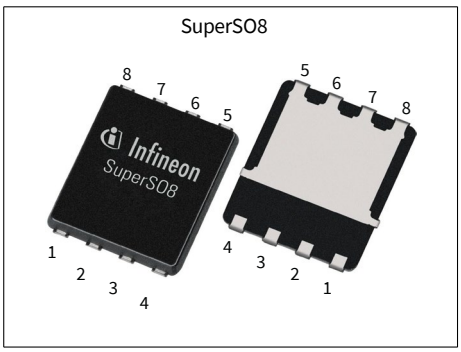
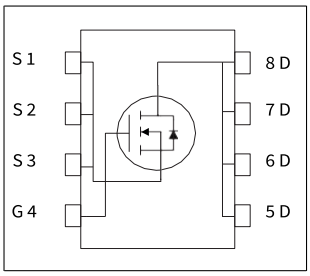
# MOSFET

## 英飞凌高耐热60V OptiMOS™功率晶体管




### 特性

- 针对高性能 SMPS（例如同步整流）进行优化
- 额定温度为 175°C
- 100% 雪崩测试
- 卓越的耐热性
- N沟道
- 符合 JEDEC [1]工业应用标准
- 无铅镀层；符合RoHS标准
- 符合 IEC61249-2-21 标准的无卤素




### 表 1　　主要性能参数

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 60 | V |
| $R_{DS(on),max}$ | 2.8 | mΩ |
| $I_D$ | 137 | A |
| $Q_{oss}$ | 43 | nC |
| $Q_G$(0..10V) | 37 | nC |

| Type / Ordering Code | Package | Marking | Related Links |
|---|---|---|---|
| BSC028N06NST | PG-TDSON-8 | 028N06NT | - |

[1] J-STD20 和 JESD22

*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）。*

## 目录

# 1 最大额定值

除非另有规定， $T_j$ = 25 °C

**表 2 最大额定值**

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current[1] | $I_D$ | -<br>-<br>- | -<br>-<br>- | 137<br>97<br>24 | A | $V_{GS}$=10 V, $T_C$=25 °C<br>$V_{GS}$=10 V, $T_C$=100 °C<br>$V_{GS}$=10 V, $T_A$=25 °C, $R_{thJA}$=50K/W[2] |
| Pulsed drain current[3] | $I_{D,pulse}$ | - | - | 548 | A | $T_C$=25 °C |
| Avalanche energy, single pulse[4] | $E_{AS}$ | - | - | 100 | mJ | $I_D$=50 A, $R_{GS}$=25 Ω |
| Gate source voltage | $V_{GS}$ | -20 | - | 20 | V | - |
| Power dissipation | $P_{tot}$ | -<br>- | -<br>- | 100<br>3.0 | W | $T_C$=25 °C<br>$T_A$=25 °C, $R_{thJA}$=50 K/W[3] |
| Operating and storage temperature | $T_j$, $T_{stg}$ | -55 | - | 175 | °C | - |

# 2 热特性

**表3 热特性**

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case, bottom | $R_{thJC}$ | - | 0.9 | 1.5 | K/W | - |
| Thermal resistance, junction - case, top | $R_{thJC}$ | - | - | 20 | K/W | - |
| Device on PCB,<br>6 cm² cooling area[2] | $R_{thJA}$ | - | - | 50 | K/W | - |

[1]额定值指产品仅具有数据表指定的绝对最大值，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]器件位于 40 mm x 40 mm x 1.5 mm 环氧 PCB FR4 上，具有 6 cm2（一层，70 µm 厚）铜面积用于漏极连接。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

## 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 | $V_{(BR)DSS}$ | 60 | - | - | V | $V_{GS}$=0 V, $I_D$=1 mA |
| Gate threshold voltage | $V_{GS(th)}$ | 2.1 | 2.8 | 3.3 | V | $V_{DS}$=$V_{GS}$, $I_D$=50 µA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | 0.5<br>10 | 1<br>100 | µA | $V_{DS}$=60 V, $V_{GS}$=0 V, $T_j$=25 °C<br>$V_{DS}$=60 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 | $R_{DS(on)}$ | -<br>- | 2.3<br>3.4 | 2.8<br>4.2 | mΩ | $V_{GS}$=10 V, $I_D$=50 A<br>$V_{GS}$=6 V, $I_D$=12.5 A |
| Gate resistance[1)] | $R_G$ | - | 1.3 | 1.95 | Ω | - |
| Transconductance | $g_{fs}$ | 50 | 100 | - | S | $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, $I_D$=50 A |

### 表5 动态特性[1)]

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance | $C_{iss}$ | 2025 | 2700 | 3375 | pF | $V_{GS}$=0 V, $V_{DS}$=30 V, $f$=1 MHz |
| Output capacitance | $C_{oss}$ | 495 | 660 | 825 | pF | $V_{GS}$=0 V, $V_{DS}$=30 V, $f$=1 MHz |
| Reverse transfer capacitance | $C_{rss}$ | 8.5 | 28 | 56 | pF | $V_{GS}$=0 V, $V_{DS}$=30 V, $f$=1 MHz |
| Turn-on delay time | $t_{d(on)}$ | - | 11 | 22 | ns | $V_{DD}$=30 V, $V_{GS}$=10 V, $I_D$=50 A, $R_{G,ext}$=3 Ω |
| Rise time | $t_r$ | - | 38 | 57 | ns | $V_{DD}$=30 V, $V_{GS}$=10 V, $I_D$=50 A, $R_{G,ext}$=3 Ω |
| Turn-off delay time | $t_{d(off)}$ | - | 19 | 38 | ns | $V_{DD}$=30 V, $V_{GS}$=10 V, $I_D$=50 A, $R_{G,ext}$=3 Ω |
| Fall time | $t_f$ | - | 8 | 16 | ns | $V_{DD}$=30 V, $V_{GS}$=10 V, $I_D$=50 A, $R_{G,ext}$=3 Ω |

