

# ZXMC4559DN8

## COMPLEMENTARY 60V ENHANCEMENT MODE MOSFET

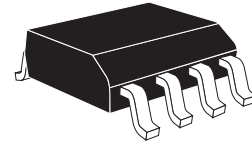
### SUMMARY

N-Channel  $V_{(BR)DSS} = 60V$ ;  $R_{DS(ON)} = 0.055\Omega$ ;  $I_D = 4.7A$

P-Channel  $V_{(BR)DSS} = -60V$ ;  $R_{DS(ON)} = 0.105\Omega$ ;  $I_D = -3.9A$

### 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.



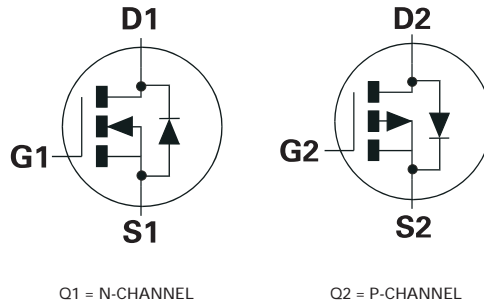
SO8

### FEATURES

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

### APPLICATIONS

- Motor Drive
- LCD backlighting



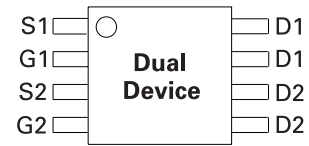
### ORDERING INFORMATION

DEVICE	REEL	TAPE WIDTH	QUANTITY PER REEL
ZXMC4559DN8TA	7"	12mm	500 units
ZXMC4559DN8TC	13"	12mm	2500 units

### DEVICE MARKING

- ZXMC  
4559

### PINOUT



Top view

# ZXMC4559DN8

## ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	N-Channel	P-Channel	UNIT
Drain-Source Voltage	$V_{DSS}$	60	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current @ $V_{GS}=10V$ ; $T_A=25^\circ C$ (b) (d)	$I_D$	4.7	-3.9	A
		3.7	-2.8	A
		3.6	-2.6	A
Pulsed Drain Current (c)	$I_{DM}$	22.2	-18.3	A
Continuous Source Current (Body Diode) (b)	$I_S$	3.4	-3.2	A
Pulsed Source Current (Body Diode)(c)	$I_{SM}$	22.2	-18.3	A
Power Dissipation at $T_A=25^\circ C$ (a) (d)	$P_D$	1.25		W
Linear Derating Factor		10		mW/ $^\circ C$
Power Dissipation at $T_A=25^\circ C$ (a) (e)	$P_D$	1.8		W
Linear Derating Factor		14		mW/ $^\circ C$
Power Dissipation at $T_A=25^\circ C$ (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

