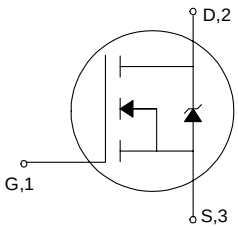
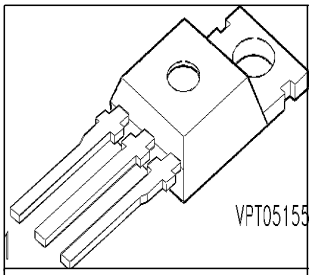
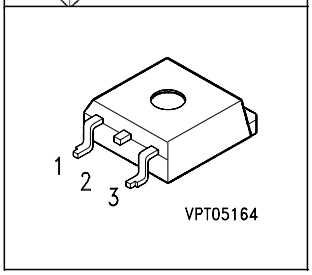
Cool MOS™ Power-Transistor

- New revolutionary high voltage technology
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- Optimized capacitances
- Improved noise immunity
- Former development designation:
  SPPx3N60S5/SPBx3N60S5







Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Marking	Ordering Code
SPP07N60S5	600 V	7.3 A	0.6 Ω	P-TO220-3-1	07N60S5	Q67040-S4172
SPB07N60S5				P-TO263-3-2	07N60S5	Q67040-S4185

Maximum Ratings, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current T_C = 25 °C T_C = 100 °C	I_D	 7.3 4.6	A
Pulsed drain current, t_p = 1ms [1)] T_C = 25 °C	$I_{D\ puls}$	14.6	
Avalanche energy, single pulse I_D = 7.3 A, V_{DD} = 50 V	E_{AS}	230	mJ
Avalanche energy (repetitive, limited by T_{jmax}) I_D = 9.1 A , V_{DD} = 50 V	E_{AR}	0.8	
Avalanche current (repetitive, limited by T_{jmax})	I_{AR}	9.1	A
Reverse diode d*v*/d*t* I_S = 7.3 A, V_{DS}<V_{DSS}, d*i*/d*t* = 100 A/µs, T_{jmax} = 150 °C	d*v*/d*t*	6	kV/µs
Gate source voltage	V_{GS}	±20	V
Power dissipation T_C = 25 °C	P_{tot}	83	W
Operating and storage temperature	T_j , T_{stg}	-55... +150	°C

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Thermal Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	1.5	K/W
Thermal resistance, junction - ambient (Leaded and through-hole packages)	R_{thJA}	-	-	62	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm^2 cooling area [2)]		-	35	-	

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

Drain-source breakdown voltage V_{GS} = 0 V, I_D = 0.25 mA	$V_{(BR)DSS}$	600	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D = 350 µA, T_j = 25 °C	$V_{GS(th)}$	3.5	4.5	5.5	
Zero gate voltage drain current, V_{DS}=V_{DSS}	I_{DSS}				µA
V_{GS} = 0 V, T_j = 25 °C		-	0.5	1	
V_{GS} = 0 V, T_j = 150 °C		-	-	100	
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0 V	I_{GSS}	-	-	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 4.6 A	$R_{DS(on)}$	-	0.54	0.6	Ω

