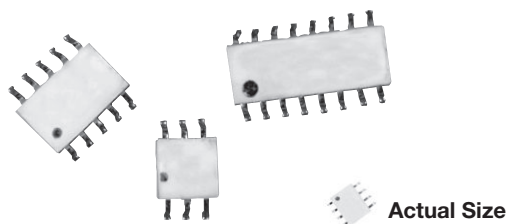


# Sandwich, 50 mil Pitch, Dual In-Line Thin Film Resistor, Surface Mount Network



## LINKS TO ADDITIONAL RESOURCES

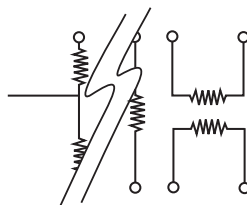


A dual-in-line monolithic ceramic sandwich in a variety of pin sizes (4 to 20) that allow higher resistance integration than traditional chip and wire molded construction. In addition, tighter resistance tolerances can be obtained over traditional molded networks due to the elimination of molding temperature and stress.



**ATTENTION!**  
Observe Precautions for  
Handling Electrostatic Sensitive Devices!

## SCHEMATIC



Custom schematics available  
Please consult factory

## FEATURES

- Lead (Pb)-free gold plated terminals standard
- Gold-to-gold terminations. External leads are attached directly to gold pads on the ceramic substrate by thermo-compression bonding (no internal solder)
- Tighter tolerances than molded standards (0.01 %)
- Ceramic package with no cavity
- Flexibility of lead variations to save PC board space
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS\***  
Available  
**HALOGEN  
FREE**

## Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

## TYPICAL PERFORMANCE

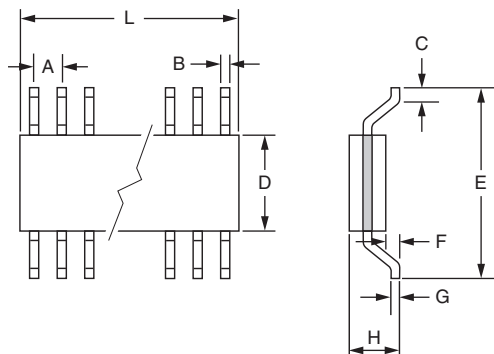
|      | ABSOLUTE | TRACKING |
|------|----------|----------|
| TCR  | 25       | 5        |
|      | ABSOLUTE | RATIO    |
| TOL. | 0.1      | 0.02     |

## STANDARD ELECTRICAL SPECIFICATIONS

| TEST                           | SPECIFICATIONS                                           | CONDITIONS                            |
|--------------------------------|----------------------------------------------------------|---------------------------------------|
| Material                       | Tantalum nitride or passivated nichrome <sup>(1)</sup>   | -                                     |
| Pin / lead number              | 4 to 20                                                  | -                                     |
| Resistance range               | 100 $\Omega$ to 1.5 M $\Omega$ total                     | -                                     |
| TCR: absolute                  | $\pm 25$ ppm/ $^{\circ}$ C to $\pm 50$ ppm/ $^{\circ}$ C | -55 $^{\circ}$ C to +125 $^{\circ}$ C |
| TCR: tracking                  | $\pm 5$ ppm/ $^{\circ}$ C (typical)                      | -55 $^{\circ}$ C to +125 $^{\circ}$ C |
| Tolerance: absolute            | $\pm 0.05$ % to $\pm 1.0$ %                              | +25 $^{\circ}$ C                      |
| Tolerance: ratio               | $\pm 0.02$ % to $\pm 0.1$ %                              | +25 $^{\circ}$ C                      |
| Power rating: resistor         | 100 mW                                                   | Per element at +70 $^{\circ}$ C       |
| Power rating: package          | 500 mW                                                   | Maximum at +70 $^{\circ}$ C           |
| Stability: absolute            | $\Delta R \pm 0.1$ %                                     | 2000 h at +70 $^{\circ}$ C            |
| Stability: ratio               | $\Delta R \pm 0.03$ %                                    | 2000 h at +70 $^{\circ}$ C            |
| Voltage coefficient            | 0.1 ppm/V                                                | -                                     |
| Working voltage                | 100 V max. not to exceed $\sqrt{P \times R}$             | -                                     |
| Operating temperature range    | -55 $^{\circ}$ C to +125 $^{\circ}$ C                    | -                                     |
| Storage temperature range      | -55 $^{\circ}$ C to +150 $^{\circ}$ C                    | -                                     |
| Noise                          | < -30 dB                                                 | -                                     |
| Thermal EMF                    | 0.08 $\mu$ V/ $^{\circ}$ C                               | -                                     |
| Shelf life stability: absolute | $\Delta R \pm 0.01$ %                                    | 1 year at +25 $^{\circ}$ C            |
| Shelf life stability: ratio    | $\Delta R \pm 0.002$ %                                   | 1 year at +25 $^{\circ}$ C            |

