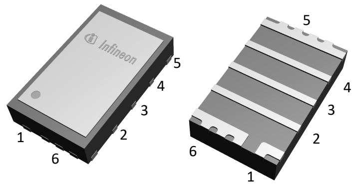
CoolGaN™

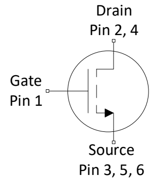
CoolGaN™ Transistor 60 V G3

PG-TSON-6



Features

- Ultra fast switching and high efficiency
- Space saving and highly robust package
- No reverse recovery charge
- Ultra low gate charge and output charge
- Exposed die for top-side thermal excellence
- Moisture rating MSL1
- Industrial grade 3x5 package



Top side is exposed silicon substrate, internally connected to source terminal. Not recommended to use as an electrical connection.

Potential applications

- Battery powered tools
- Low-power SMPS
- Telecom & Datacenter
- e-Mobility, e-bike, UAVs
- Robotics and drones
- Solar & Energy storage systems

Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key performance parameters

Parameter	Value	Unit
V_{DS}	60	V
$R_{DS(on)}$	1.3	mΩ
I_D	99	A
Q_{oss}	37	nC
Q_G	13	nC
Q_{rr}	0	nC

Type / Ordering code	Package	Marking	Related links
IGC019S06S1	PG-TSON-6	19SC1	see Appendix A

Table of contents

1 Maximum ratings

at T_j = 25 °C, unless otherwise specified. Stresses beyond max ratings may cause permanent damage to the device. For optimum lifetime and reliability, Infineon recommends operating conditions that do not continuously exceed 80 % of the maximum ratings stated (unless otherwise explicitly stated). For further information, contact your local Infineon sales office.

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Continuous drain-source voltage	V_{DS}	-	-	60	V	V_{GS}=0 V
Pulsed drain-source voltage [1)]	$V_{DS,\ pulse}$	-	-	72	V	V_{GS}=0 V, 1 h total time
Continuous drain current	I_D	-	-	99 27	A	V_{GS}=5 V, T_C=25 °C V_{GS}=5 V, T_A=25 °C, R_{thJA}=38 °C/W [2)]
Pulsed drain current [3)]	$I_{D,pulse}$	-	-	700 380	A	T_j=25 °C T_j=150 °C
Pulsed gate-source voltage [1)]	V_{GS}	-6.5	-	6.5	V	Pulsed 100 h total time
Power dissipation	P_{tot}	-	-	45 3.3	W	T_C=25 °C T_A=25 °C, R_{thJA}=38 °C/W [2)]
Storage temperature	T_{stg}	-55	-	150	°C	-
Junction temperature	T_j	-40	-	150	°C	

1) Provided as measure of robustness under abnormal operating conditions and not recommended for normal operation.

2) Device on 4-layer FR4 PCB, vertical in still air.

3) Pulse current limited by transfer characteristic.

2 Recommended operating conditions

Table 3 Recommended operating conditions

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate-source voltage	V_{GS}	-4	5	5.5	V	-

3 Thermal characteristics

Table 4 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, top	R_{thJC}	-	0.5	0.6	°C/W	-
Thermal resistance, junction - case, bottom	R_{thJC}	-	1.9	2.8	°C/W	
Thermal resistance, junction - ambient 1s0p	R_{thJA}	-	60	-	°C/W	On 1 layer PCB, vertical in still air.
Thermal resistance, junction - ambient 2s2p	R_{thJA}	-	38	-	°C/W	With vias on 4 layer PCB, vertical in still air.

4 Electrical Characteristics

at T_j=25 °C, unless otherwise specified

Table 5 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate threshold voltage	$V_{GS(th)}$	1.2	2	2.9	V	V_{DS}=V_{GS}, I_D=12 mA
Drain-source leakage current	I_{DSS}	-	0.4 8	-	µA	V_{DS}=60 V, V_{GS}=0 V, T_j=25 °C V_{DS}=60 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	23 0.014 170 0.014	-	µA	V_{GS}=5 V, T_j=25 °C V_{GS}=-4 V, T_j=25 °C V_{GS}=5 V, T_j=125 °C V_{GS}=-4 V, T_j=125 °C
Drain-source on-state resistance	$R_{DS(on)}$	-	1.3	1.9	mΩ	V_{GS}=5 V, I_D=35 A
Gate resistance [4)]	R_G	-	0.5	-	Ω	-

4) Defined by design. Not subject to production test.

Table 6 Capacitance characteristics [5)]

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	1450	-	pF	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz
Output capacitance	C_{oss}	-	700	-	pF	
Reverse transfer capacitance	C_{rss}	-	17	-	pF	

5) Defined by design. Not subject to production test.

Table 7 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	4.0	-	nC	V_{DS}=30 V, I_D=35 A, V_{GS}=0 to 5 V
Gate charge at threshold	$Q_{g(th)}$	-	2.9	-	nC	
Gate to drain charge [6)]	Q_{gd}	-	3.6	-	nC	
Switching charge	Q_{sw}	-	4.7	-	nC	
Gate charge total [6)]	Q_g	-	13	-	nC	
Gate plateau voltage	$V_{plateau}$	-	2.8	-	V	
Output charge [6)]	Q_{oss}	-	37	-	nC	V_{DS}=30 V, V_{GS}=0 V

6) Defined by design. Not subject to production test.

