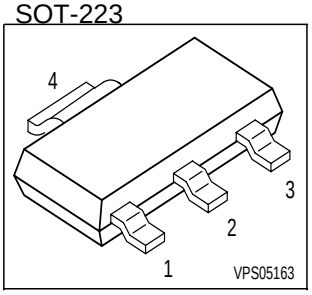
Cool MOS Power-Transistor

- New revolutionary high voltage technology
- Worldwide best $R_{DS(on)}$ in SOT 223
- Ultra low gate charge
- Extreme d*v*/d*t* rated
- Optimized capacitances
- Improved noise immunity

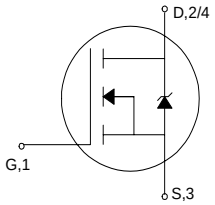
Product Summary

V_{DS} @ T_{jmax}	650	V
$R_{DS(on)}$	0.95	Ω
I_D	0.8	A

SOT-223



Type	Package	Ordering Code	Marking
SPN04N60S5	SOT-223	Q67040-S4211	04N60S5



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

Parameter	Symbol	Value	Unit
Continuous drain current T_A = 25 °C T_A = 70 °C	I_D	 0.8 0.65	A
Pulsed drain current [1] T_A = 25 °C	$I_{D\ puls}$	3	
Reverse diode d*v*/d*t* I_S = 0.8 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_A = 25 °C	P_{tot}	1.8	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 - soldering point	R_{thJS}	-	20	-	K/W
SMD version, device on PCB:	R_{thJA}				K/W
@ min. footprint		-	110	-	
@ 6 cm^2 cooling area [2)]		-	-	70	

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 = 200 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		-	-	50	
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 = 0.65 A	$R_{DS(on)}$	-	0.8	0.95	Ω

[1] current limited by T_{jmax}

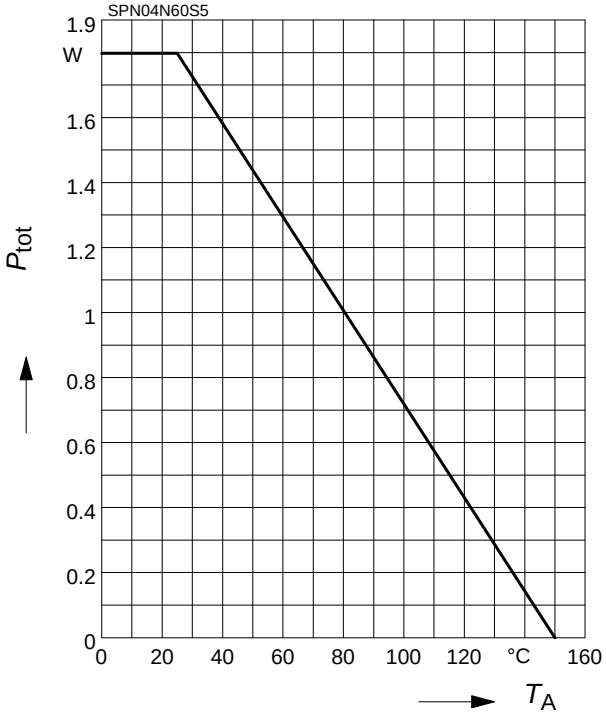
[2] Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6 cm^2 (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air.

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=0.65A	-	1	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	600	-	pF
Output capacitance	C_{oss}		-	325	-	
Reverse transfer capacitance	C_{rss}		-	15	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=350V, V_{GS}=10V, I_D=0.8A, R_G=18Ω	-	40	-	ns
Rise time	t_r		-	20	-	
Turn-off delay time	$t_{d(off)}$		-	130	-	
Fall time	t_f		-	30	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=350V, I_D=0.8A	-	4.1	-	nC
Gate to drain charge	Q_{gd}		-	9.2	-	
Total gate charge	Q_g	V_{DD}=350V, I_D=0.8A, V_{GS}=0 to 10V	-	17	-	
Reverse Diode						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	0.8	A
Inverse diode direct current,pulsed	I_{SM}		-	-	3	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=0.8A	-	0.85	1.05	V
Reverse recovery time	t_{rr}	V_R=350V, I_F=I_S, di_F/dt=100A/µs	-	200	-	ns
Reverse recovery charge	Q_{rr}		-	1.2	-	µC

