

# **SIPMOS® Small-Signal-Transistor**

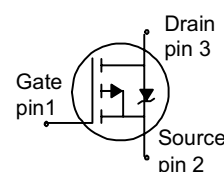
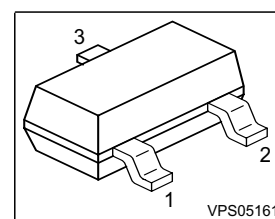
## **Feature**

- P-Channel
- Enhancement mode
- Logic Level
- Avalanche rated
- $dv/dt$  rated
- Pb-free lead plating; RoHS compliant

## **Product Summary**

$V_{DS}$	-60	V
$R_{DS(on)}$	8	$\Omega$
$I_D$	-0.17	A

PG-SOT-23



Type	Package	Tape and Reel	Marking
BSS 84 P	PG-SOT-23	L6327:3000pcs/r.	YBs
BSS 84 P	PG-SOT-23	L6433:10000pcs/r.	YBs

## **Maximum Ratings, at $T_A = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25^\circ\text{C}$ $T_A=70^\circ\text{C}$	$I_D$	-0.17 -0.14	A
Pulsed drain current $T_A=25^\circ\text{C}$	$I_{D \text{ puls}}$	-0.68	
Avalanche energy, single pulse $I_D=-0.17 \text{ A}$ , $V_{DD}=-25\text{V}$ , $R_{GS}=25\Omega$	$E_{AS}$	2.6	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	0.036	
Reverse diode $dv/dt$ $I_S=-0.17\text{A}$ , $V_{DS}=-48\text{V}$ , $di/dt=-200\text{A}/\mu\text{s}$ , $T_{jmax}=150^\circ\text{C}$	$dv/dt$	-6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_A=25^\circ\text{C}$	$P_{tot}$	0.36	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +150	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/150/56	

**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - soldering point (Pin 3)	$R_{thJS}$	-	-	200	K/W
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	350	
@ 6 cm <sup>2</sup> cooling area 1)		-	-	300	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0$ , $I_D=-250\mu A$	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-20\mu A$	$V_{GS(th)}$	-1	-1.5	-2	
Zero gate voltage drain current $V_{DS}=-60V$ , $V_{GS}=0$ , $T_A=25^{\circ}C$ $V_{DS}=-60V$ , $V_{GS}=0$ , $T_A=125^{\circ}C$	$I_{DSS}$	- -	-0.1 -10	-1 -100	$\mu A$
Gate-source leakage current $V_{GS}=-20V$ , $V_{DS}=0$	$I_{GSS}$	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-4.5V$ , $I_D=-0.14A$	$R_{DS(on)}$	-	8	12	$\Omega$
Drain-source on-state resistance $V_{GS}=-10V$ , $I_D=-0.17A$	$R_{DS(on)}$	-	5.8	8	

<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  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

### Dynamic Characteristics

Transconductance	$g_{fs}$	$V_{DS} \leq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = -0.14\text{A}$	0.065	0.13	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$	-	15	19	pF
Output capacitance	$C_{oss}$		-	6	8	
Reverse transfer capacitance	$C_{rss}$		-	2	3	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -30\text{V}$ , $V_{GS} = -4.5\text{V}$ , $I_D = -0.14\text{A}$ , $R_G = 25\Omega$	-	6.7	10	ns
Rise time	$t_r$		-	16.2	24.3	
Turn-off delay time	$t_{d(off)}$		-	8.6	12.9	
Fall time	$t_f$		-	20.5	30.8	

