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**ZXMC3AMC**
**30V COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET**
**Product Summary**

| Device | $V_{(BR)DSS}$ | $R_{DS(on)}$ max                        | $I_D$ max<br>$T_A = 25^\circ\text{C}$<br>(Notes 4 & 7) |
|--------|---------------|---|--|
| Q1     | 30V           | 120m $\Omega$ @ $V_{GS} = 10\text{V}$   | 3.7A   |
|        |               | 180m $\Omega$ @ $V_{GS} = 4.5\text{V}$  | 3.0A   |
| Q2     | -30V          | 210m $\Omega$ @ $V_{GS} = -10\text{V}$  | -2.7A  |
|        |               | 330m $\Omega$ @ $V_{GS} = -4.5\text{V}$ | -2.2A  |

**Description and Applications**

This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

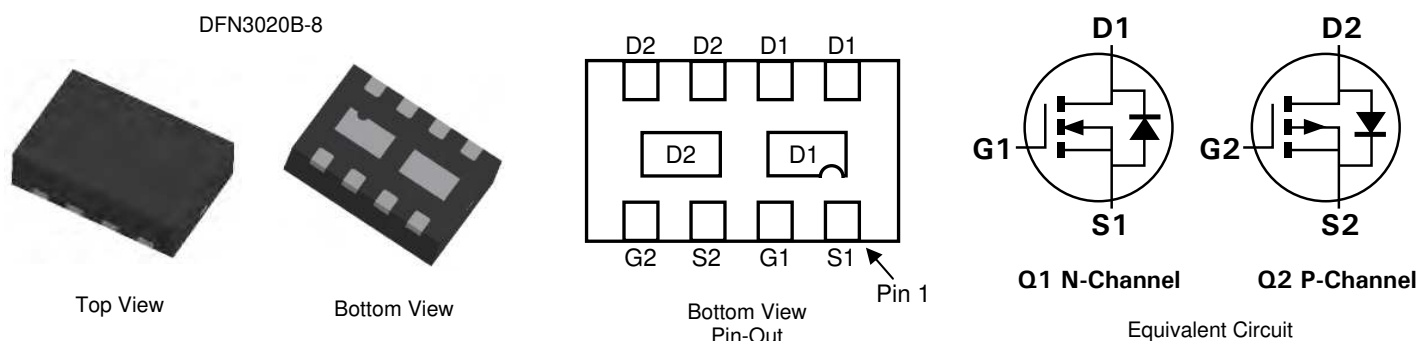
- MOSFET gate drive
- LCD backlight inverters
- Motor control
- Portable applications

**Features and Benefits**

- Low profile package, for thin applications
- Low  $R_{\theta JA}$ , 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

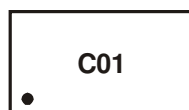
**Mechanical Data**

- 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

## 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           |      |

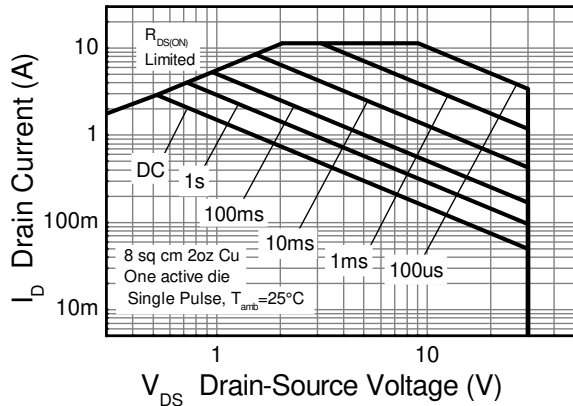
## Thermal Characteristics @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                              |               | Symbol                            | N-channel – Q1 | P-channel – Q2 | Unit       |
|---|---------------|-----------------------------------|----------------|----------------|------------|
| Power Dissipation<br>Linear Derating Factor | (Notes 3 & 7) | P <sub>D</sub>                    | 1.50           |                | W<br>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           |                |            |
|   | (Notes 7 & 9) |                                   | 51.0           |                |            |
| Thermal Resistance, Junction to Lead        |               | R <sub>θJL</sub>                  | 111            |                |            |
| Operating and Storage Temperature Range     |               | T <sub>J</sub> , T <sub>STG</sub> | 73.5           |                |            |
|   |               |                                   | -55 to +150    |                | °C         |

