

MOSFET

StrongIRFET™2 Power-Transistor, 60 V

Features

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

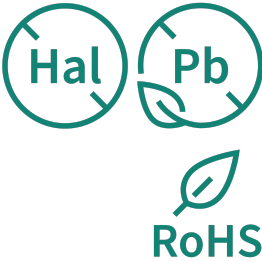
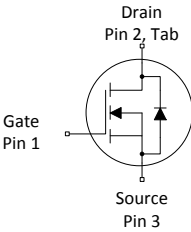
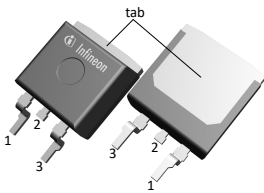
Product validation

Qualified according to JEDEC Standard

Table 1 Key Performance Parameters

| Parameter        | Value | Unit |
|------------------|-------|------|
| $V_{DS}$         | 60    | V    |
| $R_{DS(on),max}$ | 1.8   | mΩ   |
| $I_D$            | 191   | A    |
| $Q_{oss}$        | 108   | nC   |
| $Q_G(0V..10V)$   | 108   | nC   |

D<sup>2</sup>PAK



| Type/Ordering Code | Package    | Marking  | Related Links |
|--------------------|------------|----------|---------------|
| IPB018N06NF2S      | PG-TO263-3 | 018N06NS | -             |



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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 <sup>1)</sup>       | $I_D$          | -      | -    | 191<br>147<br>34 | A    | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=40\text{ °C/W}$ <sup>2)</sup> |
| Pulsed drain current <sup>3)</sup>           | $I_{D,pulse}$  | -      | -    | 764              | A    | $T_C=25\text{ °C}$                                                                                                                                                             |
| Avalanche energy, single pulse <sup>4)</sup> | $E_{AS}$       | -      | -    | 349              | mJ   | $I_D=100\text{ A}$ , $R_{GS}=25\text{ }\Omega$                                                                                                                                 |
| Gate source voltage                          | $V_{GS}$       | -20    | -    | 20               | V    | -                                                                                                                                                                              |
| Power dissipation                            | $P_{tot}$      | -      | -    | 231<br>3.8       | W    | $T_C=25\text{ °C}$<br>$T_A=25\text{ °C}$ , $R_{thJA}=40\text{ °C/W}$ <sup>2)</sup>                                                                                             |
| Operating and storage temperature            | $T_j, T_{stg}$ | -55    | -    | 175              | °C   | -                                                                                                                                                                              |

<sup>1)</sup> 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.

<sup>2)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

<sup>3)</sup> See Diagram 3 for more detailed information

<sup>4)</sup> See Diagram 13 for more detailed information

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

| Parameter                                                                            | Symbol     | Values |      |      | Unit | Note/ Test Condition |
|--------------------------------------------------------------------------------------|------------|--------|------|------|------|----------------------|
|                                                                                      |            | Min.   | Typ. | Max. |      |                      |
| Thermal resistance, junction - case                                                  | $R_{thJC}$ | -      | -    | 0.65 | °C/W | -                    |
| Thermal resistance, junction - ambient, 6 cm <sup>2</sup> cooling area <sup>5)</sup> | $R_{thJA}$ | -      | -    | 40   | °C/W | -                    |
| Thermal resistance, junction - ambient, minimal footprint                            | $R_{thJA}$ | -      | -    | 62   | °C/W | -                    |

<sup>5)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

### 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   | $V_{(BR)DSS}$ | 60     | -           | -           | V             | $V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$                                                                                             |
| Gate threshold voltage           | $V_{GS(th)}$  | 2.1    | 2.8         | 3.3         | V             | $V_{DS}=V_{GS}$ , $I_D=129\text{ }\mu\text{A}$                                                                                      |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | 0.5<br>10   | 1<br>100    | $\mu\text{A}$ | $V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$<br>$V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | 10          | 100         | nA            | $V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$                                                                                          |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 1.49<br>1.9 | 1.80<br>2.7 | m $\Omega$    | $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$<br>$V_{GS}=6\text{ V}$ , $I_D=50\text{ A}$                                                |
| Gate resistance                  | $R_G$         | -      | 2.7         | -           | $\Omega$      | -                                                                                                                                   |
| Transconductance <sup>6)</sup>   | $g_{fs}$      | 105    | -           | -           | S             | $ V_{DS} \geq 2 I_D R_{DS(on)max}$ , $I_D=100\text{ A}$                                                                             |

<sup>6)</sup> Defined by design. Not subject to production test.

