ZXMP6A13G

60V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$	I_D T_A = 25°C
-60V	390mΩ @ V_{GS} = -10V	-2.3A
	595mΩ @ V_{GS} = -4.5V	-1.9A

Features and Benefits

- Fast switching speed
- Low gate drive
- Low input capacitance
- **"Lead Free", RoHS Compliant (Note 1)**
- **Halogen and Antimony Free. "Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

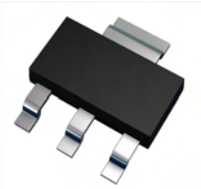
This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Motor control
- DC-DC Converters
- Power management functions
- Uninterrupted power supply

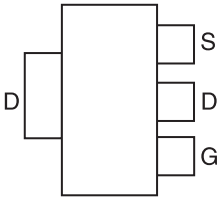
Mechanical Data

- Case: SOT223
- 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 lead frame. Solderable per MIL-STD-202, Method 208
- Weight: 0.112 grams (approximate)

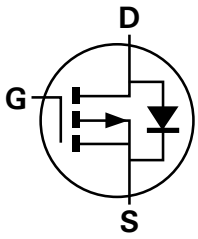
SOT223



Top View



Pin Out - Top View



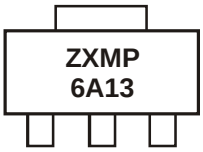
Equivalent Circuit

Ordering Information (Note 3)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMP6A13GTA	ZXMP6A13	7	12	1,000

Notes: 1. No purposefully added lead
2. Diodes Inc's "Green" policy can be found on our website at http://www.diodes.com.
3. For packaging details, go to our website at http://www.diodes.com.

Marking Information



ZXMP = Product Type Marking Code, Line 1
6A13 = Product Type Marking Code, Line 2

Maximum Ratings @T_A = 25°C unless otherwise specified

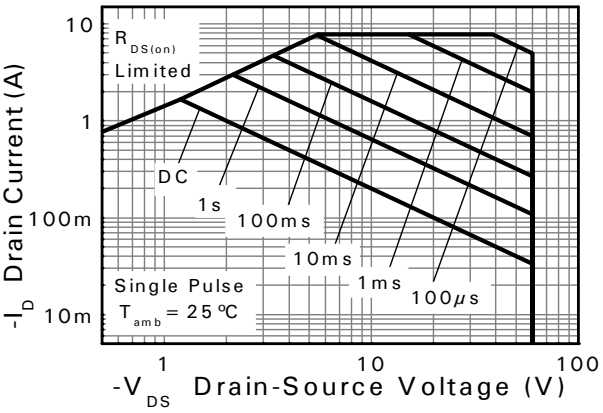
Characteristic			Symbol	Value	Unit
Drain-Source voltage			V_{DSS}	-60	V
Gate-Source voltage			V_{GS}	±20	V
Continuous Drain current	V_{GS} = 10V	(Note 5)	I_D	-2.3	A
		T_A = 70°C (Note 5)		-1.9	
		(Note 4)		-1.7	
Pulsed Drain current	V_{GS}= 10V	(Note 6)	I_{DM}	-7.8	A
Continuous Source current (Body diode)		(Note 5)	I_S	-4.1	A
Pulsed Source current (Body diode)		(Note 6)	I_{SM}	-7.8	A

Thermal Characteristics @T_A = 25°C unless otherwise specified

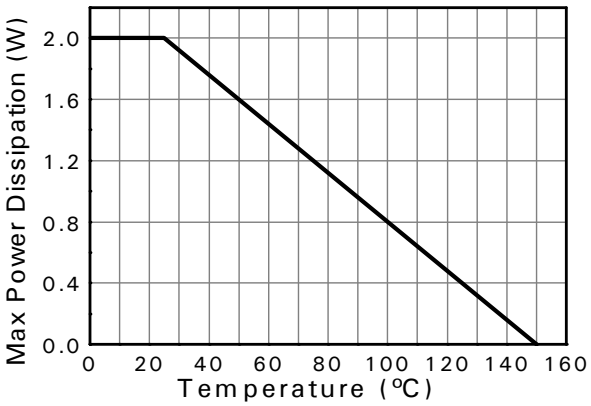
Characteristic		Symbol	Value	Unit
Power dissipation	(Note 4)	P_D	2.0	W
Linear derating factor			16	mW/°C
	(Note 5)		3.9	W
			31	mW/°C
Thermal Resistance, Junction to Ambient	(Note 4)	$R_{\theta JA}$	62.5	°C/W
	(Note 5)		32.0	
Thermal Resistance, Junction to Lead	(Note 7)	$R_{\theta JL}$	9.8	
Operating and storage temperature range		T_J, T_{STG}	-55 to 150	°C

Notes:
4. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
5. Same as note (1), except the device is measured at t ≤ 10 sec.
6. Same as note (1), except the device is pulsed with D = 0.02 and pulse width 300µs. The pulse current is limited by the maximum junction temperature.
7. Thermal resistance from junction to solder-point (at the end of the drain lead).

