OptiMOS® Power-Transistor

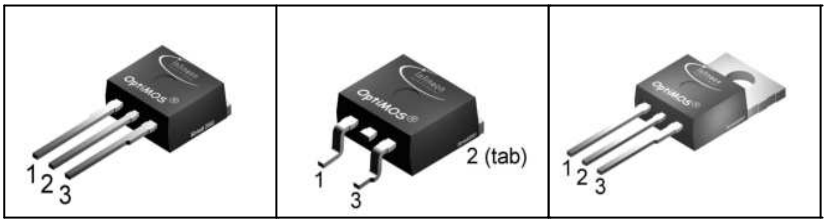
Feature

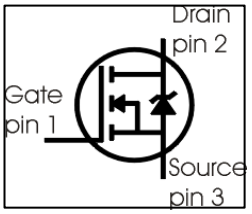
- N-Channel
- Enhancement mode
- Excellent Gate Charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- d*v*/d*t* rated

Product Summary

V_{DS}	30	V
$R_{DS(on)}$ max. SMD version	3.1	mΩ
I_D	80	A

P- TO262 -3-1 | P- TO263 -3-2 | P- TO220 -3-1





Type	Package	Ordering Code	Marking
SPP80N03S2-03	P- TO220 -3-1	Q67040-S4247	2N0303
SPB80N03S2-03	P- TO263 -3-2	Q67040-S4258	2N0303
SPI80N03S2-03	P- TO262 -3-1	Q67042-S4079	2N0303

Maximum Ratings, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current 1) T_C=25°C	I_D	80 80	A
Pulsed drain current T_C=25°C	$I_{D\ puls}$	320	
Avalanche energy, single pulse I_D=80 A , V_{DD}=25V, R_{GS}=25Ω	E_{AS}	810	mJ
Repetitive avalanche energy, limited by T_{jmax} 2)	E_{AR}	30	
Reverse diode d*v*/d*t* I_S=80A, V_{DS}=24V, d*i*/d*t*=200A/µs, T_{jmax}=175°C	d*v*/d*t*	6	kV/µs
Gate source voltage	V_{GS}	±20	V
Power dissipation T_C=25°C	P_{tot}	300	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}	-	0.3	0.5	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm2 cooling area 3)		-	-	40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	-	-	V
V_{GS}=0V, I_D=1mA					
Gate threshold voltage, V_{GS} = V_{DS}	$V_{GS(th)}$	2.1	3	4	
I_D=250µA					
Zero gate voltage drain current	I_{DSS}				µA
V_{DS}=30V, V_{GS}=0V, T_j=25°C		-	0.01	1	
V_{DS}=30V, V_{GS}=0V, T_j=125°C		-	1	100	
Gate-source leakage current	I_{GSS}	-	1	100	nA
V_{GS}=20V, V_{DS}=0V					
Drain-source on-state resistance 4)	$R_{DS(on)}$				mΩ
V_{GS}=10V, I_D=80A		-	2.6	3.4	
V_{GS}=10V, I_D=80A, SMD version		-	2.3	3.1	

1Current limited by bondwire ; with an R_{thJC} = 0.5K/W the chip is able to carry I_D= 307A at 25°C, for detailed information see app.-note ANPS071E available at *www.infineon.com/optimos*

2Defined by design. Not subject to production test.

3Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6 cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