### 表6 栅极电荷特性[2)]

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | $Q_{gs}$ | 9 | 12 | 16.5 | nC | $V_{DD}$=30 V, $I_D$=50 A, $V_{GS}$=0 to 10 V |
| Gate charge at threshold | $Q_{g(th)}$ | 6 | 8 | 11 | nC | $V_{DD}$=30 V, $I_D$=50 A, $V_{GS}$=0 to 10 V |
| Gate to drain charge | $Q_{gd}$ | 5 | 7 | 10.3 | nC | $V_{DD}$=30 V, $I_D$=50 A, $V_{GS}$=0 to 10 V |
| Switching charge | $Q_{sw}$ | 8 | 12 | 17 | nC | $V_{DD}$=30 V, $I_D$=50 A, $V_{GS}$=0 to 10 V |
| Gate charge total | $Q_g$ | 31 | 37 | 49 | nC | $V_{DD}$=30 V, $I_D$=50 A, $V_{GS}$=0 to 10 V |
| Gate plateau voltage | $V_{plateau}$ | 4.0 | 4.6 | 5.2 | V | $V_{DD}$=30 V, $I_D$=50 A, $V_{GS}$=0 to 10 V |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | 27 | 33 | 43 | nC | $V_{DS}$=0.1 V, $V_{GS}$=0 to 10 V |
| Output charge | $Q_{oss}$ | 32 | 43 | 54 | nC | $V_{DD}$=30 V, $V_{GS}$=0 V |

[1)]由设计标定，不受制于生产测试。
[2)]由设计定义。不接受生产测试。有关栅极电荷参数定义，请参阅“栅极电荷波形”

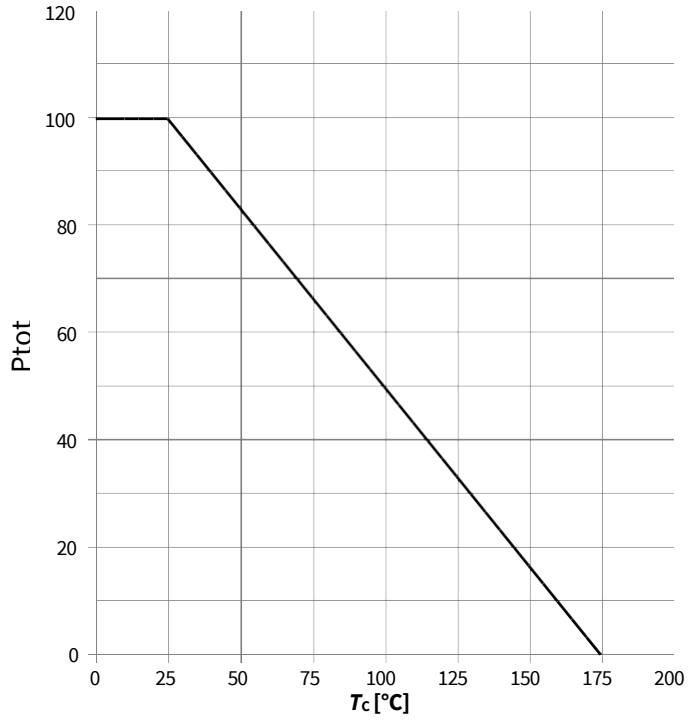
## 表 7　　反向二极管

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | $I_S$ | - | - | 100 | A | $T_C$=25 °C |
| Diode pulse current | $I_{S,pulse}$ | - | - | 400 | A | $T_C$=25 °C |
| Diode forward voltage | $V_{SD}$ | - | 0.9 | 1.2 | V | $V_{GS}$=0 V, $I_F$=50 A, $T_j$=25 °C |
| Reverse recovery time[1)] | $t_{rr}$ | 14 | 35 | 56 | ns | $V_R$=30 V, $I_F$=50 A, d$i_F$/d$t$=100 A/µs |
| Reverse recovery charge[1)] | $Q_{rr}$ | 14 | 29 | 58 | nC | $V_R$=30 V, $I_F$=50 A, d$i_F$/d$t$=100 A/µs |

