Final data

SPD07N60C2
SPU07N60C2

Cool MOS™ Power Transistor

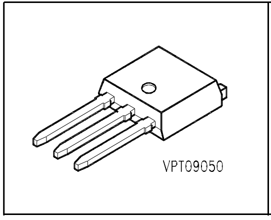
Feature

- New revolutionary high voltage technology
- Worldwide best $R_{DS(on)}$ in TO-251 and TO-252
- Ultra low gate charge
- Periodic avalanche rated
- Extreme dv/dt rated
- Ultra low effective capacitances
- Improved noise immunity

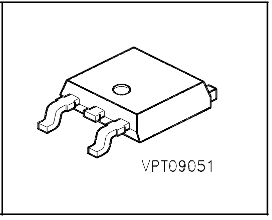
Product Summary

V_{DS}	600	V
$R_{DS(on)}$	0.6	Ω
I_D	7.3	A

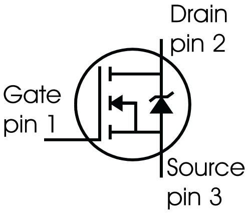
P-TO251



P-TO252



Type	Package	Ordering Code	Marking
SPD07N60C2	P-TO252	Q67040-S4312	07N60C2
SPU07N60C2	P-TO251	Q67040-S4311	07N60C2



Maximum Ratings, at T_C = 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 limited by T_{jmax}	$I_{D\ puls}$	14.6	
Avalanche energy, single pulse I_D=5.5A, V_{DD}=50V	E_{AS}	230	mJ
Avalanche energy, repetitive t_{AR} limited by T_{jmax}[1)] I_D=7.3A, V_{DD}=50V	E_{AR}	0.5	
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	7.3	A
Reverse diode dv/dt I_S=7.3A, $V_{DS} < V_{DD}$, di/dt=100A/µs, T_{jmax}=150°C	dv/dt	6	V/ns
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

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	1.5	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	75	
SMD version, device on PCB: @ min. footprint @ 6 cm^2 cooling area [2]	R_{thJA}	 - -	 - -	 75 50	
Linear derating factor		-	-	0.66	W/K
Soldering temperature, 1.6 mm (0.063 in.) from case for 10s	T_{sold}	-	-	260	°C

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

Parameter	Symbol	min.	typ.	max.	Unit
Static Characteristics					
Drain-source breakdown voltage V_{GS}=0V, I_D=0.25mA	$V_{(BR)DSS}$	600	-	-	V
Drain-source avalanche breakdown voltage V_{GS}=0V, I_D=7.3A	$V_{(BR)DS}$	-	700	-	
Gate threshold voltage, V_{GS} = V_{DS} I_D=350µA	$V_{GS(th)}$	3.5	4.5	5.5	
Zero gate voltage drain current V_{DS} = 600 V, V_{GS} = 0 V, T_j = 25 °C V_{DS} = 600 V, V_{GS} = 0 V, T_j = 150 °C	I_{DSS}	 - -	 0.1 -	 1 100	µA
Gate-source leakage current V_{GS}=20V, V_{DS}=0V	I_{GSS}	-	-	100	nA
Drain-source on-state resistance V_{GS}=10V, I_D=4.6A, T_j=25°C	$R_{DS(on)}$	-	0.54	0.6	Ω
Gate input resistance f = 1 MHz, open drain	R_G	-	0.8	-	

[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.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
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	-	
Effective output capacitance,$^{1)}$ energy related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0V to 480V	-	30	-	pF
Effective output capacitance,$^{2)}$ time related	$C_{o(tr)}$		-	55	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=380V, V_{GS}=0/13V, I_D=7.3A, R_G=12Ω, T_j=125°C	-	11	-	ns
Rise time	t_r		-	33	-	
Turn-off delay time	$t_{d(off)}$		-	47	70	
Fall time	t_f		-	9	13.5	

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	-	
Gate charge total	Q_g	V_{DD}=350V, I_D=7.3A, V_{GS}=0 to 10V	-	27	35	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=350V, I_D=7.3A	-	8	-	V

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

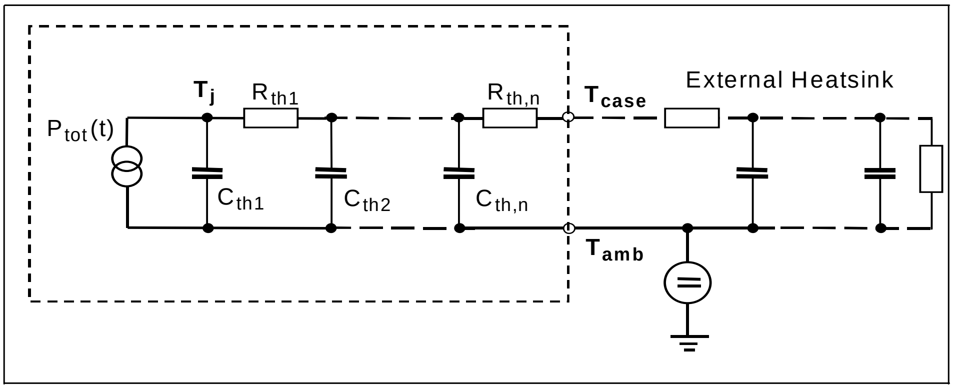
[2] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Characteristics						
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=I_S	-	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
Peak reverse recovery current	I_{rrm}		-	18	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt		-	550	-	A/µs

