

N-CHANNEL ENHANCEMENT MODE FIELD MOSFET
Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ | I_D $T_A = +25^\circ C$ |
|---------------|-----------------------------|------------------------------|
| 50V | $1.8\Omega @ V_{GS} = 10V$ | 500mA |
| | $2.0\Omega @ V_{GS} = 4.5V$ | 450mA |

Description

This new generation 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.

Applications

- Backlighting
- DC-DC Converters
- Power Management Functions

Features and Benefits

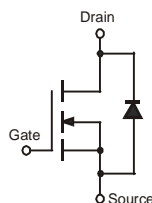
- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

Mechanical Data

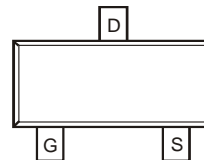
- Case: SOT23
- Case Material: Molded Plastic "Green" Molding Compound.
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208^{e3}
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)



Top View



Equivalent Circuit

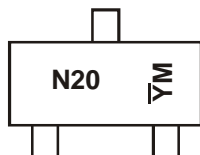


Top View

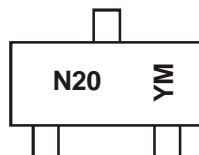
Ordering Information (Note 5)

| Part Number | Qualification | Case | Packaging |
|-------------|---------------|-------|------------------|
| BSN20-7 | Standard | SOT23 | 3000/Tape & Reel |
| BSN20Q-7 | Automotive | SOT23 | 3000/Tape & Reel |

- 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 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to http://www.diodes.com/quality/product_grade_definitions/
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information


Chengdu A/T Site



Shanghai A/T Site

N20 = Product Type Marking Code
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)
 Y̅M = Date Code Marking for CAT (Chengdu Assembly/ Test site)
 Y or Y̅ = Year (ex: A = 2013)
 M = Month (ex: 9 = September)

Date Code Key

Date Code Key

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|------|------|------|------|------|------|------|------|
| Code | W | X | Y | Z | A | B | C |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Units |
|--|-----------------|---|------------------|------------|-------|
| Drain-Source Voltage | | | V _{DSS} | 50 | V |
| Gate-Source Voltage | | | V _{GSS} | ±20 | V |
| Continuous Drain Current @ T _{SP} = +25°C (Note 6) | Steady State | T _A = +25°C T _A = +100°C | I _D | 500 300 | mA |
| Pulsed Drain Current @ T _{SP} = +25°C (Notes 6 & 7) | | | I _{DM} | 1.2 | A |

Thermal Characteristics

| Characteristic | Symbol | Value | Units |
|--|-----------------------------------|-------------|-------|
| Power Dissipation, @T _A = +25°C (Note 6) | P _D | 600 | mW |
| Thermal Resistance, Junction to Ambient @T _A = +25°C (Note 6) | R _{θJA} | 200 | °C/W |
| Power Dissipation, @T _{SP} = +25°C (Note 6) | P _D | 920 | mW |
| Thermal Resistance, @T _{SP} = +25°C (Note 6) | R _{θJSP} | 136 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C |

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 50 | – | – | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | – | – | 0.5 | μA | V _{DS} = 50V, V _{GS} = 0V |
| Gate-Body Leakage | I _{GSS} | – | – | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 0.4 | 1.0 | 1.5 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | – | 1.3 | 1.8 | Ω | V _{GS} = 10V, I _D = 0.22A |
| | | | 1.6 | 2.0 | | V _{GS} = 4.5V, I _D = 0.1A |
| Forward Transfer Admittance | Y _{fs} | 40 | 320 | – | mS | V _{DS} = 10V, I _D = 0.1A |
| Diode Forward Voltage | V _{SD} | – | 1.0 | 1.5 | V | V _{GS} = 0V, I _S = 180mA |
| Source (diode forward) Current | I _S | – | – | 194 | mA | T _{SP} = +25°C |
| Peak Source (diode forward) Current | I _{SM} | – | – | 1.2 | A | T _{SP} = +25°C (Notes 3 & 4) |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C _{iss} | – | 21.8 | 40 | pF | V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | – | 5.6 | 15 | pF | |
| Reverse Transfer Capacitance | C _{rss} | – | 3.3 | 10 | pF | |
| Gate Resistance | R _g | – | 49 | – | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge | Q _g | – | 800 | – | pC | V _{GS} = 10V, V _{DD} = 25V, I _D = 250mA |
| Gate-Source Charge | Q _{gs} | – | 100 | – | pC | |
| Gate-Drain Charge | Q _{gd} | – | 100 | – | pC | |
| Turn-On Delay Time | t _{D(on)} | – | 2.93 | – | ns | V _{DD} = 30V, V _{GEN} = 10V, R _L = 150Ω, R _{GEN} = 50Ω, I _D = 0.2A |
| Turn-On Rise Time | t _r | – | 2.99 | – | ns | |
| Turn-Off Delay Time | t _{D(off)} | – | 9.45 | – | ns | |
| Turn-Off Fall Time | t _f | – | 8.3 | – | ns | |

