

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain Source voltage slope $V_{DS} = 400\text{ V}$, $I_D = 16\text{ A}$, $T_j = 125\text{ °C}$	dv/dt	50	V/ns

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	-	-	0.78	K/W
Thermal resistance, junction - case, FullPAK	R_{thJC_FP}	-	-	3.7	
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
Thermal resistance, junction - ambient, FullPAK	R_{thJA_FP}	-	-	80	
Soldering temperature, reflow soldering, MSL1 1.6 mm (0.063 in.) from case for 10s ³)	T_{sold}	-	-	260	°C

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{V}$, $I_D=0.25\text{mA}$	500	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	$V_{GS}=0\text{V}$, $I_D=16\text{A}$	-	600	-	
Gate threshold voltage	$V_{GS(th)}$	$I_D=675\mu\text{A}$, $V_{GS}=V_{DS}$	2.1	3	3.9	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=500\text{V}$, $V_{GS}=0\text{V}$, $T_j=25\text{ °C}$ $T_j=150\text{ °C}$	-	0.1	1	μA
			-	-	100	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{V}$, $V_{DS}=0\text{V}$	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{V}$, $I_D=10\text{A}$ $T_j=25\text{ °C}$ $T_j=150\text{ °C}$	-	0.25	0.28	Ω
			-	0.68	-	
Gate input resistance	R_G	$f=1\text{MHz}$, open drain	-	1.5	-	

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Characteristics						
Transconductance	g_{fs}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 10\text{A}$	-	14	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$	-	1600	-	pF
Output capacitance	C_{oss}		-	800	-	
Reverse transfer capacitance	C_{rss}		-	30	-	
Effective output capacitance, ⁴⁾ energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$, $V_{DS} = 0\text{V to } 400\text{V}$	-	64	-	
Effective output capacitance, ⁵⁾ time related	$C_{o(tr)}$		-	124	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 380\text{V}$, $V_{GS} = 0/10\text{V}$, $I_D = 16\text{A}$, $R_G = 4.3\Omega$	-	10	-	ns
Rise time	t_r		-	8	-	
Turn-off delay time	$t_{d(off)}$		-	50	-	
Fall time	t_f		-	8	-	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DD} = 380\text{V}$, $I_D = 16\text{A}$	-	7	-	nC
Gate to drain charge	Q_{gd}		-	36	-	
Gate charge total	Q_g	$V_{DD} = 380\text{V}$, $I_D = 16\text{A}$, $V_{GS} = 0\text{ to } 10\text{V}$	-	66	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 380\text{V}$, $I_D = 16\text{A}$	-	5	-	V

⁰J-STD20 and JESD22

¹Limited only by maximum temperature

²Repetitive avalanche causes additional power losses that can be calculated as $P_{AV} = E_{AR} \cdot f$.

³Soldering temperature for TO-263: 220°C, reflow

⁴ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

⁵ $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

⁶ $I_{SD} \leq I_D$, $di/dt \leq 400\text{A/us}$, $V_{DClink} = 400\text{V}$, $V_{peak} < V_{BR, DSS}$, $T_j < T_{j,max}$.

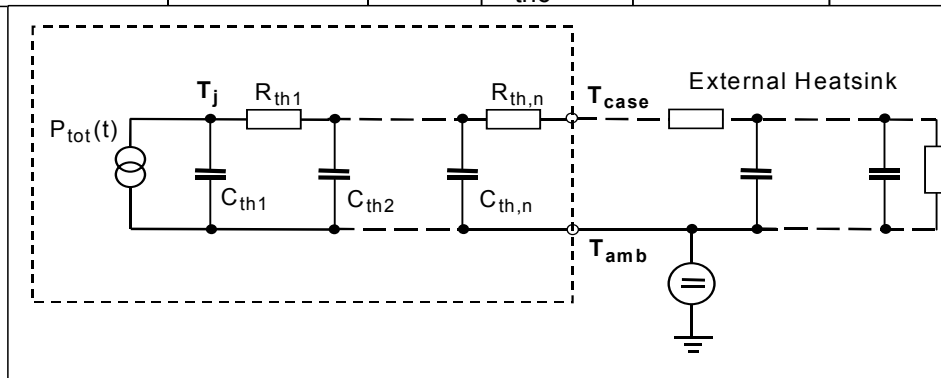
Identical low-side and high-side switch.