[1)]由设计标定，不受制于生产测试。

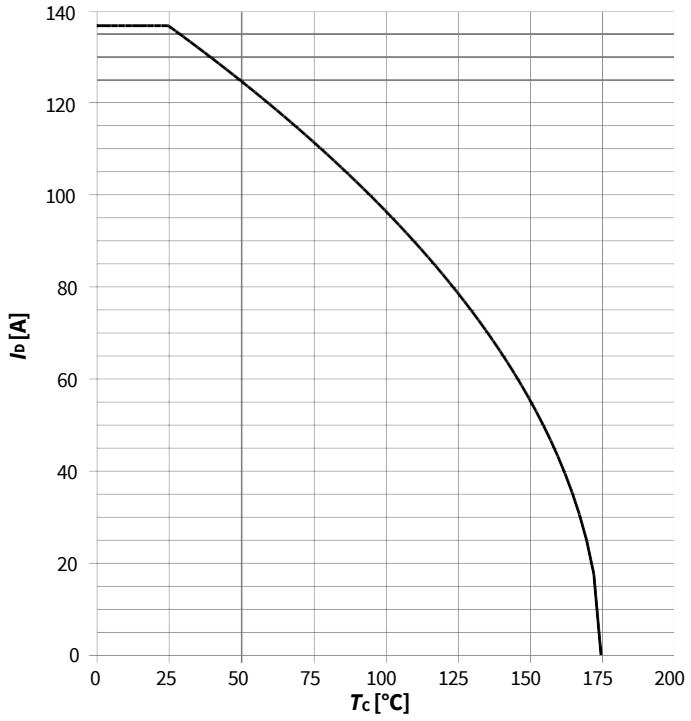
# 4 电气特性图

**图 1：功率耗散**



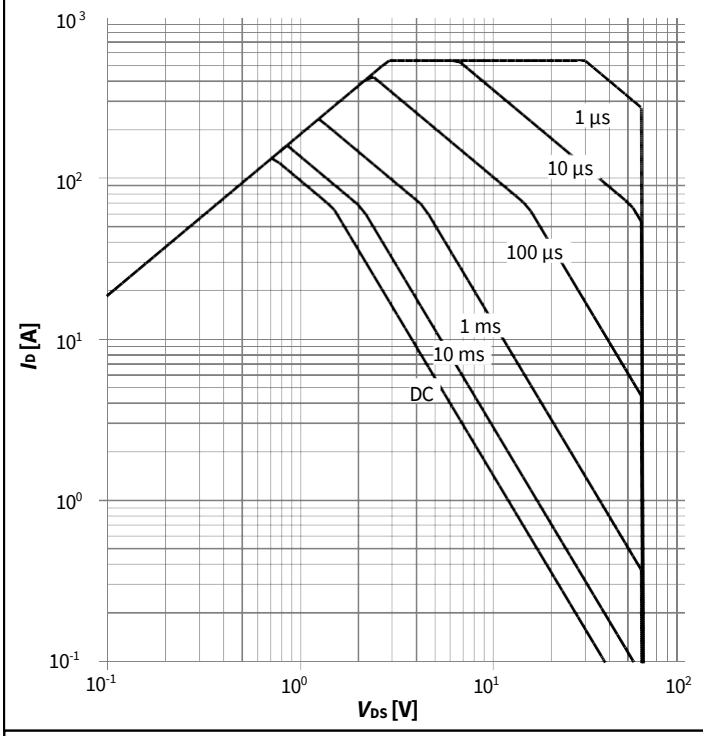

$P_{tot}=f(T_C)$

**图 2：漏极电流**



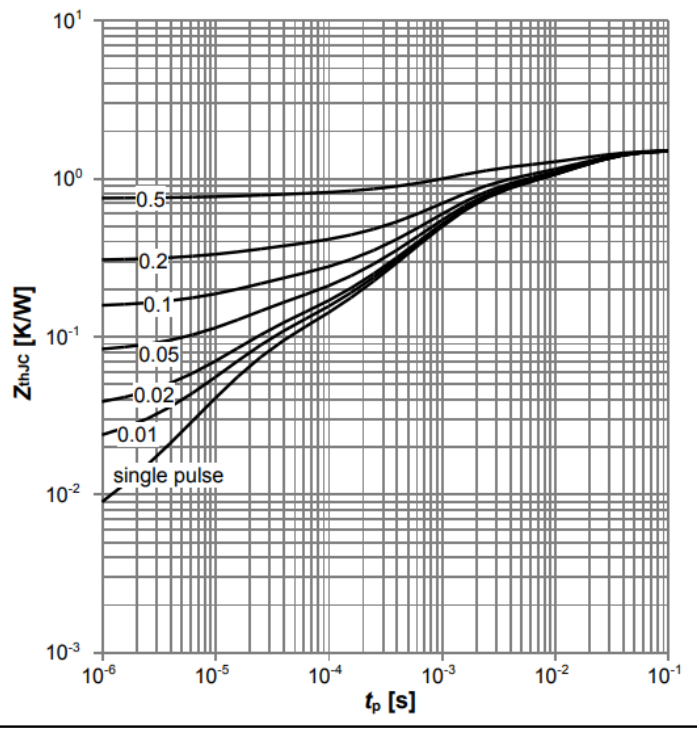

$I_D=f(T_C)$; $V_{GS}\geq 10$ V

**图 3：安全操作区**



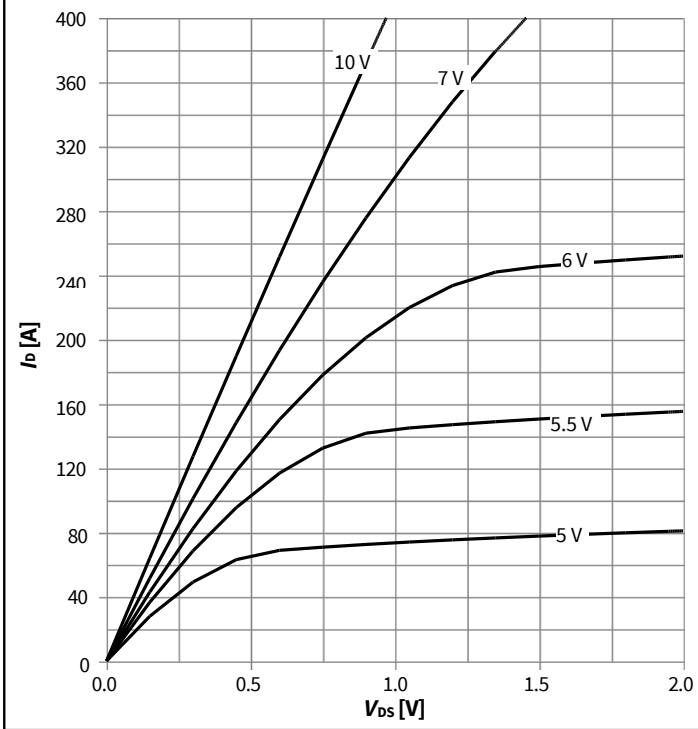

$I_D=f(V_{DS})$; $T_C$=25 °C; $D$=0; 参数：$t_p$

