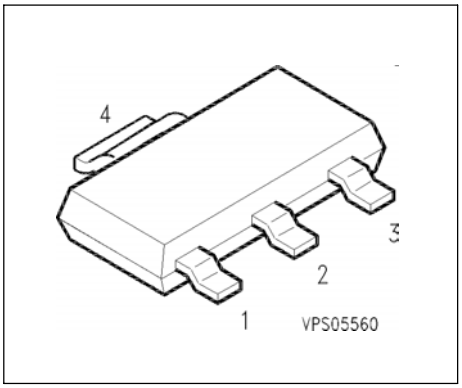
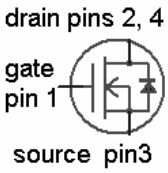
SIPMOS ® Small-Signal Transistor

- N channel
- Enhancement mode
- Avalanche rated
- $V_{GS(th)}$= 2.1 ... 4.0 V
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21





Pin 1	Pin 2	Pin 3	Pin 4
G	D	S	D

Halogen-Free AEC Qualified RoHS

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Marking
BSP 299	500 V	0.4 A	4 Ω	SOT-223	BSP299

Type	Pb-free	Tape and Reel Information	Packaging
BSP 299	Yes	H6327: 1000 pcs / reel	Dry

Maximum Ratings

Parameter	Symbol	Values	Unit
Continuous drain current T_A = 25 °C	I_D	0.4	A
DC drain current, pulsed T_A = 25 °C	I_{Dpuls}	1.6	
Avalanche energy, single pulse I_D = 1.2 A, R_{GS} = 25 Ω T_j = 25 °C	E_{AS}	130	mJ
Gate source voltage	V_{GS}	± 20	V
Power dissipation T_A = 25 °C	P_{tot}	1.8	W
ESD Class JESD22-A114-HBM		Class 1b	

Maximum Ratings

Parameter	Symbol	Values	Unit
Chip or operating temperature	T_j	-55 ... + 150	°C
Storage temperature	T_{stg}	-55 ... + 150	
Thermal resistance, chip to ambient air [1)]	R_{thJA}	≤ 70	K/W
Therminal resistance, junction-soldering point	R_{thJS}	≤ 25	
DIN humidity category, DIN 40 040		E	
IEC climatic category, DIN IEC 68-1		55 / 150 / 56	

1) Transistor on epoxy pcb 40 mm x 40 mm x 1,5 mm with 6 cm^2 copper area for drain connection

Electrical Characteristics, at T_j = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain- source breakdown voltage V_{GS} = 0 V, I_D = 0.25 mA, T_j = 0 °C	$V_{(BR)DSS}$	500	-	-	V
Gate threshold voltage V_{GS}=V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current V_{DS} = 500 V, V_{GS} = 0 V, T_j = 25 °C V_{DS} = 500 V, V_{GS} = 0 V, T_j = 125 °C	I_{DSS}	- -	0.1 10	1 100	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0 V	I_{GSS}	-	10	100	nA
Drain-Source on-state resistance V_{GS} = 10 V, I_D = 0.4 A	$R_{DS(on)}$	-	3.1	4	Ω

Electrical Characteristics, at T_j = 25°C, unless otherwise specified

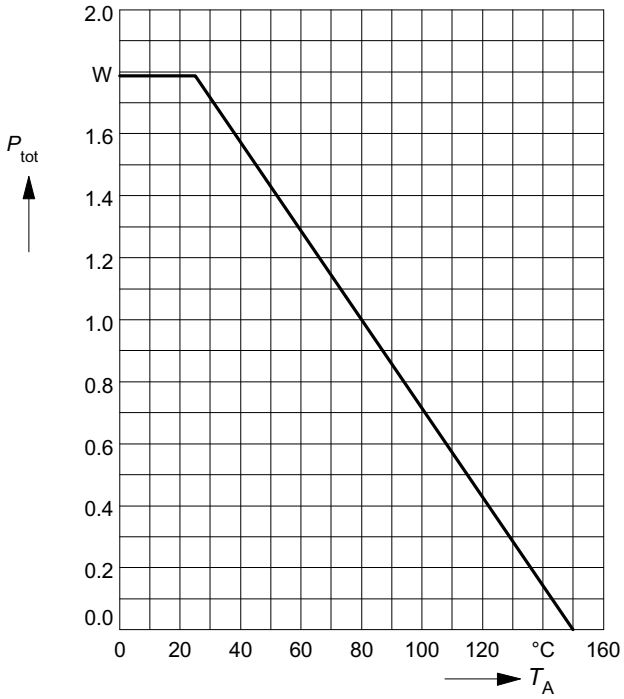
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS} \geq 2 * I_D * R_{DS(on)max}$, I_D = 0.4 A	g_{fs}	0.3	1.2	-	S
Input capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{iss}	-	300	400	pF
Output capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{oss}	-	40	60	
Reverse transfer capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{rss}	-	15	25	
Turn-on delay time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 0.3 A R_{GS} = 50 Ω	$t_{d(on)}$	-	8	12	ns
Rise time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 0.3 A R_{GS} = 50 Ω	t_r	-	15	22	
Turn-off delay time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 0.3 A R_{GS} = 50 Ω	$t_{d(off)}$	-	55	70	
Fall time V_{DD} = 30 V, V_{GS} = 10 V, I_D = 0.3 A R_{GS} = 50 Ω	t_f	-	30	40	

