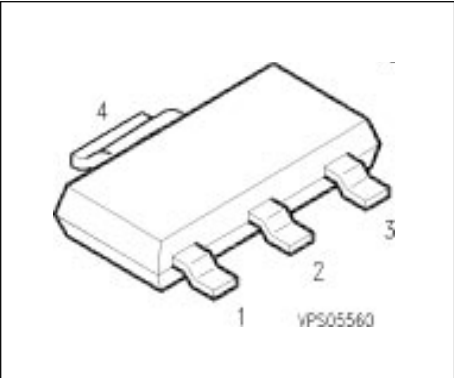


**SIPMOS® Small-Signal Transistor**

- N channel
- Enhancement mode
- $V_{GS(th)} = 1.5 \dots 2.5 \text{ V}$



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

| Type    | $V_{DS}$      | $I_D$  | $R_{DS(on)}$              | Package | Marking |
|---------|---------------|--------|---------------------------|---------|---------|
| BSP 324 | 400 V         | 0.17 A | 25 $\Omega$               | SOT-223 | BSP 324 |
| Type    | Ordering Code |        | Tape and Reel Information |         |         |
| BSP 324 | Q67000-S215   |        | E6327                     |         |         |

**Maximum Ratings**

| Parameter                                                     | Symbol      | Values   | Unit |
|---------------------------------------------------------------|-------------|----------|------|
| Drain source voltage                                          | $V_{DS}$    | 400      | V    |
| Drain-gate voltage<br>$R_{GS} = 20 \text{ k}\Omega$           | $V_{DGR}$   | 400      |      |
| Gate source voltage                                           | $V_{GS}$    | $\pm 14$ |      |
| Gate-source peak voltage, aperiodic                           | $V_{gs}$    | $\pm 20$ |      |
| Continuous drain current<br>$T_A = 33 \text{ }^\circ\text{C}$ | $I_D$       | 0.17     | A    |
| DC drain current, pulsed<br>$T_A = 25 \text{ }^\circ\text{C}$ | $I_{Dpuls}$ | 0.68     |      |
| Power dissipation<br>$T_A = 25 \text{ }^\circ\text{C}$        | $P_{tot}$   | 1.7      | W    |

## 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                    | $R_{thJA}$ | ≤ 72          | K/W  |
| Thermal resistance, junction-soldering point <sup>1)</sup> | $R_{thJS}$ | ≤ 12          |      |
| 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>$V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$ , $T_j = 25^\circ\text{C}$  | $V_{(BR)DSS}$ | 400 | -  | -   | V  |
| Gate threshold voltage<br>$V_{GS} = V_{DS}$ , $I_D = 1\text{ mA}$                                             | $V_{GS(th)}$  | 1.5 | 2  | 2.5 |    |
| Zero gate voltage drain current<br>$V_{DS} = 400\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25^\circ\text{C}$ | $I_{DSS}$     | -   | 10 | 100 | nA |
| $V_{DS} = 400\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 125^\circ\text{C}$                                   |               | -   | 8  | 50  | μA |
| 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>$V_{GS} = 10\text{ V}$ , $I_D = 0.17\text{ A}$                            | $R_{DS(on)}$  | -   | 20 | 25  | Ω  |

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

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

### Dynamic Characteristics

|                                                                                                                     |              |     |      |     |    |
|---------------------------------------------------------------------------------------------------------------------|--------------|-----|------|-----|----|
| Transconductance<br>$V_{DS} \geq 2 * I_D * R_{DS(on)max}, I_D = 0.17 \text{ A}$                                     | $g_{fs}$     | 0.1 | 0.17 | -   | S  |
| Input capacitance<br>$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$                               | $C_{iss}$    | -   | 90   | 120 | pF |
| Output capacitance<br>$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$                              | $C_{oss}$    | -   | 10   | 15  |    |
| Reverse transfer capacitance<br>$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$                    | $C_{rss}$    | -   | 4    | 6   |    |
| Turn-on delay time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.21 \text{ A}$<br>$R_{GS} = 50 \Omega$  | $t_{d(on)}$  | -   | 5    | 8   | ns |
| Rise time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.21 \text{ A}$<br>$R_{GS} = 50 \Omega$           | $t_r$        | -   | 10   | 15  |    |
| Turn-off delay time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.21 \text{ A}$<br>$R_{GS} = 50 \Omega$ | $t_{d(off)}$ | -   | 18   | 25  |    |
| Fall time<br>$V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.21 \text{ A}$<br>$R_{GS} = 50 \Omega$           | $t_f$        | -   | 15   | 20  |    |