**图 4：最大瞬态热阻抗**



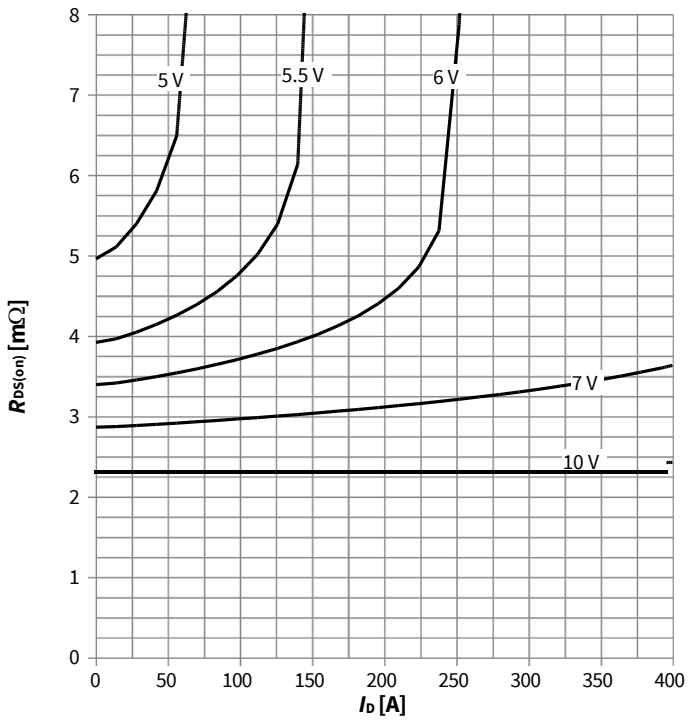

$Z_{thJC}=f(t_p)$; 参数：$D=t_p/T$

**图 5：典型输出特性**



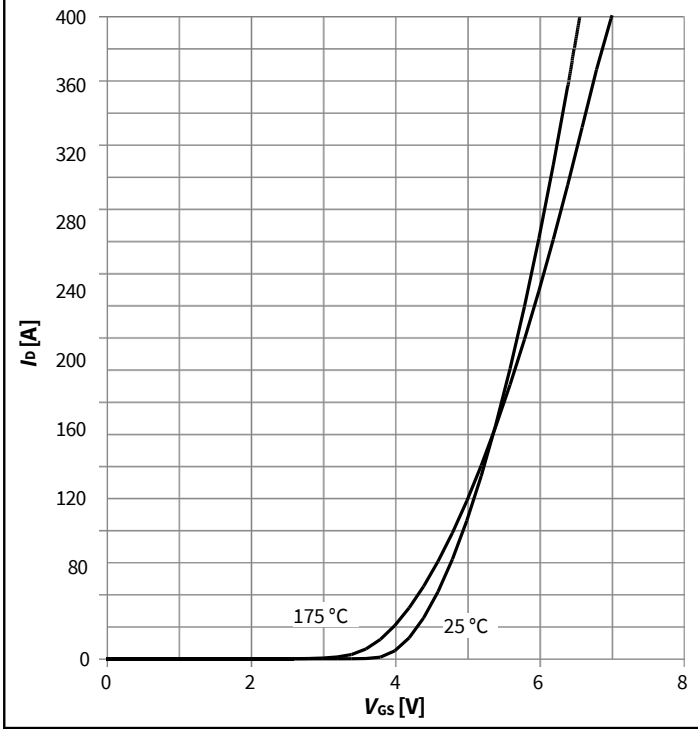

$I_D=f(V_{DS})$; $T_j$=25 °C; 参数: $V_{GS}$

**图 6：典型漏源导通电阻**



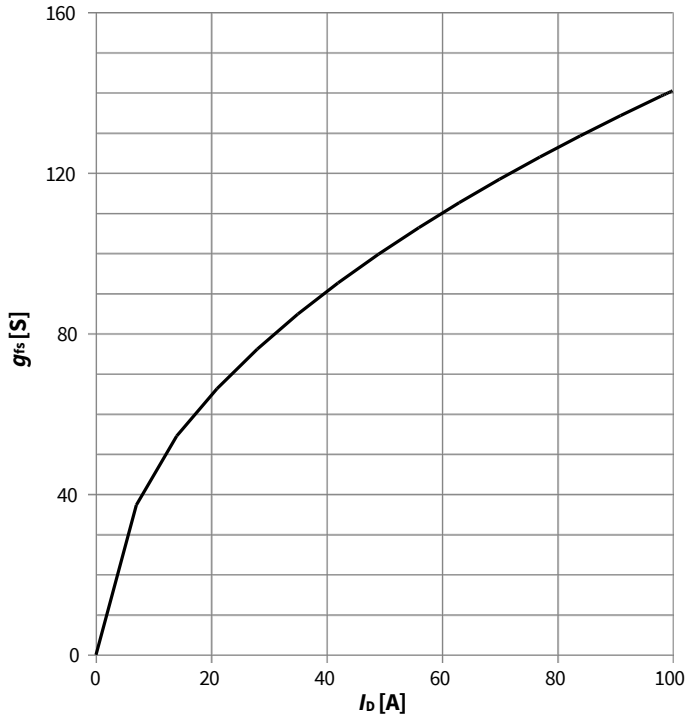

$R_{DS(on)}=f(I_D)$; $T_j$=25 °C; 参数: $V_{GS}$

**图 7：典型转移特性**



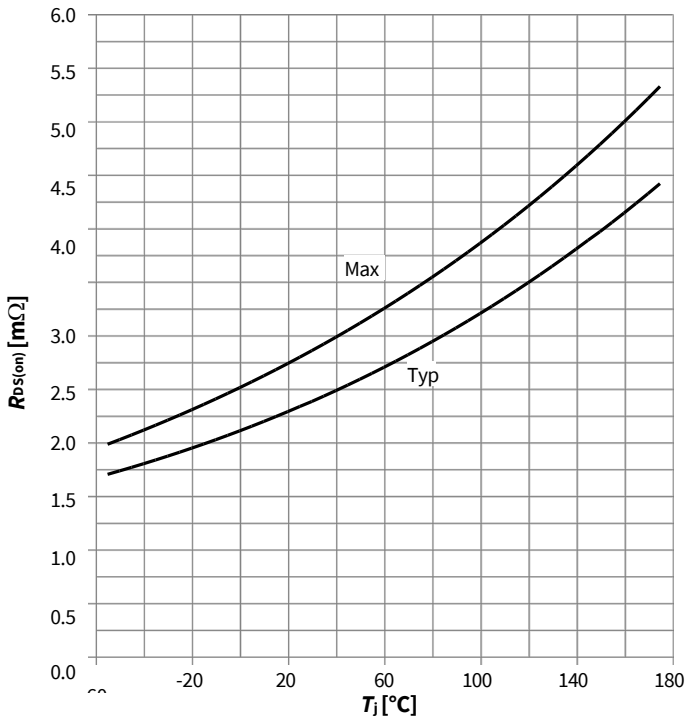