Power Dissipation

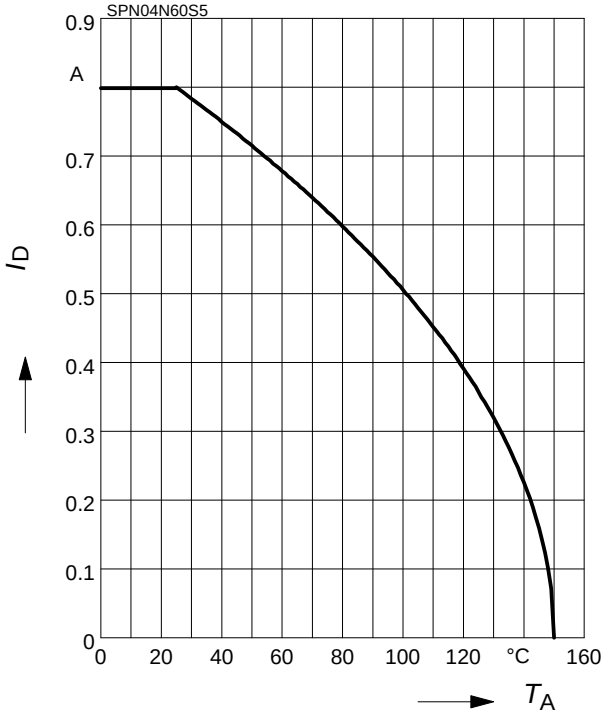
$P_{tot} = f(T_A)$



Drain current

$I_D = f(T_A)$

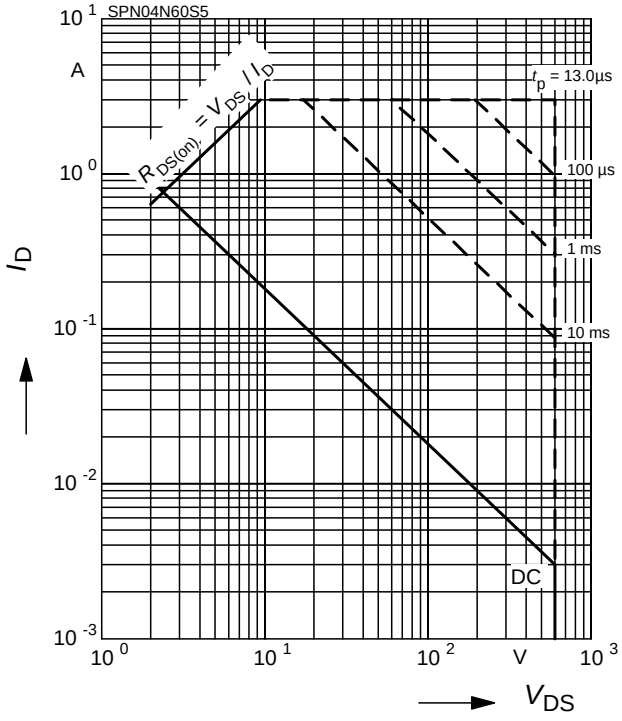
parameter: $V_{GS} \geq 10$ V



Safe operating area

$I_D = f(V_{DS})$

