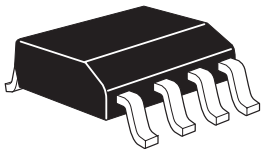
# ZXMHC3A01T8

## COMPLEMENTARY 30V ENHANCEMENT MODE MOSFET H-BRIDGE

### SUMMARY

**N-Channel = $V_{(BR)DSS}$= 30V : $R_{DS(on)}$= 0.12Ω; $I_D$= 3.1A**
**P-Channel = $V_{(BR)DSS}$= -30V : $R_{DS(on)}$= 0.21Ω; $I_D$= -2.3A**



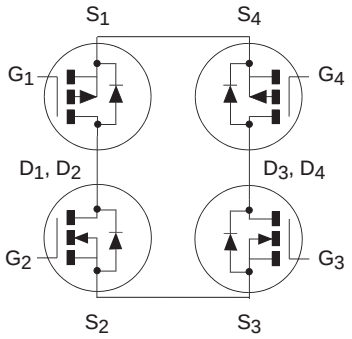
**SM8**

### 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
- Single SM-8 surface mount package




### APPLICATIONS

- Single phase DC fan motor drive

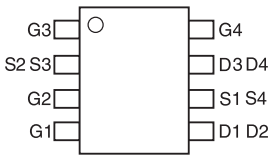
### ORDERING INFORMATION

| DEVICE | REEL SIZE | TAPE WIDTH | QUANTITY PER REEL |
|---|---|---|---|
| ZXMHC3A01T8TA | 7” | 12mm | 1,000 units |
| ZXMHC3A01T8TC | 13” | 12mm | 4,000 units |

### DEVICE MARKING

- ZXMH
  C3A01

### PINOUT




Top View

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | N-Channel | P-channel | UNIT |
|---|---|---|---|---|
| Drain-source voltage | $V_{DSS}$ | 30 | -30 | V |
| Gate-source voltage | $V_{GS}$ | ±20 | ±20 | V |
| Continuous drain current ($V_{GS}$= 10V; $T_A$=25°C)[b][d] | $I_D$ | 3.1 | -2.3 | A |
| ($V_{GS}$= 10V; $T_A$=70°C) [b][d] | | 2.5 | -1.8 | A |
| ($V_{GS}$= 10V; $T_A$=25°C) [a][d] | | 2.7 | -2.0 | A |
| Pulsed drain current [c] | $I_{DM}$ | 14.5 | -10.8 | A |
| Continuous source current (body diode) [b] | $I_S$ | 2.3 | -2.2 | A |
| Pulsed source current (body diode) [c] | $I_{SM}$ | 14.5 | -10.8 | A |
| Power dissipation at $T_A$ =25°C [a] [d] | $P_D$ | 1.3 | | W |
| Linear derating factor | | 10.4 | | mW/°C |
| Power dissipation at $T_A$ =25°C [b] [d] | $P_D$ | 1.7 | | W |
| Linear derating factor | | 13.6 | | mW/°C |
| Operating and storage temperature range | $T_j$, $T_{stg}$ | -55 to +150 | | °C |

## THERMAL RESISTANCE

| PARAMETER | SYMBOL | VALUE | UNIT |
|---|---|---|---|
| Junction to ambient [a] [d] | $R_{\theta JA}$ | 96 | °C/W |
| Junction to ambient [b] [d] | $R_{\theta JA}$ | 73 | °C/W |

**NOTES**

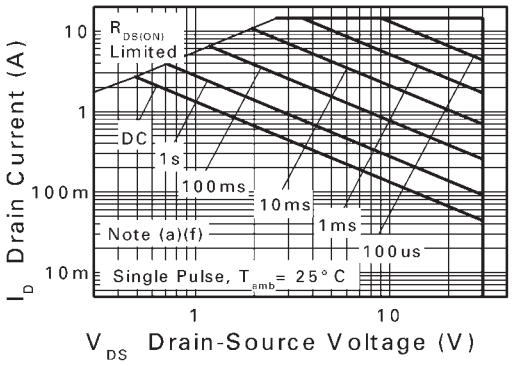
(a) For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions.

(b) For a device surface mounted on FR4 PCB measured at t ≤10 sec.

