

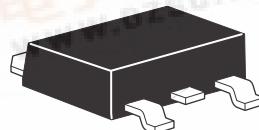


## ZXMN6A09K

### 60V N-channel enhancement mode MOSFET in DPAK

#### Summary

$V_{(BR)DSS}=60V$  :  $R_{DS(on)}=0.040\Omega$ ;  $I_D=12.2A$

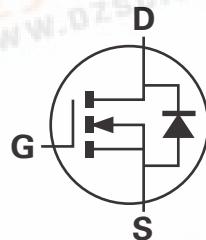


#### Description

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.

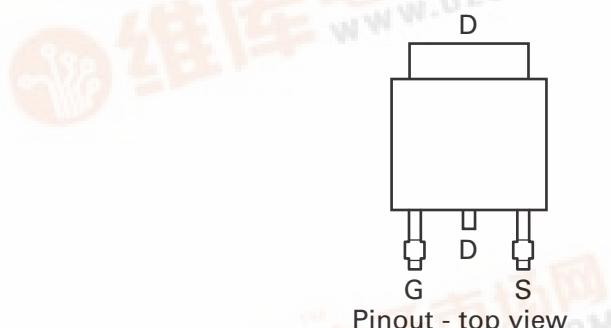
#### Features

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- DPAK (TO-252) package



#### Applications

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



#### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMN6A09KTC	13	16	2500

#### Device marking

ZXMN  
6A09K

ZXMN6A09K

## 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 @ $V_{GS}=10V$ ; $T_{amb}=25^{\circ}C$ <sup>(b)</sup> @ $V_{GS}=10V$ ; $T_{amb}=70^{\circ}C$ <sup>(b)</sup> @ $V_{GS}=10V$ ; $T_{amb}=25^{\circ}C$ <sup>(a)</sup>	$I_D$	12.2 9.8 7.9	A
Pulsed drain current <sup>(c)</sup>	$I_{DM}$	43	A
Continuous source current (body diode) <sup>(b)</sup>	$I_S$	10.8	A
Pulsed source current (body diode) <sup>(c)</sup>	$I_{SM}$	43	A
Power dissipation at $T_{amb}=25^{\circ}C$ <sup>(a)</sup>	$P_D$	4.3	W
Linear derating factor		34.4	$mW/^{\circ}C$
Power dissipation at $T_{amb}=25^{\circ}C$ <sup>(a)</sup>	$P_D$	10.1	W
Linear derating factor		80.8	$mW/^{\circ}C$
Power dissipation at $T_{amb}=25^{\circ}C$ <sup>(a)</sup>	$P_D$	2.15	W
Linear derating factor		17.2	$mW/^{\circ}C$
Operating and storage temperature range	$T_j, T_{stg}$	-55 to +150	$^{\circ}C$

