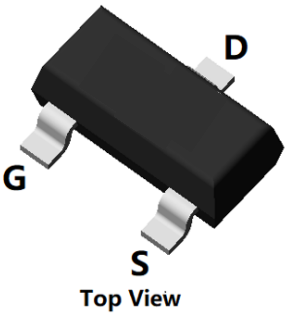
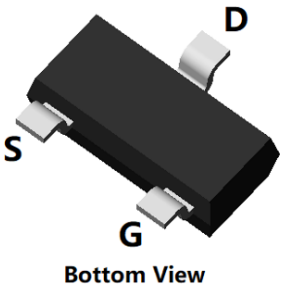
# BSS138

RoHS COMPLIANT

## N-Channel Enhancement Mode Field Effect Transistor

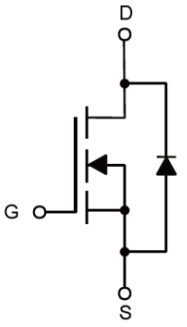


Top View



Bottom View

SOT-23




### Product Summary

- $V_{DS}$ 50V
- $I_D$ 340mA
- $R_{DS(ON)}$( at $V_{GS}$=10V) ＜2.5ohm
- $R_{DS(ON)}$( at $V_{GS}$=4.5V) ＜3.0ohm

### General Description

- Trench Power MV MOSFET technology
- Voltage controlled small signal switch
- Low input Capacitance
- Fast Switching Speed
- Low Input / Output Leakage
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

### Applications

- Battery operated systems
- Solid-state relays
- Direct logic-level interface：TTL/CMOS

### ■ Absolute Maximum Ratings ($T_A$=25℃unless otherwise noted)

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-source Voltage | | $V_{DS}$ | 50 | V |
| Gate-source Voltage | | $V_{GS}$ | ±20 | V |
| Drain Current | $T_A$=25℃ @ Steady State | $I_D$ | 340 | mA |
| | $T_A$=70℃ @ Steady State | | 272 | |
| Pulsed Drain Current [A] | | $I_{DM}$ | 1.5 | A |
| Total Power Dissipation @ $T_A$=25℃ | | $P_D$ | 350 | mW |
| Thermal Resistance Junction-to-Ambient @ Steady State [B] | | $R_{\theta JA}$ | 357 | ℃/ W |
| Junction and Storage Temperature Range | | $T_J$ ,$T_{STG}$ | -55～+150 | ℃ |

### ■ Ordering Information (Example)

| PREFERED P/N | PACKING CODE | Marking | MINIMUM PACKAGE(pcs) | INNER BOX QUANTITY(pcs) | OUTER CARTON QUANTITY(pcs) | DELIVERY MODE |
|---|---|---|---|---|---|---|
| BSS138 | F2 | SS. | 3000 | 30000 | 120000 | 7“ reel |

## ■ Electrical Characteristics ($T_J$=25℃ unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Static Parameter** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$= 0V, $I_D$=250μA | 50 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=50V,$V_{GS}$=0V | | | 0.5 | μA |
| Gate-Body Leakage Current | $I_{GSS1}$ | $V_{GS}$= ±20V, $V_{DS}$=0V | | | ±100 | nA |
| | $I_{GSS2}$ | $V_{GS}$= ±10V, $V_{DS}$=0V | | | ±50 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$= $V_{GS}$, $I_D$=250μA | 0.8 | 1.2 | 1.6 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$= 10V, $I_D$=300mA | | 1.1 | 2.5 | Ω |
| | | $V_{GS}$= 4.5V, $I_D$=200mA | | 1.2 | 3.0 | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=300mA,$V_{GS}$=0V | | | 1.2 | V |
| Maximum Body-Diode Continuous Current | $I_S$ | | | | 340 | mA |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=25V,$V_{GS}$=0V,f=1MHZ | | 28.5 | | pF |
| Output Capacitance | $C_{oss}$ | | | 2.7 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 1.78 | | |
| **Switching Parameters** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=10V,$V_{DS}$=25V,$I_D$=0.3A | | 1.7 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 0.4 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 0.24 | | |
| Reverse Recovery Charge | $Q_{rr}$ | $I_F$=0.3A, di/dt=-100A/us | | 2.65 | | |
| Reverse Recovery Time | $t_{rr}$ | | | 12.2 | | ns |
| Turn-on Delay Time | $t_{D(on)}$ | $V_{GS}$=10V,$V_{DD}$=25V, $I_D$=300mA, $R_{GEN}$=6Ω | | 2.6 | | |
| Turn-on Rise Time | $t_r$ | | | 18.8 | | |
| Turn-off Delay Time | $t_{D(off)}$ | | | 9.7 | | |
| Turn-off fall Time | $t_f$ | | | 47 | | |

