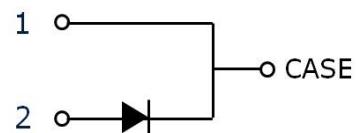


CoolSiC™ Automotive Schottky Diode 650V G5

650V/16A Silicon Carbide Schottky Diode in D2PAK (Real 2 Pins)

Features

- Revolutionary semiconductor material - Silicon Carbide
- Benchmark switching behavior
- No reverse recovery/No forward recovery
- Temperature independent switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Junction Temperature range from -40°C to 175°C
- System efficiency improvement over Si diodes
- System cost/size savings due to reduced cooling requirements
- Enabling higher frequency/increased power density solutions
- Higher system reliability due to lower operating temperatures
- Reduced EMI



Potential Applications

- Booster/DCDC Converter
- On board Charger/PFC



Product Validation

“Qualified for Automotive Applications. Product Validation according to AEC-Q100/101”

Description

The 5th Generation CoolSiC™ Automotive Schottky Diode represents Infineon leading edge technology for Silicon Carbide Schottky Barrier diodes. Thanks to a compact design and a technology based on thin wafers, this family of products shows improved efficiency over all load conditions resulting from both its thermal characteristics and low figure of merit ($Q_c \times V_f$). This product family has been designed to complement Infineon's IGBT and CoolMOS™ portfolio. This ensures meeting the most stringent application requirements in the 650V voltage class.

Product Information	
Ordering Code	AIDK16S65C5
Marking	AD1665C5
Package	PG-T0263-2-1
SP Number	SP001725240

Parameter	Value/Unit
$V_{DC,max}$	650 V
$I_F; T_C < 124^\circ C$	16 A
$Q_c; V_R = 400 V$	23 nC
$E_c; V_R = 400 V$	5.3 μJ
$T_{j,max}$	175 °C

Pin	Definition
Pin 1, case	Cathode
Pin 2	Anode

Table of Contents

Table of Contents	
Features	1
Potential Applications	1
Product Validation	1
Description	1
Table of Contents	2
1 Maximum Ratings	3
2 Thermal Characteristics	4
3 Electrical Characteristics	5
4 Electrical Characteristics Diagrams	6
5 Package Outlines	9
Revision History	10

Maximum Ratings

1 Maximum Ratings

Table 1 Maximum ratings¹

Parameter	Symbol	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	650	V
Continuous forward current for $R_{thJC,max}$ $T_C = 129^\circ\text{C}$, D=1	I_F	16	A
Surge non-repetitive forward current, sine halfwave $T_C = 25^\circ\text{C}$, $t_p = 10\text{ms}$ $T_C = 150^\circ\text{C}$, $t_p = 10\text{ms}$	$I_{F,SM}$	63 51	A
Non-repetitive peak forward current $T_C = 25^\circ\text{C}$, $t_p = 10\mu\text{s}$	$I_{F,max}$	637	A
i^2t value $T_C = 25^\circ\text{C}$, $t_p = 10\text{ms}$ $T_C = 150^\circ\text{C}$, $t_p = 10\text{ms}$	$\int i^2 dt$	20 13	A^2s
Diode dv/dt ruggedness $V_R = 0 \dots 480\text{V}$	dv/dt	100	V/ns
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	79	W
Operating temperature	T_j	-40...175	$^\circ\text{C}$
Storage temperature	T_{stg}	-55...150	$^\circ\text{C}$
ESD			
Human body model, $R = 1.5 \text{ k}\Omega$, $C = 100 \text{ pF}$		8	kV
Charged device model		2	

Thermal Characteristics

2 Thermal Characteristics

Table 2 Thermal Characteristics¹

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case ²	R _{thJC}	-	1.5	1.9	K/W	
Thermal resistance, junction-ambient ²	R _{thJA}	-	-	62	K/W	

