

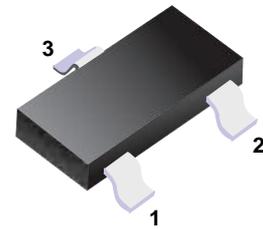
## Small-Signal-Transistor

### ■ Features

- N-Channel
- Enhancement mode
- Logic level
- $dv/dt$  rated

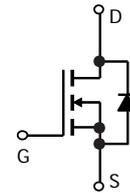
### ■ Product Summary

$V_{DS}$	240	V
$R_{DS(on),max}$	14	$\Omega$
$I_D$	0.1	A



1. Gate
2. Source
3. Drain

### ■ Simplified outline(SOT-23)



### ■ Absolute Maximum Ratings $T_a = 25^\circ\text{C}$

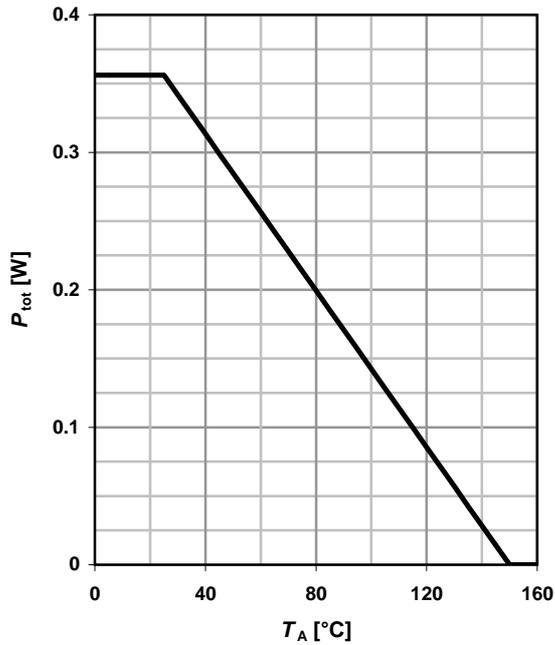
Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_A=25^\circ\text{C}$	0.11	A
		$T_A=70^\circ\text{C}$	0.09	
Pulsed drain current	$I_{D,pulse}$	$T_A=25^\circ\text{C}$	0.4	
Reverse diode $dv/dt$	$dv/dt$	$I_D=0.1\text{ A}$ , $V_{DS}=192\text{ V}$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{j,max}=150^\circ\text{C}$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$		$\pm 20$	V
ESD class (JESD22-A114-HBM)			0 (<250V)	
Power dissipation	$P_{tot}$	$T_A=25^\circ\text{C}$	0.36	W
Operating and storage temperature	$T_j, T_{stg}$		-55 ... 150	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1			55/150/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Thermal characteristics</b>						
Thermal resistance, junction - minimal footprint	$R_{thJA}$		-	-	350	K/W
<b>Electrical characteristics, at <math>T_j=25\text{ }^\circ\text{C}</math>, unless otherwise specified</b>						
<b>Static characteristics</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=250\text{ }\mu\text{A}$	240	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=0\text{ V}, I_D=56\text{ }\mu\text{A}$	0.8	1.4	1.8	
Drain-source leakage current	$I_{D(off)}$	$V_{DS}=240\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$	-	-	0.01	$\mu\text{A}$
		$V_{DS}=240\text{ V}, V_{GS}=0\text{ V}, T_j=150\text{ }^\circ\text{C}$	-	-	5	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	-	-	10	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}, I_D=0.09\text{ A}$	-	9.07	20	$\Omega$
		$V_{GS}=10\text{ V}, I_D=0.1\text{ A}$	-	7.7	14	
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=0.08\text{ A}$	0.06	0.13	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V}, f=1\text{ MHz}$	-	58	77	pF
Output capacitance	$C_{oss}$		-	7.3	10	
Reverse transfer capacitance	$C_{rss}$		-	2.8	4.2	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=120\text{ V}, V_{GS}=10\text{ V}, I_D=0.1\text{ A}, R_G=6\ \Omega$	-	3.3	5.0	ns
Rise time	$t_r$		-	3.1	4.6	
Turn-off delay time	$t_{d(off)}$		-	13.7	20	
Fall time	$t_f$		-	64.5	97	
<b>Gate Charge Characteristics</b>						
Gate to source charge	$Q_{gs}$	$V_{DD}=192\text{ V}, I_D=0.1\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	0.16	0.22	nC
Gate to drain charge	$Q_{gd}$		-	0.8	1.2	
Gate charge total	$Q_g$		-	2.1	3.1	
Gate plateau voltage	$V_{plateau}$		-	2.90	-	V
<b>Reverse Diode</b>						
Diode continuous forward current	$I_S$	$T_A=25\text{ }^\circ\text{C}$	-	-	0.11	A
Diode pulse current	$I_{S,pulse}$		-	-	0.43	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=0.1\text{ A}, T_j=25\text{ }^\circ\text{C}$	-	0.81	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=120\text{ V}, I_F=0.1\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$	-	42.9	64.3	ns
Reverse recovery charge	$Q_{rr}$		-	22.6	34	nC

