

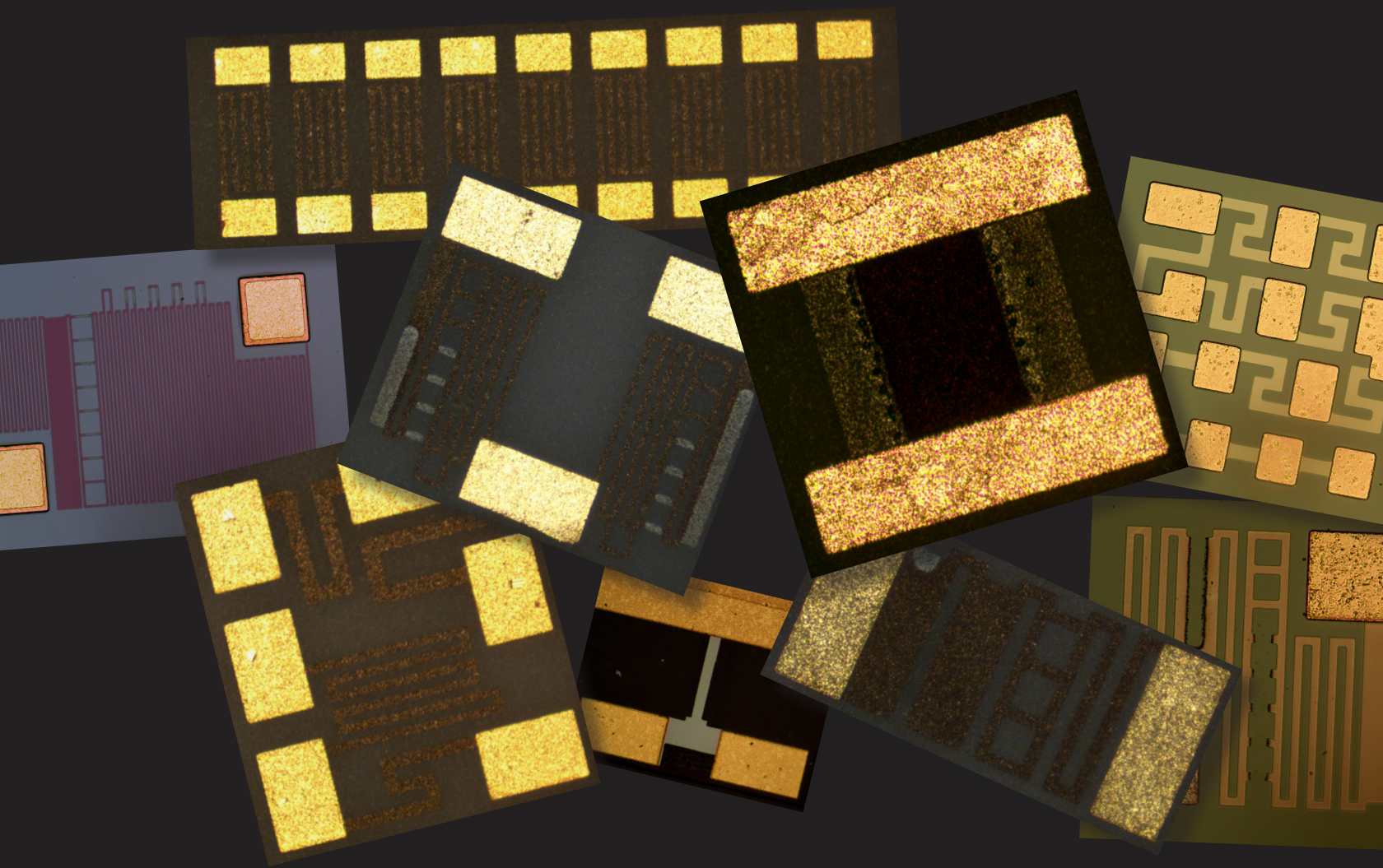
CX Thin Films

Resistors

Attenuators

Thin-Film Products

Thin-Film Services



www.cxthinfilms.com
ISO 9001:2015
RoHS/REACH Compliant
ITAR Compliant

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CX Thin Films

Resistors and Thin Film Devices



Corporate Profile

CX Thin Films is a privately held company that specializes in providing components to the RF, microwave, telecommunications, fiber-optic, defense, and aerospace industries. Our seasoned staff has decades of production experience in high reliability thin film products. We are focused on providing a broad variety of high-quality resistors and electronic components. All design and manufacturing is carried out in our 17,000 ft² facility including 2,000 ft² of class 10000 clean room area. Our facility in Cranston, Rhode Island, USA is ITAR compliant and implements the ISO 9001:2015 quality management system.

Why Buy From CX Thin Films?

Build to Specification. We manufacture all parts directly to the customer's specification. Length, width, thickness, resistance, and metallization can all be adjusted to provide optimal components for your application.

Free Samples. We understand that engineering design, analysis, and simulation cannot always provide a definitive answer to how components will perform. Therefore, we will provide samples at no cost to ensure our customers receive the right part for their design.

Responsiveness. We pride ourselves on our ability to ship parts quickly when our customers have urgent requirements.

Customer Service. Whether you need a quote, want to place an order, or have a technical question, you can count on receiving a response from CX Thin Films on the very same day of your request, or the next business day for after-hours inquiries. Our customers can depend on a fast reply.

Quality. We are driven to provide high quality products to our customers. We work with our customers to ensure they have a component that not only works to specification, but is also the right part for their design.

High-Reliability Products

Chip resistors: single, back contact, dual chip resistors, multi-taps, and arrays.

Microwave Resistors.

Attenuators.

Custom Resistor Networks: resistor/capacitor network capabilities.

Up to **Six-Sided Metallization.**

Plated or un-plated **Thru Hole Vias** available.

All parts are made to your specifications, and are RoHS/REACH compliant.

Standard delivery can be as little as two weeks.

Contract Services

100% Electrical: laser test and trim with full mapping (read and record data).

Photolithography: patterning, wet and dry etching.

Electroplating: Nickel and Gold.

Wafer Dicing: Silicon, Alumina, Quartz, Beryllium Oxide, Aluminum Nitride, and custom substrates (contact sales).

RF and DC Sputtering: supporting Au, Pt, Ag, Ni, Pd, Ta, TiW, Ti, TaN, NiCr, and SiO₂. Custom plating stacks are also available.

Repackaging: Tape and reel, waffle pack, gel pak, and film frame.

Full In-House Design Capability.

100% Visual and DC Electrical Inspection, Element Evaluation, and Test Capabilities, per MIL-PRF-55342 and MIL-STD-883.

For a full list of custom manufacturing capabilities, see Page 16.

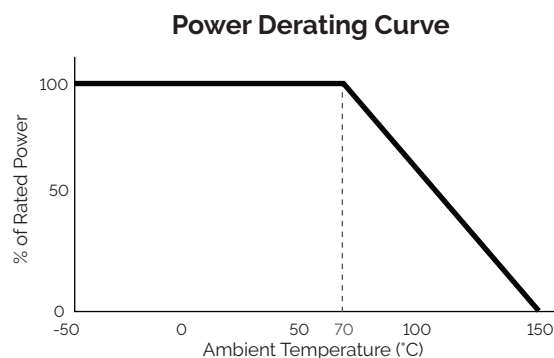
Please allow our staff to recommend the best part for your application.