Electrical Characteristics

3 Electrical Characteristics

Table 3 Static Characteristics

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
DC blocking voltage	V_{DC}	650	-	-		$T_j = 25^\circ C, I_R = 0.09 \text{ mA}$
Diode forward voltage ³	V_F	-	1.5	1.7	V	$T_j = 25^\circ C, I_F = 16 \text{ A}$
		-	1.8	2.1		$T_j = 150^\circ C, I_F = 16 \text{ A}$
		-	3	90	μA	$V_R = 650 \text{ V}, T_j = 25^\circ C$
Reverse current	I_R	-	19	-		$V_R = 650 \text{ V}, T_j = 150^\circ C$

Table 4 Dynamic Characteristics at $T_j=25^\circ C$ unless noted otherwise

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_C	-	23	-	nC	$V_R = 400 \text{ V}, di/dt = 200 \text{ A}/\mu\text{s}, I_F \leq I_{F,MAX}, T_j = 150^\circ C$
Total capacitance	C	-	483	-	pF	$V_R = 1 \text{ V}, f = 1 \text{ MHz}$
		-	57	-		$V_R = 300 \text{ V}, f = 1 \text{ MHz}$
		-	53	-	pF	$V_R = 600 \text{ V}, f = 1 \text{ MHz}$

Footnotes:

¹ The parameter is not subject to production test- verified by design/characterization.

² $R_{th,JC}$ defined as per JESD-51-14. $R_{th,JA}$ defined as per JESD-51-5/7.

³ Only the value at $25^\circ C$ is subject to production test. The value at $150^\circ C$ is only verified by design/characterization.

