

## OptiMOS™ Small-Signal-Transistor

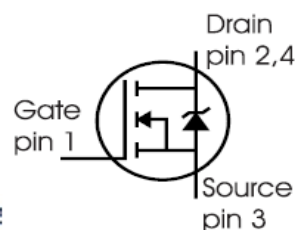
### Features

- N-channel
- Enhancement mode
- Logic level (4.5V rated)
- Avalanche rated
- Qualified according to AEC Q101
- 100% lead-free; RoHS compliant
- Halogen-free according to IEC61249-2-21

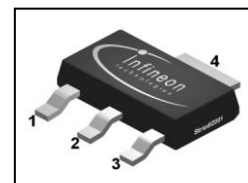


### Product Summary

$V_{DS}$	100	V
$R_{DS(on),max}$	$V_{GS}=10\text{ V}$	0.6 $\Omega$
	$V_{GS}=4.5\text{ V}$	0.8
$I_D$	1.2	A



PG-SOT223



Type	Package	Tape and Reel Information	Marking	Halogen-Free	Packing
BSP296N	SOT223	H6327: 1000 pcs/ reel	BSP296N	Yes	Non dry

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_A=25\text{ °C}$	1.2	A
		$T_A=70\text{ °C}$	0.9	
Pulsed drain current	$I_{D,pulse}$	$T_A=25\text{ °C}$	4.6	
Avalanche energy, single pulse	$E_{AS}$	$I_D=1.2\text{ A}$ , $R_{GS}=25\text{ }\Omega$	15.0	mJ
Reverse diode $dv/dt$	$dv/dt$	$I_D=1.2\text{ A}$ , $V_{DS}=80\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{j,max}=150\text{ °C}$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$		$\pm 20$	V
Power dissipation	$P_{tot}$	$T_A=25\text{ °C}$	1.8	W
Operating and storage temperature	$T_j$ , $T_{stg}$		-55 ... 150	$^{\circ}\text{C}$
ESD Class		JESD22-A114 -HBM	0 (<250V)	
Soldering Temperature			260 $^{\circ}\text{C}$	
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	-	-	110	
		6 cm <sup>2</sup> cooling area <sup>1)</sup>	-	-	70	

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

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$	100	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}\text{ V}$ , $I_D=100\text{ }\mu\text{A}$	0.8	1.4	1.8	
Drain-source leakage current	$I_{DSS}$	$V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$	-	-	0.1	$\mu\text{A}$
		$V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=150\text{ °C}$	-	-	10	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$	-	-	10	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}$ , $I_D=0.95\text{ A}$	-	371	800	m $\Omega$
		$V_{GS}=10\text{ V}$ , $I_D=1.2\text{ A}$	-	329	600	
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}$ , $I_D=0.9\text{ A}$		2.66	-	S

<sup>1)</sup> Device on 40mm x 40mm x 1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70 $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$	-	114.8	152.7	pF
Output capacitance	$C_{oss}$		-	19.7	26.3	
Reverse transfer capacitance	$C_{rss}$		-	9.8	14.7	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$ $I_D=1.2\text{ A}, R_{G,ext}=6\text{ }\Omega$	-	3.5	5.3	ns
Rise time	$t_r$		-	3.8	5.7	
Turn-off delay time	$t_{d(off)}$		-	18.4	27.6	
Fall time	$t_f$		-	5.2	7.8	

