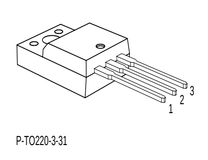
Cool MOS™ Power Transistor

V_{DS}	800	V
$R_{DS(on)}$	0.29	Ω
I_D	17	A

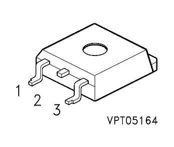
Feature

- New revolutionary high voltage technology
- Worldwide best $R_{DS(on)}$ in TO 220
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- Ultra low effective capacitances
- Improved transconductance
- P-TO-220-3-31: Fully isolated package (2500 VAC; 1 minute)

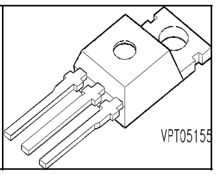
P-TO220-3-31



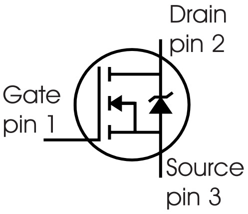
P-TO263-3-2



P-TO220-3-1



Type	Package	Ordering Code	Marking
SPP17N80C3	P-TO220-3-1	Q67040-S4353	17N80C3
SPB17N80C3	P-TO263-3-2	Q67040-S4354	17N80C3
SPA17N80C3	P-TO220-3-31	Q67040-S4441	17N80C3



Maximum Ratings

Parameter	Symbol	Value		Unit
		SPP_B	SPA	
Continuous drain current	I_D			A
T_C = 25 °C		17	$17^{1)}$	
T_C = 100 °C		11	$11^{1)}$	
Pulsed drain current, t_p limited by T_{jmax}	$I_{D\ puls}$	51	51	A
Avalanche energy, single pulse I_D=3.4A, V_{DD}=50V	E_{AS}	670	670	mJ
Avalanche energy, repetitive t_{AR} limited by T_{jmax} 2) I_D=17A, V_{DD}=50V	E_{AR}	0.5	0.5	
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	17	17	A
Gate source voltage	V_{GS}	±20	±20	V
Gate source voltage AC (f >1Hz)	V_{GS}	±30	±30	
Power dissipation, T_C = 25°C	P_{tot}	208	42	W
Operating and storage temperature	T_j , T_{stg}	-55...+150		°C

Maximum Ratings

Parameter	**Symbol**	**Value**	**Unit**
Drain Source voltage slope V_{DS} = 640 V, I_D = 17 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}	-	-	0.6	K/W
Thermal resistance, junction - case, FullPAK	R_{thJC_FP}	-	-	3.6	
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, 1.6 mm (0.063 in.) from case for 10s 4)	T_{sold}	-	-	260	°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	800	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0V, I_D=17A	-	870	-	
Gate threshold voltage	$V_{GS(th)}$	I_D=1000µA, V_{GS}=V_{D}	2.1	3	3.9	
Zero gate voltage drain current	I_{DSS}	V_{DS}=800V, V_{GS}=0V, T_j=25°C T_j=150°C	 - -	 0.5 -	 25 250	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=11A T_j=25°C T_j=150°C	 - -	 0.25 0.78	 0.29 -	Ω
Gate input resistance	R_G	f=1MHz, open drain	-	0.7	-	

Electrical Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Transconductance	g_{fs}	V_{DS}≥2*I_D*$R_{DS(on)max}$, I_D=11A	-	15	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	2320	-	pF
Output capacitance	C_{oss}		-	1250	-	
Reverse transfer capacitance	C_{rss}		-	60	-	
Effective output capacitance,[5) energy related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0V to 480V	-	59	-	
Effective output capacitance,[6) time related	$C_{o(tr)}$		-	124	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=400V, V_{GS}=0/10V, I_D=17A, R_G=4.7Ω, T_j=125°C	-	25	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	72	82	
Fall time	t_f		-	6	9	

Gate Charge Characteristics

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Gate to source charge	Q_{gs}	V_{DD}=640V, I_D=17A	-	12	-	nC
Gate to drain charge	Q_{gd}		-	46	-	
Gate charge total	Q_g	V_{DD}=640V, I_D=17A, V_{GS}=0 to 10V	-	91	177	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=640V, I_D=17A	-	6	-	V

---

[1] Limited only by maximum temperature

[2] Repetitve avalanche causes additional power losses that can be calculated as P_{AV}=E_{AR}*f.

[3] 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.

[4] Soldering temperature for TO-263: 220°C, reflow

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

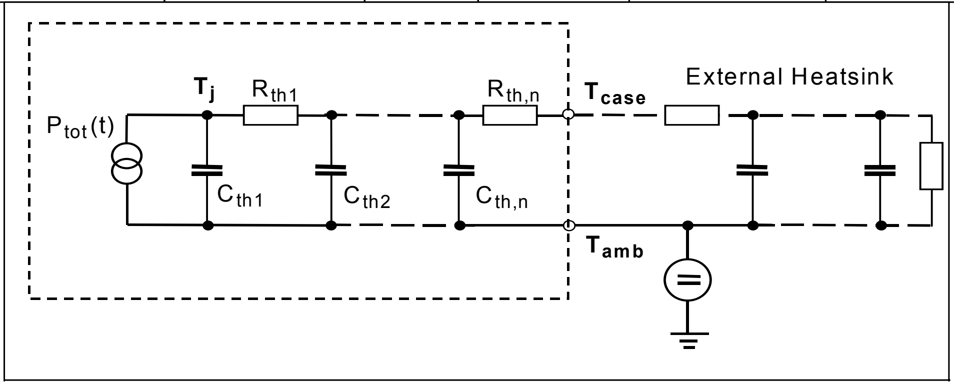
[6] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