Electrical Characteristics Diagrams

4 Electrical Characteristics Diagrams

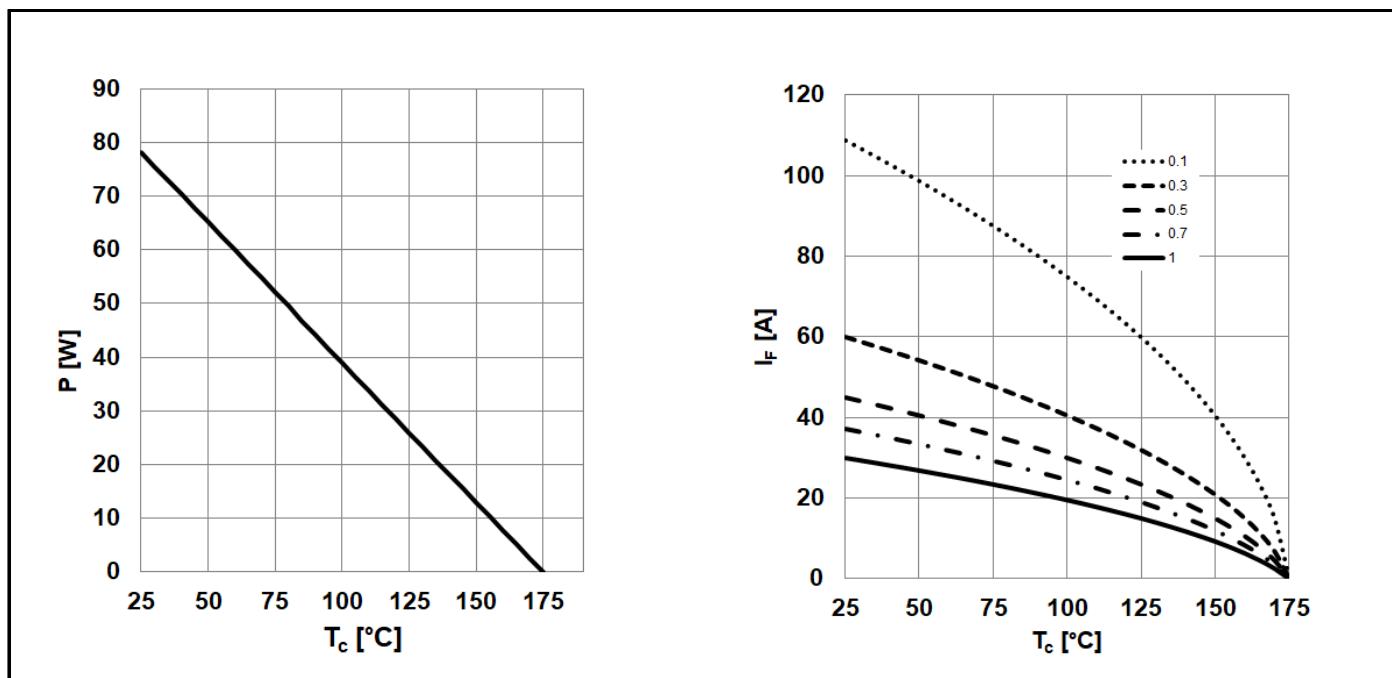


Figure 1 (LEFT) Power dissipation; $P_{tot} = f(T_c)$; $R_{thJC,max}$
(RIGHT) Diode forward current; $I_F = f(T_c)$; $T_j \leq 175$ °C; $R_{thJC,max}$; parameter: D=duty cycle

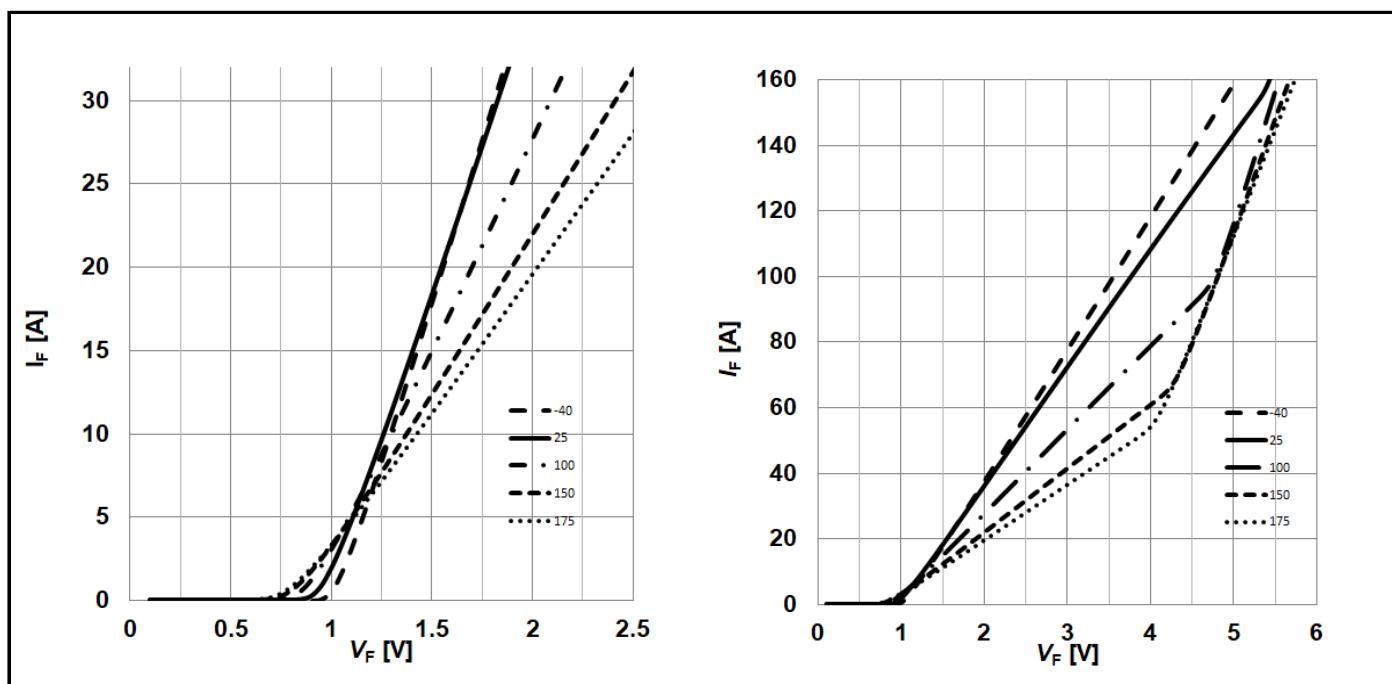


Figure 2 (LEFT) Typical forward characteristic; $I_F = f(V_F)$; $t_p=20$ µs; parameter: T_j
(RIGHT) Typical forward characteristics in surge current; $I_F = f(V_F)$; $t_p=20$ µs; parameter: T_j

