SPP03N60S5

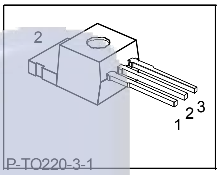
Cool MOS™ Power Transistor

V_{DS}	600	V
$R_{DS(on)}$	1.4	Ω
I_D	3.2	A

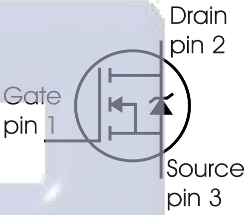
Feature

- New revolutionary high voltage technology
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- Ultra low effective capacitances
- Improved transconductance
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC0) for target applications

PG-TO220



Type	Package	Ordering Code	Marking
SPP03N60S5	PG-TO220	Q67040-S4184	03N60S5



Maximum Ratings

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
T_C = 25 °C		3.2	
T_C = 100 °C		2	
Pulsed drain current, t_p limited by T_{jmax}	$I_{D\ puls}$	5.7	
Avalanche energy, single pulse I_D = 2.4 A, V_{DD} = 50 V	E_{AS}	100	mJ
Avalanche energy, repetitive t_{AR} limited by T_{jmax} 1) I_D = 3.2 A, V_{DD} = 50 V	E_{AR}	0.2	
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	3.2	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}	38	W
Operating and storage temperature	T_j , T_{stg}	-55... +150	°C

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain Source voltage slope V_{DS} = 480 V, I_D = 3.2 A, T_j = 125 °C	dv/dt	20	V/ns

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	-	-	3.3	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm^2 cooling area [2]		-	35	-	
Soldering temperature, wavesoldering 1.6 mm (0.063 in.) from case for 10s [3]	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	600	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0V, I_D=3.2A	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	I_D=135µA, V_{GS}=V_{DS}	3.5	4.5	5.5	
Zero gate voltage drain current	I_{DSS}	V_{DS}=600V, V_{GS}=0V,				µA
		T_j=25°C,	-	0.5	1	
		T_j=150°C	-	-	70	
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=2A,				Ω
		T_j=25°C	-	1.26	1.4	
		T_j=150°C	-	3.4	-	

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

Parameter	**Symbol**	**Conditions**	**Values**			**Unit**
			min.	**typ.**	**max.**	
Characteristics						
Transconductance	g_{fs}	V_{DS}≥2*I_D*$R_{DS(on)max}$, I_D=2A	-	1.8	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	420	-	pF
Output capacitance	C_{oss}		-	150	-	
Reverse transfer capacitance	C_{rss}		-	3.6	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=350V, V_{GS}=0/10V, I_D=3.2A, R_G=20Ω	-	35		ns
Rise time	t_r		-	25	-	
Turn-off delay time	$t_{d(off)}$		-	40		
Fall time	t_f		-	15	22.5	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	V_{DD}=350V, I_D=3.2A	-	3.5	-	nC
Gate to drain charge	Q_{gd}		-	7	-	
Gate charge total	Q_g	V_{DD}=350V, I_D=3.2A, V_{GS}=0 to 10V	-	12.4	16	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=350V, I_D=3.2A	-	8	-	V

[0] J-STD20 and JESD22

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

[2] 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.

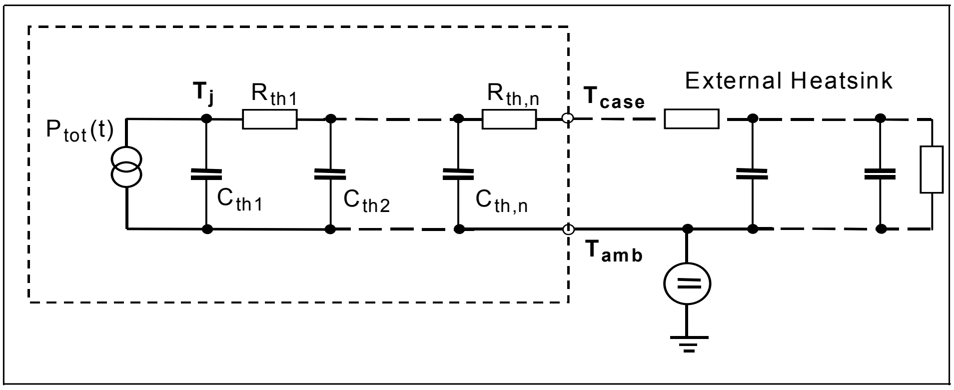
[3] Soldering temperature for TO-263: 220°C, reflow

