SIPMOS® Small-Signal Transistor

BSS 139

- V_{DS} 250 V
- I_D 0.04 A
- $R_{DS(on)}$ 100 Ω
- N channel
- Depletion mode
- High dynamic resistance
- Available grouped in $V_{GS(th)}$

5:1

Type	Ordering Code	Tape and Reel Information	Pin Configuration 1	2	3	Marking	Package
BSS 139	Q62702-S612	E6327: 3000 pcs/reel;	G	S	D	STs	SOT-23
BSS 139	Q67000-S221	E7941: 3000 pcs/reel; $V_{GS(th)}$ selected in groups: **(see page 3)**					

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	250	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	250	
Gate-source voltage	V_{GS}	± 20	
ESD Sensitivity (HBM) as per MIL-STD 883	–	Class 1	
Continuous drain current, T_A = 25 °C	I_D	0.04	A
Pulsed drain current, T_A = 25 °C	$I_{D\ puls}$	0.12	
Max. power dissipation, T_A = 25 °C	P_{tot}	0.36	W
Operating and storage temperature range	T_j, T_{stg}	– 55 … + 150	°C

Thermal resistance, chip-ambient (without heat sink) chip-substrate – reverse side [1]	R_{thJA} R_{thJSR}	≤ 350 ≤ 285	K/W
DIN humidity category, DIN 40 040	–	E	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

[1] For package mounted on aluminum 15 mm x 16.7 mm x 0.7 mm.

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} = – 3 V, I_D = 0.25 mA	$V_{(BR)DSS}$	250	–	–	V
Gate threshold voltage V_{DS} = 3 V, I_D = 1 mA	$V_{GS(th)}$	– 1.8	– 1.4	– 0.7	
Drain-source cutoff current V_{DS} = 250 V, V_{GS} = – 3 V T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 – –	 100 200	 nA µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-resistance V_{GS} = 0 V, I_D = 0.014 A	$R_{DS(on)}$	–	75	100	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, I_D = 0.04 A	g_{fs}	0.05	0.07	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	85	120	pF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	6	10	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	2	3	
Turn-on time t_{on}, (t_{on} = $t_{d(on)}$ + t_r) V_{DD} = 30 V, V_{GS} = – 2 V ... + 5 V, R_{GS} = 50 Ω, I_D = 0.15 A	$t_{d(on)}$ t_r	– –	4 10	6 15	ns
Turn-off time t_{off}, (t_{off} = $t_{d(off)}$ + t_f) V_{DD} = 30 V, V_{GS} = – 2 V ... + 5 V, R_{GS} = 50 Ω, I_D = 0.15 A	$t_{d(off)}$ t_f	– –	10 15	13 20	

Electrical Characteristics (cont'd)

at T_j = 25 °C, unless otherwise specified.

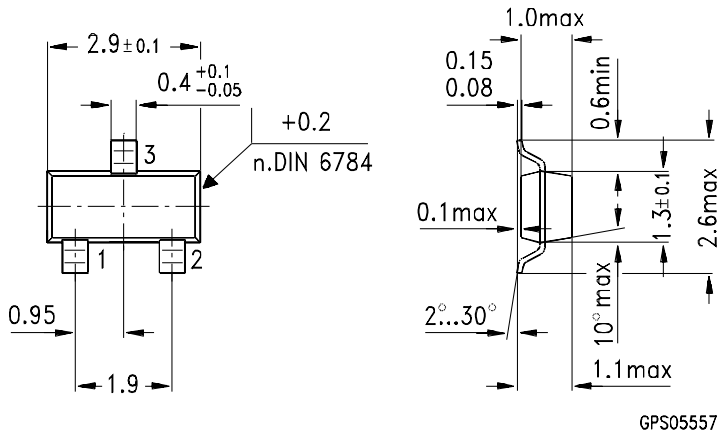
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Continuous reverse drain current T_A = 25 °C	I_S	–	–	0.04	A
Pulsed reverse drain current T_A = 25 °C	I_{SM}	–	–	0.12	
Diode forward on-voltage I_F = 0.08 A, V_{GS} = 0	V_{SD}	–	0.7	1.2	V

$V_{GS(th)}$ Grouping	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Range of $V_{GS(th)}$	$\Delta V_{GS(th)}$	–	0.15	V	–
Threshold voltage selected in groups: [1]	$V_{GS(th)}$				V_{DS1} = 0.2 V;
F		– 1.535	– 1.385	V	V_{DS2} = 3 V;
G		– 1.635	– 1.485	V	I_D = 10 µA
A		– 1.735	– 1.585	V	
B		– 1.835	– 1.685	V	
C		– 1.935	– 1.785	V	
D		– 2.035	– 1.885	V	

1) A specific group cannot be ordered separately.
Each reel only contains transistors from one group.

