

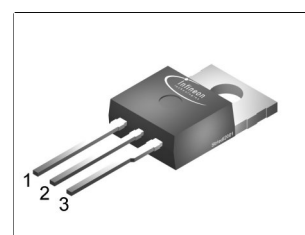
# **SIPMOS® Power-Transistor**

## **Features**

- P-Channel
- Enhancement mode
- Avalanche rated
- $dv/dt$  rated
- 175°C operating temperature
- Pb-free lead plating; RoHS compliant
  - Halogen-free according to IEC61249-2-21
  - Qualified according to AEC Q101

## **Product Summary**

|                                  |              |      |          |
|----------------------------------|--------------|------|----------|
| Drain source voltage             | $V_{DS}$     | -60  | V        |
| Drain-source on-state resistance | $R_{DS(on)}$ | 0.3  | $\Omega$ |
| Continuous drain current         | $I_D$        | -8.8 | A        |



| Type        | Package    |
|-------------|------------|
| SPP08P06P H | PG-TO220-3 |

| Pin 1 | PIN 2/4 | PIN 3 |
|-------|---------|-------|
| G     | D       | S     |

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

| Parameter                                                                                                                            | Symbol             | Value        | Unit              |
|--------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------|-------------------|
| Continuous drain current<br>$T_C = 25\text{ °C}$<br>$T_C = 100\text{ °C}$                                                            | $I_D$              | -8.8<br>-6.2 | A                 |
| Pulsed drain current<br>$T_C = 25\text{ °C}$                                                                                         | $I_D \text{ puls}$ | -35.2        |                   |
| Avalanche energy, single pulse<br>$I_D = -8.8\text{ A}$ , $V_{DD} = -25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$                      | $E_{AS}$           | 70           | mJ                |
| Avalanche energy, periodic limited by $T_{jmax}$                                                                                     | $E_{AR}$           | 4.2          |                   |
| Reverse diode $dv/dt$<br>$I_S = -8.8\text{ A}$ , $V_{DS} = -48$ , $di/dt = 200\text{ A}/\mu\text{s}$ ,<br>$T_{jmax} = 175\text{ °C}$ | $dv/dt$            | 6            | kV/ $\mu\text{s}$ |
| Gate source voltage                                                                                                                  | $V_{GS}$           | $\pm 20$     | V                 |
| Power dissipation<br>$T_C = 25\text{ °C}$                                                                                            | $P_{tot}$          | 42           | W                 |
| Operating and storage temperature                                                                                                    | $T_j$ , $T_{stg}$  | -55...+175   | °C                |
| IEC climatic category; DIN IEC 68-1                                                                                                  |                    | 55/175/56    |                   |

**Thermal Characteristics**

| Parameter                                      | Symbol     | Values |      |      | Unit |
|------------------------------------------------|------------|--------|------|------|------|
|                                                |            | min.   | typ. | max. |      |
| Characteristics                                |            |        |      |      |      |
| Thermal resistance, junction - case            | $R_{thJC}$ | -      | -    | 3.6  | K/W  |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | -      | -    | 62   |      |
| SMD version, device on PCB:                    | $R_{thJA}$ |        |      |      |      |
| @ min. footprint                               |            | -      | -    | 62   |      |
| @ 6 cm <sup>2</sup> cooling area <sup>1)</sup> |            | -      | -    | 40   |      |

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

| Parameter                                                                                                                                                                                                        | Symbol        | Values |             |            | Unit          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|-------------|------------|---------------|
|                                                                                                                                                                                                                  |               | min.   | typ.        | max.       |               |
| Static Characteristics                                                                                                                                                                                           |               |        |             |            |               |
| Drain- source breakdown voltage<br>$V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$                                                                                                                       | $V_{(BR)DSS}$ | -60    | -           | -          | V             |
| Gate threshold voltage, $V_{GS} = V_{DS}$<br>$I_D = -250\text{ }\mu\text{A}$ , $T_j = 25\text{ }^{\circ}\text{C}$                                                                                                | $V_{GS(th)}$  | -2.1   | -3          | -4         |               |
| Zero gate voltage drain current<br>$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ }^{\circ}\text{C}$<br>$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ }^{\circ}\text{C}$ | $I_{DSS}$     | -      | -0.1<br>-10 | -1<br>-100 | $\mu\text{A}$ |
| Gate-source leakage current<br>$V_{GS} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$                                                                                                                                   | $I_{GSS}$     | -      | -10         | -100       | nA            |
| Drain-source on-state resistance<br>$V_{GS} = -10\text{ V}$ , $I_D = -6.2\text{ A}$                                                                                                                              | $R_{DS(on)}$  | -      | 0.23        | 0.3        | $\Omega$      |

