

OptiMOS™ Power-Transistor

Feature

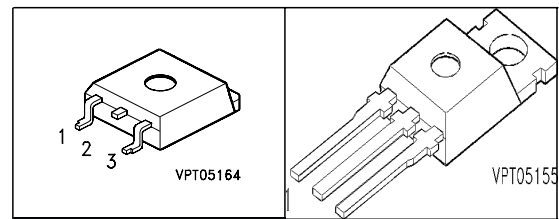
- N-Channel
- Enhancement mode
- Logic Level
- Low on-resistance $R_{DS(on)}$
- Excellent Gate Charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

Product Summary

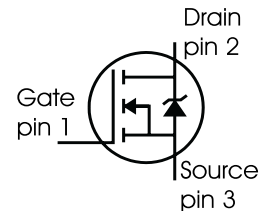
V_{DS}	30	V
$R_{DS(on)}$	5	mΩ
I_D	80	A

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



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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25\text{ °C}^1$ $T_C = 100\text{ °C}$	I_D	80 80	A
Pulsed drain current $T_C = 25\text{ °C}$	$I_{D\text{ puls}}$	320	
Avalanche energy, single pulse $I_D = 80\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\text{ Ω}$	E_{AS}	325	mJ
Reverse diode dv/dt $I_S = 80\text{ A}$, $V_{DS} = 24\text{ V}$, $di/dt = 200\text{ A/μs}$, $T_{j\text{max}} = 175\text{ °C}$	dv/dt	6	kV/μs
Gate source voltage	V_{GS}	±20	V
Power dissipation $T_C = 25\text{ °C}$	P_{tot}	154	W
Operating and storage temperature	T_j, T_{stg}	-55... +175	°C
IEC climatic category; DIN IEC 68-1		55/175/56	

¹Current limited by bondwire; with an $R_{thJC} = 0.97\text{ K/W}$ the chip is able to carry $I_D = 110\text{ A}$

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	0.97	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm ² cooling area ¹⁾		-	-	40	

Electrical Characteristics, at $T_j = 25\text{ °C}$, 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, $V_{GS} = V_{DS}$ $I_D=100\mu A$	$V_{GS(th)}$	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 10	1 100	μA
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	I_{GSS}	-	1	100	
Drain-source on-state resistance $V_{GS}=4.5V, I_D=55A$	$R_{DS(on)}$	-	5.5	7.3	m Ω
Drain-source on-state resistance $V_{GS}=10V, I_D=55A$	$R_{DS(on)}$	-	3.9	5	

¹⁾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.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic Characteristics

Transconductance	g_{fs}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 80\text{A}$	55	110	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$	-	2590	3885	pF
Output capacitance	C_{oss}		-	1025	1540	
Reverse transfer capacitance	C_{rss}		-	205	308	
Gate resistance	R_G		-	1.75	-	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 20\text{A}$, $R_G = 2.7\Omega$	-	10	15	ns
Rise time	t_r		-	50	75	
Turn-off delay time	$t_{d(off)}$		-	44	66	
Fall time	t_f		-	20	30	

Gate Charge Characteristics

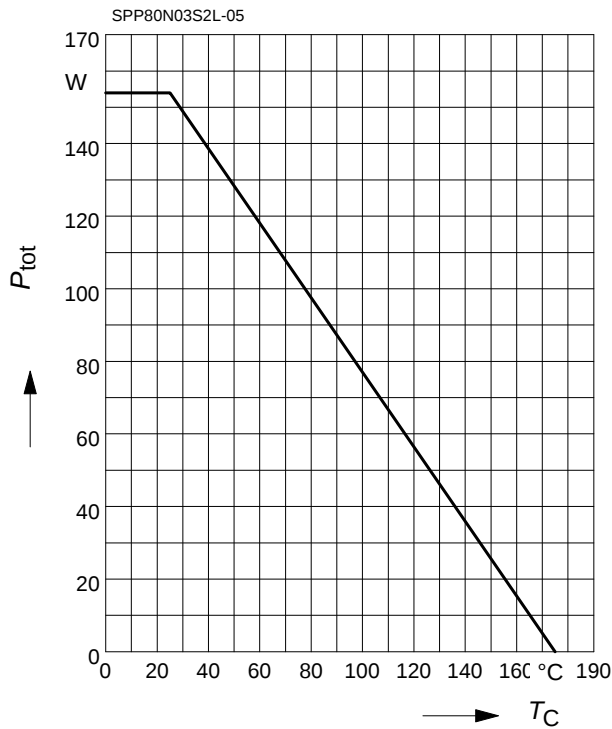
Gate to source charge	Q_{gs}	$V_{DD} = 24\text{V}$, $I_D = 40\text{A}$	-	7.9	9.9	nC
Gate to drain charge	Q_{gd}		-	20.3	25.4	
Gate charge total	Q_g	$V_{DD} = 24\text{V}$, $I_D = 40\text{A}$, $V_{GS} = 0$ to 10V	-	64.8	81	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 24\text{V}$, $I_D = 40\text{A}$	-	3.2	-	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}	$V_{GS} = 0\text{V}$, $I_F = 80\text{A}$	-	0.95	1.26	V
Reverse recovery time	t_{rr}	$V_R = 15\text{V}$, $I_F = I_S$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	38.6	58	ns
Reverse recovery charge	Q_{rr}		-	44.8	76.2	nC

