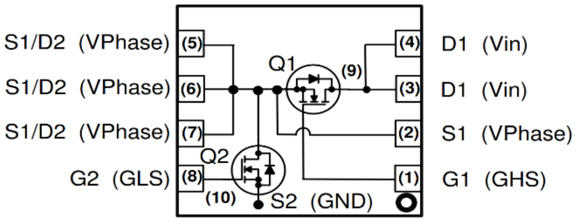
# 英飞凌功率模块

## 特性

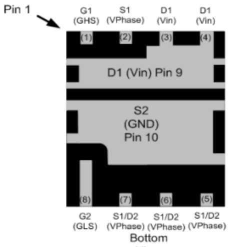
- 双非对称 N 沟道 OptiMOS™5 MOSFET
- 逻辑电平（额定4.5V）
- 无铅镀层；符合 RoHS 标准
- 针对高性能降压转换器进行了优化
- 符合 IEC61249-2-21 标准的无卤素
- 符合 JEDEC[1] 目标应用要求

### 产品概述

| | | Q1 | Q2 | |
|---|---|---|---|---|
| $V_{DS}$ | | 25 | 25 | V |
| $R_{DS(on),max}$ | $V_{GS}$=10 V | 3.5 | 0.9 | mΩ |
| | $V_{GS}$=4.5 V | 4.6 | 1.3 | |
| $I_D$ | | 50 | 50 | A |



Top view



Bottom View

| **Type** | **Package** | **Marking** |
|---|---|---|
| BSG0812ND | PG-TISON8-4 | 0812ND |

**最大额定值，**除非另有说明，否则均为 $T_j$=25 °C 。[2]

| **Parameter** | **Symbol** | **Conditions** | **Value** | | **Unit** |
|---|---|---|---|---|---|
| | | | **Q1** | **Q2** | |
| Continuous drain current | $I_D$ | $T_C$=70 °C, $V_{GS}$=10 V | 50 | 50 | A |
| | | $T_C$=70 °C, $V_{GS}$=4.5 V | 49 | 50 | |
| | | $T_A$=25 °C,<br>$V_{GS}$ =4.5 V[3] | 29 | 50 | |
| | | $T_A$=25 °C,<br>$V_{GS}$ =4.5 V[4] | 18 | 37 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_C$=70 °C | 160 | 160 | |
| Avalanche energy, single pulse | $E_{AS}$ | Q1: $I_D$=10 A,<br>Q2: $I_D$=20 A,<br>$R_{GS}$=25 Ω | 26 | 137 | mJ |
| Gate source voltage | $V_{GS}$ | | ±16 | | V |
| Power dissipation | $P_{tot}$ | $T_A$ =25 °C[3] | 6.25 | 6.25 | W |
| | | $T_A$=25 °C[4] | 2.5 | 2.5 | |
| Operating and storage temperature | $T_j$, $T_{stg}$ | | -55 ... 150 | | °C |
| IEC climatic category; DIN IEC 68-1 | | | 55/150/56 | | |

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[1] J-STD20 和 JESD22

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

### Thermal characteristics

| **Parameter** | | **Symbol** | **Conditions** | **min.** | **typ.** | **max.** | **Unit** |
|---|---|---|---|---|---|---|---|
| Thermal resistance, junction - case | Q1 | $R_{thJC}$ | | - | - | 4.3 | K/W |
| | Q2 | | | - | - | 1.8 | |
| Thermal resistance, junction - ambient[2] | Q1 | $R_{thJA}$ | Application specific board[3] | - | - | 20 | |
| | Q2 | | | | | | |
| | Q1 | | 6 $cm^2$ cooling area[4] | - | - | 50 | |
| | Q2 | | | | | | |

**Electrical characteristics,** at $T_j$=25 °C, unless otherwise specified

### Static characteristics

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | Q1 | $V_{(BR)DSS}$ | $V_{GS}$=0 V, $I_D$=1 mA | 25 [6] | - | - | V |
| | Q2 | | | | | | |
| Gate threshold voltage | Q1 | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250 µA | 1.2 | 1.6 | 2 | |
| | Q2 | | | | | | |
| Zero gate voltage drain current | Q1 | $I_{DSS}$ | $V_{DS}$=25 V, $V_{GS}$=0 V, $T_j$=25 °C | - | - | 1 | µA |
| | Q2 | | | | | | |
| | Q1 | | $V_{DS}$=25 V, $V_{GS}$=0 V, $T_j$=150 °C | - | - | 100 | |
| | Q2 | | | | | | |
| Gate-source leakage current | Q1 | $I_{GSS}$ | $V_{GS}$=20 V, $V_{DS}$=0 V | - | - | 100 | nA |
| | Q2 | | | | | | |
| Drain-source on-state resistance | Q1 | $R_{DS(on)}$ | $V_{GS}$=4.5 V, $I_D$=20 A | - | 3.7 | 4.6 | mν |
| | Q2 | | | - | 1.1 | 1.3 | |
| | Q1 | | $V_{GS}$=10 V, $I_D$=20 A | - | 2.8 | 3.5 | |
| | Q2 | | | - | 0.8 | 0.9 | |
| Gate resistance | Q1 | $R_G$ | | - | 0.7 | 1.2 | ν |
| | Q2 | | | - | 0.7 | 1.2 | |
| Transconductance | Q1 | $g_{fs}$ | $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, $I_D$=20 A | 47 | 94 | - | S |
| | Q2 | | | 90 | 180 | - | |

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[2] 两个晶体管中只有一个工作

[3] 8 层铜，厚度 70µm。PCB 处于静止空气中。

[4] 器件置于 40 mm x 40 mm x 1.5 mm 环氧 PCB FR4 上，配有 6 $cm^2$（一层，70 µm 厚）铜层面积用于漏极连接。PCB 在静止空气中垂直放置。

| **Parameter** | | **Symbol** | **Conditions** | **Values** | | | **Unit** |
|---|---|---|---|---|---|---|---|
| | | | | **min.** | **typ.** | **max.** | |
| **Dynamic characteristics** | | | | | | | |
| Input capacitance | Q1 | $C_{iss}$ | $V_{GS}$=0 V,<br>$V_{DS}$= 12 V, $f$=1 MHz | - | 780 | 1100 | pF |
| | Q2 | | | - | 2700 | 3700 | |
| Output capacitance | Q1 | $C_{oss}$ | | - | 390 | 520 | |
| | Q2 | | | - | 1400 | 1900 | |
| Reverse transfer capacitance | Q1 | $C_{rss}$ | | - | 38 | - | |
| | Q2 | | | - | 130 | - | |
| Turn-on delay time | Q1 | $t_{d(on)}$ | $V_{IN}$=12 V,<br>$V_{DRV}$=5 V,<br>$f_{SW}$=500 kHz,<br>$I_{OUT}$=30 A [5] | - | 4.3 | | ns |
| | Q2 | | | - | 5.6 | - | |
| Rise time | Q1 | $t_r$ | | - | 4.7 | - | |
| | Q2 | | | - | 4.3 | - | |
| Turn-off delay time | Q1 | $t_{d(off)}$ | | - | 4.3 | - | |
| | Q2 | | | - | 8.8 | - | |
| Fall time | Q1 | $t_f$ | | - | 1.4 | - | |
| | Q2 | | | - | 2.6 | - | |
| Gate Charge Characteristics | | | | | | | |
| Gate to source charge | Q1 | $Q_{gs}$ | $V_{DD}$=12 V,<br>$I_D$=30 A,<br>$V_{GS}$=0 to 4.5 V | - | 2.0 | - | nC |
| Gate to drain charge | | $Q_{gd}$ | | - | 1.4 | - | |
| Gate charge total | | $Q_g$ | | - | 5.6 | 8.4 | |
| Gate plateau voltage | | $V_{plateau}$ | | - | 2.6 | - | V |
| Gate to source charge | Q2 | $Q_{gs}$ | | - | 6.4 | - | nC |
| Gate to drain charge | | $Q_{gd}$ | | - | 4.7 | - | |
| Gate charge total | | $Q_g$ | | - | 20 | 29 | |
| Gate plateau voltage | | $V_{plateau}$ | | - | 2.3 | - | V |
| Output charge | Q1 | $Q_{oss}$ | $V_{DD}$=12 V, $V_{GS}$=0 V | - | 8 | - | nC |
| | Q2 | | | - | 27 | - | |