[1]current limited by T_{jmax}

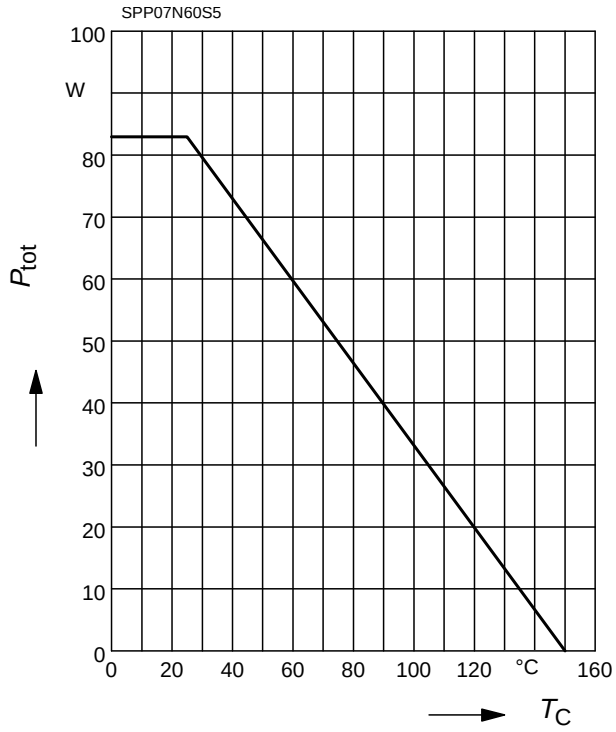
[2] Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6 cm2 (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	g_{fs}	$V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D=4.6A	-	4	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	970	-	pF
Output capacitance	C_{oss}		-	370	-	
Reverse transfer capacitance	C_{rss}		-	10	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=350V, V_{GS}=10V, I_D=7.3A, R_G=12Ω	-	120	-	ns
Rise time	t_r		-	40	-	
Turn-off delay time	$t_{d(off)}$		-	170	255	
Fall time	t_f		-	20	30	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=350V, I_D=7.3A	-	7.5	-	nC
Gate to drain charge	Q_{gd}		-	16.5	-	
Total gate charge	Q_g	V_{DD}=350V, I_D=7.3A, V_{GS}=0 to 10V	-	27	35	
Reverse Diode						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	7.3	A
Inverse diode direct current,pulsed	I_{SM}		-	-	14.6	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=7.3A	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=350V, I_F=I_S, di_F/dt=100A/µs	-	750	1275	ns
Reverse recovery charge	Q_{rr}		-	4.9	-	µC

