

N-Channel Logic Level Enhancement Mode Field Effect Transistor

BSS138K

Features

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- Green Compound
- ESD HBM = 2000 V as per JEDEC A114A;
ESD CDM = 2000 V as per JEDEC C101C
- This Device is Pb-Free and is RoHS Compliant

ABSOLUTE MAXIMUM RATINGS

($T_A = 25^\circ\text{C}$ unless otherwise noted) (Note 1)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	50	V
V_{GS}	Gate-Source Voltage	± 12	V
I_D	Drain Current – Continuous	0.22	A
	Drain Current – Pulsed	0.88	
P_D	Total Device Dissipation	350	mW
	Derating above $T_A = 25^\circ\text{C}$	2.8	mW/ $^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to $+150$	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to $+150$	$^\circ\text{C}$

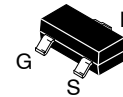
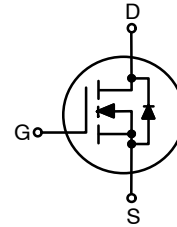
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. These ratings are limiting values above which the serviceability of any semiconductor device maybe impaired.

THERMAL CHARACTERISTICS

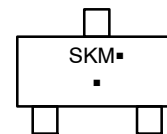
Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	350	$^\circ\text{C/W}$

2. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch. Minimum land pad size.



SOT-23-3
CASE 318-08

MARKING DIAGRAM



SK = Specific Device Code
M = Assembly Operation Month
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
BSS138K	SOT-23-3 (Pb-Free)	3000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

BSS138K

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 10\text{ }\mu\text{A}$	50	–	–	V
$\frac{BV_{DSS}}{T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	–	0.11	–	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$	–	–	0.1	μA
I_{GSS}	Gate–Body Leakage	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$	–	–	± 1	μA
		$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	–	–	± 0.5	
		$V_{GS} = \pm 5\text{ V}, V_{DS} = 0\text{ V}$	–	–	± 0.05	

ON CHARACTERISTICS

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.6	–	1.2	V
$\frac{V_{GS(th)}}{T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 1\text{ mA}$, Referenced to 25°C	–	–1.4	–	mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 1.8\text{ V}, I_D = 50\text{ mA}$	–	–	2.5	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 50\text{ mA}$	–	–	2.0	
		$V_{GS} = 5\text{ V}, I_D = 50\text{ mA}$	–	–	1.6	
$I_{D(ON)}$	On–State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	0.2	–	–	A
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 200\text{ mA}$	200	–	–	mS

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	–	58	–	pF
C_{oss}	Output Capacitance		–	9.75	–	
C_{rss}	Reverse Transfer Capacitance		–	5.2	–	
R_G	Gate Resistance	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ mV}$	–	281	–	Ω

SWITCHING CHARACTERISTICS

$t_{D(ON)}$	Turn–On Delay Time	$V_{DD} = 30\text{ V}, I_D = 0.29\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$	–	–	5	ns
t_r	Turn–On Rise Time		–	–	5	
$t_{D(OFF)}$	Turn–Off Delay Time		–	–	60	
t_f	Turn–Off Fall Time		–	–	35	
Q_g	Total Gate Charge	$V_{DS} = 25\text{ V}, I_D = 0.2\text{ A},$ $V_{GS} = 10\text{ V}, I_G = 0.1\text{ mA}$	–	–	2.4	nC
Q_{gs}	Gate–Source Charge		–	–	0.5	
Q_{gd}	Gate–Drain Charge		–	–	0.5	

DRAIN–SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

V_{sd}	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 115\text{ mA}$	–	–	1.2	V
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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

