

## OptiMOS™3 Power-Transistor

### Package

### Marking

- N-channel, normal level
- Excellent gate charge  $\times R_{DS(on)}$  product (FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target application
- Halogen-free according to IEC61249-2-21

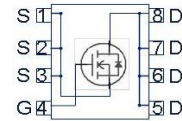


| Type           | Package     | Marking |
|----------------|-------------|---------|
| BSZ900N15NS3 G | PG-TSDSON-8 | 900N15N |

### Product Summary

|                  |     |    |
|------------------|-----|----|
| $V_{DS}$         | 150 | V  |
| $R_{DS(on),max}$ | 90  | mΩ |
| $I_D$            | 13  | A  |

PG-TSDSON-8



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

| Parameter                           | Symbol            | Conditions                               | Value       | Unit |
|-------------------------------------|-------------------|------------------------------------------|-------------|------|
| Continuous drain current            | $I_D$             | $T_C=25\text{ °C}$                       | 13          | A    |
|                                     |                   | $T_C=100\text{ °C}$                      | 8           |      |
| Pulsed drain current <sup>2)</sup>  | $I_{D,pulse}$     | $T_C=25\text{ °C}$                       | 52          |      |
| Avalanche energy, single pulse      | $E_{AS}$          | $I_D=10\text{ A}$ , $R_{GS}=25\text{ Ω}$ | 30          | mJ   |
| Gate source voltage                 | $V_{GS}$          |                                          | ±20         | V    |
| Power dissipation                   | $P_{tot}$         | $T_C=25\text{ °C}$                       | 38          | W    |
| 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

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

**Thermal characteristics**

|                                        |            |                                              |   |   |     |     |
|----------------------------------------|------------|----------------------------------------------|---|---|-----|-----|
| Thermal resistance, junction - case    | $R_{thJC}$ |                                              | - | - | 3.3 | K/W |
| Thermal resistance, junction - ambient | $R_{thJA}$ | 6 cm <sup>2</sup> cooling area <sup>3)</sup> | - | - | 60  |     |

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

|                                  |               |                                                                           |     |      |     |               |
|----------------------------------|---------------|---------------------------------------------------------------------------|-----|------|-----|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$                                      | 150 | -    | -   | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=20\text{ }\mu\text{A}$                                | 2   | 3    | 4   |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=120\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^{\circ}\text{C}$  | -   | 0.01 | 1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=120\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^{\circ}\text{C}$ | -   | 10   | 100 |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                                   | -   | 1    | 100 | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=10\text{ V}, I_D=10\text{ A}$                                     | -   | 74   | 90  | m $\Omega$    |
|                                  |               | $V_{GS}=8\text{ V}, I_D=5\text{ A}$                                       | -   | 75   | 91  |               |
| Gate resistance                  | $R_G$         |                                                                           | -   | 1.7  | -   | $\Omega$      |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=10\text{ A}$                           | 6   | 12   | -   | S             |

<sup>3)</sup> see figure 3

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

**Dynamic characteristics**

|                              |              |                                                                                |   |     |     |    |
|------------------------------|--------------|--------------------------------------------------------------------------------|---|-----|-----|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=75\text{ V},$<br>$f=1\text{ MHz}$                   | - | 380 | 510 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                | - | 46  | 61  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                | - | 3   | -   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=75\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=5\text{ A}, R_G=1.6\ \Omega$ | - | 4   | -   | ns |
| Rise time                    | $t_r$        |                                                                                | - | 4   | -   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                | - | 8   | -   |    |
| Fall time                    | $t_f$        |                                                                                | - | 3   | -   |    |

**Gate Charge Characteristics<sup>4)</sup>**

|                       |               |                                                                           |   |     |    |    |
|-----------------------|---------------|---------------------------------------------------------------------------|---|-----|----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=75\text{ V}, I_D=5\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 1.9 | -  | nC |
| Gate to drain charge  | $Q_{gd}$      |                                                                           | - | 0.9 | -  |    |
| Switching charge      | $Q_{sw}$      |                                                                           | - | 1.7 | -  |    |
| Gate charge total     | $Q_g$         |                                                                           | - | 5.0 | 7  |    |
| Gate plateau voltage  | $V_{plateau}$ |                                                                           | - | 5.2 | -  | V  |
| Output charge         | $Q_{oss}$     | $V_{DD}=75\text{ V}, V_{GS}=0\text{ V}$                                   | - | 12  | 17 | nC |

