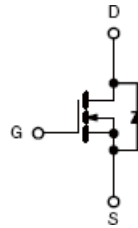


SOT-23 Plastic-Encapsulate MOSFETS

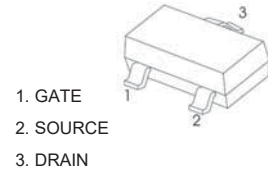
BSS139 N-channel SIPMOS® Small-Signal-Transistor

Features

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



SOT-23



Marking:ST

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}	± 14	
Gate-source peak voltage, aperiodic	V_{gs}	± 20	
Continuous drain current, $T_A = 25 \text{ }^\circ\text{C}$	I_D	0.04	A
Pulsed drain current, $T_A = 25 \text{ }^\circ\text{C}$	$I_{D \text{ puls}}$	0.12	
Max. power dissipation, $T_A = 25 \text{ }^\circ\text{C}$	P_{tot}	0.36	W
Operating and storage temperature range	T_j, T_{stg}	$-55 \dots +15$	$^\circ\text{C}$

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

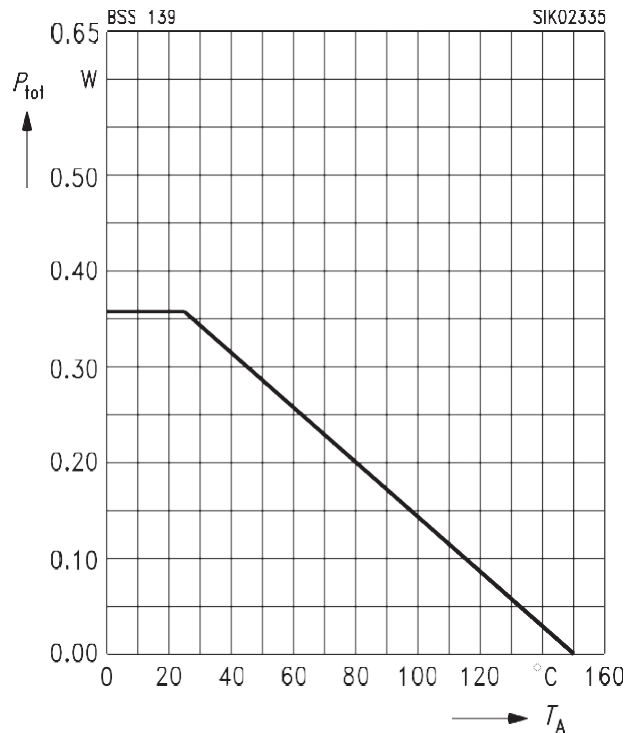
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Drain-source breakdown voltage $V_{GS} = -3\text{ V}$, $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	250	—	—	V
Gate threshold voltage $V_{DS} = 3\text{ V}$, $I_D = 1\text{ mA}$	$V_{GS(th)}$	— 1.8	— 1.4	— 0.7	
Drain-source cutoff current $V_{DS} = 250\text{ V}$, $V_{GS} = -3\text{ V}$ $T_j = 25\text{ }^{\circ}\text{C}$ $T_j = 125\text{ }^{\circ}\text{C}$	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
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	
Continuous reverse drain current $T_A = 25\text{ }^{\circ}\text{C}$	I_S	—	—	0.04	A
Pulsed reverse drain current $T_A = 25\text{ }^{\circ}\text{C}$	I_{SM}	—	—	0.12	
Diode forward on-voltage $I_F = 0.08\text{ A}$, $V_{GS} = 0$	V_{SD}	—	0.7	1.2	V

