

OptiMOS® Power-Transistor

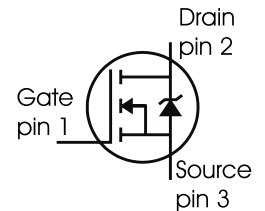
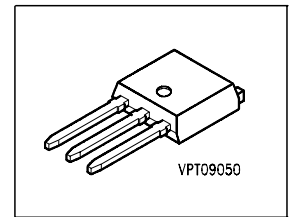
Feature

- N-Channel
- Logic Level
- Low on-resistance $R_{DS(on)}$
- Excellent Gate Charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- dv/dt rated
- Ideal for fast switching applications

Product Summary

V_{DS}	30	V
$R_{DS(on)}$	10	mΩ
I_D	30	A

P-TO251



Type	Package	Ordering Code	Marking
SPU30N03S2L-10	P-TO251	Q67042-S4042	2N03L10

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C=25\text{ °C}, ^{1)}$ $T_C=100\text{ °C}$	I_D	30 30	A
Pulsed drain current $T_C=25\text{ °C}$	$I_{D\text{ puls}}$	120	
Avalanche energy, single pulse $I_D=30\text{ A}, V_{DD}=25\text{ V}, R_{GS}=25\text{ Ω}$	E_{AS}	150	mJ
Reverse diode dv/dt $I_S=30\text{ A}, V_{DS}=24\text{ V}, di/dt=200\text{ A}/\mu\text{s}, T_{j\text{max}}=175\text{ °C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation $T_C=25\text{ °C}$	P_{tot}	82	W
Operating and storage temperature	T_j, T_{stg}	-55... +175	°C
IEC climatic category; DIN IEC 68-1		55/175/56	

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	1.8	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	100	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	75	
@ 6 cm ² cooling area ²⁾		-	-	50	

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 $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=50\mu A$	$V_{GS(th)}$	1.2	1,6	2	
Zero gate voltage drain current $V_{DS}=30V, V_{GS}=0V, T_j=25^\circ C$ $V_{DS}=30V, V_{GS}=0V, T_j=125^\circ C$	I_{DSS}	-	0.01	1	μA
		-	10	100	
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	I_{GSS}	-	1	100	nA
Drain-source on-state resistance $V_{GS}=4.5V, I_D=30A$	$R_{DS(on)}$	-	11.6	14.6	m Ω
Drain-source on-state resistance $V_{GS}=10V, I_D=30A$	$R_{DS(on)}$	-	8.1	10	

¹Current limited by bondwire; with a $R_{thJC} = 1.8\text{ K/W}$ the chip is able to carry $I_D = 64A$ and calculated with max. source pin temperature of $85^\circ C$.

²Device 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.

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}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 30\text{A}$	23.8	47.5	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$	-	1170	1460	pF
Output capacitance	C_{oss}		-	490	610	
Reverse transfer capacitance	C_{rss}		-	125	155	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 30\text{A}$, $R_G = 5.4\Omega$	-	6.1	9.2	ns
Rise time	t_r		-	63	94	
Turn-off delay time	$t_{d(off)}$		-	27	41	
Fall time	t_f		-	17	26	