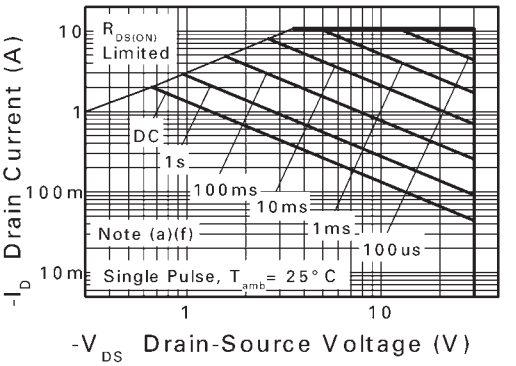
(c) Repetitive rating on 50mm x 50mm x 1.6mm FR4, D= 0.02, pulse width 300μS - pulse width limited by maximum junction temperature. Refer to transient thermal impedance graph.

(d) For device with one active die.

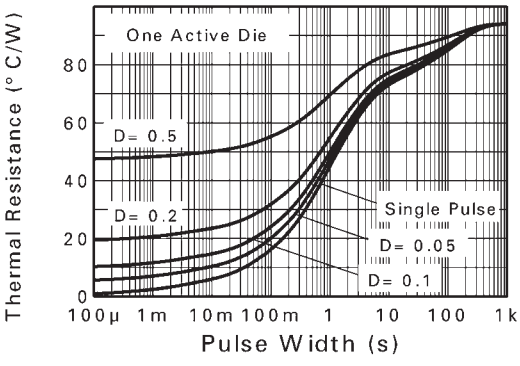
## CHARACTERISTICS



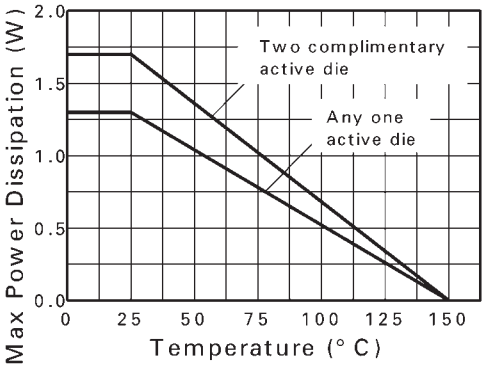

**N-channel Safe Operating Area**



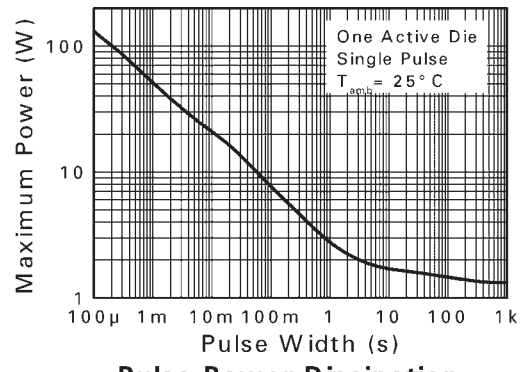

**P-channel Safe Operating Area**




**Transient Thermal Impedance**




**Derating Curve**




**Pulse Power Dissipation**

## N-channel

**ELECTRICAL CHARACTERISTICS** (at $T_{amb}$ = 25°C unless otherwise stated)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|---|---|---|---|---|---|---|
| **STATIC** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 30 | | | V | $I_D$= 250μA, $V_{GS}$=0V |
| Zero gate voltage drain current | $I_{DSS}$ | | | 1.0 | μA | $V_{DS}$=30V, $V_{GS}$=0V |
| Gate-body leakage | $I_{GSS}$ | | | 100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| Gate-source threshold voltage | $V_{GS(th)}$ | 1.0 | | 3.0 | V | $I_D$= 250μA, $V_{DS}$=$V_{GS}$ |
| Static drain-source on-state resistance (1) | $R_{DS(on)}$ | | | 0.12<br>0.18 | Ω<br>Ω | $V_{GS}$= 10V, $I_D$= 2.5A<br>$V_{GS}$= 4.5V, $I_D$= 2.0A |
| Forward transconductance (1) (3) | $g_{fs}$ | | 3.5 | | S | $V_{DS}$=4.5V, $I_D$= 2.5A |
| **DYNAMIC (3)** | | | | | | |
| Input capacitance | $C_{iss}$ | | 190 | | pF | $V_{DS}$= 25V, $V_{GS}$=0V<br>f=1MHz |
| Output capacitance | $C_{oss}$ | | 38 | | pF | |
| Reverse transfer capacitance | $C_{rss}$ | | 20 | | pF | |
| **SWITCHING(2) (3)** | | | | | | |
| Turn-on-delay time | $t_{d(on)}$ | | 1.7 | | ns | $V_{DD}$= 15V, $I_D$= 2.5A<br>$R_G \cong 6.0\Omega$, $V_{GS}$= 10V |
| Rise time | $t_r$ | | 2.3 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 6.6 | | ns | |
| Fall time | $t_f$ | | 2.9 | | ns | |
| Total gate charge | $Q_g$ | | 3.9 | | nC | $V_{DS}$= 15V, $V_{GS}$= 10V<br>$I_D$= 2.5A |
| Gate-source charge | $Q_{gs}$ | | 0.6 | | nC | |
| Gate drain charge | $Q_{gd}$ | | 0.9 | | nC | |
| **SOURCE-DRAIN DIODE** | | | | | | |
| Diode forward voltage (1) | $V_{SD}$ | | | 0.95 | V | $T_j$=25°C, $I_S$= 1.7A, $V_{GS}$=0V |
| Reverse recovery time (3) | $t_{rr}$ | | 17.7 | | ns | $T_j$=25°C, $I_S$= 2.5A, di/dt=100A/μs |
| Reverse recovery charge (3) | $Q_{rr}$ | | 13.0 | | nC | |

