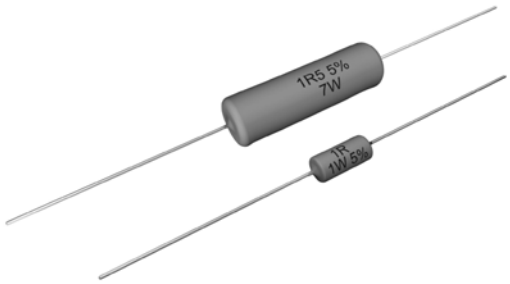
# Cemented Wirewound Resistors




## FEATURES

- All welded construction
- Ceramic core
- Non-flammable cement coating
- Tinned copper-clad iron leads (for axial parts)
- High power dissipation in small volume
- Ideal for pulse application
- Compliant to RoHS Directive 2002/95/EC

**Note**

** Please see document “Vishay Material Category Policy”: www.vishay.com/doc?99902

Pb-free
RoHS COMPLIANT
GREEN (5-2008)

## STANDARD ELECTRICAL SPECIFICATIONS

| MODEL | POWER RATING $P_{40\,°C}$ W | POWER RATING $P_{70\,°C}$ W | LIMITING VOLTAGE $U_{max.}$ | RESISTANCE RANGE (1) Ω TCR = - 10 ppm/K to - 80 ppm/K | RESISTANCE RANGE (1) Ω TCR = 100 ppm/K to 180 ppm/K | RESISTANCE RANGE (1) Ω TCR= ± 100 ppm/K | TOLERANCE ± % |
|---|---|---|---|---|---|---|---|
| AC01 | 1 | 0.9 | $\sqrt{P \times R}$ | 0.10 to 33 | 36 to 2.4K | n/a | 5 |
| AC03 (2) | 3 | 2.5 | $\sqrt{P \times R}$ | 0.10 to 390 | 430 to 3.3K | 3.6K to 5.1K | 5 |
| AC04 | 4 | 3.5 | $\sqrt{P \times R}$ | 0.10 to 620 | 680 to 6.8K | n/a | 5 |
| AC05 | 5 | 4.7 | $\sqrt{P \times R}$ | 0.10 to 910 | 1K to 10K | n/a | 5 |
| AC07 | 7 | 5.8 | $\sqrt{P \times R}$ | 0.10 to 1.5K | 1.6K to 15K | n/a | 5 |
| AC10 | 10 | 8.4 | $\sqrt{P \times R}$ | 0.22 to 560 | 620 to 27K | n/a | 5 |

**Notes**

(1) Resistance value to be selected for ± 10 % tolerance from E12 and for ± 5 % from E24
(2) AC03 WSZ: $P_{40\,°C}$ = 1.8 W; $P_{70\,°C}$ = 1.5 W

## PART NUMBER AND PRODUCT DESCRIPTION

**Part Number: AC03000001509JAC00**

| A | C | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 9 | J | A | C | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| MODEL | VARIANT | TCR/MATERIAL | VALUE | TOLERANCE CODE | PACKAGING CODE | SPECIAL |
|---|---|---|---|---|---|---|
| **AC01000** = AC01<br>**AC03000** = AC03<br>**AC04000** = AC04<br>**AC05000** = AC05<br>**AC07000** = AC07<br>**AC10000** = AC10 | **0** = Neutral<br>**1** = RT<br>**2** = SWI = Special winding (3)<br>**3** = DK SP 20 mm (4)<br>**4** = DK LP 33 mm (4)<br>**5** = DK LP 17.8 mm (4)<br>**6** = NI = Non inductive (7)<br>**7** = DK LP 25.4 mm (4)<br>**9** = WSZ 6720<br>**8** = DK SP 25.4 mm<br>**Z** = Value overflow (Special)<br>**C** = E/K 25.4 mm (4) | **0** = Standard | **3 digit value**<br>**1 digit multiplier**<br>MULTIPLIER<br>**7** = $*10^{-3}$<br>**8** = $*10^{-2}$<br>**9** = $*10^{-1}$<br>**0** = $*10^{0}$<br>**1** = $*10^{1}$<br>**2** = $*10^{2}$<br>**5** = $10^{-4}$ | **J** = ± 5.0 % | (See Packaging table) | The 5 digit BV number will be encoded using a 36 character code. This code contains numbers 0...9 and letters A...Z (36 characters total) and allows to encode at least 46 655 five digit BV numbers.<br>**00** = Standard |

