

SIPMOS® Small-Signal-Transistor

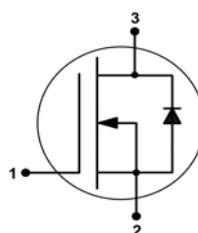
Features

- N-channel
- Depletion mode
- dv/dt rated
- Available with $V_{GS(th)}$ indicator on reel
- Qualified according to AEC Q101
- 100% lead-free; Halogen-free; RoHS compliant

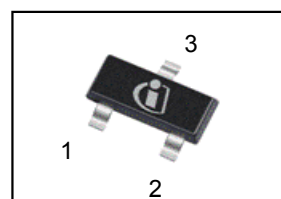


Product Summary

V_{DS}	60	V
$R_{DS(on),max}$	8	Ω
$I_{DSS,min}$	0.13	A



PG-SOT-23



Type	Package	Pb-free	Halogen-free	Tape and Reel Information	Marking
BSS159N	PG-SOT-23	Yes	Yes	H6327: 3000 pcs/reel	SGs
BSS159N	PG-SOT-23	Yes	Yes	H6906: 3000 pcs/reel sorted in $V_{GS(th)}$ bands ¹⁾	SGs

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_A=25\text{ °C}$	0.23	A
		$T_A=70\text{ °C}$	0.18	
Pulsed drain current	$I_{D,pulse}$	$T_A=25\text{ °C}$	0.92	
Reverse diode dv/dt	dv/dt	$I_D=0.23\text{ A}$, $V_{DS}=60\text{ V}$, $di/dt=200\text{ A}/\mu\text{s}$, $T_{j,max}=150\text{ °C}$	6	kV/ μs
Gate source voltage	V_{GS}		± 20	V
ESD Class		JESD22-A114 -HBM	0(<250V)	
Power dissipation	P_{tot}	$T_A=25\text{ °C}$	0.36	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 characteristics	R_{thJA}	minimal footprint	-	-	350	K/W

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

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=-10\text{ V}$, $I_D=250\text{ }\mu\text{A}$	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=3\text{ V}$, $I_D=26\text{ }\mu\text{A}$	-3.5	-2.8	-2.4	
Drain-source cutoff current	$I_{D(off)}$	$V_{DS}=60\text{ V}$, $V_{GS}=-10\text{ V}$, $T_j=25\text{ °C}$	-	-	0.1	μA
		$V_{DS}=60\text{ V}$, $V_{GS}=-10\text{ V}$, $T_j=125\text{ °C}$	-	-	10	
Gate-source leakage current	I_{GSS}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	-	-	10	nA
On-state drain current	I_{DSS}	$V_{GS}=0\text{ V}$, $V_{DS}=10\text{ V}$	130	-	-	mA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=0\text{ V}$, $I_D=0.07\text{ A}$	-	3.9	8	Ω
		$V_{GS}=10\text{ V}$, $I_D=0.16\text{ A}$	-	1.7	3.5	
Transconductance	g_{fs}	$ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=0.16\text{ A}$	0.1	0.19	-	S

Threshold voltage $V_{GS(th)}$ sorted in bands²⁾

J	$V_{GS(th)}$	$V_{DS}=3\text{ V}$, $I_D=26\text{ }\mu\text{A}$	-2.6	-	-2.4	V
K			-2.75	-	-2.55	
L			-2.9	-	-2.7	
M			-3.05	-	-2.85	
N			-3.2	-	-3	

²⁾ 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}	$V_{GS} = -3\text{ V}, V_{DS} = 25\text{ V},$ $f = 1\text{ MHz}$	-	29	39	pF
Output capacitance	C_{oss}		-	7.4	10	
Reverse transfer capacitance	C_{rss}		-	3.1	5	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 25\text{ V},$ $V_{GS} = -3 \dots -7\text{ V},$ $I_D = 0.16\text{ A}, R_G = 6\ \Omega$	-	3.1	4.7	ns
Rise time	t_r		-	2.9	4.4	
Turn-off delay time	$t_{d(off)}$		-	9	13	
Fall time	t_f		-	9	13	

