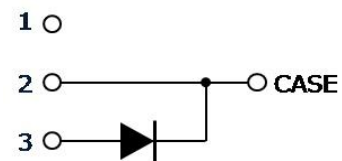


# CoolSiC™ Automotive Schottky Diode 650V G5

650V/40A Silicon Carbide Schottky Diode in TO247-3

## 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

- Traction inverter
- 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	AIDW40S65C5
Marking	AD4065C5
Package	PG-TO247-3-41
SP Number	SP001725204

Parameter	Value/Unit
$V_{DC,max}$	650 V
$I_F; T_C < 117\text{ °C}$	40 A
$Q_C; V_R = 400\text{ V}$	56 nC
$E_C; V_R = 400\text{ V}$	12.9 μJ
$T_{j,max}$	175 °C

Pin	Definition
Pin 2, case	Cathode
Pin 3	Anode

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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 ratings<sup>1</sup>

Parameter	Symbol	Value	Unit
Repetitive peak reverse voltage	$V_{RRM}$	650	V
Continuous forward current for $R_{thJC,max}$ $T_C = 117\text{ °C}$ , $D=1$	$I_F$	40	A
Surge non-repetitive forward current, sine halfwave $T_C = 25\text{ °C}$ , $t_p = 10\text{ms}$ $T_C = 150\text{ °C}$ , $t_p = 10\text{ms}$	$I_{F,SM}$	182 153	A
Non-repetitive peak forward current $T_C = 25\text{ °C}$ , $t_p = 10\mu\text{s}$	$I_{F,max}$	1432	A
$i^2t$ value $T_C = 25\text{ °C}$ , $t_p = 10\text{ms}$ $T_C = 150\text{ °C}$ , $t_p = 10\text{ms}$	$\int i^2 dt$	166 118	$\text{A}^2\text{s}$
Diode $dv/dt$ ruggedness $V_R = 0 \dots 480\text{V}$	$dv/dt$	100	V/ns
Power dissipation $T_C = 25\text{ °C}$	$P_{tot}$	183	W
Operating temperature	$T_j$	-40...175	°C
Storage temperature	$T_{stg}$	-55...150	°C
ESD Human body model, $R = 1.5\text{ k}\Omega$ , $C = 100\text{ pF}$ Charged device model		8 2	kV
Soldering temperature, wavesoldering only allowed at leads, 1.6mm (0.063 in.) from case for 10 s	$T_{sold}$	260	°C
Mounting Torque (M3 and M4 screws)		70	Ncm

Thermal Characteristics

## 2 Thermal Characteristics

Table 2 Thermal Characteristics<sup>1</sup>

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case <sup>2</sup>	$R_{thJC}$	-	0.6	0.8	K/W	
Thermal resistance, junction-ambient <sup>2</sup>	$R_{thJA}$	-	-	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	-	-	V	$T_j = 25^\circ\text{C}$ , $I_R = 0.12\text{ mA}$
Diode forward voltage <sup>3</sup>	$V_F$	-	1.5	1.7		$T_j = 25^\circ\text{C}$ , $I_F = 40\text{ A}$
		-	1.8	2.1		$T_j = 150^\circ\text{C}$ , $I_F = 40\text{ A}$
Reverse current	$I_R$	-	7	120	$\mu\text{A}$	$V_R = 650\text{ V}$ , $T_j = 25^\circ\text{C}$
		-	47	-		$V_R = 650\text{ V}$ , $T_j = 150^\circ\text{C}$

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

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Total capacitive charge	$Q_C$	-	56	-	nC	$V_R = 400\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ , $I_F \leq I_{F,MAX}$ , $T_j = 150^\circ\text{C}$
Total capacitance	C	-	1138	-	pF	$V_R = 1\text{ V}$ , $f = 1\text{ MHz}$
		-	148	-		$V_R = 300\text{ V}$ , $f = 1\text{ MHz}$
		-	145	-		$V_R = 600\text{ V}$ , $f = 1\text{ MHz}$

Footnotes:

- <sup>1</sup> The parameter is not subject to production test- verified by design/characterization.
- <sup>2</sup>  $R_{th,JC}$  defined as per JESD-51-14.  $R_{th,JA}$  defined as per JESD-51-2.
- <sup>3</sup> Only the value at  $25^\circ\text{C}$  is subject to production test. The value at  $150^\circ\text{C}$  is only verified by design/characterization.

