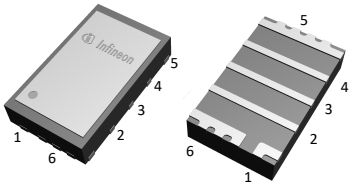
CoolGaN™

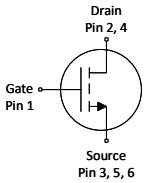
PG-TSON-6

CoolGaN™ Transistor 200 V G3



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

- Telecom & Datacenter
- Class D Audio
- Sync Rectification for AC-DC and DC-DC converters
- e-Mobility, UAVs
- Battery powered tools
- Solar & Energy storage systems

Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key performance parameters

Parameter	Value	Unit
V_{DS}	200	V
$R_{DS(on)}$	6.7	mΩ
I_D	46	A
Q_{oss}	65	nC
Q_G	8.5	nC
Q_{rr}	0	nC

Type / Ordering code	Package	Marking	Related links
IGC090S20S1	PG-TSON-6	90SB1	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}	-	-	200	V	V_{GS}=0 V
Pulsed drain-source voltage [1]	$V_{DS,\ pulse}$	-	-	240	V	V_{GS}=0 V, 1 h total time
Continuous drain current	I_D	-	-	46 12	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]	$I_{D,pulse}$	-	-	340 190	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}	-4.0	5.0	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	2.0	2.9	V	V_{DS}=V_{GS}, I_D=5 mA
Drain-source leakage current	I_{DSS}	-	0.25 3.0	-	µA	V_{DS}=160 V, V_{GS}=0 V, T_j=25 °C V_{DS}=160 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	18 0.01 150 0.01	-	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	$R_{DS(on)}$	-	6.7	9.0	mΩ	V_{GS}=5 V, I_D=10 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}	-	800	-	pF	V_{GS}=0 V, V_{DS}=100 V, f=1 MHz
Output capacitance	C_{oss}	-	400	-	pF	
Reverse transfer capacitance	C_{rss}	-	3.8	-	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}	-	2.0	-	nC	V_{DS}=100 V, I_D=10 A, V_{GS}=0 to 5 V
Gate charge at threshold	$Q_{g(th)}$	-	1.6	-	nC	
Gate to drain charge [6)]	Q_{gd}	-	2.1	-	nC	
Switching charge	Q_{sw}	-	2.5	-	nC	
Gate charge total [6)]	Q_g	-	8.5	-	nC	
Gate plateau voltage	$V_{plateau}$	-	2.5	-	V	
Output charge [6)]	Q_{oss}	-	65	-	nC	V_{DS}=100 V, V_{GS}=0 V

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

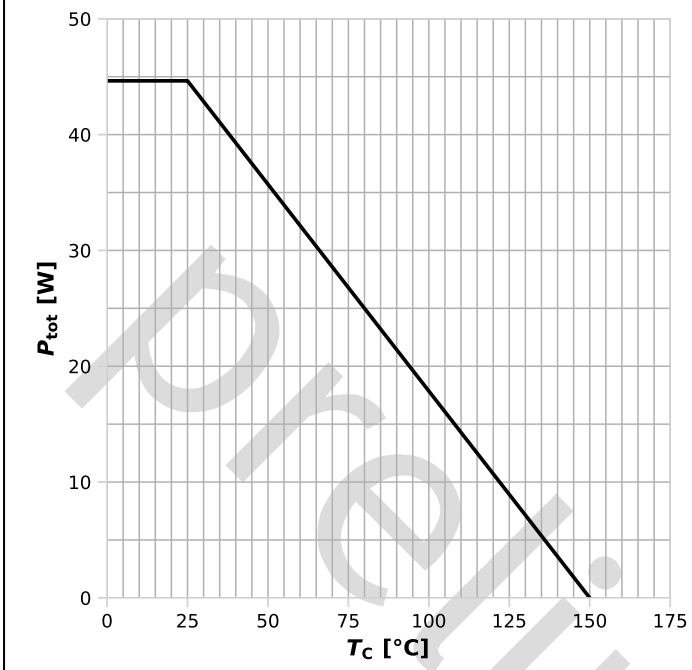
Table 8 Reverse operation

Parameter	Symbol	Values			Unit	Note / Test condition
		Min.	Typ.	Max.		
Reverse continuous current	I_S	-	-	15	A	T_C=25 °C
Pulsed current, reverse	$I_{S,pulse}$	-	-	184	A	
Source-Drain reverse voltage	V_{SD}	-	2.3 2.0	-	V	V_{GS}=0 V, $I_{S,pulse}$=10 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=100 V, $I_{S,pulse}$=10 A, $di_{S,pulse}/dt$ =100 A/µs

