

SIPMOS® Small-Signal-Transistor

Features

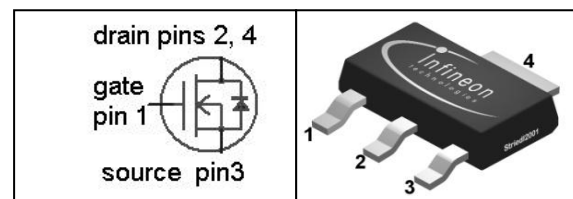
- N-channel
- Depletion mode
- dv/dt rated
- Available with $V_{GS(th)}$ indicator on reel
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21



Product Summary

V_{DS}	600	V
$R_{DS(on),max}$	60	Ω
$I_{DSS,min}$	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 ¹⁾	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/ μs
Gate source voltage	V_{GS}		± 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	°C
IEC climatic category; DIN IEC 68-1			55/150/56	

¹⁾ 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 ² cooling area ²⁾	-	-	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	μA
		$V_{DS}=600\text{ V},$ $V_{GS}=-3\text{ V}, T_j=125\text{ °C}$	-	-	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	Ω
		$V_{GS}=10\text{ V}, I_D=0.12\text{ A}$	-	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 bands³⁾

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	

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (single layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

³⁾ 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	$t_{d(on)}$	$V_{DD} = 300 \text{ V}$, $V_{GS} = -3 \dots -5 \text{ V}$, $I_D = 0.1 \text{ A}$, $R_G = 6 \Omega$	-	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

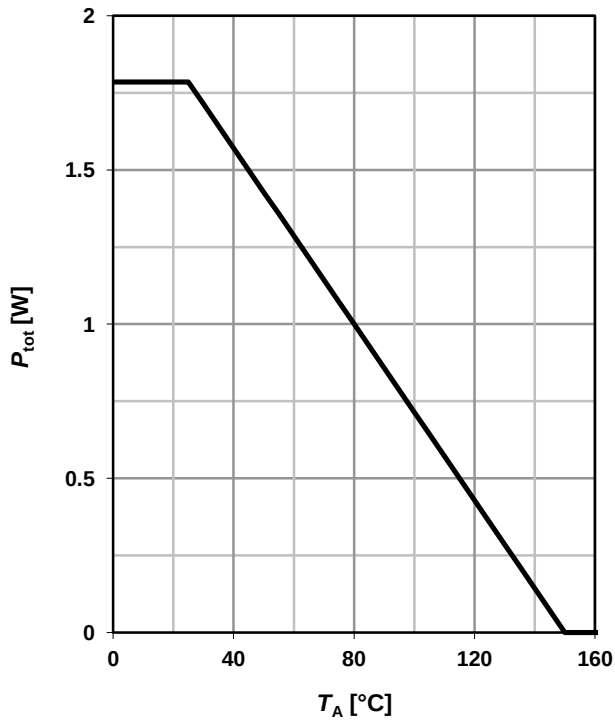
Gate to source charge	Q_{gs}	$V_{DD} = 400 \text{ V}$, $I_D = 0.1 \text{ A}$, $V_{GS} = -3 \text{ to } 5 \text{ V}$	-	0.24	0.36	nC
Gate to drain charge	Q_{gd}		-	2.0	3.0	
Gate charge total	Q_g		-	3.7	4.9	
Gate plateau voltage	$V_{plateau}$		-	0.20	-	V

Reverse Diode

Diode continuous forward current	I_S	$T_A = 25 \text{ °C}$	-	-	0.12	A
Diode pulse current	$I_{S,pulse}$		-	-	0.48	
Diode forward voltage	V_{SD}	$V_{GS} = -3 \text{ V}$, $I_F = 0.12 \text{ A}$, $T_j = 25 \text{ °C}$	-	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

