

**COMPLEMENTARY 30V ENHANCEMENT MODE MOSFET H-BRIDGE**
**Product Summary**

| Device    | BV <sub>DSS</sub> | R <sub>DS(ON)</sub> max        | I <sub>D</sub> max<br>T <sub>A</sub> = +25°C |
|-----------|-------------------|--------------------------------|----------------------------------------------|
| N-Channel | 30V               | 0.12Ω @ V <sub>GS</sub> = 10V  | 3.1A                                         |
| P-Channel | -30V              | 0.21Ω @ V <sub>GS</sub> = -10V | -2.3A                                        |

**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.

**Applications**

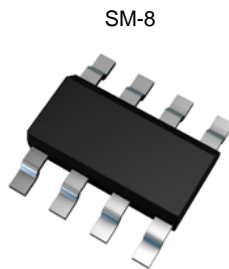
- Single Phase DC Fan Motor Drive

**Features**

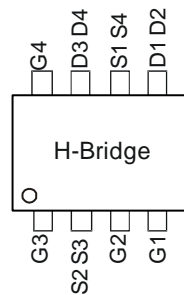
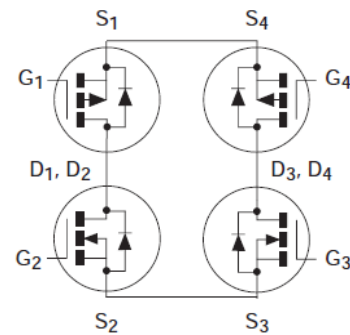
- Low On-Resistance
- Fast Switching Speed
- Low Threshold
- Low Gate Drive
- Single SM-8 Surface Mount Package
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**

**Mechanical Data**

- Case: SM-8 (8 LEAD SOT223)
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208(Ⓢ)
- Weight: 0.117 grams (Approximate)



Top View

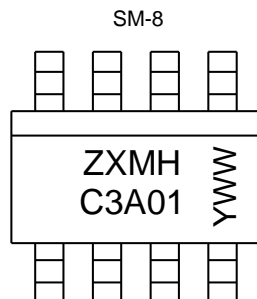

 Top View  
Pin Configuration


Internal Schematic

**Ordering Information** (Note 4)

| Part Number   | REEL SIZE | TAPE WIDTH | QUANTITY PER REEL |
|---------------|-----------|------------|-------------------|
| ZXMHC3A01T8TA | 7"        | 12mm       | 1,000 units       |

- Notes:
- EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  - See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**


ZXMHC3A01 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y or  $\bar{Y}$  = Last Digit of Year (ex: 5= 2015)  
 WW or  $\bar{W}\bar{W}$  = Week Code (01~53)

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                                           |              |                                        | Symbol    | N-channel | P-channel | Units |
|----------------------------------------------------------|--------------|----------------------------------------|-----------|-----------|-----------|-------|
| Drain-Source Voltage                                     |              |                                        | $V_{DSS}$ | 30        | -30       | V     |
| Gate-Source Voltage                                      |              |                                        | $V_{GSS}$ | $\pm 20$  | $\pm 20$  | V     |
| Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 8) | Steady State | $T_A = +25^\circ\text{C}$ (Note 6 & 8) | $I_D$     | 3.1       | -2.3      | A     |
|                                                          |              | $T_A = +70^\circ\text{C}$ (Note 6 & 8) |           | 2.5       | -1.8      |       |
|                                                          |              | $T_A = +25^\circ\text{C}$ (Note 5 & 8) |           | 2.7       | -2.0      |       |
| Continuous Source Current (body diode) (Note 6)          |              |                                        | $I_S$     | 2.3       | -2.2      | A     |
| Pulsed Drain Current (Note 7)                            |              |                                        | $I_{DM}$  | 14.3      | -10.8     | A     |
| Pulsed Source Current (Note 7)                           |              |                                        | $I_{SM}$  | 14.5      | -10.8     | A     |

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                                   |                                    | Symbol          | Value       | Units                     |
|--------------------------------------------------|------------------------------------|-----------------|-------------|---------------------------|
| Total Power Dissipation (Note 8)                 | $T_A = +25^\circ\text{C}$ (Note 5) | $P_D$           | 1.3         | W                         |
| Linear Derating Factor                           |                                    |                 | 10.4        | mW/ $^\circ\text{C}$      |
| Total Power Dissipation (Note 8)                 | $T_A = +25^\circ\text{C}$ (Note 6) | $P_D$           | 1.7         | W                         |
| Linear Derating Factor                           |                                    |                 | 13.6        | mW/ $^\circ\text{C}$      |
| Thermal Resistance, Junction to Ambient (Note 8) | Steady State (Note 5)              | $R_{\theta JA}$ | 96          | $^\circ\text{C}/\text{W}$ |
|                                                  | Steady State (Note 6)              |                 | 73          | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range          |                                    | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$          |

- Notes:
5. For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions..
  6. For a device surface mounted on FR4 PCB measured at  $t \leq 10$  seconds.
  7. Repetitive rating 50mm x 50mm x 1.6mm FR4 PCB,  $D = 0.02$ , pulse width 300 $\mu\text{s}$  - pulse width limited by maximum junction temperature. Refer to transient thermal Impedance graph.
  8. For device with one active die.