Electrical Characteristics, at T_j = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current T_A = 25 °C	I_S	-	-	0.4	A
Inverse diode direct current,pulsed T_A = 25 °C	I_{SM}	-	-	1.6	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 0.8 A, T_j = 25 °C	V_{SD}	-	0.9	1.2	V
Reverse recovery time V_R = 100 V, I_F=I_S, di_F/dt = 100 A/µs	t_{rr}	-	300	-	ns
Reverse recovery charge V_R = 100 V, I_F=I_S, di_F/dt = 100 A/µs	Q_{rr}	-	2.5	-	µC

Power dissipation

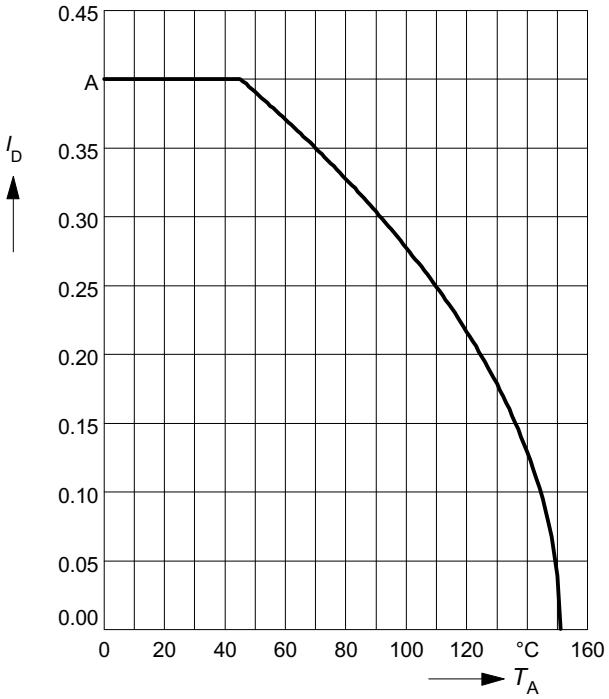
$P_{tot} = f(T_A)$



Drain current

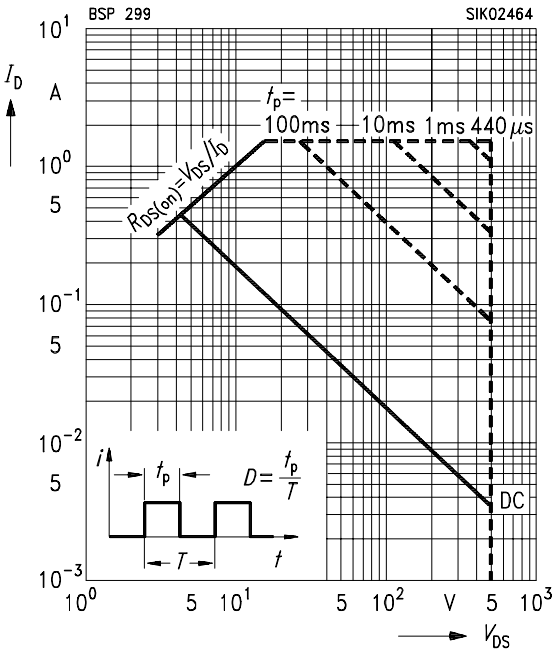
$I_D = f(T_A)$

parameter: $V_{GS} \geq 10$ V



Safe operating area I_D=f(V_{DS})

