

## Dual N-Channel OptiMOS™ MOSFET

### Features

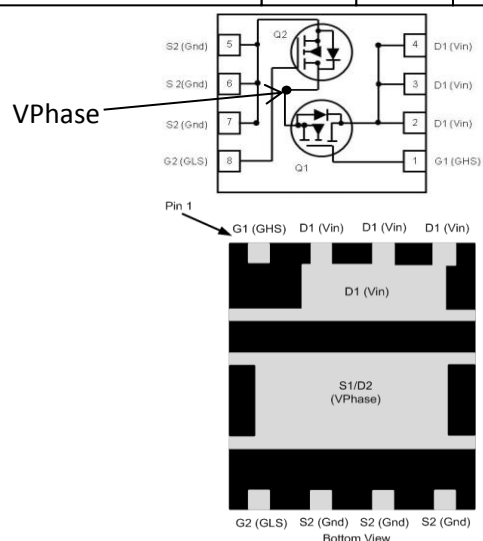
- Dual N-channel OptiMOS™ MOSFET
- Optimized for high performance Buck converter
- Logic level (4.5V rated)
- N-channel
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



| Type      | Package    | Marking |
|-----------|------------|---------|
| BSC0911ND | PG-TISON-8 | 0911ND  |

### Product Summary

|                  |                       | Q1  | Q2  |           |
|------------------|-----------------------|-----|-----|-----------|
| $V_{DS}$         |                       | 25  | 25  | V         |
| $R_{DS(on),max}$ | $V_{GS}=10\text{ V}$  | 3.2 | 1.2 | $m\Omega$ |
|                  | $V_{GS}=4.5\text{ V}$ | 4.8 | 1.7 |           |
| $I_D$            |                       | 40  | 40  | A         |



Maximum ratings, at  $T_j=25\text{ °C}$ , unless otherwise specified <sup>2)</sup>

| Parameter                           | Symbol         | Conditions                                                                      | Value       |     | Unit |
|-------------------------------------|----------------|---------------------------------------------------------------------------------|-------------|-----|------|
|                                     |                |                                                                                 | Q1          | Q2  |      |
| Continuous drain current            | $I_D$          | $T_C=70\text{ °C}, V_{GS}=10\text{ V}$                                          | 40          | 40  | A    |
|                                     |                | $T_A=25\text{ °C}, V_{GS}=4.5\text{ V}^{3)}$                                    | 18          | 30  |      |
|                                     |                | $T_A=70\text{ °C}, V_{GS}=4.5\text{ V}^{3)}$                                    | 14          | 24  |      |
|                                     |                | $T_A=25\text{ °C}, V_{GS}=4.5\text{ V}^{4)}$                                    | 14          | 22  |      |
| Pulsed drain current <sup>5)</sup>  | $I_{D,pulse}$  | $T_C=70\text{ °C}$                                                              | 160         | 160 |      |
| Avalanche energy, single pulse      | $E_{AS}$       | Q1: $I_D=20\text{ A}$ ,<br>Q2: $I_D=20\text{ A}$ ,<br>$R_{GS}=25\text{ }\Omega$ | 20          | 160 | mJ   |
| Gate source voltage                 | $V_{GS}$       |                                                                                 | $\pm 20$    |     | V    |
| Power dissipation                   | $P_{tot}$      | $T_A=25\text{ °C}^{2)}$                                                         | 2.5         | 2.5 | W    |
|                                     |                | $T_A=25\text{ °C}$ , minimum footprint <sup>3)</sup>                            | 1.0         | 1.0 |      |
| Operating and storage temperature   | $T_j, T_{stg}$ |                                                                                 | -55 ... 150 |     | °C   |
| IEC climatic category; DIN IEC 68-1 |                |                                                                                 | 55/150/56   |     |      |

<sup>1)</sup> J-STD20 and JESD22

<sup>2)</sup> One transistor active

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

### Thermal characteristics

|                                                      |    |            |                                               |   |   |     |     |
|------------------------------------------------------|----|------------|-----------------------------------------------|---|---|-----|-----|
| Thermal resistance, junction - case                  | Q1 | $R_{thJC}$ |                                               | - | - | 3.4 | K/W |
|                                                      | Q2 |            |                                               | - | - | 1.5 |     |
| Thermal resistance, junction - ambient <sup>1)</sup> | Q1 | $R_{thJA}$ | 6 cm <sup>2</sup> cooling area <sup>3)</sup>  | - | - | 50  |     |
|                                                      | Q2 |            |                                               | - | - |     |     |
|                                                      | Q1 |            | minimal footprint, steady state <sup>4)</sup> | - | - | 125 |     |
|                                                      | Q2 |            |                                               | - | - |     |     |

**Electrical characteristics**, at  $T_j=25\text{ °C}$ , unless otherwise specified

### Static characteristics

|                                  |    |               |                                                            |     |     |     |               |
|----------------------------------|----|---------------|------------------------------------------------------------|-----|-----|-----|---------------|
| Drain-source breakdown voltage   | Q1 | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$                       | 25  | -   |     | V             |
|                                  | Q2 |               |                                                            |     |     |     |               |
| Gate threshold voltage           | Q1 | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=250\text{ }\mu\text{A}$                | 1.2 | 1.6 | 2   |               |
|                                  | Q2 |               |                                                            |     |     |     |               |
| Zero gate voltage drain current  | Q1 | $I_{DSS}$     | $V_{DS}=25\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$  | -   | -   | 1   | $\mu\text{A}$ |
|                                  | Q2 |               |                                                            |     |     |     |               |
|                                  | Q1 |               | $V_{DS}=25\text{ V}, V_{GS}=0\text{ V}, T_j=150\text{ °C}$ | -   | -   | 100 |               |
|                                  | Q2 |               |                                                            |     |     |     |               |
| Gate-source leakage current      | Q1 | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                    | -   | -   | 100 | nA            |
|                                  | Q2 |               |                                                            |     |     |     |               |
| Drain-source on-state resistance | Q1 | $R_{DS(on)}$  | $V_{GS}=4.5\text{ V}, I_D=20\text{ A}$                     | -   | 3.7 | 4.8 | m $\Omega$    |
|                                  | Q2 |               |                                                            | -   | 1.3 | 1.7 |               |
|                                  | Q1 |               | $V_{GS}=10\text{ V}, I_D=20\text{ A}$                      | -   | 2.5 | 3.2 |               |
|                                  | Q2 |               |                                                            | -   | 0.9 | 1.2 |               |
| Gate resistance                  | Q1 | $R_G$         |                                                            | 0.5 | 0.9 | 1.8 | $\Omega$      |
|                                  | Q2 |               |                                                            | 0.3 | 0.6 | 1.2 |               |
| Transconductance                 | Q1 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=20\text{ A}$            | 38  | 77  | -   | S             |
|                                  | Q2 |               |                                                            | 65  | 130 | -   |               |

<sup>3)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

<sup>4)</sup> Device mounted on a minimum pad (one layer, 70  $\mu\text{m}$  thick). One transistor active

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

### Dynamic characteristics

|                              |    |              |                                                                                      |   |      |      |    |
|------------------------------|----|--------------|--------------------------------------------------------------------------------------|---|------|------|----|
| Input capacitance            | Q1 | $C_{iss}$    | $V_{GS}=0\text{ V},$<br>$V_{DS}=12\text{ V}, f=1\text{ MHz}$                         | - | 1200 | 1600 | pF |
|                              | Q2 |              |                                                                                      | - | 3800 | 5100 |    |
| Output capacitance           | Q1 | $C_{oss}$    |                                                                                      | - | 470  | 625  |    |
|                              | Q2 |              |                                                                                      | - | 1400 | 1862 |    |
| Reverse transfer capacitance | Q1 | $C_{rss}$    |                                                                                      | - | 51   | -    |    |
|                              | Q2 |              |                                                                                      | - | 150  | -    |    |
| Turn-on delay time           | Q1 | $t_{d(on)}$  | $V_{DD}=12\text{ V},$<br>$V_{GS}=10\text{ V}, R_G=1.6\ \Omega,$<br>$I_D=20\text{ A}$ | - | 3.3  |      | ns |
|                              | Q2 |              |                                                                                      | - | 3.8  | -    |    |
| Rise time                    | Q1 | $t_r$        |                                                                                      | - | 2.8  | -    |    |
|                              | Q2 |              |                                                                                      | - | 5.4  | -    |    |
| Turn-off delay time          | Q1 | $t_{d(off)}$ |                                                                                      | - | 15   | -    |    |
|                              | Q2 |              |                                                                                      | - | 25   | -    |    |
| Fall time                    | Q1 | $t_f$        |                                                                                      | - | 2.2  | -    |    |
|                              | Q2 |              |                                                                                      | - | 4.0  | -    |    |

