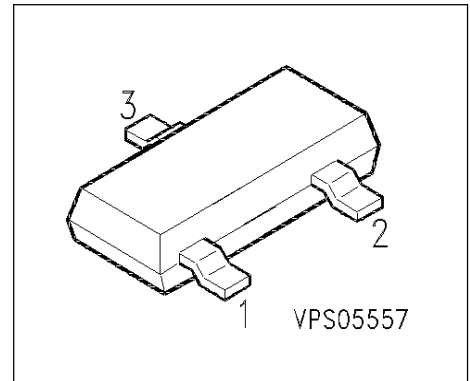


## SIPMOS® Small-Signal Transistor

- N channel
- Enhancement mode
- Logic Level
- $V_{GS(th)} = 0.8...2.0V$



Pin 1	Pin 2	Pin 3
G	S	D

Type	$V_{DS}$	$I_D$	$R_{DS(on)}$	Package	Marking
BSS 138	50 V	0.22 A	3.5 $\Omega$	SOT-23	SSs
Type	Ordering Code	Tape and Reel Information			
BSS 138	Q67000-S566	E6327			
BSS 138	Q67000-S216	E6433			

## Maximum Ratings

Parameter	Symbol	Values	Unit
Drain source voltage	$V_{DS}$	50	V
Drain-gate voltage	$V_{DGR}$	50	V
$R_{GS} = 20\text{ k}\Omega$			
Gate source voltage	$V_{GS}$		
Gate-source peak voltage, aperiodic	$V_{gs}$	$\pm 20$	
Continuous drain current	$I_D$	0.22	A
$T_A = 31\text{ }^\circ\text{C}$			
DC drain current, pulsed	$I_{Dpuls}$	0.88	A
$T_A = 25\text{ }^\circ\text{C}$			
Power dissipation	$P_{tot}$	0.36	W
$T_A = 25\text{ }^\circ\text{C}$			

## 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	$R_{thJA}$	≤ 350	K/W
Thermal resistance, chip-substrate- reverse side <sup>1)</sup>	$R_{thJSR}$	≤ 285	
DIN humidity category, DIN 40 040		E	
IEC climatic category, DIN IEC 68-1		55 / 150 / 56	

1) For package mounted on aluminium 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 $V_{GS} = 0 \text{ V}, I_D = 0.25 \text{ mA}, T_j = 25^\circ\text{C}$	$V_{(BR)DSS}$	50	-	-	V
Gate threshold voltage $V_{GS} = V_{DS}, I_D = 1 \text{ mA}$	$V_{GS(th)}$	0.8	1.2	1.6	
Zero gate voltage drain current $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 25^\circ\text{C}$	$I_{DSS}$	-	0.05	0.5	μA
$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 125^\circ\text{C}$		-	-	5	
$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 25^\circ\text{C}$		-	-	100	nA
Gate-source leakage current $V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$	$I_{GSS}$	-	10	100	nA
Drain-Source on-state resistance $V_{GS} = 10 \text{ V}, I_D = 0.22 \text{ A}$	$R_{DS(on)}$	-	1.8	3.5	Ω
$V_{GS} = 4.5 \text{ V}, I_D = 0.22 \text{ A}$		-	2.8	6	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

### Dynamic Characteristics

Transconductance $V_{DS} \geq 2 * I_D * R_{DS(on)max}, I_D = 0.22 \text{ A}$	$g_{fs}$	0.12	0.2	-	S
Input capacitance $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$	$C_{iss}$	-	40	55	pF
Output capacitance $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$	$C_{oss}$	-	15	25	
Reverse transfer capacitance $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$	$C_{rss}$	-	5	8	
Turn-on delay time $V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.29 \text{ A}$ $R_{GS} = 50 \Omega$	$t_{d(on)}$	-	5	8	ns
Rise time $V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.29 \text{ A}$ $R_{GS} = 50 \Omega$	$t_r$	-	6	9	
Turn-off delay time $V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.29 \text{ A}$ $R_{GS} = 50 \Omega$	$t_{d(off)}$	-	12	16	
Fall time $V_{DD} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 0.29 \text{ A}$ $R_{GS} = 50 \Omega$	$t_f$	-	15	20	