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Electrical Characteristics Diagrams

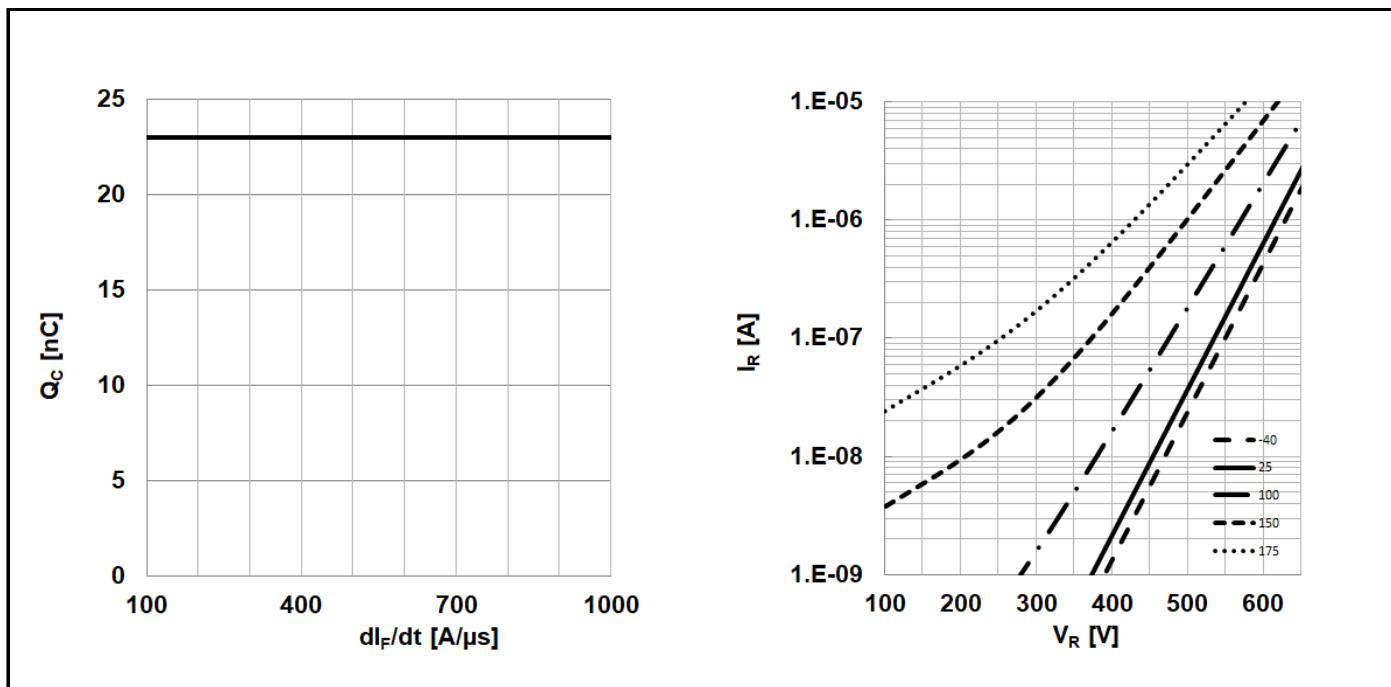


Figure 3 (LEFT) Typical capacitive charge versus current slope (only capacitive charge, guaranteed by design); $Q_c = f(dI_F/dt)$; $T_j = 150^\circ\text{C}$; $V_R = 400\text{V}$; $I_F \leq I_{F,\text{max}}$
(RIGHT) Typical reverse current versus reverse voltage; $I_R = f(V_R)$; parameter: T_j

