



Certificate Number: Q10561



Certificate Number: E17276

## BZW04 SERIES

**V<sub>BR</sub> : 6.8 - 440 Volts**

**P<sub>PK</sub> : 400 Watts**

### FEATURES :

- \* 400W surge capability at 1ms
- \* Excellent clamping capability
- \* Low zener impedance
- \* Fast response time : typically less than 1.0 ps from 0 volt to V<sub>BR(min)</sub>
- \* Typical I<sub>R</sub> less than 1μA above 10V

### MECHANICAL DATA

- \* Case : DO-41 Molded plastic
- \* Epoxy : UL94V-O rate flame retardant
- \* Lead : Axial lead solderable per MIL-STD-202, method 208 guaranteed
- \* Polarity : Color band denotes cathode end except Bipolar.
- \* Mounting position : Any
- \* Weight : 0.339 gram

### DEVICES FOR BIPOLAR APPLICATIONS

For bi-directional use B Suffix.

Electrical characteristics apply in both directions

### MAXIMUM RATINGS

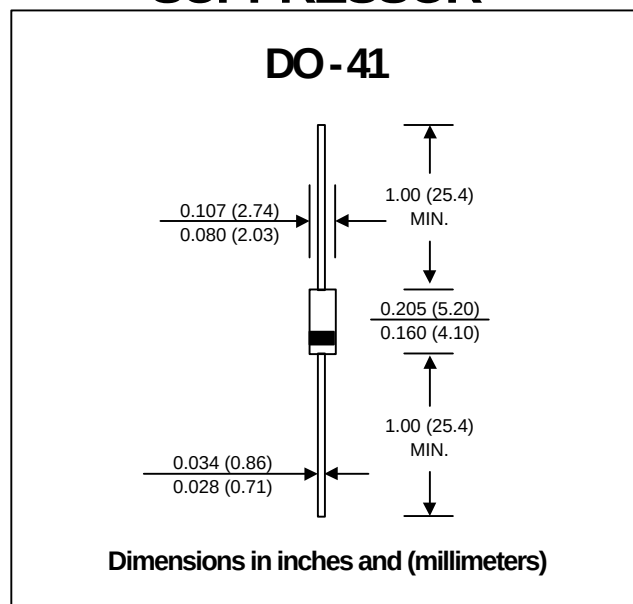
Rating at 25 °C ambient temperature unless otherwise specified.

| Rating                                                                                                           | Symbol                            | Value         | Unit  |
|------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------|-------|
| Peak Power Dissipation at Ta = 25 °C, Tp=1ms (Note1)                                                             | P <sub>PK</sub>                   | Minimum 400   | Watts |
| Steady State Power Dissipation at TL = 75 °C<br>Lead Lengths 0.375", (9.5mm) (Note 2)                            | P <sub>D</sub>                    | 1.0           | Watt  |
| Peak Forward Surge Current, 8.3ms Single Half<br>Sine-Wave Superimposed on Rated Load<br>(JEDEC Method) (Note 3) | I <sub>FSM</sub>                  | 40            | Amps. |
| Operating and Storage Temperature Range                                                                          | T <sub>J</sub> , T <sub>STG</sub> | - 65 to + 175 | °C    |

### Note :

- (1 ) Non-repetitive Current pulse, per Fig. 5 and derated above Ta = 25 °C per Fig. 1
- (2) Mounted on Copper Leaf area of 1.57 in<sup>2</sup> (40mm<sup>2</sup>).
- (3) 8.3 ms single half sine-wave, duty cycle = 4 pulses per minutes maximum.

