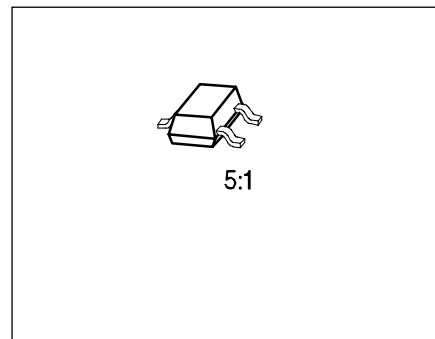


SIPMOS® Small-Signal Transistor

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 $V_{GS(th)}$



Type	Ordering Code	Tape and Reel Information	Pin Configuration			Marking	Package
			1	2	3		
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, $R_{GS} = 20 \text{ k}\Omega$	V_{DGR}	250	
Gate-source voltage	V_{GS}	± 20	
ESD Sensitivity (HBM) as per MIL-STD 883	—	Class 1	
Continuous drain current, $T_A = 25^\circ\text{C}$	I_D	0.04	A
Pulsed drain current, $T_A = 25^\circ\text{C}$	$I_{D \text{ puls}}$	0.12	
Max. power dissipation, $T_A = 25^\circ\text{C}$	P_{tot}	0.36	W
Operating and storage temperature range	T_j, T_{stg}	$-55 \dots +150$	$^\circ\text{C}$

Thermal resistance, chip-ambient (without heat sink)	R_{thJA}	≤ 350	K/W
chip-substrate – reverse side ¹⁾	R_{thJSR}	≤ 285	
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 $T_j = 25^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

Static Characteristics

Drain-source breakdown voltage $V_{GS} = -3\text{ V}$, $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	250	–	–	V
Gate threshold voltage $V_{DS} = 3\text{ V}$, $I_D = 1\text{ mA}$	$V_{GS(th)}$	– 1.8	– 1.4	– 0.7	
Drain-source cutoff current $V_{DS} = 250\text{ V}$, $V_{GS} = -3\text{ V}$ $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	I_{DSS}	– –	– –	100 200	nA μA
Gate-source leakage current $V_{GS} = 20\text{ V}$, $V_{DS} = 0$	I_{GSS}	–	10	100	nA
Drain-source on-resistance $V_{GS} = 0\text{ V}$, $I_D = 0.014\text{ A}$	$R_{DS(on)}$	–	75	100	Ω

Dynamic Characteristics

Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, $I_D = 0.04\text{ A}$	g_{fs}	0.05	0.07	–	S
Input capacitance $V_{GS} = 0$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{iss}	–	85	120	pF
Output capacitance $V_{GS} = 0$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{oss}	–	6	10	
Reverse transfer capacitance $V_{GS} = 0$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{rss}	–	2	3	
Turn-on time t_{on} , ($t_{on} = t_{d(on)} + t_r$) $V_{DD} = 30\text{ V}$, $V_{GS} = -2\text{ V} \dots + 5\text{ V}$, $R_{GS} = 50\text{ }\Omega$, $I_D = 0.15\text{ A}$	$t_{d(on)}$	–	4	6	ns
	t_r	–	10	15	
Turn-off time t_{off} , ($t_{off} = t_{d(off)} + t_f$) $V_{DD} = 30\text{ V}$, $V_{GS} = -2\text{ V} \dots + 5\text{ V}$, $R_{GS} = 50\text{ }\Omega$, $I_D = 0.15\text{ A}$	$t_{d(off)}$	–	10	13	
	t_f	–	15	20	

Electrical Characteristics (cont'd)

