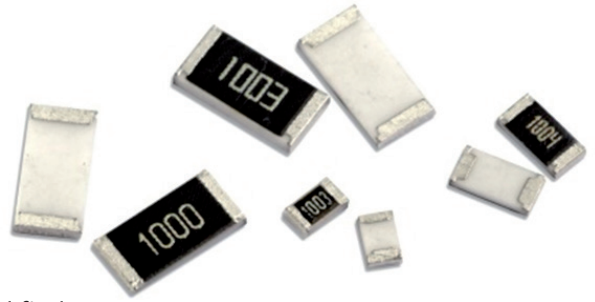


## Anti-Sulphur Precision Chip

### APC Series

- Precision thin film technology
- Two grades of sulphur protection
- Precision to  $\pm 0.05\%$  and  $\pm 10\text{ppm}/^\circ\text{C}$
- AEC-Q200 qualified option
- Anti-sulphur tested to EIA-977 cond. B & ASTM-B-809-95 modified



All parts are Pb-free and comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

### Summary of Types

| Range | Sulphur protection grade | Test applied           | AEC-Q200 qualified | High power option |
|-------|--------------------------|------------------------|--------------------|-------------------|
| SR    | Sulphur Resistant        | ASTM-B-809-95 modified |                    |                   |
| AS    | Anti-Sulphur             | EIA-977 cond. B        |                    |                   |

### Electrical Data – SR Range

| Type     | TCR (ppm/ $^\circ\text{C}$ ) | Power (W) | Limiting Element Voltage (V) | Ohmic Value Range |             |              |             |             |
|----------|------------------------------|-----------|------------------------------|-------------------|-------------|--------------|-------------|-------------|
|          |                              |           |                              | $\pm 0.05\%$      | $\pm 0.1\%$ | $\pm 0.25\%$ | $\pm 0.5\%$ | $\pm 1.0\%$ |
| APC0402R | 25, 50                       | 0.063     | 50                           | 10 – 100K         |             |              |             |             |
| APC0603R | 25, 50                       | 0.063     | 50                           | 4.7 – 330K        |             |              |             |             |
| APC0805R | 25, 50                       | 0.1       | 100                          | 10 – 1M           |             |              |             |             |
| APC1206R | 25, 50                       | 0.125     | 200                          | 10 – 1M           |             |              |             |             |
| APC1210R | 25, 50                       | 0.25      | 200                          | 10 – 1M           |             |              |             |             |
| APC2010R | 25, 50                       | 0.5       | 200                          | 10 – 1.5M         |             |              |             |             |
| APC2512R | 25, 50                       | 0.75      | 200                          | 10 – 1.5M         |             |              |             |             |

### Electrical Data – AS Range

| Type     | TCR (ppm/°C)   | Power (W) | Limiting Element Voltage (V) | Ohmic Value Range |              |        |       |       |
|----------|----------------|-----------|------------------------------|-------------------|--------------|--------|-------|-------|
|          |                |           |                              | ±0.05%            | ±0.1%        | ±0.25% | ±0.5% | ±1.0% |
| APC0402A | 10             | 0.063     | 25                           | 49.9 – 10K        |              |        |       |       |
|          | 15             |           |                              | 49.9 – 10K        | 49.9 – 69.8K |        |       |       |
|          | 25, 50         |           |                              | 49.9 – 10K        | 49.9 – 100K  |        |       |       |
| APC0603A | 10, 15, 25, 50 | 0.063     | 50                           | 10 – 49.9K        | 10 – 332K    |        |       |       |
| APC0805A | 10             | 0.1       | 100                          | 10 – 100K         | 10 – 511K    |        |       |       |
|          | 15, 25, 50     |           |                              |                   | 10 – 1M      |        |       |       |
| APC1206A | 10, 15, 25, 50 | 0.125     | 150                          | 10 – 200K         | 10 – 1M      |        |       |       |
| APC1210A | 10, 15, 25, 50 | 0.25      | 150                          | 10 – 499K         | 10 – 1M      |        |       |       |
| APC2010A | 10, 15, 25, 50 | 0.25      | 150                          | 10 – 499K         | 10 – 1M      |        |       |       |
| APC2512A | 10, 15, 25, 50 | 0.5       | 150                          | 10 – 499K         | 10 – 1M      |        |       |       |

