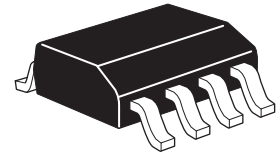


ZXMN6A09DN8

60V SO8 N-channel enhancement mode MOSFET

Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$ (Ω) | I_D (A) |
|---------------|---------------------------|-----------|
| 60 | 0.040 @ $V_{GS} = 10V$ | 5.6 |
| | 0.060 @ $V_{GS} = 4.5V$ | 4.6 |

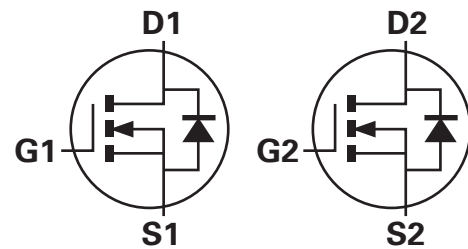


Description

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.

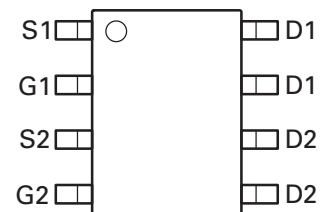
Features

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



Applications

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



Top view

Ordering information

| Device | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---------------|--------------------|-----------------|-------------------|
| ZXMN6A09DN8TA | 7 | 12 | 500 |

Device marking

ZXMN
6A09D

ZXMN6A09DN8

Absolute maximum ratings

| Parameter | Symbol | Limit | Unit |
|---|----------------|-------------|-----------------|
| Drain-source voltage | V_{DSS} | 60 | V |
| Gate-source voltage | V_{GS} | ± 20 | V |
| Continuous drain current @ $V_{GS}=10V$; $T_{amb}=25^{\circ}C^{(b)}$ | I_D | 5.6 | A |
| @ $V_{GS}=10V$; $T_{amb}=70^{\circ}C^{(b)}$ | | 4.5 | |
| @ $V_{GS}=10V$; $T_{amb}=25^{\circ}C^{(a)}$ | | 4.3 | |
| Pulsed drain current ^(c) | I_{DM} | 27 | A |
| Continuous source current (body diode) ^(b) | I_S | 3.5 | A |
| Pulsed source current (body diode) ^(c) | I_{SM} | 27 | A |
| Power dissipation at $T_{amb} = 25^{\circ}C^{(a)(d)}$ | P_D | 1.25 | W |
| Linear derating factor | | 10 | mW/ $^{\circ}C$ |
| Power dissipation at $T_{amb} = 25^{\circ}C^{(b)(e)}$ | P_D | 1.8 | W |
| Linear derating factor | | 14 | mW/ $^{\circ}C$ |
| Power dissipation at $T_{amb} = 25^{\circ}C^{(b)(d)}$ | P_D | 2.1 | W |
| Linear derating factor | | 17 | mW/ $^{\circ}C$ |
| Operating and storage temperature range | T_j, T_{stg} | -55 to +150 | $^{\circ}C$ |

