

MOSFET

OptiMOS™ 3 Power-Transistor, 100 V

Features

- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target application
- Ideal for high-frequency switching and synchronous rectification
- Halogen-free according to IEC61249-2-21

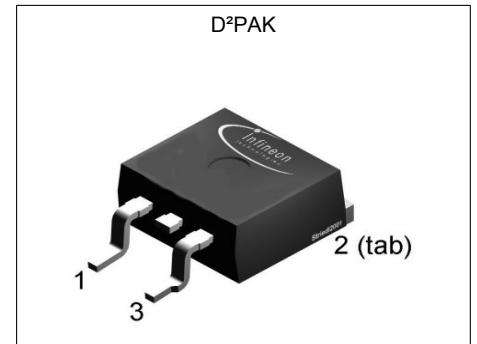
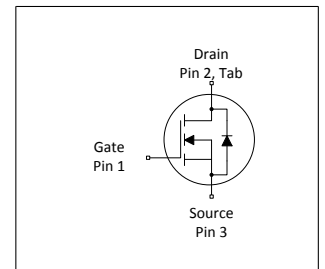


Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|------------------|-------|------|
| V_{DS} | 100 | V |
| $R_{DS(on),max}$ | 4.2 | mΩ |
| I_D | 137 | A |



| Type / Ordering Code | Package | Marking | Related Links |
|----------------------|-------------|---------|---------------|
| IPB042N10N3 G | PG-TO 263-3 | 042N10N | - |

¹⁾ J-STD20 and JESD22

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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 | I_D | - | - | 137 105 | A | $T_C=25\text{ °C}^{1)}$ $T_C=100\text{ °C}$ |
| Pulsed drain current ¹⁾ | $I_{D,pulse}$ | - | - | 548 | A | $T_C=25\text{ °C}$ |
| Avalanche energy, single pulse | E_{AS} | - | - | 340 | mJ | $I_D=100\text{ A}$, $R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -20 | - | 20 | V | - |
| Power dissipation | P_{tot} | - | - | 214 | W | $T_C=25\text{ °C}$ |
| 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} | - | - | 0.7 | K/W | - |
| Thermal resistance, junction - ambient, minimal footprint | R_{thJA} | - | - | 62 | K/W | - |
| Thermal resistance, junction - ambient, 6 cm ² cooling area ²⁾ | R_{thJA} | - | - | 50 | K/W | - |

3 Electrical characteristics

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 | 2.7 | 3.5 | V | $V_{DS}=V_{GS}$, $I_D=150\text{ }\mu\text{A}$ |
| 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} | - | 1 | 100 | nA | $V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 3.6 4.4 | 4.2 7.4 | m Ω | $V_{GS}=10\text{ V}$, $I_D=100\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=50\text{ A}$ |
| Gate resistance | R_G | - | 1.4 | - | Ω | - |
| Transconductance | g_{fs} | 73 | 145 | - | S | $ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=100\text{ A}$ |

¹⁾ See Diagram 3

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.

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------|--------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance | C_{iss} | - | 6320 | 8410 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Output capacitance | C_{oss} | - | 1210 | 1610 | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Reverse transfer capacitance | C_{rss} | - | 41 | - | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 27 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_G=1.6\ \Omega$ |
| Rise time | t_r | - | 59 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_G=1.6\ \Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 48 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_G=1.6\ \Omega$ |
| Fall time | t_f | - | 14 | - | ns | $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_G=1.6\ \Omega$ |

Table 6 Gate charge characteristics¹⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|-----------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 30 | 39 | 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} | - | 16 | - | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Switching charge | Q_{sw} | - | 27 | - | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total | Q_g | - | 88 | 117 | nC | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | 4.7 | - | V | $V_{DD}=50\text{ V}$, $I_D=100\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Output charge | Q_{oss} | - | 122 | 162 | nC | $V_{DD}=50\text{ V}$, $V_{GS}=0\text{ V}$ |

Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | I_S | - | - | 134 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | 548 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | 1.0 | 1.2 | V | $V_{GS}=0\text{ V}$, $I_F=100\text{ A}$, $T_J=25\text{ °C}$ |
| Reverse recovery time | t_{rr} | - | 68 | - | ns | $V_R=50\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | - | 135 | - | nC | $V_R=50\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$ |