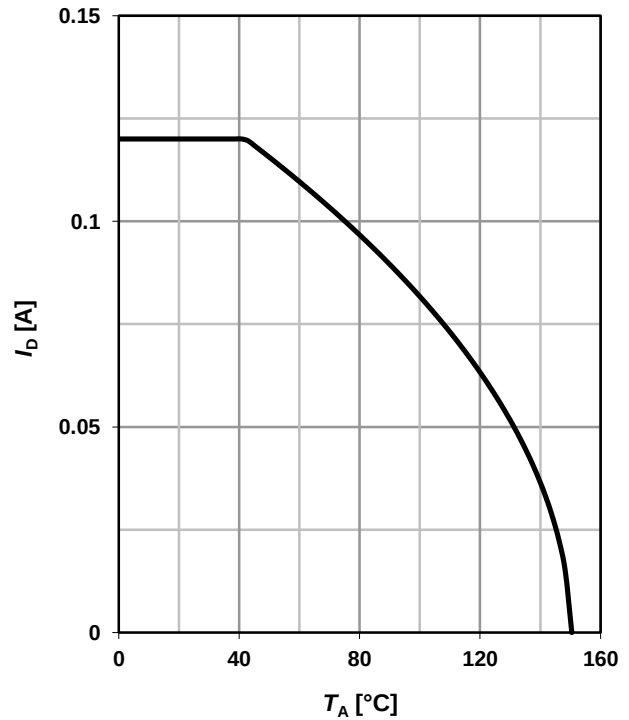
1 Power dissipation

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



2 Drain current

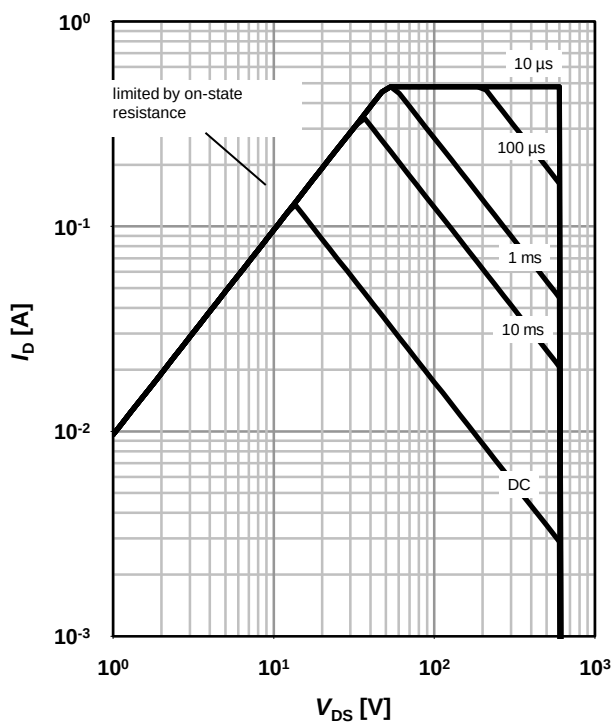
$$I_D = f(T_A); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

