# SOT223 N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

## Product Summary

| $V_{(BR)DSS}$ | Max $R_{DS(on)}$ | Max $I_D$ $T_A$ = +25°C |
|---|---|---|
| 60V | 1Ω @ $V_{GS}$ = 10V | 1A |

## Features and Benefits

- Repetitive avalanche rating
- No transient protection required
- Characterized for 5V logic drive
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Description and Applications

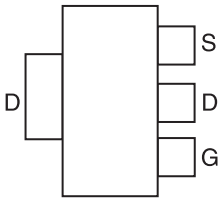
- Automotive Relay Drivers
- Stepper Motor Driver

## Mechanical Data

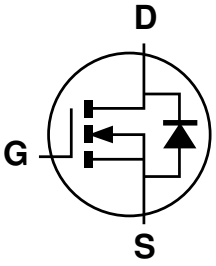
- Case: SOT223
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram Below
- Terminals: Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.112 grams (Approximate)

SOT223

Top View




Pin Out Top-view




Equivalent Circuit

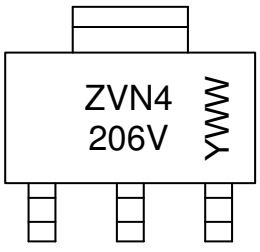
## Ordering Information (Note 4)

| Part Number | Compliance | Case | Packaging |
|---|---|---|---|
| ZVN4206GVTA | Standard | SOT223 | 1,000 |

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See http://www.diodes.com/quality/lead_free.html 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 http://www.diodes.com/products/packages.html.

## Marking Information

SOT223




ZVN4 206V = Product Type Marking Code
YWW = Date Code Marking
Y or $\overline{Y}$ = Last Digit of Year (ex: 5= 2015)
WW or $\overline{WW}$ = Week Code (01~53)

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $I_D$ | 1 | A |
| Pulsed Drain Current | $I_{DM}$ | 8 | A |
| Continuous Drain Current | $I_D$ | 1 | A |
| Continuous Body Diode Current | $I_{SD}$ | 600 | mA |
| Avalanche Current - Repetitive | $I_{AR}$ | 600 | mA |
| Avalanche Energy - Repetitive | $E_{AR}$ | 15 | mJ |

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

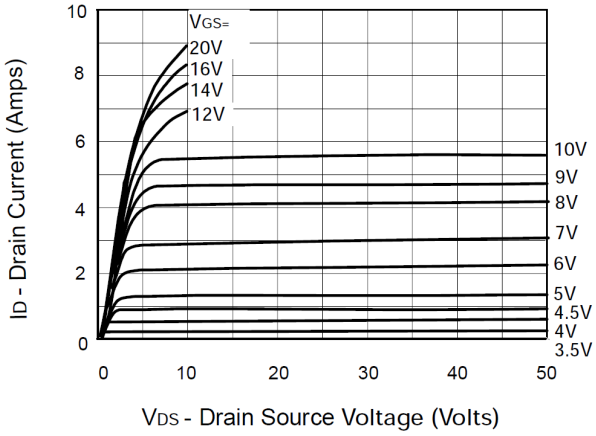
| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation at $T_A$= +25°C | $P_{tot}$ | 2 | W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