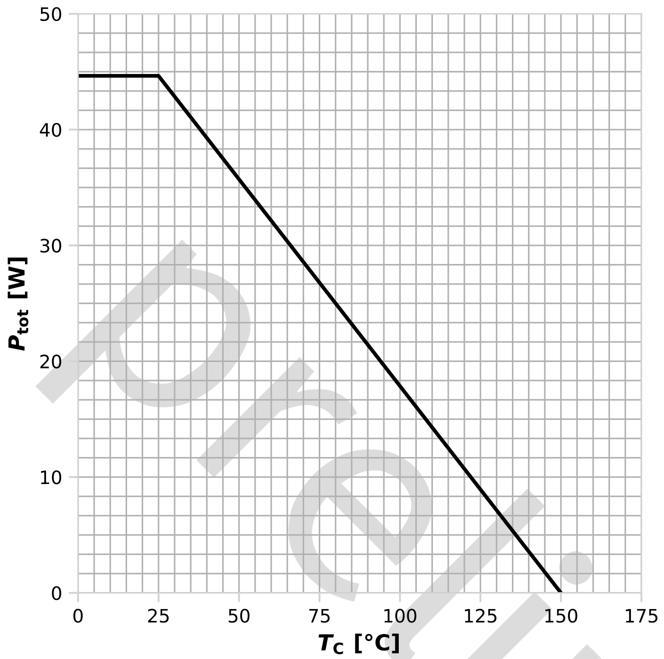
Table 8 Reverse operation

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Reverse continuous current	I_S	-	-	16	A	T_C=25 °C
Pulsed current, reverse	$I_{S,pulse}$	-	-	396	A	
Source-Drain reverse voltage	V_{SD}	-	2.6 2.1	-	V	V_{GS}=0 V, $I_{S,pulse}$=35 A, T_j=25 °C V_{GS}=0 V, $I_{S,pulse}$=0.5 A, T_j=25 °C
Reverse recovery charge [7)]	Q_{rr}	-	0	-	nC	V_R=30 V, $I_{S,pulse}$=35 A, $di_{S,pulse}/dt$ =100 A/µs

7) Defined by design. Not subject to production test.

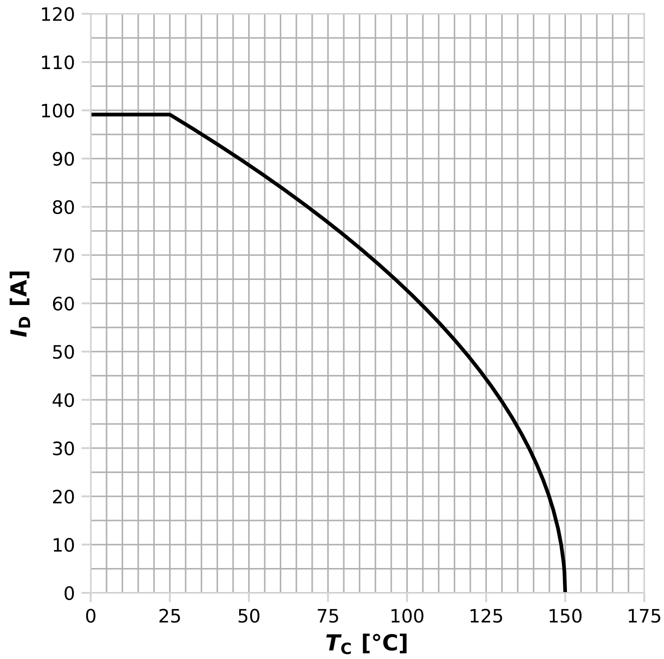
5 Electrical characteristics diagrams

Diagram 1: Power dissipation



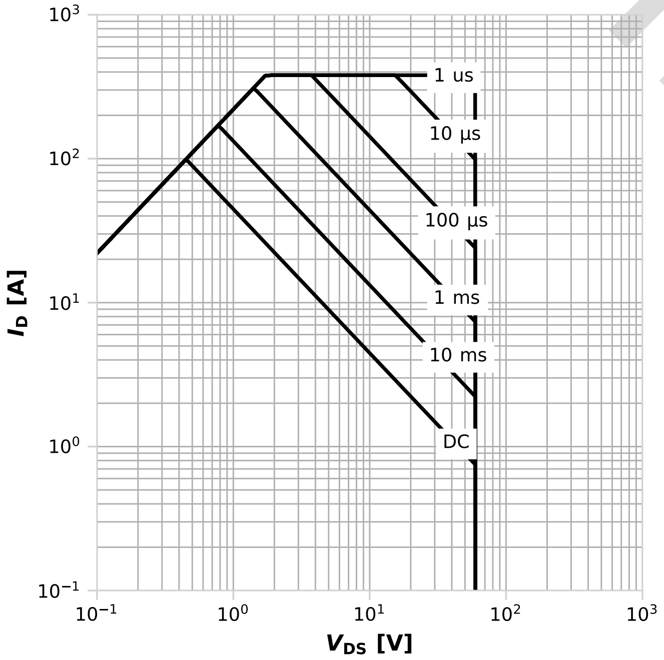
P_{tot}=f(T_C)

