

MOSFET

StrongIRFET™ 2 Power-Transistor

Features

- Optimized for a wide range of applications
- N-Channel, normal level
- 100% avalanche tested
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product validation

Qualified according to JEDEC Standard

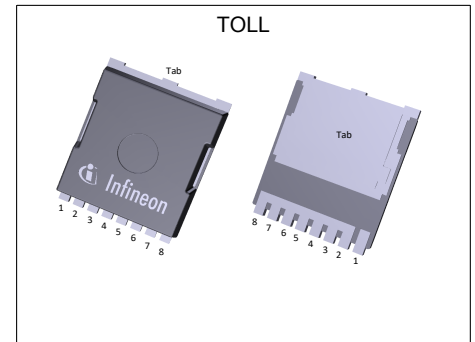
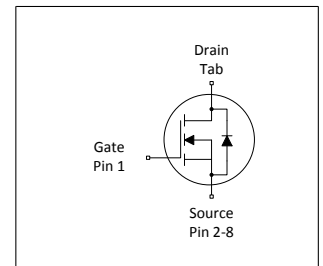


Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|------------------|-------|------------|
| V_{DS} | 100 | V |
| $R_{DS(on),max}$ | 2.25 | m Ω |
| I_D | 236 | A |
| Q_{oss} | 131 | nC |
| Q_G | 103 | nC |



RoHS

| Type / Ordering Code | Package | Marking | Related Links |
|----------------------|-----------|----------|---------------|
| IPT022N10NF2S | PG-HSOF-8 | 022N10NS | - |

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1 Maximum ratings

at $T_A=25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|-------------------|--------|------|-------------------------|------|--|
| | | Min. | Typ. | Max. | | |
| Continuous drain current ¹⁾ | I_D | - | - | 236 167 148 29 | A | $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=6\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=40\text{ °C/W}^2)$ |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | - | - | 944 | A | $T_A=25\text{ °C}$ |
| Avalanche energy, single pulse ⁴⁾ | E_{AS} | - | - | 150 | mJ | $I_D=130\text{ A}$, $R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -20 | - | 20 | V | - |
| Power dissipation | P_{tot} | - | - | 250 3.8 | W | $T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=40\text{ °C/W}^2)$ |
| Operating and storage temperature | T_j , T_{stg} | -55 | - | 175 | °C | - |

2 Thermal characteristics

Table 3 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|------------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | R_{thJC} | - | - | 0.6 | °C/W | - |
| Thermal resistance, junction - ambient, 6 cm ² cooling area ²⁾ | R_{thJA} | - | - | 40 | °C/W | - |
| Thermal resistance, junction - ambient, minimal footprint | R_{thJA} | - | - | 62 | °C/W | - |

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 cm² (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

3 Electrical characteristics

at $T_j=25\text{ °C}$, unless otherwise specified

Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------------|-------------|------------------|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 100 | - | - | V | $V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 2.2 | 3.0 | 3.8 | V | $V_{DS}=V_{GS}$, $I_D=169\text{ }\mu\text{A}$ |
| Zero gate voltage drain current | I_{DSS} | - | 0.1 10 | 1 100 | μA | $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$ |
| Gate-source leakage current | I_{GSS} | - | 10 | 100 | nA | $V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 2.0 2.5 | 2.25 2.9 | $\text{m}\Omega$ | $V_{GS}=10\text{ V}$, $I_D=150\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=75\text{ A}$ |
| Gate resistance | R_G | - | 1.8 | - | Ω | - |
| Transconductance ¹⁾ | g_{fs} | 110 | - | - | S | $ V_{DS} \geq 2 I_D R_{DS(on)max}$, $I_D=100\text{ A}$ |

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------|--------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance | C_{iss} | - | 7300 | - | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Output capacitance | C_{oss} | - | 1100 | - | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Reverse transfer capacitance | C_{rss} | - | 49 | - | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 20 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=100\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time | t_r | - | 65 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=100\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 47 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=100\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time | t_f | - | 26 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=100\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |

Table 6 Gate charge characteristics²⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 34 | - | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge at threshold | $Q_{g(th)}$ | - | 22 | - | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate to drain charge | Q_{gd} | - | 21 | - | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Switching charge | Q_{sw} | - | 33 | - | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total ¹⁾ | Q_g | - | 103 | 155 | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | 4.6 | - | V | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Output charge | Q_{oss} | - | 131 | - | nC | $V_{DS}=50\text{ V}$, $V_{GS}=0\text{ V}$ |

¹⁾ Defined by design. Not subject to production test.