### Gate Charge Characteristics

|                       |    |               |                                                                                  |   |     |     |    |
|-----------------------|----|---------------|----------------------------------------------------------------------------------|---|-----|-----|----|
| Gate to source charge | Q1 | $Q_{gs}$      | $V_{DD}=12\text{ V},$<br>$I_D=20\text{ A},$<br>$V_{GS}=0\text{ to }4.5\text{ V}$ | - | 3.0 | 3.9 | nC |
| Gate to drain charge  |    | $Q_{gd}$      |                                                                                  | - | 1.8 | 2.7 |    |
| Gate charge total     |    | $Q_g$         |                                                                                  | - | 7.7 | 12  |    |
| Gate plateau voltage  |    | $V_{plateau}$ |                                                                                  | - | 2.6 | -   | V  |
| Gate to source charge | Q2 | $Q_{gs}$      |                                                                                  | - | 8.8 | 12  | nC |
| Gate to drain charge  |    | $Q_{gd}$      |                                                                                  | - | 5.5 | 8.3 |    |
| Gate charge total     |    | $Q_g$         |                                                                                  |   | 25  | 37  |    |
| Gate plateau voltage  |    | $V_{plateau}$ |                                                                                  |   | 2.3 |     | V  |
| Output charge         | Q1 | $Q_{oss}$     | $V_{DD}=12\text{ V}, V_{GS}=0\text{ V}$                                          | - | 9   | 12  | nC |
|                       | Q2 |               |                                                                                  | - | 28  | 37  |    |

<sup>5)</sup> See figure 3 for more detailed information.

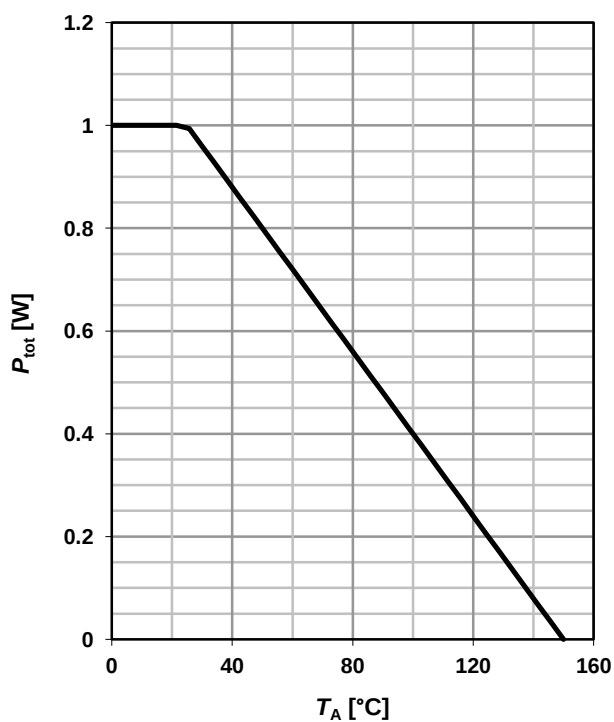
| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

### Reverse Diode

|                                  |    |               |                                                                   |   |      |     |    |
|----------------------------------|----|---------------|-------------------------------------------------------------------|---|------|-----|----|
| Diode continuous forward current | Q1 | $I_S$         | $T_C=25\text{ °C}$                                                | - | -    | 37  | A  |
|                                  | Q2 |               |                                                                   |   |      | 40  |    |
| Diode pulse current              | Q1 | $I_{S,pulse}$ |                                                                   | - | -    | 160 |    |
|                                  | Q2 |               |                                                                   | - | -    | 160 |    |
| Diode forward voltage            | Q1 | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=20\text{ A},$<br>$T_j=25\text{ °C}$       | - | 0.84 | -   | V  |
|                                  | Q2 |               |                                                                   | - | 0.79 | -   |    |
| Reverse recovery charge          | Q1 | $Q_{rr}$      | $V_R=15\text{ V}, I_F=I_S,$<br>$di_F/dt=100\text{ A/}\mu\text{s}$ | - | 10   | -   | nC |
|                                  | Q2 |               |                                                                   | - | 20   | -   | nC |

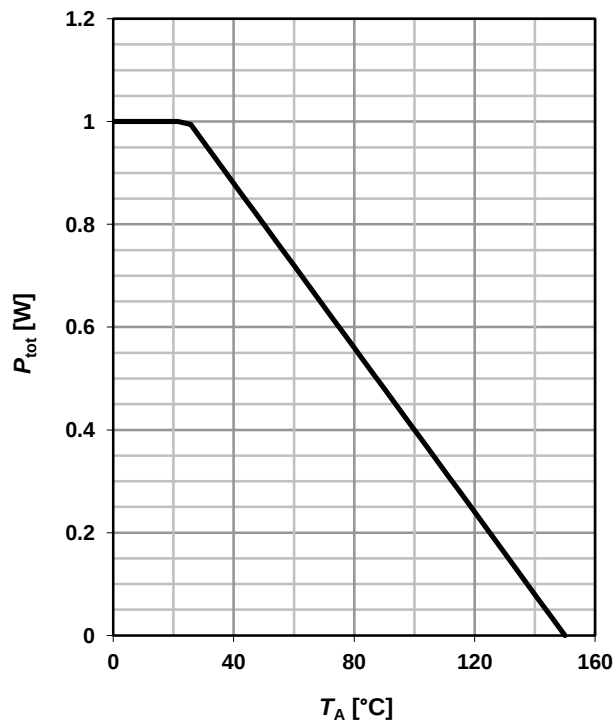
### 1 Power dissipation (Q1)

