

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON) MAX}$	$I_D$ $T_A = +25^\circ C$
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

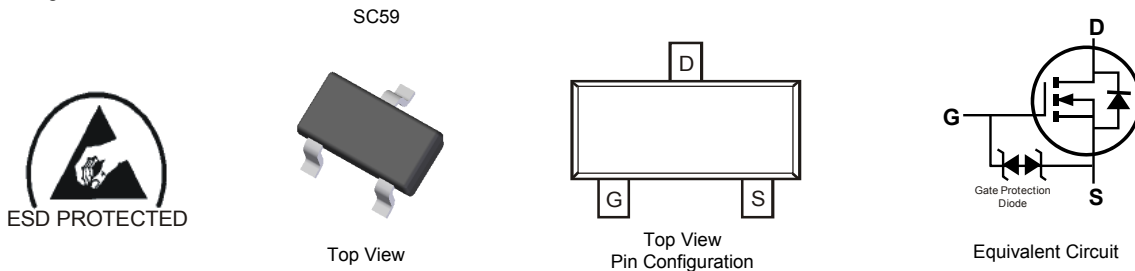
- Load Switch
- DC-DC Converters
- Power Management Functions

## 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)

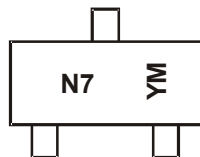


## Ordering Information (Note 4)

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	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	9.3 7.4	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	11 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.

