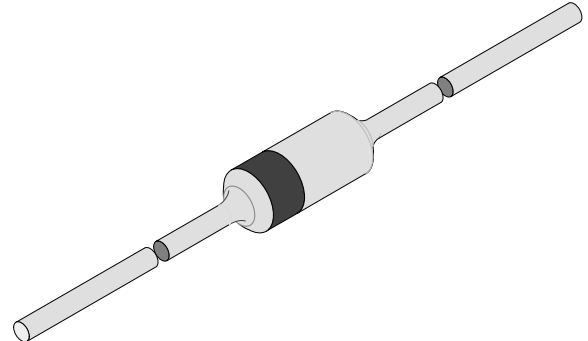


# Silicon Epitaxial Planar Z-Diodes

## Features

- Zener voltage specified at 50  $\mu\text{A}$
- Maximum delta  $V_Z$  given from 10  $\mu\text{A}$  to 100  $\mu\text{A}$
- Very high stability
- Low noise



94 9367

## Applications

Voltage stabilization

## Order Instruction

| Type   | Ordering Code | Remarks       |
|--------|---------------|---------------|
| 1N4678 | 1N4678-TAP    | Ammopack      |
|        | 1N4678-TR     | Tape and Reel |

## Absolute Maximum Ratings

 $T_j = 25^\circ\text{C}$ 

| Parameter                 | Test Conditions                       | Type | Symbol           | Value      | Unit             |
|---------------------------|---------------------------------------|------|------------------|------------|------------------|
| Power dissipation         | $l=4\text{ mm}, T_L=25^\circ\text{C}$ |      | $P_V$            | 500        | mW               |
| Z-current                 |                                       |      | $I_Z$            | $P_V/V_Z$  | mA               |
| Junction temperature      |                                       |      | $T_j$            | 175        | $^\circ\text{C}$ |
| Storage temperature range |                                       |      | $T_{\text{stg}}$ | -65...+175 | $^\circ\text{C}$ |

## Maximum Thermal Resistance

 $T_j = 25^\circ\text{C}$ 

| Parameter        | Test Conditions                      | Symbol            | Value | Unit |
|------------------|--------------------------------------|-------------------|-------|------|
| Junction ambient | $l=4\text{ mm}, T_L=\text{constant}$ | $R_{\text{thJA}}$ | 300   | K/W  |

## Electrical Characteristics

 $T_j = 25^\circ\text{C}$ 

| Parameter       | Test Conditions    | Type | Symbol | Min | Typ | Max | Unit |
|-----------------|--------------------|------|--------|-----|-----|-----|------|
| Forward voltage | $I_F=100\text{mA}$ |      | $V_F$  |     |     | 1.5 | V    |

