



**THE DATASHEET OF
770101103P**



770 Series Conformal Coated SIP Resistor Network



Features

- High-Reliability Cermet Resistors
- Space Saving Versus Individual Resistors
- Available Odd or Even Number of Pins [4 – 12]
- Low Profile w/ 2.54mm Pin Spacing
- Improved TCR Tracking vs. Discrete Resistors
- Epoxy Resin Coating

RoHS Compliant in Accordance with EU Directive 2011/65/EU and 2015/863
 - Lead-Free Termination Finish
 - Exemption 7(c)-I, Electrical and electronic components containing lead [Pb] in glass

Applications

- Data Communications
- Image Processing
- Medical Equipment
- Networking
- Pull-Up/Pull-Down Logic Gates
- DDR SDRAM, MDDR, DRAM
- Portable Test Equipment
- Low Profile High Density Designs

Description

770 Series Chip Arrays are single packaged devices containing an array of homogeneous resistor elements. Arrays are typically used for convenience when several resistors occupy the same area in a layout. Multiple package sizes and circuit configurations help save placement costs by reducing application component count.

Ordering Information

| Model | Number of Pins | Schematic | Resistor Code | RoHS Compliant |
|-------|----------------|-----------|---------------|----------------|
| 770 | 10 | 3 | 103 | P |

| Schematic | Pin Count |
|-----------|-----------------|
| Bussed | 4 - 12 |
| Isolated | 4, 6, 8, 10, 12 |
| Dual | 6, 8, 10 |

| Code | Resistor Value * |
|------|------------------|
| 103 | 10k Ohms |

* See notes below.

| Code | Schematic Type |
|------|-------------------------|
| 1 | Bussed Circuit |
| 3 | Isolated Circuit |
| 5 | Dual Terminator Circuit |

| Code | Termination |
|------|---------------|
| P | SnAgCu Finish |

Notes:

1. See Addendum for standard EIA values and resistor codes.
2. Resistor Tolerance is $\pm 2\%$ for all part numbers.
3. Schematic 5 codes use the following formats. See Addendum tables for available part numbers.
 Ex. 220/330 = 220 Ohms/330 Ohms, 470/1.2k = 470 Ohms/1,200 Ohms

**Not all performance combinations and resistor values 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.



Ordering Information

Part Number Examples

| Schematic 1 or 3 Examples | | | | Schematic 5 Examples For R1 & R2 <1k | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|-----------|-----------|-----------------|---|--------|---------|----------------|--------|--------|-------|-------------|-----|----|--------|---------------|-----|------|----------|-----------------|----|----|-------|--------------|------|------|-----------|-----------------|------|------|-----------|-----------------|
| # Pins | Schematic | R [Ω] | Part Number | R1 [Ω] | R2 [Ω] | R1/R2 | Part Number | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 1 | 22 | 77041220P | 81 | 130 | 81/130 | 77010581/130P | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 1 | 1,600 | 77041162P | 100 | 200 | 100/200 | 770105100/200P | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 1 | 150,000 | 77041154P | 180 | 270 | 180/270 | 770105180/270P | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | 1 | 390,000 | 77041394P | 220 | 330 | 220/330 | 770105220/330P | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 3 | 51 | 77043510P | For R1 & R2 >1k <table border="1"> <thead> <tr> <th>R1 [Ω]</th> <th>R2 [Ω]</th> <th>R1/R2</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>470</td> <td>1k</td> <td>470/1k</td> <td>770105470/1KP</td> </tr> <tr> <td>750</td> <td>2.3k</td> <td>750/2.3k</td> <td>770105750/2.3KP</td> </tr> <tr> <td>1k</td> <td>2k</td> <td>1k/2k</td> <td>7701051K/2KP</td> </tr> <tr> <td>1.1k</td> <td>2.2k</td> <td>1.1k/2.2k</td> <td>7701051.1/2.2KP</td> </tr> <tr> <td>1.5k</td> <td>3.3k</td> <td>1.5k/3.3k</td> <td>7701051.5/3.3KP</td> </tr> </tbody> </table> | | | | R1 [Ω] | R2 [Ω] | R1/R2 | Part Number | 470 | 1k | 470/1k | 770105470/1KP | 750 | 2.3k | 750/2.3k | 770105750/2.3KP | 1k | 2k | 1k/2k | 7701051K/2KP | 1.1k | 2.2k | 1.1k/2.2k | 7701051.1/2.2KP | 1.5k | 3.3k | 1.5k/3.3k | 7701051.5/3.3KP |
| R1 [Ω] | R2 [Ω] | R1/R2 | Part Number | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 470 | 1k | 470/1k | 770105470/1KP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 750 | 2.3k | 750/2.3k | 770105750/2.3KP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1k | 2k | 1k/2k | 7701051K/2KP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1k | 2.2k | 1.1k/2.2k | 7701051.1/2.2KP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.5k | 3.3k | 1.5k/3.3k | 7701051.5/3.3KP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 3 | 270 | 77043271P | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 3 | 10,000 | 77043103P | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | 3 | 680,000 | 77043684P | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | CTS Part Number is limited to 15 characters maximum, therefore first K is omitted. | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Electrical & Environmental Specifications

