



**THE DATASHEET OF  
767165131APTR13**



# 767 Series

## Surface Mount Resistor Network



### Features

- Surface Mount Gull Wing Package
- Solid Ceramic Construction
- Medium Body Design – 5.59mm
- No Internal Dendrite Growth
- Meets EIA PDP 100 SOGN-0002 Outline
- Requires 30% Less Board Space Than Molded Products of the Same Power Rating
- Tape and Reel Packaging or Slide Pack

RoHS Compliant in Accordance with EU Directive 2011/65/EU

- Lead-Free Termination Finish
- Exemption 7(c)-I, Electrical and electronic components containing lead [Pb] in glass

### Applications

- Telecom Infrastructure
- Optical Networking
- Wireless Networks
- Edge Routers
- Internet/Network Security
- Storage Area Networks
- Network Attached Storage
- Switches
- RAID Controllers

### Description

767 Series Resistor Networks are single packaged devices containing an array of homogeneous resistor elements. CTS network designs provide a smaller circuit footprint, excellent reliability, improved TCR tracking and resistor tolerance matching; while helping to save placement costs by reducing application component count.

### Ordering Information

| Model                 | Number of Pins                                                                                                                                                                            | Schematic                                                                                                                                                                                                                                                                                                         | Resistor Code | Resistor Tolerance | RoHS Compliant                | Packaging      |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|-------------------------------|----------------|---------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------|------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------|-----------|------------|-----------|------------------|-----|-------|-----|---|--------|---|-----------|--|--|---|----------|---|-----|--|--|--|-------------------------------|---|-------|--|--|--|--|--|
| 767                   | 16                                                                                                                                                                                        | 3                                                                                                                                                                                                                                                                                                                 | 103           | G                  | P                             | TR13           |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
|                       | <table border="1"> <thead> <tr> <th>Code</th> <th>Pin Count</th> </tr> </thead> <tbody> <tr> <td>14</td> <td>14 Pins</td> </tr> <tr> <td>16</td> <td>16 Pins</td> </tr> </tbody> </table> | Code                                                                                                                                                                                                                                                                                                              | Pin Count     | 14                 | 14 Pins                       | 16             | 16 Pins |                  | <table border="1"> <thead> <tr> <th>Code</th> <th>Resistor Value *</th> </tr> </thead> <tbody> <tr> <td>103</td> <td>10k ohm</td> </tr> </tbody> </table> <p>See Addendum for Standard EIA Values</p> | Code                    | Resistor Value * | 103            | 10k ohm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       | <table border="1"> <thead> <tr> <th>Code</th> <th>Compliance</th> </tr> </thead> <tbody> <tr> <td>P</td> <td>RoHS</td> </tr> </tbody> </table> | Code             | Compliance | P                | RoHS | <table border="1"> <thead> <tr> <th>Code</th> <th>Packing</th> </tr> </thead> <tbody> <tr> <td>Blank</td> <td>Slide Pack</td> </tr> <tr> <td>TR13</td> <td>Tape &amp; Reel, 13"</td> </tr> </tbody> </table> | Code      | Packing | Blank     | Slide Pack | TR13      | Tape & Reel, 13" |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| Code                  | Pin Count                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| 14                    | 14 Pins                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| 16                    | 16 Pins                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| Code                  | Resistor Value *                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| 103                   | 10k ohm                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| Code                  | Compliance                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| P                     | RoHS                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| Code                  | Packing                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| Blank                 | Slide Pack                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| TR13                  | Tape & Reel, 13"                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
|                       |                                                                                                                                                                                           | <table border="1"> <thead> <tr> <th>Code</th> <th>Schematic Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Bussed Circuit</td> </tr> <tr> <td>3</td> <td>Isolated Circuit</td> </tr> <tr> <td>5</td> <td>Dual Terminator Circuit</td> </tr> <tr> <td>7</td> <td>Ladder Circuit</td> </tr> </tbody> </table> | Code          | Schematic Type     | 1                             | Bussed Circuit | 3       | Isolated Circuit | 5                                                                                                                                                                                                     | Dual Terminator Circuit | 7                | Ladder Circuit | <table border="1"> <thead> <tr> <th colspan="2">Schematic Types 1 &amp; 3</th> <th colspan="2">Schematic Type 5</th> <th colspan="2">Schematic Type 7</th> </tr> <tr> <th>Code</th> <th>Tolerance</th> <th>Code</th> <th>Tolerance</th> <th>Code</th> <th>Tolerance</th> </tr> </thead> <tbody> <tr> <td>J</td> <td>±5%</td> <td>Blank</td> <td>±2%</td> <td>F</td> <td>±1 LSB</td> </tr> <tr> <td>G</td> <td>±2% [std]</td> <td></td> <td></td> <td>D</td> <td>±0.5 LSB</td> </tr> <tr> <td>F</td> <td>±1%</td> <td></td> <td></td> <td></td> <td>[LSB = Least Significant Bit]</td> </tr> <tr> <td>D</td> <td>±0.5%</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Schematic Types 1 & 3 |                                                                                                                                                | Schematic Type 5 |            | Schematic Type 7 |      | Code                                                                                                                                                                                                         | Tolerance | Code    | Tolerance | Code       | Tolerance | J                | ±5% | Blank | ±2% | F | ±1 LSB | G | ±2% [std] |  |  | D | ±0.5 LSB | F | ±1% |  |  |  | [LSB = Least Significant Bit] | D | ±0.5% |  |  |  |  |  |
| Code                  | Schematic Type                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| 1                     | Bussed Circuit                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| 3                     | Isolated Circuit                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| 5                     | Dual Terminator Circuit                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| 7                     | Ladder Circuit                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| Schematic Types 1 & 3 |                                                                                                                                                                                           | Schematic Type 5                                                                                                                                                                                                                                                                                                  |               | Schematic Type 7   |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| Code                  | Tolerance                                                                                                                                                                                 | Code                                                                                                                                                                                                                                                                                                              | Tolerance     | Code               | Tolerance                     |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| J                     | ±5%                                                                                                                                                                                       | Blank                                                                                                                                                                                                                                                                                                             | ±2%           | F                  | ±1 LSB                        |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| G                     | ±2% [std]                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                   |               | D                  | ±0.5 LSB                      |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| F                     | ±1%                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                   |               |                    | [LSB = Least Significant Bit] |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |
| D                     | ±0.5%                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                   |               |                    |                               |                |         |                  |                                                                                                                                                                                                       |                         |                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                |                  |            |                  |      |                                                                                                                                                                                                              |           |         |           |            |           |                  |     |       |     |   |        |   |           |  |  |   |          |   |     |  |  |  |                               |   |       |  |  |  |  |  |

