

**SIPMOS<sup>®</sup> Small-Signal-Transistor**
**Features**

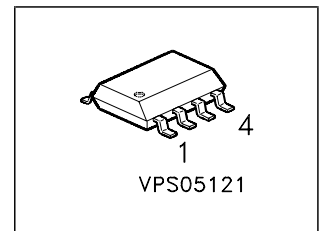
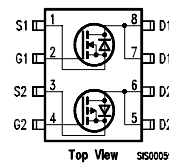
- Dual N- and P -Channel
- Enhancement mode
- Avalanche rated
- Pb-free lead plating;RoHS compliant



Type	Package	Marking
BSO 612 CV	PG-DSO-8	612CV

**Product Summary**

		N	P	
Drain source voltage	$V_{DS}$	60	-60	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.12	0.3	$\Omega$
Continuous drain current	$I_D$	3	-2	A


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

Parameter	Symbol	Value		Unit
		N	P	
Continuous drain current $T_A = 25\text{ °C}$ $T_A = 70\text{ °C}$	$I_D$	3 2.4	-2 -1.6	A
Pulsed drain current $T_A = 25\text{ °C}$	$I_{D\text{ puls}}$	12	-8	
Avalanche energy, single pulse $I_D = 3\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\ \Omega$ $I_D = -2\text{ A}$ , $V_{DD} = -25\text{ V}$ , $R_{GS} = 25\ \Omega$	$E_{AS}$	47 -	- 70	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	0.2	0.2	
Reverse diode $dv/dt$ , $T_{jmax} = 150\text{ °C}$ $I_S = 3\text{ A}$ , $V_{DS} = 48\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ $I_S = -2\text{ A}$ , $V_{DS} = -48\text{ V}$ , $di/dt = -200\text{ A}/\mu\text{s}$	$dv/dt$	6 -	- 6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V
Power dissipation $T_A = 25\text{ °C}$	$P_{tot}$	2	2	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.	

**Dynamic Characteristics**

Thermal resistance, junction - soldering point ( Pin 4)	N	$R_{thJS}$	-	-	40	K/W
	P		-	-	40	
SMD version, device on PCB: @ min. footprint; $t \leq 10$ sec. @ 6 cm <sup>2</sup> cooling area <sup>1)</sup> ; $t \leq 10$ sec. @ min. footprint; $t \leq 10$ sec. @ 6 cm <sup>2</sup> cooling area <sup>1)</sup> ; $t \leq 10$ sec.	N	$R_{thJA}$	-	-	110	
	N		-	-	62.5	
	P		-	-	70	
	P		-	-	62.5	

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

Drain- source breakdown voltage $V_{GS} = 0$ V, $I_D = 250$ $\mu$ A $V_{GS} = 0$ V, $I_D = -250$ $\mu$ A	N	$V_{(BR)DSS}$	60	-	-	V
	P		-60	-	-	
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 20$ $\mu$ A $I_D = -450$ $\mu$ A	N	$V_{GS(th)}$	2.1	3	4	
	P		-2.1	-3	-4	
Zero gate voltage drain current $V_{DS} = 60$ V, $V_{GS} = 0$ V, $T_j = 25$ °C $V_{DS} = 60$ V, $V_{GS} = 0$ V, $T_j = 125$ °C $V_{DS} = -60$ V, $V_{GS} = 0$ V, $T_j = 25$ °C $V_{DS} = -60$ V, $V_{GS} = 0$ V, $T_j = 125$ °C	N	$I_{DSS}$	-	0.1	1	$\mu$ A
	N		-	10	100	
	P		-	-0.1	-1	
	P		-	-10	-100	
Gate-source leakage current $V_{GS} = 20$ V, $V_{DS} = 0$ V $V_{GS} = -20$ V, $V_{DS} = 0$ V	N	$I_{GSS}$	-	10	100	nA
	P		-	-10	-100	
Drain-source on-state resistance $V_{GS} = 10$ V, $I_D = 3$ A $V_{GS} = -10$ V, $I_D = -2$ A	N	$R_{DS(on)}$	-	0.09	0.12	$\Omega$
	P		-	0.22	0.3	

<sup>1</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu$ m thick) copper area for drain connection. PCB is vertical without blown air.

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

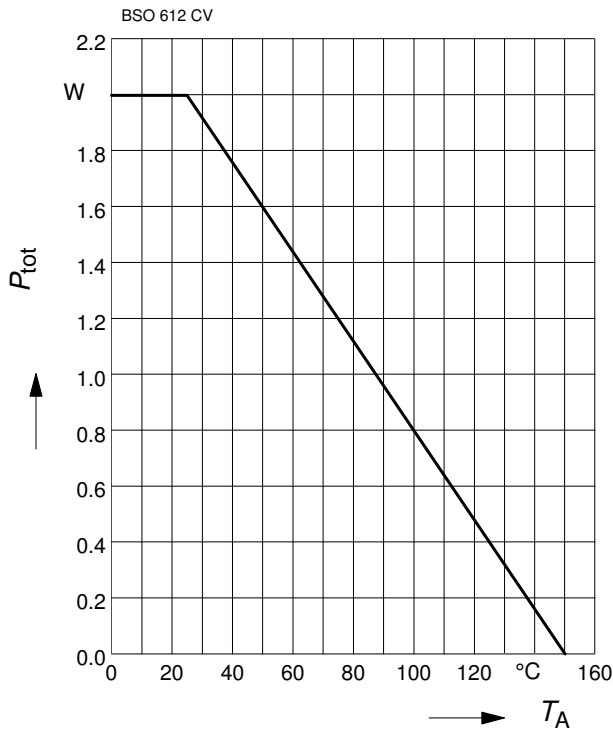
Parameter	Symbol	Values			Unit	
		min.	typ.	max.		
<b>Characteristics</b>						
Transconductance		$g_{fs}$				S
$V_{DS} \geq 2 * I_D * R_{DS(on)max}$ , $I_D = 3\text{ A}$	N		2	4	-	
$V_{V_{DS} \geq 2 * I_D * R_{DS(on)max}}$ , $I_D = -2\text{ A}$	P		1.2	2.4	-	
Input capacitance		$C_{iss}$				pF
$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	N		-	275	340	
$V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	P		-	320	400	
Output capacitance		$C_{oss}$				
$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	N		-	90	115	
$V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	P		-	105	130	
Reverse transfer capacitance		$C_{rss}$				
$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	N		-	50	65	
$V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	P		-	40	50	
Turn-on delay time		$t_{d(on)}$				ns
$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 33\text{ }\Omega$	N		-	12	18	
$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -2\text{ A}$ , $R_G = 27\text{ }\Omega$	P		-	15	23	
Rise time		$t_r$				
$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 33\text{ }\Omega$	N		-	35	55	
$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -2\text{ A}$ , $R_G = 27\text{ }\Omega$	P		-	60	90	
Turn-off delay time		$t_{d(off)}$				
$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 33\text{ }\Omega$	N		-	25	40	
$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -2\text{ A}$ , $R_G = 27\text{ }\Omega$	P		-	145	220	
Fall time		$t_f$				
$V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ , $R_G = 33\text{ }\Omega$	N		-	30	45	
$V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -2\text{ A}$ , $R_G = 27\text{ }\Omega$	P		-	95	140	

