

## OptiMOS™ Power-Transistor

### Feature

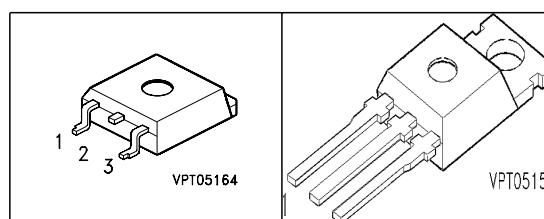
- N-Channel
- Enhancement mode
- Logic Level
- Excellent Gate Charge x  $R_{DS(on)}$  product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- $dv/dt$  rated

### Product Summary

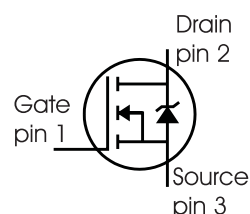
$V_{DS}$	30	V
$R_{DS(on)}$ max. SMD version	2.8	mΩ
$I_D$	80	A

P-TO263-3-2

P-TO220-3-1



Type	Package	Ordering Code	Marking
SPP80N03S2L-03	P-TO220-3-1	Q67040-S4248	2N03L03
SPB80N03S2L-03	P-TO263-3-2	Q67040-S4259	2N03L03



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

Parameter	Symbol	Value	Unit
Continuous drain current	$I_D$	80	A
$T_C = 25\text{ °C}$ , 1)		80	
$T_C = 100\text{ °C}$		80	
Pulsed drain current	$I_{D\text{ puls}}$	320	
$T_C = 25\text{ °C}$			
Avalanche energy, single pulse	$E_{AS}$	810	mJ
$I_D = 80\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ Ω}$			
Reverse diode $dv/dt$	$dv/dt$	6	kV/μs
$I_S = 80\text{ A}$ , $V_{DS} = 24\text{ V}$ , $di/dt = 200\text{ A/μs}$ , $T_{j\text{ max}} = 175\text{ °C}$			
Gate source voltage	$V_{GS}$	±20	V
Power dissipation	$P_{tot}$	300	W
$T_C = 25\text{ °C}$			
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	$R_{thJC}$	-	-	0.5	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$	-	-	62	
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	62	
@ 6 cm <sup>2</sup> cooling area <sup>2)</sup>		-	-	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 $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=250\mu A$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS}=30V, V_{GS}=0V, T_j=25^{\circ}C$ $V_{DS}=30V, V_{GS}=0V, T_j=125^{\circ}C$	$I_{DSS}$	- -	0.01 1	1 100	$\mu A$
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	$I_{GSS}$	-	1	100	
Drain-source on-state resistance $V_{GS}=4.5V, I_D=80A$ $V_{GS}=4.5V, I_D=80A, SMD\ version$	$R_{DS(on)}$	- -	3.2 2.9	3.8 3.5	m $\Omega$
Drain-source on-state resistance <sup>3)</sup> $V_{GS}=10V, I_D=80A$ $V_{GS}=10V, I_D=80A, SMD\ version$	$R_{DS(on)}$	- -	2.5 2.2	3.1 2.8	

<sup>1</sup>Current limited by bondwire; with a  $R_{thJC} = 0.5 \text{ K/W}$  the chip is able to carry  $I_D = 255\text{A}$  and calculated with max. source pin temperature of  $85^\circ\text{C}$ .

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

<sup>3</sup>Diagrams are related to straight lead versions

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D=80A$	93	185	-	S
Input capacitance	$C_{iss}$	$V_{GS}=0V$ , $V_{DS}=25V$ , $f=1MHz$	-	6100	7600	pF
Output capacitance	$C_{oss}$		-	2360	2950	
Reverse transfer capacitance	$C_{rss}$		-	555	830	
Gate resistance	$R_G$		-	2.5	-	$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15V$ , $V_{GS}=10V$ , $I_D=40A$ , $R_G=1.1\Omega$	-	11.8	17.7	ns
Rise time	$t_r$		-	105	158	
Turn-off delay time	$t_{d(off)}$		-	99	148	
Fall time	$t_f$		-	90	135	