Power dissipation

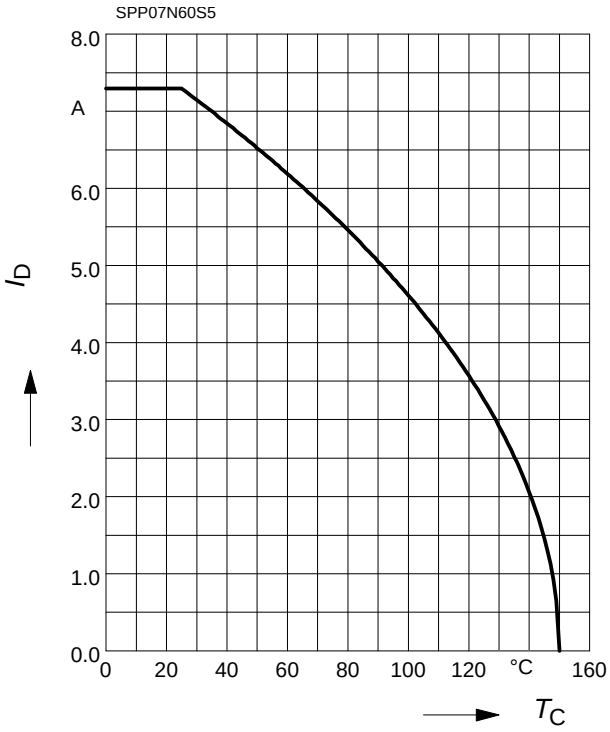
$P_{tot} = f(T_C)$



Drain current

$I_D = f(T_C)$

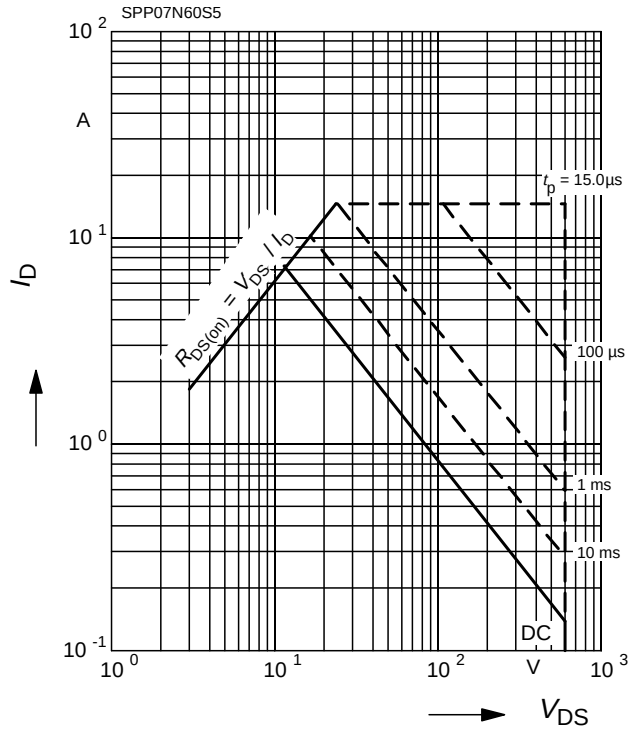
parameter: $V_{GS} \geq 10$ V



Safe operating area

$I_D = f(V_{DS})$

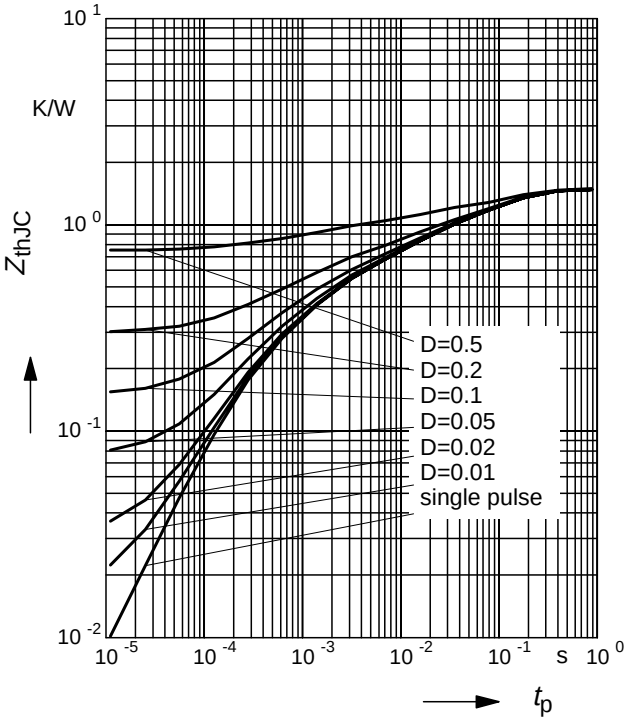
parameter: D=0.01, T_C=25°C



Transient thermal impedance

$Z_{thJC} = f(t_p)$

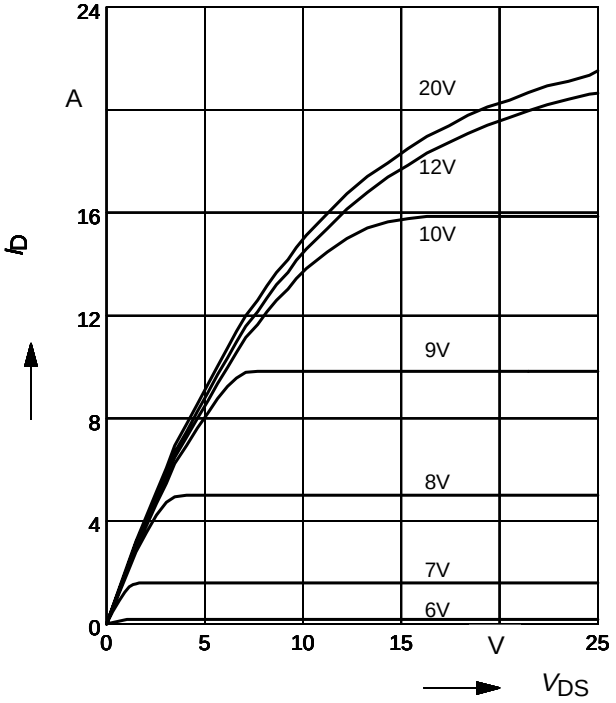
parameter : $D = t_p / T$



Typ. output characteristic

I_D = f (V_{DS})

