

## OptiMOS<sup>â</sup> Power-Transistor

### Feature

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

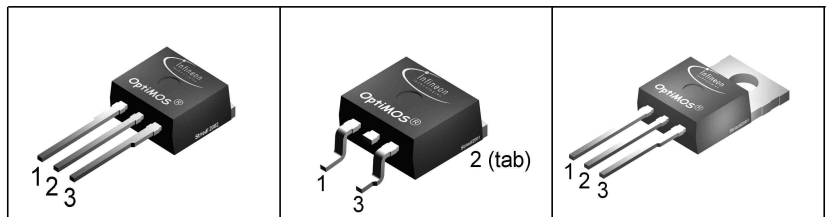
### Product Summary

$V_{DS}$	30	V
$R_{DS(on)}$	5.2	m $\Omega$
$I_D$	80	A

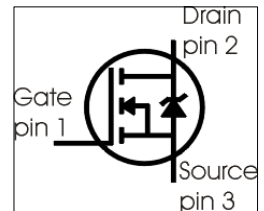
P- TO262 -3-1

P- TO263 -3-2

P- TO220 -3-1



Type	Package	Ordering Code	Marking
SPP80N03S2L-05	P- TO220 -3-1	Q67042-S4033	2N03L05
SPB80N03S2L-05	P- TO263 -3-2	Q67042-S4032	2N03L05
SPI80N03S2L-05	P- TO262 -3-1	Q67042-S4093	2N03L05



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

Parameter	Symbol	Value	Unit
Continuous drain current <sup>1)</sup> $T_C=25^\circ\text{C}$	$I_D$	80 80	A
Pulsed drain current $T_C=25^\circ\text{C}$	$I_{D\text{ puls}}$	320	
Avalanche energy, single pulse $I_D=80\text{ A}$ , $V_{DD}=25\text{V}$ , $R_{GS}=25\Omega$	$E_{AS}$	325	mJ
Repetitive avalanche energy, limited by $T_{jmax}$ <sup>2)</sup>	$E_{AR}$	16	
Reverse diode $dv/dt$ $I_S=80\text{A}$ , $V_{DS}=24\text{V}$ , $di/dt=200\text{A}/\mu\text{s}$ , $T_{jmax}=175^\circ\text{C}$	$dv/dt$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C=25^\circ\text{C}$	$P_{tot}$	167	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/175/56	

### Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	0.6	0.9	K/W
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	62	
@ 6 cm <sup>2</sup> cooling area <sup>3)</sup>		-	-	40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain-source breakdown voltage $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=110\mu A$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS}=30V, V_{GS}=0V, T_j=25^\circ\text{C}$ $V_{DS}=30V, V_{GS}=0V, T_j=125^\circ\text{C}$	$I_{DSS}$	-	0.01	1	$\mu A$
		-	10	100	
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	$I_{GSS}$	-	1	100	nA
Drain-source on-state resistance $V_{GS}=4.5V, I_D=55A$ $V_{GS}=4.5V, I_D=55A, \text{SMD version}$	$R_{DS(on)}$	-	5.6	7.5	m $\Omega$
		-	5.2	7.2	
Drain-source on-state resistance <sup>4)</sup> $V_{GS}=10V, I_D=55A$ $V_{GS}=10V, I_D=55A, \text{SMD version}$	$R_{DS(on)}$	-	4	5.2	
		-	3.7	4.9	

<sup>1</sup>Current limited by bondwire ; with an  $R_{thJC} = 0.9K/W$  the chip is able to carry  $I_D= 139A$  at  $25^\circ\text{C}$ , for detailed information see app.-note ANPS071E available at [www.infineon.com/optimos](http://www.infineon.com/optimos)

<sup>2</sup>Defined by design. Not subject to production test.