¹⁾ See "Gate charge waveforms" for parameter definition

4 Electrical characteristics diagrams

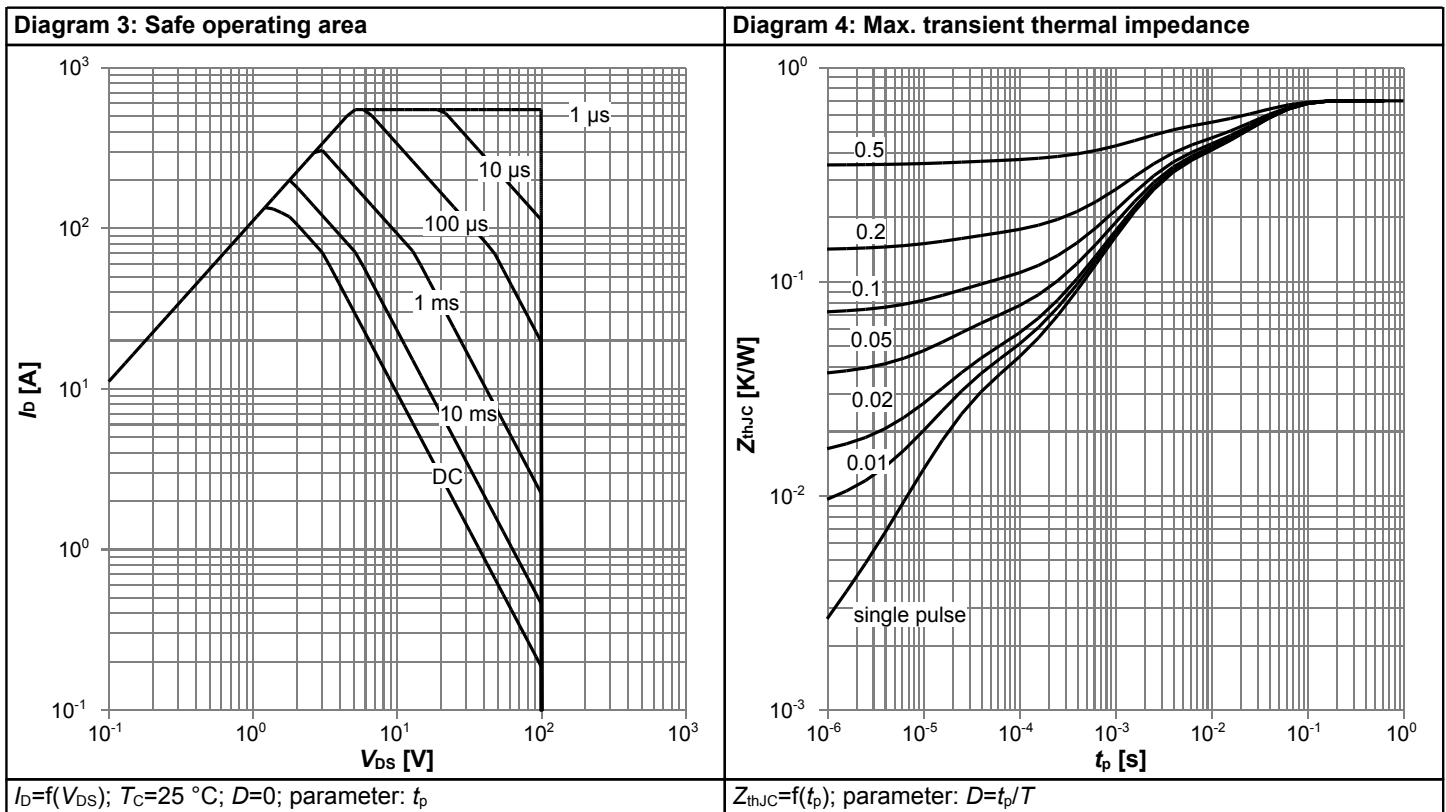
