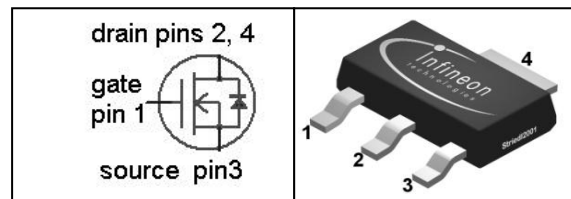


**SIPMOS<sup>®</sup> Small-Signal-Transistor**
**Features**

- N-channel
- Depletion mode
- $dv/dt$  rated
- Available with  $V_{GS(th)}$  indicator on reel
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21

**Product Summary**

$V_{DS}$	600	V
$R_{DS(on),max}$	60	$\Omega$
$I_{DSS,min}$	0.02	A


**PG-SOT223**


Type	Package	Tape and Reel Information	Marking	Packaging
BSP135	PG-SOT223	H6327: 1000 pcs/reel	BSP135	Non dry
BSP135	PG-SOT223	H6906: 1000 pcs/reel sorted in $V_{GS(th)}$ bands <sup>1)</sup>	BSP135	Non dry

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_A=25\text{ °C}$	0.12	A
		$T_A=70\text{ °C}$	0.10	
Pulsed drain current	$I_{D,pulse}$	$T_A=25\text{ °C}$	0.48	
Reverse diode $dv/dt$	$dv/dt$	$I_D=0.12\text{ A}$ , $V_{DS}=20\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{j,max}=150\text{ °C}$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$		$\pm 20$	V
ESD Class (JESD22-A114-HBM)			1A(>250V,<500V)	
Power dissipation	$P_{tot}$	$T_A=25\text{ °C}$	1.8	W
Operating and storage temperature	$T_j$ , $T_{stg}$		-55 ... 150	$^{\circ}\text{C}$
IEC climatic category; DIN IEC 68-1			55/150/56	

<sup>1)</sup> see table on next page and diagram 11

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - soldering point (pin 4)	$R_{thJS}$		-	-	25	K/W
SMD version, device on PCB	$R_{thJA}$	minimal footprint	-	-	115	
		6 cm <sup>2</sup> cooling area <sup>2)</sup>	-	-	70	

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

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=-3\text{ V}, I_D=250\text{ }\mu\text{A}$	600	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=3\text{ V}, I_D=94\text{ }\mu\text{A}$	-2.1	-1.4	-1	
Drain-source cutoff current	$I_{D(off)}$	$V_{DS}=600\text{ V}, V_{GS}=-3\text{ V}, T_j=25\text{ °C}$	-	-	0.1	$\mu\text{A}$
		$V_{DS}=600\text{ V}, V_{GS}=-3\text{ V}, T_j=125\text{ °C}$	-	-	10	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	-	-	100	nA
On-state drain current	$I_{DSS}$	$V_{GS}=0\text{ V}, V_{DS}=10\text{ V}$	20	-	-	mA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=0\text{ V}, I_D=0.01\text{ A}$	-	30	60	$\Omega$
		$V_{GS}=10\text{ V}, I_D=0.12\text{ A}$	-	25	45	
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=0.1\text{ A}$	0.08	0.16	-	S

**Threshold voltage  $V_{GS(th)}$  sorted in bands<sup>3)</sup>**

J	$V_{GS(th)}$	$V_{DS}=3\text{ V}, I_D=94\text{ }\mu\text{A}$	-1.2	-	-1	V
K			-1.35	-	-1.15	
L			-1.5	-	-1.3	
M			-1.65	-	-1.45	
N			-1.8	-	-1.6	

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

<sup>3)</sup> Each reel contains transistors out of one band whose identifying letter is printed on the reel label. A specific band cannot be ordered separately.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=-3\text{ V}$ , $V_{DS}=25\text{ V}$ , $f=1\text{ MHz}$	-	98	146	pF
Output capacitance	$C_{oss}$		-	8.5	13	
Reverse transfer capacitance	$C_{rss}$		-	3.4	5.1	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=300\text{ V}$ , $V_{GS}=-3...5\text{ V}$ , $I_D=0.1\text{ A}$ , $R_G=6\ \Omega$	-	5.4	8.1	ns
Rise time	$t_r$		-	5.6	8.4	
Turn-off delay time	$t_{d(off)}$		-	28	42	
Fall time	$t_f$		-	182	273	

