

Product Summary

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

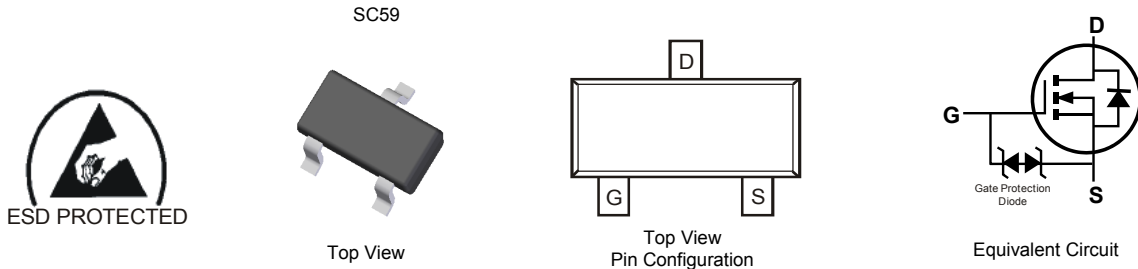
- Load Switch
- DC-DC Converters
- Power Management Functions

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)

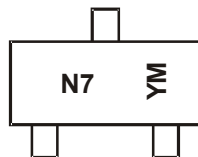


Ordering Information (Note 4)

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 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}	± 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 μs 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
OFF CHARACTERISTICS (Note 7)						
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	μA	$V_{DS} = 12\text{V}, V_{GS} = 0\text{V}$
Gate-Body Leakage	I_{GSS}	—	—	± 2	μA	$V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
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 Ω	$V_{GS} = 4.5\text{V}, I_D = 9.7\text{A}$
		—	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	$V_{GS} = 0\text{V}, I_S = 10\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
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	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
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.

