

## DUAL P-CHANNEL 60V ENHANCEMENT MODE MOSFET

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	Package	$I_D$ $T_A = +25^\circ C$ (Notes 4 & 6)
-60V	85m $\Omega$ @ $V_{GS} = -10V$	SO-8	-3.9A
	125m $\Omega$ @ $V_{GS} = -4.5V$		-3.2A

## Description

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.

## Applications

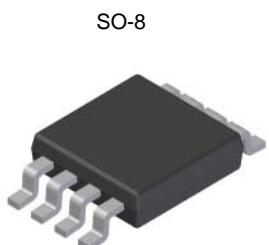
- DC-DC Converters
- Power Management Functions
- Disconnect Switches
- Motor Control

## Features

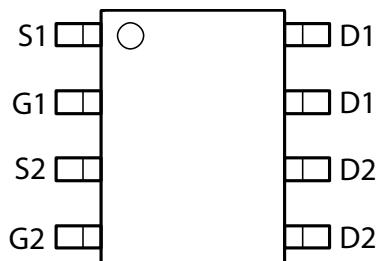
- Low On-Resistance
- Fast Switching Speed
- Low Threshold
- Low Gate Drive
- Low Profile SOIC Package
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability

## Mechanical Data

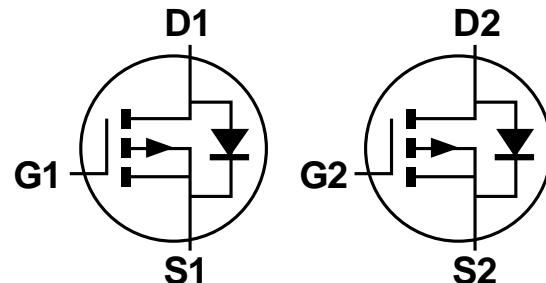
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.074 grams (approximate)



Top View



Top View



Equivalent Circuit

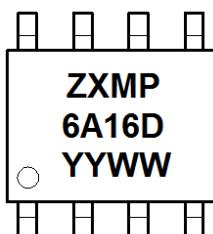
## Ordering Information

Part Number	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMP6A16DN8TA	ZXMP6A16D	7	12	500

Notes:

- EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
- See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Marking Information



ZXMP6A16D = Product Type Marking Code  
YYWW = Date Code Marking  
YY = Year (ex: 11 = 2011)  
WW = Week (01 - 53)

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

Characteristic		Symbol	Value	Unit
Drain-Source voltage		$V_{DSS}$	-60	V
Gate-Source voltage	(Note 4)	$V_{GS}$	$\pm 20$	V
Continuous Drain current  $V_{GS} = 10\text{V}$	(Notes 6 & 8)	$I_D$	-3.9	A
	$T_A = +70^\circ\text{C}$ (Notes 6 & 8)		-3.1	
	(Notes 5 & 8)		-2.9	
Pulsed Drain current	(Notes 7 & 8)	$I_{DM}$	-18.3	A
Continuous Source current (Body diode)	(Notes 6 & 8)	$I_S$	-3.2	A
Pulsed Source current (Body diode)	(Notes 7 & 8)	$I_{SM}$	-18.3	A

