

CoolGaN™
CoolGaN™ Transistor 120 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

Potential applications

- Battery powered tools
- Sync Rectification for AC-DC and DC-DC converters
- Robotics and drones
- e-Mobility, UAVs
- Solar & Energy storage systems

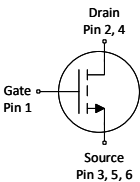
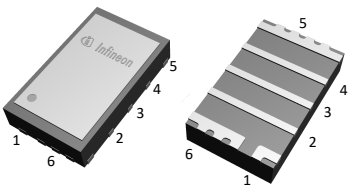
Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key performance parameters

Parameter	Value	Unit
V_{DS}	120	V
$R_{DS(on)}$	2.7	mΩ
I_D	71	A
Q_{oss}	49	nC
Q_G	10	nC
Q_{rr}	0	nC

Part number	Package	Marking	Related links
IGC037S12S1	PG-TSON-6	37SE1	see Appendix A



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

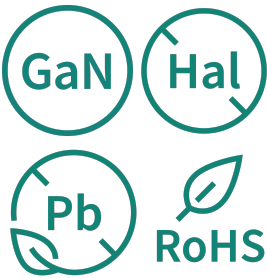


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1 Maximum ratings

at $T_j = 25\text{ °C}$, 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}	-	-	120	V	$V_{GS}=0\text{ V}$
Pulsed drain-source voltage ¹⁾	$V_{DS, pulse}$	-	-	144	V	$V_{GS}=0\text{ V}$, 1 h total time
Continuous drain current	I_D	-	-	71	A	$V_{GS}=5\text{ V}$, $T_C=25\text{ °C}$
				19		$V_{GS}=5\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=38\text{ °C/W}$ ²⁾
Pulsed drain current ³⁾	$I_{D, pulse}$	-	-	520	A	$T_j=25\text{ °C}$
				270		$T_j=150\text{ °C}$
Pulsed gate-source voltage ¹⁾	V_{GS}	-6.5	-	6.5	V	Pulsed 100 h total time
Power dissipation	P_{tot}	-	-	45	W	$T_C=25\text{ °C}$
				3.3		$T_A=25\text{ °C}$, $R_{thJA}=38\text{ °C/W}$ ²⁾
Storage temperature	T_{stg}	-55	-	150	°C	-
Junction temperature	T_j	-40				

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			1.9	2.8		
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 $T_j=25\text{ °C}$, 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	$V_{DS}=V_{GS}$, $I_D=7.0\text{ mA}$
Drain-source leakage current	I_{DSS}	-	0.15	2.1	μA	$V_{DS}=120\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$
			6.0	50		$V_{DS}=120\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	15	250	μA	$V_{GS}=5\text{ V}$, $T_j=25\text{ °C}$
			0.01	0.1		$V_{GS}=-4\text{ V}$, $T_j=25\text{ °C}$
			110	1010		$V_{GS}=5\text{ V}$, $T_j=125\text{ °C}$
			0.01	0.1		$V_{GS}=-4\text{ V}$, $T_j=125\text{ °C}$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.7	3.7	$\text{m}\Omega$	$V_{GS}=5\text{ V}$, $I_D=18\text{ A}$
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}	-	1000	1100	pF	$V_{GS}=0\text{ V}$, $V_{DS}=60\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}		500	550		
Reverse transfer capacitance	C_{rss}		4.9	6.4		

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}	-	2.7	-	nC	$V_{DS}=60\text{ V}$, $I_D=18\text{ A}$, $V_{GS}=0\text{ to }5\text{ V}$
Gate charge at threshold	$Q_{g(th)}$		2.0	-	nC	
Gate to drain charge ⁶⁾	Q_{gd}		2.3	-	nC	
Switching charge	Q_{sw}		3.0	-	nC	
Gate charge total ⁶⁾	Q_g		10	13	nC	
Gate plateau voltage	$V_{plateau}$		2.7	-	V	
Output charge ⁶⁾	Q_{oss}	-	49	54	nC	$V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$

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	$T_C=25\text{ °C}$
Pulsed current, reverse	$I_{S,pulse}$			284		
Source-Drain reverse voltage	V_{SD}	-	2.6	3.4	V	$V_{GS}=0\text{ V}, I_{S,pulse}=18\text{ A}, T_j=25\text{ °C}$
			2.1	-		$V_{GS}=0\text{ V}, I_{S,pulse}=0.5\text{ A}, T_j=25\text{ °C}$
Reverse recovery charge ⁷⁾	Q_{rr}	-	0	-	nC	$V_R=60\text{ V}, I_{S,pulse}=18\text{ A}, di_{S,pulse}/dt=100\text{ A}/\mu\text{s}$