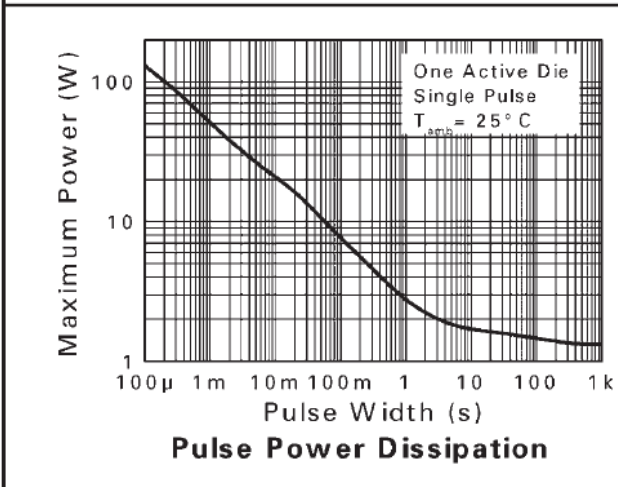
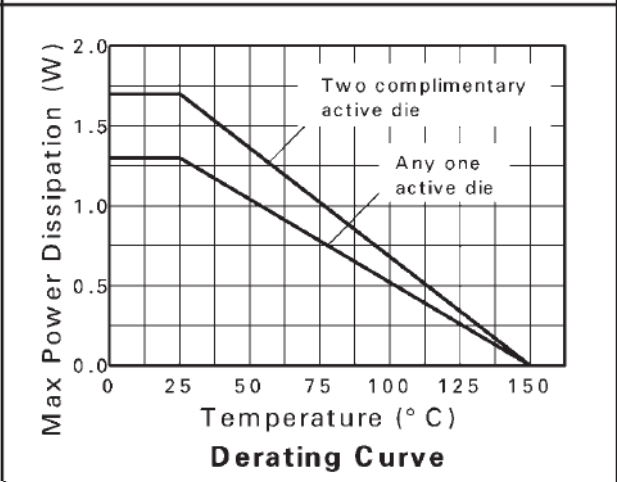
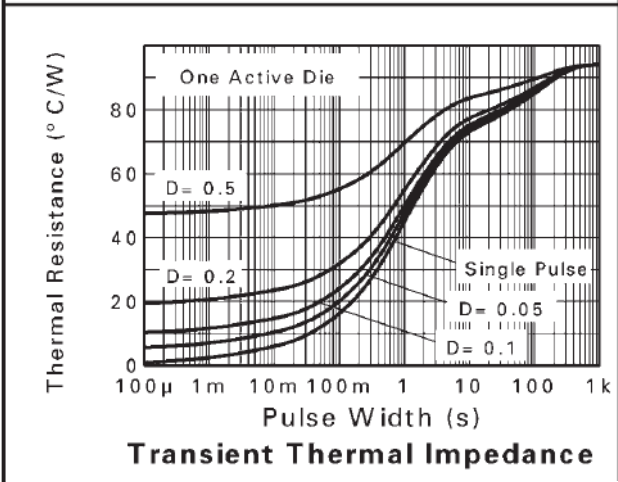
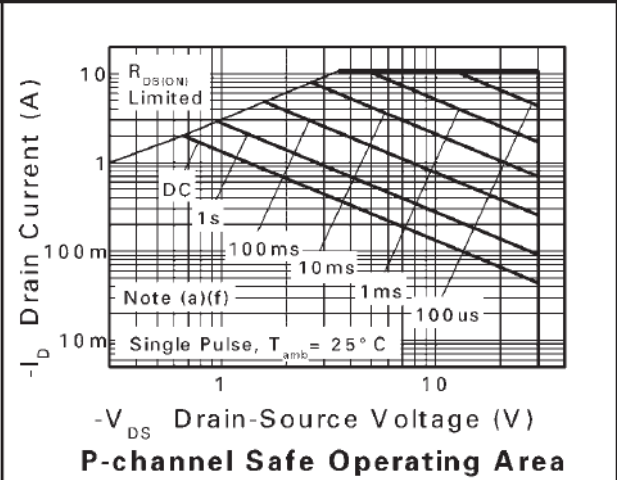
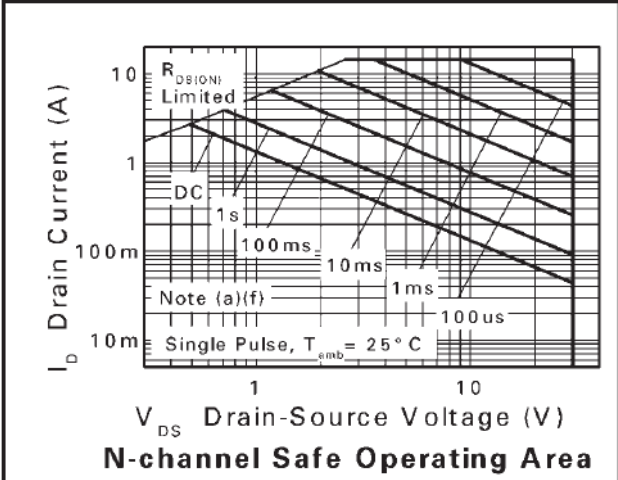
**Electrical Characteristics N-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                             | Symbol              | Min | Typ  | Max  | Unit | Test Condition                                                                                 |
|--------------------------------------------|---------------------|-----|------|------|------|------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS</b>                 |                     |     |      |      |      |                                                                                                |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 30  | —    | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                   |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —   | —    | 1.0  | 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    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                     |
| Static Drain-Source On-Resistance (Note 9) | R <sub>DS(ON)</sub> | —   | —    | 0.12 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.5A                                                   |
|                                            |                     | —   | —    | 0.18 |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 2.0A                                                  |
| Forward Transfer Admittance (Notes 9 & 11) | g <sub>fs</sub>     | —   | 3.5  | —    | S    | V <sub>DS</sub> = 4.5V, I <sub>D</sub> = 2.5A                                                  |
| Diode Forward Voltage (Note 9)             | V <sub>SD</sub>     | —   | —    | 0.95 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.7A                                                    |
| <b>DYNAMIC CHARACTERISTICS (Note 11)</b>   |                     |     |      |      |      |                                                                                                |
| Input Capacitance                          | C <sub>iss</sub>    | —   | 190  | —    | pF   | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                       |
