

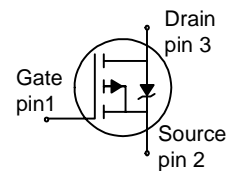
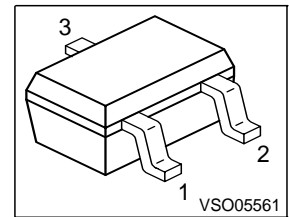
OptiMOS[®]-P Small-Signal-Transistor Feature

- P-Channel
- Enhancement mode
- Super Logic Level (2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- dv/dt rated

Product Summary

V_{DS}	-20	V
$R_{DS(on)}$	550	mΩ
I_D	-0.58	A

SOT-323



Type	Package	Ordering Code	Marking
BSS 209PW	SOT-323	Q67042-S4074	X3s

Maximum Ratings, at $T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
$T_A=25\text{ °C}$		-0.58	
$T_A=70\text{ °C}$		-0.46	
Pulsed drain current	$I_{D\text{ puls}}$	-2.3	
$T_A=25\text{ °C}$			
Avalanche energy, single pulse	E_{AS}	3.5	mJ
$I_D=-0.58\text{ A}$, $V_{DD}=-10\text{ V}$, $R_{GS}=25\text{ }\Omega$			
Reverse diode dv/dt	dv/dt	-6	kV/ μ s
$I_S=-0.58\text{ A}$, $V_{DS}=-16\text{ V}$, $di/dt=200\text{ A}/\mu\text{s}$, $T_{j\text{ max}}=150\text{ °C}$			
Gate source voltage	V_{GS}	± 12	V
Power dissipation	P_{tot}	0.52	W
$T_A=25\text{ °C}$			
Operating and storage temperature	T_j, T_{stg}	-55... +150	°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	R_{thJS}	-	-	120	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	240	
@ 6 cm ² cooling area ¹⁾		-	-	160	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0V, I_D=-250\mu A$	$V_{(BR)DSS}$	-20	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-3.5\mu A$	$V_{GS(th)}$	-0.6	-0.9	-1.2	
Zero gate voltage drain current $V_{DS}=-20V, V_{GS}=0, T_j=25^\circ C$ $V_{DS}=-20V, V_{GS}=0, T_j=150^\circ C$	I_{DSS}	-	-0.1	-1	μA
Gate-source leakage current $V_{GS}=-12V, V_{DS}=0$	I_{GSS}	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-2.5V, I_D=-0.46A$	$R_{DS(on)}$	-	563	900	$m\Omega$
Drain-source on-state resistance $V_{GS}=-4.5, I_D=-0.58A$	$R_{DS(on)}$	-	369	550	

¹⁾Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air; $t \leq 10$ sec.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic Characteristics

Transconductance	g_{fs}	$ V_{DS} \geq 2 * I_D * R_{DS(on)max}$ $I_D = -0.46\text{A}$	0.87	1.74	-	S
Input capacitance	C_{iss}	$V_{GS} = 0, V_{DS} = -15\text{V},$ $f = 1\text{MHz}$	-	89.9	-	pF
Output capacitance	C_{oss}		-	40.1	-	
Reverse transfer capacitance	C_{rss}		-	31.5	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -10\text{V}, V_{GS} = -4.5\text{V},$ $I_D = -0.58\text{A}, R_G = 6\Omega$	-	4.4	6.6	ns
Rise time	t_r		-	5.8	8.7	
Turn-off delay time	$t_{d(off)}$		-	7.6	11.4	
Fall time	t_f		-	4.5	6.7	