<sup>3</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

<sup>4</sup>Diagrams are related to straight lead versions

### Electrical Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

### Dynamic Characteristics

Transconductance	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 80A$	55	110	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0V$ , $V_{DS} = 25V$ , $f = 1MHz$	-	2500	3320	pF
Output capacitance	$C_{oss}$		-	975	1300	
Reverse transfer capacitance	$C_{rss}$		-	215	325	
Gate resistance	$R_G$		-	1.75	-	$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15V$ , $V_{GS} = 10V$ , $I_D = 20A$ , $R_G = 2.7\Omega$	-	10	15	ns
Rise time	$t_r$		-	18	27	
Turn-off delay time	$t_{d(off)}$		-	44	66	
Fall time	$t_f$		-	20	30	

### Gate Charge Characteristics

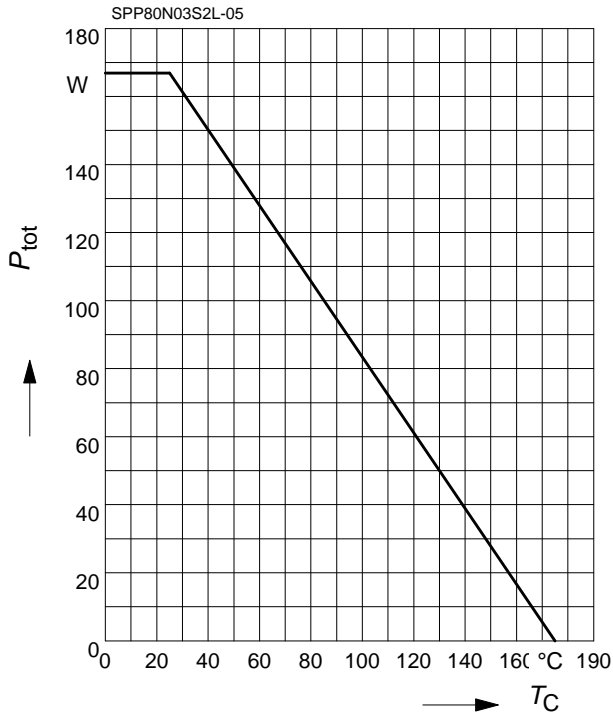
Gate to source charge	$Q_{gs}$	$V_{DD} = 24V$ , $I_D = 40A$	-	7.9	10.5	nC
Gate to drain charge	$Q_{gd}$		-	23.3	35	
Gate charge total	$Q_g$	$V_{DD} = 24V$ , $I_D = 40A$ , $V_{GS} = 0$ to $10V$	-	67.5	89.7	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 24V$ , $I_D = 40A$	-	3.2	-	V

### Reverse Diode

Inverse diode continuous forward current	$I_S$	$T_C = 25^\circ C$	-	-	80	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	320	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0V$ , $I_F = 80A$	-	0.95	1.26	V
Reverse recovery time	$t_{rr}$	$V_R = 15V$ , $I_F = I_S$ , $di_F/dt = 100A/\mu s$	-	46.5	58.1	ns
Reverse recovery charge	$Q_{rr}$		-	55.5	69.4	nC

### 1 Power dissipation

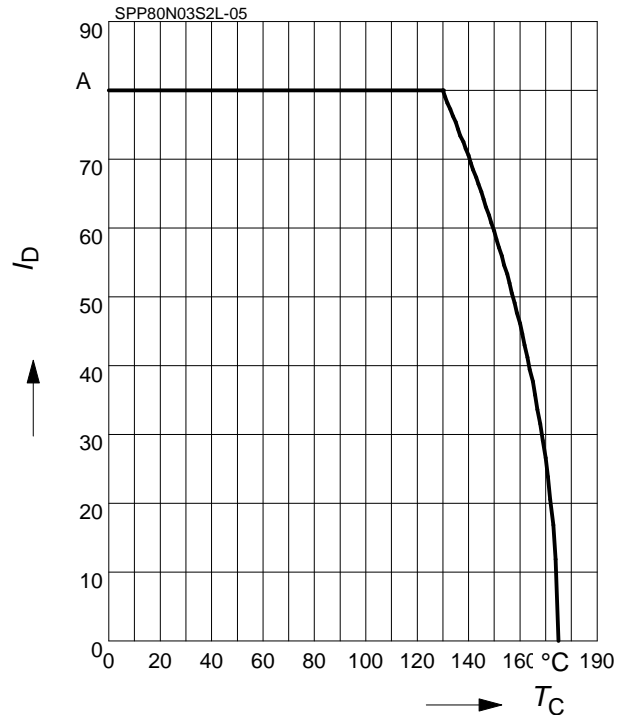
$$P_{tot} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