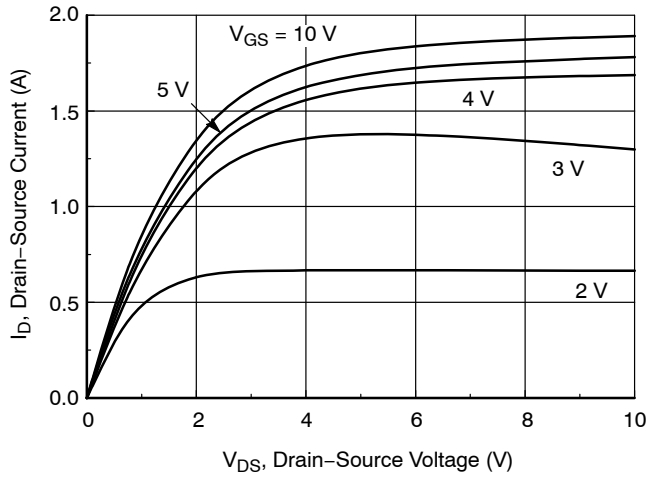


Figure 1. On-Region Characteristics

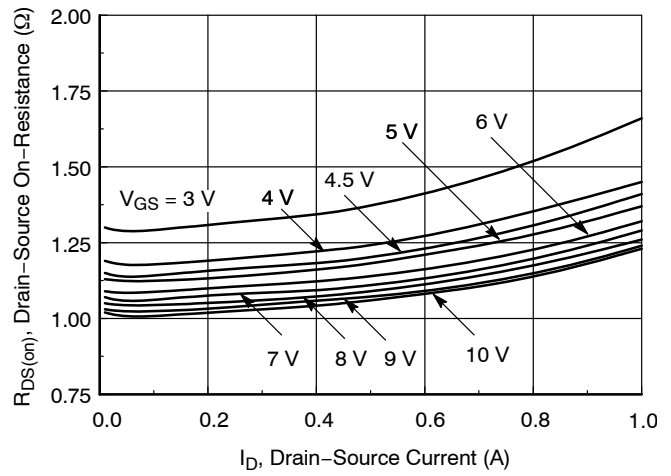


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

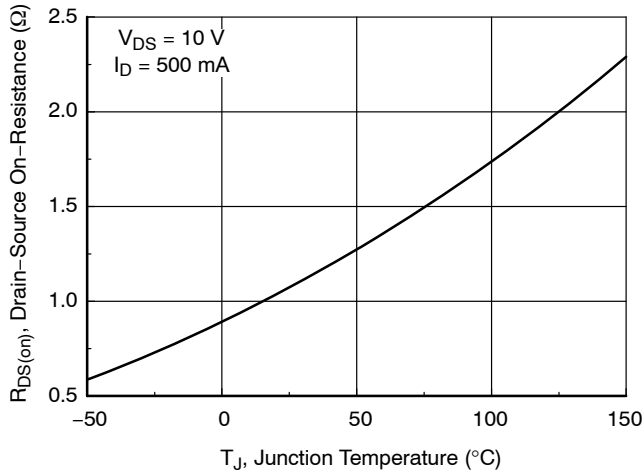


Figure 3. On-Resistance Variation with Temperature

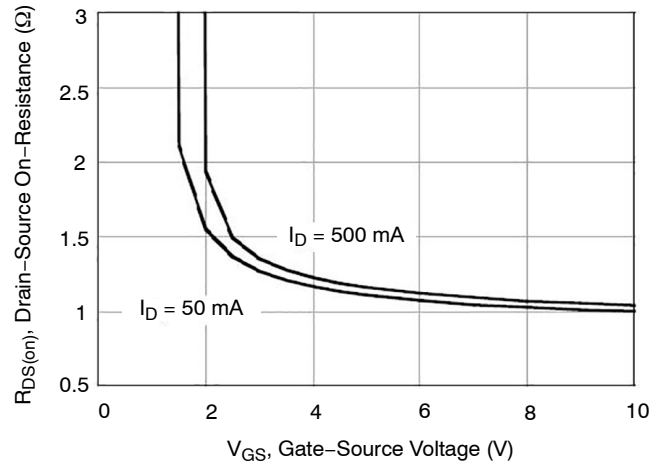


Figure 4. On-Resistance Variation with Gate-Source Voltage

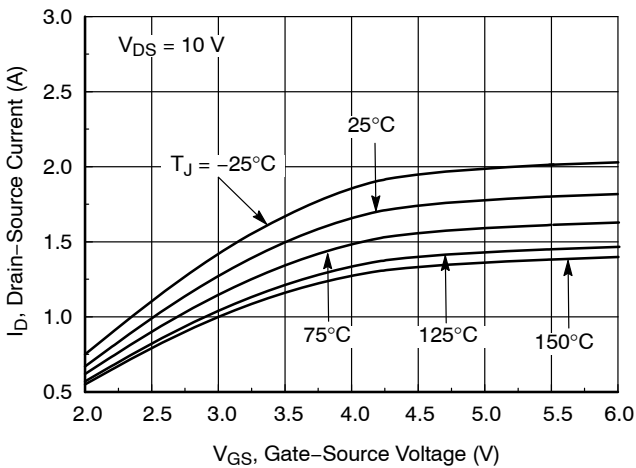


Figure 5. Transfer Characteristics

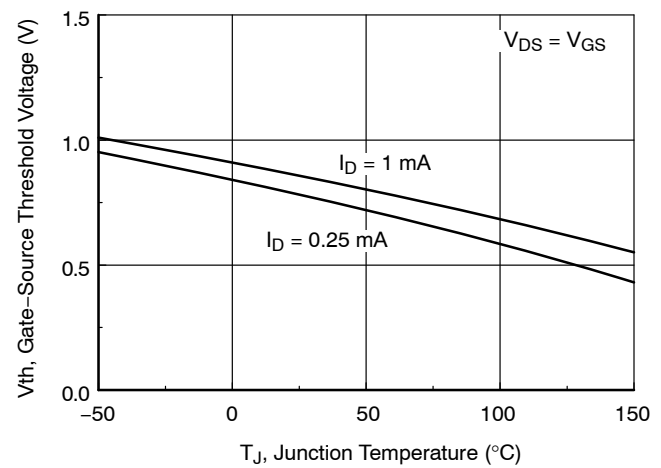


Figure 6. Gate Threshold Variation with Temperature

TYPICAL CHARACTERISTICS (continued)

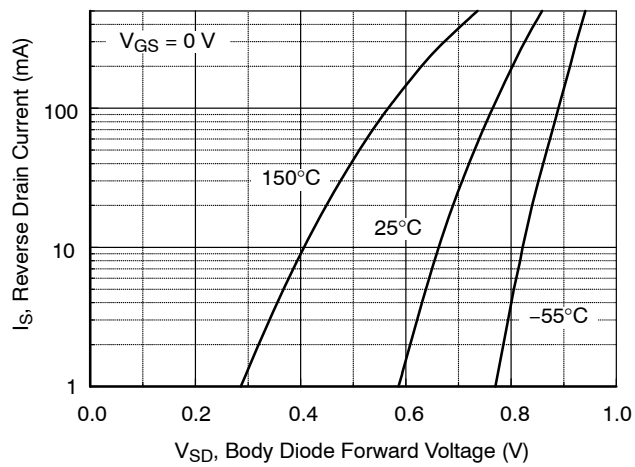


Figure 7. Reverse Drain Current Variation with Diode Forward Voltage and Temperature

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