

# ZXMN6A09K

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## 60V N-CANNEL ENHANCEMENT MODE MOSFET IN D-PAK

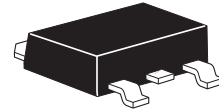
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### SUMMARY

$V_{(BR)DSS} = 60V$  ;  $R_{DS(on)} = 0.045\Omega$  ;  $I_D = 11.2A$

### 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.



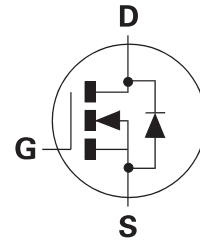
DPAK

### FEATURES

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- D-Pak (T0-252) package

### APPLICATIONS

- DC-DC Converters
- Power Management functions
- Disconnect switches
- Motor control



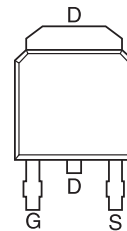
### ORDERING INFORMATION

DEVICE	REEL SIZE	TAPE WIDTH	QUANTITY PER REEL
ZXMN6A09KTC	13"	16mm	2500 units

### DEVICE MARKING

- ZXMN  
6A09K

### PINOUT



TOP VIEW

# 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 @ $V_{GS} = 10V$ ; $T_A = 25^\circ C$ <sup>(b)</sup>	$I_D$	11.2	A
@ $V_{GS} = 10V$ ; $T_A = 70^\circ C$ <sup>(b)</sup>		9.0	
@ $V_{GS} = 10V$ ; $T_A = 25^\circ C$ <sup>(a)</sup>		7.3	
Pulsed drain current <sup>(c)</sup>	$I_{DM}$	40	A
Continuous source current (body diode) <sup>(b)</sup>	$I_S$	10.8	A
Pulsed source current (body diode) <sup>(c)</sup>	$I_{SM}$	40	A
Power dissipation at $T_A = 25^\circ C$ <sup>(a)</sup>	$P_D$	4.3	W
Linear derating factor		34.4	
Power dissipation at $T_A = 25^\circ C$ <sup>(b)</sup>	$P_D$	10.1	W
Linear derating factor		80.8	
Power dissipation at $T_A = 25^\circ C$ <sup>(d)</sup>	$P_D$	2.15	W
Linear derating factor		17.2	
Operating and storage temperature range	$T_J, T_{stg}$	-55 to +150	$^\circ C$