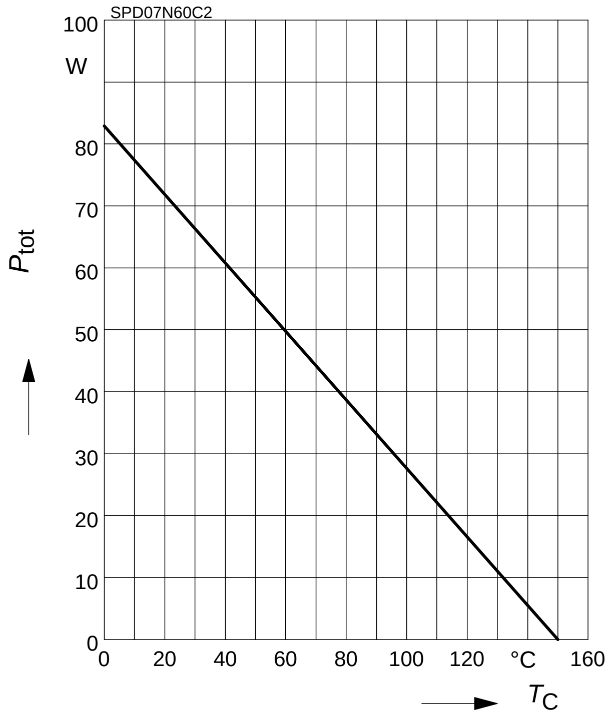
Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
	typ.			typ.	
Thermal resistance			Thermal capacitance		
R_{th1}	0.024	K/W	C_{th1}	0.0001354	Ws/K
R_{th2}	0.052		C_{th2}	0.0004561	
R_{th3}	0.065		C_{th3}	0.0007717	
R_{th4}	0.172		C_{th4}	0.001013	
R_{th5}	0.177		C_{th5}	0.00738	
R_{th6}	0.064		C_{th6}	0.04	