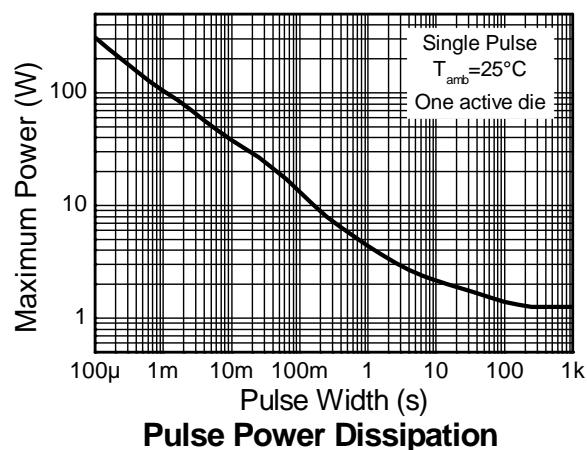
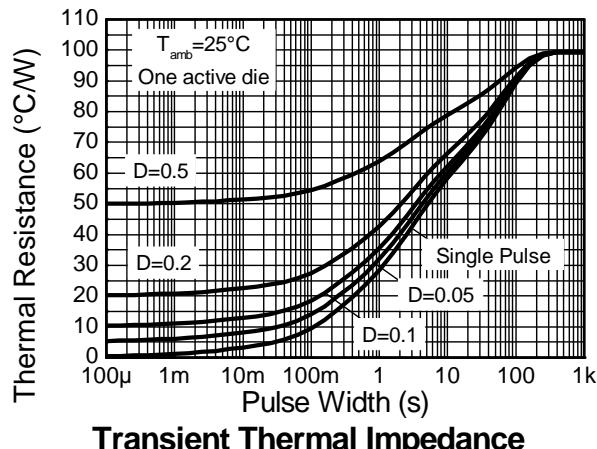
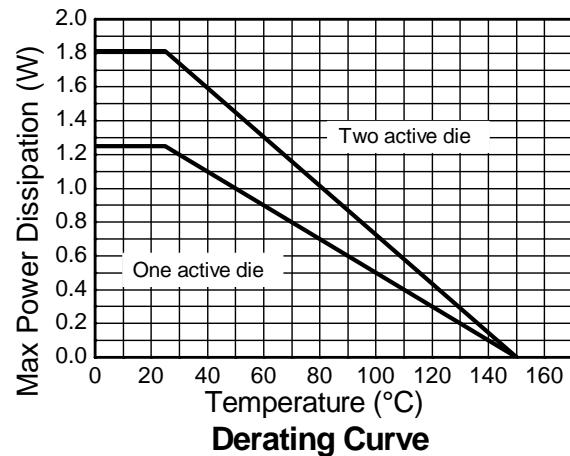
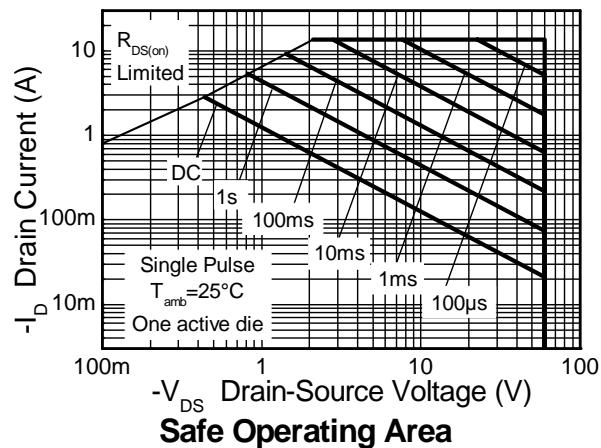
**Thermal Characteristics**

Characteristic		Symbol	Value	Unit
Power dissipation  Linear derating factor	(Notes 5 & 8)	$P_D$	1.25 10.0	W mW/ $^\circ\text{C}$
	(Notes 5 & 9)		1.81 14.5	
	(Notes 6 & 8)		2.15 17	
Thermal Resistance, Junction to Ambient	(Notes 5 & 8)	$R_{\theta JA}$	100	$^\circ\text{C/W}$
	(Notes 5 & 9)		70	
	(Notes 6 & 8)		60	
Thermal Resistance, Junction to Lead	(Notes 8 & 10)	$R_{\theta JL}$	48.85	
Operating and storage temperature range		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

Notes:

4. AEC-Q101  $V_{GS}$  maximum is  $\pm 16\text{V}$ .
5. 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.
6. Same as note (5), except the device is measured at  $t \leq 10$  sec.
7. Same as note (5), except the device is pulsed with  $D = 0.02$  and pulse width 300 $\mu\text{s}$ .
8. For a dual device with one active die.
9. For a device with two active die running at equal power.
10. Thermal resistance from junction to solder-point.