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

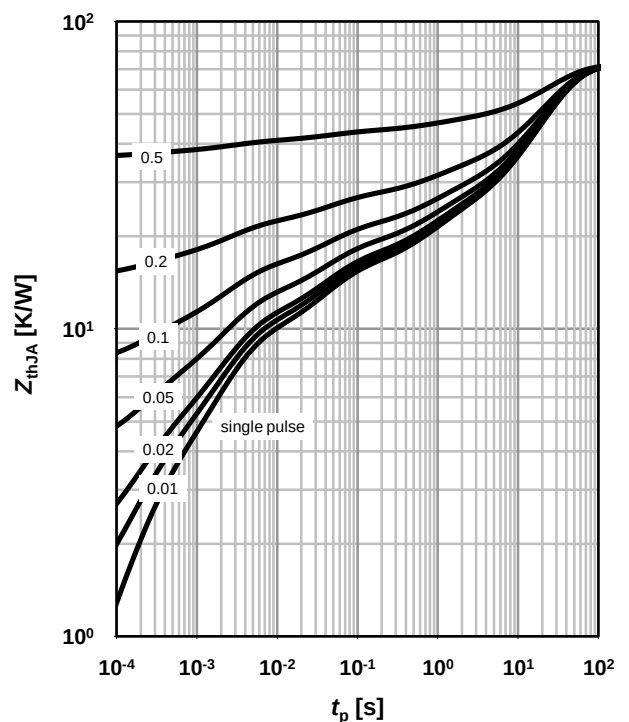
parameter: t_p



4 Max. transient thermal impedance

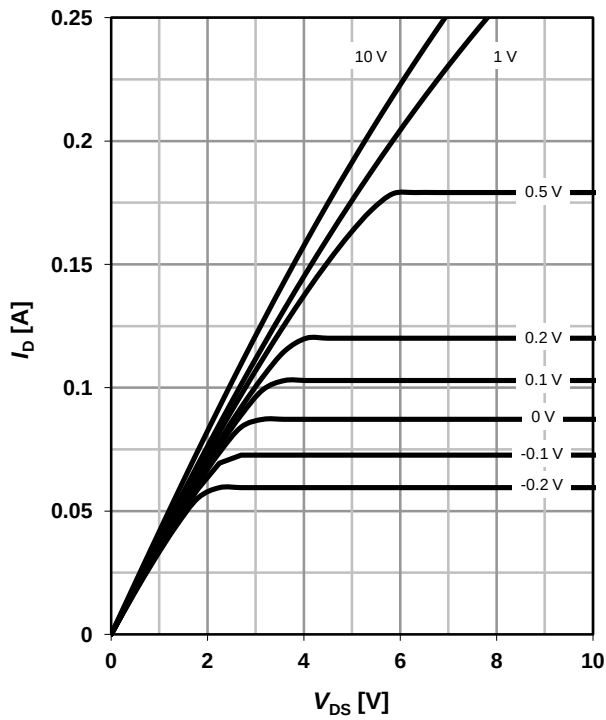
$$Z_{thJA} = f(t_p)$$

parameter: $D = t_p/T$



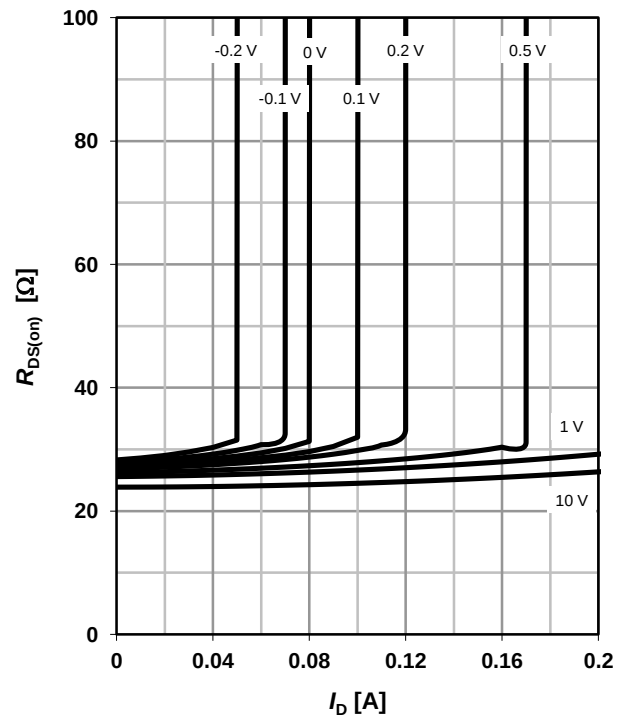
5 Typ. output characteristics

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

