

# 16R Series

## Radial Leaded



### Web Resources



Download ECAD models, order samples, and find technical resources at [www.littelfuse.com](http://www.littelfuse.com)

### Description

Littelfuse 16R Series Radial Leaded PTCs are designed to provide resettable overcurrent protection serving a wide range of electronics applications. With maximum 16 volts and maximum 100-ampere short circuit rating, they offer an ideal solution for USB protection.

### Features & Benefits

- 100A short circuit rating
- 16V Operating voltages
- Fast time-to-trip
- Meets all USB protection requirements
- RoHS compliant, Lead- Free and Halogen-Free\*

### Applications

- Computers & peripherals
- Any USB application
- General Electronics

### Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
|        | E74889             |
|        | R72161783          |

### Electrical Characteristics

| Part Number | $I_{hold}$<br>(A) | $I_{trip}$<br>(A) | $V_{max}$<br>(Vdc) | $I_{max}$<br>(A) | $P_d$ typ.<br>(W) | Maximum Time To Trip |                | Resistance                |                            | Agency Approvals |   |
|-------------|-------------------|-------------------|--------------------|------------------|-------------------|----------------------|----------------|---------------------------|----------------------------|------------------|---|
|             |                   |                   |                    |                  |                   | Current<br>(A)       | Time<br>(Sec.) | $R_{min}$<br>( $\Omega$ ) | $R_{1max}$<br>( $\Omega$ ) |                  |   |
| 16R250G     | 2.5               | 4.7               | 16                 | 100              | 1.0               | 12.5                 | 5.0            | 0.0220                    | 0.0530                     | X                | X |
| 16R300G     | 3.0               | 5.1               | 16                 | 100              | 2.3               | 15.0                 | 1.0            | 0.0380                    | 0.0975                     | X                | X |
| 16R400G     | 4.0               | 6.8               | 16                 | 100              | 2.4               | 20.0                 | 1.7            | 0.0210                    | 0.0600                     | X                | X |
| 16R500G     | 5.0               | 8.5               | 16                 | 100              | 2.6               | 25.0                 | 2.0            | 0.0150                    | 0.0340                     | X                | X |
| 16R700G     | 7.0               | 11.9              | 16                 | 100              | 3.0               | 35.0                 | 3.5            | 0.0077                    | 0.0200                     | X                | X |
| 16R800G     | 8.0               | 13.6              | 16                 | 100              | 3.0               | 40.0                 | 5.0            | 0.0056                    | 0.0175                     | X                | X |
| 16R900G     | 9.0               | 15.3              | 16                 | 100              | 3.3               | 45.0                 | 5.5            | 0.0047                    | 0.0135                     | X                | X |
| 16R1000G    | 10.0              | 17.0              | 16                 | 100              | 3.6               | 50.0                 | 6.0            | 0.0040                    | 0.0102                     | X                | X |
| 16R1400G    | 14.0              | 23.8              | 16                 | 100              | 4.6               | 70.0                 | 9.0            | 0.0026                    | 0.0064                     | X                | X |

**Caution:** Operation beyond the specified rating may result in damage and possible arcing and flame.

$I_{hold}$  = Hold current: maximum current device will pass without tripping in 20°C still air.  
 $I_{trip}$  = Trip current: minimum current at which the device will trip in 20°C still air.  
 $V_{max}$  = Maximum voltage the device can withstand without damage at rated current ( $I_{max}$ )  
 $V_{op}$  = The device regular operation voltage  
 $I_{max}$  = Maximum fault current device can withstand without damage at rated voltage ( $V_{max}$ )  
 $P_d$  = Power dissipated from device when in the tripped state at 20°C still air.

$R_{min}$  = Minimum resistance of device in initial (un-soldered) state.  
 $R_{typ}$  = Typical resistance of device in initial (un-soldered) state.  
 $R_{1max}$  = Maximum resistance of device at 20°C measured one hour after tripping.

