

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) MAX}$               | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|--------------------------------|------------------------------|
| 12V           | 10m $\Omega$ @ $V_{GS} = 4.5V$ | 9.3A                         |
|               | 12m $\Omega$ @ $V_{GS} = 2.5V$ | 8.5A                         |
|               | 14m $\Omega$ @ $V_{GS} = 1.8V$ | 7.9A                         |
|               | 18m $\Omega$ @ $V_{GS} = 1.5V$ | 6.9A                         |
|               | 41m $\Omega$ @ $V_{GS} = 1.2V$ | 4.6A                         |

## 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

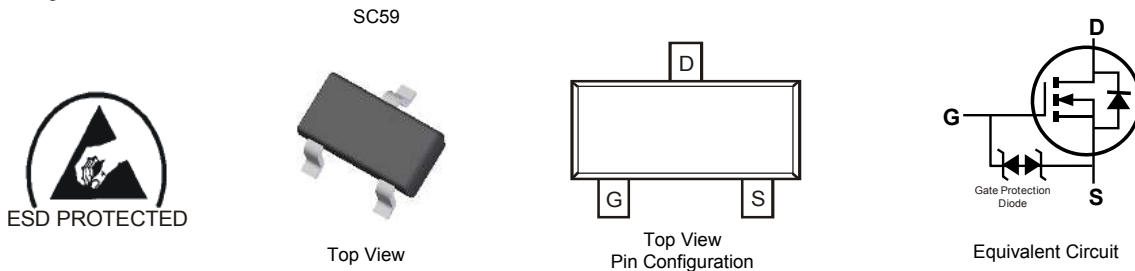
- Load Switch
- DC-DC Converters
- Power Management Functions

## Features

- Low On-Resistance
- ESD Protected Gate
- **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: SC59
- Case Material – Molded Plastic. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Solderable per MIL-STD-202, Method 208  $\text{\textcircled{e3}}$
- Terminal Connections: See Diagram
- Weight: 0.014 grams (approximate)

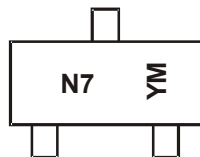


## Ordering Information (Note 4)

| Part Number   | Case | Packaging          |
|---------------|------|--------------------|
| DMN1019USN-7  | SC59 | 3,000/Tape & Reel  |
| DMN1019USN-13 | SC59 | 10,000/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](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



N7 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: A = 2013  
 M = Month ex: 9 = September

### Date Code Key

| Year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|------|------|------|------|------|------|------|------|------|
| Code | A    | B    | C    | D    | E    | F    | G    | H    |

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

| Characteristic   |                  |  | Symbol    | Value      | Units |
|--|------------------|--|-----------|------------|-------|
| Drain-Source Voltage   |                  |  | $V_{DSS}$ | 12         | V     |
| Gate-Source Voltage  |                  |  | $V_{GSS}$ | $\pm 8$    | V     |
| Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$       | Steady State     | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 9.3<br>7.4 | A     |
|  | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 11<br>8.8  | A     |
| Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%) |                  |  | $I_{DM}$  | 70         | A     |
| Maximum Body Diode Forward Current (Note 6)                    |                  |  | $I_S$     | 2          | A     |

**Thermal Characteristics**

| Characteristic                                   |                           | Symbol          | Value       | Units              |
|--|---------------------------|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5)                 | $T_A = +25^\circ\text{C}$ | $P_D$           | 0.68        | W                  |
|  | $T_A = +70^\circ\text{C}$ |                 | 0.4         |                    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state              | $R_{\theta JA}$ | 160         | $^\circ\text{C/W}$ |
|  | $t < 10\text{s}$          |                 | 115         | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6)                 | $T_A = +25^\circ\text{C}$ | $P_D$           | 1.2         | W                  |
|  | $T_A = +70^\circ\text{C}$ |                 | 0.83        |                    |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state              | $R_{\theta JA}$ | 96          | $^\circ\text{C/W}$ |
|  | $t < 10\text{s}$          |                 | 68          | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case (Note 6)    |                           | $R_{\theta JC}$ | 18          | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          |                           | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$   |

