Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D T_A = +25°C
50V	3.5Ω @ V_{GS} = 10V	200mA

Description and Applications

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

- Systems/load switches

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. https://www.diodes.com/quality/product-definitions/**
- **An automotive-compliant part is available under separate datasheet (BSS138Q)**

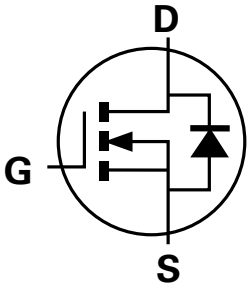
Mechanical Data

- Package: SOT23
- Package Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

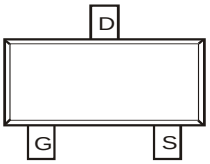
SOT23 (Standard)



Top View



Equivalent Circuit



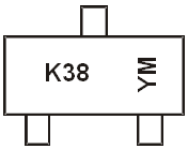
Top View

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
BSS138-7-F	SOT23 (Standard)	3000	Tape & Reel
BSS138-13-F	SOT23 (Standard)	10000	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
Y or $\overline{Y}$ or $\underline{Y}$= Year (ex: L = 2024)
M or $\overline{M}$ = Month (ex: 9 = September)

Date Code Key

Year	2003	…	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Code	P	…	L	M	N	P	R	S	T	U	V	W

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

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Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
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}	±20	V
Gate-Source Voltage	Non Repetitive, Pulse Width<50µs		±40	V
Drain Current	Continuous	I_D	200	mA
Pulsed Drain Current (10µs Pulse Duty Cycle = 1%)		I_{DM}	1	A

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	300	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	417	°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 (Note 7)						
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 (Note 7)						
Turn-On Delay Time	$t_{D(ON)}$	—	—	20	ns	V_{DD} = 30V, I_D = 0.2A, R_{GEN} = 50Ω
Turn-Off Delay Time	$t_{D(OFF)}$	—	—	20	ns	

Notes:
5. Device mounted on FR-4 PCB 1.0 x 0.75 x 0.062 inch pad layout as shown on Diodes Incorporated's suggested pad layout, 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. Guarantee by design. Not subject to production testing.

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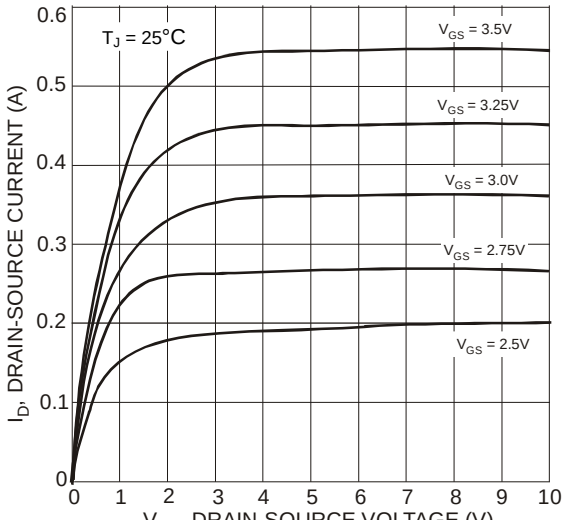