\* Effective February 11, 2010 onward, all 600R PTC products will be manufactured Halogen Free (HF). Existing Non-Halogen Free 600R PTC products may continue to be sold, until supplies are depleted. This change will have no effect on 600R product specifications or performance.

#### Warning

- Users shall independently assess the suitability of these devices for each of their applications
- Operation of these devices beyond the stated maximum ratings could result in damage to the devices and lead to electrical arcing and/or fire
- These devices are intended to protect against the effects of temporary over-current or over-temperature conditions and are not intended to perform as protective devices where such conditions are expected to be repetitive or prolonged in duration
- Exposure to silicon-based oils, solvents, electrolytes, acids, and similar materials can adversely affect the performance of these PPTC devices
- These devices undergo thermal expansion under fault conditions, and thus shall be provided with adequate space and be protected against mechanical stresses
- Circuits with inductance may generate a voltage ( $L di/dt$ ) above the rated voltage of the PPTC device.

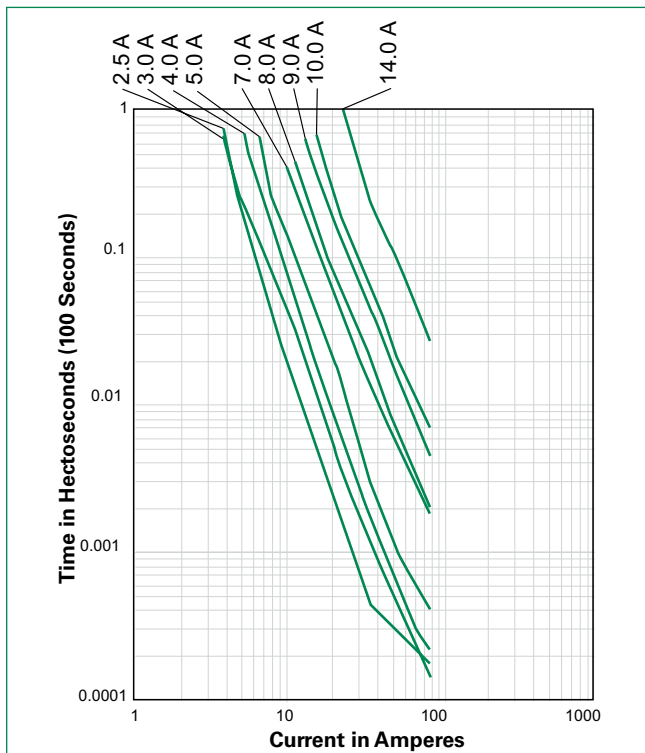
# 16R Series

## Radial Leaded

### Temperature Derating

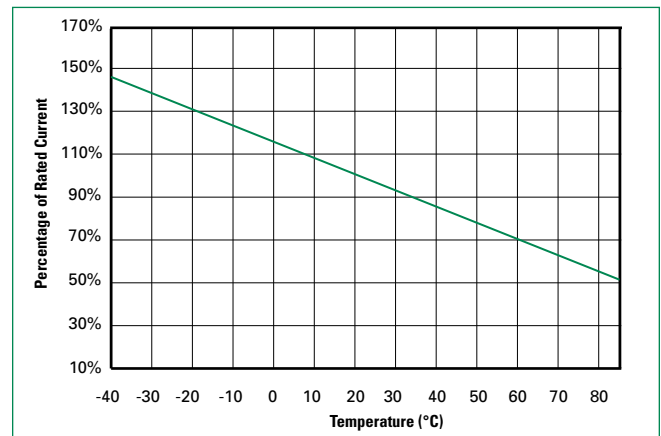
| Part Number      | Ambient Operation Temperature |       |      |      |      |      |      |      |      |
|------------------|-------------------------------|-------|------|------|------|------|------|------|------|
|                  | -40°C                         | -20°C | 0°C  | 20°C | 40°C | 50°C | 60°C | 70°C | 85°C |
| Hold Current (A) |                               |       |      |      |      |      |      |      |      |
| 16R250G          | 3.7                           | 3.3   | 2.9  | 2.5  | 2.2  | 2.0  | 1.8  | 1.6  | 1.3  |
| 16R300G          | 4.4                           | 4.0   | 3.5  | 3.0  | 2.6  | 2.4  | 2.1  | 1.9  | 1.6  |
| 16R400G          | 5.9                           | 5.3   | 4.7  | 4.0  | 3.5  | 3.2  | 2.9  | 2.6  | 2.1  |
