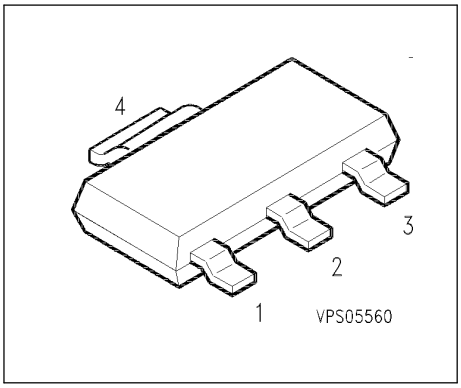
SIPMOS ® Small-Signal Transistor

- N channel
- Enhancement mode
- Avalanche rated
- $V_{GS(th)}$= 2.1 ... 4.0 V



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

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Marking	Ordering Code
BSP 320 S	60 V	2.9 A	0.12 Ω	SOT-223		Q67000-S4001

Maximum Ratings

Parameter	Symbol	Values	Unit
Continuous drain current	I_D		A
T_A = 25 °C		2.9	
T_A = 100 °C		1.85	
DC drain current, pulsed	I_{Dpuls}		
T_A = 25 °C		11.6	
Avalanche energy, single pulse	E_{AS}		mJ
I_D = 2.9 A, V_{DD} = 25 V, R_{GS} = 25 Ω			
L = 14.3 mH, T_j = 25 °C		60	
Avalanche energy, periodic limited by $T_{j(max)}$	E_{AR}	0.18	
Avalanche current, repetitive,limited by $T_{j(max)}$	I_{AR}	2.9	A
Reverse diode dv/dt	dv/dt		KV/µs
I_S = 2.9 A, V_{DS} = 40 V, di/dt = 200 A/µs			
T_{jmax} = 150 °C		6	
Gate source voltage	V_{GS}	± 20	V
Power dissipation	P_{tot}		W
T_A = 25 °C		1.8	

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 1)	R_{thJA}	≤ 70	K/W
Thermal resistance, junction-soldering point 1)	R_{thJS}	17	
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^2 copper area for drain connection

*) MIL STD 883, Method 3015, Class 2

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 V, I_D = 0.25 mA, T_j = 25 °C	$V_{(BR)DSS}$	60	-	-	V
Gate threshold voltage V_{GS}=$V_{DS,}$ I_D = 20 µA	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current V_{DS} = 60 V, V_{GS} = 0 V, T_j = -40 °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	I_{DSS}	 - - -	 - 0.1 -	 0.1 1 100	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0 V	I_{GSS}	-	10	100	nA
Drain-Source on-state resistance V_{GS} = 10 V, I_D = 2.9 A	$R_{DS(on)}$	-	0.09	0.12	Ω

