

400W, 5.8V - 376V Transient Voltage Suppressor

FEATURES

- AEC-Q101 qualified available
- Excellent clamping capability
- Low impedance surge resistance
- 400W surge capability at 10/1000 μ s waveform
- Very fast response time
- Typical I_R less than 1 μ A above 10V
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

APPLICATIONS

- Protect sensitive circuit from damage by high voltage transients
- Lighting, ESD transient voltage protection of IC, system
- Inductive switching load protection of IC, system
- Electrical Fast Transient Immunity protection of IC, system

MECHANICAL DATA

- Case: DO-204AL (DO-41)
- Molding compound meets UL 94V-0 flammability rating
- Terminal: Pure tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 2 whisker test
- Polarity: As marked
- Weight: 0.300g (approximately)

| KEY PARAMETERS | | |
|------------------------------|------------------|--------------|
| PARAMETER | VALUE | UNIT |
| V_{WM} | 5.8 - 376 | V |
| V_{BR} (uni - directional) | 6.45 - 462 | V |
| V_{BR} (bi - directional) | 6.45 - 462 | V |
| P_{PK} | 400 | W |
| T_{JMAX} | 175 | $^{\circ}$ C |
| Package | DO-204AL (DO-41) | |



DO-204AL (DO-41)

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^{\circ}$ C unless otherwise noted)

| PARAMETER | SYMBOL | VALUE | UNIT |
|---|-----------|-------------|--------------|
| Peak power dissipation at $T_A = 25^{\circ}$ C, $T_p = 1ms^{(1)}$ | P_{PK} | 400 | W |
| Steady state power dissipation at $T_L = 75^{\circ}$ C lead lengths .375", 9.5mm ⁽²⁾ | P_D | 1 | W |
| Peak forward surge current, 8.3 ms single half sine-wave superimposed on rated load ⁽³⁾ | I_{FSM} | 40 | A |
| Operating junction temperature range | T_J | -55 to +175 | $^{\circ}$ C |
| Storage temperature range | T_{STG} | -55 to +175 | $^{\circ}$ C |

Note:

1. Non-repetitive current pulse per Fig.3 and Derated above $T_A = 25^{\circ}$ C per Fig.2
2. Mounted on 5 x 5 mm copper pads to each terminal
3. 8.3ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum

THERMAL PERFORMANCE

| PARAMETER | SYMBOL | TYP | UNIT |
|---|-----------------|-----|----------------|
| Junction-to-lead thermal resistance | $R_{\theta JL}$ | 60 | $^{\circ}$ C/W |
| Junction-to-ambient thermal resistance on printed circuit, L lead=10mm | $R_{\theta JA}$ | 100 | $^{\circ}$ C/W |

| MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted) | | | | | | | | | |
|--|---------------|---|------|--|---|---|--|--|---------------------------------|
| Device ⁽¹⁾ | | Breakdown voltage V _{BR} @I _T (V) | | Test current I _T (mA) | Working stand-off voltage V _{WM} (V) | Reverse leakage current @ V _{WM} I _D (uA) ⁽³⁾ | Maximum peak impulse current I _{PP} (A) | Maximum clamping voltage V _C @I _{PP} (V) | Maximum temperature coefficient |
| | | V _{BR} | | I _T | V _{WM} | I _D | I _{PPM} | V _C | V _{BR} |
| | | V | | mA | V | μA | A | V | %/°C |
| Unidirectional | Bidirectional | Min | Max | | | | | | |
| BZW04-5V8 | BZW04-5V8B | 6.45 | 7.14 | 10 | 5.80 | 1000 | 38.0 | 10.5 | 0.057 |
| BZW04-6V4 | BZW04-6V4B | 7.13 | 7.88 | 10 | 6.40 | 500 | 35.4 | 11.3 | 0.061 |
| BZW04-7V0 | BZW04-7V0B | 7.79 | 8.61 | 10 | 7.02 | 200 | 33.0 | 12.1 | 0.065 |
| BZW04-7V8 | BZW04-7V8B | 8.65 | 9.55 | 1 | 7.78 | 50 | 30.0 | 13.4 | 0.068 |
| BZW04-8V5 | BZW04-8V5B | 9.50 | 10.5 | 1 | 8.55 | 10 | 27.6 | 14.5 | 0.073 |
| BZW04-9V4 | BZW04-9V4B | 10.5 | 11.6 | 1 | 9.40 | 5 | 25.7 | 15.6 | 0.075 |
| BZW04-10 | BZW04-10B | 11.4 | 12.6 | 1 | 10.2 | 5 | 24.0 | 16.7 | 0.078 |
| BZW04-11 | BZW04-11B | 12.4 | 13.7 | 1 | 11.1 | 5 | 22.0 | 18.2 | 0.081 |
| BZW04-13 | BZW04-13B | 14.3 | 15.8 | 1 | 12.8 | 5 | 19.0 | 21.2 | 0.084 |
| BZW04-14 | BZW04-14B | 15.2 | 16.8 | 1 | 13.6 | 1 | 17.8 | 22.5 | 0.083 |
| BZW04-15 | BZW04-15B | 17.1 | 18.9 | 1 | 15.3 | 1 | 16.0 | 25.2 | 0.088 |
| BZW04-17 | BZW04-17B | 19.0 | 21.0 | 1 | 17.1 | 1 | 14.5 | 27.7 | 0.090 |
| BZW04-19 | BZW04-19B | 20.9 | 23.1 | 1 | 18.8 | 1 | 13.0 | 30.6 | 0.092 |
| BZW04-20 | BZW04-20B | 22.8 | 25.2 | 1 | 20.5 | 1 | 12.0 | 33.2 | 0.094 |
| BZW04-23 | BZW04-23B | 25.7 | 28.4 | 1 | 23.1 | 1 | 10.7 | 37.5 | 0.096 |
| BZW04-26 | BZW04-26B | 28.5 | 31.5 | 1 | 25.6 | 1 | 9.6 | 41.5 | 0.097 |
| BZW04-28 | BZW04-28B | 31.4 | 34.7 | 1 | 28.2 | 1 | 8.8 | 45.7 | 0.098 |
| BZW04-31 | BZW04-31B | 34.2 | 37.8 | 1 | 30.8 | 1 | 8.0 | 49.9 | 0.099 |
| BZW04-33 | BZW04-33B | 37.1 | 41.0 | 1 | 33.3 | 1 | 7.4 | 53.9 | 0.100 |
| BZW04-37 | BZW04-37B | 40.9 | 45.2 | 1 | 36.8 | 1 | 6.7 | 59.3 | 0.101 |
| BZW04-40 | BZW04-40B | 44.7 | 49.4 | 1 | 40.2 | 1 | 6.2 | 64.8 | 0.101 |
| BZW04-44 | BZW04-44B | 48.5 | 53.6 | 1 | 43.6 | 1 | 5.7 | 70.1 | 0.102 |
| BZW04-48 | BZW04-48B | 53.2 | 58.8 | 1 | 47.8 | 1 | 5.2 | 77.0 | 0.103 |
| BZW04-53 | BZW04-53B | 58.9 | 65.1 | 1 | 53.0 | 1 | 4.7 | 85.0 | 0.104 |
| BZW04-58 | BZW04-58B | 64.6 | 71.4 | 1 | 58.1 | 1 | 4.3 | 92.0 | 0.104 |
| BZW04-64 | BZW04-64B | 71.3 | 78.8 | 1 | 64.1 | 1 | 3.9 | 103 | 0.105 |
| BZW04-70 | BZW04-70B | 77.9 | 86.1 | 1 | 70.1 | 1 | 3.5 | 113 | 0.105 |
| BZW04-78 | BZW04-78B | 86.5 | 95.5 | 1 | 78.0 | 1 | 3.2 | 125 | 0.105 |
| BZW04-85 | BZW04-85B | 95 | 105 | 1 | 85.5 | 1 | 2.9 | 137 | 0.106 |
| BZW04-94 | BZW04-94B | 105 | 116 | 1 | 94.0 | 1 | 2.6 | 152 | 0.107 |
| BZW04-102 | BZW04-102B | 114 | 126 | 1 | 102 | 1 | 2.4 | 165 | 0.107 |
| BZW04-110 | BZW04-110B | 124 | 137 | 1 | 111 | 1 | 2.2 | 179 | 0.107 |
| BZW04-128 | BZW04-128B | 143 | 158 | 1 | 128 | 1 | 2.0 | 207 | 0.108 |
| BZW04-136 | BZW04-136B | 152 | 168 | 1 | 136 | 1 | 1.8 | 219 | 0.108 |

| MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted) | | | | | | | | | |
|---|---------------|---|-----|--|---|---|--|--|---------------------------------|
| Device ⁽¹⁾ | | Breakdown voltage V _{BR} @I _T (V) | | Test current I _T (mA) | Working stand-off voltage V _{WM} (V) | Reverse leakage current @ V _{WM} I _D (μ A) ⁽³⁾ | Maximum peak impulse current I _{PP} (A) | Maximum clamping voltage V _C @I _{PP} (V) | Maximum temperature coefficient |
| | | V _{BR} | | I _T | V _{WM} | I _D | I _{PPM} | V _C | V _{BR} |
| | | V | | mA | V | μ A | A | V | %/°C |
| Unidirectional | Bidirectional | Min | Max | | | | | | |
| BZW04-145 | BZW04-145B | 161 | 179 | 1 | 145 | 1 | 1.7 | 234 | 0.108 |
| BZW04-154 | BZW04-154B | 171 | 189 | 1 | 154 | 1 | 1.6 | 246 | 0.108 |
| BZW04-171 | BZW04-171B | 190 | 210 | 1 | 171 | 1 | 1.5 | 274 | 0.108 |
| BZW04-188 | BZW04-188B | 209 | 231 | 1 | 188 | 1 | 1.4 | 301 | 0.108 |
| BZW04-213 | BZW04-213B | 237 | 263 | 1 | 213 | 1 | 1.2 | 344 | 0.110 |
| BZW04-239 | BZW04-239B | 266 | 294 | 1 | 239 | 1 | 1.1 | 384 | 0.110 |
| BZW04-256 | BZW04-256B | 285 | 315 | 1 | 256 | 1 | 1.0 | 414 | 0.110 |
| BZW04-273 | BZW04-273B | 304 | 336 | 1 | 273 | 1 | 0.9 | 438 | 0.110 |
| BZW04-299 | BZW04-299B | 332 | 368 | 1 | 299 | 1 | 0.8 | 482 | 0.110 |
| BZW04-342 | BZW04-342B | 380 | 420 | 1 | 342 | 1 | 0.75 | 548 | 0.110 |
| BZW04-376 | BZW04-376B | 418 | 462 | 1 | 376 | 1 | 0.67 | 603 | 0.110 |

Notes:

1. Pulse test : tp<50ms
2. All terms and symbols are consistent with ANSI/IEEE C62.35
3. For bipolar types having V_{WM} of 10 volts and less, the I_D limit is doubled.

| ORDERING INFORMATION | | |
|---------------------------------|------------------|---------------------|
| ORDERING CODE ⁽¹⁾⁽²⁾ | PACKAGE | PACKING |
| BZW04-x | DO-204AL (DO-41) | 5,000 / Tape & Reel |
| BZW04-x A0G | DO-204AL (DO-41) | 3,000 / Ammo box |
| BZW04-xH | DO-204AL (DO-41) | 5,000 / Tape & Reel |
| BZW04-xHA0G | DO-204AL (DO-41) | 3,000 / Ammo box |

Notes:

1. "x" defines voltage from 5.8V (BZW04-5V8) to 376V (BZW04-376)
2. "H" means AEC-Q101 qualified

CHARACTERISTICS CURVES

($T_A = 25^\circ\text{C}$ unless otherwise noted)