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

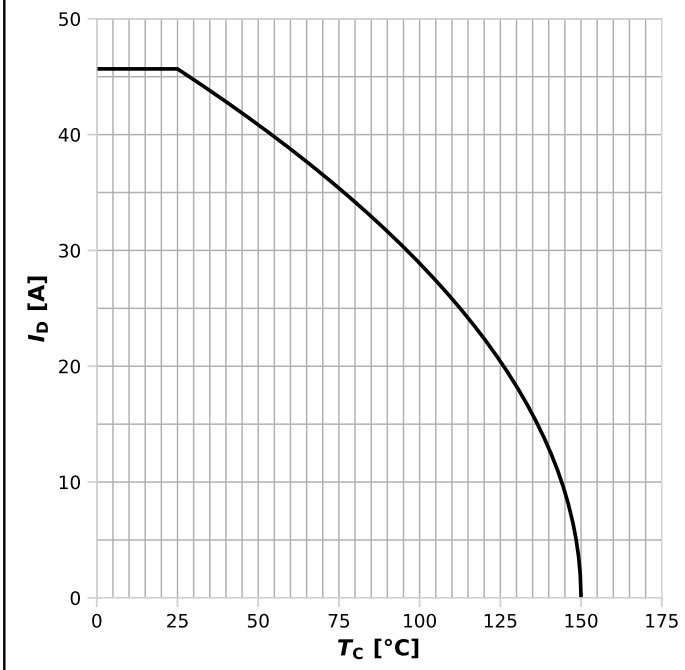
5 Electrical characteristics diagrams

Diagram 1: Power dissipation



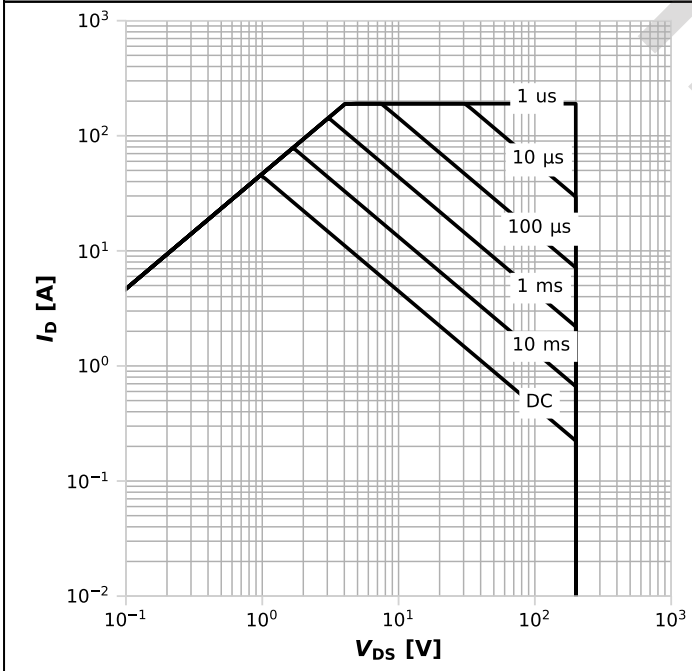
P_{tot}=f(T_C)

Diagram 2: Drain Current



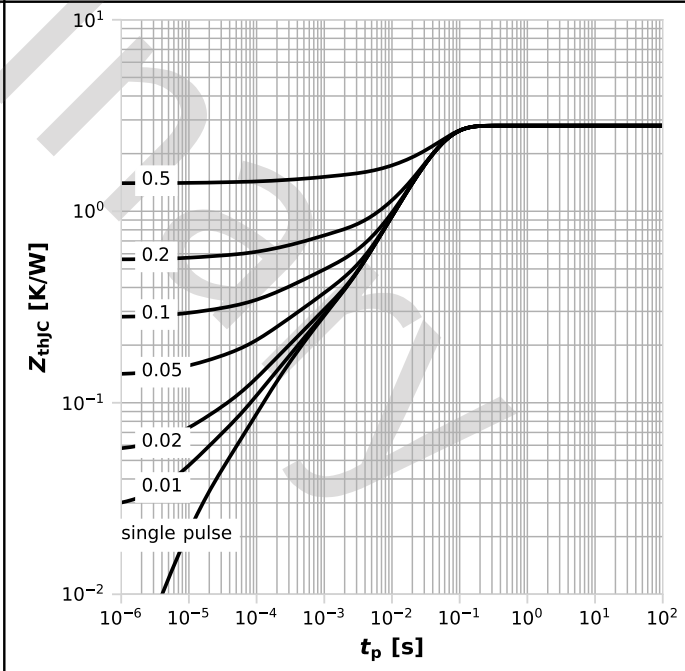
I_D=f(T_C)

