

ZXMC6A09DN8

COMPLEMENTARY 60V ENHANCEMENT MODE MOSFET

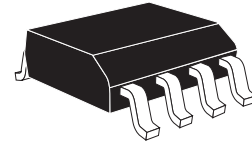
SUMMARY

N-Channel $V_{(BR)DSS} = 60V$; $R_{DS(ON)} = 0.045\Omega$; $I_D = 5.1A$

P-Channel $V_{(BR)DSS} = -60V$; $R_{DS(ON)} = 0.055\Omega$; $I_D = -4.8A$

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.



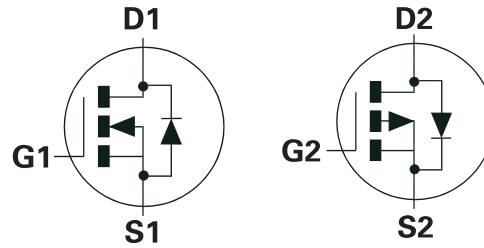
SO8

FEATURES

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

APPLICATIONS

- Motor drive
- LCD backlighting



Q1 = N-CHANNEL

Q2 = P-CHANNEL

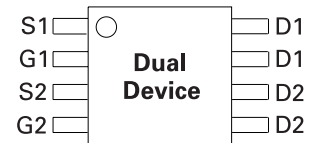
ORDERING INFORMATION

DEVICE	REEL	TAPE WIDTH	QUANTITY PER REEL
ZXMC6A09DN8TA	7"	12mm	500 units
ZXMC6A09DN8TC	13"	12mm	2500 units

DEVICE MARKING

ZXMC
6A09

PINOUT



Top view

ZXMC6A09DN8

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	N-Channel	P-Channel	UNIT
Drain-Source Voltage	V_{DSS}	60	-60	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current @ $V_{GS}=10V$; $T_A=25^\circ C$ (b)(d) @ $V_{GS}=10V$; $T_A=25^\circ C$ (b)(d) @ $V_{GS}=10V$; $T_A=25^\circ C$ (a)(d)	I_D	5.1 4.1 3.9	-4.8 -3.8 -3.7	A A A
Pulsed Drain Current (c)	I_{DM}	25	-23	A
Continuous Source Current (Body Diode)(b)	I_S	3.5	-3.3	A
Pulsed Source Current (Body Diode)(c)	I_{SM}	25.4	-23.8	A
Power Dissipation at $T_A=25^\circ C$ (a)(d) Linear Derating Factor	P_D	1.25 10		W mW/°C
Power Dissipation at $T_A=25^\circ C$ (a)(e) Linear Derating Factor	P_D	1.8 14		W mW/°C
Power Dissipation at $T_A=25^\circ C$ (b)(d) 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

