

Product Summary

| $V_{(BR)DSS}$ | Max $R_{DS(on)}$ | Max I_D $T_A = +25^\circ C$ |
|---------------|----------------------------------|----------------------------------|
| -60V | 400m Ω @ $V_{GS} = -10V$ | -1.1A |
| | 600m Ω @ $V_{GS} = -4.5V$ | -0.9A |

Description

This MOSFET utilizes a unique structure that combines the benefits of low on-resistance with fast switching speed, making it ideal for high-efficiency power management applications.

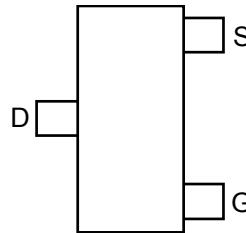
Applications

- DC-DC Converters
- Power Management Functions
- Relay and Solenoid Driving
- Motor Control

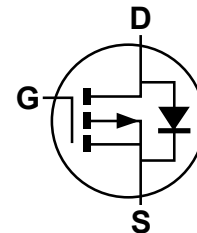
SOT23



Top View



Top View
Pin Out



Equivalent Circuit

Features

- Fast switching speed
- Low input capacitance
- Low gate charge
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

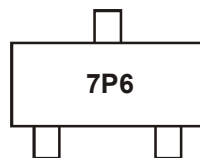
- Case: SOT23
- Case Material: Molded Plastic, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 ^(e3)
- Weight: 0.008 grams (approximate)

Ordering Information (Notes 4)

| Product | Compliance | Case | Packaging |