4Diagrams are related to straight lead versions

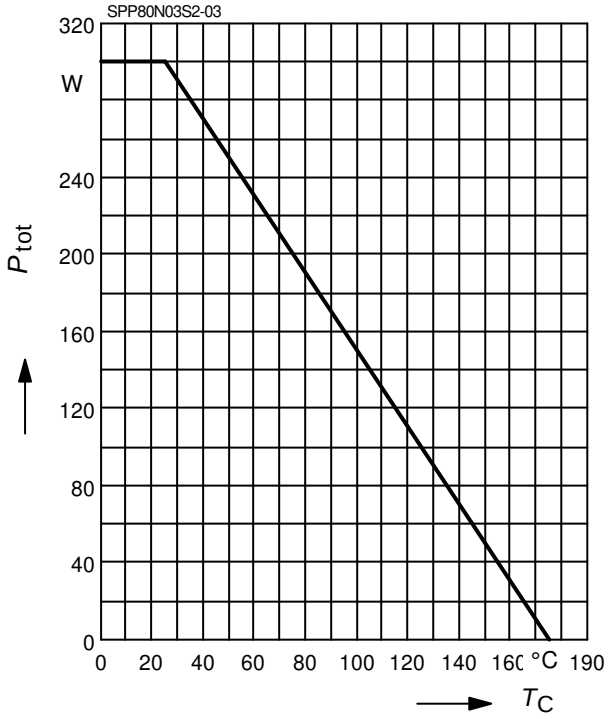
Electrical Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	g_{fs}	$V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D=80A	66	132	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	5280	7020	pF
Output capacitance	C_{oss}		-	2420	3220	
Reverse transfer capacitance	C_{rss}		-	470	700	
Turn-on delay time	$t_{d(on)}$	V_{DD}=15V, V_{GS}=10V, I_D=80A, R_G=2.2Ω	-	22	33	ns
Rise time	t_r		-	325	490	
Turn-off delay time	$t_{d(off)}$		-	90	140	
Fall time	t_f		-	110	160	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=24V, I_D=80A	-	26	34	nC
Gate to drain charge	Q_{gd}		-	45	68	
Gate charge total	Q_g	V_{DD}=24V, I_D=80A, V_{GS}=0 to 10V	-	110	150	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} = 24 V , I_D=80A	-	5.2	-	V
Reverse Diode						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	80	A
Inv. diode direct current, pulsed	I_{SM}		-	-	320	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=80A	-	0.9	1.3	V
Reverse recovery time	t_{rr}	V_R=15V, I_F=I_S, di_F/dt=100A/µs	-	65	80	ns
Reverse recovery charge	Q_{rr}		-	87	110	nC

