OptiMOS® Power-Transistor

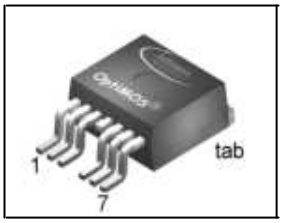
Feature

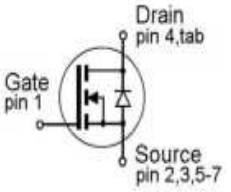
- N-Channel
- Enhancement mode
- High Current Rating
- Low On-Resistance $R_{DS(on)}$
- 175°C operating temperature
- Avalanche rated
- d*v*/d*t* rated

Product Summary

V_{DS}	40	V
$R_{DS(on)}$	2.9	mΩ
I_D	160	A

P- TO263 -7-3





Type	Package	Ordering Code	Marking
SPB160N04S2-03	P- TO263 -7-3	Q67060-S6123	P2N0403

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

Parameter	Symbol	Value	Unit
Continuous drain current[1)] T_C=25°C	I_D	 160 160	A
Pulsed drain current T_C=25°C	$I_{D\ puls}$	640	
Avalanche energy, single pulse I_D=80A, 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=160A, V_{DS}=44V, 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	

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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_{GS}=0V, I_D=1mA	$V_{(BR)DSS}$	40	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D =250µA	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS}=40V, V_{GS}=0V, T_j=25°C		-	0.01	1	
V_{DS}=40V, V_{GS}=0V, T_j=125°C2)		-	1	100	
Gate-source leakage current V_{GS}=20V, V_{DS}=0V	I_{GSS}	-	1	100	nA
Drain-source on-state resistance V_{GS}=10V, I_D=80A	$R_{DS(on)}$	-	2.3	2.9	mΩ

1Current limited by bondwire ; with an R_{thJC} = 0.5K/W the chip is able to carry I_D= 235A 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 6cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

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Electrical Characteristics

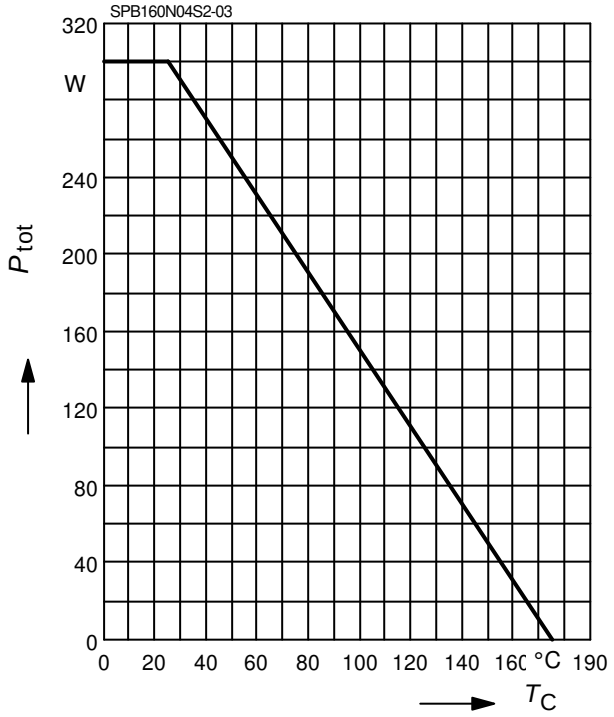
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	g_{fs}	$V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D=160A	90	180	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	5500	7320	pF
Output capacitance	C_{oss}		-	1900	2530	
Reverse transfer capacitance	C_{rss}		-	500	750	
Turn-on delay time	$t_{d(on)}$	V_{DD}=20V, V_{GS}=10V, I_D=160A, R_G=2.2Ω	-	21	32	ns
Rise time	t_r		-	50	75	
Turn-off delay time	$t_{d(off)}$		-	61	92	
Fall time	t_f		-	40	60	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=32V, I_D=160A	-	25	30	nC
Gate to drain charge	Q_{gd}		-	50	75	
Gate charge total	Q_g	V_{DD}=32V, I_D=160A, V_{GS}=0 to 10V	-	135	170	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=32V, I_D=160A	-	5.3	-	V
Reverse Diode						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	160	A
Inv. diode direct current, pulsed	I_{SM}		-	-	640	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=80A	-	0.9	1.3	V
Reverse recovery time	t_{rr}	V_R=20V, I_F=I_S, di_F/dt=100A/µs	-	60	75	ns
Reverse recovery charge	Q_{rr}		-	100	125	nC

