

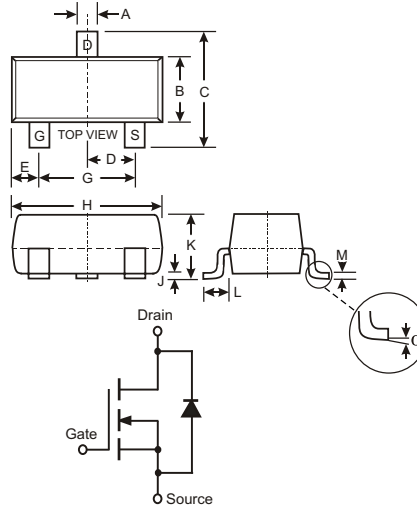
## N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR

### Features

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage

### Mechanical Data

- Case: SOT-23, Molded Plastic
- Case Material - UL Flammability Classification Rating 94V-0
- Moisture sensitivity: Level 1 per J-STD-020A
- Terminals: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Marking (See Page 2): K38
- Ordering & Date Code Information: See Page 2
- Weight: 0.008 grams (approx.)



| SOT-23               |       |       |
|----------------------|-------|-------|
| Dim                  | Min   | Max   |
| A                    | 0.37  | 0.51  |
| B                    | 1.20  | 1.40  |
| C                    | 2.30  | 2.50  |
| D                    | 0.89  | 1.03  |
| E                    | 0.45  | 0.60  |
| G                    | 1.78  | 2.05  |
| H                    | 2.80  | 3.00  |
| J                    | 0.013 | 0.10  |
| K                    | 0.903 | 1.10  |
| L                    | 0.45  | 0.61  |
| M                    | 0.085 | 0.180 |
| $\alpha$             | 0°    | 8°    |
| All Dimensions in mm |       |       |

### Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic                                   | Symbol               | BSS138      | Units                     |
|--|----------------------|-------------|---------------------------|
| Drain-Source Voltage                             | $V_{DSS}$            | 50          | V                         |
| Drain-Gate Voltage $R_{GS} \leq 20K\Omega$       | $V_{DGR}$            | 50          | V                         |
| Gate-Source Voltage                              | Continuous $V_{GSS}$ | $\pm 20$    | V                         |
| Drain Current                                    | Continuous $I_D$     | 200         | mA                        |
| Power Dissipation (Note 1)                       | $P_d$                | 300         | mW                        |
| Thermal Resistance, Junction to Ambient (Note 1) | $R_{\theta JA}$      | 417         | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range          | $T_j, T_{STG}$       | -55 to +150 | $^\circ\text{C}$          |

### Electrical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic                      | Symbol       | Min | Typ | Max       | Unit          | Test Condition                                      |
|-------------------------------------|--------------|-----|-----|-----------|---------------|---|
| <b>OFF CHARACTERISTICS (Note 2)</b> |              |     |     |           |               |   |
| Drain-Source Breakdown Voltage      | $BV_{DSS}$   | 50  | 75  | —         | V             | $V_{GS} = 0V, I_D = 250\mu\text{A}$                 |
| Zero Gate Voltage Drain Current     | $I_{DSS}$    | —   | —   | 0.5       | $\mu\text{A}$ | $V_{DS} = 50V, V_{GS} = 0V$                         |
| Gate-Body Leakage                   | $I_{GSS}$    | —   | —   | $\pm 100$ | nA            | $V_{GS} = \pm 20V, V_{DS} = 0V$                     |
| <b>ON CHARACTERISTICS (Note 2)</b>  |              |     |     |           |               |   |
| Gate Threshold Voltage              | $V_{GS(th)}$ | 0.5 | 1.2 | 1.5       | V             | $V_{DS} = V_{GS}, I_D = -250\mu\text{A}$            |
| Static Drain-Source On-Resistance   | $R_{DS(on)}$ | —   | 1.4 | 3.5       | $\Omega$      | $V_{GS} = 10V, I_D = 0.22A$                         |
| Forward Transconductance            | $g_{FS}$     | 100 | —   | —         | mS            | $V_{DS} = 25V, I_D = 0.2A, f = 1.0\text{KHz}$       |
| <b>DYNAMIC CHARACTERISTICS</b>      |              |     |     |           |               |   |
| Input Capacitance                   | $C_{iss}$    | —   | —   | 50        | pF            | $V_{DS} = 10V, V_{GS} = 0V$<br>$f = 1.0\text{MHz}$  |
| Output Capacitance                  | $C_{oss}$    | —   | —   | 25        | pF            |   |
| Reverse Transfer Capacitance        | $C_{rss}$    | —   | —   | 8.0       | pF            |   |
| <b>SWITCHING CHARACTERISTICS</b>    |              |     |     |           |               |   |
| Turn-On Delay Time                  | $t_{D(ON)}$  | —   | —   | 20        | ns            | $V_{DD} = 30V, I_D = 0.2A,$<br>$R_{GEN} = 50\Omega$ |
| Turn-Off Delay Time                 | $t_{D(OFF)}$ | —   | —   | 20        | ns            |   |

