

Product Overview

The SMBJ59 is a family of surface mount 2 watt Zener diode equivalent to JEDEC registered 1N5918 – 1N5924 with identical electrical characteristics, however lower thermal resistance features allows it to be rated at 2.0W instead of 1.5W. Available in Zener voltages of 5.1V–9.1V. The SMBJ J-bend design in the DO-214AA package allows for greater PC board mounting density. These plastic encapsulated Zeners have a moisture classification of “Level 1” with no dry pack required. They may be operated at high maximum dc currents with adequate heat sinking due to their comparatively low thermal resistance design. Microchip also offers numerous other Zener products to meet higher and lower power applications. Available with SnPb plated or RoHS compliant matte-tin plating

Figure 1. DO-214AA J-Bend Package¹



Note:

1. All SMB series are equivalent to prior SMS package identifications.

Features

- Ideal for high-density and low-profile mounting
- Zener voltage available 5.1V to 9.1V
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020F
- Standard voltage tolerances are plus/minus 10%, 5%, and 2%.
- RoHS compliant devices with e3 suffix
- Axial-lead equivalent package for thru-hole mounting is available as JEDEC registered 1N5918 - 1N5924 series. SMBJ59 series has a 30% higher power rating.

Applications/Benefits

- Regulates voltage over a broad operating current and temperature range
- Non-sensitive to ESD per MIL-STD-750 method 1020
- Withstands high surge stresses (see [Figure 4-2](#))
- Minimal changes of voltage versus current
- High specified maximum current (I_{ZM}) when adequately heat sunk
- Available in Zener voltages V_Z 5.1V–9.1V, with V_Z tolerance of $A = 5\%$

Table of Contents

Product Overview..... 1

1. Maximum Ratings.....3

 1.1. Mechanical Packaging..... 3

2. Part Nomenclature.....4

 2.1. Symbols and Definitions..... 4

3. Electrical Characteristics.....5

4. Graphs..... 6

5. Package Dimensions.....8

 5.1. Pad Layout..... 8

6. Revision History..... 9

Microchip Information..... 10

 Trademarks.....10

 Legal Notice.....10

 Microchip Devices Code Protection Feature.....10

1. Maximum Ratings

Table 1-1. Maximum Ratings at 25 °C Unless Otherwise Noted

Parameters/Test Conditions	Symbol	Value	Unit
Junction and storage temperature	T_J and T_{STG}	-65 to +150	°C
Thermal resistance, junction-to-lead	$R_{\theta JL}$	35	°C/W
Thermal resistance, junction-to-ambient ¹	$R_{\theta JA}$	100	°C/W
Off-State power dissipation at $T_L \leq 80$ °C ²	P_D	2.0	W
Solder temperature at 10 seconds	T_{SP}	260	°C

Notes:

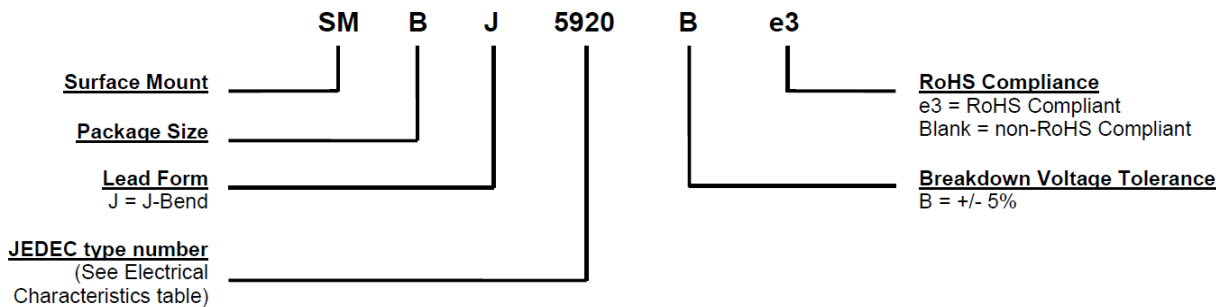
1. When mounted on FR4 PC board (1 oz Cu) with recommended footprint
2. 2 watts $T_L \leq 80$ °C or 1.25 watts at $T_A = 25$ °C when mounted on FR4 PC board with recommended footprint (also see [Figure 4-1](#))