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1 Power dissipation

$P_{tot} = f(T_C)$

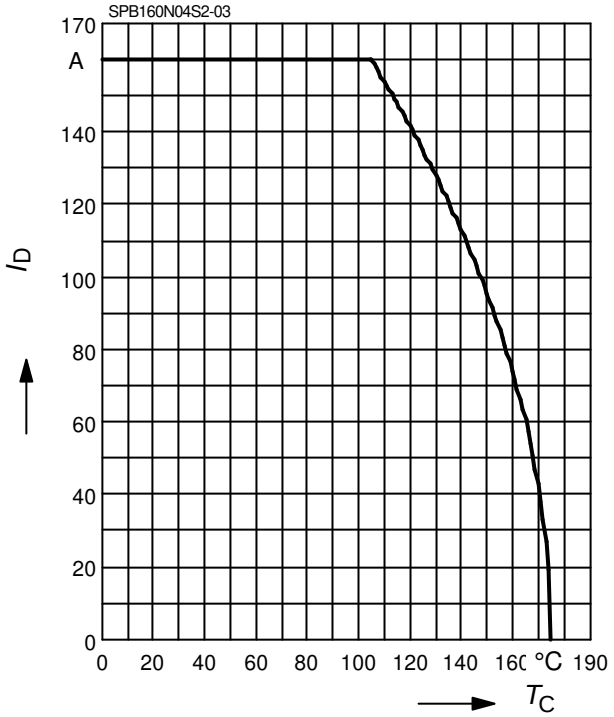
parameter: $V_{GS} \geq 6$ V



2 Drain current

$I_D = f(T_C)$

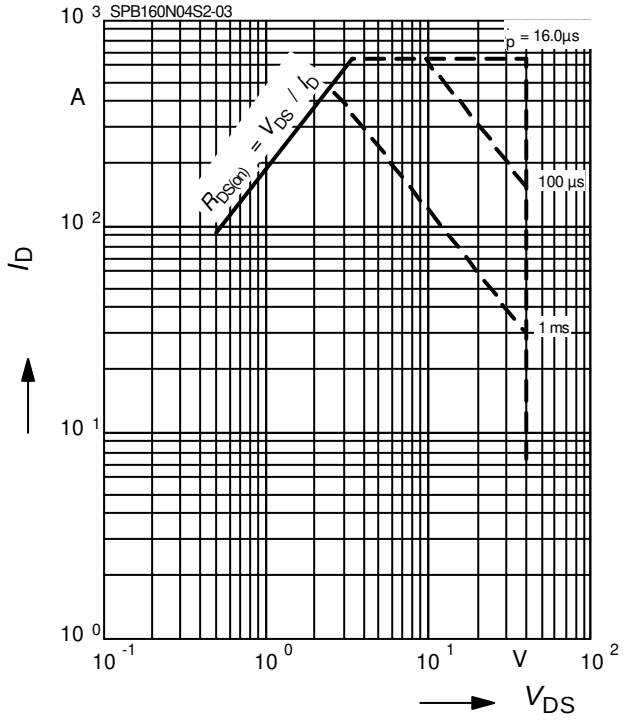
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