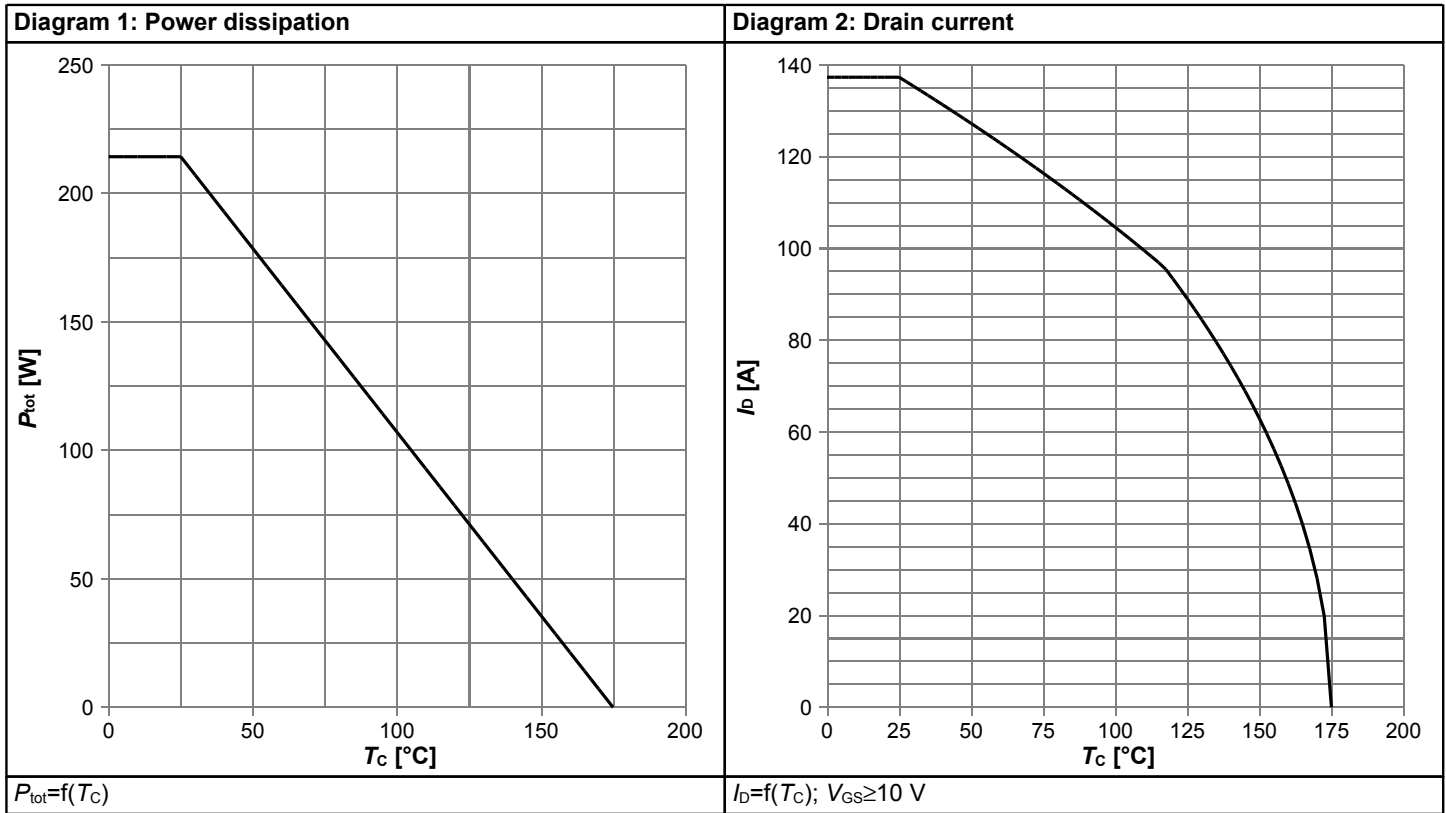
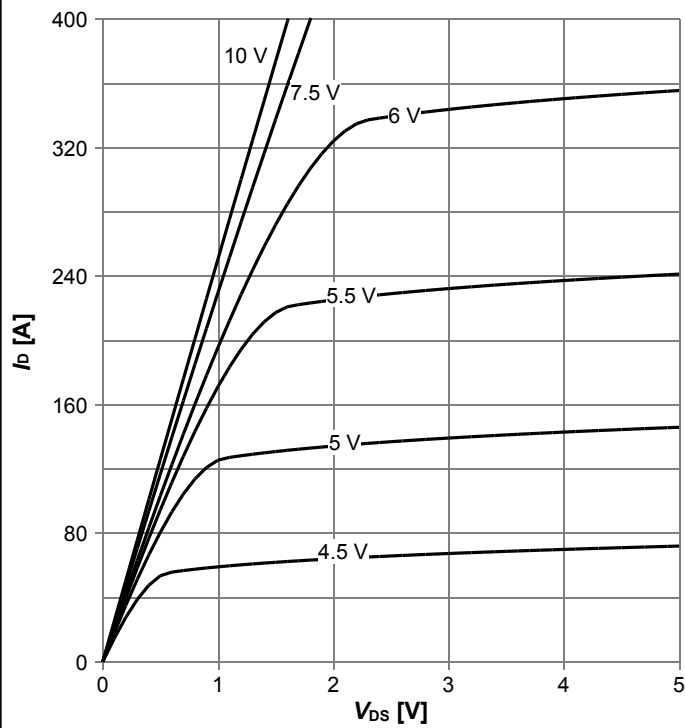
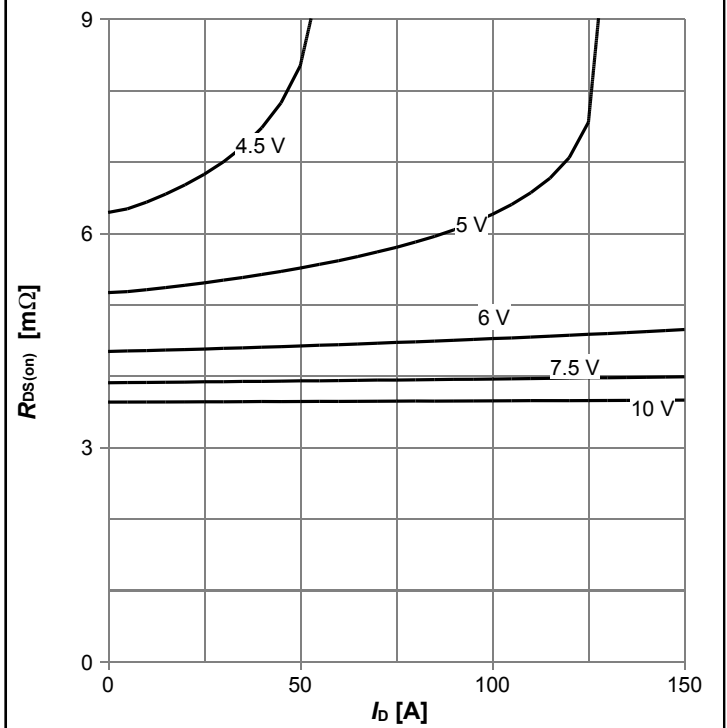


