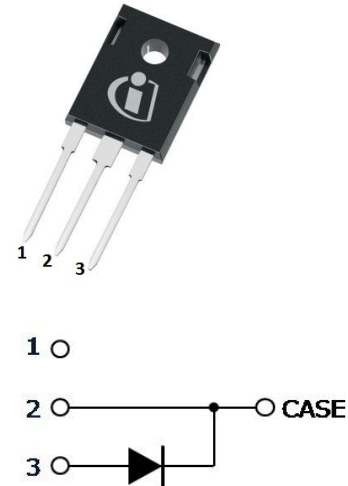


CoolSiC™ Automotive Schottky Diode 650V G5

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
$I_F; T_C < 117^\circ\text{C}$	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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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 $R_{thJC,max}$ $T_C = 117^\circ\text{C}$, $D=1$	I_F	40	A
Surge non-repetitive forward current, sine halfwave $T_C = 25^\circ\text{C}$, $t_p=10\text{ms}$ $T_C = 150^\circ\text{C}$, $t_p=10\text{ms}$	$I_{F,SM}$	182 153	A
Non-repetitive peak forward current $T_C = 25^\circ\text{C}$, $t_p=10\mu\text{s}$	$I_{F,max}$	1432	A
i^2t value $T_C = 25^\circ\text{C}$, $t_p=10\text{ms}$ $T_C = 150^\circ\text{C}$, $t_p=10\text{ms}$	$\int i^2 dt$	166 118	A^2s
Diode dv/dt ruggedness $V_R=0\ldots 480\text{V}$	dv/dt	100	V/ns
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	183	W
Operating temperature	T_j	$-40\ldots 175$	$^\circ\text{C}$
Storage temperature	T_{stg}	$-55\ldots 150$	$^\circ\text{C}$
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	$^\circ\text{C}$
Mounting Torque (M3 and M4 screws)		70	Ncm

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}	-	0.6	0.8	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	-	-		$T_j = 25^\circ\text{C}$, $I_R = 0.12\text{ mA}$
Diode forward voltage ³	V_F	-	1.5	1.7	V	$T_j = 25^\circ\text{C}$, $I_F = 40\text{ A}$
		-	1.8	2.1		$T_j = 150^\circ\text{C}$, $I_F = 40\text{ A}$
Reverse current	I_R	-	7	120	μA	$V_R = 650\text{ V}$, $T_j = 25^\circ\text{C}$
		-	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:

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-51-2.