| 16R500G          | 7.4                           | 6.6   | 5.9  | 5.0  | 4.4  | 4.0  | 3.6  | 3.2  | 2.6  |
| 16R700G          | 10.4                          | 9.3   | 8.2  | 7.0  | 6.1  | 5.6  | 5.0  | 4.5  | 3.7  |
| 16R800G          | 11.8                          | 10.6  | 9.4  | 8.0  | 7.0  | 6.3  | 5.7  | 5.1  | 4.2  |
| 16R900G          | 13.3                          | 12.0  | 10.6 | 9.0  | 7.8  | 7.1  | 6.5  | 5.8  | 4.7  |
| 16R1000G         | 14.8                          | 13.3  | 11.8 | 10.0 | 8.7  | 7.9  | 7.1  | 6.4  | 5.3  |
| 16R1400G         | 20.7                          | 18.6  | 16.5 | 14.0 | 12.2 | 11.1 | 10.0 | 9.0  | 7.4  |

### Average Time Current Curves



The average time current curves and Temperature Derating curve performance is affected by a number of variables, and these curves provided as guidance only. Customer must verify the performance in their application.

### Temperature Derating Curve



**Note:**

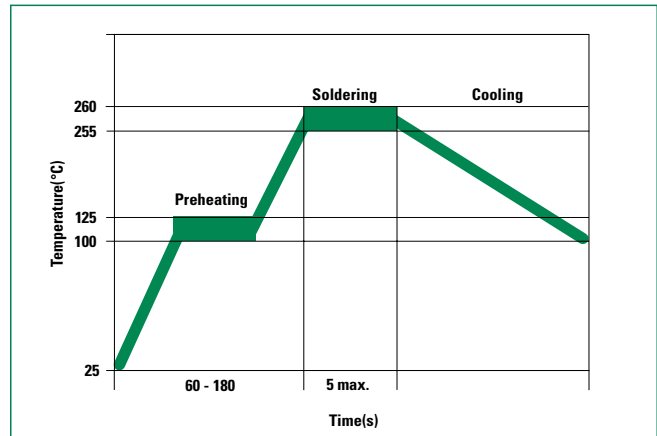
Typical Temperature derating curve, refer to table for derating data

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### Soldering Parameters - Wave Soldering

|                         |                                                                                                                                                                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pre-Heating Zone</b> | Refer to the condition recommended by the flux manufacturer.<br>Max. ramping rate should not exceed 4°C/Sec.                                                                                                                     |
| <b>Soldering Zone</b>   | Max. solder temperature should not exceed 260°C.<br>Time within 5°C of actual Max. solder temperature within 3 - 5 seconds.<br>Total time from 25°C room to Max. solder temperature within 5 minutes including Pre-Heating time. |
| <b>Cooling Zone</b>     | Cooling by natural convection in air.<br>Max. ramping down rate should not exceed 6°C/Sec.                                                                                                                                       |