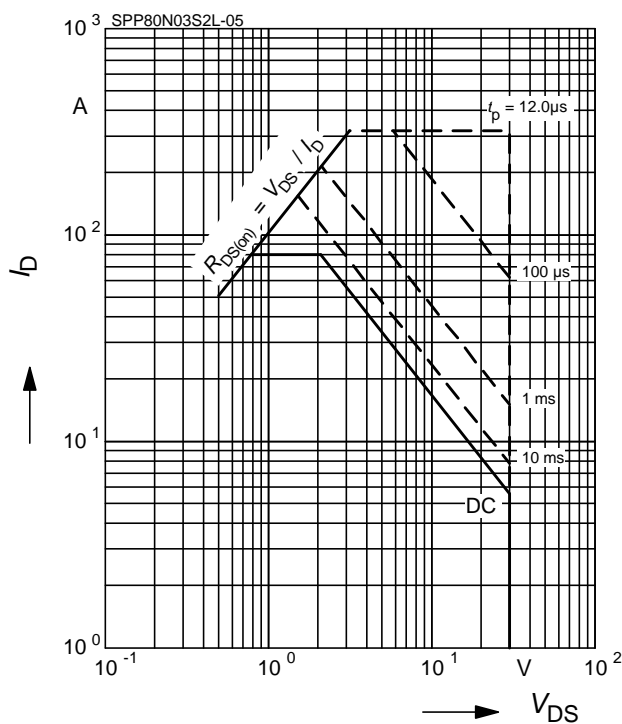
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

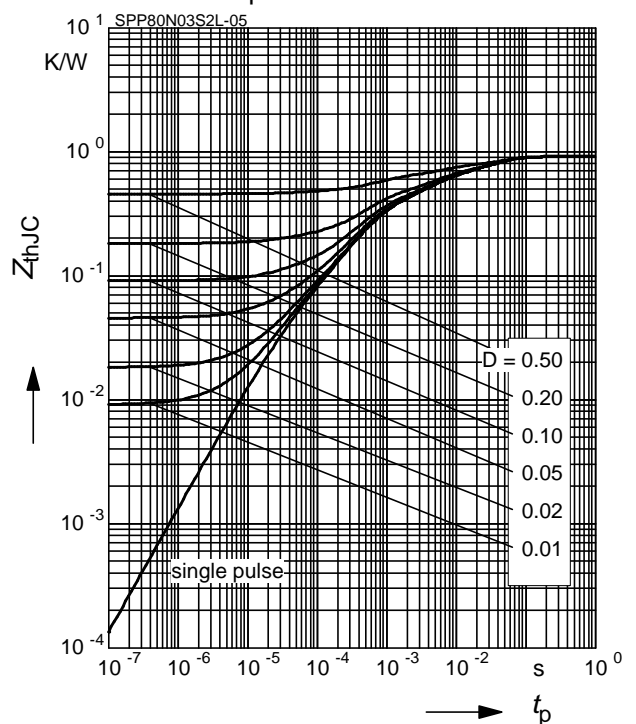
parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$



