

SIPMOS® Power-Transistor

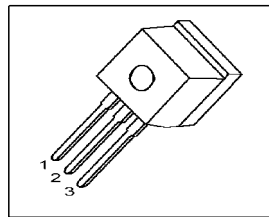
Feature

- Pb-free, RoHS compliant
- N-Channel, Enhancement mode
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

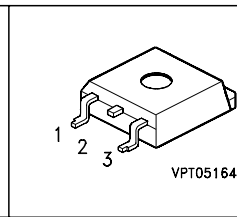
Product Summary

V_{DS}	100	V
$R_{DS(on)}$	80	mΩ
I_D	21	A

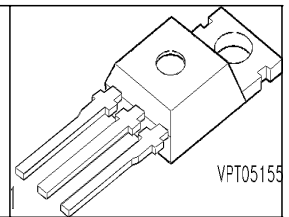
PG-TO262-3-1



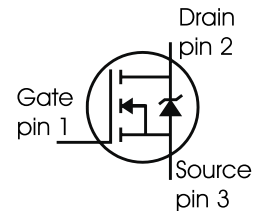
PG-TO263-3-2



PG-TO220-3-1



Type	Package	Marking
SPP21N10	PG-TO220-3-1	21N10
SPB21N10	PG-TO263-3-2	21N10
SPI21N10	PG-TO262-3-1	21N10



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

Parameter	Symbol	Value	Unit
Continuous drain current	I_D	21	A
$T_C = 25^\circ\text{C}$		15.0	
$T_C = 100^\circ\text{C}$			
Pulsed drain current	$I_{D \text{ puls}}$	84	
$T_C = 25^\circ\text{C}$			
Avalanche energy, single pulse	E_{AS}	130	mJ
$I_D = 21 \text{ A}$, $V_{DD} = 25 \text{ V}$, $R_{GS} = 25 \Omega$			
Reverse diode dv/dt	dv/dt	6	kV/μs
$I_S = 21 \text{ A}$, $V_{DS} = 80 \text{ V}$, $di/dt = 200 \text{ A}/\mu\text{s}$, $T_{j \text{ max}} = 175^\circ\text{C}$			
Gate source voltage	V_{GS}	±20	V
Power dissipation	P_{tot}	90	W
$T_C = 25^\circ\text{C}$			
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}	-	-	1.7	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm ² cooling area ^{F)}		-	-	40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	100	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 44 \mu A$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS}=100V, V_{GS}=0V, T_j=25^{\circ}C$ $V_{DS}=100V, V_{GS}=0V, T_j=125^{\circ}C$	I_{DSS}	- -	0.01 1	1 100	μA
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	I_{GSS}	-	1	100	
Drain-source on-state resistance $V_{GS}=10V, I_D=15.0A$	$R_{DS(on)}$	-	65	80	m Ω

¹Device 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 $T_j = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic Characteristics

Transconductance	g_{fs}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 15.0\text{A}$	6.5	12.4	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$	-	650	865	pF
Output capacitance	C_{oss}		-	140	186	
Reverse transfer capacitance	C_{rss}		-	80	120	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 50\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 21\text{A}$, $R_G = 13\Omega$	-	10	15	ns
Rise time	t_r		-	56	84	
Turn-off delay time	$t_{d(off)}$		-	37	55	
Fall time	t_f		-	23	35	

