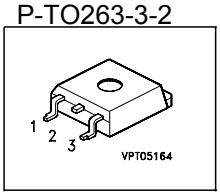
Cool MOS™ Power Transistor

V_{DS} @ T_{jmax}	560	V
$R_{DS(on)}$	0.95	Ω
I_D	4.5	A

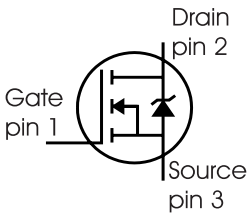
Feature

- New revolutionary high voltage technology
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- Ultra low effective capacitances
- Improved transconductance
- Qualified according to JEDEC[0)] for target applications

P-TO263-3-2



Type	Package	Ordering Code	Marking
SPB04N50C3	P-TO263-3-2	Q67040-S4573	04N50C3



Maximum Ratings

Parameter	Symbol	Value		Unit
		SPB		
Continuous drain current T_C = 25 °C T_C = 100 °C	I_D	 4.5 2.8		A
Pulsed drain current, t_p limited by T_{jmax}	$I_{D\ puls}$	13.5		A
Avalanche energy, single pulse I_D=3.4A, V_{DD}=50V	E_{AS}	130		mJ
Avalanche energy, repetitive t_{AR} limited by T_{jmax}[2)] I_D=4.5A, V_{DD}=50V	E_{AR}	0.4		
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	4.5		A
Gate source voltage	V_{GS}	±20		V
Gate source voltage AC (f >1Hz)	V_{GS}	±30		
Power dissipation, T_C = 25°C	P_{tot}	50		W
Operating and storage temperature	T_j , T_{stg}	-55...+150		°C
Reverse diode dv/dt [7)]	dv/dt	15		V/ns

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain Source voltage slope V_{DS} = 400 V, I_D = 4.5 A, T_j = 125 °C	dv/dt	50	V/ns

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	-	-	2.5	K/W
Thermal resistance, junction - case, FullPAK	R_{thJC_FP}	-	-	4	
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
Thermal resistance, junction - ambient, FullPAK	R_{thJA_FP}	-	-	80	
SMD version, device on PCB: @ min. footprint @ 6 cm^2 cooling area [3]	R_{thJA}	 - -	 - 35	 62 -	
Soldering temperature, reflow soldering, MSL1 1.6 mm (0.063 in.) from case for 10s [4]	T_{sold}	-	-	220	°C

Electrical Characteristics, at T_j=25°C unless otherwise specified

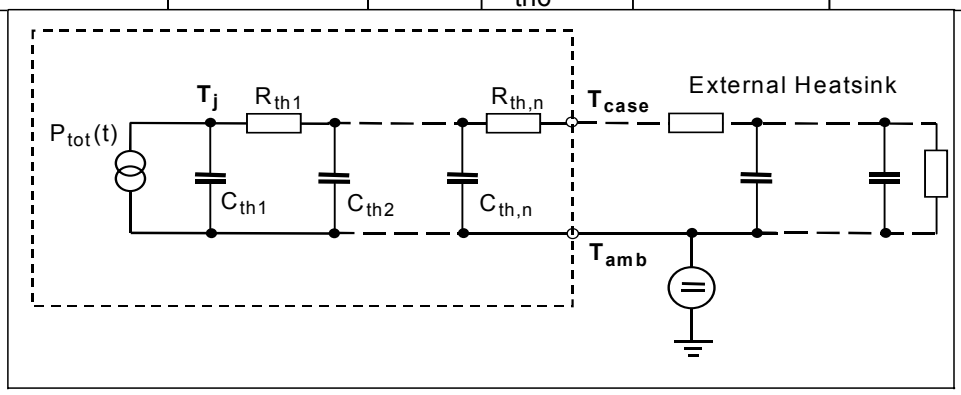
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=0.25mA	500	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0V, I_D=4.5A	-	600	-	
Gate threshold voltage	$V_{GS(th)}$	I_D=200µA, V_{GS}=V_{DS}	2.1	3	3.9	
Zero gate voltage drain current	I_{DSS}	V_{DS}=500V, V_{GS}=0V, T_j=25°C T_j=150°C	 - -	 0.1 -	 1 100	µA
Gate-source leakage current	I_{GSS}	V_{GS}=20V, V_{DS}=0V	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=2.8A T_j=25°C T_j=150°C	 - -	 0.85 2.3	 0.95 -	Ω
Gate input resistance	R_G	f=1MHz, open drain	-	1.4	-	

Electrical Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	4.5	A
Inverse diode direct current, pulsed	I_{SM}		-	-	13.5	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=I_S	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=400V, I_F=I_S , di_F/dt=100A/µs	-	280	-	ns
Reverse recovery charge	Q_{rr}		-	2.3	-	µC
Peak reverse recovery current	I_{rrm}		-	16	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	T_j=25°C	-	860	-	A/µs