## TRANSIENT VOLTAGE SUPPRESSOR



**UPDATE : MAY 18, 1998**



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## ELECTRICAL CHARACTERISTICS

Rating at = 25 °C ambient temperature unless otherwise specified

| TYPE      | Breakdown Voltage @ It<br>( Note 1 ) |      |      | Working Peak<br>Reverse<br>Voltage | Maximum<br>Reverse Leakage<br>@ VRWM | Maximum<br>Reverse<br>Current | Maximum<br>Clamping<br>Voltage @ IRSM | Maximum<br>Temperature<br>Co-efficient<br>of VBR |
|-----------|--------------------------------------|------|------|------------------------------------|--------------------------------------|-------------------------------|---------------------------------------|--------------------------------------------------|
|           | VBR (V)                              |      | It   | VRWM                               | IR                                   | IRSM                          | VRSM                                  | of VBR<br>(% / °C)                               |
|           | Min.                                 | Max. | (mA) | (V)                                | (µA)                                 | (A)                           | (V)                                   |                                                  |
| BZW04P5V8 | 6.45                                 | 7.48 | 10   | 5.80                               | 1000                                 | 38.0                          | 10.5                                  | 0.057                                            |
| BZW04-5V8 | 6.45                                 | 7.14 | 10   | 5.80                               | 1000                                 | 38.0                          | 10.5                                  | 0.057                                            |
| BZW04P6V4 | 7.13                                 | 8.25 | 10   | 6.40                               | 500                                  | 35.4                          | 11.3                                  | 0.061                                            |
| BZW04-6V4 | 7.13                                 | 7.88 | 10   | 6.40                               | 500                                  | 35.4                          | 11.3                                  | 0.061                                            |
| BZW04P7V0 | 7.79                                 | 9.02 | 10   | 7.02                               | 200                                  | 33.0                          | 12.1                                  | 0.065                                            |
| BZW04-7V0 | 7.79                                 | 8.61 | 10   | 7.02                               | 200                                  | 33.0                          | 12.1                                  | 0.065                                            |
| BZW04P7V8 | 8.65                                 | 10.0 | 1.0  | 7.78                               | 50                                   | 30.0                          | 13.4                                  | 0.068                                            |
| BZW04-7V8 | 8.65                                 | 9.55 | 1.0  | 7.78                               | 50                                   | 30.0                          | 13.4                                  | 0.068                                            |
| BZW04P8V5 | 9.50                                 | 11.0 | 1.0  | 8.55                               | 10                                   | 27.6                          | 14.5                                  | 0.073                                            |
| BZW04-8V5 | 9.50                                 | 10.5 | 1.0  | 8.55                               | 10                                   | 27.6                          | 14.5                                  | 0.073                                            |
| BZW04P9V4 | 10.5                                 | 12.1 | 1.0  | 9.40                               | 5.0                                  | 25.7                          | 15.6                                  | 0.075                                            |
| BZW04-9V4 | 10.5                                 | 11.6 | 1.0  | 9.40                               | 5.0                                  | 25.7                          | 15.6                                  | 0.075                                            |
| BZW04P10  | 11.4                                 | 13.2 | 1.0  | 10.2                               | 5.0                                  | 24.0                          | 16.7                                  | 0.078                                            |
| BZW04-10  | 11.4                                 | 12.6 | 1.0  | 10.2                               | 5.0                                  | 24.0                          | 16.7                                  | 0.078                                            |
| BZW04P11  | 12.4                                 | 14.3 | 1.0  | 11.1                               | 5.0                                  | 22.0                          | 18.2                                  | 0.081                                            |
| BZW04-11  | 12.4                                 | 13.7 | 1.0  | 11.1                               | 5.0                                  | 22.0                          | 18.2                                  | 0.081                                            |
| BZW04P13  | 14.3                                 | 16.5 | 1.0  | 12.8                               | 5.0                                  | 19.0                          | 21.2                                  | 0.084                                            |
| BZW04-13  | 14.3                                 | 15.8 | 1.0  | 12.8                               | 5.0                                  | 19.0                          | 21.2                                  | 0.084                                            |
| BZW04P14  | 15.2                                 | 17.6 | 1.0  | 13.6                               | 5.0                                  | 17.8                          | 22.5                                  | 0.086                                            |
| BZW04-14  | 15.2                                 | 16.8 | 1.0  | 13.6                               | 5.0                                  | 17.8                          | 22.5                                  | 0.086                                            |
| BZW04P15  | 17.1                                 | 19.8 | 1.0  | 15.3                               | 5.0                                  | 16.0                          | 25.2                                  | 0.088                                            |
| BZW04-15  | 17.1                                 | 18.9 | 1.0  | 15.3                               | 5.0                                  | 16.0                          | 25.2                                  | 0.088                                            |
