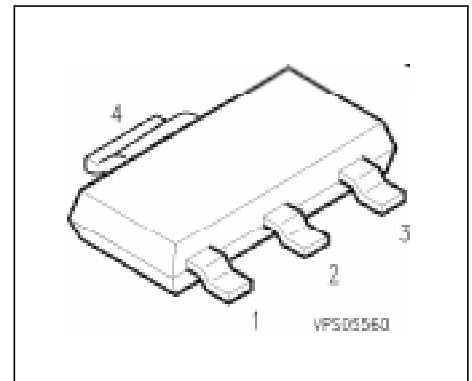


## SIPMOS<sup>®</sup> Small-Signal Transistor

- P channel
- Enhancement mode
- Avalanche rated
- $V_{GS(th)} = -2.1 \dots -4.0 \text{ V}$



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

Type	$V_{DS}$	$I_D$	$R_{DS(on)}$	Package	Marking
BSP 170	-60 V	-1.7 A	0.35 $\Omega$	SOT-223	

Type	Ordering Code	Tape and Reel Information
BSP 170	Q67000-S . . .	E6327

### Maximum Ratings

Parameter	Symbol	Values	Unit
Continuous drain current $T_A = 25 \text{ }^\circ\text{C}$	$I_D$	-1.7	A
DC drain current, pulsed $T_A = 25 \text{ }^\circ\text{C}$	$I_{Dpuls}$	-6.8	
Avalanche energy, single pulse $I_D = -1.7 \text{ A}$ , $V_{DD} = -25 \text{ V}$ , $R_{GS} = 25 \text{ } \Omega$ $L = 3.23 \text{ mH}$ , $T_j = 25 \text{ }^\circ\text{C}$	$E_{AS}$	8	mJ
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_A = 25 \text{ }^\circ\text{C}$	$P_{tot}$	1.8	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 <sup>1)</sup>	$R_{thJA}$	≤ 70	K/W
Thermal resistance, junction-soldering point <sup>1)</sup>	$R_{thJS}$	≤ 10	
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 $V_{GS} = 0 \text{ V}, I_D = -0.25 \text{ mA}, T_j = 25 \text{ }^\circ\text{C}$	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage $V_{GS}=V_{DS}, I_D = -1 \text{ mA}$	$V_{GS(th)}$	-2.1	-3	-4	
Zero gate voltage drain current $V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 25 \text{ }^\circ\text{C}$ $V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 125 \text{ }^\circ\text{C}$	$I_{DSS}$	-	-0.1 -10	-1 -100	μA
Gate-source leakage current $V_{GS} = -20 \text{ V}, V_{DS} = 0 \text{ V}$	$I_{GSS}$	-	-10	-100	
Drain-Source on-state resistance $V_{GS} = -10 \text{ V}, I_D = -1.7 \text{ A}$	$R_{DS(on)}$	-	0.255	0.35	Ω