Gate Charge Characteristics

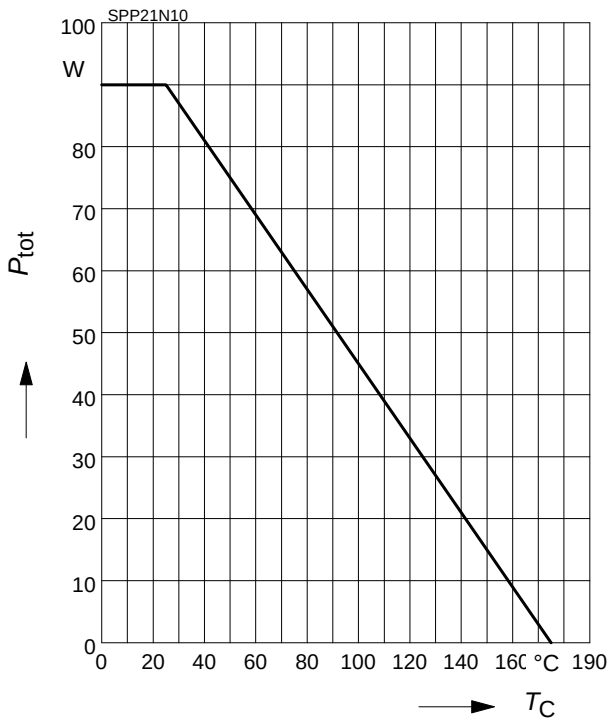
Gate to source charge	Q_{gs}	$V_{DD} = 80\text{V}$, $I_D = 21\text{A}$	-	3.9	5.2	nC
Gate to drain charge	Q_{gd}		-	15.5	23.3	
Gate charge total	Q_g	$V_{DD} = 80\text{V}$, $I_D = 21\text{A}$, $V_{GS} = 0 \text{ to } 10\text{V}$	-	28.9	38.4	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 80\text{V}$, $I_D = 21\text{A}$	-	6.2	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_C = 25^\circ\text{C}$	-	-	21	A
Inverse diode direct current, pulsed	I_{SM}		-	-	84	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0\text{V}$, $I_F = 21\text{A}$	-	0.94	1.25	V
Reverse recovery time	t_{rr}	$V_R = 50\text{V}$, $I_F = I_S$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	65	81.5	ns
Reverse recovery charge	Q_{rr}		-	153	192	nC

1 Power dissipation

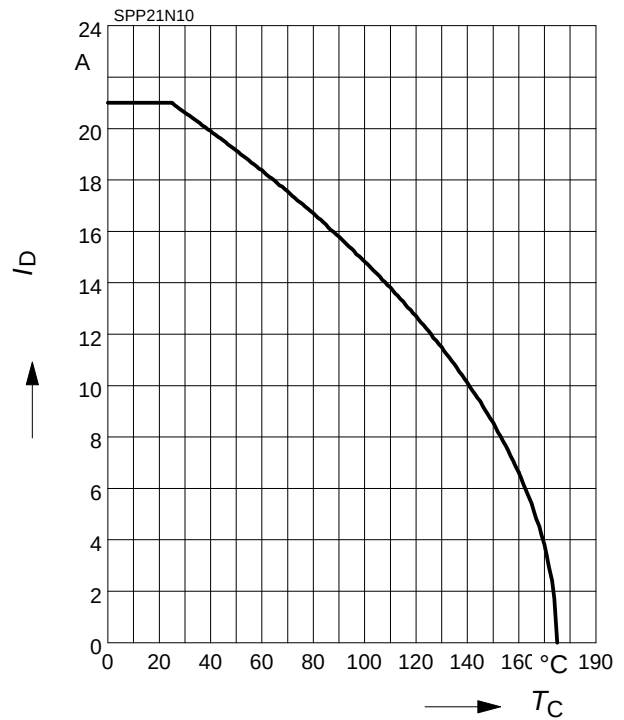
$$P_{\text{tot}} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