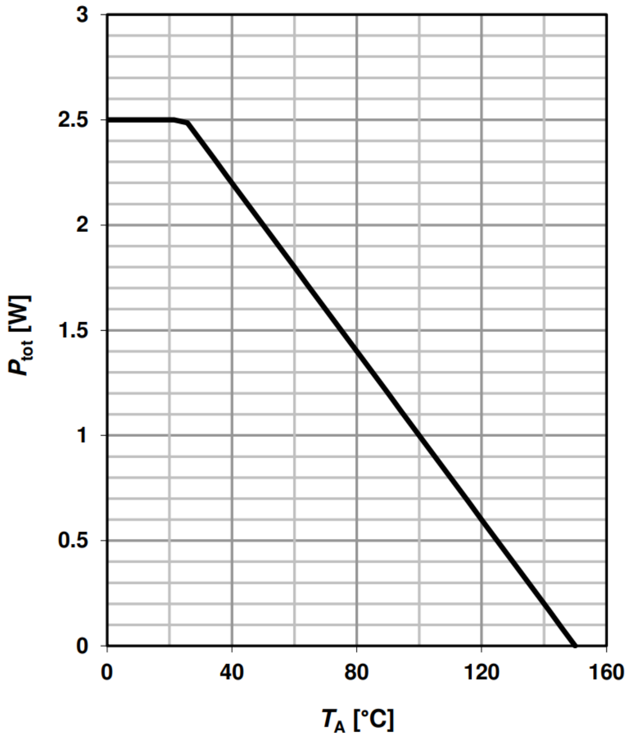
[5] 欲了解更多信息，请参见应用笔记 n° TBD

[6] 在频率为 600 kHz、降压转换器最大输入电压 $V_{IN}$=16 V 时，器件可承受电压不超过 30 V、持续时间不超过 2 ns 的脉冲。

| **Parameter** | | **Symbol** | **Conditions** | **Values** | | | **Unit** |
|---|---|---|---|---|---|---|---|
| | | | | **min.** | **typ.** | **max.** | |
| **Reverse Diode** | | | | | | | |
| Diode continuous forward current | Q1 | $I_S$ | $T_C$=25 °C | - | - | 29 | A |
| | Q2 | | | - | - | 50 | |
| Diode pulse current | Q1 | $I_{S,pulse}$ | | - | - | 160 | |
| | Q2 | | | - | - | 160 | |
| Diode forward voltage | Q1 | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=20 A,<br>$T_j$=25 °C | - | 0.84 | 1 | V |
| | Q2 | | | - | 0.77 | 1 | |
| Reverse recovery charge | Q1 | $Q_{rr}$ | $V_R$=12 V, $I_F$=$I_S$,<br>d$i_F$/d$t$ =100 A/µs | - | 10 | - | nC |
| | Q2 | | | - | 20 | - | |

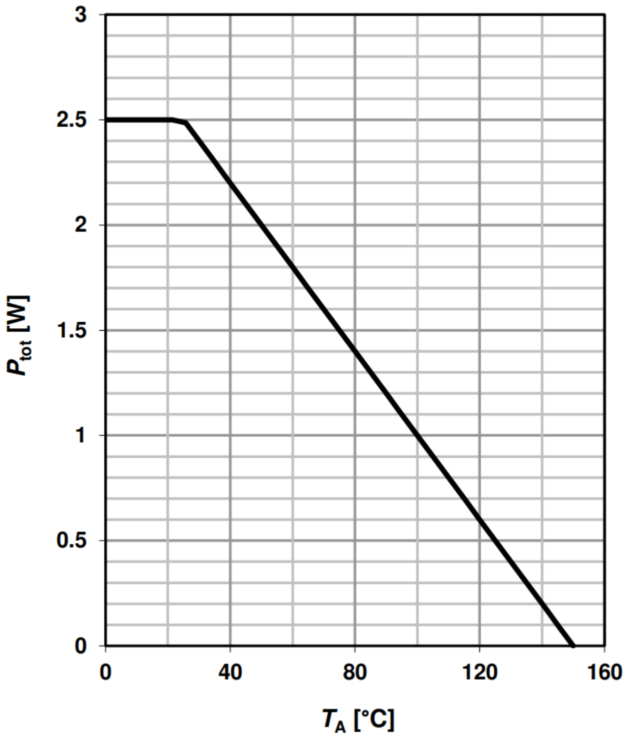
**1 Power dissipation (Q1)**

$P_{tot}$=f($T_A$)$^{4)}$



**2 Power dissipation (Q2)**

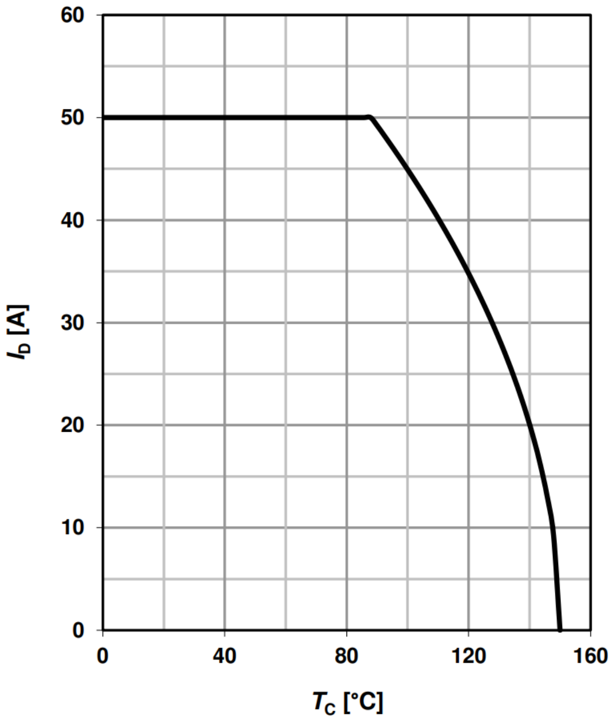
$P_{tot}$=f($T_A$)$^{4)}$



**3 Drain current (Q1)**

$I_D$=f($T_C$)

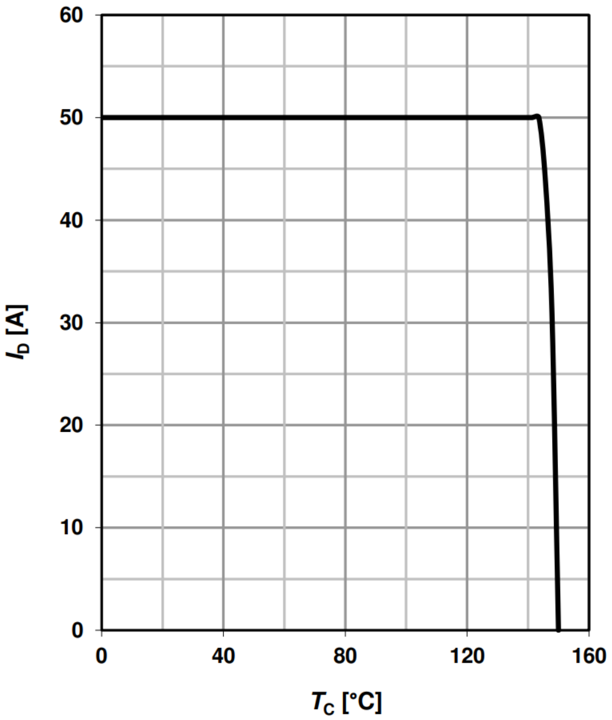
parameter: $V_{GS}$≥10 V



**4 Drain current (Q2)**

$I_D$=f($T_C$)