**NOTES**

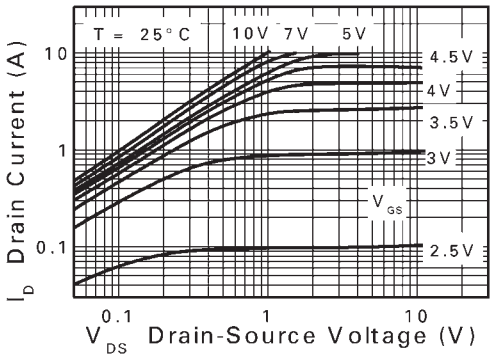
(1) Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%.

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

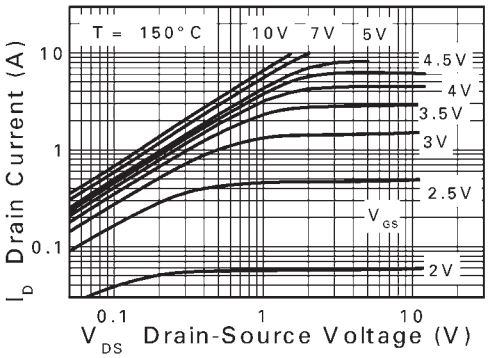
(3) For design aid only, not subject to production testing.

**N-channel**

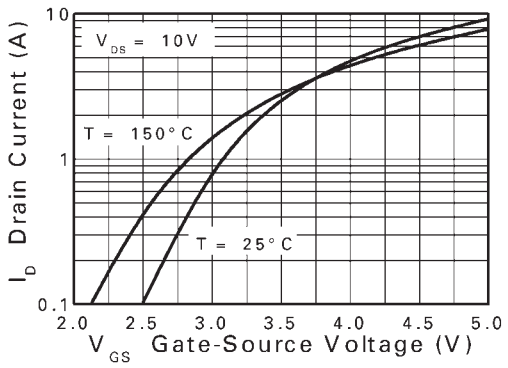
## TYPICAL CHARACTERISTICS



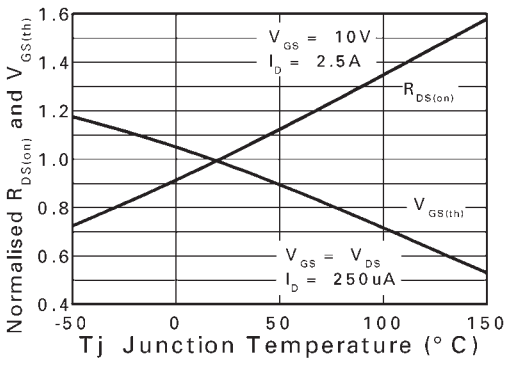

**Output Characteristics**



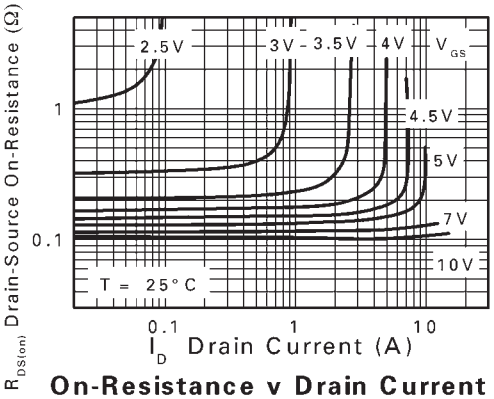

**Output Characteristics**



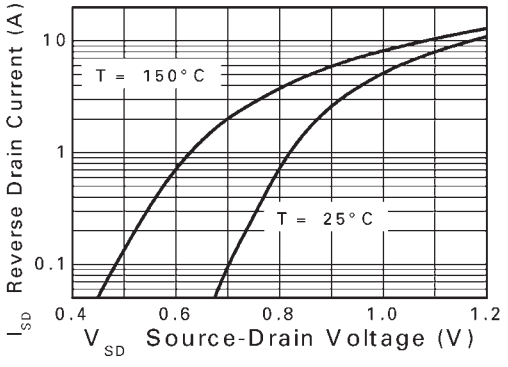

**Typical Transfer Characteristics**




**Normalised Curves v Temperature**



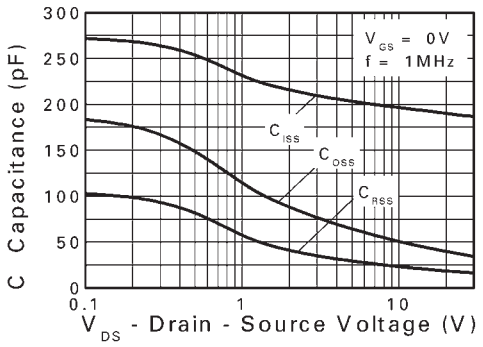

**On-Resistance v Drain Current**



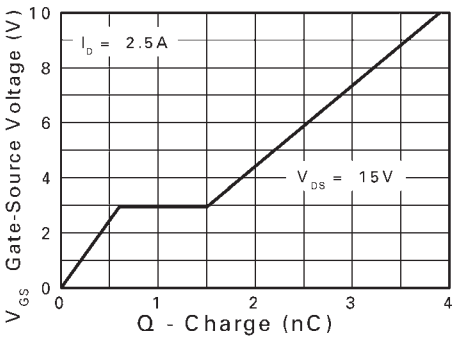

**Source-Drain Diode Forward Voltage**

**N-channel**

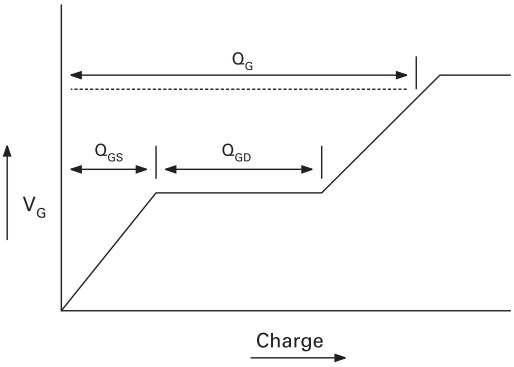
## TYPICAL CHARACTERISTICS



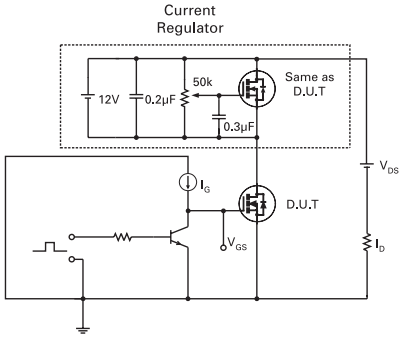

**Capacitance v Drain-Source Voltage**



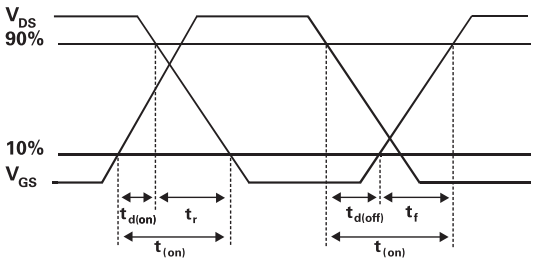

**Gate-Source Voltage v Gate Charge**



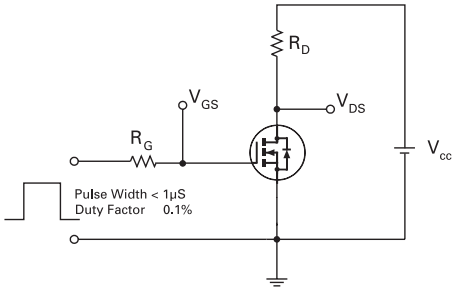

