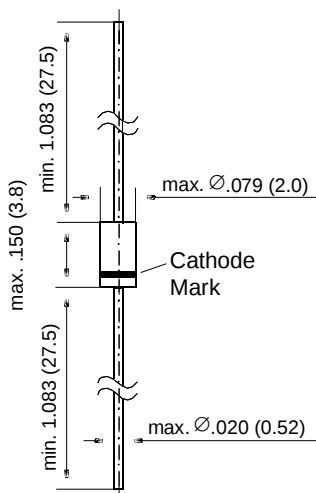


# ZPD1 THRU ZPD75

## ZENER DIODES

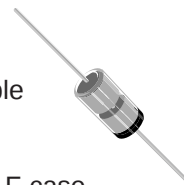
### DO-35



Dimensions are in inches and (millimeters)

### FEATURES

- ♦ Silicon Planar Zener Diodes
- ♦ The Zener voltages are graded according to the international E 12 standard. Smaller voltage tolerances and other Zener voltages are available upon request.
- ♦ These diodes are also available in the Mini-MELF case with the type designation ZMM1 ... ZMM75.



### MECHANICAL DATA

**Case:** DO-35 Glass Case

**Weight:** approx. 0.13 g

### MAXIMUM RATINGS

Ratings at 25°C ambient temperature unless otherwise specified.

|                                                     | SYMBOL    | VALUE              | UNIT |
|-----------------------------------------------------|-----------|--------------------|------|
| Zener Current (see Table "Characteristics")         |           |                    |      |
| Power Dissipation at $T_{amb} = 25^{\circ}\text{C}$ | $P_{tot}$ | 500 <sup>(1)</sup> | mW   |
| Junction Temperature                                | $T_j$     | 175                | °C   |
| Storage Temperature Range                           | $T_s$     | - 55 to +175       | °C   |

#### NOTES:

(1) Valid provided that leads at a distance of 8 mm from case are kept at ambient temperature.

|                                               | SYMBOL     | MIN. | TYP. | MAX.               | UNIT |
|-----------------------------------------------|------------|------|------|--------------------|------|
| Thermal Resistance<br>Junction to Ambient Air | $R_{thJA}$ | —    | —    | 0.3 <sup>(1)</sup> | °C/W |

#### NOTES:

(1) Valid provided that leads at a distance of 4 mm from case are kept at ambient temperature.

