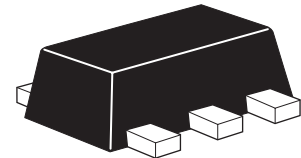


# ZXMN6A11Z

## 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       |

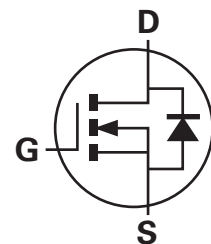


### Description

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

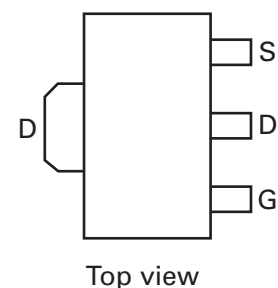


### Applications

- 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 @ $V_{GS} = 10V$ ; $T_{amb} = 25^{\circ}C^{(b)}$<br>@ $V_{GS} = 10V$ ; $T_{amb} = 70^{\circ}C^{(b)}$<br>@ $V_{GS} = 10V$ ; $T_{amb} = 25^{\circ}C^{(a)}$ | $I_D$          | 3.6<br>2.9<br>2.7 | A                    |
| 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 $T_{amb} = 25^{\circ}C^{(a)}$<br>Linear derating factor                                                                                                      | $P_D$          | 1.5<br>12         | W<br>mW/ $^{\circ}C$ |
| Power dissipation at $T_{amb} = 25^{\circ}C^{(b)}$<br>Linear derating factor                                                                                                      | $P_D$          | 2.6<br>21         | W<br>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  | $^{\circ}C/W$ |

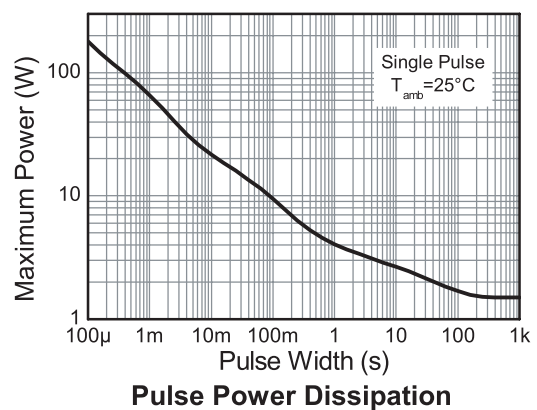
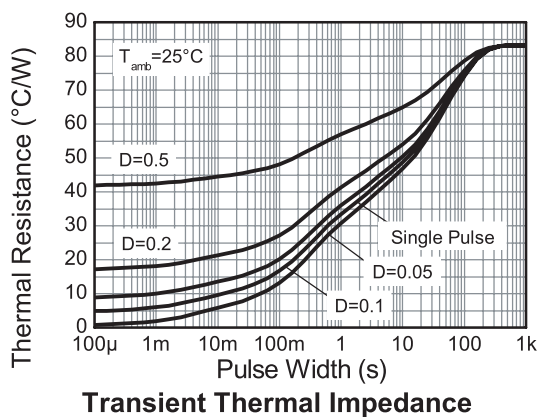
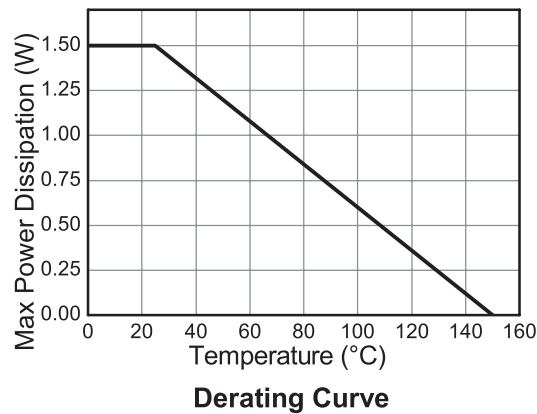
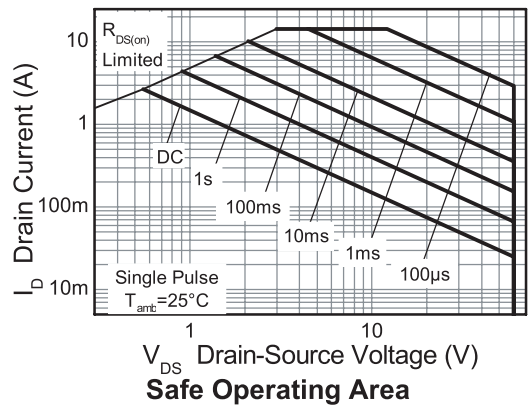
### NOTES:

(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                                                                                  |
|---------------------------------------------|----------------------|------|------|-------|------|---------------------------------------------------------------------------------------------|
| Static                                      |                      |      |      |       |      |                                                                                             |
| Drain-source breakdown voltage              | V <sub>(BR)DSS</sub> | 60   |      |       | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> =0V                                                 |
| Zero gate voltage drain current             | I <sub>DSS</sub>     |      |      | 1.0   | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> =0V                                                  |
| Gate-body leakage                           | I <sub>GSS</sub>     |      |      | 100   | nA   | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                  |
| Gate-source threshold voltage               | V <sub>GS(th)</sub>  | 1.0  |      |       | V    | I <sub>D</sub> = 250μA, V <sub>DS</sub> =V <sub>GS</sub>                                    |
| Static drain-source on-state resistance (*) | R <sub>DS(on)</sub>  |      |      | 0.120 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.5A                                                |
|                                             |                      |      |      | 0.180 | Ω    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 2A                                                 |
| Forward transconductance(*)(‡)              | g <sub>fs</sub>      |      | 4.9  |       | S    | V <sub>DS</sub> = 15V, I <sub>D</sub> = 2.5A                                                |
| Dynamic(‡)                                  |                      |      |      |       |      |                                                                                             |
| Input capacitance                           | C <sub>iss</sub>     |      | 330  |       | pF   | V <sub>DS</sub> = 40V, V <sub>GS</sub> =0V<br>f=1MHz                                        |
| Output capacitance                          | C <sub>oss</sub>     |      | 35.2 |       | pF   |                                                                                             |
| Reverse transfer capacitance                | C <sub>rss</sub>     |      | 17.1 |       | pF   |                                                                                             |
| Switching (†) (‡)                           |                      |      |      |       |      |                                                                                             |
| Turn-on-delay time                          | t <sub>d(on)</sub>   |      | 1.95 |       | ns   | V <sub>DD</sub> = 30V, I <sub>D</sub> = 2.5A<br>R <sub>G</sub> ≐6.0Ω, V <sub>GS</sub> = 10V |
| Rise time                                   | t <sub>r</sub>       |      | 3.5  |       | ns   |                                                                                             |
| Turn-off delay time                         | t <sub>d(off)</sub>  |      | 8.2  |       | ns   |                                                                                             |
| Fall time                                   | t <sub>f</sub>       |      | 4.6  |       | ns   |                                                                                             |
| Gate charge                                 | Q <sub>g</sub>       |      | 3.0  |       | nC   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 5V<br>I <sub>D</sub> = 2.5A                        |
| Total gate charge                           | Q <sub>g</sub>       |      | 5.7  |       | nC   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V<br>I <sub>D</sub> = 2.5A                       |
| Gate-source charge                          | Q <sub>gs</sub>      |      | 1.25 |       | nC   |                                                                                             |
| Gate drain charge                           | Q <sub>gd</sub>      |      | 0.86 |       | nC   |                                                                                             |
| Source-drain diode                          |                      |      |      |       |      |                                                                                             |
| Diode forward voltage(*)                    | V <sub>SD</sub>      |      | 0.85 | 0.95  | V    | T <sub>j</sub> =25°C, I <sub>S</sub> = 2.8A,<br>V <sub>GS</sub> =0V                         |
| Reverse recovery time(‡)                    | t <sub>rr</sub>      |      | 21.5 |       | ns   | T <sub>j</sub> =25°C, I <sub>S</sub> = 2.5A,<br>di/dt=100A/μs                               |
| Reverse recovery charge(‡)                  | Q <sub>rr</sub>      |      | 20.5 |       | nC   |                                                                                             |