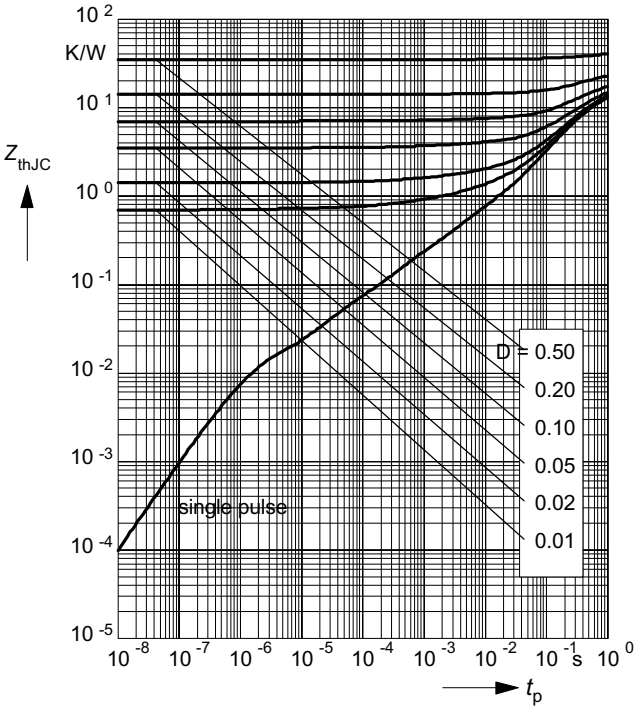
parameter : D = 0, T_C=25°C



Transient thermal impedance

$Z_{th\ JA} = f(t_p)$

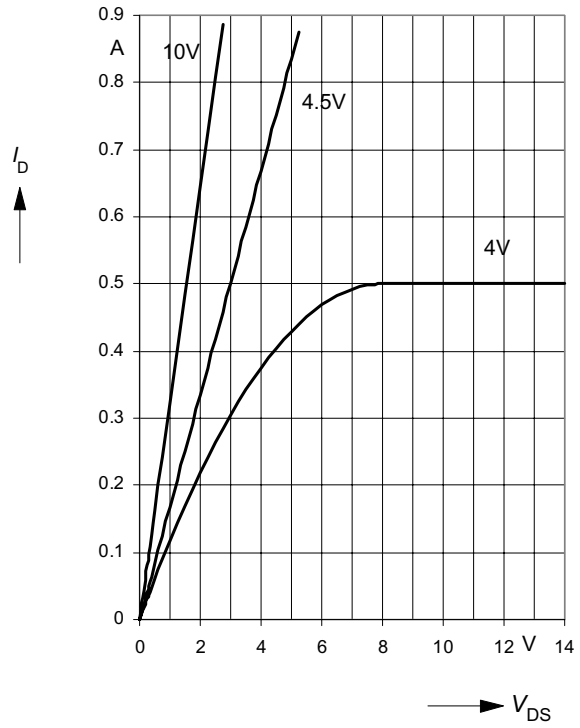
parameter: $D = t_p / T$



Typ. output characteristics

$I_D = f(V_{DS})$

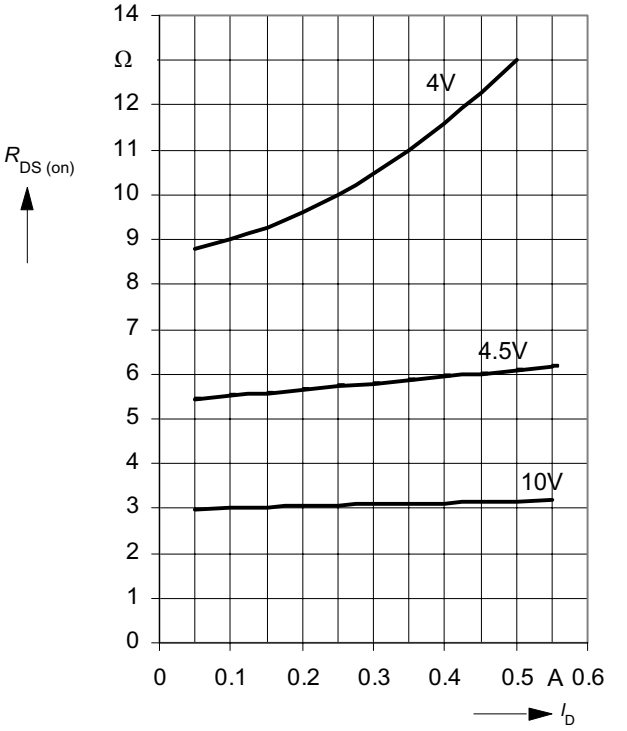