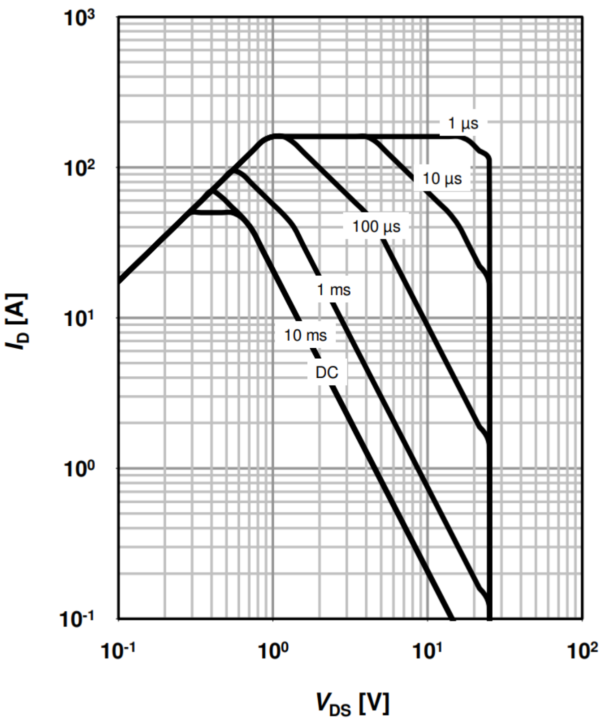
parameter: $V_{GS}$≥10 V



### 5 Safe operating area (Q1)

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

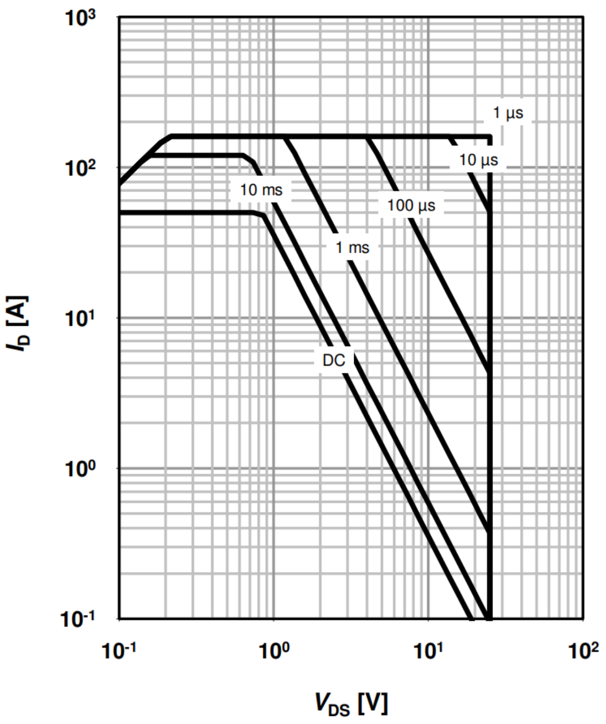
parameter: $t_p$



### 6 Safe operating area (Q2)

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

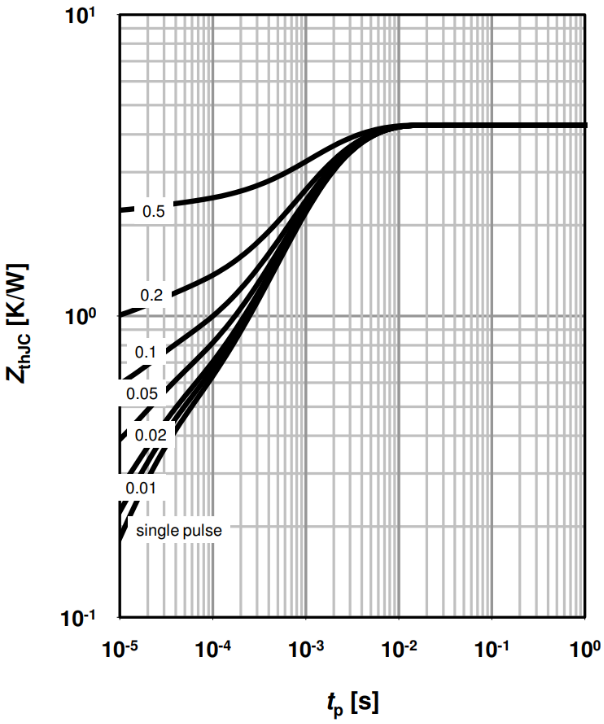
parameter: $t_p$



### 7 Max. transient thermal impedance (Q1)

$Z_{thJC}=f(t_p)$

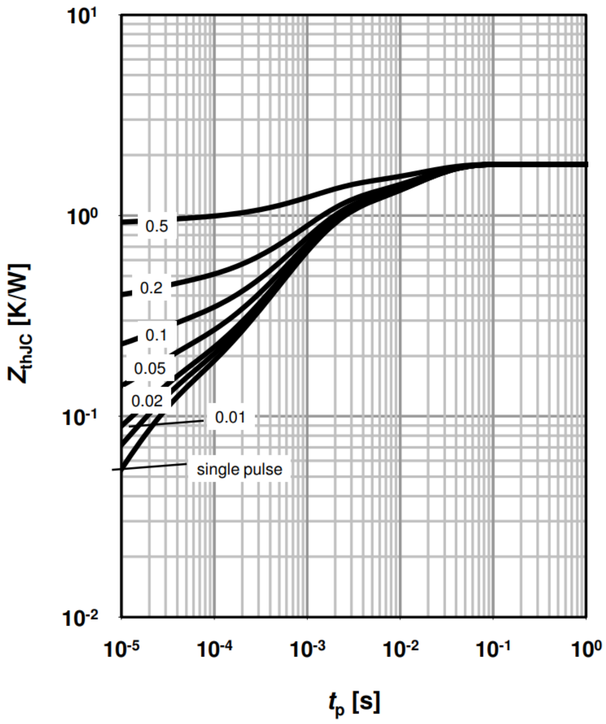
parameter: $D=t_p/T$



### 8 Max. transient thermal impedance (Q2)

$Z_{thJC}=f(t_p)$

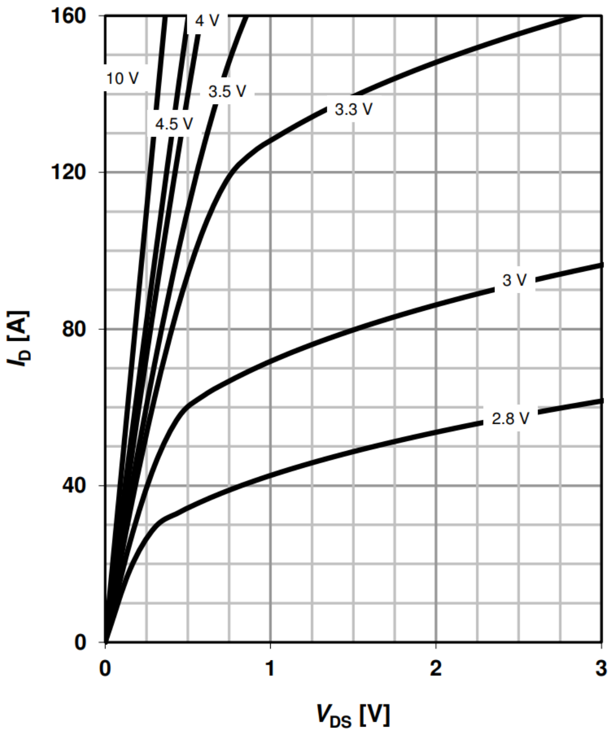
parameter: $D=t_p/T$



## 9 Typ. output characteristics (Q1)

$I_D$=f($V_{DS}$); $T_j$=25 °C

