



**THE DATASHEET OF
BSS138TA**



50V N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET IN SOT23

Features and Benefits

- $BV_{DSS} > 50V$
- $R_{DS(on)} \leq 3.5\Omega @ V_{GS} = 5V$
- Maximum continuous drain current $I_D = 200mA$
- "Lead Free", RoHS Compliant (Note 1)
- Halogen and Antimony Free. "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

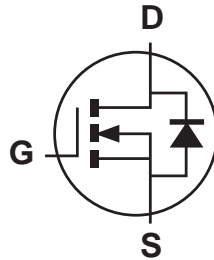
Mechanical Data

- Case: SOT-23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matt Tin Finish; Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (approximate)

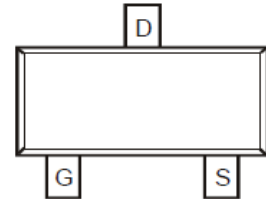
SOT-23



Top View



Device symbol



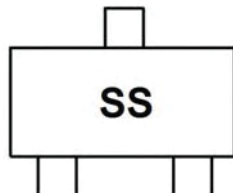
Pin-Out
Top View

Ordering Information (Note 3)

| Part Number | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-------------|---------|--------------------|-----------------|-------------------|
| BSS138TA | SS | 7 | 8 | 3000 |

- Notes:
1. No purposefully added lead
 2. Diodes Inc's "Green" policy can be found on our website at <http://www.diodes.com>.
 3. For packaging details, go to our website at <http://www.diodes.com>.

Marking Information



SS = Product Type Marking Code

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

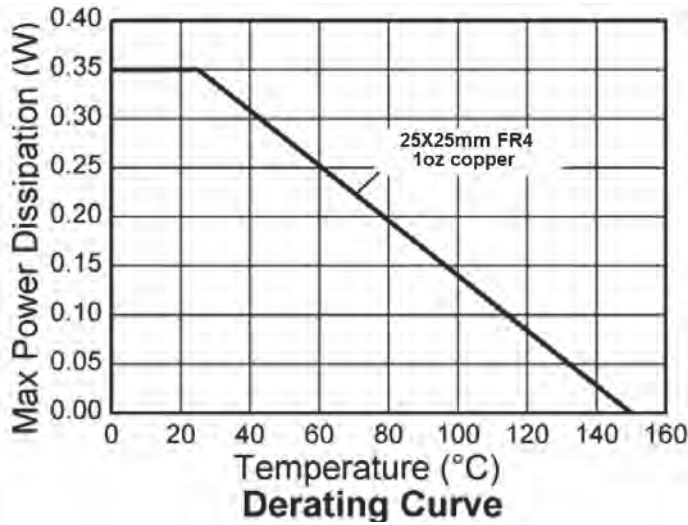
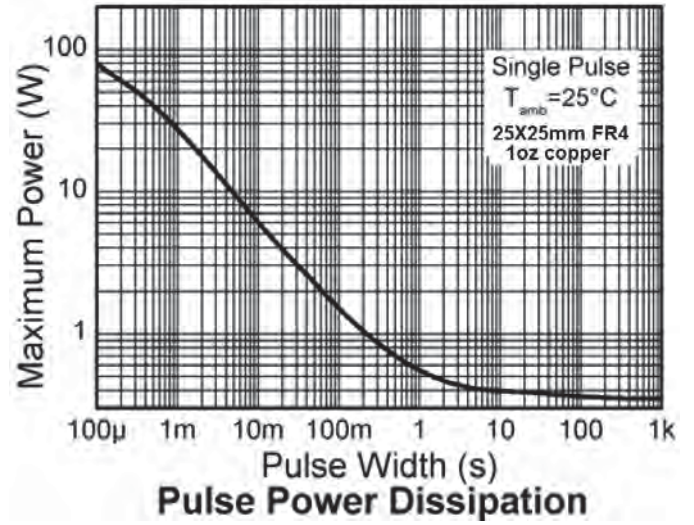
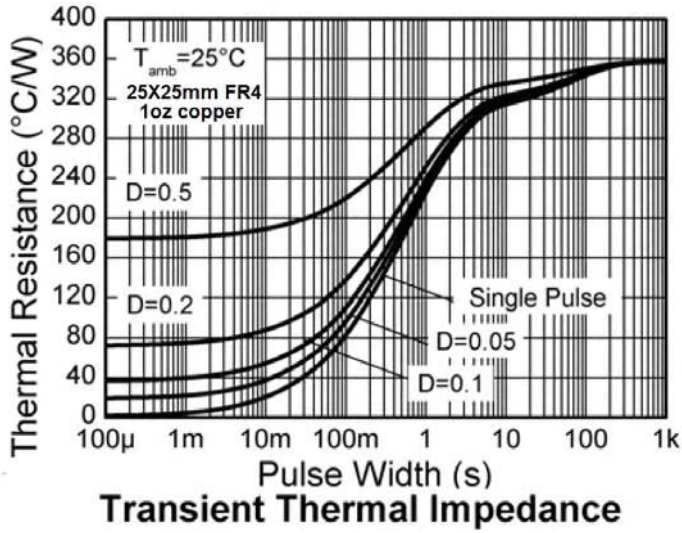
| Characteristic | Symbol | Value | Unit |
|-------------------------------|----------|----------|------|
| Drain-Source Voltage | V_{DS} | 50 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current | I_D | 200 | mA |
| Pulsed Drain Current (Note 5) | I_{DM} | 800 | mA |