**Gate Charge Characteristics**

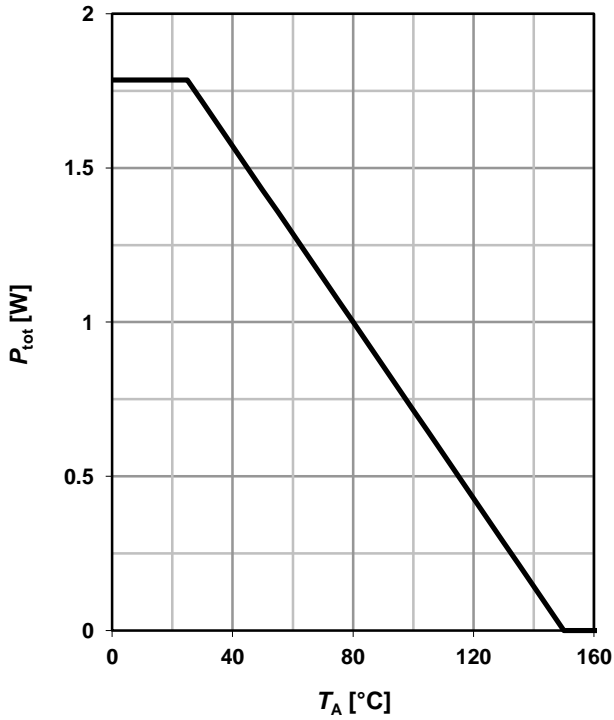
Gate to source charge	$Q_{gs}$	$V_{DD}=400\text{ V}$ , $I_D=0.1\text{ A}$ , $V_{GS}=-3\text{ to }5\text{ V}$	-	0.24	0.36	nC
Gate to drain charge	$Q_{gd}$		-	2.0	3.0	
Gate charge total	$Q_g$		-	3.7	4.9	
Gate plateau voltage	$V_{plateau}$		-	0.20	-	V

**Reverse Diode**

Diode continuous forward current	$I_S$	$T_A=25\text{ }^\circ\text{C}$	-	-	0.12	A
Diode pulse current	$I_{S,pulse}$		-	-	0.48	
Diode forward voltage	$V_{SD}$	$V_{GS}=-3\text{ V}$ , $I_F=0.12\text{ A}$ , $T_j=25\text{ }^\circ\text{C}$	-	0.78	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=300\text{ V}$ , $I_F=0.1\text{ A}$ , $di_F/dt=100\text{ A}/\mu\text{s}$	-	87	130	ns
Reverse recovery charge	$Q_{rr}$		-	70	104	nC

