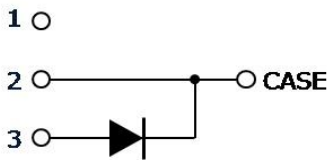
CoolSiC™ Automotive Schottky Diode 650V G5

650V/12A 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 (Qc x Vf). 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	AIDW12S65C5
Marking	AD1265C5
Package	PG-TO247-3-41
SP Number	SP001725222

Parameter	Value/Unit
$V_{DC,max}$	650 V
I_F; T_C< 133 °C	12 A
Q_C; V_R= 400 V	18 nC
E_C; V_R= 400 V	4.1 µJ
$T_{j,max}$	175 °C

Pin	Definition
Pin 2, case	Cathode
Pin 3	Anode

Table of Contents

1 Maximum Ratings

Table 1 Maximum ratings[1]

Parameter	Symbol	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	650	V
Continuous forward current for $R_{thJC,max}$ T_C = 133 °C, D=1	I_F	12	A
Surge non-repetitive forward current, sine halfwave T_C= 25°C, t_p=10ms T_C= 150°C, t_p=10ms	$I_{F,SM}$	 71 56	A
Non-repetitive peak forward current T_C= 25°C, t_p=10µs	$I_{F,max}$	505	A
i^2t value T_C= 25°C, t_p=10ms T_C= 150°C, t_p=10ms	$\int i^2\,dt$	 25.4 15.7	A^2s
Diode dv/dt ruggedness V_R=0...480V	dv/dt	100	V/ns
Power dissipation T_C = 25°C	P_{tot}	76	W
Operating temperature	T_j	-40…175	°C
Storage temperature	T_{stg}	-55…150	°C
ESD Human body model, R= 1.5 kΩ, C = 100 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

2 Thermal Characteristics

Table 2 Thermal Characteristics[1]

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction–case[2]	R_{thJC}	-	1.5	2.0	K/W	
Thermal resistance, junction-ambient[2]	R_{thJA}	-	-	62	K/W	

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°C, I_R = 0.07 mA
Diode forward voltage[3]	V_F	-	1.5	1.7		T_j = 25°C, I_F = 12 A
		-	1.8	2.1		T_j = 150°C, I_F = 12 A
Reverse current	I_R	-	2	70	µA	V_R = 650 V, T_j = 25 °C
		-	14	-		V_R = 650 V, T_j = 150 °C

Table 4 Dynamic Characteristics at Tj=25°C unless noted otherwise

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_C	-	18	-	nC	V_R = 400 V, di/dt = 200 A/µs, $I_F \leq I_{F,MAX}$, T_j = 150 °C
Total capacitance	C	-	363	-	pF	V_R = 1 V, f = 1 MHz
		-	47	-		V_R = 300 V, f = 1 MHz
		-	46	-		V_R = 600 V, f = 1 MHz

Footnotes:

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

[2] Rth,JC defined as per JESD-51-14. Rth,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.

