6^{th} 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.

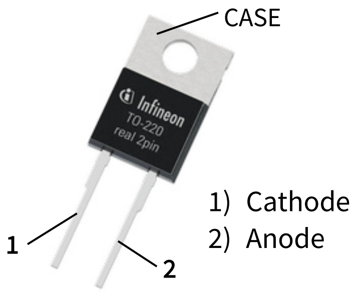
Table 1 Key performance parameters

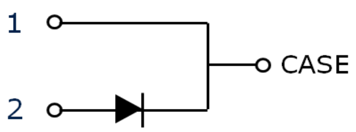
Parameter	Value	Unit
V_{RRM}	650	V
Q_C (V_R = 400 V)	14.7	nC
E_C (V_R = 400 V)	2.7	µJ
I_F ($T_C \le 140$ °C, D = 1)	10	A
V_F (I_F = 10 A, T_j = 25 °C)	1.25	V

Table 2 Package information

Type / ordering Code	Package	Marking
IDH10G65C6	PG-TO220-2	D1065C6

PG-TO220-2





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 Min.	Typ.	Max.	Unit	Note/Test condition
Continuous forward current	I_F	–	–	10	A	$T_C \leq 140$ °C, $D = 1$
		–	–	13		$T_C \leq 125$ °C, $D = 1$
		–	–	24		$T_C \leq 25$ °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
i²t value	$\int i^2 dt$	–	–	15	A²s	$T_C = 25$ °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}	–	–	72	W	$T_C = 25$°C, $R_{thJC,max}$
Operating and storage temperature	T_j T_{stg}	-55	–	175	°C	–
Mounting torque	–	–	–	70	Ncm	M3 screw

2 Thermal characteristics

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

Parameter	Symbol	Values Min.	Typ.	Max.	Unit	Note/Test condition
Thermal resistance, junction-case	R_{thJC}	–	1.3	2.1	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

[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

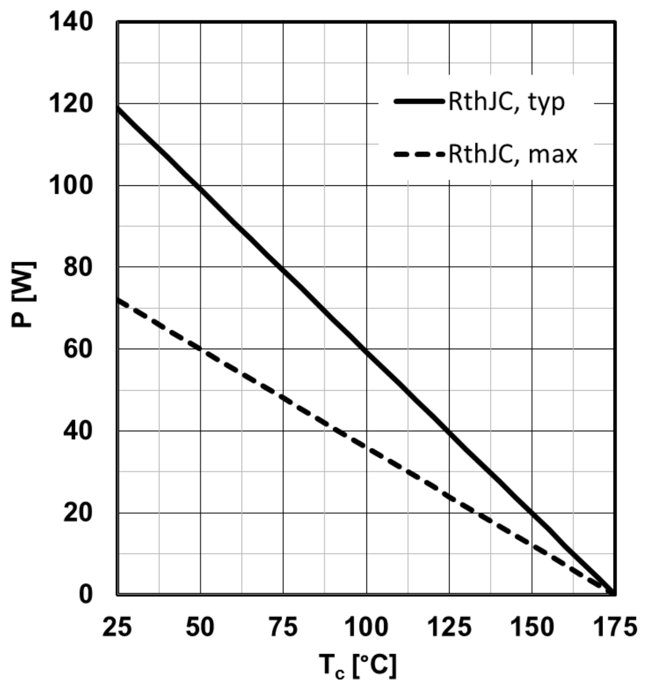
Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
DC blocking voltage	V_{DC}	650	–	–	V	$T_j = 25$ °C
Diode forward voltage	V_F	–	1.25	1.35		$I_F = 10$ A, $T_j = 25$ °C
		–	1.5	–		$I_F = 10$ A, $T_j = 150$ °C
Reverse current	I_R	–	1.0	33	µA	$V_R = 420$ V, $T_j = 25$ °C
		–	33	–		$V_R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