Thermal resistance

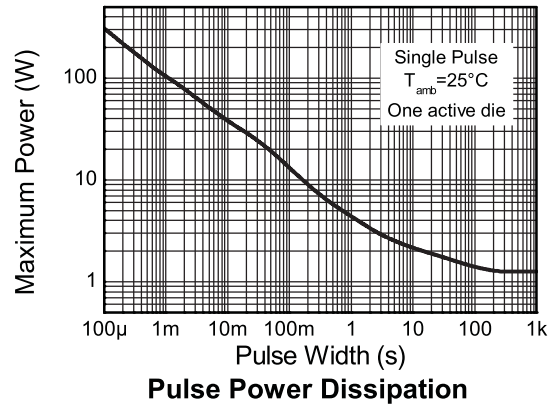
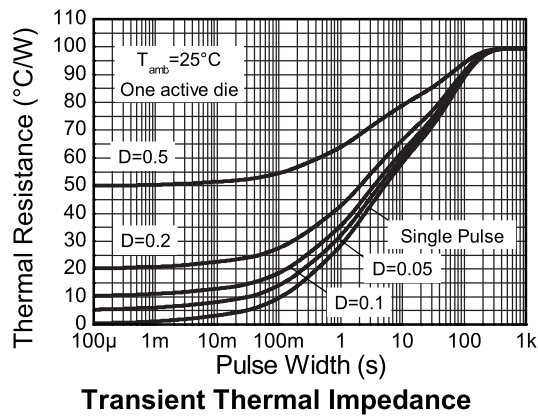
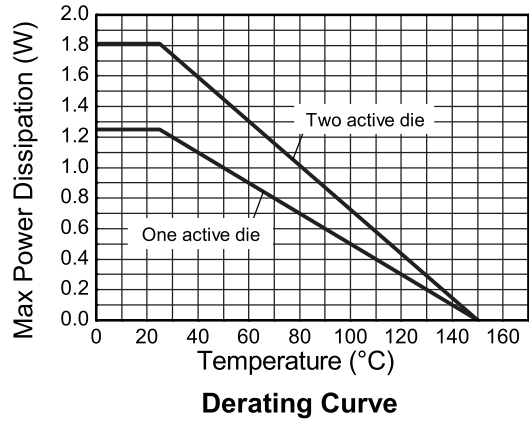
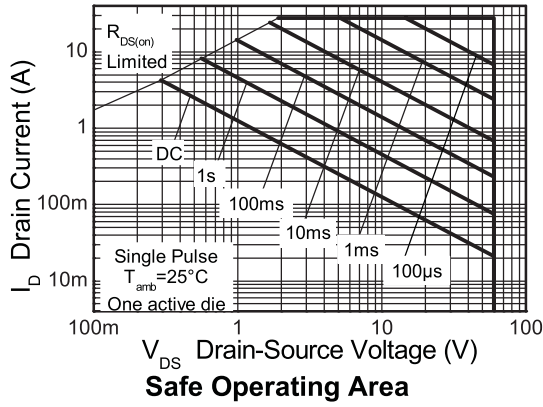
| Parameter | Symbol | Limit | Unit |
|---------------------------------------|-----------------|-------|---------------|
| Junction to ambient ^{(a)(d)} | $R_{\theta JA}$ | 100 | $^{\circ}C/W$ |
| Junction to ambient ^{(a)(e)} | $R_{\theta JA}$ | 70 | $^{\circ}C/W$ |
| Junction to ambient ^{(b)(d)} | $R_{\theta JA}$ | 60 | $^{\circ}C/W$ |

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 $t \leq 10$ sec.
- (c) Repetitive rating - 25mm x 25mm FR4 PCB, $D=0.02$, pulse width 300 μ s - pulse width limited by maximum junction temperature.
- (d) For a dual device with one active die.
- (e) For a device with two active die running at equal power.

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Characteristics



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

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---------------|------|------|-------|---------------|--|
| Static | | | | | | |
| 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 | μA | $V_{DS} = 60\text{V}$, $V_{GS} = 0\text{V}$ |
| 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 | | 3.0 | V | $I_D = 250\mu\text{A}$, $V_{DS} = V_{GS}$ |
| Static drain-source on-state resistance (*) | $R_{DS(on)}$ | | | 0.040 | Ω | $V_{GS} = 10\text{V}$, $I_D = 8.2\text{A}$ |
| | | | | 0.060 | Ω | $V_{GS} = 4.5\text{V}$, $I_D = 7.4\text{A}$ |
| Forward transconductance(*) (‡) | g_{fs} | | 15 | | S | $V_{DS} = 15\text{V}$, $I_D = 8.2\text{A}$ |
| Dynamic (‡) | | | | | | |
| Input capacitance | C_{iss} | | 1407 | | pF | $V_{DS} = 40\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ |
| Output capacitance | C_{oss} | | 121 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 59 | | pF | |
| Switching (†) (‡) | | | | | | |
| Turn-on-delay time | $t_{d(on)}$ | | 4.9 | | ns | $V_{DD} = 15\text{V}$, $I_D = 3.5\text{A}$ $R_G \approx 6.0\Omega$, $V_{GS} = 10\text{V}$ |
| Rise time | t_r | | 5.0 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 25.3 | | ns | |
| Fall time | t_f | | 4.6 | | ns | |
| Total gate charge | Q_g | | 12.4 | | nC | $V_{DS} = 15\text{V}$, $V_{GS} = 5\text{V}$ $I_D = 3.5\text{A}$ |
| Total gate charge | Q_g | | 24.2 | | nC | $V_{DS} = 15\text{V}$, $V_{GS} = 5\text{V}$ $I_D = 3.5\text{A}$ |
| Gate-source charge | Q_{gs} | | 5.2 | | nC | |
| Gate drain charge | Q_{gd} | | 3.5 | | nC | |
| Source-drain diode | | | | | | |
| Diode forward voltage(*) | 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(‡) | t_{rr} | | 26.3 | | ns | $T_j = 25^{\circ}\text{C}$, $I_S = 3.5\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ |
| Reverse recovery charge(‡) | Q_{rr} | | 26.6 | | nC | |