Diagram 2: Drain Current



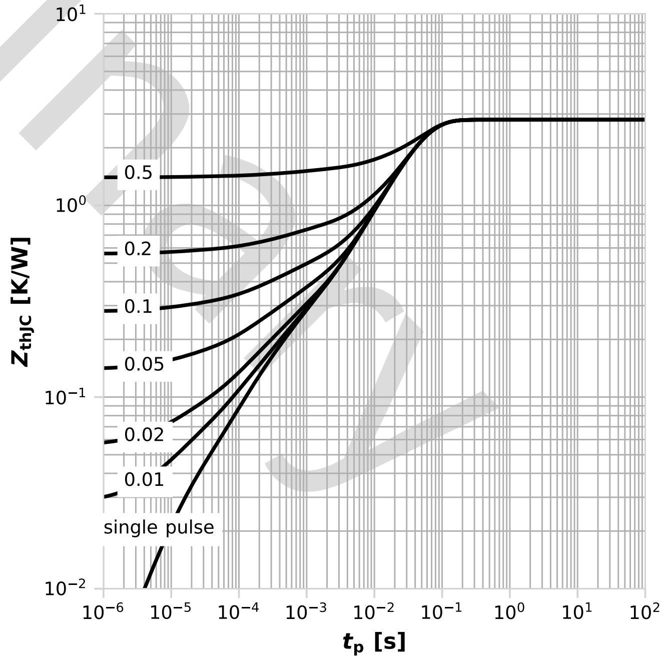
I_D=f(T_C)

Diagram 3: Safe operating area



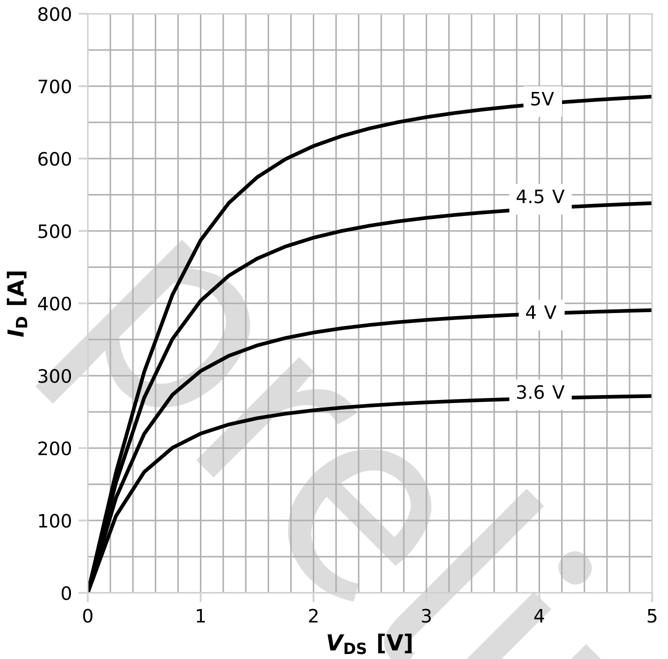
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



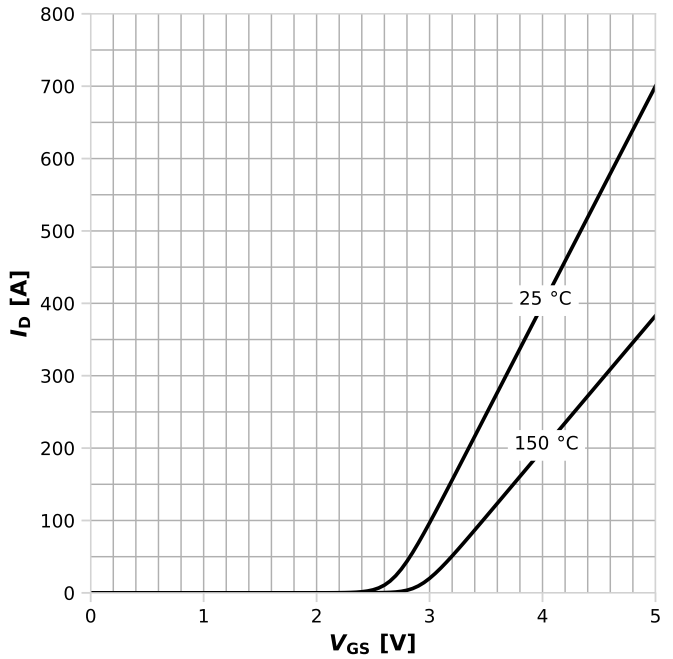
Z_{thJC} =f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



