

60V P-CHANNEL ENHANCEMENT MODE MOSFET

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

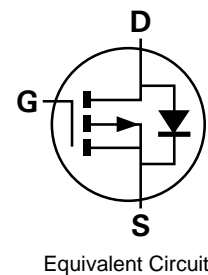
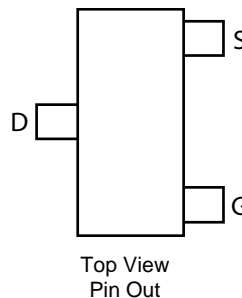
- DC - DC converters
- Power management functions
- Relay and solenoid driving
- Motor control

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 capable (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: 0.008 grams (approximate)

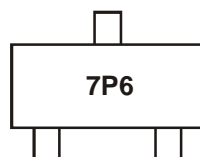


Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMP6A13FTA	AEC-Q101	7P6	7	8	3000 Units
ZXMP6A13FQTA	Automotive	7P6	7	8	3000 Units

- 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> 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. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
 5. For packaging details, go to our website at <http://www.diodes.com>

Marking Information



7P6 = Product Type Marking Code

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

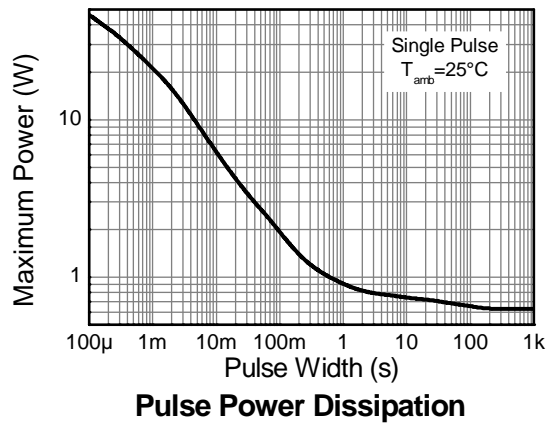
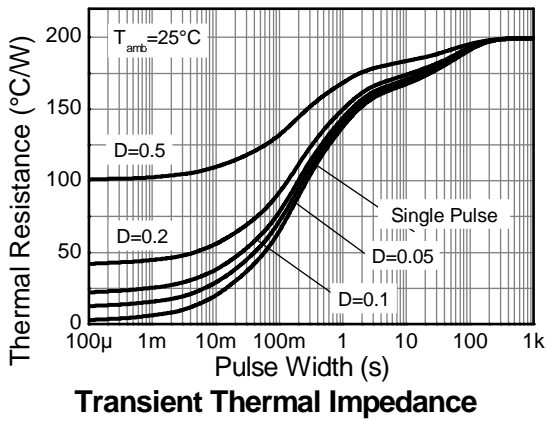
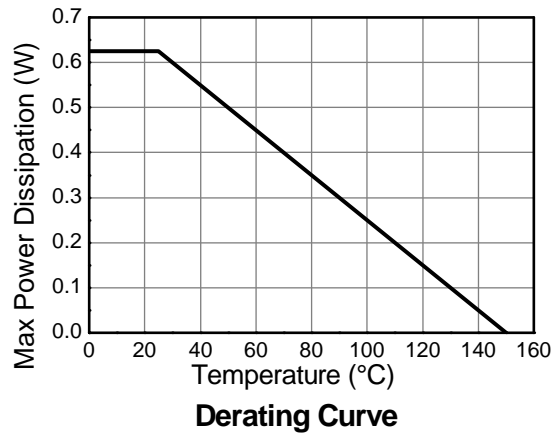
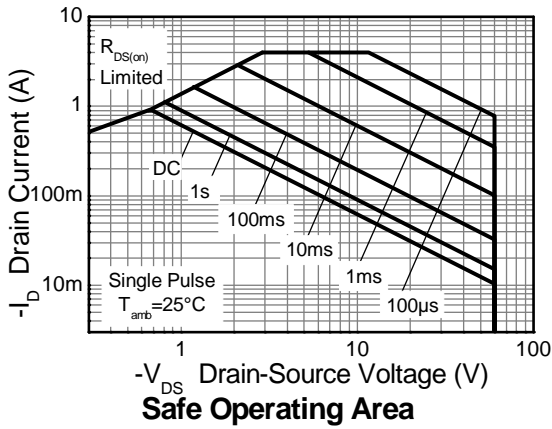
Characteristic			Symbol	Value	Units
Drain-Source Voltage			V _{DSS}	-60	V
Gate-Source Voltage			V _{GS}	±20	V
Continuous Drain Current	V _{GS} = 10V	(Note 7)	I _D	-1.1	A
		(Note 7)		-0.8	
		(Note 6)		-0.9	
Pulsed Drain Current (Note 8)			I _{DM}	-4.0	A
Continuous Source Current (Body Diode) (Note 7)			I _S	-1.2	A
Pulsed Source Current (Body Diode) (Note 8)			I _{SM}	-4.0	A