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	3.2	A
Inverse diode direct current, pulsed	I_{SM}		-	-	5.7	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=I_S	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=350V, I_F=I_S , di_F/dt=100A/µs	-	1000	1700	ns
Reverse recovery charge	Q_{rr}		-	2.3	-	µC

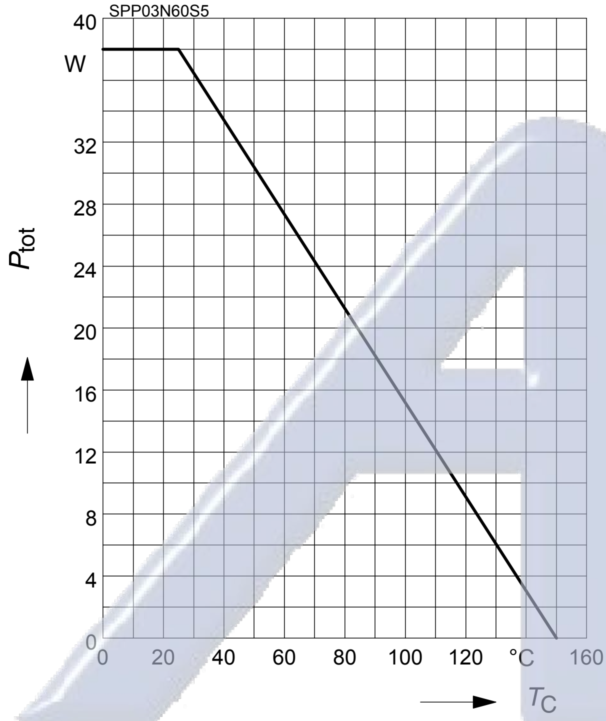
Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
	typ.			typ.	
Thermal resistance			Thermal capacitance		
R_{th1}	0.054	K/W	C_{th1}	0.00005232	Ws/K
R_{th2}	0.103		C_{th2}	0.0002034	
R_{th3}	0.178		C_{th3}	0.0002963	
R_{th4}	0.757		C_{th4}	0.0009103	
R_{th5}	0.682		C_{th5}	0.002084	
R_{th6}	0.202		C_{th6}	0.024	