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

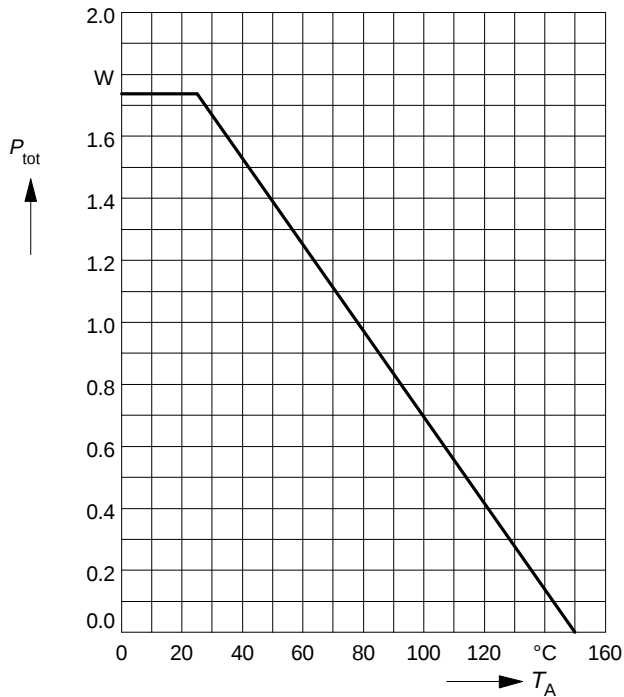
| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

#### Reverse Diode

|                                                                                                           |          |   |      |      |               |
|-----------------------------------------------------------------------------------------------------------|----------|---|------|------|---------------|
| Inverse diode continuous forward current<br>$T_A = 25^\circ\text{C}$                                      | $I_S$    | - | -    | 0.17 | A             |
| Inverse diode direct current, pulsed<br>$T_A = 25^\circ\text{C}$                                          | $I_{SM}$ | - | -    | 0.68 |               |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}$ , $I_F = 0.34\text{ A}$ , $T_j = 25^\circ\text{C}$ | $V_{SD}$ | - | 0.85 | 1.3  | V             |
| Reverse recovery time<br>$V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$         | $t_{rr}$ | - | 300  | -    | ns            |
| Reverse recovery charge<br>$V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$       | $Q_{rr}$ | - | 0.82 | -    | $\mu\text{C}$ |