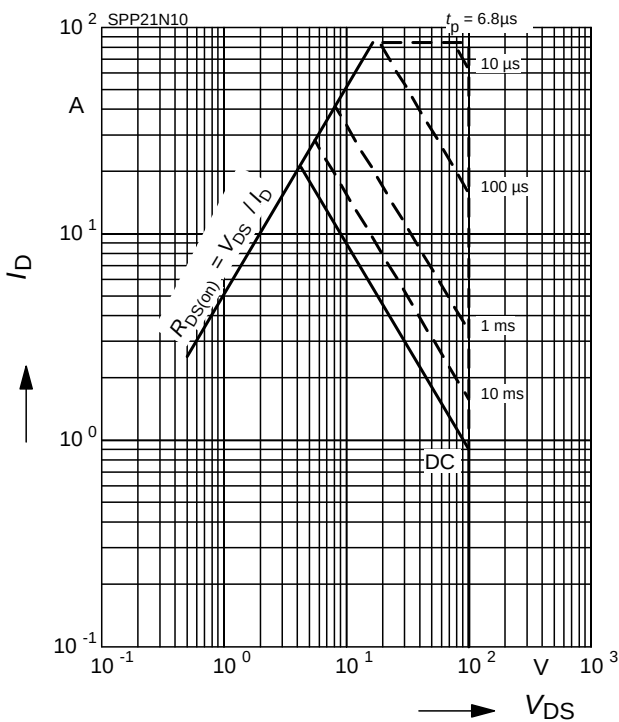
parameter: $V_{GS} \geq 10 \text{ V}$



3 Safe operating area

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

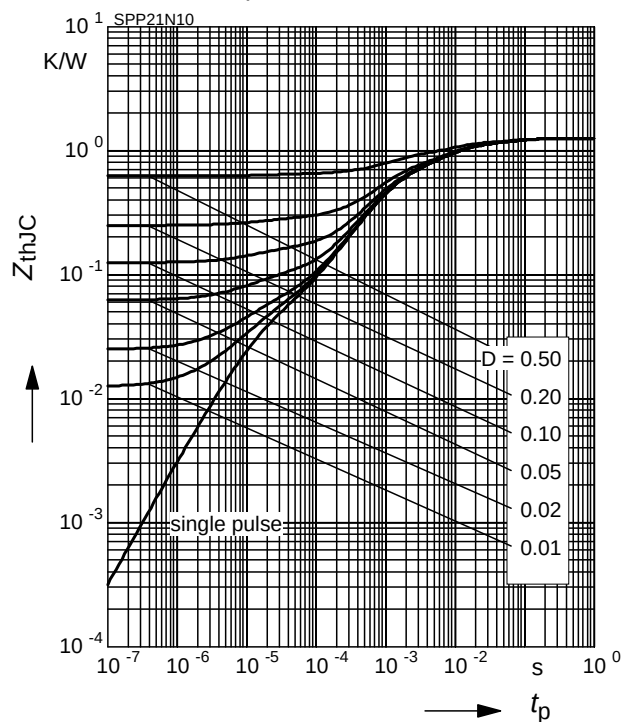
parameter: $D = 0$, $T_C = 25^\circ\text{C}$



