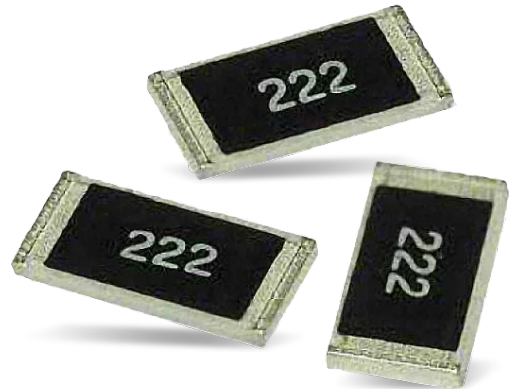


# SMD THIN FILM PRECISION RESISTORS - AEC-Q200 COMPLIANT

## TYPE RQ73 SERIES

### INTRODUCTION

TE Connectivity (TE) is proud to introduce this automotive grade thin film precision chip resistor, a sister to our highly successful RN73 range. The resistors are constructed in a high grade raw materials and laser trimmed to give precise tolerance figures. This, coupled with the tight TCR and anti-corrosive protection layer gives us a range of resistors which are ideal not just for automotive applications, but also for medical equipment, measuring instruments and industrial applications.



### FEATURES

- SMD TaN thin film resistor
- Special passivation layer on resistive element
- AEC-Q200 qualified
- Sulfur resistant
- RoHS Compliant

### CHARACTERISTICS - ELECTRICAL

| Type                                            | RQ73 1E         | RQ73 1J    | RQ73 2A    | RQ73 2B   |
|-------------------------------------------------|-----------------|------------|------------|-----------|
| Size                                            | 0402            | 0603       | 0805       | 1206      |
| Resistance tolerance                            | ±0.05%, ±0.1%   |            |            |           |
| Resistance Range                                | 40R - 35K       | 40R - 130K | 10R - 350K | 10R - 1MΩ |
| TCR (ppm/°C)                                    | ±10PPM/°C       |            |            |           |
| Power rating @ 85°C                             | 0.0625 W        | 0.166 W    | 0.2 W      | 0.5 W     |
| Max. Working Voltage (DC or RMS) <sup>1 2</sup> | 50 V            | 75 V       | 100 V      | 200 V     |
| Max. Overload Voltage (DC or RMS)               | 100 V           | 150 V      | 200 V      | 400 V     |
| Operating Temperature                           | -55 °C ~ 155 °C |            |            |           |

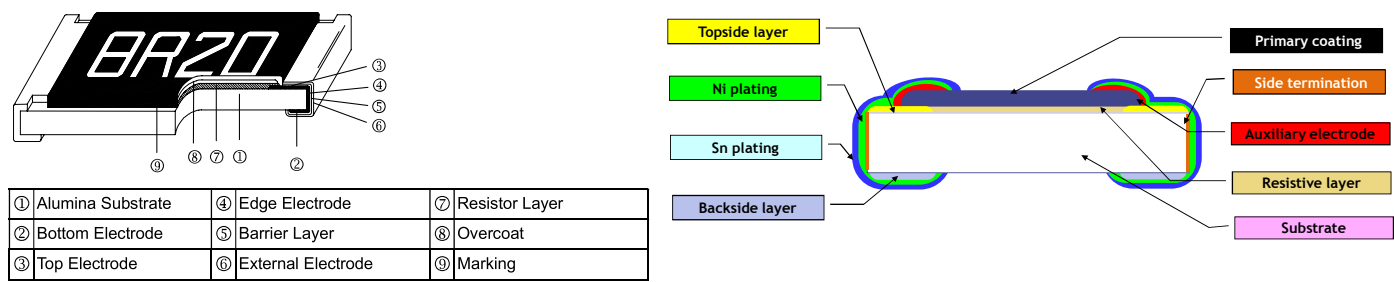
#### Notes:

1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"
2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by  $RCWV = \sqrt{(Rated\ Power \times Resistance\ Value)}$  or Max. RCWV listed above, whichever is lower.