# ZPD1 THRU ZPD75

## ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

| Type                | Zener Voltage <sup>(1)</sup><br>at<br>I <sub>Z</sub> = 5 mA<br>V <sub>Z</sub> (V) | Dynamic Resistance                                              |                                                                 | Temp. Coeff.<br>of Zener Voltage<br>at<br>I <sub>Z</sub> = 5 mA<br>$\alpha_{VZ}$ (10 <sup>-4</sup> /K) | Reverse<br>Voltage<br>at<br>I <sub>R</sub> = 100 nA<br>V <sub>R</sub> (V) | Admissible<br>Zener current <sup>(2)</sup>           |                                                      |
|---------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|
|                     |                                                                                   | at<br>I <sub>Z</sub> = 5 mA<br>f = 1 kHz<br>r <sub>Zj</sub> (Ω) | at<br>I <sub>Z</sub> = 1 mA<br>f = 1 kHz<br>r <sub>Zj</sub> (Ω) |                                                                                                        |                                                                           | at<br>T <sub>amb</sub> = 45°C<br>I <sub>Z</sub> (mA) | at<br>T <sub>amb</sub> = 25°C<br>I <sub>Z</sub> (mA) |
| ZPD1 <sup>(3)</sup> | 0.7 ... 0.8                                                                       | 6.5 (< 8)                                                       | < 50                                                            | -26 ... -23                                                                                            | —                                                                         | 280                                                  | 340                                                  |
| ZPD2.7              | 2.5 ... 2.9                                                                       | 75 (< 83)                                                       | < 500                                                           | -9 ... -4                                                                                              | —                                                                         | 135                                                  | 160                                                  |
| ZPD3                | 2.8 ... 3.2                                                                       | 80 (< 95)                                                       | < 500                                                           | -9 ... -3                                                                                              | —                                                                         | 117                                                  | 140                                                  |
| ZPD3.3              | 3.1 ... 3.5                                                                       | 80 (< 95)                                                       | < 500                                                           | -8 ... -3                                                                                              | —                                                                         | 109                                                  | 130                                                  |
| ZPD3.6              | 3.4 ... 3.8                                                                       | 80 (< 95)                                                       | < 500                                                           | -8 ... -3                                                                                              | —                                                                         | 101                                                  | 120                                                  |
| ZPD3.9              | 3.7 ... 4.1                                                                       | 80 (< 95)                                                       | < 500                                                           | -7 ... -3                                                                                              | —                                                                         | 92                                                   | 110                                                  |
| ZPD4.3              | 4.0 ... 4.6                                                                       | 80 (< 95)                                                       | < 500                                                           | -6 ... -1                                                                                              | —                                                                         | 85                                                   | 100                                                  |
| ZPD4.7              | 4.4 ... 5.0                                                                       | 70 (< 78)                                                       | < 500                                                           | -5 ... +2                                                                                              | —                                                                         | 76                                                   | 90                                                   |
| ZPD5.1              | 4.8 ... 5.4                                                                       | 30 (< 60)                                                       | < 480                                                           | -3 ... +4                                                                                              | > 0.8                                                                     | 67                                                   | 80                                                   |
| ZPD5.6              | 5.2 ... 6.0                                                                       | 10 (< 40)                                                       | < 400                                                           | -2 ... +6                                                                                              | > 1                                                                       | 59                                                   | 70                                                   |
| ZPD6.2              | 5.8 ... 6.6                                                                       | 4.8 (< 10)                                                      | < 200                                                           | -1 ... +7                                                                                              | > 2                                                                       | 54                                                   | 64                                                   |
| ZPD6.8              | 6.4 ... 7.2                                                                       | 4.5 (< 8)                                                       | < 150                                                           | +2 ... +7                                                                                              | > 3                                                                       | 49                                                   | 58                                                   |
| ZPD7.5              | 7.0 ... 7.9                                                                       | 4 (< 7)                                                         | < 50                                                            | +3 ... +7                                                                                              | > 5                                                                       | 44                                                   | 53                                                   |
| ZPD8.2              | 7.7 ... 8.7                                                                       | 4.5 (< 7)                                                       | < 50                                                            | +4 ... +7                                                                                              | > 6                                                                       | 40                                                   | 47                                                   |
| ZPD9.1              | 8.5 ... 9.6                                                                       | 4.8 (< 10)                                                      | < 50                                                            | +5 ... +8                                                                                              | > 7                                                                       | 36                                                   | 43                                                   |
| ZPD10               | 9.4 ... 10.6                                                                      | 5.2 (< 15)                                                      | < 70                                                            | +5 ... +8                                                                                              | > 7.5                                                                     | 33                                                   | 40                                                   |
| ZPD11               | 10.4 ... 11.6                                                                     | 6 (< 20)                                                        | < 70                                                            | +5 ... +9                                                                                              | > 8.5                                                                     | 30                                                   | 36                                                   |