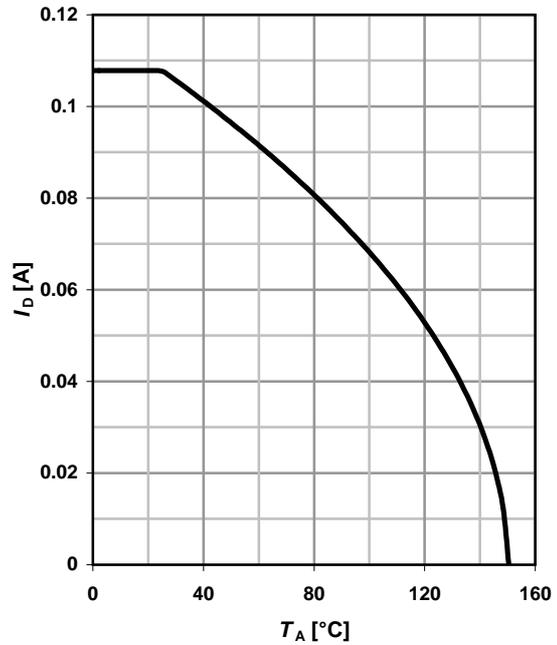
**1 Power dissipation**

$P_{tot}=f(T_A)$



**2 Drain current**

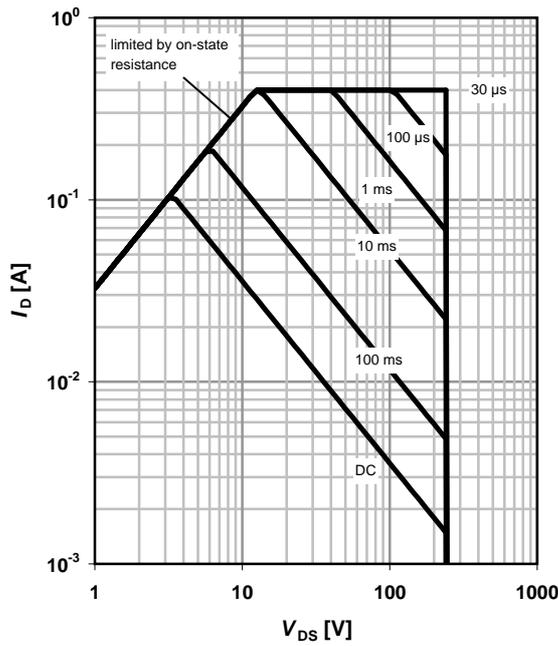
$I_D=f(T_A); V_{GS} \geq 10\text{ V}$



**3 Safe operating area**

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

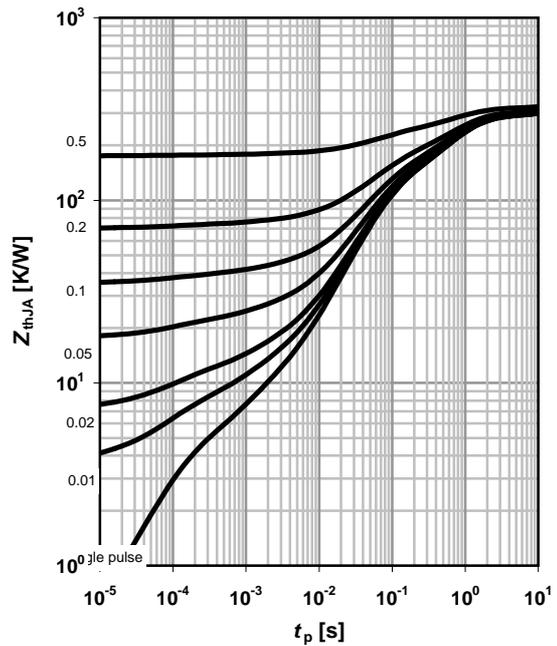