4 Electrical Characteristics Diagrams

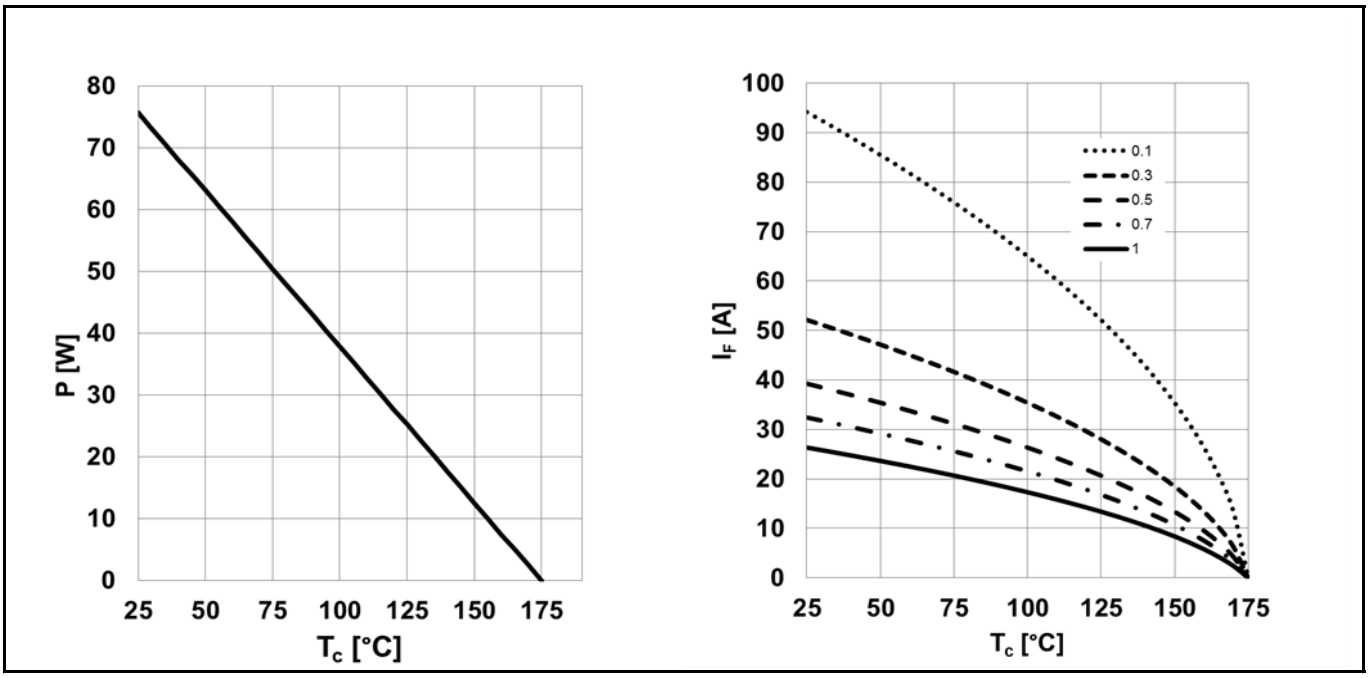


Figure 1 (LEFT) Power dissipation; $P_{tot}= f(T_C)$; $R_{thJC,max}$
(RIGHT) Diode forward current; $I_F= f(T_C)$; $T_j \leq 175$ °C; $R_{thJC,max}$; parameter: D=duty cycle

