

SIPMOS[®] Small-Signal-Transistor

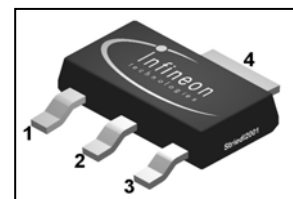
Features

- P-Channel
- Enhancement mode
- Logic level
- Avalanche rated
- dv/dt rated

Product Summary

V_{DS}	-60	V
$R_{DS(on),max}$	0.3	Ω
I_D	-1.9	A

SOT-223



Type	Package	Ordering Code	Marking
BSP 171 P	SOT-223	Q67041-S4019	171P

Maximum ratings, at $T_J=25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
			steady state	
Continuous drain current	I_D	$T_A=25\text{ °C}^{(1)}$	-1.9	A
		$T_A=70\text{ °C}^{(1)}$	-1.5	
		$T_A=25\text{ °C}$	-7.6	
Pulsed drain current	$I_{D,pulse}$	$T_A=25\text{ °C}$	-7.6	
Avalanche energy, single pulse	E_{AS}	$I_D=-1.9\text{ A}$, $R_{GS}=25\text{ }\Omega$	70	mJ
Reverse diode dv/dt	dv/dt	$I_D=-1.9\text{ A}$, $V_{DS}=-48\text{ V}$, $di/dt=-200\text{ A}/\mu\text{s}$, $T_{j,max}=150\text{ °C}$	-6	kV/ μs
Gate source voltage	V_{GS}		± 20	V
Power dissipation	P_{tot}	$T_A=25\text{ °C}^{(1)}$	1.8	W
Operating and storage temperature	T_j , T_{stg}		-55 ... 150	$^{\circ}\text{C}$
IEC climatic category; DIN IEC 68-1			55/150/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Thermal characteristics

Thermal resistance, junction - soldering point	R_{thJS}		-	-	25	K/W
Thermal resistance, junction - ambient	R_{thJA}	minimal footprint, steady state	-	-	110	
		6 cm ² cooling area ¹⁾ , steady state	-	-	70	

Electrical characteristics, at $T_j=25\text{ °C}$, unless otherwise specified
Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$, $I_D=-250\text{ }\mu\text{A}$	-60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=-460\text{ }\mu\text{A}$	-1	-1.5	-2	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$	-	-0.1	-1	μA
		$V_{DS}=-60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$	-	-10	-100	
Gate-source leakage current	I_{GSS}	$V_{GS}=-20\text{ V}$, $V_{DS}=0\text{ V}$	-	-10	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-4.5\text{ V}$, $I_D=-1.5\text{ A}$	-	0.3	0.45	Ω
		$V_{GS}=-10\text{ V}$, $I_D=-1.9\text{ A}$	-	0.21	0.3	
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=-1.5\text{ A}$	1.4	2.7	-	S

¹⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{GS}=0\text{ V},$ $V_{DS}=-25\text{ V}, f=1\text{ MHz}$	-	365	460	pF
Output capacitance	C_{oss}		-	105	135	
Reverse transfer capacitance	C_{rss}		-	40	55	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=-25\text{ V},$ $V_{GS}=-10\text{ V},$ $I_D=-1.9\text{ A}, R_G=6\text{ }\Omega$	-	6	8	ns
Rise time	t_r		-	25	33	
Turn-off delay time	$t_{d(off)}$		-	208	276	
Fall time	t_f		-	87	130	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=-48\text{ V}, I_D=1.9\text{ A},$ $V_{GS}=0\text{ to }-10\text{ V}$	-	-1.2	-1.6	nC
Gate to drain charge	Q_{gd}		-	-5	-7	
Gate charge total	Q_g		-	-13	-20	
Gate plateau voltage	$V_{plateau}$		-	-3	-	V
Output charge	Q_{oss}	$V_{DD}=-15\text{ V}, V_{GS}=0\text{ V}$	-	-5	-7	