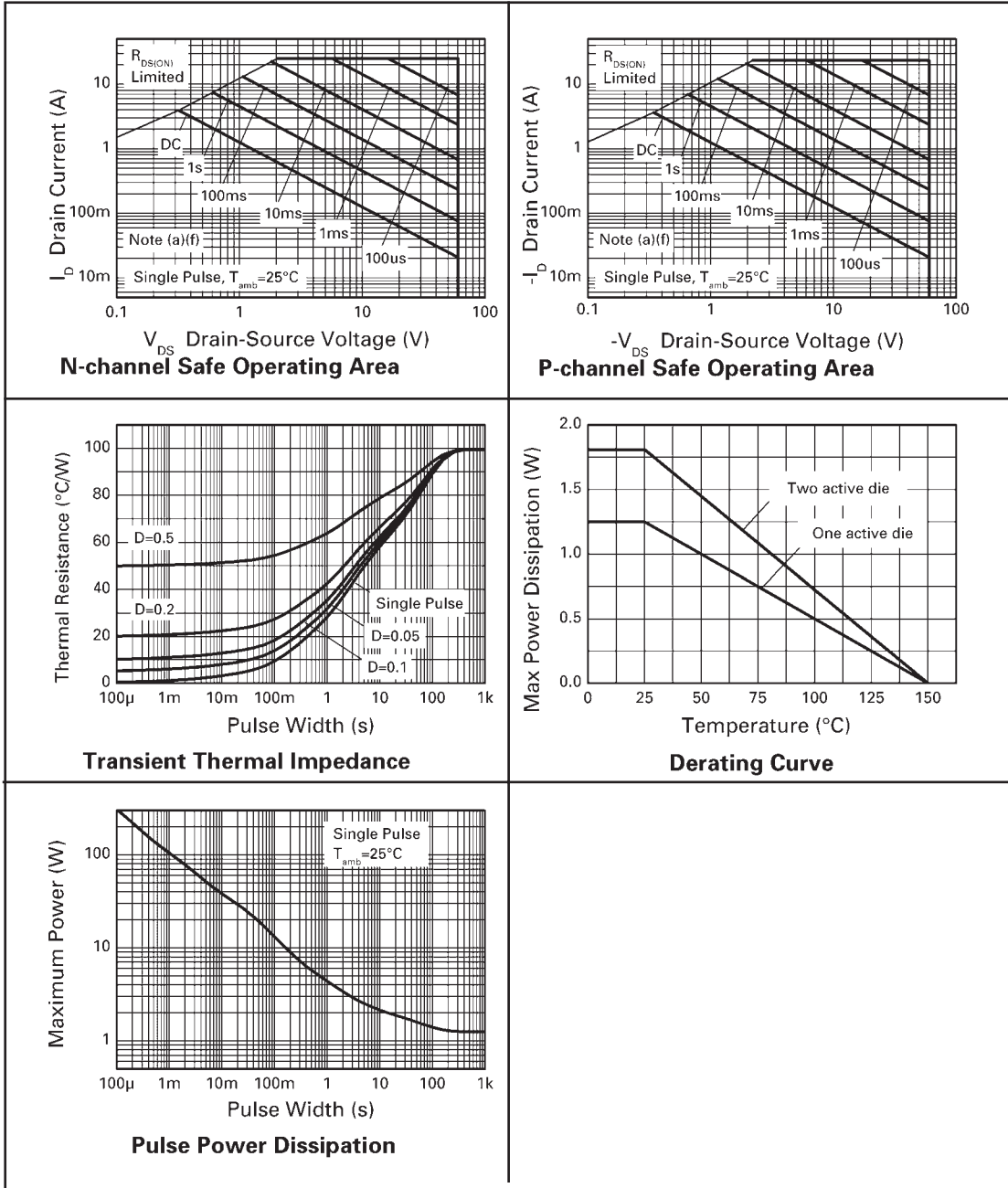
PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a)(d)	$R_{\theta JA}$	100	°C/W
Junction to Ambient (b)(e)	$R_{\theta JA}$	69	°C/W
Junction to Ambient (b)(d)	$R_{\theta JA}$	58	°C/W

Notes:

- (a) For a dual device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high 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 μ s - pulse width limited by maximum junction temperature.
- (d) For a dual device with one active die.
- (e) For a device with two active die running at equal power.

