

## Product Summary

$BV_{DSS}$	Max $R_{DS(ON)}$	Max $I_D$ $T_A = +25^\circ C$
-100V	1.0 $\Omega$ @ $V_{GS} = -10V$	-0.7A
	1.45 $\Omega$ @ $V_{GS} = -6.0V$	-0.5A

## Description and Applications

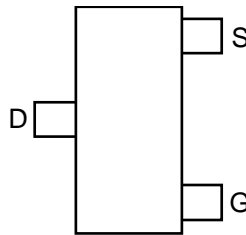
This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- DC-DC Converters
- Power Management Functions
- Disconnect Switches
- Motor Control

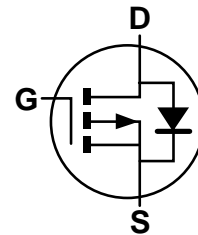
SOT23 (Type DN)



Top View



Top View  
Pin Out



Equivalent Circuit

## Features and Benefits

- Fast Switching Speed
- Low Input Capacitance
- Low Gate Charge
- Low Threshold
- **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 Capable (Note 4)**

## Mechanical Data

- Case: SOT23 (Type DN)
- Case Material: Molded Plastic, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Weight: 0.009 grams (Approximate)

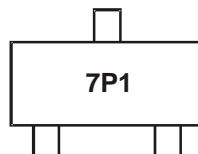
## Ordering Information (Note 5)

Part Number	Case	Packaging
ZXMP10A13FQTA	SOT23 (Type DN)	3000/Tape & Reel