Electrical Characteristics Diagrams

4 Electrical Characteristics Diagrams

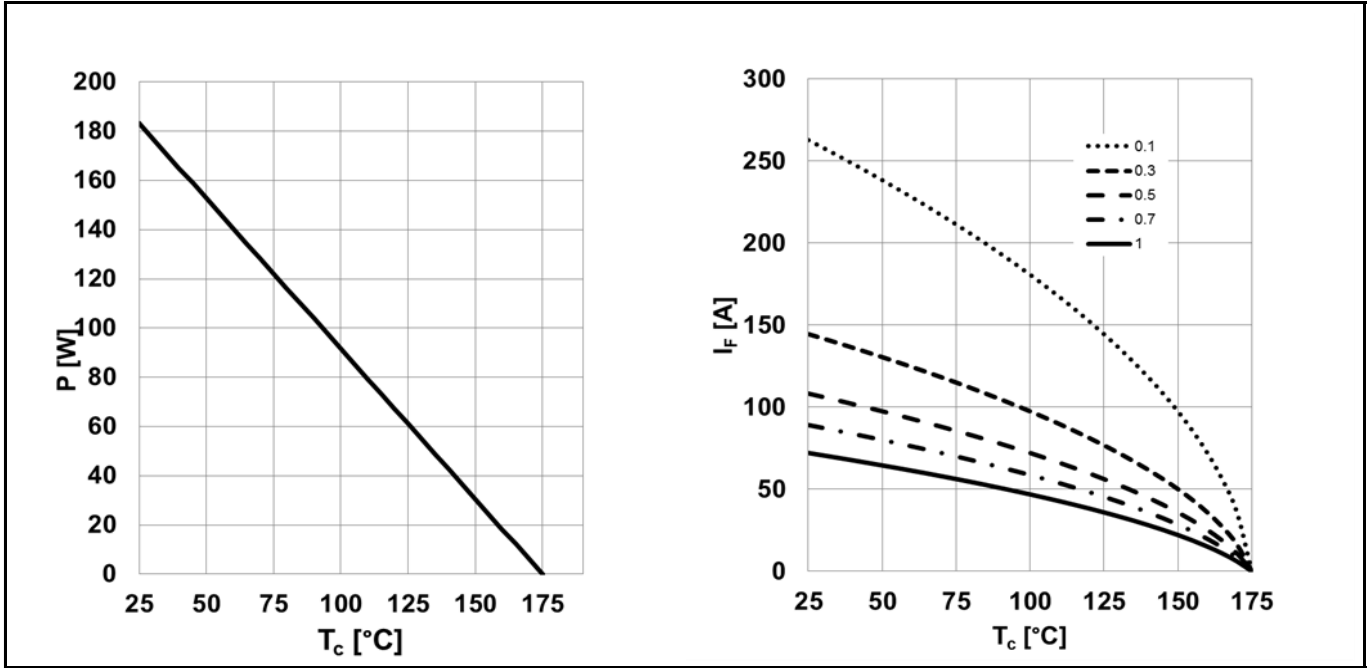


Figure 1 (LEFT) Power dissipation;  $P_{tot} = f(T_c)$ ;  $R_{thJC,max}$   
 (RIGHT) Diode forward current;  $I_F = f(T_c)$ ;  $T_j \leq 175$  °C;  $R_{thJC,max}$ ; parameter:  $D$ =duty cycle