## Thermal resistance

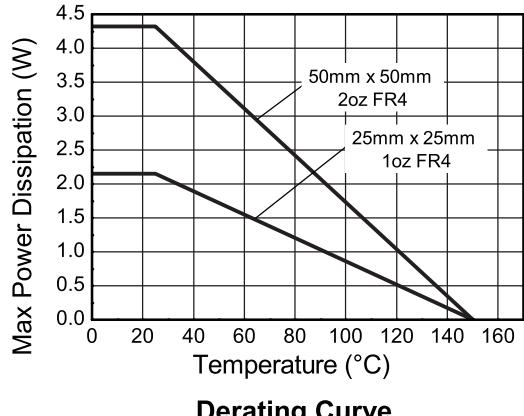
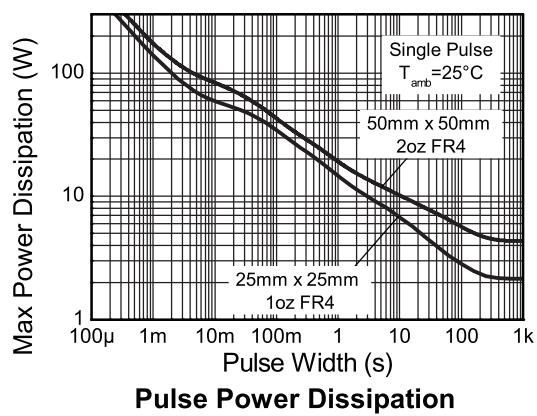
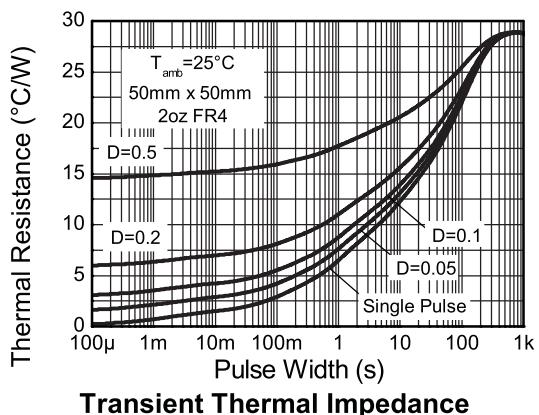
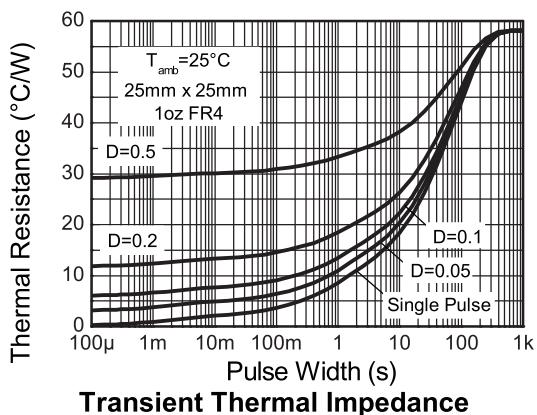
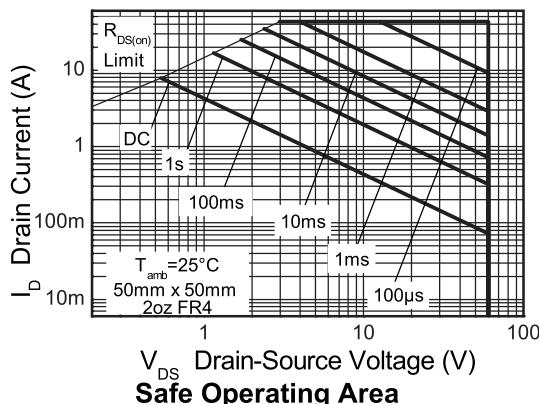
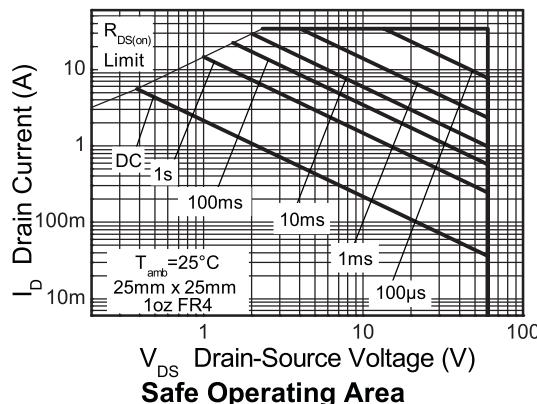
Parameter	Symbol	Limit	Unit
Junction to ambient <sup>(a)</sup>	$R_{\Theta JA}$	29	°C/W
Junction to ambient <sup>(b)</sup>	$R_{\Theta JA}$	12.3	°C/W
Junction to ambient <sup>(d)</sup>	$R_{\Theta JA}$	58.1	°C/W

## NOTES:

**NOTES:**

- (a) For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions.
- (b) For a device surface mounted on FR4 PCB measured at  $t \leq 10$  sec.
- (c) Repetitive rating 50mm x 50mm x 1.6mm FR4 PCB,  $D=0.02$  pulse width=300 $\mu$ s - pulse width limited by maximum junction temperature.
- (d) 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.