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CHARACTERISTICS



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N-CHANNEL

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

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
STATIC						
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	μA	$V_{DS}=60\text{V}, V_{GS}=0\text{V}$
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 ⁽¹⁾	$R_{DS(on)}$			0.045 0.070	Ω Ω	$V_{GS}=10\text{V}, I_D=8.2\text{A}$ $V_{GS}=4.5\text{V}, I_D=7.4\text{A}$
Forward Transconductance ⁽¹⁾⁽³⁾	g_{fs}		15		S	$V_{DS}=15\text{V}, I_D=8.2\text{A}$
DYNAMIC ⁽³⁾						
Input Capacitance	C_{iss}		1407		pF	$V_{DS}=40\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}$
Output Capacitance	C_{oss}		121		pF	
Reverse Transfer Capacitance	C_{rss}		59		pF	
SWITCHING ^{(2) (3)}						
Turn-On Delay Time	$t_{d(on)}$		4.9		ns	$V_{DD}=30\text{V}, I_D=1.0\text{A}$ $R_G=6.0\Omega, V_{GS}=10\text{V}$
Rise Time	t_r		3.3		ns	
Turn-Off Delay Time	$t_{d(off)}$		28.5		ns	
Fall Time	t_f		11.0		ns	
Gate Charge	Q_g		12.4		nC	$V_{DS}=15\text{V}, V_{GS}=5\text{V},$ $I_D=3.5\text{A}$
Total Gate Charge	Q_g		24.2		nC	$V_{DS}=15\text{V}, V_{GS}=10\text{V},$ $I_D=3.5\text{A}$
Gate-Source Charge	Q_{gs}		5.2		nC	
Gate-Drain Charge	Q_{gd}		3.5		nC	
SOURCE-DRAIN DIODE						
Diode Forward Voltage ⁽¹⁾	V_{SD}		0.85	0.95	V	$T_J=25^{\circ}\text{C}, I_S=6.6\text{A},$ $V_{GS}=0\text{V}$
Reverse Recovery Time ⁽³⁾	t_{rr}		26.3		ns	$T_J=25^{\circ}\text{C}, I_F=3.5\text{A},$ $di/dt=100\text{A}/\mu\text{s}$
Reverse Recovery Charge ⁽³⁾	Q_{rr}		26.6		nC	

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)

