

# ZXMHC3A01T8

## COMPLEMENTARY 30V ENHANCEMENT MODE MOSFET H-BRIDGE

### SUMMARY

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

### 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

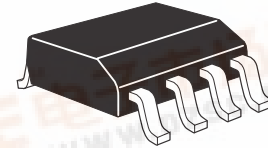
- Single phase DC fan motor drive

### ORDERING INFORMATION

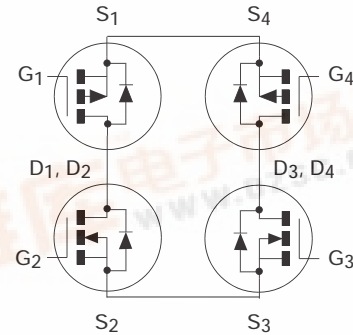
DEVICE	REEL SIZE	TAPE WIDTH	QUANTITY PER REEL
ZXMHC3A01T8TA	7"	12mm	1,000 units
ZXMHC3A01T8TC	13"	12mm	4,000 units

### DEVICE MARKING

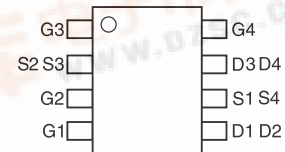
- ZXMH  
C3A01



SM8



### PINOUT



Top View



# ZXMHC3A01T8

## ABSOLUTE MAXIMUM RATINGS

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

## THERMAL RESISTANCE

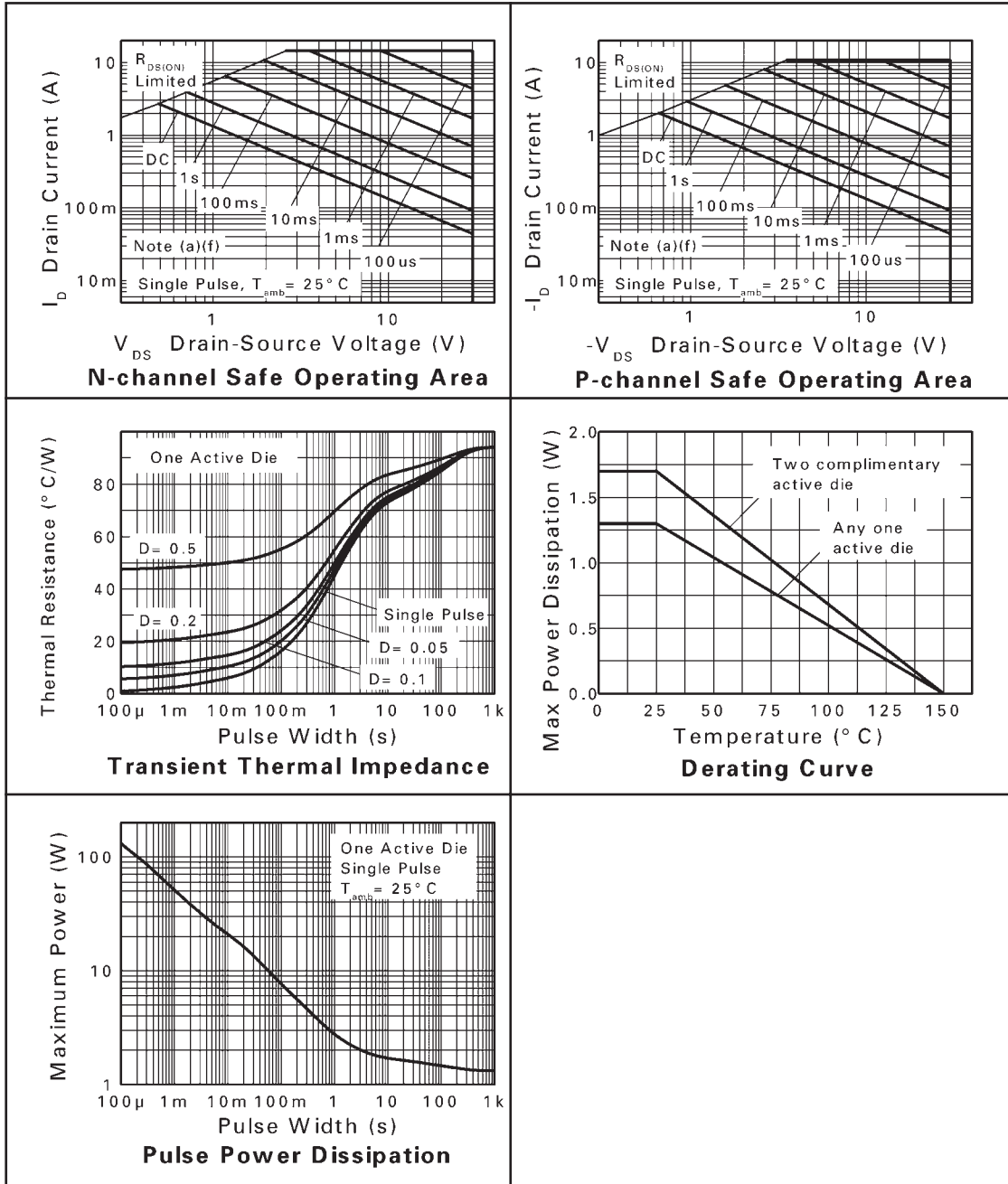
PARAMETER	SYMBOL	VALUE	UNIT
Junction to ambient <sup>(a)(d)</sup>	$R_{\theta JA}$	96	$^\circ C/W$
Junction to ambient <sup>(b)(d)</sup>	$R_{\theta JA}$	73	$^\circ C/W$