Typical Characteristics

Characteristics

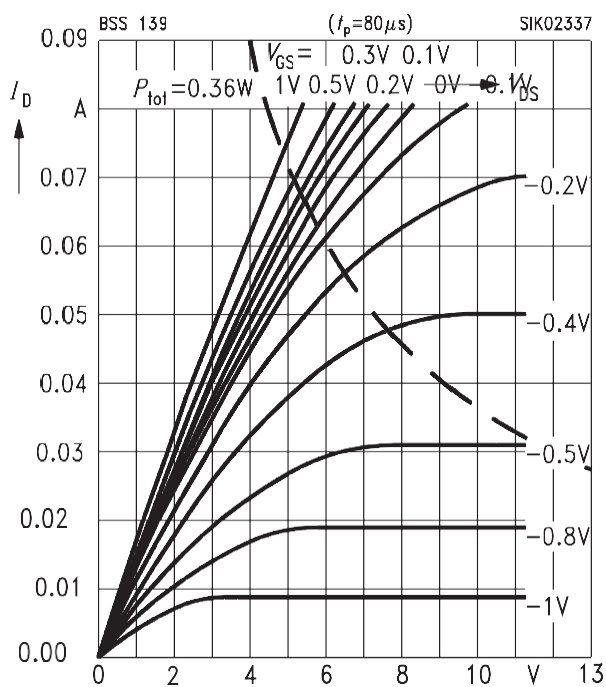
at $T_j = 25\text{ }^{\circ}\text{C}$, unless otherwise specified.

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



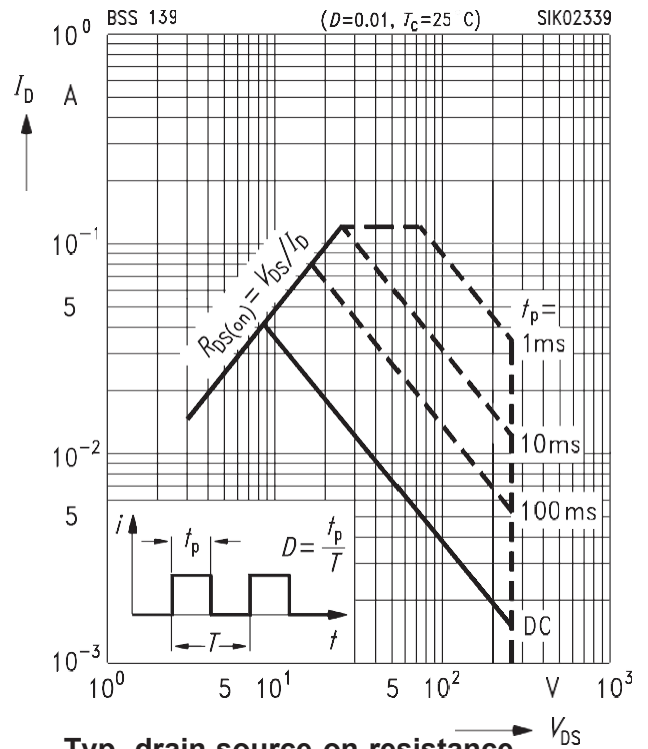
Typ. output characteristics $I_D = f(V_{\text{DS}})$

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



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

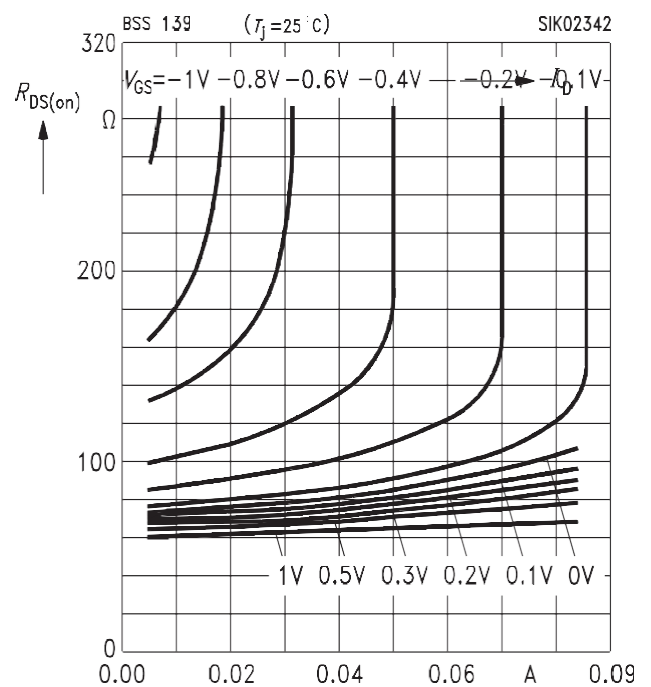
parameter: $D = 0.01$, $T_C = 25\text{ }^{\circ}\text{C}$