- Notes:
6. Device mounted on FR-4 PCB, with minimum recommended pad layout.
 7. Repetitive rating, pulse width limited by junction temperature.
 8. Short duration pulse test used to minimize self-heating effect.
 9. Guaranteed by design. Not subject to production testing.

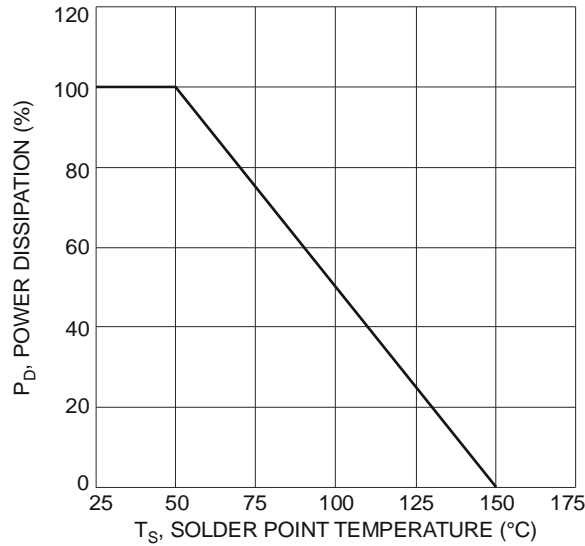


Fig 1. Normalized Total Power Dissipation as a Function of Solder Point Temperature