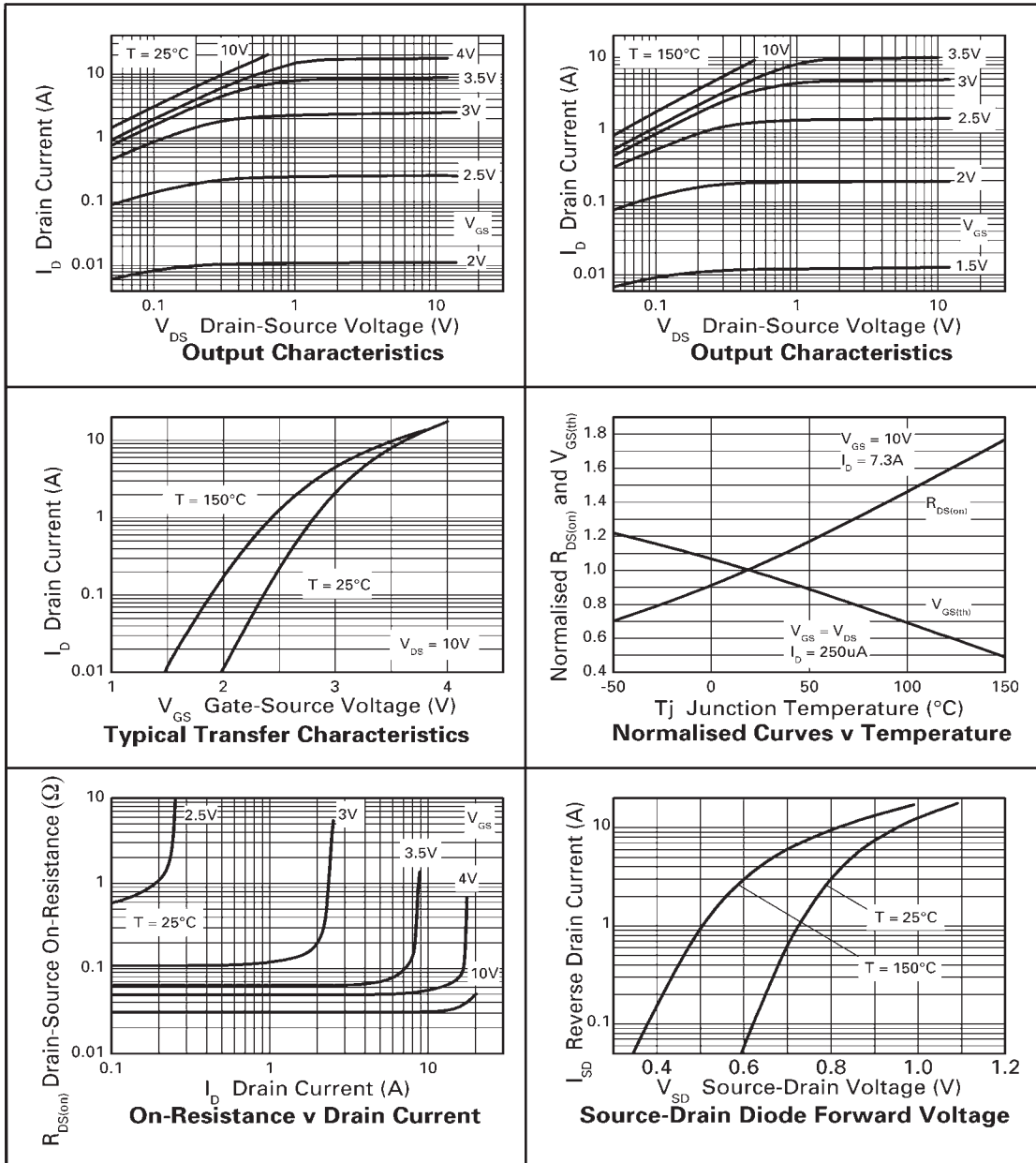
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	-60			V	$I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	I_{DSS}			-1.0	μA	$V_{DS} = -60\text{V}, V_{GS} = 0\text{V}$
Gate-Body Leakage	I_{GSS}			100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
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 ⁽¹⁾	$R_{DS(on)}$			0.055 0.080	Ω Ω	$V_{GS} = -10\text{V}, I_D = -3.5\text{A}$ $V_{GS} = -4.5\text{V}, I_D = -2.9\text{A}$
Forward Transconductance ⁽¹⁾⁽³⁾	g_{fs}		8.7		S	$V_{DS} = -15\text{V}, I_D = -3.5\text{A}$
DYNAMIC ⁽³⁾						
Input Capacitance	C_{iss}		1580		pF	$V_{DS} = -30\text{V}, V_{GS} = 0\text{V},$ $f = 1\text{MHz}$
Output Capacitance	C_{oss}		160		pF	
Reverse Transfer Capacitance	C_{rss}		140		pF	
SWITCHING ^{(2) (3)}						
Turn-On Delay Time	$t_{d(on)}$		4.6		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		5.8		ns	
Turn-Off Delay Time	$t_{d(off)}$		55		ns	
Fall Time	t_f		23		ns	
Gate Charge	Q_g		23		nC	$V_{DS} = -30\text{V}, V_{GS} = -5\text{V},$ $I_D = -3.5\text{A}$
Total Gate Charge	Q_g		44		nC	$V_{DS} = -30\text{V}, V_{GS} = -10\text{V},$ $I_D = -3.5\text{A}$
Gate-Source Charge	Q_{gs}		3.9		nC	
Gate-Drain Charge	Q_{gd}		9.8		nC	
SOURCE-DRAIN DIODE						
Diode Forward Voltage ⁽¹⁾	V_{SD}		-0.85	-0.95	V	$T_J = 25^{\circ}\text{C}, I_S = -4.2\text{A},$ $V_{GS} = 0\text{V}$
Reverse Recovery Time ⁽³⁾	t_{rr}		37		ns	$T_J = 25^{\circ}\text{C}, I_F = -2.1\text{A},$ $di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge ⁽³⁾	Q_{rr}		56		nC	