Diagram 5: Typ. output characteristics



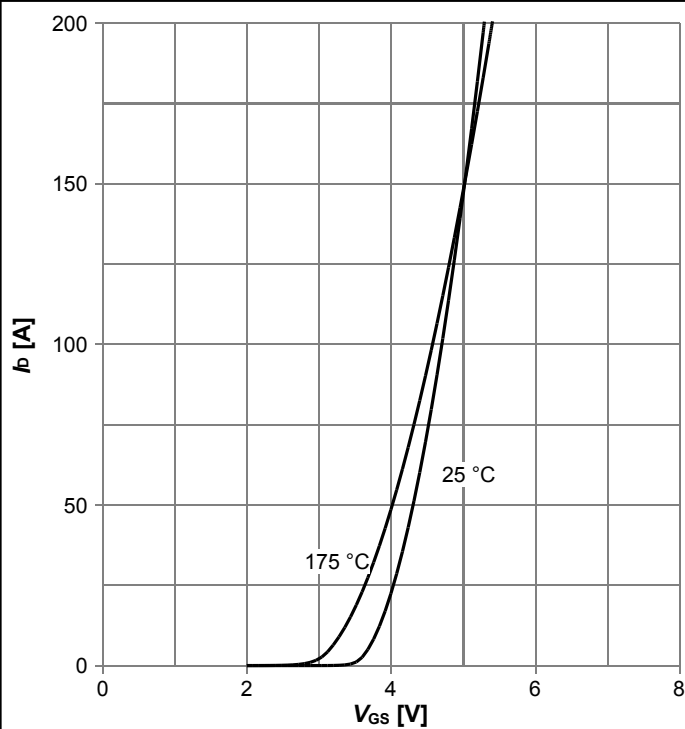
$I_D = f(V_{DS}); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



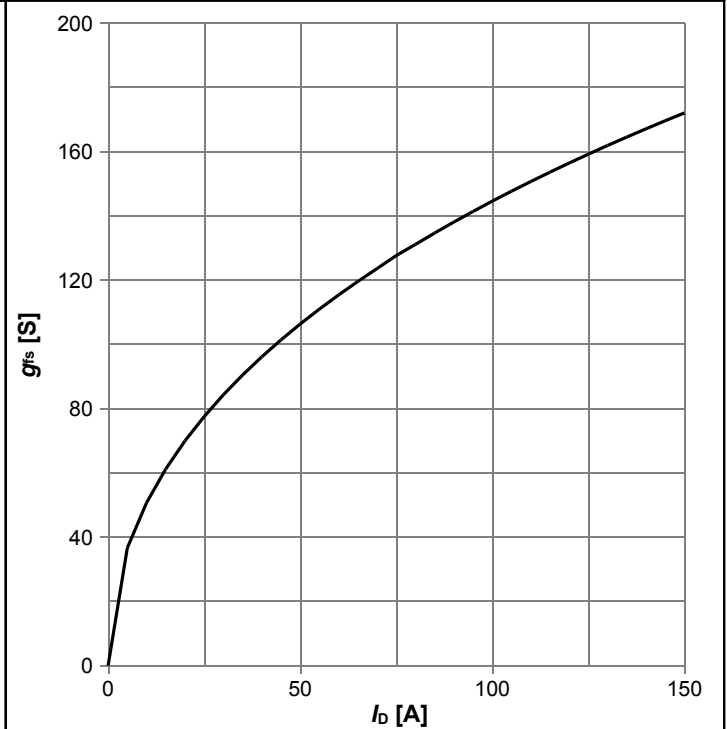
$R_{DS(on)} = f(I_D); T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