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

| Characteristic | Symbol | Value | Unit |
|--------------------------------------------------|-----------------|-------------|---------------------------|
| Power Dissipation (Note 4) | P_D | 350 | mW |
| Thermal Resistance, Junction to Ambient (Note 4) | $R_{\theta JA}$ | 357 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Leads (Note 6) | $R_{\theta JL}$ | 195 | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

- Notes:
4. For a device mounted on 25mm X 25mm X 1.6mm FR-4 PCV with high coverage of single sided 1oz copper, in still air condition.
 5. Device mounted on minimum recommended pad layout test board, 10 μs pulse duty cycle = 1%.
 6. Thermal resistance from junction to solder-point (at the end of the collector lead).

Thermal Characteristics

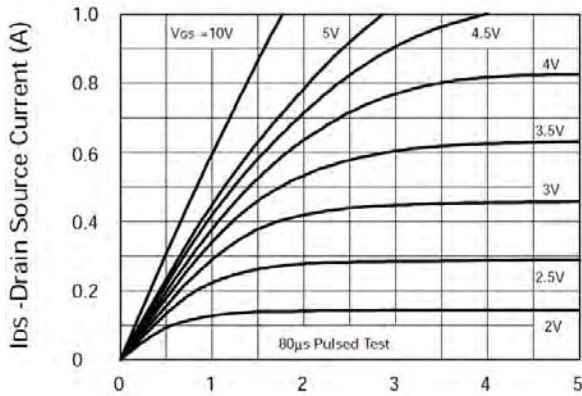


Electrical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--------------------------------------------|--------------|-----|-----|-----------------|--------------------------|--------------------------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 50 | - | - | V | $V_{GS} = 0V, I_D = 0.25mA$ |
| Zero Gate Voltage Drain Current | I_{DSS} | - | - | 0.5 5 100 | μA μA nA | $V_{DS} = 50V, V_{GS} = 0V$ $V_{DS} = 50V, V_{GS} = 0V, T_A = 125^\circ C$ $V_{DS} = 20V, V_{GS} = 0V$ |
| Gate-Source Leakage | I_{GSS} | - | - | ± 100 | nA | $V_{GS} = \pm 20V, V_{DS} = 0V$ |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 0.5 | - | 1.5 | V | $V_{DS} = V_{GS}, I_D = 1mA$ |
| Static Drain-Source On-Resistance (Note 7) | $R_{DS(on)}$ | - | - | 3.5 | Ω | $V_{GS} = 5V, I_D = 200mA$ |
| Forward Transconductance (Note 7 & 8) | g_{fs} | 120 | - | - | mS | $V_{DS} = 25V, I_D = 200mA$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | - | - | 50 | pF | $V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$ |
| Output Capacitance | C_{oss} | - | - | 25 | pF | |
| Reverse Transfer Capacitance | C_{rss} | - | - | 8 | pF | |
| Turn-On Delay Time (Note 9) | $t_{D(on)}$ | - | 10 | - | ns | $V_{DD} = 30V, I_D = 280mA$ |
| Turn-On Rise Time (Note 9) | t_r | - | 10 | - | ns | |
| Turn-Off Delay Time (Note 9) | $t_{D(off)}$ | - | 15 | - | ns | |
| Turn-Off Fall Time (Note 9) | t_f | - | 25 | - | ns | |

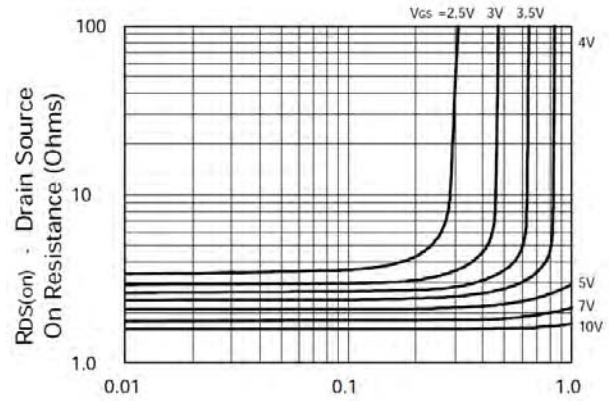
- Notes:**
7. Measured under pulsed conditions. Width = 300 μs . Duty cycle $\leq 2\%$.
 8. Sample test.
 9. Switching times measured with 50 Ω source impedance and <5ns rise time on a pulse generator.