### 4 Max. transient thermal impedance

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

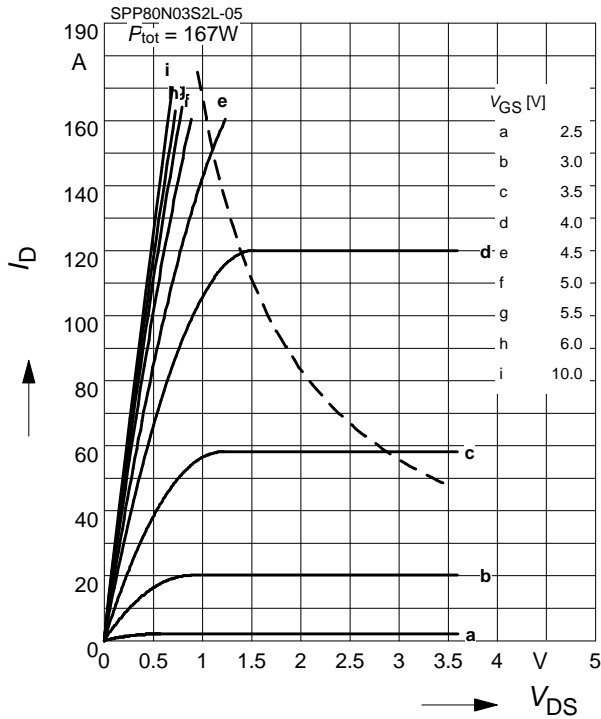
parameter:  $D = t_p/T$



### 5 Typ. output characteristic

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

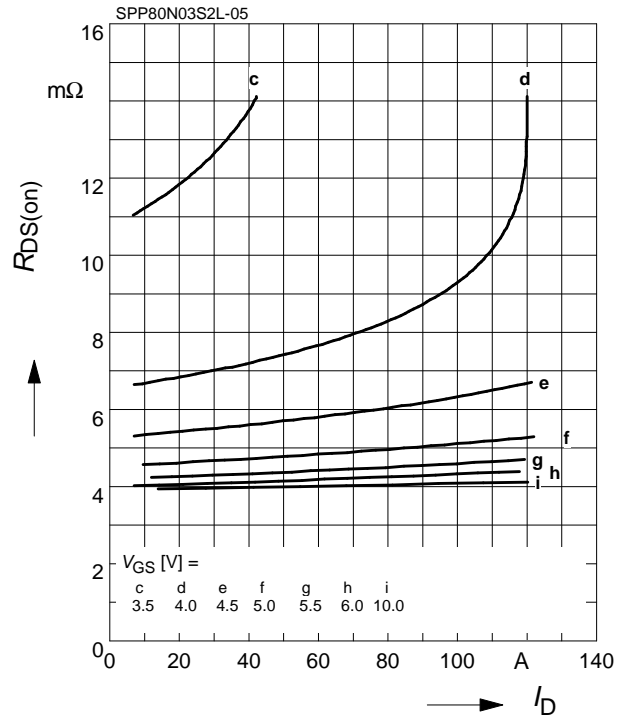
parameter:  $t_p = 80 \mu\text{s}$



### 6 Typ. drain-source on resistance

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

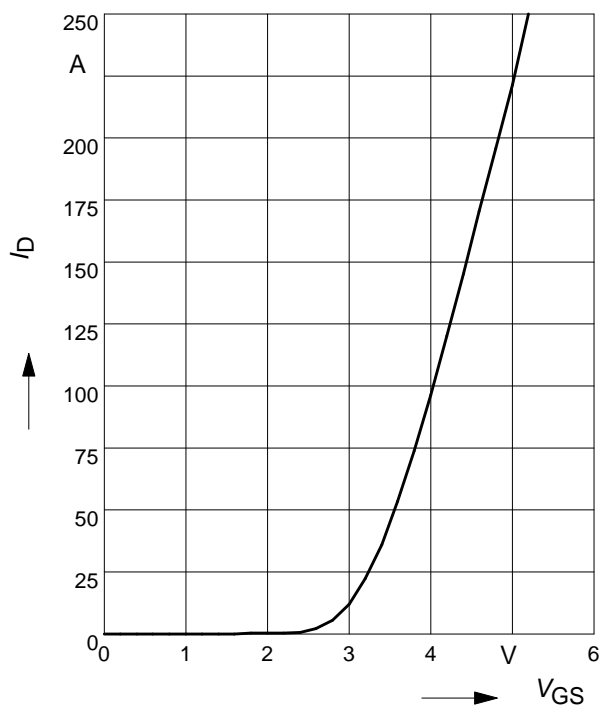
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