A. Pulse Test: Pulse Width≤300us,Duty cycle ≤2%.
B. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.

## ■ Typical Performance Characteristics

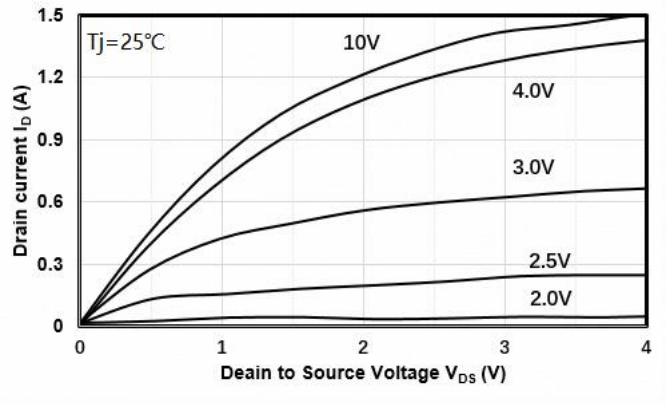



Figure1. Output Characteristics

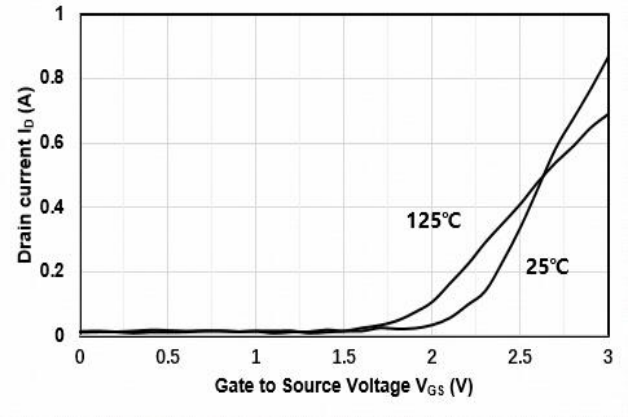



Figure2. Transfer Characteristics

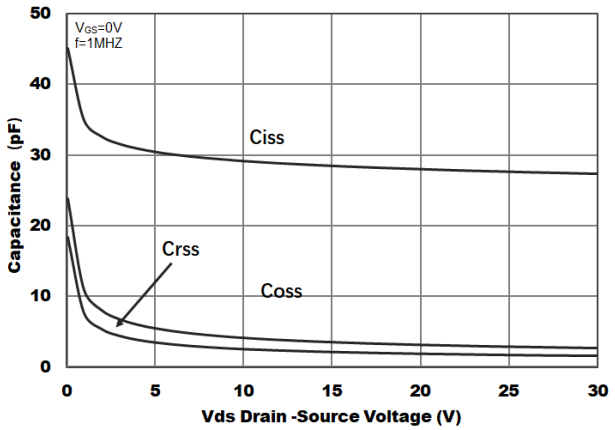



Figure3. Capacitance Characteristics

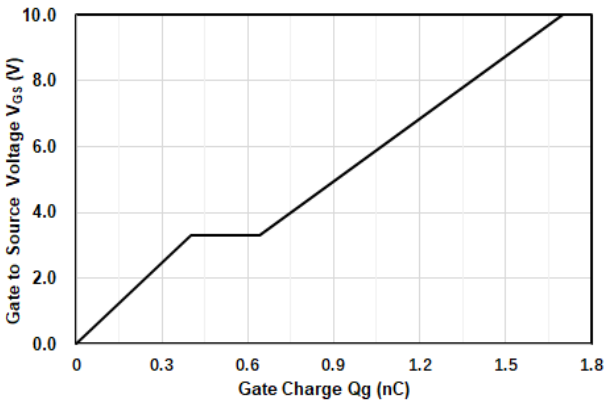



Figure4. Gate Charge

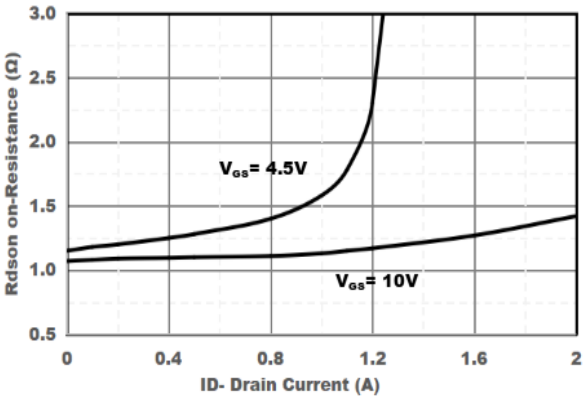



Figure5. Drain-Source on Resistance

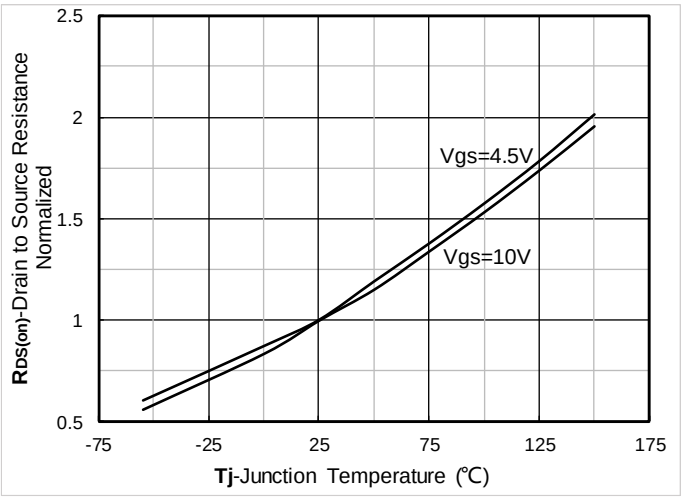



Figure6. Drain-Source on Resistance

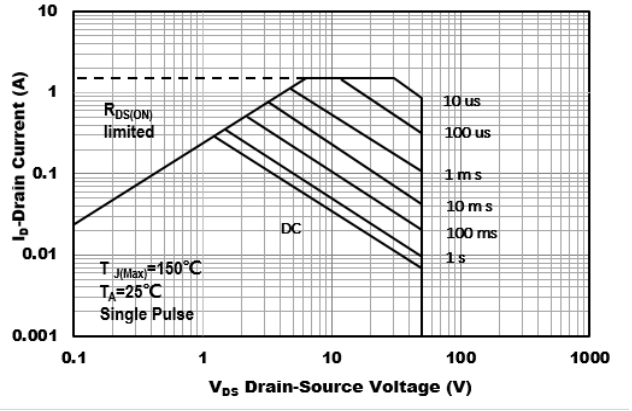



