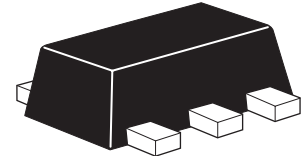


# ZXMN6A11Z

## 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       |

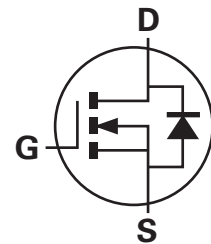


### Description

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

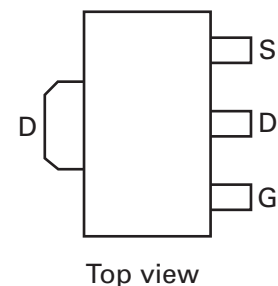


### Applications

- 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  | $^{\circ}C/W$ |

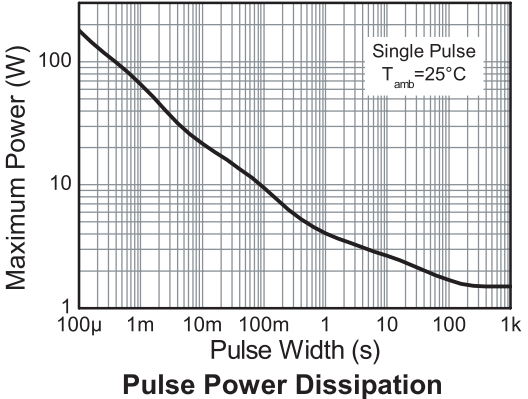
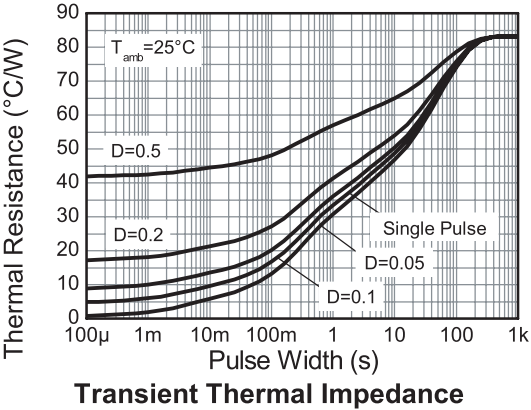
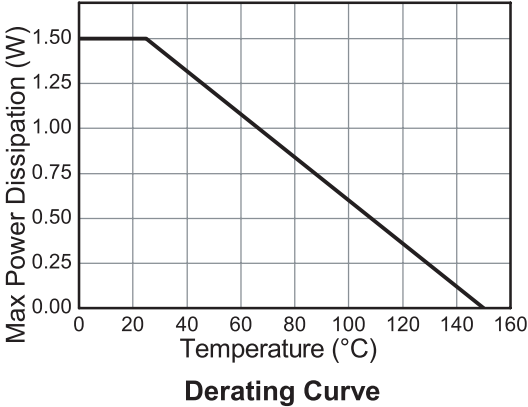
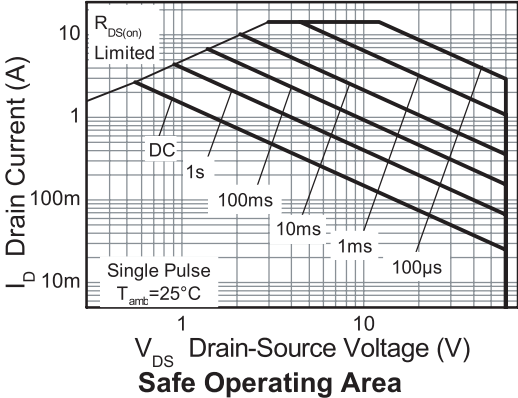
### NOTES:

(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 (@ $T_{amb} = 25^{\circ}C$ 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                        | $I_{DSS}$     |      |      | 1.0   | $\mu A$  | $V_{DS} = 60V, V_{GS} = 0V$                                   |
| Gate-body leakage                                      | $I_{GSS}$     |      |      | 100   | nA       | $V_{GS} = \pm 20V, V_{DS} = 0V$                               |
| Gate-source threshold voltage                          | $V_{GS(th)}$  | 1.0  |      |       | V        | $I_D = 250\mu A, V_{DS} = V_{GS}$                             |
| Static drain-source on-state resistance <sup>(*)</sup> | $R_{DS(on)}$  |      |      | 0.120 | $\Omega$ | $V_{GS} = 10V, I_D = 2.5A$                                    |
|  |               |      |      | 0.180 | $\Omega$ | $V_{GS} = 4.5V, I_D = 2A$                                     |
| Forward transconductance <sup>(*)(‡)</sup>             | $g_{fs}$      |      | 4.9  |       | S        | $V_{DS} = 15V, I_D = 2.5A$                                    |
| <b>Dynamic<sup>(‡)</sup></b>                           |               |      |      |       |          |   |
| Input capacitance                                      | $C_{iss}$     |      | 330  |       | pF       | $V_{DS} = 40V, V_{GS} = 0V$<br>$f = 1MHz$                     |
| 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       | $V_{DD} = 30V, I_D = 2.5A$<br>$R_G = 6.0\Omega, V_{GS} = 10V$ |
| 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       | $V_{DS} = 15V, V_{GS} = 5V$<br>$I_D = 2.5A$                   |
| Total gate charge                                      | $Q_g$         |      | 5.7  |       | nC       | $V_{DS} = 15V, V_{GS} = 10V$<br>$I_D = 2.5A$                  |
| 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        | $T_j = 25^{\circ}C, I_S = 2.8A,$<br>$V_{GS} = 0V$             |
| Reverse recovery time <sup>(‡)</sup>                   | $t_{rr}$      |      | 21.5 |       | ns       | $T_j = 25^{\circ}C, I_S = 2.5A,$<br>$di/dt = 100A/\mu s$      |
| Reverse recovery charge <sup>(‡)</sup>                 | $Q_{rr}$      |      | 20.5 |       | nC       |   |

