BSS138P

N-Channel Enhancement Mode MOSFET
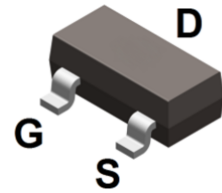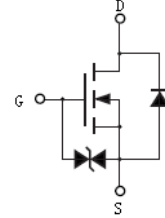
Halogen-Free   REACH ✓   ROHS ✓

Features

- Low on-resistance
- Low input capacitance
- Fast switching speed
- HBM: JESD22-A114-B: 2

Typical Applications

- DC-DC converters
- Power management functions
- Battery operated systems and solid-state relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.

Mechanical Data

- Case: SOT-23
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin-Plated Leads, Solderability-per MIL-STD-202, Method 208

SOT-23

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
BSS138P	SOT-23	3000 pcs / Tape & Reel	138

Maximum Ratings (@ T_A = 25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	60	V
Gate-to-Source Voltage	V_{GSS}	±20	V
Continuous Drain Current (T_A = 25°C) [1]	I_D	360	mA
Continuous Drain Current (T_A = 70°C) [1]		290	mA
Pulsed Drain Current (t_p = 10µs, T_A = 25°C)	I_{DM}	1500	mA
Single Pulse Avalanche Energy [3]	E_{AS}	0.2	mJ
Power Dissipation (T_A = 25°C) [1]	P_D	350	mW
Operating Junction Temperature Range	T_J	-55 ~ +150	°C
Storage Temperature Range	T_{STG}	-55 ~ +150	°C

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Air [1]	$R_{\theta JA}$	-	335	357	°C/W

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Electrical Characteristics (@ T_A = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
V_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250µA	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60V, V_{GS} = 0V	-	-	1	µA
I_{GSS}	Gate-Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±10	µA
On Characteristics						
$R_{DS(ON)}$	Drain-Source On-resistance [2]	V_{GS} = 10V, I_D = 0.5A	-	1	1.6	Ω
		V_{GS} = 4.5V, I_D = 0.2A	-	1.2	2.5	
		V_{GS} = 2.5V, I_D = 0.1A	-	1.7	4.5	
$V_{GS(TH)}$	Static Drain-Source On-resistance	V_{DS} = V_{GS}, I_D = 250µA	0.8	1	1.5	V
R_G	Gate Resistance	V_{GS} = 0V, f = 1MHz	-	48	-	Ω
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{GS} = 0V	-	32	-	pF
C_{OSS}	Output Capacitance	V_{DS} = 25V	-	6	-	
C_{RSS}	Reverse Transfer Capacitance	f = 1.0MHz	-	3	-	
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time [4]	V_{DD} = 25V, I_D = 0.36A	-	2.2	-	ns
t_r	Turn-on Rise Time [4]	V_{GS} = 10V, R_G = 6Ω	-	19.2	-	
$t_{d(off)}$	Turn-Off Delay Time [4]		-	6.2	-	
t_f	Turn-Off Fall Time [4]		-	23	-	
Q_G	Total Gate-Charge	V_{DS} = 25V	-	4	-	nC
Q_{GS}	Gate to Source Charge	V_{GS} = 10V	-	0.5	-	
Q_{GD}	Gate to Drain (Miller) Charge	I_D = 0.2A	-	0.4	-	
Source-Drain Diode Characteristics						
V_{SD}	Diode Forward Voltage [2]	I_S = 0.5A, V_{GS} = 0V	-	0.89	1.4	V
trr	Reverse Recovery Time	I_F = 1A, V_{GS} = 0V	-	15	-	ns
Qrr	Reverse Recovery Charge	d_{IF}/d_t = 100A/µs	-	8	-	nC

Notes:

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper

2. The data tested by pulsed, pulse width ≤ 300µs, duty cycle ≤ 2%

3. The E_{AS} data shows Max. rating. The test condition is V_{DD} = 30V, V_{GS} = 10V, L = 0.5mH

4. Guaranteed by design, not subject to production

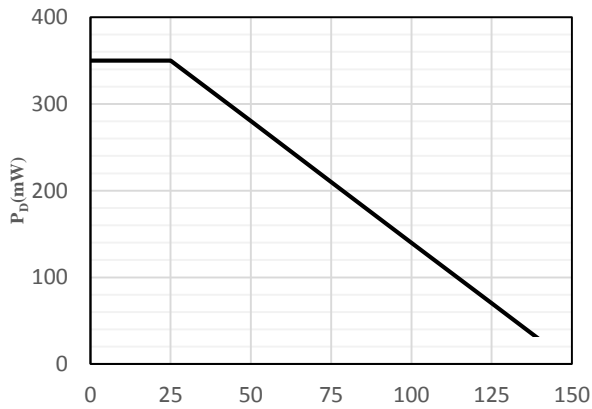## Ratings and Characteristic Curves (@ T_A = 25°C unless otherwise specified)