²⁾ See "Gate charge waveforms" for parameter definition

Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | I_S | - | - | 182 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | 944 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | 0.87 | 1.2 | V | $V_{GS}=0\text{ V}, I_F=100\text{ A}, T_j=25\text{ °C}$ |
| Reverse recovery time | t_{rr} | - | 44 | - | ns | $V_R=50\text{ V}, I_F=100\text{ A}, di_F/dt=500\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | - | 327 | - | nC | $V_R=50\text{ V}, I_F=100\text{ A}, di_F/dt=500\text{ A}/\mu\text{s}$ |

4 Electrical characteristics diagrams

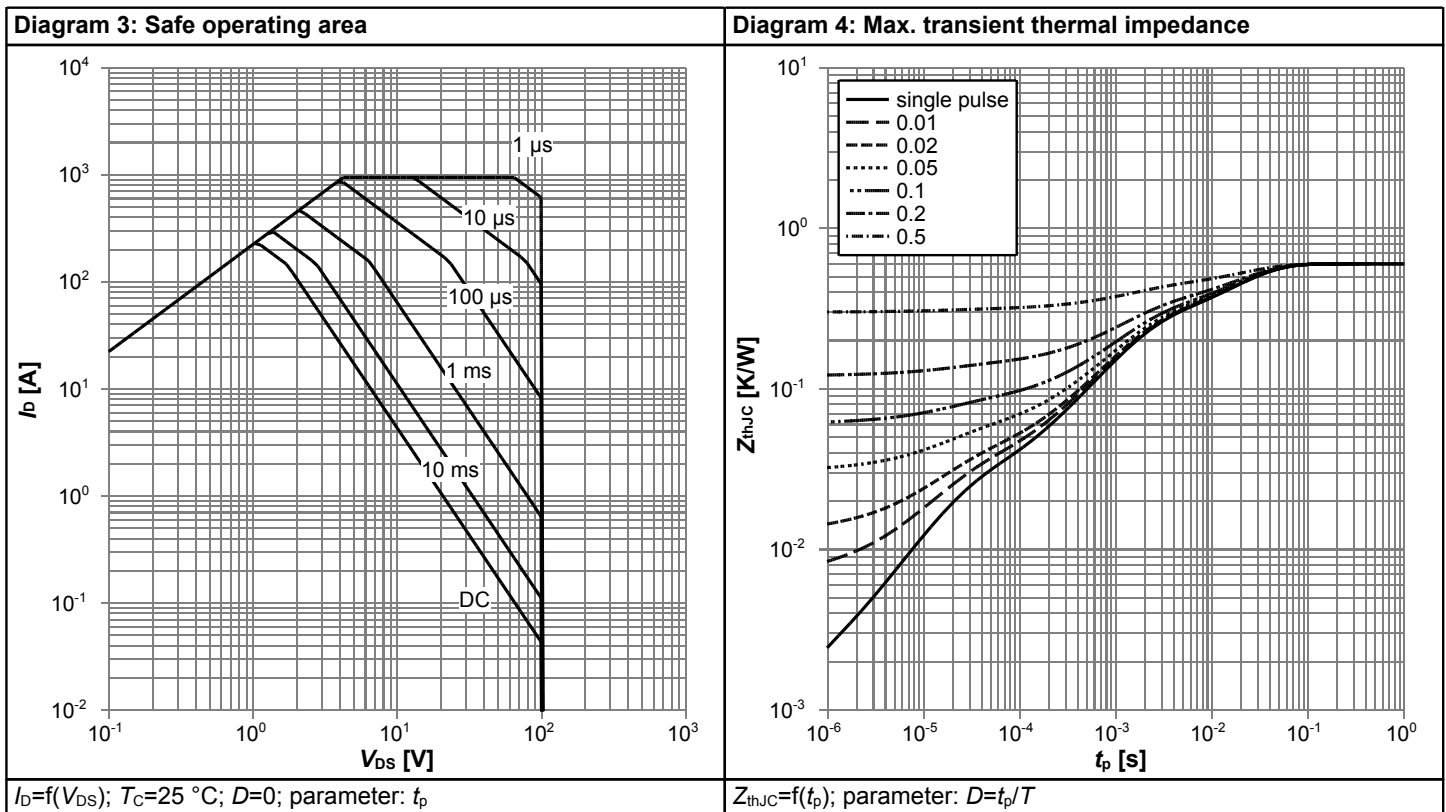
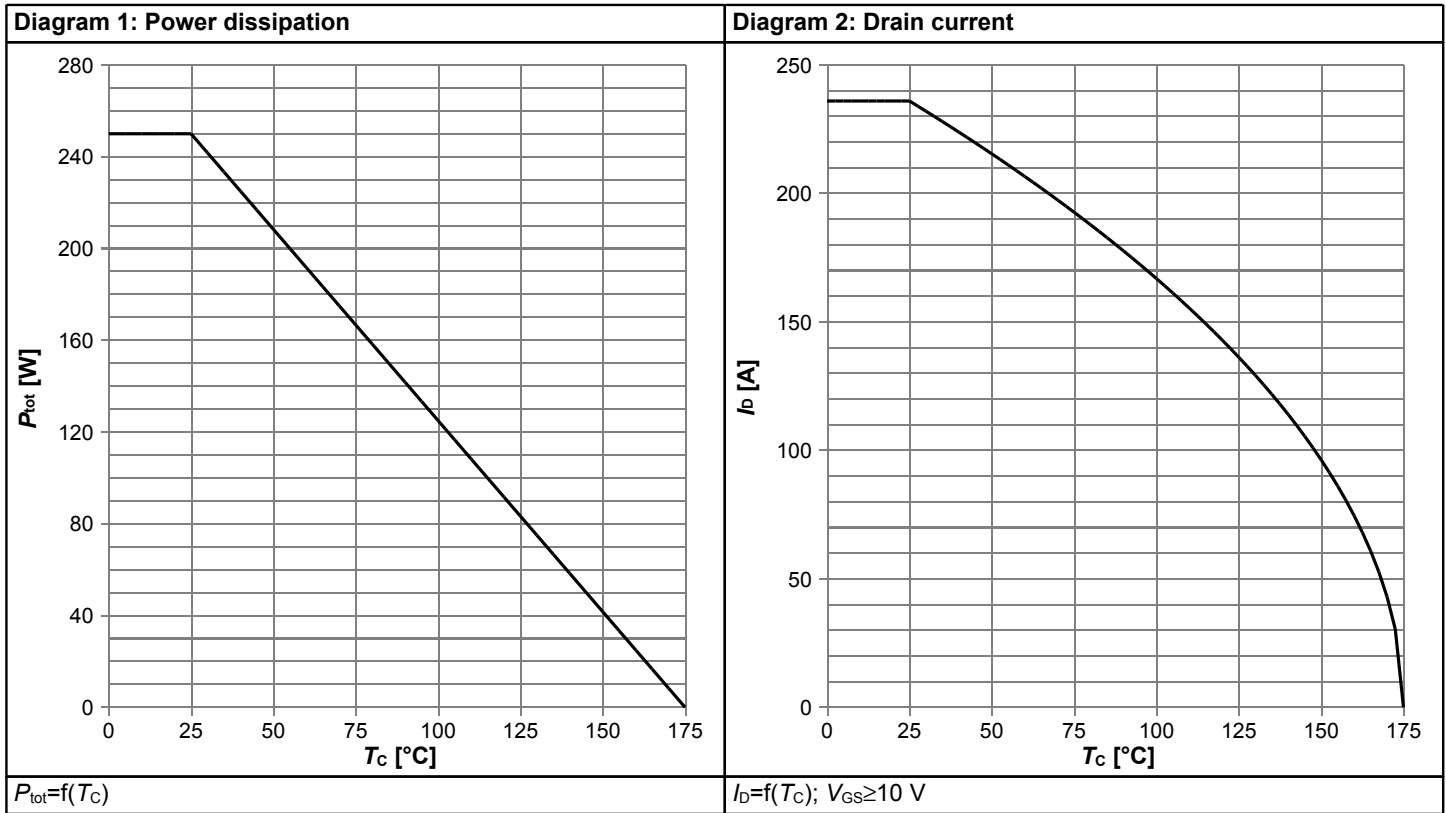
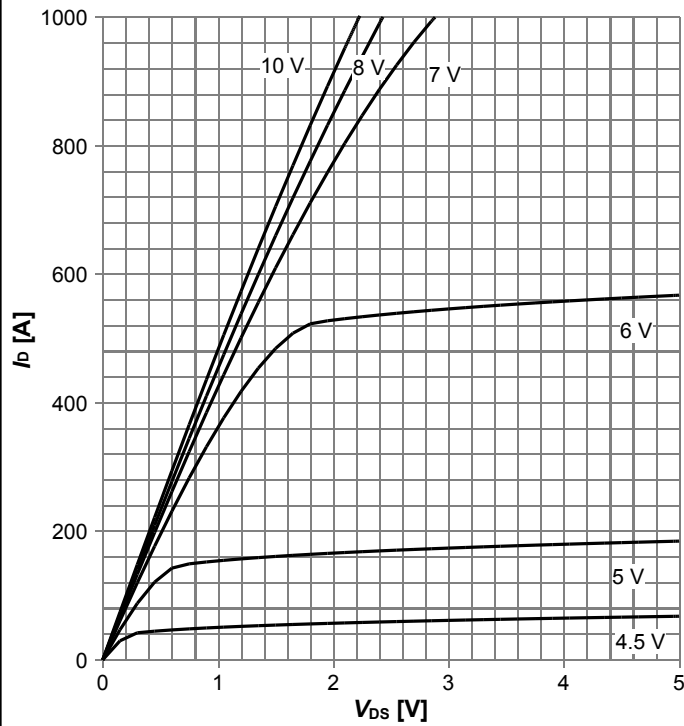
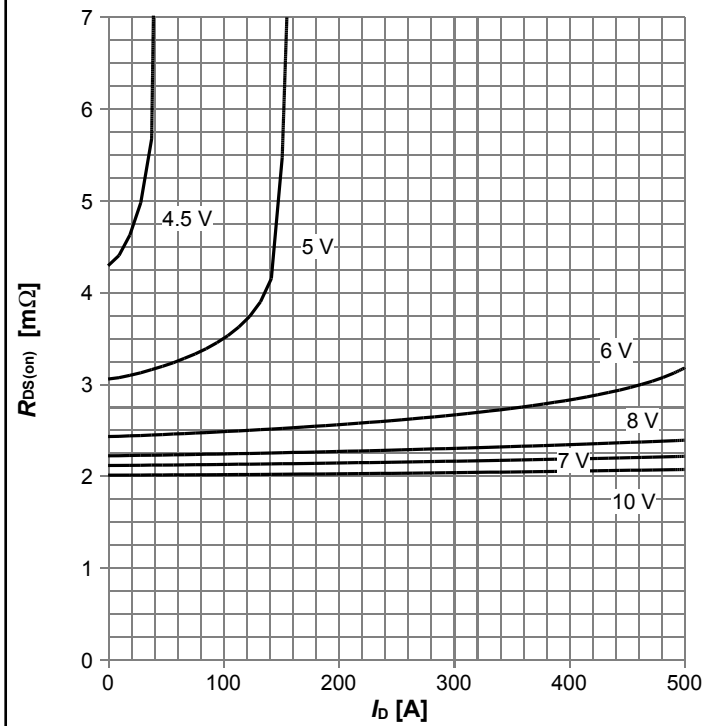