ZXMP10A13FQTC	SOT23 (Type DN)	10,000/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](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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/product-compliance-definitions/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information

SOT23 (Type DN)



7P1 = Product Type Marking Code

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

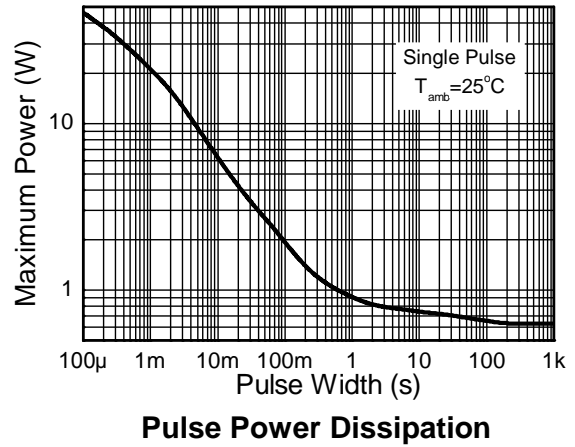
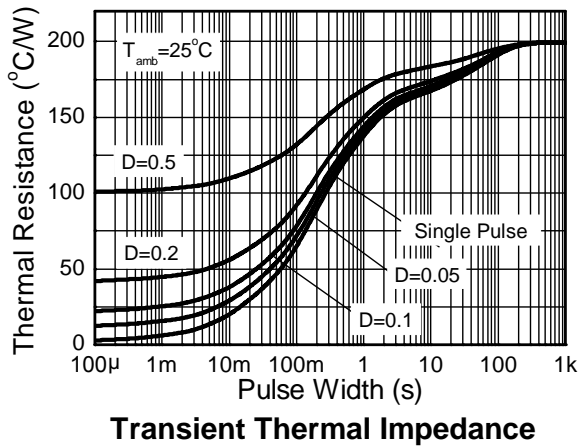
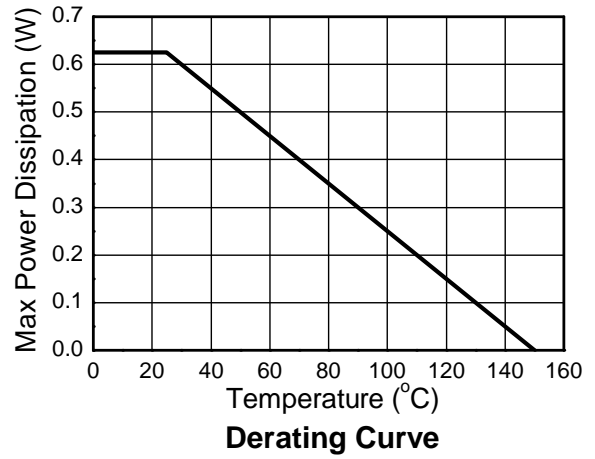
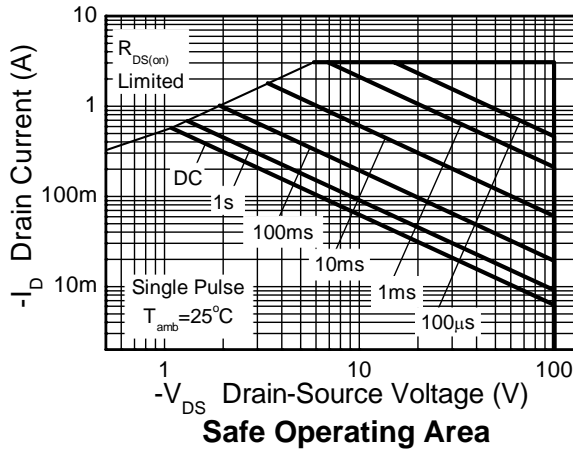
Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V <sub>DSS</sub>	-100	V
Gate-Source Voltage			V <sub>GS</sub>	±20	V
Continuous Drain Current	V <sub>GS</sub> = -10V	T <sub>A</sub> = +70°C (Note 7)	I <sub>D</sub>	-0.7	A
		(Note 7)		-0.5	
		(Note 7)		-0.6	
Pulsed Drain Current (Note 8)			I <sub>DM</sub>	-3.1	A
Continuous Source Current (Body Diode) (Note 6)			I <sub>S</sub>	-1.1	A
Pulsed Source Current (Body Diode) (Note 8)			I <sub>SM</sub>	-3.1	A