Diagram 3: Safe operating area



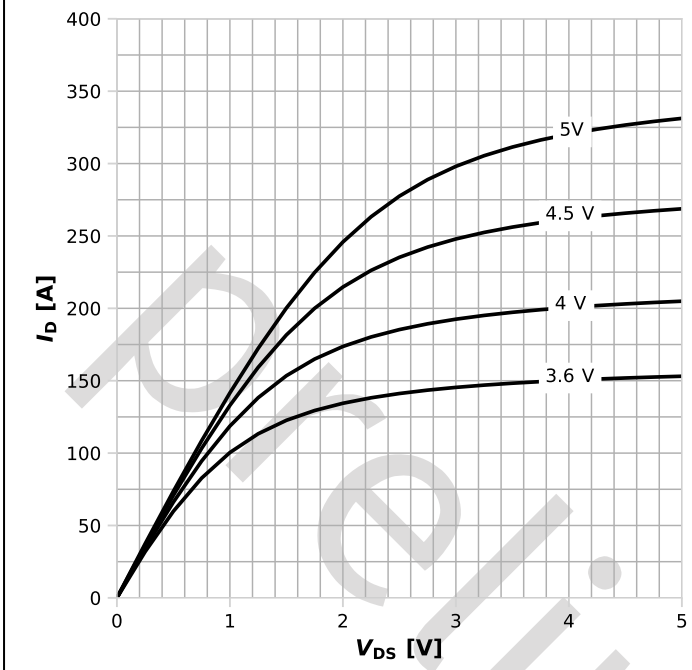
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



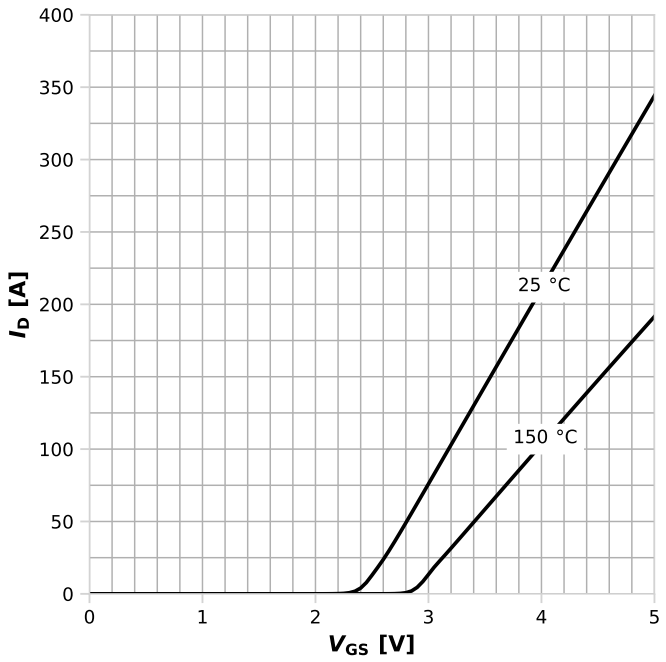
Z_{thJC} =f(t_P); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



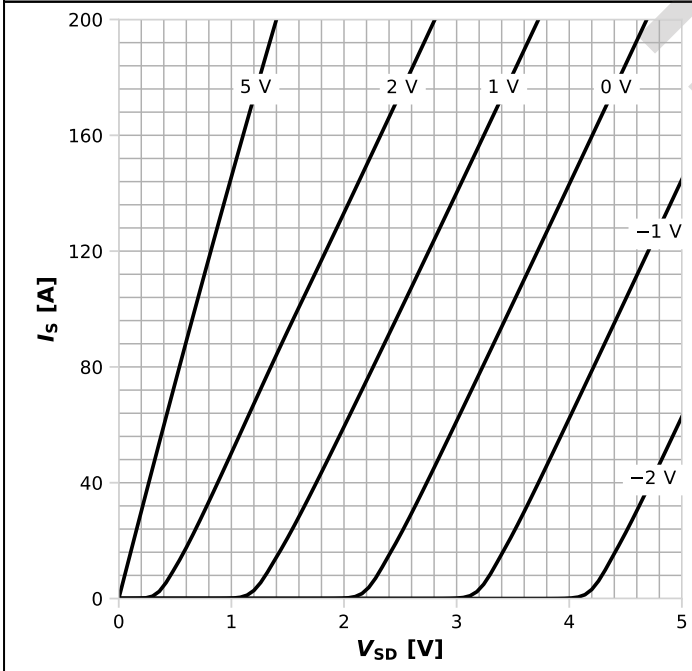
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. transfer characteristics