**Table 5 Dynamic characteristics**

| Parameter                    | Symbol       | Values |      |      | Unit | Note/ Test Condition                                                                                |
|------------------------------|--------------|--------|------|------|------|-----------------------------------------------------------------------------------------------------|
|                              |              | Min.   | Typ. | Max. |      |                                                                                                     |
| Input capacitance            | $C_{iss}$    | -      | 7300 | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=30\text{ V}$ , $f=1\text{ MHz}$                                       |
| Output capacitance           | $C_{oss}$    | -      | 1550 | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=30\text{ V}$ , $f=1\text{ MHz}$                                       |
| Reverse transfer capacitance | $C_{rss}$    | -      | 63   | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=30\text{ V}$ , $f=1\text{ MHz}$                                       |
| Turn-on delay time           | $t_{d(on)}$  | -      | 22   | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time                    | $t_r$        | -      | 31   | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time          | $t_{d(off)}$ | -      | 48   | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time                    | $t_f$        | -      | 17   | -    | ns   | $V_{DD}=30\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=100\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |

**Table 6 Gate charge characteristics <sup>7)</sup>**

| Parameter                       | Symbol      | Values |      |      | Unit | Note/ Test Condition                                                         |
|---------------------------------|-------------|--------|------|------|------|------------------------------------------------------------------------------|
|                                 |             | Min.   | Typ. | Max. |      |                                                                              |
| Gate to source charge           | $Q_{gs}$    | -      | 33   | -    | nC   | $V_{DD}=30\text{ V}$ , $I_D=100\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge at threshold        | $Q_{g(th)}$ | -      | 20   | -    | nC   | $V_{DD}=30\text{ V}$ , $I_D=100\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate to drain charge            | $Q_{gd}$    | -      | 20   | -    | nC   | $V_{DD}=30\text{ V}$ , $I_D=100\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Switching charge                | $Q_{sw}$    | -      | 33   | -    | nC   | $V_{DD}=30\text{ V}$ , $I_D=100\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total <sup>8)</sup> | $Q_g$       | -      | 108  | 162  | nC   | $V_{DD}=30\text{ V}$ , $I_D=100\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |

**Table 6 Gate charge characteristics** <sup>7)</sup>

| Parameter                    | Symbol               | Values |      |      | Unit | Note/ Test Condition                                                                                |
|------------------------------|----------------------|--------|------|------|------|-----------------------------------------------------------------------------------------------------|
|                              |                      | Min.   | Typ. | Max. |      |                                                                                                     |
| Gate plateau voltage         | $V_{\text{plateau}}$ | -      | 4.6  | -    | V    | $V_{\text{DD}}=30\text{ V}$ , $I_{\text{D}}=100\text{ A}$ , $V_{\text{GS}}=0\text{ to }10\text{ V}$ |
| Gate charge total, sync. FET | $Q_{\text{g(sync)}}$ | -      | 100  | -    | nC   | $V_{\text{DS}}=0.1\text{ V}$ , $V_{\text{GS}}=0\text{ to }10\text{ V}$                              |
| Output charge                | $Q_{\text{oss}}$     | -      | 108  | -    | nC   | $V_{\text{DS}}=30\text{ V}$ , $V_{\text{GS}}=0\text{ V}$                                            |

<sup>7)</sup> See "Gate charge waveforms" for parameter definition

<sup>8)</sup> Defined by design. Not subject to production test.

**Table 7 Reverse diode**

| Parameter                        | Symbol               | Values |      |      | Unit | Note/ Test Condition                                                                                   |
|----------------------------------|----------------------|--------|------|------|------|--------------------------------------------------------------------------------------------------------|
|                                  |                      | Min.   | Typ. | Max. |      |                                                                                                        |
| Diode continuous forward current | $I_{\text{S}}$       | -      | -    | 154  | A    | $T_{\text{C}}=25\text{ °C}$                                                                            |
| Diode pulse current              | $I_{\text{S,pulse}}$ | -      | -    | 764  | A    | $T_{\text{C}}=25\text{ °C}$                                                                            |
| Diode forward voltage            | $V_{\text{SD}}$      | -      | 0.90 | 1.0  | V    | $V_{\text{GS}}=0\text{ V}$ , $I_{\text{F}}=100\text{ A}$ , $T_{\text{J}}=25\text{ °C}$                 |
| Reverse recovery time            | $t_{\text{rr}}$      | -      | 46   | -    | ns   | $V_{\text{R}}=30\text{ V}$ , $I_{\text{F}}=100\text{ A}$ , $di_{\text{F}}/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge          | $Q_{\text{rr}}$      | -      | 53   | -    | nC   | $V_{\text{R}}=30\text{ V}$ , $I_{\text{F}}=100\text{ A}$ , $di_{\text{F}}/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery time            | $t_{\text{rr}}$      | -      | 33   | -    | ns   | $V_{\text{R}}=30\text{ V}$ , $I_{\text{F}}=100\text{ A}$ , $di_{\text{F}}/dt=500\text{ A}/\mu\text{s}$ |
| Reverse recovery charge          | $Q_{\text{rr}}$      | -      | 164  | -    | nC   | $V_{\text{R}}=30\text{ V}$ , $I_{\text{F}}=100\text{ A}$ , $di_{\text{F}}/dt=500\text{ A}/\mu\text{s}$ |

