

## 英飞凌100V 175°C N沟道

### 增强型OptiMOS™ -T2 功率晶体管



#### 特点

- N沟道-增强模式
- 通过 AEC-Q101 认证
- MSL1 回流焊峰值温度高达 260°C
- 工作温度 175°C
- 符合 RoHS 标准
- 100% 雪崩测试

| Type           | Package      | Marking |
|----------------|--------------|---------|
| IPB180N10S4-02 | PG-TO263-7-3 | 4N1002  |

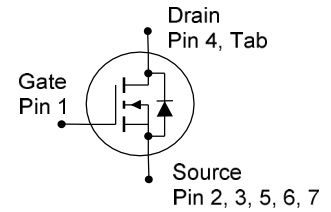
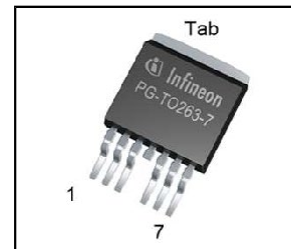
除非另有规定，否则均为  $T_j=25^\circ\text{C}$  的**最大额定值**。

| Parameter                                     | Symbol         | Conditions                                       | Value        | Unit |
|-----------------------------------------------|----------------|--------------------------------------------------|--------------|------|
| Continuous drain current                      | $I_D$          | $T_C=25^\circ\text{C}, V_{GS}=10\text{V}^{(1)}$  | 180          | A    |
|                                               |                | $T_C=100^\circ\text{C}, V_{GS}=10\text{V}^{(2)}$ | 171          |      |
| Pulsed drain current <sup>(2)</sup>           | $I_{D,pulse}$  | $T_C=25^\circ\text{C}$                           | 720          |      |
| Avalanche energy, single pulse <sup>(2)</sup> | $E_{AS}$       | $I_D=90\text{A}$                                 | 1110         | mJ   |
| Avalanche current, single pulse               | $I_{AS}$       | -                                                | 180          | A    |
| Gate source voltage                           | $V_{GS}$       | -                                                | $\pm 20$     | V    |
| Power dissipation                             | $P_{tot}$      | $T_C=25^\circ\text{C}$                           | 300          | W    |
| Operating and storage temperature             | $T_j, T_{stg}$ | -                                                | -55 ... +175 | °C   |
| IEC climatic category; DIN IEC 68-1           | -              | -                                                | 55/175/56    |      |

#### 产品概述

|              |     |    |
|--------------|-----|----|
| $V_{DS}$     | 100 | V  |
| $R_{DS(on)}$ | 2.5 | mΩ |
| $I_D$        | 180 | A  |

PG-TO263-7-3



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| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

## 热特性<sup>2)</sup>

|                                     |            |                                             |   |   |     |     |
|-------------------------------------|------------|---------------------------------------------|---|---|-----|-----|
| Thermal resistance, junction - case | $R_{thJC}$ | -                                           | - | - | 0.5 | K/W |
| SMD version, device on PCB          | $R_{thJA}$ | minimal footprint                           | - | - | 62  |     |
|                                     |            | 6cm <sup>2</sup> cooling area <sup>3)</sup> | - | - | 40  |     |

除非另有规定，否则均为 $T_j=25^\circ\text{C}$ 的电气特性。

## 静态参数特性

|                                  |               |                                                      |     |     |     |            |
|----------------------------------|---------------|------------------------------------------------------|-----|-----|-----|------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=1mA$                                 | 100 | -   | -   | V          |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=275\mu A$                        | 2.0 | 2.7 | 3.5 |            |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=100V, V_{GS}=0V, T_j=25^\circ\text{C}$       | -   | 0.1 | 1   | $\mu A$    |
|                                  |               | $V_{DS}=100V, V_{GS}=0V, T_j=125^\circ\text{C}^{2)}$ | -   | 10  | 100 |            |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20V, V_{DS}=0V$                              | -   | -   | 100 | nA         |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=10V, I_D=100A$                               | -   | 2.0 | 2.5 | m $\Omega$ |

| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

### 动态参数特性<sup>2)</sup>

|                              |              |                                                          |   |       |       |    |
|------------------------------|--------------|----------------------------------------------------------|---|-------|-------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0V, V_{DS}=25V,$<br>$f=1MHz$                     | - | 11240 | 14600 | pF |
| Output capacitance           | $C_{oss}$    |                                                          | - | 3660  | 4760  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                          | - | 230   | 460   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=50V, V_{GS}=10V,$<br>$I_D=180A, R_G=1.6\ \Omega$ | - | 15    | -     | ns |
| Rise time                    | $t_r$        |                                                          | - | 9     | -     |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                          | - | 30    | -     |    |
| Fall time                    | $t_f$        |                                                          | - | 40    | -     |    |

### 栅极电荷特性<sup>2)</sup>

|                       |               |                                                     |   |     |     |    |
|-----------------------|---------------|-----------------------------------------------------|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=80V, I_D=180A,$<br>$V_{GS}=0\text{ to }10V$ | - | 52  | 68  | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                     | - | 30  | 60  |    |
| Gate charge total     | $Q_g$         |                                                     | - | 156 | 200 |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                     | - | 4.7 | -   | V  |

### 反向二极管

|                                                |               |                                             |   |     |     |    |
|------------------------------------------------|---------------|---------------------------------------------|---|-----|-----|----|
| Diode continuous forward current <sup>2)</sup> | $I_S$         | $T_C=25^\circ C$                            | - | -   | 180 | A  |
| Diode pulse current <sup>2)</sup>              | $I_{S,pulse}$ |                                             | - | -   | 720 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0V, I_F=100A,$<br>$T_j=25^\circ C$  | - | 1.0 | 1.2 | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=50V, I_F=50A,$<br>$di_F/dt=100A/\mu s$ | - | 100 | -   | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |                                             | - | 230 | -   | nC |

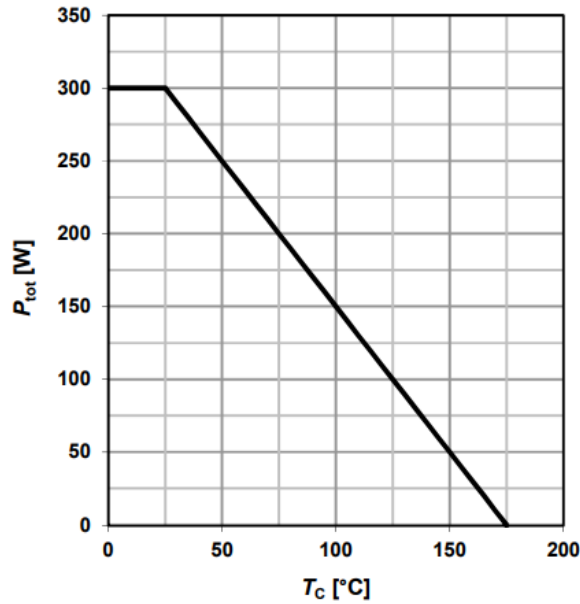
<sup>1)</sup> 电流受封装限制；当  $R_{thJC} = 0.5\text{ K/W}$  时，该芯片在  $25^\circ C$  时能够承载 242 A。

<sup>2)</sup> 由设计标定，不受限于生产测试。

<sup>3)</sup> 器件安装在  $40\text{ mm} \times 40\text{ mm} \times 1.5\text{ mm}$  环氧树脂印刷电路板 FR4 上，漏极连接用铜面积为  $6\text{ cm}^2$ （一层， $70\ \mu m$  厚）。印刷电路板垂直放置在静止空气中。