Electrical Characteristics



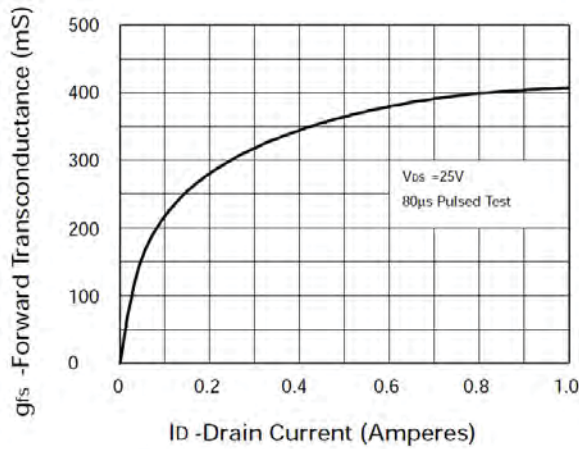
V_{DS} - Drain Source Voltage (Volts)

Saturation Characteristics

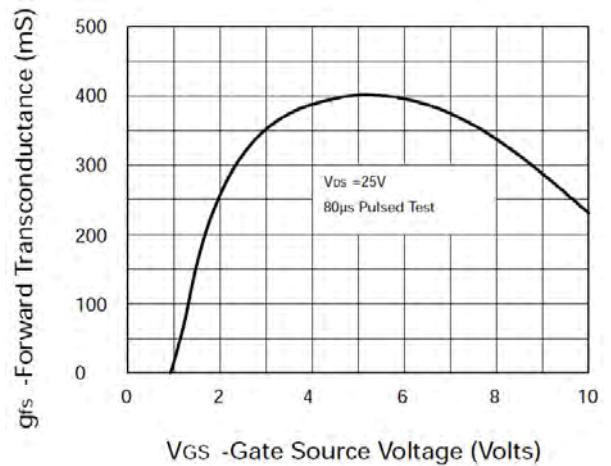


I_D -Drain Current (Amperes)

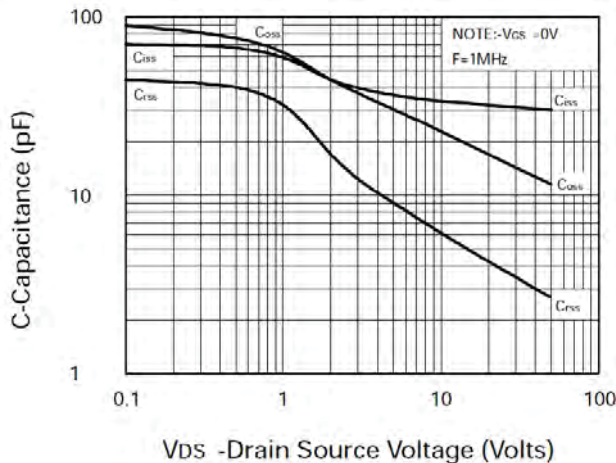
Typical On Resistance vs. Drain Current



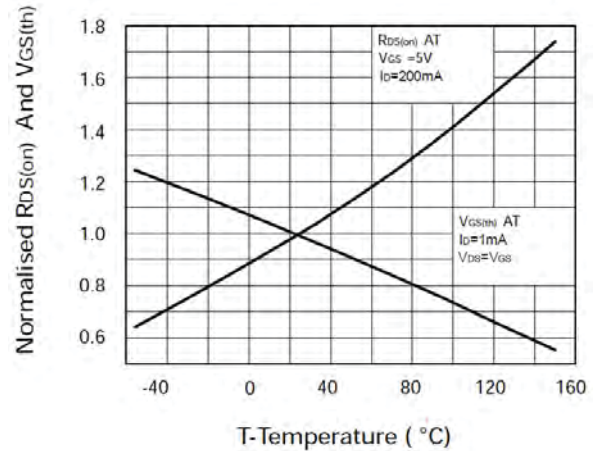
Typical Transconductance vs. Drain Current