### Gate Charge Characteristics

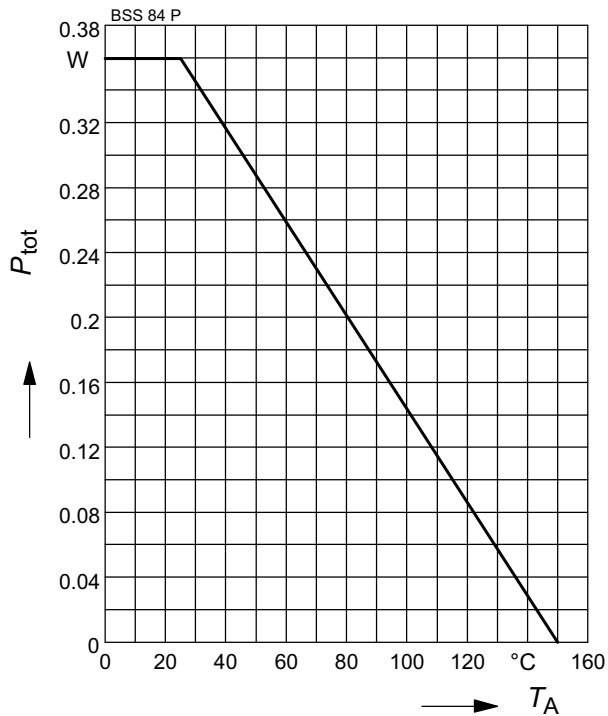
Gate to source charge	$Q_{gs}$	$V_{DD} = -48\text{V}$ , $I_D = -0.17\text{A}$	-	0.25	0.37	nC
Gate to drain charge	$Q_{gd}$		-	0.3	0.45	
Gate charge total	$Q_g$	$V_{DD} = -48\text{V}$ , $I_D = -0.17\text{A}$ , $V_{GS} = 0$ to $-10\text{V}$	-	1	1.5	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -48\text{V}$ , $I_D = -0.17\text{A}$	-	-3.42	-	V

### Reverse Diode

Inverse diode continuous forward current	$I_S$	$T_A = 25^{\circ}\text{C}$	-	-	-0.17	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	-0.68	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0$ , $I_F = -0.17\text{A}$	-	-0.93	-1.24	V
Reverse recovery time	$t_{rr}$	$V_R = -30\text{V}$ , $I_F = I_S$ , $di_F/dt = 100\text{A}/\mu\text{s}$	-	23	34	ns
Reverse recovery charge	$Q_{rr}$		-	10	15	

### 1 Power dissipation

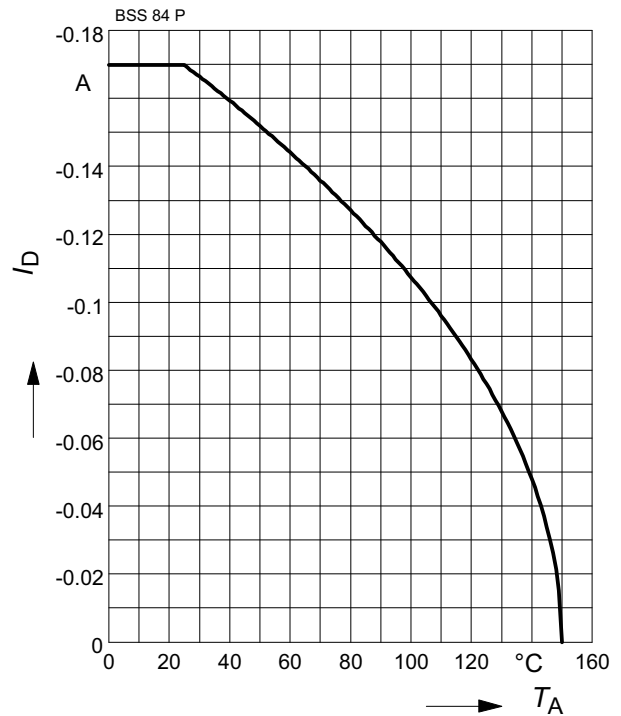
$$P_{\text{tot}} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