1 Power dissipation

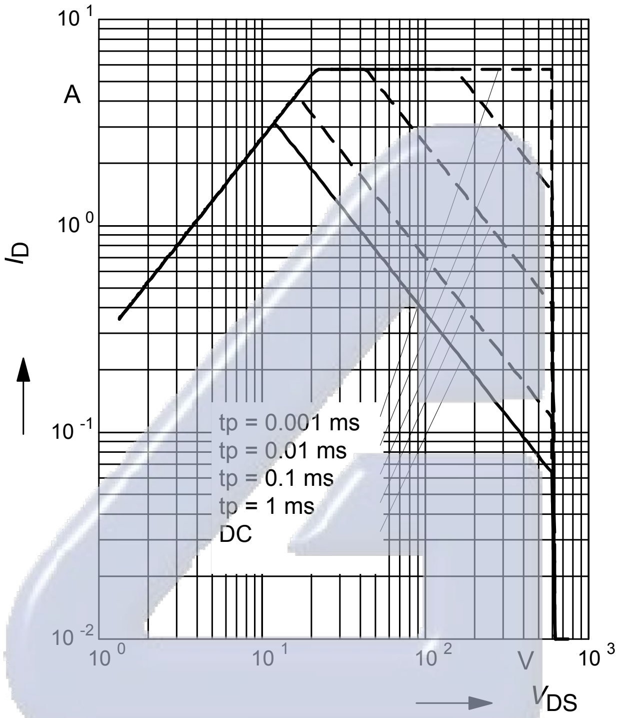
$P_{tot} = f(T_C)$



2 Safe operating area

$I_D = f(V_{DS})$

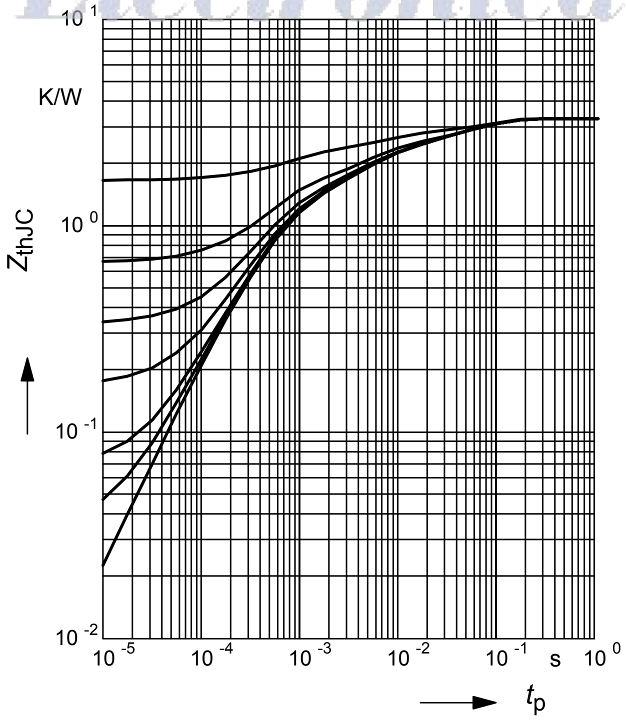
parameter : $D = 0$, T_C=25°C



3 Transient thermal impedance

$Z_{thJC} = f(t_p)$

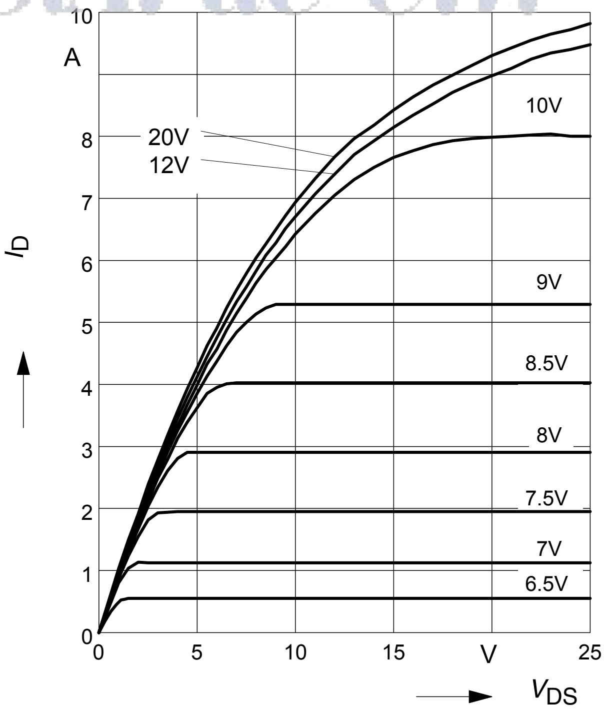
parameter: $D = t_p/T$



4 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

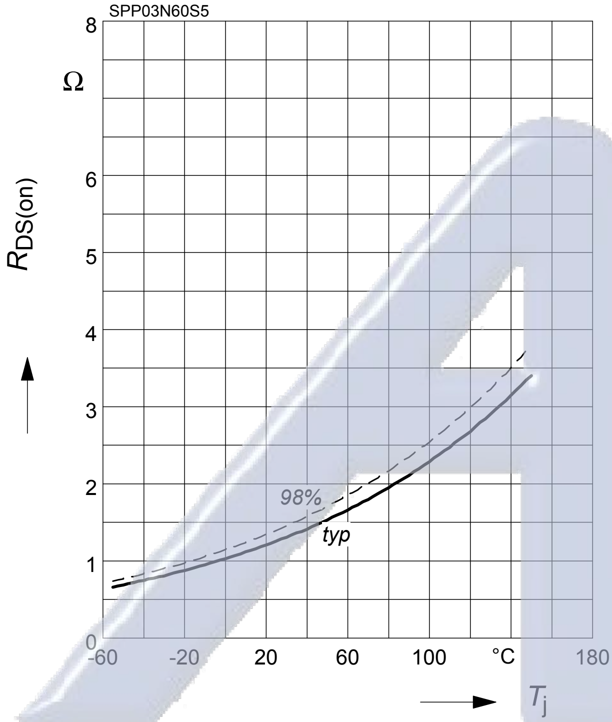
parameter: t_p = 10 µs, V_{GS}