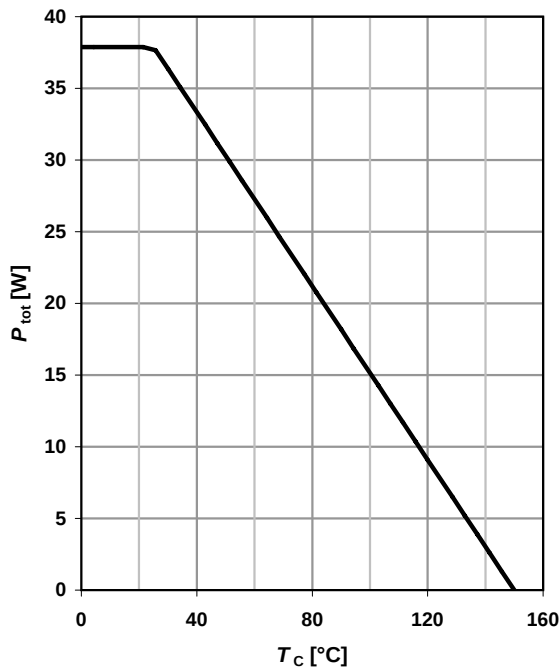
**Reverse Diode**

|                                  |               |                                                                          |   |     |     |    |
|----------------------------------|---------------|--------------------------------------------------------------------------|---|-----|-----|----|
| Diode continuous forward current | $I_S$         | $T_C=25\text{ °C}$                                                       | - | -   | 13  | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                          | - | -   | 52  |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=13\text{ A},$<br>$T_j=25\text{ °C}$              | - | 0.9 | 1.2 | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=75\text{ V}, I_F=5\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 59  | -   | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                          | - | 123 | -   | nC |

<sup>4)</sup> See figure 16 for gate charge parameter definition

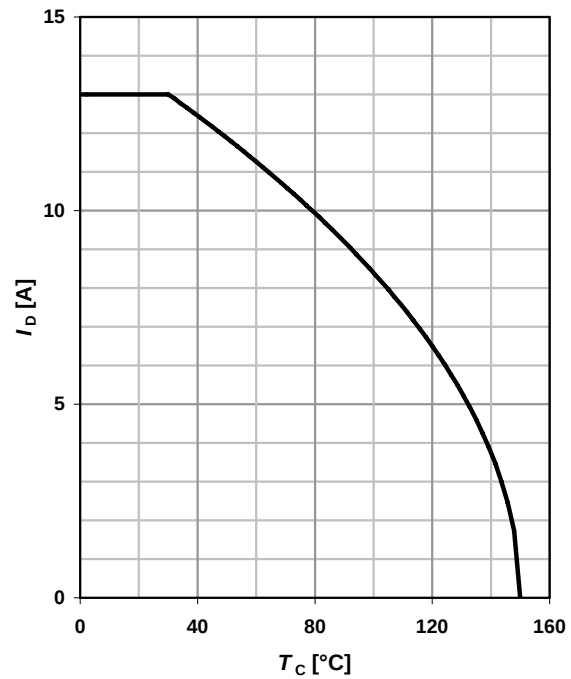
### 1 Power dissipation

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



### 2 Drain current

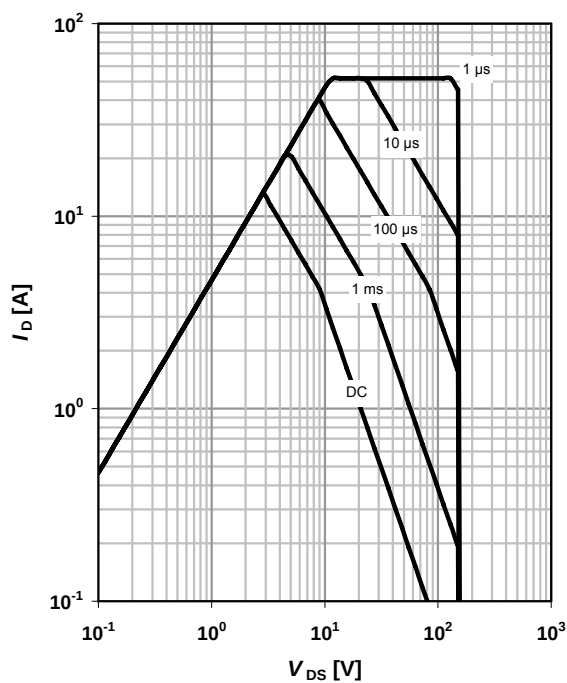
$$I_D = f(T_c); V_{GS} \geq 10 \text{ V}$$