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

5 Electrical characteristics diagrams

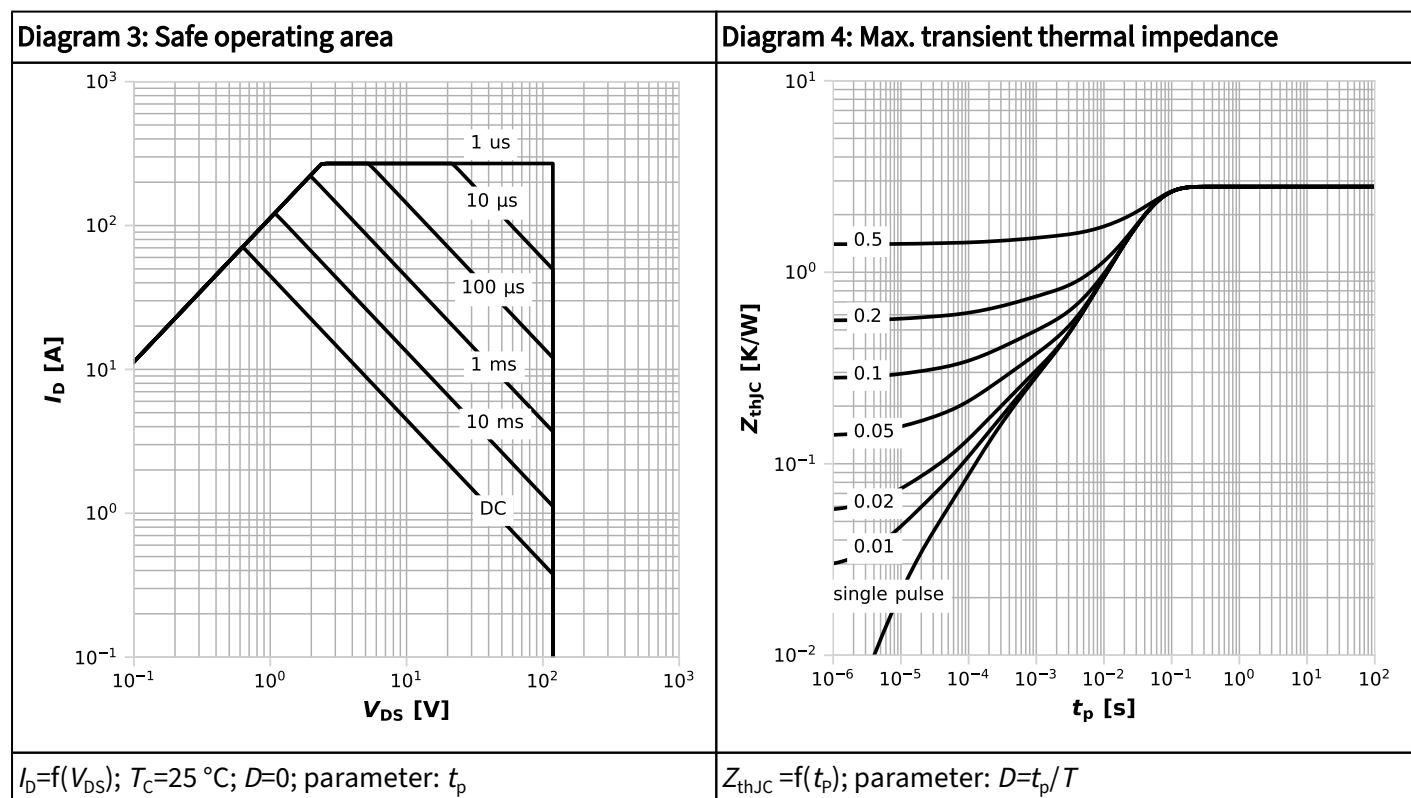
