

## Long Side Termination Thick Film Chip Resistors



### FEATURES

- Enhanced power rating
- Long side terminations
- Pure tin solder contacts on Ni barrier layer, provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- AEC-Q200 qualified



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL      | SIZE |          | RATED DISSIPATION<br>$P_{70}$<br>W | LIMITING ELEMENT VOLTAGE<br>$U_{max. AC/DC}$<br>V | TEMPERATURE COEFFICIENT<br>ppm/K | TOLERANCE<br>% | RESISTANCE RANGE<br>$\Omega$ | SERIES   |
|------------|------|----------|------------------------------------|---------------------------------------------------|----------------------------------|----------------|------------------------------|----------|
|            | INCH | METRIC   |                                    |                                                   |                                  |                |                              |          |
| RCL0612 e3 | 0612 | RR 1632M | 0.5                                | 75                                                | $\pm 100$                        | $\pm 1$        | 1R0 to 1M                    | E24; E96 |
|            |      |          |                                    |                                                   | $\pm 200$                        | $\pm 5$        |                              | E24      |
| RCL1218 e3 | 1218 | RR 3246M | 1.0                                | 200                                               | $\pm 100$                        | $\pm 1$        | 1R0 to 2.2M                  | E24; E96 |
|            |      |          |                                    |                                                   | $\pm 200$                        | $\pm 5$        |                              | E24      |
| RCL1225 e3 | 1225 | RR 3263M | 2.0 <sup>(1)</sup>                 | 200                                               | $\pm 100$                        | $\pm 1$        | 1R0 to 1M                    | E24; E96 |
|            |      |          |                                    |                                                   | $\pm 200$                        | $\pm 5$        |                              | E24      |

#### Notes

- These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.
  - Marking: See datasheet "Surface Mount Resistor Marking" (document number 20020).
  - Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.
- <sup>(1)</sup> Specified power rating requires dedicated mounting conditions to achieve the required thermal resistance.

### TECHNICAL SPECIFICATIONS

| DESCRIPTION                                  | UNIT               | RCL0612       | RCL1218 | RCL1225            |
|----------------------------------------------|--------------------|---------------|---------|--------------------|
| Rated Dissipation $P_{70}$ <sup>(2)</sup>    | W                  | 0.5           | 1.0     | 2.0 <sup>(3)</sup> |
| Limiting Element Voltage<br>$U_{max. AC/DC}$ | V                  | 75            | 200     | 200                |
| Insulation Voltage $U_{ins}$ (1 min)         | V                  | > 100         | > 300   | > 300              |
| Insulation Resistance                        | $\Omega$           | > $10^9$      |         |                    |
| Category Temperature Range                   | $^{\circ}\text{C}$ | - 55 to + 155 |         |                    |
| Weight                                       | mg                 | 11            | 29.5    | 55                 |

#### Notes

- <sup>(2)</sup> The power dissipation on the resistors generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 155  $^{\circ}\text{C}$  is not exceeded.
- <sup>(3)</sup> Specified power rating requires dedicated mounting conditions to achieve the required thermal resistance.

## PART NUMBER AND PRODUCT DESCRIPTION

PART NUMBER: RCL061210K0FKEA

R C L 0 6 1 2 1 0 K 0 F K E A 0 0

| MODEL/SIZE                    | RESISTANCE                                                  | TOLERANCE                                    | TCR                                                      | PACKAGING                  | SPECIAL                         |
|-------------------------------|-------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------|----------------------------|---------------------------------|
| RCL0612<br>RCL1218<br>RCL1225 | R = Decimal<br>K = Thousand<br>M = Million<br>0000 = Jumper | F = $\pm 1\%$<br>J = $\pm 5\%$<br>Z = Jumper | K = $\pm 100$ ppm/K<br>N = $\pm 200$ ppm/K<br>0 = Jumper | EA<br>EB<br>EC<br>EK<br>EG | Up to 2 digits<br>00 = Standard |