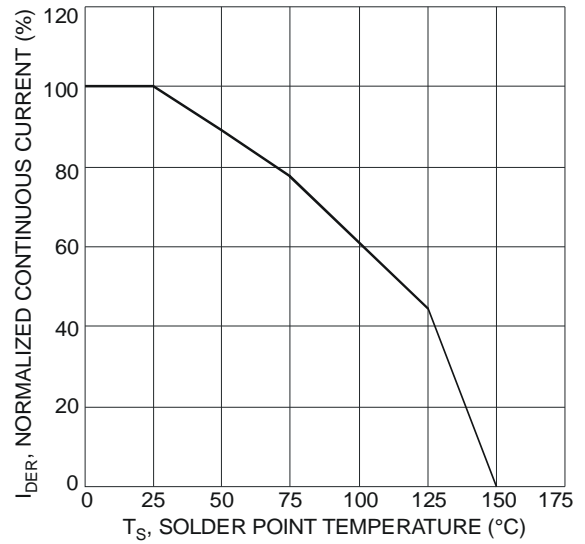


Fig 2. Normalized Continuous Current vs. Solder Point Temperature

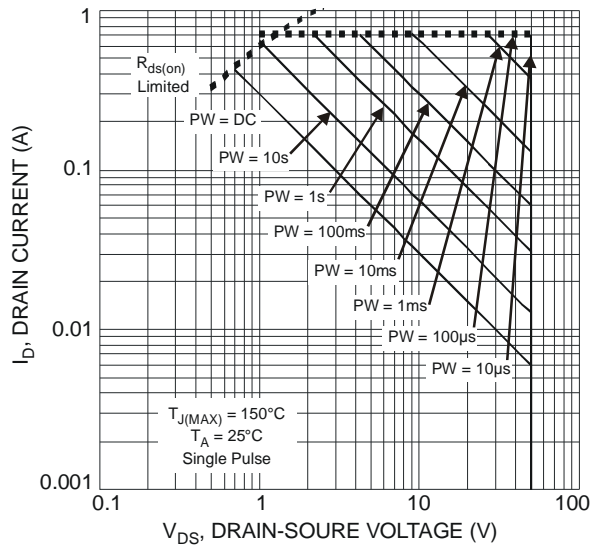


Fig 3 SOA, Safe Operation Area

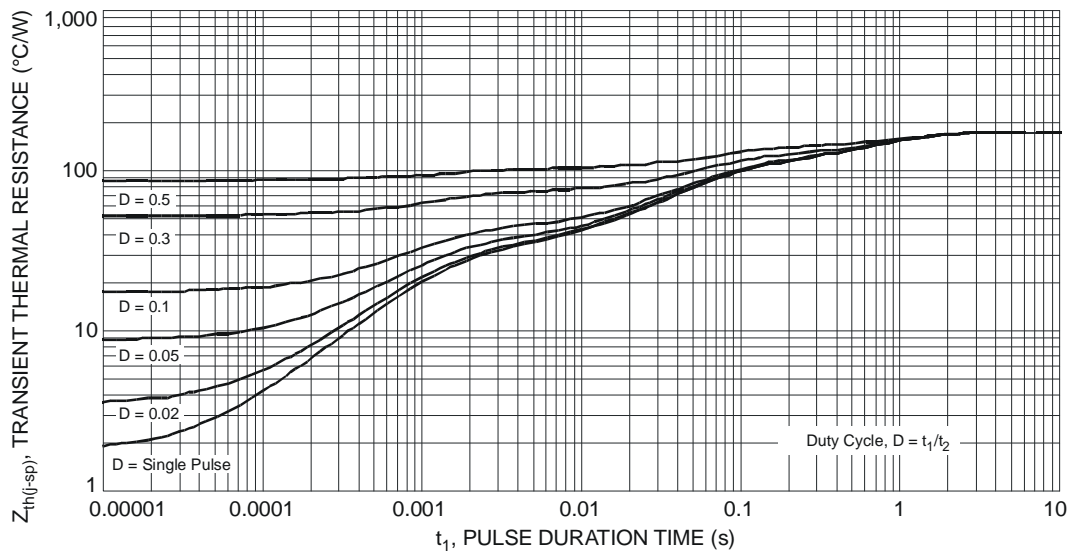


Fig. 4 Transient Thermal Response

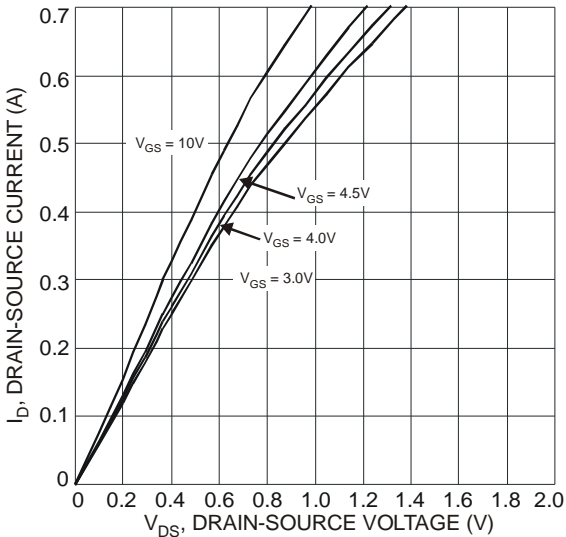


Fig. 5 Drain-Source Current vs. Drain-Source Voltage

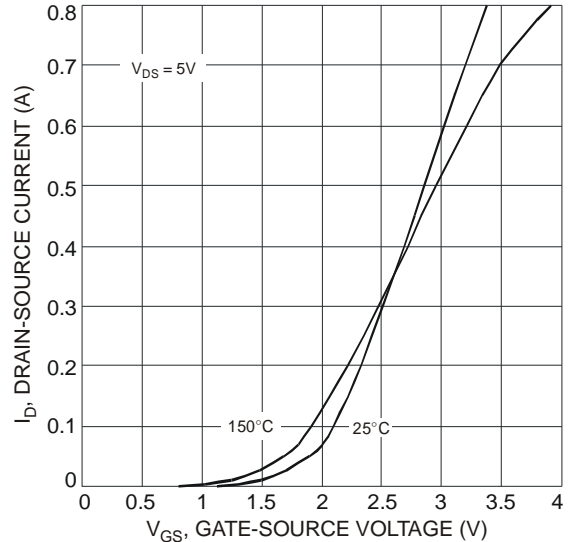


Fig. 6 Transfer Characteristics

