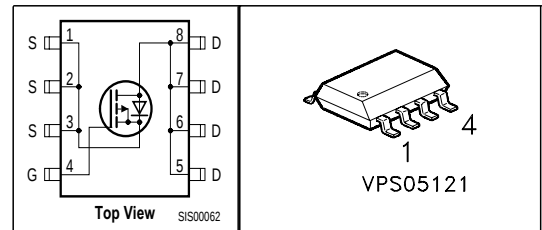


SIPMOS® Power-Transistor
Features

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- ° Qualified according to AEC Q101
- ° Halogen-free according to IEC61249-2-21

Product Summary

Drain source voltage	V_{DS}	-60	V
Drain-source on-state resistance	$R_{DS(on)}$	0.13	Ω
Continuous drain current	I_D	-3.44	A



Type	Package	Lead free
BSO613SPV G	PG-SO 8	Yes


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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A = 25\text{ °C}$	I_D	-3.44	A
Pulsed drain current $T_A = 25\text{ °C}$	$I_D \text{ puls}$	-13.8	
Avalanche energy, single pulse $I_D = -3.44\text{ A}$, $V_{DS} = -25\text{ V}$, $R_{GS} = 25\text{ }\Omega$	E_{AS}	150	mJ
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	0.25	
Reverse diode dv/dt $I_S = -3.44\text{ A}$, $V_{DS} = -48\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$, $T_{jmax} = 150\text{ °C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation $T_A = 25\text{ °C}$	P_{tot}	2.5	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 4)	R_{thJS}	-	-	25	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint; $t \leq 10$ sec.		-	-	100	
@ 6 cm ² cooling area ¹⁾ ; $t \leq 10$ sec.		-	-	50	

Electrical Characteristics, at $T_j = 25$ °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain- source breakdown voltage $V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	$V_{(BR)DSS}$	-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	nA
Drain-source on-state resistance $V_{GS} = -10\text{ V}$, $I_D = -3.44\text{ A}$	$R_{DS(on)}$	-	0.11	0.13	Ω

¹Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μ m thick) copper area for drain connection. PCB is vertical without blown air.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(ON)max}$, $I_D = -3.44$ A	g_{fs}	2.2	4.4	-	S
Input capacitance $V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz	C_{iss}	-	700	875	pF
Output capacitance $V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz	C_{oss}	-	235	295	
Reverse transfer capacitance $V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz	C_{rss}	-	95	120	
Turn-on delay time $V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -3.44$ A, $R_G = 2.7 \Omega$	$t_{d(ON)}$	-	10	15	ns
Rise time $V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -3.44$ A, $R_G = 2.7 \Omega$	t_r	-	11	16.5	
Turn-off delay time $V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -3.44$ A, $R_G = 2.7 \Omega$	$t_{d(OFF)}$	-	32	48	
Fall time $V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -3.44$ A, $R_G = 2.7 \Omega$	t_f	-	12	18	

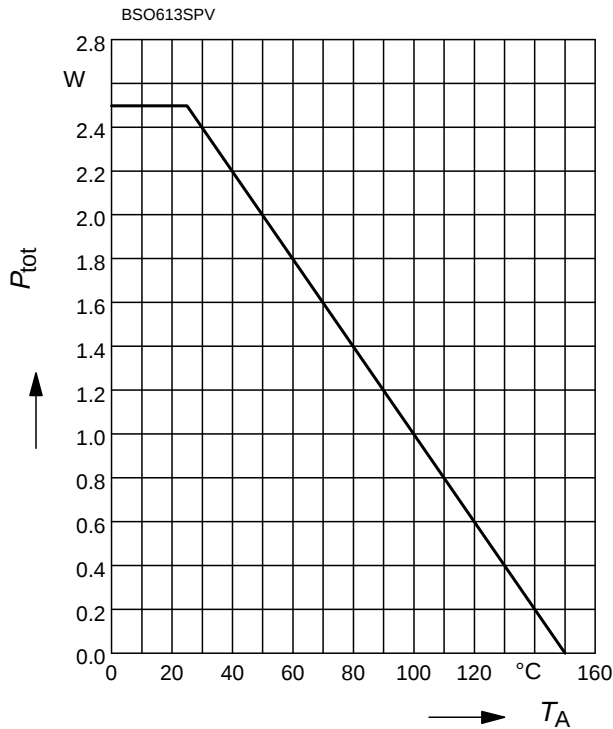
Electrical Characteristics, at $T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Gate to source charge $V_{DD} = -48\text{ V}$, $I_D = -3.44\text{ A}$	Q_{gs}	-	1.6	2.4	nC
Gate to drain charge $V_{DD} = -48\text{ V}$, $I_D = -3.44\text{ A}$	Q_{gd}	-	10	15	
Gate charge total $V_{DD} = -48\text{ V}$, $I_D = -3.44\text{ A}$, $V_{GS} = 0\text{ to }-10\text{ V}$	Q_g	-	20	30	
Gate plateau voltage $V_{DD} = -48\text{ V}$, $I_D = -3.44\text{ A}$	$V_{(plateau)}$	-	-3.74	-	V