# 1N4678...1N4717



Vishay Semiconductors

| Type <sup>1)</sup> | Zener Voltage $V_Z$ @ $I_Z = 50\mu A$ |       |       | Max. Reverse Current<br>$I_R$ <sup>3)</sup> | Test Voltage<br>$V_R$ <sup>3)</sup> | Max. Zener Current<br>$I_{ZM}$ <sup>2)</sup> | Max. Voltage Change<br>$\Delta V_Z$ <sup>4)</sup> |
|--------------------|---------------------------------------|-------|-------|---|-------------------------------------|--|---|
|                    | Typ. <sup>1)</sup>                    | Min.  | Max.  |   |                                     |  |   |
|                    | V                                     | V     | V     | $\mu A$                                     | V                                   | mA   | V   |
| 1N4678             | 1.8                                   | 1.710 | 1.890 | 7.5   | 1.0                                 | 120  | 0.70  |
| 1N4679             | 2.0                                   | 1.900 | 2.100 | 5.0   | 1.0                                 | 110  | 0.70  |
| 1N4680             | 2.2                                   | 2.090 | 2.310 | 4.0   | 1.0                                 | 100  | 0.75  |
| 1N4681             | 2.4                                   | 2.280 | 2.520 | 2.0   | 1.0                                 | 95   | 0.80  |
| 1N4682             | 2.7                                   | 2.565 | 2.835 | 1.0   | 1.0                                 | 90   | 0.85  |
| 1N4683             | 3.0                                   | 2.850 | 3.150 | 0.8   | 1.0                                 | 85   | 0.90  |
| 1N4684             | 3.3                                   | 3.135 | 3.465 | 7.5   | 1.5                                 | 80   | 0.95  |
| 1N4685             | 3.6                                   | 3.420 | 3.780 | 7.5   | 2.0                                 | 75   | 0.95  |
| 1N4686             | 3.9                                   | 3.705 | 4.095 | 5.0   | 2.0                                 | 70   | 0.97  |
| 1N4687             | 4.3                                   | 4.085 | 4.515 | 4.0   | 2.0                                 | 65   | 0.99  |
| 1N4688             | 4.7                                   | 4.465 | 4.935 | 10  | 3.0                                 | 60   | 0.99  |
| 1N4689             | 5.1                                   | 4.845 | 5.355 | 10  | 3.0                                 | 55   | 0.97  |
| 1N4690             | 5.6                                   | 5.320 | 5.880 | 10  | 4.0                                 | 50   | 0.96  |
| 1N4691             | 6.2                                   | 5.890 | 6.510 | 10  | 5.0                                 | 45   | 0.95  |
| 1N4692             | 6.8                                   | 6.460 | 7.140 | 10  | 5.1                                 | 35   | 0.90  |
| 1N4693             | 7.5                                   | 7.125 | 7.875 | 10  | 5.7                                 | 31.8   | 0.75  |
| 1N4694             | 8.2                                   | 7.790 | 8.610 | 1.0   | 6.2                                 | 29.0   | 0.50  |
| 1N4695             | 8.7                                   | 8.265 | 9.135 | 1.0   | 6.6                                 | 27.4   | 0.10  |
| 1N4696             | 9.1                                   | 8.645 | 9.555 | 1.0   | 6.9                                 | 26.2   | 0.08  |
| 1N4697             | 10                                    | 9.500 | 10.50 | 1.0   | 7.6                                 | 24.8   | 0.10  |
| 1N4698             | 11                                    | 10.45 | 11.55 | 0,05  | 8.4                                 | 21.6   | 0.11  |
| 1N4699             | 12                                    | 11.40 | 12.60 | 0.05  | 9.1                                 | 20.4   | 0.12  |
| 1N4700             | 13                                    | 12.35 | 13.65 | 0.05  | 9.8                                 | 19.0   | 0.13  |
| 1N4701             | 14                                    | 13.30 | 14.70 | 0.05  | 10.6                                | 17.5   | 0.14  |
| 1N4702             | 15                                    | 14.25 | 15.75 | 0.05  | 11.4                                | 16.3   | 0.15  |
| 1N4703             | 16                                    | 15.20 | 16.80 | 0.05  | 12.1                                | 15.4   | 0.16  |
| 1N4704             | 17                                    | 16.15 | 17.85 | 0.05  | 12.9                                | 14.5   | 0.17  |
| 1N4705             | 18                                    | 17.10 | 18.90 | 0.05  | 13.6                                | 13.2   | 0.18  |
| 1N4706             | 19                                    | 18.05 | 19.95 | 0.05  | 14.4                                | 12.5   | 0.19  |
| 1N4707             | 20                                    | 19.00 | 21.00 | 0.01  | 15.2                                | 11.9   | 0.20  |
| 1N4708             | 22                                    | 20.90 | 23.10 | 0.01  | 16.7                                | 10.8   | 0.22  |
| 1N4709             | 24                                    | 22.80 | 25.20 | 0.01  | 18.2                                | 9.9  | 0.24  |
| 1N4710             | 25                                    | 23.75 | 26.25 | 0.01  | 19.0                                | 9.5  | 0.25  |
| 1N4711             | 27                                    | 25.65 | 28.35 | 0.01  | 20.4                                | 8.8  | 0.27  |
| 1N4712             | 28                                    | 26.60 | 29.40 | 0.01  | 21.2                                | 8.5  | 0.28  |
| 1N4713             | 30                                    | 28.50 | 31.50 | 0.01  | 22.8                                | 7.9  | 0.30  |
| 1N4714             | 33                                    | 31.35 | 34.65 | 0.01  | 25.0                                | 7.2  | 0.33  |
| 1N4715             | 36                                    | 34.20 | 37.80 | 0.01  | 27.3                                | 6.6  | 0.36  |
| 1N4716             | 39                                    | 37.05 | 40.95 | 0.01  | 29.6                                | 6.1  | 0.39  |
| 1N4717             | 43                                    | 40.85 | 45.15 | 0.01  | 32.6                                | 5.5  | 0.43  |