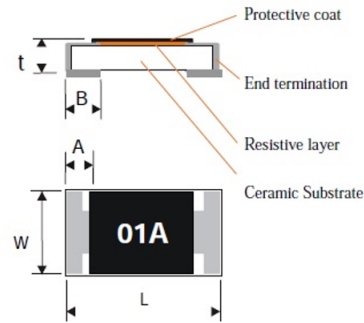
SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

CONSTRUCTION

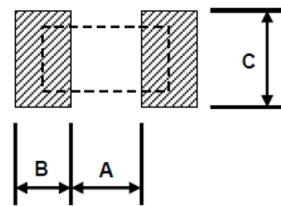


DIMENSIONS (Unit:mm)



| Type | RQ73 1E     | RQ73 1J     | RQ73 2A     | RQ73 2B     |
|------|-------------|-------------|-------------|-------------|
| L    | 1.00 ± 0.05 | 1.55 ± 0.10 | 2.00 ± 0.15 | 3.05 ± 0.15 |
| W    | 0.50 ± 0.05 | 0.80 ± 0.10 | 1.25 ± 0.15 | 1.55 ± 0.15 |
| A    | 0.20 ± 0.10 | 0.30 ± 0.20 | 0.30 ± 0.20 | 0.42 ± 0.20 |
| B    | 0.20 ± 0.10 | 0.30 ± 0.20 | 0.40 ± 0.20 | 0.35 ± 0.25 |
| t    | 0.30 ± 0.05 | 0.45 ± 0.10 | 0.55 ± 0.10 | 0.55 ± 0.10 |

RECOMMENDED LAND PATTERN

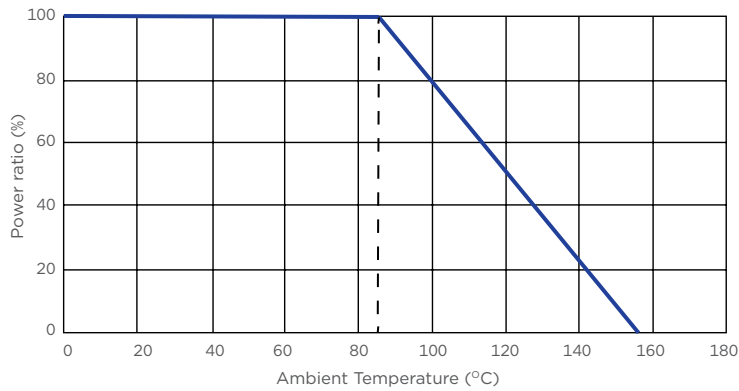


| Type | RQ73 1E    | RQ73 1J    | RQ73 2A    | RQ73 2B    |
|------|------------|------------|------------|------------|
| A    | 0.50       | 0.80       | 1.00       | 2.00       |
| B    | 0.50       | 1.00       | 1.00       | 1.15       |
| C    | 0.60 ± 0.2 | 0.90 ± 0.2 | 1.35 ± 0.2 | 1.70 ± 0.2 |