## Power dissipation

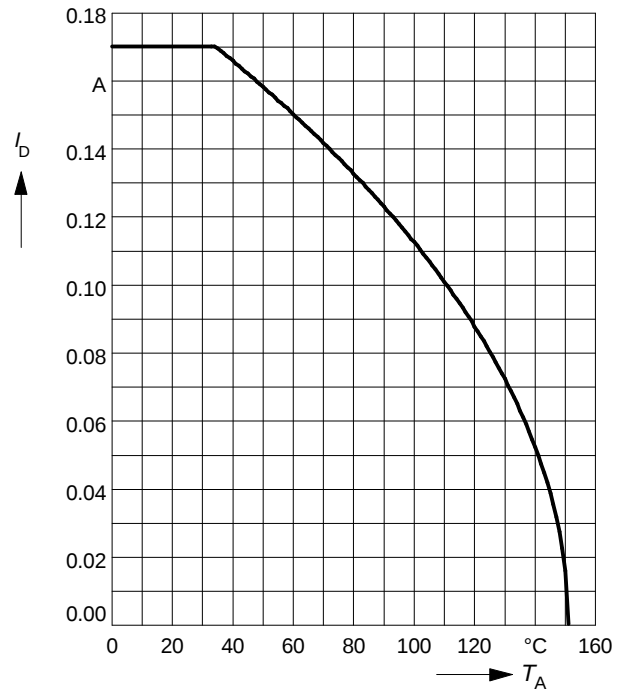
$$P_{\text{tot}} = f(T_A)$$



## Drain current

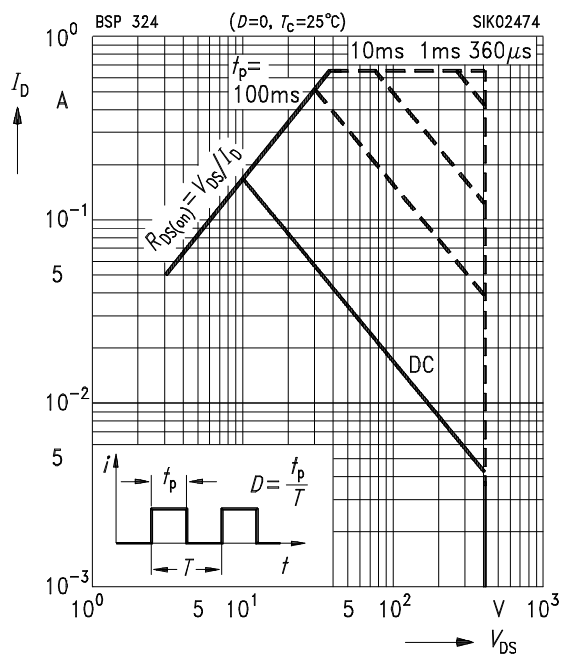
$$I_D = f(T_A)$$

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



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

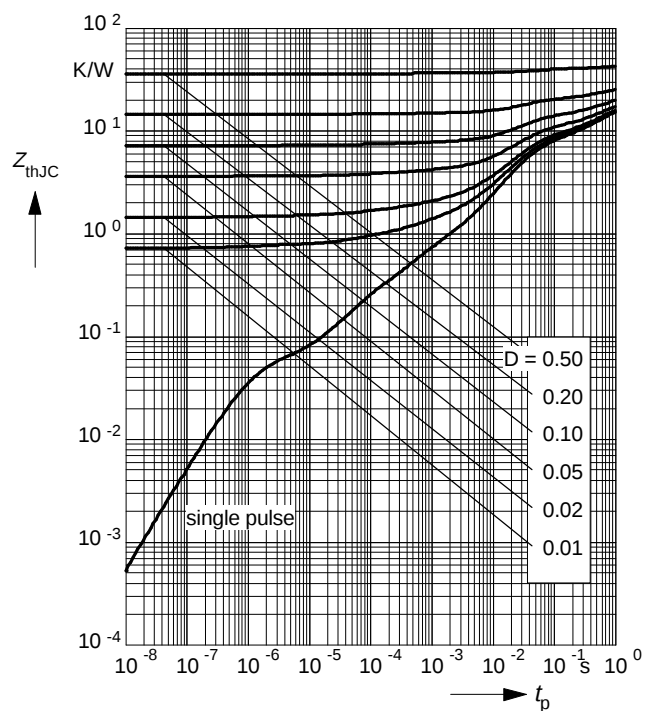
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



