

**ZXMC3AMC**

**30V COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET**

**Product Summary**

Device	V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub> max T <sub>A</sub> = 25°C (Notes 4 & 7)
Q1	30V	120mΩ @ V <sub>GS</sub> = 10V	3.7A
		180mΩ @ V <sub>GS</sub> = 4.5V	3.0A
Q2	-30V	210mΩ @ V <sub>GS</sub> = -10V	-2.7A
		330mΩ @ V <sub>GS</sub> = -4.5V	-2.2A

**Description and Applications**

This MOSFET has been designed to minimize the on-state resistance (R<sub>DS(on)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

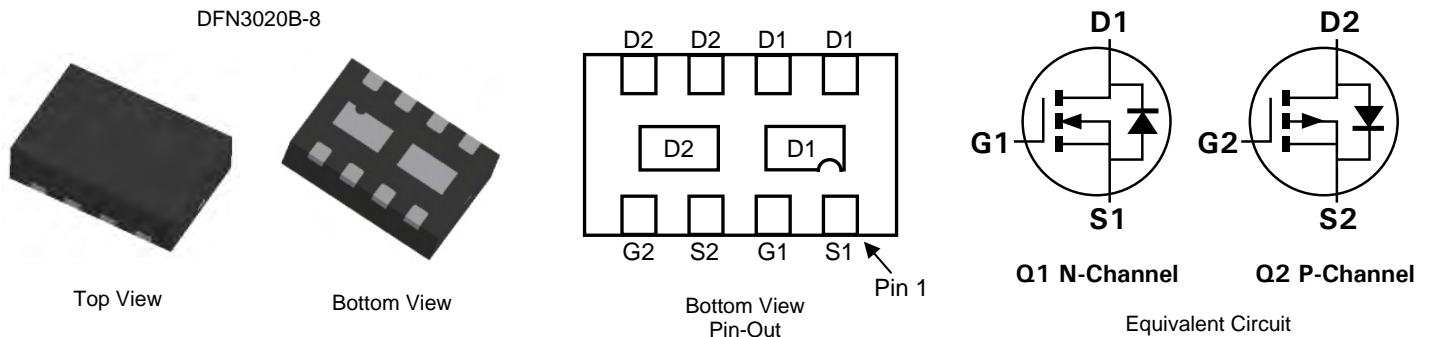
- MOSFET gate drive
- LCD backlight inverters
- Motor control
- Portable applications

**Features and Benefits**

- Low profile package, for thin applications
- Low R<sub>θJA</sub>, thermally efficient package
- 6mm<sup>2</sup> footprint, 50% smaller than TSOP6 and SOT23-6
- Low on-resistance
- Fast switching speed
- "Lead-Free", RoHS Compliant (Note 1)
- Halogen and Antimony Free. "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

**Mechanical Data**

- Case: DFN3020B-8
- Terminals: Pre-Plated NiPdAu leadframe
- Nominal package height: 0.8mm
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Solderable per MIL-STD-202, Method 208
- Weight: 0.013 grams (approximate)

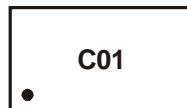


**Ordering Information** (Note 3)

Part Number	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMC3AMCTA	C01	7	8	3000

- Notes:
1. No purposefully added lead
  2. Diodes Inc's "Green" policy can be found on our website at <http://www.diodes.com>.
  3. For packaging details, go to our website at <http://www.diodes.com>.

**Marking Information**



C01 = Product Type Marking Code  
Top view, Dot Denotes Pin 1

**ZXMC3AMC**

**Maximum Ratings** @T<sub>A</sub> = 25°C unless otherwise specified

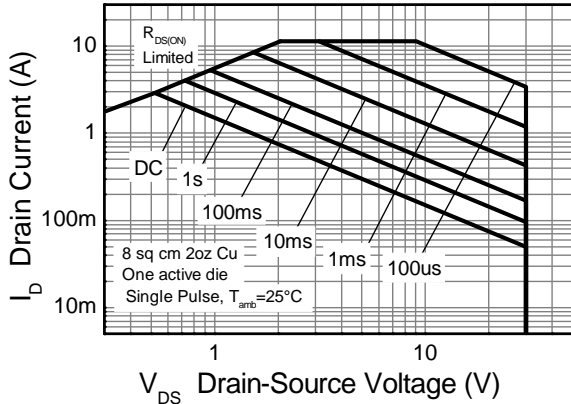
Characteristic			Symbol	N-channel – Q1	P-channel – Q2	Unit
Drain-Source Voltage			V <sub>DSS</sub>	30	-30	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	±20	
Continuous Drain Current	V <sub>GS</sub> = 10V	(Notes 4 & 7)	I <sub>D</sub>	3.7	-2.7	A
		T <sub>A</sub> = 70°C (Notes 4 & 7)		3.0	-2.2	
		(Notes 3 & 7)		2.9	-2.1	
Pulsed Drain Current	V <sub>GS</sub> = 10V	(Notes 6 & 7)	I <sub>DM</sub>	13	-9.2	
Continuous Source Current (Body diode)			I <sub>S</sub>	3.2	-2.8	
Pulse Source Current (Body diode)			I <sub>SM</sub>	13	-9.2	