3.2 AC characteristics

Table 6 AC characteristics

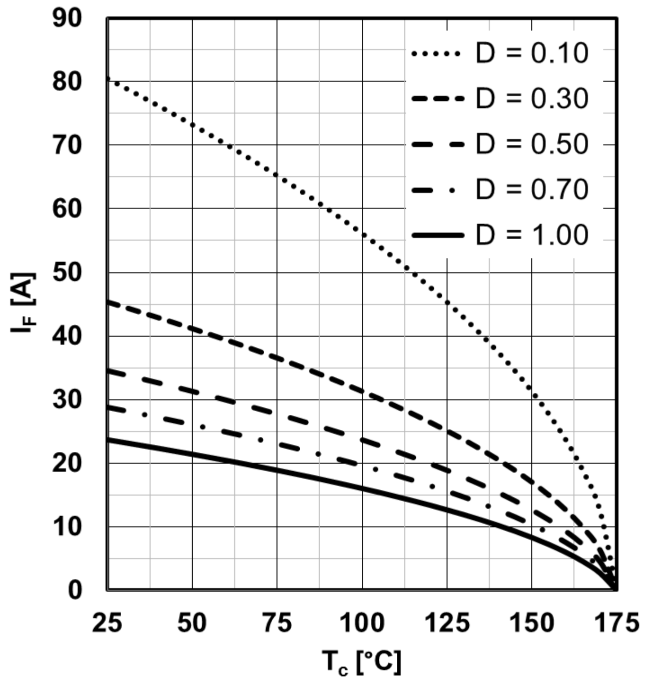
Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_c	–	14.7	–	nC	$V_R = 400$ V, $T_j = 150$ °C, di/dt = 200 A/µs, $I_F \le I_{F,MAX}$
Total capacitance	C	–	495	–	pF	$V_R = 1$ V, $f = 1$ MHz, $T_j = 25$ °C
		–	29	–		$V_R = 300$ V, $f = 1$ MHz, $T_j = 25$ °C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

4 Diagrams



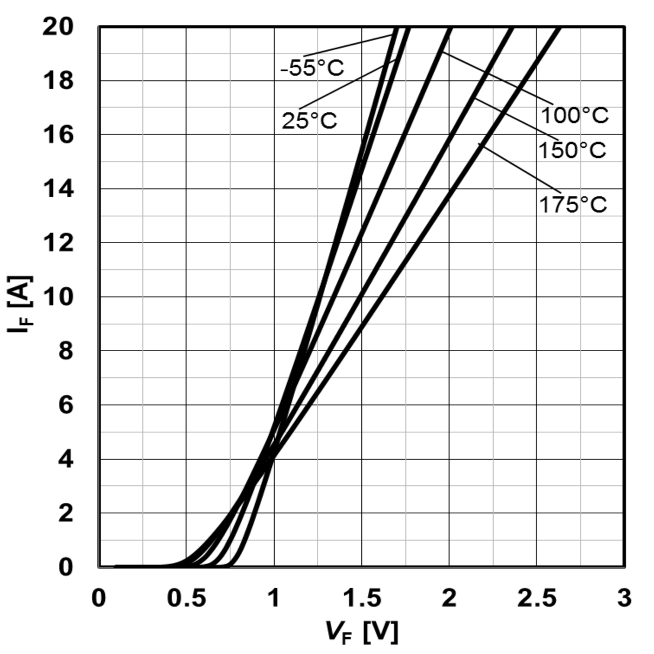
$P_{tot} = f(T_C)$

Figure 1 Power dissipation



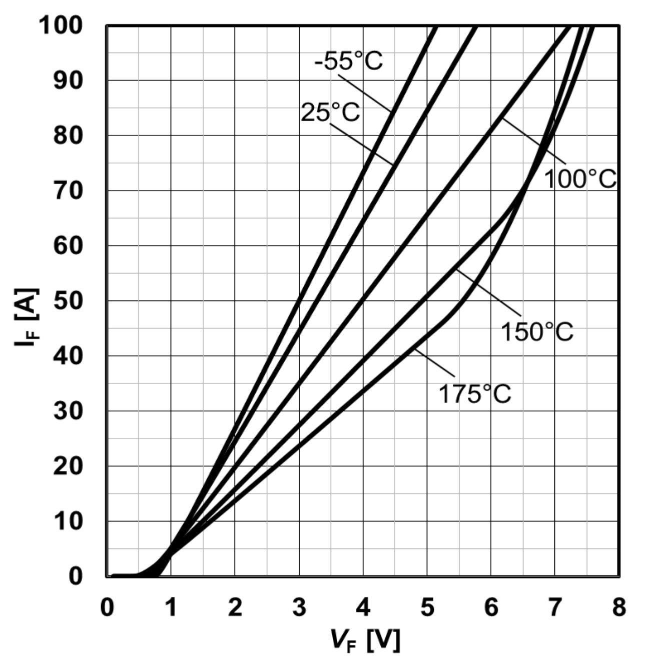
$I_F = f(T_C)$; $R_{thJC,max}$; $T_j \leq 175$ °C; parameter: $D = t_P/T$