Gate Charge Characteristics

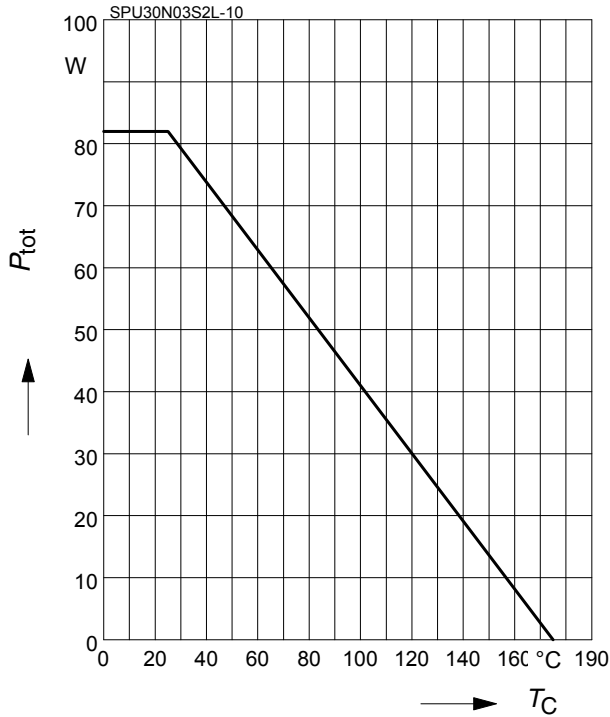
Gate to source charge	Q_{gs}	$V_{DD} = 24\text{V}$, $I_D = 30\text{A}$	-	3.8	4.3	nC
Gate to drain charge	Q_{gd}		-	10.8	16.2	
Gate charge total	Q_g	$V_{DD} = 24\text{V}$, $I_D = 30\text{A}$, $V_{GS} = 0$ to 10V	-	31.5	39.4	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 24\text{V}$, $I_D = 30\text{A}$	-	3.4	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	30	A
Inverse diode direct current, pulsed	I_{SM}		-	-	120	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0\text{V}$, $I_F = 30\text{A}$	-	0.9	1.2	V
Reverse recovery time	t_{rr}	$V_R = -\text{V}$, $I_F = I_S$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	25.5	38	ns
Reverse recovery charge	Q_{rr}		-	26.5	40	nC

1 Power dissipation

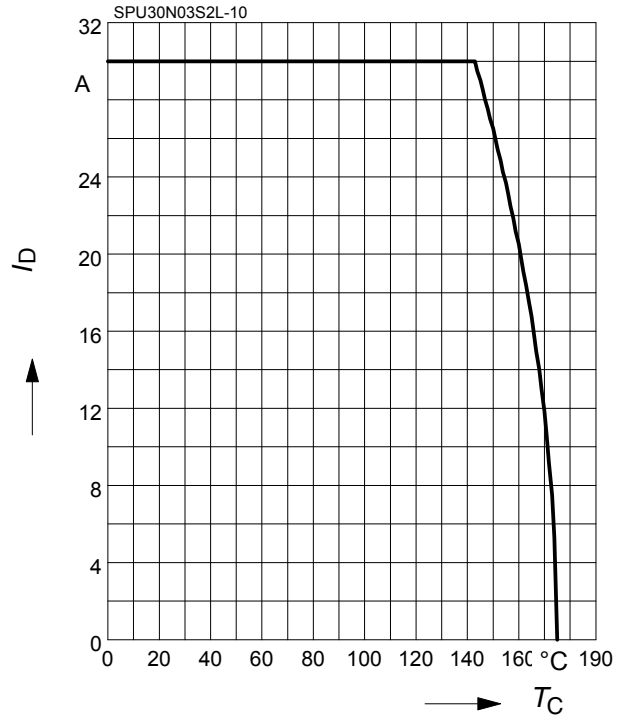
$$P_{tot} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