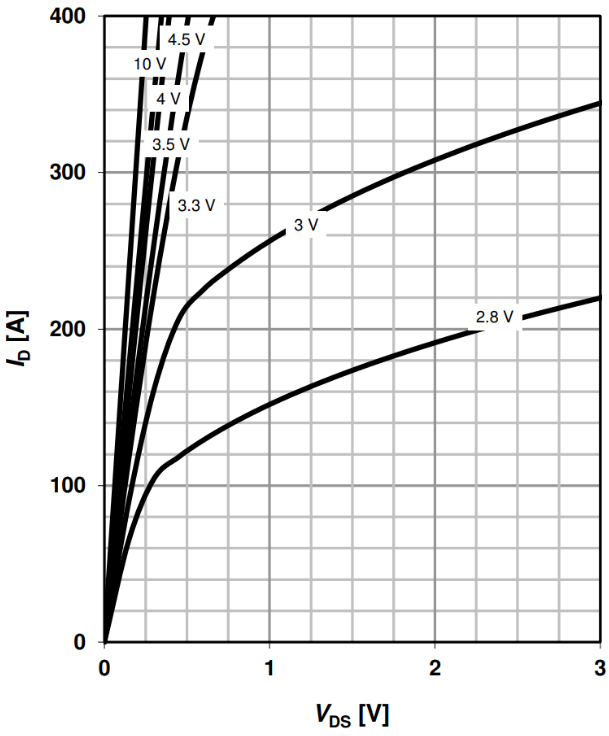
parameter: $V_{GS}$



## 10 Typ. output characteristics (Q2)

$I_D$=f($V_{DS}$); $T_j$=25 °C

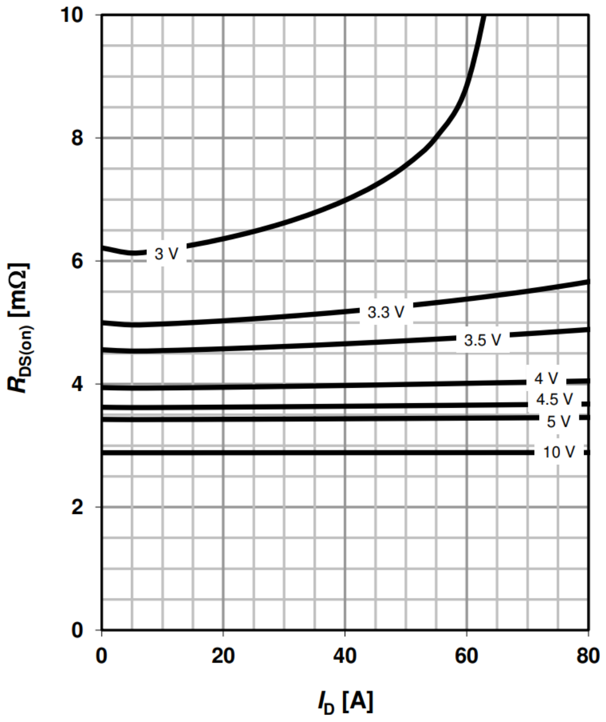
parameter: $V_{GS}$



## 11 Typ. drain-source on resistance (Q1)

$R_{DS(on)}$=f($I_D$); $T_j$=25 °C

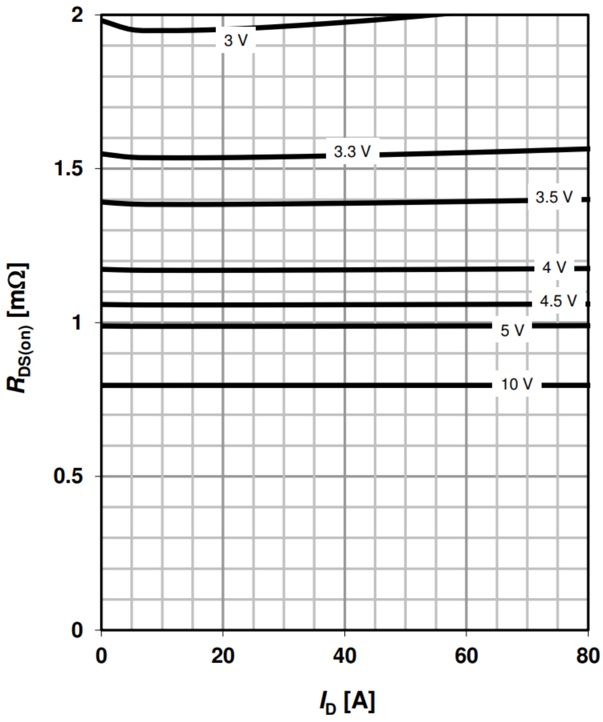
parameter: $V_{GS}$



## 12 Typ. drain-source on resistance (Q2)

$R_{DS(on)}$=f($I_D$); $T_j$=25 °C

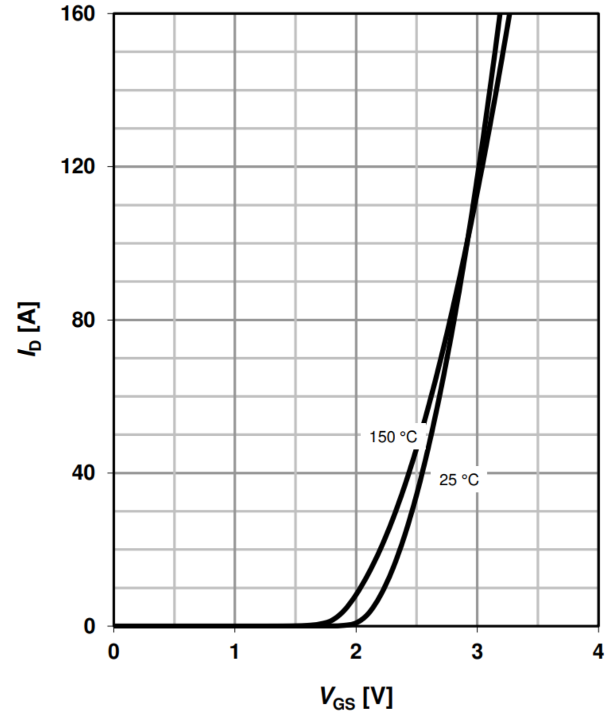
parameter: $V_{GS}$



## 13 Typ. transfer characteristics (Q1)

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

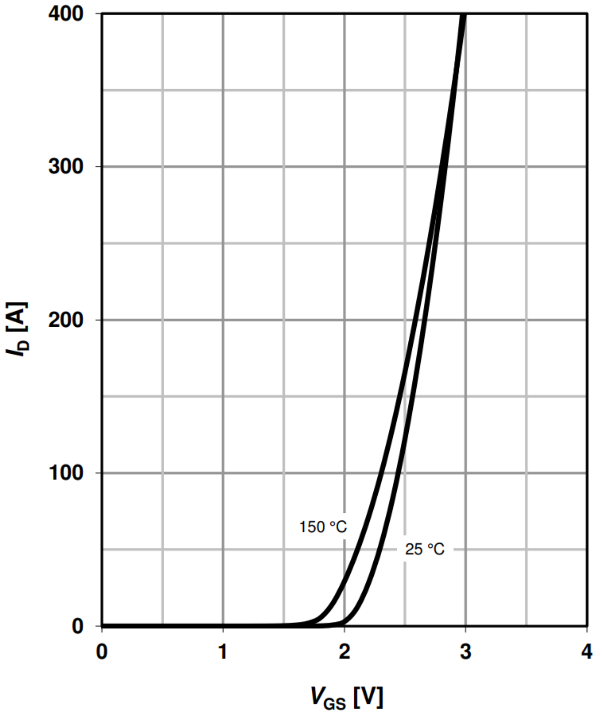
parameter: $T_j$