## Transient thermal impedance

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

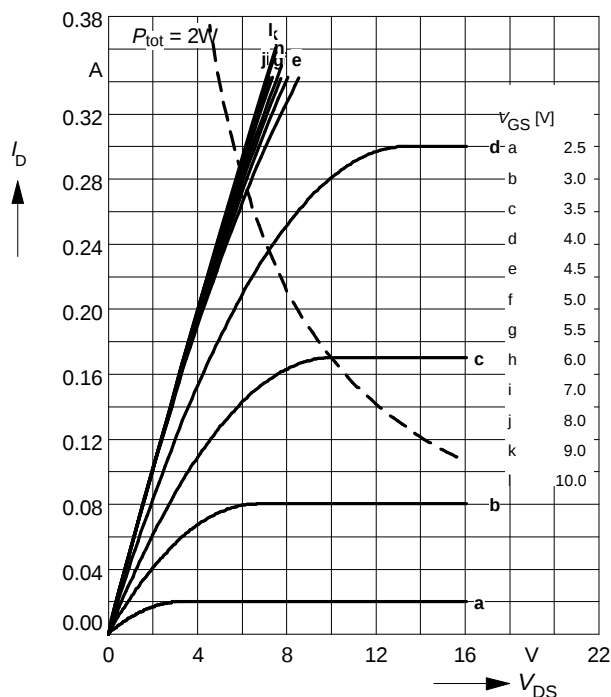
parameter:  $D = t_p / T$



## Typ. output characteristics

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

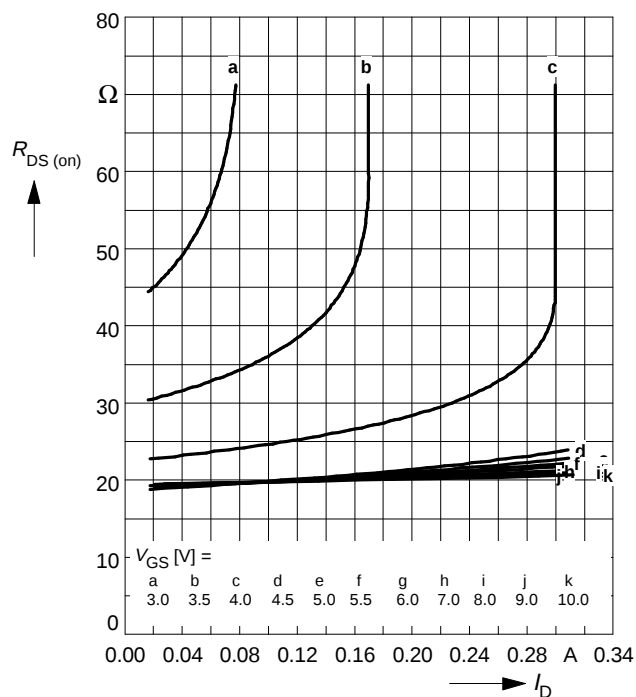
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