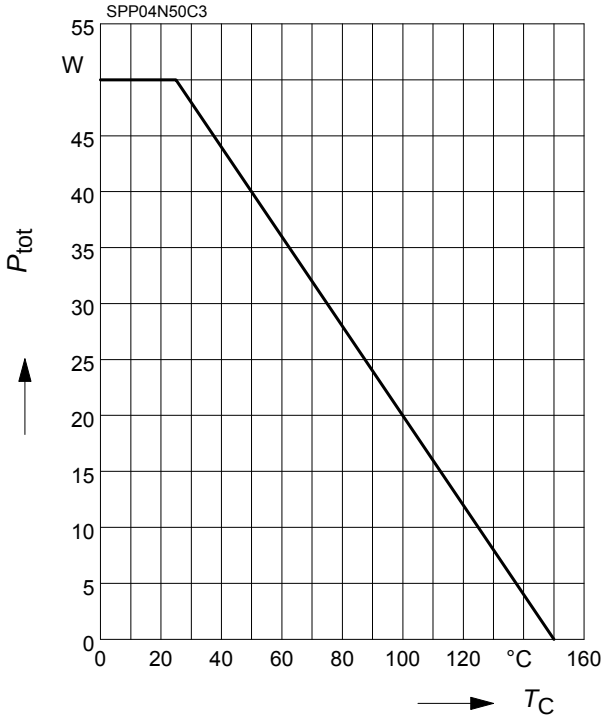
Typical Transient Thermal Characteristics

Symbol	Value		Unit	Symbol	Value		Unit
	SPB				SPB		
R_{th1}	0.039		K/W	C_{th1}	0.00007347		Ws/K
R_{th2}	0.074			C_{th2}	0.0002831		
R_{th3}	0.132			C_{th3}	0.0004062		
R_{th4}	0.555			C_{th4}	0.001215		
R_{th5}	0.529			C_{th5}	0.00276		
R_{th6}	0.169			C_{th6}	0.029		



