

CoolGaN™  
CoolGaN™ Transistor 100 V G3

PG-TSON-4

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 3x3 package

Potential applications

- Telecom & Datacenter 48V IBC
- Sync Rectification for AC-DC and DC-DC converters
- Robotics and drones
- Battery powered tools
- 48V servo drive
- e-Mobility, UAVs
- Class D Audio
- Solar & Energy storage systems
- Point of Load Converters

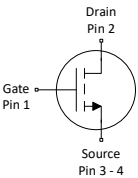
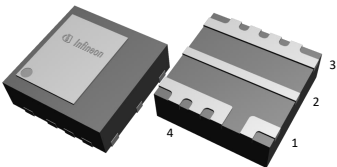
Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key performance parameters

| Parameter    | Value | Unit |
|--------------|-------|------|
| $V_{DS}$     | 100   | V    |
| $R_{DS(on)}$ | 9.4   | mΩ   |
| $I_D$        | 23    | A    |
| $Q_{oss}$    | 14    | nC   |
| $Q_G$        | 3.4   | nC   |
| $Q_{rr}$     | 0     | nC   |

| Type / Ordering code | Package   | Marking | Related links  |
|----------------------|-----------|---------|----------------|
| IGB110S10S1          | PG-TSON-4 | BA1     | see Appendix A |



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

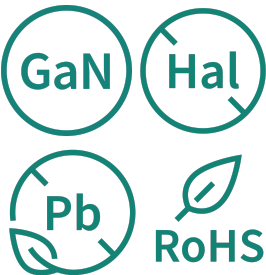




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## 1 Maximum ratings

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           | $V_{DS}$        | -      | -    | 100       | V    | $V_{GS}=0\text{ V}$                                                                                                            |
| Pulsed drain-source voltage <sup>1)</sup> | $V_{DS, pulse}$ | -      | -    | 120       | V    | $V_{GS}=0\text{ V}$ , 1 h total time                                                                                           |
| Continuous drain current                  | $I_D$           | -      | -    | 23<br>9.0 | A    | $V_{GS}=5\text{ V}$ , $T_C=25\text{ °C}$<br>$V_{GS}=5\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=50\text{ °C/W}$ <sup>2)</sup> |
| Pulsed drain current <sup>3)</sup>        | $I_{D, pulse}$  | -      | -    | 210<br>97 | A    | $T_j=25\text{ °C}$<br>$T_j=150\text{ °C}$                                                                                      |
| Pulsed gate-source voltage <sup>1)</sup>  | $V_{GS}$        | -6.5   | -    | 6.5       | V    | Pulsed 100 h total time                                                                                                        |
| Power dissipation                         | $P_{tot}$       | -      | -    | 15<br>2.5 | W    | $T_C=25\text{ °C}$<br>$T_A=25\text{ °C}$ , $R_{thJA}=50\text{ °C/W}$ <sup>2)</sup>                                             |
| Storage temperature                       | $T_{stg}$       | -55    | -    | 150       | °C   | -                                                                                                                              |
| Junction temperature                      | $T_j$           | -40    | -    | 150       | °C   |                                                                                                                                |

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

<sup>2)</sup> Device on 4-layer FR4 PCB, vertical in still air.

<sup>3)</sup> 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    | $R_{thJC}$ | -      | 1.4  | 1.7  | °C/W | -                                                |
| Thermal resistance, junction - case, bottom | $R_{thJC}$ | -      | 5.6  | 8.1  | °C/W |                                                  |
| Thermal resistance, junction - ambient 1s0p | $R_{thJA}$ | -      | 70   | -    | °C/W | On 1 layer PCB, vertical in still air.           |
| Thermal resistance, junction - ambient 2s2p | $R_{thJA}$ | -      | 50   | -    | °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                | $V_{DS}=V_{GS}$ , $I_D=3.0\text{ mA}$                                                                                                                                            |
| Drain-source leakage current     | $I_{DSS}$    | -      | 0.1<br>2.0                  | 0.5<br>20                   | $\mu\text{A}$    | $V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$<br>$V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}$                                            |
| Gate-source leakage current      | $I_{GSS}$    | -      | 5.0<br>0.003<br>40<br>0.003 | 50<br>0.009<br>370<br>0.012 | $\mu\text{A}$    | $V_{GS}=5\text{ V}$ , $T_j=25\text{ °C}$<br>$V_{GS}=-4\text{ V}$ , $T_j=25\text{ °C}$<br>$V_{GS}=5\text{ V}$ , $T_j=125\text{ °C}$<br>$V_{GS}=-4\text{ V}$ , $T_j=125\text{ °C}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | -      | 9.4                         | 11                          | $\text{m}\Omega$ | $V_{GS}=5\text{ V}$ , $I_D=10\text{ A}$                                                                                                                                          |
| Gate resistance <sup>4)</sup>    | $R_G$        | -      | 0.5                         | -                           | $\Omega$         | -                                                                                                                                                                                |

<sup>4)</sup> Defined by design. Not subject to production test.