**Thermal Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

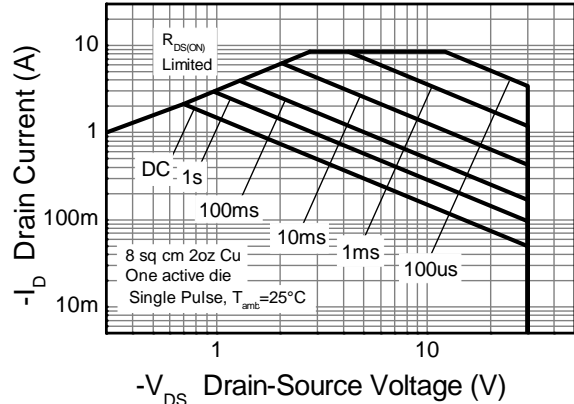
Characteristic		Symbol	N-channel – Q1	P-channel – Q2	Unit
Power Dissipation Linear Derating Factor	(Notes 3 & 7)	P <sub>D</sub>	1.50		W mW/°C
	(Notes 4 & 7)		12		
	(Notes 5 & 7)		2.45		
	(Notes 5 & 8)		19.6		
	(Notes 5 & 8)		1.13		
Thermal Resistance, Junction to Ambient	(Notes 3 & 7)	R <sub>θJA</sub>	9		°C/W
	(Notes 4 & 7)		1.70		
	(Notes 5 & 7)		13.6		
	(Notes 5 & 8)		83.3		
Thermal Resistance, Junction to Lead	(Notes 7 & 9)	R <sub>θJL</sub>	51.0		°C/W
	(Notes 7 & 9)	R <sub>θJL</sub>	111		
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150		°C

- Notes:
3. For a device surface mounted on 28mm x 28mm (8cm<sup>2</sup>) FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition. The heatsink is split in half with the exposed drain pads connected to each half.
  4. Same as note (3) except the device is measured at t < 5 sec.
  5. Same as note (3), except the device is surface mounted on 31mm x 31mm (10cm<sup>2</sup>) FR4 PCB with high coverage of single sided 1oz copper.
  6. Same as note (3), except the device is pulsed with D = 0.02 and pulse width 300µs. The pulse current is limited by the maximum junction temperature.
  7. For a dual device with one active die.
  8. For dual device with 2 active die running at equal power.
  9. Thermal resistance from junction to solder-point (at the end of the drain lead).

