

## Product Summary

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

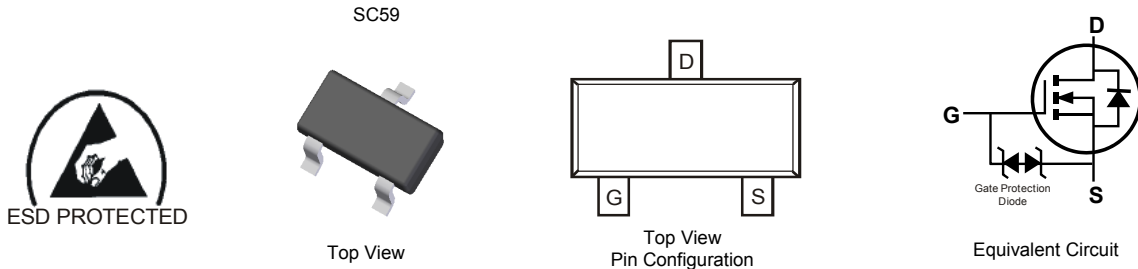
- Load Switch
- DC-DC Converters
- Power Management Functions

## 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)

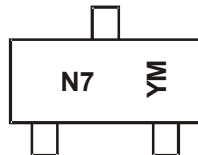


## Ordering Information (Note 4)

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

- Notes:
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<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 T <sub>A</sub> = +70°C	I <sub>D</sub>	9.3 7.4	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	11 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, 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, 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.