Physical Properties of Our Products

General Properties

The following properties hold for all standard resistor products CX Thin Films manufactures:

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Insulation Resistance	$10^{12} \Omega \cdot \text{min}$ at 25°C
Voltage Rating	100 V maximum
Power Derating (See Chart at Right)	Full power up to 70°C Derated linearly to zero power at 150°C



Substrate Materials

Material	Size	Surface Finish	Dielectric Constant (at 1 MHz)	Thermal Conductivity (W / m · K)
Silicon (Si) (With 12 kÅ SiO ₂)	3 in diameter	Chemical Polish	N/A (SiO ₂ K = 3.8)	149 (SiO ₂ 1.38)
Alumina (Al ₂ O ₃)	To 4 in square	2 μin – 3 μin	9.8	26.9
Polished Alumina (Al ₂ O ₃)	To 4 in square	< 2 μin	9.8	26.9
Quartz (Fused Silica)	2.25 in square	60 / 40 Optical Polish	3.8	1.38
Beryllium Oxide (BeO)	To 4 in square	< 5 μin	6.6	285
Polished Beryllium Oxide (BeO)		< 2 μin	6.6	
Aluminum Nitride (AlN)	To 4 in square	< 10 μin	8.7	170
Polished Aluminum Nitride (AlN)		< 2 μin	8.7	

Standard dimensional tolerance for length and width is ±0.002 in. For thickness, standard tolerance is ±0.001 in.

Standard thickness on all chips except size 12 × 9 is 0.010 in. Standard thickness on size 12 × 9 chips is 0.005 in.

Custom materials and material specifications are available — contact sales.

Conductor Materials

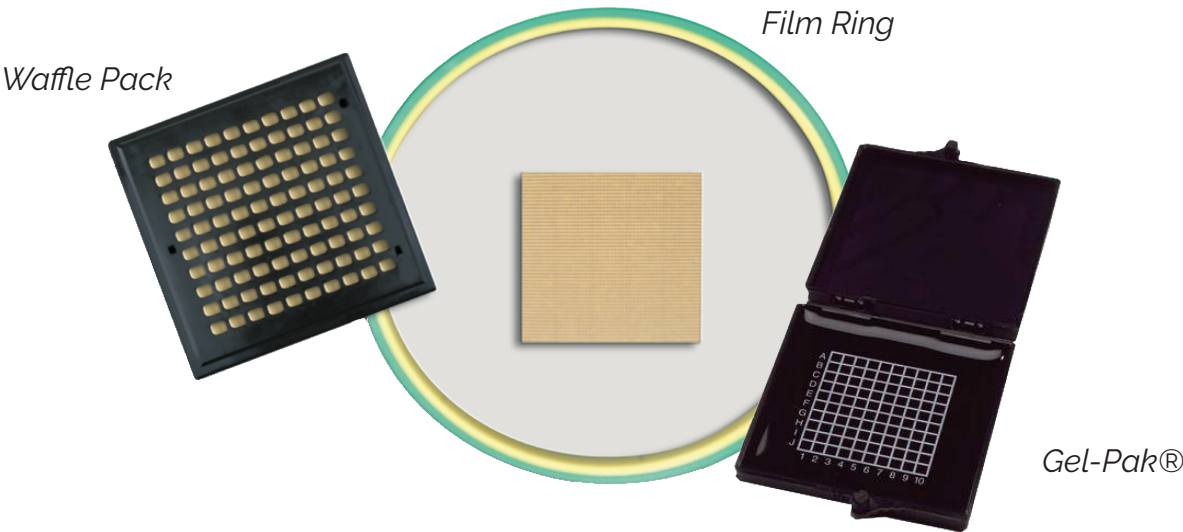
Material	Standard Thickness
Sputtered Gold (Au)	5 kÅ (Si/Au Back)
Plated Gold (Au)	25 kÅ
Silver (Ag)	2 kÅ

Testing and Standards

All CX Thin Films products meet or exceed MIL-PRF-55342 testing and standards. Additionally, our manufacturing process and quality assurance procedures adhere to the specifications or standards shown in the table below.

Packaging Options

ESD waffle packs are standard. Film rings, gel paks, and bulk packaging are available upon request. All film rings are shipped with 100% known good die. Any component that does not meet final inspection criteria is removed to avoid potential use.



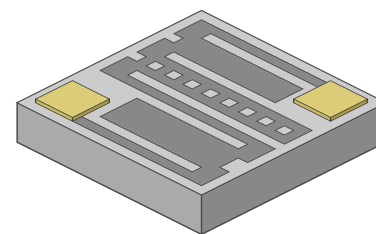
Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Top-Side Termination Resistors

Standard Chip Resistors

CX Thin Films standard line of wire-bondable thin film resistors offers our customers significant flexibility to meet the most challenging designs. Built to the customer's exact specifications, available configurations include single, dual, array, and custom configurations. Operating frequencies from DC to 500 MHz.

Resistance Range	0.5 Ω to 35 M Ω
Resistance Tolerance	$\pm 0.01\%$ to $\pm 20\%$, value-dependent
Voltage Rating	100 V maximum
Power Rating	Full power up to 70°C Derated linearly to 0 power at 150°C



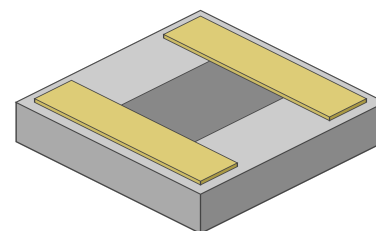
Recommended Substrates

99.6% Alumina (Al_2O_3)
Silicon (SiO_2)
Quartz
Beryllium Oxide (BeO)
Aluminum Nitride (AlN)

Microwave Chip Resistors

Microwave Chip Resistors are specifically designed to operate at frequencies up to 60 GHz; higher frequencies are available. Special microwave laser-trimming is used to ensure a tight tolerance at high frequencies. Our microwave resistors are compatible with flip-chip configurations on request.

Resistance Range	2 Ω to 5 k Ω		
Resistance Tolerance	$\pm 0.1\%$ to $\pm 20\%$, value-dependent		
VSWR	DC to 10 GHz	10 to 20 GHz	20 to 60 GHz
	1.2:1	1.3:1	1.5:1



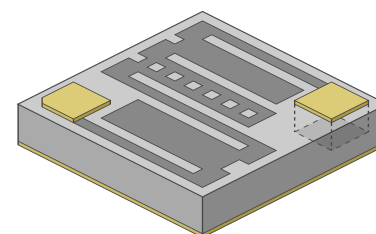
Recommended Substrates

99.6% Alumina (Al_2O_3)
Quartz
Beryllium Oxide (BeO)
Aluminum Nitride (AlN)

Back Contact Resistors

Back Contact Resistors provide engineers with a space-saving option. Only one wirebond is required to the top side of the chip, increasing reliability, with the bottom connection made by eutectic or conductive epoxy. One of the top pads is notched to indicate that wirebonding to that pad is required. Custom dual configuration back contact chip resistors offer the opportunity to further simplify a design, contact sales for more information.

