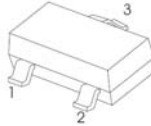


### FEATURE

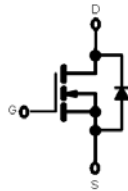
- High density cell design for low  $R_{DS(ON)}$
- Voltage controlled small signal switch
- Rugged and reliable
- High saturation current capability

### SOT-23

1. GATE
2. SOURCE
3. DRAIN

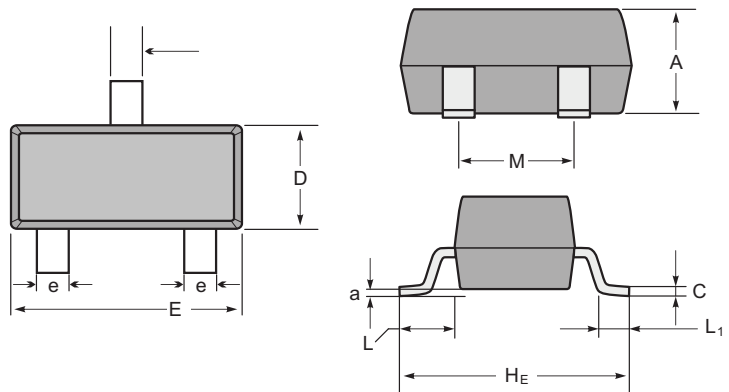


### Equivalent Circuit



### Marking

| Type number | Marking code |
|-------------|--------------|
| BSS138      | SS           |



SOT-23 mechanical data

| UNIT |     | A   | C    | D   | E   | H <sub>E</sub> | e   | M    | L          | L <sub>1</sub> | a    |
|------|-----|-----|------|-----|-----|----------------|-----|------|------------|----------------|------|
| mm   | max | 1.1 | 0.15 | 1.4 | 3.0 | 2.6            | 0.5 | 1.95 | 0.55 (ref) | 0.36 (ref)     | 0.0  |
|      | min | 0.9 | 0.08 | 1.2 | 2.8 | 2.2            | 0.3 | 1.7  |            |                | 0.15 |
| mil  | max | 43  | 6    | 55  | 118 | 102            | 20  | 77   | 22 (ref)   | 14 (ref)       | 0.0  |
|      | min | 35  | 3    | 47  | 110 | 87             | 12  | 67   |            |                | 6    |

### Maximum ratings ( $T_a=25^\circ\text{C}$ unless otherwise noted)

| Parameter                                   | Symbol          | Value      | Unit               |
|---|-----------------|------------|--------------------|
| Drain-Source Voltage                        | $V_{DS}$        | 50         | V                  |
| Continuous Gate-Source Voltage              | $V_{GSS}$       | $\pm 20$   |                    |
| Continuous Drain Current                    | $I_D$           | 0.22       | A                  |
| Power Dissipation                           | $P_D$           | 0.35       | W                  |
| Thermal Resistance from Junction to Ambient | $R_{\theta JA}$ | 357        | $^\circ\text{C/W}$ |
| Operating Temperature                       | $T_j$           | 150        | $^\circ\text{C}$   |
| Storage Temperature                         | $T_{stg}$       | -55 ~ +150 |                    |

# BSS138

$T_a=25^\circ\text{C}$  unless otherwise specified

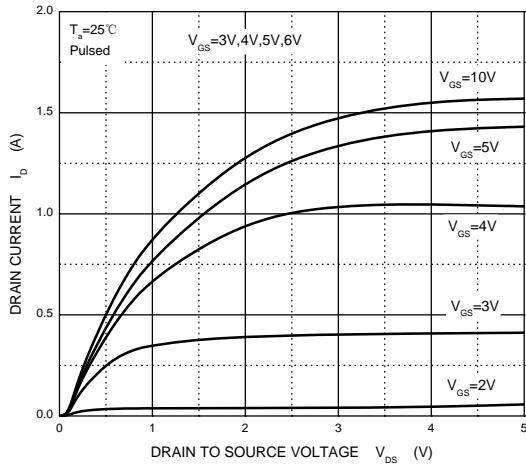
| Parameter                                      | Symbol        | Test Condition  | Min  | Typ | Max       | Units    |
|--|---------------|---|------|-----|-----------|----------|
| <b>Off characteristics</b>                     |               |   |      |     |           |          |
| Drain-source breakdown voltage                 | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$                                     | 50   |     |           | V        |
| Gate-body leakage                              | $I_{GSS}$     | $V_{DS} = 0V, V_{GS} = \pm 20V$                                   |      |     | $\pm 100$ | nA       |
| Zero gate voltage drain current                | $I_{DSS}$     | $V_{DS} = 50V, V_{GS} = 0V$                                       |      |     | 0.5       | $\mu A$  |
|  |               | $V_{DS} = 30V, V_{GS} = 0V$                                       |      |     | 100       | nA       |
| <b>On characteristics</b>                      |               |   |      |     |           |          |
| Gate-threshold voltage (note 1)                | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 1mA$                                      | 0.80 |     | 1.50      | V        |
| Static drain-source on-resistance (note 1)     | $R_{DS(on)}$  | $V_{GS} = 10V, I_D = 0.22A$                                       |      | 1.7 | 3.50      | $\Omega$ |
|  |               | $V_{GS} = 4.5V, I_D = 0.22A$                                      |      |     | 6         |          |
| Forward transconductance (note 1)              | $g_{FS}$      | $V_{DS} = 10V, I_D = 0.22A$                                       | 0.12 |     |           | S        |
| <b>Dynamic characteristics (note 2)</b>        |               |   |      |     |           |          |
| Input capacitance                              | $C_{iss}$     | $V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$                             |      | 27  |           | pF       |
| Output capacitance                             | $C_{oss}$     |   |      | 13  |           |          |
| Reverse transfer capacitance                   | $C_{rss}$     |   |      | 6   |           |          |
| <b>Switching characteristics</b>               |               |   |      |     |           |          |
| Turn-on delay time (note 1,2)                  | $t_{d(on)}$   | $V_{DD} = 30V, V_{DS} = 10V,$<br>$I_D = 0.29A, R_{GEN} = 6\Omega$ |      |     | 5         | ns       |
| Rise time (note 1,2)                           | $t_r$         |   |      |     | 18        |          |
| Turn-off delay time (note 1,2)                 | $t_{d(off)}$  |   |      |     | 36        |          |
| Fall time (note 1,2)                           | $t_f$         |   |      |     | 14        |          |
| <b>Drain-source body diode characteristics</b> |               |   |      |     |           |          |
| Body diode forward voltage (note 1)            | $V_{SD}$      | $I_S = 0.44A, V_{GS} = 0V$  |      |     | 1.4       | V        |