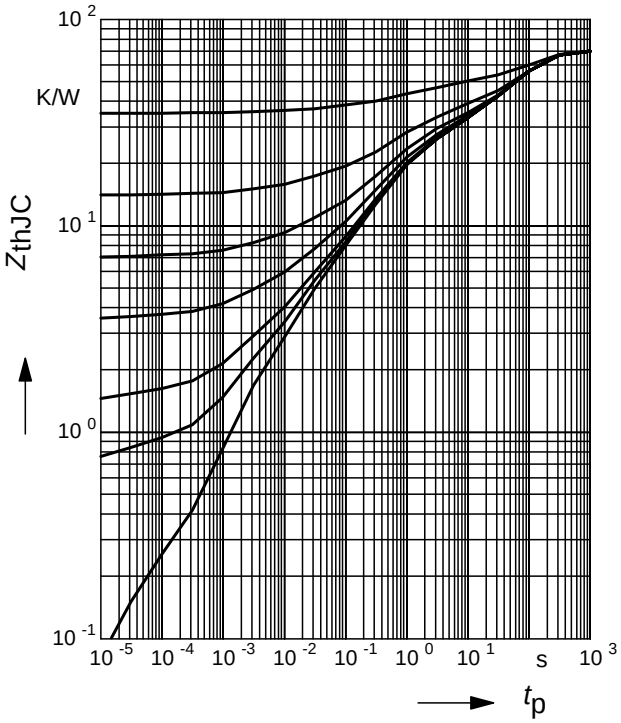
parameter: D=0.01, T_A=25°C



Transient thermal impedance

$Z_{thJS} = f(t_P)$

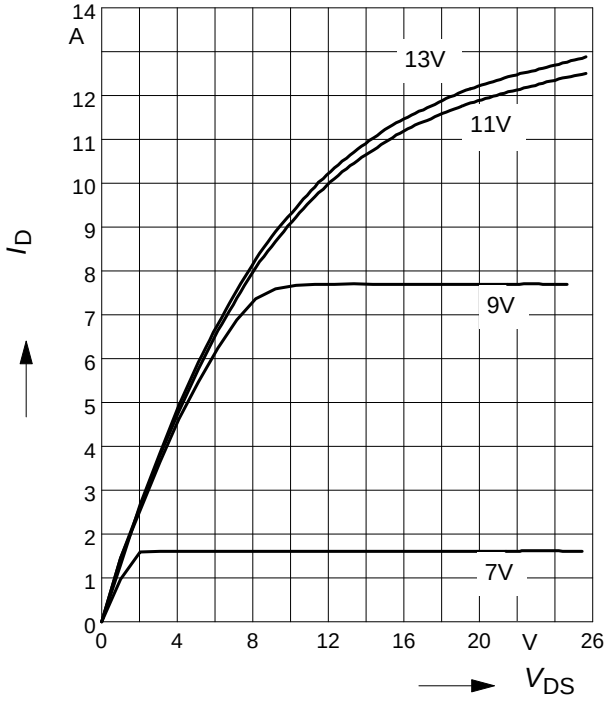
Parameter: $D=t_P/T$



Typ. output characteristic

I_D = f (V_{DS})