1 Power dissipation

$P_{tot} = f(T_C)$

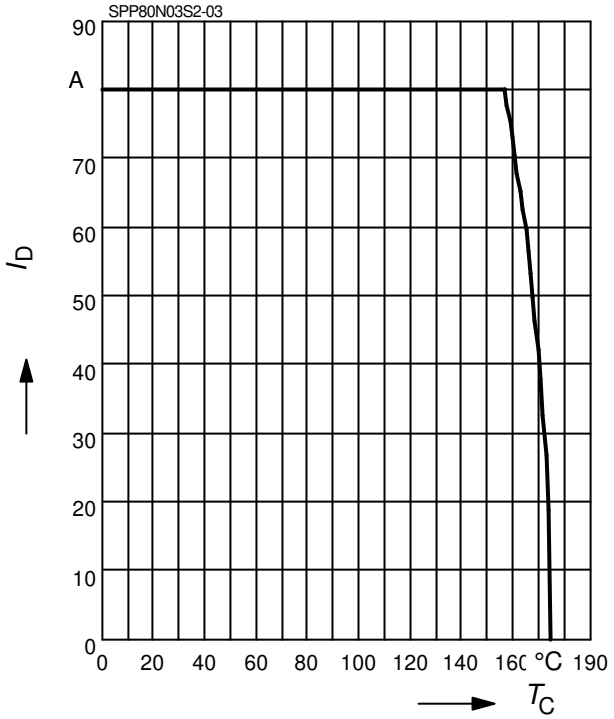
parameter: $V_{GS} \geq 6$ V



2 Drain current

$I_D = f(T_C)$

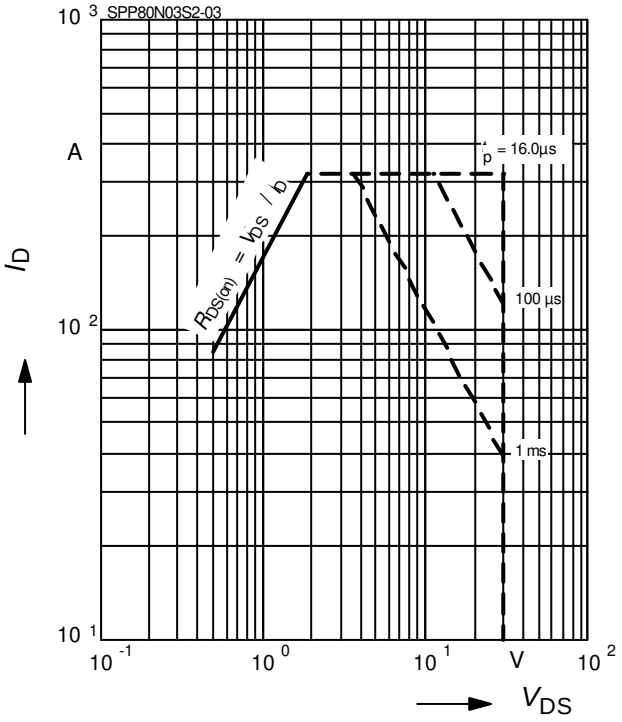
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

