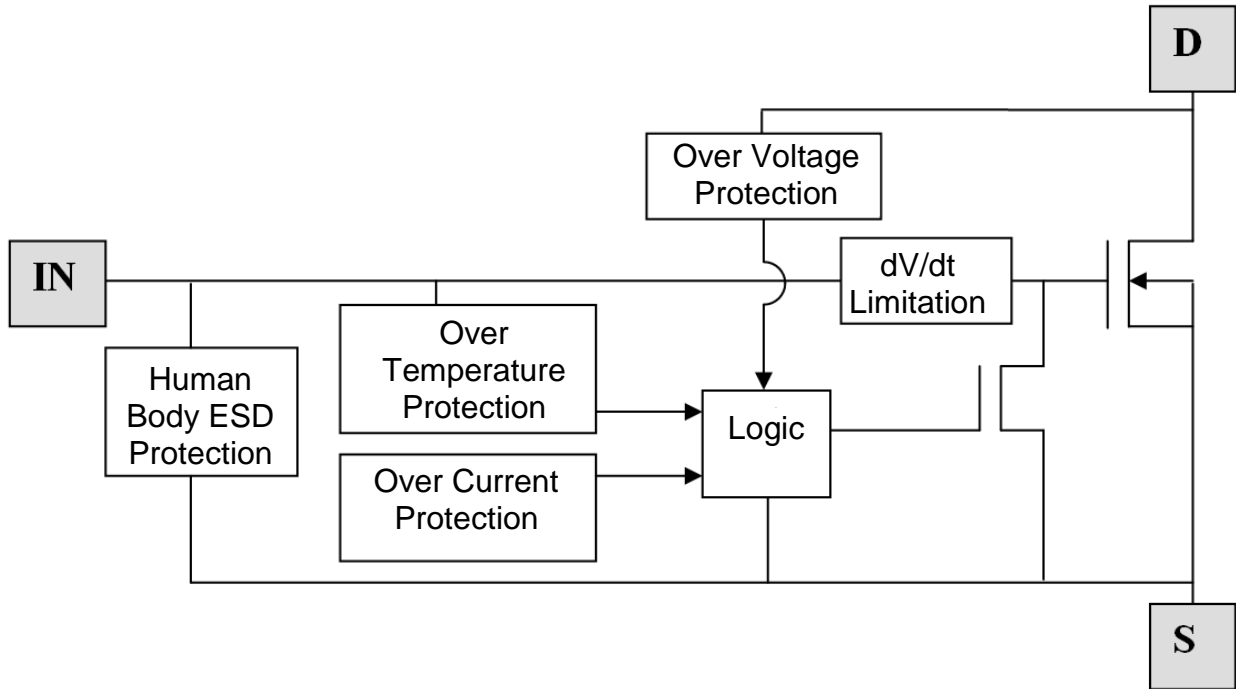


Functional Block Diagram

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

| Characteristic | Symbol | Value | Unit |
|---|---------------------|-----------------------|------|
| Continuous Drain-Source Voltage | V _{DS} | 60 | V |
| Drain-Source Voltage for Short Circuit Protection | V _{DS(SC)} | 36 | V |
| Continuous Input Voltage | V _{IN} | -0.5 to 6 | V |
| Continuous Input Current @ -0.2V ≤ V _{IN} ≤ 6V | I _{IN} | No Limit | mA |
| Continuous Input Current @ V _{IN} < -0.2V or V _{IN} > 6V | I _{IN} | I _{IN} ≤ 2 | mA |
| Pulsed Drain Current @ V _{IN} = 3.3V | I _{DM} | 2 | A |
| Pulsed Drain Current @ V _{IN} = 5V | I _{DM} | 2.5 | A |
| Continuous Source Current (Body Diode) (Note 6) | I _S | 1 | A |
| Pulsed Source Current (Body Diode) | I _{SM} | 5 | A |
| Unclamped Single Pulse Inductive Energy, T _J = +25°C, I _D = 0.5A, V _{DD} = 24V | E _{AS} | 490 | mJ |
| Electrostatic Discharge (Human Body Model) | V _{ESD} | 4000 | V |
| Charged Device Model | V _{CDM} | 1000 | V |

