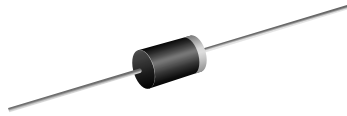


TRANSZORB[®] Transient Voltage Suppressors



DO-204AL (DO-41)

| PRIMARY CHARACTERISTICS | |
|---|----------------|
| V _{BR} uni-directional | 6.8 V to 540 V |
| V _{BR} bi-directional | 6.8 V to 440 V |
| P _{PPM} | 400 W |
| P _D | 1.5 W |
| I _{FSM} (uni-directional only) | 40 A |
| T _J max. | 175 °C |

DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-direction use C or CA suffix (e.g. P4KE440CA).
Electrical characteristics apply in both directions.

FEATURES

- Glass passivated chip junction
- Available in uni-directional and bi-directional
- 400 W peak pulse power capability with a 10/1000 μ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Solder dip 260 °C, 40 s
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



RoHS
COMPLIANT

TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive and telecommunication.

MECHANICAL DATA

Case: DO-204AL, molded epoxy over passivated chip
Molding compound meets UL 94 V-0 flammability rating

Base P/N-E3 - RoHS compliant, commercial grade
Base P/NHE3 - RoHS compliant, high reliability/
automotive grade (AEC Q101 qualified)

Terminals: Matte tin plated leads, solderable per J-STD-002 and JESD22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

Note: P4KE250 ~ P4KE540A and P4KE250C ~ P4KE440CA for commercial grade only

Polarity: For uni-directional types the color band denotes cathode end, no marking on bi-directional types

| MAXIMUM RATINGS (T _A = 25 °C unless otherwise noted) | | | |
|--|-----------------------------------|----------------|------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Peak power dissipation with a 10/1000 μ s waveform ⁽¹⁾ (Fig. 1) | P _{PPM} | 400 | W |
| Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾ | I _{PPM} | See next table | A |
| Power dissipation on infinite heatsink at T _L = 75 °C (Fig. 5) | P _D | 1.5 | W |
| Peak forward surge current, 8.3 ms single half sine-wave uni-directional only ⁽²⁾ | I _{FSM} | 40 | A |
| Maximum instantaneous forward voltage at 25 A for uni-directional only ⁽³⁾ | V _F | 3.5/5.0 | V |
| Operating junction and storage temperature range | T _J , T _{STG} | - 55 to + 175 | °C |

Notes:

(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A = 25 °C per Fig. 2

(2) Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum

(3) V_F = 3.5 V for P4KE220(A) and below; V_F = 5.0 V for P4KE250(A) and above



| ELECTRICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) | | | | | | | | |
|--|---|------|-------------------------------|--|---|--|---|--|
| DEVICE TYPE | BREAKDOWN VOLTAGE V_{BR} AT $I_T^{(1)}$ (V) | | TEST CURRENT I_T (mA) | STAND- OFF VOLTAGE V_{WM} (V) | MAXIMUM REVERSE LEAKAGE AT V_{WM} $I_D^{(3)}$ (μA) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}^{(2)}$ (A) | MAXIMUM CLAMPING VOLTAGE AT I_{PPM} V_C (V) | MAXIMUM TEMPERATURE COEFFICIENT OF V_{BR} (%/°C) |
| | MIN. | MAX. | | | | | | |
| P4KE6.8 | 6.12 | 7.48 | 10 | 5.50 | 1000 | 37.0 | 10.8 | 0.057 |
| P4KE6.8A | 6.45 | 7.14 | 10 | 5.80 | 1000 | 38.1 | 10.5 | 0.057 |
| P4KE7.5 | 6.75 | 8.25 | 10 | 6.05 | 500 | 34.2 | 11.7 | 0.061 |
| P4KE7.5A | 7.13 | 7.88 | 10 | 6.40 | 500 | 35.4 | 11.3 | 0.061 |
| P4KE8.2 | 7.38 | 9.02 | 10 | 6.63 | 200 | 32.0 | 12.5 | 0.065 |
| P4KE8.2A | 7.79 | 8.61 | 10 | 7.02 | 200 | 33.1 | 12.1 | 0.06 |
| P4KE9.1 | 8.19 | 10.0 | 1.0 | 7.37 | 50 | 29.0 | 13.8 | 0.068 |
| P4KE9.1A | 8.65 | 9.55 | 1.0 | 7.78 | 50 | 29.9 | 13.4 | 0.068 |
| P4KE10 | 9.00 | 11.0 | 1.0 | 8.10 | 10 | 26.7 | 15.0 | 0.073 |
| P4KE10A | 9.50 | 10.5 | 1.0 | 8.55 | 10 | 27.6 | 14.5 | 0.073 |
| P4KE11 | 9.90 | 12.1 | 1.0 | 8.92 | 5.0 | 24.7 | 16.2 | 0.075 |
| P4KE11A | 10.5 | 11.6 | 1.0 | 9.40 | 5.0 | 25.6 | 15.6 | 0.075 |
| P4KE12 | 10.8 | 13.2 | 1.0 | 9.72 | 1.0 | 23.1 | 17.3 | 0.076 |
| P4KE12A | 11.4 | 12.6 | 1.0 | 10.2 | 1.0 | 24.0 | 16.7 | 0.078 |
| P4KE13 | 11.7 | 14.3 | 1.0 | 10.5 | 1.0 | 21.1 | 19.0 | 0.081 |
| P4KE13A | 12.4 | 13.7 | 1.0 | 11.1 | 1.0 | 22.0 | 18.2 | 0.081 |
| P4KE15 | 13.5 | 16.5 | 1.0 | 12.1 | 1.0 | 18.2 | 22.0 | 0.084 |
| P4KE15A | 14.3 | 15.8 | 1.0 | 12.8 | 1.0 | 18.9 | 21.2 | 0.084 |
| P4KE16 | 14.4 | 17.6 | 1.0 | 12.9 | 1.0 | 17.0 | 23.5 | 0.086 |
| P4KE16A | 15.2 | 16.8 | 1.0 | 13.6 | 1.0 | 17.8 | 22.5 | 0.086 |