$I_D = f(V_{DS})$

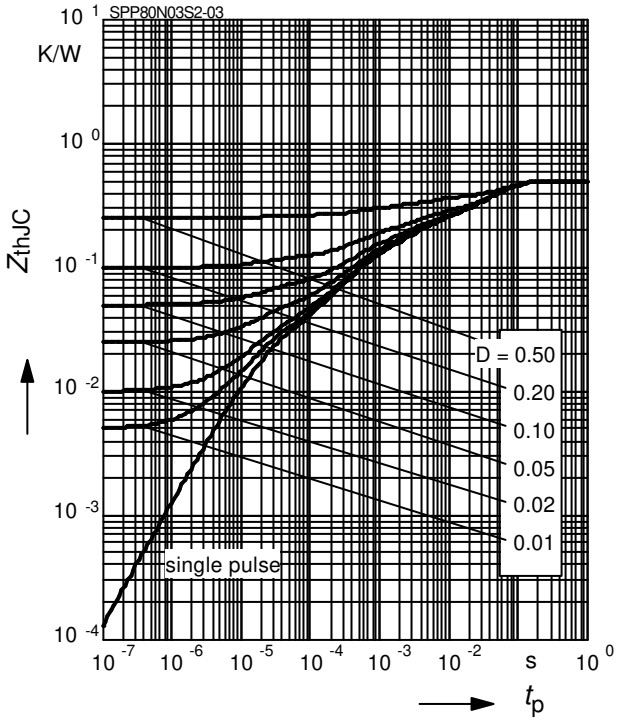
parameter : $D = 0$, $T_C = 25$ °C



4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

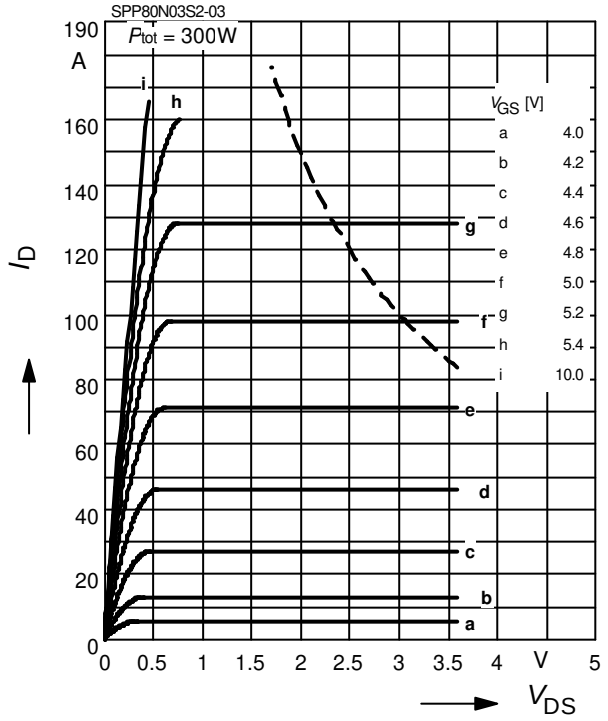
parameter : $D = t_p/T$



5 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

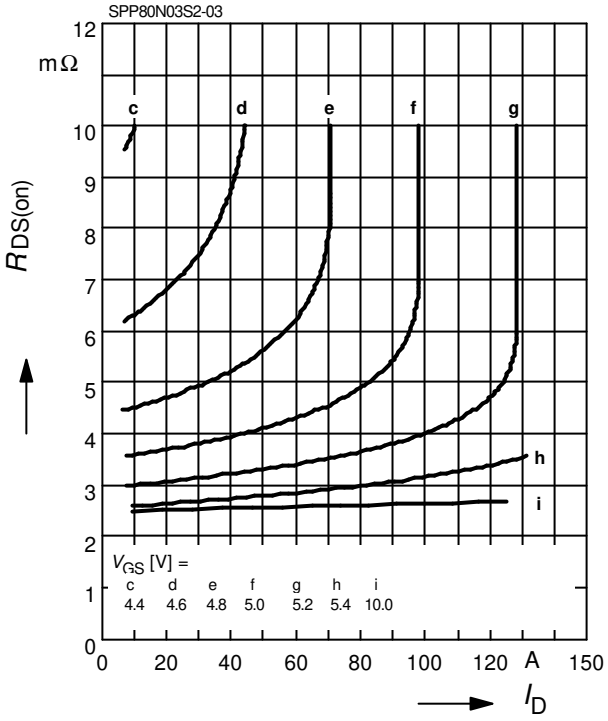
parameter: t_p = 80 µs



6 Typ. drain-source on resistance