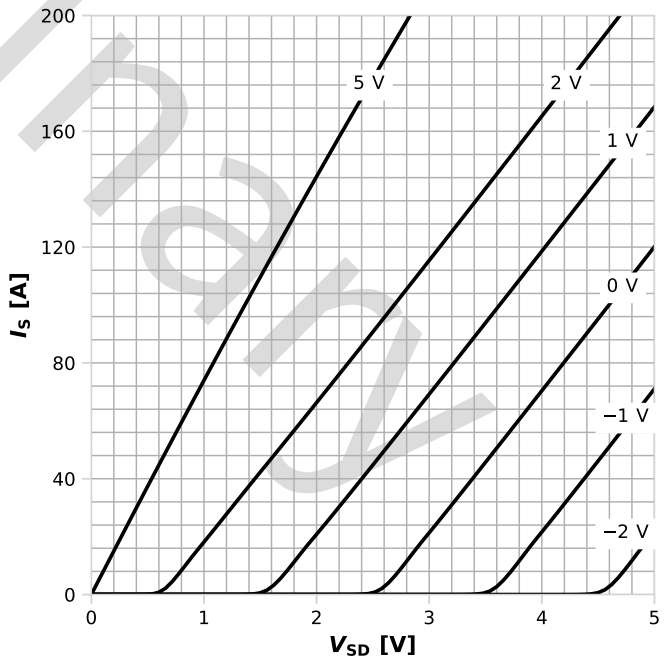
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

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}

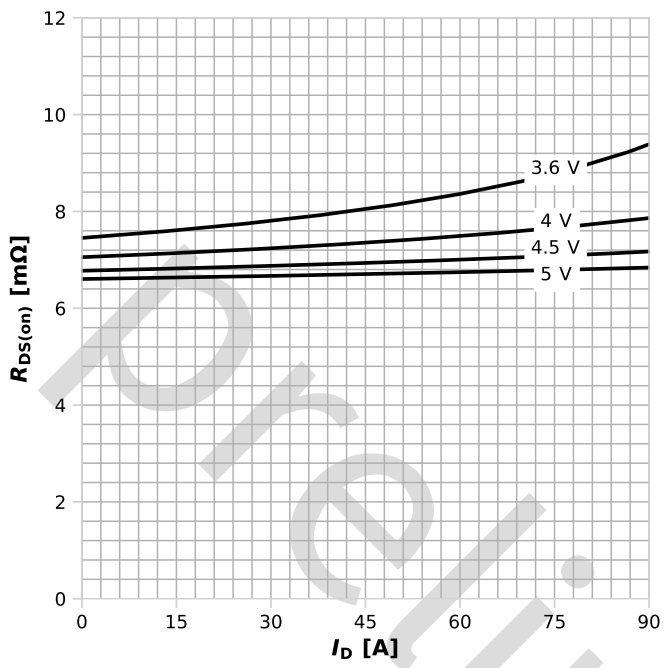
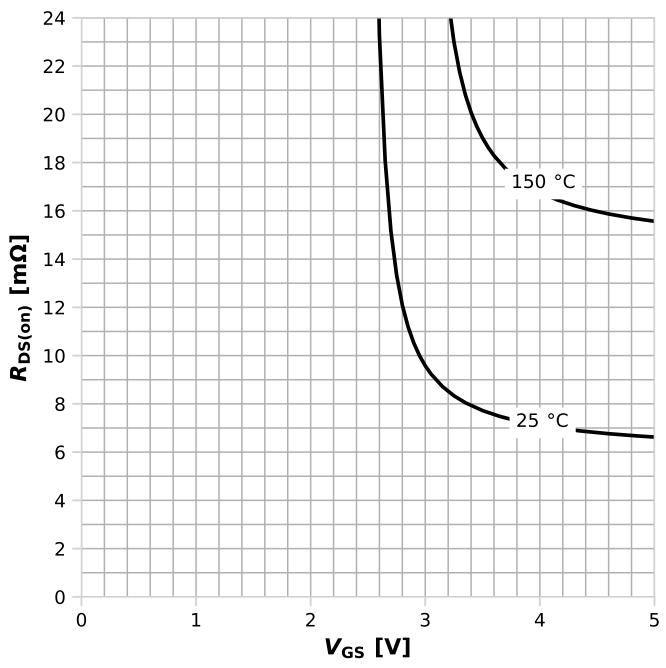
Diagram 9: Typ. drain-source on-state resistance	Diagram 10: Typ. Drain-source on-state resistance
	
$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}	$R_{DS(on)}$=f(V_{GS}); I_D=10 A; parameter: T_j