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

Electrical Characteristics Diagrams

4 Electrical Characteristics Diagrams

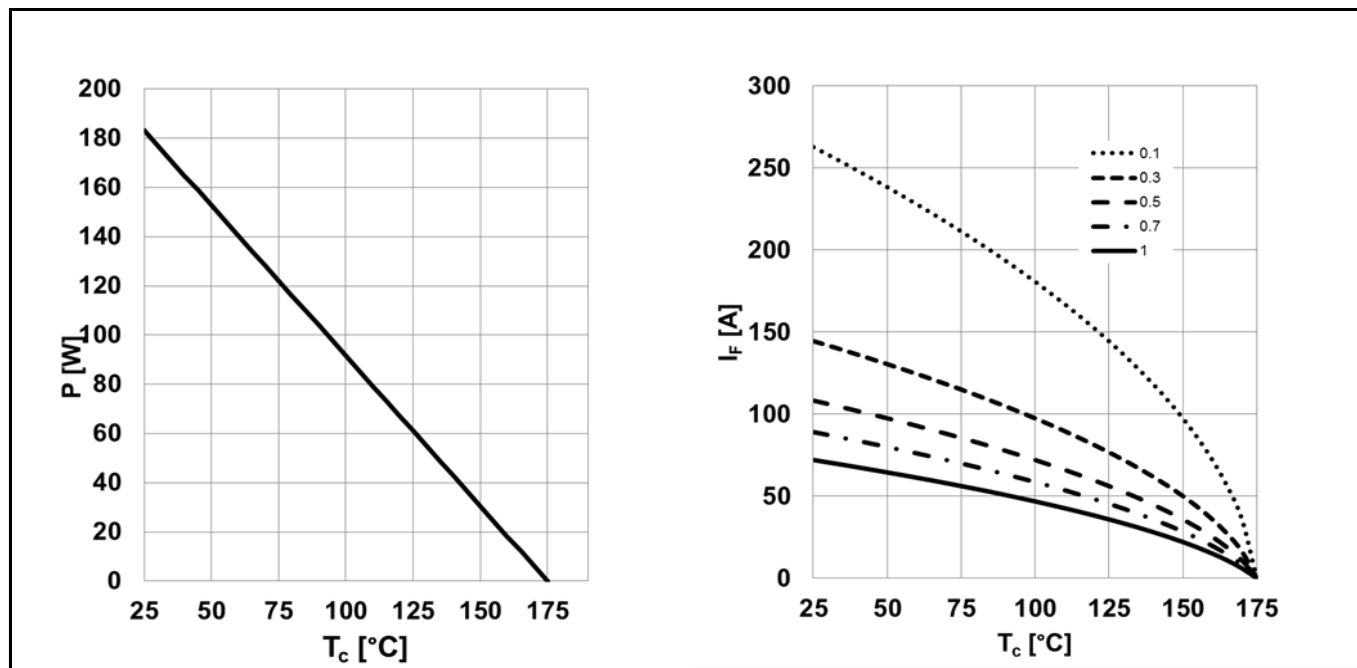


Figure 1 (LEFT) Power dissipation; $P_{\text{tot}} = f(T_c)$; $R_{\text{thJC,max}}$
(RIGHT) Diode forward current; $I_F = f(T_c)$; $T_j \leq 175$ °C; $R_{\text{thJC,max}}$; parameter: D =duty cycle