1 Power dissipation

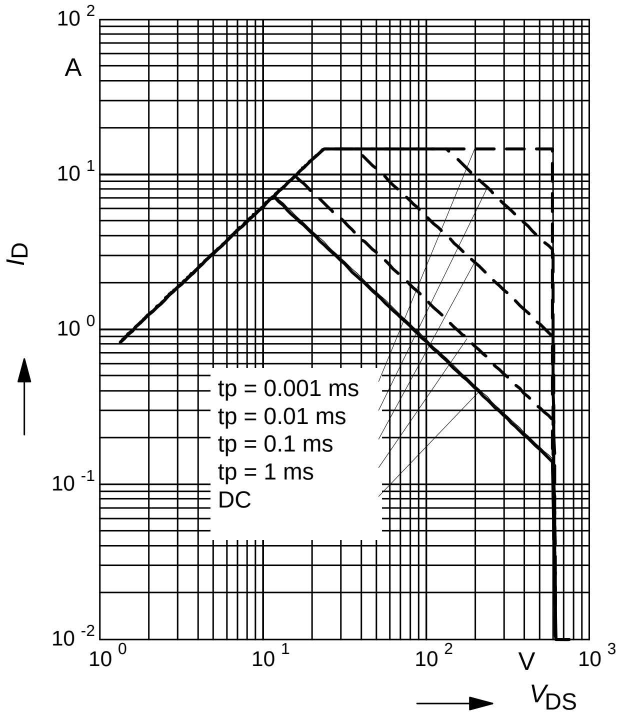
$P_{tot} = f\,(T_C)$



2 Safe operating area

$I_D = f\,(\,V_{DS}\,)$

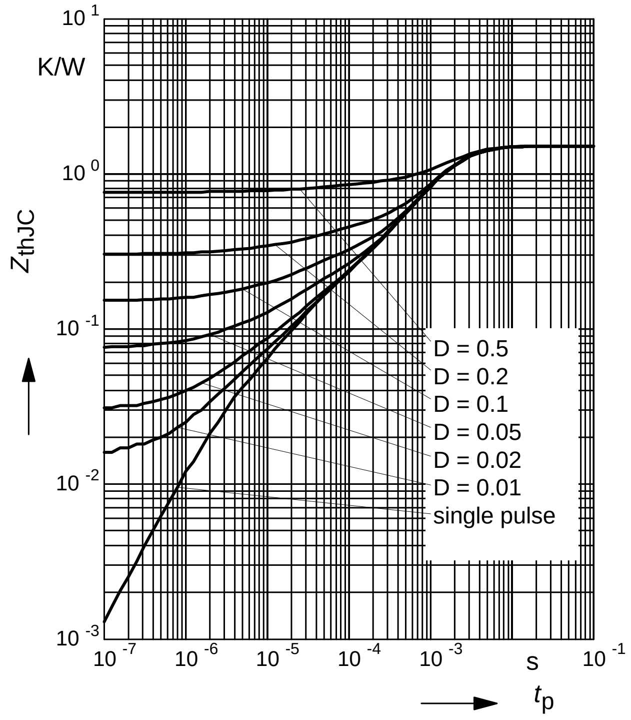
parameter : $D = 0$, T_C=25°C



3 Transient thermal impedance

$Z_{thJC} = f\,(t_p)$

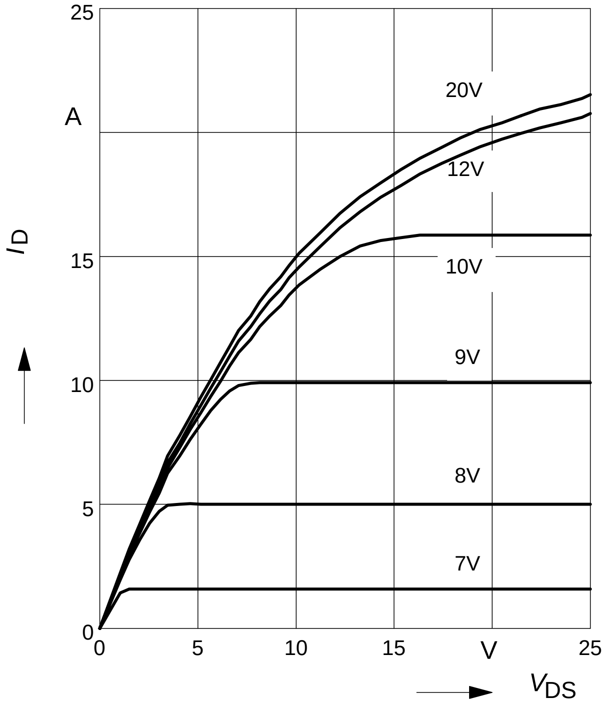
parameter: $D = t_p/T$



4 Typ. output characteristic

$I_D = f\,(V_{DS})$; T_j=25°C

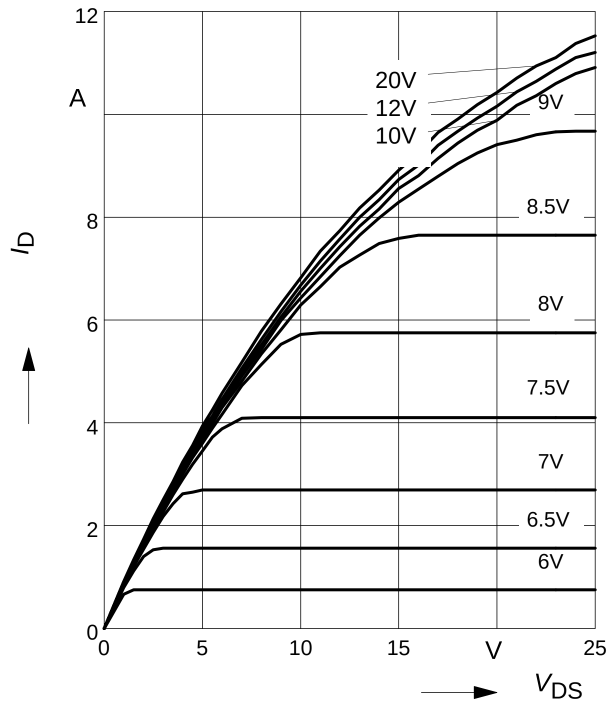
parameter: t_p = 10 µs, V_{GS}



5 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=150°C

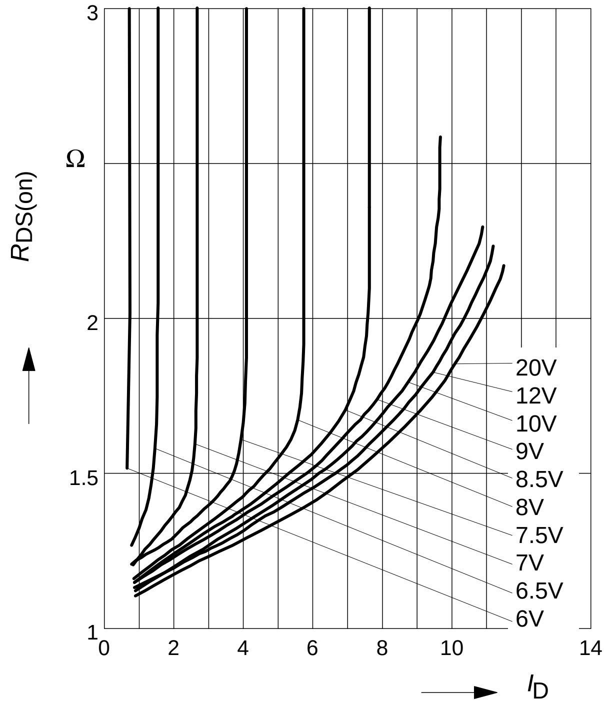