Electrical Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	17	A
Inverse diode direct current, pulsed	I_{SM}		-	-	51	
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	-	550	-	ns
Reverse recovery charge	Q_{rr}		-	15	-	µC
Peak reverse recovery current	I_{rrm}		-	51	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	T_j=25°C	-	1200	-	A/µs

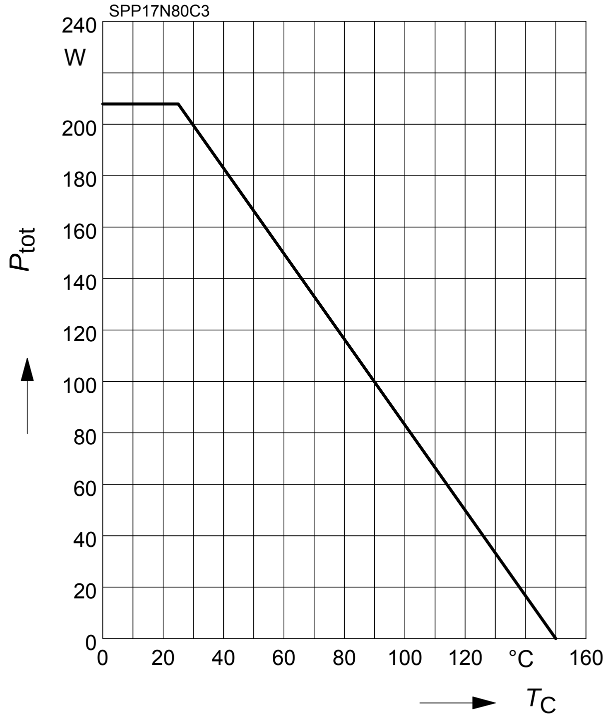
Typical Transient Thermal Characteristics

Symbol	Value		Unit	Symbol	Value		Unit
	SPP_B	SPA			SPP_B	SPA	
R_{th1}	0.00812	0.00812	K/W	C_{th1}	0.0003562	0.0003562	Ws/K
R_{th2}	0.016	0.016		C_{th2}	0.001337	0.001337	
R_{th3}	0.031	0.031		C_{th3}	0.001831	0.001831	
R_{th4}	0.114	0.16		C_{th4}	0.005033	0.005033	
R_{th5}	0.135	0.324		C_{th5}	0.012	0.008657	
R_{th6}	0.059	2.522		C_{th6}	0.092	0.412	