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

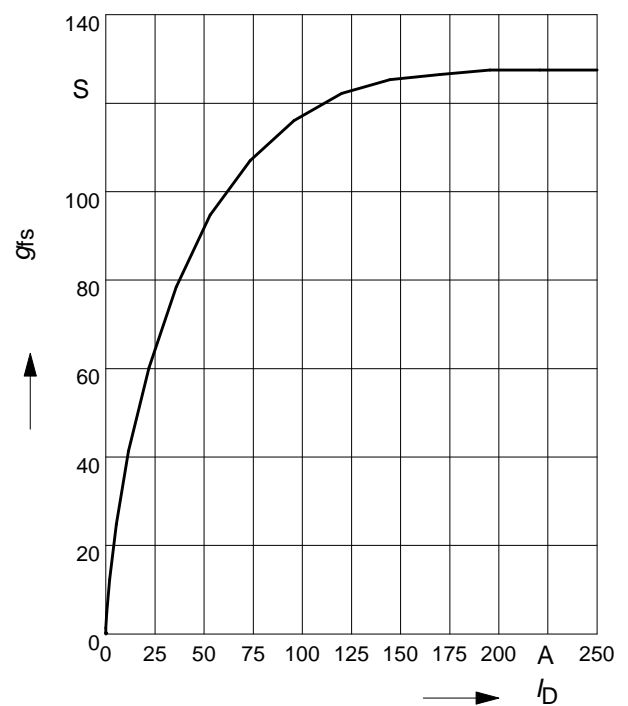
parameter:  $t_p = 80 \mu\text{s}$



### 8 Typ. forward transconductance

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

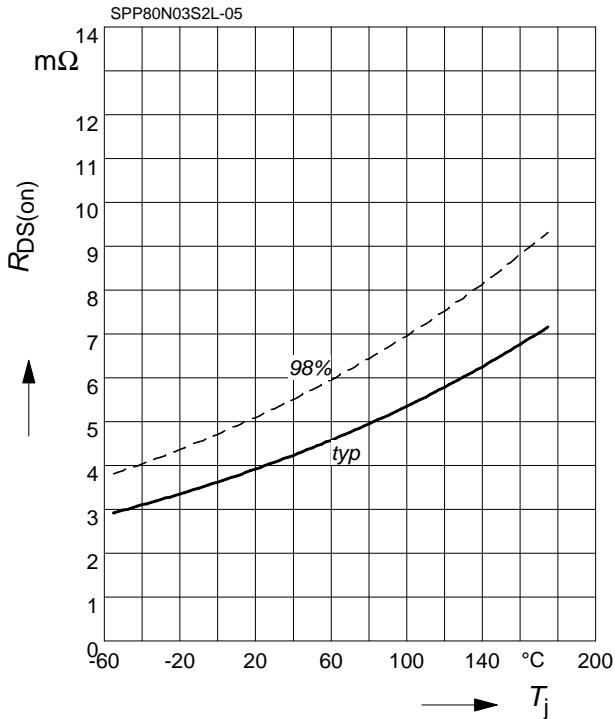
parameter:  $g_{fs}$



### 9 Drain-source on-state resistance

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

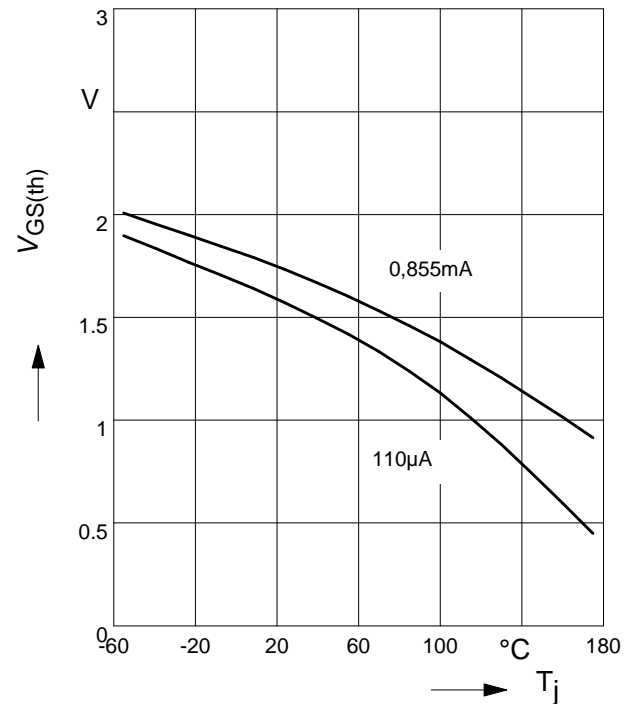
parameter:  $I_D = 55\text{ A}$ ,  $V_{GS} = 10\text{ V}$