Resistance Range	5 Ω to 25 M Ω
Resistive Material	Tantalum Nitride
Resistance Tolerance	$\pm 0.01\%$ to $\pm 20\%$, value-dependent



Recommended Substrates

Silicon (SiO_2)

Resistor Arrays

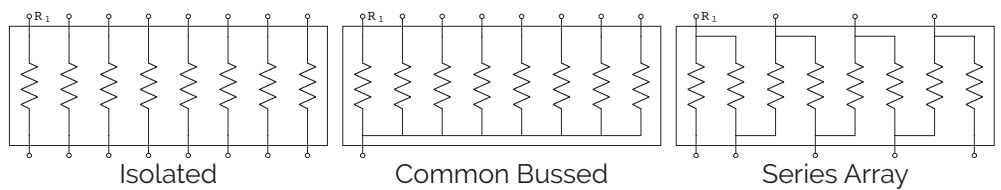
Standard Resistor Array

Resistor Arrays can be configured in 3 to 12 resistor combinations with all resistors at the same value and tolerance. Arrays can be extremely useful where working area is critical. Custom arrays can be designed for your needs.

Resistance Range	5 Ω to 100 kΩ per resistor (<i>Alumina</i>) 5 Ω to 1 MΩ per resistor (<i>Silicon</i>)
Resistive Material	Tantalum Nitride
Ratio Tolerance	To 0.01%, value-dependent

The minimum chip length for each type of resistor array is shown below.

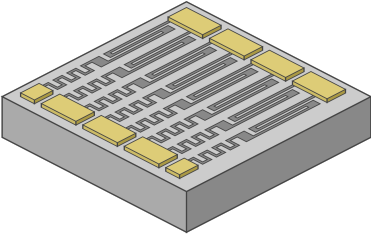
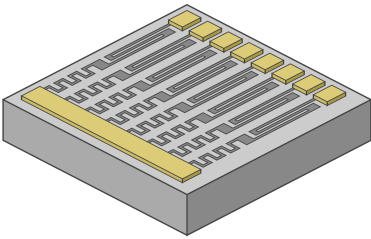
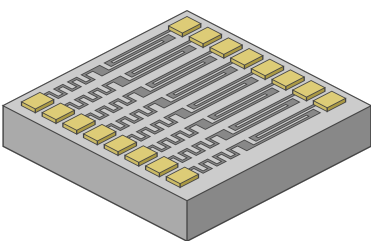
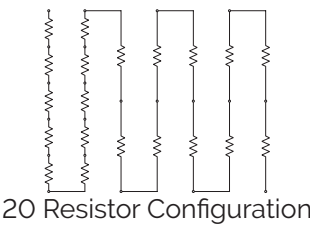
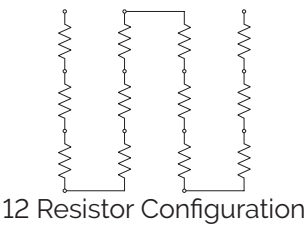
Resistors	3	4	5	6	7	8	9	10	11	12
Length (mils)	40	50	60	70	80	90	100	110	120	130
Width	60 mils standard									
Thickness	10 mils standard									
Power	50 mW / resistor (<i>standard</i>)									



Multi-Tap Network Resistors

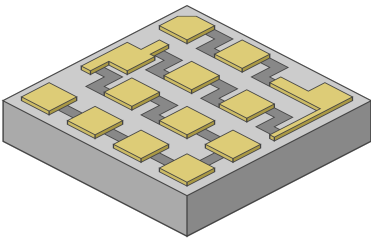
Multi-tap Resistor Arrays offer the value of multiple resistances in a single, space-saving chip. Single chip geometry offers excellent TCR tracking and resistance ratio tracking. We offer chips with 12 or 20 resistive elements as standard, other configurations are available upon request.

Tolerance	5%, 10%, or 20%		
Power	250 mW		
Resistance Range		Size 30 × 30	Size 38 × 38
	Silicon	80 Ω to 240 kΩ	550 Ω to 500 kΩ
	Alumina	80 Ω to 50 kΩ	550 Ω to 50 kΩ
Resistance Distribution		R ₁ to R ₇ = R _t / 8 R ₈ to R ₁₂ = R _t / 40	R ₁ to R ₁₀ = R _t / 110 R ₁₁ to R ₂₀ = R _t / 11



Recommended Substrates

99.6% Alumina (Al₂O₃)
Silicon (SiO₂)



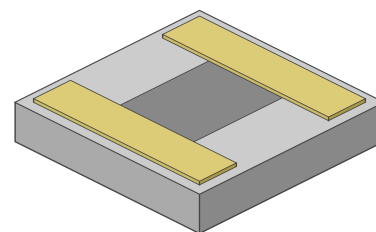
Recommended Substrates

99.6% Alumina (Al₂O₃)
Silicon (SiO₂)

High Power Resistors

Standard and Microwave High Power Chip Resistors

CX Thin Films proprietary high power line of chips can support a much greater power rating than a standard chip in the same case size. Top-contact and edge wrap configurations are supported to fit your exact application.



High Power Resistor Selection Charts

Most standard chips can be made in high power configurations, including wrap chips. Use the resistance and power charts below with the part number builder on pages 10 and 11 to construct a high power part number.

High Power Resistor Power Handling
by Material and Case Size

Case Size	Min Value	Max Value	Alumina (C-35)	AlN (C-28)	BeO (C-25)
20 × 10	2 Ω	1000 Ω	250 mW	1.0 W	2.0 W
15 × 15	2 Ω	1000 Ω	250 mW	1.0 W	2.0 W
20 × 20	2 Ω	1000 Ω	500 mW	2.0 W	4.0 W
30 × 20	2 Ω	1000 Ω	500 mW	2.0 W	4.0 W
40 × 20	2 Ω	1000 Ω	750 mW	3.0 W	6.0 W
30 × 30	2 Ω	1000 Ω	750 mW	3.0 W	6.0 W
35 × 35	2 Ω	1000 Ω	1.0 W	4.0 W	6.0 W
40 × 40	2 Ω	1000 Ω	1.0 W	4.0 W	6.0 W
50 × 25	2 Ω	1000 Ω	1.0 W	4.0 W	6.0 W
60 × 30	2 Ω	1000 Ω	1.4 W	5.0 W	10.0 W
50 × 50	2 Ω	1000 Ω	1.4 W	5.0 W	10.0 W
60 × 60	2 Ω	1000 Ω	1.4 W	5.0 W	10.0 W
80 × 50	2 Ω	1000 Ω	2.8 W	10.0 W	15.0 W
100 × 50	2 Ω	1000 Ω	2.8 W	10.0 W	15.0 W
120 × 60	2 Ω	1000 Ω	2.8 W	10.0 W	15.0 W
100 × 100	2 Ω	1000 Ω	2.8 W	10.0 W	15.0 W

Power ratings are based on adequate heat sinking to keep chips below 90°C.