Fig 1   Power Dissipation
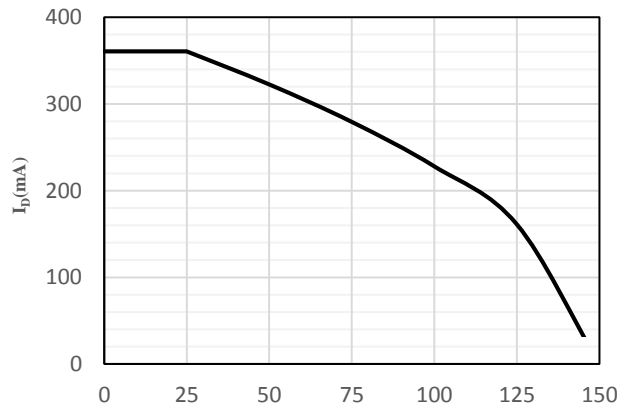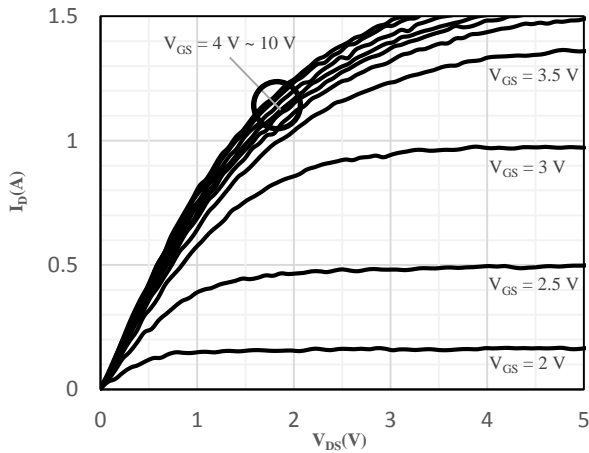

Fig 2   Drain Current

Fig 3   Typical Output Characteristics
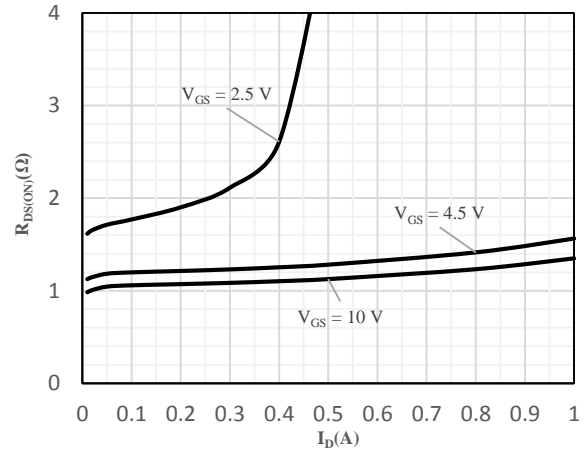

Fig 4   On-Resistance vs. Drain Current

and Gate Voltage
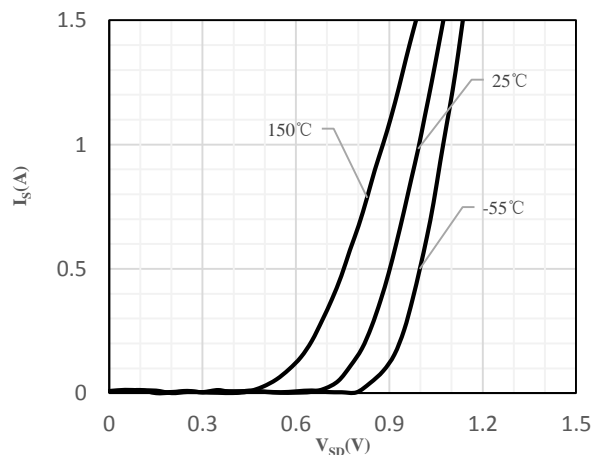

Fig 5   On-Resistance vs. Gate-Source Voltage
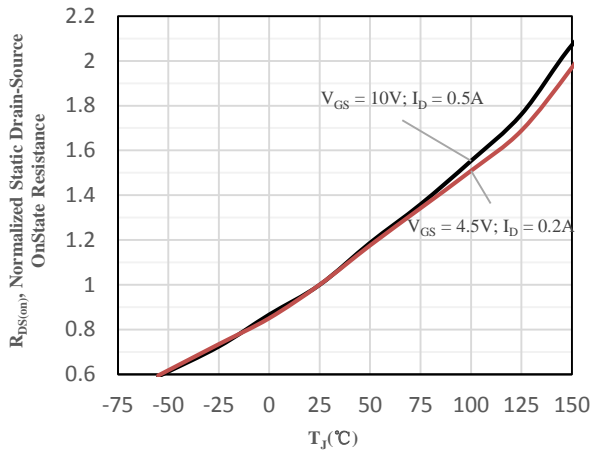

Fig 6   Body-Diode Characteristics

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Fig 7   Normalized On-Resistance vs. Junction Temperature