4 Transient thermal impedance

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

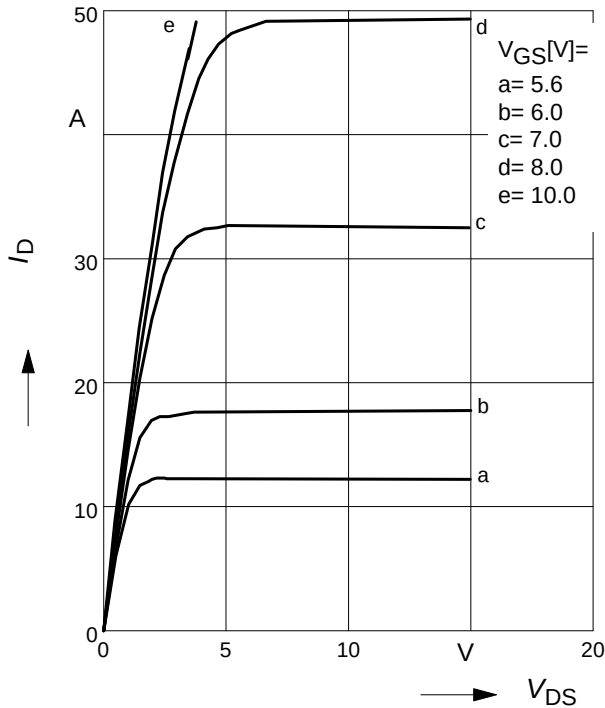
parameter: $D = t_p/T$



5 Typ. output characteristic

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

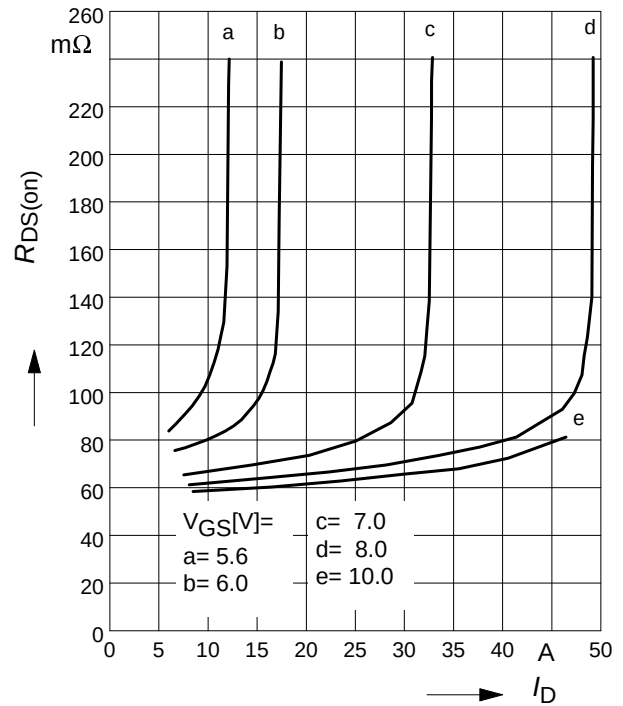
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