**Thermal Characteristics**

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			6.4	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 ≤ 5 secs.
  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 drain lead).

**Thermal Characteristics**

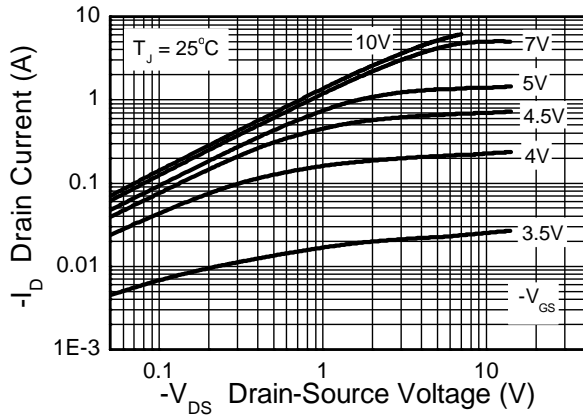


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

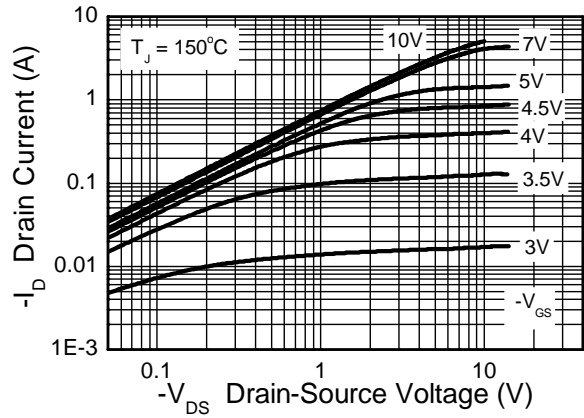
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-100	—	—	V	I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1.0	μA	V <sub>DS</sub> = -100V, V <sub>GS</sub> = 0V
Gate-Source 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>	-2.0	—	-4.0	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>	—	—	1.0	Ω	V <sub>GS</sub> = -10V, I <sub>D</sub> = -0.6A
				1.45		V <sub>GS</sub> = -6.0V, I <sub>D</sub> = -0.5A
Forward Transconductance (Notes 10 and 12)	g <sub>fs</sub>	—	1.2	—	S	V <sub>DS</sub> = -15V, I <sub>D</sub> = -0.6A
Diode Forward Voltage (Note 10)	V <sub>SD</sub>	—	-0.85	-0.95	V	T <sub>J</sub> = +25°C, I <sub>S</sub> = -0.75A, V <sub>GS</sub> = 0V
Reverse Recovery Time (Note 12)	t <sub>RR</sub>	—	29	—	ns	T <sub>J</sub> = +25°C, I <sub>F</sub> = -0.9A,
Reverse Recovery Charge (Note 12)	Q <sub>RR</sub>	—	31	—	nC	di/dt = 100A/μs
<b>DYNAMIC CHARACTERISTICS</b> (Note 12)						
Input Capacitance	C <sub>iss</sub>	—	141	—	pF	V <sub>DS</sub> = -50V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	13.1	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	10.8	—		
Turn-On Delay Time (Note 11)	t <sub>D(ON)</sub>	—	1.6	—	ns	V <sub>DD</sub> = -50V, I <sub>D</sub> = -1.0A, R <sub>G</sub> ≈ 6.0Ω, V <sub>GS</sub> = -10V
Turn-On Rise Time (Note 11)	t <sub>R</sub>	—	2.1	—		
Turn-Off Delay Time (Note 11)	t <sub>D(OFF)</sub>	—	5.9	—		
Turn-Off Fall Time (Note 11)	t <sub>F</sub>	—	3.3	—		
Total Gate Charge (Note 11)	Q <sub>g</sub>	—	1.8	—	nC	V <sub>DS</sub> = -50V, V <sub>GS</sub> = -5.0V, I <sub>D</sub> = -0.6A
Total Gate Charge (Note 11)	Q <sub>g</sub>	—	3.5	—	nC	V <sub>DS</sub> = -50V, V <sub>GS</sub> = -10V, I <sub>D</sub> = -0.6A
Gate-Source Charge (Note 11)	Q <sub>gs</sub>	—	0.6	—		
Gate-Drain Charge (Note 11)	Q <sub>gd</sub>	—	1.6	—		

- 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.