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



### 2 Power dissipation (Q2)

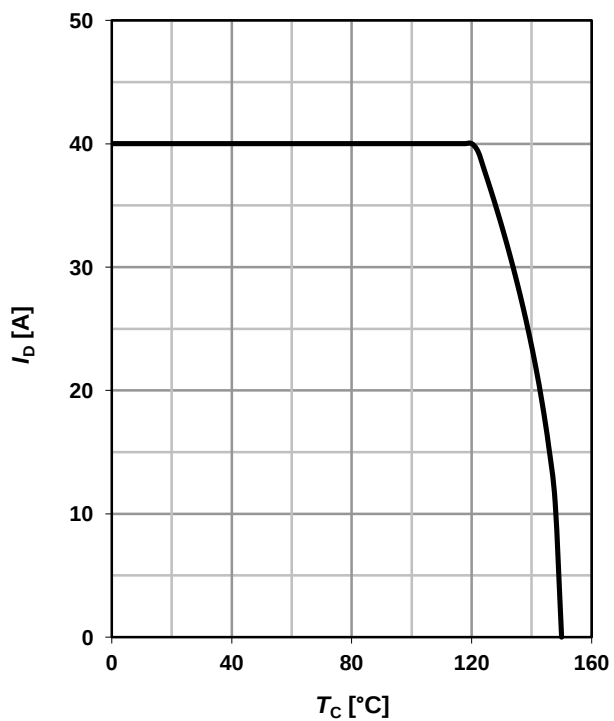
$$P_{\text{tot}} = f(T_A)^{(4)}$$



### 3 Drain current (Q1)

$$I_D = f(T_C)$$

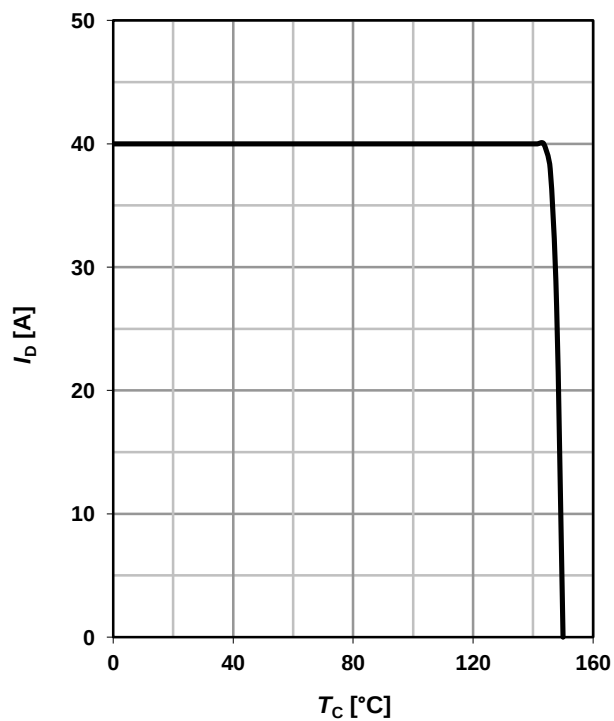
parameter:  $V_{GS} \geq 10$  V



### 4 Drain current (Q2)

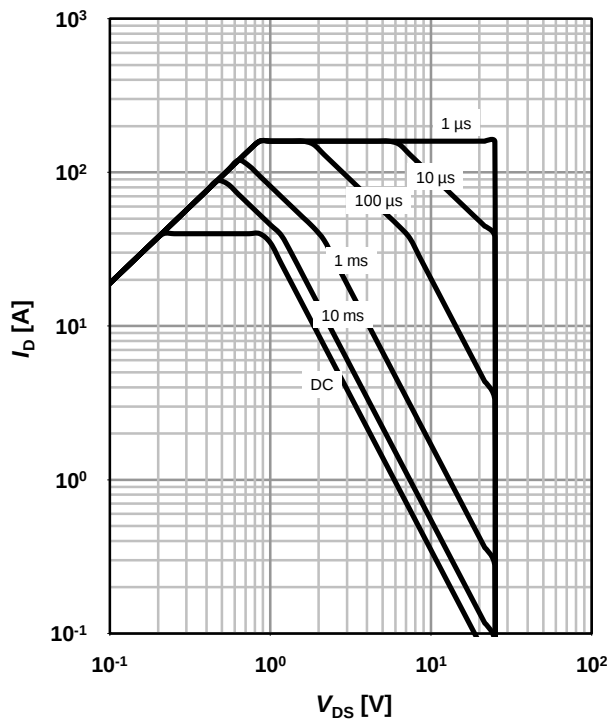
$$I_D = f(T_C)$$

parameter:  $V_{GS} \geq 10$  V



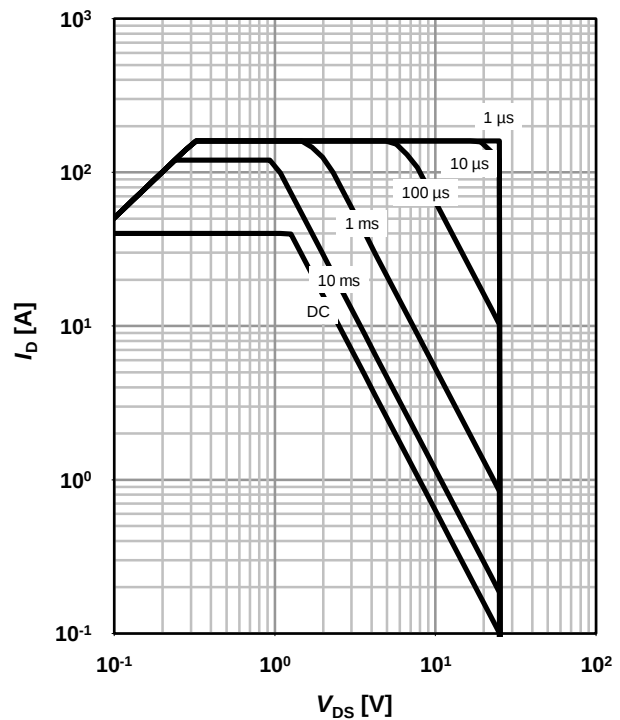
### 5 Safe operating area (Q1)

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

parameter:  $t_p$ 


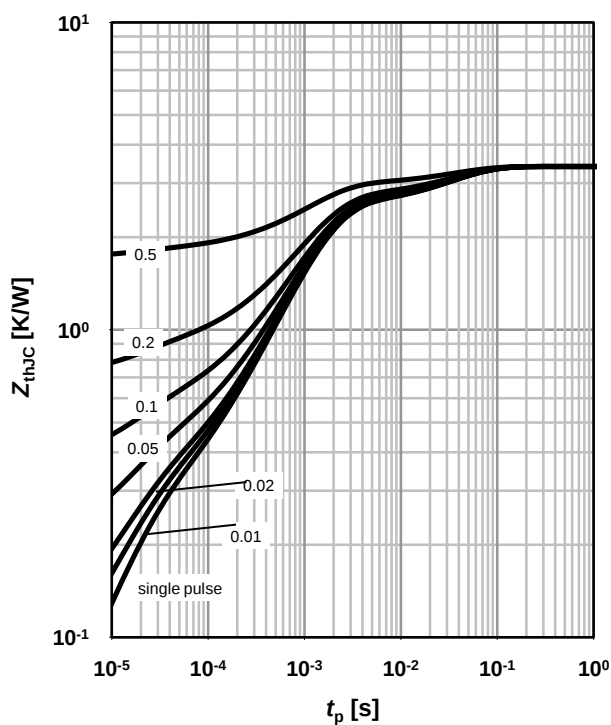
### 6 Safe operating area (Q2)

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

parameter:  $t_p$ 


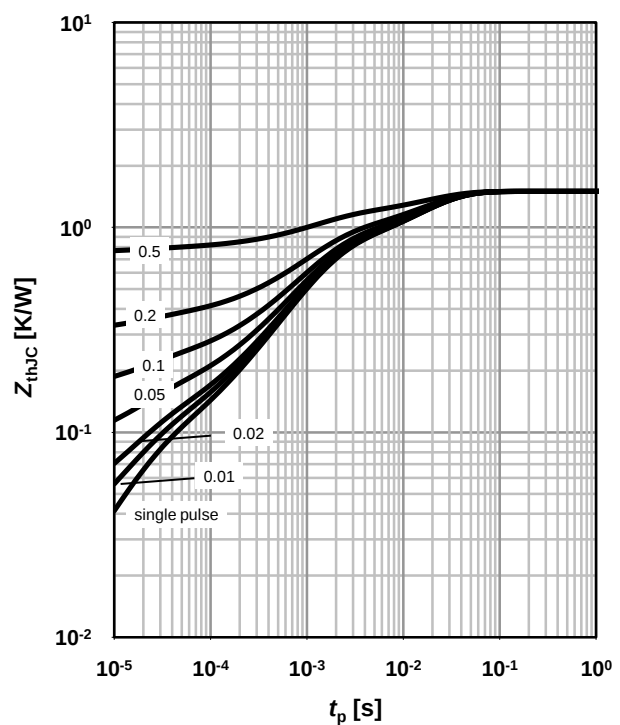
### 7 Max. transient thermal impedance (Q1)