| Output Capacitance                         | C <sub>oss</sub>    | —   | 38   | —    |      |                                                                                                |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | —   | 20   | —    |      |                                                                                                |
| Total Gate Charge (Note 10)                | Q <sub>g</sub>      | —   | 3.9  | —    | nC   | V <sub>DS</sub> = 15V, I <sub>D</sub> = 2.5A, V <sub>GS</sub> = 10V                            |
| Gate-Source Charge (Note 10)               | Q <sub>gs</sub>     | —   | 0.6  | —    |      |                                                                                                |
| Gate-Drain Charge (Note 10)                | Q <sub>gd</sub>     | —   | 0.9  | —    |      |                                                                                                |
| Turn-On Delay Time (Note 10)               | t <sub>D(on)</sub>  | —   | 1.7  | —    | ns   | V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V,<br>I <sub>D</sub> = 2.5A, R <sub>G</sub> ≅ 6.0Ω, |
| Turn-On Rise Time (Note 10)                | t <sub>r</sub>      | —   | 2.3  | —    |      |                                                                                                |
| Turn-Off Delay Time (Note 10)              | t <sub>D(off)</sub> | —   | 6.6  | —    |      |                                                                                                |
| Turn-Off Fall Time                         | t <sub>f</sub>      | —   | 2.9  | —    |      |                                                                                                |
| Reverse Recovery Time                      | t <sub>rr</sub>     | —   | 17.7 | —    | ns   | I <sub>S</sub> = 1.8A, di/dt = 100A/μs                                                         |
| Reverse Recovery Charge                    | Q <sub>rr</sub>     | —   | 13   | —    | nC   |                                                                                                |