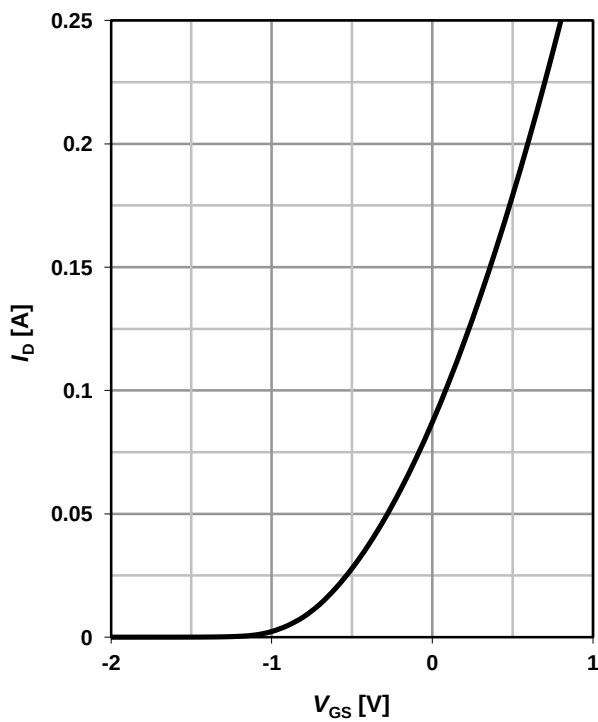
parameter: V_{GS}


6 Typ. drain-source on resistance

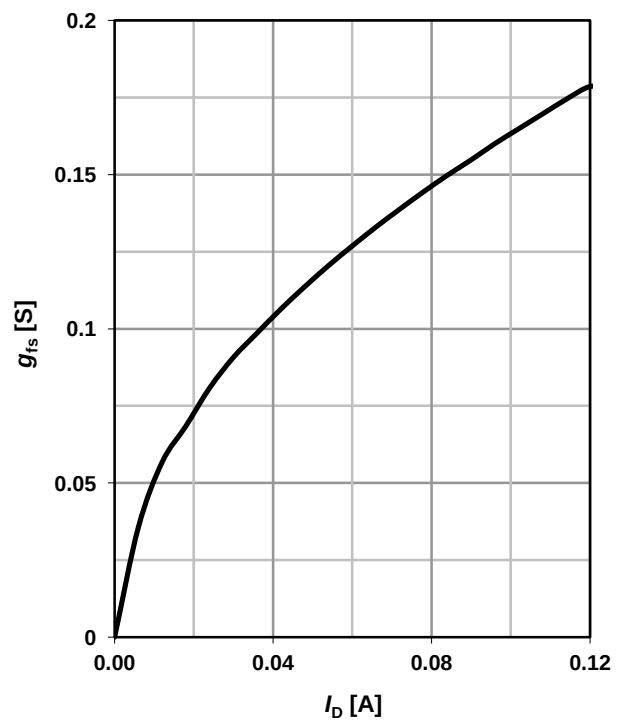
 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$

parameter: V_{GS}


7 Typ. transfer characteristics

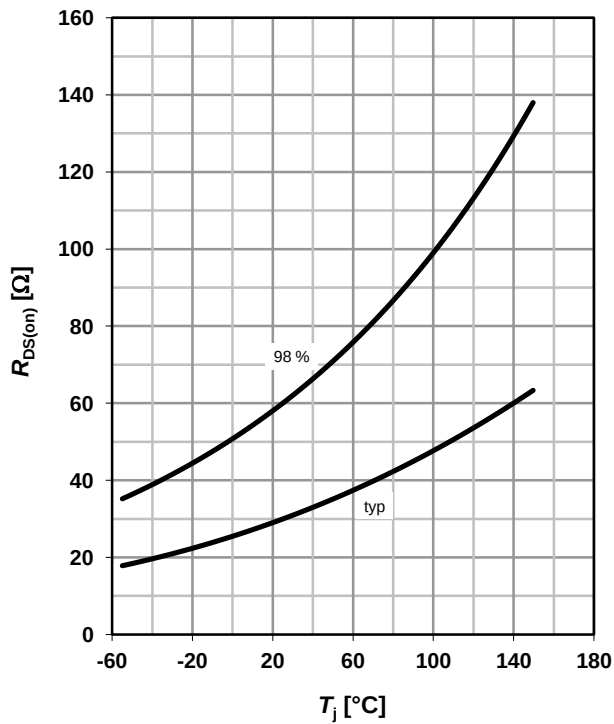
 $I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$