### 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  $t \leq 10$  sec.  
 (c) Repetitive rating on 50mm x 50mm x 1.6mm FR4,  $D = 0.02$ , pulse width 300 $\mu$ S - pulse width limited by maximum junction temperature. Refer to transient thermal impedance graph.  
 (d) For device with one active die.

# ZXMHC3A01T8

## CHARACTERISTICS



# ZXMHC3A01T8

## N-channel

### ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
<b>STATIC</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	30			V	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero gate voltage drain current	$I_{DSS}$			1.0	$\mu\text{A}$	$V_{DS} = 30\text{V}$ , $V_{GS} = 0\text{V}$
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 <sup>(1)</sup>	$R_{DS(on)}$			0.12	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 2.5\text{A}$
				0.18	$\Omega$	$V_{GS} = 4.5\text{V}$ , $I_D = 2.0\text{A}$
Forward transconductance <sup>(1) (3)</sup>	$g_{fs}$		3.5		S	$V_{DS} = 4.5\text{V}$ , $I_D = 2.5\text{A}$
<b>DYNAMIC <sup>(3)</sup></b>						
Input capacitance	$C_{iss}$		190		pF	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	$C_{oss}$		38		pF	
Reverse transfer capacitance	$C_{rss}$		20		pF	
<b>SWITCHING <sup>(2) (3)</sup></b>						
Turn-on-delay time	$t_{d(on)}$		1.7		ns	$V_{DD} = 15\text{V}$ , $I_D = 2.5\text{A}$ $R_G \equiv 6.0\Omega$ , $V_{GS} = 10\text{V}$
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	$V_{DS} = 15\text{V}$ , $V_{GS} = 10\text{V}$ $I_D = 2.5\text{A}$
Gate-source charge	$Q_{gs}$		0.6		nC	
Gate drain charge	$Q_{gd}$		0.9		nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode forward voltage <sup>(1)</sup>	$V_{SD}$			0.95	V	$T_J = 25^{\circ}\text{C}$ , $I_S = 1.7\text{A}$ , $V_{GS} = 0\text{V}$
Reverse recovery time <sup>(3)</sup>	$t_{rr}$		17.7		ns	$T_J = 25^{\circ}\text{C}$ , $I_S = 2.5\text{A}$ ,
Reverse recovery charge <sup>(3)</sup>	$Q_{rr}$		13.0		nC	$di/dt = 100\text{A}/\mu\text{s}$