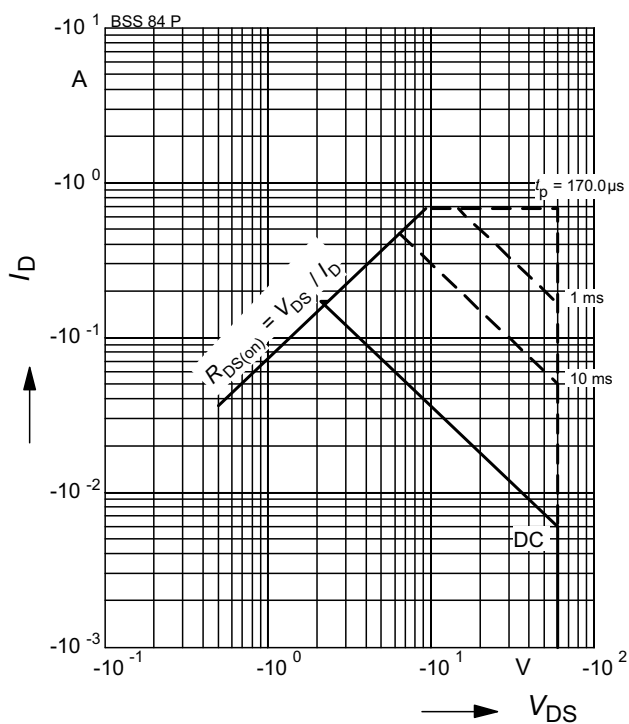
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

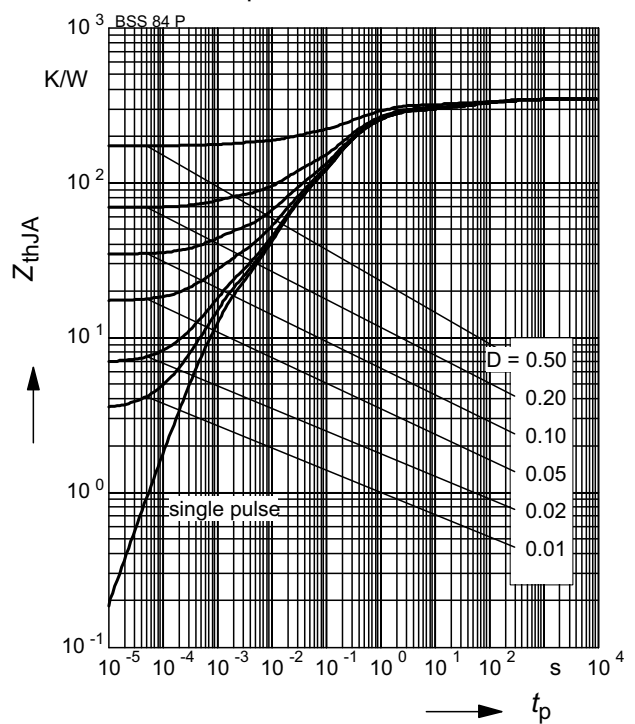
parameter:  $D = 0$ ,  $T_A = 25^\circ\text{C}$