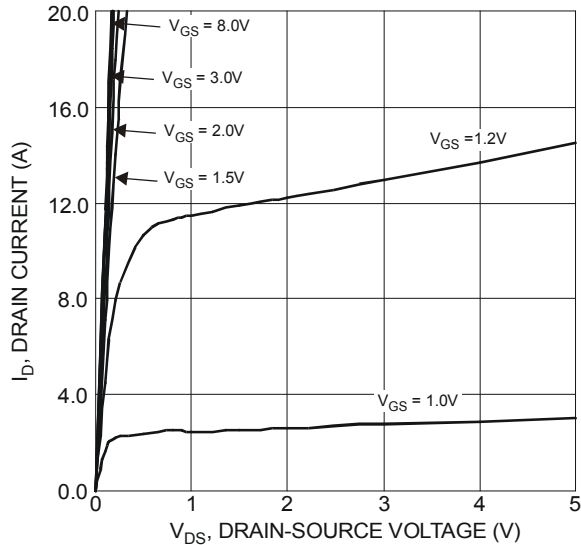


Figure 1 Typical Output Characteristics

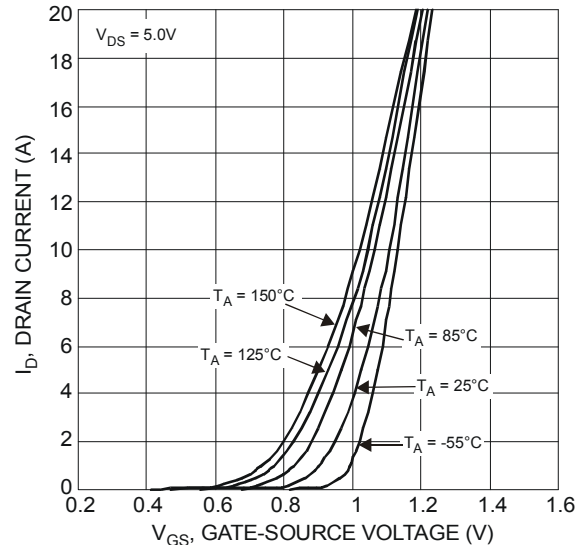


Figure 2 Typical Transfer Characteristics

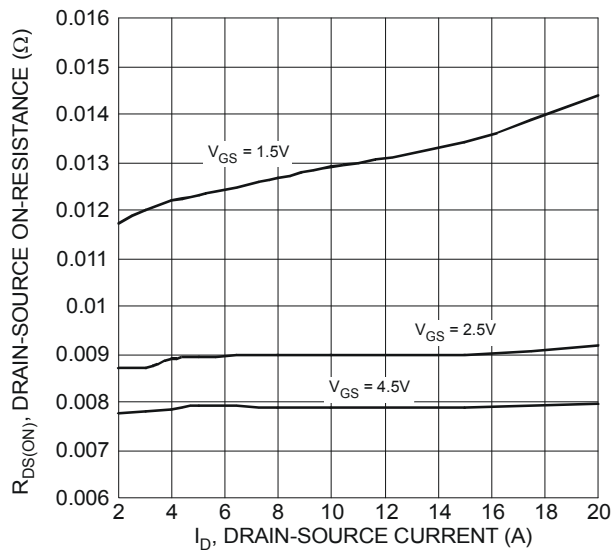


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

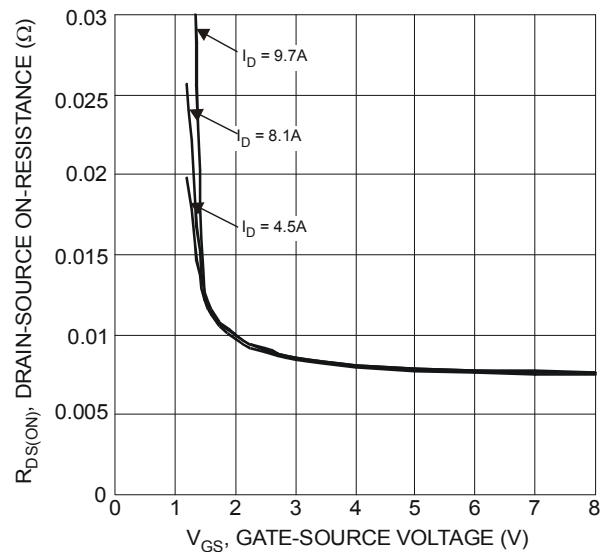


Figure 4 Typical Transfer Characteristics

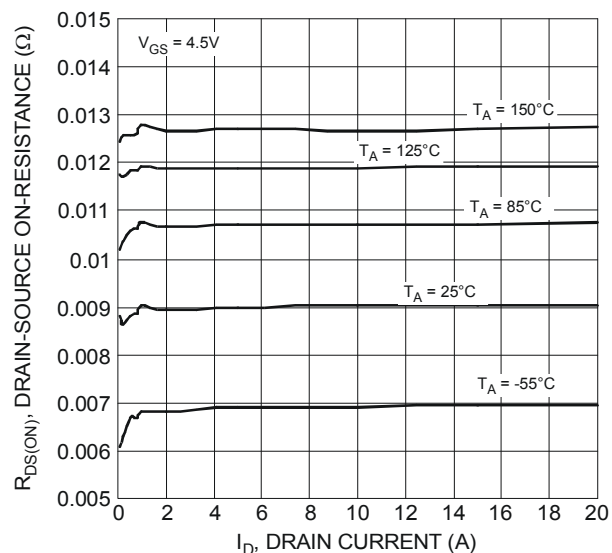


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

