

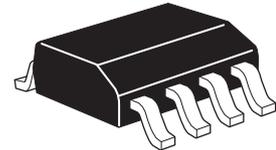
# ZXMC3A18DN8

## Complementary 30V enhancement mode MOSFET

### Summary

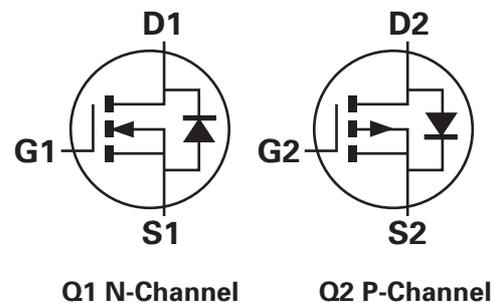
N-Channel =  $V_{(BR)DSS} = 30V$  ;  $R_{DS(on)} = 0.025\Omega$ ;  $I_D = 7.6A$

P-Channel =  $V_{(BR)DSS} = -30V$  ;  $R_{DS(on)} = 0.035\Omega$ ;  $I_D = -6.3A$



### 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.

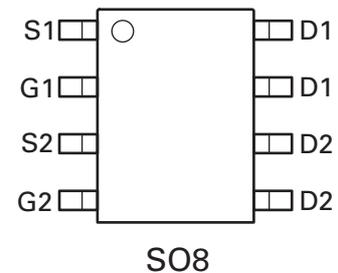


### Features

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

### Applications

- Motor Drive
- LCD backlighting



### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMC3A18DN8TC	13	12	2500

### Device marking

ZXMC  
3A18

# ZXMC3A18DN8

## 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 ( $V_{GS}=10V$ ; $T_{amb}=25^{\circ}C$ )(b)(d) ( $V_{GS}=10V$ ; $T_{amb}=70^{\circ}C$ )(b)(d) ( $V_{GS}=10V$ ; $T_{amb}=25^{\circ}C$ )(a)(d)	$I_D$	7.6 6.1 5.8	-6.3 -5.0 -4.8	A
Pulsed drain current <sup>(c)</sup>	$I_{DM}$	37	-30	A
Continuous source current (body diode)(b)	$I_S$	3.6	3.2	A
Pulsed source current (body diode)(c)	$I_{SM}$	37	30	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 $T_{amb}=25^{\circ}C$ (a)(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

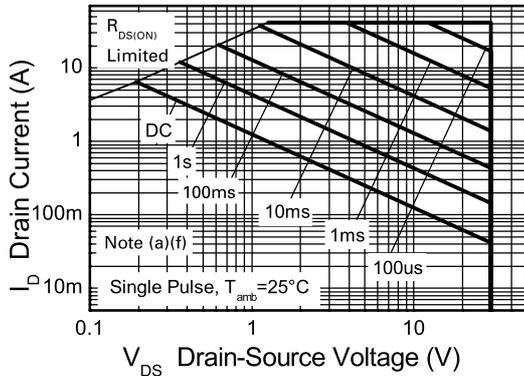
Parameter	Symbol	Value	Unit
Junction to ambient <sup>(a)(d)</sup>	$R_{\theta JA}$	100	$^{\circ}C/W$
Junction to ambient <sup>(a)(e)</sup>	$R_{\theta JA}$	70	$^{\circ}C/W$
Junction to ambient <sup>(b)(d)</sup>	$R_{\theta JA}$	60	$^{\circ}C/W$

### NOTES:

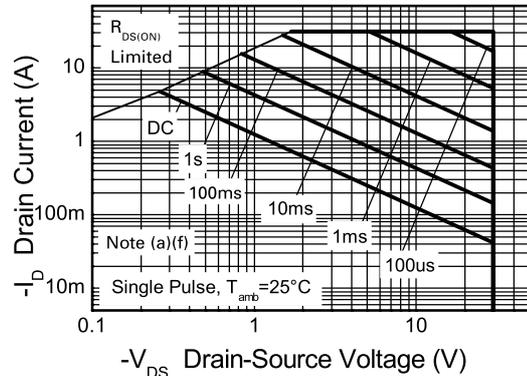
- (a) For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
- (b) For a device surface mounted on FR4 PCB measured at  $t \leq 10$  sec.
- (c) Repetitive rating - pulse width limited by maximum junction temperature. Pulse width 300 $\mu$ s,  $d \leq 0.02$ . Refer to transient thermal impedance graph.
- (d) For device with one active die.
- (e) For device with two active die running at equal power.