**Gate Charge Characteristics**

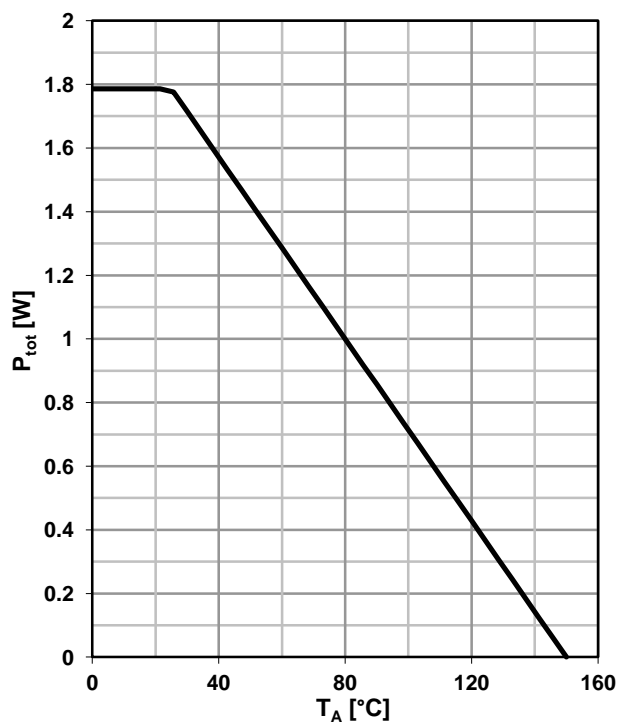
Gate to source charge	$Q_{gs}$	$V_{DD}=50\text{ V}, I_D=1.2\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	0.27	0.4	nC
Gate to drain charge	$Q_{gd}$		-	1.45	2.2	
Gate charge total	$Q_g$		-	4.5	6.7	
Gate plateau voltage	$V_{plateau}$		-	2.4	-	V

**Reverse Diode**

Diode continuous forward current	$I_S$	$T_A=25\text{ }^\circ\text{C}$	-	-	1.2	A
Diode pulse current	$I_{S,pulse}$		-	-	4.6	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=1.2\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	0.85	1.1	V
Reverse recovery time	$t_{rr}$	$V_R=50\text{ V}, I_F=1.2\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	27	40.5	ns
Reverse recovery charge	$Q_{rr}$		-	30	45	nC

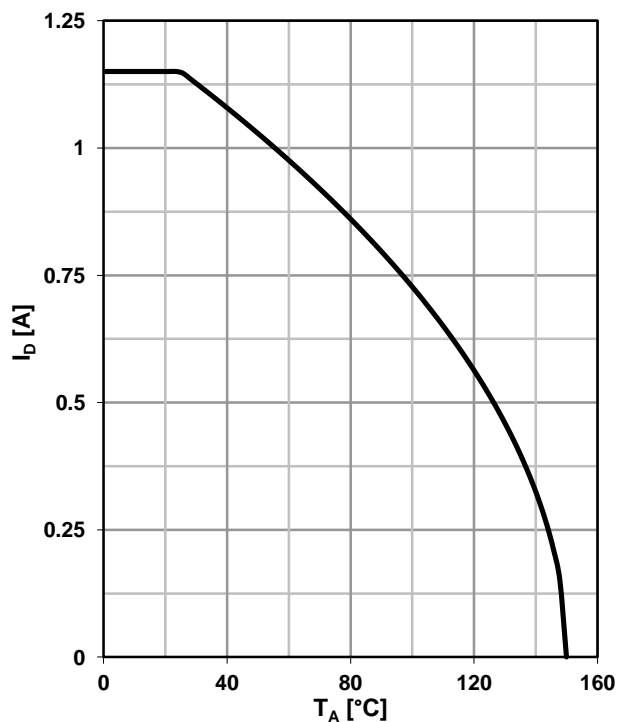
## 1 Power dissipation

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



## 2 Drain current

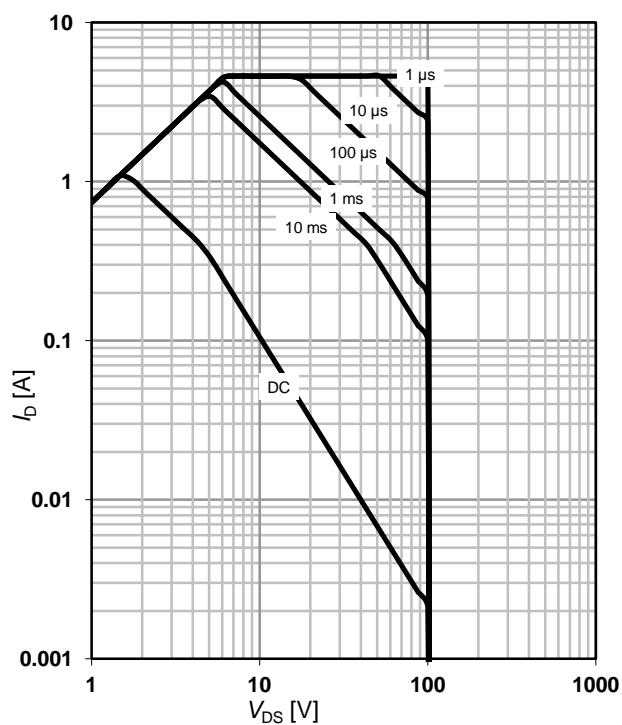
$$I_D = f(T_A); V_{GS} \geq 10 \text{ V}$$