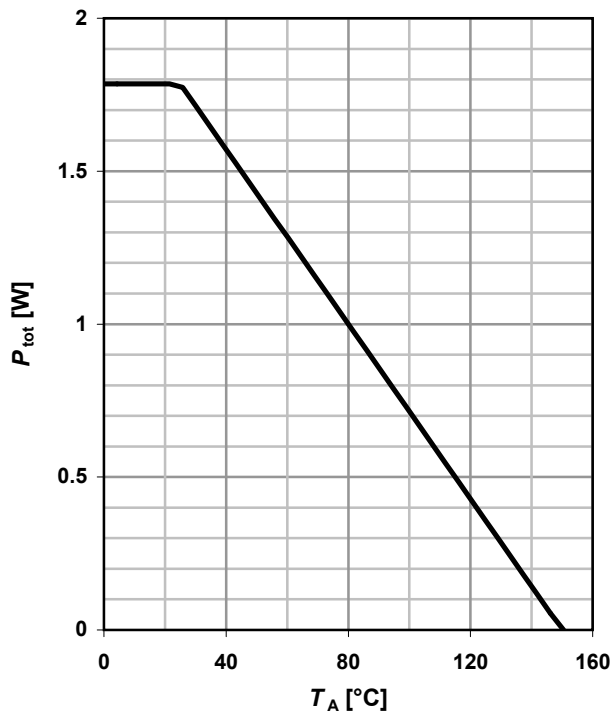
Reverse Diode

Diode continuous forward current	I_S	$T_A=25\text{ }^\circ\text{C}$	-	-	-1.9	A
Diode pulse current	$I_{S,pulse}$		-	-	-7.6	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=1.9\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	-0.84	-1.1	V
Reverse recovery time	t_{rr}	$V_R=-30\text{ V}, I_F= I_S ,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	80	120	ns
Reverse recovery charge	Q_{rr}		-	-125	-190	nC