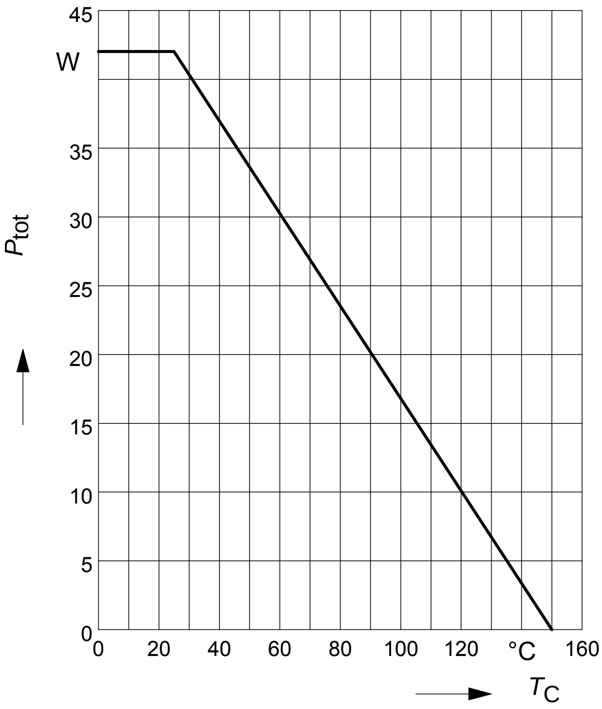
1 Power dissipation

$P_{tot} = f(T_C)$



2 Power dissipation FullPAK

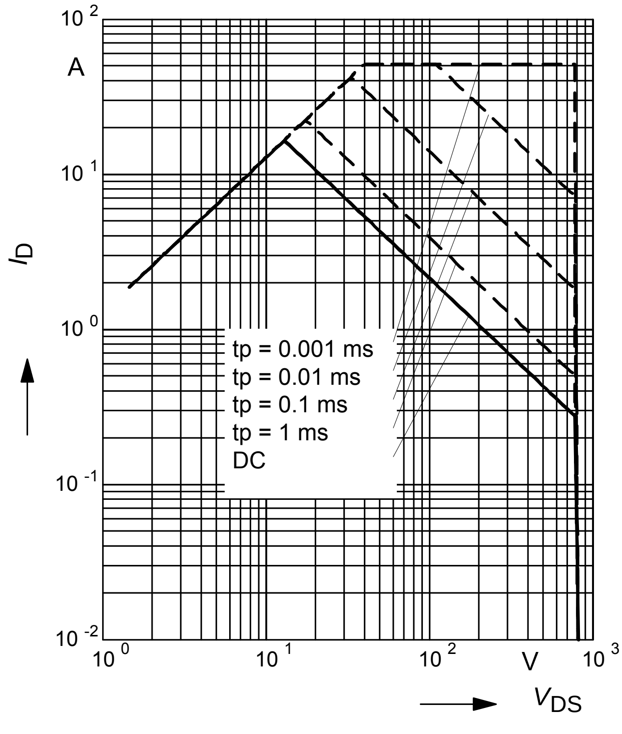
$P_{tot} = f(T_C)$



3 Safe operating area

$I_D = f(V_{DS})$

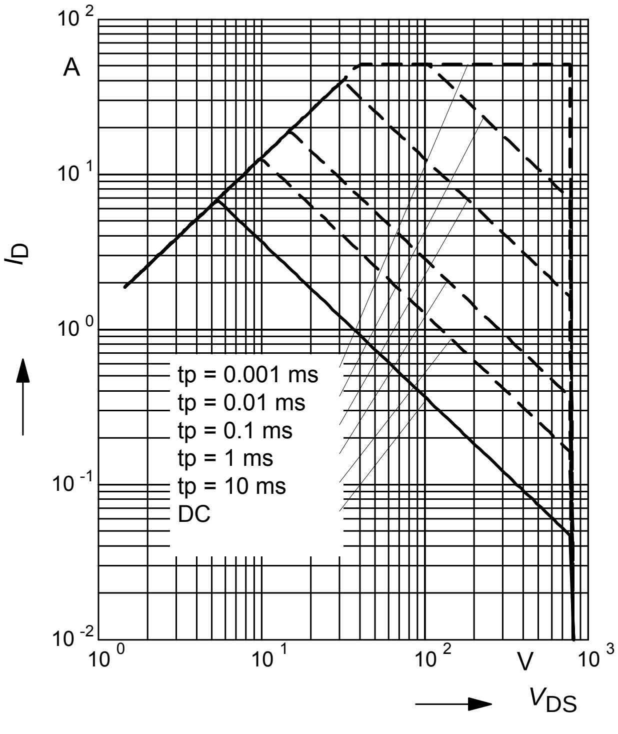
parameter : $D = 0$, T_C=25°C



4 Safe operating area FullPAK

$I_D = f(V_{DS})$

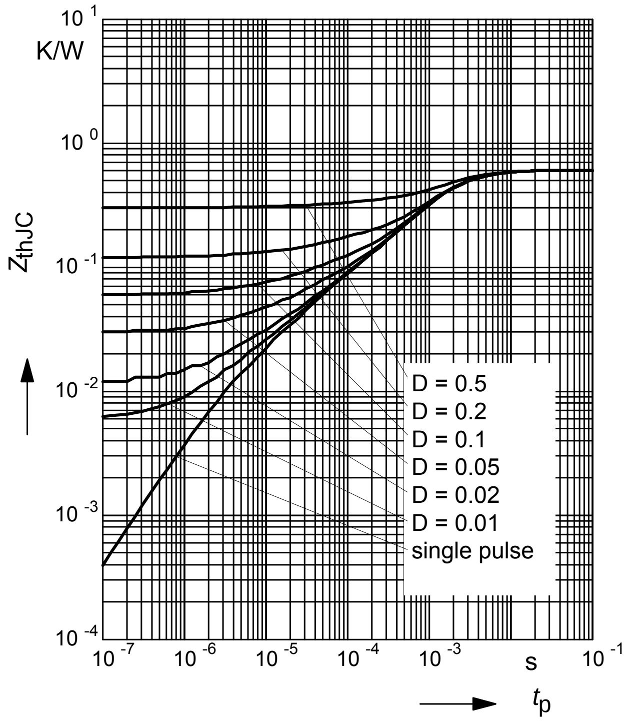
parameter: $D = 0$, T_C = 25°C



5 Transient thermal impedance

$Z_{thJC} = f(t_p)$

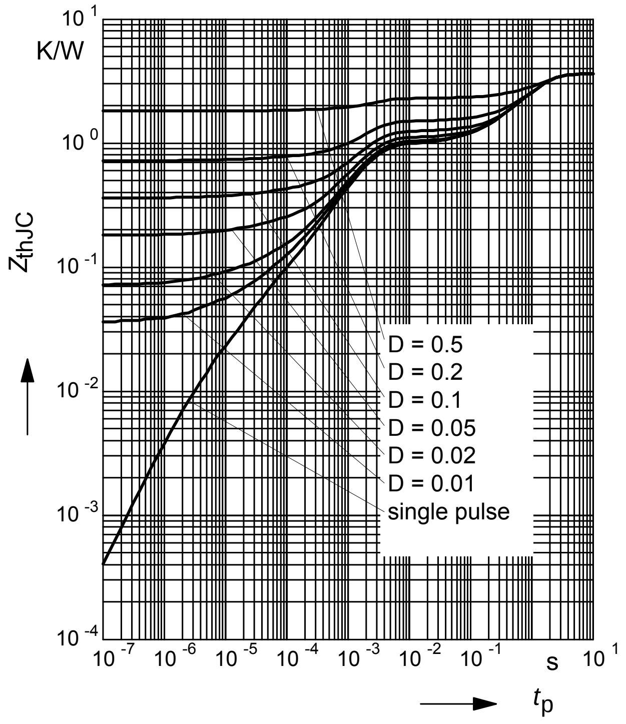