Figure 2 Max. forward current



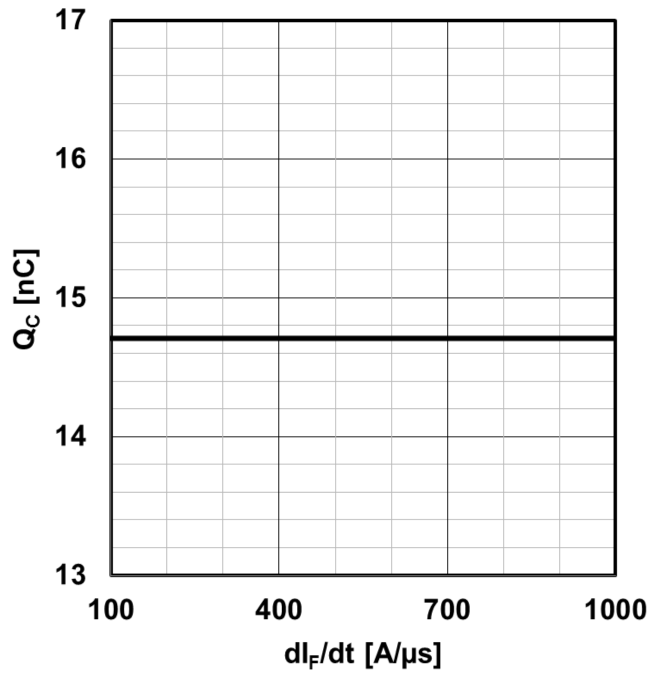
$I_F = f(V_F)$; $t_p = 10$ µs; parameter: T_j

Figure 3 Typ. forward characteristics



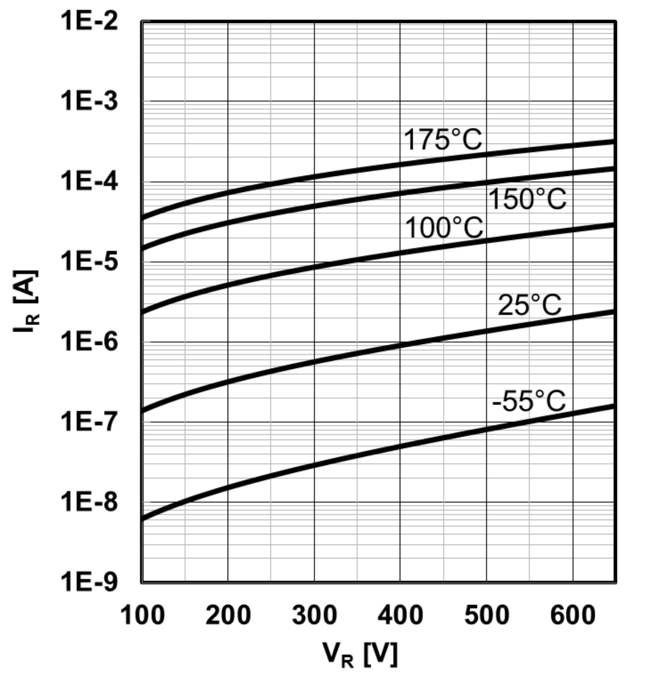
$I_F = f(V_F)$; $t_p = 10$ µs; parameter: T_j

Figure 4 Typ. forward characteristics in surge current



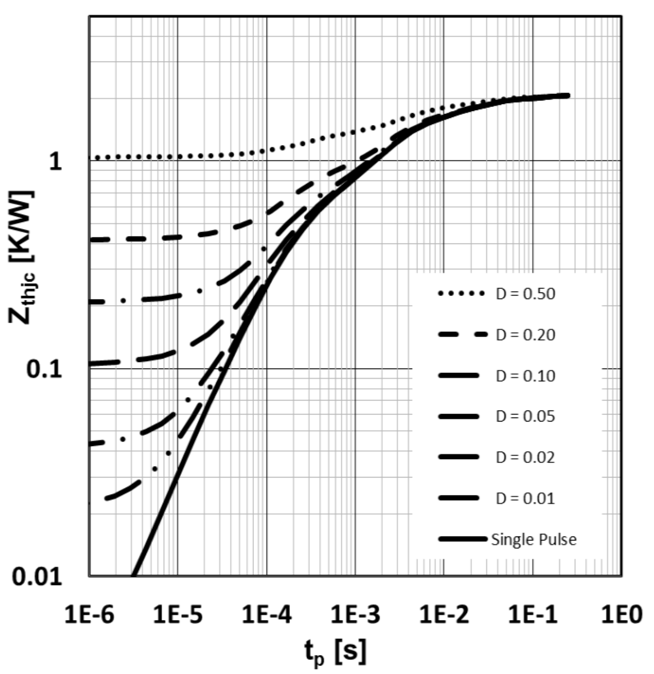
$Q_C = f(di_F/dt)$; $T_j = 150$ °C; $V_R = 400$ V; $I_F \leq I_{F,max}$