## THERMAL RESISTANCE

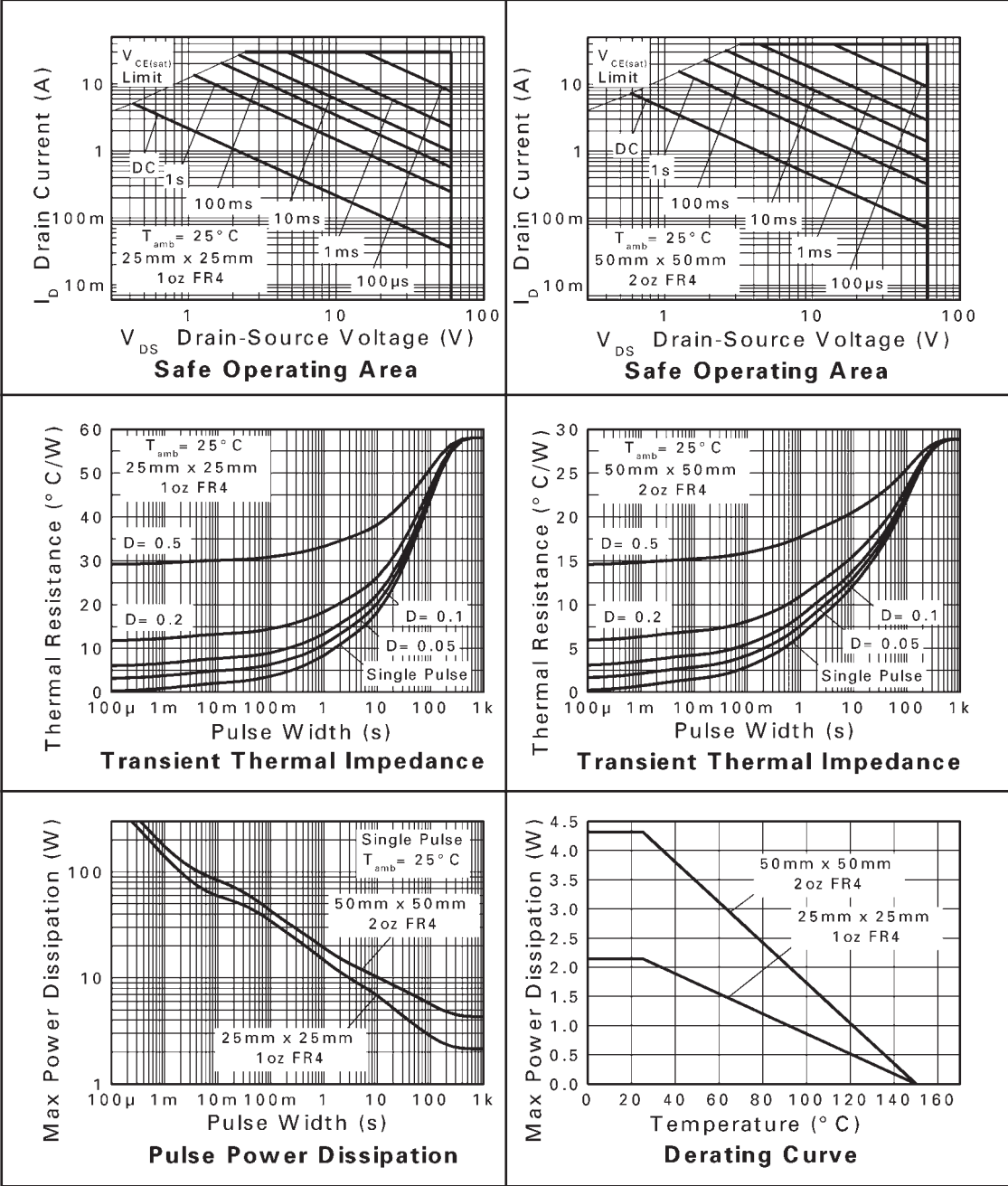
PARAMETER	SYMBOL	VALUE	UNIT
Junction to ambient <sup>(a)</sup>	$R_{\theta JA}$	29	$^\circ C/W$
Junction to ambient <sup>(b)</sup>	$R_{\theta JA}$	12.3	$^\circ C/W$
Junction to ambient <sup>(d)</sup>	$R_{\theta JA}$	58	$^\circ C/W$

### 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 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.

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## TYPICAL CHARACTERISTICS



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## 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			V	$I_D = 250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static drain-source on-state resistance <sup>(1)</sup>	$R_{DS(on)}$			0.045	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 7.3\text{A}$
				0.070	$\Omega$	$V_{GS} = 4.5\text{V}$ , $I_D = 5.6\text{A}$
Forward transconductance <sup>(1)</sup> <sup>(3)</sup>	$g_{fs}$		15		S	$V_{DS} = 15\text{V}$ , $I_D = 7.3\text{A}$
<b>DYNAMIC <sup>(3)</sup></b>						
Input capacitance	$C_{iss}$		1426		pF	$V_{DS} = 30\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	$C_{oss}$		134		pF	
Reverse transfer capacitance	$C_{rss}$		64		pF	
<b>SWITCHING <sup>(2)</sup> <sup>(3)</sup></b>						
Turn-on-delay time	$t_{d(on)}$		4.8		ns	$V_{DD} = 30\text{V}$ , $I_D = 1\text{A}$ $R_G = 6.0\Omega$ , $V_{GS} = 10\text{V}$ (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	$V_{DS} = 30\text{V}$ , $V_{GS} = 4.5\text{V}$ $I_D = 5.6\text{A}$
Total gate charge	$Q_g$		29		nC	$V_{DS} = 30\text{V}$ , $V_{GS} = 10\text{V}$ $I_D = 7.3\text{A}$
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>(1)</sup>	$V_{SD}$		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 <sup>(3)</sup>	$t_{rr}$		25.6		ns	$T_J = 25^{\circ}\text{C}$ , $I_S = 3\text{A}$ ,
Reverse recovery charge <sup>(3)</sup>	$Q_{rr}$		26.0		nC	$di/dt = 100\text{A}/\mu\text{s}$

