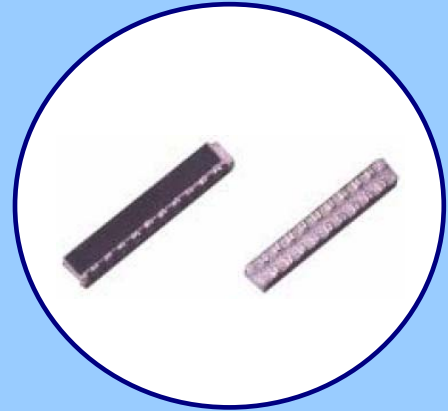


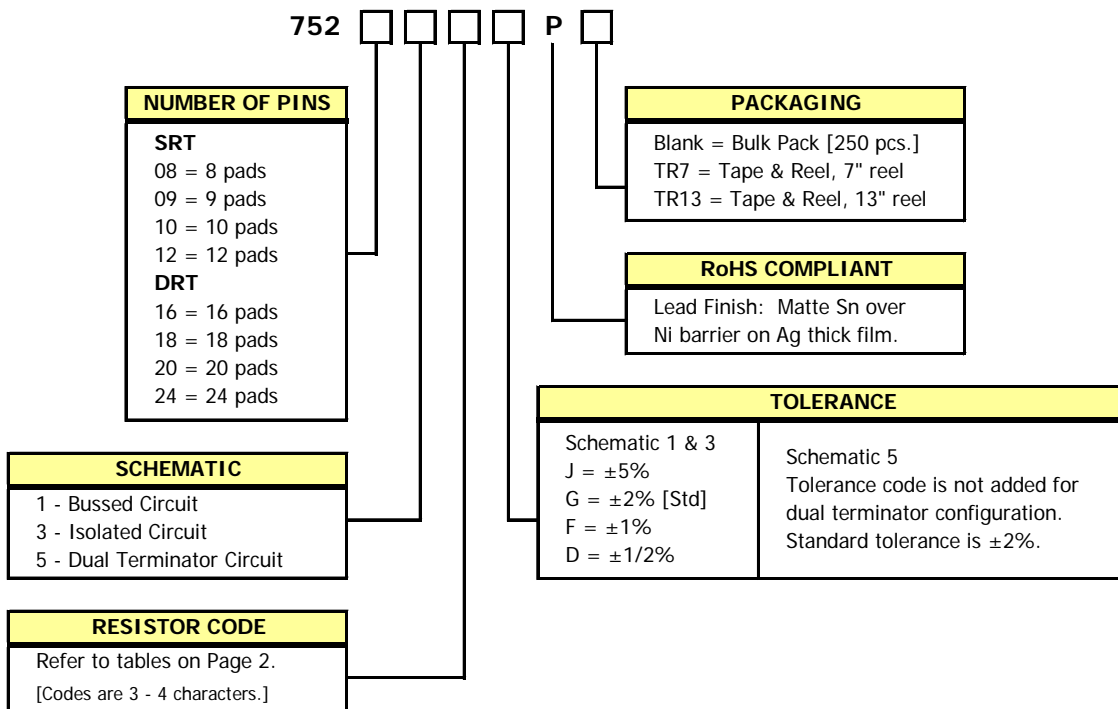


FEATURES

- **High Density Packaging**
- **Low Profile**
- **Inputs/Outputs Available**
 - Single Row Terminations [SRT] – 08, 09, 10, 12
 - Dual Row Terminations [DRT] – 16, 18, 20, 24
- **Nickel Barrier Solder-Coated Pads**
- Designed for Visual Inspection of Solder Joints
- Designed for Board Cleaning
- Application Specific Circuits are Available
- Compatible with Solder Reflow Process
- Tape and Reel 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



Notes:

1. No dashes or spaces to appear in part number.
2. Example Part Numbers;
 - Tape & Reel, 752091103GPTR13.
 - Bulk, 752103221GP.