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

Parameter	Symbol	Values			Unit	
		min.	typ.	max.		
<b>Characteristics</b>						
Gate to source charge $V_{DD} = 48\text{ V}$ , $I_D = 3\text{ A}$ $V_{DD} = -48\text{ V}$ , $I_D = -2\text{ A}$	N P	$Q_{gs}$	- -	1 2	1.5 3	nC
Gate to drain charge $V_{DD} = 48\text{ V}$ , $I_D = 3\text{ A}$ $V_{DD} = -48\text{ V}$ , $I_D = -2\text{ A}$	N P	$Q_{gd}$	- -	5.5 4.5	8.3 6.8	
Gate charge total $V_{DD} = 48\text{ V}$ , $I_D = 3\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$ $V_{DD} = -48\text{ V}$ , $I_D = -2\text{ A}$ , $V_{GS} = 0\text{ to }-10\text{ V}$	N P	$Q_g$	- -	10.3 10.5	15.5 16	
Gate plateau voltage $V_{DD} = 48\text{ V}$ , $I_D = 3\text{ A}$ $V_{DD} = -48\text{ V}$ , $I_D = -2\text{ A}$	N P	$V_{(\text{plateau})}$	- -	5 -4	- -	V
<b>Reverse Diode</b>						
Inverse diode continuous forward current $T_A = 25\text{ °C}$	N P	$I_S$	- -	- -	3 -2	A
Inverse diode direct current, pulsed $T_A = 25\text{ °C}$	N P	$I_{SM}$	- -	- -	12 -8	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = I_S$ $V_{GS} = 0\text{ V}$ , $I_F = I_S$	N P	$V_{SD}$	- -	0.9 -0.9	1.2 -1.2	V
Reverse recovery time $V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = -100\text{ A}/\mu\text{s}$	N P	$t_{rr}$	- -	55 55	85 85	ns
Reverse recovery charge $V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = -100\text{ A}/\mu\text{s}$	N P	$Q_{rr}$	- -	90 65	135 100	nC