Operating Conditions

| Circuit Schematic | Pin Count | Resistance Range ¹ [Ohm] | Resistance Tolerance [%] | Operating Temperature Range | Temperature Coefficient | +70°C Power Per Resistor ³ [Watts] | Maximum Working Voltage ⁴ | Maximum Overload Voltage ⁴ |
|----------------------------|-----------------|-------------------------------------|--------------------------|-----------------------------|-------------------------|---|--------------------------------------|---------------------------------------|
| 1 - Bussed | 4 - 12 | 22 - 1M | ±2% Std. | -55°C to +125°C | ±100ppm/°C | 150mW @ +25°C 100mW @ +70°C | E=√P*R or 50, whichever is less | E=(√P*R)2.5 or 100, whichever is less |
| 3 - Isolated | 4, 6, 8, 10, 12 | | | | | | | |
| 5 - Dual Terminator | 6, 8, 10 | Note 2 | | | | | | |

1. Except Part Number 77083120P [12 Ohms].

2. See Addendum for Schematic 5 available part numbers.

3. Power rating is based on continuous full load operation at an ambient temperature of +25°C.

For resistors operating at ambient temperatures above +25°C, power rating shall be derated per the Derating Curve below.

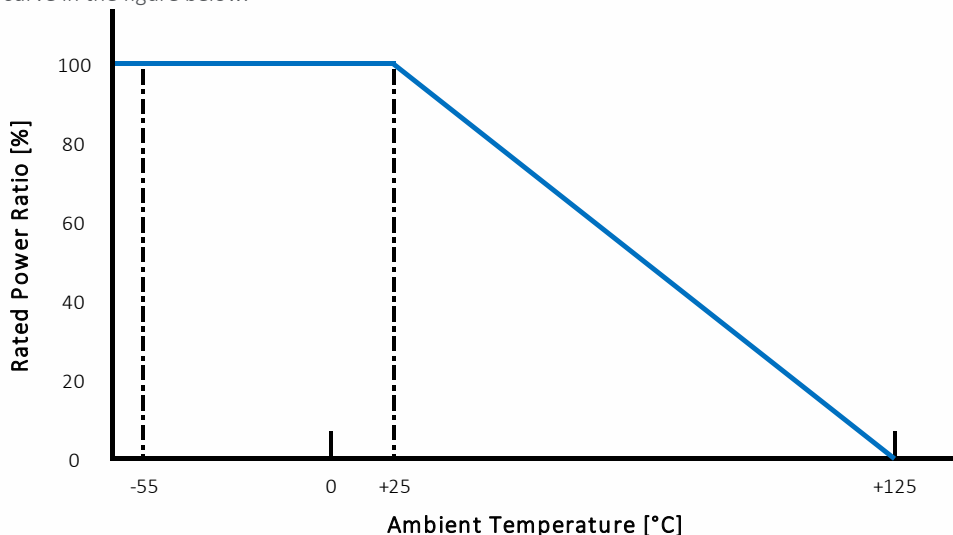
4. P = Power Rating, R = Resistance.

| Pin Count | Package Power @ +25°C | Package Power @ +70°C | Pin Count | Package Power @ +25°C | Package Power @ +70°C |
|-----------|-----------------------|-----------------------|-----------|-----------------------|-----------------------|
| 4 | 500mW | 300mW | 9 | 1.2W | 800mW |
| 5 | 700mW | 400mW | 10 | 1.4W | 900mW |
| 6 | 800mW | 500mW | 11 | 1.5W | 1.0W |
| 7 | 900mW | 600mW | 12 | 1.6W | 1.1W |
| 8 | 1.1W | 700mW | | | |

Electrical & Environmental Specifications

Power Derating Curve – Typical

With the rated ambient temperature set to +25°C, the maximum power [maximum current for 0Ω product] at a temperature of no more than rated ambient temperature shall be equal to the rated power [rate current for 0Ω product]. The maximum power at a temperature exceeding the rated ambient temperature shall be a value determined by reducing the rated power according to the power reduction curve in the figure below.



Rated Voltage

The rated voltage shall be the DC or AC [effective power frequency] voltage corresponding to the rated power and shall be determined with the formula shown below. If the determined rated voltage exceeds the maximum operating voltage specified in Operating Conditions table, the maximum operating voltage shall be the rated voltage.