$I_D=f(V_{GS})$, $|V_{DS}|>2|I_D|R_{DS(on)max}$; 参数： $T_j$

**图 8：典型正向跨导**



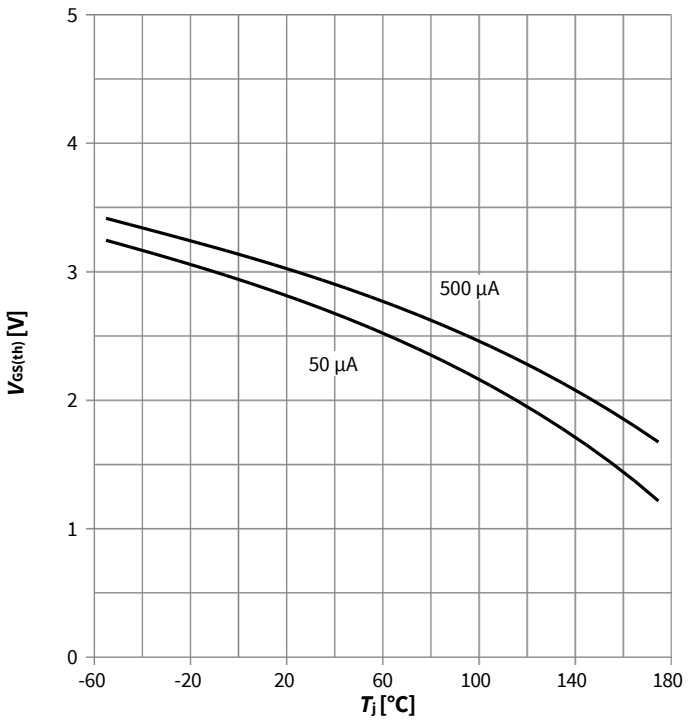

$g_{fs}=f(I_D)$; $T_j$=25 °C

**图 9：漏源导通电阻**



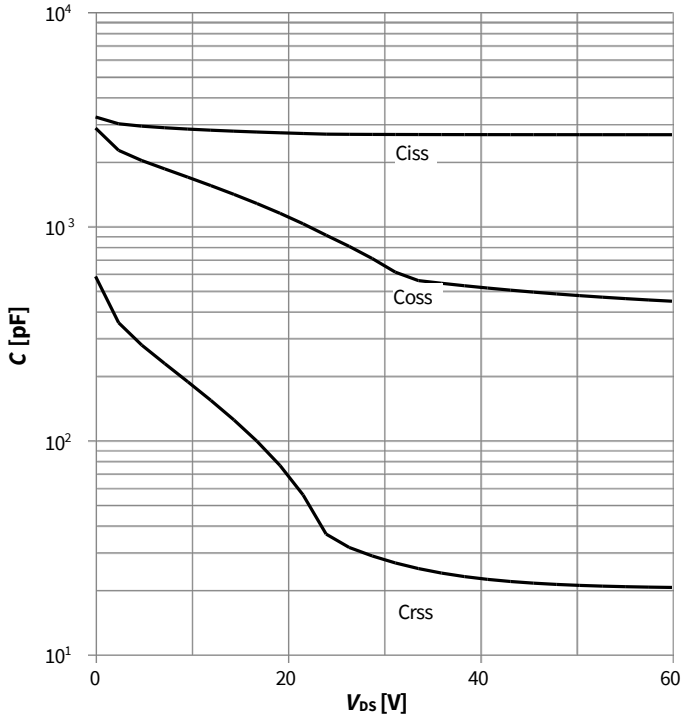

$R_{DS(on)}=f(T_j)$; $I_D$=50 A; $V_{GS}$=10 V

**图 10：典型栅极阈值电压**



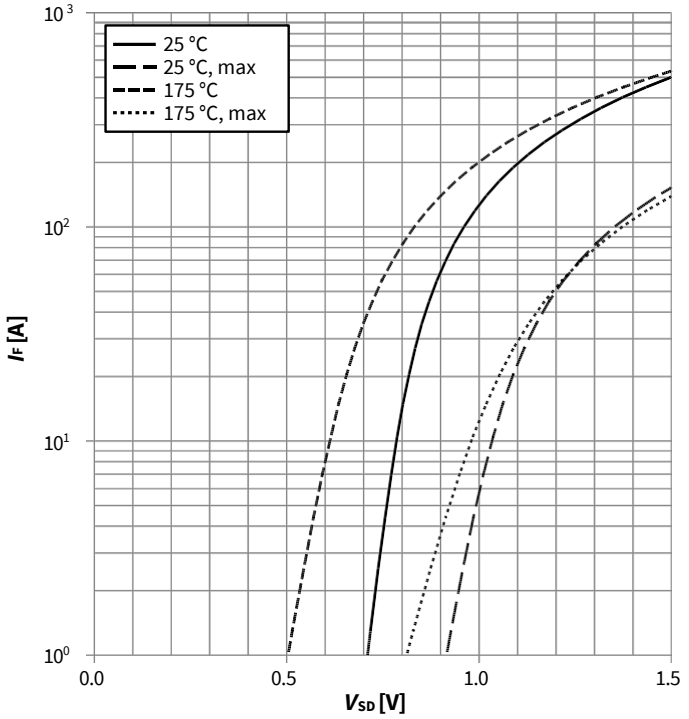

$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$