$I_D = f(V_{DS})$

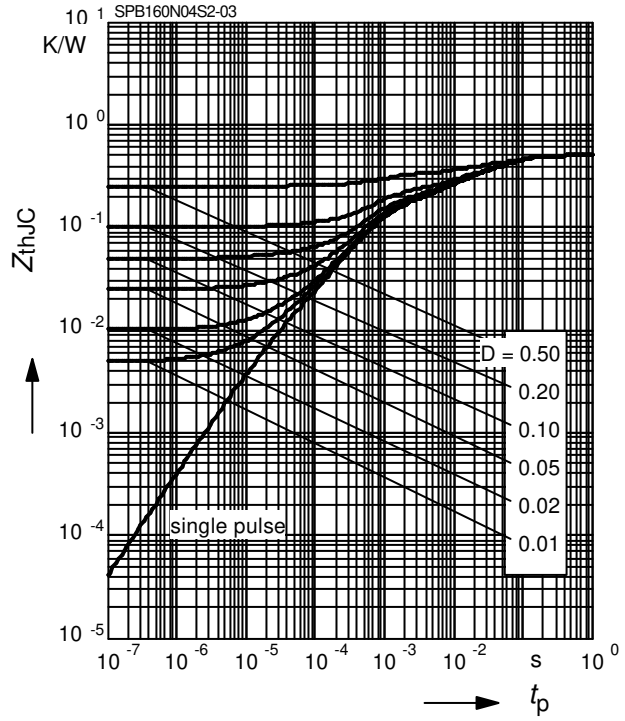
parameter : $D = 0$, $T_C = 25$ °C



4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

parameter : $D = t_p/T$

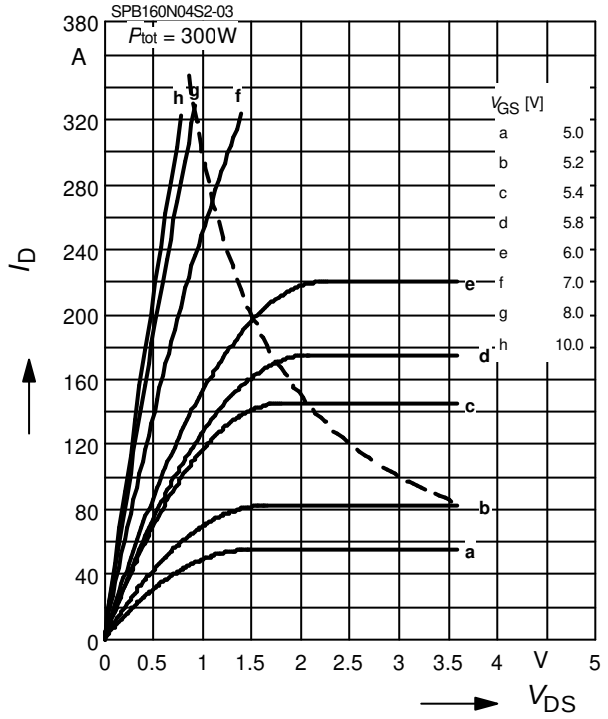


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5 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