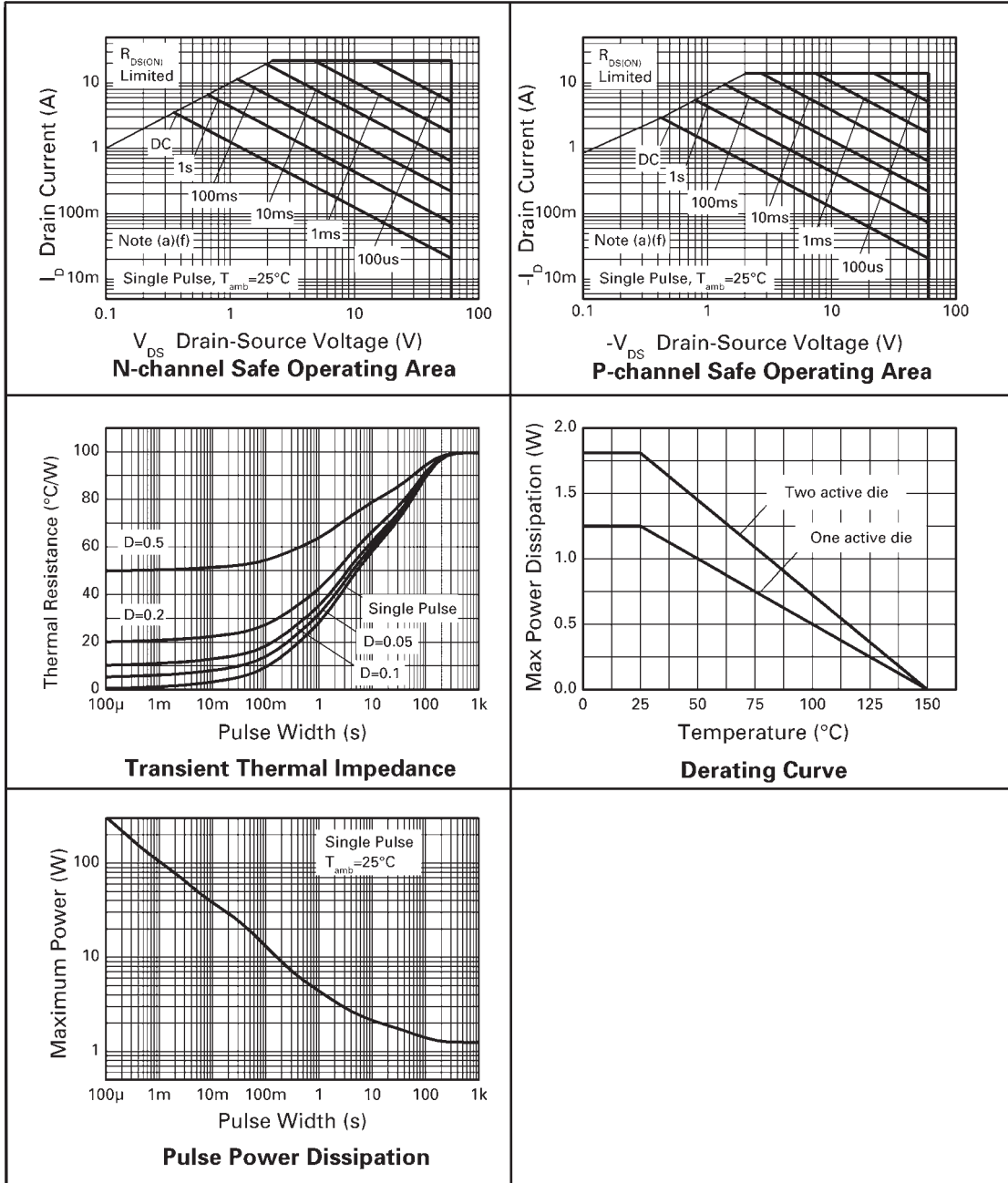
PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a) (d)	$R_{\theta JA}$	100	$^\circ C/W$
Junction to Ambient (b) (e)	$R_{\theta JA}$	69	$^\circ C/W$
Junction to Ambient (b) (d)	$R_{\theta JA}$	58	$^\circ C/W$

### Notes

- (a) For a dual device surface mounted on 25mm x 25mm FR4 PCB with coverage of single sided 1oz copper in still air conditions.
- (b) For a dual 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 $\mu s$  - pulse width limited by maximum junction temperature.
- (d) For a device with one active die.
- (e) For device with 2 active die running at equal power.