 $Z_{thJC} = f(t_p)$ 

parameter:  $D = t_p/T$ 


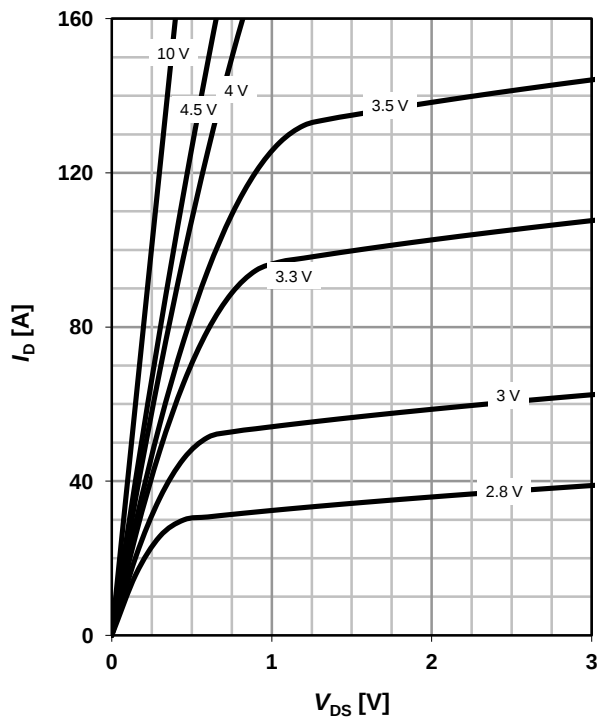
### 8 Max. transient thermal impedance (Q2)

 $Z_{thJC} = f(t_p)$ 

parameter:  $D = t_p/T$ 


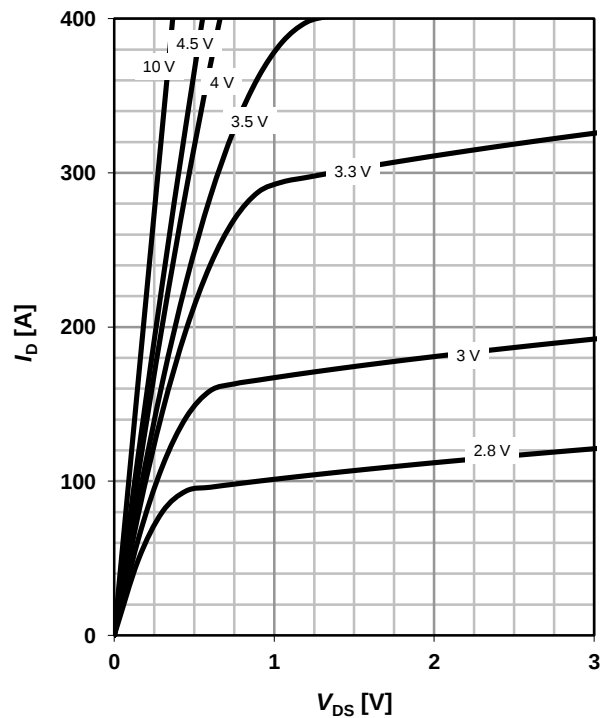
### 9 Typ. output characteristics (Q1)

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

parameter:  $V_{GS}$ 


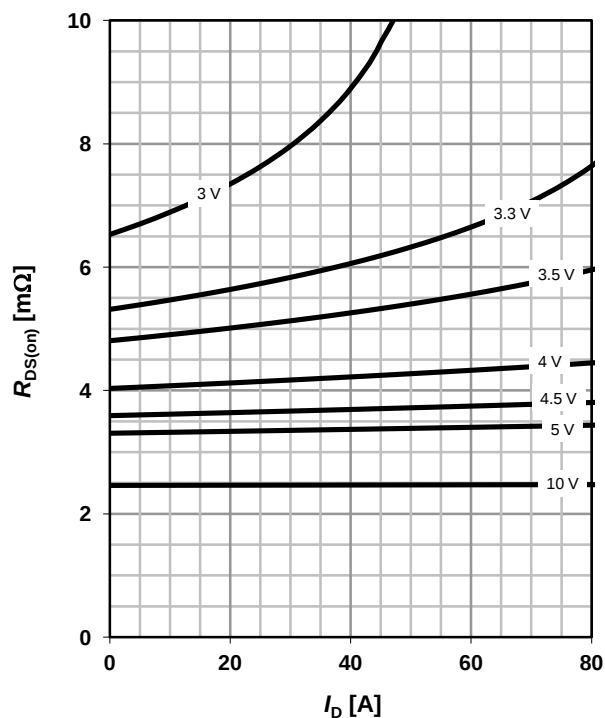
### 10 Typ. output characteristics (Q2)

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

parameter:  $V_{GS}$ 


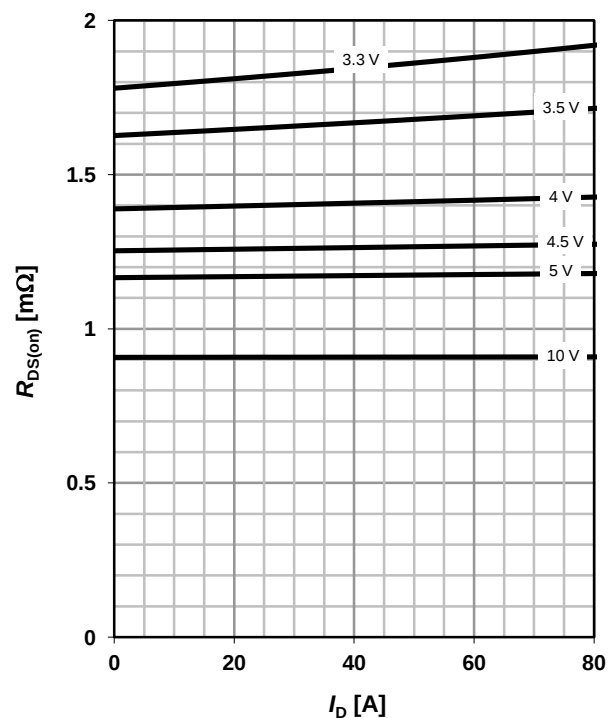
### 11 Typ. drain-source on resistance (Q1)

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

parameter:  $V_{GS}$ 


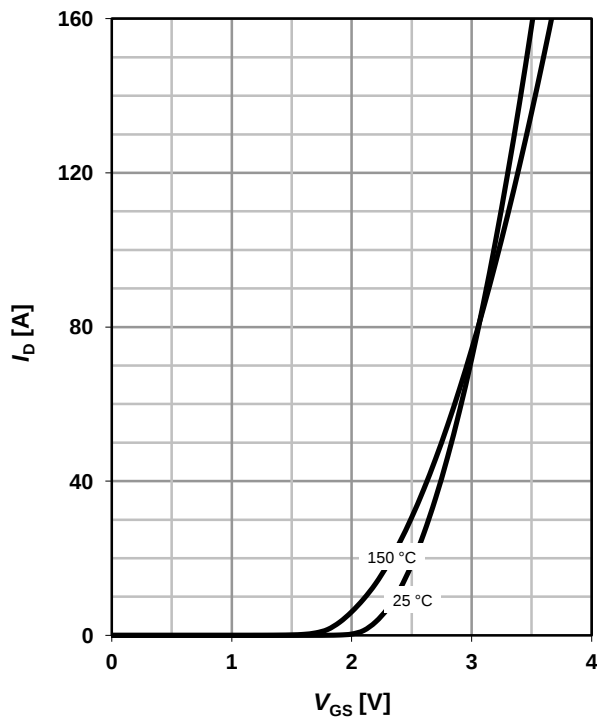
### 12 Typ. drain-source on resistance (Q2)