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

| Characteristic                               | Symbol       | Min  | Typ  | Max     | Unit          | Test Condition  |
|--|--------------|------|------|---------|---------------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>          |              |      |      |         |               |   |
| Drain-Source Breakdown Voltage               | $BV_{DSS}$   | 12   | —    | —       | V             | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$  |
| Zero Gate Voltage Drain Current              | $I_{DSS}$    | —    | —    | 1       | $\mu\text{A}$ | $V_{DS} = 12\text{V}, V_{GS} = 0\text{V}$   |
| Gate-Body Leakage                            | $I_{GSS}$    | —    | —    | $\pm 2$ | $\mu\text{A}$ | $V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$  |
| <b>ON CHARACTERISTICS (Note 7)</b>           |              |      |      |         |               |   |
| Gate Threshold Voltage                       | $V_{GS(th)}$ | 0.35 | 0.53 | 0.8     | V             | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$   |
| Static Drain-Source On-Resistance            | $R_{DS(on)}$ | —    | 7    | 10      | m $\Omega$    | $V_{GS} = 4.5\text{V}, I_D = 9.7\text{A}$   |
|  |              | —    | 8    | 12      |               | $V_{GS} = 2.5\text{V}, I_D = 9\text{A}$   |
|  |              | —    | 10   | 14      |               | $V_{GS} = 1.8\text{V}, I_D = 8.1\text{A}$   |
|  |              | —    | 14   | 18      |               | $V_{GS} = 1.5\text{V}, I_D = 4.5\text{A}$   |
|  |              | —    | 28   | 41      |               | $V_{GS} = 1.2\text{V}, I_D = 2.4\text{A}$   |
| Forward Transfer Admittance                  | $ Y_{fs} $   | —    | 28   | —       | S             | $V_{DS} = 4\text{V}, I_D = 9.7\text{A}$   |
| Diode Forward Voltage                        | $V_{SD}$     | —    | 0.8  | 1.2     | V             | $V_{GS} = 0\text{V}, I_S = 10\text{A}$  |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>      |              |      |      |         |               |   |
| Input Capacitance                            | $C_{iss}$    | —    | 2426 | —       | pF            | $V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$                                  |
| Output Capacitance                           | $C_{oss}$    | —    | 396  | —       | pF            |   |
| Reverse Transfer Capacitance                 | $C_{rss}$    | —    | 375  | —       | pF            |   |
| Gate Resistance                              | $R_g$        | —    | 1.1  | —       | $\Omega$      | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$                                   |
| Total Gate Charge ( $V_{GS} = 8\text{V}$ )   | $Q_g$        | —    | 50.6 | —       | nC            | $V_{DS} = 4\text{V}, I_D = 10\text{A}$  |
| Total Gate Charge ( $V_{GS} = 4.5\text{V}$ ) | $Q_g$        | —    | 27.3 | —       |               |   |
| Gate-Source Charge                           | $Q_{gs}$     | —    | 3.4  | —       |               |   |
| Gate-Drain Charge                            | $Q_{gd}$     | —    | 5.2  | —       |               |   |
| Turn-On Delay Time                           | $t_{D(on)}$  | —    | 7.6  | —       | ns            | $V_{DD} = 4\text{V}, V_{GEN} = 5\text{V}, I_D = 10\text{A}, R_G = 1\Omega, R_L = 0.4\Omega$ |
| Turn-Off Delay Time                          | $t_{D(off)}$ | —    | 22.2 | —       | ns            |   |
| Turn-On Rise Time                            | $t_r$        | —    | 57.6 | —       | ns            |   |
| Turn-Off Fall Time                           | $t_f$        | —    | 16.8 | —       | ns            |   |

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout, single sided. The power dissipation  $P_D$  is based on  $t < 10\text{s}$   $R_{\theta JA}$ .
  - Device mounted on 1" x 1" FR-4 PCB with high coverage 2 oz. Copper, single sided. The power dissipation  $P_D$  is based on  $t < 10\text{s}$   $R_{\theta JA}$ .
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