**Table 6 Capacitance characteristics <sup>5)</sup>**

| Parameter                    | Symbol    | Values |      |      | Unit | Note / Test condition                                         |
|------------------------------|-----------|--------|------|------|------|---------------------------------------------------------------|
|                              |           | Min.   | Typ. | Max. |      |                                                               |
| Input capacitance            | $C_{iss}$ | -      | 300  | 340  | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$ |
| Output capacitance           | $C_{oss}$ | -      | 140  | 150  | pF   |                                                               |
| Reverse transfer capacitance | $C_{rss}$ | -      | 2.3  | 3.0  | pF   |                                                               |

<sup>5)</sup> 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              | $Q_{gs}$      | -      | 1.0  | -    | nC   | $V_{DS}=50\text{ V}$ , $I_D=10\text{ A}$ , $V_{GS}=0\text{ to }5\text{ V}$ |
| Gate charge at threshold           | $Q_{g(th)}$   | -      | 0.7  | -    | nC   |                                                                            |
| Gate to drain charge <sup>6)</sup> | $Q_{gd}$      | -      | 0.9  | -    | nC   |                                                                            |
| Switching charge                   | $Q_{sw}$      | -      | 1.2  | -    | nC   |                                                                            |
| Gate charge total <sup>6)</sup>    | $Q_g$         | -      | 3.4  | 4.4  | nC   |                                                                            |
| Gate plateau voltage               | $V_{plateau}$ | -      | 2.8  | -    | V    |                                                                            |
| Output charge <sup>6)</sup>        | $Q_{oss}$     | -      | 14   | 15   | nC   | $V_{DS}=50\text{ V}$ , $V_{GS}=0\text{ V}$                                 |

<sup>6)</sup> 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            | $I_S$         | -      | -          | 5.0      | A    | $T_C = 25\text{ °C}$                                                                                                              |
| Pulsed current, reverse               | $I_{S,pulse}$ | -      | -          | 92       | A    |                                                                                                                                   |
| Source-Drain reverse voltage          | $V_{SD}$      | -      | 2.6<br>2.2 | 3.4<br>- | V    | $V_{GS}=0\text{ V}, I_{S,pulse}=10\text{ A}, T_j=25\text{ °C}$<br>$V_{GS}=0\text{ V}, I_{S,pulse}=0.5\text{ A}, T_j=25\text{ °C}$ |
| Reverse recovery charge <sup>7)</sup> | $Q_{rr}$      | -      | 0          | -        | nC   | $V_R=50\text{ V}, I_{S,pulse}=10\text{ A}, di_{S,pulse}/dt=100\text{ A}/\mu\text{s}$                                              |

<sup>7)</sup> Defined by design. Not subject to production test.

