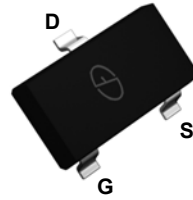
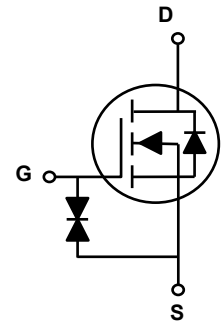


### Main Product Characteristics

$BV_{DSS}$	50V
$R_{DS(ON)}$	3.5Ω
$I_D$	220mA



SOT-23



Schematic Diagram

### Features and Benefits

- Advanced MOSFET process technology
- Ideal for high efficiency switched mode power supplies
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery



### Description

The BSS138 utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supply and a wide variety of other applications.

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

Parameter	Symbol	Max.	Unit
Drain-Source Voltage	$V_{DS}$	50	V
Gate-Source Voltage	$V_{GS}$	±20	V
Drain Current-Continuous <sup>1</sup>	$I_D$	0.22	A
Drain Current-Continuous ( $T_A=70^\circ\text{C}$ ) <sup>1</sup>		0.18	
Drain Current-Pulsed <sup>1</sup>	$I_{DM}$	0.88	A
Maximum Power Dissipation	$P_D$	0.43	W
Thermal Resistance, Junction-to-Ambient <sup>2</sup>	$R_{\theta JA}$	350	°C/W
Operating Junction Temperature Range	$T_J$	-55 To +175	°C
Storage Temperature Range	$T_{STG}$	-55 To +175	°C

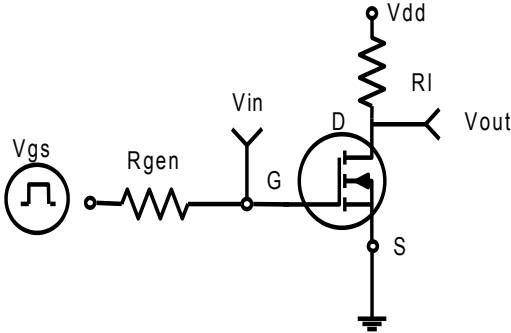
**Electrical Characteristics** ( $T_A=25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	50	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=50V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	10	$\mu A$
Gate-Source Breakdown Voltage	$BV_{GSO}$	$V_{DS}=0V, I_G=\pm 250\mu A$	$\pm 20$	-	-	V
<b>On Characteristics<sup>3</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	0.8	-	1.5	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=0.22A$	-	-	3.5	$\Omega$
		$V_{GS}=4.5V, I_D=0.22A$	-	-	6	
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=0.22A$	-	0.1	-	S
<b>Dynamic and Switching Characteristics<sup>4</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, F=1MHz$	-	30	-	pF
Output Capacitance	$C_{oss}$		-	15	-	
Reverse Transfer Capacitance	$C_{rss}$		-	6	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=30V, R_{GEN}=6\Omega, V_{GS}=10V, I_D=0.22A$	-	2.6	-	nS
Rise Time	$t_r$		-	9	-	
Turn-Off Delay Time	$t_{d(off)}$		-	20	-	
Fall Time	$t_f$		-	6	-	
Total Gate Charge	$Q_g$	$V_{DS}=25V, I_D=0.22A, V_{GS}=10V$	-	1.7	2.4	nC
Gate-Source Charge	$Q_{gs}$		-	0.1	-	
Gate-Drain Charge	$Q_{gd}$		-	0.4	-	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
Diode Forward Voltage <sup>3</sup>	$V_{SD}$	$V_{GS}=0V, I_S=0.44A$	-	-	1.4	V

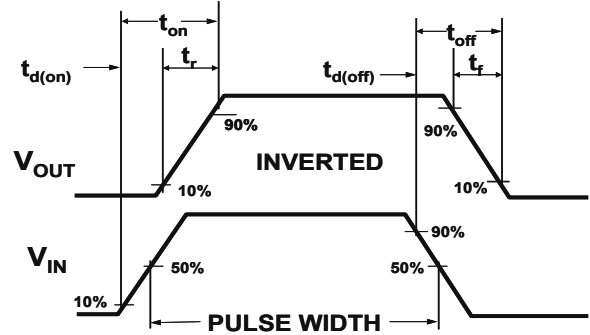
Note:

1. Repetitive rating: Pulsed width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production testing.

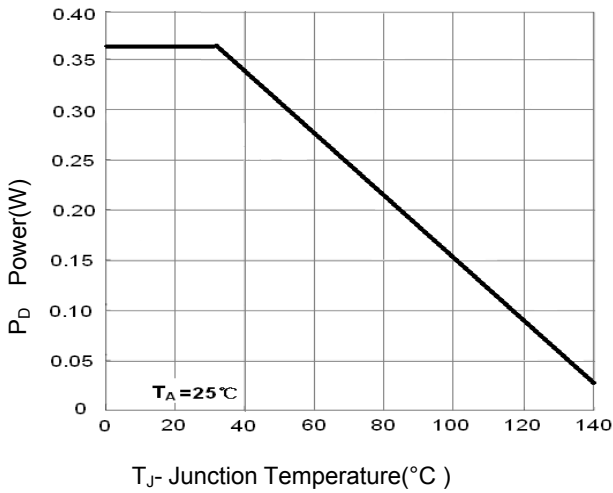
**Typical Electrical and Thermal Characteristic Curves**



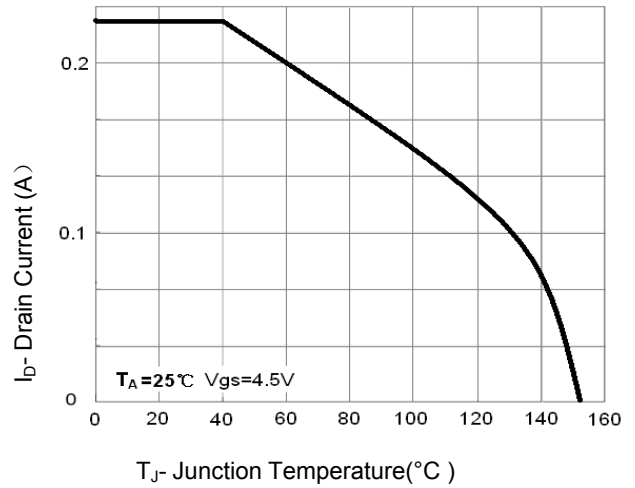
**Figure 1. Switching Test Circuit**



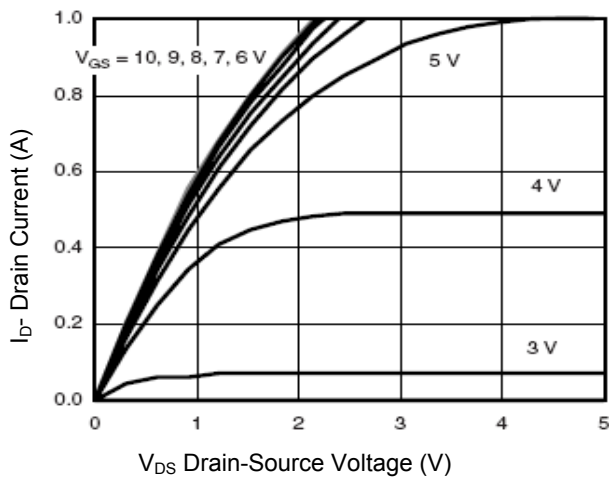