Power ratings may be limited by 100 V maximum voltage rating.

Edge Wrap Resistors

Standard Chip Resistors with Edge Wrap

CX Thin Films' standard line of single or dual edge wrap resistors offer customers significant flexibility to meet challenging design needs. Half wrap style chips have a solid gold back contiguous with one pad, therefore eliminating one wirebond. Full wrap style chips have both pads continue to the back side, allowing elimination of all wirebonds.

Resistance Range	1 Ω to 3.5 MΩ
Resistance Tolerance	±0.01% to ±20%, value-dependent

Microwave Chip Resistors with Edge Wrap

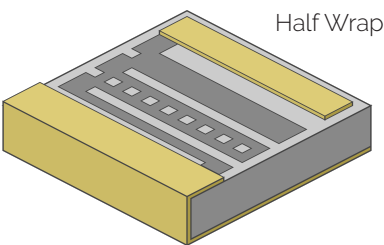
Surface Mount Microwave Chip Resistors have an edge wrap similar in construction to our standard surface mount wrap resistors, with half wrap and full wrap styles available. The addition of a microwave design allows for operation at frequencies up to 60 GHz.

Resistance Range	2 Ω to 5 kΩ
Resistance Tolerance	±0.5% to ±20%, value-dependent

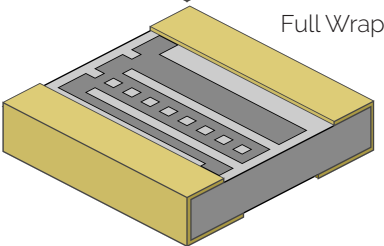
Wrap Metallization Selection Chart

Most standard chips can be made in wrap configuration, including dual chips and resistor arrays. Use the metallization chart below with the part number builder and charts on pages 10 and 11 to construct a wrap part number.

Wrap Bonding Pad Metallizations		
Metallization	Application	Code
1 Side Wrap	Epoxy or Au/Sn	H
1 Side Wrap	Epoxy, Au/Sn, or Sn Solder	M
1 Side Wrap	Sn Solder Ball	S
2 Side Wrap	Epoxy or Au/Sn	J
2 Side Wrap	Epoxy, Au/Sn, or Sn Solder	N
2 Side Wrap	Sn Solder Ball	T
Custom	Application-Specific	X



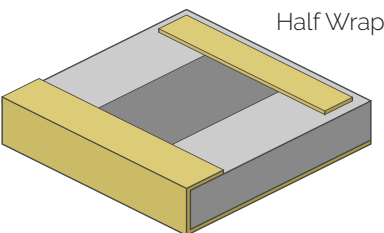
Half Wrap



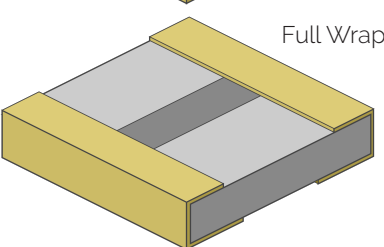
Full Wrap

Recommended Substrates

99.6% Alumina (Al₂O₃)
Beryllium Oxide (BeO)
Aluminum Nitride (AlN)



Half Wrap



Full Wrap

Recommended Substrates

99.6% Alumina (Al₂O₃)
Beryllium Oxide (BeO)
Aluminum Nitride (AlN)

Part Number Assembly

Top-Side Termination Resistors & Resistor Arrays

Example shown: Standard Resistor, TaN resistive element, alumina substrate, case size 0.020" × 0.020" × 0.010", PdAu bonding pad, bottom side bare, resistance 1000 Ω ± 5%, 150 ppm TCR, regular trim, 100 mW max power handling.

R T 1 - 35 - 20 X 20 X 10 - A - 10000 - J - Q E													
Resistor Style R – Standard (< 500 MHz) M – Microwave N – Multi-Tap Network I – Isolated Array B – Common-Bus Array S – Series Array												Power Handling See Power Table, page 11	
												TCR See TCR Table, page 11	
Resistive Metallization T – Tantalum Nitride N – NiChrome												Resistance Tolerance See Tolerance Codes, page 11	
Number of Resistors For dual resistors, see page 12												Resistance Digits 1 - 4 are significant figures. Digit 5 is the number of zeros to follow. When required, "R" is used as a decimal point and the exponent is omitted. e.g. 10001 = 10000 Ω, 10000 = 1000 Ω, 100R5 = 100.5 Ω	
Material Type See Material Selection Table, page 11												Metallization Code See Metallization Table, page 11	
Length and Width See Size Selection Table, page 1													
Thickness 10 mils standard (5 mils standard for size 12 × 9)													

The standard dimensional tolerance for length and width is ± 2 mils.
The standard dimensional tolerance for thickness is ± 1 mil.

Performance Specifications

Typical CX Thin Films commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling. Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements outlined in the table on page 5. Please contact sales for your exact testing requirements.

Resistor Selection Charts

Microwave Resistance Standard Resistance Ranges by Case Size

Case Size	Min (Ω)	Max (Ω)	Case Size	Min* (Ω)	Max (Ω) Alumina	Max (Ω) Silicon
12 × 9	4	500	12 × 9	1 - 3	25K	150K
14 × 12	3	750	14 × 12	1 - 3	40K	200K
20 × 10	3	1000	20 × 10	1 - 3	60K	250K
15 × 15	4	1000	15 × 15	1 - 2	70K	500K
20 × 20	2	1250	20 × 20	1 - 2	125K	1.0M
30 × 20	2	2500	30 × 20	1 - 2	200K	1.0M
40 × 20	2	3750	40 × 20	1 - 2	250K	1.5M
30 × 30	2	2500	30 × 30	1 - 2	275K	2.0M
35 × 35	2	3000	35 × 35	1 - 2	300K	3.0M
40 × 40	2	3750	40 × 40	1 - 2	500K	5.0M
50 × 25	3	5000	50 × 25	1 - 2	300K	3.0M
60 × 30	3	5000	60 × 30	1 - 2	500K	6.0M
50 × 50	2	5000	50 × 50	1 - 2	700K	7.0M
60 × 60	2	5000	60 × 60	1 - 2	2.0M	15M
80 × 50	2	5000	80 × 50	1 - 2	2.0M	20M
100 × 50	2	5000	100 × 50	1 - 2	2.5M	25M
120 × 60	2	5000	120 × 60	1 - 2	3.0M	30M
100 × 100	2	5000	100 × 100	1 - 2	3.5M	35M

Non-microwave wrap resistors may have a lower maximum resistance, please consult sales.

