



**THE DATASHEET OF  
ZXMC4A16DN8TC**



# ZXMC4A16DN8

## COMPLEMENTARY 40V ENHANCEMENT MODE MOSFET

### SUMMARY

N-Channel =  $V_{(BR)DSS} = 40V$  ;  $R_{DS(on)} = 0.05\Omega$  ;  $I_D = 5.2A$

P-Channel =  $V_{(BR)DSS} = -40V$  ;  $R_{DS(on)} = 0.06\Omega$  ;  $I_D = -4.7A$

### DESCRIPTION

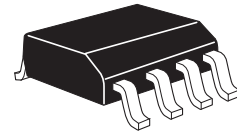
This new generation of trench MOSFETs from Zetex utilises a unique structure that combines the benefits of low on-resistance with fast switching speed. This makes them ideal for high efficiency, low voltage, power management applications.

### FEATURES

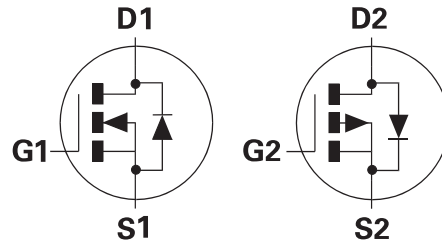
- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- Low profile SOIC package

### APPLICATIONS

- Motor drive
- LCD backlighting



SO8



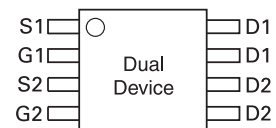
### ORDERING INFORMATION

DEVICE	REEL SIZE	TAPE WIDTH	QUANTITY PER REEL
ZXMC4A16DN8TA	7"	12mm	500
ZXMC4A16DN8TC	13"	12mm	2,500

### DEVICE MARKING

- ZXMC  
4A16

### PINOUT



### TOP VIEW

# ZXMC4A16DN8

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	N-channel	P-channel	UNIT
Drain-source voltage	$V_{DSS}$	40	-40	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>	$I_D$	5.2 4.1 4.0	-4.7 -3.8 -3.6	A A A
Pulsed drain current <sup>(c)</sup>	$I_{DM}$	24	-23	A
Continuous source current (body diode) <sup>(b)</sup>	$I_S$	2.5	2.3	A
Pulsed source current (body diode) <sup>(c)</sup>	$I_{SM}$	24	23	A
Power dissipation at $T_A = 25^\circ C$ <sup>(a)(d)</sup> Linear derating factor	$P_D$	1.25 10		W mW/°C
Power dissipation at $T_A = 25^\circ C$ <sup>(a)(e)</sup> Linear derating factor	$P_D$	1.8 14		W mW/°C
Power dissipation at $T_A = 25^\circ C$ <sup>(b)(d)</sup> Linear derating factor	$P_D$	2.1 17		W mW/°C
Operating and storage temperature range	$T_j, T_{stg}$	-55 to +150		°C