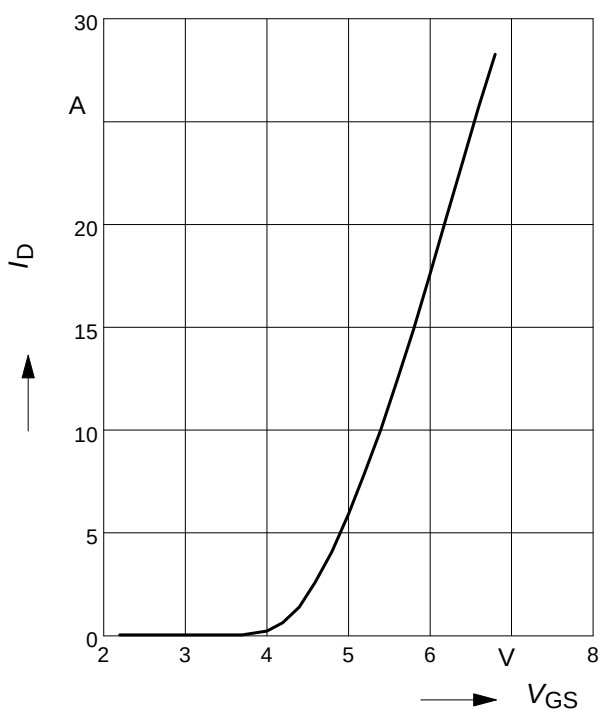
parameter: V_{GS}



7 Typ. transfer characteristics

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

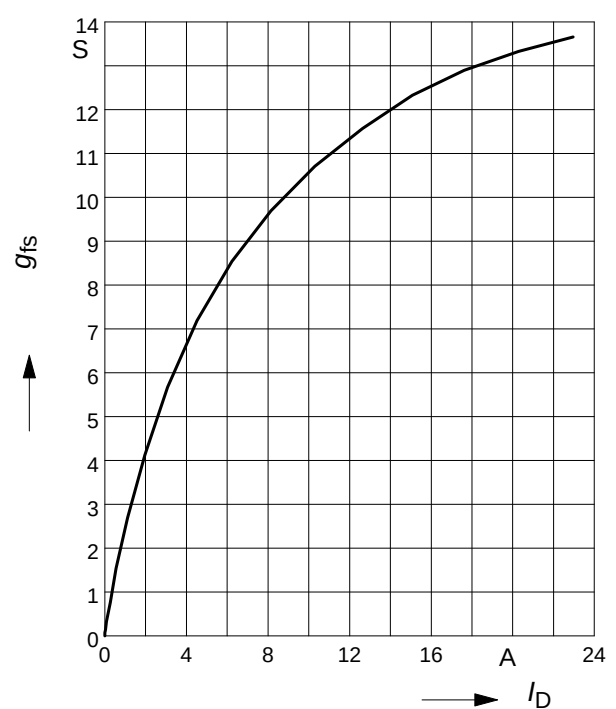
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

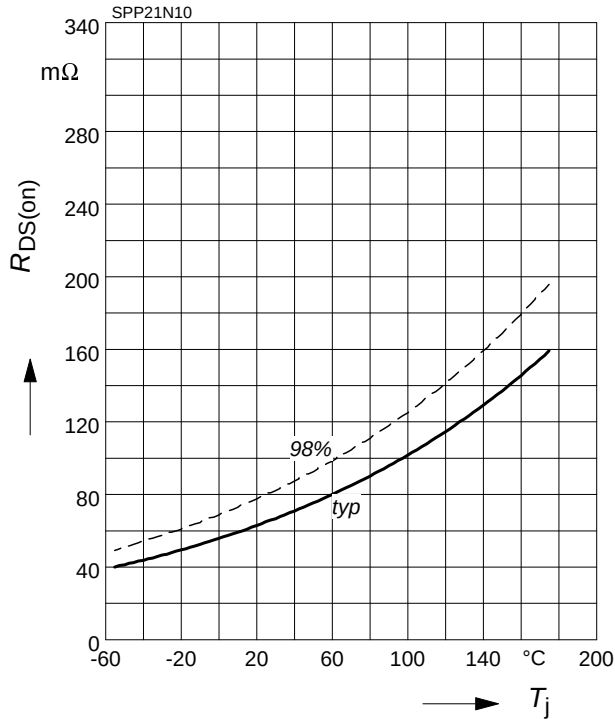
parameter: g_{fs}



9 Drain-source on-state resistance

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

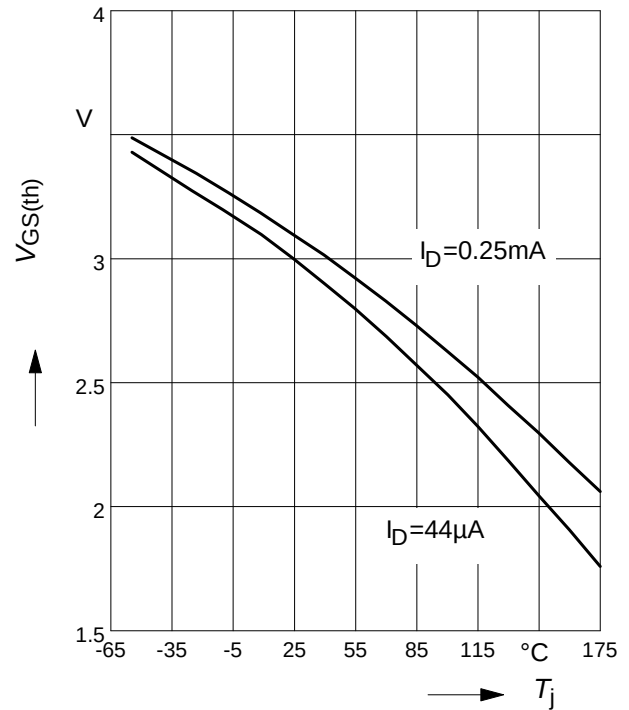
parameter: $I_D = 15.0\text{ A}$, $V_{GS} = 10\text{ V}$