# ZXMC3A18DN8

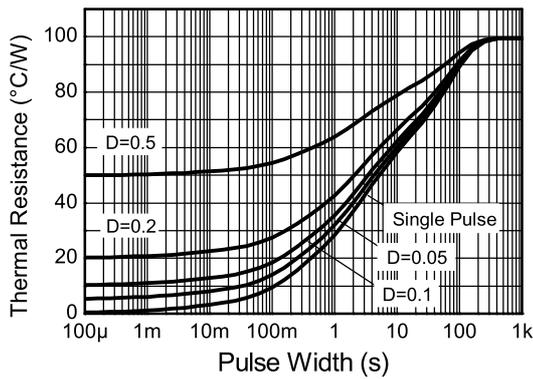
## Characteristics



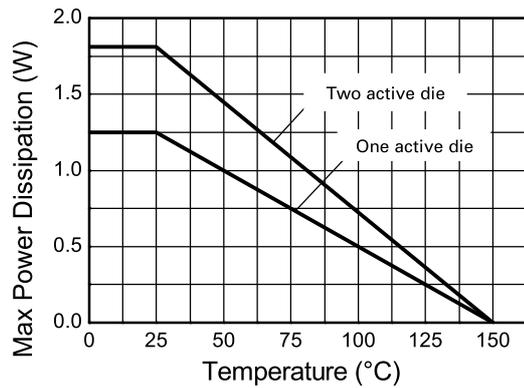
**N-channel Safe Operating Area**



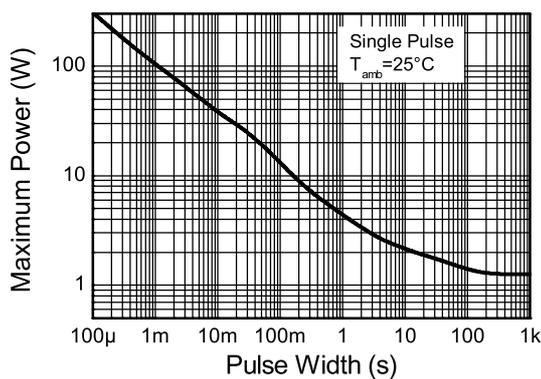
**P-channel Safe Operating Area**



**Transient Thermal Impedance**



**Derating Curve**



**Pulse Power Dissipation**

# ZXMC3A18DN8

## 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	$I_{DSS}$			0.5	$\mu\text{A}$	$V_{DS} = 30\text{V}$ , $V_{GS} = 0\text{V}$
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			V	$I_D = 250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static drain-source on-state resistance <sup>(*)</sup>	$R_{DS(on)}$			0.025 0.030	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 5.8\text{A}$ $V_{GS} = 4.5\text{V}$ , $I_D = 5.3\text{A}$
Forward transconductance <sup>(*)(‡)</sup>	$g_{fs}$		17.5		S	$V_{DS} = 15\text{V}$ , $I_D = 5.8\text{A}$
<b>Dynamic<sup>(‡)</sup></b>						
Input capacitance	$C_{iss}$		1800		pF	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	$C_{oss}$		289		pF	
Reverse transfer capacitance	$C_{rss}$		178		pF	
<b>Switching<sup>(†) (‡)</sup></b>						