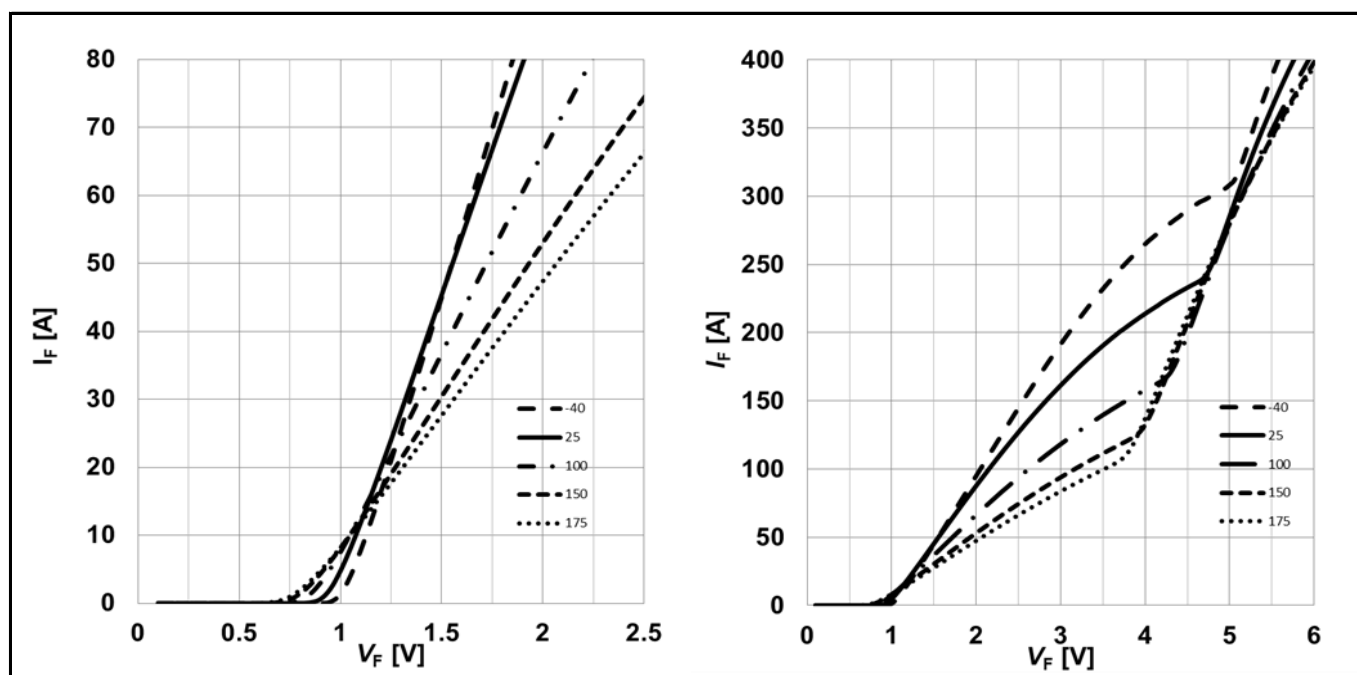


Figure 2 (LEFT) Typical forward characteristic; $I_F = f(V_F)$; $t_p = 200$ μs; parameter: T_j
(RIGHT) Typical forward characteristics in surge current; $I_F = f(V_F)$; $t_p = 200$ μs; parameter: T_j