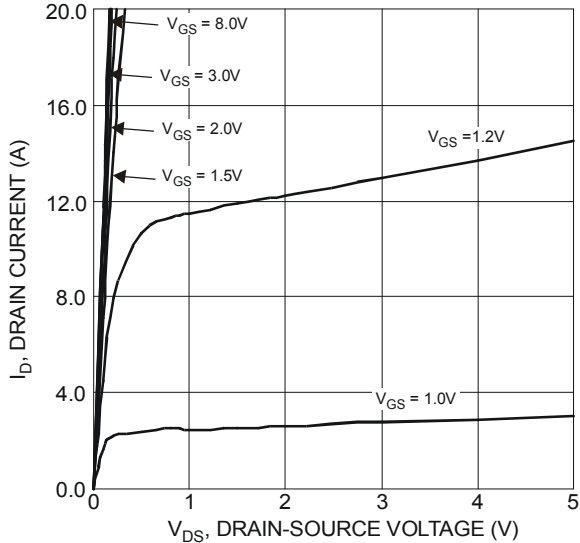


Figure 1 Typical Output Characteristics

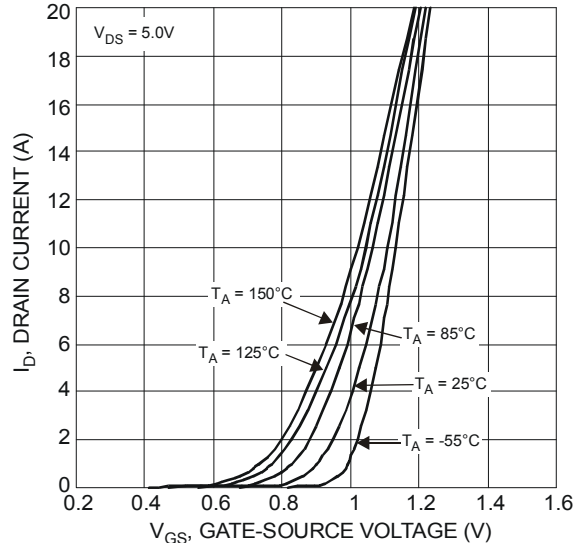


Figure 2 Typical Transfer Characteristics

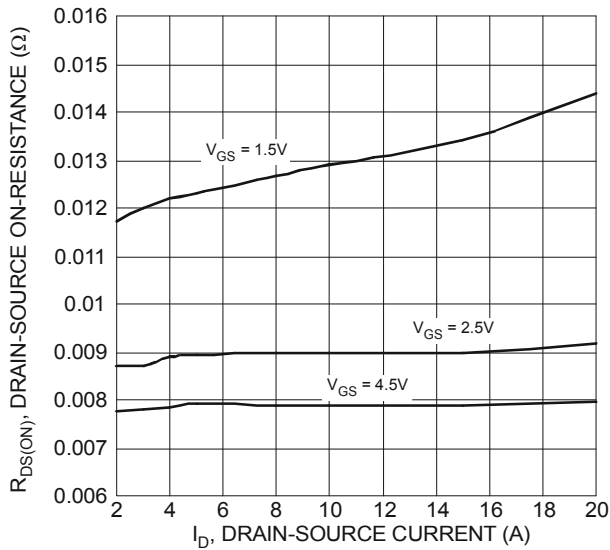


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

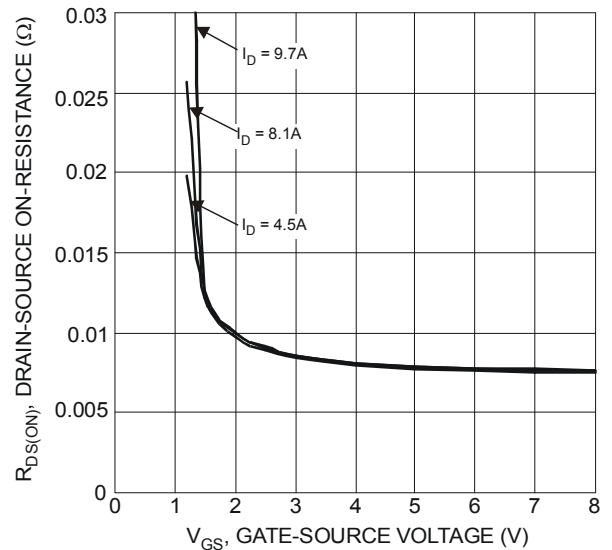


Figure 4 Typical Transfer Characteristics

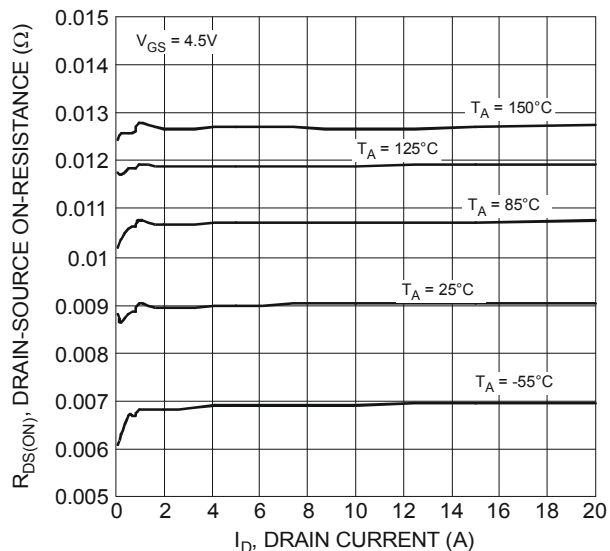


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

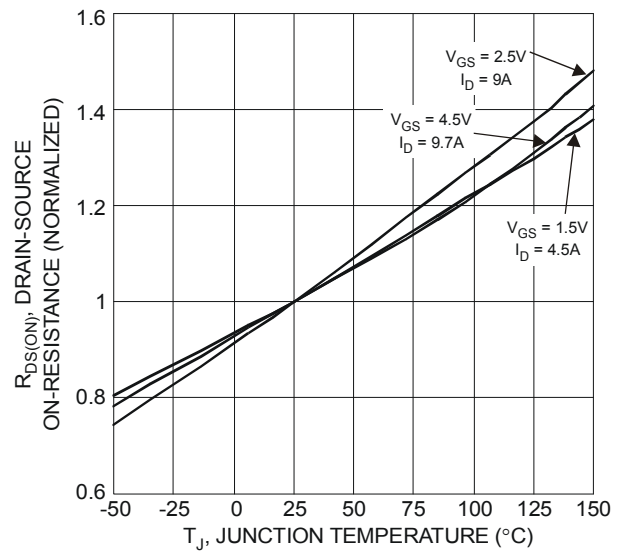


Figure 6 On-Resistance Variation with Temperature