NOTES

- (1) Measured under pulsed conditions. Width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.
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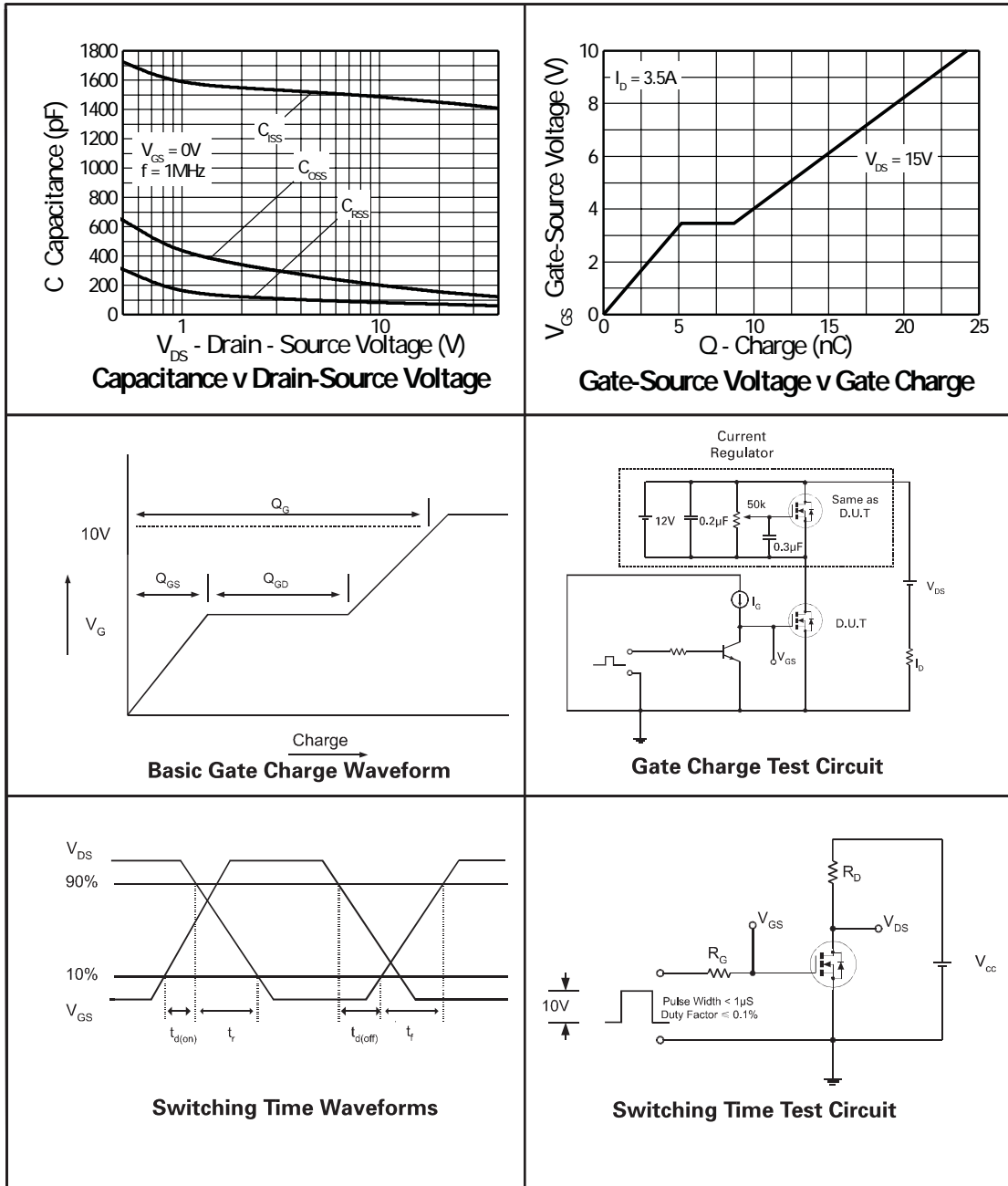
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N-CHANNEL TYPICAL CHARACTERISTICS



