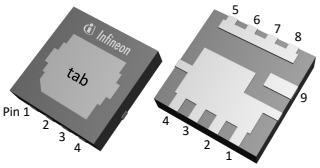
MOSFET

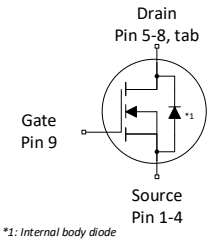
PG-WHTFN-9 (3x3)

OptiMOS™ 6 Power-Transistor, 60 V



Features

- Optimized for high frequency switching and synchronous rectification
- N-channel, normal level
- Very low on-resistance $R_{DS(on)}$
- Superior thermal resistance
- 100% avalanche tested
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key performance parameters

Parameter	Value	Unit
V_{DS}	60	V
$R_{DS(on),max}$	1.8	mΩ
I_D	178	A
Q_{oss}	64	nC
Q_G(0V...10V)	43	nC
Q_{rr}(100A/µs)	26	nC

Part number	Package	Marking	Related links
IQE018N06NM6CGSC	PG-WHTFN-9	T	-

Table of contents

Description 1
Maximum ratings 3
Thermal characteristics 4
Electrical characteristics 5
Electrical characteristics diagrams 7
Package outlines 11
Revision history 14
Trademarks 15
Disclaimer 15

1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Continuous drain current [1]	I_D	-	-	178	A	V_{GS}=10 V, T_C=25 °C
				126		V_{GS}=10 V, T_C=100 °C
				93		V_{GS}=6 V, T_C=100 °C
				25		V_{GS}=10 V, T_A=25°C, R_{thJA}=60°C/W [2]
Pulsed drain current [3]	$I_{D,pulse}$	-	-	712	A	T_C=25 °C
Avalanche energy, single pulse [4]	E_{AS}	-	-	280	mJ	I_D=20 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	125	W	T_C=25 °C
				2.5		T_A=25 °C, R_{thJA}=60 °C/W [2]
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	-

[1] Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature as specified. For other case temperatures please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

[2] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

[3] See Diagram 3 for more detailed information

[4] See Diagram 13 for more detailed information

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	0.57	1.2	°C/W	-
Thermal resistance, junction - case, top	R_{thJC}		0.7	1.4		
Thermal resistance, junction - ambient, 6 cm² cooling area [5)]	R_{thJA}		-	60		

[5)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

3 Electrical characteristics

at T_j=25 °C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2.1	2.7	3.3	V	V_{DS}=V_{GS}, I_D=51 µA
Zero gate voltage drain current	I_{DSS}	-	0.1	1	µA	V_{DS}=48 V, V_{GS}=0 V, T_j=25 °C
			10	100		V_{DS}=48 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	1.5	1.8	mΩ	V_{GS}=10 V, I_D=30 A
Drain-source on-state resistance [6]	$R_{DS(on)}$	-	1.68	2.2	mΩ	V_{GS}=8 V, I_D=15 A
Gate resistance	R_G	0.3	0.6	1.0	Ω	-
Transconductance [6]	g_{fs}	60	120	-	S	$\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, I_D=30 A

[6] Defined by design. Not subject to production test.

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	2800	3600	pF	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz
Output capacitance [7]	C_{oss}		1000	1300		
Reverse transfer capacitance [7]	C_{rss}		53	93		
Turn-on delay time	$t_{d(on)}$	-	7.2	-	ns	V_{DD}=30 V, V_{GS}=10 V, I_D=30 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r		1.5			
Turn-off delay time	$t_{d(off)}$		14.5			
Fall time	t_f		4.4			

[7] Defined by design. Not subject to production test.

Table 6 Gate charge characteristics [8)]

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	12.4	-	nC	V_{DD}=30 V, I_D=30 A, V_{GS}=0 to 10 V
Gate charge at threshold	$Q_{g(th)}$		7.6	-	nC	
Gate to drain charge [9)]	Q_{gd}		9.7	14.6	nC	
Switching charge	Q_{sw}		14.5	-	nC	
Gate charge total [9)]	Q_g		43	56	nC	
Gate plateau voltage	$V_{plateau}$		4.4	-	V	
Gate charge total, sync. FET	$Q_{g(sync)}$	-	38	-	nC	V_{DS}=0.1 V, V_{GS}=0 to 10 V
Output charge [9)]	Q_{oss}	-	64	85	nC	V_{DS}=30 V, V_{GS}=0 V

[8)] See "Gate charge waveforms" for parameter definition

[9)] Defined by design. Not subject to production test.

