

## 20V DUAL N AND P-CHANNEL ENHANCEMENT MODE MOSFET

### SUMMARY

**N-CHANNEL:**  $V_{(BR)DSS}=20V$ ;  $R_{DS(ON)}=0.13\Omega$ ;  $I_D=2.4A$

**P-CHANNEL:**  $V_{(BR)DSS}=-20V$ ;  $R_{DS(ON)}=0.27\Omega$ ;  $I_D=-1.7A$

### DESCRIPTION

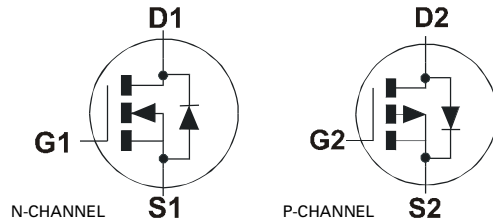
This new generation of high density MOSFETs from Zetex utilises a unique structure that combines the benefits of low on-resistance with fast switching speed. This makes them ideal for high efficiency, low voltage, power management applications.



**MSOP8**

### FEATURES

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

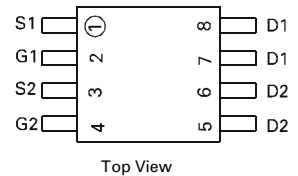


### APPLICATIONS

- DC - DC Converters
- Power Management Functions
- Disconnect switches
- Motor control

### ORDERING INFORMATION

DEVICE	REEL SIZE (inches)	TAPE WIDTH (mm)	QUANTITY PER REEL
ZXMD63C02XTA	7	12mm embossed	1000 units
ZXMD63C02XTC	13	12mm embossed	4000 units



### DEVICE MARKING

- ZXMD63C02

# ZXMD63C02X

## ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	N-CHANNEL	P-CHANNEL	UNIT
Drain-Source Voltage	$V_{DSS}$	20	-20	V
Gate- Source Voltage	$V_{GS}$	± 12		V
Continuous Drain Current ( $V_{GS}=4.5V$ ; $T_A=25^\circ C$ )(b)(d) ( $V_{GS}=4.5V$ ; $T_A=70^\circ C$ )(b)(d)	$I_D$	2.4 1.9	-1.7 -1.35	A
Pulsed Drain Current (c)(d)	$I_{DM}$	19	-9.6	A
Continuous Source Current (Body Diode)(b)(d)	$I_S$	-1.5	-1.4	A
Pulsed Source Current (Body Diode)(c)(d)	$I_{SM}$	19	-9.6	A
Power Dissipation at $T_A=25^\circ C$ (a)(d) Linear Derating Factor	$P_D$	0.87 6.9		W mW/°C
Power Dissipation at $T_A=25^\circ C$ (a)(e) Linear Derating Factor	$P_D$	1.04 8.3		W mW/°C
Power Dissipation at $T_A=25^\circ C$ (b)(d) Linear Derating Factor	$P_D$	1.25 10		W mW/°C
Operating and Storage Temperature Range	$T_j; T_{stg}$	-55 to +150		°C