| BZW04P17  | 19.0                                 | 22.0 | 1.0  | 17.1                               | 5.0                                  | 14.5                          | 27.7                                  | 0.090                                            |
| BZW04-17  | 19.0                                 | 21.0 | 1.0  | 17.1                               | 5.0                                  | 14.5                          | 27.7                                  | 0.090                                            |
| BZW04P19  | 20.9                                 | 24.2 | 1.0  | 18.8                               | 5.0                                  | 13.0                          | 30.6                                  | 0.092                                            |
| BZW04-19  | 20.9                                 | 23.1 | 1.0  | 18.8                               | 5.0                                  | 13.0                          | 30.6                                  | 0.092                                            |
| BZW04P20  | 22.8                                 | 26.4 | 1.0  | 20.5                               | 5.0                                  | 12.0                          | 33.2                                  | 0.094                                            |
| BZW04-20  | 22.8                                 | 25.2 | 1.0  | 20.5                               | 5.0                                  | 12.0                          | 33.2                                  | 0.094                                            |
| BZW04P23  | 25.7                                 | 29.7 | 1.0  | 23.1                               | 5.0                                  | 10.7                          | 37.5                                  | 0.096                                            |
| BZW04-23  | 25.7                                 | 28.4 | 1.0  | 23.1                               | 5.0                                  | 10.7                          | 37.5                                  | 0.096                                            |
| BZW04P26  | 28.5                                 | 33.0 | 1.0  | 25.6                               | 5.0                                  | 9.6                           | 41.5                                  | 0.097                                            |
| BZW04-26  | 28.5                                 | 31.5 | 1.0  | 25.6                               | 5.0                                  | 9.6                           | 41.5                                  | 0.097                                            |
| BZW04P28  | 31.4                                 | 36.3 | 1.0  | 28.2                               | 5.0                                  | 8.8                           | 45.7                                  | 0.098                                            |
| BZW04-28  | 31.4                                 | 34.7 | 1.0  | 28.2                               | 5.0                                  | 8.8                           | 45.7                                  | 0.098                                            |
| BZW04P31  | 34.2                                 | 39.6 | 1.0  | 30.8                               | 5.0                                  | 8.0                           | 49.9                                  | 0.099                                            |
| BZW04-31  | 34.2                                 | 37.8 | 1.0  | 30.8                               | 5.0                                  | 8.0                           | 49.9                                  | 0.099                                            |
| BZW04P33  | 37.1                                 | 42.9 | 1.0  | 33.3                               | 5.0                                  | 7.4                           | 53.9                                  | 0.100                                            |
| BZW04-33  | 37.1                                 | 41.0 | 1.0  | 33.3                               | 5.0                                  | 7.4                           | 53.9                                  | 0.100                                            |
| BZW04P37  | 40.9                                 | 47.3 | 1.0  | 36.8                               | 5.0                                  | 6.7                           | 59.3                                  | 0.101                                            |
| BZW04-37  | 40.9                                 | 45.2 | 1.0  | 36.8                               | 5.0                                  | 6.7                           | 59.3                                  | 0.101                                            |
| BZW04P40  | 44.7                                 | 51.7 | 1.0  | 40.2                               | 5.0                                  | 6.2                           | 64.8                                  | 0.101                                            |
| BZW04-40  | 44.7                                 | 49.4 | 1.0  | 40.2                               | 5.0                                  | 6.2                           | 64.8                                  | 0.101                                            |
| BZW04P44  | 48.5                                 | 56.1 | 1.0  | 43.6                               | 5.0                                  | 5.7                           | 70.1                                  | 0.102                                            |
| BZW04-44  | 48.5                                 | 53.6 | 1.0  | 43.6                               | 5.0                                  | 5.7                           | 70.1                                  | 0.102                                            |
| BZW04P48  | 53.2                                 | 61.6 | 1.0  | 47.8                               | 5.0                                  | 5.2                           | 77.0                                  | 0.103                                            |
| BZW04-48  | 53.2                                 | 58.8 | 1.0  | 47.8                               | 5.0                                  | 5.2                           | 77.0                                  | 0.103                                            |
| BZW04P53  | 58.9                                 | 68.2 | 1.0  | 53.0                               | 5.0                                  | 4.7                           | 85.0                                  | 0.104                                            |
| BZW04-53  | 58.9                                 | 65.1 | 1.0  | 53.0                               | 5.0                                  | 4.7                           | 85.0                                  | 0.104                                            |