## Note

<sup>(1)</sup> Passivated nichrome is not standard film type for CSO series, consult factory if required

**DIMENSIONS AND IMPRINTING** in inches and millimeters


| DIMENSION   | INCHES                 | MILLIMETERS |
|-------------|------------------------|-------------|
| A           | 0.050                  | 1.27        |
| B (Typ.)    | 0.015                  | 0.38        |
| C           | 0.017 - 0.005 + 0.0010 | 0.432       |
| D (Max.)    | 0.157                  | 3.99        |
| E           | 0.239                  | 6.07        |
| F (Min.)    | 0.005                  | 0.13        |
| G (Typ.)    | 0.006                  | 0.15        |
| H (Max.)    | 0.070                  | 1.72        |
| L (6 Pins)  | 0.150 ± 0.01           | 3.81        |
| L (8 Pins)  | 0.200 ± 0.01           | 5.08        |
| L (10 Pins) | 0.250 ± 0.01           | 6.35        |
| L (12 Pins) | 0.300 ± 0.01           | 7.62        |
| L (14 Pins) | 0.350 ± 0.01           | 8.89        |
| L (16 Pins) | 0.400 ± 0.01           | 10.16       |
| L (18 Pins) | 0.450 ± 0.01           | 11.43       |
| L (20 Pins) | 0.500 ± 0.01           | 12.70       |

**MECHANICAL SPECIFICATIONS**

|                                                  |                                         |
|--------------------------------------------------|-----------------------------------------|
| Resistive element                                | Passivated nichrome or tantalum nitride |
| Body                                             | Ceramic                                 |
| Lead coplanarity                                 | ± 0.004                                 |
| Substrate material                               | Alumina                                 |
| Marking resistance to solvents                   | Per MIL-PRF-83401                       |
| Terminals                                        | Copper alloy                            |
| Plating                                          | Nickel/gold                             |
| Model CSOG - lead (Pb)-free standard             | Gold plated                             |
| Model CSO - tin / lead solder coated option      | Sn63                                    |
| Model CSOT - lead (Pb)-free solder coated option | 96.5 % Sn, 3.0 % Ag, 0.5 % Cu           |

**ORDERING INFORMATION CHECK LIST**

Special requirements should be identified in advance, but as a minimum, you should have the following information ready.

| ELECTRICAL                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MECHANICAL                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>Resistors, by value and tolerance</li> <li>Reference resistor(s) and matching of which resistors to which reference resistors</li> <li>Reference by ratio</li> <li>Absolute temperature coefficient of resistivity</li> <li>Temperature tracking of subordinate resistors to reference resistor(s)</li> <li>Maximum operating voltage</li> <li>Resistor power ratings</li> <li>Operating temperature range</li> </ol> | <ol style="list-style-type: none"> <li>Maximum allowable seated height (from PC board to top of network)</li> <li>Special marking concerns</li> <li>Schematic pin out of package</li> <li>Specify if solder coated leads are required</li> </ol> |



## GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CSOG1xx-xxxT1

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | S | O | G |   | 1 | x | x | - | x | x | x |   | T | 1 |
|   | C | S | O |   | 1 | x | x | - | x | x | x |   | T | 1 |
| C | S | O | T | 1 | x | x | - | x | x | x | - | x | T | 1 |

GLOBAL MODEL  
(3 or 4 digits)

**CSOG**  
(Lead (Pb)-free)  
(e4)

**CSO**  
(Tin lead)

**CSOT**  
(Lead (Pb)-free)  
(e1)

CUSTOM PART NUMBER  
(7 or 9 digits)

**1xx-xxx**  
**1xx-xxx-x**

PACKAGING

TAPE AND REEL  
**T0** = 100 min., 100 mult.  
**T1** = 1000 min., 1000 mult.  
**T3** = 300 min., 300 mult.  
**T5** = 500 min., 500 mult.  
**TF** = full reel  
**TS** = 100 min., 1 mult.

**UF** = TUBED

Historical Part Number Example: 1xx-xxx (for reference purposes only)

**1xx-xxx**

CUSTOM PART NUMBER



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