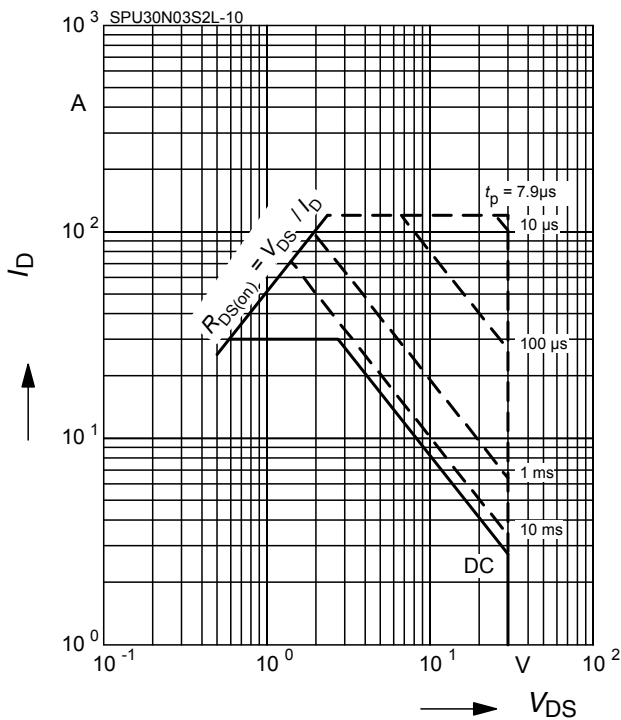
parameter: $V_{GS} \geq 10\text{ V}$



3 Safe operating area

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

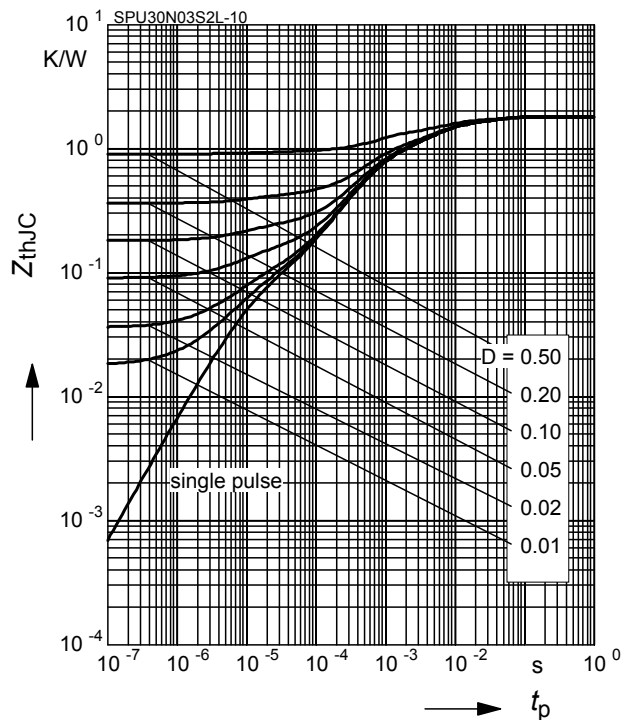
parameter: $D = 0$, $T_C = 25\text{ °C}$