Electrical Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Inverse diode continuous forward current	I_S	$T_C=25^\circ\text{C}$	-	-	16	A
Inverse diode direct current, pulsed	I_{SM}		-	-	48	
Inverse diode forward voltage	V_{SD}	$V_{GS}=0\text{V}, I_F=I_S$	-	1	1.2	V
Reverse recovery time	t_{rr}	$V_R=380\text{V}, I_F=I_S,$	-	420	-	ns
Reverse recovery charge	Q_{rr}	$di_F/dt=100\text{A}/\mu\text{s}$	-	7	-	μC
Peak reverse recovery current	I_{rrm}		-	40	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	$T_j=25^\circ\text{C}$	-	1100	-	$\text{A}/\mu\text{s}$

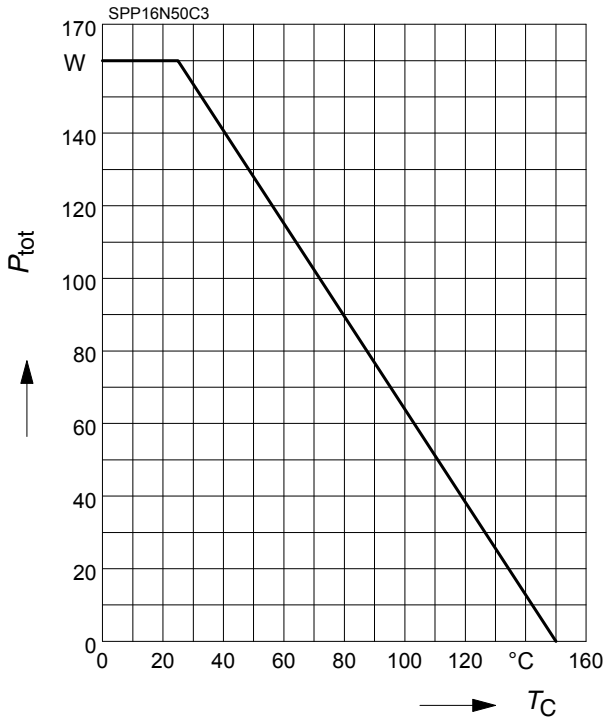
Typical Transient Thermal Characteristics

Symbol	Value		Unit	Symbol	Value		Unit
	SPB				SPB		
R_{th1}	0.012		K/W	C_{th1}	0.0002495		Ws/K
R_{th2}	0.023			C_{th2}	0.0009406		
R_{th3}	0.043			C_{th3}	0.001298		
R_{th4}	0.149			C_{th4}	0.00362		
R_{th5}	0.17			C_{th5}	0.009484		
R_{th6}	0.069			C_{th6}	0.077		



