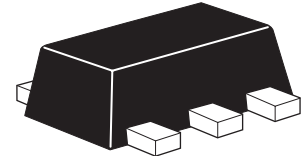


# ZXMN6A11Z

## 60V SOT89 N-channel enhancement mode MOSFET

### Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
60	0.120 @ $V_{GS}= 10V$	3.6
	0.180 @ $V_{GS}= 4.5V$	2.9

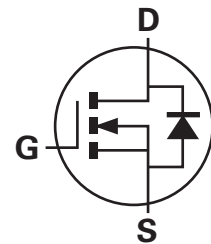


### Description

This new generation trench MOSFET from Zetex features a unique structure combining the benefits of low on-resistance and fast switching, making it ideal for high efficiency power management applications.

### Features

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- SOT89 package

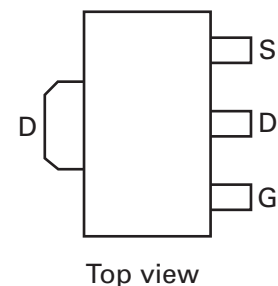


### Applications

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

### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMN6A11ZTA	7	12	1,000



### Device marking

11N6

# ZXMN6A11Z

## 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 @ $V_{GS} = 10V$ ; $T_{amb} = 25^{\circ}C^{(b)}$	$I_D$	3.6	A
@ $V_{GS} = 10V$ ; $T_{amb} = 70^{\circ}C^{(b)}$		2.9	
@ $V_{GS} = 10V$ ; $T_{amb} = 25^{\circ}C^{(a)}$		2.7	
Pulsed drain current <sup>(c)</sup>	$I_{DM}$	14.5	A
Continuous source current (body diode) <sup>(b)</sup>	$I_S$	3.7	A
Pulsed source current (body diode) <sup>(c)</sup>	$I_{SM}$	14.5	A
Power dissipation at $T_{amb} = 25^{\circ}C^{(a)}$	$P_D$	1.5	W
Linear derating factor		12	mW/ $^{\circ}C$
Power dissipation at $T_{amb} = 25^{\circ}C^{(b)}$	$P_D$	2.6	W
Linear derating factor		21	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>	$R_{\theta JA}$	83.3	$^{\circ}C/W$
Junction to ambient <sup>(b)</sup>	$R_{\theta JA}$	47.4	$^{\circ}C/W$

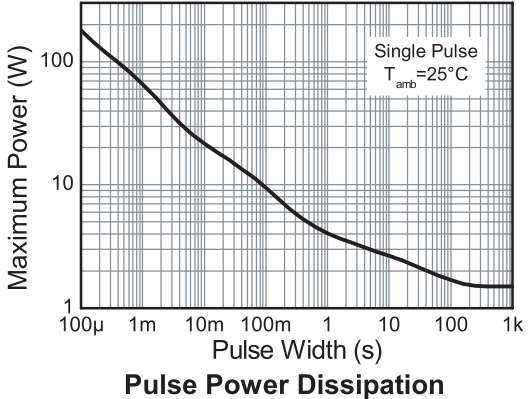
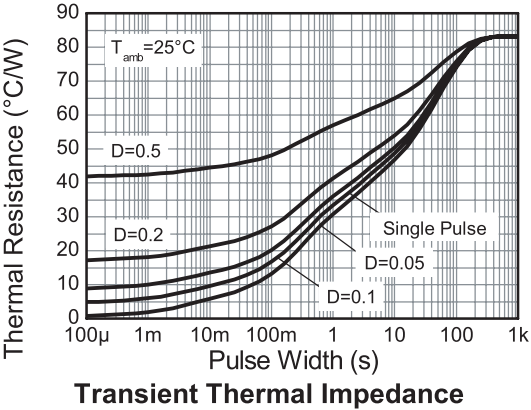
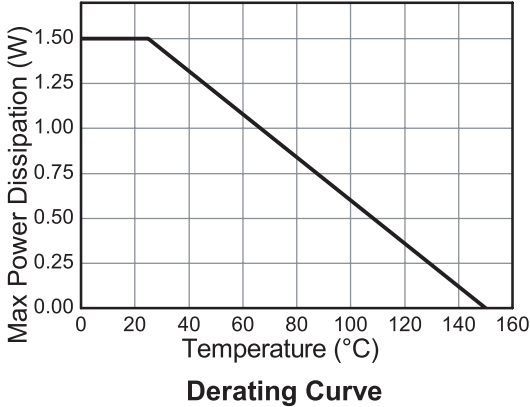
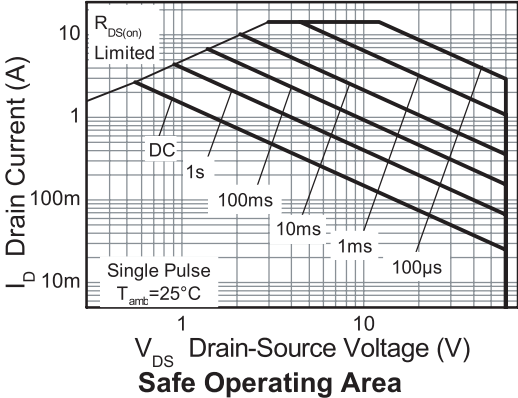
### NOTES:

(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  $t = 10$  sec.