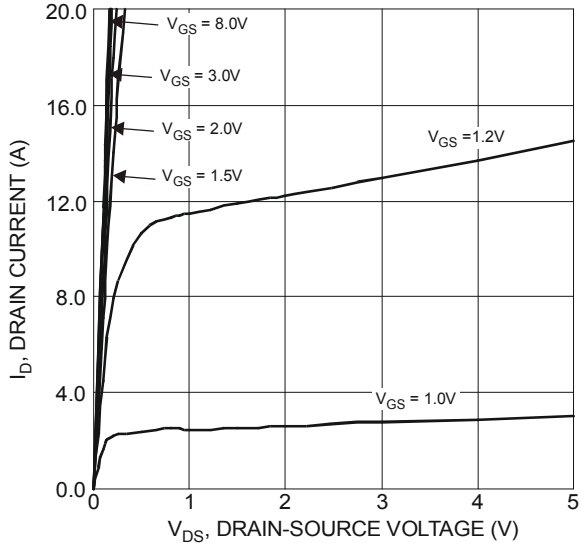


Figure 1 Typical Output Characteristics

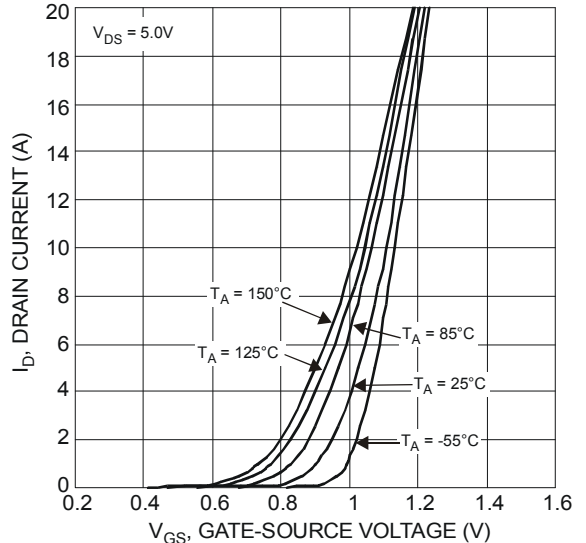


Figure 2 Typical Transfer Characteristics

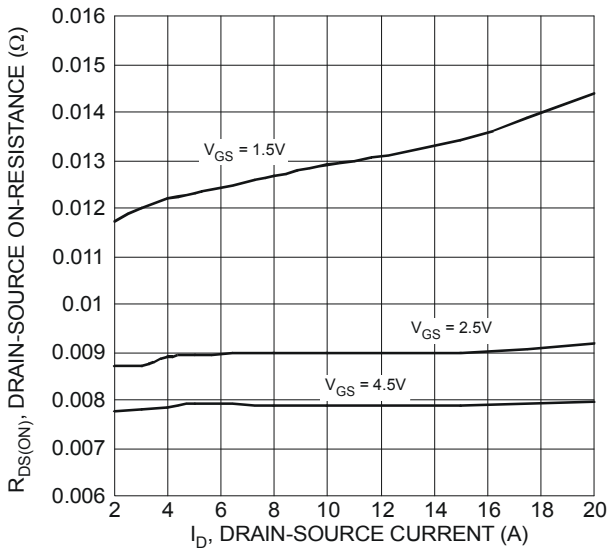


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

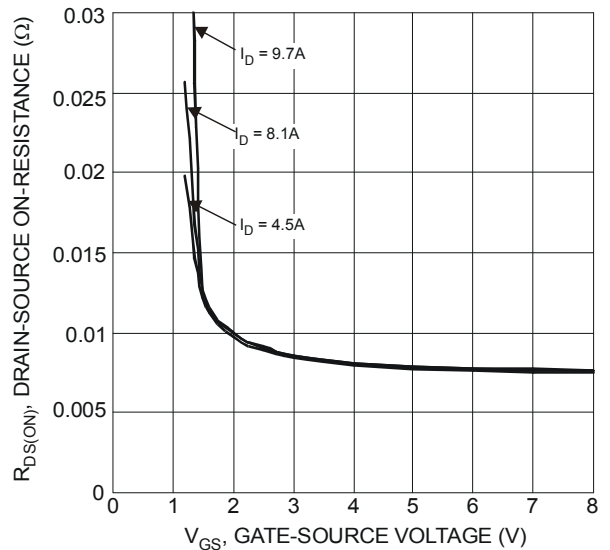


Figure 4 Typical Transfer Characteristics

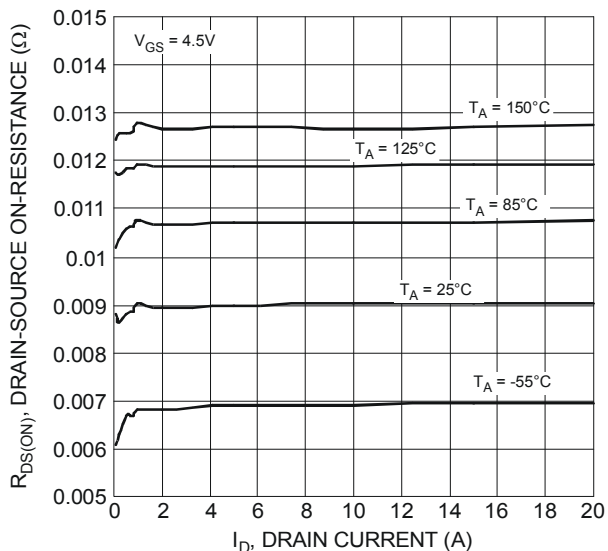


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