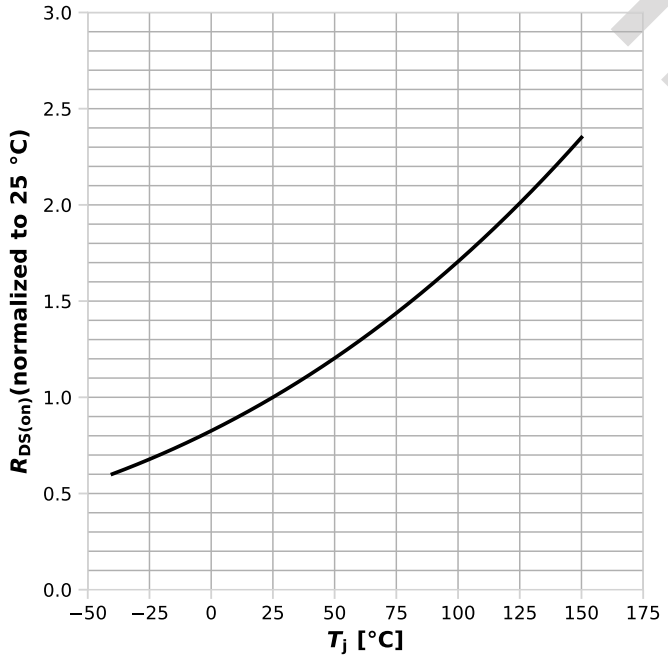
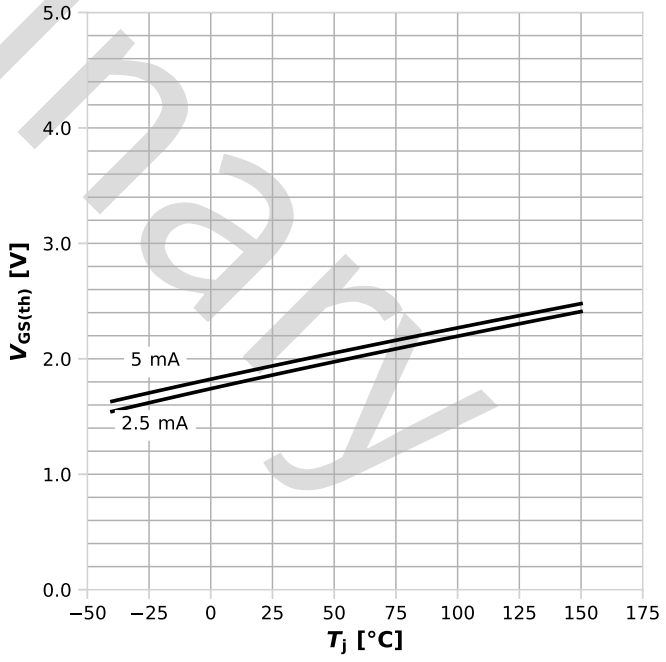
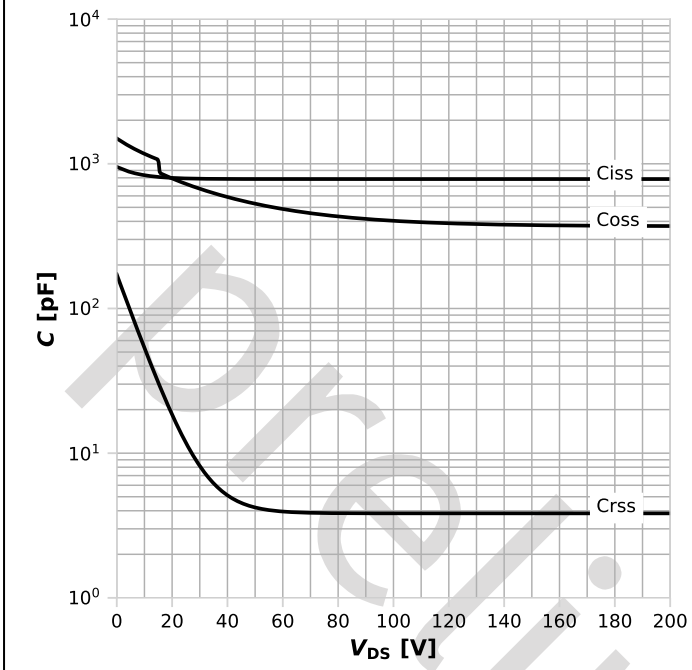
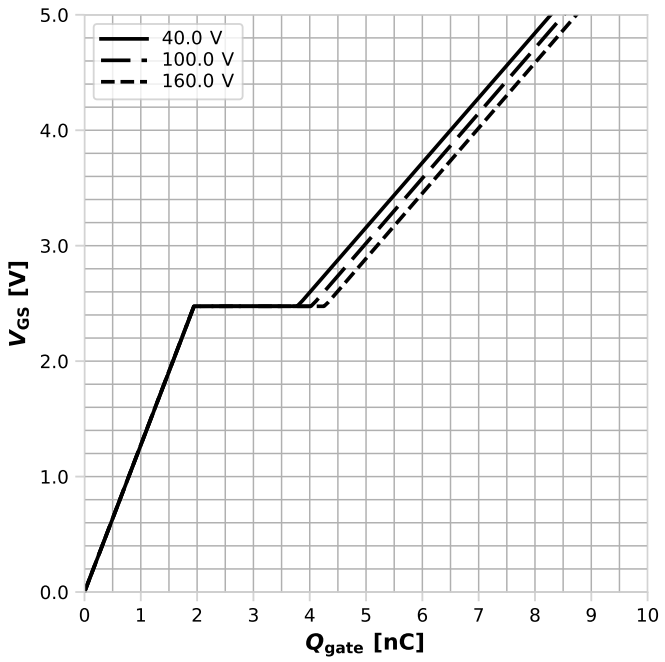
Diagram 11: Drain-source on-state resistance	Diagram 12: Typ. gate threshold voltage
	
