

**DUAL N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR**

**Product Summary**

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ Max           | $I_D$ Max<br>$T_A = +25^\circ\text{C}$ |
|---------------|----------------------------|----------------------------------------|
| 50V           | $3.5\Omega @ V_{GS} = 10V$ | 200mA                                  |

**Description**

This MOSFET is designed to minimize the on-state resistance ( $R_{DS(ON)}$ ), yet maintain superior switching performance, making it ideal for high efficiency power management applications.

**Applications**

- Load Switch

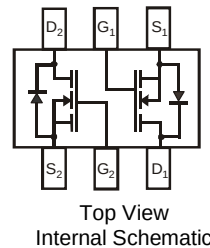


**Features**

- Low On-Resistance
  - Low Gate Threshold Voltage
  - Low Input Capacitance
  - Fast Switching Speed
  - Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
  - Halogen and Antimony Free. "Green" Device (Note 3)
  - The BSS138DWQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.
- <https://www.diodes.com/quality/product-definitions/>

**Mechanical Data**

- Case: SOT-363
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)

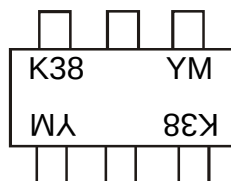


**Ordering Information** (Note 4)

| Part Number  | Case   | Packaging          |
|--------------|--------|--------------------|
| BSS138DWQ-7  | SOT363 | 3,000/Tape & Reel  |
| BSS138DWQ-13 | SOT363 | 10,000/Tape & Reel |

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  - See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

**Marking Information**



K38 = Product Type Marking Code  
YM = Date Code Marking  
Y or = Year (ex: D = 2016)  
M = Month (ex: 9 = September)

**Date Code Key**

| Year | 2005 | 2006 | ... | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|------|------|------|-----|------|------|------|------|------|------|------|------|
| Code | S    | T    | ... | D    | E    | F    | G    | H    | I    | J    | K    |

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

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic              | Symbol           | BSS138DW | Units |
|-----------------------------|------------------|----------|-------|
| Drain-Source Voltage        | V <sub>DSS</sub> | 50       | V     |
| Drain-Gate Voltage (Note 7) | V <sub>DGR</sub> | 50       | V     |
| Gate-Source Voltage         | V <sub>GSS</sub> | ±20      | V     |
| Drain Current (Note 5)      | I <sub>D</sub>   | 200      | mA    |

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                          | Symbol                            | BSS138DW    | Units |
|-----------------------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)        | P <sub>D</sub>                    | 200         | mW    |
| Thermal Resistance, Junction to Ambient | R <sub>θJA</sub>                  | 625         | °C/W  |
| Operating and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                    | Symbol              | Min | Typ | Max  | Unit | Test Condition                                                          |
|-----------------------------------|---------------------|-----|-----|------|------|-------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 6)      |                     |     |     |      |      |                                                                         |
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>   | 50  | 75  | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                            |
| Zero Gate Voltage Drain Current   | I <sub>DSS</sub>    | —   | —   | 0.5  | μA   | V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V                             |
| Gate-Body Leakage                 | I <sub>GSS</sub>    | —   | —   | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                            |
| ON CHARACTERISTICS (Note 6)       |                     |     |     |      |      |                                                                         |
| Gate Threshold Voltage            | V <sub>GS(TH)</sub> | 0.5 | 1.2 | 1.5  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA              |
| Static Drain-Source On-Resistance | R <sub>DS(ON)</sub> | —   | 1.4 | 3.5  | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.22A                           |
| Forward Transconductance          | g <sub>FS</sub>     | 100 | —   | —    | mS   | V <sub>DS</sub> = 25V, I <sub>D</sub> = 0.2A, f = 1.0KHz                |
| DYNAMIC CHARACTERISTICS           |                     |     |     |      |      |                                                                         |
| Input Capacitance                 | C <sub>ISS</sub>    | —   | —   | 50   | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1.0MHz                 |
| Output Capacitance                | C <sub>OSS</sub>    | —   | —   | 25   | pF   |                                                                         |
| Reverse Transfer Capacitance      | C <sub>RSS</sub>    | —   | —   | 8.0  | pF   |                                                                         |
| SWITCHING CHARACTERISTICS         |                     |     |     |      |      |                                                                         |
| Turn-On Delay Time                | t <sub>D(ON)</sub>  | —   | —   | 20   | ns   | V <sub>DD</sub> = 30V, I <sub>D</sub> = 0.2A,<br>R <sub>GEN</sub> = 50Ω |
| Turn-Off Delay Time               | t <sub>D(OFF)</sub> | —   | —   | 20   | ns   |                                                                         |

- Notes:
- Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown at <http://www.diodes.com/package-outlines.html>.
  - Short duration pulse test used to minimize self-heating effect.
  - R<sub>GS</sub> ≤ 20KΩ.