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current $T_A = 25\text{ }^{\circ}\text{C}$	I_S	-	-	-3.44	A
Inverse diode direct current,pulsed $T_A = 25\text{ }^{\circ}\text{C}$	I_{SM}	-	-	-13.8	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$, $I_F = -3.44\text{ A}$	V_{SD}	-	-0.87	-1.16	V
Reverse recovery time $V_R = -30\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	t_{rr}	-	56	84	ns
Reverse recovery charge $V_R = -30\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	Q_{rr}	-	38	57	nC

Power Dissipation

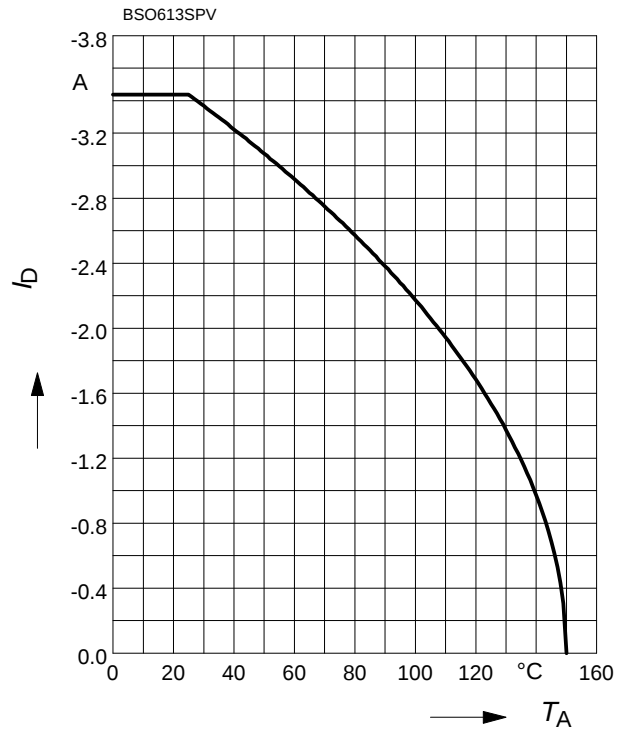
$$P_{\text{tot}} = f(T_A)$$



Drain current

$$I_D = f(T_A)$$

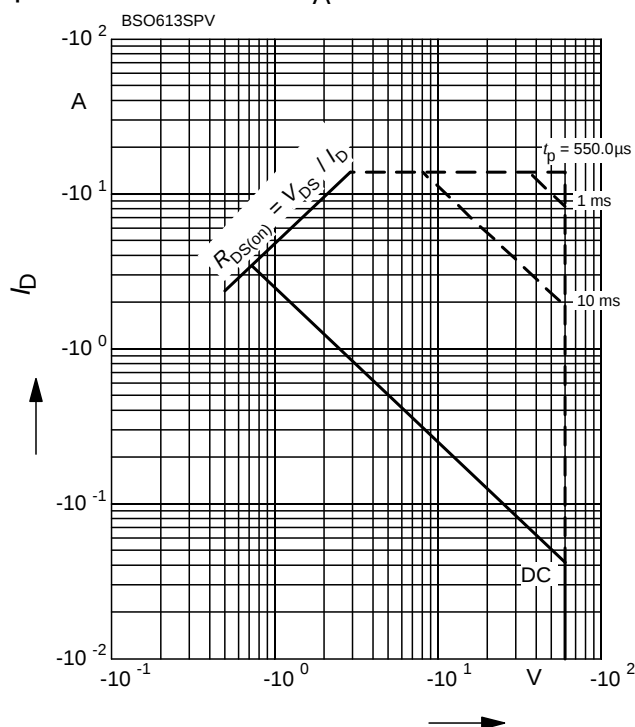
parameter: $V_{GS} \geq 10 \text{ V}$



Safe operating area

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

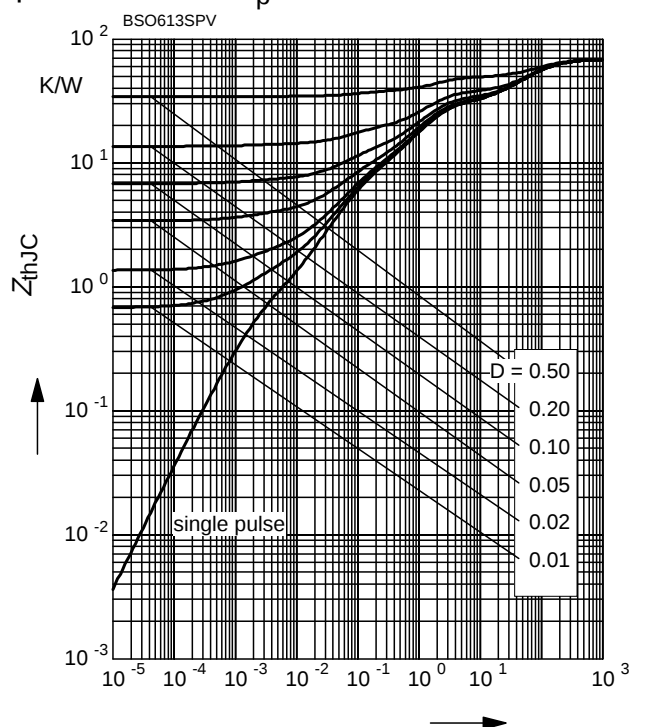
parameter: $D = 0$, $T_A = 25 \text{ °C}$