### 3 Safe operating area

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

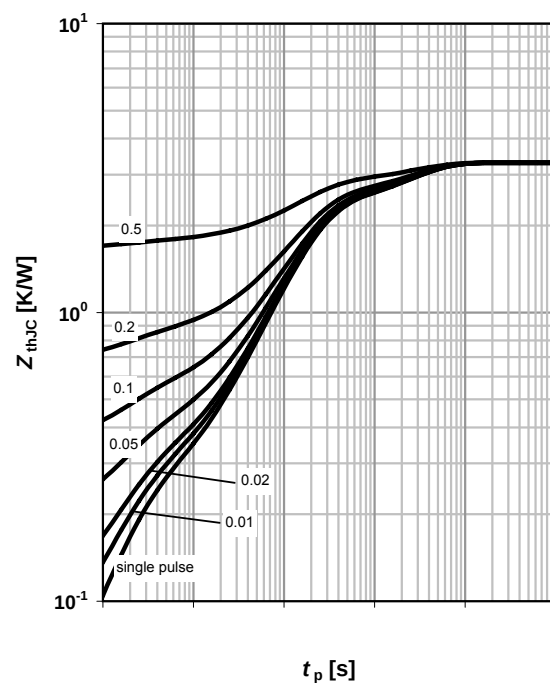
parameter:  $t_p$



### 4 Max. transient thermal impedance

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

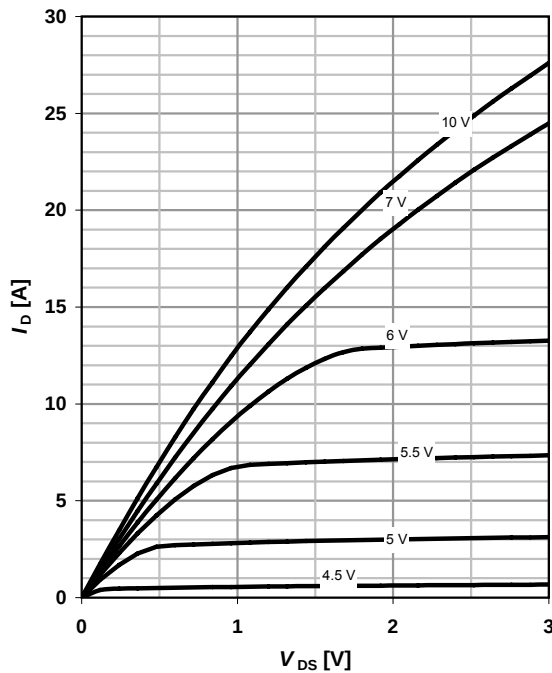
parameter:  $D = t_p/T$



### 5 Typ. output characteristics

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