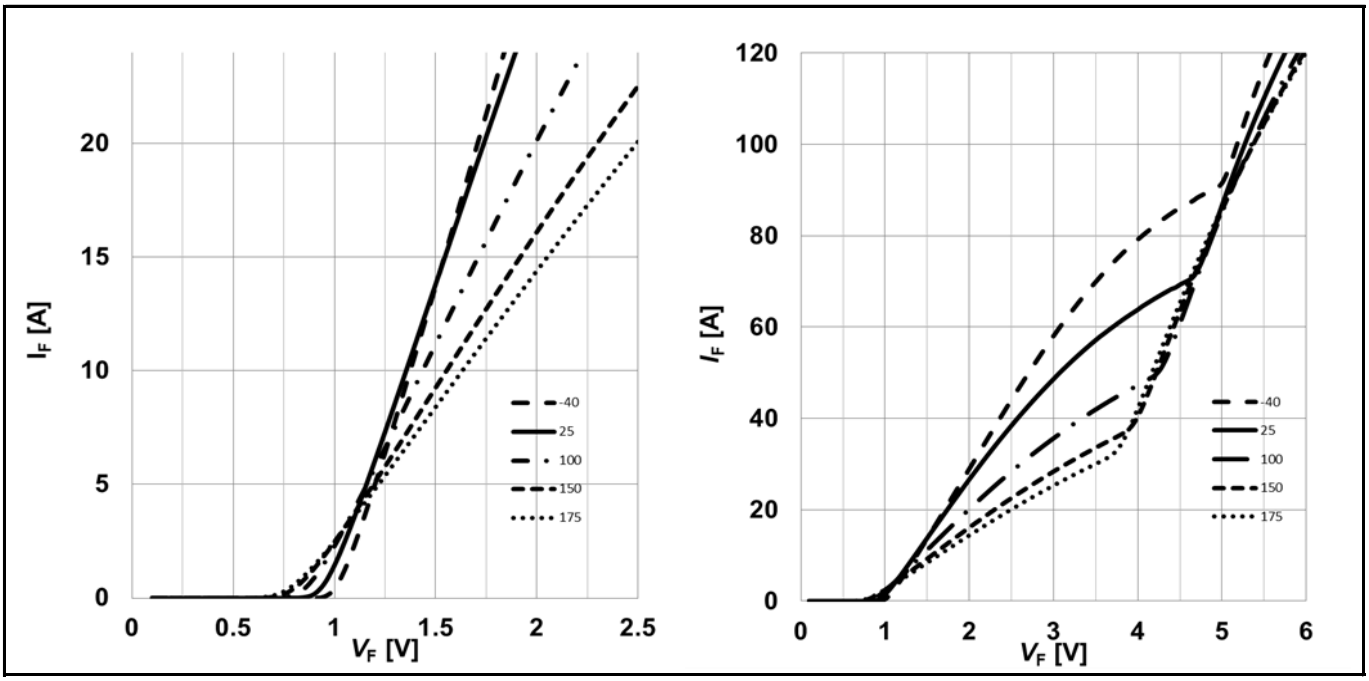


Figure 2 (LEFT) Typical forward characteristic; $I_F= f(V_F)$; t_P=200 µs; parameter:T_j
(RIGHT) Typical forward characteristics in surge current; $I_F= f(V_F)$; t_P=200 µs; parameter:T_j