Electrical Characteristics Diagrams

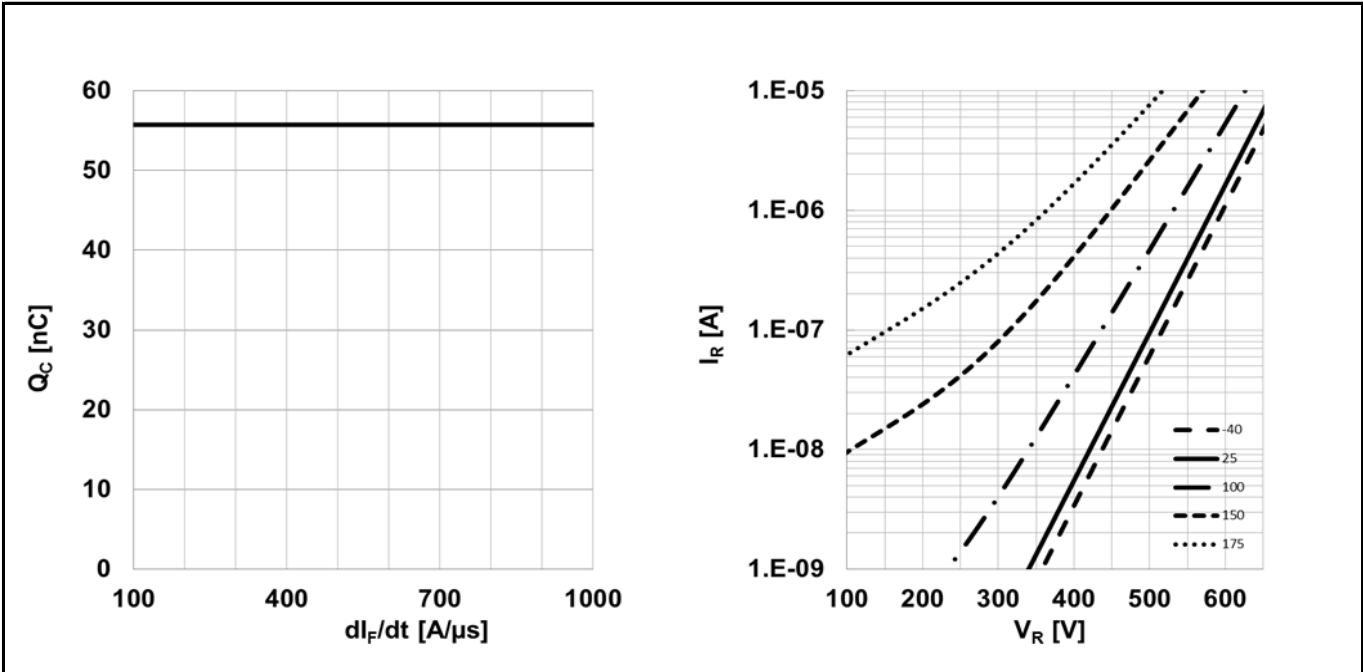


Figure 3 (LEFT) Typical capacitive charge versus current slope (only capacitive charge, guaranteed by design); $Q_C = f(di_F/dt)$; $T_j = 150^\circ\text{C}$; $V_R = 400\text{V}$; $I_F \leq I_{F,max}$
(RIGHT) Typical reverse current versus reverse voltage; $I_R = f(V_R)$; parameter: T_j