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

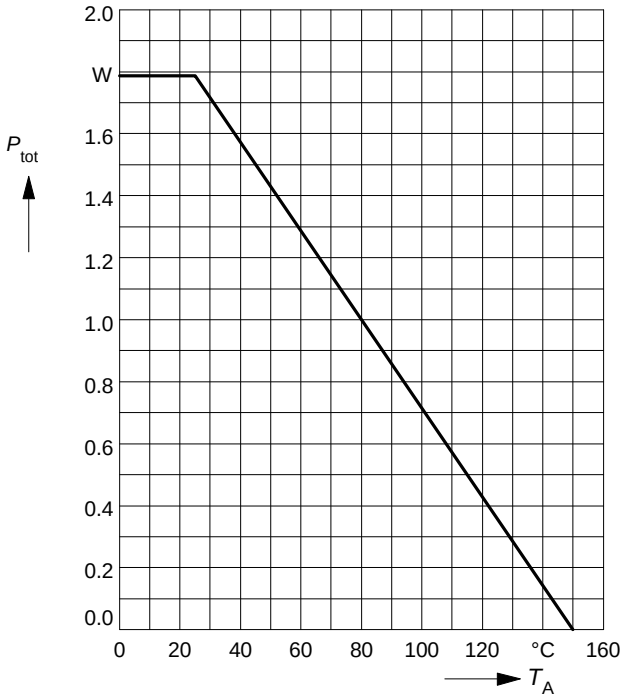
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS} \geq 2 * I_D * R_{DS(on)max}$, I_D = 2.9 A	g_{fs}	2.5	-	-	S
Input capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{iss}	-	275	340	pF
Output capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{oss}	-	90	120	
Reverse transfer capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{rss}	-	50	65	
Turn-on delay time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A R_G = 33 Ω	$t_{d(on)}$	-	11	17	ns
Rise time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A R_G = 33 Ω	t_r	-	25	40	
Turn-off delay time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A R_G = 33 Ω	$t_{d(off)}$	-	25	40	
Fall time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 2.9 A R_G = 33 Ω	t_f	-	35	55	
Gate charge at threshold V_{DD} = 40 V, I_D = 0.1 A, V_{GS} 0 to 1 V	$Q_{g(th)}$	-	0.24	0.3	nC
Gate Charge at 7.0 V V_{DD} = 40 V, I_D = 2.9 A, V_{GS} 0 to 7 V	$Q_{g(7)}$	-	7.4	9.3	
Gate Charge total V_{DD} = 40 V, I_D = 2.9 A, V_{GS} 0 to 10 V	$Q_{g(total)}$	-	9.7	12	
Gate plateau voltage V_{DS} = 15 V, I_D = 2.9 A	$V_{(plateau)}$	-	4.7	-	V

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current T_A = 25 °C	I_S	-	-	2.9	A
Inverse diode direct current,pulsed T_A = 25 °C	I_{SM}	-	-	11.6	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 5.8 A	V_{SD}	-	0.94	1.2	V
Reverse recovery time V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs	t_{rr}	-	45	56	ns
Reverse recovery charge V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs	Q_{rr}	-	0.08	0.12	µC