Gate Charge Characteristics

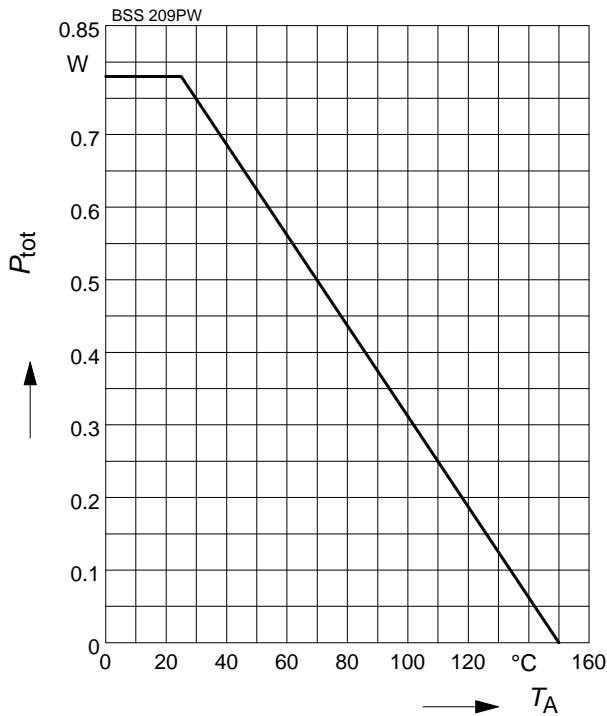
Gate to source charge	Q_{gs}	$V_{DD} = -10\text{V}, I_D = -0.58\text{A}$	-	-0.12	-0.17	nC
Gate to drain charge	Q_{gd}		-	-0.74	-1.1	
Gate charge total	Q_g	$V_{DD} = -10\text{V}, I_D = -0.58\text{A},$ $V_{GS} = 0 \text{ to } -4.5\text{V}$	-	-0.92	-1.38	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -10\text{V}, I_D = -0.58\text{A}$	-	-1.7	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A = 25\text{ }^\circ\text{C}$	-	-	-0.5	A
Inverse diode direct current, pulsed	I_{SM}		-	-	-2.3	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0, I_F = I_D $	-	-1.3	-0.88	V
Reverse recovery time	t_{rr}	$V_R = -10\text{V}, I_F = I_D ,$ $di_F/dt = 100\text{A}/\mu\text{s}$	-	9	11.2	ns
Reverse recovery charge	Q_{rr}		-	1.27	1.59	nC

1 Power dissipation

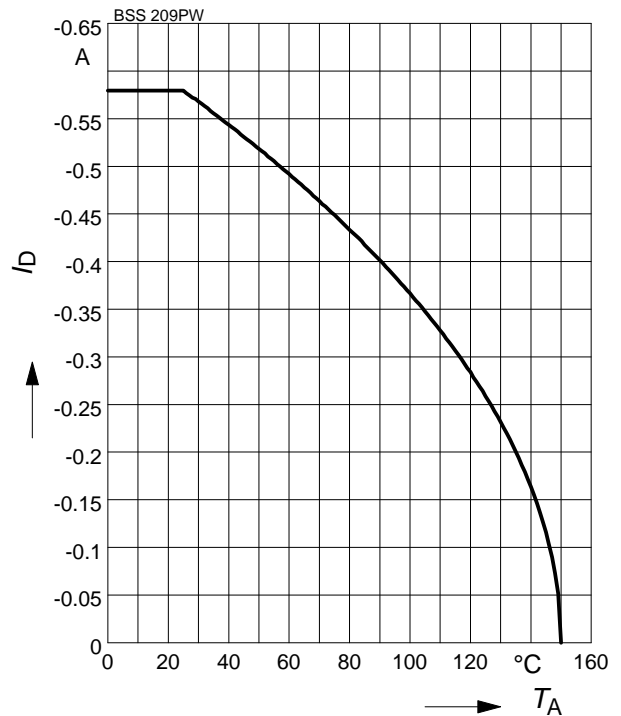
$$P_{tot} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

