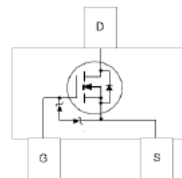
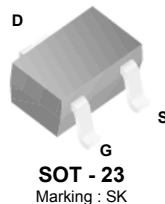


# BSS138K

## N-Channel Logic Level Enhancement Mode Field Effect Transistor

### Features

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



### Absolute Maximum Ratings \* $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-Source Voltage	50	V
$V_{GSS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current	Continuous	0.22
		Pulsed	0.88
$T_J$	Operating Junction Temperature Range	-55 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

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

### Thermal Characteristics

Symbol	Parameter	Value	Units
$P_D$	Total Device Dissipation Derating above $T_A = 25^\circ\text{C}$	350	mW
		2.8	mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient *	350	$^\circ\text{C}/\text{W}$

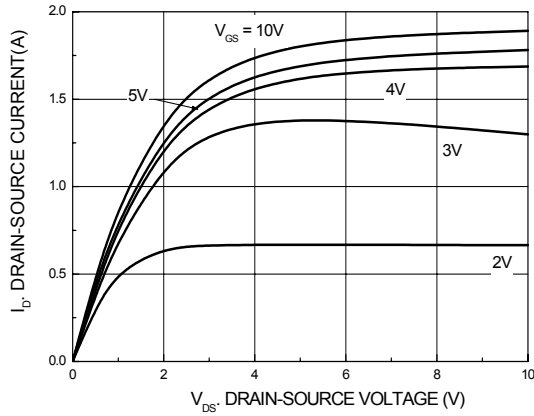
\* Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch. Minimum land pad size

**Electrical Characteristics**  $T_A = 25^\circ\text{C}$  unless otherwise noted

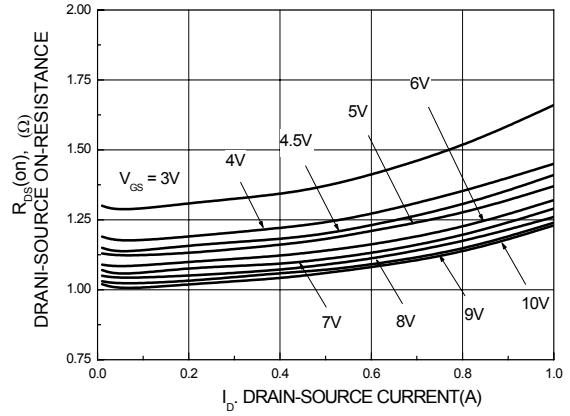
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 10\mu A$	50			V
$\frac{BV_{DSS}}{T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$ , Referenced to $25^\circ\text{C}$		0.11		$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 50V, V_{GS} = 0V$			0.1	$\mu A$
$I_{GSS}$	Gate-Body Leakage	$V_{GS} = \pm 12V, V_{DS} = 0V$ $V_{GS} = \pm 10V, V_{DS} = 0V$ $V_{GS} = \pm 5V, V_{DS} = 0V$			$\pm 1$ $\pm 0.5$ $\pm 0.05$	$\mu A$
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	0.6		1.2	V
$\frac{V_{GS(th)}}{T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 1mA$ , Referenced to $25^\circ\text{C}$		-1.4		$mV/^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 1.8V, I_D = 50mA$ , $V_{GS} = 2.5V, I_D = 50mA$ , $V_{GS} = 5V, I_D = 50mA$ ,			2.5 2.0 1.6	$\Omega$
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10V, V_{DS} = 5V$	0.2			A
$g_{FS}$	Forward Transconductance	$V_{DS} = 10V, I_D = 200mA$	200			mS
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$		58		pF
$C_{oss}$	Output Capacitance			9.75		
$C_{rss}$	Reverse Transfer Capacitance			5.2		
$R_G$	Gate Resistance	$V_{DS} = 5V, V_{GS} = 10mV$		281		$\Omega$
<b>Switching Characteristics</b>						
$t_{D(on)}$	Turn-On Delay Time	$V_{DD} = 30V, I_D = 0.29A$ , $V_{GS} = 10V, R_{GEN} = 6\Omega$			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 Change	$V_{DS} = 25V, I_D = 0.2A$ , $V_{GS} = 10V, I_G = 0.1mA$			2.4	nC
$Q_{gs}$	Gate-Source Change				0.5	
$Q_{gd}$	Gate-Drain Change				0.5	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$V_{sd}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 115mA$			1.2	V

## Typical Performance Characteristics

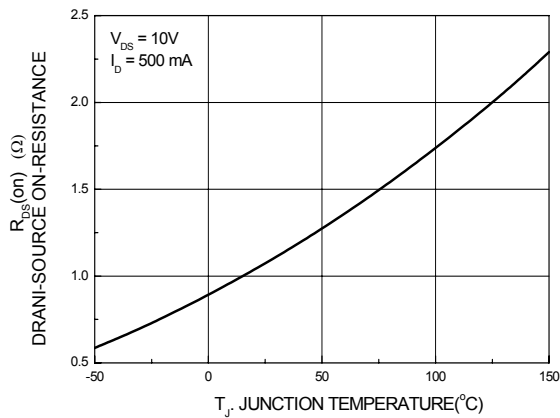
**Figure 1. On-Region Characteristics**



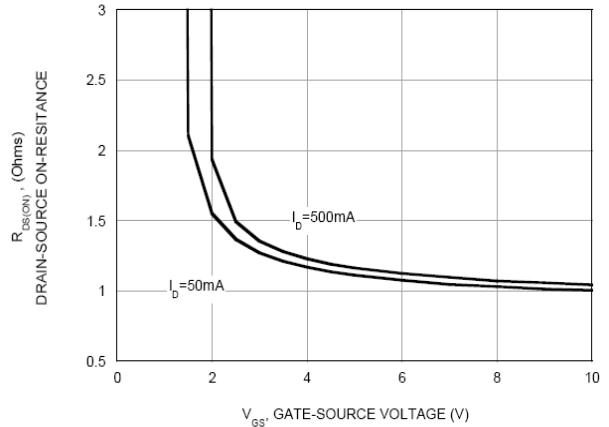
**Figure 2. On-Resistance Variation with Gate Voltage and Drain Current**