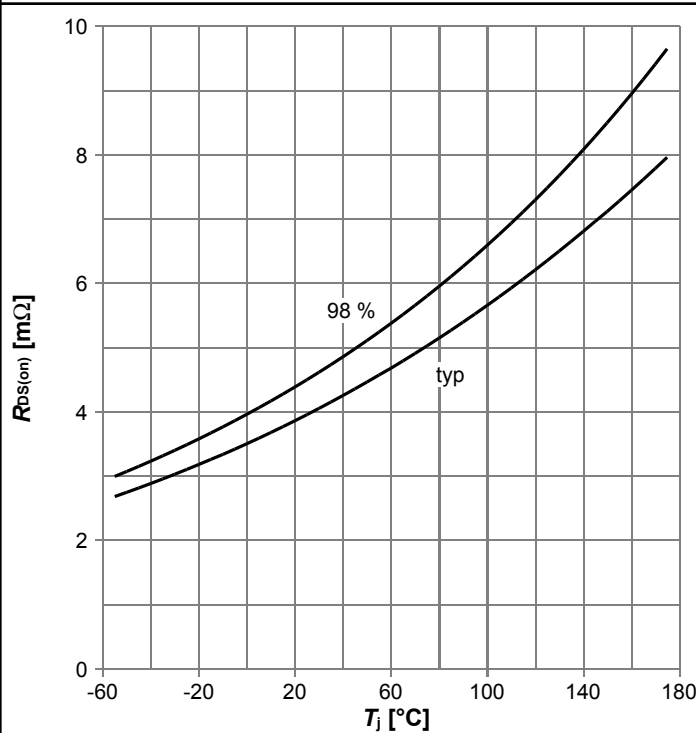
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. forward transconductance