Typ. drain-source on-resistance

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

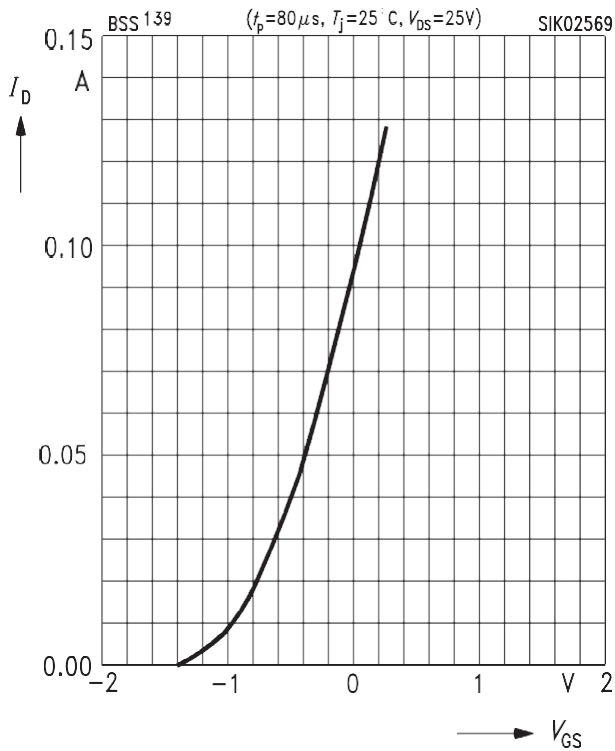
parameter: V_{GS}



Typical Characteristics

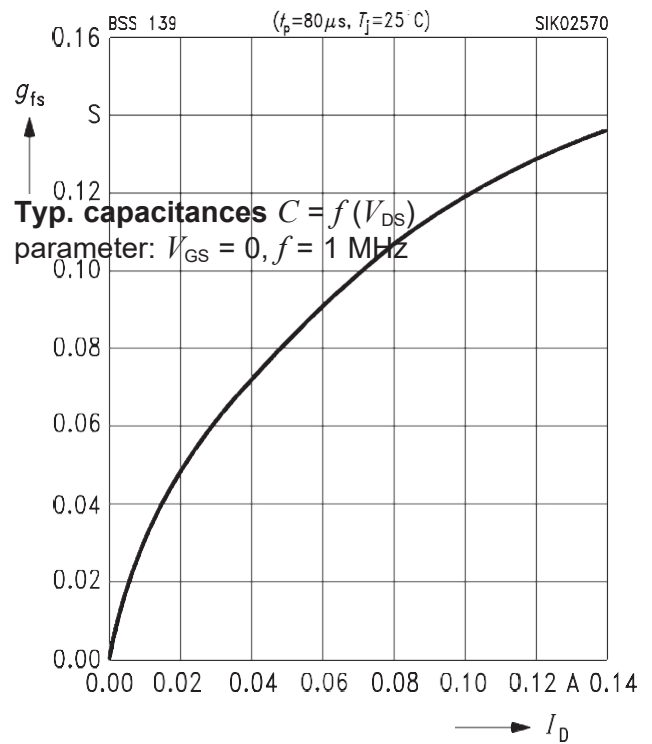
Typ. transfer characteristics $I_D = f(V_{GS})$

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: $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, $t_p = 80 \mu s$