**Product Description: AC03 15R 5 % AC**

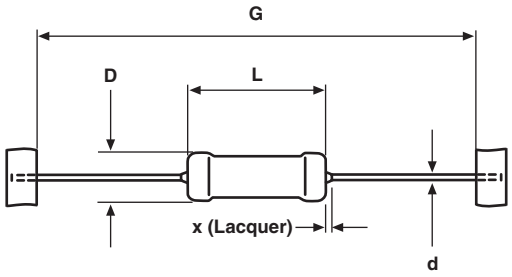
| AC03 | 15R | 5 % | AC |
|---|---|---|---|
| MODEL (5) | VALUE (5) | TOLERANCE CODE (5) | PACKAGING DESCRIPTION (6) |

**Notes**

(3) Special winding on request
(4) Other dimensions and variants on request
(5) See “Part Number and Product Description”
(6) See “Packaging Table”
(7) Resistance range on request

| PACKAGING TABLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MODEL | AMMO | | | LOOSE | | | BLISTER | | |
| | PIECES | PACK. CODE | PACK. DESC. | PIECES | PACK. CODE | PACK. DESC. | PIECES | PACK. CODE | PACK. DESC. |
| AC01 | 1000 | A1 | A1 | | | | | | |
| AC01 DK/EK | | | | 500 | LC | LC | | | |
| AC01RT | 2500 | AE | AE | | | | | | |
| AC03 | 500 | AC | AC | | | | | | |
| AC03 DK/EK | | | | 500 | LC | LC | | | |
| AC03 WSZ | | | | | | | 1250 | BM | BM |
| AC04 | 500 | AC | AC | | | | | | |
| AC04 DK/EK | | | | 500 | LC | LC | | | |
| AC05 | 500 | AC | AC | | | | | | |
| AC05 DK/EK | | | | 500 | LC | LC | | | |
| AC07 | 500 | AC | AC | | | | | | |
| AC07 DK/EK | | | | 250 | LB | LB | | | |
| AC10 | 250 | AB | AB | | | | | | |

## DIMENSIONS

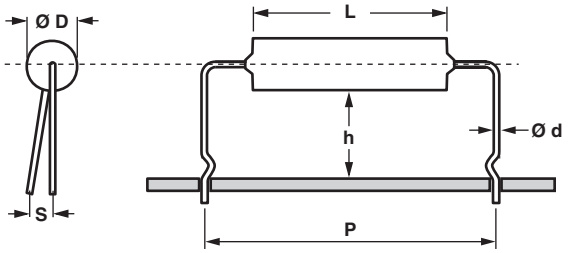



For packaging dimensions see: www.vishay.com/doc?28721

| DIMENSIONS - Resistor types, mass and relevant physical dimensions | | | | | | |
|---|---|---|---|---|---|---|
| MODEL | DIMENSIONS in millimeters [inches] | | | | | |
| | $D_{max.}$ | $L_{max.}$ | d | $x_{max.}$ | G | WEIGHT g PER UNIT |
| **AC01** | 4.3 [0.169] | 11 [0.433] | 0.8 ± 0.03 [0.031 ± 0.001] | 2 | 63 ± 1 [2.480 ± 0.039] | 0.52 |
| **AC03** | 4.8 [0.189] | 13 [0.512] | | 2 | 63 ± 1 [2.480 ± 0.039] | 0.75 |
| **AC04** | 5.5 [0.217] | 16.5 [0.650] | | 3 | 63 ± 1 [2.480 ± 0.039] | 1.10 |
| **AC05** | 7.5 [0.295] | 18 [0.709] | | 3 | 63 ± 1 [2.480 ± 0.039] | 1.90 |
| **AC07** | 7.5 [0.295] | 26 [1.024] | | 3 | 73 ± 1 [2.874 ± 0.039] | 2.60 |
| **AC10** | 8.0 [0.315] | 44 [1.732] | | 3 | 88 ± 1 [3.465 ± 0.039] | 4.50 |

