

## FEATURES

- **High-Reliability Cermet Resistors**
- **Space Saving Over Individual Resistors**
- **Low Profile**
- Available in Odd or Even Number of Pins From 4 to 12 Leads
- 0.100 inch [2.54 mm] Pin Spacing
- Resistance Range 22Ω to 1 MΩ (E-24 Series)
- Temperature Coefficient of Resistance (T.C.R.) ±100ppm/°C
- Operating Temperature to -55°C to +125°C
- Epoxy Resin Coating
- Bulk Packaging
- **RoHS Compliant in Accordance with EU Directive 2005/95/EC**
  - Lead-Free Termination Finish
  - Exemption 5 for Pb in glass material and resistor elements



## ORDERING INFORMATION



**Not all pin count, schematic combinations and resistor values may be available.**  
Contact your local CTS Representative or CTS Customer Service for availability.

Schematic 5 Example Part Numbers

| For R1 and R2 <1k Ohms |           |         |                |
|------------------------|-----------|---------|----------------|
| R1 (ohms)              | R2 (ohms) | R1/R2   | Part Number    |
| 81                     | 130       | 81/130  | 77010581/130P  |
| 100                    | 200       | 100/200 | 770105100/200P |
| 180                    | 270       | 180/270 | 770105180/270P |
| 220                    | 330       | 220/330 | 770105220/330P |

Schematic 5 Example Part Numbers

| For R1 or R2 >1k Ohms |           |           |                   |
|-----------------------|-----------|-----------|-------------------|
| R1 (ohms)             | R2 (ohms) | 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 * |

\* CTS Part Number limited to 15 characters maximum.  
First k is omitted

**ORDERING INFORMATION**
**AVAILABLE RESISTOR VALUES & EIA CODE (E-24 Series)**

| Ohms | Code | Ohms | Code | Ohms | Code | Ohms | Code | Ohms | Code | Ohms  | Code | Ohms  | Code | Ohms  | Code | Ohms | Code | Ohms | Code |
|------|------|------|------|------|------|------|------|------|------|-------|------|-------|------|-------|------|------|------|------|------|
| 22   | 220  | 68   | 680  | 220  | 221  | 680  | 681  | 2.2K | 222  | 6.8K  | 682  | 22.0K | 223  | 68.0K | 683  | 220K | 224  | 680K | 684  |
| 24   | 240  | 75   | 750  | 240  | 241  | 750  | 751  | 2.4K | 242  | 7.5K  | 752  | 24.0K | 243  | 75.0K | 753  | 240K | 244  | 750K | 754  |
| 27   | 270  | 82   | 820  | 270  | 271  | 820  | 821  | 2.7K | 272  | 8.2K  | 822  | 27.0K | 273  | 82.0K | 823  | 270K | 274  | 820K | 824  |
| 30   | 300  | 91   | 910  | 300  | 301  | 910  | 911  | 3.0K | 302  | 9.1K  | 912  | 30.0K | 303  | 91.0K | 913  | 300K | 304  | 910K | 914  |
| 33   | 330  | 100  | 101  | 330  | 331  | 1.0K | 102  | 3.3K | 332  | 10.0K | 103  | 33.0K | 333  | 100K  | 104  | 330K | 334  | 1M   | 105  |
| 36   | 360  | 110  | 111  | 360  | 361  | 1.1K | 112  | 3.6K | 362  | 11.0K | 113  | 36.0K | 363  | 110K  | 114  | 360K | 364  |      |      |
| 39   | 390  | 120  | 121  | 390  | 391  | 1.2K | 122  | 3.9K | 392  | 12.0K | 123  | 39.0K | 393  | 120K  | 124  | 390K | 394  |      |      |
| 43   | 430  | 130  | 131  | 430  | 431  | 1.3K | 132  | 4.3K | 432  | 13.0K | 133  | 43.0K | 433  | 130K  | 134  | 430K | 434  |      |      |
| 47   | 470  | 150  | 151  | 470  | 471  | 1.5K | 152  | 4.7K | 472  | 15.0K | 153  | 47.0K | 473  | 150K  | 154  | 470K | 474  |      |      |
| 51   | 510  | 160  | 161  | 510  | 511  | 1.6K | 162  | 5.1K | 512  | 16.0K | 163  | 51.0K | 513  | 160K  | 164  | 510K | 514  |      |      |
| 56   | 560  | 180  | 181  | 560  | 561  | 1.8K | 182  | 5.6K | 562  | 18.0K | 183  | 56.0K | 563  | 180K  | 184  | 560K | 564  |      |      |
| 62   | 620  | 200  | 201  | 620  | 621  | 2.0K | 202  | 6.2K | 622  | 20.0K | 203  | 62.0K | 623  | 200K  | 204  | 620K | 624  |      |      |

