OptiMOS® Power-Transistor

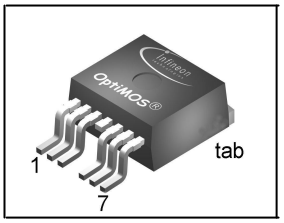
Feature

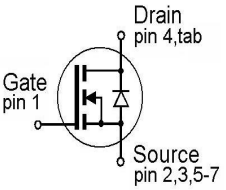
- N-Channel
- Enhancement mode
- High Current Rating
- Low On-Resistance $R_{DS(on)}$
- 175°C operating temperature
- Avalanche rated
- d*v*/d*t* rated

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	

Downloaded from Arrow.com.

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 cm^2 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°C [2]		-	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

[1] Current 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*

[2] Defined by design. Not subject to production test.

[3] Device 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.

Downloaded from Arrow.com.

Electrical Characteristics

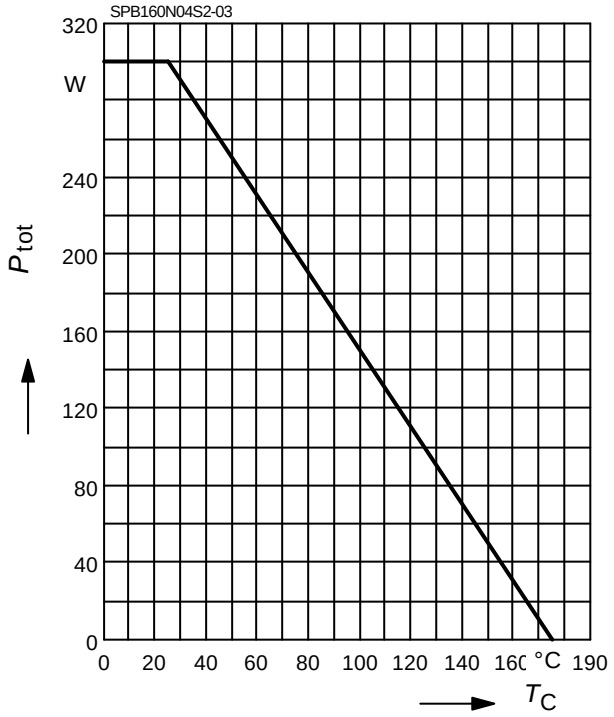
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	g_{fs}	$V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D=160A	90	180	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	5500	7320	pF
Output capacitance	C_{oss}		-	1900	2530	
Reverse transfer capacitance	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

Downloaded from Arrow.com.

