

## Product Summary

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

## Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- DC - DC converters
- Power management functions
- Relay and solenoid driving
- Motor control

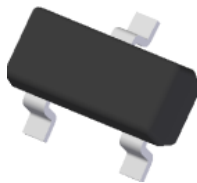
## Features

- 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**
- **PPAP Available (Note 4)**

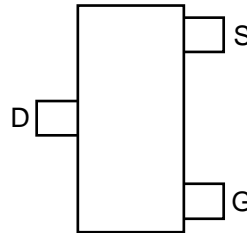
## Mechanical Data

- 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
- Weight: 0.009 grams (Approximate)

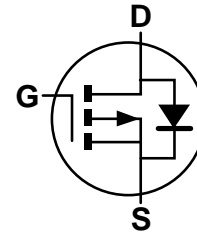
SOT23 (Type DN)



Top View



Top View  
Pin Out



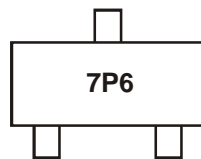
Equivalent Circuit

## Ordering Information (Notes 5)

Part Number	Compliance	Case	Quantity per Reel
ZXMP6A13FQTA	Automotive	SOT23 (Type DN)	3,000

- 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



7P6 = Product Type Marking Code

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

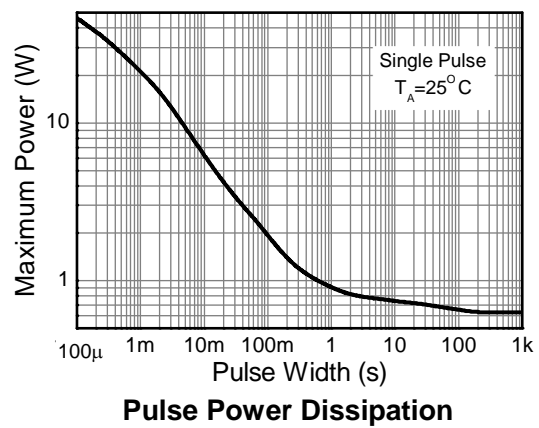
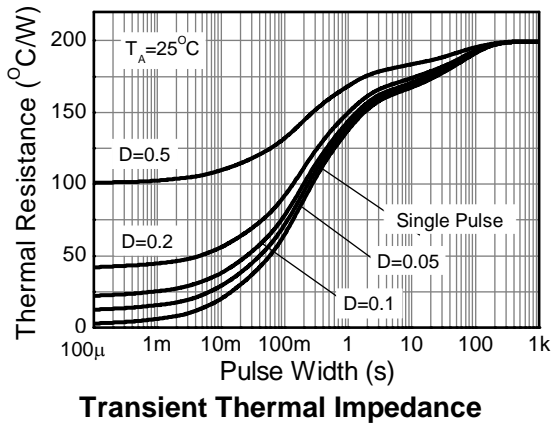
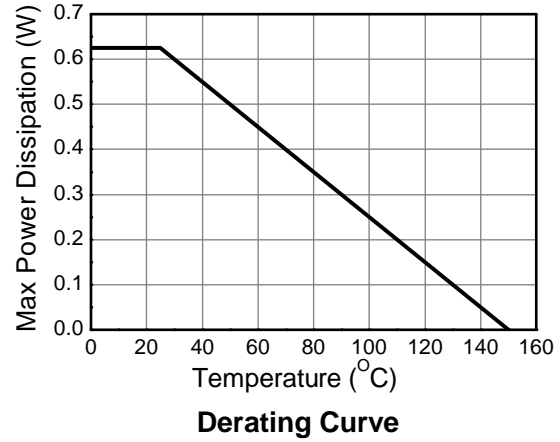
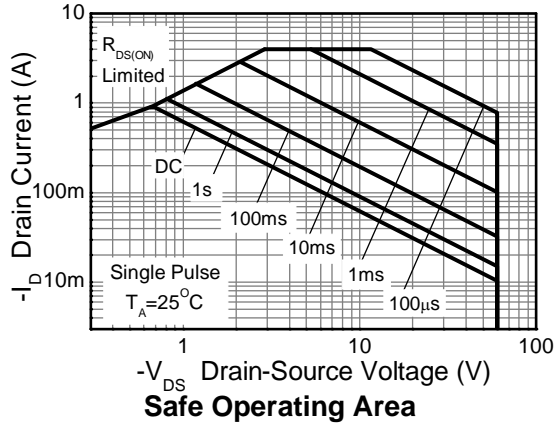
Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V <sub>DSS</sub>	-60	V
Gate-Source Voltage			V <sub>GS</sub>	±20	V
Continuous Drain Current	V <sub>GS</sub> = -10V	T <sub>A</sub> = +70°C	I <sub>D</sub>	(Note 8)	-1.1
				(Note 7)	-0.8
				(Note 6)	-0.9
Pulsed Drain Current (Note 8)			I <sub>DM</sub>	-4.0	A
Continuous Source Current (Body Diode) (Note 7)			I <sub>S</sub>	-1.2	A
Pulsed Source Current (Body Diode) (Note 8)			I <sub>SM</sub>	-4.0	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Power Dissipation (Note 6)			P <sub>D</sub>	625	mW
Linear Derating Factor				5	mW/°C
Power Dissipation (Note 7)			P <sub>D</sub>	806	mW
Linear Derating Factor				6.5	mW/°C
Thermal Resistance, Junction to Ambient (Note 6)			R <sub>θJA</sub>	200	°C/W
Thermal Resistance, Junction to Ambient (Note 7)			R <sub>θJA</sub>	155	°C/W
Thermal Resistance, Junction to Leads (Note 9)			R <sub>θJL</sub>	194	°C/W
Operating and Storage Temperature Range			T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