Gate Charge Characteristics

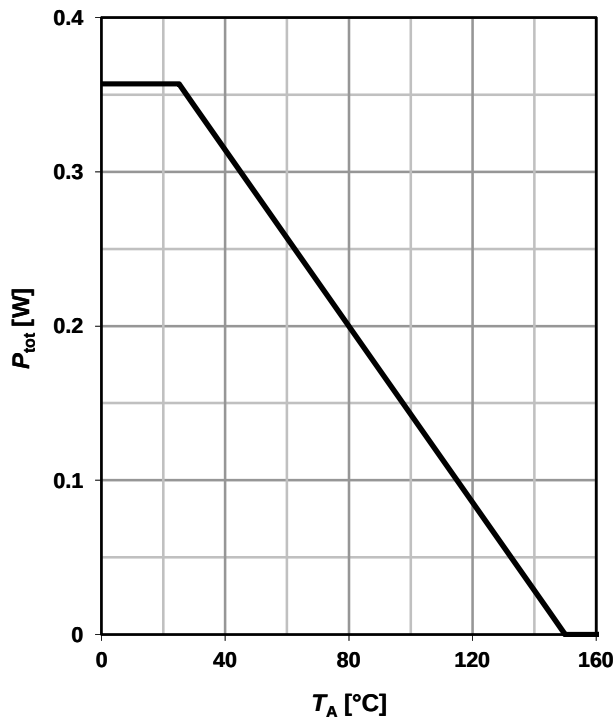
Gate to source charge	Q_{gs}	$V_{DD} = 48\text{ V}, I_D = 0.16\text{ A},$ $V_{GS} = -3\text{ to }5\text{ V}$	-	0.22	-	nC
Gate to drain charge	Q_{gd}		-	0.42	-	
Gate charge total	Q_g		-	1.4	-	
Gate plateau voltage	$V_{plateau}$		-	-0.80	-	V

Reverse Diode

Diode continuous forward current	I_S	$T_A = 25\text{ °C}$	-	-	0.20	A
Diode pulse current	$I_{S,pulse}$		-	-	0.91	
Diode forward voltage	V_{SD}	$V_{GS} = -3\text{ V}, I_F = 0.16\text{ A},$ $T_J = 25\text{ °C}$	-	0.81	1.2	V
Reverse recovery time	t_{rr}	$V_R = 30\text{ V}, I_F = 0.16\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	-	10.4	13	ns
Reverse recovery charge	Q_{rr}		-	3.3	4.1	nC