1 Power dissipation

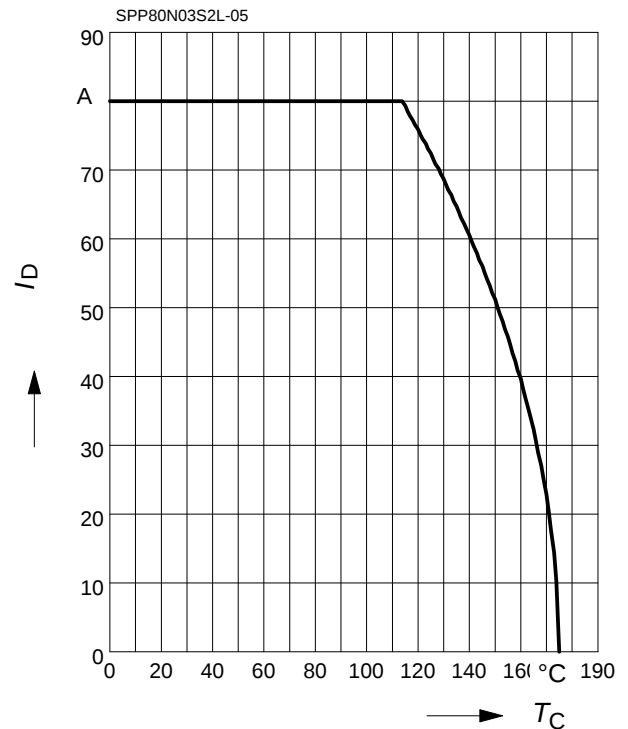
$$P_{\text{tot}} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