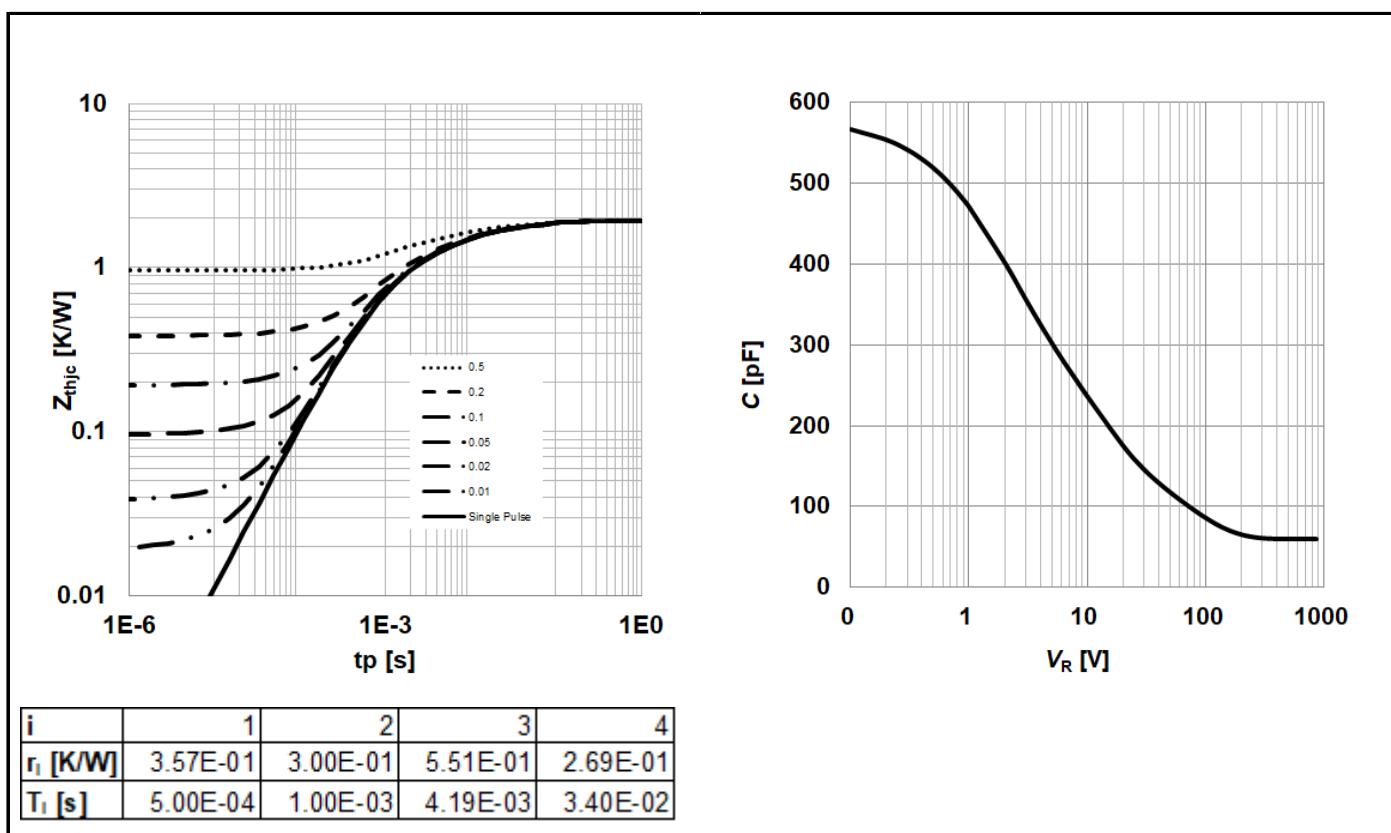


Figure 4 (LEFT) Max. Transient thermal impedance; $Z_{thJC} = f(t_p)$; parameter: $D = t_p/T$
(RIGHT) Typ. Capacitance vs. Reverse voltage; $C = f(V_R)$; $T_j = 25^\circ\text{C}$; $f = 1\text{ MHz}$