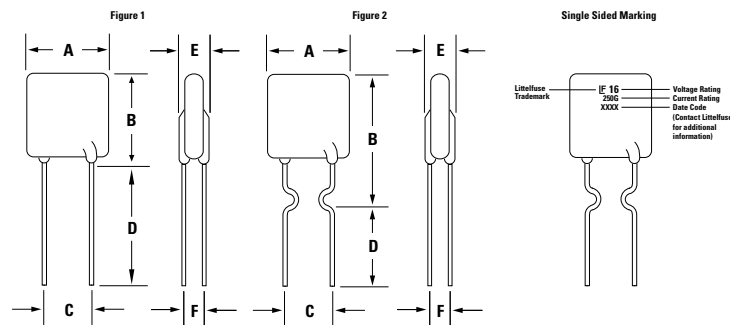
### Physical Specifications

|                                  |                                                                      |
|----------------------------------|----------------------------------------------------------------------|
| <b>Lead Material</b>             | 2.5A: Tin-plated Copper clad Steel<br>3.0 - 14.0A: Tin-plated Copper |
| <b>Soldering Characteristics</b> | Solderability per MIL-STD-202, Method 208                            |
| <b>Insulating Material</b>       | Cured, flame retardant epoxy polymer meets UL94V-0 requirements.     |
| <b>Device Labeling</b>           | Marked with 'LF', voltage, current rating, and date code.            |

### Environmental Specifications

|                                                            |                                                                |
|------------------------------------------------------------|----------------------------------------------------------------|
| <b>Operating/Storage Temperature</b>                       | -40°C to +85°C                                                 |
| <b>Maximum Device Surface Temperature in Tripped State</b> | 125°C                                                          |
| <b>Passive Aging</b>                                       | +85°C, 1000 hours<br>-/+5% typical resistance change           |
| <b>Humidity Aging</b>                                      | +85°C, 85% R.H., 1000 hours<br>-/+5% typical resistance change |
| <b>Thermal Shock</b>                                       | +85°C to -40°C 10 times<br>-/+5% typical resistance change     |
| <b>Solvent Resistance</b>                                  | MIL-STD-202, Method 215<br>No change                           |
| <b>Moisture Resistance Level</b>                           | Level 1, J-STD-020                                             |