### 10 Typ. gate threshold voltage

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

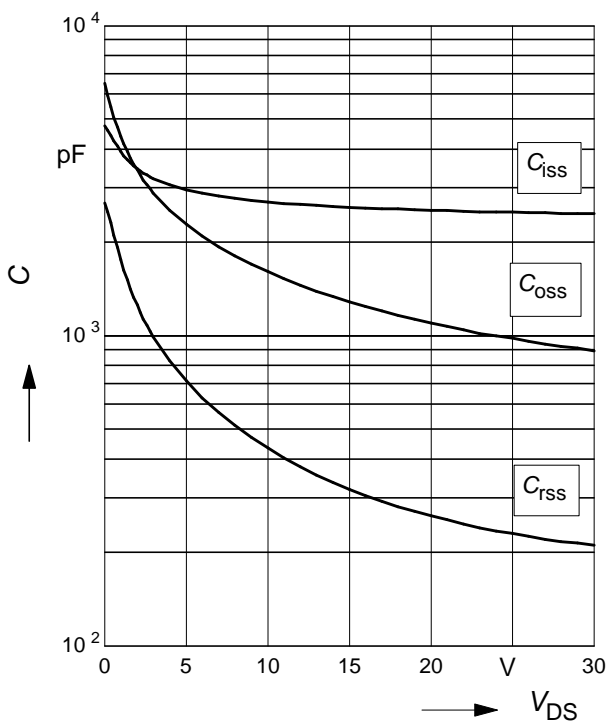
parameter:  $V_{GS} = V_{DS}$



### 11 Typ. capacitances

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

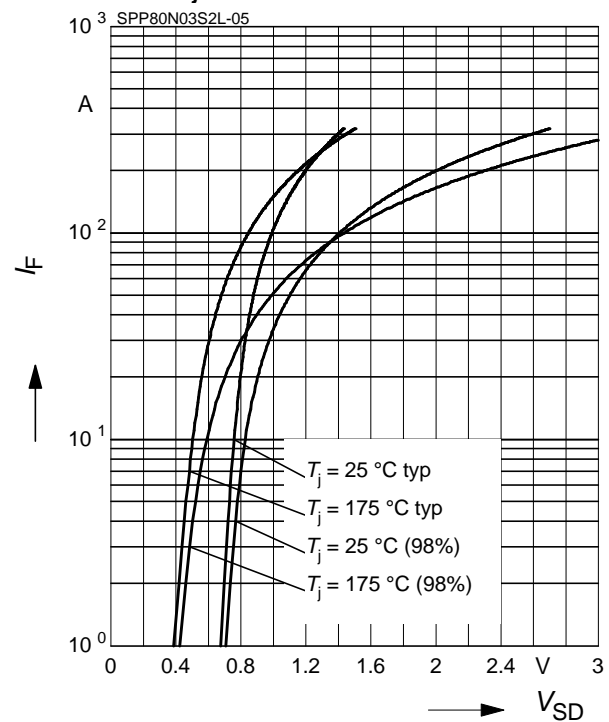
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



### 12 Forward character. of reverse diode

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

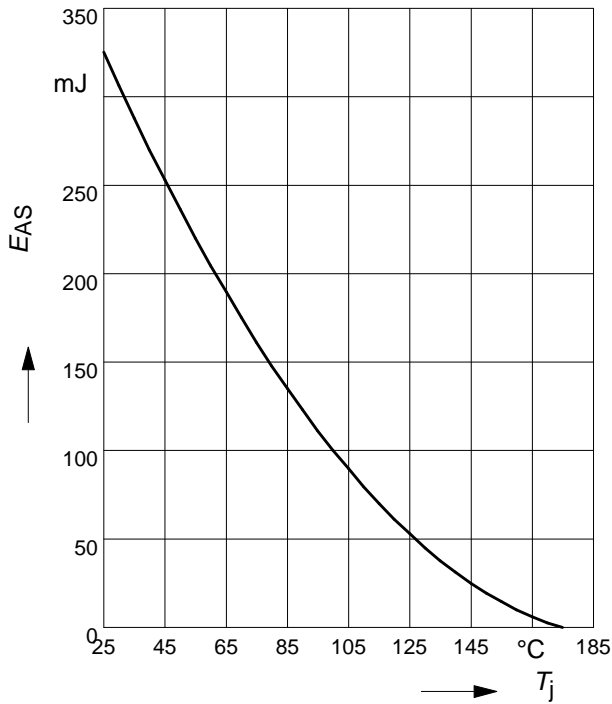
parameter:  $T_j$ ,  $t_p = 80\text{ μs}$