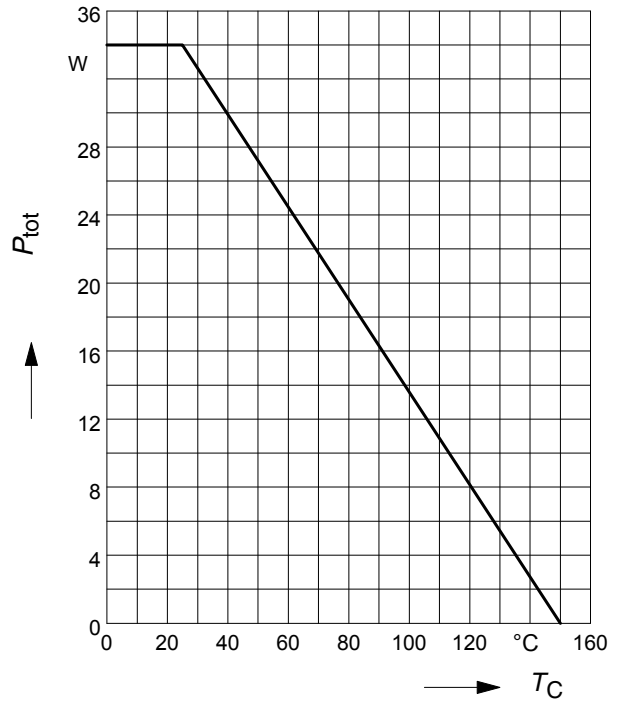
1 Power dissipation

$P_{tot} = f(T_C)$



2 Power dissipation FullPAK

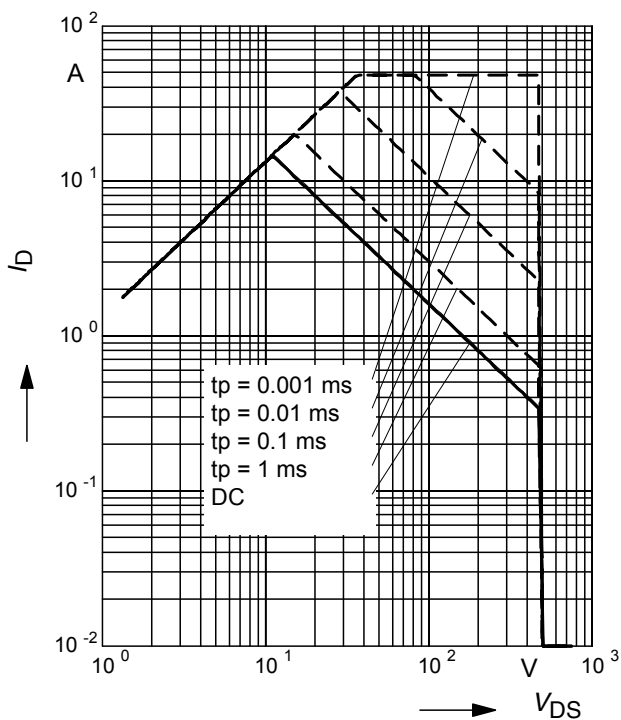
$P_{tot} = f(T_C)$



3 Safe operating area

$I_D = f(V_{DS})$

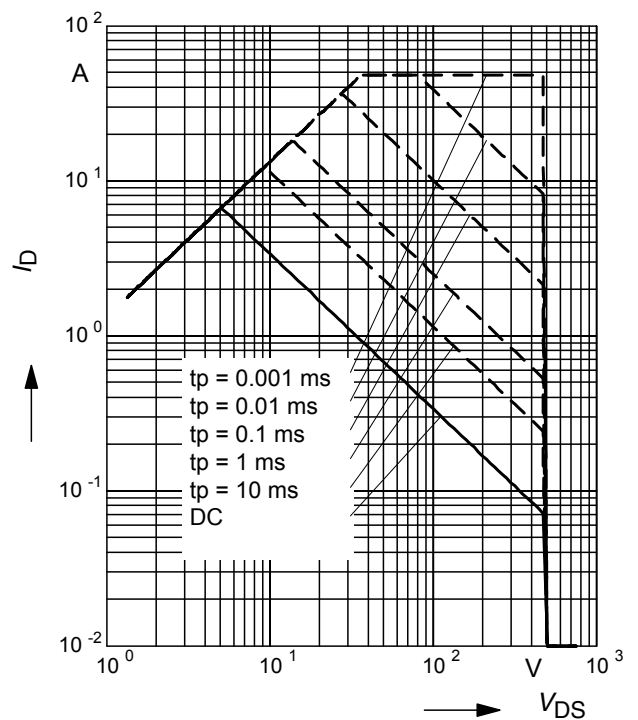
parameter : $D = 0$, $T_C = 25^\circ\text{C}$



4 Safe operating area FullPAK

$I_D = f(V_{DS})$

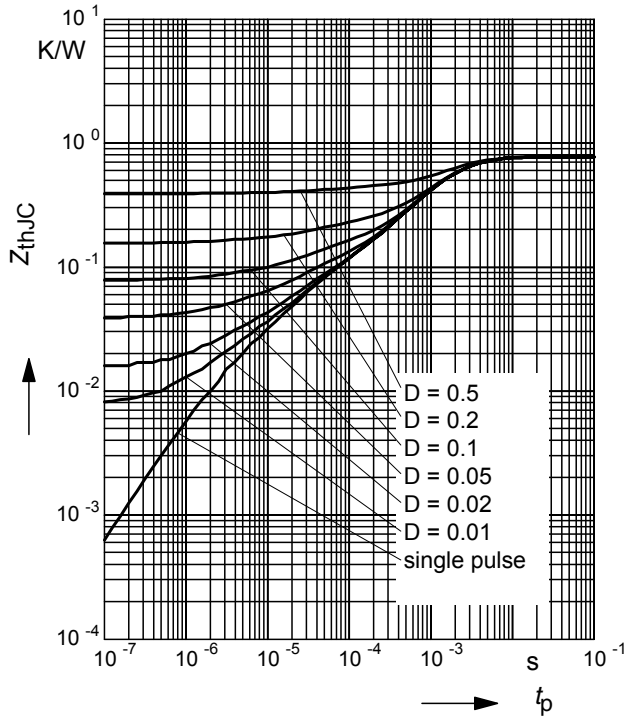
parameter: $D = 0$, $T_C = 25^\circ\text{C}$