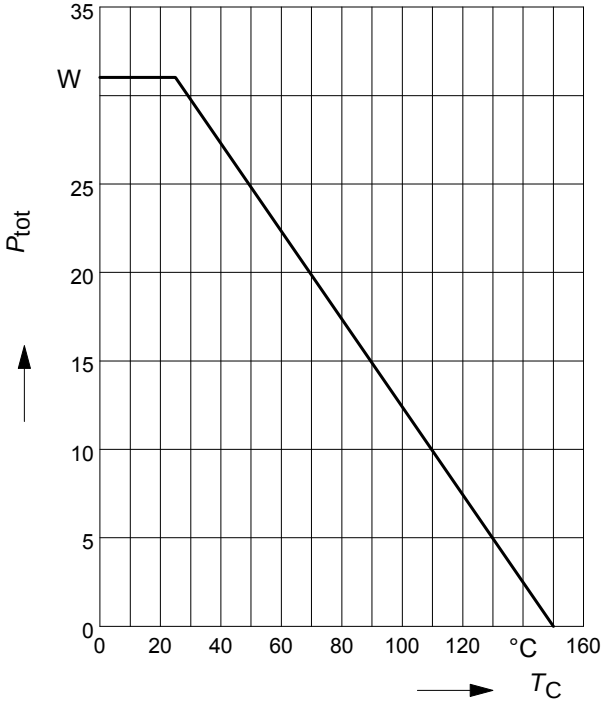
1 Power dissipation

$P_{tot} = f(T_C)$



2 Power dissipation FullPAK

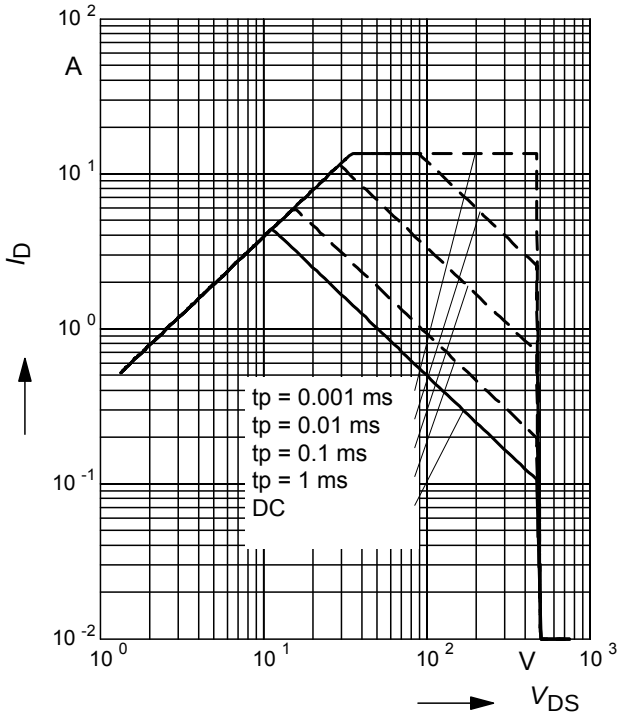
$P_{tot} = f(T_C)$



3 Safe operating area

$I_D = f(V_{DS})$

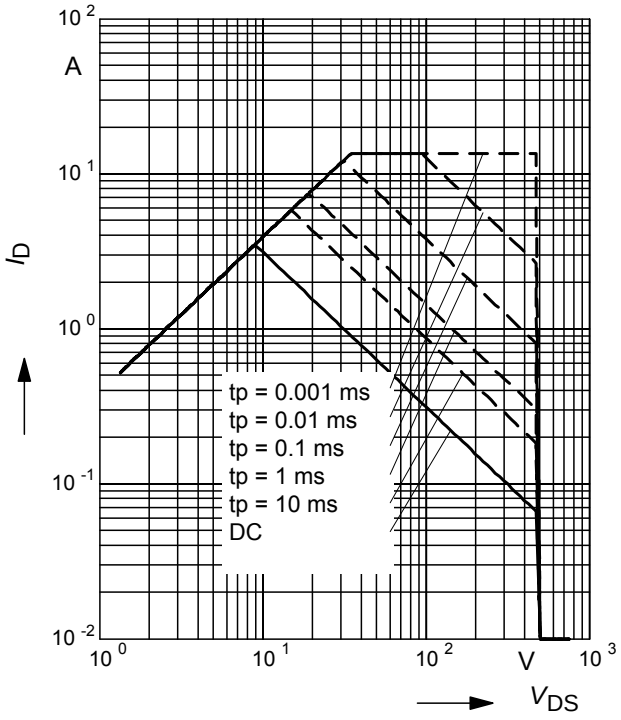
parameter : $D = 0$, T_C=25°C



4 Safe operating area FullPAK

$I_D = f(V_{DS})$