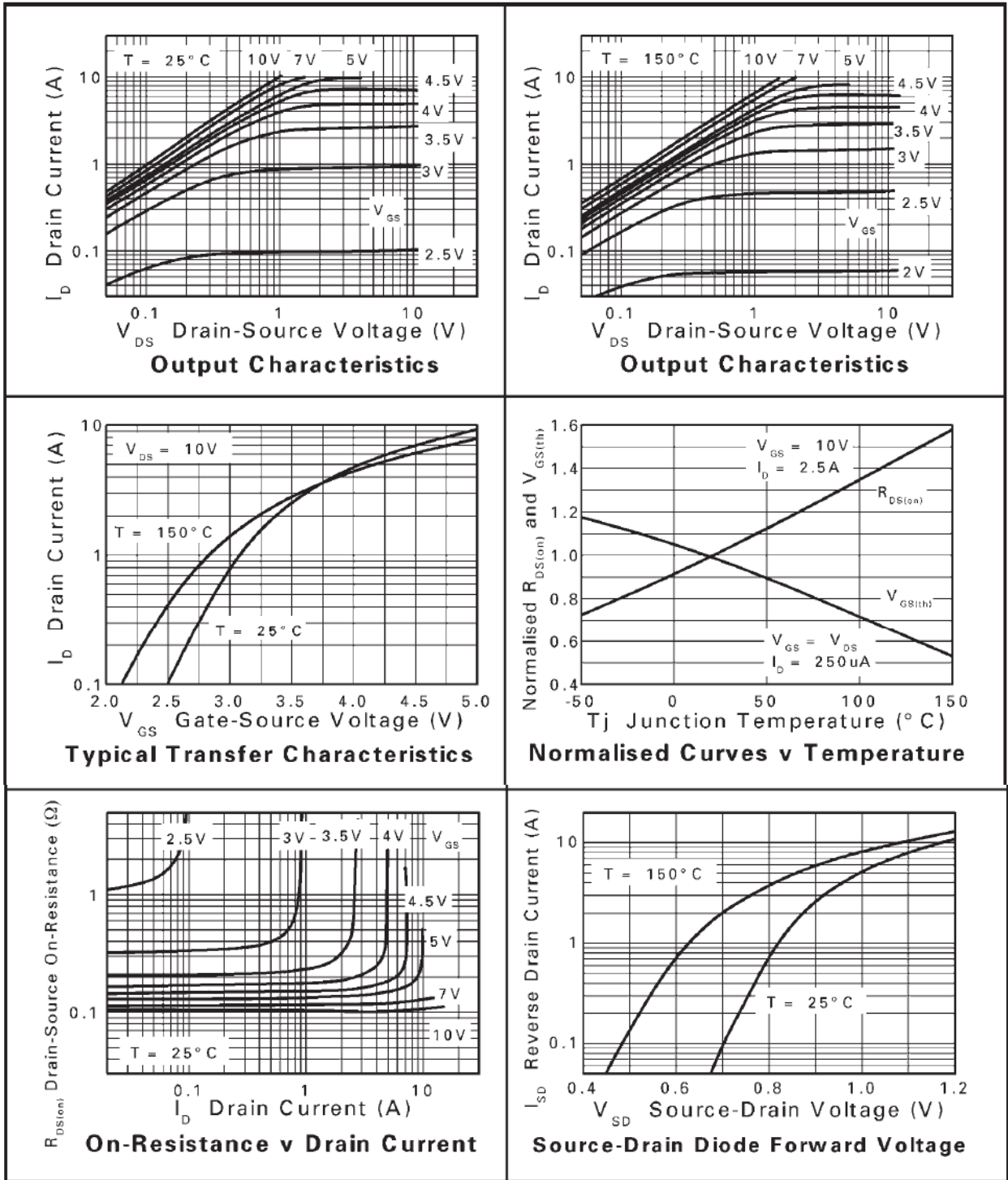
**Electrical Characteristics P-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                       | Symbol              | Min  | Typ   | Max   | Unit | Test Condition                                                                                   |
|------------------------------------------------------|---------------------|------|-------|-------|------|--------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS</b>                           |                     |      |       |       |      |                                                                                                  |
| Drain-Source Breakdown Voltage                       | BV <sub>DSS</sub>   | -30  | —     | —     | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                                    |
| Zero Gate Voltage Drain Current                      | I <sub>DSS</sub>    | —    | —     | -1.0  | 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    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                      |
| Static Drain-Source On-Resistance (Note 9)           | R <sub>DS(ON)</sub> | —    | —     | 0.21  | Ω    | V <sub>GS</sub> = -10V, I <sub>D</sub> = -1.4A                                                   |
|                                                      |                     | —    | —     | 0.33  |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -1.1A                                                  |
| Forward Transfer Admittance (Notes 9 & 11)           | g <sub>fs</sub>     | —    | 2.5   | —     | S    | V <sub>DS</sub> = -15V, I <sub>D</sub> = -1.4A                                                   |
| Diode Forward Voltage (Note 9)                       | V <sub>SD</sub>     | —    | -0.85 | -0.95 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -1.1A                                                     |
| <b>DYNAMIC CHARACTERISTICS (Note 11)</b>             |                     |      |       |       |      |                                                                                                  |
| Input Capacitance                                    | C <sub>iss</sub>    | —    | 204   | —     | pF   | V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                        |
| Output Capacitance                                   | C <sub>oss</sub>    | —    | 39.8  | —     | pF   |                                                                                                  |
| Reverse Transfer Capacitance                         | C <sub>rss</sub>    | —    | 25.8  | —     | pF   |                                                                                                  |
| Gate Charge (V <sub>GS</sub> = -5.0V) (Note 10)      | Q <sub>g</sub>      | —    | 2.6   | —     | nC   | V <sub>DS</sub> = -15V, I <sub>D</sub> = -1.4A,                                                  |
| Total Gate Charge (V <sub>GS</sub> = -10V) (Note 10) | Q <sub>g</sub>      | —    | 5.2   | —     | nC   |                                                                                                  |
| Gate-Source Charge (Note 10)                         | Q <sub>gs</sub>     | —    | 0.7   | —     | nC   |                                                                                                  |
| Gate-Drain Charge (Note 10)                          | Q <sub>gd</sub>     | —    | 0.9   | —     | nC   | V <sub>DD</sub> = -15V, V <sub>GS</sub> = -10V,<br>R <sub>G</sub> ≅ 6.0Ω, I <sub>D</sub> = -1.0A |
| Turn-On Delay Time (Note 10)                         | t <sub>D(on)</sub>  | —    | 1.2   | —     | ns   |                                                                                                  |
| Turn-On Rise Time (Note 10)                          | t <sub>r</sub>      | —    | 2.3   | —     | ns   |                                                                                                  |
| Turn-Off Delay Time (Note 10)                        | t <sub>D(off)</sub> | —    | 12.1  | —     | ns   |                                                                                                  |
| Turn-Off Fall Time                                   | t <sub>f</sub>      | —    | 7.5   | —     | ns   | I <sub>S</sub> = -0.95A, di/dt = 100A/μs                                                         |
| Reverse Recovery Time                                | t <sub>rr</sub>     | —    | 19    | —     | ns   |                                                                                                  |
| Reverse Recovery Charge                              | Q <sub>rr</sub>     | —    | 15    | —     | nC   |                                                                                                  |

