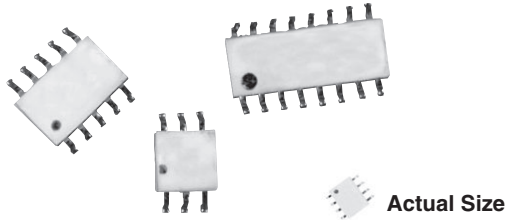


# Sandwich, 50 mil Pitch, Dual In-Line Thin Film Resistor, Surface Mount Network



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.

## 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
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition



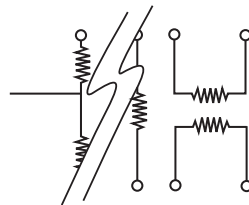
## Note

\* Pb containing terminations are not RoHS compliant, exemptions may apply

## TYPICAL PERFORMANCE

	ABSOLUTE	TRACKING
TCR	25	5
	ABSOLUTE	RATIO
TOL.	0.1	0.02

## SCHEMATIC



Custom schematics available  
Please consult factory

STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITIONS
Material	Tantalum nitride or passivated nichrome <sup>(1)</sup>	-
Pin/Lead Number	4 to 20	-
Resistance Range	100 Ω to 1.5 MΩ total	-
TCR: Absolute	± 25 ppm/°C to ± 50 ppm/°C	- 55 °C to + 125 °C
TCR: Tracking	± 5 ppm/°C (typical)	- 55 °C to + 125 °C
Tolerance: Absolute	± 0.05 % to ± 1.0 %	+ 25 °C
Tolerance: Ratio	± 0.02 % to ± 0.1 %	+ 25 °C
Power Rating: Resistor	100 mW	Per element at + 70 °C
Power Rating: Package	500 mW	Maximum at + 70 °C
Stability: Absolute	ΔR ± 0.1 %	2000 h at + 70 °C
Stability: Ratio	ΔR ± 0.03 %	2000 h at + 70 °C
Voltage Coefficient	0.1 ppm/V	-
Working Voltage	100 V max. not to exceed $\sqrt{P \times R}$	-
Operating Temperature Range	- 55 °C to + 125 °C	-
Storage Temperature Range	- 55 °C to + 150 °C	-
Noise	< - 30 dB	-
Thermal EMF	0.08 μV/°C	-
Shelf Life Stability: Absolute	ΔR ± 0.01 %	1 year at + 25 °C
Shelf Life Stability: Ratio	ΔR ± 0.002 %	1 year at + 25 °C

## Note

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

<b>DIMENSIONS AND IMPRINTING</b> in inches and millimeters			
	<b>DIMENSION</b>	<b>INCHES</b>	<b>MILLIMETERS</b>
	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

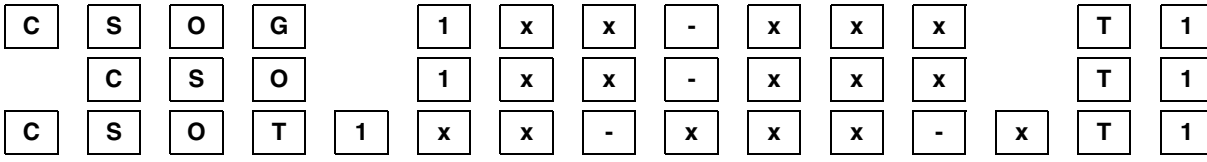
<b>MECHANICAL SPECIFICATIONS</b>	
<b>Resistive Element</b>	Passivated nichrome or tantalum nitride
<b>Body</b>	Ceramic
<b>Lead Coplanarity</b>	± 0.004
<b>Substrate Material</b>	Alumina
<b>Marking Resistance to Solvents</b>	Per MIL-PRF-83401
<b>Terminals</b>	Copper alloy
<b>Plating</b>	Nickel/gold
<b>Model CSOG - Lead (Pb)-free Standard</b>	Gold plated
<b>Model CSO - Tin/Lead Solder Coated Option</b>	Sn63
<b>Model CSOT - Lead (Pb)-free Solder Coated Option</b>	96.5 % Sn, 3.0 % Ag, 0.5 % Cu

<b>ORDERING INFORMATION CHECK LIST</b>	
Special requirements should be identified in advance, but as a minimum, you should have the following information ready.	
<b>ELECTRICAL</b>	<b>MECHANICAL</b>
<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



**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**

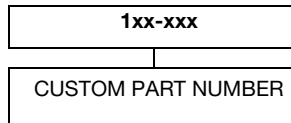
**PACKAGING**

**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)





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