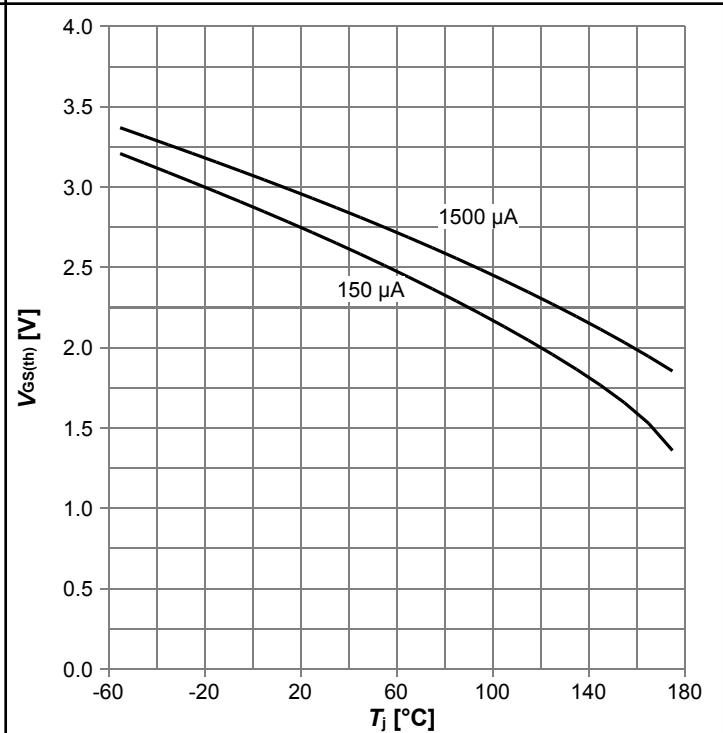
$g_{fs} = f(I_D); T_j = 25\text{ °C}$

Diagram 9: Drain-source on-state resistance



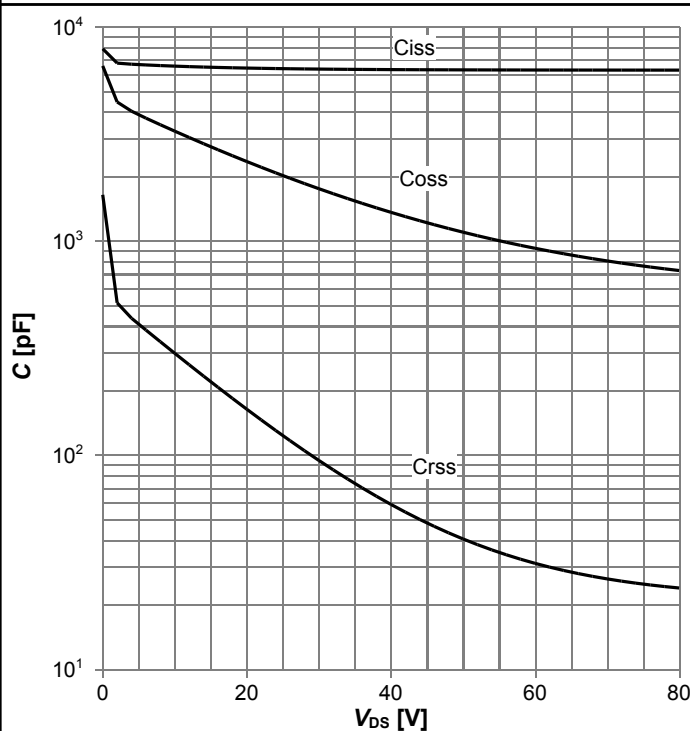
$R_{DS(on)}=f(T_j)$; $I_D=100\text{ A}$; $V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



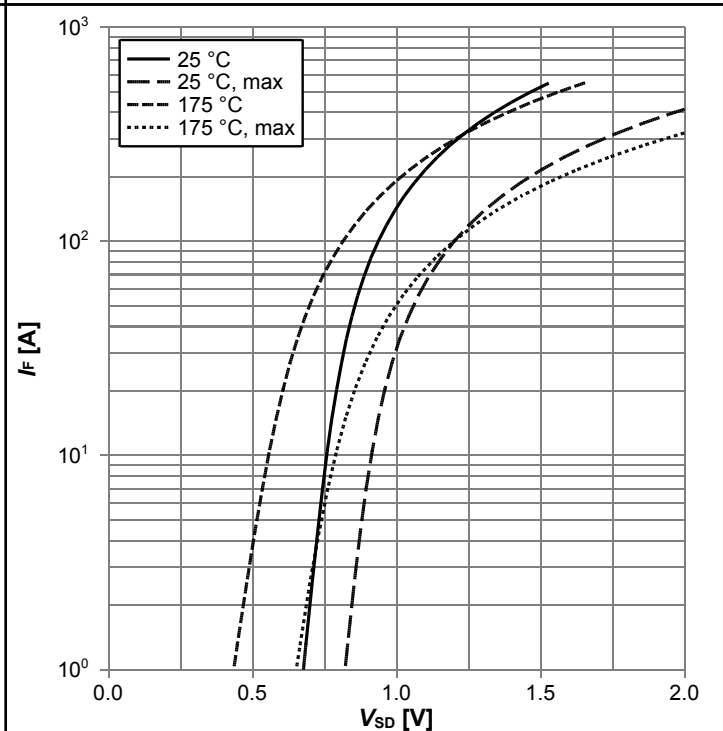
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



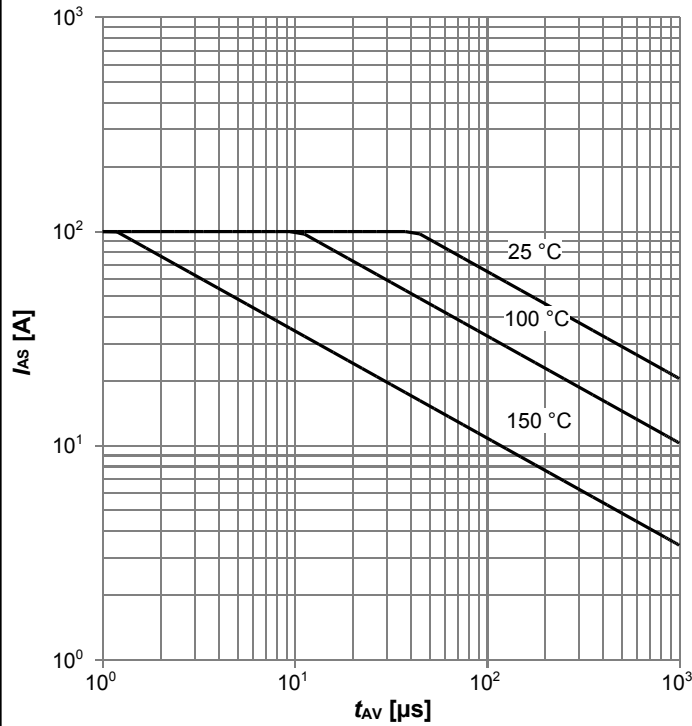
$C=f(V_{DS})$; $V_{GS}=0\text{ V}$; $f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



