

SuperMOS – SOT-23 60V BV_{DSS} , $1.5\Omega R_{DS(on)}$, N-channel MOSFET

1. Description

The BSS138-13-F-ES is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product BSS138-13-F-ES is Pb-free.

2. Features

- 60V, $R_{DS(ON)}=1.5\Omega(TYP.) @V_{GS}=10V$
 $R_{DS(ON)}=1.6\Omega(TYP.) @V_{GS}=4.5V$
- Use trench MOSFET technology
- High density cell design for low $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

3. Applications

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

4. Ordering Information

Part Number	Package	Marking	Material	Packing	Quantity per reel	Flammability Rating	Reel Size
BSS138-13-F-ES	SOT-23	38K	Halogen free	Tape & Reel	3,000 PCS	UL 94V-0	7 inches

Table-1 Ordering information

5. Pin Configuration and Functions

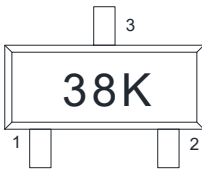
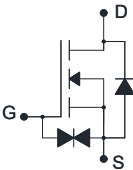
Pin	Function	Outline	Circuit Diagram
1	Gate		
2	Source		
3	Drain		

Table-2 Pin configuration

6. Specification

Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		BV_{DSS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	$T_A = 25^\circ\text{C}$	I_D	0.40	A
Maximum Power Dissipation		P_D	417	mW
Pulsed Drain Current ^a		I_{DM}	1.60	A
Operating Junction Temperature		T_J	150	°C
Lead Temperature		T_L	260	°C
Storage Temperature Range		T_{stg}	-55 to 150	°C

Thermal resistance ratings

Single Operation			
Parameter	Symbol	Typical	Unit
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	300	°C/W

Note:

a: Repetitive rating, pulse width limited by junction temperature, $t_p=10\mu\text{s}$, Duty Cycle=1%

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Electrical Characteristics

At TA = 25°C unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =10mA	60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V, T _J =25℃			1.0	uA
		V _{DS} =40V, V _{GS} =0V, T _J =125℃			100	
Gate-to-source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±10	uA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} =V _{DS} , I _D =250uA	0.8	1.0	1.5	V
Drain-to-source On-resistance	R _{DS(on)}	V _{GS} =10V, I _D =0.4A		1.5	1.9	Ω
		V _{GS} =4.5V, I _D =0.2A		1.6	2.5	
		V _{GS} =2.5V, I _D =0.1A		2.73	4.5	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C _{ISS}	V _{GS} =0V, f=1MHz, V _{DS} =25V		25	50	pF
Output Capacitance	C _{OSS}			9.7	22	
Reverse Transfer Capacitance	C _{RSS}			2.2	5	
Total Gate Charge	Q _{G(TOT)}	V _{GS} =4.5V, V _{DS} =25V, I _D =0.25A		0.65	1	nC
Gate-to-Source Charge	Q _{GS}			0.2		
Gate-to-Drain Charge	Q _{GD}			0.23		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(ON)}	V _{GS} =10V, V _{DS} =25V, I _D =0.4A, R _G =6Ω		2.3	5	ns
Rise Time	t _r			19.2	40	
Turn-Off Delay Time	t _{d(OFF)}			6.3	12	
Fall Time	t _f			23	50	
BODY DIODE CHARACTERISTICS						
Forward Voltage	V _{SD}	V _{GS} =0V, I _S =0.5A		0.86	1.5	V

