

SuperMOS – SOT-23 60V V_{DSS} 1.5 Ω $R_{DS(on)}$ 0.41A I_D , N-channel MOSFET

1. Description

The BSS138BK 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 BSS138BK 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 | Material | Packing | Quantity per reel | Flammability Rating | Reel Size |
|-------------|---------|--------------|-------------|-------------------|---------------------|-----------|
| BSS138BK | SOT-23 | Halogen free | Tape & Reel | 3,000 PCS | UL 94V-0 | 7 inches |

Table-1 Ordering information

5. Pin Configuration and Functions

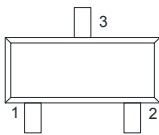
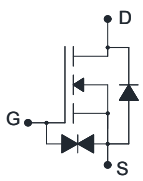
| Pin | Function | Outline | Circuit Diagram |
|-----|----------|---|---|
| 1 | Gate |  |  |
| 2 | Source | | |
| 3 | Drain | | |

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 | I_D | 0.41 | A |
| Maximum Power Dissipation | P_D | 417 | mW |
| Pulsed Drain Current ^a | I_{DM} | 1.64 | 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, $t_p=10\mu s$, Duty Cycle=1%

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} | $V_{DS}=60V, V_{GS}=0V, T_J=25^\circ C$ | | | 1.0 | uA |
| | | $V_{DS}=40V, V_{GS}=0V, T_J=125^\circ C$ | | | 100 | |
| Gate-to-source Leakage Current | I_{GSS} | $V_{DS}=0V, V_{GS}=\pm 20V$ | | | ± 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 | $R_{DS(on)}$ | $V_{GS}=10V, I_D=0.5A$ | | 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 | $t_{d(ON)}$ | $V_{GS}=10V, V_{DS}=25V, I_D=0.5A,$ $R_G=6\Omega$ | | 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