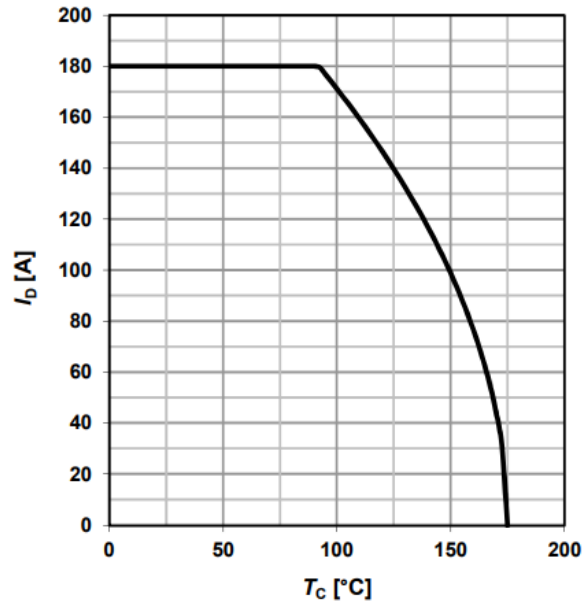
### 1 功率耗散

$$P_{\text{tot}} = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



### 2 漏极电流

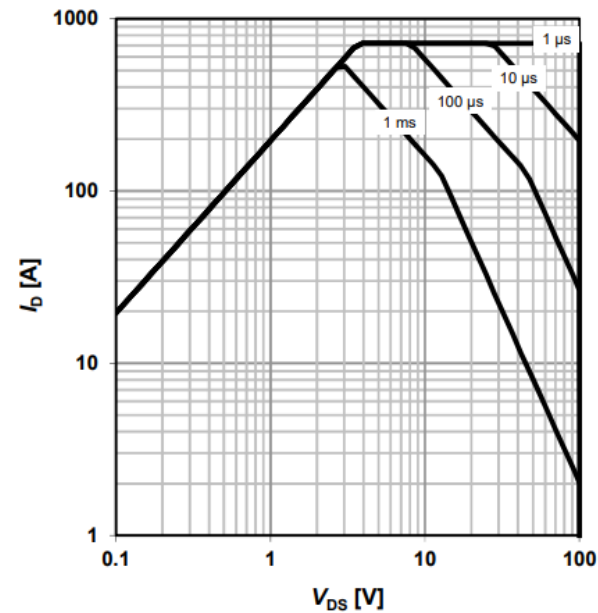
$$I_D = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