Power Handling by Material and Case Size

Case Size	Alumina (C-35)	Silicon (C-22)	AlN (C-28)	BeO (C-25)	Quartz (C-20)
12 × 9	50 mW	50 mW	200 mW	400 mW	10 mW
14 × 12	100 mW	100 mW	400 mW	750 mW	20 mW
20 × 10	100 mW	100 mW	400 mW	750 mW	20 mW
15 × 15	100 mW	100 mW	400 mW	750 mW	20 mW
20 × 20	250 mW	250 mW	1.0 W	2.0 W	50 mW
30 × 20	250 mW	250 mW	1.0 W	2.0 W	50 mW
40 × 20	250 mW	250 mW	1.0 W	2.0 W	50 mW
30 × 30	250 mW	250 mW	1.0 W	2.0 W	50 mW
35 × 35	250 mW	250 mW	1.0 W	2.0 W	50 mW
40 × 40	350 mW	350 mW	1.4 W	2.8 W	75 mW
50 × 25	350 mW	350 mW	1.4 W	2.8 W	75 mW
60 × 30	500 mW	500 mW	2.0 W	4.0 W	100 mW
50 × 50	500 mW	500 mW	2.0 W	4.0 W	100 mW
60 × 60	500 mW	500 mW	2.0 W	4.0 W	100 mW
80 × 50	500 mW	500 mW	2.0 W	4.0 W	100 mW
100 × 50	500 mW	500 mW	2.0 W	4.0 W	100 mW
120 × 60	750 mW	750 mW	3.0 W	6.0 W	125 mW
100 × 100	750 mW	750 mW	3.0 W	6.0 W	125 mW

Higher power ratings are available, please consult sales.

Power may be limited by 100 V maximum voltage rating.

Power Codes

Watts	Code
10 mW	A
20 mW	B
50 mW	C
75 mW	D
100 mW	E
125 mW	I
150 mW	F
200 mW	O
250 mW	G
350 mW	M
400 mW	R
500 mW	H
750 mW	J
1.0 W	K
1.4 W	U
2.0 W	L
2.8 W	Y
3.0 W	N
4.0 W	P
5.0 W	Q
6.0 W	Z
10 W	S
15 W	T
20 W	V
25 W	W
50 W	X

Standard Resistance Tolerance Codes

Tolerance	Code	Tolerance	Code	Tolerance	Code	Tolerance	Code
± 20%	M	± 5%	J	± 1%	F	± 0.05%	Q
± 15%	L	± 3%	H	± 0.5%	D	± 0.01%	S
± 10%	K	± 2%	G	± 0.1%	B	± 0.005%	T

Bonding Pad Metallizations

Metallization		Code
Top Side	Bottom Side	
Pd / Au	—	A
Pd / Au	Ta / Pd / Au	D
Pd / Au	Ti / Pt / Au	L
Ti / Pt / Au for Flip Chip Applications		R
Pd / Au (<i>silicon only</i>)	Au (<i>Sputtered</i>)	K
Window (<i>silicon only</i>)	Au	W
Custom metallizations are available!		

Materials Available

Material	Code
Quartz	20
Silicon	22
Beryllium Oxide (BeO)	25
Aluminum Nitride (AlN)	28
Alumina (Al ₂ O ₃)	35
Custom substrates available.	

Temperature Coefficient of Resistance

TCR (ppm / °C)	Available on		Code
	TaN	NiCr	
± 150	Standard	No	Q
± 100	Yes	No	V
± 50	Yes	Yes	W
± 25		Standard	X
± 10		Yes	Y
± 5		Yes	Z

Higher power ratings, additional sizes, other metal stacks, and other resistor configurations are available. Please contact sales to request samples.

Dual Chip Resistors

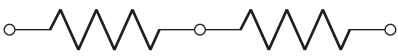
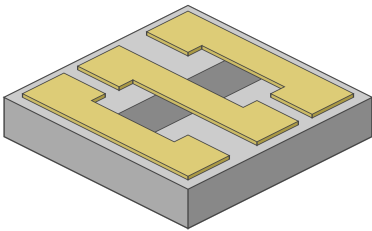
Dual Chip Resistors

This series allows two resistors on a single chip area. Available styles are common or isolated node. The nature of this design lends itself to tightly matched TCR and electrical tolerance, with resistance ratios within 0.01% possible.

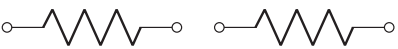
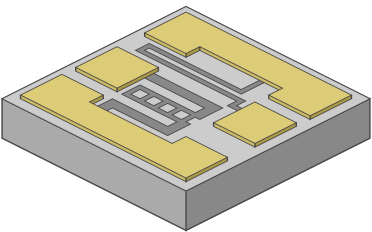
Common node dual chip resistors also allow for one fewer wirebond to be made, reducing cost and increasing reliability.

Custom wrap configurations offer the ability to further simplify a design, please contact sales for more information.

Resistance Range	2 Ω – 1 M Ω per resistor (<i>silicon or quartz</i>) 2 Ω – 160 k Ω per resistor (<i>Al₂O₃, BeO, or AlN</i>)
Resistance Tolerance	±0.01% to ±20%, value-dependent
Standard Size	30 mil × 30 mil × 10 mil