5 Transient thermal impedance

$Z_{thJC} = f(t_p)$

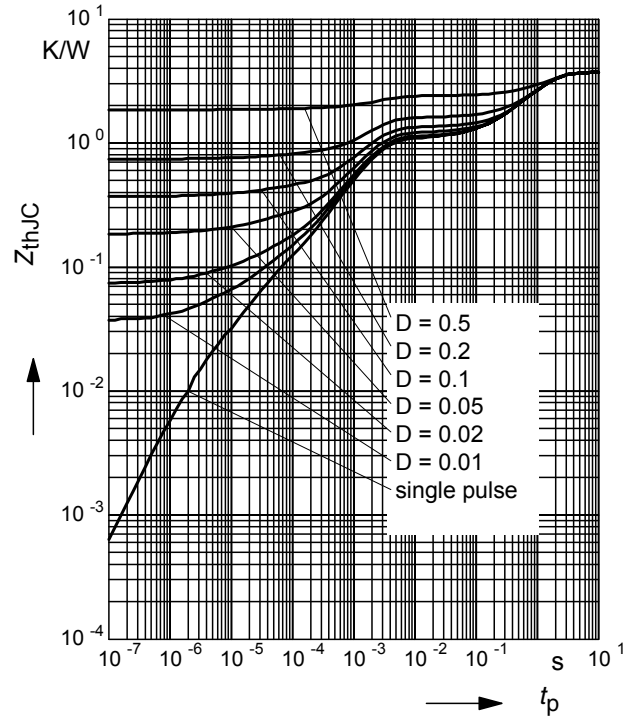
parameter: $D = t_p/T$



6 Transient thermal impedance FullPAK

$Z_{thJC} = f(t_p)$

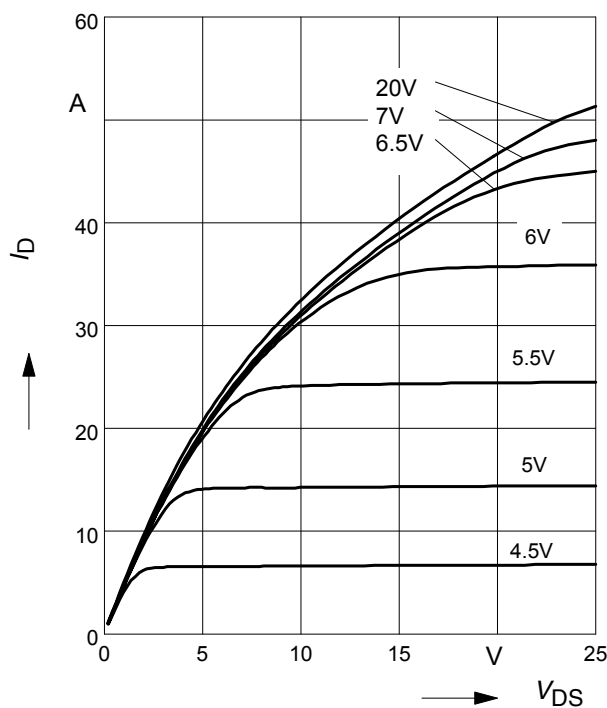
parameter: $D = t_p/t$



7 Typ. output characteristic

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

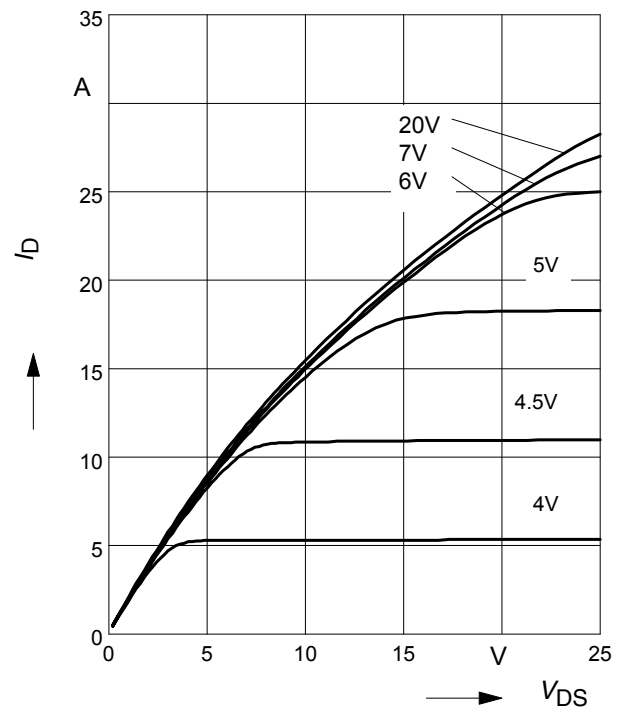
parameter: $t_p = 10 \mu s, V_{GS}$



8 Typ. output characteristic

$I_D = f(V_{DS}); T_j=150^\circ C$