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

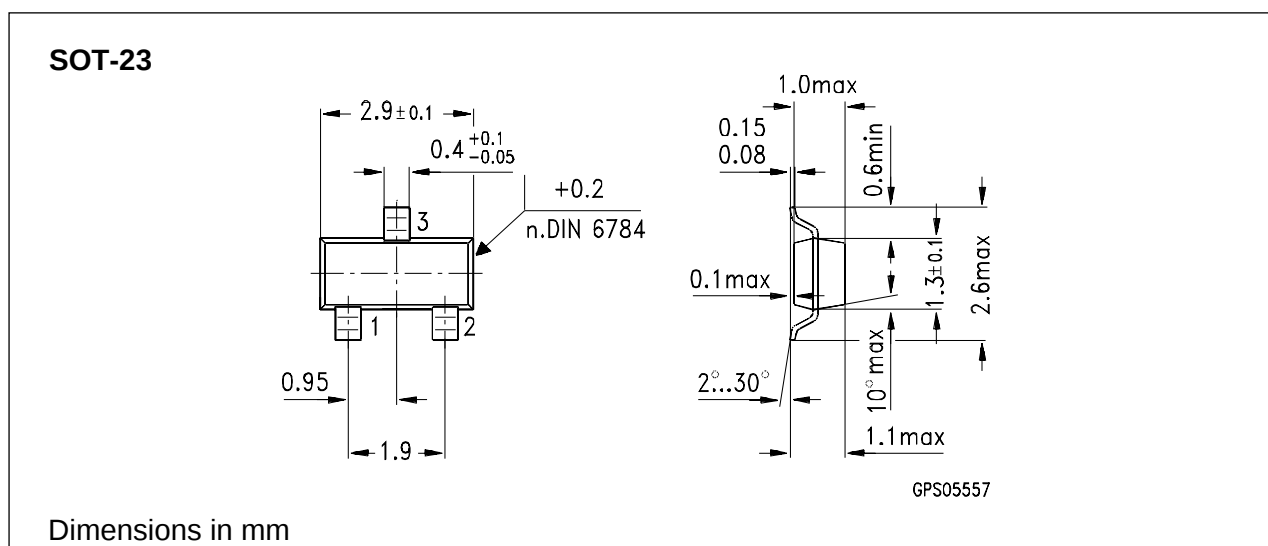
Reverse Diode

Continuous reverse drain current $T_A = 25\text{ °C}$	I_S	–	–	0.04	A
Pulsed reverse drain current $T_A = 25\text{ °C}$	I_{SM}	–	–	0.12	
Diode forward on-voltage $I_F = 0.08\text{ A}$, $V_{GS} = 0$	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)	$V_{GS(th)}$				$V_{DS1} = 0.2\text{ V};$ $V_{DS2} = 3\text{ V};$ $I_D = 10\text{ }\mu\text{A}$
F		– 1.535	– 1.385	V	
G		– 1.635	– 1.485	V	
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.

