

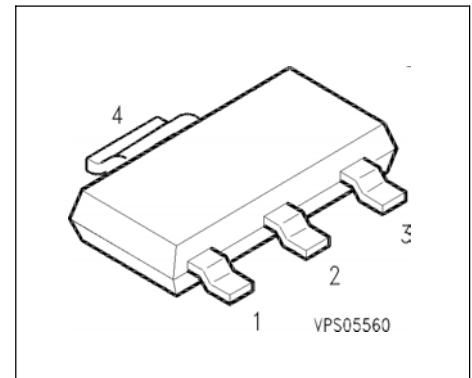
## SIPMOS® Small-Signal Transistor

- N channel
- Enhancement mode
- Avalanche rated
- $V_{GS(th)} = 2.1 \dots 4.0 \text{ V}$
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21

drain pins 2, 4



source pin3



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



| Type   | $V_{DS}$ | $I_D$ | $R_{DS(on)}$ | Package   | Marking |
|--------|----------|-------|--------------|-----------|---------|
| BSP298 | 400 V    | 0.5 A | $3 \Omega$   | PG-SOT223 | BSP298  |

| Type   | Pb-free | Tape and Reel Information | Packaging |
|--------|---------|---------------------------|-----------|
| BSP298 | Yes     | H6327                     | Dry       |

## Maximum Ratings

| Parameter                                                                                                                                                             | Symbol      | Values   | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------|------|
| Continuous drain current<br>$T_A = 26 \text{ }^\circ\text{C}$                                                                                                         | $I_D$       | 0.5      | A    |
| DC drain current, pulsed<br>$T_A = 25 \text{ }^\circ\text{C}$                                                                                                         | $I_{Dpuls}$ | 2        | A    |
| Avalanche energy, single pulse<br>$I_D = 1.35 \text{ A}$ , $V_{DD} = 50 \text{ V}$ , $R_{GS} = 25 \Omega$<br>$L = 125 \text{ mH}$ , $T_j = 25 \text{ }^\circ\text{C}$ | $E_{AS}$    | 130      | mJ   |
| Gate source voltage                                                                                                                                                   | $V_{GS}$    | $\pm 20$ | V    |
| Power dissipation<br>$T_A = 25 \text{ }^\circ\text{C}$                                                                                                                | $P_{tot}$   | 1.8      | W    |
| ESD Class<br>JESD22-A114-HBM                                                                                                                                          |             | Class 1b |      |

### Maximum Ratings

| Parameter                                                  | Symbol     | Values        | Unit |
|------------------------------------------------------------|------------|---------------|------|
| Chip or operating temperature                              | $T_j$      | -55 ... + 150 | °C   |
| Storage temperature                                        | $T_{stg}$  | -55 ... + 150 |      |
| Thermal resistance, chip to ambient air                    | $R_{thJA}$ | ≤ 70          | K/W  |
| Thermal resistance, junction-soldering point <sup>1)</sup> | $R_{thJS}$ | ≤ 10          |      |
| DIN humidity category, DIN 40 040                          |            | E             |      |
| IEC climatic category, DIN IEC 68-1                        |            | 55 / 150 / 56 |      |

1) Transistor on epoxy pcb 40 mm x 40 mm x 1,5 mm with 6 cm<sup>2</sup> copper area for drain connection