| P4KE18 | 16.2 | 19.8 | 1.0 | 14.5 | 1.0 | 15.1 | 26.5 | 0.088 |
| P4KE18A | 17.1 | 18.9 | 1.0 | 15.3 | 1.0 | 15.9 | 25.2 | 0.088 |
| P4KE20 | 18.0 | 22.0 | 1.0 | 16.2 | 1.0 | 13.7 | 29.1 | 0.090 |
| P4KE20A | 19.0 | 21.0 | 1.0 | 17.1 | 1.0 | 14.4 | 27.7 | 0.090 |
| P4KE22 | 19.8 | 24.2 | 1.0 | 17.8 | 1.0 | 12.5 | 31.9 | 0.092 |
| P4KE22A | 20.9 | 23.1 | 1.0 | 18.8 | 1.0 | 13.1 | 30.6 | 0.092 |
| P4KE24 | 21.6 | 26.4 | 1.0 | 19.4 | 1.0 | 11.5 | 34.7 | 0.094 |
| P4KE24A | 22.8 | 25.2 | 1.0 | 20.5 | 1.0 | 12.0 | 33.2 | 0.094 |
| P4KE27 | 24.3 | 29.7 | 1.0 | 21.8 | 1.0 | 10.2 | 39.1 | 0.096 |
| P4KE27A | 25.7 | 28.4 | 1.0 | 23.1 | 1.0 | 10.7 | 37.5 | 0.096 |
| P4KE30 | 27.0 | 33.0 | 1.0 | 24.3 | 1.0 | 9.2 | 43.5 | 0.097 |
| P4KE30A | 28.5 | 31.5 | 1.0 | 25.6 | 1.0 | 9.7 | 41.4 | 0.097 |
| P4KE33 | 29.7 | 36.3 | 1.0 | 26.8 | 1.0 | 8.4 | 47.7 | 0.098 |
| P4KE33A | 31.4 | 34.7 | 1.0 | 28.2 | 1.0 | 8.8 | 45.7 | 0.098 |
| P4KE36 | 32.4 | 39.6 | 1.0 | 29.1 | 1.0 | 7.7 | 52.0 | 0.099 |
| P4KE36A | 34.2 | 37.8 | 1.0 | 30.8 | 1.0 | 8.0 | 49.9 | 0.099 |
| P4KE39 | 35.1 | 42.9 | 1.0 | 31.6 | 1.0 | 7.1 | 56.4 | 0.100 |
| P4KE39A | 37.1 | 41.0 | 1.0 | 33.3 | 1.0 | 7.4 | 53.9 | 0.100 |
| P4KE43 | 38.7 | 47.3 | 1.0 | 34.8 | 1.0 | 6.5 | 61.9 | 0.101 |
| P4KE43A | 40.9 | 45.2 | 1.0 | 36.8 | 1.0 | 6.7 | 59.3 | 0.101 |
| P4KE47 | 42.3 | 51.7 | 1.0 | 38.1 | 1.0 | 5.9 | 67.8 | 0.101 |
| P4KE47A | 44.7 | 49.4 | 1.0 | 40.2 | 1.0 | 6.2 | 64.8 | 0.101 |
| P4KE51 | 45.9 | 56.1 | 1.0 | 41.3 | 1.0 | 5.4 | 73.5 | 0.102 |
| P4KE51A | 48.5 | 53.6 | 1.0 | 43.6 | 1.0 | 5.7 | 70.1 | 0.102 |
| P4KE56 | 50.4 | 61.6 | 1.0 | 45.4 | 1.0 | 5.0 | 80.5 | 0.103 |
| P4KE56A | 53.2 | 58.8 | 1.0 | 47.8 | 1.0 | 5.2 | 77.0 | 0.103 |
| P4KE62 | 55.8 | 68.2 | 1.0 | 50.2 | 1.0 | 4.5 | 89.0 | 0.104 |
| P4KE62A | 58.9 | 65.1 | 1.0 | 53.0 | 1.0 | 4.7 | 85.0 | 0.104 |
| P4KE68 | 61.2 | 74.8 | 1.0 | 55.1 | 1.0 | 4.1 | 98.0 | 0.104 |
| P4KE68A | 64.6 | 71.4 | 1.0 | 58.1 | 1.0 | 4.3 | 92.0 | 0.104 |
| P4KE75 | 67.5 | 82.5 | 1.0 | 60.7 | 1.0 | 3.7 | 108 | 0.105 |
| P4KE75A | 71.3 | 78.8 | 1.0 | 64.1 | 1.0 | 3.9 | 103 | 0.105 |



| ELECTRICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) | | | | | | | | |
|--|---|------|----------------------------|-----------------------------------|--|---|--|---|
| DEVICE TYPE | BREAKDOWN VOLTAGE V_{BR} AT $I_T^{(1)}$ (V) | | TEST CURRENT I_T (mA) | STAND-OFF VOLTAGE V_{WM} (V) | MAXIMUM REVERSE LEAKAGE AT V_{WM} $I_D^{(3)}$ (μA) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}^{(2)}$ (A) | MAXIMUM CLAMPING VOLTAGE AT I_{PPM} V_C (V) | MAXIMUM TEMPERATURE COEFFICIENT OF V_{BR} (%/°C) |
| | MIN. | MAX. | | | | | | |
| P4KE82 | 73.8 | 90.2 | 1.0 | 66.4 | 1.0 | 3.4 | 118 | 0.105 |
| P4KE82A | 77.9 | 86.1 | 1.0 | 70.1 | 1.0 | 3.5 | 113 | 0.105 |
| P4KE91 | 81.9 | 100 | 1.0 | 73.7 | 1.0 | 3.1 | 131 | 0.106 |
| P4KE91A | 86.5 | 95.5 | 1.0 | 77.8 | 1.0 | 3.2 | 125 | 0.106 |
| P4KE100 | 90.0 | 110 | 1.0 | 81.0 | 1.0 | 2.8 | 144 | 0.106 |
| P4KE100A | 95.0 | 105 | 1.0 | 85.5 | 1.0 | 2.9 | 137 | 0.106 |
| P4KE110 | 99.0 | 121 | 1.0 | 89.2 | 1.0 | 2.5 | 158 | 0.107 |
| P4KE110A | 105 | 116 | 1.0 | 94.0 | 1.0 | 2.6 | 152 | 0.107 |
| P4KE120 | 108 | 132 | 1.0 | 97.2 | 1.0 | 2.3 | 173 | 0.107 |
| P4KE120A | 114 | 126 | 1.0 | 102 | 1.0 | 2.4 | 165 | 0.107 |
| P4KE130 | 117 | 143 | 1.0 | 105 | 1.0 | 2.1 | 187 | 0.107 |
| P4KE130A | 124 | 137 | 1.0 | 111 | 1.0 | 2.2 | 179 | 0.107 |
| P4KE150 | 135 | 165 | 1.0 | 121 | 1.0 | 1.9 | 215 | 0.108 |
| P4KE150A | 143 | 158 | 1.0 | 128 | 1.0 | 1.9 | 207 | 0.108 |
| P4KE160 | 144 | 176 | 1.0 | 130 | 1.0 | 1.7 | 230 | 0.108 |
| P4KE160A | 152 | 168 | 1.0 | 136 | 1.0 | 1.8 | 219 | 0.108 |
| P4KE170 | 153 | 187 | 1.0 | 138 | 1.0 | 1.6 | 244 | 0.108 |
| P4KE170A | 162 | 179 | 1.0 | 145 | 1.0 | 1.7 | 234 | 0.108 |
| P4KE180 | 162 | 198 | 1.0 | 146 | 1.0 | 1.6 | 258 | 0.108 |
| P4KE180A | 171 | 189 | 1.0 | 154 | 1.0 | 1.6 | 246 | 0.108 |
| P4KE200 | 180 | 220 | 1.0 | 162 | 1.0 | 1.4 | 287 | 0.108 |
| P4KE200A | 190 | 210 | 1.0 | 171 | 1.0 | 1.5 | 274 | 0.108 |
| P4KE220 | 198 | 242 | 1.0 | 175 | 1.0 | 1.2 | 344 | 0.108 |
| P4KE220A | 209 | 231 | 1.0 | 185 | 1.0 | 1.2 | 328 | 0.108 |
| P4KE250 | 225 | 275 | 1.0 | 202 | 1.0 | 1.1 | 360 | 0.110 |
| P4KE250A | 237 | 263 | 1.0 | 214 | 1.0 | 1.2 | 344 | 0.110 |
| P4KE300 | 270 | 330 | 1.0 | 243 | 1.0 | 0.93 | 430 | 0.110 |
| P4KE300A | 285 | 315 | 1.0 | 256 | 1.0 | 1.0 | 414 | 0.110 |
| P4KE350 | 315 | 385 | 1.0 | 284 | 1.0 | 0.79 | 504 | 0.110 |
| P4KE350A | 333 | 368 | 1.0 | 300 | 1.0 | 0.83 | 482 | 0.110 |
| P4KE400 | 360 | 440 | 1.0 | 324 | 1.0 | 0.70 | 574 | 0.110 |
| P4KE400A | 380 | 420 | 1.0 | 342 | 1.0 | 0.73 | 548 | 0.110 |
| P4KE440 | 396 | 484 | 1.0 | 356 | 1.0 | 0.63 | 631 | 0.110 |
| P4KE440A | 418 | 462 | 1.0 | 376 | 1.0 | 0.66 | 602 | 0.110 |
| P4KE480 | 432 | 528 | 1.0 | 389 | 1.0 | 0.58 | 686 | 0.110 |
| P4KE480A | 456 | 504 | 1.0 | 408 | 1.0 | 0.61 | 658 | 0.110 |
| P4KE510 | 459 | 561 | 1.0 | 413 | 1.0 | 0.55 | 729 | 0.110 |
| P4KE510A | 485 | 535 | 1.0 | 434 | 1.0 | 0.57 | 698 | 0.110 |
| P4KE540 | 486 | 594 | 1.0 | 437 | 1.0 | 0.52 | 772 | 0.110 |
| P4KE540A | 513 | 567 | 1.0 | 459 | 1.0 | 0.54 | 740 | 0.110 |

