



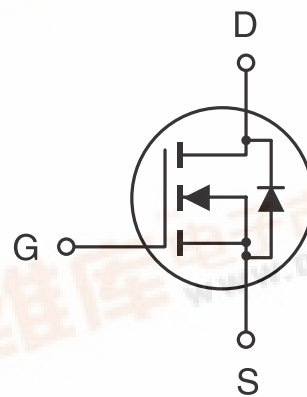
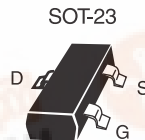
# BSS138

March 1998

## N-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- 50V, 0.22A,  $R_{DS(ON)}=3.5\Omega$  @  $V_{GS}=10V$ .  
 $R_{DS(ON)}=6\Omega$  @  $V_{GS}=4.5V$ .
- High dense cell design for low  $R_{DS(ON)}$ .
- Rugged and reliable.
- SOT-23 package.



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### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	50	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Drain Current-Continuous <sup>a</sup> @ T <sub>J</sub> =125°C -Pulsed <sup>b</sup>	I <sub>D</sub>	220	mA
	I <sub>DM</sub>	880	mA
Drain-Source Diode Forward Current <sup>a</sup>	I <sub>S</sub>	220	mA
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	300	mW
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

### THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Ambient <sup>a</sup>	R <sub>θJA</sub>	417	°C/W
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## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise noted)

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Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	50			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V			0.5	μA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V			±100	nA
<b>ON CHARACTERISTICS<sup>b</sup></b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1mA	0.8	1.5	1.6	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =220mA		1.6	3.5	Ω
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =220mA		2.5	6	Ω
On-State Drain Current	I <sub>D(ON)</sub>	V <sub>DS</sub> =7V, V <sub>GS</sub> =10V	500			mA
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =220mA	120	450		mS
<b>DYNAMIC CHARACTERISTICS<sup>c</sup></b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V f=1.0MHz		42	55	pF
Output Capacitance	C <sub>OSS</sub>			11	15	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			7	10	pF
<b>SWITCHING CHARACTERISTICS<sup>c</sup></b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =290mA, V <sub>GS</sub> =10V, R <sub>GEN</sub> =50Ω		6	8	ns
Rise Time	t <sub>r</sub>			9	12	ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			12	16	ns
Fall Time	t <sub>f</sub>			16	22	ns

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>DRAIN-SOURCE DIODE CHARACTERISTICS<sup>b</sup></b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{V}, I_s = 440\text{mA}$		0.8	1.4	V

### Notes

- a. Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$ .
- b. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- c. Guaranteed by design, not subject to production testing.

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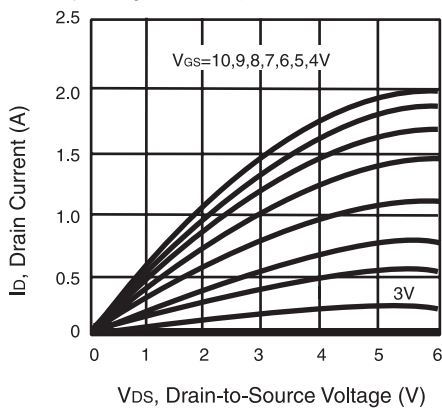