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

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

### Static Characteristics

|                                                                                                                                                                                                  |               |        |           |          |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|-----------|----------|----|
| Drain- source breakdown voltage<br>$V_{GS} = 0 \text{ V}$ , $I_D = 0.25 \text{ mA}$ , $T_j = 0^\circ\text{C}$                                                                                    | $V_{(BR)DSS}$ | 400    | -         | -        | V  |
| Gate threshold voltage<br>$V_{GS}=V_{DS}$ , $I_D = 1 \text{ mA}$                                                                                                                                 | $V_{GS(th)}$  | 2.1    | 3         | 4        |    |
| Zero gate voltage drain current<br>$V_{DS} = 400 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_j = 25^\circ\text{C}$<br>$V_{DS} = 400 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_j = 125^\circ\text{C}$ | $I_{DSS}$     | -<br>- | 0.1<br>10 | 1<br>100 | μA |
| Gate-source leakage current<br>$V_{GS} = 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$                                                                                                                  | $I_{GSS}$     | -      | 10        | 100      |    |
| Drain-Source on-state resistance<br>$V_{GS} = 10 \text{ V}$ , $I_D = 0.5 \text{ A}$                                                                                                              | $R_{DS(on)}$  | -      | 2.2       | 3        | Ω  |

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

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

**Dynamic Characteristics**

|                                                                                                                    |              |     |     |     |    |
|--------------------------------------------------------------------------------------------------------------------|--------------|-----|-----|-----|----|
| Transconductance<br>$V_{DS} \geq 2 * I_D * R_{DS(on)max}, I_D = 0.5 \text{ A}$                                     | $g_{fs}$     | 0.5 | 1.2 | -   | S  |
| Input capacitance<br>$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$                              | $C_{iss}$    | -   | 300 | 400 | pF |
| Output capacitance<br>$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$                             | $C_{oss}$    | -   | 50  | 75  |    |
| Reverse transfer capacitance<br>$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$                   | $C_{rss}$    | -   | 20  | 30  |    |
| Turn-on delay time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.3 \text{ A}$<br>$R_{GS} = 50 \Omega$  | $t_{d(on)}$  | -   | 10  | 15  | ns |
| Rise time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.3 \text{ A}$<br>$R_{GS} = 50 \Omega$           | $t_r$        | -   | 25  | 40  |    |
| Turn-off delay time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.3 \text{ A}$<br>$R_{GS} = 50 \Omega$ | $t_{d(off)}$ | -   | 30  | 40  |    |
| Fall time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.3 \text{ A}$<br>$R_{GS} = 50 \Omega$           | $t_f$        | -   | 20  | 30  |    |

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

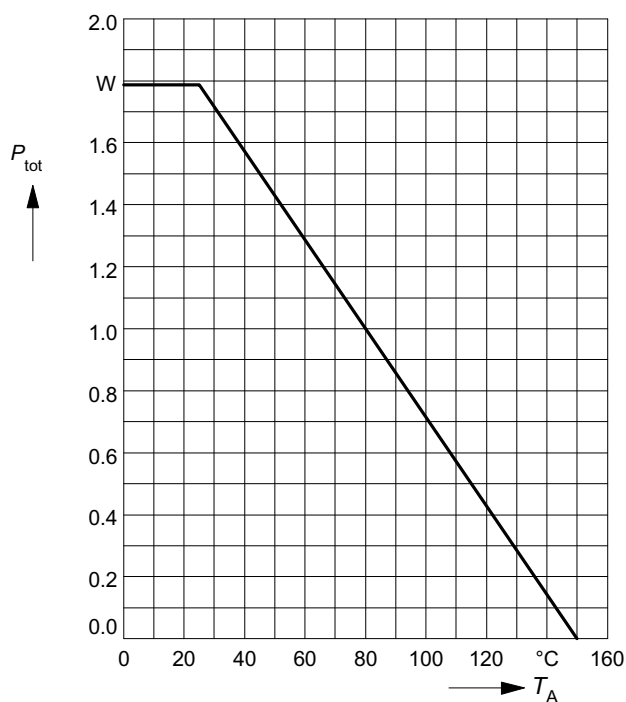
| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