## 3 Safe operating area

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

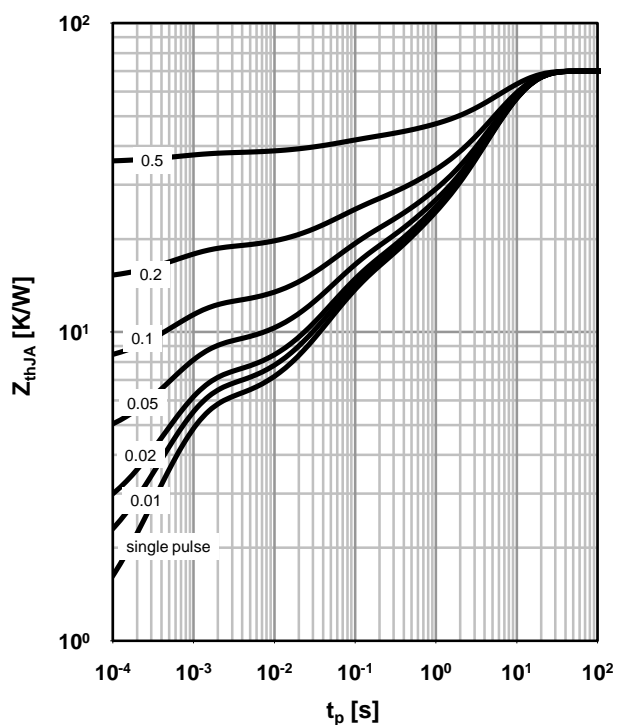
parameter:  $t_p$



## 4 Max. transient thermal impedance

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

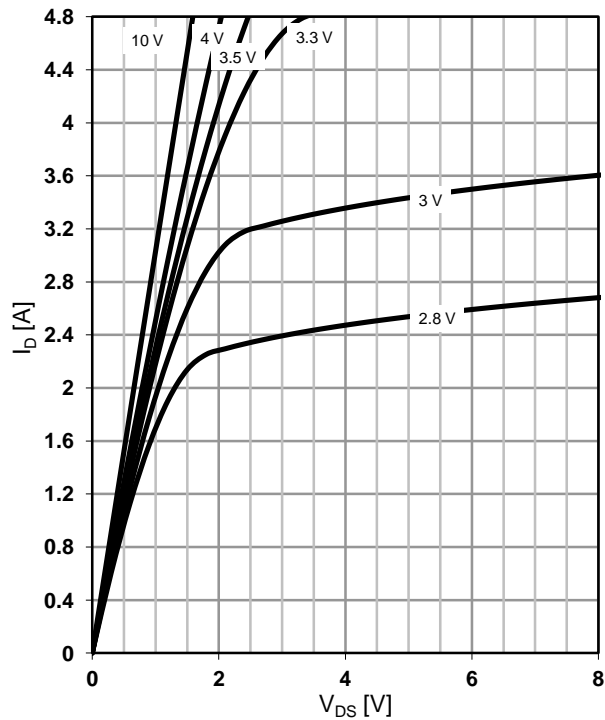
parameter:  $D = t_p / T$



## 5 Typ. output characteristics

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

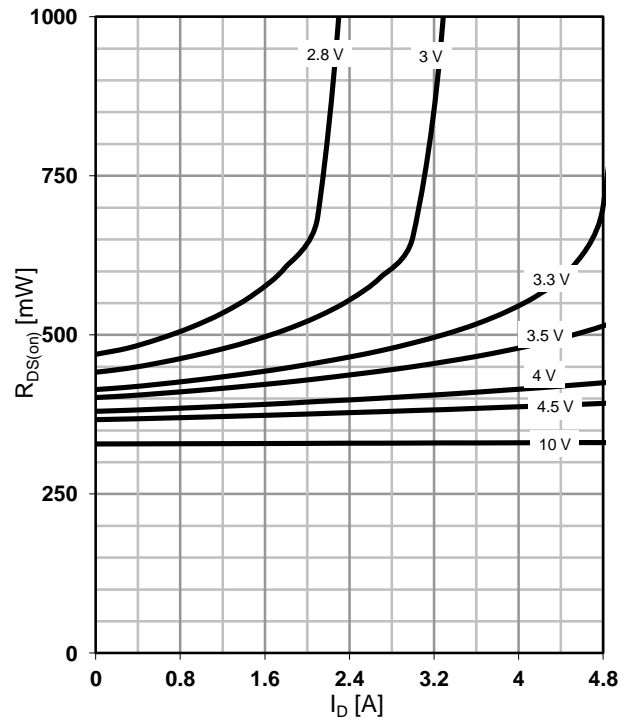
parameter:  $V_{GS}$



## 6 Typ. drain-source on resistance

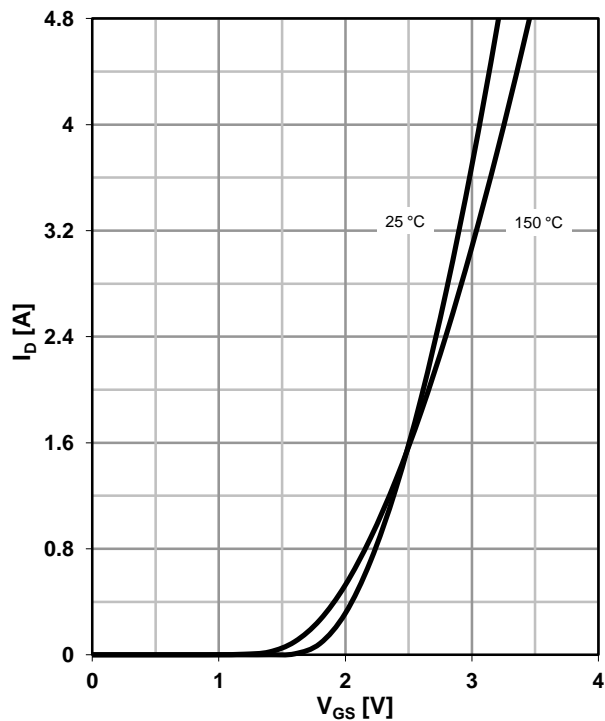
$$R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$$