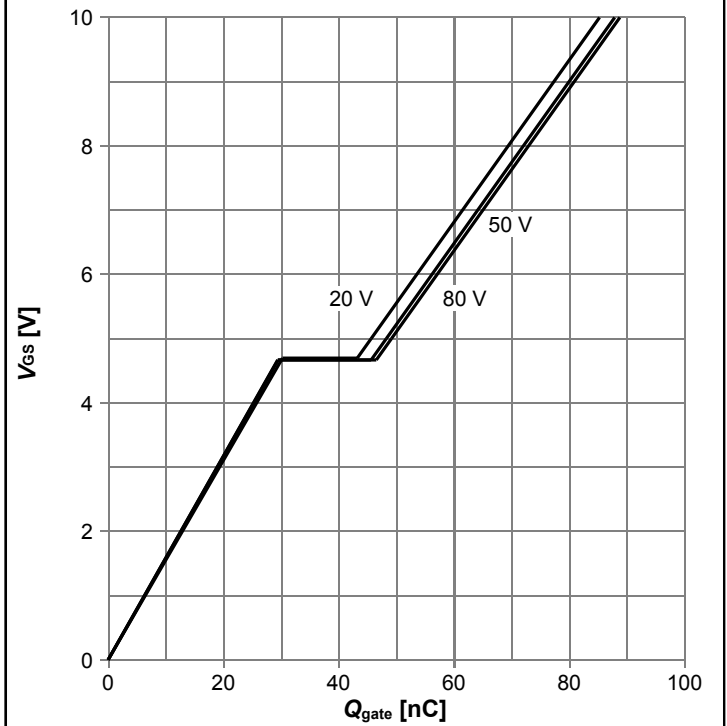
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



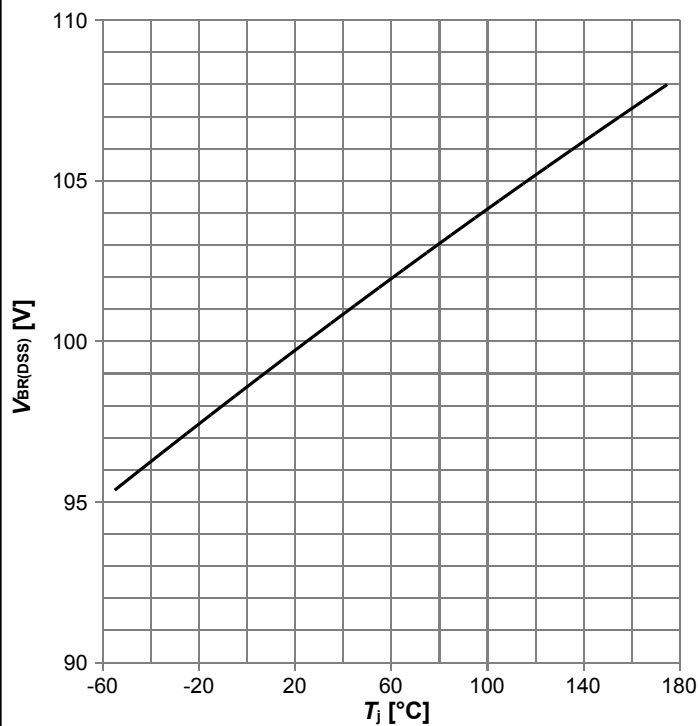
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



