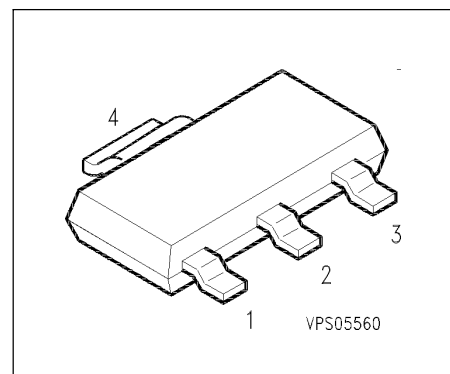


## BSP 296

### SIPMOS® Small-Signal Transistor

- N channel
- Enhancement mode
- Logic Level
- $V_{GS(th)} = 0.8...2.0V$



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

| Type    | $V_{DS}$ | $I_D$ | $R_{DS(on)}$ | Package | Marking |
|---------|----------|-------|--------------|---------|---------|
| BSP 296 | 100 V    | 1 A   | $0.8 \Omega$ | SOT-223 | BSP 296 |

| Type    | Ordering Code | Tape and Reel Information |
|---------|---------------|---------------------------|
| BSP 296 | Q67000-S067   | E6327                     |

### Maximum Ratings

| Parameter                                | Symbol      | Values   | Unit |
|------------------------------------------|-------------|----------|------|
| Drain source voltage                     | $V_{DS}$    | 100      | V    |
| Drain-gate voltage                       | $V_{DGR}$   | 100      |      |
| $R_{GS} = 20 \text{ k}\Omega$            |             |          |      |
| Gate source voltage                      | $V_{GS}$    | $\pm 20$ |      |
| ESD Sensitivity (HBM) as per MIL-STD 883 |             | Class 1  |      |
| Continuous drain current                 | $I_D$       | 1        | A    |
| $T_A = 42 \text{ }^\circ\text{C}$        |             |          |      |
| DC drain current, pulsed                 | $I_{Dpuls}$ | 4        | A    |
| $T_A = 25 \text{ }^\circ\text{C}$        |             |          |      |
| Power dissipation                        | $P_{tot}$   | 1.8      | W    |
| $T_A = 25 \text{ }^\circ\text{C}$        |             |          |      |

### 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>$V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$ , $T_j = 25^\circ\text{C}$                                                                                                                                                              | $V_{(BR)DSS}$ | 100         | -             | -              | V                       |
| Gate threshold voltage<br>$V_{GS} = V_{DS}$ , $I_D = 1\text{ mA}$                                                                                                                                                                                                         | $V_{GS(th)}$  | 0.8         | 1.4           | 2              |                         |
| Zero gate voltage drain current<br>$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25^\circ\text{C}$<br>$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 125^\circ\text{C}$<br>$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25^\circ\text{C}$ | $I_{DSS}$     | -<br>-<br>- | 0.1<br>8<br>- | 1<br>50<br>100 | $\mu\text{A}$<br><br>nA |
| 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>$V_{GS} = 10\text{ V}$ , $I_D = 1\text{ A}$<br>$V_{GS} = 4.5\text{ V}$ , $I_D = 1\text{ A}$                                                                                                                                           | $R_{DS(on)}$  | -<br>-      | 0.55<br>0.95  | 0.8<br>1.4     | $\Omega$                |

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

| Parameter                                                                                                                     | Symbol       | Values |      |      | Unit |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|--------|------|------|------|
|                                                                                                                               |              | min.   | typ. | max. |      |
| Dynamic Characteristics                                                                                                       |              |        |      |      |      |
| Transconductance<br>$V_{DS} \geq 2 * I_D * R_{DS(ON)max}$ , $I_D = 1\text{ A}$                                                | $g_{fs}$     | 0.5    | 1.3  | -    | 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>$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$                                     | $C_{oss}$    | -      | 60   | 90   |      |
| Reverse transfer capacitance<br>$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$                           | $C_{rss}$    | -      | 30   | 45   |      |
| Turn-on delay time<br>$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 0.29\text{ A}$<br>$R_{GS} = 50\text{ }\Omega$  | $t_{d(ON)}$  | -      | 8    | 12   | ns   |
| Rise time<br>$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 0.29\text{ A}$<br>$R_{GS} = 50\text{ }\Omega$           | $t_r$        | -      | 15   | 25   |      |
| Turn-off delay time<br>$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 0.29\text{ A}$<br>$R_{GS} = 50\text{ }\Omega$ | $t_{d(OFF)}$ | -      | 120  | 160  |      |
| Fall time<br>$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 0.29\text{ A}$<br>$R_{GS} = 50\text{ }\Omega$           | $t_f$        | -      | 65   | 85   |      |

