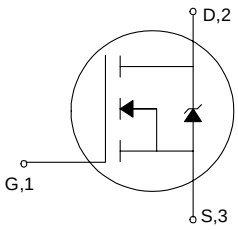
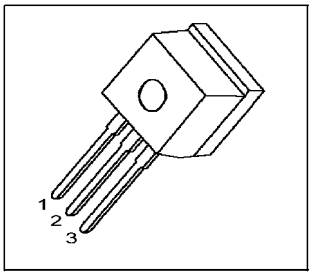
Cool MOS™ Power-Transistor

- 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:
  SPPx2N60S5





COOLMOS Power Semiconductors

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Marking	Ordering Code
SPI11N60S5	600 V	11 A	0.38 Ω	P-TO262	11N60S5	Q67040-S4250

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	 11 7	A
Pulsed drain current, t_p = 1ms [1)] T_C = 25 °C	$I_{D\ puls}$	22	
Avalanche energy, single pulse I_D = 5.5 A, V_{DD} = 50 V	E_{AS}	340	mJ
Avalanche energy (repetitive, limited by T_{jmax}) I_D = 13.8 A, V_{DD} = 50 V	E_{AR}	1	
Avalanche current (repetitive, limited by T_{jmax})	I_{AR}	13.8	A
Reverse diode d*v*/d*t* I_S = 11 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}	125	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	K/W
Thermal resistance, junction - ambient (Leaded and through-hole packages)	R_{thJA}	-	-	62	

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 = 0.5 mA, 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		-	-	25	
V_{GS} = 0 V, T_j = 150 °C		-	-	250	
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 = 7 A	$R_{DS(on)}$	-	0.34	0.38	Ω

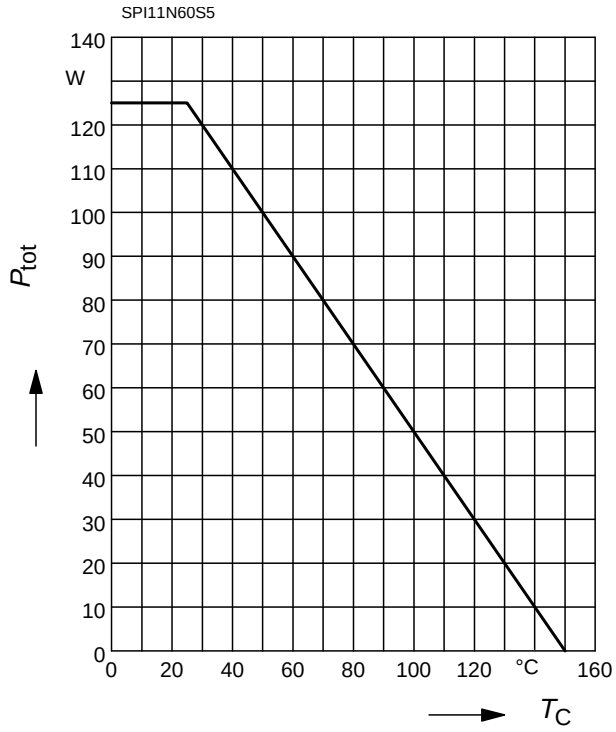
[1]current limited by T_{jmax}

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=7A	-	6	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	1460	-	pF
Output capacitance	C_{oss}		-	610	-	
Reverse transfer capacitance	C_{rss}		-	21	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=350V, V_{GS}=10V, I_D=11A, R_G=6.8Ω	-	130	-	ns
Rise time	t_r		-	35	-	
Turn-off delay time	$t_{d(off)}$		-	150	225	
Fall time	t_f		-	20	30	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=350V, I_D=11A	-	10.5	-	nC
Gate to drain charge	Q_{gd}		-	24	-	
Total gate charge	Q_g	V_{DD}=350V, I_D=11A, V_{GS}=0 to 10V	-	41.5	54	
Reverse Diode						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	11	A
Inverse diode direct current,pulsed	I_{SM}		-	-	22	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=11A	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=350V, I_F=I_S, di_F/dt=100A/µs	-	650	1105	ns
Reverse recovery charge	Q_{rr}		-	7.9	-	µC