## THERMAL RESISTANCE

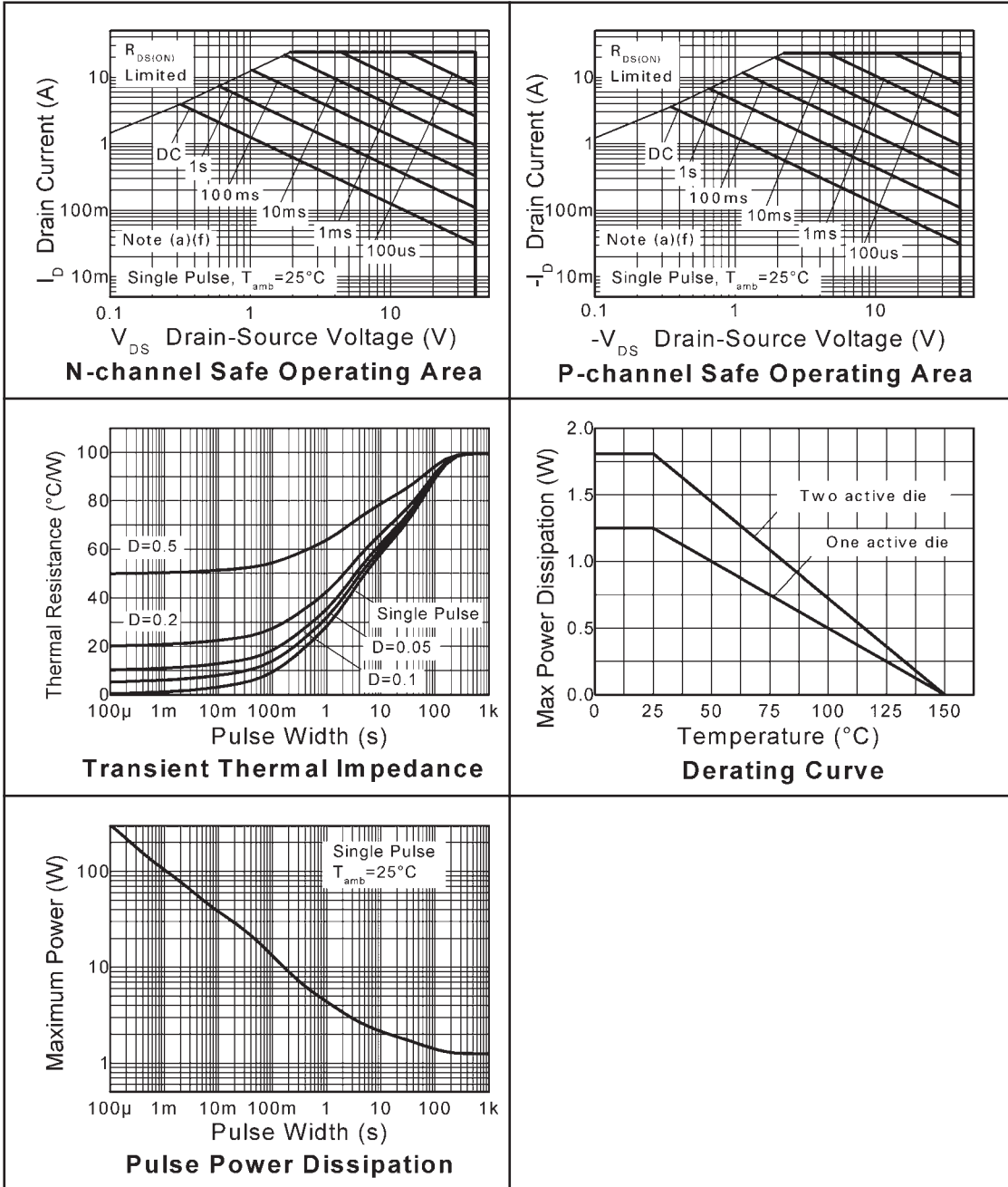
PARAMETER	SYMBOL	VALUE	UNIT
Junction to ambient <sup>(a)(d)</sup>	$R_{\theta JA}$	100	°C/W
Junction to ambient <sup>(a)(e)</sup>	$R_{\theta JA}$	70	°C/W
Junction to ambient <sup>(b)(d)</sup>	$R_{\theta JA}$	60	°C/W

### 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 - pulse width limited by maximum junction temperature. Pulse width 300us,  $d \leq 0.02$ . Refer to Transient Thermal Impedance graph.  
 (d) For device with one active die.  
 (e) For device with two active die running at equal power.