Figure 5 Typ. cap. charge vs. current slope



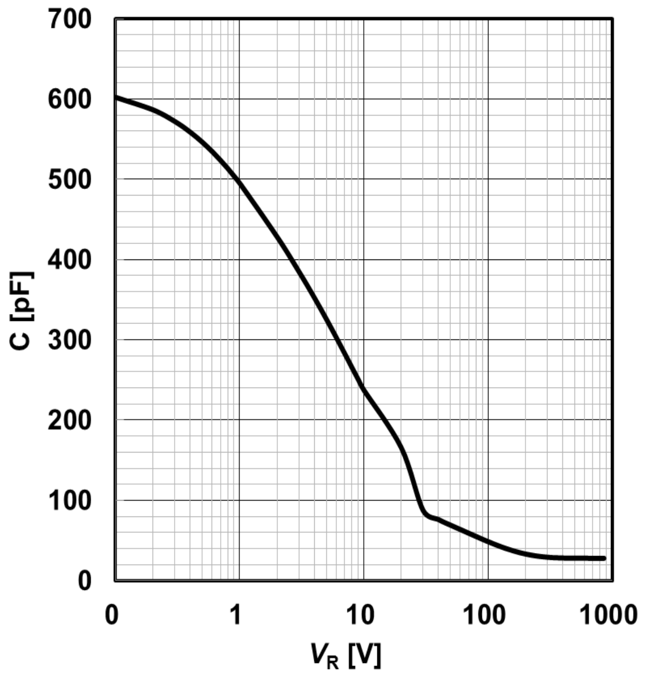
$I_R = f(V_R)$; parameter: T_j

Figure 6 Typ. reverse current vs. reverse voltage



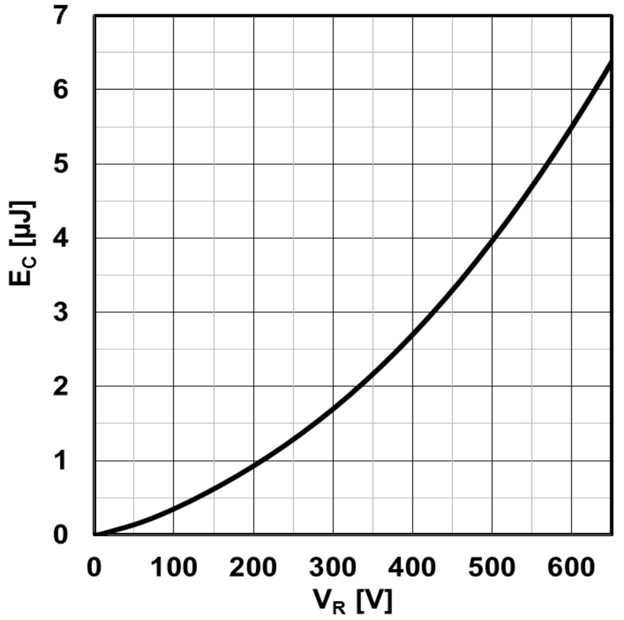
$Z_{th,jc} =$ f(t_P); parameter: $D = t_P/T$

Figure 7 Max. transient thermal impedance



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

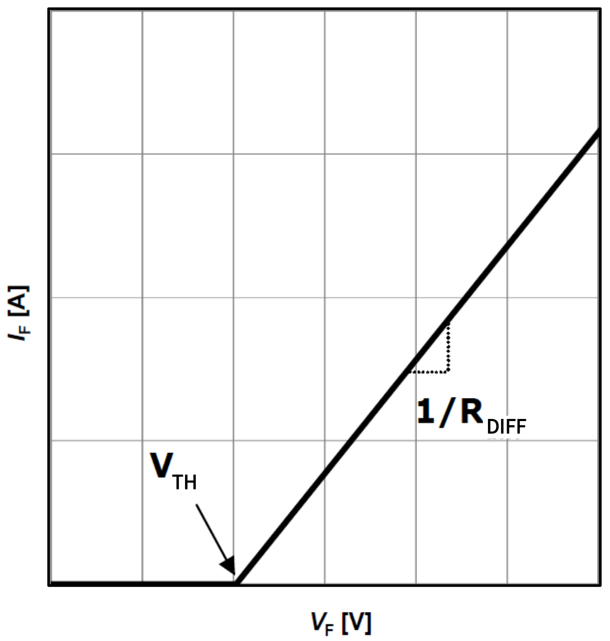
Figure 8 Typ. capacitance vs. reverse voltage