# ZXMC4559DN8

## CHARACTERISTICS



# ZXMC4559DN8

## 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	$V_{(BR)DSS}$	60			V	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$			1.0	$\mu\text{A}$	$V_{DS}=60\text{V}, V_{GS}=0\text{V}$
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			V	$I_D=250\mu\text{A}, V_{DS}=V_{GS}$
Static Drain-Source On-State Resistance <sup>(1)</sup>	$R_{DS(on)}$			0.055	$\Omega$	$V_{GS}=10\text{V}, I_D=4.5\text{A}$
				0.075	$\Omega$	$V_{GS}=4.5\text{V}, I_D=4.0\text{A}$
Forward Transconductance <sup>(1) (3)</sup>	$g_{fs}$		10.2		S	$V_{DS}=15\text{V}, I_D=4.5\text{A}$
<b>DYNAMIC</b> <sup>(3)</sup>						
Input Capacitance	$C_{iss}$		1063		pF	$V_{DS}=30\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}$
Output Capacitance	$C_{oss}$		104		pF	
Reverse Transfer Capacitance	$C_{rss}$		64		pF	
<b>SWITCHING</b> <sup>(2) (3)</sup>						
Turn-On Delay Time	$t_{d(on)}$		3.5		ns	$V_{DD}=30\text{V}, I_D=1\text{A}$ $R_G=6.0\Omega, V_{GS}=10\text{V}$
Rise Time	$t_r$		4.1		ns	
Turn-Off Delay Time	$t_{d(off)}$		26.2		ns	
Fall Time	$t_f$		10.6		ns	
Gate Charge	$Q_g$		11.0		nC	$V_{DS}=30\text{V}, V_{GS}=5\text{V},$ $I_D=4.5\text{A}$
Total Gate Charge	$Q_g$		20.4		nC	$V_{DS}=30\text{V}, V_{GS}=10\text{V},$ $I_D=4.5\text{A}$
Gate-Source Charge	$Q_{gs}$		4.1		nC	
Gate-Drain Charge	$Q_{gd}$		5.1		nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage <sup>(1)</sup>	$V_{SD}$		0.85	1.2	V	$T_J=25^{\circ}\text{C}, I_S=5.5\text{A},$ $V_{GS}=0\text{V}$
Reverse Recovery Time <sup>(3)</sup>	$t_{rr}$		22		ns	$T_J=25^{\circ}\text{C}, I_F=2.2\text{A},$
Reverse Recovery Charge <sup>(3)</sup>	$Q_{rr}$		21.4		nC	$di/dt=100\text{A}/\mu\text{s}$

### NOTES

- (1) Measured under pulsed conditions. 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.