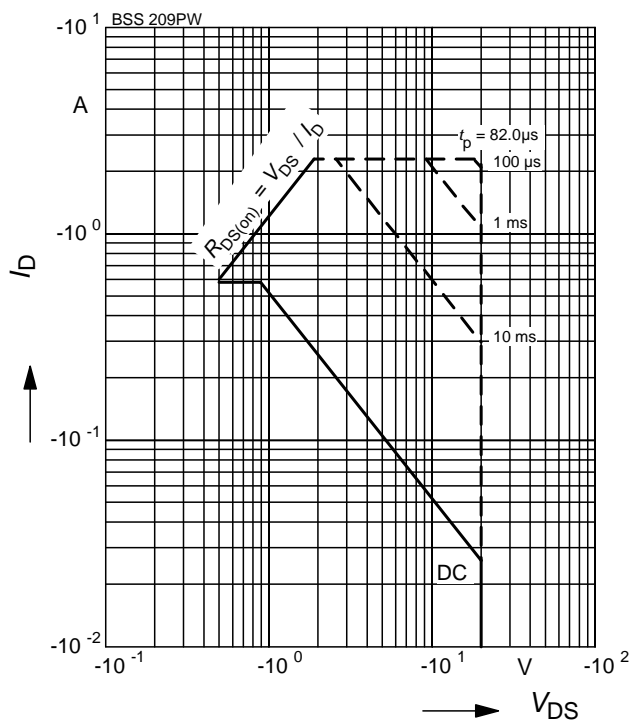
parameter: $|V_{GS}| \geq 4.5 \text{ V}$