## 14 Typ. transfer characteristics (Q2)

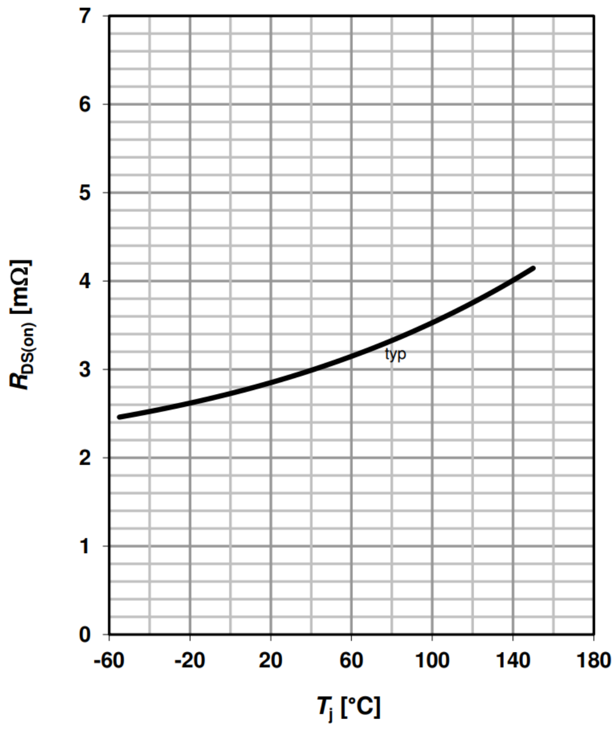
$I_D$=f($V_{GS}$); /$V_{DS}$ |>2 | $I_D$/ $R_{DS(on)max}$

parameter: $T_j$



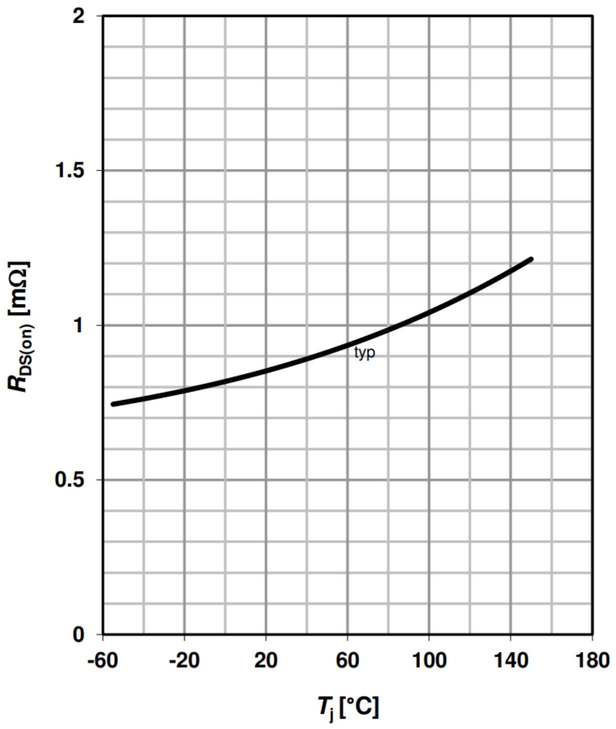
## 15 Drain-source on-state resistance (Q1)

$R_{DS(on)}$=f($T_j$); $I_D$=20 A; $V_{GS}$=10 V



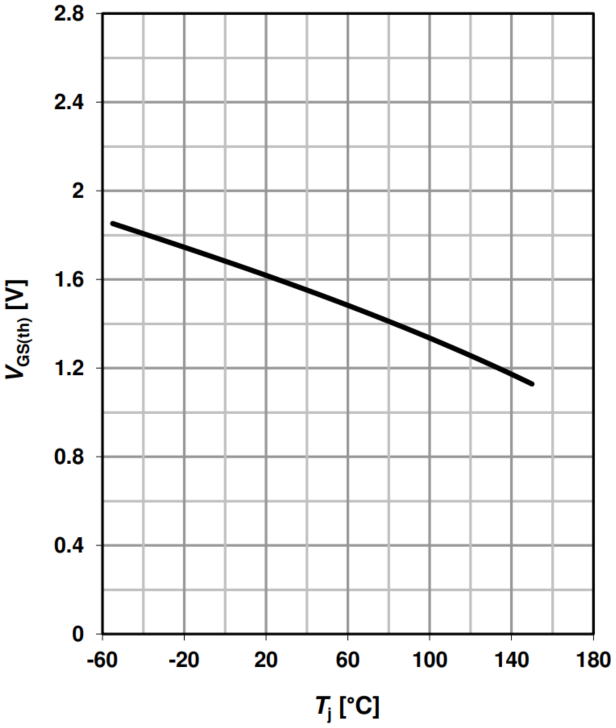
## 16 Drain-source on-state resistance (Q2)

$R_{DS(on)}$=f($T_j$); $I_D$=20 A; $V_{GS}$=10 V



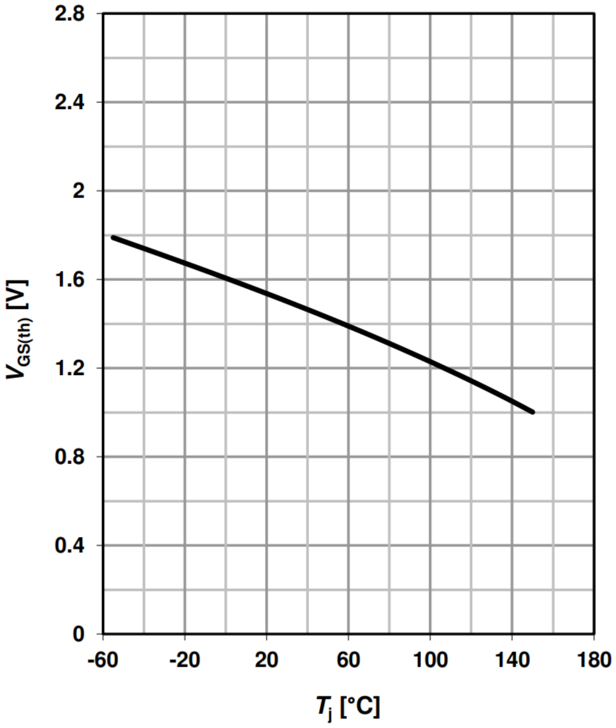
### 17 Typ. gate threshold voltage (Q1)

$V_{GS(th)}$=f($T_j$); $V_{GS}$=$V_{DS}$; $I_D$=250 µA



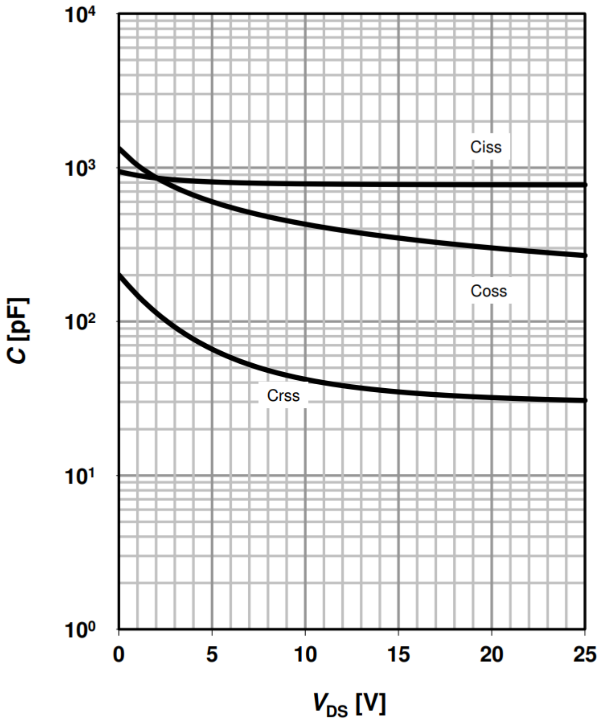
### 18 Typ. gate threshold voltage (Q2)