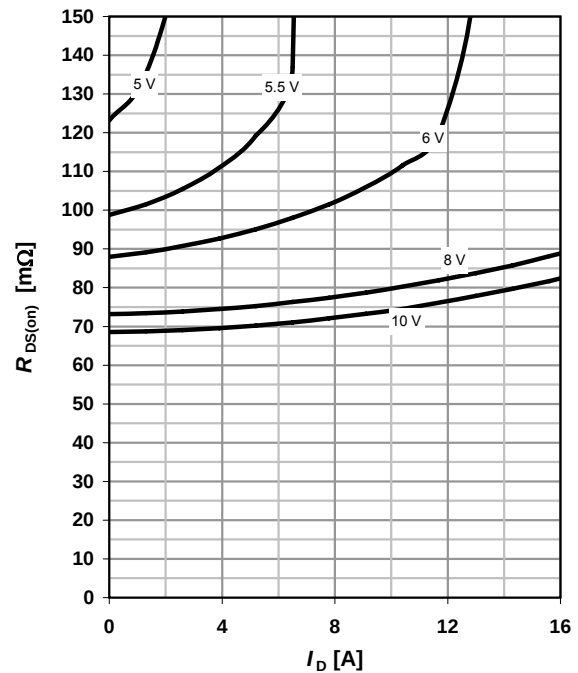
parameter:  $V_{GS}$



### 6 Typ. drain-source on resistance

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

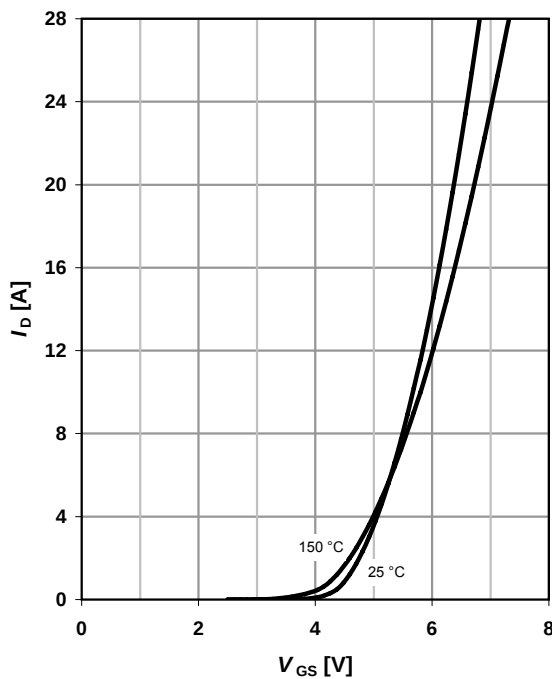
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

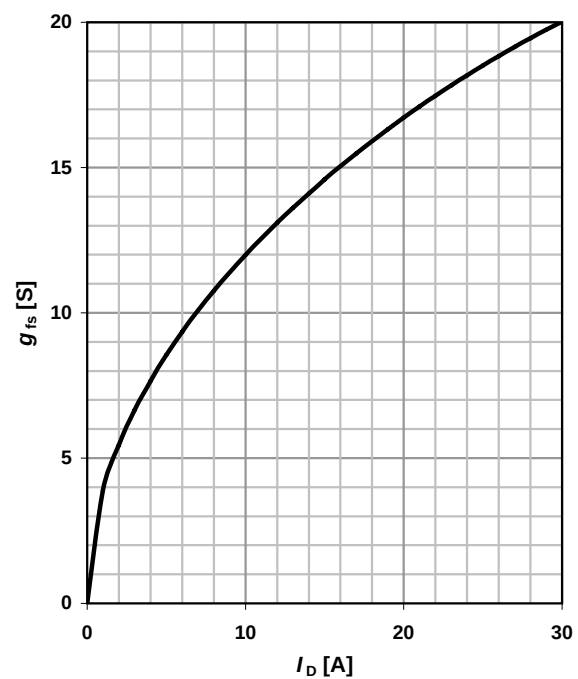
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$

