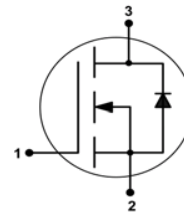


**OptiMOS™ 2 Small-Signal-Transistor**
**Features**

- N-channel
- Enhancement mode
- Ultra Logic level (1.8V rated)
- Avalanche rated
- Footprint compatible to SOT23
- Qualified according to AEC Q101
- 100% lead-free; RoHS compliant


**Product Summary**

|                  |                       |     |           |
|------------------|-----------------------|-----|-----------|
| $V_{DS}$         |                       | 20  | V         |
| $R_{DS(on),max}$ | $V_{GS}=2.5\text{ V}$ | 23  | $m\Omega$ |
|                  | $V_{GS}=1.8\text{ V}$ | 32  |           |
| $I_D$            |                       | 3.7 | A         |


**PG-SC59**


| Type    | Package | Tape and Reel Information | Marking | Lead Free | Packing |
|---------|---------|---------------------------|---------|-----------|---------|
| BSR802N | PG-SC59 | L6327 = 3000 pcs. / reel  | LFs     | Yes       | Non dry |

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

| Parameter                           | Symbol            | Conditions                                                                                                     | Value       | Unit               |
|-------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------|-------------|--------------------|
| Continuous drain current            | $I_D$             | $T_A=25\text{ °C}$                                                                                             | 3.7         | A                  |
|                                     |                   | $T_A=25\text{ °C}$                                                                                             | 2.9         |                    |
| Pulsed drain current                | $I_{D,pulse}$     | $T_A=70\text{ °C}$                                                                                             | 14.8        |                    |
| Avalanche energy, single pulse      | $E_{AS}$          | $I_D=3.8\text{ A}$ , $R_{GS}=25\text{ }\Omega$                                                                 | 30          | mJ                 |
| Reverse diode $dv/dt$               | $dv/dt$           | $I_D=3.8\text{ A}$ , $V_{DS}=16\text{ V}$ ,<br>$di/dt=200\text{ A}/\mu\text{s}$ ,<br>$T_{j,max}=150\text{ °C}$ | 6           | kV/ $\mu\text{s}$  |
| Gate source voltage                 | $V_{GS}$          |                                                                                                                | $\pm 8$     | V                  |
| Power dissipation <sup>1)</sup>     | $P_{tot}$         | $T_A=25\text{ °C}$                                                                                             | 0.5         | W                  |
| Operating and storage temperature   | $T_j$ , $T_{stg}$ |                                                                                                                | -55 ... 150 | $^{\circ}\text{C}$ |
| ESD Class                           |                   | JESD22-A114-HBM                                                                                                | 0 (<250V)   |                    |
| Soldering Temperature               |                   |                                                                                                                | 260 °C      |                    |
| IEC climatic category; DIN IEC 68-1 |                   |                                                                                                                | 55/150/56   |                    |

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

**Thermal characteristics**

|                                           |            |                                 |   |   |     |     |
|-------------------------------------------|------------|---------------------------------|---|---|-----|-----|
| Thermal resistance,<br>junction - ambient | $R_{thJA}$ | minimal footprint <sup>1)</sup> | - | - | 250 | K/W |
|-------------------------------------------|------------|---------------------------------|---|---|-----|-----|

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

|                                  |               |                                                                     |     |      |      |                  |
|----------------------------------|---------------|---------------------------------------------------------------------|-----|------|------|------------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$                  | 20  | -    | -    | V                |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ , $I_D=30\text{ }\mu\text{A}$                       | 0.3 | 0.55 | 0.75 |                  |
| Drain-source leakage current     | $I_{DSS}$     | $V_{DS}=20\text{ V}$ , $V_{GS}=0\text{ V}$ ,<br>$T_j=25\text{ °C}$  | -   | -    | 1    | $\mu\text{A}$    |
|                                  |               | $V_{DS}=20\text{ V}$ , $V_{GS}=0\text{ V}$ ,<br>$T_j=150\text{ °C}$ | -   | -    | 100  |                  |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=8\text{ V}$ , $V_{DS}=0\text{ V}$                           | -   | -    | 100  | nA               |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=1.8\text{ V}$ , $I_D=3.2\text{ A}$                          | -   | 22   | 32   | $\text{m}\Omega$ |
|                                  |               | $V_{GS}=2.5\text{ V}$ , $I_D=3.7\text{ A}$                          | -   | 17   | 23   |                  |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}$ ,<br>$I_D=2.9\text{ A}$              |     | 16   | -    | S                |

