# MOSFET

## 英飞凌OptiMOS™ 6 功率晶体管，200 V

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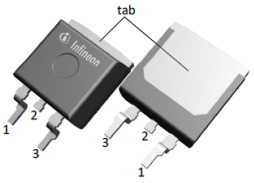
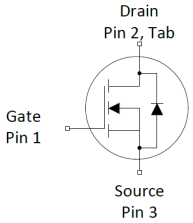



## 特性

- N沟道，标准电平
- 极低的导通电阻 $R_{DS(on)}$
- 出色的栅极电荷 x $R_{DS(on)}$乘积 (FOM)
- 极低的反向恢复电荷 ($Q_{rr}$)
- 高等级雪崩能量
- 工作温度 175°C
- 无铅镀层；符合 RoHS 标准
- 符合 IEC61249-2-21 标准的无卤素
- 基于 J-STD-020 的 MSL 1 分类
- 100% 雪崩测试

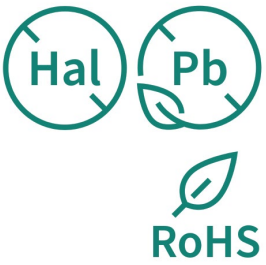



## 产品验证

符合 JEDEC JESD47, JESD22 和 J-STD-020 相关测试的工业应用要求。

**表 1　　主要性能参数**

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 200 | V |
| $R_{DS(on),max}$ | 17.5 | mΩ |
| $I_D$ | 61 | A |
| $Q_{oss}$ | 95 | nC |
| $Q_G$ | 31 | nC |
| $Q_{rr}$ (1000A/µs) | 255 | nC |




| Part number | Package | Marking | Related links |
|---|---|---|---|
| IPB175N20NM6 | PG-TO263-3 | 175N20N6 | - |

*本数据手册的原文使用英文撰写。为方便起见，英飞凌提供了译文；由于翻译过程中可能使用了自动化工具，英飞凌不保证译文的准确性。 为确认准确性，请务必访问 infineon.com 参考最新的英文版本（控制文档）。*

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# 1 最大额定值

除非另有规定，$T_A$ =25 °C

**表 2 最大额定值**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current [1] | $I_D$ | - | - | 61 | A | $V_{GS}$=10 V, $T_C$=25 °C |
| | | | | 46 | | $V_{GS}$=10 V, $T_C$=100 °C |
| | | | | 46 | | $V_{GS}$=15 V, $T_C$=100 °C |
| | | | | 9.7 | | $V_{GS}$=10 V,$T_A$=25 °C,$R_{thJA}$=40 °C/W [2] |
| Pulsed drain current [3] | $I_{D,pulse}$ | - | - | 244 | A | $T_C$=25 °C |
| Avalanche energy, single pulse [4] | $E_{AS}$ | - | - | 209 | mJ | $I_D$=31 A, $R_{GS}$=25 Ω |
| Gate source voltage | $V_{GS}$ | -20 | - | 20 | V | - |
| Power dissipation | $P_{tot}$ | - | - | 203 | W | $T_C$=25 °C |
| | | | | 3.8 | | $T_A$=25 °C, $R_{thJA}$=40 °C/W [2] |
| Operating and storage temperature | $T_j$, $T_{stg}$ | -55 | - | 175 | °C | - |

[1] 额定值指产品仅具有数据手册指定的绝对最大值，保持外壳温度符合规定要求。其他外壳温度请参见图 2。需要根据实际环境条件降低额定值。

[2] 器件置于40 mm × 40 mm × 1.5 mm 环氧树脂 PCB FR4 上，配有6 $cm^2$（单层，70 µm厚）铜层面积用于漏极连接。PCB 在静止空气中垂直放置。

[3] 详细信息请参见图 3

[4] 详细信息请参见图 13

## 2 热特性

**表 3 热特性**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | 0.37 | 0.74 | °C/W | - |
| Thermal resistance, junction - ambient, 6 $cm^2$ cooling area [5)] | $R_{thJA}$ | | - | 40 | | |
| Thermal resistance, junction - ambient, minimal footprint | $R_{thJA}$ | | - | 62 | | |

[5)] 器件置于40 mm × 40 mm × 1.5 mm 环氧树脂 PCB FR4 上，配有6 $cm^2$（单层，70 µm厚）铜层面积用于漏极连接。PCB 垂直放置在静止空气中。