10 Typ. gate threshold voltage

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

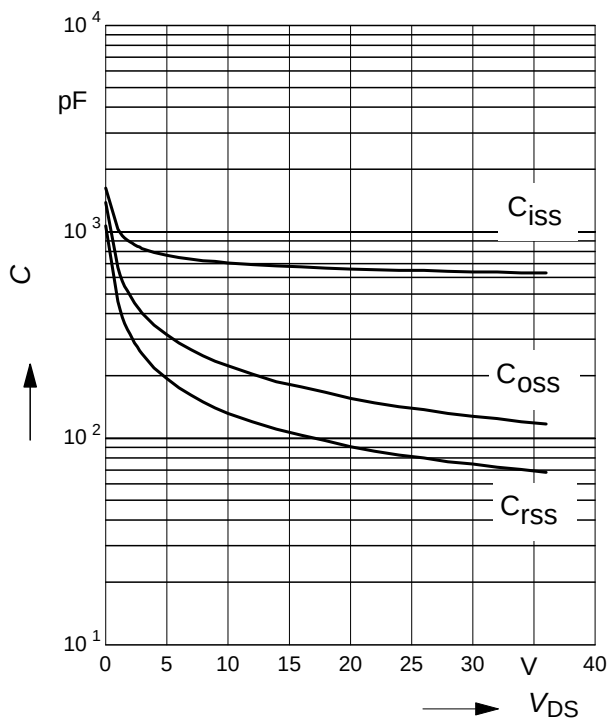
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

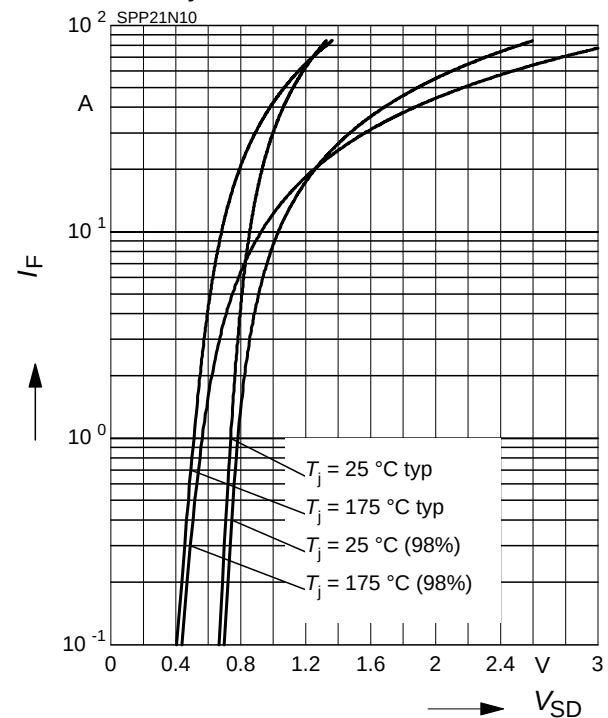
parameter: $V_{GS}=0\text{V}$, $f=1\text{ MHz}$