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

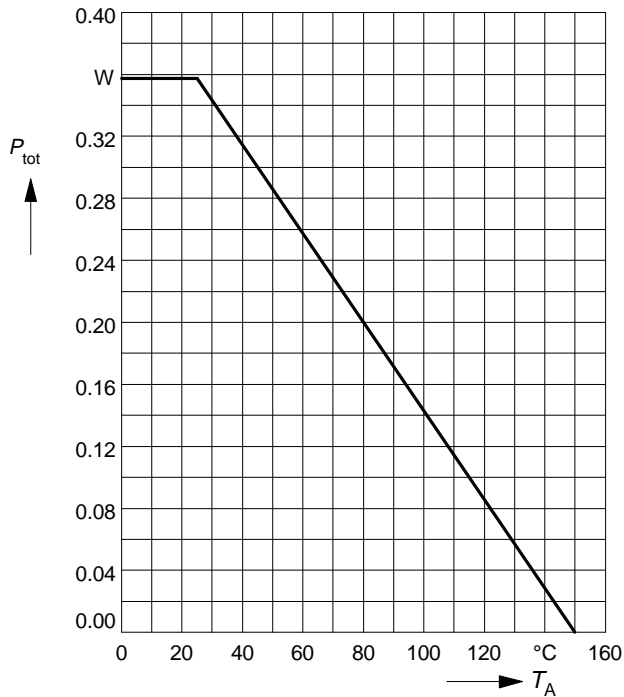
Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**Reverse Diode**

Inverse diode continuous forward current $T_A = 25^\circ\text{C}$	$I_S$	-	-	0.22	A
Inverse diode direct current, pulsed $T_A = 25^\circ\text{C}$	$I_{SM}$	-	-	0.88	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = 0.44\text{ A}$ , $T_j = 25^\circ\text{C}$	$V_{SD}$	-	0.9	1.4	V

