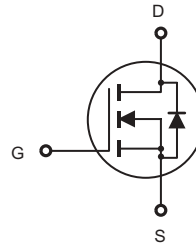


FEATURES

- High density cell design for extremely low  $R_{DS(ON)}$
- Rugged and Reliable
- Compact industry standard SOT-23 surface mount package

**BSS138**  
N-Channel MOSFET



Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-Source Voltage	50	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous (Note 1) – Pulsed	0.22	A
		0.88	
$P_D$	Maximum Power Dissipation (Note 1)	0.36	W
	Derate Above $25^{\circ}\text{C}$	2.8	mW/ $^{\circ}\text{C}$
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	$-55$ to $+150$	$^{\circ}\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds	300	$^{\circ}\text{C}$

**Thermal Characteristics**

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	350	$^{\circ}\text{C}/\text{W}$
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**Package Marking and Ordering Information**

Device Marking	Device	Reel Size	Tape width	Quantity
SS	BSS138	7"	8mm	3000 units

## BSS138

Electrical Characteristics (TA=25°C, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain–Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	50			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		72		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0 V			0.5	μA
		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			100	nA
I <sub>GSS</sub>	Gate–Body Leakage.	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±100	nA
<b>On Characteristics (Note 2)</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1 mA	0.8	1.3	1.6	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 1 mA, Referenced to 25°C		-2		mV/°C
R <sub>DS(on)</sub>	Static Drain–Source On–Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.22 A V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.22 A			3.5 6.0	Ω
I <sub>D(on)</sub>	On–State Drain Current	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 5 V	0.2			A
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.22 A	0.12			S
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz		27		pF
C <sub>oss</sub>	Output Capacitance			13		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			6		pF
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 15 mV, f = 1.0 MHz		9		Ω
<b>Switching Characteristics (Note 2)</b>						
t <sub>d(on)</sub>	Turn–On Delay Time	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 0.29 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω		2.5	5	ns
t <sub>r</sub>	Turn–On Rise Time			9	18	ns
t <sub>d(off)</sub>	Turn–Off Delay Time			20	36	ns
t <sub>f</sub>	Turn–Off Fall Time			7	14	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 25 V, I <sub>D</sub> = 0.22 A, V <sub>GS</sub> = 10 V		1.7	2.4	nC
Q <sub>gs</sub>	Gate–Source Charge			0.1		nC
Q <sub>gd</sub>	Gate–Drain Charge			0.4		nC
<b>Drain–Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain–Source Diode Forward Current				0.22	A
V <sub>SD</sub>	Drain–Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 0.44 A (Note 2)		0.8	1.4	V

**Notes:**

- R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design.

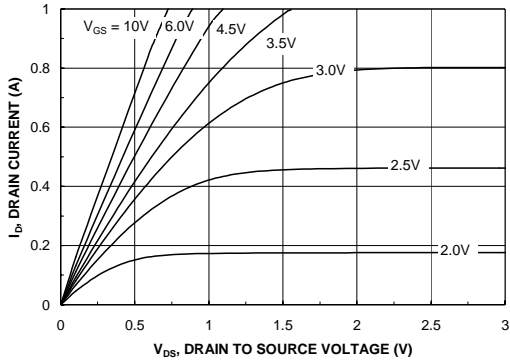


a) 350°C/W when mounted on a minimum pad..

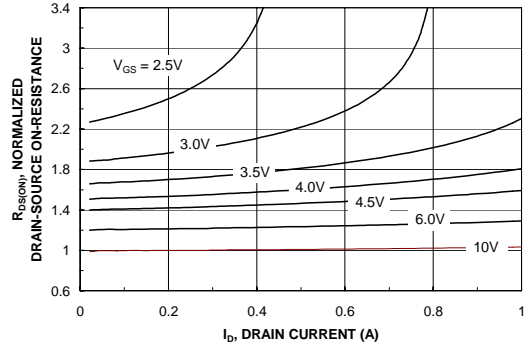
Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

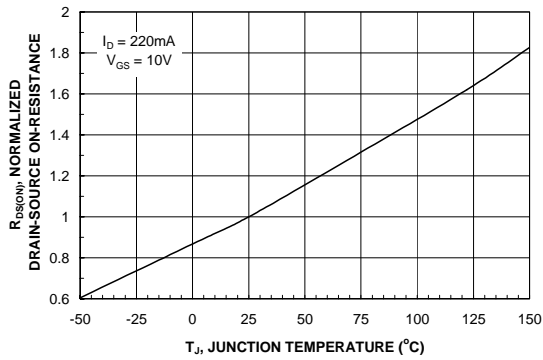
**BSS138** Typical Characteristics



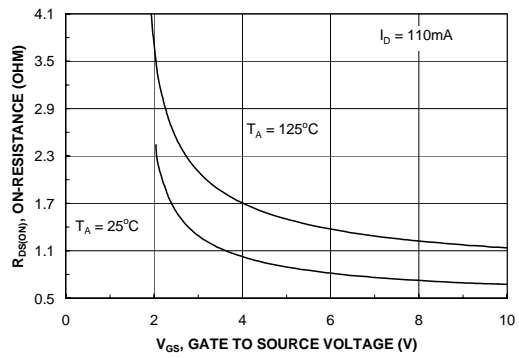
**Figure 1. On-Region Characteristics.**



