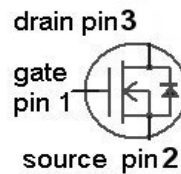


**SIPMOS® Small-Signal-Transistor**
**Features**

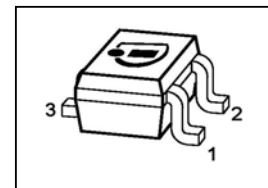
- N-channel
- Enhancement mode
- Logic level
- $dv/dt$  rated
- Pb-free lead-plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21

**Product Summary**

$V_{DS}$	60	V
$R_{DS(on),max}$	3.5	$\Omega$
$I_D$	0.28	A



PG-SOT-323



Type	Package	Tape and Reel	Marking
BSS138W	PG-SOT-323	H6327: 3000	SWs
BSS138W	PG-SOT-323	H6433: 10000	SWs

**Maximum ratings**, at  $T_j=25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_A=25\text{ °C}$	0.28	A
		$T_A=70\text{ °C}$	0.22	
Pulsed drain current	$I_{D,pulse}$	$T_A=25\text{ °C}$	1.12	
Reverse diode $dv/dt$	$dv/dt$	$I_D=0.28\text{ A}$ , $V_{DS}=48\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{j,max}=150\text{ °C}$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$		$\pm 20$	V
ESD class (JESD22-A114-HBM)			0 (<250V)	
Power dissipation	$P_{tot}$	$T_A=25\text{ °C}$	0.50	W
Operating and storage temperature	$T_j$ , $T_{stg}$		-55 ... 150	°C
IEC climatic category; DIN IEC 68-1			55/150/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - minimal footprint	$R_{thJA}$		-	-	250	K/W
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**Electrical characteristics, at  $T_j=25\text{ °C}$ , unless otherwise specified**
**Static characteristics**

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=250\text{ }\mu\text{A}$	60	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=26\text{ }\mu\text{A}$	0.6	1.0	1.4	
Drain-source leakage current	$I_{D(off)}$	$V_{DS}=60\text{ V},$ $V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	-	0.1	$\mu\text{A}$
		$V_{DS}=60\text{ V},$ $V_{GS}=0\text{ V}, T_j=150\text{ °C}$	-	-	5	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	-	1	10	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}, I_D=0.03\text{ A}$	-	3	4.0	$\Omega$
		$V_{GS}=4.5\text{ V}, I_D=0.16\text{ A}$	-	3.2	6	
		$V_{GS}=10\text{ V}, I_D=0.2\text{ A}$	-	2.1	3.5	
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max},$ $I_D=0.22\text{ A}$	0.12	0.23	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$	-	32	43	pF
Output capacitance	$C_{oss}$		-	7.2	10	
Reverse transfer capacitance	$C_{rss}$		-	2.8	4.2	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$ $I_D=0.2\text{ A}, R_G=6\ \Omega$	-	2.2	3.3	ns
Rise time	$t_r$		-	3.0	4.5	
Turn-off delay time	$t_{d(off)}$		-	6.7	10	
Fall time	$t_f$		-	8.2	12	

**Gate Charge Characteristics**

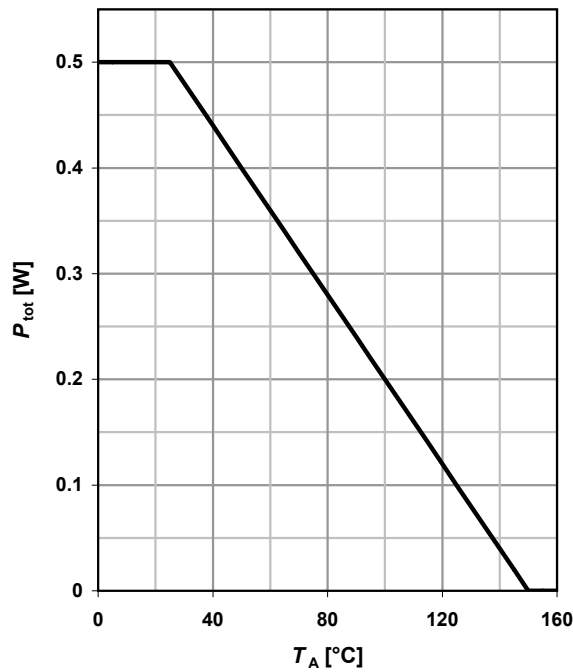
Gate to source charge	$Q_{gs}$	$V_{DD}=48\text{ V}, I_D=0.2\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	0.10	0.13	nC
Gate to drain charge	$Q_{gd}$		-	0.3	0.4	
Gate charge total	$Q_g$		-	1.0	1.5	
Gate plateau voltage	$V_{plateau}$		-	3.2	-	V