### Gate Charge Characteristics

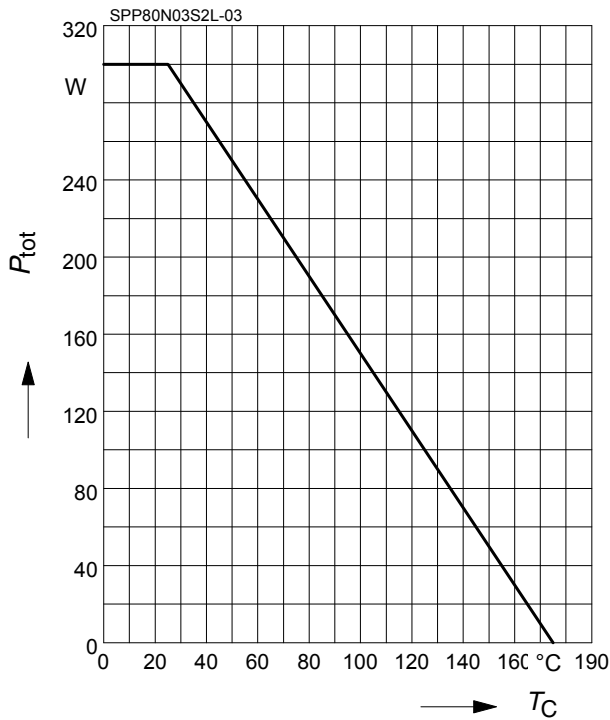
Gate to source charge	$Q_{gs}$	$V_{DD} = 24\text{V}$ , $I_D = 80\text{A}$	-	18	23	nC
Gate to drain charge	$Q_{gd}$		-	51	75	
Gate charge total	$Q_g$	$V_{DD} = 24\text{V}$ , $I_D = 80\text{A}$ , $V_{GS} = 0$ to $10\text{V}$	-	160	210	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 24\text{V}$ , $I_D = 80\text{A}$	-	2.9	-	V

### Reverse Diode

Inverse diode continuous forward current	$I_S$	$T_C = 25^\circ\text{C}$	-	-	80	A
Inverse diode direct current, pulsed	$I_{SM}$		-	-	320	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0\text{V}$ , $I_F = 80\text{A}$	-	1	1.3	V
Reverse recovery time	$t_{rr}$	$V_R = 15\text{V}$ , $I_F = I_S$ , $di_F/dt = 100\text{A}/\mu\text{s}$	-	58	72	ns
Reverse recovery charge	$Q_{rr}$		-	71	88	nC

### 1 Power dissipation

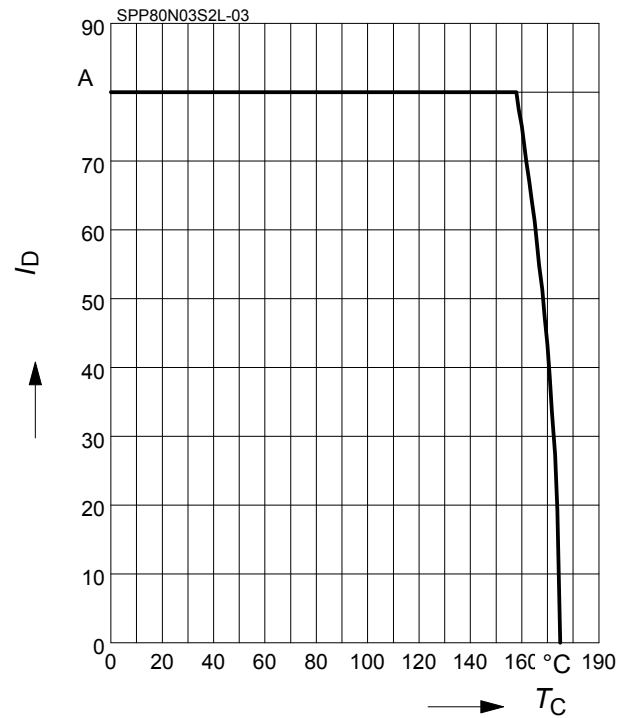
$$P_{\text{tot}} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