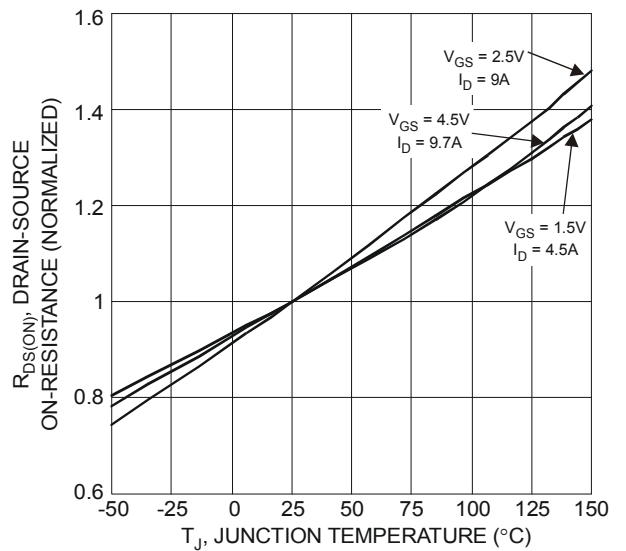


Figure 6 On-Resistance Variation with Temperature

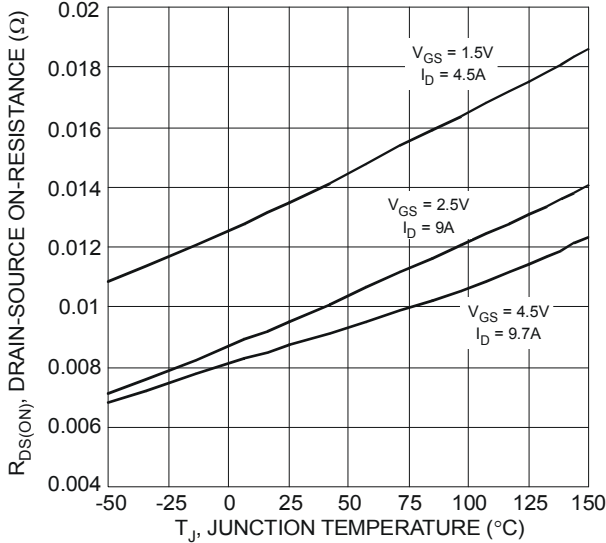


Figure 7 On-Resistance Variation with Temperature

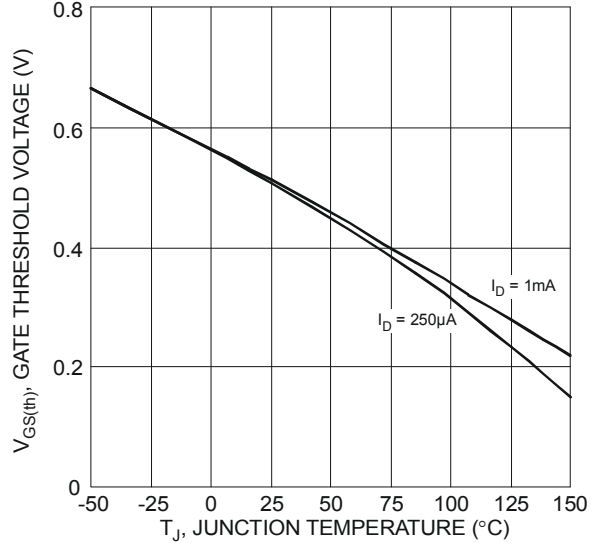


Figure 8 Gate Threshold Variation vs. Ambient Temperature

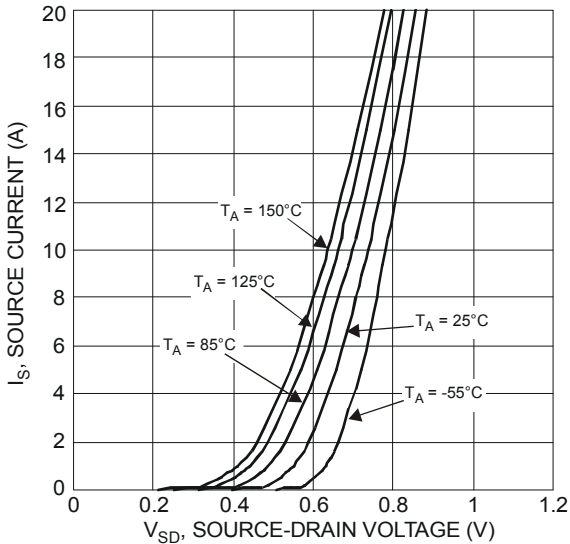


Figure 9 Diode Forward Voltage vs. Current

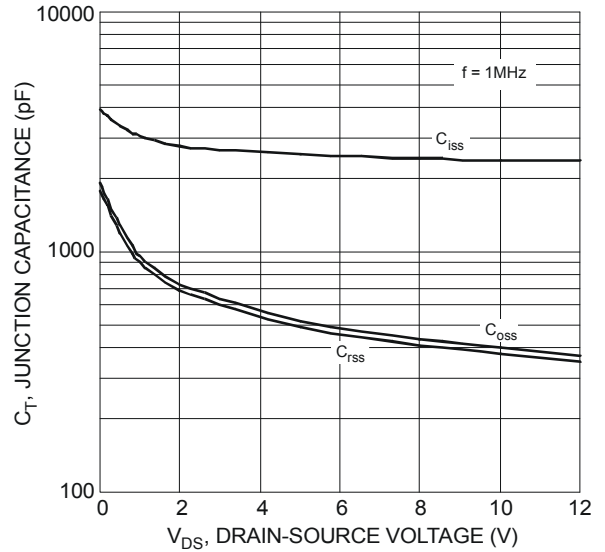