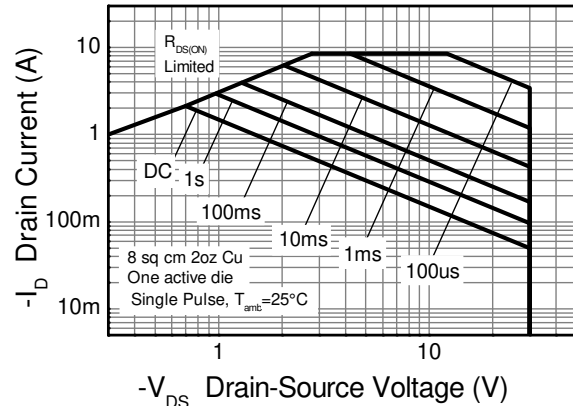
- Notes:
3. For a device surface mounted on 28mm x 28mm (8cm<sup>2</sup>) FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition. The heatsink is split in half with the exposed drain pads connected to each half.
  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).



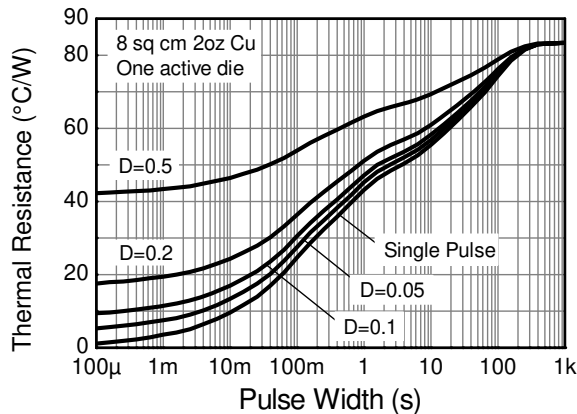
## Thermal Characteristics



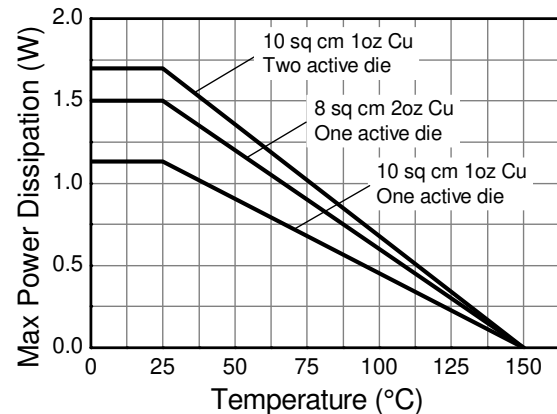
**N-channel Safe Operating Area**



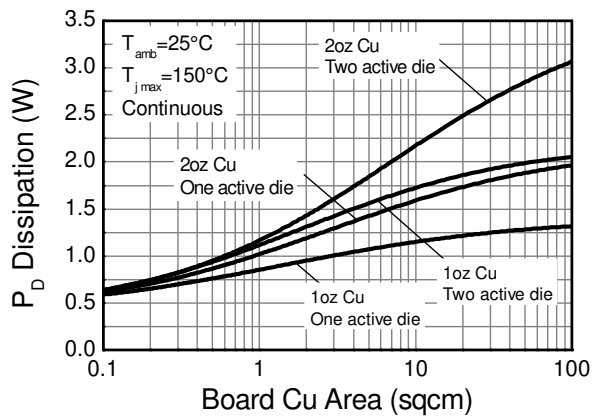
**P-channel Safe Operating Area**



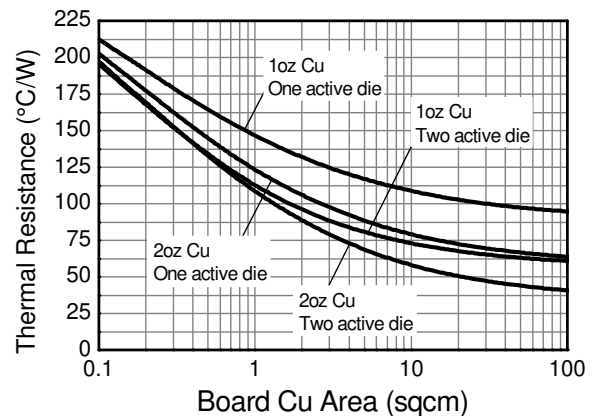
**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