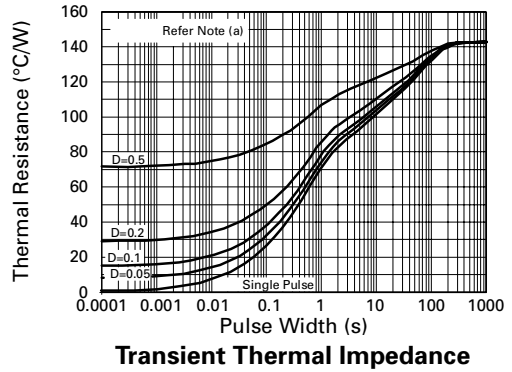
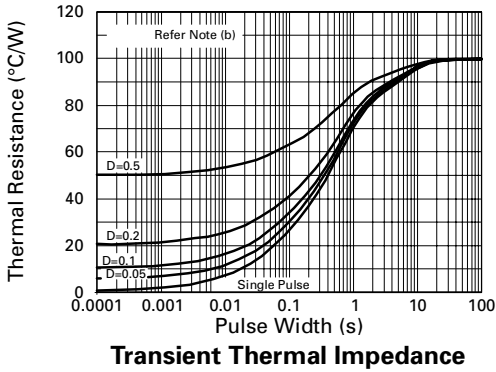
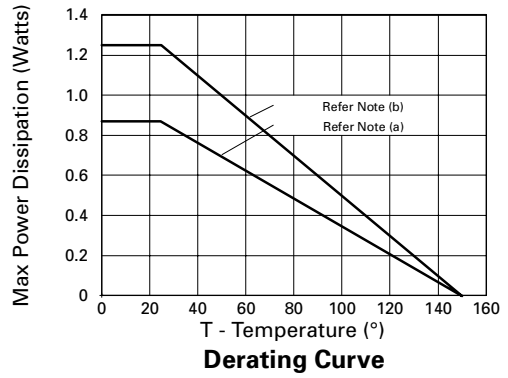
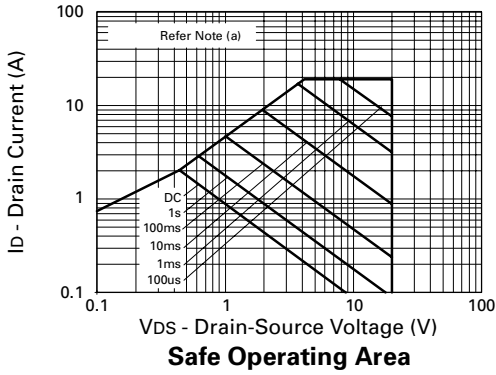
## THERMAL RESISTANCE

PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a)(d)	$R_{\theta JA}$	143	°C/W
Junction to Ambient (b)(d)	$R_{\theta JA}$	100	°C/W
Junction to Ambient (a)(e)	$R_{\theta JA}$	120	°C/W

### NOTES

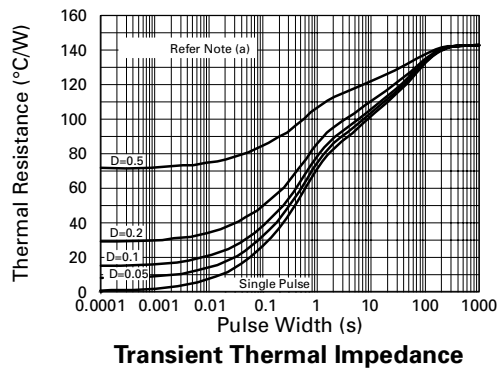
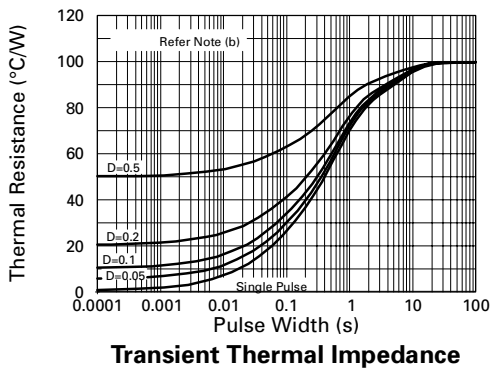
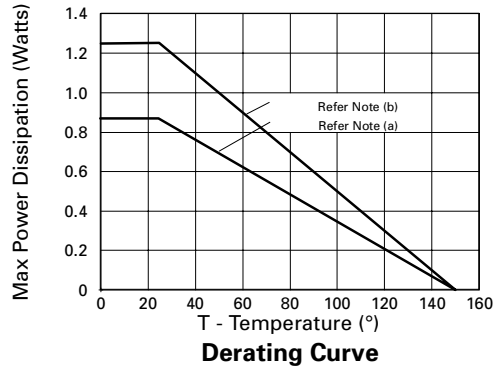
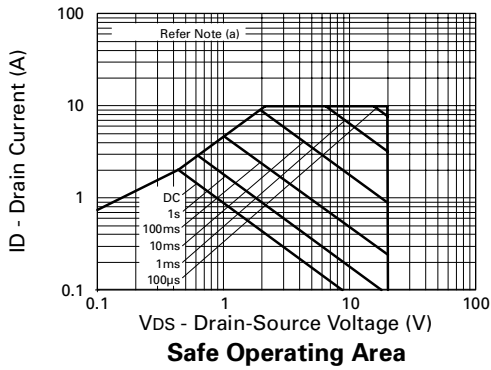
- (a) For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions
- (b) For a device surface mounted on FR4 PCB measured at  $t \leq 10$  secs.
- (c) Repetitive rating - pulse width limited by maximum junction temperature. Refer to Transient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