### 13 Typ. avalanche energy

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

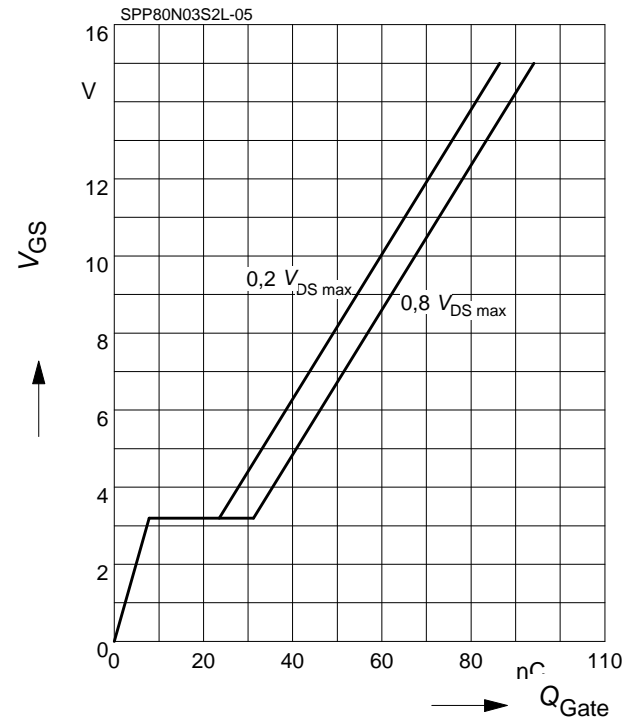
par.:  $I_D = 80 \text{ A}$  ,  $V_{DD} = 25 \text{ V}$ ,  $R_{GS} = 25 \Omega$



### 14 Typ. gate charge

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

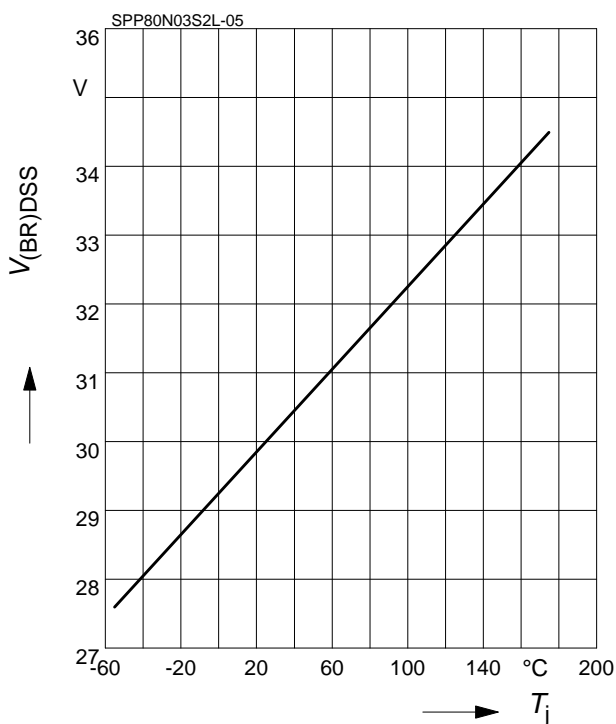
parameter:  $I_D = 40 \text{ A}$  pulsed



### 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 BSPP80N03S2L-05, BSPB80N03S2L-05 and BSPI80N03S2L-05, for simplicity the device is referred to by the term SPP80N03S2L-05, SPB80N03S2L-05 and SPI80N03S2L-05 throughout this documentation