

OptiMOS™ Small-Signal-Transistor

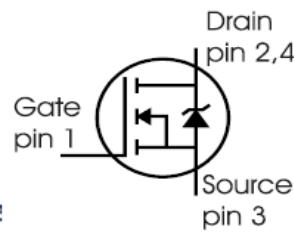
Features

- 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

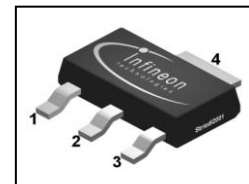


Product Summary

V_{DS}	100	V
$R_{DS(on),max}$	$V_{GS}=10\text{ V}$	0.6 Ω
	$V_{GS}=4.5\text{ V}$	0.8 Ω
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/ μs
Gate source voltage	V_{GS}		± 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 ² cooling area ¹⁾	-	-	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	μA
		$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}, T_j=150\text{ °C}$	-	-	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 Ω
		$V_{GS}=10\text{ V}, I_D=1.2\text{ A}$	-	329	600	
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=0.9\text{ A}$		2.66	-	S

¹⁾ Device on 40mm x 40mm x 1.5mm epoxy PCB FR4 with 6cm² (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}	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$	-	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	$t_{d(on)}$	$V_{DD}=50\text{ V}, V_{GS}=10\text{ V},$ $I_D=1.2\text{ A}, R_{G,ext}=6\ \Omega$	-	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

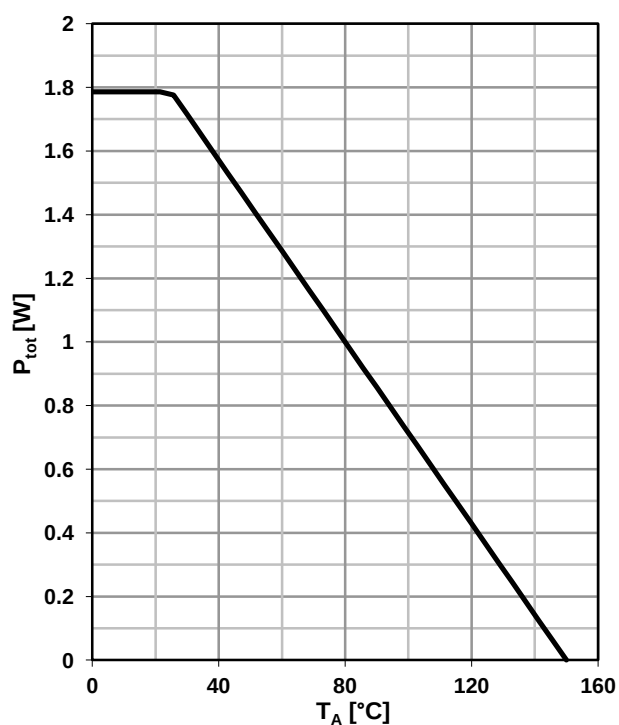
Gate to source charge	Q_{gs}	$V_{DD}=50\text{ V}, I_D=1.2\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	0.27	0.4	nC
Gate to drain charge	Q_{gd}		-	1.45	2.2	
Gate charge total	Q_g		-	4.5	6.7	
Gate plateau voltage	$V_{plateau}$		-	2.4	-	V

Reverse Diode

Diode continuous forward current	I_S	$T_A=25\text{ °C}$	-	-	1.2	A
Diode pulse current	$I_{S,pulse}$		-	-	4.6	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=1.2\text{ A},$ $T_j=25\text{ °C}$	-	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