4 Transient thermal impedance

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

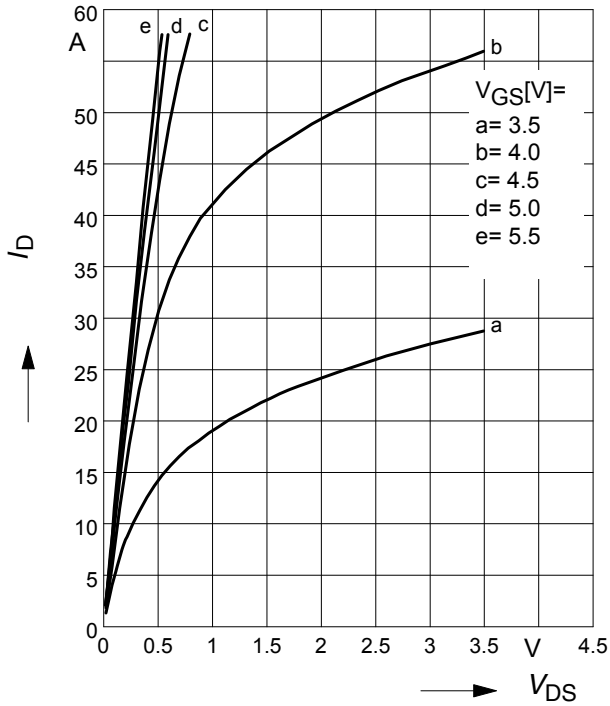
parameter: $D = t_p/T$



5 Typ. output characteristic

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

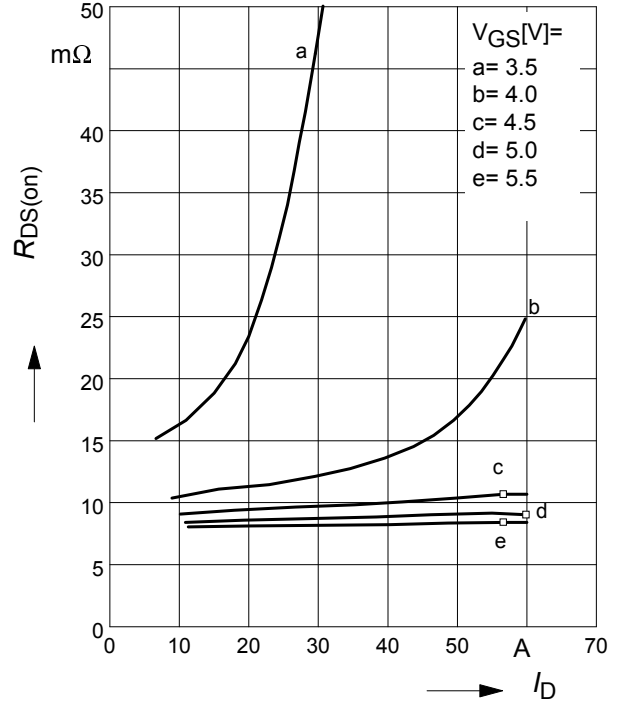
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

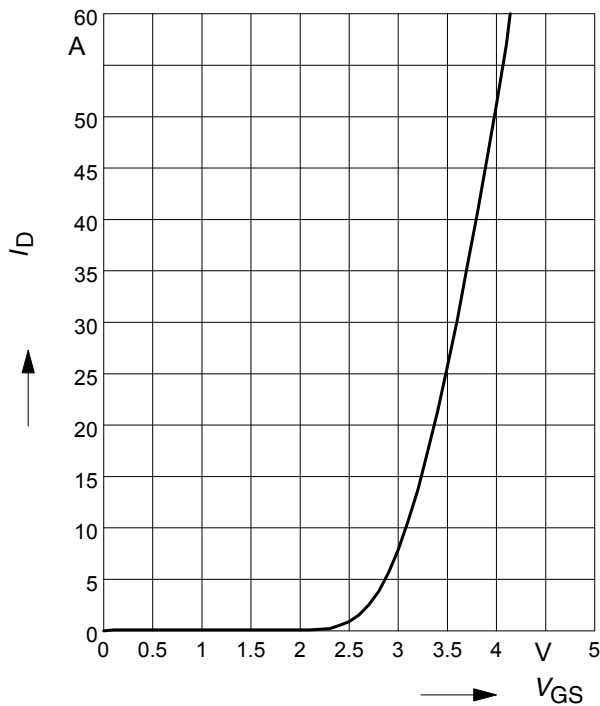
parameter: V_{GS}



7 Typ. transfer characteristics

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

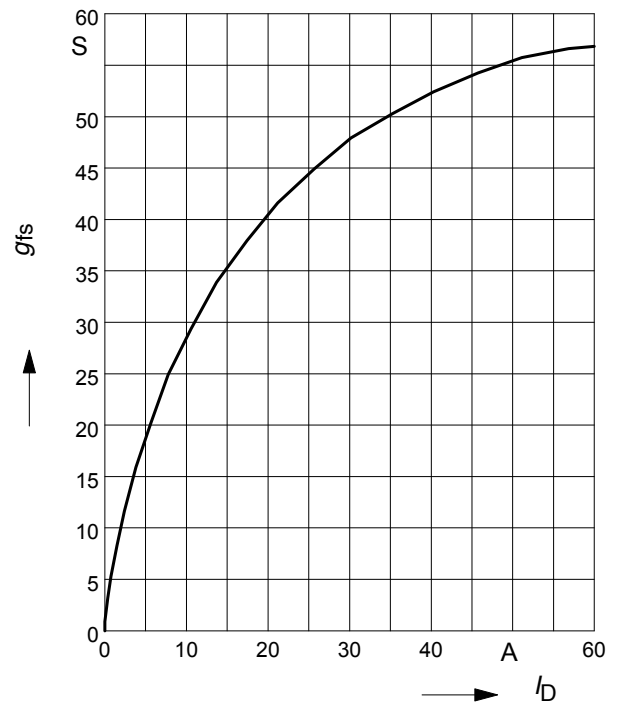
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