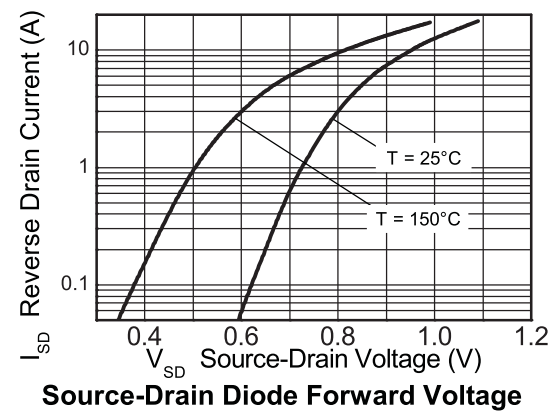
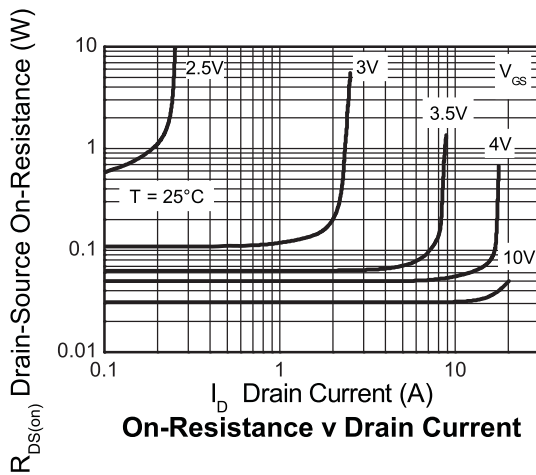
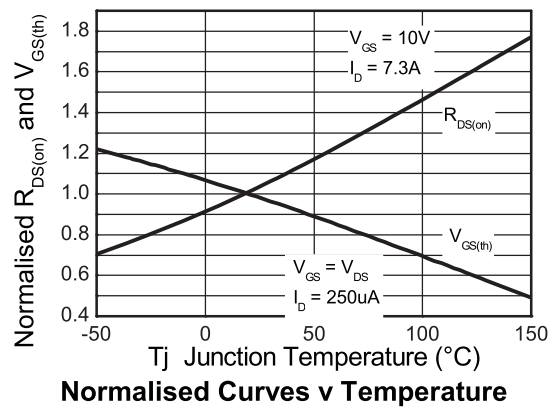
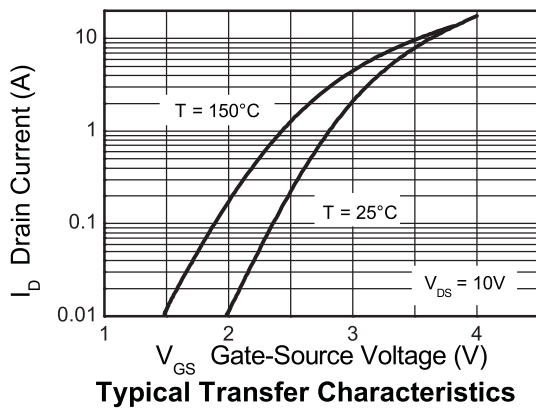
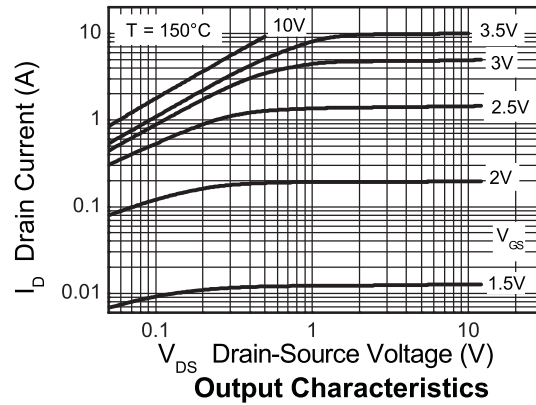
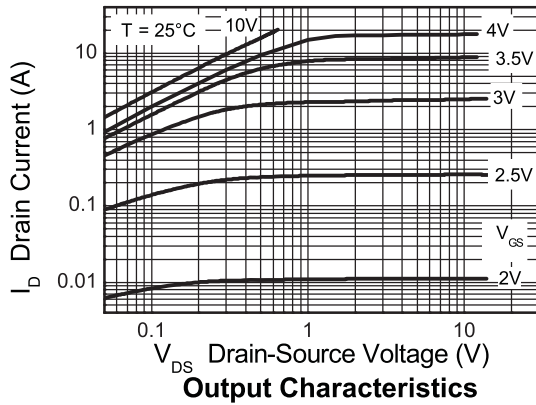
NOTES:

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

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

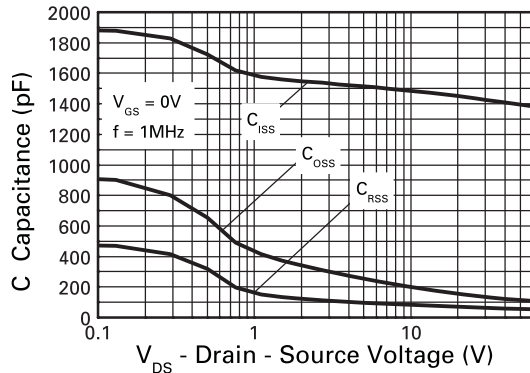
(‡) For design aid only, not subject to production testing.

Typical characteristics

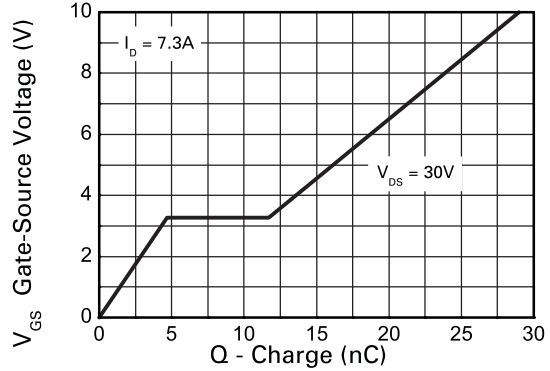


ZXMN6A09DN8

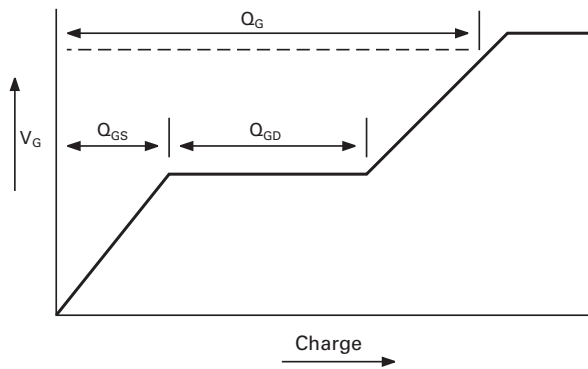
Typical characteristics



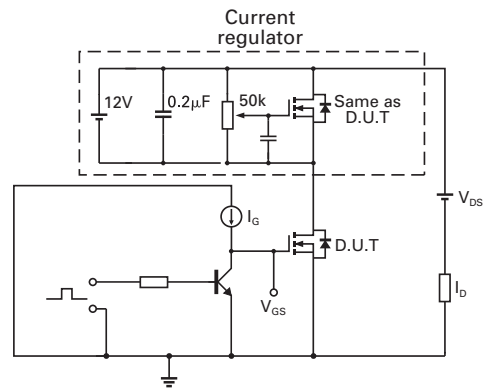
Capacitance v Drain-Source Voltage



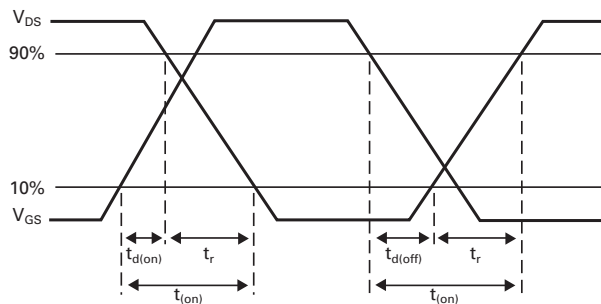
Gate-Source Voltage v Gate Charge



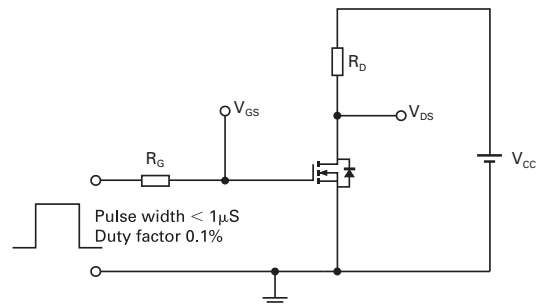
Basic gate charge waveform



Gate charge test circuit



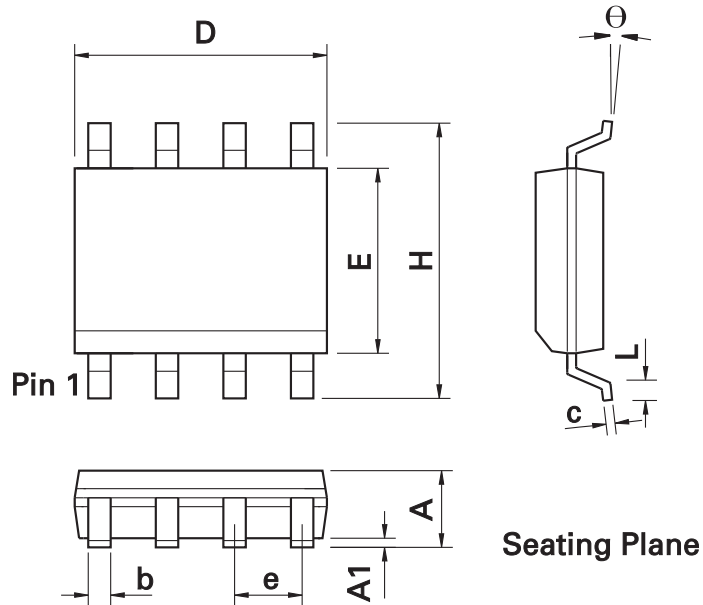
Switching time waveforms



Switching time test circuit

ZXMN6A09DN8

Package outline - SO8



| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|------|-----|-----------|-------|-------------|------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.053 | 0.069 | 1.35 | 1.75 | e | 0.050 BSC | | 1.27 BSC | |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 | b | 0.013 | 0.020 | 0.33 | 0.51 |
| D | 0.189 | 0.197 | 4.80 | 5.00 | c | 0.008 | 0.010 | 0.19 | 0.25 |
| H | 0.228 | 0.244 | 5.80 | 6.20 | Θ | 0° | 8° | 0° | 8° |
| E | 0.150 | 0.157 | 3.80 | 4.00 | h | 0.010 | 0.020 | 0.25 | 0.50 |
| L | 0.016 | 0.050 | 0.40 | 1.27 | - | - | - | - | - |

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

ZXMN6A09DN8

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| | |
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| | |
|-----------------------|---|
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