

## Type RA73 Series

### Key Features

High thermal conductivity  
Aluminum-Nitride substrate.

High Power / Size ratio – Up  
to 1W in 0805 size.

Thin film precision  
resistors with TCR to  
25ppm and tolerances to  
0.1%.



### Applications

#### Power Supplies

#### Power Switching

#### Braking Systems

TE are pleased to introduce the new RA73 series.

This is a high stability precision Thin Film chip resistor range offering very high power / size ratio – up to 1W in 0805 size. The RA73 series offers TCR down to 25ppm/°C and resistance tolerances to 0.1%. Standard values are within the IEC 63 E96 and E24 value grids. The RA73 resistors have accurate and uniform physical dimensions to facilitate automatic placement methods.

### Electrical Characteristics

|                                |      |              |      |      |      |      |      |      |      |
|--------------------------------|------|--------------|------|------|------|------|------|------|------|
| Chip Size                      |      | 0603         |      |      |      |      |      |      |      |
| Rated Power @70°C              |      | 0.5W         |      |      |      |      |      |      |      |
| Resistance Range Ω             | Min. | 50R          | 50R  | 50R  | 50R  | 50R  | 50R  | 50R  | 50R  |
|                                | Max  | 30K1         | 30K1 | 30K1 | 30K1 | 30K1 | 30K1 | 30K1 | 30K1 |
| Tolerance                      |      | 0.1          |      | 0.25 |      | 0.50 |      | 1    |      |
| Code Letter                    |      | B            |      | C    |      | D    |      | F    |      |
| Selection series               |      | E24 & E96    |      |      |      |      |      |      |      |
| Temp. Coefficient (ppm/°C)     |      | 25           | 50   | 25   | 50   | 25   | 50   | 25   | 50   |
| Code Letter                    |      | F            | G    | F    | G    | F    | G    | F    | G    |
| Operating Voltage (Max)        |      | 75V          |      |      |      |      |      |      |      |
| Max. Overload Voltage          |      | 150V         |      |      |      |      |      |      |      |
| Operating Temp. Range          |      | -55 ~ +155°C |      |      |      |      |      |      |      |
| Insulation Resistance dry min. |      | >9999MΩ      |      |      |      |      |      |      |      |
| Stability                      |      | 1%           |      |      |      |      |      |      |      |

Power rating Dependant on component mounting by user

|                                |      |              |       |       |       |       |       |       |       |
|--------------------------------|------|--------------|-------|-------|-------|-------|-------|-------|-------|
| Chip Size                      |      | 0805         |       |       |       |       |       |       |       |
| Rated Power @70°C              |      | 1W           |       |       |       |       |       |       |       |
| Resistance Range Ω             | Min. | 50R          | 50R   | 50R   | 50R   | 50R   | 50R   | 50R   | 50R   |
|                                | Max  | 30.1K        | 30.1K | 30.1K | 30.1K | 30.1K | 30.1K | 30.1K | 30.1K |
| Tolerance                      |      | 0.1          |       | 0.25  |       | 0.50  |       | 1     |       |
| Code Letter                    |      | B            |       | C     |       | D     |       | F     |       |
| Selection series               |      | E24 & E96    |       |       |       |       |       |       |       |
| Temp. Coefficient (ppm/°C)     |      | 25           | 50    | 25    | 50    | 25    | 50    | 25    | 50    |
| Code Letter                    |      | F            | G     | F     | G     | F     | G     | F     | G     |
| Operating Voltage (Max)        |      | 100V         |       |       |       |       |       |       |       |
| Max. Overload Voltage          |      | 200V         |       |       |       |       |       |       |       |
| Operating Temp. Range          |      | -55 ~ +155°C |       |       |       |       |       |       |       |
| Insulation Resistance dry min. |      | >9999MΩ      |       |       |       |       |       |       |       |
| Stability                      |      | 1%           |       |       |       |       |       |       |       |

Power rating Dependant on component mounting by user

Operating Voltage=  $\sqrt{P \cdot R}$  or Max. Operating voltage listed above, whichever is lower