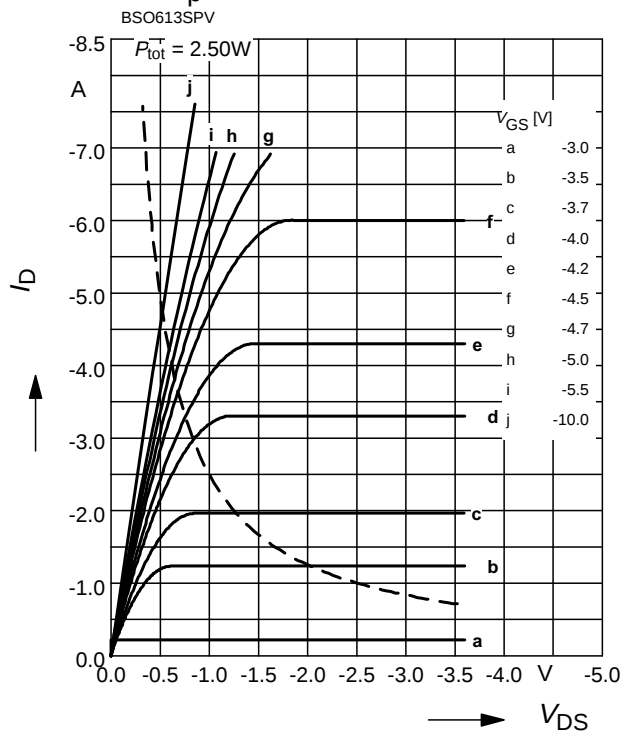
Transient thermal impedance

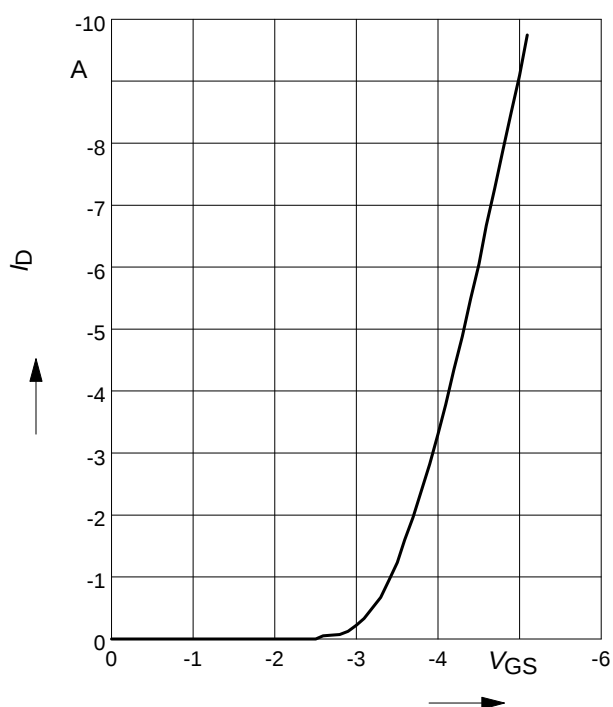
$$Z_{\text{thJC}} = f(t_p)$$

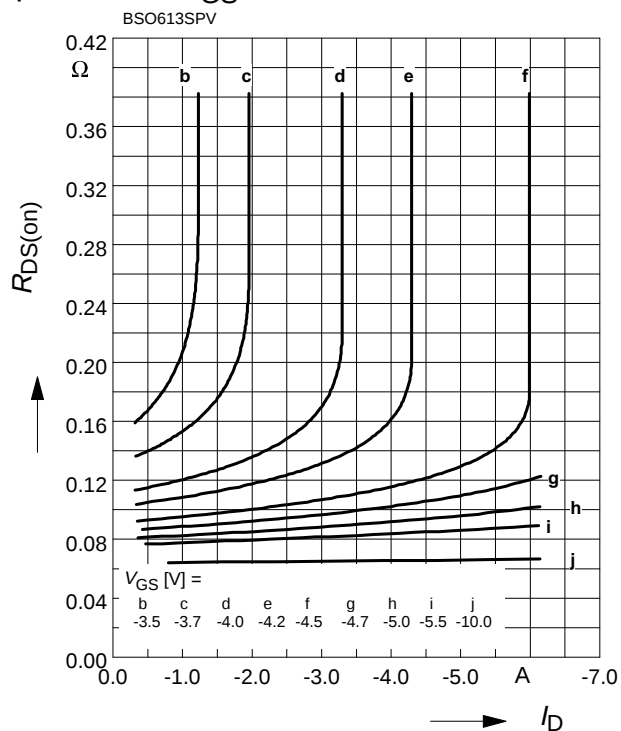