²⁾ See figure 16 for gate charge parameter definition

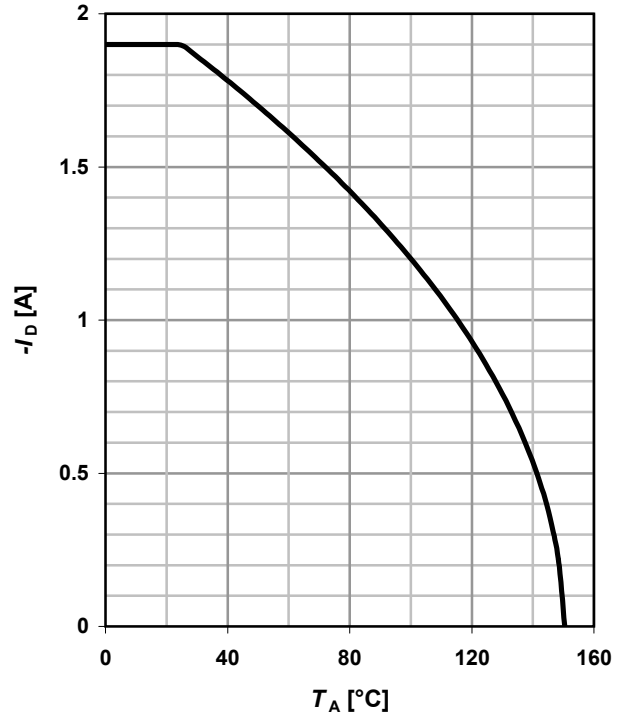
1 Power dissipation

$$P_{\text{tot}} = f(T_A)$$



2 Drain current

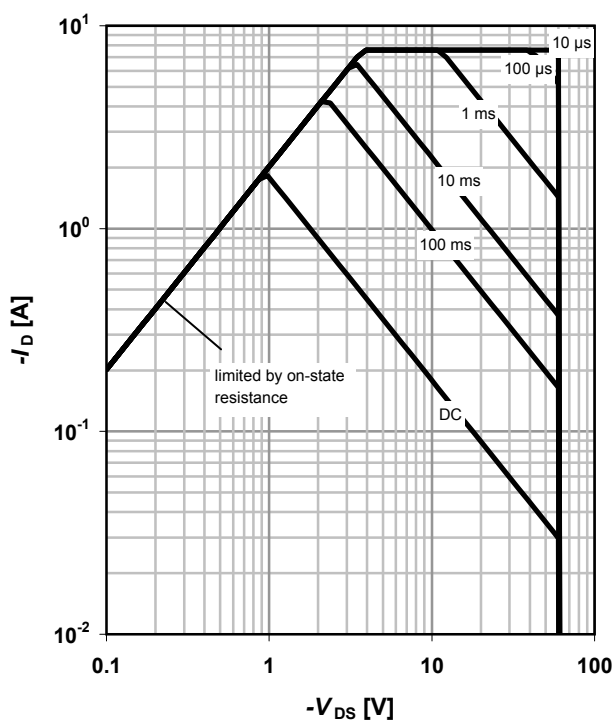
$$I_D = f(T_A); |V_{GS}| \geq 10 \text{ V}$$