### 3 安全工作区

$$I_D = f(V_{\text{DS}}); T_C = 25^\circ\text{C}; D = 0$$

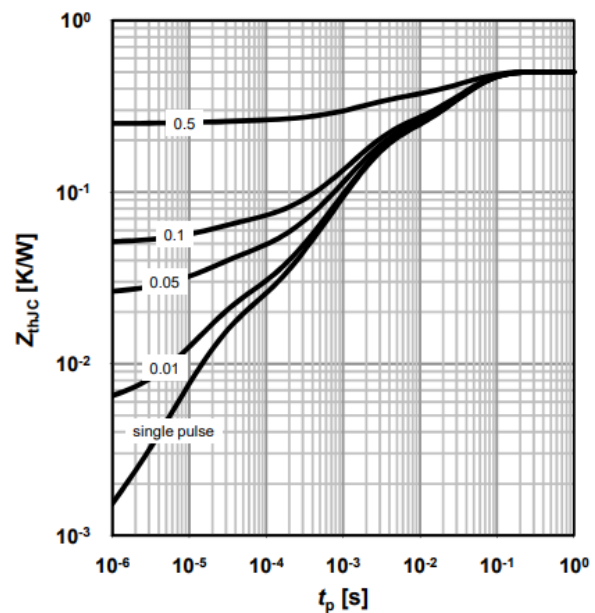
parameter:  $t_p$



### 4 最大瞬态热阻抗

$$Z_{\text{thJC}} = f(t_p)$$

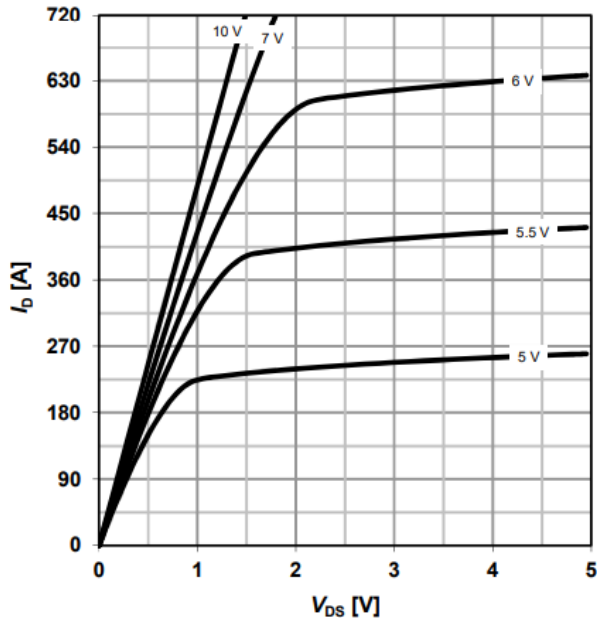
parameter:  $D = t_p/T$



## 5 典型输出特性

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

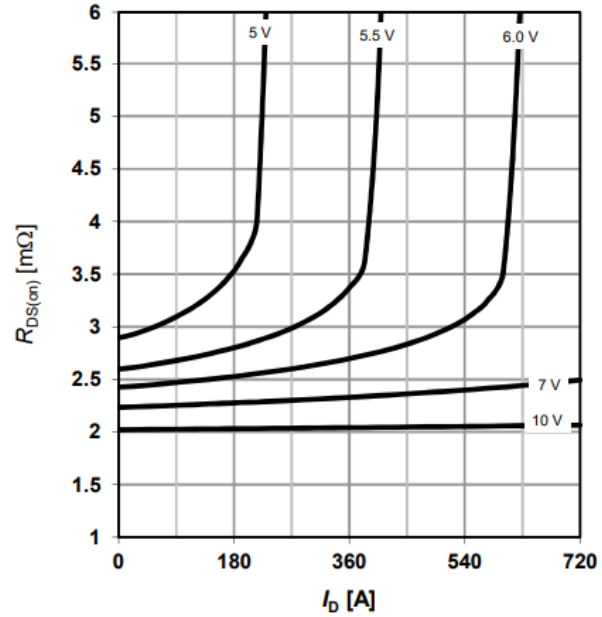
parameter:  $V_{GS}$



## 6 典型漏源导通电阻

$$R_{DS(on)} = (I_D); T_j = 25^\circ\text{C}$$