parameter: $D = t_p/T$



6 Transient thermal impedance FullPAK

$Z_{thJC} = f(t_p)$

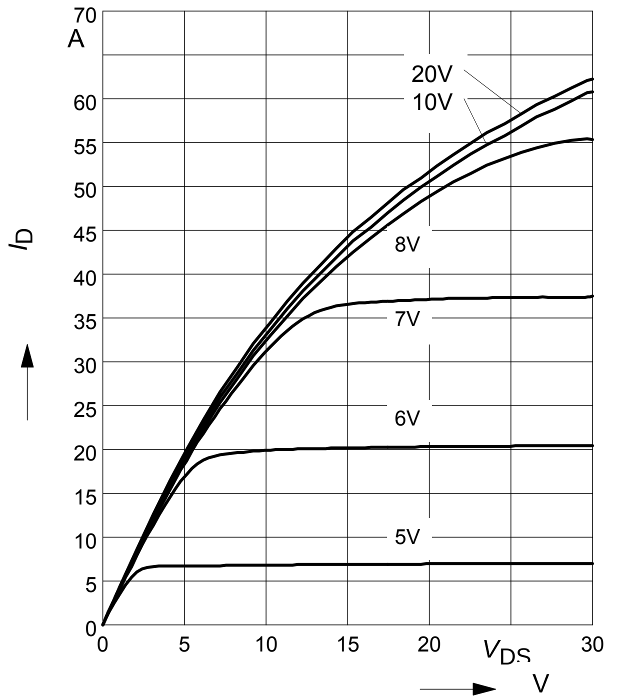
parameter: $D = t_p/t$



7 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

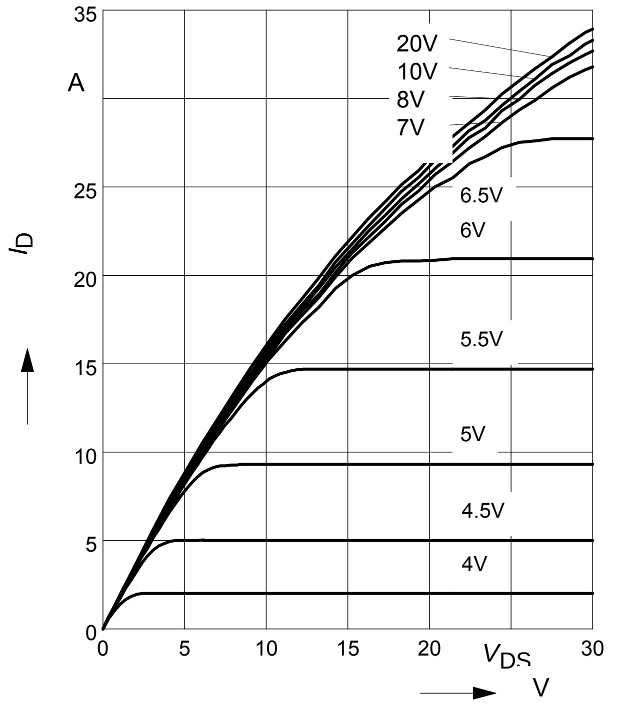
parameter: t_p = 10 µs, V_{GS}



8 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=150°C

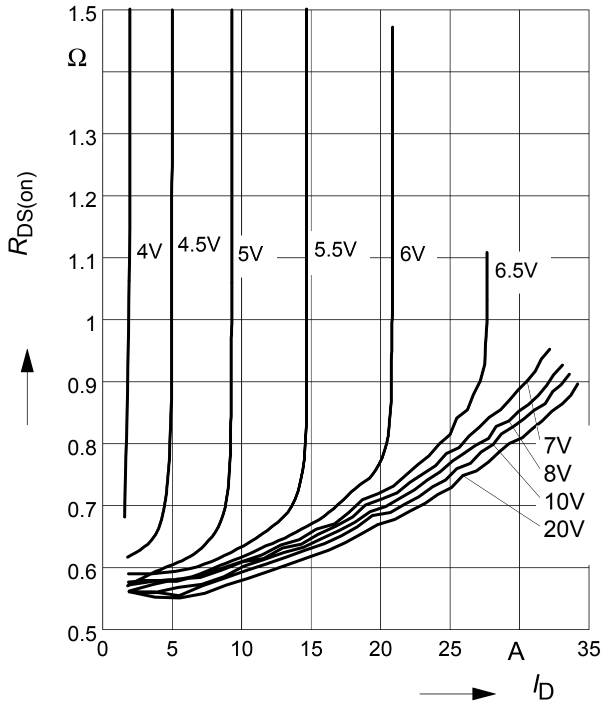
parameter: t_p = 10 µs, V_{GS}



9 Typ. drain-source on resistance

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

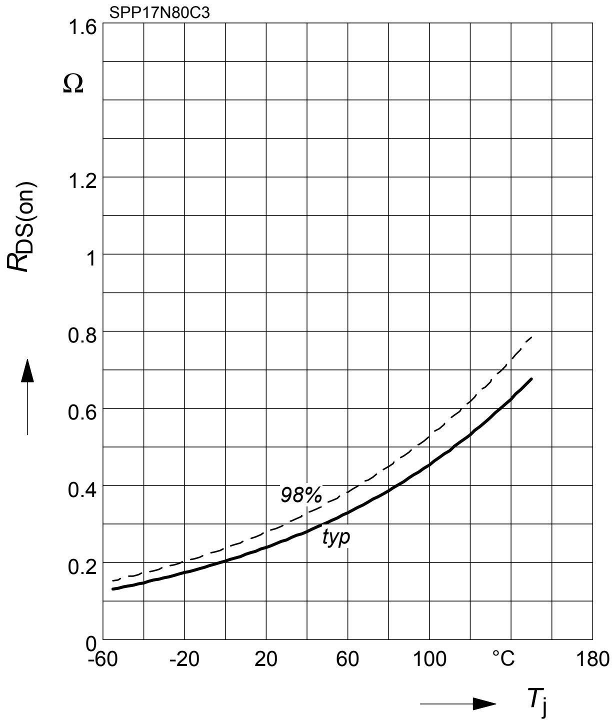