Electrical Characteristics Diagrams

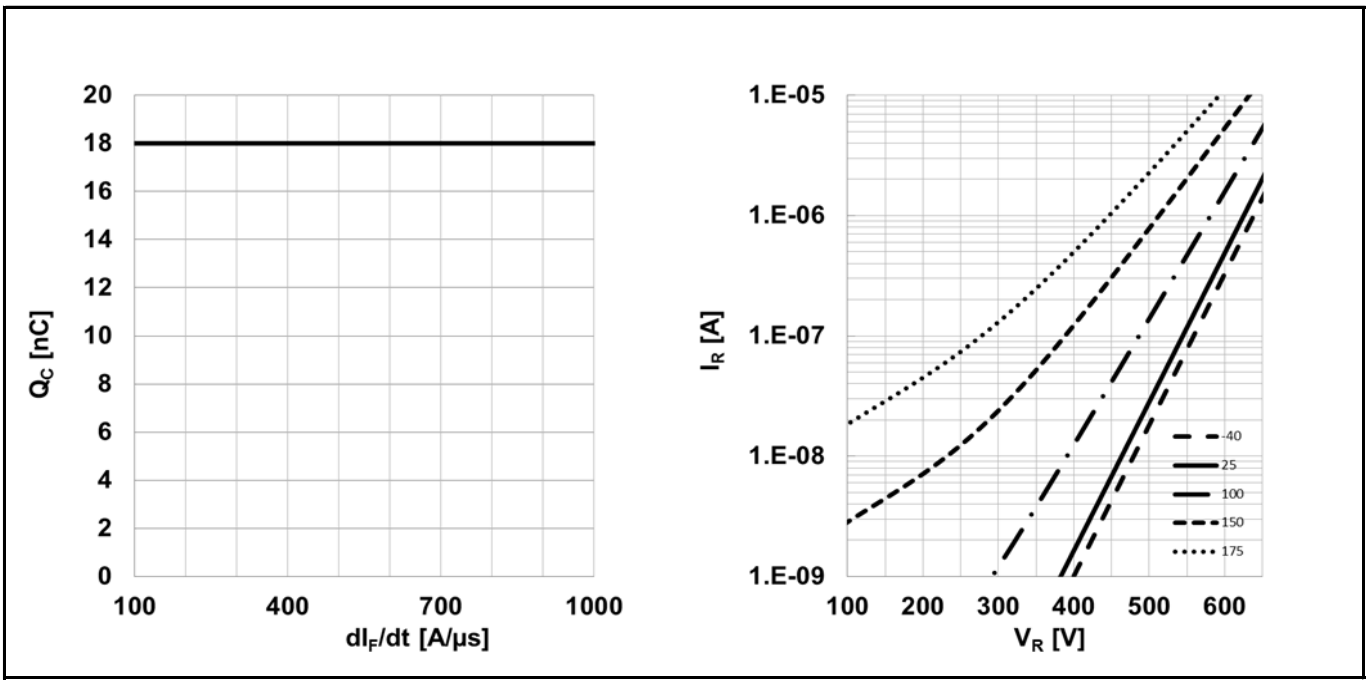
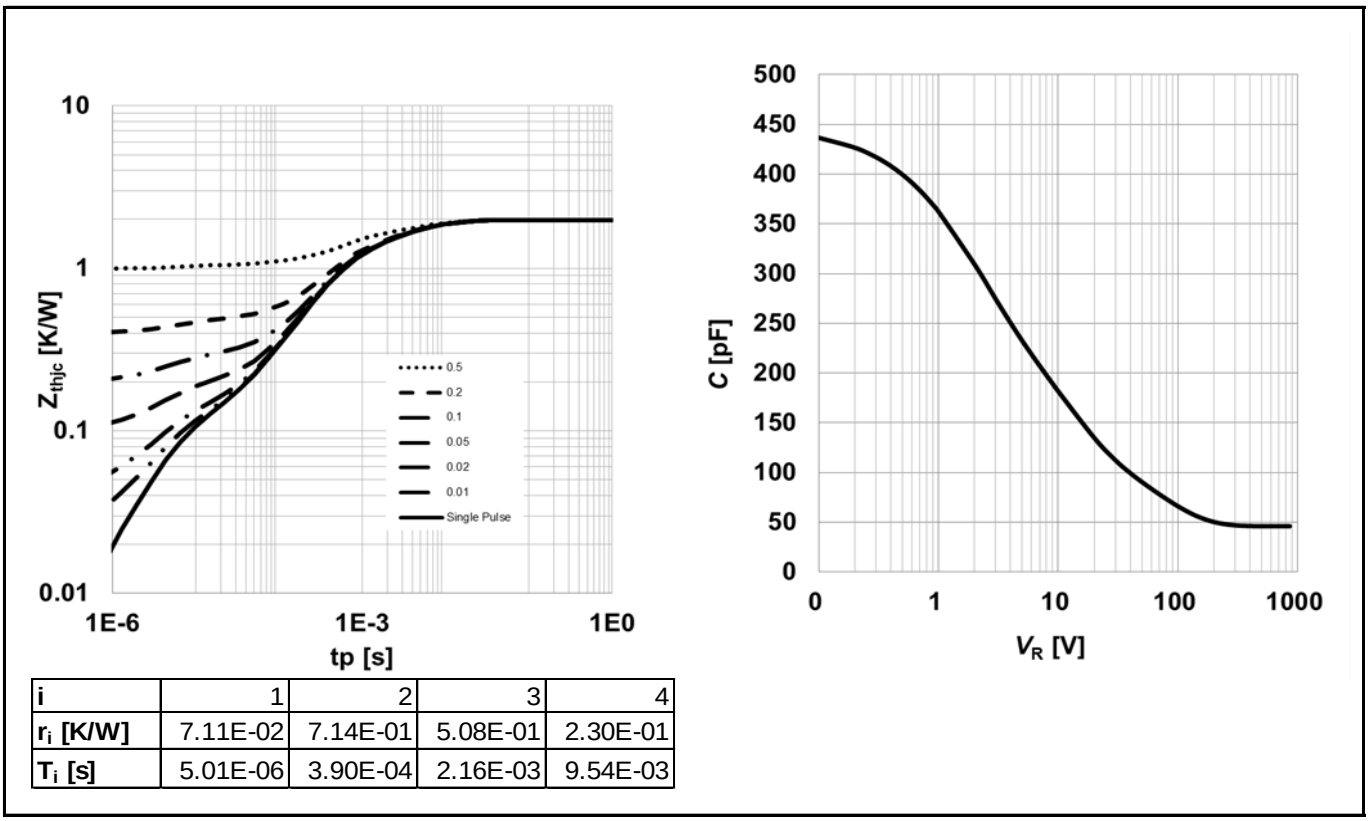