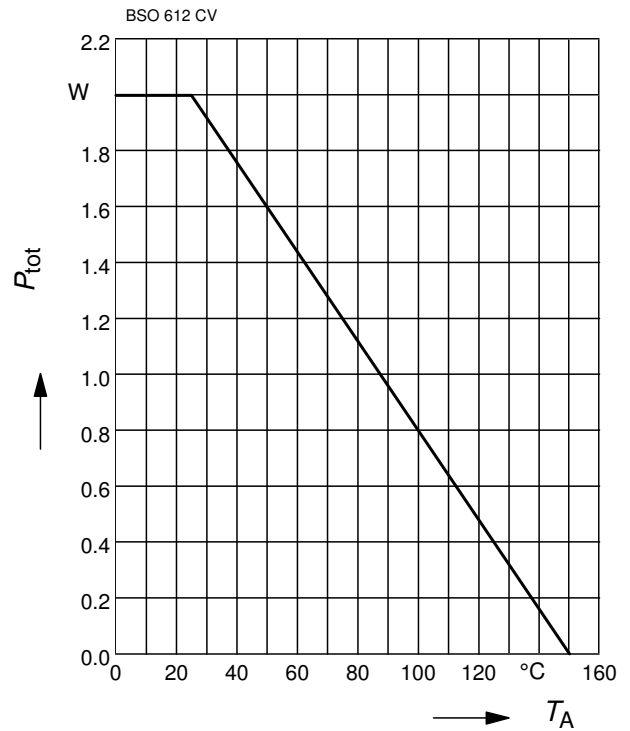
**Power Dissipation (N-Ch.)**

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



**Power Dissipation (P-Ch.)**

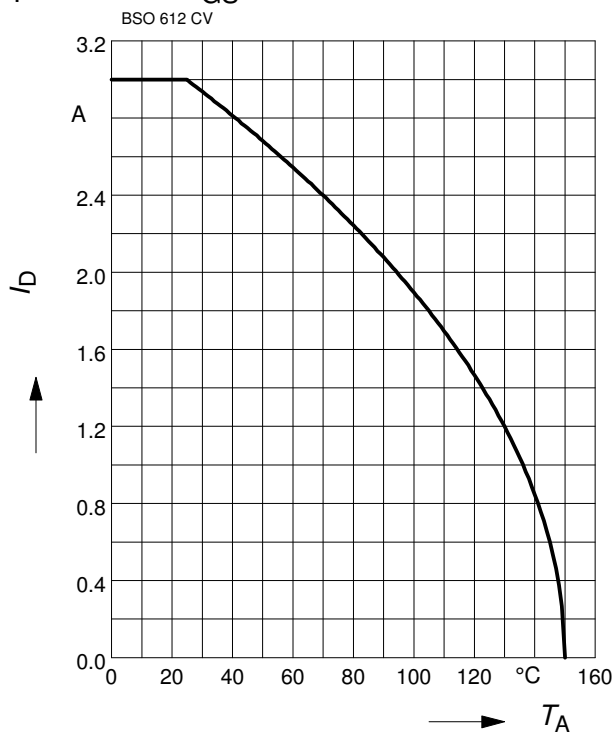
$$P_{\text{tot}} = f(T_A)$$



**Drain current (N-Ch.)**

$$I_D = f(T_A)$$

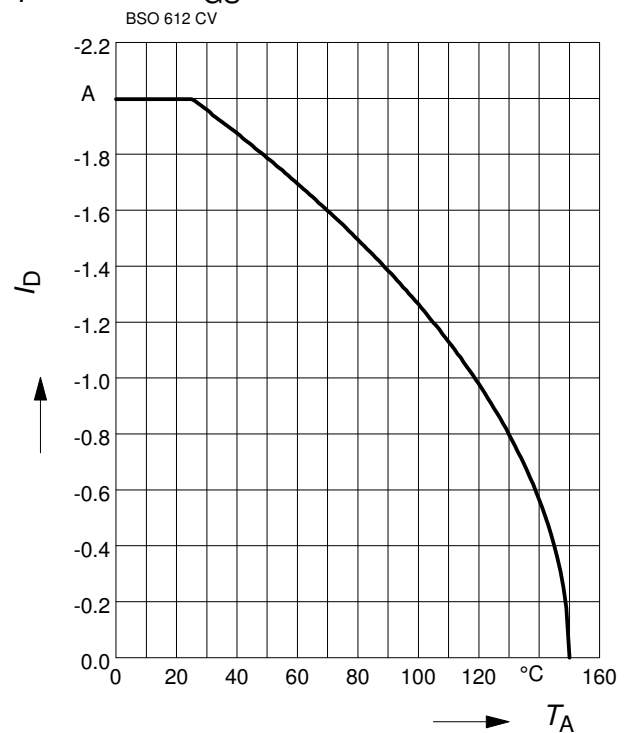
parameter:  $V_{GS} \geq 10 \text{ V}$



**Drain current (P-Ch.)**

$$I_D = f(T_A)$$

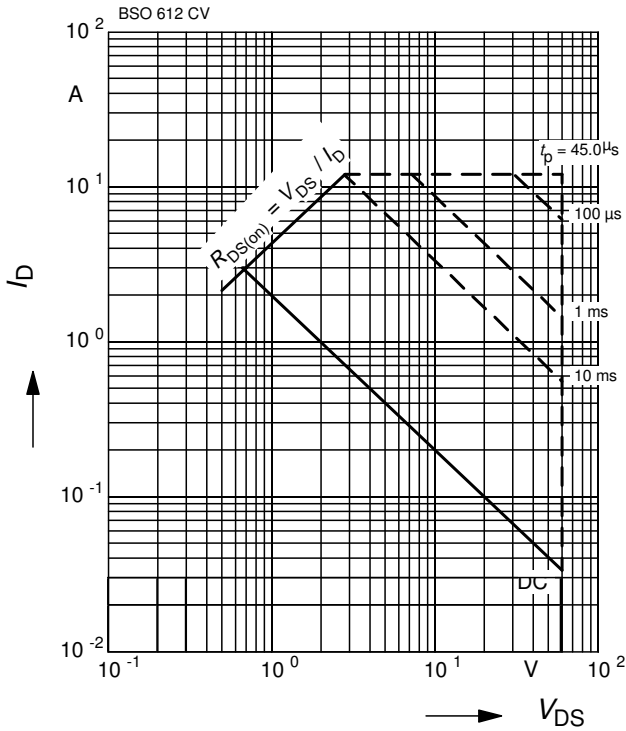
parameter:  $V_{GS} \geq -10 \text{ V}$



**Safe operating area (N-Ch.)**

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

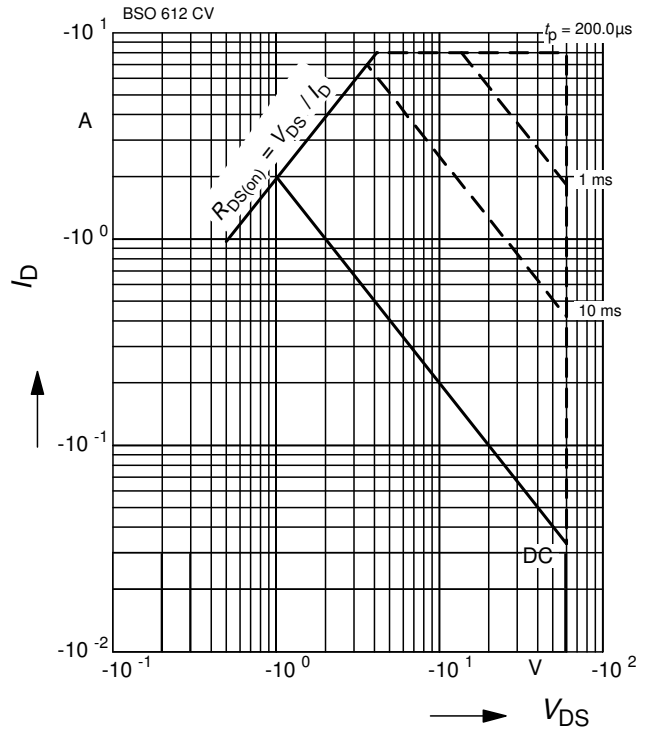
parameter :  $D = 0, T_A = 25\text{ }^\circ\text{C}$



**Safe operating area (P-Ch.)**

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

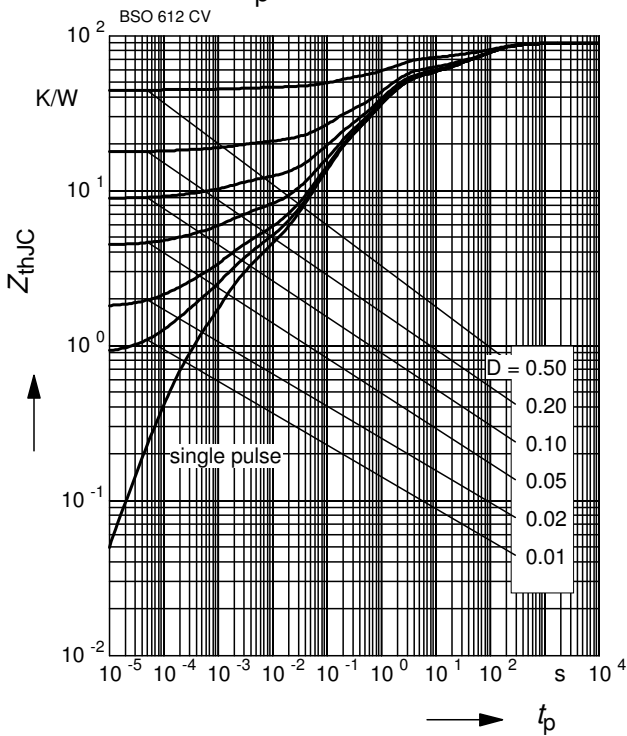
parameter :  $D = 0, T_A = 25\text{ }^\circ\text{C}$