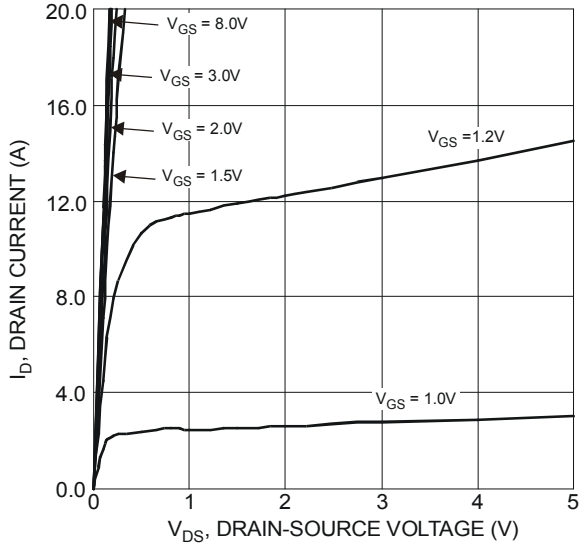


Figure 1 Typical Output Characteristics

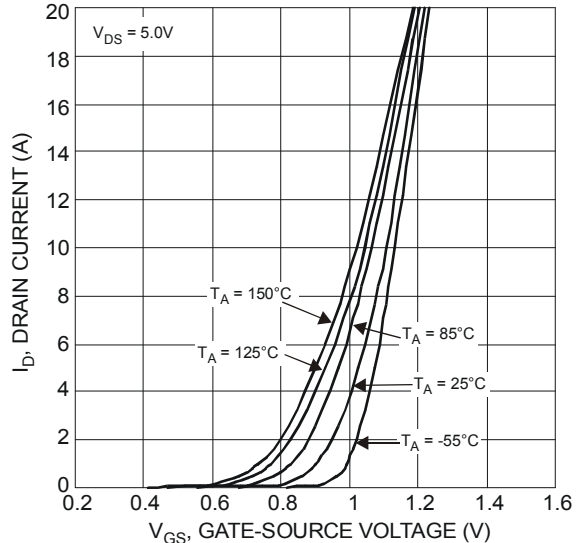


Figure 2 Typical Transfer Characteristics

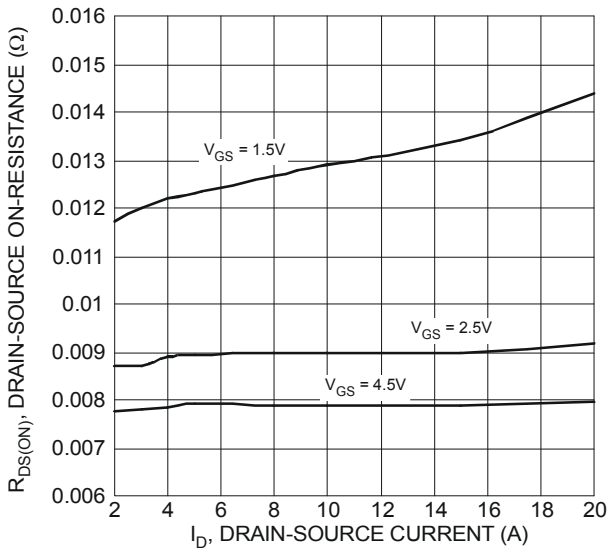


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

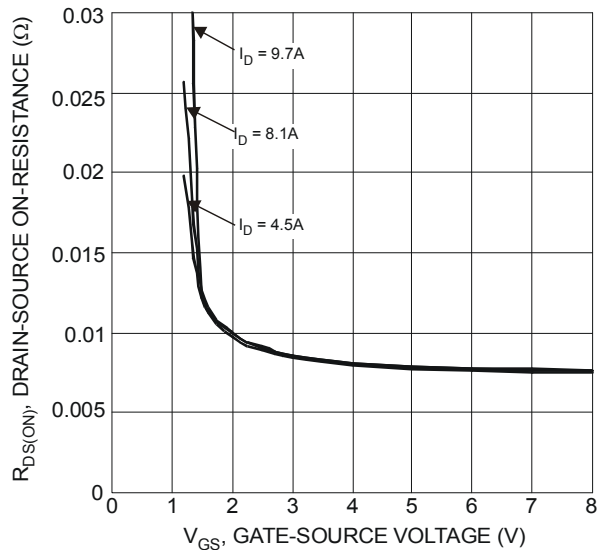


Figure 4 Typical Transfer Characteristics

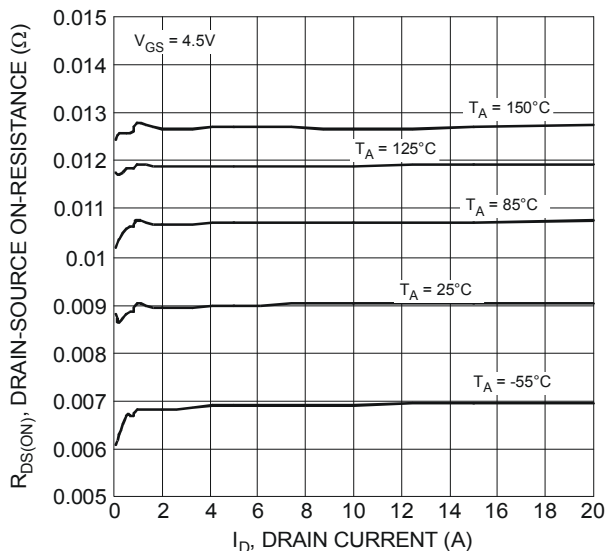


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