**Basic Gate Charge Waveform**




**Gate Charge Test Circuit**




**Switching Time Waveforms**




**Switching Time Test Circuit**

## P-channel

**ELECTRICAL CHARACTERISTICS** (at $T_{amb}$ = 25°C unless otherwise stated)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|---|---|---|---|---|---|---|
| **STATIC** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | -30 | | | V | $I_D$= -250μA, $V_{GS}$=0V |
| Zero gate voltage drain current | $I_{DSS}$ | | | -1.0 | μA | $V_{DS}$= -30V, $V_{GS}$=0V |
| Gate-body leakage | $I_{GSS}$ | | | 100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| Gate-source threshold voltage | $V_{GS(th)}$ | -1.0 | | -3.0 | V | $I_D$= -250μA, $V_{DS}$=$V_{GS}$ |
| Static drain-source on-state resistance (1) | $R_{DS(on)}$ | | | 0.21<br>0.33 | Ω<br>Ω | $V_{GS}$= -10V, $I_D$= -1.4A<br>$V_{GS}$= -4.5V, $I_D$= -1.1A |
| Forward transconductance (1) (3) | $g_{fs}$ | | 2.5 | | S | $V_{DS}$= -15V, $I_D$= -1.4A |
| **DYNAMIC (3)** | | | | | | |
