

### Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$             | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|--------------------------|------------------------------|
| -20V          | 600mΩ @ $V_{GS} = -4.5V$ | -0.92A                       |
|               | 900mΩ @ $V_{GS} = -2.7V$ | -0.75A                       |

### Description and Applications

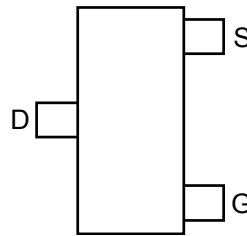
This MOSFET utilizes a unique structure that combines the benefits of low on-resistance with fast switching speed, making it ideal for high-efficiency power management applications.

- DC - DC converters
- Power management functions
- Disconnect switches
- Motor control

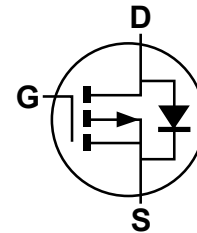
SOT23



Top View



Top View  
Pin Out



Equivalent Circuit

### Features and Benefits

- Fast switching speed
- Low on-resistance
- Low threshold
- Low gate drive
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

### Mechanical Data

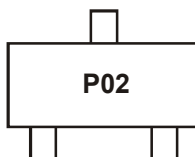
- Case: SOT23
- Case Material: Molded Plastic, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (approximate)

### Ordering Information (Note 4)

| Product     | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-------------|---------|--------------------|-----------------|-------------------|
| ZXM61P02FTA | P02     | 7                  | 8               | 3000 Units        |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. 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.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