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

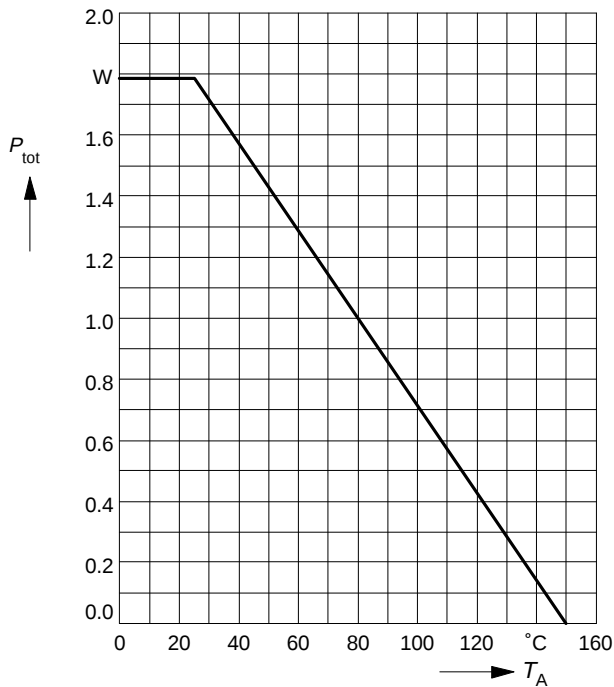
| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

#### Reverse Diode

|                                                                                                        |          |   |      |     |   |
|--------------------------------------------------------------------------------------------------------|----------|---|------|-----|---|
| Inverse diode continuous forward current<br>$T_A = 25^\circ\text{C}$                                   | $I_S$    | - | -    | 1   | A |
| Inverse diode direct current,pulsed<br>$T_A = 25^\circ\text{C}$                                        | $I_{SM}$ | - | -    | 4   |   |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}$ , $I_F = 2\text{ A}$ , $T_j = 25^\circ\text{C}$ | $V_{SD}$ | - | 0.95 | 1.3 | V |