<sup>1)</sup> Performed on 40mm<sup>2</sup> FR4 PCB. The traces are 1mm wide, 70 $\mu\text{m}$  thick and 20mm long; they are present on both sides of the PCB.

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

**Dynamic characteristics**

|                              |              |                                                                                 |   |      |      |    |
|------------------------------|--------------|---------------------------------------------------------------------------------|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=10\text{ V},$<br>$f=1\text{ MHz}$                    | - | 1013 | 1447 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                 | - | 290  | 414  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                 | - | 51   | 73.0 |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=10\text{ V}, V_{GS}=2.5\text{ V},$<br>$I_D=3.7\text{ A}, R_G=6\ \Omega$ | - | 9.8  | -    | ns |
| Rise time                    | $t_r$        |                                                                                 | - | 18   | -    |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                 | - | 26   | -    |    |
| Fall time                    | $t_f$        |                                                                                 | - | 4.1  | -    |    |

**Gate Charge Characteristics**

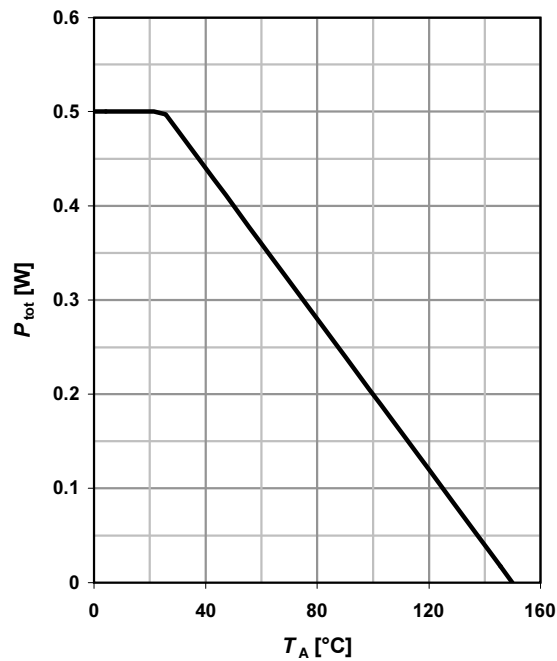
|                       |               |                                                                              |   |     |   |    |
|-----------------------|---------------|------------------------------------------------------------------------------|---|-----|---|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=10\text{ V}, I_D=3.7\text{ A},$<br>$V_{GS}=0\text{ to }2.5\text{ V}$ | - | 1.4 | - | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                              | - | 1.5 | - |    |
| Gate charge total     | $Q_g$         |                                                                              | - | 4.7 | - |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                              | - | 1.4 | - | V  |

**Reverse Diode**

|                                  |               |                                                                            |   |      |     |    |
|----------------------------------|---------------|----------------------------------------------------------------------------|---|------|-----|----|
| Diode continuous forward current | $I_S$         | $T_A=25\text{ °C}$                                                         | - | -    | 0.5 | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                            | - | -    | 15  |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=3.7\text{ A},$<br>$T_j=25\text{ °C}$               | - | 0.78 | 1.1 | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=10\text{ V}, I_F=3.7\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 15   | -   | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                            | - | 5.2  | -   | nC |

