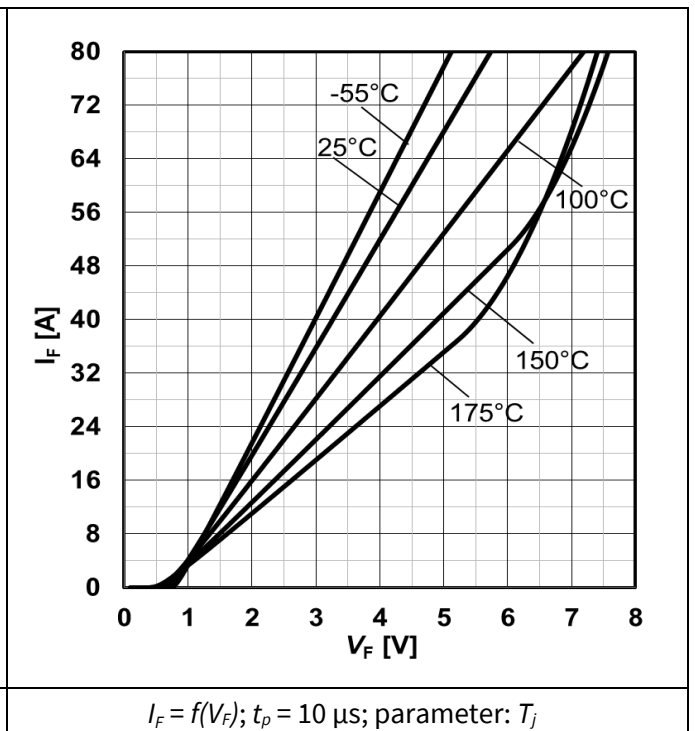
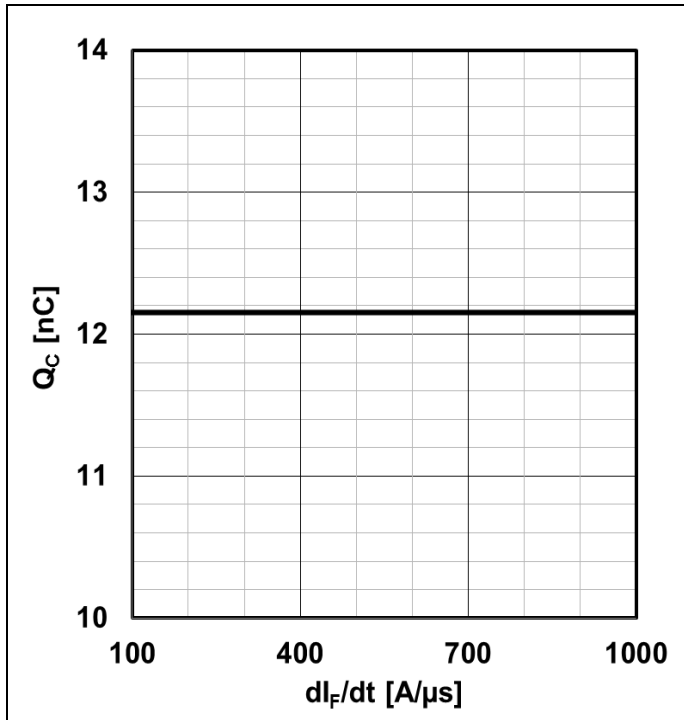
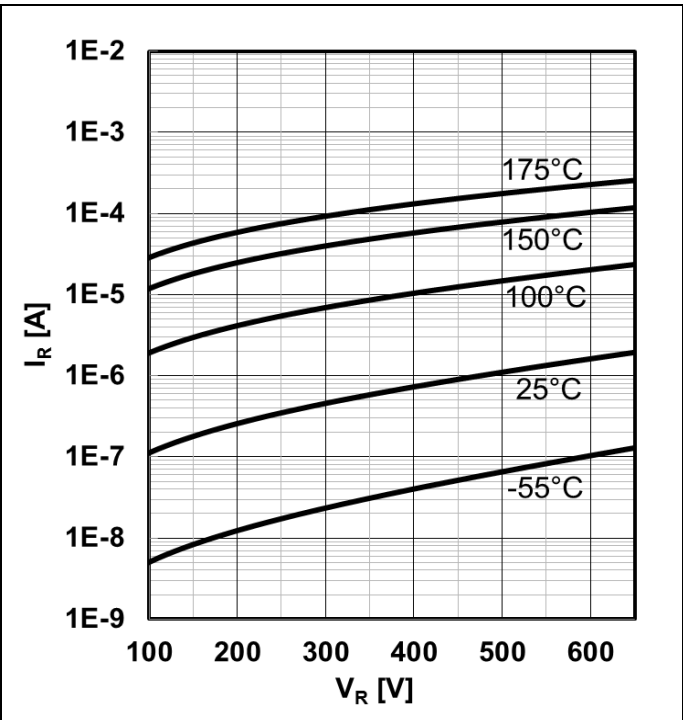