|-------------|------------|-------|---------------------|
| ZXMP6A13FTA | Standard | SOT23 | 3,000 / Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 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



7P6 = Product Type Marking Code

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

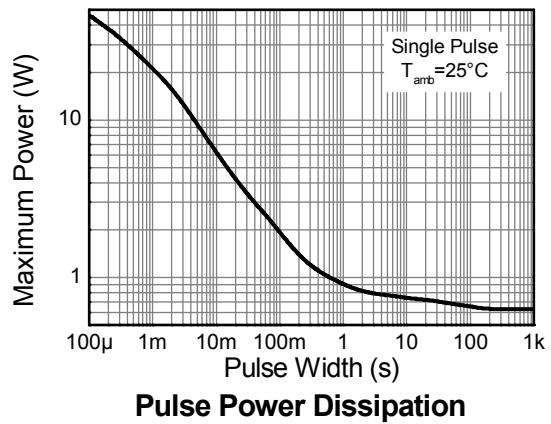
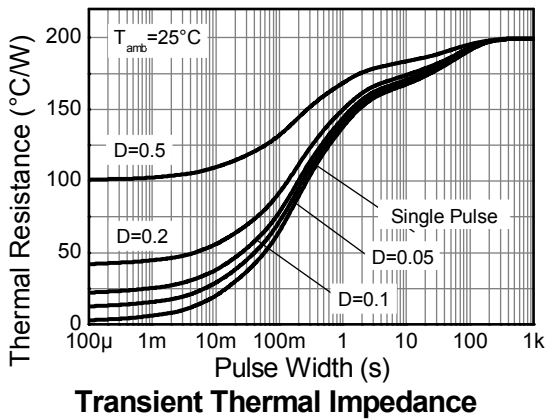
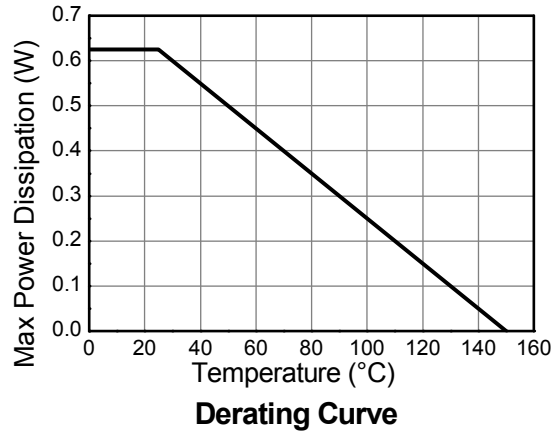
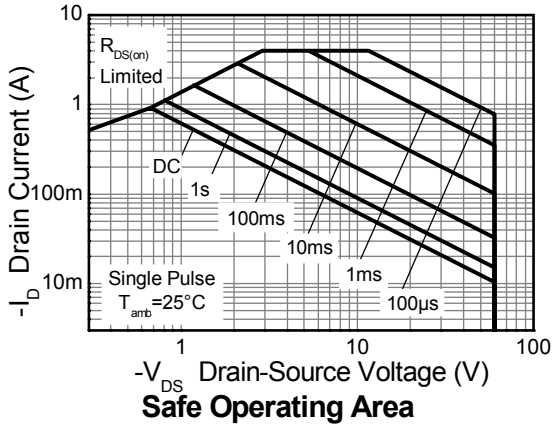
| Characteristic | | | Symbol | Value | Units |
|---|------------------------|------------------------------------|-----------|--------------|-------|
| Drain-Source Voltage | | | V_{DSS} | -60 | V |
| Gate-Source Voltage | | | V_{GS} | ± 20 | V |
| Continuous Drain Current | $V_{GS} = -10\text{V}$ | $T_A = +70^\circ\text{C}$ (Note 7) | I_D | -1.1 | A |
| | | (Note 7) (Note 6) | | -0.8 -0.9 | |
| Pulsed Drain Current (Note 7) | | | I_{DM} | -4 | A |
| Continuous Source Current (Body Diode) (Note 6) | | | I_S | -1.2 | A |
| Pulsed Source Current (Body Diode) (Note 7) | | | I_{SM} | -4 | A |