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**Dynamic Characteristics**

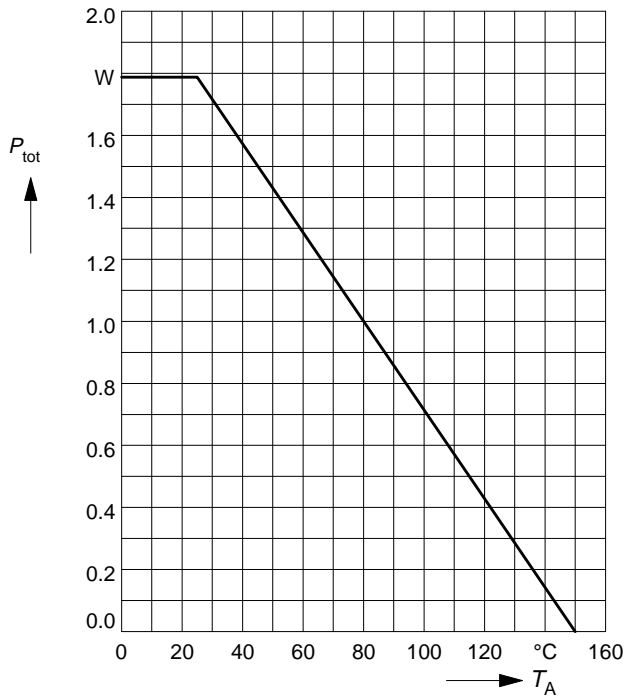
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = -1.7 \text{ A}$	$g_{fs}$	1	1.35	-	S
Input capacitance $V_{GS} = 0 \text{ V}$ , $V_{DS} = -25 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{iss}$	-	800	1100	pF
Output capacitance $V_{GS} = 0 \text{ V}$ , $V_{DS} = -25 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{oss}$	-	250	375	
Reverse transfer capacitance $V_{GS} = 0 \text{ V}$ , $V_{DS} = -25 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{rss}$	-	95	145	
Turn-on delay time $V_{DD} = -30 \text{ V}$ , $V_{GS} = -10 \text{ V}$ , $I_D = -0.3 \text{ A}$ $R_G = 50 \Omega$	$t_{d(on)}$	-	25	38	ns
Rise time $V_{DD} = -30 \text{ V}$ , $V_{GS} = -10 \text{ V}$ , $I_D = -0.3 \text{ A}$ $R_G = 50 \Omega$	$t_r$	-	80	120	
Turn-off delay time $V_{DD} = -30 \text{ V}$ , $V_{GS} = -10 \text{ V}$ , $I_D = 0.3 \text{ A}$ $R_G = 50 \Omega$	$t_{d(off)}$	-	130	175	
Fall time $V_{DD} = -30 \text{ V}$ , $V_{GS} = -10 \text{ V}$ , $I_D = -0.3 \text{ A}$ $R_G = 50 \Omega$	$t_f$	-	150	200	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Reverse Diode</b>					
Inverse diode continuous forward current $T_A = 25^\circ\text{C}$	$I_S$	-	-	-1.7	A
Inverse diode direct current, pulsed $T_A = 25^\circ\text{C}$	$I_{SM}$	-	-	-6.8	
Inverse diode forward voltage $V_{GS} = 0\text{ V}, I_F = -3.4\text{ A}$	$V_{SD}$	-	-0.9	-1.2	V
Reverse recovery time $V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	80	-	ns
Reverse recovery charge $V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	0.23	-	$\mu\text{C}$