## ELECTRICAL CHARACTERISTICS

Rating at = 25 °C ambient temperature unless otherwise specified

| TYPE      | Breakdown Voltage @ $I_t$<br>( Note 1 ) |      | Working Peak<br>Reverse<br>Voltage | Maximum<br>Reverse Leakage<br>@ $V_{RWM}$ | Maximum<br>Reverse<br>Current | Maximum<br>Clamping<br>Voltage @ $I_{RSM}$ | Maximum<br>Temperature<br>Co-efficient<br>of $V_{BR}$ |       |
|-----------|-----------------------------------------|------|------------------------------------|-------------------------------------------|-------------------------------|--------------------------------------------|-------------------------------------------------------|-------|
|           | $V_{BR}$ (V)                            |      | $I_t$                              | $V_{RWM}$                                 | $I_R$                         | $I_{RSM}$                                  | $V_{RSM}$                                             |       |
|           | Min.                                    | Max. | (mA)                               | (V)                                       | ( $\mu$ A)                    | (A)                                        | (V)                                                   |       |
|           |                                         |      |                                    |                                           |                               |                                            | (% / °C)                                              |       |
| BZW04P58  | 64.6                                    | 74.8 | 1.0                                | 58.1                                      | 5.0                           | 4.3                                        | 92.0                                                  | 0.104 |
| BZW04-58  | 64.6                                    | 71.4 | 1.0                                | 58.1                                      | 5.0                           | 4.3                                        | 92.0                                                  | 0.104 |
| BZW04P64  | 71.3                                    | 82.5 | 1.0                                | 64.1                                      | 5.0                           | 3.9                                        | 103                                                   | 0.105 |
| BZW04-64  | 71.3                                    | 78.8 | 1.0                                | 64.1                                      | 5.0                           | 3.9                                        | 103                                                   | 0.105 |
| BZW04P70  | 77.9                                    | 90.2 | 1.0                                | 70.1                                      | 5.0                           | 3.5                                        | 113                                                   | 0.105 |
| BZW04-70  | 77.9                                    | 86.1 | 1.0                                | 70.1                                      | 5.0                           | 3.5                                        | 113                                                   | 0.105 |
| BZW04P78  | 86.5                                    | 100  | 1.0                                | 77.8                                      | 5.0                           | 3.2                                        | 125                                                   | 0.106 |
| BZW04-78  | 86.5                                    | 95.5 | 1.0                                | 77.8                                      | 5.0                           | 3.2                                        | 125                                                   | 0.106 |
| BZW04P85  | 95.0                                    | 110  | 1.0                                | 85.5                                      | 5.0                           | 2.9                                        | 137                                                   | 0.106 |
| BZW04-85  | 95.0                                    | 105  | 1.0                                | 85.5                                      | 5.0                           | 2.9                                        | 137                                                   | 0.106 |
| BZW04P94  | 105                                     | 121  | 1.0                                | 94.0                                      | 5.0                           | 2.6                                        | 152                                                   | 0.107 |
| BZW04-94  | 105                                     | 116  | 1.0                                | 94.0                                      | 5.0                           | 2.6                                        | 152                                                   | 0.107 |
| BZW04P102 | 114                                     | 132  | 1.0                                | 102                                       | 5.0                           | 2.4                                        | 165                                                   | 0.107 |
| BZW04-102 | 114                                     | 126  | 1.0                                | 102                                       | 5.0                           | 2.4                                        | 165                                                   | 0.107 |
| BZW04P111 | 124                                     | 143  | 1.0                                | 111                                       | 5.0                           | 2.2                                        | 179                                                   | 0.107 |
| BZW04-111 | 124                                     | 137  | 1.0                                | 111                                       | 5.0                           | 2.2                                        | 179                                                   | 0.107 |
| BZW04P128 | 143                                     | 165  | 1.0                                | 128                                       | 5.0                           | 2.0                                        | 207                                                   | 0.108 |
| BZW04-128 | 143                                     | 158  | 1.0                                | 128                                       | 5.0                           | 2.0                                        | 207                                                   | 0.108 |