### NOTES

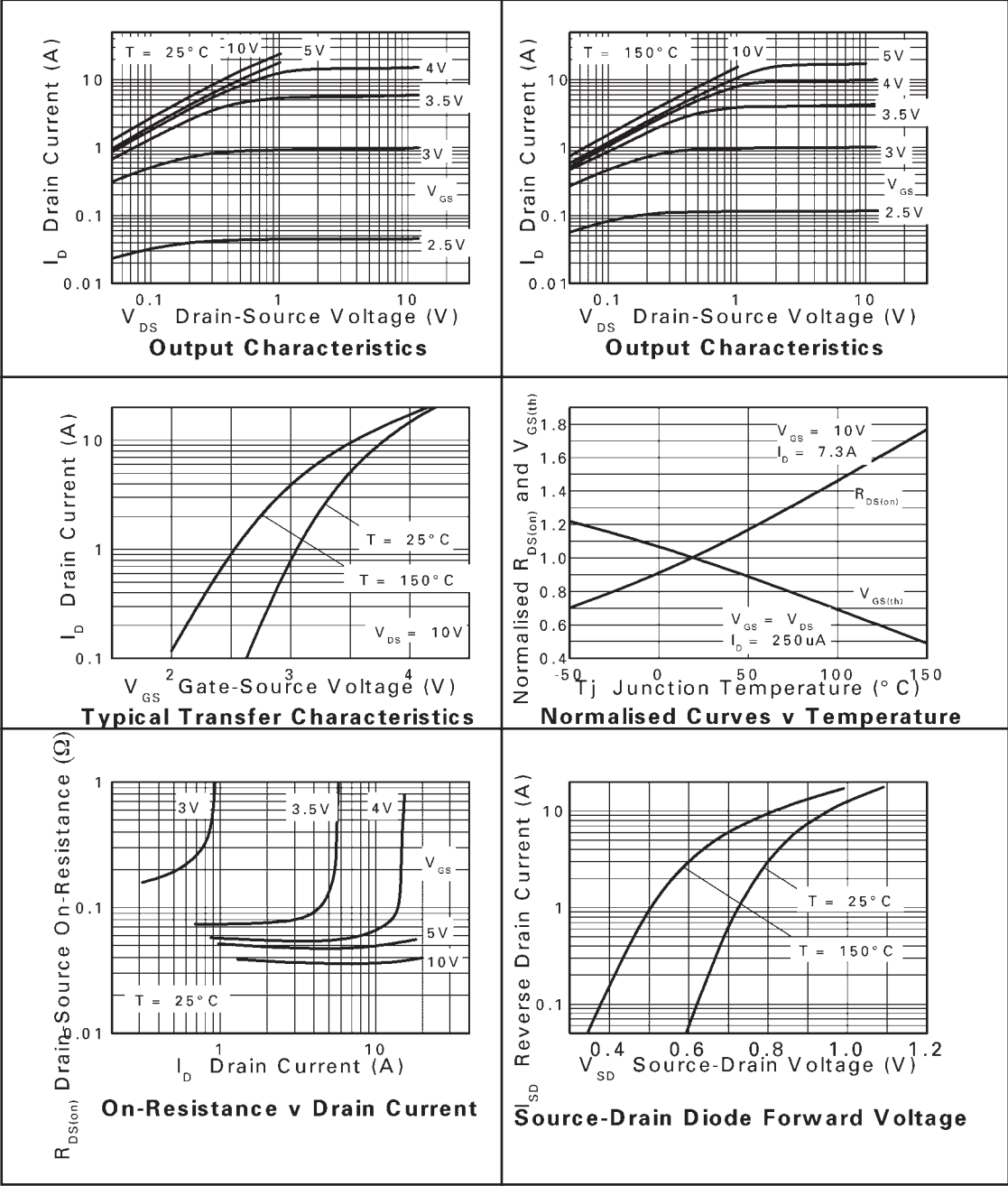
(1) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