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

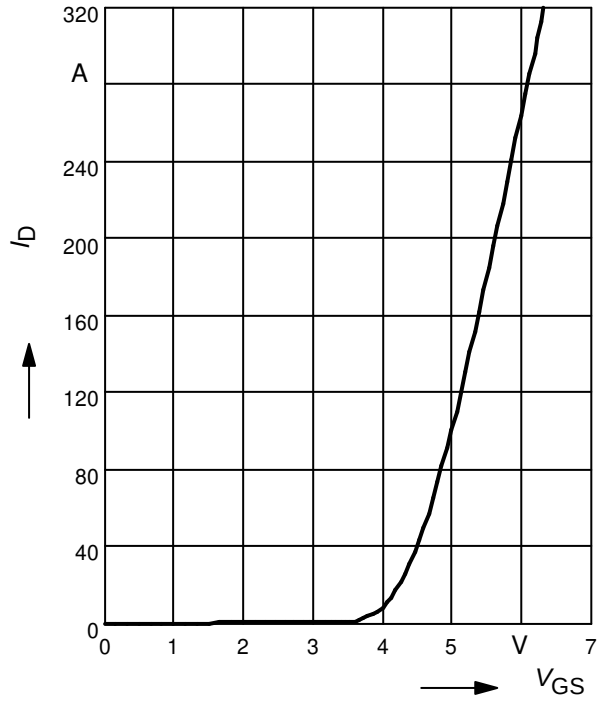
parameter: V_{GS}



7 Typ. transfer characteristics

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

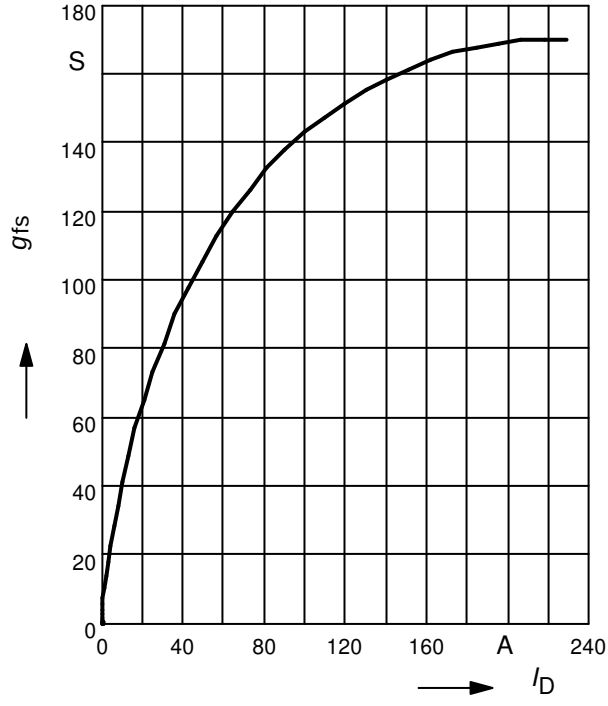
parameter: t_p = 80 µs



8 Typ. forward transconductance

$g_{fs} = f(I_D)$; T_j=25°C

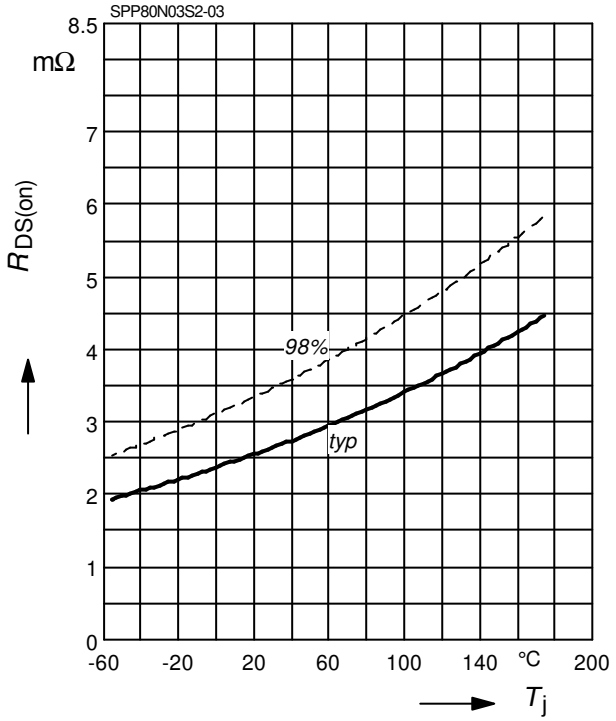