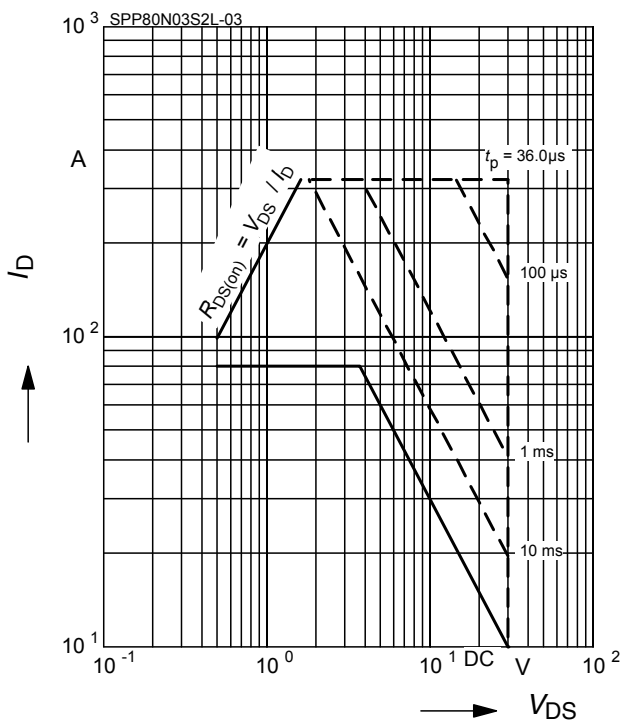
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

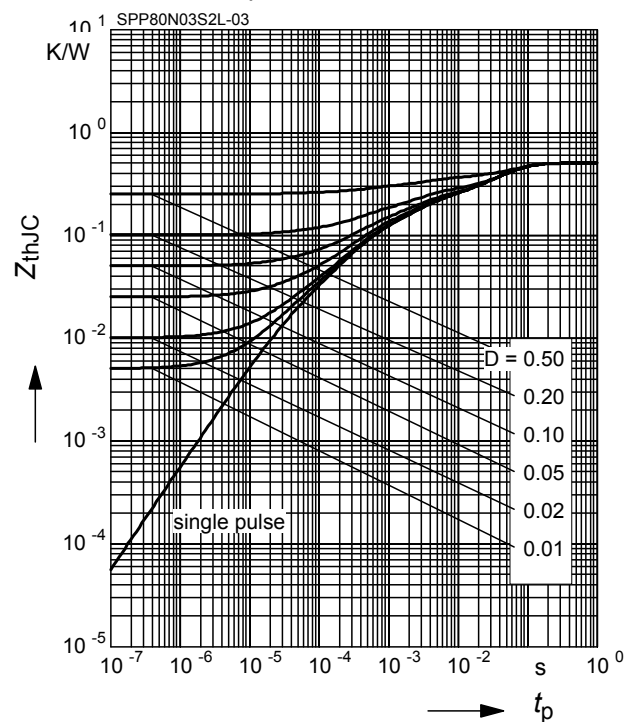
parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$