**Reverse Diode**

Diode continuous forward current	$I_S$	$T_A=25\text{ °C}$	-	-	0.28	A
Diode pulse current	$I_{S,pulse}$		-	-	1.12	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=0.28\text{ A},$ $T_j=25\text{ °C}$	-	0.85	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=30\text{ V}, I_F=0.28\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	8.3	12.4	ns
Reverse recovery charge	$Q_{rr}$		-	3.3	5	nC

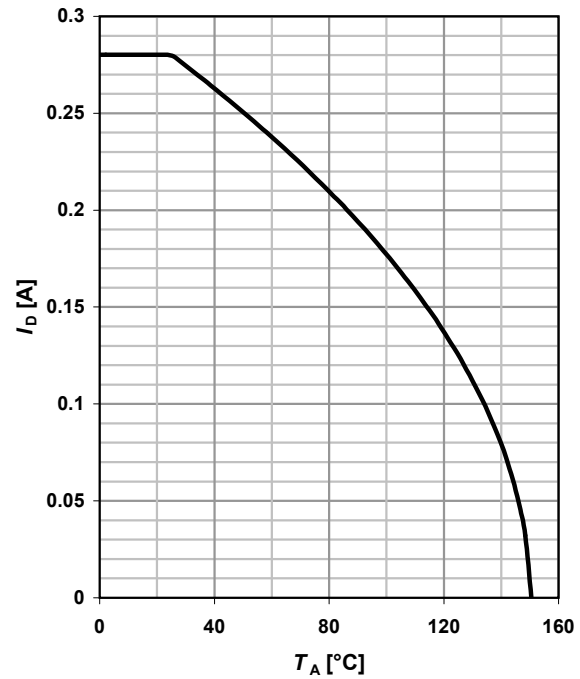
### 1 Power dissipation

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



### 2 Drain current

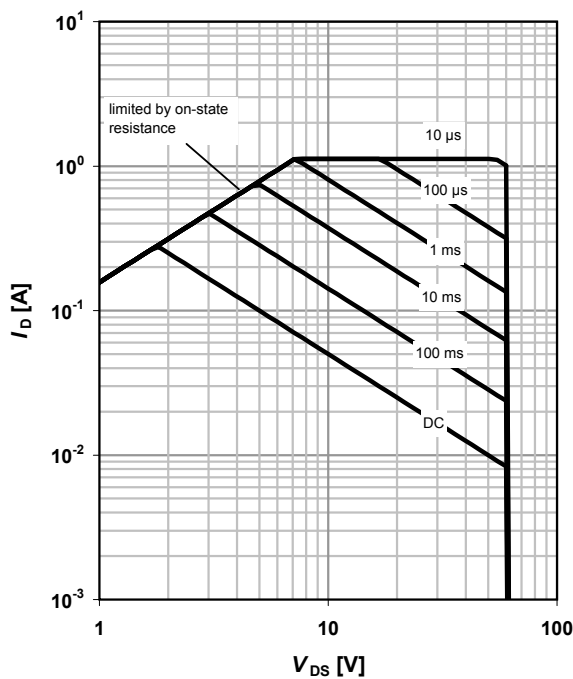
$$I_D = f(T_A); V_{GS} \geq 10 \text{ V}$$