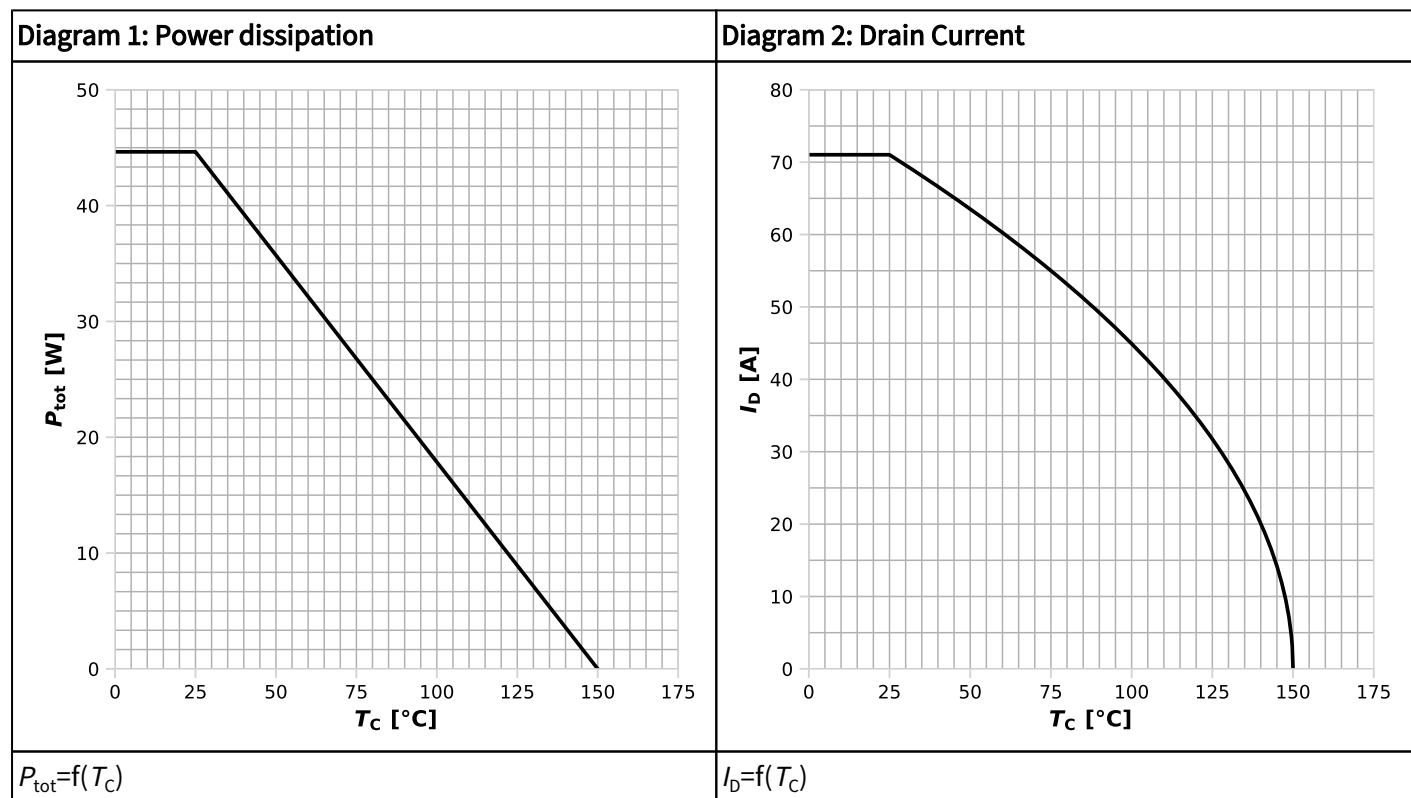
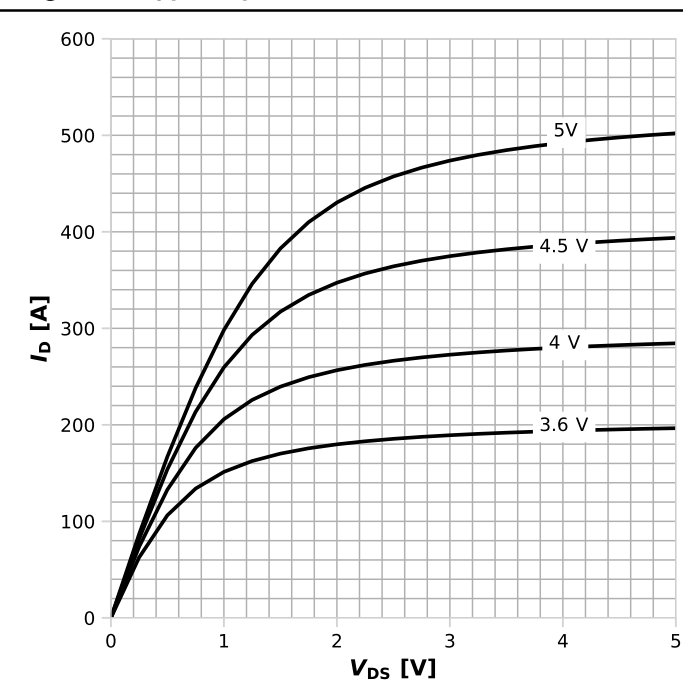
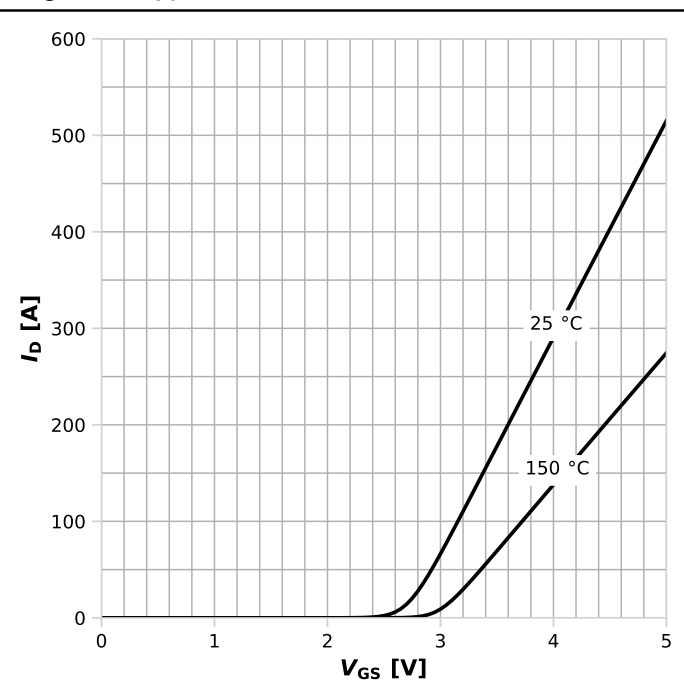