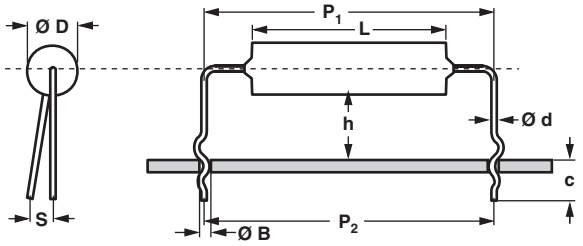
## BENDING FORMS

KINK TYPE S = EK



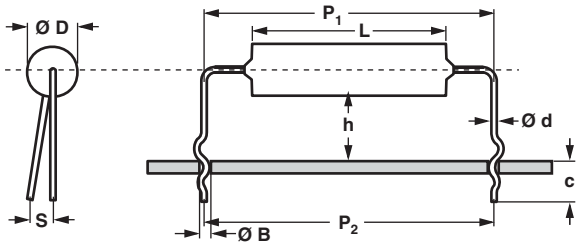

| TYPE | Ø d | Ø $D_{max.}$ | L | h ± 1 | P ± 1 | $S_{max.}$ |
|---|---|---|---|---|---|---|
| AC01 | 0.8 | (1) | (1) | 8 | 17.8 | 2 |
| AC03 - AC05 | | | | | 25.4 | |
| AC07 | | | | | 33.0 | |

DOUBLE KINK SP = DK SP




| TYPE | Ø d | Ø $D_{max.}$ | L | h ± 1 | $P_1$ ± 1 | $P_2$ ± 3 | $S_{max.}$ | Ø B | c |
|---|---|---|---|---|---|---|---|---|---|
| AC01 | 0.8 | (1) | (1) | 8 | 19.8 | 17.8 | 2 | 1.0 ± 0.1 | 4.5 ± 1 |
| AC03 - AC05 | | | | | 22.0 | 20.0 | | | |
| | | | | | 27.4 | 25.4 | | | |
| AC07 | | | | | 35.0 | 33.0 | | | |

DOUBLE KINK LP = DK LP



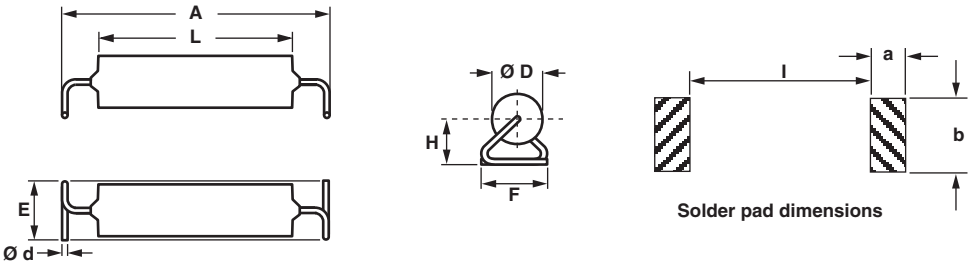

| TYPE | Ø d | Ø $D_{max.}$ | L | h ± 1 | $P_1$ ± 1 | $P_2$ ± 3 | $S_{max.}$ | Ø B | c |
|---|---|---|---|---|---|---|---|---|---|
| AC01 - AC03 | 0.8 | (1) | (1) | 8 | 17.8 | 17.8 | 2 | 1.0 ± 0.1 | 4.5 ± 1 |
| AC03 - AC05 | | | | | 25.4 | 25.4 | | | |
| AC07 | | | | | 33.0 | 33.0 | | | |