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

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

| Parameter                                                                                       | Symbol       | Values |      |      | Unit |
|-------------------------------------------------------------------------------------------------|--------------|--------|------|------|------|
|                                                                                                 |              | min.   | typ. | max. |      |
| Dynamic Characteristics                                                                         |              |        |      |      |      |
| Transconductance<br>$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = -6.2$ A              | $g_{fs}$     | 1.5    | 3.6  | -    | S    |
| Input capacitance<br>$V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz                              | $C_{iss}$    | -      | 335  | 420  | pF   |
| Output capacitance<br>$V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz                             | $C_{oss}$    | -      | 105  | 135  |      |
| Reverse transfer capacitance<br>$V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz                   | $C_{rss}$    | -      | 65   | 95   |      |
| Turn-on delay time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -6.2$ A,<br>$R_G = 6\ \Omega$  | $t_{d(on)}$  | -      | 16   | 24   | ns   |
| Rise time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -6.2$ A,<br>$R_G = 6\ \Omega$           | $t_r$        | -      | 46   | 69   |      |
| Turn-off delay time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -6.2$ A,<br>$R_G = 6\ \Omega$ | $t_{d(off)}$ | -      | 48   | 72   |      |
| Fall time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -6.2$ A,<br>$R_G = 6\ \Omega$           | $t_f$        | -      | 14   | 21   |      |

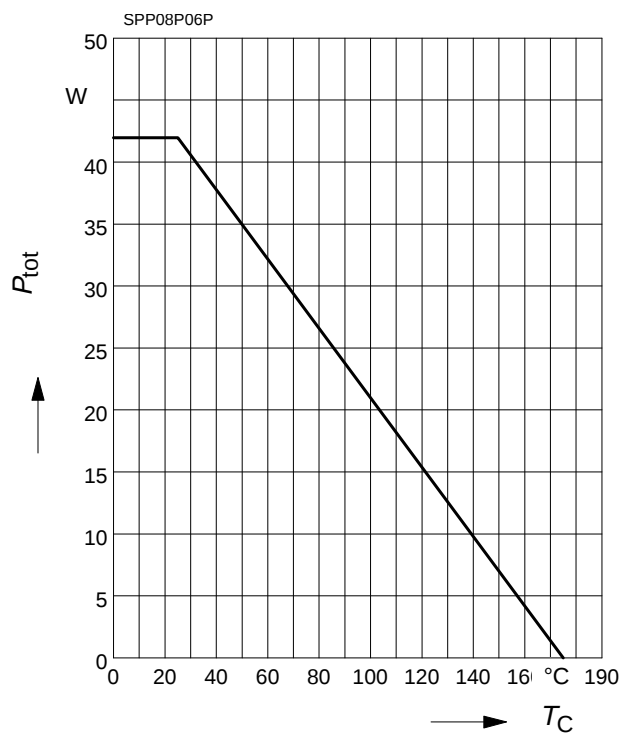
**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

| Parameter                                                                      | Symbol          | Values |       |      | Unit |
|--------------------------------------------------------------------------------|-----------------|--------|-------|------|------|
|                                                                                |                 | min.   | typ.  | max. |      |
| Dynamic Characteristics                                                        |                 |        |       |      |      |
| Gate to source charge<br>$V_{DD} = -48$ , $I_D = -8.8$ A                       | $Q_{gs}$        | -      | 1.4   | 2.1  | nC   |
| Gate to drain charge<br>$V_{DD} = -48$ V, $I_D = -8.8$ A                       | $Q_{gd}$        | -      | 4     | 6    |      |
| Gate charge total<br>$V_{DD} = -48$ V, $I_D = -8.8$ A, $V_{GS} = 0$ to $-10$ V | $Q_g$           | -      | 10    | 15   |      |
| Gate plateau voltage<br>$V_{DD} = -48$ , $I_D = -8.8$ A                        | $V_{(plateau)}$ | -      | -3.85 | -    | V    |

| Parameter                                                                                            | Symbol   | Values |       |       | Unit |
|------------------------------------------------------------------------------------------------------|----------|--------|-------|-------|------|
|                                                                                                      |          | min.   | typ.  | max.  |      |
| Reverse Diode                                                                                        |          |        |       |       |      |
| Inverse diode continuous forward current<br>$T_C = 25\text{ }^{\circ}\text{C}$                       | $I_S$    | -      | -     | -8.8  | A    |
| Inverse diode direct current,pulsed<br>$T_C = 25\text{ }^{\circ}\text{C}$                            | $I_{SM}$ | -      | -     | -35.2 |      |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}$ , $I_F = -8.8\text{ A}$                       | $V_{SD}$ | -      | -1.17 | -1.55 | V    |
| Reverse recovery time<br>$V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$   | $t_{rr}$ | -      | 60    | 90    | ns   |
| Reverse recovery charge<br>$V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ | $Q_{rr}$ | -      | 100   | 150   | nC   |