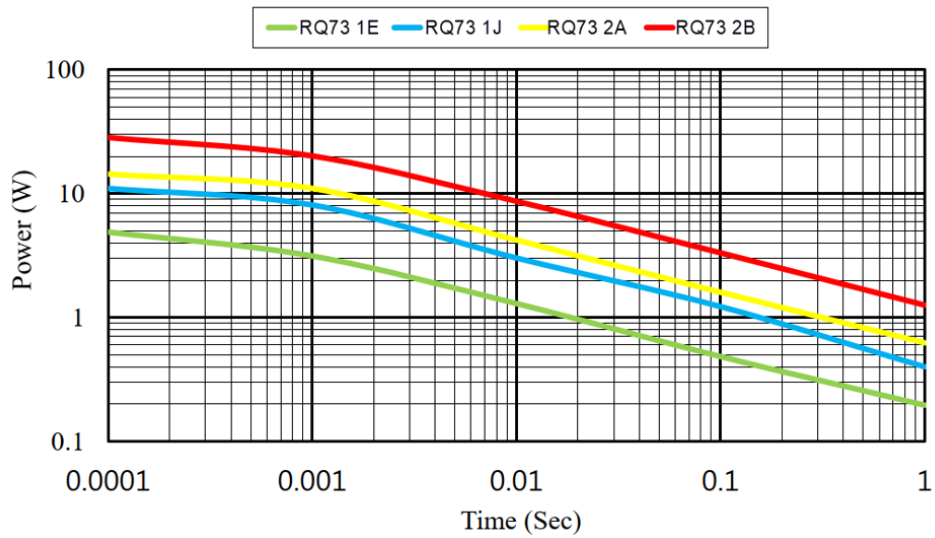
SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