## 5 Electrical characteristics diagrams

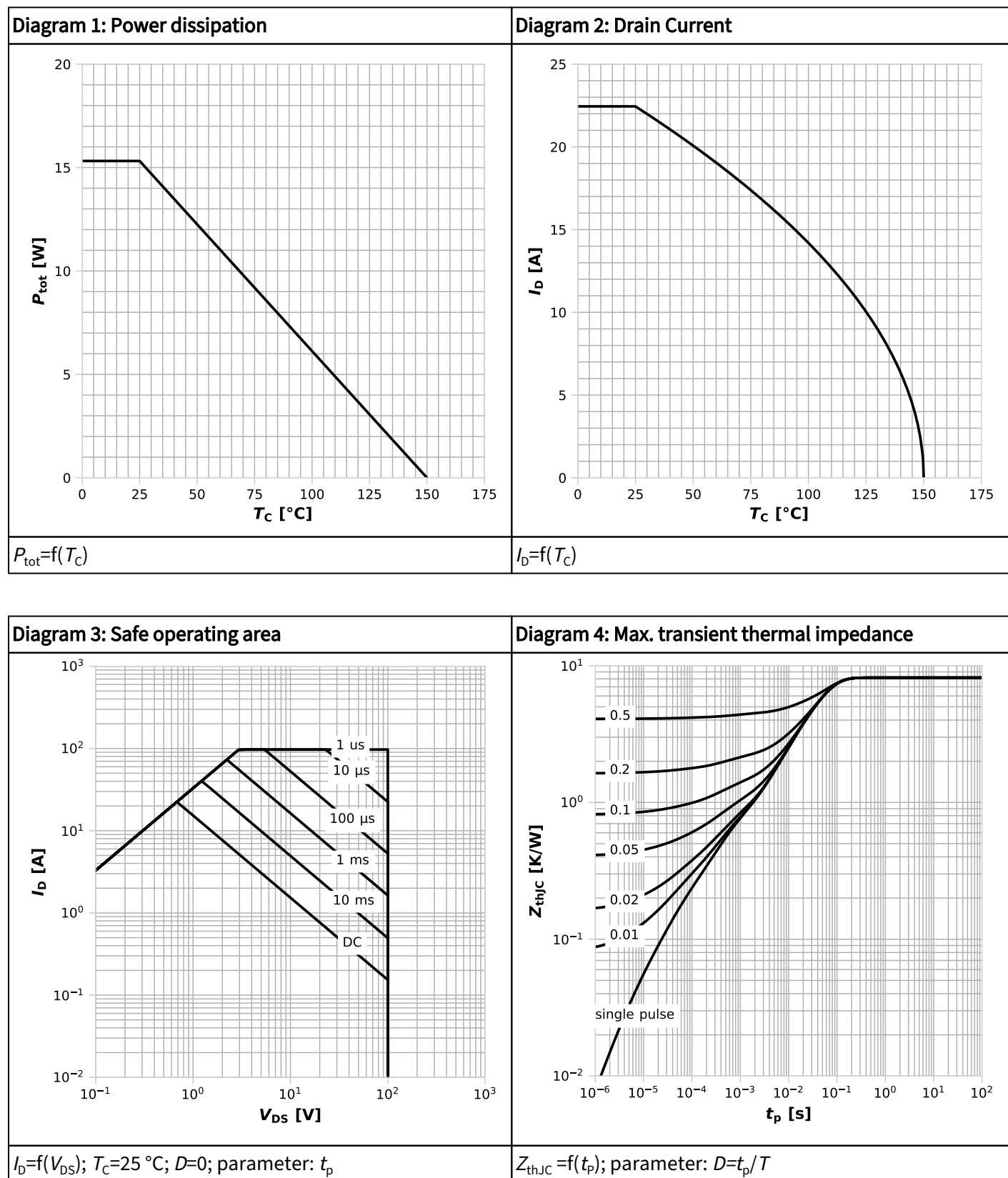
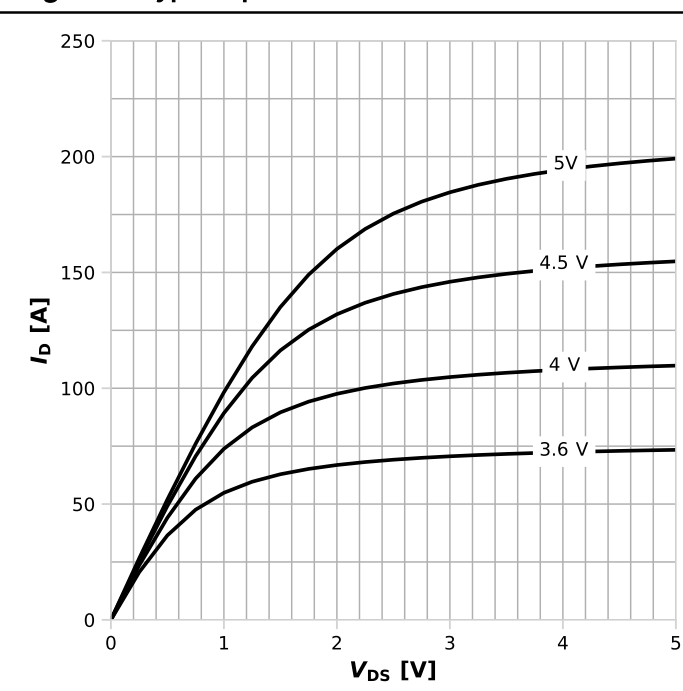
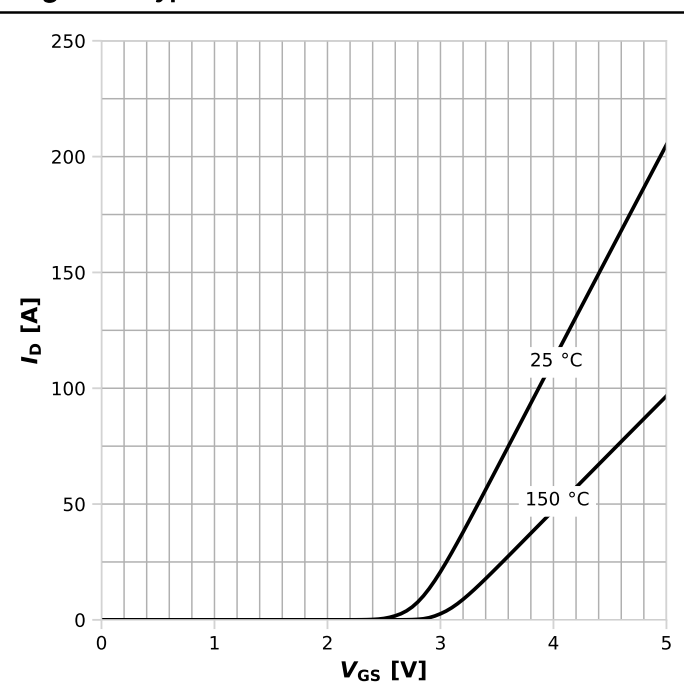


Diagram 5: Typ. output characteristics



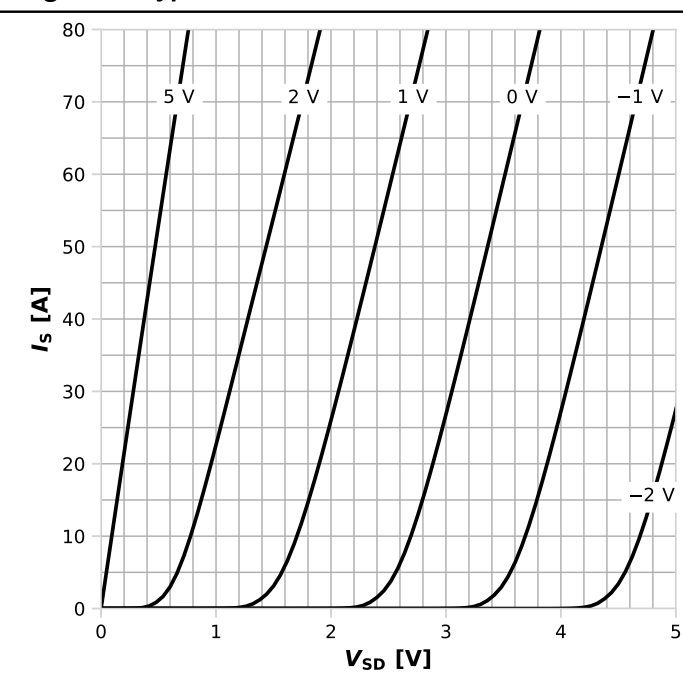
$I_D = f(V_{DS})$ ;  $T_j = 25^\circ\text{C}$ ; parameter:  $V_{GS}$