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

ORDERING INFORMATION

AVAILABLE RESISTOR VALUES & EIA CODES

| Ohms | Code | Ohms | Code | Ohms | Code | Ohms | Code | Ohms | Code | Ohms | Code |
|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 000X | 68 | 680 | 470 | 471 | 3.3K | 332 | 27K | 273 | 220K | 224 |
| 10 | 100 | 75 | 750 | 510 | 511 | 3.9K | 392 | 33K | 333 | 270K | 274 |
| 12 | 120 | 82 | 820 | 560 | 561 | 4.7K | 472 | 39K | 393 | 330K | 334 |
| 15 | 150 | 100 | 101 | 680 | 681 | 5.1K | 512 | 47K | 473 | 390K | 394 |
| 18 | 180 | 110 | 111 | 820 | 821 | 5.6K | 562 | 51K | 513 | 470K | 474 |
| 22 | 220 | 120 | 121 | 1K | 102 | 6.8K | 682 | 56K | 563 | 510K | 514 |
| 27 | 270 | 150 | 151 | 1.2K | 122 | 8.2K | 822 | 68K | 683 | 560K | 564 |
| 33 | 330 | 180 | 181 | 1.5K | 152 | 10K | 103 | 82K | 823 | 680K | 684 |
| 39 | 390 | 220 | 221 | 1.8K | 182 | 12K | 123 | 100K | 104 | 820K | 824 |
| 47 | 470 | 270 | 271 | 2.0K | 202 | 15K | 153 | 120K | 124 | 1M | 105 |
| 51 | 510 | 330 | 331 | 2.2K | 222 | 18K | 183 | 150K | 154 | | |
| 56 | 560 | 390 | 391 | 2.7K | 272 | 22K | 223 | 180K | 184 | | |

DUAL TERMINATOR RESISTOR VALUES – Schematic 5

Standard CTS Dual Terminator products contain 2[N-2] resistors of two different values with resistor value connected to a common buss. The part number includes the EIA Code value of the Thevenin equivalent resistances of R₁ and R₂. The Thevenin equivalent resistance is calculated in the following way: [The suffix letter relates only to the sequence of variations that equal the same equivalent resistance.]

$$R_{EO} = R_1 * R_2 / (R_1 + R_2)$$

| Example | | | |
|------------|---------------------------|---------------------------|----------------------------|
| 752095131A | R ₁ = 220 Ohms | R ₂ = 330 Ohms | R _{EO} = 132 Ohms |
| 752095191A | R ₁ = 330 Ohms | R ₂ = 470 Ohms | R _{EO} = 194 Ohms |
| 752095131C | R ₁ = 180 Ohms | R ₂ = 470 Ohms | R _{EO} = 130 Ohms |

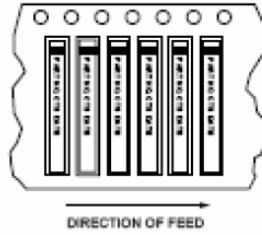
[Pad 1 is common to R₂ and Pin N is common to R₁.]

