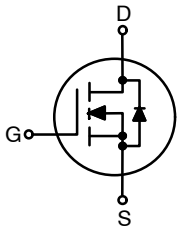
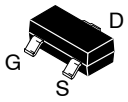
N-Channel Logic Level Enhancement Mode Field Effect Transistor

BSS138K



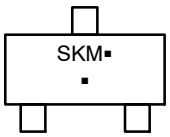


SOT−23−3
CASE 318−08

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

MARKING DIAGRAM



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

(Note: Microdot may be in either location)

ABSOLUTE MAXIMUM RATINGS

(T_A = 25°C unless otherwise noted) (Note 1)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain−Source Voltage	50	V
V_{GSS}	Gate−Source Voltage	±12	V
I_D	Drain Current − Continuous	0.22	A
	Drain Current − Pulsed	0.88	
P_D	Total Device Dissipation	350	mV
	Derating above T_A = 25°C	2.8	mW/°C
T_J	Operating Junction Temperature Range	−55 to +150	°C
T_{STG}	Storage Temperature Range	−55 to +150	°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	V

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

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.

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ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 10 μA	50	–	–	V
$\frac{BV_{DSS}}{T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	0.11	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 50 V, V_{GS} = 0 V	–	–	0.1	μA
I_{GSS}	Gate–Body Leakage	V_{GS} = ±12 V, V_{DS} = 0 V	–	–	±1	μA
		V_{GS} = ±10 V, V_{DS} = 0 V	–	–	±0.5	
		V_{GS} = ±5 V, V_{DS} = 0 V	–	–	±0.05	
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	0.6	–	1.2	V
$\frac{V_{GS(th)}}{T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 1 mA, Referenced to 25°C	–	–1.4	–	mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 1.8 V, I_D = 50 mA	–	–	2.5	Ω
		V_{GS} = 2.5 V, I_D = 50 mA	–	–	2.0	
		V_{GS} = 5 V, I_D = 50 mA,	–	–	1.6	
$I_{D(ON)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	0.2	–	–	A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 200 mA	200	–	–	mS
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	–	58	–	pF
C_{oss}	Output Capacitance		–	9.75	–	
C_{rss}	Reverse Transfer Capacitance		–	5.2	–	
R_G	Gate Resistance	V_{DS} = 5 V, V_{GS} = 10 mV	–	281	–	Ω
SWITCHING CHARACTERISTICS						
$t_{D(ON)}$	Turn–On Delay Time	V_{DD} = 30 V, I_D = 0.29 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	–	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 V, I_D = 0.2 A, V_{GS} = 10 V, I_G = 0.1 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 V, I_S = 115 mA	–	–	1.2	V