7. Typical Characteristic

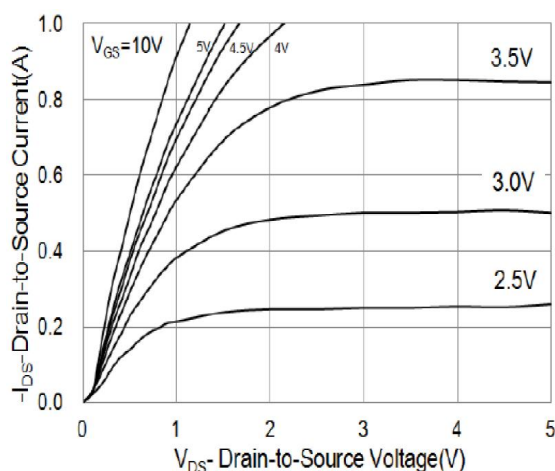


Fig.1 On-Region Characteristics

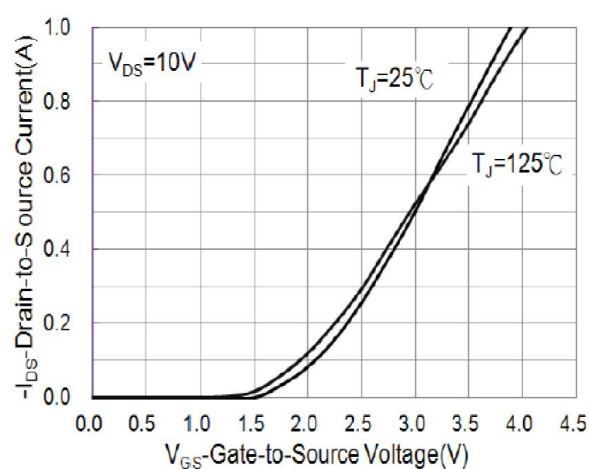


Fig.2 Transfer Characteristics

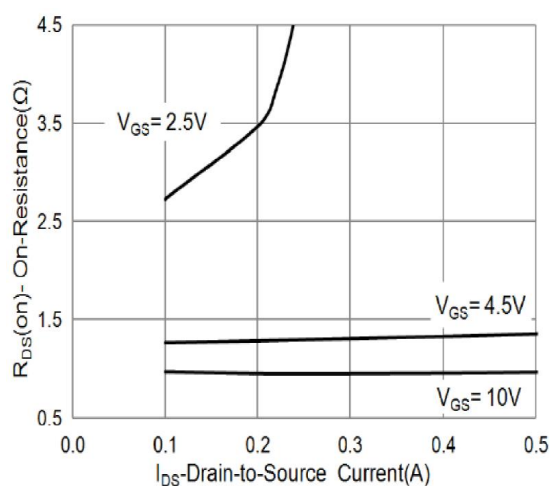


Fig.3 On-Resistance vs. Drain Current

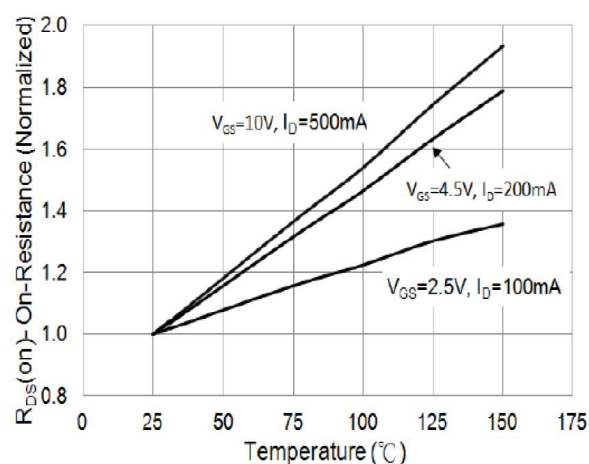