# ZXMC4A16DN8

## TYPICAL CHARACTERISTICS



# ZXMC4A16DN8

## 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	$V_{(BR)DSS}$	40			V	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$			0.5	$\mu\text{A}$	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$
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			V	$I_D = 250\text{mA}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-State Resistance <sup>(1)</sup>	$R_{DS(on)}$			0.050 0.075	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 4.5\text{A}$ $V_{GS} = 4.5\text{V}$ , $I_D = 3.2\text{A}$
Forward Transconductance <sup>(1)</sup> <sup>(3)</sup>	$g_{fs}$		8.6		S	$V_{DS} = 15\text{V}$ , $I_D = 4.5\text{A}$
<b>DYNAMIC <sup>(3)</sup></b>						
Input Capacitance	$C_{iss}$		770		pF	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$		92		pF	
Reverse Transfer Capacitance	$C_{rss}$		61		pF	
<b>SWITCHING <sup>(2)</sup> <sup>(3)</sup></b>						
Turn-On-Delay Time	$t_{d(on)}$		3.3		ns	$V_{DD} = 30\text{V}$ , $I_D = 1\text{A}$ $R_G \cong 6.0\Omega$ , $V_{GS} = 10\text{V}$
Rise Time	$t_r$		4.7		ns	
Turn-Off Delay Time	$t_{d(off)}$		29		ns	
Fall Time	$t_f$		14		ns	
Total Gate Charge	$Q_g$		17		nC	
Gate-Source Charge	$Q_{gs}$		2.5		nC	$V_{DS} = 30\text{V}$ , $V_{GS} = 10\text{V}$ $I_D = 4.5\text{A}$
Gate Drain Charge	$Q_{gd}$		3.8		nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage <sup>(1)</sup>	VSD		0.8	0.95	V	$T_J = 25^{\circ}\text{C}$ , $I_S = 4.5\text{A}$ , $V_{GS} = 0\text{V}$
Reverse Recovery Time <sup>(3)</sup>	$t_{rr}$		20		ns	$T_J = 25^{\circ}\text{C}$ , $I_S = 2.5\text{A}$ ,
Reverse Recovery Charge <sup>(3)</sup>	$Q_{rr}$		16		nC	$di/dt = 100\text{A}/\mu\text{s}$

### NOTES

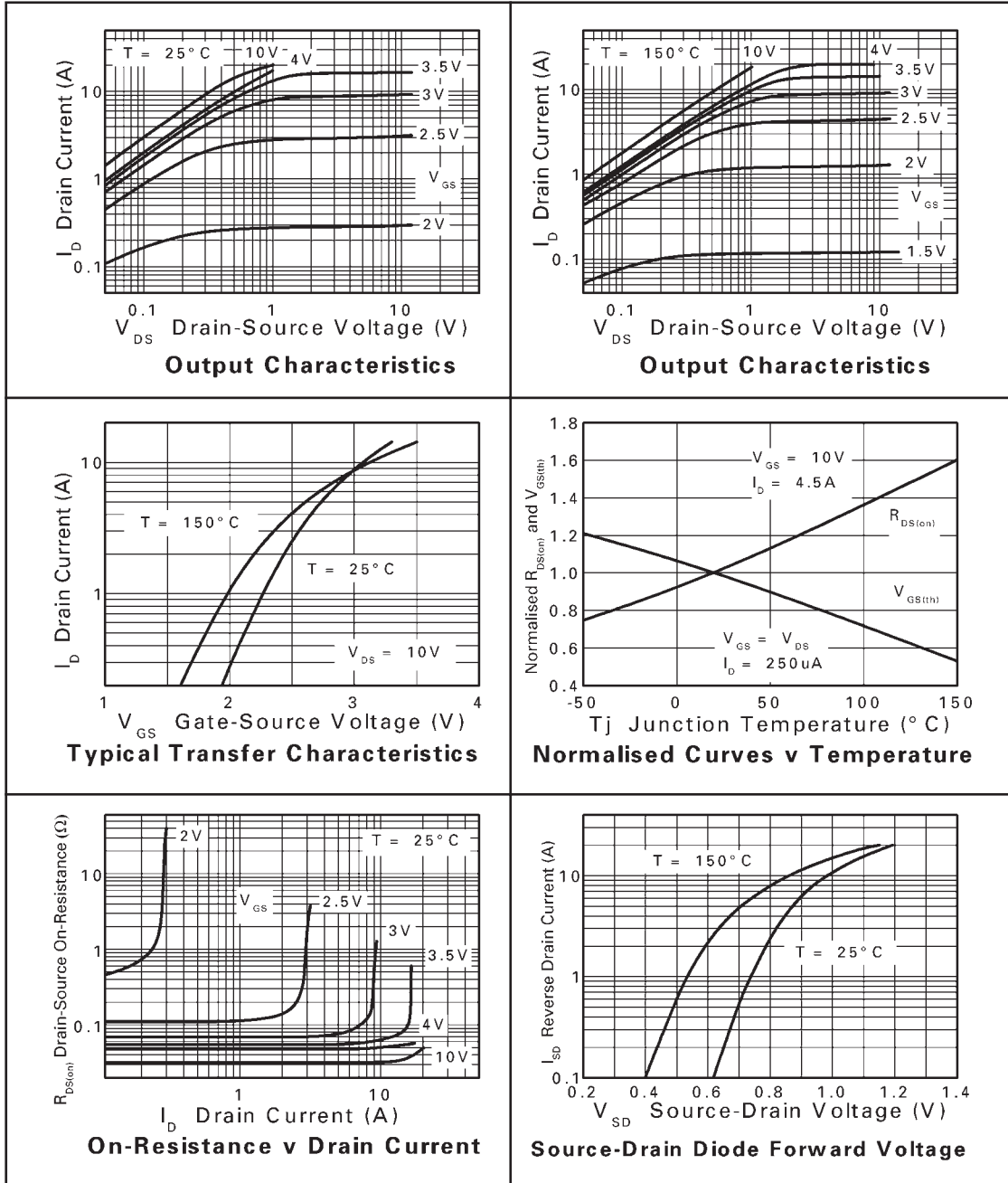
(1) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