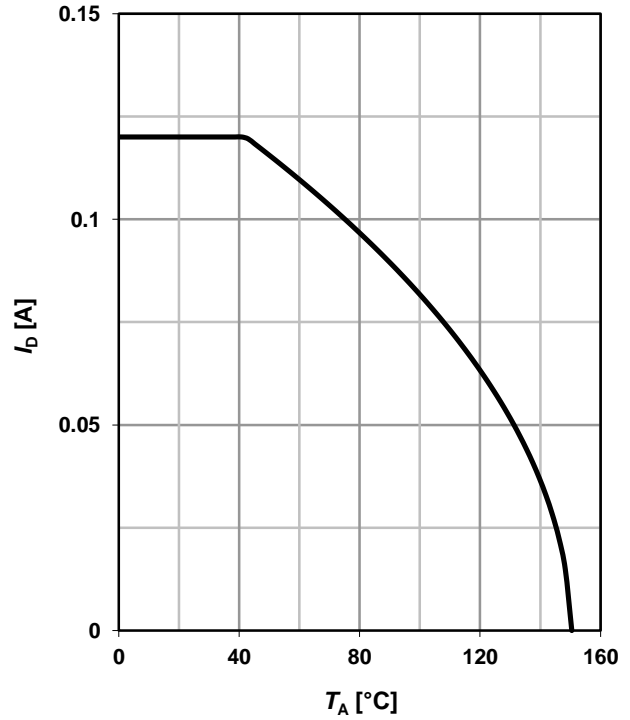
**1 Power dissipation**

$P_{tot}=f(T_A)$



**2 Drain current**

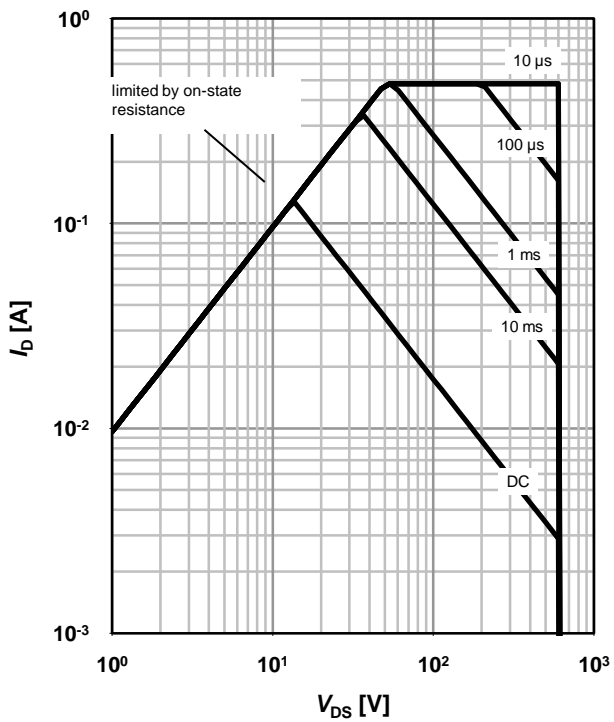
$I_D=f(T_A); V_{GS} \geq 10\text{ V}$



**3 Safe operating area**

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

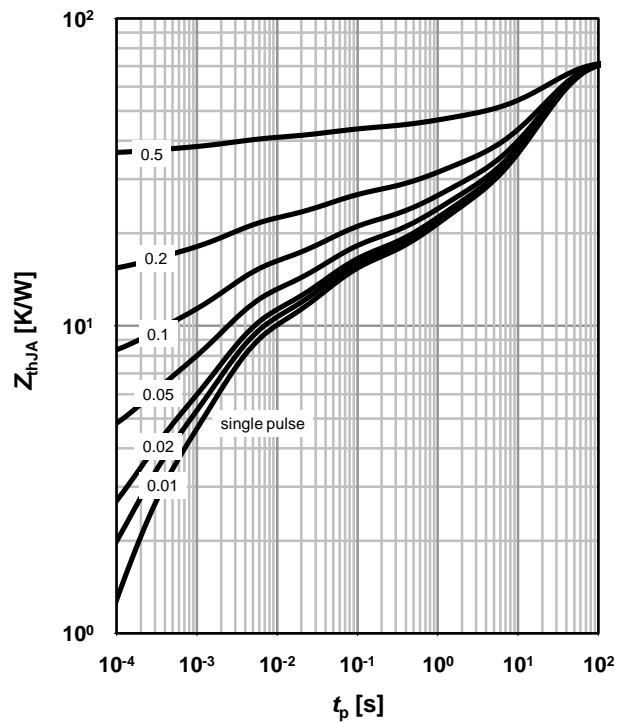
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJA}=f(t_p)$