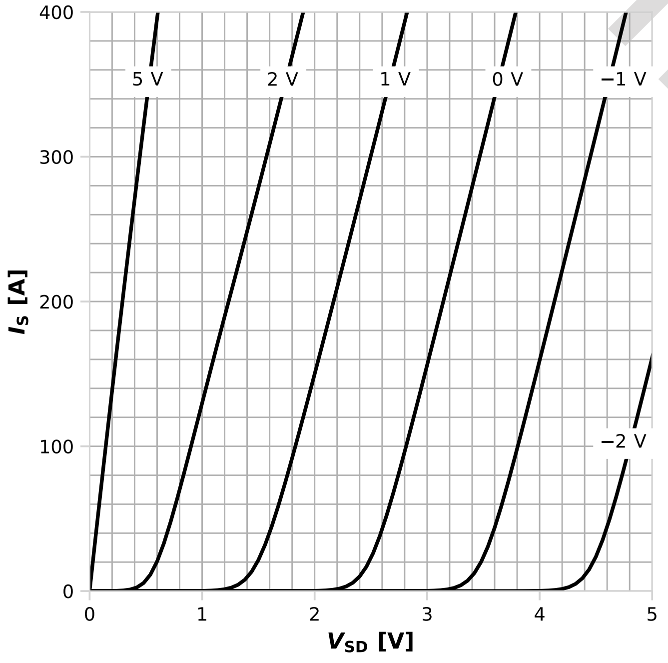
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. transfer characteristics



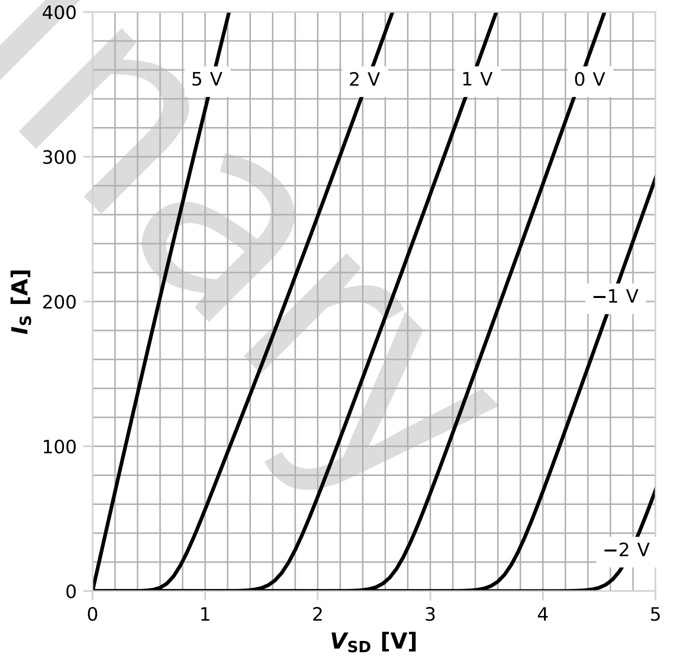
I_D=f(V_{GS}); $|V_{DS}|$>2$|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 7: Typ. channel reverse characteristics



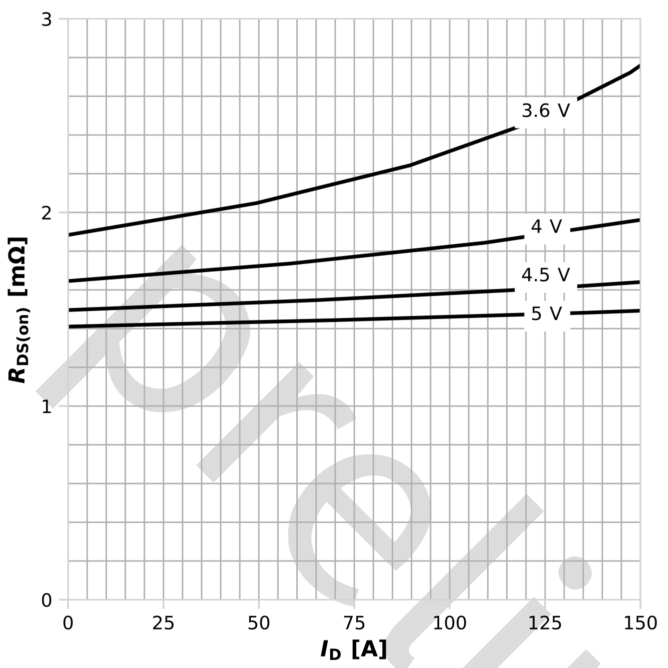
I_S=f(V_{SD}); T_j=25 °C; parameter: V_{GS}

Diagram 8: Typ. channel reverse characteristics



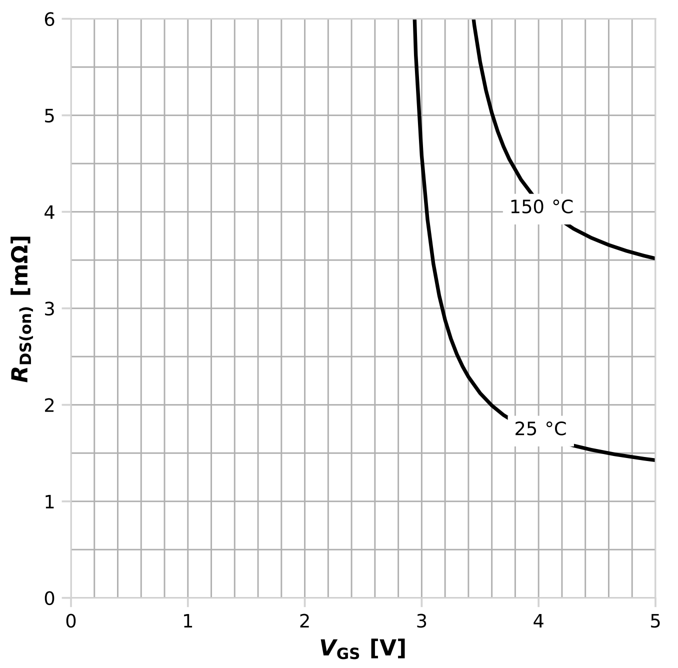
I_S=f(V_{SD}); T_j=125 °C; parameter: V_{GS}