### 4 Transient thermal impedance

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

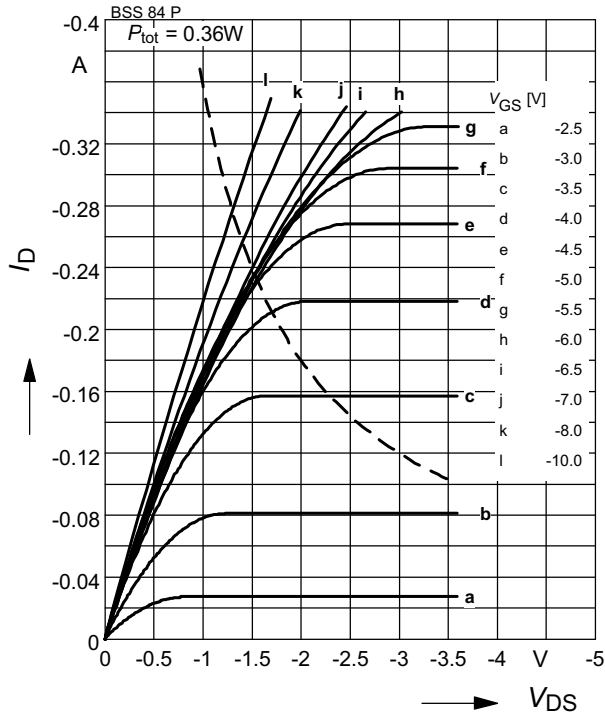
parameter:  $D = t_p / T$



### 5 Typ. output characteristic

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

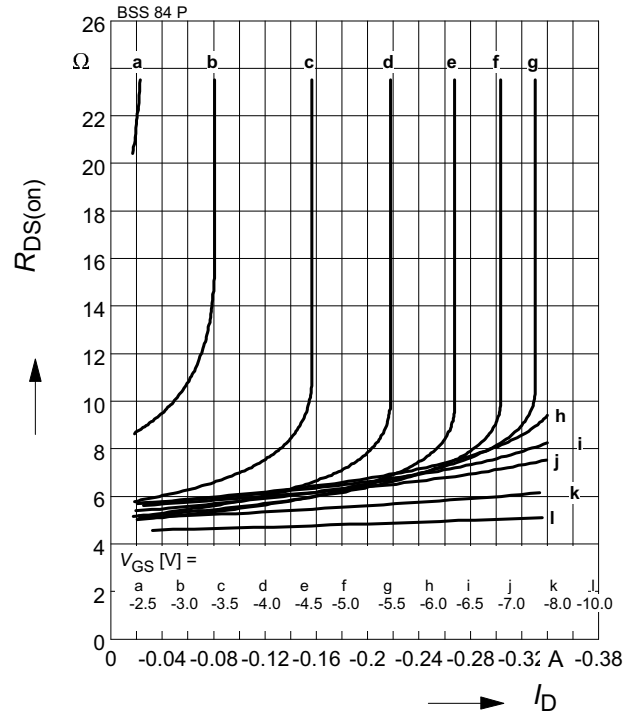
parameter:  $T_j = 25^\circ\text{C}$



### 6 Typ. drain-source on resistance

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

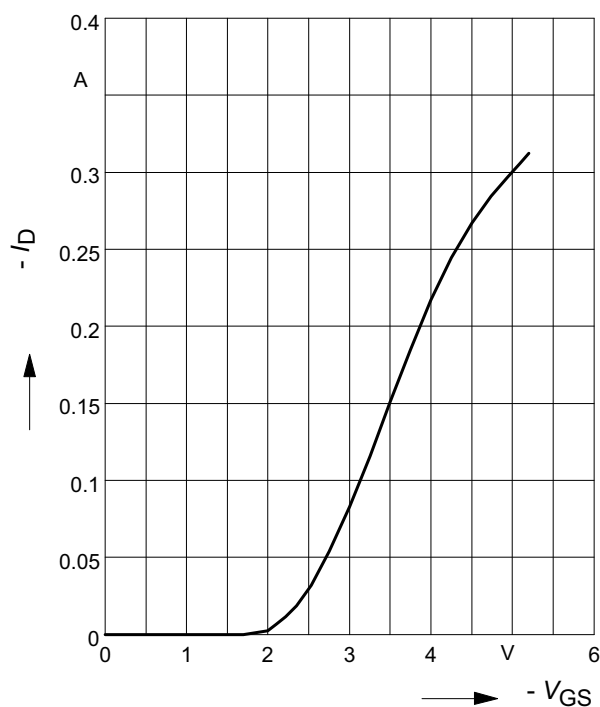
parameter:  $V_{GS}; T_j = 25^\circ\text{C}$