Power dissipation

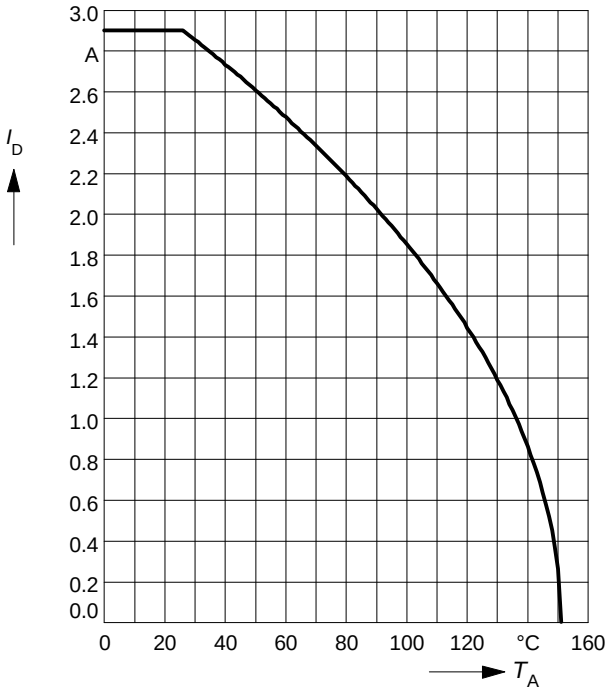
$P_{tot} = f(T_A)$



Drain current

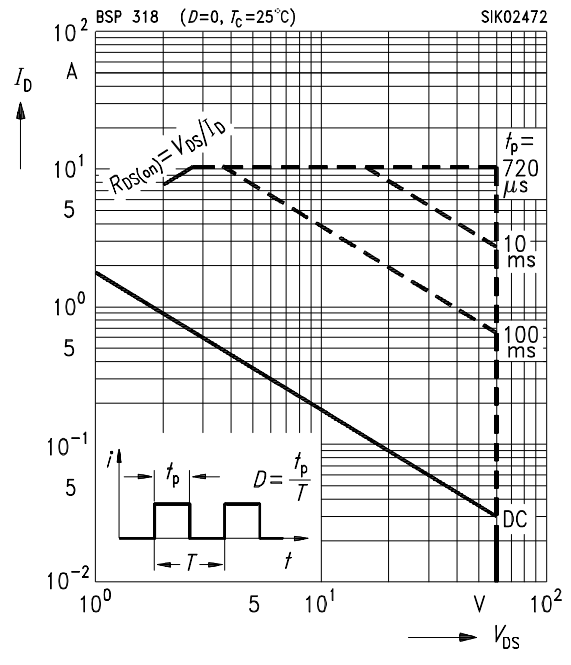
$I_D = f(T_A)$

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



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

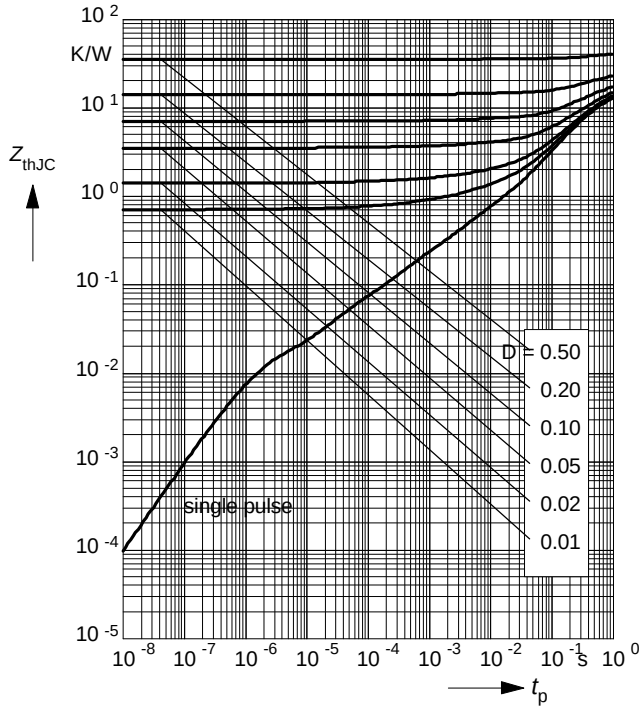
parameter : D = 0, T_C=25°C



Transient thermal impedance

$Z_{th\ JA} = f(t_p)$

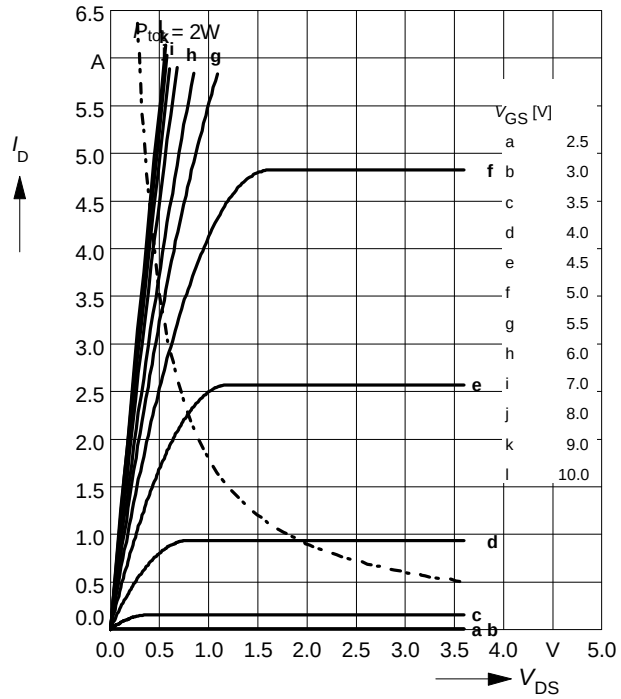
parameter: $D = t_p / T$