Diagram 5: Typ. output characteristics



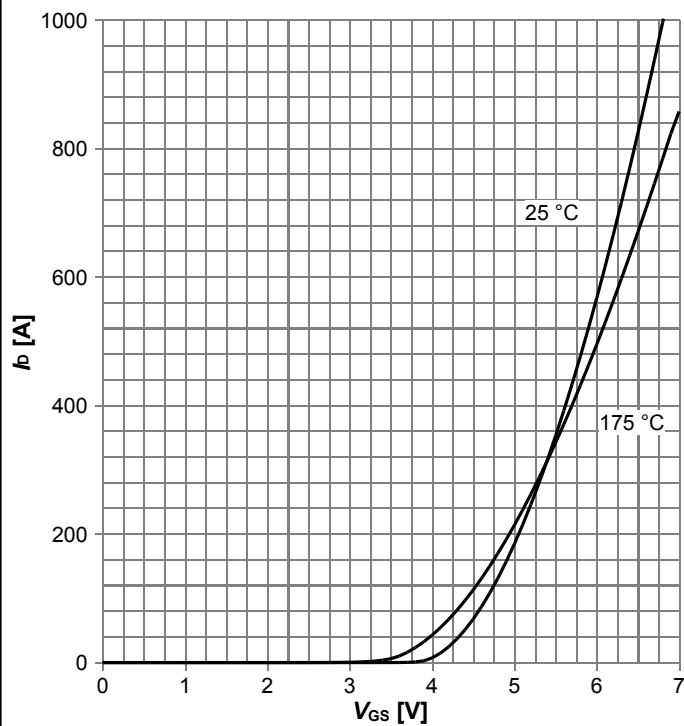
$I_D = f(V_{DS}), T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



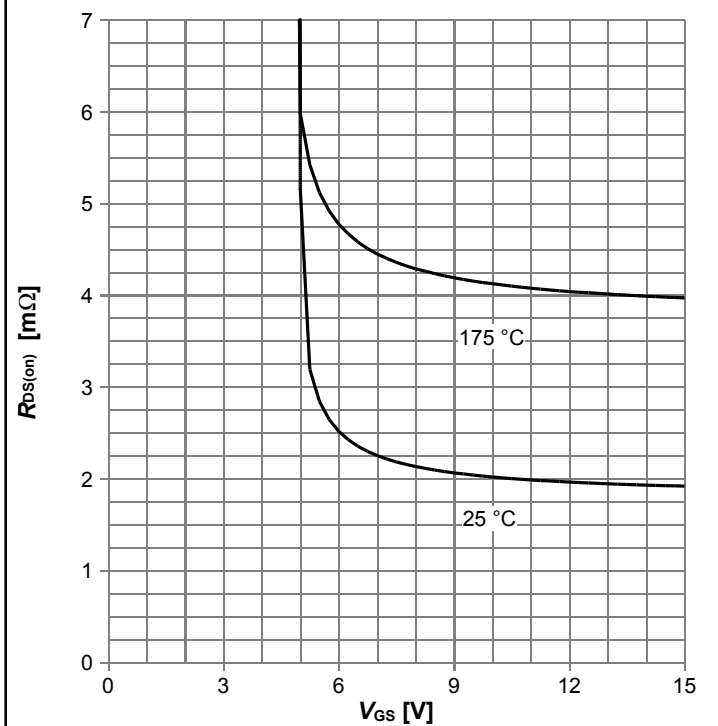
$R_{DS(on)} = f(I_D), T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