(c) Repetitive rating - 25mm x 25mm FR4 PCB,  $D=0.02$ , pulse width 300 $\mu$ s - pulse width limited by maximum junction temperature.

## Typical characteristics



# ZXMN6A11Z

## Electrical characteristics (@ $T_{amb} = 25^{\circ}\text{C}$ 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	$I_{DSS}$			1.0	$\mu\text{A}$	$V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$
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>(*)</sup>	$R_{DS(on)}$			0.120	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 2.5\text{A}$
				0.180	$\Omega$	$V_{GS} = 4.5\text{V}$ , $I_D = 2\text{A}$
Forward transconductance <sup>(*)(‡)</sup>	$g_{fs}$		4.9		S	$V_{DS} = 15\text{V}$ , $I_D = 2.5\text{A}$
<b>Dynamic<sup>(‡)</sup></b>						
Input capacitance	$C_{iss}$		330		pF	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	$C_{oss}$		35.2		pF	
Reverse transfer capacitance	$C_{rss}$		17.1		pF	
<b>Switching<sup>(†)</sup> (‡)</b>						
Turn-on-delay time	$t_{d(on)}$		1.95		ns	$V_{DD} = 30\text{V}$ , $I_D = 2.5\text{A}$ $R_G = 6.0\Omega$ , $V_{GS} = 10\text{V}$
Rise time	$t_r$		3.5		ns	
Turn-off delay time	$t_{d(off)}$		8.2		ns	
Fall time	$t_f$		4.6		ns	
Gate charge	$Q_g$		3.0		nC	$V_{DS} = 15\text{V}$ , $V_{GS} = 5\text{V}$ $I_D = 2.5\text{A}$
Total gate charge	$Q_g$		5.7		nC	$V_{DS} = 15\text{V}$ , $V_{GS} = 10\text{V}$ $I_D = 2.5\text{A}$
Gate-source charge	$Q_{gs}$		1.25		nC	
Gate drain charge	$Q_{gd}$		0.86		nC	
<b>Source-drain diode</b>						
Diode forward voltage <sup>(*)</sup>	$V_{SD}$		0.85	0.95	V	$T_j = 25^{\circ}\text{C}$ , $I_S = 2.8\text{A}$ , $V_{GS} = 0\text{V}$
Reverse recovery time <sup>(‡)</sup>	$t_{rr}$		21.5		ns	$T_j = 25^{\circ}\text{C}$ , $I_S = 2.5\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge <sup>(‡)</sup>	$Q_{rr}$		20.5		nC	