$R_{DS(on)}$=f(T_j); I_D=10 A, V_{GS}=5V	$V_{GS(th}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

Diagram 13: Typ. capacitances



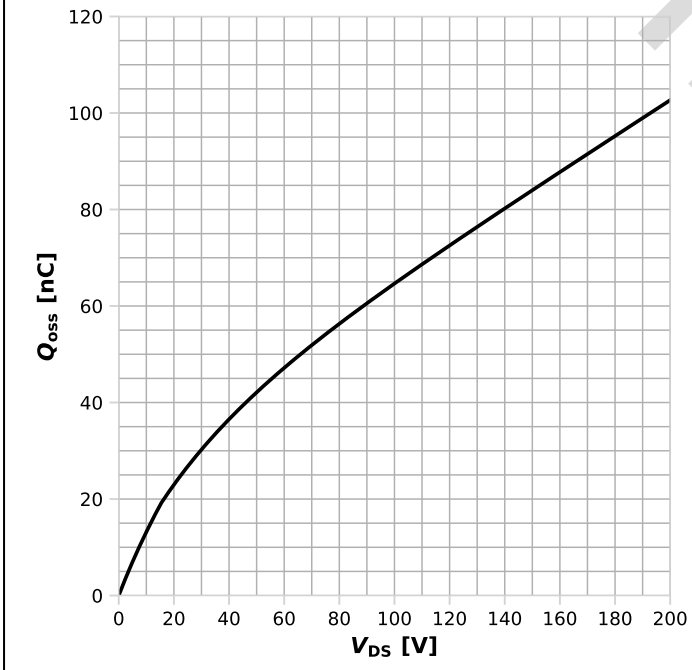
C=f(V_{DS}); V_{GS}=0 V

Diagram 14 Typ. gate charge



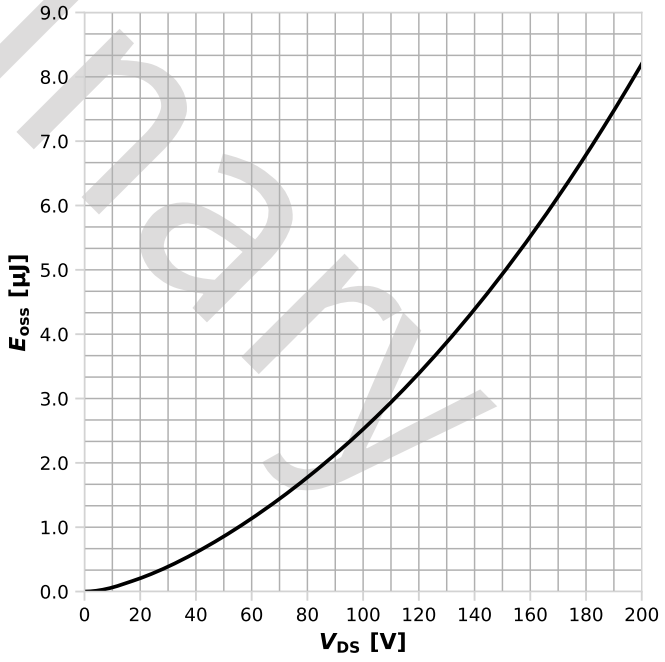
V_{GS}=f(Q_{gate}); I_D=10 A pulsed; parameter: V_{DS}