| ZPD12               | 11.4 ... 12.7                                                                     | 7 (< 20)                                                        | < 90                                                            | +6 ... +9                                                                                              | > 9                                                                       | 28                                                   | 32                                                   |
| ZPD13               | 12.4 ... 14.1                                                                     | 9 (< 25)                                                        | < 110                                                           | +7 ... +9                                                                                              | > 10                                                                      | 25                                                   | 29                                                   |
| ZPD15               | 13.8 ... 15.6                                                                     | 11 (< 30)                                                       | < 110                                                           | +7 ... +9                                                                                              | > 11                                                                      | 23                                                   | 27                                                   |
| ZPD16               | 15.3 ... 17.1                                                                     | 13 (< 40)                                                       | < 170                                                           | +8 ... +9.5                                                                                            | > 12                                                                      | 20                                                   | 24                                                   |
| ZPD18               | 16.8 ... 19.1                                                                     | 18 (< 50)                                                       | < 170                                                           | +8 ... +9.5                                                                                            | > 14                                                                      | 18                                                   | 21                                                   |
| ZPD20               | 18.8 ... 21.2                                                                     | 20 (< 50)                                                       | < 220                                                           | +8 ... +10                                                                                             | > 15                                                                      | 17                                                   | 20                                                   |
| ZPD22               | 20.8 ... 23.3                                                                     | 25 (< 55)                                                       | < 220                                                           | +8 ... +10                                                                                             | > 17                                                                      | 16                                                   | 18                                                   |
| ZPD24               | 22.8 ... 25.6                                                                     | 28 (< 80)                                                       | < 220                                                           | +8 ... +10                                                                                             | > 18                                                                      | 13                                                   | 16                                                   |
| ZPD27               | 25.1 ... 28.9                                                                     | 30 (< 80)                                                       | < 250                                                           | +8 ... +10                                                                                             | > 20                                                                      | 12                                                   | 14                                                   |
| ZPD30               | 28 ... 32                                                                         | 35 (< 80)                                                       | < 250                                                           | +8 ... +10                                                                                             | > 22.5                                                                    | 10                                                   | 13                                                   |
| ZPD33               | 31 ... 35                                                                         | 40 (< 80)                                                       | < 250                                                           | +8 ... +10                                                                                             | > 25                                                                      | 9                                                    | 12                                                   |
| ZPD36               | 34 ... 38                                                                         | 40 (< 90)                                                       | < 250                                                           | +8 ... +10                                                                                             | > 27                                                                      | 9                                                    | 11                                                   |
| ZPD39               | 37 ... 41                                                                         | 50 (< 90)                                                       | < 300                                                           | +10 ... +12                                                                                            | > 29                                                                      | 8                                                    | 10                                                   |
| ZPD43               | 40 ... 46                                                                         | 60 (< 100)                                                      | < 700                                                           | +10 ... +12                                                                                            | > 32                                                                      | 7                                                    | 9.2                                                  |
| ZPD47               | 44 ... 50                                                                         | 70 (< 100)                                                      | < 750                                                           | +10 ... +12                                                                                            | > 35                                                                      | 6                                                    | 8.5                                                  |
| ZPD51               | 48 ... 54                                                                         | 70 (< 100)                                                      | < 750                                                           | +10 ... +12                                                                                            | > 38                                                                      | 6                                                    | 7.8                                                  |
| ZPD56               | 52.0 ... 60.0 <sup>(4)</sup>                                                      | < 135 <sup>(4)</sup>                                            | < 1000 <sup>(5)</sup>                                           | typ. +10 <sup>(4)</sup>                                                                                | —                                                                         | —                                                    | —                                                    |
| ZPD62               | 58.0 ... 66.0 <sup>(4)</sup>                                                      | < 150 <sup>(4)</sup>                                            | < 1000 <sup>(5)</sup>                                           | typ. +10 <sup>(4)</sup>                                                                                | —                                                                         | —                                                    | —                                                    |
| ZPD68               | 64.0 ... 72.0 <sup>(4)</sup>                                                      | < 200 <sup>(4)</sup>                                            | < 1000 <sup>(5)</sup>                                           | typ. +10 <sup>(4)</sup>                                                                                | —                                                                         | —                                                    | —                                                    |
| ZPD75               | 70.0 ... 79.0 <sup>(4)</sup>                                                      | < 250 <sup>(4)</sup>                                            | < 1500 <sup>(5)</sup>                                           | typ. +10 <sup>(4)</sup>                                                                                | —                                                                         | —                                                    | —                                                    |