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJA}=f(t_p)$

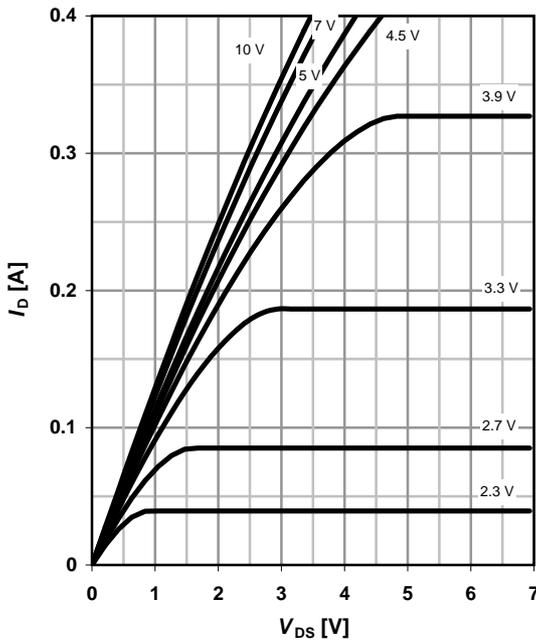
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

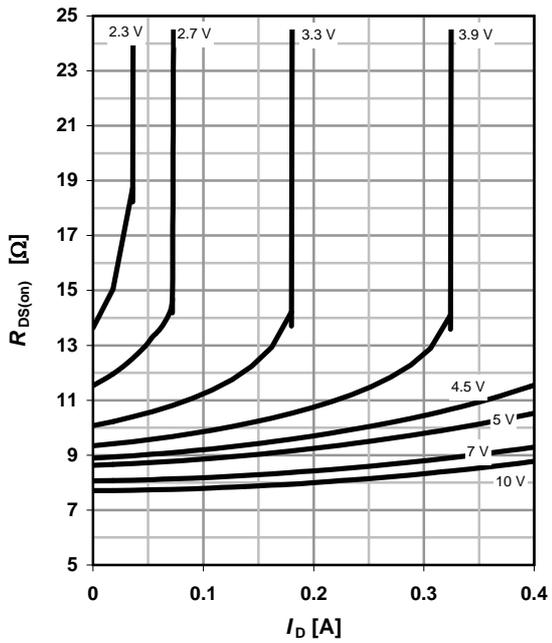
parameter:  $V_{GS}$



**6 Typ. drain-source on resistance**

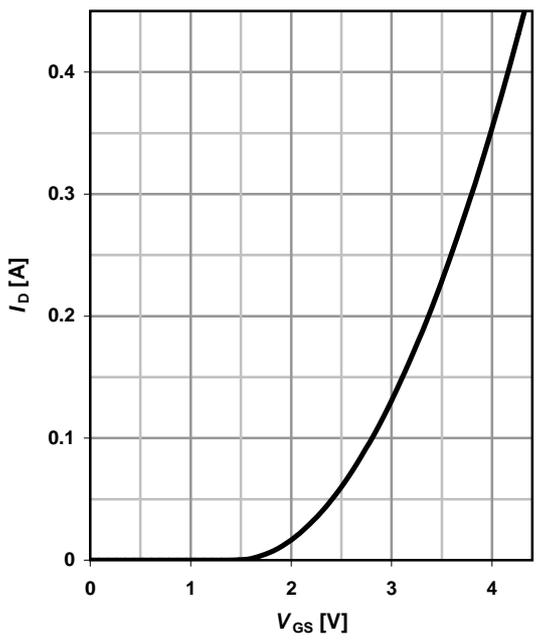
$R_{DS(on)} = f(I_D); T_j = 25\text{ }^\circ\text{C}$