### Power dissipation

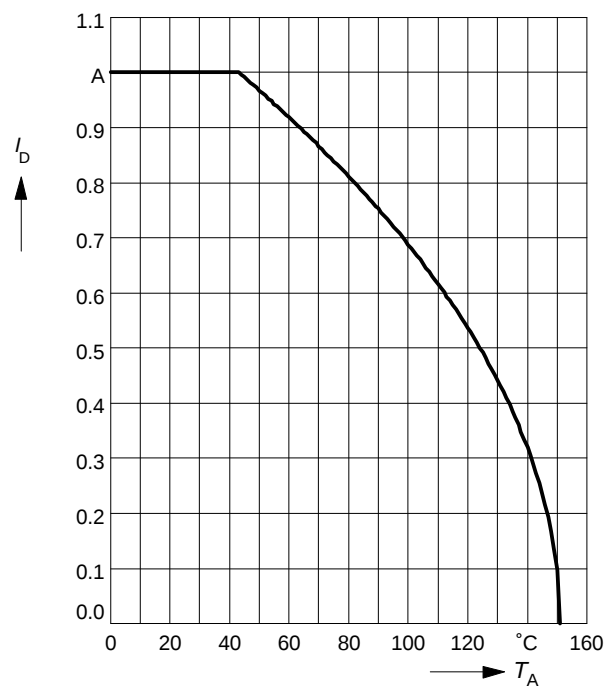
$$P_{\text{tot}} = f(T_A)$$



### Drain current

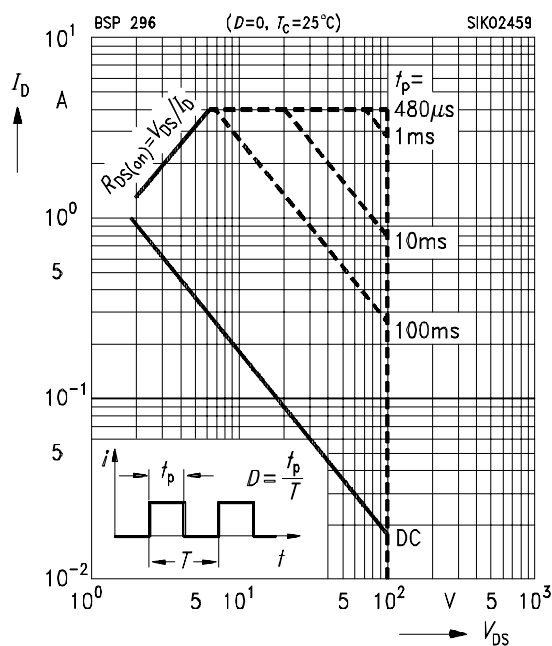
$$I_D = f(T_A)$$

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



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

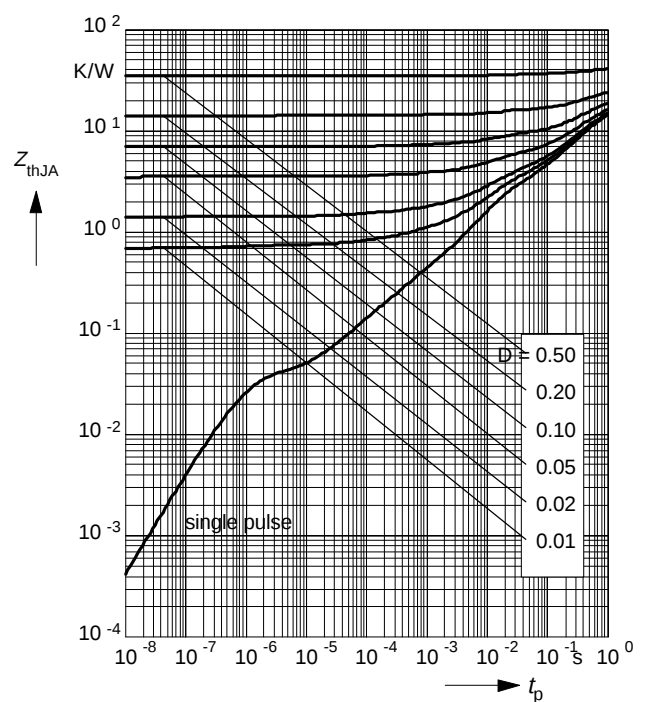
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### Transient thermal impedance