parameter: $D = t_p / T$

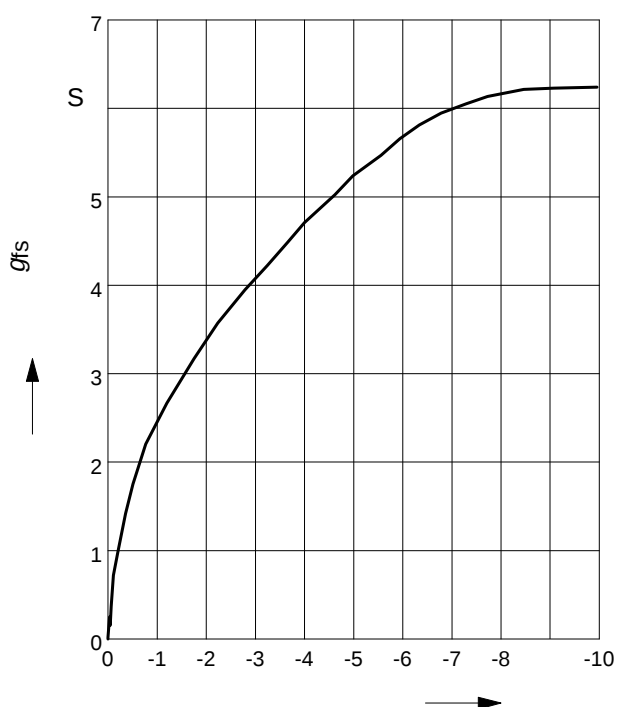


Typ. output characteristic
 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}$