Fig.4 On-Resistance vs. Junction temperature

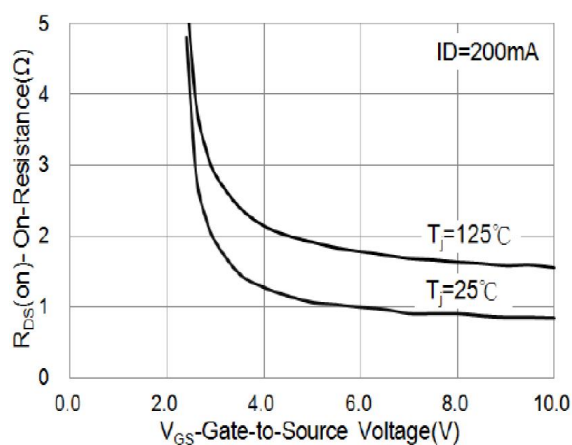


Fig.5 On-Resistance Variation with V_{GS}

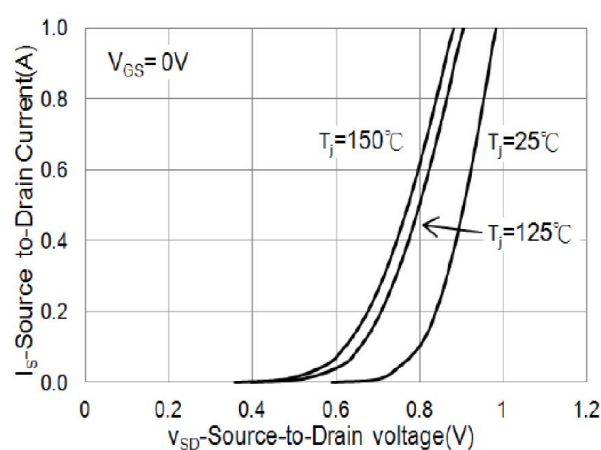


Fig.6 Body Diode Characteristics

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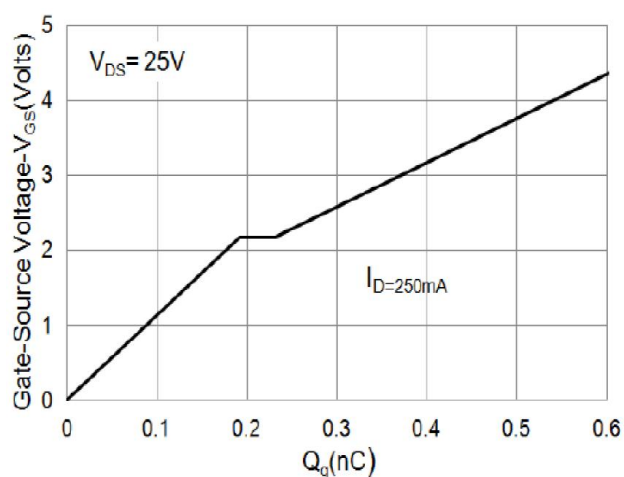