**Figure 2. Switching Waveforms**



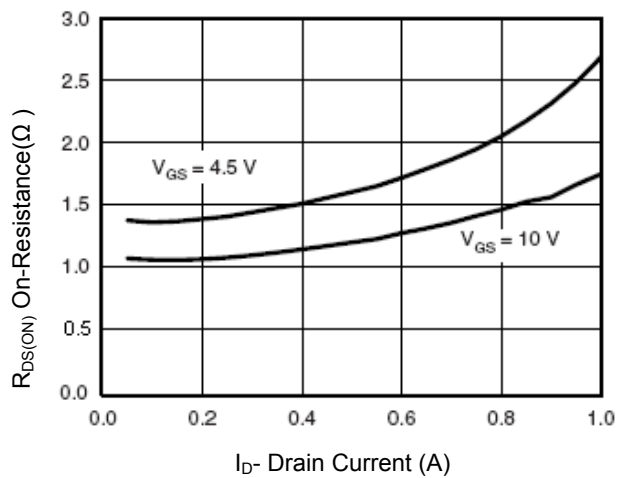
**Figure 3. Power Dissipation**



**Figure 4. Drain Current**

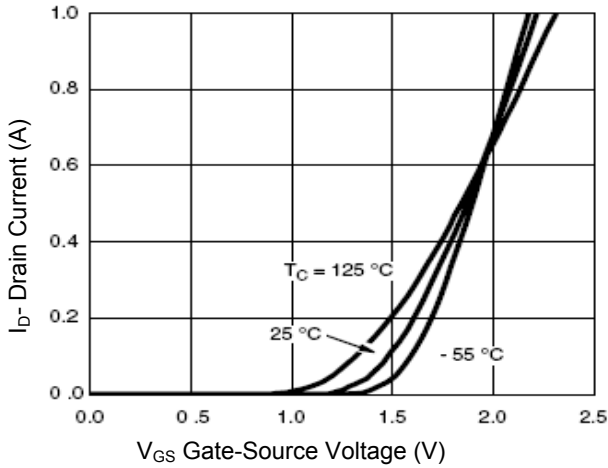


**Figure 5. Output Characteristics**

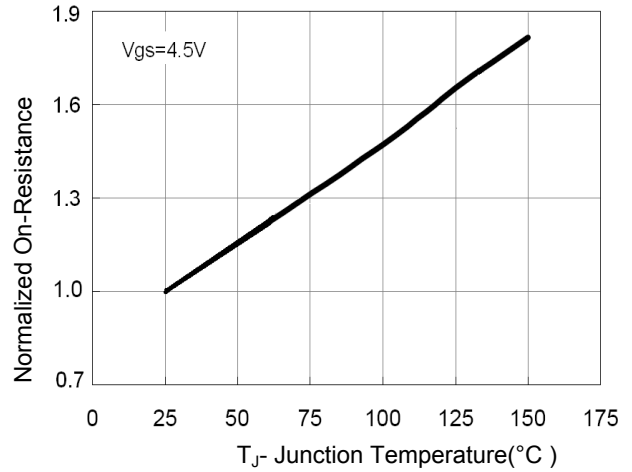


**Figure 6. Drain-Source On-Resistance**

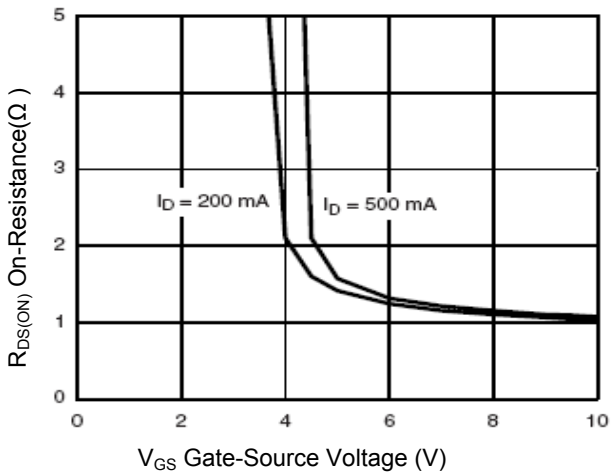
**Typical Electrical and Thermal Characteristic Curves**