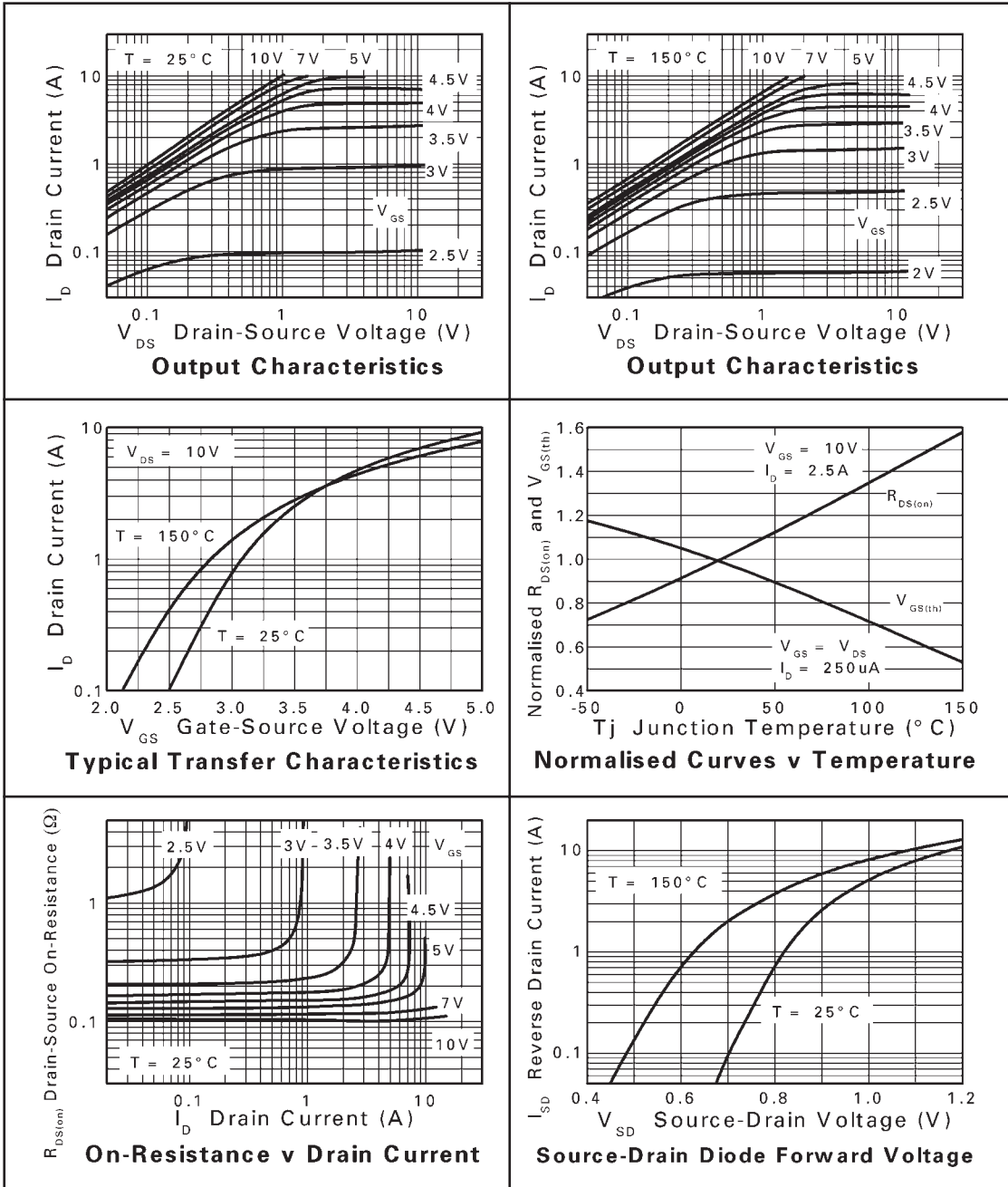
#### NOTES

- (1) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .  
 (2) Switching characteristics are independent of operating junction temperature.  
 (3) For design aid only, not subject to production testing.