Notes:

1. No dashes or spaces to appear in part number.

**Not all performance combinations and frequencies may be available.  
Contact your local CTS Representative or CTS Customer Service for availability.**

This product is specified for use only in standard commercial applications. Supplier disclaims all express and implied warranties and liability in connection with any use of this product in any non-commercial applications or in any application that may expose the product to conditions that are outside of the tolerances provided in its specification.

## Electrical & Environmental Specifications

### Operating Conditions

| Resistance Range [ohm] | Resistance Tolerance [%] <sup>1</sup>               | Operating Temperature Range | Temperature Coefficient                                                     | Dielectric Strength | Maximum Operating Voltage <sup>2</sup> |
|------------------------|-----------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------|---------------------|----------------------------------------|
| 10 - 1M                | ±2% Std.<br>or<br>0.5 ohm<br>[whichever is greater] | -55°C to +125°C             | ±200ppm/°C<br>[10 ohms - 99 ohms]<br><br>±100ppm/°C<br>[100 ohms - 1M ohms] | 100V <sub>AC</sub>  | 50V                                    |

1. See Ordering Information for other options available.

2. Not to exceed rated power.

### Power Rating

| Temperature | 14 Pin | 16 Pin |
|-------------|--------|--------|
| @ +25°C     | 2.0W   | 2.3W   |
| @ +70°C     | 1.3W   | 1.5W   |