3 Safe operation area

$$I_D = f(V_{DS}); T_A = 25^\circ\text{C}; D = 0$$

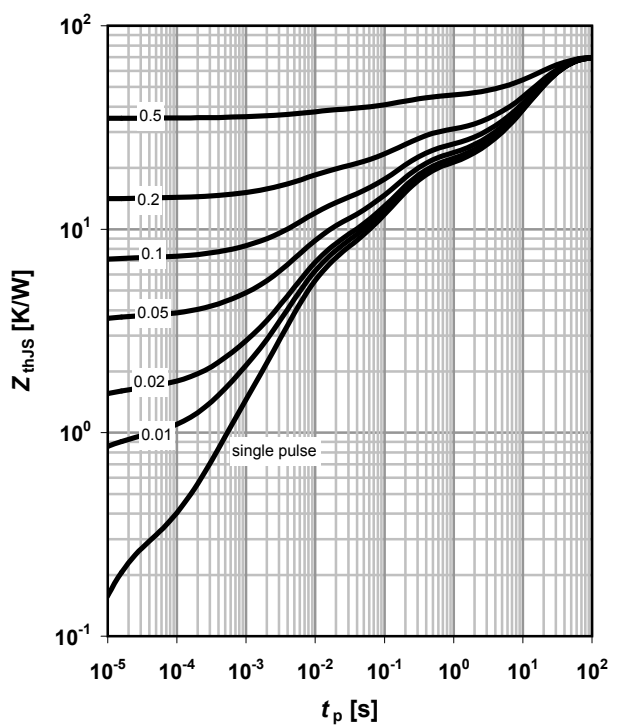
parameter: t_p



4 Max. transient thermal impedance

$$Z_{thJA} = f(t_p)$$

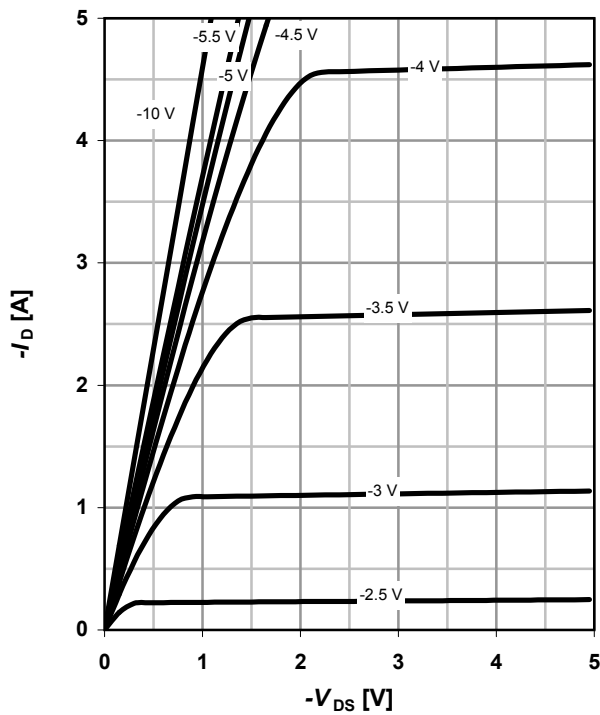
parameter: $D = t_p/T$



5 Typ. output characteristics

$$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$$

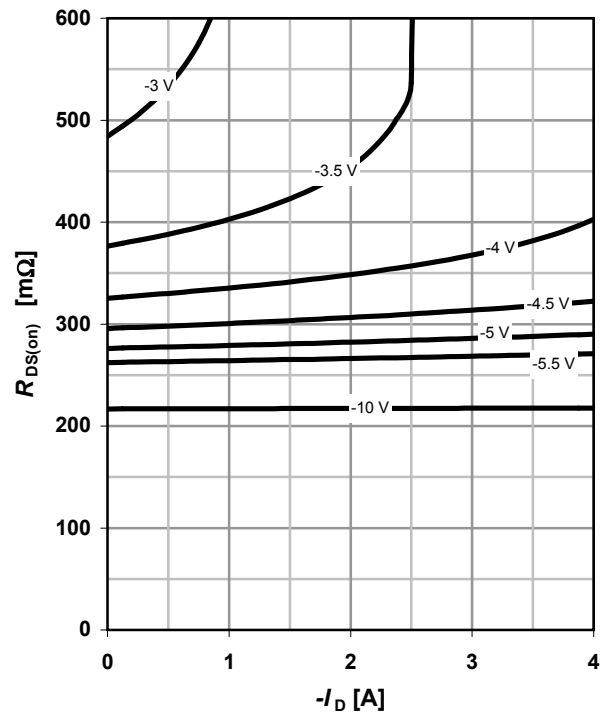
parameter: V_{GS}



6 Typ. drain-source on resistance

$$R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$$

