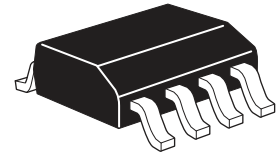


# ZXMN6A09DN8

## 60V SO8 N-channel enhancement mode MOSFET

### Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
60	0.040 @ $V_{GS} = 10V$	5.6
	0.060 @ $V_{GS} = 4.5V$	4.6

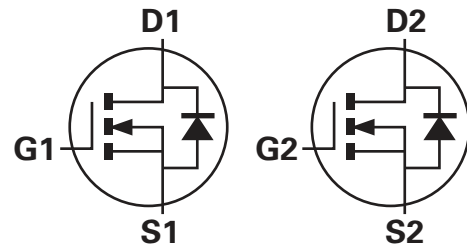


### Description

This new generation of trench MOSFETs from Zetex utilizes a unique structure that combines the benefits of low on-resistance with fast switching speed. This makes them ideal for high efficiency, low voltage power management applications.

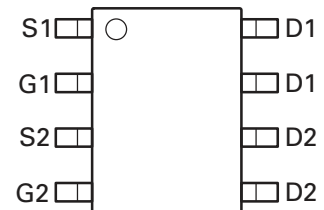
### Features

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- SOIC package



### Applications

- DC-DC converters
- Power management functions
- Disconnect switches
- Motor control



Top view

### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMN6A09DN8TA	7	12	500

### Device marking

ZXMN  
6A09D

# ZXMN6A09DN8

## Absolute maximum ratings

Parameter	Symbol	Limit	Unit
Drain-source voltage	$V_{DSS}$	60	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current @ $V_{GS}=10V$ ; $T_{amb}=25^{\circ}C^{(b)}$	$I_D$	5.6	A
@ $V_{GS}=10V$ ; $T_{amb}=70^{\circ}C^{(b)}$		4.5	
@ $V_{GS}=10V$ ; $T_{amb}=25^{\circ}C^{(a)}$		4.3	
Pulsed drain current <sup>(c)</sup>	$I_{DM}$	27	A
Continuous source current (body diode) <sup>(b)</sup>	$I_S$	3.5	A
Pulsed source current (body diode) <sup>(c)</sup>	$I_{SM}$	27	A
Power dissipation at $T_{amb} = 25^{\circ}C^{(a)(d)}$	$P_D$	1.25	W
Linear derating factor		10	mW/ $^{\circ}C$
Power dissipation at $T_{amb} = 25^{\circ}C^{(b)(e)}$	$P_D$	1.8	W
Linear derating factor		14	mW/ $^{\circ}C$
Power dissipation at $T_{amb} = 25^{\circ}C^{(b)(d)}$	$P_D$	2.1	W
Linear derating factor		17	mW/ $^{\circ}C$
Operating and storage temperature range	$T_j, T_{stg}$	-55 to +150	$^{\circ}C$