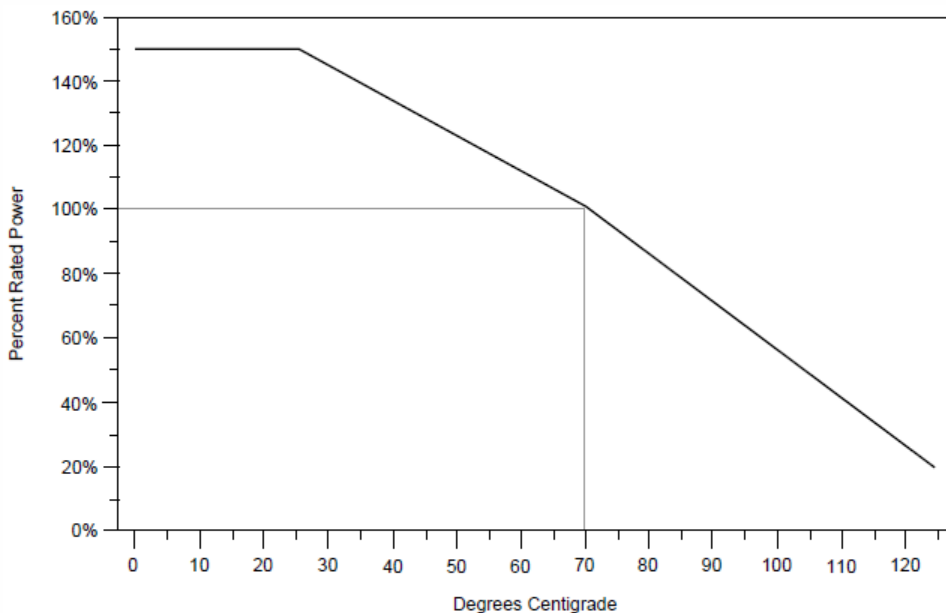
1. Total network power.

### Maximum Resistor Power

| Schematic | 1     | 3     | 5     | 7     |
|-----------|-------|-------|-------|-------|
| @ +25°C   | 0.15W | 0.30W | 0.15W | 0.15W |
| @ +70°C   | 0.10W | 0.20W | 0.10W | 0.10W |

1. Not to exceed total network power.

### Power Derating Curve



## Electrical & Environmental Specifications

### Circuit Types

Bussed [Schematic 1]



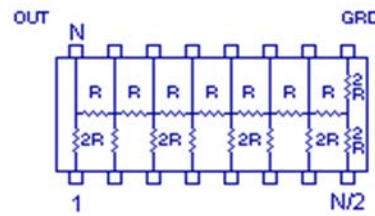
Isolated [Schematic 3]



Dual Terminator [Schematic 5]



R/2R Ladder [Schematic 7]



Note: Pin N is common to  $R_1$  and Pin N/2 common to  $R_2$ .