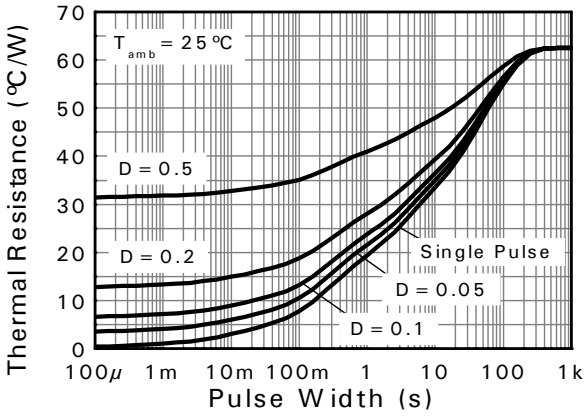
Thermal Characteristics



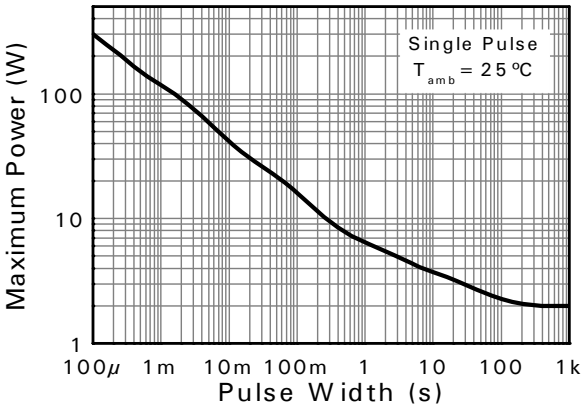
Safe Operating Area



Derating Curve



Transient Thermal Impedance



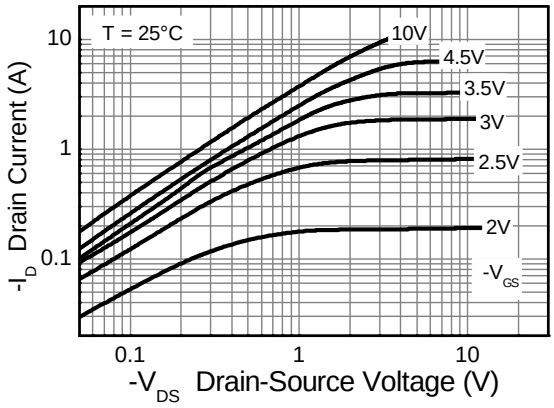
Pulse Power Dissipation

Electrical Characteristics @T_A = 25°C unless otherwise specified

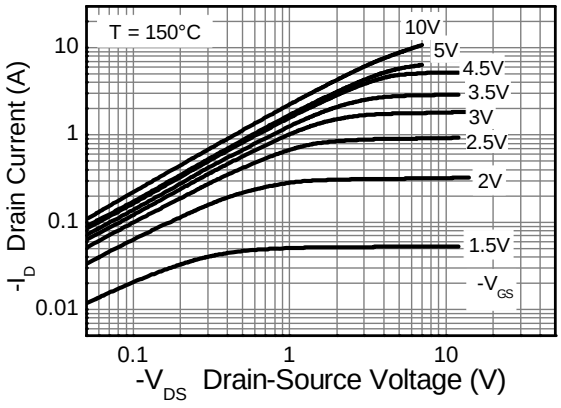
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	-60	—	—	V	I_D = -250μA, V_{GS} = 0V
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-0.5	μA	V_{DS} = -60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(th)}$	-1.0	—	-3.0	V	I_D = -250μA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 8)	$R_{DS\ (ON)}$	—	—	0.390	Ω	V_{GS} = -10V, I_D = -0.9A
				0.595		V_{GS} = -4.5V, I_D = -0.8A
Forward Transconductance (Notes 8 & 9)	g_{fs}	—	1.8	—	S	V_{DS} = -15V, I_D = -0.9A
Diode Forward Voltage (Note 8)	V_{SD}	—	-0.85	-0.95	V	I_S = -0.8A, V_{GS} = 0V, T_J = 25°C
Reverse recovery time (Note 9)	t_{rr}		21.1	—	ns	I_S = -0.9A, di/dt = 100A/μs, T_J = 25°C
Reverse recovery charge (Note 9)	Q_{rr}	—	19.3	—	nC	
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	219	—	pF	V_{DS} = -30V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	25.7	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	20.5	—	pF	
Total Gate Charge (Note 10)	Q_g	—	2.9	—	nC	V_{GS} = -4.5V; V_{DS} = -30V, I_D = -0.9A
Total Gate Charge (Note 10)	Q_g	—	5.9	—	nC	V_{GS} = -10V; V_{DS} = -30V, I_D = -0.9A
Gate-Source Charge (Note 10)	Q_{gs}	—	0.74	—	nC	
Gate-Drain Charge (Note 10)	Q_{gd}	—	1.5	—	nC	
Turn-On Delay Time (Note 10)	$t_{D(on)}$	—	1.6	—	ns	V_{DD} = -30V, V_{GS} = -10V, I_D = -1A, R_G ≅ 6.0Ω
Turn-On Rise Time (Note 10)	t_r	—	2.2	—	ns	
Turn-Off Delay Time (Note 10)	$t_{D(off)}$	—	11.2	—	ns	
Turn-Off Fall Time (Note 10)	t_f	—	5.7	—	ns	