# 3 电气特性

除非另有规定，$T_j$ = 25°C

**表 4 静态特性**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 200 | - | - | V | $V_{GS}$=0 V, $I_D$=1 mA |
| Gate threshold voltage | $V_{GS(th)}$ | 3.0 | 3.7 | 4.5 | V | $V_{DS}$=$V_{GS}$, $I_D$=105 µA |
| Zero gate voltage drain current | $I_{DSS}$ | - | 0.1 | 1 | µA | $V_{DS}$=160 V, $V_{GS}$=0 V, $T_j$=25 °C |
| | | | 10 | 100 | | $V_{DS}$=160 V, $V_{GS}$=0 V, $T_j$=125 °C |
| Gate-source leakage current | $I_{GSS}$ | - | 10 | 100 | nA | $V_{GS}$=20 V, $V_{DS}$=0 V |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 14.0 | 15.5 | mΩ | $V_{GS}$=15 V, $I_D$=38 A |
| | | | 15.6 | 17.5 | | $V_{GS}$=10 V, $I_D$=38 A |
| Gate resistance | $R_G$ | - | 5.4 | - | Ω | - |
| Transconductance [6] | $g_{fs}$ | 13 | 26 | - | S | $\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, $I_D$=38 A |

[6] 由设计指定，未经过生产测试。

**表 5 动态特性**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance | $C_{iss}$ | - | 2400 | 3100 | pF | $V_{GS}$=0 V, $V_{DS}$=100 V, $f$=1 MHz |
| Output capacitance [7] | $C_{oss}$ | | 380 | 490 | | |
| Reverse transfer capacitance [7] | $C_{rss}$ | | 17 | 30 | | |
| Turn-on delay time | $t_{d(on)}$ | - | 12 | - | ns | $V_{DD}$=100 V, $V_{GS}$=10 V, $I_D$=19 A, $R_{G,ext}$=1.6 Ω |
| Rise time | $t_r$ | | 23 | | | |
| Turn-off delay time | $t_{d(off)}$ | | 23 | | | |
| Fall time | $t_f$ | | 9.8 | | | |

[7] 由设计定义。未经过生产测试。

**表 6　　栅极电荷特性** [8)]

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | $Q_{gs}$ | - | 15.6 | - | nC | $V_{DD}$=100 V, $I_D$=19 A, $V_{GS}$=0 to 10 V |
| Gate charge at threshold | $Q_{g(th)}$ | | 8.8 | - | nC | |
| Gate to drain charge [9)] | $Q_{gd}$ | | 6.2 | 9.3 | nC | |
| Switching charge | $Q_{sw}$ | | 13 | - | nC | |
| Gate charge total [9)] | $Q_g$ | | 31 | 39 | nC | |
| Gate plateau voltage | $V_{plateau}$ | | 6.6 | - | V | |
| Output charge [9)] | $Q_{oss}$ | - | 95 | 126 | nC | $V_{DS}$=100 V, $V_{GS}$=0 V |

8)　参数定义请参数见“栅极充电波形”。

9)　由设计指定，未经过生产测试。

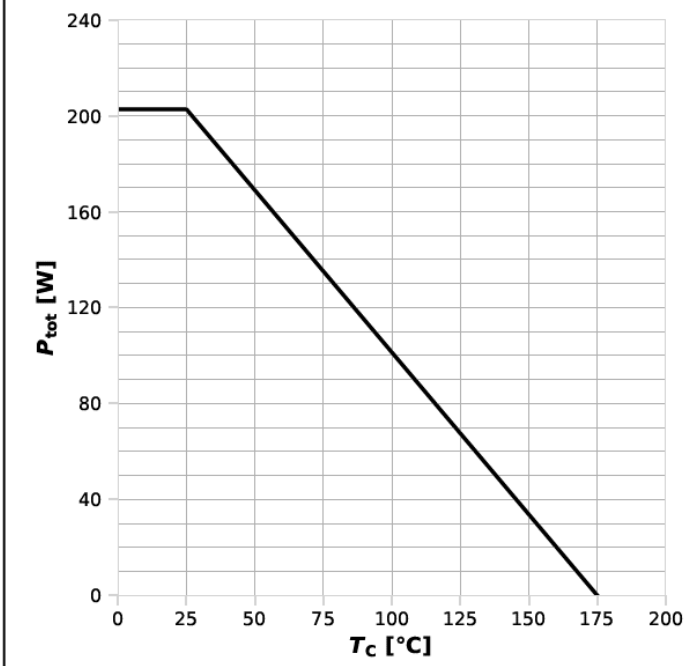
**表 7　　反向二极管**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | $I_S$ | - | - | 61 | A | $T_C$=25 °C |
| Diode pulse current | $I_{S,pulse}$ | | | 244 | | |
| Diode forward voltage | $V_{SD}$ | - | 0.91 | 1.0 | V | $V_{GS}$=0 V, $I_F$=38 A, $T_j$=25 °C |
| Reverse recovery time | $t_{rr}$ | - | 76 | - | ns | $V_R$=100 V, $I_F$=19 A, d$i_F$/d$t$=100 A/µs |
| Reverse recovery charge [10)] | $Q_{rr}$ | | 91 | | nC | |
| Reverse recovery time | $t_{rr}$ | - | 34 | - | ns | $V_R$=100 V, $I_F$=19 A, d$i_F$/d$t$=1000 A/µs |
| Reverse recovery charge [10)] | $Q_{rr}$ | | 255 | | nC | |