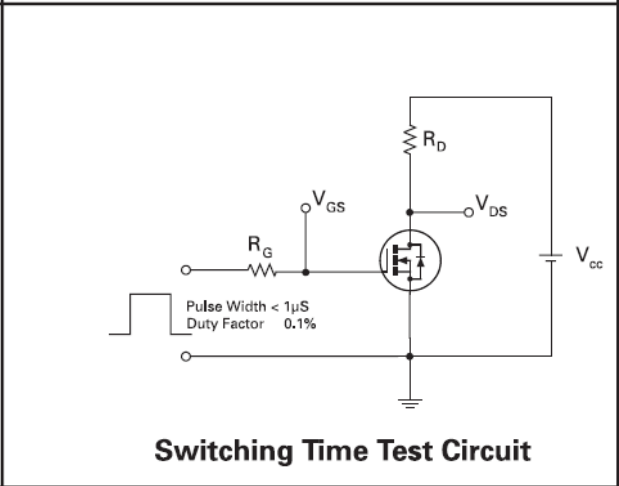
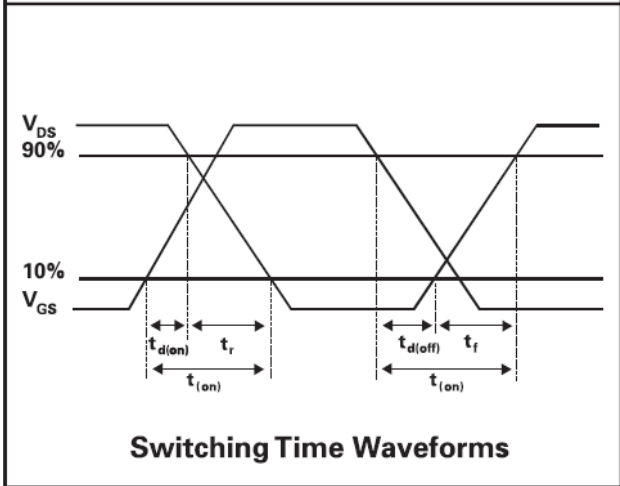
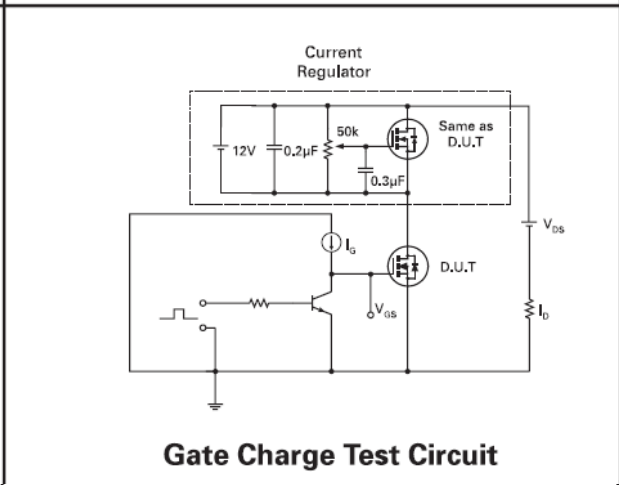
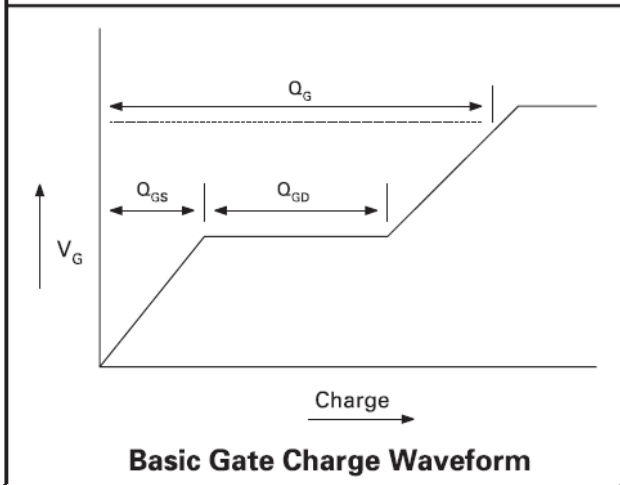
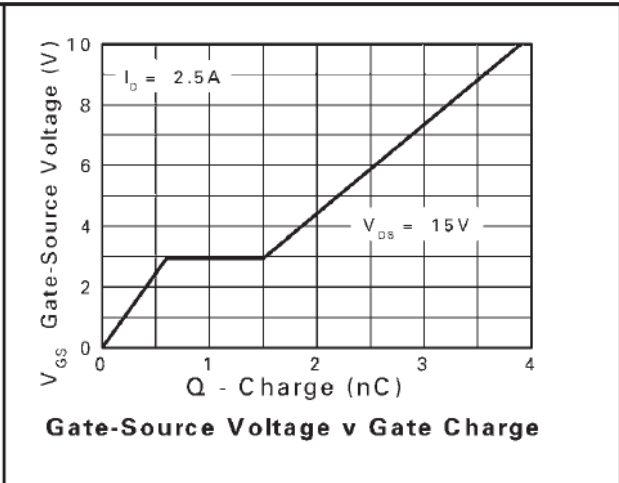
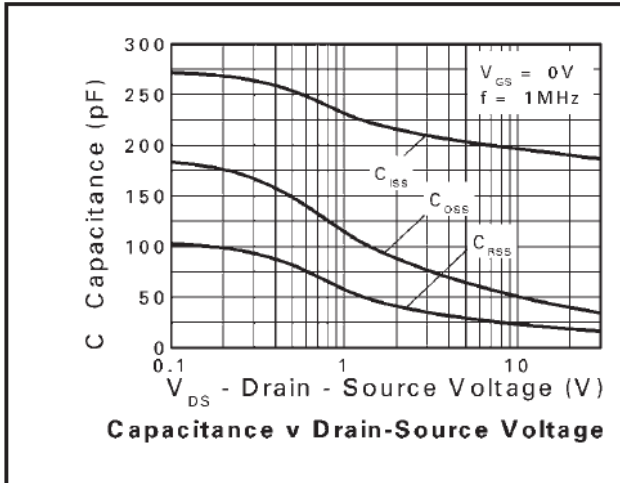
- Notes: 9. Measured under pulsed conditions. Width ≤ 300μs. Duty cycle ≤ 2%.  
10. Switching characteristics are independent of operating junction temperature.  
11. For design aid only, not subject to production testing.