1 Power dissipation

$P_{tot} = f(T_C)$

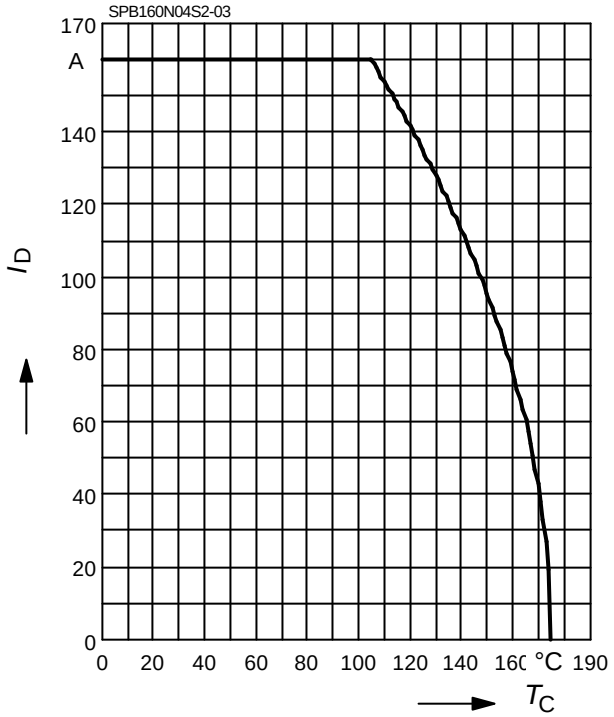
parameter: $V_{GS} \geq 6$ V



2 Drain current

$I_D = f(T_C)$

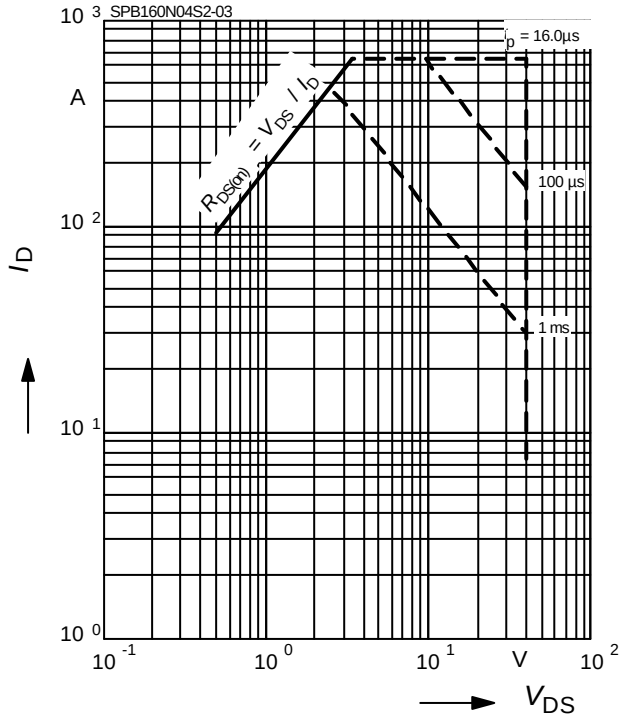
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