| Input capacitance | $C_{iss}$ | | 204 | | pF | $V_{DS}$= -15V, $V_{GS}$=0V |
| Output capacitance | $C_{oss}$ | | 39.8 | | pF | f=1MHz |
| Reverse transfer capacitance | $C_{rss}$ | | 25.8 | | pF | |
| **SWITCHING(2) (3)** | | | | | | |
| Turn-on-delay time | $t_{d(on)}$ | | 1.2 | | ns | $V_{DD}$= -15V, $I_D$= -1A |
| Rise time | $t_r$ | | 2.3 | | ns | $R_G \cong 6.0\Omega$, $V_{GS}$= -10V |
| Turn-off delay time | $t_{d(off)}$ | | 12.1 | | ns | |
| Fall time | $t_f$ | | 7.5 | | ns | |
| Total gate charge | | | 2.6 | | nC | $V_{DS}$= -15V, $V_{GS}$= -5V<br>$I_D$= -1.4A |
| Total gate charge | $Q_g$ | | 5.2 | | nC | $V_{DS}$= -15V, $V_{GS}$= -10V |
| Gate-source charge | $Q_{gs}$ | | 0.7 | | nC | $I_D$= -1.4A |
| Gate drain charge | $Q_{gd}$ | | 0.9 | | nC | |
| **SOURCE-DRAIN DIODE** | | | | | | |
| Diode forward voltage (1) | $V_{SD}$ | | -0.85 | -0.95 | V | $T_j$=25°C, $I_S$= -1.1A, $V_{GS}$=0V |
| Reverse recovery time (3) | $t_{rr}$ | | 19 | | ns | $T_j$=25°C, $I_S$= -0.95A, |
| Reverse recovery charge (3) | $Q_{rr}$ | | 15 | | nC | di/dt=100A/μs |