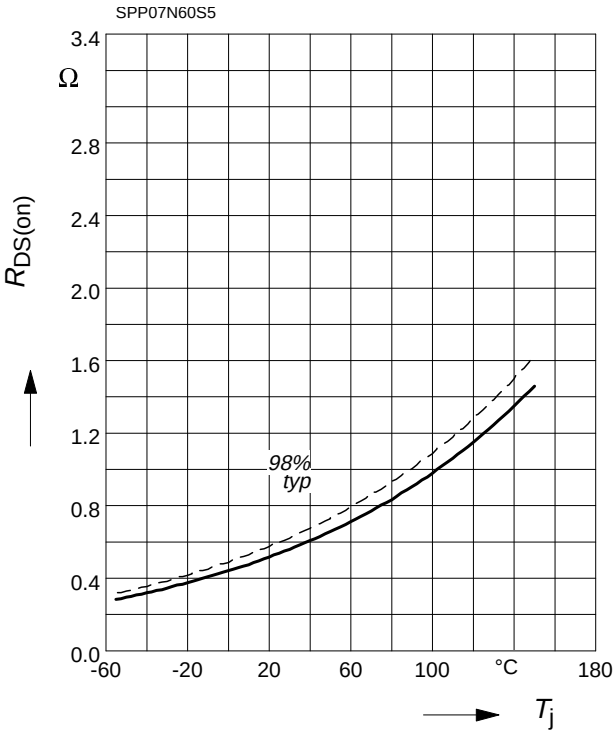
Parameter: V_{GS}, T_j = 25 °C



Drain-source on-resistance

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

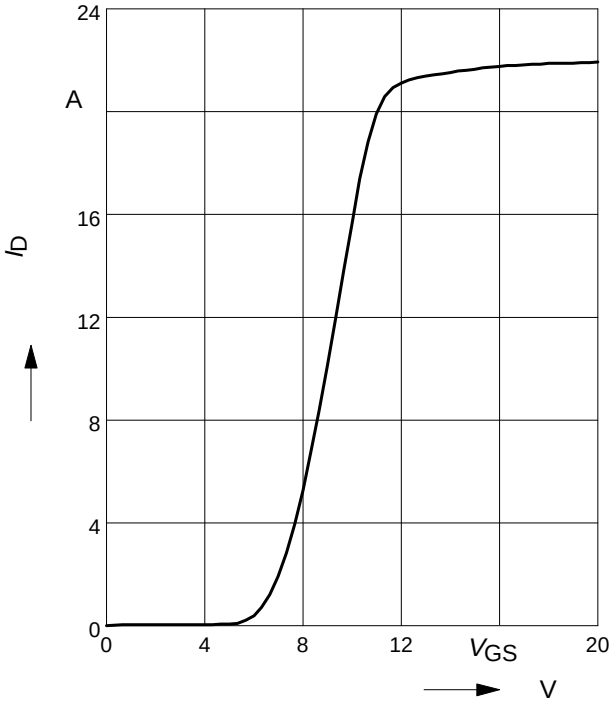
parameter : I_D = 4.6 A, V_{GS} = 10 V



Typ. transfer characteristics

$I_D = f(V_{GS})$

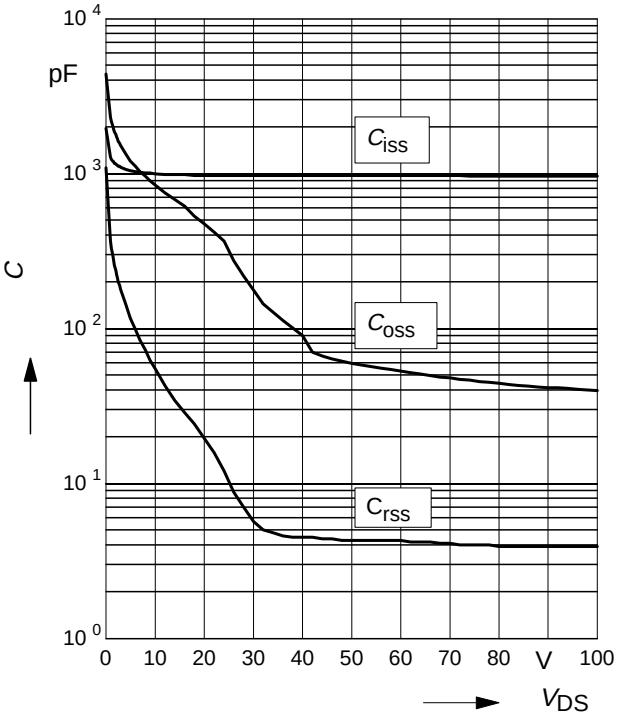
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