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

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

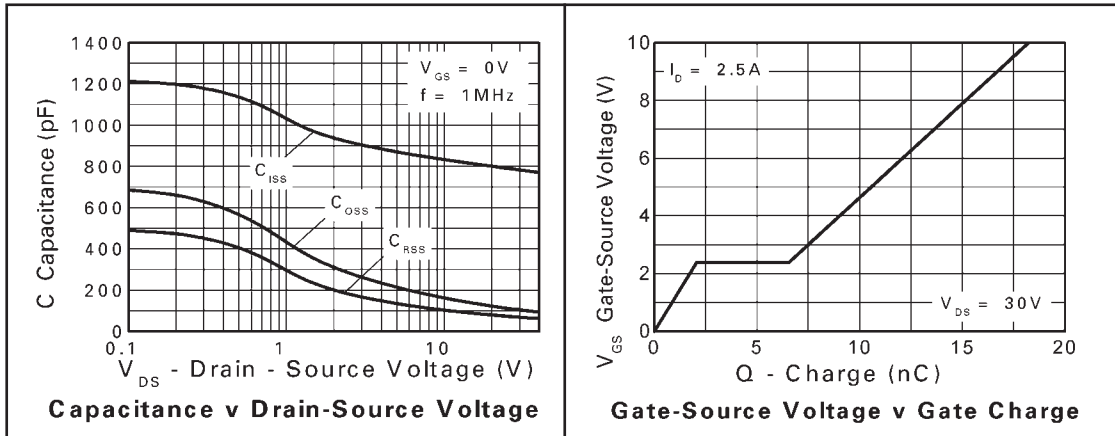
# ZXMC4A16DN8

## TYPICAL CHARACTERISTICS



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## TYPICAL CHARACTERISTICS



# ZXMC4A16DN8

## 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	$V_{(BR)DSS}$	-40			V	$I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$			-1.0	$\mu\text{A}$	$V_{DS} = -40\text{V}$ , $V_{GS} = 0\text{V}$
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			V	$I_D = -250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-State Resistance <sup>(1)</sup>	$R_{DS(on)}$			0.060 0.100	$\Omega$	$V_{GS} = -10\text{V}$ , $I_D = -3.8\text{A}$ $V_{GS} = -4.5\text{V}$ , $I_D = -2.9\text{A}$
Forward Transconductance <sup>(1) (3)</sup>	$g_{fs}$		6.8		S	$V_{DS} = -15\text{V}$ , $I_D = -3.8\text{A}$
<b>DYNAMIC <sup>(3)</sup></b>						
Input Capacitance	$C_{iss}$		1000		pF	$V_{DS} = -20\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$		180		pF	
Reverse Transfer Capacitance	$C_{rss}$		160		pF	
<b>SWITCHING <sup>(2) (3)</sup></b>						
Turn-On-Delay Time	$t_{d(on)}$		3.7		ns	$V_{DD} = -20\text{V}$ , $I_D = -1\text{A}$ $R_G \cong 6.0\Omega$ , $V_{GS} = 10\text{V}$
Rise Time	$t_r$		5.5		ns	
Turn-Off Delay Time	$t_{d(off)}$		33		ns	
Fall Time	$t_f$		18		ns	
Gate Charge	$Q_g$		15		nC	$V_{DS} = -20\text{V}$ , $V_{GS} = -5\text{V}$ $I_D = -3.8\text{A}$
Total Gate Charge	$Q_g$		26		nC	$V_{DS} = -20\text{V}$ , $V_{GS} = -10\text{V}$ $I_D = -3.8\text{A}$
Gate-Source Charge	$Q_{gs}$		3.2		nC	
Gate Drain Charge	$Q_{gd}$		7.3		nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage <sup>(1)</sup>	$V_{SD}$		-0.86	-0.95	V	$T_j = 25^{\circ}\text{C}$ , $I_S = -3.4\text{A}$ , $V_{GS} = 0\text{V}$
Reverse Recovery Time <sup>(3)</sup>	$t_{rr}$		27		ns	$T_j = 25^{\circ}\text{C}$ , $I_S = -3\text{A}$ ,
Reverse Recovery Charge <sup>(3)</sup>	$Q_{rr}$		25		nC	$di/dt = 100\text{A}/\mu\text{s}$