Fig.7 Gate-Charge Characteristics

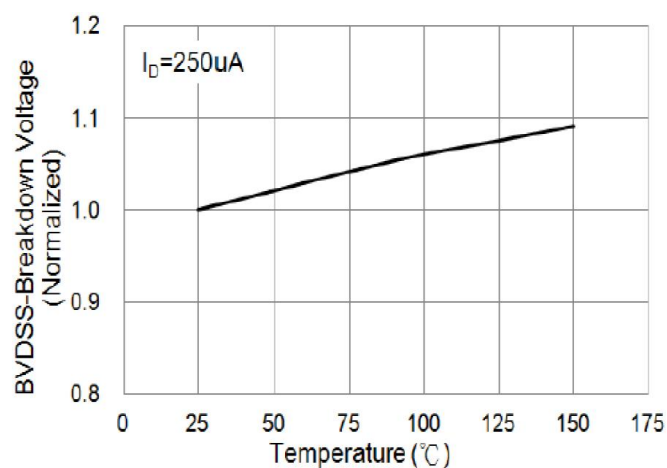


Fig.8 Breakdown Voltage Variation vs. Temperature

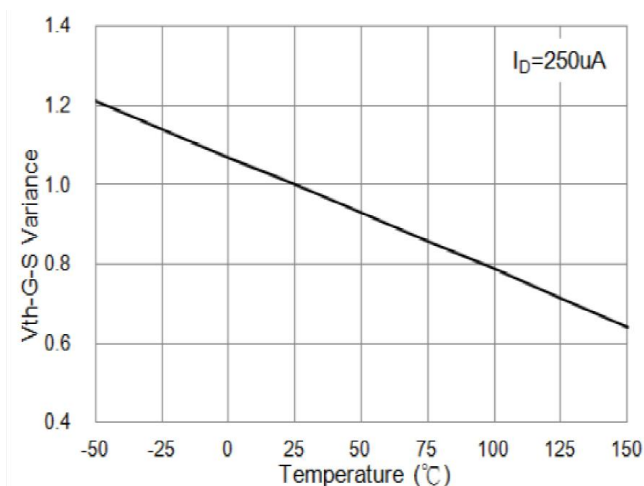


Fig.9 Threshold Voltage Variation with Temperature

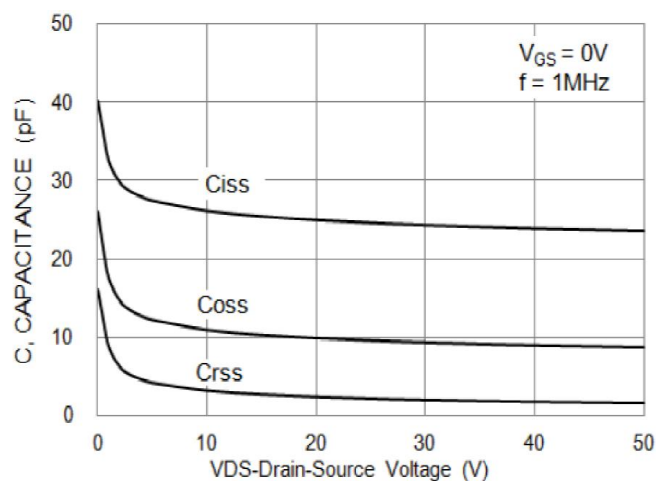
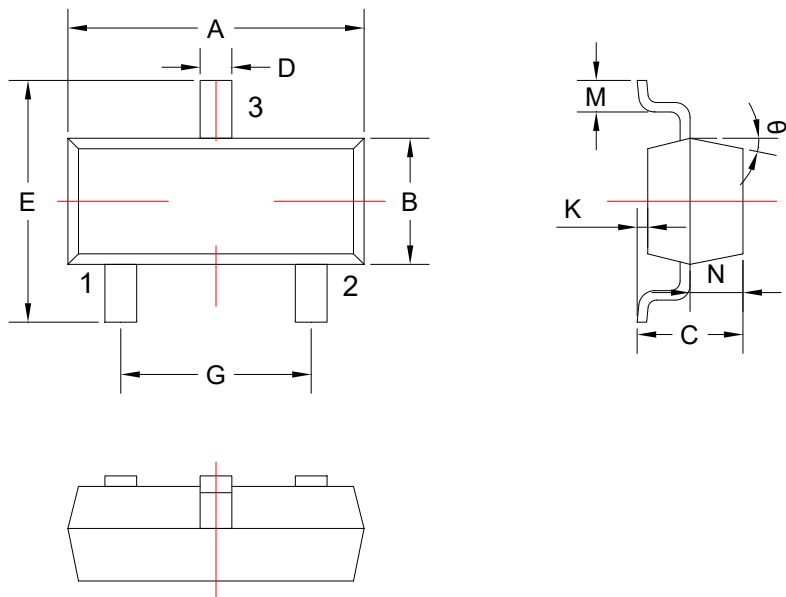


Fig.10 Capacitance vs. Drain-Source Voltage.

8. Dimension (SOT-23)



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER					
SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.85	3.04	G	1.80	2.00
B	1.20	1.40	K	0	0.10
C	0.90	1.10	M	0.20	-
D	0.40	0.50	N	0.50	0.70
E	2.25	2.55	θ	5°	9°

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