**NOTES**

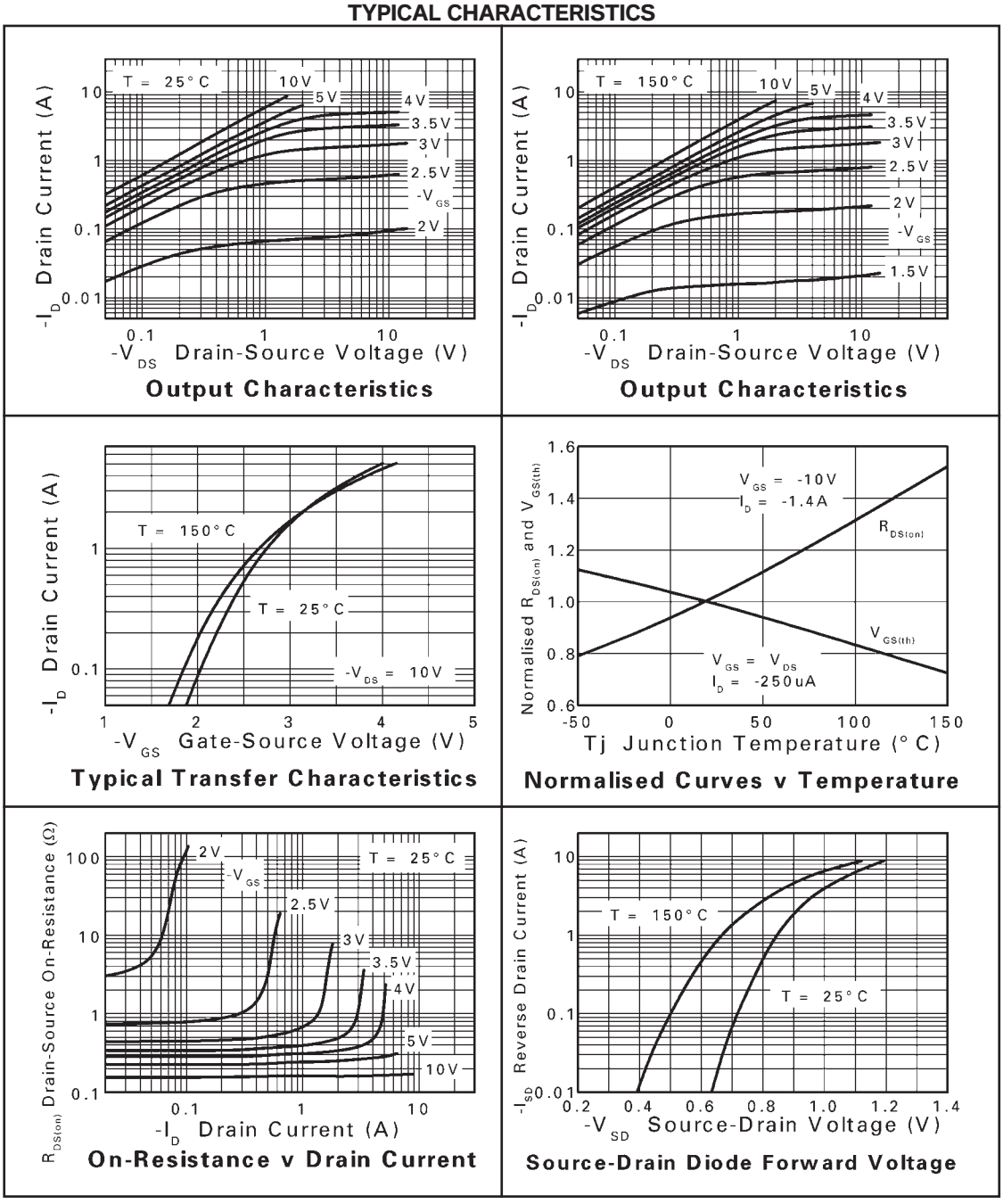
(1) Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%.

