

MOSFET

OptiMOS™ Power-Transistor, -100 V

Features

- P-channel
- 100% avalanche tested
- Normal level
- Enhancement mode
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product validation

Fully qualified according to JEDEC for Industrial Applications

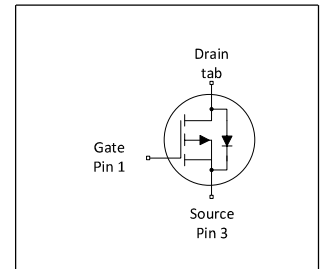


Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|------------------|-------|------|
| V_{DS} | -100 | V |
| $R_{DS(on),max}$ | 186 | mΩ |
| I_D | -13.7 | A |
| Q_{oss} | -13 | nC |
| Q_G | -36 | nC |



RoHS

| Type / Ordering Code | Package | Marking | Related Links |
|----------------------|------------|----------|---------------|
| IPD19DP10NM | PG-TO252-3 | 19DP10NM | - |

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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 | - | - | -13.7 -9.7 -2.6 | A | $V_{GS}=-10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=-10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=-10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=50\text{ °C/W}^2)$ |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | - | - | -55 | A | $T_A=25\text{ °C}$ |
| Avalanche energy, single pulse ⁴⁾ | E_{AS} | - | - | 300 | mJ | $I_D=-12\text{ A}$, $R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -20 | - | 20 | V | - |
| Power dissipation | P_{tot} | - | - | 83 3.0 | W | $T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=50\text{ °C/W}^2)$ |
| Operating and storage temperature | T_j , T_{stg} | -55 | - | 175 | °C | IEC climatic category; DIN IEC 68-1: 55/175/56 |

2 Thermal characteristics

Table 3 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|------------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | R_{thJC} | - | - | 1.8 | °C/W | - |
| Thermal resistance, junction - ambient, 6 cm ² cooling area | R_{thJA} | - | - | 50 | °C/W | - |
| Thermal resistance, junction - ambient, minimal footprint ²⁾ | R_{thJA} | - | - | 75 | °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 | $V_{GS(th)}$ | -2.1 | -3.0 | -4.0 | V | $V_{DS}=V_{GS}$, $I_D=-1040\text{ }\mu\text{A}$ |
| Zero gate voltage drain current | I_{DSS} | - | -0.1 -10 | -1.0 -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 | $R_{DS(on)}$ | - | 147.9 | 186 | m Ω | $V_{GS}=-10\text{ V}$, $I_D=-12\text{ A}$ |
| Gate resistance | R_G | - | 5.1 | - | Ω | - |
| Transconductance | g_{fs} | - | 16 | - | S | $ V_{DS} \geq 2 I_D R_{DS(on)max}$, $I_D=-12\text{ A}$ |

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|--------------|--------|-------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance ¹⁾ | C_{iss} | - | 1500 | 2000 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=-50\text{ V}$, $f=1\text{ MHz}$ |
| Output capacitance ¹⁾ | C_{oss} | - | 110 | 140 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=-50\text{ V}$, $f=1\text{ MHz}$ |
| Reverse transfer capacitance ¹⁾ | C_{riss} | - | 23 | 40 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=-50\text{ V}$, $f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 7.05 | - | ns | $V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-12\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time | t_r | - | 3.13 | - | ns | $V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-12\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 28.86 | - | ns | $V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-12\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time | t_f | - | 16.99 | - | ns | $V_{DD}=-50\text{ V}$, $V_{GS}=-10\text{ V}$, $I_D=-12\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$ |

Table 6 Gate charge characteristics²⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------------|---------------|--------|-------|-------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | -7.7 | - | nC | $V_{DD}=-50\text{ V}$, $I_D=-12\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate charge at threshold | $Q_{g(th)}$ | - | -4.6 | - | nC | $V_{DD}=-50\text{ V}$, $I_D=-12\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate to drain charge ¹⁾ | Q_{gd} | - | -11.9 | -17.9 | nC | $V_{DD}=-50\text{ V}$, $I_D=-12\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Switching charge | Q_{sw} | - | -15 | - | nC | $V_{DD}=-50\text{ V}$, $I_D=-12\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate charge total ¹⁾ | Q_g | - | -36 | -45 | nC | $V_{DD}=-50\text{ V}$, $I_D=-12\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | -5.0 | - | V | $V_{DD}=-50\text{ V}$, $I_D=-12\text{ A}$, $V_{GS}=0\text{ to }-10\text{ V}$ |
| Output charge ¹⁾ | Q_{oss} | - | -13 | -17 | 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 | - | - | -13.7 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | -55 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | -0.86 | -1.2 | V | $V_{GS}=0\text{ V}, I_F=-12\text{ A}, T_j=25\text{ °C}$ |
| Reverse recovery time ¹⁾ | t_{rr} | - | 75 | 150 | ns | $V_R=-50\text{ V}, I_F=-12\text{ A}, di_F/dt=-100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge ¹⁾ | Q_{rr} | - | 270 | 540 | nC | $V_R=-50\text{ V}, I_F=-12\text{ A}, di_F/dt=-100\text{ A}/\mu\text{s}$ |