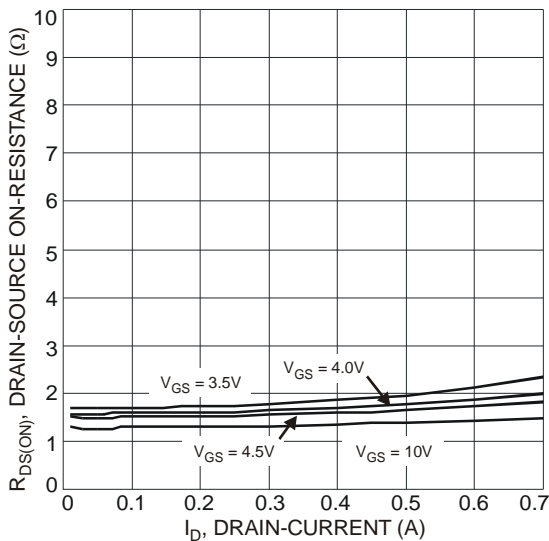


Fig. 7 Drain-Source On-Resistance vs. Drain-Current

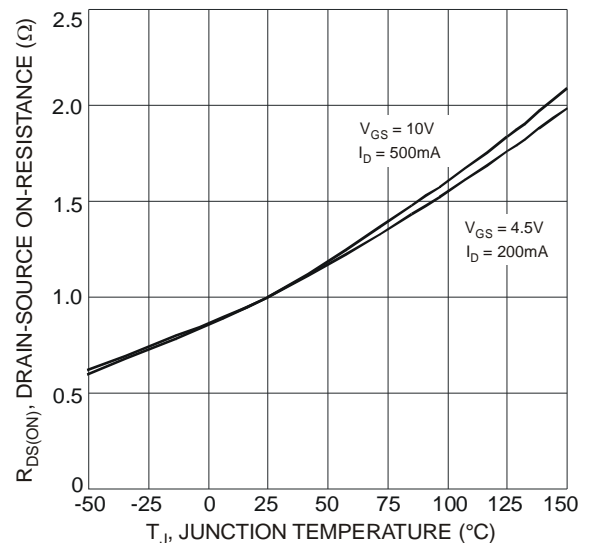


Fig. 8 Drain-Source On-Resistance vs. Junction Temperature

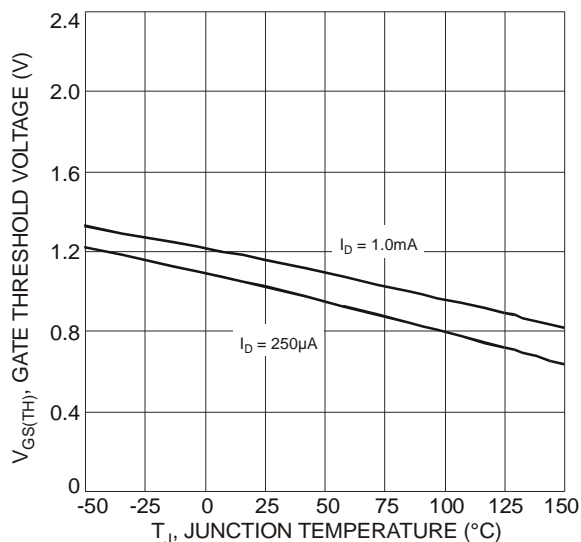


Fig. 9 Gate Threshold Voltage vs. Junction Temperature

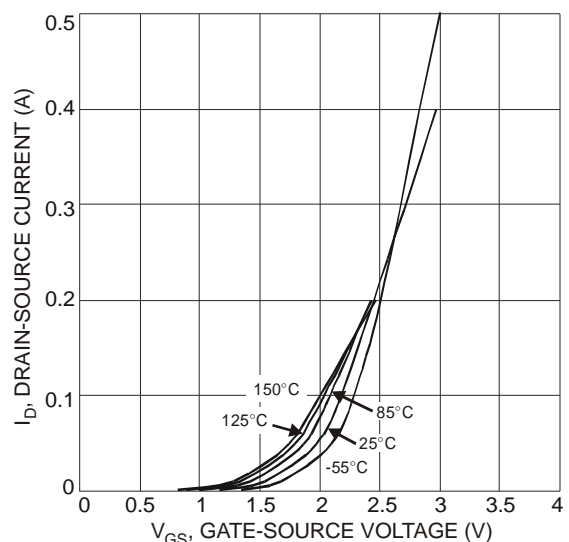


Fig. 10 Transfer Characteristics

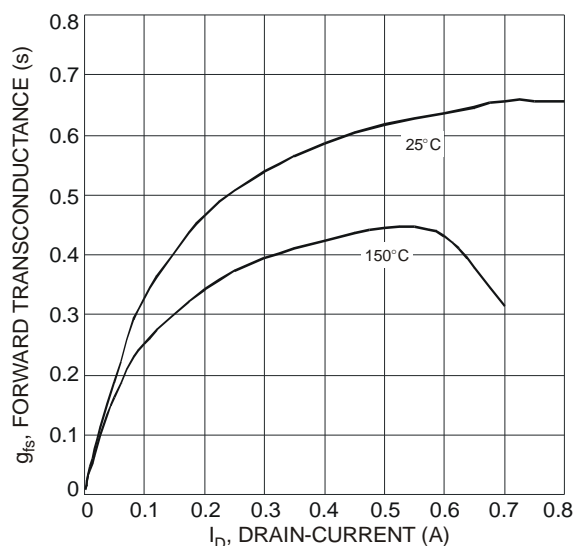


Fig. 11 Typical Transfer Characteristic