**Note**

(1) See table DIMENSIONS

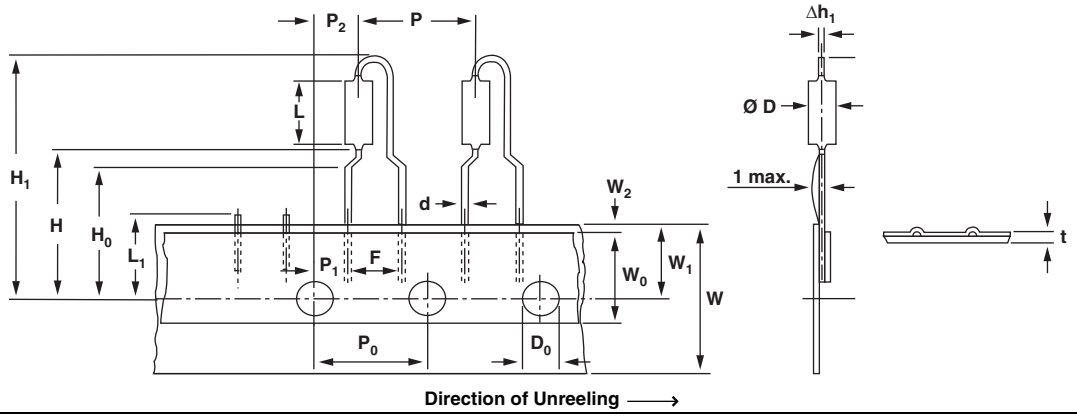
## BENDING FORMS

WSZ




| TYPE | Ø d | Ø $D_{max.}$ | A | L | F | H | E | a | b | l |
|---|---|---|---|---|---|---|---|---|---|---|
| AC03 WSZ | 0.8 | (1) | 17 ± 0.5 | 11 - 12 | 4.8 ± 0.5 | 3.6 ± 0.5 | 5.0 ± 0.5 | 2.5 | 5.5 | 14.5 |

RADIAL TAPED = RT

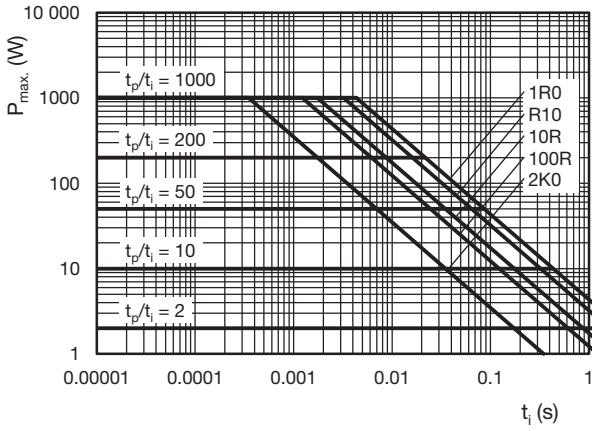



| TYPE AC01 | | |
|---|---|---|
| Lead Ø | Ø d | 0.8 |
| Diameter | Ø D | (1) |
| Length | L | (1) |
| Pitch of components | P | 12.7 ± 1.0 |
| Pitch of spocket holes (2) | $P_0$ | 12.7 ± 0.3 |
| Distance between hole center and resistor center | $P_1$ | 3.85 ± 0.7 |
| Distance between hole center and lead center | $P_2$ | 6.35 ± 1.0 |
| Lead spacing | F | 5.0 + 0.6, - 0.1 |
| Angle of insertion | $\Delta h_1$ | 2 max. |
| Width of carrier tape | W | 18.0 ± 0.5 |
| Width of adhesive tape | $W_0$ | 12.0 ± 0.5 |
| Position of holes | $W_1$ | 9.0 ± 0.5 |
| Position of adhesive tape | $W_2$ | 0.5 max. |
| Body to hole center | H | 19.5 ± 1.0 |
| Lead crimp to hole center (3) | $H_0$ | 16.0 ± 0.5 |
| Hole Ø | $D_0$ | 4.0 ± 0.2 |
| Thickness of tape (4) | t | 0.9 max. |
| Height for cutting | $L_1$ | 11 max. |
| Height for insertion | $H_1$ | 32 max. |