4 Electrical characteristics diagrams

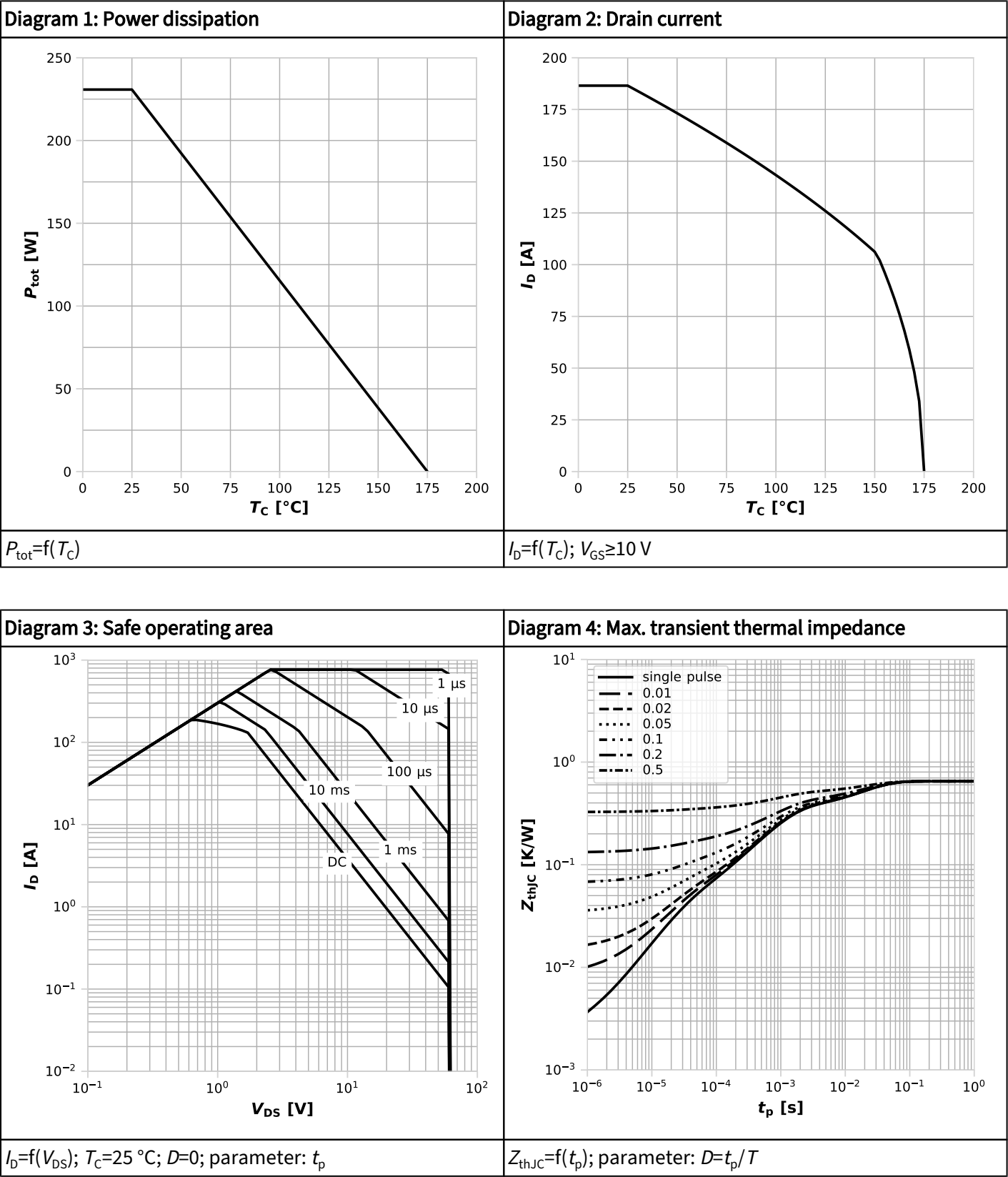
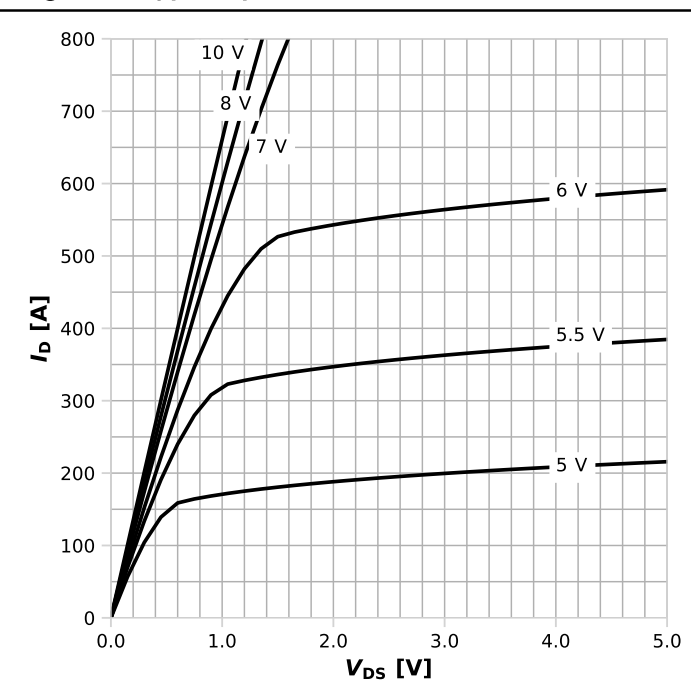