Thermal Resistance

| Characteristic | Symbol | Value | Unit |
|--|------------------|-------------|-------|
| Power Dissipation at T _A = +25°C (Note 6) | P _D | 1.18 | W |
| Linear Derating Factor | P _D | 9.4 | mW/°C |
| Power Dissipation at T _A = +25°C (Note 7) | P _D | 1.67 | W |
| Linear Derating Factor | P _D | 13.5 | mW/°C |
| Thermal Resistance, Junction to Ambient (Note 6) | R _{θJA} | 106 | °C/W |
| Thermal Resistance, Junction to Ambient (Note 7) | R _{θJA} | 74 | °C/W |
| Thermal Resistance, Junction to Case (Note 8) | R _{θJC} | 8 | °C/W |
| Operating Temperature Range | T _J | -40 to +150 | °C |
| Storage Temperature Range | T _{STG} | -55 to +150 | °C |

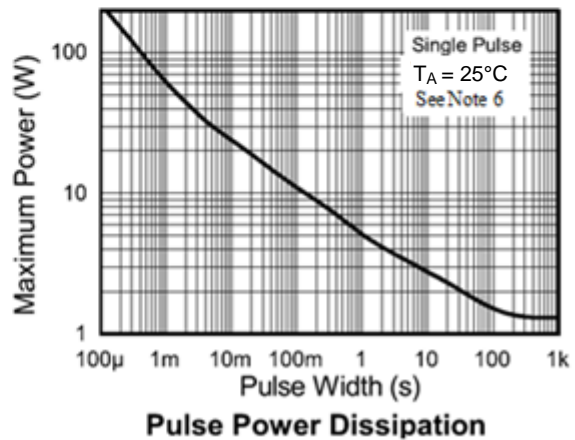
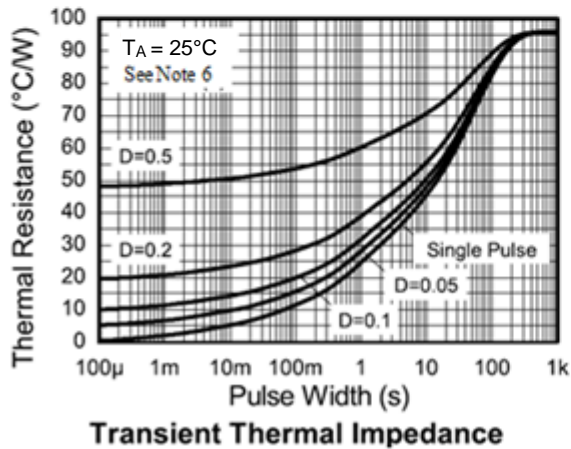
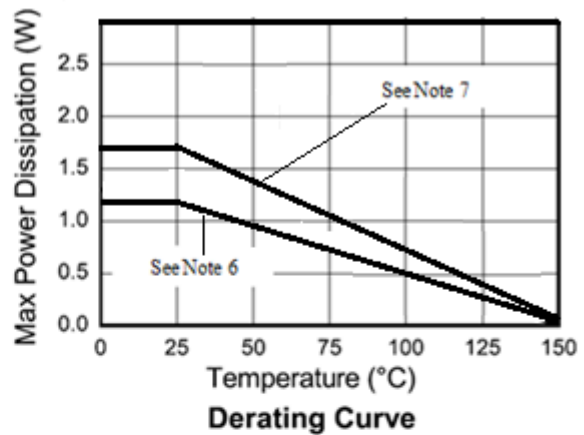
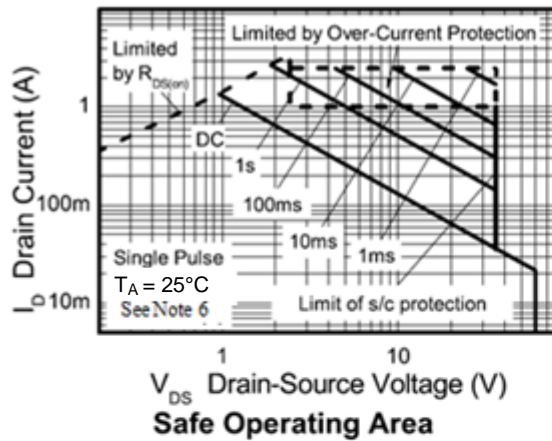
- Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout
 7. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate
 8. Thermal resistance between junction and the mounting surfaces of drain and source pins.