### Marking Information



P02 = Product Type Marking Code

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

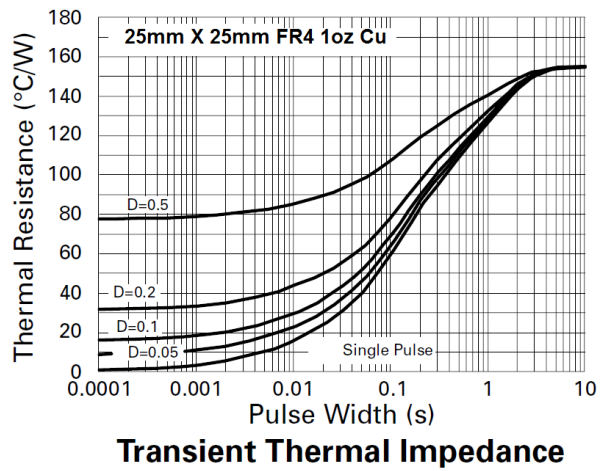
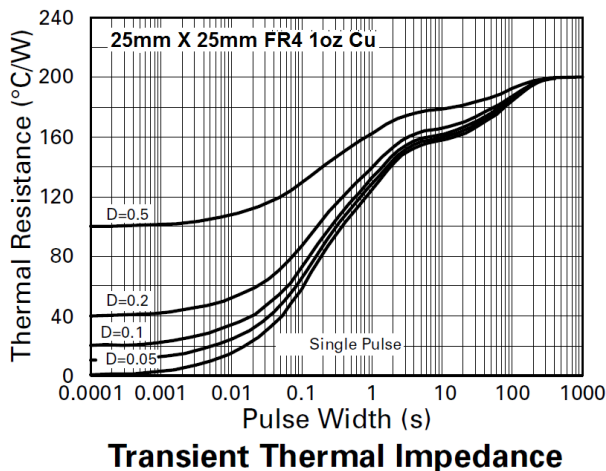
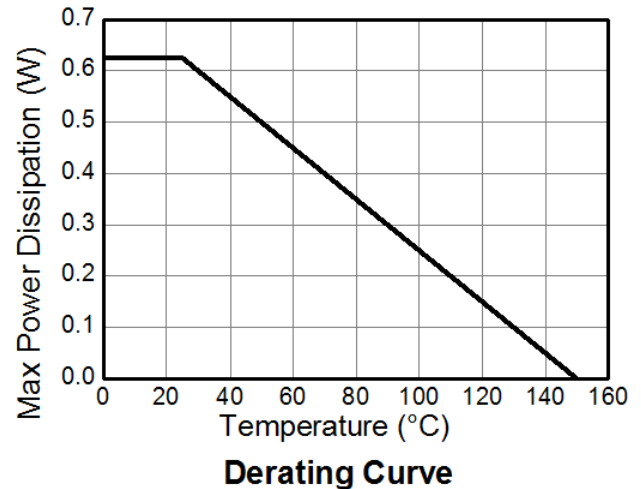
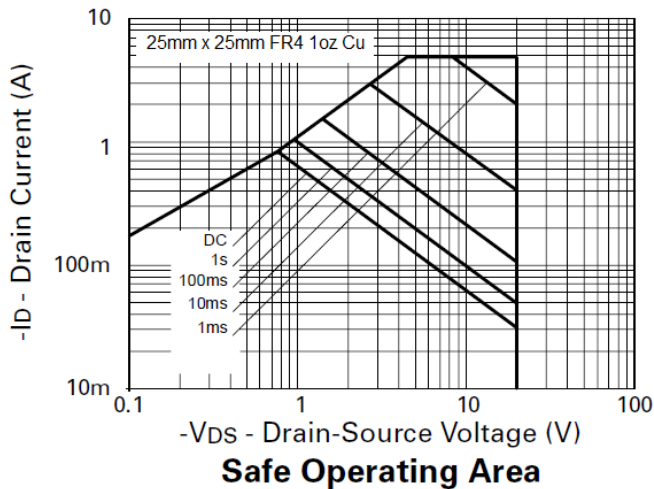
| Characteristic                                  |                        |                                 | Symbol           | Value | Units |
|---|------------------------|---------------------------------|------------------|-------|-------|
| Drain-Source Voltage                            |                        |                                 | V <sub>DSS</sub> | -20   | V     |
| Gate-Source Voltage                             |                        |                                 | V <sub>GS</sub>  | ±12   | V     |
| Continuous Drain Current                        | V <sub>GS</sub> = 4.5V | T <sub>A</sub> = +25°C (Note 6) | I <sub>D</sub>   | -0.9  | A     |
|   |                        | T <sub>A</sub> = +70°C (Note 6) |                  | -0.7  |       |
| Pulsed Drain Current (Note 7)                   |                        |                                 | I <sub>DM</sub>  | -4.9  | A     |
| Continuous Source Current (Body Diode) (Note 6) |                        |                                 | I <sub>S</sub>   | -0.9  | A     |
| Pulsed Source Current (Body Diode) (Note 7)     |                        |                                 | I <sub>SM</sub>  | -4.9  | A     |