parameter: V_{GS} , T_j = 25 °C



Typ. drain-source on-resistance

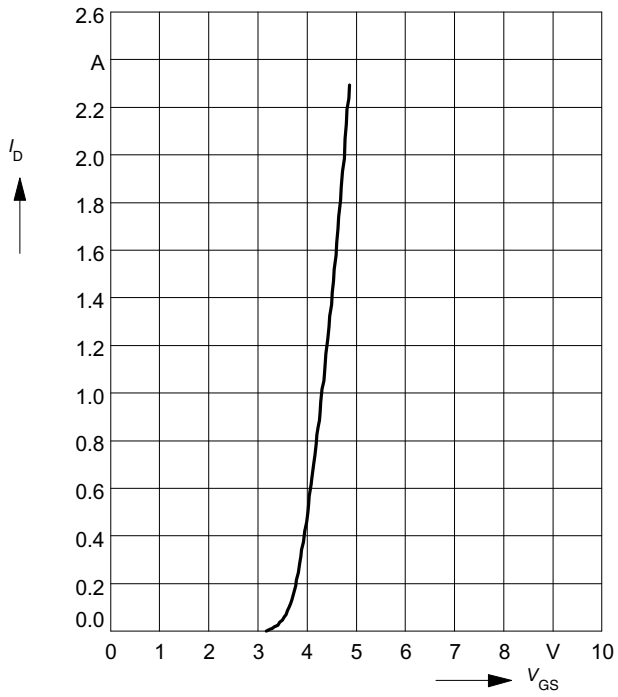
$R_{DS\ (on)} = f(I_D)$

parameter: V_{GS}, T_j = 25 °C



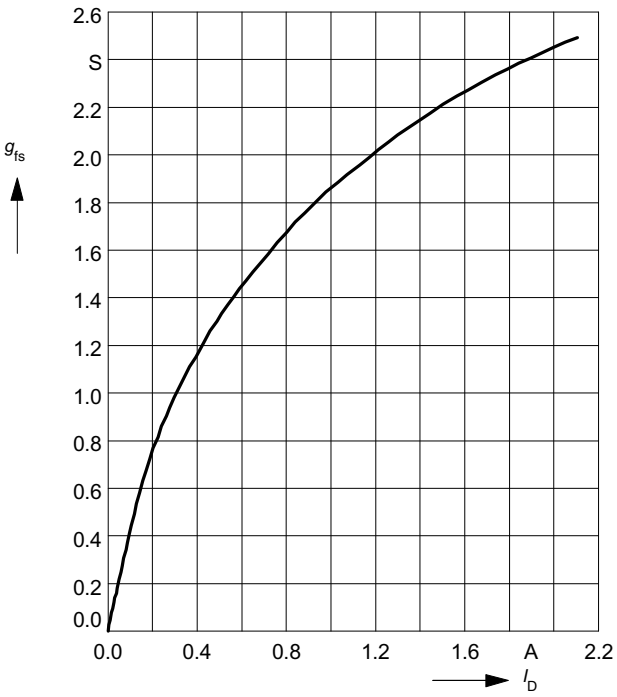
Typ. transfer characteristics $I_D = f(V_{GS})$