Typ. capacitances

$C = f(V_{DS})$

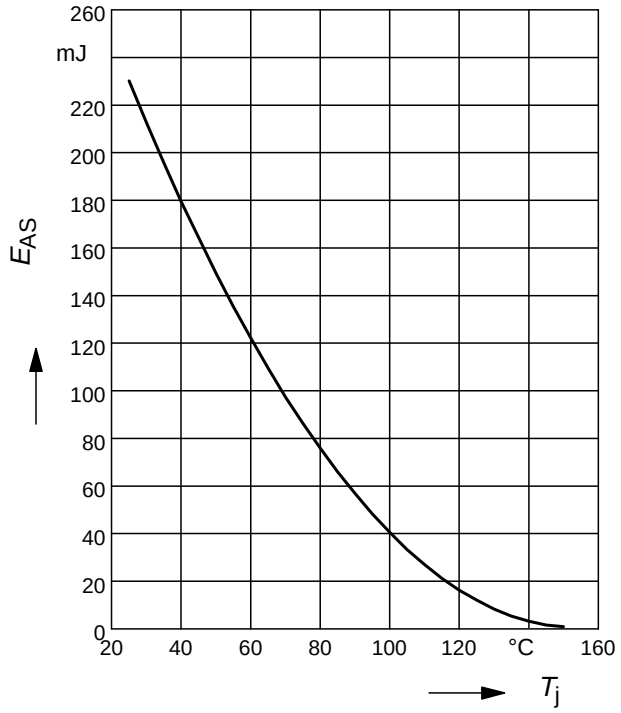
parameter: V_{GS}=0 V, f=1 MHz



Avalanche energy

$E_{AS} = f(T_j)$

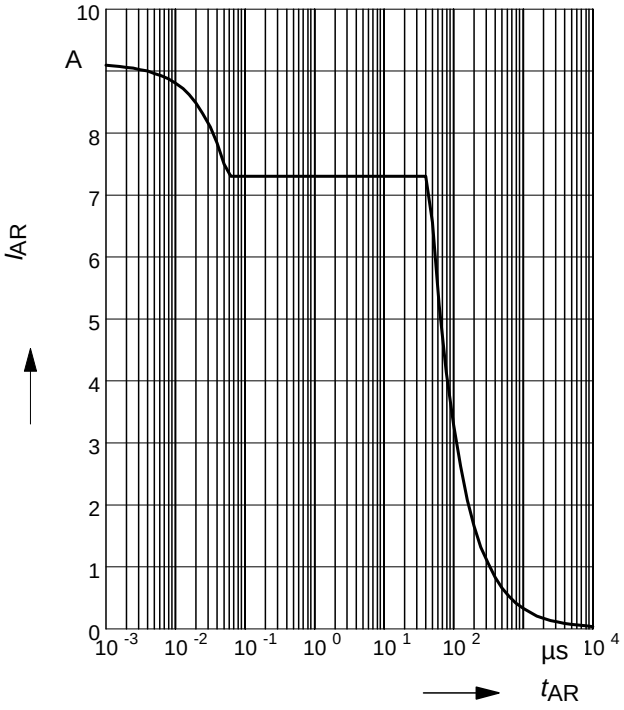
par.: I_D=7.3A, V_{DD}=50V



