



## Metal Film Resistors, Axial, Military/Established Reliability, MIL-PRF-39017 Qualified, Type RLR



### FEATURES

- Meets requirements of MIL-PRF-39017
- Failure rate: Verified failure rate (contact factory for current level)
- Epoxy coated construction provides superior moisture protection
- Traceability of materials and processing
- Monthly lot acceptance testing
- Very low noise (-40 dB)
- Extensive stocking program at distributors and factory in  $\pm 1\%$  and  $\pm 2\%$  tolerances
- Vishay Dale has complete capability to develop specific reliability programs designed to customer requirements

### STANDARD ELECTRICAL SPECIFICATIONS

| VISHAY DALE MODEL                  | MIL-PRF-39017 STYLE | MIL SPEC. SHEET | POWER RATING<br>70 °C<br>W | RESISTANCE RANGE <sup>(1)</sup><br>$\Omega$ | TOLERANCE<br>$\pm \%$ | TEMPERATURE COEFFICIENT<br>$\pm$ ppm/°C | MAXIMUM WORKING VOLTAGE <sup>(4)</sup><br>V | LIFE FAILURE RATE <sup>(2)</sup> |
|------------------------------------|---------------------|-----------------|----------------------------|---------------------------------------------|-----------------------|-----------------------------------------|---------------------------------------------|----------------------------------|
| ERL05,<br>ERL05..19 <sup>(3)</sup> | RLR05               | 05              | 0.125                      | 4.7 to 301K<br>302K to 1M                   | 1, 2                  | 100                                     | 200                                         | M, P, R, S<br>M, P, R            |
| ERL07,<br>ERL07..23 <sup>(3)</sup> | RLR07               | 01              | 0.25                       | 1 to 9.76<br>10 to 3.01M<br>3.02M to 10M    | 1, 2                  | 100                                     | 250                                         | M<br>M, P, R, S<br>M, P, R       |
| ERL20,<br>ERL20..11 <sup>(3)</sup> | RLR20               | 02              | 0.50                       | 4.3 to 3.01M                                | 1, 2                  | 100                                     | 350                                         | M, P, R, S                       |
| ERL32,<br>ERL32..1 <sup>(3)</sup>  | RLR32               | 03              | 1.0                        | 1 to 2.7M                                   | 1, 2                  | 100                                     | 500                                         | M, P, R                          |

### Notes

- <sup>(1)</sup> Extended Resistance Range: DSCC has created a series of drawings intended to support extended resistance ranges left otherwise void by the discontinuation of MIL-R-39008 RCR carbon composition resistors. Vishay Dale is listed as a resource on these drawings as follows:

| DSCC DRAWING NUMBER | VISHAY DALE MODEL                     | POWER RATING<br>$P_{70\text{ }^{\circ}\text{C}}$<br>W | RESISTANCE RANGE<br>$\Omega$ | TOLERANCE<br>$\pm \%$ | TEMPERATURE COEFFICIENT<br>$\pm$ ppm/°C | MAXIMUM WORKING VOLTAGE<br>V <sup>(4)</sup> |
|---------------------|---------------------------------------|-------------------------------------------------------|------------------------------|-----------------------|-----------------------------------------|---------------------------------------------|
| 98020               | ERL05..36, ERL05..37 <sup>(3)</sup>   | 0.125                                                 | 1.1M to 22M                  | 2, 5, 10              | 350                                     | 200                                         |
| 99011               | ERL07..100, ERL07..101 <sup>(3)</sup> | 0.25                                                  | 11M to 22M                   | 2, 5, 10              | 350                                     | 250                                         |
| 98021               | ERL20..36, ERL20..37 <sup>(3)</sup>   | 0.50                                                  | 3.3M to 22M                  | 2, 5, 10              | 350                                     | 350                                         |
| 98022               | ERL32..36, ERL32..37 <sup>(3)</sup>   | 1.0                                                   | 3M to 22M                    | 2, 5, 10              | 350                                     | 350                                         |
| 97004               | ERL62..1, ERL62..2 <sup>(3)</sup>     | 2.0                                                   | 10 to 2.7M<br>3M to 22M      | 1, 2, 5, 10           | 100<br>350                              | 500                                         |

- Low inductance: DSCC has created a drawing intended to support a resistor which exhibits low inductance over a frequency range of 1 MHz to 30 MHz. Vishay Dale is listed as a resource on these drawings as follows:

| DSCC DRAWING NUMBER | VISHAY DALE MODEL | POWER RATING<br>$P_{70\text{ }^{\circ}\text{C}}$<br>W | RESISTANCE RANGE<br>$\Omega$ | MAXIMUM INDUCTANCE<br>nH | TOLERANCE<br>$\pm \%$ | TEMPERATURE COEFFICIENT<br>$\pm$ ppm/°C | MAXIMUM WORKING VOLTAGE<br>V <sup>(4)</sup> |
|---------------------|-------------------|-------------------------------------------------------|------------------------------|--------------------------|-----------------------|-----------------------------------------|---------------------------------------------|
| 96002               | ERL07..62         | 0.25                                                  | 1 to 10<br>11 to 49.9        | 10<br>8                  | 1, 2                  | 100                                     | 250                                         |