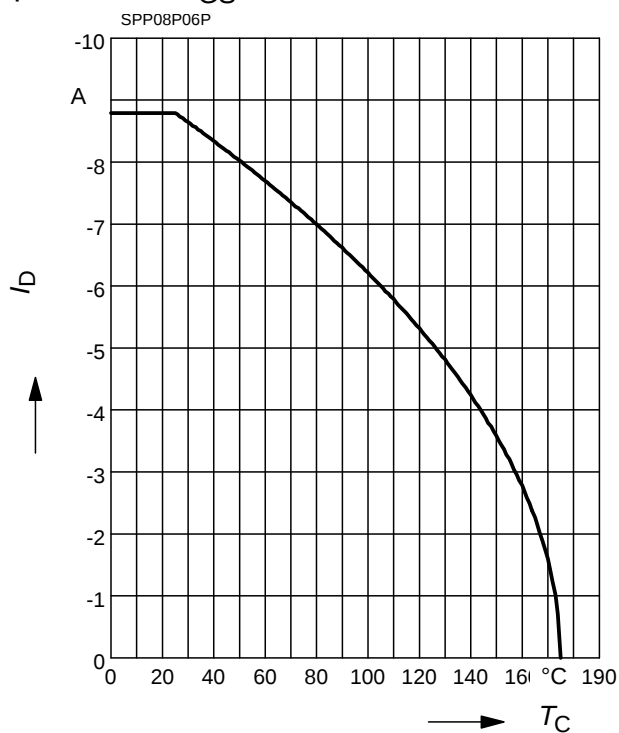
**Power dissipation**

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


**Drain current**

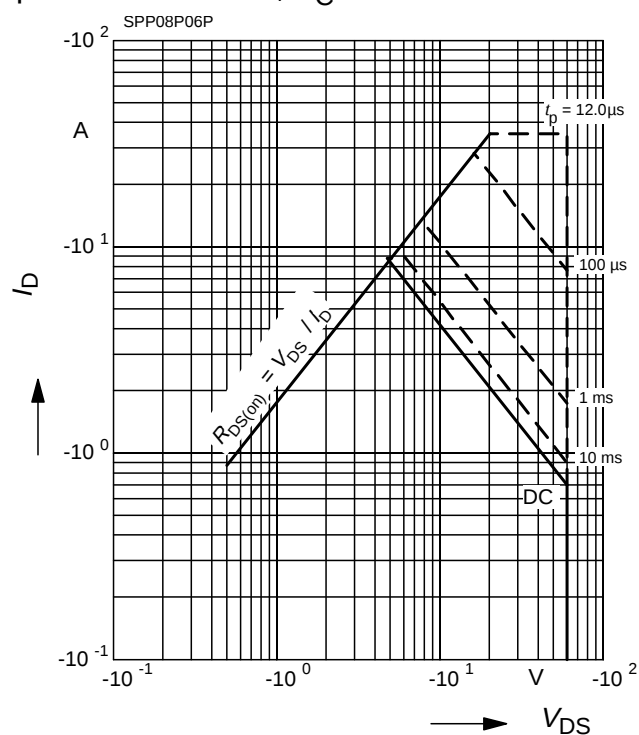
$$I_D = f(T_C)$$

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


**Safe operating area**

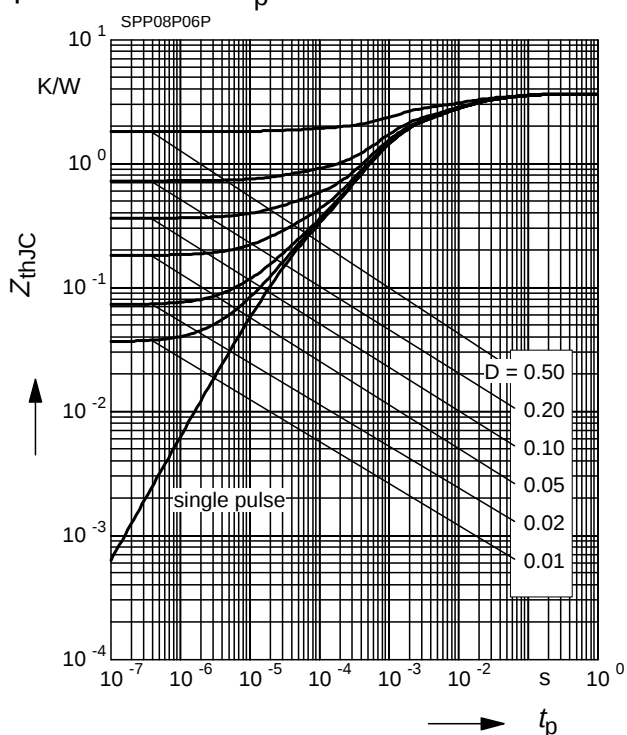
$$I_D = f(V_{DS})$$

parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$


**Transient thermal impedance**

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