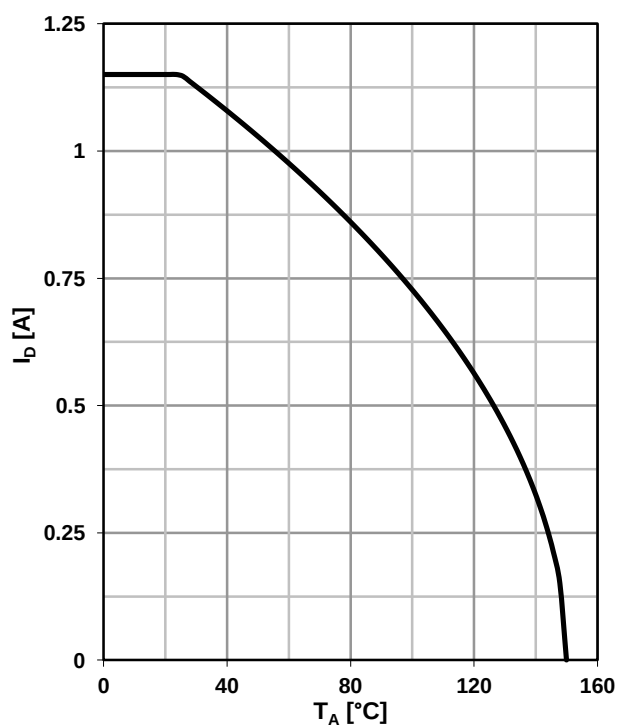
1 Power dissipation

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



2 Drain current

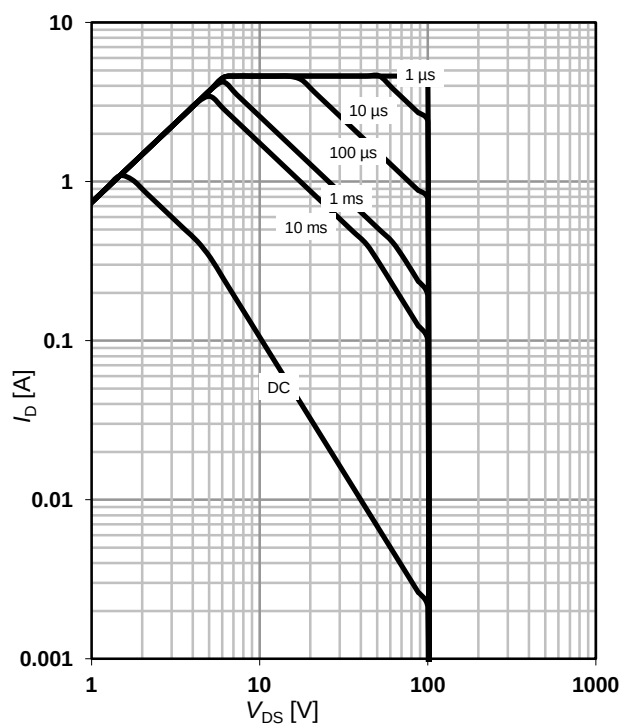
$$I_D = f(T_A); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

