

## 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

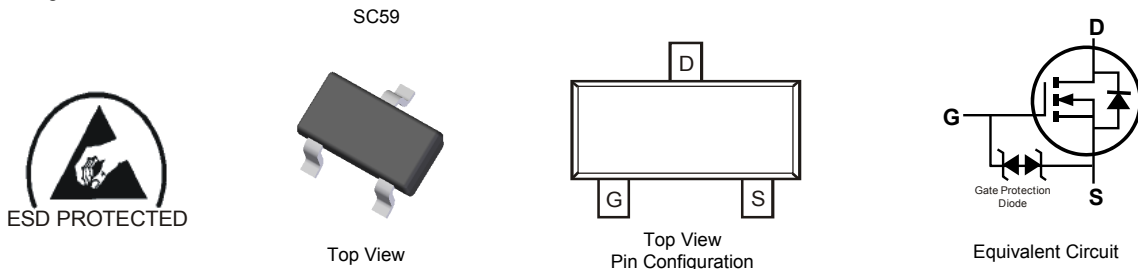
- Load Switch
- DC-DC Converters
- Power Management Functions

## 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 
- Terminal Connections: See Diagram
- Weight: 0.014 grams (approximate)

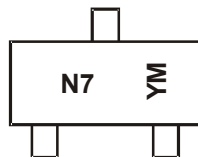


## Ordering Information (Note 4)

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

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - 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



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<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                           |              |                                                  | Symbol           | Value      | Units |
|----------------------------------------------------------|--------------|--------------------------------------------------|------------------|------------|-------|
| Drain-Source Voltage                                     |              |                                                  | V <sub>DSS</sub> | 12         | V     |
| Gate-Source Voltage                                      |              |                                                  | V <sub>GSS</sub> | ±8         | V     |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 9.3<br>7.4 | A     |
|                                                          | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 11<br>8.8  | A     |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%)       |              |                                                  | I <sub>DM</sub>  | 70         | A     |
| Maximum Body Diode Forward Current (Note 6)              |              |                                                  | I <sub>S</sub>   | 2          | A     |

**Thermal Characteristics**

| Characteristic                                   |                        | Symbol                            | Value       | Units |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 0.68        | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 0.4         |       |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state           | R <sub>θJA</sub>                  | 160         | °C/W  |
|                                                  | t < 10s                |                                   | 115         |       |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.2         | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 0.83        |       |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state           | R <sub>θJA</sub>                  | 96          | °C/W  |
|                                                  | t < 10s                |                                   | 68          |       |
| Thermal Resistance, Junction to Case (Note 6)    |                        | R <sub>θJC</sub>                  | 18          | °C/W  |
| Operating and Storage Temperature Range          |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