### Dimensions & Part Marking System

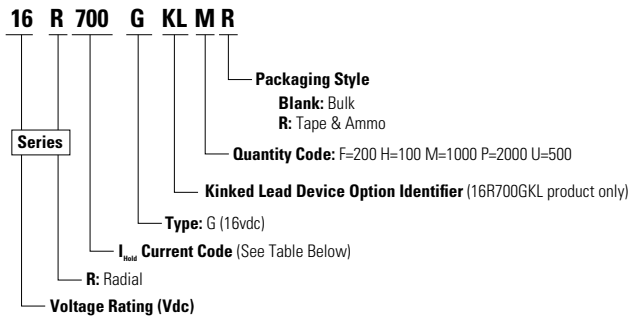


| Part Number | Figure | A      |       | B      |       | C      |      | D      |      | E      |      | F      |      | Physical Characteristics |      |  |          |
|-------------|--------|--------|-------|--------|-------|--------|------|--------|------|--------|------|--------|------|--------------------------|------|--|----------|
|             |        | Inches | mm    | Inches | mm    | Inches | mm   | Inches | mm   | Inches | mm   | Inches | mm   | Lead (dia)               |      |  |          |
|             |        | Max.   | Max.  | Max.   | Max.  | Typ.   | Typ. | Min.   | Min. | Max.   | Max. | Typ.   | Typ. | Inches                   | mm   |  | Material |
| 16R250G     | 2      | 0.35   | 8.90  | 0.50   | 12.80 | 0.20   | 5.1  | 0.13   | 3.18 | 0.12   | 3.00 | 0.035  | 0.9  | 0.020                    | 0.51 |  | Sn/CuFe  |
| 16R300G     | 1      | 0.28   | 7.10  | 0.43   | 11.00 | 0.20   | 5.1  | 0.30   | 7.6  | 0.12   | 3.00 | 0.047  | 1.2  | 0.032                    | 0.81 |  | Sn/Cu    |
| 16R400G     | 1      | 0.35   | 8.90  | 0.50   | 12.80 | 0.20   | 5.1  | 0.30   | 7.6  | 0.12   | 3.00 | 0.047  | 1.2  | 0.032                    | 0.81 |  | Sn/Cu    |
| 16R500G     | 1      | 0.41   | 10.40 | 0.56   | 14.30 | 0.20   | 5.1  | 0.30   | 7.6  | 0.12   | 3.00 | 0.047  | 1.2  | 0.032                    | 0.81 |  | Sn/Cu    |
| 16R700G     | 1      | 0.44   | 11.20 | 0.78   | 19.70 | 0.20   | 5.1  | 0.30   | 7.6  | 0.12   | 3.00 | 0.047  | 1.2  | 0.032                    | 0.81 |  | Sn/Cu    |
| 16R800G     | 1      | 0.50   | 12.70 | 0.82   | 20.90 | 0.20   | 5.1  | 0.30   | 7.6  | 0.12   | 3.00 | 0.047  | 1.2  | 0.032                    | 0.81 |  | Sn/Cu    |
| 16R900G     | 1      | 0.55   | 14.00 | 0.85   | 21.70 | 0.20   | 5.1  | 0.30   | 7.6  | 0.12   | 3.00 | 0.047  | 1.2  | 0.032                    | 0.81 |  | Sn/Cu    |
| 16R1000G    | 1      | 0.65   | 16.50 | 0.99   | 25.20 | 0.20   | 5.1  | 0.30   | 7.6  | 0.12   | 3.00 | 0.047  | 1.2  | 0.032                    | 0.81 |  | Sn/Cu    |
| 16R1400G    | 1      | 0.93   | 23.50 | 1.10   | 27.90 | 0.40   | 10.2 | 0.30   | 7.6  | 0.14   | 3.50 | 0.055  | 1.4  | 0.039                    | 1.00 |  | Sn/Cu    |

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### Part Ordering Number System



### Packaging Options

| Part Number | Ordering Number | $I_{hold}$ (A) | $I_{hold}$ Code | Packaging Option | Quantity | Quantity & Packaging Codes |
|-------------|-----------------|----------------|-----------------|------------------|----------|----------------------------|
| 16R250G     | 16R250GU        | 2.50           | 250             | Bulk             | 500      | U                          |
| 16R300G     | 16R300GU        | 3.00           | 300             | Bulk             | 500      | U                          |
|             | 16R300GPR       |                |                 | Tape and Ammo    | 2000     | PR                         |
| 16R400G     | 16R400GU        | 4.00           | 400             | Bulk             | 500      | U                          |
|             | 16R400GPR       |                |                 | Tape and Ammo    | 2000     | PR                         |
| 16R500G     | 16R500GU        | 5.00           | 500             | Bulk             | 500      | U                          |
|             | 16R500GPR       |                |                 | Tape and Ammo    | 2000     | PR                         |
| 16R700G     | 16R700GMR       | 7.00           | 700             | Tape and Ammo    | 1000     | MR                         |
| 16R800G     | 16R800GF        | 8.00           | 800             | Bulk             | 200      | F                          |
| 16R900G     | 16R900GF        | 9.00           | 900             | Bulk             | 200      | F                          |
|             | 16R900GMR       |                |                 | Tape and Ammo    | 1000     | MR                         |
| 16R1000G    | 16R1000GMR      | 10.00          | 1000            | Tape and Ammo    | 1000     | MR                         |
| 16R1400G    | 16R1400GH       | 14.00          | 1400            | Bulk             | 100      | H                          |

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### Tape and Ammo Specifications

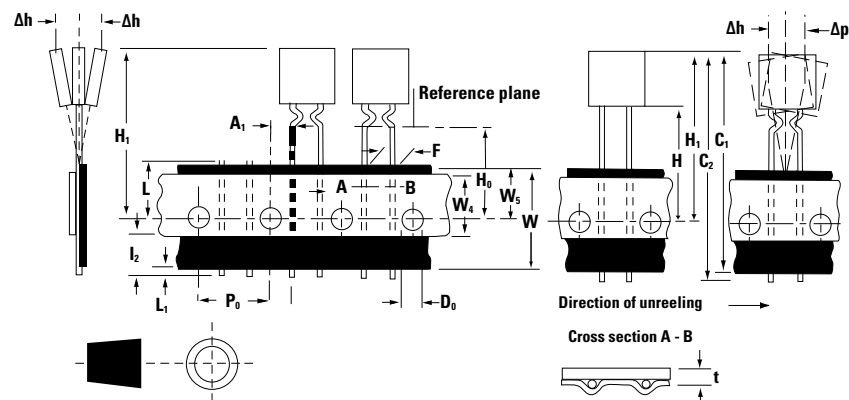
Devices taped using EIA468-B/IE286-2 standards. See table below and Figure 1 for details.