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

parameter:  $V_{GS}$ 


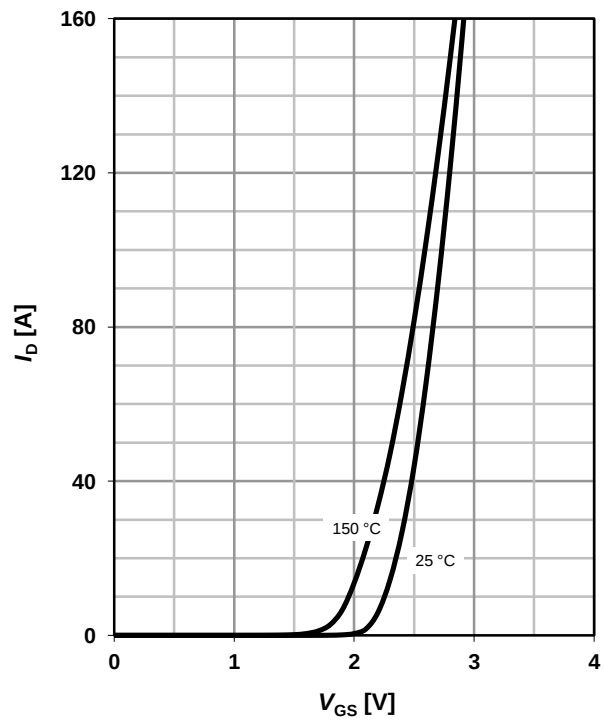
### 13 Typ. transfer characteristics (Q1)

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

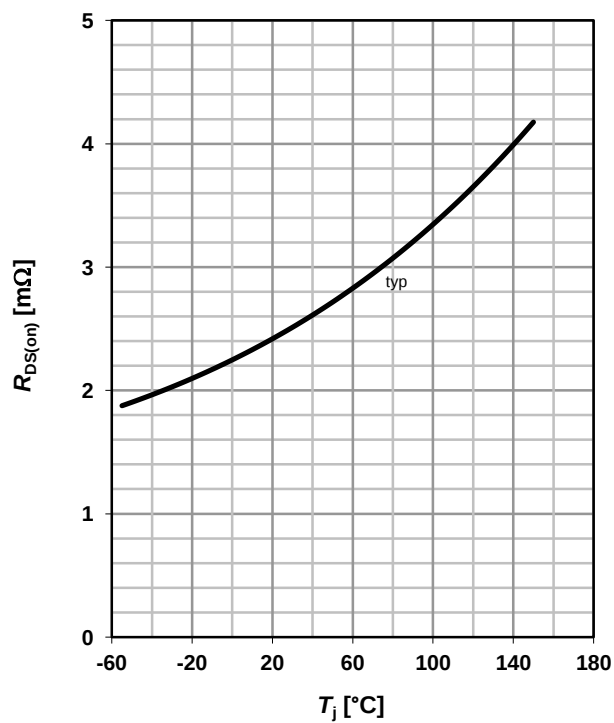
parameter:  $T_j$ 


### 14 Typ. transfer characteristics (Q2)

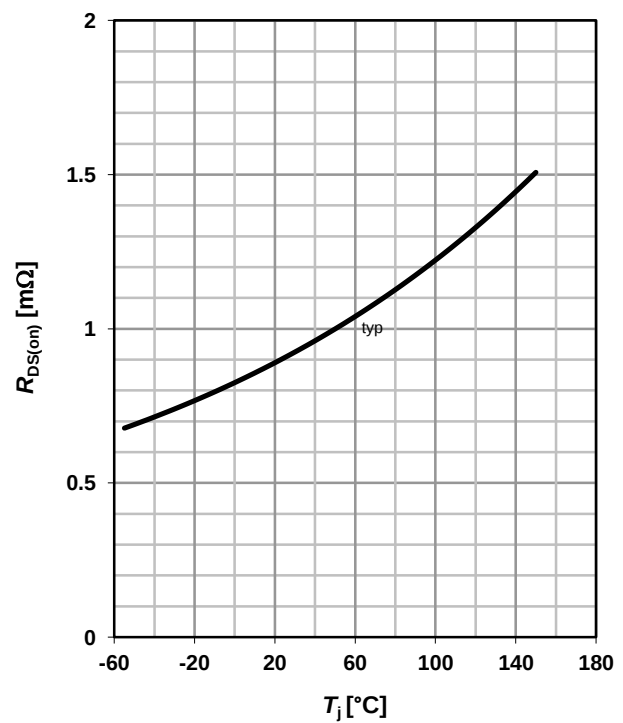
 $I_D = f(V_{GS}); |V_{DS}| > 2 |I_D| R_{DS(on)max}$ 

parameter:  $T_j$ 


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

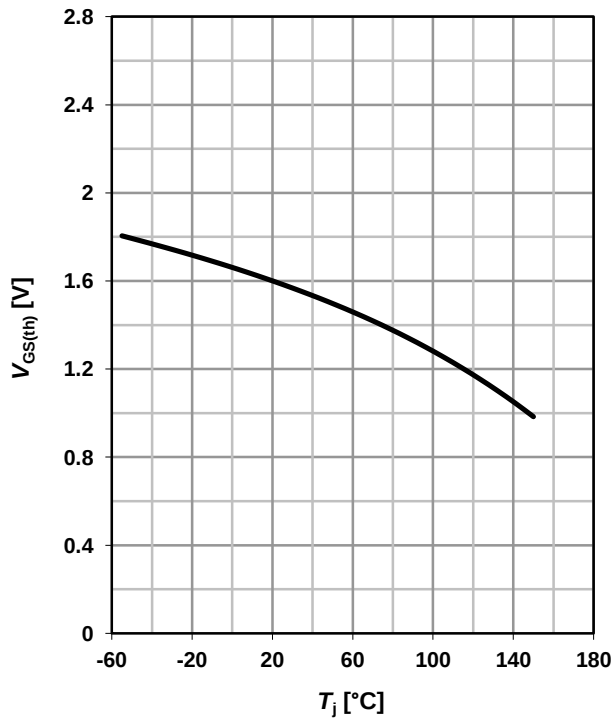
 $R_{DS(on)} = f(T_j); I_D = 20 \text{ A}; V_{GS} = 10 \text{ V}$ 


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

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


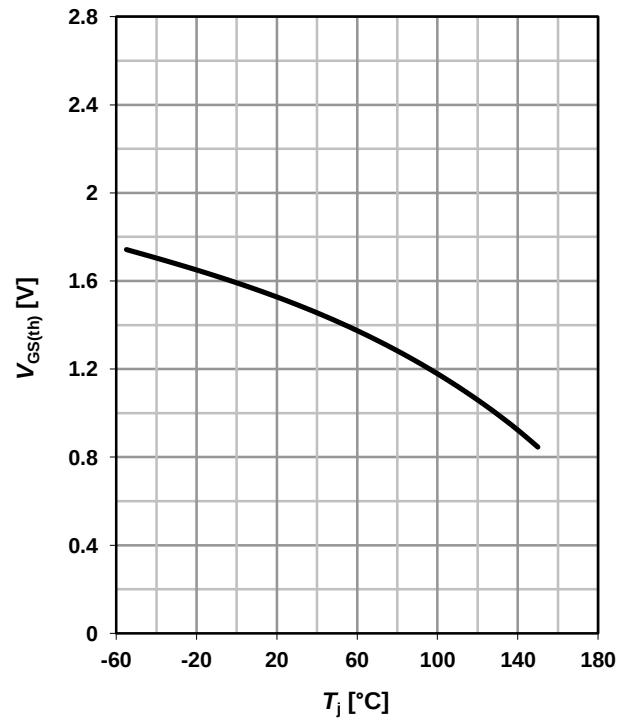
### 17 Typ. gate threshold voltage (Q1)

$V_{GS(th)} = f(T_j)$ ;  $V_{GS} = V_{DS}$ ;  $I_D = 250 \mu A$



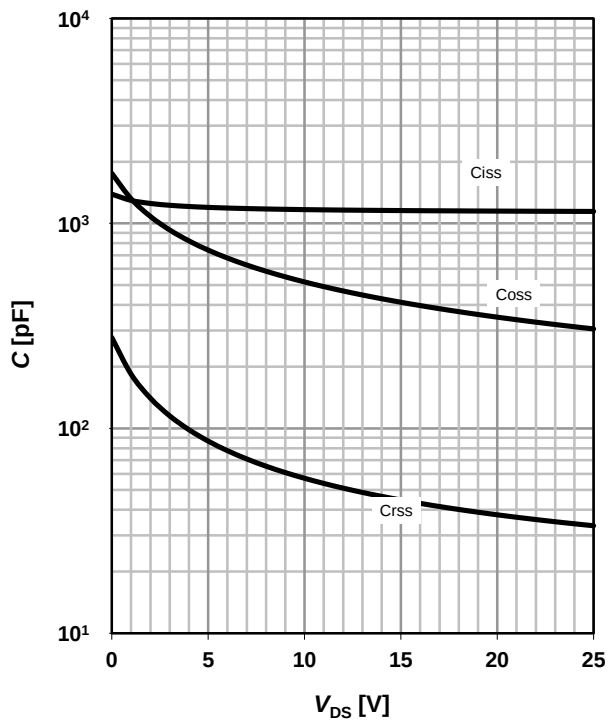
### 18 Typ. gate threshold voltage (Q2)