**图 11：典型电容值**



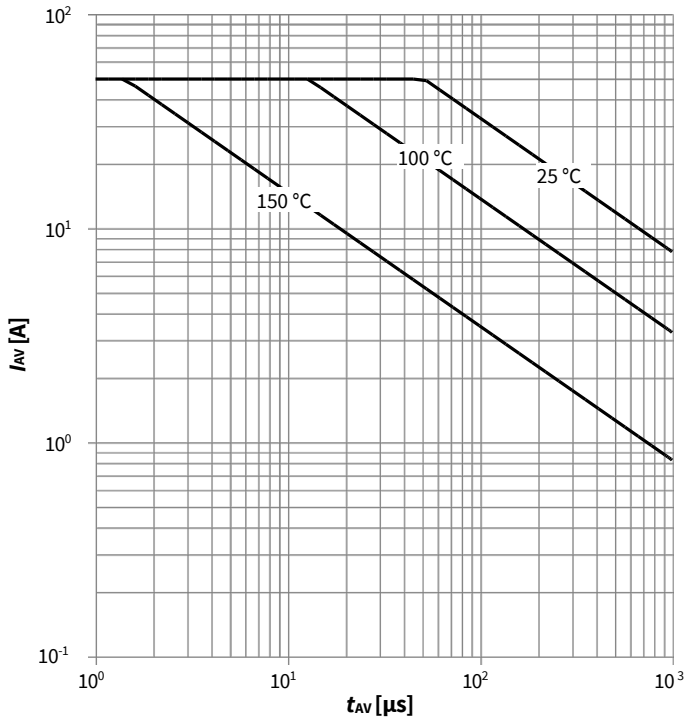

$C=f(V_{DS})$; $V_{GS}$=0 V; $f$=1 MHz

**图 12：反向二极管的正向特性**



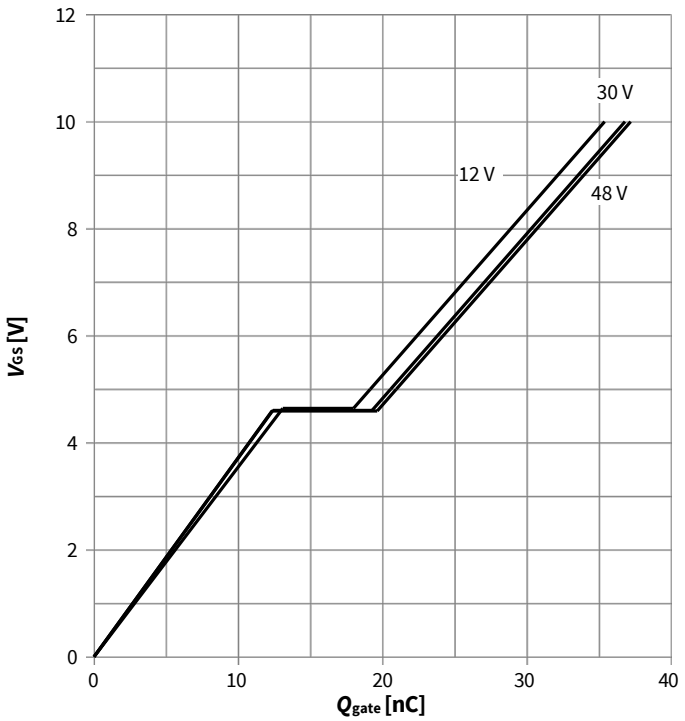

$I_F=f(V_{SD})$; 参数：$T_j$

**图 13：雪崩特性**



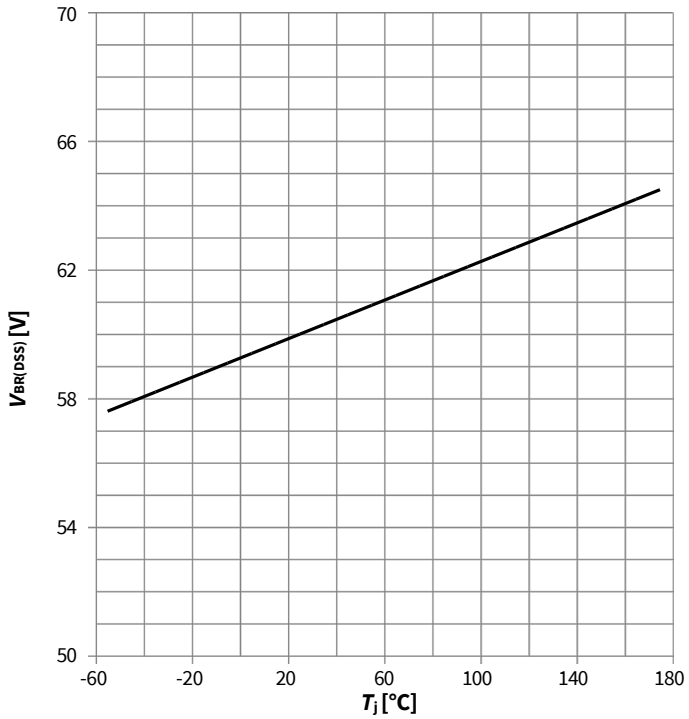

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω; parameter: $T_{j(start)}$