### NOTES:

(1) Tested with pulses t<sub>p</sub> = 5 ms

(2) Valid provided that leads at a distance of 4 mm from case are kept at ambient temperature

(3) The ZPD1 is a silicon diode operated in forward direction. Hence, the subscript of all parameters should be "F" instead of "Z".

Connect the cathode terminal to the negative pole

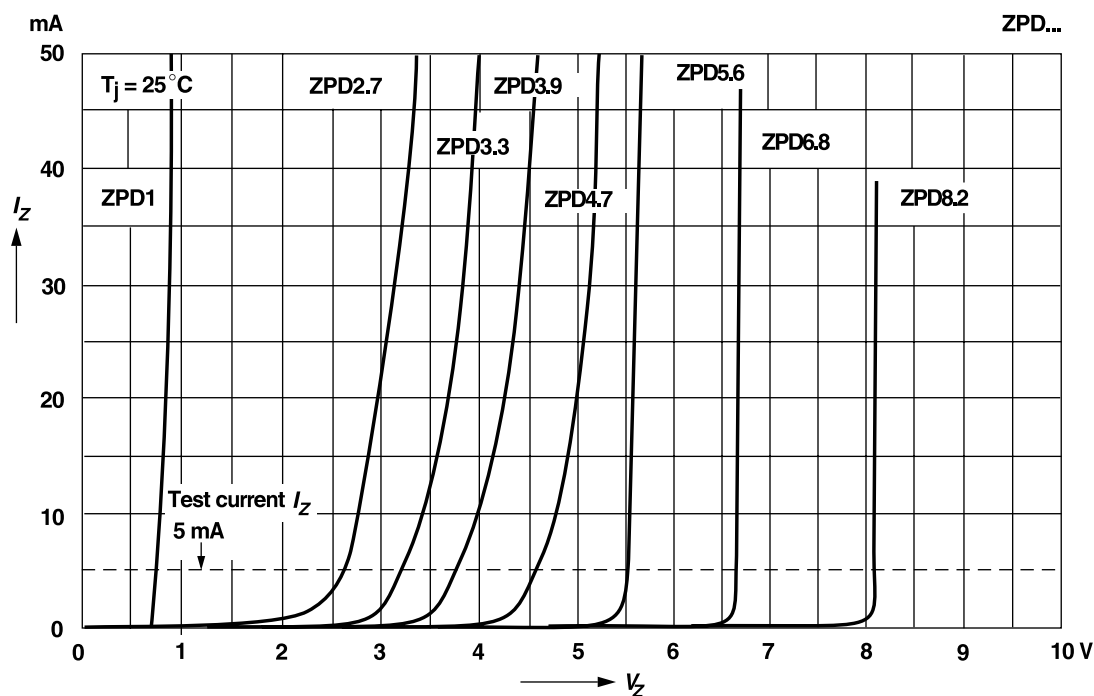
(4) at I<sub>Z</sub> = 2.5 mA

(5) at I<sub>Z</sub> = 0.5 mA

# RATINGS AND CHARACTERISTIC CURVES ZPD1 THRU ZPD75

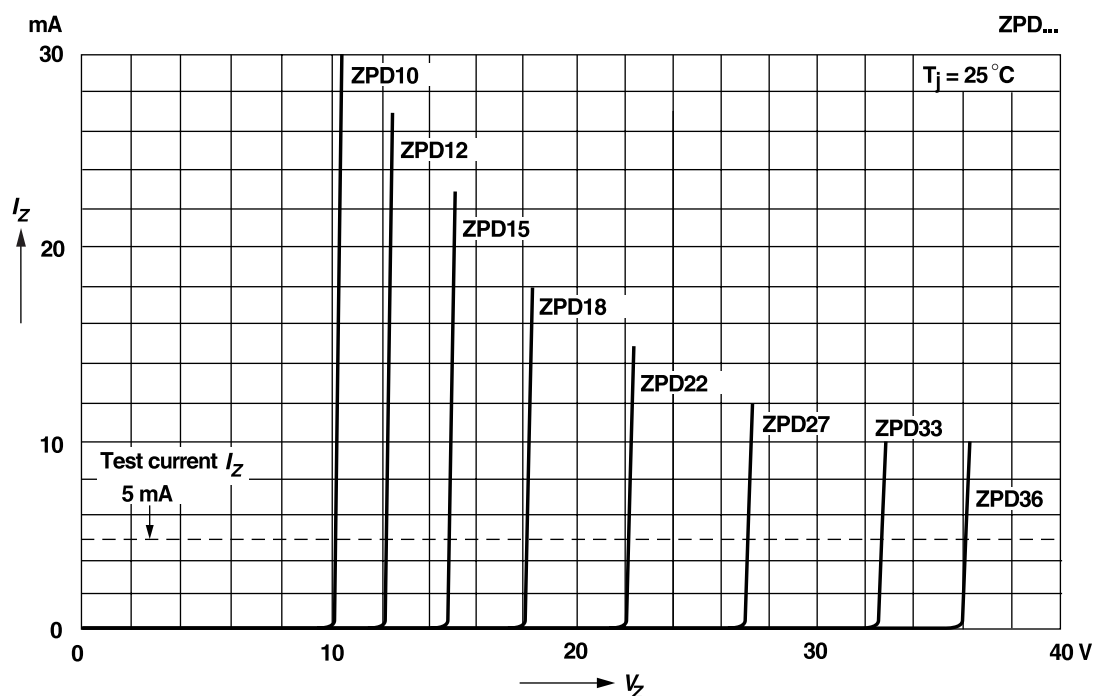