Fig. 1 Drain-Source Current vs. Drain-Source Voltage

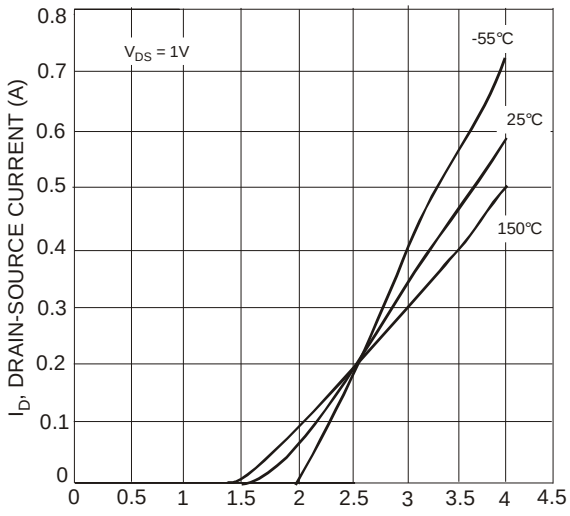

Fig. 2 Transfer Characteristics

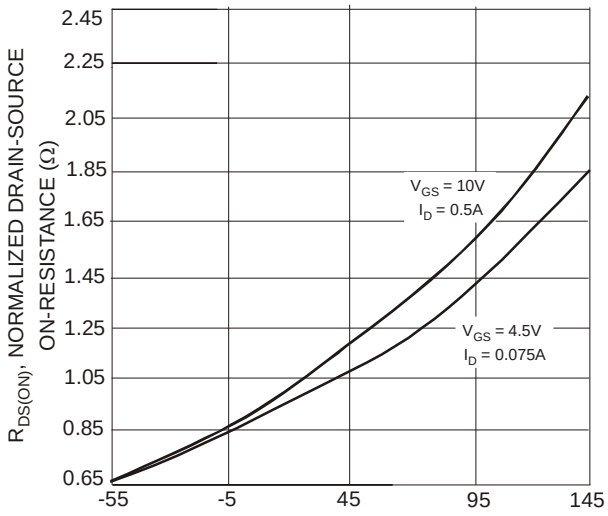

Fig. 3 Drain-Source On-Resistance vs. Junction Temperature

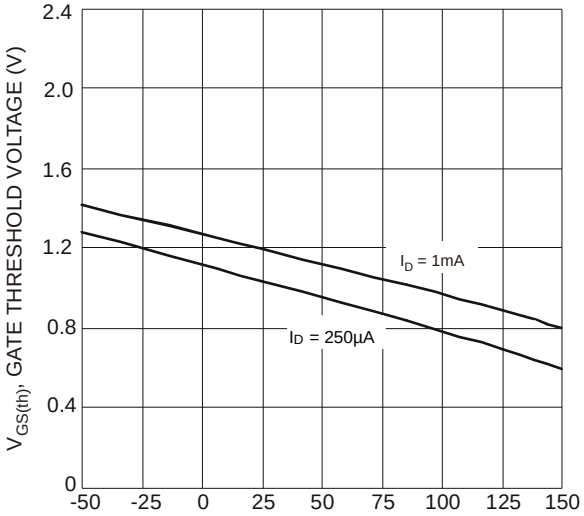

Fig. 4 Gate Threshold Variation vs. Junction Temperature