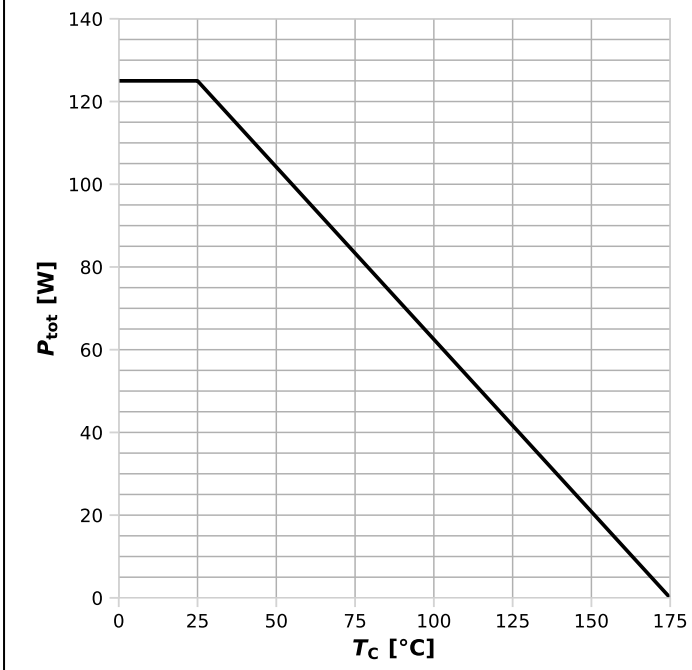
Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	123	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$			712		
Diode forward voltage	V_{SD}	-	0.80	1.0	V	V_{GS}=0 V, I_F=30 A, T_j=25 °C
Reverse recovery time [10)]	t_{rr}	-	31	62	ns	V_R=30 V, I_F=30 A, di_F/dt=100 A/µs
Reverse recovery charge [10)]	Q_{rr}		26	52	nC	
Reverse recovery time [10)]	t_{rr}	-	20	40	ns	V_R=30 V, I_F=30 A, di_F/dt=1000 A/µs
Reverse recovery charge [10)]	Q_{rr}		138	276	nC	

[10)] Defined by design. Not subject to production test.

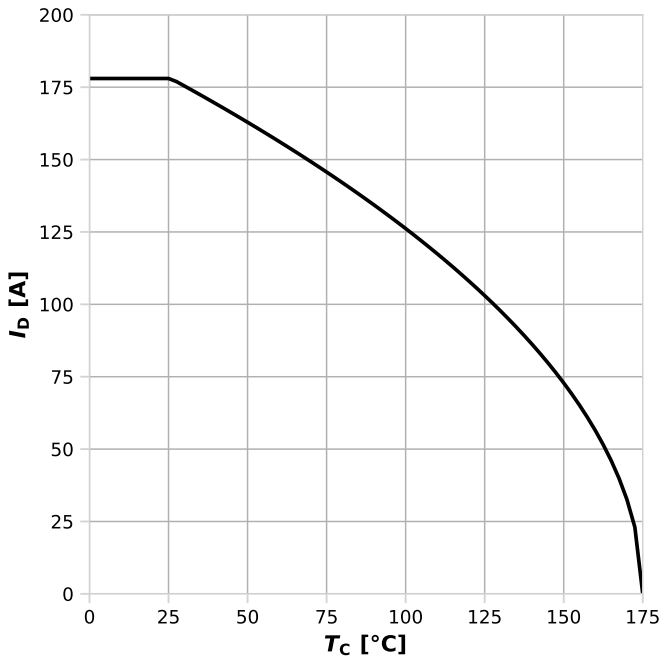
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



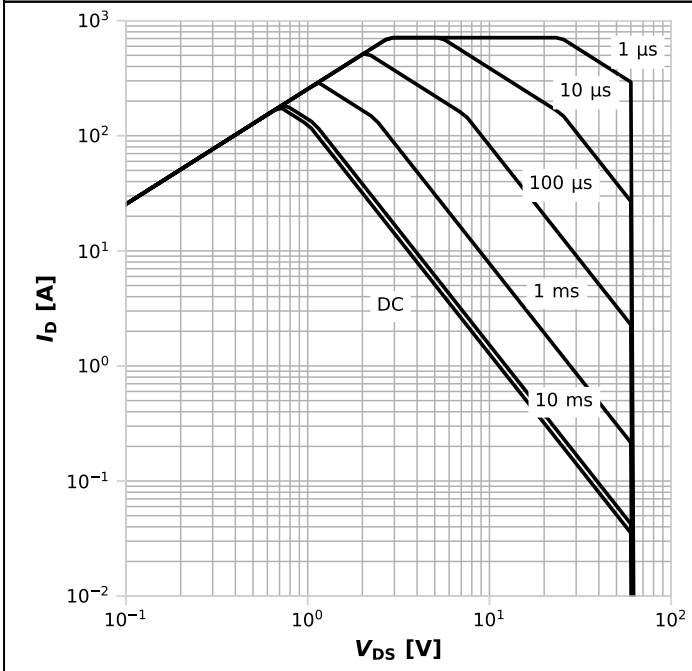
P_{tot}=f(T_C)