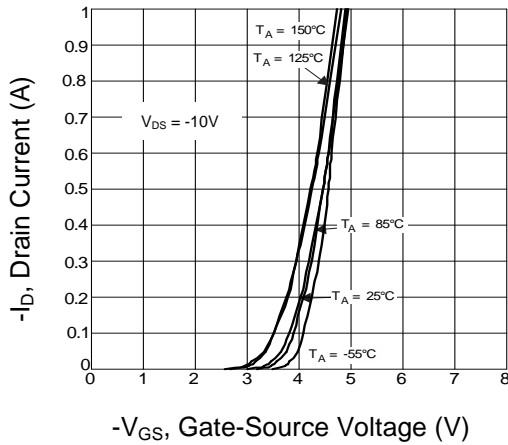
**Typical Characteristics**



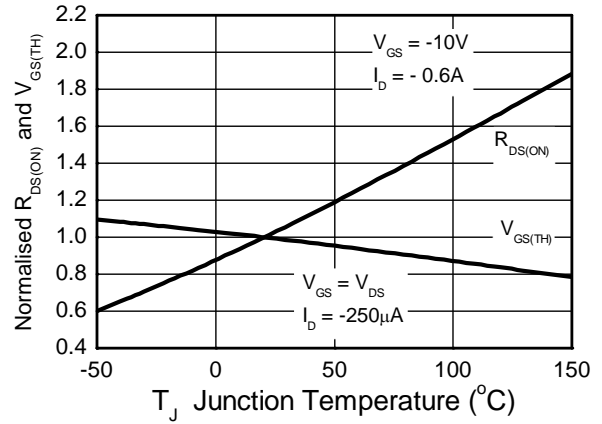
**Output Characteristics**



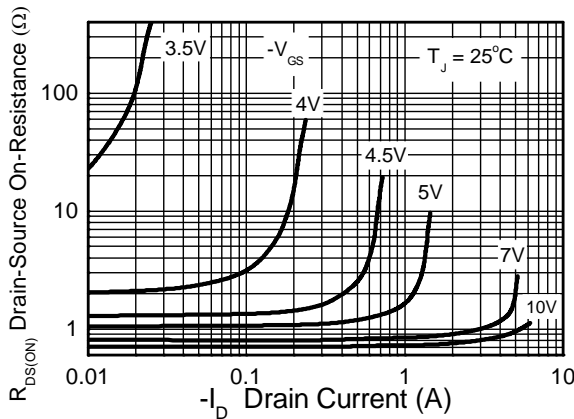
**Output Characteristics**



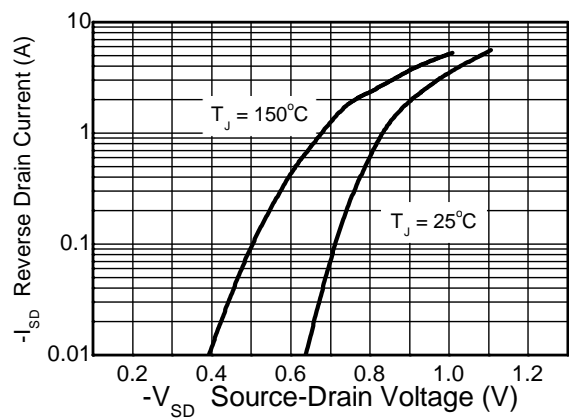
**Typical Transfer Characteristics**



**Normalised Curves v Temperature**

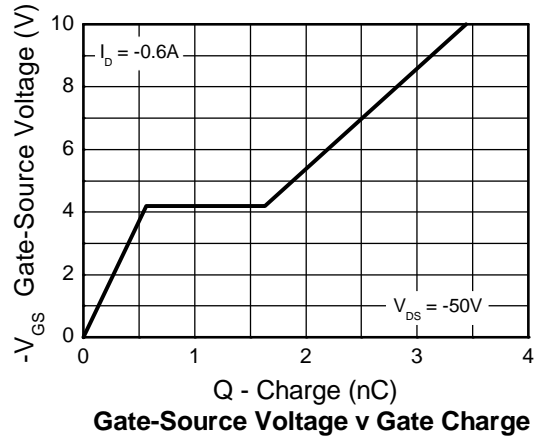
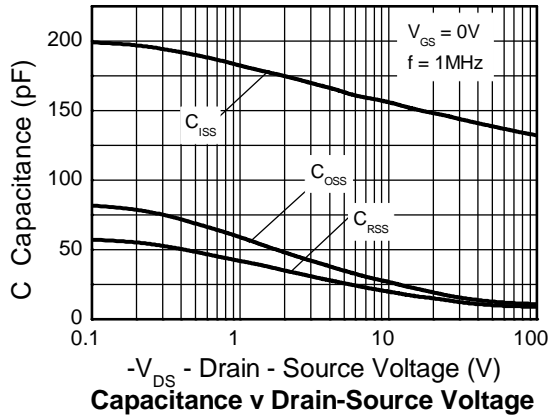