Diagram 9: Typ. drain-source on-state resistance



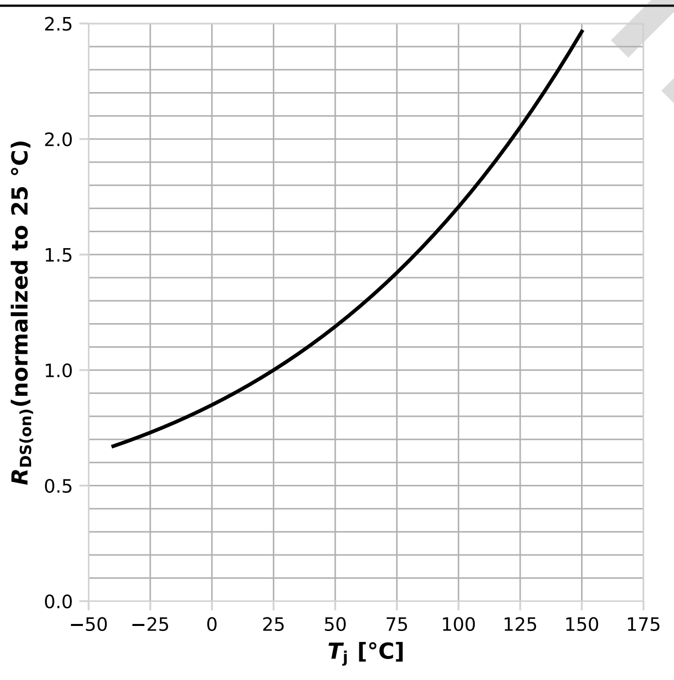
$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Diagram 10: Typ. Drain-source on-state resistance



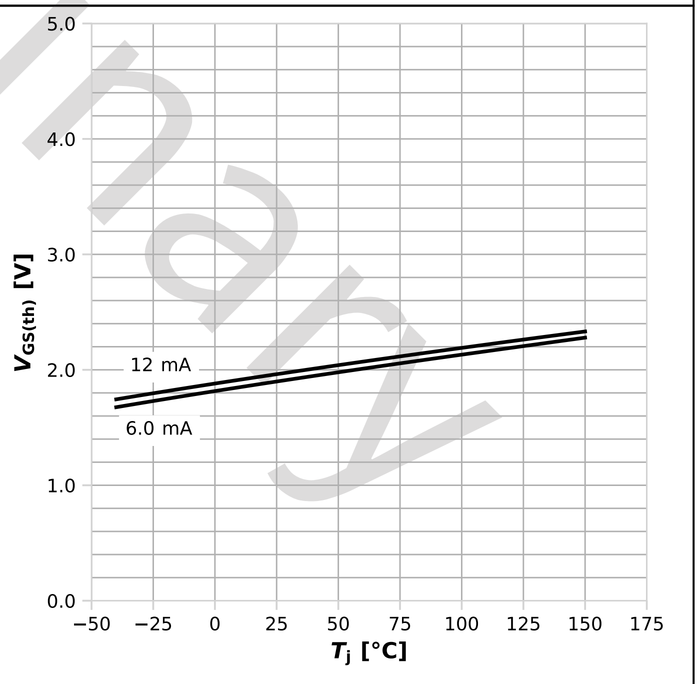
$R_{DS(on)}$=f(V_{GS});; parameter: T_j

Diagram 11: Drain-source on-state resistance



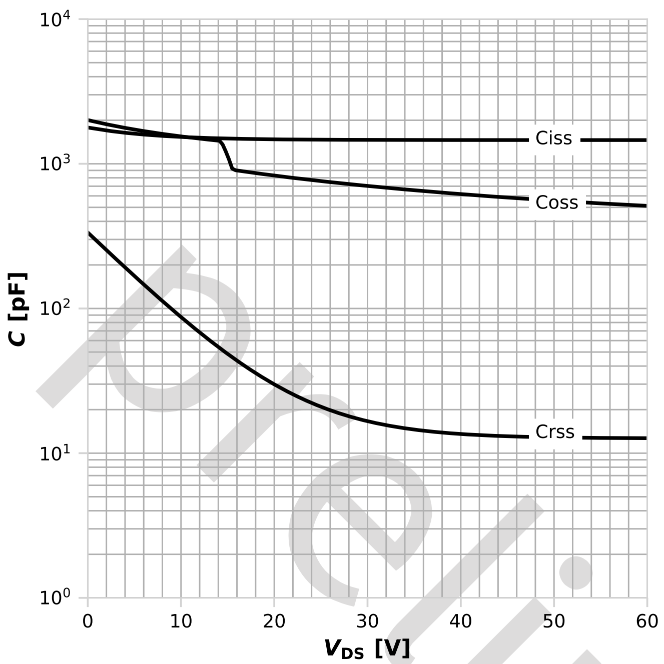
$R_{DS(on)}$=f(T_j); I_D=35 A, V_{GS}=5V