$I_D = f(V_{DS})$

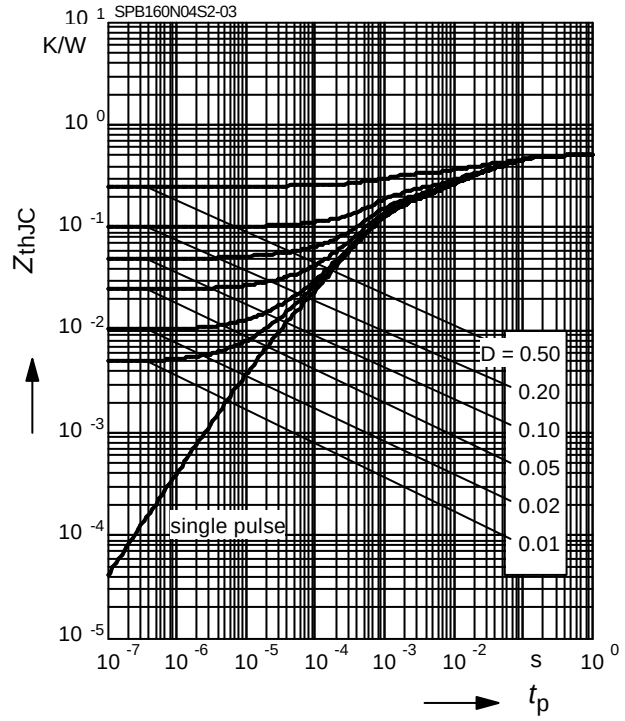
parameter : $D = 0$, $T_C = 25$ °C



4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

parameter : $D = t_p/T$

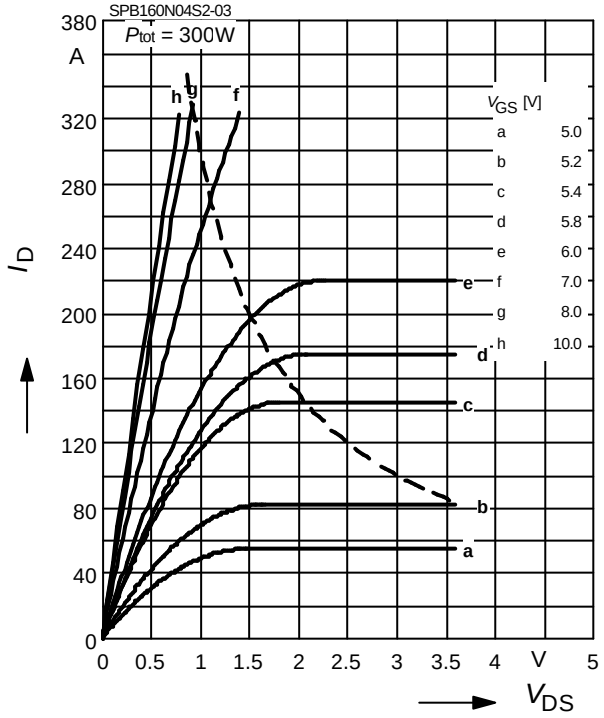


Downloaded from Arrow.com.

