

## SIPMOS® Power-Transistor

### Features

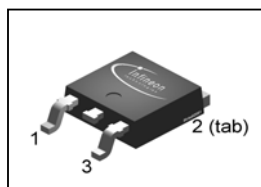
- P-Channel
- Enhancement mode
- Avalanche rated
- $dv/dt$  rated
- 175°C operating temperature
- Pb-free lead plating; RoHS compliant (PG-TO252)



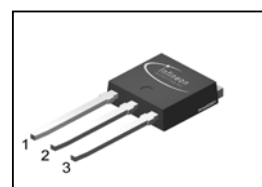
### Product Summary

|                  |      |          |
|------------------|------|----------|
| $V_{DS}$         | -60  | V        |
| $R_{DS(on),max}$ | 0.3  | $\Omega$ |
| $I_D$            | -8.8 | A        |

PG-TO252-3



P-TO251-3



| Type      | Package    | Tape and reel information | Marking | Lead free | Packing |
|-----------|------------|---------------------------|---------|-----------|---------|
| SPU08P06P | P-TO251-3  |                           |         | No        |         |
| SPD08P06P | PG-TO252-3 |                           |         | Yes       |         |

| Parameter                                        | Symbol            | Conditions                                                                                                       | Value          | Unit              |
|--------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------|----------------|-------------------|
|                                                  |                   |                                                                                                                  | steady state   |                   |
| Continuous drain current                         | $I_D$             | $T_A=25\text{ °C}$                                                                                               | -8.83          | A                 |
|                                                  |                   | $T_A=100\text{ °C}$                                                                                              | -6.25          |                   |
| Pulsed drain current                             | $I_{D,pulse}$     | $T_A=25\text{ °C}$                                                                                               | -35.32         |                   |
| Avalanche energy, single pulse                   | $E_{AS}$          | $I_D=8.83\text{ A}$ , $R_{GS}=25\text{ }\Omega$                                                                  | 70             | mJ                |
| Avalanche energy, periodic limited by $T_{jmax}$ | $E_{AR}$          |                                                                                                                  | 4.2            |                   |
| Reverse diode $dv/dt$                            | $dv/dt$           | $I_D=8.83\text{ A}$ , $V_{DS}=48\text{ V}$ ,<br>$di/dt=-200\text{ A}/\mu\text{s}$ ,<br>$T_{j,max}=175\text{ °C}$ | -6             | kV/ $\mu\text{s}$ |
| Gate source voltage                              | $V_{GS}$          |                                                                                                                  | $\pm 20$       | V                 |
| Power dissipation                                | $P_{tot}$         | $T_A=25\text{ °C}$                                                                                               | 42             | W                 |
| Operating and storage temperature                | $T_j$ , $T_{stg}$ |                                                                                                                  | "-55 ... +175" | °C                |
| ESD class                                        |                   |                                                                                                                  |                |                   |
| Soldering temperature                            |                   |                                                                                                                  | 260 °C         |                   |
| IEC climatic category; DIN IEC 68-1              |                   |                                                                                                                  | 55/175/56      |                   |

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

**Thermal characteristics**

|                                                   |            |                                              |   |   |     |     |
|---------------------------------------------------|------------|----------------------------------------------|---|---|-----|-----|
| Thermal resistance,<br>junction - case            | $R_{thJC}$ |                                              | - | - |     | K/W |
| Thermal resistance,<br>junction - ambient, leaded | $R_{thJA}$ |                                              | - | - | 110 |     |
| SMD version, device on PCB:                       | $R_{thJA}$ | minimal footprint                            | - | - | 250 | K/W |
|                                                   |            | 6 cm <sup>2</sup> cooling area <sup>1)</sup> | - | - | 70  |     |

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

**Static characteristics**

|                                  |               |                                                             |      |      |      |               |
|----------------------------------|---------------|-------------------------------------------------------------|------|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=-250\text{ }\mu\text{A}$            | -60  | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-250\text{ }\mu\text{A}$                | -2.1 | -3.0 | -4   |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=-60\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$  | -    | -0.1 | -1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=-60\text{ V}, V_{GS}=0\text{ V}, T_j=150\text{ °C}$ | -    | -10  | -100 |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$                    | -    | -10  | -100 | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=-6.2\text{ V}, I_D=-10\text{ A}$                    | -    | 230  | 300  | m $\Omega$    |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=-6.2\text{ A}$           | 2.5  | 4.9  | -    | S             |

<sup>1)</sup> Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> ( one layer, 70 $\mu$ , thick) copper area for drain connection. PCB is vertical without blown air.