parameter:  $V_{GS}$



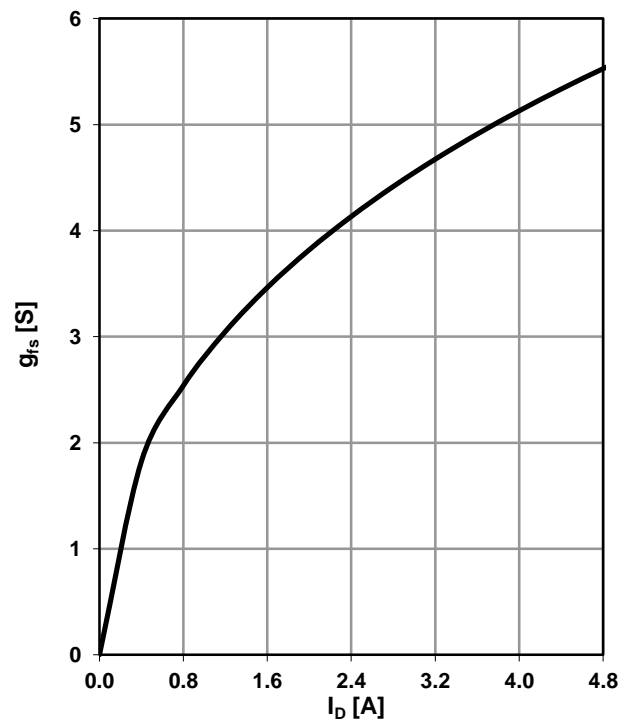
## 7 Typ. transfer characteristics

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



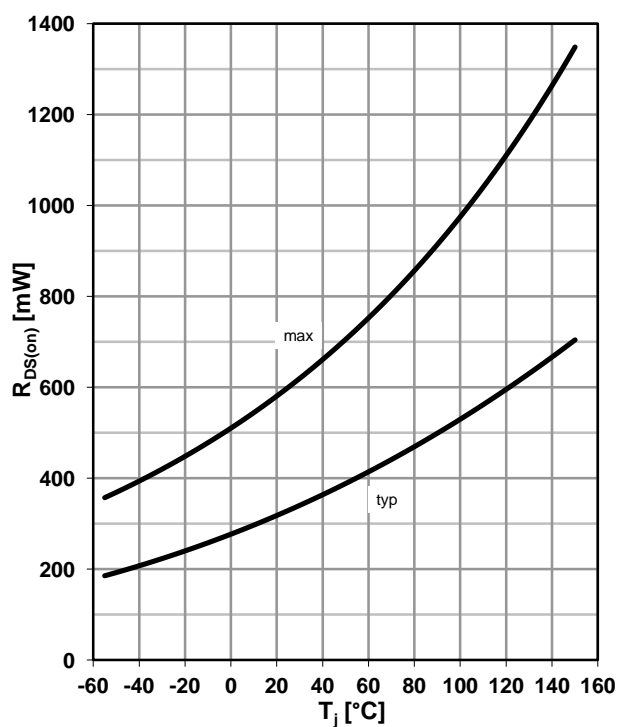
## 8 Typ. forward transconductance

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



## 9 Drain-source on-state resistance

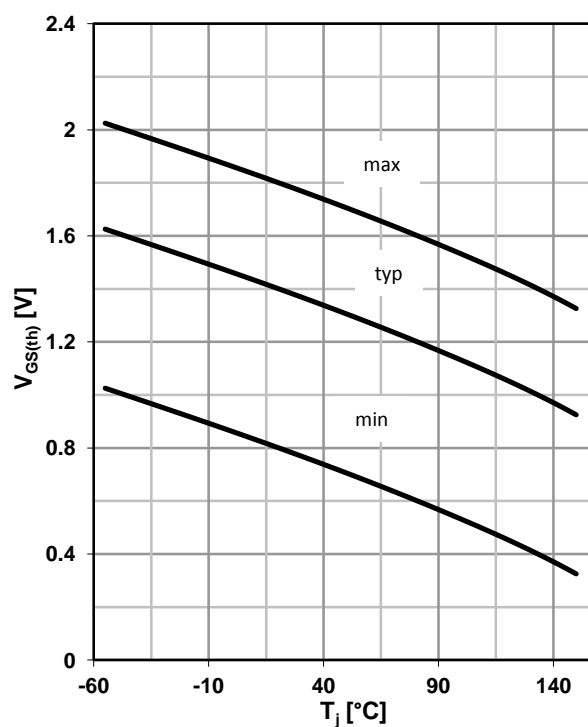
$$R_{DS(on)} = f(T_j); I_D = 1.2 \text{ A}; V_{GS} = 10 \text{ V}$$



## 10 Typ. gate threshold voltage

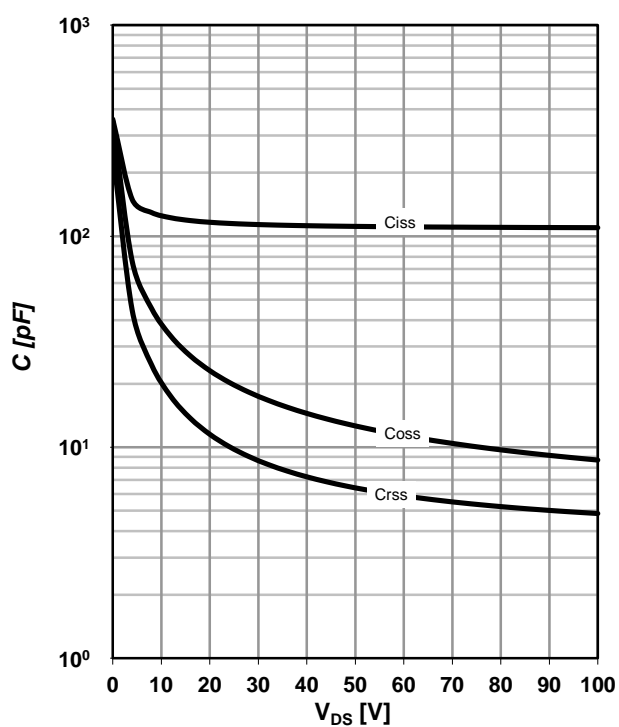
$$V_{GS(th)} = f(T_j); V_{DS} = V_{GS}; I_D = 100 \mu\text{A}$$