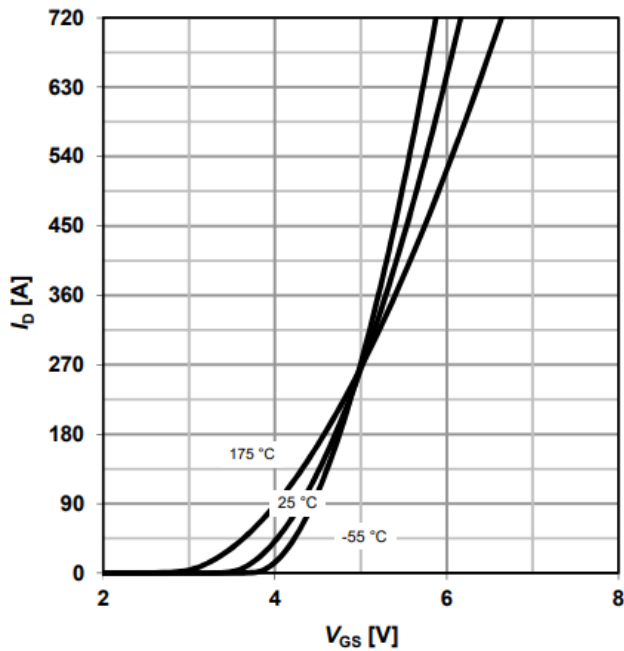
parameter:  $V_{GS}$



## 7 典型转移特性

$$I_D = f(V_{GS}); V_{DS} = 6\text{ V}$$

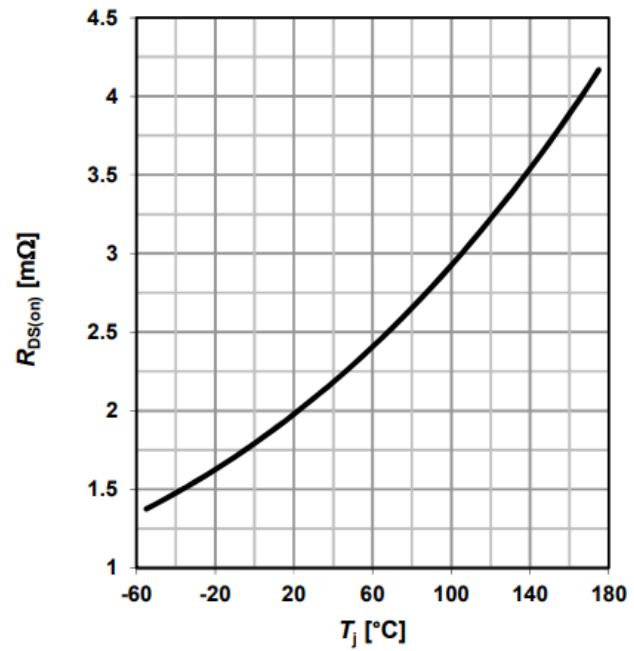
parameter:  $T_j$



## 8 典型漏源导通电阻

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

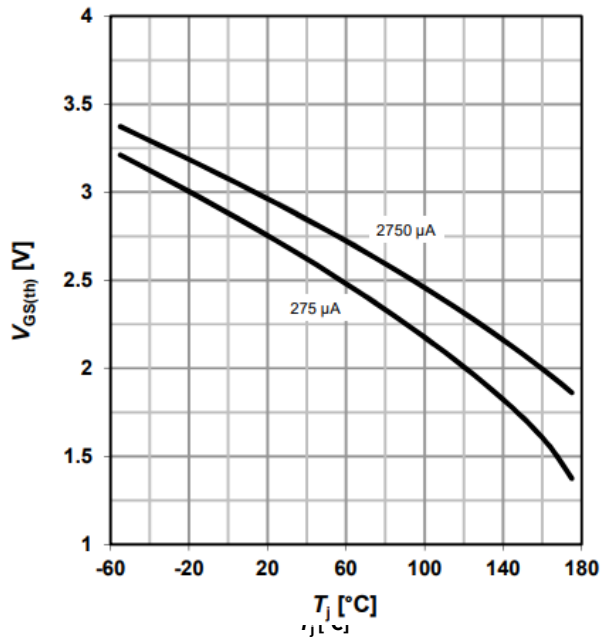
$\alpha = 0.4$



## 9 典型栅极阈值电压

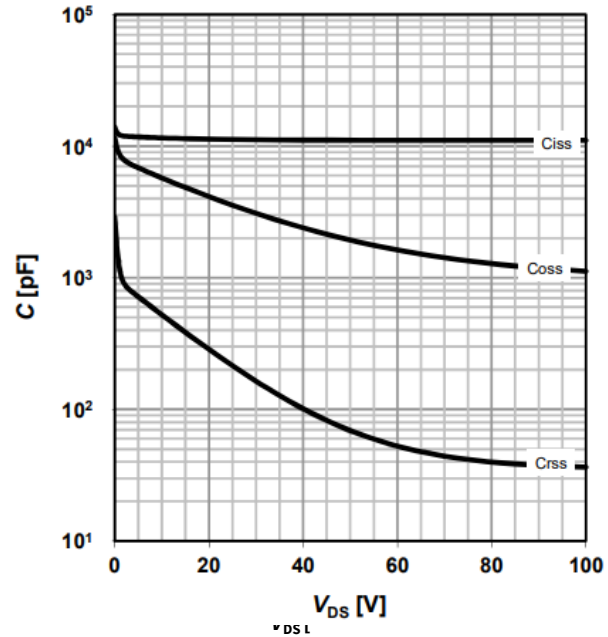
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