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

4 Electrical characteristics diagrams

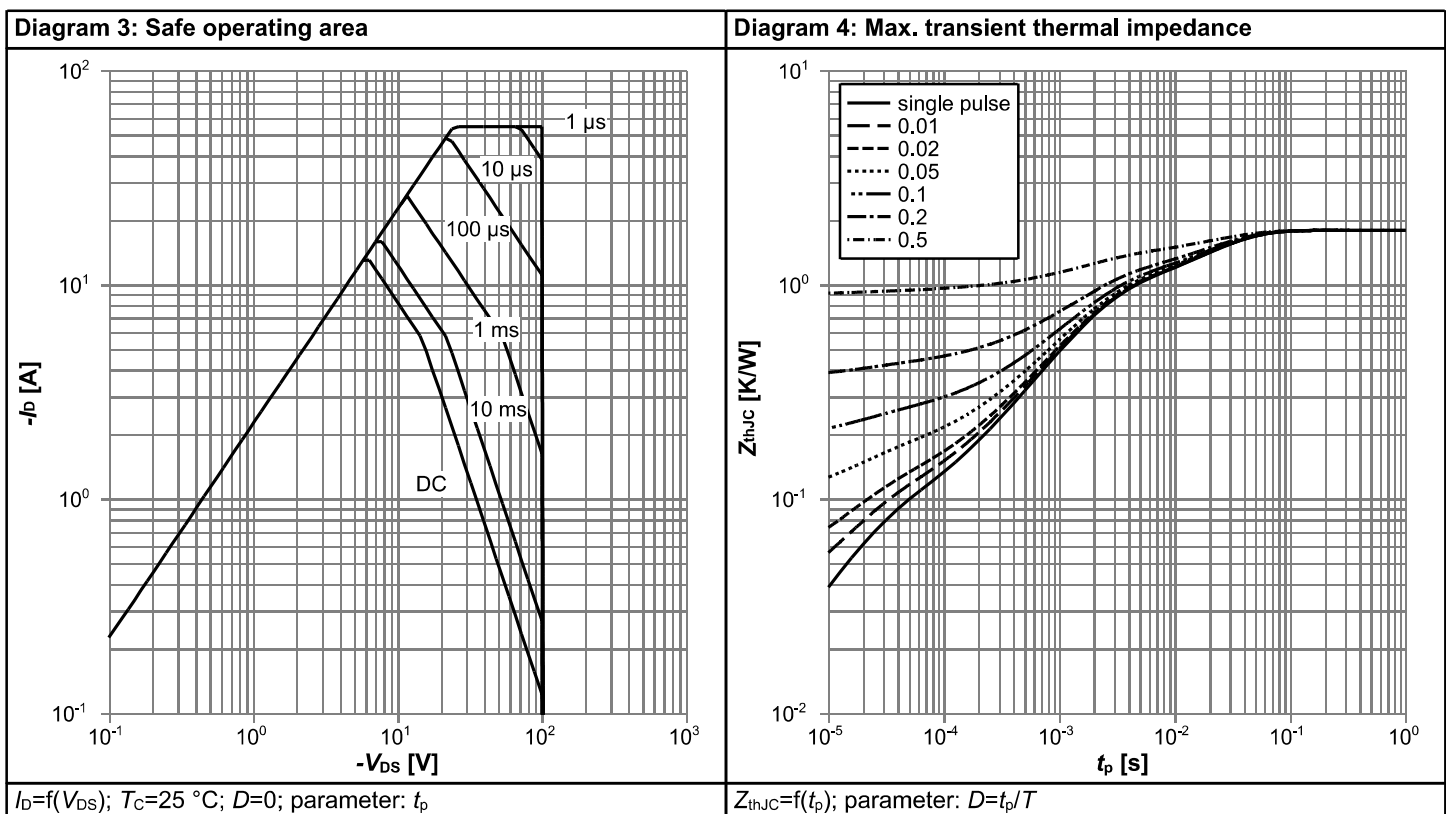