Diagram 12: Typ. gate threshold voltage



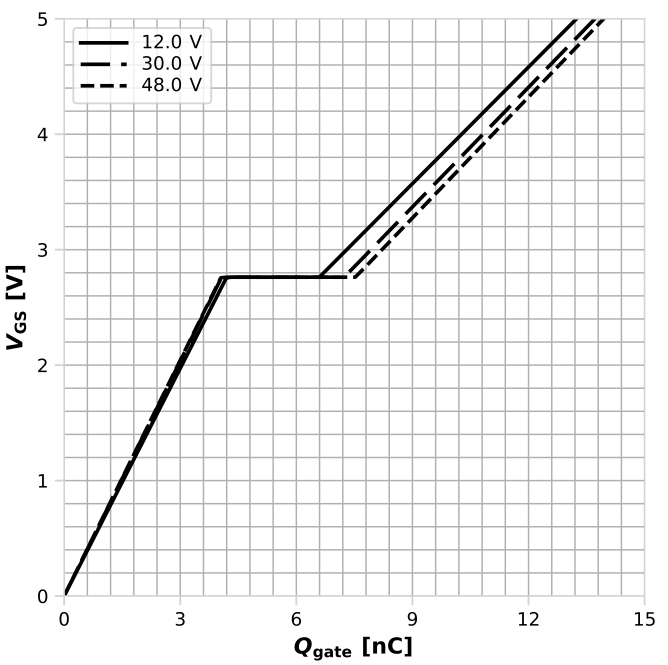
$V_{GS(th)}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

Diagram 13: Typ. capacitances



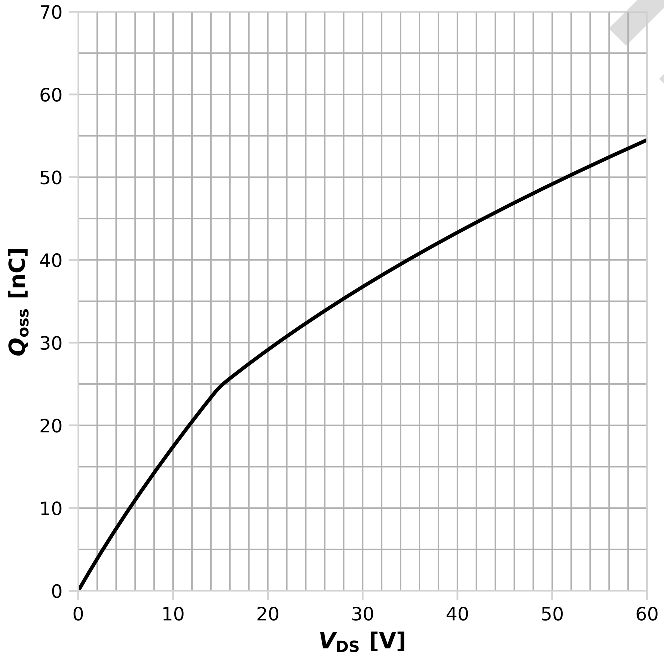
C=f(V_{DS}); V_{GS}=0 V

Diagram 14 Typ. gate charge



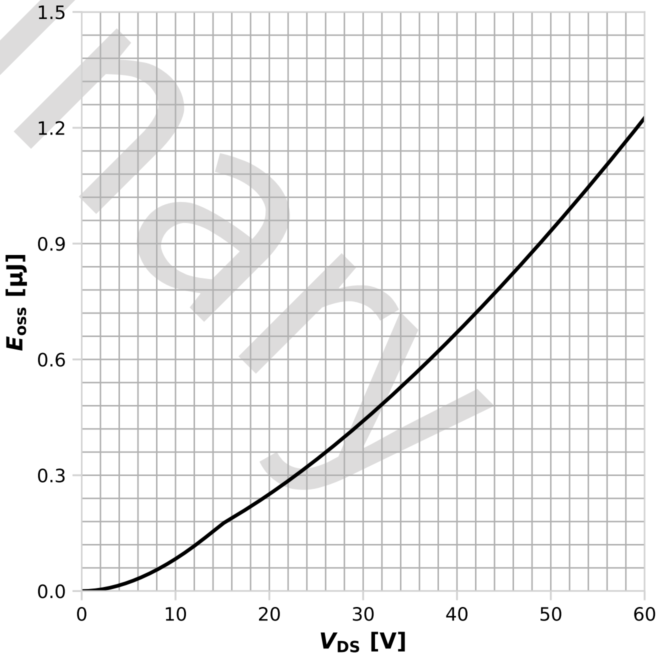
V_{GS}=f(Q_{gate}); I_D=35 A pulsed; parameter: V_{DS}