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

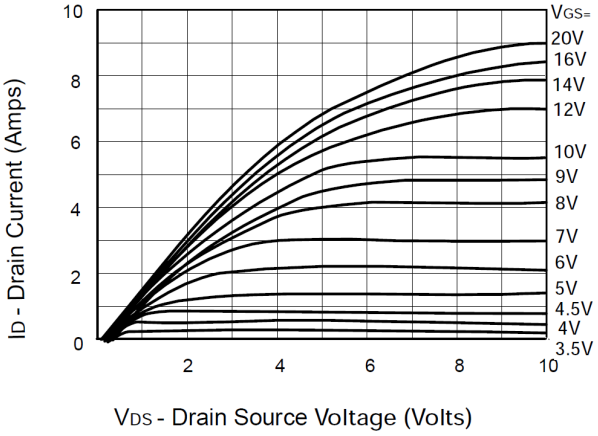
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 60 | — | — | V | $I_D$ = 1mA, $V_{GS}$ = 0V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 10<br>100 | μA | $V_{DS}$ = 60V, $V_{GS}$ = 0V<br>$V_{DS}$ = 48V, $V_{GS}$ = 0V , T=+125°C (Note 6) |
| Gate-Body Leakage | $I_{GSS}$ | — | — | 100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | 1.3 | — | 3 | V | $I_D$ = 1mA, $V_{DS}$ = $V_{GS}$ |
| On-State Drain Current (Note 5) | $I_{D(on)}$ | 3 | — | — | A | $V_{DS}$ = 25V, $V_{GS}$ = 10V |
| Static Drain-Source On-State Resistance (Note 5) | $R_{DS\ (ON)}$ | — | — | 1 | Ω | $V_{GS}$ = 10V, $I_D$ = 1.5A |
| | | — | — | 1.5 | | $V_{GS}$ = 5V, $I_D$ = 0.5A |
| Forward Transconductance (Notes 5 & 6) | $g_{fs}$ | 300 | — | — | ms | $V_{DS}$ = 25V, $I_D$ = 1.5A |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance (Note 6) | $C_{iss}$ | — | — | 100 | pF | $V_{DS}$ = 25 V, $V_{GS}$ = 0V<br>f = 1MHz |
| Output Capacitance (Note 6) | $C_{oss}$ | — | — | 60 | pF | |
| Reverse Transfer Capacitance (Note 6) | $C_{rss}$ | — | — | 20 | pF | |
| Turn-On Delay Time (Notes 6 & 7) | $t_{d(on)}$ | — | — | 8 | ns | $V_{DD}$ ≈ 25V, $V_{GEN}$ = 10V<br>$I_D$ = 1.5A |
| Turn-On Rise Time (Notes 6 & 7) | $t_r$ | — | — | 12 | ns | |
| Turn-Off Delay Time (Notes 6 & 7) | $t_{d(off)}$ | — | — | 12 | ns | |
| Turn-Off Fall Time (Notes 6 & 7) | $t_f$ | — | — | 15 | ns | |