Package Outline

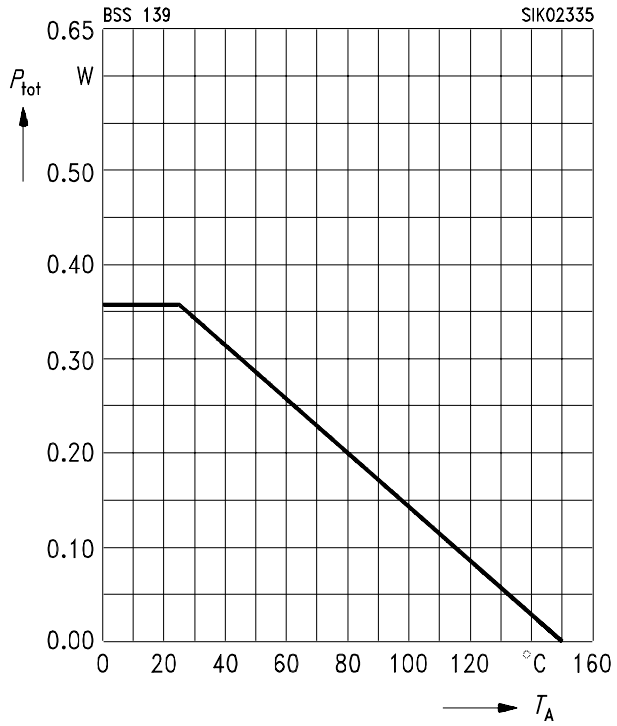
SOT-23



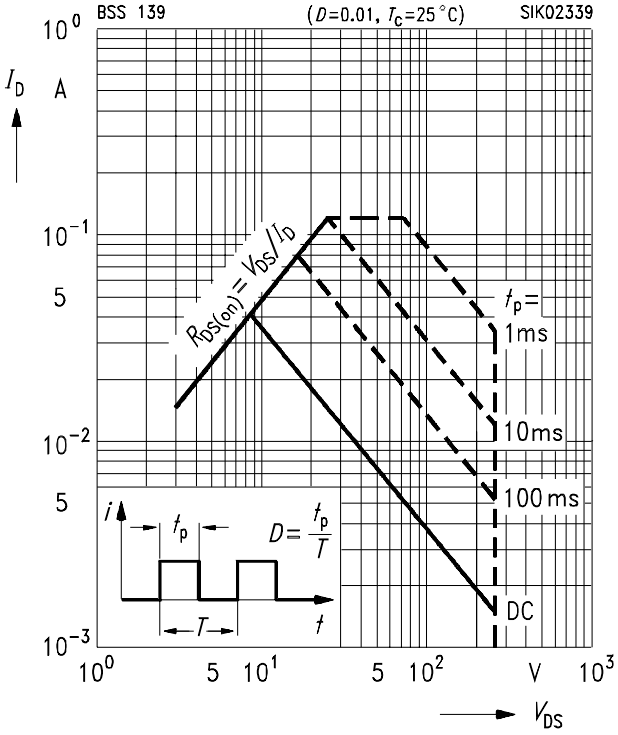
Dimensions in mm

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

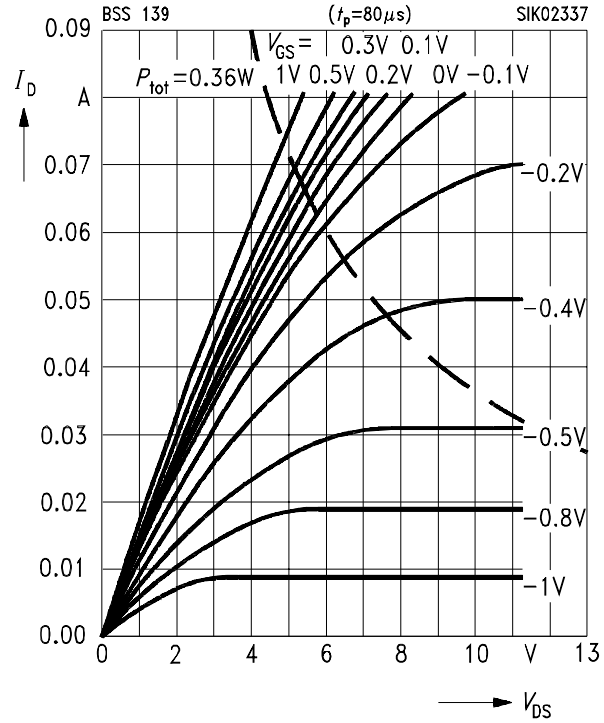
Total power dissipation $P_{tot} = f(T_A)$