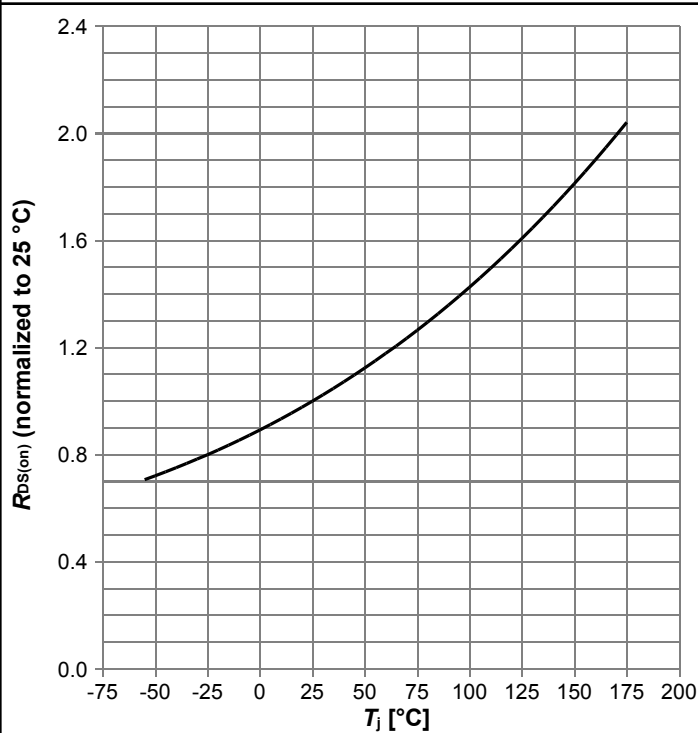
$I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. drain-source on resistance



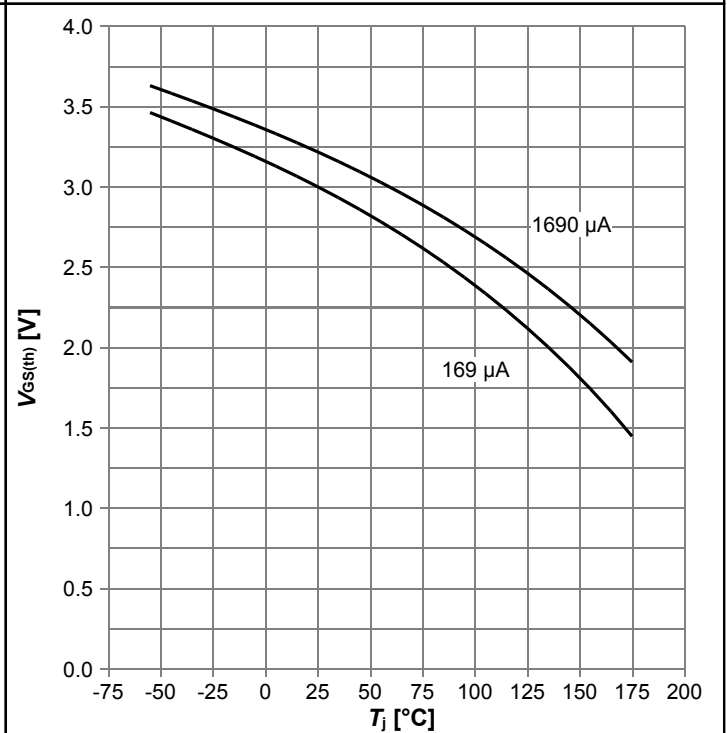
$R_{DS(on)} = f(V_{GS}), I_D = 150\text{ A};$ parameter: T_j