### Power dissipation

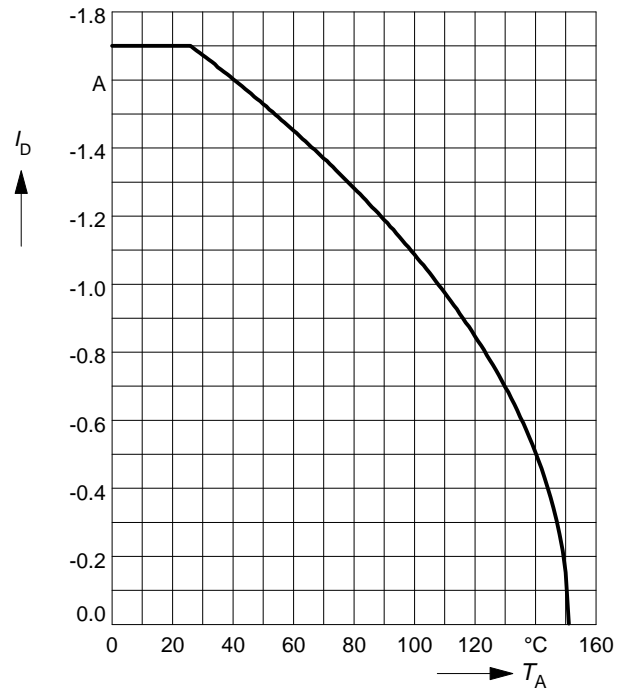
$$P_{\text{tot}} = f(T_A)$$



### Drain current

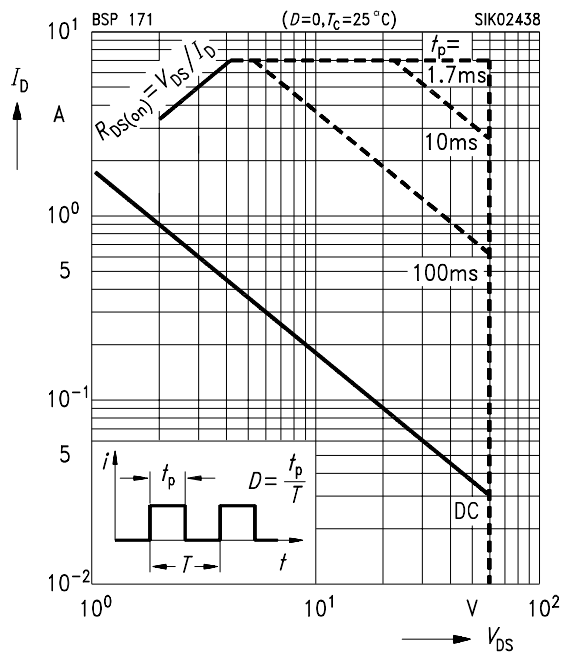
$$I_D = f(T_A)$$

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



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

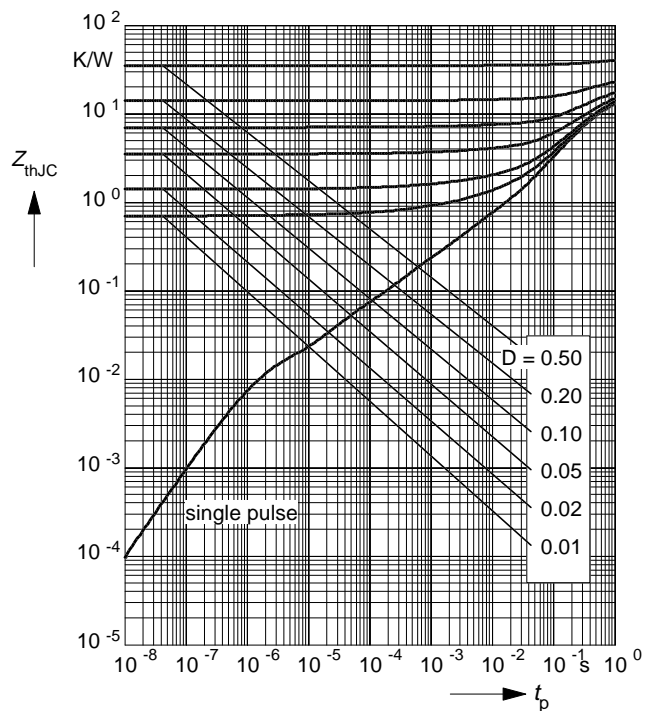
parameter:  $D = 0, T_C = 25^\circ\text{C}$



