12V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ MAX	I_D T_A = +25°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 and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- 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)**
- **The DMN1019USNQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

Mechanical Data

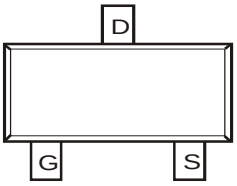
- Case: SC59
- Case Material: Molded Plastic. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.014 grams (Approximate)

SC59

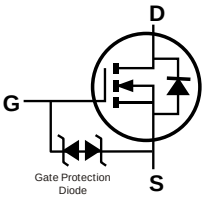




Top View



Top View
Pin Configuration



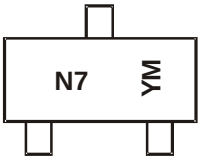
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN1019USNQ-7	SC59	3,000/Tape & Reel
DMN1019USNQ-13	SC59	10,000/Tape & Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



N7 = Product Type Marking Code
YM = Date Code Marking
Y = Year ex: I = 2021
M = Month ex: 9 = September

Date Code Key

Year	2019	…	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	G	…	I	J	K	L	M	N	O	P	R	S

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

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Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	12	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	9.3 7.4	A
	t < 10s	T_A = +25°C T_A = +70°C	I_D	11 8.8	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	70	A
Maximum Body Diode Forward Current (Note 6)			I_S	2	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.68	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	160	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	96	°C/W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	18	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics (@T_A = +25°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} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 12V, V_{GS} = 0V
Gate-Body Leakage	I_{GSS}	—	—	±2	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.35	0.53	0.8	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	7	10	mΩ	V_{GS} = 4.5V, I_D = 9.7A
		—	8	12		V_{GS} = 2.5V, I_D = 9A
		—	10	14		V_{GS} = 1.8V, I_D = 8.1A
		—	14	18		V_{GS} = 1.5V, I_D = 4.5A
		—	28	41		V_{GS} = 1.2V, I_D = 2.4A
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	V_{GS} = 0V, I_S = 10A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	2426	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	396	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	375	—	pF	
Gate Resistance	R_g	—	1.1	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 8V)	Q_g	—	50.6	—	nC	V_{DS} = 4V, I_D = 10A
Total Gate Charge (V_{GS} = 4.5V)	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} = 4V, V_{GEN} = 5V, I_D = 10A, R_G = 1Ω, R_L = 0.4Ω
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:
5. Device mounted on FR-4 PCB with minimum recommended pad layout, single sided. The power dissipation P_D is based on t < 10s $R_{\theta JA}$.
6. Device mounted on 1" × 1" FR-4 PCB with high coverage 2 oz. Copper, single sided. The power dissipation P_D is based on t < 10s $R_{\theta JA}$.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

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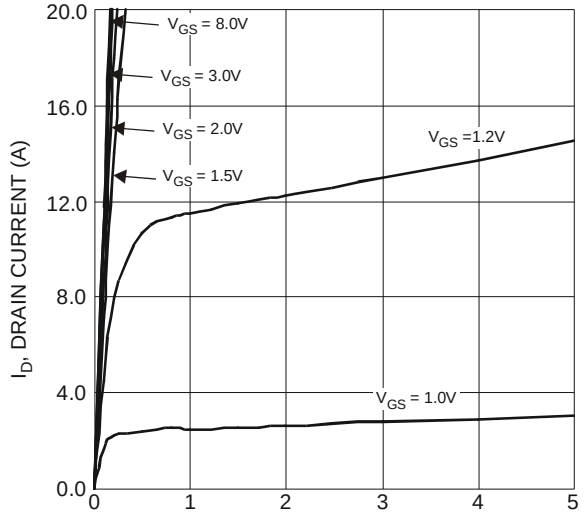