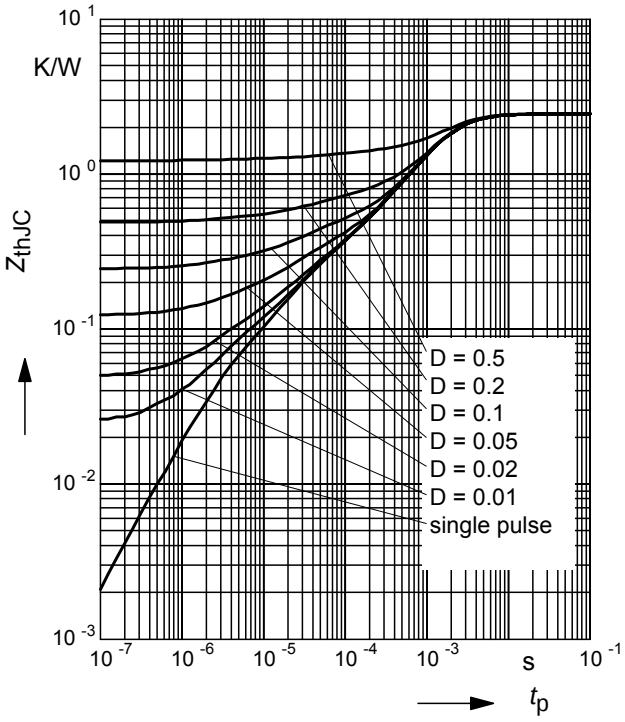
parameter: $D = 0$, $T_C = 25°C$



5 Transient thermal impedance

$Z_{thJC} = f(t_p)$

parameter: $D = t_p/T$



6 Transient thermal impedance FullPAK

$Z_{thJC} = f(t_p)$

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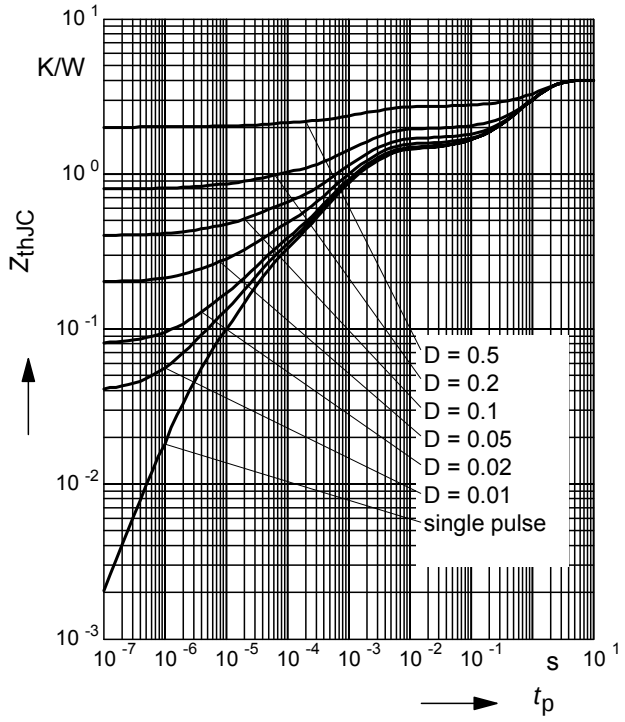
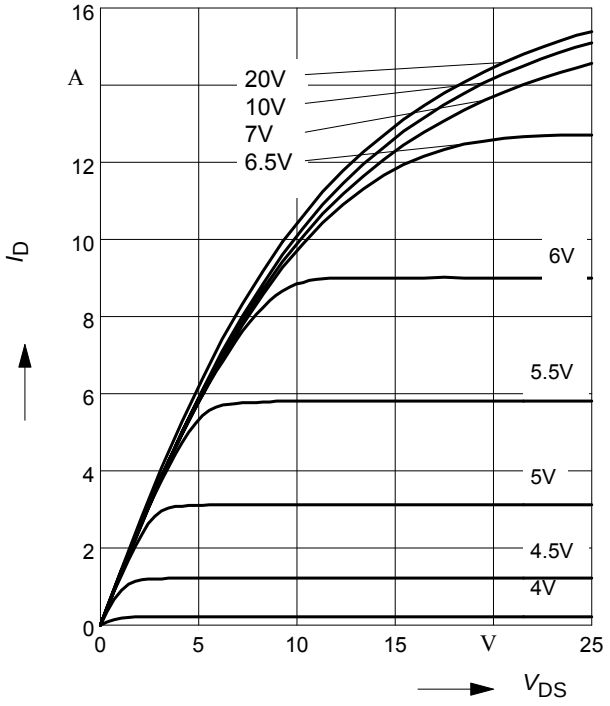