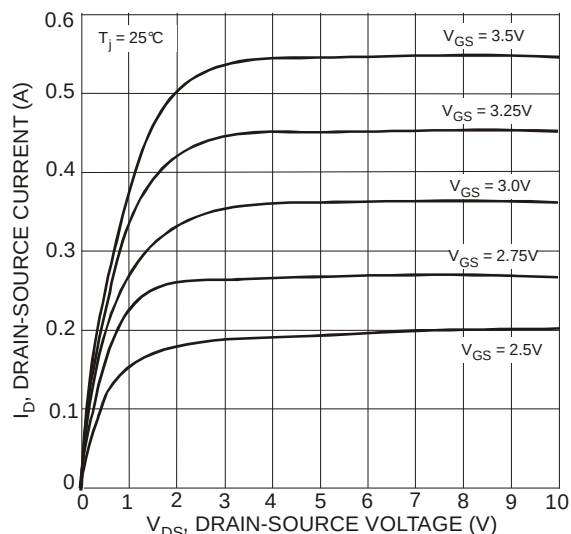


Fig. 1 Drain-Source Current vs. Drain-Source Voltage

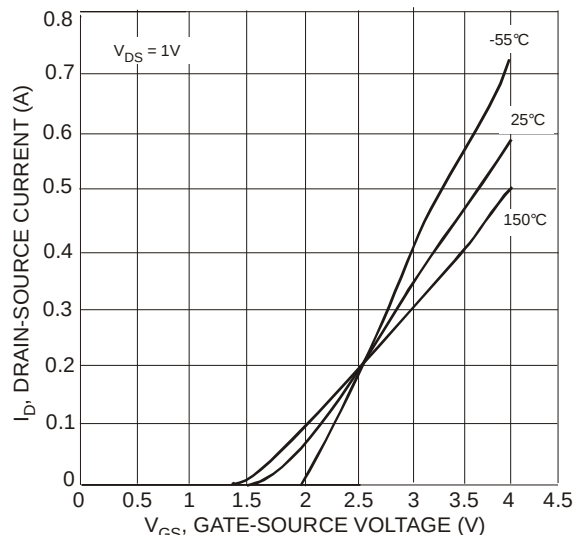


Fig. 2 Transfer Characteristics

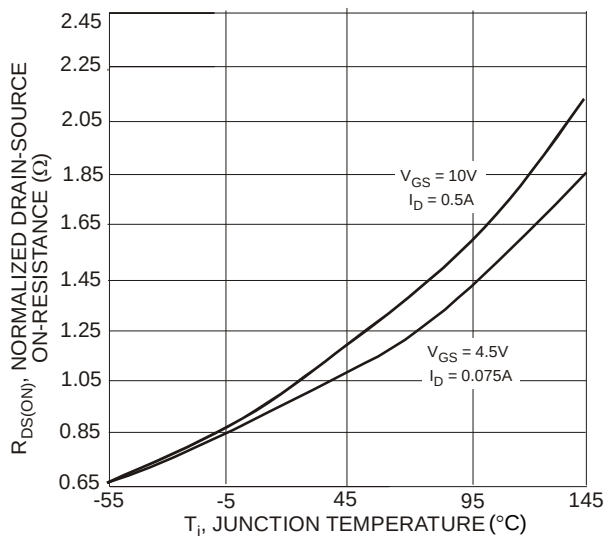


Fig. 3 Drain-Source On-Resistance vs. Junction Temperature

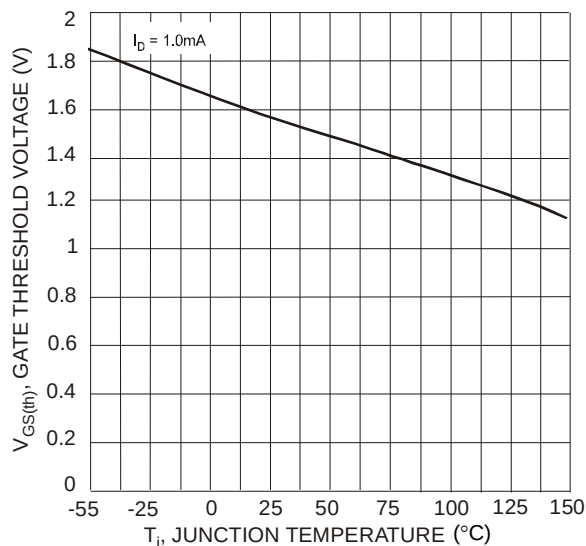


