

### Features:

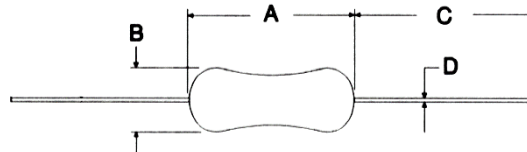
- Excellent anti-surge characteristics
- Stable characteristics through the resistance range
- Applications include power supplies, CRT's and anti-surge circuits
- Good alternative to carbon composition resistors
- Cut and formed product is available on select sizes; contact Stackpole for details
- 100% RoHS compliant and lead free without exemption
- Halogen free
- REACH compliant



### Electrical Specifications

| Type/Code | Power Rating (W)<br>@ 70°C | Maximum Working Voltage | Maximum Overload Voltage (V) | Surge Withstanding Voltage (KV) | Ohmic Range (Ω) and Tolerance |
|-----------|----------------------------|-------------------------|------------------------------|---------------------------------|-------------------------------|
|           |                            |                         |                              |                                 | 5%                            |
| SPRM12    | 0.5                        | $E = \sqrt{P \cdot R}$  | 2500                         | 10                              | 1M - 12M                      |
| SPR1      | 1                          |                         | 5000                         |                                 |                               |

### Mechanical Specifications



| Type/Code | A<br>Body Length | B<br>Body Diameter | C<br>Lead Length (Bulk) | D<br>Lead Diameter | Unit   |
|-----------|------------------|--------------------|-------------------------|--------------------|--------|
| SPRM12    | 0.354 ± 0.039    | 0.118 ± 0.020      | 1.102 ± 0.079           | 0.028 ± 0.002      | inches |
|           | 9.00 ± 1.00      | 3.00 ± 0.50        | 28.00 ± 2.00            | 0.70 ± 0.05        | mm     |
| SPR1      | 0.591 ± 0.039    | 0.197 ± 0.020      | 1.378 ± 0.118           | 0.031 ± 0.002      | inches |
|           | 15.00 ± 1.00     | 5.00 ± 0.50        | 35.00 ± 3.00            | 0.80 ± 0.05        | mm     |

### Performance Characteristics (JIS C 5201-1)

| Test                         | Test Results |
|------------------------------|--------------|
| Moisture Resistance          | ± 5%         |
| Temperature Cycling          | ± 1%         |
| Load Life                    | ± 5%         |
| Resistance to Soldering Heat | ± 1%         |
| Short Time Overload          | ± 2%         |
| Discharge                    | ± 10%        |

Operating Temperature Range: -55°C to +155°C

**Repetitive Pulse Information:**

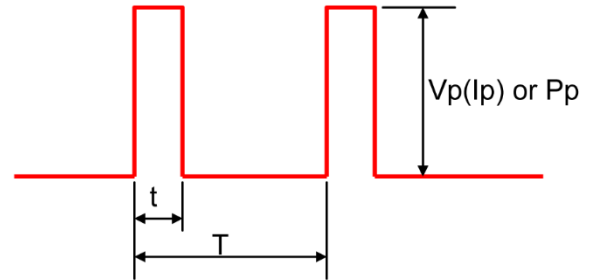
If repetitive pulses are applied to resistors, pulse wave form must be less than “pulse limiting voltage”, “pulse limiting current” or “pulse limiting wattage” calculated by the formula below.