8 Typ. forward transconductance

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


9 Drain-source on-state resistance

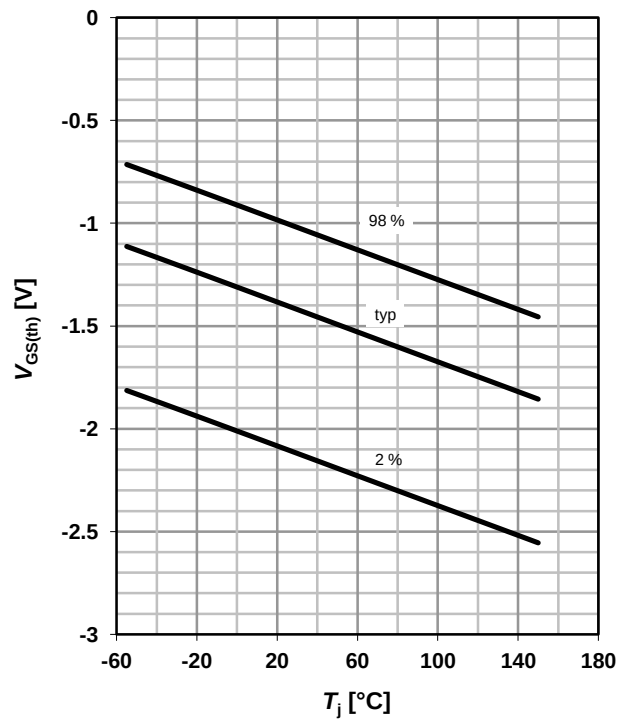
$$R_{DS(on)} = f(T_j); I_D = 0.01 \text{ A}; V_{GS} = 0 \text{ V}$$



10 Typ. gate threshold voltage

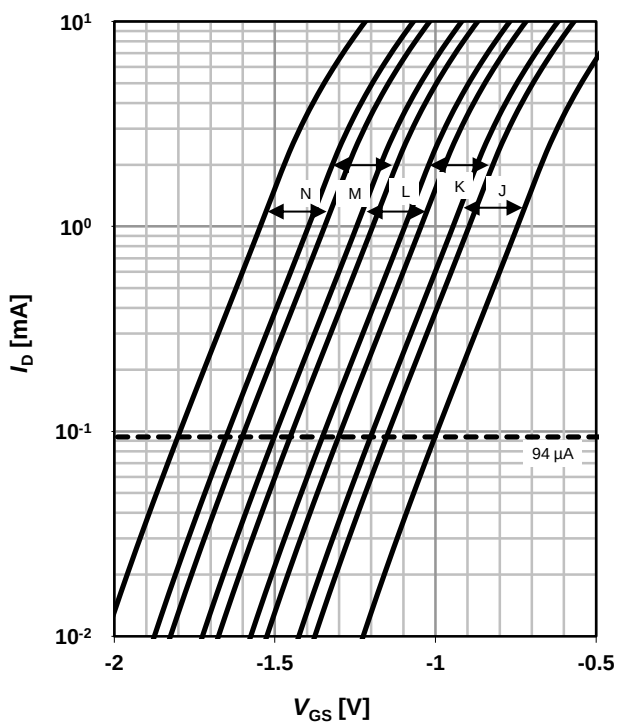
$$V_{GS(th)} = f(T_j); V_{DS} = 3 \text{ V}; I_D = 94 \text{ μA}$$