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## P-CHANNEL

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

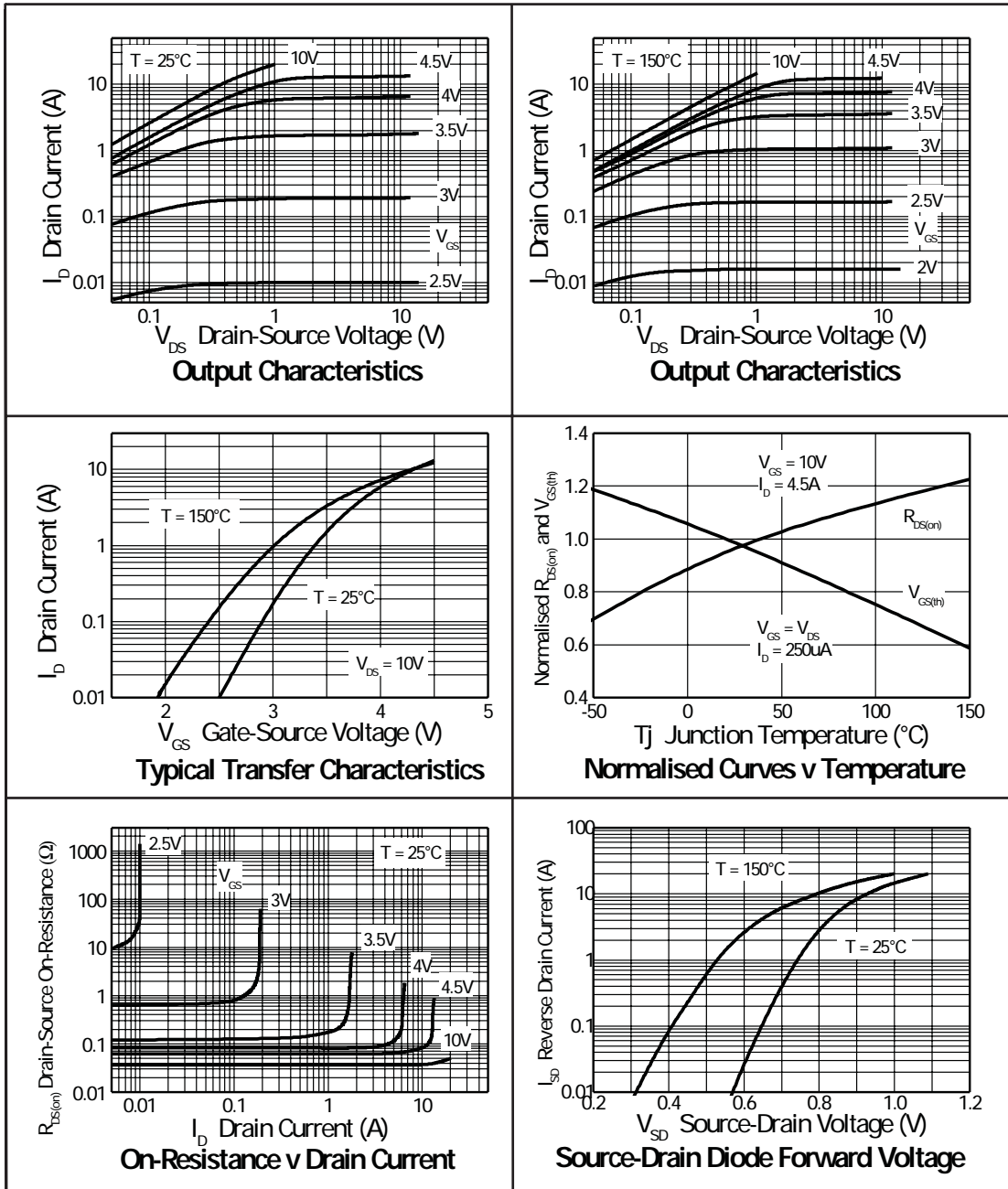
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
<b>STATIC</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	-60			V	$I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$			-1.0	$\mu\text{A}$	$V_{DS} = -60\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Body Leakage	$I_{GSS}$			100	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.0			V	$I_D = -250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-State Resistance <sup>(1)</sup>	$R_{DS(on)}$			0.085 0.125	$\Omega$ $\Omega$	$V_{GS} = -10\text{V}$ , $I_D = -2.9\text{A}$ $V_{GS} = -4.5\text{V}$ , $I_D = -2.4\text{A}$
Forward Transconductance <sup>(1) (3)</sup>	$g_{fs}$		7.2		S	$V_{DS} = -15\text{V}$ , $I_D = -2.9\text{A}$
<b>DYNAMIC</b> <sup>(3)</sup>						
Input Capacitance	$C_{iss}$		1021		pF	$V_{DS} = -30\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$		83.1		pF	
Reverse Transfer Capacitance	$C_{rss}$		56.4		pF	
<b>SWITCHING</b> <sup>(2) (3)</sup>						
Turn-On Delay Time	$t_{d(on)}$		3.5		ns	$V_{DD} = -30\text{V}$ , $I_D = -1\text{A}$ $R_G = 6.0\Omega$ , $V_{GS} = -10\text{V}$
Rise Time	$t_r$		4.1		ns	
Turn-Off Delay Time	$t_{d(off)}$		35		ns	
Fall Time	$t_f$		10		ns	
Gate Charge	$Q_g$		12.1		nC	$V_{DS} = -30\text{V}$ , $V_{GS} = -5\text{V}$ , $I_D = -2.9\text{A}$
Total Gate Charge	$Q_g$		24.2		nC	$V_{DS} = -30\text{V}$ , $V_{GS} = -10\text{V}$ , $I_D = -2.9\text{A}$
Gate-Source Charge	$Q_{gs}$		2.5		nC	
Gate-Drain Charge	$Q_{gd}$		3.7		nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage <sup>(1)</sup>	$V_{SD}$		-0.85	-0.95	V	$T_J = 25^{\circ}\text{C}$ , $I_S = -3.4\text{A}$ , $V_{GS} = 0\text{V}$
Reverse Recovery Time <sup>(3)</sup>	$t_{rr}$		29.2		ns	$T_J = 25^{\circ}\text{C}$ , $I_F = -2\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge <sup>(3)</sup>	$Q_{rr}$		39.6		nC	