Diagram 6: Typ. transfer characteristics



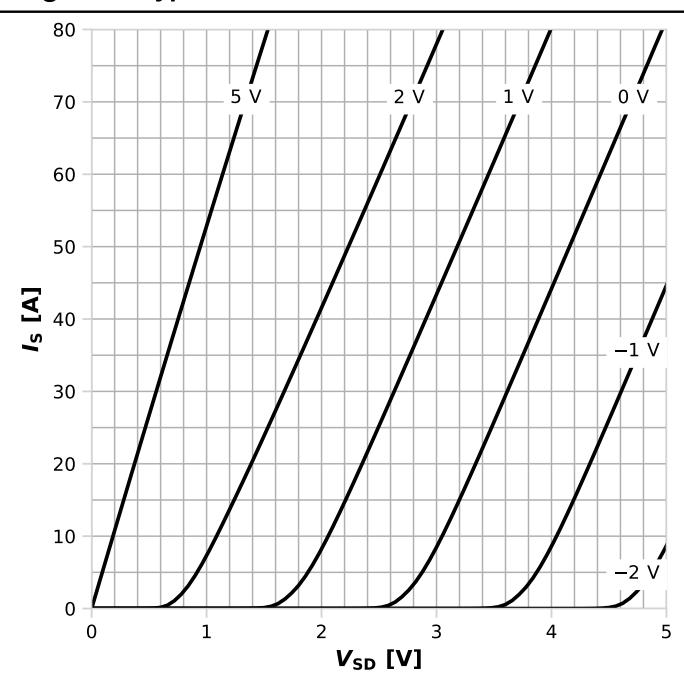
$I_D = f(V_{GS})$ ;  $|V_{DS}| > 2|I_D|R_{DS(on)max}$ ; parameter:  $T_j$

Diagram 7: Typ. channel reverse characteristics



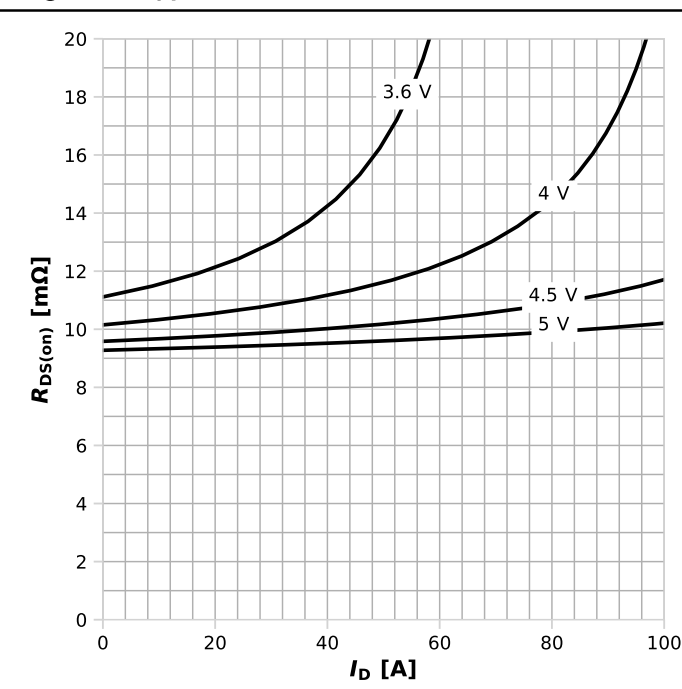
$I_S = f(V_{SD})$ ;  $T_j = 25^\circ\text{C}$ ; parameter:  $V_{GS}$

Diagram 8: Typ. channel reverse characteristics



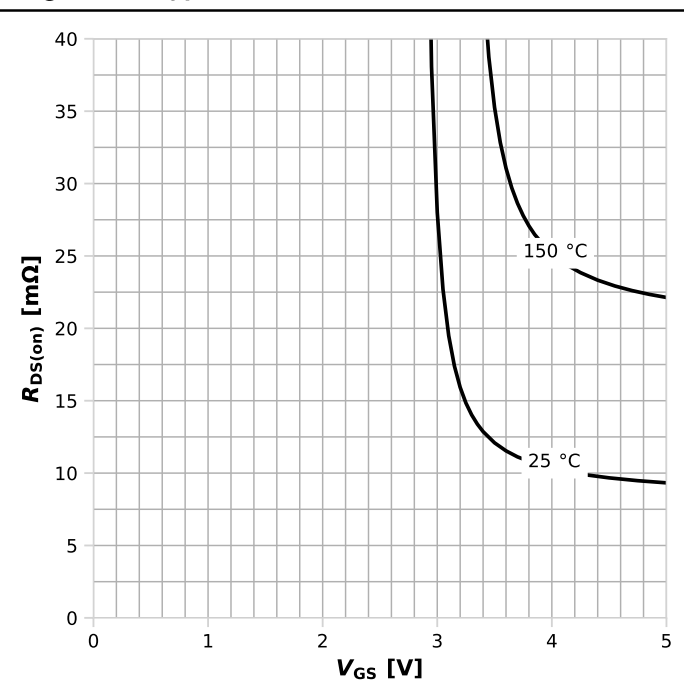
$I_S = f(V_{SD})$ ;  $T_j = 125^\circ\text{C}$ ; parameter:  $V_{GS}$