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

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

- Notes:
6. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions
 7. For a device surface mounted on FR4 PCB measured at t ≤ 5 secs.
 8. Repetitive rating 25mm x 25mm FR4 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

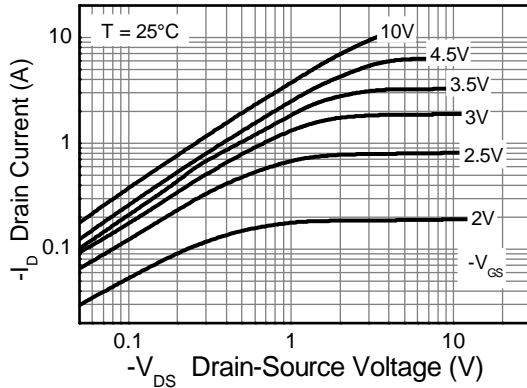


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

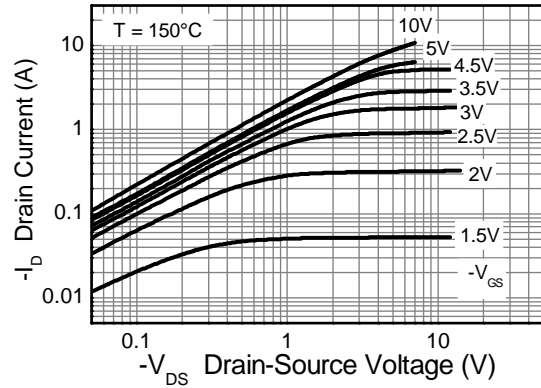
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	-60	—	—	V	I _D = -250μA, V _{GS} = 0V
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-0.5	μA	V _{DS} = -60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 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 10)	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 10 and 12)	g _{fs}	—	1.8	—	S	V _{DS} = -15V, I _D = -0.9A
Diode Forward Voltage (Note 10)	V _{SD}	—	-0.85	-0.95	V	T _J = 25°C, I _S = -0.8A, V _{GS} = 0V
Reverse Recovery Time (Note 12)	t _{rr}	—	21.1	—	ns	T _J = 25°C, I _F = -0.9A,
Reverse Recovery Charge (Note 12)	Q _{rr}	—	19.3	—	nC	di/dt = 100A/μs
DYNAMIC CHARACTERISTICS (Note 12)						
Input Capacitance	C _{iss}	—	219	—	pF	V _{DS} = -30V, V _{GS} = 0V f = 1.0MHz
Output Capacitance	C _{oss}	—	25.7	—		
Reverse Transfer Capacitance	C _{rss}	—	20.5	—		
Turn-On Delay Time (Note 11)	t _{D(on)}	—	1.6	—	ns	V _{DD} = -30V, I _D = -1A, R _G ≅ 6.0Ω, V _{GS} = -10V
Turn-On Rise Time (Note 11)	t _r	—	2.2	—		
Turn-Off Delay Time (Note 11)	t _{D(off)}	—	11.2	—		
Turn-Off Fall Time (Note 11)	t _f	—	5.7	—		
Total Gate Charge (Note 11)	Q _g	—	2.9	—	nC	V _{DS} = -30V, V _{GS} = -4.5V, I _D = -0.9A
Total Gate Charge (Note 11)	Q _g	—	5.9	—	nC	V _{DS} = -30V, V _{GS} = -10V, I _D = -0.9A
Gate-Source Charge (Note 11)	Q _{gs}	—	0.74	—		
Gate-Drain Charge (Note 11)	Q _{gd}	—	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.