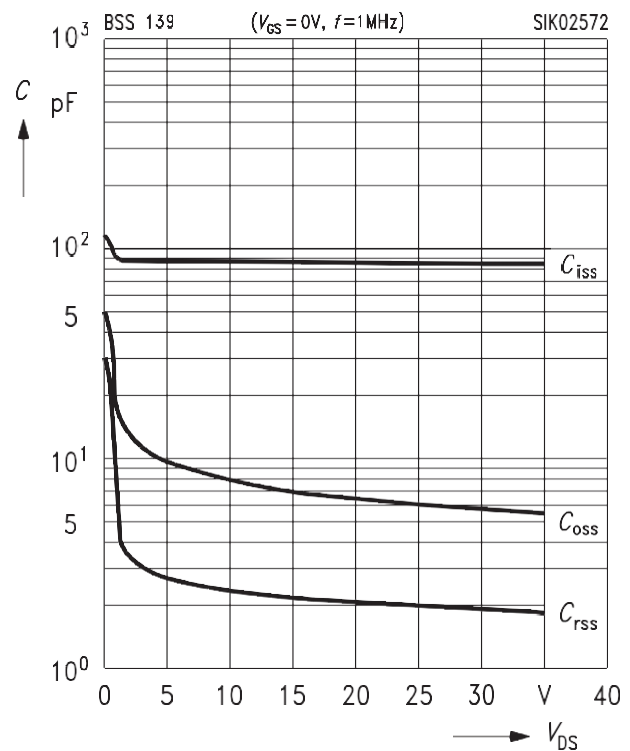
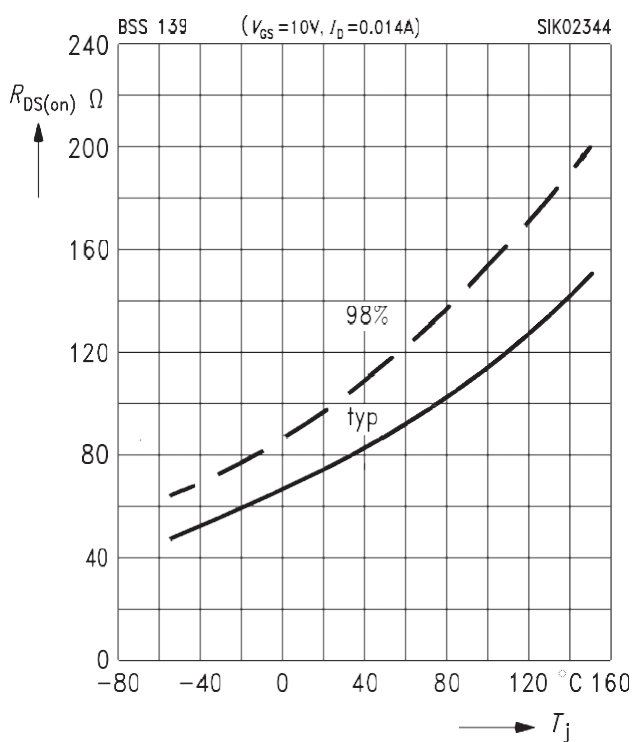
Typ. capacitances $C = f(V_{DS})$

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

Drain-source on-resistance

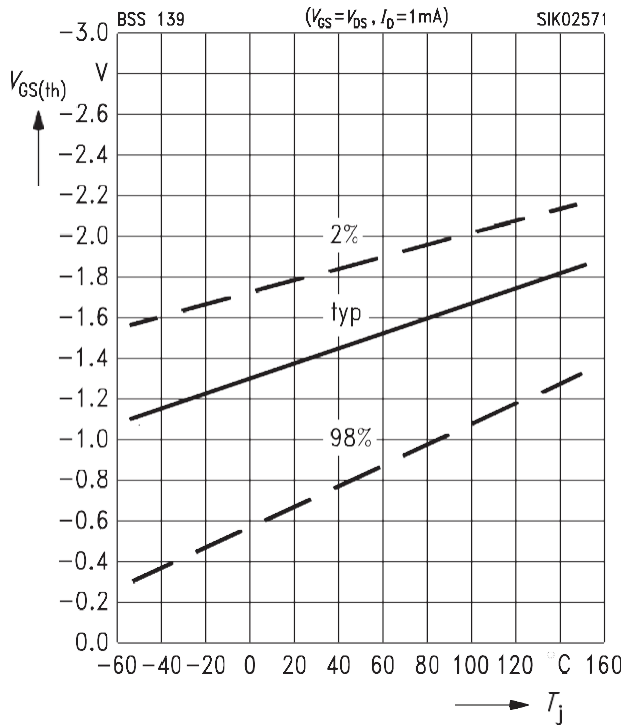
$$R_{DS(on)} = f(T_j)$$

parameter: $I_D = 0.014 A$, $V_{GS} = 0 V$, (spread)