# ZXMHC3A01T8

N-channel

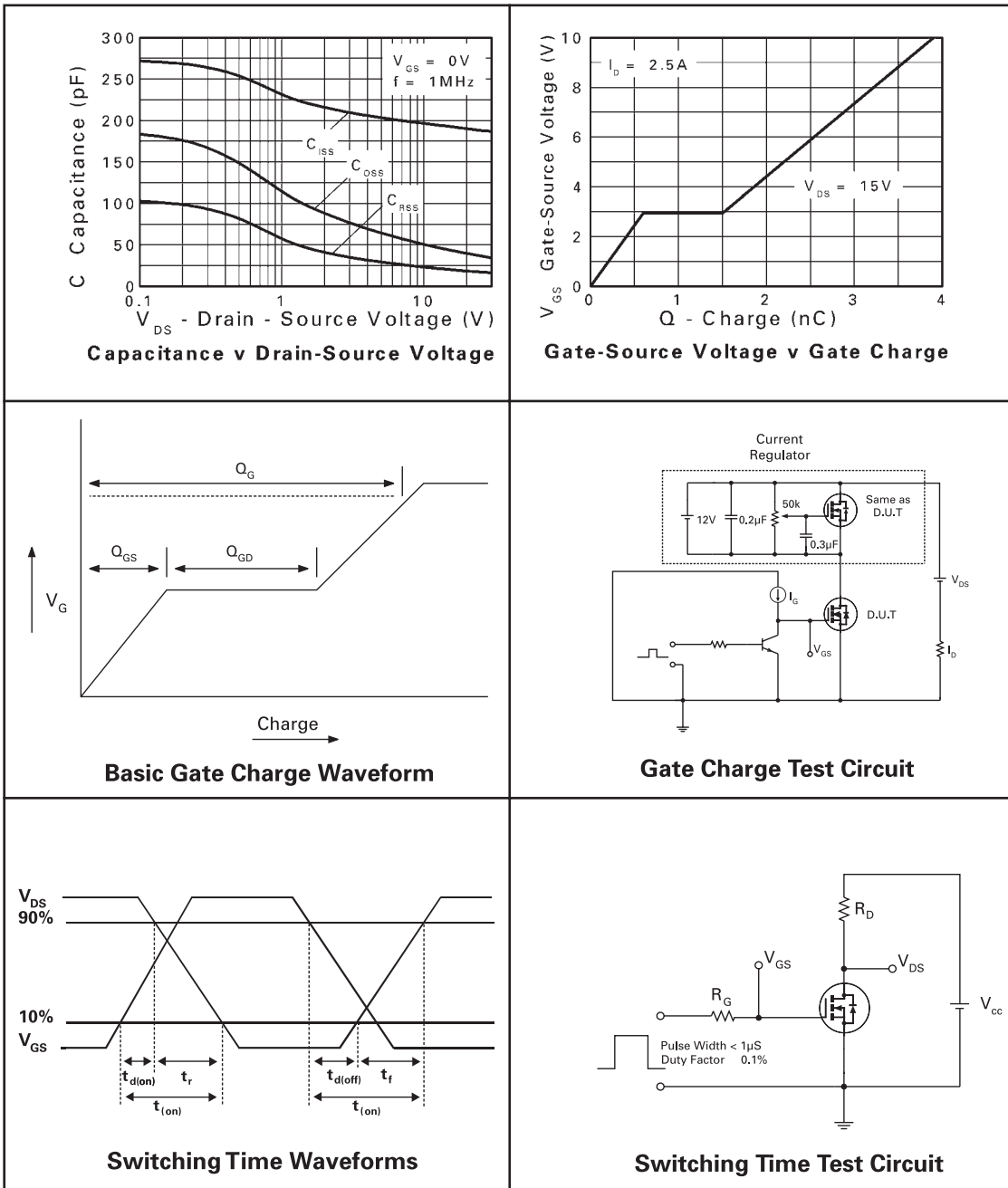
## TYPICAL CHARACTERISTICS



# ZXMHC3A01T8

N-channel

## TYPICAL CHARACTERISTICS



# ZXMHC3A01T8

## P-channel

### ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

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