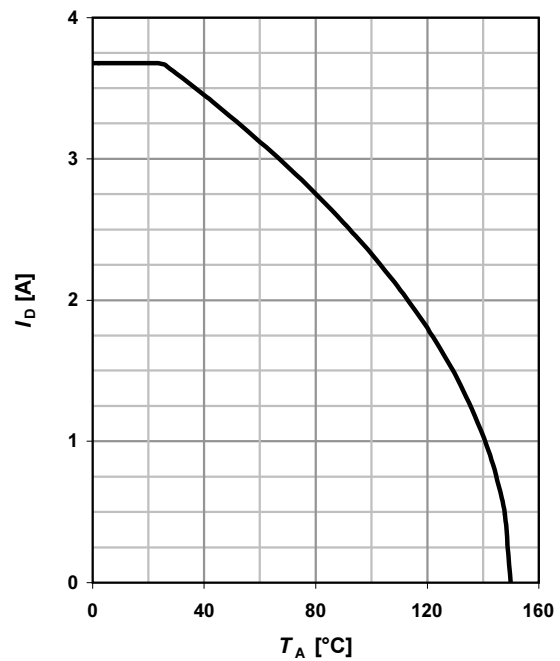
### 1 Power dissipation

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



### 2 Drain current

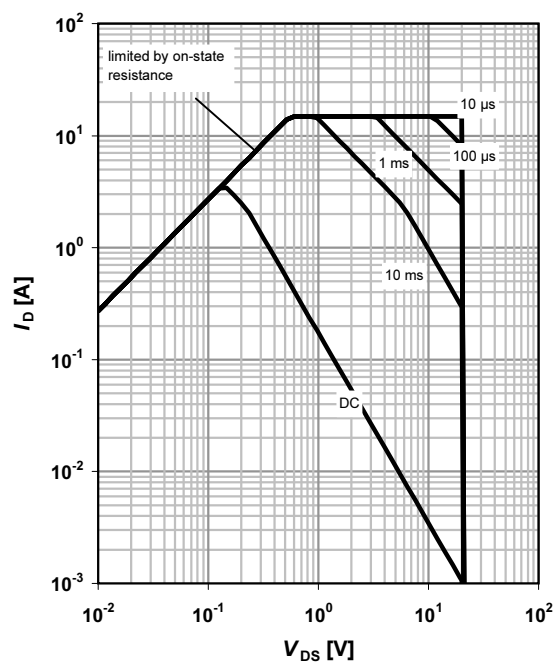
$$I_D = f(T_A); V_{\text{GS}} \geq 2.5 \text{ V}$$