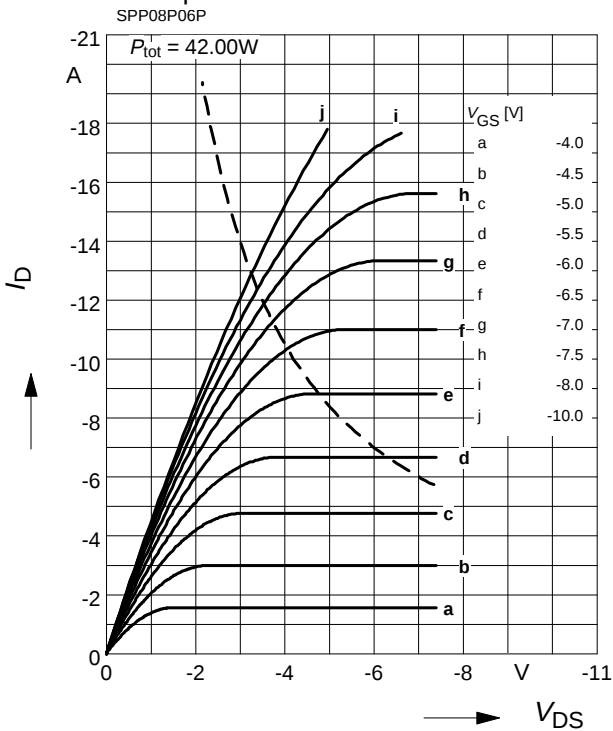
parameter:  $D = t_p/T$



### Typ. output characteristic

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

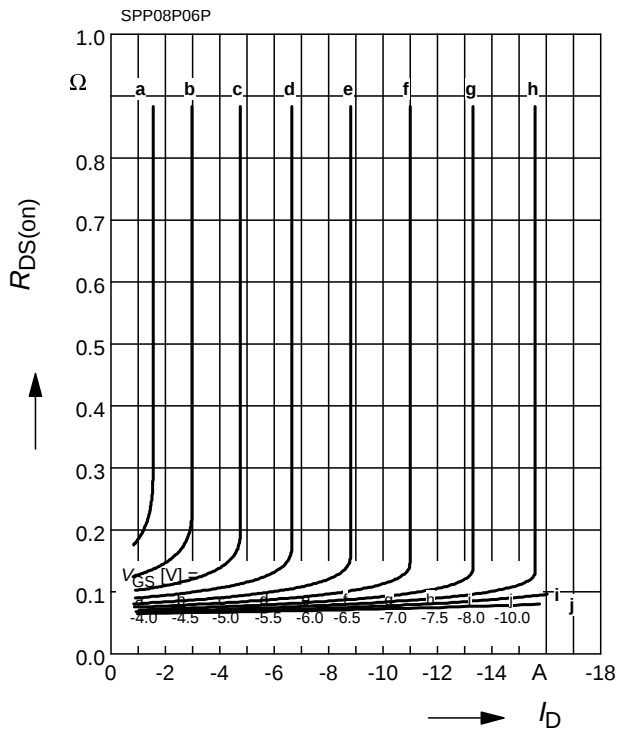
parameter:  $t_p = 80 \mu\text{s}$



### Typ. drain-source-on-resistance

$$R_{DS(on)} = f(I_D)$$

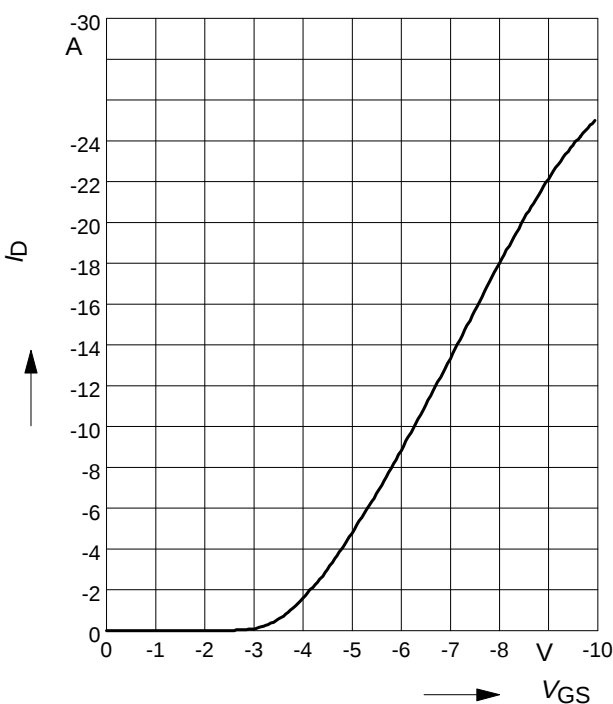
parameter:  $V_{GS}$



### Typ. transfer characteristics $I_D = f(V_{GS})$

$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