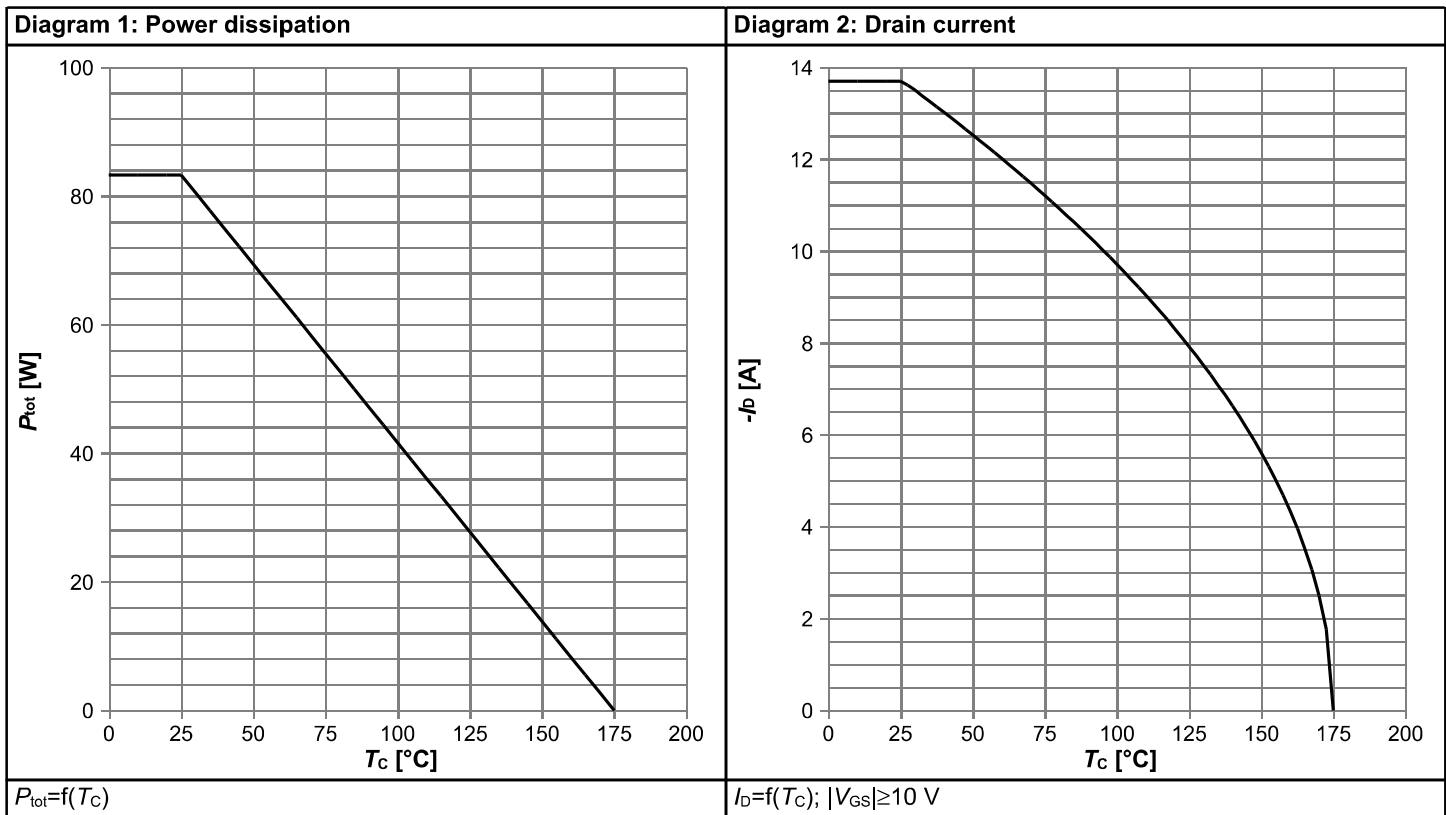
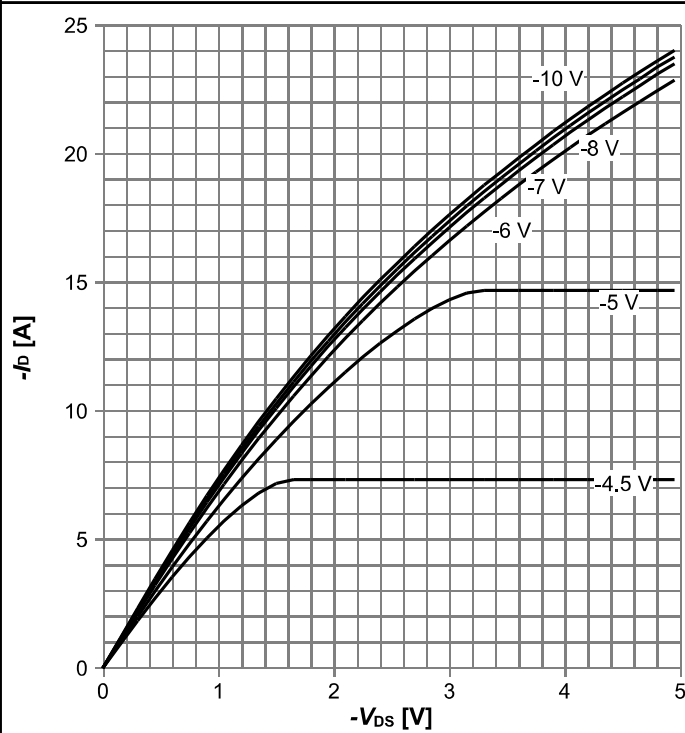
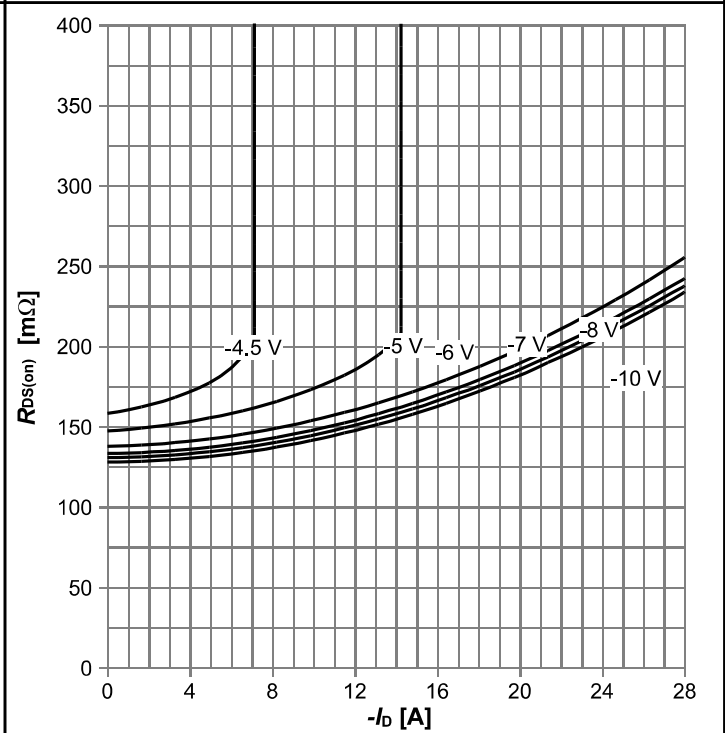