Fig.1 Peak Pulse Power Rating Curve

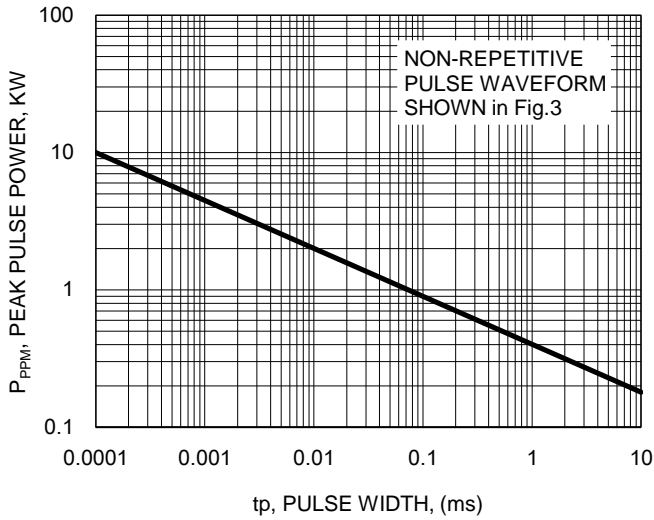


Fig.2 Pulse Derating Curve

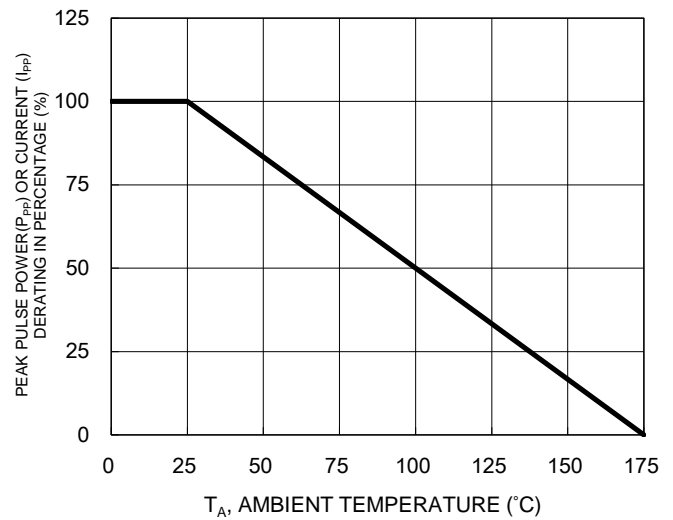


Fig.3 Clamping Power Pulse Waveform

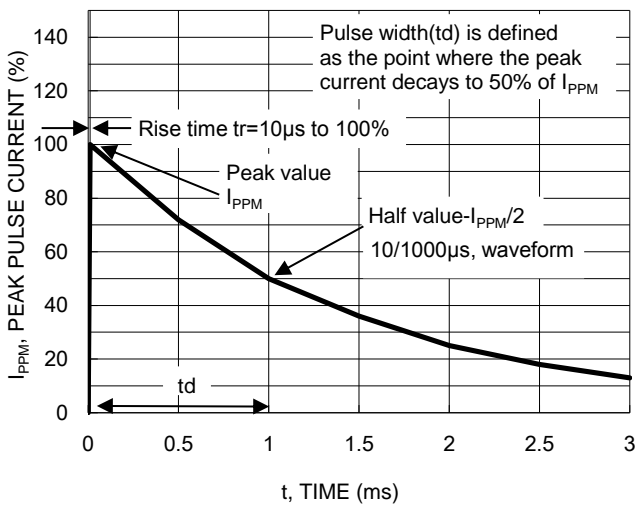
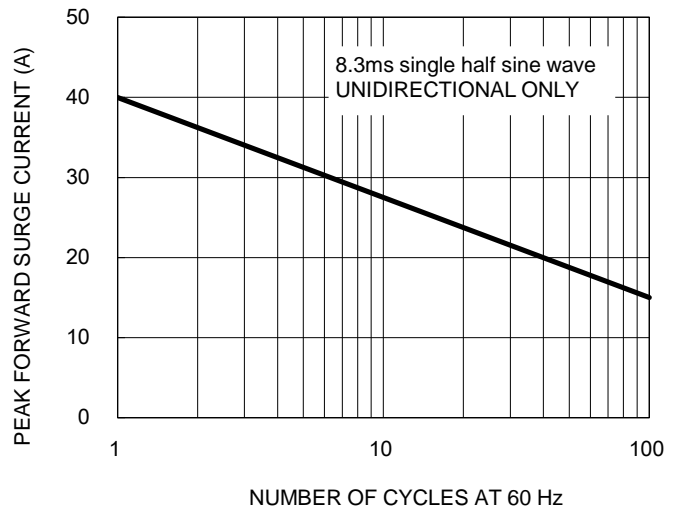


Fig.4 Maximum Non-Repetitive Forward Surge Current



CHARACTERISTICS CURVES

($T_A = 25^\circ\text{C}$ unless otherwise noted)