parameter:  $T_j$



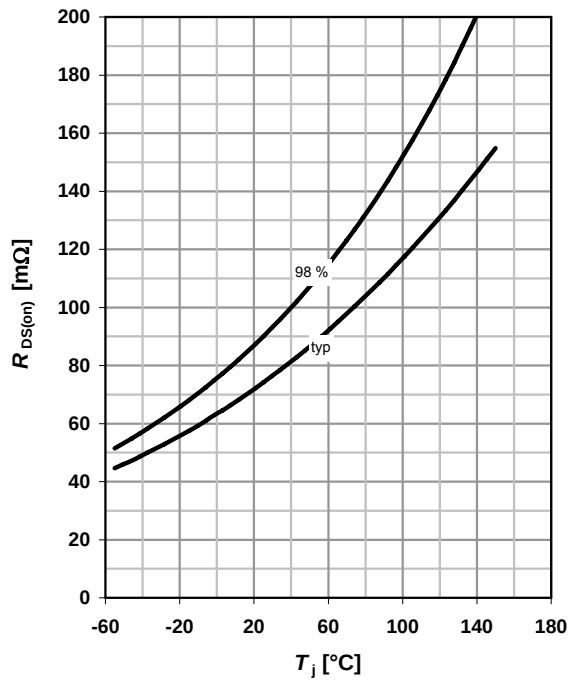
### 8 Typ. forward transconductance

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



### 9 Drain-source on-state resistance

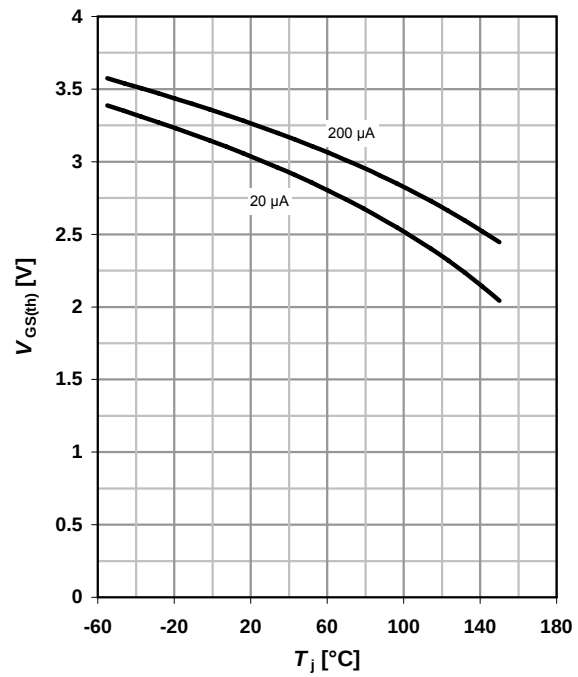
$$R_{DS(on)} = f(T_j); I_D = 10 \text{ A}; V_{GS} = 10 \text{ V}$$



### 10 Typ. gate threshold voltage

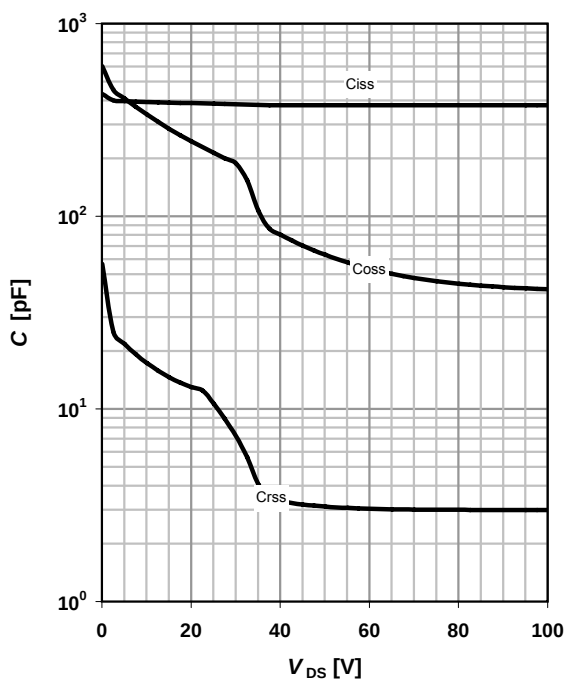
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter:  $I_D$



### 11 Typ. capacitances

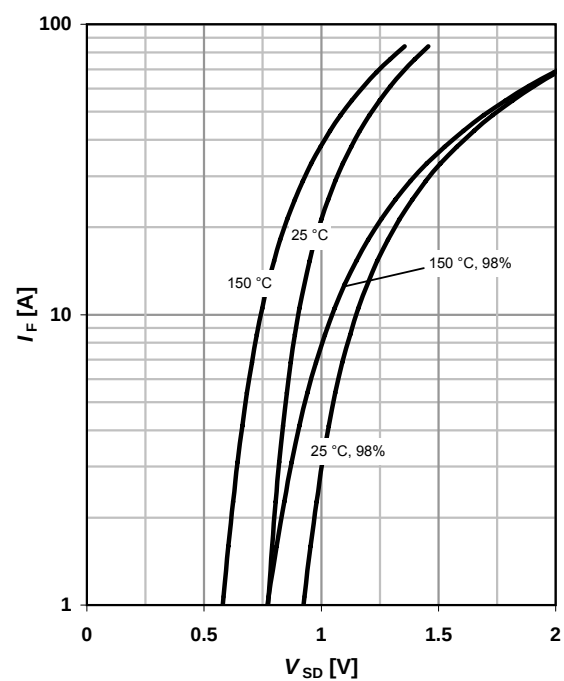
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



