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December 2010

BSS138W

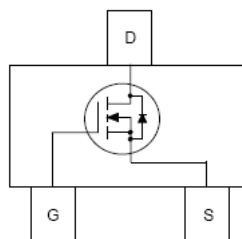
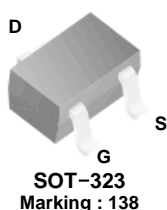
N-Channel Logic Level Enhancement Mode Field Effect Transistor

General Description

These N-Channel enhancement mode field effect transistor. These products have been designed to minimize on-state resistance while provide rugged, reliable, and fast switching performance. These products are particularly suited for low voltage, low current applications such as small servo motor control, power MOSFET gate drivers, and other switching applications.

Features

- $R_{DS(ON)} = 3.5\Omega$ @ $V_{GS} = 10V$, $I_D = 0.22A$
 $R_{DS(ON)} = 6.0\Omega$ @ $V_{GS} = 4.5V$, $I_D = 0.22A$
- High density cell design for extremely low $R_{DS(ON)}$
- Rugged and Reliable
- Compact industry standard SOT-323 surface mount package



Absolute Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	50	V
V_{GSS}	Gate-Source Voltage	± 20	V
I_D	Drain Current - Continuous (Note1) - Pulsed	0.21 0.84	A A
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds	300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Value	Units
P_D	Maximum Power Dissipation (Note1) Derate Above $25^\circ C$	340 2.72	mW mW/ $^\circ C$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note1)	367	$^\circ C/W$

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
138	BSS138W	7"	8mm	3000 units

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	50			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C		71		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 50V, V _{GS} = 0V V _{DS} = 50V, V _{GS} = 0V, T _J = 125°C V _{DS} = 30V, V _{GS} = 0V			0.5 5 100	μA μA nA
I _{GSS}	Gate-Body Leakage	V _{GS} = ±20V, V _{DS} = 0V			±100	nA
On Characteristics (Note2)						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 1mA	0.8	1.3	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I _D = 1mA, Referenced to 25°C		-3.9		mV/°C
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 0.22A V _{GS} = 4.5V, I _D = 0.22A V _{GS} = 10V, I _D = 0.22A, T _J =125°C		1.17 1.36 2.16	3.5 6.0 5.8	Ω Ω Ω
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 = 0.22A	0.12			S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz		38		pF
C _{oss}	Output Capacitance			5.9		pF
C _{rss}	Reverse Transfer Capacitance			3.5		pF
R _G	Gate Resistance	V _{GS} = 15mV, f = 1.0MHz		11		Ω
Switching Characteristics (Note2)						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 30V, I _D = 0.29A, V _{GS} = 10V, R _{GEN} = 6Ω		2.3	5	ns
t _r	Turn-On Rise Time			1.9	18	ns
t _{d(off)}	Turn-Off Delay Time			6.7	36	ns
t _f	Turn-Off Fall Time			6.5	14	ns
Q _g	Total Gate Change	V _{DS} = 25V, I _D = 0.22A, V _{GS} = 10V		1.1		nC
Q _{gs}	Gate-Source Change			0.12		nC
Q _{gd}	Gate-Drain Change			0.22		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain–Source Diode Forward Current				0.22	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 0.44A (Note2)			1.4	V

Notes:

1. 367°C/W when mounted on a minimum pad.
2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2.0\%$

Typical Performance Characteristics

Figure 1. On-Region Characteristics.

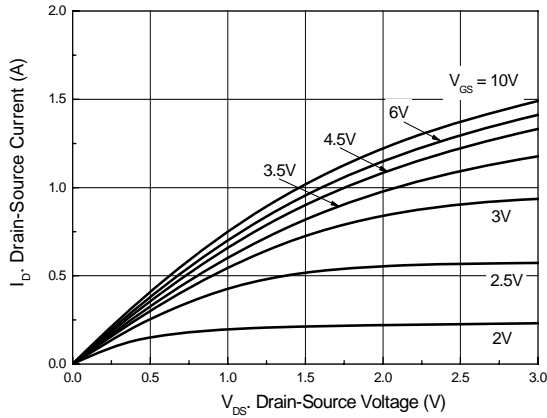


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

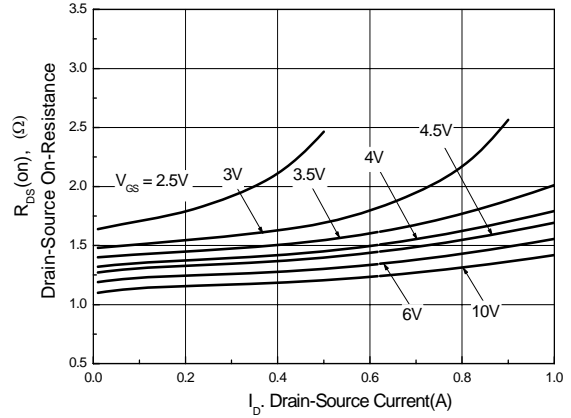


Figure 3. On-Resistance Variation with Temperature.