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

| Characteristic                             | Symbol              | Min  | Typ  | Max | Unit | Test Condition                                                                                                   |
|--------------------------------------------|---------------------|------|------|-----|------|------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 7)</b>        |                     |      |      |     |      |                                                                                                                  |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 12   | —    | —   | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA                                                                     |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —    | —    | 1   | µA   | V <sub>DS</sub> = 12V, V <sub>GS</sub> = 0V                                                                      |
| Gate-Body Leakage                          | I <sub>GSS</sub>    | —    | —    | ±2  | µA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V                                                                      |
| <b>ON CHARACTERISTICS (Note 7)</b>         |                     |      |      |     |      |                                                                                                                  |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub> | 0.35 | 0.53 | 0.8 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                                       |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | —    | 7    | 10  | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 9.7A                                                                    |
|                                            |                     | —    | 8    | 12  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 9A                                                                      |
|                                            |                     | —    | 10   | 14  |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 8.1A                                                                    |
|                                            |                     | —    | 14   | 18  |      | V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 4.5A                                                                    |
|                                            |                     | —    | 28   | 41  |      | V <sub>GS</sub> = 1.2V, I <sub>D</sub> = 2.4A                                                                    |
| Forward Transfer Admittance                | Y <sub>fs</sub>     | —    | 28   | —   | S    | V <sub>DS</sub> = 4V, I <sub>D</sub> = 9.7A                                                                      |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —    | 0.8  | 1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 10A                                                                       |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>    |                     |      |      |     |      |                                                                                                                  |
| Input Capacitance                          | C <sub>iss</sub>    | —    | 2426 | —   | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                                         |
| Output Capacitance                         | C <sub>oss</sub>    | —    | 396  | —   | pF   |                                                                                                                  |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | —    | 375  | —   | pF   |                                                                                                                  |
| Gate Resistance                            | R <sub>g</sub>      | —    | 1.1  | —   | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                                             |
| Total Gate Charge (V <sub>GS</sub> = 8V)   | Q <sub>g</sub>      | —    | 50.6 | —   | nC   | V <sub>DS</sub> = 4V, I <sub>D</sub> = 10A                                                                       |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>g</sub>      | —    | 27.3 | —   |      |                                                                                                                  |
| Gate-Source Charge                         | Q <sub>gs</sub>     | —    | 3.4  | —   |      |                                                                                                                  |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | —    | 5.2  | —   |      |                                                                                                                  |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | —    | 7.6  | —   | ns   | V <sub>DD</sub> = 4V, V <sub>GEN</sub> = 5V, I <sub>D</sub> = 10A,<br>R <sub>G</sub> = 1Ω, R <sub>L</sub> = 0.4Ω |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | —    | 22.2 | —   | ns   |                                                                                                                  |
| Turn-On Rise Time                          | t <sub>r</sub>      | —    | 57.6 | —   | ns   |                                                                                                                  |
| Turn-Off Fall Time                         | t <sub>f</sub>      | —    | 16.8 | —   | ns   |                                                                                                                  |

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout, single sided. The power dissipation P<sub>D</sub> is based on t < 10s R<sub>θJA</sub>.
  - Device mounted on 1" x 1" FR-4 PCB with high coverage 2 oz. Copper, single sided. The power dissipation P<sub>D</sub> is based on t < 10s R<sub>θJA</sub>.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