1.) Tolerancing and voltage designation ( $V_Z$ ).  
The type numbers shown have a standard tolerance of  $\pm 5\%$  on the nominal zener voltage.

2.) Maximum zener current ratings ( $I_{ZM}$ ). Maximum zener current ratings are based on maximum zener voltage of the individual units.

3.) Reverse leakage current ( $I_R$ ). Reverse leakage currents are guaranteed and measured at  $V_R$  as shown on the table.

4.) Maximum voltage change ( $\Delta V_Z$ ). Voltage change is equal to the difference between  $V_Z$  at  $100\mu A$  and  $V_Z$  at  $10\mu A$ .

### Characteristics ( $T_j = 25^\circ C$ unless otherwise specified)

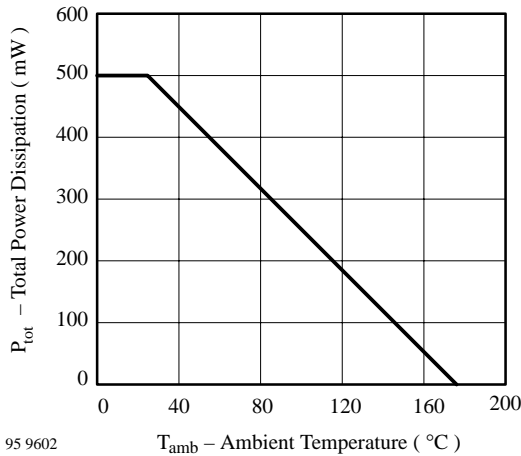


Figure 1. Total Power Dissipation vs. Ambient Temperature

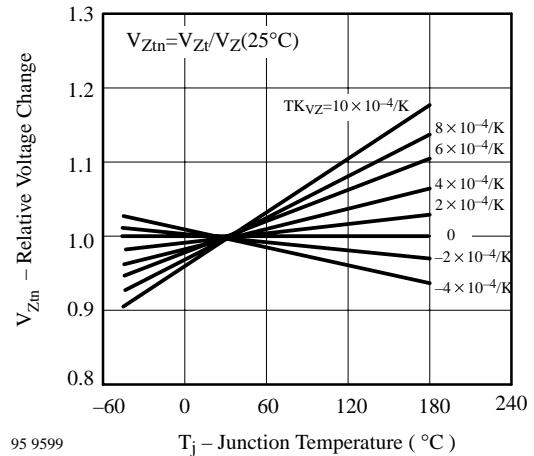


Figure 3. Typical Change of Working Voltage vs. Junction Temperature

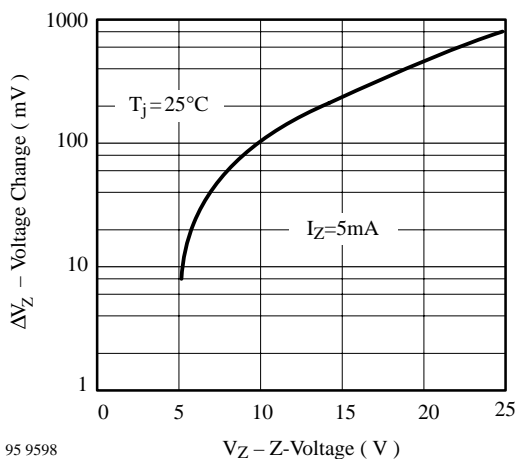


Figure 2. Typical Change of Working Voltage under Operating Conditions at  $T_{amb}=25^\circ C$