Power dissipation

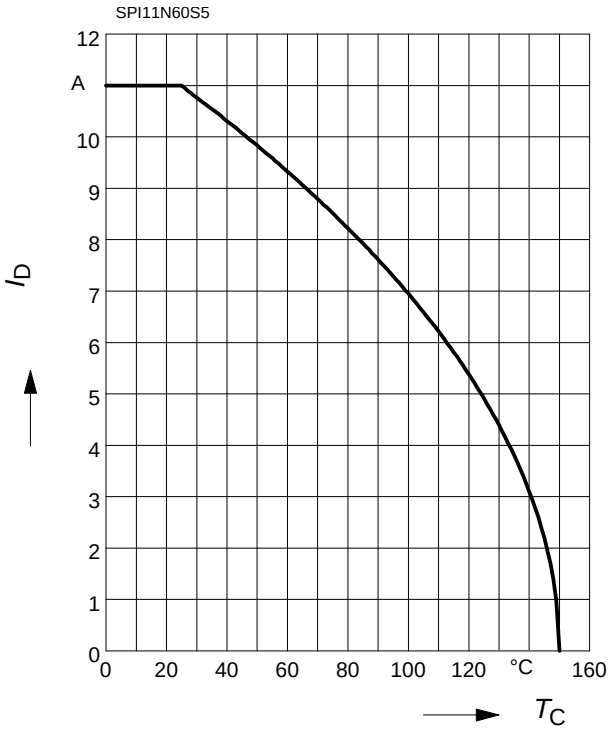
$P_{tot} = f(T_C)$



Drain current

$I_D = f(T_C)$

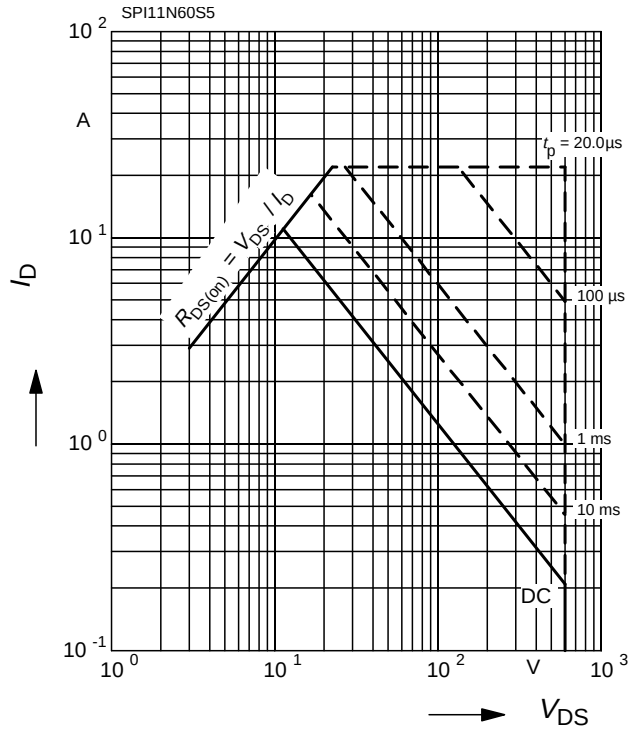
parameter: $V_{GS} \geq 10$ V



Safe operating area

$I_D = f(V_{DS})$