Diagram 15: Typ. output charge



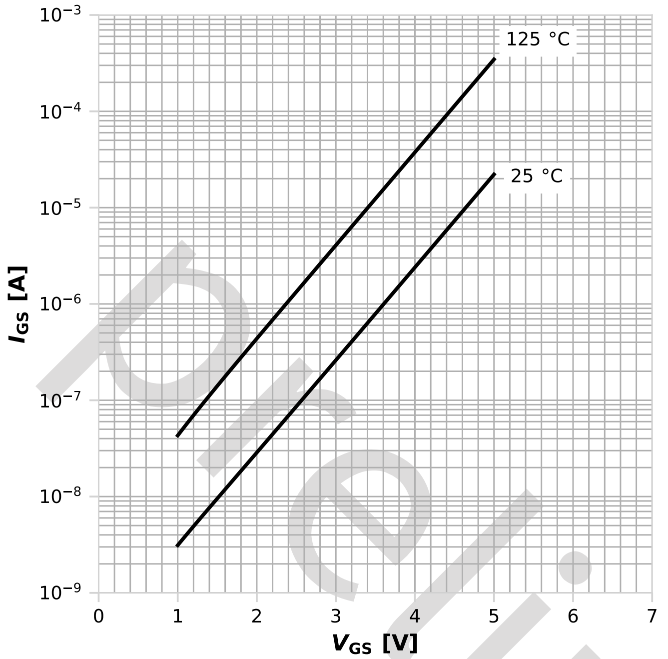
Q_{oss}=f(V_{DS}), V_{GS}=0 V

Diagram 16: Typ. Coss stored Energy



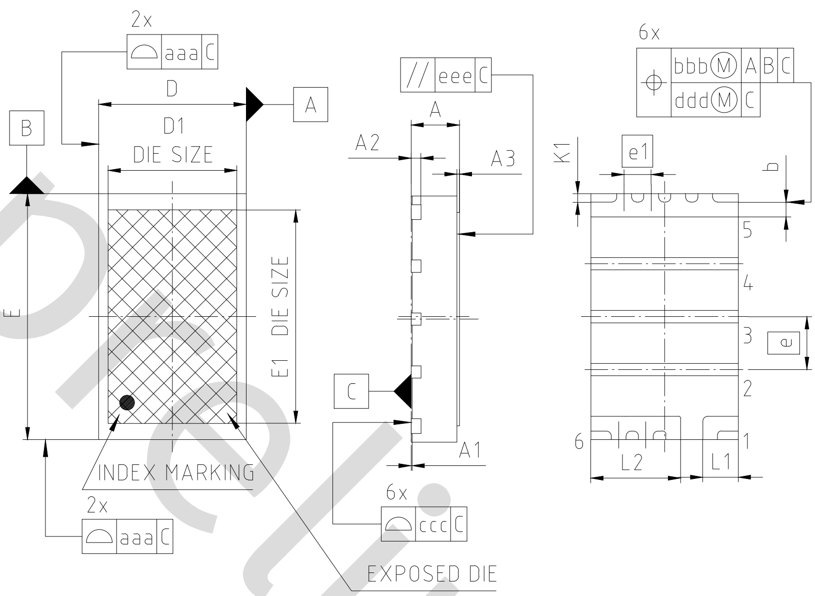
E_{oss}=f(V_{DS}), V_{GS}=0 V

Diagram 17: Typ. gate characteristics forward



I_{GS}=f(V_{GS}); V_{DS}=0 V; parameter: T_j

6 Package outlines



PACKAGE - GROUP NUMBER:	PG-TSON-6-U01	
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	-	1.032
A1	-	0.05
A2	0.20	
A3	-	0.05
b	0.18	0.30
D	2.90	3.10
D1	2.616	
E	4.90	5.10
E1	4.336	
e	1.075	
e1	0.55	
K1	0.125	0.225
L1	0.625	0.825
L2	1.725	1.925
aaa	0.05	
bbb	0.10	
ccc	0.08	
ddd	0.05	
eee	0.10	