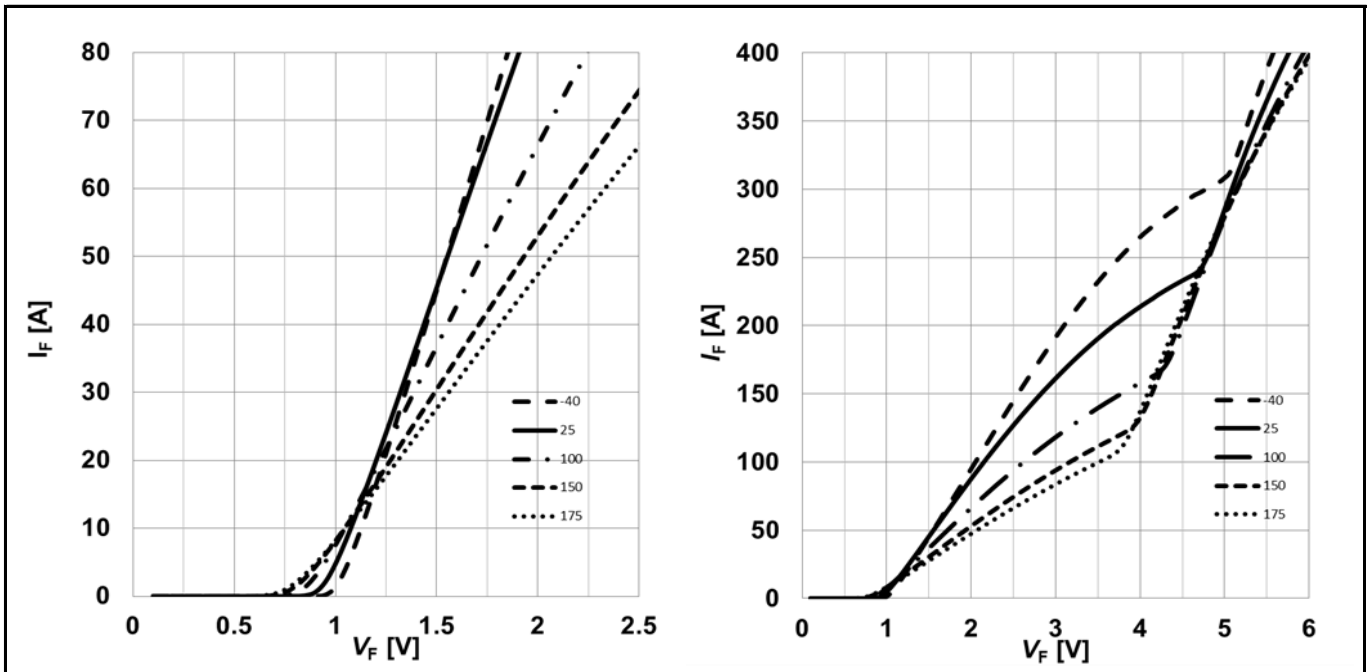


Figure 2 (LEFT) Typical forward characteristic;  $I_F = f(V_F)$ ;  $t_p = 200$   $\mu$ s; parameter:  $T_j$   
 (RIGHT) Typical forward characteristics in surge current;  $I_F = f(V_F)$ ;  $t_p = 200$   $\mu$ s; parameter:  $T_j$