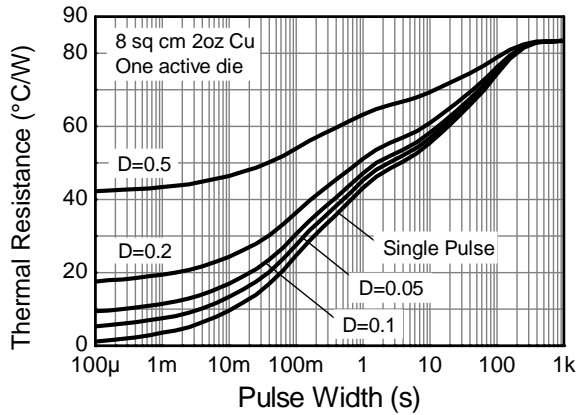
**Thermal Characteristics**



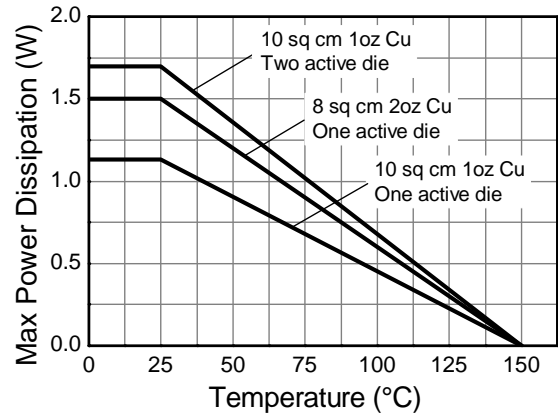
**N-channel Safe Operating Area**



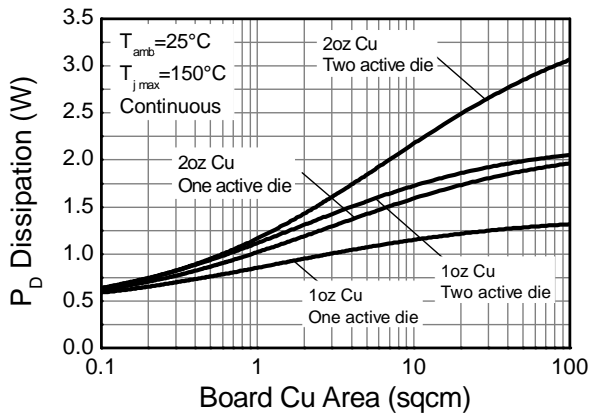
**P-channel Safe Operating Area**



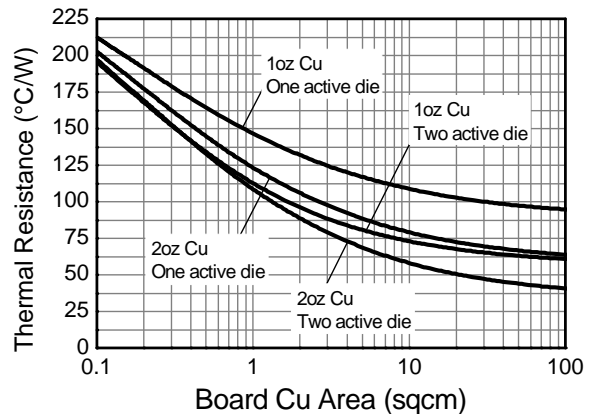
**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



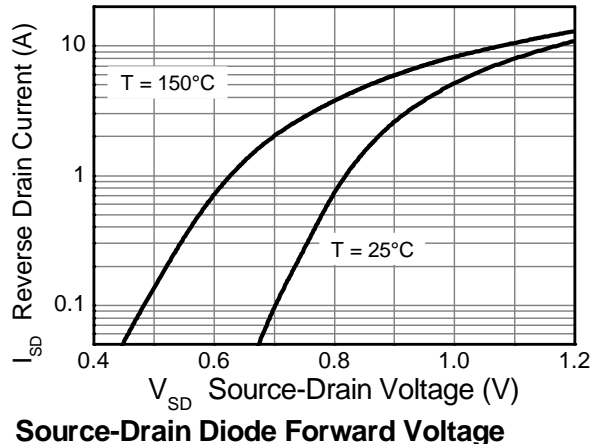
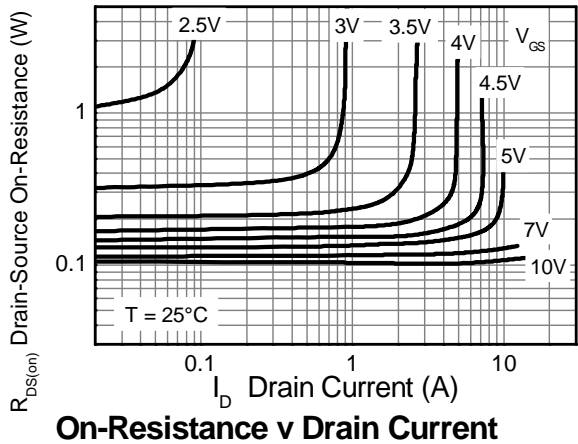
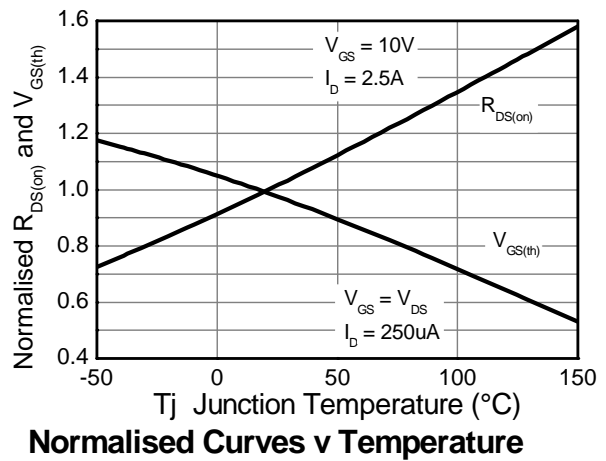
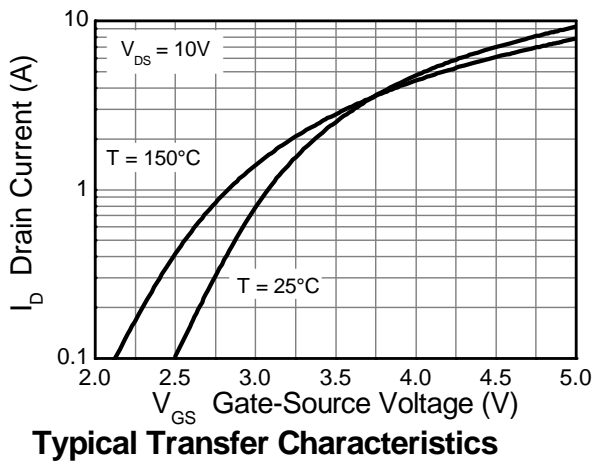
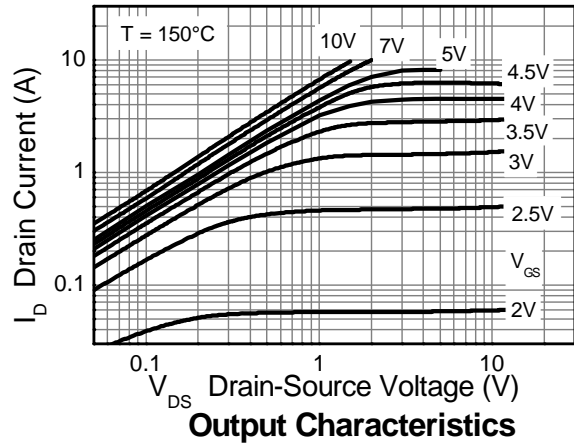
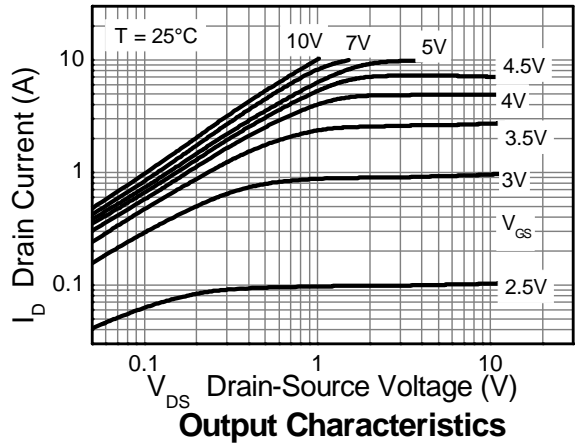
**Thermal Resistance v Board Area**