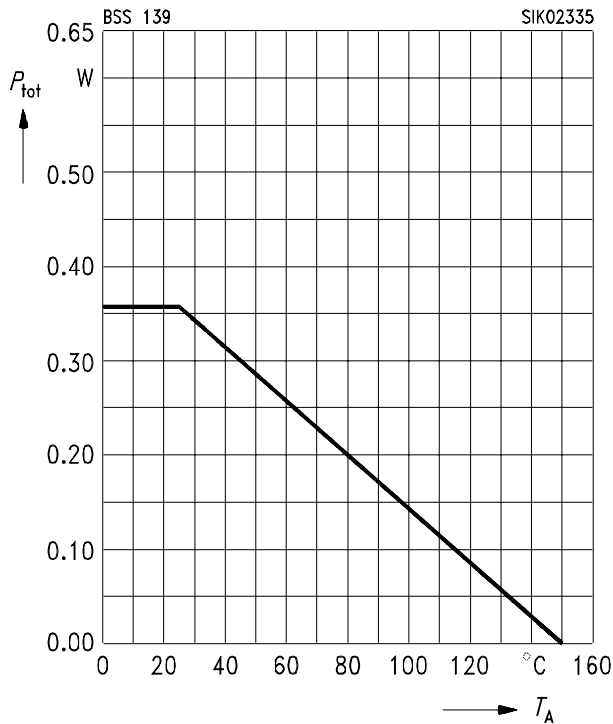
Package Outline



Characteristics

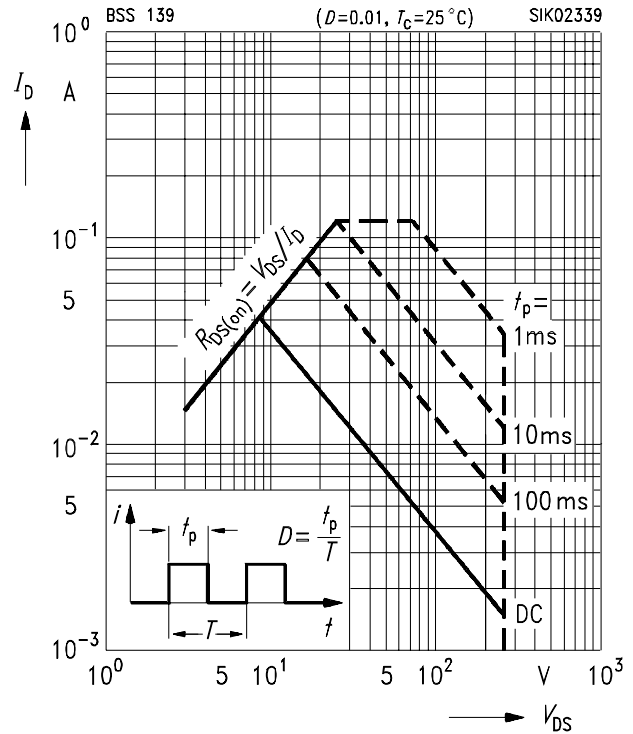
at $T_j = 25^\circ\text{C}$, unless otherwise specified.

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



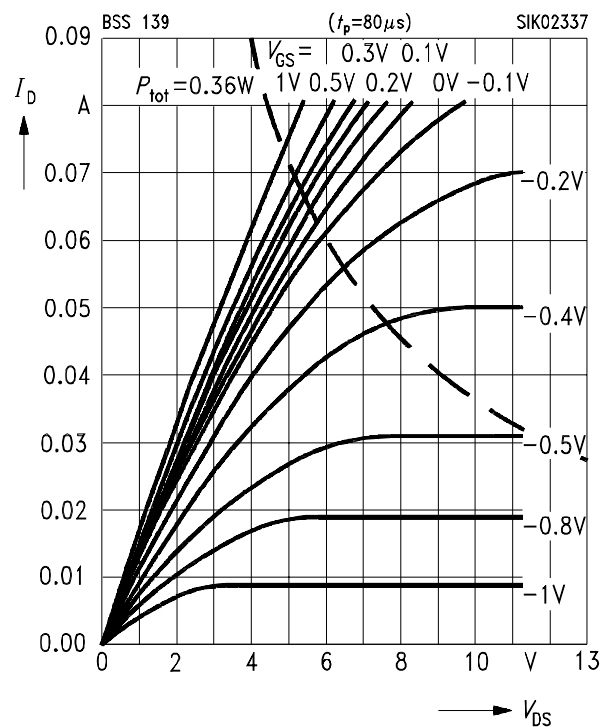
Safe operating area $I_D = f(V_{\text{DS}})$