Typical Characteristics

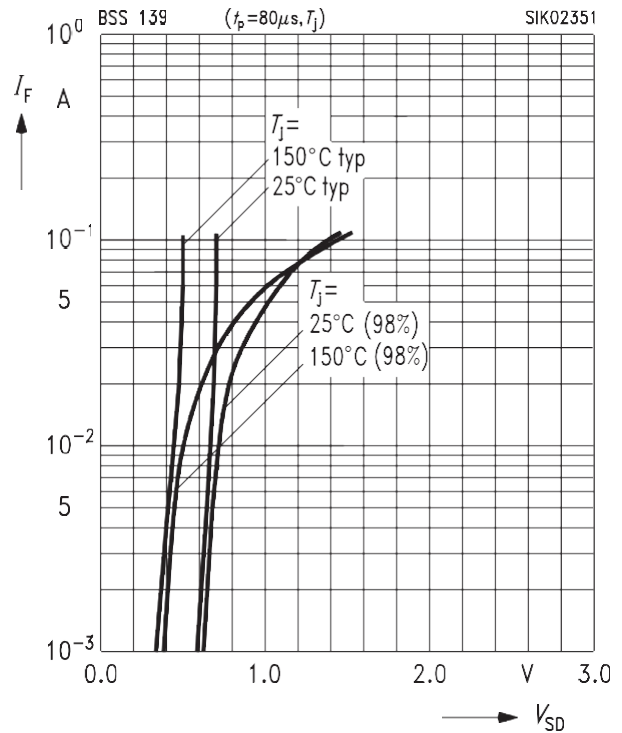
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = 3\text{ V}$, $I_D = 1\text{ mA}$, (spread)



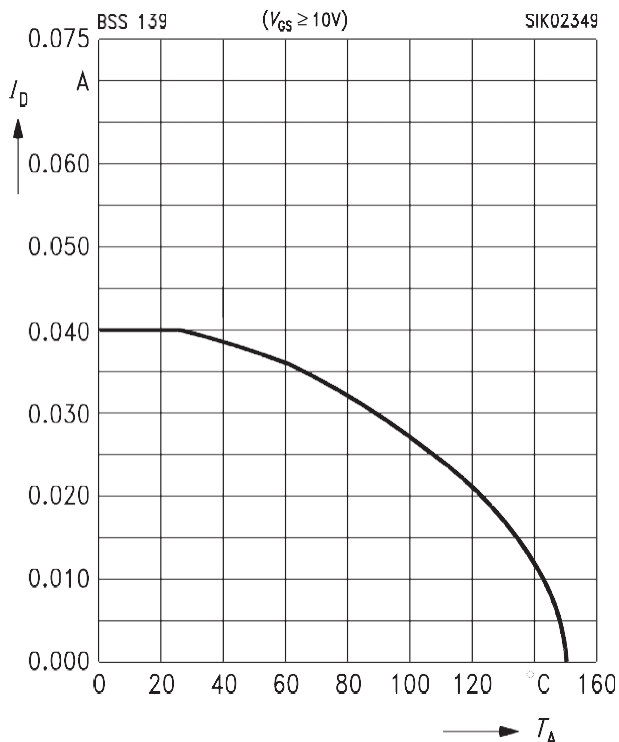
Forward characteristics of reverse diode