**Transient thermal impedance (N-Ch.)**

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

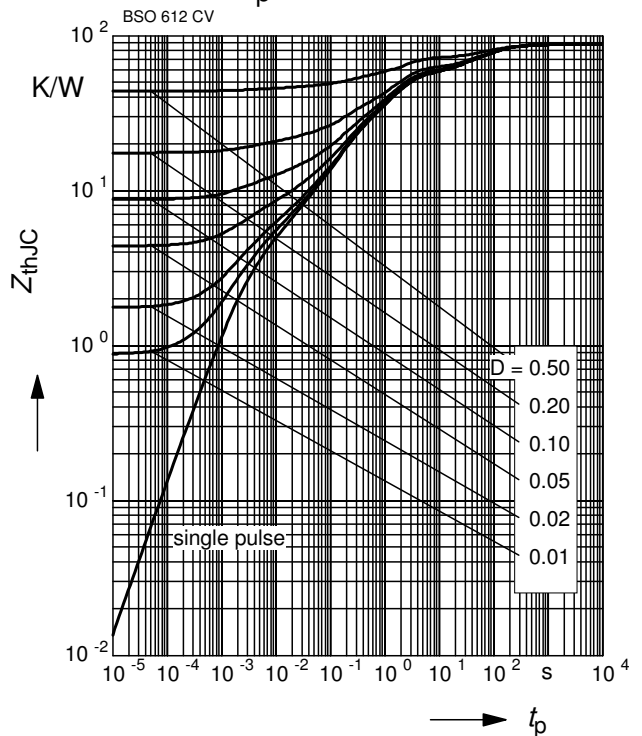
parameter :  $D = t_p/T$



**Transient thermal impedance (P-Ch.)**

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

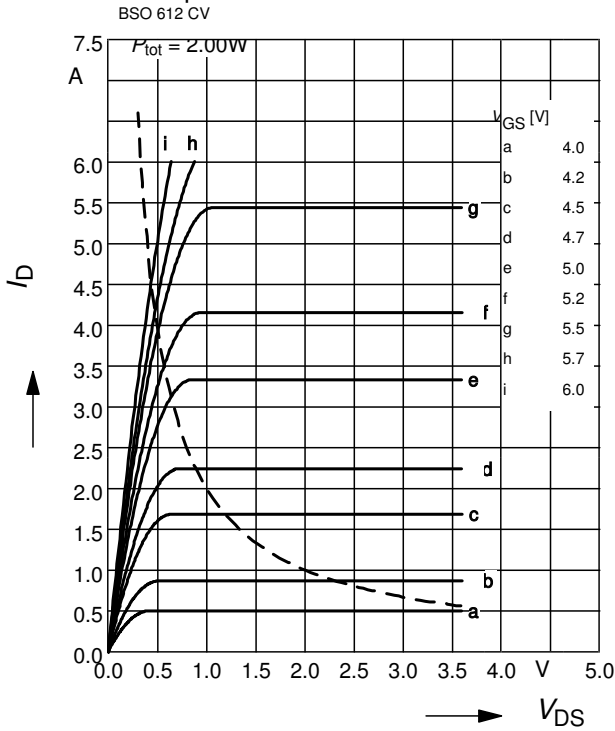
parameter :  $D = t_p/T$



Typ. output characteristics (N-Ch.)

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

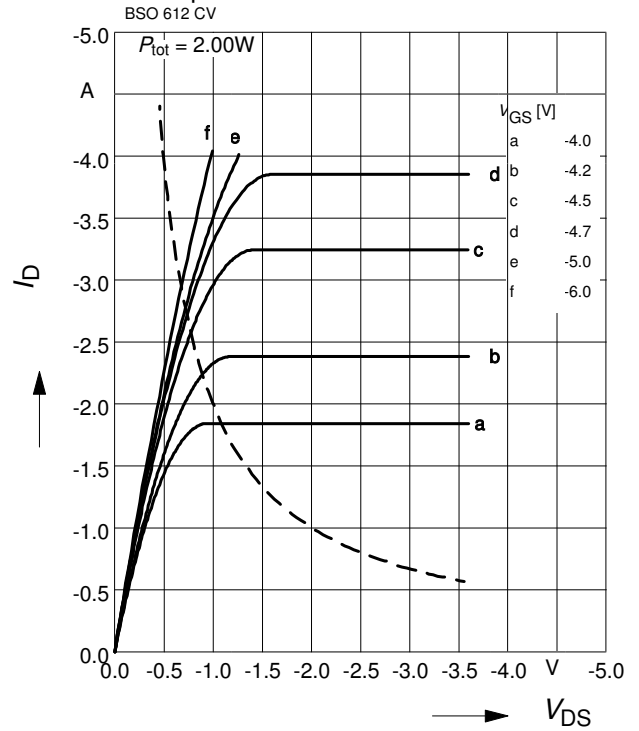
parameter:  $t_p = 80 \mu s$



Typ. output characteristics (P-Ch.)

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

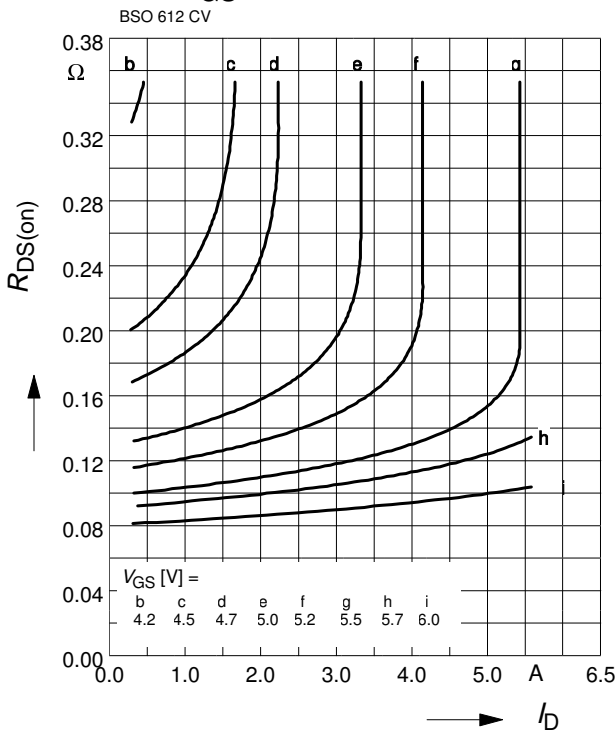
parameter:  $t_p = 80 \mu s$



Typ. drain-source-on-resistance (N-Ch.)

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

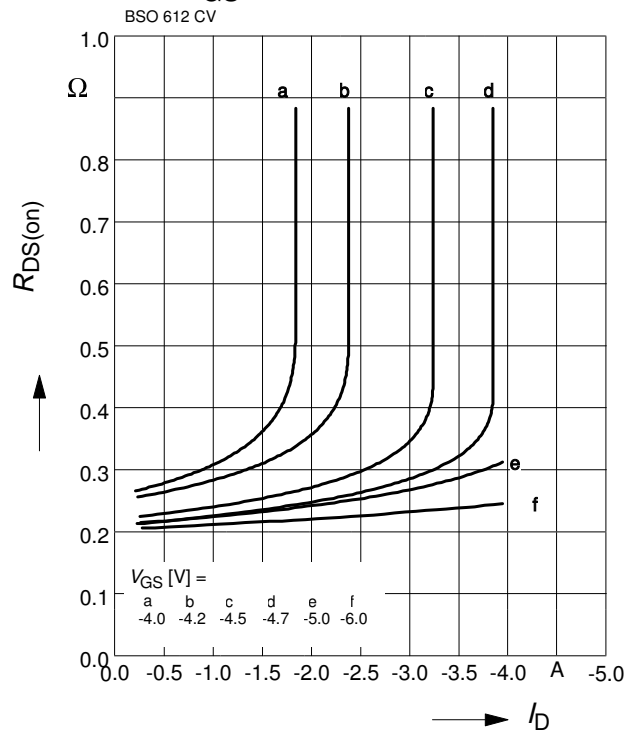
parameter:  $V_{GS}$



Typ. drain-source-on-resistance (P-Ch.)