Fig. 4 Gate Threshold Voltage vs. Junction Temperature

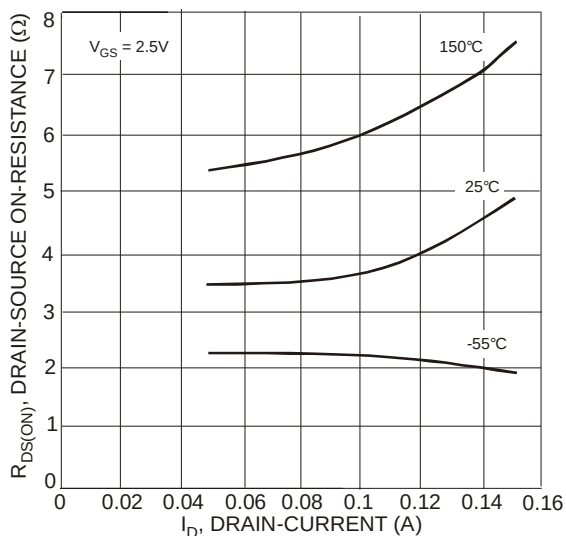


Fig. 5 Drain-Source On-Resistance vs. Drain-Current

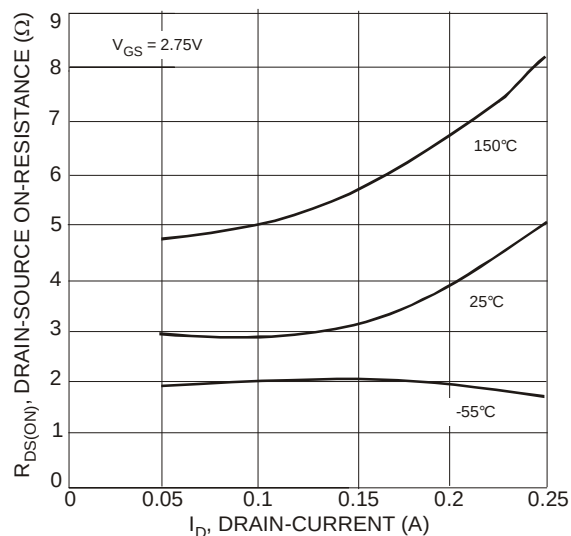
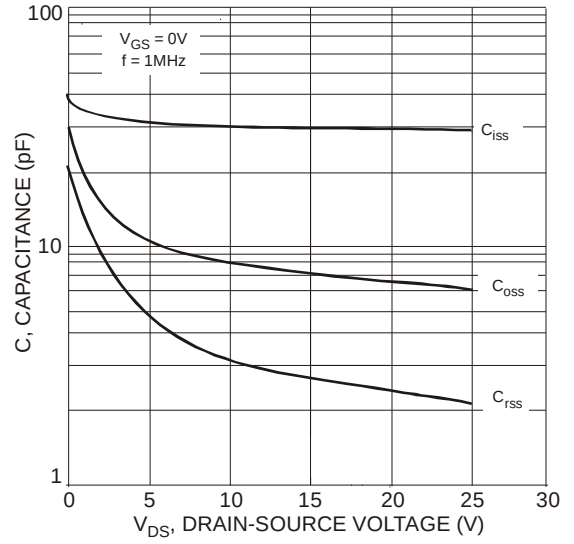
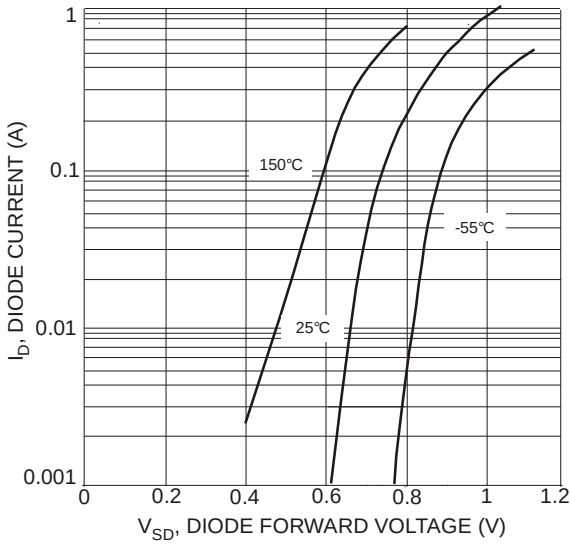
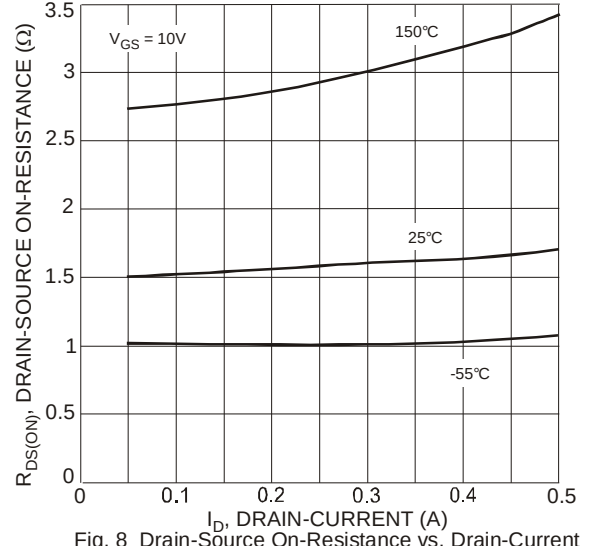
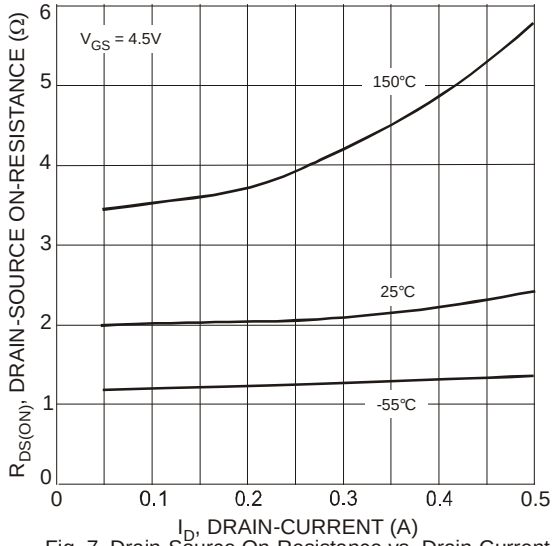