Figure 4 Typ. forward characteristics in surge current



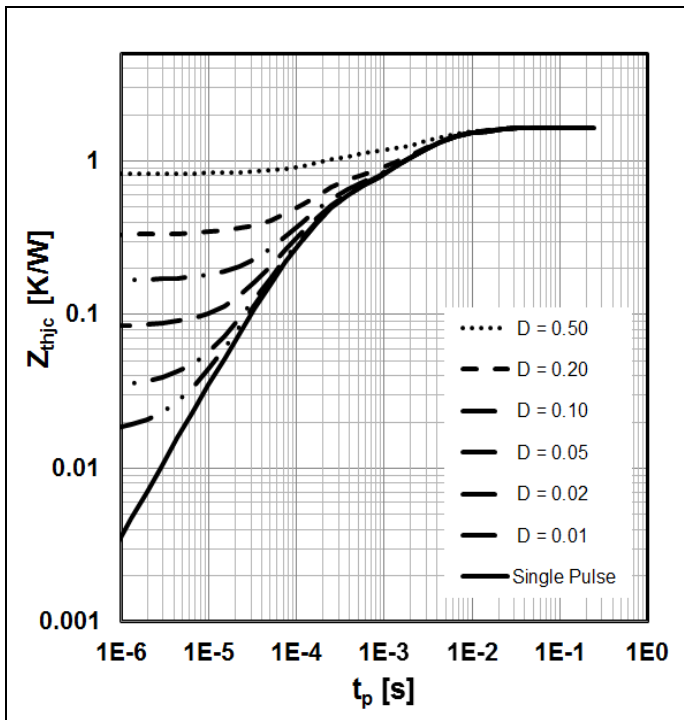
$Q_c = f(di_F/dt); T_j = 150\text{ °C}; V_R = 400\text{ V}; I_F \leq I_{F,max}$