**On-Resistance v Drain Current**

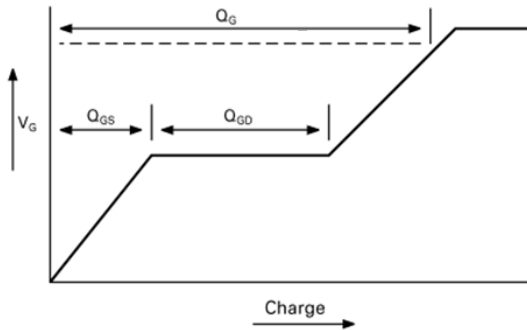


**Source-Drain Diode Forward Voltage**

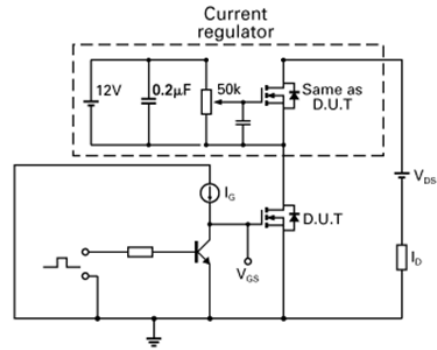
**Typical Characteristics (Cont.)**



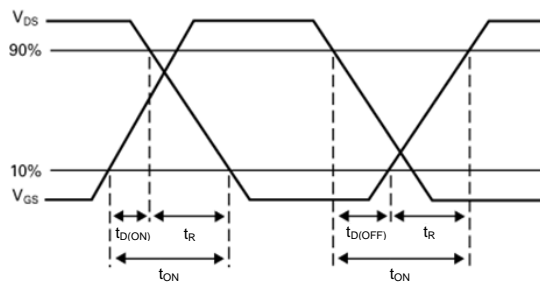
**Test Circuits**



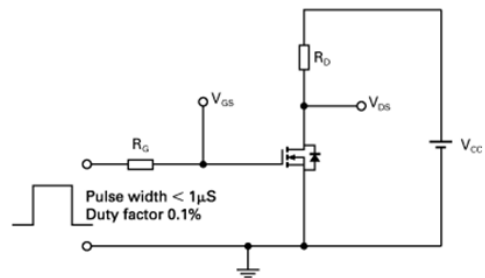
**Basic gate charge waveform**



**Gate charge test circuit**



**Switching time waveforms**

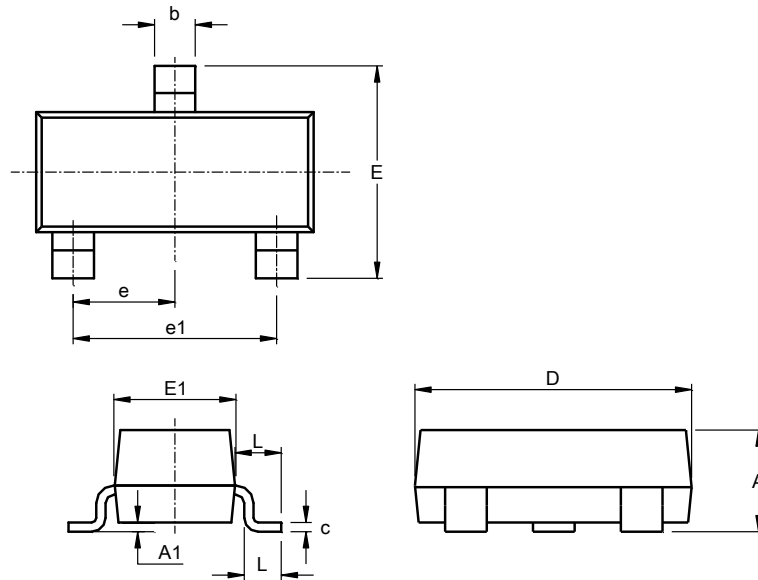


**Switching time test circuit**

## Package Outline Dimensions

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

### SOT23 (Type DN)

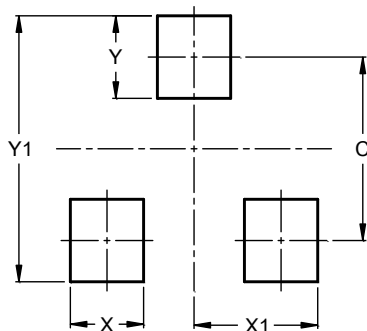


SOT23 (Type DN)			
Dim	Min	Max	Typ
A	0.89	1.12	1.00
A1	0.01	0.10	0.05
b	0.30	0.51	0.45
c	0.08	0.20	0.10
D	2.80	3.04	3.00
E	2.10	2.64	2.42
E1	1.20	1.40	1.37
e	0.95 REF		
e1	1.90 REF		
L	0.25	0.60	0.30
L1	0.45	0.62	0.54
All Dimensions in mm			

## 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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