## Typ. drain-source on-resistance

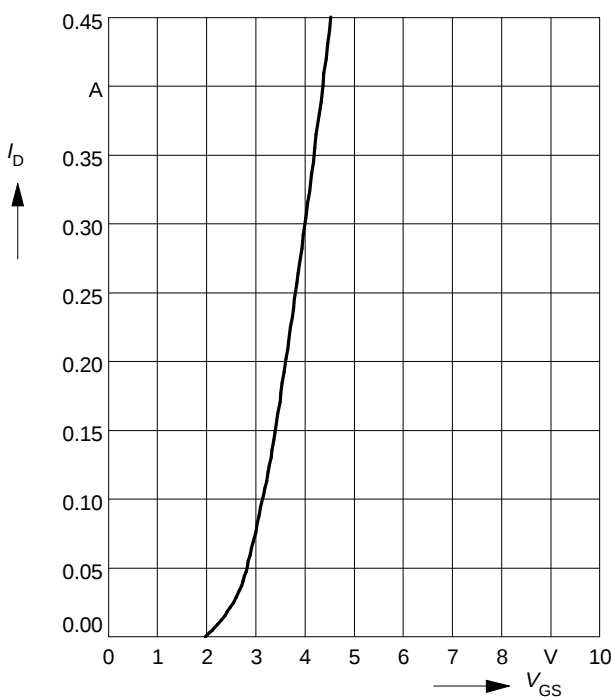
$$R_{DS(on)} = f(I_D)$$

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



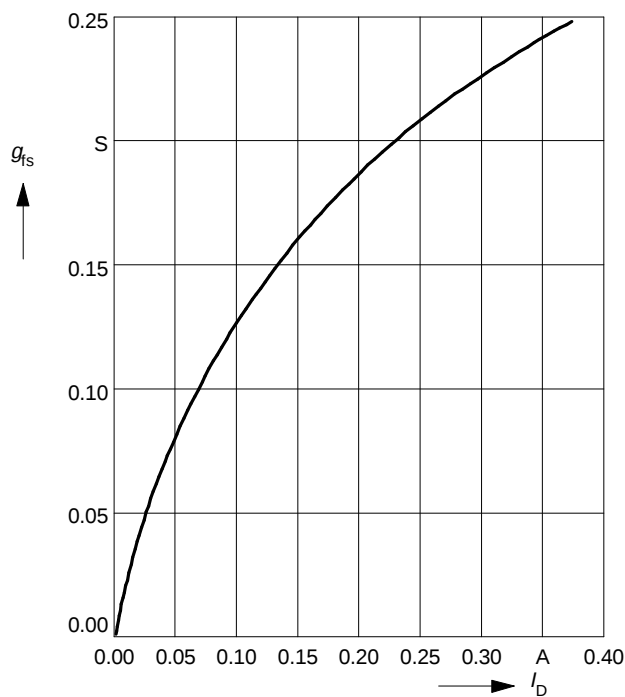
## Typ. transfer characteristics $I_D = f(V_{GS})$

parameter:  $t_p = 80 \mu s$



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

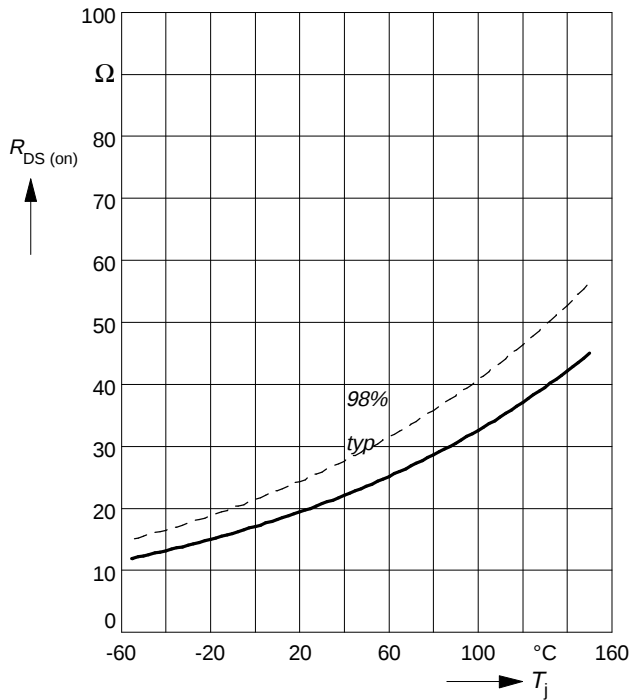
parameter:  $t_p = 80 \mu s$ ,



## Drain-source on-resistance

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

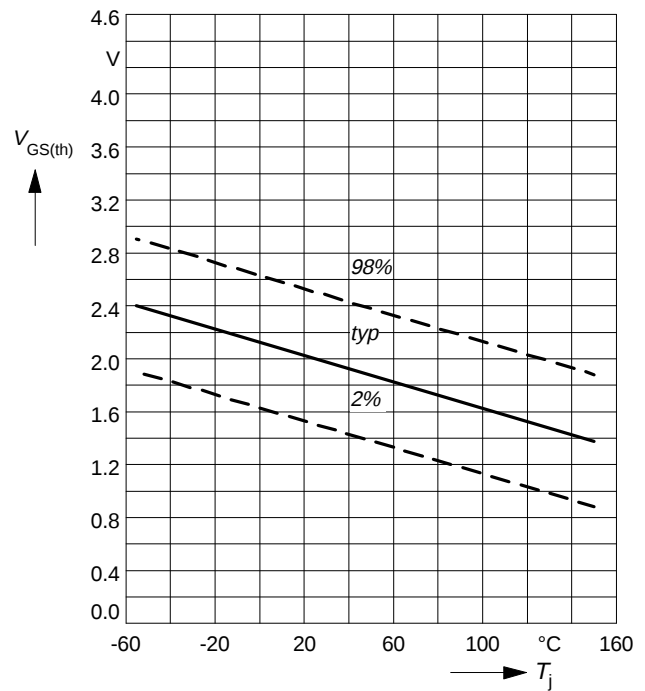
parameter:  $I_D = 0.17 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