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

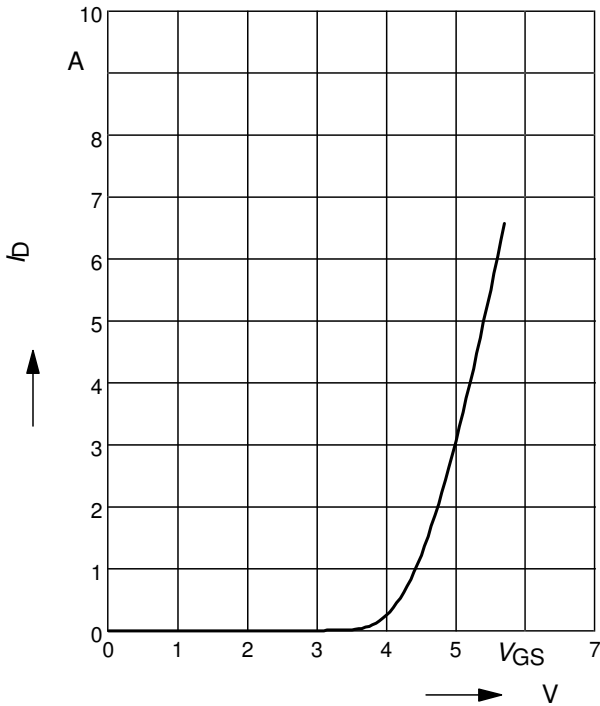
parameter:  $V_{GS}$



**Typ. transfer characteristics (N-Ch.)**

parameter:  $t_p = 80 \mu s$

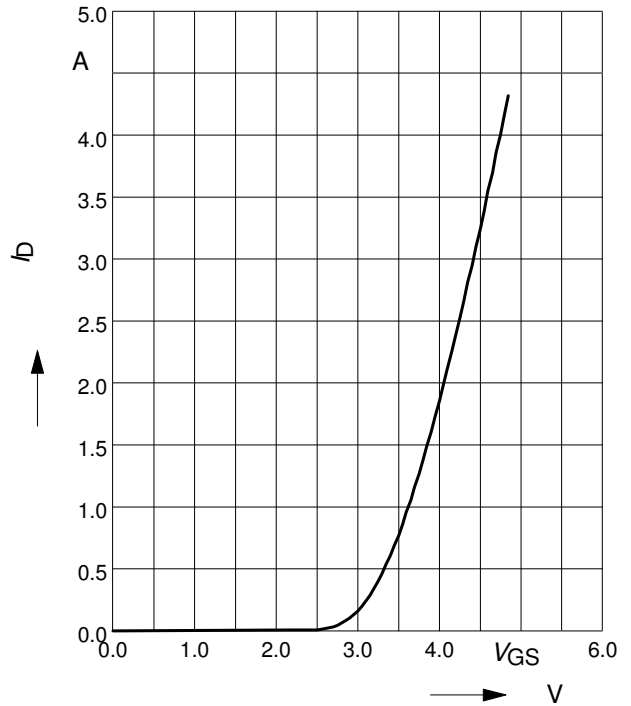
$I_D = f(V_{GS}), V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Typ. transfer characteristics (P-Ch.)**

parameter:  $t_p = 80 \mu s$

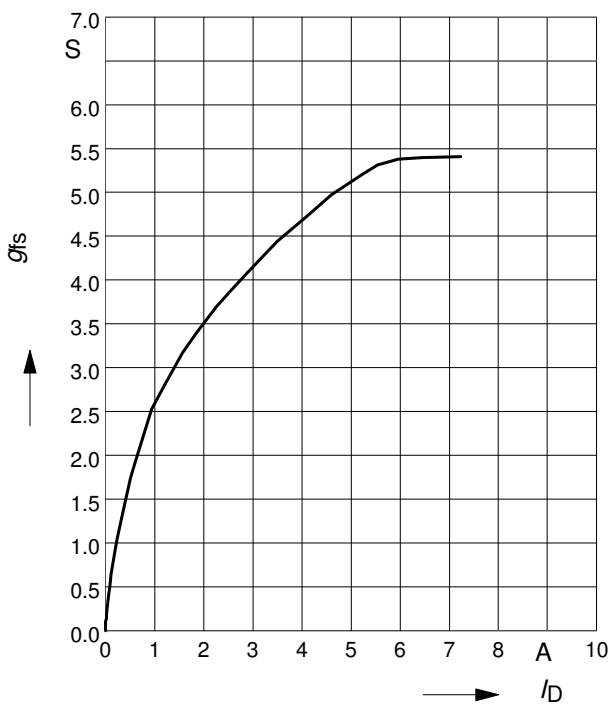
$I_D = f(V_{GS}), V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Typ. forward transconductance (N-Ch.)**