Figure 1 Outline PG-TSON-6, dimensions in mm

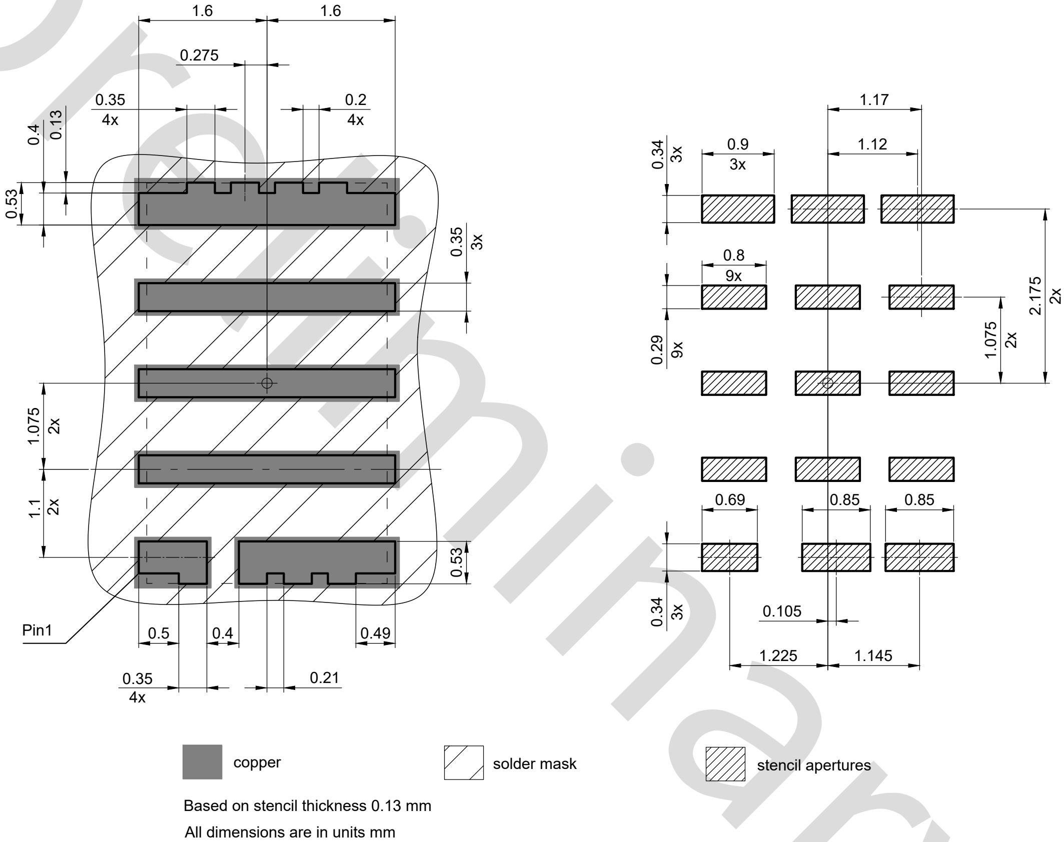


Figure 2 Footprint drawing PG-TSON-6, dimensions in mm

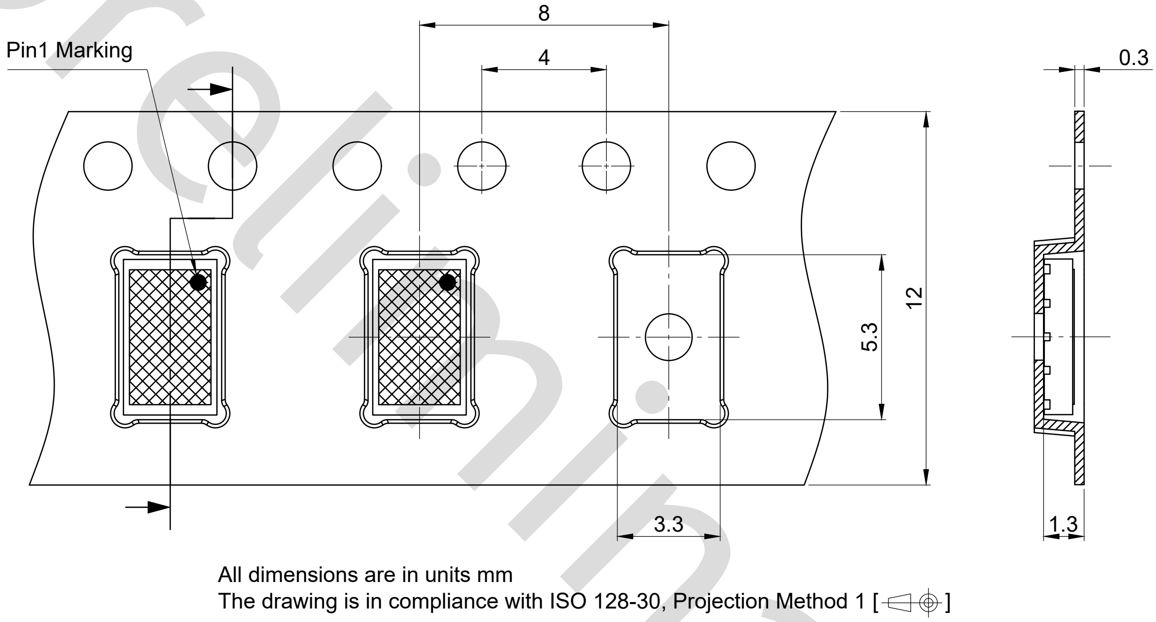


Figure 3 Packaging variant PG-TSON-6, dimensions in mm

7 Appendix A

Table 9 Related links

- IFX CoolGaN™ GaN webpage
- IFX CoolGaN™ reliability white paper
- IFX CoolGaN™ gate driver application note
- IFX CoolGaN™ Evaluation Boards
- IFX Packages Description-PG-TSON-6-2

Revision history

IGC019S06S1

Revision 2024-11-28, Rev. 0.1

Previous revisions

Revision	Date	Subjects (major changes since last revision)
0.1	2024-11-28	Release of preliminary

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

Legal Disclaimer
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.

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

Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.
The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.