parameter: t_p = 10 µs, V_{GS}



6 Typ. drain-source on resistance

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

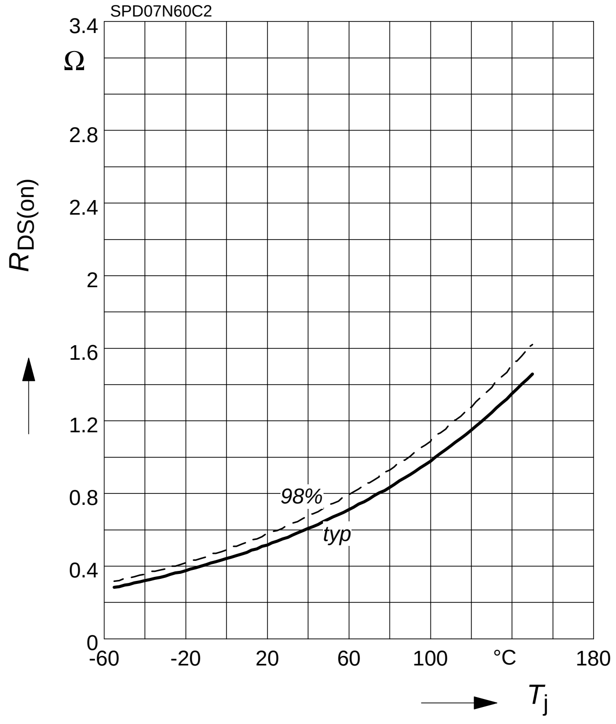
parameter: T_j=150°C, V_{GS}



7 Drain-source on-state resistance

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

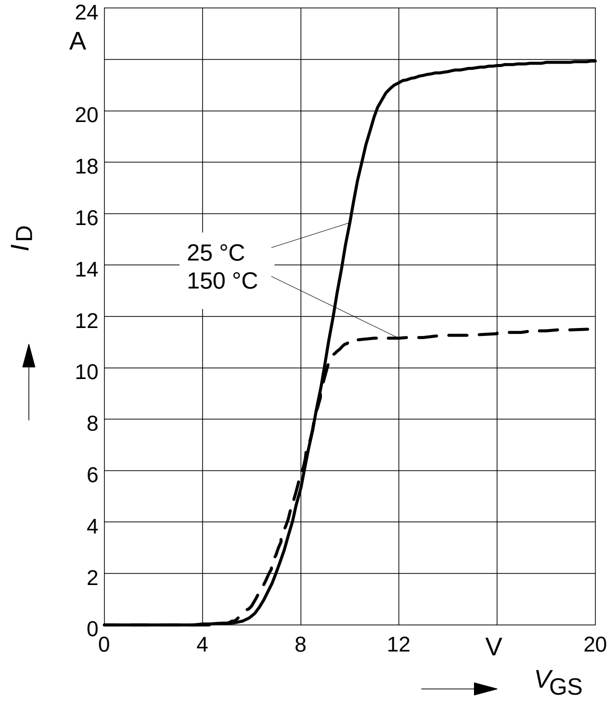
parameter : I_D = 4.6 A, V_{GS} = 10 V



8 Typ. transfer characteristics

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

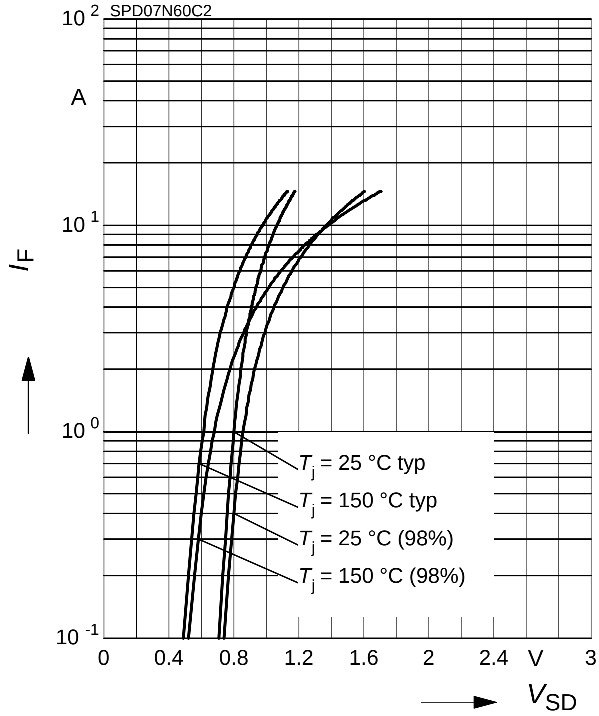
parameter: t_p = 10 µs



9 Forward characteristics of body diode

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