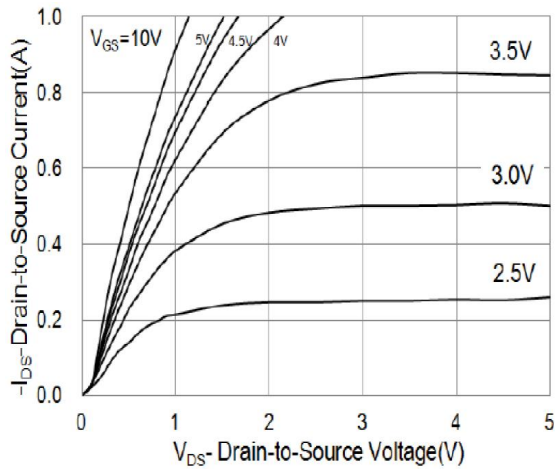


Fig.1 On-Region Characteristics

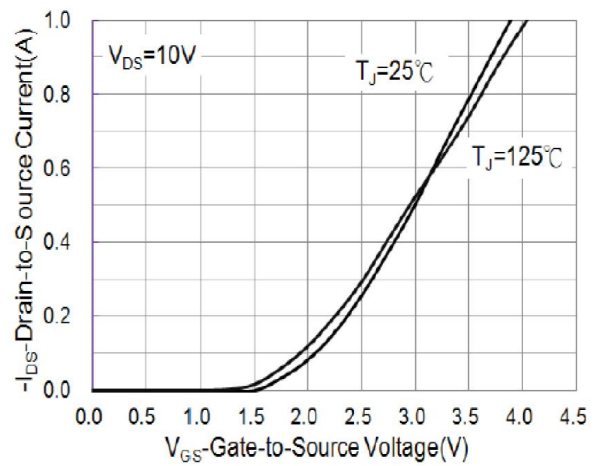


Fig.2 Transfer Characteristics

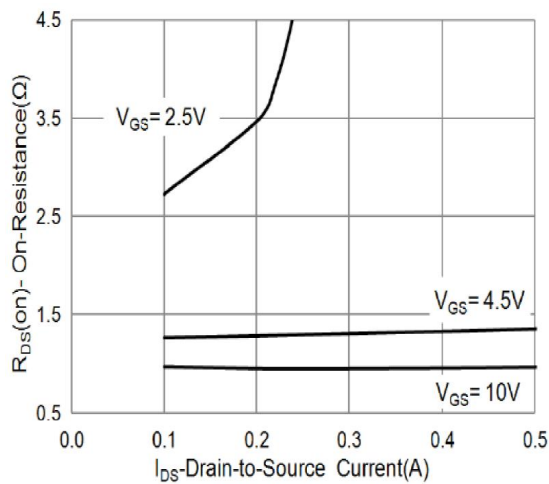


Fig.3 On-Resistance vs. Drain Current

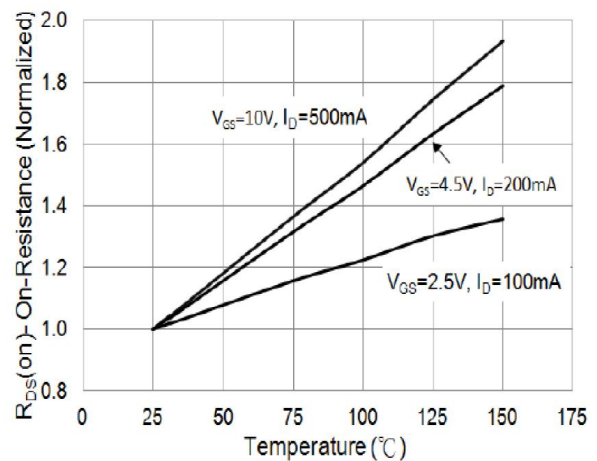


Fig.4 On-Resistance vs. Junction temperature

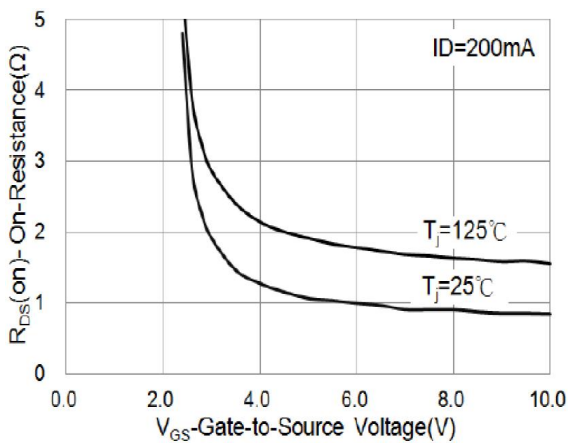


Fig.5 On-Resistance Variation with VGS

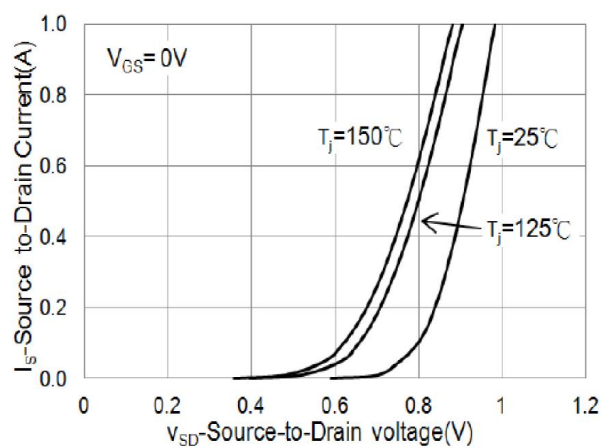


Fig.6 Body Diode Characteristics

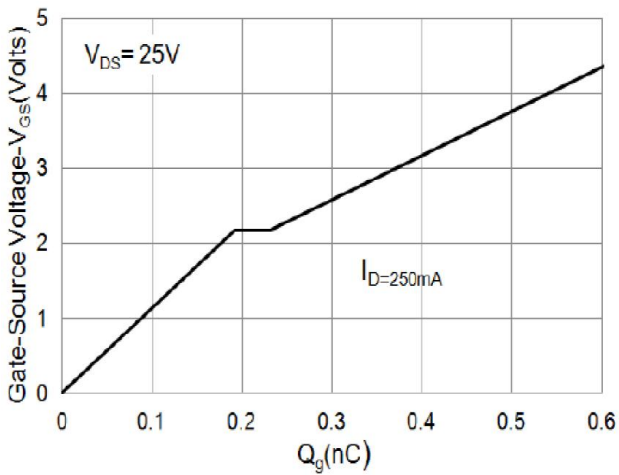


Fig.7 Gate-Charge Characteristics

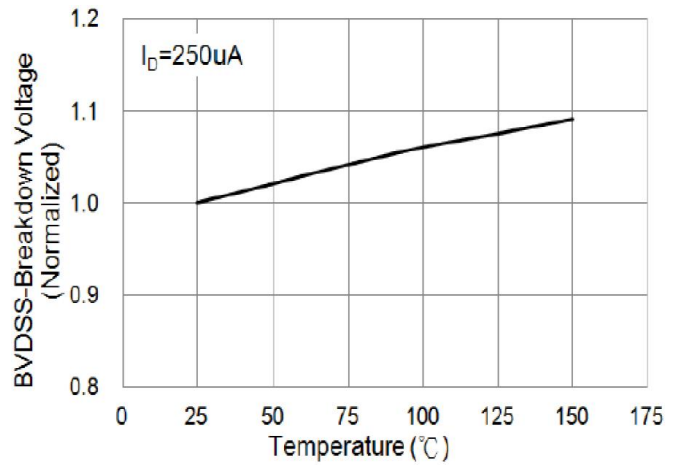


Fig.8 Breakdown Voltage Variation vs. Temperature

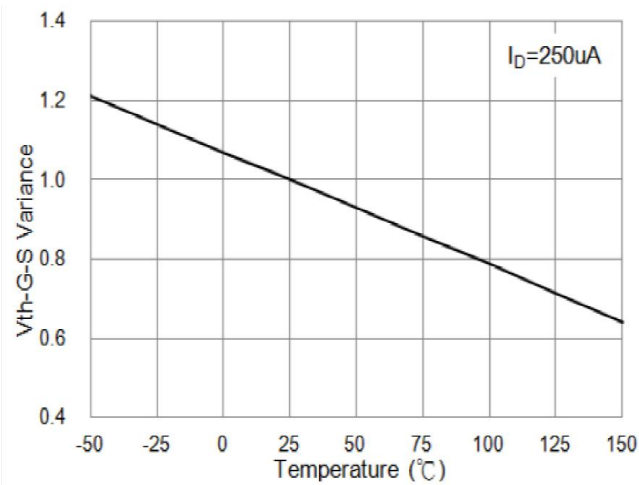


Fig.9 Threshold Voltage Variation with Temperature

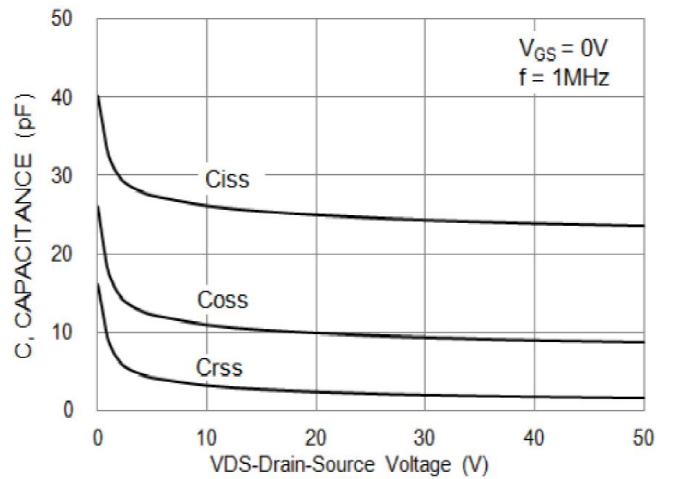