parameter: T_j=150°C, V_{GS}



10 Drain-source on-state resistance

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

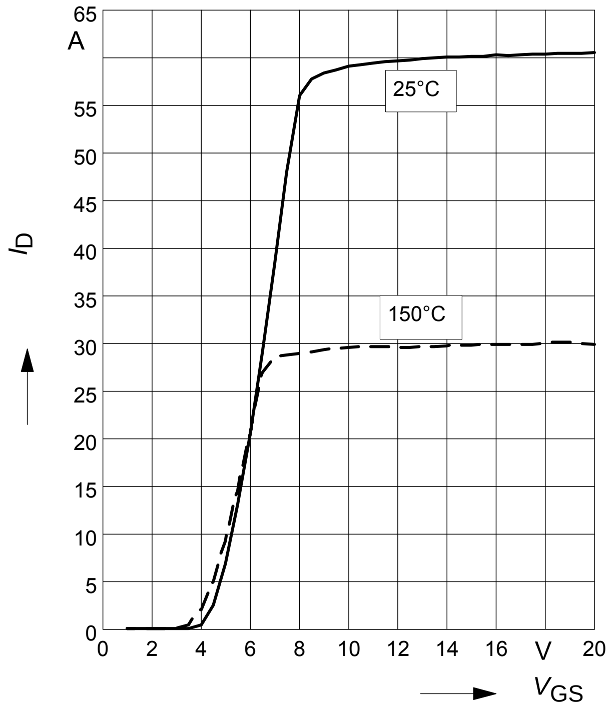
parameter : I_D = 11 A, V_{GS} = 10 V



11 Typ. transfer characteristics

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

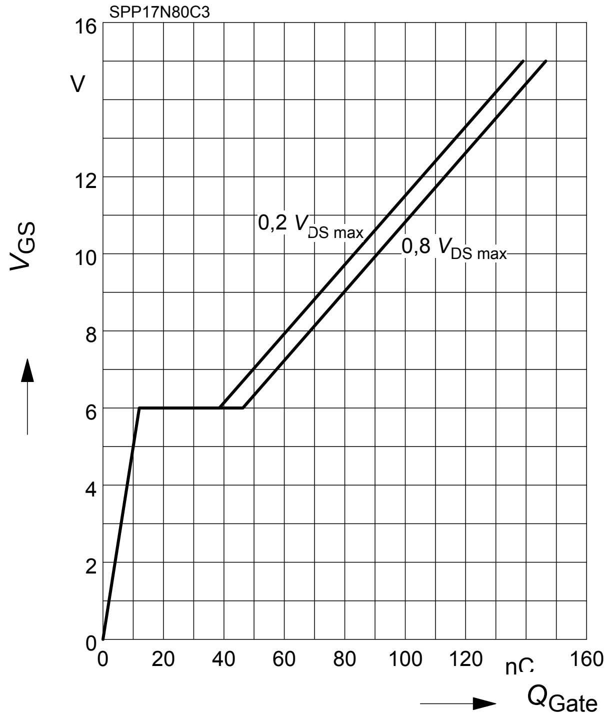
parameter: t_p = 10 µs



12 Typ. gate charge

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

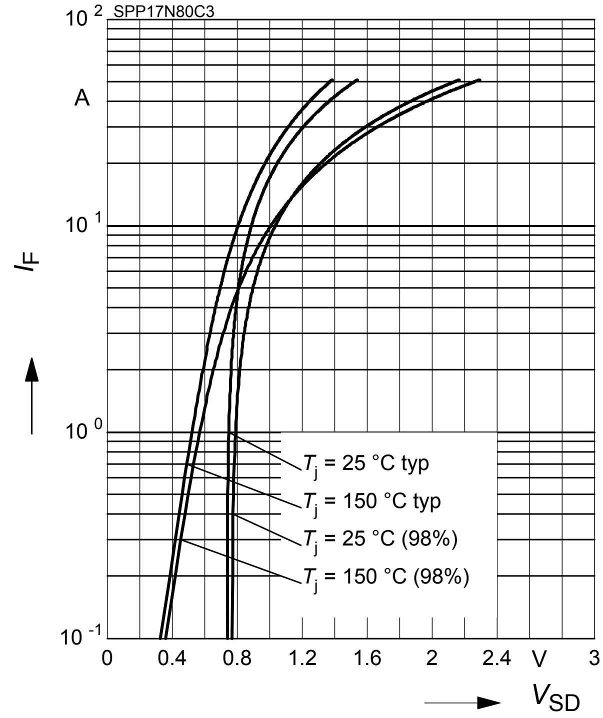
parameter: I_D = 17 A pulsed