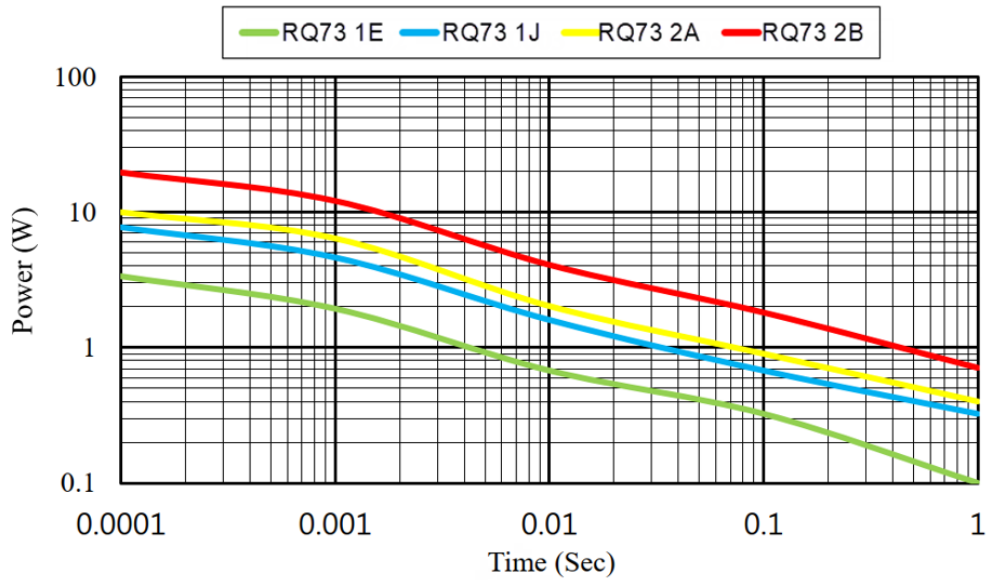
DERATING CURVE



SINGLE PULSE



CONTINUOUS PULSE



## SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

### ENVIRONMENTAL CHARACTERISTICS

| Test                                           | Procedure                                                                                                                                  | Requirement                     |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Temperature Coefficient of Resistance (T.C.R.) | JIS-C-5201-1 4.8<br>IEC-60115-1 4.8<br>-55 °C ~ +125 °C, 25 °C is the reference temperature                                                | As Spec.                        |
| Short time overload                            | JIS-C-5201-1 4.13<br>RCWV*2.5 or Max. overload voltage<br>whichever is lower for 5 seconds                                                 | $\Delta R \pm 0.1\%$            |
| Insulation resistance                          | JIS-C-5201-1 4.6<br>IEC-60115-1 4.6<br>Apply 100 VDC for 1 minute                                                                          | >1000 M $\Omega$                |
| Resistance to soldering heat                   | JIS-C-5201-1 4.18<br>IEC-60115-1 4.18<br>260 $\pm$ 5 °C for 10 seconds                                                                     | $\Delta R \pm 0.1\%$            |
| Solderability                                  | JIS-C-5201-1 4.17<br>IEC-60115-1 4.17<br>245 $\pm$ 5 °C for 3 seconds                                                                      | 95% min. coverage               |
| Temperature cycling                            | JESD22 Method JA-104<br>-55 °C to +125 °C, 1000 cycles<br>-55 °C to +155 °C, 1000 cycles                                                   | $\Delta R \pm 0.1\%$ for 125 °C |
|                                                |                                                                                                                                            | $\Delta R \pm 0.2\%$ for 155 °C |
| Bias humidity                                  | MIL-STD-202 Method 103<br>1000 hrs 85 °C / 85% RH 10% of operating power.                                                                  | $\Delta R \pm 0.1\%$            |
| Load life                                      | IEC60115-1 4.25<br>1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 85 $\pm$ 2 °C, 1.5 hours on and 0.5 hours off         | $\Delta R \pm 0.1\%$            |
| Operational life                               | MIL-STD-202 Method 108<br>Condition D Steady State TA = 125 °C at derated power.<br>Measurement at 24 $\pm$ 4 hours after test conclusion. | $\Delta R \pm 0.1\%$            |
| High temperature exposure                      | MIL-STD-202 Method 108<br>at +155 °C for 1000 hrs                                                                                          | $\Delta R \pm 0.15\%$           |
| Moisture resistance                            | MIL-STD-202 Method 106<br>65 $\pm$ 2°C, 80-100% RH, 10 cycles, 24 hours/cycle                                                              | $\Delta R \pm 0.1\%$            |
| Mechanical shock                               | MIL-STD-202 Method 213<br>Wave Form: Tolerance for half sine shock pulse.<br>Peak value is 100 g's. Normal duration(D) is 6.               | $\Delta R \pm 0.1\%$            |
| Vibration                                      | MIL-STD-202 Method 204<br>5 g's for 20 min., 12 cycles each of 3 orientations,<br>10-2000 Hz                                               | $\Delta R \pm 0.1\%$            |
| Terminal strength                              | AEC-Q200-006<br>Force of 1 kg for 60 seconds.                                                                                              | No Damage                       |
| Board flex                                     | JIS-C-5201-1 4.33<br>Bending 2 mm for 60 seconds                                                                                           | $\Delta R \pm 0.1\%$            |
| ESD                                            | AEC-Q200-002<br>Human body model<br>RQ0402, RQ0603 0.2KV classification level 1A<br>RQ0805, RQ1206 1KV classification level 1C             | $\Delta R \pm 0.1\%$            |
| Resistance to solvents                         | MIL-STD-202 Method 215<br>Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.                                | Marking unsmeared               |

## SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

### ENVIRONMENTAL CHARACTERISTICS

| Test         | Procedure                                                                                                                      | Requirement                                                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Flammability | UL-94<br>V-0 or V-1 are acceptable. Electrical test not required.                                                              | No ignition of the tissue paper or scorching or the pinewood board |
| Sulfur test  | ASTM-B-809-95<br>105 ±2 °C no power rating for 750 hrs                                                                         | ΔR ±1%                                                             |
| Endurance    | IEC60115-1 4.25<br>1000 = 48/-0 hours, loaded with RCWV or Vmax in chamber controller 85 ±2 °C, 1.5 hours on and 0.5 hours off | ΔR±0.1%                                                            |