10)　由设计指定，未经过生产测试。

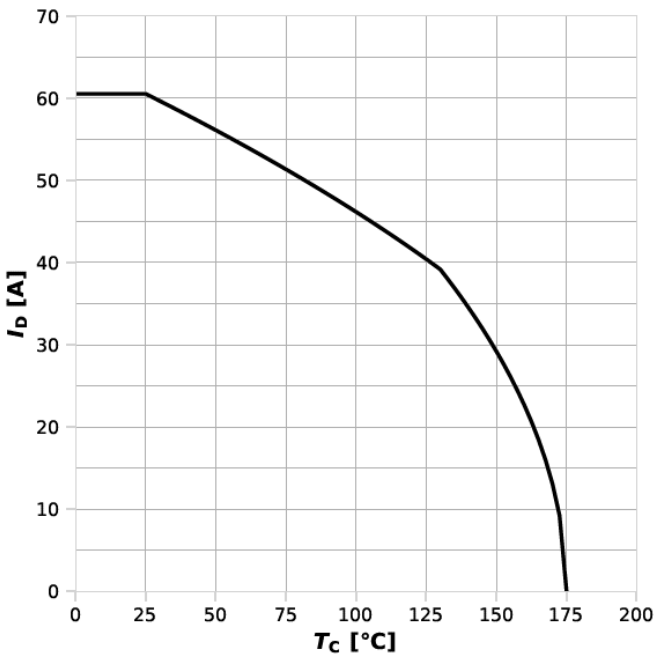
# 4 电气特性

**Diagram 1: Power dissipation**



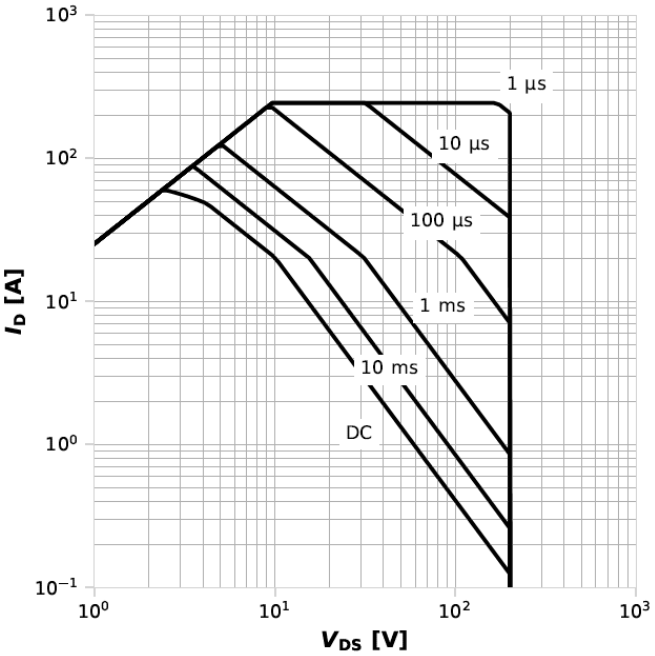

$P_{tot}$=f($T_C$)