### 12 Forward characteristics of reverse diode

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

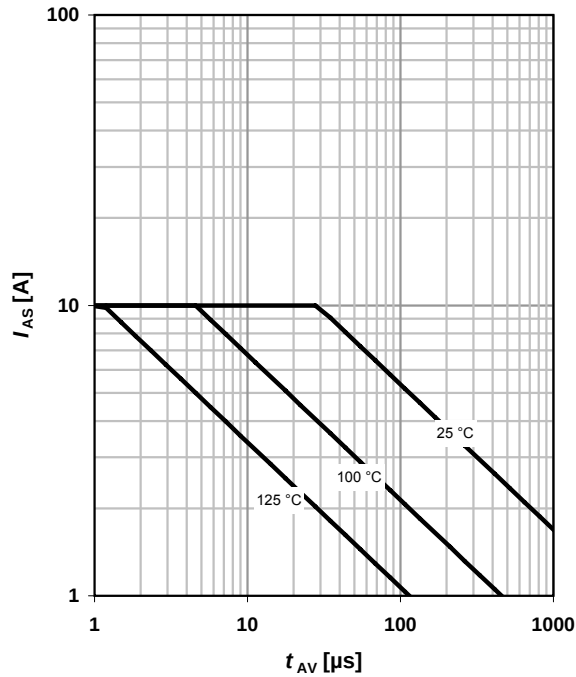
parameter:  $T_j$



### 13 Avalanche characteristics

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

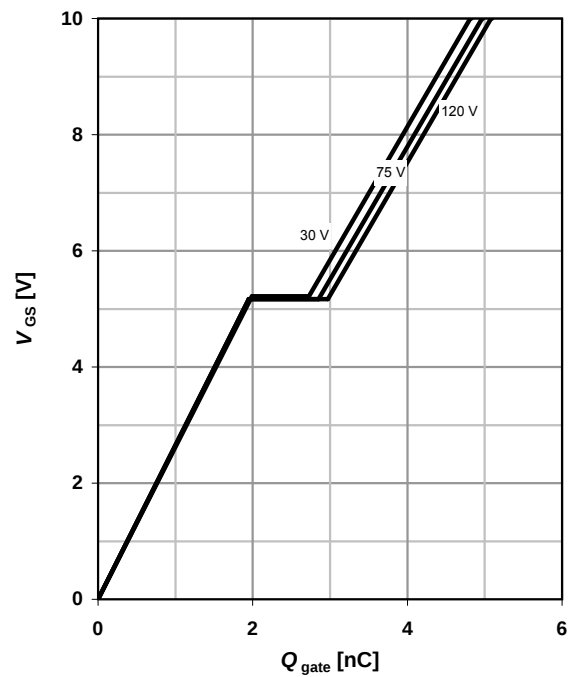
parameter:  $T_{j(\text{start})}$



### 14 Typ. gate charge

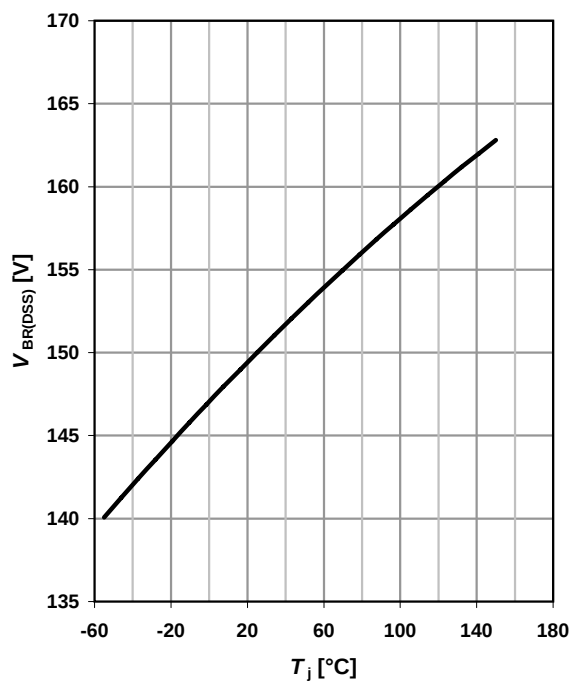
$$V_{GS}=f(Q_{\text{gate}}); I_D=5\ \text{A pulsed}$$