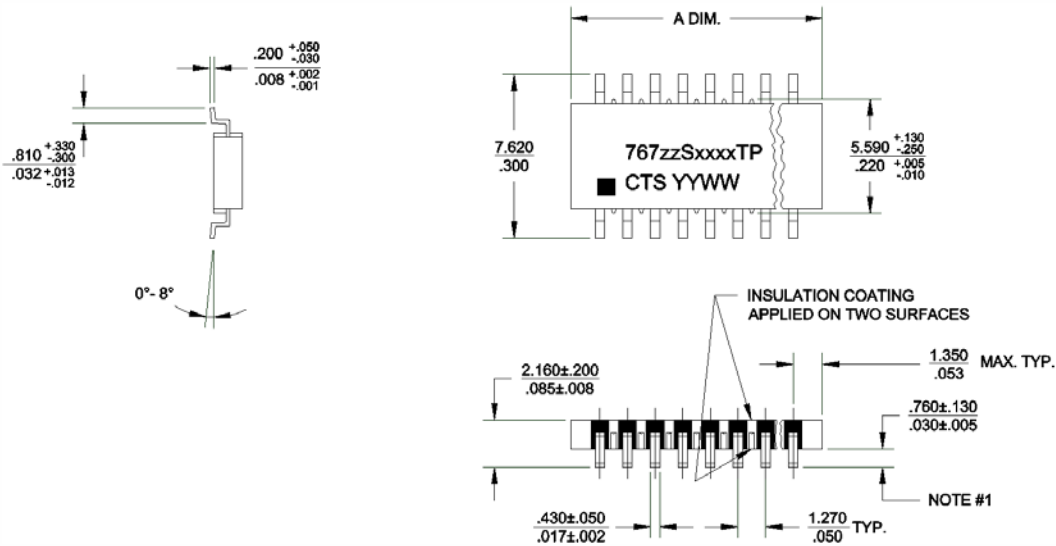
### Environmental Parameters

| Test                      | Maximum Delta R [%] | MIL-STD-202 Method | Test Description                                            |
|---------------------------|---------------------|--------------------|-------------------------------------------------------------|
| Thermal Cycle             | 0.25                | 107 Condition B    | 5 cycles -65°C to +125°C                                    |
| Short Time Overload       | 0.25                |                    | 2½ times rated working voltage for 5 seconds [100V maximum] |
| Moisture Resistance       | 0.50                | 106                | 240 hours, 0.1 rated load, -10°C to +65°C, 90% RH           |
| Load Humidity             | 1.00                |                    | 1,000 hours, 0.1 rated load, +70°C, 85% - 92% RH            |
| High Temperature Exposure | 1.00                |                    | 240 hours @ +125°C, no load                                 |
| Load Life                 | 1.00                | 108 Condition F    | 2,000 hours @ +70°C, rated load                             |
| Resistance to Solder Heat | 0.25                |                    | 30 seconds @ +218°C, dwell                                  |
| Mechanical Shock          | 0.25                | 213 Condition I    | 100g, 1m second, 3 shocks each plane                        |
| Vibration                 | 0.25                | 204 Condition D    | 20g, 10Hz - 2,000Hz, 4 hours per plane                      |
| Terminal Strength         | 0.25                |                    | 0.9kg pull, 30 seconds; two 45° bends                       |
| Low Temperature Storage   | 0.25                |                    | 24 hours @ -65°C, no load                                   |
| Low Temperature Operation | 0.25                |                    | 45 minutes @ -65°C, full load                               |
| Flammability              | N/A                 |                    | 94V-0                                                       |
| Non-Fungus                | Pass                | ---                | MIL-STD-810C                                                |
| Resistance to Solvents    | Pass                |                    | Isopropyl alcohol, Freon TMC                                |
| Solderability             | Pass                |                    | RMA Flux, +230°C, 5 seconds dip, 95% coverage               |

## Mechanical Specifications

### Package Drawing

| Package | "A" Dimension |              |
|---------|---------------|--------------|
|         | mm            | inch         |
| 14 Pin  | 9.91 ±0.25    | 0.390 ±0.010 |
| 16 Pin  | 11.18 ±0.25   | 0.440 ±0.010 |



### Marking Information

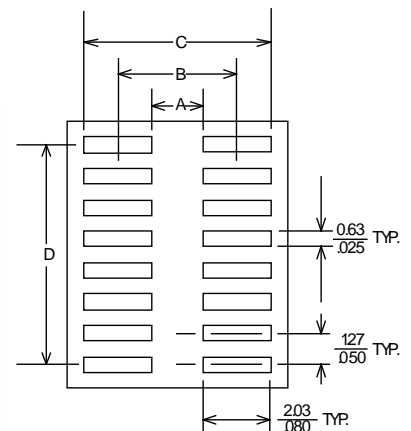
1. 767 – Product Series.
2. zz – Pin count, 14 or 16.
3. S – Schematic type, 1, 3, 5 or 7.
4. xxxx – Resistance value code, 3 or 4 digits.
5. T – Resistor tolerance code; J, G, F or D. Leave blank for Schematic Code 5.
6. P – RoHS compliant.
7. ■ – Pin 1 identifier.
8. CTS – Manufacturer.
9. YYWW – Date Code: YY – year, WW – week.

### Notes

1. Lead Co-Planarity - 0.10mm maximum [0.039in.].
2. General Tolerances - ±0.25mm [±0.010in.].
3. Lead termination (e1). Barrier plating is nickel [Ni] with tin/silver/copper [Sn Ag Cu] finish.
4. Reflow conditions per JEDEC-J-STD-020; +260°C maximum, 30 seconds.