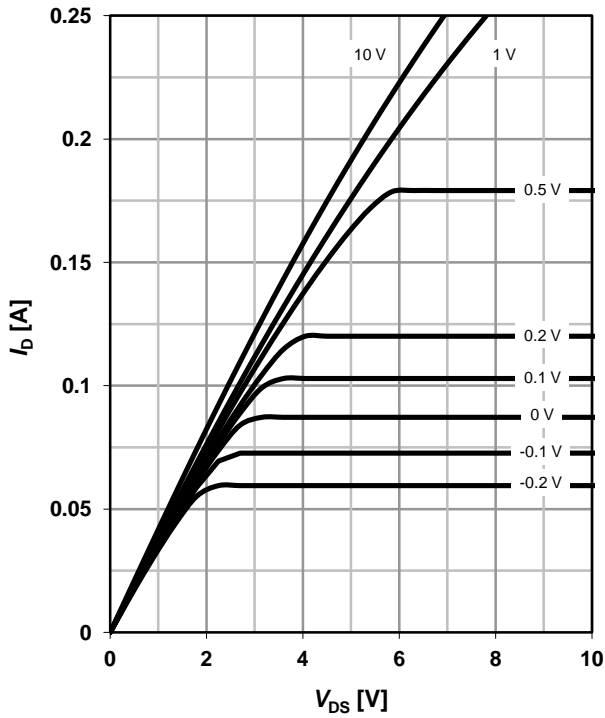
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

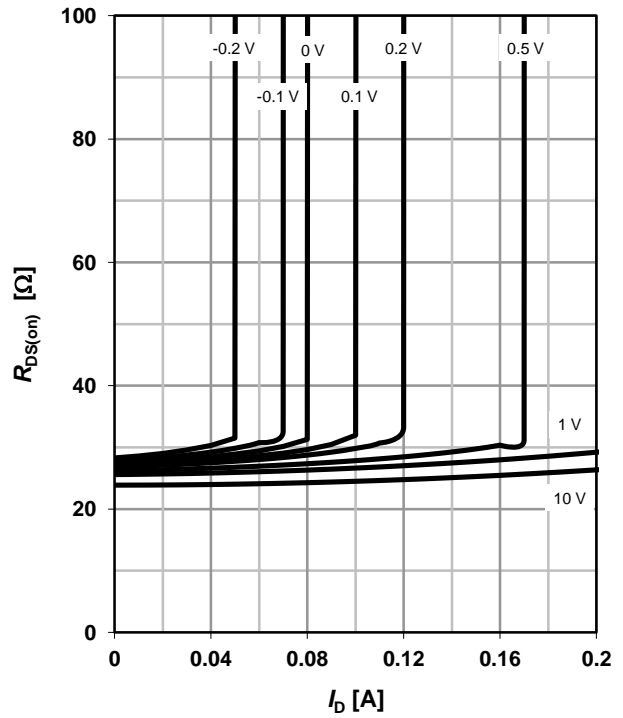
parameter:  $V_{GS}$



**6 Typ. drain-source on resistance**

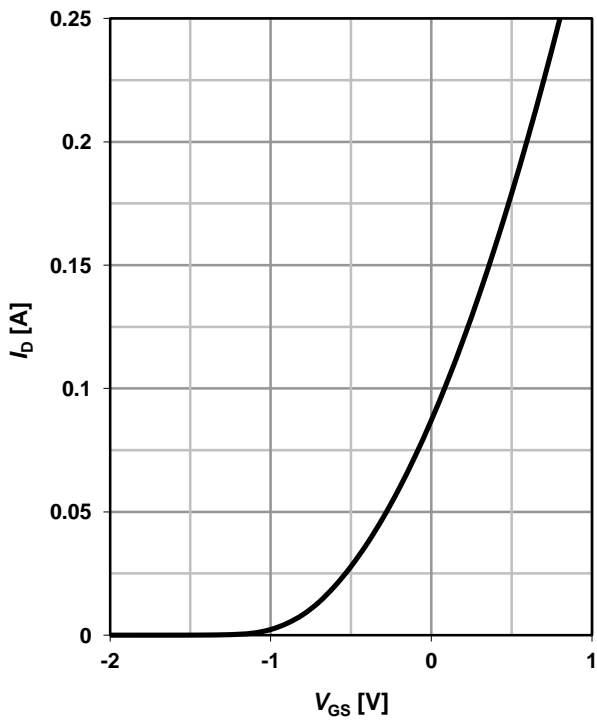
$R_{DS(on)}=f(I_D); T_j=25\text{ }^\circ\text{C}$