**Electrical Characteristics – Q1 N-Channel** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

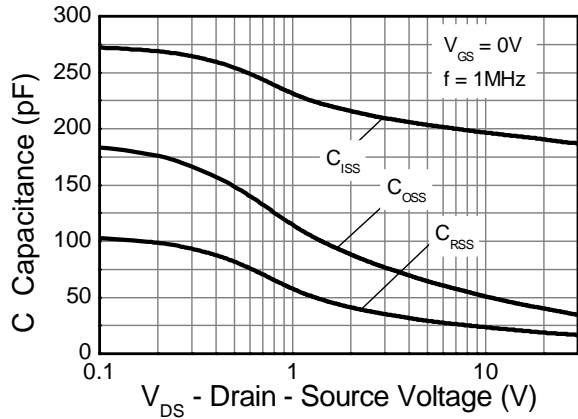
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	30	-	-	V	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$	-	-	0.5	$\mu\text{A}$	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	-	-	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	-	3.0	V	$I_D = 250\mu\text{A}, V_{DS} = V_{GS}$
Static Drain-Source On-Resistance (Note 10)	$R_{DS(on)}$	-	0.100	0.120	$\Omega$	$V_{GS} = 10\text{V}, I_D = 2.5\text{A}$
			0.140	0.180		$V_{GS} = 4.5\text{V}, I_D = 2.0\text{A}$
Forward Transconductance (Note 10 & 11)	$g_{fs}$	-	3.5	-	S	$V_{DS} = 10\text{V}, I_D = 2.5\text{A}$
Diode Forward Voltage (Note 10)	$V_{SD}$	-	0.85	0.95	V	$I_S = 1.7\text{A}, V_{GS} = 0\text{V}$
Reverse Recover Time (Note 11)	$t_{rr}$	-	17.7	-	ns	$I_S = 2.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recover Charge (Note 11)	$Q_{rr}$	-	13.0	-	nC	
<b>DYNAMIC CHARACTERISTICS (Note 11)</b>						
Input Capacitance	$C_{iss}$	-	190	-	pF	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	-	38	-	pF	
Reverse Transfer Capacitance	$C_{rss}$	-	20	-	pF	
Total Gate Charge (Note 12)	$Q_g$	-	2.3	-	nC	$V_{GS} = 4.5\text{V}$
Total Gate Charge (Note 12)	$Q_g$	-	3.9	-	nC	$V_{GS} = 10\text{V}$
Gate-Source Charge (Note 12)	$Q_{gs}$	-	0.6	-	nC	
Gate-Drain Charge (Note 12)	$Q_{gd}$	-	0.9	-	nC	
Turn-On Delay Time (Note 12)	$t_{D(on)}$	-	1.7	-	ns	$V_{DS} = 15\text{V}, I_D = 2.5\text{A}$ $V_{GS} = 10\text{V}, R_G = 6\Omega$
Turn-On Rise Time (Note 12)	$t_r$	-	2.3	-	ns	
Turn-Off Delay Time (Note 12)	$t_{D(off)}$	-	6.6	-	ns	
Turn-Off Fall Time (Note 12)	$t_f$	-	2.9	-	ns	