Typical Transconductance vs. Gate - Source Voltage

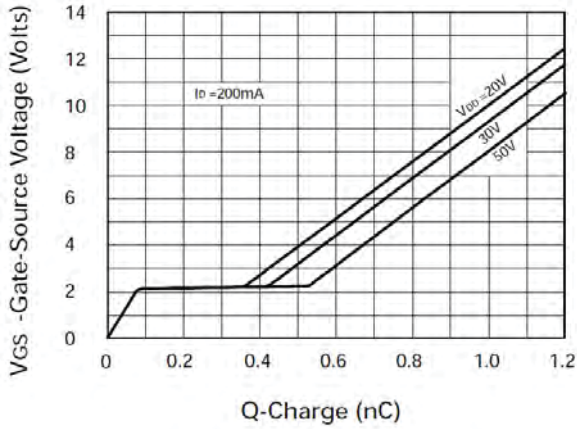


Typical Capacitance vs. Drain - Source Voltage

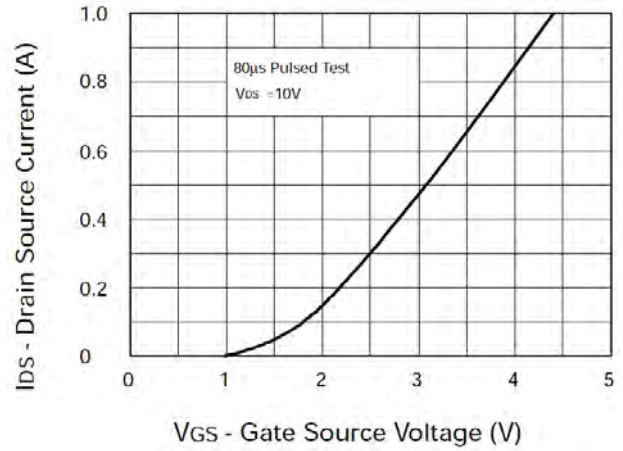


Normalised $R_{DS(on)}$ And $V_{GS(th)}$ vs. Temperature

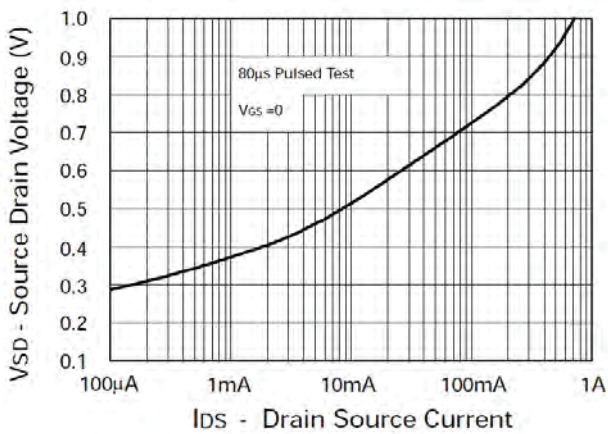
Electrical Characteristics – (Continuous)



Typical Gate Charge vs. Gate-Source Voltage

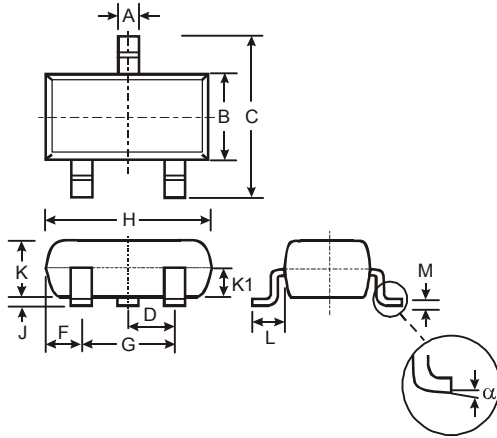


Typical Transfer Characteristics



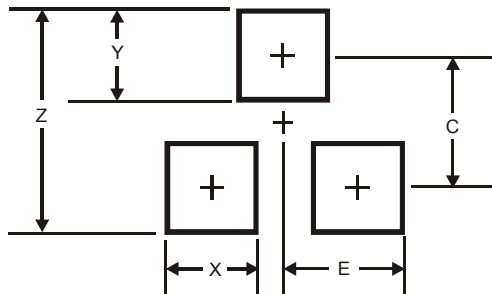
Typical Diode Forward Voltage

Package Outline Dimensions



| SOT23 | | | |
|----------------------|-------|------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.903 | 1.10 | 1.00 |
| K1 | - | - | 0.400 |
| L | 0.45 | 0.61 | 0.55 |
| M | 0.085 | 0.18 | 0.11 |
| α | 0° | 8° | - |
| All Dimensions in mm | | | |

Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 2.9 |
| X | 0.8 |
| Y | 0.9 |
| C | 2.0 |
| E | 1.35 |

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