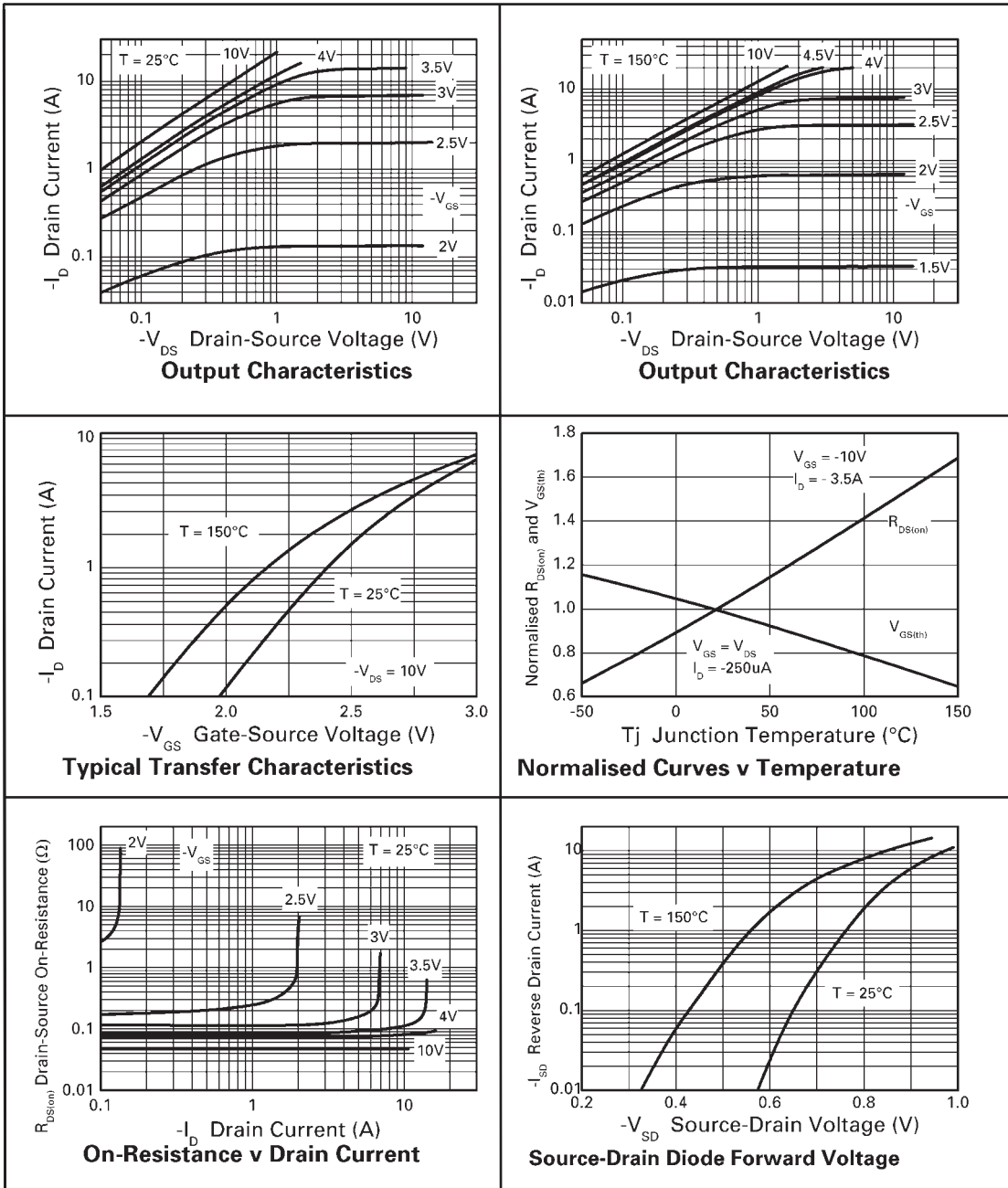
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N-CHANNEL TYPICAL CHARACTERISTICS