parameter:  $I_D$



## 11 Typ. capacitances

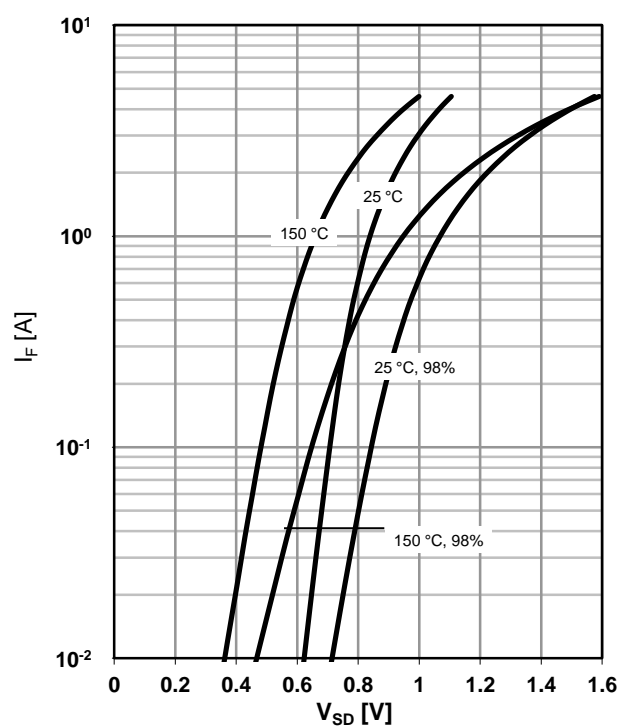
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25^\circ\text{C}$$



## 12 Forward characteristics of reverse diode

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

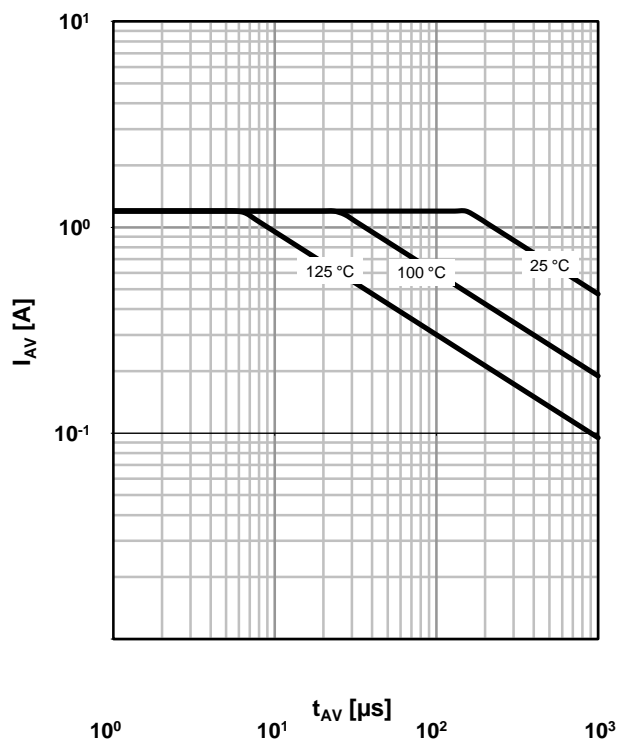
parameter:  $T_j$



### 13 Avalanche characteristics

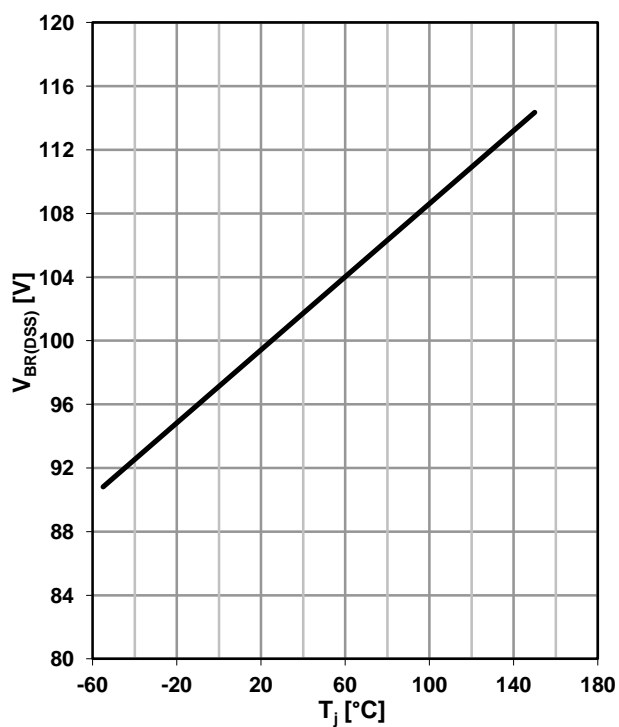
$$I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega$$