- Notes:
6. For a device surface mounted on 25mm x 25mm FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions.
  7. For a device surface mounted on FR-4 PCB measured at t ≤ 5s.
  8. Repetitive rating 25mm x 25mm FR-4 PCB, D = 0.05 pulse width = 10μs - pulse current limited by maximum junction temperature.
  9. Thermal resistance from junction to solder-point (at the end of the collector lead).

**Thermal Characteristics**

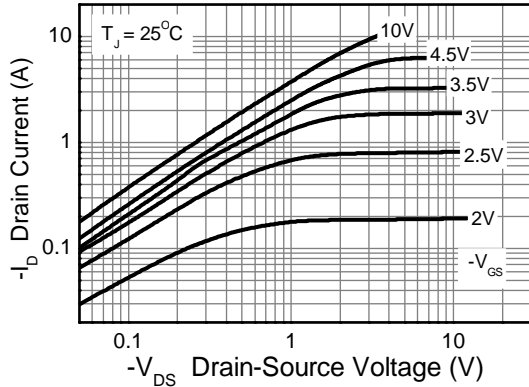


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

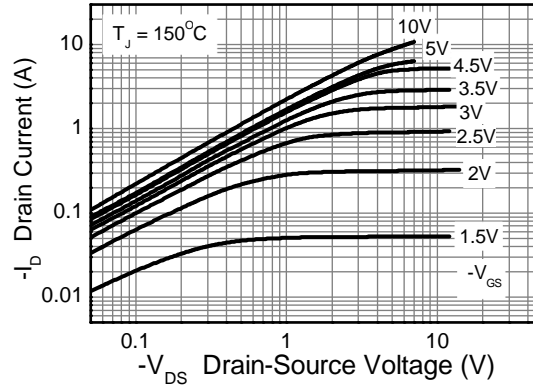
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-60	—	—	V	I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-0.5	μA	V <sub>DS</sub> = -60V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-1.0	—	-3.0	V	I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>
Static Drain-Source On-Resistance (Note 10)	R <sub>DS(ON)</sub>	—	—	0.4	Ω	V <sub>GS</sub> = -10V, I <sub>D</sub> = -0.9A
				0.6		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.8A
Forward Transconductance (Notes 10 and 12)	g <sub>fs</sub>	—	1.8	—	S	V <sub>DS</sub> = -15V, I <sub>D</sub> = -0.9A
Diode Forward Voltage (Note 10)	V <sub>SD</sub>	—	-0.85	-0.95	V	T <sub>J</sub> = +25°C, I <sub>S</sub> = -0.8A, V <sub>GS</sub> = 0V
Reverse Recovery Time (Note 12)	t <sub>RR</sub>	—	21.1	—	ns	T <sub>J</sub> = +25°C, I <sub>F</sub> = -0.9A,
Reverse Recovery Charge (Note 12)	Q <sub>RR</sub>	—	19.3	—	nC	di/dt = 100A/μs
<b>DYNAMIC CHARACTERISTICS (Note 12)</b>						
Input Capacitance	C <sub>ISS</sub>	—	219	—	pF	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	25.7	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	20.5	—		
Turn-On Delay Time (Note 11)	t <sub>D(ON)</sub>	—	1.6	—	ns	V <sub>DD</sub> = -30V, I <sub>D</sub> = -1A, R <sub>g</sub> ≅ 6.0Ω, V <sub>GS</sub> = -10V
Turn-On Rise Time (Note 11)	t <sub>R</sub>	—	2.2	—		
Turn-Off Delay Time (Note 11)	t <sub>D(OFF)</sub>	—	11.2	—		
Turn-Off Fall Time (Note 11)	t <sub>F</sub>	—	5.7	—		
Total Gate Charge (Note 11)	Q <sub>g</sub>	—	2.9	—	nC	V <sub>DS</sub> = -30V, V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.9A
Total Gate Charge (Note 11)	Q <sub>g</sub>	—	5.9	—	nC	V <sub>DS</sub> = -30V, V <sub>GS</sub> = -10V, I <sub>D</sub> = -0.9A
Gate-Source Charge (Note 11)	Q <sub>gs</sub>	—	0.74	—		
Gate-Drain Charge (Note 11)	Q <sub>gd</sub>	—	1.5	—		