parameter: I_D



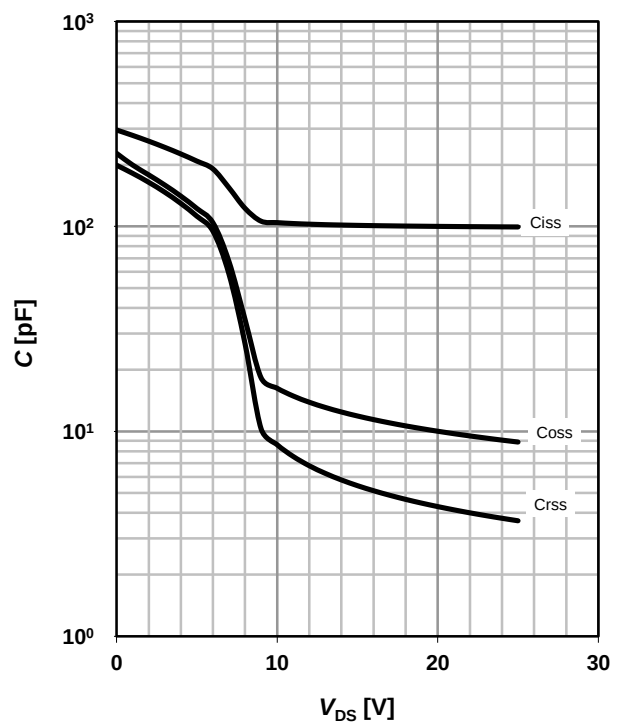
11 Threshold voltage bands

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



12 Typ. capacitances

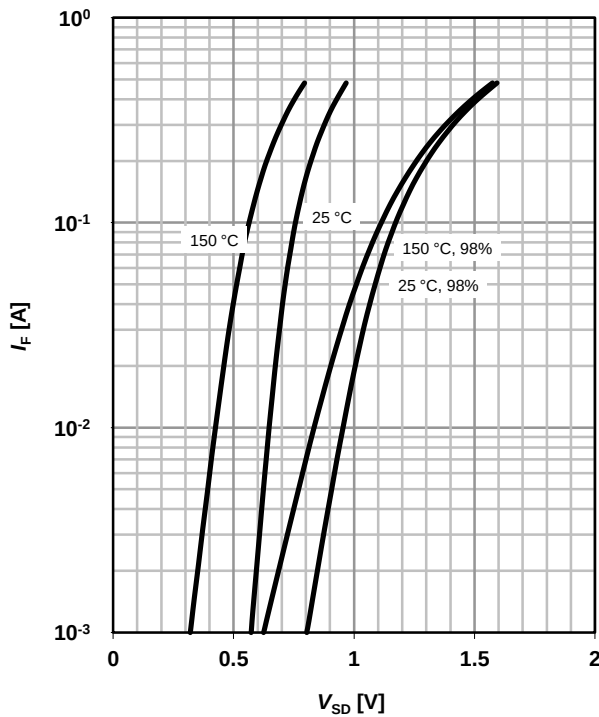
$$C = f(V_{DS}); V_{GS} = -3 \text{ V}; f = 1 \text{ MHz}$$



13 Forward characteristics of reverse diode

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

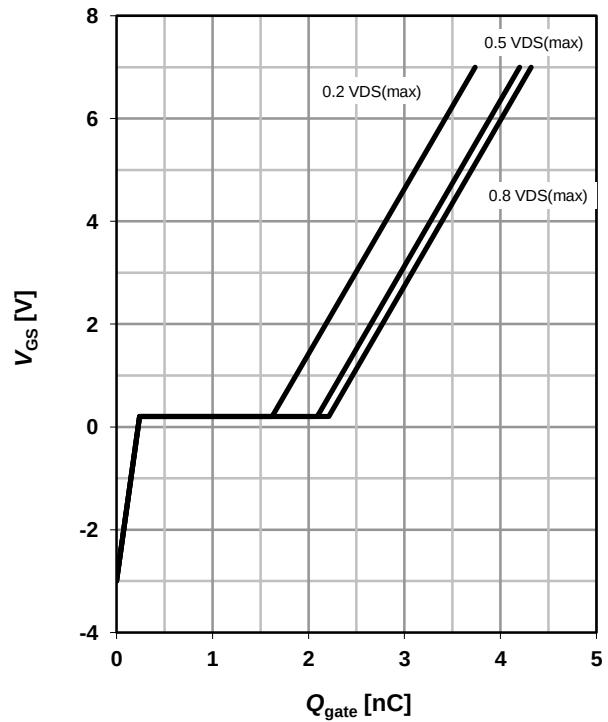
parameter: T_j



15 Typ. gate charge

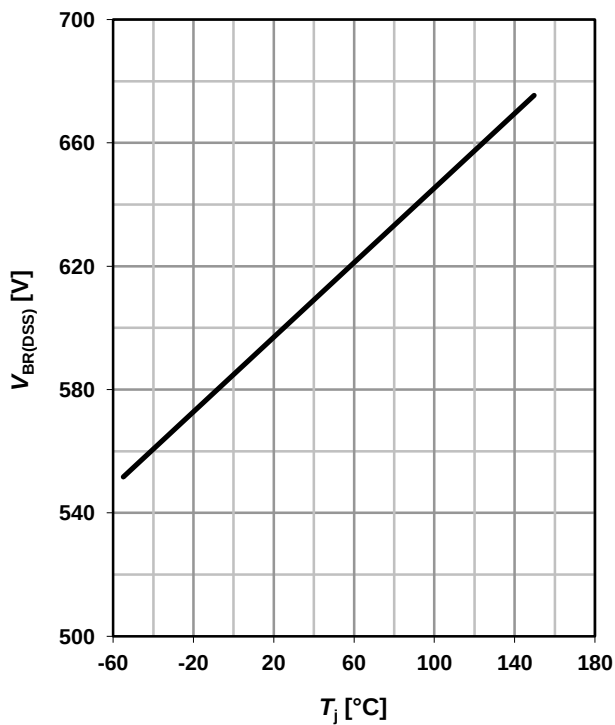
$$V_{GS} = f(Q_{gate}); I_D = 0.1\text{ A pulsed}$$