3 Safe operating area

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

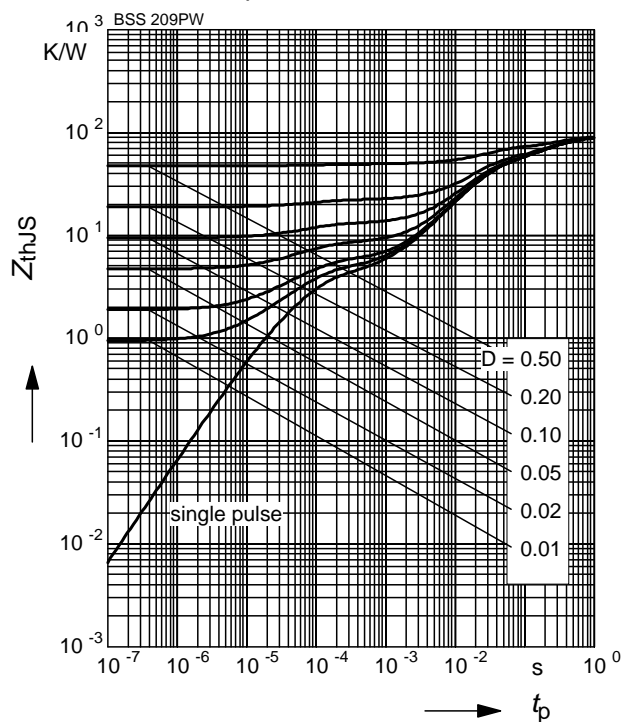
parameter: $D = 0, T_A = 25 \text{ °C}$



4 Transient thermal impedance

$$Z_{thJS} = f(t_p)$$

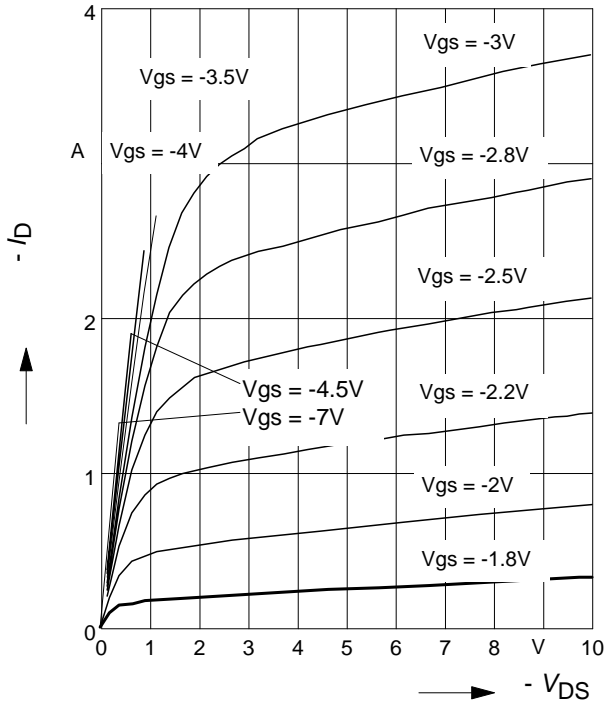
parameter: $D = t_p/T$



5 Typ. output characteristic

$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$

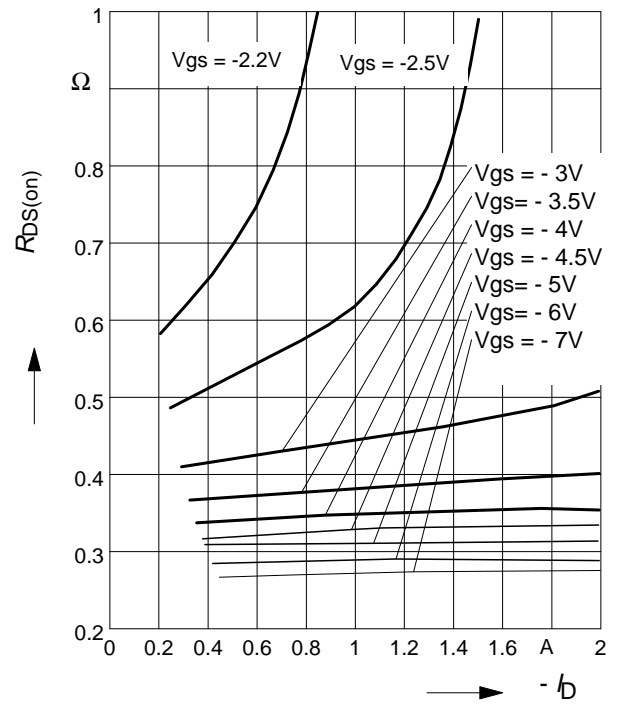
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