| BZW04P136 | 152                                     | 176  | 1.0                                | 136                                       | 5.0                           | 1.8                                        | 219                                                   | 0.108 |
| BZW04-136 | 152                                     | 168  | 1.0                                | 136                                       | 5.0                           | 1.8                                        | 219                                                   | 0.108 |
| BZW04P145 | 161                                     | 187  | 1.0                                | 145                                       | 5.0                           | 1.7                                        | 234                                                   | 0.108 |
| BZW04-145 | 161                                     | 179  | 1.0                                | 145                                       | 5.0                           | 1.7                                        | 234                                                   | 0.108 |
| BZW04P154 | 171                                     | 198  | 1.0                                | 154                                       | 5.0                           | 1.6                                        | 246                                                   | 0.108 |
| BZW04-154 | 171                                     | 189  | 1.0                                | 154                                       | 5.0                           | 1.6                                        | 246                                                   | 0.108 |
| BZW04P171 | 190                                     | 220  | 1.0                                | 171                                       | 5.0                           | 1.5                                        | 274                                                   | 0.108 |
| BZW04-171 | 190                                     | 210  | 1.0                                | 171                                       | 5.0                           | 1.5                                        | 274                                                   | 0.108 |
| BZW04P188 | 209                                     | 242  | 1.0                                | 188                                       | 5.0                           | 1.4                                        | 301                                                   | 0.108 |
| BZW04-188 | 209                                     | 231  | 1.0                                | 188                                       | 5.0                           | 1.4                                        | 301                                                   | 0.108 |
| BZW04P213 | 237                                     | 275  | 1.0                                | 213                                       | 5.0                           | 1.3                                        | 344                                                   | 0.110 |
| BZW04-213 | 237                                     | 263  | 1.0                                | 213                                       | 5.0                           | 1.3                                        | 344                                                   | 0.110 |
| BZW04P239 | 266                                     | 308  | 1.0                                | 239                                       | 5.0                           | 1.3                                        | 384                                                   | 0.110 |
| BZW04-239 | 266                                     | 294  | 1.0                                | 239                                       | 5.0                           | 1.3                                        | 384                                                   | 0.110 |
| BZW04P256 | 285                                     | 330  | 1.0                                | 256                                       | 5.0                           | 1.2                                        | 414                                                   | 0.110 |
| BZW04-256 | 285                                     | 315  | 1.0                                | 256                                       | 5.0                           | 1.2                                        | 414                                                   | 0.110 |
| BZW04P273 | 304                                     | 352  | 1.0                                | 273                                       | 5.0                           | 1.2                                        | 438                                                   | 0.110 |
| BZW04-273 | 304                                     | 336  | 1.0                                | 273                                       | 5.0                           | 1.2                                        | 438                                                   | 0.110 |
| BZW04P299 | 332                                     | 385  | 1.0                                | 299                                       | 5.0                           | 0.9                                        | 482                                                   | 0.110 |
| BZW04-299 | 332                                     | 368  | 1.0                                | 299                                       | 5.0                           | 0.9                                        | 482                                                   | 0.110 |
| BZW04P342 | 380                                     | 440  | 1.0                                | 342                                       | 5.0                           | 0.9                                        | 548                                                   | 0.110 |
| BZW04-342 | 380                                     | 420  | 1.0                                | 342                                       | 5.0                           | 0.9                                        | 548                                                   | 0.110 |
| BZW04P376 | 418                                     | 484  | 1.0                                | 376                                       | 5.0                           | 0.8                                        | 603                                                   | 0.110 |
| BZW04-376 | 418                                     | 462  | 1.0                                | 376                                       | 5.0                           | 0.8                                        | 603                                                   | 0.110 |