### 3 Safe operating area

$$I_D = f(V_{DS}); T_A = 25 \text{ °C}; D = 0$$

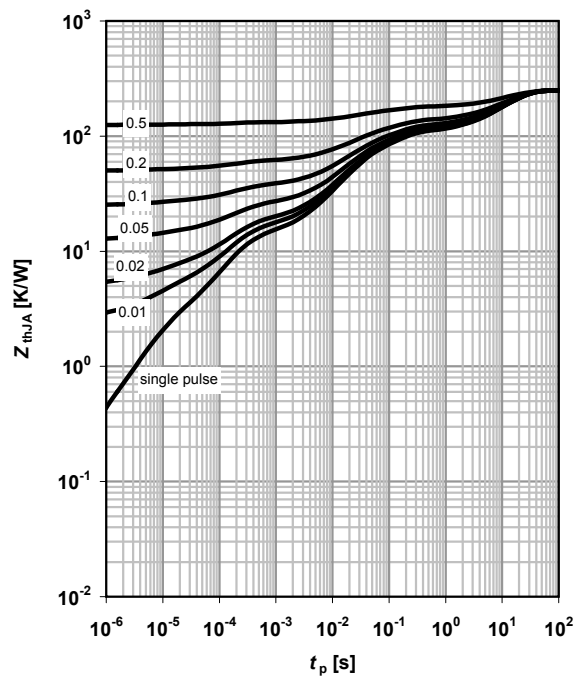
parameter:  $t_p$



### 4 Max. transient thermal impedance

$$Z_{\text{thJA}} = f(t_p)$$

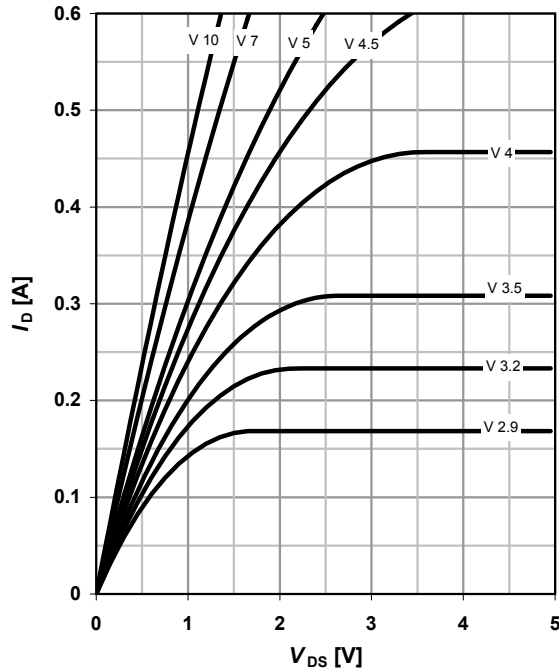
parameter:  $D = t_p / T$



### 5 Typ. output characteristics

$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}$$

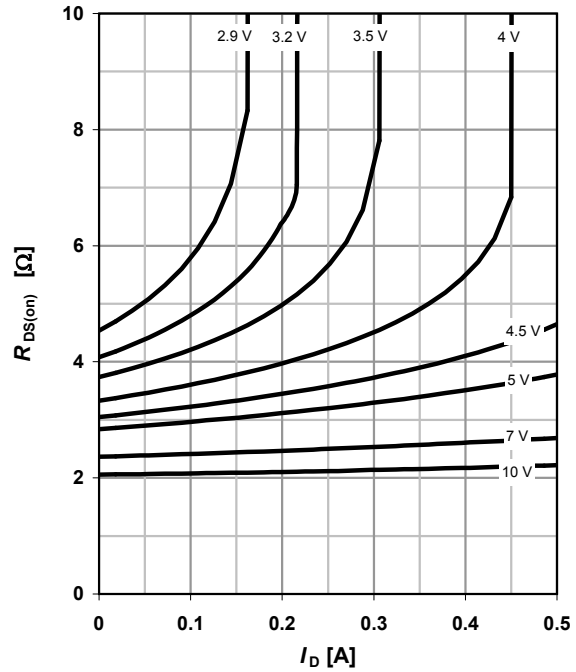
parameter:  $V_{GS}$



### 6 Typ. drain-source on resistance

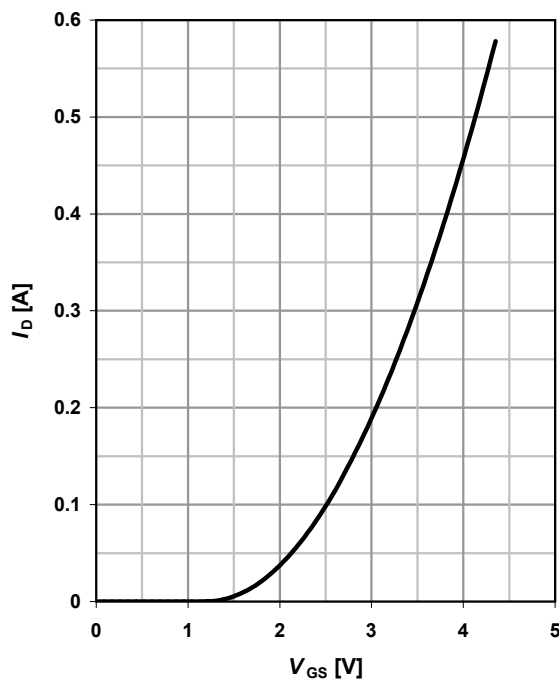
$$R_{DS(on)} = f(I_D); T_J = 25^\circ\text{C}$$