**Thermal Resistance v Board Area**

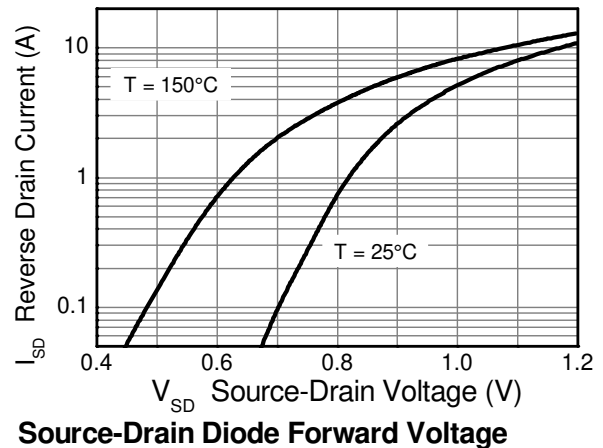
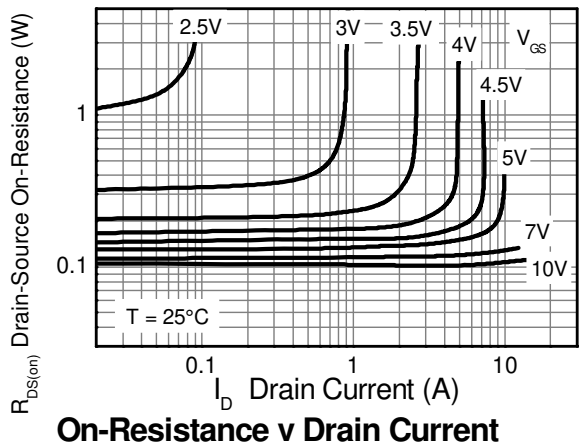
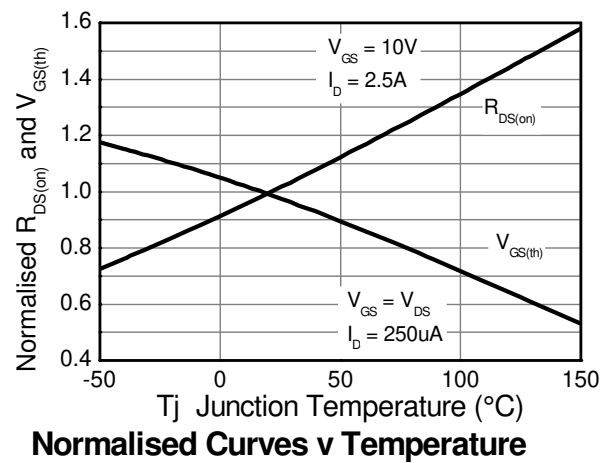
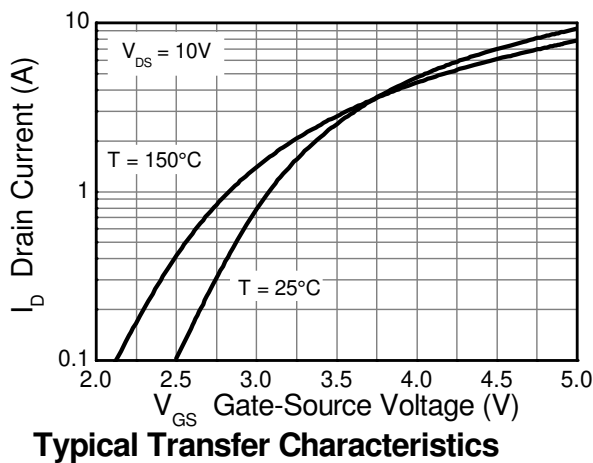
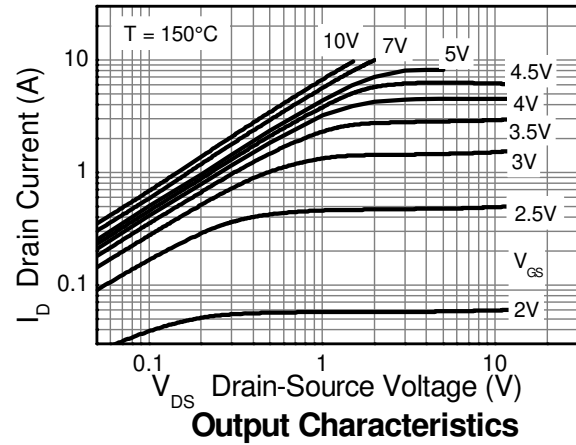
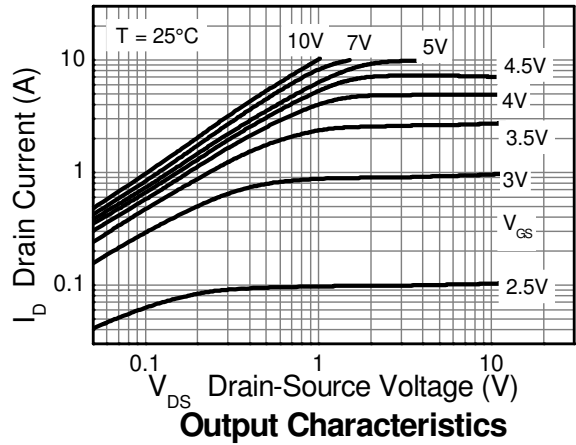
**ZXMC3AMC**