Diagram 2: Drain current



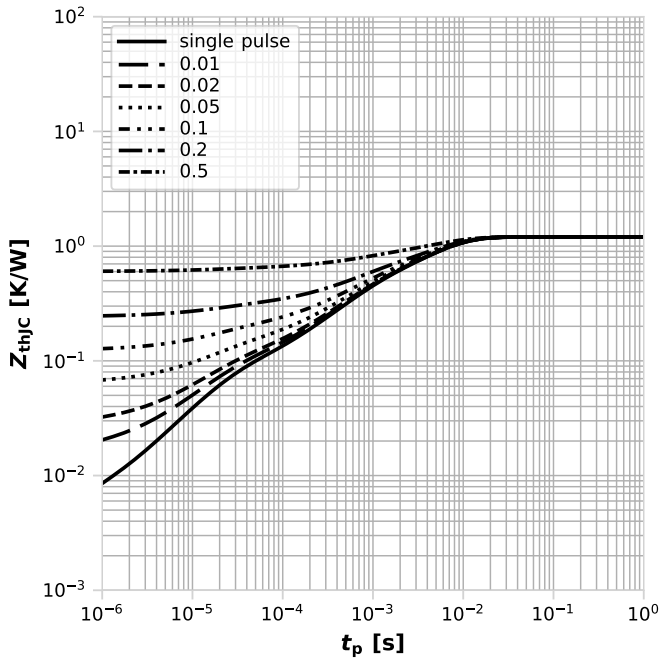
I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area



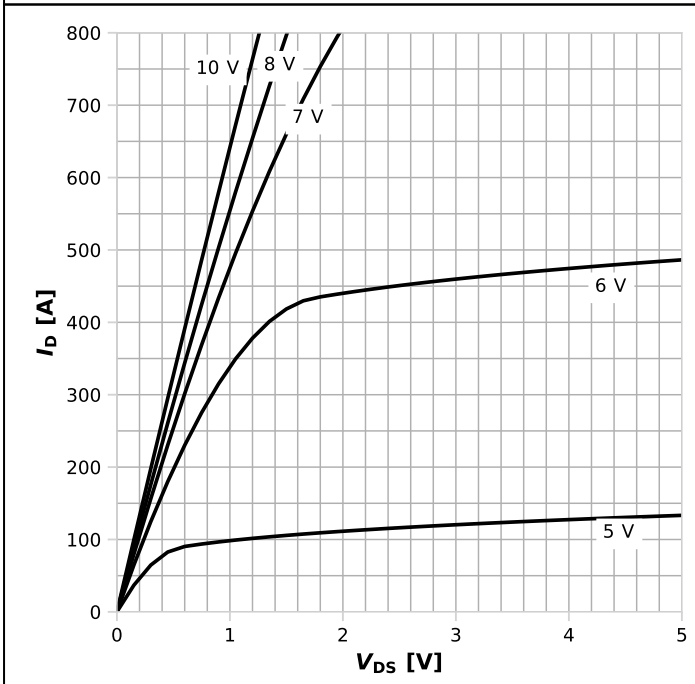
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



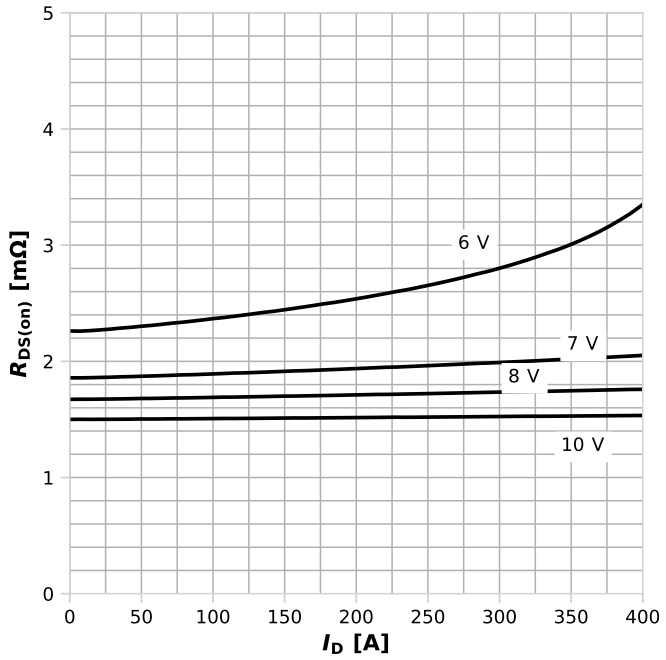
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



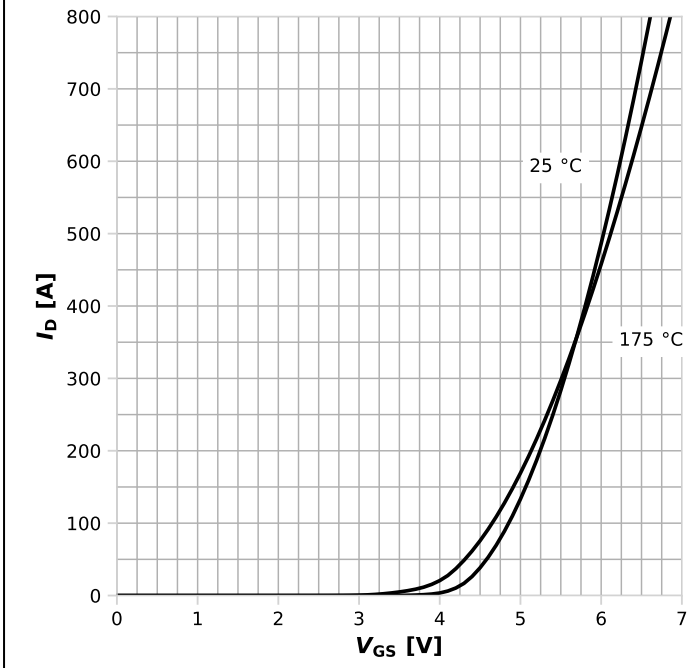
I_D=f(V_{DS}), T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