Figure 3 (LEFT) Typical capacitive charge versus current slope (only capacitive charge, guaranteed by design); $Q_C = f(di_F/dt)$; T_j=150°C; V_R=400V; $I_F \leq I_{F,max}$
(RIGHT) Typical reverse current versus reverse voltage; $I_R = f(V_R)$;parameter: T_j



i	1	2	3	4
r_i [K/W]	7.11E-02	7.14E-01	5.08E-01	2.30E-01
T_i [s]	5.01E-06	3.90E-04	2.16E-03	9.54E-03

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°C; f=1 MHz

Electrical Characteristics Diagrams

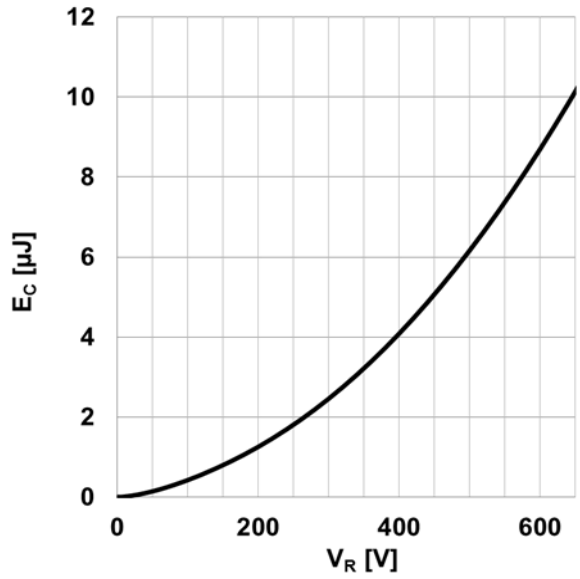
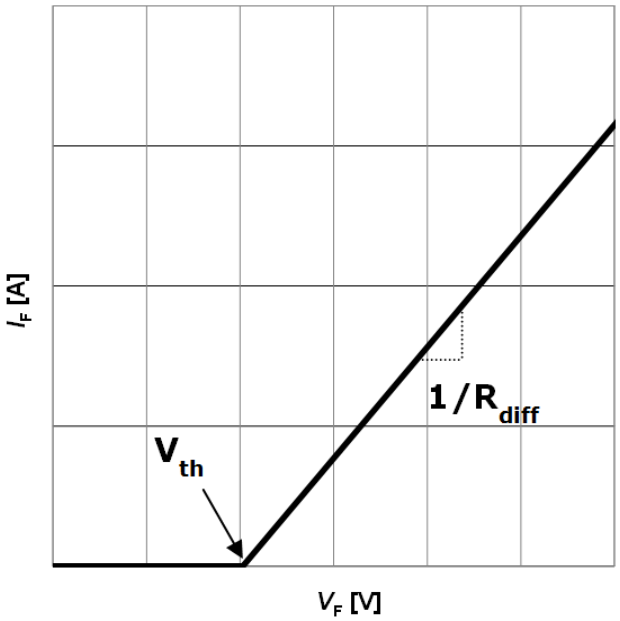