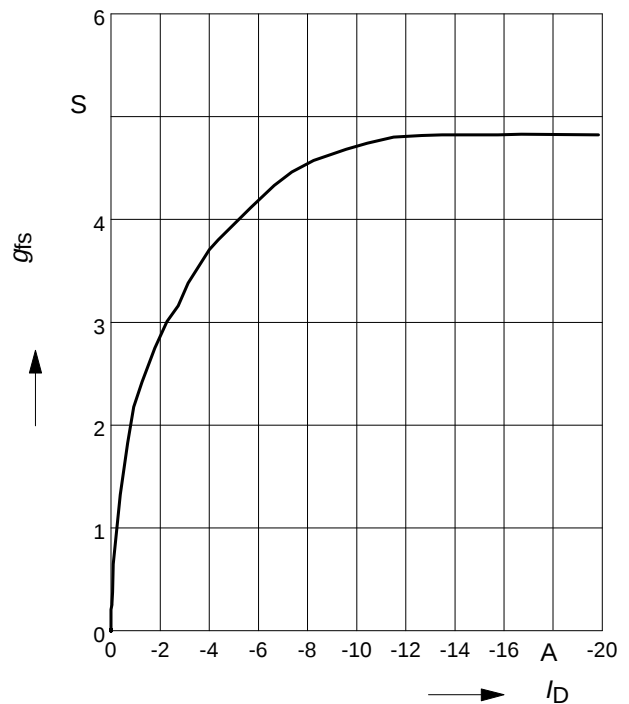
parameter:  $t_p = 80 \mu\text{s}$



### Typ. forward transconductance

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

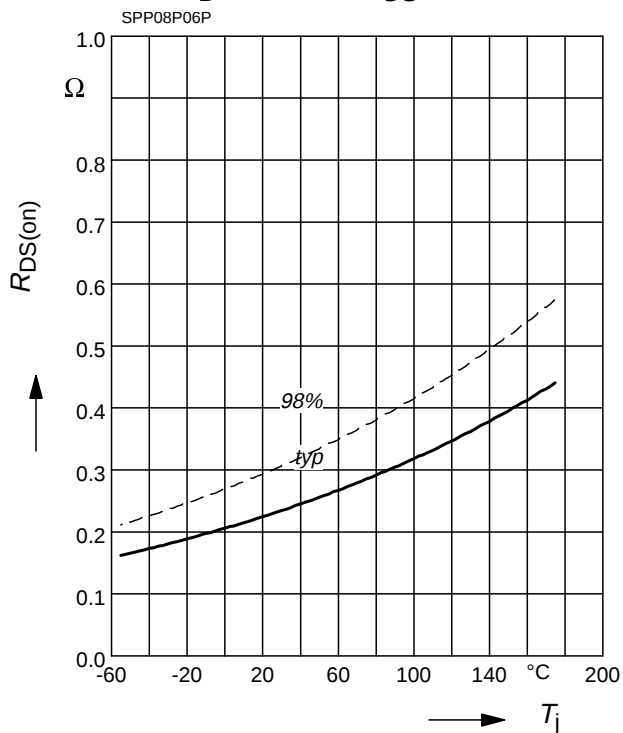
parameter:  $g_{fs}$



### Drain-source on-state resistance

$$R_{DS(on)} = f(T_j)$$

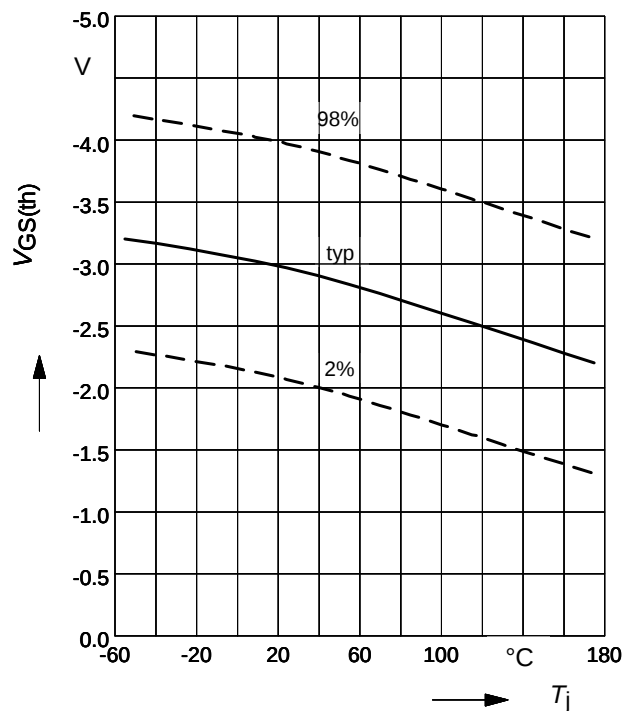
parameter:  $I_D = -6.2 \text{ A}$ ,  $V_{GS} = -10 \text{ V}$