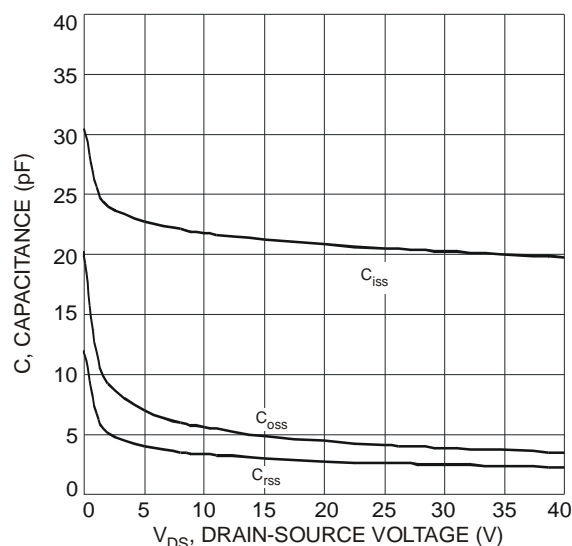


Fig. 12 Capacitance vs. Drain-Source Voltage

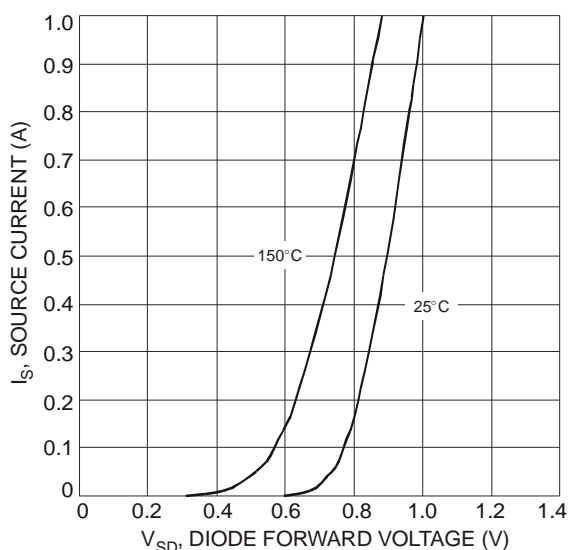
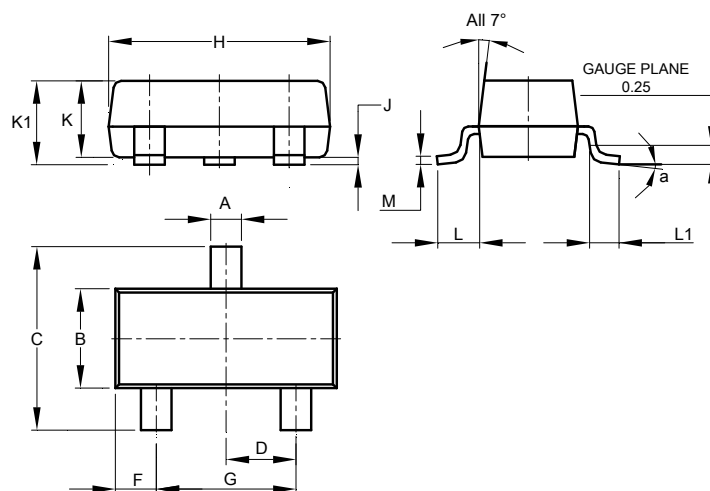


Fig. 13 Source Current vs. Diode Forward Voltage

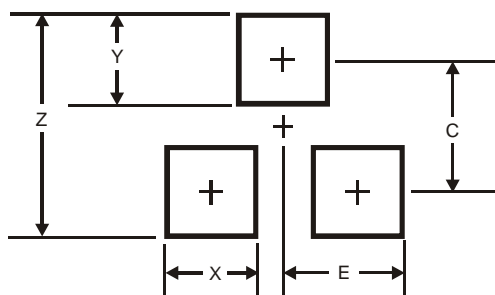
Package Outline Dimensions

 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 |
| α | 8° | | |
| All Dimensions in mm | | | |

Suggested Pad Layout

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