### MARKING

0603 E24 series 3 Digits - first two digits denote significant figures of resistance and third digit denotes number of zeros thereafter.  
EG

|  |     |  |   |     |
|--|-----|--|---|-----|
|  | 222 |  | = | 2K2 |
|--|-----|--|---|-----|

0603 E96 series 3 Digits - The 1st two digit codes are referring to the CODE in the table, the 3rd code is the index of resistance value :

$$Y=10^{-2}, X=10^{-1}, A=10^0, B=10^1, C=10^2, D=10^3, E=10^4, F=10^5$$

EX : 17.8Ω=25X, 178Ω=25A, 1K78 =25B

17K8=25C, 178K=25D, 1M78=25E

| Code | R_value | Code | R_value | Code | R_value | Code | R_value | Code | R_value | Code | R_value | Code | R_value | Code | R_value |
|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|
| 1    | 100     | 13   | 133     | 25   | 178     | 37   | 237     | 49   | 316     | 61   | 422     | 73   | 562     | 85   | 750     |
| 2    | 102     | 14   | 137     | 26   | 182     | 38   | 243     | 50   | 324     | 62   | 432     | 74   | 576     | 86   | 768     |
| 3    | 105     | 15   | 140     | 27   | 187     | 39   | 249     | 51   | 332     | 63   | 442     | 75   | 590     | 87   | 787     |
| 4    | 107     | 16   | 143     | 28   | 191     | 40   | 255     | 52   | 340     | 64   | 453     | 76   | 604     | 88   | 806     |
| 5    | 110     | 17   | 147     | 29   | 196     | 41   | 261     | 53   | 34B     | 65   | 464     | 77   | 619     | 89   | 825     |
| 6    | 113     | 18   | 150     | 30   | 200     | 42   | 267     | 54   | 357     | 66   | 475     | 78   | 634     | 90   | 845     |
| 7    | 115     | 19   | 154     | 31   | 205     | 43   | 274     | 55   | 365     | 67   | 487     | 79   | 649     | 91   | 866     |
| 8    | 118     | 20   | 158     | 32   | 210     | 44   | 280     | 56   | 374     | 68   | 499     | 80   | 665     | 92   | 887     |
| 9    | 121     | 21   | 162     | 33   | 215     | 45   | 287     | 57   | 383     | 69   | 511     | 81   | 681     | 93   | 909     |
| 10   | 124     | 22   | 165     | 34   | 221     | 46   | 294     | 58   | 392     | 70   | 523     | 82   | 698     | 94   | 931     |
| 11   | 127     | 23   | 169     | 35   | 226     | 47   | 301     | 59   | 402     | 71   | 536     | 83   | 715     | 95   | 953     |
| 12   | 130     | 24   | 174     | 36   | 232     | 48   | 309     | 60   | 412     | 72   | 549     | 84   | 732     | 96   | 976     |

0805 & 1206 E24 and E96 4 digits - Where value is below 100R use R as decimal, otherwise three significant figures plus number of following zeros.

EG:

| Resistance      | 10Ω  | 12Ω  | 100Ω | 6K8  | 47K  |
|-----------------|------|------|------|------|------|
| 4 digit marking | 10R0 | 12R0 | 1000 | 6801 | 4702 |

#### Notes:

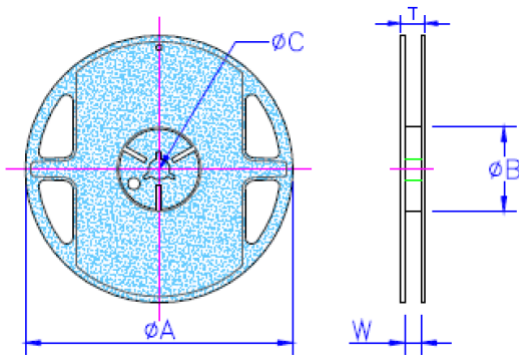
- No marking for non-E24/E96 resistance values.
- No marking for 0402 size resistors

SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

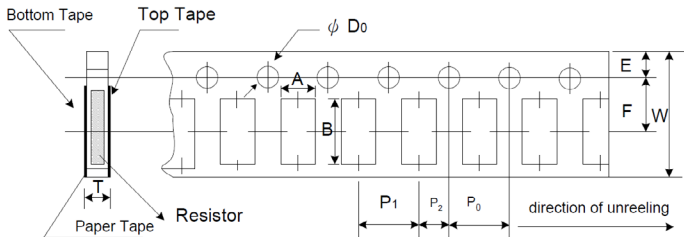
PACKAGING

Reel Dimensions (mm)