### Gate threshold voltage

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

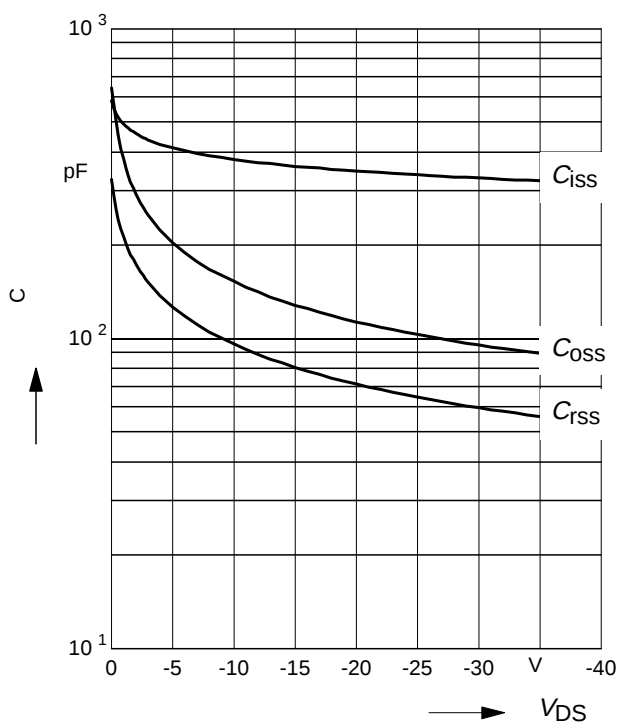
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -250 \mu\text{A}$



### Typ. capacitances

$$C = f(V_{DS})$$

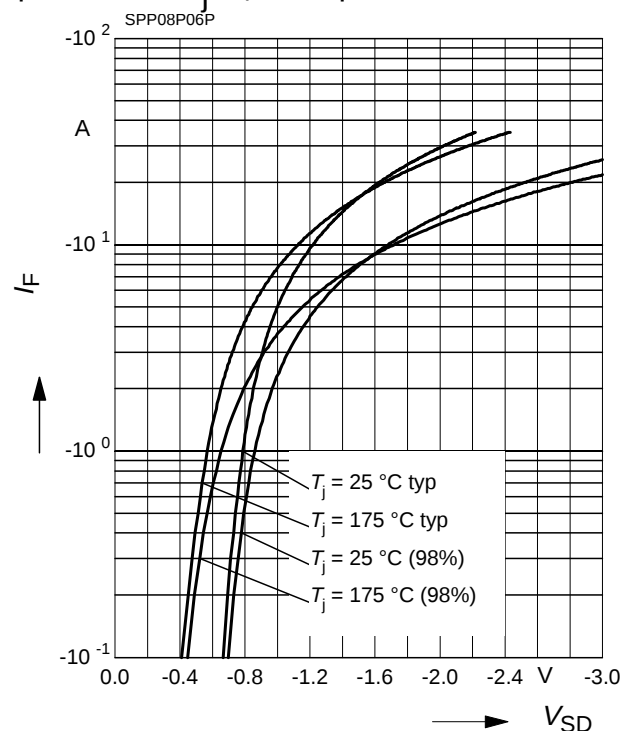
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



### Forward characteristics of reverse diode

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

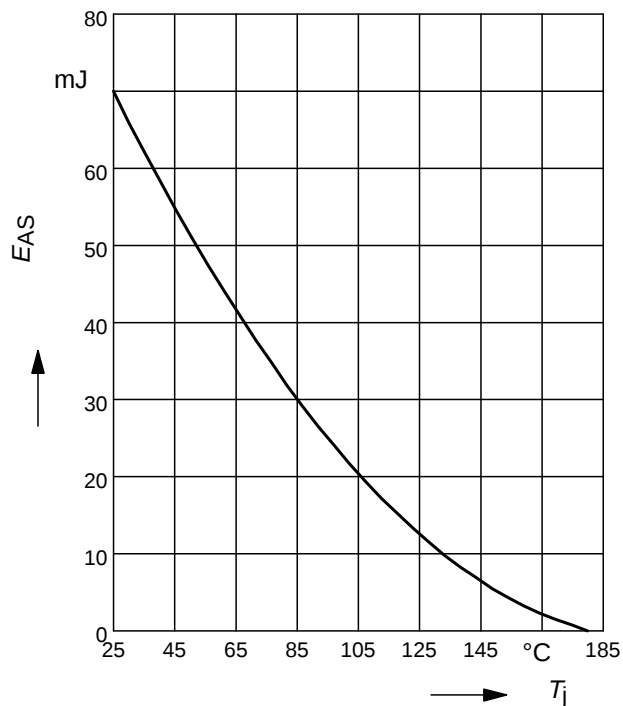
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**Avalanche energy**