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

#### Dynamic characteristics

|                              |              |                                                                                   |   |      |      |    |
|------------------------------|--------------|-----------------------------------------------------------------------------------|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=-25\text{ V},$<br>$f=1\text{ MHz}$                     | - | 335  | 420  | pF |
| Output capacitance           | $C_{oss}$    |                                                                                   | - | 105  | 135  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                   | - | 65   | 95   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=-30\text{ V}, V_{GS}=-10\text{ V}, I_D=-6.2\text{ A},$<br>$R_G=6\ \Omega$ | - | 16.0 | 24.0 |    |
| Rise time                    | $t_r$        |                                                                                   | - | 46.0 | 69   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                   | - | 48   | 72   |    |
| Fall time                    | $t_f$        |                                                                                   | - | 14   | 21   |    |

#### Gate Charge Characteristics

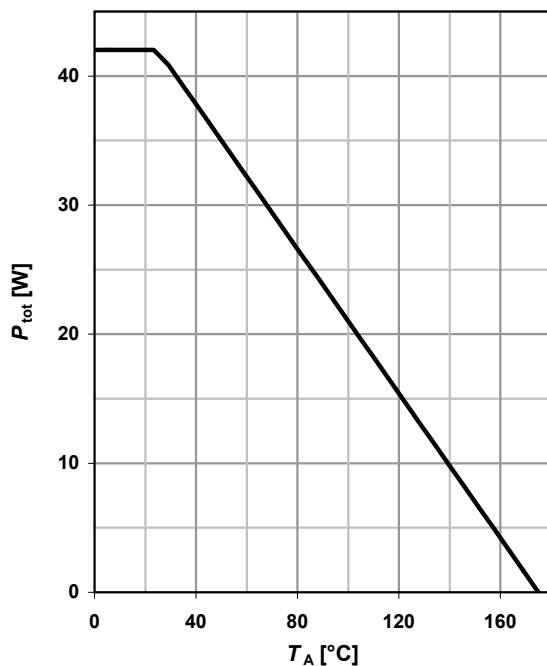
|                       |               |                                                                                |   |      |      |    |
|-----------------------|---------------|--------------------------------------------------------------------------------|---|------|------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=-48\text{ V}, I_D=-8.8\text{ A},$<br>$V_{GS}=0\text{ to }-10\text{ V}$ | - | -1.9 | -2.6 | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                                | - | -5   | -8   |    |
| Gate charge total     | $Q_g$         |                                                                                | - | -10  | -13  |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                                | - | -6   | -    | V  |

#### Reverse Diode

|                                  |               |                                                                     |   |       |       |    |
|----------------------------------|---------------|---------------------------------------------------------------------|---|-------|-------|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ °C}$                                                  | - | -     | -8.80 | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                     | - | -     | -35.3 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=-8.83\text{ A},$<br>$T_j=25\text{ °C}$      | - | -0.98 | -1.55 | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=30\text{ V}, I_F= I_S ,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 60    | 90    | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                     | - | 100   | 150   | nC |