Figure 10 Typical Junction Capacitance

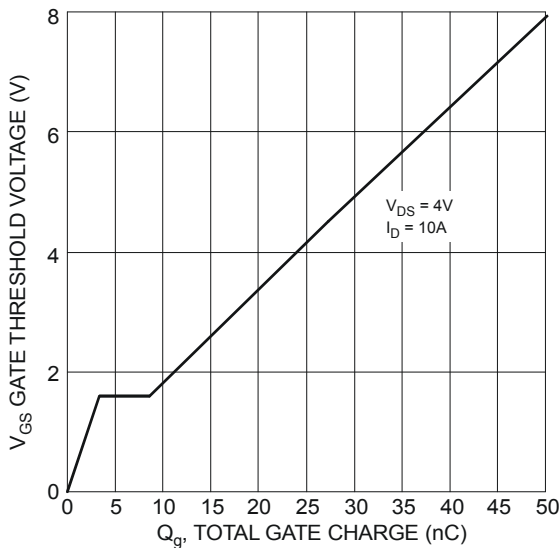


Figure 11 Gate Charge

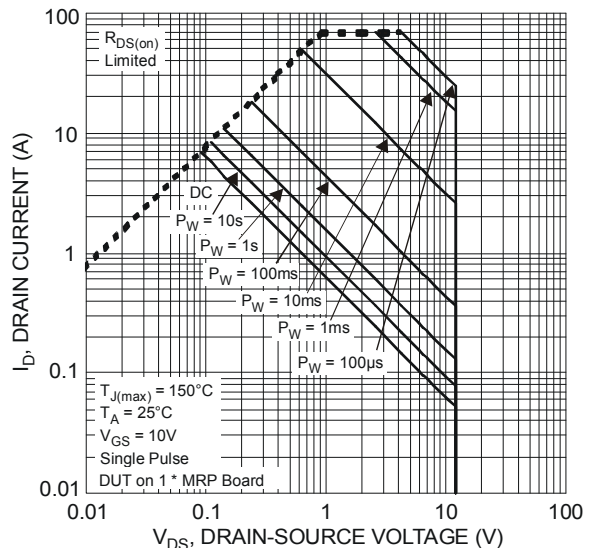
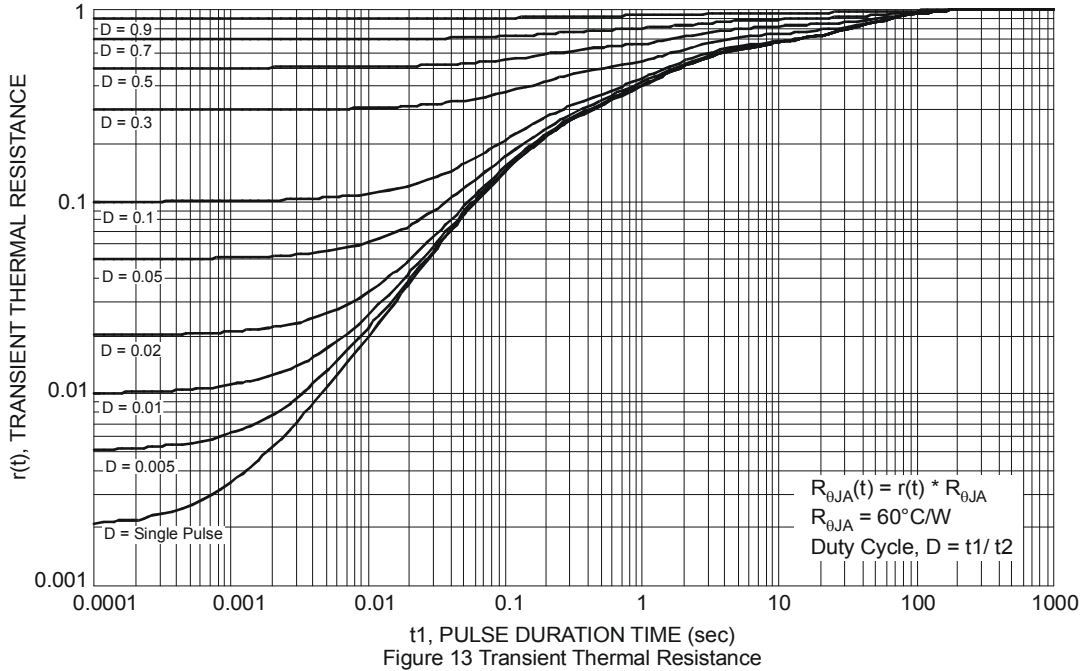
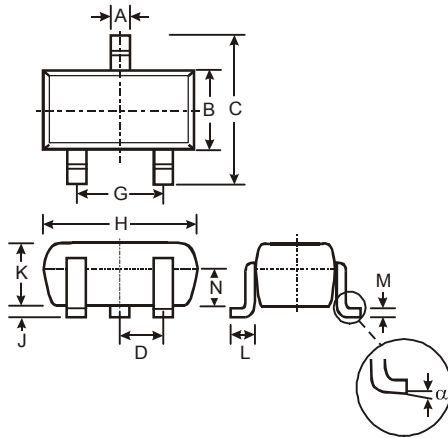


Figure 12 SOA, Safe Operation Area



**Package Outline Dimensions**

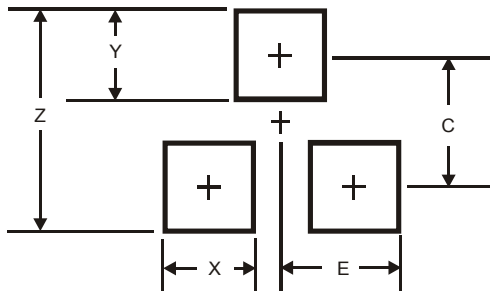
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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