### Recommended Pad Layout

| Package |      | Dimensions |      |      |      |
|---------|------|------------|------|------|------|
|         |      | A          | B    | C    | D    |
| 14 Pin  | mm   | 5.34       | 7.37 | 9.40 | 7.60 |
|         | inch | 0.21       | 0.29 | 0.37 | 0.30 |
| 16 Pin  | mm   | 5.34       | 7.37 | 9.40 | 8.90 |
|         | inch | 0.21       | 0.29 | 0.37 | 0.35 |

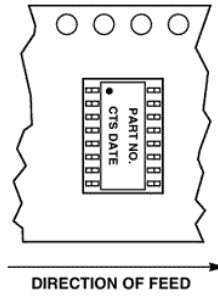


## Packaging

### Tape and Reel Information

| Reel Diameter<br>330mm [13"] | 14 Pin<br>Package | 16 Pin<br>Package |
|------------------------------|-------------------|-------------------|
| Parts Per Reel               | 2,000             | 2,000             |
| Pitch                        | 12mm              | 12mm              |
| Carrier Width                | 24mm              | 24mm              |
| Material                     | Plastic           | Plastic           |

1. See Ordering Information for packaging code



### Plastic Tube

| Slide Pack     | 14 Pin<br>Package | 16 Pin<br>Package |
|----------------|-------------------|-------------------|
| Tube Length    | 508mm             | 508mm             |
| Parts Per Tube | 48                | 43                |



## Addendum

### Standard EIA Codes and Resistor Values – E-24 [3-Digit Resistor Code for J, G, F & D Tolerances]

| CODE              | OHMS | CODE | OHMS | CODE | OHMS  | CODE | OHMS   | CODE | OHMS    | CODE | OHMS      |
|-------------------|------|------|------|------|-------|------|--------|------|---------|------|-----------|
| 000X <sup>1</sup> | 0    | 680  | 68   | 511  | 510   | 392  | 3,900  | 303  | 30,000  | 224  | 220,000   |
| 100               | 10   | 750  | 75   | 561  | 560   | 432  | 4,300  | 333  | 33,000  | 244  | 240,000   |
| 110               | 11   | 820  | 82   | 621  | 620   | 472  | 4,700  | 363  | 36,000  | 274  | 270,000   |
| 120               | 12   | 910  | 91   | 681  | 680   | 512  | 5,100  | 393  | 39,000  | 304  | 300,000   |
| 130               | 13   | 101  | 100  | 751  | 750   | 562  | 5,600  | 433  | 43,000  | 334  | 330,000   |
| 150               | 15   | 111  | 110  | 821  | 820   | 622  | 6,200  | 473  | 47,000  | 364  | 360,000   |
| 160               | 16   | 121  | 120  | 911  | 910   | 682  | 6,800  | 513  | 51,000  | 394  | 390,000   |
| 180               | 18   | 131  | 130  | 102  | 1,000 | 752  | 7,500  | 563  | 56,000  | 434  | 430,000   |
| 200               | 20   | 151  | 150  | 112  | 1,100 | 822  | 8,200  | 623  | 62,000  | 474  | 470,000   |
| 220               | 22   | 161  | 160  | 122  | 1,200 | 912  | 9,100  | 683  | 68,000  | 514  | 510,000   |
| 240               | 24   | 181  | 180  | 132  | 1,300 | 103  | 10,000 | 753  | 75,000  | 564  | 560,000   |
| 270               | 27   | 201  | 200  | 152  | 1,500 | 113  | 11,000 | 823  | 82,000  | 624  | 620,000   |
| 300               | 30   | 221  | 220  | 162  | 1,600 | 123  | 12,000 | 913  | 91,000  | 684  | 680,000   |
| 330               | 33   | 241  | 240  | 182  | 1,800 | 133  | 13,000 | 104  | 100,000 | 754  | 750,000   |
| 360               | 36   | 271  | 270  | 202  | 2,000 | 153  | 15,000 | 114  | 110,000 | 824  | 820,000   |
| 390               | 39   | 301  | 300  | 222  | 2,200 | 163  | 16,000 | 124  | 120,000 | 914  | 910,000   |
| 430               | 43   | 331  | 330  | 242  | 2,400 | 183  | 18,000 | 134  | 130,000 | 105  | 1,000,000 |
| 470               | 47   | 361  | 360  | 272  | 2,700 | 203  | 20,000 | 154  | 150,000 |      |           |
| 510               | 51   | 391  | 390  | 302  | 3,000 | 223  | 22,000 | 164  | 160,000 |      |           |
| 560               | 56   | 431  | 430  | 332  | 3,300 | 243  | 24,000 | 184  | 180,000 |      |           |
| 620               | 62   | 471  | 470  | 362  | 3,600 | 273  | 27,000 | 204  | 200,000 |      |           |

