

**SuperMOS – SOT363 60V  $BV_{DSS}$  1.5 $\Omega$   $R_{DS(on)}$  0.41A  $I_D$ , N-channel MOSFET**

**1. Description**

The BSS138PS 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 BSS138PS 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 |
|-------------|---------|---------|--------------|-------------|-------------------|---------------------|-----------|
| BSS138PS    | SOT363  | 38KZ    | 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   | Source1  |         |                 |
| 2   | Gate1    |         |                 |
| 6   | Drain1   |         |                 |
| 4   | Source2  |         |                 |
| 5   | Gate2    |         |                 |
| 3   | Drain2   |         |                 |

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               | $V_{GS}$   | $\pm 20$   | V    |
| Continuous Drain Current          | $I_D$      | 0.41       | A    |
| Maximum Power Dissipation         | $P_D$      | 417        | mW   |
| Pulsed Drain Current <sup>a</sup> | $I_{DM}$   | 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:

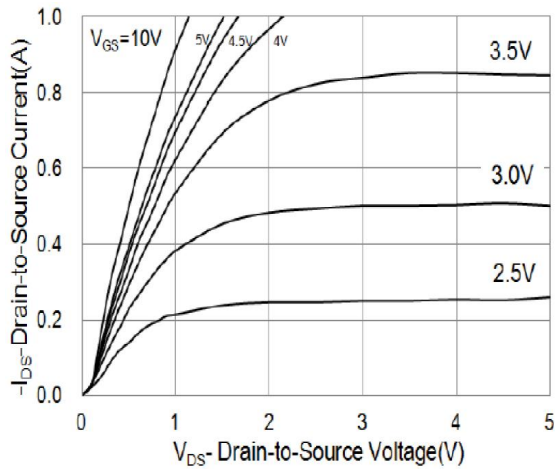
a: Repetitive rating, pulse width limited by junction temperature,  $t_p=10\mu s$ , Duty Cycle=1%

## Electrical Characteristics

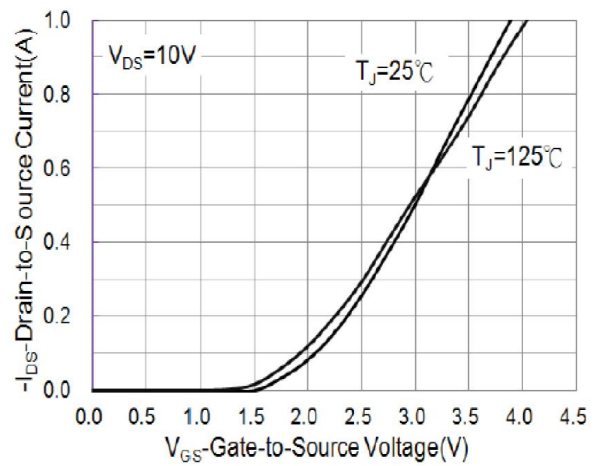
At TA = 25°C unless otherwise specified

| Parameter  | Symbol       | Test Conditions                                      | Min. | Typ. | Max.     | Unit     |
|--|--------------|--|------|------|----------|----------|
| <b>OFF CHARACTERISTICS</b>                       |              |  |      |      |          |          |
| 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                   | $I_{GSS}$    | $V_{DS}=0V, V_{GS}=\pm 20V$                          |      |      | $\pm 10$ | uA       |
| <b>ON CHARACTERISTICS</b>                        |              |  |      |      |          |          |
| 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      | $\Omega$ |
|  |              | $V_{GS}=4.5V, I_D=0.2A$                              |      | 1.6  | 2.5      |          |
| <b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b> |              |  |      |      |          |          |
| 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 |          |          |
| <b>SWITCHING CHARACTERISTICS</b>                 |              |  |      |      |          |          |
| Turn-On Delay Time                               | $t_{d(ON)}$  | $V_{GS}=10V, V_{DS}=25V, I_D=0.5A,$<br>$R_G=6\Omega$ |      | 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       |          |
| <b>BODY DIODE CHARACTERISTICS</b>                |              |  |      |      |          |          |
| Forward Voltage                                  | $V_{SD}$     | $V_{GS}=0V, I_S=0.5A$                                |      | 0.86 | 1.5      | V        |

