

FEATURE

- AEC-Q200 qualified.
- High reliability and stability
- Superior anti-sulfur performance
- RoHS complaint.
- Meet application requirements for high temperature and high humidity with 85°C and 85%RH
- Compatible with reflow and wave soldering
- Applications:
 - Automotive electronics
 - Home appliances
 - Medical devices
 - Industrial control system
 - etc.

MANUFACTURER PART NO.

For example: AC0402D11KTAG00 – AC0402 ±0.5% 11KΩ T/R-10,000

| Series | Size | Tol. | Value | PKG | SPQ | Feature | TCR |
|--|------------------------------|------------------|--|--------------------|---------------|-------------------------------|---|
| 2 codes | 4 codes | 1 code | 2~5 codes | 1 code | 1 code | 1 code | 2 codes |
| AC | 0402 | D | 11K | T | A | G | 00 |
| Automotive Grade Low TCR Thick Film Chip Resistors | 0402 0603 0805 1206 | D=±0.5% F=±1% | 100R ^① =100Ω 4K7 ^② =4.7KΩ 100K=100KΩ 1M ^③ =1MΩ | T=T/R ^④ | 5=5K A=10K | G=Std. S=P.C. ^⑤ | 00=Std. TCR according to RELIABILITY. |

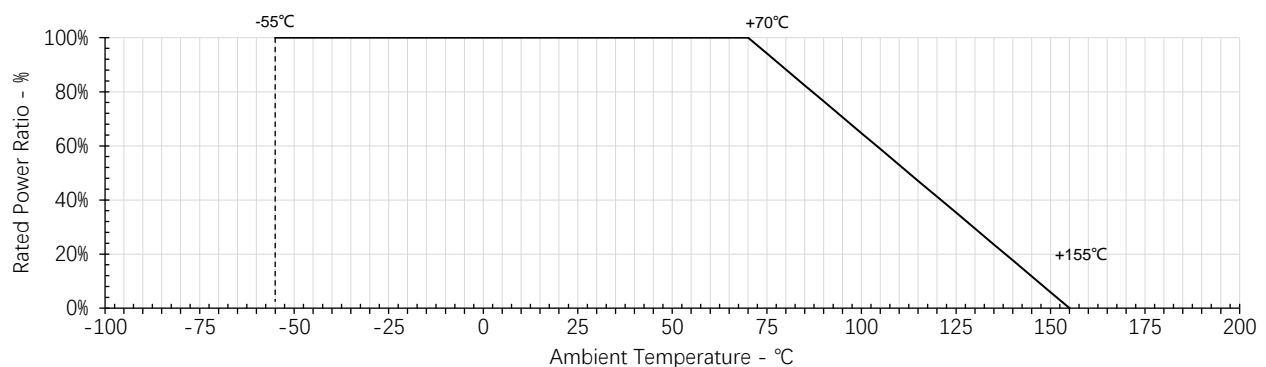
Note: ① R=Radix, 10⁰, Ω ② K=Kilo, 10³, KΩ ③ M=Mega, 10⁶, MΩ
 ④ T/R=Taping in Reel package type ⑤ P.C.=Personal and Customized.

CHARACTERISTIC

| Type | Rated Power | MWV ^① | MOV ^② | Tolerance | Value Range |
|--------|-------------|------------------|------------------|------------|---------------|
| AC0402 | 1/10W | 50V | 100V | ±0.5%, ±1% | 100Ω ≤ R ≤ 1M |
| AC0603 | 1/10W | 75V | 150V | ±0.5%, ±1% | 100Ω ≤ R ≤ 1M |
| AC0805 | 1/8W | 150V | 300V | ±0.5%, ±1% | 100Ω ≤ R ≤ 1M |
| AC1206 | 1/4W | 200V | 400V | ±0.5%, ±1% | 100Ω ≤ R ≤ 1M |

Note: ① MWV=Max. Working Voltage ② MOV=Max. Overload Voltage

POWER DERATING CURVE



Note: Operating Temperature Range: -55°C~+155°C

RATED VOLTAGE

Resistors should have a Rated Voltage DC or AC corresponding to Rated Power which can be calculated by formula as below.

The Rated Voltage of certain resistance value should be the calculated result or Max. Working Voltage of product series whichever less.

