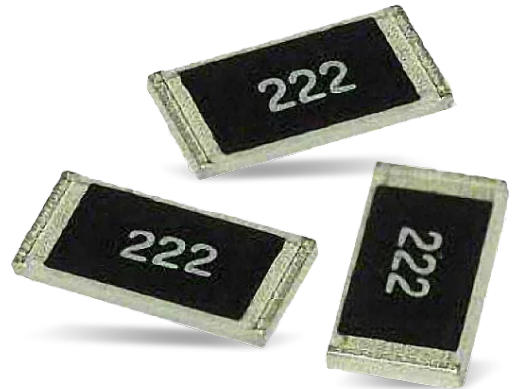


# SMD THIN FILM PRECISION RESISTORS - AEC-Q200 COMPLIANT

## 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
- Moisture Sensitive Level - MSL1

**Note:** SMD (Surface mount devices) resistors and inductors should be kept in their original packaging to protect them from ESD (Electrostatic Discharge). The full reels can be broken into smaller quantities, without exposing them to ESD, as long as the components are still in the plastic or paper tape. These resistors and inductors should not be removed from the plastic or paper tape unless they are in an ESD protected environment.

### 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 |            |            |           |

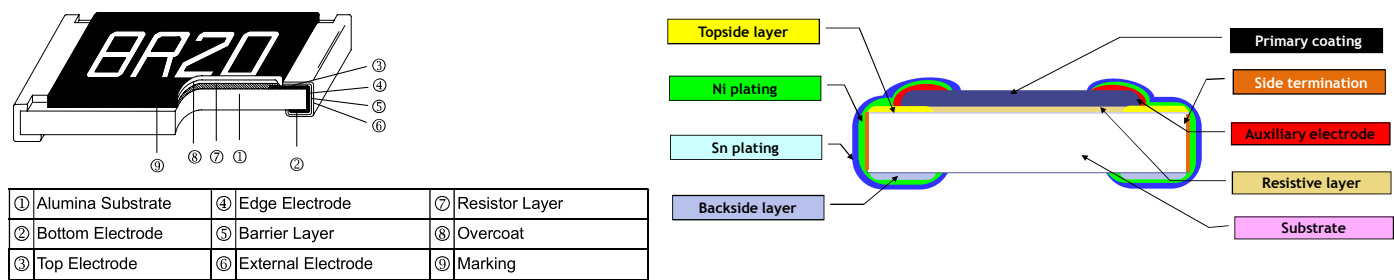
#### Notes:

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  $RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$  or Max. RCWV listed above, whichever is lower.

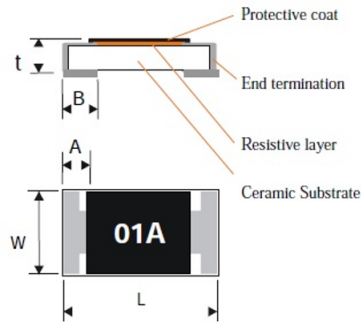
SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

CONSTRUCTION

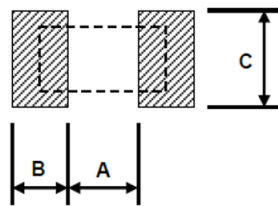


DIMENSIONS (Unit:mm)



| 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

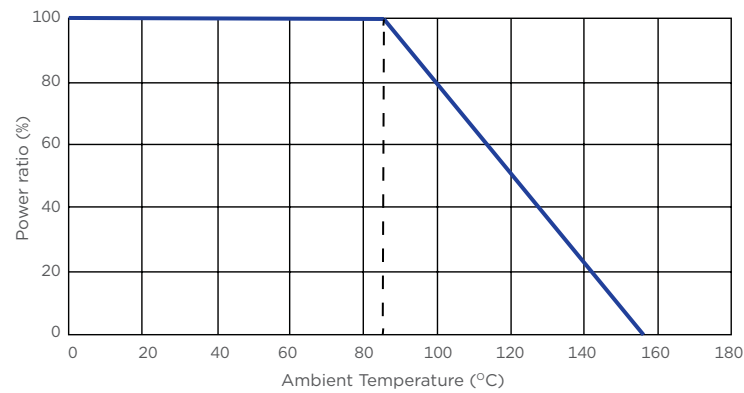


| Type | RQ73 1E    | RQ73 1J    | RQ73 2A    | RQ73 2B    |
|------|------------|------------|------------|------------|
| A    | 0.50       | 0.80       | 1.00       | 2.00       |
| B    | 0.50       | 1.00       | 1.00       | 1.15       |
| C    | 0.60 ± 0.2 | 0.90 ± 0.2 | 1.35 ± 0.2 | 1.70 ± 0.2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