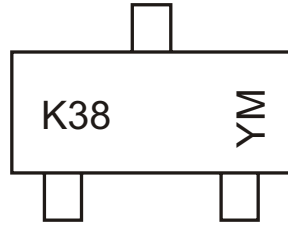
Notes: 1. Device mounted on FR-5 PCB 1.0 x 0.75 x 0.062 inch pad layout as shown on Diodes, Inc. suggested pad layout AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.  
2. Short duration test pulse used to minimize self-heating effect.

**Ordering Information** (Note 3)

| Device   | Packaging | Shipping         |
|----------|-----------|------------------|
| BSS138-7 | SOT-23    | 3000/Tape & Reel |

Notes: 3. For Packaging Details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

**Marking Information**



K38 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: N = 2002  
 M = Month ex: 9 = September

Date Code Key

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | J    | K    | L    | M    | N    | P    | R    | S    | T    | U    | V    | W    |

| Month | Jan | Feb | March | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3     | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

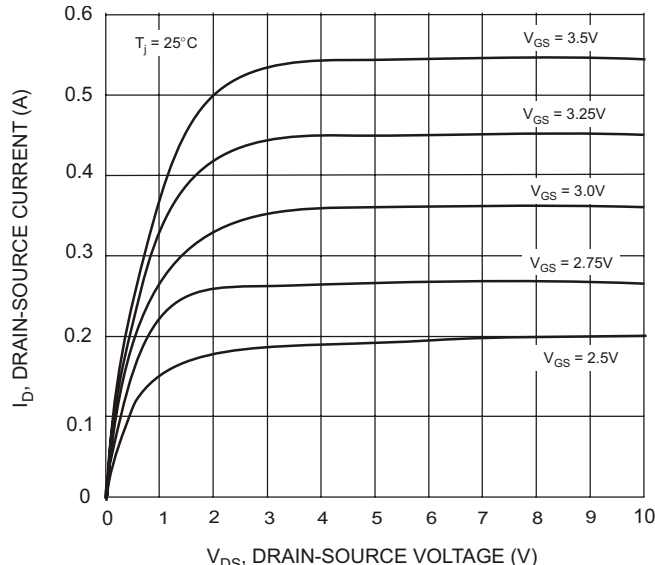


Fig. 1 Drain-Source Current vs. Drain-Source Voltage

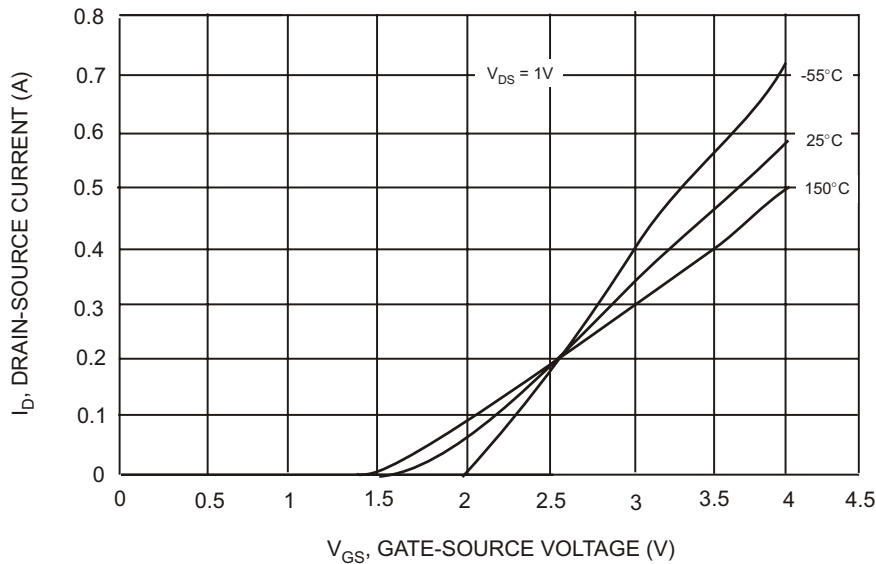


Fig. 2 Transfer Characteristics

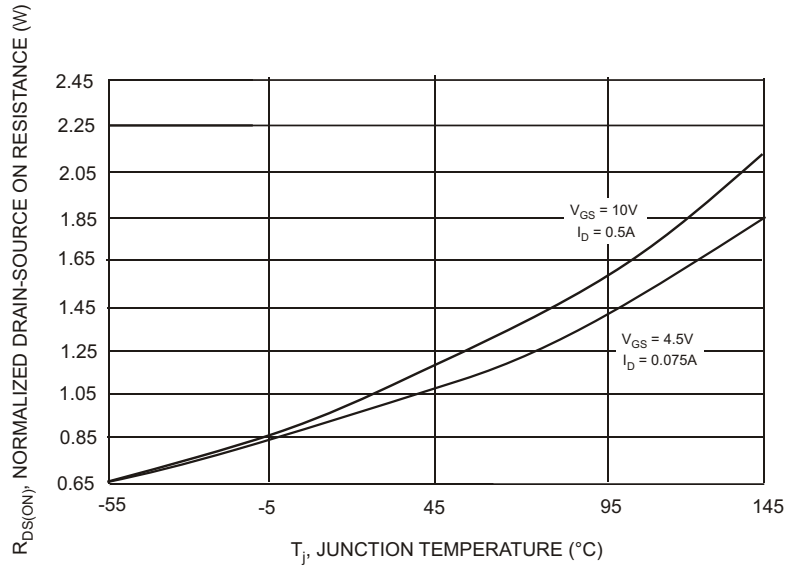


Fig. 3 Drain-Source On Resistance vs. Junction Temperature

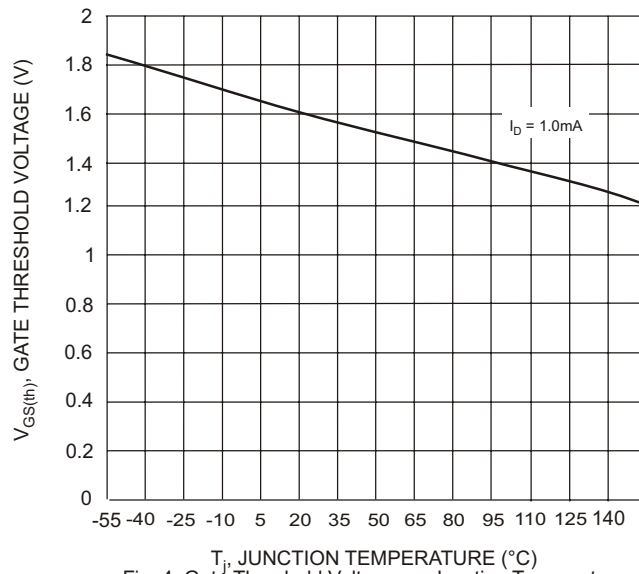


Fig. 4 Gate Threshold Voltage vs. Junction Temperature

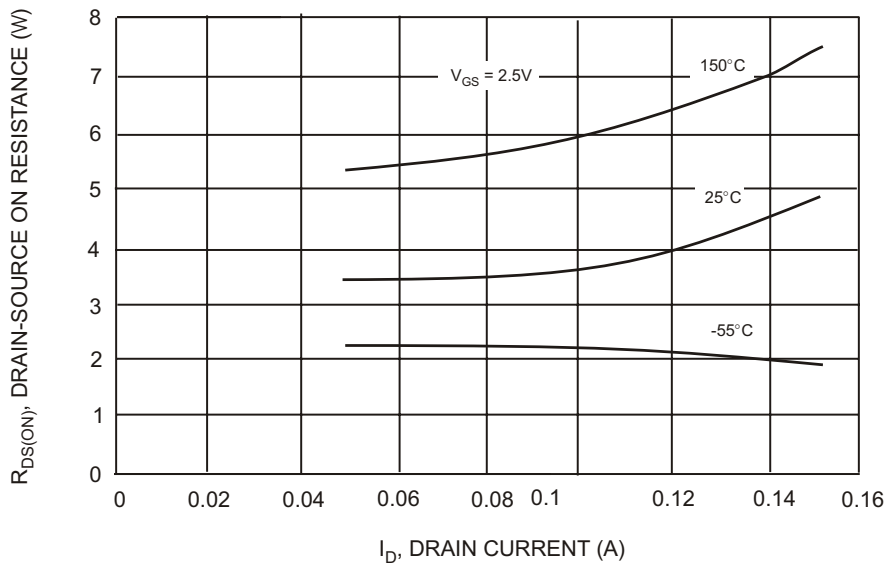


Fig. 5 Drain-Source On Resistance vs. Drain Current