#### Reverse Diode

|                                                                                                        |          |   |      |     |               |
|--------------------------------------------------------------------------------------------------------|----------|---|------|-----|---------------|
| Inverse diode continuous forward current<br>$T_A = 25^\circ\text{C}$                                   | $I_S$    | - | -    | 0.5 | A             |
| Inverse diode direct current,pulsed<br>$T_A = 25^\circ\text{C}$                                        | $I_{SM}$ | - | -    | 2   |               |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}$ , $I_F = 1\text{ A}$ , $T_j = 25^\circ\text{C}$ | $V_{SD}$ | - | 0.95 | 1.2 | V             |
| Reverse recovery time<br>$V_R = 100\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$     | $t_{rr}$ | - | 300  | -   | ns            |
| Reverse recovery charge<br>$V_R = 100\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$   | $Q_{rr}$ | - | 2.5  | -   | $\mu\text{C}$ |

### Power dissipation

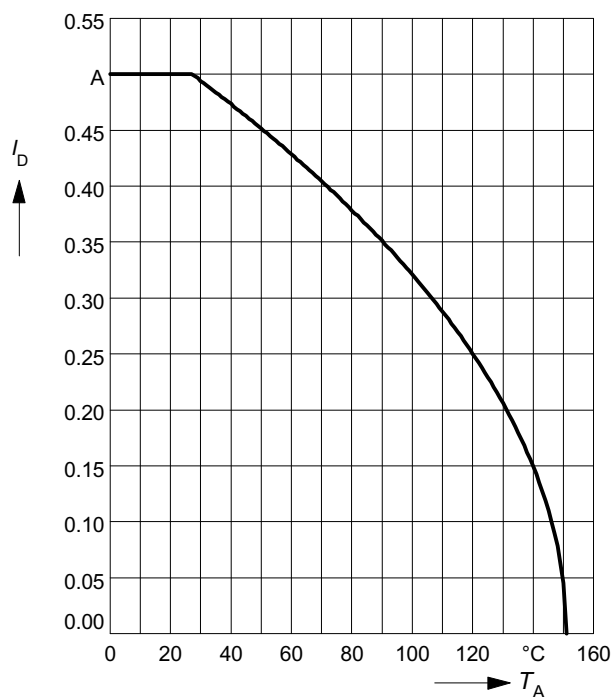
$$P_{\text{tot}} = f(T_A)$$



### Drain current

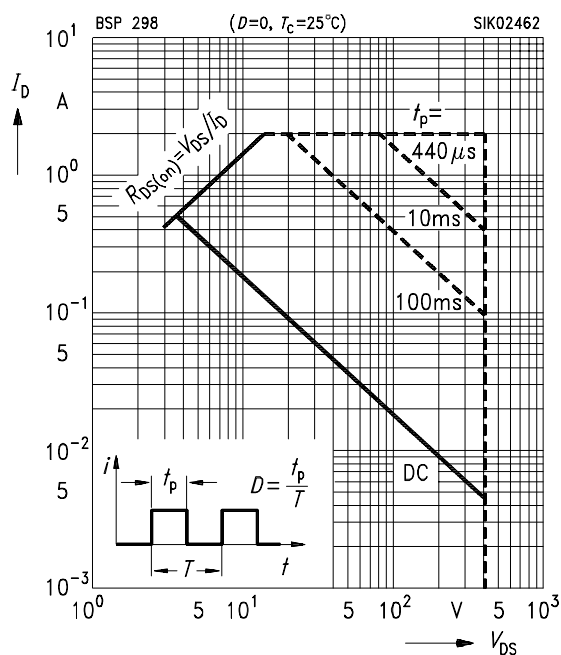
$$I_D = f(T_A)$$

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



### Safe operating area $I_D = f(V_{DS})$

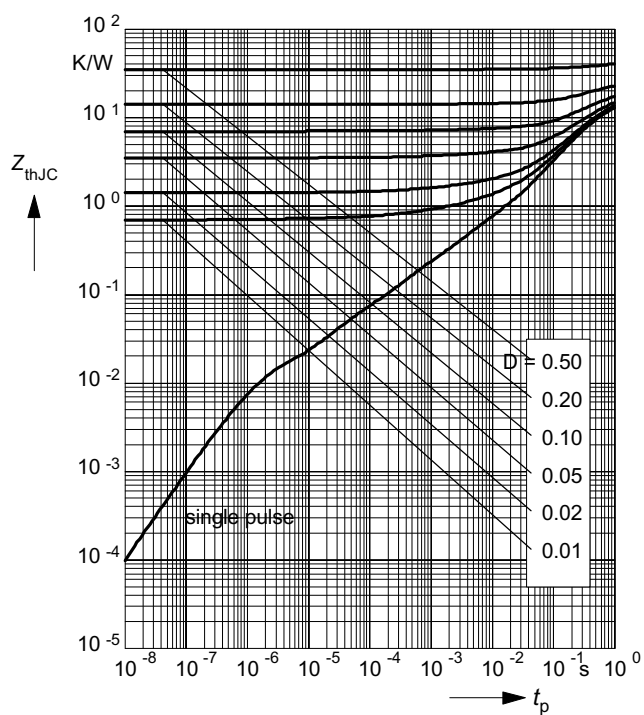
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### Transient thermal impedance

$$Z_{\text{th JA}} = f(t_p)$$

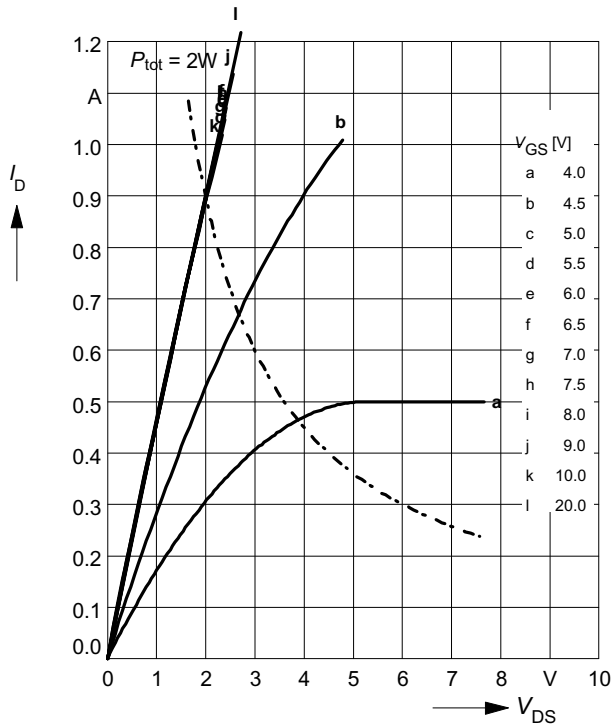
parameter:  $D = t_p / T$



### Typ. output characteristics

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

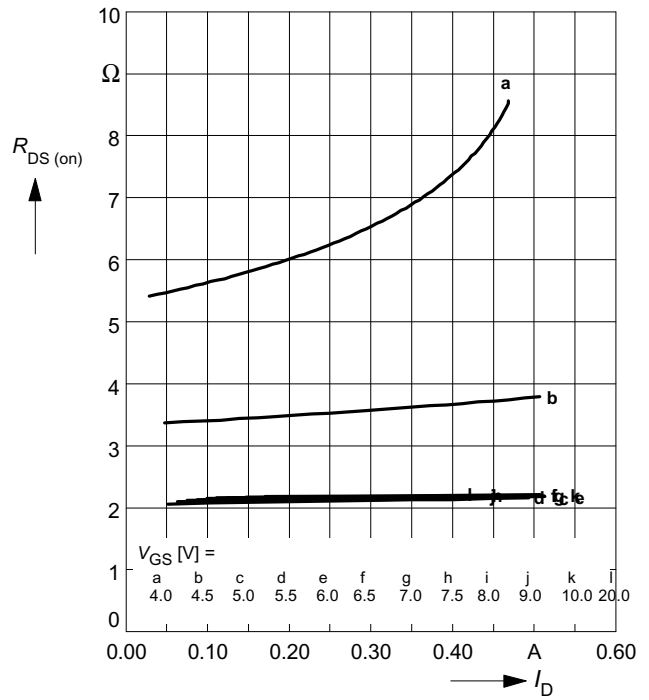
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. drain-source on-resistance