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

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

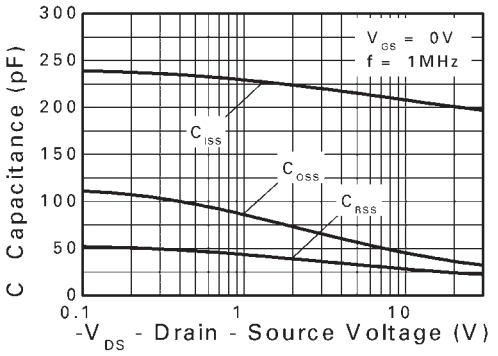
**P-channel**

**TYPICAL CHARACTERISTICS**

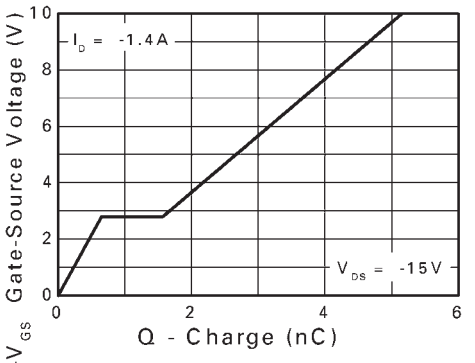


**P-channel**

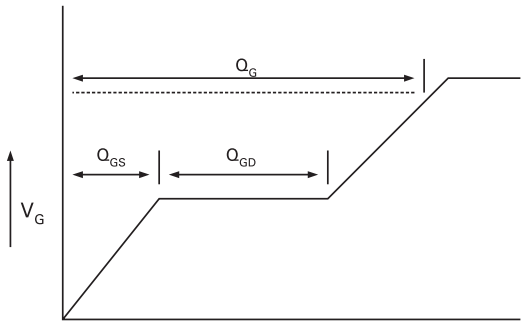
## TYPICAL CHARACTERISTICS



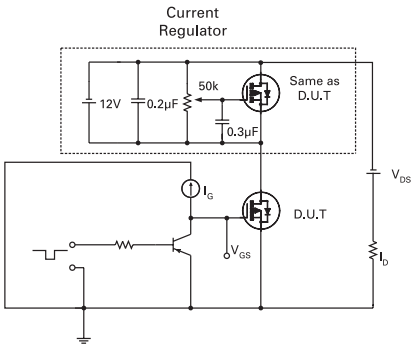

Capacitance v Drain-Source Voltage



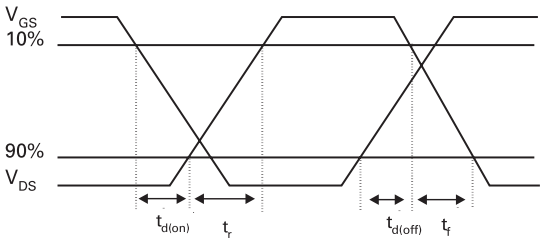

Gate-Source Voltage v Gate Charge



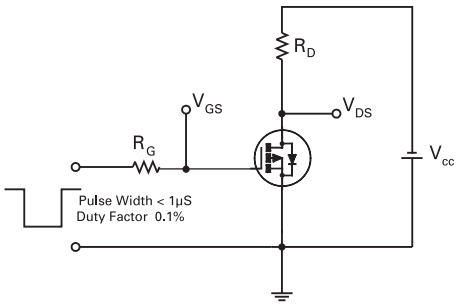

Basic Gate Charge Waveform




Gate Charge Test Circuit



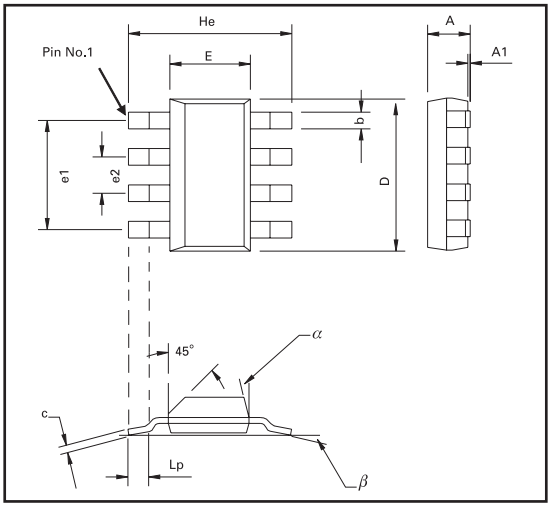

Switching Time Waveforms




Switching Time Test Circuit

# ZXMHC3A01T8

## PACKAGE OUTLINE




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

## PACKAGE DIMENSIONS

| DIM | Millimeters | | | Inches | | | DIM | Millimeters | | | Inches | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Typ. | Min | Max | Typ. | | Min | Max | Typ. | Min | Max | Typ. |
| A | - | 1.7 | - | - | 0.067 | - | e1 | - | - | 4.59 | - | - | 0.1807 |
| A1 | 0.02 | 0.1 | - | 0.008 | 0.004 | - | e2 | - | - | 1.53 | - | - | 0.0602 |
| b | - | - | 0.7 | - | - | 0.0275 | He | 6.7 | 7.3 | - | 0.264 | 0.287 | - |
| c | 0.24 | 0.32 | - | 0.009 | 0.013 | - | Lp | 0.9 | - | - | 0.035 | - | - |
| D | 6.3 | 6.7 | - | 0.248 | 0.264 | - | α | - | 15° | - | - | 15° | - |
| E | 3.3 | 3.7 | - | 0.130 | 0.145 | - | β | - | - | 10° | - | - | 10° |

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