# DUAL N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | $I_D$ max<br>$T_A$ = +25°C |
|---|---|---|
| 50V | 3.5Ω @ $V_{GS}$ = 10V | 200mA |

## Description

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

## Applications

- Load Switch

## Features

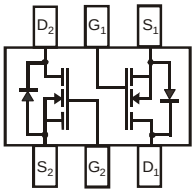
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q101, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q101) for High Reliability. https://www.diodes.com/quality/product-definitions/**
- **An Automotive-Compliant Part is Available Under Separate Datasheet (BSS138DWQ)**

## 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)

SOT-363

TOP VIEW



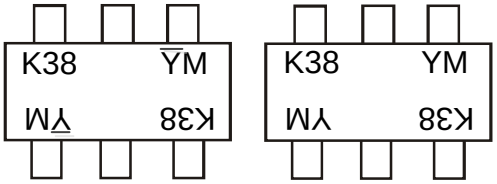

TOP VIEW
Internal Schematic

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| BSS138DW-7-F | SOT-363 | 3000/Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. 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.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. 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 for SAT (Shanghai Assembly/ Test site)
$\overline{Y}$M = Date Code Marking for CAT (Chengdu Assembly/ Test site)
Y or $\overline{Y}$ = Year (ex: A = 2013)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | S | T | U | V | W | X | Y | Z | A | B | C | D | E | F | G |

| 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 (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | BSS138DW | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 50 | V |
| Drain-Gate Voltage (Note 7) | | $V_{DGR}$ | 50 | V |
| Gate-Source Voltage | Continuous | $V_{GSS}$ | ±20 | V |
| Drain Current (Note 5) | Continuous | $I_D$ | 200 | mA |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | BSS138DW | Units |
|---|---|---|---|
| Total Power Dissipation (Note 5) | $P_D$ | 200 | mW |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 625 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 6)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 50 | 75 | — | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 0.5 | μA | $V_{DS}$ = 50V, $V_{GS}$ = 0V |
| Gate-Body Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 6)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 0.5 | 1.2 | 1.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | — | 1.4 | 3.5 | Ω | $V_{GS}$ = 10V, $I_D$ = 0.22A |
| Forward Transconductance | $g_{FS}$ | 100 | — | — | mS | $V_{DS}$ =25V, $I_D$ = 0.2A, f = 1.0KHz |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | — | 50 | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | — | 25 | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | — | 8.0 | pF | |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | — | 20 | ns | $V_{DD}$ = 30V, $I_D$ = 0.2A, |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | — | 20 | ns | $R_{GEN}$ = 50Ω |

Notes:
5. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at http://www.diodes.com/package-outlines.html.
6. Short duration pulse test used to minimize self-heating effect.
7. $R_{GS} \leq 20K\Omega$.