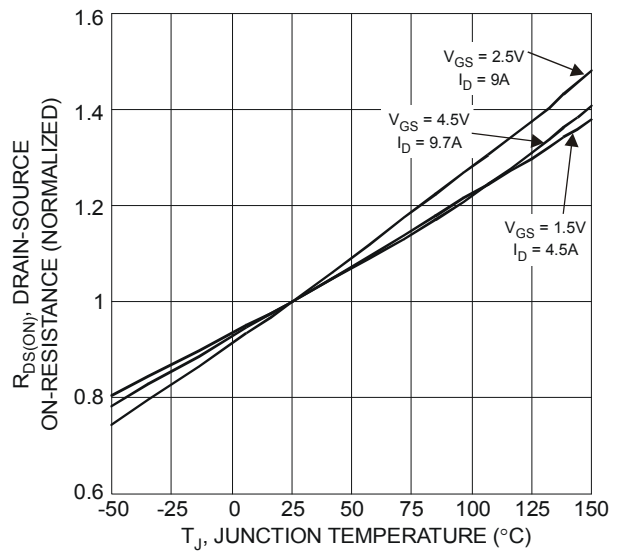


Figure 6 On-Resistance Variation with Temperature

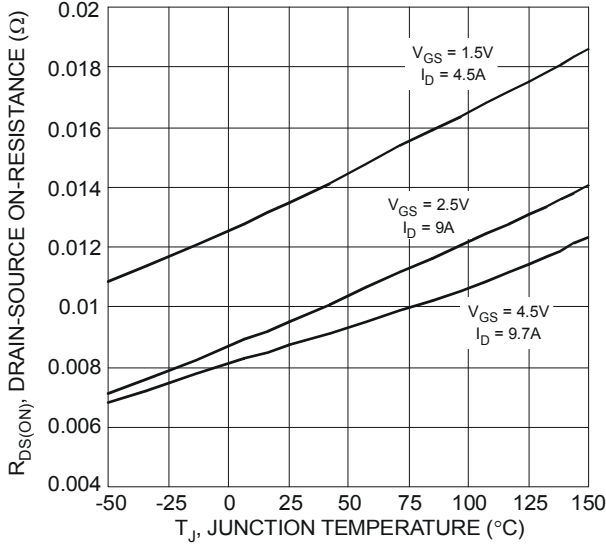


Figure 7 On-Resistance Variation with Temperature

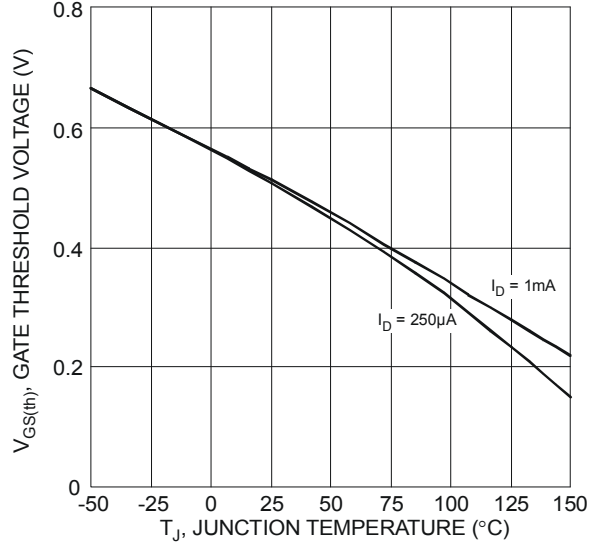


Figure 8 Gate Threshold Variation vs. Ambient Temperature

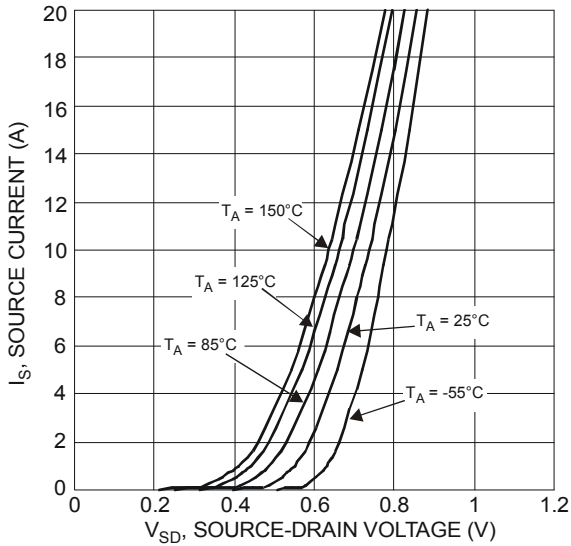


Figure 9 Diode Forward Voltage vs. Current

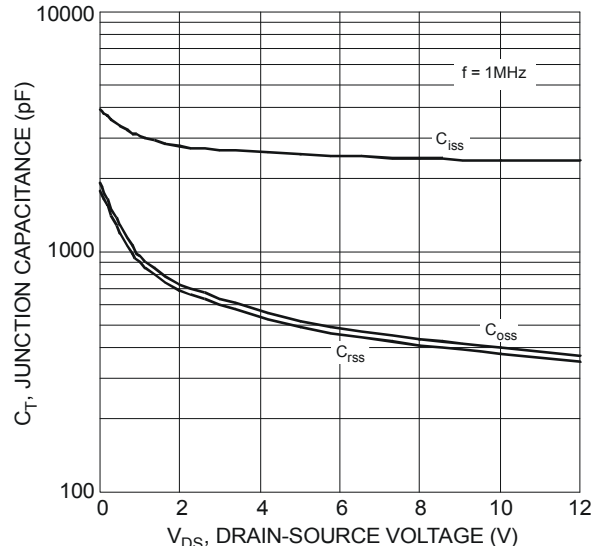


Figure 10 Typical Junction Capacitance