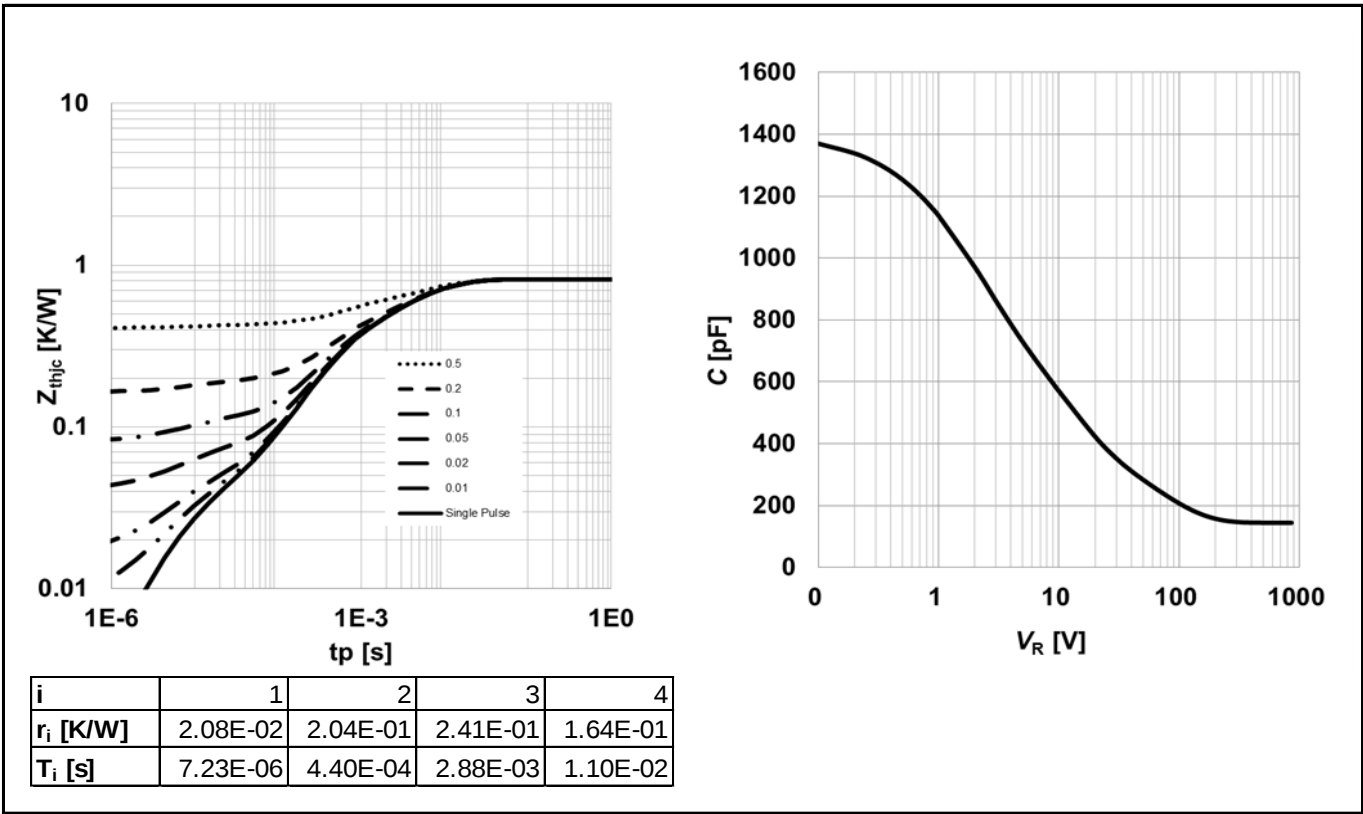


Figure 4 (LEFT) Max. Transient thermal impedance; $Z_{thJC} = f(t_p)$; parameter: $D = t_p/T$
(RIGHT) Typ. Capacitance vs. Reverse voltage; $C = f(V_R)$; $T_j = 25^\circ\text{C}$; $f = 1\text{ MHz}$