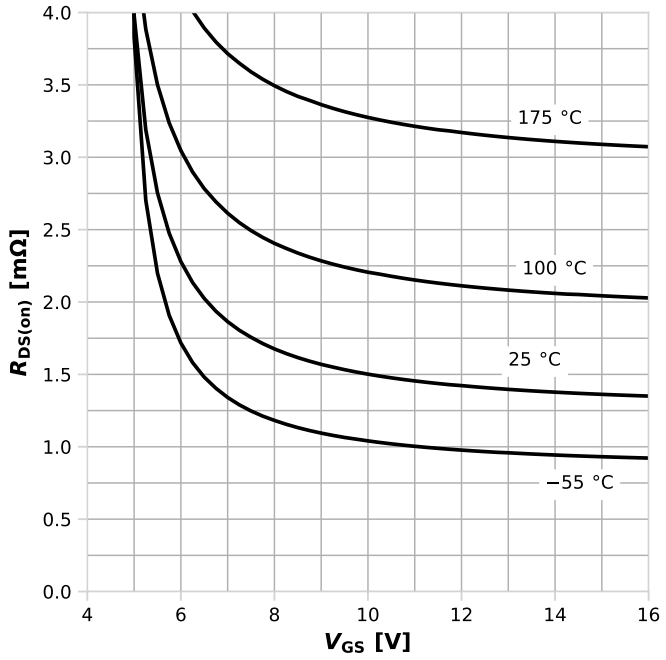
$R_{DS(on)}$=f(I_D), T_j=25 °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



I_D=f(V_{GS}), |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. drain-source on resistance



$R_{DS(on)}$=f(V_{GS}), I_D=30 A; parameter: T_j

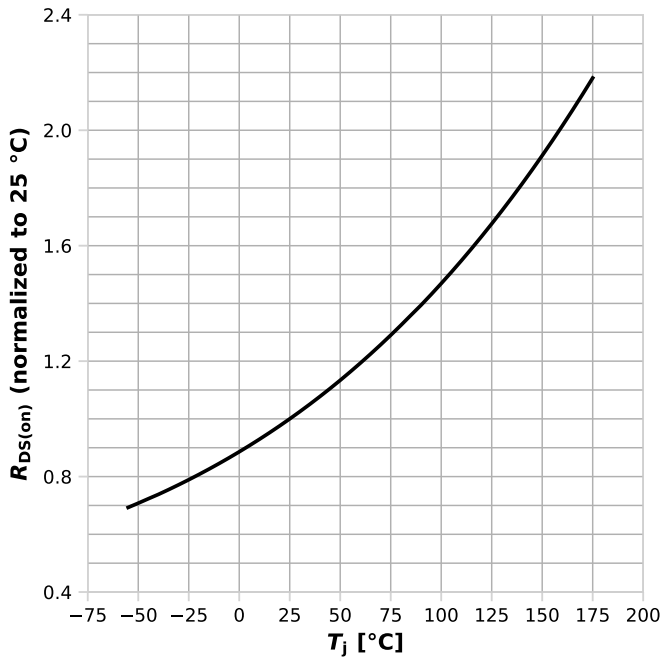
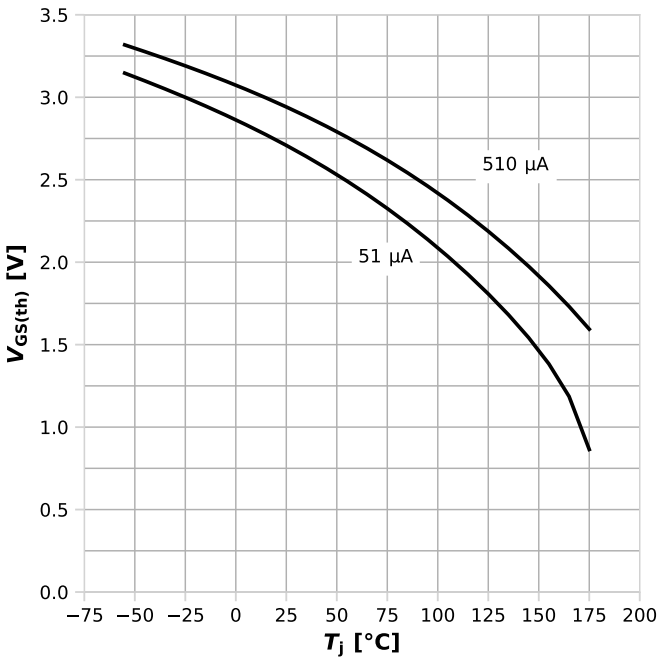
Diagram 9: Normalized drain-source on resistance	Diagram 10: Typ. gate threshold voltage
	
$R_{DS(on)}$=f(T_j), I_D=30 A, V_{GS}=10 V	$V_{GS(th)}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