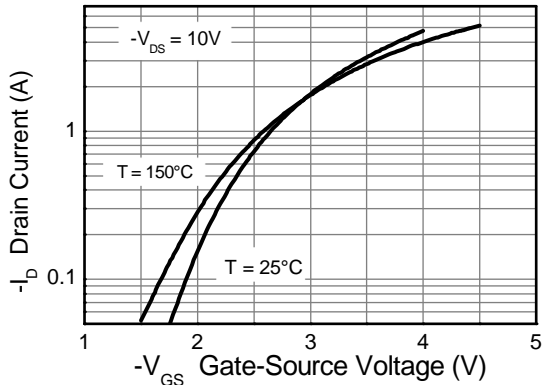
Typical Characteristics



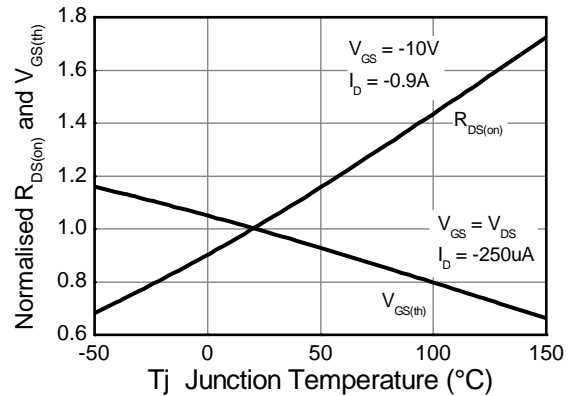
Output Characteristics



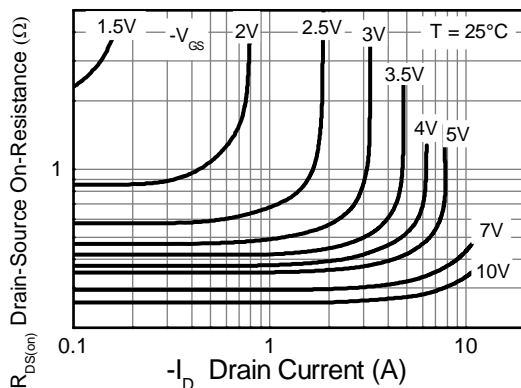
Output Characteristics



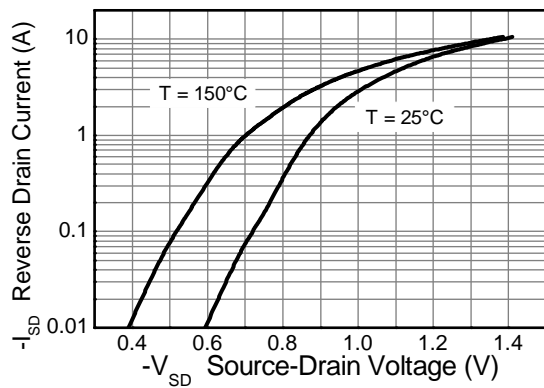
Typical Transfer Characteristics



Normalised Curves v Temperature

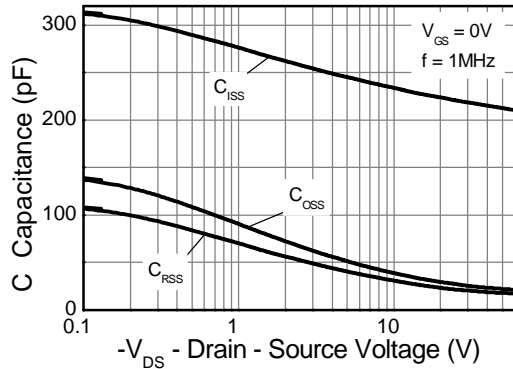


On-Resistance v Drain Current

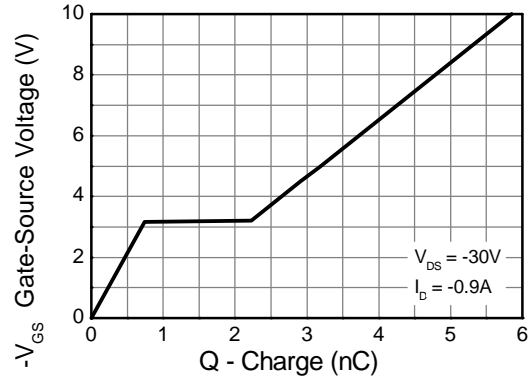


Source-Drain Diode Forward Voltage

Typical Characteristics - continued

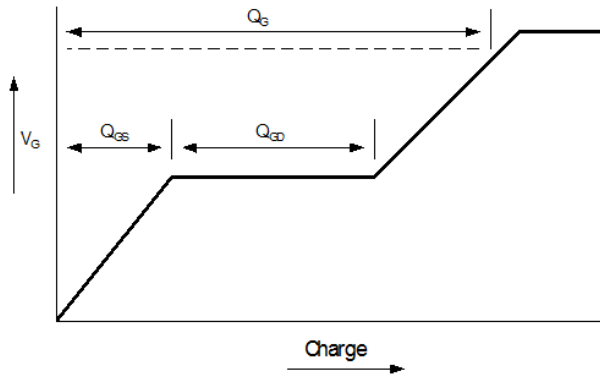