#### NOTES

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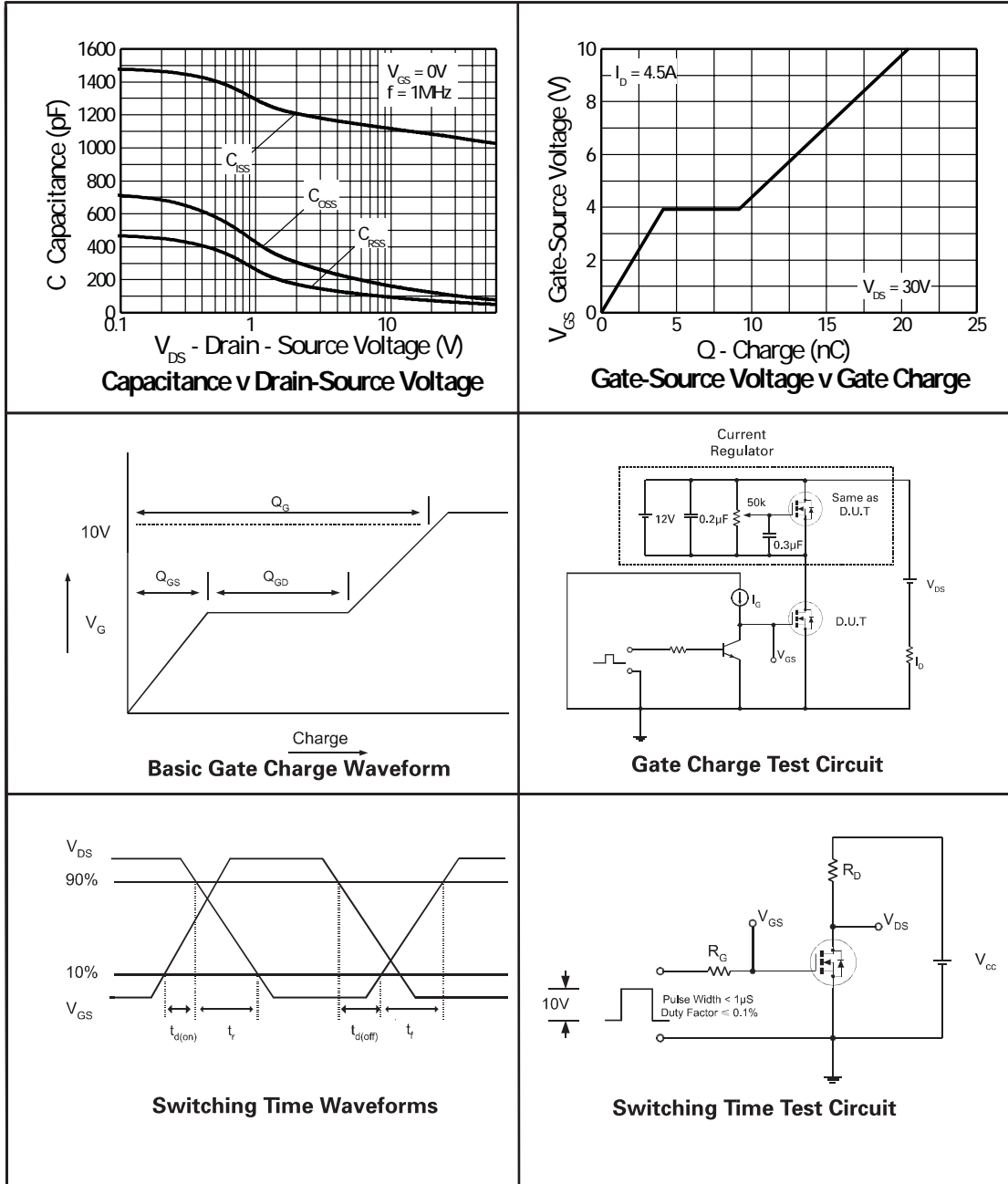
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## N-CHANNEL TYPICAL CHARACTERISTICS