## Thermal Characteristics



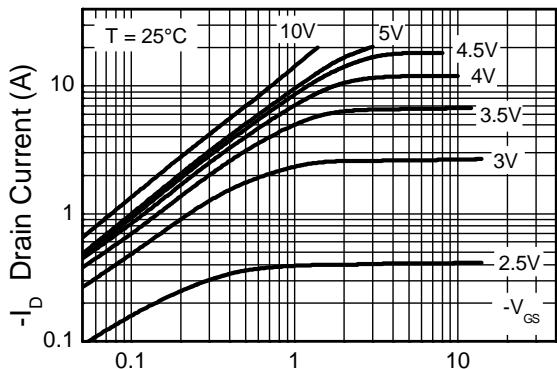
**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	-60	—	—	V	$I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{\text{DSS}}$	—	—	-1.0	$\mu\text{A}$	$V_{DS} = -60\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{\text{GSS}}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(\text{th})}$	-1.0	—	—	V	$I_D = -250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-Resistance (Note 11)	$R_{DS(\text{ON})}$	—	—	85	$\text{m}\Omega$	$V_{GS} = -10\text{V}$ , $I_D = -2.9\text{A}$
		—	—	125		$V_{GS} = -4.5\text{V}$ , $I_D = -2.4\text{A}$
Forward Transconductance (Notes 11 & 12)	$g_{fs}$	—	7.2	—	S	$V_{DS} = -15\text{V}$ , $I_D = -2.9\text{A}$
Diode Forward Voltage (Note 11)	$V_{SD}$	—	-0.85	-0.95	V	$I_S = -3.4\text{A}$ , $V_{GS} = 0\text{V}$ , $T_J = +25^\circ\text{C}$
Reverse recovery time (Note 12)	$t_{rr}$	—	29.2	—	ns	$I_S = -2\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ ,
Reverse recovery charge (Note 12)	$Q_{rr}$	—	39.6	—	nC	$T_J = +25^\circ\text{C}$
<b>DYNAMIC CHARACTERISTICS (Note 12)</b>						
Input Capacitance	$C_{iss}$	—	1021	—	pF	$V_{DS} = -30\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	83.1	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	56.4	—	pF	
Total Gate Charge (Note 13)	$Q_g$	—	12.1	—	nC	$V_{GS} = -5\text{V}$
Total Gate Charge (Note 13)	$Q_g$	—	24.2	—	nC	$V_{DS} = -30\text{V}$ , $I_D = -2.9\text{A}$
Gate-Source Charge (Note 13)	$Q_{gs}$	—	2.5	—	nC	
Gate-Drain Charge (Note 13)	$Q_{gd}$	—	3.7	—	nC	
Turn-On Delay Time (Note 13)	$t_{D(\text{on})}$	—	3.5	—	ns	$V_{DD} = -30\text{V}$ , $V_{GS} = -10\text{V}$ , $I_D = -1\text{A}$ , $R_G \geq 6.0\Omega$
Turn-On Rise Time (Note 13)	$t_r$	—	4.1	—	ns	
Turn-Off Delay Time (Note 13)	$t_{D(\text{off})}$	—	35	—	ns	
Turn-Off Fall Time (Note 13)	$t_f$	—	10	—	ns	

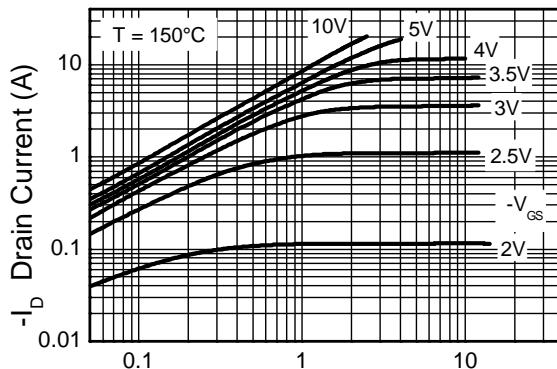
Notes:

11. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$
12. For design aid only, not subject to production testing.
13. Switching characteristics are independent of operating junction temperatures.