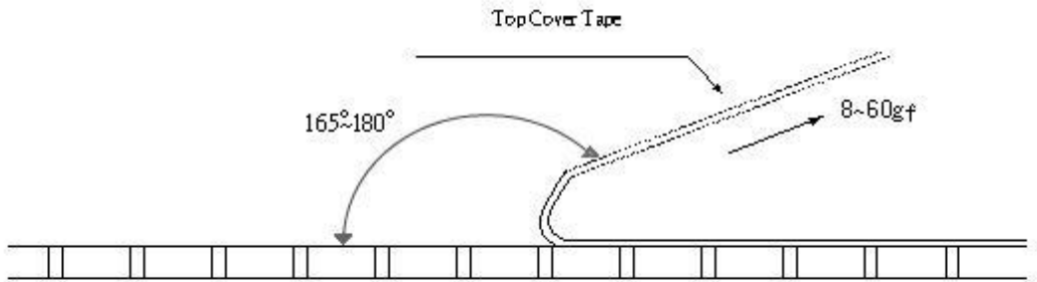
| ØA         | ØB        | ØC        | W        | T         | QTY         |
|------------|-----------|-----------|----------|-----------|-------------|
| 178.0 ±1.0 | 60.0 +1.0 | 13.5 ±0.7 | 9.5 ±1.0 | 11.5 ±1.0 | 1000 / 5000 |

Paper Tape Specification (mm)



|      | A             | B             | W             | E             | F            | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ØD <sub>0</sub> | T             |
|------|---------------|---------------|---------------|---------------|--------------|----------------|----------------|----------------|-----------------|---------------|
| 0402 | 0.70<br>±0.05 | 1.16<br>±0.05 | 8.00<br>±0.10 | 1.75<br>±0.05 | 3.5<br>±0.05 | 4.00<br>±0.10  | 2.00<br>±0.05  | 2.00<br>±0.05  | 1.55<br>±0.05   | 0.40<br>±0.03 |
| 0603 | 1.10<br>±0.05 | 1.90<br>±0.05 | 8.00<br>±0.10 | 1.75<br>±0.05 | 3.5<br>±0.05 | 4.00<br>±0.10  | 4.00<br>±0.10  | 2.00<br>±0.05  | 1.55<br>±0.05   | 0.60<br>±0.03 |
| 0805 | 1.60<br>±0.05 | 2.37<br>±0.05 | 8.00<br>±0.10 | 1.75<br>±0.05 | 3.5<br>±0.05 | 4.00<br>±0.10  | 4.00<br>±0.10  | 2.00<br>±0.05  | 1.55<br>±0.05   | 0.75<br>±0.05 |
| 1206 | 2.00<br>±0.05 | 3.55<br>±0.05 | 8.00<br>±0.10 | 1.75<br>±0.05 | 3.5<br>±0.05 | 4.00<br>±0.10  | 4.00<br>±0.10  | 2.00<br>±0.05  | 1.55<br>±0.05   | 0.75<br>±0.05 |

- Peel force of top cover tape
- The peel speed shall be about 300 mm/min ±5 %
- The peel force of top cover tape shall be between 8 gf to 60 gf