5 Drain-source on-state resistance

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

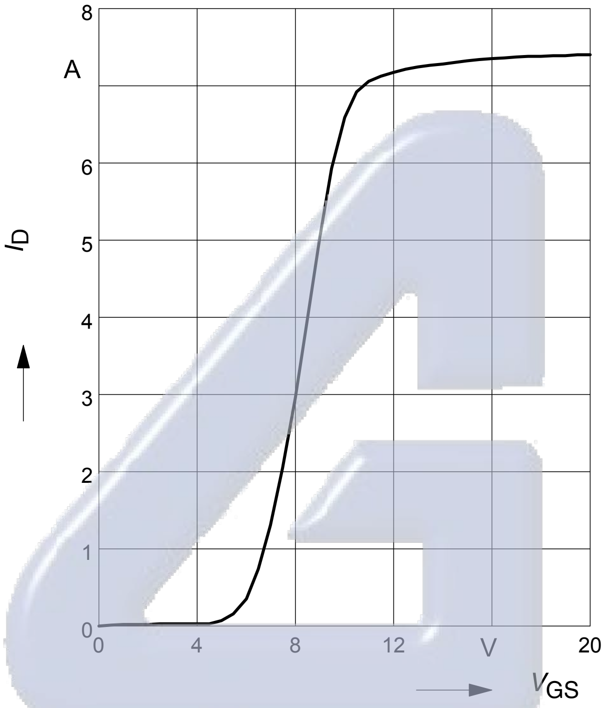
parameter : I_D = 2 A, V_{GS} = 10 V



6 Typ. transfer characteristics

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

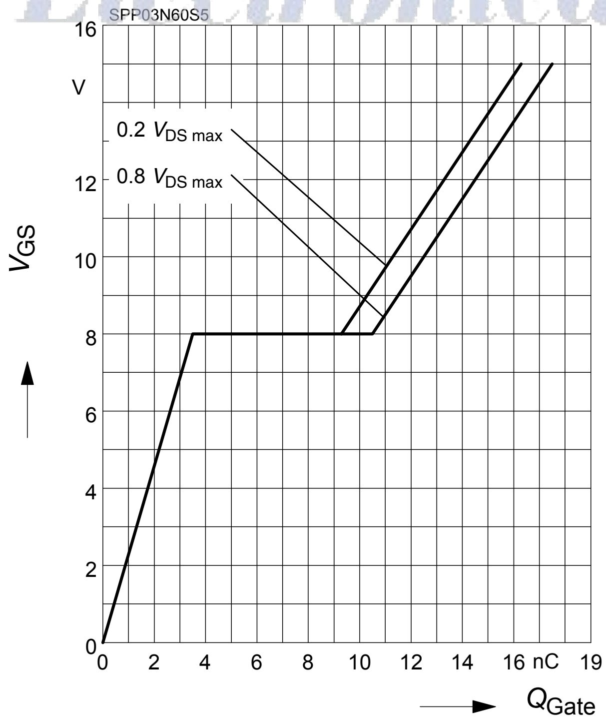
parameter: t_p = 10 µs



7 Typ. gate charge

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

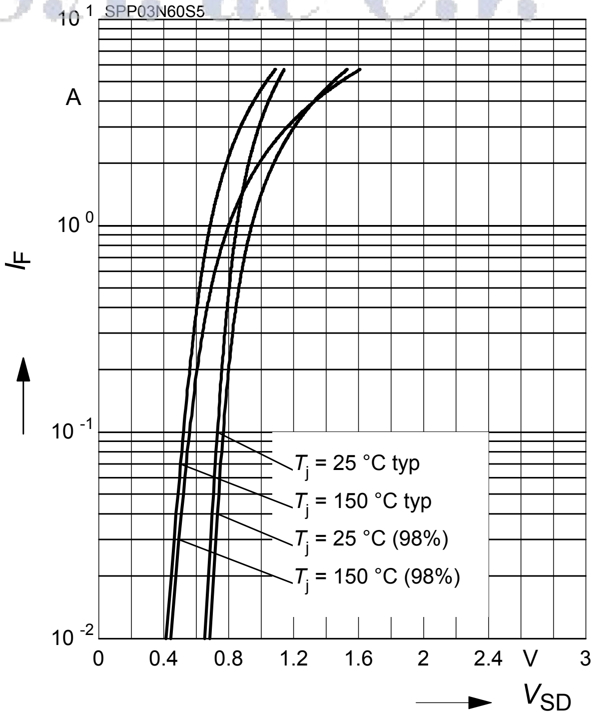