parameter: $D = 0.01$, $T_C = 25^\circ\text{C}$



Typ. output characteristics $I_D = f(V_{\text{DS}})$

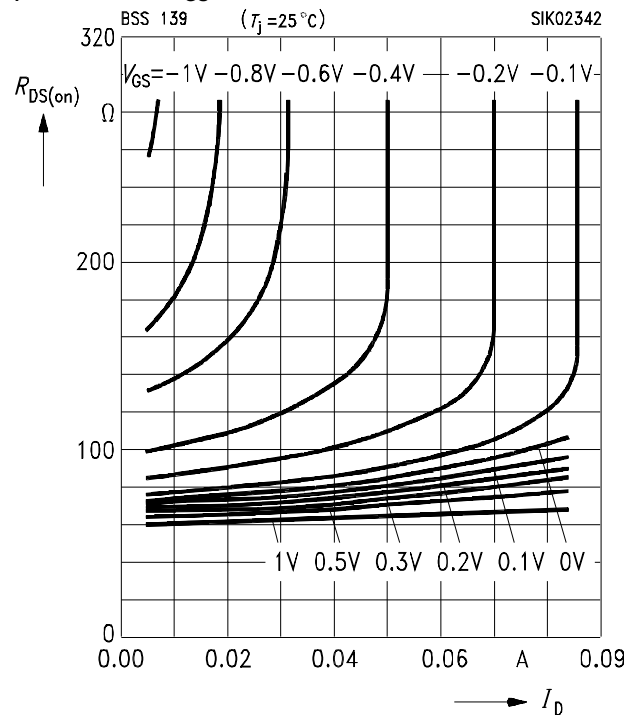
parameter: $t_p = 80 \mu\text{s}$



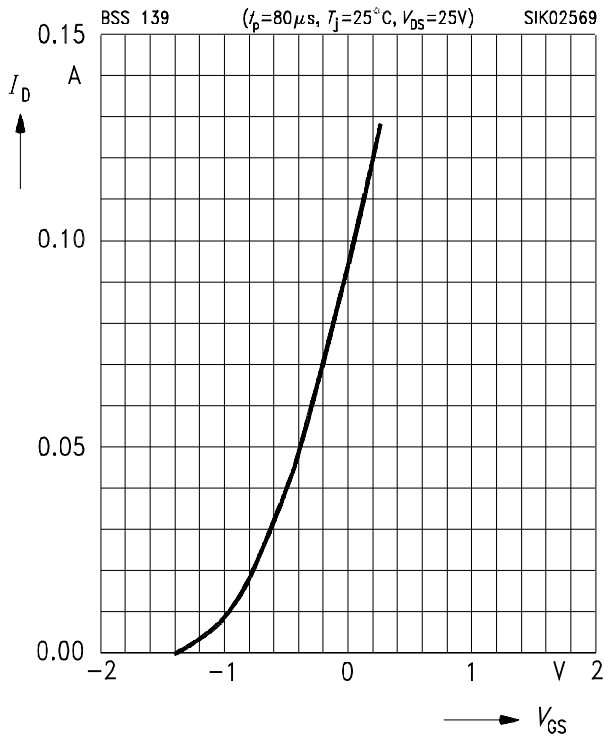
Typ. drain-source on-resistance

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

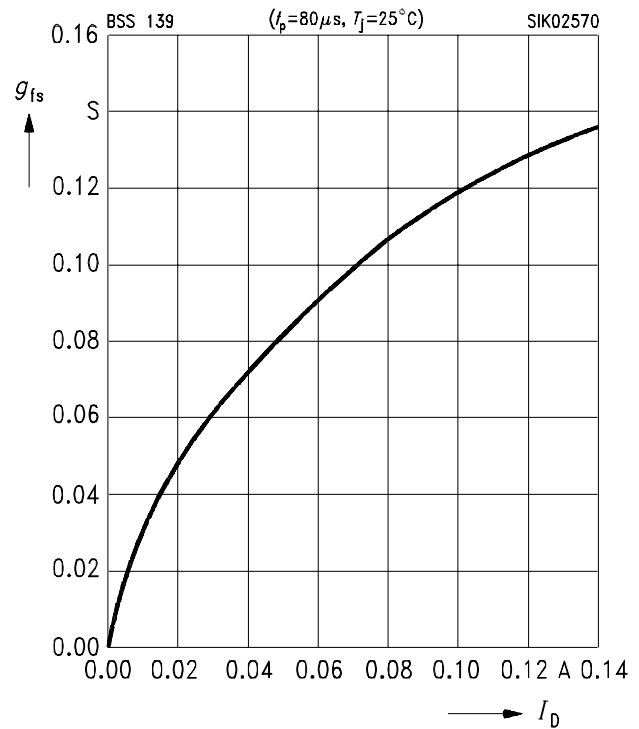
parameter: V_{GS}



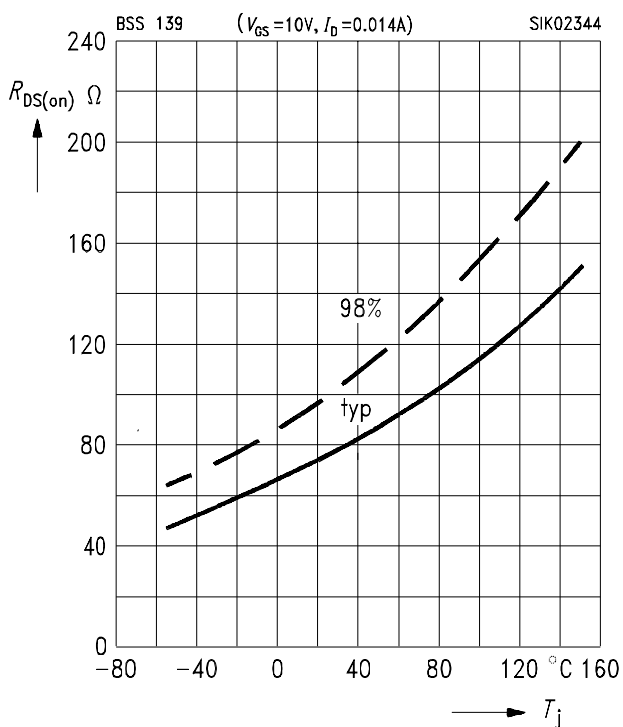