## N-CHANNEL CHARACTERISTICS



# ZXMD63C02X

## P-CHANNEL CHARACTERISTICS



## 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	$V_{(BR)DSS}$	20			V	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$			1	$\mu\text{A}$	$V_{DS}=20\text{V}$ , $V_{GS}=0\text{V}$
Gate-Body Leakage	$I_{GSS}$			100	nA	$V_{GS}=\pm 12\text{V}$ , $V_{DS}=0\text{V}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.7			V	$I_D=250\mu\text{A}$ , $V_{DS}=V_{GS}$
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$			0.130 0.150	$\Omega$ $\Omega$	$V_{GS}=4.5\text{V}$ , $I_D=1.7\text{A}$ $V_{GS}=2.7\text{V}$ , $I_D=0.85\text{A}$
Forward Transconductance (3)	$g_{fs}$	2.6			S	$V_{DS}=10\text{V}$ , $I_D=0.85\text{A}$
<b>DYNAMIC (3)</b>						
Input Capacitance	$C_{iss}$		350		pF	$V_{DS}=15\text{V}$ , $V_{GS}=0\text{V}$ , $f=1\text{MHz}$
Output Capacitance	$C_{oss}$		120		pF	
Reverse Transfer Capacitance	$C_{rss}$		50		pF	
<b>SWITCHING(2) (3)</b>						
Turn-On Delay Time	$t_{d(on)}$		3.4		ns	$V_{DD}=10\text{V}$ , $I_D=1.7\text{A}$ $R_G=6.0\Omega$ , $R_D=5.7\Omega$ (Refer to test circuit)
Rise Time	$t_r$		8.1		ns	
Turn-Off Delay Time	$t_{d(off)}$		13.5		ns	
Fall Time	$t_f$		9.1		ns	
Total Gate Charge	$Q_g$			6	nC	$V_{DS}=16\text{V}$ , $V_{GS}=4.5\text{V}$ , $I_D=1.7\text{A}$ (Refer to test circuit)
Gate-Source Charge	$Q_{gs}$			0.65	nC	
Gate Drain Charge	$Q_{gd}$			2.5	nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage (1)	$V_{SD}$			0.95	V	$T_j=25^{\circ}\text{C}$ , $I_S=1.7\text{A}$ , $V_{GS}=0\text{V}$
Reverse Recovery Time (3)	$t_{rr}$		15.0		ns	$T_j=25^{\circ}\text{C}$ , $I_F=1.7\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$
Reverse Recovery Charge(3)	$Q_{rr}$		5.9		nC	