Turn-on-delay time	$t_{d(on)}$		5.5		ns	$V_{DD} = 15\text{V}$ , $I_D = 6\text{A}$ $R_G \cong 6.0\Omega$ , $V_{GS} = 10\text{V}$
Rise time	$t_r$		8.7		ns	
Turn-off delay time	$t_{d(off)}$		33		ns	
Fall time	$t_f$		8.5		ns	
Gate charge	$Q_g$		19.4		nC	$V_{DS} = 15\text{V}$ , $V_{GS} = 5\text{V}$ $I_D = 3.5\text{A}$
Total gate charge	$Q_g$		36		nC	$V_{DS} = 15\text{V}$ , $V_{GS} = 10\text{V}$ $I_D = 3.5\text{A}$
Gate-source charge	$Q_{gs}$		5.5		nC	
Gate drain charge	$Q_{gd}$		7.0		nC	
<b>Source-drain diode</b>						
Diode forward voltage <sup>(*)</sup>	$V_{SD}$			0.95	V	$T_j = 25^{\circ}\text{C}$ , $I_S = 6\text{A}$ , $V_{GS} = 0\text{V}$
Reverse recovery time <sup>(‡)</sup>	$t_{rr}$		20.5		ns	$T_j = 25^{\circ}\text{C}$ , $I_S = 6\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge <sup>(‡)</sup>	$Q_{rr}$		41.5		nC	

#### NOTES:

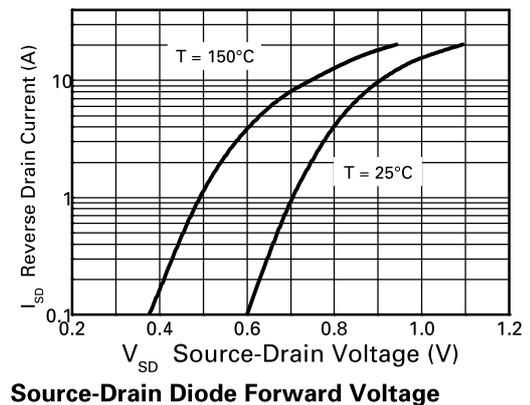
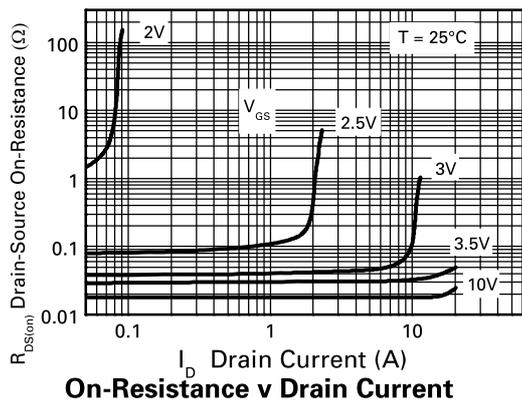
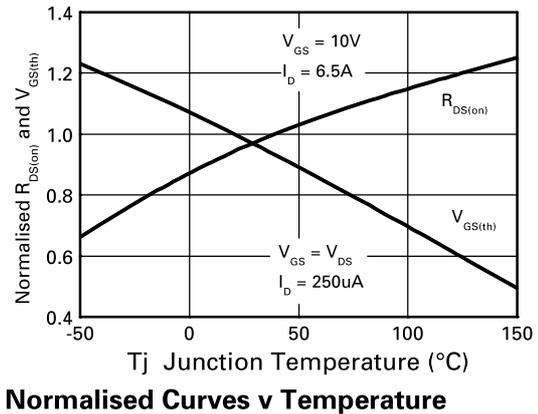
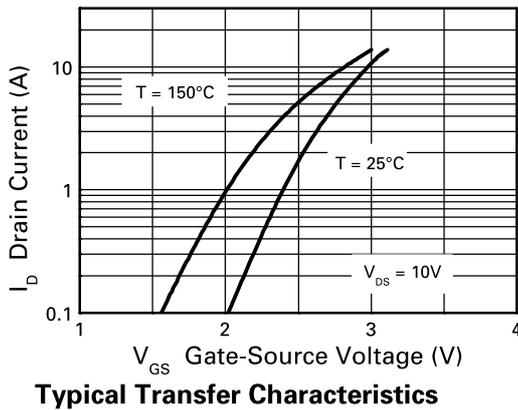
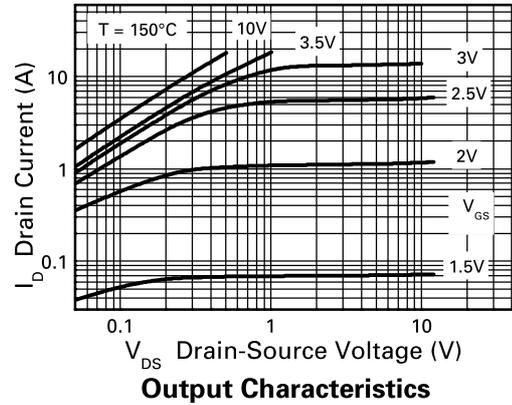
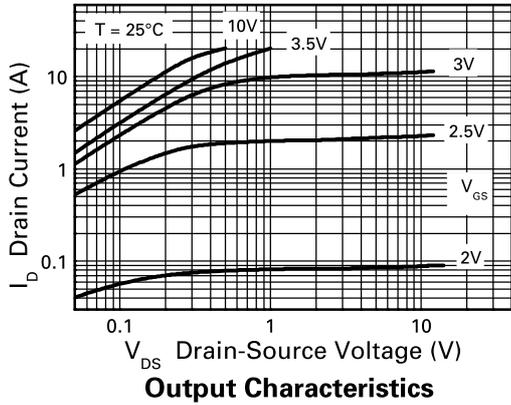
(\*) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