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

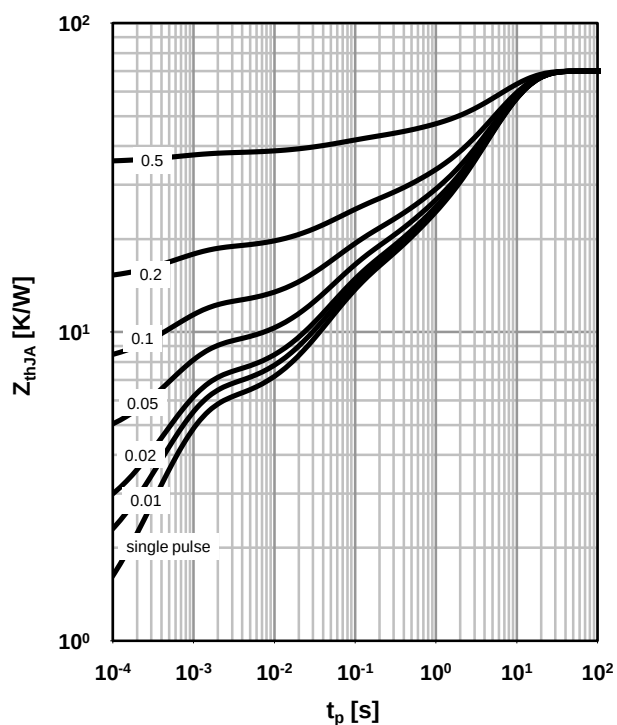
parameter: t_p



4 Max. transient thermal impedance

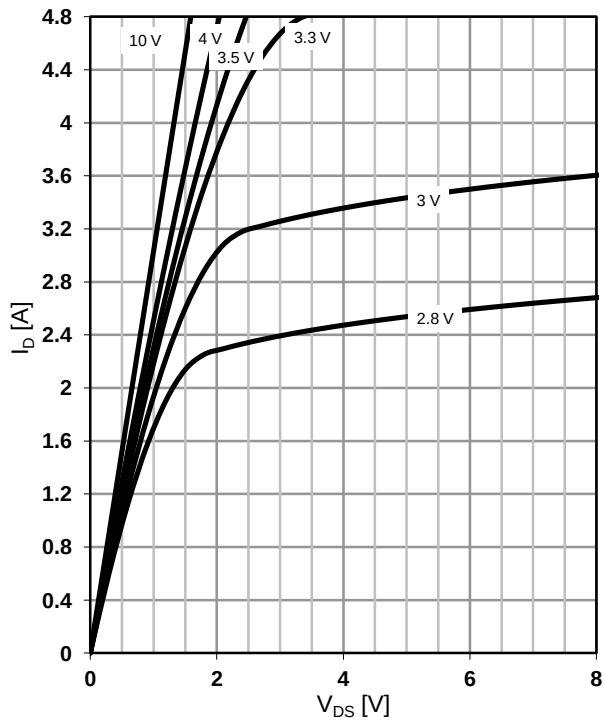
$$Z_{thJA} = f(t_p)$$

parameter: $D = t_p/T$



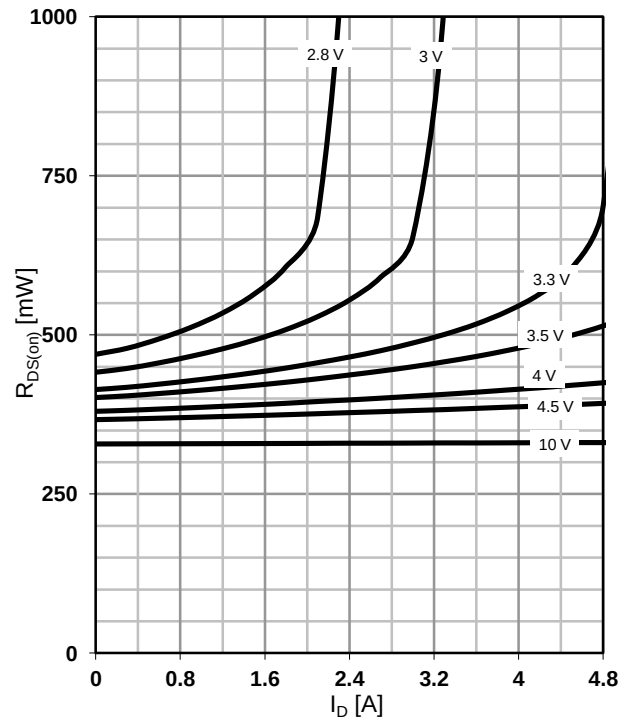
5 Typ. output characteristics

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