parameter:  $V_{DD}$

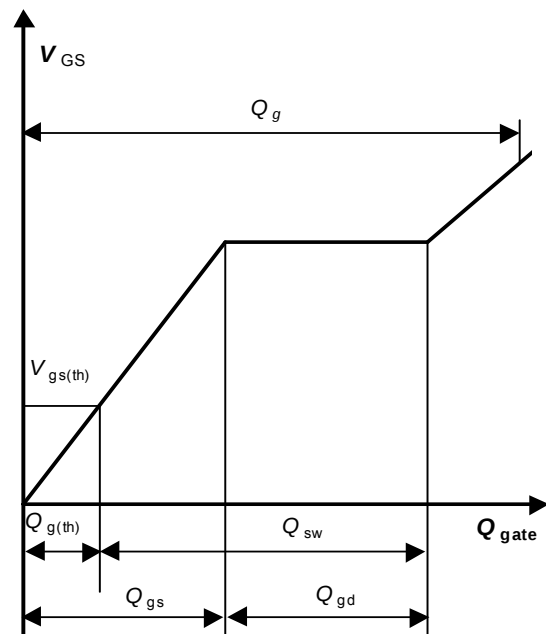


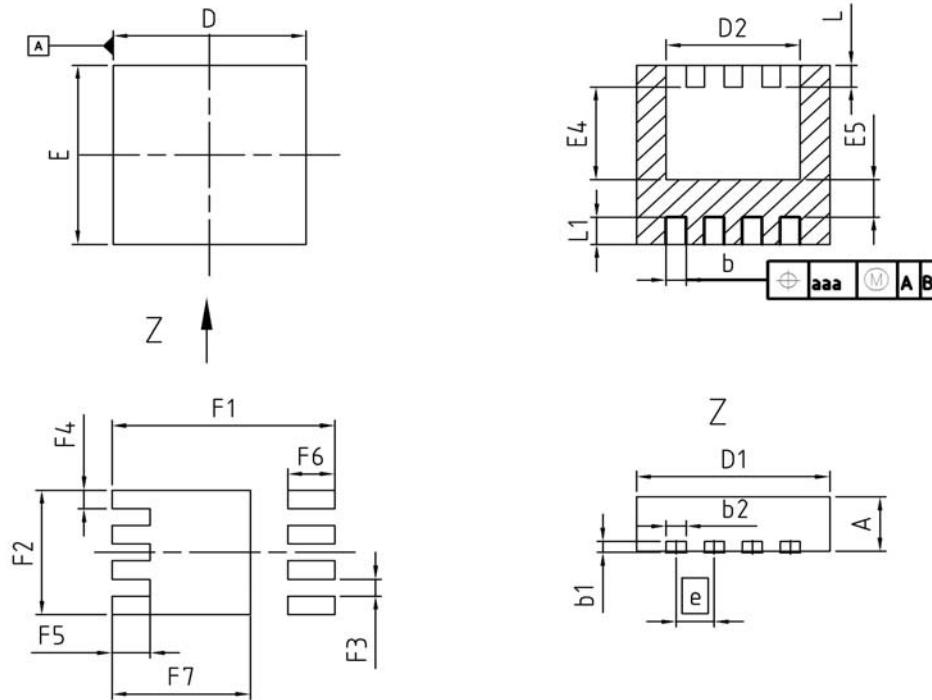
### 15 Drain-source breakdown voltage

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

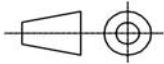


### 16 Gate charge waveforms



**Package Outline: PG-TSDSON-8**


| DIM  | MILLIMETERS |      | INCHES |       |
|------|-------------|------|--------|-------|
|      | MIN         | MAX  | MIN    | MAX   |
| A    | 0.90        | 1.10 | 0.035  | 0.043 |
| b    | 0.24        | 0.44 | 0.009  | 0.017 |
| b1   | 0.10        | 0.30 | 0.004  | 0.012 |
| b2   | 0.20        | 0.44 | 0.008  | 0.017 |
| D=D1 | 3.20        | 3.40 | 0.126  | 0.134 |
| D2   | 2.15        | 2.45 | 0.085  | 0.096 |
| E    | 3.20        | 3.40 | 0.126  | 0.134 |
| E4   | 1.60        | 1.81 | 0.063  | 0.071 |
| E5   | 0.59        | 0.86 | 0.023  | 0.034 |
| e    | 0.65        |      | 0.026  |       |
| N    | 8           |      | 8      |       |
| L    | 0.30        | 0.56 | 0.012  | 0.022 |
| L1   | 0.33        | 0.60 | 0.013  | 0.024 |
| aaa  | 0.25        |      | 0.010  |       |
| F1   | 3.80        |      | 0.150  |       |
| F2   | 2.29        |      | 0.090  |       |
| F3   | 0.31        |      | 0.012  |       |
| F4   | 0.34        |      | 0.013  |       |
| F5   | 0.65        |      | 0.026  |       |
| F6   | 0.80        |      | 0.031  |       |
| F7   | 2.36        |      | 0.093  |       |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
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