1. Include "X" in tolerance code.



## Addendum

### Dual Terminator Resistor Values [Schematic 5 - 4-Digit Resistor Code]

The 766 Series part number includes the EIA Code value of the Thevenin equivalent resistances of R<sub>1</sub> and R<sub>2</sub>.

The Thevenin equivalent resistance is calculated using the following formula;  $R_{EQ} = R_1 * R_2 / (R_1 + R_2)$ .


| R1 [ohms] | R2 [ohms] | Thevenin Equivalent [ohms] | CTS Resistor Code | R1 [ohms] | R2 [ohms] | Thevenin Equivalent [ohms] | CTS Resistor Code | R1 [ohms] | R2 [ohms] | Thevenin Equivalent [ohms] | CTS Resistor Code | R1 [ohms] | R2 [ohms] | Thevenin Equivalent [ohms] | CTS Resistor Code |
|-----------|-----------|----------------------------|-------------------|-----------|-----------|----------------------------|-------------------|-----------|-----------|----------------------------|-------------------|-----------|-----------|----------------------------|-------------------|
| 22        | 50        | 15                         | 150A              | 118       | 178       | 71                         | 710A              | 240       | 620       | 173                        | 171C              | 680       | 1,500     | 468                        | 471A              |
| 25        | 50        | 17                         | 170A              | 120       | 120       | 60                         | 600B              | 250       | 250       | 125                        | 131B              | 715       | 240       | 180                        | 181B              |
| 30        | 50        | 19                         | 190A              | 120       | 150       | 67                         | 670C              | 260       | 162       | 100                        | 101G              | 750       | 750       | 375                        | 381A              |
| 30        | 620       | 29                         | 290A              | 120       | 180       | 72                         | 720A              | 270       | 130       | 88                         | 880B              | 750       | 2,300     | 566                        | 571A              |
| 33        | 680       | 31                         | 310A              | 120       | 200       | 75                         | 750B              | 270       | 180       | 108                        | 111C              | 780       | 390       | 260                        | 261A              |
| 33        | 4,700     | 33                         | 330A              | 120       | 220       | 78                         | 780B              | 270       | 270       | 135                        | 141A              | 820       | 560       | 333                        | 331B              |
| 36        | 620       | 34                         | 340A              | 121       | 195       | 75                         | 750C              | 270       | 470       | 171                        | 171A              | 1,000     | 1,000     | 500                        | 501A              |
| 38        | 125       | 29                         | 290B              | 122       | 253       | 82                         | 820A              | 271       | 131       | 88                         | 880A              | 1,000     | 1,500     | 600                        | 601B              |
| 43        | 620       | 40                         | 400A              | 130       | 210       | 80                         | 800A              | 330       | 220       | 132                        | 131D              | 1,000     | 2,000     | 667                        | 671A              |
| 47        | 68        | 28                         | 280A              | 133       | 154       | 71                         | 710B              | 330       | 330       | 165                        | 171B              | 1,000     | 2,200     | 688                        | 691A              |
| 47        | 270       | 40                         | 400B              | 150       | 150       | 75                         | 750A              | 330       | 390       | 179                        | 181A              | 1,000     | 3,300     | 767                        | 771A              |
| 65        | 90        | 38                         | 380A              | 150       | 180       | 82                         | 820B              | 330       | 470       | 194                        | 191A              | 1,100     | 820       | 470                        | 471B              |
| 68        | 189       | 50                         | 500B              | 150       | 1,000     | 130                        | 131E              | 330       | 680       | 222                        | 221A              | 1,100     | 2,200     | 733                        | 731A              |
| 75        | 620       | 67                         | 670A              | 160       | 240       | 96                         | 960A              | 330       | 3,900     | 304                        | 301A              | 1,200     | 1,200     | 600                        | 601A              |
| 80        | 220       | 59                         | 590A              | 160       | 260       | 99                         | 990A              | 360       | 390       | 187                        | 191B              | 1,500     | 1,500     | 750                        | 751A              |
| 81        | 130       | 50                         | 500A              | 160       | 270       | 100                        | 101D              | 360       | 600       | 225                        | 231A              | 1,500     | 3,300     | 1,031                      | 102A              |