### 4 Transient thermal impedance

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

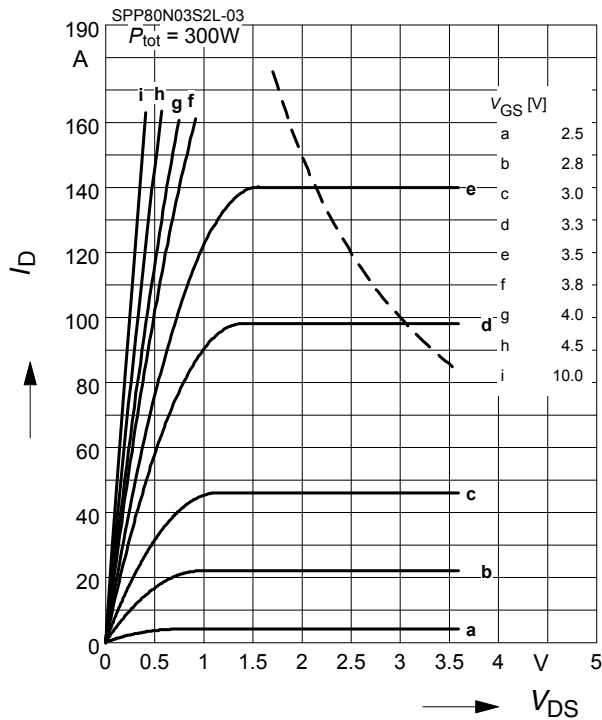
parameter:  $D = t_p/T$



### 5 Typ. output characteristic

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

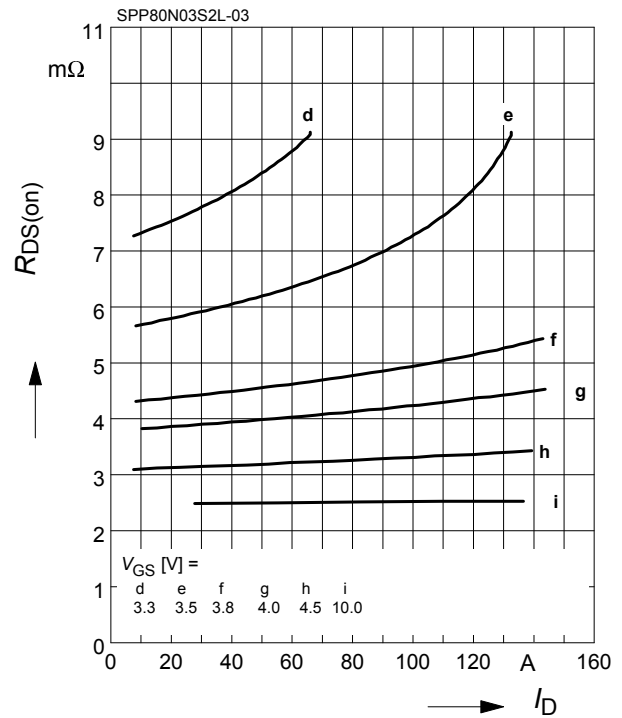
parameter:  $t_p = 80 \mu\text{s}$



### 6 Typ. drain-source on resistance

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

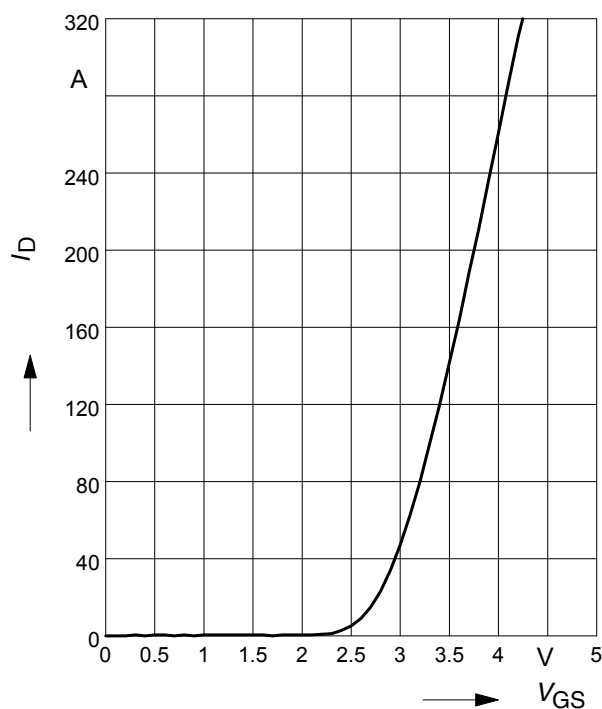
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