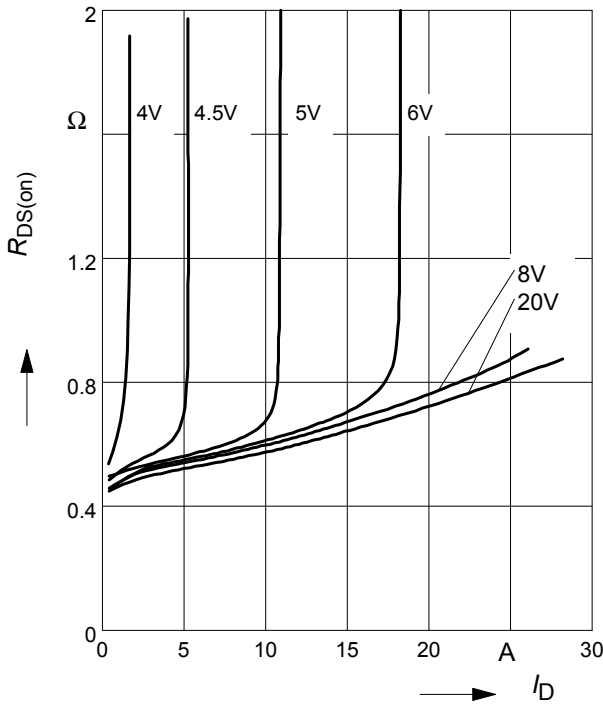
parameter: $t_p = 10 \mu s, V_{GS}$



9 Typ. drain-source on resistance

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

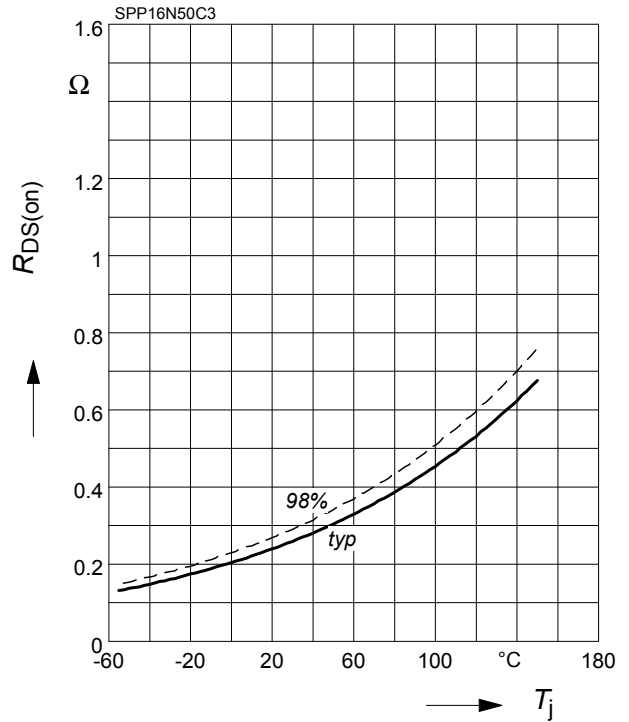
parameter: $T_j = 150^\circ\text{C}$, V_{GS}



10 Drain-source on-state resistance

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

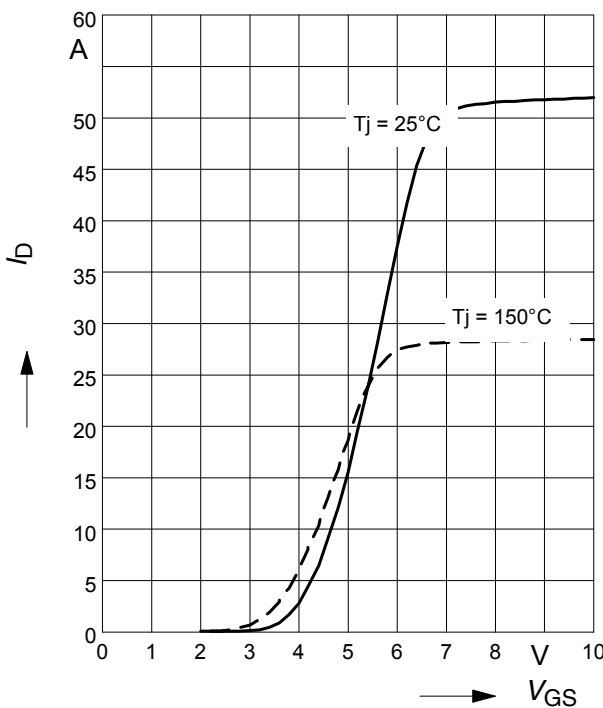
parameter: $I_D = 10\text{ A}$, $V_{GS} = 10\text{ V}$