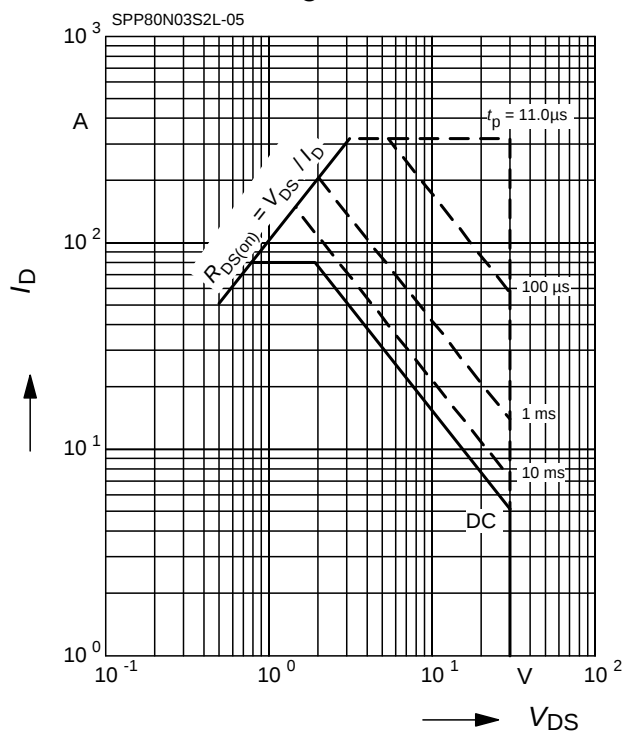
parameter: $V_{GS} \geq 10 \text{ V}$



3 Safe operating area

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

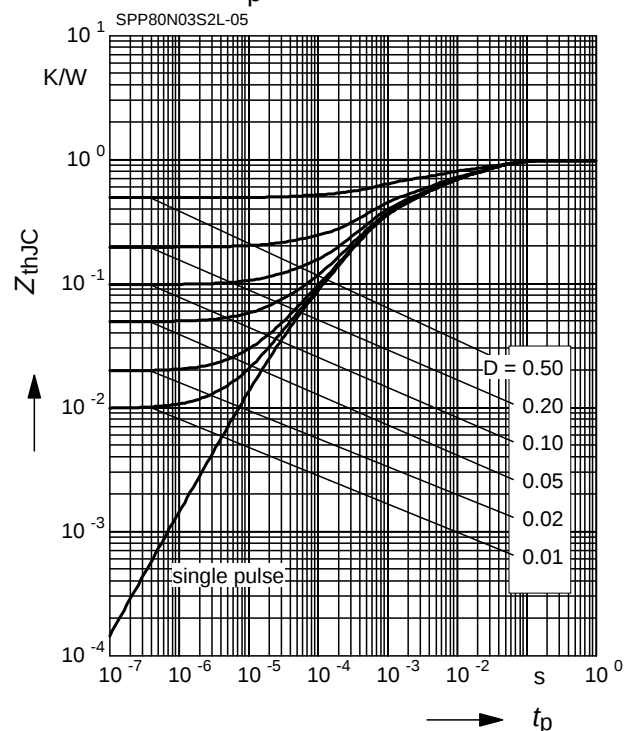
parameter: $D = 0$, $T_C = 25 \text{ °C}$



4 Transient thermal impedance

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

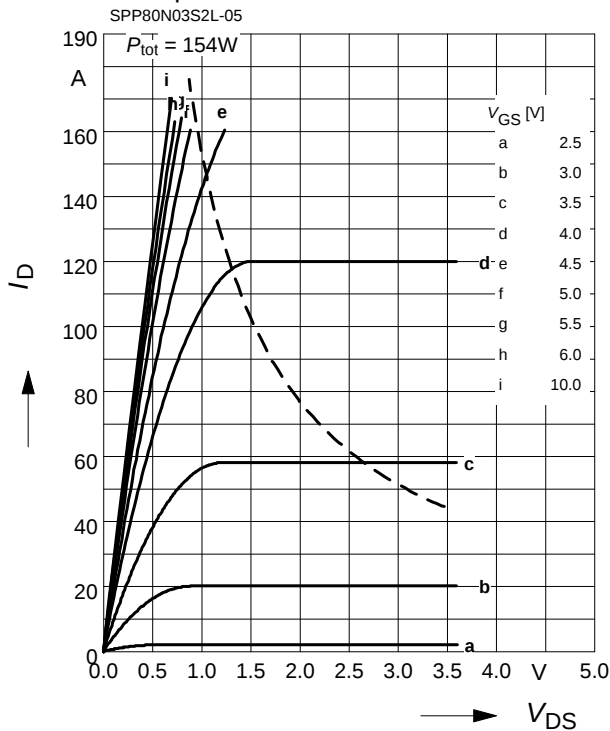
parameter: $D = t_p / T$



5 Typ. output characteristic

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

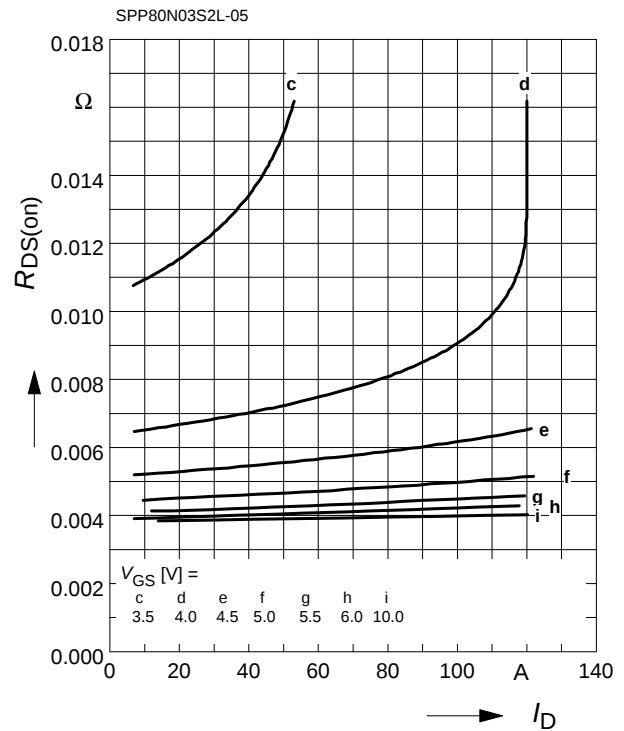
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