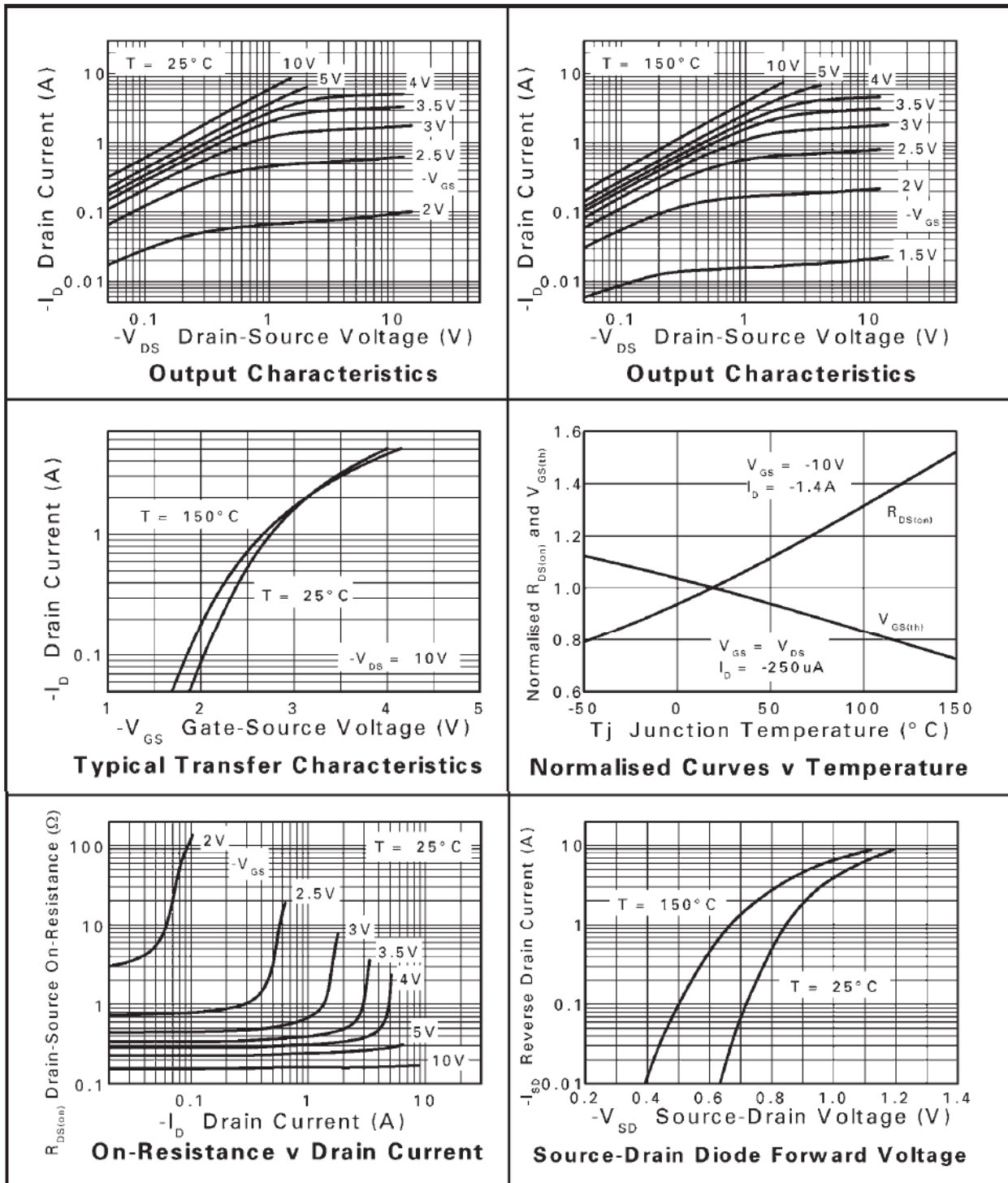
**Typical Characteristics N-CHANNEL**



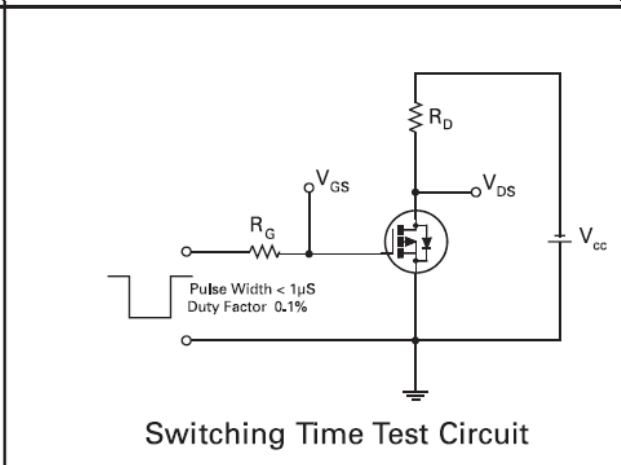
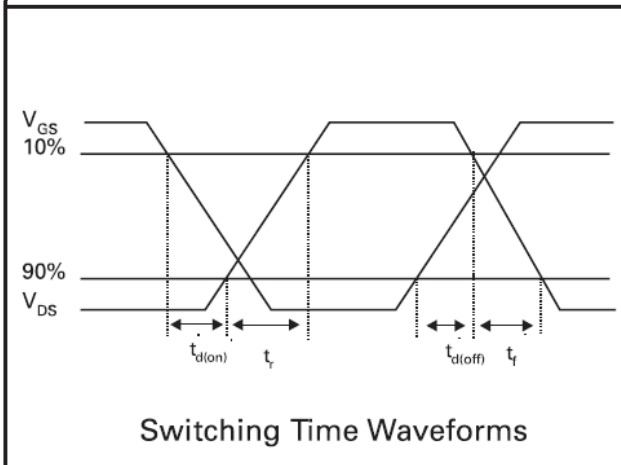