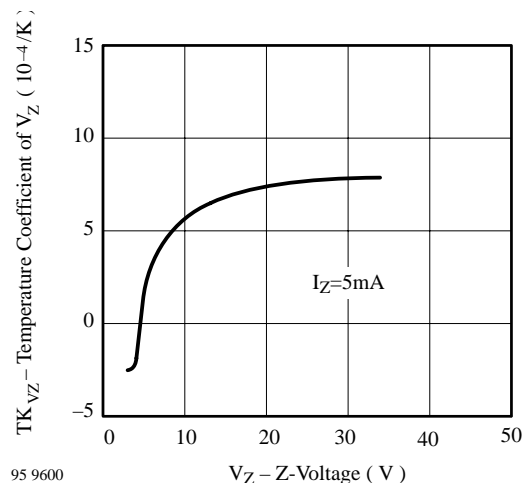


Figure 4. Temperature Coefficient of  $V_Z$  vs. Z-Voltage

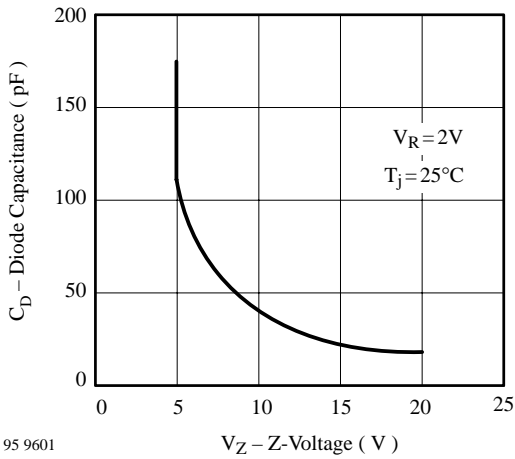


Figure 5. Diode Capacitance vs. Z-Voltage



Figure 8. Z-Current vs. Z-Voltage

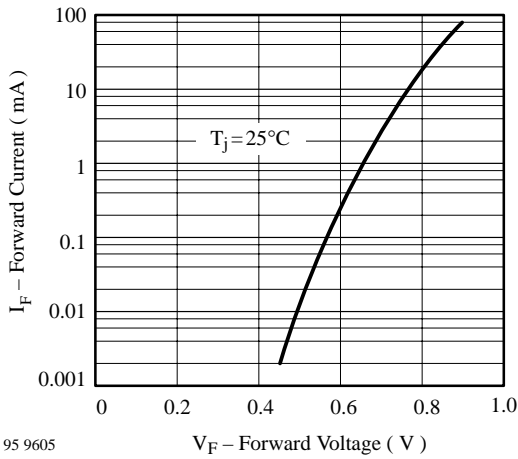


Figure 6. Forward Current vs. Forward Voltage

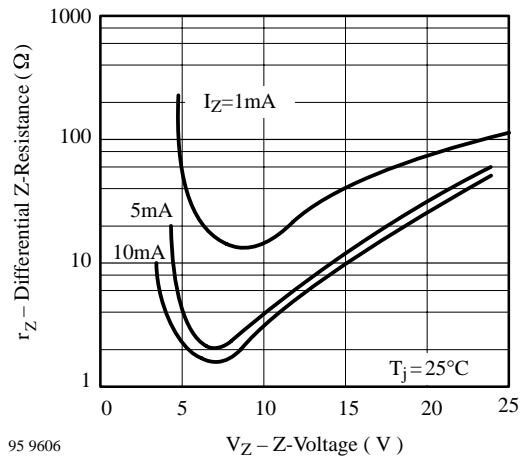


Figure 9. Differential Z-Resistance vs. Z-Voltage

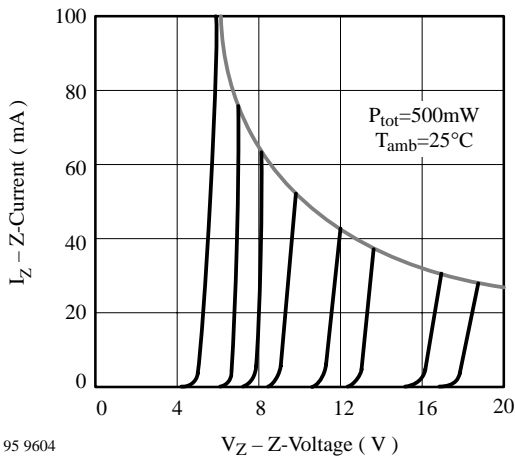


Figure 7. Z-Current vs. Z-Voltage

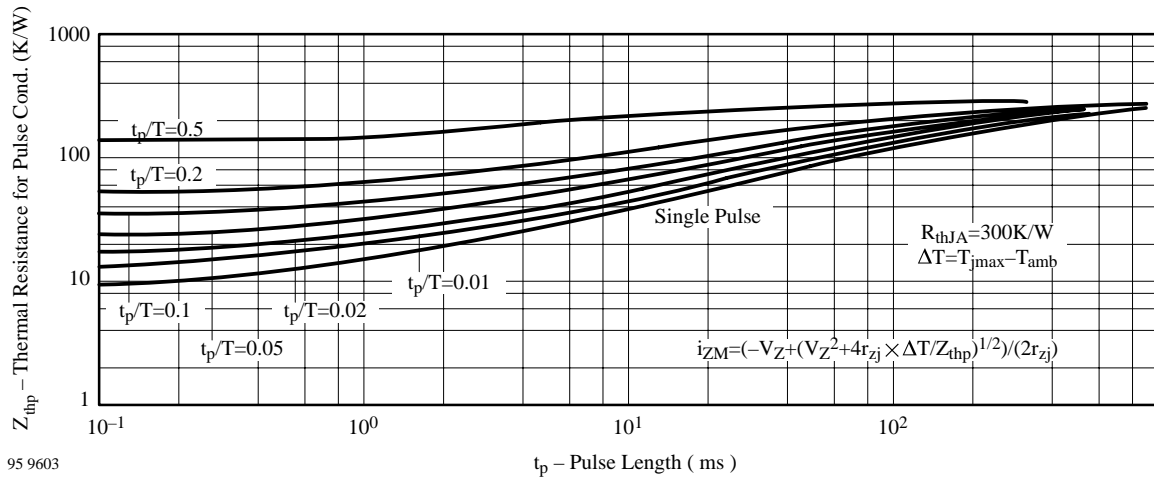


Figure 10. Thermal Response

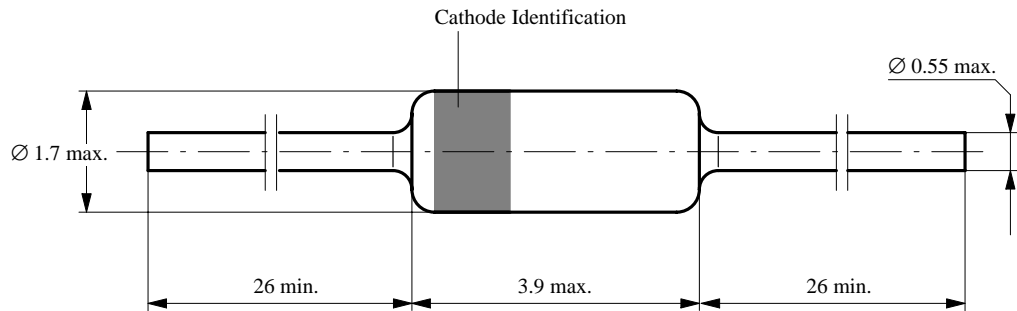
### Dimensions in mm



technical drawings  
according to DIN  
specifications

94 9366

Standard Glass Case  
54 A 2 DIN 41880  
JEDEC DO 35  
Weight max. 0.3g





### Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems  
with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

**Vishay Semiconductor GmbH** has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

**Vishay Semiconductor GmbH** can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

**We reserve the right to make changes to improve technical design and may do so without further notice.**

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay-Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay-Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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