Diagram 5: Typ. output characteristics



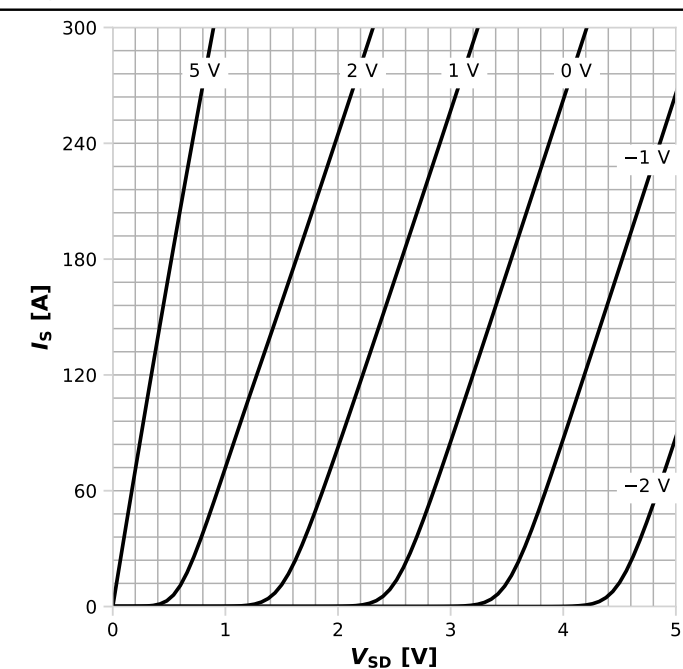
$I_D = f(V_{DS})$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. transfer characteristics



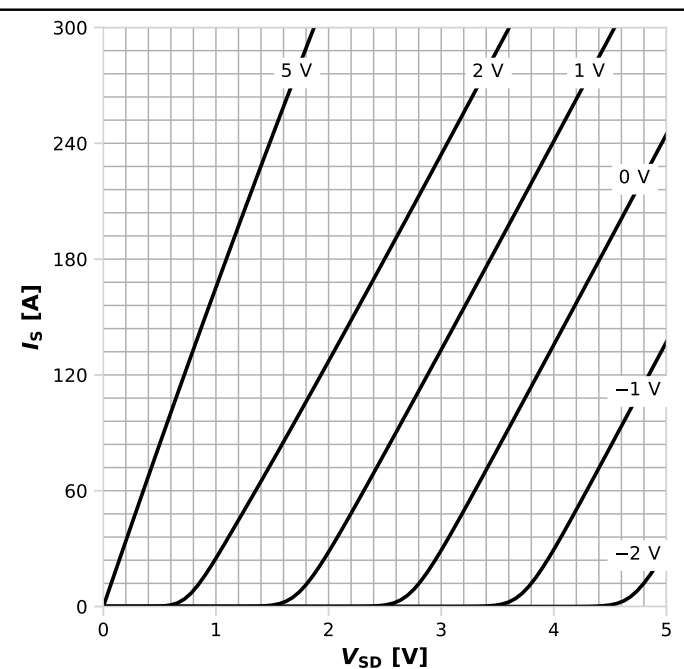
$I_D = f(V_{GS})$; $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 7: Typ. channel reverse characteristics



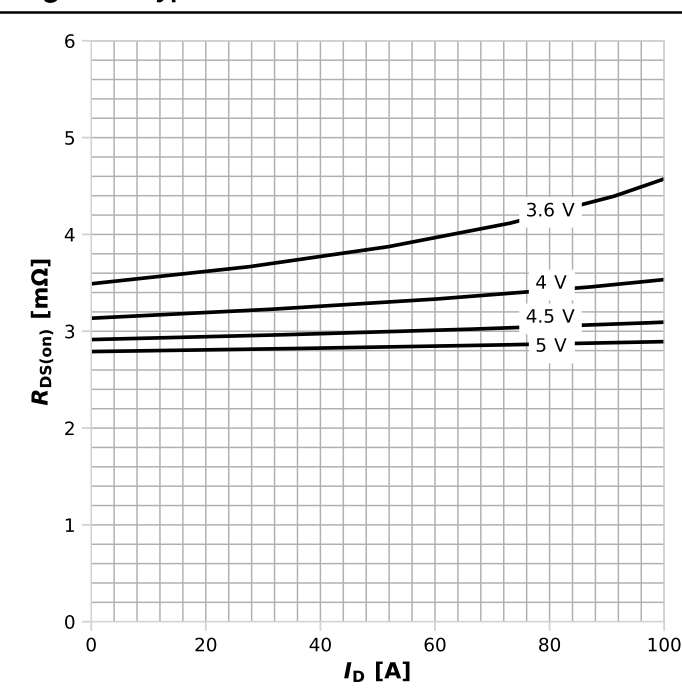
$I_S = f(V_{SD})$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 8: Typ. channel reverse characteristics