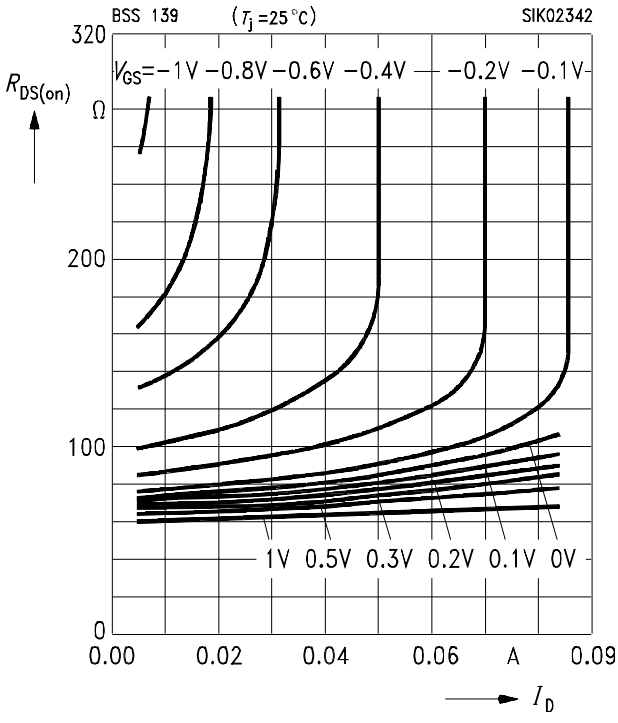
Safe operating area $I_D = f(V_{DS})$
parameter: D = 0.01, T_C = 25 °C



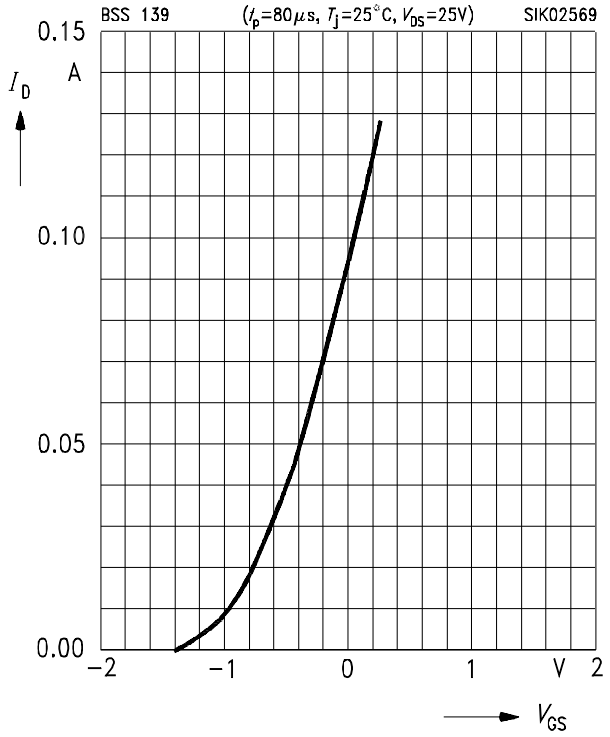
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



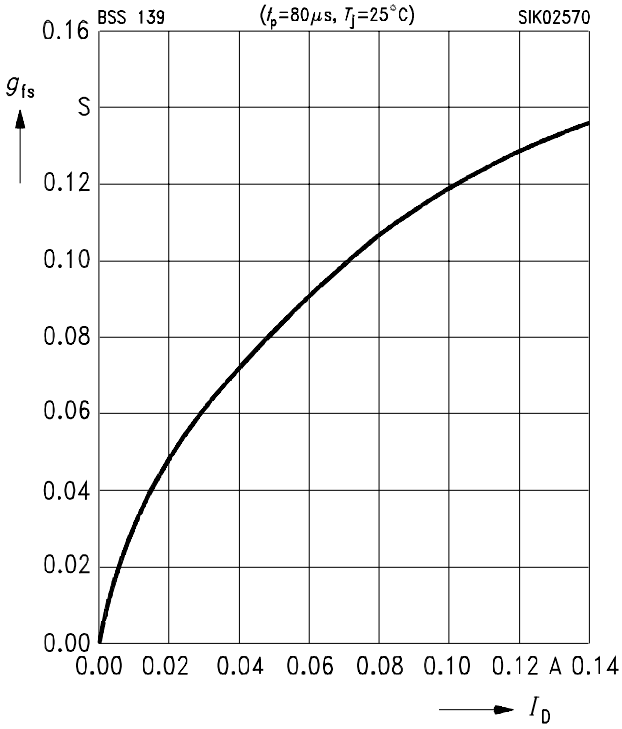
Typ. drain-source on-resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