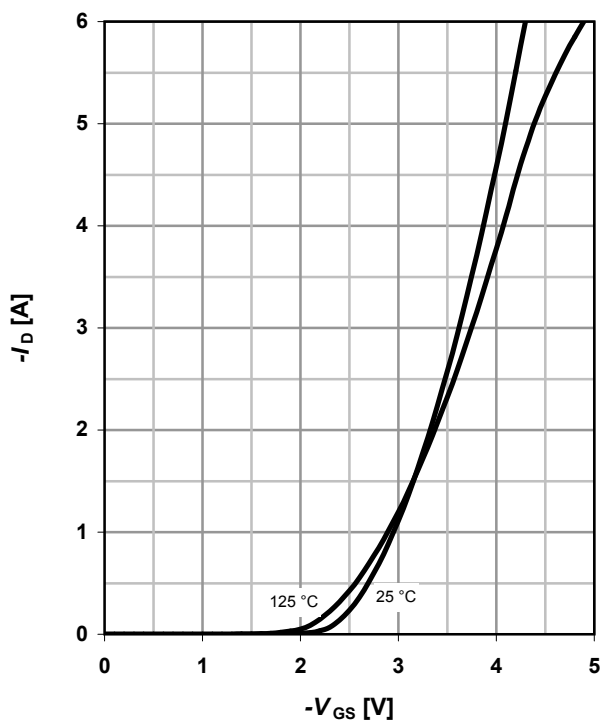
parameter: V_{GS}



7 Typ. transfer characteristics

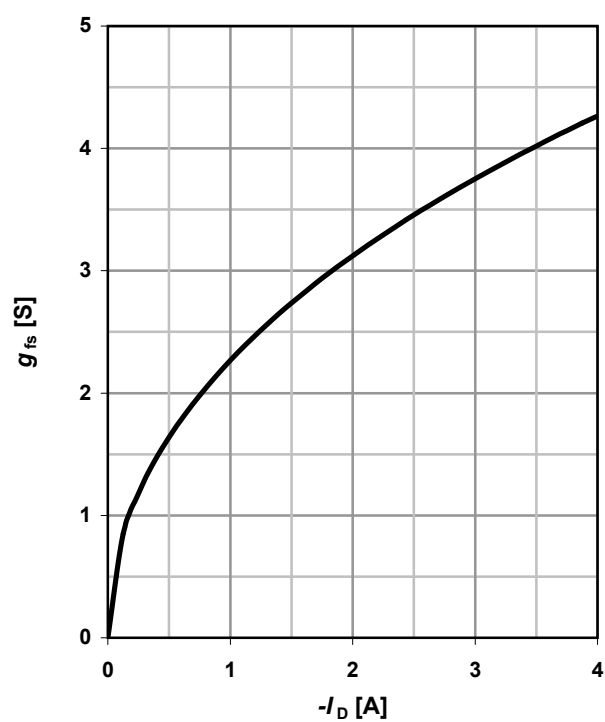
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)\max}$$

parameter: T_j



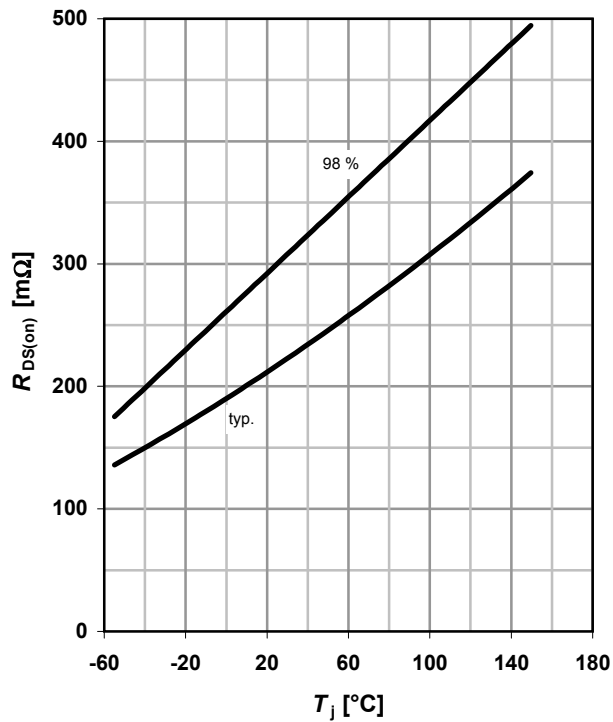
8 Typ. forward transconductance

$$g_{fs} = f(I_D); T_j = 25^\circ\text{C}$$



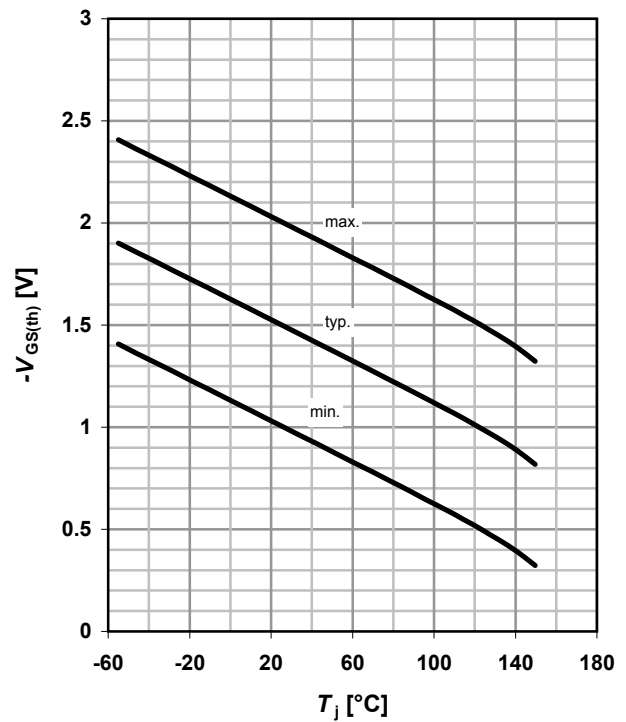
9 Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = -1.9 \text{ A}; V_{GS} = -10 \text{ V}$$