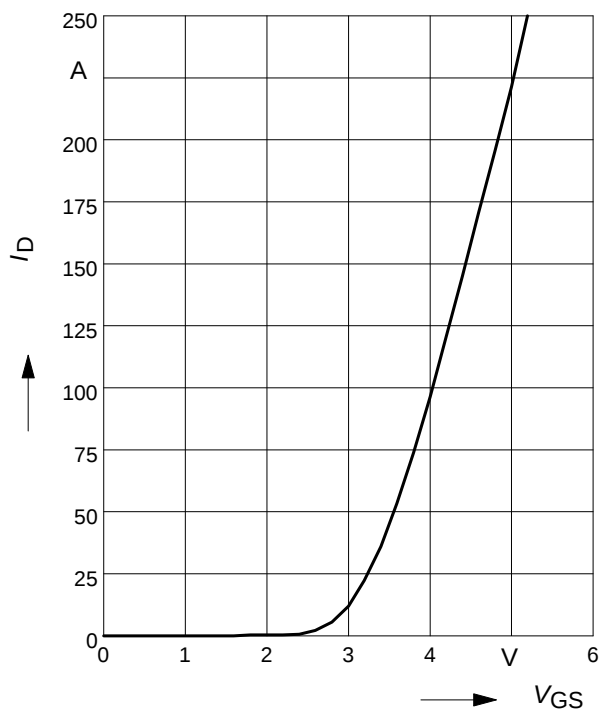
parameter: V_{GS}



7 Typ. transfer characteristics

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

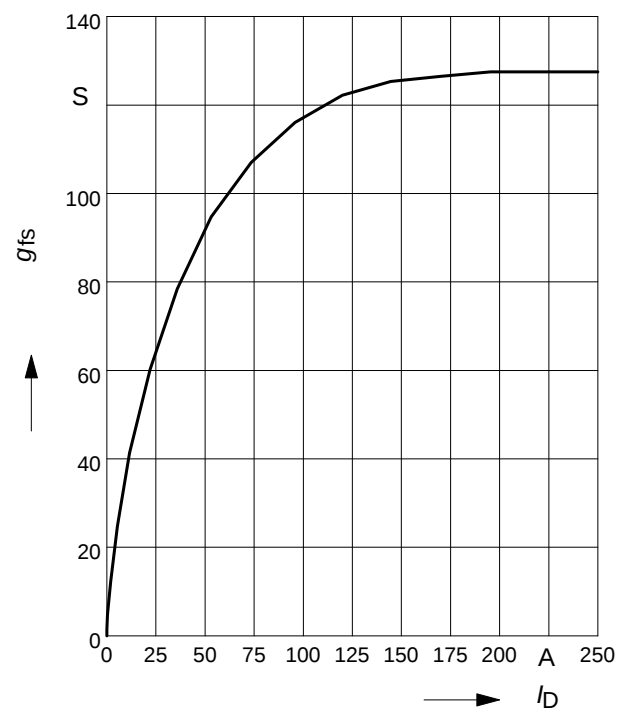
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