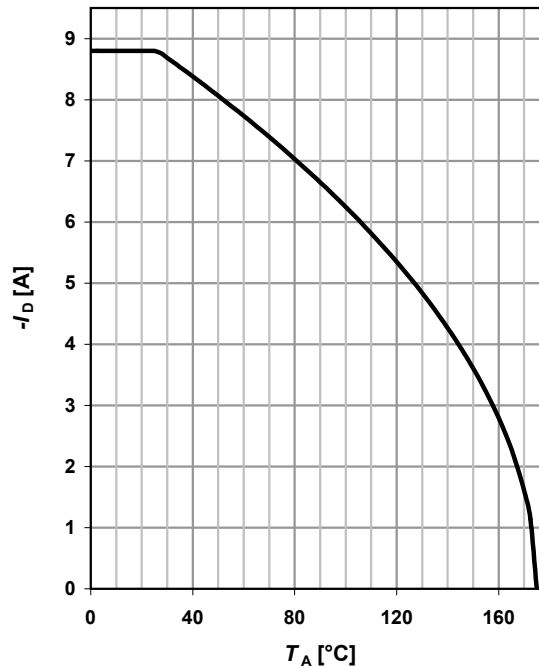
### 1 Power dissipation

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



### 2 Drain current

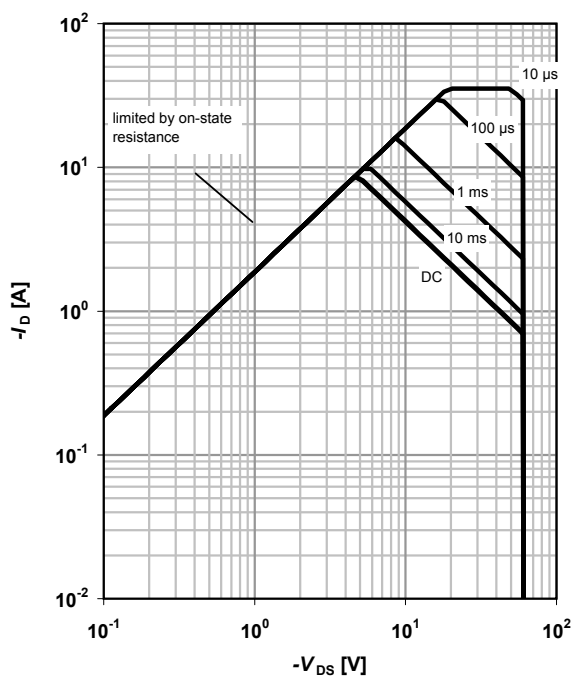
$$I_D = f(T_A); |V_{GS}| \geq 10 \text{ V}$$