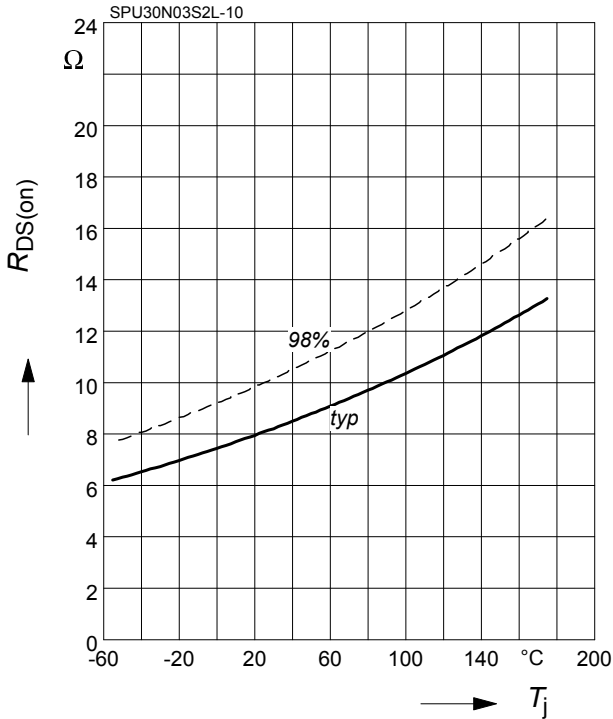
parameter: g_{fs}



9 Drain-source on-state resistance

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

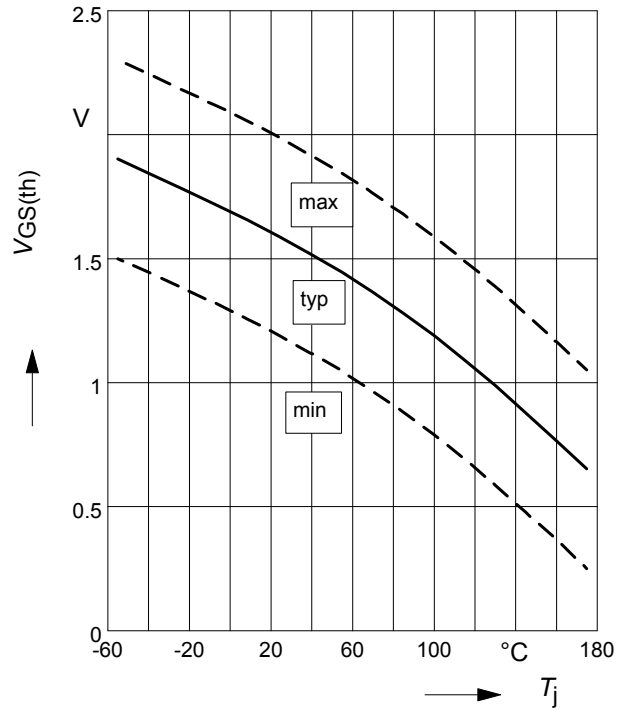
parameter : $I_D = 30\text{ A}$, $V_{GS} = 10\text{ V}$