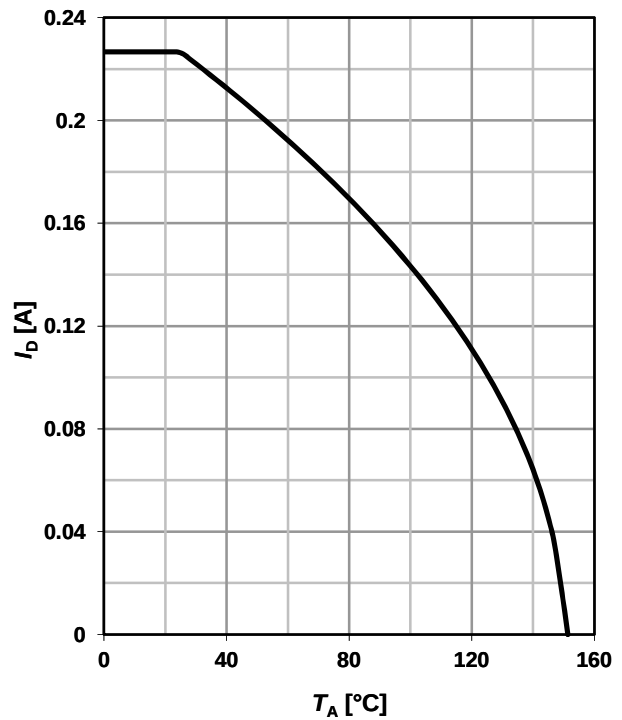
1 Power dissipation

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



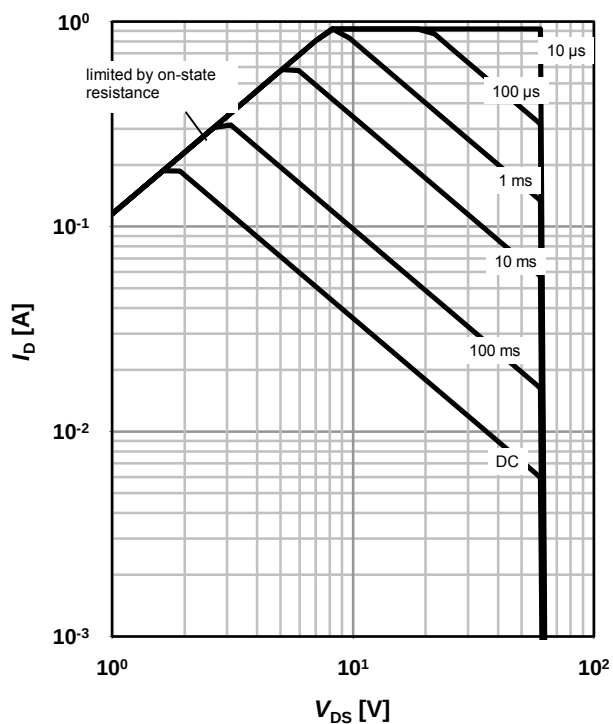
2 Drain current

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



3 Safe operating area

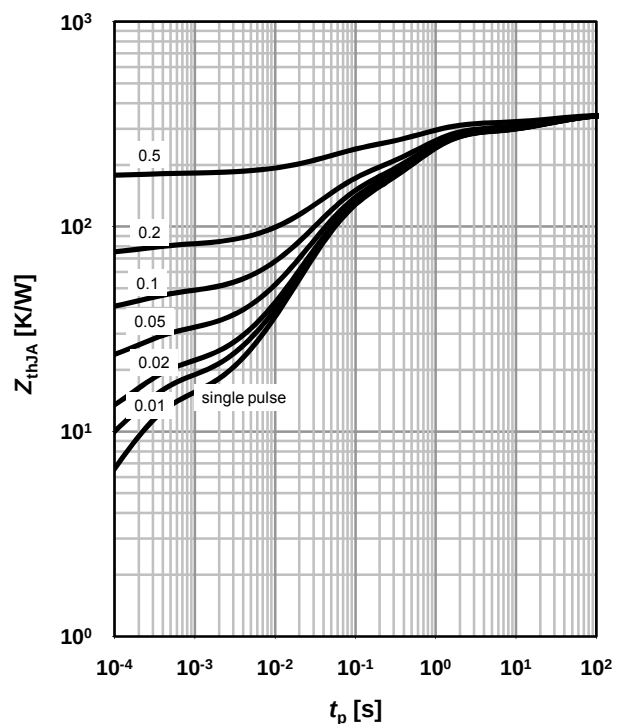
$$I_D = f(V_{DS}); T_A = 25^\circ\text{C}; D = 0$$



