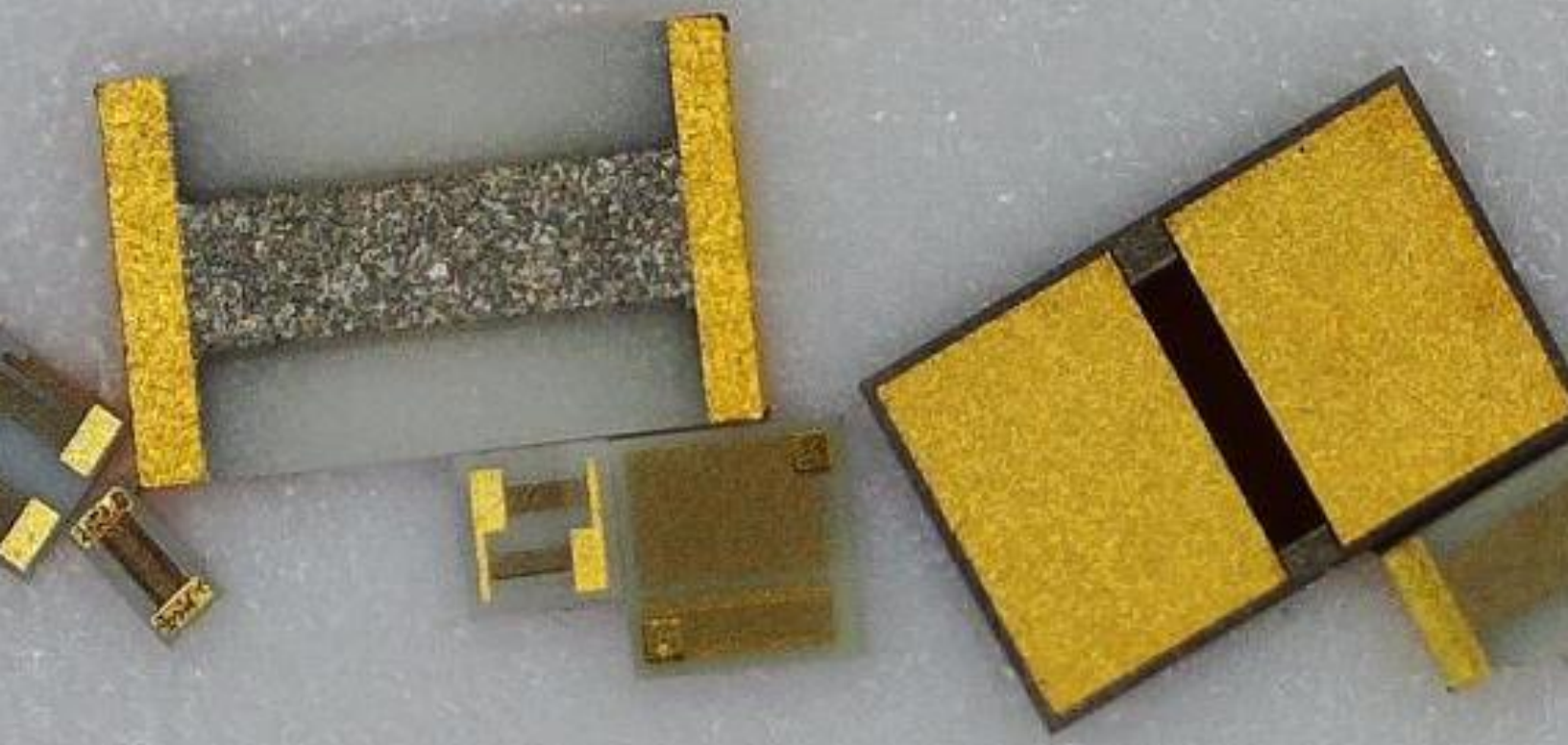
PPI®

THIN FILM COMPONENTS



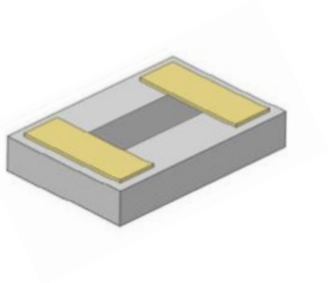
- PRECISION RESISTORS
- CHIP ATTENUATORS
- RESISTOR ARRAYS
- PATTERNED SUBSTRATES
- THERMAL CONDUCTORS

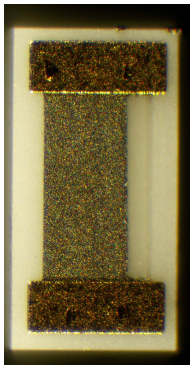
Thin Film Products

Standard Chip Resistors – PR Series

Product Features

- Solderable and Wire-bondable Thin Film Resistors
- Operating frequencies from DC to 500 MHz
- Can be used in Non-Magnetic Applications





Product Specifications

Resistance Range	0.5Ω to 35MΩ
Resistance Tolerance	±0.01% to ±20%, value dependent

Part Numbering

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, microwave trim, 100 mW max power handling.