### 7 Typ. transfer characteristics

$$I_D = f(V_{GS}); |V_{DS}| \geq 2 \times |I_D| \times R_{DS(on)max}$$

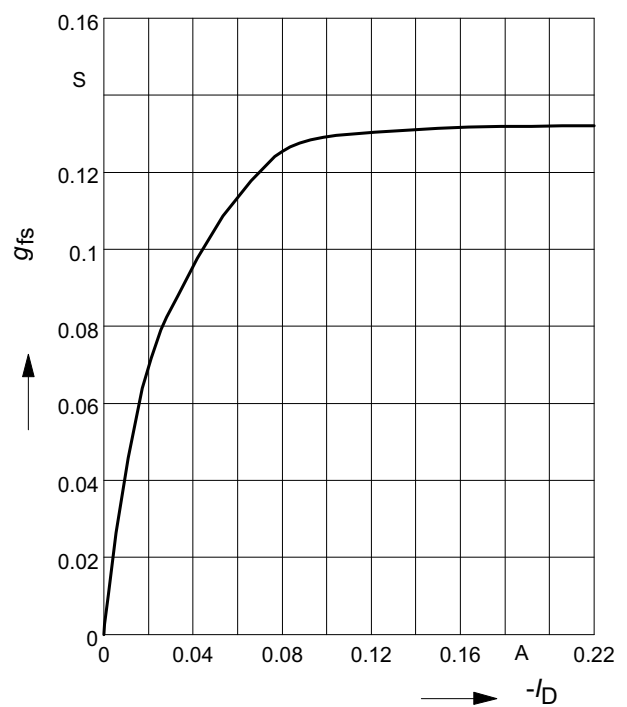
parameter:  $T_j = 25^\circ\text{C}$



### 8 Typ. forward transconductance

$$g_{fs} = f(I_D)$$

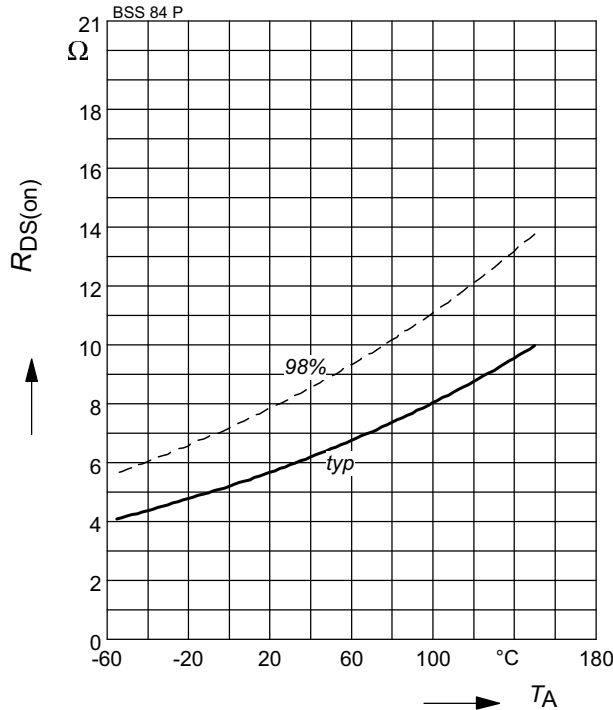
parameter:  $T_j = 25^\circ\text{C}$



### 9 Drain-source on-state resistance

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

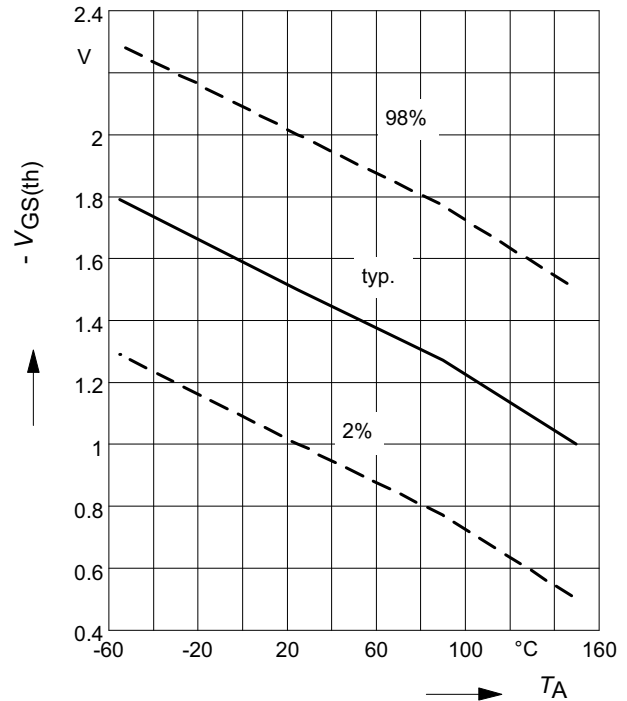
parameter:  $I_D = -0.17 \text{ A}$ ,  $V_{GS} = -10 \text{ V}$