parameter:  $V_{GS}$



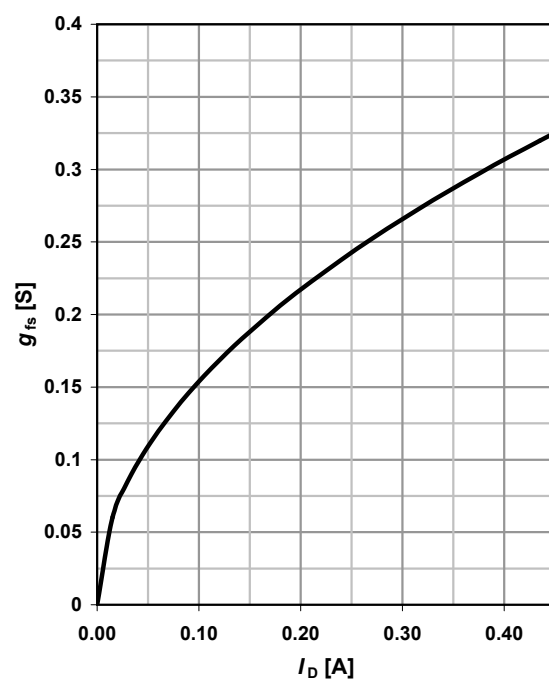
### 7 Typ. transfer characteristics

$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$$



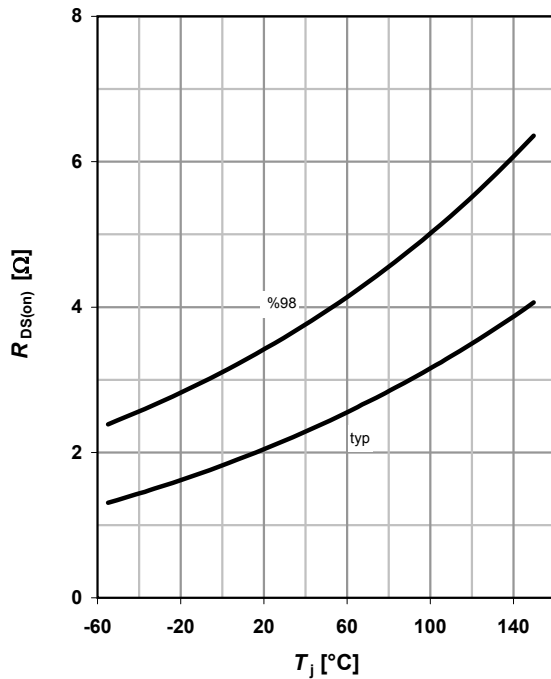
### 8 Typ. forward transconductance

$$g_{fs} = f(I_D); T_J = 25^\circ\text{C}$$



### 9 Drain-source on-state resistance

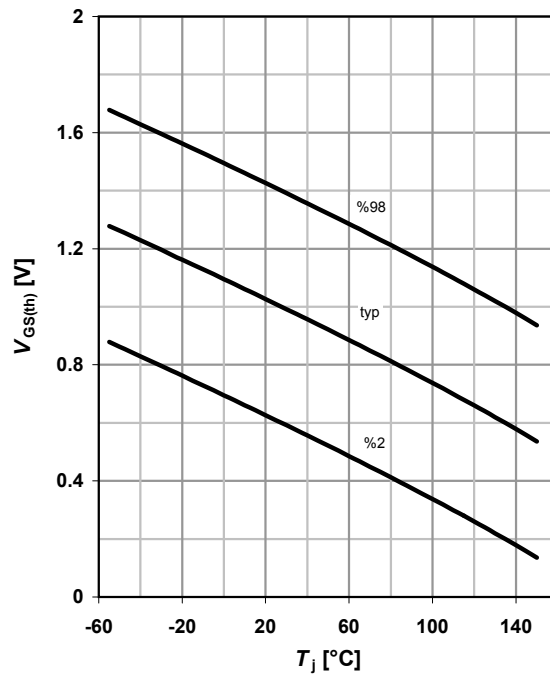
$$R_{DS(on)} = f(T_j); I_D = 0.2 \text{ A}; V_{GS} = 10 \text{ V}$$