| 81        | 220       | 59                         | 600C              | 160       | 440       | 117                        | 121D              | 360       | 720       | 240                        | 241B              | 2,000     | 1,000     | 667                        | 671B              |
| 81        | 330       | 65                         | 650B              | 162       | 260       | 100                        | 101B              | 390       | 620       | 239                        | 241A              | 2,000     | 2,000     | 1,000                      | 102B              |
| 81        | 2,200     | 78                         | 780A              | 180       | 220       | 99                         | 101A              | 400       | 200       | 133                        | 131F              | 2,200     | 3,300     | 1,320                      | 132A              |
| 82        | 120       | 49                         | 490A              | 180       | 240       | 103                        | 101F              | 400       | 600       | 240                        | 241C              | 2,200     | 4,400     | 1,467                      | 152A              |
| 82        | 130       | 50                         | 500D              | 180       | 270       | 108                        | 111A              | 470       | 330       | 194                        | 191C              | 2,200     | 5,600     | 1,579                      | 162A              |
| 83        | 128       | 50                         | 500C              | 180       | 300       | 113                        | 111B              | 470       | 680       | 278                        | 281C              | 3,000     | 2,000     | 1,200                      | 122A              |
| 95        | 156       | 59                         | 590B              | 180       | 390       | 123                        | 121A              | 470       | 940       | 313                        | 311A              | 3,000     | 6,200     | 2,022                      | 202A              |
| 100       | 75        | 43                         | 430A              | 180       | 470       | 130                        | 131C              | 470       | 1,000     | 320                        | 321A              | 3,300     | 4,700     | 1,939                      | 192A              |
| 100       | 82        | 45                         | 450A              | 182       | 245       | 104                        | 101E              | 500       | 500       | 250                        | 251A              | 3,900     | 3,300     | 1,788                      | 182A              |
| 100       | 100       | 50                         | 500E              | 200       | 100       | 67                         | 670D              | 510       | 760       | 305                        | 311B              | 4,400     | 2,200     | 1,467                      | 152B              |
| 100       | 150       | 60                         | 600A              | 200       | 270       | 115                        | 121C              | 560       | 390       | 230                        | 231B              | 4,700     | 4,700     | 2,350                      | 242A              |
| 100       | 175       | 64                         | 640A              | 200       | 1,500     | 176                        | 171D              | 560       | 820       | 333                        | 331A              | 4,700     | 22,000    | 3,873                      | 392A              |
| 100       | 200       | 67                         | 670B              | 220       | 220       | 110                        | 111D              | 560       | 910       | 347                        | 351A              | 5,000     | 5,000     | 2,500                      | 252A              |
| 100       | 220       | 69                         | 690A              | 220       | 270       | 121                        | 121B              | 560       | 1,000     | 359                        | 361A              | 6,800     | 22,000    | 5,194                      | 522A              |
| 100       | 430       | 81                         | 810A              | 220       | 330       | 132                        | 131A              | 620       | 820       | 353                        | 351B              | 10,000    | 20,000    | 6,667                      | 672A              |
| 106       | 169       | 65                         | 650A              | 220       | 470       | 150                        | 151A              | 620       | 910       | 369                        | 371A              | 10,000    | 51,000    | 8,361                      | 842A              |
| 110       | 91        | 50                         | 500F              | 220       | 1,800     | 196                        | 201A              | 660       | 990       | 396                        | 401B              | 50,000    | 100,000   | 33,333                     | 333A              |
| 110       | 220       | 73                         | 730A              | 240       | 170       | 100                        | 101C              | 680       | 1,000     | 405                        | 401A              | 360,000   | 390,000   | 187,200                    | 194A              |

1. Resistor tolerances are ±2%.

2. Suffix letter in CTS Code has no significance, assigned in sequential order.

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