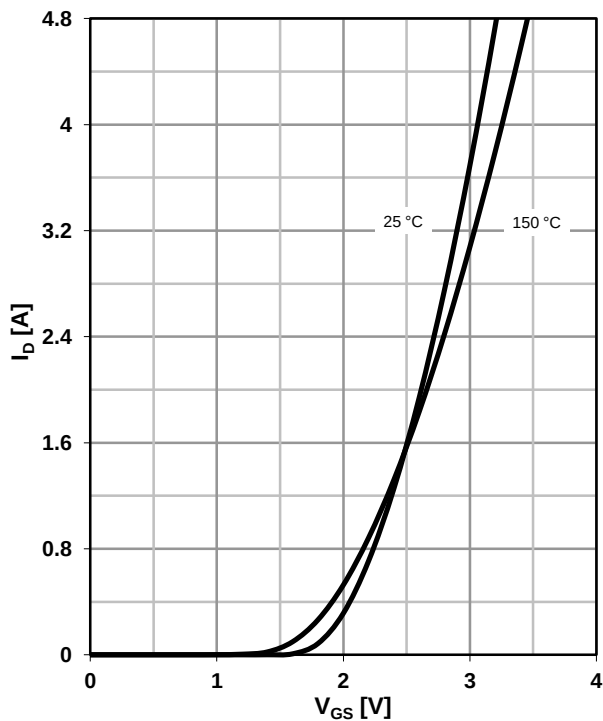
parameter: V_{GS}


6 Typ. drain-source on resistance

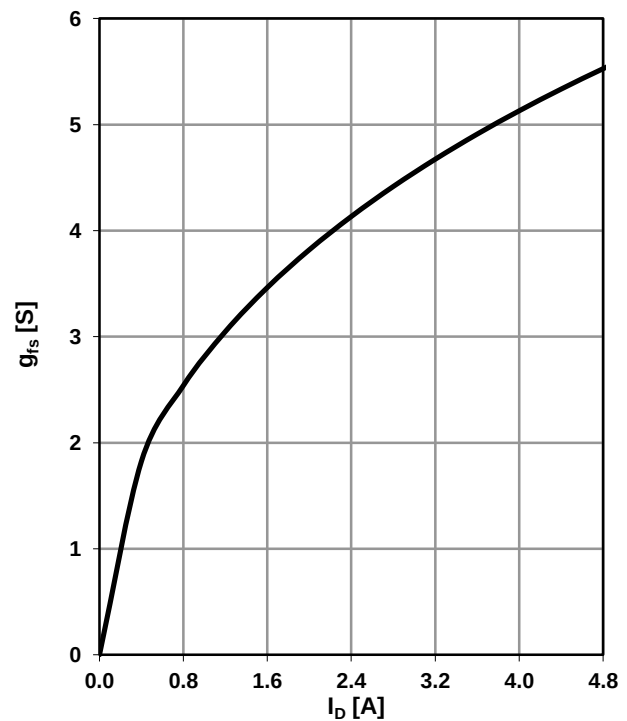
 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$

parameter: V_{GS}


7 Typ. transfer characteristics

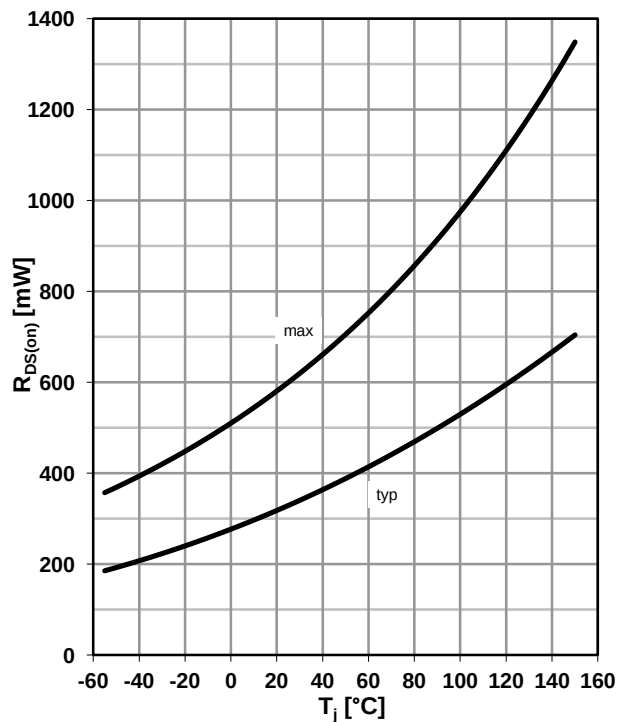
 $I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$