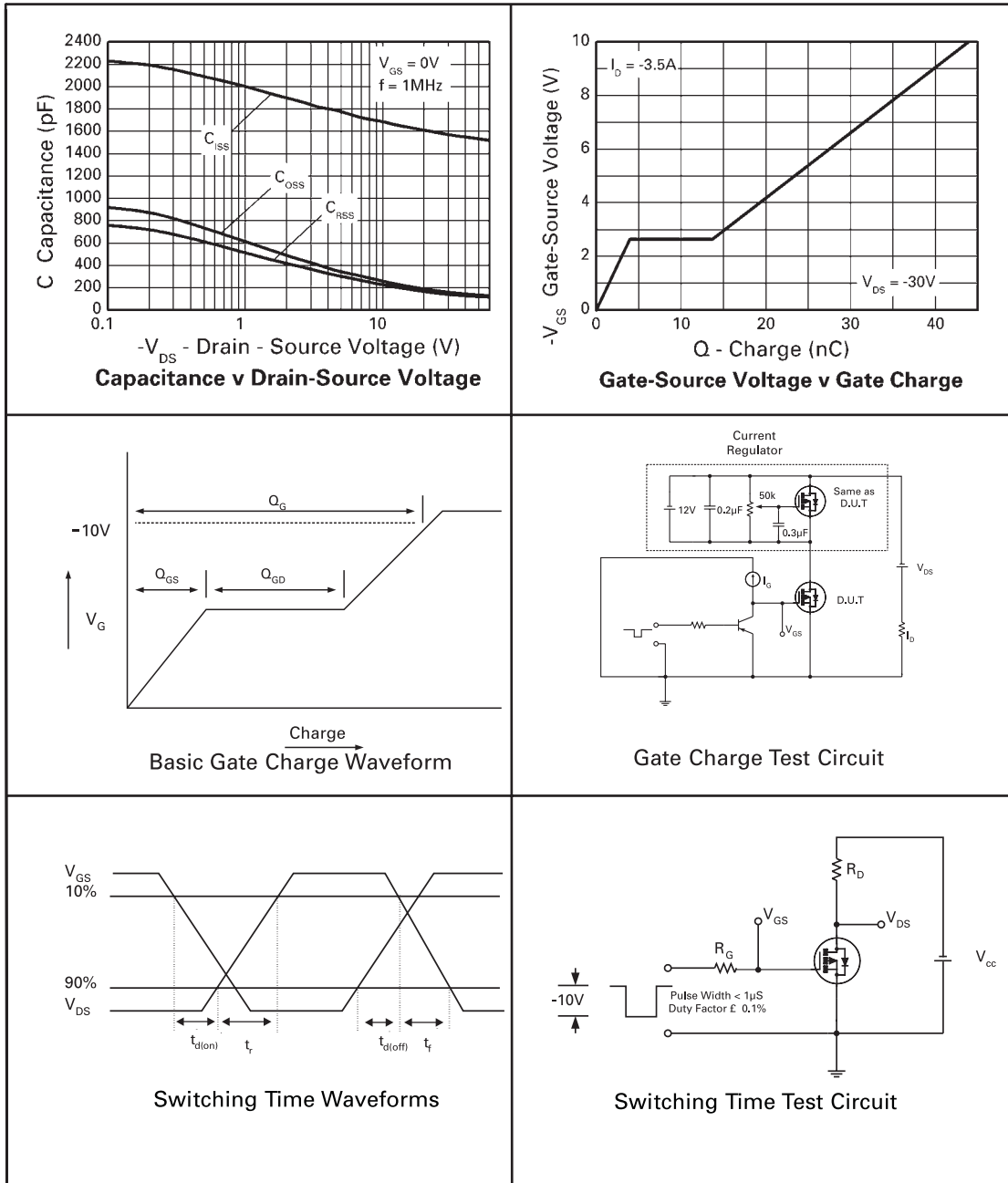
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P-CHANNEL TYPICAL CHARACTERISTICS



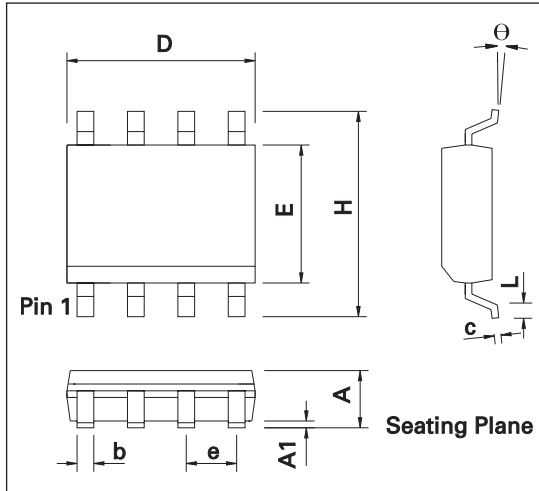
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P-CHANNEL TYPICAL CHARACTERISTICS



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PACKAGE OUTLINE



CONTROLLING DIMENSIONS ARE IN INCHES
APPROX IN MILLIMETERS

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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