## Characteristics



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

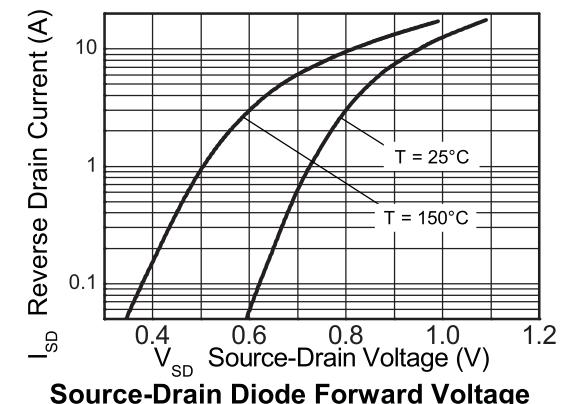
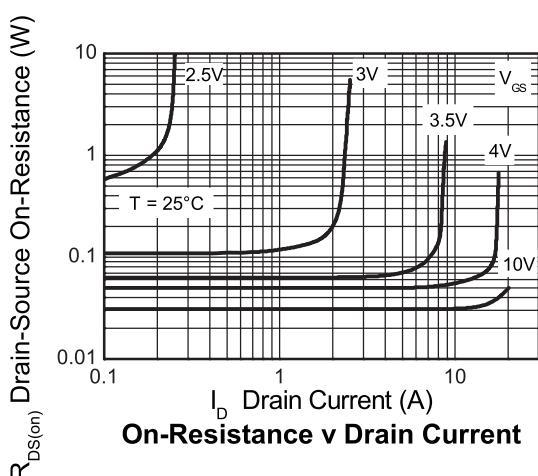
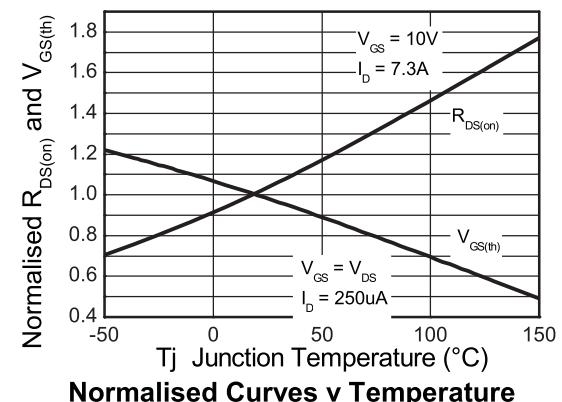
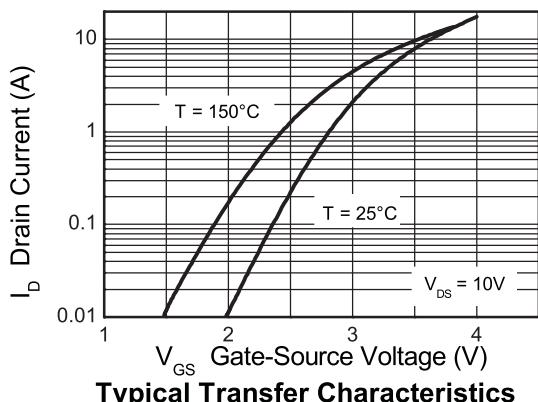
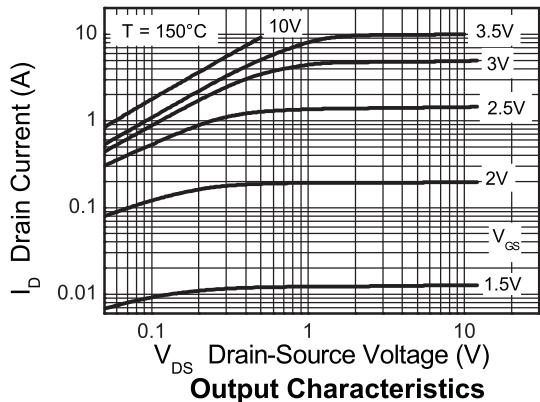
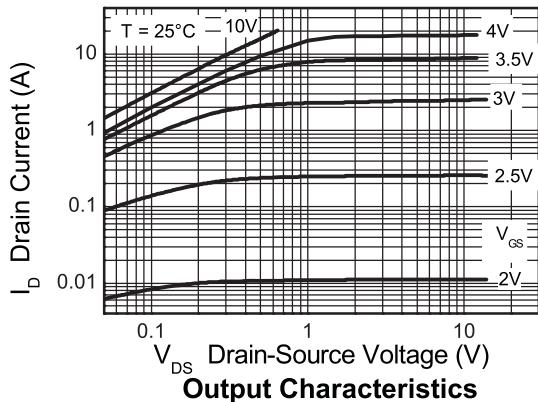
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>Static</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	60			V	$I_D = 250\mu A, V_{GS}=0V$
Zero gate voltage drain current	$I_{DSS}$			1	$\mu A$	$V_{DS}= 60V, V_{GS}=0V$
Gate-body leakage	$I_{GSS}$			100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Gate-source threshold voltage	$V_{GS(th)}$	1.0		3.0	V	$I_D = 250\mu A, V_{DS}=V_{GS}$
Static drain-source on-state resistance (*)	$R_{DS(on)}$			0.040	$\Omega$	$V_{GS}= 10V, I_D = 7.3A$
				0.060	$\Omega$	$V_{GS}= 4.5V, I_D = 5.6A$
Forward transconductance <sup>(*)</sup> (‡)	$g_{fs}$		15		S	$V_{DS}= 15V, I_D = 7.3A$