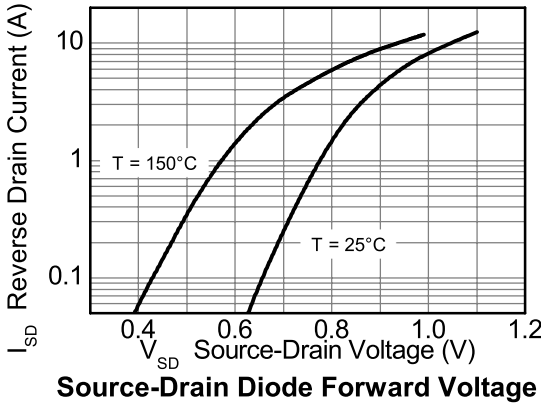
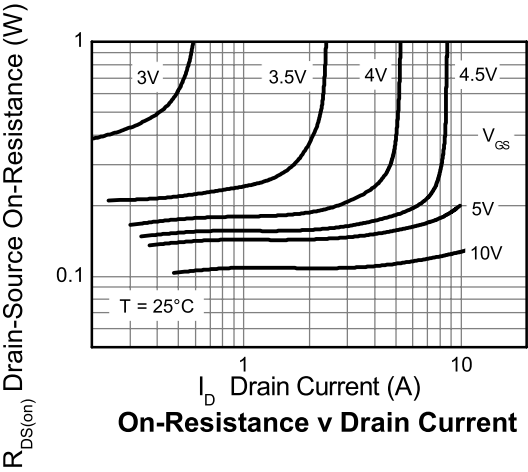
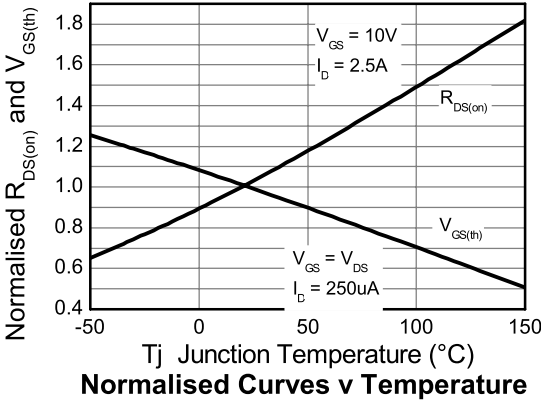
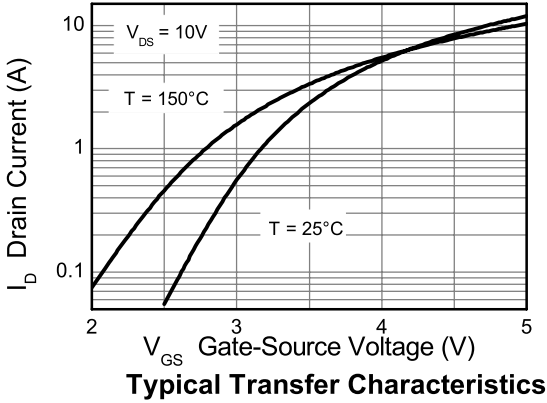
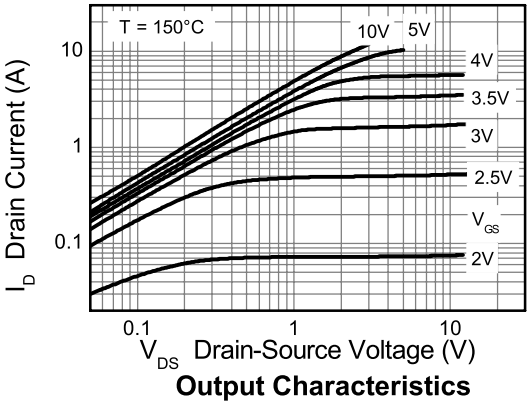
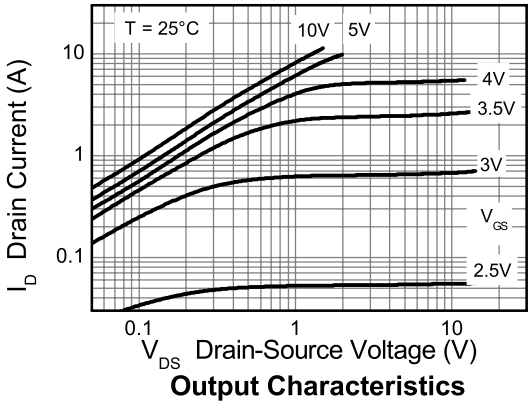
### NOTES:

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

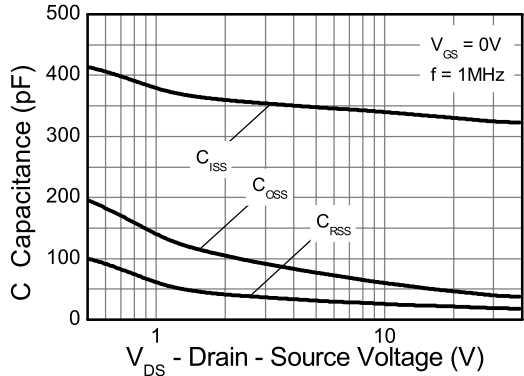
(†) Switching characteristics are independent of operating junction temperature.