**Notes:**

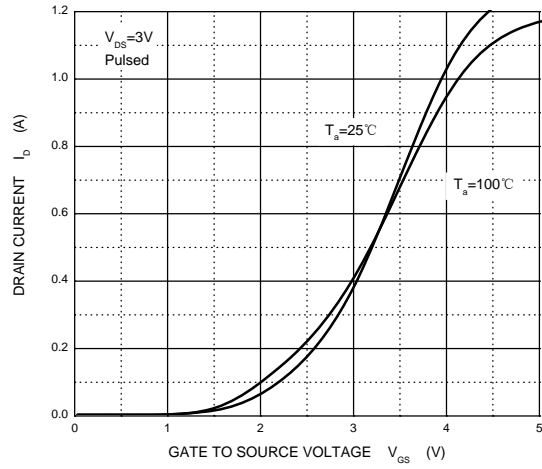
1. Pulse Test ; Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
2. These parameters have no way to verify.

# RATING AND CHARACTERISTIC CURVES (BSS138)

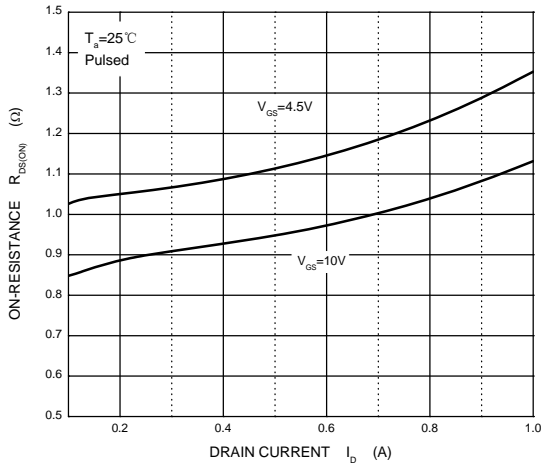
### Output Characteristics



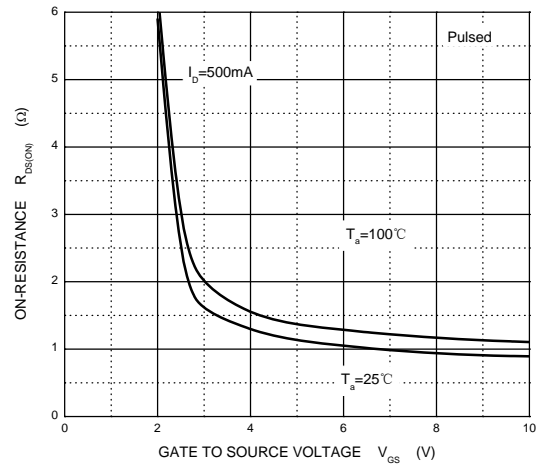
### Transfer Characteristics



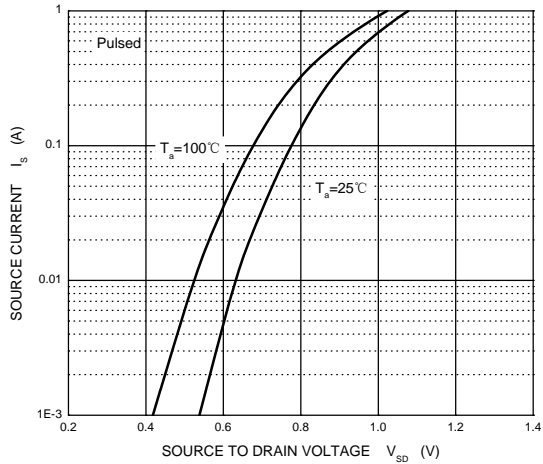
### $R_{DS(ON)}$ — $I_D$



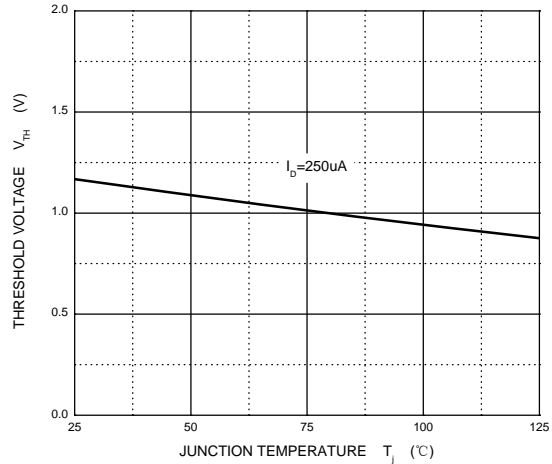
### $R_{DS(ON)}$ — $V_{GS}$



### $I_S$ — $V_{SD}$



### Threshold Voltage



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