8 Typ. forward transconductance

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


9 Drain-source on-state resistance

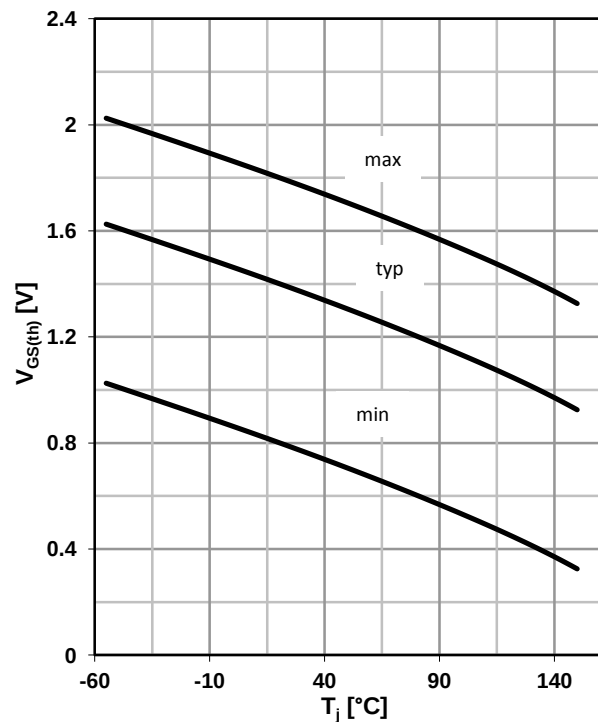
$R_{DS(on)} = f(T_j)$; $I_D = 1.2 \text{ A}$; $V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

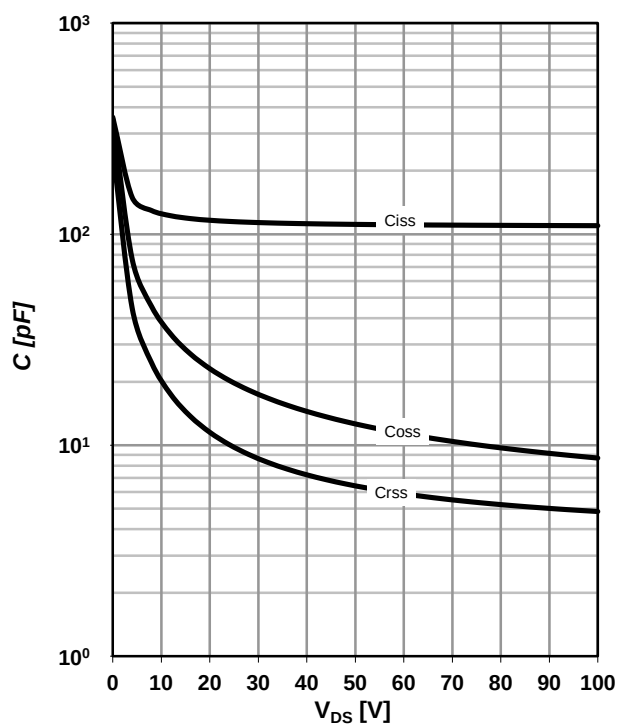
$V_{GS(th)} = f(T_j)$; $V_{DS} = V_{GS}$; $I_D = 100 \mu\text{A}$