## Thermal resistance

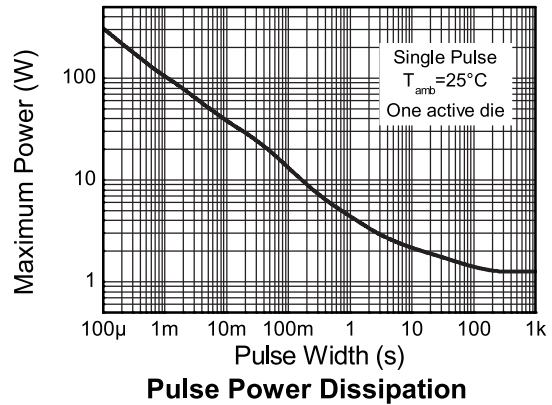
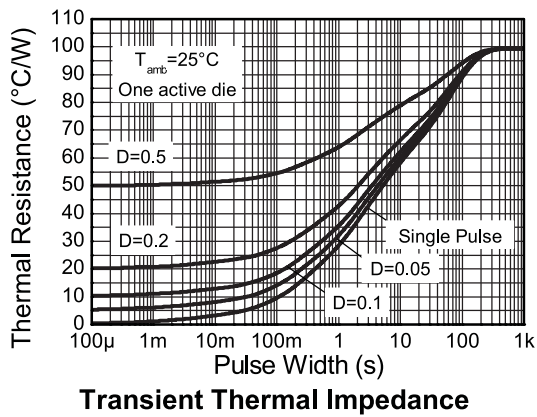
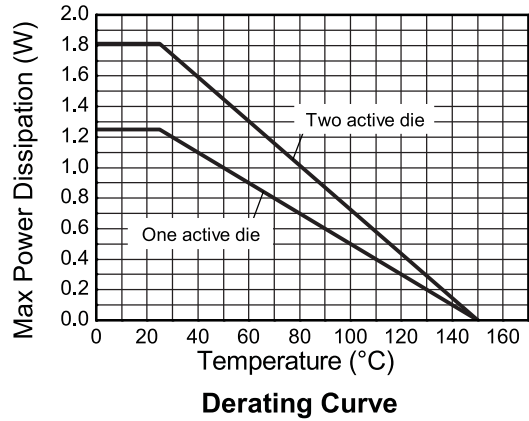
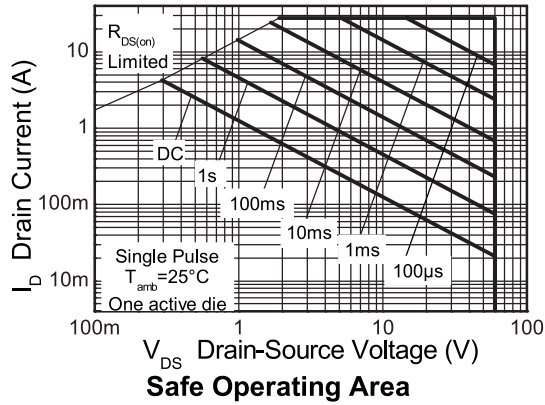
Parameter	Symbol	Limit	Unit
Junction to ambient <sup>(a)(d)</sup>	$R_{\theta JA}$	100	$^{\circ}C/W$
Junction to ambient <sup>(a)(e)</sup>	$R_{\theta JA}$	70	$^{\circ}C/W$
Junction to ambient <sup>(b)(d)</sup>	$R_{\theta JA}$	60	$^{\circ}C/W$

### NOTES:

- (a) For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
- (b) For a device surface mounted on FR4 PCB measured at  $t \leq 10$  sec.
- (c) Repetitive rating - 25mm x 25mm FR4 PCB,  $D=0.02$ , pulse width 300 $\mu$ s - pulse width limited by maximum junction temperature.
- (d) For a dual device with one active die.
- (e) For a device with two active die running at equal power.

# ZXMN6A09DN8

## Characteristics



# ZXMN6A09DN8

## Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>Static</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	60			V	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero gate voltage drain current	$I_{DSS}$			1	$\mu\text{A}$	$V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$
Gate-body leakage	$I_{GSS}$			100	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
Gate-source threshold voltage	$V_{GS(th)}$	1.0		3.0	V	$I_D = 250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static drain-source on-state resistance (*)	$R_{DS(on)}$			0.040	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 8.2\text{A}$
				0.060	$\Omega$	$V_{GS} = 4.5\text{V}$ , $I_D = 7.4\text{A}$
Forward transconductance(*) (‡)	$g_{fs}$		15		S	$V_{DS} = 15\text{V}$ , $I_D = 8.2\text{A}$
<b>Dynamic</b> (‡)						
Input capacitance	$C_{iss}$		1407		pF	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	$C_{oss}$		121		pF	
Reverse transfer capacitance	$C_{rss}$		59		pF	
<b>Switching</b> (†) (‡)						
Turn-on-delay time	$t_{d(on)}$		4.9		ns	$V_{DD} = 15\text{V}$ , $I_D = 3.5\text{A}$ $R_G \approx 6.0\Omega$ , $V_{GS} = 10\text{V}$
Rise time	$t_r$		5.0		ns	
Turn-off delay time	$t_{d(off)}$		25.3		ns	
Fall time	$t_f$		4.6		ns	
Total gate charge	$Q_g$		12.4		nC	$V_{DS} = 15\text{V}$ , $V_{GS} = 5\text{V}$ $I_D = 3.5\text{A}$
Total gate charge	$Q_g$		24.2		nC	$V_{DS} = 15\text{V}$ , $V_{GS} = 5\text{V}$ $I_D = 3.5\text{A}$
Gate-source charge	$Q_{gs}$		5.2		nC	
Gate drain charge	$Q_{gd}$		3.5		nC	
<b>Source-drain diode</b>						
Diode forward voltage(*)	$V_{SD}$		0.85	0.95	V	$T_j = 25^{\circ}\text{C}$ , $I_S = 6.6\text{A}$ , $V_{GS} = 0\text{V}$
Reverse recovery time(‡)	$t_{rr}$		26.3		ns	$T_j = 25^{\circ}\text{C}$ , $I_S = 3.5\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge(‡)	$Q_{rr}$		26.6		nC	