P R T 1 35 – 20×20× 10 D 10000 J Q E W

RoHS

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Thickness
- Resistance Value *See Table*
- TCR *See Table*
- Packaging *W = Waffle Pack*
- Resistor Style *R = Standard (<500MHz)*
- Number of Resistors
- Length & Width (mils)
- Termination *See Table*
- Resistance Tolerance *See Table*
- Power Handling *See Table*

**Flip Chip – wire bondable or solderable*

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

Packaging

Code	Style
W	Waffle Pack (Standard)

Contact PPI for additional packaging options.

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

Thin Film Products

Standard Chip Resistors – PR Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285
22	Silicon (Si) (with 12kÅ SiO_2)	0.005" - 0.010"	Chemical Polish	N/A (SiO_2 K=1.38)	2.49 - 4.44 (25°C to < 1000°C)	149 (SiO_2 1.38)
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

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

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	Yes	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
R	Flip Chip (Ti/Pt/Au)	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Power Handling Codes

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

Thin Film Products

Standard Chip Resistors – PR Series

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		Silicon (22)		Quartz (20)		High Power Resistor				
												Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	150K	50 mW	150K	10 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	200K	100 mW	200K	20 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	250K	100 mW	250K	20 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	500K	100 mW	500K	20 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	750K	250 mW	750K	50 mW	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	1M	250 mW	1M	50 mW	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	1.5M	250 mW	1.5M	50 mW	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2M	250 mW	2M	50 mW	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	3M	250 mW	3M	50 mW	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	5M	350 mW	5M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	3M	350 mW	3M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	6M	500 mW	6M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	7M	500 mW	7M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	15M	500 mW	15M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	20M	500 mW	20M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	25M	500 mW	25M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	30M	750 mW	30M	125 mW	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	35M	750 mW	35M	125 mW	2	1000	2.8 W	10.0 W	15.0 W

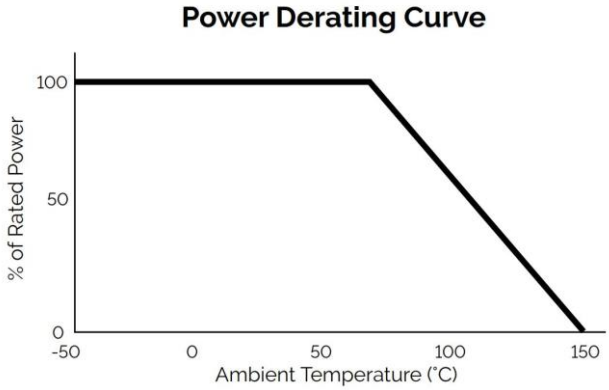
Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Standard Chip Resistors – PR Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

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

Performance Specifications

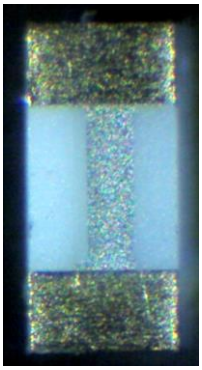
Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Thin Film Products

Standard Edge Wrapped Chip Resistors – PR Series

Product Features

- Half wrap style chips have 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
- Can be used in Non-Magnetic Applications

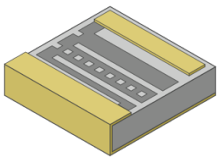


20x10 392Ω
Full Wrap Resistor

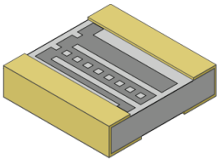
Product Specifications

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

Half Wrap



Full Wrap



Part Numbering

Example shown: Microwave 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, microwave trim, 100 mW max power handling.