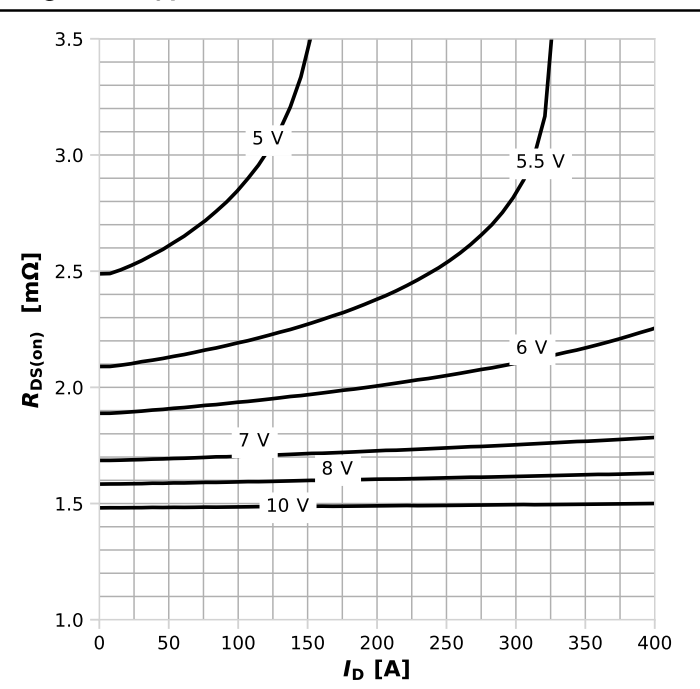


Diagram 5: Typ. output characteristics



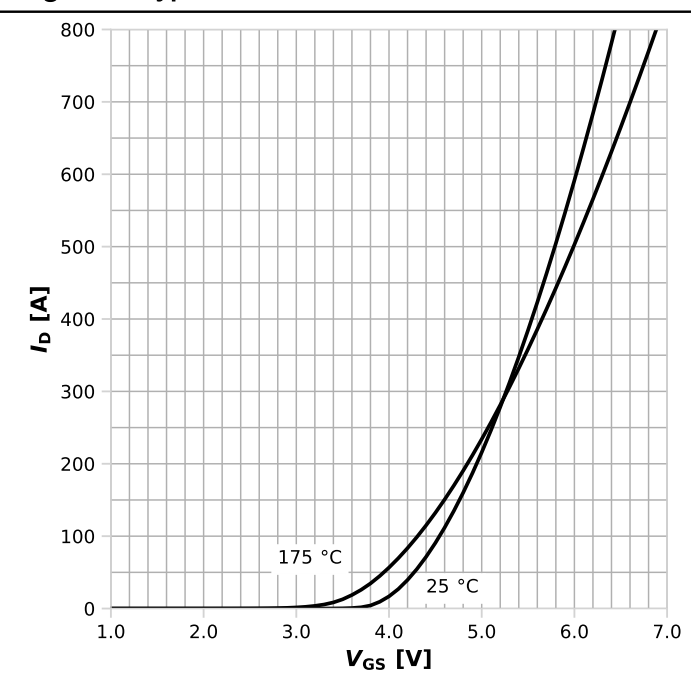
$I_D = f(V_{DS})$ ,  $T_j = 25\text{ °C}$ ; parameter:  $V_{GS}$