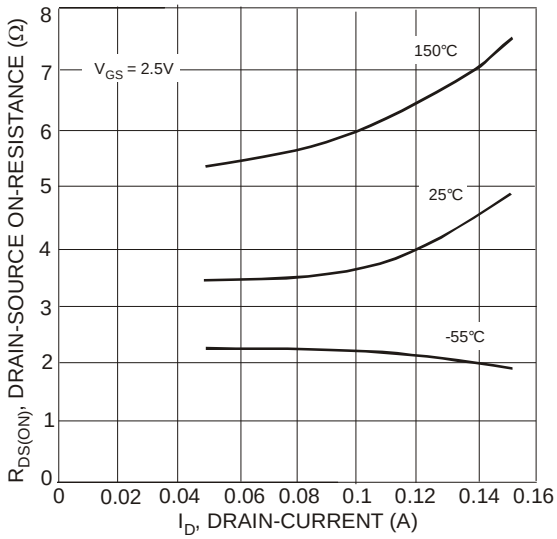

Fig. 5 Drain-Source On-Resistance vs. Drain-Current

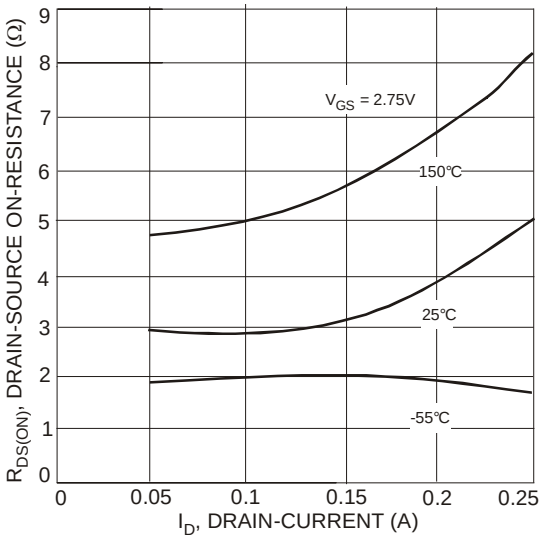

Fig. 6 Drain-Source On-Resistance vs. Drain-Current

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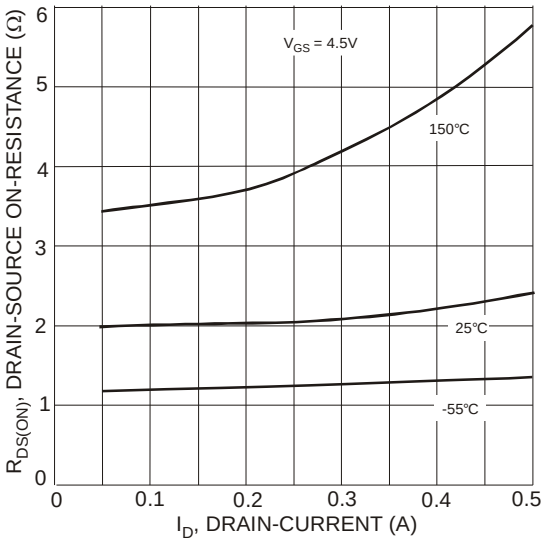