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

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

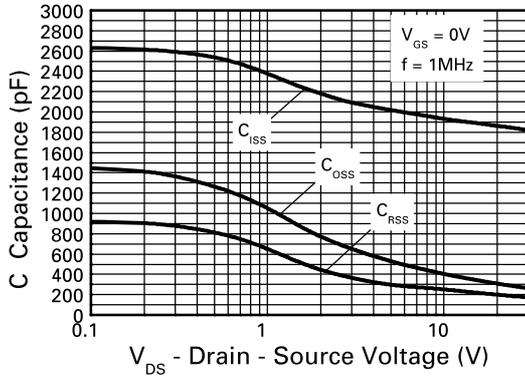
# ZXMC3A18DN8

## Typical characteristics

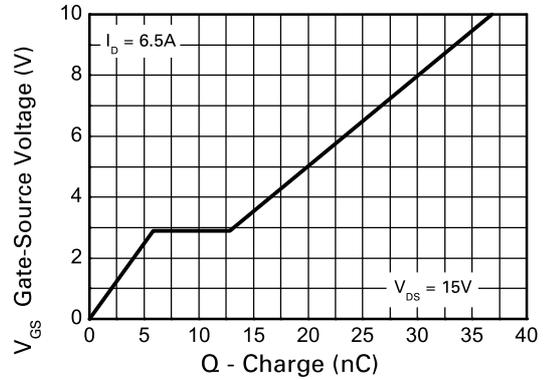


# ZXMC3A18DN8

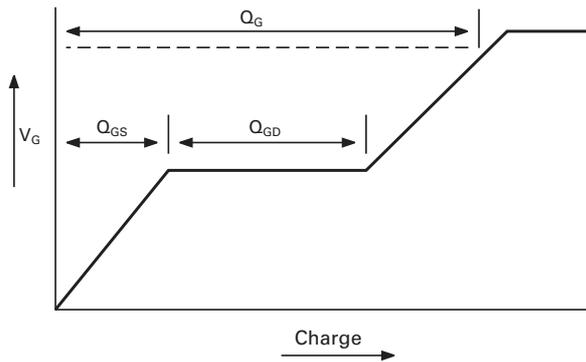
## Typical characteristics



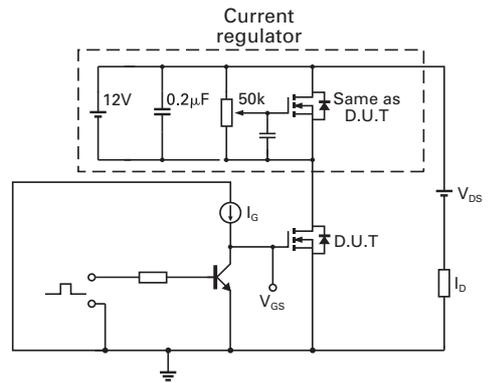
Capacitance v Drain-Source Voltage



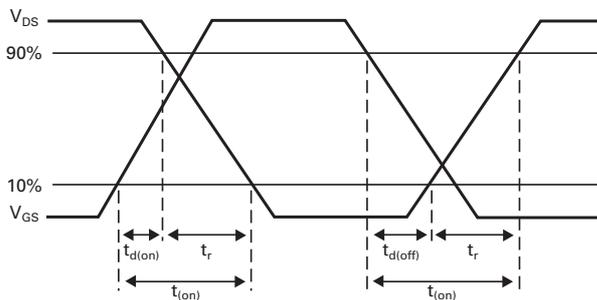
Gate-Source Voltage v Gate Charge



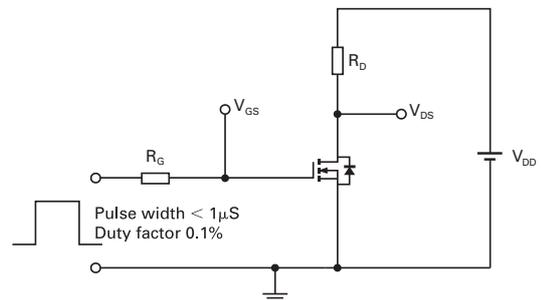
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms



Switching time test circuit

# ZXMC3A18DN8

## 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			V	$I_D = -250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static drain-source on-state resistance <sup>(*)</sup>	$R_{DS(on)}$			0.035 0.050	W	$V_{GS} = -10\text{V}$ , $I_D = -4.8\text{A}$ $V_{GS} = -4.5\text{V}$ , $I_D = -4.0\text{A}$
Forward transconductance <sup>(*)(‡)</sup>	$g_{fs}$		8.6		S	$V_{DS} = -15\text{V}$ , $I_D = -4.8\text{A}$
<b>Dynamic<sup>(‡)</sup></b>						