13 Forward characteristics of body diode

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

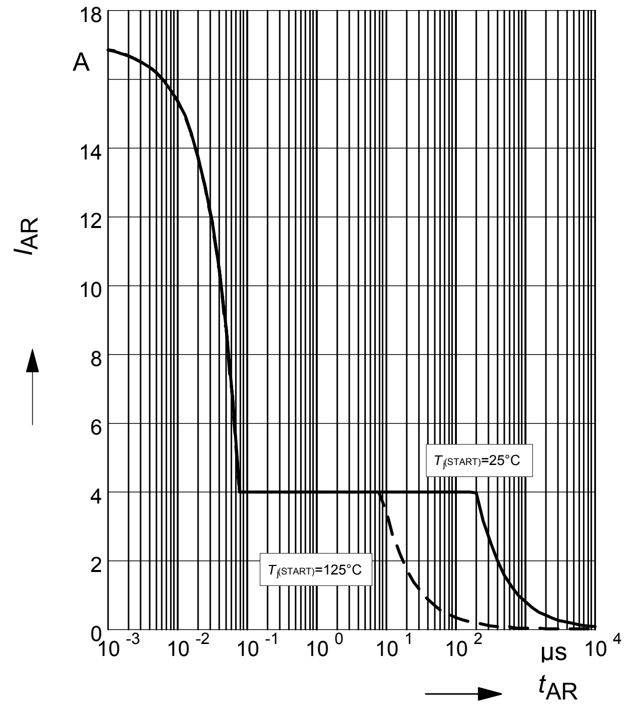
parameter: T_j , tp = 10 µs



14 Avalanche SOA

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

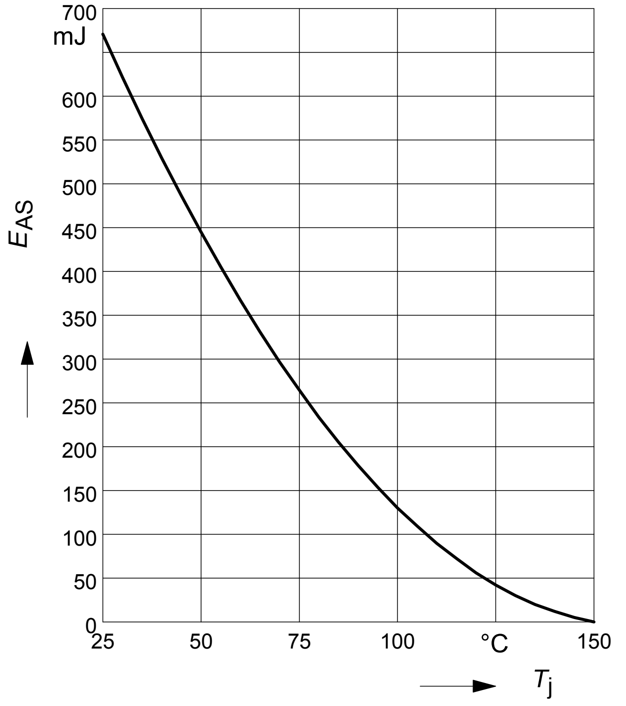
par.: $T_j \leq 150$ °C



15 Avalanche energy

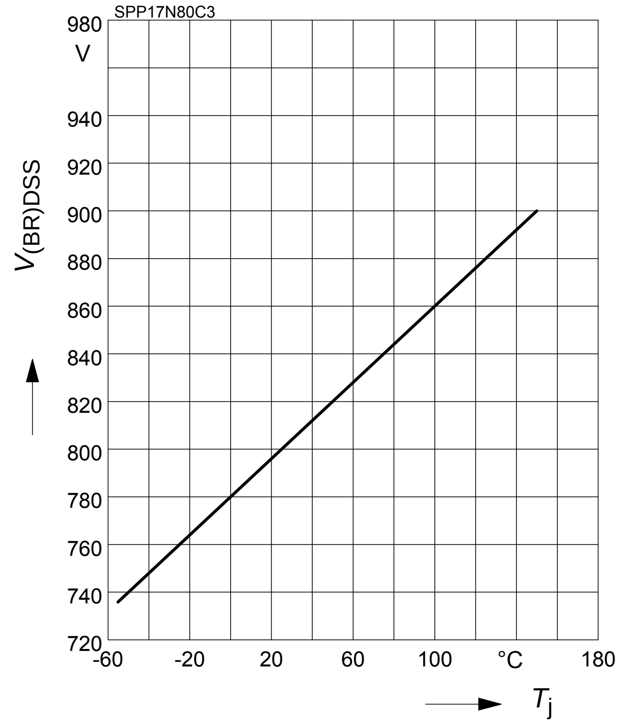
$E_{AS} = f\,(T_j)$

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



16 Drain-source breakdown voltage

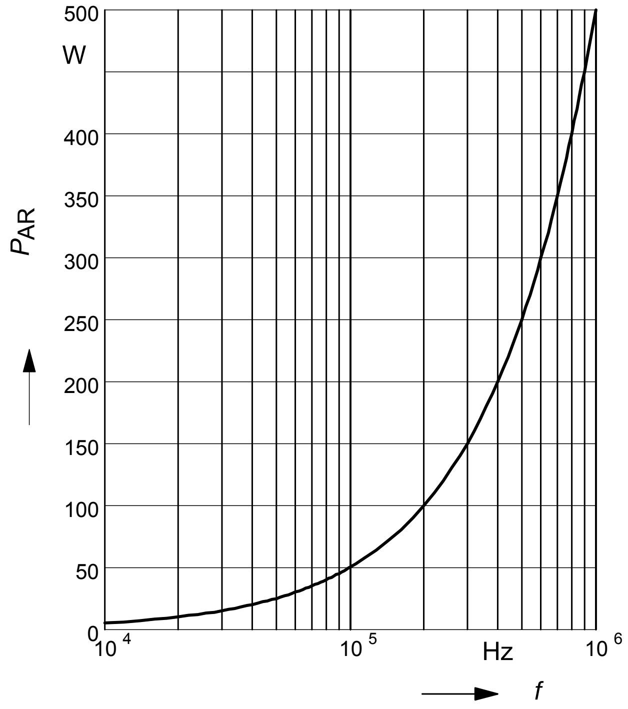