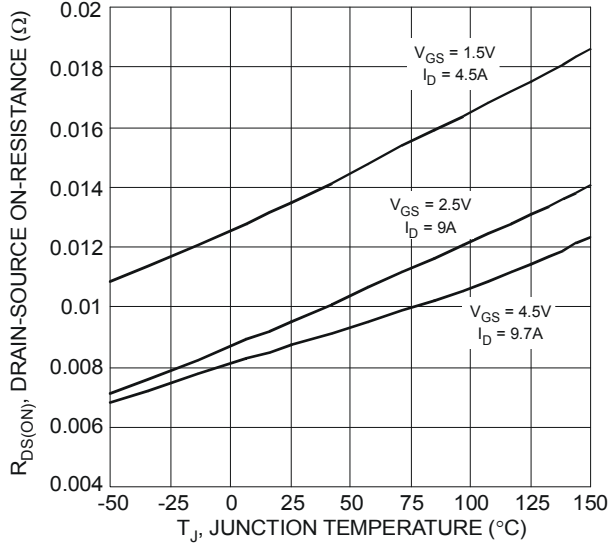


Figure 7 On-Resistance Variation with Temperature

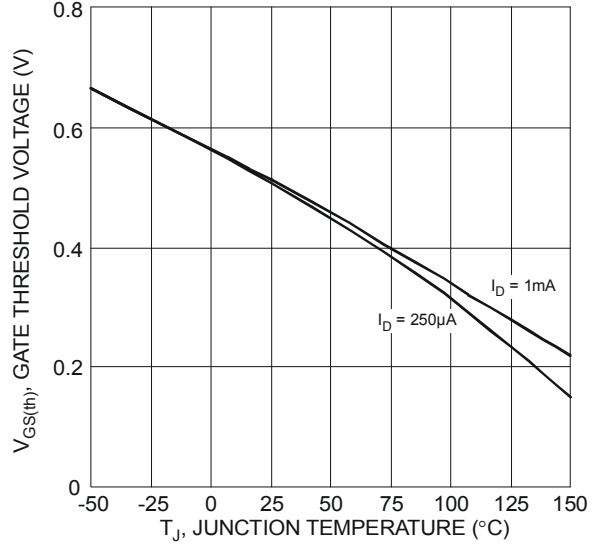


Figure 8 Gate Threshold Variation vs. Ambient Temperature

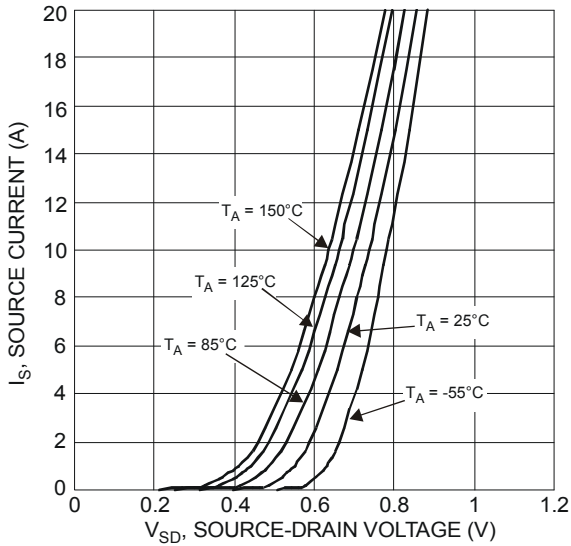


Figure 9 Diode Forward Voltage vs. Current

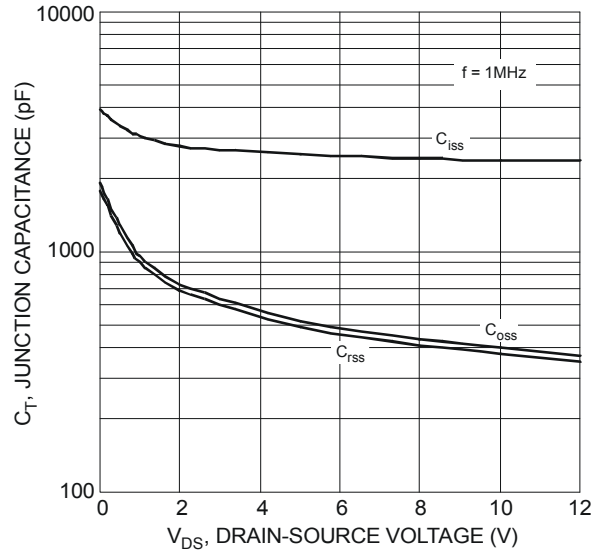


Figure 10 Typical Junction Capacitance

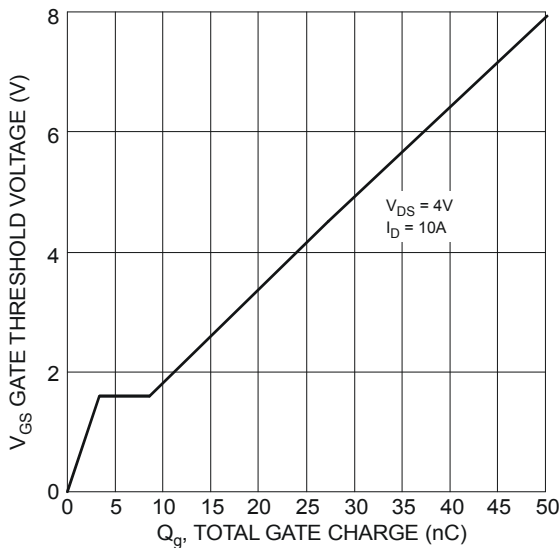


Figure 11 Gate Charge

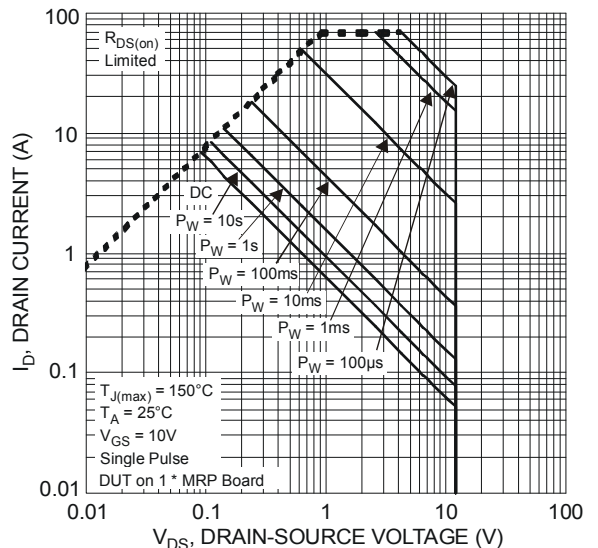
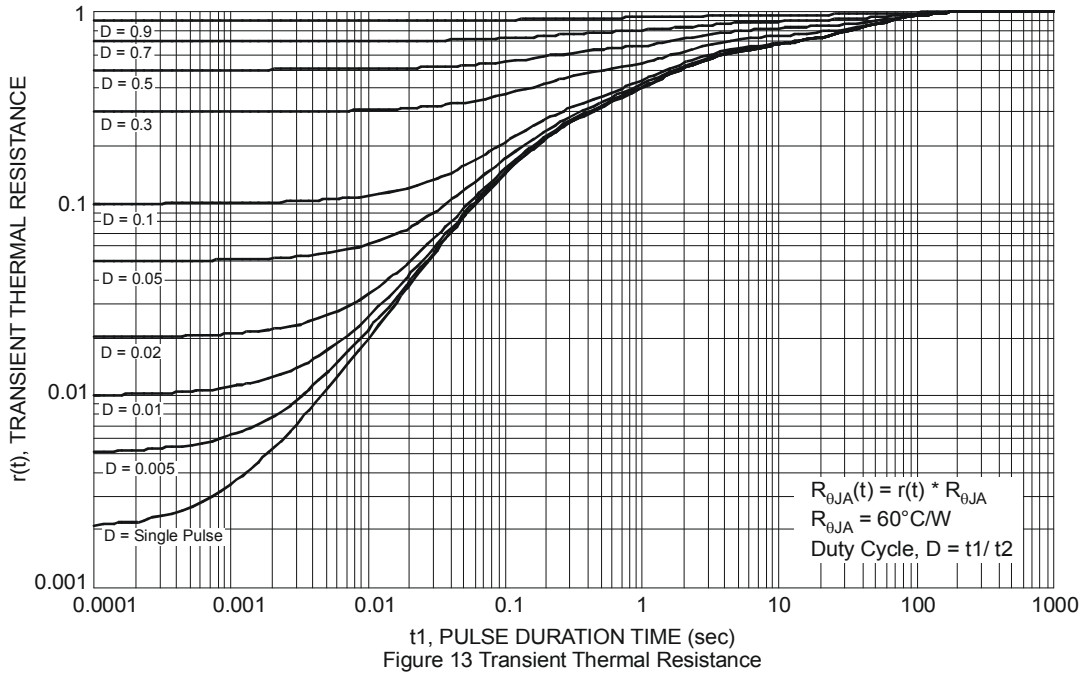