parameter: t_p = 80 µs



Typ. forward transconductance $g_{fs} = f(I_D)$

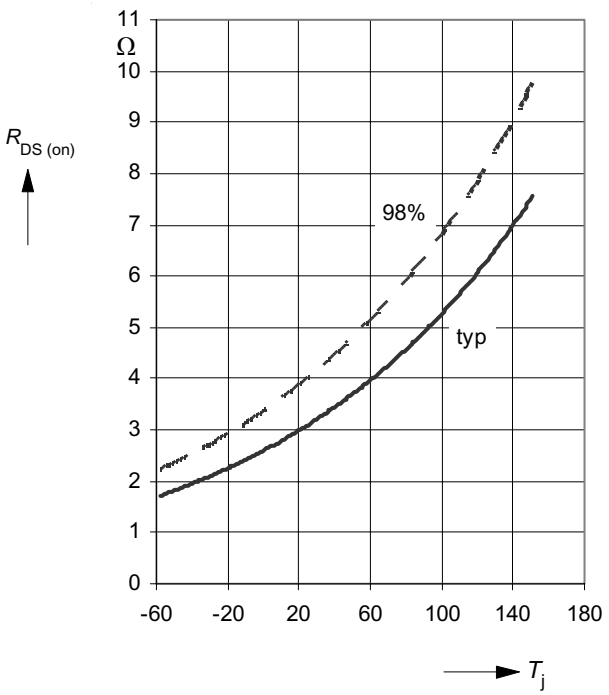
parameter: t_p = 80 µs,



Drain-source on-resistance

$R_{DS\ (on)} = f(T_j)$

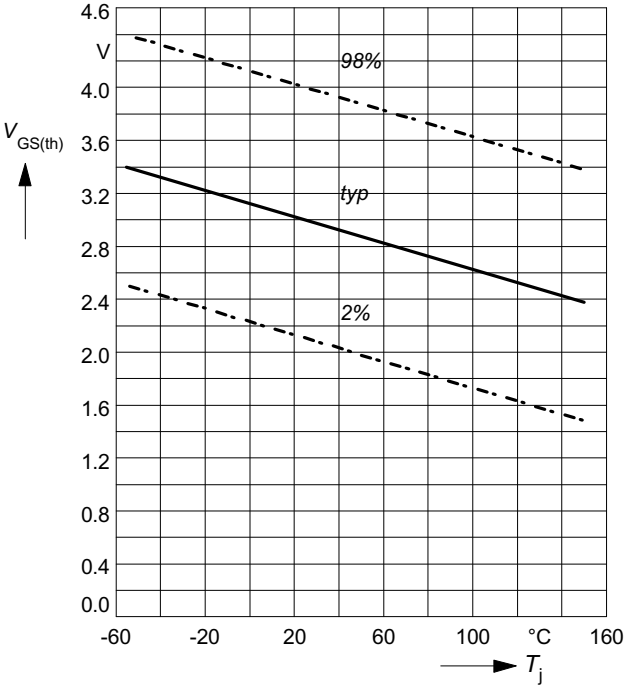
parameter: I_D = 0.4 A, V_{GS} = 10 V



Gate threshold voltage

$V_{GS\ (th)} = f(T_j)$

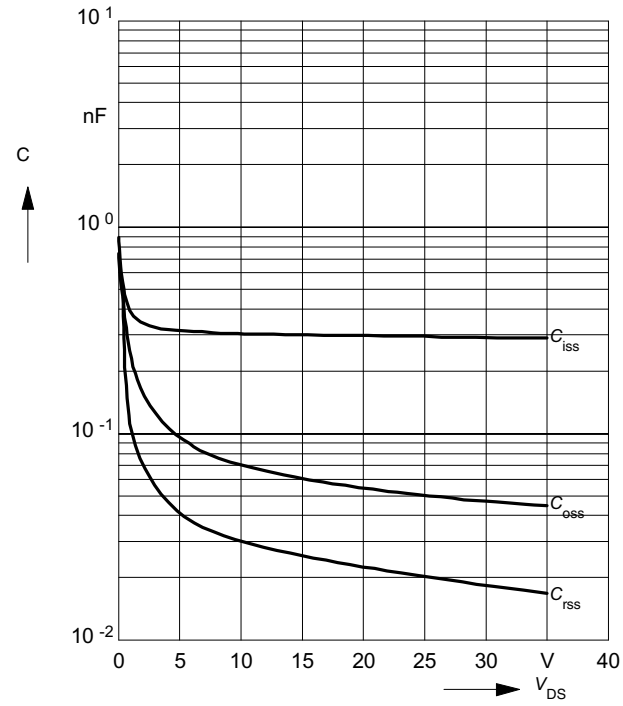
parameter: $V_{GS} = V_{DS}$, I_D = 1 mA