parameter: I_D = 3.2 A pulsed



8 Forward characteristics of body diode

$I_F = f(V_{SD})$

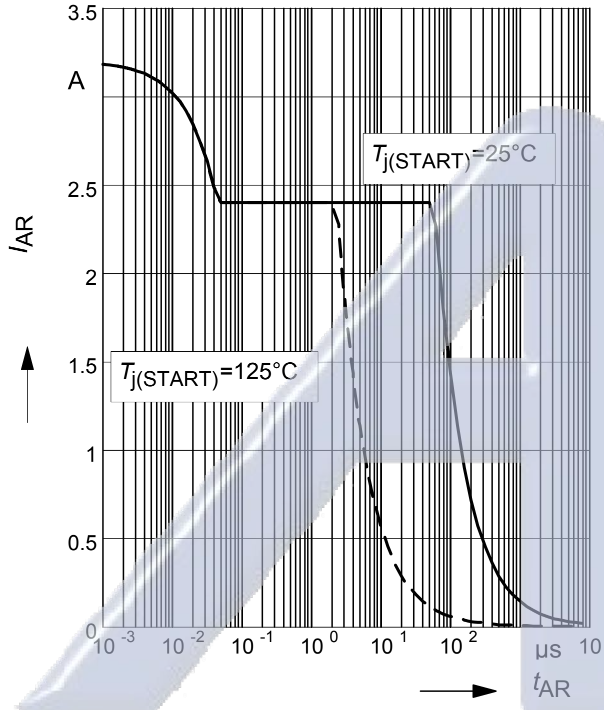
parameter: T_j , tp = 10 µs



9 Avalanche SOA

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

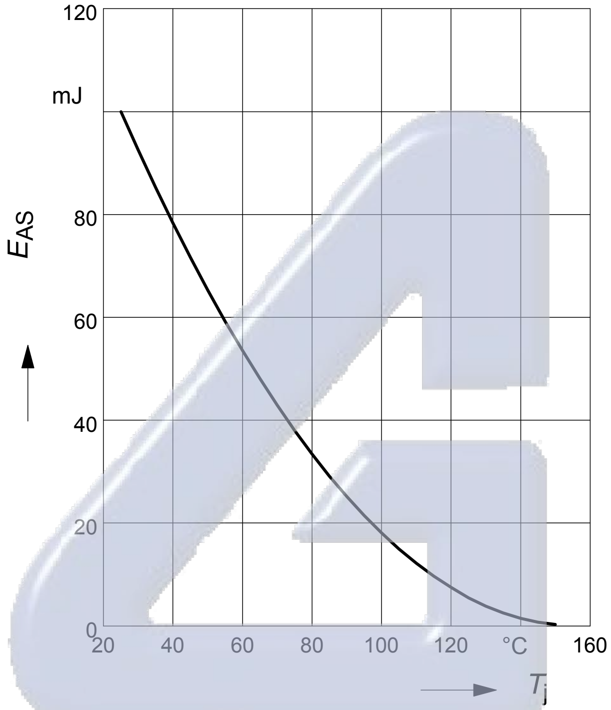
par.: $T_j \leq 150$ °C



10 Avalanche energy

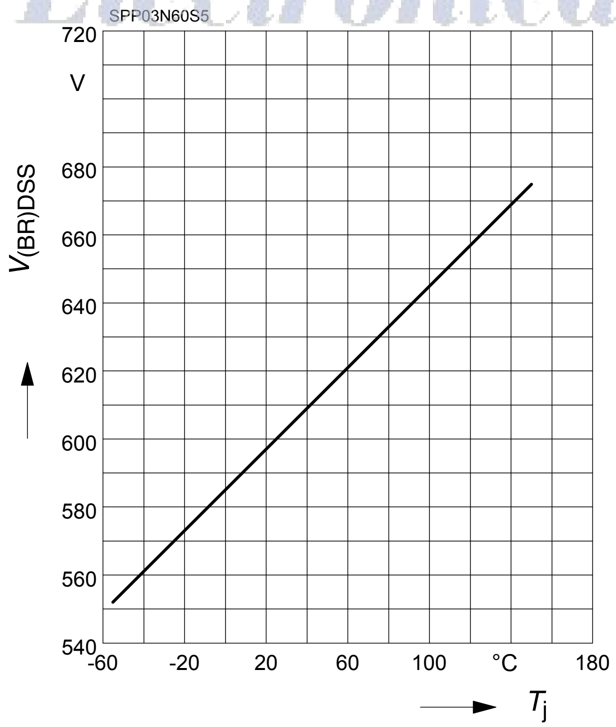
$E_{AS} = f(T_j)$

par.: I_D = 2.4 A, V_{DD} = 50 V