### 3 Safe operating area

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

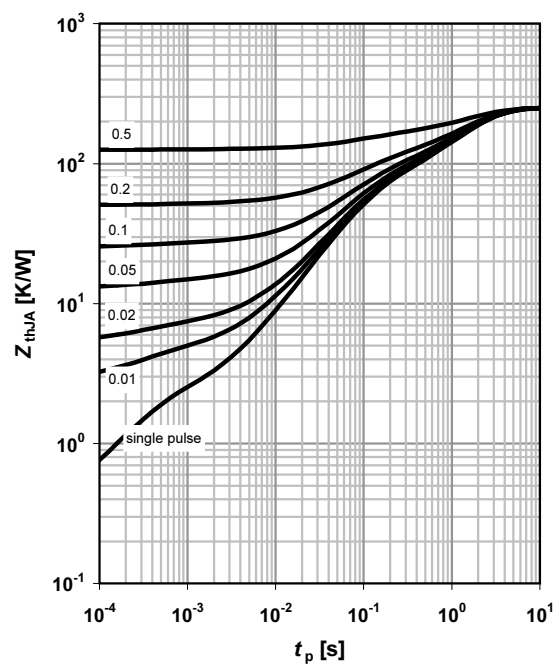
parameter:  $t_p$



### 4 Max. transient thermal impedance

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

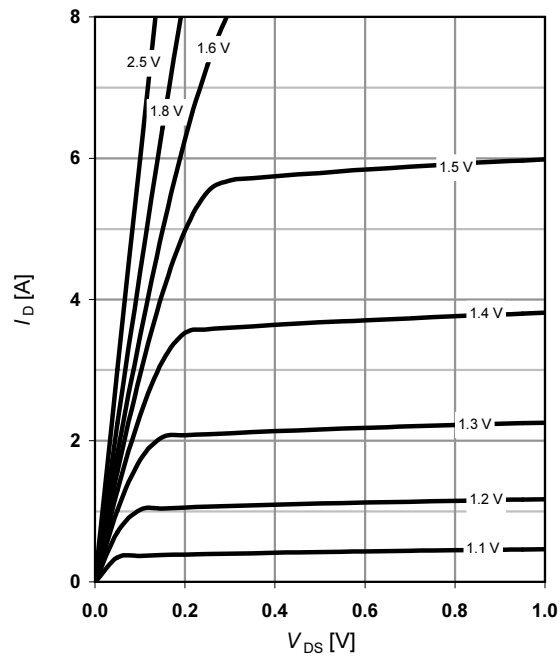
parameter:  $D = t_p/T$



### 5 Typ. output characteristics

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

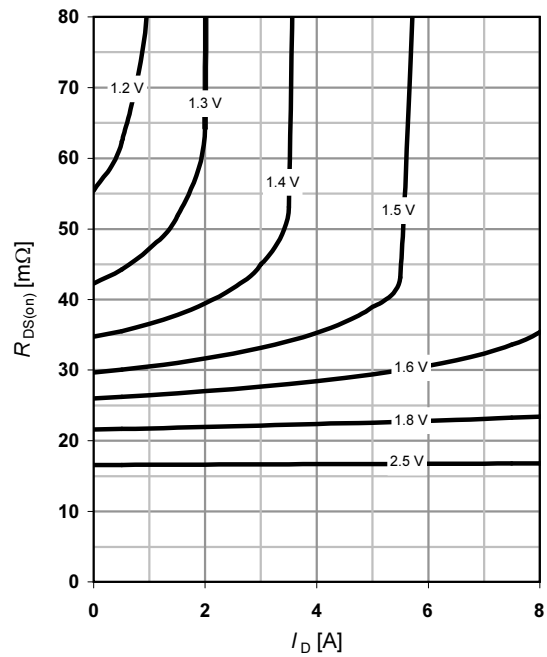
parameter:  $V_{GS}$



### 6 Typ. drain-source on resistance

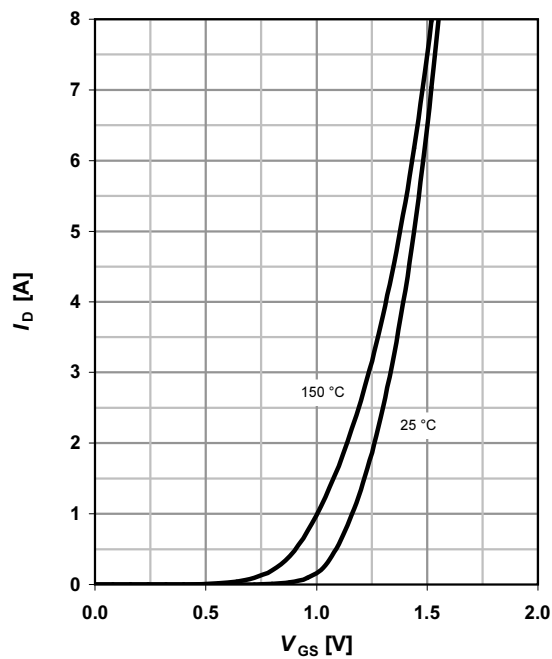
$$R_{DS(on)} = f(I_D); T_J = 25^\circ\text{C}$$