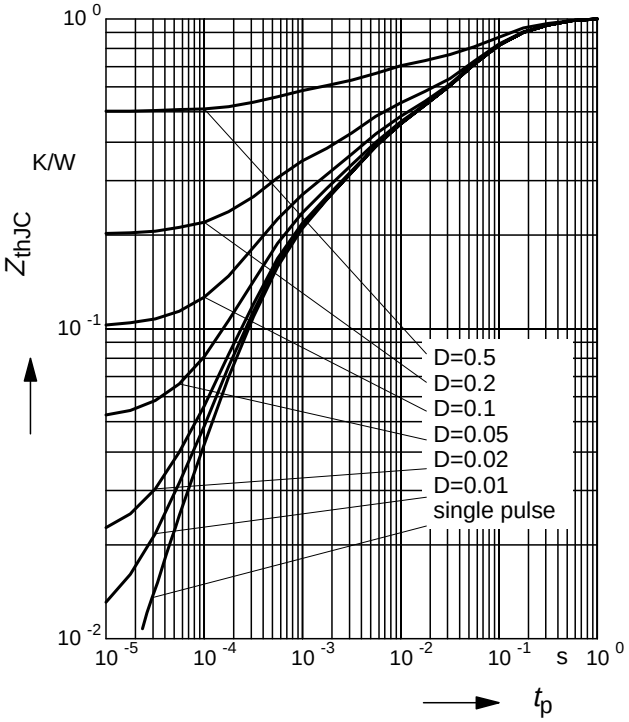
parameter: D=0.01, T_C=25°C



Transient thermal impedance

$Z_{thJC} = f(t_p)$

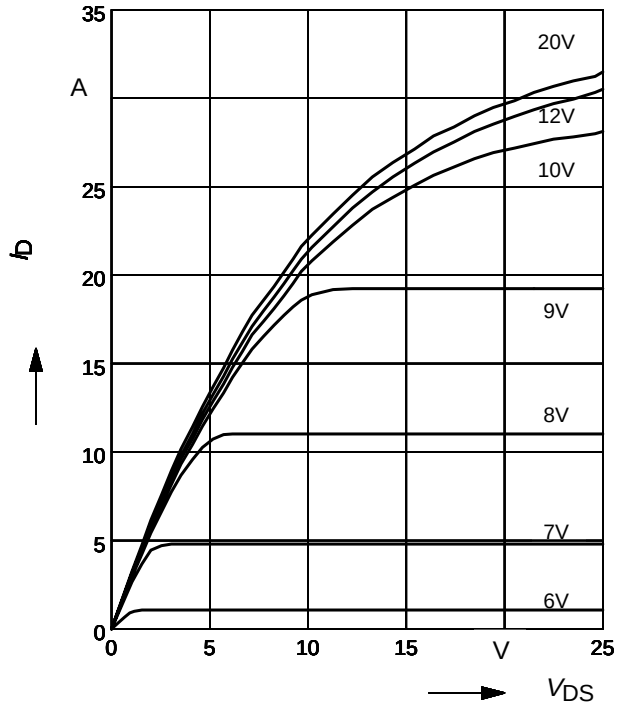
parameter : $D = t_p / T$



Typ. output characteristic

I_D = f (V_{DS})