### Electrical Data – AS High Power Range

| Type      | TCR (ppm/°C)   | Power (W) | Limiting Element Voltage (V) | Ohmic Value Range |           |        |       |       |  |
|-----------|----------------|-----------|------------------------------|-------------------|-----------|--------|-------|-------|--|
|           |                |           |                              | ±0.05%            | ±0.1%     | ±0.25% | ±0.5% | ±1.0% |  |
| APC0603AH | 10, 15, 25, 50 | 0.1       | 75                           | 10 – 49.9K        | 10 – 332K |        |       |       |  |
| APC0805AH | 10             | 0.125     | 150                          | 10 – 100K         | 10 – 511K |        |       |       |  |
|           | 15, 25, 50     |           |                              |                   | 10 – 1M   |        |       |       |  |
| APC1206AH | 10, 15, 25, 50 | 0.25      | 200                          | 10 – 200K         | 10 – 1M   |        |       |       |  |
| APC1210AH | 10, 15, 25, 50 | 0.33      | 200                          | 10 – 499K         | 10 – 1M   |        |       |       |  |
| APC2010AH | 10, 15, 25, 50 | 0.33      | 200                          | 10 – 499K         | 10 – 1M   |        |       |       |  |

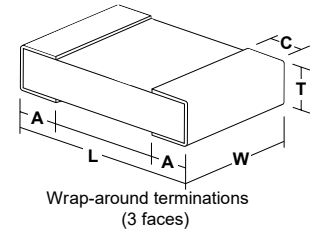
#### General Note

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## APC Series

### Physical Data

| Dimensions (mm) and weight (mg) |            |            |           |            |            |      |
|---------------------------------|------------|------------|-----------|------------|------------|------|
| Size                            | L          | W          | C         | A          | T          | Wt   |
| 0402                            | 1 ±0.1     | 0.5 ±0.05  | 0.3 ±0.15 | 0.25 ±0.1  | 0.35 ±0.05 | 0.54 |
| 0603                            | 1.55 ±0.1  | 0.8 ±0.1   | 0.3 ±0.2  | 0.3 ±0.2   | 0.45 ±0.1  | 1.8  |
| 0805                            | 2 ±0.15    | 1.25 ±0.15 | 0.3 ±0.2  | 0.4 ±0.2   | 0.55 ±0.1  | 4.7  |
| 1206                            | 3.05 ±0.15 | 1.55 ±0.15 | 0.42 ±0.2 | 0.35 ±0.25 | 0.55 ±0.1  | 9.0  |
| 1210                            | 3.1 ±0.15  | 2.6 ±0.15  | 0.5 ±0.2  | 0.5 ±0.25  | 0.55 ±0.1  | 10   |
| 2010                            | 4.9 ±0.15  | 2.5 ±0.15  | 0.6 ±0.3  | 0.6 ±0.25  | 0.55 ±0.1  | 24   |
| 2512                            | 6.3 ±0.15  | 3.2 ±0.15  | 0.6 ±0.3  | 0.9 ±0.25  | 0.55 ±0.1  | 38   |



### Construction

A thin-film material is selectively deposited on an alumina substrate together with metallic contacts at each end of the resistor. The unadjusted resistors are heat treated to give the required TCR and stability, then a precisely controlled laser trim process adjusts the resistance value. Epoxy protection is applied, and wrap-around terminations are added and plated. Each resistor is measured immediately before packing into tape.

### Marking

APC resistors size 0603 and larger are marked white on black with 3 or 4 characters indicating ohmic value. APC0402 is not marked.