Figure 5 Typical capacitance stored energy; $E_C = f(V_R)$



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

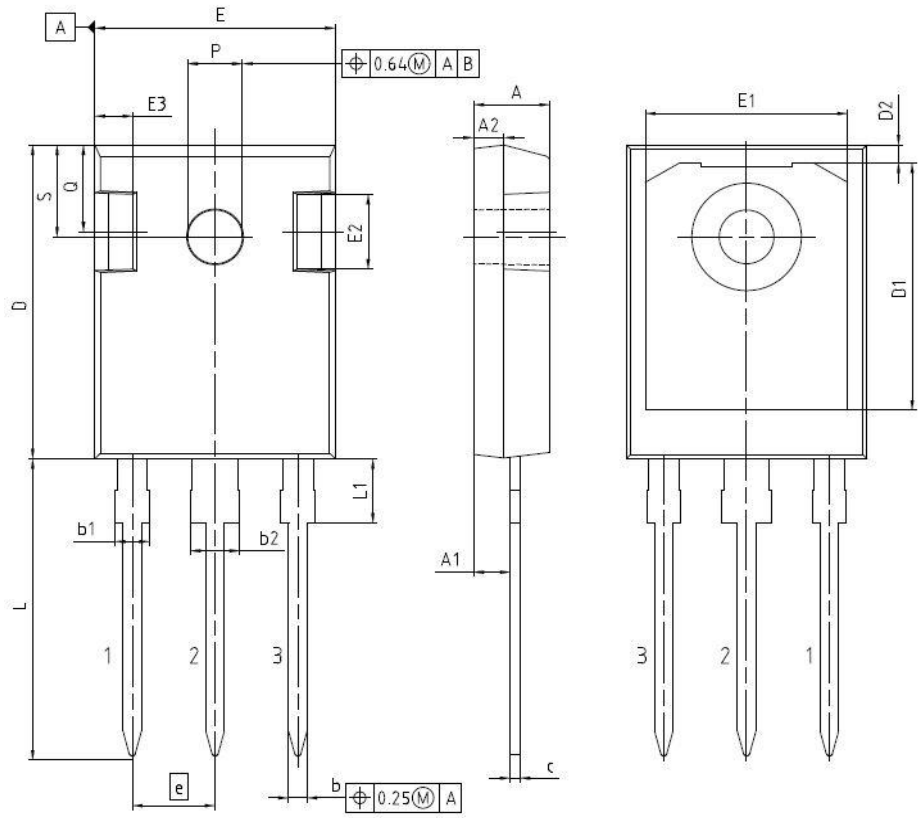
$$V_{th} = A \cdot T_j + B \text{ [V]}$$

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

A =	-9.2E-04	[V/°C]
B =	1.0E+00	[V]
C =	1.0E-06	[Ω/(°C)^2]
D =	6.1E-05	[Ω/°C]
E =	3.3E-02	[Ω]

Figure 6 Simplified forward characteristics model $V_F = f(I_F)$;
$-40°C < T_j < 175°C$; $I_F <$ 24 A

5 Package Outlines



DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.70	5.30
A1	2.20	2.60
A2	1.50	2.50
b	1.00	1.40
b1	1.60	2.41
b2	2.57	3.43
c	0.38	0.89
D	20.70	21.50
D1	13.08	17.65
D2	0.51	1.35
E	15.50	16.30
E1	12.38	14.15
E2	3.40	5.10
E3	1.00	2.60
e	5.44	
L	19.80	20.40
L1	3.85	4.50
P	3.50	3.70
Q	5.35	6.25
S	6.04	6.30

DOCUMENT NO.
Z8B00003327

REVISION
06

SCALE 3:1
0 1 2 3 4 5mm

EUROPEAN PROJECTION

ISSUE DATE
25.07.2018

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

Revision History

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

Trademarks
All referenced product or service names and trademarks are the property of their respective owners.

Edition 2017-07-07

Published by
Infineon Technologies AG
81726 München, Germany

Do you have a question about this document?
Email: erratum@infineon.com

Document reference

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie") .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (www.infineon.com).

WARNINGS
Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.