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

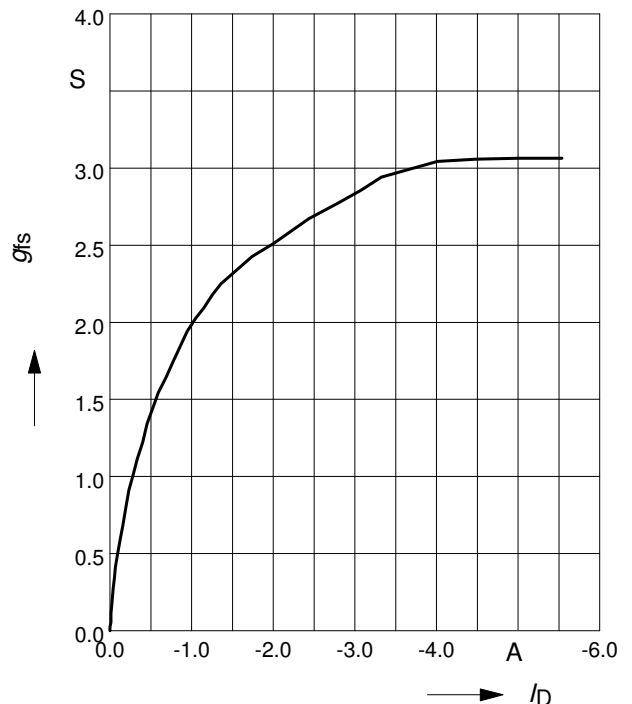
parameter:  $g_{fs}$



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

parameter:  $g_{fs}$

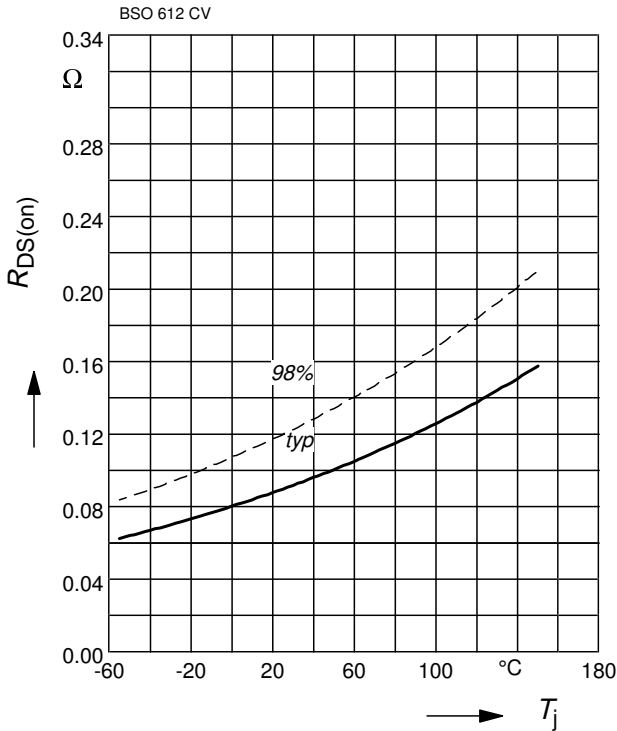




**Drain-source on-resistance (N-Ch.)**

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

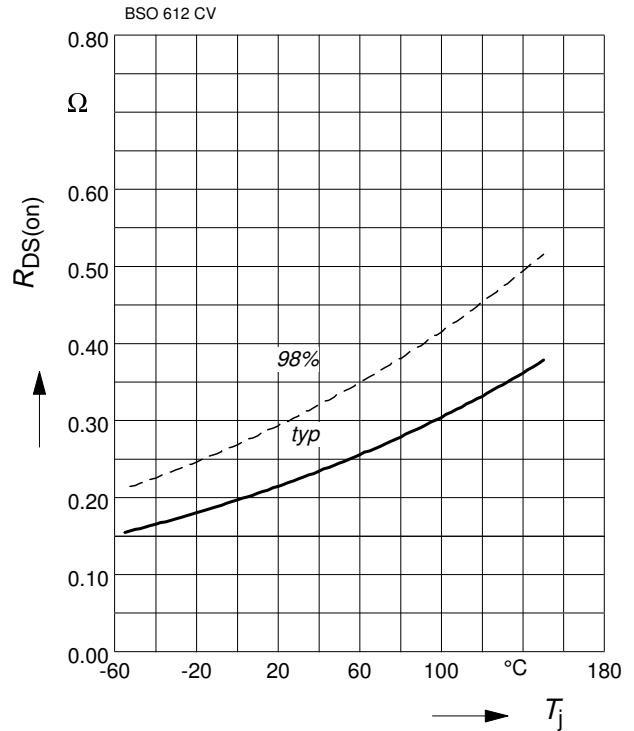
parameter :  $I_D = 3 \text{ A}$  ,  $V_{GS} = 10 \text{ V}$



**Drain-source on-resistance (P-Ch.)**

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

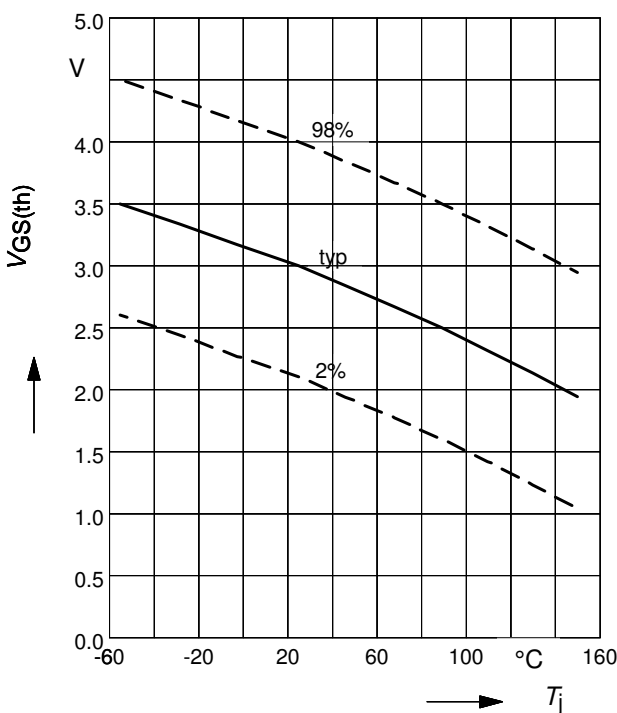
parameter :  $I_D = -2 \text{ A}$  ,  $V_{GS} = -10 \text{ V}$



**Gate threshold voltage (N-Ch.)**

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

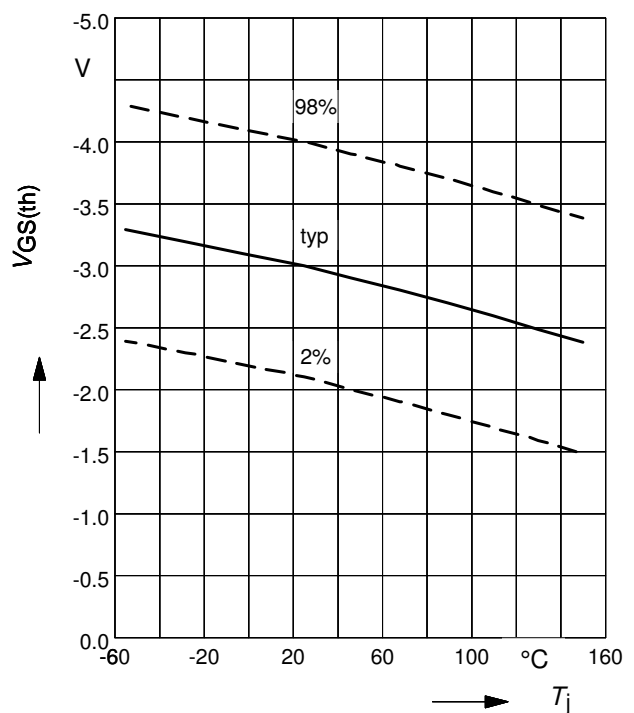
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 20 \mu\text{A}$



**Gate threshold voltage (P-Ch.)**

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

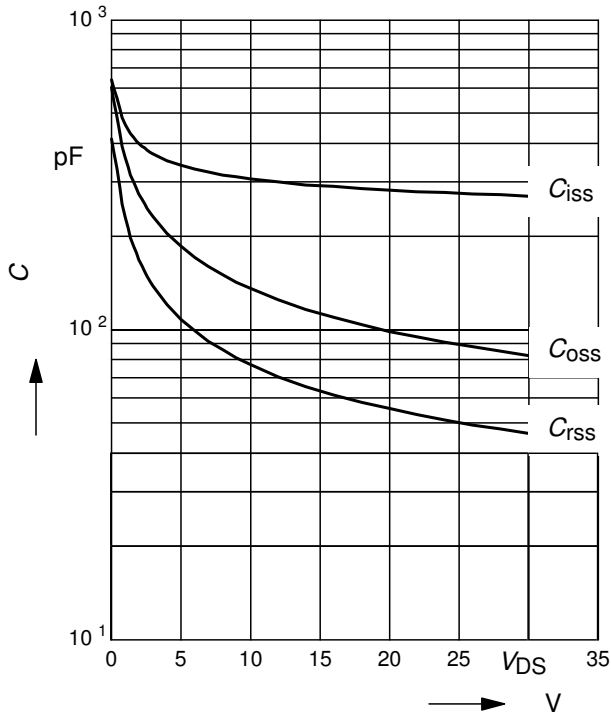
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -450 \mu\text{A}$



**Typ. capacitances (N-Ch.)**

$C = f(V_{DS})$

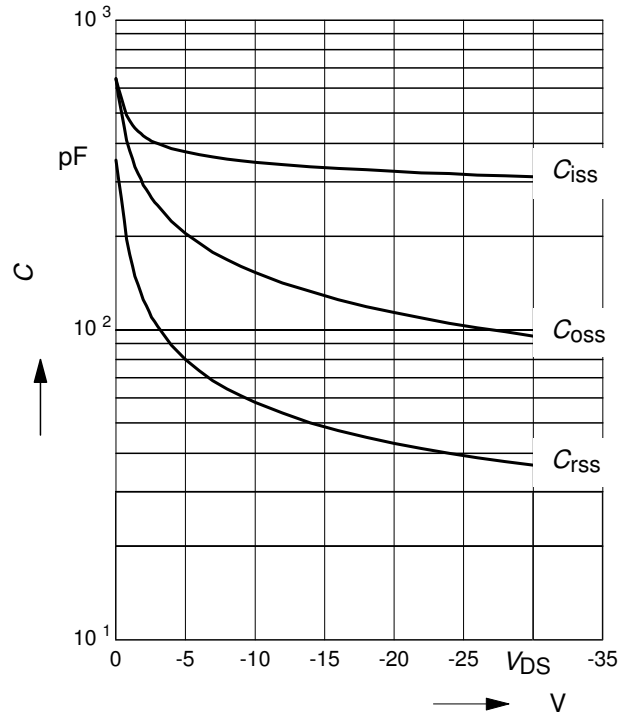
parameter:  $V_{GS}=0\text{ V}$ ,  $f=1\text{ MHz}$