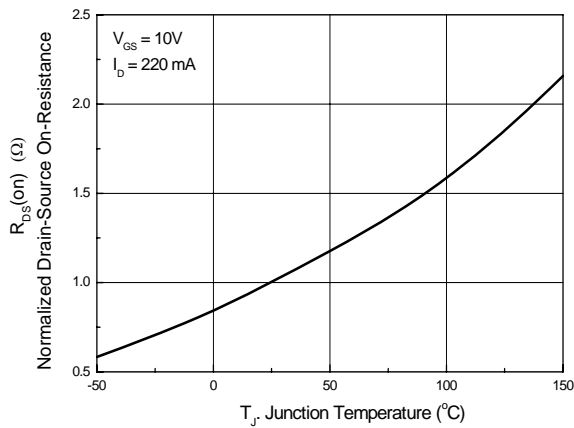


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

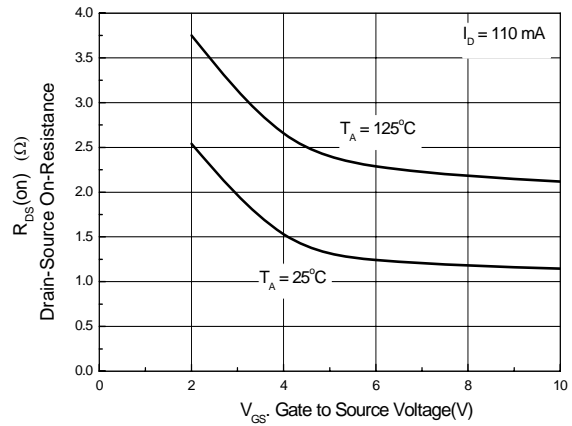


Figure 5. Drain-Source On Voltage with Temperature.

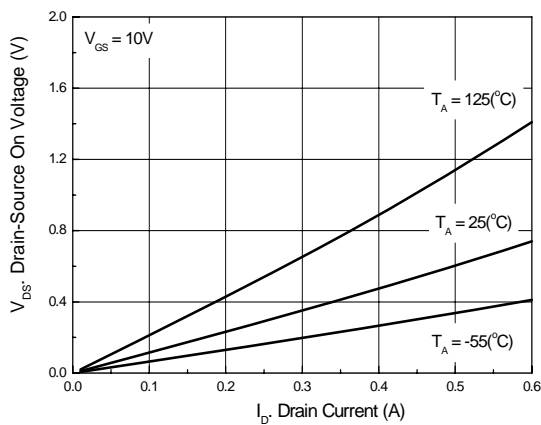
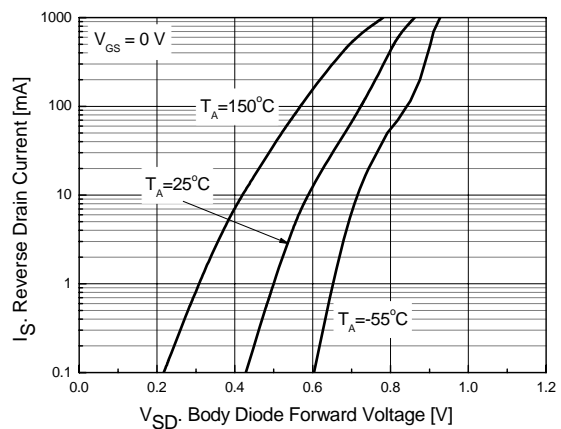


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.



Typical Performance Characteristics (Continued)

Figure 7. Gate Charge Characteristics.