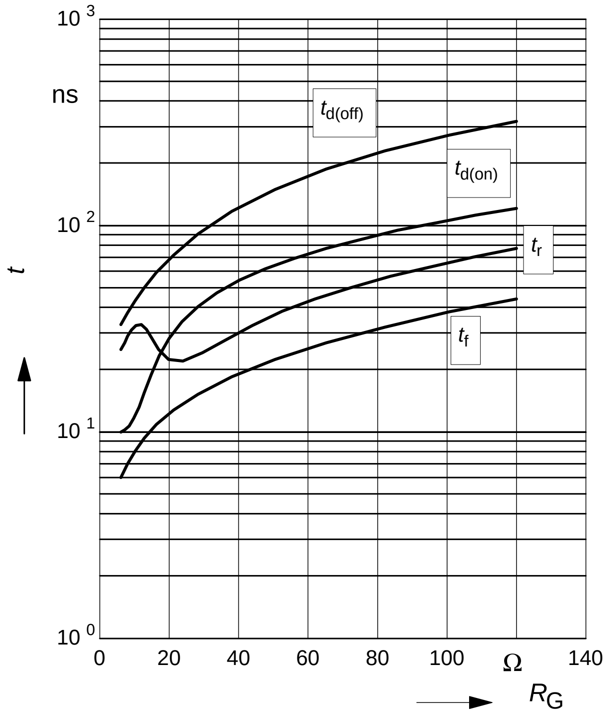
parameter: T_j , t_p = 10 µs



10 Typ. switching time

$t = f\ (R_G)$, inductive load, T_j=125°C

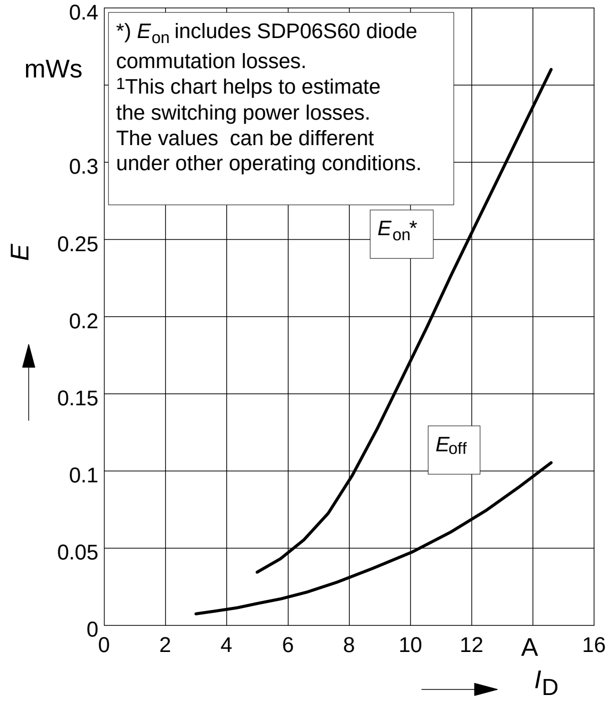
par.: V_{DS}=380V, V_{GS}=0/+13V, I_D=7.3 A



11 Typ. switching losses[1)]

$E = f\ (I_D)$, inductive load, T_j=125°C

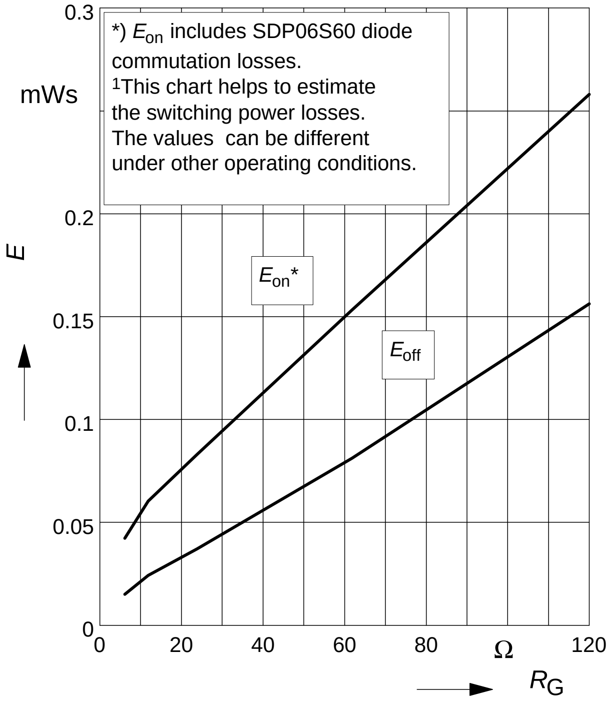
par.: V_{DS}=380V, V_{GS}=0/+13V, R_G=12Ω


*) E_{on} includes SDP06S60 diode commutation losses.
¹This chart helps to estimate the switching power losses. The values can be different under other operating conditions.