Recommended Operating Conditions

The ZXMS6004DGQ-13 is optimized for use with μC operating from 3.3V and 5V supplies.

| Characteristic | Symbol | Min | Max | Unit |
|---|----------|-----|------|--------------------|
| Input Voltage Range | V_{IN} | 0 | 5.5 | V |
| Ambient Temperature Range | T_A | -40 | +125 | $^{\circ}\text{C}$ |
| High Level Input Voltage for MOSFET to be On | V_{IH} | 3 | 5.5 | V |
| Low Level Input Voltage for MOSFET to be Off | V_{IL} | 0 | 0.7 | V |
| Peripheral Supply Voltage (Voltage to Which Load is Referred) | V_P | 0 | 36 | V |

Thermal Characteristics

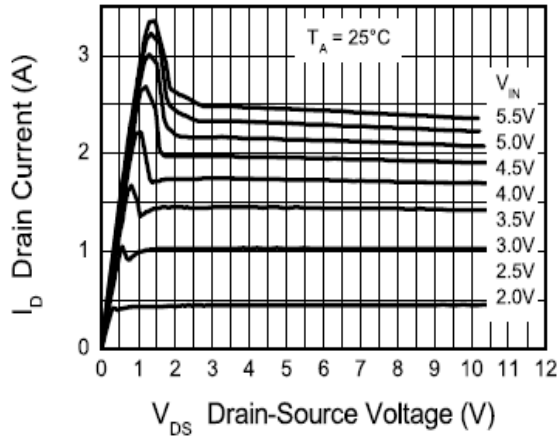


Electrical Characteristics (@T_A = +25°C, unless otherwise stated.)

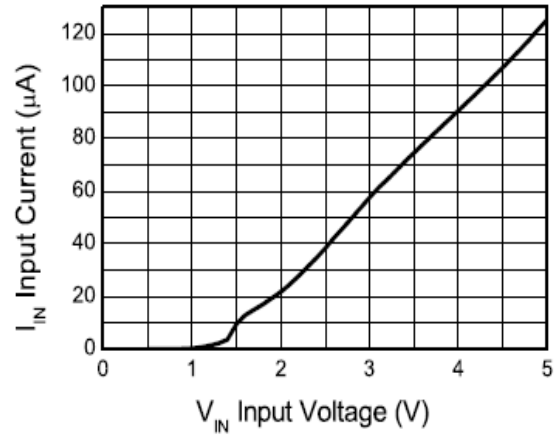
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---------------------|------|------|-----|------|---|
| Static Characteristics | | | | | | |
| Drain-Source Clamp Voltage | V _{DS(AZ)} | 60 | 65 | 70 | V | I _D = 10mA |
| Off State Drain Current | I _{DSS} | — | — | 0.5 | μA | V _{DS} = 12V, V _{IN} = 0V |
| | | — | — | 1 | | V _{DS} = 36V, V _{IN} = 0V |
| Input Threshold Voltage | V _{IN(TH)} | 0.7 | 1.2 | 1.5 | V | V _{DS} = V _{GS} , I _D = 1mA |
| Input Current | I _{IN} | — | 60 | 100 | μA | V _{IN} = 3V |
| | | — | 120 | 200 | | V _{IN} = 5V |
| Input Current While Over Temperature Active | — | — | — | 400 | μA | V _{IN} = 5V |
| Static Drain-Source On-State Resistance | R _{DS(ON)} | — | 400 | 600 | mΩ | V _{IN} = 3V, I _D = 0.5A |
| | | — | 350 | 500 | | V _{IN} = 5V, I _D = 0.5A |
| Continuous Drain Current (Note 6) | I _D | 0.9 | — | — | A | V _{IN} = 3V; T _A = +25°C |
| | | 1.0 | — | — | | V _{IN} = 5V; T _A = +25°C |
| Continuous Drain Current (Note 7) | | 1.2 | — | — | | V _{IN} = 3V; T _A = +25°C |
| | | 1.3 | — | — | | V _{IN} = 5V; T _A = +25°C |
| Current Limit (Note 9) | I _{D(LIM)} | 0.7 | 1.7 | — | A | V _{IN} = 3V |
| | | 1 | 2.2 | — | | V _{IN} = 5V |
| Dynamic Characteristics | | | | | | |
| Turn On Delay Time | t _{D(ON)} | — | 5 | — | μs | V _{DD} = 12V, I _D = 0.5A, V _{GS} = 5V |
| Rise Time | t _R | — | 10 | — | | |
| Turn Off Delay Time | t _{D(OFF)} | — | 45 | — | | |
| Fall Time | t _F | — | 15 | — | | |
| Over-Temperature Protection | | | | | | |
| Thermal Overload Trip Temperature (Note 10) | T _{JT} | +150 | +175 | — | °C | — |
| Thermal Hysteresis (Note 10) | — | — | +10 | — | °C | — |