**Diagram 2: Drain current**



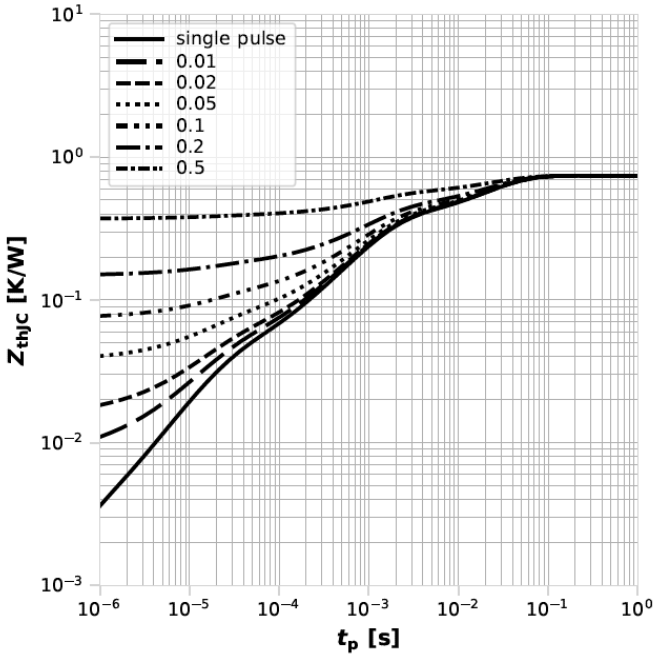

$I_D$=f($T_C$); $V_{GS}$≥10 V

**Diagram 3: Safe operating area**



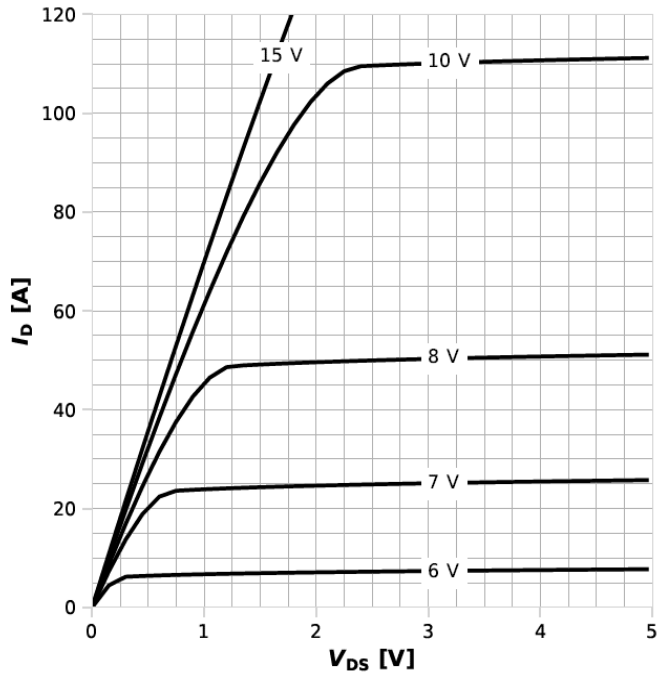

$I_D$=f($V_{DS}$); $T_C$=25 °C; $D$=0; parameter: $t_p$

**Diagram 4: Max. transient thermal impedance**



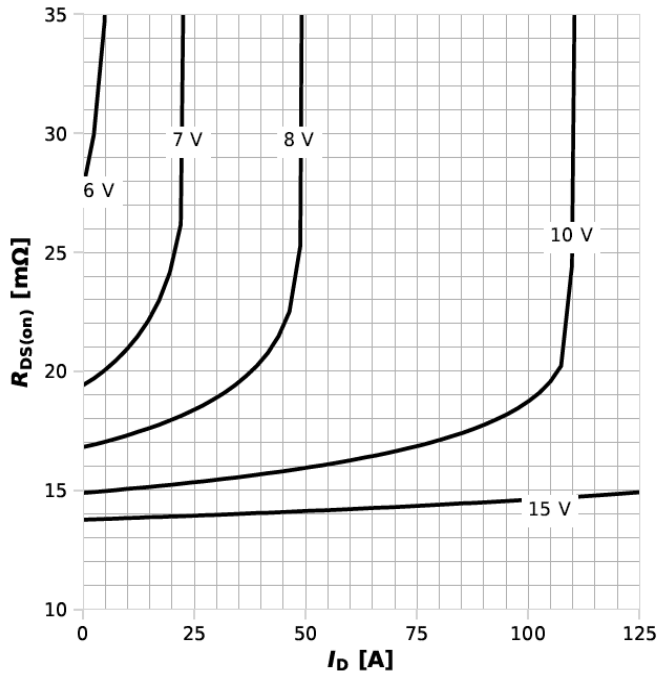

$Z_{thJC}$=f($t_p$); parameter: $D$=$t_p$/$T$