### Transient thermal impedance

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

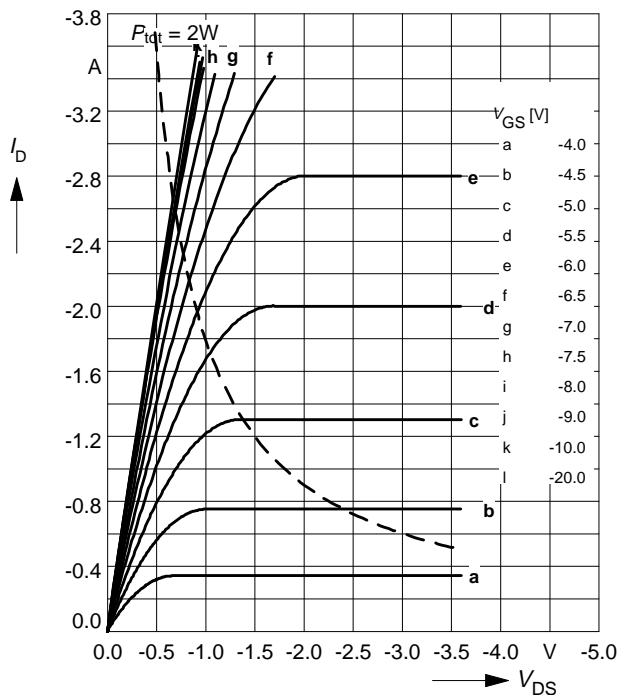
parameter:  $D = t_p / T$



### Typ. output characteristics

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

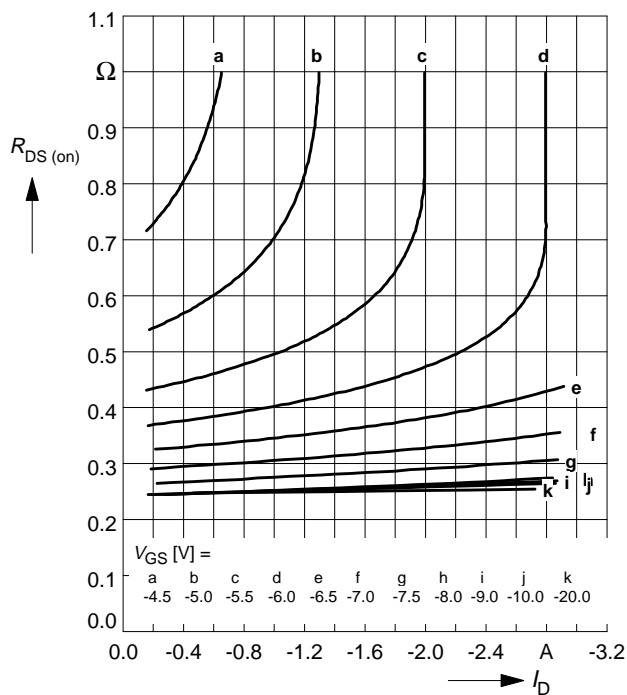
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. drain-source on-resistance

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

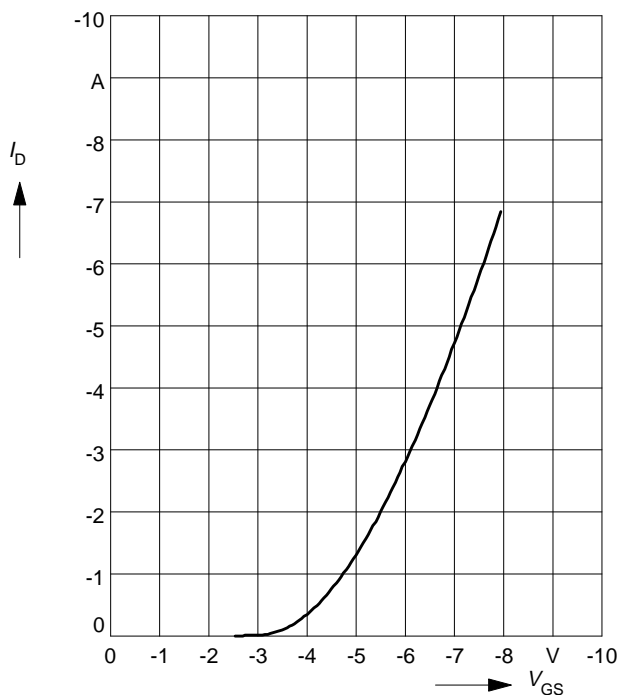
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



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

parameter:  $t_p = 80 \mu s$

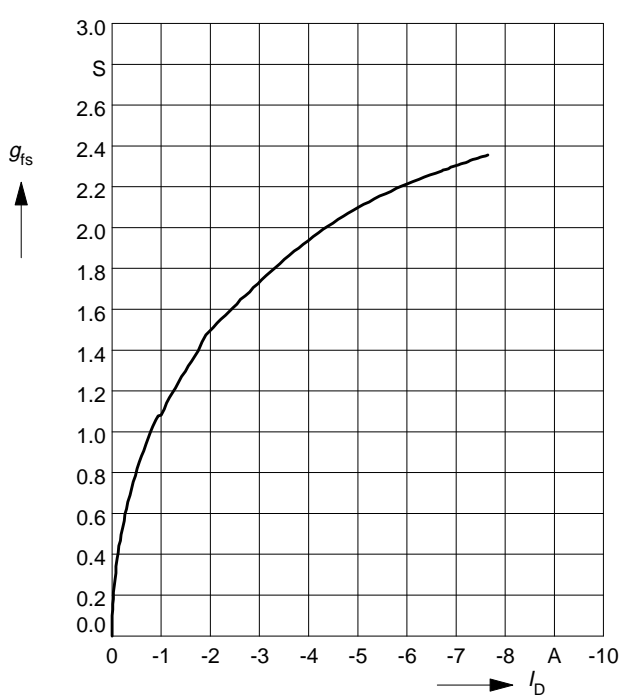
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