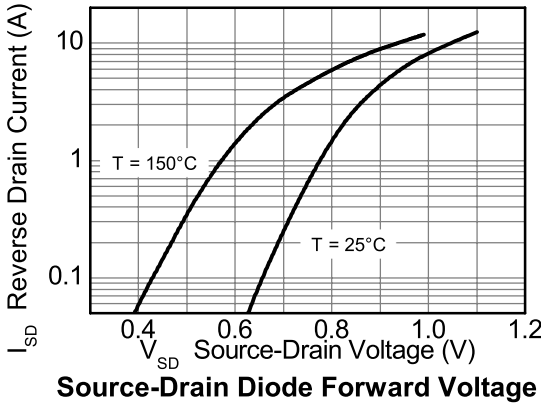
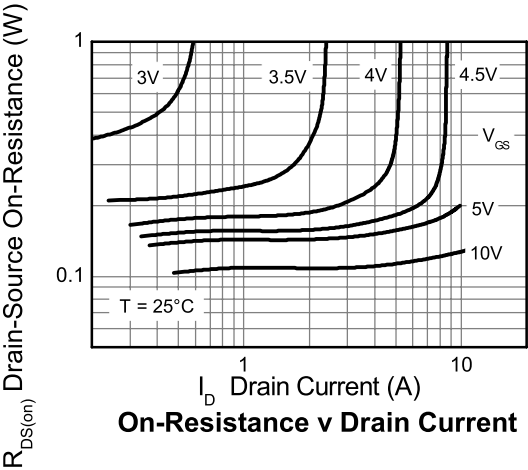
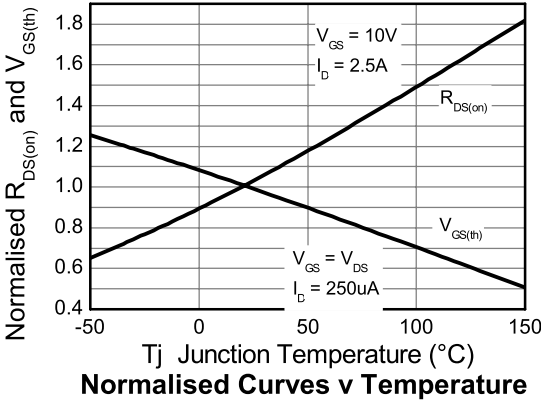
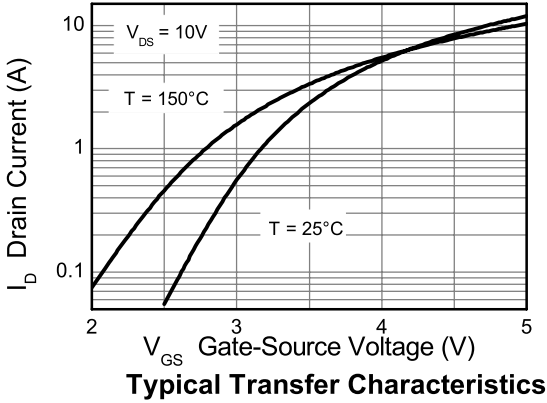
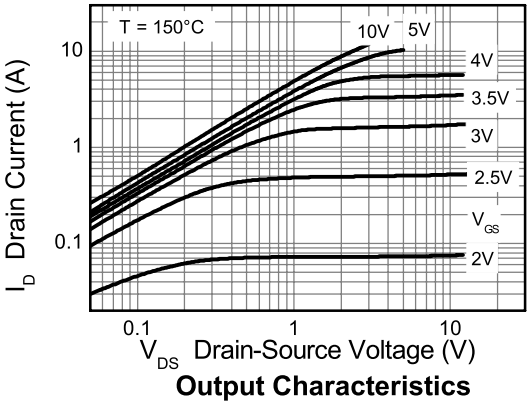
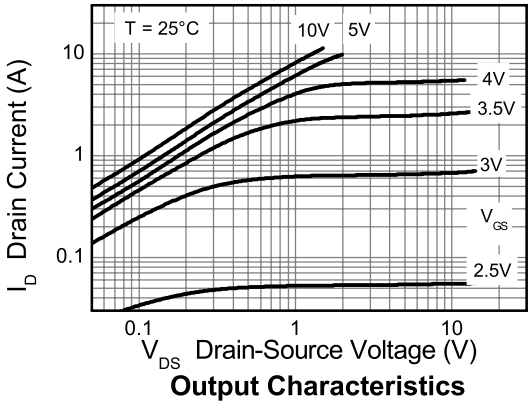
### NOTES:

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

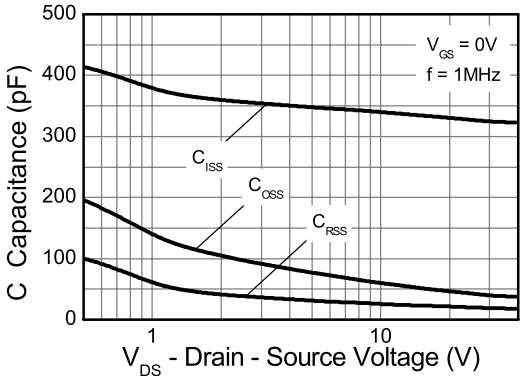
(†) Switching characteristics are independent of operating junction temperature.