5 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

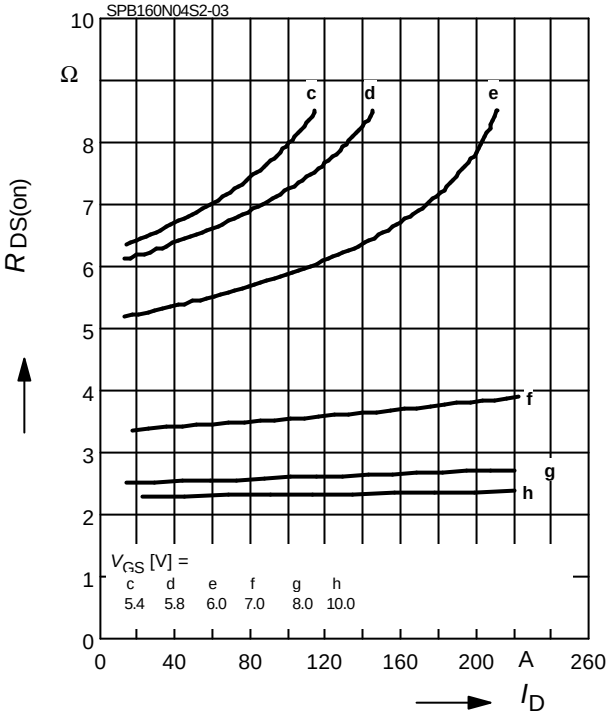
parameter: t_p = 80 µs



6 Typ. drain-source on resistance

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

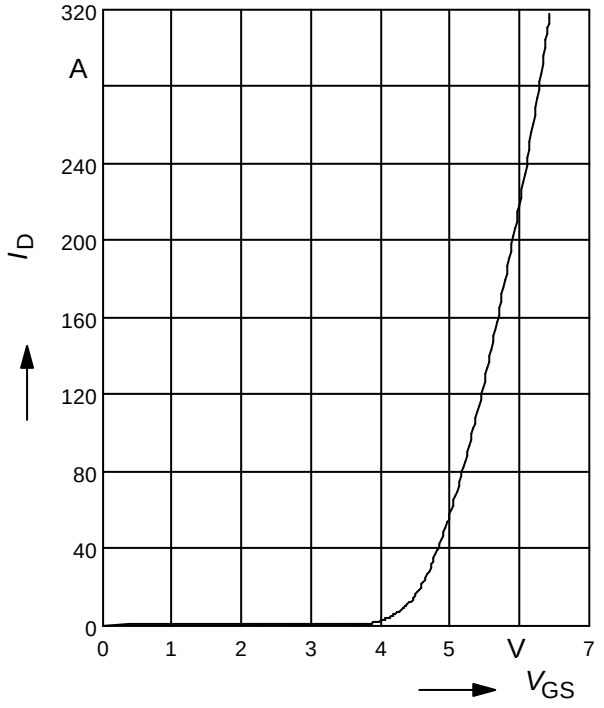
parameter: V_{GS}



7 Typ. transfer characteristics

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

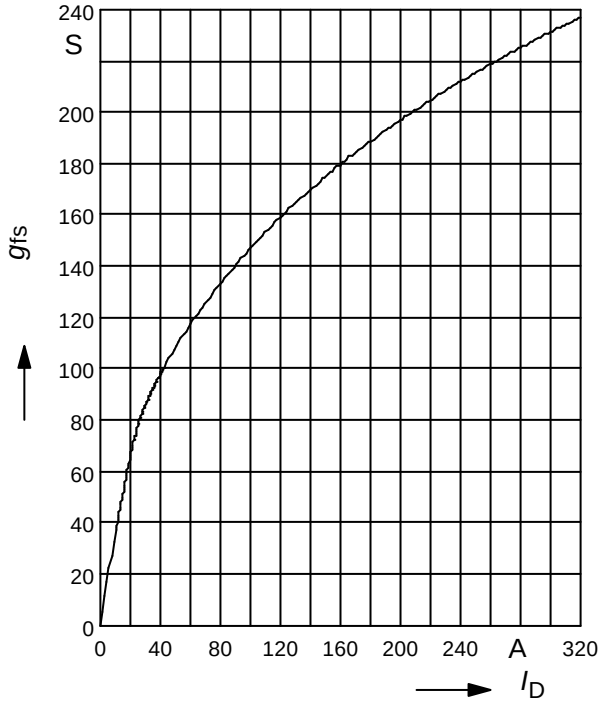
parameter: t_p = 80 µs



8 Typ. forward transconductance

$g_{fs} = f(I_D)$; T_j=25°C

parameter: g_{fs}

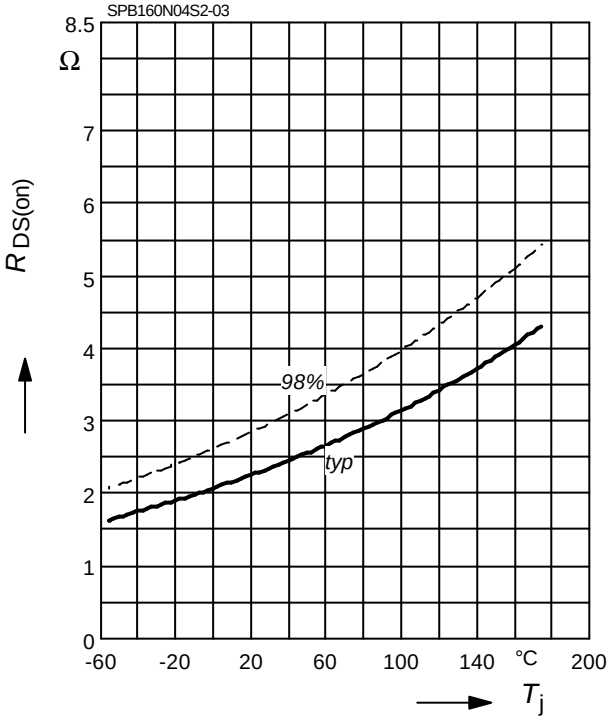


Downloaded from Arrow.com.