Diagram 5: Typ. output characteristics



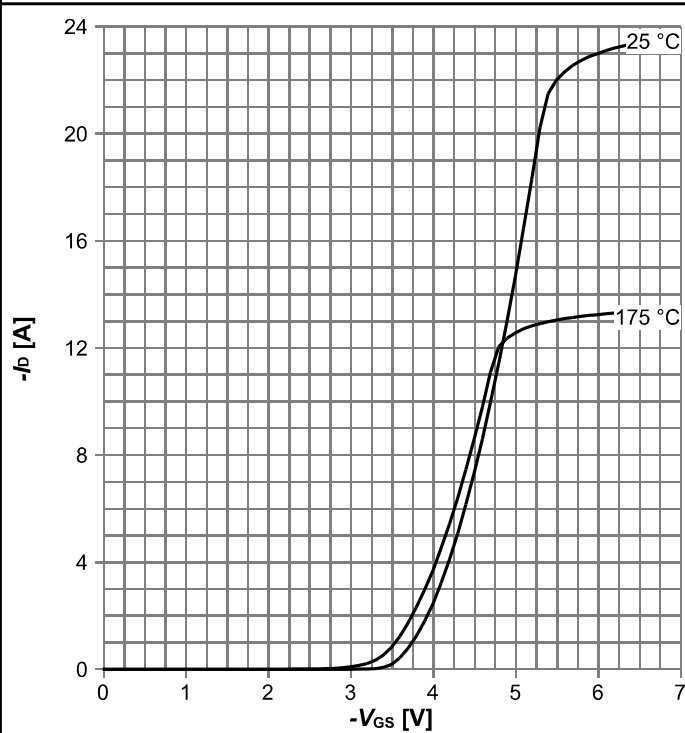
$I_D=f(V_{DS})$, $T_j=25\text{ }^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



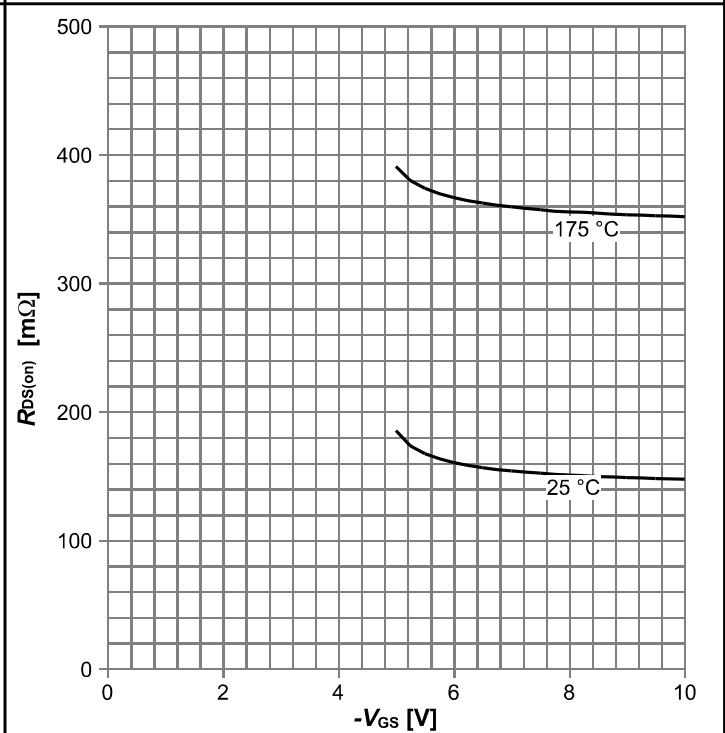
$R_{DS(on)}=f(I_D)$, $T_j=25\text{ }^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