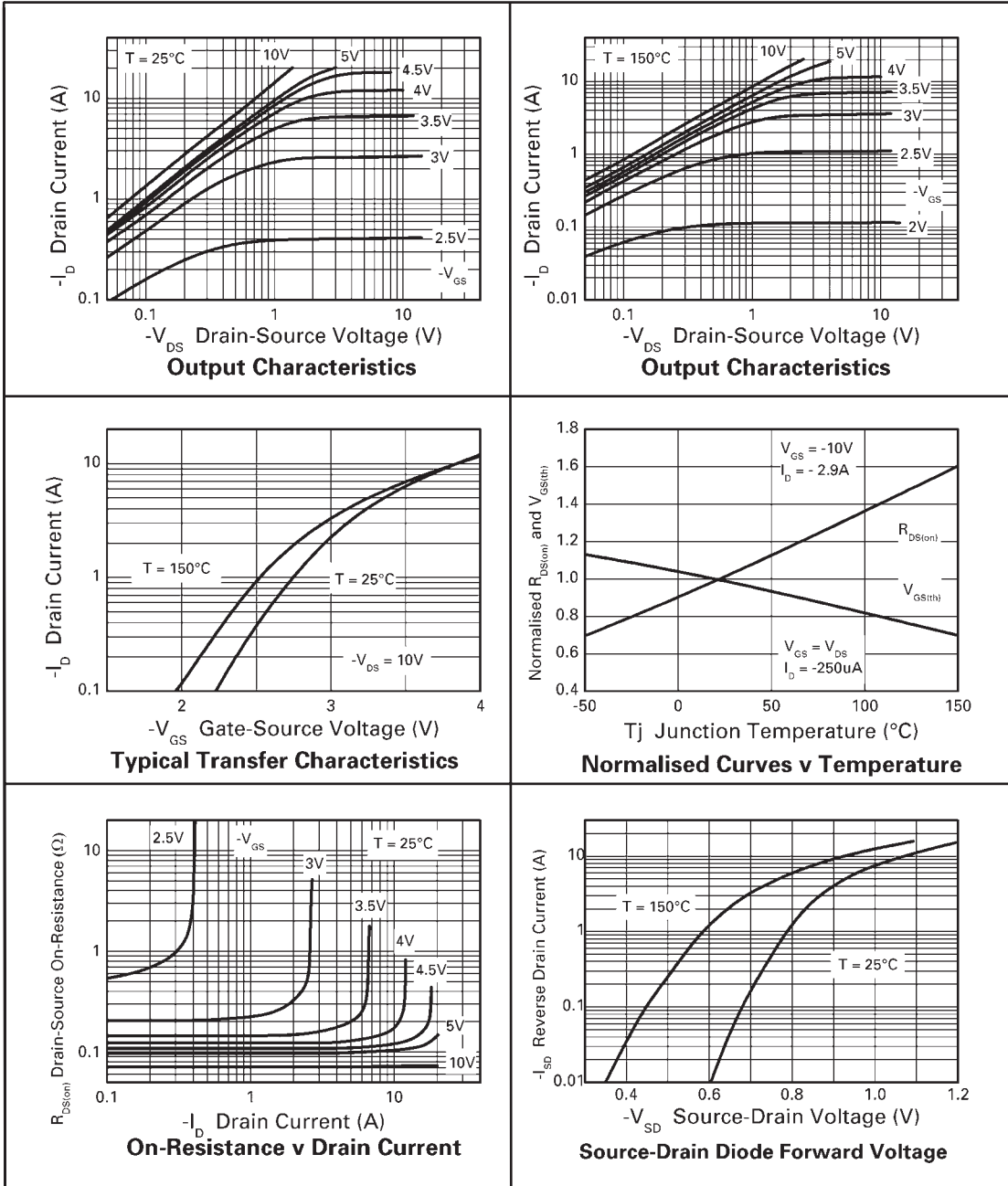
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## N-CHANNEL TYPICAL CHARACTERISTICS