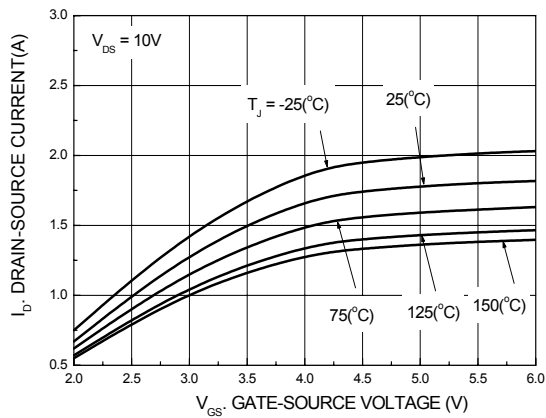
**Figure 3. On-Resistance Variation with Temperature**



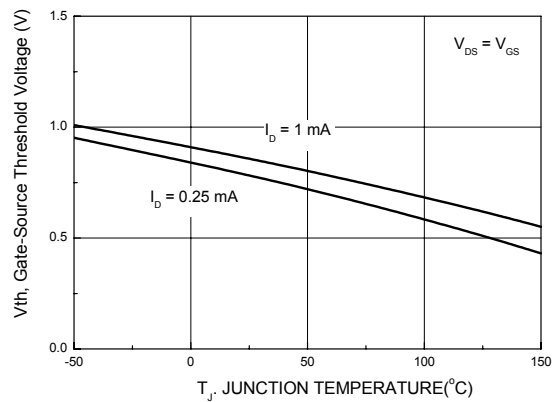
**Figure 4. On-Resistance Variation with Gate-Source Voltage**



**Figure 5. Transfer Characteristics**

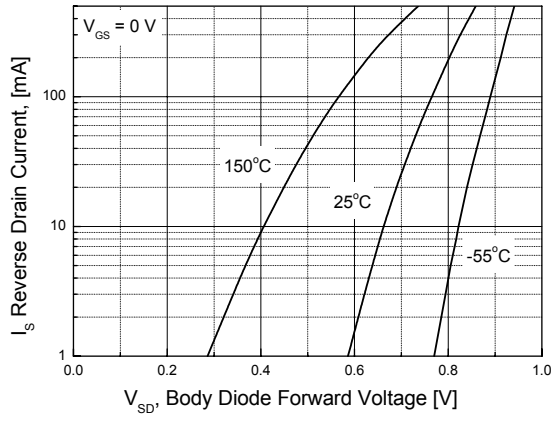


**Figure 6. Gate Threshold Variation with Temperature**



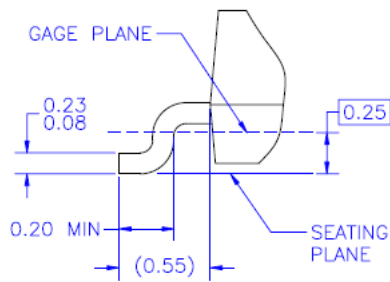
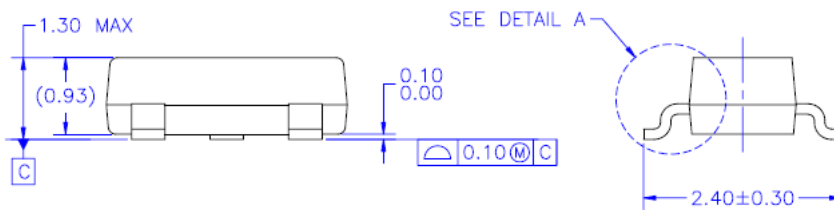
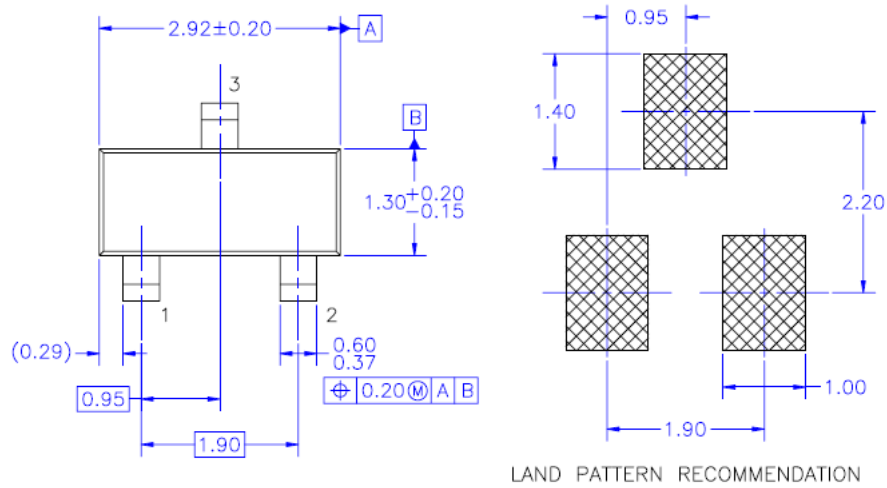
Typical Performance Characteristics (Continue)

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



Physical Dimensions

SOT - 23



DETAIL A  
SCALE: 2X






NOTES: UNLESS OTHERWISE SPECIFIED

- A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 1994.
- E) DRAWING FILE NAME: MA03DREV9



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