**图 14：典型栅极电荷**



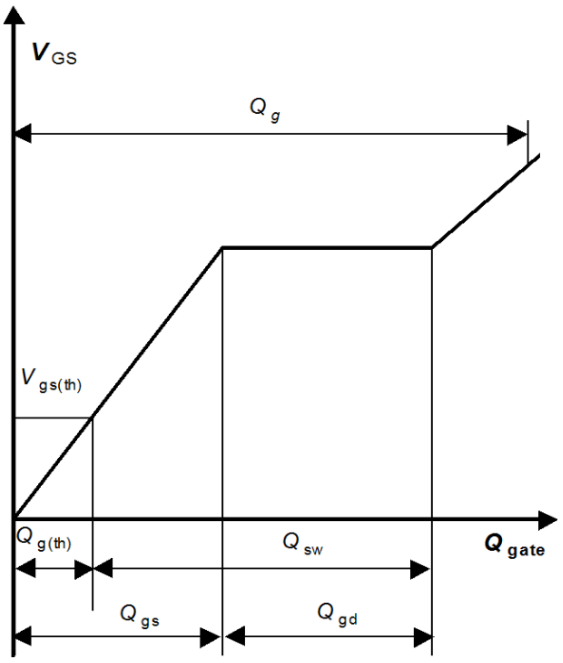

$V_{GS}$=f($Q_{gate}$); $I_D$=50 A pulsed；参数：$V_{DD}$

**图 15：漏源击穿电压**

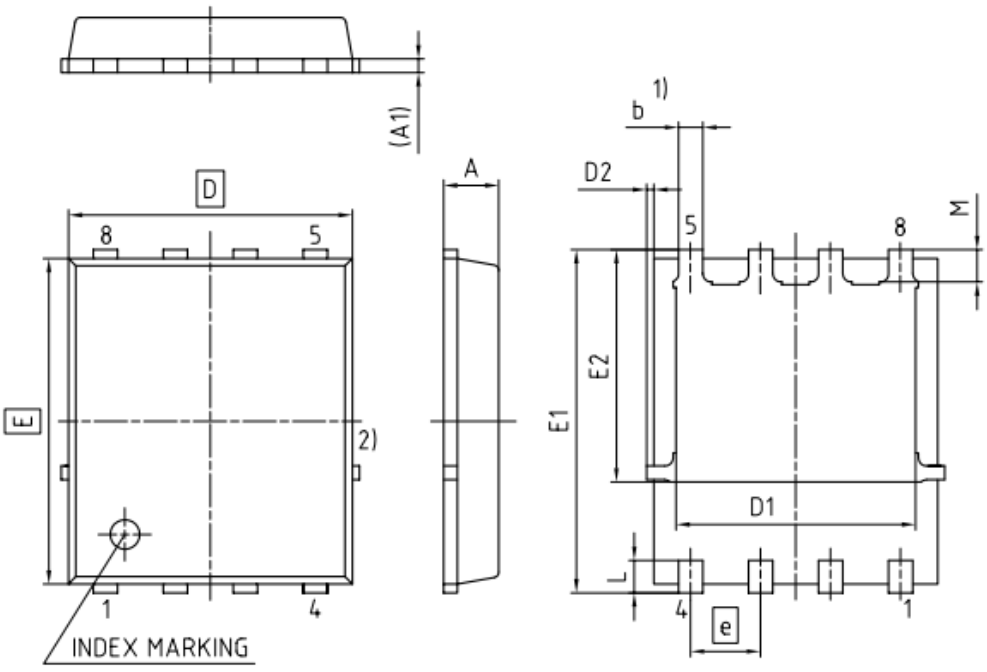



$V_{BR(DSS)}$ = f($T_j$); $I_D$ = 1 mA

图 栅极充电波形



## 5 封装外形




1) EXCLUDING MOLD FLASH
2) REMOVAL ON MOLD GATE
INTRUSION 0.1 MM
PROTRUSION 0.1 MM
LEAD LENGTH UP TO ANTI FLASH LINE
ALL METAL SURFACES ARE PLATED, EXCEPT AREA OF CUT

| DIMENSION | MILLIMETERS | |
|---|---|---|
| | MIN. | MAX. |
| A | 0.90 | 1.20 |
| A1 | 0.15 | 0.35 |
| b | 0.34 | 0.54 |
| D | 4.80 | 5.35 |
| D1 | 3.90 | 4.40 |
| D2 | 0.03 | 0.23 |
| E | 5.70 | 6.00 |
| E1 | 5.90 | 6.42 |
| E2 | 3.88 | 4.31 |
| e | 1.27 | |
| L | 0.45 | 0.71 |
| M | 0.45 | 0.69 |

| |
|---|
| DOCUMENT NO. Z8B00003332 |
| REVISION 07 |
| SCALE 10:1 0 1 2 3mm |
| EUROPEAN PROJECTION |
| ISSUE DATE 06.06.2019 |