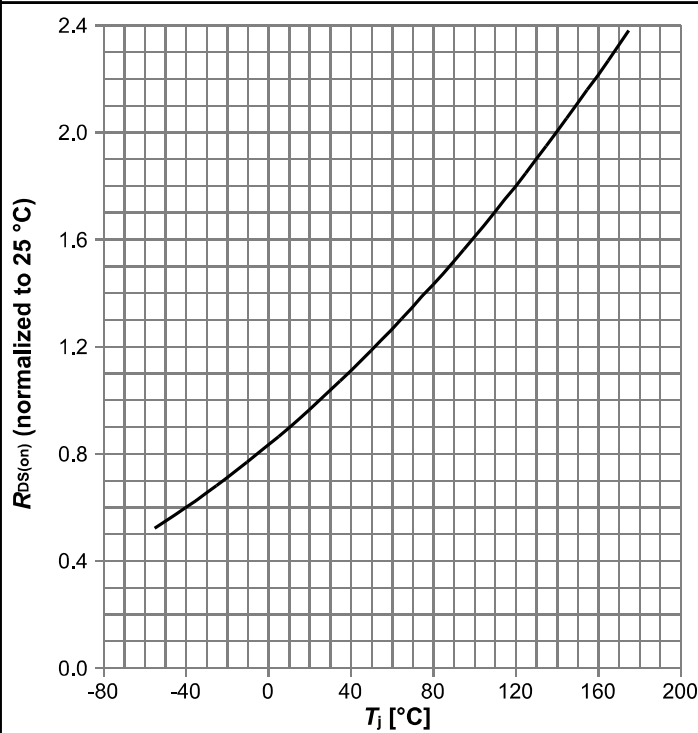
$I_D=f(V_{GS})$, $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. drain-source on resistance



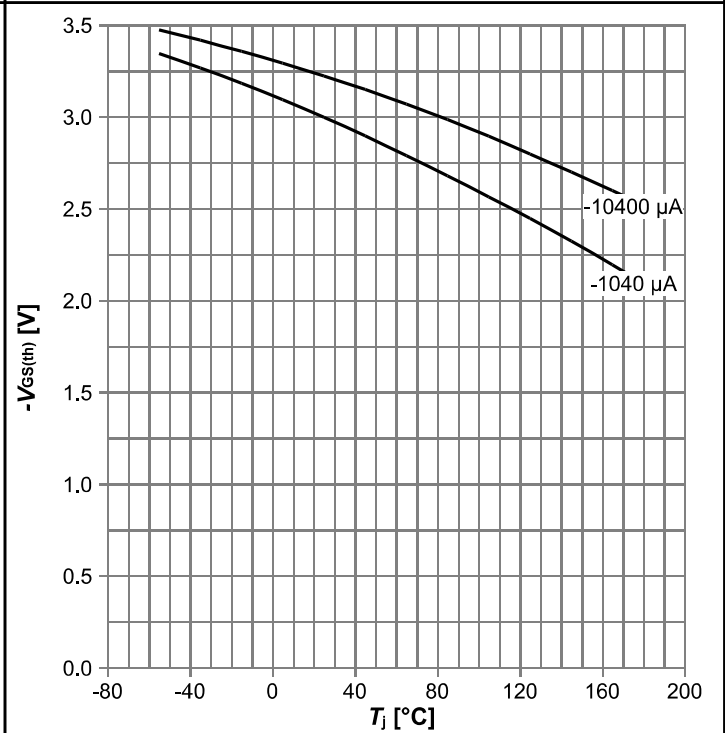
$R_{DS(on)}=f(V_{GS})$, $I_D=-12\text{ A}$; parameter: T_j