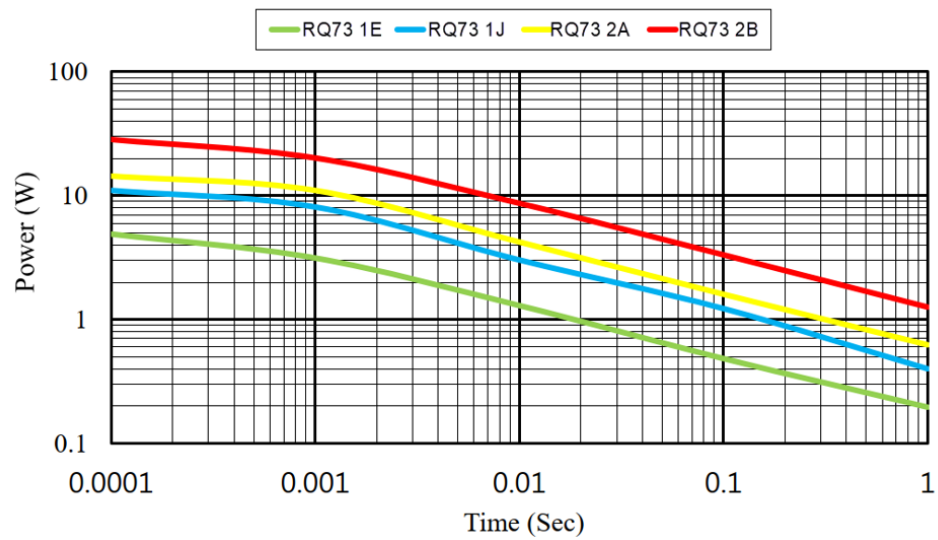
## SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

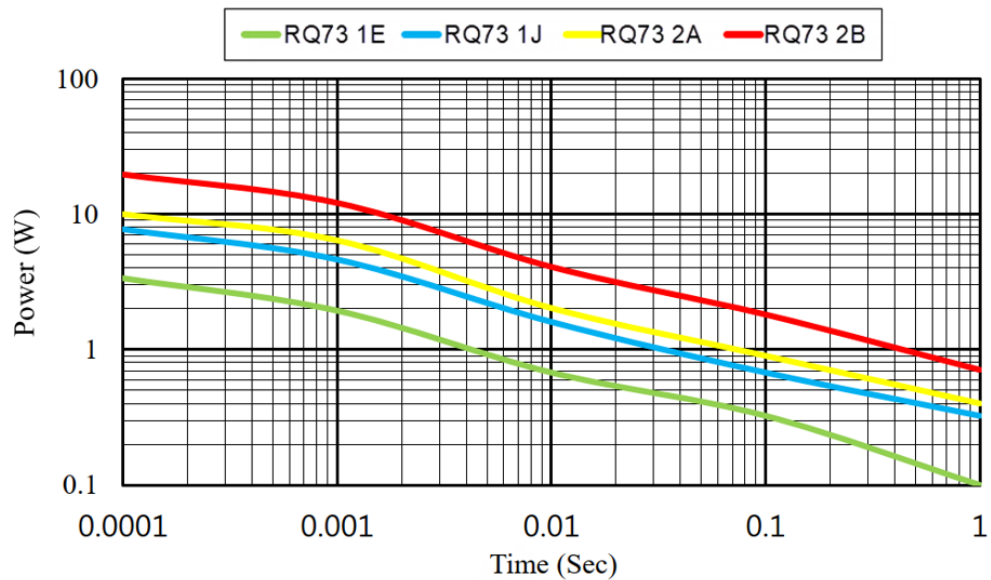
### DERATING CURVE



### 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:

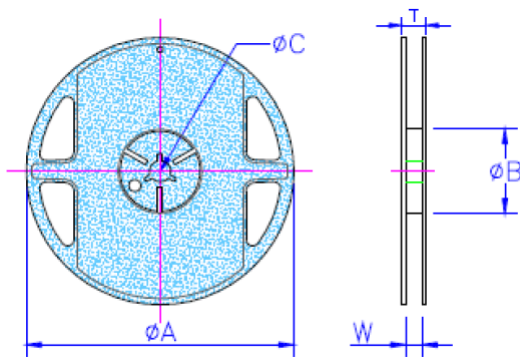
- No marking for non-E24/E96 resistance values.
- No marking for 0402 size resistors