1.1 Mechanical Packaging

- Case: Void-free transfer molded thermosetting epoxy body meeting UL94V-0.
- Terminals: Tin-lead or RoHS compliant annealed matte-tin plating solderable per MIL-STD-750, method 2026.
- Marking: Part number without SMBx prefix (for example, 5914B, 5914Be3, MX5946C, 5956A, and so on).
- Polarity: Cathode indicated by band. Diode to be operated with the banded end positive with respect to the opposite end for Zener regulation.
- Tape and reel option: Standard per EIA-481-1-A with 12 mm tape (add "TR" suffix to part number). Consult factory for quantities.
- Weight: 0.1 grams.
- See [Package Dimensions](#)

2. Part Nomenclature

Figure 2-1. Part Nomenclature



2.1 Symbols and Definitions

Table 2-1. Symbols and Definitions

Symbol	Definition
I_R	Reverse current: The maximum reverse (leakage) current that will flow at the specified voltage and temperature.
I_Z , I_{ZT} , I_{ZK}	Regulator current: The dc regulator current (I_Z), at a specified test point (I_{ZT}), near the breakdown knee (I_{ZK}).
I_{ZM}	Maximum regulator (Zener) current: The maximum rated dc current for the specified power rating.
I_{ZSM}	Maximum zener surge current: The non-repetitive peak value of Zener surge current at a specified wave form.
N_D	Noise density: The noise generated over a specified frequency bandwidth usually specified in terms of mV/√Hz
V_R	Reverse voltage: The reverse voltage dc value, no alternating component.
V_Z	Zener voltage: The Zener voltage the device will exhibit at a specified current (I_Z) in its breakdown region.
Z_{ZT} or Z_{ZK}	Dynamic impedance: The small signal impedance of the diode when biased to operate in its breakdown region at a specified rms current modulation (typically 10% of I_{ZT} or I_{ZK}) and superimposed on I_{ZT} or I_{ZK} respectively.

3. Electrical Characteristics

Table 3-1. Electrical Characteristics at 30 °C Unless Otherwise Stated¹⁻⁴

Part Number	Regulator Voltage (V _Z at I _{ZT})			Test Current (I _{ZT})	Max Dynamic Impedance Z _{ZT} at I _{ZT}	Max Dynamic Knee Impedance Z _{ZK} at I _{ZK}	Test Current (I _{ZK})	Maximum Reverse Leakage Current		Max Regulator Current (I _{ZM})
	V							I _R at V _R	V _R	
	Min.	Nom.	Max.					mA	Ω	
SMBJ5918B	4.85	5.1	5.36	73.5	4.0	400	1.0	5.0	2.0	392
SMBJ5919B	5.32	5.6	5.88	66.9	2.0	300	1.0	5.0	3.0	356
SMBJ5920B	5.89	6.2	6.51	60.5	2.0	200	1.0	5.0	4.0	321
SMBJ5922B	7.13	7.5	7.88	50.0	3.0	400	0.5	5.0	6.0	266
SMBJ5924B	8.65	9.1	9.56	41.2	4.0	500	0.5	5.0	7.0	218

Notes:

1. Zener voltage (V_Z) is measured at $T_L = 30\text{ °C}$ and 20 seconds after application of dc current.
2. The Zener impedance is derived from 1 kHz ac voltage resulting from an ac current modulation having an rms value equal to 10% of the dc Zener current (I_{ZT} or I_{ZK}) superimposed on I_{ZT} or I_{ZK} . See [MicroNote 202](#) for Zener impedance variation with different operating currents.
3. The maximum dc current (I_{ZM}) is based only on the maximum power of 2.0 watts at $T_L < 80\text{ °C}$. These values must be reduced by 37.5% (1.25W) when mounted on PC boards as described in [Maximum Ratings](#).
4. Forward voltage (V_F) is 1.2 volts maximum at 200 mA peak for 8.3 ms half-sine wave