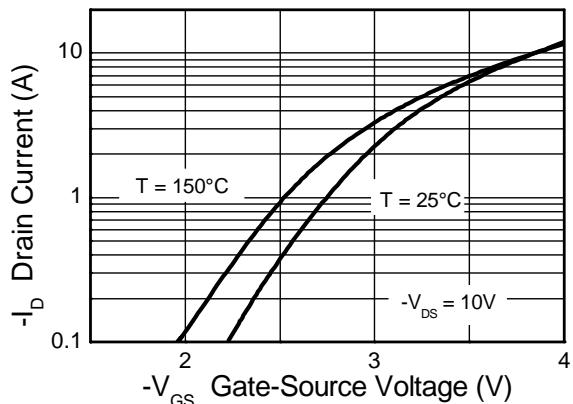
## Typical Characteristics



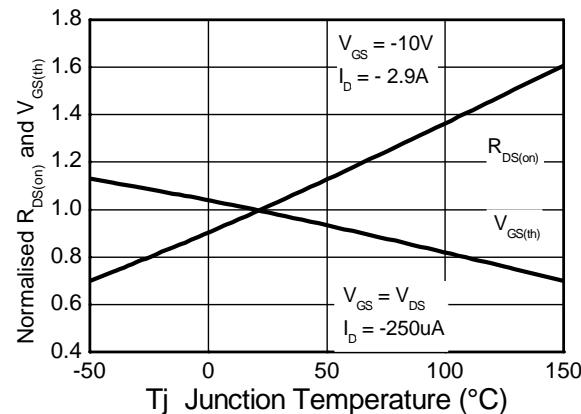
**Output Characteristics**



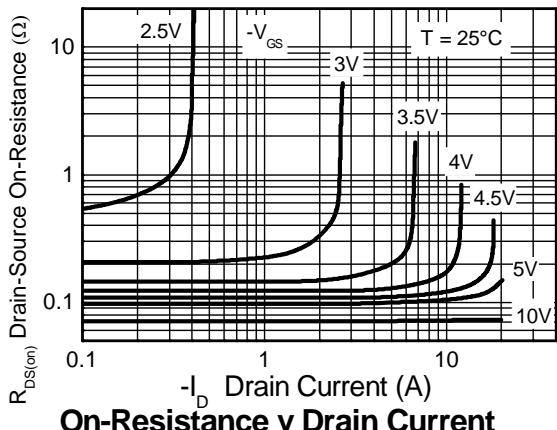
**Output Characteristics**



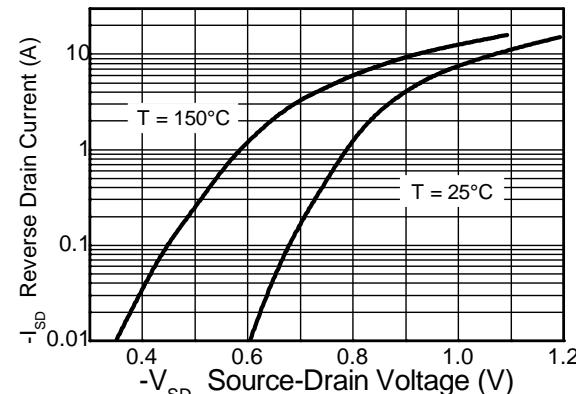
**Typical Transfer Characteristics**



**Normalised Curves v Temperature**

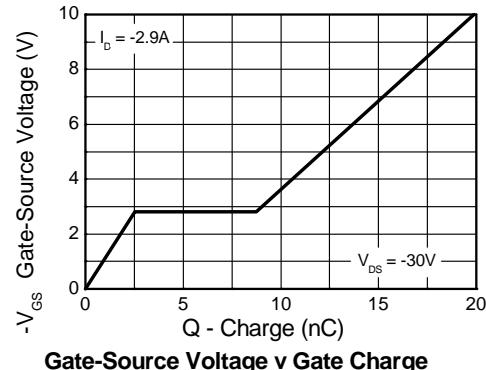
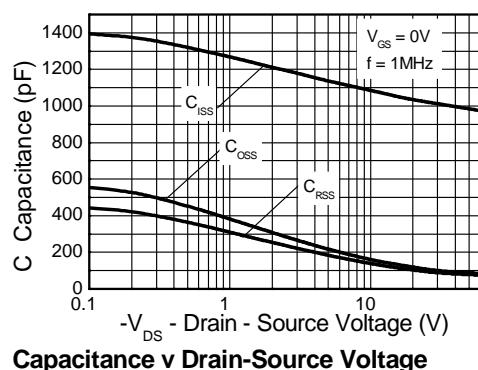