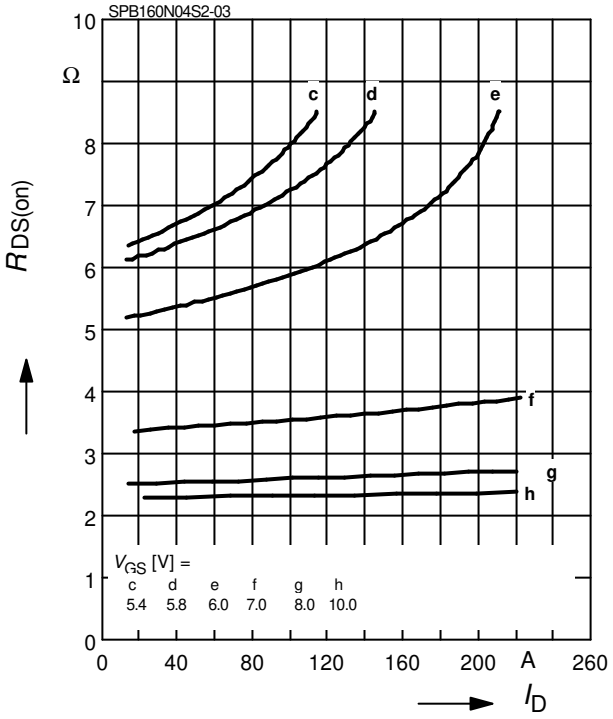
parameter: t_p = 80 µs



6 Typ. drain-source on resistance

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

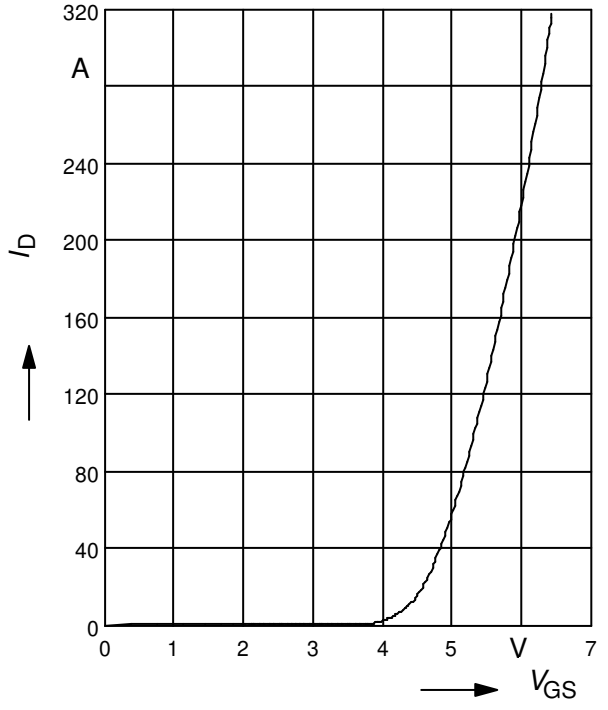
parameter: V_{GS}



7 Typ. transfer characteristics

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

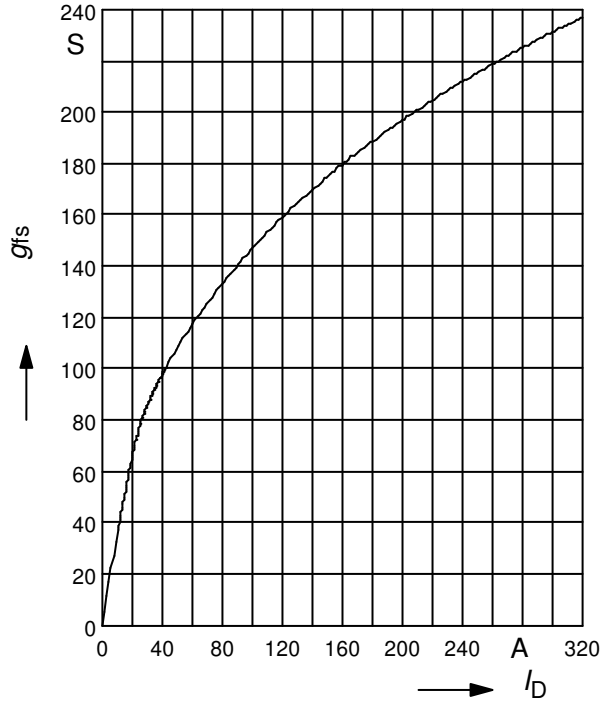
parameter: t_p = 80 µs



8 Typ. forward transconductance

$g_{fs} = f(I_D)$; T_j=25°C

parameter: g_{fs}

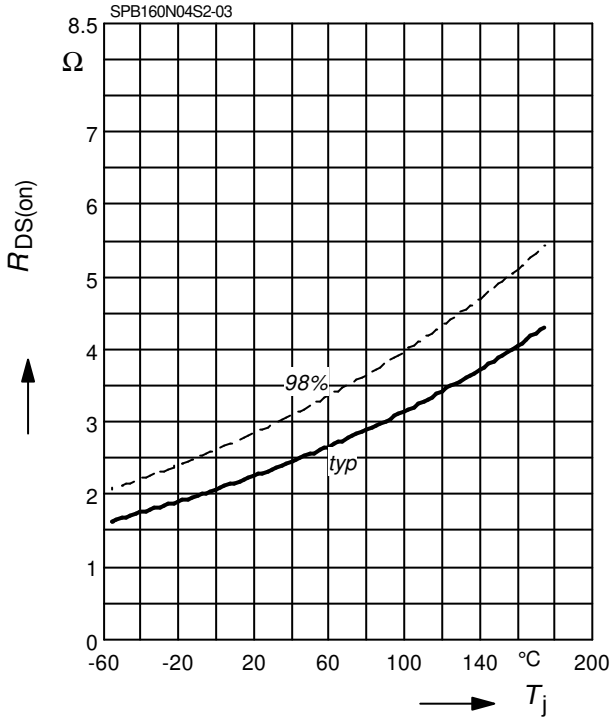


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9 Drain-source on-state resistance