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



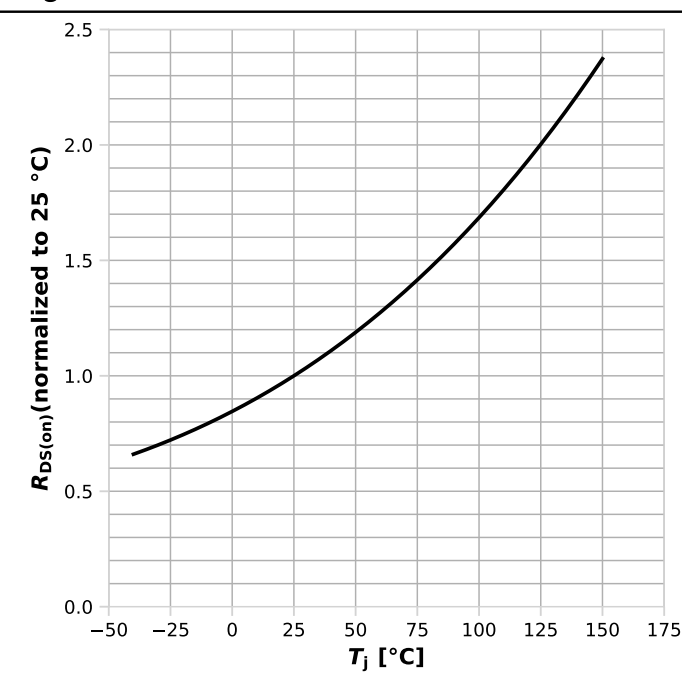
$R_{DS(on)}=f(I_D); T_j=25\text{ °C}; \text{parameter: } V_{GS}$

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



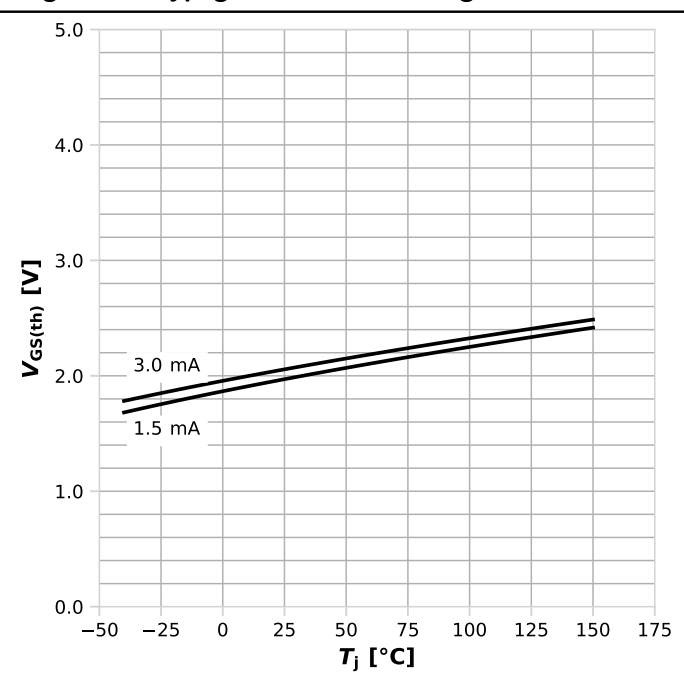
$R_{DS(on)}=f(V_{GS}); I_D=10\text{ A}; \text{parameter: } T_j$

Diagram 11: Drain-source on-state resistance



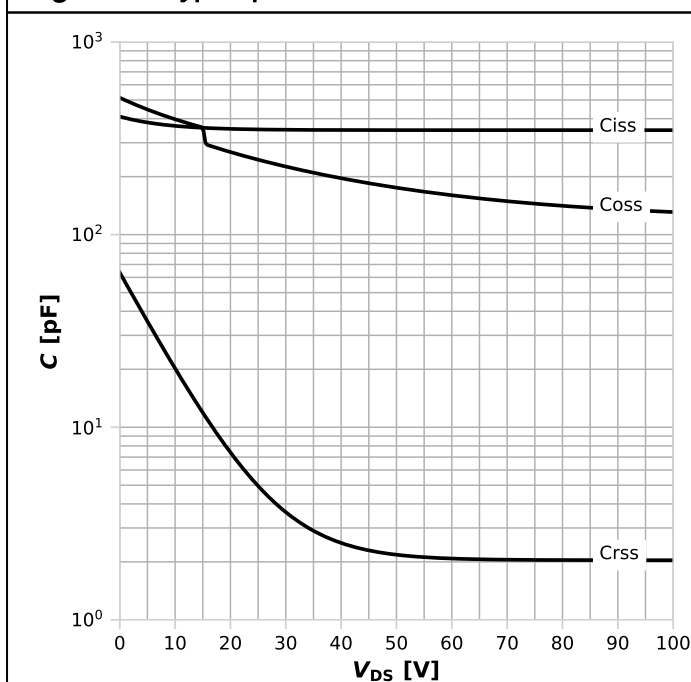
$R_{DS(on)}=f(T_j); I_D=10\text{ A}, V_{GS}=5\text{ V}$