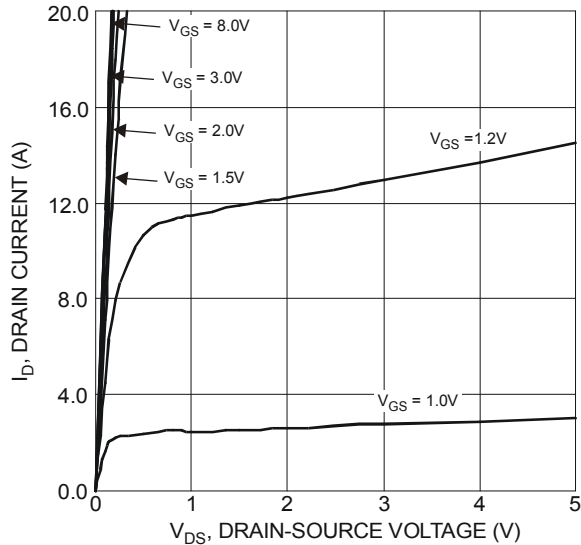


Figure 1 Typical Output Characteristics

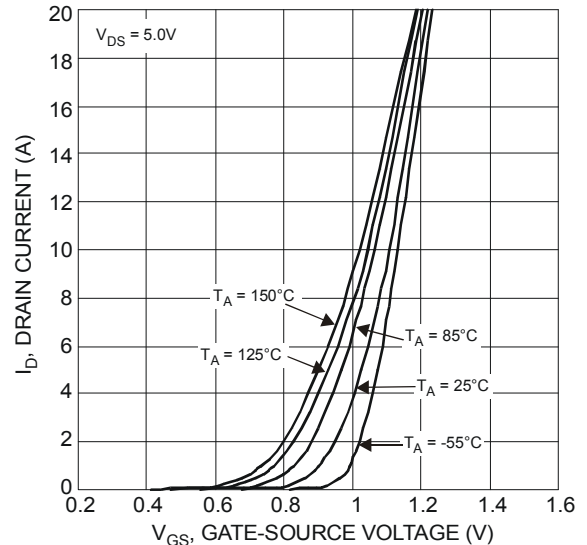


Figure 2 Typical Transfer Characteristics

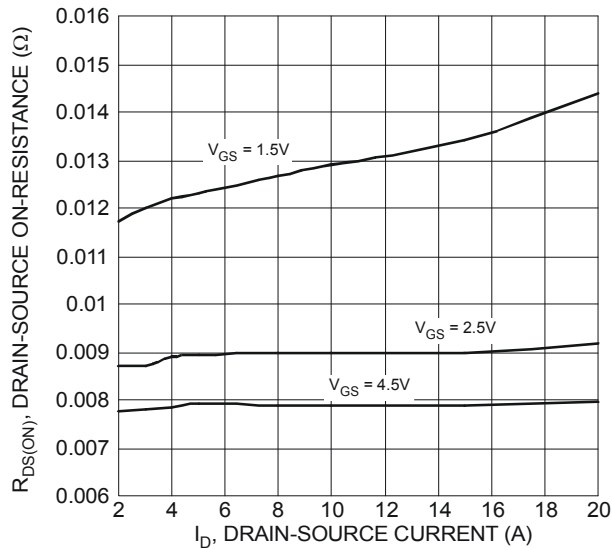


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

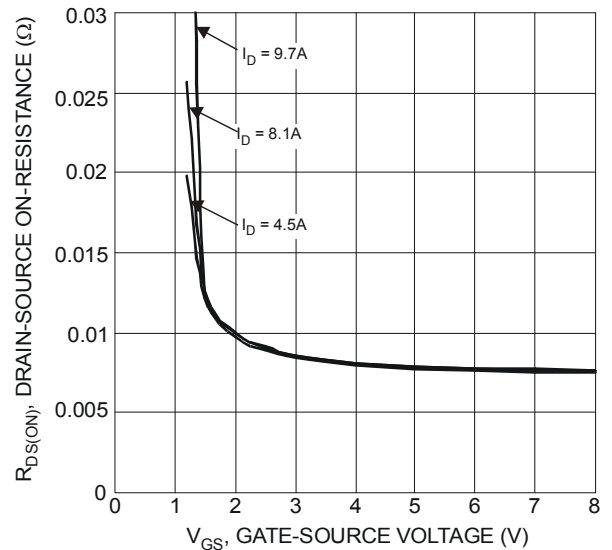


Figure 4 Typical Transfer Characteristics