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

Typ. transfer characteristics $I_D = f(V_{GS})$
 $V_{DS} \geq 2 \times I_D \times R_{DS(\text{on})\text{max}}$

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

Typ. drain-source-on-resistance
 $R_{DS(\text{on})} = f(I_D)$

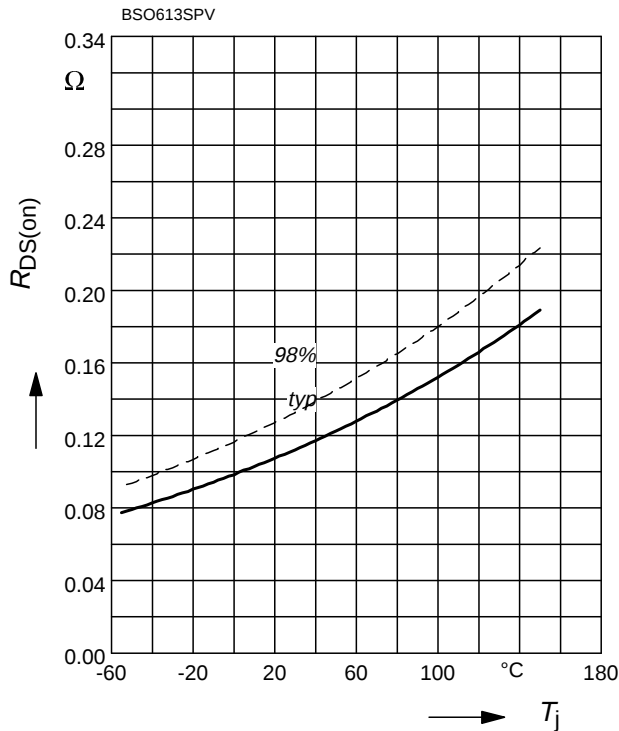
parameter: V_{GS}

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

parameter: g_{fs}


Drain-source on-state resistance

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

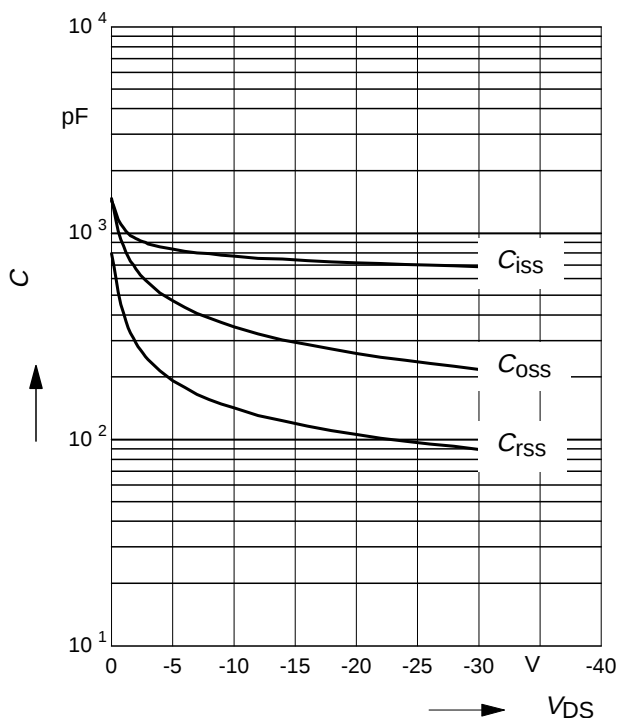
parameter : $I_D = -3.44$ A, $V_{GS} = -10$ V