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

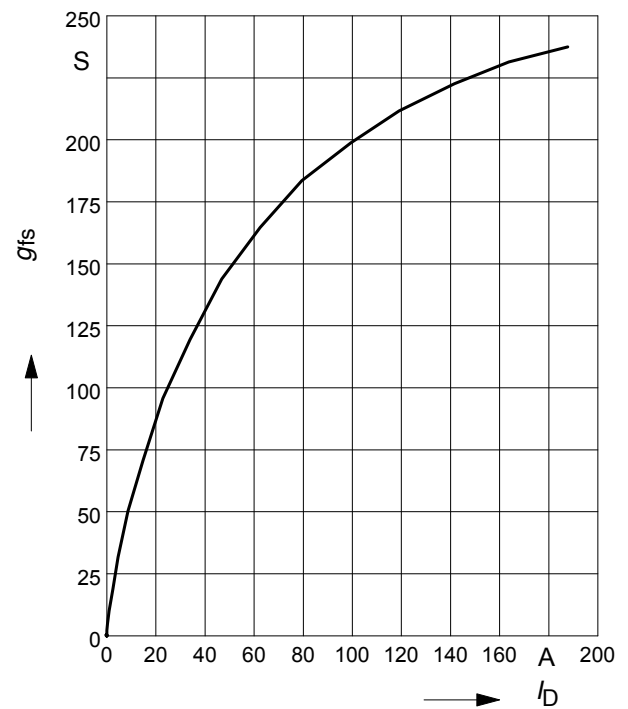
parameter:  $t_p = 80 \mu\text{s}$



### 8 Typ. forward transconductance

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

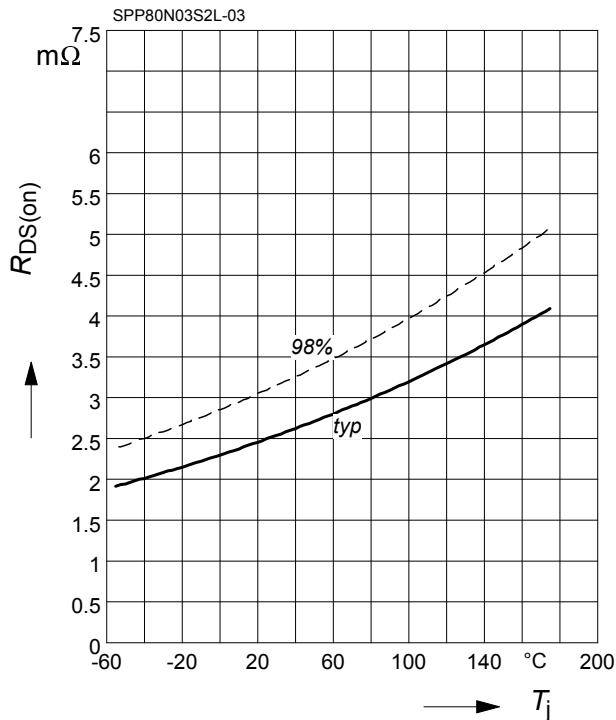
parameter:  $g_{fs}$



## 9 Drain-source on-state resistance

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

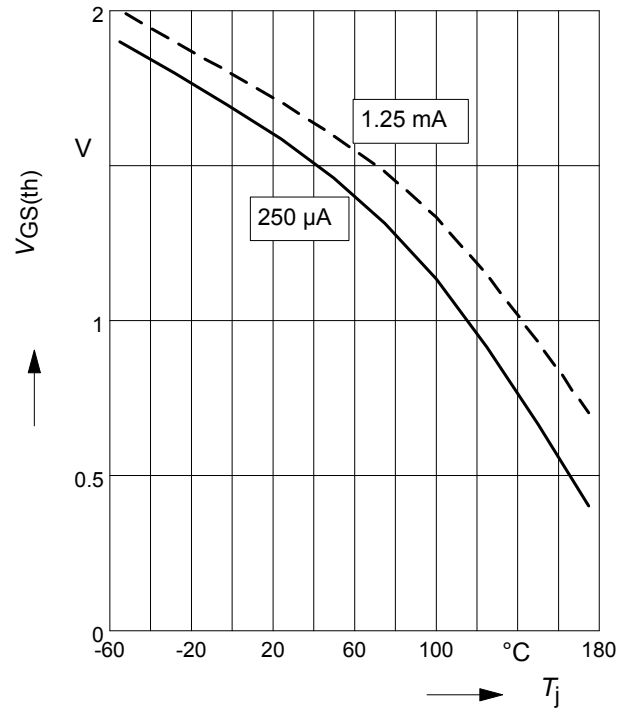
parameter:  $I_D = 80\text{ A}$ ,  $V_{GS} = 10\text{ V}$