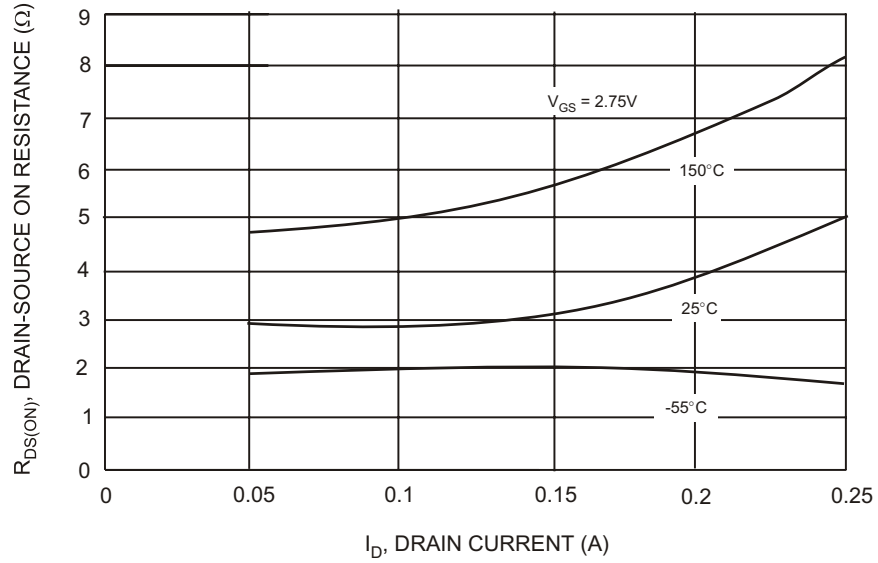


Fig. 6 Drain-Source On Resistance vs. Drain Current

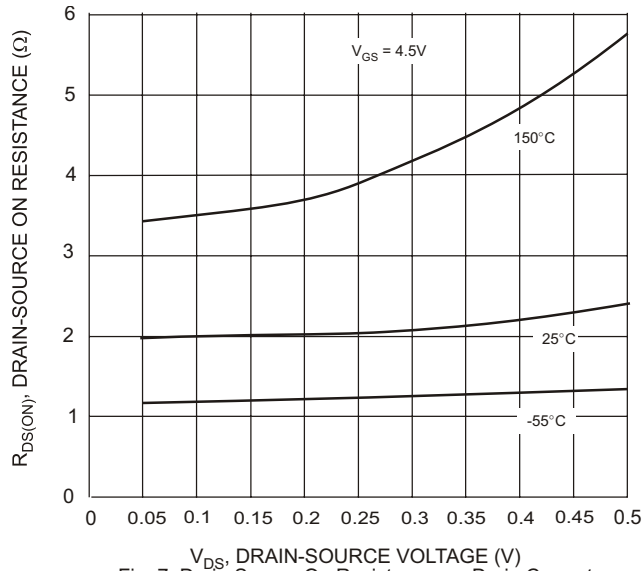


Fig. 7 Drain-Source On Resistance vs. Drain Current

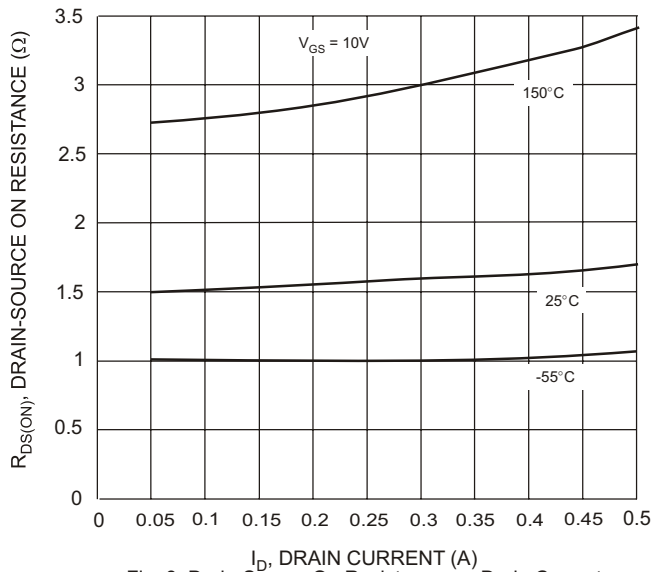


Fig. 8 Drain-Source On Resistance vs. Drain Current

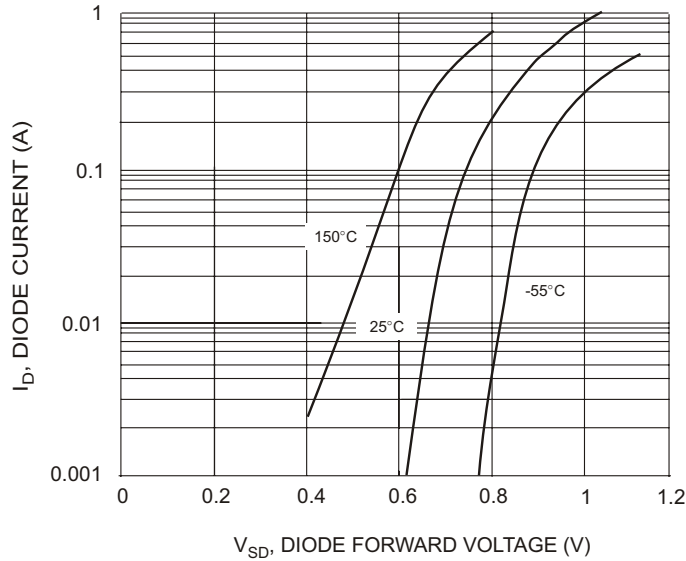


Fig. 9 Body Diode Current vs. Body Diode Voltage

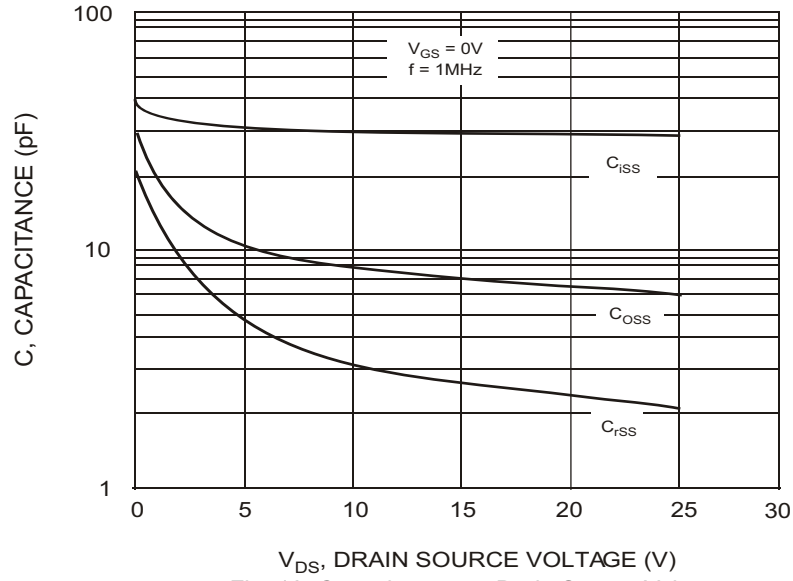


Fig. 10 Capacitance vs. Drain Source Voltage