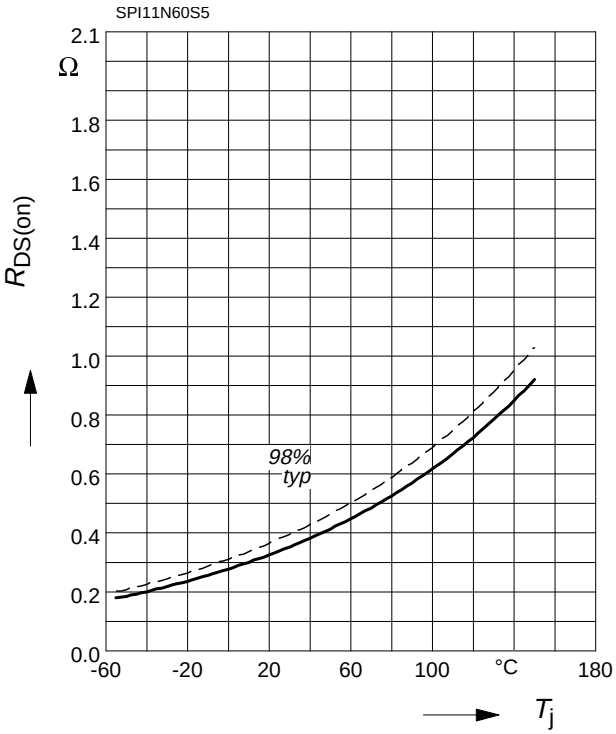
Parameter: V_{GS}, T_j = 25 °C



Drain-source on-resistance

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

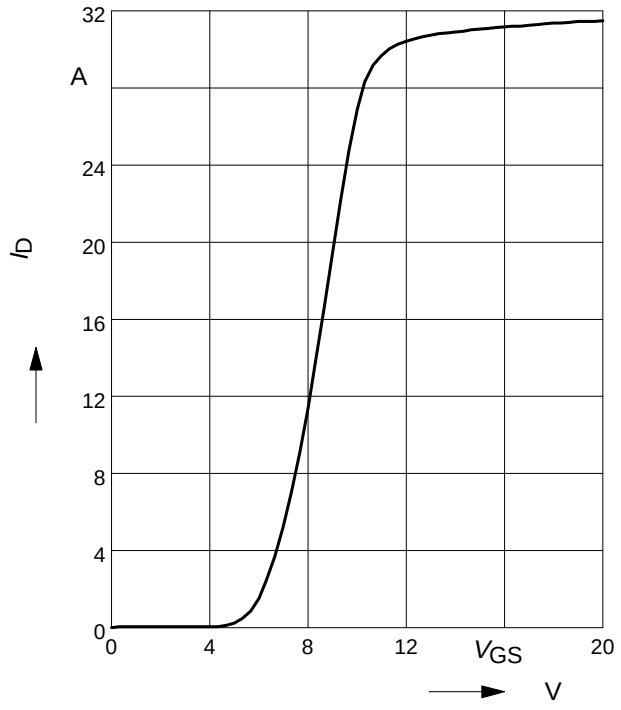
parameter : I_D = 7 A, V_{GS} = 10 V



Typ. transfer characteristics

I_D= f (V_{GS})

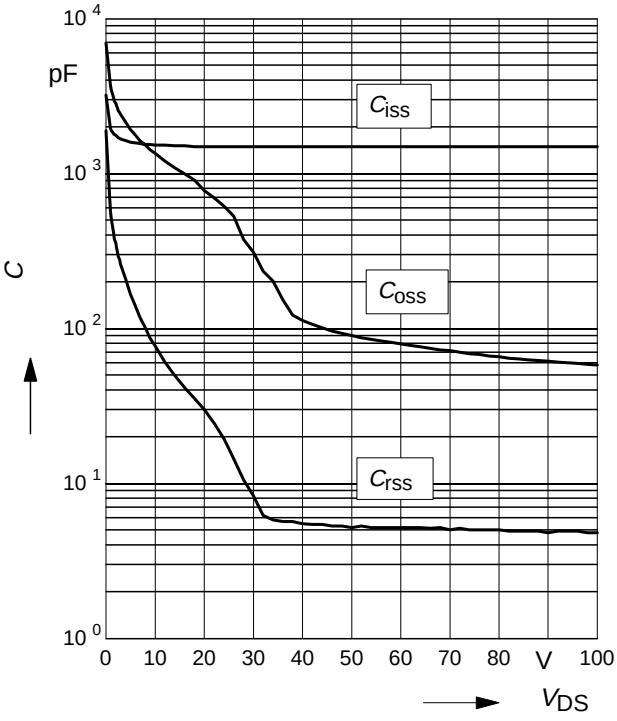
V_{DS}≥ 2 x I_D x $R_{DS(on)max}$



Typ. capacitances

C = f (V_{DS})