Diagram 6: Typ. drain-source on resistance



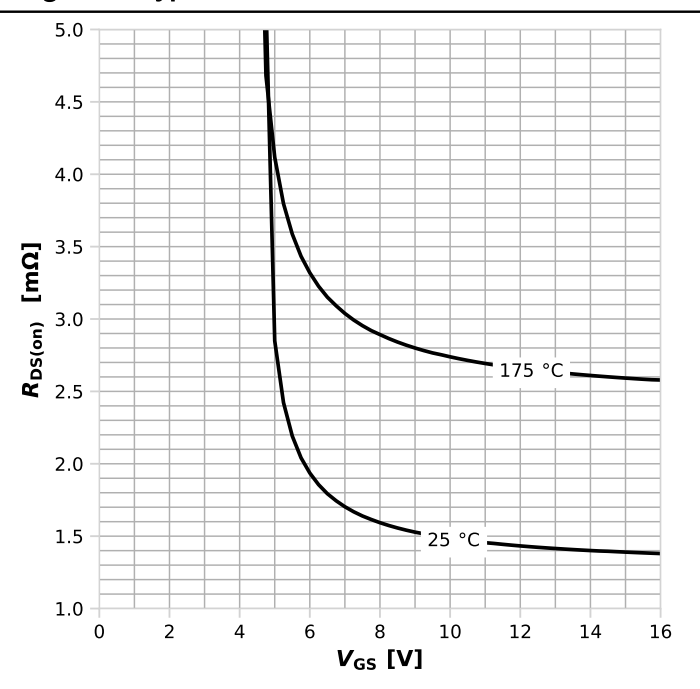
$R_{DS(on)} = f(I_D)$ ,  $T_j = 25\text{ °C}$ ; parameter:  $V_{GS}$

Diagram 7: Typ. transfer characteristics



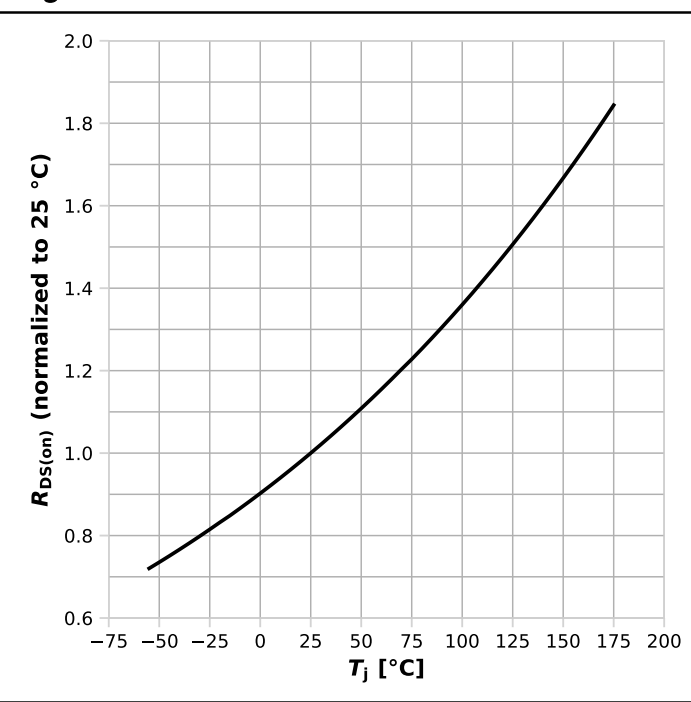
$I_D = f(V_{GS})$ ,  $|V_{DS}| > 2|I_D|R_{DS(on)max}$ ; parameter:  $T_j$

Diagram 8: Typ. drain-source on resistance



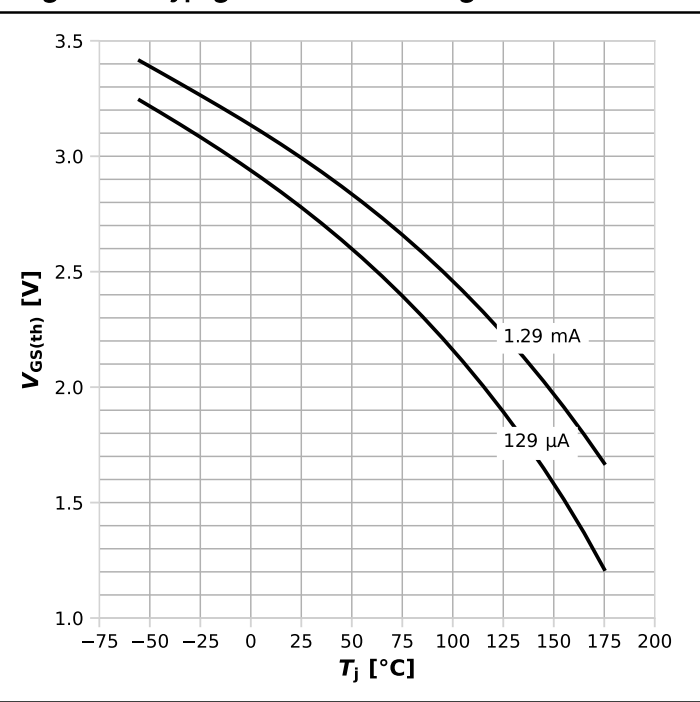
$R_{DS(on)} = f(V_{GS})$ ,  $I_D = 100\text{ A}$ ; parameter:  $T_j$