Notes: 10. Measured under pulsed conditions. Width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .  
 11. For design aid only, not subject to production testing.  
 12. Switching characteristics are independent of operating junction temperature.

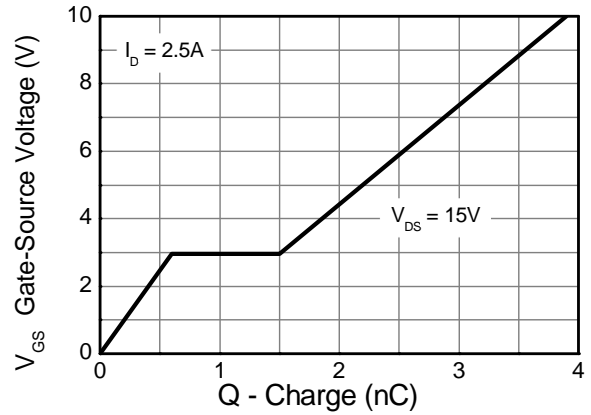
**Typical Electrical Characteristics – Q1 N-Channel**



**Typical Electrical Characteristics – Q1 N-Channel - Continued**

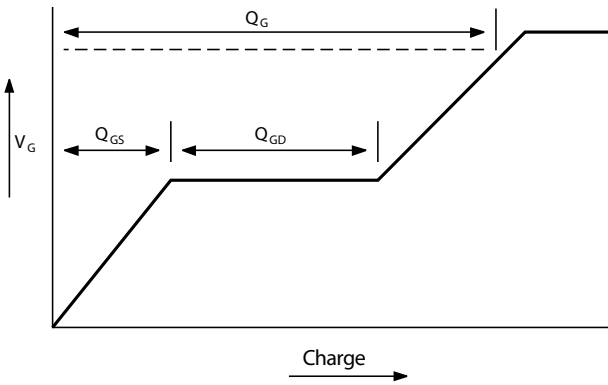


**Capacitance v Drain-Source Voltage**

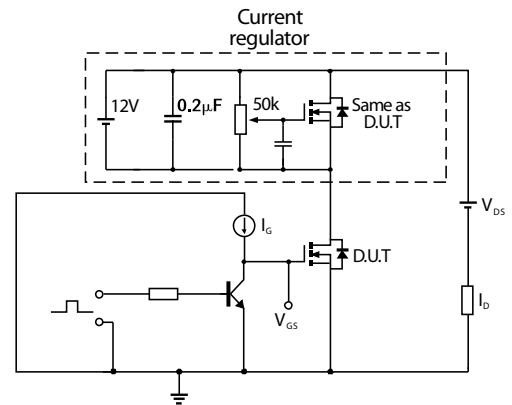