### Note:

- ( 1 )  $V_{BR}$  measured after  $I_t$  applied for 300  $\mu$ s.,  $I_t$  = square wave pulse or equivalent.
- ( 2 )  $V_F$  = 3.5  $V_{max.}$ ,  $I_F$  = 25 Amps. ( 6.8 Volts thru 110 Volts )  
 $V_F$  = 5.0  $V_{max.}$ ,  $I_F$  = 25 Amps. ( 120 Volts thru 440 Volts ) per 1/2 square or equivalent sine wave.  
PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

## RATING AND CHARACTERISTIC CURVES ( BZW04 SERIES )

FIG.1 - PULSE DERATING CURVE

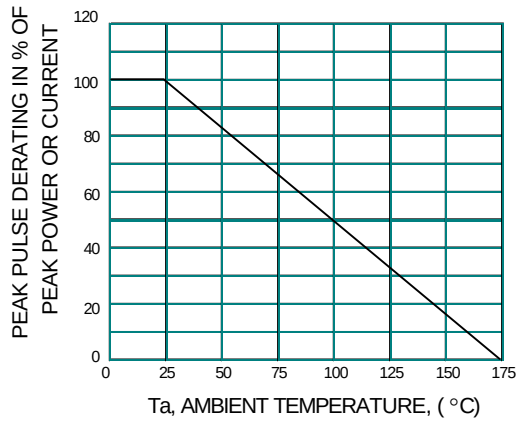


FIG.2 - MAXIMUM NON-REPETITIVE SURGE CURRENT

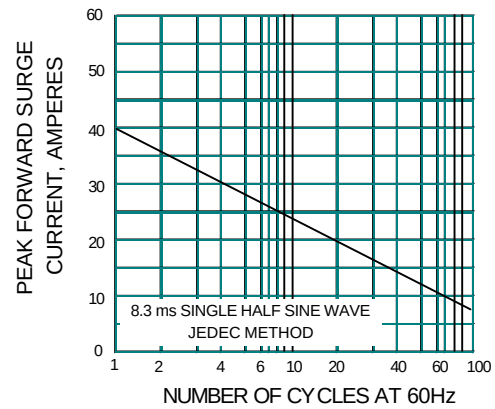


FIG.3 - STEADY STATE POWER DERATING

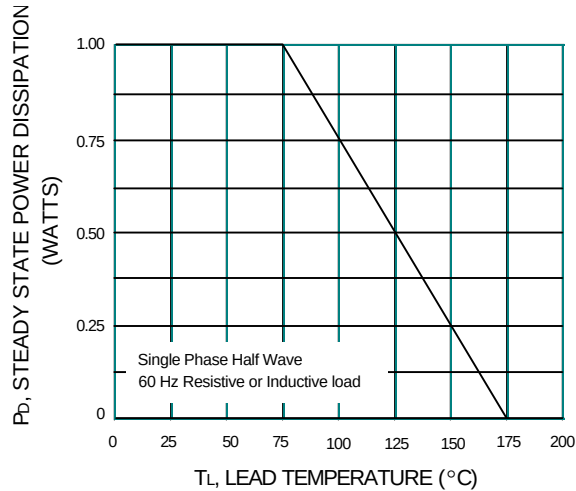


FIG.4 - PULSE RATING CURVE

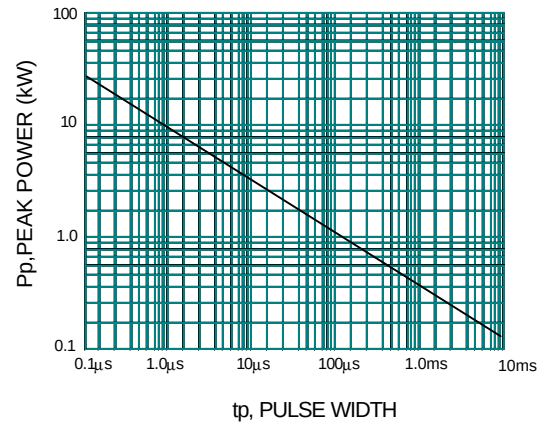


FIG.5 - PULSE WAVEFORM