Diagram 9: Normalized drain-source on resistance



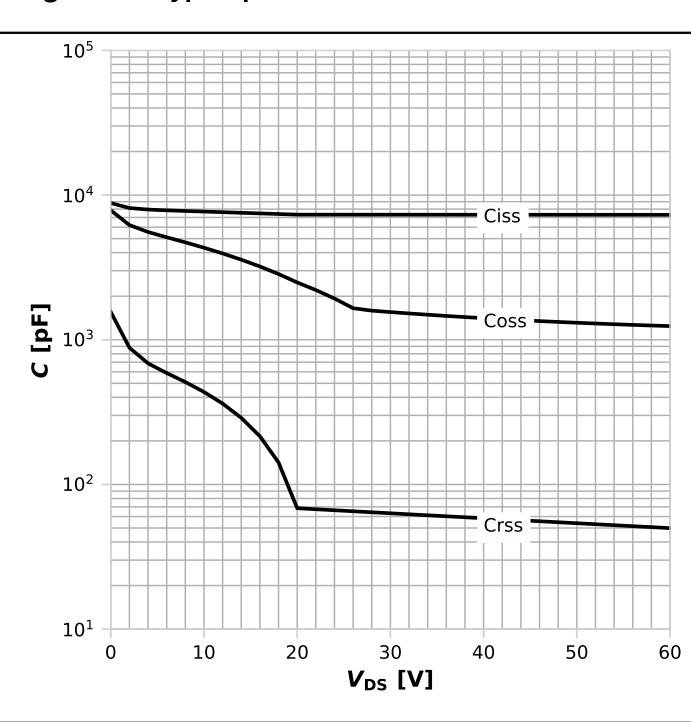
$R_{DS(on)}=f(T_j)$ ,  $I_D=100$  A,  $V_{GS}=10$  V

Diagram 10: Typ. gate threshold voltage



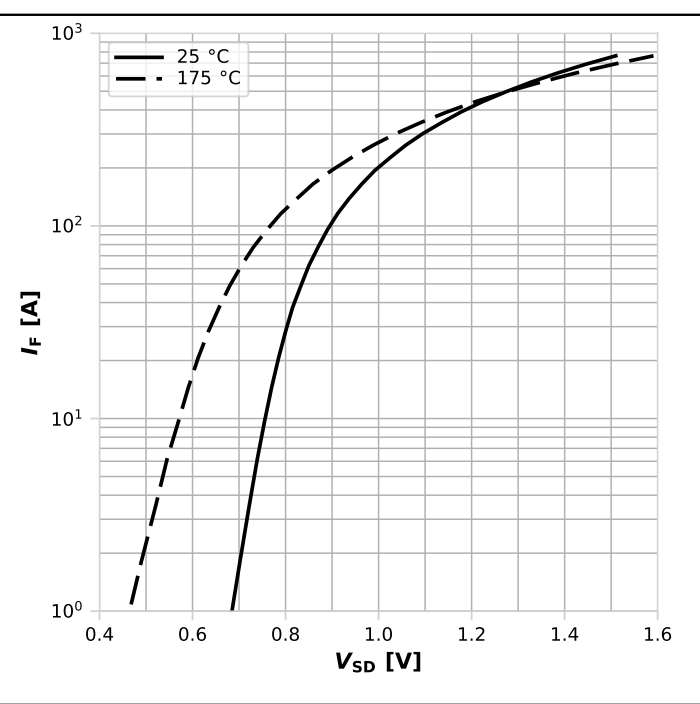
$V_{GS(th)}=f(T_j)$ ,  $V_{GS}=V_{DS}$ ; parameter:  $I_D$

Diagram 11: Typ. capacitances



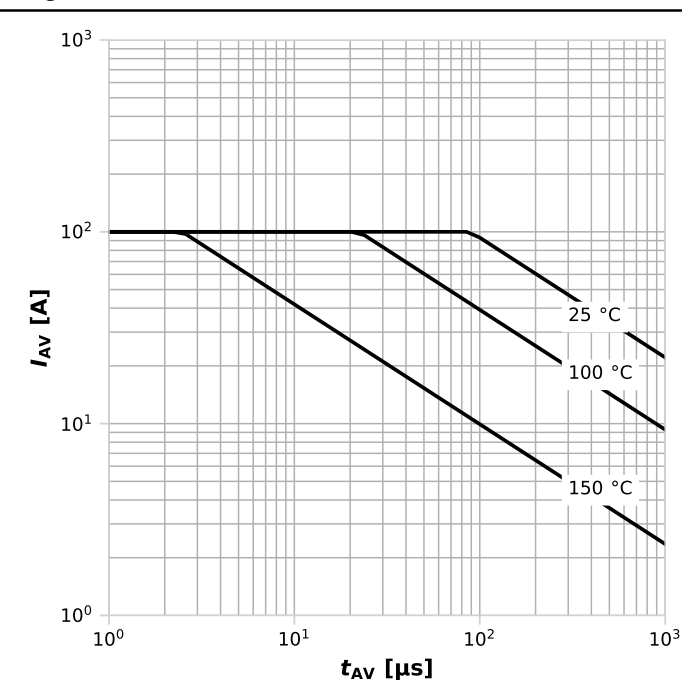
$C=f(V_{DS})$ ;  $V_{GS}=0$  V;  $f=1$  MHz