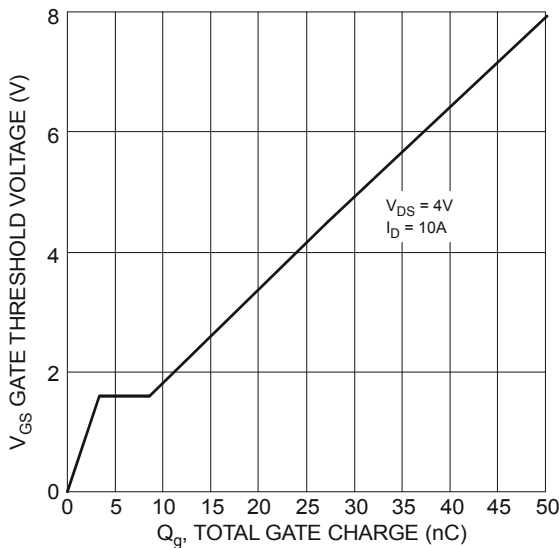


Figure 11 Gate Charge

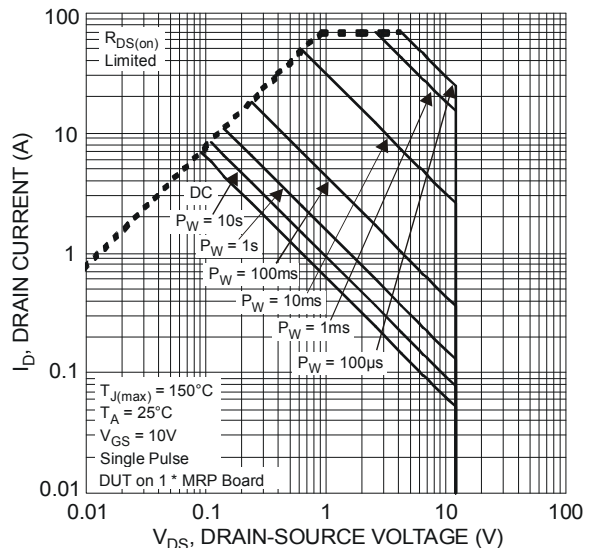


Figure 12 SOA, Safe Operation Area

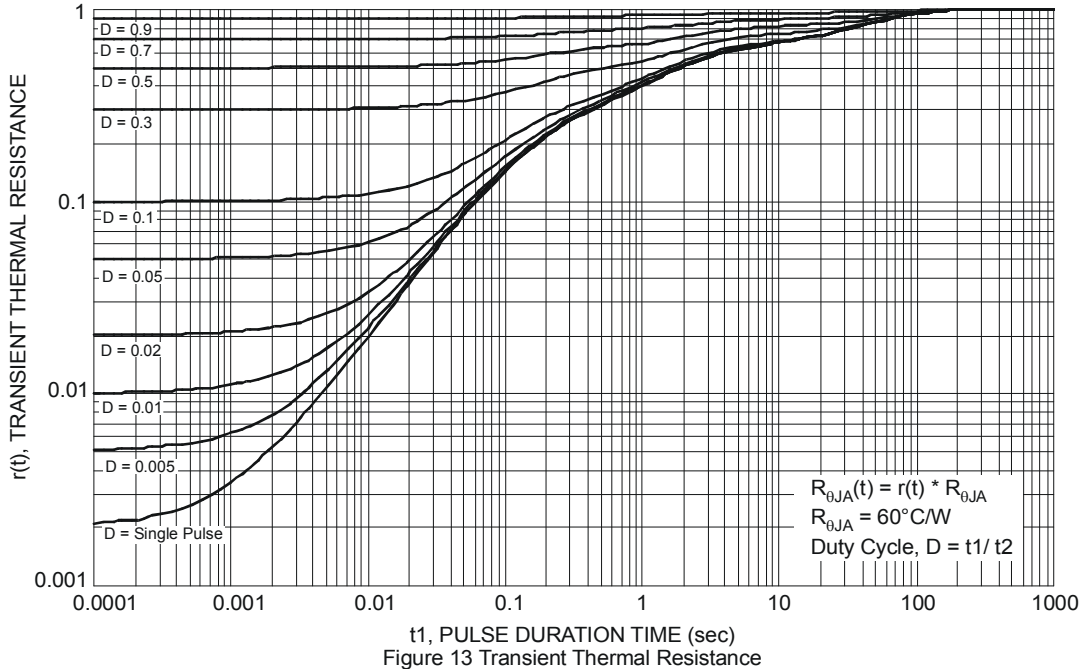
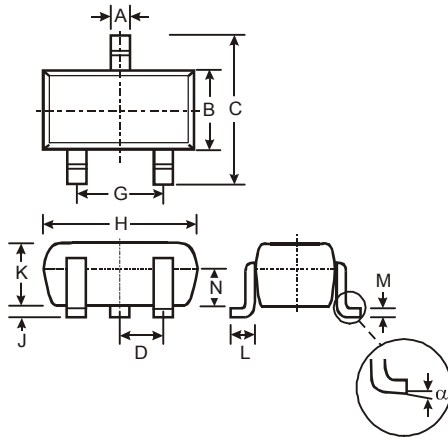


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

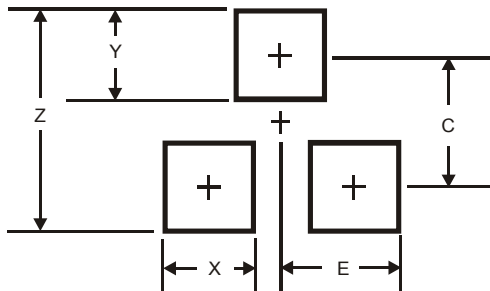
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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