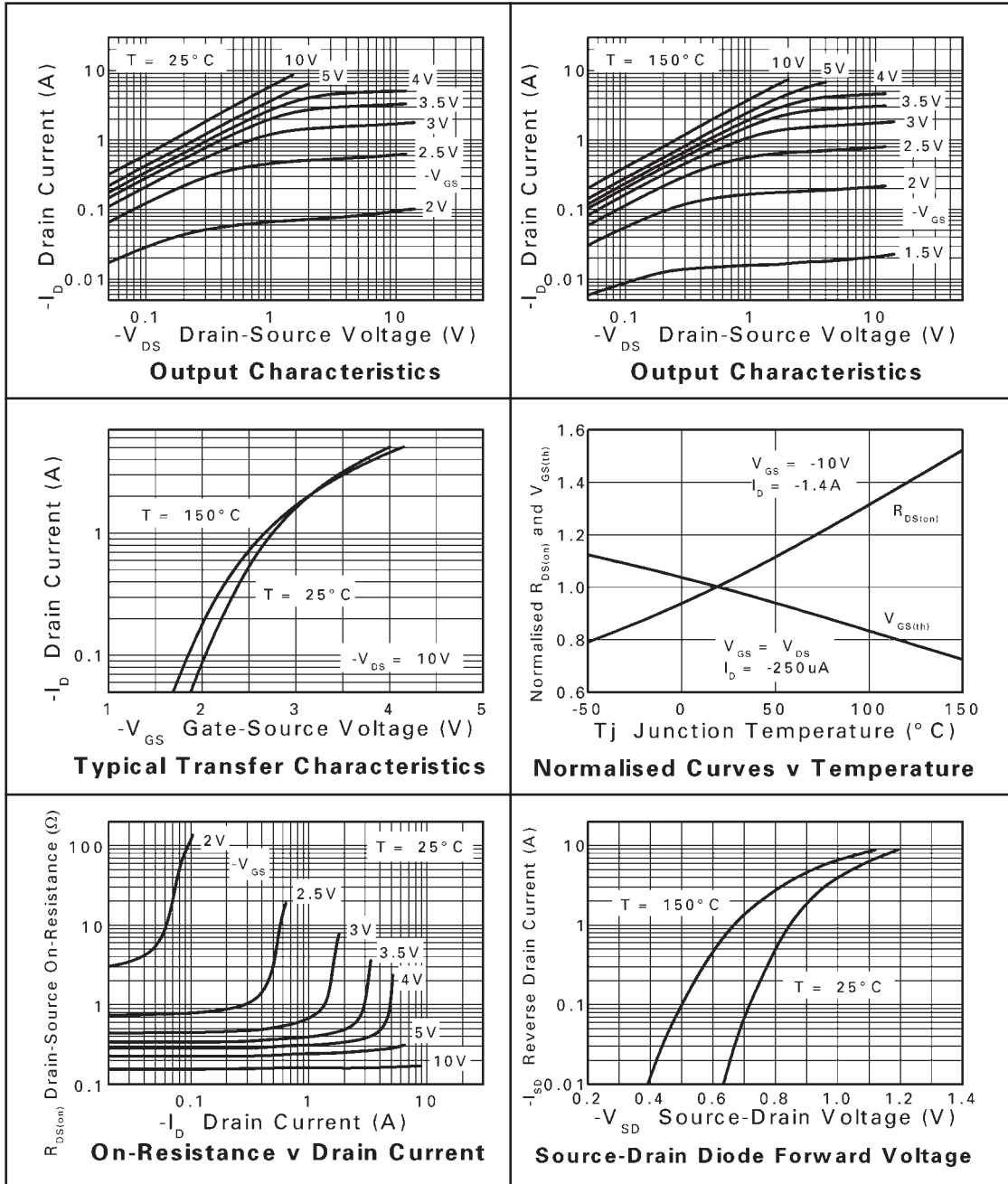
#### NOTES

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

## TYPICAL CHARACTERISTICS

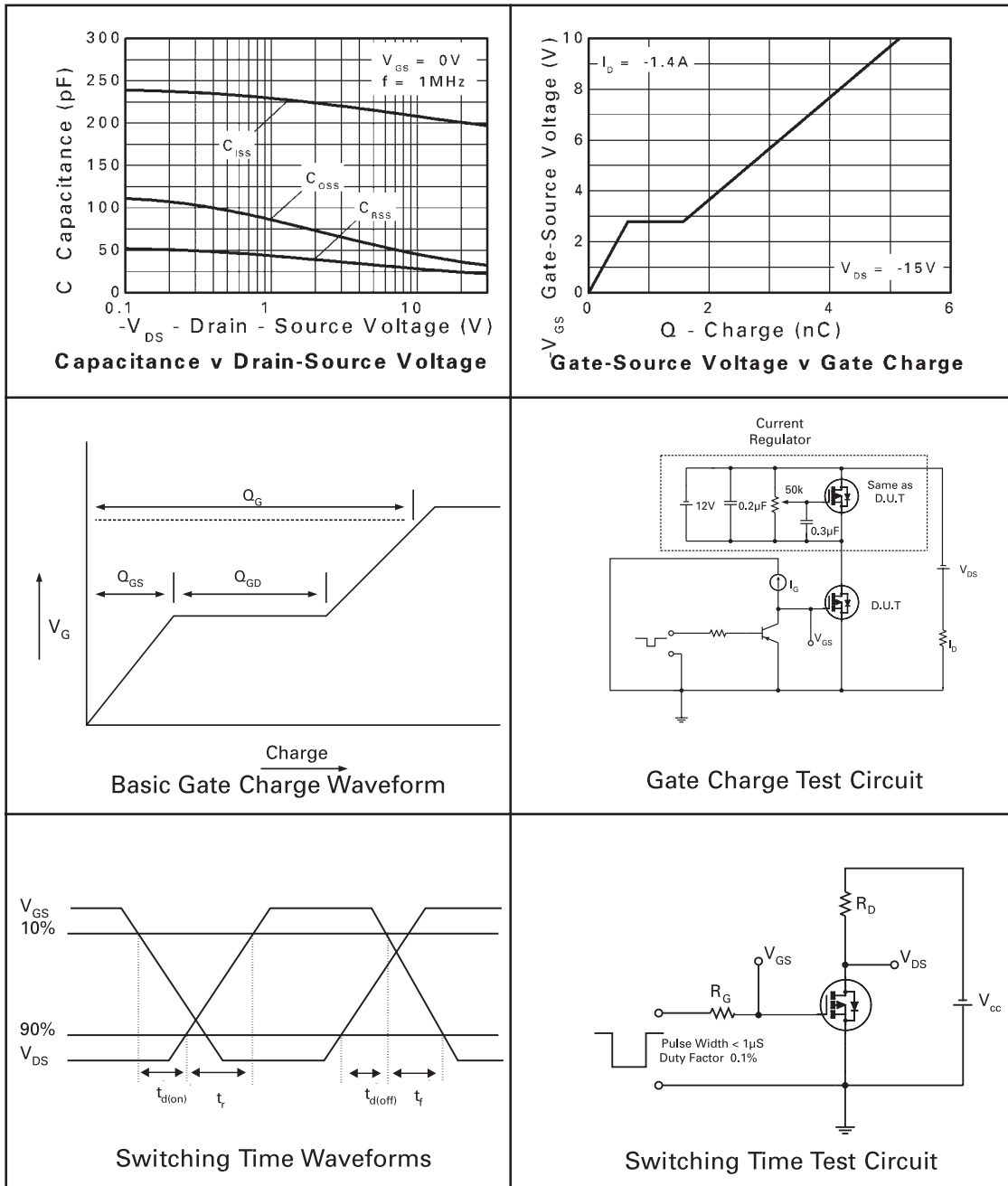




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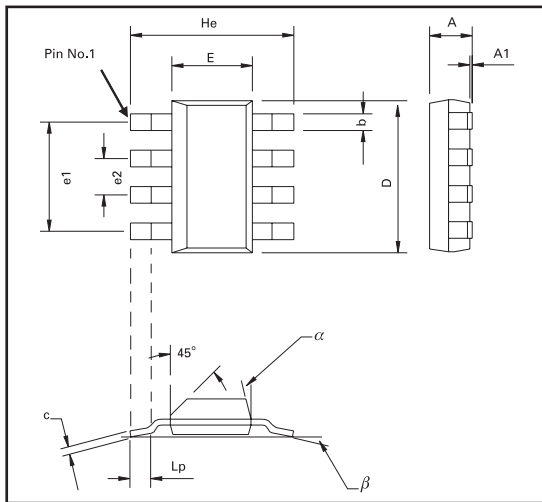
P-channel

## TYPICAL CHARACTERISTICS



# 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	-	$\alpha$	-	15°	-	-	15°	-
E	3.3	3.7	-	0.130	0.145	-	$\beta$	-	-	10°	-	-	10°

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