$V_{GS(th)} = f(T_j)$ ;  $V_{GS} = V_{DS}$ ;  $I_D = 250 \mu A$



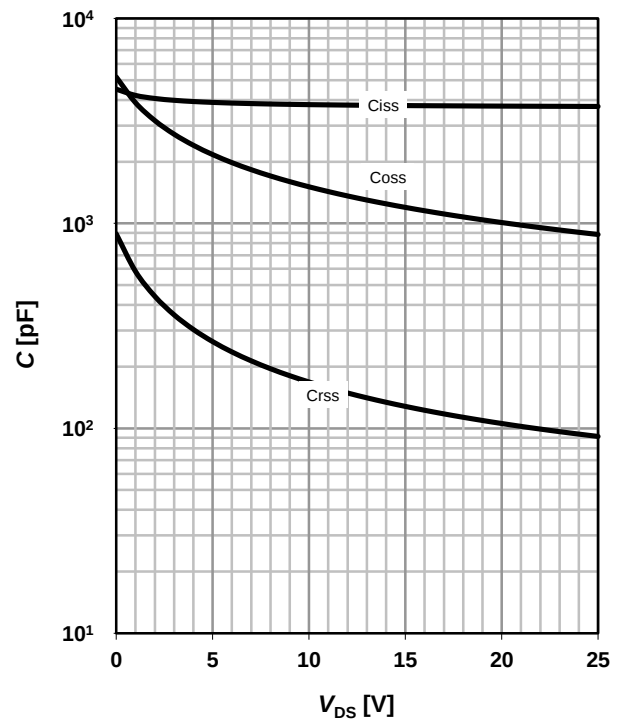
### 19 Typ. capacitances (Q1)

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



### 20 Typ. capacitances (Q2)

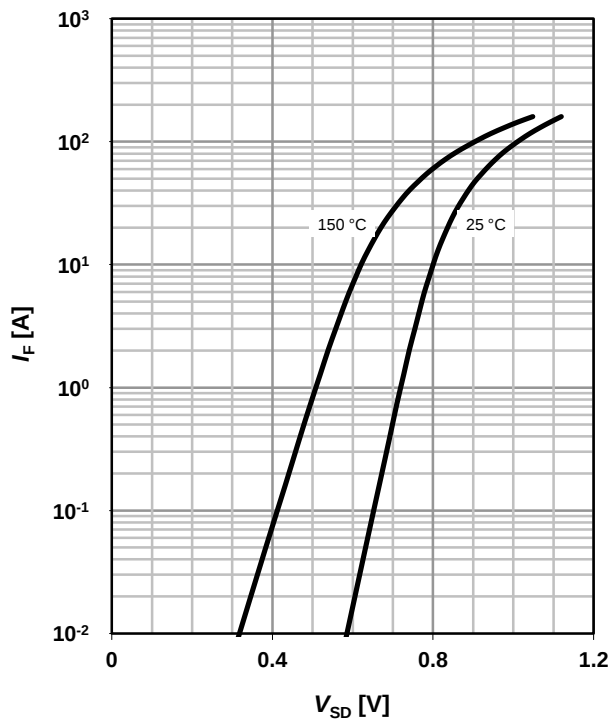
$C = f(V_{DS})$ ;  $V_{GS} = 0 V$ ;  $f = 1 MHz$