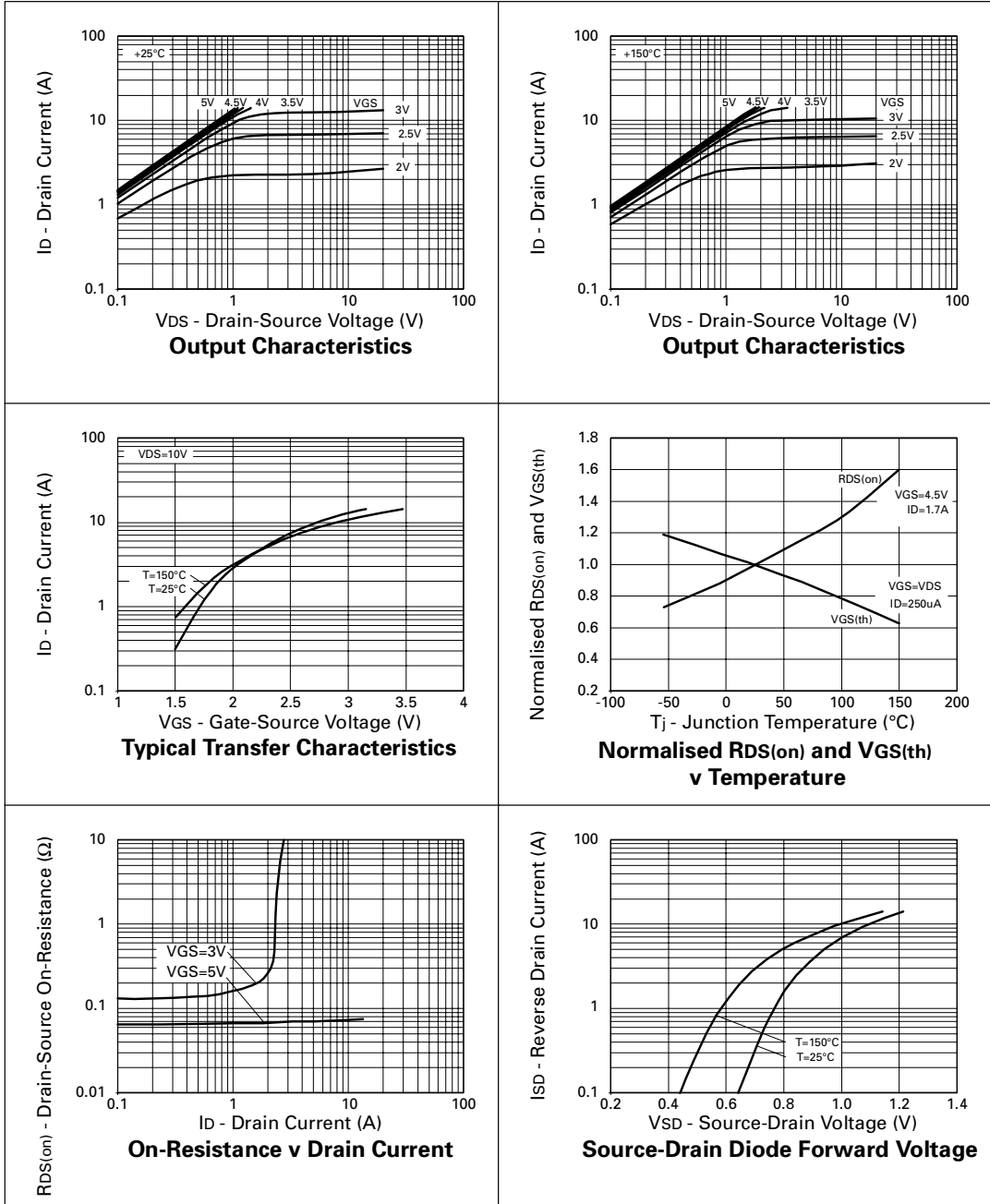
(1) Measured under pulsed conditions. Width=300 $\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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