## 10 Typ. gate threshold voltage

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

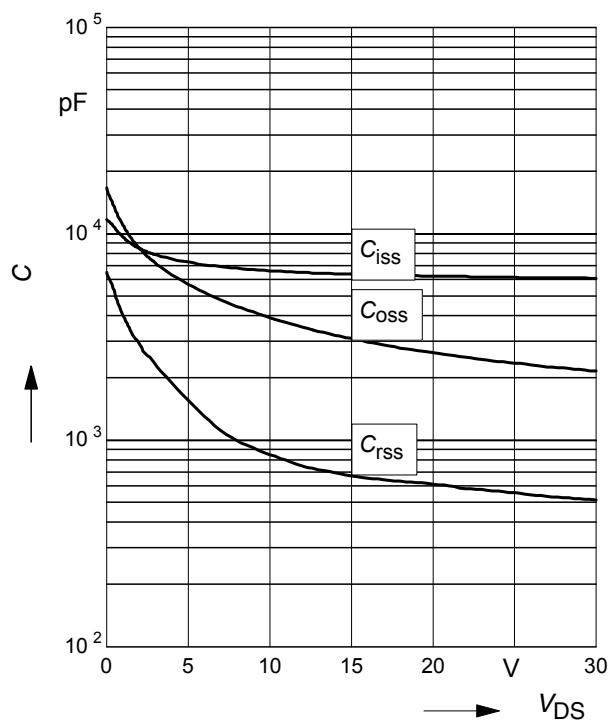
parameter:  $V_{GS} = V_{DS}$



## 11 Typ. capacitances

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

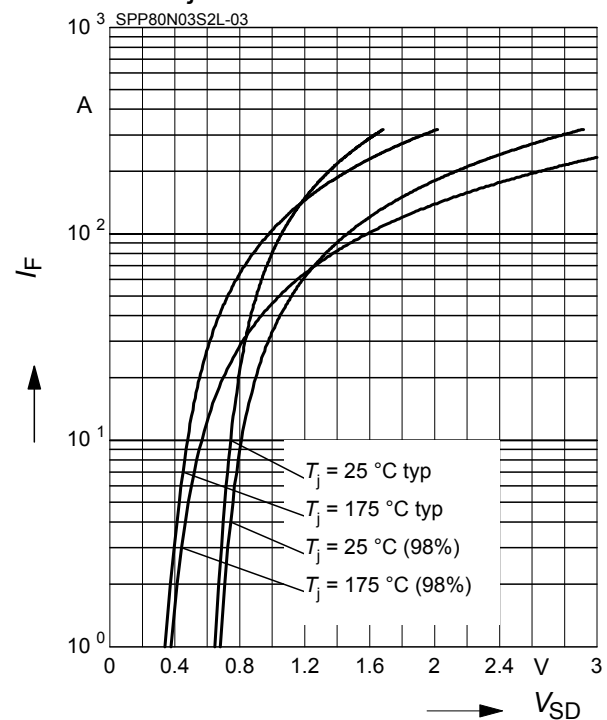
parameter:  $V_{GS}=0\text{ V}$ ,  $f=1\text{ MHz}$



## 12 Forward character. of reverse diode

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

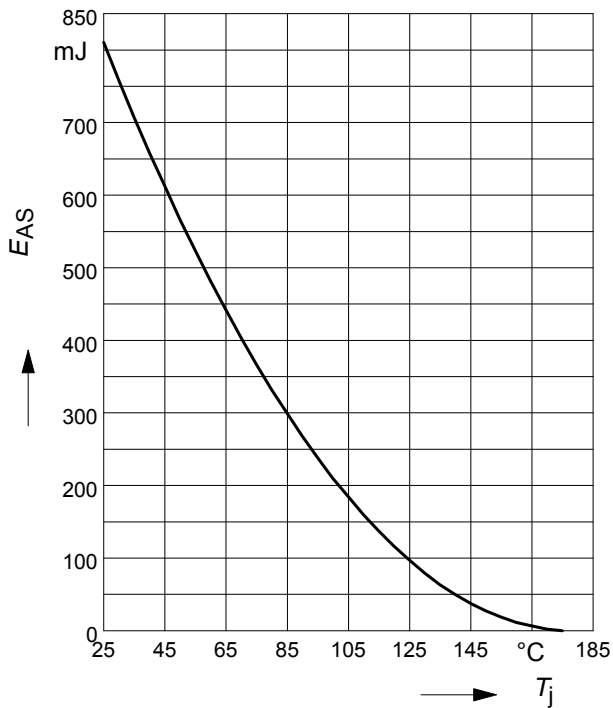
parameter:  $T_j$ ,  $t_p = 80\text{ μs}$