### Power dissipation

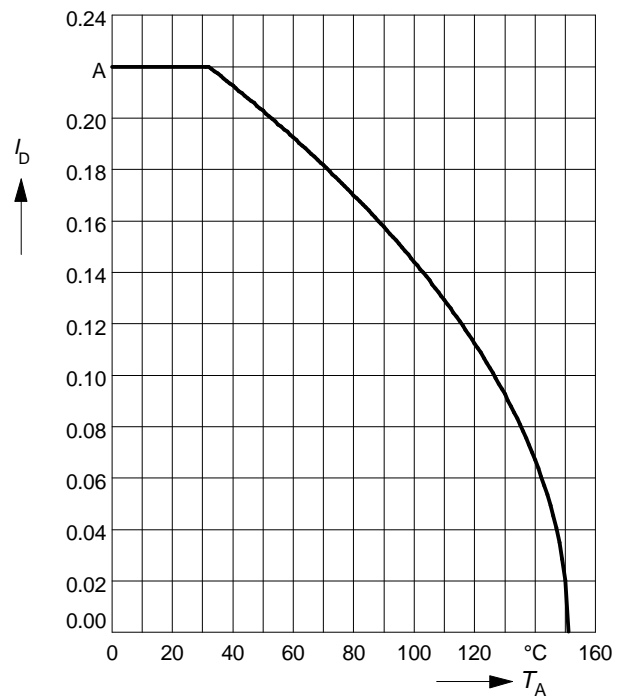
$$P_{\text{tot}} = f(T_A)$$



### Drain current

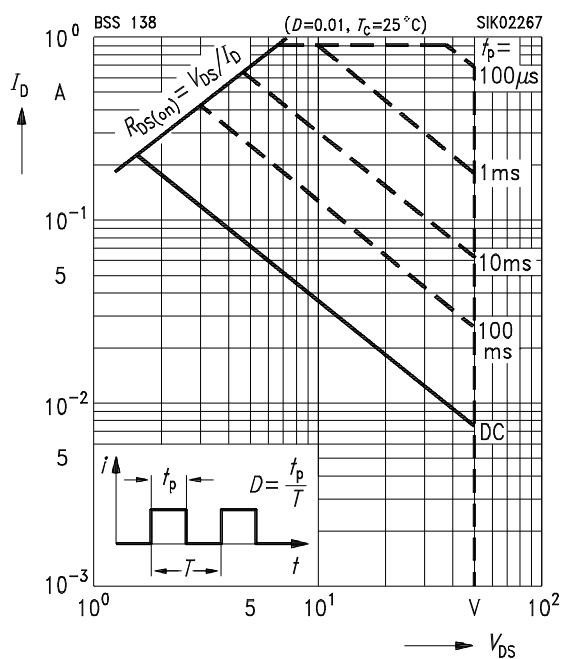
$$I_D = f(T_A)$$

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



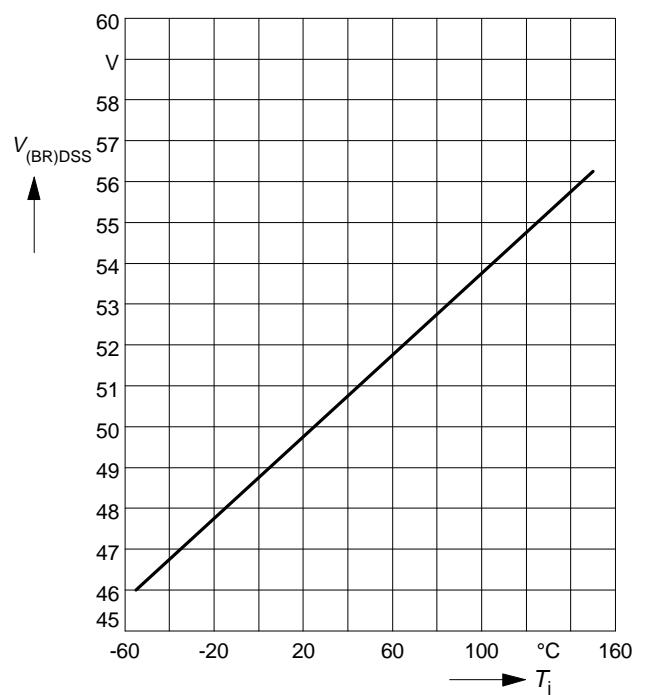
### Safe operating area $I_D = f(V_{DS})$