Avalanche SOA

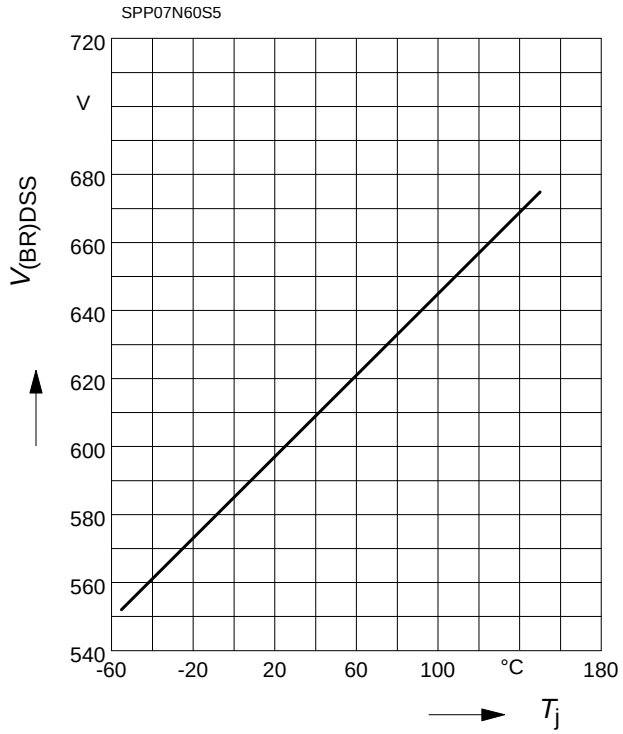
$I_{AR} = f(t_{AR})$

par.: $T_{j(START)}$ = 25 °C, $T_j \leq$ 150 °C



Drain-source breakdown voltage

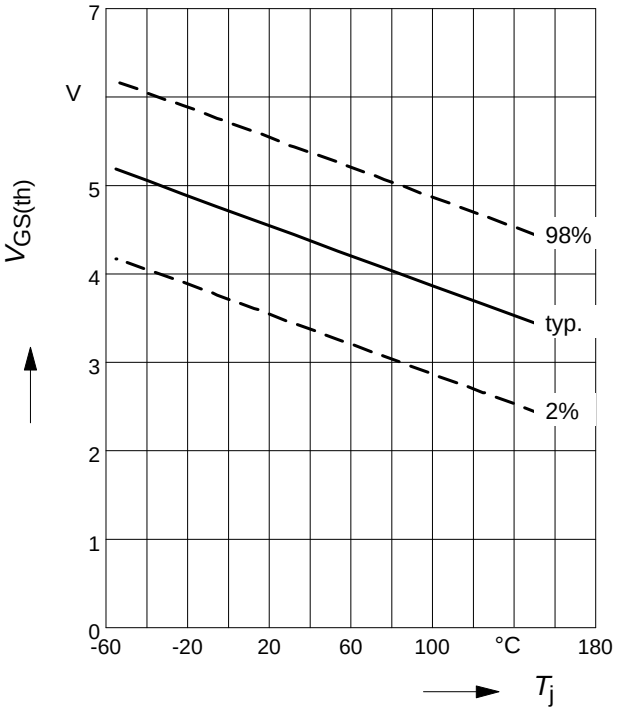
$V_{(BR)DSS}$ = f (T_j)