Diagram 12: Typ. forward characteristics of reverse diode



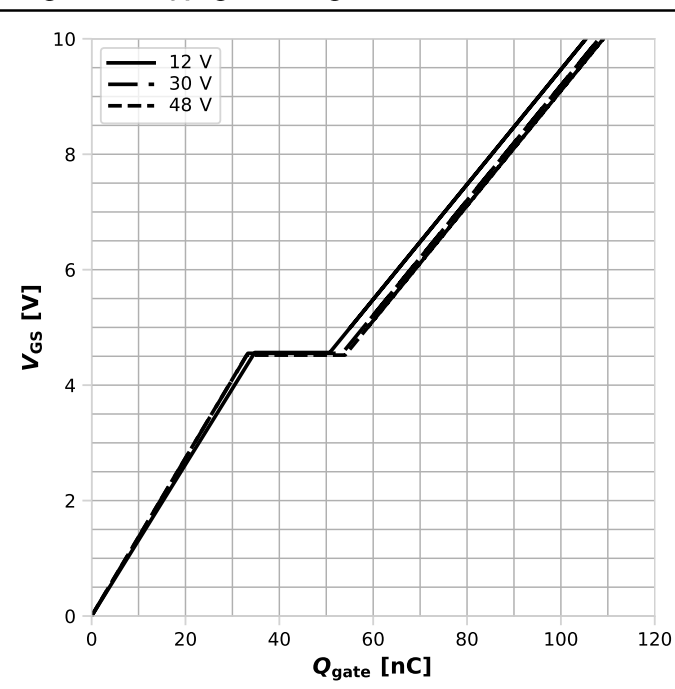
$I_F=f(V_{SD})$ ; parameter:  $T_j$

Diagram 13: Avalanche characteristics



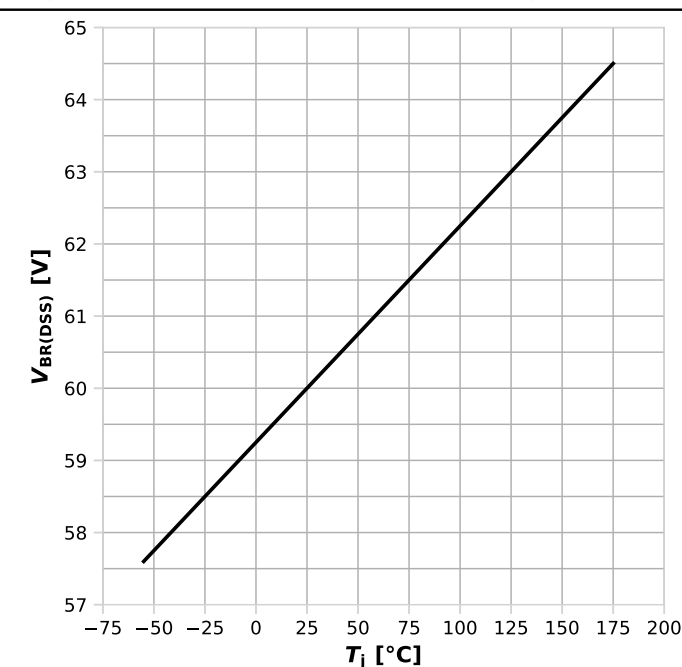
$I_{AS}=f(t_{AV})$ ;  $R_{GS}=25\ \Omega$ ; parameter:  $T_{j,start}$