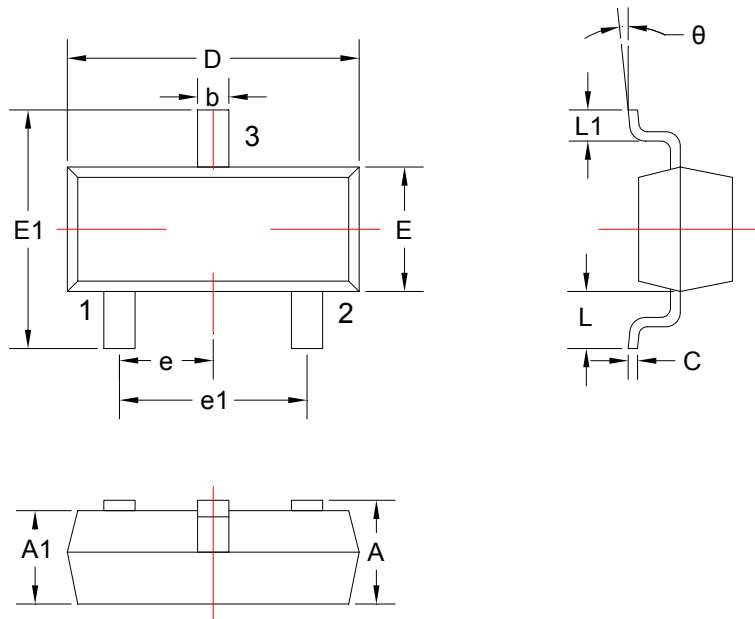


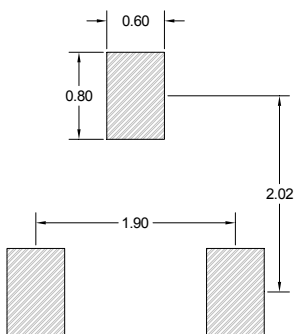
Fig.10 Capacitance vs. Drain-Source Voltage.

8. Dimension and Patterns (SOT-23)



Units: mm

| Symbol | Dimensions | | Symbol | Dimensions | |
|--------|------------|-------|--------|------------|-------|
| | Min. | Max. | | Min. | Max. |
| A | 0.900 | 1.150 | E1 | 2.250 | 2.550 |
| A1 | 0.900 | 1.050 | e | 0.950TYP | |
| b | 0.300 | 0.500 | e1 | 1.800 | 2.000 |
| c | 0.080 | 0.150 | L | 0.550REF | |
| D | 2.800 | 3.00 | L1 | 0.300 | 0.500 |
| E | 1.200 | 1.400 | θ | 0° | 8° |



Note:

1. Controlling dimension: in millimeters
2. General tolerance: ±0.05mm
3. The pad layout is for reference only
4. Unit: mm

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