**Electrical Characteristics – Q1 N-Channel** @T<sub>A</sub> = 25°C unless otherwise specified

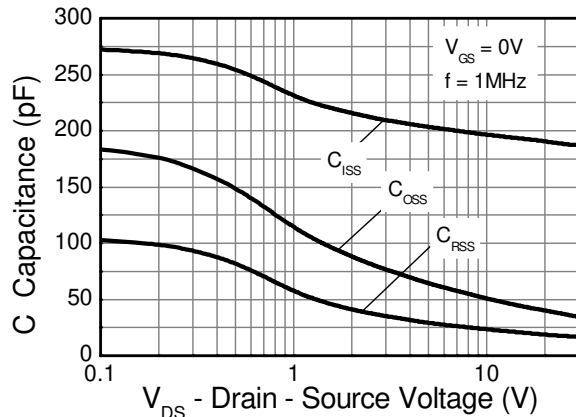
| Characteristic                              | Symbol               | Min | Typ   | Max   | Unit | Test Condition   |  |
|---|----------------------|-----|-------|-------|------|--|--|
| OFF CHARACTERISTICS                         |                      |     |       |       |      |  |  |
| Drain-Source 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   |  |
| ON CHARACTERISTICS                          |                      |     |       |       |      |  |  |
| 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 10) | R <sub>DS (ON)</sub> | -   | 0.100 | 0.120 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.5A   |  |
|   |                      |     | 0.140 | 0.180 |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 2.0A  |  |
| Forward Transconductance (Note 10 & 11)     | g <sub>fs</sub>      | -   | 3.5   | -     | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 2.5A   |  |
| Diode Forward Voltage (Note 10)             | V <sub>SD</sub>      | -   | 0.85  | 0.95  | V    | I <sub>S</sub> = 1.7A, V <sub>GS</sub> = 0V  |  |
| Reverse Recover Time (Note 11)              | t <sub>rr</sub>      | -   | 17.7  | -     | ns   | I <sub>S</sub> = 2.5A, di/dt= 100A/μs  |  |
| Reverse Recover Charge (Note 11)            | Q <sub>rr</sub>      | -   | 13.0  | -     | nC   |  |  |
| DYNAMIC CHARACTERISTICS (Note 11)           |                      |     |       |       |      |  |  |
| Input Capacitance                           | C <sub>iSS</sub>     | -   | 190   | -     | pF   | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                 |  |
| Output Capacitance                          | C <sub>oSS</sub>     | -   | 38    | -     | pF   |  |  |
| Reverse Transfer Capacitance                | C <sub>rSS</sub>     | -   | 20    | -     | pF   |  |  |
| Total Gate Charge (Note 12)                 | Q <sub>g</sub>       | -   | 2.3   | -     | nC   | V <sub>GS</sub> = 4.5V   | V <sub>DS</sub> = 15V<br>I <sub>D</sub> = 2.5A |
| Total Gate Charge (Note 12)                 | Q <sub>g</sub>       | -   | 3.9   | -     | nC   | V <sub>GS</sub> = 10V  |  |
| Gate-Source Charge (Note 12)                | Q <sub>gs</sub>      | -   | 0.6   | -     | nC   |  |  |
| Gate-Drain Charge (Note 12)                 | Q <sub>gd</sub>      | -   | 0.9   | -     | nC   |  |  |
| Turn-On Delay Time (Note 12)                | t <sub>D(on)</sub>   | -   | 1.7   | -     | ns   | V <sub>DS</sub> = 15V, I <sub>D</sub> = 2.5A<br>V <sub>GS</sub> = 10V, R <sub>G</sub> = 6Ω |  |
| Turn-On Rise Time (Note 12)                 | t <sub>r</sub>       | -   | 2.3   | -     | ns   |  |  |
| Turn-Off Delay Time (Note 12)               | t <sub>D(off)</sub>  | -   | 6.6   | -     | ns   |  |  |
| Turn-Off Fall Time (Note 12)                | t <sub>f</sub>       | -   | 2.9   | -     | ns   |  |  |