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



### 15 Drain-source breakdown voltage

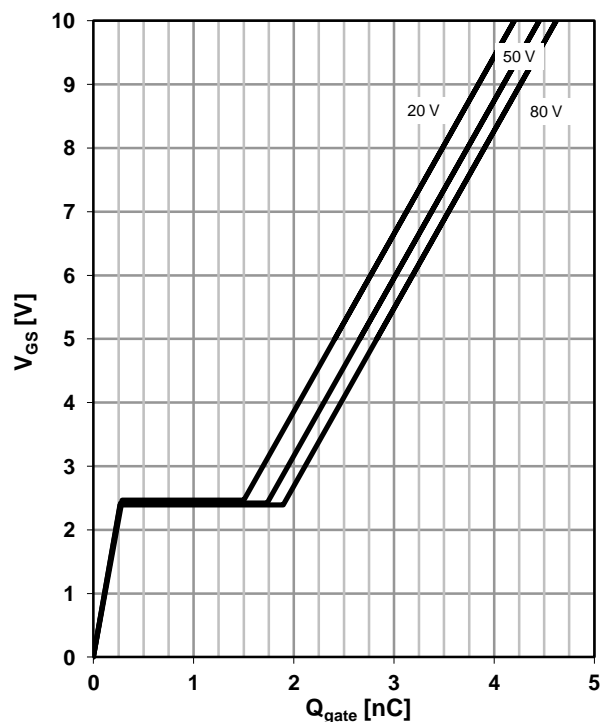
$$V_{BR(DSS)}=f(T_j); I_D=250\ \mu\text{A}$$