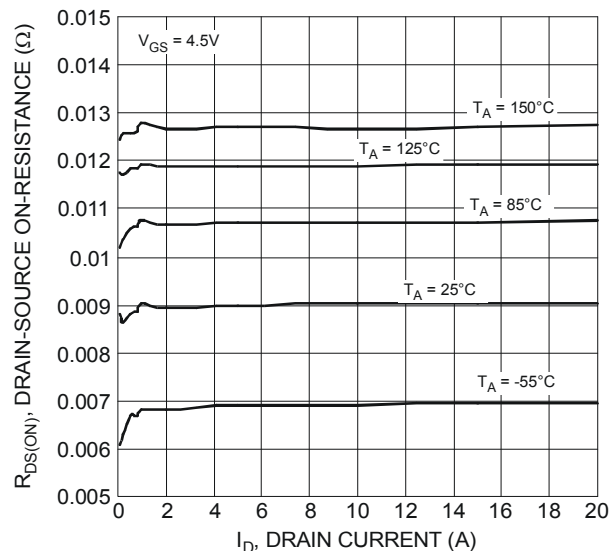


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

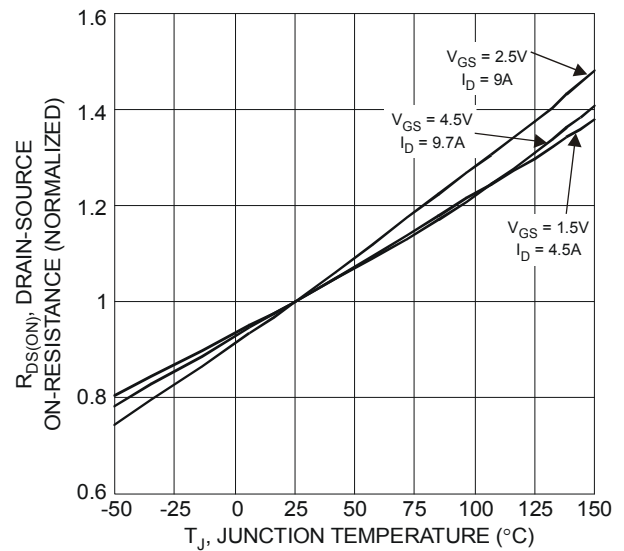


Figure 6 On-Resistance Variation with Temperature

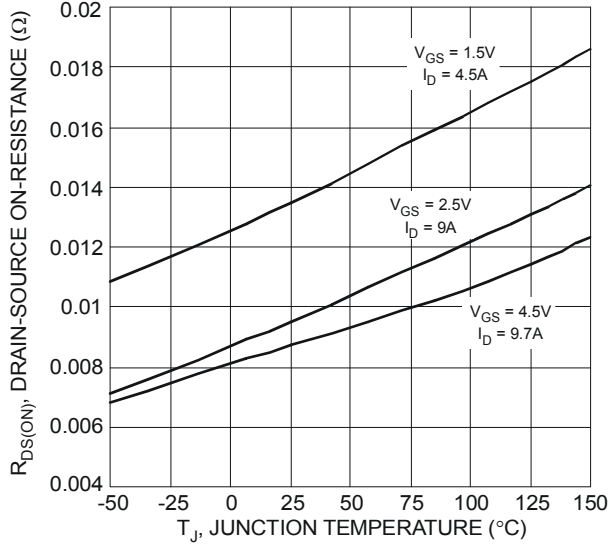


Figure 7 On-Resistance Variation with Temperature

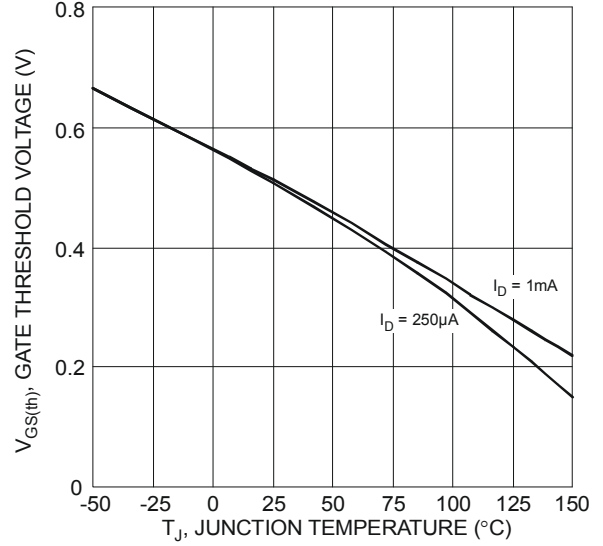