Common Node (Dual) Configuration



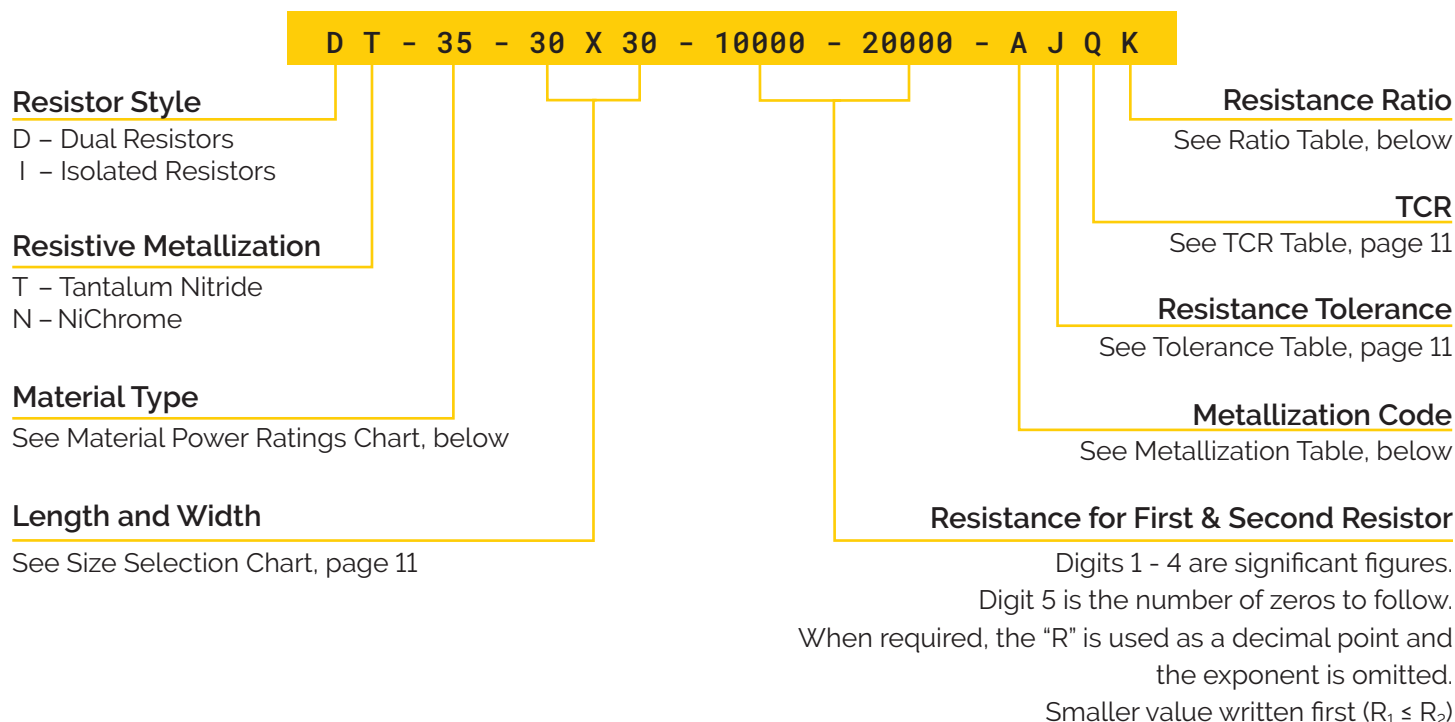
Isolated Node Configuration

Recommended Substrates
99.6% Alumina (Al ₂ O ₃)
Silicon (SiO ₂)
Quartz
Beryllium Oxide (BeO)
Aluminum Nitride (AlN)

Part Number Assembly

Dual Chip Resistors

Example shown: Dual Resistor Style, TaN resistive element, alumina substrate, case size 0.030" × 0.030" × 0.010" (standard thickness), Pd/Au metallization, $R_1 = 1000 \Omega \pm 5\%$, $R_2 = 2000 \Omega \pm 5\%$, ratio between R_1 and R_2 within $\pm 0.25\%$, 150 ppm TCR, 125 mW max power handling.



Bonding Pad Metallizations

Metallization		Code
Top Side	Bottom Side	
Pd / Au	—	A
Pd / Au	Ta / Pd / Au	D
Pd / Au	Ti / Pt / Au	L
Pd / Au (silicon only)	Au (Sputtered)	K

Material Power Ratings

Code	Material	Power per resistor
20	Quartz	25 mW
22	Silicon	125 mW
25	Beryllium Oxide (BeO)	1 W
28	Aluminum Nitride (AlN)	500 mW
35	Alumina (Al ₂ O ₃)	125 mW
Custom substrates available.		

Resistance Ratio Codes

Tolerance to other resistor	Code
± 0.01%	G
+ 0.05%	H
± 0.10%	J
± 0.25%	K
± 0.50%	M
+ 1.00%	N
No Ratio	R

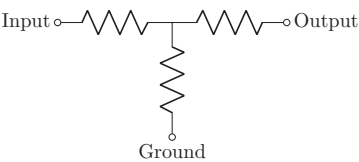
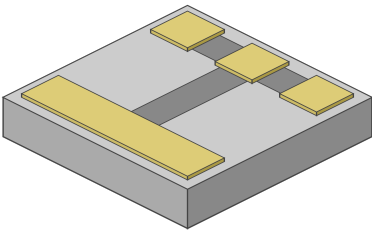
Attenuators

Standard Thin Film Attenuator

CX Thin Films attenuators reduce amplitude or power of a signal by a known value. This is achieved with very little distortion of the signal, maintaining accuracy up to 40 GHz.

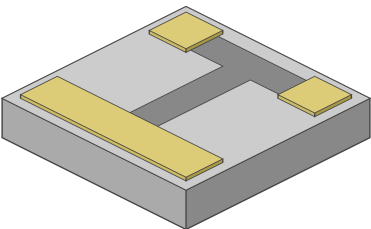
Attenuators are available in *S* and *T* configurations. Single wraps of the ground pad to a full gold backside are available for all attenuator types.

Additional attenuator configurations, including balanced attenuators and triple wrap attenuators, are available as custom parts; please contact sales with your exact requirements.

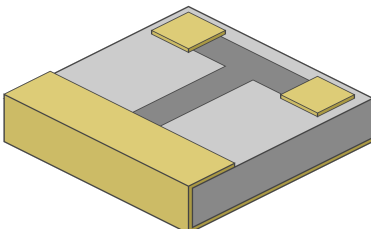


Attenuator Schematic

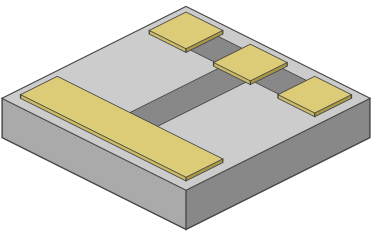
Recommended Substrates
99.6% Alumina (Al_2O_3)
Beryllium Oxide (BeO)
Aluminum Nitride (AlN)



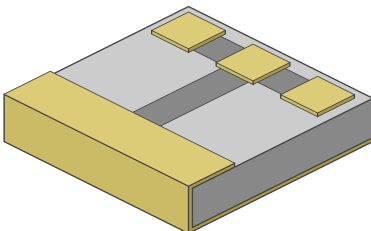
S-Type Attenuator, Top Contact



S-Type Attenuator, Single Pad Wrap



T-Type Attenuator, Top Contact



T-Type Attenuator, Single Pad Wrap

Part Number Assembly

Attenuators

Example shown: S-Type Attenuator, TaN resistive element, AlN substrate, case size 0.050" × 0.050" × 0.010", top metallization only, attenuation -3 dB ± 0.1 dB, 150 ppm TCR, 250 mW max power handling.

A T S - 35 - 50 X 50 X 10 - A - 3R00 - F - Q G

Attenuator Style

A – Attenuator

Resistive Metallization

T – Tantalum Nitride

Attenuator Type

T – T-Pattern with Center Tap
S – T-Pattern without Center Tap

Material Type

See Material & Size Table, below

Length and Width

See Material & Size Table, below

Thickness

See Material & Size Table, below

Power Handling

See Power Table, below

TCR

See TCR Table, below

Attenuation Tolerance

See Attenuation Tolerance Table, below

Attenuation (dB)

Digits 1-4 are significant figures.
R is used as a decimal point.
Values are available in 0.5 db increments.

Bond Pad and Wrap Configuration

See Bond Pad and Wrap Table, below

Properties by Material and Size

Dimensions (mils) (L × W × T)	Power (W)			Value	
	Al ₂ O ₃ (35)	AlN (28)	BeO (25)	Min	Max
50 × 50 × 10	250 mW	1 W	2 W	0.5 db	24.5 db
80 × 60 × 15	250 mW	1 W	2 W	0.5 db	24.5 db
150 × 120 × 25	2 W	8 W	16 W	0.5 db	24.5 db

Bond Pad & Wrap Configuration

Metallization	Code
Top Only	A
Single Wrap, Full GRD Plane	M
Flip Chip	R

Power Handling Codes

Power	Code
250 mW	G
1.0 W	K
2.0 W	L
8.0 W	R
16.0 W	Y

Attenuation Tolerance

Tolerance	Code
± 0.1 dB (-0.5 to -6.0 dB)	F
± 0.2 dB (-6.0 to -24.5 dB)	G

Temperature Coefficient of Resistance

TCR	Availability	Code
± 150 ppm	Standard	Q
± 100 ppm	Optional	V

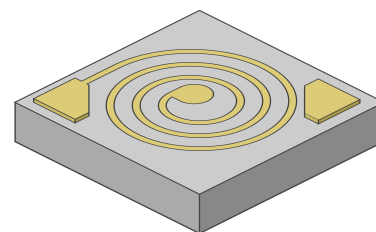
Selection charts are for guidance only. All CX Thin Films parts are built to specific customer requirements. Contact sales with your exact requirements.