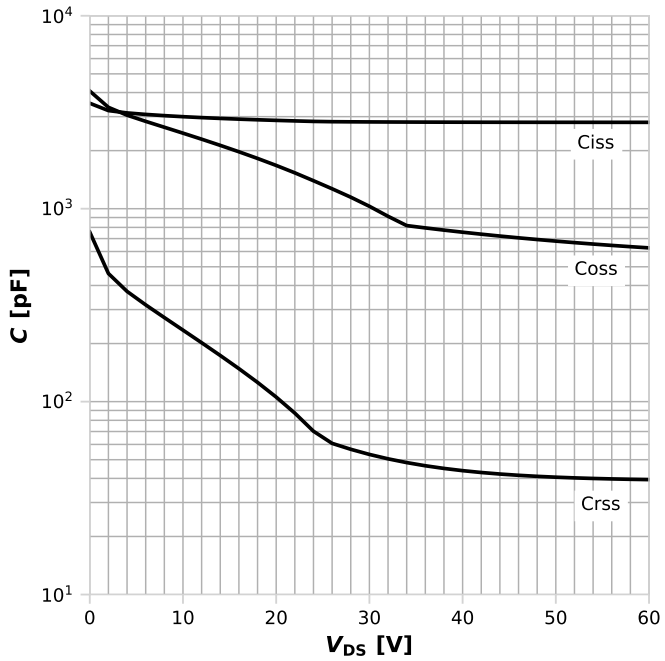
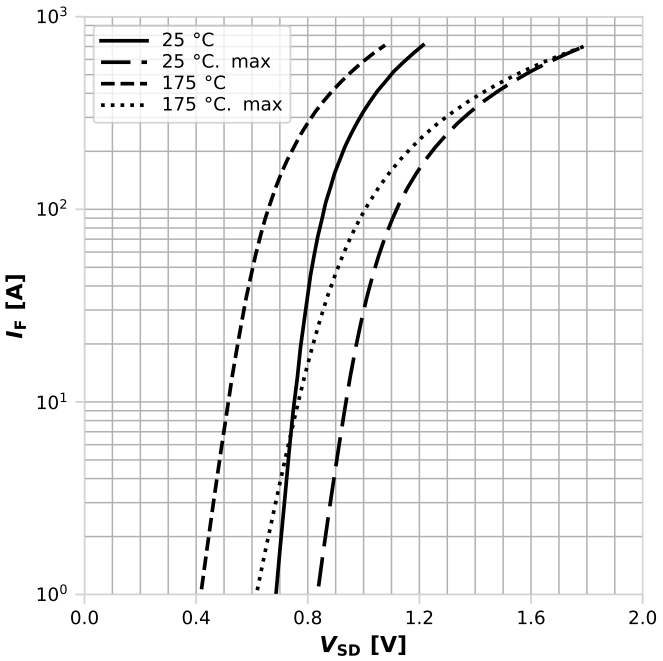
Diagram 11: Typ. capacitances	Diagram 12: Forward characteristics of reverse diode
	
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz	I_F=f(V_{SD}); parameter: T_j