Diagram 12: Typ. gate threshold voltage



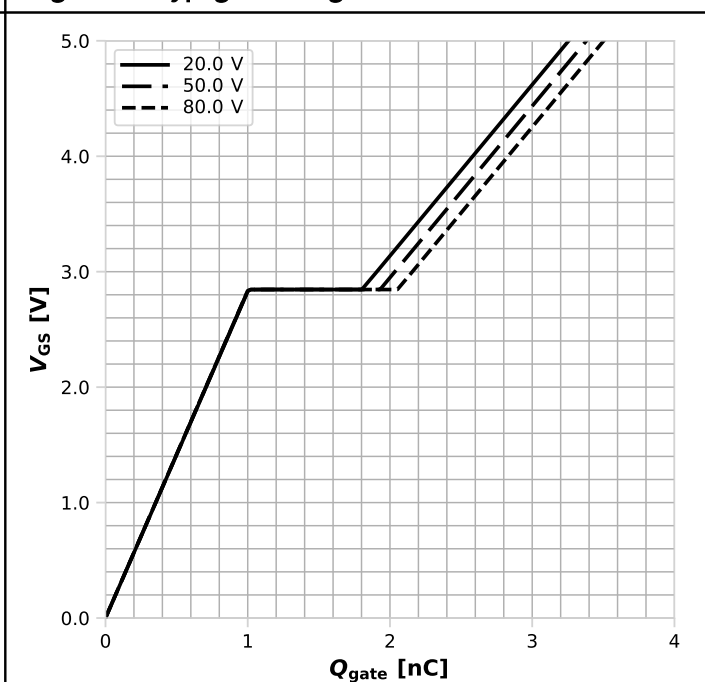
$V_{GS(th)}=f(T_j), V_{GS}=V_{DS}; \text{parameter: } I_D$

Diagram 13: Typ. capacitances



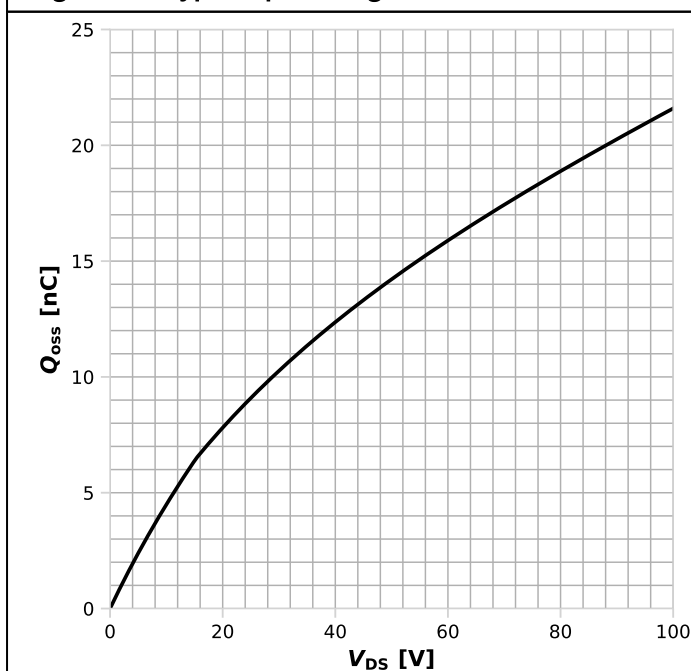
$$C=f(V_{DS}); V_{GS}=0\text{ V}$$

Diagram 14 Typ. gate charge



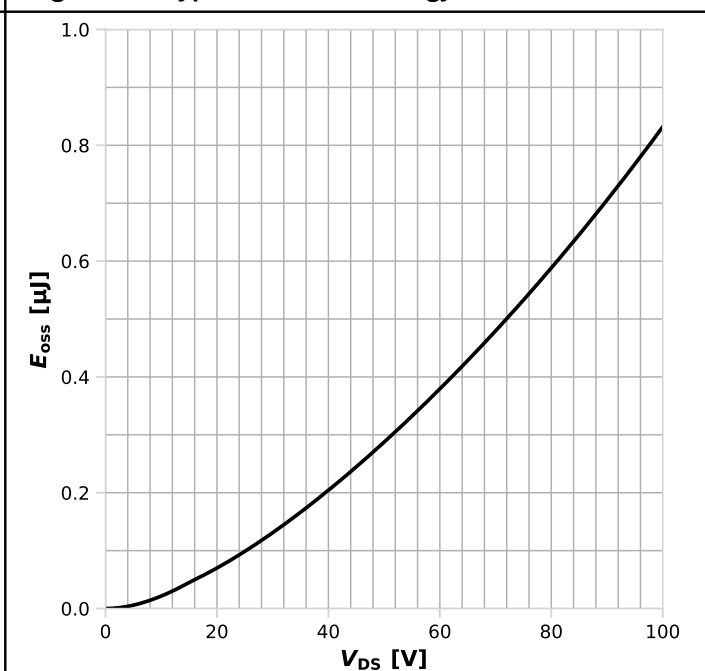
$$V_{GS}=f(Q_{gate}); I_D=10\text{ A pulsed; parameter: }V_{DS}$$