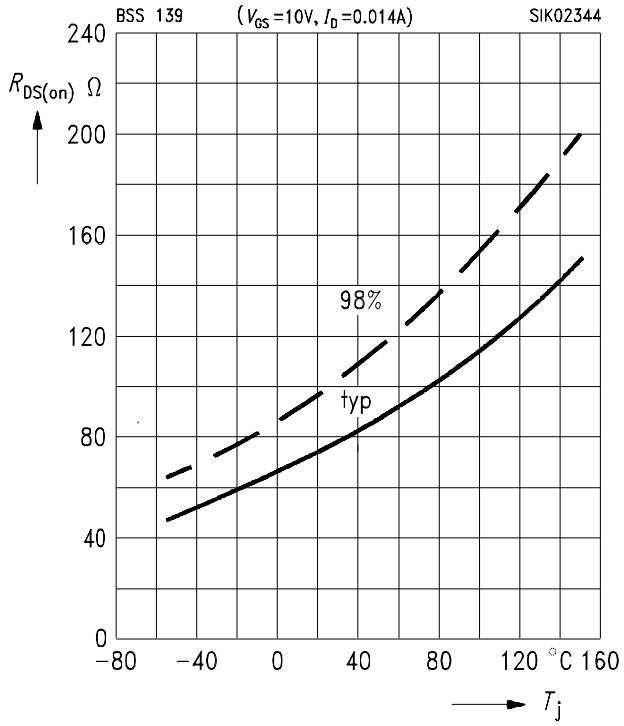
Typ. transfer characteristics $I_D = f(V_{GS})$
parameter: t_p = 80 µs, $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$



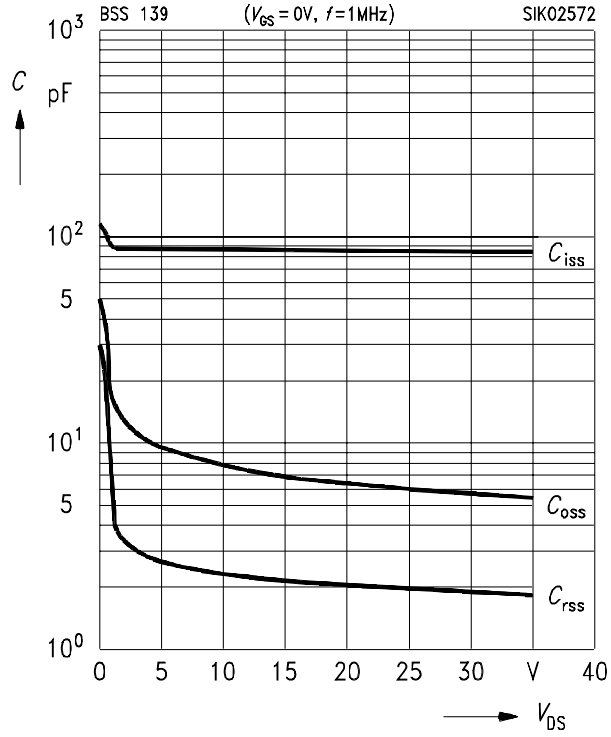
Typ. forward transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, t_p = 80 µs