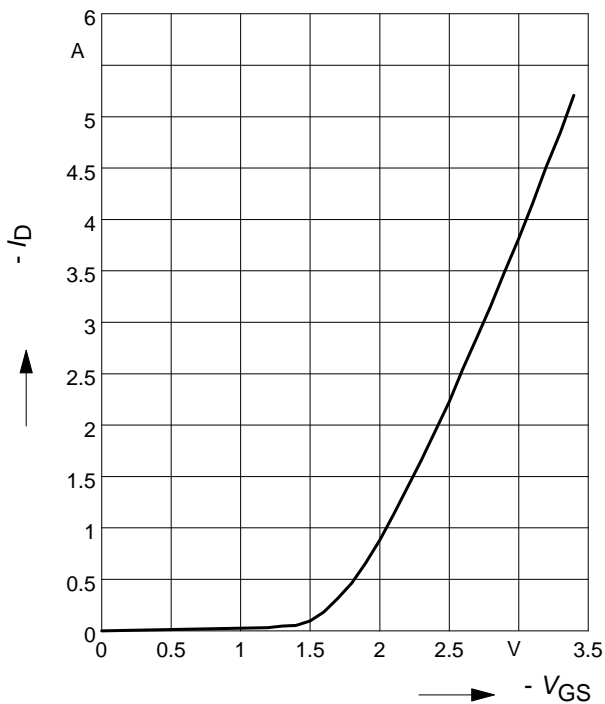
parameter: V_{GS}



7 Typ. transfer characteristics

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

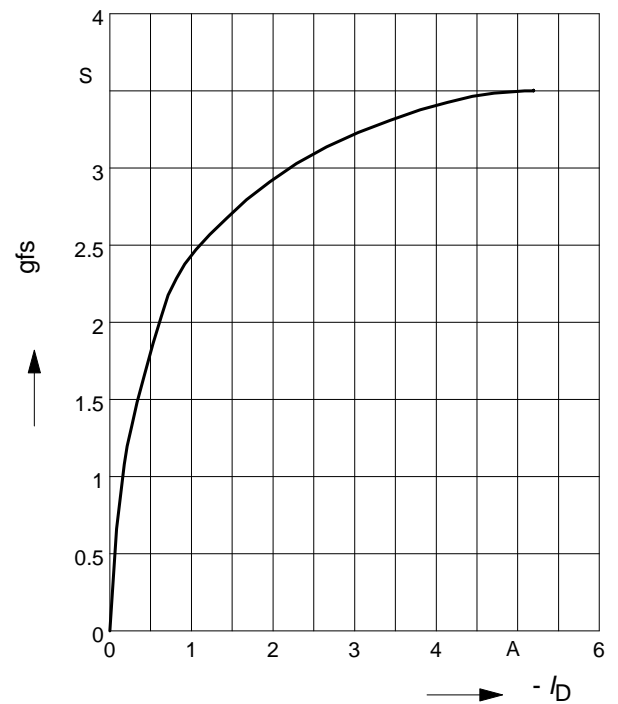
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25^\circ\text{C}$

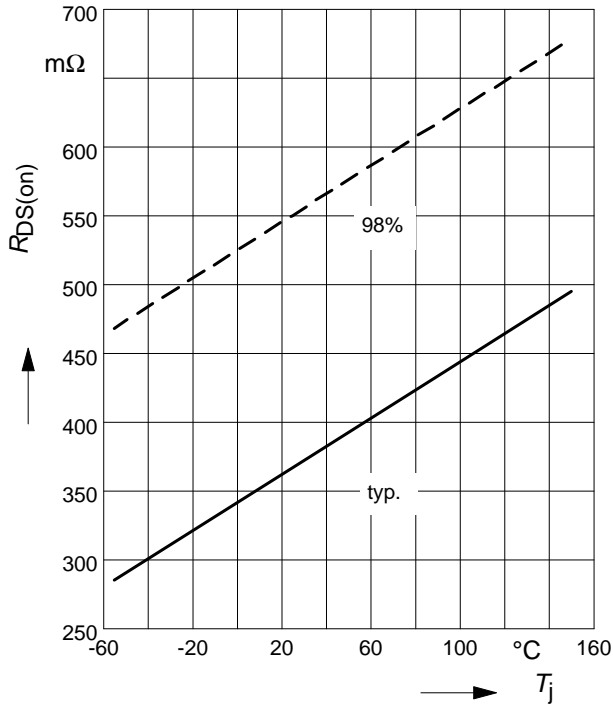
parameter: $t_p = 80 \mu\text{s}$



9 Drain-source on-resistance

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

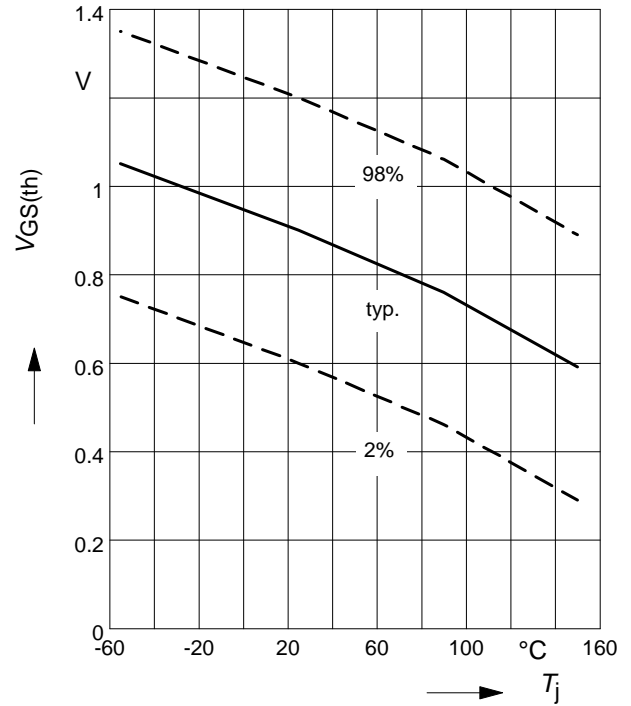
parameter: $I_D = -0.58 \text{ A}$, $V_{GS} = -4.5 \text{ V}$