### 10 Typ. gate threshold voltage

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

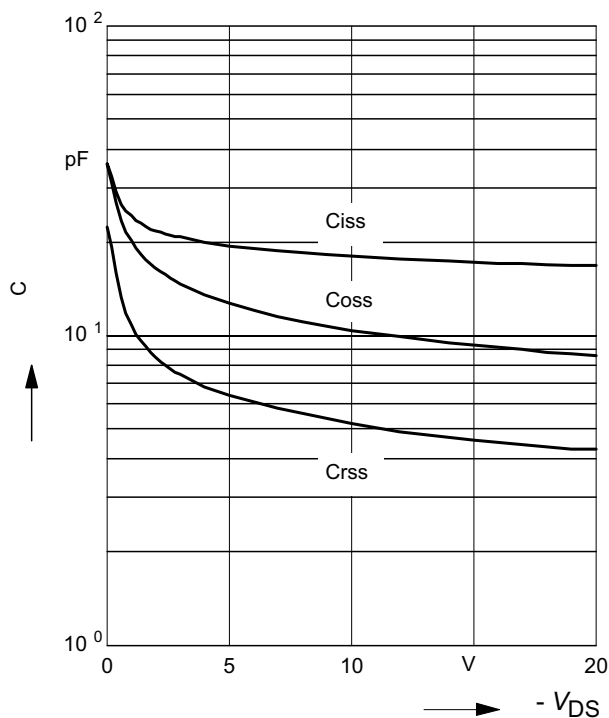
parameter:  $V_{GS} = V_{DS}$



### 11 Typ. capacitances

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

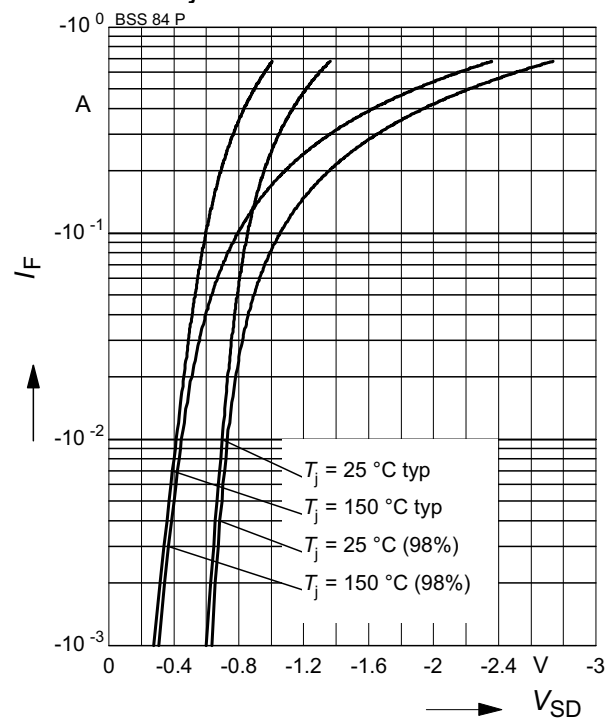
parameter:  $V_{GS} = 0$ ,  $f = 1 \text{ MHz}$



### 12 Forward character. of reverse diode

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

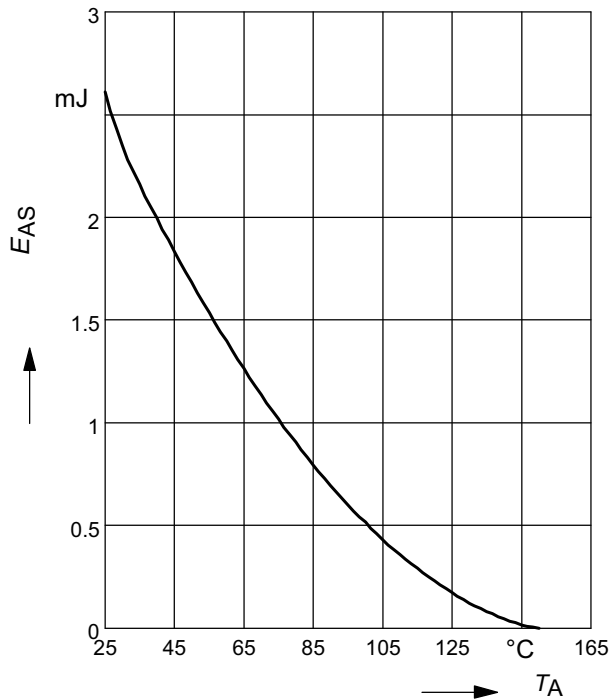
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