parameter: I_D



11 Typ. capacitances

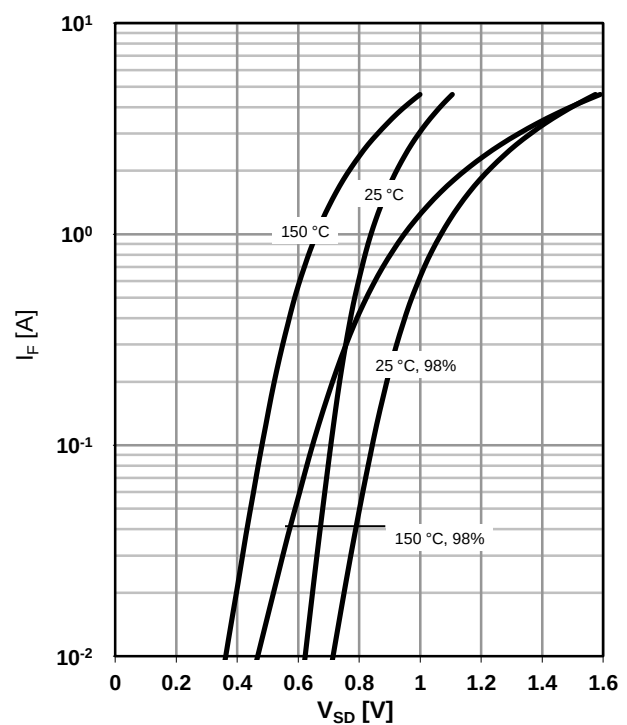
$C = f(V_{DS})$; $V_{GS} = 0 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25^\circ\text{C}$