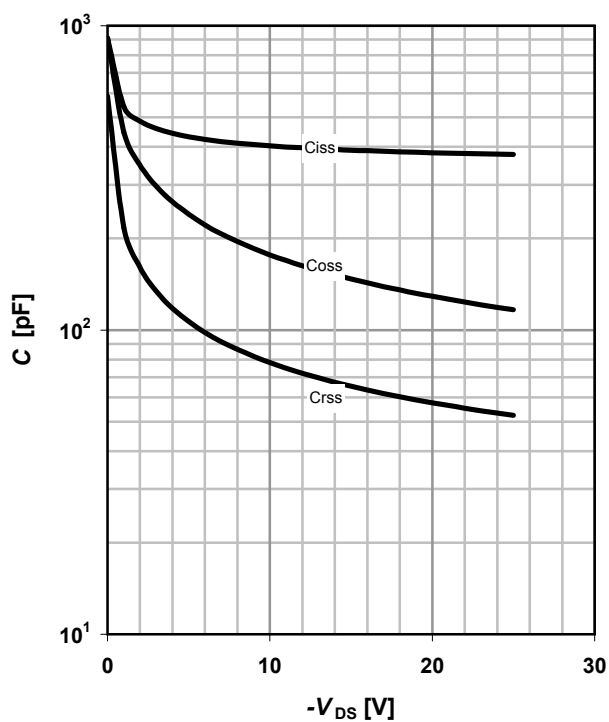
10 Typ. gate threshold voltage

$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -460 \text{ μA}$$



11 Typ. capacitances

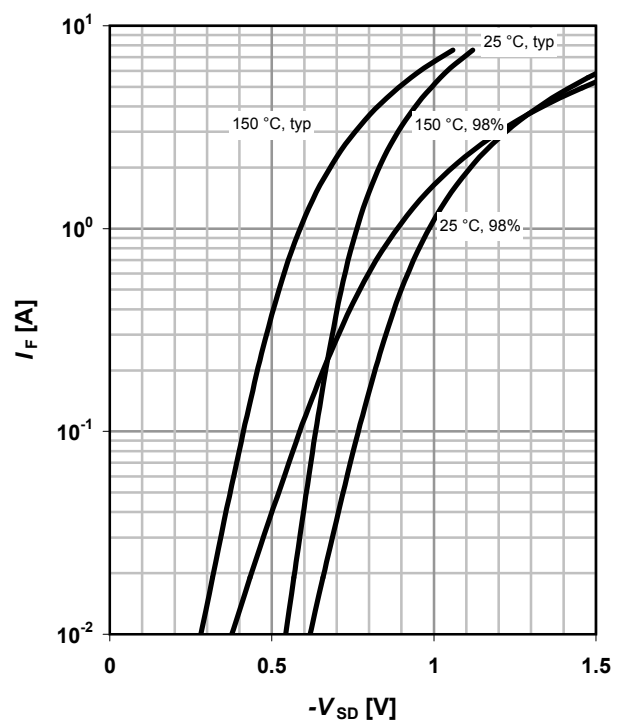
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