Typ. output characteristics

$I_D = f(V_{DS})$

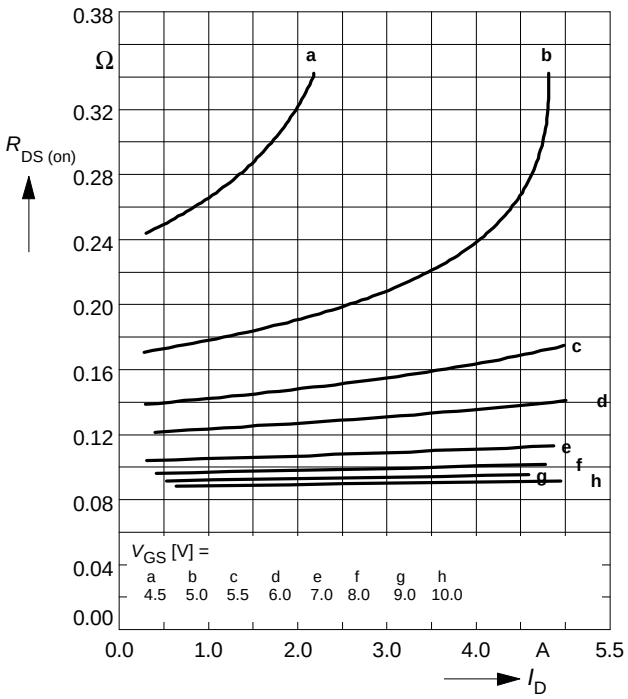
parameter: t_p = 80 µs , T_j = 25 °C



Typ. drain-source on-resistance

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

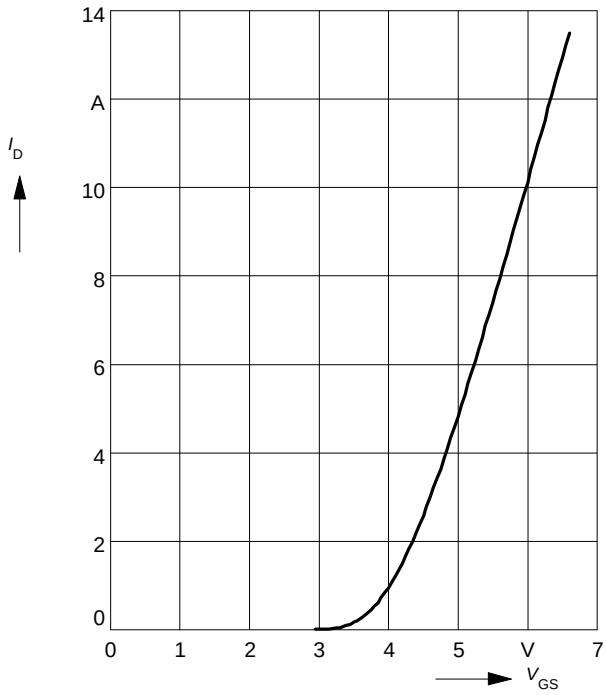
parameter: t_p = 80 µs, T_j = 25 °C



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

parameter: t_p = 80 µs

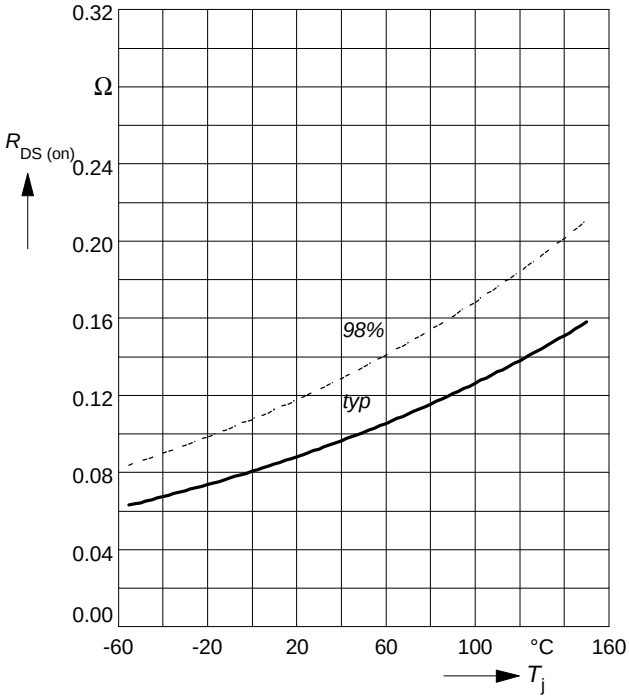
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