parameter: g_{fs}



9 Drain-source on-state resistance

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

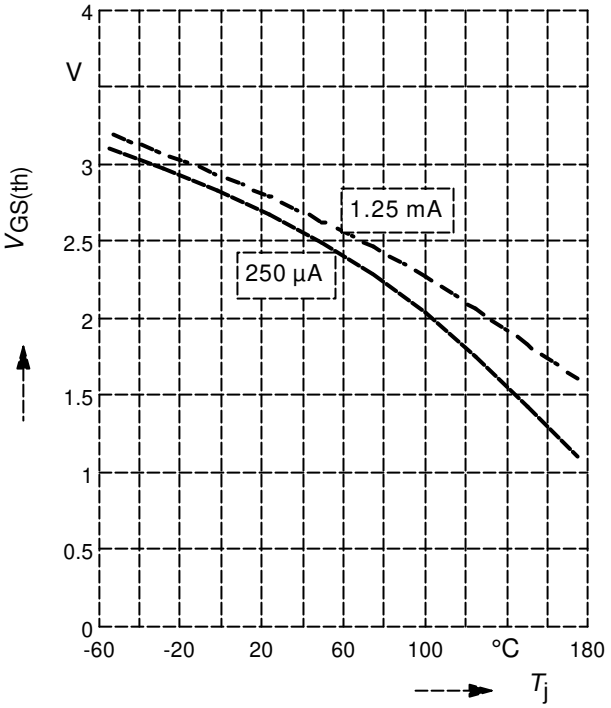
parameter : I_D = 80 A, V_{GS} = 10 V



10 Typ. gate threshold voltage

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

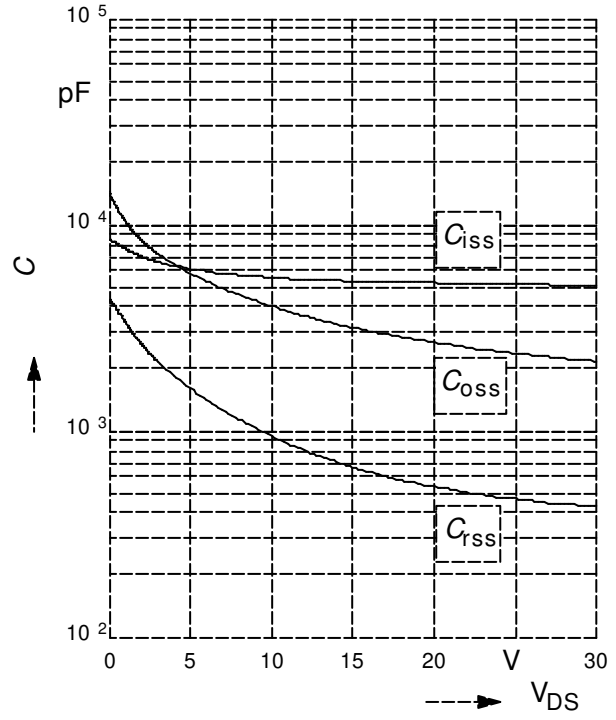
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