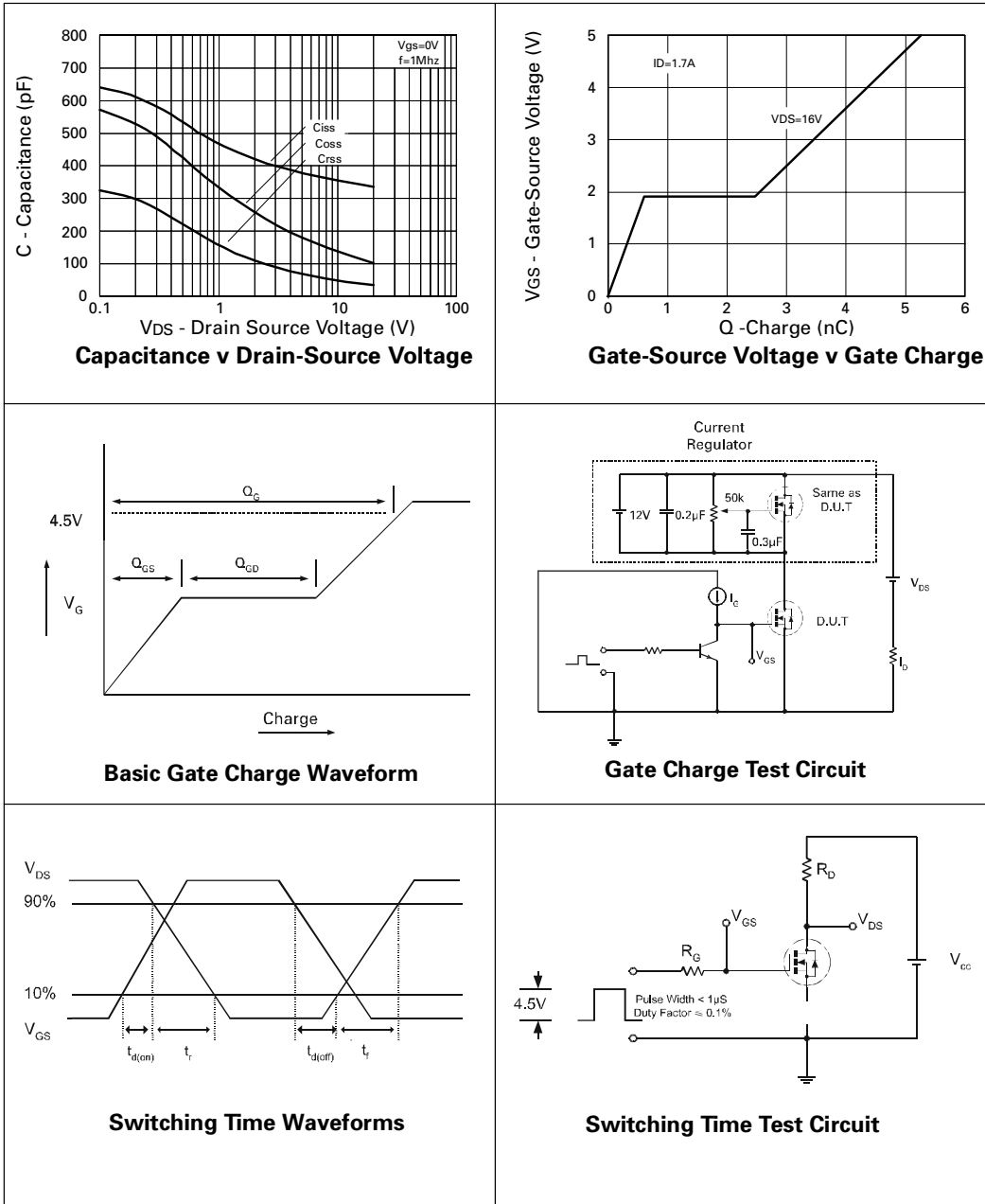
(3) For design aid only, not subject to production testing.