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

parameter:  $t_p = 80 \mu s$ ,

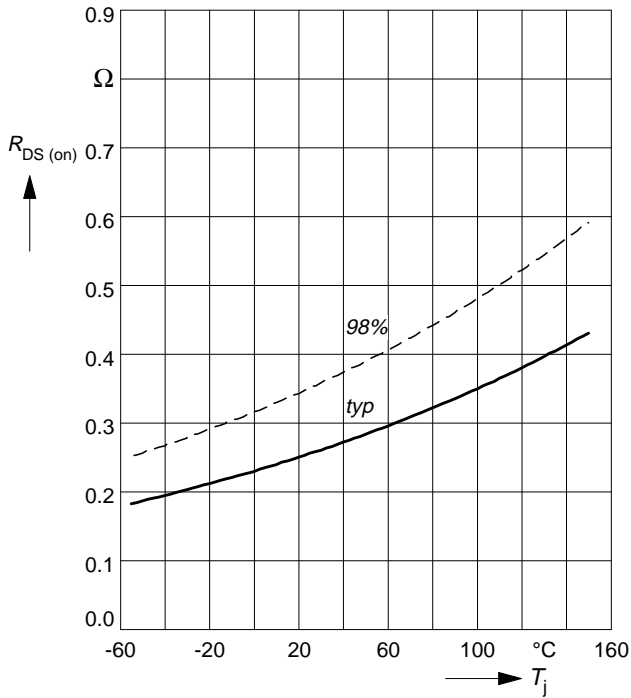
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



### Drain-source on-resistance

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

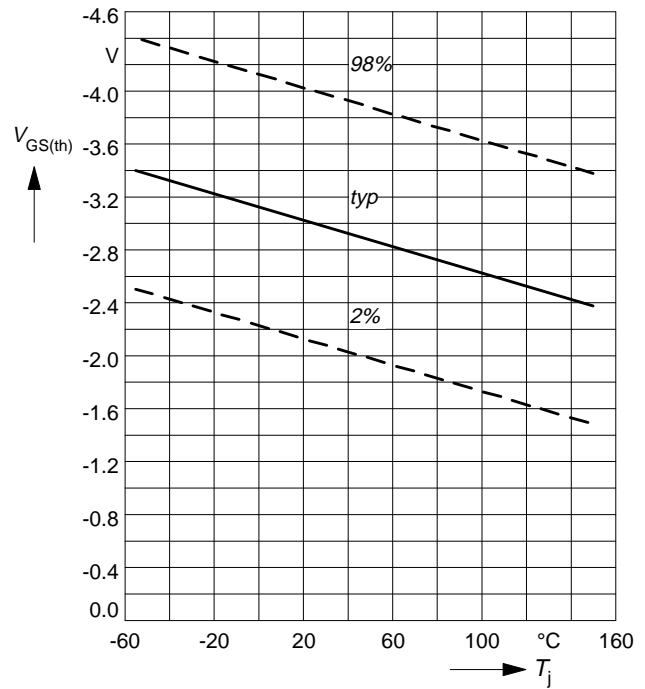
parameter:  $I_D = -1.7 \text{ A}$ ,  $V_{GS} = -10 \text{ V}$