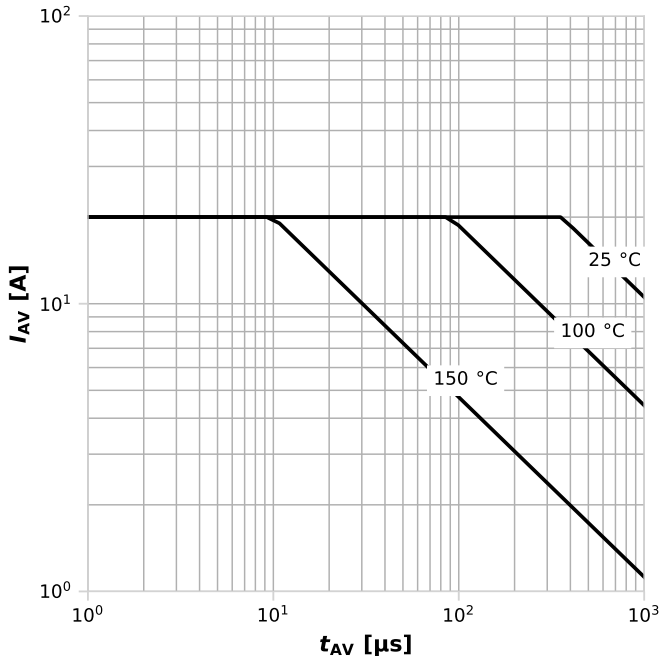
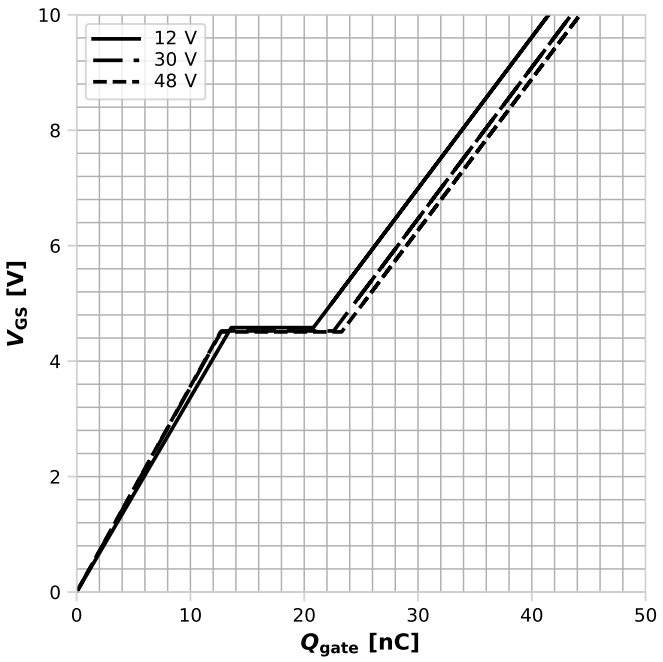
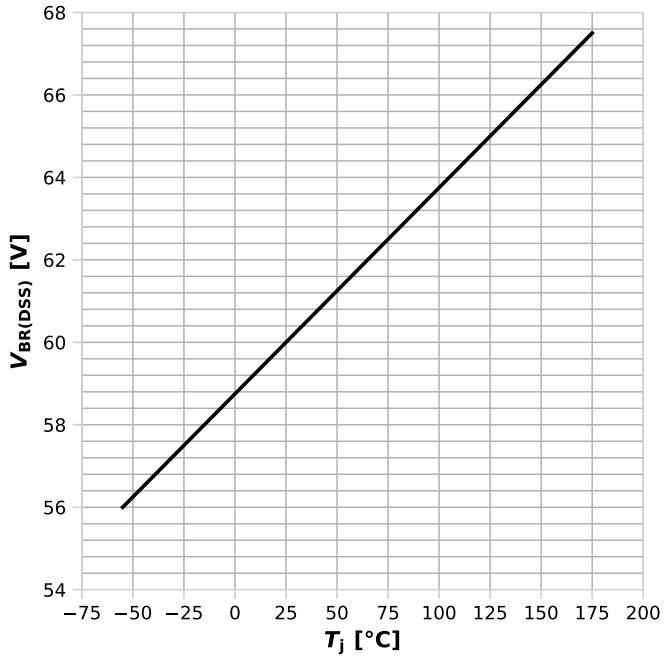
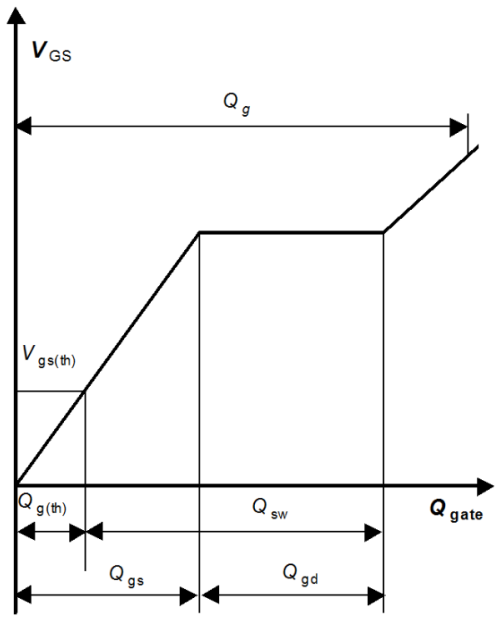
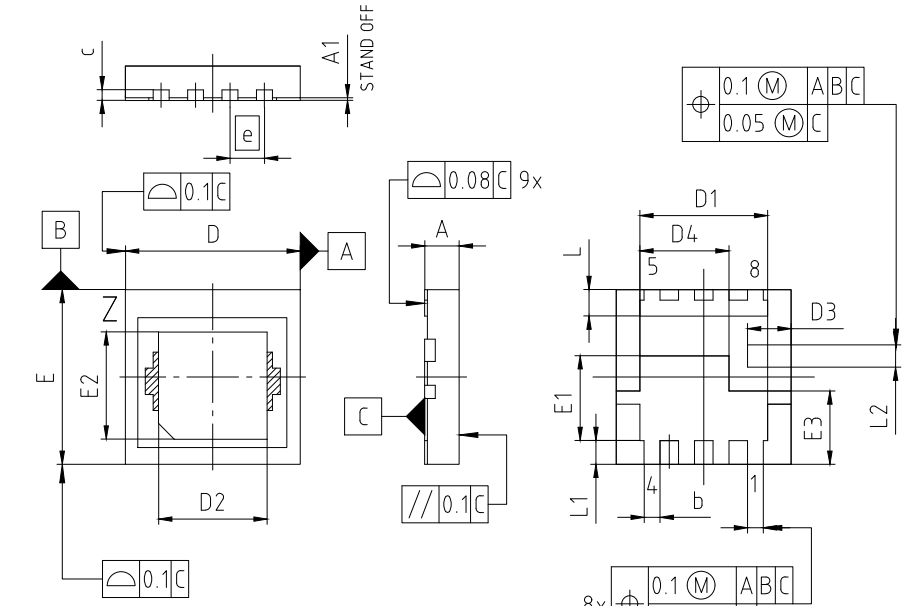
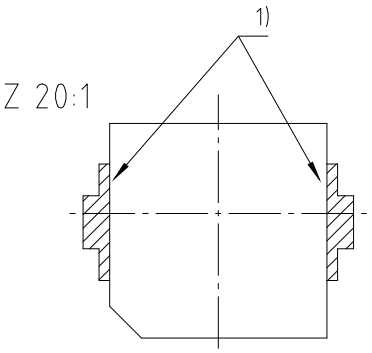
Diagram 13: Avalanche characteristics	Diagram 14: Typ. gate charge
	