### 10 Typ. gate threshold voltage

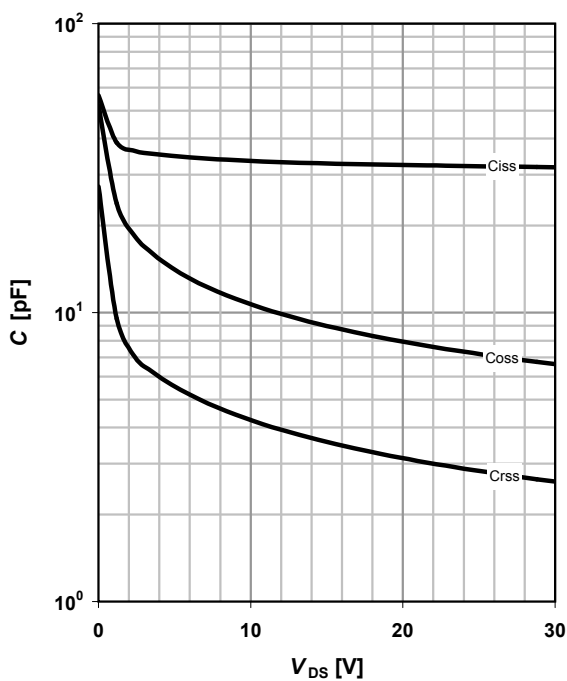
$$V_{GS(th)} = f(T_j); V_{DS} = V_{GS}; I_D = 26 \mu\text{A}$$

parameter:  $I_D$



### 11 Typ. capacitances

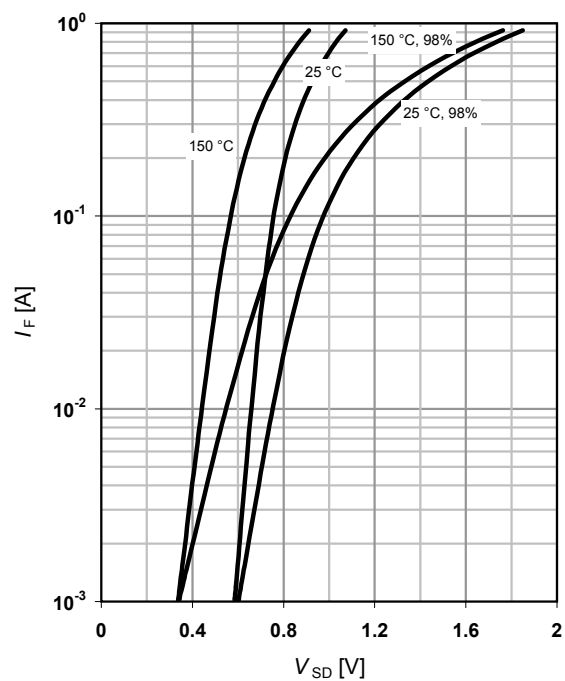
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}; T_j = 25^\circ\text{C}$$