Input capacitance	$C_{iss}$		1603		pF	$V_{DS} = -15\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	$C_{oss}$		434		pF	
Reverse transfer capacitance	$C_{rss}$		388		pF	
<b>Switching<sup>(†)</sup> (‡)</b>						
Turn-on-delay time	$t_{d(on)}$		4.8		ns	$V_{DD} = -15\text{V}$ , $I_D = -1\text{A}$ $R_G @ 6.0\Omega$ , $V_{GS} = 10\text{V}$
Rise time	$t_r$		9.5		ns	
Turn-off delay time	$t_{d(off)}$		60		ns	
Fall time	$t_f$		38		ns	
Gate charge	$Q_g$		25		nC	$V_{DS} = -15\text{V}$ , $V_{GS} = -5\text{V}$ $I_D = -4.8\text{A}$
Total gate charge	$Q_g$		45		nC	$V_{DS} = -15\text{V}$ , $V_{GS} = -10\text{V}$ $I_D = -4.8\text{A}$
Gate-source charge	$Q_{gs}$		5.1		nC	
Gate drain charge	$Q_{gd}$		11.5		nC	
<b>Source-drain diode</b>						
Diode forward voltage <sup>(*)</sup>	$V_{SD}$		0.82	-0.95	V	$T_j = 25^{\circ}\text{C}$ , $I_S = -3.7$ $V_{GS} = 0\text{V}$
Reverse recovery time <sup>(‡)</sup>	$t_{rr}$		32.5		ns	$T_j = 25^{\circ}\text{C}$ , $I_S = -2.2$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge <sup>(‡)</sup>	$Q_{rr}$		18.4		nC	