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

| Characteristic                                   | Symbol                            | Value       | Unit  |
|--|-----------------------------------|-------------|-------|
| Power Dissipation (Note 5)                       | P <sub>D</sub>                    | 625         | mW    |
| Linear Derating Factor                           |                                   | 5           | mW/°C |
| Power Dissipation (Note 6)                       | P <sub>D</sub>                    | 806         | mW    |
| Linear Derating Factor                           |                                   | 6.4         | mW/°C |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 200         | °C/W  |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 155         | °C/W  |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

- Notes: 5. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions  
 6. For a device surface mounted on FR4 PCB measured at t ≤ 5 secs.  
 7. Repetitive rating 25mm x 25mm FR4 PCB, D=0.05 pulse width=10µs - pulse current limited by maximum junction temperature.

**Thermal Characteristics**

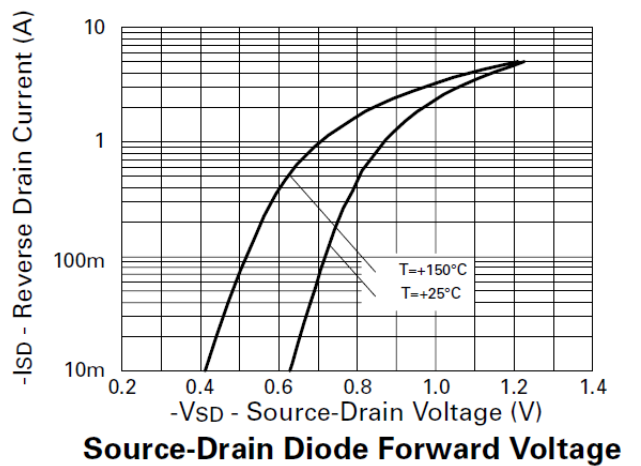
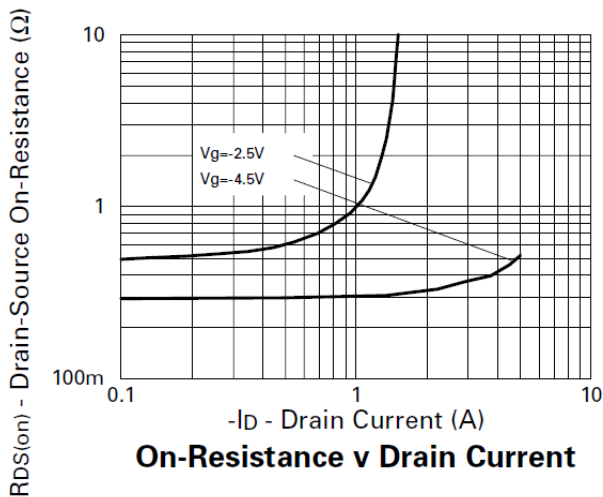
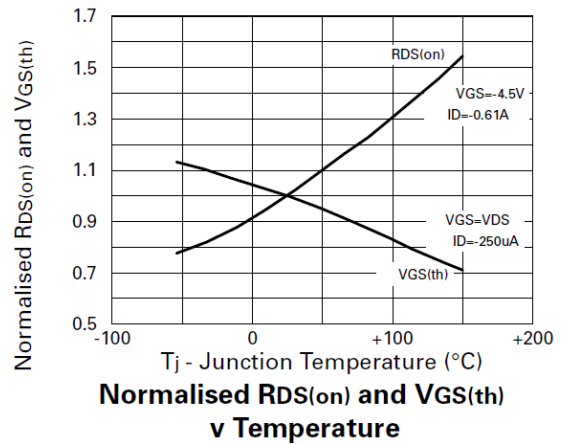
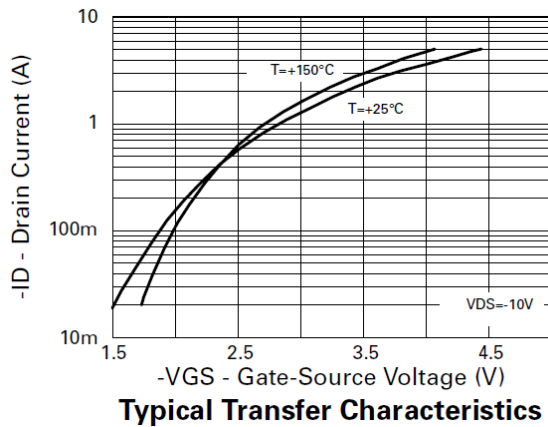
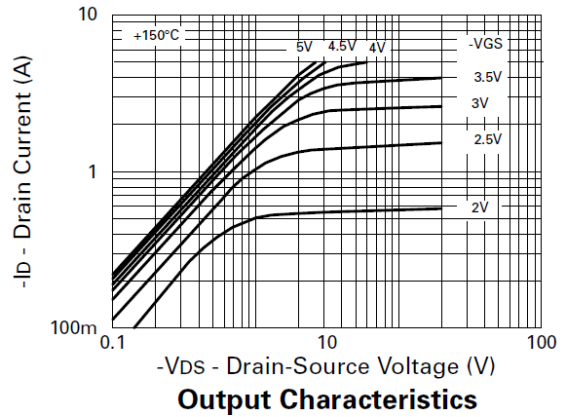
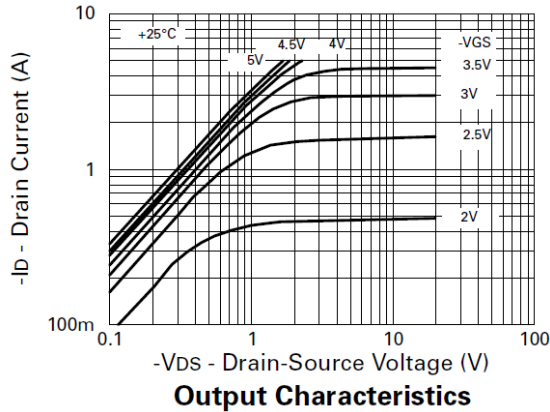