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

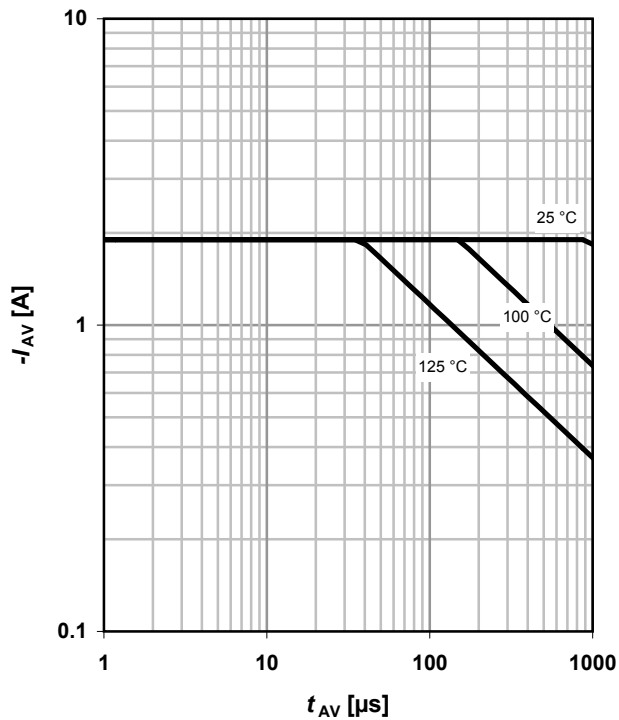
parameter: T_j



13 Avalanche characteristics

$$I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega$$

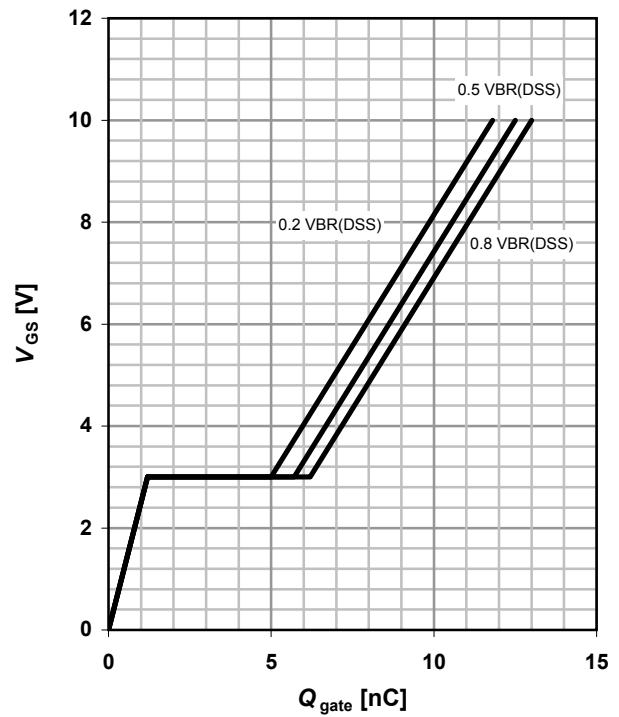
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

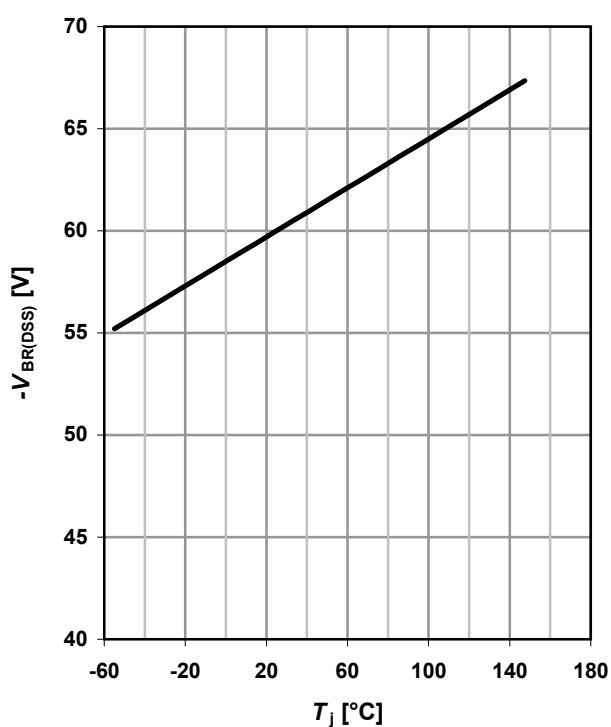
$$V_{GS}=f(Q_{\text{gate}}); I_D=-1.9\ \text{A pulsed}$$