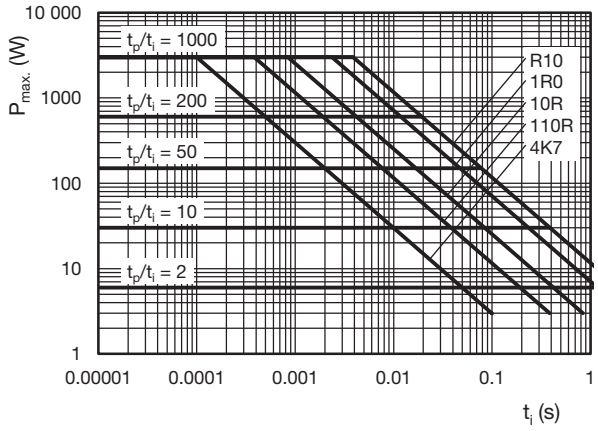
**Notes**

(1) See table DIMENSIONS
(2) Test over 10 holes - 9 intervals $P_0$ 12.7 x 9 = 114.3 ± 0.5
(3) Parallelism, < 0.5 mm
(4) Thickness of carrier tape: 0.55 mm ± 0.1

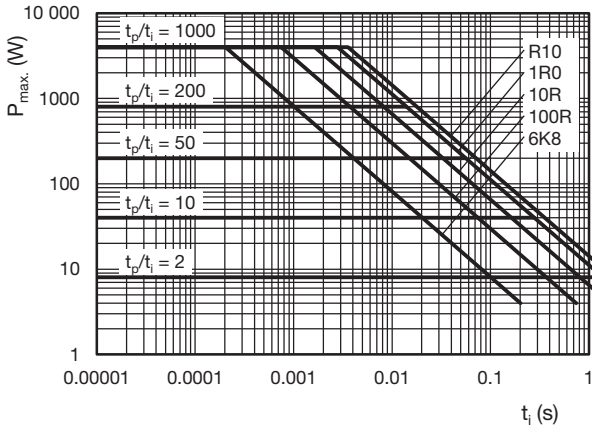
## PULSE DIAGRAMS



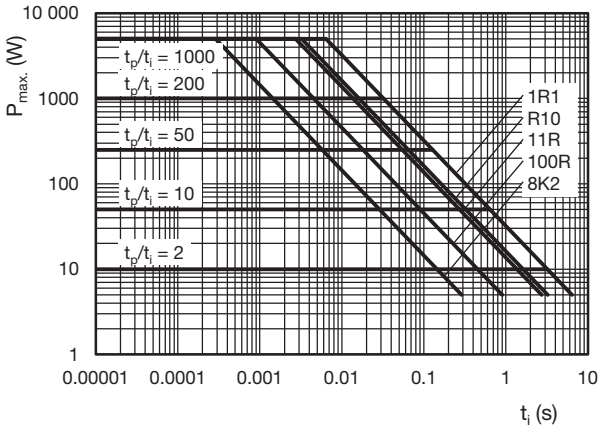

**AC01** Pulse on a regular basis; maximum permissible peak pulse power ($\hat{P}_{max.}$) as a function of pulse duration ($t_i$)



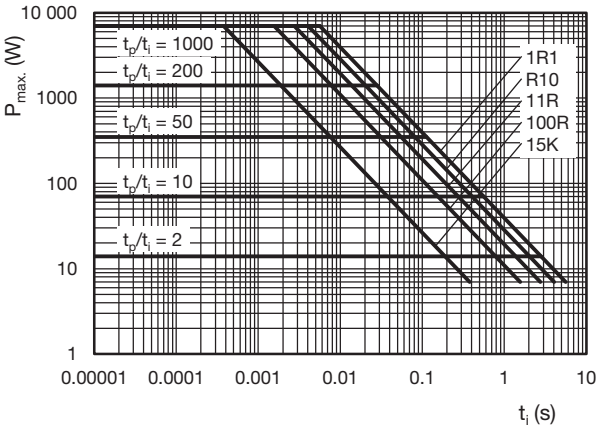

**AC03** Pulse on a regular basis; maximum permissible peak pulse power ($\hat{P}_{max.}$) as a function of pulse duration ($t_i$)