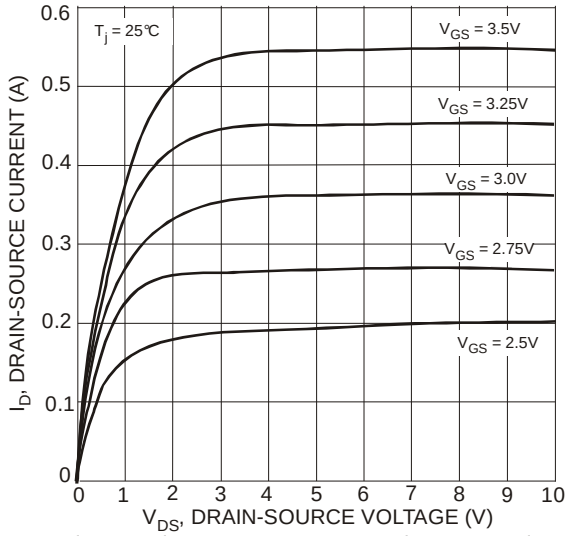



Fig. 1 Drain-Source Current vs. Drain-Source Voltage

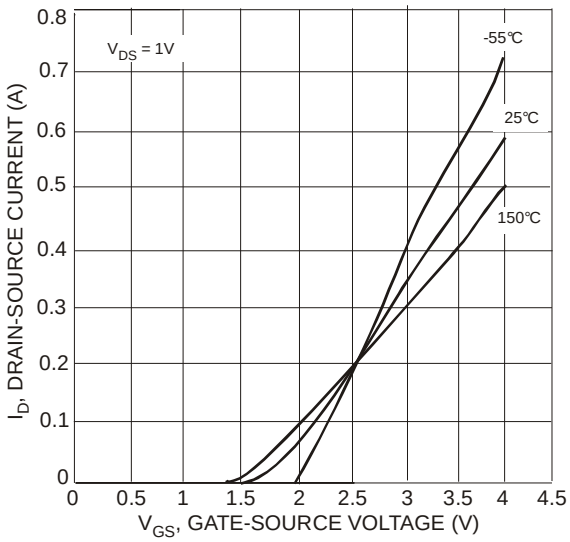



Fig. 2 Transfer Characteristics

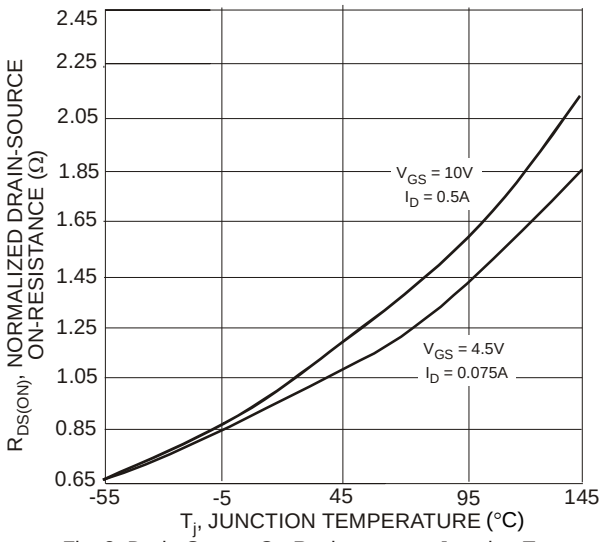



Fig. 3 Drain-Source On Resistance vs. Junction Temperature

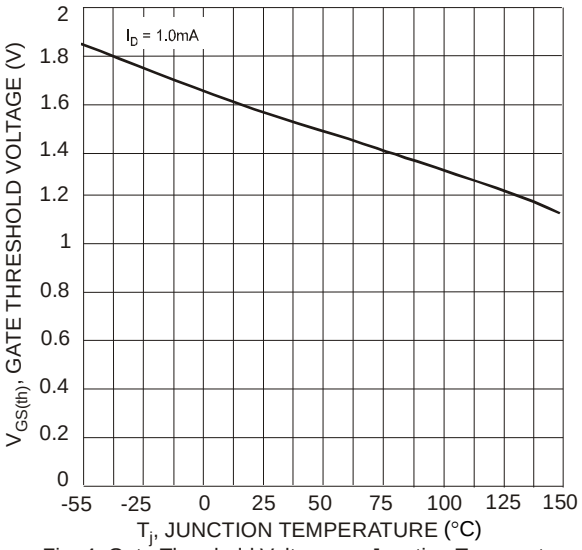



Fig. 4 Gate Threshold Voltage vs. Junction Temperature

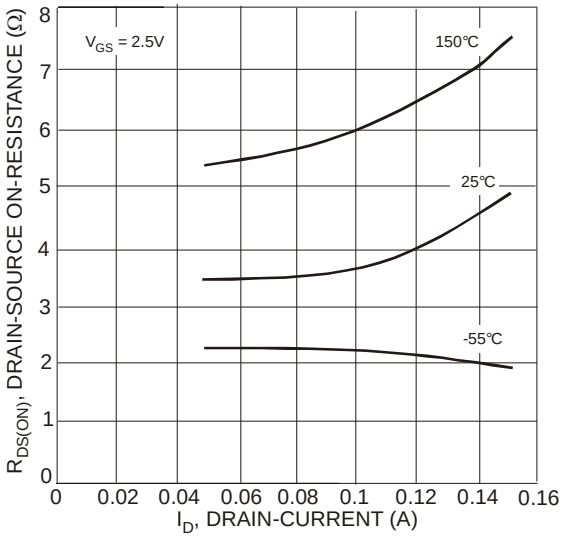



Fig. 5 Drain-Source On-Resistance vs. Drain-Current

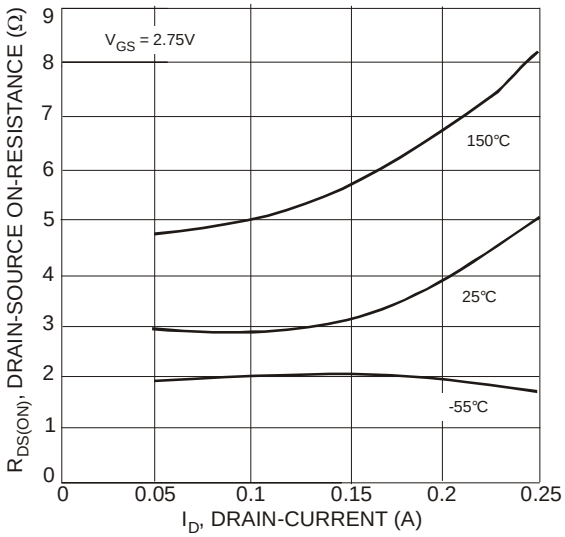



Fig. 6 Drain-Source On-Resistance vs. Drain-Current

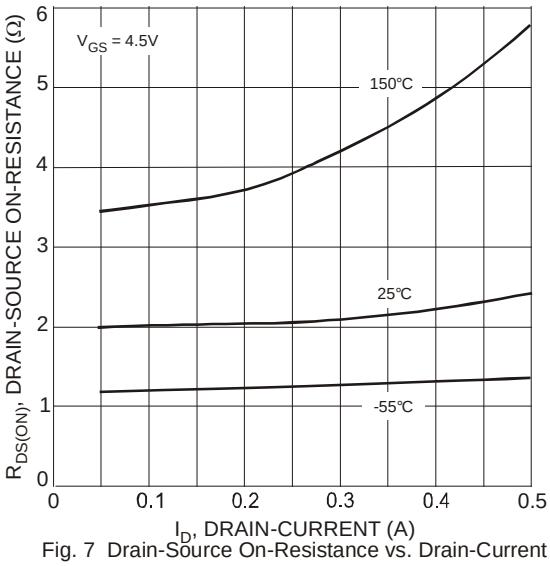