Diagram 5: Typ. output characteristics



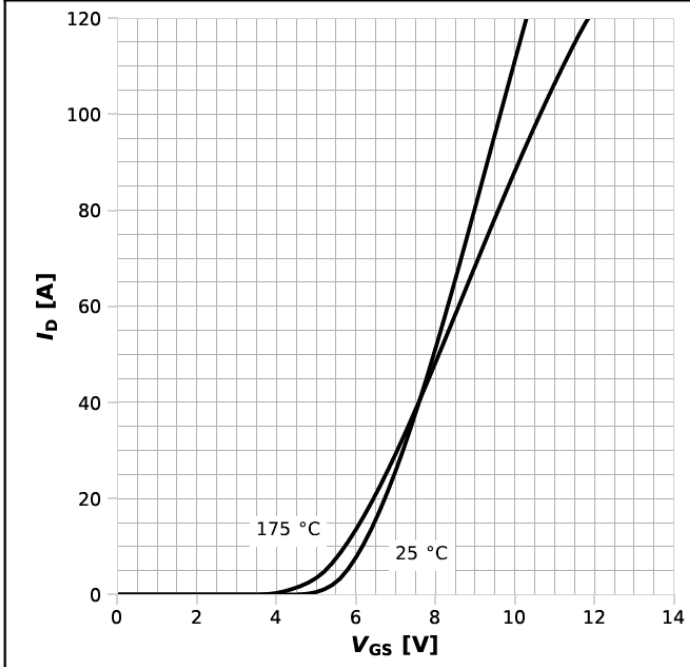

$I_D$=f($V_{DS}$), $T_j$=25 °C; parameter: $V_{GS}$

Diagram 6: Typ. drain-source on resistance



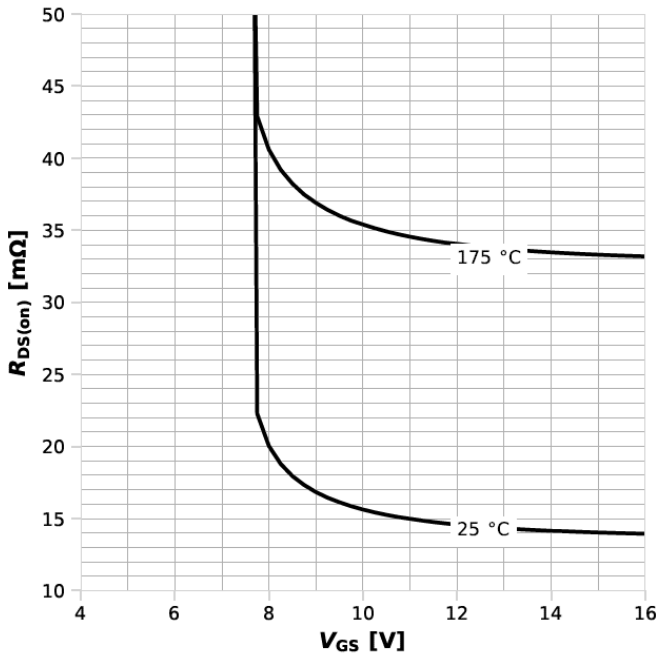

$R_{DS(on)}$=f($I_D$), $T_j$=25 °C; parameter: $V_{GS}$

Diagram 7: Typ. transfer characteristics



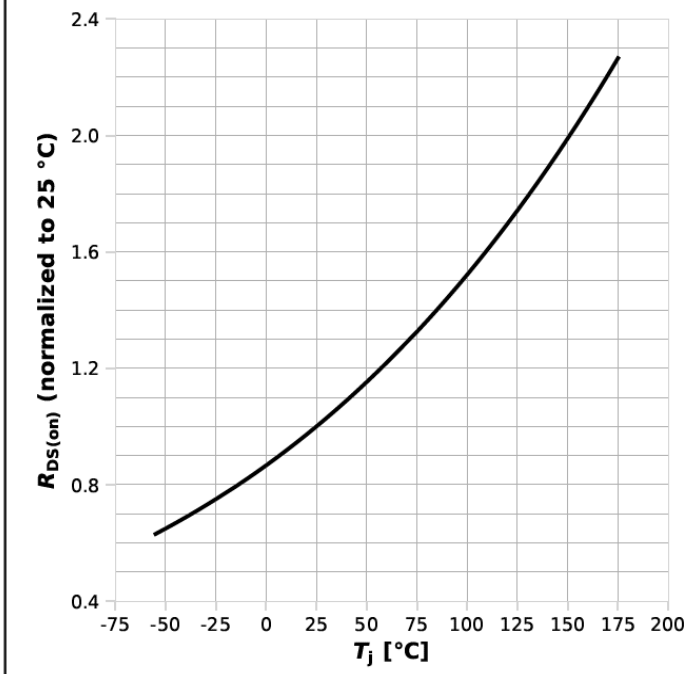