Electrical Characteristics Diagrams

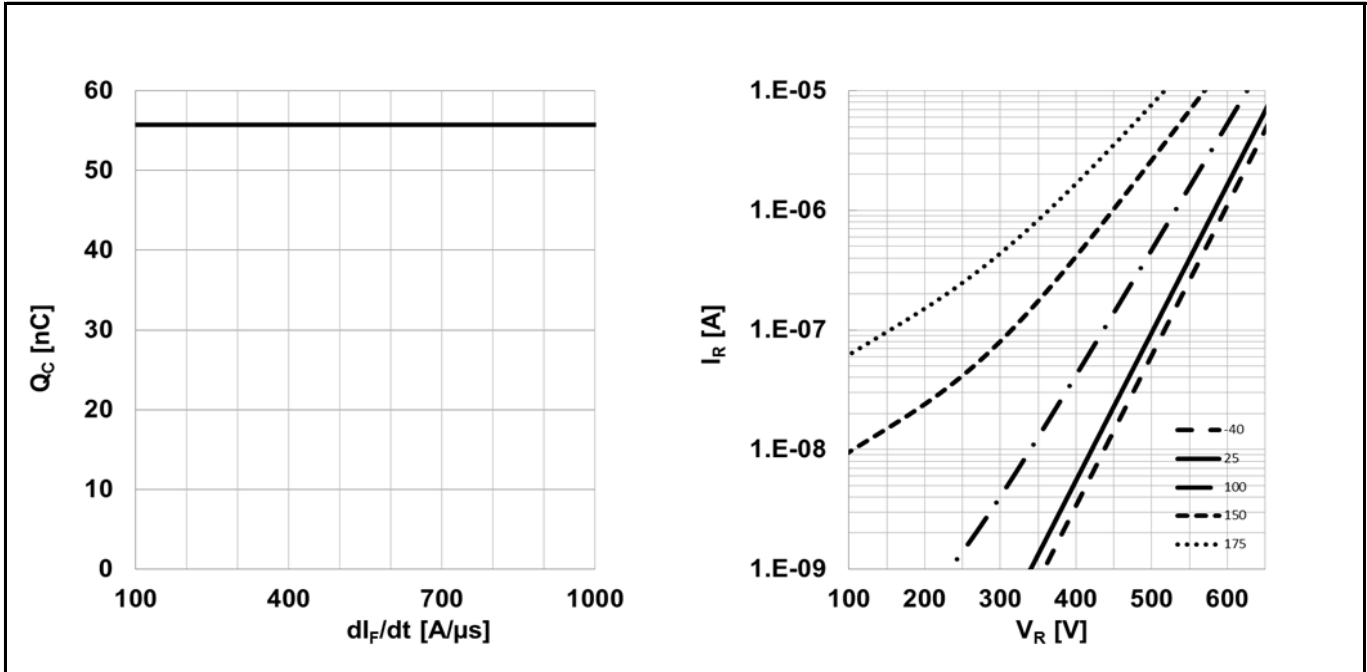


Figure 3 (LEFT) Typical capacitive charge versus current slope (only capacitive charge, guaranteed by design);  $Q_C = f(di_F/dt)$ ;  $T_j = 150^\circ\text{C}$ ;  $V_R = 400\text{V}$ ;  $I_F \leq I_{F,max}$   
(RIGHT) Typical reverse current versus reverse voltage;  $I_R = f(V_R)$ ; parameter:  $T_j$