Figure 1. Output Characteristics

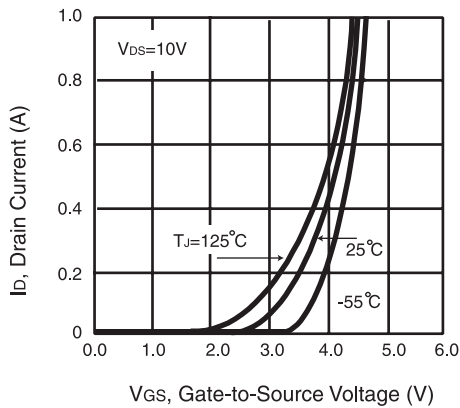


Figure 2. Transfer Characteristics

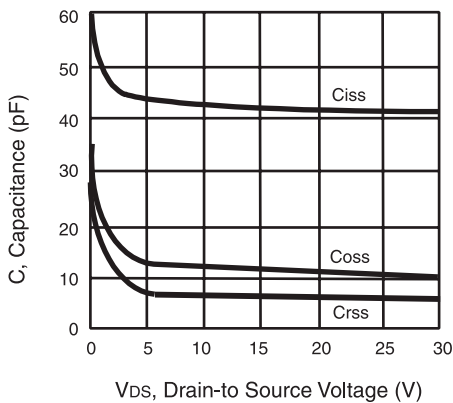


Figure 3. Capacitance

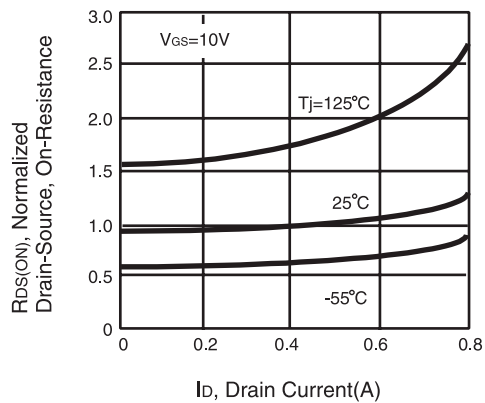
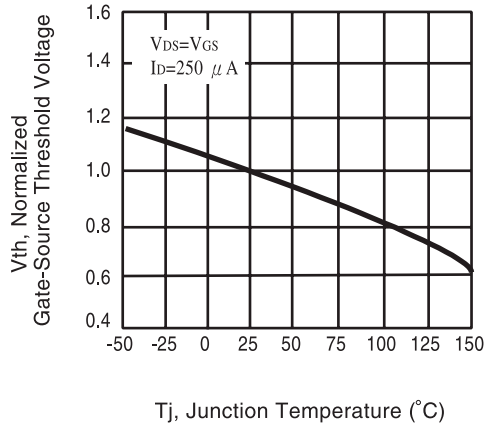


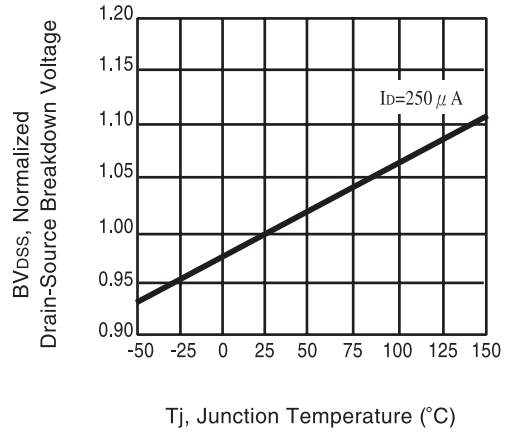
Figure 4. On-Resistance Variation with Drain Current and Temperature

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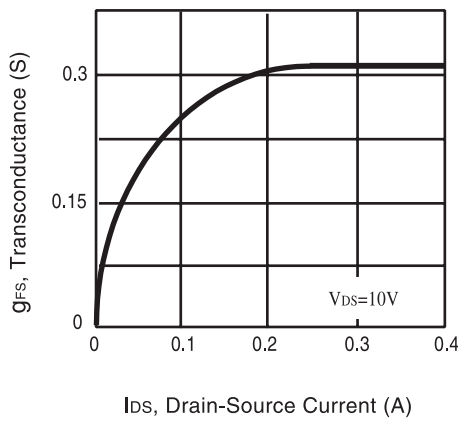
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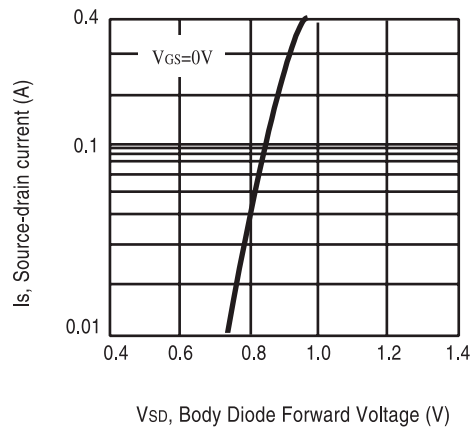
**Figure 5. Gate Threshold Variation with Temperature**