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

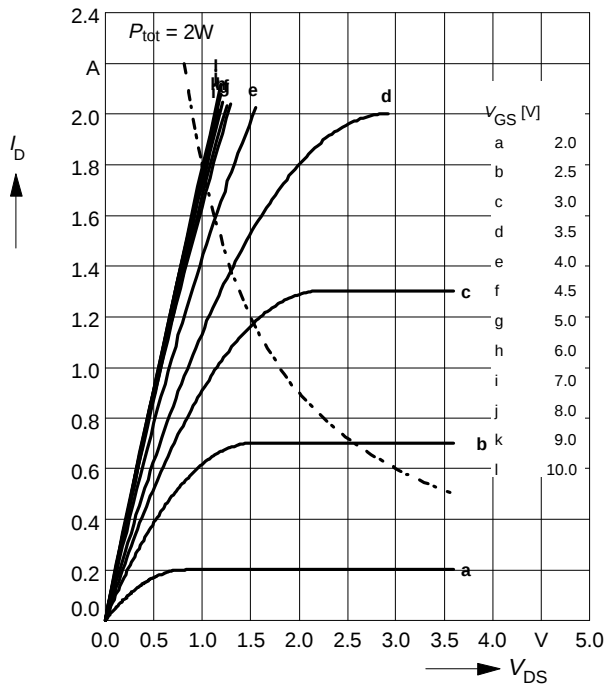
parameter:  $D = t_p / T$



### Typ. output characteristics

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

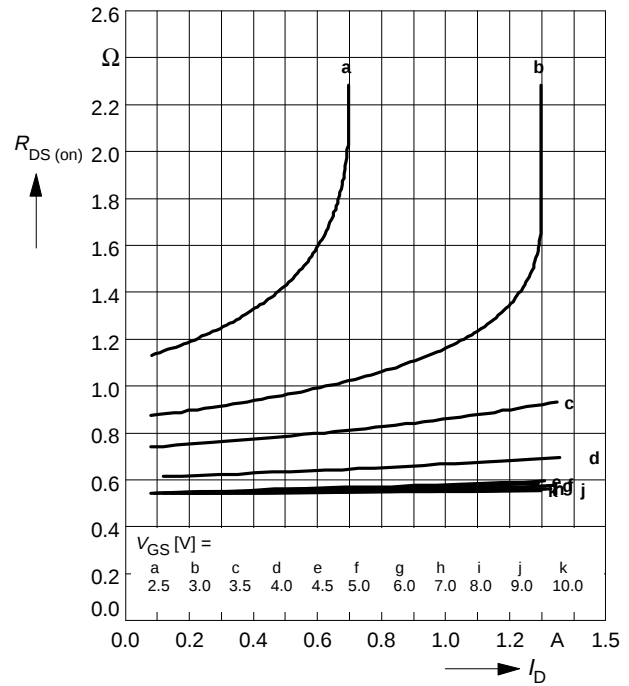
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. drain-source on-resistance

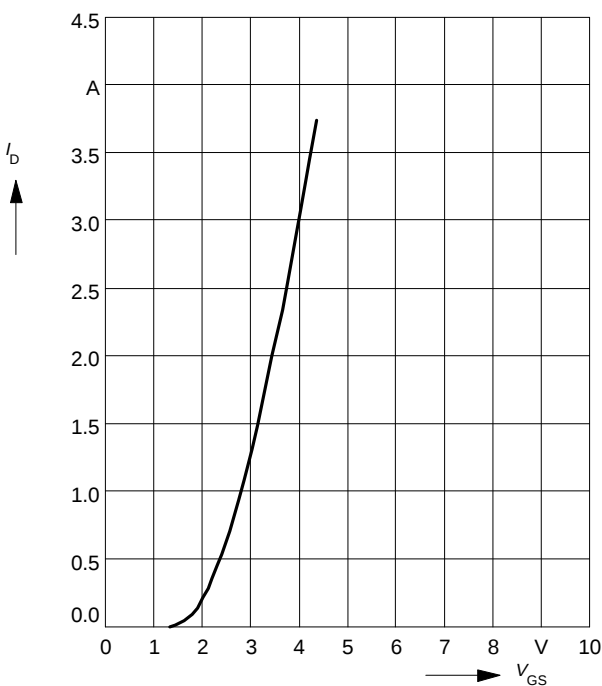
$$R_{DS(on)} = f(I_D)$$

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



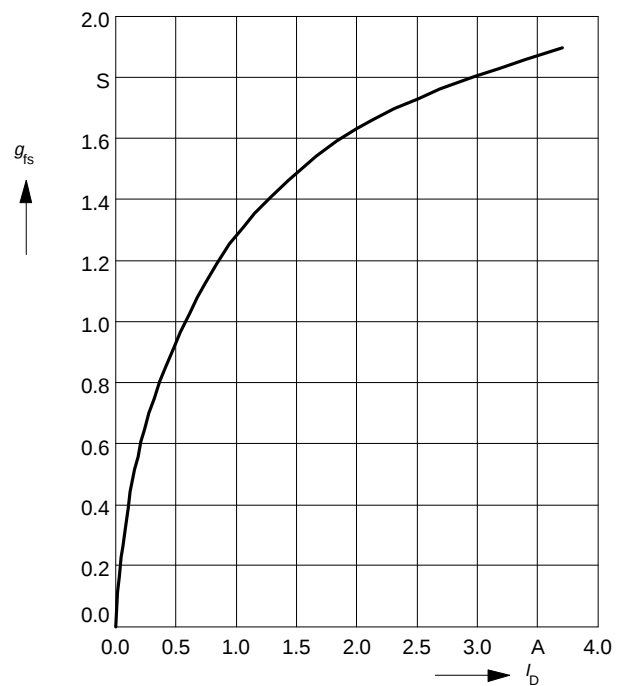
### Typ. transfer characteristics $I_D = f(V_{GS})$