Figure 5 Typ. cap. charge vs. current slope



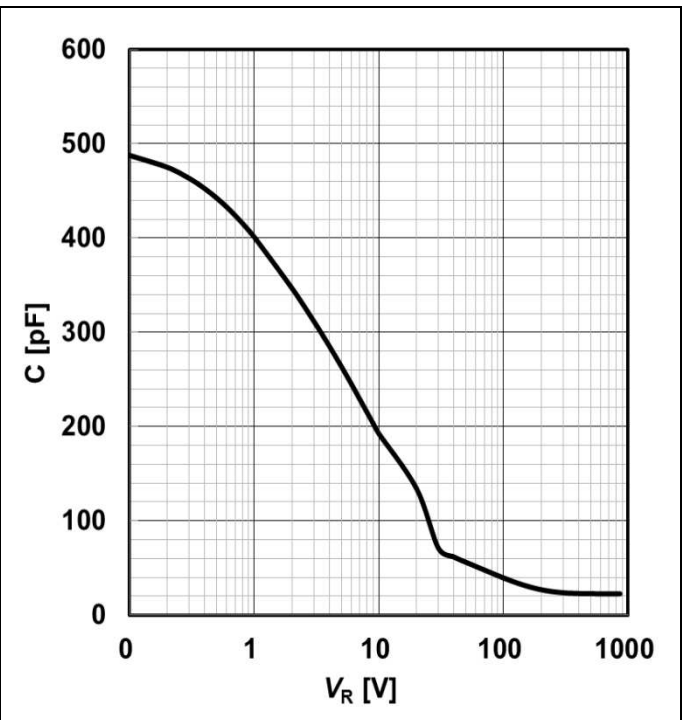
$I_R = f(V_R); \text{parameter: } T_j$

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

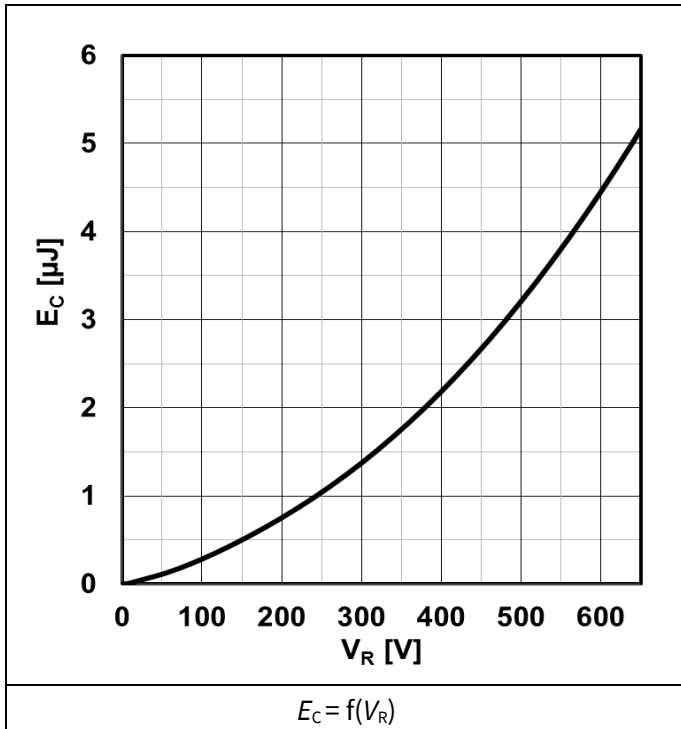


Figure 9 Typ. capacitance stored energy

5 Simplified forward characteristic

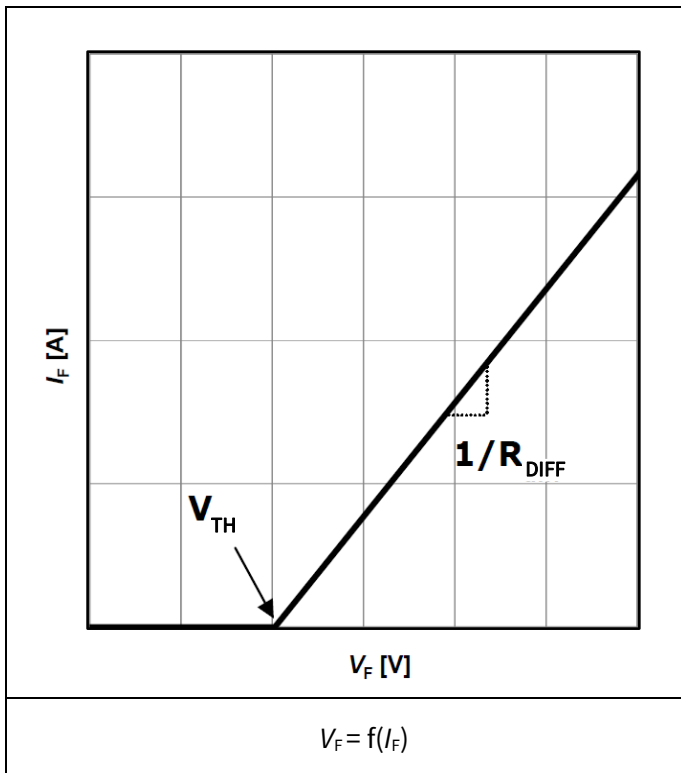


Figure 10 Equivalent forward current curve