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



### Drain-source breakdown voltage

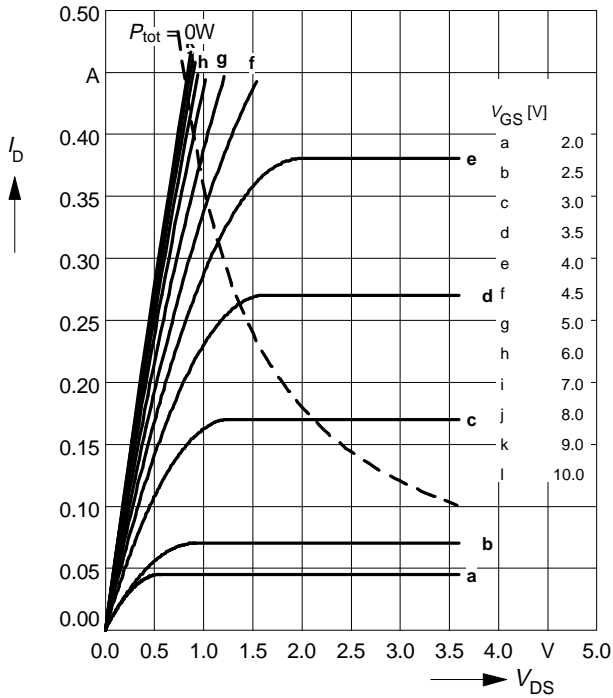
$$V_{(BR)DSS} = f(T_j)$$



### Typ. output characteristics

$$I_D = f(V_{DS})$$

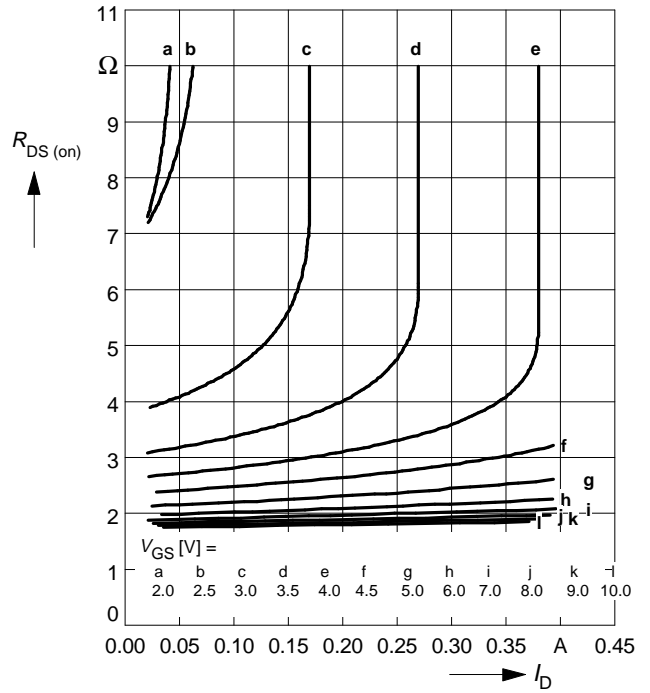
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. drain-source on-resistance

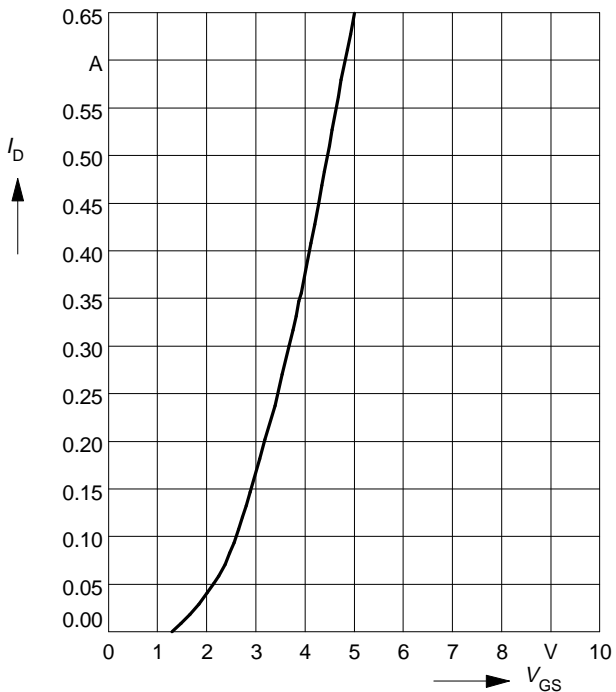
$$R_{DS(on)} = f(I_D)$$

parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



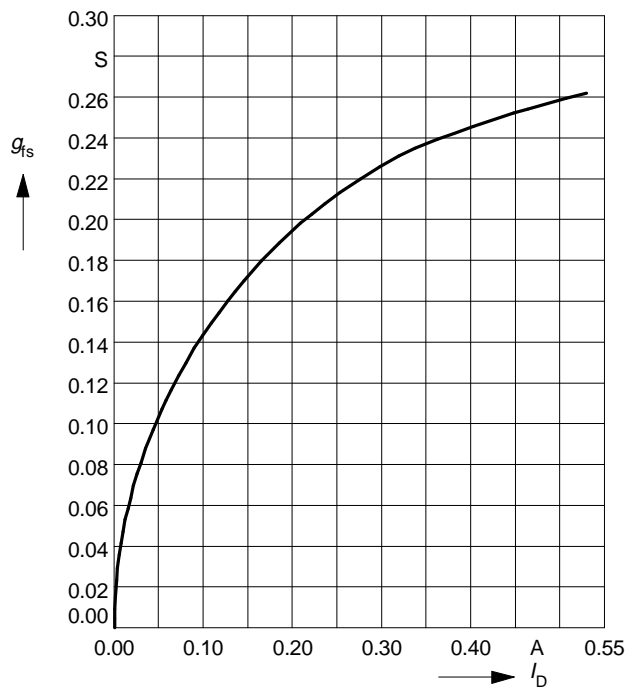
### Typ. transfer characteristics $I_D = f(V_{GS})$