Diagram 15: Typ. output charge



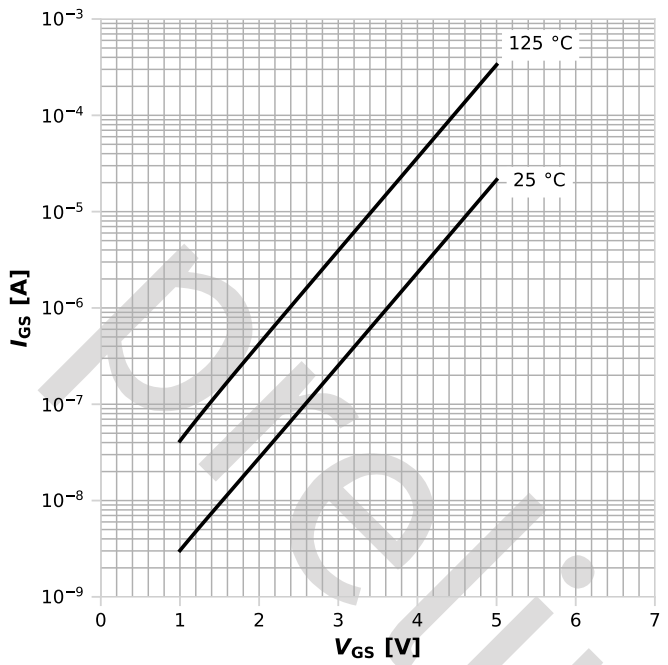
Q_{oss}=f(V_{DS}), V_{GS}=0 V

Diagram 16: Typ. Coss stored Energy



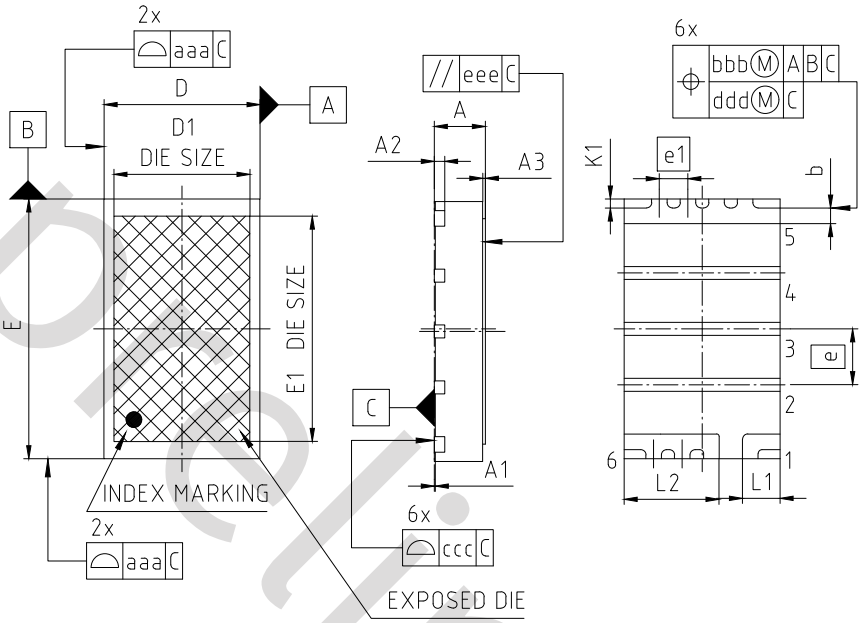
E_{oss}=f(V_{DS}), V_{GS}=0 V

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	

NOTE:
DIMENSIONS DO NOT INCLUDE MOLD FLASH,
PROTRUSION OR GATE BURRS

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

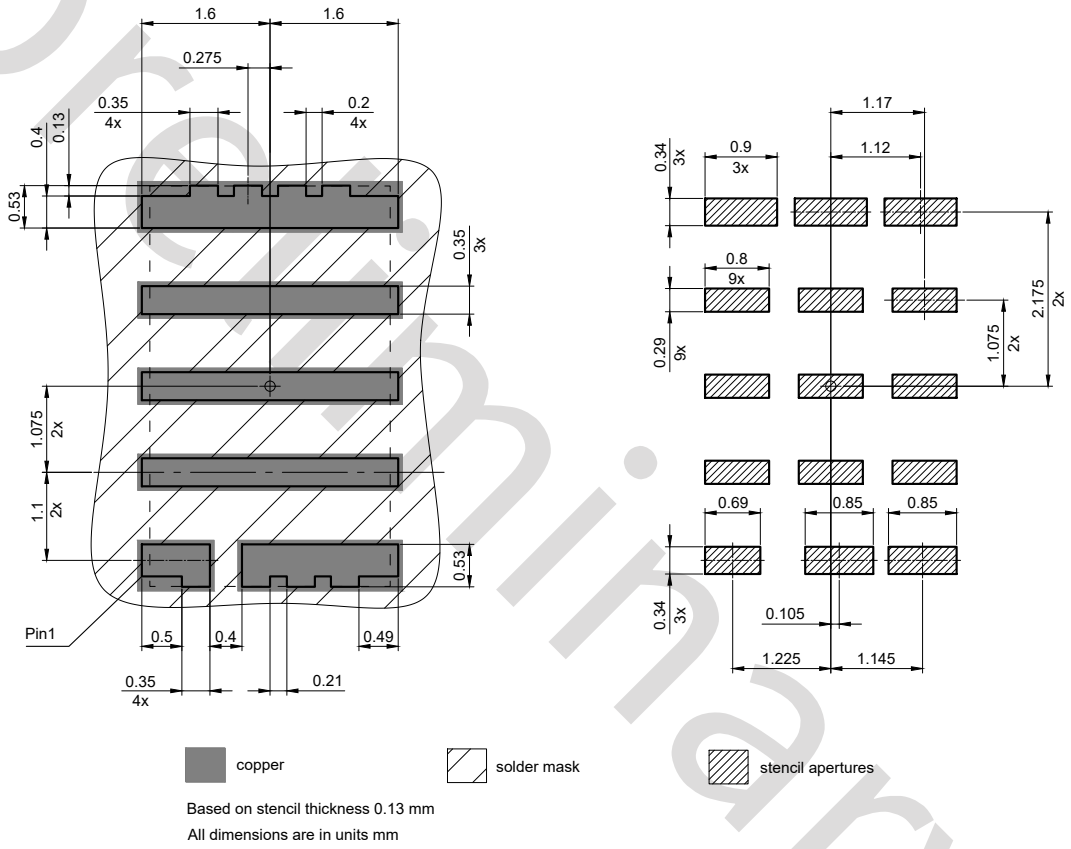