Typ. capacitances

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

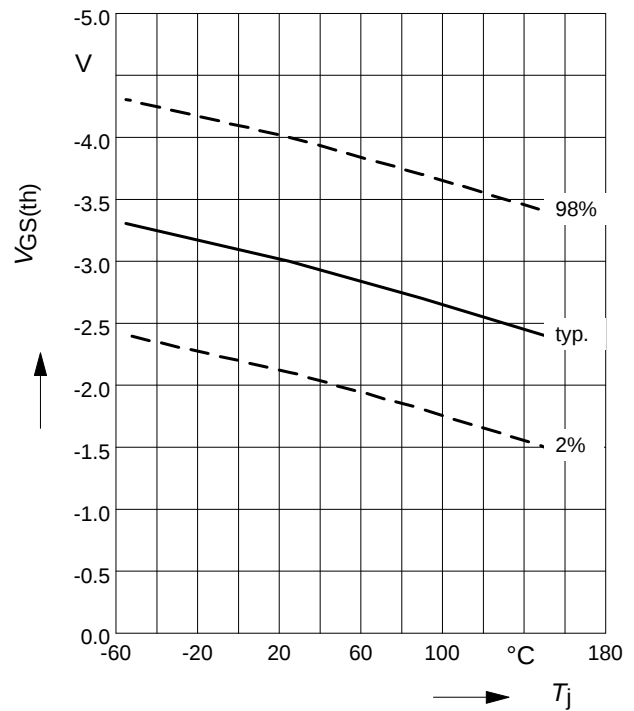
parameter: $V_{GS}=0$ V, $f=1$ MHz



Gate threshold voltage

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

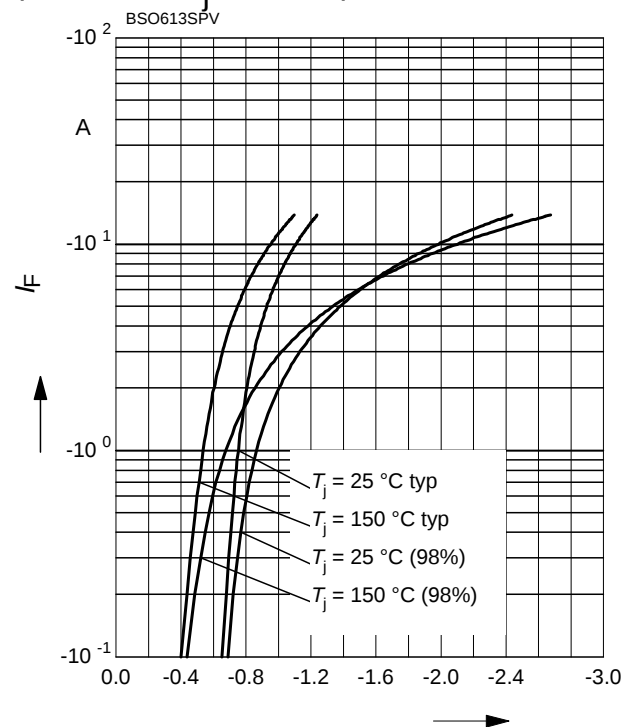
parameter: $V_{GS} = V_{DS}$, $I_D = 1$ mA