Notes:
8. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
9. For design aid only, not subject to production testing.
10. Switching characteristics are independent of operating junction temperatures.

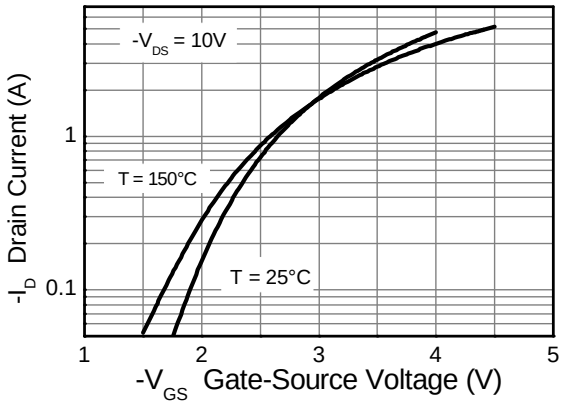
Typical Characteristics



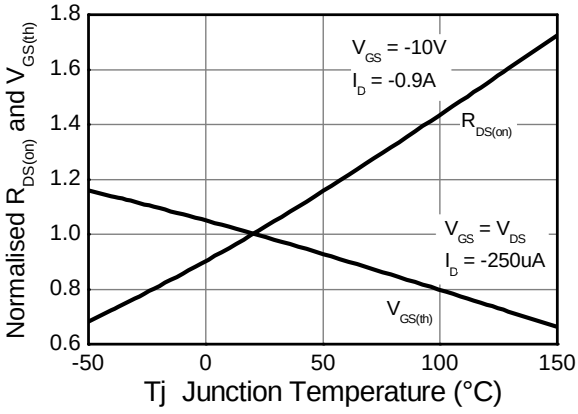
Output Characteristics



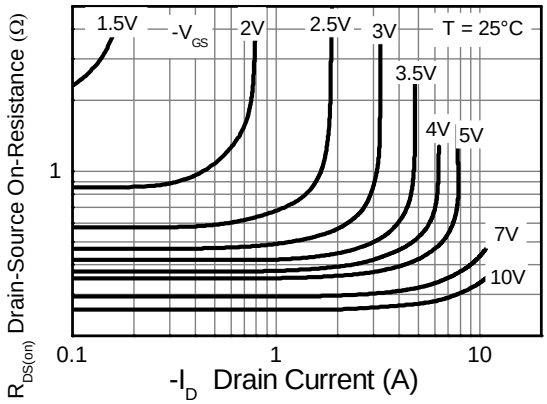
Output Characteristics



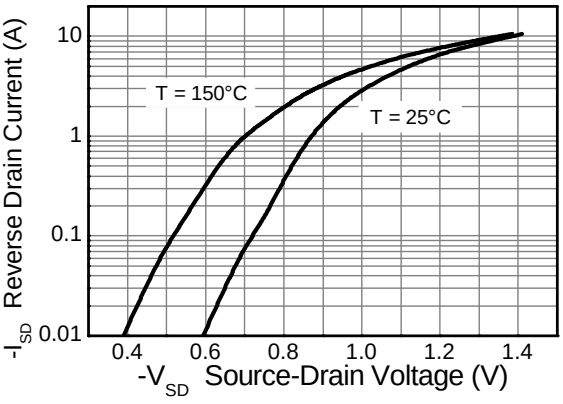
Typical Transfer Characteristics



Normalised Curves v Temperature

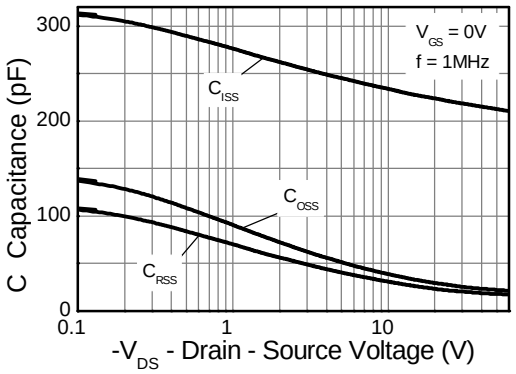


On-Resistance v Drain Current

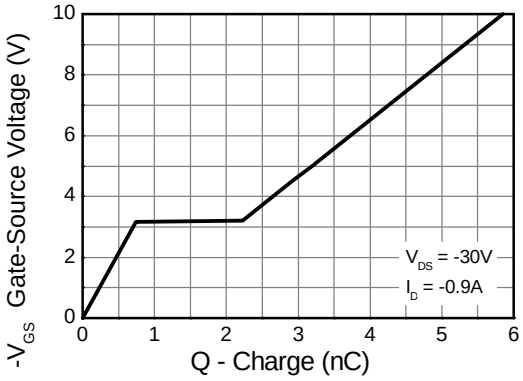


Source-Drain Diode Forward Voltage

Typical Characteristics - continued

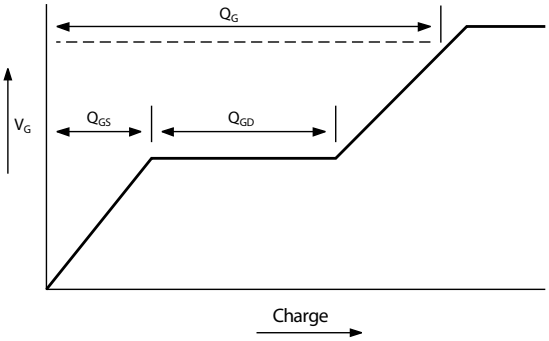