11 Typ. transfer characteristics

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

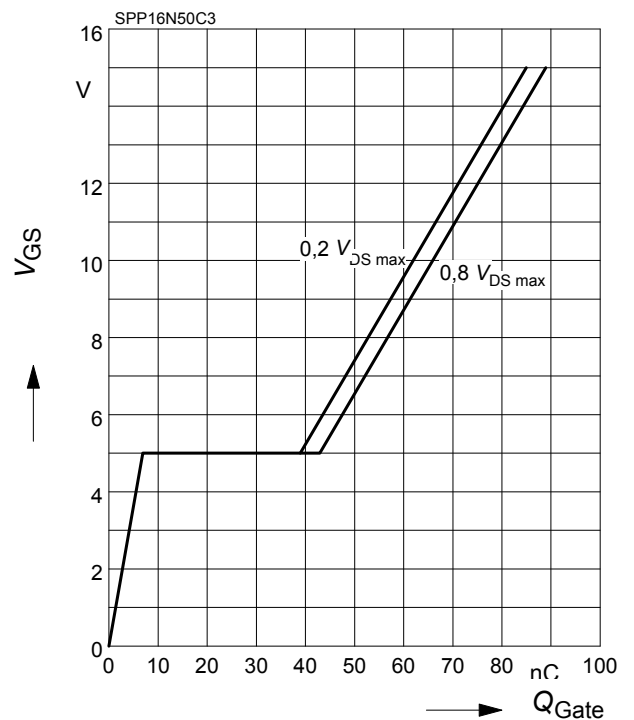
parameter: $t_p = 10\ \mu\text{s}$



12 Typ. gate charge

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

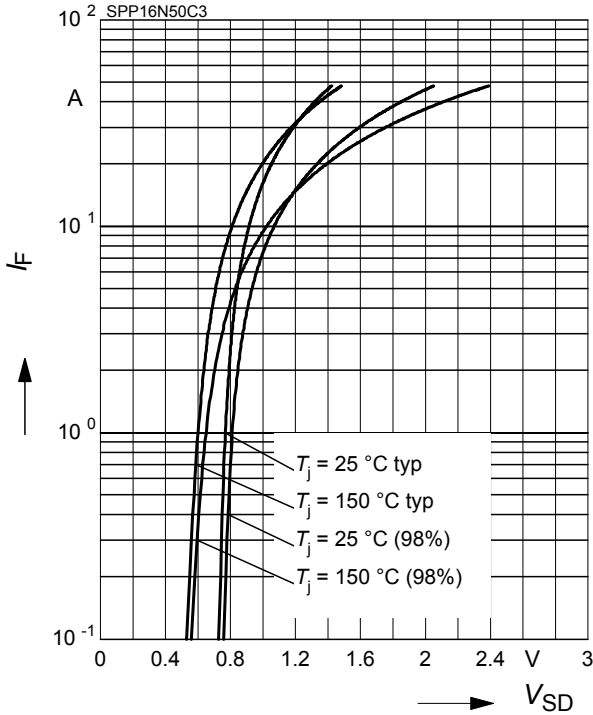
parameter: $I_D = 16\text{ A pulsed}$



13 Forward characteristics of body diode

$I_F = f(V_{SD})$

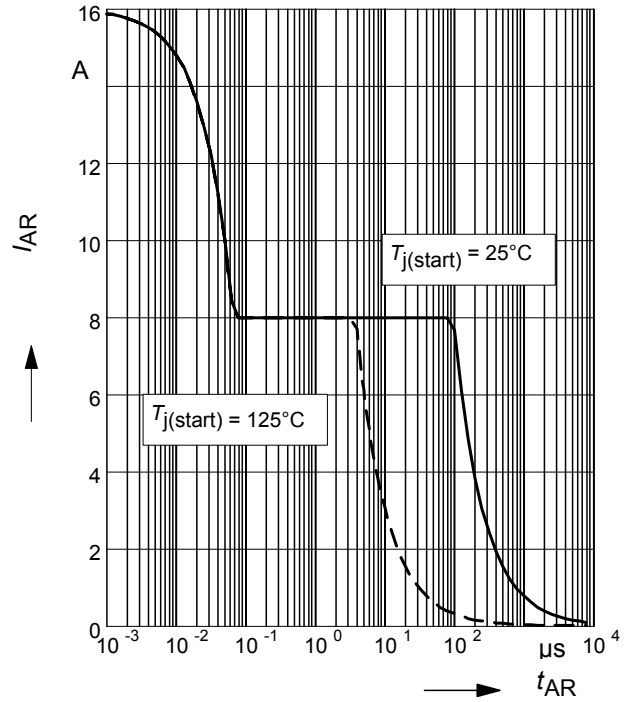