$I_D$=f($V_{GS}$), $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: $T_j$

Diagram 8: Typ. drain-source on resistance



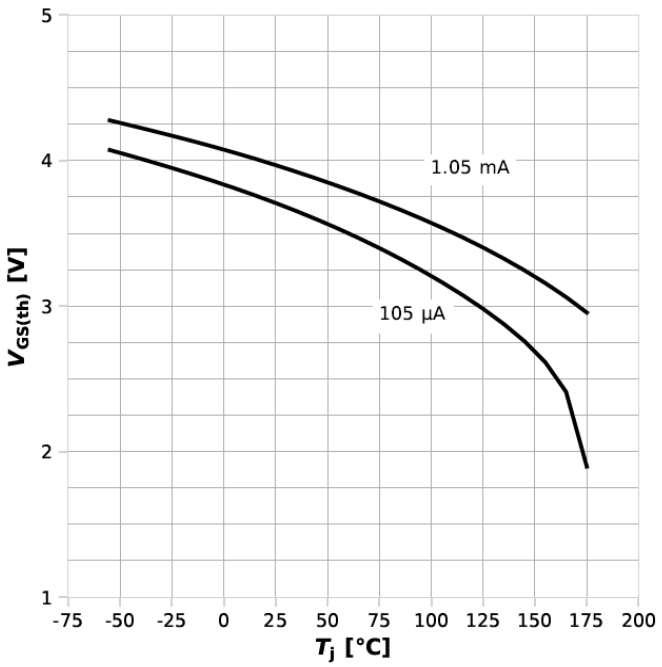

$R_{DS(on)}$=f($V_{GS}$), $I_D$=38 A; parameter: $T_j$

Diagram 9: Normalized drain-source on resistance



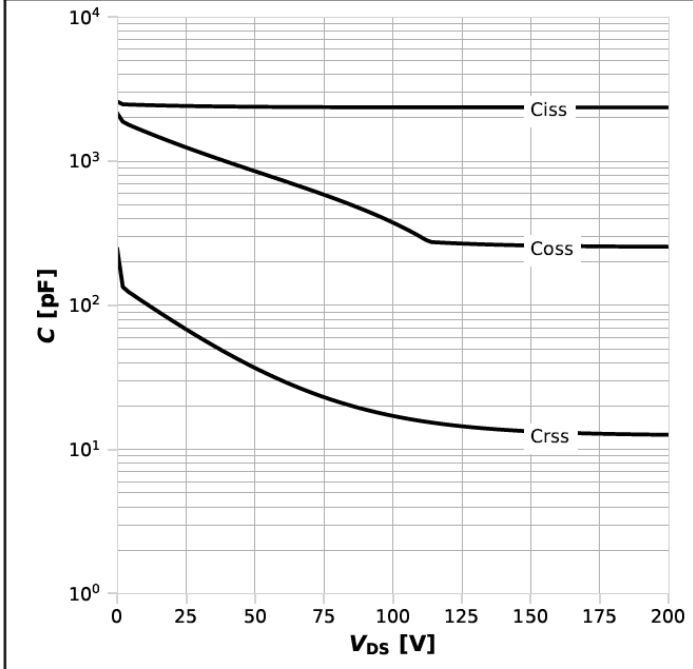

$R_{DS(on)}$=f($T_j$), $I_D$=38 A, $V_{GS}$=10 V