<b>Dynamic<sup>(‡)</sup></b>						
Input capacitance	$C_{iss}$		1426		pF	$V_{DS}= 30V, V_{GS}=0V$
Output capacitance	$C_{oss}$		134		pF	$f=1MHz$
Reverse transfer capacitance	$C_{rss}$		64		pF	
<b>Switching<sup>(†) (‡)</sup></b>						
Turn-on-delay time	$t_{d(on)}$		4.8		ns	$V_{DD}= 30V, I_D = 1A$ $R_G \geq 6.0\Omega, V_{GS}= 10V$ (refer to test circuit)
Rise time	$t_r$		4.6		ns	
Turn-off delay time	$t_{d(off)}$		32.5		ns	
Fall time	$t_f$		14.5		ns	
Total gate charge	$Q_g$		15		nC	$V_{DS}= 30V, V_{GS}= 4.5V$ $I_D = 5.6A$
Total gate charge	$Q_g$		29		nC	$V_{DS}= 30V, V_{GS}= 10V$ $I_D = 7.3A$
Gate-source charge	$Q_{gs}$		7.0		nC	
Gate drain charge	$Q_{gd}$		4.7		nC	
<b>Source-drain diode</b>						
Diode forward voltage <sup>(*)</sup>	$V_{SD}$		0.85	0.95	V	$T_j=25^\circ C, I_S= 6.6A$ $V_{GS}=0V$
Reverse recovery time <sup>(‡)</sup>	$t_{rr}$		25.6		ns	$T_j=25^\circ C, I_S= 3A$ $di/dt=100A/\mu s$
Reverse Recovery charge <sup>(‡)</sup>	$Q_{rr}$		26.0		nC	