4. Graphs

Figure 4-1. Power Derating Curve

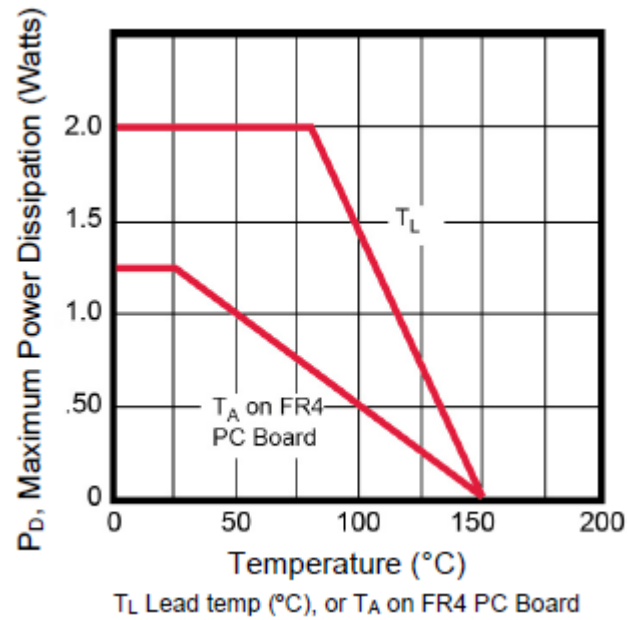


Figure 4-2. Transient Surge Capability Square-Wave Pulse Width (Non-Repetitive) in Milliseconds

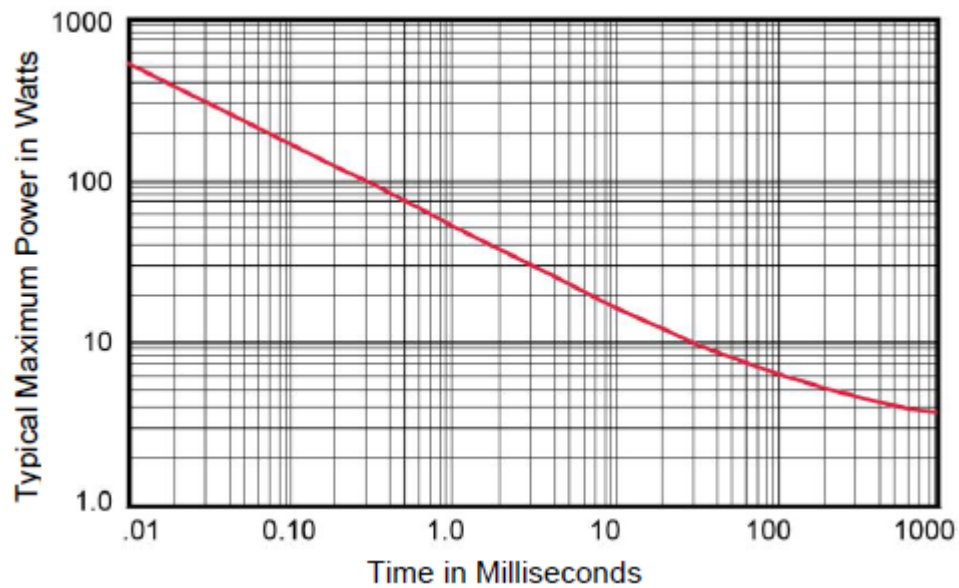
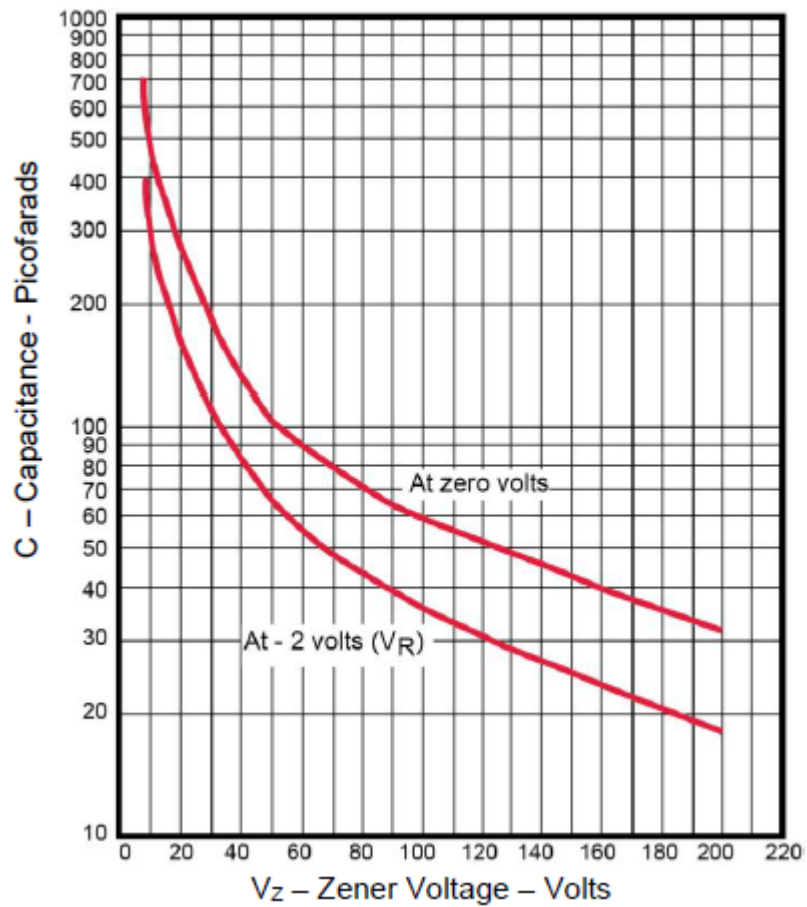