**Typ. capacitances (P-Ch.)**

$C = f(V_{DS})$

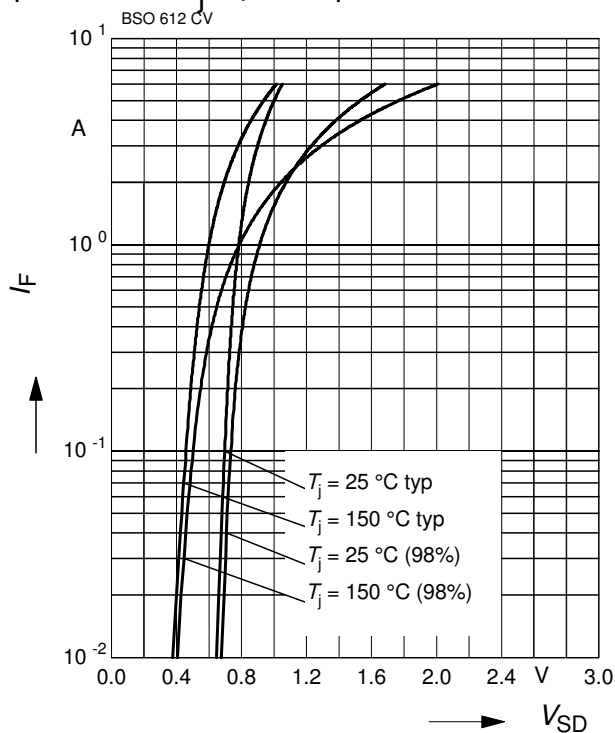
parameter:  $V_{GS}=0\text{ V}$ ,  $f=1\text{ MHz}$



**Forward characteristics of reverse diode**

$I_F = f(V_{SD})$ , (N-Ch.)

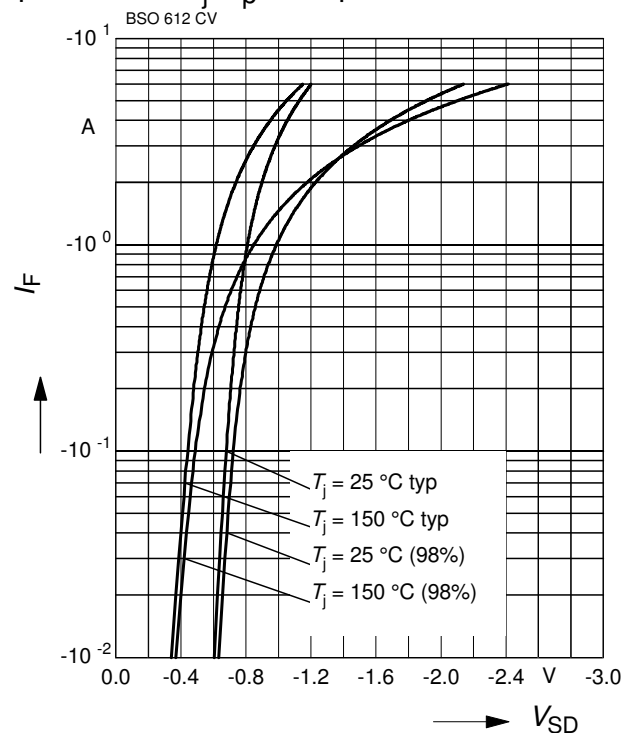
parameter:  $T_j$ ,  $t_p = 80\ \mu\text{s}$



**Forward characteristics of reverse diode**

$I_F = f(V_{SD})$ , (P-Ch.)

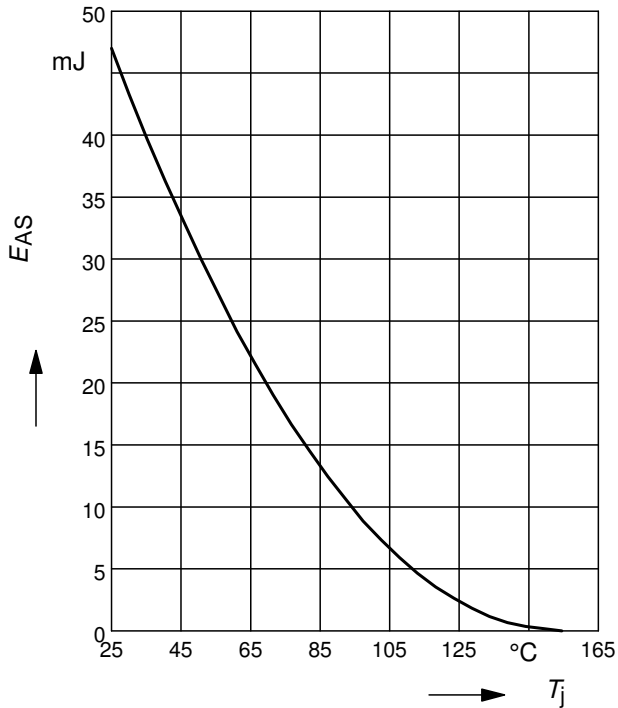
parameter:  $T_j$ ,  $t_p = 80\ \mu\text{s}$