Diagram 14: Typ. gate charge



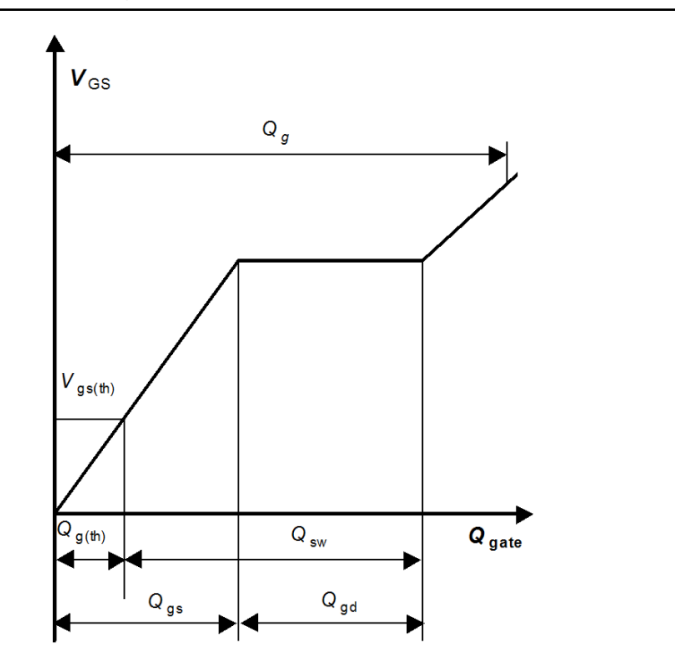
$V_{GS}=f(Q_{gate})$ ,  $I_D=100\text{ A}$  pulsed,  $T_j=25\text{ °C}$ ; parameter:  $V_{DD}$

Diagram 15: Drain-source breakdown voltage

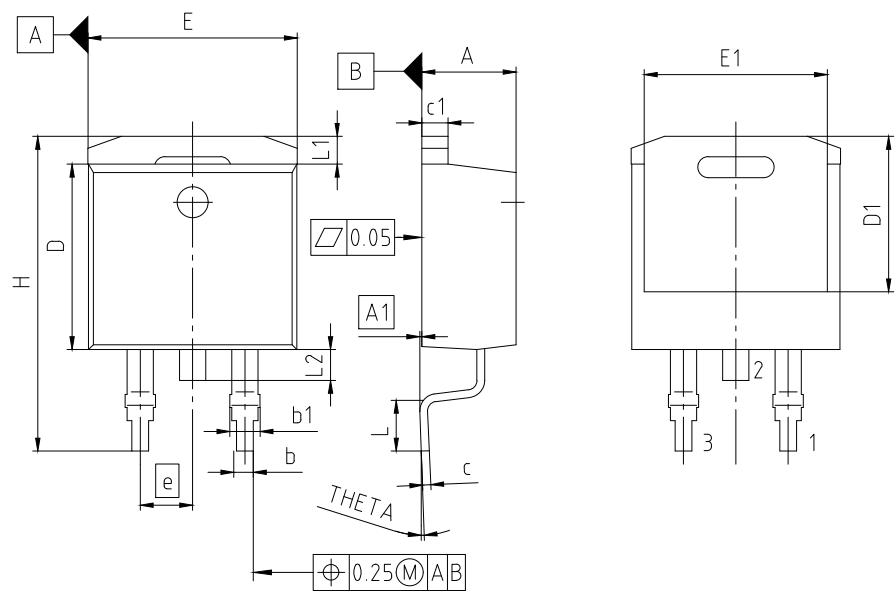


$V_{BR(DSS)}=f(T_j)$ ;  $I_D=1\text{ mA}$

Gate charge waveforms



5 Package Outlines



| PACKAGE - GROUP<br>NUMBER: PG-T0263-3-U02 |             |       |
|-------------------------------------------|-------------|-------|
| DIMENSIONS                                | MILLIMETERS |       |
|                                           | MIN.        | MAX.  |
| A                                         | 4.06        | 4.83  |
| A1                                        | 0.00        | 0.25  |
| b                                         | 0.51        | 1.00  |
| b1                                        | 1.07        | 1.78  |
| c                                         | 0.30        | 0.73  |
| c1                                        | 1.14        | 1.65  |
| D                                         | 8.38        | 9.65  |
| D1                                        | 6.60        | 7.50  |
| E                                         | 9.65        | 10.67 |
| E1                                        | 6.22        | 8.70  |
| e                                         | 2.54        |       |
| N                                         | 3           |       |
| H                                         | 14.60       | 15.88 |
| L                                         | 1.52        | 2.60  |
| L1                                        | 1.05        | 1.68  |
| L2                                        | 1.35        | 1.78  |
| THETA                                     | -9.00°      | 8.00° |

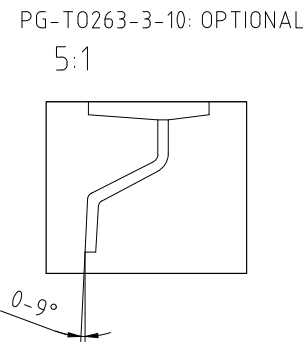


Figure 1 Outline PG-T0263-3, dimensions in mm

Revision History

IPB018N06NF2S

Revision 2024-10-14, Rev. 2.1

Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 2.0      | 2022-10-19 | Release of final version                     |
| 2.1      | 2024-10-14 | Added trr and Qrr at diF/dt=100 A/μs         |

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