parameter: V_{DD}

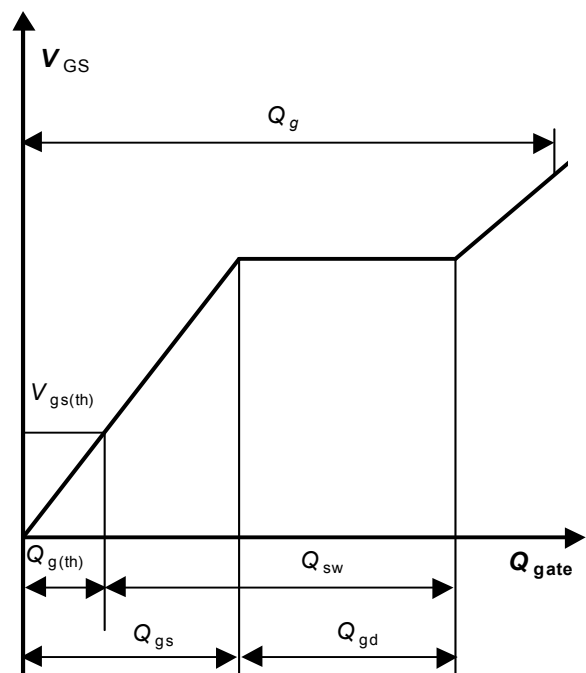


15 Drain-source breakdown voltage

$$V_{BR(DSS)}=f(T_j); I_D=-1\ \text{mA}$$

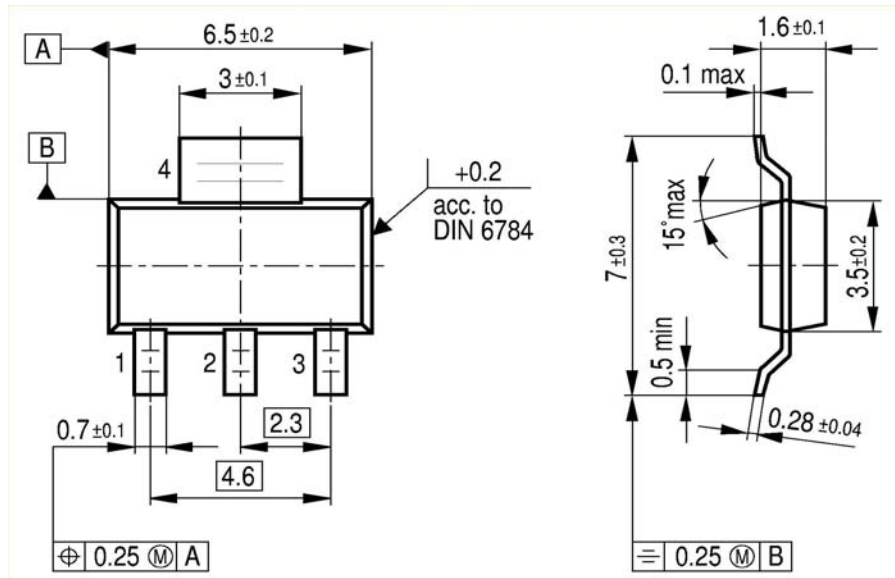


16 Gate charge waveforms

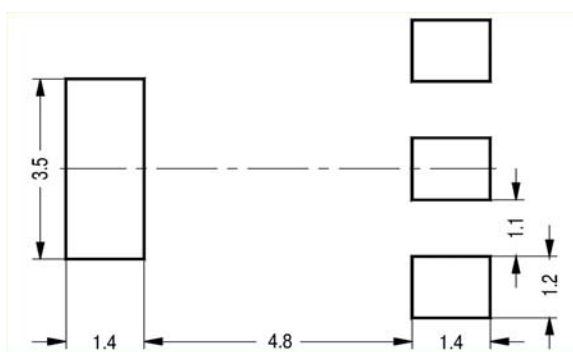


Package Outline

SOT-223: Outline

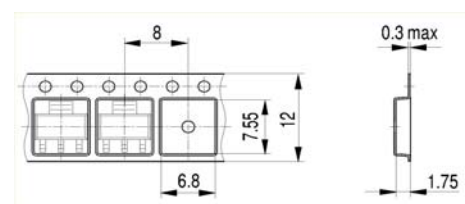


Footprint



Packaging

Tape



Dimensions in mm

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