4 Max. transient thermal impedance

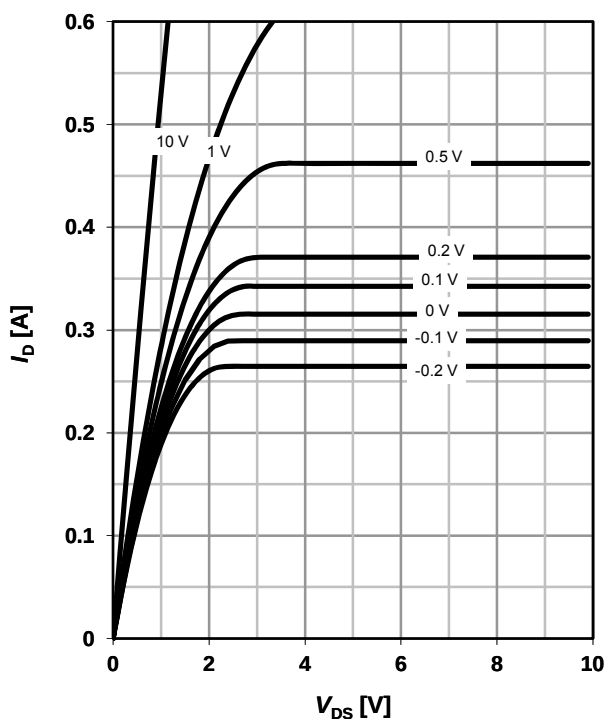
$$Z_{\text{thJA}} = f(t_p)$$

$$\text{parameter: } D = t_p / T$$



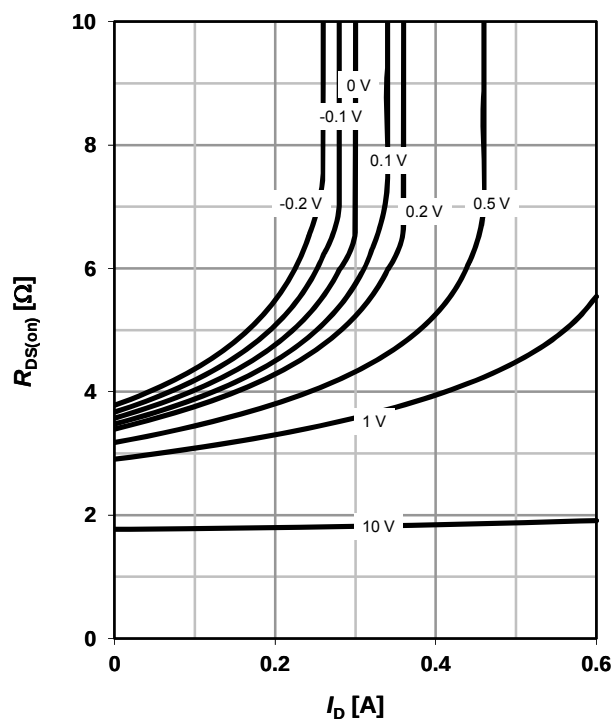
5 Typ. output characteristics

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

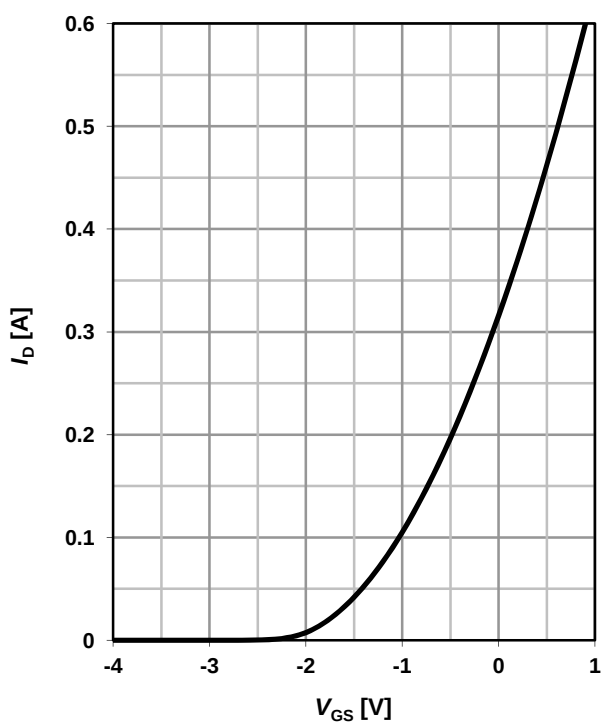
parameter: V_{GS}


6 Typ. drain-source on resistance

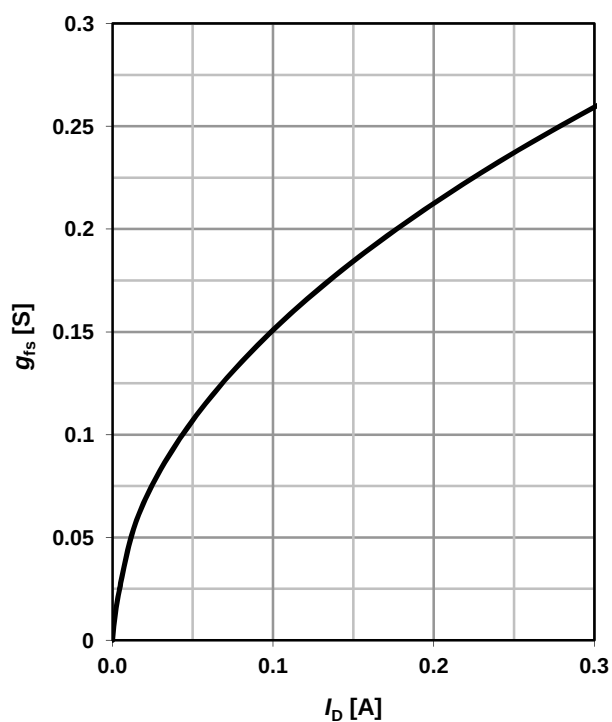
 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$