**SCHEMATIC 5, AVAILABE PART NUMBERS**

| Model 770105<br>For R1 and R2 <1k |           |         |                |
|-----------------------------------|-----------|---------|----------------|
| R1 (ohms)                         | R2 (ohms) | R1/R2   | Part Number    |
| 81                                | 130       | 81/130  | 77010581/130P  |
| 100                               | 200       | 100/200 | 770105100/200P |
| 100                               | 150       | 100/150 | 770105100/150P |
| 100                               | 430       | 100/430 | 770105100/430P |
| 106                               | 169       | 106/169 | 770105106/169P |
| 120                               | 180       | 120/180 | 770105120/180P |
| 121                               | 195       | 121/195 | 770105121/195P |
| 160                               | 240       | 160/240 | 770105160/240P |
| 162                               | 260       | 162/260 | 770105162/260P |
| 180                               | 220       | 180/220 | 770105180/220P |
| 180                               | 270       | 180/270 | 770105180/270P |
| 180                               | 300       | 180/300 | 770105180/300P |
| 180                               | 390       | 180/390 | 770105180/390P |
| 220                               | 270       | 220/270 | 770105220/270P |
| 220                               | 330       | 220/330 | 770105220/330P |
| 250                               | 250       | 250/250 | 770105250/250P |
| 270                               | 470       | 270/470 | 770105270/470P |
| 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 |

| Model 770105<br>For R1 or R2 >1k |           |           |                 |
|----------------------------------|-----------|-----------|-----------------|
| R1 (ohms)                        | R2 (ohms) | R1/R2     | Part Number     |
| 470                              | 1K        | 470/1K    | 770105470/1KP   |
| 560                              | 1K        | 560/1K    | 770105560/1KP   |
| 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 |
| 1K                               | 3.3K      | 1K/3.3K   | 7701051K/3.3KP  |
| 1.5K                             | 1.5K      | 1.5K/1.5K | 7701051.5/1.5KP |
| 1.5K                             | 3.3K      | 1.5K/3.3K | 7701051.5/3.3KP |
| 2.2K                             | 4.4K      | 2.2K/4.4K | 7701052.2/4.4KP |
| 2.2K                             | 5.6K      | 2.2K/5.6K | 7701052.2/5.6KP |
| 3K                               | 6.2K      | 3K/6.2K   | 7701053K/6.2KP  |
| 3.3K                             | 4.7K      | 3.3K/4.7K | 7701053.3/4.7KP |
| 3.9K                             | 3.3K      | 3.9K/3.3K | 7701053.9/3.3KP |
| 5K                               | 5K        | 5K/5K     | 7701055K/5KP    |
| 22K                              | 56K       | 22K/56K   | 77010522K/56KP  |

First K is omitted

**PACKAGING INFORMATION**

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

## ELECTRICAL CHARACTERISTICS

### PRODUCT CHARACTERISTICS

| CIRCUIT SCHEMATIC   | PIN COUNT | POWER RATING<br>SINGLE RESISTOR<br>ELEMENT |         | T.C.R.<br>MAXIMUM | RESISTANCE<br>RANGE        | RESISTANCE<br>TOLERANCE | MAXIMUM<br>WORKING<br>VOLTAGE                     | MAXIMUM<br>OVERLOAD VOLTAGE                             | RATED<br>AMBIENT<br>TEMPERATURE | OPERATING<br>TEMPERATURE<br>RANGE |  |  |  |  |  |
|---------------------|-----------|--------------------------------------------|---------|-------------------|----------------------------|-------------------------|---------------------------------------------------|---------------------------------------------------------|---------------------------------|-----------------------------------|--|--|--|--|--|
| 1 - Bussed          | 4 - 12    | 150mW <sup>1</sup>                         | 100mW   | ±100ppm/°C        | 22 - 1M (E24) <sup>2</sup> | ±2%                     | E = √P*R or 50,<br>whichever is less <sup>3</sup> | E = (√P*R)2.5 or 100,<br>whichever is less <sup>3</sup> | +25°C                           | -55°C to +125°C                   |  |  |  |  |  |
| 3 - Isolated        | 4 - 12    | @ +25°C                                    | @ +70°C |                   | Note 3                     |                         |                                                   |                                                         |                                 |                                   |  |  |  |  |  |
| 5 - Dual Terminator | 6, 8, 10  |                                            |         |                   |                            |                         |                                                   |                                                         |                                 |                                   |  |  |  |  |  |

Notes:

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

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

2 Except Part Number 77083120P (12 ohms).

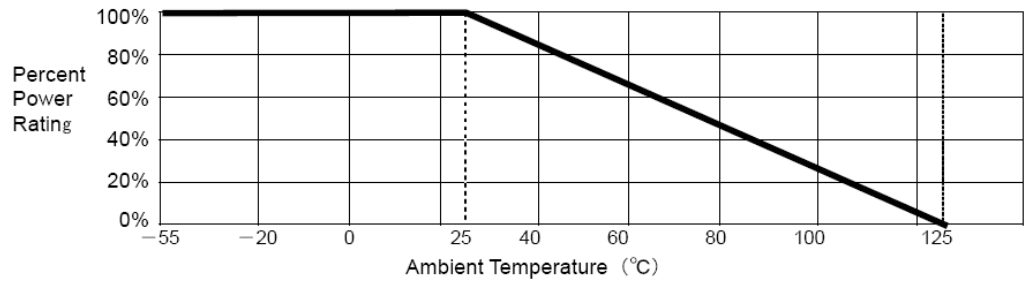
3 See Page 2 for Schematic 5 available part numbers.

4 P = Power Rating, R = Resistance.

### PACKAGE POWER RATINGS

| PIN COUNT | PACKAGE POWER<br>@+25°C | PACKAGE POWER<br>@+70°C |
|-----------|-------------------------|-------------------------|
| 4         | 500mW                   | 300mW                   |
| 5         | 700mW                   | 400mW                   |
| 6         | 800mW                   | 500mW                   |
| 7         | 900mW                   | 600mW                   |
| 8         | 1.10W                   | 700mW                   |
| 9         | 1.20W                   | 800mW                   |
| 10        | 1.40W                   | 900mW                   |
| 11        | 1.50W                   | 1.00W                   |
| 12        | 1.60W                   | 1.10W                   |

### PACKAGE POWER DERATING CURVE



### CIRCUIT SCHEMATICS

#### (1) BUSSED

Available in 4 to 12 pin configurations.



#### (3) ISOLATED

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



#### (5) DUAL TERMINATOR

Available in 6, 8, 10 pin configurations.



## ENVIRONMENTAL SPECIFICATIONS

| TEST                             |           | DELTA RESISTANCE |            | TEST CONDITION                                    |
|----------------------------------|-----------|------------------|------------|---------------------------------------------------|
|                                  |           | TYPICAL          | LIMIT      |                                                   |
| Temperature Cycling              |           | ±0.25%           | ±0.5%      | -40°C (30 minutes), +85°C (30 minutes), 5 cycles  |
| Short Time Overload              |           | ±0.25%           | ±0.5%      | 2.5 times rated voltage, 5 seconds (100V maximum) |
| Moisture Resistance              | R ≤ 100Ω  |                  | ±1.00%     | +40°C ±2°C, 90%/95% R.H., 1000 hours              |
|                                  | R > 100Ω  |                  | ±2.00%     |                                                   |
| Temperature Coefficient (T.C.R.) |           |                  | ±100ppm/°C | +25°C/-55°C, +25°C/+125°C                         |
| Life at Elevated Temperature     |           | ±3.00%           |            | +125°C, 1000 hours, no load                       |
| Load Life                        | R ≤ 100Ω  |                  | ±1.00%     | +70°C ±2°C, 1000 hours, rated load                |
|                                  | R > 100Ω  |                  | ±2.00%     |                                                   |
| 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                              |
|                                  | 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     |
| 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      |           |                  |            |                                                   |
| Resistance to Solvents           |           |                  |            | Isopropyl alcohol                                 |

## MECHANICAL SPECIFICATIONS

### PACKAGE DRAWING



### PACKAGE LENGTHS

| PIN COUNT | "L" MAXIMUM<br>Inch [mm] |
|-----------|--------------------------|
| 4         | 0.40 [10.16]             |
| 5         | 0.50 [12.70]             |
| 6         | 0.60 [15.24]             |
| 7         | 0.70 [17.78]             |
| 8         | 0.80 [20.32]             |
| 9         | 0.90 [22.86]             |
| 10        | 1.00 [25.40]             |
| 11        | 1.10 [27.94]             |
| 12        | 1.20 [30.48]             |

### MARKING INFORMATION

- – Pin 1 identifier.
- CTSK – CTS identifier.
- YYWW – Date code, YY – year, WW – week.
- xxxxxxxxxxxx – Reserved for CTS part number, Ex. 77083472P.

For parts with reduced marking (8 pins or less), the part series 770 may be omitted from the part number portion of the marking code.  
Ex. CTSK434729

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

### NOTES

- Copper (Cu) plated iron (Fe) leads.
- Termination finish (e1); tin (Sn) silver (Ag) copper (Cu).
- Reflow conditions per JEDEC J-STD-020, +260°C maximum.