Electrical Characteristics Diagrams

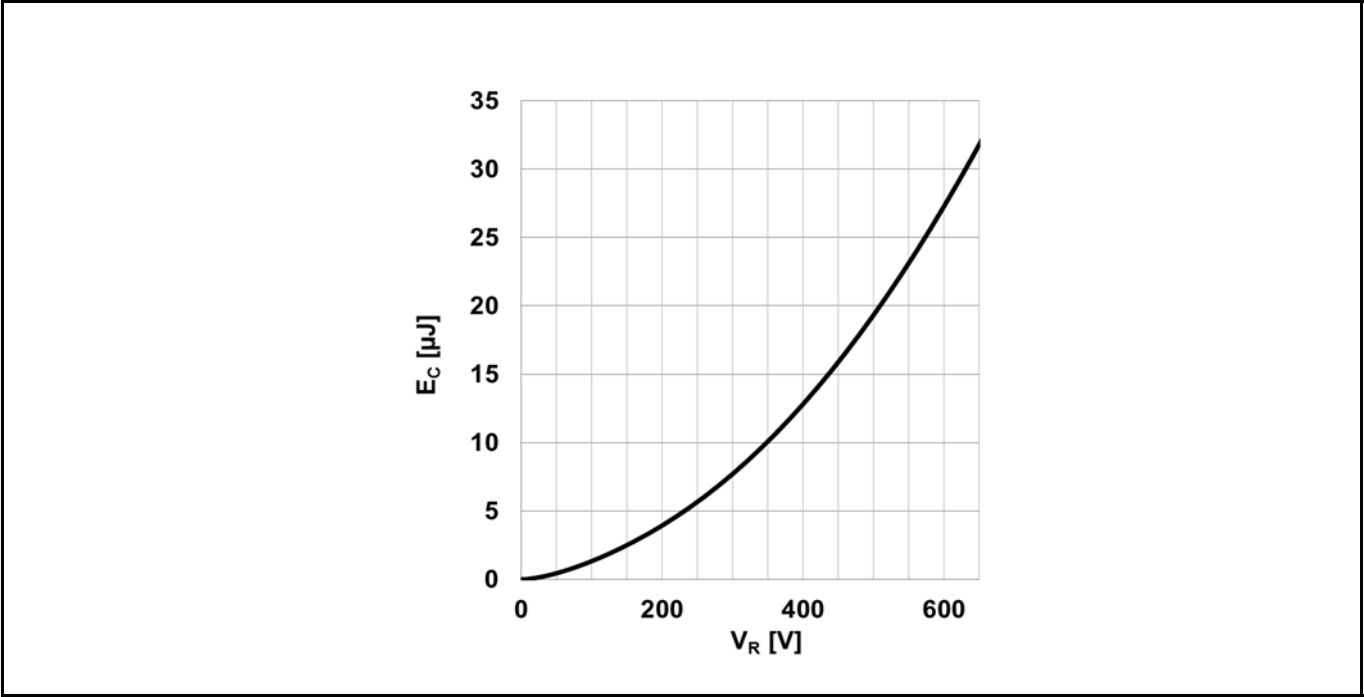


Figure 5 Typical capacitance stored energy; $E_C = f(V_R)$

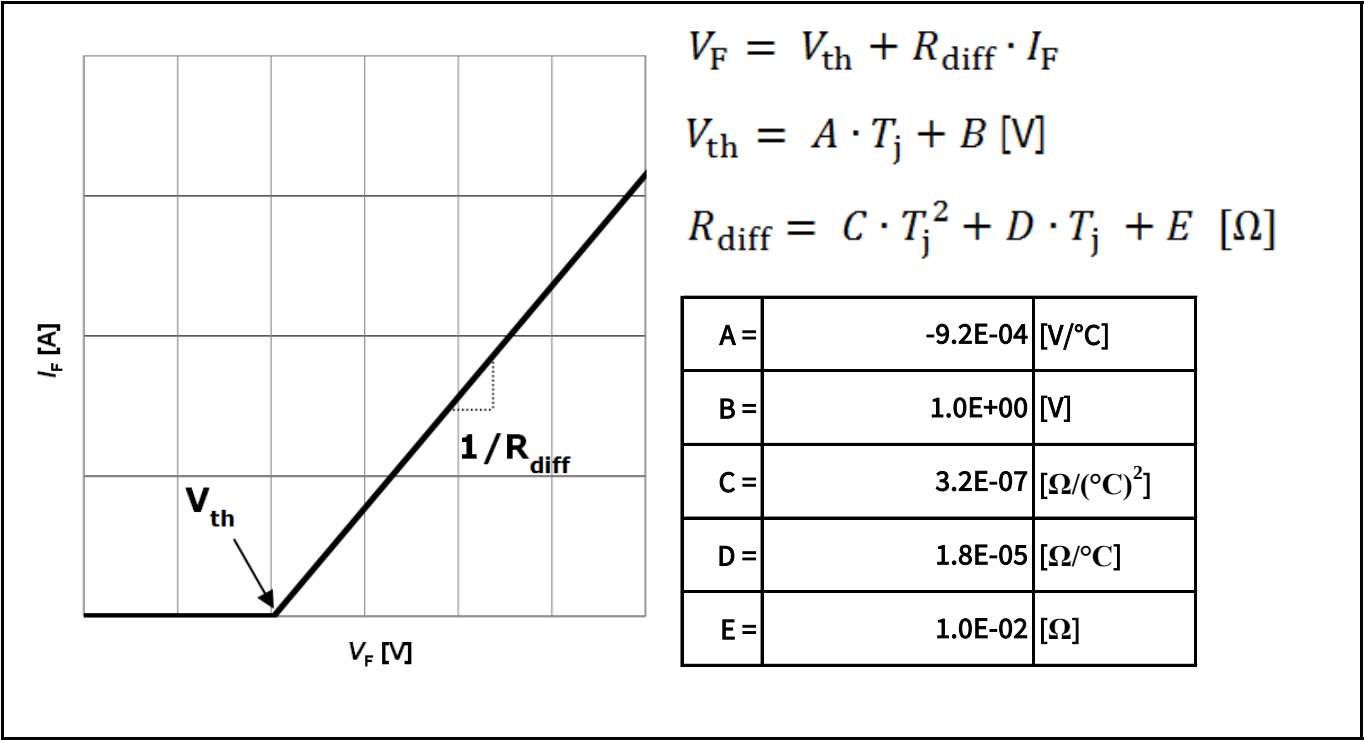


Figure 6 Simplified forward characteristics model $V_F = f(I_F)$;
 $-40^\circ\text{C} < T_j < 175^\circ\text{C}$; $I_F < 80 \text{ A}$