Figure7. Safe Operation Area

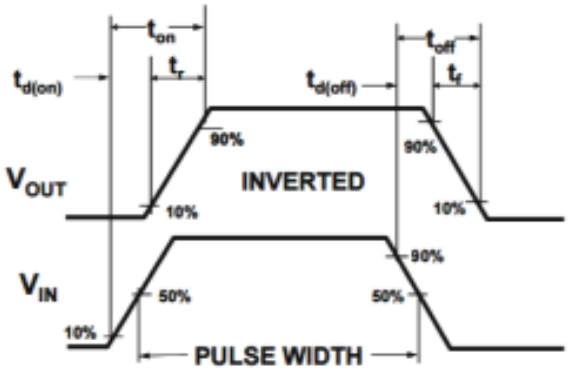



Figure8. Switching wave

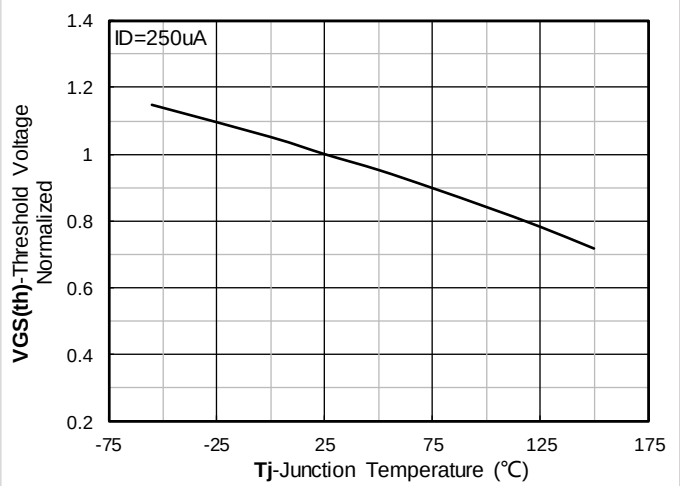



Figure 9. Normalized Threshold voltage

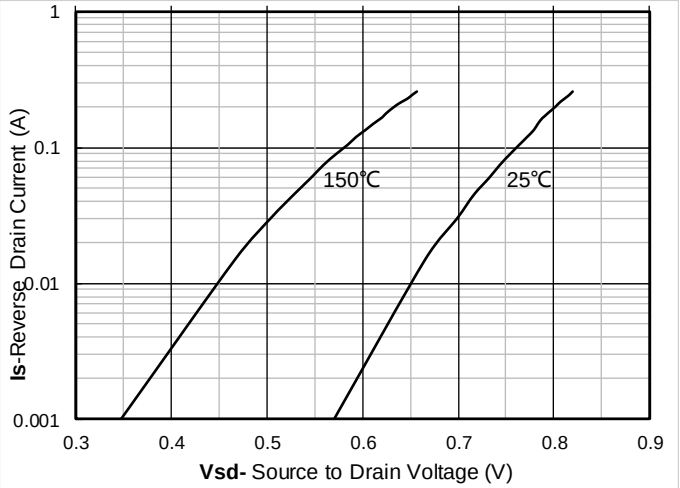
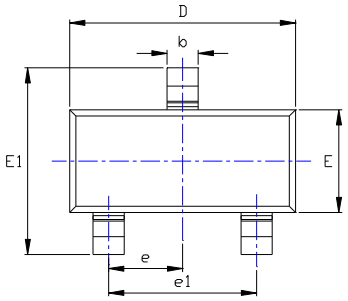
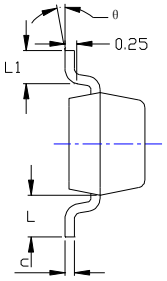



Figure 10. Forward characteristics of reverse diode

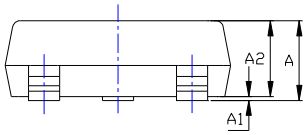
## ■ SOT-23 Package information



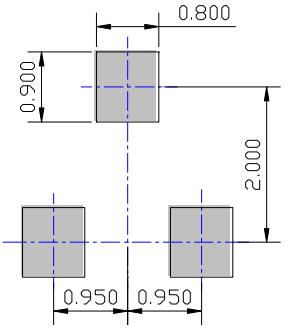

TOP VIEW




SIDE VIEW




SIDE VIEW




UNIT：mm

SUGGESTED SOLDER PAD LAYOUT

| DIMENSIONS | | | | |
|---|---|---|---|---|
| SYMBOL | INCHES | | Millimeter | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.035 | 0.045 | 0.900 | 1.150 |
| A1 | 0.000 | 0.004 | 0.000 | 0.100 |
| A2 | 0.035 | 0.041 | 0.900 | 1.050 |
| b | 0.012 | 0.020 | 0.300 | 0.500 |
| c | 0.004 | 0.008 | 0.100 | 0.200 |
| D | 0.110 | 0.118 | 2.800 | 3.000 |
| E | 0.047 | 0.055 | 1.200 | 1.400 |
| E1 | 0.089 | 0.100 | 2.250 | 2.550 |
| e | 0.037TYP | | 0.950TYP | |
| e1 | 0.071 | 0.079 | 1.800 | 2.000 |
| L | 0.022REF | | 0.550REF | |
| L1 | 0.012 | 0.200 | 0.300 | 0.500 |
| θ | 0° | 8° | 0° | 8° |

NOTE:
1.PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
2.TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
3.THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.