10 Typ. gate threshold voltage

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

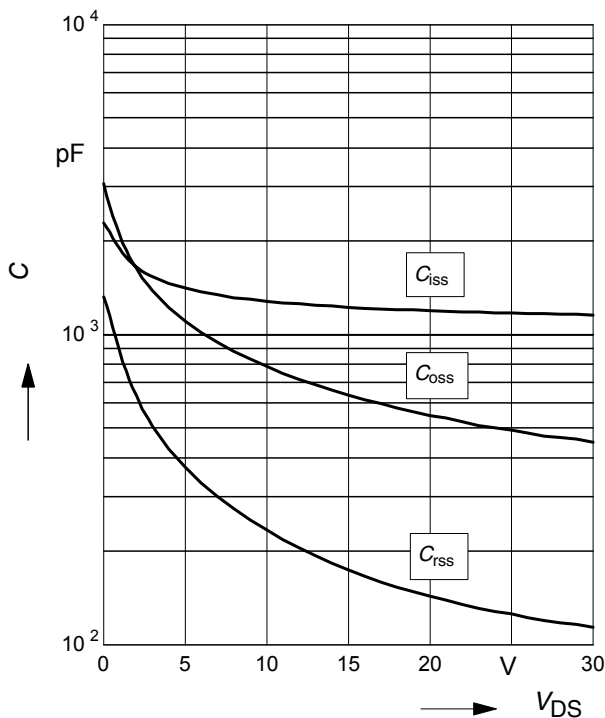
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

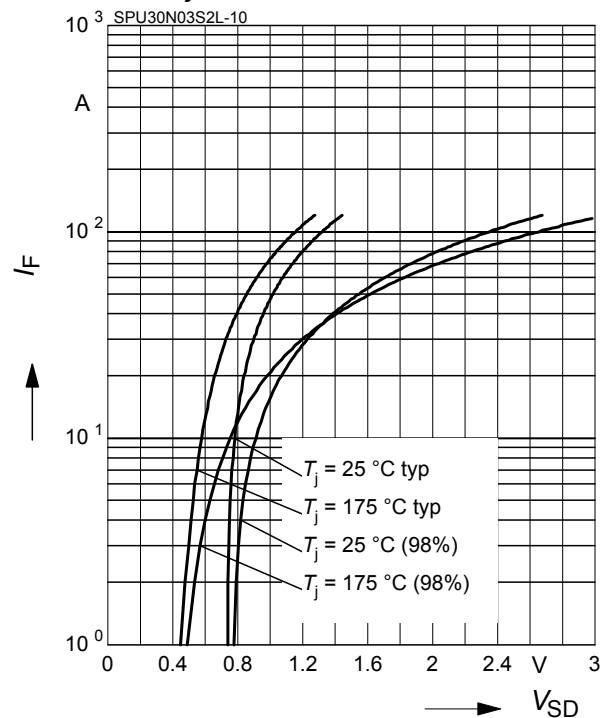
parameter: $V_{GS}=0\text{V}$, $f=1\text{ MHz}$



12 Forward character. of reverse diode

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

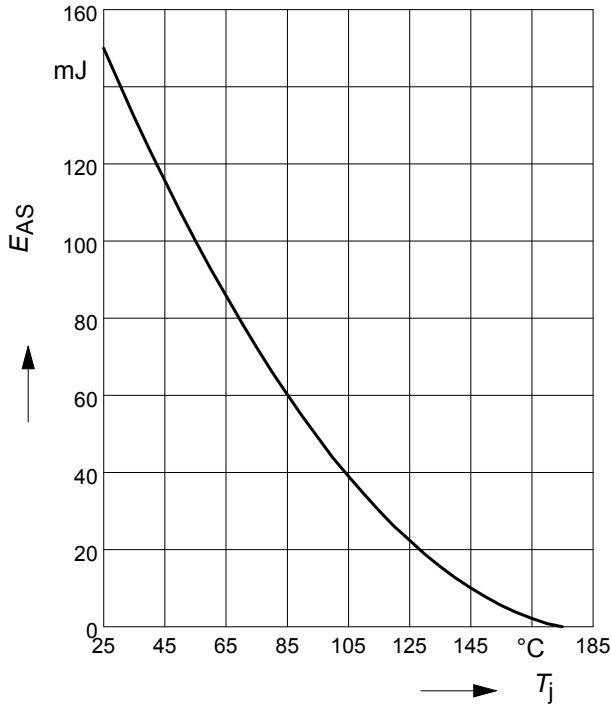
parameter: T_j , $t_p = 80\text{ }\mu\text{s}$