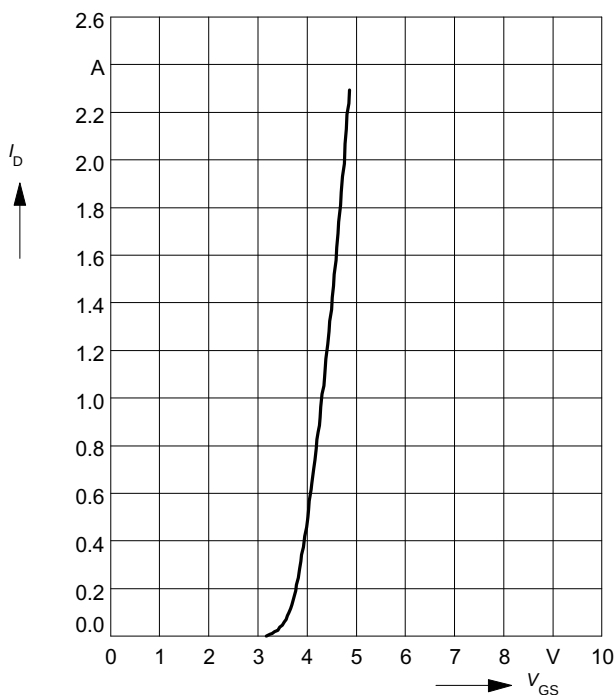
$$R_{DS(on)} = f(I_D)$$

parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



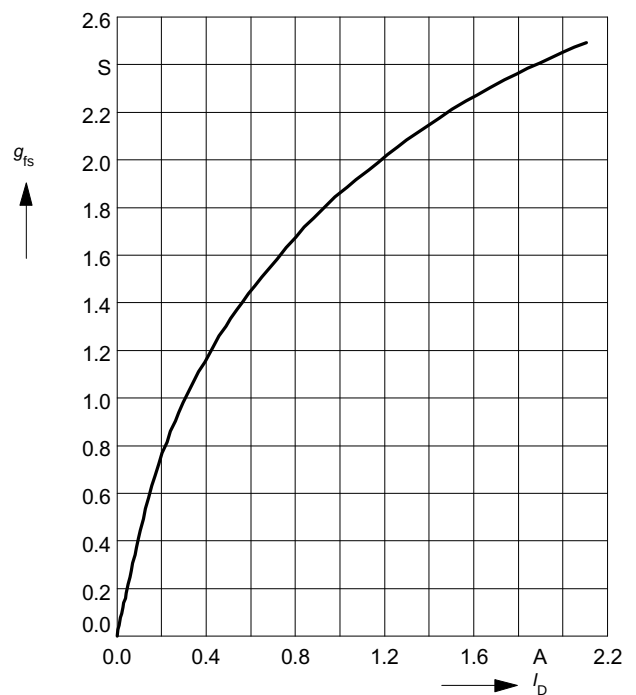
### Typ. transfer characteristics $I_D = f(V_{GS})$