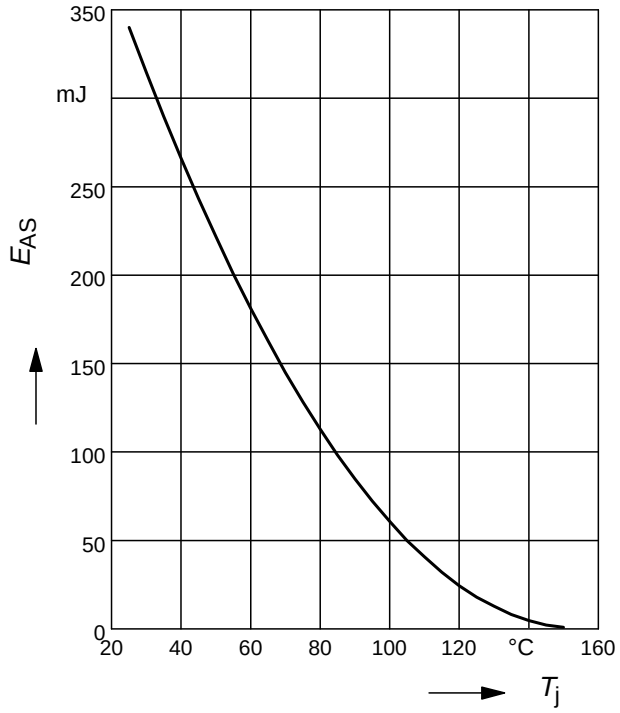
parameter: V_{GS}=0 V, f=1 MHz



Avalanche energy

$E_{AS} = f(T_j)$

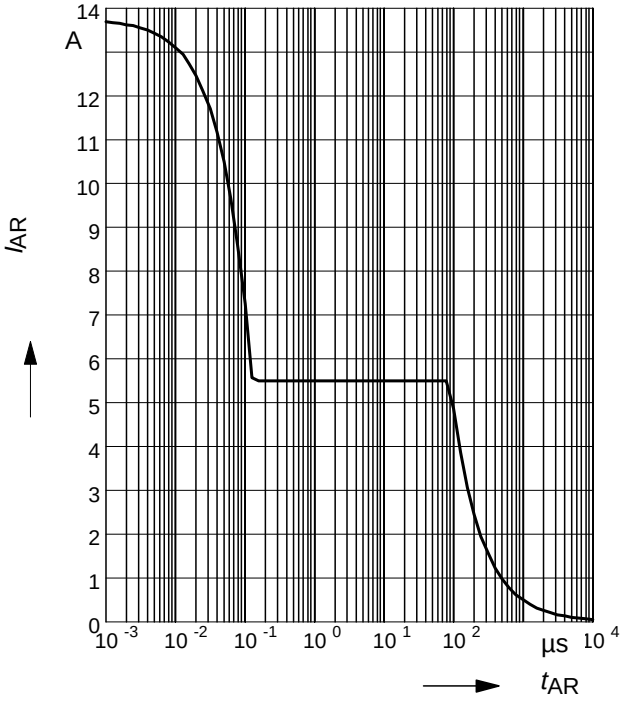
par.: I_D=5.5A, V_{DD}=50V



Avalanche SOA

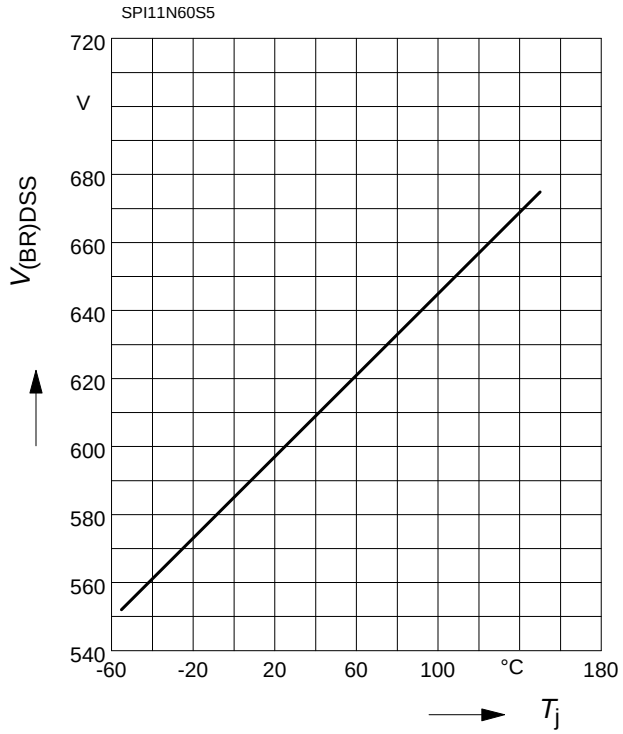
$I_{AR} = f(t_{AR})$

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