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

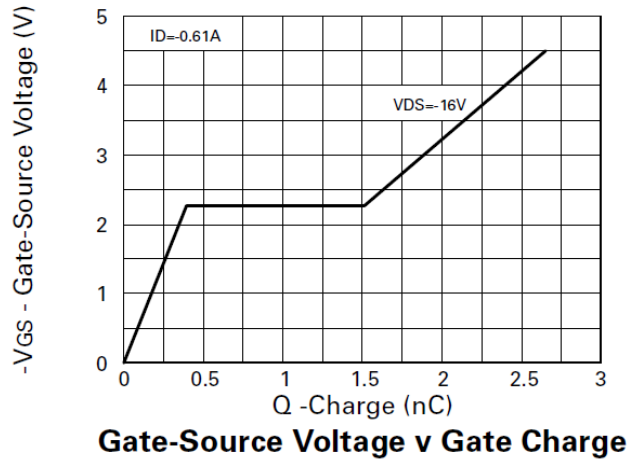
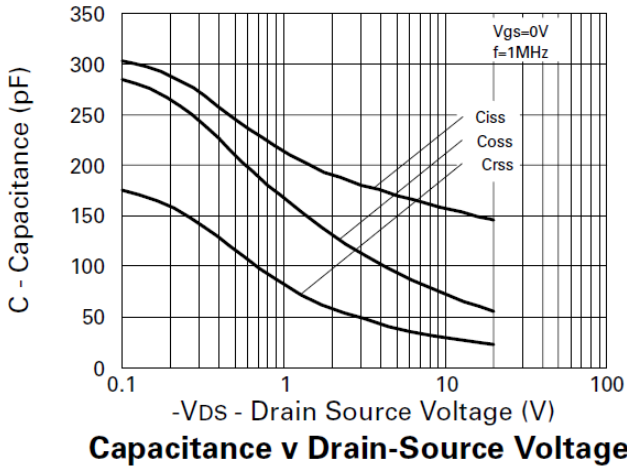
| Characteristic                             | Symbol              | Min  | Typ  | Max   | Unit | Test Condition  |
|--|---------------------|------|------|-------|------|---|
| <b>OFF CHARACTERISTICS</b>                 |                     |      |      |       |      |   |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | -20  | —    | —     | V    | I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V   |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —    | —    | -0.1  | μA   | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | —    | —    | ±100  | nA   | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS</b>                  |                     |      |      |       |      |   |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub> | -0.7 | —    | -1.5  | V    | I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>  |
| Static Drain-Source On-Resistance (Note 8) | R <sub>DS(on)</sub> | —    | —    | 0.6   | Ω    | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.61A  |
|  |                     |      |      | 0.9   |      | V <sub>GS</sub> = -2.7V, I <sub>D</sub> = -0.31A  |
| Forward Transconductance (Notes 8 and 10)  | g <sub>fs</sub>     | 0.56 | —    | —     | S    | V <sub>DS</sub> = -10V, I <sub>D</sub> = -0.31A   |
| Diode Forward Voltage (Note 8)             | V <sub>SD</sub>     | —    | —    | -0.95 | V    | T <sub>J</sub> = +25°C, I <sub>S</sub> = -0.61A, V <sub>GS</sub> = 0V                             |
| Reverse Recovery Time (Note 10)            | t <sub>rr</sub>     | —    | 14.9 | —     | ns   | T <sub>J</sub> = +25°C, I <sub>F</sub> = -0.61A,  |
| Reverse Recovery Charge (Note 10)          | Q <sub>rr</sub>     | —    | 5.6  | —     | nC   | di/dt = 100A/μs   |
| <b>DYNAMIC CHARACTERISTICS (Note 10)</b>   |                     |      |      |       |      |   |
| Input Capacitance                          | C <sub>iSS</sub>    | —    | 150  | —     | pF   | V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V<br>f = 1.0MHz  |
| Output Capacitance                         | C <sub>oss</sub>    | —    | 70   | —     |      |   |
| Reverse Transfer Capacitance               | C <sub>rSS</sub>    | —    | 30   | —     |      |   |
| Turn-On Delay Time (Note 9)                | t <sub>d(on)</sub>  | —    | 2.9  | —     | ns   | V <sub>DD</sub> = -110V, I <sub>D</sub> = -0.93A,<br>R <sub>G</sub> ≅ 6.2Ω, R <sub>D</sub> ≅ 11Ω, |
| Turn-On Rise Time (Note 9)                 | t <sub>r</sub>      | —    | 6.7  | —     |      |   |
| Turn-Off Delay Time (Note 9)               | t <sub>d(off)</sub> | —    | 11.2 | —     |      |   |
| Turn-Off Fall Time (Note 9)                | t <sub>f</sub>      | —    | 10.1 | —     |      |   |
| Total Gate Charge (Note 9)                 | Q <sub>g</sub>      | —    | 3.5  | —     | nC   | V <sub>DS</sub> = -16V, V <sub>GS</sub> = -4.5V,<br>I <sub>D</sub> = -0.61A                       |
| Gate-Source Charge (Note 9)                | Q <sub>gs</sub>     | —    | 0.5  | —     |      |   |
| Gate-Drain Charge (Note 9)                 | Q <sub>gd</sub>     | —    | 1.5  | —     |      |   |