$V_{GS(th)}$=f($T_j$); $V_{GS}$=$V_{DS}$; $I_D$=250 µA



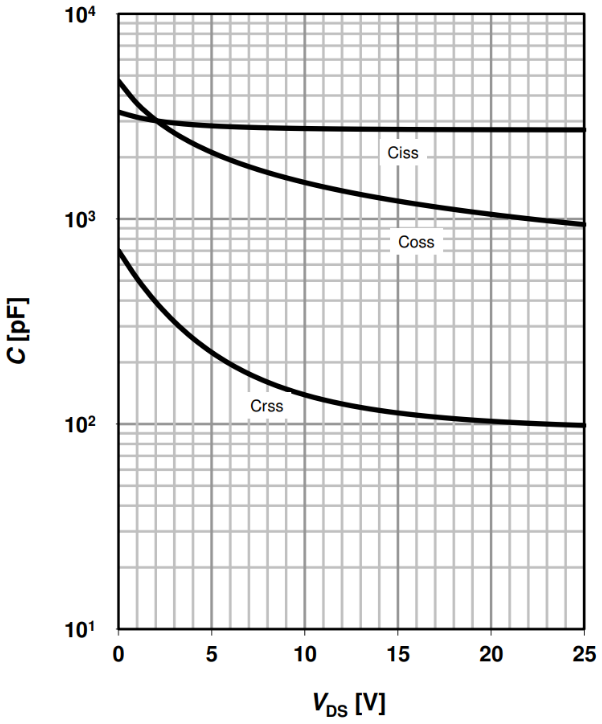
### 19 Typ. capacitances (Q1)

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



### 20 Typ. capacitances (Q2)

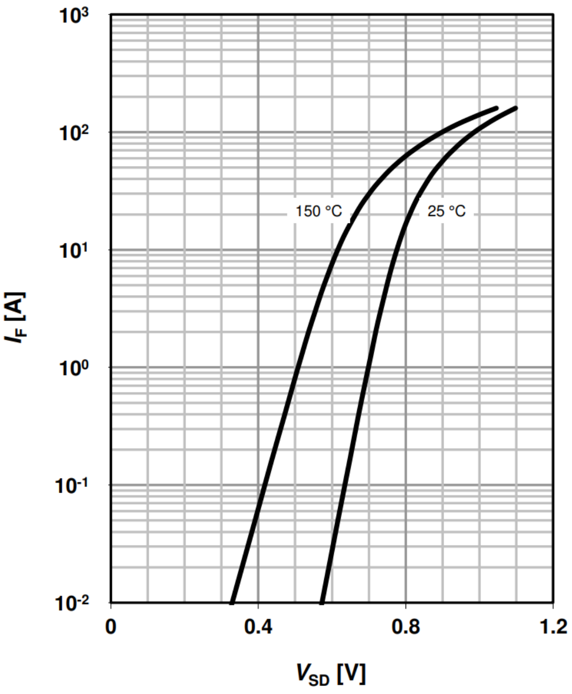
$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz



## 21 Forward characteristics of reverse diode (Q1)

$I_F = f(V_{SD})$

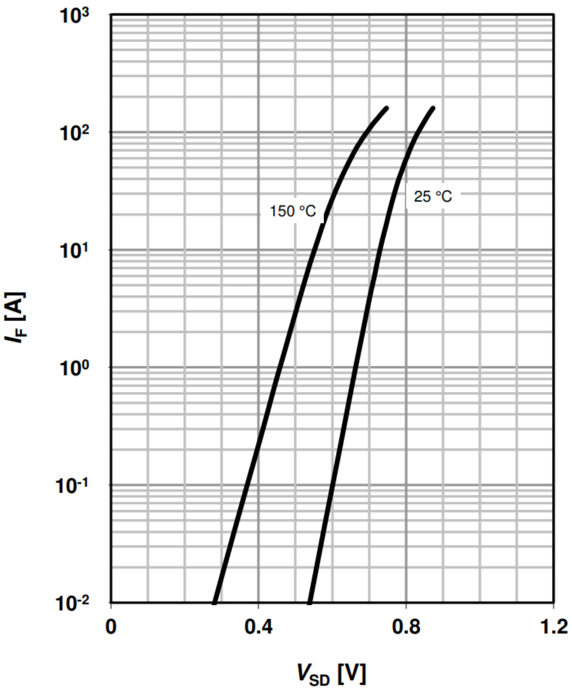
parameter: $T_j$



## 22 Forward characteristics of reverse diode (Q2)

$I_F = f(V_{SD})$

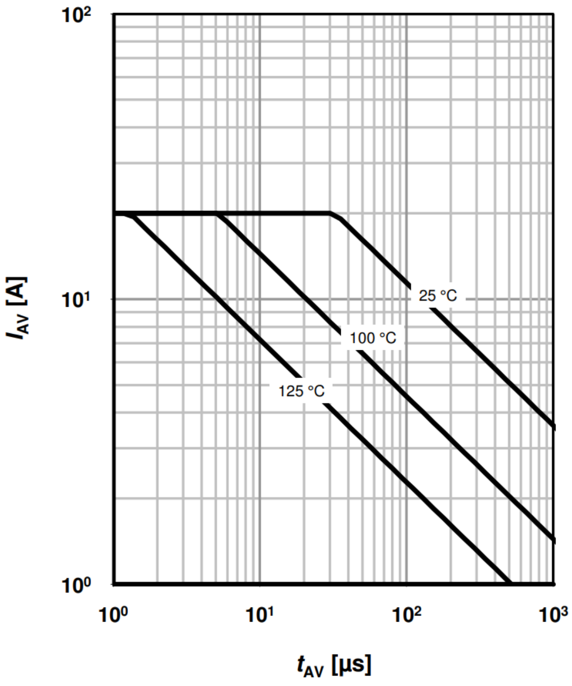
parameter: $T_j$



## 23 Avalanche characteristics (Q1)

$I_{AS} = f(t_{AV})$; $R_{GS} = 25\ \Omega$

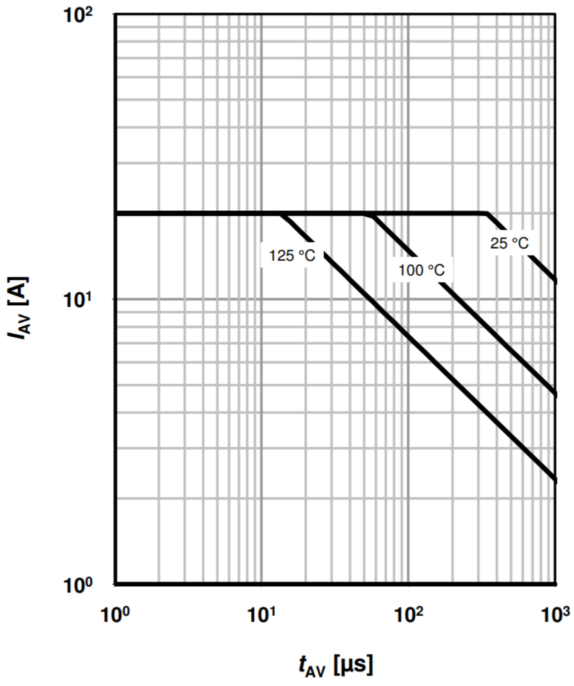
parameter: $T_{j(start)}$



## 24 Avalanche characteristics (Q2)

$I_{AS} = f(t_{AV})$; $R_{GS} = 25\ \Omega$

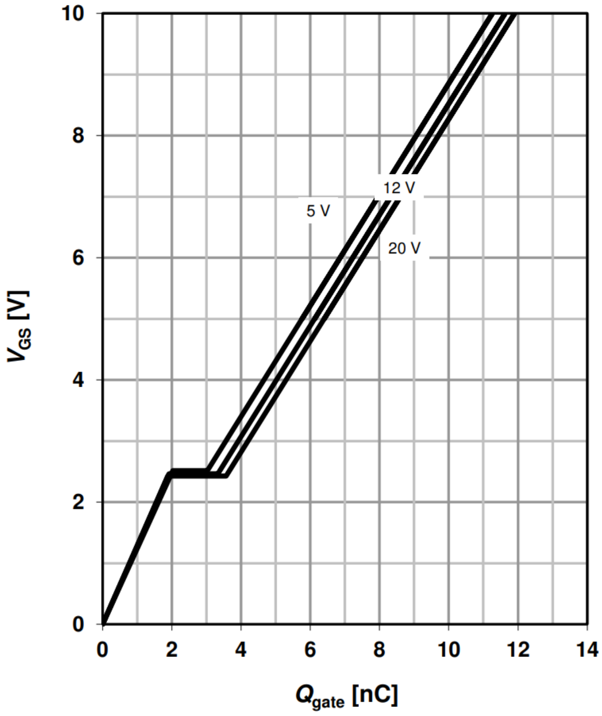
parameter: $T_{j(start)}$



### 25 Typ. gate charge (Q1)

$V_{GS}$=f($Q_{gate}$); $I_D$=20 A pulsed

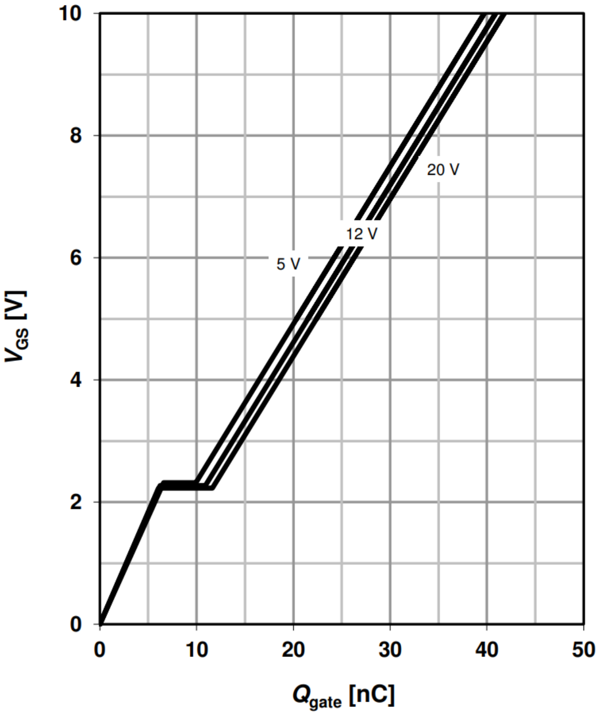
parameter: $V_{DD}$



### 26 Typ. gate charge (Q2)

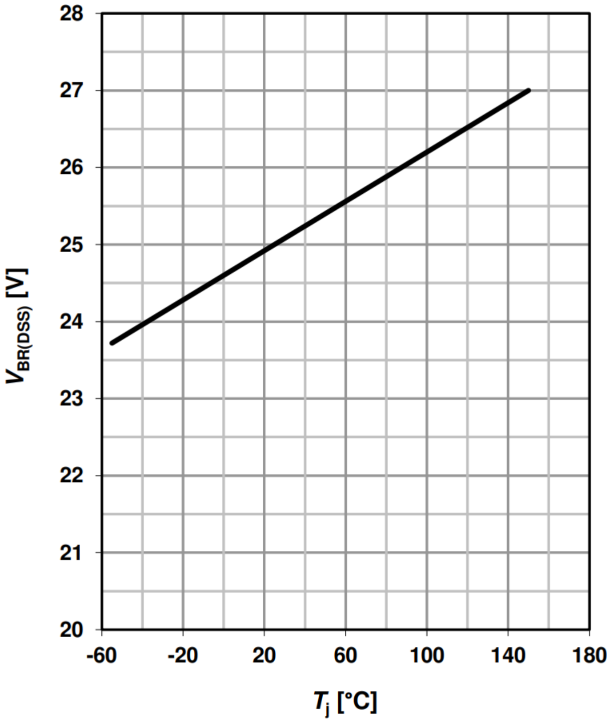
$V_{GS}$=f($Q_{gate}$); $I_D$=20 A pulsed

parameter: $V_{DD}$



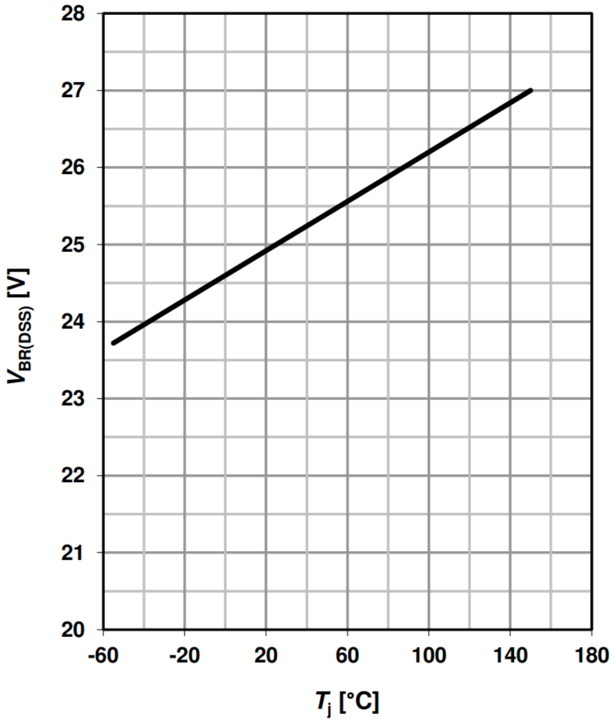
### 27 Drain-source breakdown voltage (Q1)