12 Typ. switching losses[1)]

$E = f(R_G)$, inductive load, T_j=125°C

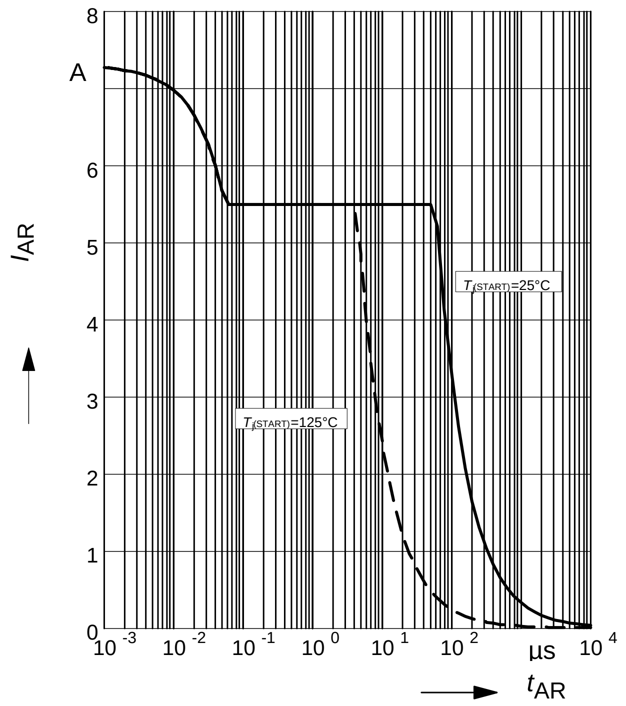
par.: V_{DS}=380V, V_{GS}=0/+13V,I_D=7.3A


*) E_{on} includes SDP06S60 diode commutation losses.
¹This chart helps to estimate the switching power losses. The values can be different under other operating conditions.