Forward characteristics of reverse diode

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

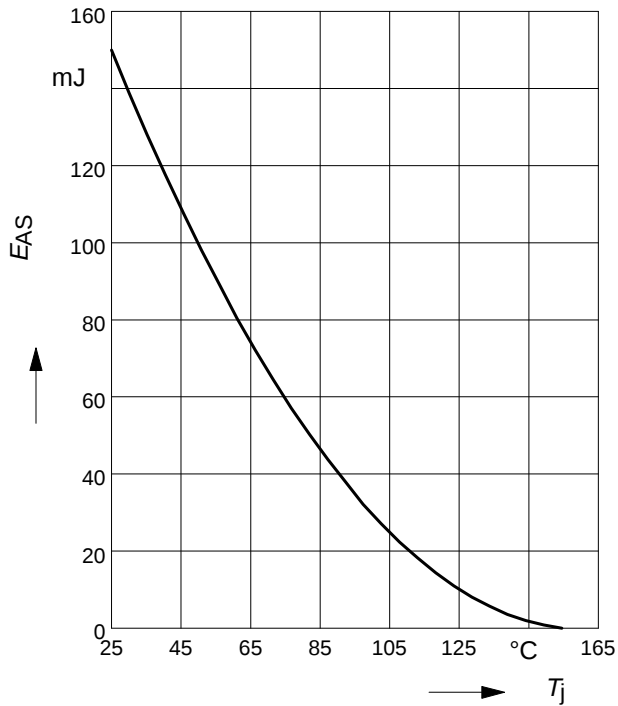
parameter: T_j , $t_p = 80$ μs



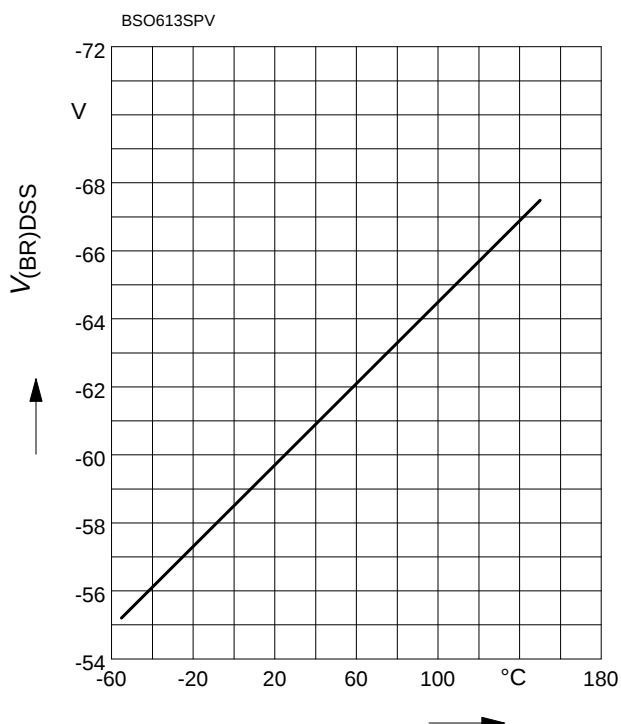
Avalanche energy

$$E_{AS} = f(T_j)$$

para.: $I_D = -3.44 \text{ A}$, $V_{DD} = -25 \text{ V}$, $R_{GS} = 25$

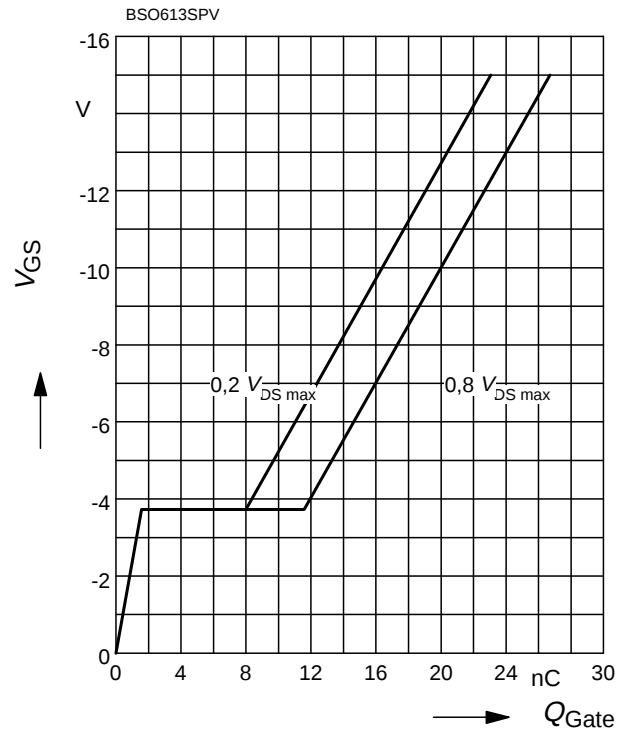

Drain-source breakdown voltage

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


Typ. gate charge

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

parameter: $I_D = -3.44 \text{ A}$ pulsed



Revision History

BSO613SPV

Revision: 2019-07-31, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2019-07-31	Release of final version

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