**Gate-Source Voltage v Gate Charge**

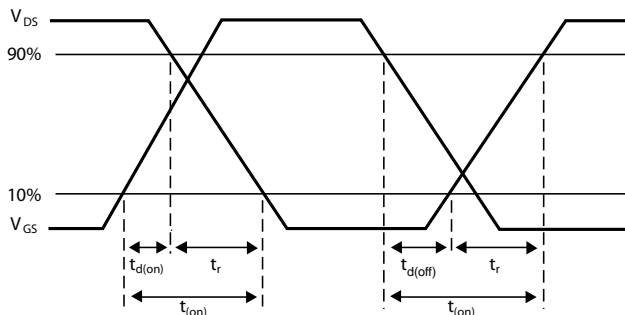
**Test Circuits**



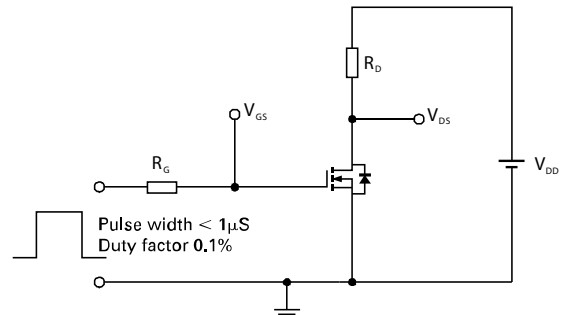
**Basic gate charge waveform**



**Gate charge test circuit**



**Switching time waveforms**



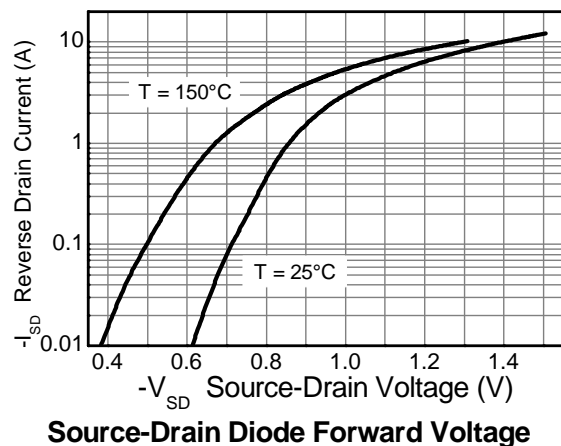
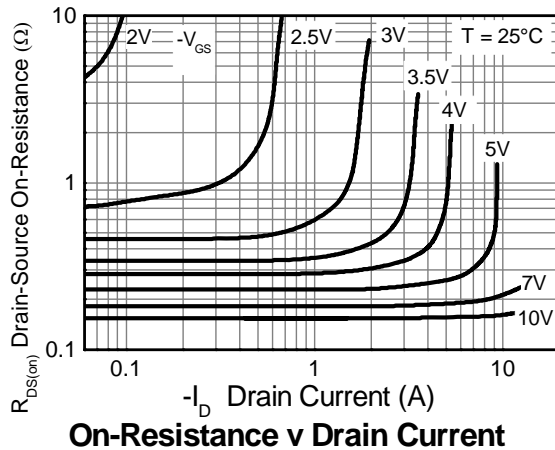
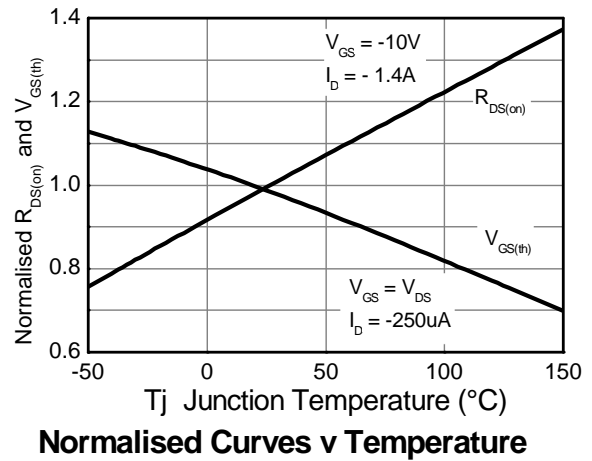
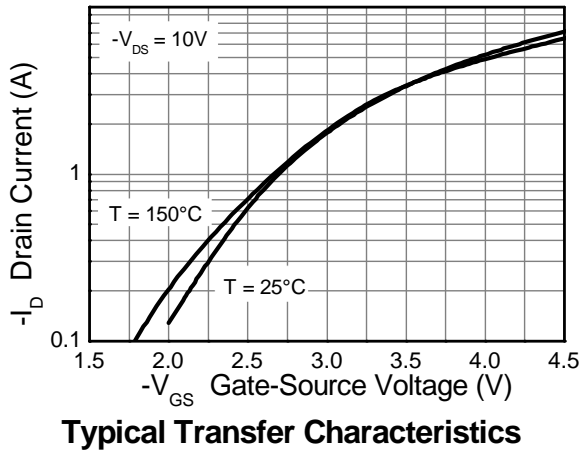
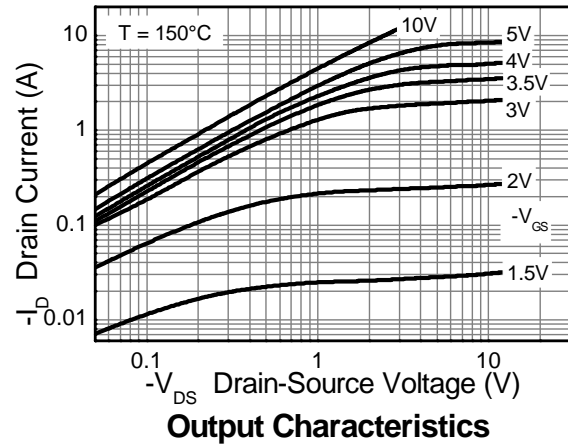
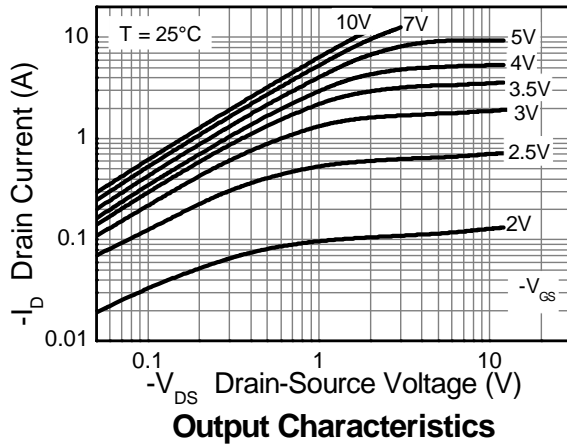
**Switching time test circuit**