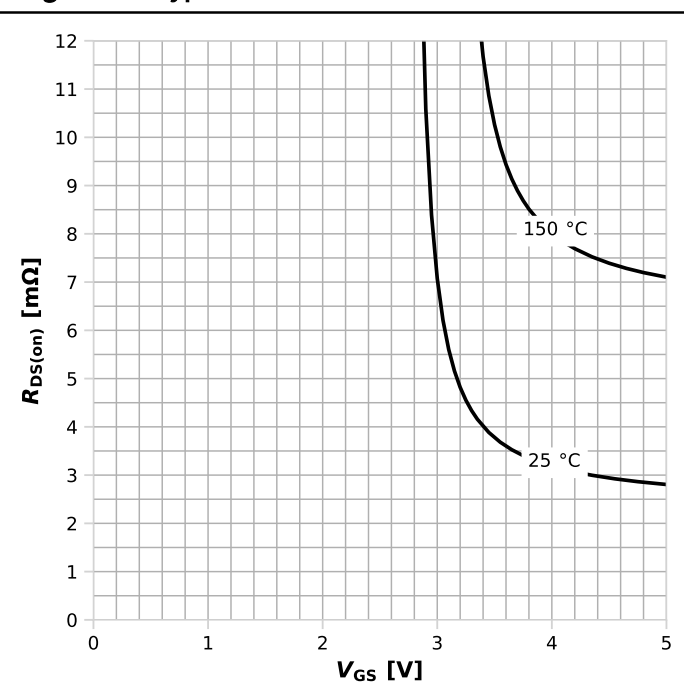
$I_S = f(V_{SD})$; $T_j = 125^\circ\text{C}$; parameter: V_{GS}

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



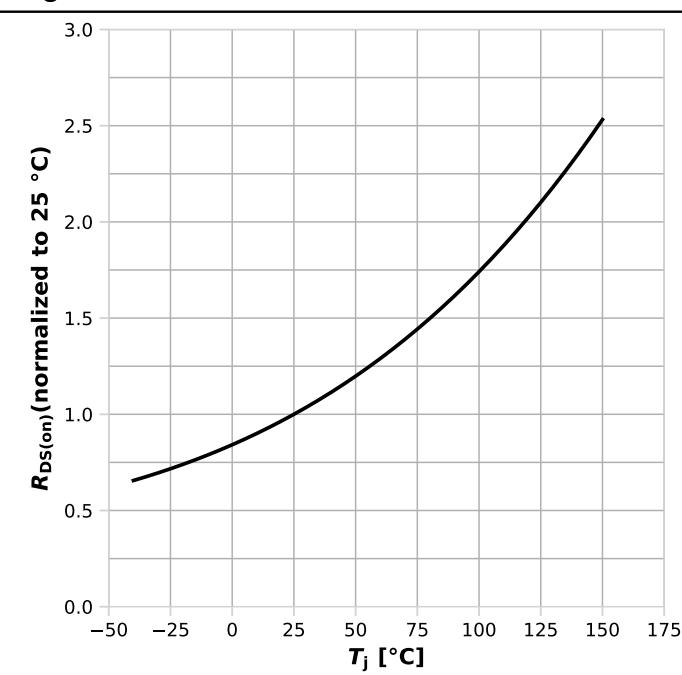
$R_{DS(on)}=f(I_D); T_j=25\text{ }^{\circ}\text{C}; \text{parameter: } V_{GS}$

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



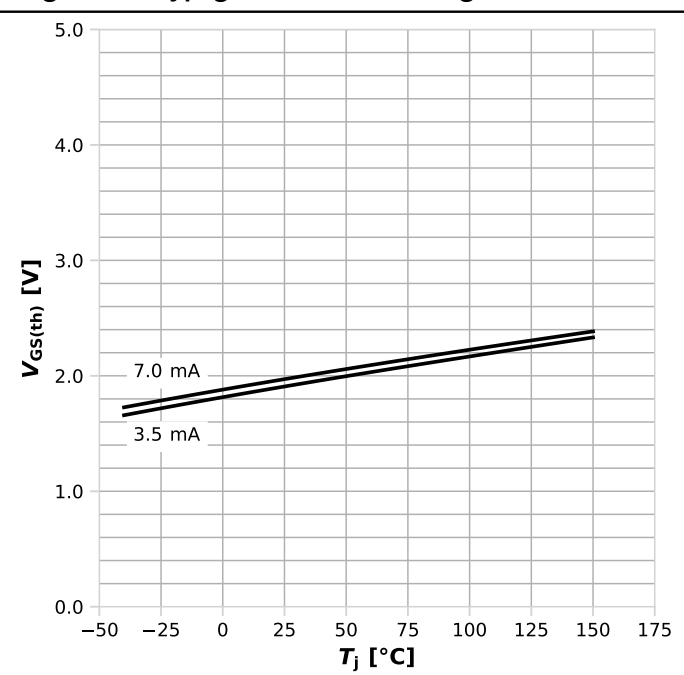
$R_{DS(on)}=f(V_{GS}); I_D=18\text{ A}; \text{parameter: } T_j$

Diagram 11: Drain-source on-state resistance



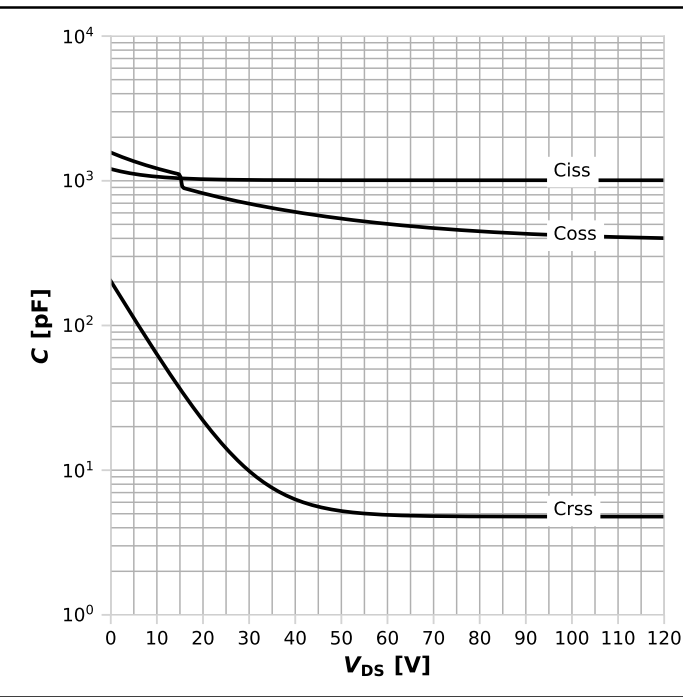
$R_{DS(on)}=f(T_j); I_D=18\text{ A}, V_{GS}=5\text{ V}$