parameter:  $V_{GS}$



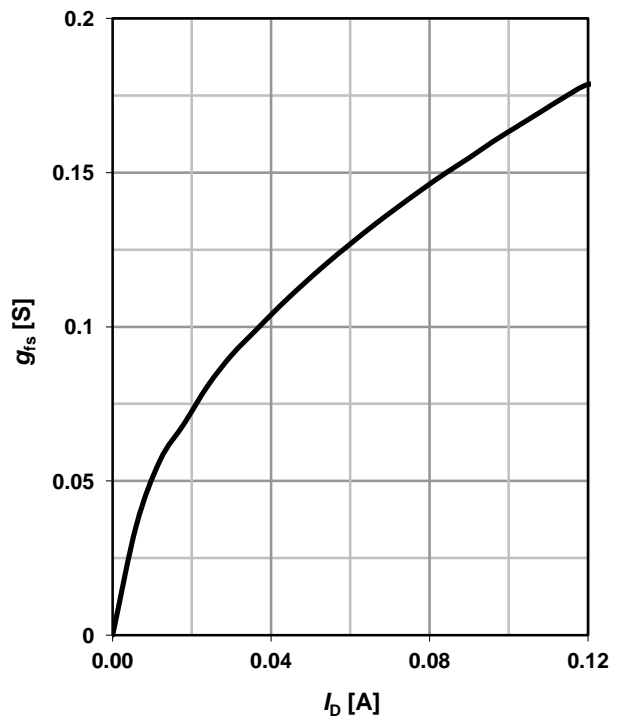
**7 Typ. transfer characteristics**

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



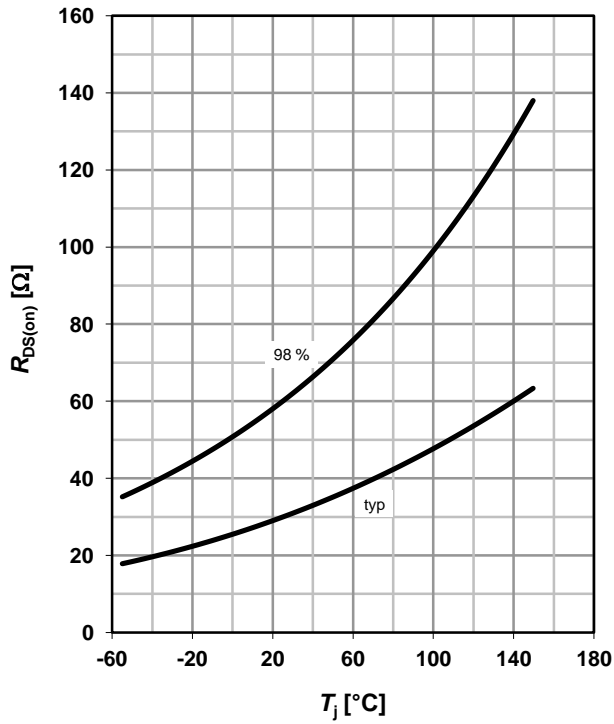
**8 Typ. forward transconductance**

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



**9 Drain-source on-state resistance**

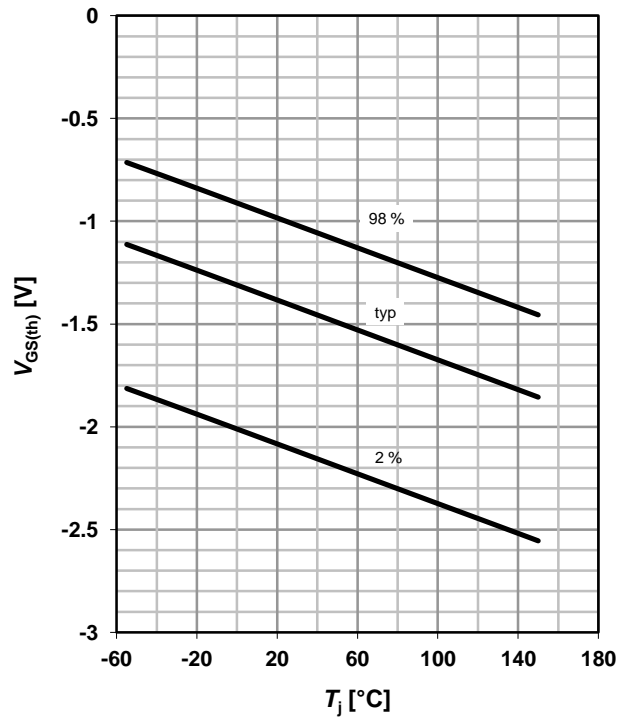
$R_{DS(on)}=f(T_j); I_D=0.01\text{ A}; V_{GS}=0\text{ V}$