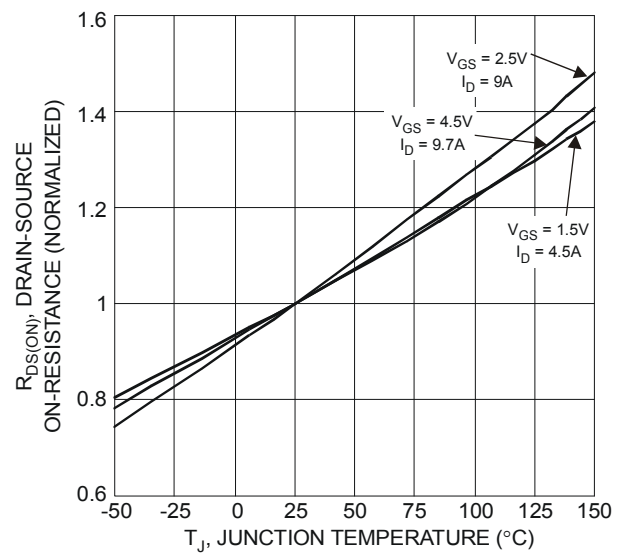


Figure 6 On-Resistance Variation with Temperature

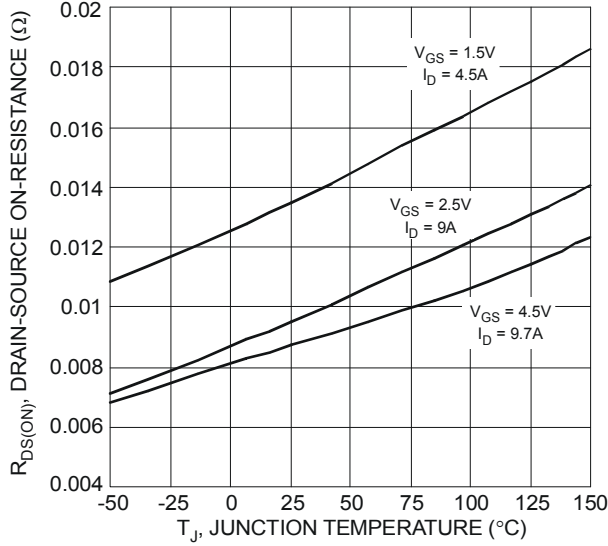


Figure 7 On-Resistance Variation with Temperature

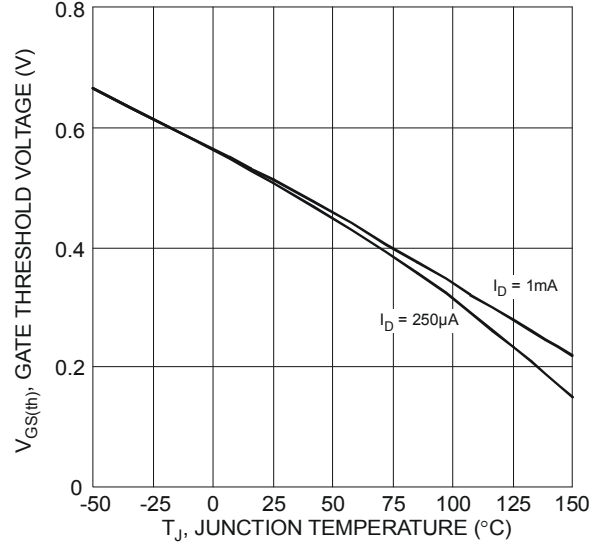


Figure 8 Gate Threshold Variation vs. Ambient Temperature

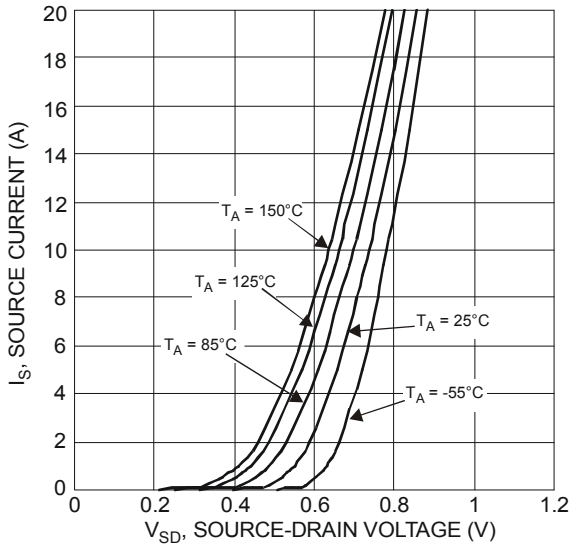


Figure 9 Diode Forward Voltage vs. Current

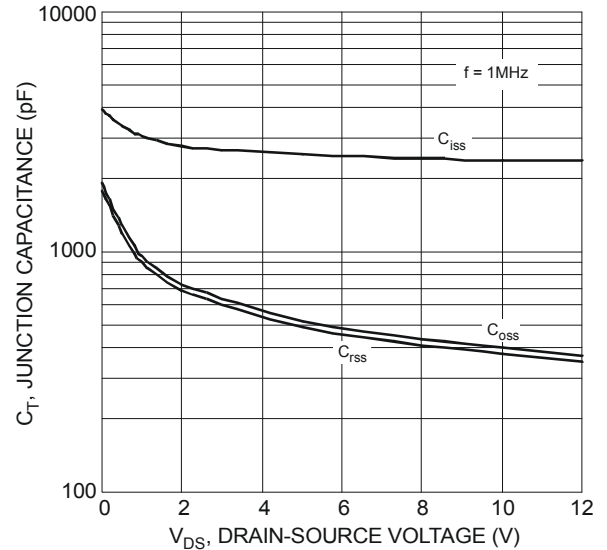