# ZXMD63C02X

## N-CHANNEL TYPICAL CHARACTERISTICS



## N-CHANNEL CHARACTERISTICS



# ZXMD63C02X

## 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	$V_{(BR)DSS}$	-20			V	$I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$			-1	$\mu\text{A}$	$V_{DS} = -20\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Body Leakage	$I_{GSS}$			$\pm 100$	nA	$V_{GS} = \pm 12\text{V}$ , $V_{DS} = 0\text{V}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	-0.7			V	$I_D = -250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$			0.27 0.40	$\Omega$ $\Omega$	$V_{GS} = -4.5\text{V}$ , $I_D = -1.2\text{A}$ $V_{GS} = -2.7\text{V}$ , $I_D = -0.6\text{A}$
Forward Transconductance (3)	$g_{fs}$	1.3			S	$V_{DS} = -10\text{V}$ , $I_D = -0.6\text{A}$
<b>DYNAMIC (3)</b>						
Input Capacitance	$C_{iss}$		290		pF	$V_{DS} = -15\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$		120		pF	
Reverse Transfer Capacitance	$C_{rss}$		50		pF	
<b>SWITCHING(2) (3)</b>						
Turn-On Delay Time	$t_{d(on)}$		3.4		ns	$V_{DD} = -10\text{V}$ , $I_D = -1.2\text{A}$ $R_G = 6.0\Omega$ , $R_D = 8.3\Omega$ (Refer to test circuit)
Rise Time	$t_r$		9.6		ns	
Turn-Off Delay Time	$t_{d(off)}$		16.4		ns	
Fall Time	$t_f$		20.4		ns	
Total Gate Charge	$Q_g$			5.25	nC	$V_{DS} = -16\text{V}$ , $V_{GS} = -4.5\text{V}$ , $I_D = -1.2\text{A}$ (Refer to test circuit)
Gate-Source Charge	$Q_{gs}$			1.0	nC	
Gate Drain Charge	$Q_{gd}$			2.25	nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage (1)	$V_{SD}$			-0.95	V	$T_j = 25^{\circ}\text{C}$ , $I_S = -1.2\text{A}$ , $V_{GS} = 0\text{V}$
Reverse Recovery Time (3)	$t_{rr}$		21.7		ns	$T_j = 25^{\circ}\text{C}$ , $I_F = -1.2\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge(3)	$Q_{rr}$		9.6		nC	