## Breakdown characteristics

$T_j = \text{constant (pulsed)}$



## Breakdown characteristics

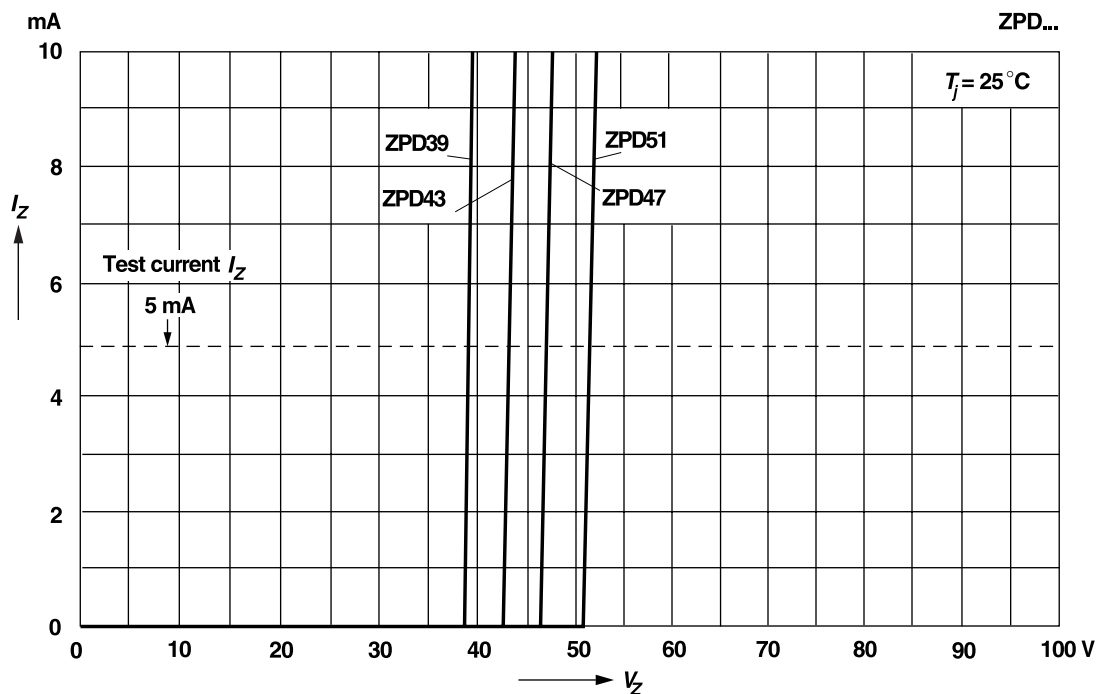
$T_j = \text{constant (pulsed)}$



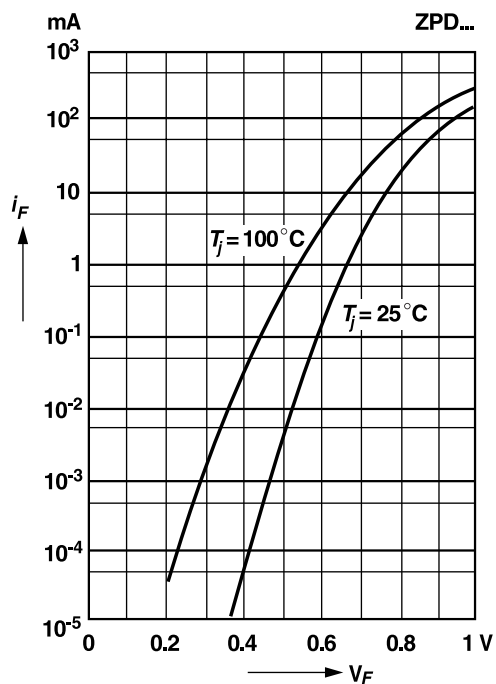
# RATINGS AND CHARACTERISTIC CURVES ZPD1 THRU ZPD75

## Breakdown characteristics

$T_j = \text{constant (pulsed)}$

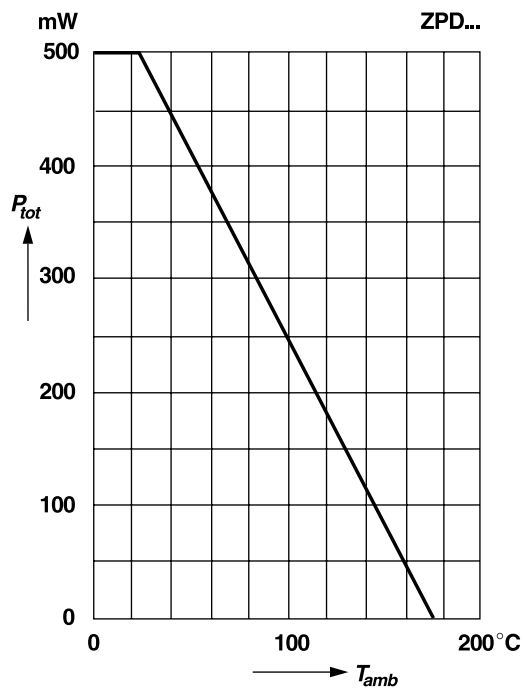


## Forward characteristics



## Admissible power dissipation versus ambient temperature

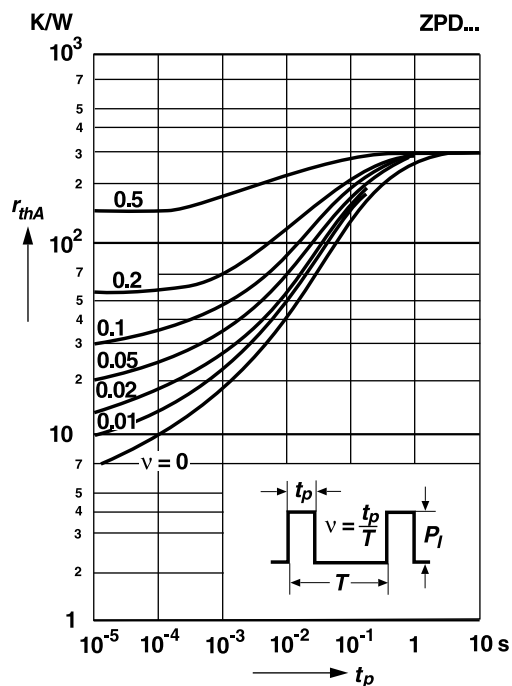
Valid provided that leads at a distance of 4 mm from case are kept at ambient temperature