$V_{(BR)DSS} = f\,(T_j)$



17 Avalanche power losses

$P_{AR} = f(f)$

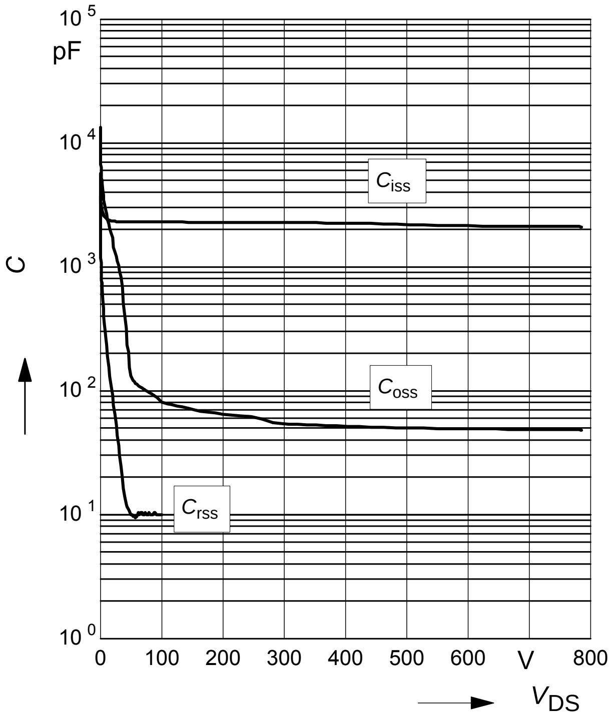
parameter: E_{AR}=0.5mJ



18 Typ. capacitances

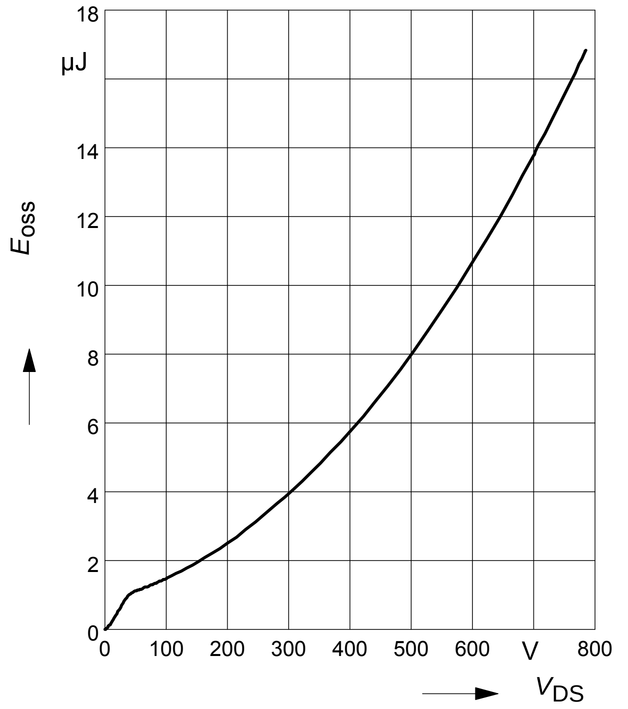
$C = f(V_{DS})$

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

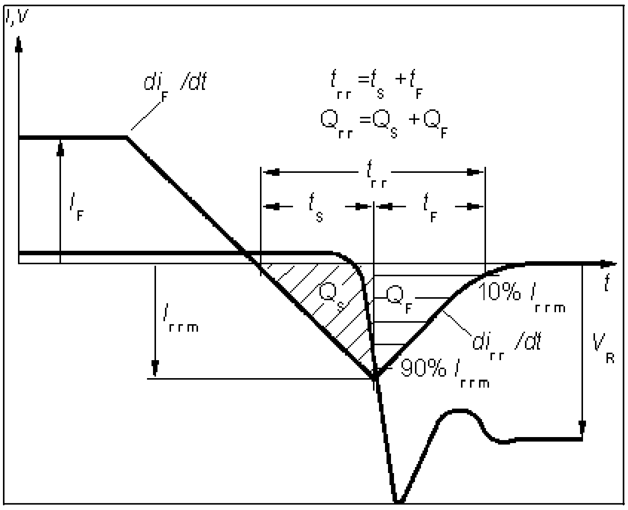


19 Typ. C_{oss} stored energy

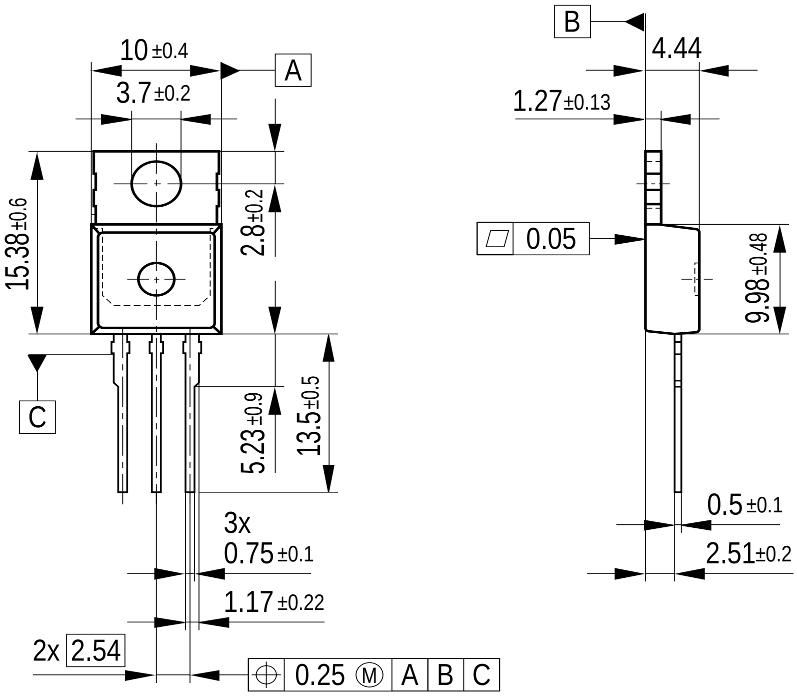
$E_{oss}=f(V_{DS})$



Definition of diodes switching characteristics

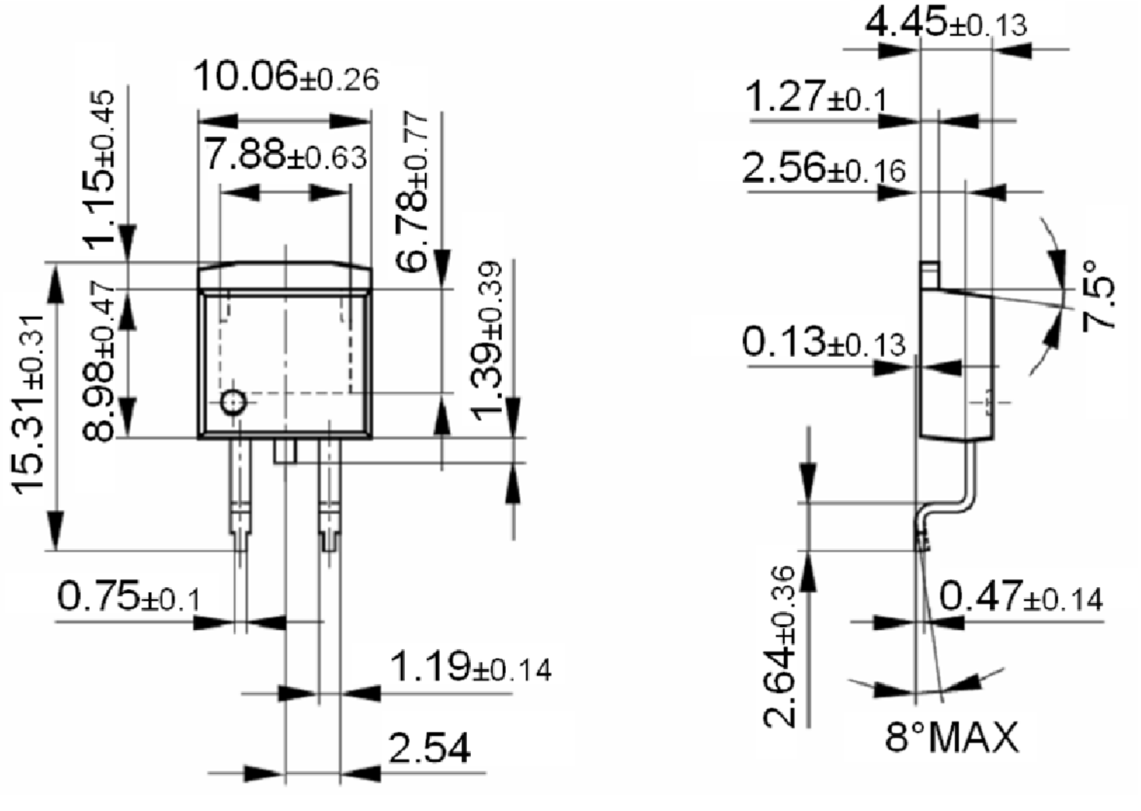