parameter: V_{GS}


7 Typ. transfer characteristics

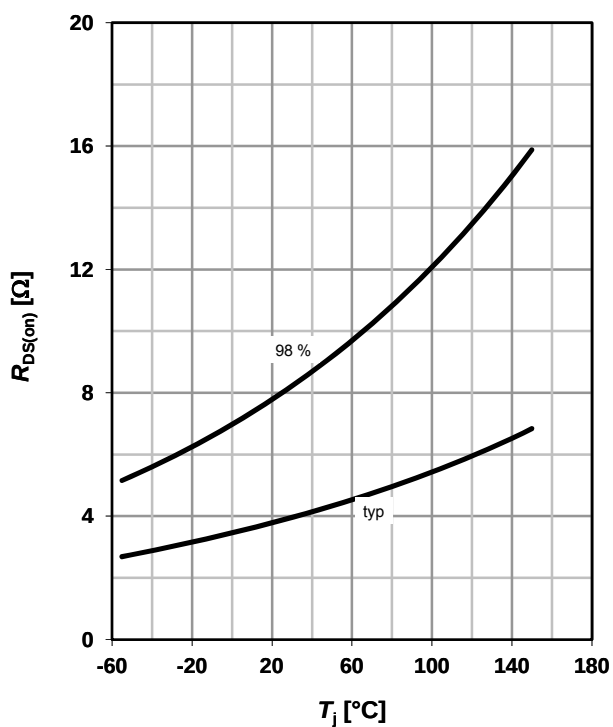
 $I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$


8 Typ. forward transconductance

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


9 Drain-source on-state resistance

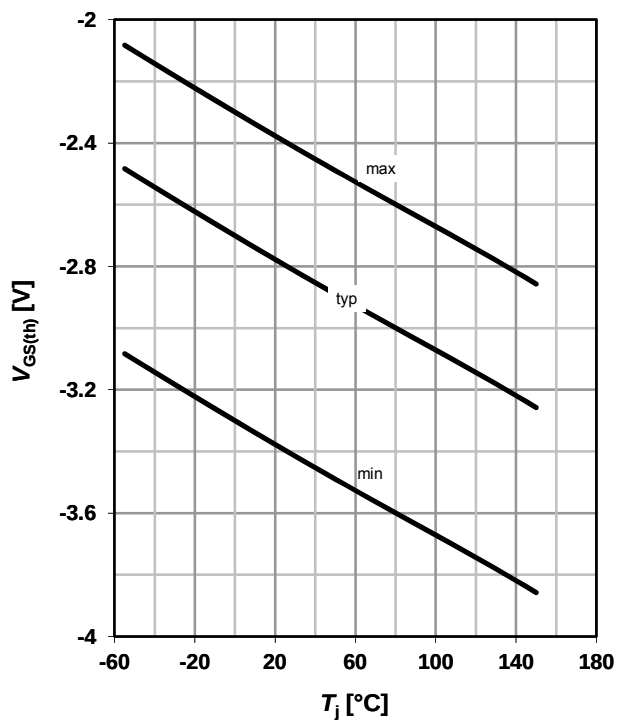
$$R_{DS(on)} = f(T_j); I_D = 0.07 \text{ A}; V_{GS} = 0 \text{ V}$$