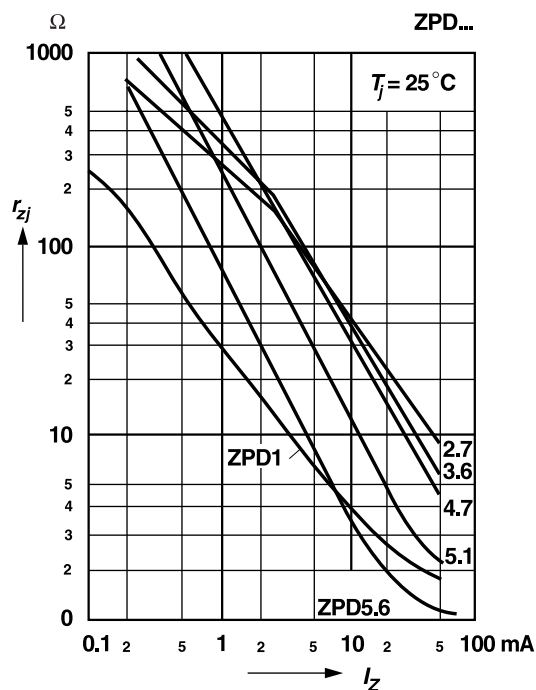
# RATINGS AND CHARACTERISTIC CURVES ZPD1 THRU ZPD75

## Pulse thermal resistance versus pulse duration

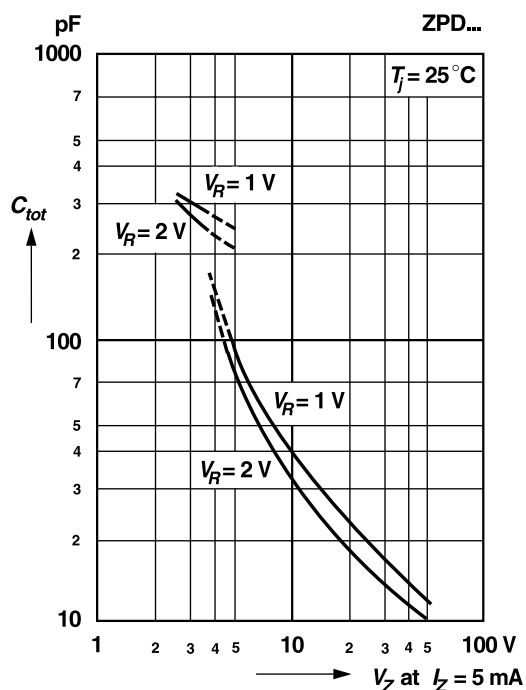
Valid provided that leads at a distance of 4 mm from case  
are kept at ambient temperature



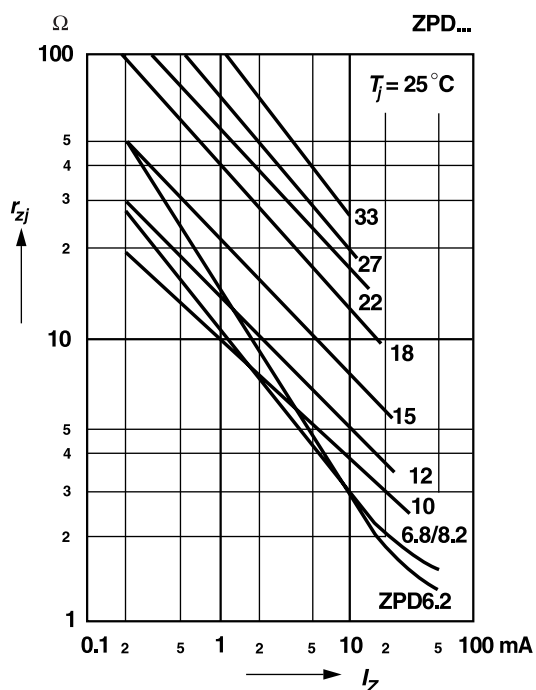
## Dynamic resistance versus Zener current