parameter: T_j , $t_p = 10 \mu s$



14 Avalanche SOA

$I_{AR} = f(t_{AR})$

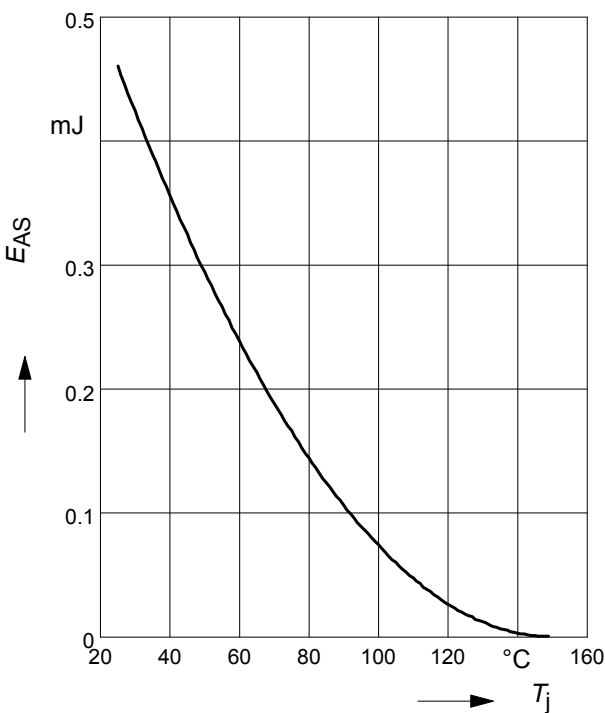
par.: $T_j \leq 150 \text{ °C}$



15 Avalanche energy

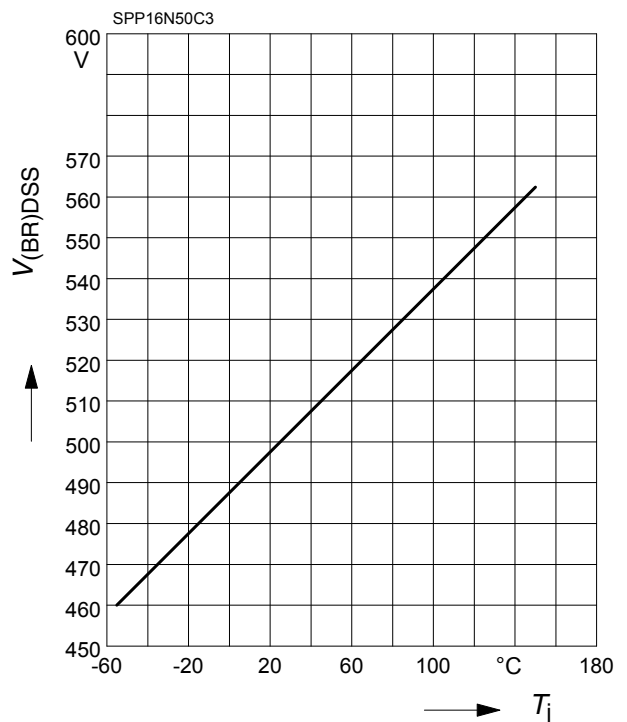
$E_{AS} = f(T_j)$

par.: $I_D = 8$, $V_{DD} = 50 \text{ V}$



16 Drain-source breakdown voltage

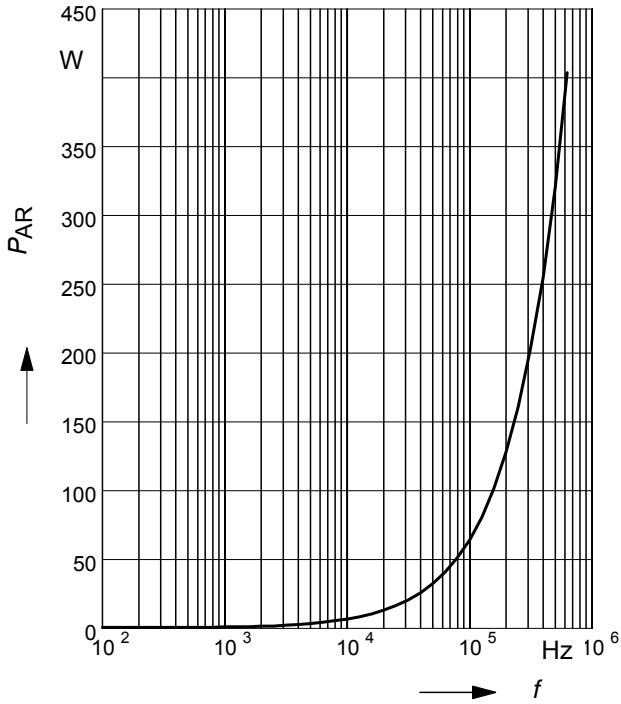
$V_{(BR)DSS} = f(T_j)$



17 Avalanche power losses

$$P_{AR} = f(f)$$