9 Drain-source on-state resistance

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

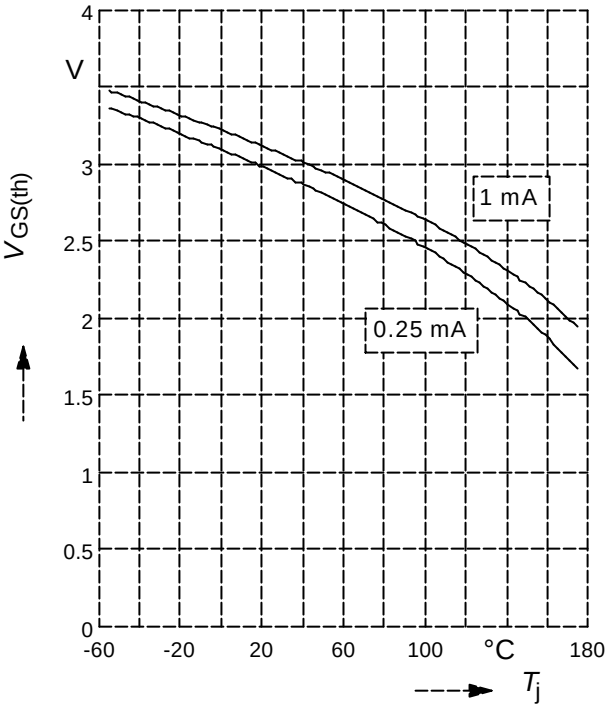
parameter : I_D = 80 A, V_{GS} = 10 V



10 Typ. gate threshold voltage

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

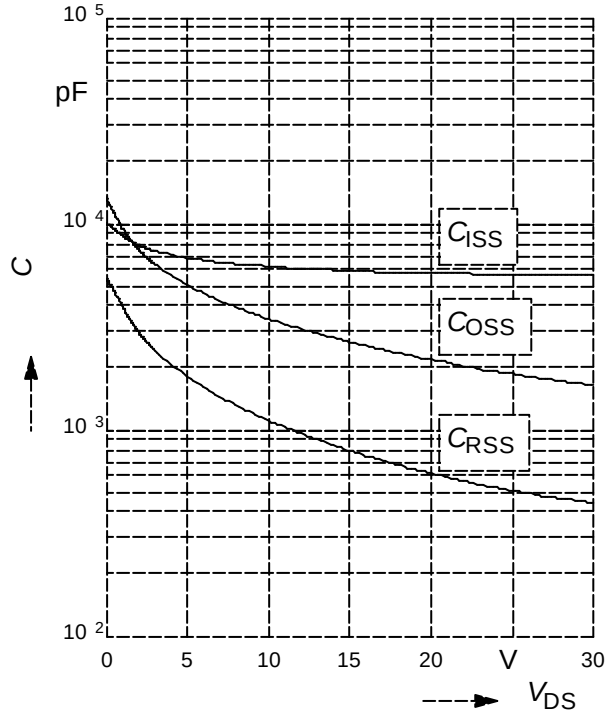
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