### 13 Typ. avalanche energy

$E_{AS} = f(T_A)$ , parameter:

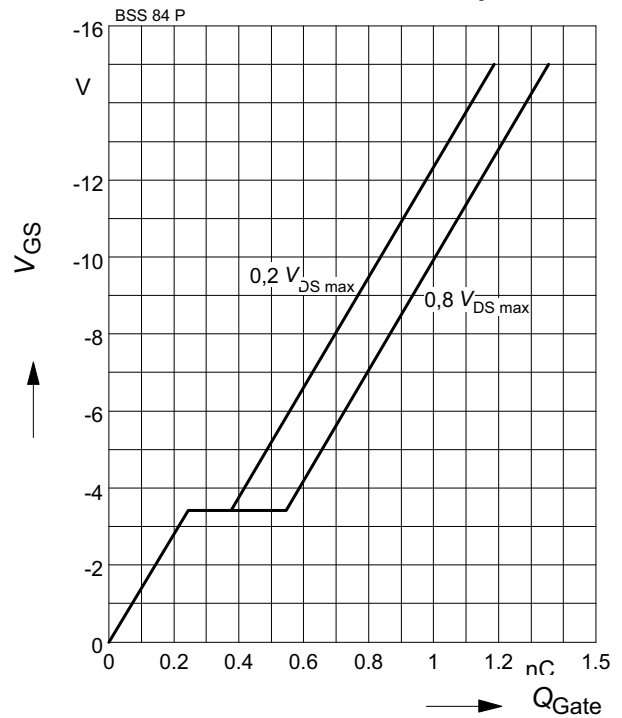
$I_D = -0.17\text{ A}$  ,  $V_{DD} = -25\text{ V}$ ,  $R_{GS} = 25\ \Omega$



### 14 Typ. gate charge

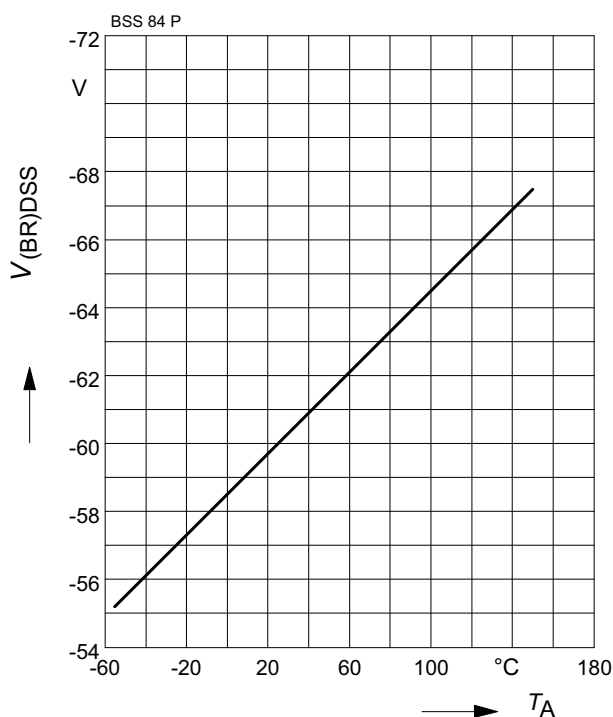
$V_{GS} = f(Q_{Gate})$

parameter:  $I_D = -0.17\text{ A}$  pulsed;  $T_j = 25\text{ °C}$



### 15 Drain-source breakdown voltage

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



**Published by**  
**Infineon Technologies AG,**  
**Bereichs Kommunikation**  
**St.-Martin-Strasse 53,**  
**D-81541 München**  
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