| Dimension                            | EIA Mark             | IEC Mark             | Dimensions      |             |
|--------------------------------------|----------------------|----------------------|-----------------|-------------|
|                                      |                      |                      | Dim. (mm)       | Tol. (mm)   |
| Carrier tape width                   | <b>W</b>             | <b>W</b>             | 18              | -0.5 /+1.0  |
| Hold down tape width:                | <b>W<sub>4</sub></b> | <b>W<sub>0</sub></b> | 11              | min.        |
| Top distance between tape edges      | <b>W<sub>6</sub></b> | <b>W<sub>2</sub></b> | 3               | max.        |
| Sprocket hole position               | <b>W<sub>5</sub></b> | <b>W<sub>1</sub></b> | 9               | -0.5 /+0.75 |
| Sprocket hole diameter*              | <b>D<sub>0</sub></b> | <b>D<sub>0</sub></b> | 4               | -0.32 /+0.2 |
| Abscissa to plane(straight lead)     | <b>H</b>             | <b>H</b>             | 18.5            | -/+ 3.0     |
| Abscissa to plane(kinked lead)       | <b>H<sub>0</sub></b> | <b>H<sub>0</sub></b> | 16              | -/+ 0.5     |
| Abscissa to top                      | -                    | -                    | 45.0            | max.        |
| Overall width w/o lead protrusion    | -                    | -                    | 56              | max.        |
| Overall width w/ lead protrusion     | -                    | -                    | 57              | max.        |
| Lead protrusion                      | <b>L<sub>1</sub></b> | <b>L<sub>1</sub></b> | 1.0             | max.        |
| Protrusion of cut out                | <b>L</b>             | <b>L</b>             | 11              | max.        |
| Protrusion beyond hold-down tape     | <b>L<sub>2</sub></b> | <b>L<sub>2</sub></b> | Not specified   |             |
| Sprocket hole pitch                  | <b>P<sub>0</sub></b> | <b>P<sub>0</sub></b> | 25.4            | -/+ 0.5     |
| Device pitch:                        | -                    | -                    | 25.4            |             |
| Pitch tolerance                      | -                    | -                    | 20 consecutive. | -/+ 1       |
| Tape thickness                       | <b>t</b>             | <b>t</b>             | 0.9             | max.        |
| Tape thickness with splice           | <b>t<sub>1</sub></b> | -                    | 2.0             | max.        |
| Splice sprocket hole alignment       | -                    | -                    | 0               | -/+ 0.3     |
| Body lateral deviation               | <b>Δh</b>            | <b>Δh</b>            | 0               | -/+ 1.0     |
| Body tape plane deviation            | <b>Δp</b>            | <b>Δp</b>            | 0               | -/+ 1.3     |
| Ordinate to adjacent component lead* | <b>P<sub>1</sub></b> | <b>P<sub>1</sub></b> | 3.81            | -/+ 0.7     |
| Ordinate to adjacent component lead* | -                    | -                    | 7.62            | -/+ 0.7     |
| Lead spacing:16R250G-16R1000G        | <b>F</b>             | <b>F</b>             | 5.08            | -/+ 0.8     |
| Lead spacing:16R1400G                | <b>F</b>             | <b>F</b>             | 10.18           | -/+ 0.8     |

\*Differs from EIA specification

### Tape and Ammo Diagram

Figure 1



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