Figure 10 Typical Junction Capacitance

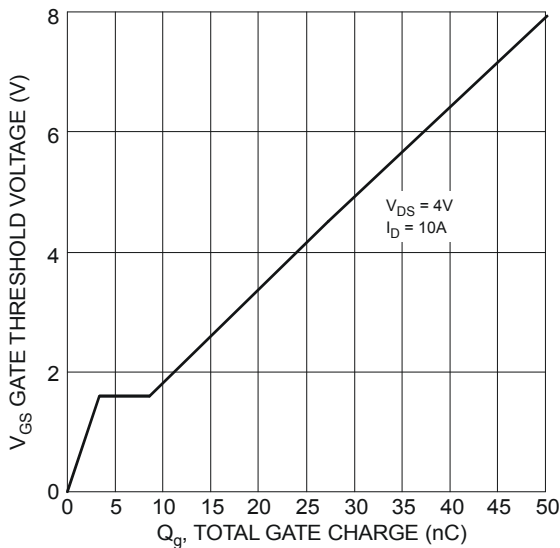


Figure 11 Gate Charge

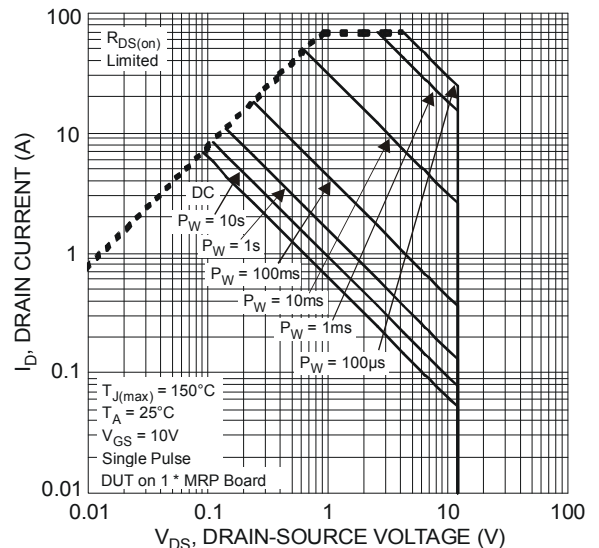
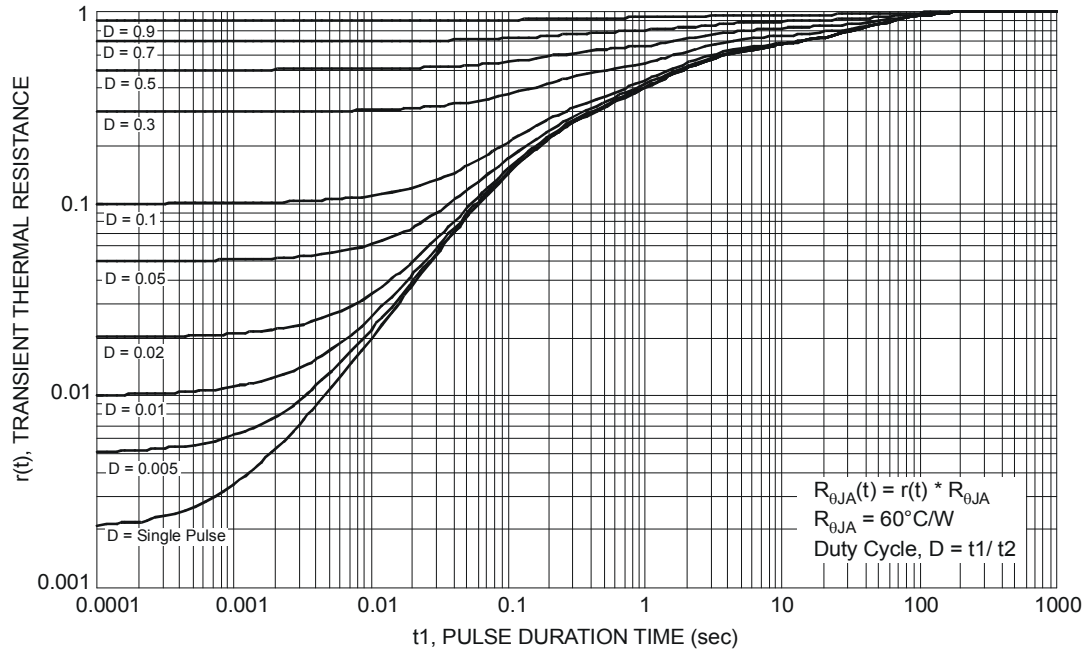
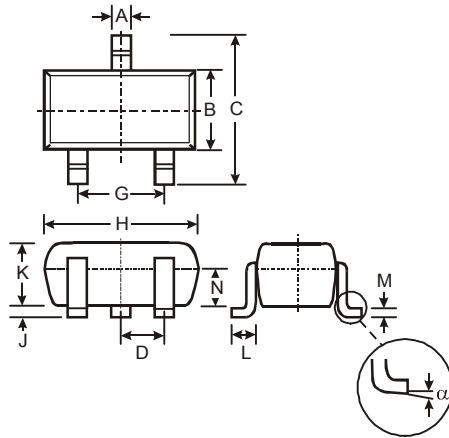


Figure 12 SOA, Safe Operation Area



## Package Outline Dimensions

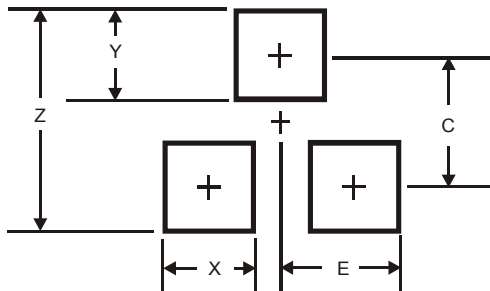
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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