## 10 典型电容值

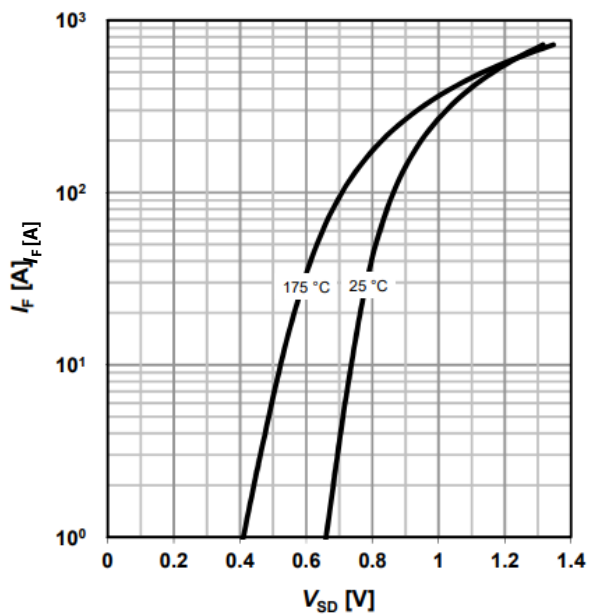
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



## 11 典型二极管正向导通特性

$$I_F = f(V_{SD})$$

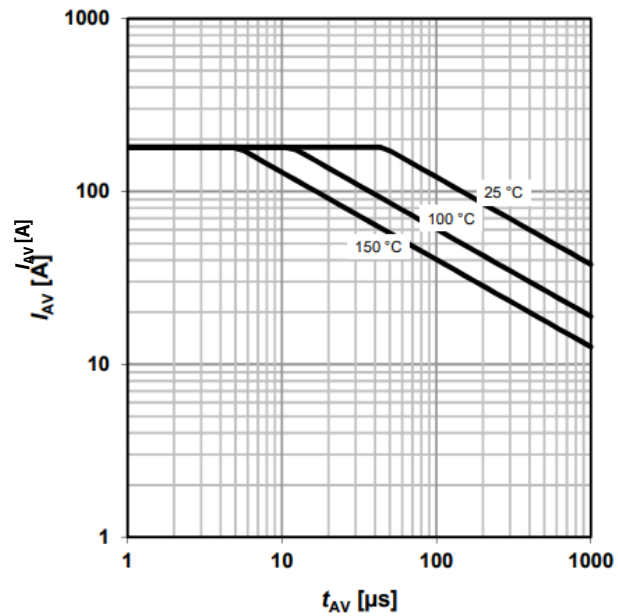
parameter:  $T_j$



## 12 典型雪崩特性

$$I_{AS} = f(t_{AV})$$

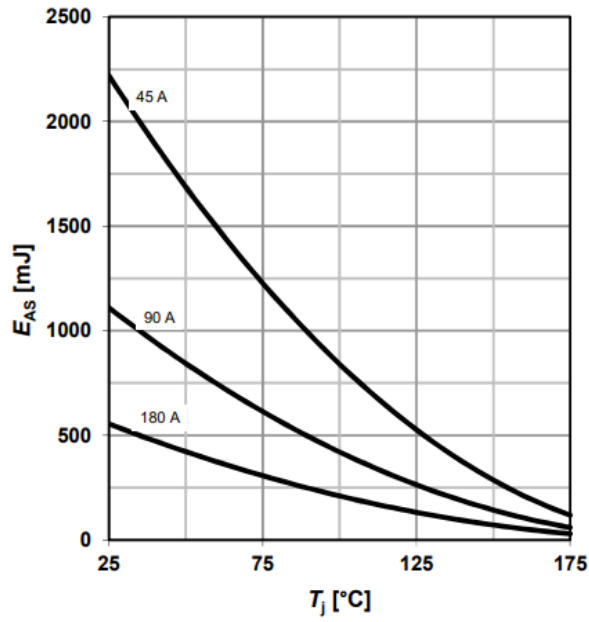
parameter:  $T_{j(start)}$



### 13 典型雪崩能量

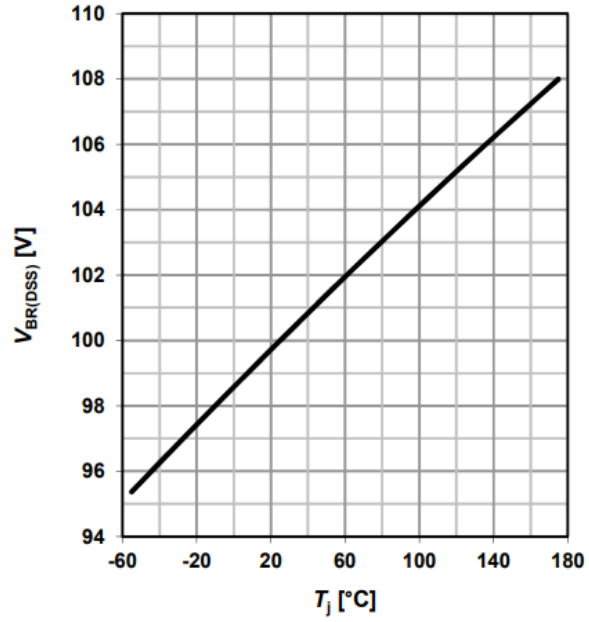
$$E_{AS} = f(T_J)$$

parameter:  $I_D$



### 14 漏源击穿电压

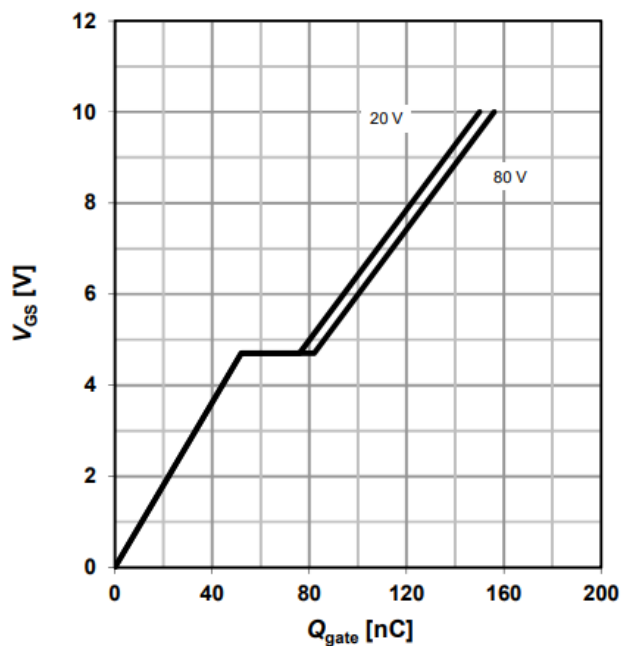
$$V_{BR(DSS)} = f(T_J); I_D = 1 \text{ mA}$$



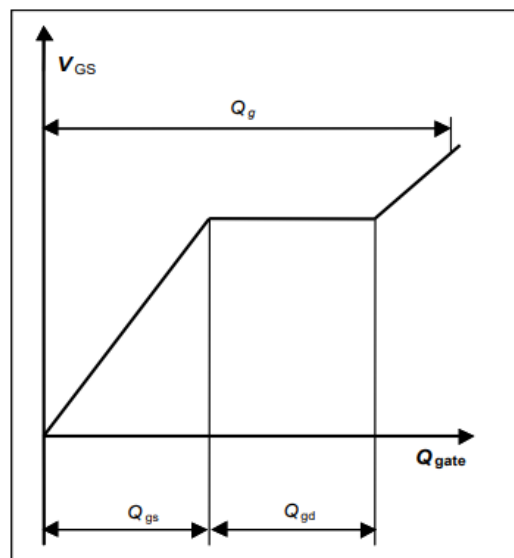
### 15 典型栅极电荷

$$V_{GS} = f(Q_{gate}); I_D = 180 \text{ A pulsed}$$

parameter:  $V_{DD}$



### 16 栅极充电波形



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## 修订记录

| Version      | Date       | Changes                                                                        |
|--------------|------------|--------------------------------------------------------------------------------|
| Revision 1.0 | 2013-01-30 | Final Data Sheet                                                               |
| Revision 1.1 | 2023-01-30 | Diagram 8 Typ. drain-source on-state resistance: used $\alpha$ value clarified |



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