Power ratings assume proper heat sinking is used.

Inductors

Standard Thin Film Spiral Inductor

CX Thin Films spiral inductors consist of a thin film gold spiral patterned on a substrate for use in a wide variety of uses in frequencies from DC to RF. An optional polyimide coating over the coil is available for increased resistance to scratches or shorts. Non-conductive epoxy is recommended as a mounting method, though backside metallization is also available. A second corner pad is provided for easy wirebonding from the center pad for edge-contact mounting.



Recommended Substrates

99.6% Alumina (Al_2O_3)

Quartz

Standard Spiral Inductor Sizes and Values

Case Size	# of Turns	Inductance	DC Resistance	Q (at 200 MHz)	Q (at 500 MHz)
25 × 25	1.5	1.2 nH	0.6 Ω	3	7
25 × 25	2.0	2.0 nH	0.9 Ω	3	8
25 × 25	2.5	3.0 nH	1.2 Ω	4	9
30 × 30	3.0	4.4 nH	1.5 Ω	4	10
30 × 30	3.5	6.0 nH	1.9 Ω	4	11
30 × 30	4.0	7.9 nH	2.3 Ω	4	11
40 × 40	4.5	10 nH	2.7 Ω	5	12
40 × 40	5.0	13 nH	3.2 Ω	5	12
40 × 40	5.5	16 nH	3.7 Ω	5	13
40 × 40	6.0	19 nH	4.2 Ω	6	13
40 × 40	6.5	23 nH	4.7 Ω	6	14
50 × 50	7.0	28 nH	5.3 Ω	7	14

Inductance values are computed in free air, using a magnetic permeability for free air of $\mu = 4.0 \times 10^{-7}$.

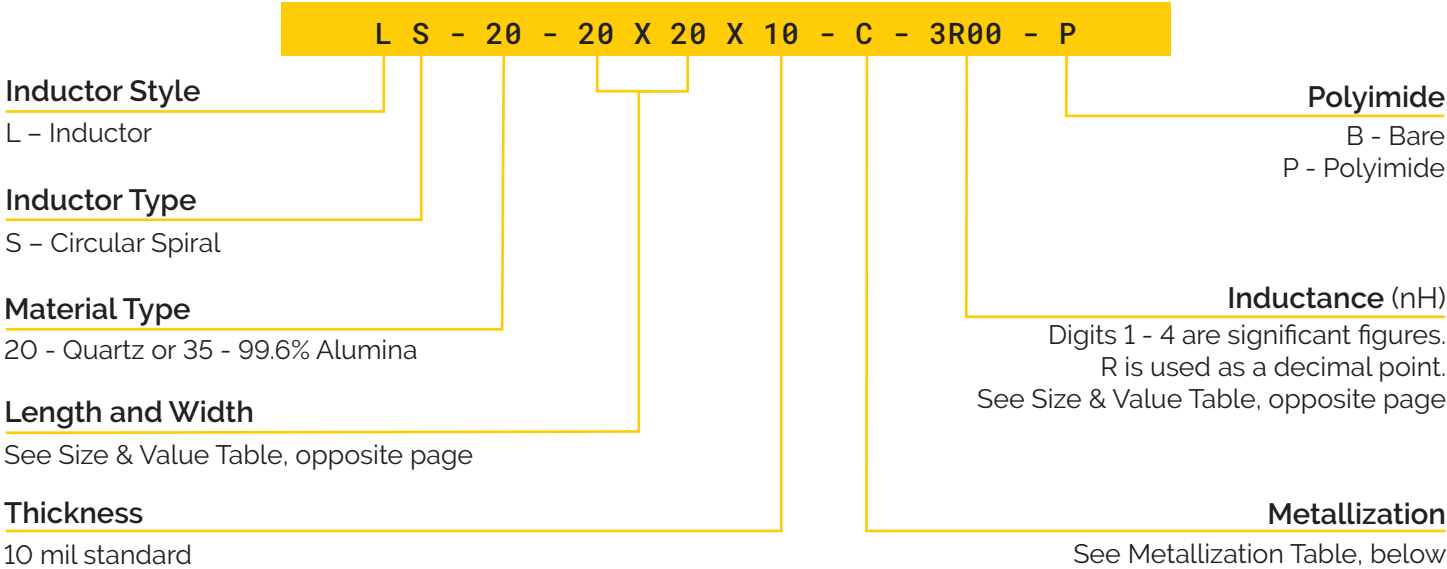
DC resistance is based on a gold metallization.

Other inductance values, DC resistance values, substrates, geometries, metallizations, and custom inductors are available! Consult the factory for a solution to your exact problem.

Part Number Assembly

Inductors

Example shown: 3.0 nH Spiral Inductor, quartz sustrate, case size 0.020" × 0.020" × 0.010", Ti/Pt/Au top metallization only, with polyimide.



Metallization Options

Metallization		Code
Top Side	Bottom Side	
Ta / Pd / Au	—	A
Ti / Pt / Au	—	C
Ta / Pd / Au	Ta / Pd / Au	D

Custom & Build-to-Print

Custom Design & Manufacturing

Our advanced manufacturing methods ensure sheet rho uniformity, metallization adhesion, and thickness control. Our design and manufacturing capabilities allow us to meet and exceed our customers' custom requirements. CX Thin Films components will be the perfect part for your individual applications.

Build-to-Print services are also available to produce your exact design, including complex conductor and resistor geometries, via holes, wraps, and custom plating stacks.

General Characteristics

Resistance Tolerance	±0.01% to ±20%
Resistance Ratio	±0.01% available
TCR Tracking	± 2 ppm/°C
Termination Material	Gold (<i>Standard</i>)
Wafer Size	Up to 4 in × 4 in
Line Width Definition (<i>Resistor</i>)	0.1 mils
Line Width Definition (<i>Conductor</i>)	0.2 mils
Metals Available	Gold, Nickel, NiChrome, Palladium, Platinum, Tantalum, Tantalum Nitride, Titanium, Titanium Tungsten (TiW), Silver
Specialty Processing	Metallization available on 1 – 6 sides Through-holes (vias; plated or unplated) Edge Wraps Custom Laser Cutouts (irregular shapes)
Lift-off Process	Lift-off patterning available

Standard Substrate Characteristics

Code	Substrate Material	Available Thickness (standard)	Dielectric Constant (at 1 MHz)	Thermal Conductivity (W · m ⁻¹ · K ⁻¹)
20	Quartz	0.005 in – 0.010 in	3.8	1.38
22	Silicon	0.005 in – 0.010 in	N/A (<i>SiO₂ K = 3.8</i>)	149 (<i>SiO₂ 1.38</i>)
25	Beryllium Oxide (<i>BeO</i>)	0.005 in – 0.025 in	6.6	285
28	Aluminum Nitride (<i>AlN</i>)	0.005 in – 0.025 in	8.7	170
35	Alumina (<i>Al₂O₃</i>)	0.005 in – 0.025 in	9.8	26.9

Specialty substrates and surface finishes are available, including Z-cut quartz, class I and class II ceramic titanates, silicon carbide (SiC), and diamond.