Electrical Characteristics Diagrams

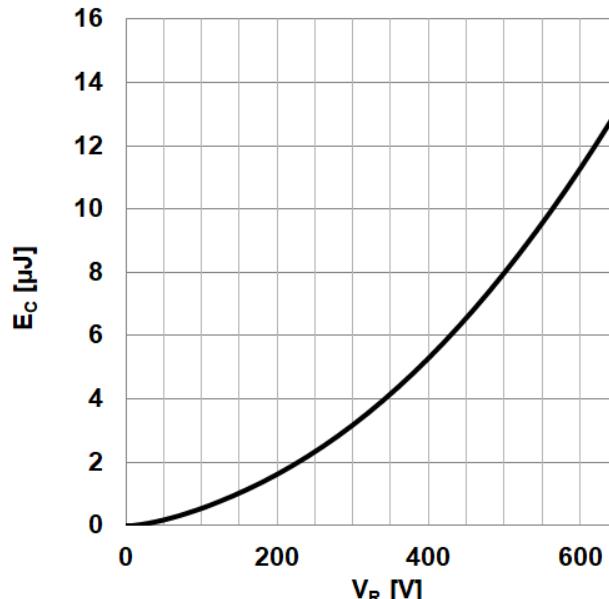
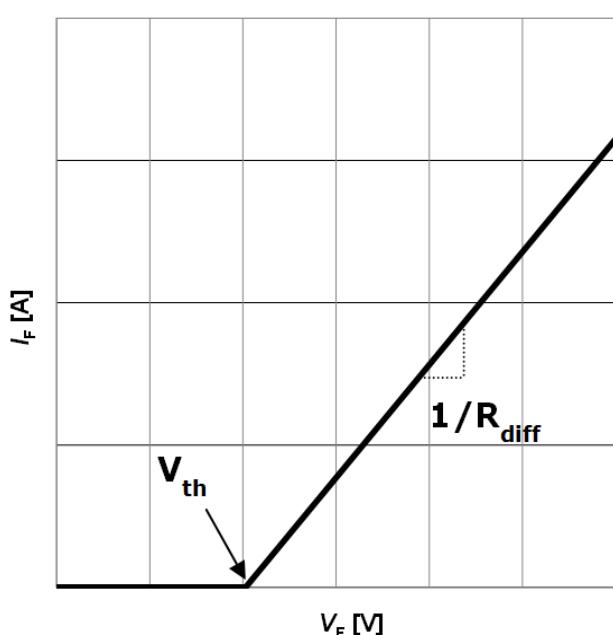


Figure 5 Typical capacitance stored energy; $E_C = f(V_R)$



$$V_F = V_{th} + R_{diff} \cdot I_F$$

$$V_{th} = A \cdot T_j + B \text{ [V]}$$

$$R_{diff} = C \cdot T_j^2 + D \cdot T_j + E \text{ [\Omega]}$$

A =	-9.2E-04	[V/°C]
B =	1.0E+00	[V]
C =	8.0E-07	[\Omega/(°C) ²]
D =	4.6E-05	[\Omega/°C]
E =	2.6E-02	[\Omega]

Figure 6 Simplified forward characteristics model $V_F = f(I_F)$;
 $-40^\circ\text{C} < T_j < 175^\circ\text{C}$; $I_F < 32 \text{ A}$