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j,start}$	V_{GS}=f(Q_{gate}), I_D=30 A pulsed, T_j=25 °C; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage	Gate charge waveforms
	
$V_{BR(DSS)}$=f(T_j); I_D=10 mA	-

5 Package outlines



PACKAGE - GROUP NUMBER:	PG-WHTFN-9-U01	
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	0.55	0.75
A1	0	0.05
b	0.20	0.40
c	0.10	0.30
D	3.20	3.40
D1	2.31	2.51
D2	1.95	2.25
D3	0.73	0.93
D4	1.58	1.78
E	3.20	3.40
E1	1.50	1.70
E2	1.93	2.23
E3	1.285	1.485
e	0.65	
L	0.40	0.60
L1	0.35	0.55
L2	0.32	0.52



1) NOT PART OF SPECIFIED HEATSINK AREA -
SHAPE MIGHT VARY DEPENDING ON HEATSINK DESIGN

Figure 1 Outline PG-WHTFN-9, dimensions in mm

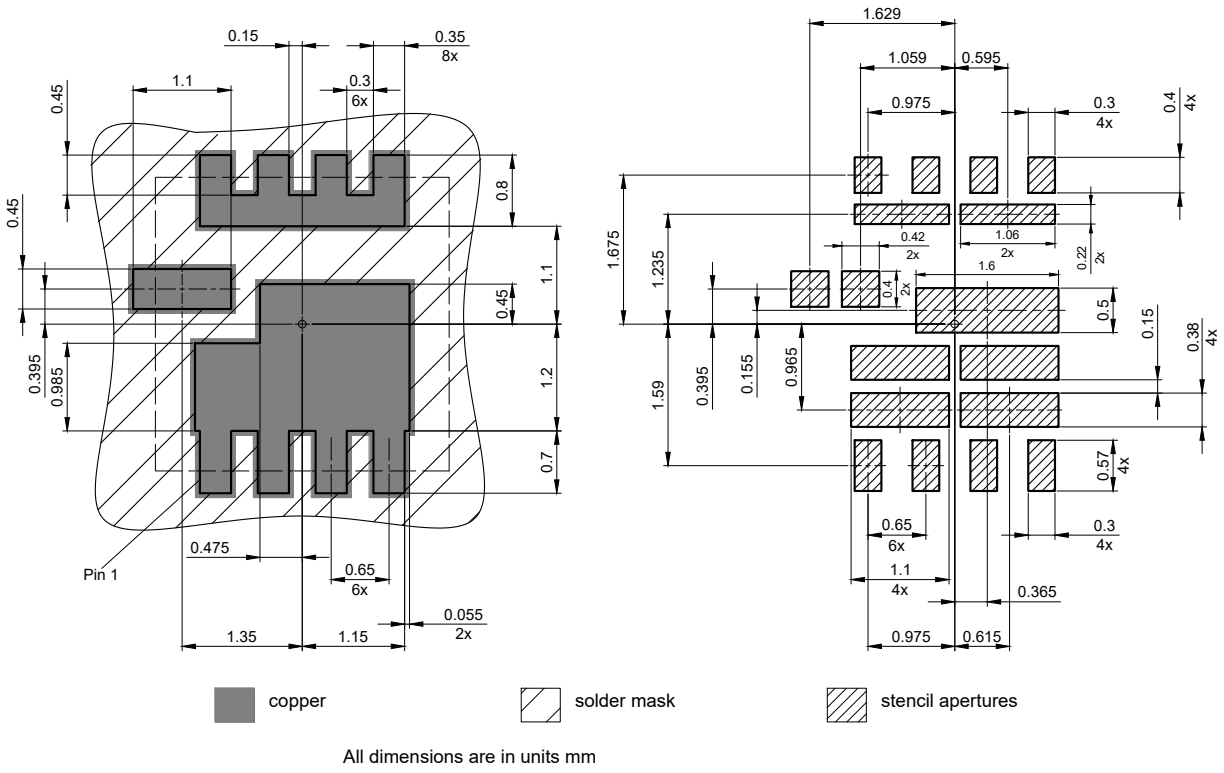


Figure 2 Footprint drawing PG-WHTFN-9, dimensions in mm

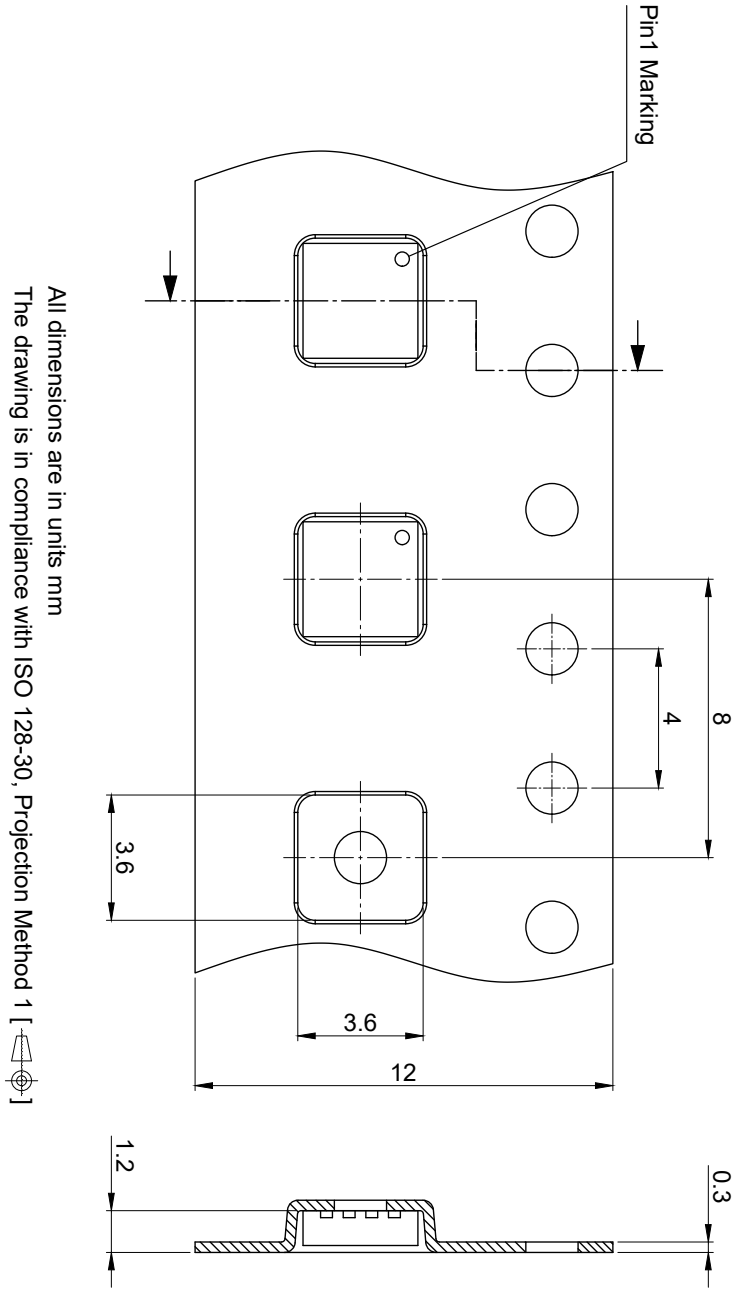


Figure 3 Packaging variant PG-WHTFN-9, dimensions in mm

Revision history

IQE018N06NM6CGSC

Revision 2025-02-06, Rev. 2.1

Previous revisions

Revision	Date	Subjects (major changes since last revision)
2.0	2023-12-07	Release of final version
2.1	2025-02-06	Update current, Added RthJC, top and Revised Rdson at Vgs from 6V to 8V

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

We Listen to Your Comments Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to: **erratum@infineon.com**

Published by
Infineon Technologies AG
81726 München, Germany

Important notice
The products which may also include samples and may be comprised of hardware or software or both ("Product") are sold or provided and delivered by Infineon Technologies AG and its affiliates ("Infineon") subject to the terms and conditions of the frame supply contract or other written agreement(s) executed by a customer and Infineon or, in the absence of the foregoing, the applicable Sales Conditions of Infineon. General terms and conditions of a customer or deviations from applicable Sales Conditions of Infineon shall only be binding for Infineon if and to the extent Infineon has given its express written consent.

For the avoidance of doubt, Infineon disclaims all warranties of non-infringement of third-party rights and implied warranties such as warranties of fitness for a specific use/purpose or merchantability.

Infineon shall not be responsible for any information with respect to samples, the application or customer's specific use of any Product or for any examples or typical values given in this document.