PRODUCT DESCRIPTION: RCL0612 100 10K 1% ET1 e3

| RCL0612                                | 100                                       | 10K                                                                                          | 1%                                  | ET1                                          | e3                                                 |
|----------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------|----------------------------------------------------|
| MODEL<br>RCL0612<br>RCL1218<br>RCL1225 | TCR<br>$\pm 100$ ppm/K<br>$\pm 200$ ppm/K | RESISTANCE<br>10R = $10\ \Omega$<br>10K = $10\ k\Omega$<br>1M = $1\ M\Omega$<br>0R0 = Jumper | TOLERANCE<br>$\pm 1\%$<br>$\pm 5\%$ | PACKAGING<br>ET1<br>ET5<br>ET6<br>ET9<br>E67 | LEAD (Pb)-FREE<br>e3 = Pure tin termination finish |

## PACKAGING

| MODEL   | UNIT          | PAPER TAPE ON REEL<br>ACC. TO IEC 60286-3, TYPE I |             |               | BLISTER TAPE ON REEL<br>ACC. TO IEC 60286-3, TYPE II |             |               |
|---------|---------------|---------------------------------------------------|-------------|---------------|------------------------------------------------------|-------------|---------------|
|         |               | QUANTITY                                          | PART NUMBER | PRODUCT DESC. | QUANTITY                                             | PART NUMBER | PRODUCT DESC. |
| RCL0612 | 180 mm/7"     | 5000                                              | EA          | ET1           |                                                      |             |               |
|         | 285 mm/11.25" | 10 000                                            | EB          | ET5           |                                                      |             |               |
|         | 330 mm/13"    | 20 000                                            | EC          | ET6           |                                                      |             |               |
| RCL1218 | 180 mm/7"     |                                                   |             |               | 4000                                                 | EK          | ET9           |
| RCL1225 | 180 mm/7"     |                                                   |             |               | 2000                                                 | EG          | E67           |

## DIMENSIONS in millimeters



| SIZE |        | DIMENSIONS            |                |                 |                 |                 | SOLDER PAD DIMENSIONS |     |     |                |     |     |
|------|--------|-----------------------|----------------|-----------------|-----------------|-----------------|-----------------------|-----|-----|----------------|-----|-----|
|      |        |                       |                |                 |                 |                 | REFLOW SOLDERING      |     |     | WAVE SOLDERING |     |     |
| INCH | METRIC | L                     | W              | H               | T1              | T2              | a                     | b   | l   | a              | b   | l   |
| 0612 | 1632   | $1.6 \pm 0.2$         | $3.2 \pm 0.2$  | $0.55 \pm 0.1$  | $0.35 \pm 0.15$ | $0.25 \pm 0.15$ | 0.6                   | 3.2 | 1.0 | 1.1            | 3.2 | 1.0 |
| 1218 | 3246   | $3.2^{+0.10}_{-0.20}$ | $4.6 \pm 0.15$ | $0.55 \pm 0.05$ | $0.45 \pm 0.2$  | $0.4 \pm 0.2$   | 1.1                   | 4.9 | 1.9 | 1.25           | 4.8 | 1.9 |
| 1225 | 3263   | $3.2 \pm 0.2$         | $6.3 \pm 0.2$  | $0.75 \pm 0.15$ | $0.8 \pm 0.2$   | $0.4 \pm 0.2$   | 1.9                   | 7.6 | 1.2 | 1.9            | 7.6 | 1.2 |