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

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

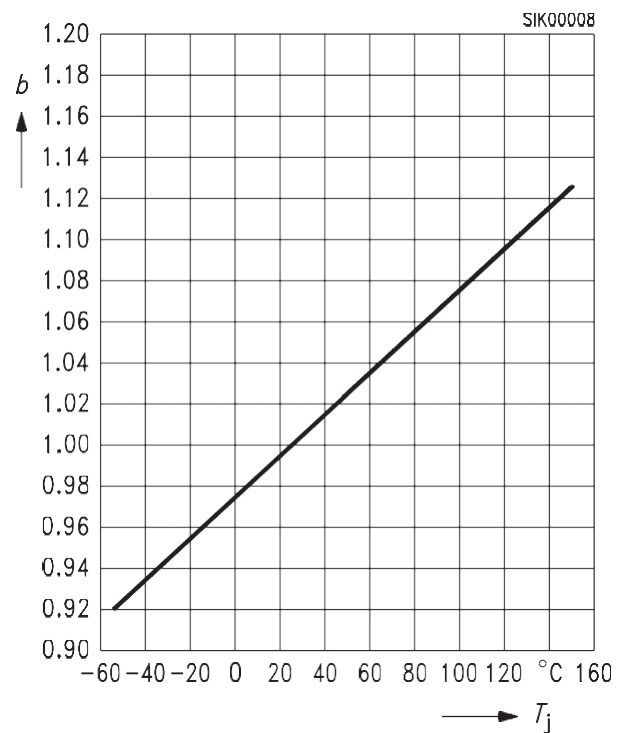


Drain current $I_D = f(T_A)$
parameter: $V_{GS} \geq 3\text{ V}$



Drain-source breakdown voltage

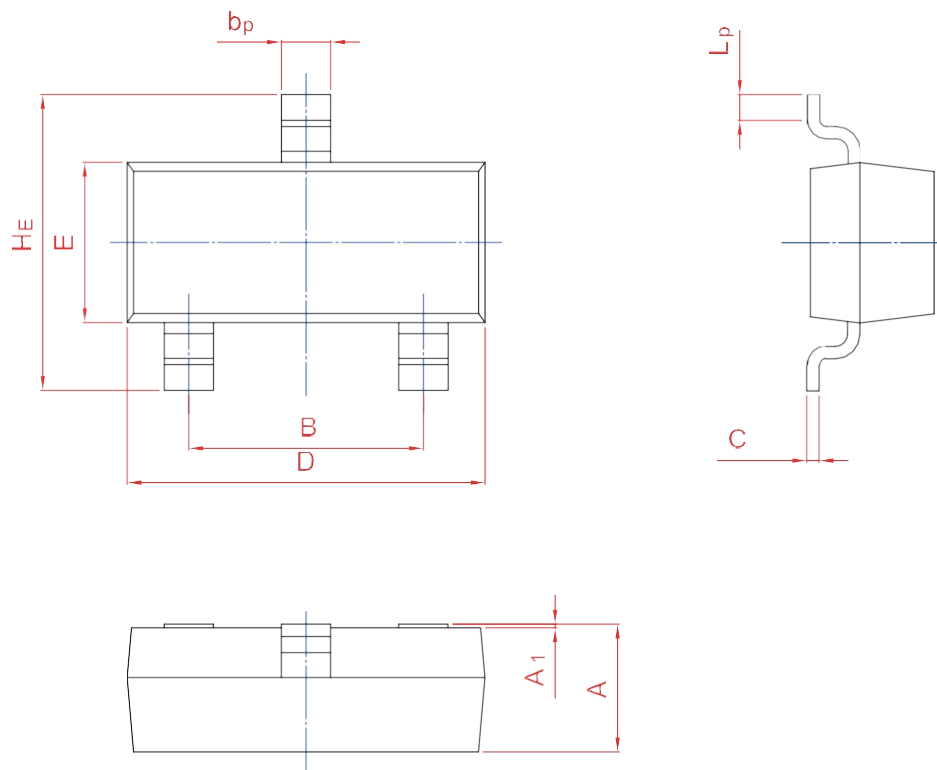
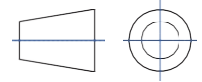
$$V_{(BR)DSS} = b \times V_{(BR)DSS}(25^\circ\text{C})$$



PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT-23



UNIT	A	B	b _p	C	D	E	H _E	A ₁	L _p
mm	1.40 0.95	2.04 1.78	0.50 0.35	0.19 0.08	3.10 2.70	1.65 1.20	3.00 2.20	0.100 0.013	0.50 0.20