#### Environmental Characteristics

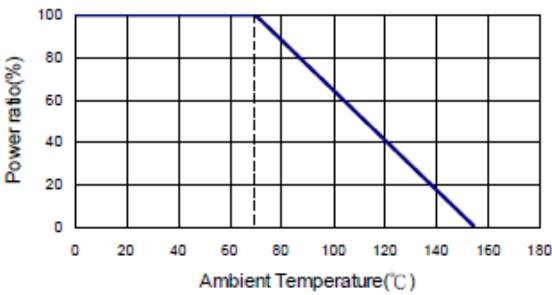
| Item                                        | Requirement                                                | Test Method                                                                                                                                                                                             |
|---------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient of Resistance (TCR) | As per TCRs specified in Electrical Characteristics tables | MIL-STD-202 Method 304<br>+25/-55/+25/+125/+25°C                                                                                                                                                        |
| Short Time Overload                         | $\Delta R \pm 0.5\%$                                       | Actual power handling capability is limited by the end user mounting process. As with any high power chip resistor the ability to remove the heat is critical to the overall performance of the device. |
| Insulation Resistance                       | >9999 MΩ                                                   | MIL-STD-202 Method 302<br>Apply 100VDC for 1 minute                                                                                                                                                     |
| Endurance                                   | $\Delta R \pm 0.1\%$                                       | MIL-STD-202 Method 108<br>70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"                                                                                                                 |
| Damp Heat with Load                         | $\Delta R \pm 0.4\%$                                       | MIL-STD-202 Method 103<br>40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"                                                                                                     |
| Solderability                               | 95% min. coverage                                          | MIL-STD-202 Method 208<br>245±5°C for 3 seconds                                                                                                                                                         |
| Resistance to Soldering Heat                | $\Delta R \pm 0.2\%$                                       | MIL-STD-202 Method 210E<br>260±5°C for 10 seconds                                                                                                                                                       |
| Low Temperature Operation                   | $\Delta R \pm 0.2\%$                                       | JIS-C-5201-1 4.36<br>1 hour, -65°C, followed by 45 minutes of RCWV                                                                                                                                      |
| High Temperature Exposure                   | $\Delta R \pm 0.2\%$                                       | MIL-STD-202 Method 108<br>At +155°C for 1000 hours                                                                                                                                                      |
| Thermal Shock                               | $\Delta R \pm 0.2\%$                                       | MIL-STD-202F Method 107<br>-55°C ~150°C, 100 cycles                                                                                                                                                     |

RCWV(Rated continuous working voltage)=  $\sqrt{P \cdot R}$  or Max. Operating voltage whichever is lower

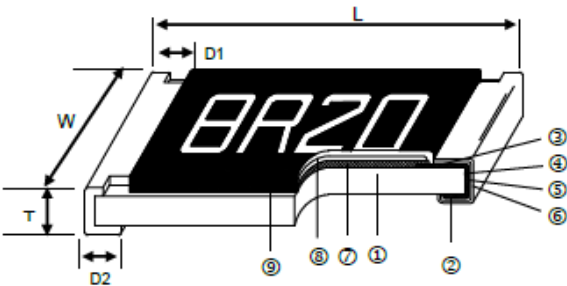
Reference Standards: MIL-SRD-202, JIS-C 5201

Storage Temperature: 25±3°C; Humidity < 80%RH

Derating Curve

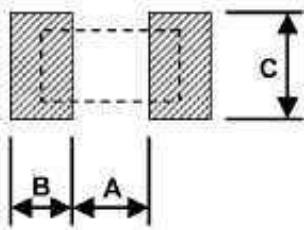


Construction and Dimensions



|   |                           |   |                    |   |                |
|---|---------------------------|---|--------------------|---|----------------|
| ① | Alumina Nitride Substrate | ④ | Edge Electrode     | ⑦ | Resistor Layer |
| ② | Bottom Electrode          | ⑤ | Barrier Layer      | ⑧ | Overcoat       |
| ③ | Top Electrode             | ⑥ | External Electrode | ⑨ | Marking        |

| Size | L (mm)    | W (mm)    | T (mm)    | D1 (mm)   | D2 (mm)   | Weight (g)<br>(1000 Pcs.) |
|------|-----------|-----------|-----------|-----------|-----------|---------------------------|
| 0603 | 1.55±0.10 | 0.80±0.10 | 0.43±0.15 | 0.30±0.15 | 0.50±0.20 | 1.73                      |
| 0805 | 2.00±0.15 | 1.25±0.15 | 0.43±0.15 | 0.35±0.15 | 0.60±0.20 | 3.95                      |



| Recommended Land Pattern |      |      |          |
|--------------------------|------|------|----------|
| Size                     | A    | B    | C        |
| 0603                     | 0.37 | 0.99 | 0.86±0.1 |
| 0805                     | 0.50 | 1.08 | 1.32±0.1 |

Use a board with a copper thickness of two ounces

## Marking

Case size 0805 IEC 4 Digit Marking:

|            |             |             |            |                |
|------------|-------------|-------------|------------|----------------|
| Resistance | 500R (500Ω) | 2K2 (2.2kΩ) | 10K (10kΩ) | 12.5K (12.5kΩ) |
| Code       | 5000        | 2201        | 1002       | 1252           |

Case Size 0603 E24 3 digit marking – Example 101 = 100R 102=1K0

|     |    |    |    |    |    |    |    |    |    |    |    |    |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|
| E24 | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 |
|     | 33 | 36 | 39 | 43 | 47 | 51 | 56 | 62 | 68 | 75 | 82 | 91 |