Gate threshold voltage

$V_{GS(th)} = f(T_j)$

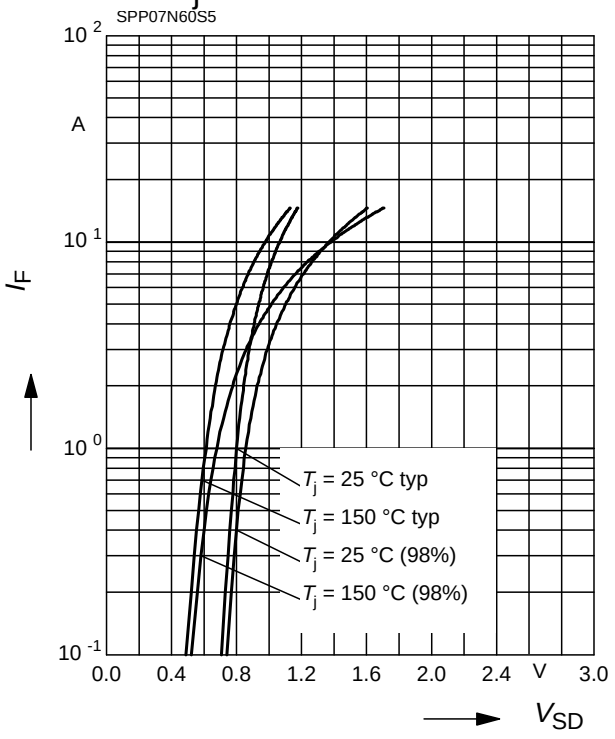
parameter: $V_{GS} = V_{DS}$, I_D = 350 µA