parameter:  $t_p = 80 \mu s$



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

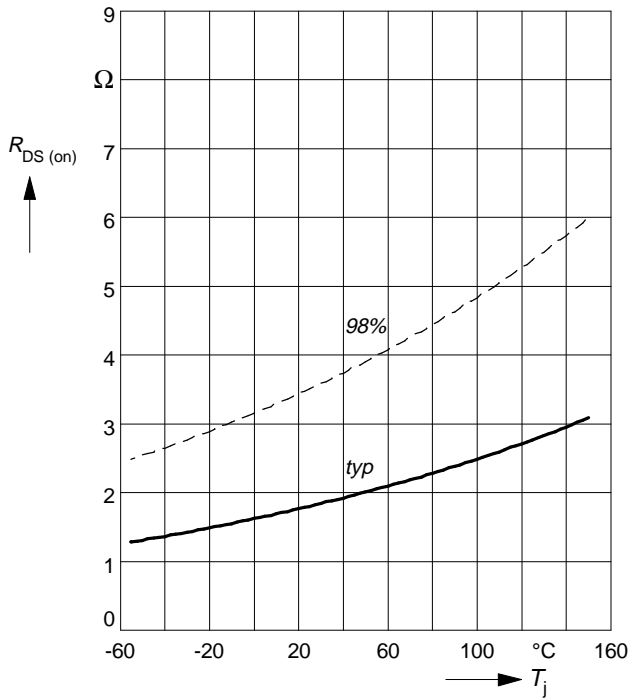
parameter:  $t_p = 80 \mu s$



### Drain-source on-resistance

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

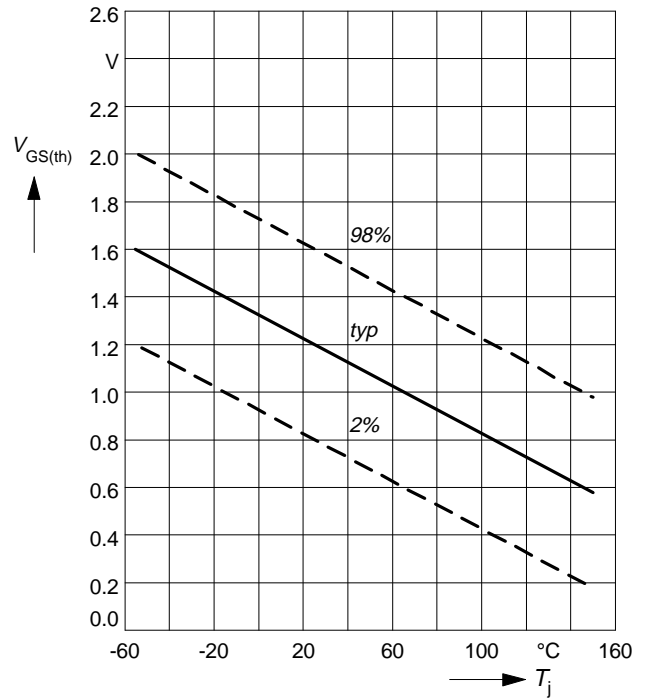
parameter:  $I_D = 0.22 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