10 Typ. gate threshold voltage

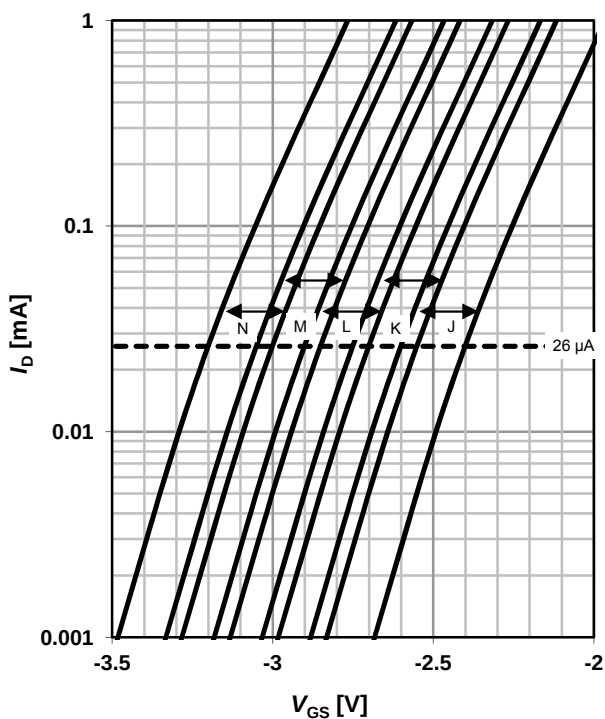
$$V_{GS(th)} = f(T_j); V_{DS} = 3 \text{ V}; I_D = 26 \text{ μA}$$

parameter: I_D



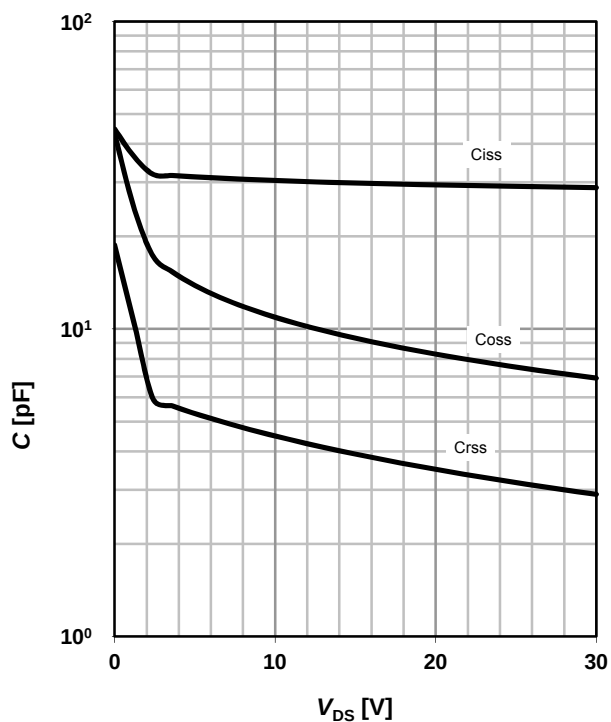
11 Threshold voltage bands

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



12 Typ. capacitances

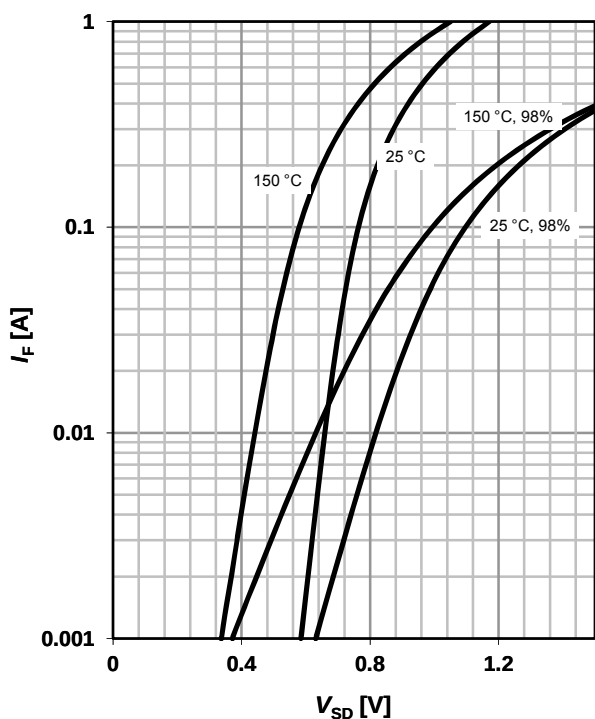
$$C = f(V_{DS}); V_{GS} = -3 \text{ V}; f = 1 \text{ MHz}$$