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

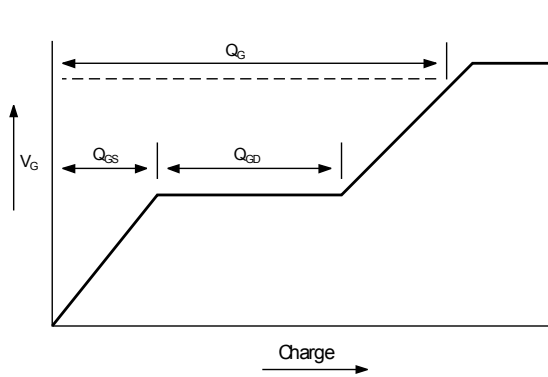
**Typical Characteristics**



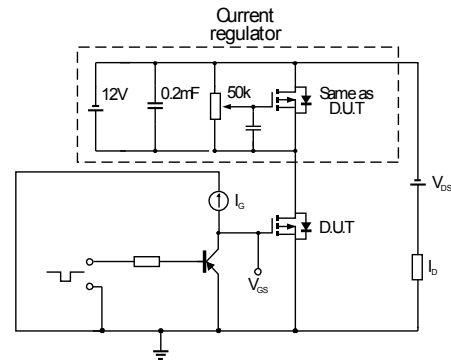
**Typical Characteristics - continued**



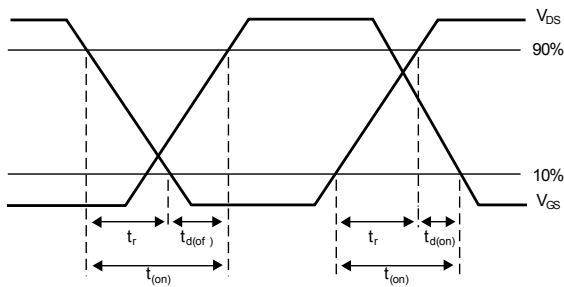
**Test Circuits**



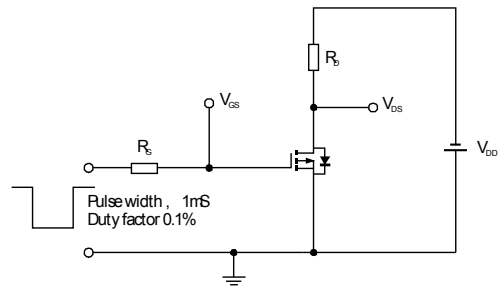
**Basic gate charge waveform**



**Gate charge test circuit**



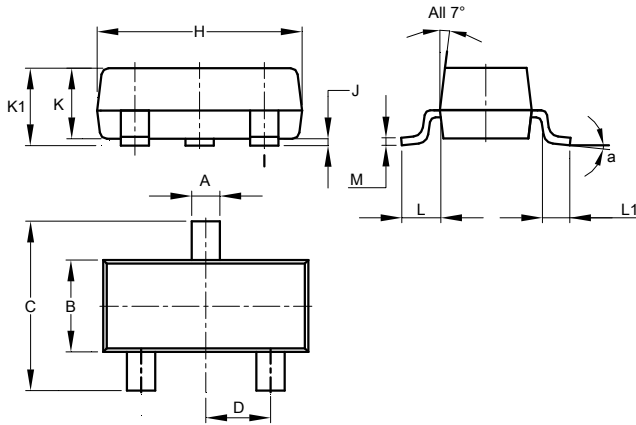
**Switching time waveforms**



**Switching time test circuit**

**Package Outline Dimensions**

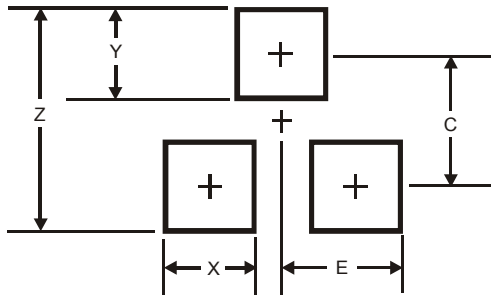
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT23                |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 0.37  | 0.51  | 0.40  |
| B                    | 1.20  | 1.40  | 1.30  |
| C                    | 2.30  | 2.50  | 2.40  |
| D                    | 0.89  | 1.03  | 0.915 |
| F                    | 0.45  | 0.60  | 0.535 |
| G                    | 1.78  | 2.05  | 1.83  |
| H                    | 2.80  | 3.00  | 2.90  |
| J                    | 0.013 | 0.10  | 0.05  |
| K                    | 0.890 | 1.00  | 0.975 |
| K1                   | 0.903 | 1.10  | 1.025 |
| L                    | 0.45  | 0.61  | 0.55  |
| L1                   | 0.25  | 0.55  | 0.40  |
| M                    | 0.085 | 0.150 | 0.110 |
| a                    | 8°    |       |       |
| 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) |
|------------|---------------|
| Z          | 2.9           |
| X          | 0.8           |
| Y          | 0.9           |
| C          | 2.0           |
| E          | 1.35          |

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