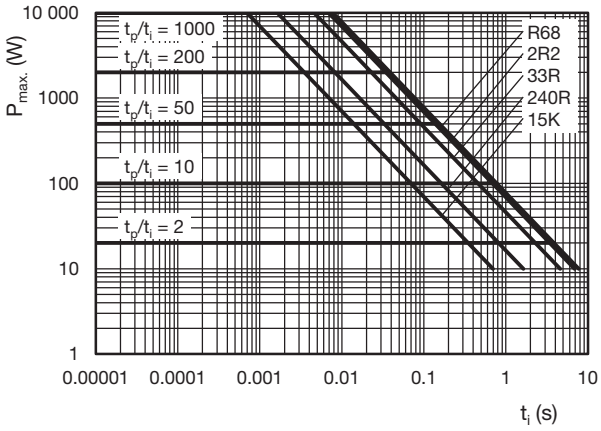

**AC04** Pulse on a regular basis; maximum permissible peak pulse power ($\hat{P}_{max.}$) as a function of pulse duration ($t_i$)




**AC05** Pulse on a regular basis; maximum permissible peak pulse power ($\hat{P}_{max.}$) as a function of pulse duration ($t_i$)

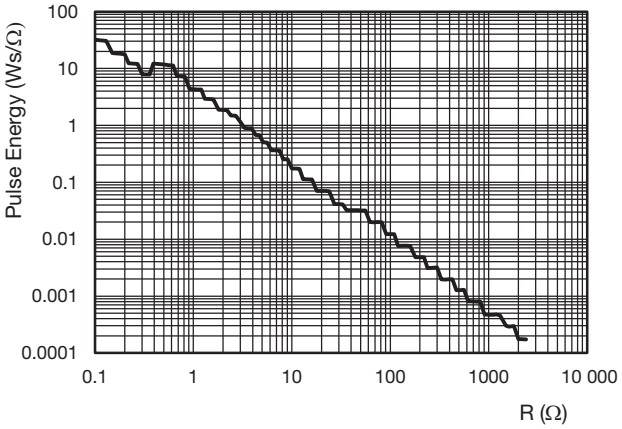



**AC07** Pulse on a regular basis; maximum permissible peak pulse power ($\hat{P}_{max.}$) as a function of pulse duration ($t_i$)

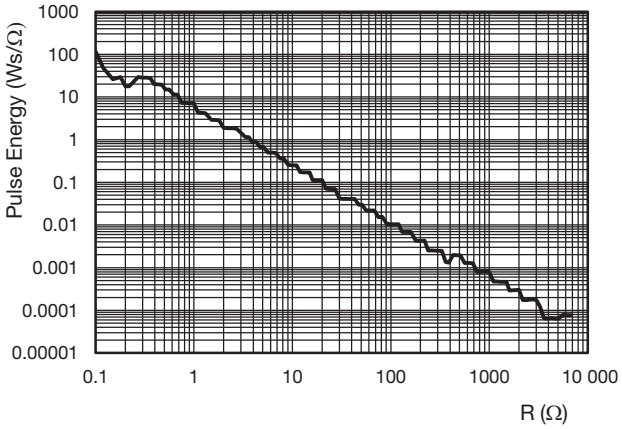



**AC10** Pulse on a regular basis; maximum permissible peak pulse power ($\hat{P}_{max.}$) as a function of pulse duration ($t_i$)