Drain-source breakdown voltage

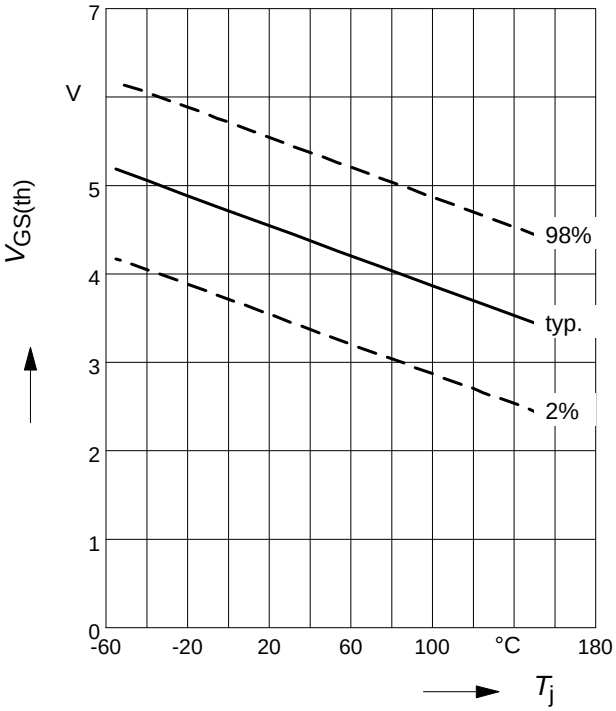
$V_{(BR)DSS}$ = f (T_j)



Gate threshold voltage

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

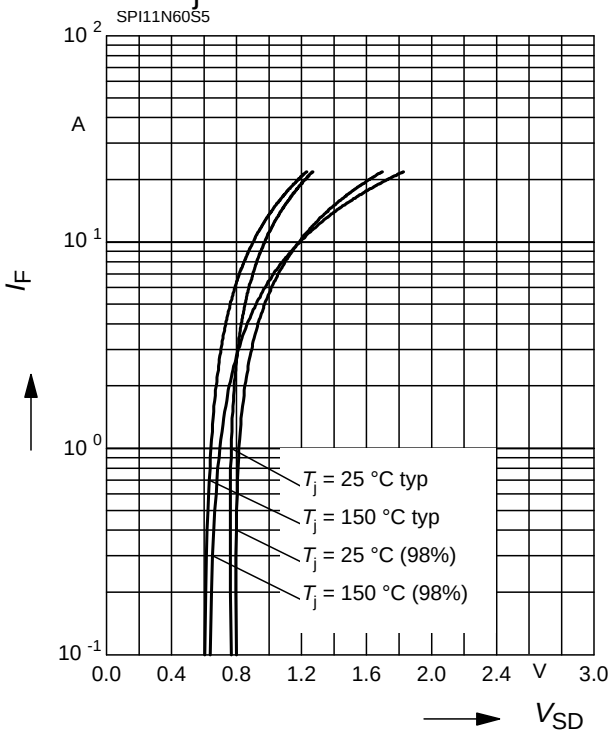
parameter: $V_{GS} = V_{DS}$, I_D = 0.5 mA