Diagram 9: Normalized drain-source on resistance



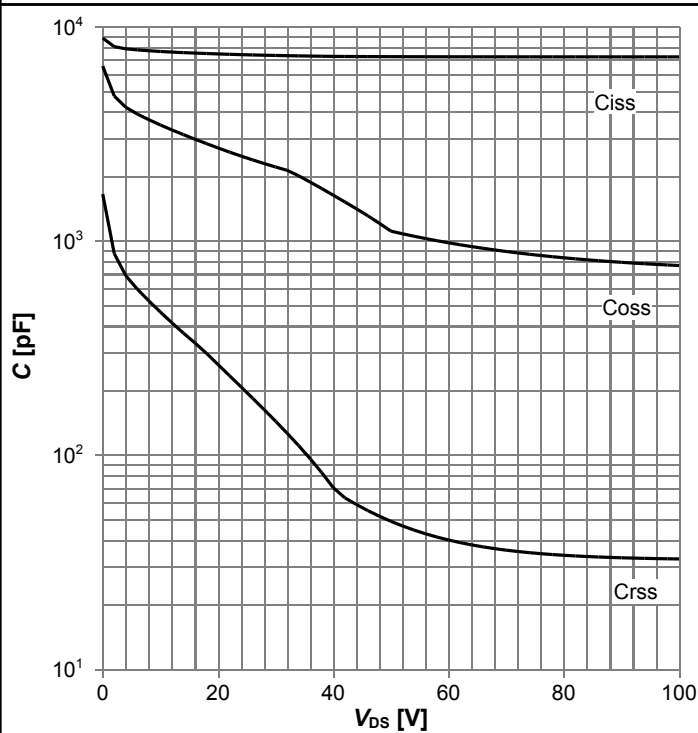
$R_{DS(on)}=f(T_j)$, $I_D=150$ A, $V_{GS}=10$ V

Diagram 10: Typ. gate threshold voltage



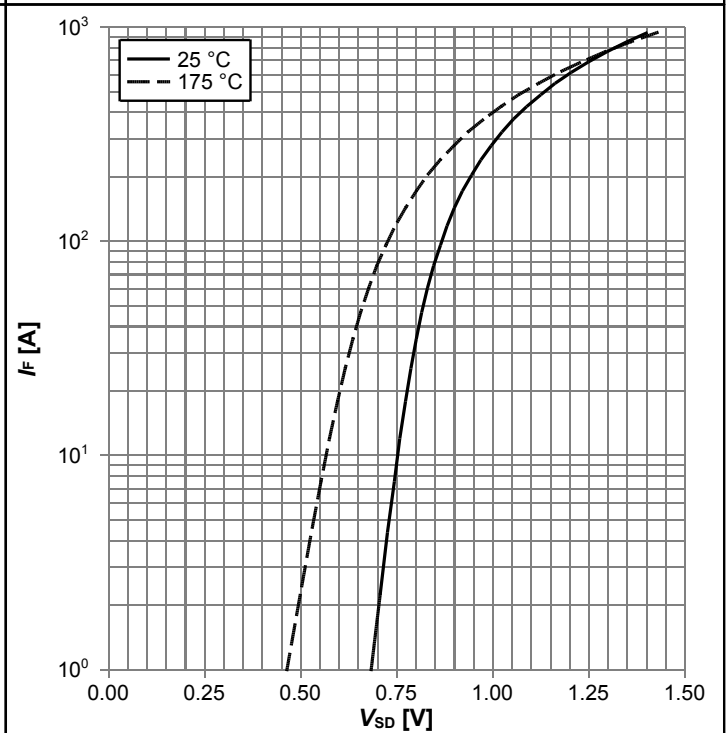
$V_{GS(th)}=f(T_j)$, $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



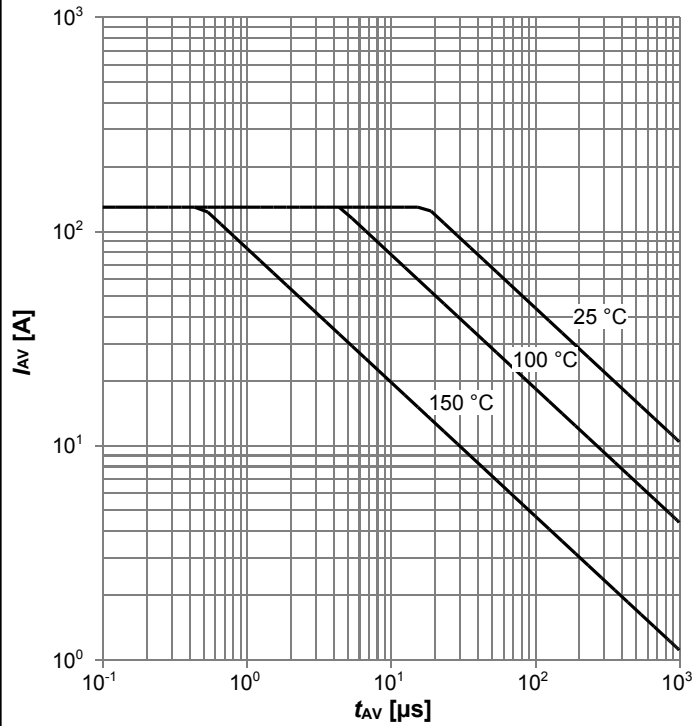
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz

Diagram 12: Typ. forward characteristics of reverse diode



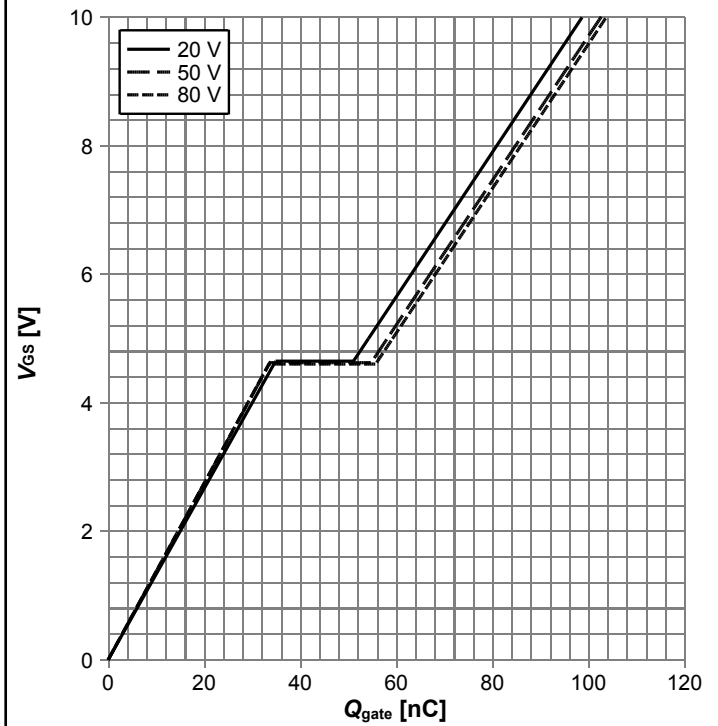
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



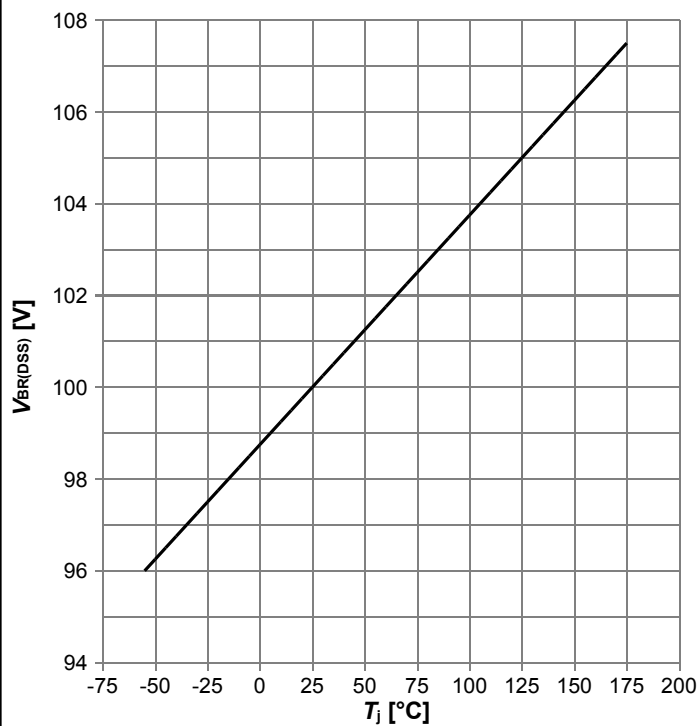
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



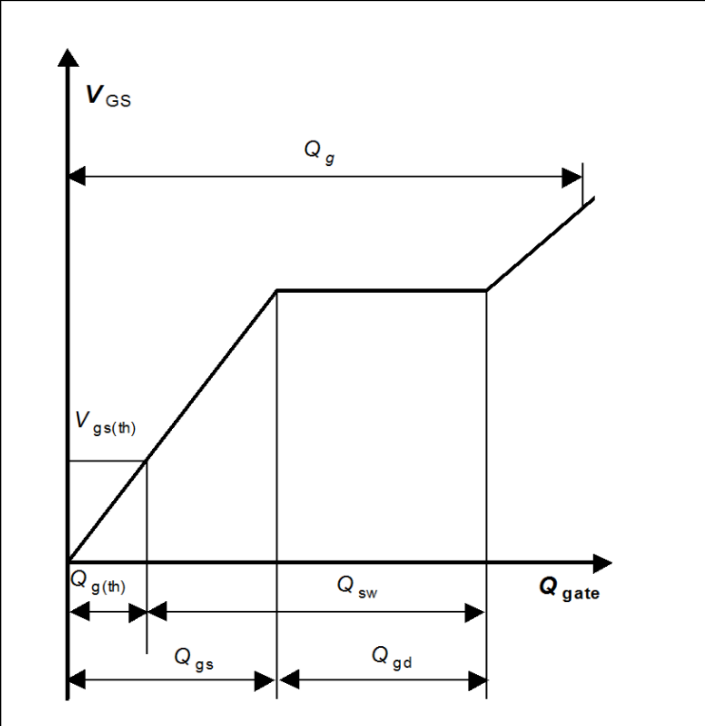
$V_{GS}=f(Q_{gate}), I_D=100$ A pulsed, $T_j=25$ °C; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