- Notes:
- The drain current is restricted only when the device is in saturation (see graph 'typical output characteristic'). This allows the device to be used in the fully on state without interference from the current limit. The device is fully protected at all drain currents, as the low power dissipation generated outside saturation makes current limit unnecessary.
 - Over-temperature protection is designed to prevent device destruction under fault conditions. Fault conditions are considered as "outside" normal operating range, so this part is not designed to withstand over-temperature for extended periods.

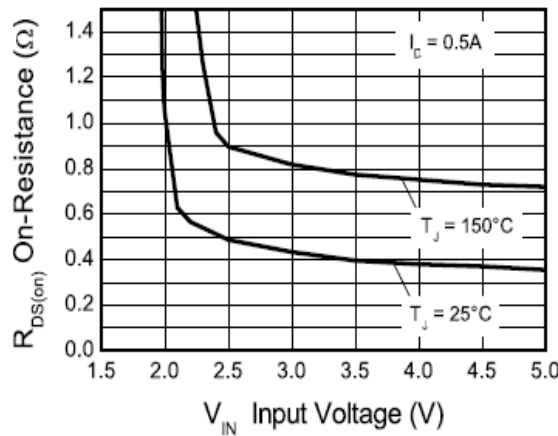
Typical Characteristics



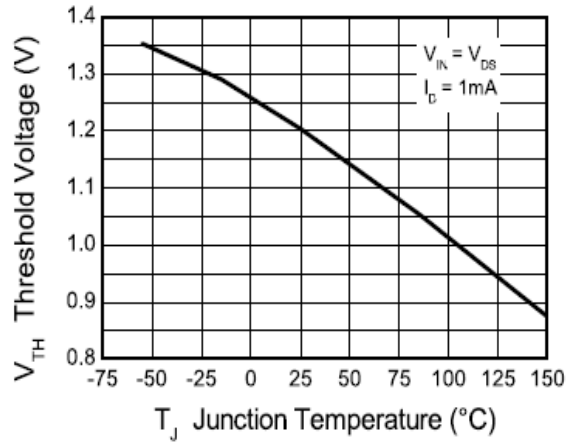
Typical Output Characteristic



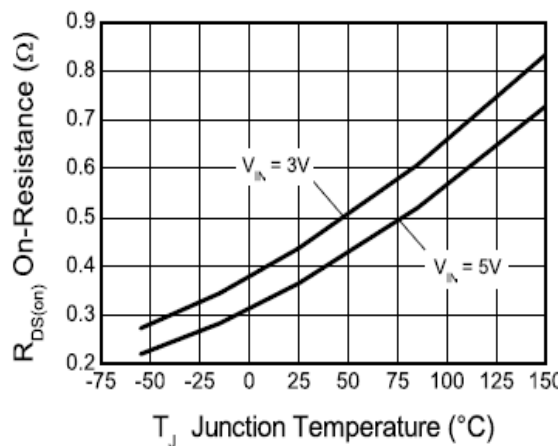
Input Current vs Input Voltage



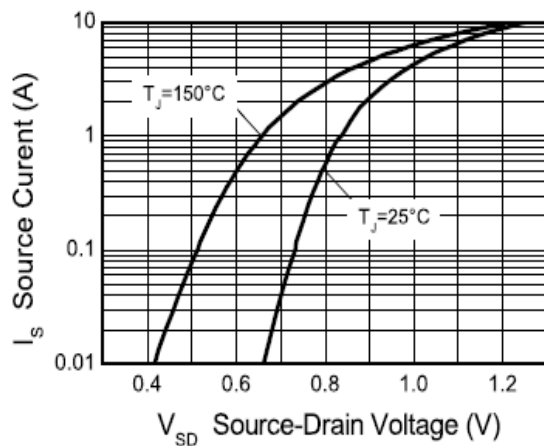
On-Resistance vs Input Voltage



Threshold Voltage vs Temperature

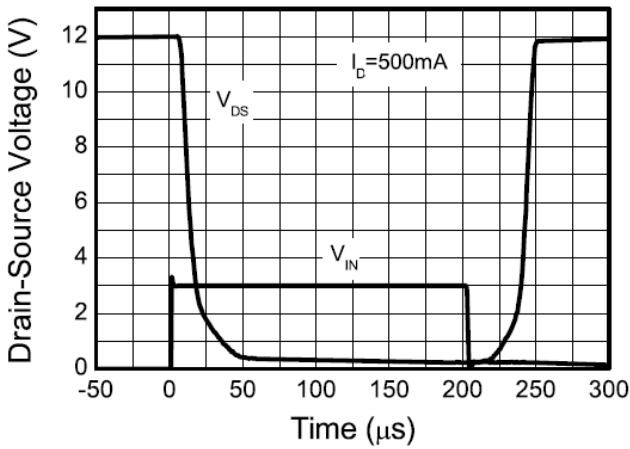


On-Resistance vs Temperature

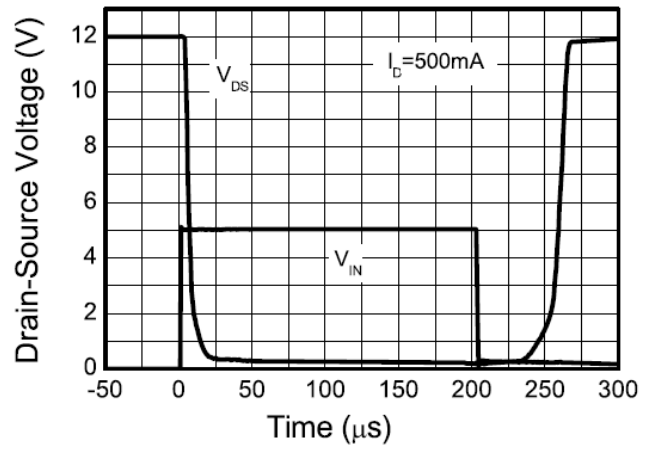


Reverse Diode Characteristic

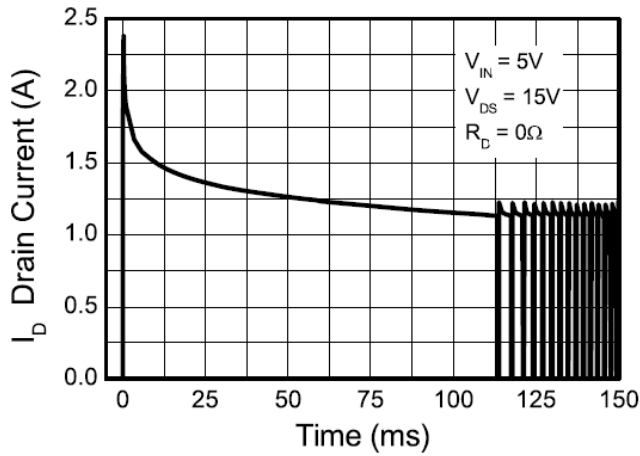
Typical Characteristics (continued)



Switching Speed



Switching Speed

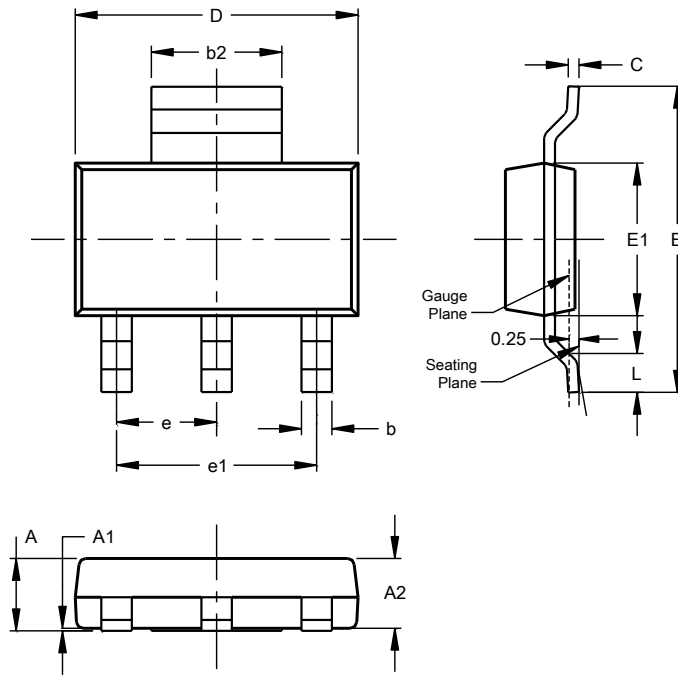


Typical Short Circuit Protection

Package Outline Dimensions

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

SOT223(Type DN)