Fig. 7 Drain-Source On-Resistance vs. Drain-Current

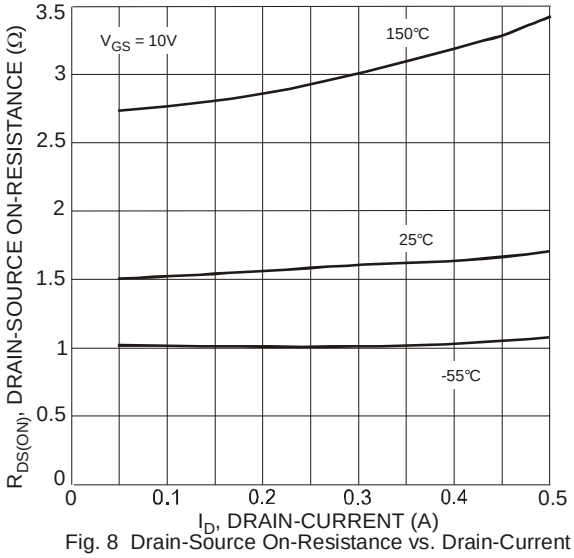



Fig. 8 Drain-Source On-Resistance vs. Drain-Current

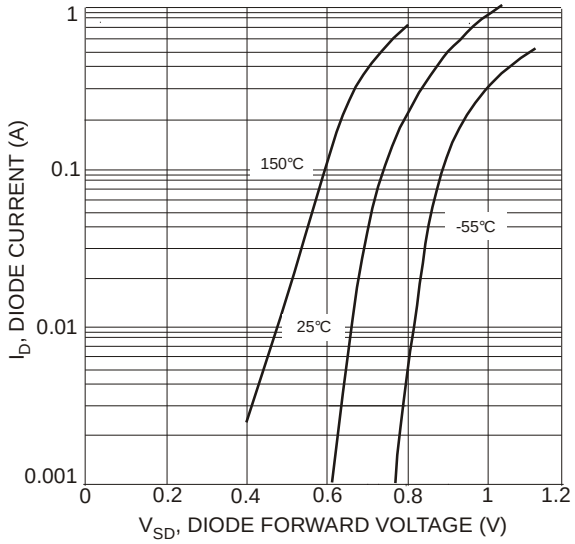



Fig. 9 Body Diode Current vs. Body Diode Voltage

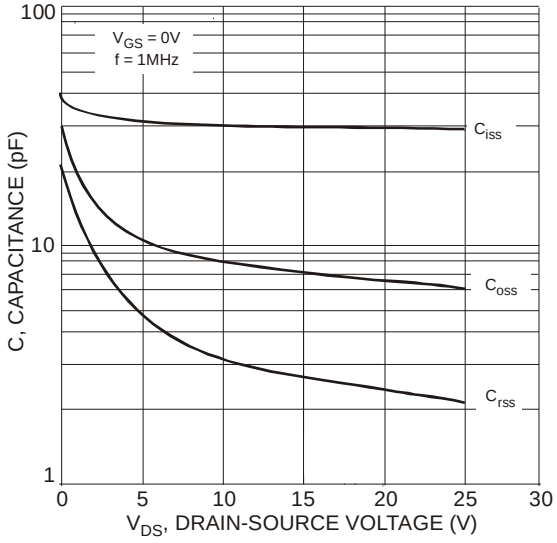
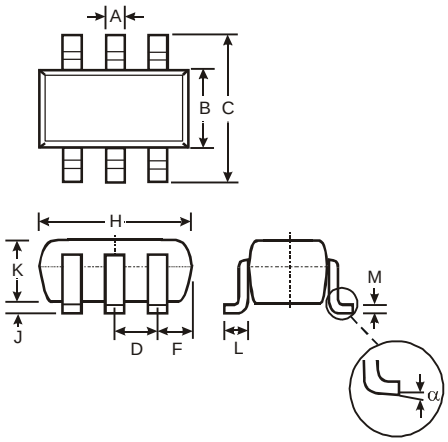



Fig. 10 Capacitance vs. Drain-Source Voltage

## Package Outline Dimensions

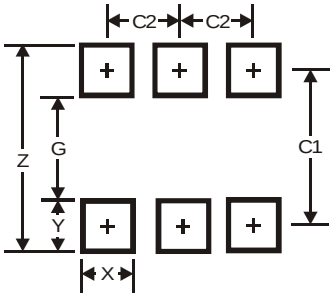
Please see http://www.diodes.com/package-outlines.html for the latest version.




| SOT363 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.10 | 0.30 | 0.25 |
| **B** | 1.15 | 1.35 | 1.30 |
| **C** | 2.00 | 2.20 | 2.10 |
| **D** | 0.65 Typ | | |
| **F** | 0.40 | 0.45 | 0.425 |
| **H** | 1.80 | 2.20 | 2.15 |
| **J** | 0 | 0.10 | 0.05 |
| **K** | 0.90 | 1.00 | 1.00 |
| **L** | 0.25 | 0.40 | 0.30 |
| **M** | 0.10 | 0.22 | 0.11 |
| **α** | 0° | 8° | - |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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




| Dimensions | Value (in mm) |
|---|---|
| **Z** | 2.5 |
| **G** | 1.3 |
| **X** | 0.42 |
| **Y** | 0.6 |
| **C1** | 1.9 |
| **C2** | 0.65 |

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