12 Forward characteristics of reverse diode

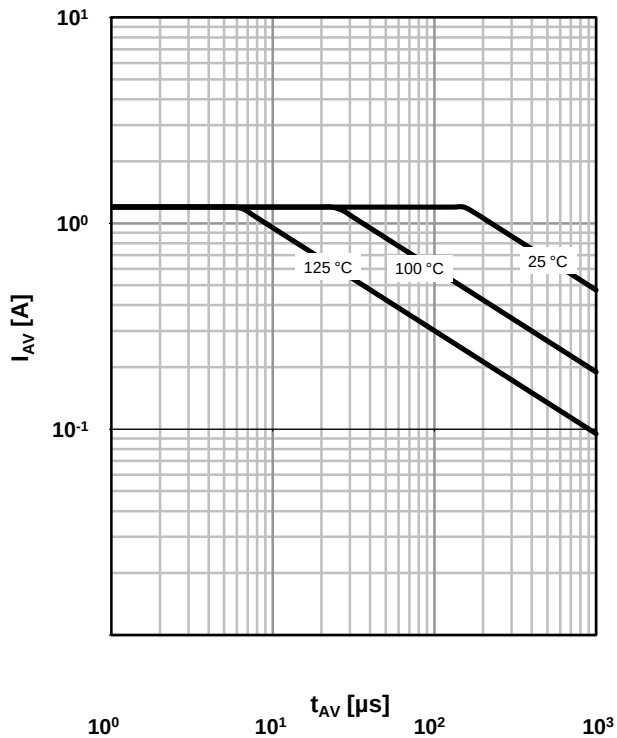
$I_F = f(V_{SD})$

parameter: T_j

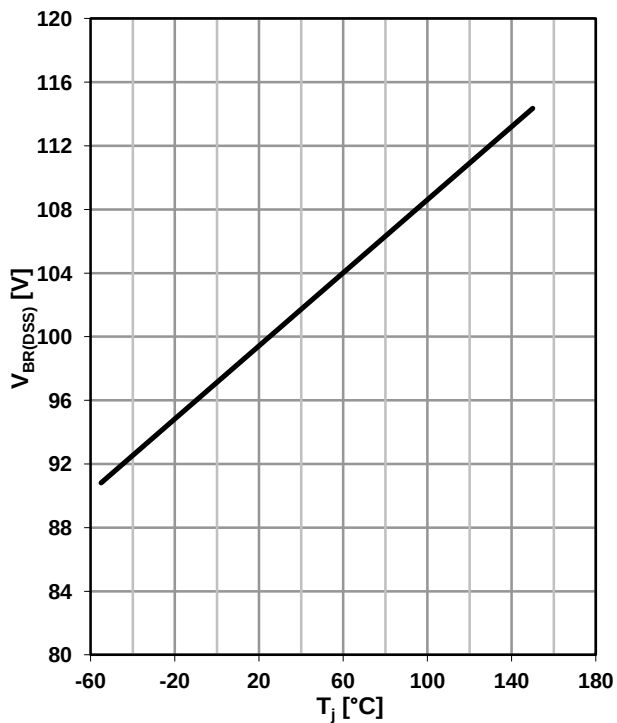


13 Avalanche characteristics

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

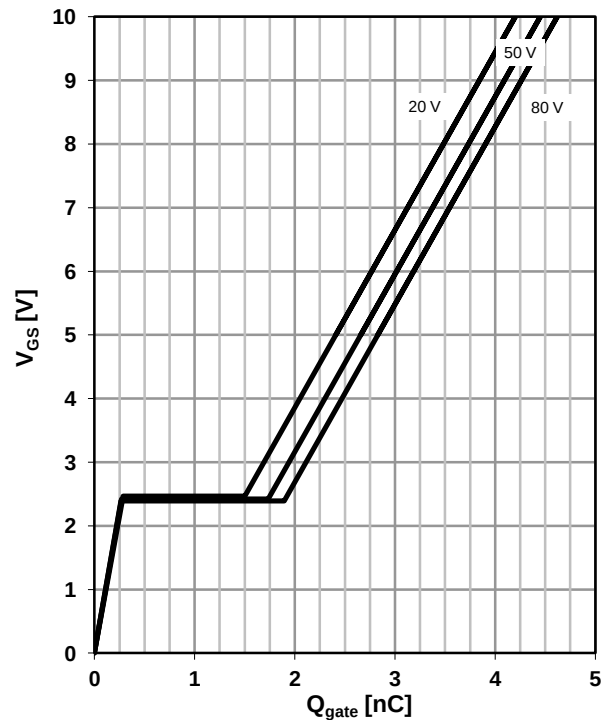
parameter: $T_{j(start)}$


15 Drain-source breakdown voltage