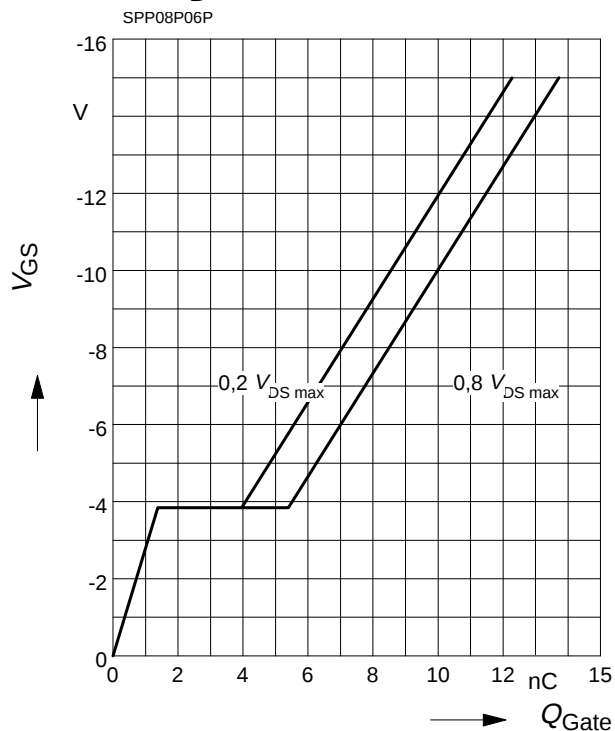
$$E_{AS} = f(T_j)$$

para.:  $I_D = -8.8 \text{ A}$ ,  $V_{DD} = -25 \text{ V}$ ,  $R_{GS} = 25 \text{ } \Omega$