### Gate threshold voltage

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

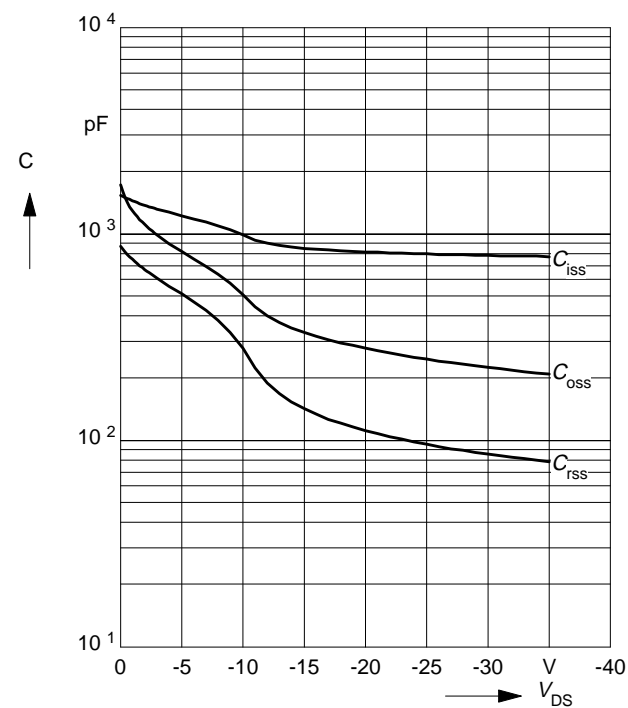
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -1 \text{ mA}$



### Typ. capacitances

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

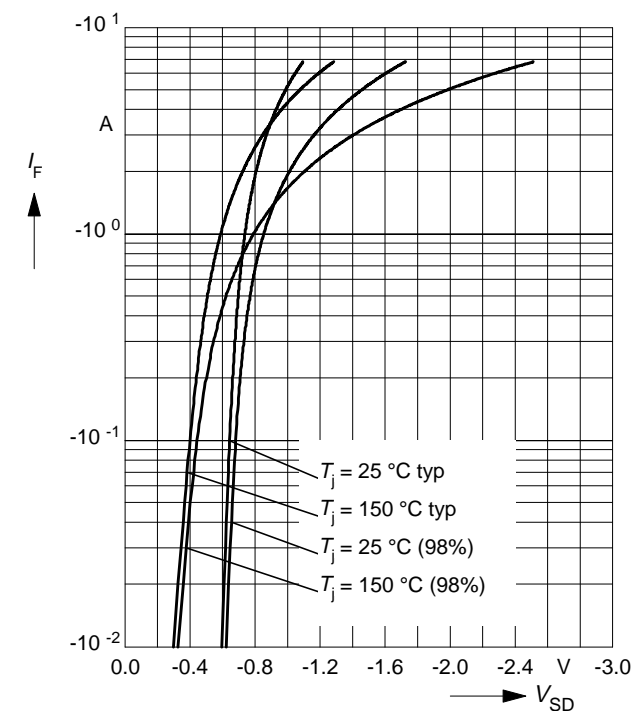
parameter:  $V_{GS}=0\text{V}$ ,  $f = 1 \text{ MHz}$



### Forward characteristics of reverse diode

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

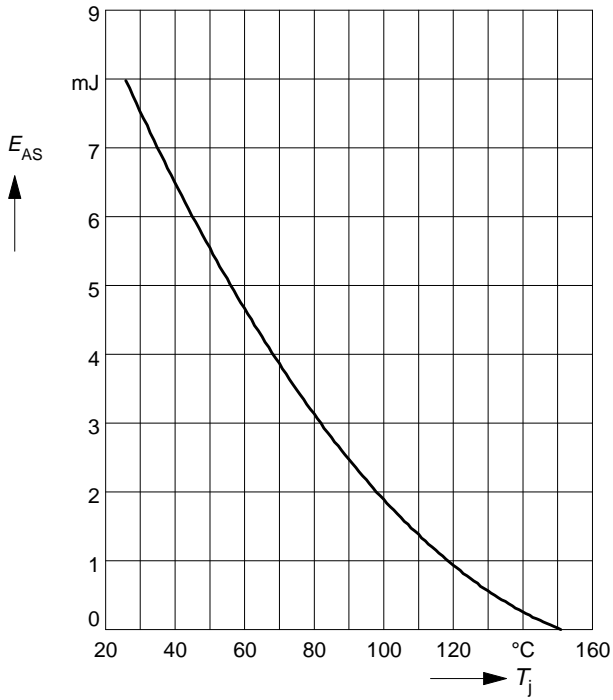
parameter:  $T_j, t_p = 80 \mu\text{s}$



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

parameter:  $I_D = -1.7$  A,  $V_{DD} = -25$  V

$R_{GS} = 25 \Omega$ ,  $L = 3.23$  mH



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

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