parameter: V_{DD}

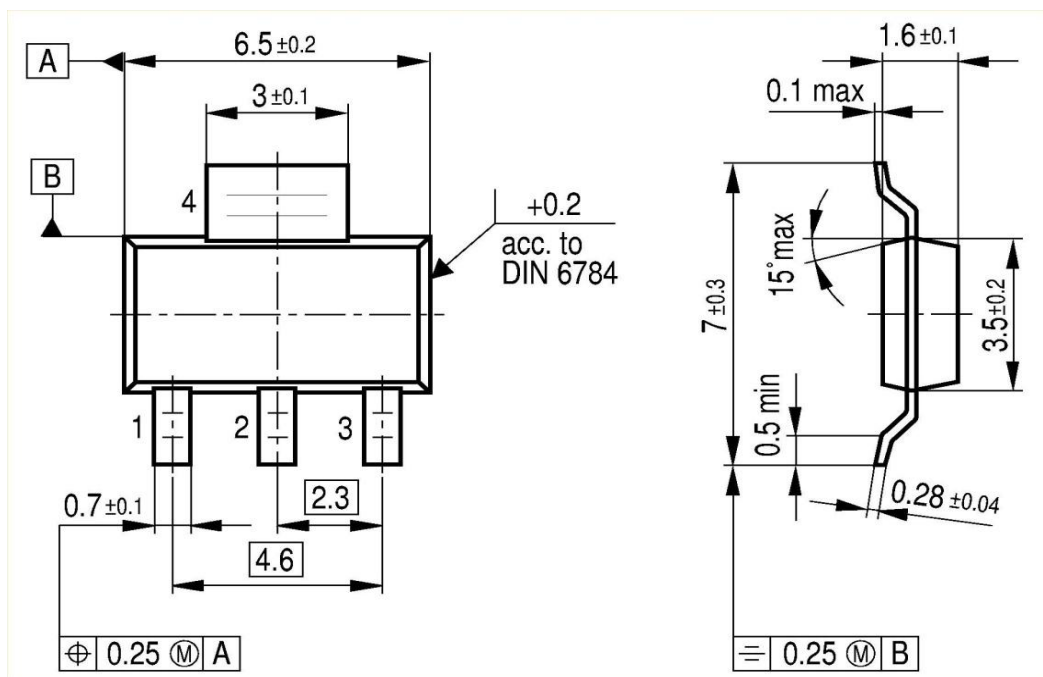


16 Drain-source breakdown voltage

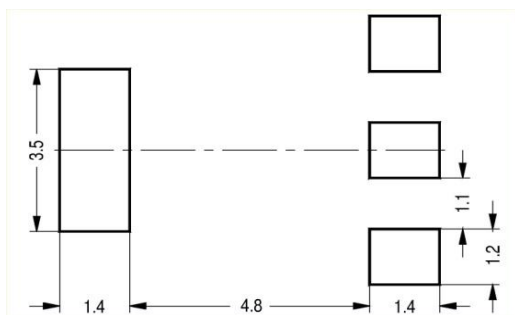
$$V_{BR(DSS)} = f(T_j); I_D = 250\text{ }\mu\text{A}$$



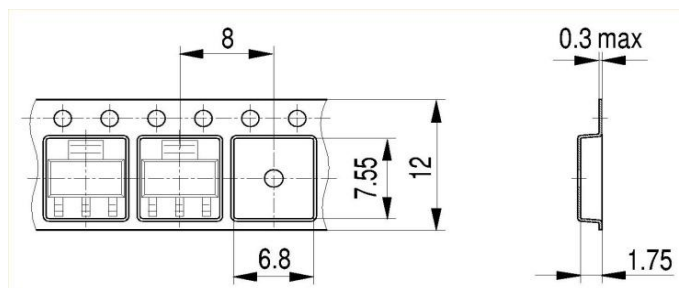
Package Outline:



Footprint:



Packaging:



Dimensions in mm

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