Diagram 10: Typ. gate threshold voltage



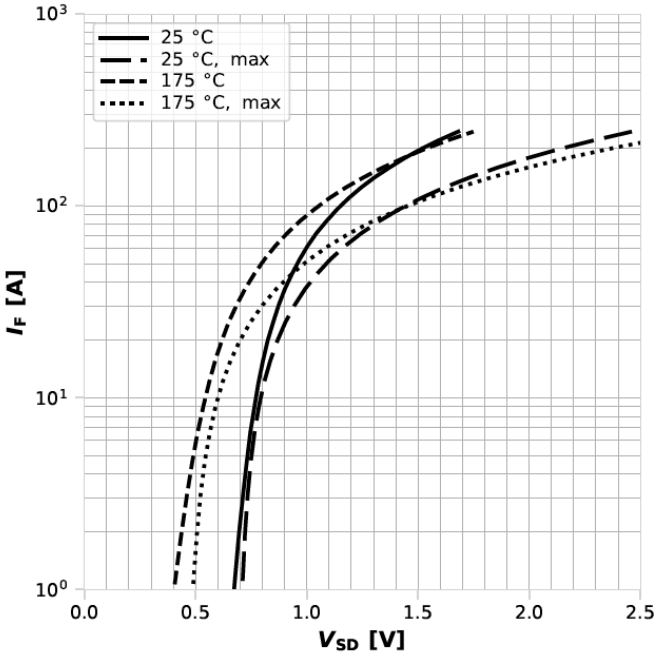

$V_{GS(th)}$=f($T_j$), $V_{GS}$=$V_{DS}$; parameter: $I_D$

Diagram 11: Typ. capacitances

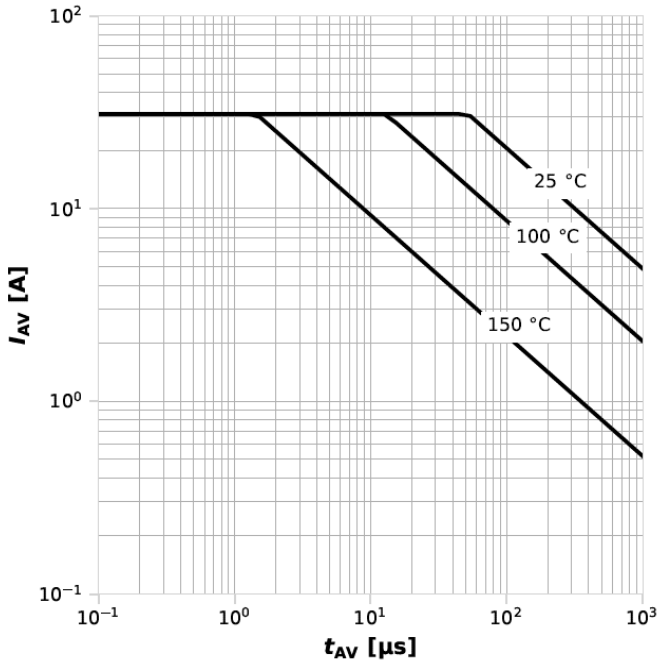
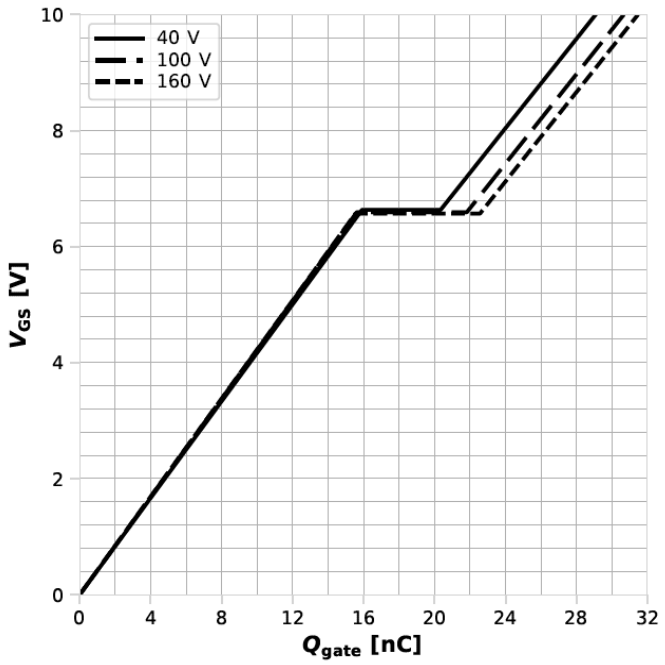


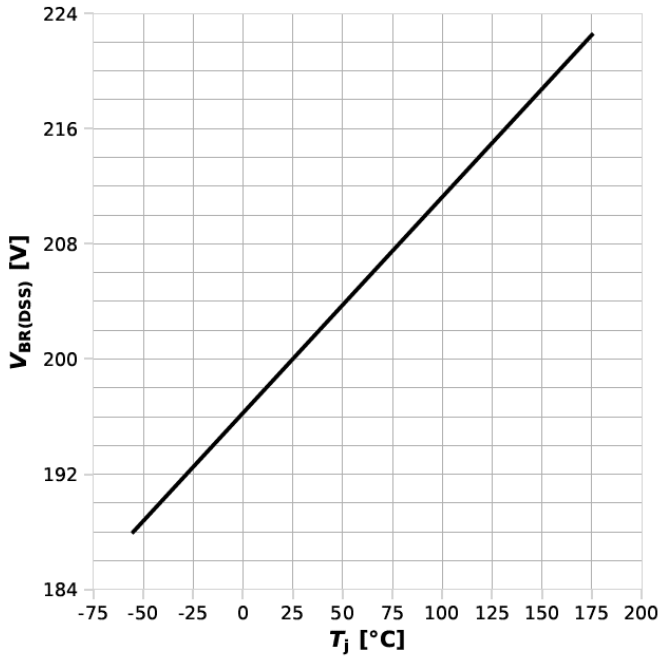
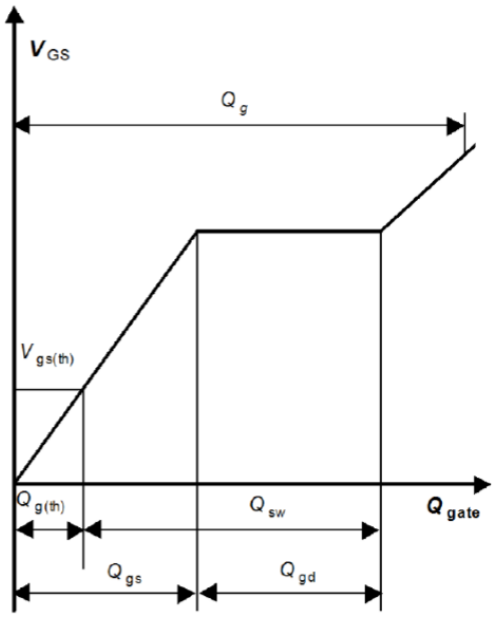