Fig. 7 Drain-Source On-Resistance vs. Drain-Current

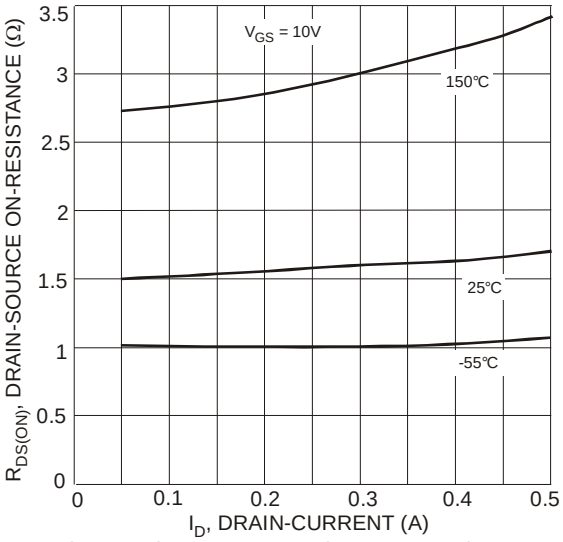

Fig. 8 Drain-Source On Resistance vs. Drain-Current

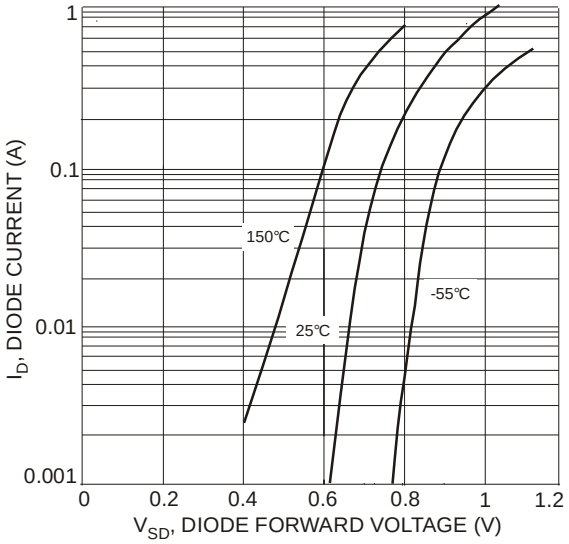

Fig. 9 Body Diode Current vs. Body Diode Voltage

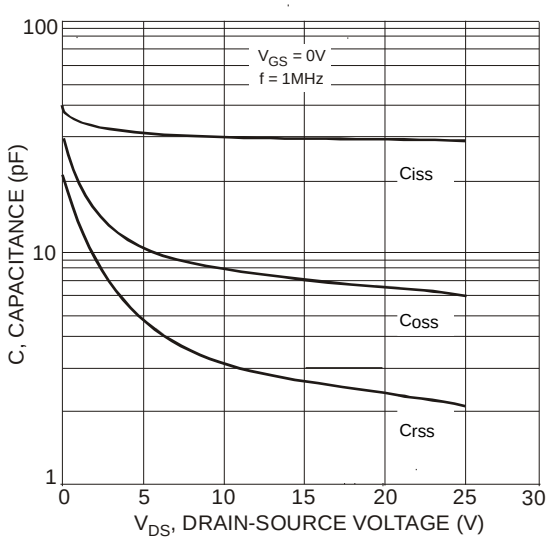

Fig. 10 Capacitance vs. Drain-Source Voltage

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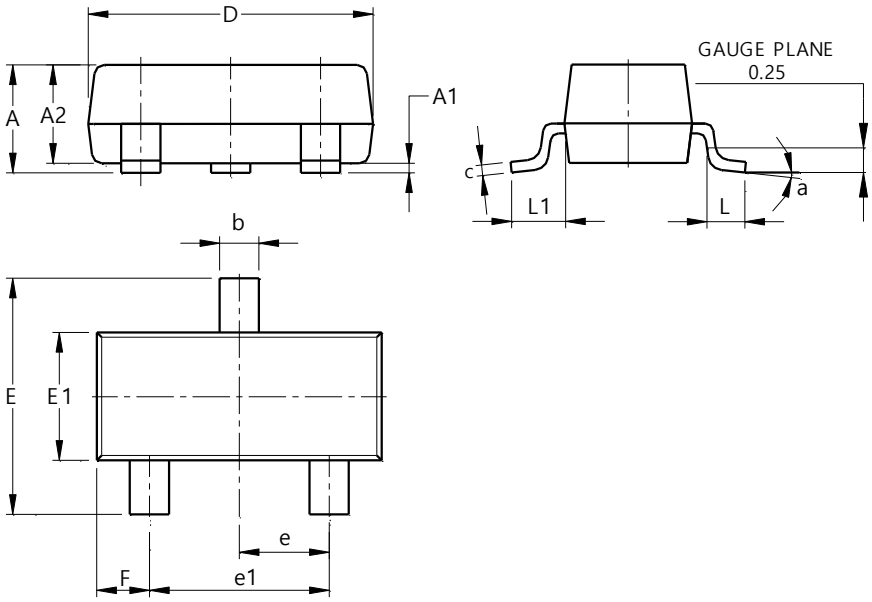
Package Outline Dimensions

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

SOT23 (Standard)

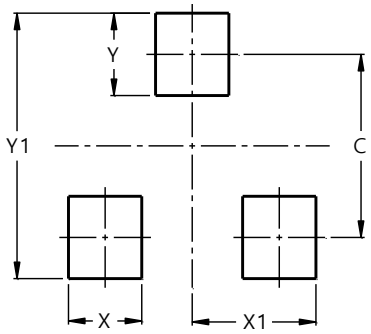


SOT23 (Standard)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.15	1.025
A1	0.00	0.10	0.05
A2	0.85	1.10	0.975
b	0.30	0.51	0.40
c	0.080	0.202	0.11
D	2.80	3.00	2.90
E	2.25	2.55	2.40
E1	1.20	1.40	1.30
e	0.89	1.03	0.915
e1	1.78	2.05	1.83
F	0.40	0.60	0.535
L1	0.45	0.61	0.55
L	0.25	0.55	0.40
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

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

SOT23 (Standard)



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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