11 Drain-source breakdown voltage

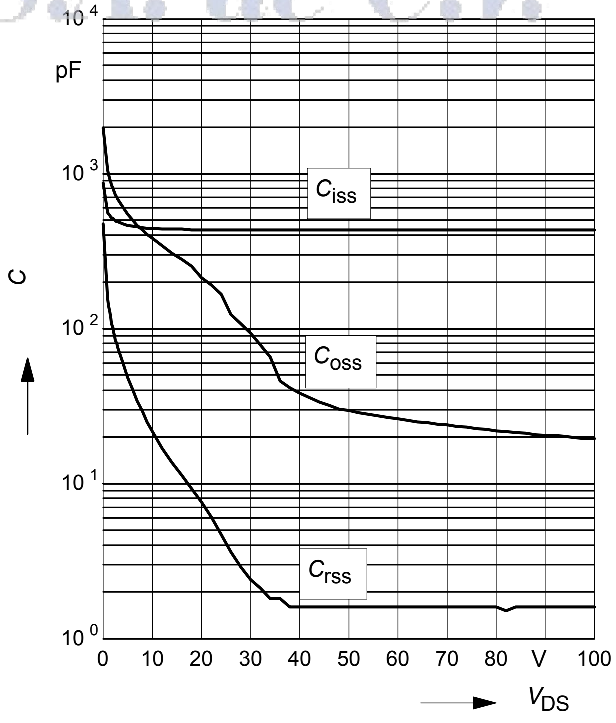
$V_{(BR)DSS} = f(T_j)$



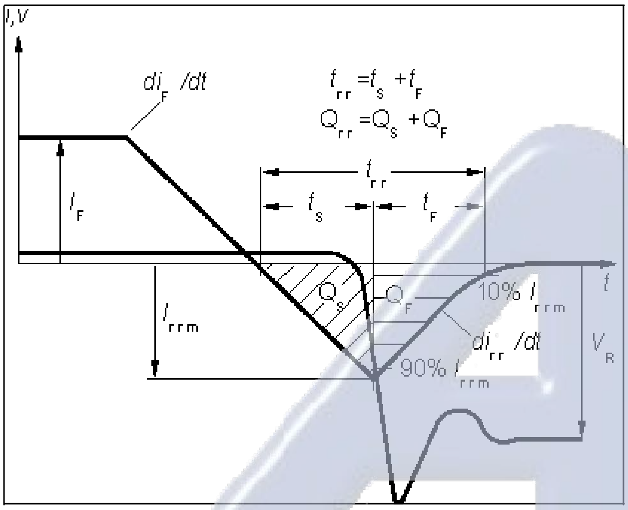
12 Typ. capacitances

$C = f(V_{DS})$

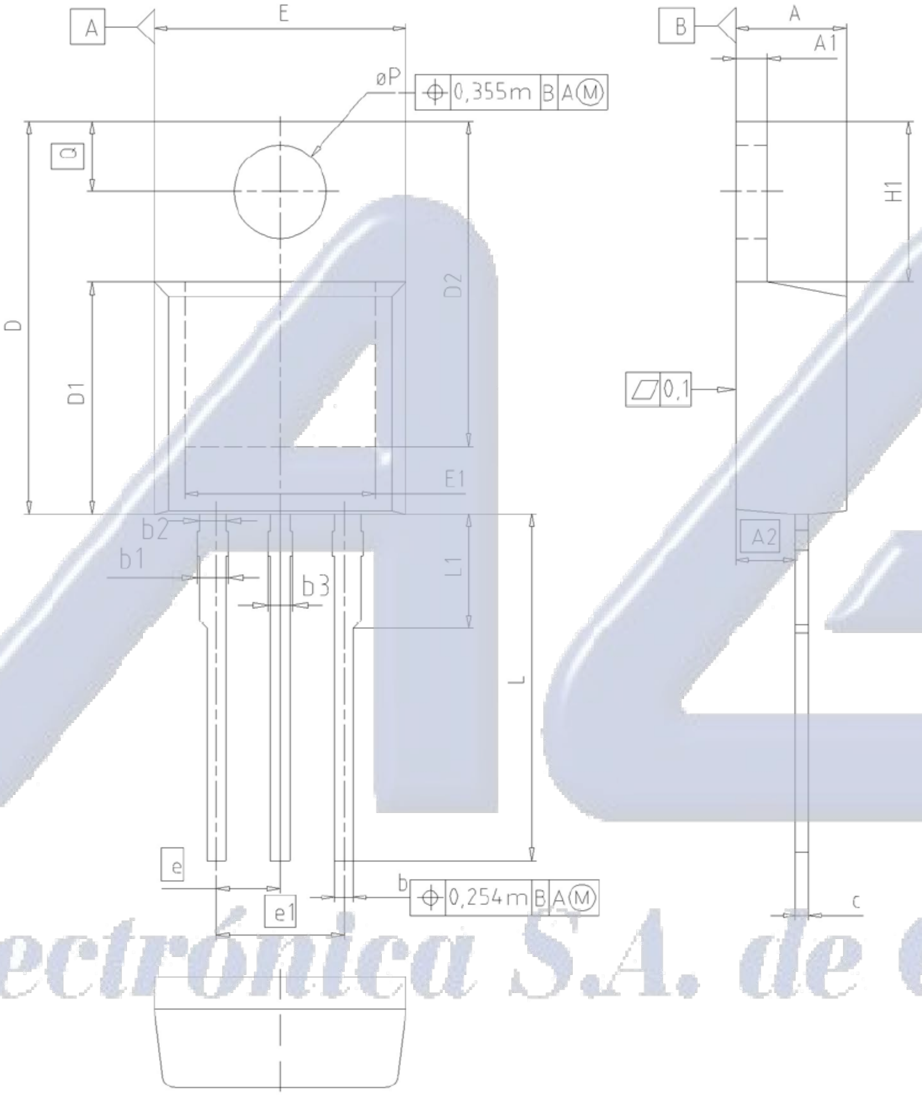
parameter: V_{GS}=0V, f=1 MHz



Definition of diodes switching characteristics



PG-TO220-3-1, PG-TO220-3-21



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	1.17	1.40	0.046	0.055
A2	2.15	2.72	0.085	0.107
b	0.65	0.86	0.026	0.034
b1	0.95	1.40	0.037	0.055
b2	0.95	1.15	0.037	0.045
b3	0.65	1.15	0.026	0.045
c	0.33	0.60	0.013	0.024
D	14.81	15.95	0.583	0.628
D1	8.51	9.45	0.335	0.372
D2	12.19	13.10	0.480	0.516
E	9.70	10.36	0.382	0.408
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	-	4.80	-	0.189
øP	3.60	3.89	0.142	0.153
Q	2.60	3.00	0.102	0.118

DOCUMENT NO.
Z8B00003318

SCALE
0
2.5
0 2.5
5mm

EUROPEAN PROJECTION

ISSUE DATE
23-08-2007

REVISION
05