### 3 Safe operating area

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

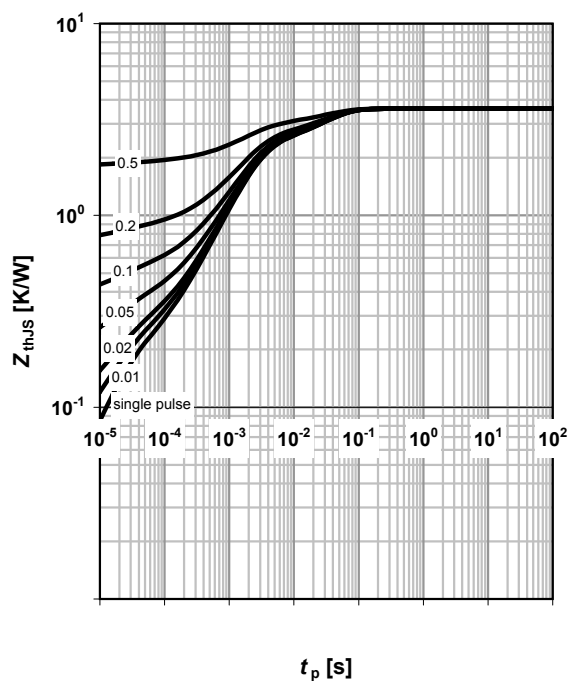
parameter:  $t_p$



### 4 Max. transient thermal impedance

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

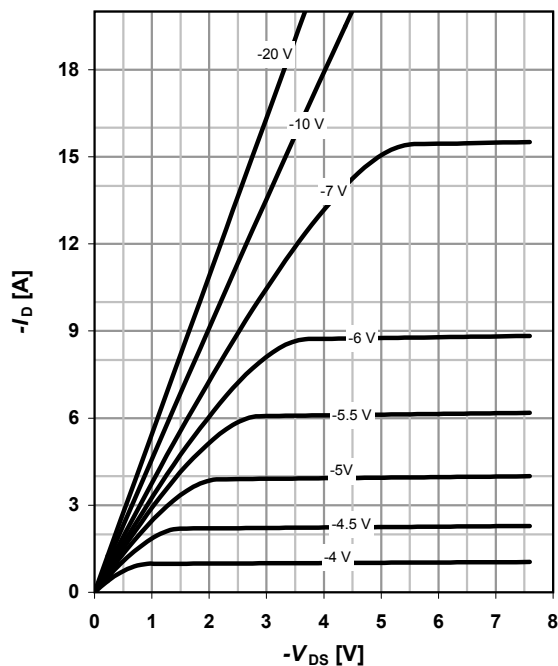
parameter:  $D = t_p / T$



### 5 Typ. output characteristics

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

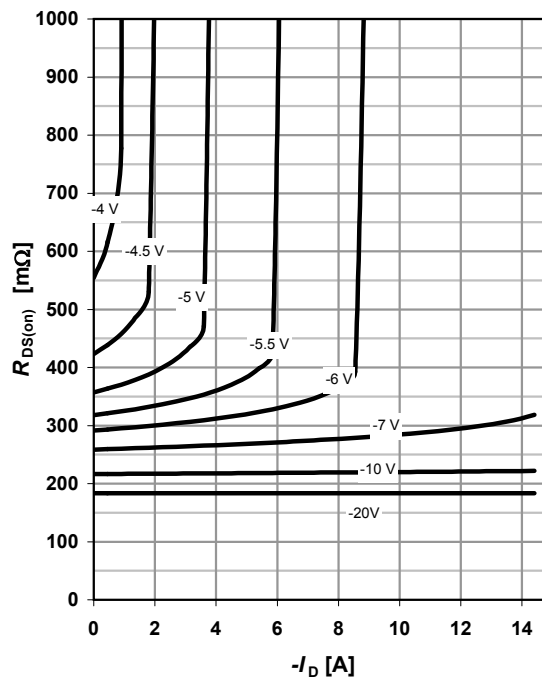
parameter:  $V_{GS}$



### 6 Typ. drain-source on resistance

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

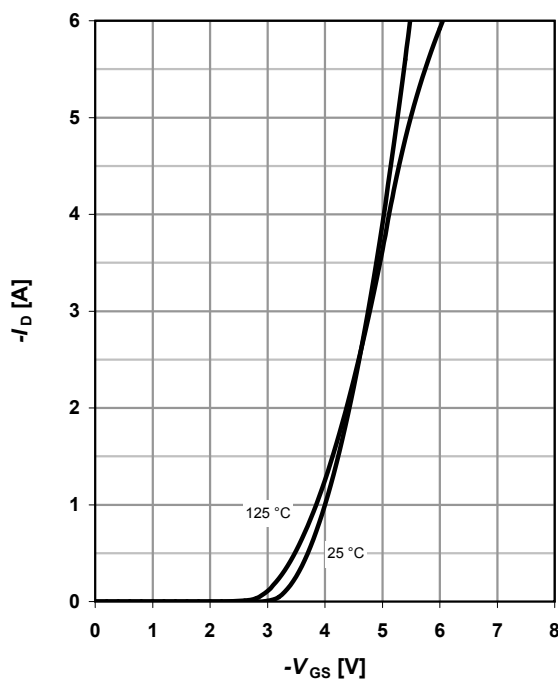
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

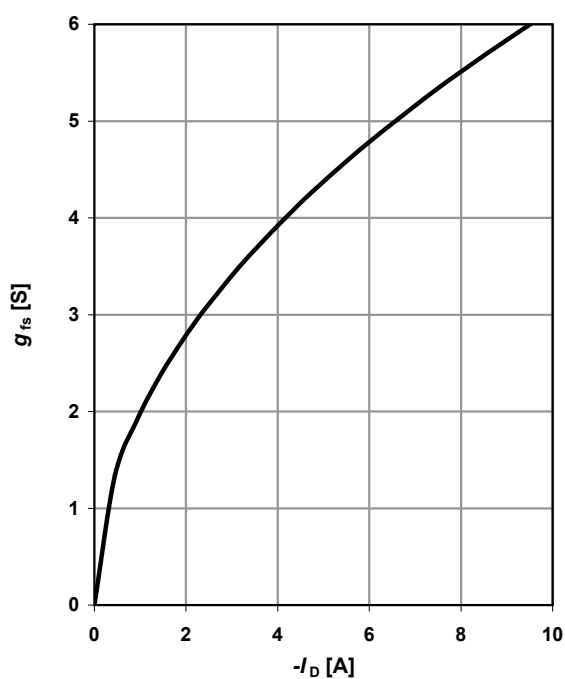
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter:  $T_j$