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

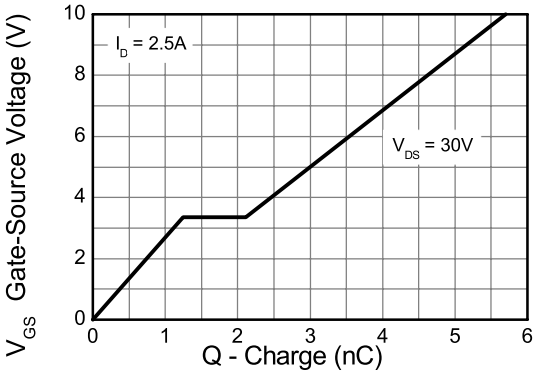
## Typical characteristics



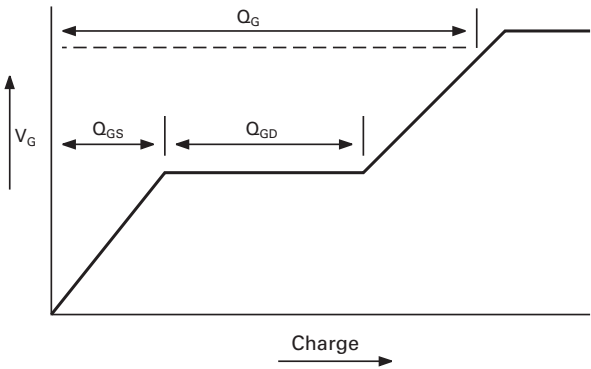
## Typical characteristics



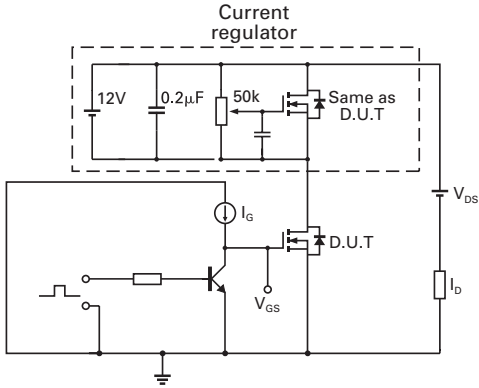
Capacitance v Drain-Source Voltage



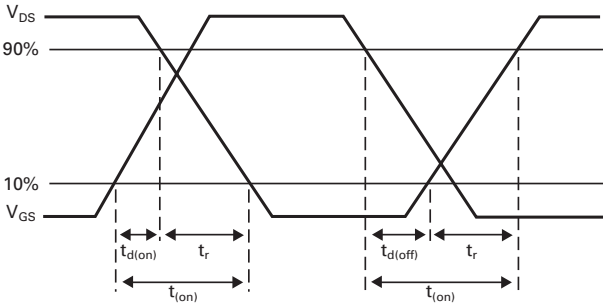
Gate-Source Voltage v Gate Charge



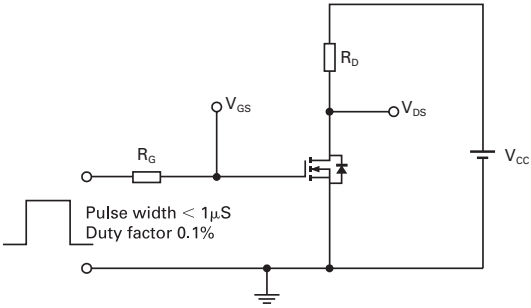
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms



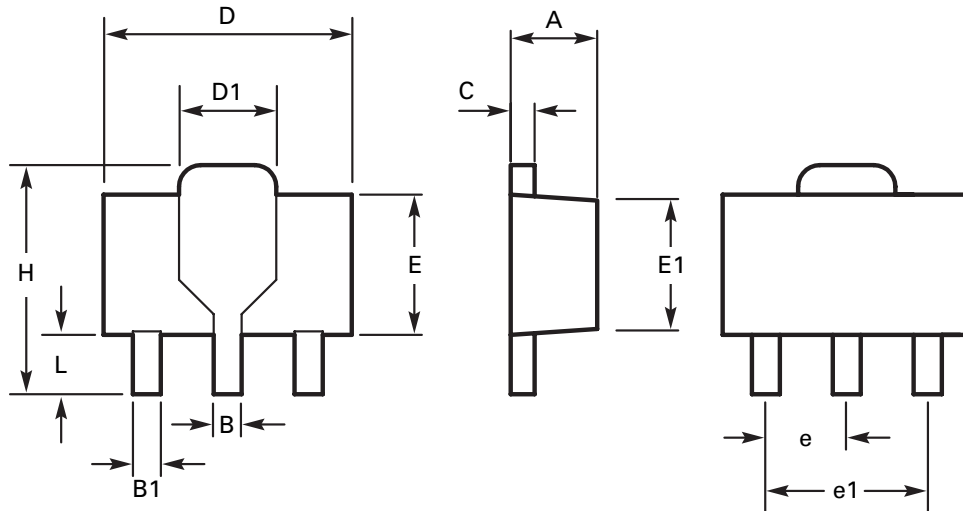
Switching time test circuit

# 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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