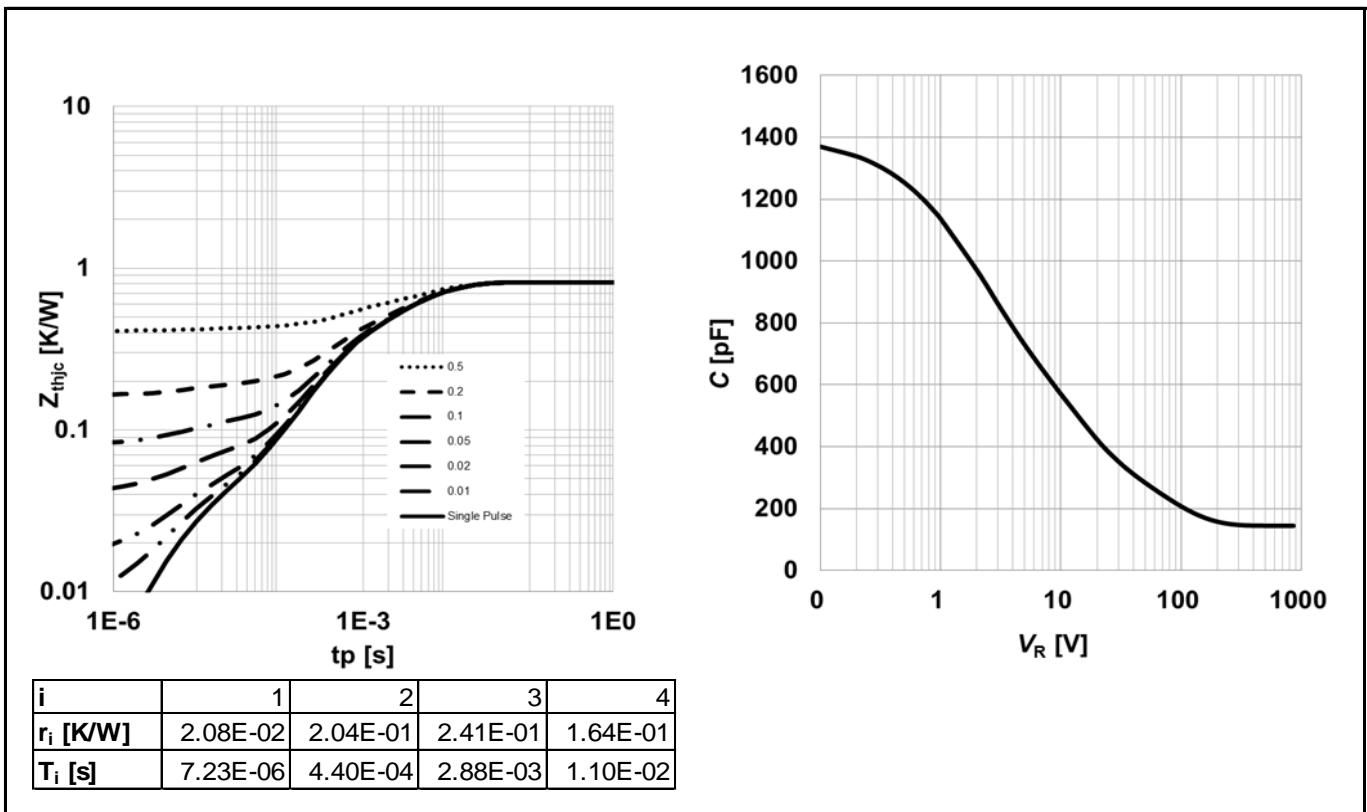


Figure 4 (LEFT) Max. Transient thermal impedance;  $Z_{thJC} = f(t_p)$ ; parameter:  $D = t_p/T$   
(RIGHT) Typ. Capacitance vs. Reverse voltage;  $C = f(V_R)$ ;  $T_j = 25^\circ\text{C}$ ;  $f = 1\text{ MHz}$