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

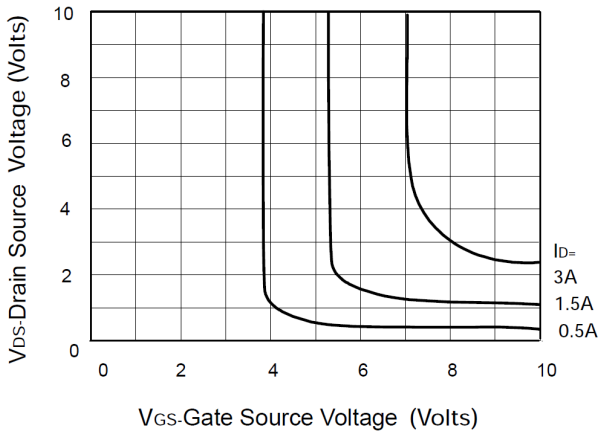
## Typical Characteristics



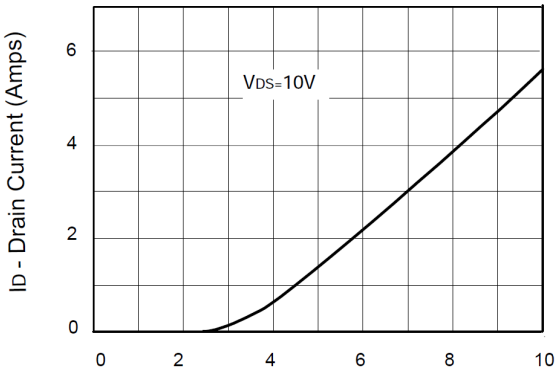

**Output Characteristics**



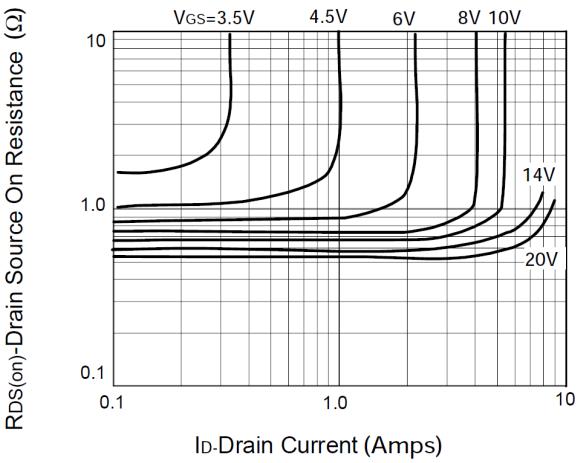

**Saturation Characteristics**



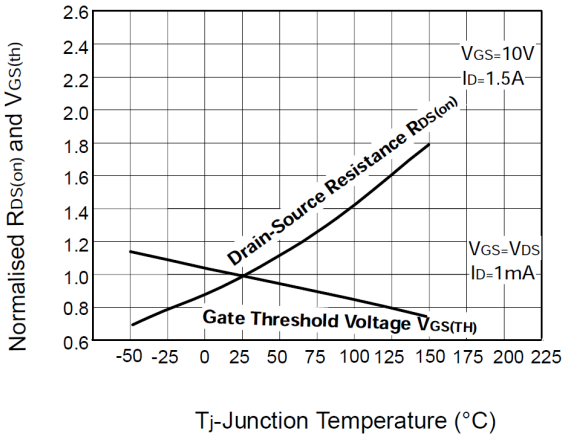

**Voltage Saturation Characteristics**




**Transfer Characteristics**

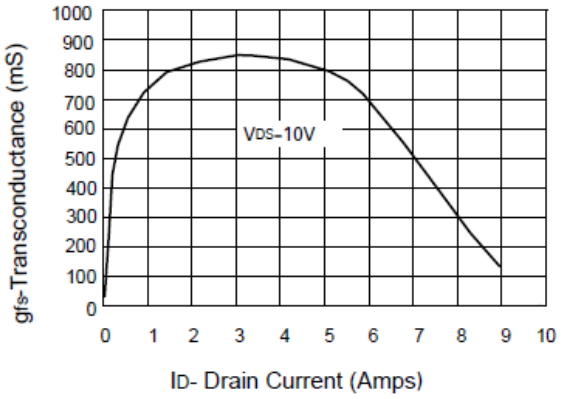



**On-resistance v drain current**

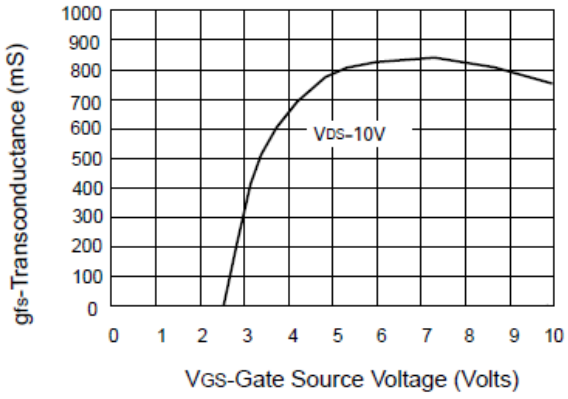



**Normalised $R_{DS(on)}$ and $V_{GS(th)}$ v Temperature**

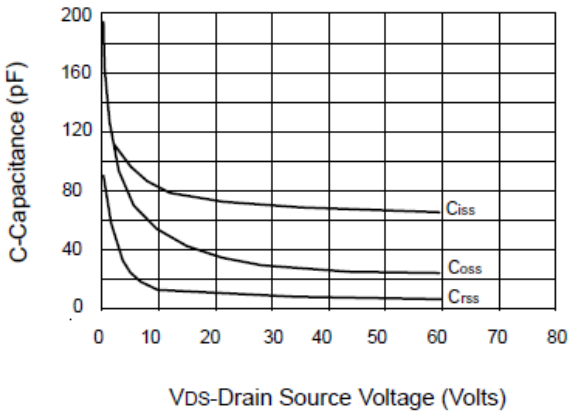
## Typical Characteristics (continued)