#### NOTES:

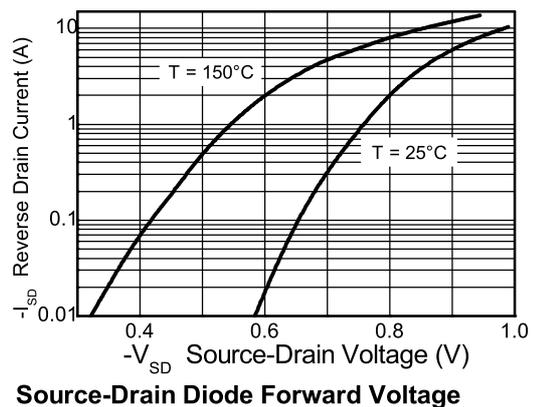
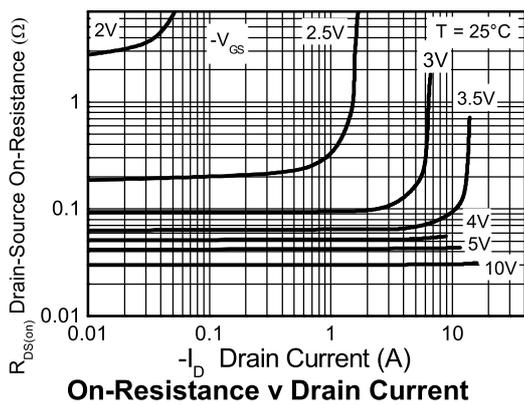
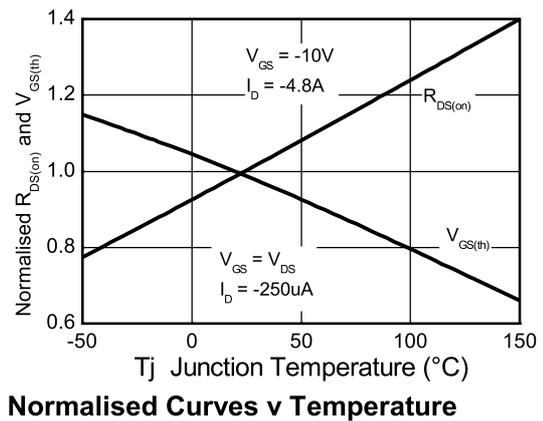
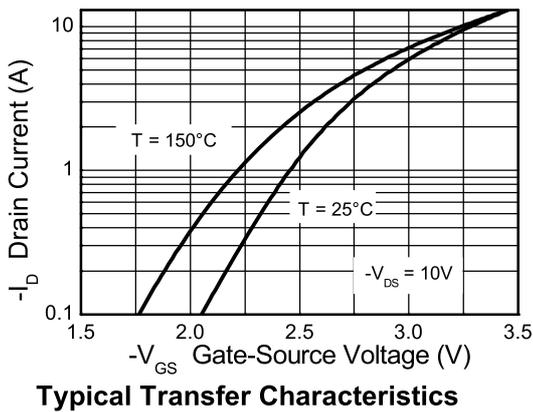
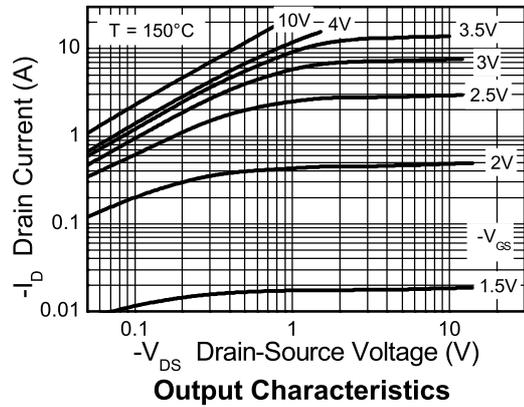
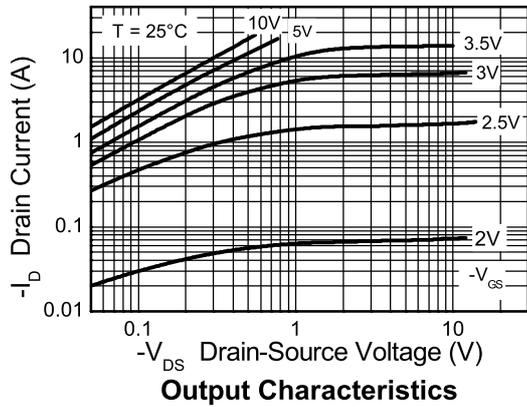
(\*) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