Diagram 15: Typ. output charge



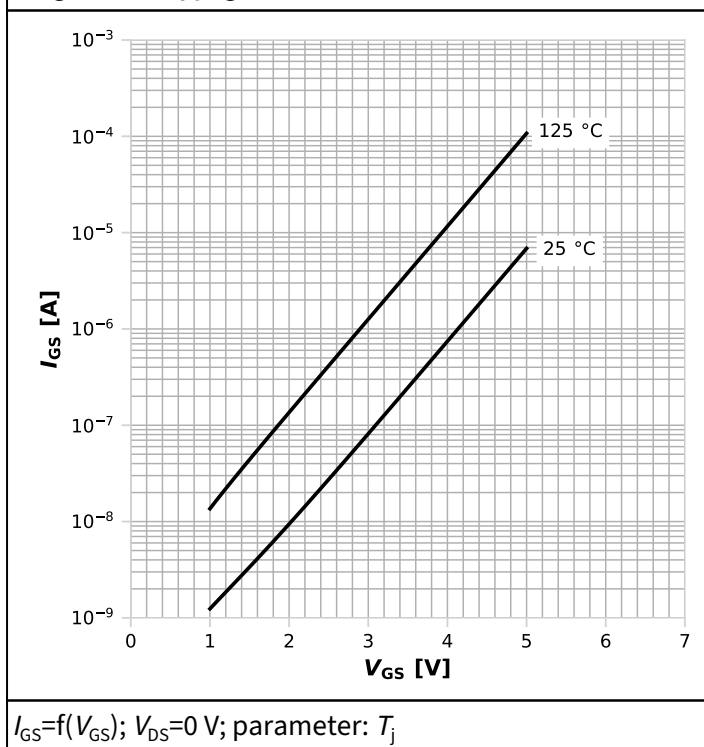
$$Q_{oss}=f(V_{DS}), V_{GS}=0\text{ V}$$