Case size 0603 E96 3 digit marking – Examples 14C = 13K7 68B = 4K99 68X = 49R9

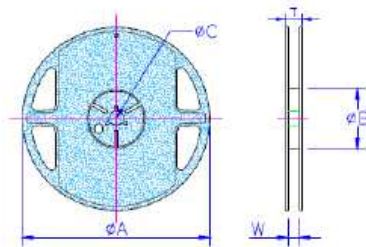
| Code | E96 | Code | E96 | Code | E96 | Code | E96 |
|------|-----|------|-----|------|-----|------|-----|
| 01   | 100 | 25   | 178 | 49   | 316 | 73   | 562 |
| 02   | 102 | 26   | 182 | 50   | 324 | 74   | 576 |
| 03   | 105 | 27   | 187 | 51   | 332 | 75   | 590 |
| 04   | 107 | 28   | 191 | 52   | 340 | 76   | 604 |
| 05   | 110 | 29   | 196 | 53   | 348 | 77   | 619 |
| 06   | 113 | 30   | 200 | 54   | 357 | 78   | 634 |
| 07   | 115 | 31   | 205 | 55   | 365 | 79   | 649 |
| 08   | 118 | 32   | 210 | 56   | 374 | 80   | 665 |
| 09   | 121 | 33   | 215 | 57   | 383 | 81   | 681 |
| 10   | 124 | 34   | 221 | 58   | 392 | 82   | 698 |
| 11   | 127 | 35   | 226 | 59   | 402 | 83   | 715 |
| 12   | 130 | 36   | 232 | 60   | 412 | 84   | 732 |
| 13   | 133 | 37   | 237 | 61   | 422 | 85   | 750 |
| 14   | 137 | 38   | 243 | 62   | 432 | 86   | 768 |
| 15   | 140 | 39   | 249 | 63   | 442 | 87   | 787 |
| 16   | 143 | 40   | 255 | 64   | 453 | 88   | 806 |
| 17   | 147 | 41   | 261 | 65   | 464 | 89   | 825 |
| 18   | 150 | 42   | 267 | 66   | 475 | 90   | 845 |
| 19   | 154 | 43   | 274 | 67   | 487 | 91   | 866 |
| 20   | 158 | 44   | 280 | 68   | 499 | 92   | 887 |
| 21   | 162 | 45   | 287 | 69   | 511 | 93   | 909 |
| 22   | 165 | 46   | 294 | 70   | 523 | 94   | 931 |
| 23   | 169 | 47   | 301 | 71   | 536 | 95   | 953 |
| 24   | 174 | 48   | 309 | 72   | 549 | 96   | 976 |

| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

Requests for non E24 and E96 values will be looked at and evaluated on a case by case basis, and where offered will be unmarked

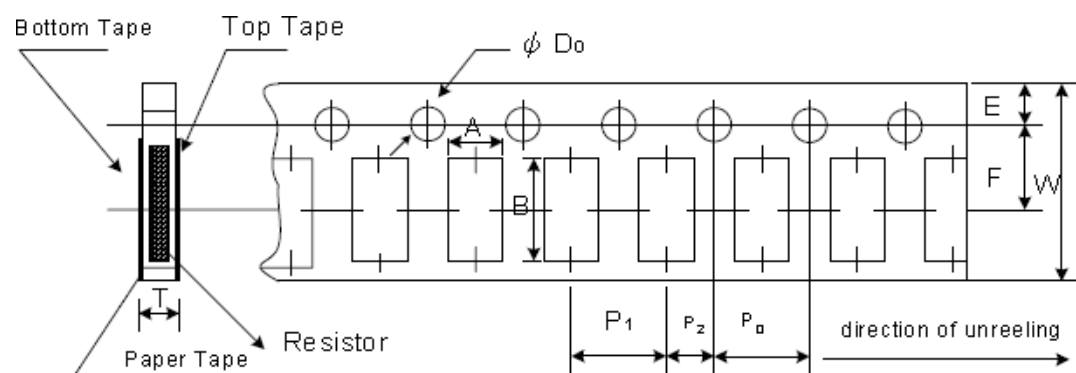
## Packaging

### Packing Quantity and Reel Specification



| Size | $\varnothing A \pm 1.0$ | $\varnothing B \pm 1.0$ | $\varnothing C \pm 0.7$ | $W \pm 1.0$ | $T \pm 1.0$ | Paper Tape  | Embossed Plastic Tape |
|------|-------------------------|-------------------------|-------------------------|-------------|-------------|-------------|-----------------------|
| 0603 | 178.0                   | 60.0                    | 13.5                    | 9.5         | 11.5        | 1000 / 5000 | -                     |
| 0805 |                         |                         |                         |             |             |             |                       |