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|--|--|-----------------|-------------|---------------------------|
| Power Dissipation (Note 5) | | P_D | 625 | mW |
| Linear Derating Factor | | | 5 | mW/ $^\circ\text{C}$ |
| Power Dissipation (Note 6) | | P_D | 806 | mW |
| Linear Derating Factor | | | 6.5 | mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient (Note 5) | | $R_{\theta JA}$ | 200 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Ambient (Note 6) | | $R_{\theta JA}$ | 155 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Leads (Note 8) | | $R_{\theta JL}$ | 194 | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range | | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

- Notes:
5. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions
 6. For a device surface mounted on FR4 PCB measured at $t \leq 5\text{secs}$.
 7. Repetitive rating 25mm x 25mm FR4 PCB, $D = 0.05$ pulse width = $10\mu\text{s}$ - pulse current limited by maximum junction temperature.
 8. Thermal resistance from junction to solder-point (at the end of the collector lead).

Thermal Characteristics

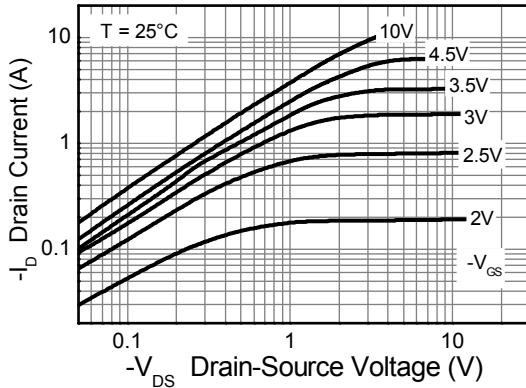


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

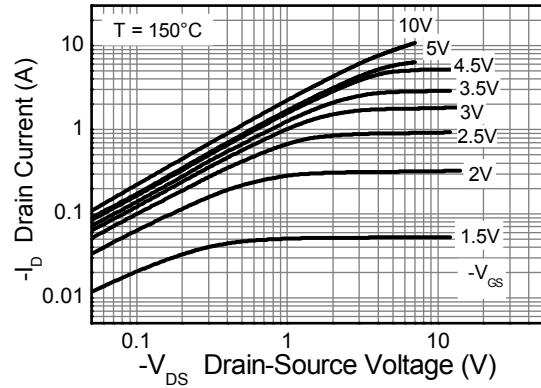
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|-------|-------|------|--|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -60 | — | — | V | I _D = -250μA, V _{GS} = 0V |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | -0.5 | μA | V _{DS} = -60V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | -1 | — | -3 | V | I _D = -250μA, V _{DS} = V _{GS} |
| Static Drain-Source On-Resistance (Note 9) | R _{DS(on)} | — | — | 0.400 | Ω | V _{GS} = -10V, I _D = -0.9A |
| | | | | 0.600 | | V _{GS} = -4.5V, I _D = -0.8A |
| Forward Transconductance (Notes 9 & 11) | g _{fs} | — | 1.8 | — | S | V _{DS} = -15V, I _D = -0.9A |
| Diode Forward Voltage (Note 9) | V _{SD} | — | -0.85 | -0.95 | V | T _J = +25°C, I _S = -0.8A, V _{GS} = 0V |
| Reverse Recovery Time (Note 11) | t _{rr} | — | 21.1 | — | ns | T _J = +25°C, I _F = -0.9A, |
| Reverse Recovery Charge (Note 11) | Q _{rr} | — | 19.3 | — | nC | di/dt = 100A/μs |
| DYNAMIC CHARACTERISTICS (Note 11) | | | | | | |
| Input Capacitance | C _{iss} | — | 219 | — | pF | V _{DS} = -30V, V _{GS} = 0V f = 1MHz |
| Output Capacitance | C _{oss} | — | 25.7 | — | | |
| Reverse Transfer Capacitance | C _{rss} | — | 20.5 | — | | |
| Turn-On Delay Time (Note 10) | t _{D(on)} | — | 1.6 | — | ns | V _{DD} = -30V, I _D = -1A, R _G ≅ 6.0Ω, V _{GS} = -10V |
| Turn-On Rise Time (Note 10) | t _r | — | 2.2 | — | | |
| Turn-Off Delay Time (Note 10) | t _{D(off)} | — | 11.2 | — | | |
| Turn-Off Fall Time (Note 10) | t _f | — | 5.7 | — | | |
| Total Gate Charge (Note 10) | Q _g | — | 2.9 | — | nC | V _{DS} = -30V, V _{GS} = -4.5V, I _D = -0.9A |
| Total Gate Charge (Note 10) | Q _g | — | 5.9 | — | nC | V _{DS} = -30V, V _{GS} = -10V, I _D = -0.9A |
| Gate-Source Charge (Note 10) | Q _{gs} | — | 0.74 | — | | |
| Gate-Drain Charge (Note 10) | Q _{gd} | — | 1.5 | — | | |

- Notes:
9. Measured under pulsed conditions. Pulse width = 300μs. Duty cycle ≤ 2%.
 10. Switching characteristics are independent of operating junction temperature.
 11. For design aid only, not subject to production testing.