Capacitance v Drain-Source Voltage

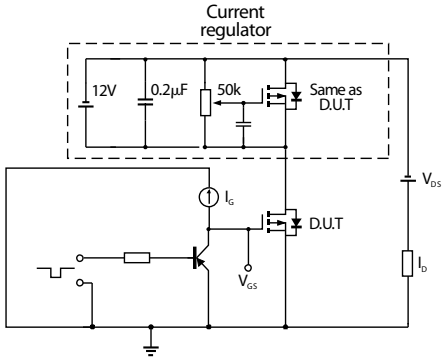


Gate-Source Voltage v Gate Charge

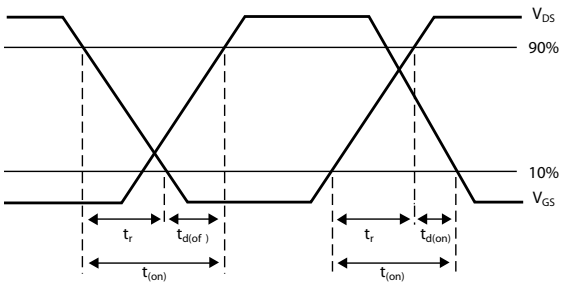
Test Circuits



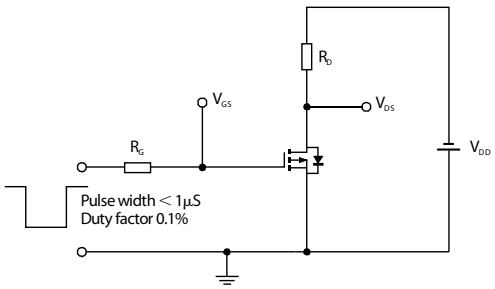
Basic gate charge waveform



Gate charge test circuit

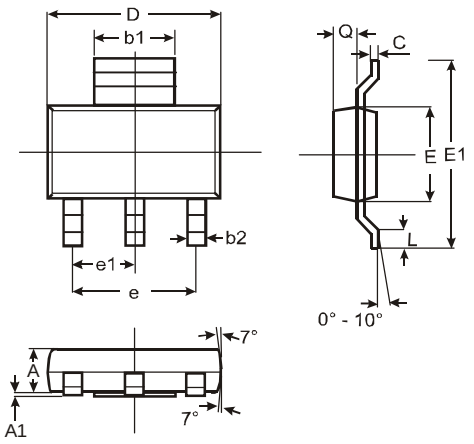


Switching time waveforms



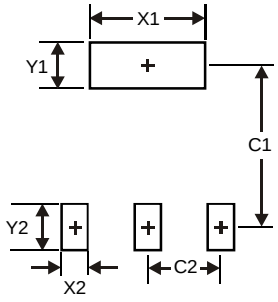
Switching time test circuit

Package Outline Dimensions



SOT223			
Dim	**Min**	**Max**	**Typ**
A	1.55	1.65	1.60
A1	0.010	0.15	0.05
b1	2.90	3.10	3.00
b2	0.60	0.80	0.70
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



Dimensions	Value (in mm)
X1	3.3
X2	1.2
Y1	1.6
Y2	1.6
C1	6.4
C2	2.3

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