

**BSS138**

Preliminary

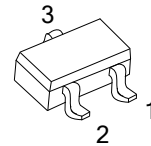
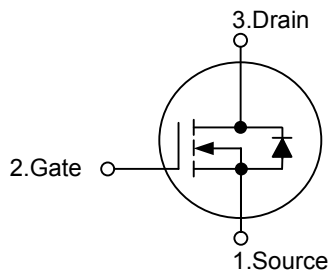
**Power MOSFET****N-CHANNEL LOGIC LEVEL  
ENHANCEMENT MODE****DESCRIPTION**

This device employs advanced MOSFET technology and features low gate charge while maintaining low on-resistance.

Optimized for switching applications, this device improves the overall efficiency of DC/DC converters and allows operation to higher switching frequencies.

**FEATURES**

- \*  $R_{DS(ON)}=3.5\Omega$  @  $V_{GS}=10V$
- \*  $R_{DS(ON)}=6.0\Omega$  @  $V_{GS}=4.5V$
- \* Low Capacitance
- \* Low Gate Charge
- \* Fast Switching Capability
- \* Avalanche Energy Specified

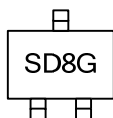
**SYMBOL**

SOT-23-3  
(JEDEC TO-236)

**ORDERING INFORMATION**

| Ordering Number | Package  | Pin Assignment |   |   | Packing   |
|-----------------|----------|----------------|---|---|-----------|
|                 |          | 1              | 2 | 3 |           |
| BSS138G-AE2-R   | SOT-23-3 | S              | G | D | Tape Reel |

|  |                 |                     |
|--|-----------------|---------------------|
|  | (1)Packing Type | (1) R: Tape Reel    |
|  | (2)Package Type | (2) AE2: SOT-23-3   |
|  | (3)Halogen Free | (3) G: Halogen Free |

**MARKING**

■ ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER                |       | SYMBOL           | RATINGS    | UNIT  |
|--------------------------|-------|------------------|------------|-------|
| Drain-Source Voltage     |       | V <sub>DSS</sub> | 50         | V     |
| Gate-Source Voltage      |       | V <sub>GSS</sub> | ±20        | V     |
| Continuous Drain Current | DC    | I <sub>D</sub>   | 0.22       | A     |
|                          | Pulse |                  | 0.88       |       |
| Power Dissipation        |       | P <sub>D</sub>   | 0.36       | W     |
| Derate Above 25°C        |       |                  | 2.8        | mW/°C |
| Junction Temperature     |       | T <sub>J</sub>   | +150       | °C    |
| Storage Temperature      |       | T <sub>STG</sub> | -55 ~ +150 | °C    |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

| PARAMETER           | SYMBOL        | RATINGS | UNIT                      |
|---------------------|---------------|---------|---------------------------|
| Junction to Ambient | $\theta_{JA}$ | 350     | $^\circ\text{C}/\text{W}$ |

■ ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER                                       | SYMBOL                                | TEST CONDITIONS                                                                        | MIN  | TYP | MAX  | UNIT  |
|-------------------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------|------|-----|------|-------|
| OFF CHARACTERISTICS                             |                                       |                                                                                        |      |     |      |       |
| Drain-Source Breakdown Voltage                  | BV <sub>DSS</sub>                     | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                             | 50   |     |      | V     |
| Breakdown Voltage Temperature Coefficient       | ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>   | I <sub>D</sub> =250μA, Referenced to 25°C                                              |      | 72  |      | mV/°C |
| Zero Gate Voltage Drain Current                 | I <sub>DSS</sub>                      | V <sub>DS</sub> =50V, V <sub>GS</sub> =0V                                              |      |     | 0.5  | μA    |
|                                                 |                                       | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V                                              |      |     | 0.1  |       |
| Gate-Body Leakage, Forward                      | I <sub>GSS</sub>                      | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                             |      |     | ±100 | nA    |
| ON CHARACTERISTICS (Note)                       |                                       |                                                                                        |      |     |      |       |
| Gate-Threshold Voltage                          | V <sub>GS(TH)</sub>                   | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1m A                                | 0.8  | 1.3 | 1.5  | V     |
| Gate Threshold Voltage Temperature Coefficient  | ΔV <sub>GS(TH)</sub> /ΔT <sub>J</sub> | I <sub>D</sub> =1mA, Referenced to 25°C                                                |      | -2  |      | mV/°C |
| Static Drain-Source On-Resistance               | R <sub>DS(ON)</sub>                   | V <sub>GS</sub> =10 V, I <sub>D</sub> =0.22A                                           |      | 0.7 | 3.5  | Ω     |
|                                                 |                                       | V <sub>GS</sub> =4.5 V, I <sub>D</sub> =0.22A                                          |      | 1.0 | 6.0  |       |
| On-State Drain Current                          | I <sub>D(ON)</sub>                    | V <sub>GS</sub> =10 V, V <sub>DS</sub> =5V                                             | 0.2  |     |      | A     |
| Forward Transconductance                        | g <sub>FS</sub>                       | V <sub>DS</sub> =10V, I <sub>D</sub> =0.22A                                            | 0.12 | 0.5 |      | S     |
| DYNAMIC PARAMETERS                              |                                       |                                                                                        |      |     |      |       |
| Input Capacitance                               | C <sub>ISS</sub>                      | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                      |      | 27  |      | pF    |
| Output Capacitance                              | C <sub>OSS</sub>                      |                                                                                        |      | 13  |      | pF    |
| Reverse Transfer Capacitance                    | C <sub>RSS</sub>                      |                                                                                        |      | 6   |      | pF    |
| SWITCHING PARAMETERS (Note)                     |                                       |                                                                                        |      |     |      |       |
| Total Gate Charge                               | Q <sub>G</sub>                        | V <sub>DS</sub> =25V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.22A                      |      | 1.7 | 2.4  | nC    |
| Gate Source Charge                              | Q <sub>GS</sub>                       |                                                                                        |      | 0.1 |      | nC    |
| Gate Drain Charge                               | Q <sub>GD</sub>                       |                                                                                        |      | 0.4 |      | nC    |
| Turn-ON Delay Time                              | t <sub>D(ON)</sub>                    | V <sub>DD</sub> =30V, I <sub>D</sub> =0.29A, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω, |      | 2.5 | 5    | ns    |
| Turn-ON Rise Time                               | t <sub>R</sub>                        |                                                                                        |      | 9   | 18   | ns    |
| Turn-OFF Delay Time                             | t <sub>D(OFF)</sub>                   |                                                                                        |      | 20  | 36   | ns    |
| Turn-OFF Fall-Time                              | t <sub>F</sub>                        |                                                                                        |      | 7   | 14   | ns    |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS |                                       |                                                                                        |      |     |      |       |
| Drain-Source Diode Forward Voltage              | V <sub>SD</sub>                       | V <sub>GS</sub> = 0V, I <sub>S</sub> =0.44A (Note)                                     |      | 0.8 | 1.4  | V     |
| Max. Diode Forward Current                      | I <sub>S</sub>                        |                                                                                        |      |     | 0.22 | A     |

Notes: Pulse test; pulse width  $\leq 300\mu\text{s}$ , duty cycles  $\leq 2\%$

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