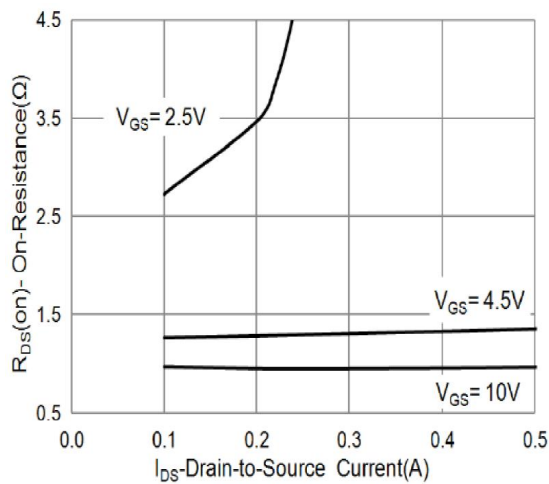
**7. Typical Characteristic**



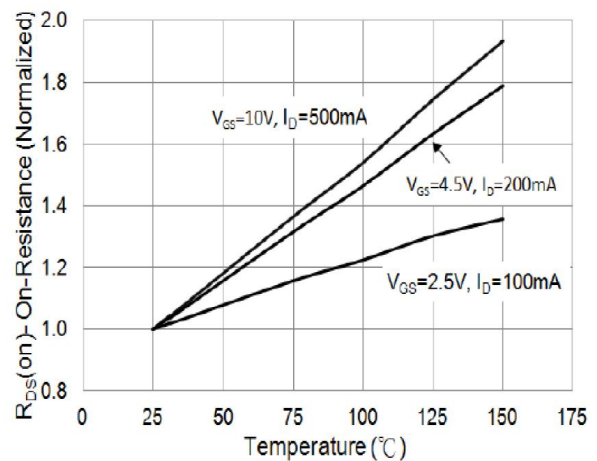
**Fig.1 On-Region Characteristics**



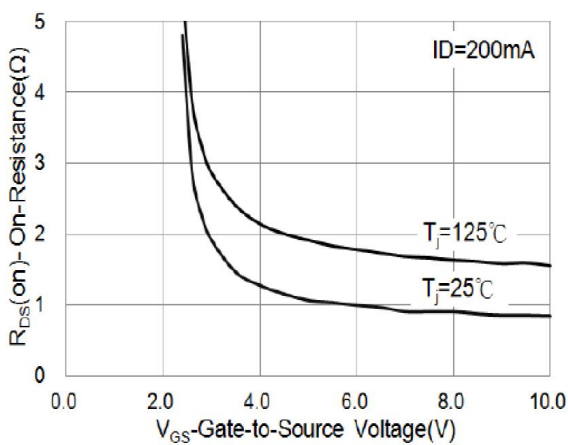
**Fig.2 Transfer Characteristics**



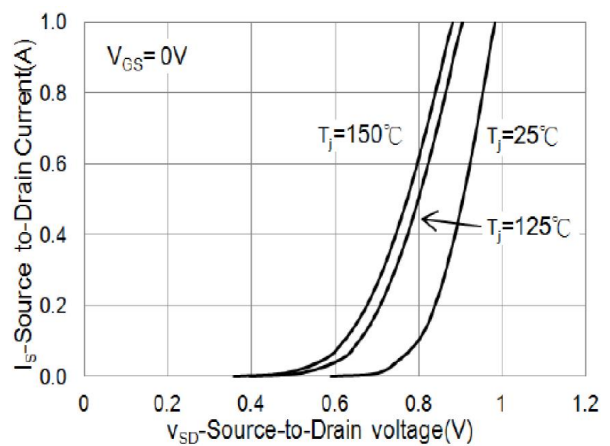
**Fig.3 On-Resistance vs. Drain Current**