Typ. transfer characteristics $I_D = f(V_{GS})$
parameter: $t_p = 80 \mu s$, $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$.



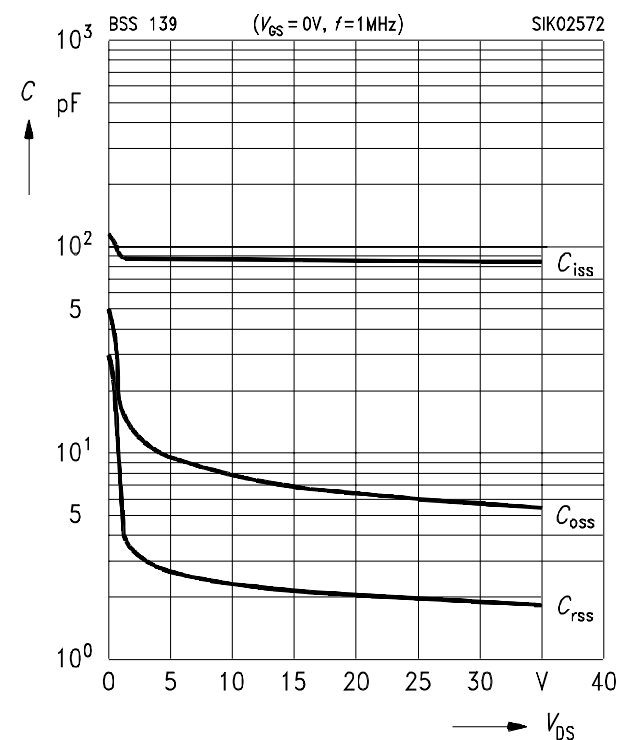
Typ. forward transconductance $g_{fs} = f(I_D)$
parameter: $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, $t_p = 80 \mu s$



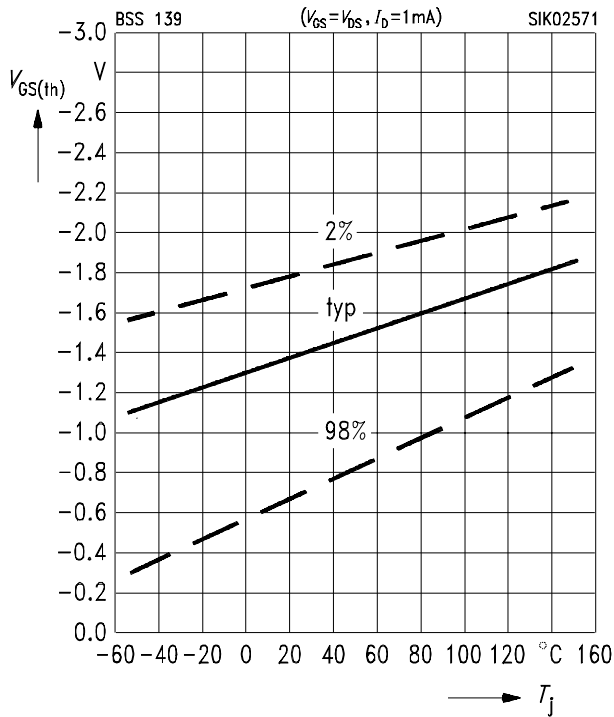
Drain-source on-resistance
 $R_{DS(on)} = f(T_j)$
parameter: $I_D = 0.014 A$, $V_{GS} = 0 V$, (spread)