Formula:

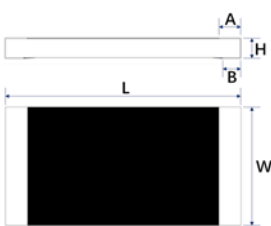
$$E = \sqrt{P \times R}$$

E=Rated voltage(V)

P=Rated power(W)

R=Nominal resistance(Ω)

DIMENSIONS

| Figure | Type | L | W | H | A | B | Unit: mm |
|---|--------|-----------|-----------|-----------|-----------|-----------|----------|
|  | AC0402 | 1.00±0.10 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 | |
| | AC0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 | |
| | AC0805 | 2.00±0.15 | 1.25±0.15 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 | |
| | AC1206 | 3.10±0.15 | 1.55±0.15 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 | |

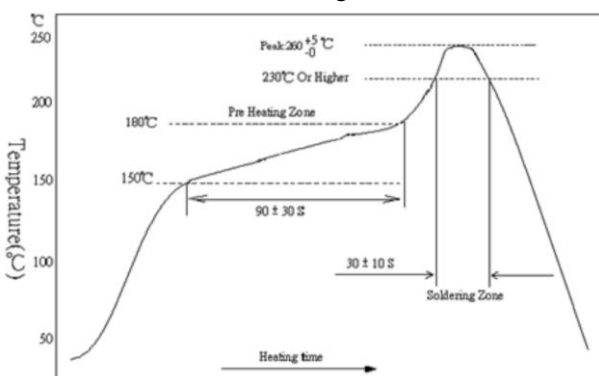
RELIABILITY

| Item | Test Method | Acceptable Criterion | | | | |
|---------------------------------|--|----------------------|------|------------|---------------|--------------|
| High Temperature Exposure | +155°C, 1000hrs., unpowered, measure the resistance change rate after test. Reference: AEC-Q200 Test 3, MIL-STD-202 Method 108 | ΔR/R=±1.0% | | | | |
| Temperature Cycling | -55~+155°C, soak time 30min, Transition Time :1minute, 1000 cycles Reference: AEC-Q200 Test 4, JESD22 Method JA-104 | ΔR/R=±2.0% | | | | |
| Humidity Bias | 85°C, 85%, 10% rated power, 1000H, after the test and stand 24H to measure the change rate of resistance value for components with specified operating voltages higher or equal to 500V, 10% of operating voltage Reference: AEC-Q200 TEST 7, MIL-STD-202 Method 103 | ΔR/R=±2.0% | | | | |
| High Temperature Operating Life | maximum specified operating temperature at 100% rated power without derating, 1000H, 90 min ON,30 min OFF Reference: AEC-Q200 Test 8, MIL-STD -202 Method 108 | ΔR/R=±2.0% | | | | |
| Resistance to Solvent | Immerse in isopropanol solvent at room temperature (23±5°C) for 5min, wipe 10 times with a hard toothbrush, repeat 3 times, take out and blow dry for examination Reference: AEC-Q200 Test 12, MIL-STD-202 Method 215 | No visible damage | | | | |
| Resistance to Soldering Heat | Reflow test, time above 217 °C is 60s-150s, time above 250 ± 5°C is 30±5s Reference: AEC-Q200 TEST 15, MIL-STD-202 Method 210 | ΔR/R=±1.0% | | | | |
| ESD | Human body mode, two discharges, positive and negative polarity once each | ΔR/R=±2.0% | | | | |
| | <table border="1"> <tr> <td>Size</td> <td>0402, 0603</td> <td>0805 and 1206</td> </tr> <tr> <td>Test Voltage</td> <td>1000V</td> <td>2000V</td> </tr> </table> Reference: AEC-Q200 Test 17, AEC-Q200-002 | | Size | 0402, 0603 | 0805 and 1206 | Test Voltage |
| Size | 0402, 0603 | 0805 and 1206 | | | | |
| Test Voltage | 1000V | 2000V | | | | |