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

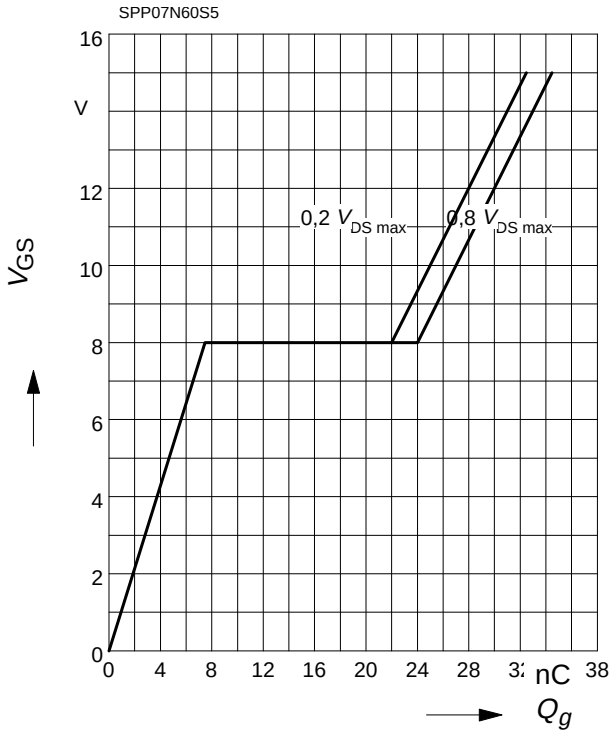
parameter: T_j , tp = 80 µs



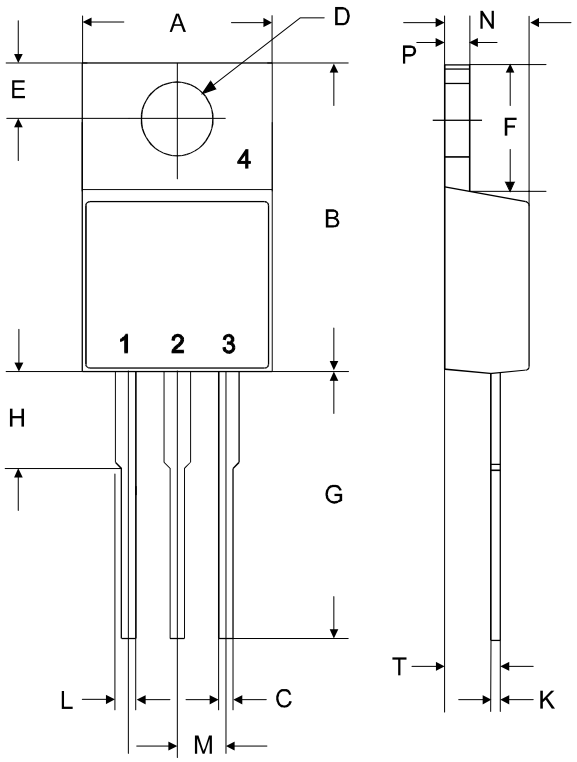
Typ. gate charge

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

parameter: I_D = 7.3 A pulsed

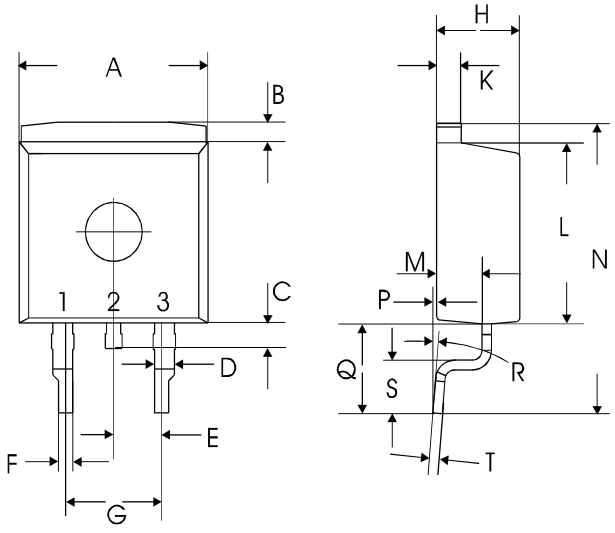


P-TO220-3-1

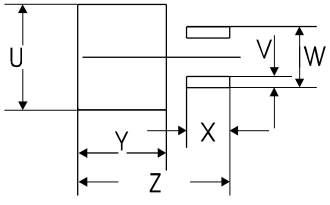


symbol	dimensions			
	[mm]		[inch]	
	min	max	min	max
A	9.70	10.30	0.3819	0.4055
B	14.88	15.95	0.5858	0.6280
C	0.65	0.86	0.0256	0.0339
D	3.55	3.89	0.1398	0.1531
E	2.60	3.00	0.1024	0.1181
F	6.00	6.80	0.2362	0.2677
G	13.00	14.00	0.5118	0.5512
H	4.35	4.75	0.1713	0.1870
K	0.38	0.65	0.0150	0.0256
L	0.95	1.32	0.0374	0.0520
M	2.54 typ.		0.1 typ.	
N	4.30	4.50	0.1693	0.1772
P	1.17	1.40	0.0461	0.0551
T	2.30	2.72	0.0906	0.1071

TO-263 (D²Pak/P-TO220SMD)



Footprint
(dif. scale)



symbol	dimensions			
	[mm]		[inch]	
	min	max	min	max
A	9.80	10.20	0.3858	0.4016
B	0.70	1.30	0.0276	0.0512
C	1.00	1.60	0.0394	0.0630
D	1.03	1.07	0.0406	0.0421
E	2.54 typ.		0.1 typ.	
F	0.65	0.85	0.0256	0.0335
G	5.08 typ.		0.2 typ.	
H	4.30	4.50	0.1693	0.1772
K	1.17	1.37	0.0461	0.0539
L	9.05	9.45	0.3563	0.3720
M	2.30	2.50	0.0906	0.0984
N	15 typ.		0.5906 typ.	
P	0.00	0.20	0.0000	0.0079
Q	4.20	5.20	0.1654	0.2047
R	8° max		8° max	
S	2.40	3.00	0.0945	0.1181
T	0.40	0.60	0.0157	0.0236
U	10.80		0.4252	
V	1.15		0.0453	
W	6.23		0.2453	
X	4.60		0.1811	
Y	9.40		0.3701	
Z	16.15		0.6358	

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