**10 Typ. gate threshold voltage**

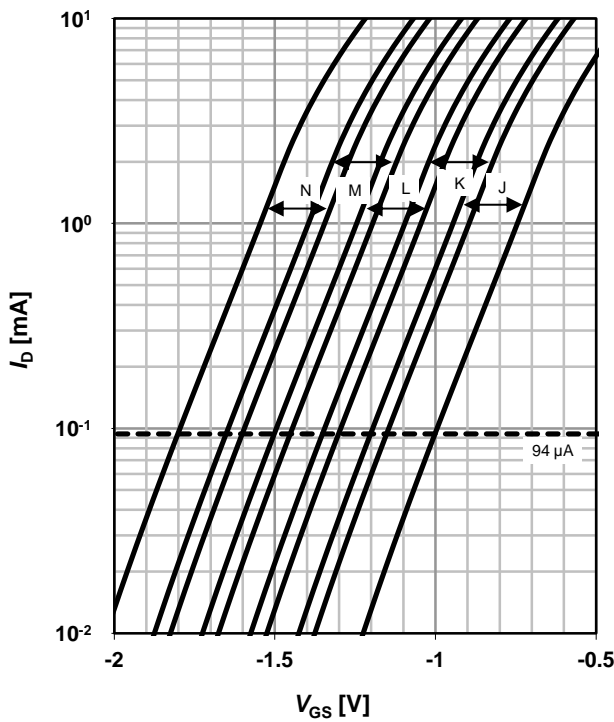
$V_{GS(th)}=f(T_j); V_{DS}=3\text{ V}; I_D=94\text{ }\mu\text{A}$