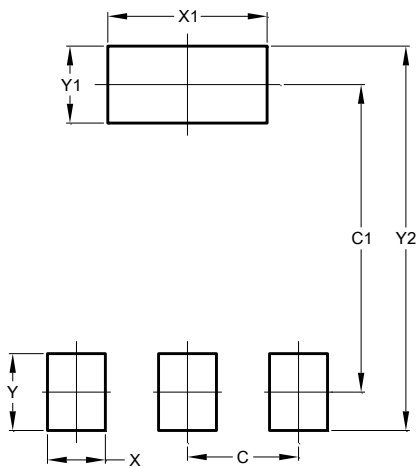


| SOT223 (Type DN) | | | |
|----------------------|------|------|------|
| Dim | Min | Max | Typ |
| A | -- | 1.70 | -- |
| A1 | 0.01 | 0.15 | -- |
| A2 | 1.50 | 1.68 | 1.60 |
| b | 0.60 | 0.80 | 0.70 |
| b2 | 2.90 | 3.10 | -- |
| c | 0.20 | 0.32 | -- |
| D | 6.30 | 6.70 | -- |
| E | 6.70 | 7.30 | -- |
| E1 | 3.30 | 3.70 | -- |
| e | -- | -- | 2.30 |
| e1 | -- | -- | 4.60 |
| L | 0.85 | -- | -- |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

SOT223(Type DN)



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 2.30 |
| C1 | 6.40 |
| X | 1.20 |
| X1 | 3.30 |
| Y | 1.60 |
| Y1 | 1.60 |
| Y2 | 8.00 |

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