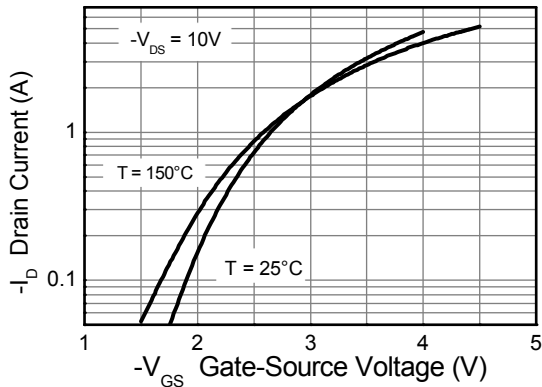
Typical Characteristics



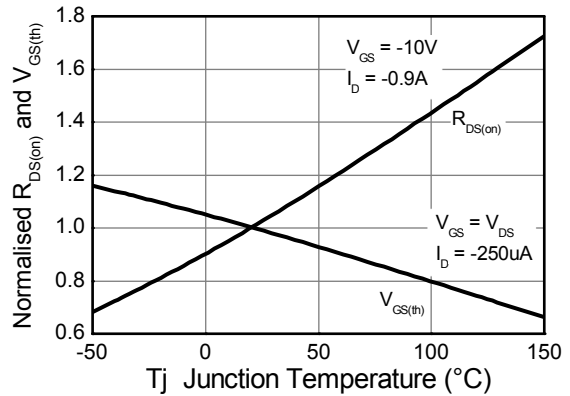
Output Characteristics



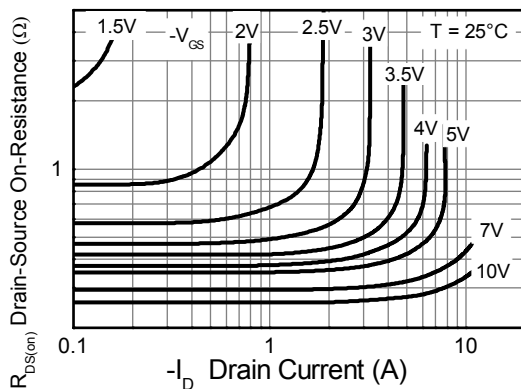
Output Characteristics



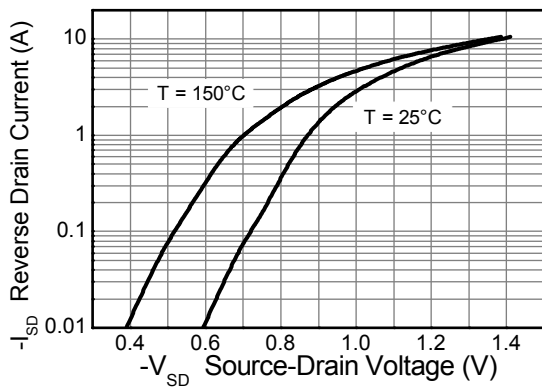
Typical Transfer Characteristics



Normalised Curves v Temperature

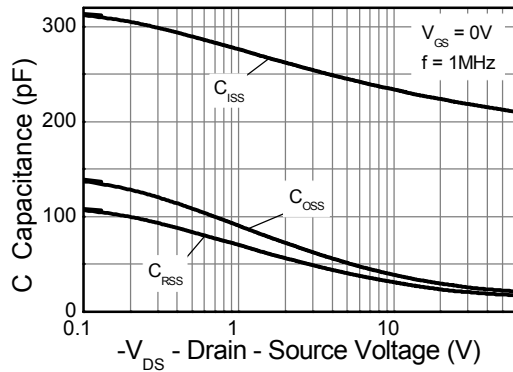


On-Resistance v Drain Current

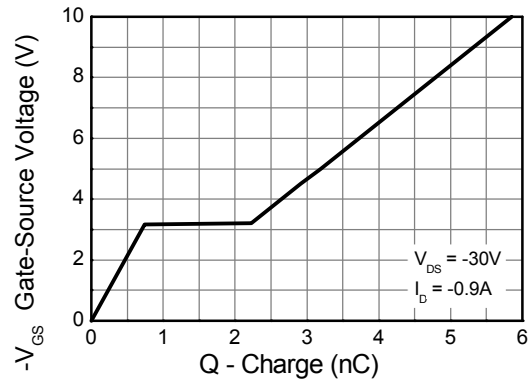


Source-Drain Diode Forward Voltage

Typical Characteristics – (cont.)