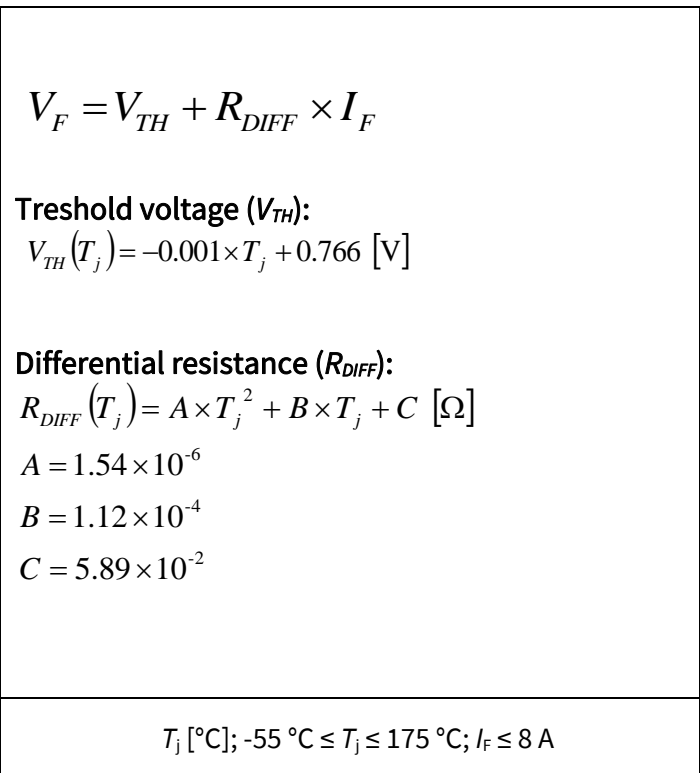


Figure 11 Mathematical Equation

6 Package outlines

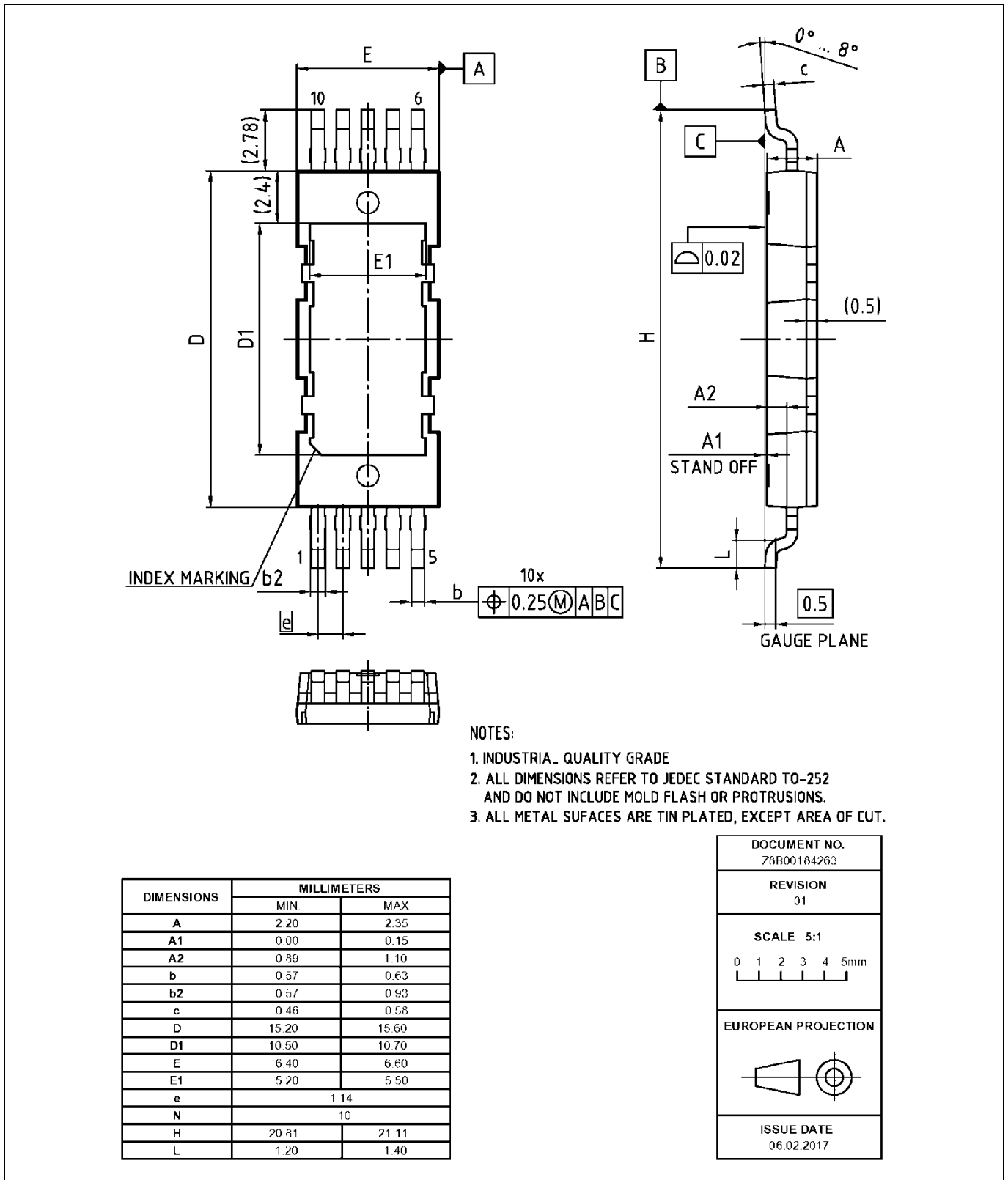


Figure 12 Outlines of the package PG-HDSOP-10-1, dimensions in millimeters

Revision History

IDDD08G65C6

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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