parameter:  $I_D$



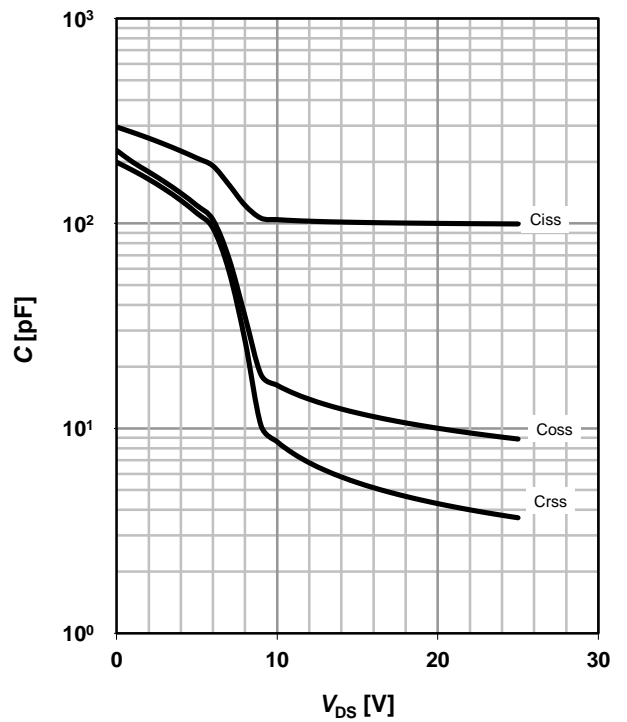
**11 Threshold voltage bands**

$I_D=f(V_{GS}); V_{DS}=3\text{ V}; T_j=25\text{ }^\circ\text{C}$



**12 Typ. capacitances**

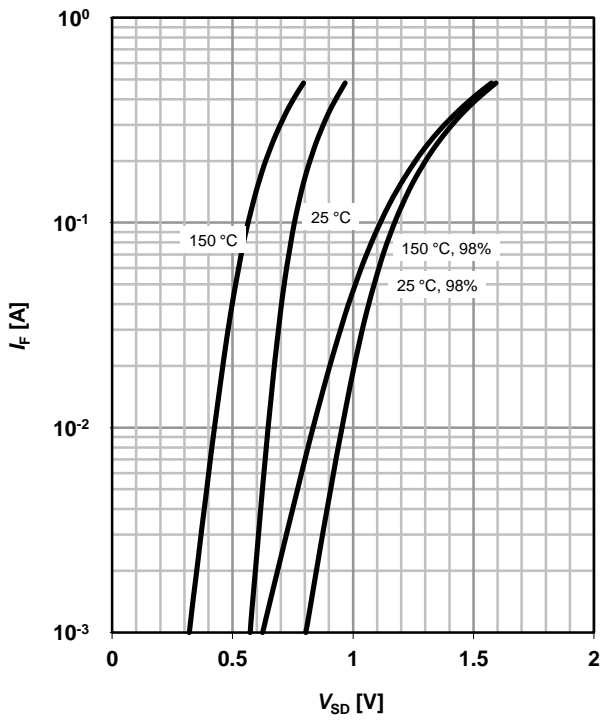
$C=f(V_{DS}); V_{GS}=-3\text{ V}; f=1\text{ MHz}$



**13 Forward characteristics of reverse diode**

$I_F=f(V_{SD})$

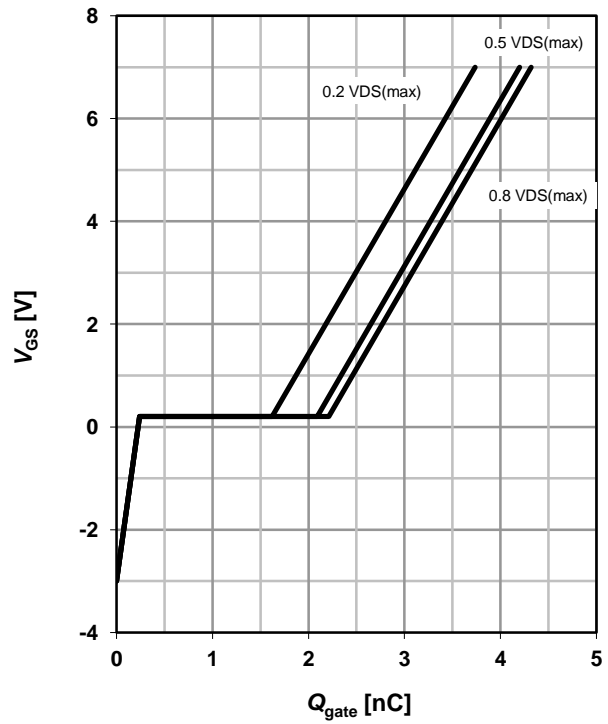
parameter:  $T_j$



**15 Typ. gate charge**

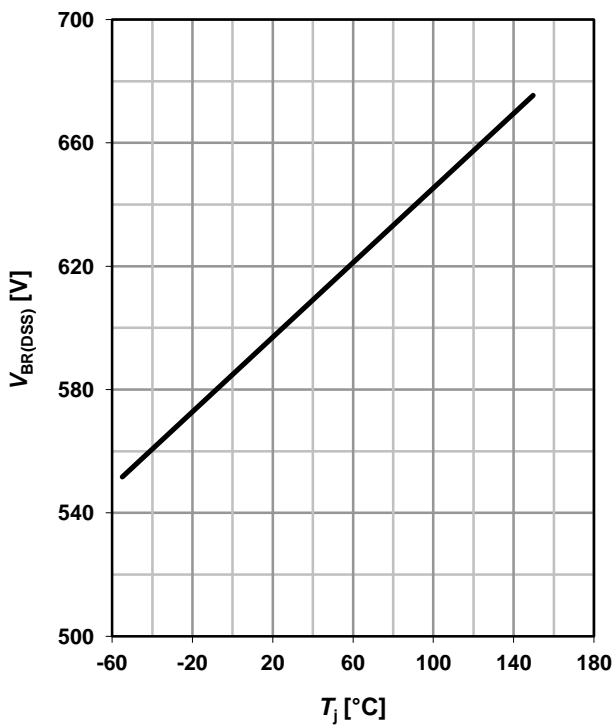
$V_{GS}=f(Q_{gate}); I_D=0.1\text{ A pulsed}$