## Capacitance versus Zener voltage

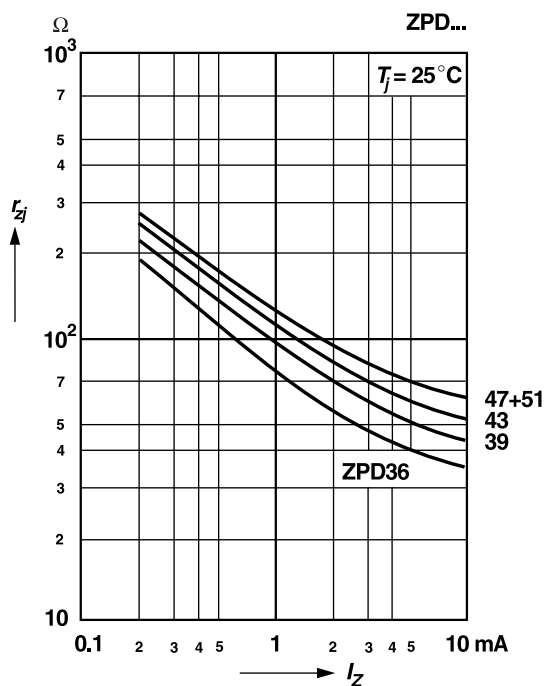


## Dynamic resistance versus Zener current



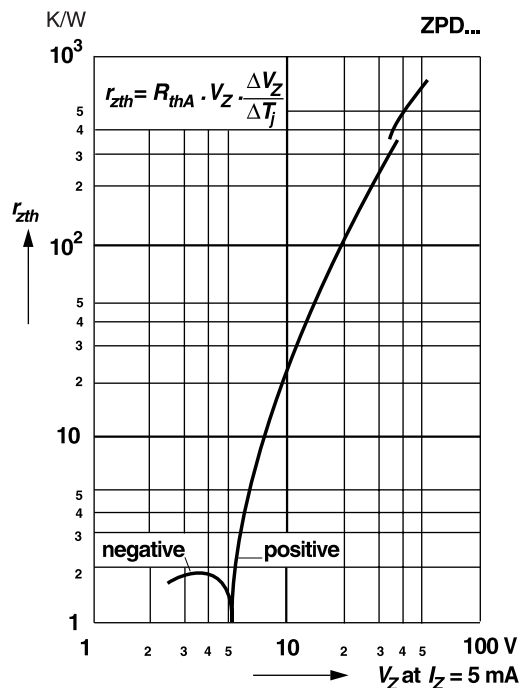
# RATINGS AND CHARACTERISTIC CURVES ZPD1 THRU ZPD75

**Dynamic resistance  
versus Zener current**

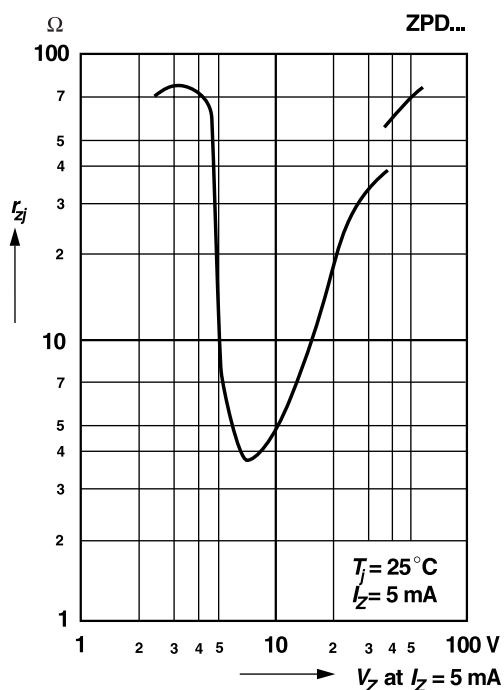


**Thermal differential resistance  
versus Zener voltage**

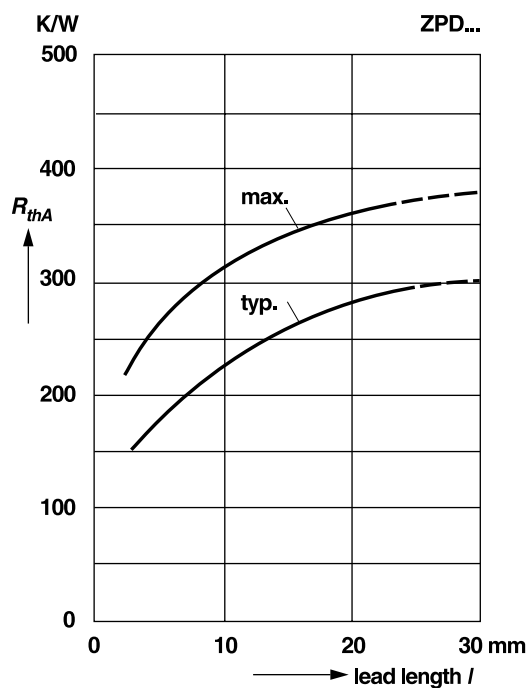
Valid provided that leads at a distance of 4 mm from case are kept at ambient temperature