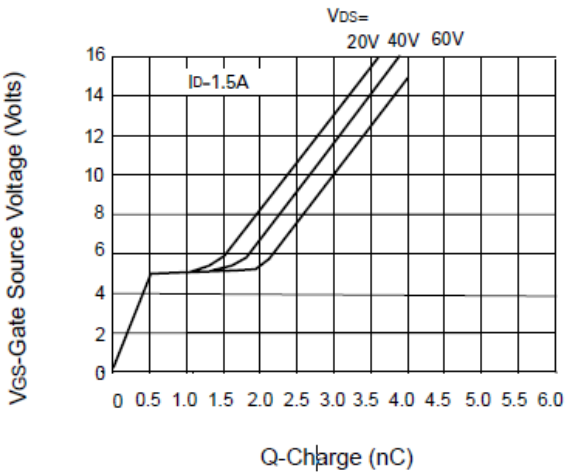

**Transconductance v drain current**



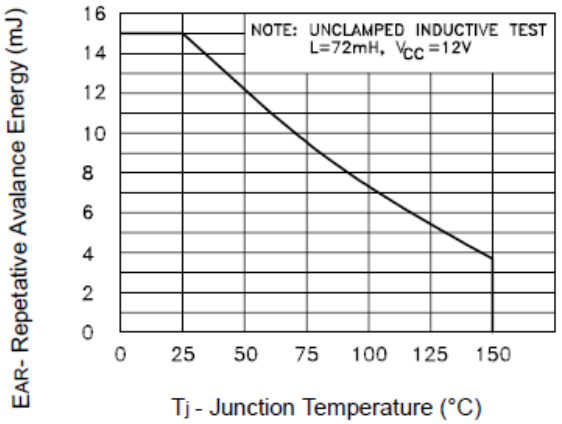

**Transconductance v gate-source voltage**



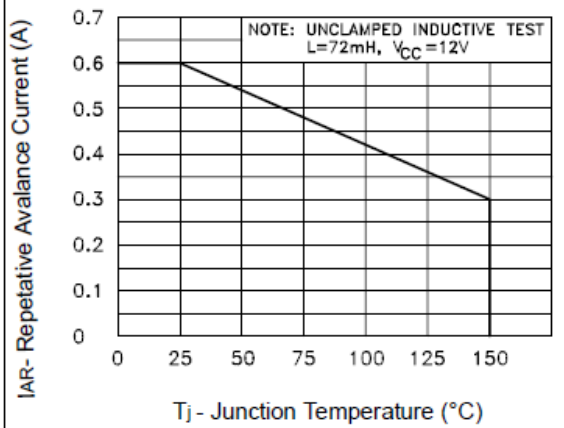

**Capacitance v drain-source voltage**




**Gate charge v gate-source voltage**



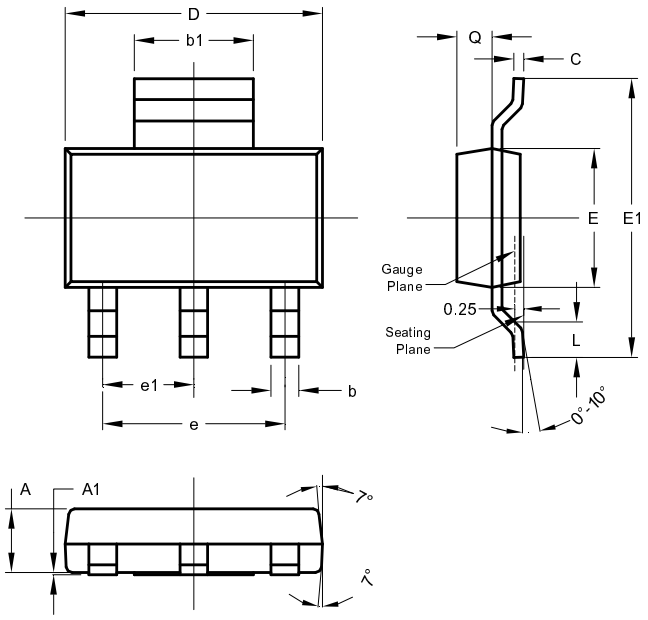

**Maximum repetative avalanche energy v Junction Temperature**




**Maximum repetative avalanche current v Junction Temperature**

## Package Outline Dimensions

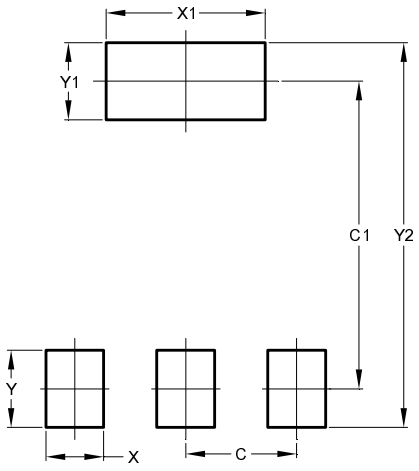
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.




| SOT223 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.55 | 1.65 | 1.60 |
| **A1** | 0.010 | 0.15 | 0.05 |
| **b** | 0.60 | 0.80 | 0.70 |
| **b1** | 2.90 | 3.10 | 3.00 |
| **C** | 0.20 | 0.30 | 0.25 |
| **D** | 6.45 | 6.55 | 6.50 |
| **E** | 3.45 | 3.55 | 3.50 |
| **E1** | 6.90 | 7.10 | 7.00 |
| **e** | - | - | 4.60 |
| **e1** | - | - | 2.30 |
| **L** | 0.85 | 1.05 | 0.95 |
| **Q** | 0.84 | 0.94 | 0.89 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.




| Dimensions | Value (in mm) |
|---|---|
| **C** | 2.30 |
| **C1** | 6.40 |
| **X** | 1.20 |
| **X1** | 3.30 |
| **Y** | 1.60 |
| **Y1** | 1.60 |
| **C2** | 8.00 |

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  401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
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- ### Sales :

  Direct +86 (21) 6401-6692

  Email amall@ameya360.com

  QQ 800077892

  Skype ameyasales1 ameyasales2

- ### Customer Service :

  Email service@ameya360.com

- ### Partnership :

  Tel +86 (21) 64016692-8333

  Email mkt@ameya360.com