Diagram 9: Normalized drain-source on resistance



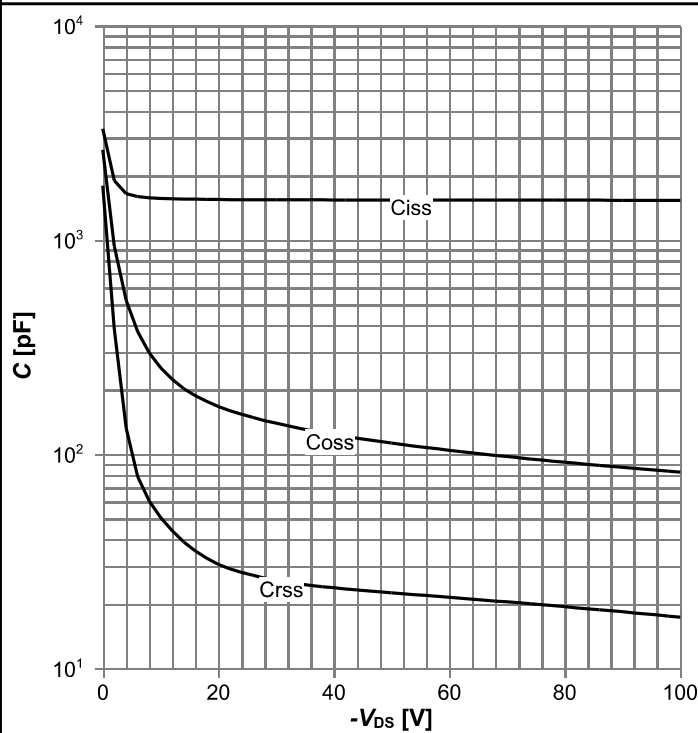
$R_{DS(on)}=f(T_j)$, $I_D=-12$ A, $V_{GS}=-10$ V

Diagram 10: Typ. gate threshold voltage



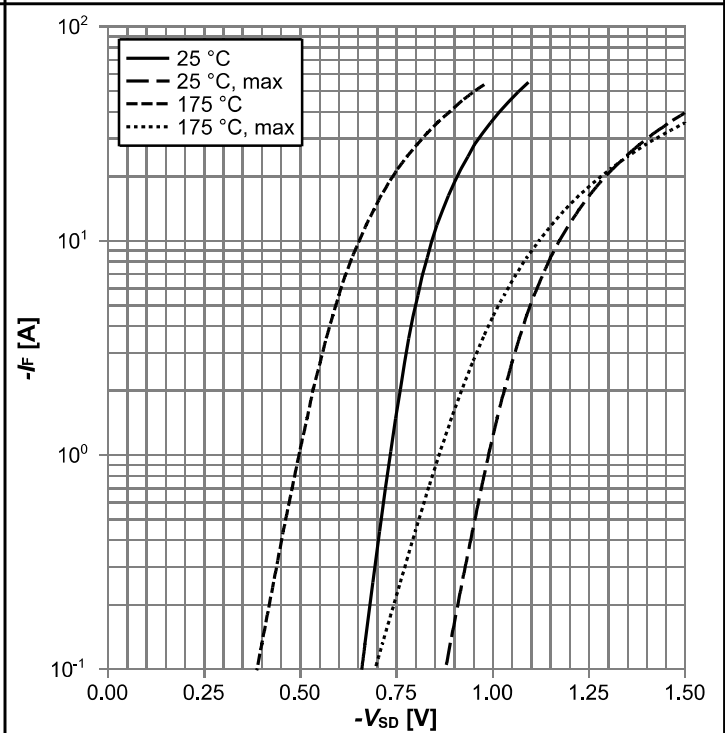
$V_{GS(th)}=f(T_j)$, $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



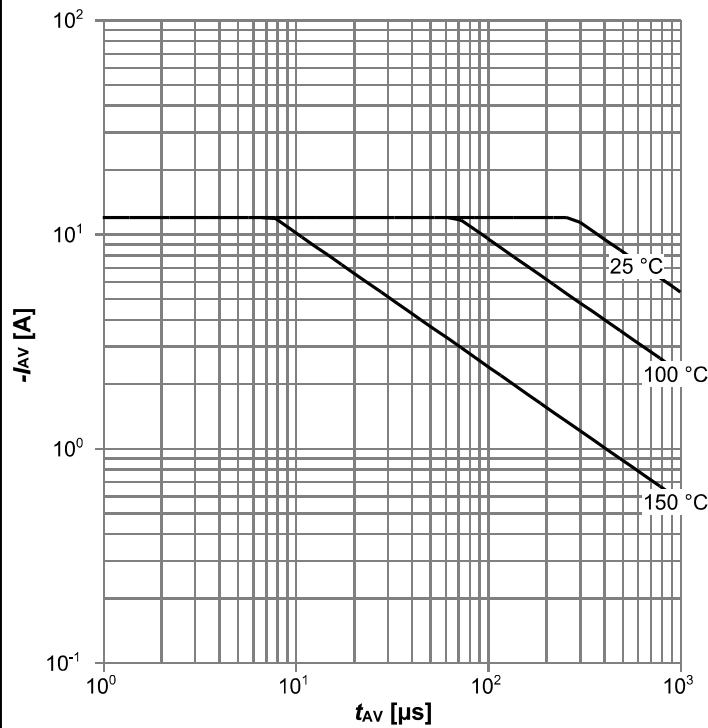
$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz

Diagram 12: Forward characteristics of reverse diode



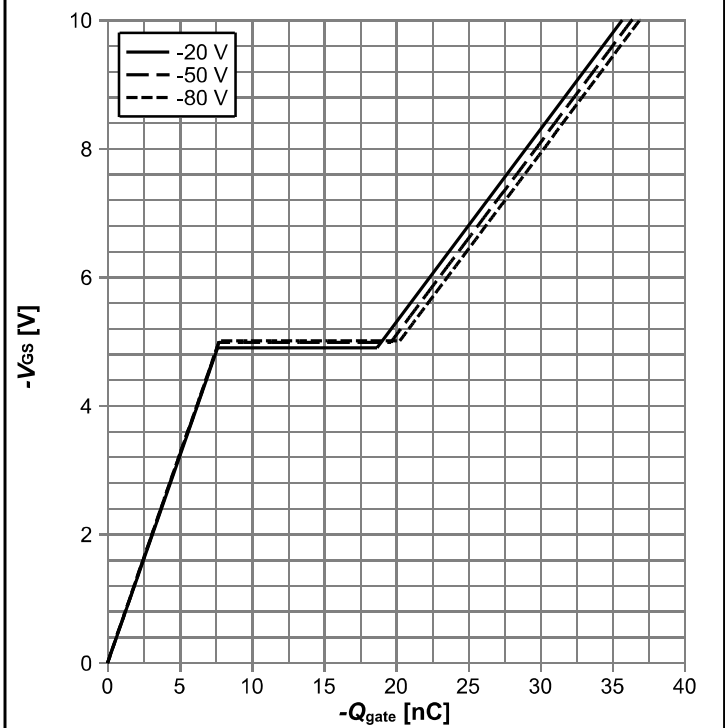
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



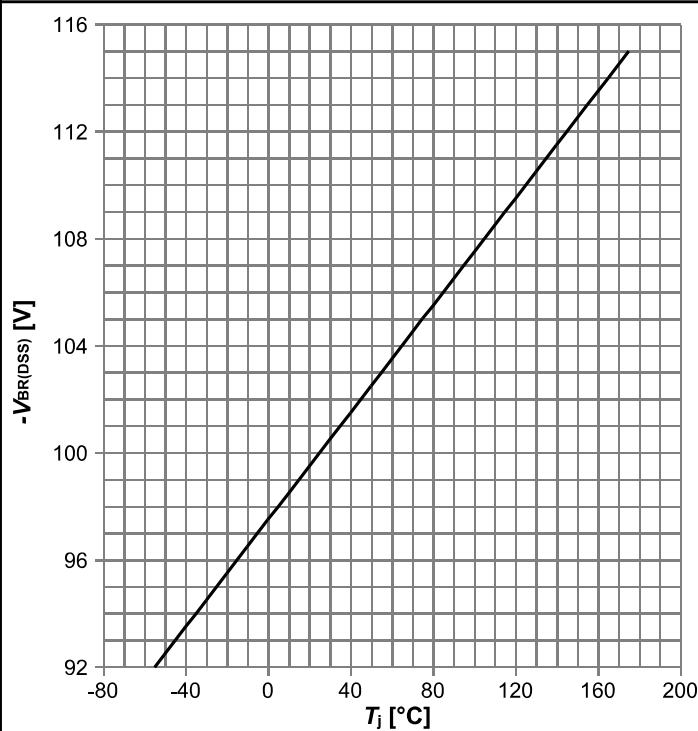
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega; \text{parameter: } T_{j,start}$

Diagram 14: Typ. gate charge



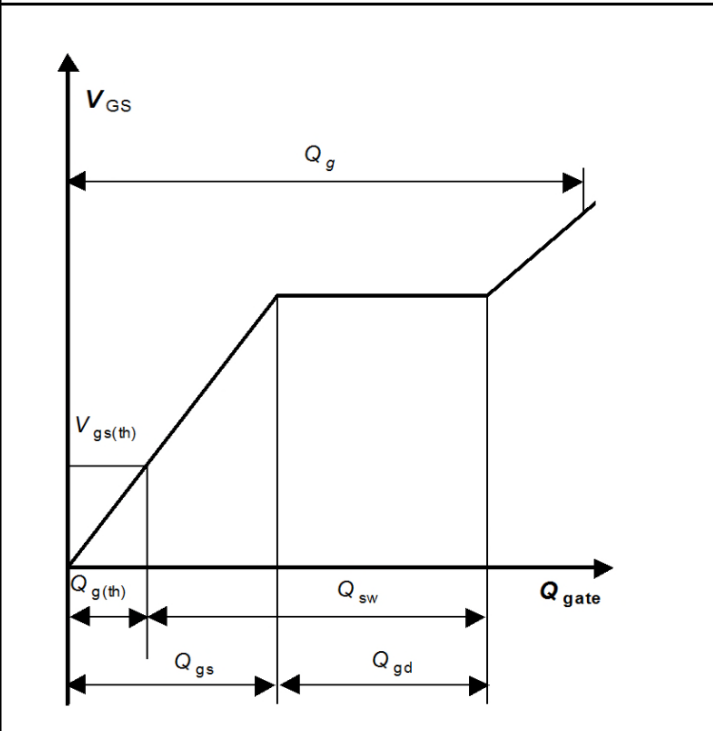
$V_{GS}=f(Q_{gate}), I_D=-12 \text{ A pulsed}, T_j=25 \text{ °C}; \text{parameter: } V_{DD}$