**Dynamic resistance  
versus Zener voltage**

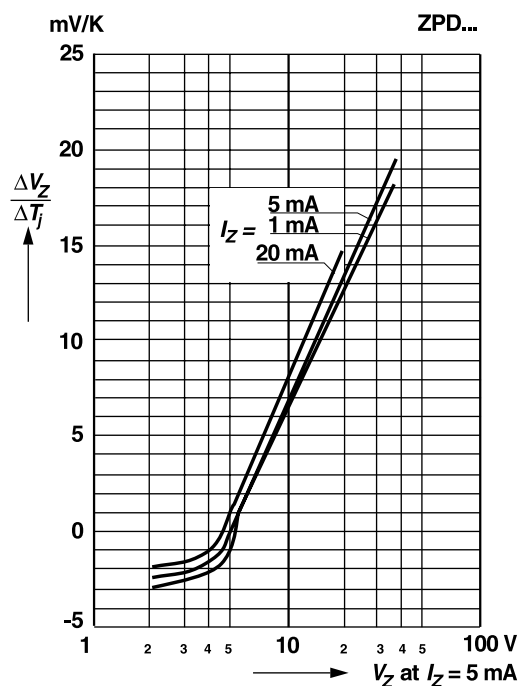


**Thermal resistance  
versus lead length**

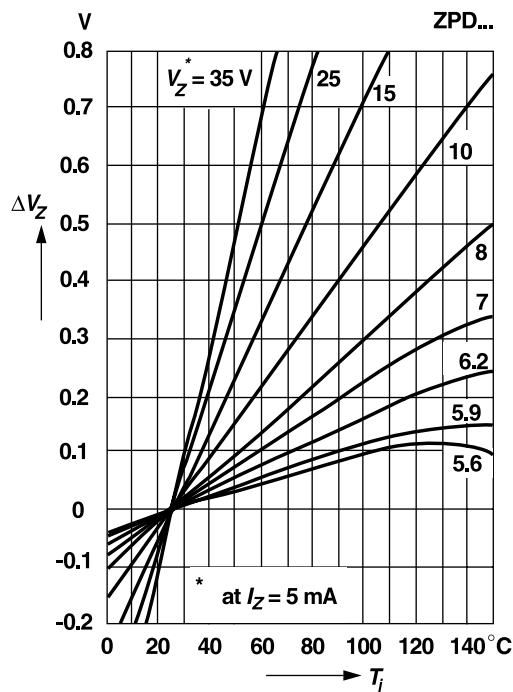


# RATINGS AND CHARACTERISTIC CURVES ZPD1 THRU ZPD75

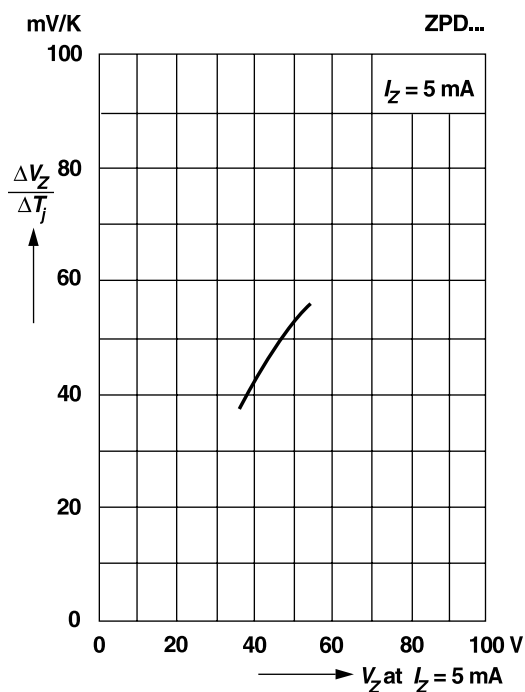
Temperature dependence of Zener voltage  
versus Zener voltage



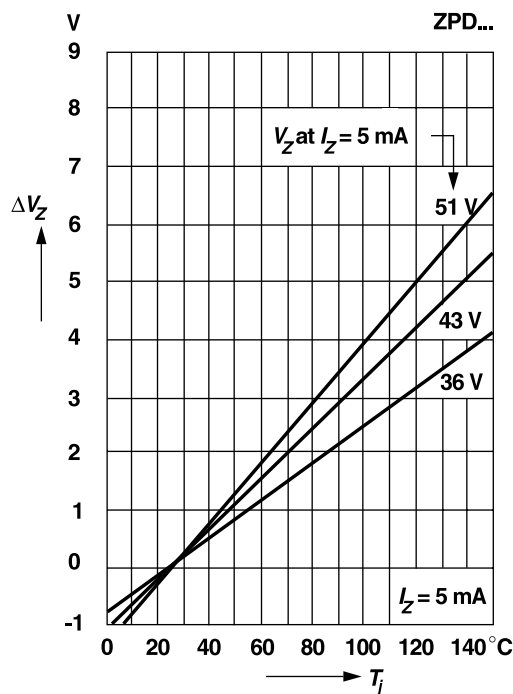
Change of Zener voltage  
versus junction temperature



Temperature dependence of Zener voltage  
versus Zener voltage

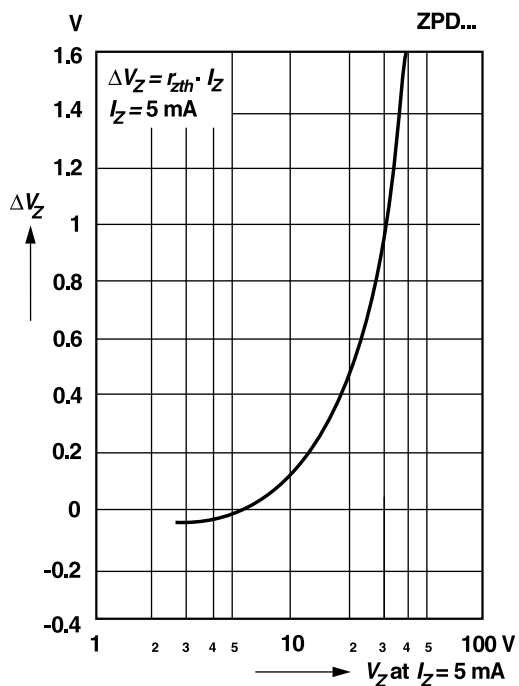


Change of Zener voltage  
versus junction temperature



# RATINGS AND CHARACTERISTIC CURVES ZPD1 THRU ZPD75

Change of Zener voltage from turn-on  
up to the point of thermal equilibrium  
versus Zener voltage



Change of Zener voltage from turn-on  
up to the point of thermal equilibrium  
versus Zener voltage