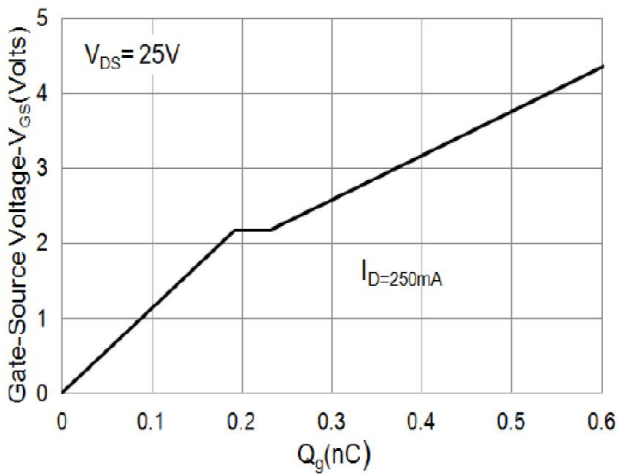
**Fig.4 On-Resistance vs. Junction temperature**



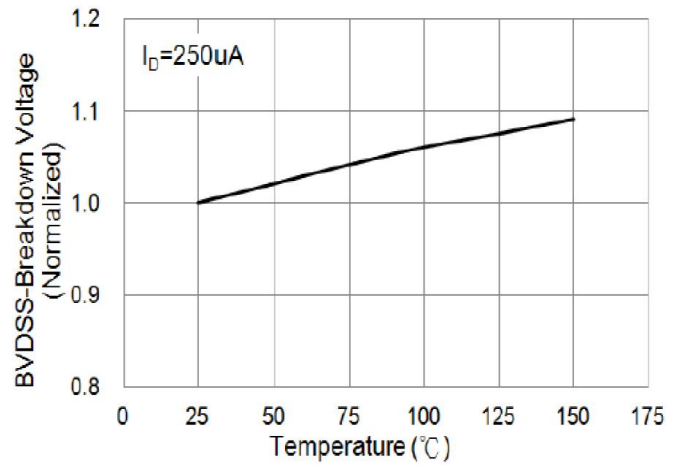
**Fig.5 On-Resistance Variation with VGS**