$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz

Diagram 12: Forward characteristics of reverse diode

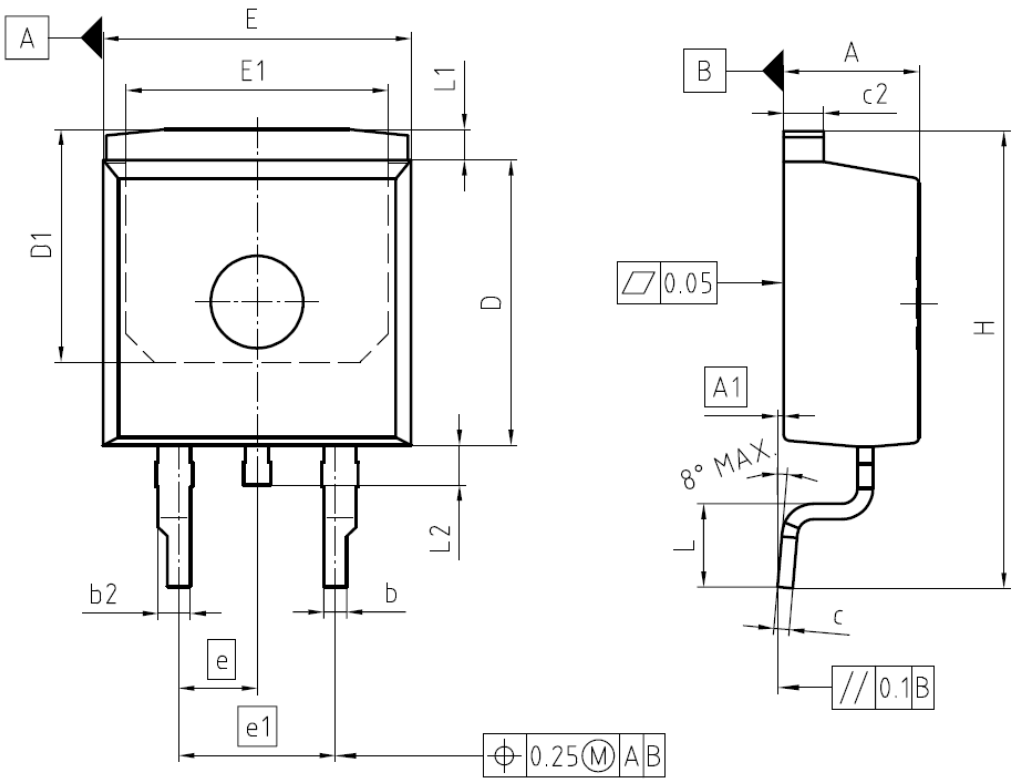



$I_F$=f($V_{SD}$); parameter: $T_j$

| Diagram 13: Avalanche characteristics | Diagram 14: Typ. gate charge |
|---|---|
|  |  |
| $I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω; parameter: $T_{j,start}$ | $V_{GS}$=f($Q_{gate}$), $I_D$=19 A pulsed, $T_j$=25 °C; parameter: $V_{DD}$ |

| Diagram 15: Drain-source breakdown voltage | Gate charge waveforms |
|---|---|
|  |  |
| $V_{BR(DSS)}$=f($T_j$); $I_D$=1 mA | - |

# 5 封装外形




| PACKAGE - GROUP NUMBER: | PG-TO263-3-U01 | |
|---|---|---|
| DIMENSIONS | MILLIMETERS | |
| | MIN. | MAX. |
| A | 4.30 | 4.50 |
| A1 | 0.00 | 0.10 |
| b | 0.65 | 0.85 |
| b2 | 0.95 | 1.15 |
| c | 0.40 | 0.60 |
| c2 | 1.17 | 1.37 |
| D | 9.05 | 9.45 |
| D1 | 7.45 | 7.65 |
| E | 9.80 | 10.20 |
| E1 | 8.40 | 8.60 |
| e | 2.54 | |
| e1 | 5.08 | |
| N | 2 | |
| H | 14.60 | 15.90 |
| L | 2.40 | 3.00 |
| L1 | 0.70 | 1.30 |
| L2 | 1.00 | 1.60 |

**图 1** PG-TO 263 - 3外形图，尺寸单位为毫米

## 修订记录

IPB175N20NM6

**Revision 2025 - 06 - 11 , Rev. 1 . 0**

Previous revisions

| Revision | Date | Subjects (major changes since last revision) |
|---|---|---|
| 1.0 | 2025-06-11 | Release of final datasheet |

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