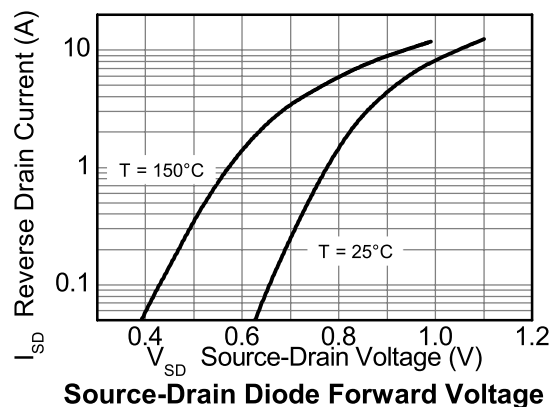
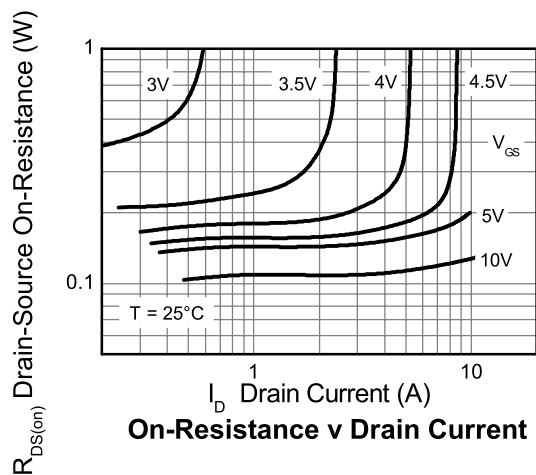
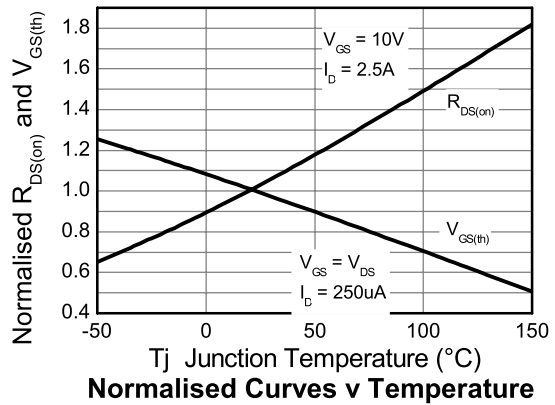
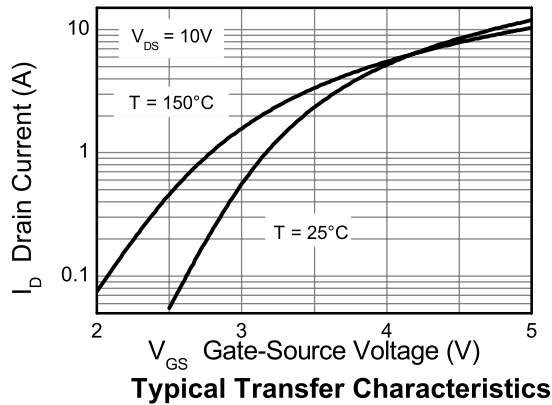
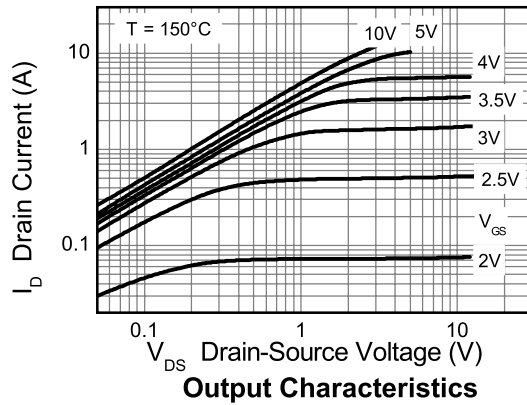
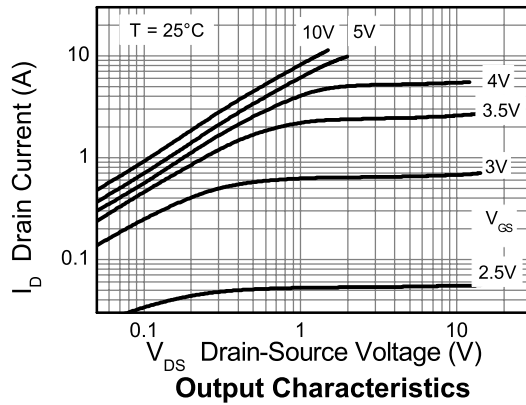
### NOTES:

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

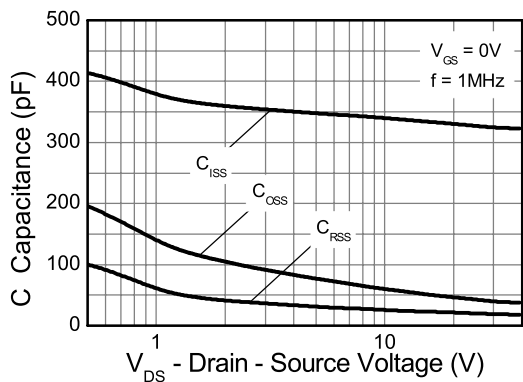
(†) Switching characteristics are independent of operating junction temperature.