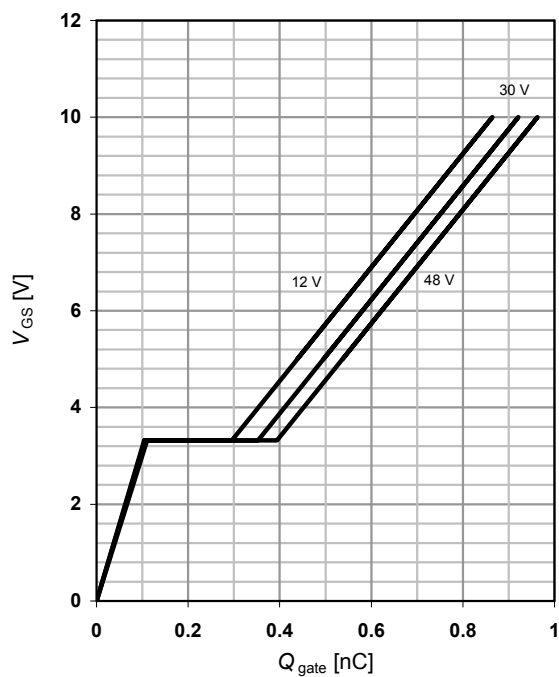
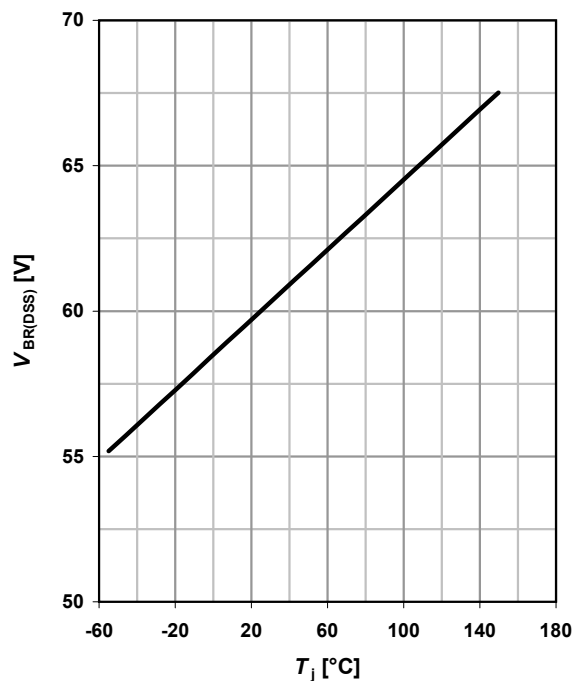
### 12 Forward characteristics of reverse diode

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

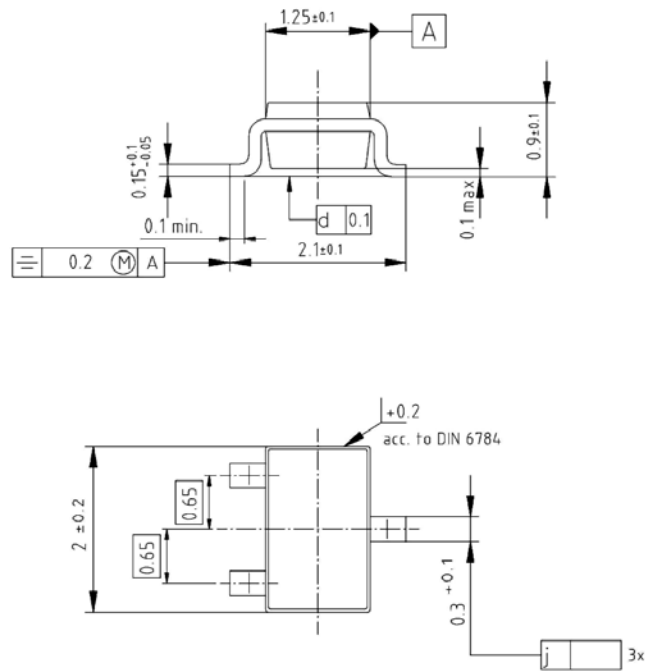
parameter:  $T_j$



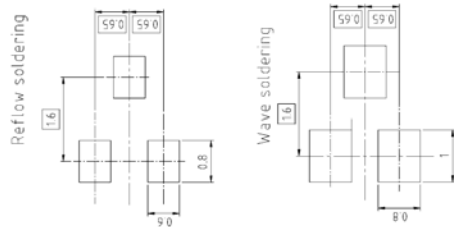
**13 Typ. gate charge**
 $V_{GS}=f(Q_{gate}); I_D=0.2\text{ A pulsed}$ 

parameter:  $V_{DD}$ 

**14 Drain-source breakdown voltage**
 $V_{BR(DSS)}=f(T_j); I_D=250\text{ }\mu\text{A}$ 


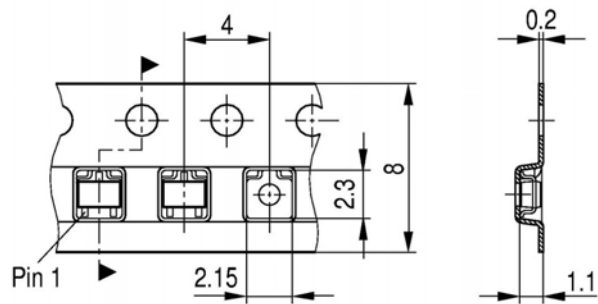
**Package Outline:**



**Footprint:**



**Packaging:**





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