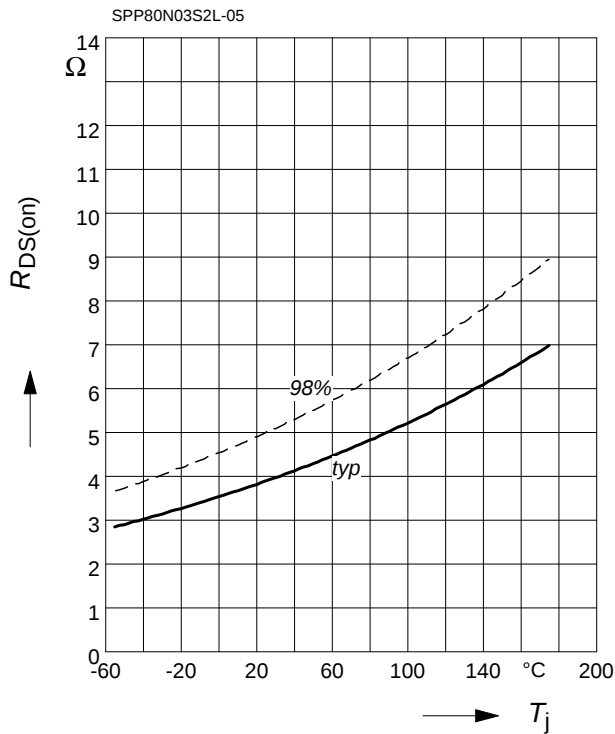
parameter: g_{fs}



9 Drain-source on-state resistance

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

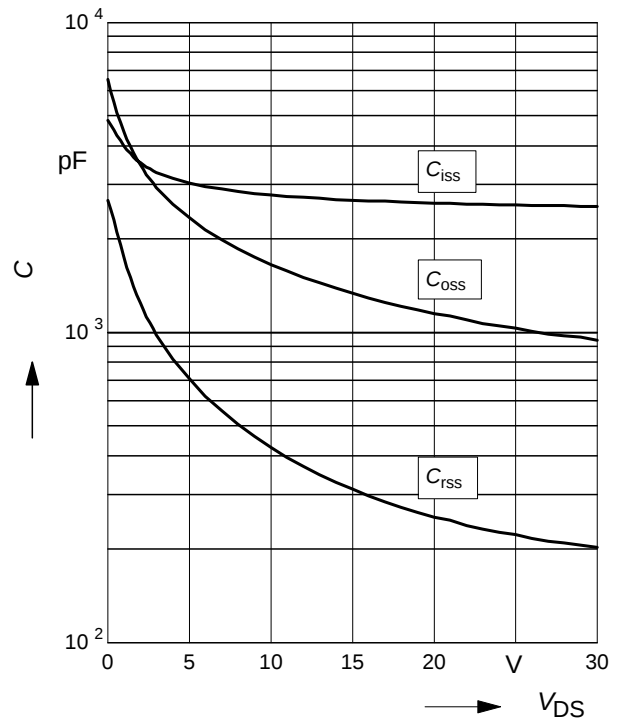
parameter: $I_D = 55 \text{ A}$, $V_{GS} = 10 \text{ V}$



10 Typ. capacitances

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

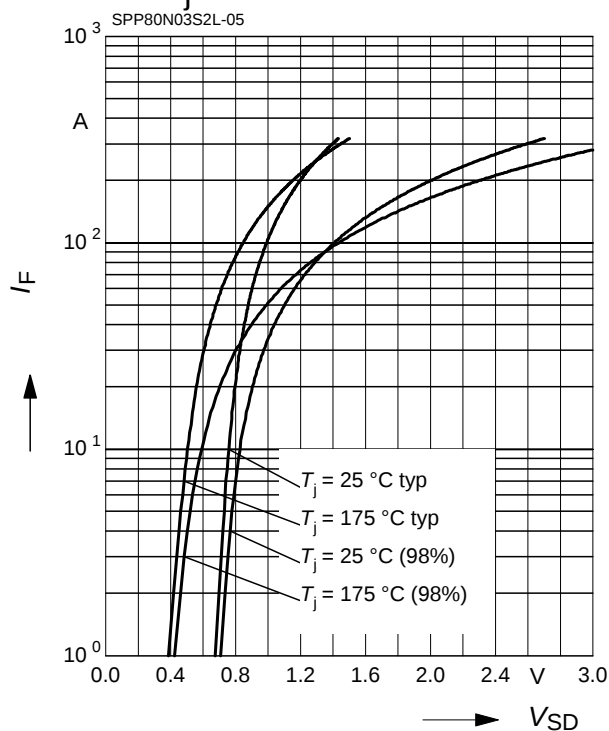
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