### Paper tape Specification

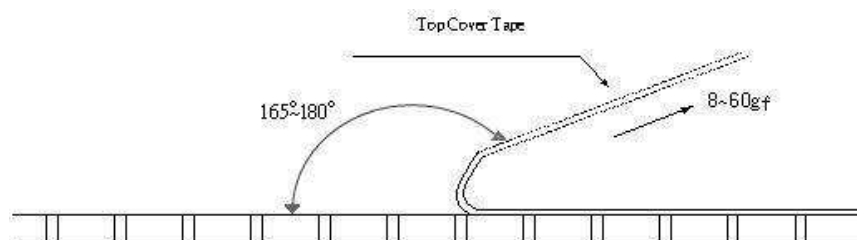


| Size | A<br>$\pm 0.05$ | B<br>$\pm 0.05$ | W<br>$\pm 0.10$ | E<br>$\pm 0.05$ | F<br>$\pm 0.05$ | P <sub>0</sub>     | P <sub>1</sub>     | P <sub>2</sub>     | $\varnothing D_0$  | T                  |
|------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 0603 | 1.10            | 1.90            | 8.00            | 1.75            | 3.5             | 4.00<br>$\pm 0.10$ | 4.00<br>$\pm 0.10$ | 2.00<br>$\pm 0.05$ | 1.55<br>$\pm 0.05$ | 0.60<br>$\pm 0.03$ |
| 0805 | 1.60            | 2.37            |                 |                 |                 |                    |                    |                    |                    | 0.75<br>$\pm 0.05$ |

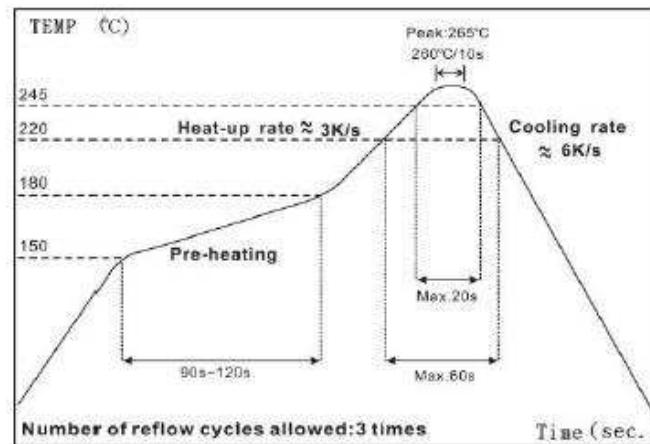
### Peel force of top cover tape

The peel speed shall be about 300mm/min $\pm 5\%$

The peel force of top cover tape shall be between 8gf to 60gf

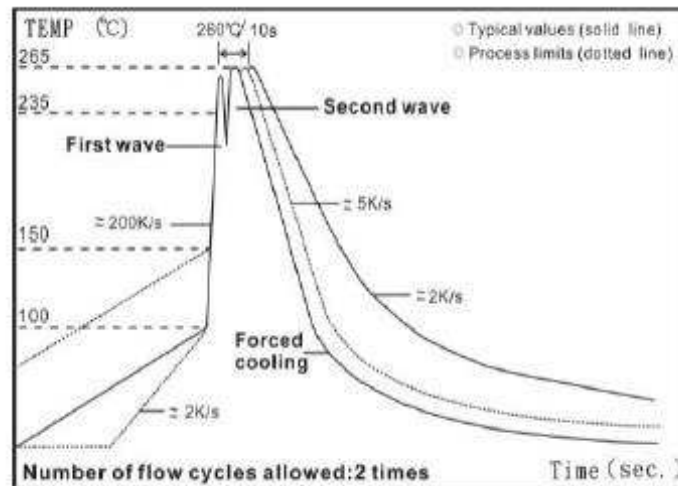


## Reflow Solder Profile



Time of Reflow soldering at maximum temperature point 260°C = 10s

## Wave Solder Profile



Time of Wave soldering at maximum temperature point 260°C = 10s

Time of Soldering Iron at maximum temperature point 410°C = 5s

## How To Order

| RA73                                                      | F                      | 1J                 | 100R                                        | B                                               | TD                            |
|-----------------------------------------------------------|------------------------|--------------------|---------------------------------------------|-------------------------------------------------|-------------------------------|
| Common Part                                               | TCR                    | Package Size       | Value                                       | Tolerance                                       | Packaging                     |
| RA73 – Aluminum Nitride precision thin film chip resistor | F - 25PPM<br>G - 50PPM | 1J:0603<br>2A:0805 | 100R - 100Ω<br>1K0 - 1000Ω<br>10K - 10,000Ω | B - ±0.1%<br>C - ±0.25%<br>D - ±0.5%<br>F - ±1% | TDF – 1K Reel<br>TD – 5K Reel |

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