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

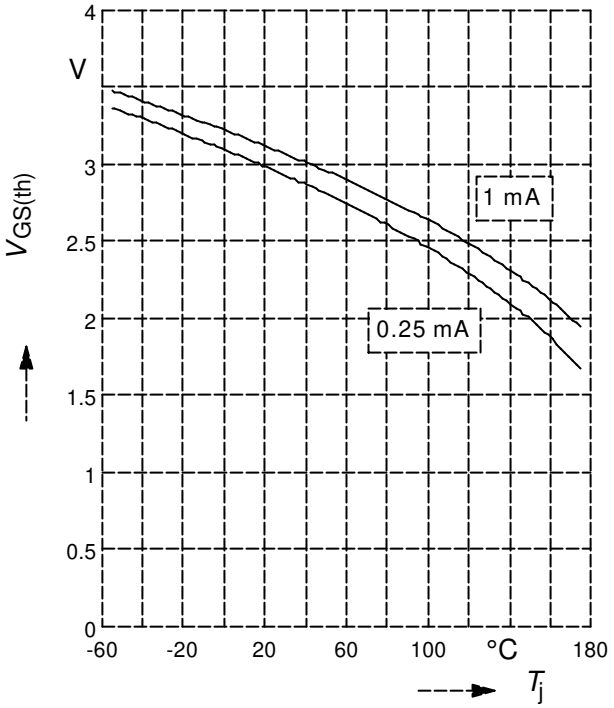
parameter : I_D = 80 A, V_{GS} = 10 V



10 Typ. gate threshold voltage

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

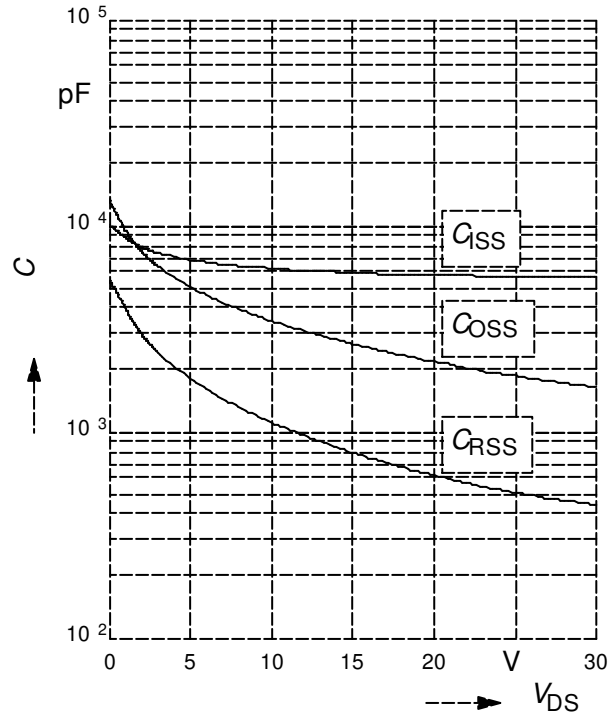
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