## Gate threshold voltage

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

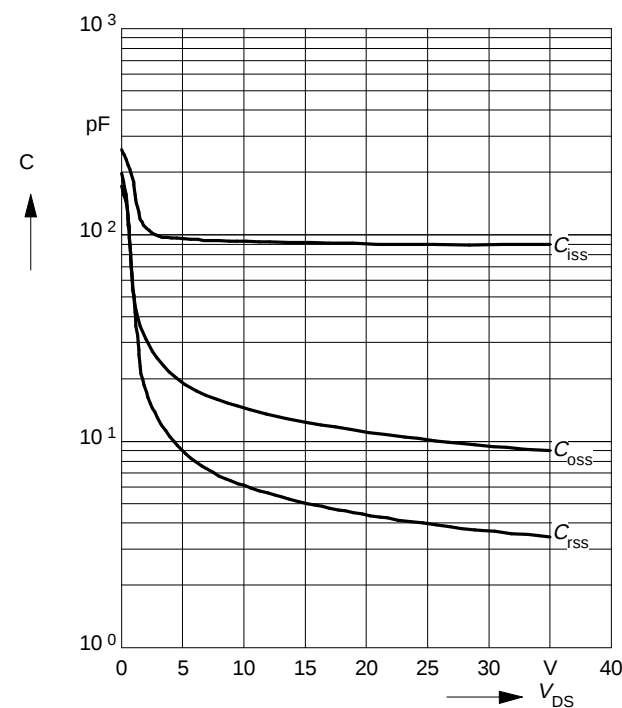
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 1 \text{ mA}$



## Typ. capacitances

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

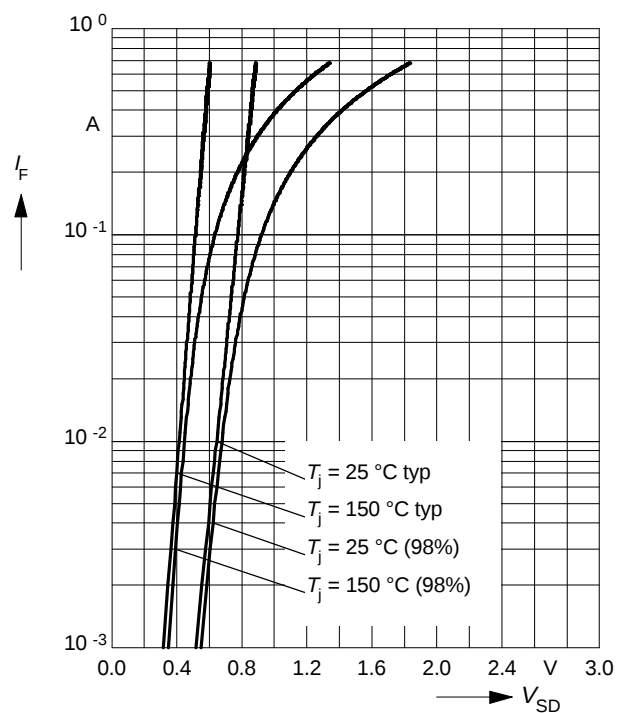
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