## 21 Forward characteristics of reverse diode (Q1)

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

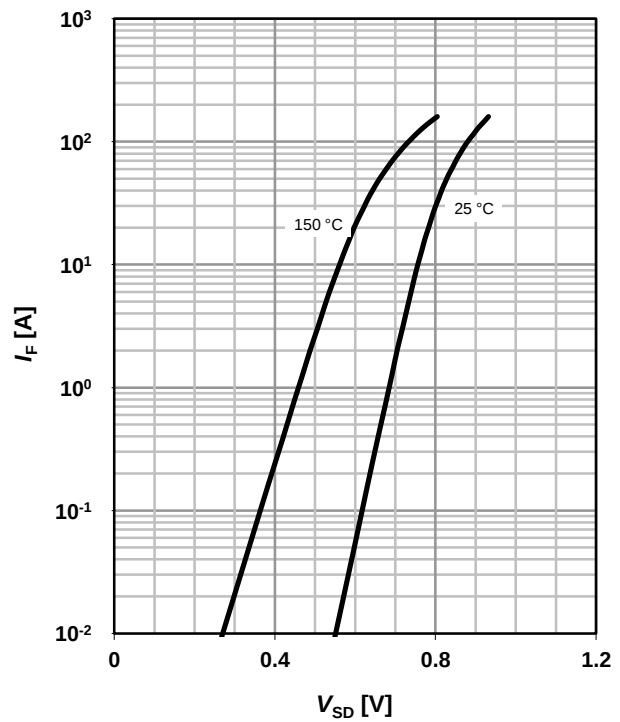
parameter:  $T_j$



## 22 Forward characteristics of reverse diode (Q2)

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

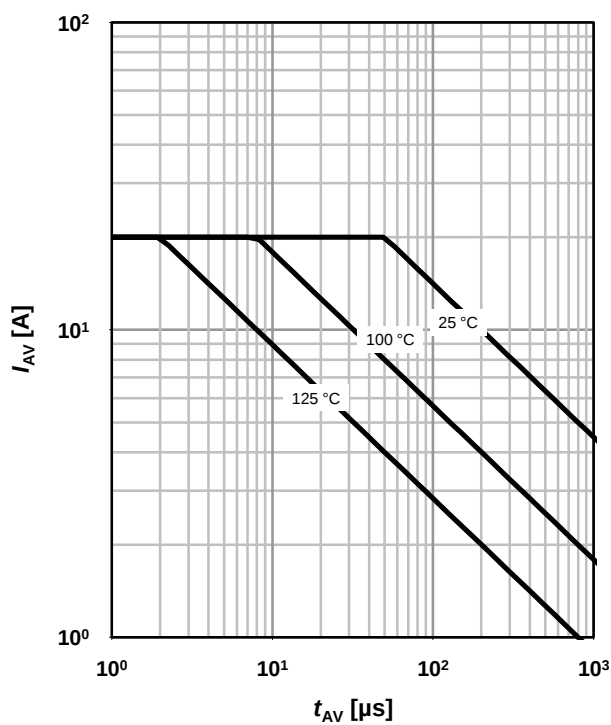
parameter:  $T_j$



## 23 Avalanche characteristics (Q1)

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

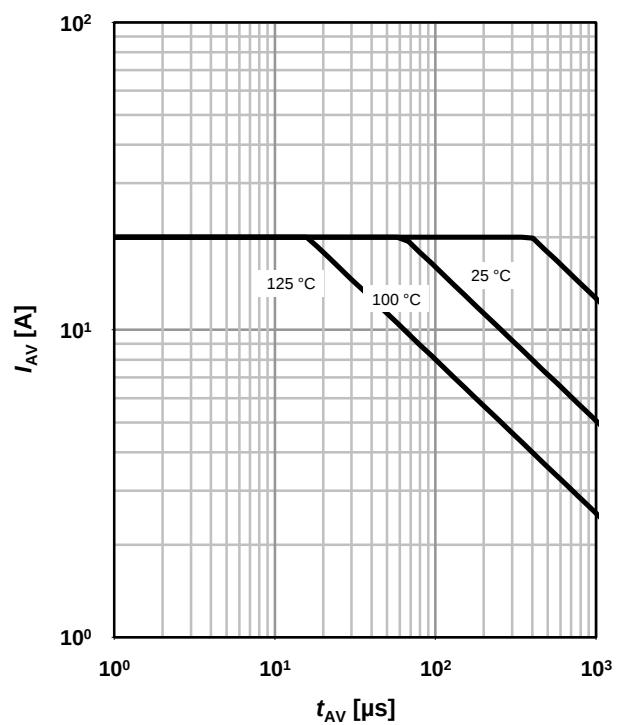
parameter:  $T_{j(\text{start})}$



## 24 Avalanche characteristics (Q2)

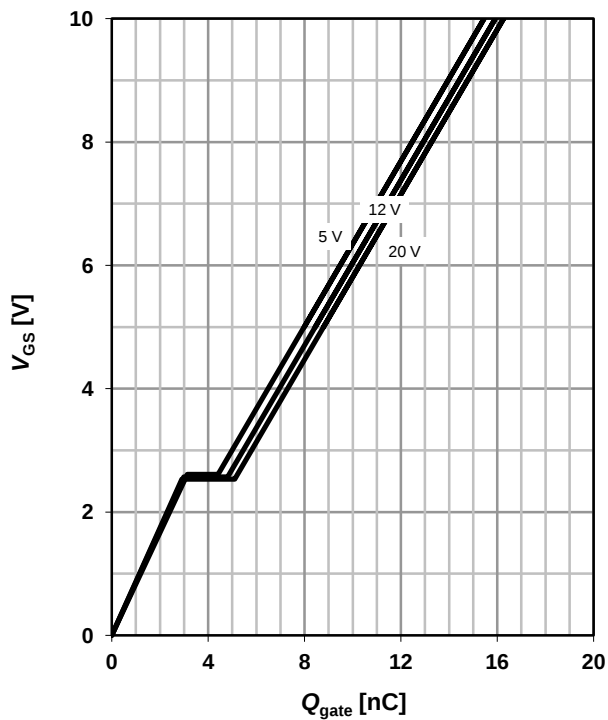
$$I_{AS} = f(t_{AV}); R_{GS} = 25 \Omega$$

parameter:  $T_{j(\text{start})}$



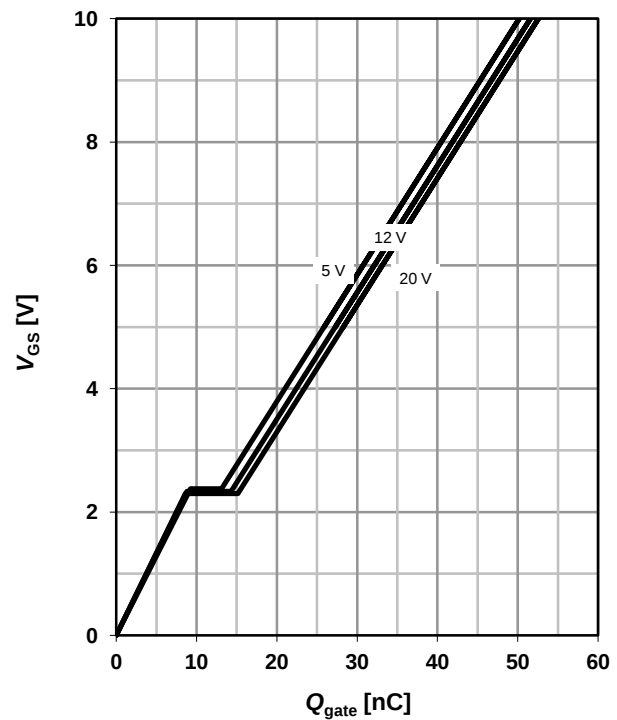
### 25 Typ. gate charge (Q1)

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

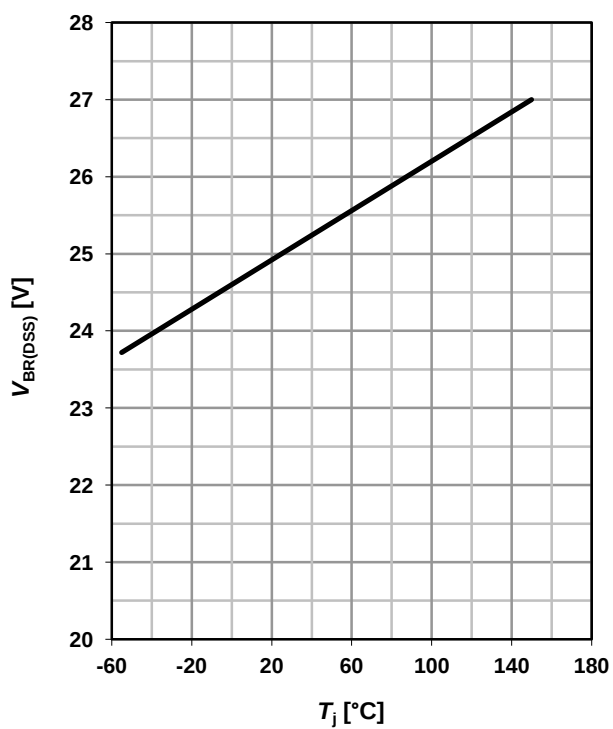
parameter:  $V_{DD}$ 


### 26 Typ. gate charge (Q2)

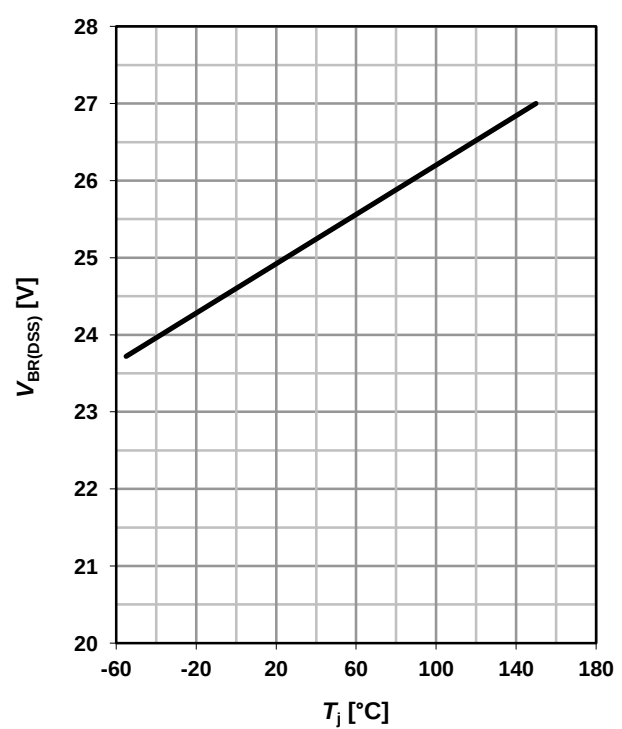
 $V_{GS}=f(Q_{gate}); I_D=20\text{ A pulsed}$ 