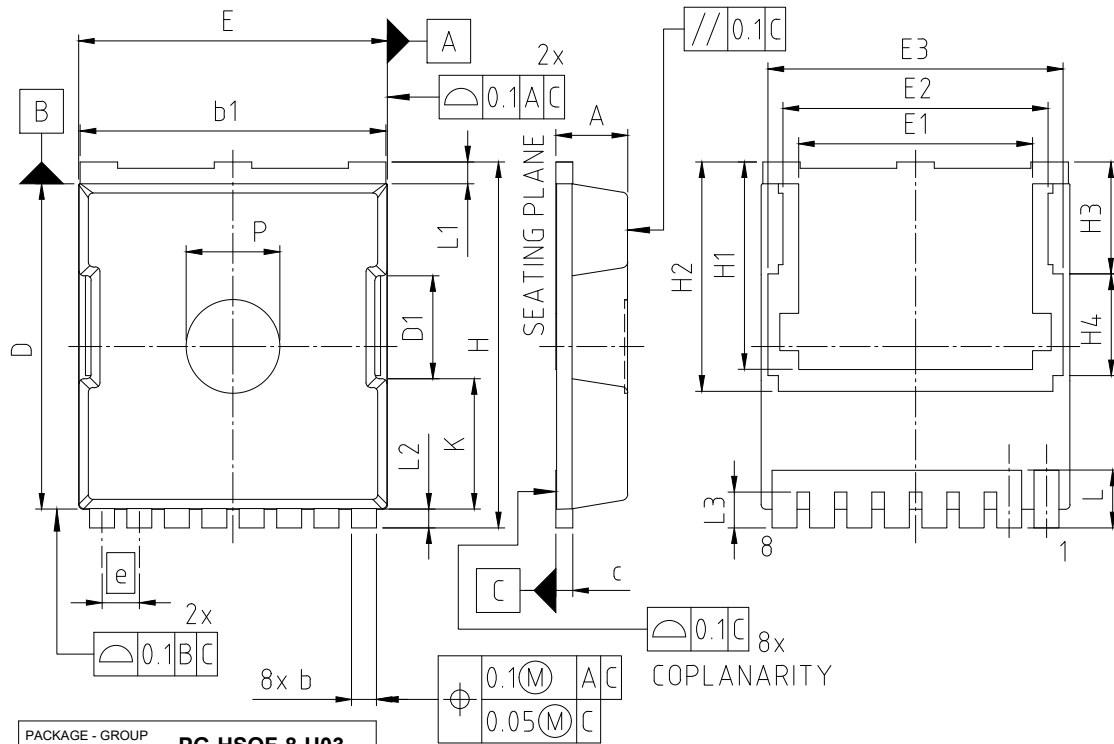


$V_{BR(DSS)}=f(T_j); I_D=1$ mA

Diagram Gate charge waveforms



5 Package Outlines



| PACKAGE - GROUP NUMBER: | | PG-HSOF-8-U03 | |
|-------------------------|-------------|----------------------|--|
| DIMENSIONS | MILLIMETERS | | |
| | MIN. | MAX. | |
| A | 2.20 | 2.40 | |
| b | 0.70 | 0.90 | |
| b1 | 9.70 | 9.90 | |
| c | 0.40 | 0.60 | |
| D | 10.28 | 10.58 | |
| D1 | 3.15 | 3.45 | |
| E | 9.70 | 10.10 | |
| E1 | 7.35 | 7.65 | |
| E2 | 8.50 | | |
| E3 | 9.46 | | |
| e | 1.20 (BSC) | | |
| H | 11.48 | 11.98 | |
| H1 | 6.55 | 6.95 | |
| H2 | 7.35 | | |
| H3 | 3.59 | | |
| H4 | 3.26 | | |
| N | 8 | | |
| K | 4.03 | 4.33 | |
| L | 1.60 | 2.10 | |
| L1 | 0.55 | 0.85 | |
| L2 | 0.45 | 0.75 | |
| L3 | 1.00 | 1.30 | |
| P | 2.90 | 3.10 | |

Note 1: Lead length up to anti flash profile, mold flashes excluded.

Figure 1 Outline PG-HSOF-8, dimensions in mm

Revision History

IPT022N10NF2S

Revision: 2022-08-08, Rev. 2.1

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0 | 2022-07-20 | Release of final version |
| 2.1 | 2022-08-08 | Update current Rds(on) |

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