Figure 1 Typical Output Characteristics

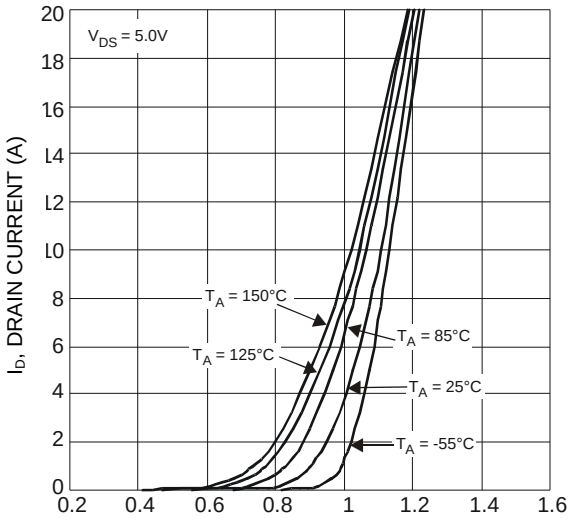

Figure 2 Typical Transfer Characteristics

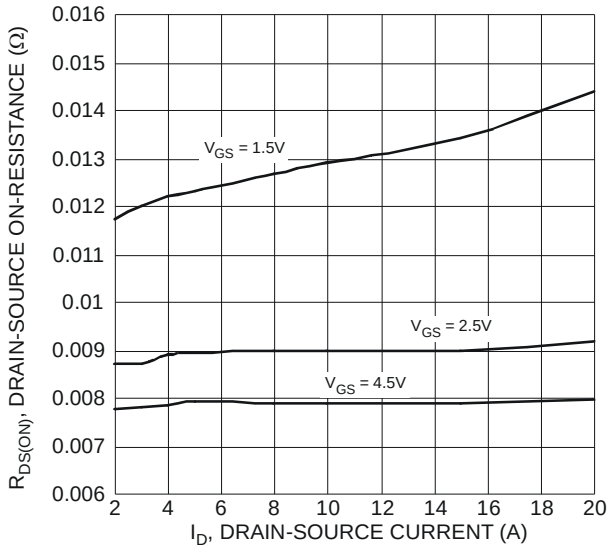

Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

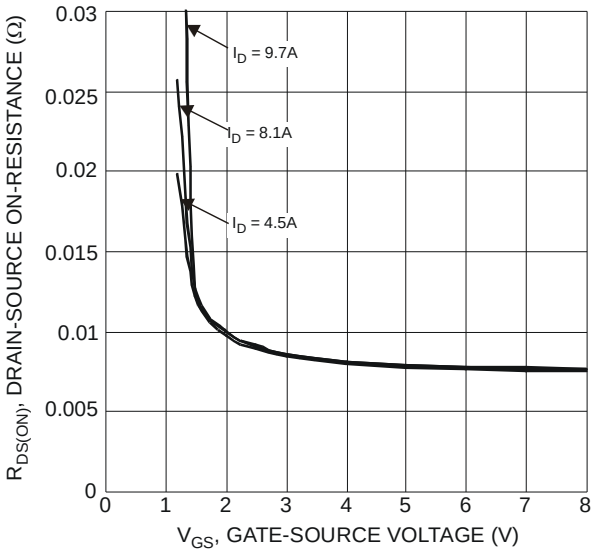

Figure 4 Typical Transfer Characteristics