Notes:

- (1) Pulse test: $t_p \leq 50\text{ ms}$
- (2) Surge current waveform per Fig. 3 and derated per Fig. 2
- (3) For bi-directional types having V_{WM} of 10 V and less, the I_D limit is doubled
- (4) All terms and symbols are consistent with ANSI/IEEE C62.35

| THERMAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) | | | |
|---|-----------------|-------|------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Typical thermal resistance, junction to lead | $R_{\theta JL}$ | 66 | °C/W |
| Typical thermal resistance, junction to ambient, $L_{Lead} = 10\text{ mm}$ | $R_{\theta JA}$ | 100 | °C/W |

| ORDERING INFORMATION (Example) | | | | |
|--------------------------------|-----------------|------------------------|---------------|----------------------------------|
| PREFERRED P/N | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE |
| P4KE6.8A-E3/54 | 0.350 | 54 | 5500 | 13" diameter paper tape and reel |
| P4KE6.8AHE3/54 ⁽¹⁾ | 0.350 | 54 | 5500 | 13" diameter paper tape and reel |

Note:

(1) Automotive grade AEC Q101 qualified

RATINGS AND CHARACTERISTICS CURVES

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

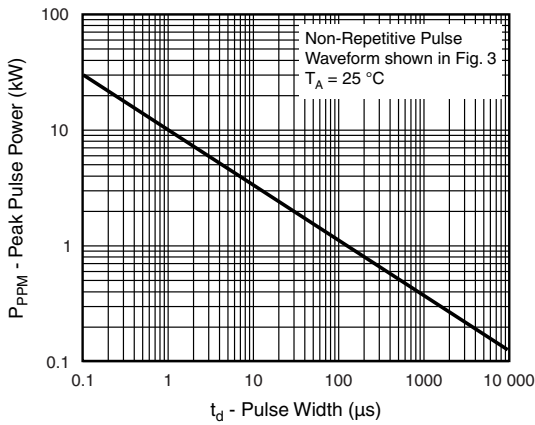


Figure 1. Peak Pulse Power Rating Curve

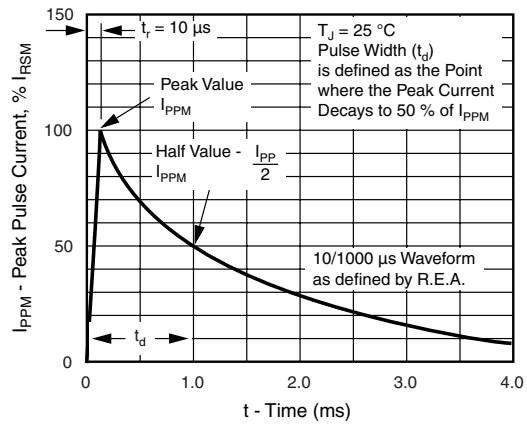


Figure 3. Pulse Waveform

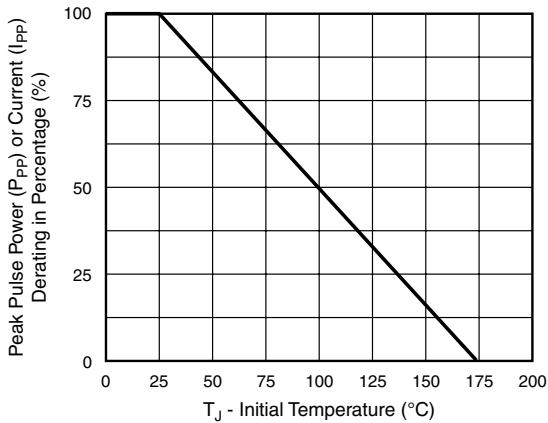


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

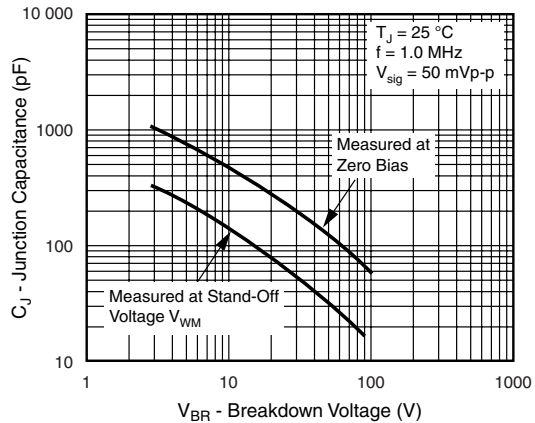


Figure 4. Typical Junction Capacitance Uni-Directional

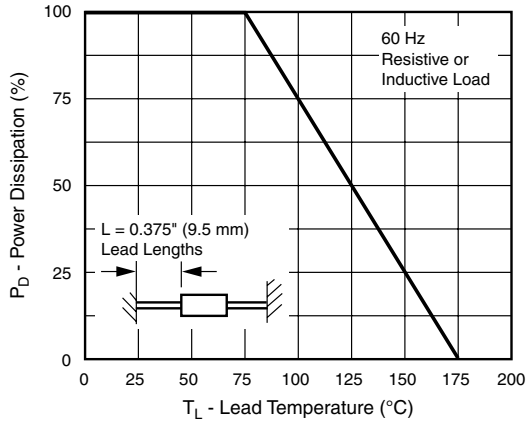


Figure 5. Power Derating Curve

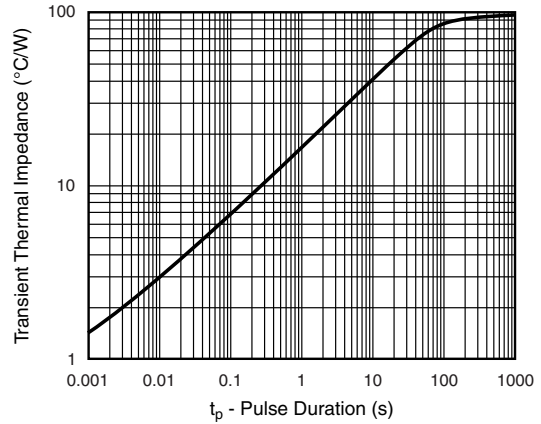


Figure 7. Typical Transient Thermal Impedance

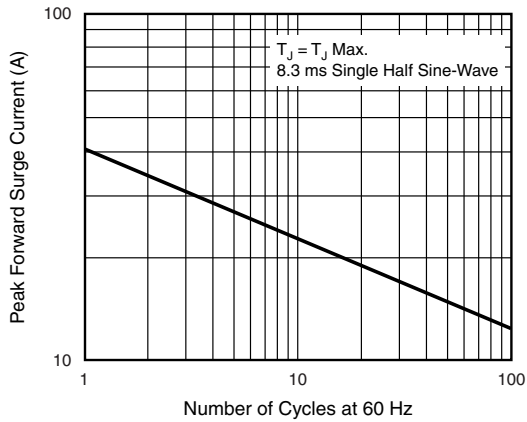
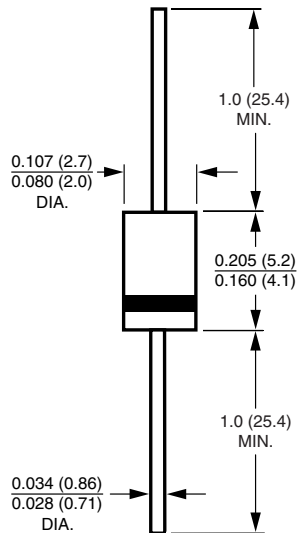


Figure 6. Max. Non-Repetitive Forward Surge Current
Uni-Directional Only

PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

DO-204AL (DO-41)





Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.