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

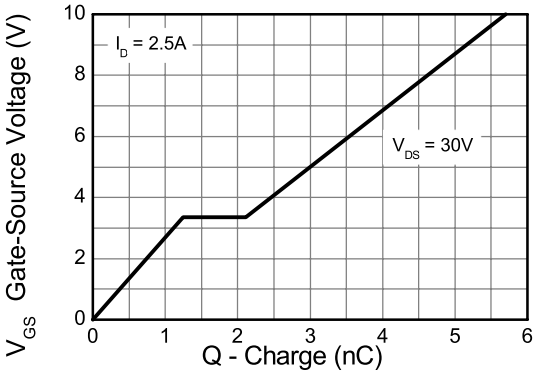
## Typical characteristics



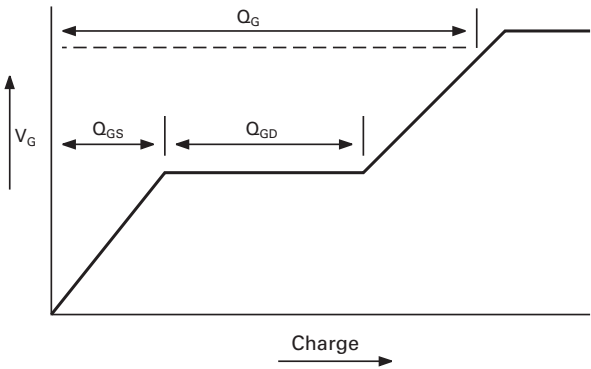
## Typical characteristics



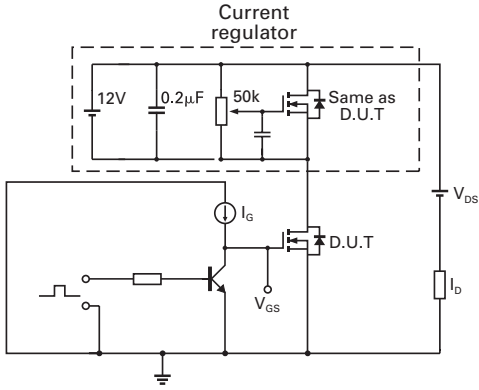
Capacitance v Drain-Source Voltage



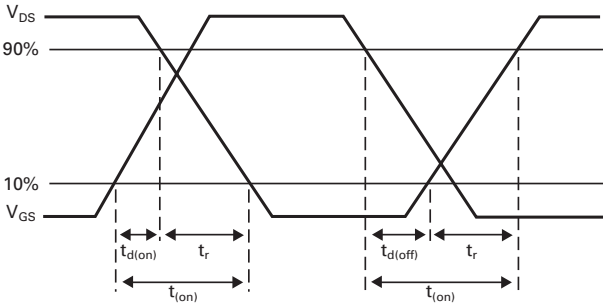
Gate-Source Voltage v Gate Charge



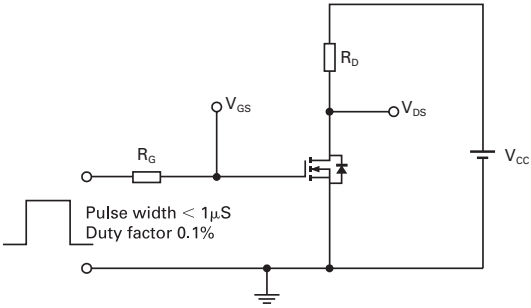
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms



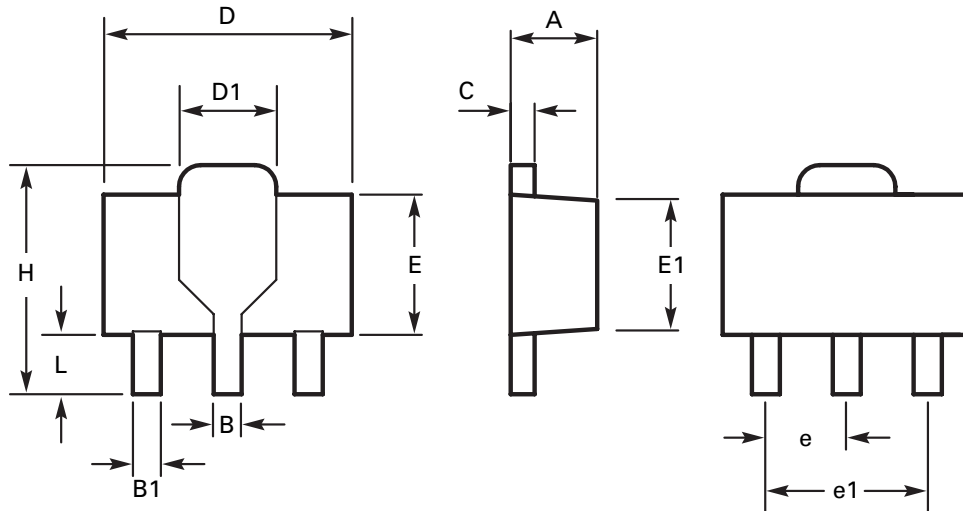
Switching time test circuit

# ZXMN6A11Z

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# ZXMN6A11Z

## Package outline - SOT89



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	1.40	1.60	0.550	0.630	E	2.29	2.60	0.090	0.102
B	0.44	0.56	0.017	0.022	E1	2.13	2.29	0.084	0.090
B1	0.36	0.48	0.014	0.019	e	1.50 BSC		0.059 BSC	
C	0.35	0.44	0.014	0.017	e1	3.00 BSC		0.118 BSC	
D	4.40	4.60	0.173	0.181	H	3.94	4.25	0.155	0.167
D1	1.52	1.83	0.064	0.072	L	0.89	1.20	0.035	0.047

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

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