parameter:  $V_{GS}$



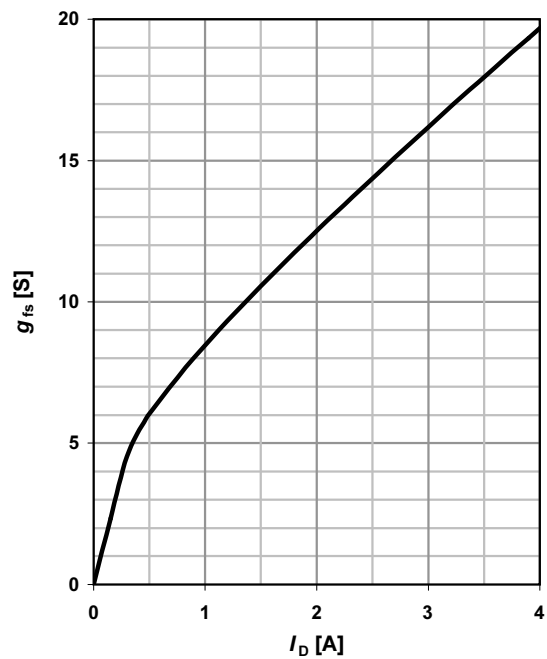
### 7 Typ. transfer characteristics

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



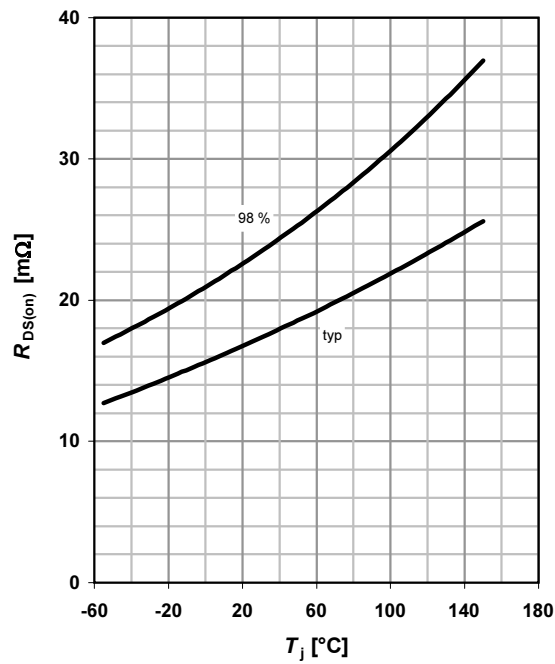
### 8 Typ. forward transconductance

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



### 9 Drain-source on-state resistance

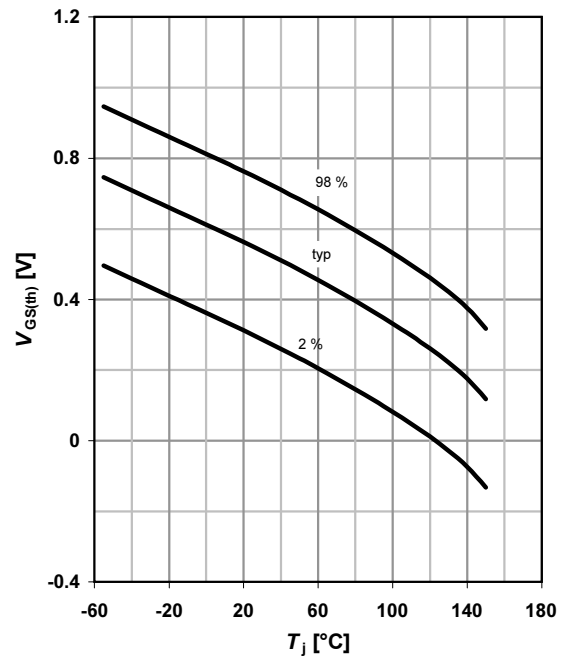
$$R_{DS(on)} = f(T_j); I_D = 3.7 \text{ A}; V_{GS} = 2.5 \text{ V}$$