$$V_p = K\sqrt{P \times R \times T/t}$$

$$I_p = K\sqrt{P/R \times T/t}$$

$$P_p = K^2 \times P \times T/t$$

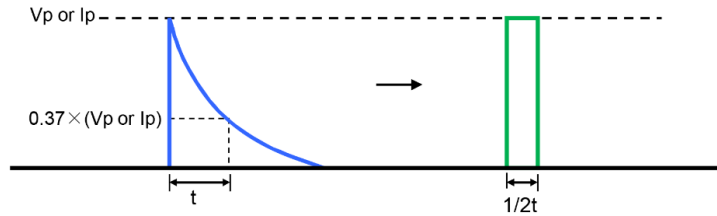
- Where:  $V_p$ : Pulse limiting voltage (V)  
 $I_p$ : Pulse limiting current (A)  
 $P_p$ : Pulse limiting wattage (W)  
 P: Power rating (W)  
 R: Nominal resistance (ohm)  
 T: Repetitive period (sec)  
 t: Pulse duration (sec)  
 K: Coefficient: 1  
 [ $V_r$ : Rated Voltage (V),  $I_r$ : Rated Current (A)]



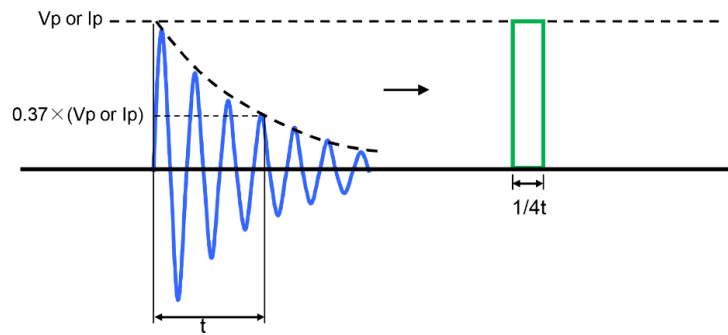
- Note 1: If  $T > 10 \rightarrow T = 10$  (sec),  $T / t > 1000 \rightarrow T / t = 1000$   
 Note 2: If  $T > 10$  and  $T / t > 1000$ , “Pulse Limiting power (Single pulse) is applied  
 Note 3: If  $V_p < V_r$  ( $I_p < I_r$  or  $P_p < P$ ),  $V_r$  ( $I_r$ , P) is  $V_p$  ( $I_p$ ,  $P_p$ )  
 Note 4: Pulse limiting voltage (current, wattage) is applied at less than rated ambient temperature.  
 If ambient temperature is more than the rated temperature (70 °C), decrease power rating according to “Power Derating Curve”  
 Note 5: Assure sufficient margin for use period and conditions for “pulse limiting voltage”  
 Note 6: If the pulse waveform is not square wave, judge after transform the waveform into square wave according to the “Waveform Transformation to Square Wave”.

Waveform Transformation to Square Wave

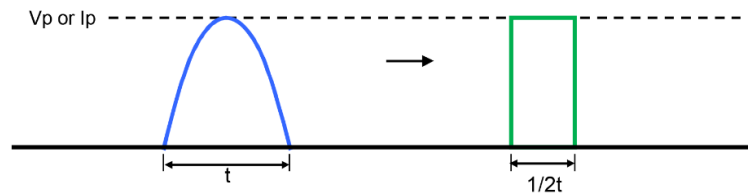
1. Discharge curve wave with time constant "t" → Square wave



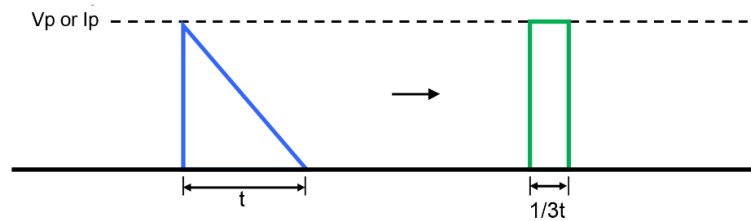
2. Damping oscillation wave with time constant of envelope "t" → Square wave



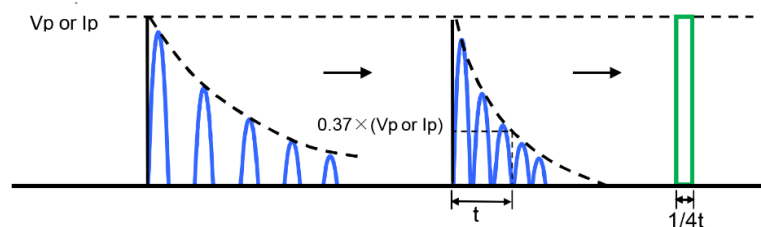
3. Half-wave rectification wave → Square wave