Diagram 12: Typ. gate threshold voltage



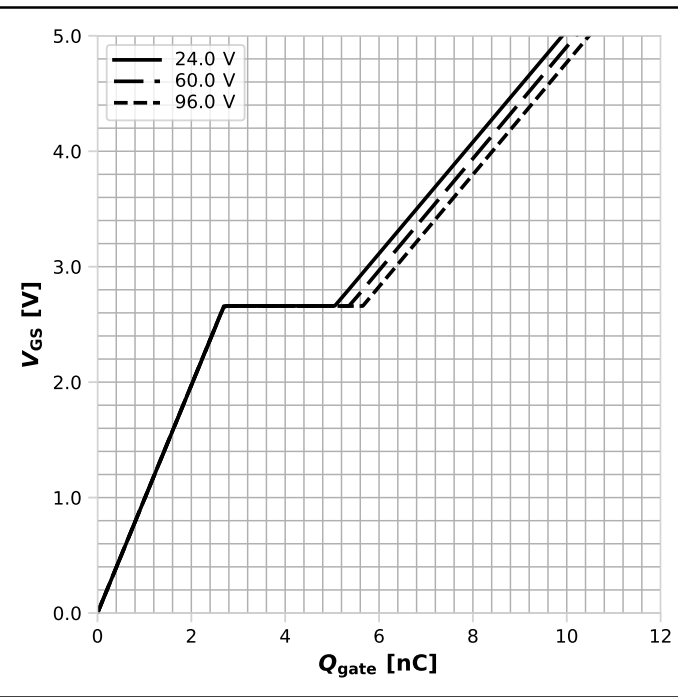
$V_{GS(th)}=f(T_j), V_{GS}=V_{DS}; \text{parameter: } I_D$

Diagram 13: Typ. capacitances



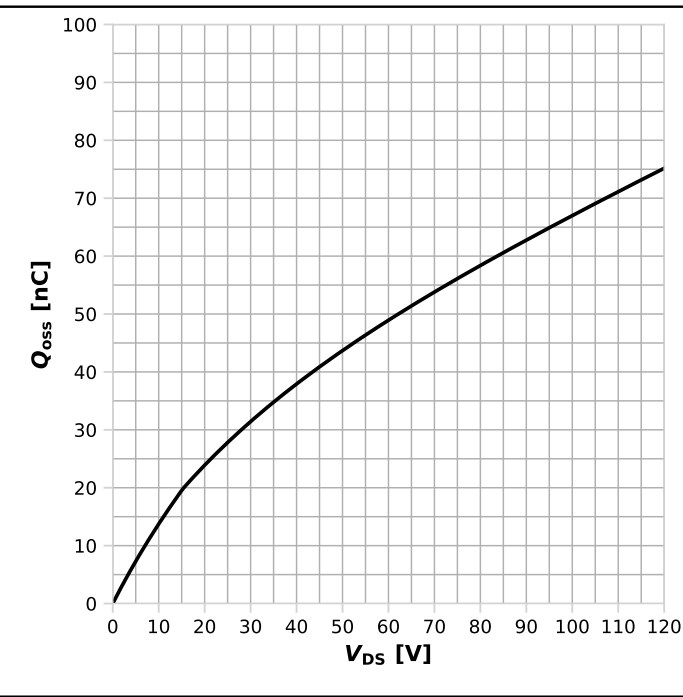
$C=f(V_{DS}); V_{GS}=0\text{ V}$

Diagram 14 Typ. gate charge



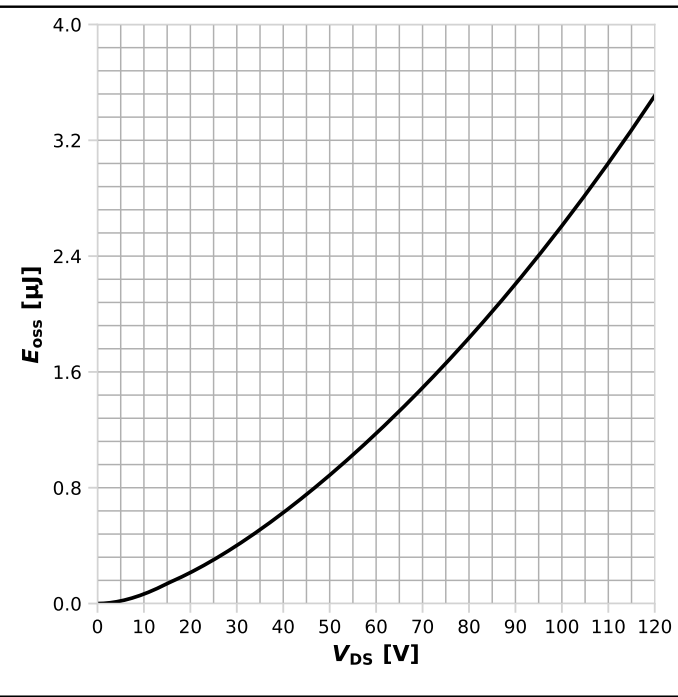
$V_{GS}=f(Q_{gate}); I_D=18\text{ A pulsed}; \text{parameter: } V_{DS}$