7 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

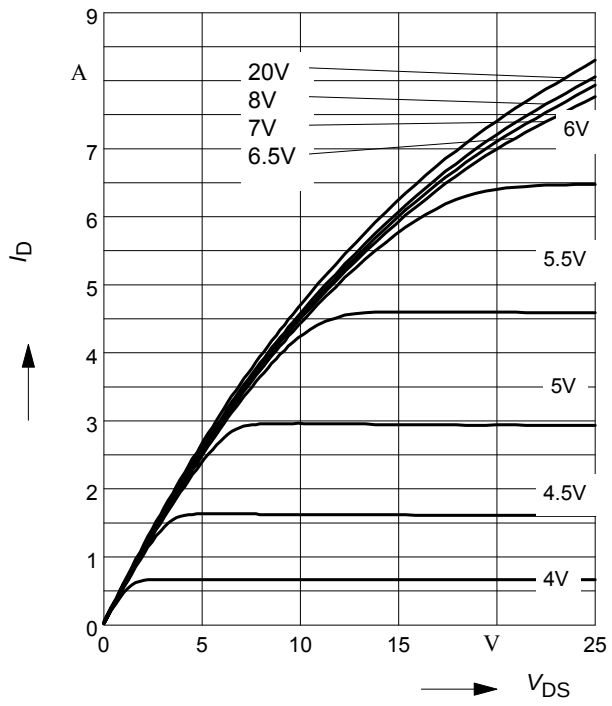
parameter: t_p = 10 µs, V_{GS}



8 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=150°C

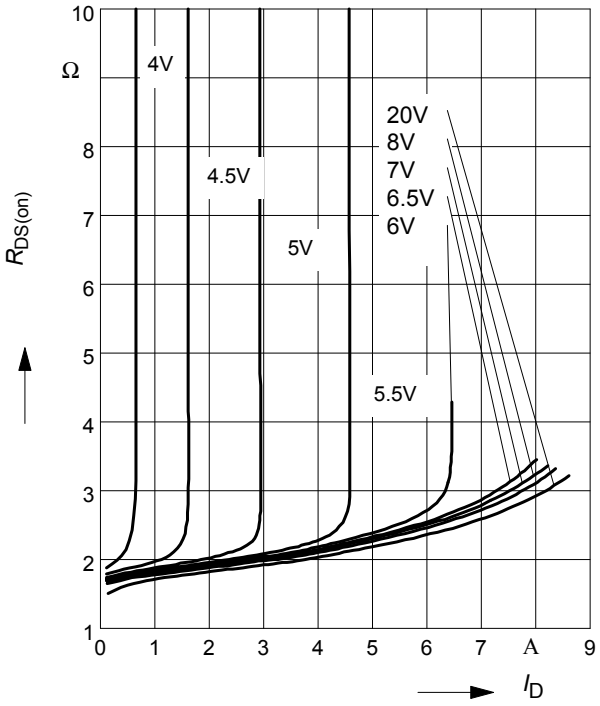
parameter: t_p = 10 µs, V_{GS}



9 Typ. drain-source on resistance

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

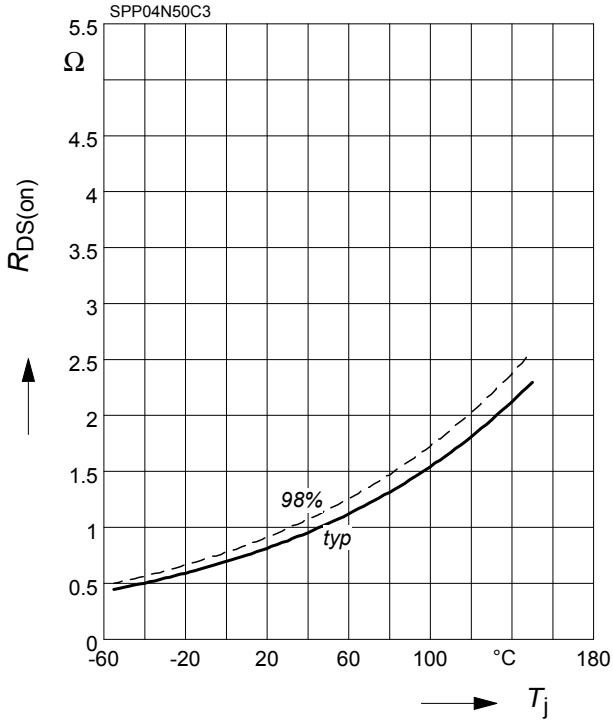
parameter: T_j=150°C, V_{GS}



10 Drain-source on-state resistance

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

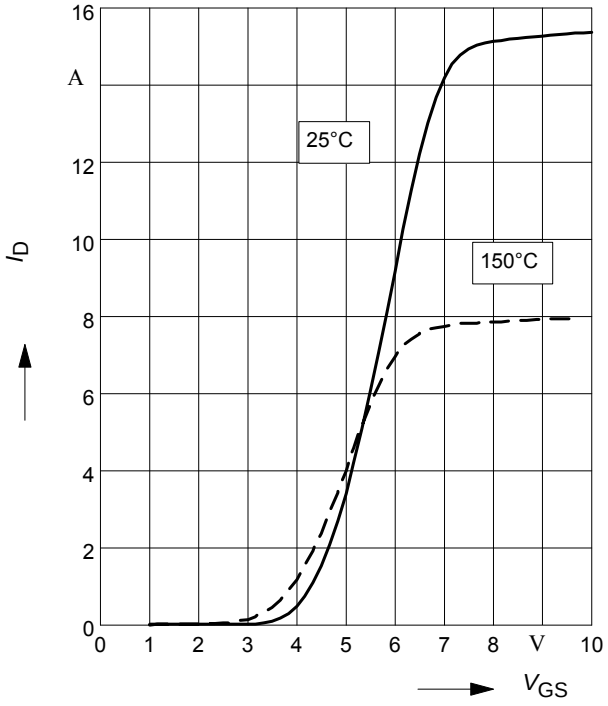
parameter : I_D = 2.8 A, V_{GS} = 10 V



11 Typ. transfer characteristics