### NOTES:

- (\*) Measured under pulsed conditions. Pulse width  $\leq 300$  s; duty cycle  $\leq 2\%$ .
- (†) Switching characteristics are independent of operating junction temperature.
- (‡) For design aid only, not subject to production testing.

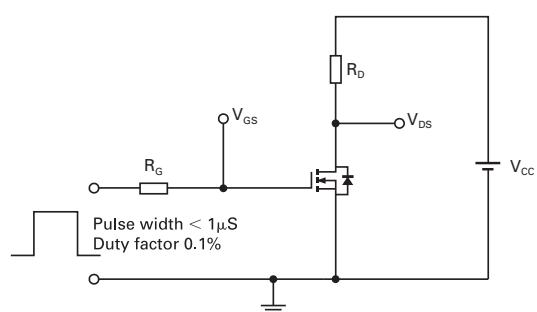
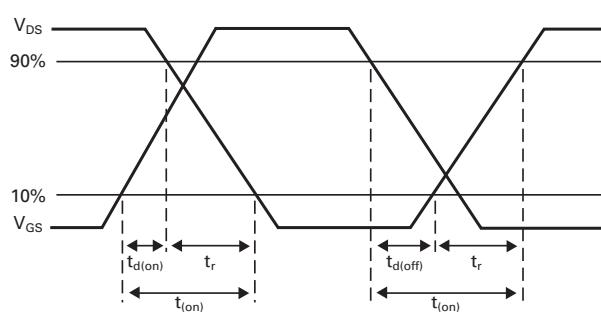
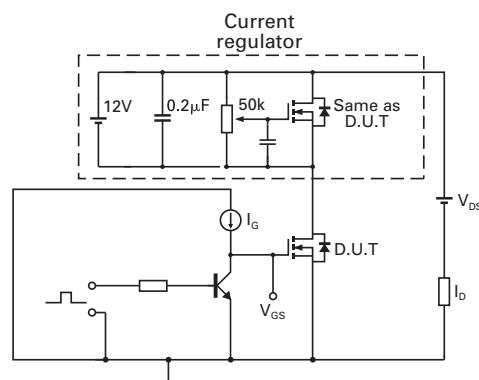
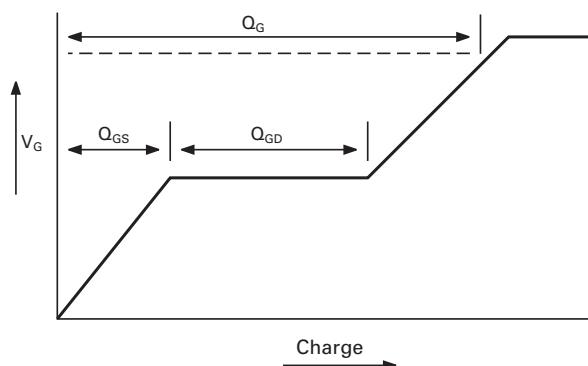
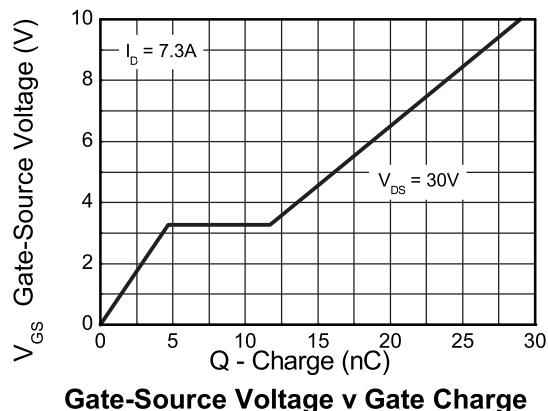
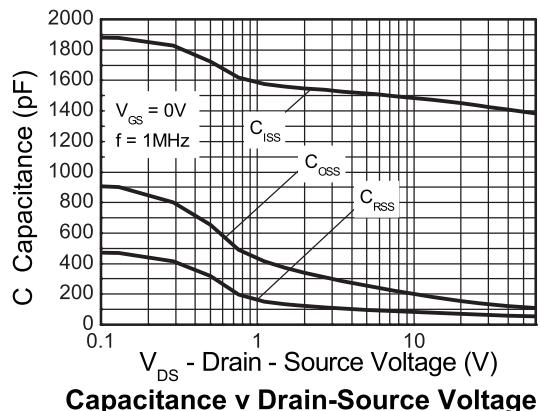
# ZXMN6A09K

## Typical characteristics



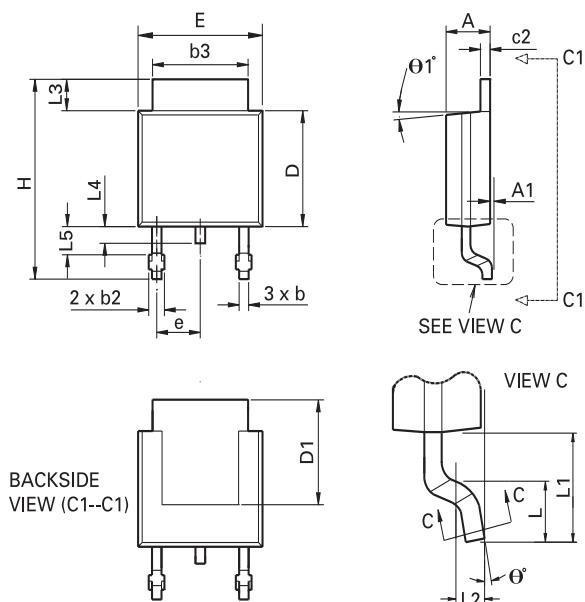
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## Typical characteristics



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## Package outline - DPAK



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	0.086	0.094	2.18	2.39	e	0.090 BSC		2.29 BSC	
A1	-	0.005	-	0.127	H	0.370	0.410	9.40	10.41
b	0.020	0.035	0.508	0.89	L	0.055	0.070	1.40	1.78
b2	0.030	0.045	0.762	1.14	L1	0.108 REF		2.74 REF	
b3	0.205	0.215	5.21	5.46	L2	0.020 BSC		0.508 BSC	
c	0.018	0.024	0.457	0.61	L3	0.035	0.065	0.89	1.65
c2	0.018	0.023	0.457	0.584	L4	0.025	0.040	0.635	1.016
D	0.213	0.245	5.41	6.22	L5	0.045	0.060	1.14	1.52
D1	0.205	-	5.21	-	theta 1	0°	10°	0°	10°
E	0.250	0.265	6.35	6.73	theta 2	0°	15°	0°	15°
E1	0.170	-	4.32	-		-	-	-	-

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

# ZXMN6A09K

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