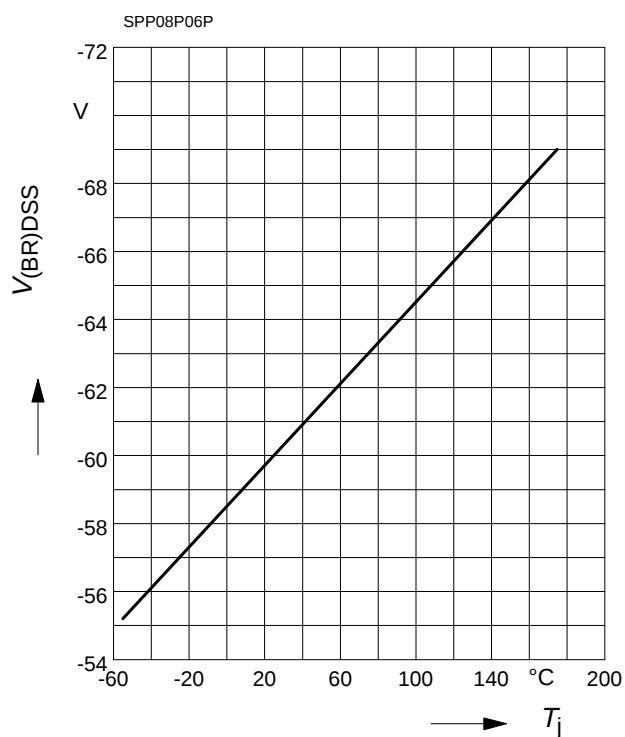

**Typ. gate charge**

$$V_{GS} = f(Q_{Gate})$$

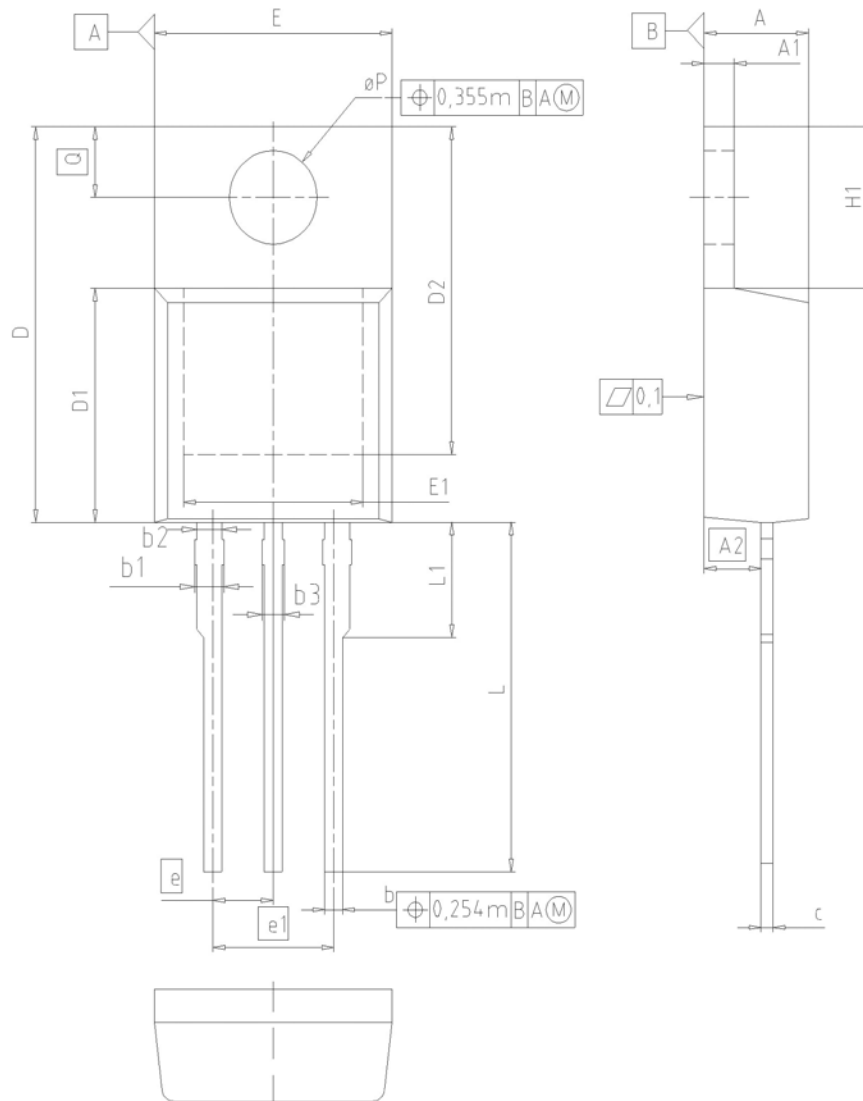
parameter:  $I_D = -8.8 \text{ A}$  pulsed


**Drain-source breakdown voltage**

$$V_{(BR)DSS} = f(T_j)$$



PG-TO220-3



| DIM      | MILLIMETERS |       | INCHES |       |
|----------|-------------|-------|--------|-------|
|          | MIN         | MAX   | MIN    | MAX   |
| A        | 4.30        | 4.57  | 0.169  | 0.180 |
| A1       | 1.17        | 1.40  | 0.046  | 0.055 |
| A2       | 2.15        | 2.72  | 0.085  | 0.107 |
| b        | 0.65        | 0.86  | 0.026  | 0.034 |
| b1       | 0.95        | 1.40  | 0.037  | 0.055 |
| b2       | 0.95        | 1.15  | 0.037  | 0.045 |
| b3       | 0.65        | 1.15  | 0.026  | 0.045 |
| c        | 0.33        | 0.60  | 0.013  | 0.024 |
| D        | 14.81       | 15.95 | 0.583  | 0.628 |
| D1       | 8.51        | 9.45  | 0.335  | 0.372 |
| D2       | 12.19       | 13.10 | 0.480  | 0.516 |
| E        | 9.70        | 10.36 | 0.382  | 0.408 |
| E1       | 6.50        | 8.60  | 0.256  | 0.339 |
| e        | 2.54        |       | 0.100  |       |
| e1       | 5.08        |       | 0.200  |       |
| N        | 3           |       | 3      |       |
| H1       | 5.90        | 6.90  | 0.232  | 0.272 |
| L        | 13.00       | 14.00 | 0.512  | 0.551 |
| L1       | -           | 4.80  | -      | 0.189 |
| $\phi P$ | 3.60        | 3.89  | 0.142  | 0.153 |
| Q        | 2.60        | 3.00  | 0.102  | 0.118 |

|                                    |
|------------------------------------|
| <b>DOCUMENT NO.</b><br>Z8B00003318 |
| <b>SCALE</b><br>0 2.5 5mm          |
| <b>EUROPEAN PROJECTION</b>         |
| <b>ISSUE DATE</b><br>23-08-2007    |
| <b>REVISION</b><br>05              |

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**Published by**  
**Infineon Technologies AG**  
**81726 Munich, Germany**  
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