| R1 Ohms | R2 Ohms | Thevenin Equivalent | CTS Code | R1 Ohms | R2 Ohms | Thevenin Equivalent | CTS Code | R3 Ohms | R4 Ohms | Thevenin Equivalent | CTS Code |
|---------|---------|---------------------|----------|---------|---------|---------------------|----------|---------|---------|---------------------|----------|
| 25 | 50 | 17 ohms | 150A | 330 | 680 | 222 ohms | 221A | 180 | 220 | 99 ohms | 101A |
| 30 | 50 | 19 ohms | 190A | 330 | 390 | 179 ohms | 181A | 560 | 1K | 359 ohms | 361A |
| 30 | 620 | 29 ohms | 290A | 330 | 220 | 132 ohms | 131D | 680 | 1K | 405 ohms | 401A |
| 33 | 4.7K | 33 ohms | 330A | 330 | 330 | 165 ohms | 171B | 750 | 750 | 375 ohms | 381A |
| 36 | 620 | 34 ohms | 340A | 360 | 720 | 240 ohms | 241B | 750 | 2.3K | 566 ohms | 571A |
| 43 | 620 | 40 ohms | 400A | 360 | 600 | 225 ohms | 231A | 1K | 3.3K | 767 ohms | 771A |
| 68 | 189 | 50 ohms | 500B | 390 | 620 | 239 ohms | 241A | 1K | 2K | 667 ohms | 671A |
| 75 | 620 | 67 ohms | 670A | 470 | 1K | 320 ohms | 321A | 1.1K | 2.2K | 733 ohms | 731A |
| 80 | 220 | 59 ohms | 590A | 470 | 680 | 278 ohms | 281A | 1.2K | 1.2K | 600 ohms | 601A |
| 81 | 130 | 50 ohms | 500A | 470 | 940 | 313 ohms | 311A | 1.5K | 1.5K | 750 ohms | 751A |
| 81 | 2.2K | 78 ohms | 780A | 500 | 500 | 250 ohms | 251A | 1.5K | 3.3K | 1031 ohms | 102A |
| 100 | 200 | 67 ohms | 670B | 560 | 910 | 347 ohms | 351A | 2K | 2K | 1000 ohms | 102B |
| 100 | 430 | 81 ohms | 810A | 110 | 220 | 73 ohms | 730A | 2.2K | 5.6K | 1579 ohms | 162A |
| 100 | 150 | 60 ohms | 600A | 118 | 178 | 71 ohms | 710A | 2.2K | 4.4K | 1467 ohms | 152A |
| 106 | 169 | 65 ohms | 650A | 120 | 200 | 75 ohms | 750B | 2.2K | 3.3K | 1320 ohms | 132A |
| 200 | 1.5K | 176 ohms | 171D | 120 | 180 | 72 ohms | 720A | 3K | 6.2K | 2022 ohms | 202A |
| 220 | 330 | 132 ohms | 131A | 120 | 120 | 60 ohms | 600B | 3K | 2K | 1200 ohms | 122A |
| 220 | 270 | 121 ohms | 121B | 150 | 150 | 75 ohms | 750A | 3.3K | 4.7K | 1939 ohms | 192A |
| 220 | 220 | 110 ohms | 111D | 160 | 260 | 99 ohms | 990A | 3.9K | 3.3K | 1788 ohms | 182A |
| 240 | 170 | 100 ohms | 101C | 160 | 240 | 96 ohms | 960A | 4.7K | 22K | 3873 ohms | 392A |
| 240 | 620 | 173 ohms | 171C | 160 | 270 | 100 ohms | 101D | 5K | 5K | 2500 ohms | 252A |
| 250 | 250 | 125 ohms | 131B | 162 | 260 | 100 ohms | 101B | 6.8K | 22K | 5194 ohms | 522A |
| 270 | 470 | 171 ohms | 171A | 180 | 300 | 113 ohms | 111B | 10K | 51K | 8361 ohms | 842A |
| 270 | 180 | 108 ohms | 111C | 180 | 470 | 130 ohms | 131C | 50K | 100K | 33,333 ohms | 333A |
| 271 | 131 | 88 ohms | 880A | 180 | 390 | 123 ohms | 121A | | | | |
| 330 | 470 | 194 ohms | 191A | 180 | 270 | 108 ohms | 111A | | | | |

1. All tolerances +/-2%.
2. Other values available on request.
3. Suffix letter has no significance - assigned in sequential order.

PACKAGING INFORMATION

| Tape & Reel | | |
|----------------|-------|-------|
| Reel Diameter | 7" | 13" |
| Tape Width | 24mm | |
| Tape Pitch | 4mm | |
| No. Parts/Reel | 1,000 | 5,000 |



ELECTRICAL CHARACTERISTICS

GENERAL REQUIREMENTS

Resistance Range:

Standard: 10 Ohms to 1M Ohms

Resistance Tolerance:

Standard: $\pm 2\%$ or 0.5 Ohms [whichever is greater]
Special: $\pm 1\%$ or 0.3 Ohms [whichever is greater]

Operating Temperature Range:

-55°C to +125°C

Dielectric Strength:

100 V_{AC}

Temperature Coefficient:

Standard: ± 200 ppm/°C
Special [33 Ohms to 1M Ohms]: ± 100 ppm/°C

Maximum Operating Voltage:

25 V, not to exceed rated power

POWER RATING

[Total Network Power, number of inputs/outputs (Watts)]

| SRT | 8 Pad | 9 Pad | 10 Pad | 12 Pad | - | - | - | - |
|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| DRT | - | - | - | - | 16 Pad | 18 Pad | 20 Pad | 24 Pad |
| @25°C | 1.2W | 1.3W | 1.4W | 1.7W | 1.4W | 1.5W | 1.6W | 2.0W |
| @70°C | 0.08W | 0.85W | 0.9W | 1.1W | 0.9W | 0.95W | 1.0W | 1.3W |

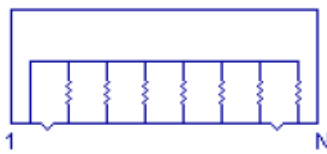
MAXIMUM RESISTOR POWER

[Not to exceed total network power]

| Schematic | 1 | 3 | 5 |
|-----------|-------|-------|-------|
| @25°C | 0.12W | 0.24W | 0.12W |
| @70°C | 0.08W | 0.16W | 0.08W |

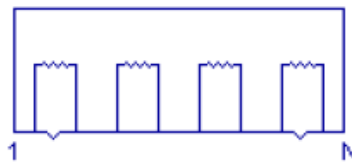
CIRCUIT TYPES

BUSSED SRT [Schematic 1]



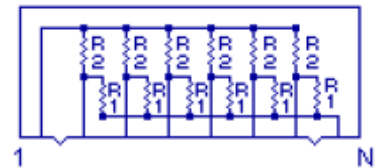
ISOLATED SRT [Schematic 3]

(Not Available in 9 Pads Configuration)

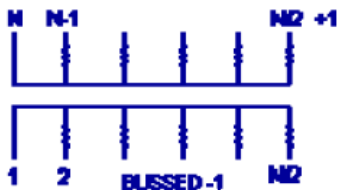


DUAL TERMINATOR SRT [Schematic 5]

(Not Available in DRT)



BUSSED DRT [Schematic 1]



ISOLATED DRT [Schematic 3]

(Not Available in 18 Pads Configuration)



MECHANICAL SPECIFICATION

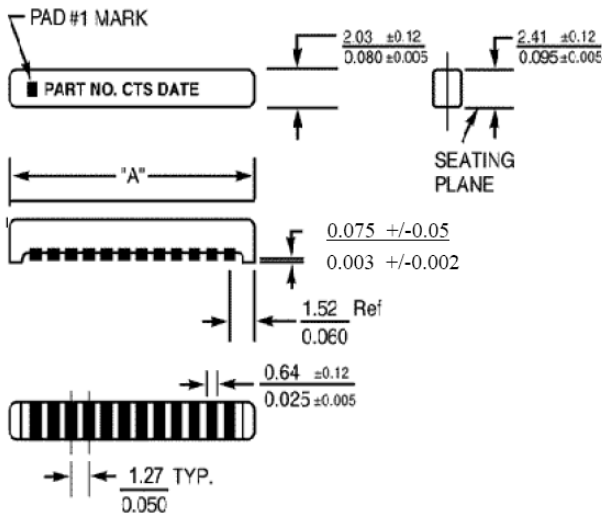
PACKAGE DRAWING

| No. of Pads SRT/DRT | "A" Dimension | |
|------------------------|---------------|--------------|
| | mm | inch |
| 08/16 | 11.81 ±0.12 | 0.465 ±0.005 |
| 09/18 | 13.08 ±0.12 | 0.515 ±0.005 |
| 10/20 | 14.35 ±0.12 | 0.565 ±0.005 |
| 12/24 | 16.89 ±0.12 | 0.665 ±0.005 |