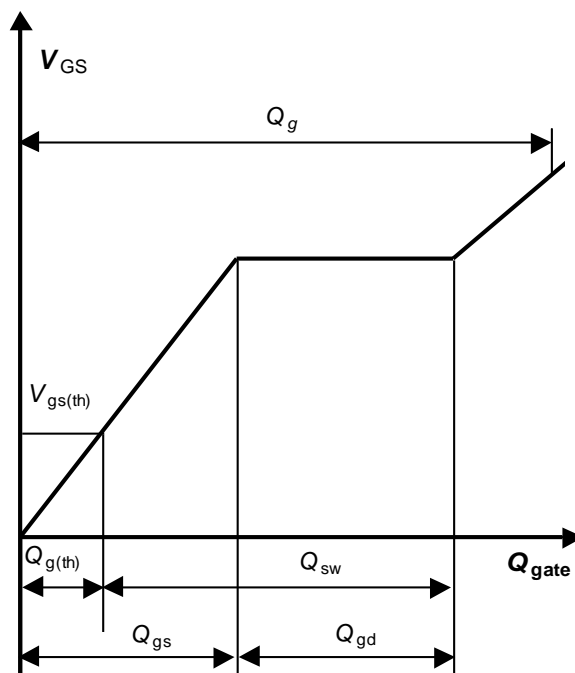
### 14 Typ. gate charge

$$V_{GS}=f(Q_{\text{gate}}); I_D=1.2\ \text{A pulsed}$$

parameter:  $V_{DD}$

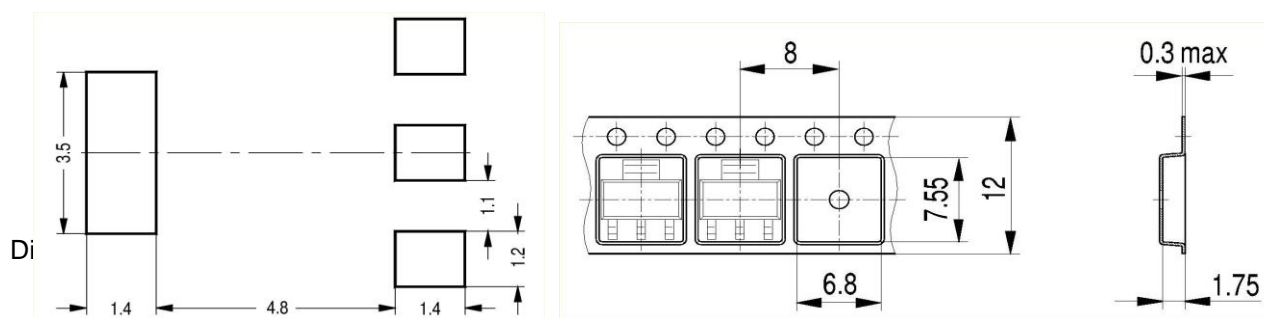