P-TO-220-3-1

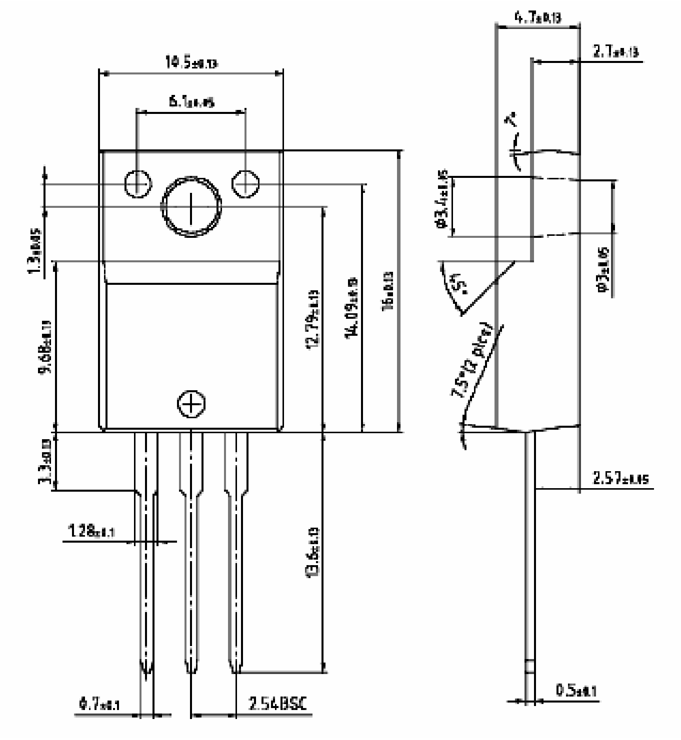


All metal surfaces tin plated, except area of cut.
Metal surface min. x=7.25, y=12.3

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



P-TO-220-3-31 (FullPAK)



Please refer to mounting instructions (application note AN-TO220-3-31-01)

Published by
Infineon Technologies AG,
Bereichs Kommunikation
St.-Martin-Strasse 53,
D-81541 München

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 Reprensatives 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.