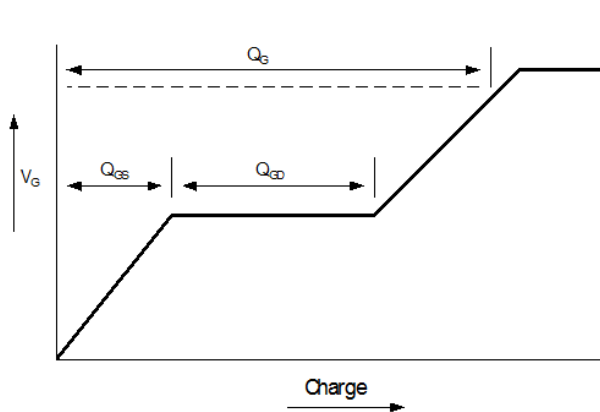


Capacitance v Drain-Source Voltage

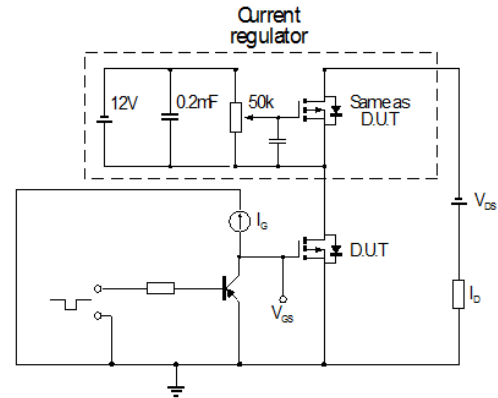


Gate-Source Voltage v Gate Charge

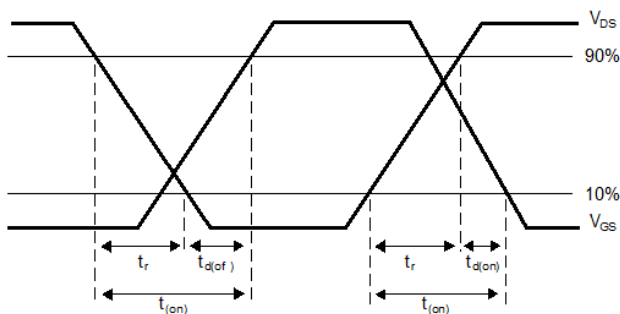
Test Circuits



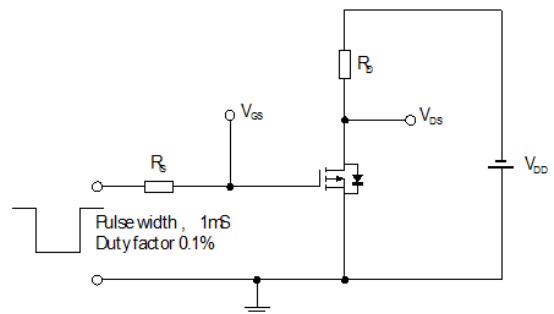
Basic gate charge waveform



Gate charge test circuit



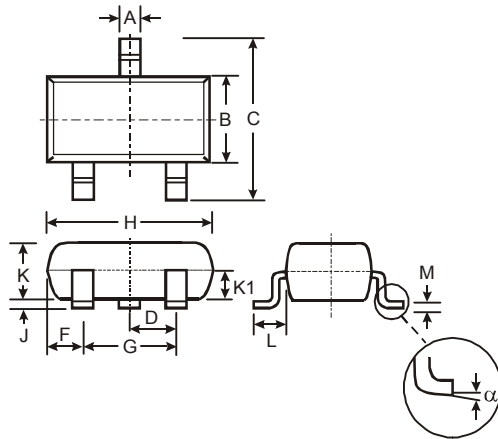
Switching time waveforms



Switching time test circuit

Package Outline Dimensions

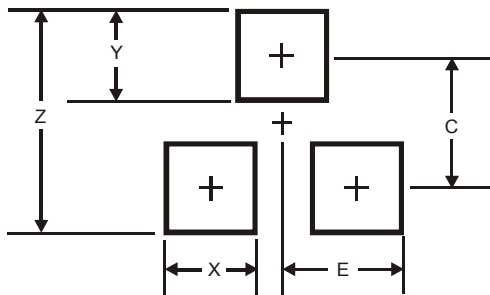
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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

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



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

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