Diagram 15: Drain-source breakdown voltage

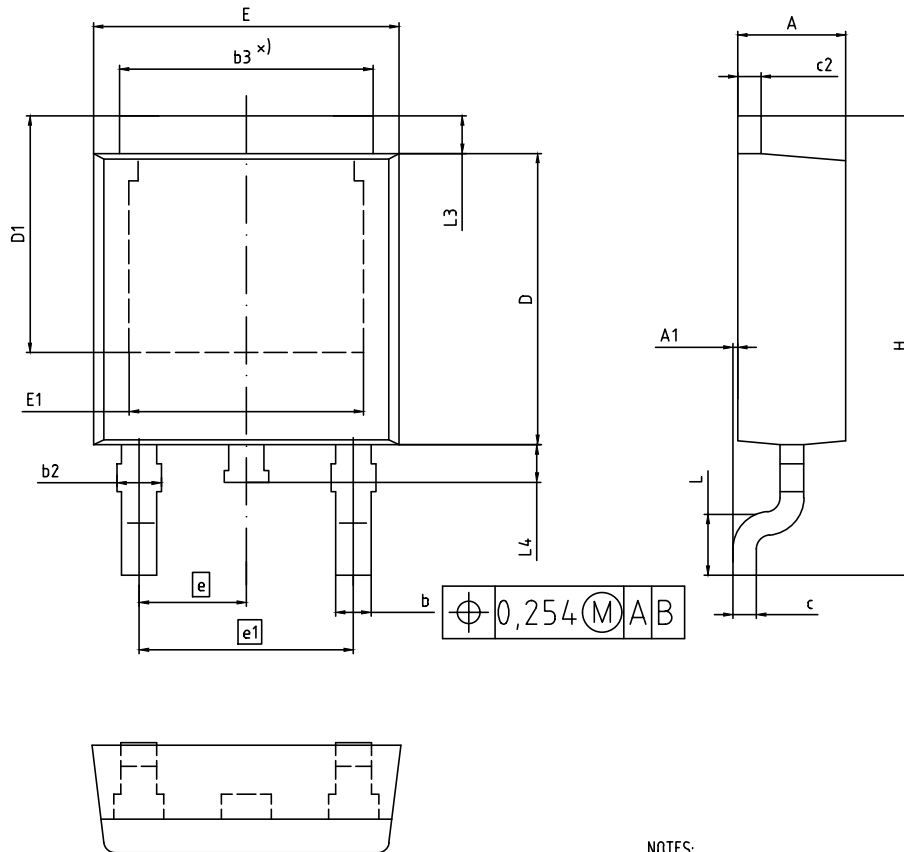


$V_{BR(DSS)}=f(T_j); I_D=-1 \text{ mA}$

Diagram Gate charge waveforms



5 Package Outlines



NOTES:

1. INDUSTRIAL QUALITY GRADE
2. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 2,16 | 2,41 | 0,085 | 0,095 |
| A1 | 0,00 | 0,15 | 0,000 | 0,006 |
| b | 0,64 | 0,89 | 0,025 | 0,035 |
| b2 | 0,65 | 1,15 | 0,026 | 0,045 |
| b3 | 4,95 | 5,50 | 0,195 | 0,217 |
| c | 0,46 | 0,61 | 0,018 | 0,024 |
| c2 | 0,40 | 0,98 | 0,016 | 0,039 |
| D | 5,97 | 6,22 | 0,235 | 0,245 |
| D1 | 5,02 | 5,84 | 0,198 | 0,230 |
| E | 6,35 | 6,73 | 0,250 | 0,265 |
| E1 | 4,32 | 5,21 | 0,185 | 0,205 |
| e | 2,29 (BSC) | | 0,090 (BSC) | |
| e1 | 4,57 (BSC) | | 0,180 (BSC) | |
| N | 3 | | 3 | |
| H | 9,40 | 10,48 | 0,370 | 0,413 |
| L | 1,18 | 1,78 | 0,046 | 0,070 |
| L3 | 0,89 | 1,27 | 0,035 | 0,050 |
| L4 | 0,51 | 1,02 | 0,020 | 0,040 |

| |
|-----------------------------|
| DOCUMENT NO. Z8B00003328 |
| SCALE 0 2.5 5mm |
| EUROPEAN PROJECTION |
| ISSUE DATE 05-02-2016 |
| REVISION 06 |

Figure 1 Outline PG-TO252-3, dimensions in mm/inches

Revision History

IPD19DP10NM

Revision: 2021-05-10, Rev. 2.0

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0 | 2021-05-10 | Release of final version |

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