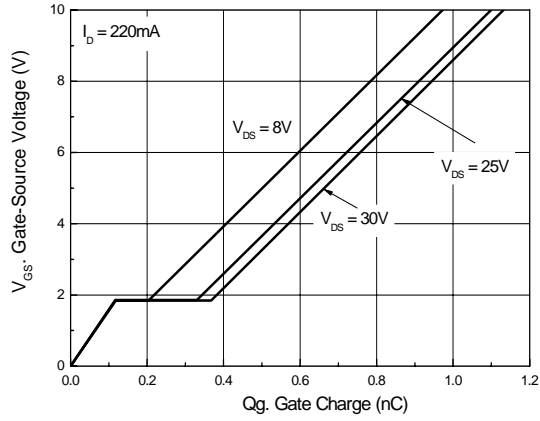


Figure 8. Capacitance Characteristics.

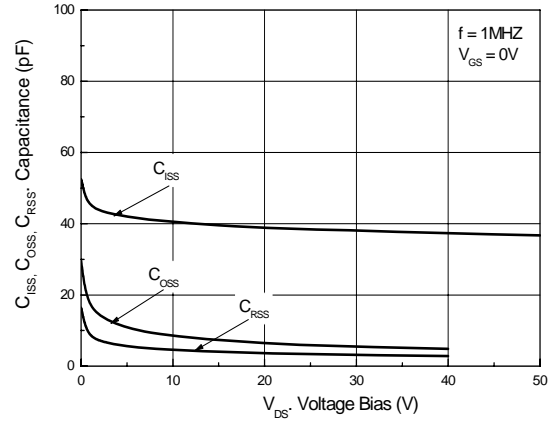


Figure 9. Maximum Safe Operating Area.

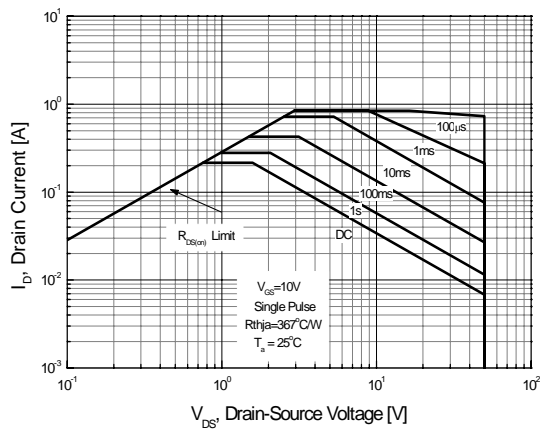


Figure 10. Single Pulse Maximum Power Dissipation.

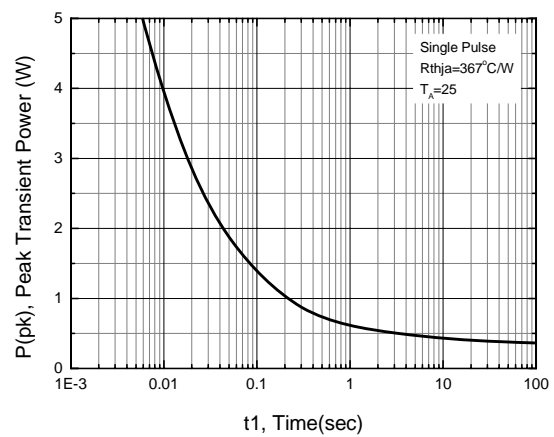
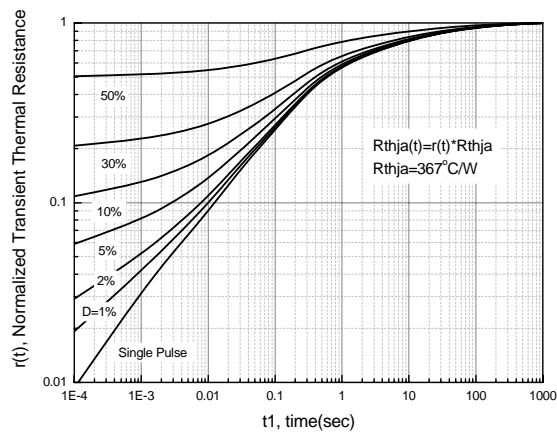


Figure 11. Transient Thermal Response Curve.





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- Technical drawing of a mechanical part. The part has a vertical section on the left and a curved section on the right. A horizontal line is labeled "SEATING PLANE" in red. Dimensions are given in millimeters. The curved section has a radius of $R0.10$. The horizontal distance from the vertical section to the start of the curve is 0.30 . The vertical distance from the seating plane to the start of the curve is 0.10 . The curved section has a horizontal distance of 0.26 and a vertical distance of 0.10 from the seating plane. The angle of the curved section is 30° and 0° .



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