parameter:  $t_p = 80 \mu s$



### Typ. forward transconductance $g_{fs} = f(I_D)$

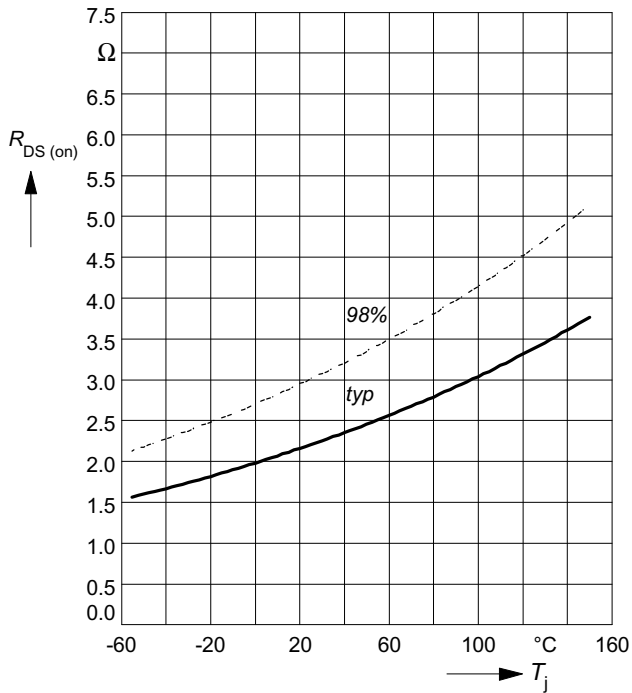
parameter:  $t_p = 80 \mu s$ ,



### Drain-source on-resistance

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

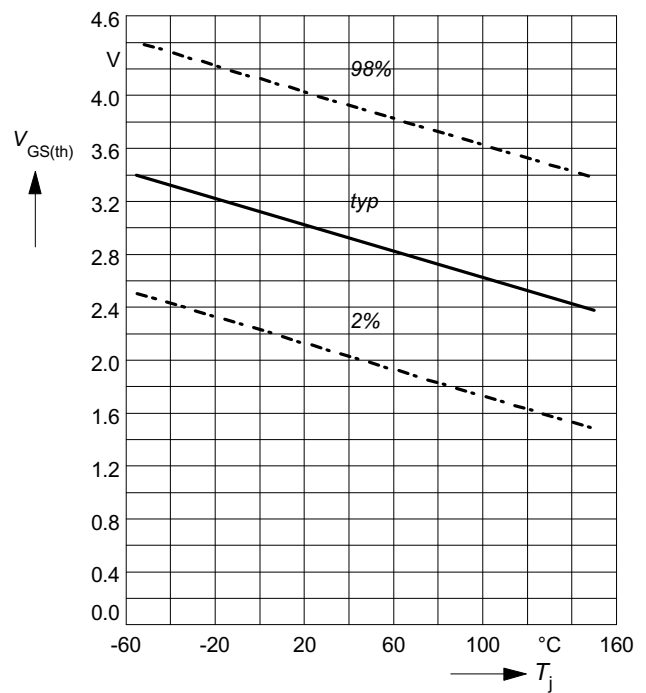
parameter:  $I_D = 0.5 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



### Gate threshold voltage

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

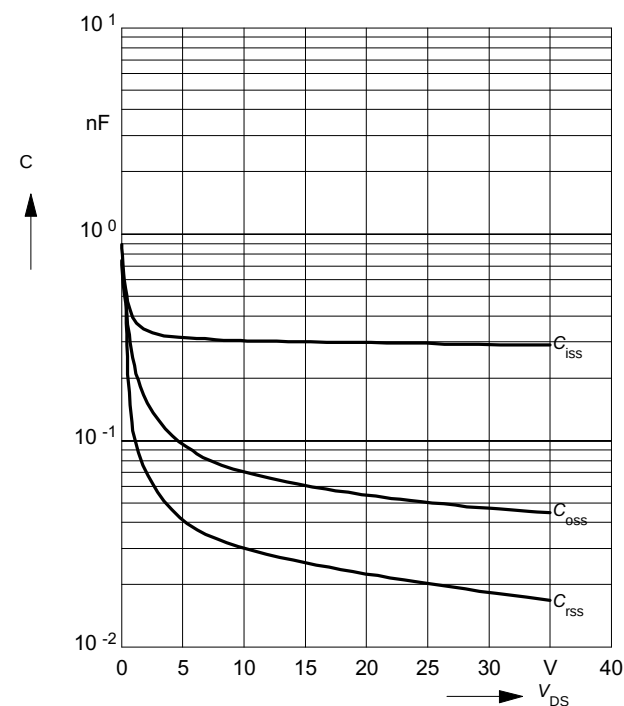
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 1 \text{ mA}$