parameter:  $V_{GS}$



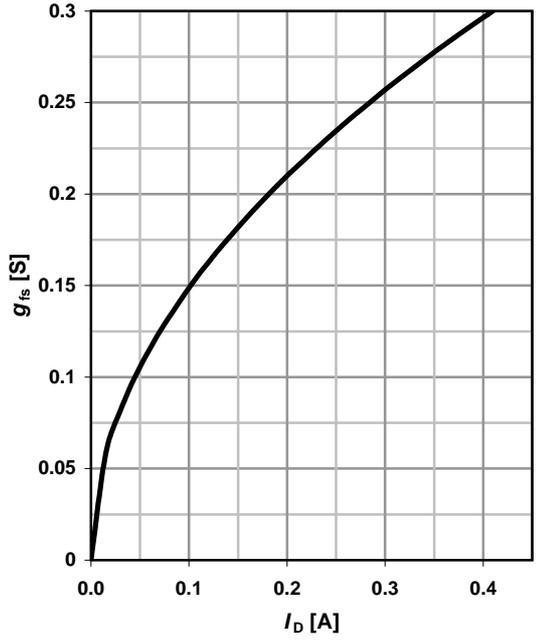
**7 Typ. transfer characteristics**

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



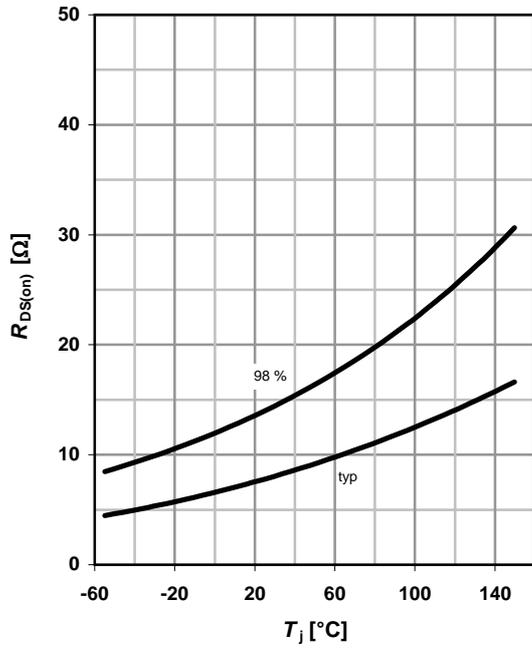
**8 Typ. forward transconductance**

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



**9 Drain-source on-state resistance**

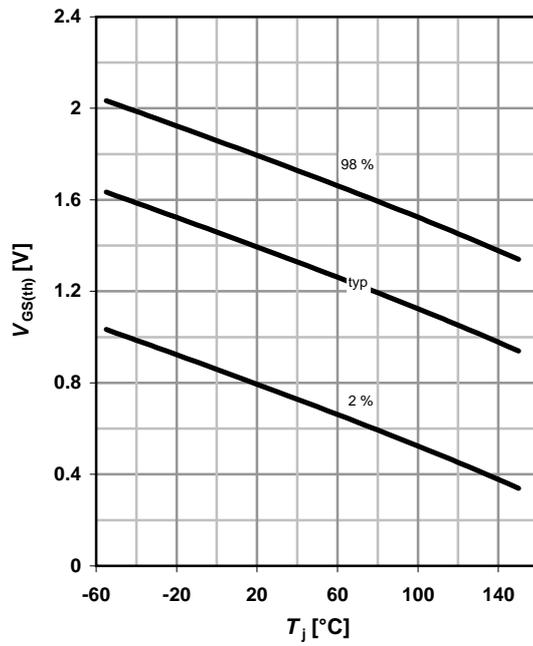
$R_{DS(on)}=f(T_j); I_D=0.1\text{ A}; V_{GS}=10\text{ V}$