**On-Resistance v Drain Current**

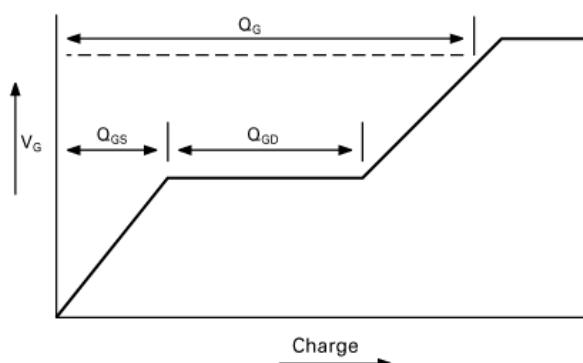


**Source-Drain Diode Forward Voltage**

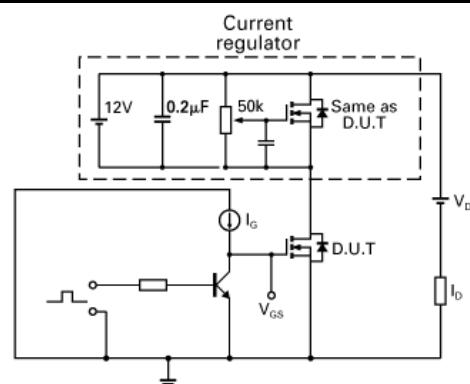
## Typical Characteristics (cont.)



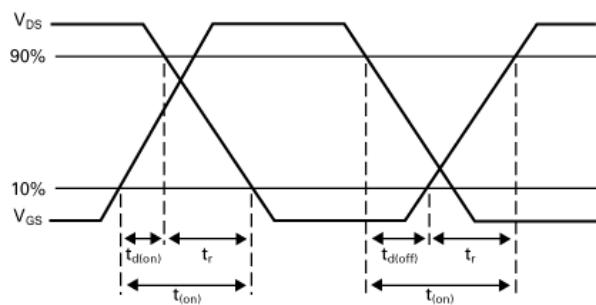
## Test Circuits



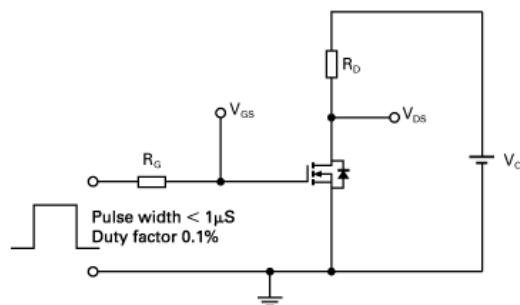
**Basic gate charge waveform**



**Gate charge test circuit**

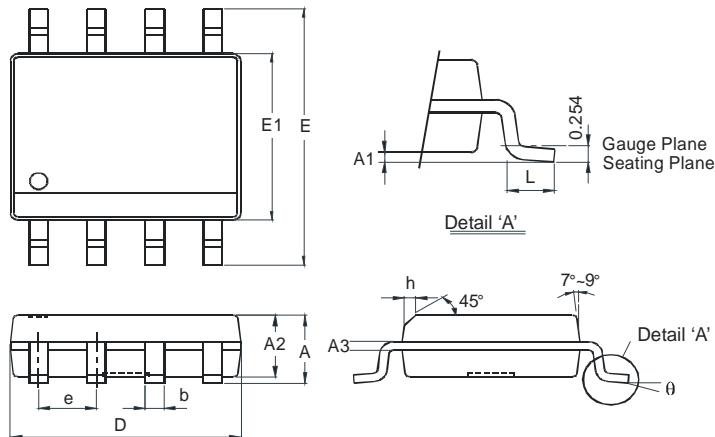


**Switching time waveforms**



**Switching time test circuit**

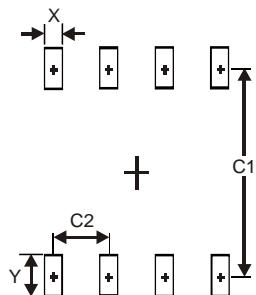
## Package Outline Dimensions



SO-8		
Dim	Min	Max
<b>A</b>	-	1.75
<b>A1</b>	0.10	0.20
<b>A2</b>	1.30	1.50
<b>A3</b>	0.15	0.25
<b>b</b>	0.3	0.5
<b>D</b>	4.85	4.95
<b>E</b>	5.90	6.10
<b>E1</b>	3.85	3.95
<b>e</b>	1.27 Typ	
<b>h</b>	-	0.35
<b>L</b>	0.62	0.82
<b>θ</b>	0°	8°

All Dimensions in mm

## Suggested Pad Layout



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

**ZXMP6A16DN8****IMPORTANT NOTICE**

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