Drain-source on-resistance

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

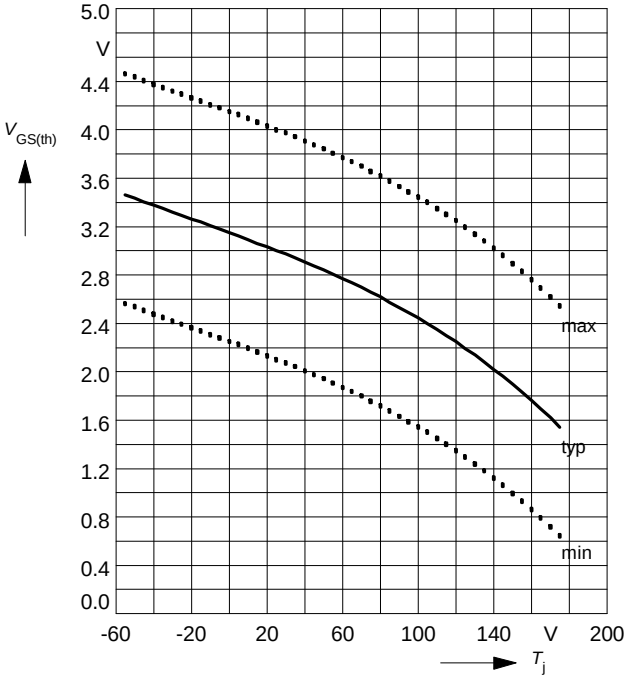
parameter: I_D = 2.9 A, V_{GS} = 10 V



Gate threshold voltage

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

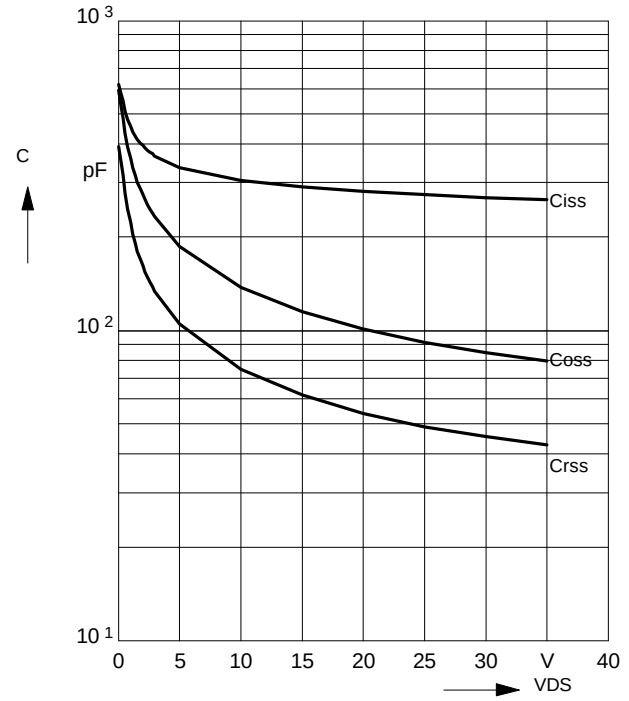
parameter: V_{GS}=V_{DS}, I_D =20µA



Typ. capacitances

$C = f(V_{DS})$

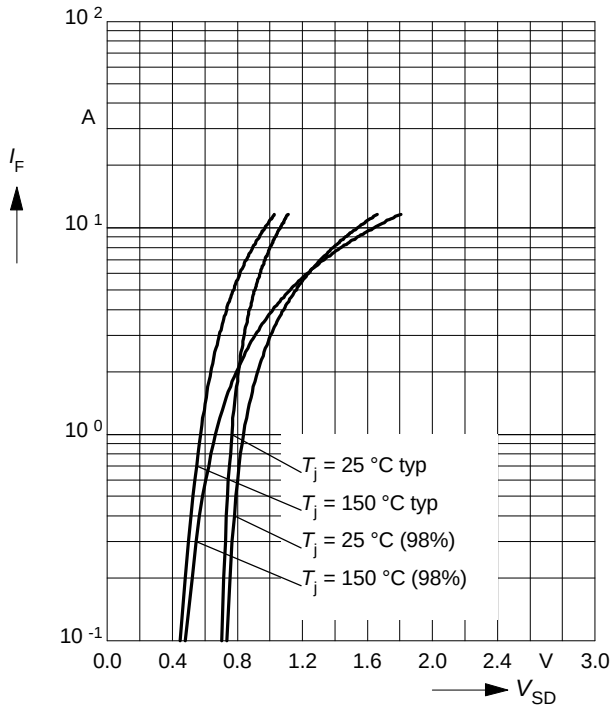
parameter: V_{GS}=0V, f = 1 MHz