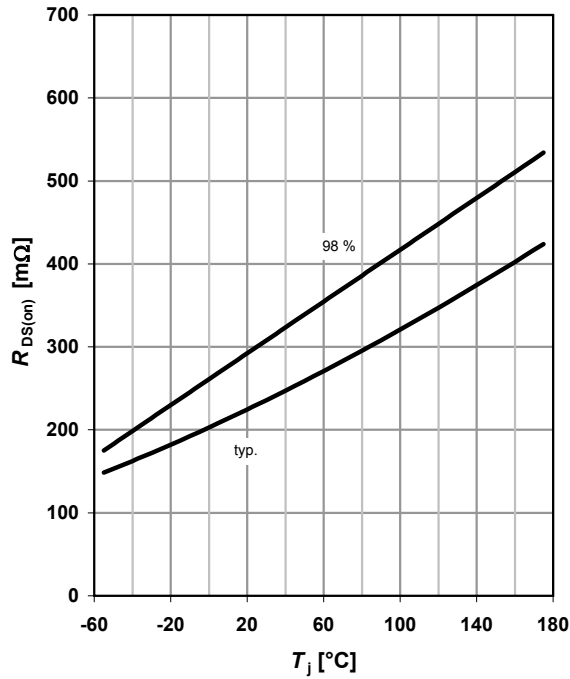
### 8 Typ. forward transconductance

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



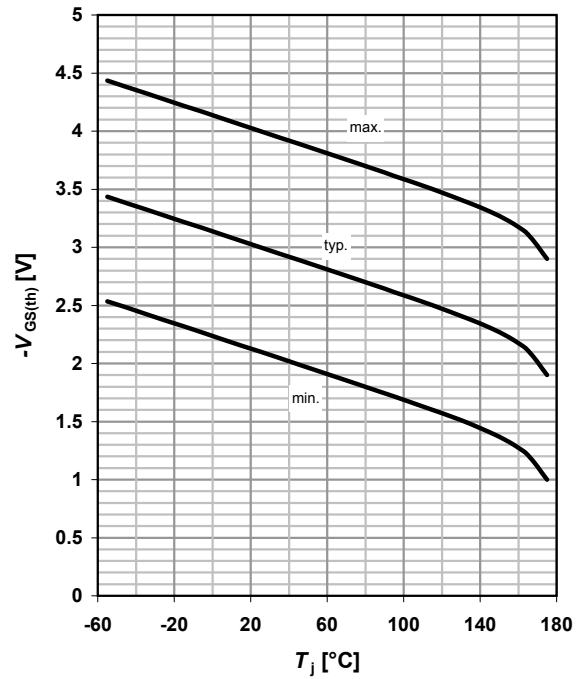
### 9 Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = -6.2 \text{ A}; V_{GS} = -10 \text{ V}$$



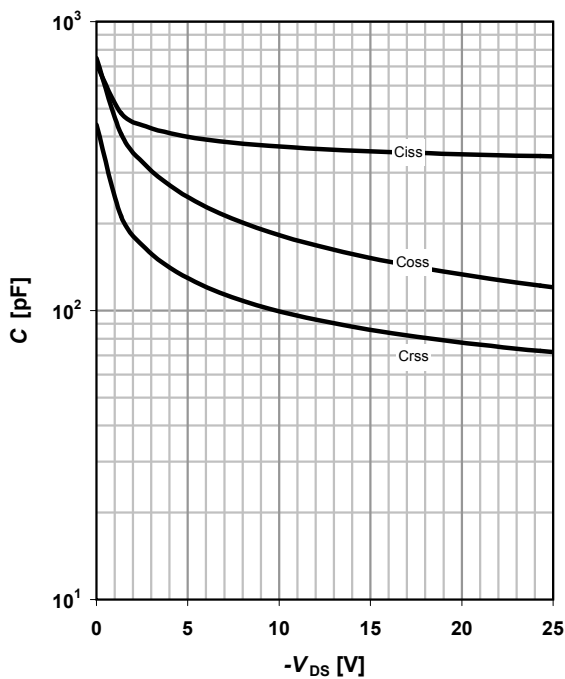
### 10 Typ. gate threshold voltage

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



### 11 Typ. capacitances

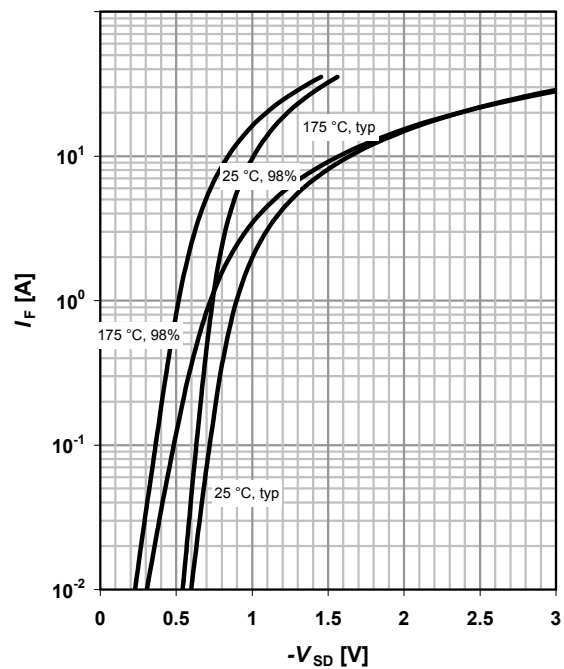
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