**Avalanche Energy  $E_{AS} = f(T_j)$  (N-Ch.)**

parameter:  $I_D = 3\text{ A}$ ,  $V_{DD} = 25\text{ V}$

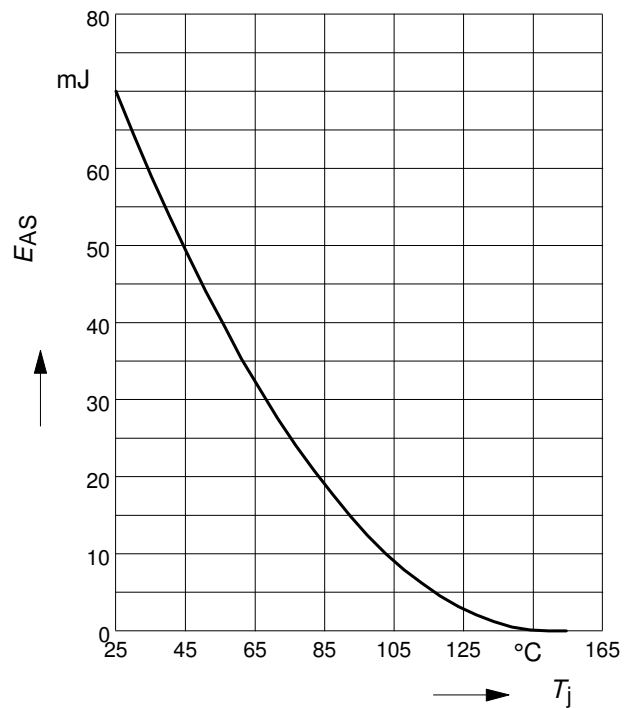
$R_{GS} = 25\ \Omega$



**Avalanche Energy  $E_{AS} = f(T_j)$**

parameter:  $I_D = -2\text{ A}$ ,  $V_{DD} = -25\text{ V}$

$R_{GS} = 25\ \Omega$

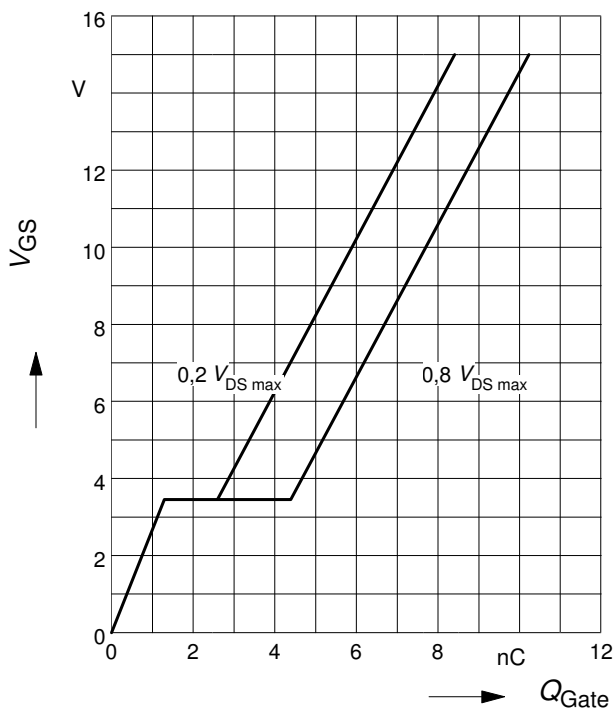


**Typ. gate charge (N-Ch.)**

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

parameter:  $I_D = 3\text{ A}$

BSO 612 CV

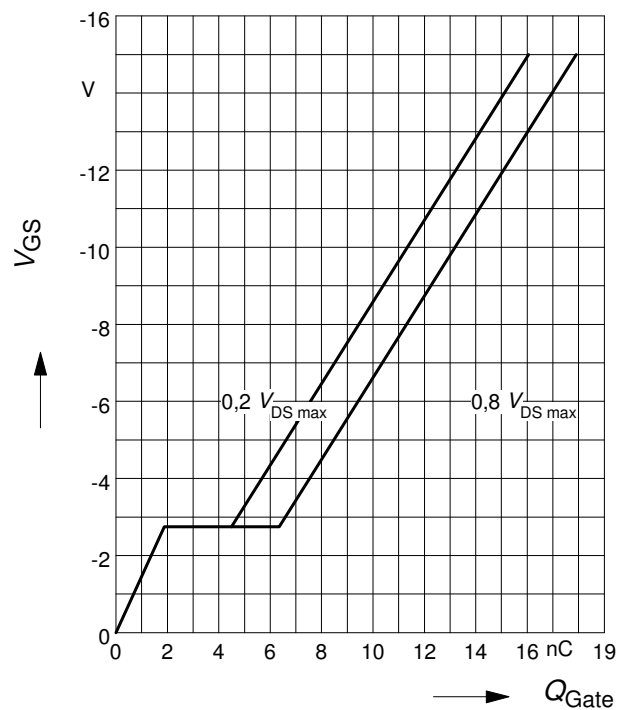


**Typ. gate charge (P-Ch.)**

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

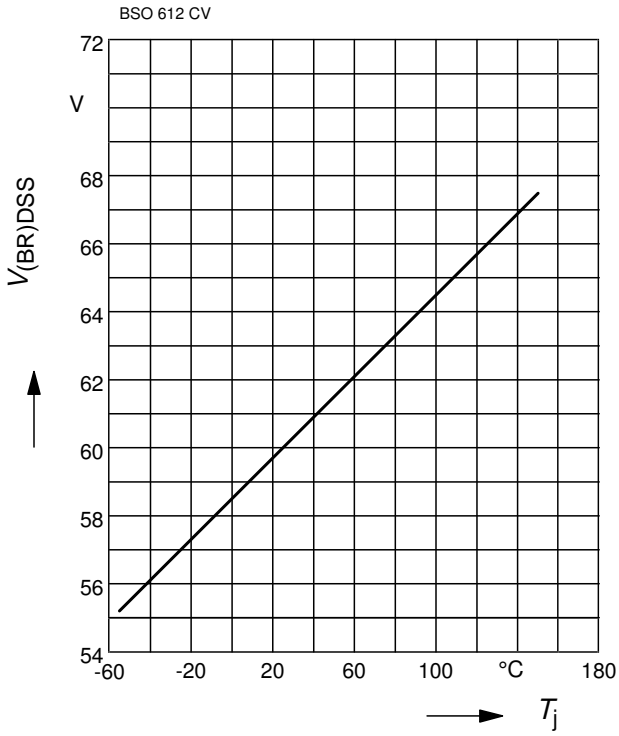
parameter:  $I_D = -2\text{ A}$

BSO 612 CV



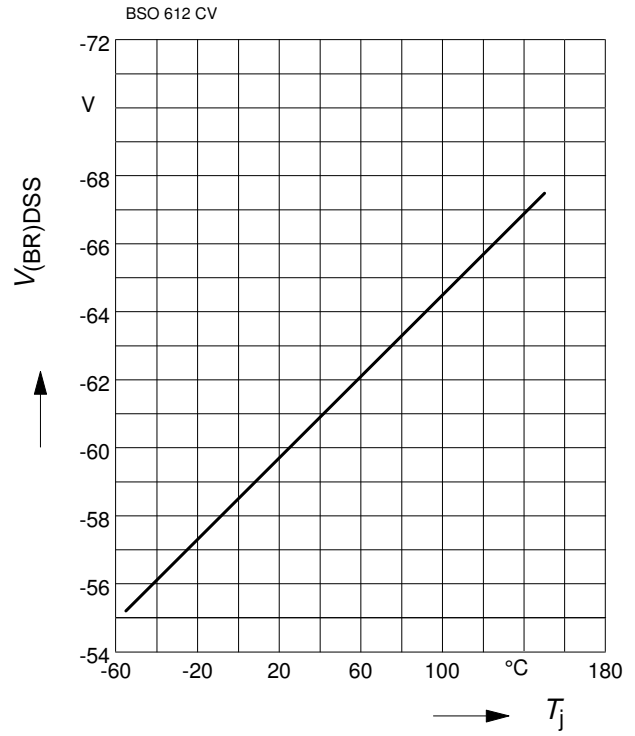
Drain-source breakdown voltage

$$V_{(BR)DSS} = f(T_j), \text{ (N-Ch.)}$$



Drain-source breakdown voltage

$$V_{(BR)DSS} = f(T_j), \text{ (P-Ch.)}$$



## Revision History

BSO612CV G

**Revision: 2019-08-06, Rev. 2.2**

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.2	2019-08-06	Update logos

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### Warnings

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The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

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