$C = f(V_{DS})$

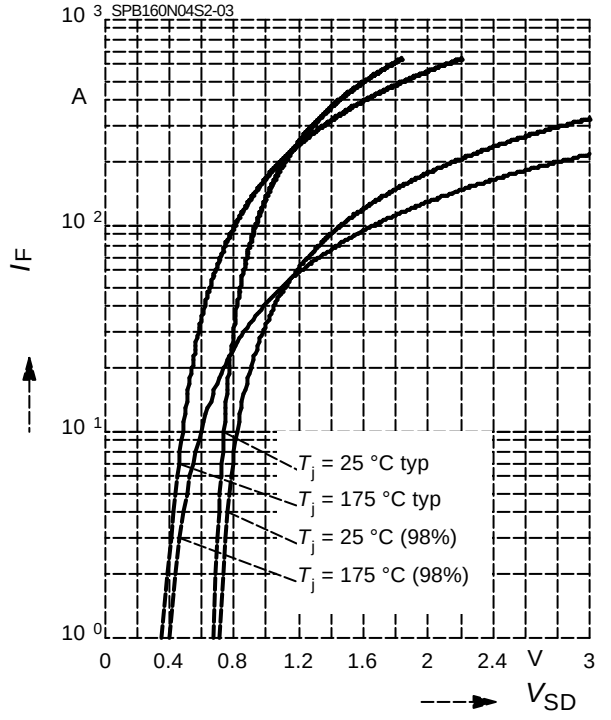
parameter: V_{GS}=0V, f=1 MHz



12 Forward character. of reverse diode

$I_F = f(V_{SD})$

parameter: T_j , tp = 80 µs

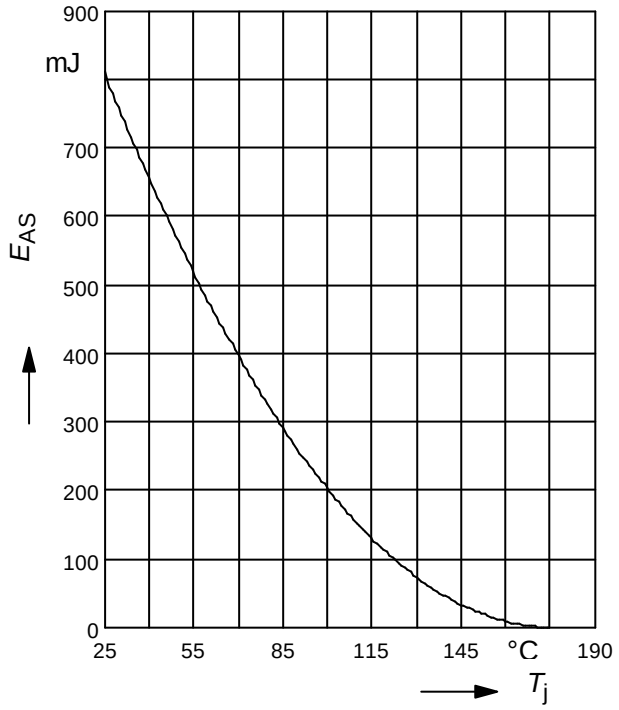


Downloaded from Arrow.com.

13 Typ. avalanche energy

$E_{AS} = f(T_j)$

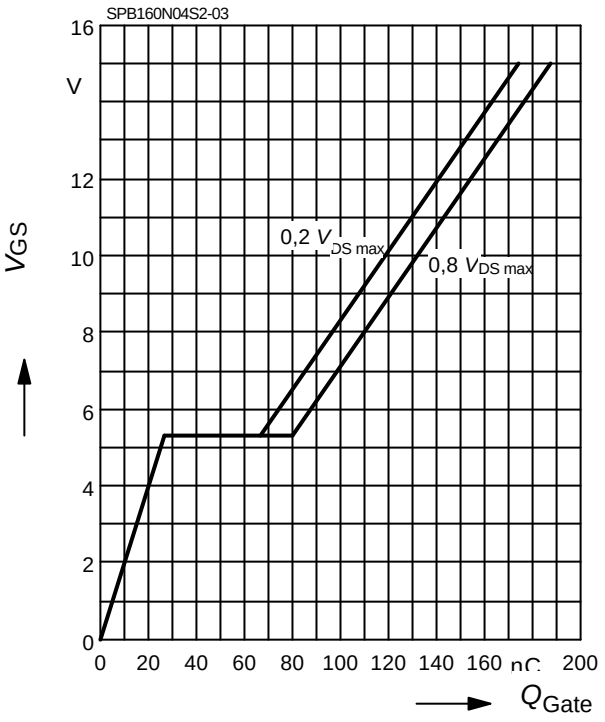
par.: $I_D = 80$ A, $V_{DD} = 25$ V, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

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

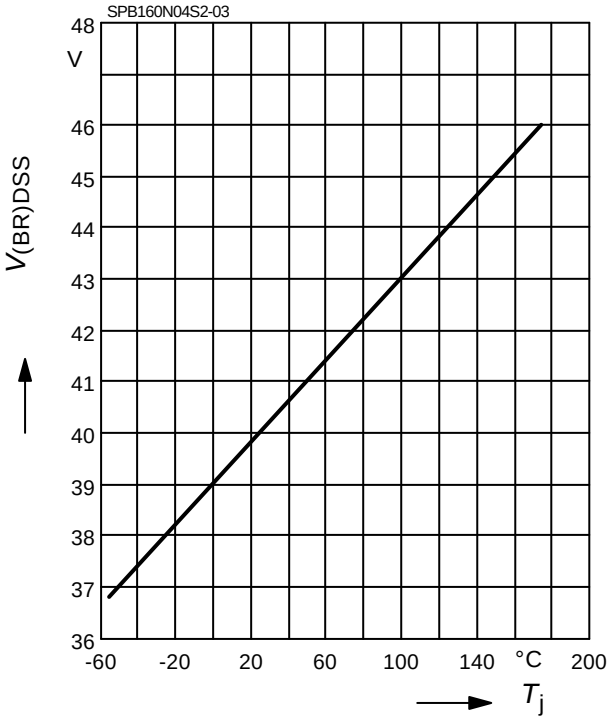
parameter: $I_D = 160$ A pulsed



15 Drain-source breakdown voltage

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

parameter: I_D=10 mA



Downloaded from Arrow.com.

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

Downloaded from Arrow.com.