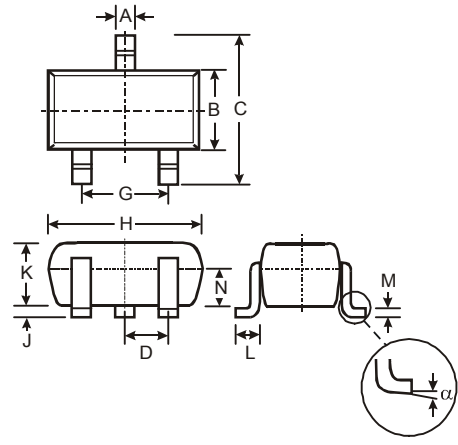
Figure 12 SOA, Safe Operation Area

NEW PRODUCT



**Package Outline Dimensions**

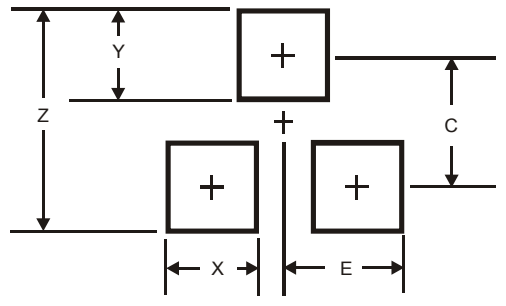
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SC59                 |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 0.35  | 0.50 | 0.38 |
| B                    | 1.50  | 1.70 | 1.60 |
| C                    | 2.70  | 3.00 | 2.80 |
| D                    | -     | -    | 0.95 |
| G                    | -     | -    | 1.90 |
| H                    | 2.90  | 3.10 | 3.00 |
| J                    | 0.013 | 0.10 | 0.05 |
| K                    | 1.00  | 1.30 | 1.10 |
| L                    | 0.35  | 0.55 | 0.40 |
| M                    | 0.10  | 0.20 | 0.15 |
| N                    | 0.70  | 0.80 | 0.75 |
| α                    | 0°    | 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          | 3.4           |
| X          | 0.8           |
| Y          | 1.0           |
| C          | 2.4           |
| E          | 1.35          |

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