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

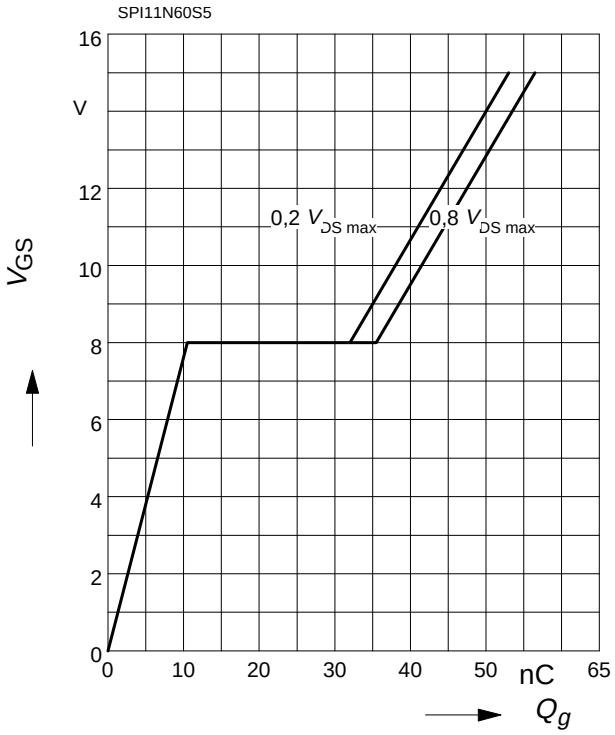
parameter: T_j , tp = 80 µs



Typ. gate charge

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

parameter: I_D = 11 A pulsed



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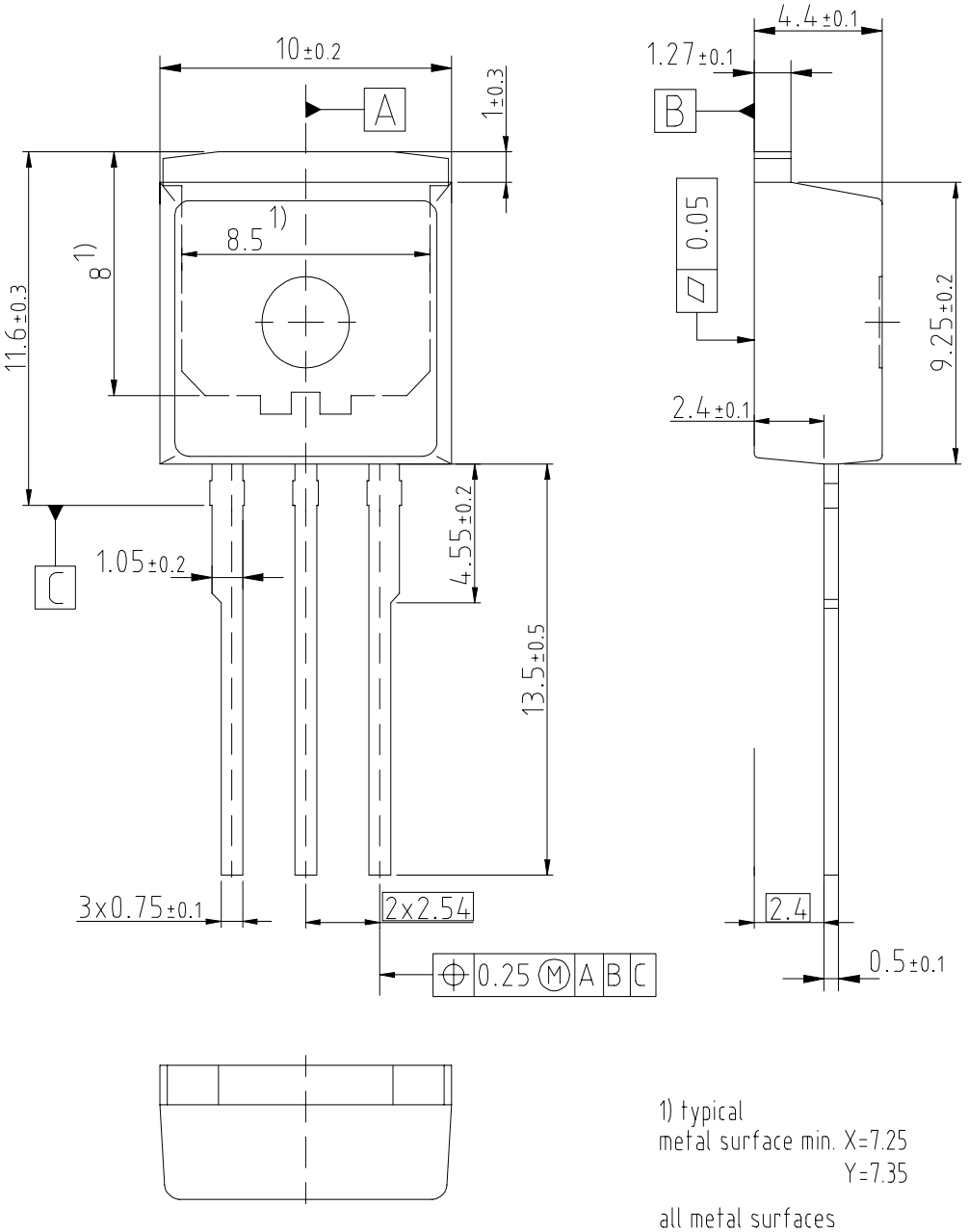

1) typical
metal surface min. X=7.25
Y=7.35

all metal surfaces
tin plated, except area of cut

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