Figure 8 Gate Threshold Variation vs. Ambient Temperature

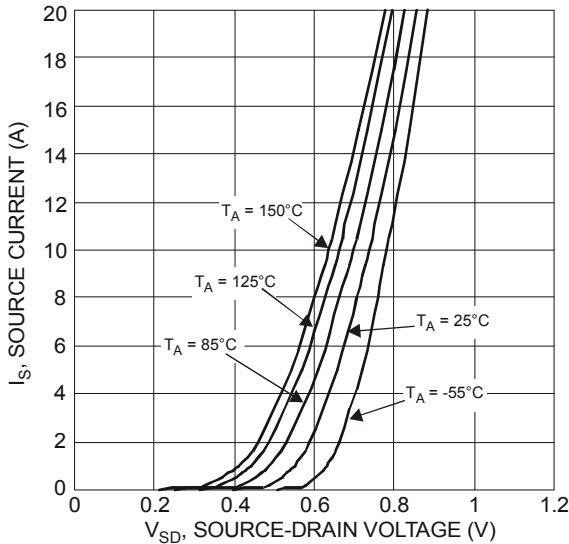


Figure 9 Diode Forward Voltage vs. Current

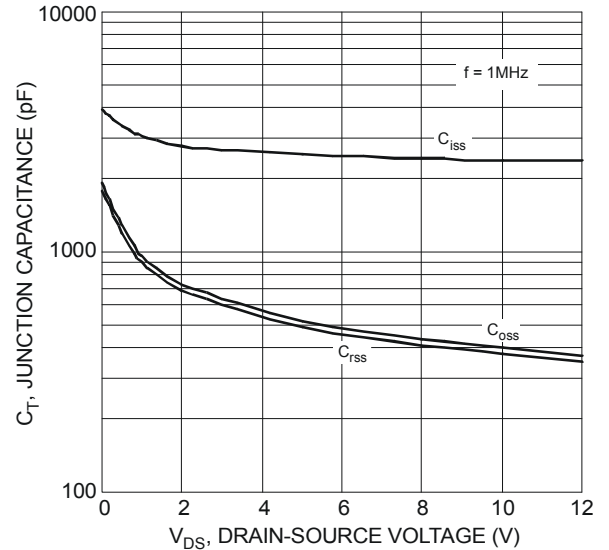


Figure 10 Typical Junction Capacitance

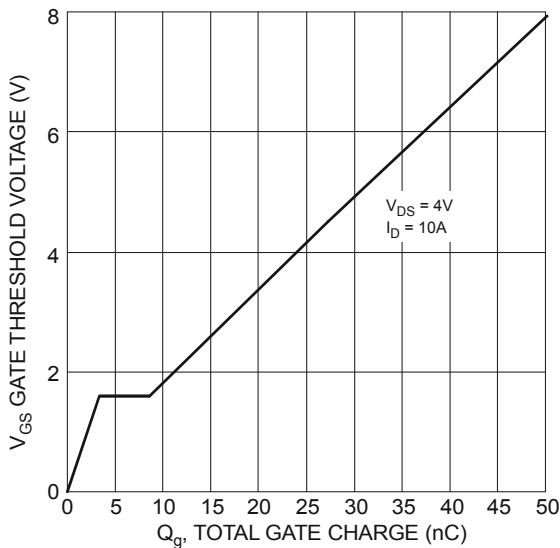


Figure 11 Gate Charge

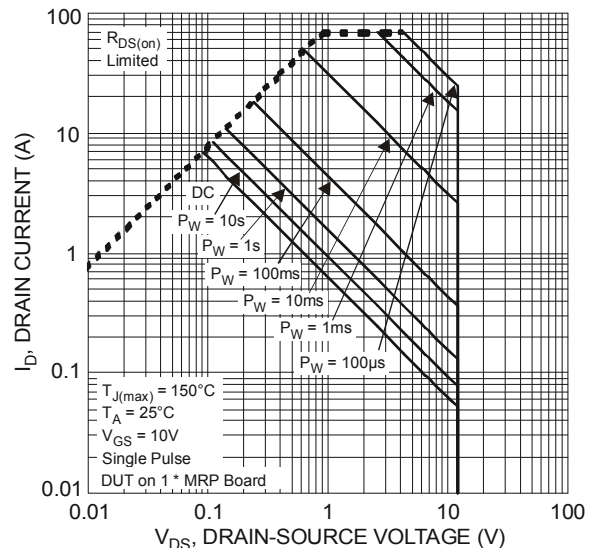