13 Avalanche SOA

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

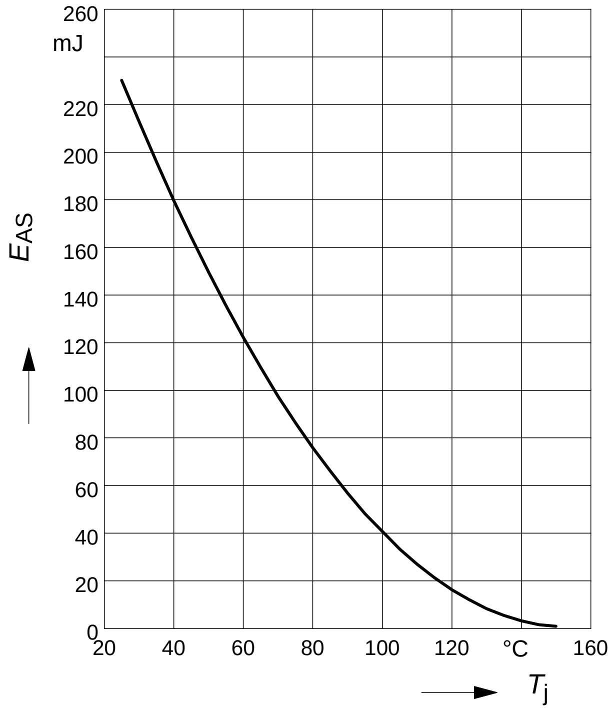
par.: $T_j \leq 150$ °C



14 Avalanche energy

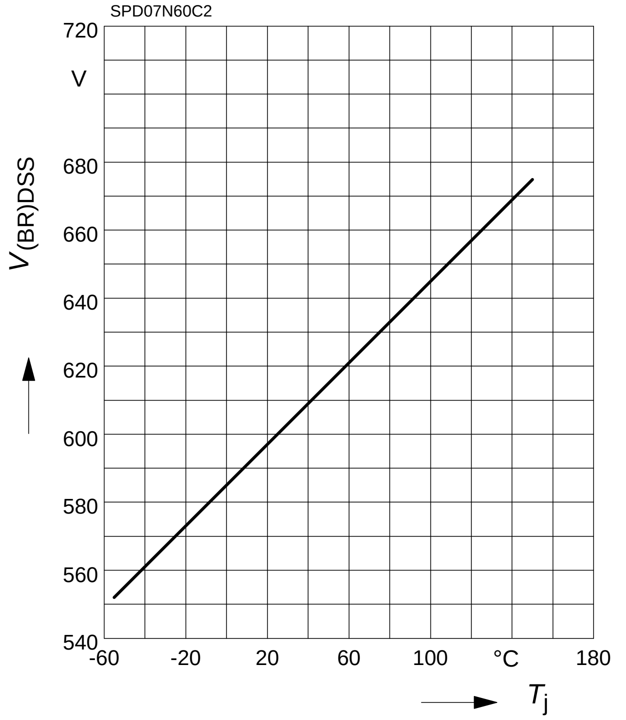
$E_{AS} = f(T_j)$

par.: $I_D = 5.5$ A, $V_{DD} = 50$ V



15 Drain-source breakdown voltage

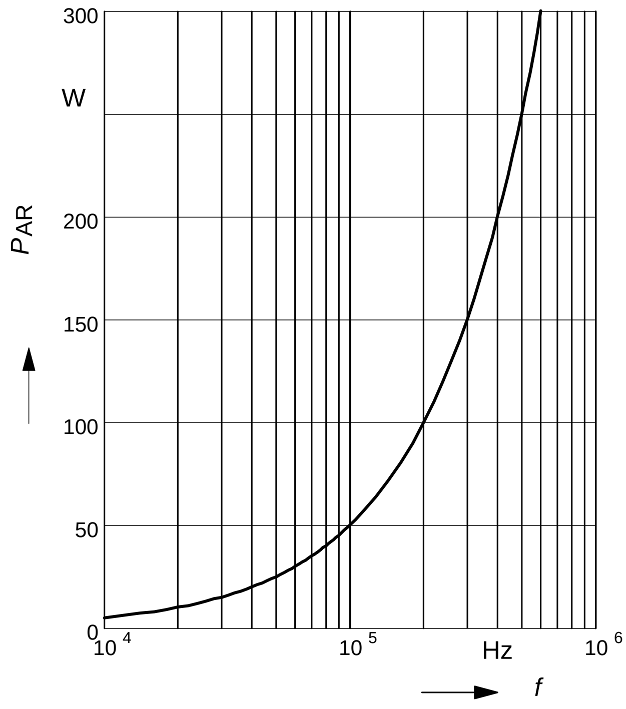
$V_{(BR)DSS} = f(T_j)$



16 Avalanche power losses

$P_{AR} = f(f)$

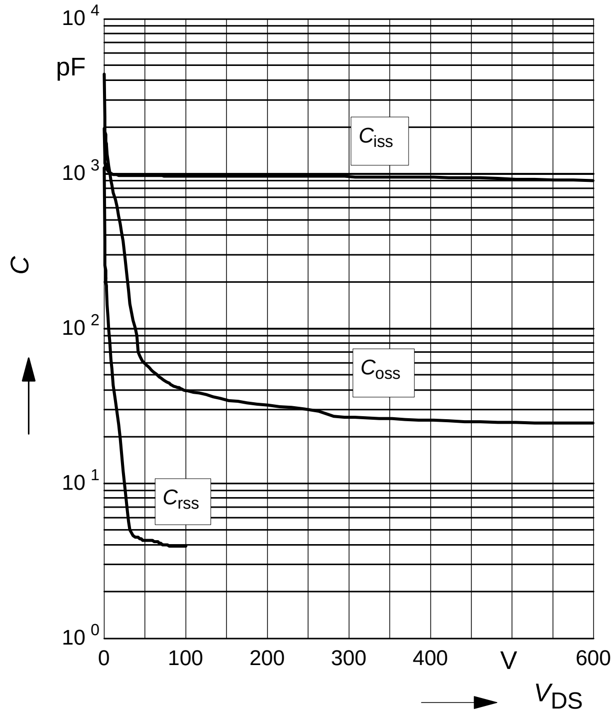
parameter: E_{AR}=0.5mJ



17 Typ. capacitances

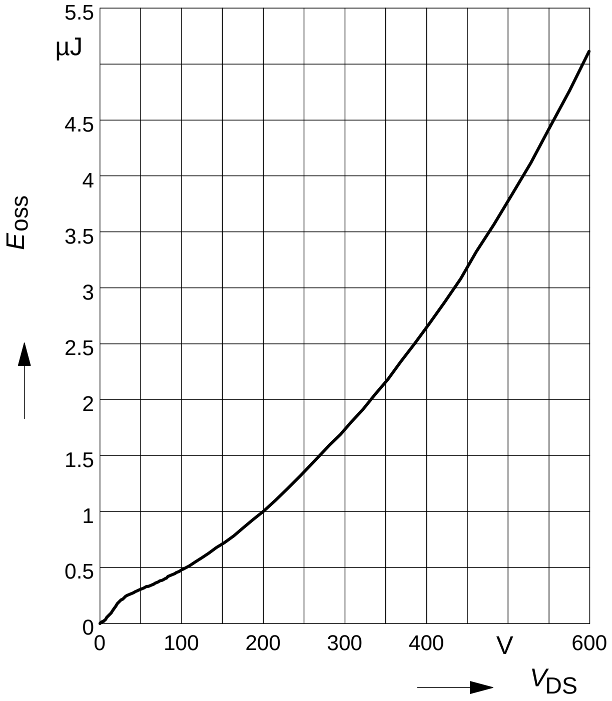