parameter:  $V_{DD}$

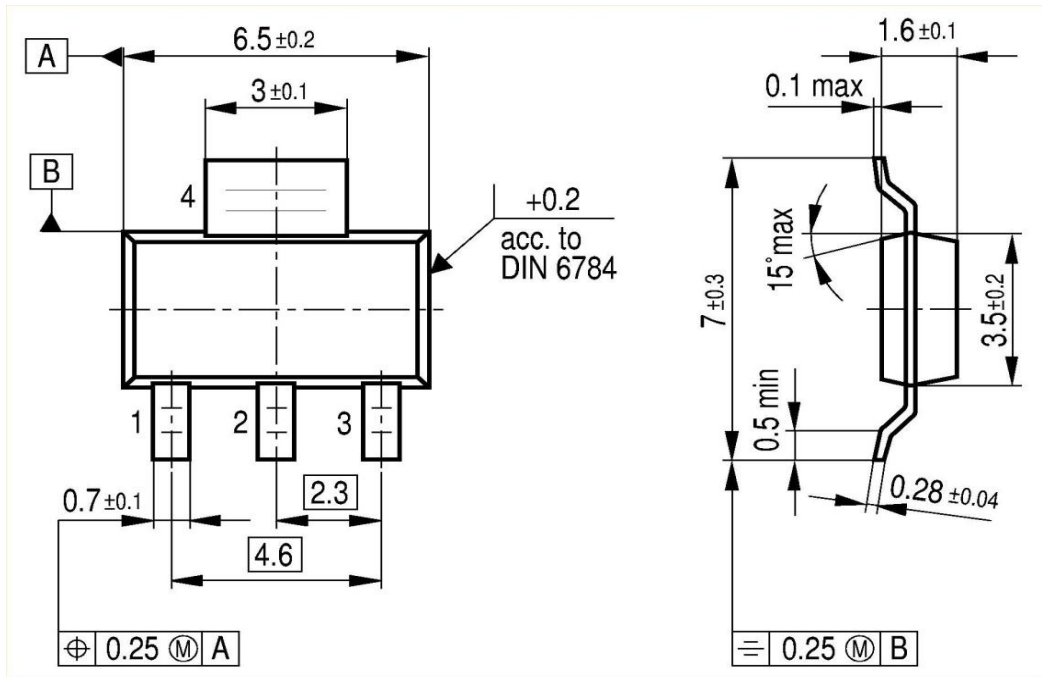


**16 Drain-source breakdown voltage**

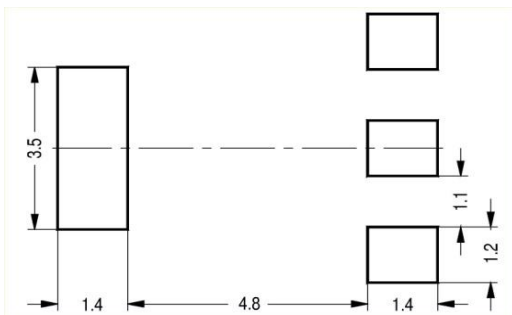
$V_{BR(DSS)}=f(T_j); I_D=250\ \mu\text{A}$



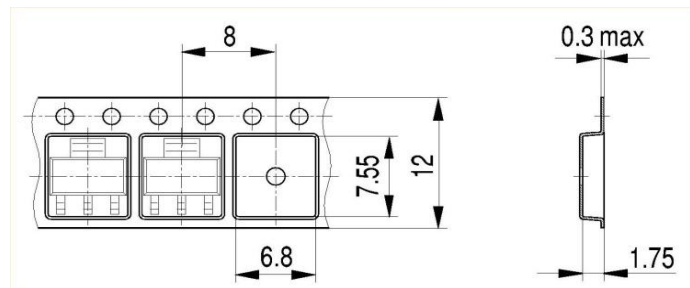
Package Outline:



Footprint:



Packaging:



Dimensions in mm



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