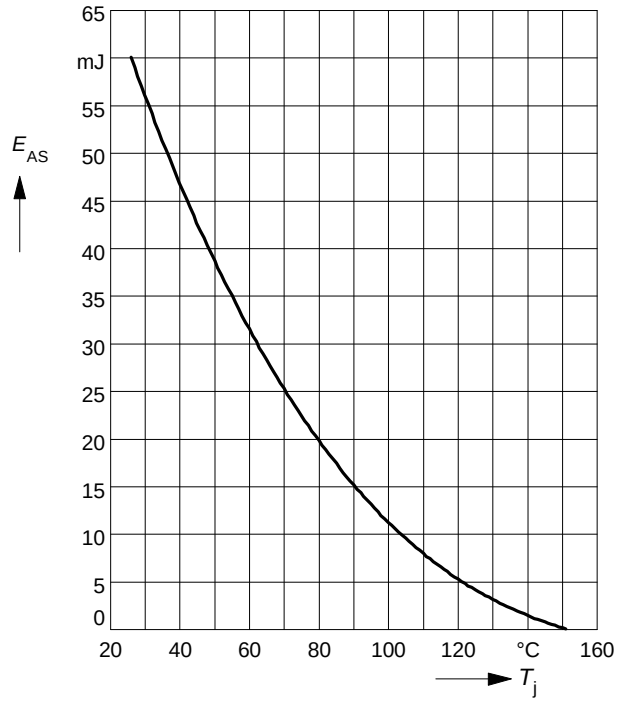
Forward characteristics of reverse diode

$I_F = f(V_{SD})$

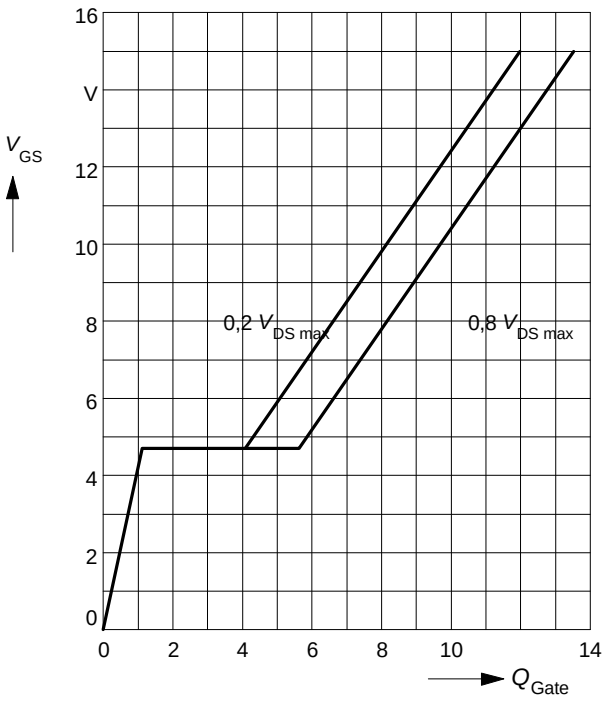
parameter: T_j, t_p = 80 µs



Avalanche energy $E_{AS} = f(T_j)$
parameter: I_D = 2.9 A, V_{DD} = 25 V
R_{GS} = 25 Ω, L = 14.3 mH



Typ. gate charge
$V_{GS} = f(Q_{Gate})$
parameter: $I_{D\ puls}$ = 3 A



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