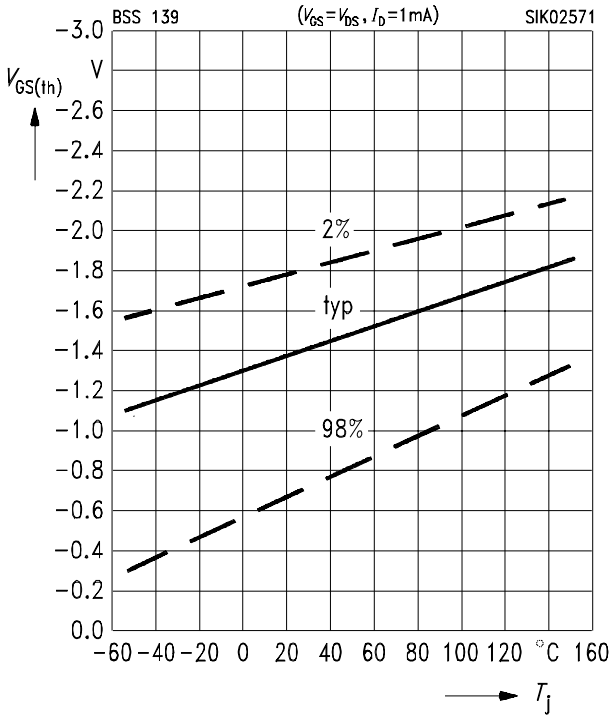
Drain-source on-resistance
$R_{DS(on)} = f(T_j)$
parameter: I_D = 0.014 A, V_{GS} = 0 V, (spread)



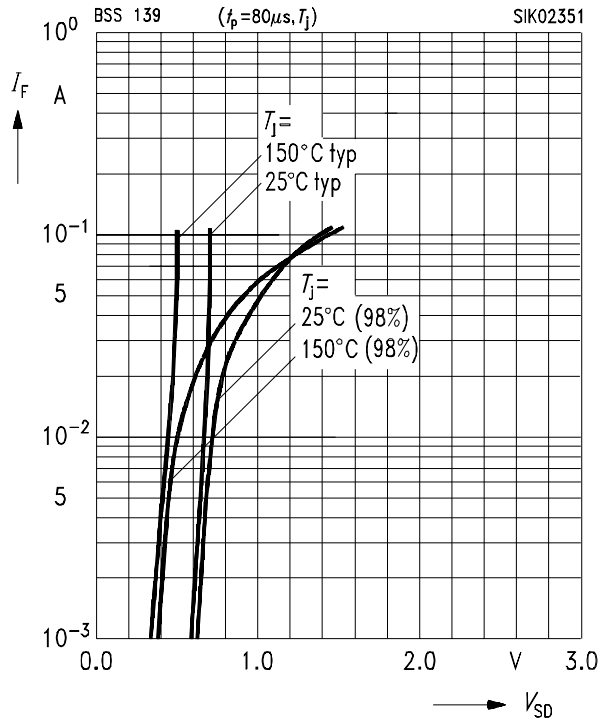
Typ. capacitances $C = f(V_{DS})$
parameter: V_{GS} = 0, f = 1 MHz



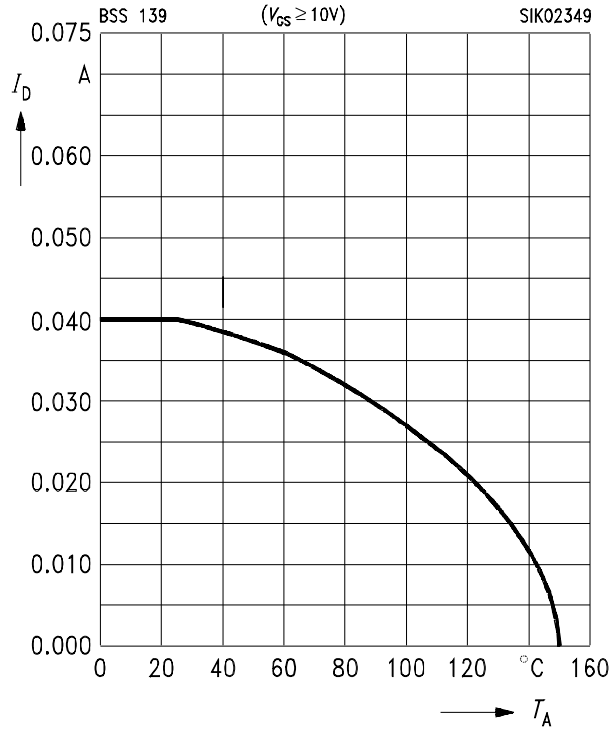
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: V_{DS} = 3 V, I_D = 1 mA, (spread)



Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: t_p = 80 µs, T_j, (spread)



Drain current $I_D = f(T_A)$
parameter: $V_{GS} \geq 3$ V



Drain-source breakdown voltage
$V_{(BR)\,DSS} = b \times V_{(BR)DSS}$ (25 °C)