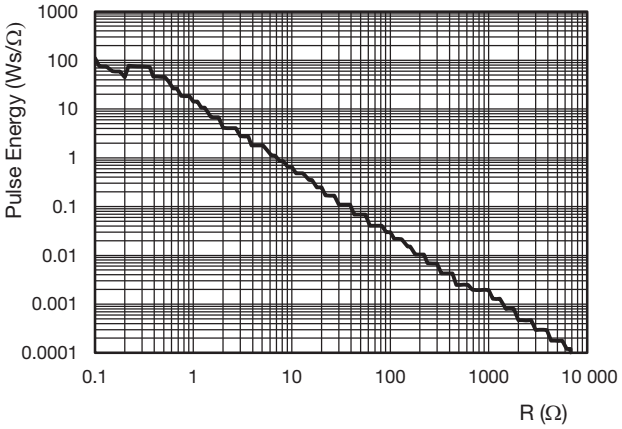
## PULSE DIAGRAMS



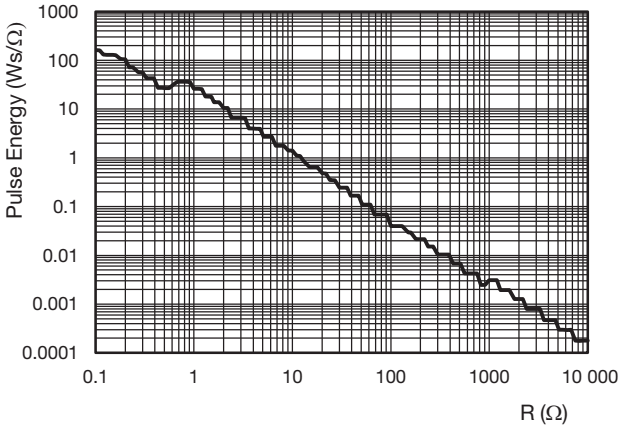

**AC01** Pulse capability; E (Ws) as a function of R (Ω)



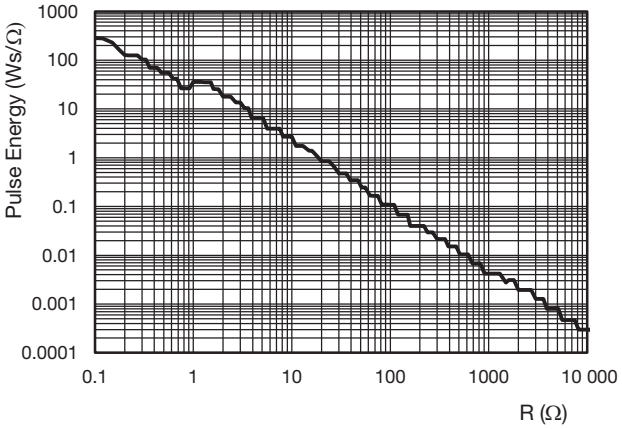

**AC03** Pulse capability; E (Ws) as a function of R (Ω)



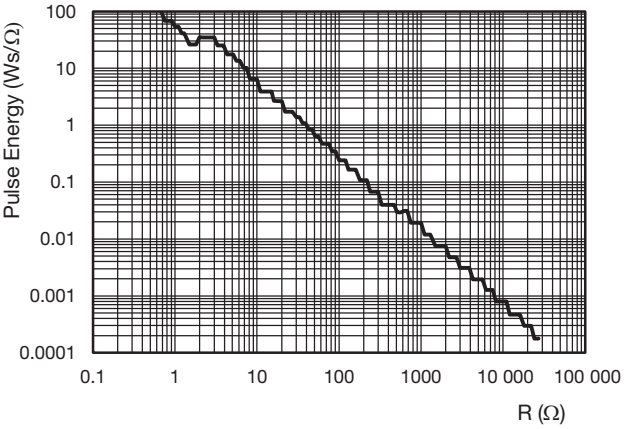

**AC04** Pulse capability; E (Ws) as a function of R (Ω)




**AC05** Pulse capability; E (Ws) as a function of R (Ω)

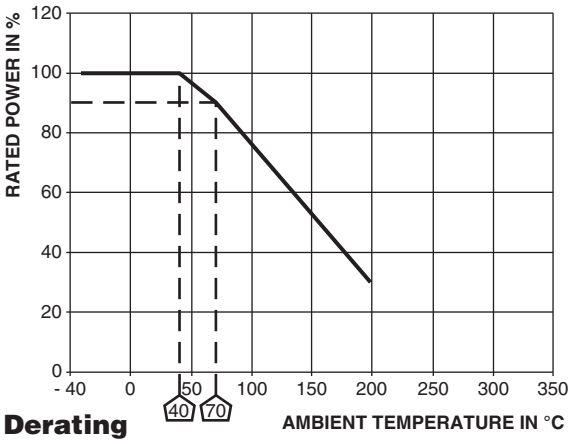



**AC07** Pulse capability; E (Ws) as a function of R (Ω)

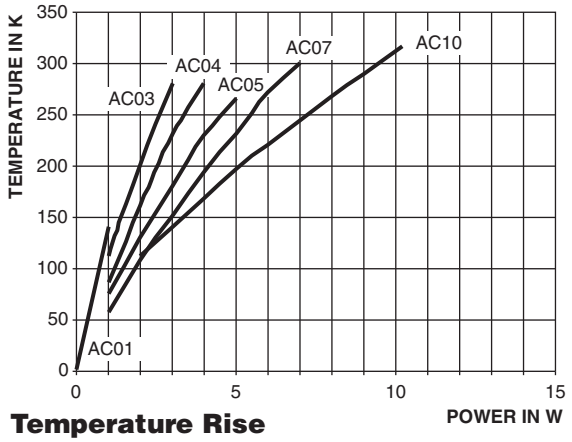



**AC10** Pulse capability; E (Ws) as a function of R (Ω)

## FUNCTIONAL PERFORMANCE




**Derating**




**Temperature Rise**

| PERFORMANCE | |
|---|---|
| **TEST** | **PERMISSIBLE CHANGE** |
| Climatic Category (LCT/UCT/Days) | 40/200/56 |
| Climatic Sequence, IEC 60115-1, 4.23 | $\Delta R = \pm (1\ \% R + 0.05\ \Omega)$ |
| Damp Heat, Steady State, IEC 60115-1, 4.24<br>(40 ± 2) °C, 56 days, (93 ± 3) % RH | $\Delta R = \pm (5\ \% R + 0.1\ \Omega)$ |
| Endurance at room temperature (116 % P70), 1000 h, IEC 60115-1, 4.25.2 | $\Delta R = \pm (5\ \% R + 0.1\ \Omega)$ |
| Endurance at UCT, 200 °C (30 % P70), 1000 h, IEC 60115-1, 4.25.3 | $\Delta R = \pm (5\ \% R + 0.1\ \Omega)$ |
| Resistance to Soldering Heat, IEC 60115-1, 4.18<br>(260 ± 5) °C, (10 ± 1) s | $\Delta R = \pm (0.5\ \% R + 0.05\ \Omega)$ |
| Robustness of Termination, IEC 60115-1, 4.16<br>10N | $\Delta R = \pm (0.5\ \% R + 0.05\ \Omega)$ |