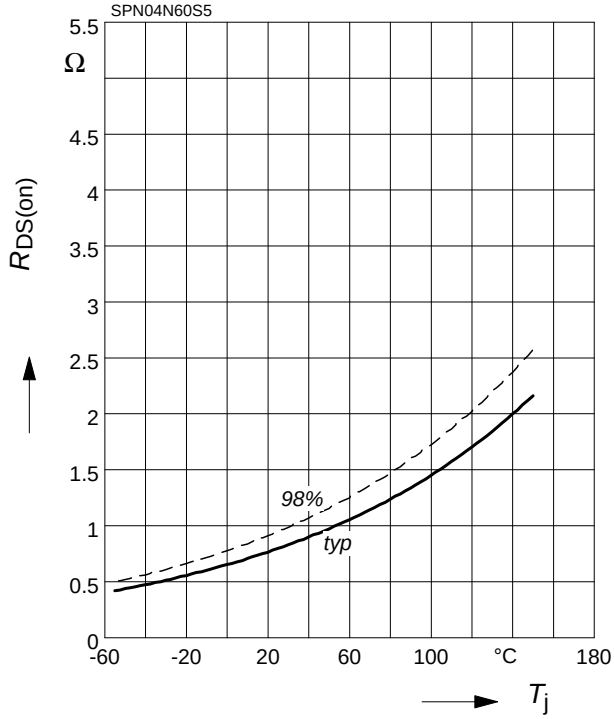
Parameter: V_{GS}, T_j = 25 °C



Drain-source on-resistance

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

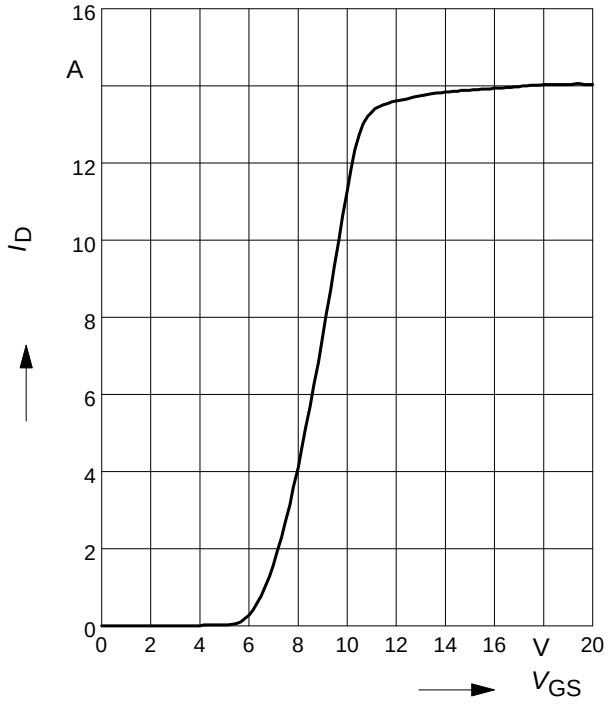
parameter : I_D = 0.65 A, V_{GS} = 10 V



Typ. transfer characteristics

I_D= f (V_{GS})

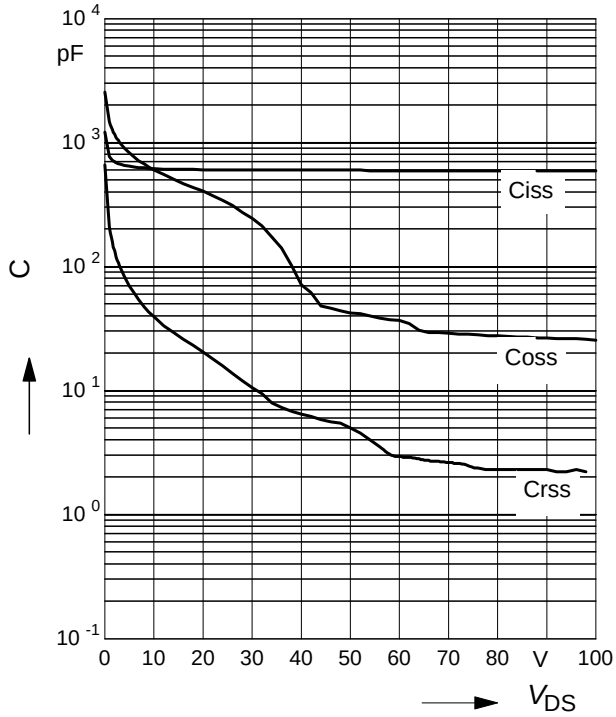
V_{DS}≥ 2 x I_D x $R_{DS(on)max}$



Typ. capacitances

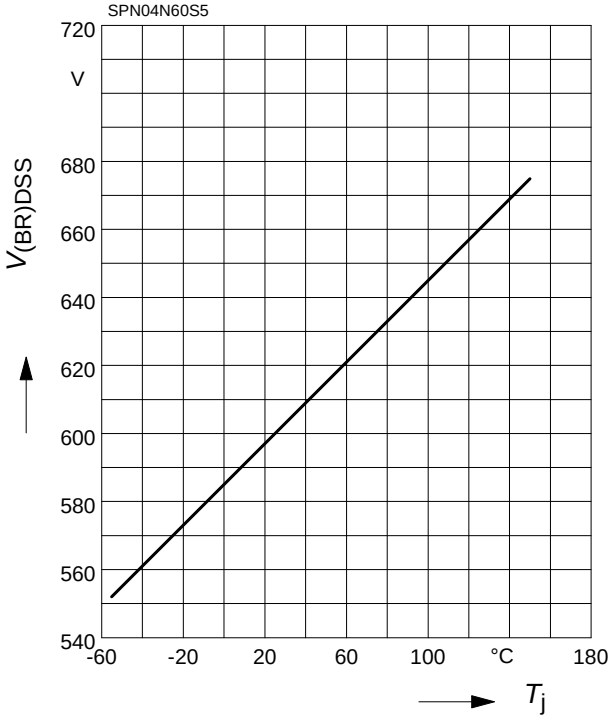
C = f (V_{DS})