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

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

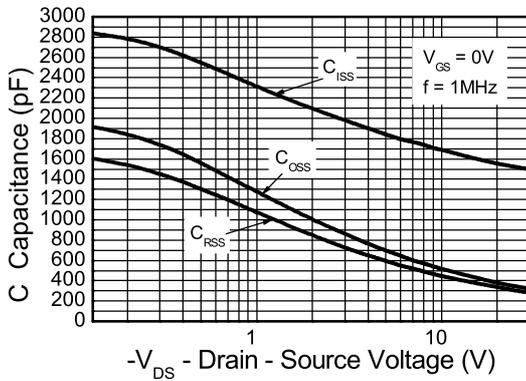
# ZXMC3A18DN8

## Typical characteristics

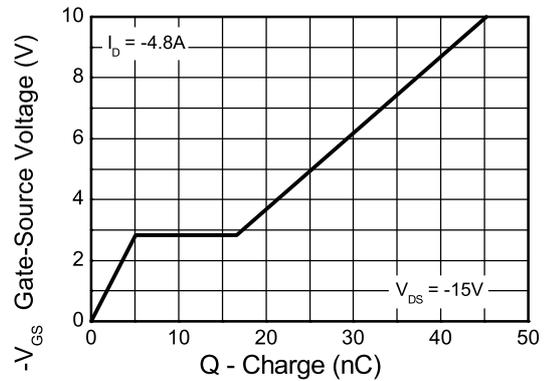


# ZXMC3A18DN8

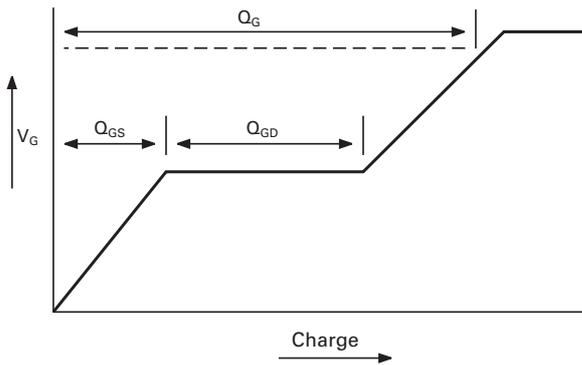
## Typical characteristics



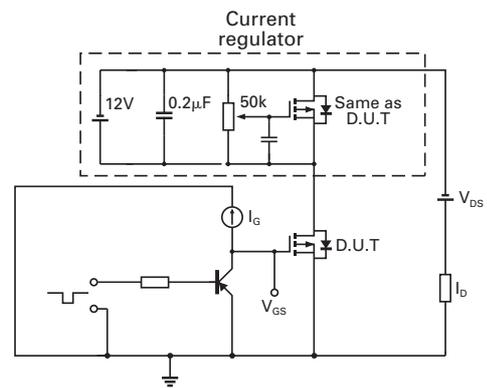
Capacitance v Drain-Source Voltage



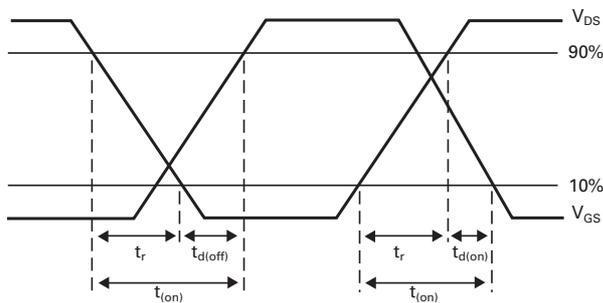
Gate-Source Voltage v Gate Charge



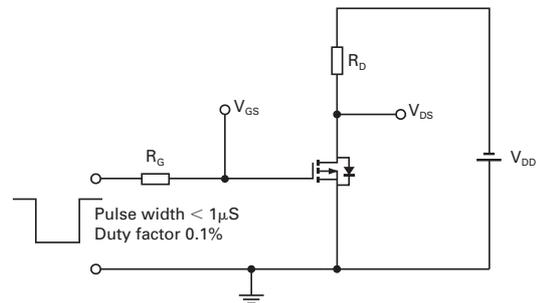
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms



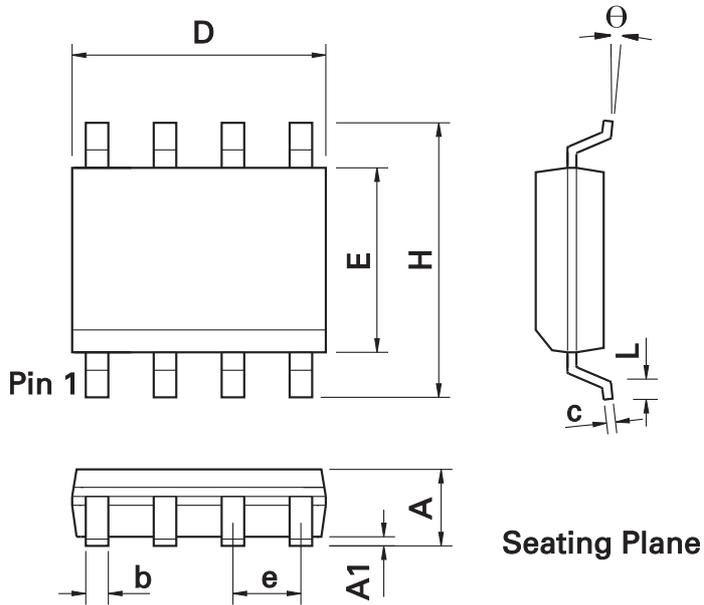
Switching time test circuit

# ZXMC3A18DN8

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# ZXMC3A18DN8

## 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

# ZXMC3A18DN8

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## Definitions

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1. are intended to implant into the body

or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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### ESD (Electrostatic discharge)

Semiconductor devices are susceptible to damage by ESD. Suitable precautions should be taken when handling and transporting devices. The possible damage to devices depends on the circumstances of the handling and transporting, and the nature of the device. The extent of damage can vary from immediate functional or parametric malfunction to degradation of function or performance in use over time. Devices suspected of being affected should be replaced.

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### Product status key:

"Preview"	Future device intended for production at some point. Samples may be available
"Active"	Product status recommended for new designs
"Last time buy (LTB)"	Device will be discontinued and last time buy period and delivery is in effect
"Not recommended for new designs"	Device is still in production to support existing designs and production
"Obsolete"	Production has been discontinued

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### Datasheet status key:

"Draft version"	This term denotes a very early datasheet version and contains highly provisional information, which may change in any manner without notice.
"Provisional version"	This term denotes a pre-release datasheet. It provides a clear indication of anticipated performance. However, changes to the test conditions and specifications may occur, at any time and without notice.
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