11 Forward character. of reverse diode

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

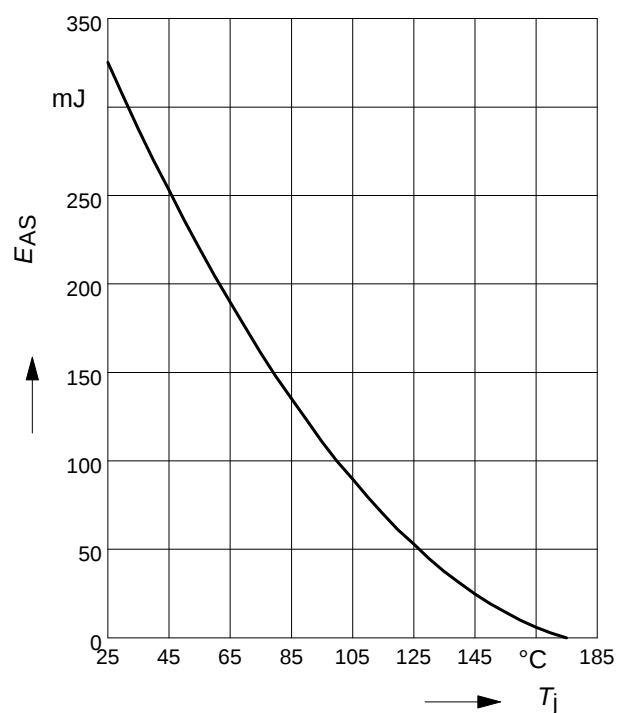
parameter: T_j , $t_p = 80 \mu\text{s}$



12 Avalanche energy

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

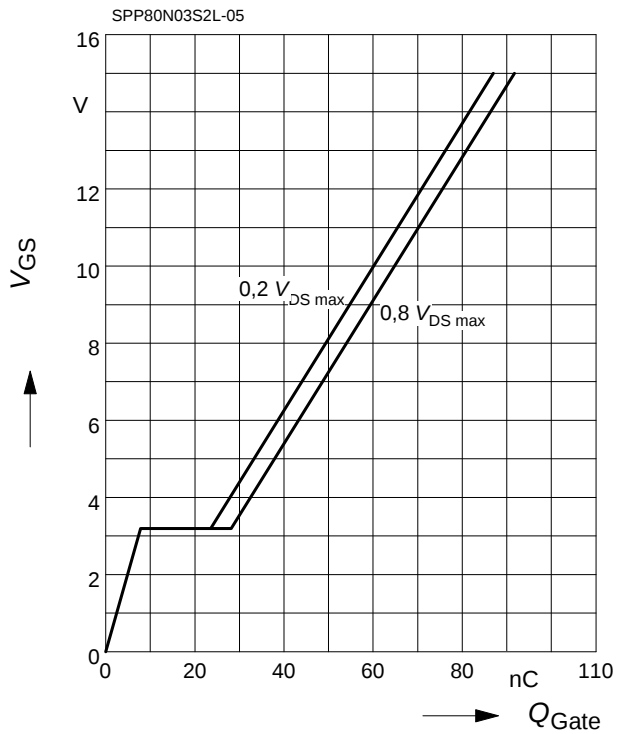
par.: $I_D = 80 \text{ A}$, $V_{DD} = 25 \text{ V}$, $R_{GS} = 25 \Omega$



13 Typ. gate charge

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

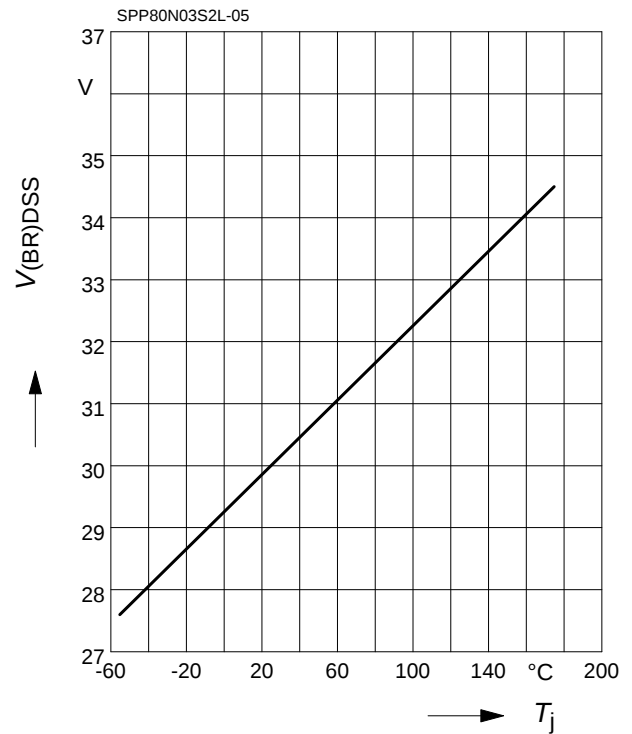
parameter: $I_D = 40$ A pulsed



14 Drain-source breakdown voltage

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

parameter: $I_D = 10$ mA



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