$C = f(V_{DS})$

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

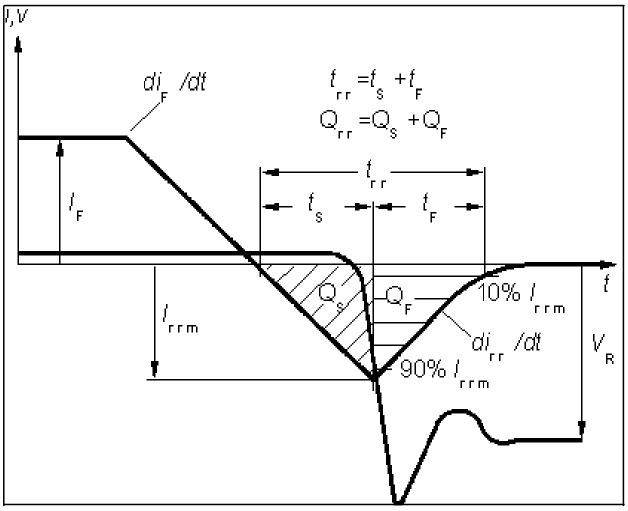


18 Typ. C_{oss} stored energy

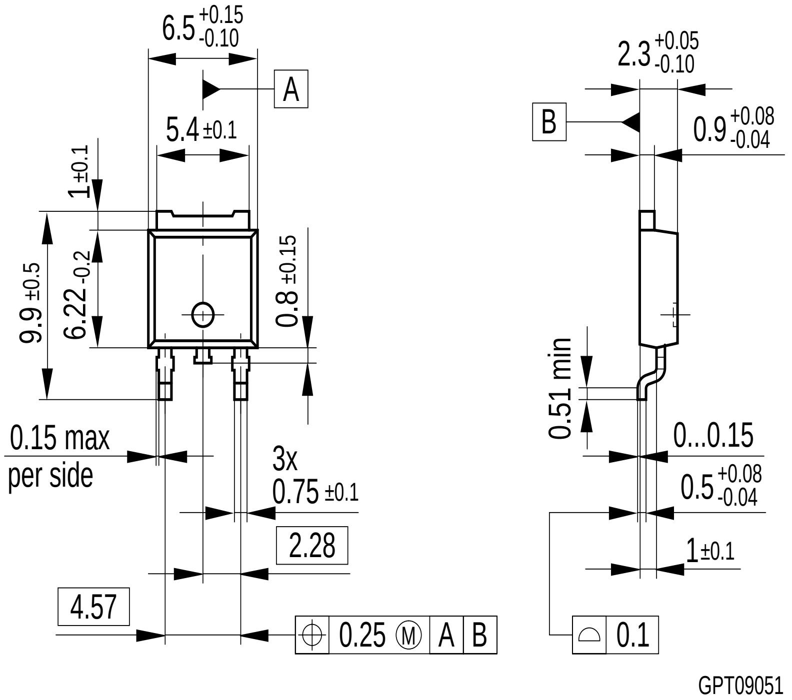
$E_{oss}=f(V_{DS})$



Definition of diodes switching characteristics

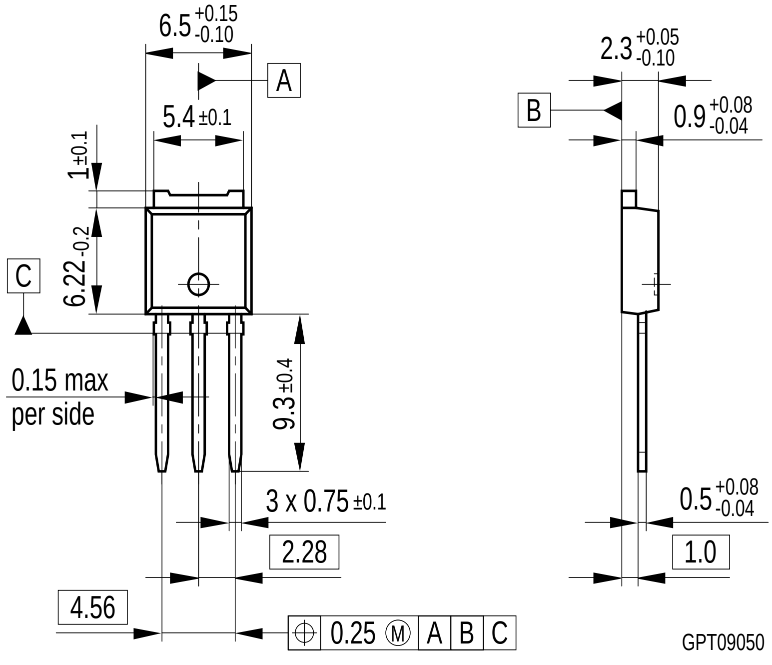


P-TO-252-3-1 (D-PAK)



All metal surfaces tin plated, except area of cut.

P-TO-251-3-1 (I-PAK)



All metal surfaces tin plated, except area of cut.

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