## Forward characteristics of reverse diode

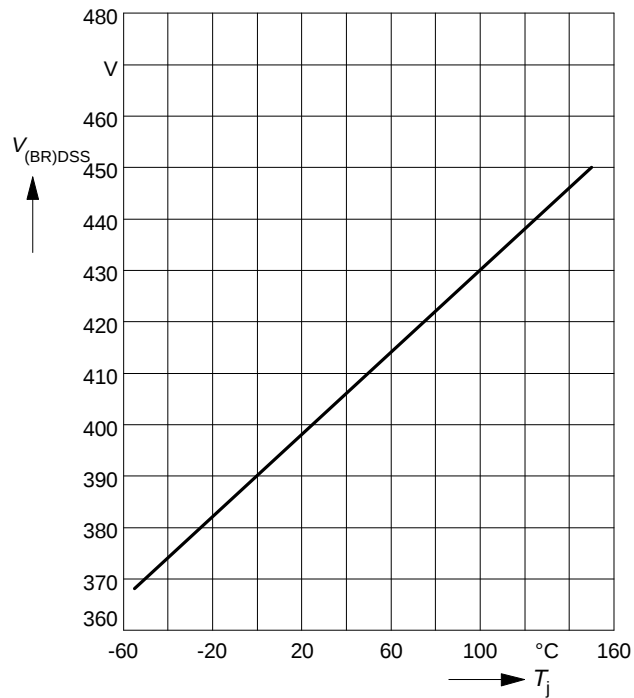
$$I_F = f(V_{SD})$$

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



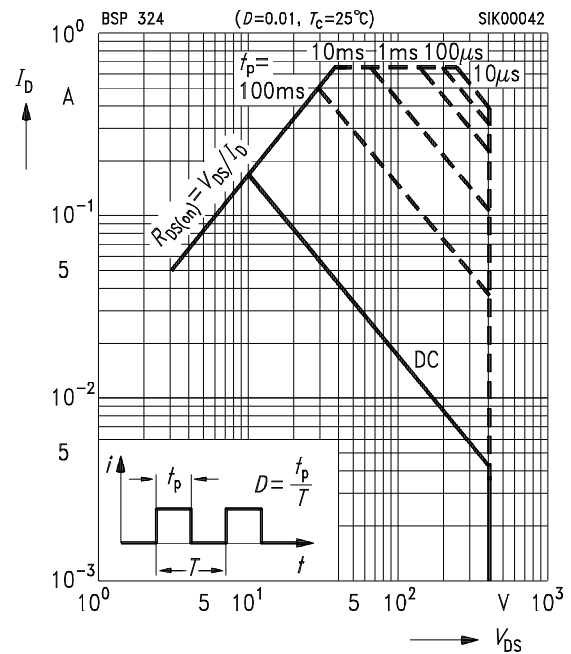
## Drain-source breakdown voltage

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



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

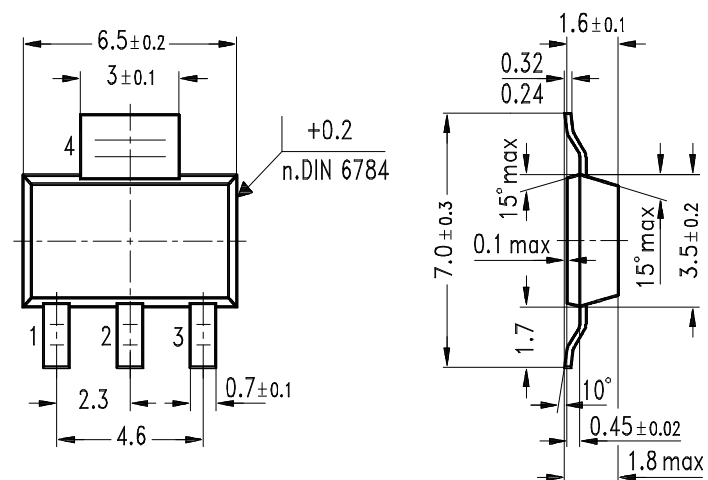
parameter :  $D = 0.01$ ,  $T_c = 25^\circ\text{C}$



## Package outlines

SOT-223

Dimensions in mm



GPS05560