Electrical Characteristics Diagrams

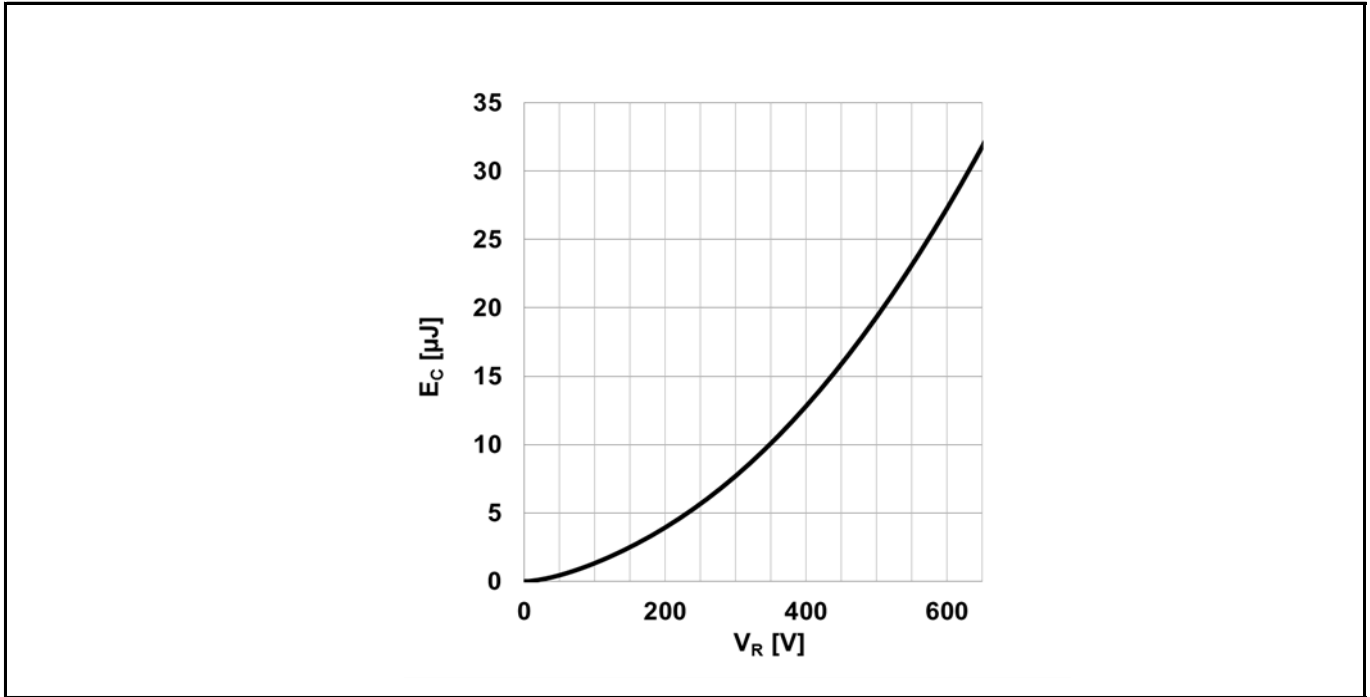


Figure 5 Typical capacitance stored energy;  $E_c = f(V_R)$

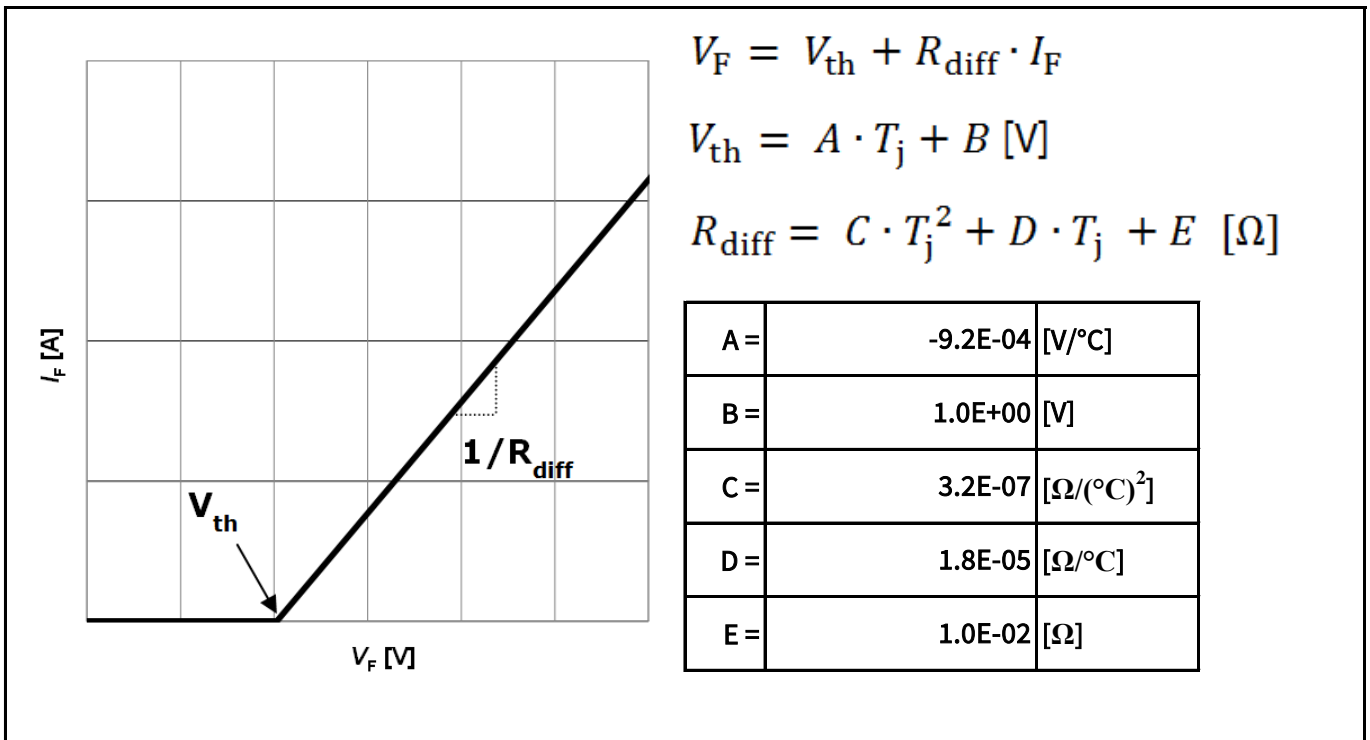


Figure 6 Simplified forward characteristics model  $V_F = f(I_F)$ ;  
-40°C <  $T_j$  < 175°C;  $I_F$  < 80 A