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

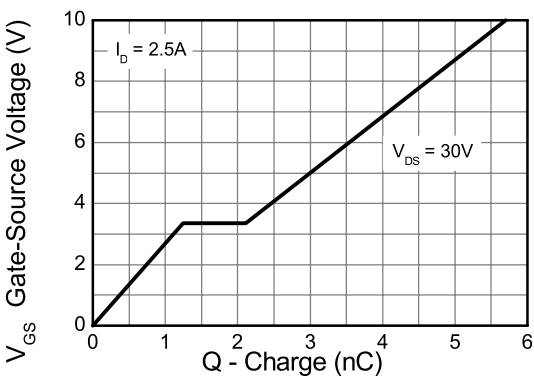
## Typical characteristics



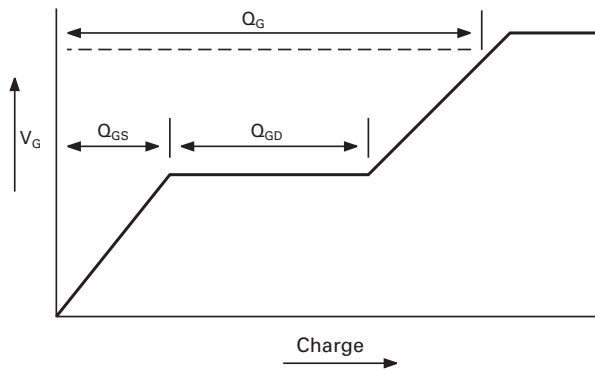
Typical characteristics



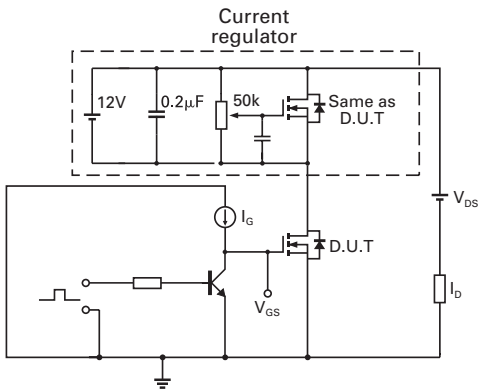
Capacitance v Drain-Source Voltage



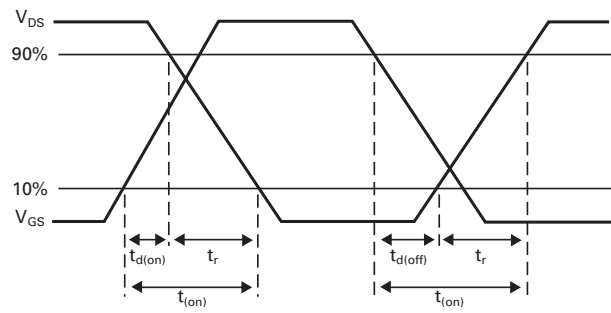
Gate-Source Voltage v Gate Charge



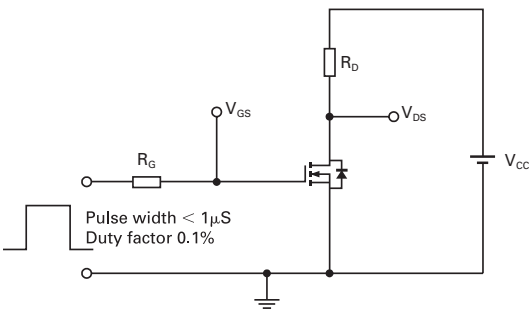
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms



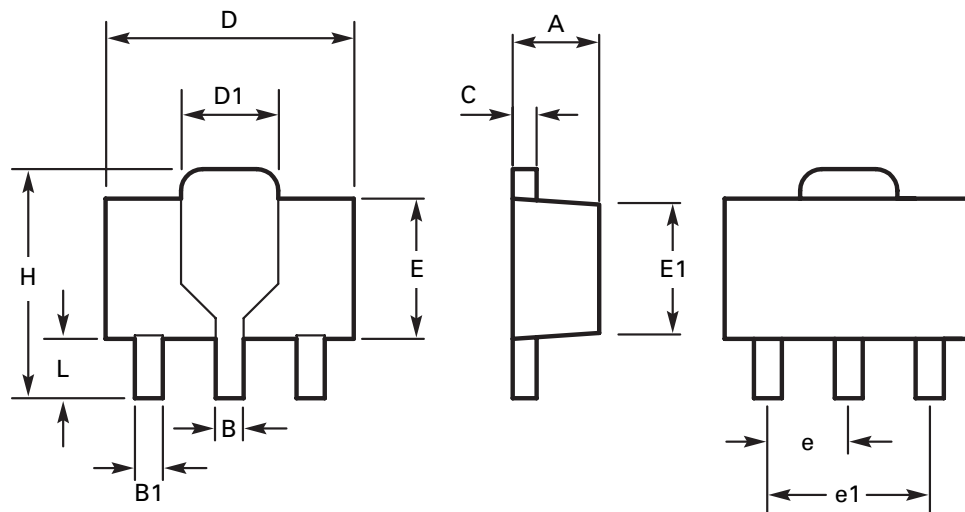
Switching time test circuit

# 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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