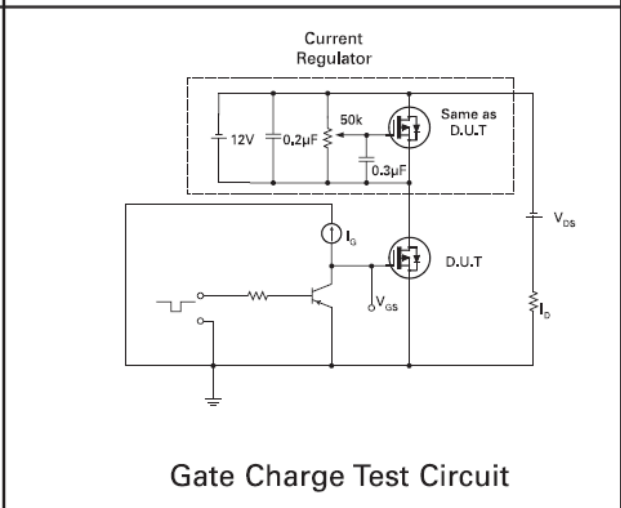
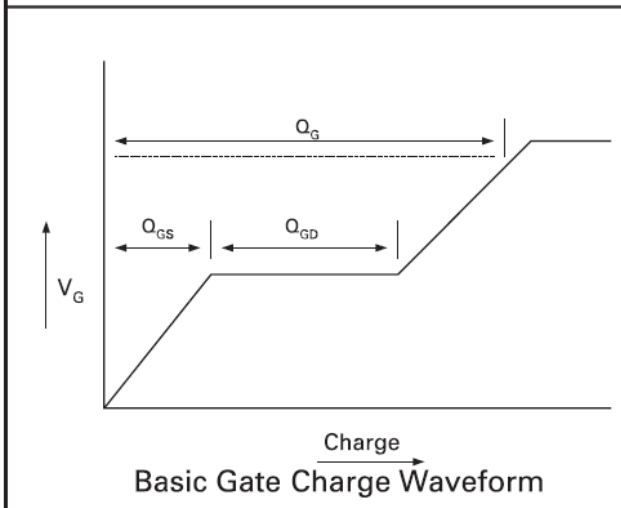
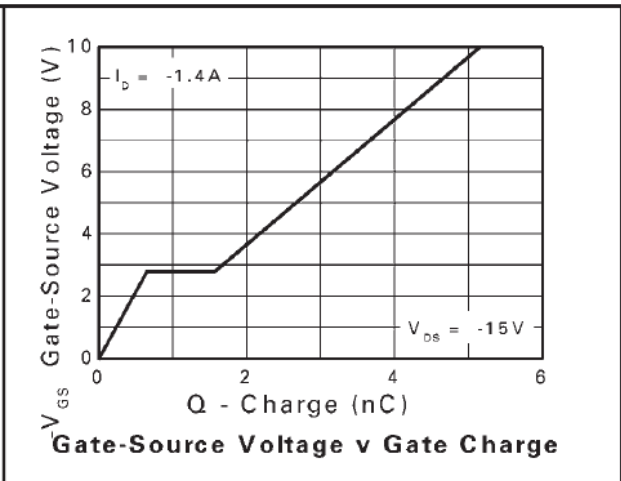
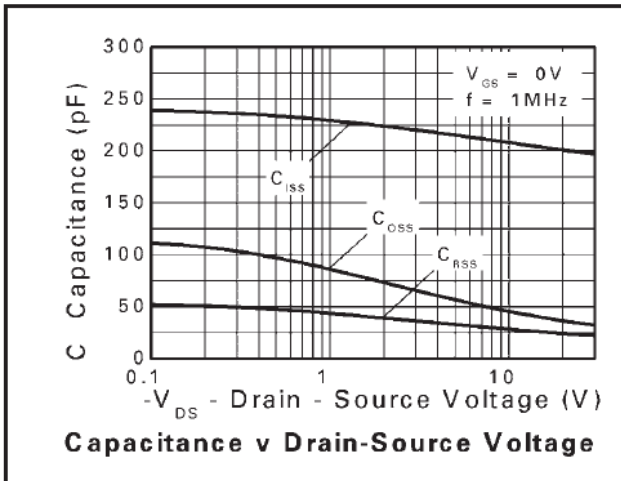
**Typical Characteristics N-CHANNEL**