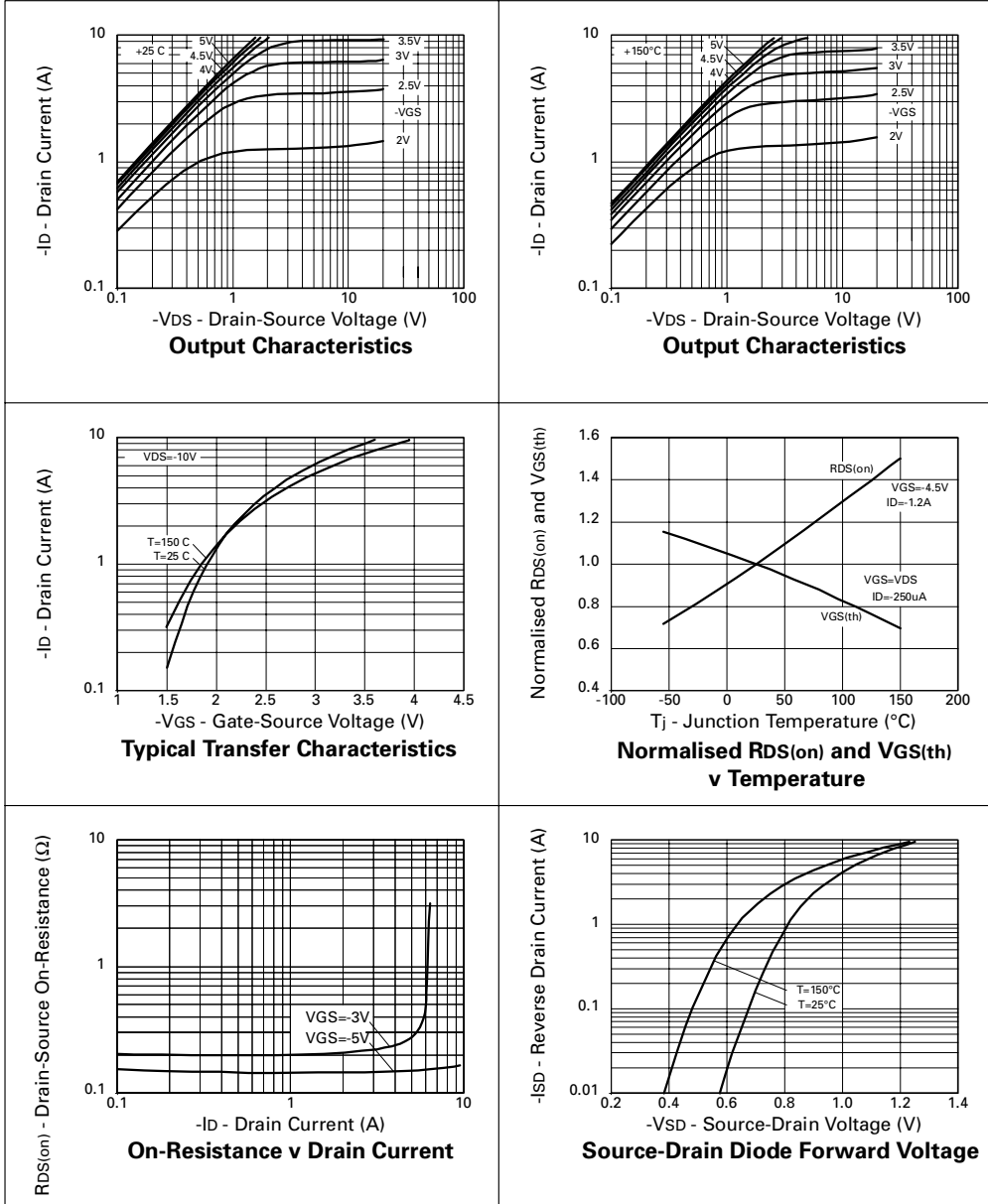
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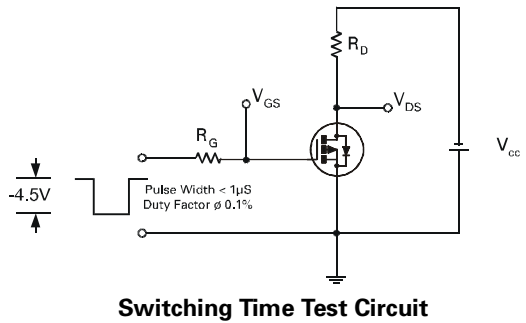
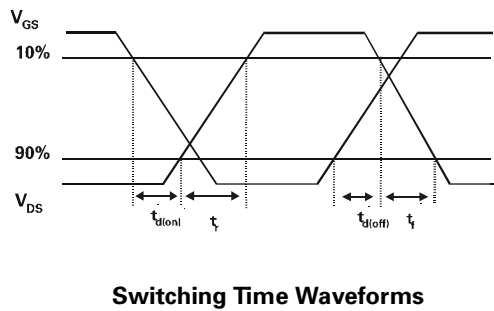
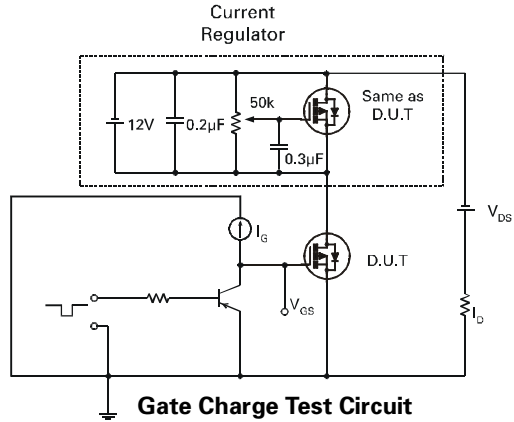
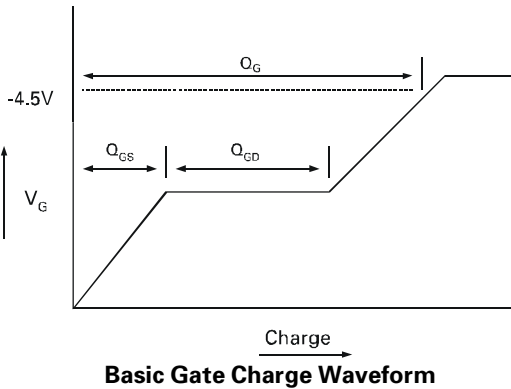
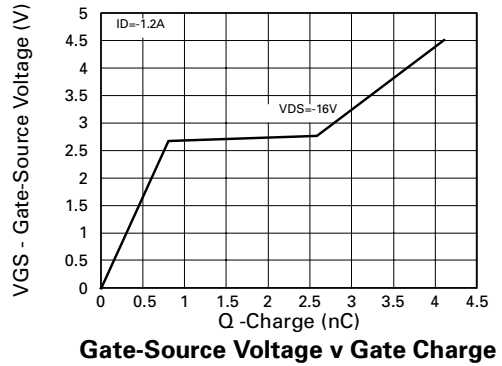
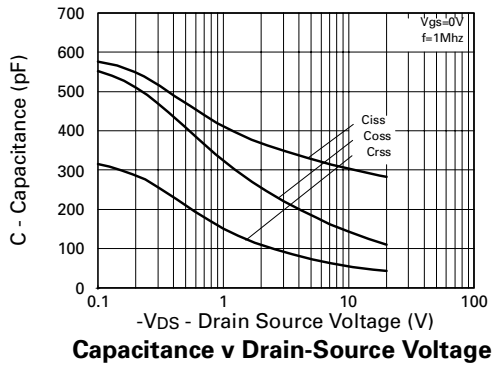