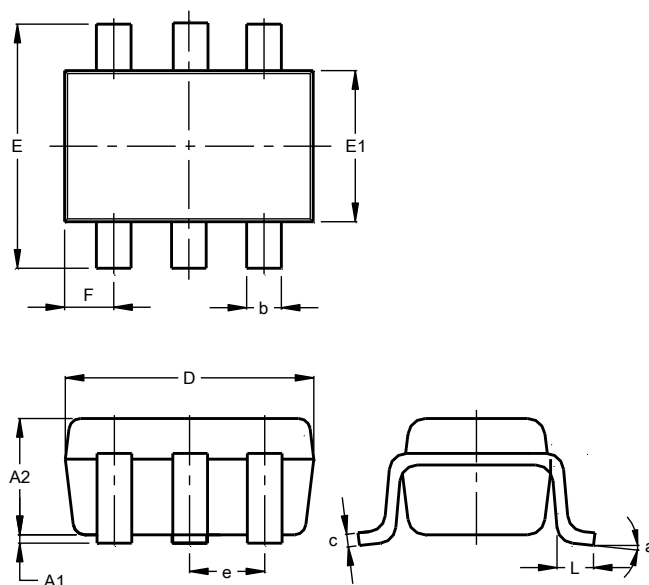
Fig. 6 Drain-Source On-Resistance vs. Drain-Current



## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### SOT363

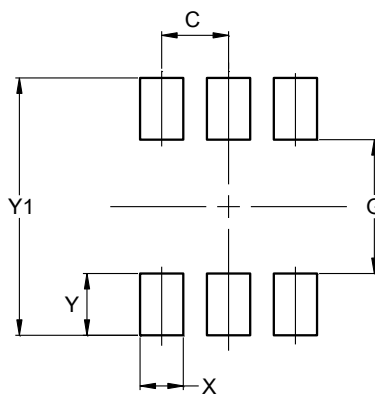


| SOT363               |           |      |       |
|----------------------|-----------|------|-------|
| Dim                  | Min       | Max  | Typ   |
| A1                   | 0.00      | 0.10 | 0.05  |
| A2                   | 0.90      | 1.00 | 1.00  |
| b                    | 0.10      | 0.30 | 0.25  |
| c                    | 0.10      | 0.22 | 0.11  |
| D                    | 1.80      | 2.20 | 2.15  |
| E                    | 2.00      | 2.20 | 2.10  |
| E1                   | 1.15      | 1.35 | 1.30  |
| e                    | 0.650 BSC |      |       |
| F                    | 0.40      | 0.45 | 0.425 |
| L                    | 0.25      | 0.40 | 0.30  |
| a                    | 0°        | 8°   | —     |
| All Dimensions in mm |           |      |       |

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### SOT363



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 1.300         |
| X          | 0.420         |
| Y          | 0.600         |
| Y1         | 2.500         |

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