SMD Thin Film Precision Resistors - AEC-Q200 Compliant

Type RQ73 series

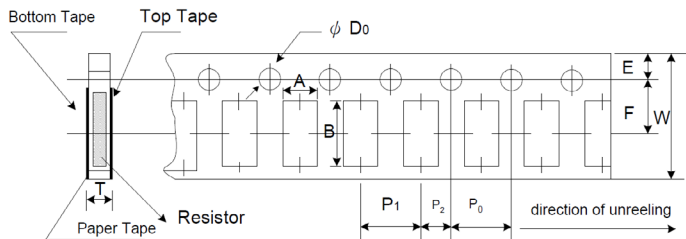
PACKAGING

Reel Dimensions (mm)



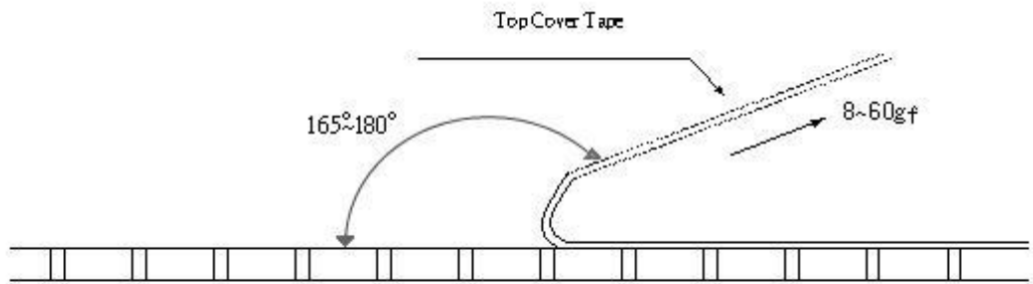
| ØA         | ØB        | ØC        | W        | T         | QTY         |
|------------|-----------|-----------|----------|-----------|-------------|
| 178.0 ±1.0 | 60.0 +1.0 | 13.5 ±0.7 | 9.5 ±1.0 | 11.5 ±1.0 | 1000 / 5000 |

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



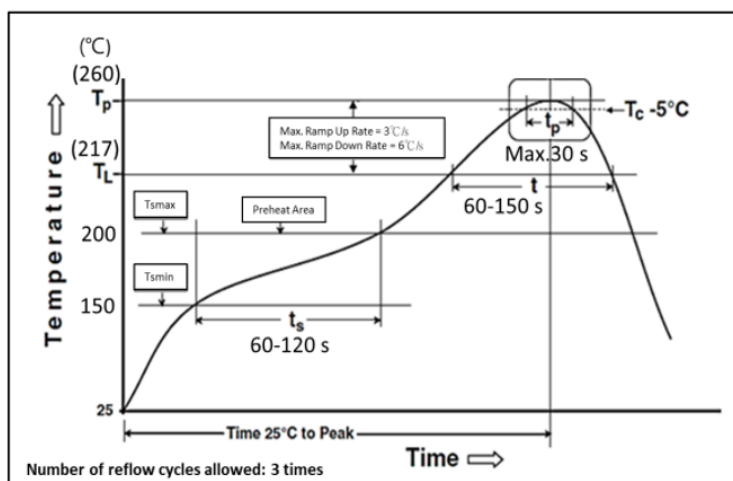
## SMD Thin Film Precision Resistors - AEC-Q200 Compliant

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 (Ts min)                                             | 150 °C                   |
| Max. Temperature (Ts max)                                             | 200 °C                   |
| Preheating time (ts) from (Ts min to Ts max)                          | 60 seconds - 120 seconds |
| Ramp-up rate (TL to Tp)                                               | 3 °C/second max.         |
| Liquidous temperature (TL)                                            | 217 °C                   |
| Time (TL) maintained above TL                                         | 60 seconds - 150 seconds |
| Min. Peak temperature (Tp min)                                        | 235 °C                   |
| Max. Peak temperature (Tp max)                                        | 260 °C                   |
| Time (tp) within 5°C of the specified classification temperature (Tc) | 30 seconds max.          |
| Ramp-down rate (Tp to TL)                                             | 6 °C/seconds max.        |
| Time 25°C to peak temperature                                         | 8 minutes max.           |

## ORDERING INFORMATION

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

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