### Gate threshold voltage

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

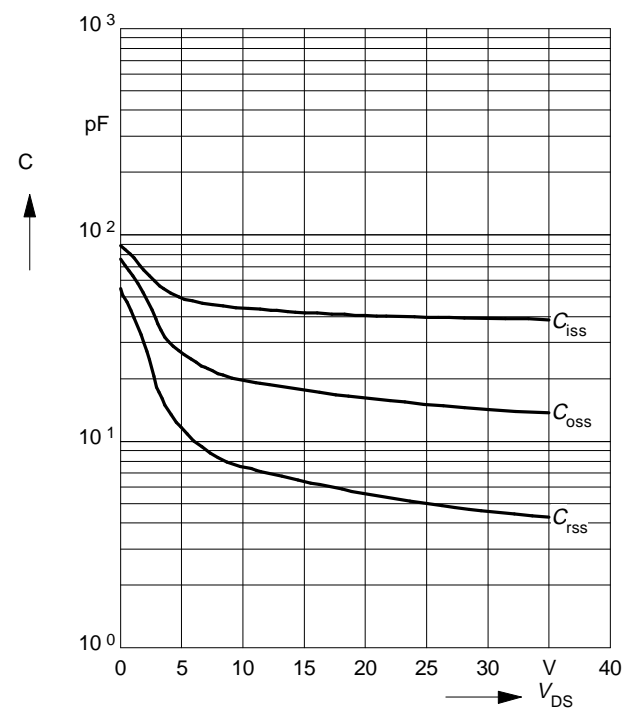
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 1 \text{ mA}$



### Typ. capacitances

$$C = f(V_{DS})$$

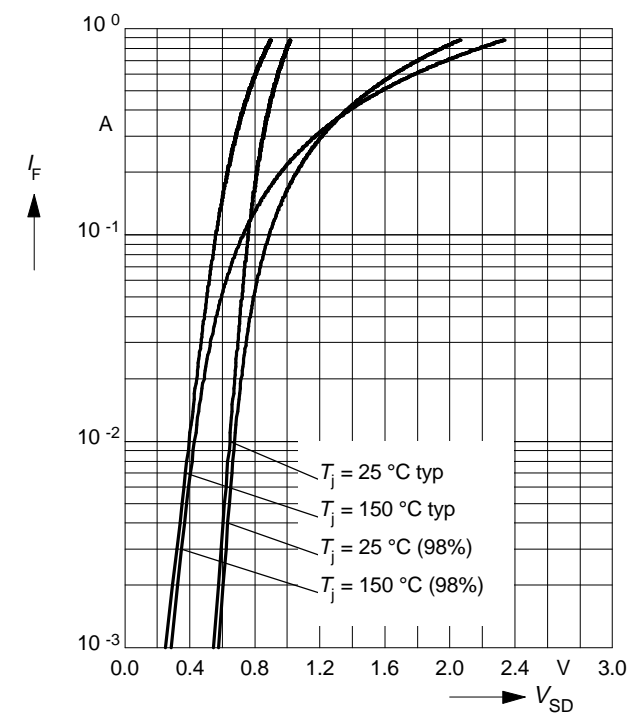
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



### Forward characteristics of reverse diode

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

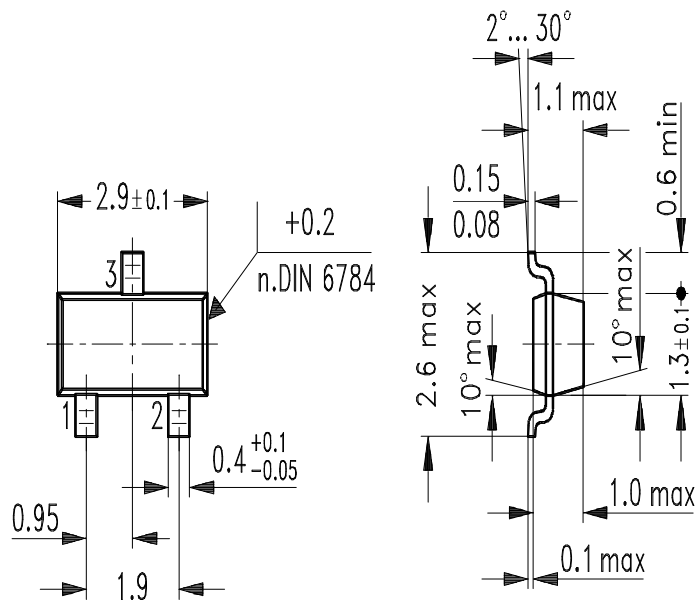
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



### Package outlines

SOT-23

Dimensions in mm



GPS05557