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



Drain-source breakdown voltage

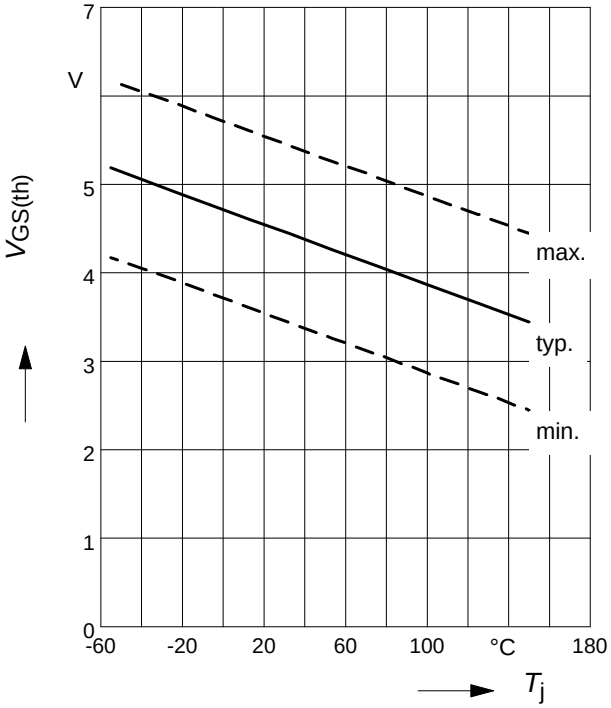
$V_{(BR)DSS} = f(T_j)$



Gate threshold voltage

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

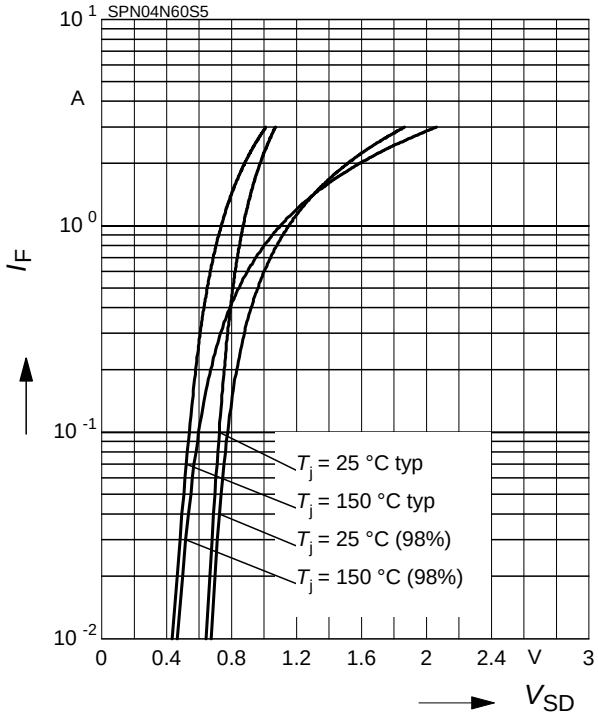
parameter: $V_{GS} = V_{DS}$, I_D = 200 µA