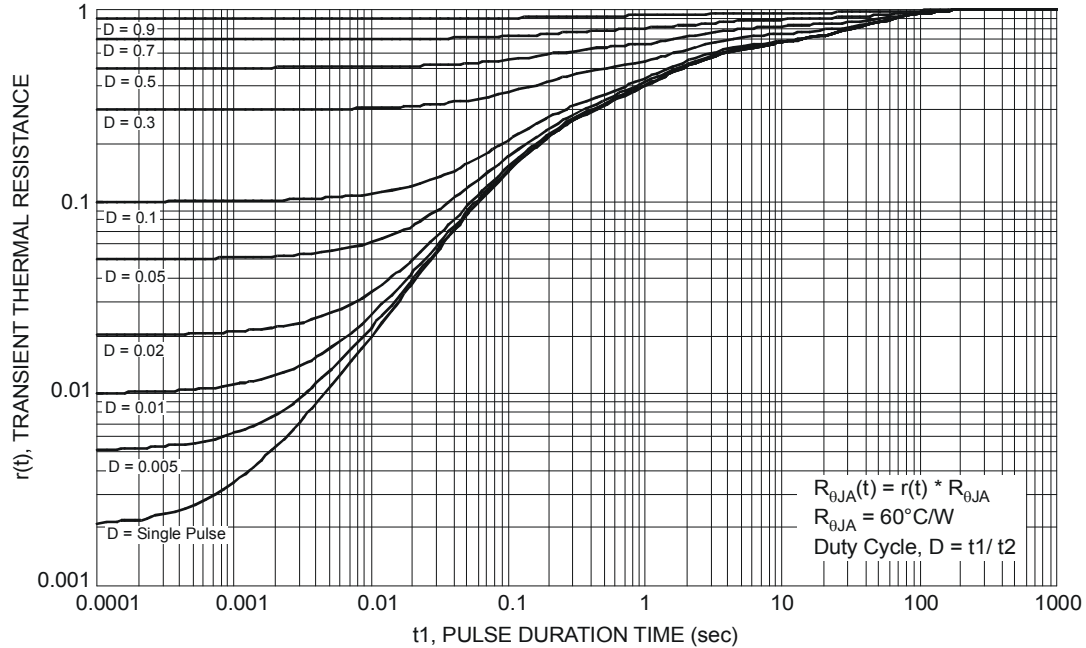
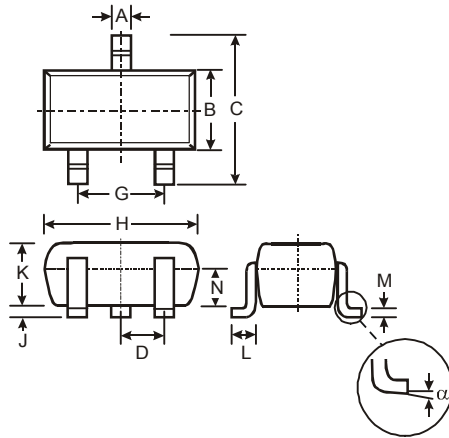


Figure 12 SOA, Safe Operation Area



## Package Outline Dimensions

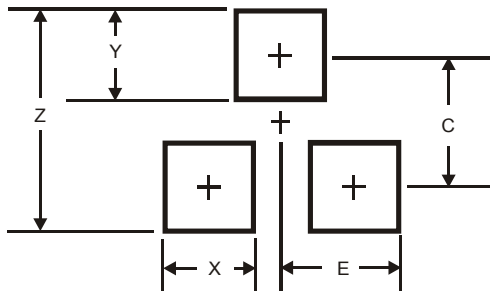
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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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