**Electrical Characteristics – Q2 P-Channel** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-30	-	-	V	I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	-	-	-0.5	μA	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1.0	-	-3.0	V	I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>
Static Drain-Source On-Resistance (Note 13)	R <sub>DS(on)</sub>	-	0.150	0.210	Ω	V <sub>GS</sub> = -10V, I <sub>D</sub> = -1.4A
			0.280	0.330		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -1.1A
Forward Transconductance (Note 13 & 14)	g <sub>fs</sub>	-	2.48	-	S	V <sub>DS</sub> = -15V, I <sub>D</sub> = -1.4A
Diode Forward Voltage (Note 13)	V <sub>SD</sub>	-	-0.85	-0.95	V	I <sub>S</sub> = -1.1A, V <sub>GS</sub> = 0V
Reverse Recover Time (Note 14)	t <sub>rr</sub>	-	18.6	-	ns	I <sub>S</sub> = -0.95A, di/dt = 100A/μs
Reverse Recover Charge (Note 14)	Q <sub>rr</sub>	-	14.8	-	nC	
<b>DYNAMIC CHARACTERISTICS (Note 14)</b>						
Input Capacitance	C <sub>iSS</sub>	-	206	-	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	59.3	-	pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>	-	49.2	-	pF	
Total Gate Charge (Note 15)	Q <sub>g</sub>	-	3.8	-	nC	V <sub>GS</sub> = -4.5V
Total Gate Charge (Note 15)	Q <sub>g</sub>	-	6.4	-	nC	V <sub>GS</sub> = -10V
Gate-Source Charge (Note 15)	Q <sub>gs</sub>	-	0.69	-	nC	
Gate-Drain Charge (Note 15)	Q <sub>gd</sub>	-	2.0	-	nC	
Turn-On Delay Time (Note 15)	t <sub>D(on)</sub>	-	1.5	-	ns	V <sub>DS</sub> = -15V, I <sub>D</sub> = -1A V <sub>GS</sub> = -10V, R <sub>G</sub> = 6Ω
Turn-On Rise Time (Note 15)	t <sub>r</sub>	-	2.8	-	ns	
Turn-Off Delay Time (Note 15)	t <sub>D(off)</sub>	-	11.3	-	ns	
Turn-Off Fall Time (Note 15)	t <sub>f</sub>	-	7.5	-	ns	

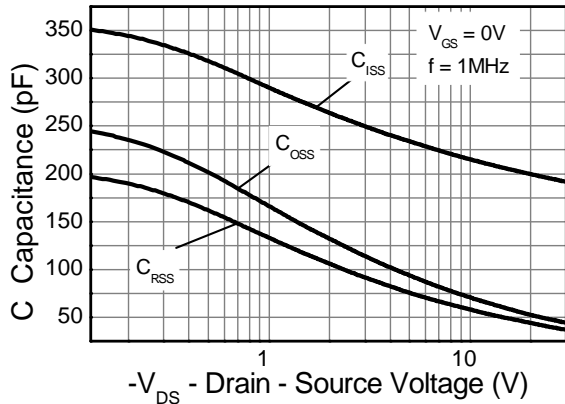
Notes: 13. Measured under pulsed conditions. Width ≤ 300μs. Duty cycle ≤ 2%.  
14. For design aid only, not subject to production testing.  
15. Switching characteristics are independent of operating junction temperature.