## P-CHANNEL CHARACTERISTICS



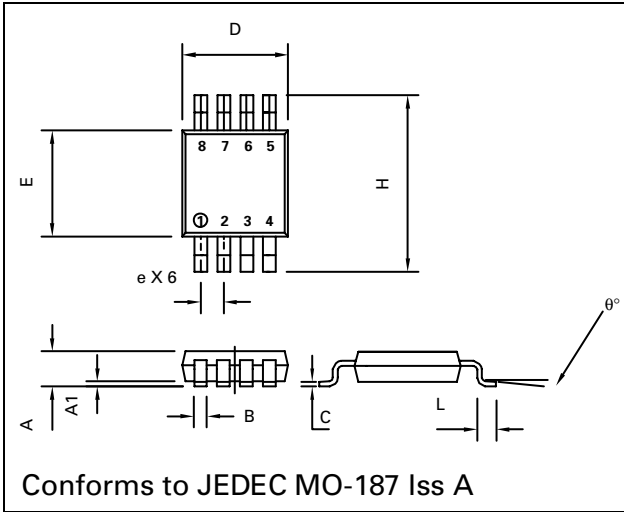
# ZXMD63C02X

## P-CHANNEL TYPICAL CHARACTERISTICS



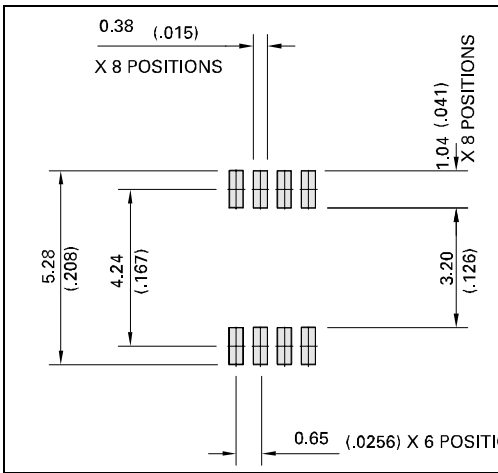
# ZXMD63C02X

## PACKAGE DIMENSIONS



DIM	Millimetres		Inches	
	MIN	MAX	MIN	MAX
A		1.10		0.043
A1	0.05	0.15	0.002	0.006
B	0.25	0.40	0.010	0.016
C	0.13	0.23	0.005	0.009
D	2.90	3.10	0.114	0.122
e	0.65	BSC	0.0256	BSC
E	2.90	3.10	0.114	0.122
H	4.90	BSC	0.193	BSC
L	0.40	0.70	0.016	0.028
q°	0°	6°	0°	6°

## PAD LAYOUT DETAILS



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