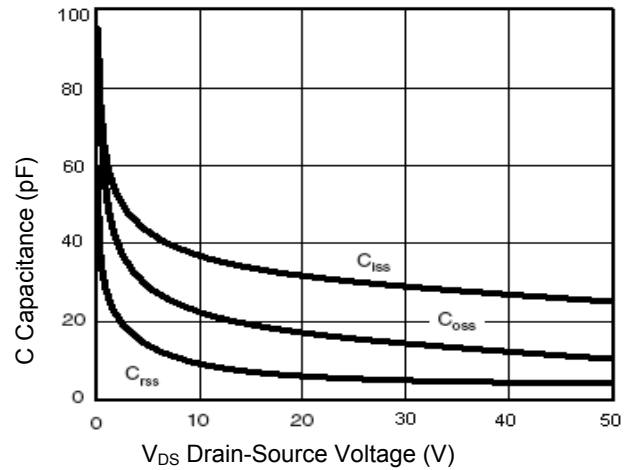
**Figure 7. Transfer Characteristics**



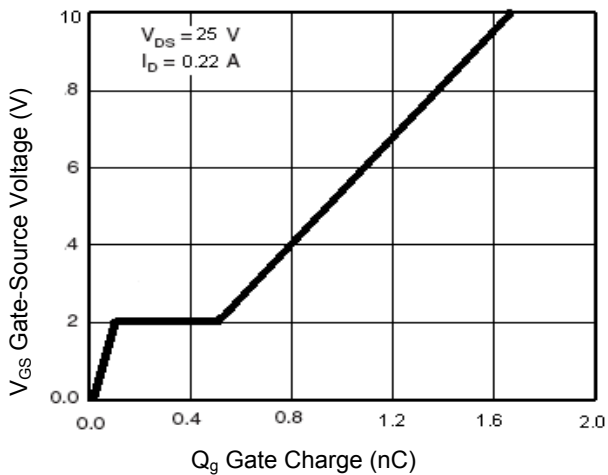
**Figure 8. Drain-Source On-Resistance**



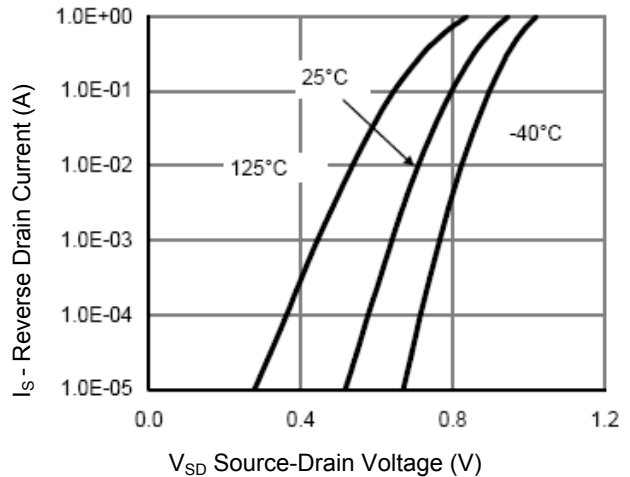
**Figure 9.  $R_{DS(ON)}$  vs  $V_{GS}$**