Capacitance v Drain-Source Voltage

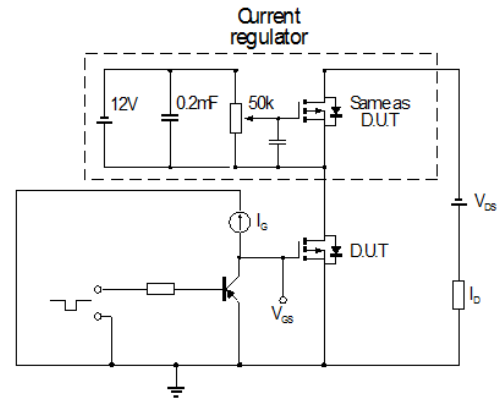


Gate-Source Voltage v Gate Charge

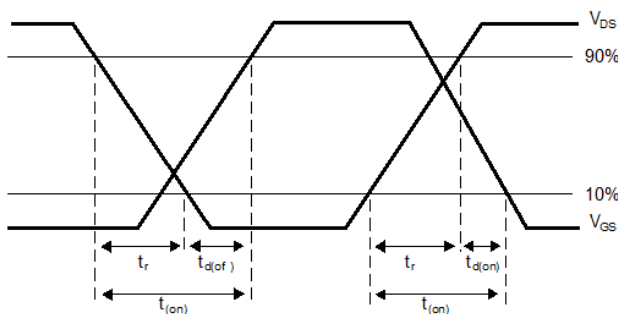
Test Circuits



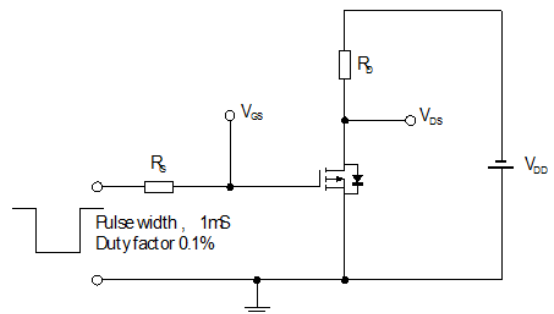
Basic gate charge waveform



Gate charge test circuit



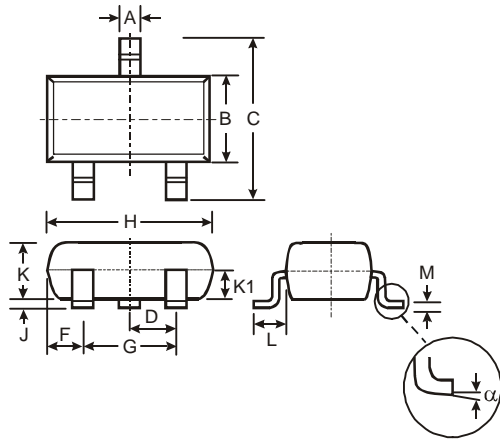
Switching time waveforms



Switching time test circuit

Package Outline Dimensions

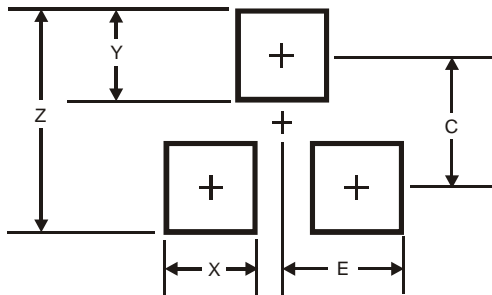
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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