Fig.5 Steady State Power Derating Curve

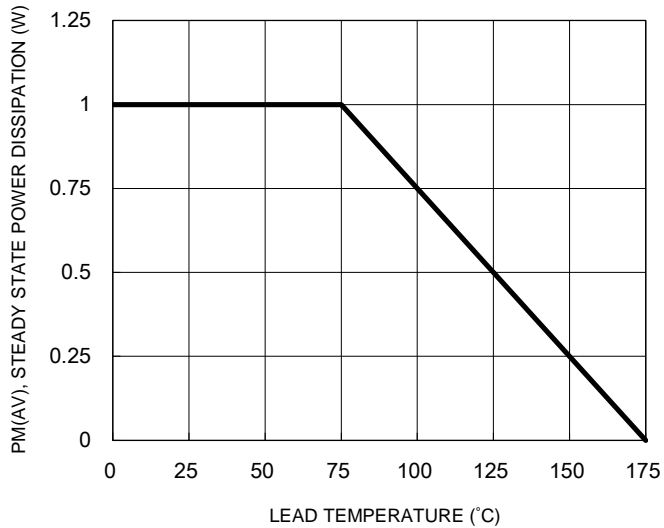


Fig.6 Typical Reverse Characteristics

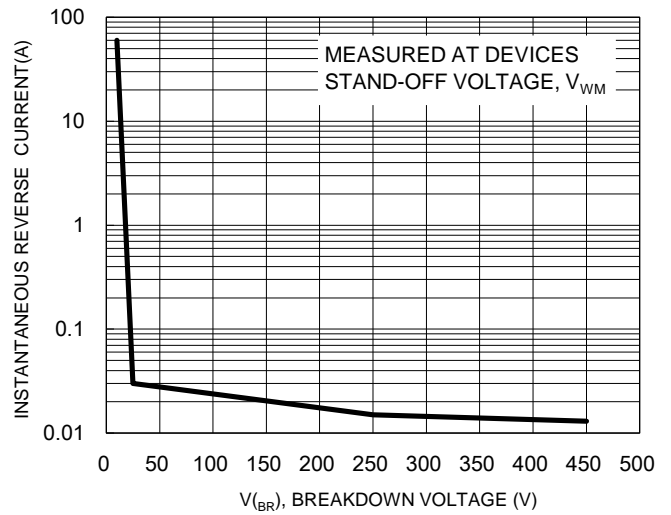
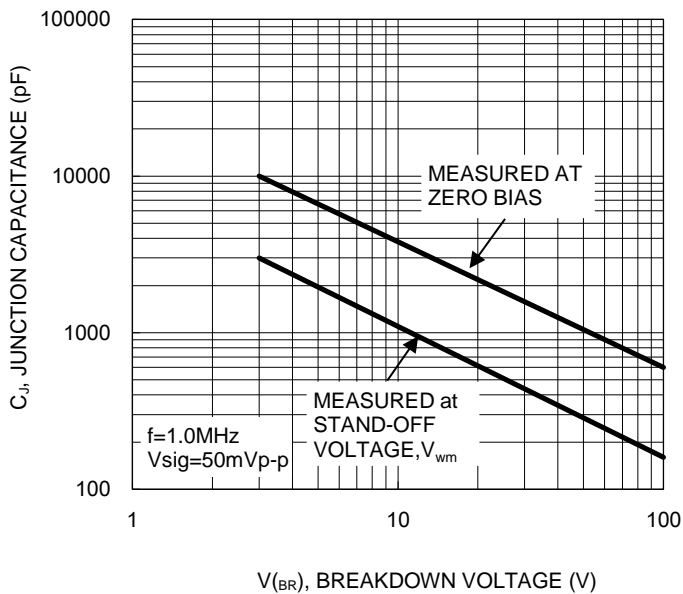
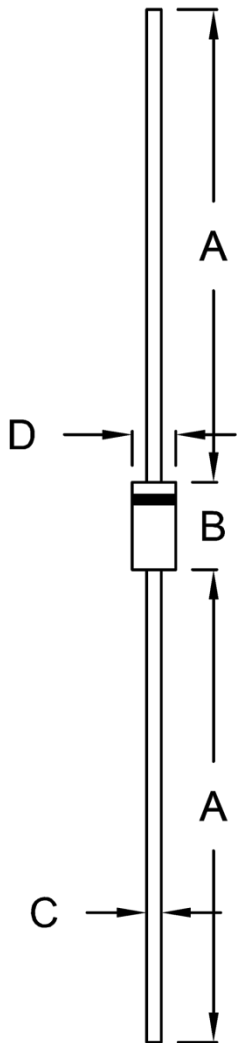


Fig.7 Typical Junction Capacitance



PACKAGE OUTLINE DIMENSIONS

DO-204AL (DO-41)



| DIM. | Unit (mm) | | Unit (inch) | |
|------|-----------|------|-------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 25.40 | - | 1.000 | - |
| B | 4.20 | 5.20 | 0.165 | 0.205 |
| C | 0.71 | 0.86 | 0.028 | 0.034 |
| D | 2.00 | 2.70 | 0.079 | 0.106 |

MARKING DIAGRAM

Cathode band for uni-directional products only



- P/N = Marking Code
- G = Green Compound
- YWW = Date Code
- F = Factory Code