### NOTES

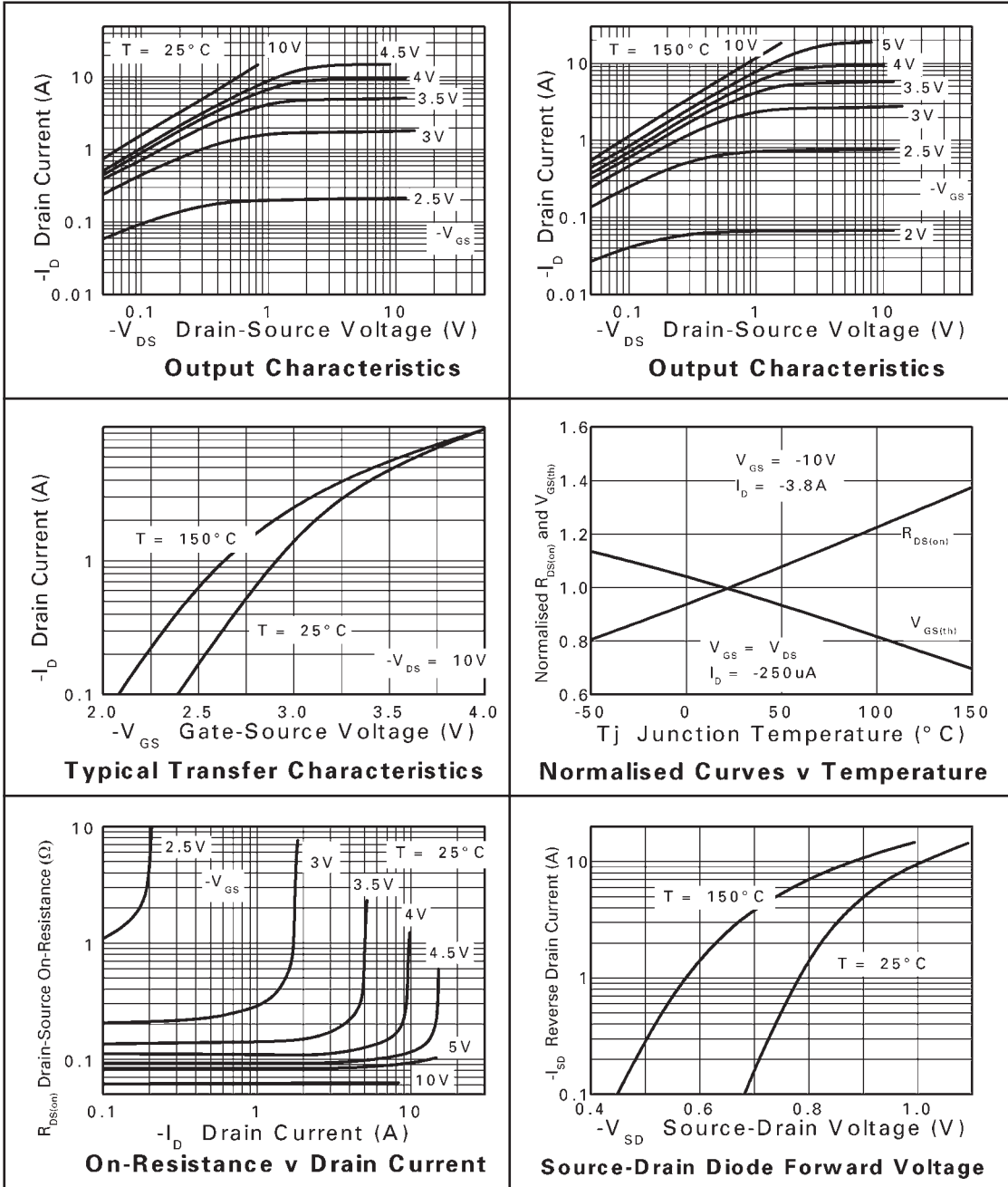
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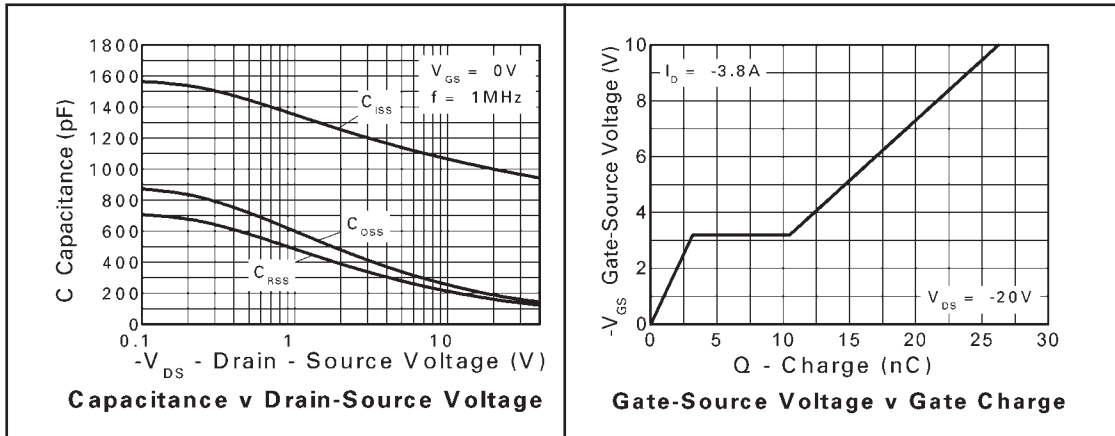
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## TYPICAL CHARACTERISTICS



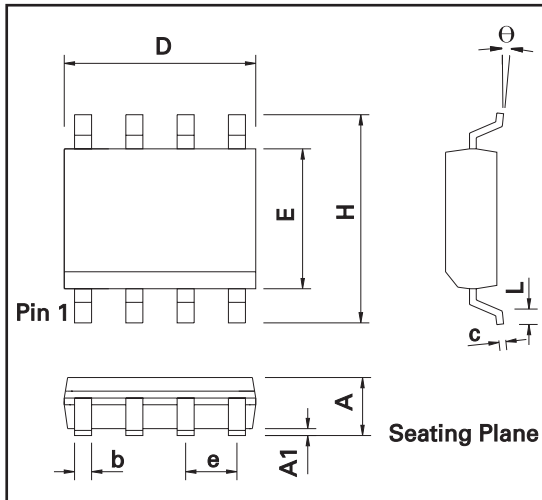
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## TYPICAL CHARACTERISTICS



# ZXMC4A16DN8

## PACKAGE OUTLINE



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

## PACKAGE DIMENSIONS

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

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