Package Outlines

5 Package Outlines

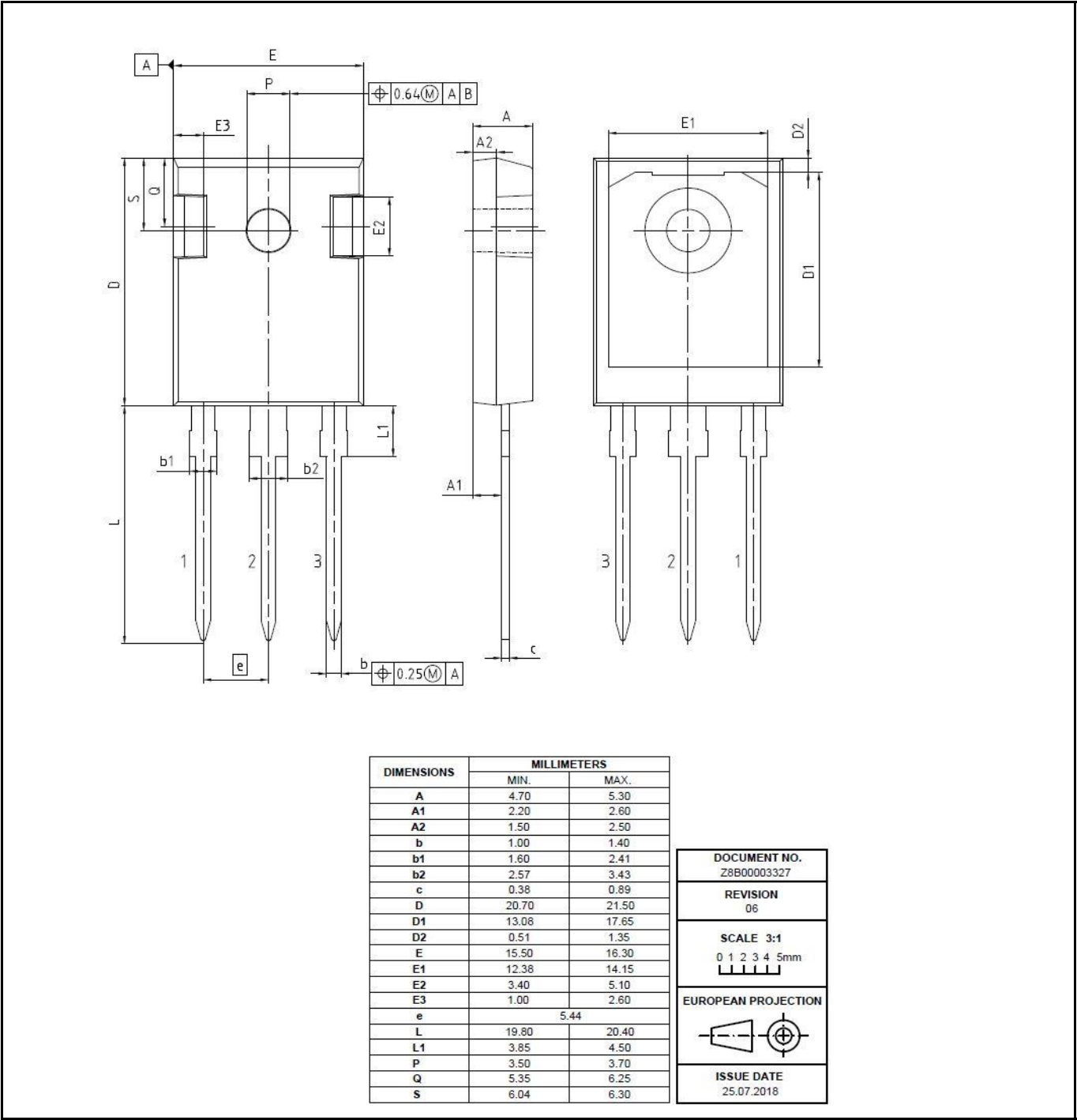


Figure 6 Package outline of PG-TO247-3-41 leaded (Dimensions in mm)



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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