**Figure 10. Capacitance vs  $V_{DS}$**

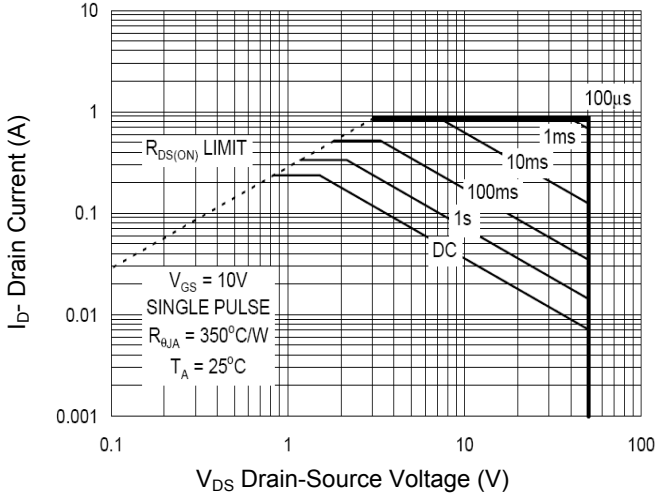


**Figure 11. Gate Charge**

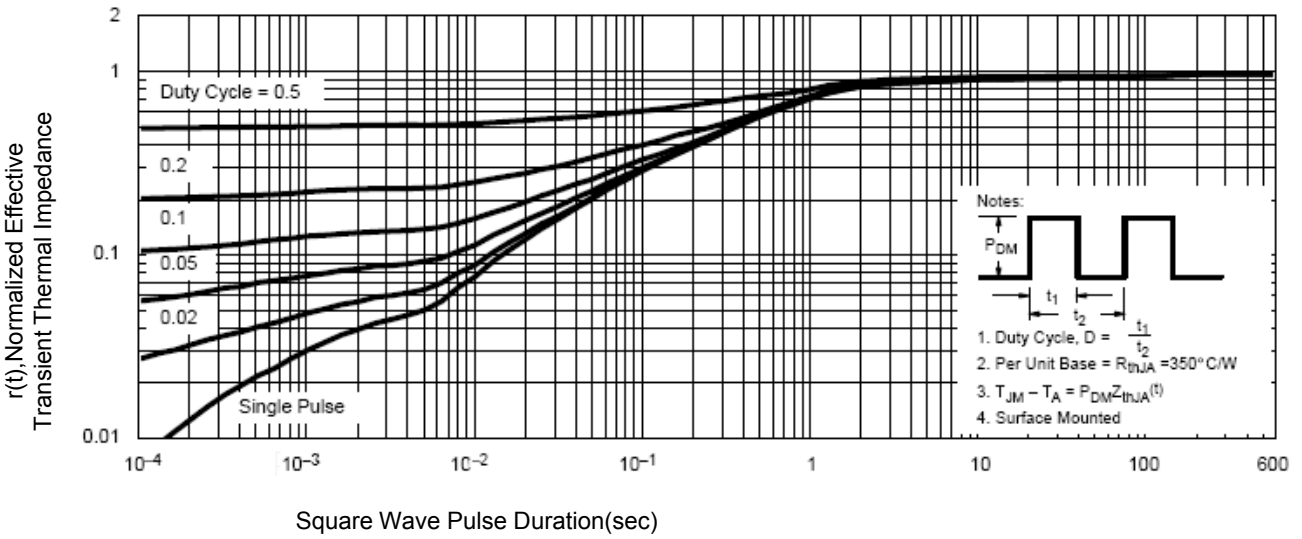


**Figure 12. Source- Drain Diode Forward**

**Typical Electrical and Thermal Characteristic Curves**

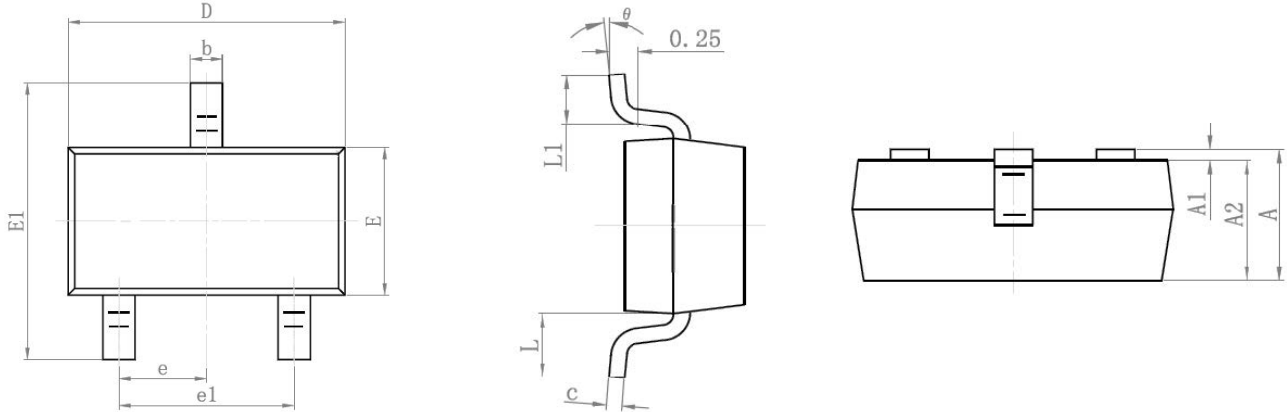


**Figure 13. Safe Operation Area**

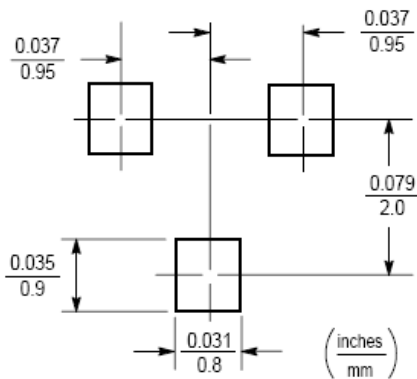


**Figure 14. Normalized Maximum Transient Thermal Impedance**

### Package Outline Dimensions (SOT-23)



### Recommended Pad Layout



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
<b>A</b>	0.900	1.150
<b>A1</b>	0.000	0.100
<b>A2</b>	0.900	1.050
<b>b</b>	0.300	0.500
<b>c</b>	0.080	0.150
<b>D</b>	2.800	3.000
<b>E</b>	1.200	1.400
<b>E1</b>	2.250	2.550
<b>e</b>	0.950TYP	
<b>e1</b>	1.800	2.000
<b>L</b>	0.550REF	
<b>L1</b>	0.300	0.500
<b>θ</b>	0°	8°

**Notes:**

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified.
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

### Order Information

Device	Package	Marking	Quantity	Carrier
BSS138	SOT-23	S138	3,000pcs / Reel	Tape & Reel