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

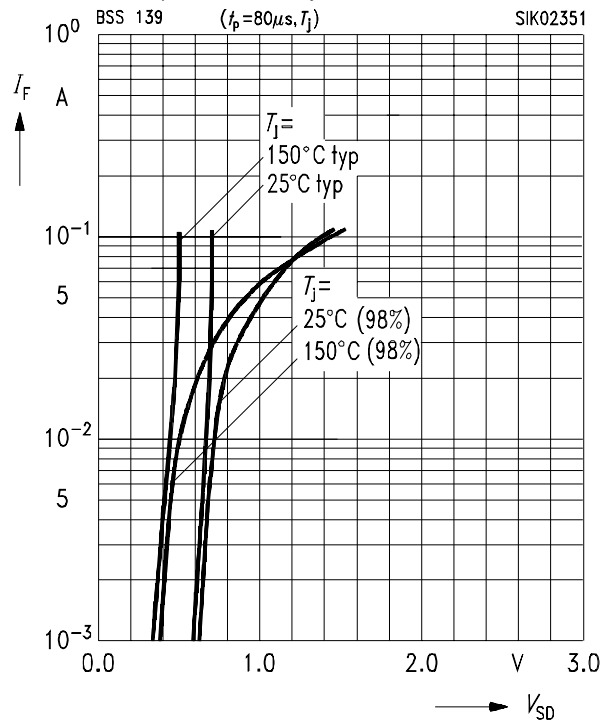


Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = 3\text{ V}$, $I_D = 1\text{ mA}$, (spread)

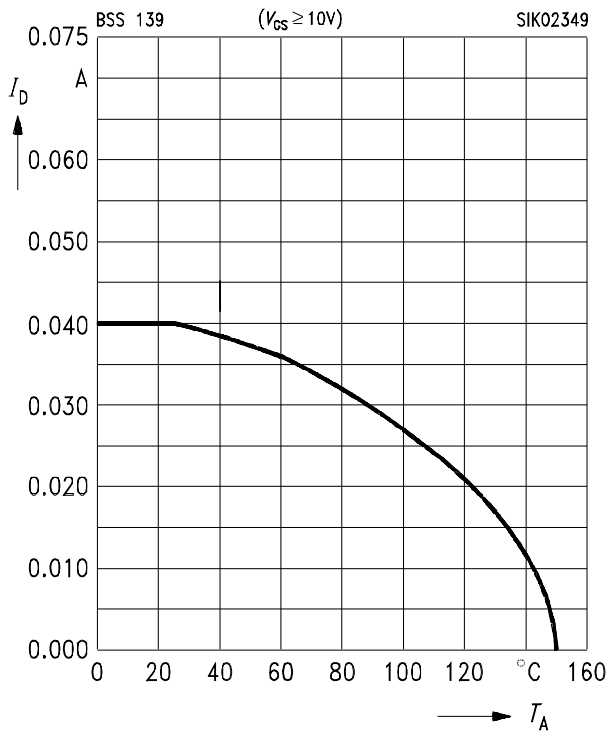


Forward characteristics of reverse diode

$I_F = f(V_{SD})$
parameter: $t_p = 80\text{ }\mu\text{s}$, T_j , (spread)



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



Drain-source breakdown voltage
 $V_{(BR)DSS} = b \times V_{(BR)DSS}(25\text{ }^\circ\text{C})$