parameter:  $t_p = 80 \mu s$



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

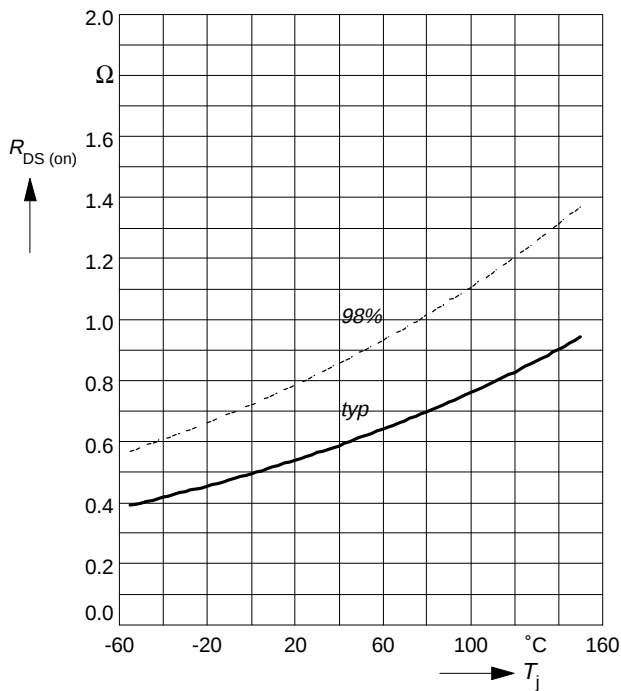
parameter:  $t_p = 80 \mu s$ ,



### Drain-source on-resistance

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

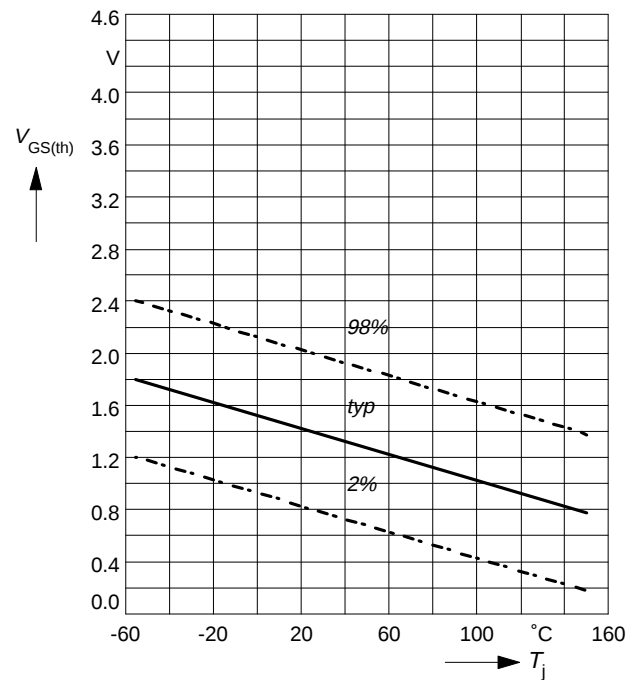
parameter:  $I_D = 1\text{ A}$ ,  $V_{GS} = 10\text{ V}$