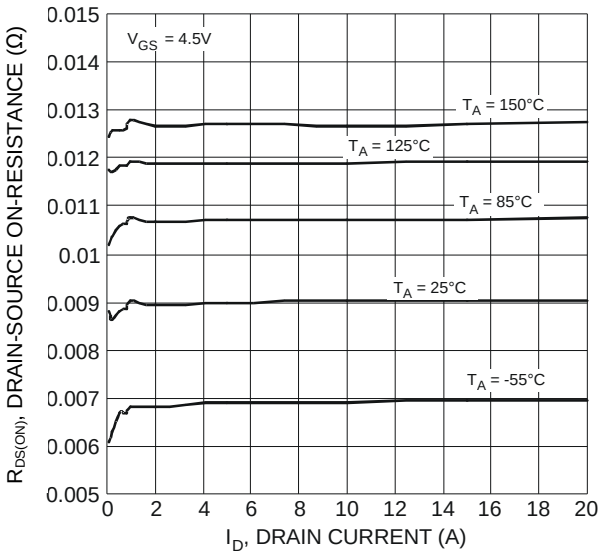

Figure 5 Typical On-Resistance vs. Drain Current and Temperature

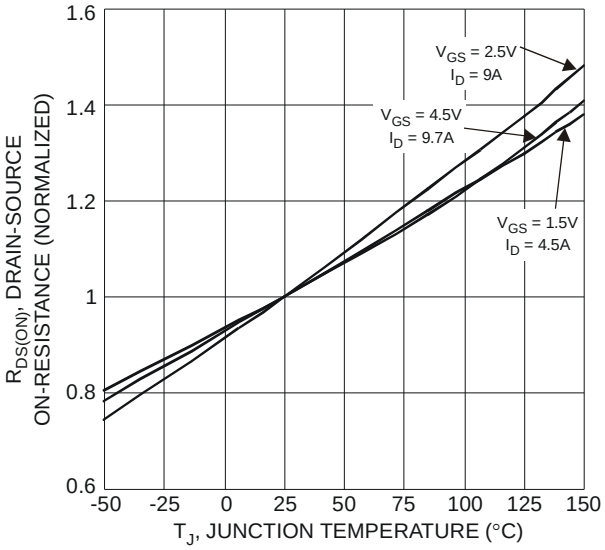

Figure 6 On-Resistance Variation with Temperature

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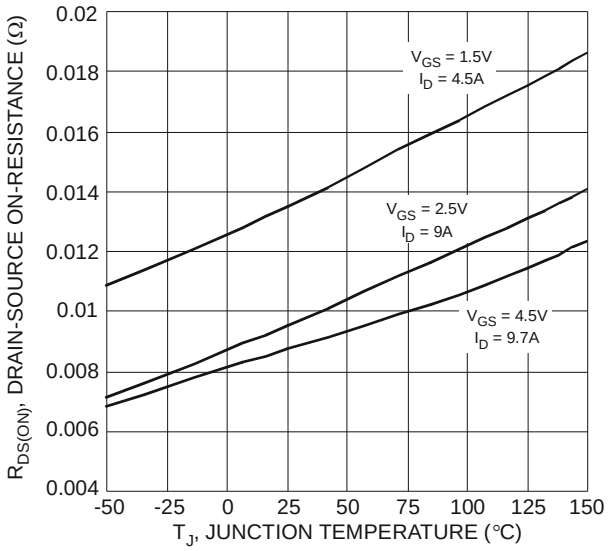