### Typ. capacitances

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

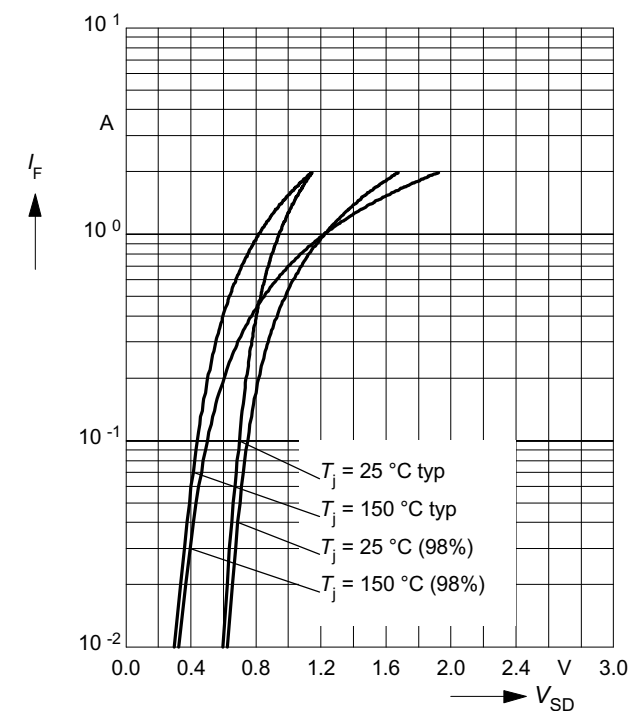
parameter:  $V_{GS}=0\text{V}$ ,  $f = 1 \text{ MHz}$



### Forward characteristics of reverse diode

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

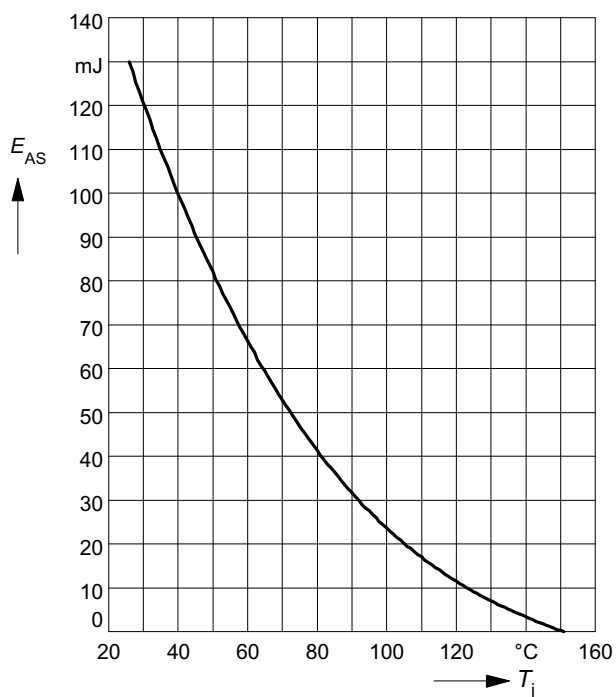
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