### Gate threshold voltage

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

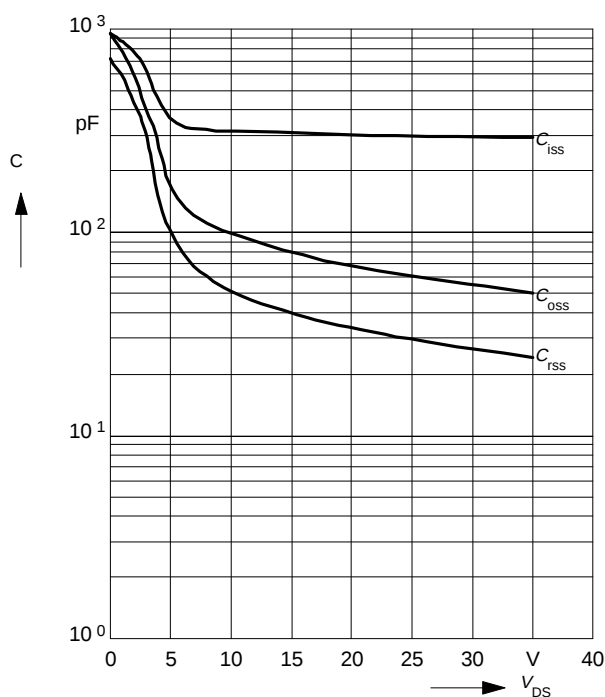
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 1\text{ mA}$



### Typ. capacitances

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

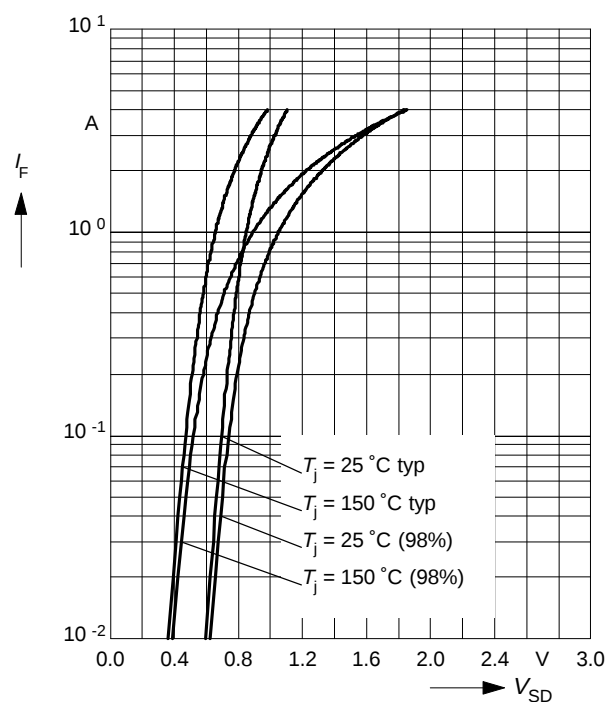
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



### Forward characteristics of reverse diode

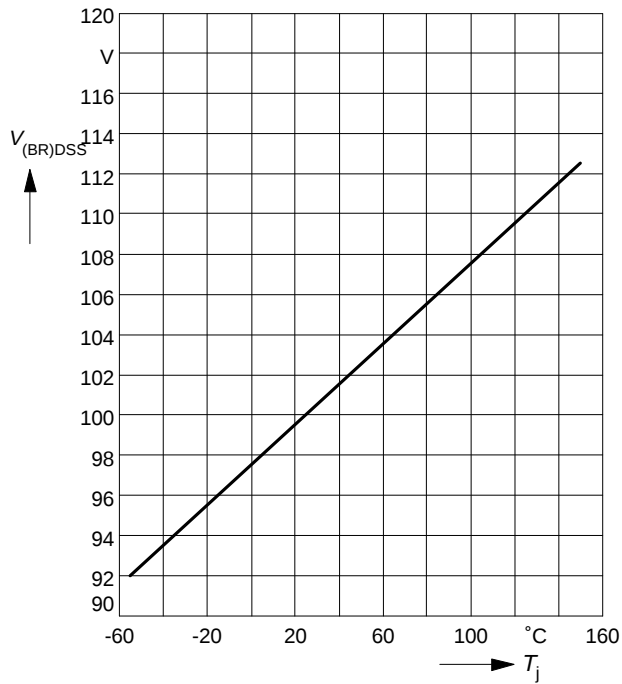
$$I_F = f(V_{SD})$$

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



### Drain-source breakdown voltage

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



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

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