| Item | Test Method | Acceptable Criterion | | | | | | |
|-----------------------------|---|---|------------------|------|-------|-----|-----|------------|
| Solderability | Pretreatment: dry heat 155°C, 4H, after take out, stand at room temperature for 2 hours. Test method B1: Dip the resistance in a tin furnace at 245±5°C for 5 seconds, then take it out and observe the solder area under a microscope; Test method D: 260±5°C, T=30+5/-0s. Reference: AEC-Q200 Test 18, J-STD-002 & IEC 60115-1 11.1.4.3 | Soldering coverage over 95% At the edge of terminal, the object underneath (e.g., white ceramic) shall not expose. | | | | | | |
| Electrical Characterization | $TCR(PPM/°C) = \frac{(R_2 - R_1)}{R_1 \times (T_2 - T_1)} \times 10^6$ R_1 : Resistance value tested at room temperature (Ω) R_2 : Resistance value tested at +125°C T_1 : Temperature at room temperature (°C) T_2 : Temperature at +125°C Reference: AEC-Q200 Test 19, IEC 60115-1 6.2 | ±50 PPM/°C | | | | | | |
| Board Flex | The SMD resistance was welded to the test board and bent with the standard pressure block. After standing for 60s under the corresponding deformation condition, the change rate of resistance value of the part was tested. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Size</td> <td style="width: 45%;">0402, 0603, 0805</td> <td style="width: 40%;">1206</td> </tr> <tr> <td>Depth</td> <td>5mm</td> <td>3mm</td> </tr> </table> Reference: AEC-Q200 TEST 21, AEC-Q200-005 | Size | 0402, 0603, 0805 | 1206 | Depth | 5mm | 3mm | ΔR/R=±1.0% |
| Size | 0402, 0603, 0805 | 1206 | | | | | | |
| Depth | 5mm | 3mm | | | | | | |
| Terminal Strength | Apply 1.8Kgf. external force (0402,1 Kgf.) on the side of the part to test the solder joint adhesion of the part Reference: AEC Q200-005 | No mechanical damage or peel-off of side end | | | | | | |
| Short Time Overload | Apply 2.5 times rated voltage or maximum overload voltage (whichever is the smallest) for 5 seconds. Reference: IEC 60115-1 8.1.4.2 | ΔR/R=±1.0% | | | | | | |
| Mechanical shock | Half sine wave, acceleration 100g's, each three times in X, Y and Z directions, pulse width 6ms. Reference: AEC-Q200 Test 13, MIL-STD -202 Method 213 | ΔR/R=±1.0% | | | | | | |
| Vibration | Frequency: 10Hz~2000Hz, acceleration: 5g's, X, Y, Z three directions, 12 cycles in each direction, a total of 36 cycles, a single cycle test for 20min. Reference: AEC-Q200 Test 14, MIL-STD -202 Method 204 | ΔR/R=±1.0% | | | | | | |
| Flammability | Protective layer flammability report or component needle flame test report Reference: AEC-Q200 Test 20, UL-94, IEC 60695-11-5 | Do not burn and cotton below do not ignite | | | | | | |
| Flame retardancy | 9V _{DC} to 32V _{DC} (clamp current 500A) in each increment 1V _{DC} for 1 hr. Reference: AEC-Q200 Test 24, AEC-Q200-001 | 1. Nonflammable and no explode 2. The temperature cannot be higher than 350°C for 10 seconds | | | | | | |
| Sulfide test | Put the test sample resistor in sulfur vapor, at a temperature of 105±2°C for 750hrs Reference: EIA-977 | ΔR/R=±4% | | | | | | |

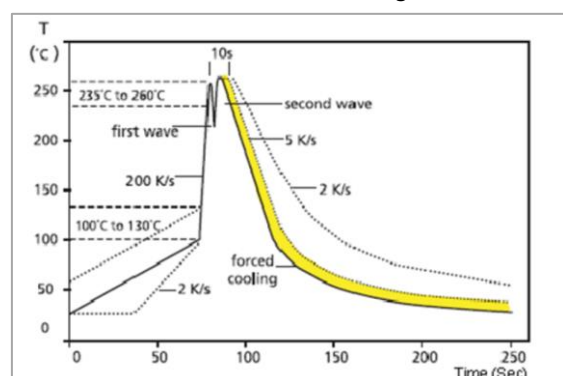
SOLDERING

Lead Free IR Reflow Soldering Profile



- Top temperature should be under 260⁺⁵₀ °C ,10 sec.
- Reference: J-STD-020D

Lead Free Double-Wave Soldering Profile



- Suitable for 0603 above size products
- 350±10°C within 3 Sec. if soldering iron.

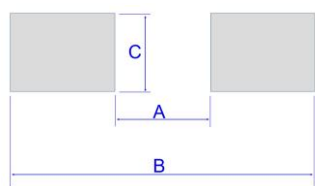
AC Series

Automotive Grade Low TCR Thick Film Chip Resistors

Version. B



SOLDERING PAD



| Type | A | B | C |
|--------|-----|-----|-----|
| AC0402 | 0.5 | 1.5 | 0.6 |
| AC0603 | 0.8 | 2.1 | 0.9 |
| AC0805 | 1.2 | 3.0 | 1.3 |
| AC1206 | 2.2 | 4.2 | 1.6 |

WORKING ENVIRONMENT

If user intends to use products in special environments or states (including but not limited to the following), it is necessary to approve special characteristics and reliability for the following or other application environments.

- High temperature.
- Near the sea, or corrosive gas, such as Cl_2 , H_2S , NH_3 , SO_2 and NO_2 , etc.
- Unverified liquids, such as water, oil, chemical or organic solvent.
- Unverified resin or paint to cover products.
- Products should be washed with water soluble cleaner even if non cleaning flux.

STORAGE / CARRY CONDITIONS

- Temperature: $25 \pm 5^\circ\text{C}$
- Humidity: $60 \pm 15\% \text{RH}$
- Storage life: 2 years. FIFO.
- Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or body may be damaged.

AC Series

Automotive Grade Low TCR Thick Film Chip Resistors

Version. B



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