13 Typ. avalanche energy

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

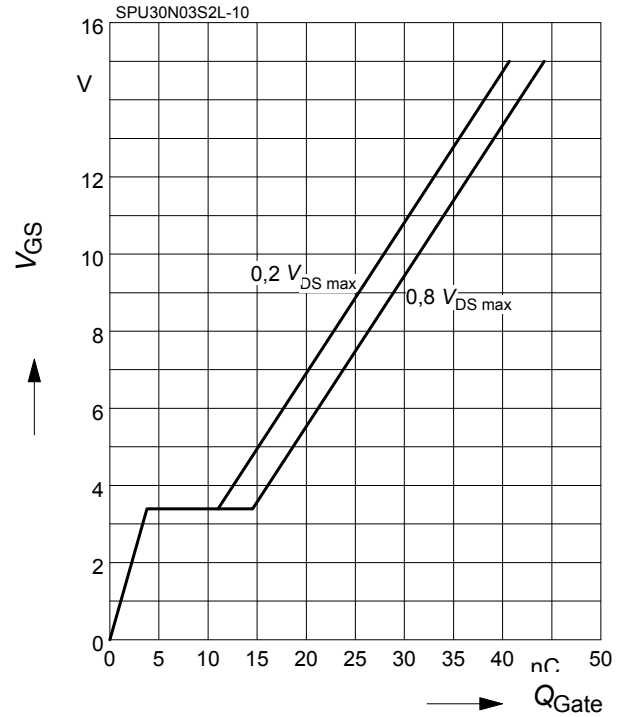
par.: $I_D = 30\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

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

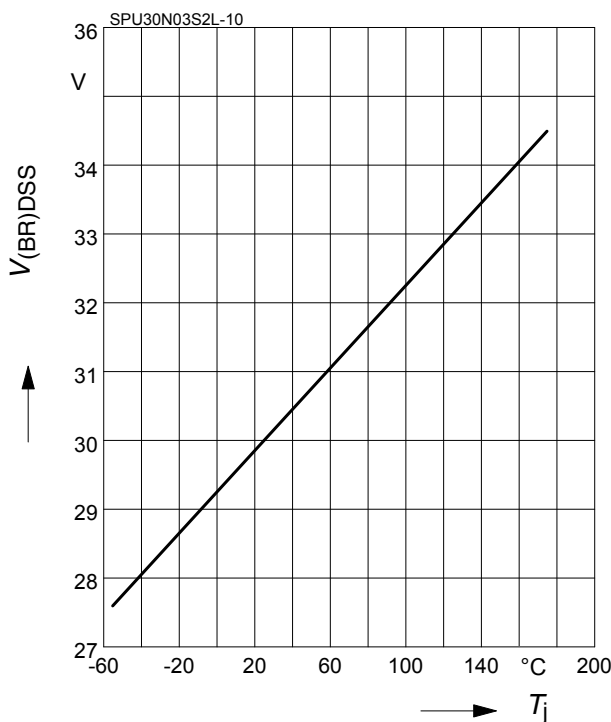
parameter: $I_D = 30\text{ A}$ pulsed



15 Drain-source breakdown voltage

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

parameter: $I_D = 10\text{ mA}$



Published by
Infineon Technologies AG,
Bereichs Kommunikation
St.-Martin-Strasse 53,
D-81541 München
© Infineon Technologies AG 1999
All Rights Reserved.

Attention please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

Infineon Technologies is an approved CECC manufacturer.

Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office in Germany or our Infineon Technologies Representatives worldwide (see address list).

Warnings

Due to technical requirements components may contain dangerous substances.
For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems 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 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.

Further information

Please notice that the part number is BSPU30N03S2L-10, for simplicity the device is referred to by the term SPU30N03S2L-10 throughout this documentation.