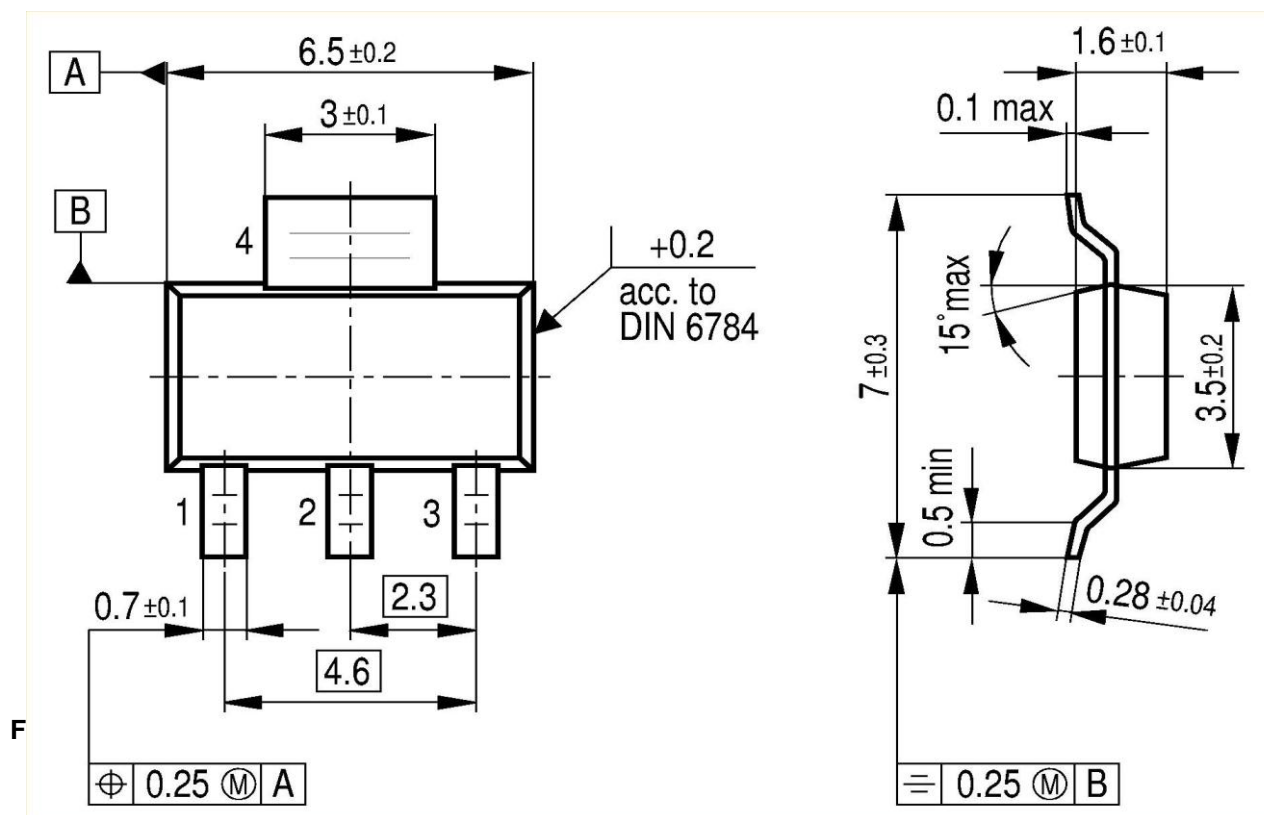


### 16 Gate charge waveforms



## SOT223

## Package Outline:



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