### 13 Typ. avalanche energy

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

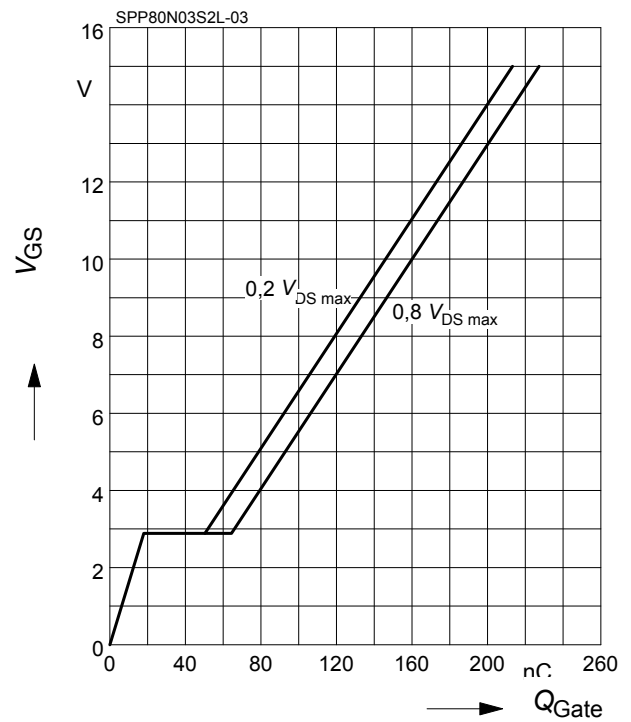
par.:  $I_D = 80\text{ A}$  ,  $V_{DD} = 25\text{ V}$  ,  $R_{GS} = 25\ \Omega$



### 14 Typ. gate charge

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

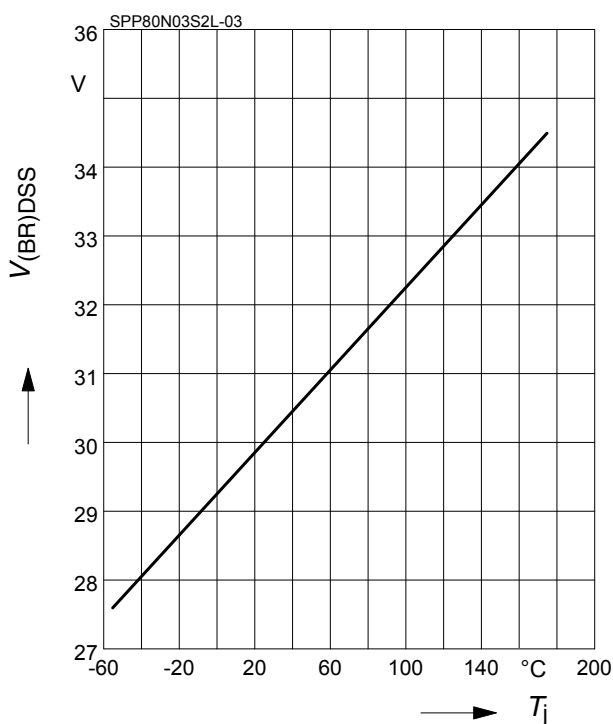
parameter:  $I_D = 80\text{ A}$  pulsed



### 15 Drain-source breakdown voltage

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

parameter:  $I_D = 10\text{ mA}$



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