Notes: 10. Measured under pulsed conditions. Width ≤ 300μs. Duty cycle ≤ 2%.  
11. For design aid only, not subject to production testing.  
12. Switching characteristics are independent of operating junction temperature.

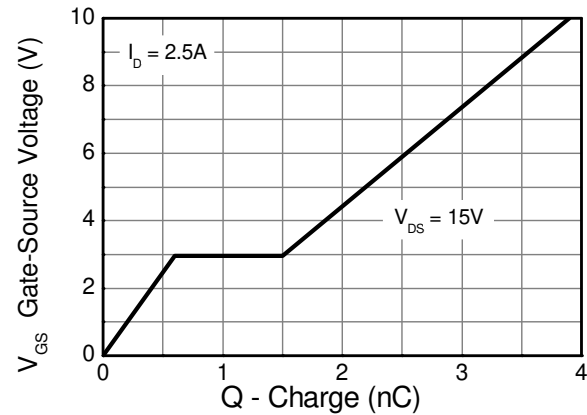
## Typical Electrical Characteristics – Q1 N-Channel



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

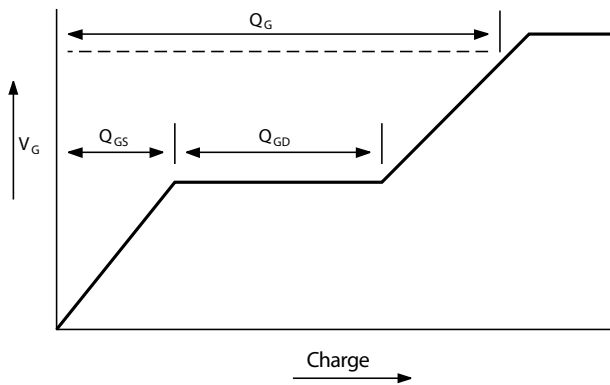


Capacitance v Drain-Source Voltage

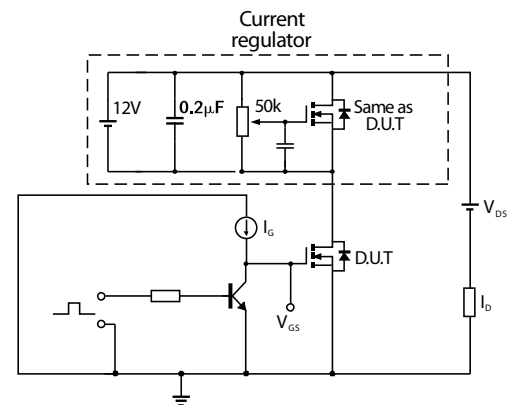


Gate-Source Voltage v Gate Charge

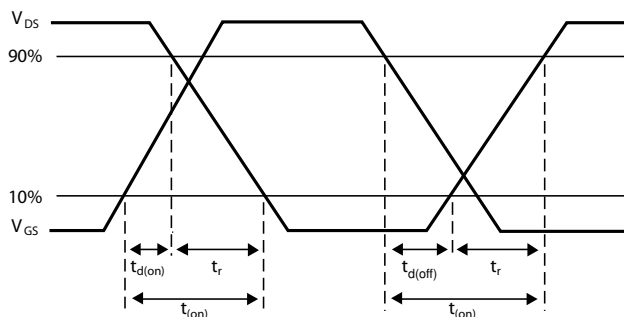
## Test Circuits



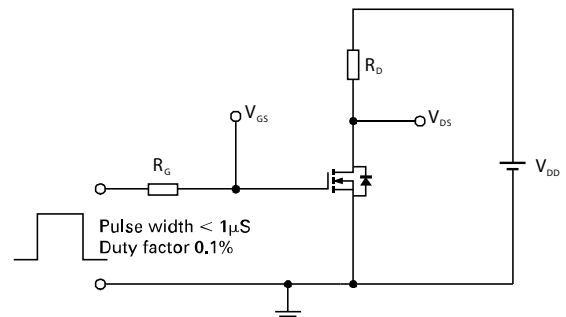
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms



Switching time test circuit

**ZXMC3AMC**

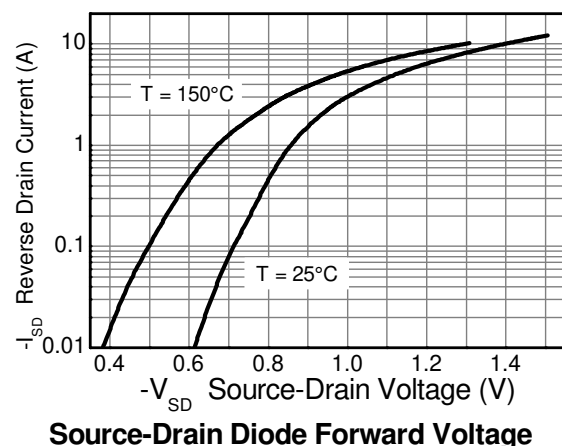
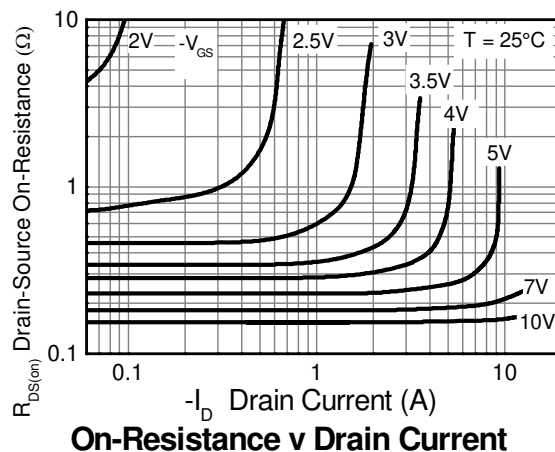
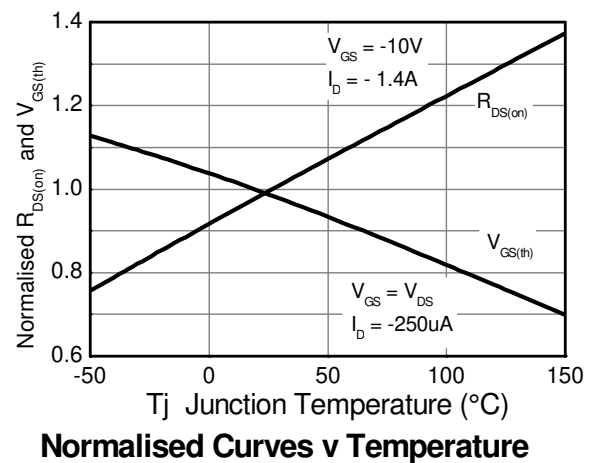
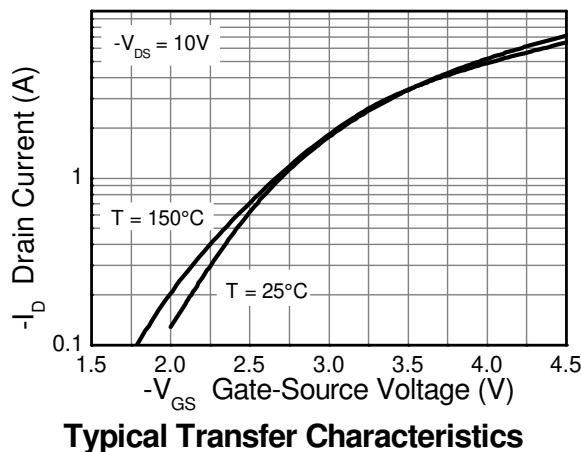
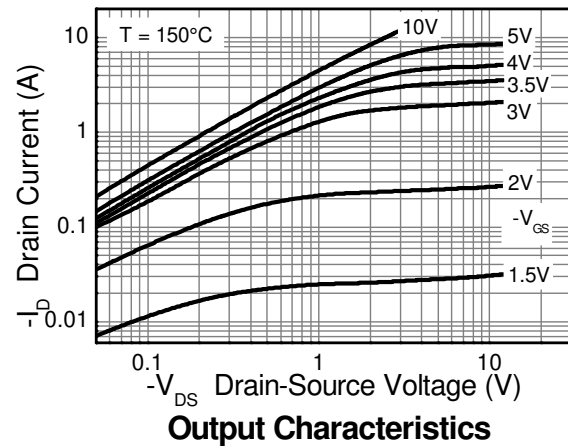
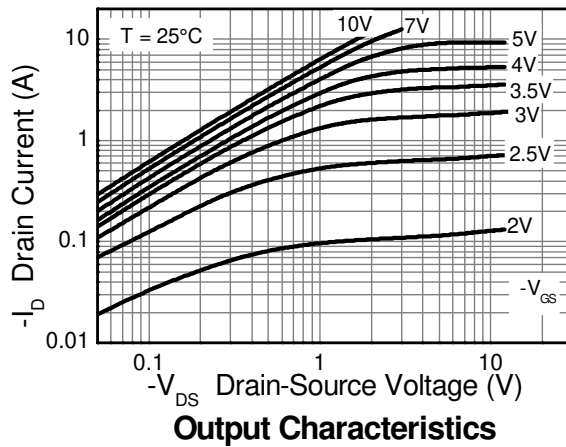
**Electrical Characteristics – Q2 P-Channel** @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                              | Symbol               | Min  | Typ   | Max   | Unit | Test Condition  |  |
|---|----------------------|------|-------|-------|------|---|--|
| OFF CHARACTERISTICS                         |                      |      |       |       |      |   |  |
| 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  |  |
| ON CHARACTERISTICS                          |                      |      |       |       |      |   |  |
| 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   |   |  |
| DYNAMIC CHARACTERISTICS (Note 14)           |                      |      |       |       |      |   |  |
| Input Capacitance                           | C <sub>iSS</sub>     | -    | 206   | -     | pF   | V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V,<br>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   | V <sub>DS</sub> = -15V<br>I <sub>D</sub> = -1.4A |
| 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<br>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   |   |  |