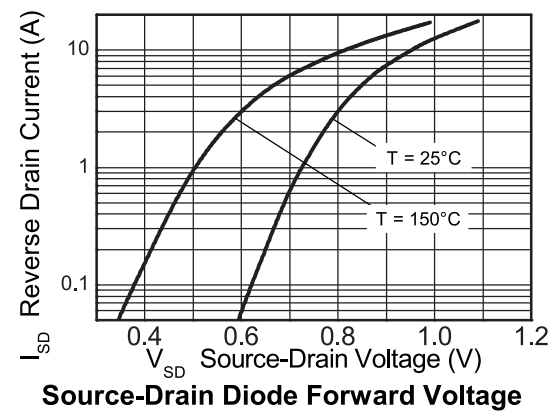
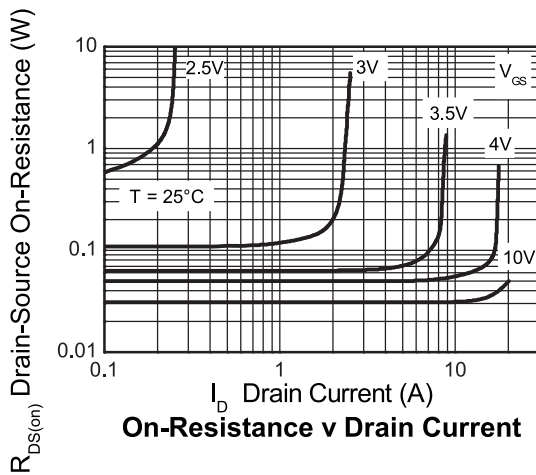
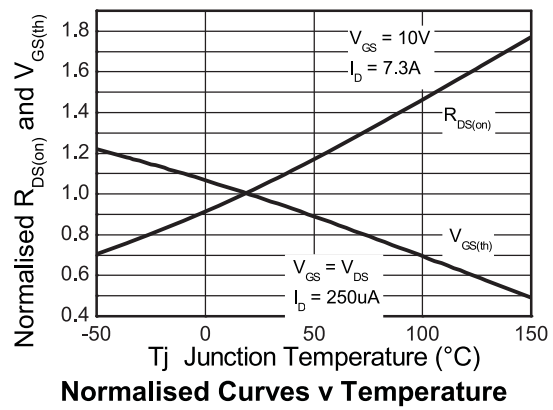
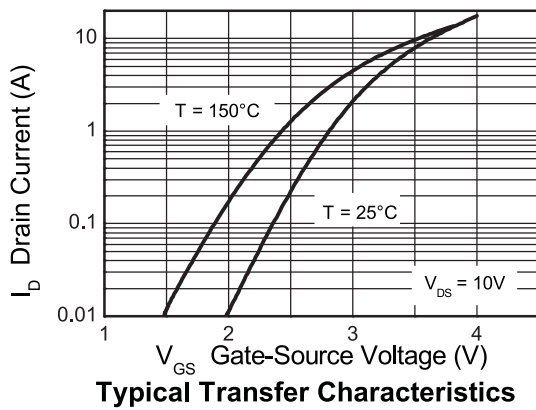
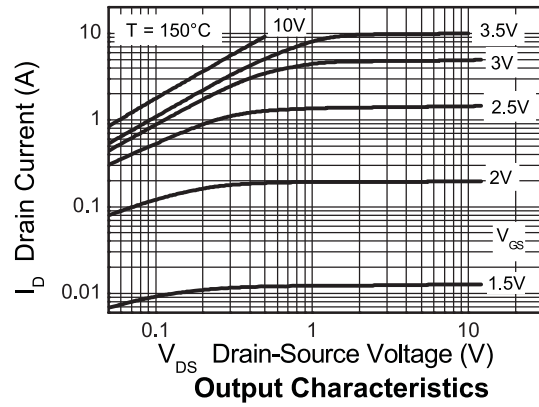
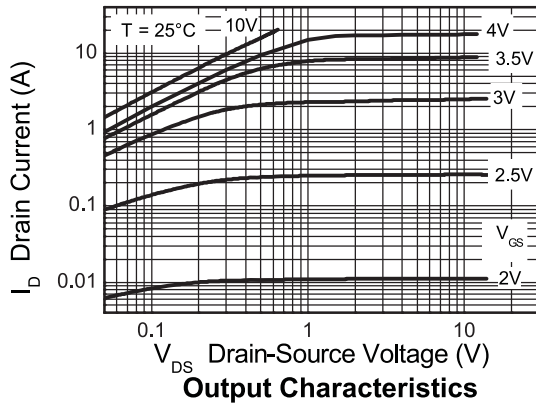
### NOTES:

(\*) Measured under pulsed conditions. Pulse width  $\leq 300\text{ s}$ ; duty cycle  $\leq 2\%$ .

(†) Switching characteristics are independent of operating junction temperature.

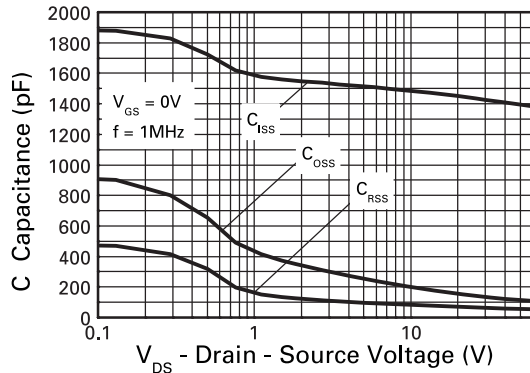
(‡) For design aid only, not subject to production testing.

## Typical characteristics

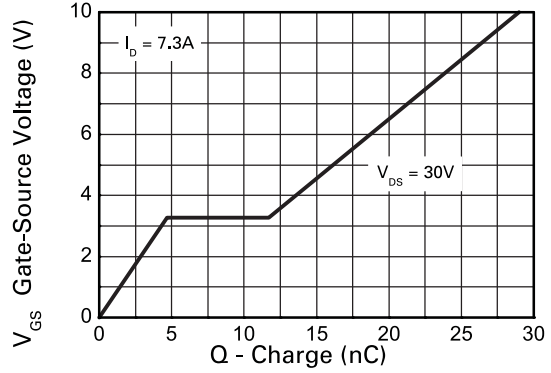


# ZXMN6A09DN8

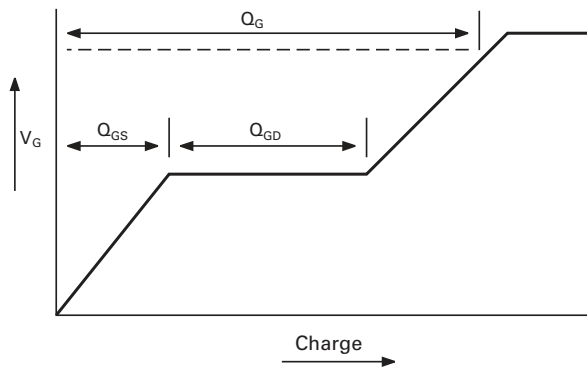
## Typical characteristics



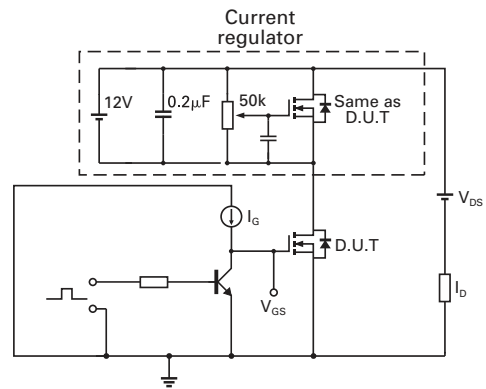
Capacitance v Drain-Source Voltage



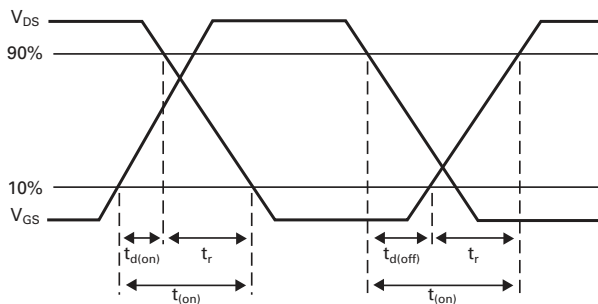
Gate-Source Voltage v Gate Charge



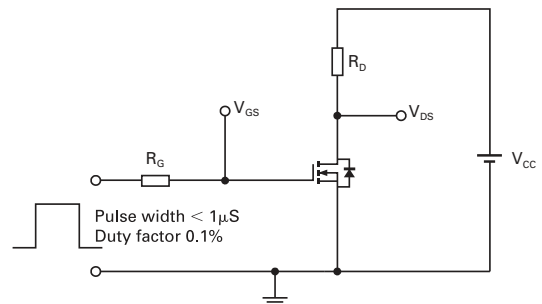
Basic gate charge waveform