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

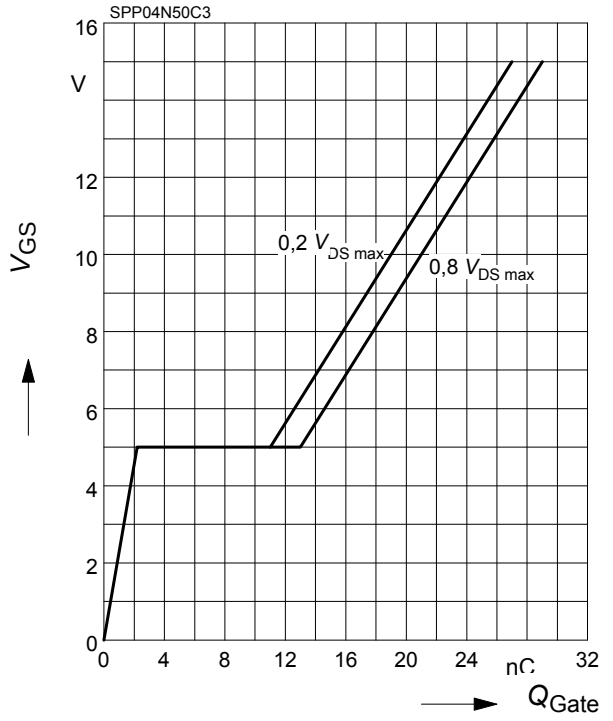
parameter: t_p = 10 µs



12 Typ. gate charge

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

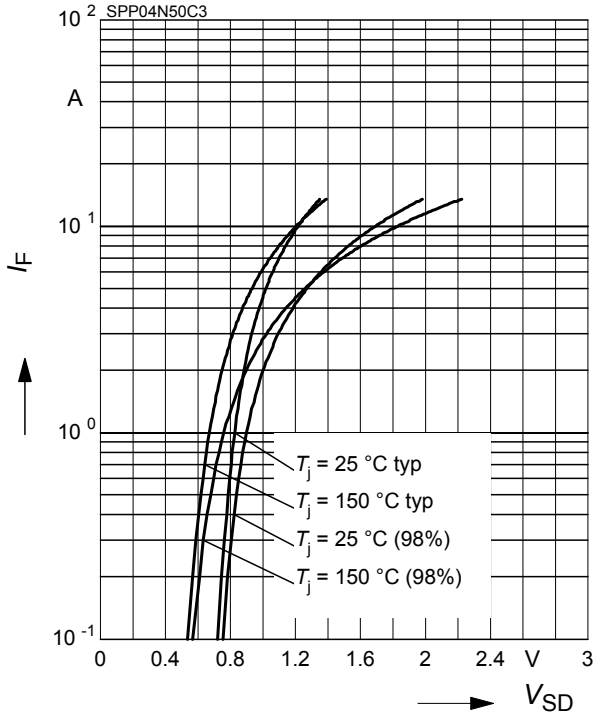
parameter: I_D = 4.5 A pulsed



13 Forward characteristics of body diode

$I_F = f(V_{SD})$

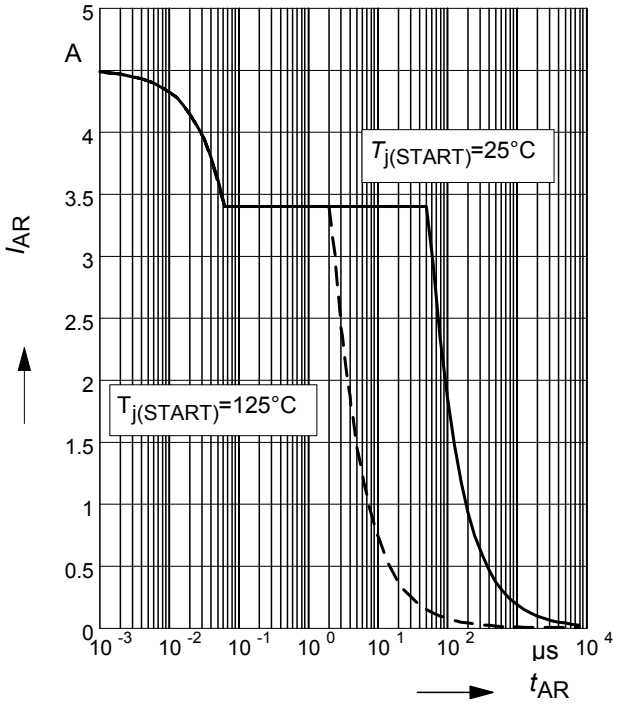
parameter: T_j , tp = 10 µs



14 Avalanche SOA

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

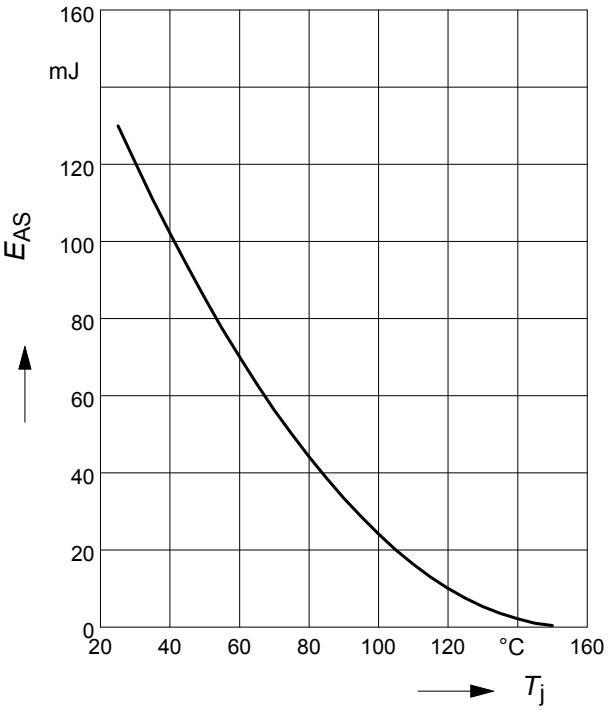
par.: $T_j \leq 150$ °C



15 Avalanche energy

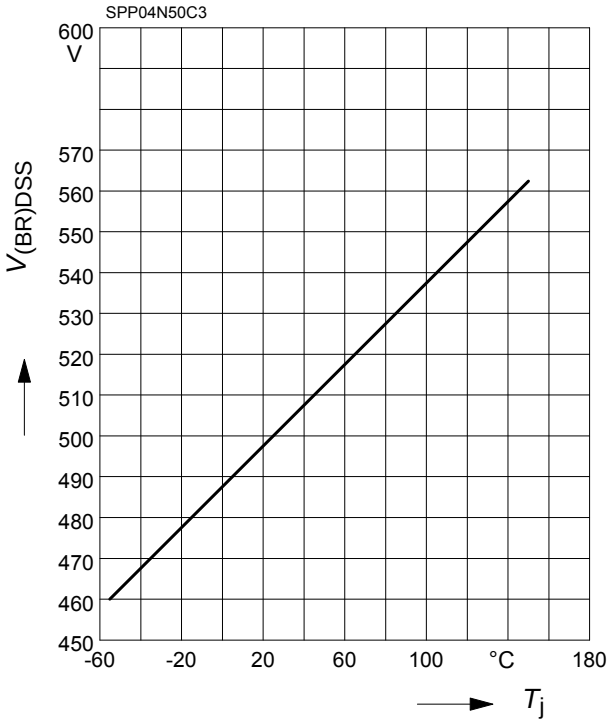
$E_{AS} = f(T_j)$

par.: I_D = 3.4 A, V_{DD} = 50 V



16 Drain-source breakdown voltage