### 10 Typ. gate threshold voltage

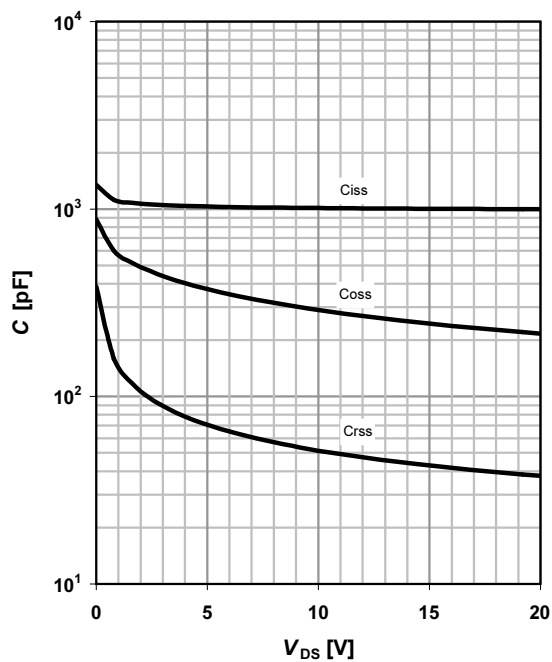
$$V_{GS(th)} = f(T_j); V_{DS} = V_{GS}; I_D = 30 \mu\text{A}$$

parameter:  $I_D$



### 11 Typ. capacitances

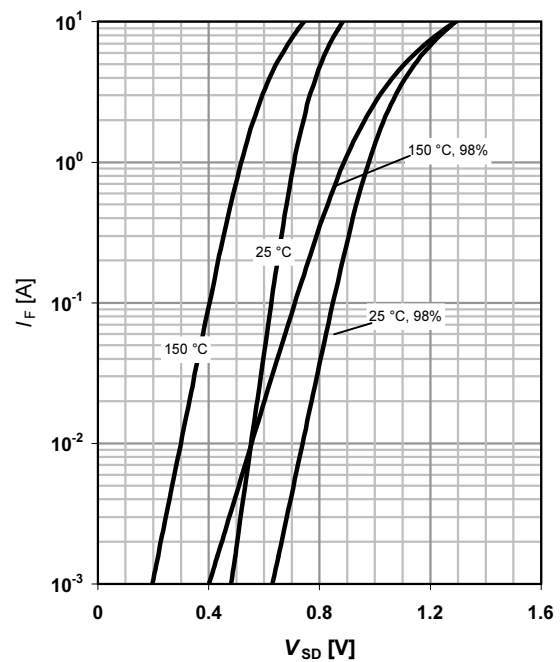
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25^\circ\text{C}$$