Figure 4-3. Capacitance Vs. Zener Voltage

5. Package Dimensions

Figure 5-1. Package Dimensions

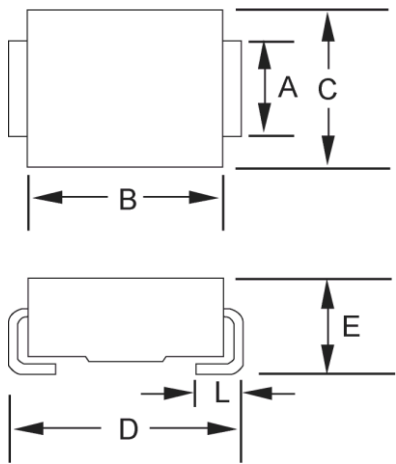


Table 5-1. SMBJ (DO-214AA)

Ltr	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A	0.077	0.083	1.96	2.10
B	0.160	0.180	4.06	4.57
C	0.130	0.155	3.30	3.94
D	0.205	0.220	5.21	5.59
E	0.077	0.104	1.95	2.65
L	0.030	0.060	0.760	1.52

5.1 Pad Layout

Figure 5-2. Pad Layout

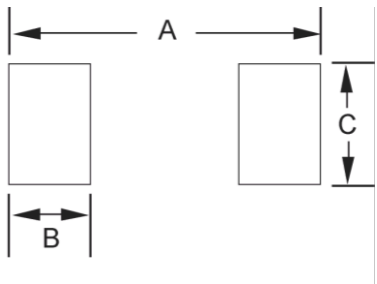


Table 5-2. SMBJ (DO-214AA)

Ltr	Inch	Millimeters
A	0.260	6.60
B	0.085	2.16
C	0.110	2.79

6. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	02/2025	Document was converted to Microchip template and assigned literature number DS00005783.
Rev. B	03/2024	Microsemi document was created and assigned literature number RF01101.

Microchip Information

Trademarks

The “Microchip” name and logo, the “M” logo, and other names, logos, and brands are registered and unregistered trademarks of Microchip Technology Incorporated or its affiliates and/or subsidiaries in the United States and/or other countries (“Microchip Trademarks”). Information regarding Microchip Trademarks can be found at <https://www.microchip.com/en-us/about/legal-information/microchip-trademarks>.

ISBN: 979-8-3371-0749-3

Legal Notice

This publication and the information herein may be used only with Microchip products, including to design, test, and integrate Microchip products with your application. Use of this information in any other manner violates these terms. Information regarding device applications is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. Contact your local Microchip sales office for additional support or, obtain additional support at www.microchip.com/en-us/support/design-help/client-support-services.

THIS INFORMATION IS PROVIDED BY MICROCHIP “AS IS”. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL, OR CONSEQUENTIAL LOSS, DAMAGE, COST, OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP’S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION.

Use of Microchip devices in life support and/or safety applications is entirely at the buyer’s risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip products are strictly prohibited and may violate the Digital Millennium Copyright Act.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is “unbreakable”. Code protection is constantly evolving. Microchip is committed to continuously improving the code protection features of our products.