Package Outlines

5 Package Outlines

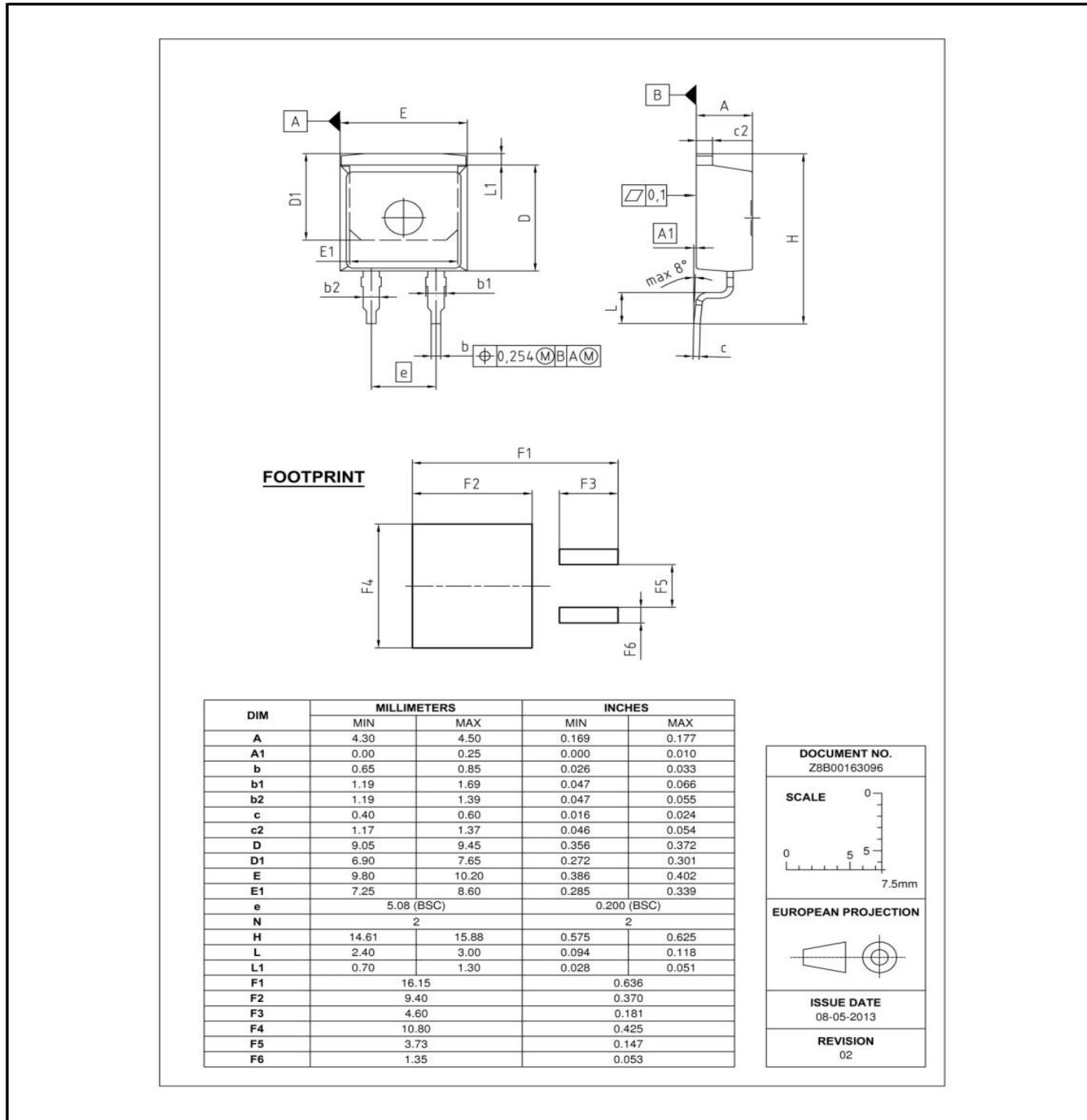


Figure 6 Package outline of PG-T0263-2-1 leaded

Revision History

Revision History

Document Version	Date of Release	Description of changes
V3.0	21.07.2021	1st release of Data Sheet

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