Fig 8   Transfer Characteristics

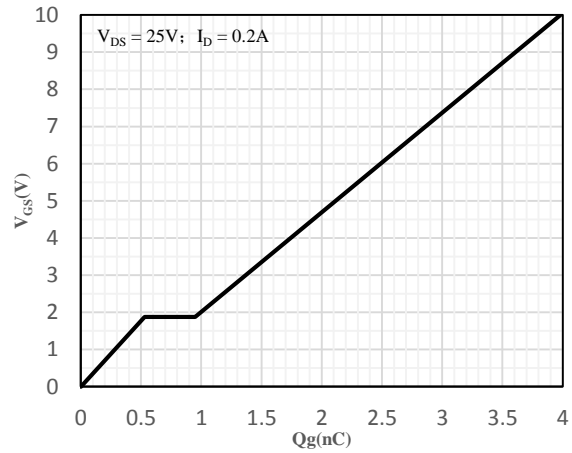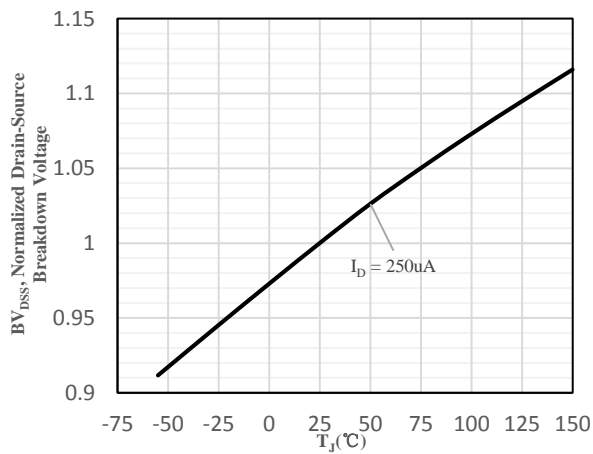**Fig 9   Capacitance Characteristics**

Fig 10   Gate-Charge Characteristics

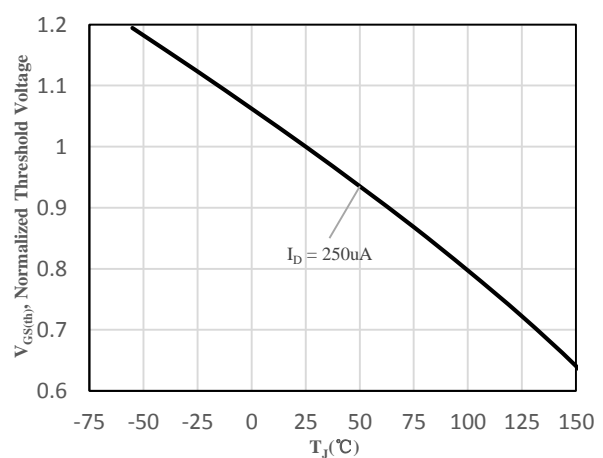**Fig 11   Normalized Breakdown Voltage vs. Junction Temperature**

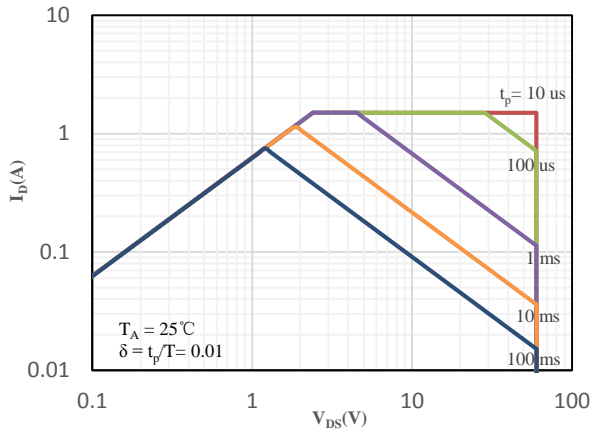
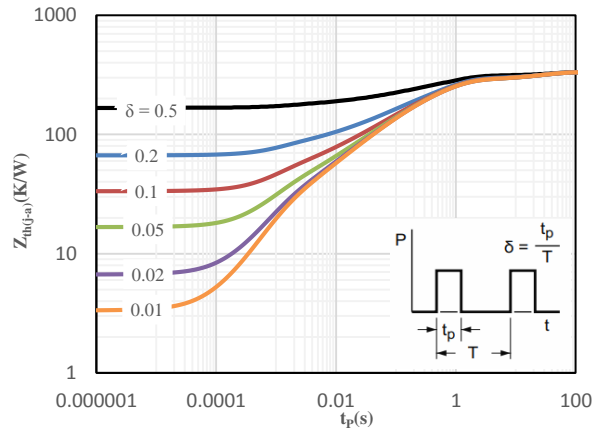**Fig 12   Normalized $V_{GS(th)}$ vs. Junction Temperature**

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Fig 13   Safe Operation Area

Fig 14   Maximum transient thermal impedance

Package Outline Dimensions (Unit: mm)

SOT-23

SOT-23		
Dimension	Min.	Max.
A	2.70	3.10
B	1.10	1.50
C	0.90	1.10
D	0.30	0.50
E	0.35	0.48
G	1.80	2.00
H	0.02	0.10
J	0.05	0.15
K	2.20	2.60

Mounting Pad Layout (Unit: mm)

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