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



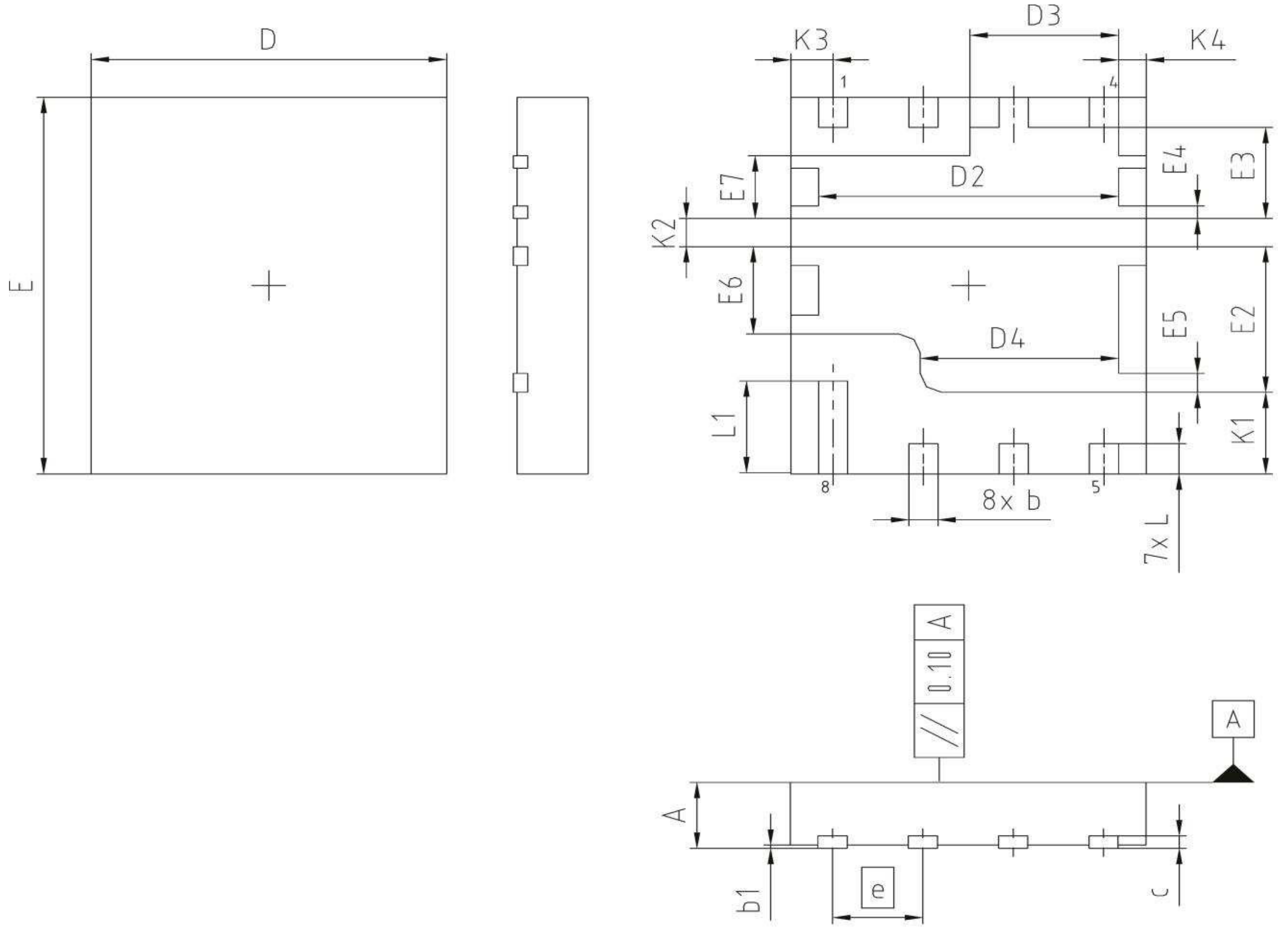
### 28 Drain-source breakdown voltage (Q2)

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



**封装外形**

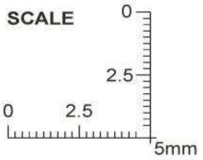
**PG-TISON8-4**



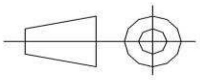
| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.90 | 1.15 | 0.035 | 0.045 |
| b | 0.31 | 0.51 | 0.012 | 0.020 |
| b1 | 0.00 | 0.05 | 0.000 | 0.002 |
| c | 0.10 | 0.30 | 0.004 | 0.012 |
| D | 4.90 | 5.10 | 0.193 | 0.201 |
| D2 | 4.12 | 4.32 | 0.162 | 0.170 |
| D3 | 1.99 | 2.19 | 0.078 | 0.086 |
| D4 | 2.69 | 2.89 | 0.106 | 0.114 |
| E | 5.90 | 6.10 | 0.232 | 0.240 |
| E2 | 2.22 | 2.42 | 0.087 | 0.095 |
| E3 | 1.35 | 1.55 | 0.053 | 0.061 |
| E4 | 0.10 | 0.30 | 0.004 | 0.012 |
| E5 | 0.20 | 0.40 | 0.008 | 0.016 |
| E6 | 1.29 | 1.49 | 0.051 | 0.059 |
| E7 | 0.90 | 1.10 | 0.035 | 0.043 |
| e | 1.27 (BSC) | | 0.05 (BSC) | |
| N | 8 | | 8 | |
| L | 0.38 | 0.58 | 0.015 | 0.023 |
| L1 | 1.38 | 1.58 | 0.054 | 0.062 |
| K1 | 1.38 | 1.58 | 0.054 | 0.062 |
| K2 | 0.35 | 0.55 | 0.014 | 0.022 |
| K3 | 0.50 | 0.70 | 0.020 | 0.028 |
| K4 | 0.29 | 0.49 | 0.011 | 0.019 |

**DOCUMENT NO.**
Z8B00176527

**SCALE**



**EUROPEAN PROJECTION**

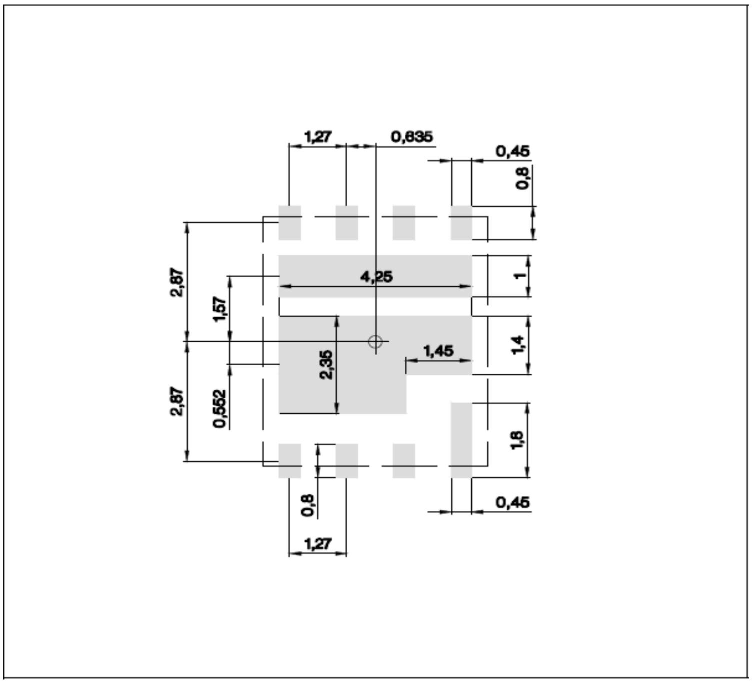


**ISSUE DATE**
09-08-2017

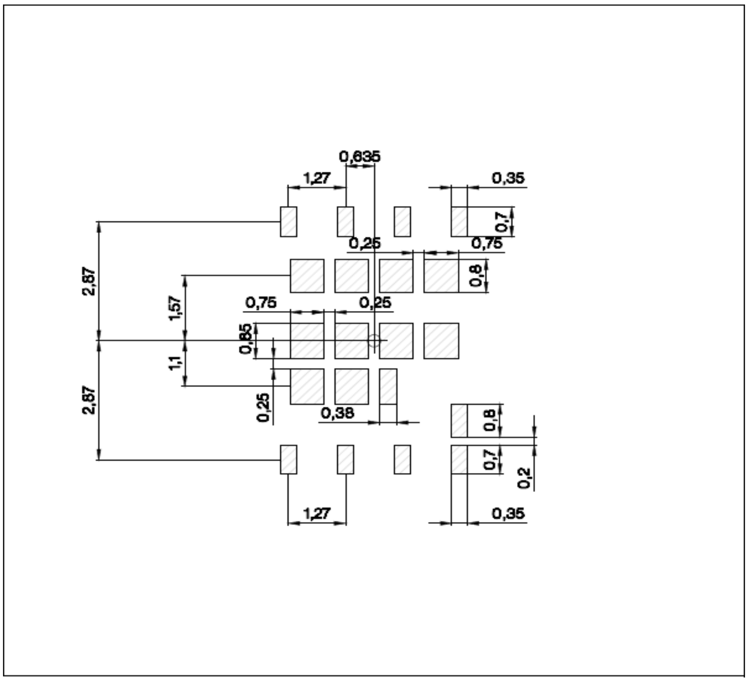
**REVISION**
02

**封装 & 钢网开窗**

**PG-TISON8-4**



▢ copper



▨ stencil apertures

所有尺寸均以毫米为单位

# 修订记录

BSG0812ND

**Revision: 2017-08-29, Rev. 2.2**

历史修订版本

| Revision | Date | Subjects (major changes since last revision) |
|---|---|---|
| 2.2 | 2017-08-29 | Update package outline |

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