$E_C = f(V_R)$

Figure 9 Typ. capacitance stored energy

5 Simplified forward characteristic



$V_F = f(I_F)$

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

Treshold voltage (V_{TH}):

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

Differential resistance (R_{DIFF}):

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

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

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

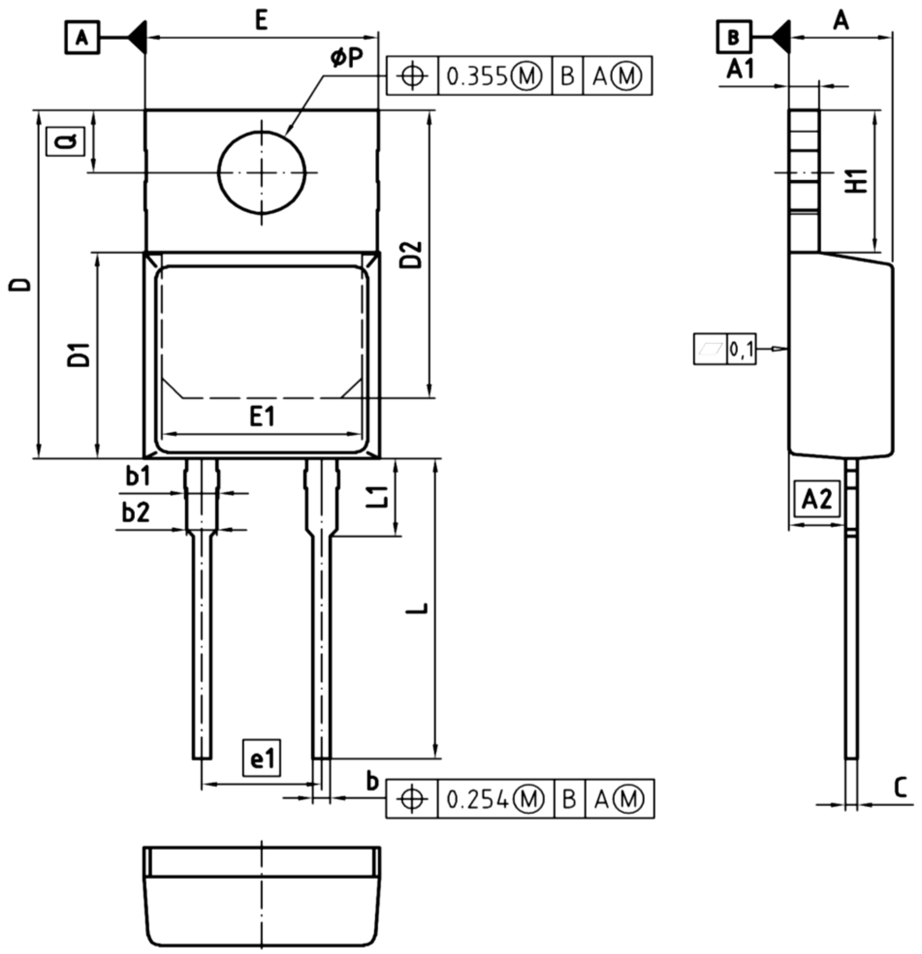
$$C = 4.75 \times 10^{-2}$$

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

Figure 10 Equivalent forward current curve

Figure 11 Mathematical Equation

6 Package outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.50	0.169	0.177
A1	1.17	1.37	0.046	0.054
A2	2.30	2.50	0.091	0.098
b	0.65	0.85	0.026	0.033
b1	1.19	1.69	0.047	0.066
b2	1.19	1.39	0.047	0.055
c	0.40	0.60	0.016	0.024
D	15.35	15.95	0.604	0.628
D1	9.05	9.45	0.356	0.372
D2	12.30	13.05	0.484	0.514
E	9.80	10.20	0.386	0.402
E1	7.25	8.60	0.285	0.339
e1	5.08		0.200	
N	2		2	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	3.30	3.70	0.130	0.146
øP	3.55	3.70	0.140	0.146
Q	2.60	3.00	0.102	0.118

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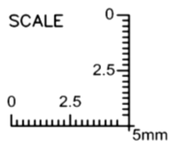
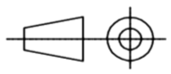
SCALE



EUROPEAN PROJECTION



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28-10-2008

REVISION
01

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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Email: erratum@infineon.com

Document reference