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

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

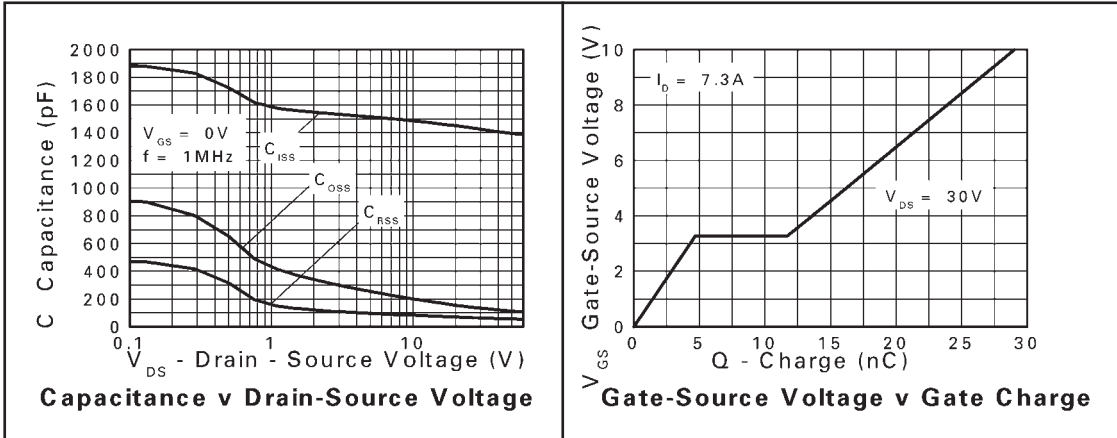
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## TYPICAL CHARACTERISTICS



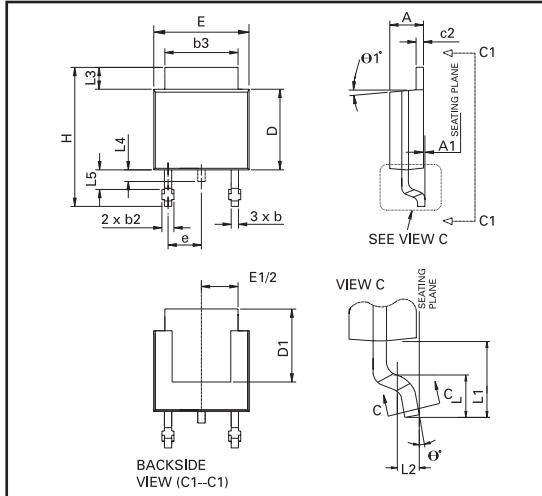
# ZXMN6A09K

## TYPICAL CHARACTERISTICS



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## PACKAGE OUTLINE



Controlling dimensions are in millimeters. Approximate conversions are given in inches

## PACKAGE DIMENSIONS

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	2.18	2.38	0.086	0.094	e	2.30 BSC		0.090 BSC	
A1	—	0.127	—	0.005	H	9.40	10.41	0.370	0.410
b	0.635	0.89	0.025	0.035	L	1.40	1.78	0.055	0.070
b2	0.762	1.114	0.030	0.045	L1	2.74 REF		0.108 REF	
b3	5.20	5.46	0.205	0.215	L2	0.051 BSC		0.020 BSC	
c	0.457	0.609	0.018	0.024	L3	0.89	1.27	0.035	0.050
c2	0.457	0.584	0.018	0.023	L4	0.635	1.01	0.025	0.040
D	5.97	6.22	0.235	0.245	L5	1.14	1.52	0.045	0.060
D1	5.20	—	0.205	—	theta 1°	0°	10°	0°	10°
E	6.35	6.73	0.250	0.265	theta°	0°	15°	0°	15°
E1	4.32	—	0.170	—	—	—	—	—	—

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