**FUNCTIONAL PERFORMANCE**
**Single Pulse**

**Continuous Pulse**

**Pulse Voltage**


## Derating



## TEST PROCEDURES AND REQUIREMENTS

| EN<br>60115-1<br>CLAUSE |                       | IEC<br>60068-2<br>TEST<br>METHOD | TEST                                                                                                                | PROCEDURE                                                                              | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ ) |  |
|-------------------------|-----------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------|--|
|                         |                       |                                  |                                                                                                                     |                                                                                        | STABILITY CLASS 2 OR BETTER                       |  |
|                         |                       |                                  | Stability for product types:                                                                                        |                                                                                        |                                                   |  |
|                         |                       |                                  | RCL e3                                                                                                              | 1 $\Omega$ to 2.2 M $\Omega$                                                           |                                                   |  |
| 4.5                     | -                     | Resistance                       | -                                                                                                                   | $\pm 1 \%$                                                                             | $\pm 5 \%$                                        |  |
| 4.7                     | -                     | Voltage proof                    | $U = 1.4 \times U_{\text{ins}}$ ; 60 s                                                                              | No flashover or breakdown                                                              |                                                   |  |
| 4.13                    | -                     | Short time overload              | $U = 2.5 \times \sqrt{P_{70} \times R}$<br>$\leq 2 \times U_{\text{max}}$ ;<br>Duration acc. to style               | $\pm (0.25 \% R + 0.05 \Omega)$                                                        | $\pm (0.5 \% R + 0.05 \Omega)$                    |  |
| 4.17.2                  | 58 (Td)               | Solderability                    | Solder bath method;<br>Sn60Pb40<br>non activated flux;<br>(235 $\pm$ 5) $^{\circ}\text{C}$<br>(2 $\pm$ 0.2) s       | Good tinning ( $\geq 95 \%$ covered);<br>no visible damage                             |                                                   |  |
|                         |                       |                                  | Solder bath method;<br>Sn96.5Ag3Cu0.5<br>non-activated flux;<br>(245 $\pm$ 5) $^{\circ}\text{C}$<br>(3 $\pm$ 0.3) s | Good tinning ( $\geq 95 \%$ covered);<br>no visible damage                             |                                                   |  |
| 4.8.4.2                 | -                     | Temperature<br>coefficient       | (20/- 55/20) $^{\circ}\text{C}$ and<br>(20/125/20) $^{\circ}\text{C}$                                               | $\pm 100 \text{ ppm/K}$                                                                | $\pm 200 \text{ ppm/K}$                           |  |
| 4.32                    | 21 (Uu <sub>3</sub> ) | Shear<br>(adhesion)              | 45N                                                                                                                 | No visible damage                                                                      |                                                   |  |
| 4.33                    | 21 (Uu <sub>1</sub> ) | Substrate bending                | Depth 2 mm;<br>3 times                                                                                              | No visible damage, no open circuit in bent position<br>$\pm (0.25 \% R + 0.05 \Omega)$ |                                                   |  |
| 4.19                    | 14 (Na)               | Rapid change of<br>temperature   | 30 min at - 55 $^{\circ}\text{C}$ ;<br>30 min at 125 $^{\circ}\text{C}$                                             |                                                                                        |                                                   |  |
|                         |                       |                                  | 5 cycles                                                                                                            | $\pm (0.25 \% R + 0.05 \Omega)$                                                        | $\pm (0.5 \% R + 0.05 \Omega)$                    |  |
|                         |                       |                                  | 1000 cycles                                                                                                         | $\pm (1 \% R + 0.05 \Omega)$                                                           | $\pm (1 \% R + 0.05 \Omega)$                      |  |