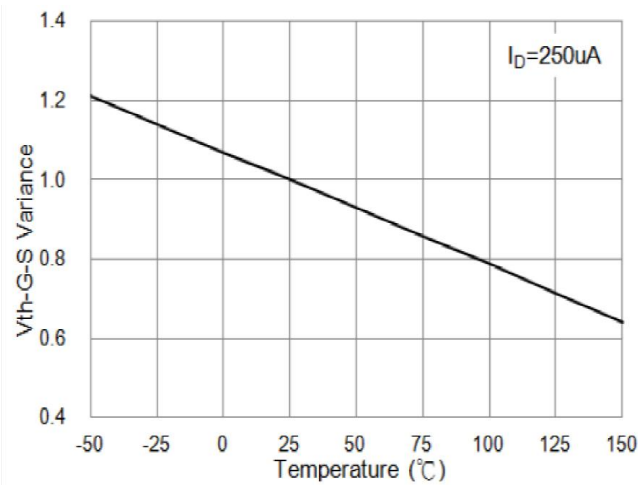
**Fig.6 Body Diode Characteristics**



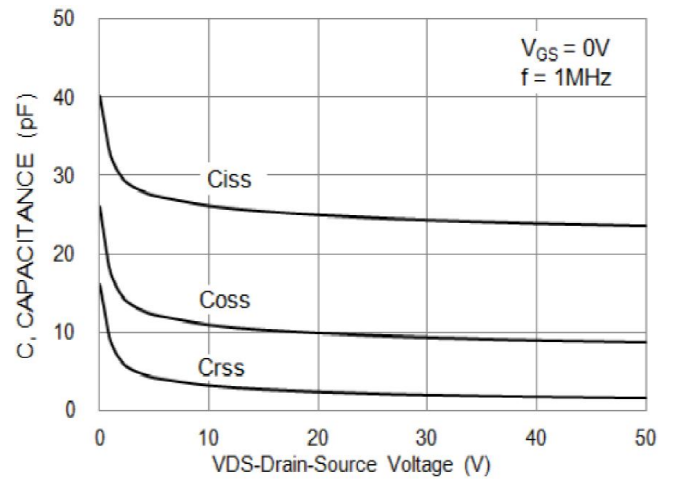
**Fig.7 Gate-Charge Characteristics**



**Fig.8 Breakdown Voltage Variation vs. Temperature**

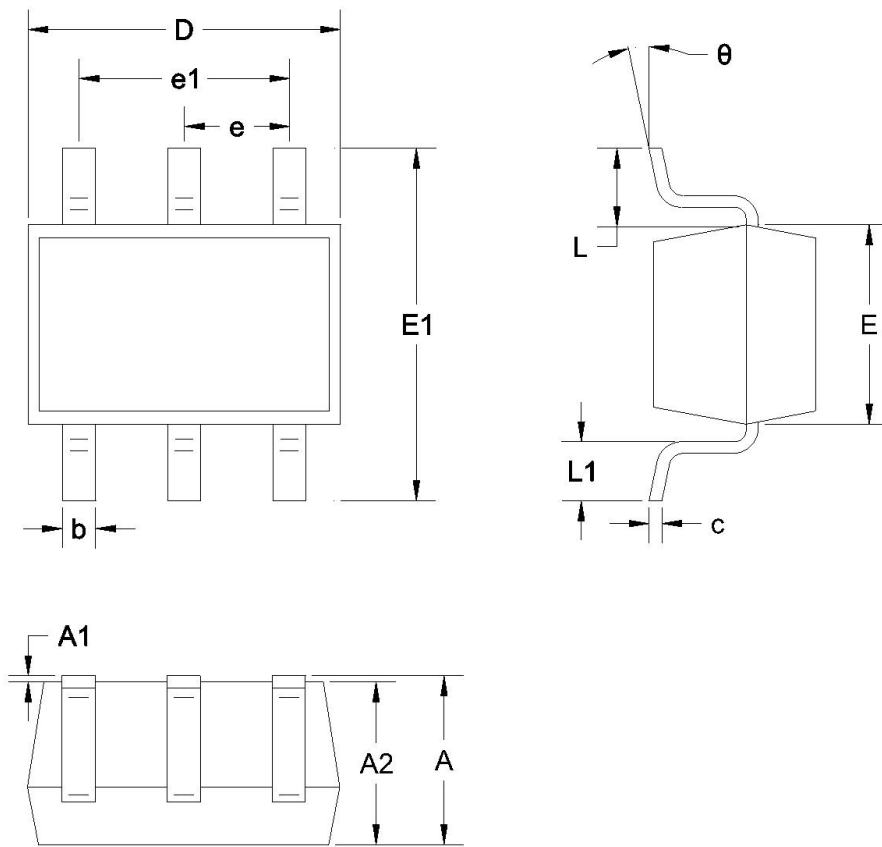


**Fig.9 Threshold Voltage Variation with Temperature**



**Fig.10 Capacitance vs. Drain-Source Voltage.**

8. Dimension (SOT363)



Unit: mm

| Symbol |     | A     | A1    | A2    | b     | c     | D      | $\theta$ |
|--------|-----|-------|-------|-------|-------|-------|--------|----------|
| Spec   | Min | 0.900 | 0.000 | 0.900 | 0.150 | 0.080 | 2.000  | 0°       |
|        | Max | 1.100 | 0.100 | 1.000 | 0.350 | 0.150 | 2.200  | 8°       |
| Symbol |     | E     | E1    | e     | e1    | L     | L1     | -        |
| Spec   | Min | 1.150 | 2.150 | 0.650 | 1.200 | 0.525 | 0.2600 | -        |
|        | Max | 1.350 | 2.450 | REF   | 1.400 | REF   | 0.4600 | -        |

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