Figure 7 On-Resistance Variation with Temperature

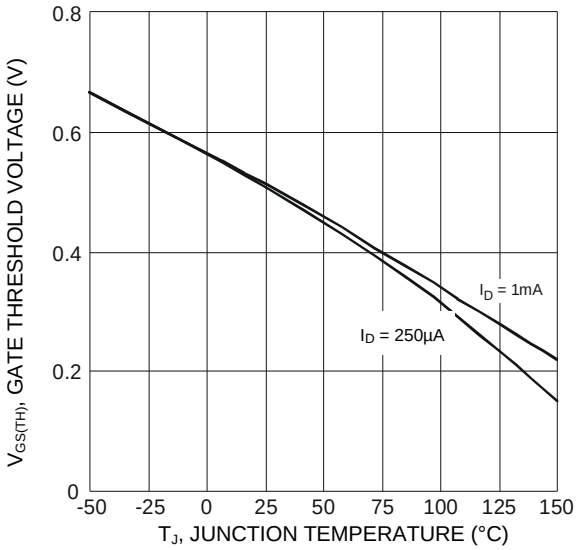

Figure 8 Gate Threshold Variation vs. Junction Temperature

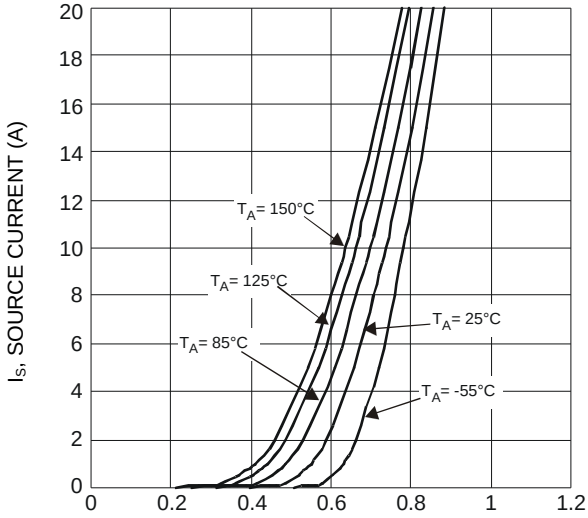

Figure 9 Diode Forward Voltage vs. Current

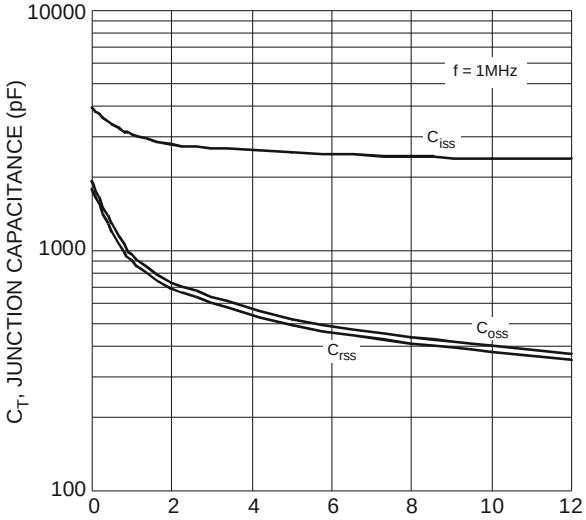

Figure 10 Typical Junction Capacitance

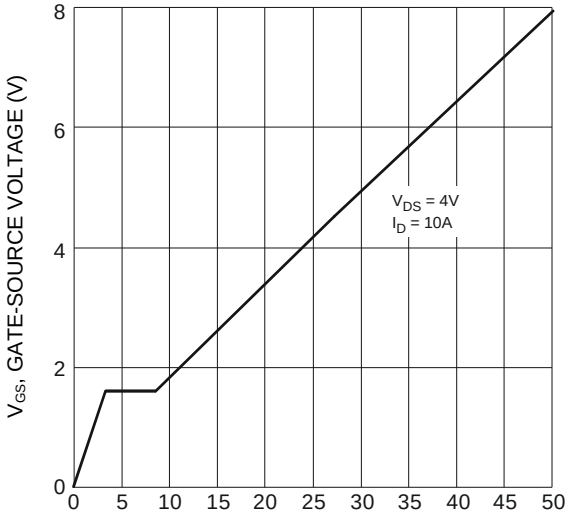

Figure 11 Gate Charge

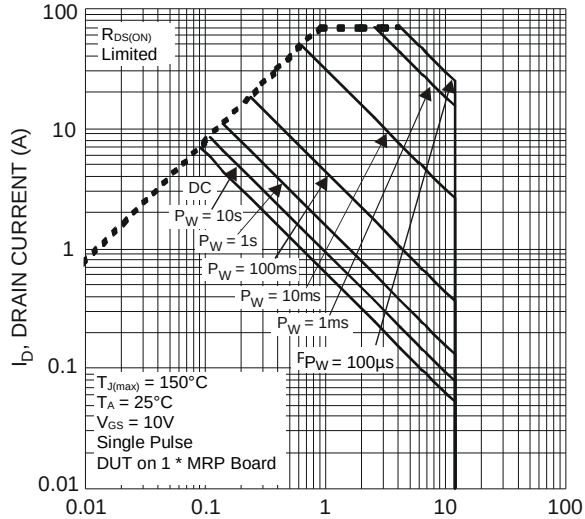

Figure 12 SOA, Safe Operation Area