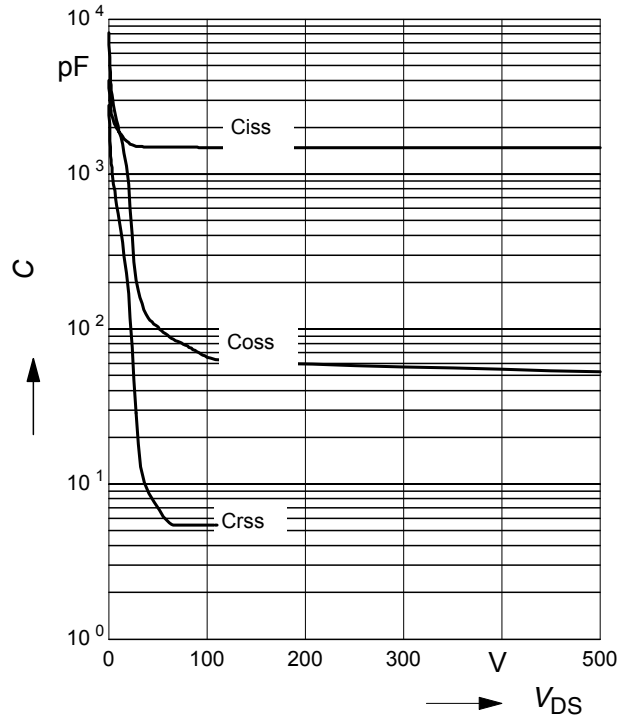
parameter: $E_{AR}=0.64\text{mJ}$



18 Typ. capacitances

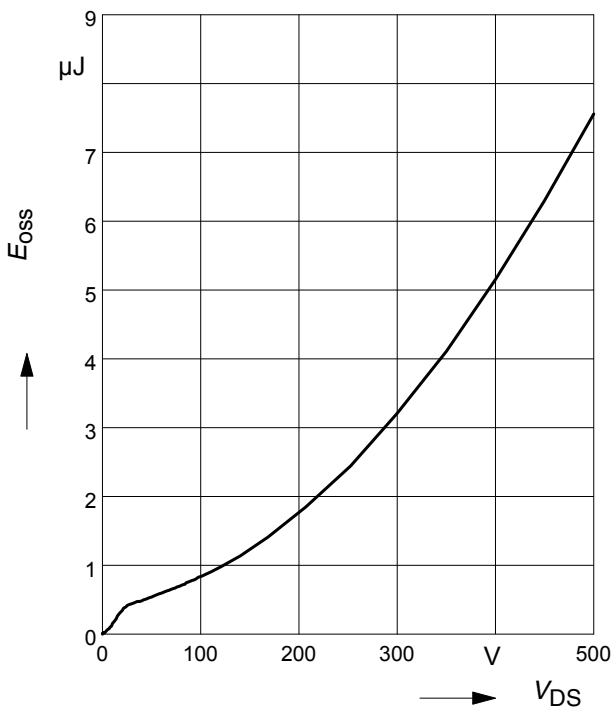
$$C = f(V_{DS})$$

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

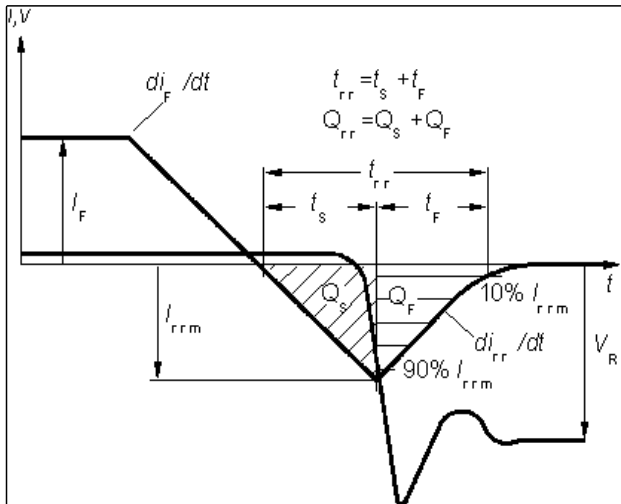


19 Typ. C_{OSS} stored energy

$$E_{OSS}=f(V_{DS})$$



Definition of diodes switching characteristics



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