4. Triangular wave → Square wave



5. Special wave → Square wave



### Color Code

Description

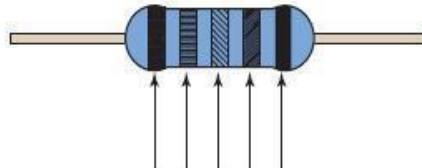
1, 1st band significant figure

2, 2nd band significant figure

3, Multiplier

4, Tolerance

5, Color code 5<sup>th</sup> Color Green (Discharge Resistor)



Color code No. 1 2 3 4 5

### Recommended Solder Profile

This information is intended as a reference for solder profiles for Stackpole resistive components. These profiles should be compatible with most soldering processes. These are only recommendations. Actual numbers will depend on board density, geometry, packages used, etc., especially those cells labeled with “\*”.

### 100% Matte Tin / RoHS Compliant Terminations

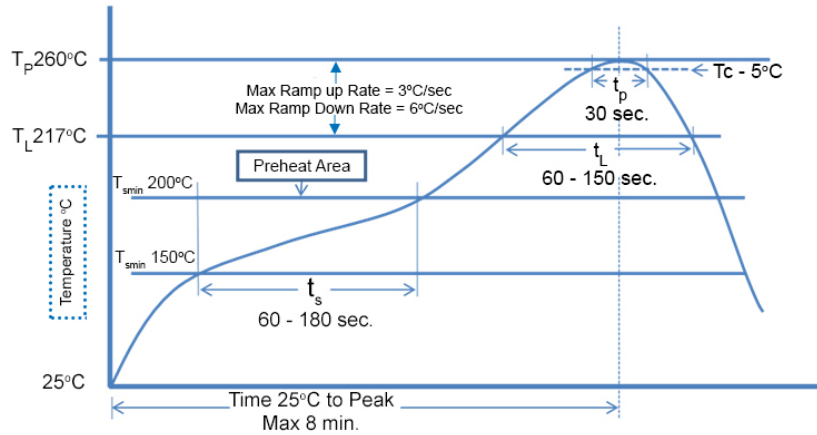
Soldering iron recommended temperatures: 330°C to 350°C with minimum duration.  
Maximum number of reflow cycles: 3.

| Wave Soldering     |            |             |            |
|--------------------|------------|-------------|------------|
| Description        | Maximum    | Recommended | Minimum    |
| Preheat Time       | 80 seconds | 70 seconds  | 60 seconds |
| Temperature Diff.  | 140°C      | 120°C       | 100°C      |
| Solder Temp.       | 260°C      | 250°C       | 240°C      |
| Dwell Time at Max. | 10 seconds | 5 seconds   | *          |
| Ramp DN (°C/sec)   | N/A        | N/A         | N/A        |

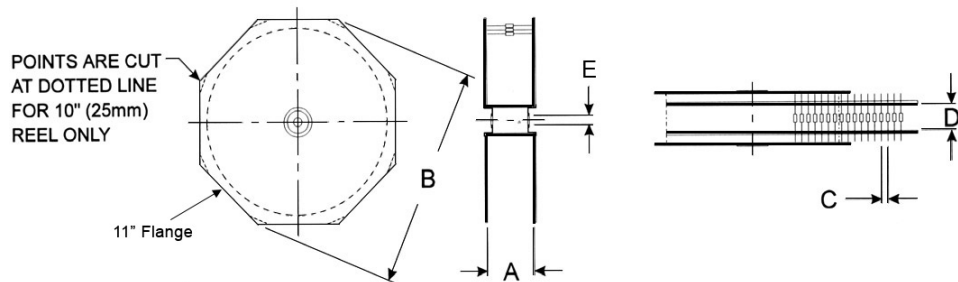
Temperature Diff. = Difference between final preheat stage and soldering stage.