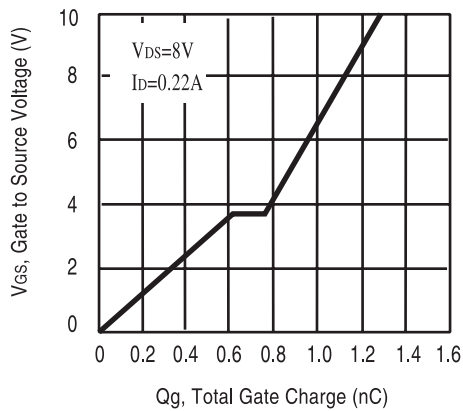
**Figure 6. Breakdown Voltage Variation with Temperature**



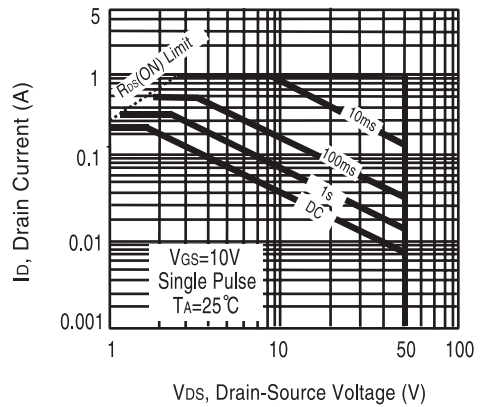
**Figure 7. Transconductance Variation with Drain Current**



**Figure 8. Body Diode Forward Voltage Variation with Source Current**



**Figure 9. Gate Charge**



**Figure 10. Maximum Safe Operating Area**

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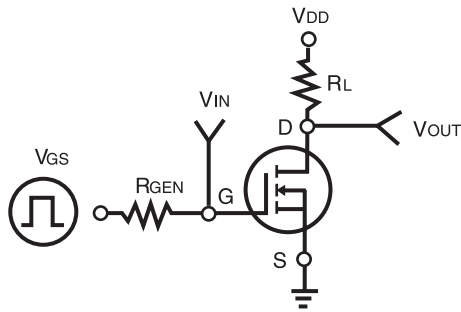


Figure 11. Switching Test Circuit

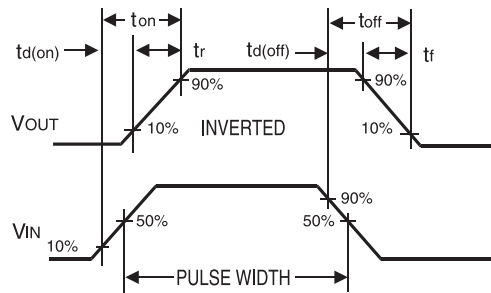


Figure 12. Switching Waveforms

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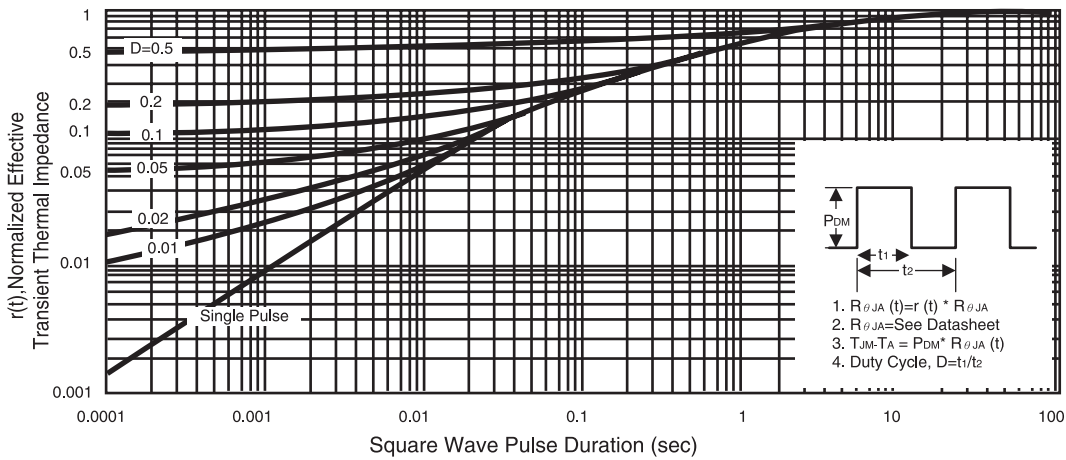


Figure 13. Normalized Thermal Transient Impedance Curve