10 Gate threshold voltage

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

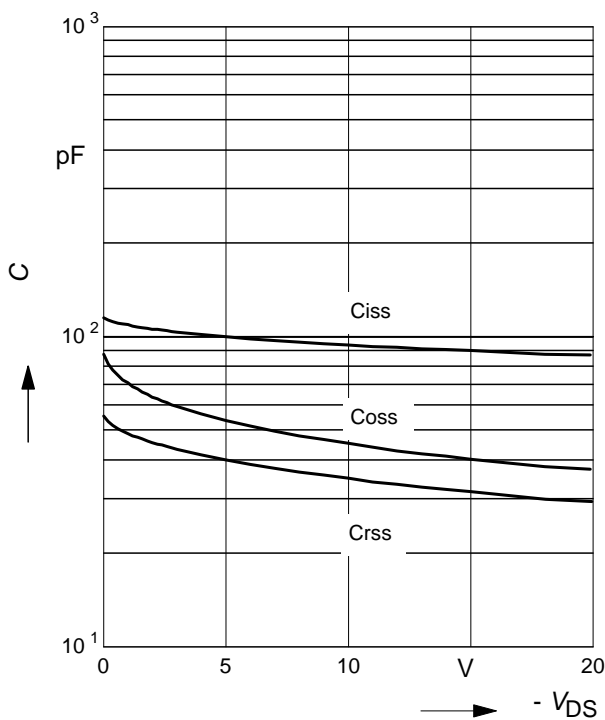
parameter: $V_{GS} = V_{DS}$, $I_D = -3.5 \mu\text{A}$



11 Typ. capacitances

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

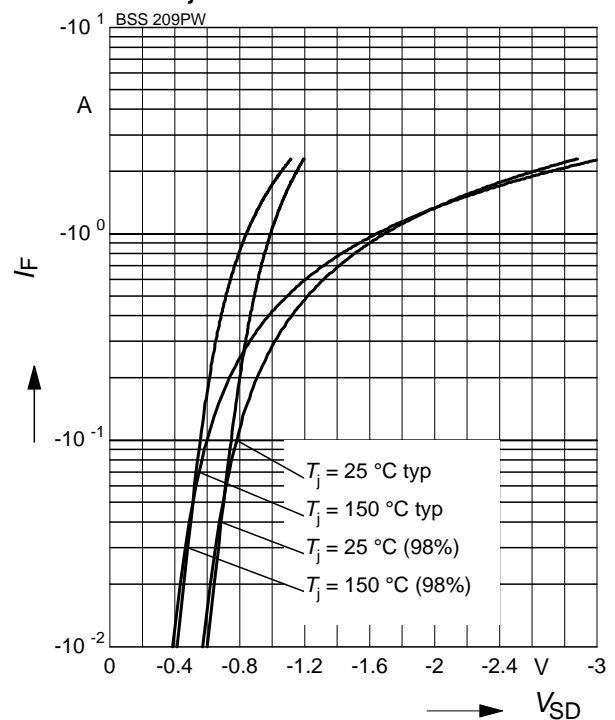
parameter: $V_{GS} = 0$, $f = 1 \text{ MHz}$