| Convection IR Reflow |             |             |            |
|----------------------|-------------|-------------|------------|
| Description          | Maximum     | Recommended | Minimum    |
| Ramp Up (°C/sec)     | 3°C/sec     | 2°C/sec     | *          |
| Dwell Time > 217°C   | 150 seconds | 90 seconds  | 60 seconds |
| Solder Temp.         | 260°C       | 245°C       | *          |
| Dwell Time at Max.   | 30 seconds  | 15 seconds  | 10 seconds |
| Ramp DN (°C/sec)     | 6°C/sec     | 3°C/sec     | *          |

**Recommended Lead Free Resistor Reflow Profile**



**Packaging Specifications**



| Series | A max <sup>(1)</sup> | B max  | C             | D <sup>(2)</sup> | Tape  | Unit   |
|--------|----------------------|--------|---------------|------------------|-------|--------|
| SPRM12 | 2.618                | 13.504 | 0.197 ± 0.020 | 2.063 ± 0.079    | 0.250 | inches |
|        | 66.50                | 343.00 | 5.00 ± 0.50   | 52.40 ± 2.00     | 6.35  | mm     |
| SPR1   | 3.917                | 13.504 | 0.394 ± 0.020 | 2.063 ± 0.079    | 0.250 | inches |
|        | 99.50                | 343.00 | 10.00 ± 0.50  | 52.40 ± 2.00     | 6.35  | mm     |

**RoHS Compliance**

Stackpole Electronics has joined the worldwide effort to reduce the amount of lead in electronic components and to meet the various regulatory requirements now prevalent, such as the European Union's directive regarding "Restrictions on Hazardous Substances" (RoHS 3). As part of this ongoing program, we periodically update this document with the status regarding the availability of our compliant components. All our standard part numbers are compliant to EU Directive 2011/65/EU of the European Parliament as amended by Directive (EU) 2015/863/EU as regards the list of restricted substances.

| RoHS Compliance Status  |                                |                            |                                |                                   |  |                                       |
|-------------------------|--------------------------------|----------------------------|--------------------------------|-----------------------------------|--|---------------------------------------|
| Standard Product Series | Description                    | Package / Termination Type | Standard Series RoHS Compliant | Lead-Free Termination Composition | Lead-Free Mfg. Effective Date (Std Product Series) | Lead-Free Effective Date Code (YY/WW) |
| SPR                     | Discharge Path Leaded Resistor | Axial                      | YES                            | 99.3/0.7 Sn/Cu                    | Apr-05   | 05/14                                 |

**“Conflict Metals” Commitment**

We at Stackpole Electronics, Inc. are joined with our industry in opposing the use of metals mined in the “conflict region” of the Eastern Democratic Republic of the Congo (DRC) in our products. Recognizing that the supply chain for metals used in the electronics industry is very complex, we work closely with our own suppliers to verify to the extent possible that the materials and products we supply do not contain metals sourced from this conflict region. As such, we are in compliance with the requirements of Dodd-Frank Act regarding Conflict Minerals.

**Compliance to “REACH”**

We certify that all passive components supplied by Stackpole Electronics, Inc. are SVHC (Substances of Very High Concern) free and compliant with the requirements of EU Directive 1907/2006/EC, “The Registration, Evaluation, Authorization and Restriction of Chemicals”, otherwise referred to as REACH. Contact us for complete list of REACH Substance Candidate List.

**Environmental Policy**

It is the policy of Stackpole Electronics, Inc. (SEI) to protect the environment in all localities in which we operate. We continually strive to improve our effect on the environment. We observe all applicable laws and regulations regarding the protection of our environment and all requests related to the environment to which we have agreed. We are committed to the prevention of all forms of pollution.

**How to Order**