12 Forward character. of reverse diode

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

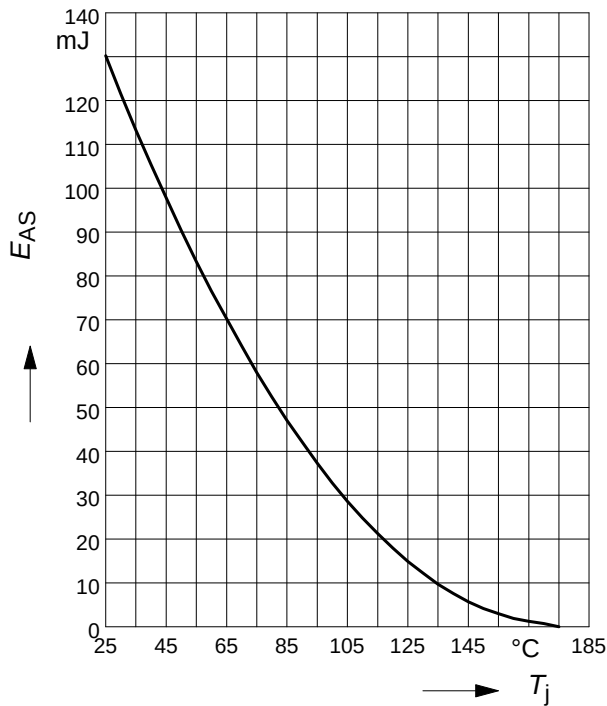
parameter: T_j , $t_p = 80\text{ μs}$



13 Typ. avalanche energy

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

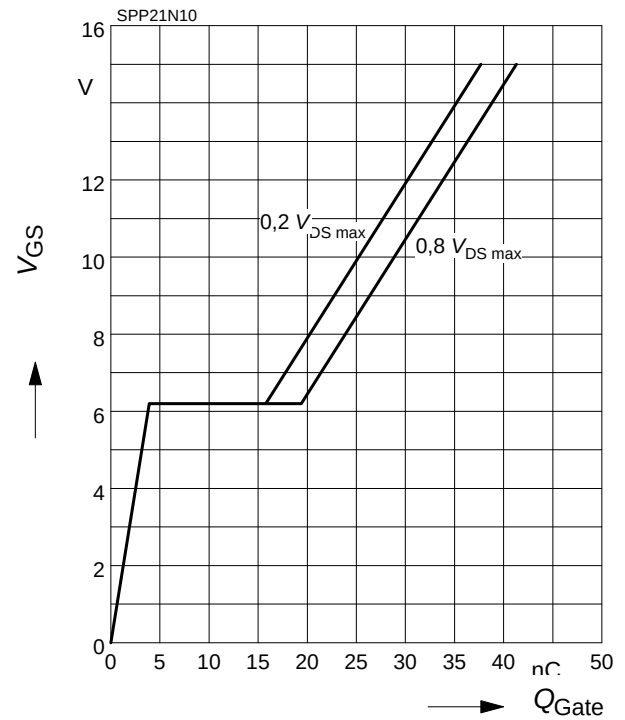
par.: $I_D = 21\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

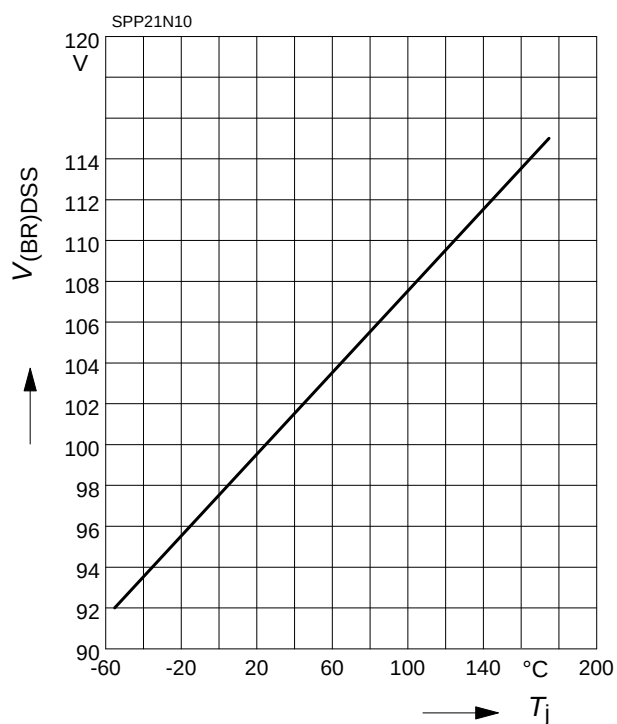
$$V_{GS} = f(Q_{Gate})$$

parameter: $I_D = 21\text{ A}$ pulsed



15 Drain-source breakdown voltage

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



Published by
Infineon Technologies AG,

D-81726 München, Germany
© Infineon Technologies AG 2006
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.