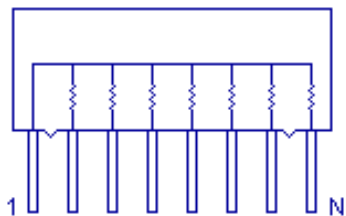
$$E = \sqrt{P \times R}$$

E = Rated Voltage [V]
 P = Rated Power [W]
 R = Nominal Resistance [Ω]

Circuit Types

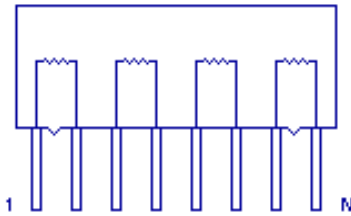
Bussed [Schematic 1]

Available in 4 to 12 pin configurations.



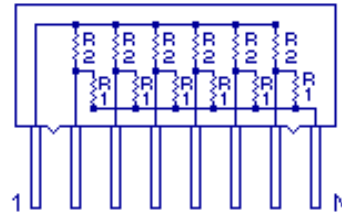
Isolated [Schematic 3]

Available in 4, 6, 8, 10, 12 pin configurations.



Dual Terminator [Schematic 5]

Available in 6, 8, 10 pin configurations.





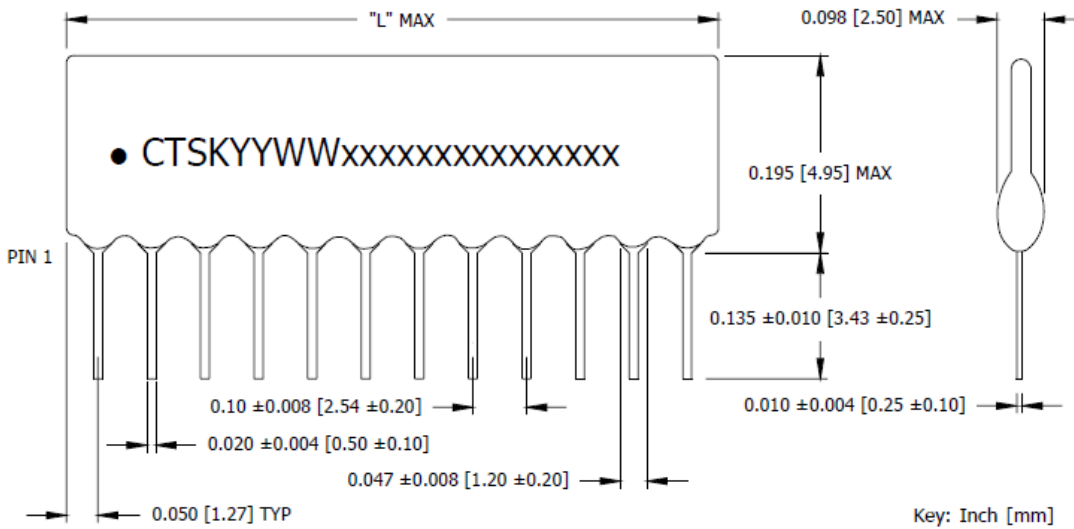
Electrical & Environmental Specifications

Environmental Parameters

| Test | Maximum Delta R | | Test Description |
|----------------------------------|-----------------|-----------------|---|
| | Typical | Limit | |
| Thermal Cycle | ±0.25% | ±0.5% | -40°C [30 minutes], +85°C [30 minutes], 5 cycles |
| Short Time Overload | ±0.25% | ±0.5% | 2½ times rated working voltage for 5 seconds [100V maximum] |
| Moisture Resistance - R ≤ 100Ω | - | ±1.0% | +40°C ±2°C, 90%/95% R.H., 1000 hours |
| Moisture Resistance - R > 100Ω | - | ±2.0% | |
| Temperature Coefficient [T.C.R.] | - | ±100ppm/°C | +25°C/-55°C, +25°C/+125°C |
| High Temperature Exposure | ±3.0% | - | 1,000 hours @ +125°C, no load |
| Load Life - R ≤ 100Ω | - | ±1.0% | 1,000 hours @ +70°C, rated load |
| Load Life - R > 100Ω | - | ±2.0% | |
| Insulation Resistance | | 10G Ω min. | 200V |
| Dielectric Strength | ±0.25% | ±0.5% | 200V |
| Terminal Strength - Lead Pull | ±0.25% | ±0.5% | 9.8N pull 10 seconds |
| Terminal Strength - Lead Bend | | three 45° bends | 2.45N |
| Resistance to Solder Heat | ±0.25% | ±0.5% | +260°C ±5°C, 10 seconds ±1 second |
| Solderability | - | - | RMA Flux, +230°C, 5 seconds dip, 95% coverage |
| Resistance to Solvents | - | - | Isopropyl alcohol, Freon TMC |
| Mechanical Shock | ±0.25% | ±0.5% | 100g, 1 msec., 3 shocks each plane |
| Vibration | ±0.25% | ±0.5% | 20g, 10-2000Hz, 4 hours/plane |
| Flammability | - | - | Conforms to UL94V-0 |
| Non-Fungus per MIL-STD 810C | - | - | - |