### Avalanche energy $E_{AS} = f(T_j)$

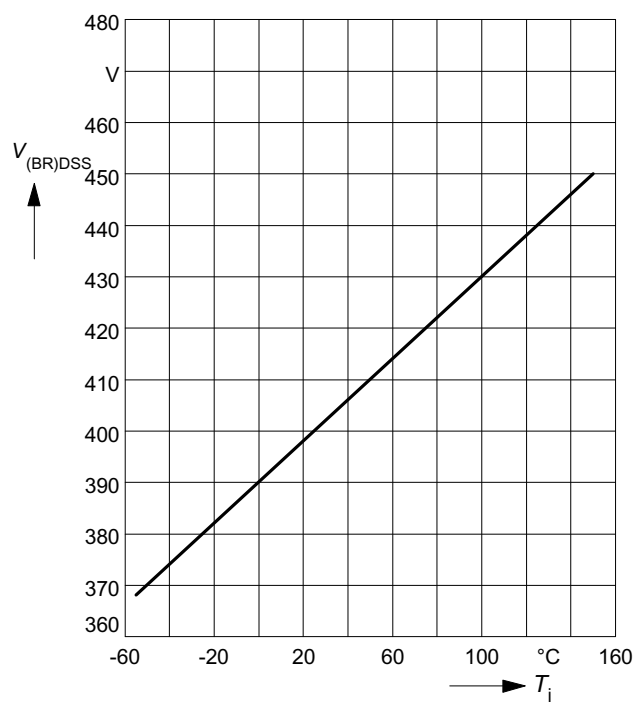
parameter:  $I_D = 1.35 \text{ A}$ ,  $V_{DD} = 50 \text{ V}$

$R_{GS} = 25 \Omega$ ,  $L = 125 \text{ mH}$



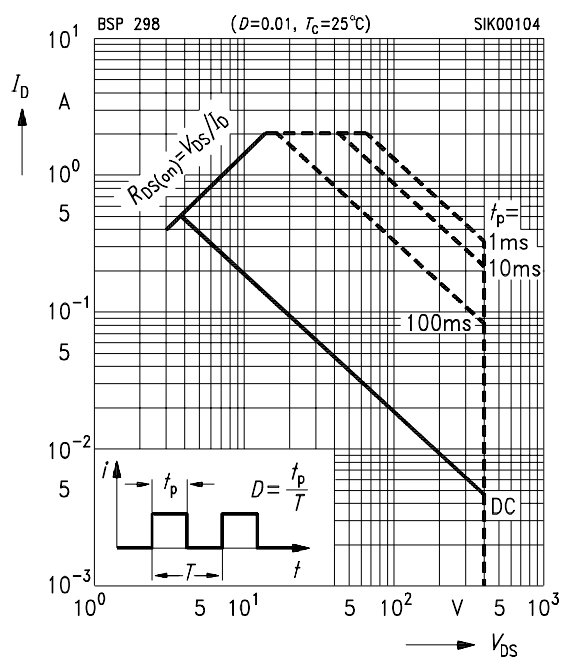
### Drain-source breakdown voltage $V_{(BR)DSS} = f(T_j)$

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



### Safe operating area $I_D = f(V_{DS})$

parameter :  $D = 0.01$ ,  $T_C = 25^\circ\text{C}$

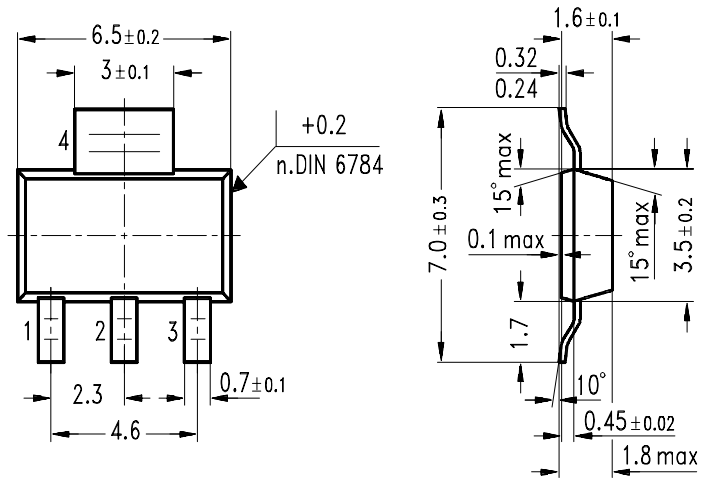




## Package outlines

SOT-223

Dimensions in mm



GPS05560

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