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

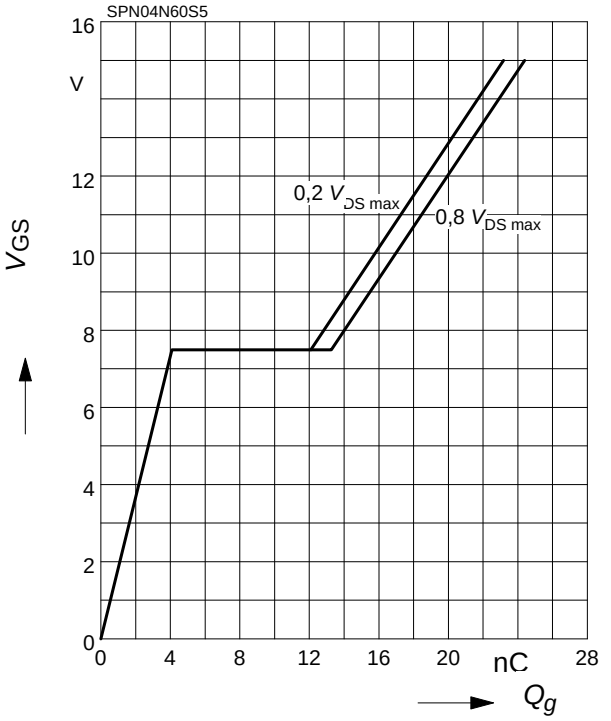
parameter: T_j , tp = 10 µs

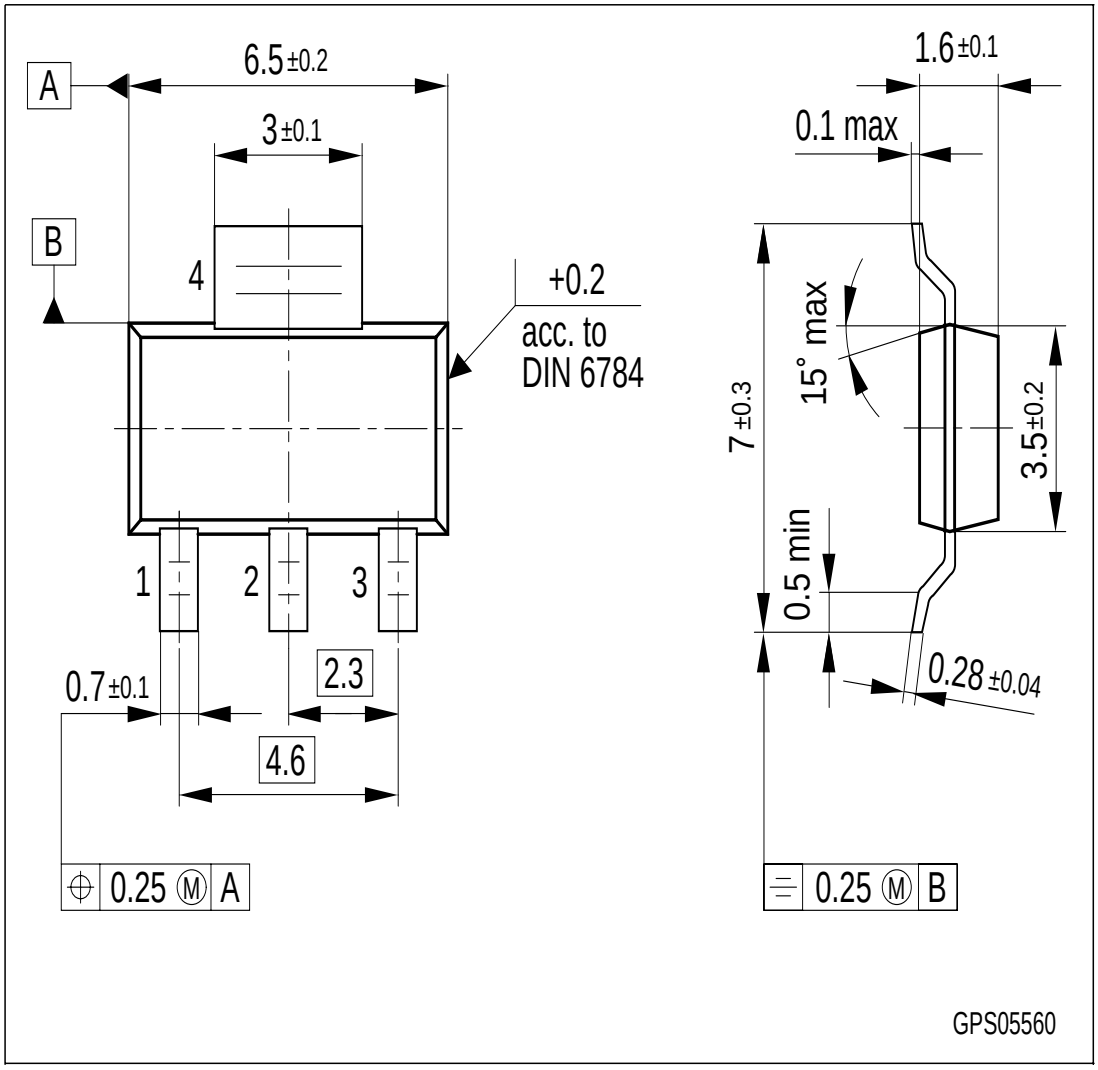


Typ. gate charge

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

parameter: I_D = 0.8 A pulsed




A
6.5±0.2
3±0.1
B
4
+0.2
acc. to
DIN 6784
1
2
3
0.7±0.1
2.3
4.6
0.25 M A
1.6±0.1
0.1 max
15° max
7±0.3
3.5±0.2
0.5 min
0.28±0.04
0.25 M B
GPS05560

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