Diagram 16: Typ. Coss stored Energy

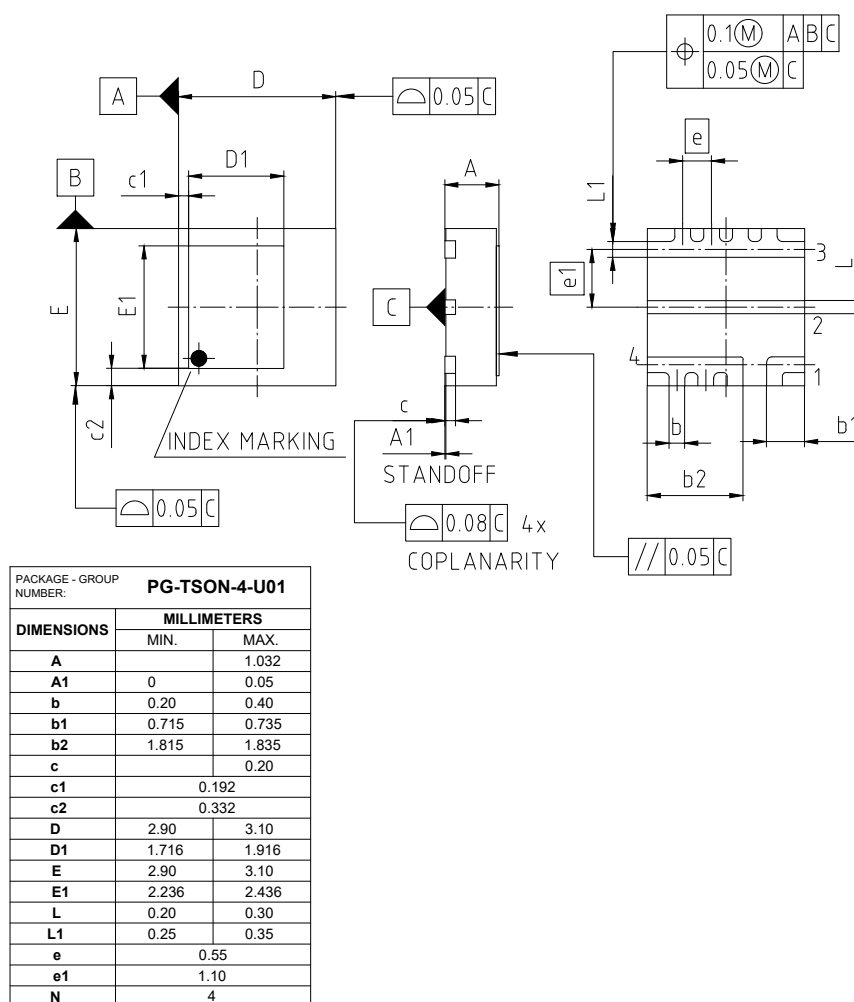


$$E_{oss}=f(V_{DS}), V_{GS}=0\text{ V}$$

Diagram 17: Typ. gate characteristics forward

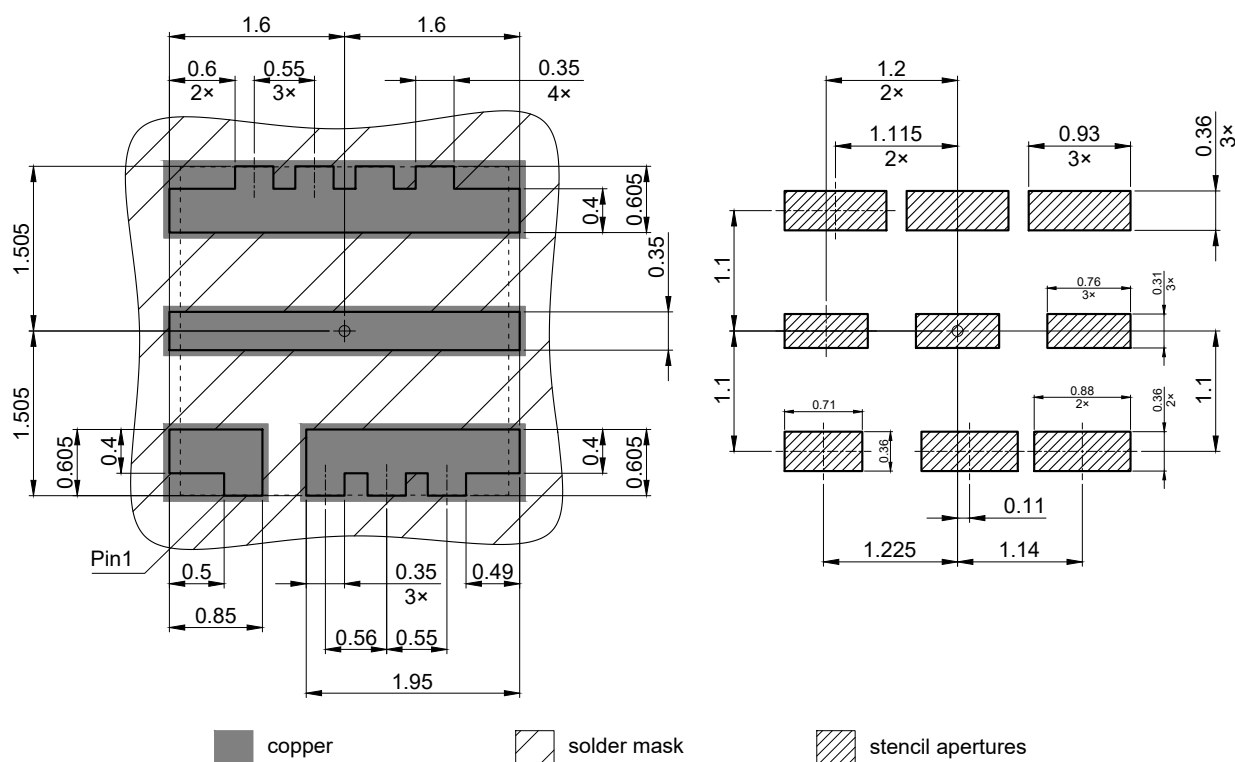


## 6 Package outlines



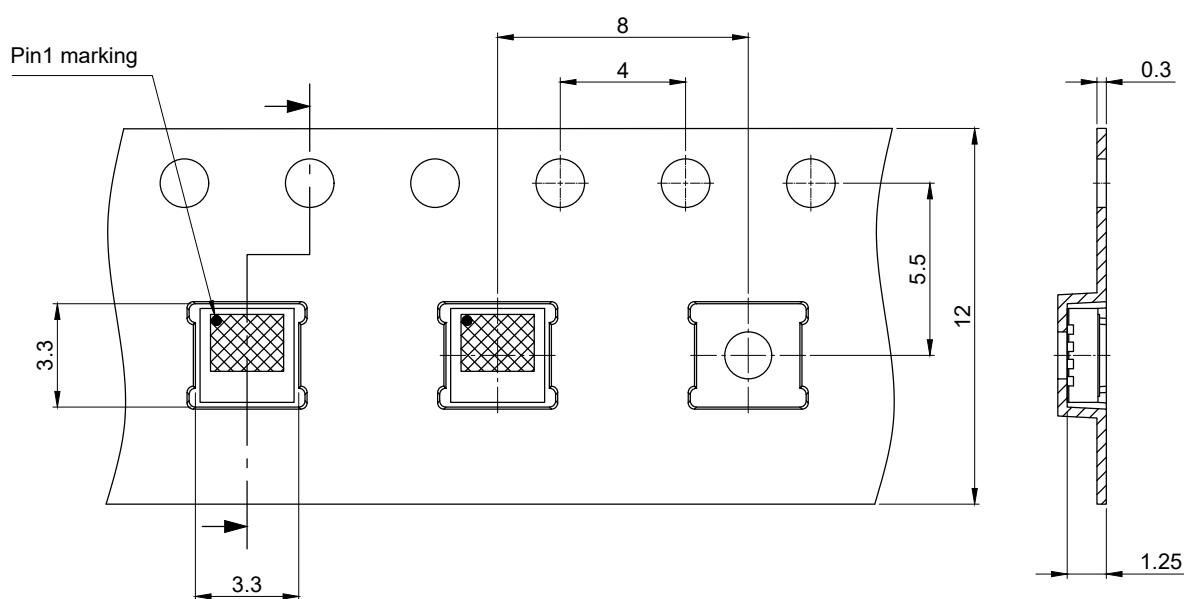
NOTE:  
 DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS

**Figure 1 Outline PG-TSON-4, dimensions in mm**



All dimensions are in units mm  
All pads are solder mask defined

**Figure 2** Footprint drawing PG-TSON-4, dimensions in mm



All dimensions are in units mm  
The drawing is in compliance with ISO 128-30, Projection Method 1 [  ]

**Figure 3** Packaging variant PG-TSON-4, 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-4-2](#)

## Revision history

IGB110S10S1

### Revision 2024-12-13, Rev. 1.0

Previous revisions

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 1.0      | 2024-12-13 | Release of final version                     |

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