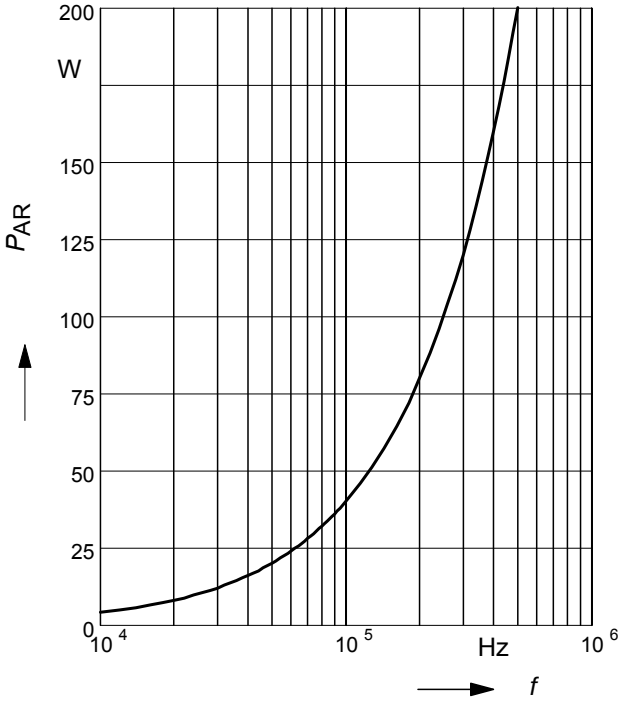
$V_{(BR)DSS} = f(T_j)$



17 Avalanche power losses

$P_{AR} = f(f)$

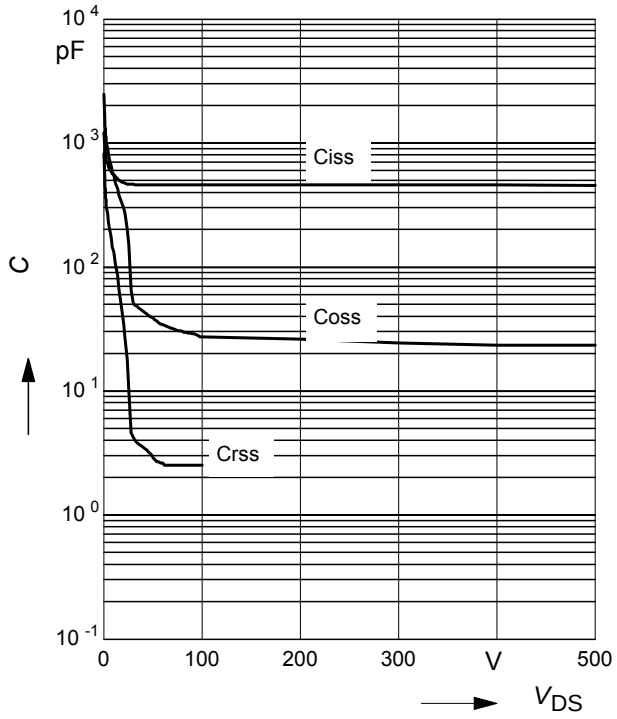
parameter: E_{AR}=0.4mJ



18 Typ. capacitances

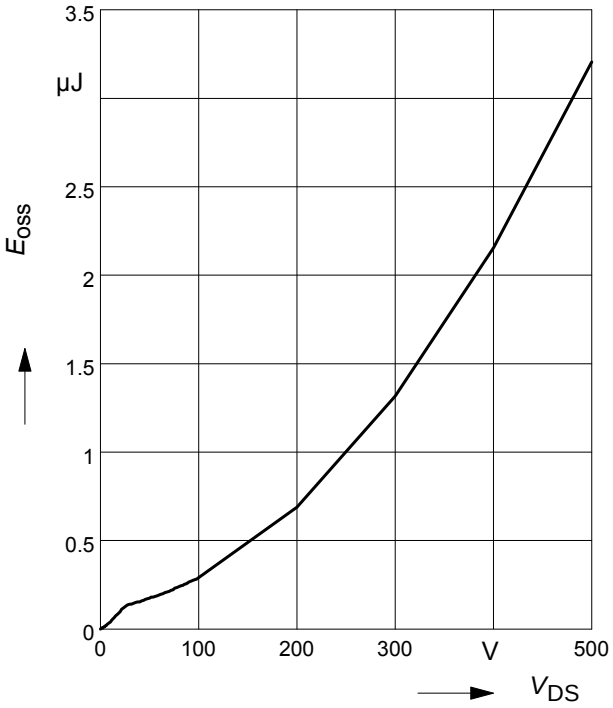
$C = f(V_{DS})$

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

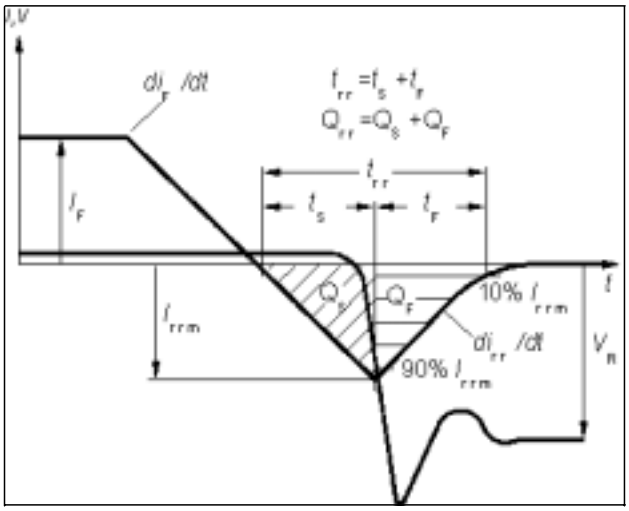


19 Typ. C_{oss} stored energy

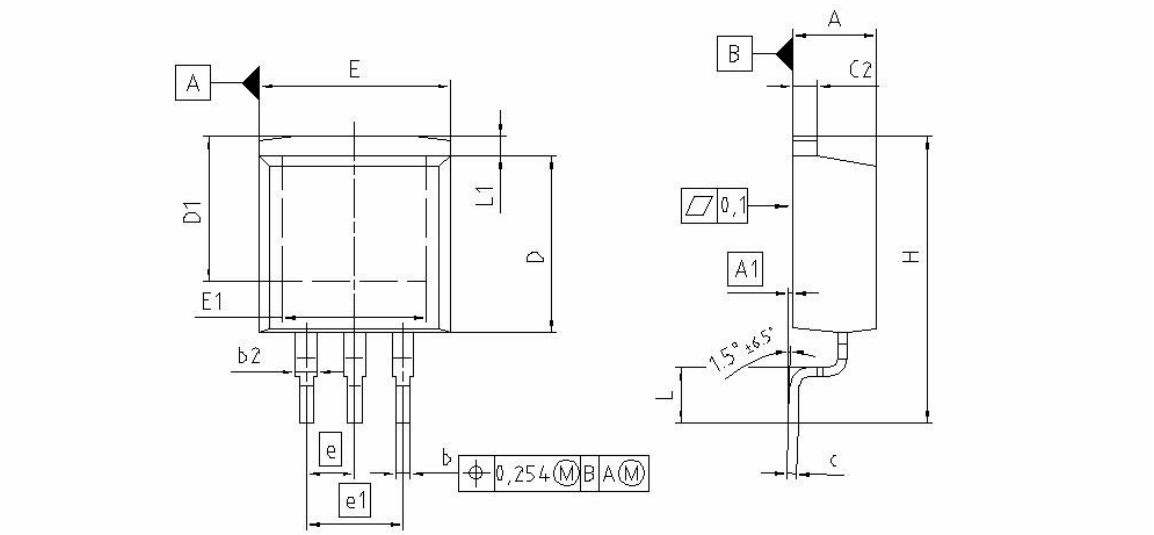
$E_{oss}=f(V_{DS})$



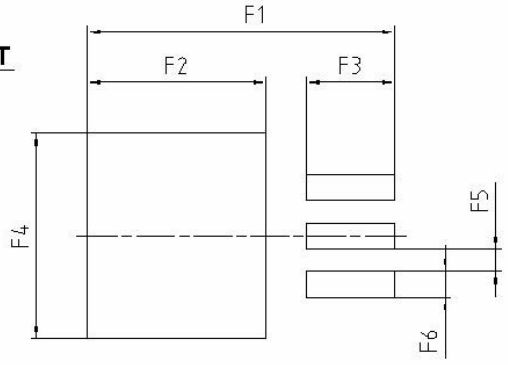
Definition of diodes switching characteristics



P-TO-263-3-2 (D^2-PAK)



FOOTPRINT

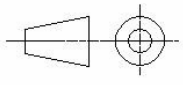


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.572	0.169	0.180
A1	0.000	0.254	0.000	0.010
b	0.650	0.850	0.026	0.033
b2	0.950	1.321	0.037	0.052
c	0.330	0.650	0.013	0.026
c2	0.170	1.400	0.046	0.055
D	8.509	9.450	0.335	0.372
D1	7.100	-	0.280	-
E	9.800	10.312	0.386	0.406
E1	6.500		0.256	
e	2.540		0.100	
e1	5.080		0.200	
N	3		3	
H	14.605	15.875	0.575	0.625
L	2.200	3.000	0.087	0.118
L1	-	1.600	-	0.063
F1	16.050	16.250	0.632	0.640
F2	9.300	9.500	0.366	0.374
F3	4.500	4.700	0.177	0.185
F4	10.700	10.900	0.421	0.429
F5	1.250	1.450	0.049	0.057
F6	1.100	1.300	0.043	0.051

REFERENCE
JEDEC TO263

SCALE
0 5 5 7.5mm

EUROPEAN PROJECTION



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