These drawings can be viewed at: <http://www.landandmaritime.dla.mil/Programs/MilSpec/ListDwgs.aspx?DocTYPE=DSCCdwg>

- <sup>(2)</sup> Consult factory for current QPL failure rates

- <sup>(3)</sup> Hot solder dipped leads

- <sup>(4)</sup> Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less.

### TECHNICAL SPECIFICATIONS

| PARAMETER                   | UNIT            | CONDITION                                                                               |
|-----------------------------|-----------------|-----------------------------------------------------------------------------------------|
| Voltage Coefficient, max.   | ppm/V           | 5/V when measured between 10 % and full rated voltage                                   |
| Dielectric Strength         | V <sub>AC</sub> | RLR05 = 300; RLR07 and RLR20 = 500; RLR32 = 1000                                        |
| Insulations Resistance      | $\Omega$        | $\geq 10^9$ min. dry; $\geq 10^{11}$ min. after moisture test                           |
| Operating Temperature Range | °C              | -65 to +150                                                                             |
| Terminal Strength           | lb              | 2 lb pull test on RLR05; 5 lb pull test on all other sizes                              |
| Solderability               |                 | Continuous satisfactory coverage when tested in accordance with MIL-STD-202, method 208 |
| Weight                      | g               | RLR05 = 0.11; RLR07 = 0.35; RLR20 = 0.75; RLR32 = 1.05                                  |

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: RLR07C3001FRR36 (preferred part numbering format)

| MIL STYLE                        | LEAD MATERIAL               | RESISTANCE VALUE                                                                                                                                | TOLERANCE CODE         | FAILURE RATE                                                                    | PACKAGING                                                                                                                                                                                                                                               | SPECIAL                                                                                                                                                                                                                    |
|----------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RLR05<br>RLR07<br>RLR20<br>RLR32 | C = solderable/<br>weldable | 3 digit<br>significant<br>figure,<br>followed by<br>a multiplier<br>Use "R" for<br>values < 100 Ω<br>1R00 = 1 Ω<br>3302 = 33 kΩ<br>1005 = 10 MΩ | F = ± 1 %<br>G = ± 2 % | M = 1.0 %/1000 h<br>P = 0.1 %/1000 h<br>R = 0.01 %/1000 h<br>S = 0.001 %/1000 h | B14 = tin/lead, bulk<br>BSL = tin/lead, bulk,<br>single lot date code<br>R36 = tin/lead,<br>T/R (full, except 32's)<br>R64 = tin/lead,<br>T/R (full; 32's only)<br>RE6 = tin/lead,<br>T/R (1000 pieces)<br>RSL = tin/lead, T/R,<br>single lot date code | Blank = standard<br>(Dash number)<br>(Up to 3 digits)<br>From 1 to 999<br>as applicable<br>1 = hot solder<br>dip (32's)<br>11 = hot solder<br>dip (20's)<br>19 = hot solder<br>dip (05's)<br>23 = hot solder<br>dip (07's) |

Historical Part Number Example: RLR07C3001FR (will continue to be accepted)

| RLR07     | C             | 3001             | F              | R            | R36       |
|-----------|---------------|------------------|----------------|--------------|-----------|
| MIL STYLE | LEAD MATERIAL | RESISTANCE VALUE | TOLERANCE CODE | FAILURE RATE | PACKAGING |

**Note**

- For additional information on packaging, refer to the Through Hole Resistor Packaging document ([www.vishay.com/doc?31544](http://www.vishay.com/doc?31544)).

**DIMENSIONS** in inches (millimeters)

**Note**

- (1) Lead length for product in bulk pack. For product supplied in tape and reel, the actual lead length would be based on the body size, tape spacing and lead trim.