**图 1 PG-TDSON-8 外形图，尺寸单位为毫米**

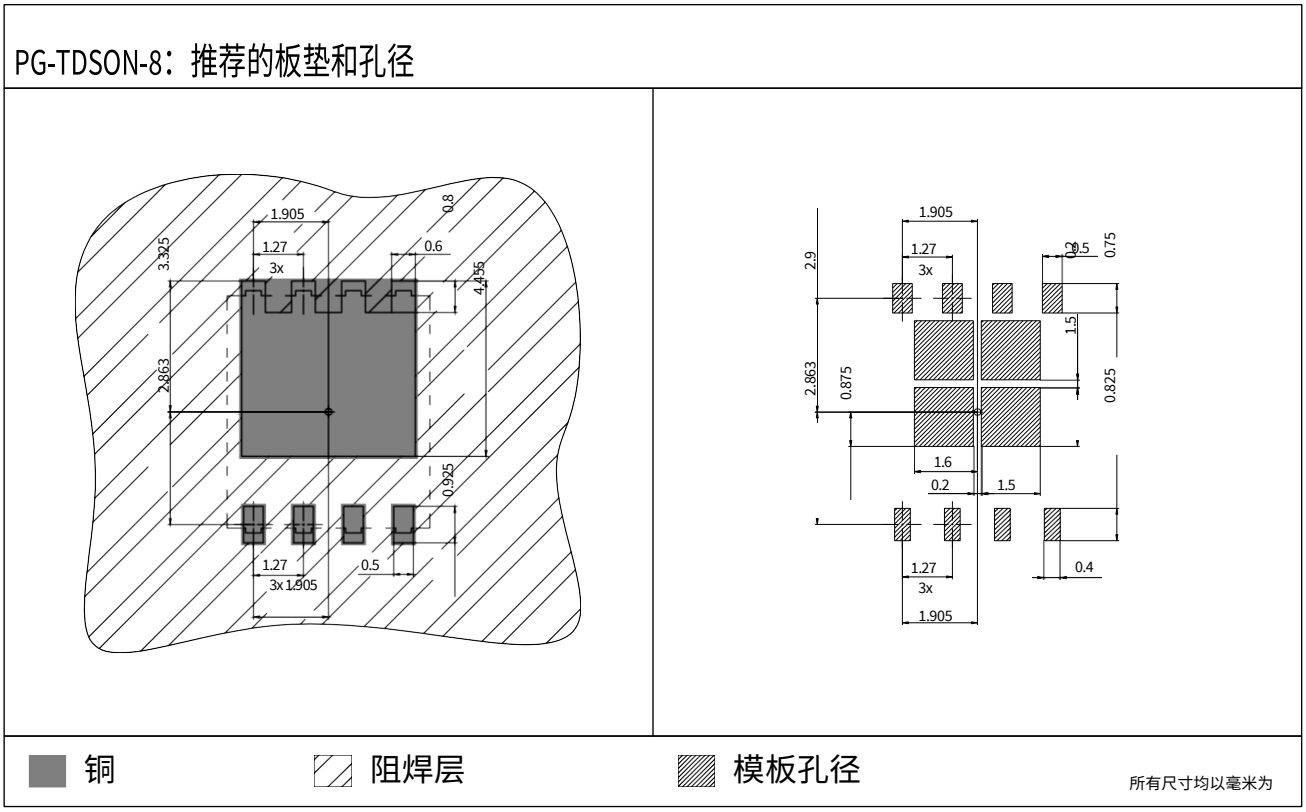
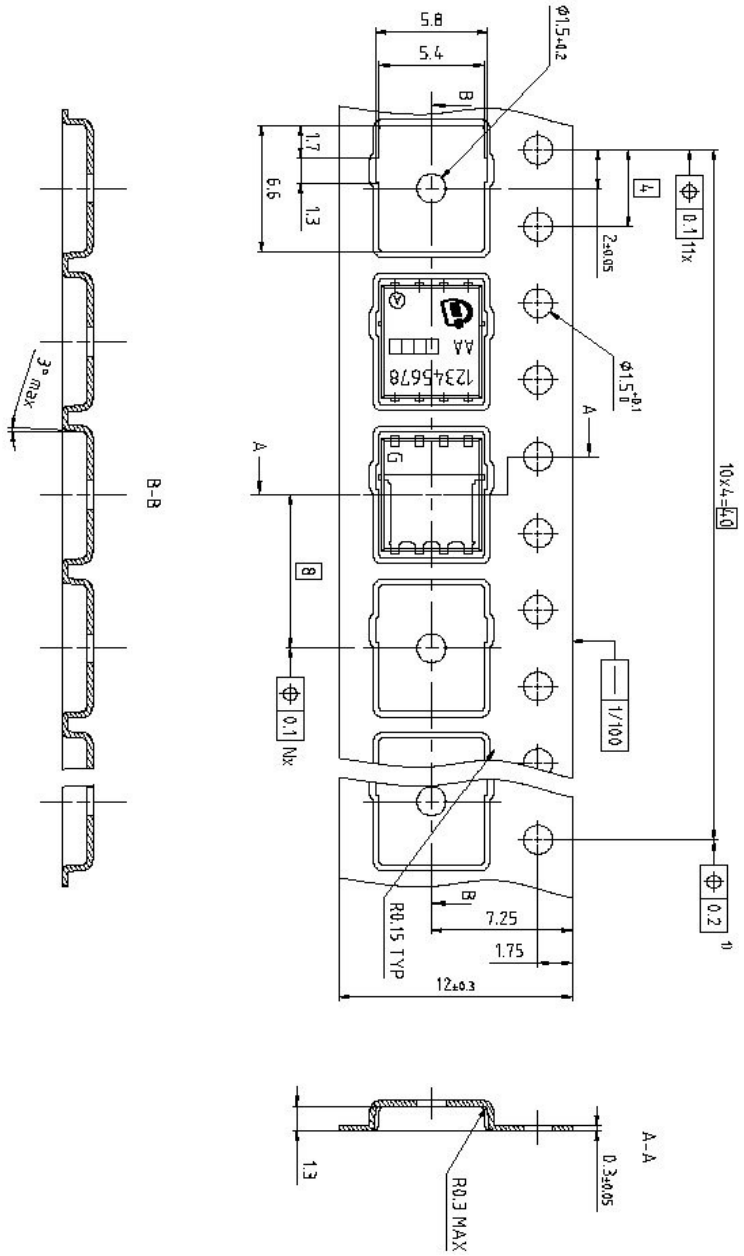



图 2　　外形板焊盘 (TDSON-8)，尺寸单位为毫米




*尺寸（毫米）*

图3　　封装外形胶带（TDSON-8）

## 修订记录

BSC028N06NST

Revision: 2020-09-21, Rev. 2.4

历史修订版本

| Revision | Date | Subjects (major changes since last revision) |
|---|---|---|
| 2.0 | 2017-03-02 | Release of final version |
| 2.1 | 2017-10-19 | Update footnotes |
| 2.2 | 2019-01-22 | Update "Marking" |
| 2.3 | 2020-02-04 | Update package drawings |
| 2.4 | 2020-09-21 | Update current rating |

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**Edition 2025-04-21**
**Published by**

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