13 Forward characteristics of reverse diode

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

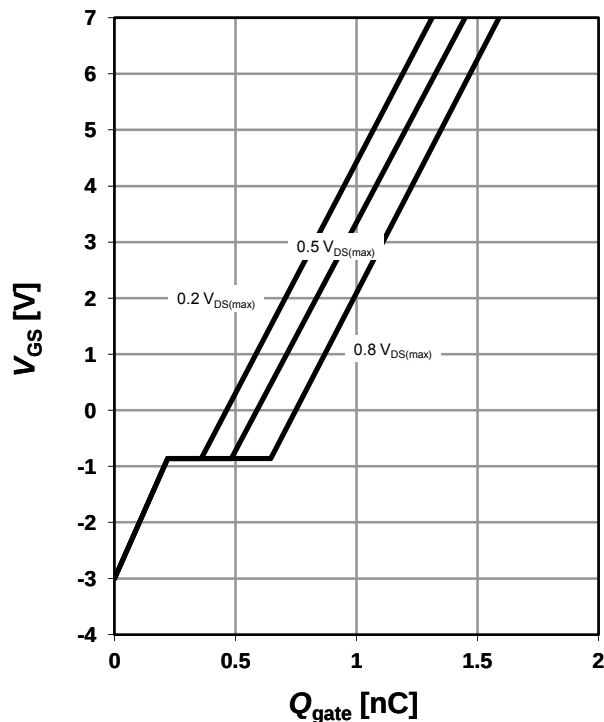
parameter: T_j



14 Typ. gate charge

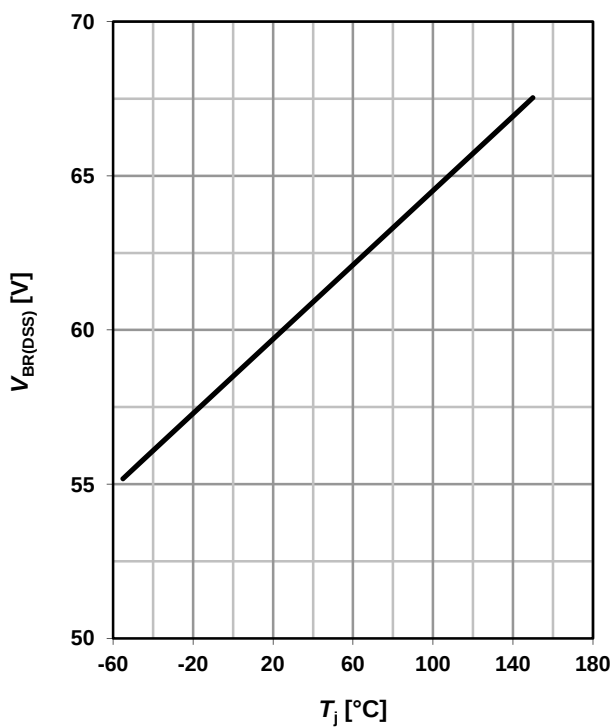
$$V_{GS} = f(Q_{gate}); I_D = 0.16 \text{ A pulsed}$$

parameter: V_{DD}

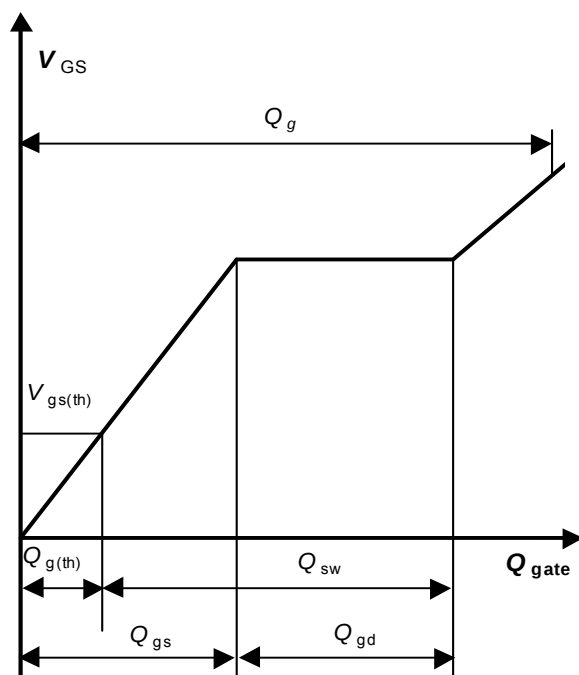


15 Drain-source breakdown voltage

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



16 Gate charge waveforms



Package Outline:



Packaging:



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Infineon Technologies AG
81726 Munich, Germany
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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331