$C = f(V_{DS})$

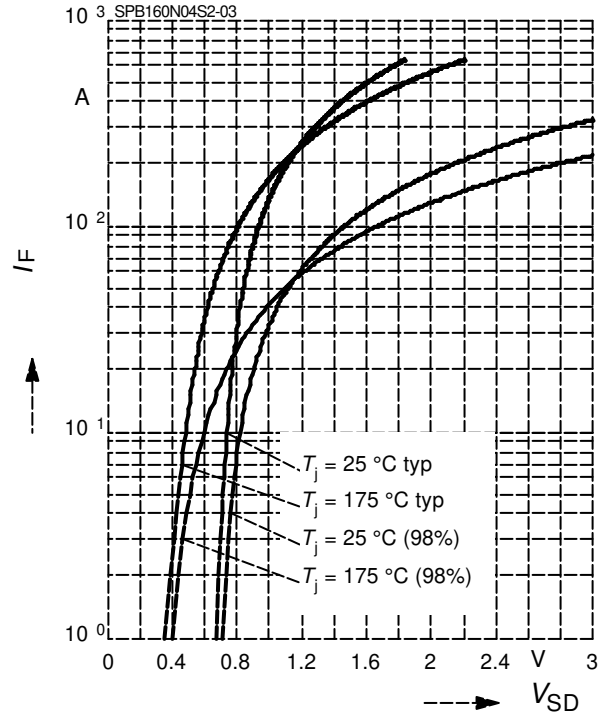
parameter: V_{GS}=0V, f=1 MHz



12 Forward character. of reverse diode

$I_F = f(V_{SD})$

parameter: T_j , tp = 80 µs

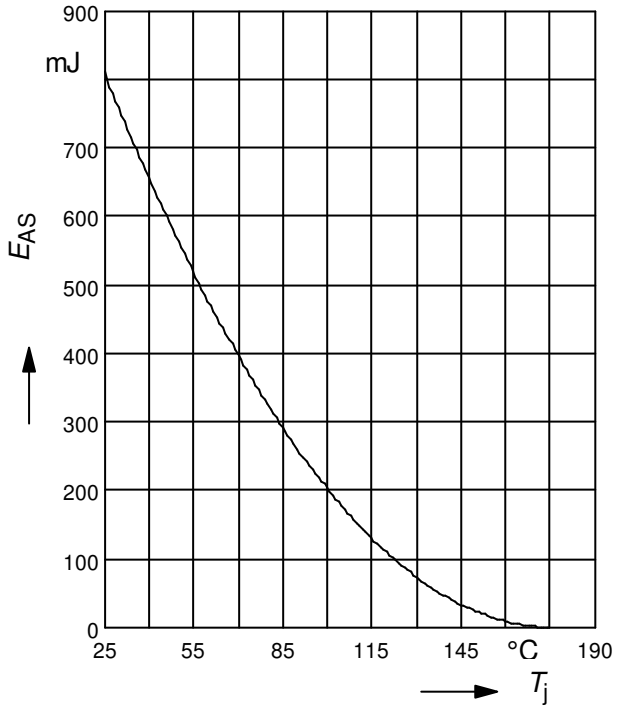


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13 Typ. avalanche energy

$E_{AS} = f(T_j)$

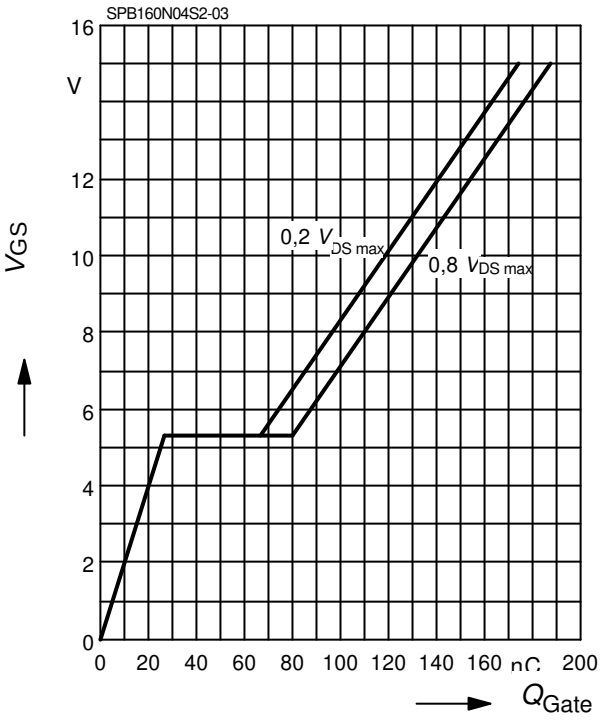
par.: $I_D = 80$ A, $V_{DD} = 25$ V, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

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

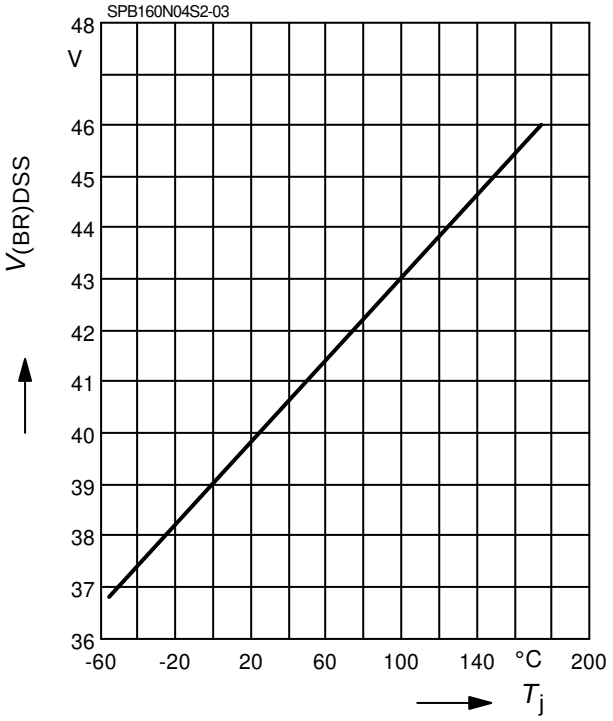
parameter: $I_D = 160$ A pulsed



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 BSPB160N04S2-03, for simplicity the device is referred to by the term SPB160N04S2-03 throughout this documentation.

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