12 Forward character. of reverse diode

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

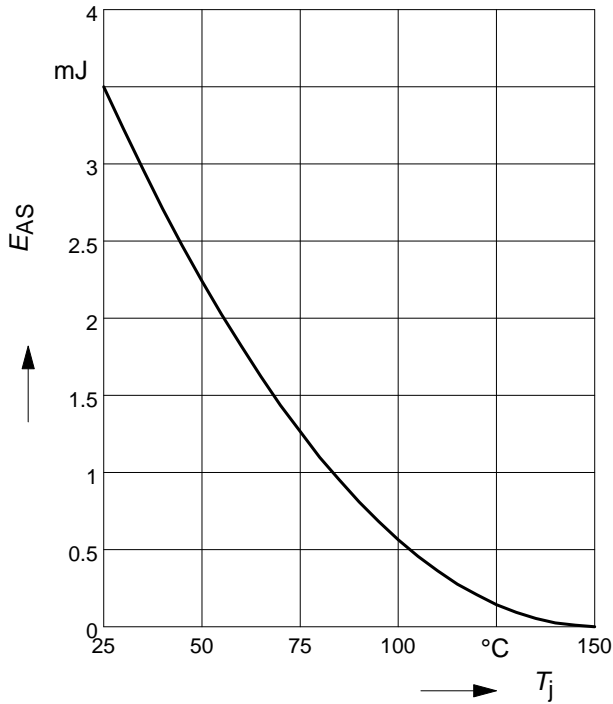
parameter: T_j , $t_p = 80 \mu\text{s}$



13 Typ. avalanche energy

$E_{AS} = f(T_j)$, par.: $I_D = -0.58$ A

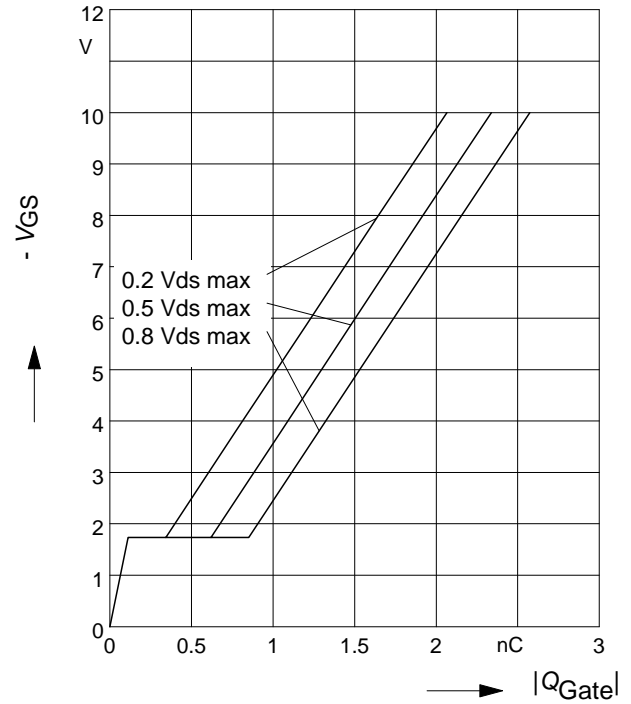
$V_{DD} = -10$ V, $R_{GS} = 25$ Ω



14 Typ. gate charge

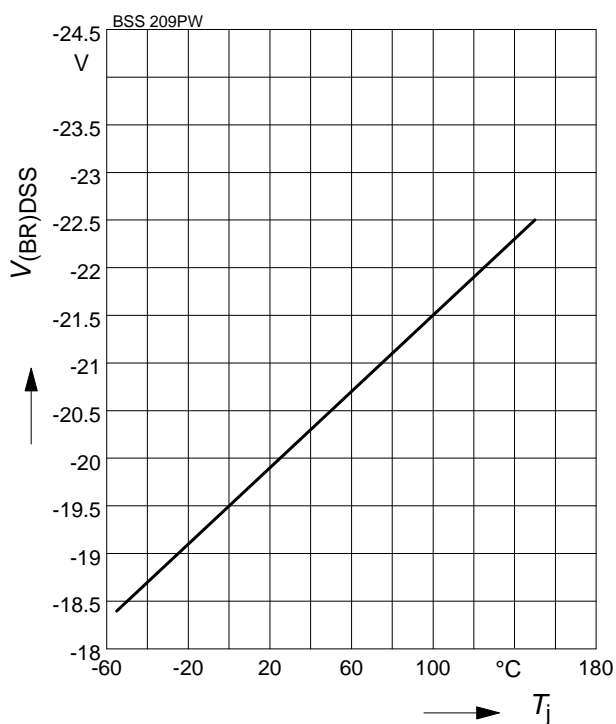
$|V_{GS}| = f(Q_{Gate})$

parameter: $I_D = -0.58$ A pulsed



15 Drain-source breakdown voltage

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



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