**Typical Electrical Characteristics – Q2 P-Channel**

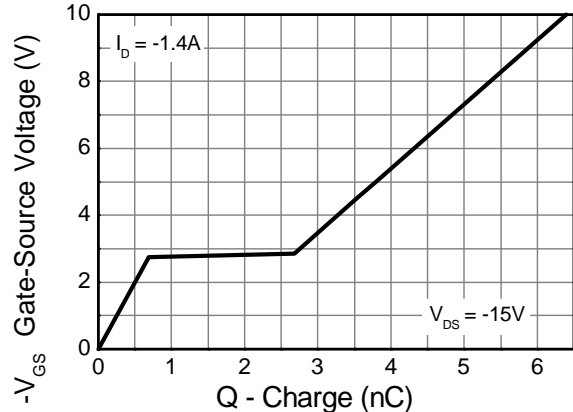




**Typical Electrical Characteristics – Q2 P-Channel - Continued**

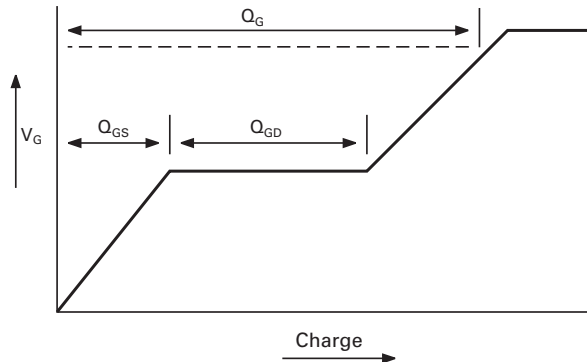


**Capacitance v Drain-Source Voltage**

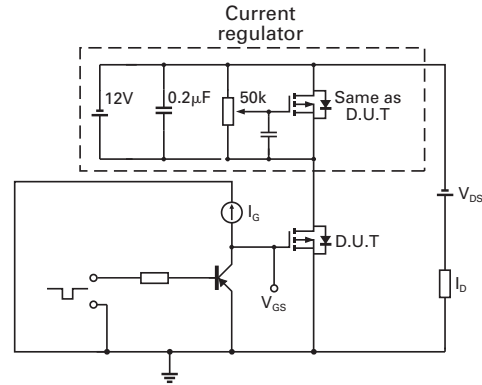


**Gate-Source Voltage v Gate Charge**

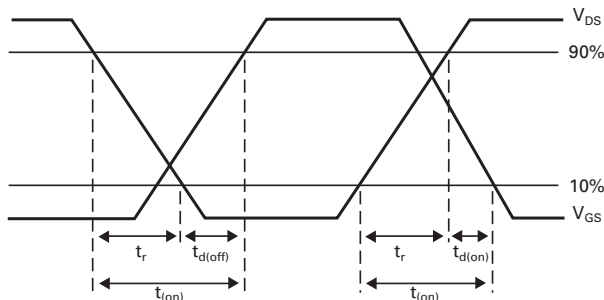
**Test Circuits**



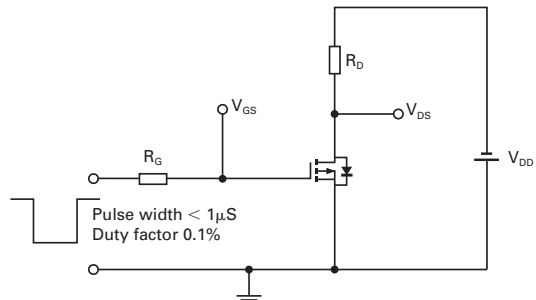
**Basic gate charge waveform**



**Gate charge test circuit**



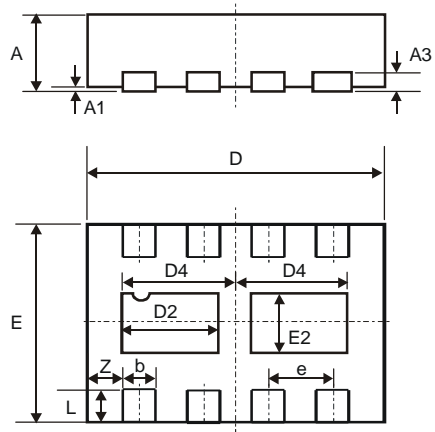
**Switching time waveforms**



**Switching time test circuit**

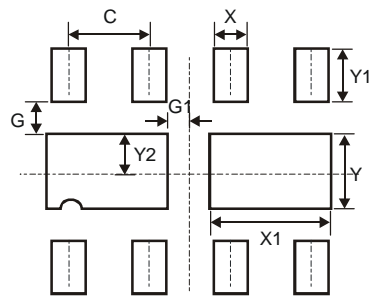
**ZXMC3AMC**

**Package Outline Dimensions**



DFN3020B-8			
Dim	Min	Max	Typ
A	0.77	0.83	0.80
A1	0	0.05	0.02
A3	-	-	0.15
b	0.25	0.35	0.30
D	2.95	3.075	3.00
D2	0.82	1.02	0.92
D4	1.01	1.21	1.11
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.43	0.63	0.53
L	0.25	0.35	0.30
Z	-	-	0.375
All Dimensions in mm			

**Suggested Pad Layout**



Dimensions	Value (in mm)
C	0.650
G	0.285
G1	0.090
X	0.400
X1	1.120
Y	0.730
Y1	0.500
Y2	0.365

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