| Short Time Overload, IEC 60115-1, 4.13<br>10 x Rated Power for 5 s | $\Delta R = \pm (2\ \% R + 0.1\ \Omega)$ |

## HISTORICAL 12NC INFORMATION

- The resistors had a 12-digit ordering code starting with 23.
- The subsequent 7 digits indicated the resistor type, specification and packaging.
- The remaining 3 digits indicated the resistance value:
  - The first 2 digits indicated the resistance value.
  - The last digit indicated the resistance decade in accordance with resistance decade table.

**Resistance Decade**

| RESISTANCE DECADE | LAST DIGIT |
|---|---|
| 0.1 Ω to 0.91 Ω | 7 |
| 1 Ω to 9.1 Ω | 8 |
| 10 Ω to 91 Ω | 9 |
| 100 Ω to 910 Ω | 1 |
| 1 kΩ to 9.1 kΩ | 2 |
| 10 kΩ to 56 kΩ | 3 |

**12NC Example**

The 12NC code of an AC01 resistor, value 47 Ω supplied in ammopack of 1000 units was: 2306 328 33479.

**HISTORICAL 12NC** - Resistor type and packaging

| TYPE | 23.. ... ..... | | | |
|---|---|---|---|---|
| | BANDOLIER IN AMMOPACK | | | |
| | RADIAL | STRAIGHT LEADS | | |
| | 2500 units | 250 units | 500 units | 1000 units |
| AC01 | 06 328 90... (2) | - | - | 06 328 33... |
| AC03 (1) | - | - | 22 329 03... | - |
| AC04 (1) | - | - | 22 329 04... | - |
| AC05 (1) | - | - | 22 329 05... | - |
| AC07 (1) | - | - | 22 329 07... | - |
| AC10 | - | - | - | - |

**Notes**

(1) Products with bent leads and bulk packaging (100 pieces) are available on request

(2) Radial parts with tin plated copper leads

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**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.**

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