| VISHAY DALE MODEL | A                                              | B                              | C (Max.)         | D                                             | E                              |
|-------------------|------------------------------------------------|--------------------------------|------------------|-----------------------------------------------|--------------------------------|
| ERL05             | 0.150 ± 0.020<br>(3.81 ± 0.51)                 | 0.066 ± 0.008<br>(1.68 ± 0.21) | 0.187<br>(4.75)  | 0.016 ± 0.002<br>(0.41 ± 0.05)                | 1.25 ± 0.266<br>(31.75 ± 6.76) |
| ERL07             | 0.250 + 0.031 - 0.046<br>(6.35 + 0.79 - 1.17)  | 0.090 ± 0.008<br>(2.29 ± 0.21) | 0.300<br>(7.62)  | 0.025 ± 0.002<br>(0.64 ± 0.05)                | 1.50 ± 0.125<br>(38.10 ± 3.18) |
| ERL20             | 0.375 ± 0.041<br>(9.53 ± 1.04)                 | 0.138 ± 0.023<br>(3.51 ± 0.58) | 0.450<br>(11.43) | 0.032 ± 0.002<br>(0.81 ± 0.05)                | 1.50 ± 0.125<br>(38.10 ± 3.18) |
| ERL32             | 0.562 ± 0.031<br>(14.27 ± 0.79)                | 0.190 ± 0.015<br>(4.83 ± 0.38) | 0.625<br>(15.87) | 0.032 + 0.002 - 0.001<br>(0.81 + 0.05 - 0.03) | 1.50 ± 0.125<br>(38.10 ± 3.18) |
| ERL62             | 0.562 + 0.031 - 0.042<br>(14.27 + 0.79 - 1.07) | 0.230 ± 0.015<br>(5.84 ± 0.38) | 0.650<br>(16.51) | 0.032 + 0.002 - 0.001<br>(0.81 + 0.05 - 0.03) | 1.50 ± 0.125<br>(38.10 ± 3.18) |

**MATERIAL SPECIFICATIONS**

|               |                                                                                                   |
|---------------|---------------------------------------------------------------------------------------------------|
| Element       | Vacuum-deposited nickel-chrome alloy                                                              |
| Core          | Fire-cleaned high purity ceramic                                                                  |
| Encapsulation | Specially formulated epoxy compound                                                               |
| Termination   | Standard lead material is solder-coated copper. Solderable and weldable per MIL-STD-1276, Type C. |

**POWER RATING**

Power ratings are based on the following two conditions:

- ± 2.0 % maximum ΔR in 2000 h load life
- +150 °C maximum operating temperature

**APPLICABLE MIL-SPECIFICATIONS**
**MIL-PRF-39017:**

The ERL series meets the electrical, environmental and dimensional requirements of MIL-PRF-39017.

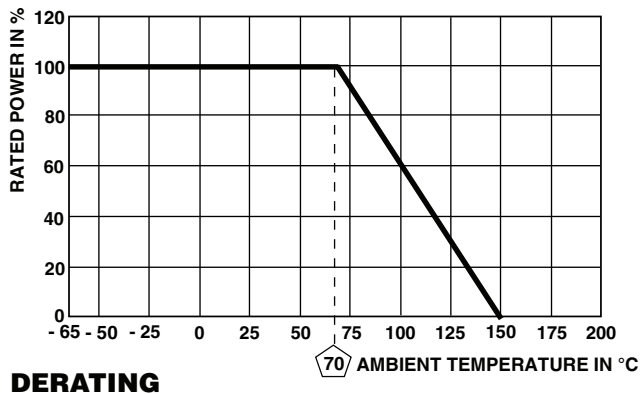
**MIL-PRF-22684:**

MIL-PRF-39017 supercedes MIL-PRF-22684 on new designs. The ERL series meet or exceed MIL-PRF-22684 requirements.

**Documentation:**

Qualification and failure rate verification test data is maintained by Vishay Dale and is available upon request. Lot traceability and identification data is maintained by Vishay Dale for five years.

**CAGE CODE: 91637**



### MARKING (per MIL-PRF-39017)

|                         |                                                      |                                                  |                                       |
|-------------------------|------------------------------------------------------|--------------------------------------------------|---------------------------------------|
|                         |                                                      | Tolerance: F = 1 %, G = 2 %                      |                                       |
|                         |                                                      | Value = three significant figures and multiplier |                                       |
|                         |                                                      | J = JAN (Joint Army - Navy) brand                |                                       |
| RLR05: (3 lines)        |                                                      | RLR07: (4 lines)                                 |                                       |
| 210A                    | 3-digit date code and lot code                       | 214AJ                                            | 3-digit date code, lot code and JAN   |
| 1002                    | Value                                                | RLR7C                                            | Style ("0" omitted) and lead material |
| FSJD                    | Tolerance, failure rate, JAN and manufacturer's code | 1300G                                            | Value and tolerance                   |
|                         |                                                      | RD                                               | Failure rate and manufacturer's code  |
| RLR20, RLR32: (4 lines) |                                                      |                                                  |                                       |
| 91637                   | CAGE code                                            |                                                  |                                       |
| RLR20C                  | Style and lead material                              |                                                  |                                       |
| 4993FR                  | Value, tolerance and failure rate                    |                                                  |                                       |
| 1225AJ                  | 4-digit date code, lot code and JAN                  |                                                  |                                       |



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