Metallization Stacks Available

This table is listed for reference on custom parts — many other plating stacks, including varying material thicknesses and materials not listed, are available for custom work. Contact Sales with your plating stack requirement and we will build a part number for you.

Code	Metallization		Applications	Attachment Options				
	Top Side	Bottom Side		Wirebond	Cond. Epoxy	Non-Cond. Epoxy	Eutectic Attach	Solder
A	Pd / Au	—	Bare Wafer	✓	—	✓	—	—
B	—	—		—	—	—	—	—
C	Ti / Pt / Au ($25k\text{\AA}$)	Ta / Pd / Au		✓	✓	✓	✓	✓
D	Pd / Au	Ta / Pd / Au		✓	✓	✓	✓	✗
E	TiW / Au	—	Silicon Window	✓	—	✓	—	✗
F	TiW / Au	Ta / Pd / Au		✓	✓	✓	✓	✗
L	Pd / Au	Ti / Pt / Au		✓	✓	✓	✓	✓
R	Ti / Pt / Au ($2k\text{\AA}$)	—		✗	✓	✓	✓	✓
W	Pd / Au	Au		✓	✓	—	✓	✗

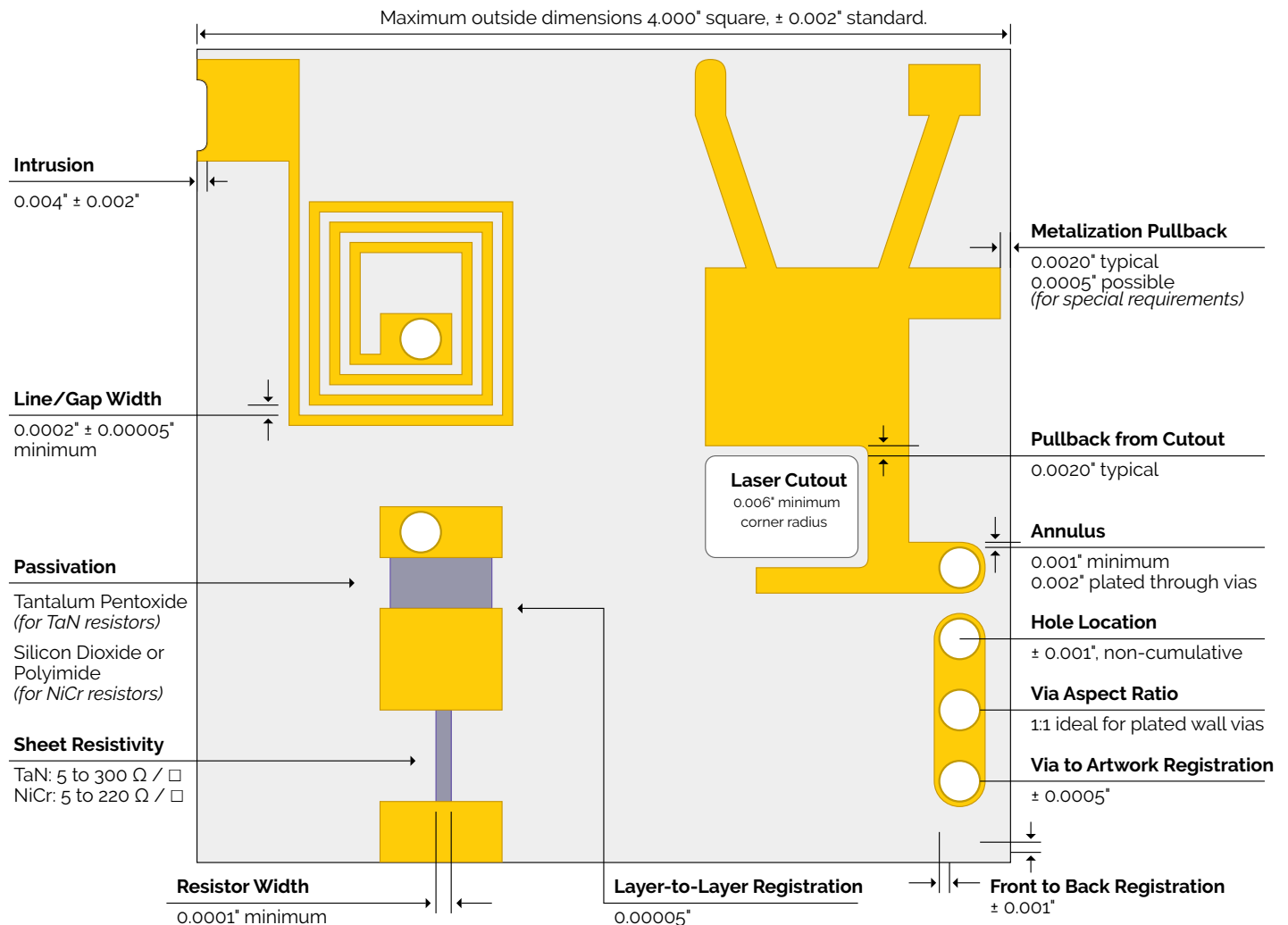
Wrap parts are sold by for specific applications without specifying the plating stack — please refer to the wrap resistor metallization chart on page 9 and contact Sales for more information.

Parts with resistors will have TaN or NiCr underneath the top-side metallization. Metallization code A, D, L, and W parts without resistors will have Ta underneath the top-side metallization.

Resistive Material Characteristics

Code	Resistive Material	Sheet Resistivity	Passivation	Standard TCR	Optional TCR
T	Tantalum Nitride	5 Ω /sq – 300 Ω /sq	Ta ₂ O ₅ (<i>Self-Passivating</i>)	± 150 ppm/°C	± 50 ppm/°C
N	NiChrome	5 Ω /sq – 250 Ω /sq	SiO ₂	± 25 ppm/°C	± 5 ppm/°C

Capability Diagram



Engineering and Design

Full engineering, prototyping, and design services are available for the most demanding special requirements. We will work with you to design, prototype, and fabricate the most important part for your application. Contact Sales and we will have an engineer work with you to provide the best part for your application.

Contract Services

All of our processing capabilities are available to meet our customers' requirements, from providing custom plating to laser trimming to inspection services. Contact Sales to discuss your requirements.

Superior Quality.
Exceptional Value.

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1515 Elmwood Ave, Suite 4A
Cranston, RI 02910-3800
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