Typ. capacitances

$C = f(V_{DS})$

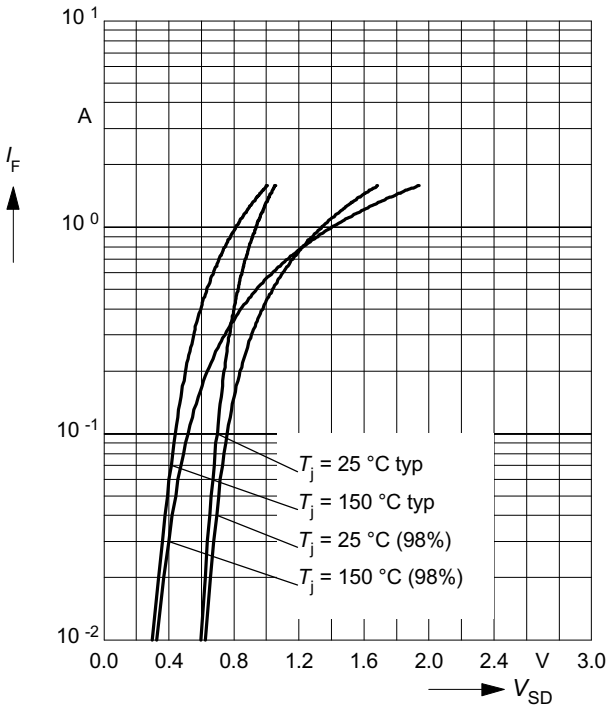
parameter: V_{GS}=0V, f = 1 MHz



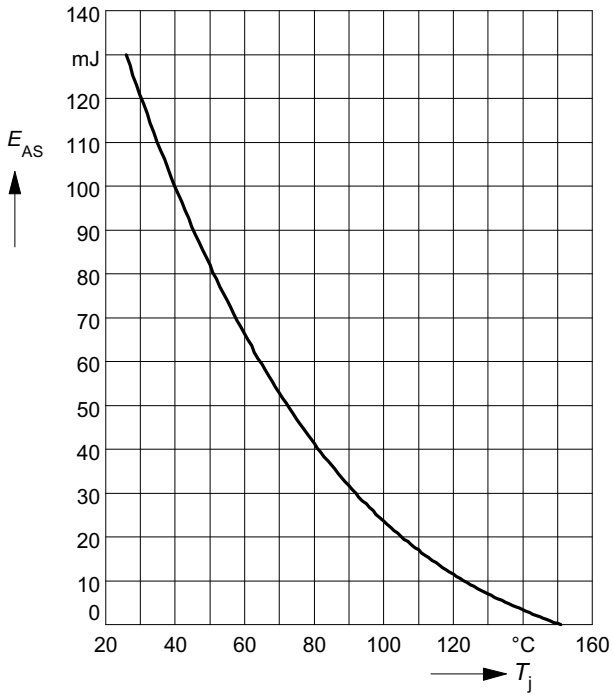
Forward characteristics of reverse diode