### 12 Forward characteristics of reverse diode

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

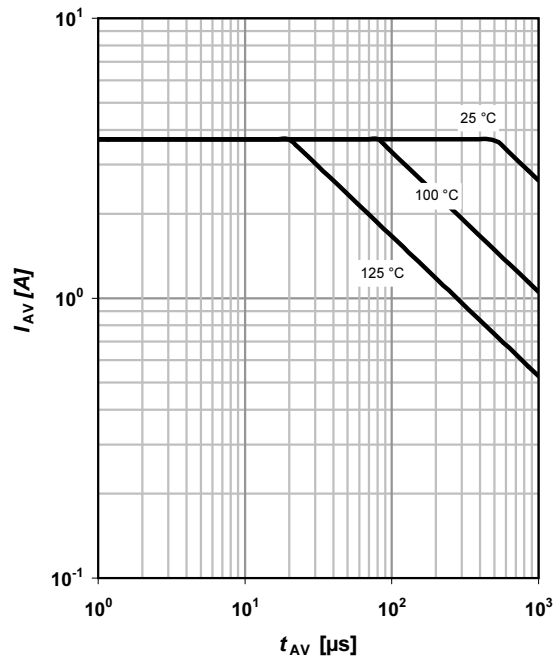
parameter:  $T_j$



### 13 Avalanche characteristics

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

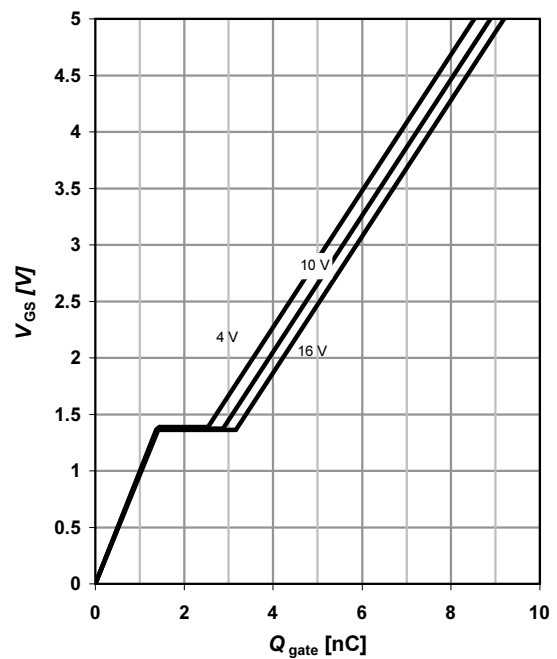
parameter:  $T_{j(\text{start})}$



### 14 Typ. gate charge

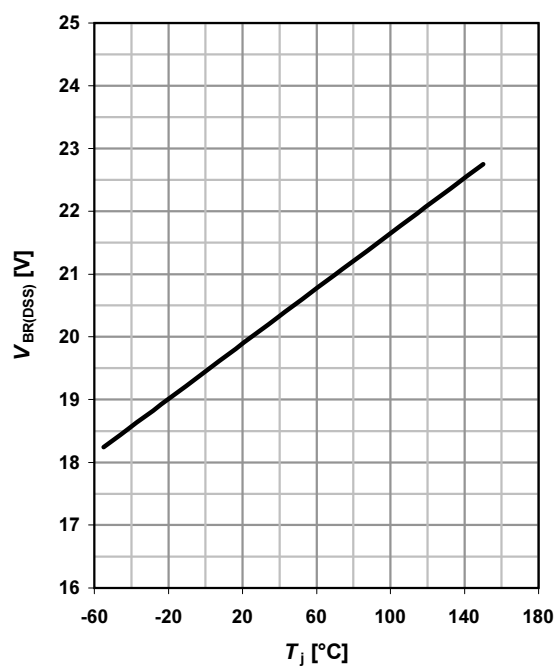
$$V_{GS}=f(Q_{\text{gate}}); I_D=3.7\ \text{A pulsed}$$

parameter:  $V_{DD}$

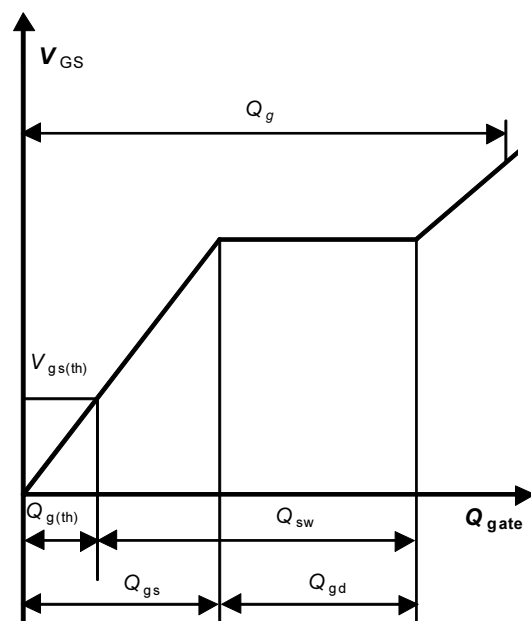


### 15 Drain-source breakdown voltage

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



### 16 Gate charge waveforms



### Package Outline:



**Footprint:**



Dimensions in mm

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