Gate charge test circuit



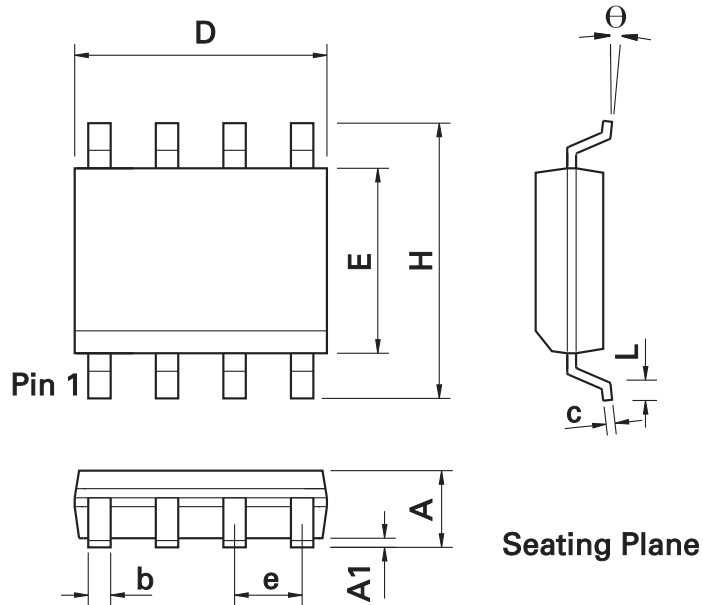
Switching time waveforms



Switching time test circuit

# ZXMN6A09DN8

## Package outline - SO8



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.053	0.069	1.35	1.75	e	0.050 BSC		1.27 BSC	
A1	0.004	0.010	0.10	0.25	b	0.013	0.020	0.33	0.51
D	0.189	0.197	4.80	5.00	c	0.008	0.010	0.19	0.25
H	0.228	0.244	5.80	6.20	Θ	0°	8°	0°	8°
E	0.150	0.157	3.80	4.00	h	0.010	0.020	0.25	0.50
L	0.016	0.050	0.40	1.27	-	-	-	-	-

**Note:** Controlling dimensions are in inches. Approximate dimensions are provided in millimeters

# ZXMN6A09DN8

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