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

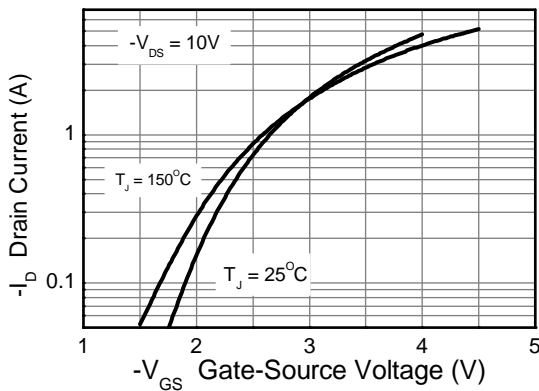
**Typical Characteristics**



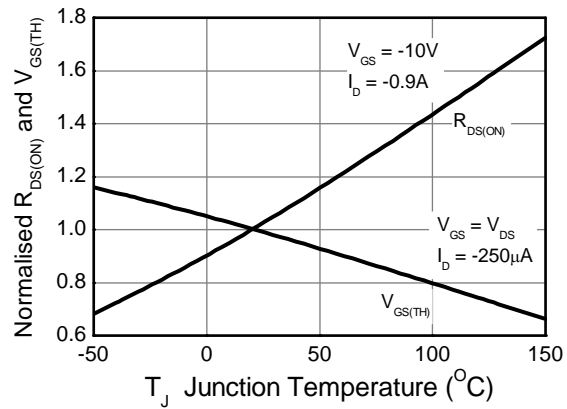
**Output Characteristics**



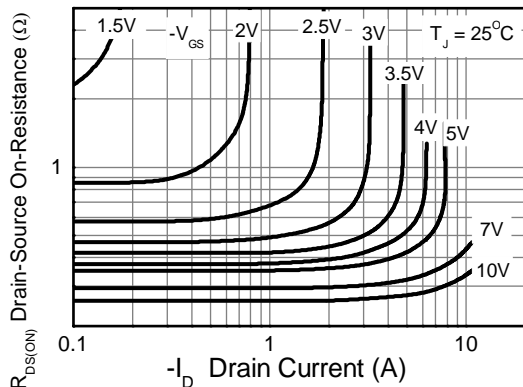
**Output Characteristics**



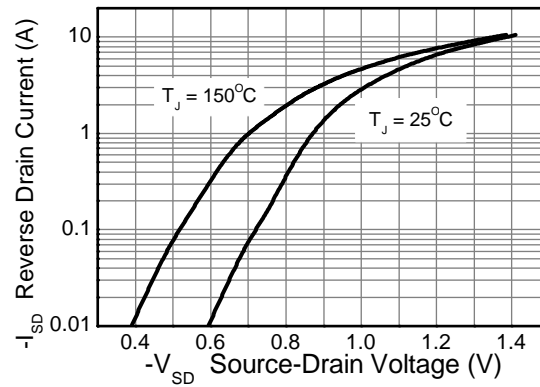
**Typical Transfer Characteristics**



**Normalised Curves v Temperature**

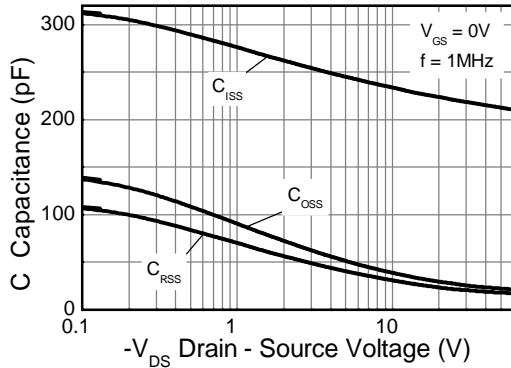


**On-Resistance v Drain Current**

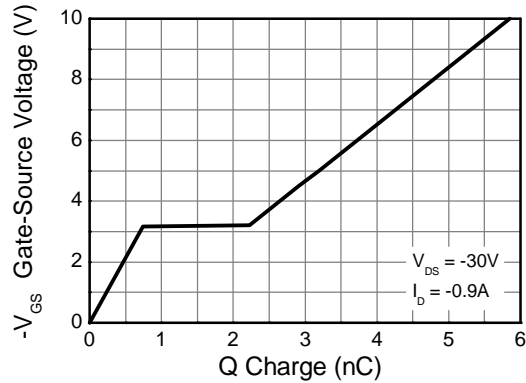