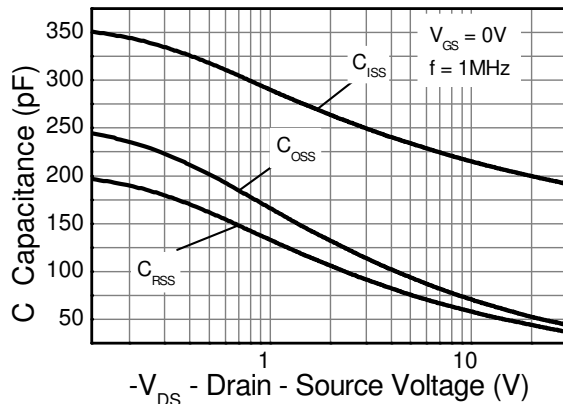
Notes: 13. Measured under pulsed conditions. Width ≤ 300μs. Duty cycle ≤ 2%.  
14. For design aid only, not subject to production testing.  
15. Switching characteristics are independent of operating junction temperature.



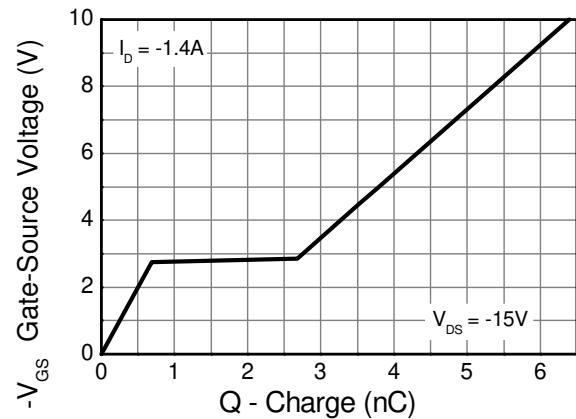
## Typical Electrical Characteristics – Q2 P-Channel



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

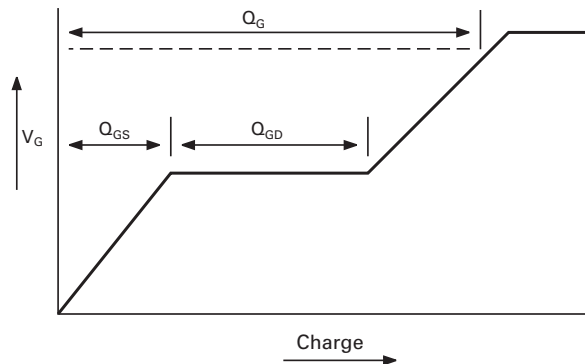


**Capacitance v Drain-Source Voltage**

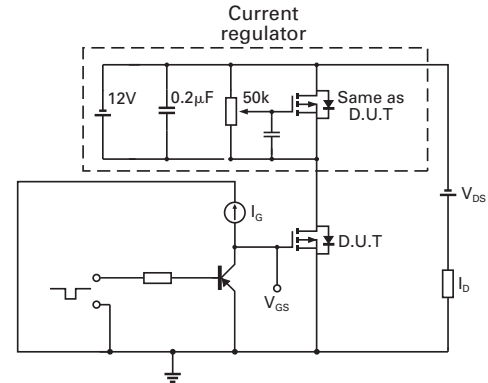


**Gate-Source Voltage v Gate Charge**

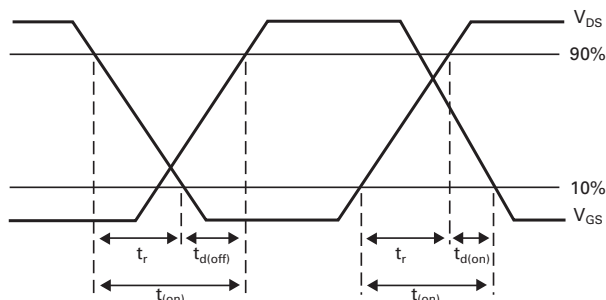
## Test Circuits



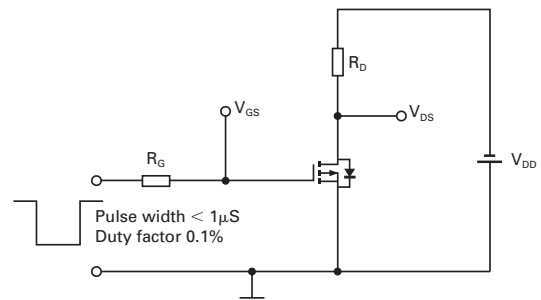
**Basic gate charge waveform**



**Gate charge test circuit**

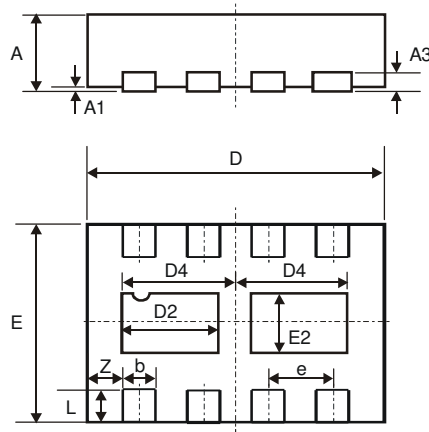


**Switching time waveforms**



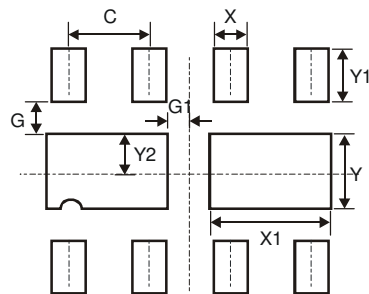
**Switching time test circuit**

## 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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