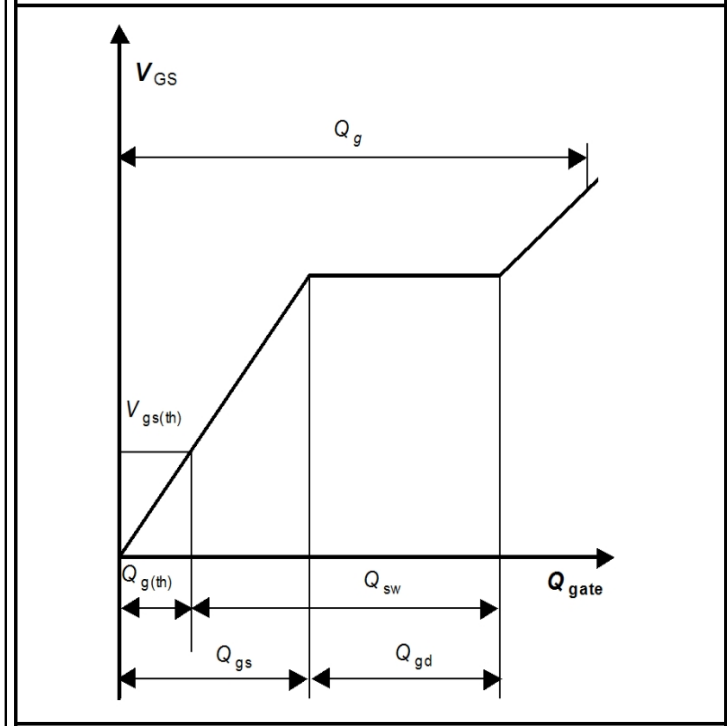
$V_{GS}=f(Q_{gate}); I_D=100$ A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



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

Gate charge waveforms



5 Package Outlines

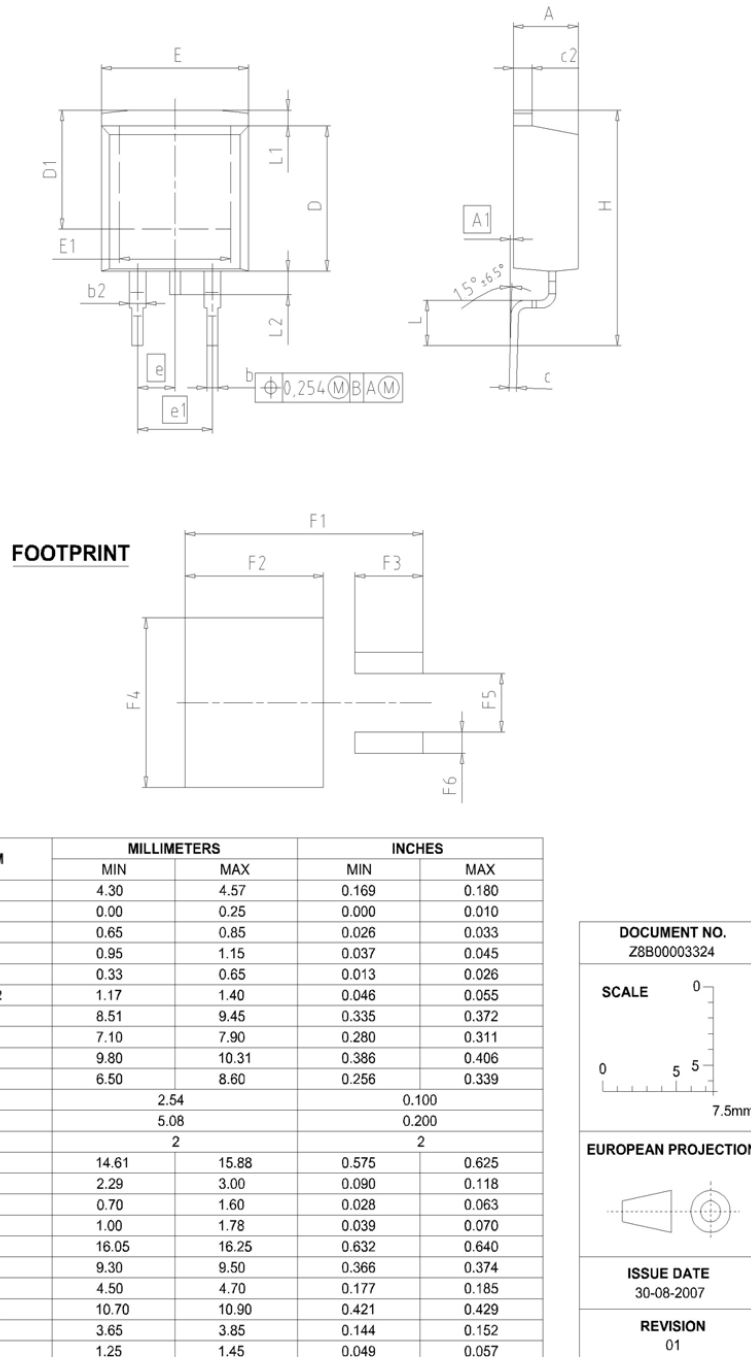


Figure 1 Outline PG-TO 263-3, dimensions in mm/inches

Revision History

IPB042N10N3 G

Revision: 2017-07-17, Rev. 2.9

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.9 | 2017-07-17 | Update product current |

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