Diagram 15: Typ. output charge



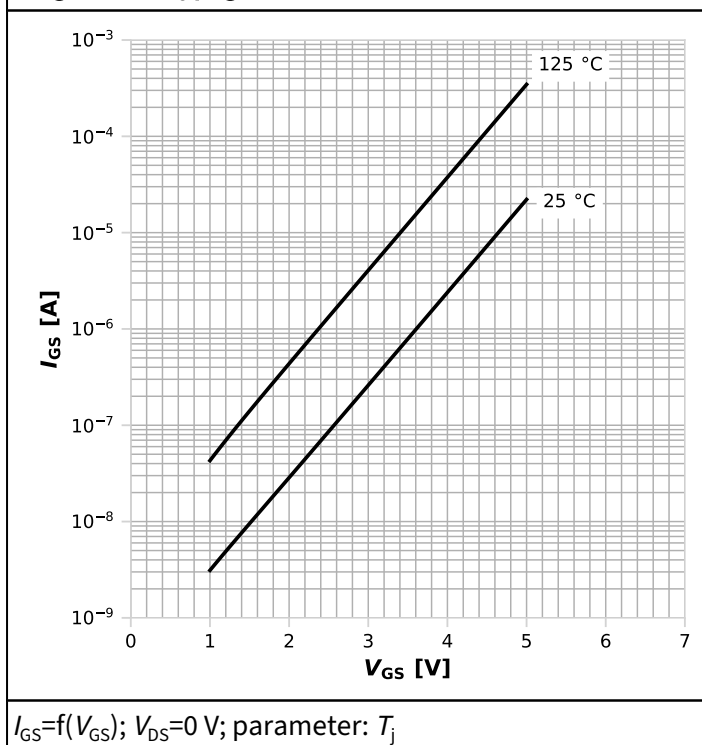
$Q_{oss}=f(V_{DS}), V_{GS}=0\text{ V}$

Diagram 16: Typ. Coss stored Energy

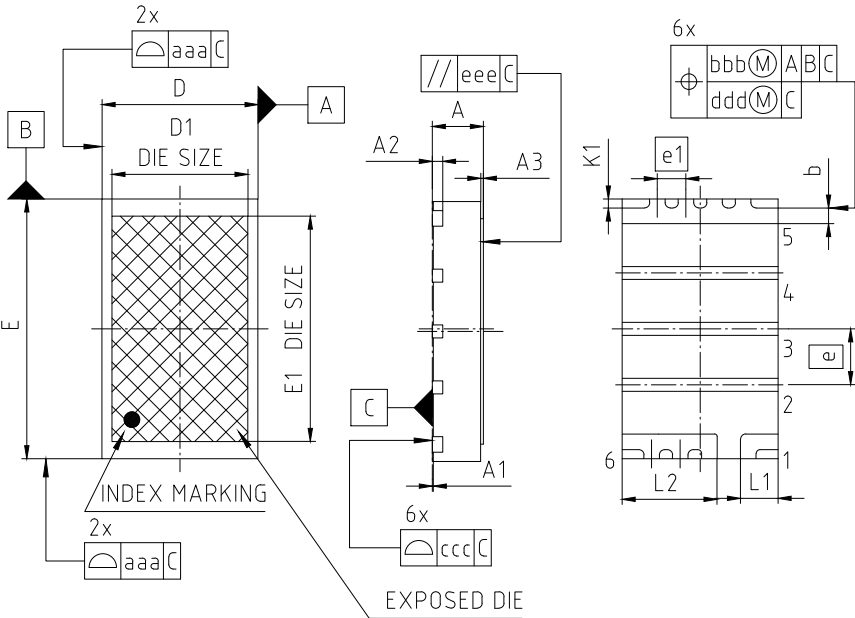


$E_{oss}=f(V_{DS}), V_{GS}=0\text{ V}$

Diagram 17: Typ. gate characteristics forward



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

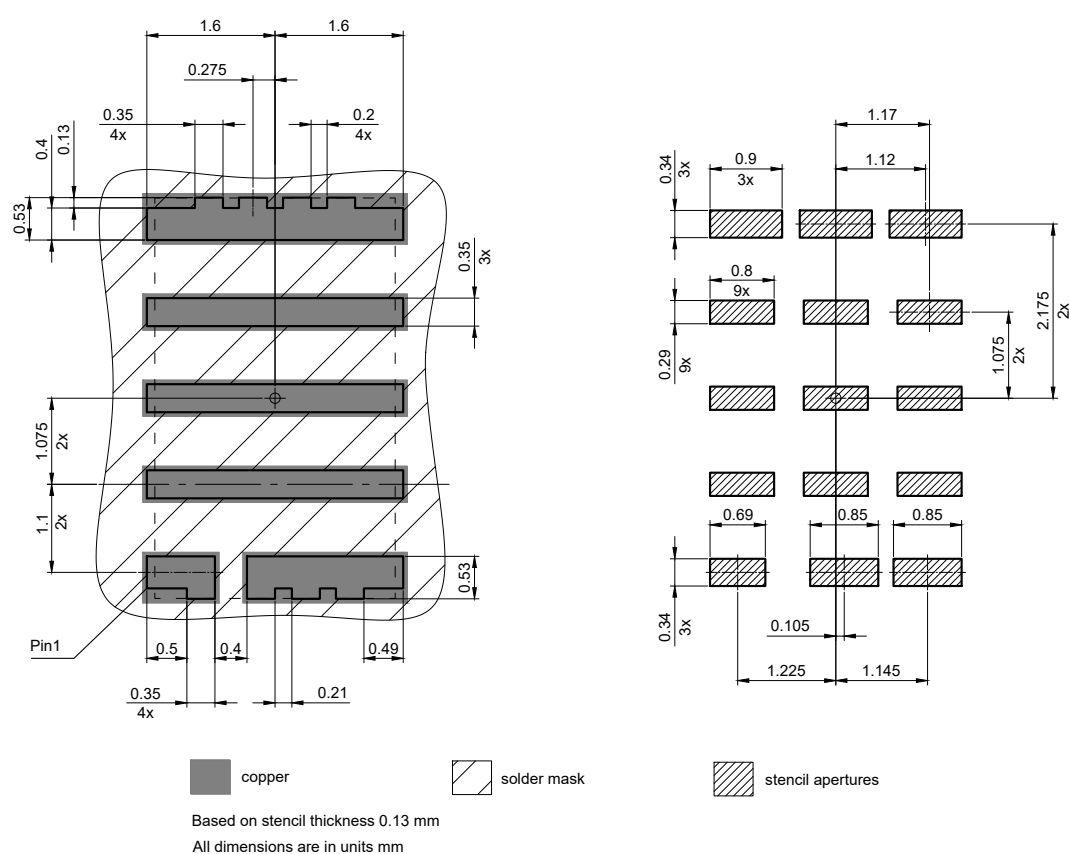


Figure 2 Footprint drawing PG-TSON-6, dimensions in mm

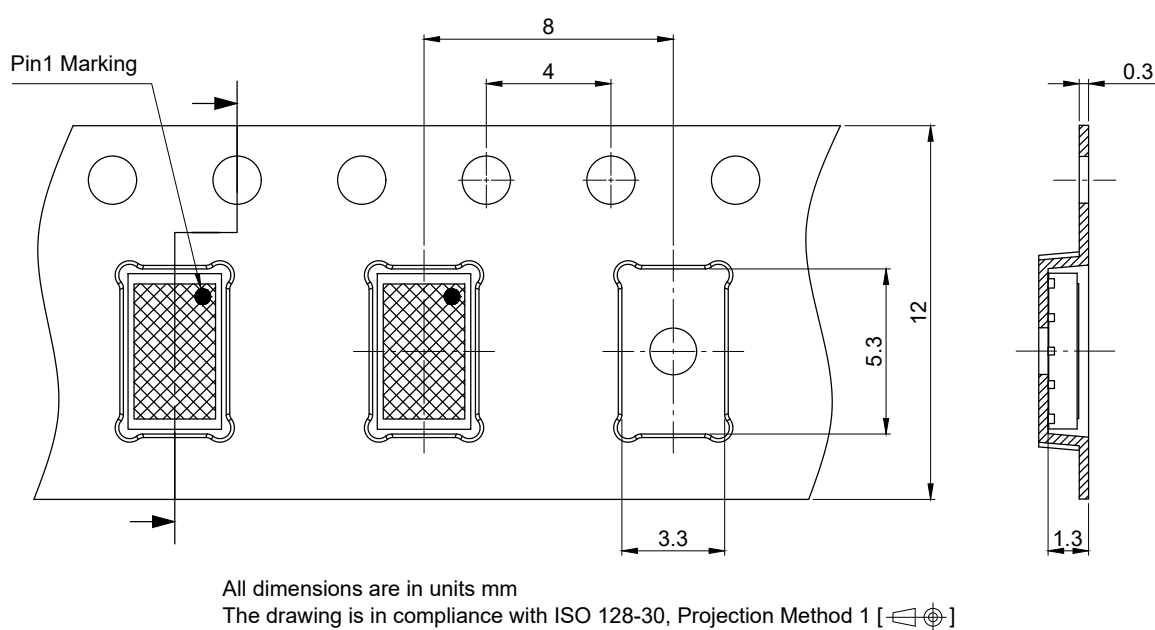


Figure 3 Packaging variant PG-TSON-6, dimensions in mm

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

IGC037S12S1

Revision 2025-02-21, Rev. 1.1

Previous revisions

Revision	Date	Subjects (major changes since last revision)
1.0	2025-01-28	Release of final version
1.1	2025-02-21	Diagram harmonization

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Infineon Technologies AG

81726 München, Germany

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