**Typical Characteristics P-CHANNEL**



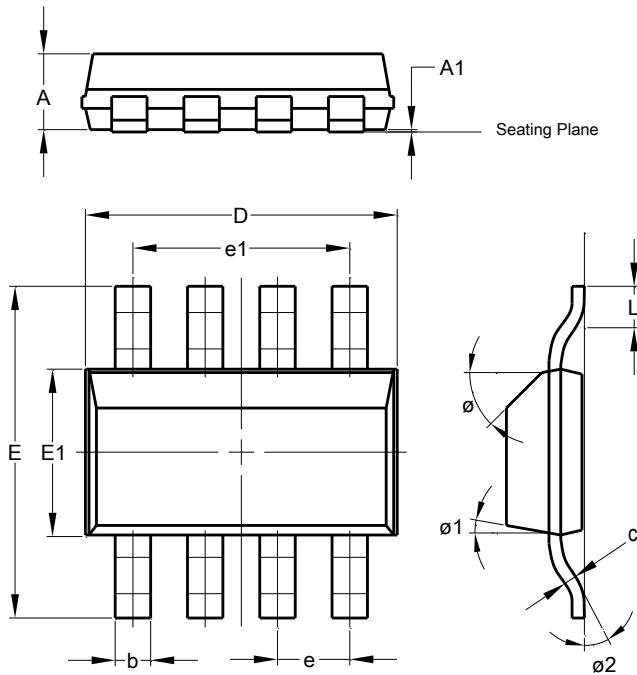
**Typical Characteristics P-CHANNEL**





**Package Outline Dimensions**

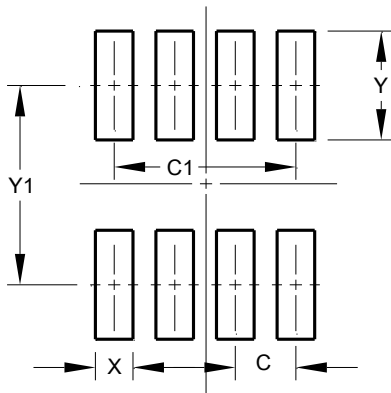
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SM-8                 |          |      |      |
|----------------------|----------|------|------|
| Dim                  | Min      | Max  | Typ  |
| A                    | --       | 1.70 | 1.60 |
| A1                   | 0.02     | 0.10 | 0.04 |
| b                    | 0.70     | 0.90 | 0.80 |
| c                    | 0.24     | 0.32 | 0.28 |
| D                    | 6.30     | 6.70 | 6.60 |
| e                    | 1.53 REF |      |      |
| e1                   | 4.59 REF |      |      |
| E                    | 6.70     | 7.30 | 7.00 |
| E1                   | 3.30     | 3.70 | 3.50 |
| L                    | 0.75     | 1.00 | 0.90 |
| Ø                    | --       | --   | 45°  |
| Ø1                   | --       | 15°  | --   |
| Ø2                   | --       | --   | 10°  |
| All Dimensions in mm |          |      |      |

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 1.52          |
| C1         | 4.60          |
| X          | 0.95          |
| Y          | 2.80          |
| Y1         | 6.80          |

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