$I_F = f(V_{SD})$

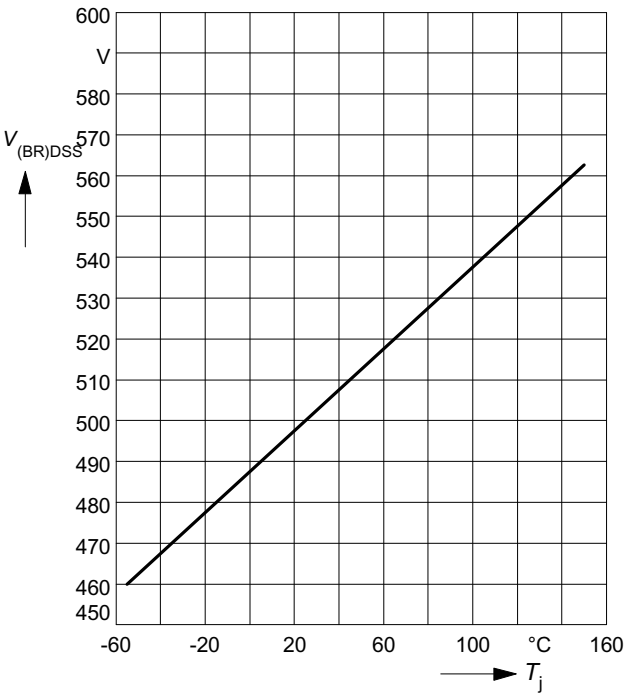
parameter: T_j, t_p = 80 µs



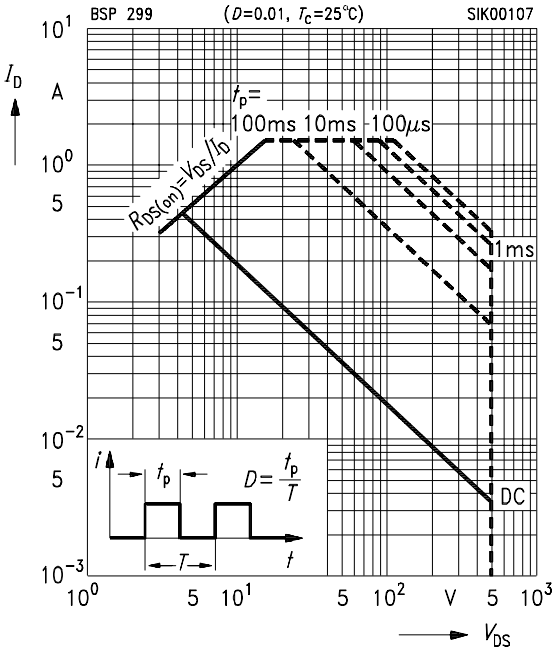
Avalanche energy $E_{AS} = f(T_j)$
parameter: I_D = 1.2 A, V_{DD} = 50 V
R_{GS} = 25 Ω, L = 163 mH



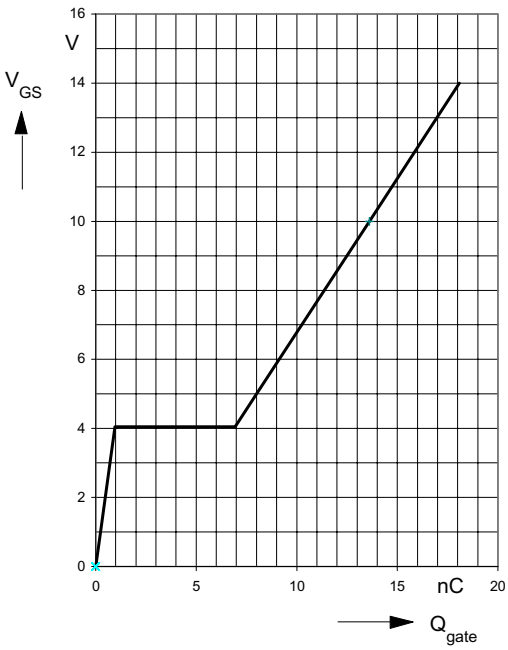
Drain-source breakdown voltage
$V_{(BR)DSS} = f(T_j)$



Safe operating area I_D=f(V_{DS})
parameter : D = 0.01, T_C=25°C



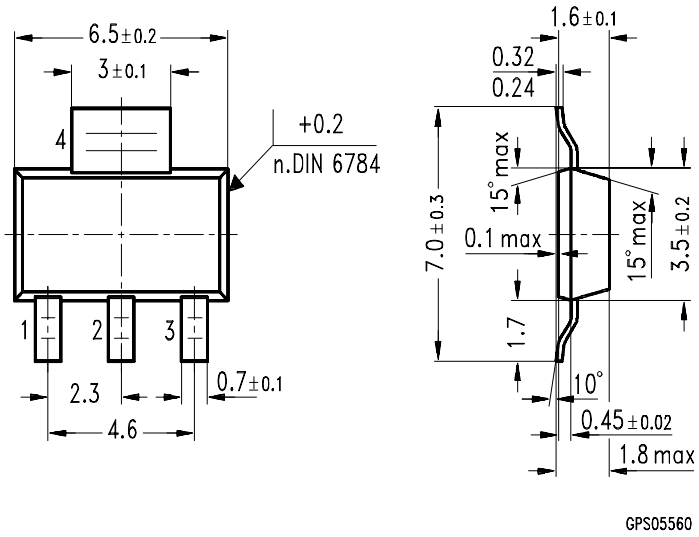
Typ. gate charge
V_{GS}=f(Q_{gate}); I_D=0.4 A pulsed
V_{DD} =200 V



Package outlines

SOT-223

Dimensions in mm



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