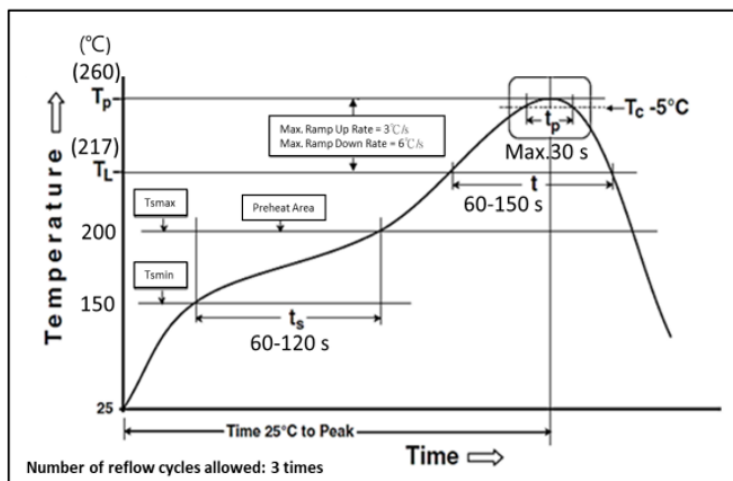
# SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

## STORAGE AND HANDLING CONDITION: MSL 1

1. Products are recommended to be used up within two years of manufacturing date. Check solderability in case shelf life extension is needed.
2. To store products with following condition: Temperature : 15 °C ~ 28 °C Humidity : < 80% relative humidity
3. Caution:
  - a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidation of electrode, which easily be resulted in poor soldering.
  - b. To store products on the shelf and avoid exposure to moisture.
  - c. Don't expose products to excessive shock, vibration, direct sunlight etc.

## SOLDERING PROFILE



| Reflow Profiles                                                                 |                          |
|---------------------------------------------------------------------------------|--------------------------|
| Profile Feature                                                                 | Pb-Free Assembly         |
| Preheat                                                                         |                          |
| Min. Temperature ( $T_{smin}$ )                                                 | 150 °C                   |
| Max. Temperature ( $T_{smax}$ )                                                 | 200 °C                   |
| Preheating time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ )                     | 60 seconds - 120 seconds |
| Ramp-up rate ( $T_L$ to $T_p$ )                                                 | 3 °C/second max.         |
| Liquidous temperature ( $T_L$ )                                                 | 217 °C                   |
| Time ( $t_L$ ) maintained above $T_L$                                           | 60 seconds - 150 seconds |
| Min. Peak temperature ( $T_{pmin}$ )                                            | 235 °C                   |
| Max. Peak temperature ( $T_{pmax}$ )                                            | 260 °C                   |
| Time ( $t_p$ ) within 5°C of the specified classification temperature ( $T_c$ ) | 30 seconds max.          |
| Ramp-down rate ( $T_p$ to $T_L$ )                                               | 6 °C/seconds max.        |
| Time 25°C to peak temperature                                                   | 8 minutes max.           |

## ORDERING INFORMATION

|                  |                 | Part Number |   |    |      |   |     |
|------------------|-----------------|-------------|---|----|------|---|-----|
|                  |                 | RQ73        | C | 1E | 40R2 | B | TDF |
| Common Part      |                 |             |   |    |      |   |     |
| RQ73 Common Part |                 |             |   |    |      |   |     |
| TCR              |                 |             |   |    |      |   |     |
| C                | 10 PPM/°C       |             |   |    |      |   |     |
| Size Code        |                 |             |   |    |      |   |     |
| 1E               | 0402            |             |   |    |      |   |     |
| 1J               | 0603            |             |   |    |      |   |     |
| 2A               | 0805            |             |   |    |      |   |     |
| 2B               | 1206            |             |   |    |      |   |     |
| Resistance Value |                 |             |   |    |      |   |     |
| 1 ohm            | 100R (100Ω)     |             |   |    |      |   |     |
| 1K ohm           | 1K0 (1000Ω)     |             |   |    |      |   |     |
| 100K ohm         | 100K (100,000Ω) |             |   |    |      |   |     |
| Tolerance        |                 |             |   |    |      |   |     |
| B                | .1%             |             |   |    |      |   |     |
| Packaging Spec.  |                 |             |   |    |      |   |     |
| TD               | Reel 5000       |             |   |    |      |   |     |
| TDF              | Reel 1000       |             |   |    |      |   |     |

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