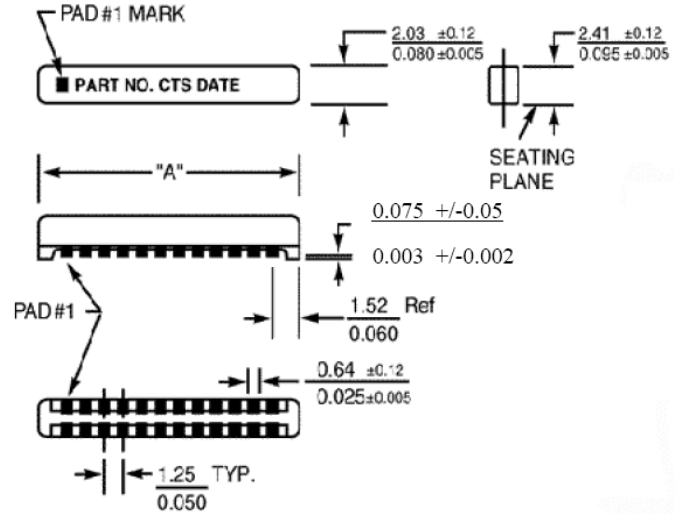
Notes:

1. Pad termination (e3). Barrier plating is nickel (Ni) over silver (Ag) thick film pad with Matte tin (Sn) finish.
2. Reflow conditions per JEDEC-J-STD-020, +260°C maximum.
3. MSL = 1.

Single Row Termination (SRT)



Dual Row Termination (DRT)



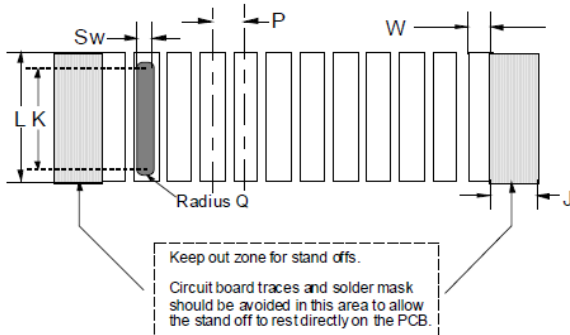
RECOMMENDED LAND PATTERN

| Recommended Land Pattern | | | | | | | |
|--------------------------|-----|------|------|-------|------|------|-------|
| Dimension | | D | P | L | W | J | S |
| 752 | mm | 1.27 | 1.27 | 3.18 | 0.76 | 1.27 | 0.64 |
| | in. | 0.05 | 0.05 | 0.125 | 0.03 | 0.05 | 0.025 |

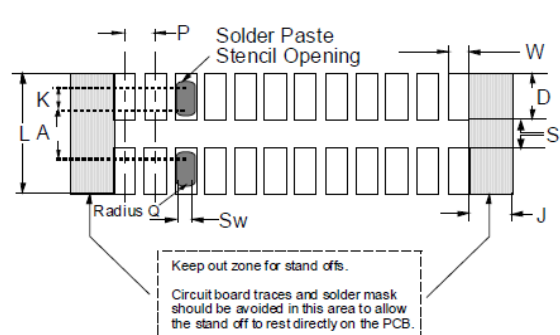
| SRT Solder Paste Stencil Opening | | | | | |
|----------------------------------|-----|-------|-------|----|-------|
| Dimension | | K | Sw | A | Q |
| 4 mil | mm | 2.40 | 0.76 | NA | 0.38 |
| | in. | 0.095 | 0.03 | NA | 0.015 |
| 6 mil | mm | 1.90 | 0.63 | NA | 0.33 |
| | in. | 0.075 | 0.025 | NA | 0.013 |

| DRT Solder Paste Stencil Opening | | | | | |
|----------------------------------|-----|-------|-------|-------|-------|
| Dimension | | K | Sw | A | Q |
| 4 mil | mm | 0.66 | 0.76 | 1.52 | 0.38 |
| | in. | 0.026 | 0.03 | 0.06 | 0.015 |
| 6 mil | mm | 0.51 | 0.63 | 1.40 | 0.30 |
| | in. | 0.02 | 0.025 | 0.055 | 0.012 |

Single Row Termination



Dual Row Termination



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