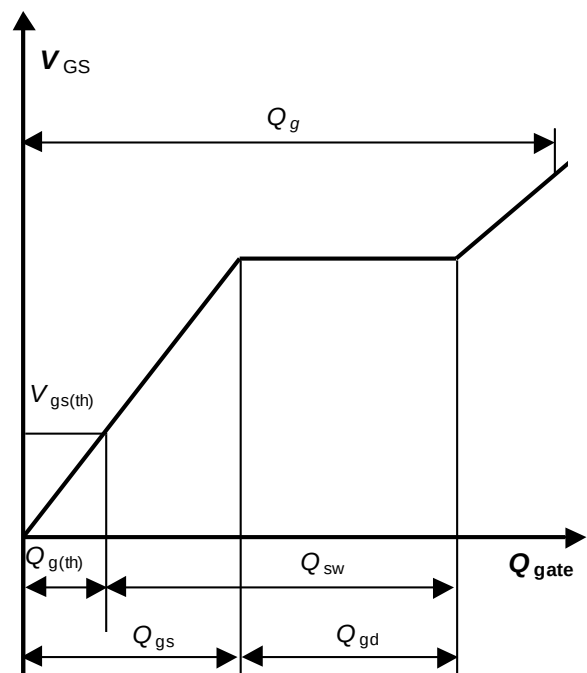
 $V_{BR(DSS)}=f(T_j); I_D=250\ \mu A$


14 Typ. gate charge

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

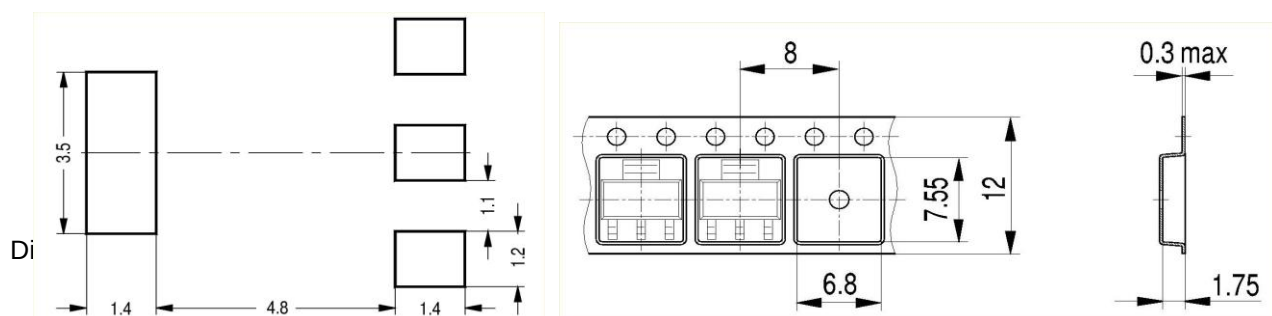
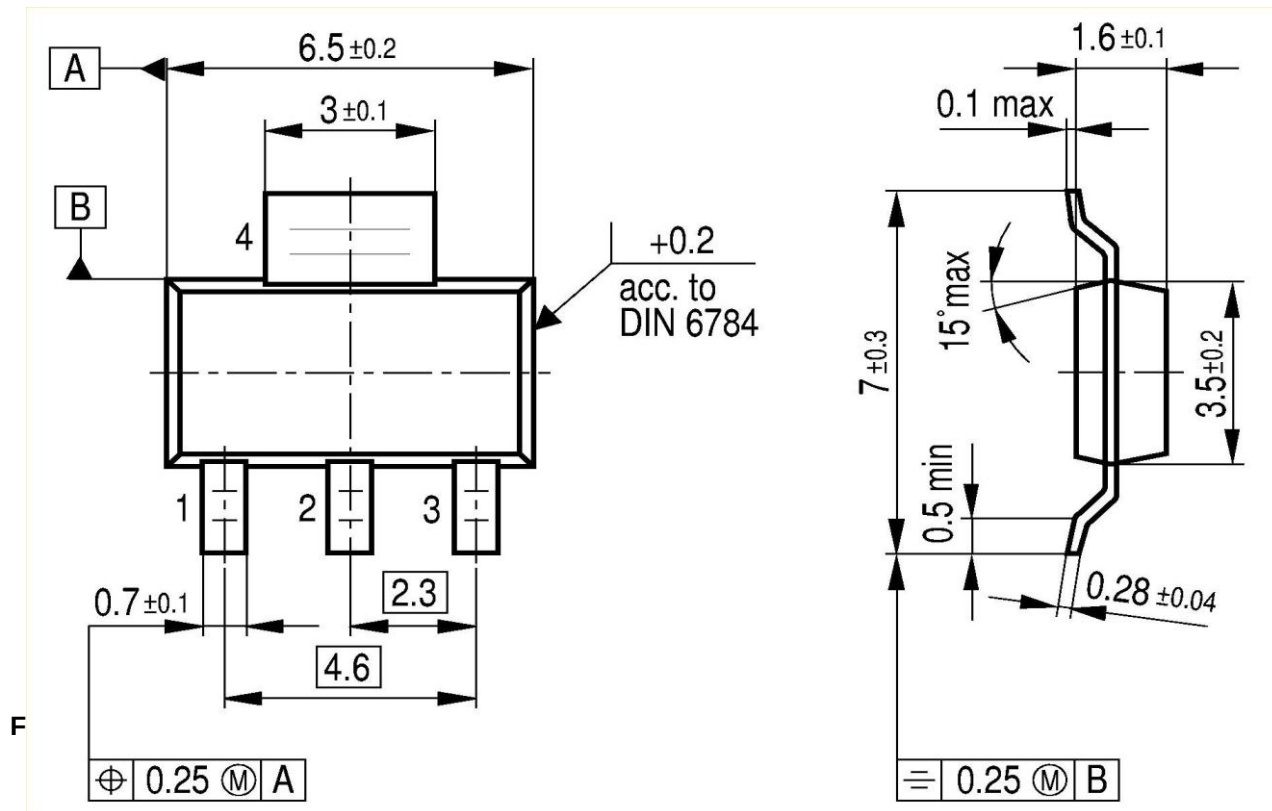
parameter: V_{DD}


16 Gate charge waveforms



SOT223

Package Outline:



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