| TEST PROCEDURES AND REQUIREMENTS                                 |                                                            |                                                                                                                 |                                                                                                                                                                                          |                                                                |                                                            |
|------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------|
| EN<br>60115-1<br>CLAUSE                                          | IEC<br>60068-2<br>TEST<br>METHOD                           | TEST                                                                                                            | PROCEDURE                                                                                                                                                                                | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ )              |                                                            |
|                                                                  |                                                            |                                                                                                                 |                                                                                                                                                                                          | STABILITY CLASS 2 OR BETTER                                    |                                                            |
|                                                                  |                                                            |                                                                                                                 | Stability for product types:                                                                                                                                                             | 1 $\Omega$ to 2.2 M $\Omega$                                   |                                                            |
|                                                                  |                                                            |                                                                                                                 | RCL e3                                                                                                                                                                                   |                                                                |                                                            |
| 4.23<br>4.23.2<br>4.23.3<br>4.23.4<br>4.23.5<br>4.23.6<br>4.23.7 | -<br>2 (Ba)<br>30 (Db)<br>1 (Aa)<br>13 (M)<br>30 (Db)<br>- | Climatic sequence:<br>Dry heat<br>Damp heat, cyclic<br>Cold<br>Low air pressure<br>Damp heat, cyclic<br>DC load | -<br>125 °C; 16 h<br>55 °C; $\geq 90$ % RH;<br>24 h; 1 cycle<br>- 55 °C; 2 h<br>1 kPa; (25 $\pm$ 10) °C; 1 h<br>55 °C; $\geq 90$ % RH;<br>24 h; 5 cycles<br>$U = \sqrt{P_{70}} \times R$ | $\pm (1 \% R + 0.05 \Omega)$                                   | $\pm (2 \% R + 0.1 \Omega)$                                |
| 4.25.1                                                           | -                                                          | Endurance<br>at 70 °C                                                                                           | $U = \sqrt{P_{70}} \times R \leq U_{\max.}$ ;<br>1.5 h on; 0.5 h off;<br>70 °C; 1000 h<br>70 °C; 8000 h                                                                                  | $\pm (0.5 \% R + 0.05 \Omega)$<br>$\pm (1 \% R + 0.05 \Omega)$ | $\pm (2 \% R + 0.1 \Omega)$<br>$\pm (4 \% R + 0.1 \Omega)$ |
| 4.18.2                                                           | 58 (Td)                                                    | Resistance to<br>soldering heat                                                                                 | Solder bath method<br>(260 $\pm$ 5) °C;<br>(10 $\pm$ 1) s                                                                                                                                | $\pm (0.25 \% R + 0.05 \Omega)$                                | $\pm (0.5 \% R + 0.05 \Omega)$                             |
| 4.35                                                             | -                                                          | Flamability,<br>needle flame test                                                                               | IEC 60695-11-5;<br>10 s                                                                                                                                                                  | No burning after 30 s                                          |                                                            |
| 4.24                                                             | 78 (Cab)                                                   | Damp heat,<br>steady state                                                                                      | (40 $\pm$ 2) °C;<br>(93 $\pm$ 3) % RH;<br>56 days                                                                                                                                        | $\pm (1 \% R + 0.05 \Omega)$                                   |                                                            |
| 4.25.3                                                           | -                                                          | Endurance at<br>upper category<br>temperature                                                                   | 155 °C, 1000 h                                                                                                                                                                           | $\pm (1 \% R + 0.05 \Omega)$                                   | $\pm (2 \% R + 0.1 \Omega)$                                |
| 4.40                                                             | -                                                          | Electrostatic<br>discharge<br>(Human Body Model)                                                                | IEC 61340-3-1<br>3 pos. + 3 neg.<br>discharges;<br>ESD voltage: 1000 V                                                                                                                   | $\pm (1 \% R + 0.05 \Omega)$                                   |                                                            |
| 4.29                                                             | 45 (XA)                                                    | Component solvent<br>resistance                                                                                 | Isopropyl alcohol;<br>50 °C; method 2                                                                                                                                                    | No visible damage                                              |                                                            |
| 4.30                                                             | 45 (XA)                                                    | Solvent resistance<br>of marking                                                                                | Isopropyl alcohol;<br>50 °C; method 1,<br>toothbrush                                                                                                                                     | Marking legible,<br>no visible damage                          |                                                            |
| 4.22                                                             | 6 (Fc)                                                     | Vibration, endurance<br>by sweeping                                                                             | f = 10 Hz to 2000 Hz;<br>x, y, z $\leq 1.5$ mm;<br>A $\leq 200$ m/s <sup>2</sup> ;<br>10 sweeps per axis                                                                                 | $\pm (0.25 \% R + 0.05 \Omega)$                                | $\pm (0.5 \% R + 0.05 \Omega)$                             |
| 4.37                                                             | -                                                          | Periodic electric<br>overload                                                                                   | $U = \sqrt{15 \times P_{70} \times R}$<br>$\leq 2 \times U_{\max.}$ ;<br>0.1 s on; 2.5 s off;<br>1000 cycles                                                                             | $\pm (1 \% R + 0.05 \Omega)$                                   |                                                            |
| 4.27                                                             | -                                                          | Single pulse high<br>voltage overload,<br>10 $\mu$ s/700 $\mu$ s                                                | $\hat{U} = 10 \times \sqrt{P_{70} \times R}$<br>$\leq 2 \times U_{\max.}$ ;<br>10 pulses                                                                                                 | $\pm (1 \% R + 0.05 \Omega)$                                   |                                                            |

All tests are carried out in accordance with the following specifications:

- EN 60115-1, generic specification
- EN 140400, sectional specification
- EN 140401-802, detail specification
- IEC 60068-2-x environmental test procedures

Packaging of components is done in paper or blister tapes according to IEC 60286-3



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