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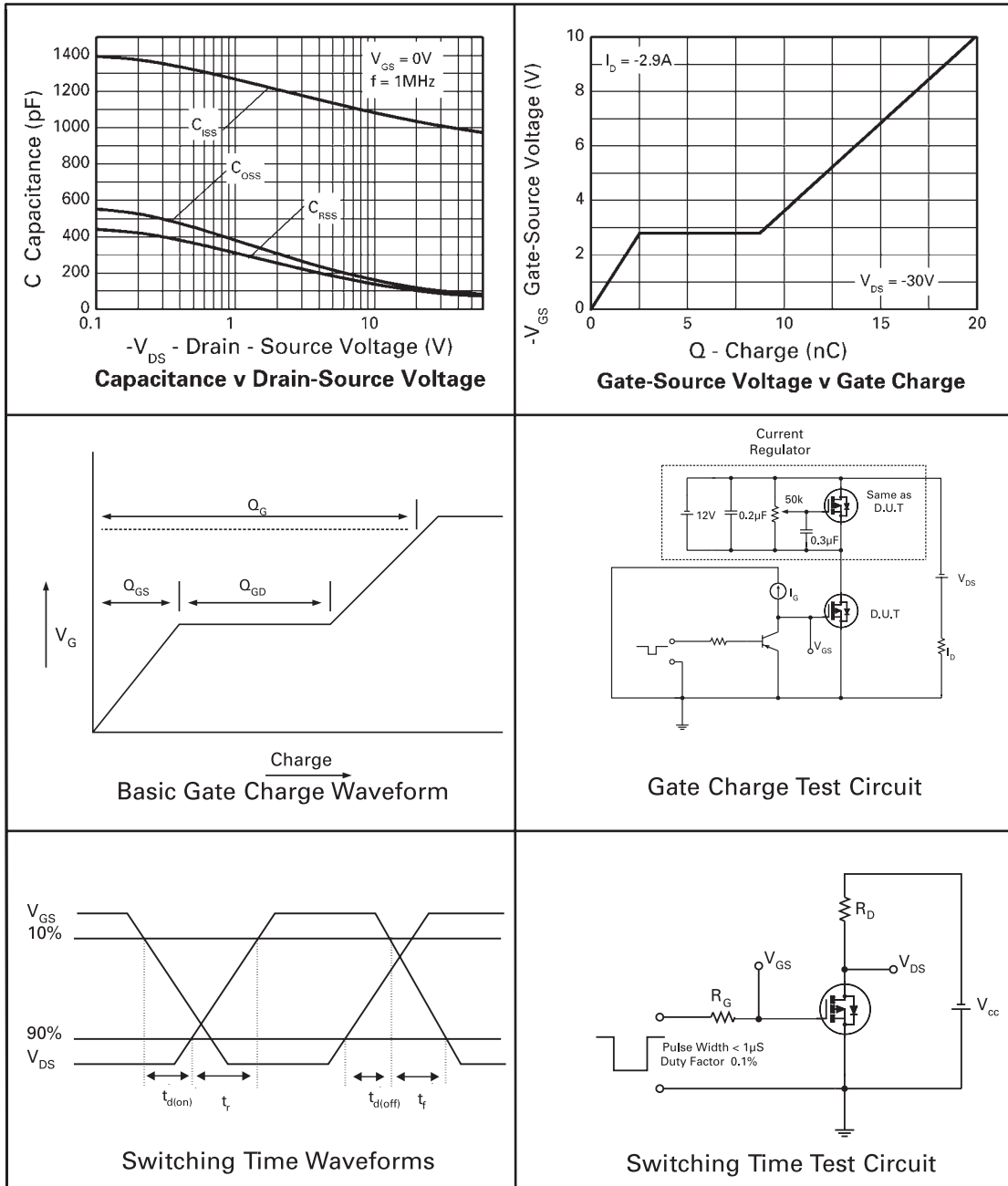
## P-CHANNEL TYPICAL CHARACTERISTICS





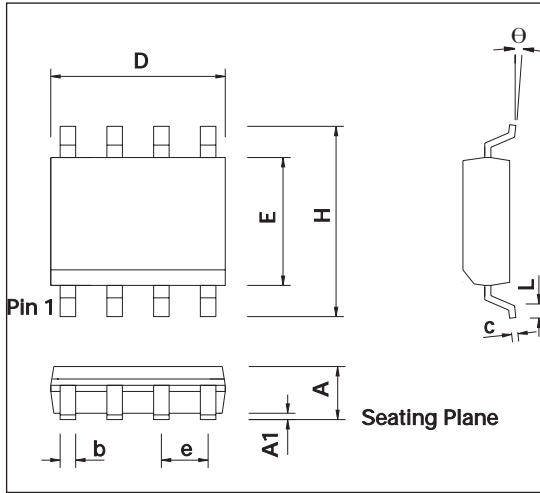
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## P-CHANNEL TYPICAL CHARACTERISTICS



# ZXMC4559DN8

## PACKAGE OUTLINE



CONTROLLING DIMENSIONS ARE IN INCHES  
APPROX IN MILLIMETRES

## PACKAGE DIMENSIONS

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

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