Package Outlines

5 Package Outlines

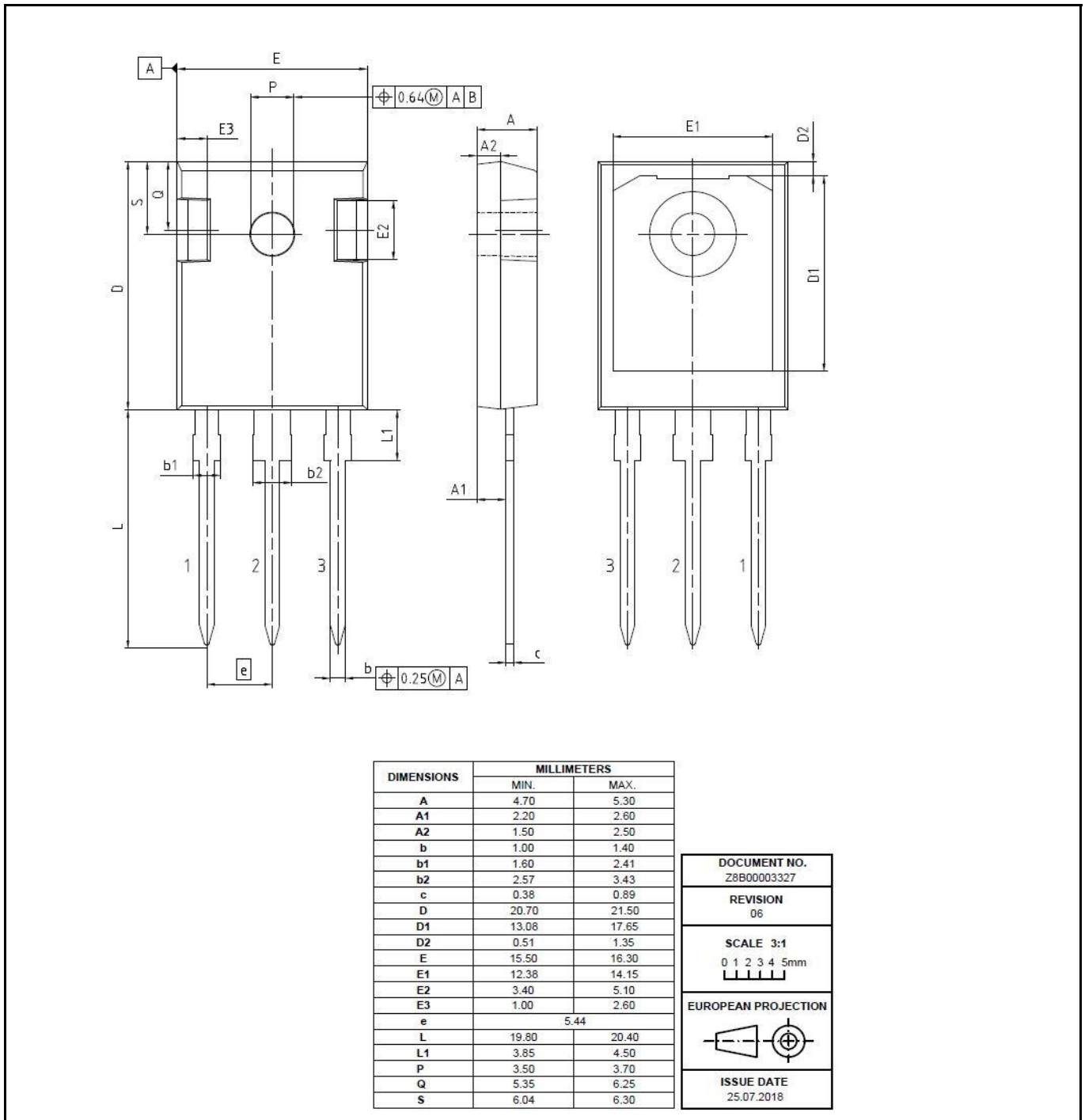


Figure 6 Package outline of PG-TO247-3-41 leaded (Dimensions in mm)

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Revision History

**Revision History**

Document Version	Date of Release	Description of changes
V3.0	26.11.2018	1st release of Data Sheet

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