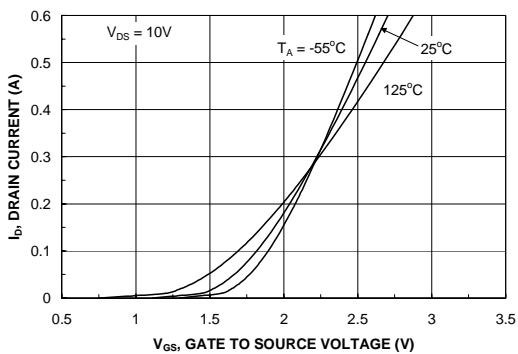
**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.**



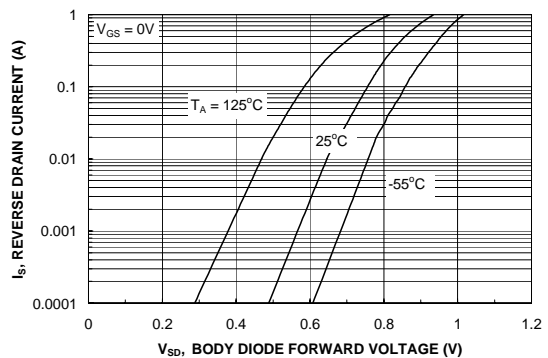
**Figure 3. On-Resistance Variation with Temperature.**



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

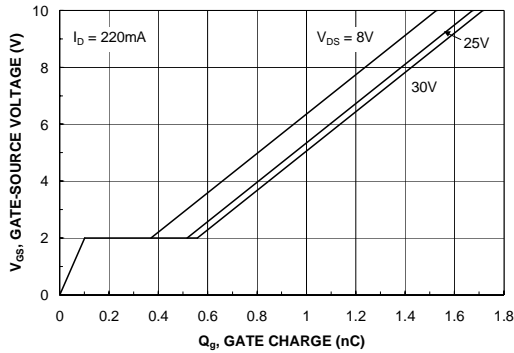


**Figure 5. Transfer Characteristics.**

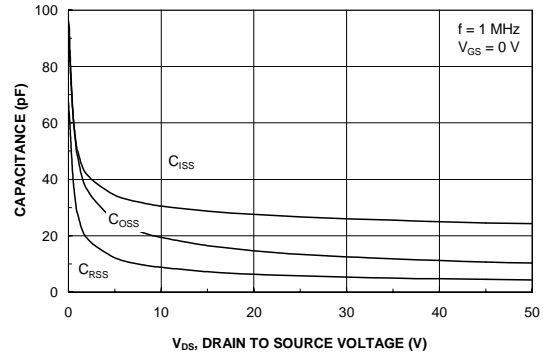


**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.**

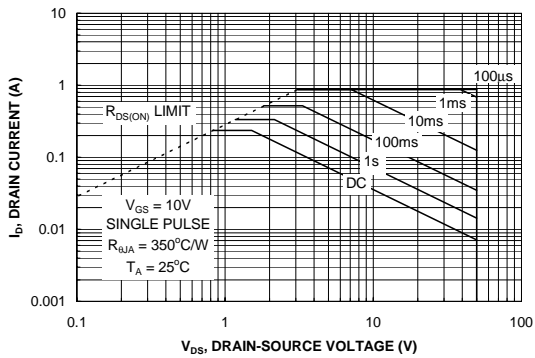
**BSS138** Typical Characteristics



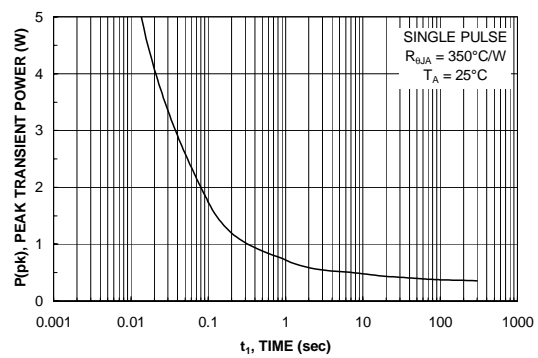
**Figure 7. Gate Charge Characteristics.**



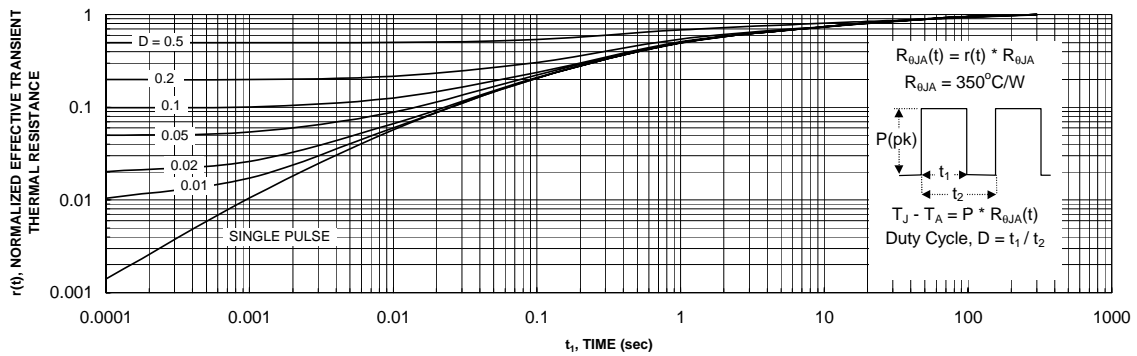
**Figure 8. Capacitance Characteristics.**



**Figure 9. Maximum Safe Operating Area.**



**Figure 10. Single Pulse Maximum Power Dissipation.**



**Figure 11. Transient Thermal Response Curve.**

Thermal characterization performed using the conditions described in Note 1a. Transient thermal response will change depending on the circuit board design.