### Performance Data

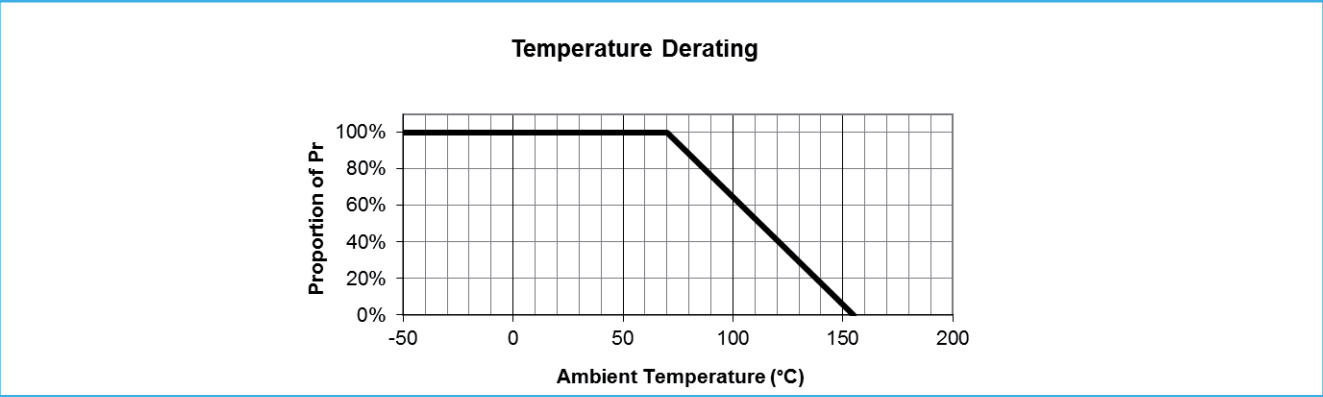
| Test                         | Condition                                        | SR Range<br>±ΔR%                | AS Range (AEC-Q200) ±ΔR%        |            |
|------------------------------|--------------------------------------------------|---------------------------------|---------------------------------|------------|
|                              |                                                  |                                 | 0.05% tol.                      | ≥0.1% tol. |
| High Temperature Exposure    | MIL-STD-202 Method 108                           | 0.3                             | 0.2                             |            |
| Temperature Cycling          | JESD22 Method JA-104                             | 0.3                             | 0.1                             |            |
| Biased Humidity              | MIL-STD-202 Method 103                           | 0.3                             | 0.1                             |            |
| Operational Life             | MIL-STD-202 Method 108                           | 0.3                             | ≤7K0: 0.05 >7K0: 0.2            | 0.2        |
|                              |                                                  |                                 | High Power range: 0.5           |            |
| Terminal Strength            | MIL-STD202 Method 211                            | No Damage                       | No Damage                       |            |
| Resistance to Solvents       | MIL-STD202 Method 215                            | Marking Legible                 | Marking Legible                 |            |
| Mechanical Shock             | MIL-STD202 Method 213                            | 0.25                            | 0.05                            | 0.1        |
| Vibration                    | MIL-STD202 Method 204                            | 0.1                             | 0.05                            | 0.1        |
| Resistance to Soldering Heat | MIL-STD-202 Method 210                           | 0.2                             | 0.05                            |            |
| ESD                          | AEC-Q200-002 or ISO/DIS 10605                    | -                               | 0.5                             |            |
| Solderability                | J-STD-002                                        | >95% covered, no visible damage | >95% covered, no visible damage |            |
| Flammability                 | UL-94                                            | -                               | No ignition                     |            |
| Board Flex                   | AEC Q200-005                                     | 0.1                             | 0.1                             |            |
| Short Term Overload          | 2.5xRCWV for 5seconds                            | 0.1                             | 0.05                            |            |
| Sulphur Test                 | EIA-977 cond. B<br>750hrs, 105°C, no humidity    | -                               | 1                               |            |
|                              | ASTM-B-809-95 modified<br>1000hrs, 105°C, 85% RH | 4                               | -                               |            |

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APC Series

Thermal Performance Data



Application Notes

APC resistors are ideally suited for handling by automatic methods due to their rectangular shape and the small dimensional tolerances. Electrical connection to a ceramic substrate or to a printed circuit board can be made by reflow or wave soldering of wrap-around terminations.

Wrap-around terminations provide good leach properties and ensure reliable contact. Due to the robust construction, the APC can be immersed in the solder bath for 30 seconds at 260°C. This enables the resistor to be mounted on one side of a printed circuit board and wire-led components applied on the other side.

Ordering Procedure

Example: APC1206AHY-1K54WT5 (1206, anti sulphur grade, high power range, 15ppm/°C, 1.54 kilohms ±0.05%, Pb-free)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | P | C | 1 | 2 | 0 | 6 | A | H | Y | - | 1 | K | 5 | 4 | W | T | 5 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |   |   |   |   |   |   |   |   |   |   |

| 1<br>Type | 2<br>Size | 3<br>Sulphur Grade | 4<br>Range        | 5<br>TCR      | 6<br>Value                                                            | 7<br>Tolerance | 8<br>Packing              |
|-----------|-----------|--------------------|-------------------|---------------|-----------------------------------------------------------------------|----------------|---------------------------|
| APC       | 0402      | A = AS Range       | Omit for Standard | T = ±10ppm/°C | E24 / E96<br>3/4 characters<br>R = ohms<br>K = kilohms<br>M = megohms | W = ±0.05%     | T10 0402 10,000/reel      |
|           | 0603      | R = SR Range       | H = High Power    | Y = ±15ppm/°C |                                                                       | B = ±0.1%      | T5 0603 to 1210 5000/reel |
|           | 0805      |                    |                   | D = ±25ppm/°C |                                                                       | C = ±0.25%     | T4 2010, 2512 4000/reel   |
|           | 1206      |                    |                   | C = ±50ppm/°C |                                                                       | D = ±0.5%      |                           |
|           | 1210      |                    |                   |               |                                                                       | F = ±1%        |                           |
|           | 2010      |                    |                   |               |                                                                       |                |                           |
|           | 2512      |                    |                   |               |                                                                       |                |                           |

Note – See Electrical Data for valid combinations of size, sulphur grade and range

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