Mechanical Specifications

Package Drawing



Package Lengths

| Pin Count | Dimensions [mm] | |
|-----------|-----------------|--|
| | L | |
| 4 | 10.16 | |
| 5 | 12.70 | |
| 6 | 15.24 | |
| 7 | 17.78 | |
| 8 | 20.32 | |
| 9 | 22.86 | |
| 10 | 25.40 | |
| 11 | 27.94 | |
| 12 | 30.48 | |

Marking Information

- – Pin 1 identifier.
- CTSK – Manufacturer identifier.
- YYWW – Date Code; YY = year, WW = week.
- xxxxxxxxxxxxxx – reserved for CTS part number, Ex. 770103472P.

Full marking: Ex. ●CTSK2312770103472P

Reduced marking: For parts with 8 pins or less, the part series 770 may be omitted from the part number portions of the marking code. Ex. ●CTSK231283472P

Complete CTS part number and date code information must appear on the bag and carton labels.

Notes

- JEDEC termination code (e1). Barrier-plating is copper [Cu] over iron [Fe] leads with tin-silver-copper [SnAgCu] finish.
- Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
- MSL = 1.

Packaging – Bulk

Standard packaging is bulk in bag. Device quantity is 250 pieces per bag.



Addendum

Standard EIA Codes and Resistor Values – E-24 [3-Digit Resistor Codes]

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





Addendum

Schematic 5 Resistor Combinations

| Model Part Number 770105 For R1 & R2 <1k | | | | Model Part Number 770105 For R1 & R2 >1k | | | |
|---|--------|---------|----------------|--|--------|-----------|-----------------|
| R1 [Ω] | R2 [Ω] | R1/R2 | Part Number | R1 [Ω] | R2 [Ω] | R1/R2 | Part Number |
| 81 | 130 | 81/130 | 77010581/130P | 470 | 1k | 470/1k | 770105470/1KP |
| 100 | 200 | 100/200 | 770105100/200P | 560 | 1k | 560/1k | 770105560/1KP |
| 100 | 150 | 100/150 | 770105100/150P | 750 | 2.3k | 750/2.3k | 770105750/2.3KP |
| 100 | 430 | 100/430 | 770105100/430P | 1k | 2k | 1k/2k | 7701051K/2KP |
| 106 | 169 | 106/169 | 770105106/169P | 1.1k | 2.2k | 1.1k/2.2k | 7701051.1/2.2KP |
| 120 | 180 | 120/180 | 770105120/180P | 1k | 3.3k | 1k/3.3k | 7701051K/3.3KP |
| 121 | 195 | 121/195 | 770105121/195P | 1.5k | 1.5k | 1.5k/1.5k | 7701051.5/1.5KP |
| 160 | 240 | 160/240 | 770105160/240P | 1.5k | 3.3k | 1.5k/3.3k | 7701051.5/3.3KP |
| 162 | 260 | 162/260 | 770105162/260P | 2.2k | 4.4k | 2.2k/4.4k | 7701052.2/4.4KP |
| 180 | 220 | 180/220 | 770105180/220P | 2.2k | 5.6k | 2.2k/5.6k | 7701052.2/5.6KP |
| 180 | 270 | 180/270 | 770105180/270P | 3k | 6.2k | 3k/6.2k | 7701053K/6.2KP |
| 180 | 300 | 180/300 | 770105180/300P | 3.3k | 4.7k | 3.3k/4.7k | 7701053.3/4.7KP |
| 180 | 390 | 180/390 | 770105180/390P | 3.9k | 3.3k | 3.9k/3.3k | 7701053.9/3.3KP |
| 220 | 270 | 220/270 | 770105220/270P | 5k | 5k | 5k/5k | 7701055K/5KP |
| 220 | 330 | 220/330 | 770105220/330P | 22k | 56k | 22k/56k | 77010522K/56KP |
| 250 | 250 | 250/250 | 770105250/250P | | | | |
| 270 | 470 | 270/470 | 770105270/470P | CTS Part Number is limited to 15 characters maximum, therefore first K is omitted. | | | |
| 330 | 330 | 330/330 | 770105330/330P | | | | |
| 330 | 390 | 330/390 | 770105330/390P | | | | |
| 330 | 470 | 330/470 | 770105330/470P | | | | |
| 360 | 720 | 360/720 | 770105360/720P | | | | |
| 390 | 620 | 390/620 | 770105390/620P | | | | |
| 470 | 680 | 470/680 | 770105470/680P | | | | |
| 750 | 750 | 750/750 | 770105750/750P | | | | |

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