**10 Typ. gate threshold voltage**

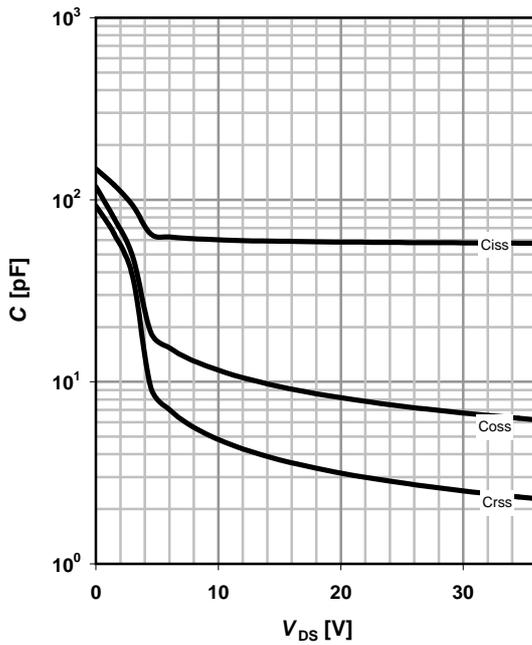
$V_{GS(th)}=f(T_j); V_{DS}=V_{GS}; I_D=56\ \mu\text{A}$

parameter:  $I_D$



**11 Typ. capacitances**

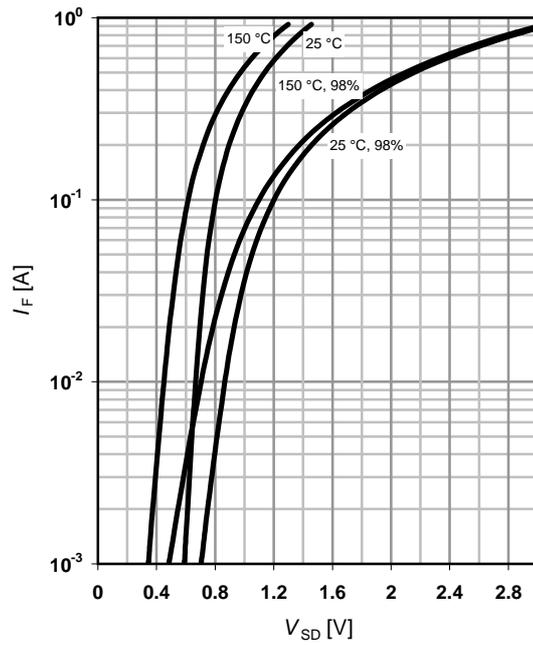
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}; T_j=25^\circ\text{C}$