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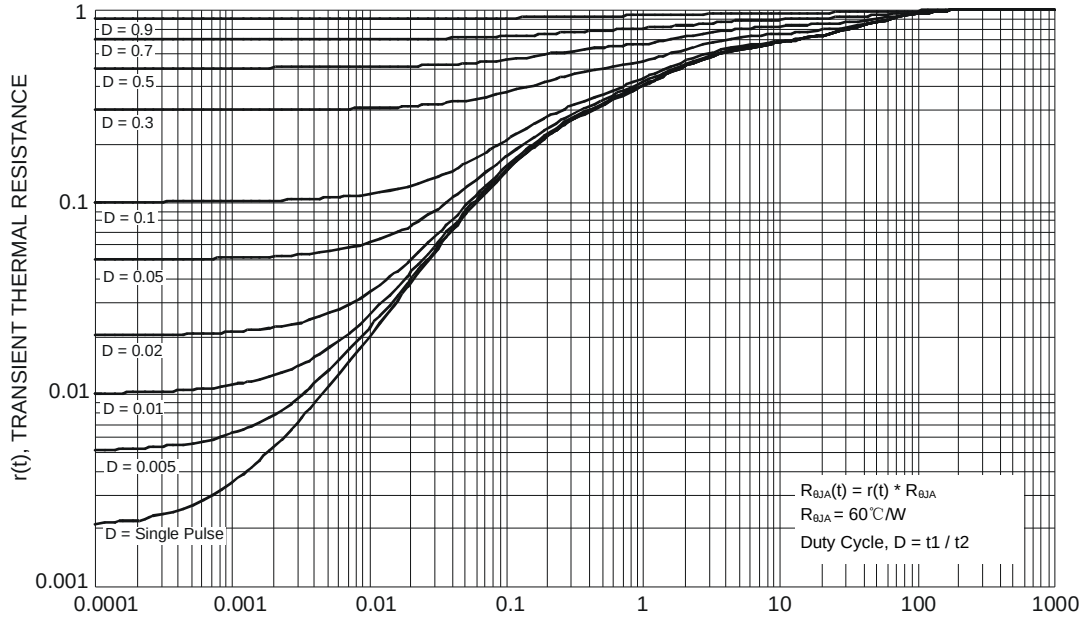

Figure 13 Transient Thermal Resistance

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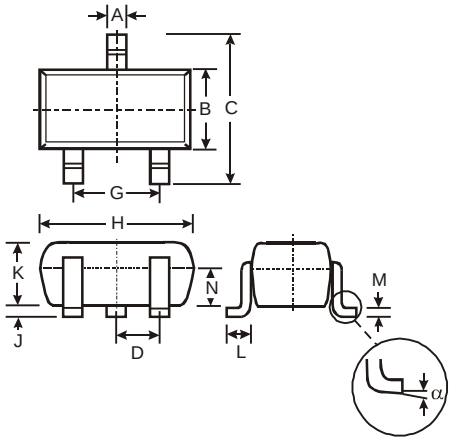
Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

SC59

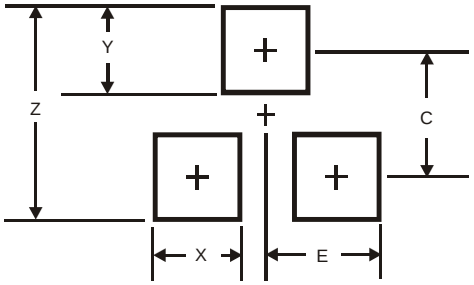


SC59			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SC59



Dimensions	Value (in mm)
Z	3.4
X	0.8
Y	1.0
C	2.4
E	1.35

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