The data contained in this document is exclusively intended for technically qualified and skilled customer representatives. It is the responsibility of the customer to evaluate the suitability of the Product for the intended application and the customer's specific use and to verify all relevant technical data contained in this document in the intended application and the customer's specific use. The customer is responsible for properly designing, programming, and testing the functionality and safety of the intended application, as well as complying with any legal requirements related to its use.

Unless otherwise explicitly approved by Infineon, Products may not be used in any application where a failure of the Product or any consequences of the use thereof can reasonably be expected to result in personal injury. However, the foregoing shall not prevent the customer from using any Product in such fields of use that Infineon has explicitly designed and sold it for, provided that the overall responsibility for the application lies with the customer.

If the Product includes security features:
Because no computing device can be absolutely secure, and despite security measures implemented in the Product, Infineon does not guarantee that the Product will be free from intrusion, data theft or loss, or other breaches ("Security Breaches"), and Infineon shall have no liability arising out of any Security Breaches.

If this document includes or references software:
The software is owned by Infineon under the intellectual property laws and treaties of the United States, Germany, and other countries worldwide. All rights reserved. Therefore, you may use the software only as provided in the software license agreement accompanying the software. If no software license agreement applies, Infineon hereby grants you a personal, non-exclusive, non-transferable license (without the right to sublicense) under its intellectual property rights in the software (a) for software provided in source code form, to modify and reproduce the software solely for use with Infineon hardware products, only internally within your organization, and (b) to distribute the software in binary code form externally to end users, solely for use on Infineon hardware products. Any other use, reproduction, modification, translation, or compilation of the software is prohibited.

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