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

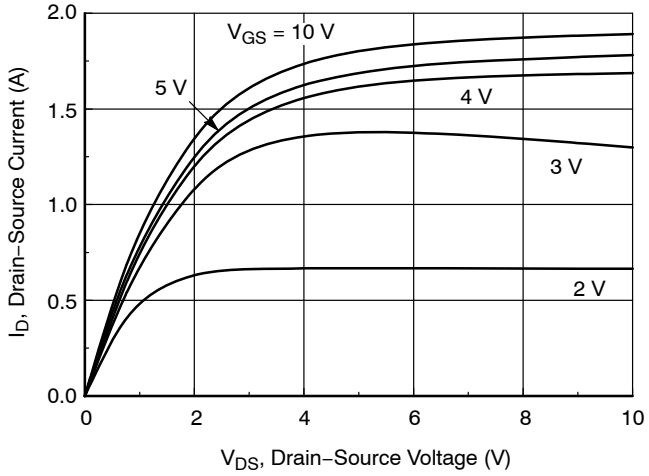

Figure 1. On−Region Characteristics

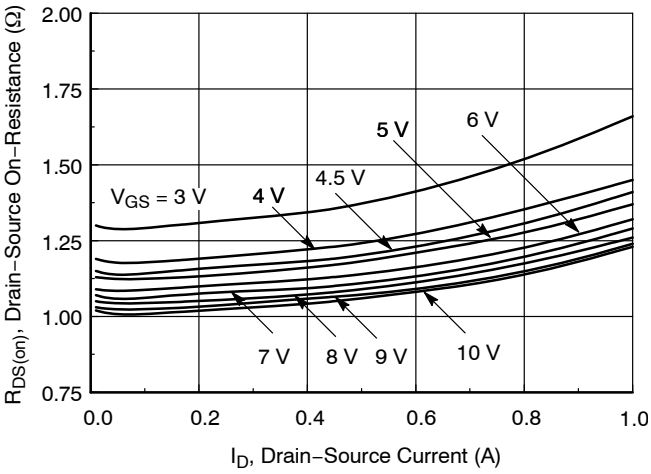

Figure 2. On−Resistance Variation with Gate Voltage and Drain Current

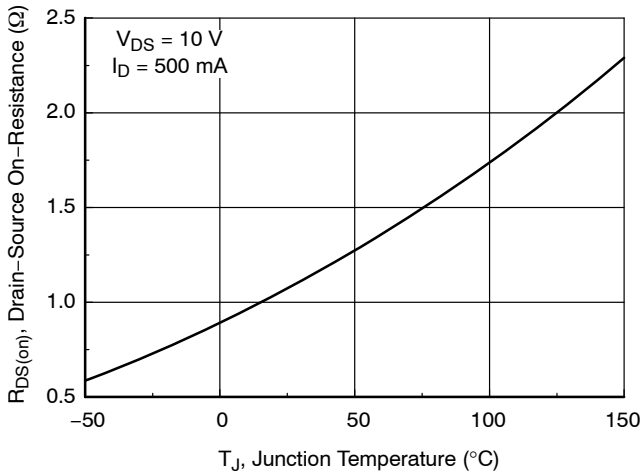

Figure 3. On−Resistance Variation with Temperature

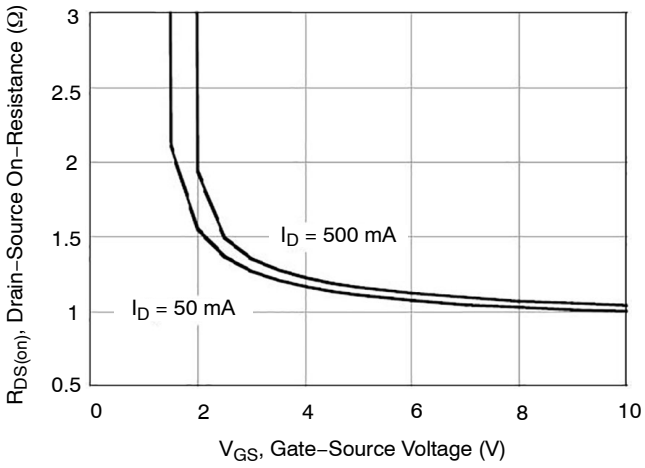

Figure 4. On−Resistance Variation with Gate−Source Voltage

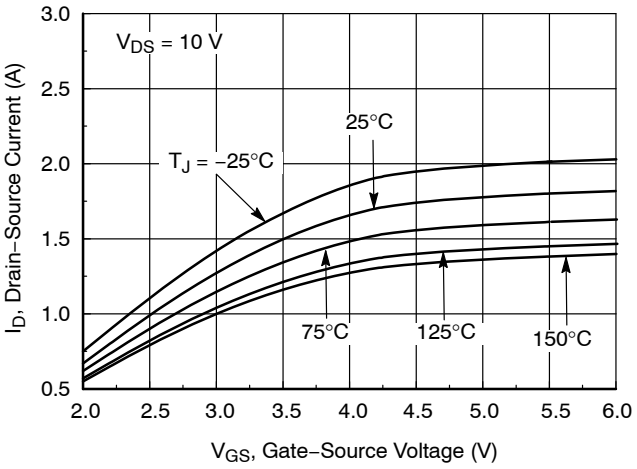

Figure 5. Transfer Characteristics

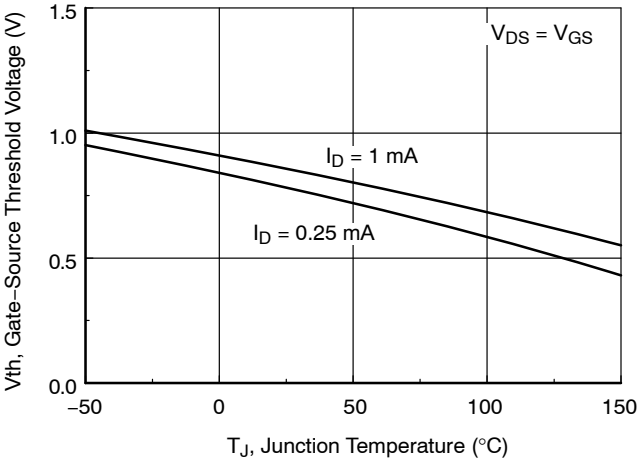

Figure 6. Gate Threshold Variation with Temperature

TYPICAL CHARACTERISTICS (continued)

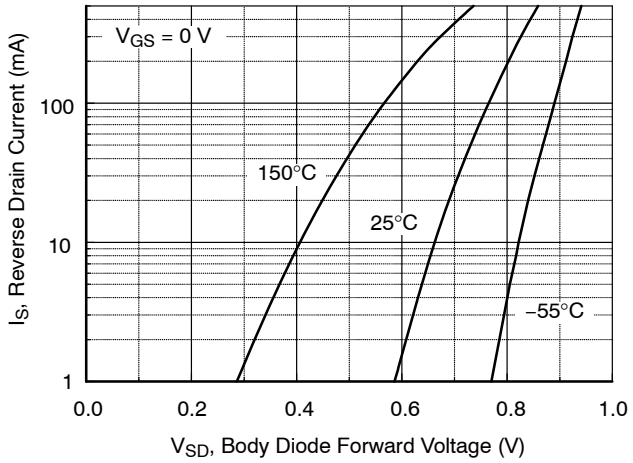

Figure 7. Reverse Drain Current Variation with Diode Forward Voltage and Temperature

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