Figure 2 Footprint drawing PG-TSON-6, dimensions in mm

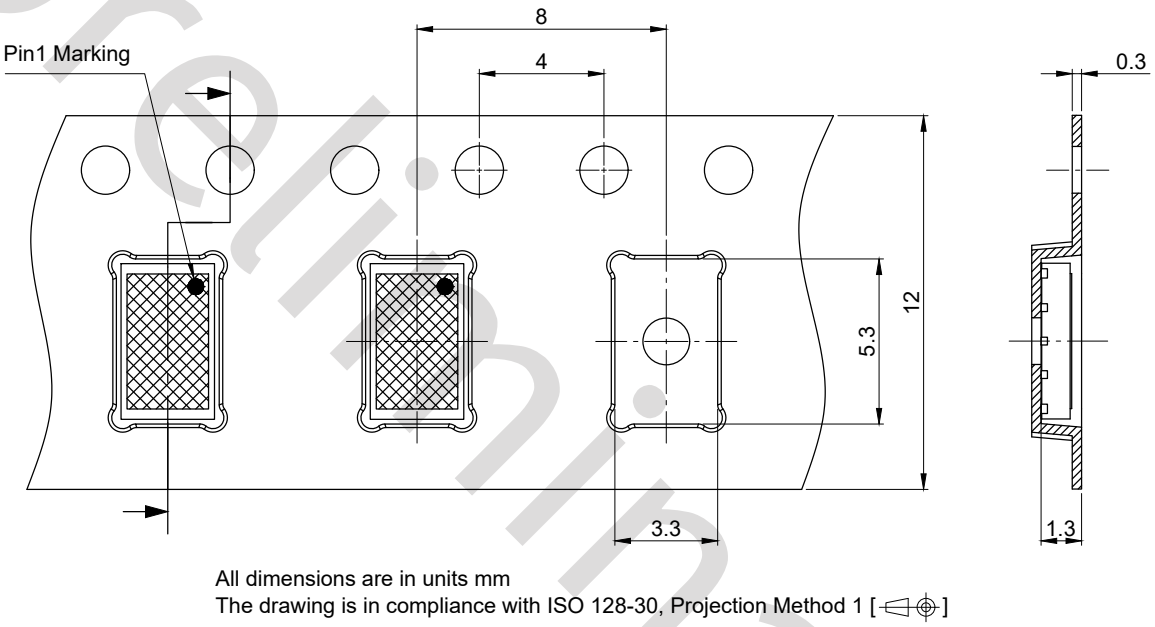


Figure 3 Packaging variant PG-TSON-6, dimensions in mm

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

IGC090S20S1

Revision 2024-12-17, Rev. 0.1

Previous revisions

Revision	Date	Subjects (major changes since last revision)
0.1	2024-12-17	Release of preliminary

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