**Source-Drain Diode Forward Voltage**

**Typical Characteristics (Cont.)**

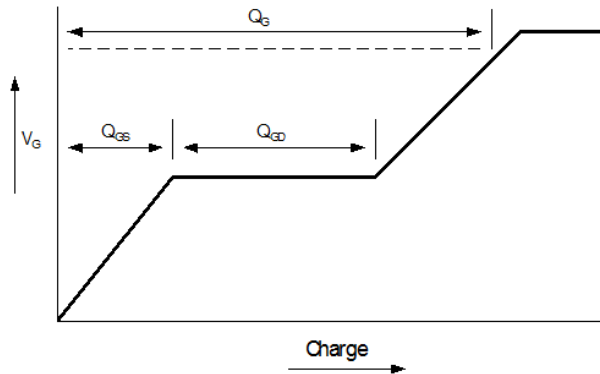


**Capacitance v Drain-Source Voltage**

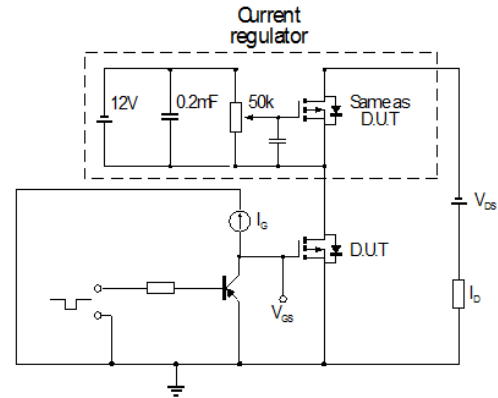


**Gate-Source Voltage v Gate Charge**

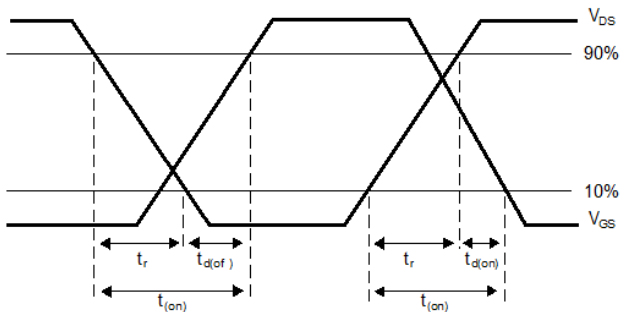
**Test Circuits**



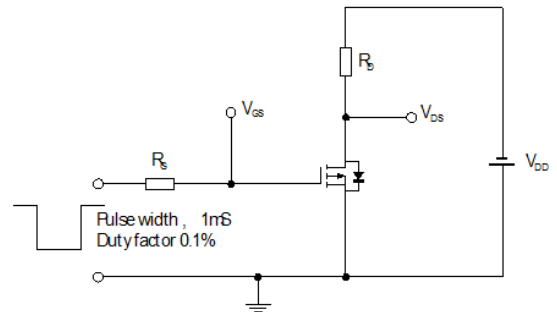
**Basic gate charge waveform**



**Gate charge test circuit**



**Switching time waveforms**

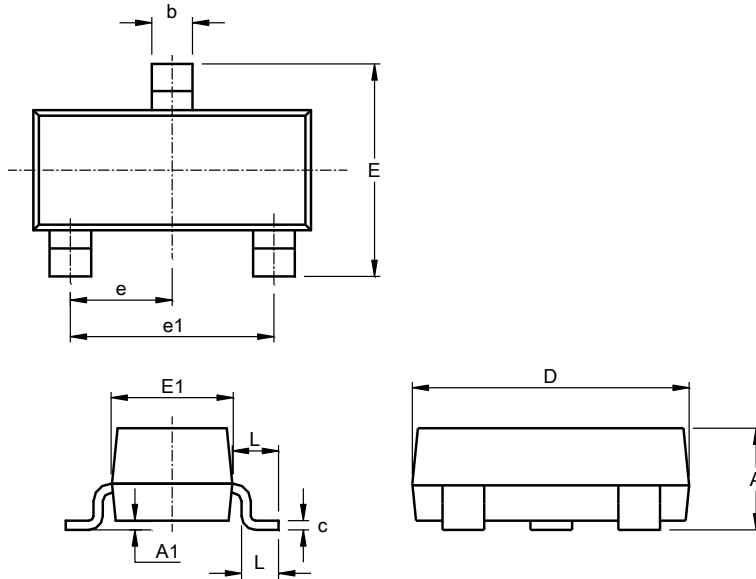


**Switching time test circuit**

**Package Outline Dimensions**

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

**SOT23 (Type DN)**

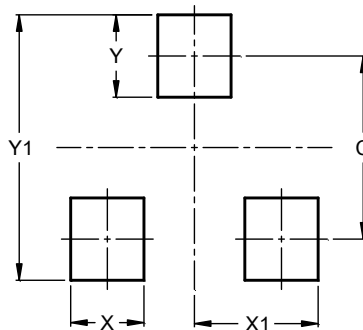


SOT23 (Type DN)			
Dim	Min	Max	Typ
A	0.89	1.12	1.00
A1	0.01	0.10	0.05
b	0.30	0.51	0.45
c	0.08	0.20	0.10
D	2.80	3.04	3.00
E	2.10	2.64	2.42
E1	1.20	1.40	1.37
e	0.95 REF		
e1	1.90 REF		
L	0.25	0.60	0.30
L1	0.45	0.62	0.54
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

**SOT23 (Type DN)**



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

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