### 12 Forward characteristics of reverse diode

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

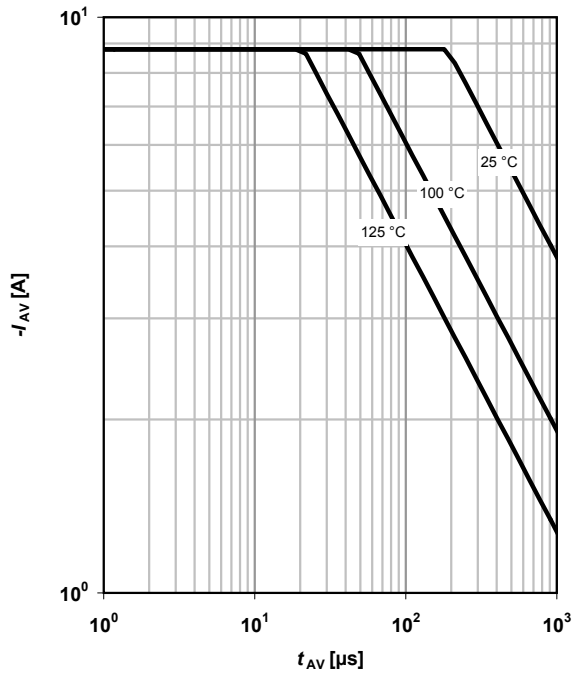
parameter:  $T_j$



### 13 Avalanche characteristics

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

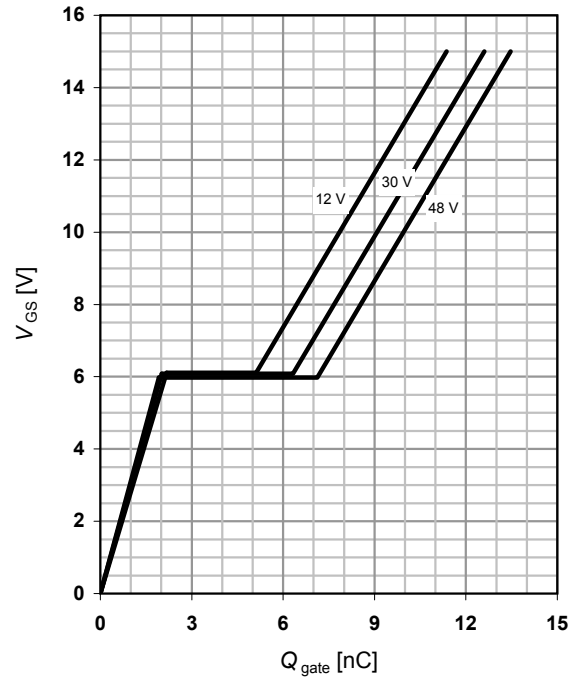
parameter:  $T_{j(\text{start})}$



### 14 Typ. gate charge

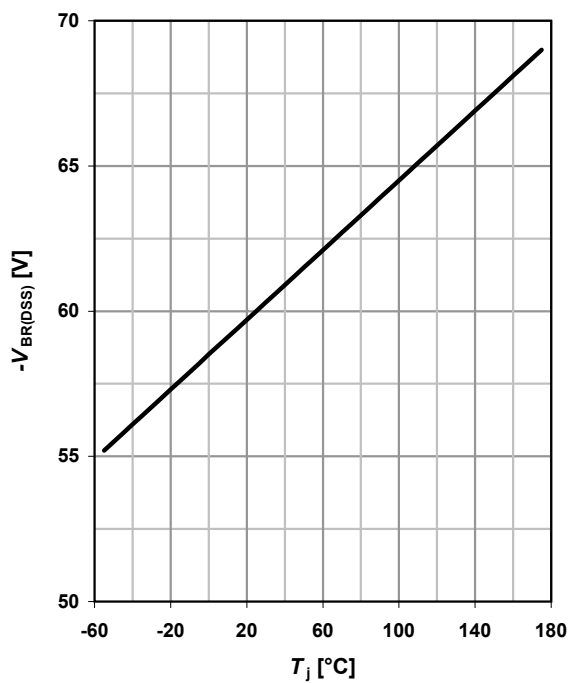
$$V_{GS}=f(Q_{\text{gate}}); I_D=-8.8\ \text{A pulsed}$$

parameter:  $V_{DD}$



### 15 Drain-source breakdown voltage

$$V_{BR(DSS)}=f(T_j); I_D=-250\ \mu\text{A}$$



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