$C = f(V_{DS})$

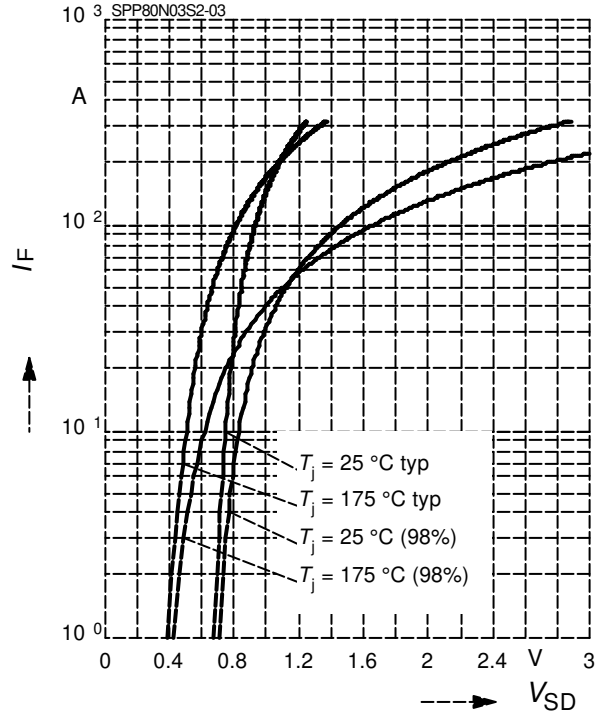
parameter: V_{GS}=0V, f=1 MHz



12 Forward character. of reverse diode

$I_F = f(V_{SD})$

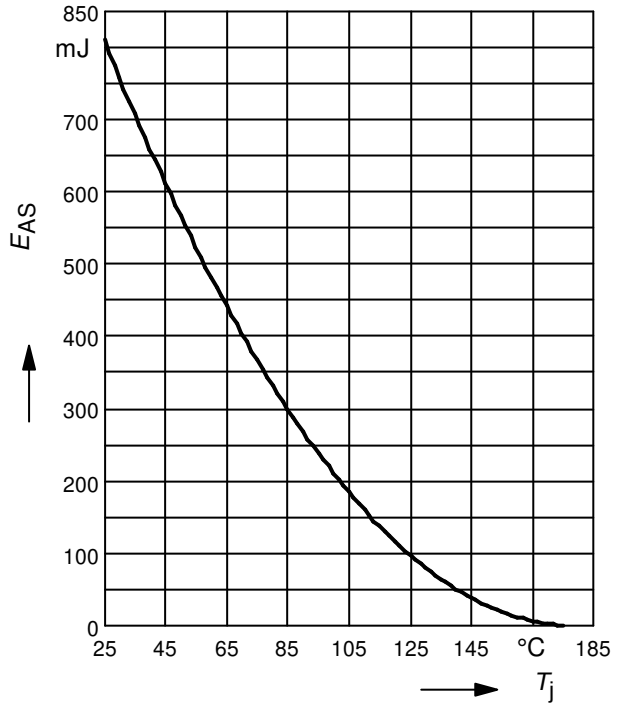
parameter: T_j , tp = 80 µs



13 Typ. avalanche energy

$E_{AS} = f(T_j)$

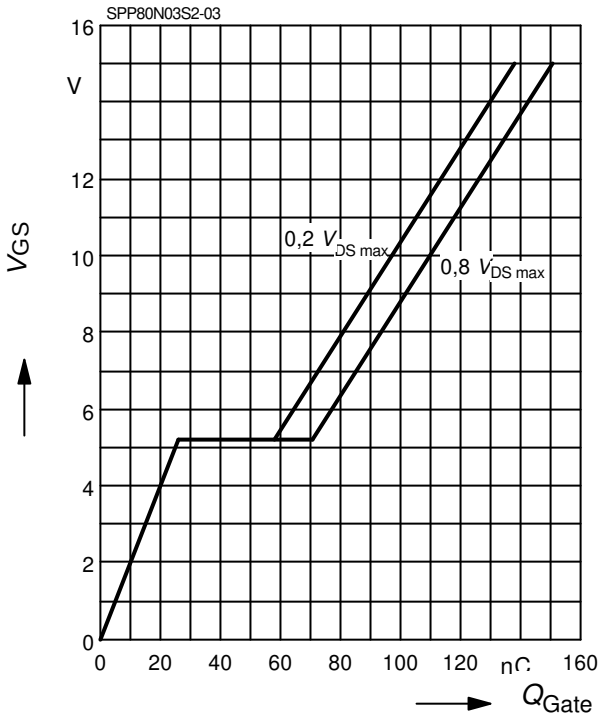
par.: $I_D = 80$ A , $V_{DD} = 25$ V, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

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

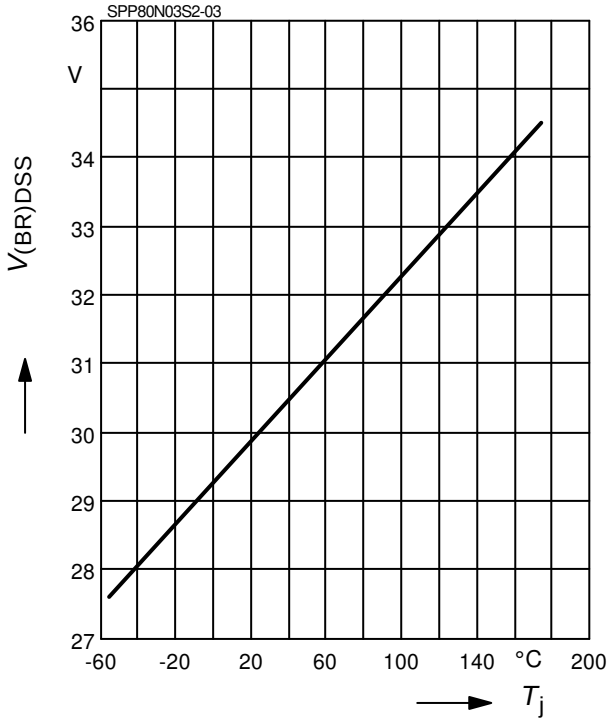
parameter: $I_D = 80$ A pulsed



15 Drain-source breakdown voltage

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

parameter: I_D=10 mA



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Further information
Please notice that the part number is BSPP80N03S2-03, BSPB80N03S2-03 and BSPI80N03S2-03, for simplicity the device is referred to by the term SPP80N03S2-03, SPB80N03S2-03 and SPI80N03S2-03 throughout this documentation