parameter:  $V_{DD}$ 


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

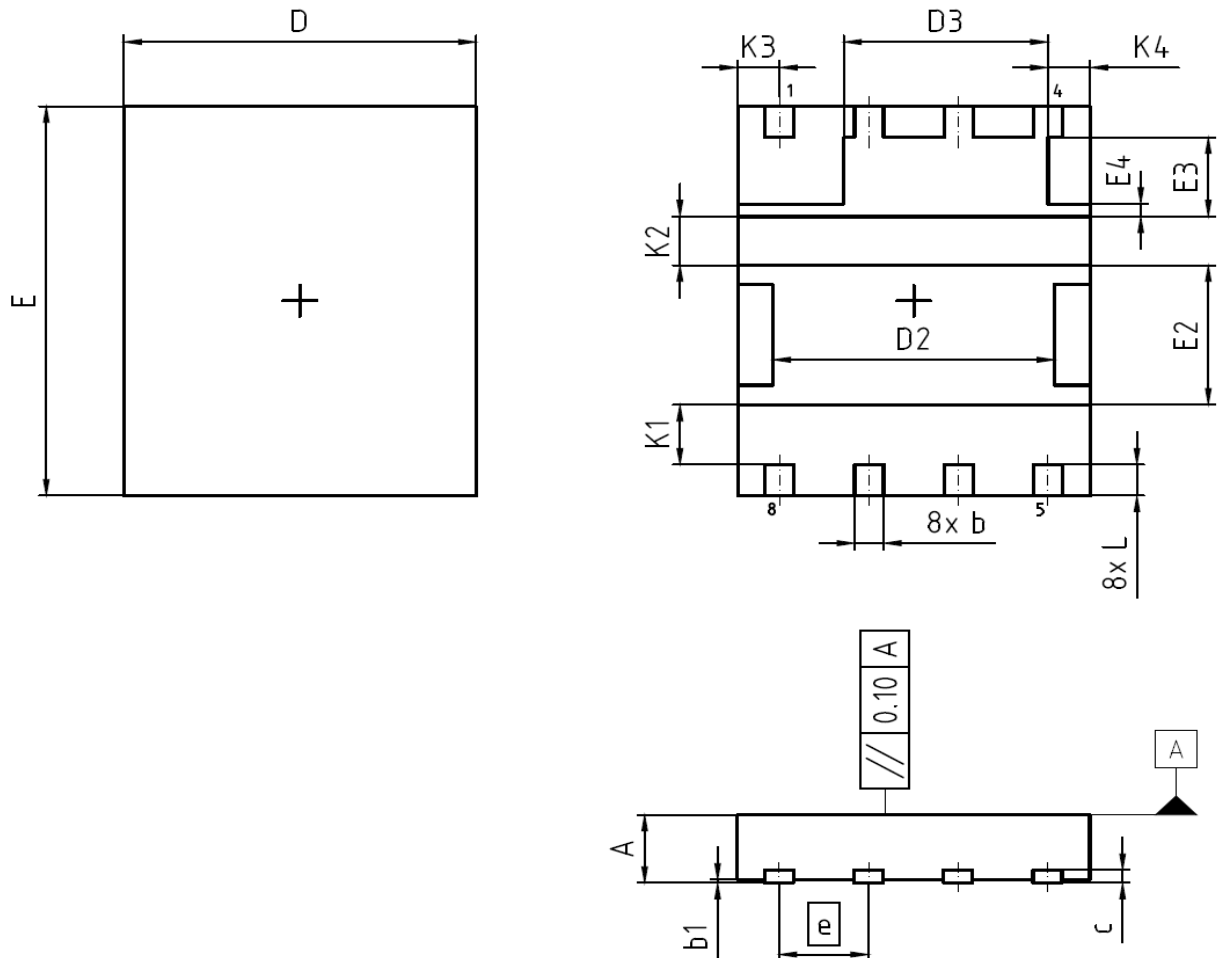
 $V_{BR(DSS)}=f(T_j); I_D=1\text{ mA}$ 


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

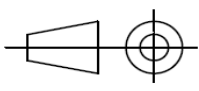
 $V_{BR(DSS)}=f(T_j); I_D=1\text{ mA}$ 


# Package Outline

## PG-TISON

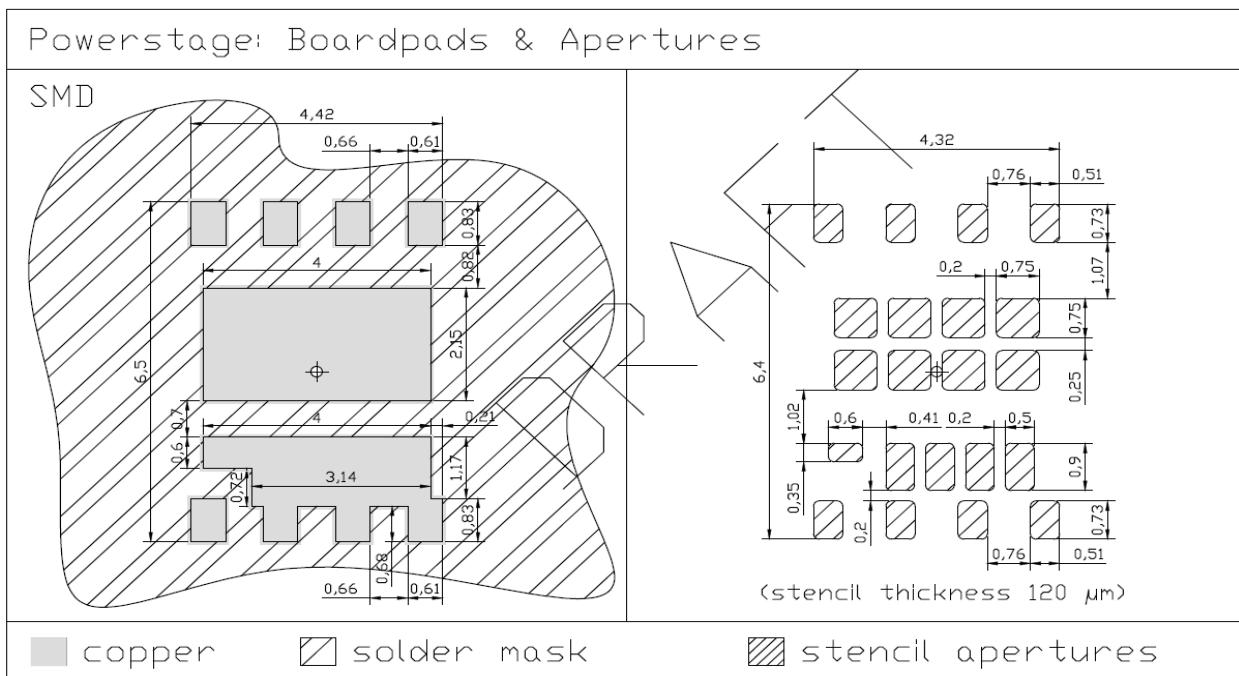


| DIM     | MILLIMETERS |      | INCHES     |       |
|---------|-------------|------|------------|-------|
|         | MIN         | MAX  | MIN        | MAX   |
| A       | 0.90        | 1.15 | 0.035      | 0.045 |
| b       | 0.31        | 0.51 | 0.012      | 0.020 |
| b1      | 0.00        | 0.05 | 0.000      | 0.002 |
| c       | 0.10        | 0.30 | 0.004      | 0.012 |
| D       | 4.90        | 5.10 | 0.193      | 0.201 |
| D2      | 3.90        | 4.10 | 0.154      | 0.161 |
| D3      | 2.80        | 3.00 | 0.110      | 0.118 |
| E       | 5.90        | 6.10 | 0.232      | 0.240 |
| E2      | 2.05        | 2.25 | 0.081      | 0.089 |
| E3      | 1.12        | 1.32 | 0.044      | 0.052 |
| E4      | 0.10        | 0.30 | 0.004      | 0.012 |
| e       | 1.27 (BSC)  |      | 0.05 (BSC) |       |
| N       | 8           |      | 8          |       |
| L       | 0.38        | 0.58 | 0.015      | 0.023 |
| K1      | 0.82        | 1.02 | 0.032      | 0.040 |
| K2      | 0.65        | 0.85 | 0.026      | 0.033 |
| K3 = K4 | 0.50        | 0.70 | 0.019      | 0.027 |

|                                                                                                              |  |
|--------------------------------------------------------------------------------------------------------------|--|
| DOCUMENT NO.<br>Z8B00162738                                                                                  |  |
| SCALE<br>0 2.5 5mm                                                                                           |  |
| EUROPEAN PROJECTION<br> |  |
| ISSUE DATE<br>21-09-2011                                                                                     |  |
| REVISION<br>01                                                                                               |  |

# Boardpads & Apertures

## PG-TISON



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## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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