**12 Forward characteristics of reverse diode**

$I_F=f(V_{SD})$

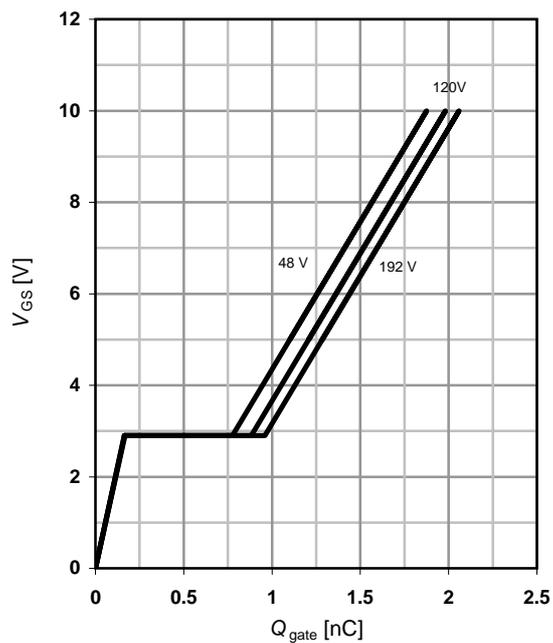
parameter:  $T_j$



**13 Typ. gate charge**

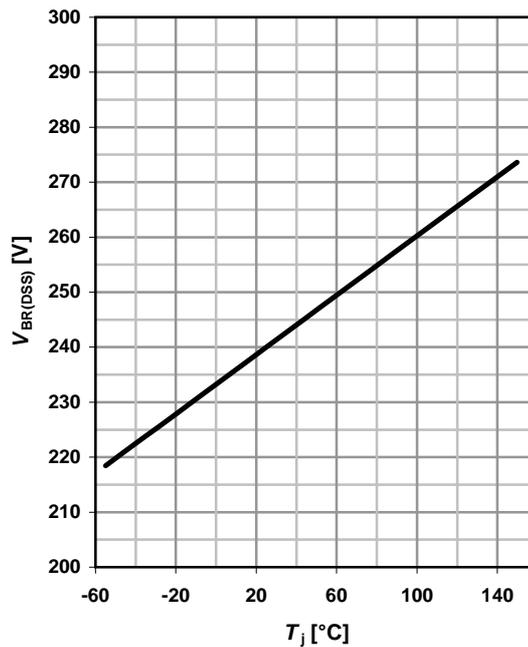
$V_{GS}=f(Q_{gate}); I_D=0.1 \text{ A pulsed}$

parameter:  $V_{DD}$

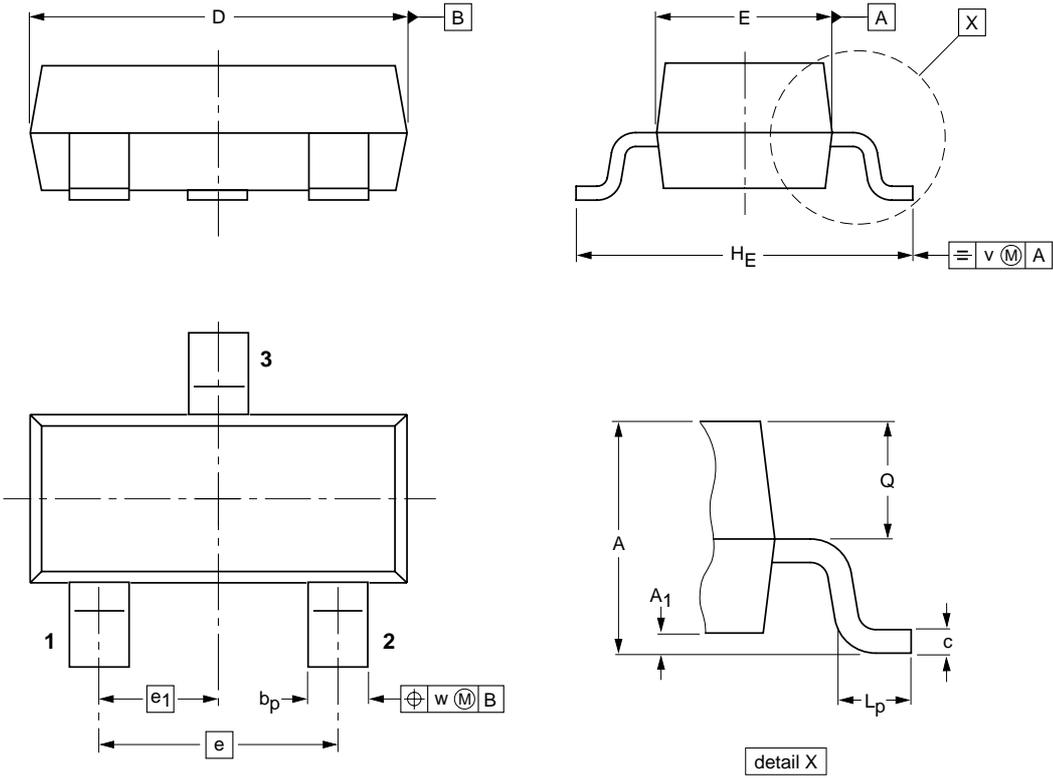


**14 Drain-source breakdown voltage**

$V_{BR(DSS)}=f(T_j); I_D=250 \mu\text{A}$



■ SOT-23



**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub> max.	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1