P R T 1 35 – 40×20× 10 N 200R0 G Q K W

RoHS

P = Passive Plus	Resistive Material *See Table*	Substrate *See Table*	Thickness	Resistance Value *See Table*	TCR *See Table*	Packaging *W = Waffle Pack*				
Resistor Style *R = Standard (<500MHz)*	Number of Resistors	Length & Width (mils)	Termination *See Table*	Resistance Tolerance *See Table*	Power Handling *See Table*					

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

Packaging

Code	Style
W	Waffle Pack (Standard)

Contact PPI for additional packaging options.

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

Thin Film Products

Standard Edge Wrapped Chip Resistors – PR Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285

Resistance Tolerance Codes

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

** Limit of ± 50mΩs*

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	Yes	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Terminations

Code	Metallization	Description	Attachement Options
H	Ta/Pd/Au	1 Side Wrap	Wirebond, Non-Cond. Epoxy
M	TiW/Ni/Au	1 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
S	TiW/Ni/Au - Solder Dipped	1 Side Wrap	Sn Solder Ball
J	Ta/Pd/Au	2 Side Wrap	Wirebond, Non-Cond. Epoxy
N	TiW/Ni/Au	2 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
T	TiW/Ni/Au - Solder Dipped	2 Side Wrap	Sn Solder Ball

Power Handling Codes

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

Standard Edge Wrapped Chip Resistors – PR Series

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		High Power Resistor				
								Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	2	1000	2.8 W	10.0 W	15.0 W

Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.

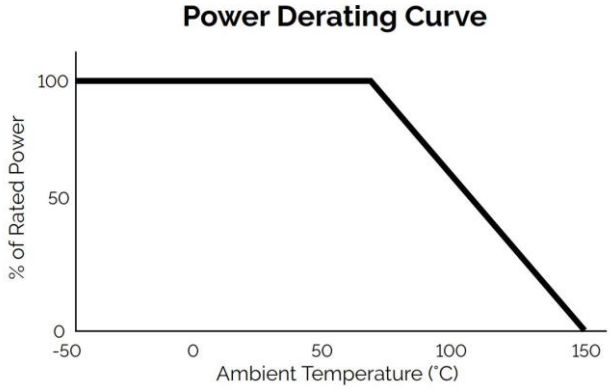
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Standard Edge Wrapped Chip Resistors – PR Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

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

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

High Frequency Resistors

R35-1209BB50R00Fx1QC

Product Features

Case Size	Std. Resistance
1209	50Ω

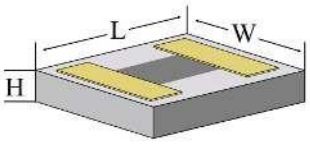
Mechanical Dimensions

L = 0.012" ± 0.001" (0.305mm ± 0.051mm)

W = 0.009" ± 0.001" (0.229mm ± 0.051mm)

H = 0.005" ± 0.001" (0.127mm ± 0.025mm)

Style: 1 Recessed Pad

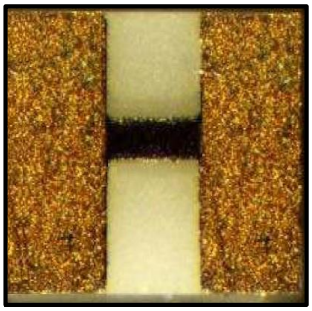


1% standard tolerance (other tolerances available)

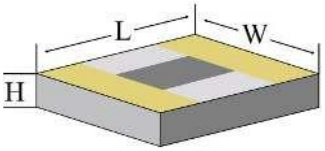
Specifications

Operating Frequency	DC to 67 GHz
Operating Temperature Range	-55°C to +150°C
Resistive Material	Tantalum Nitride (TaN)
Temperature Coefficient	±150 ppm/°C standard
Resistance Tolerance	±1% standard
Substrate	Alumina (Al_2O_3) other substrates available
Metallization	A = Tantalum/Palladium/Gold (TaN/Pd/Au) R = Titanium/Platinum/Gold (Ti/Pt/Au)
Power Derating *See Chart at Right*	Full power up to 70°C Derated linearly to zero power at 150°C

**All PPI Thin Film parts are Non-Magnetic*



Style: 2 Full Pad



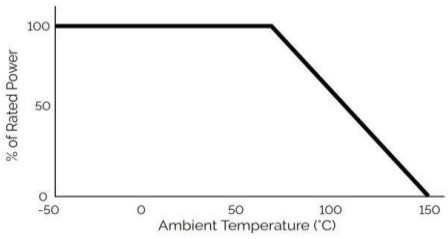
1% tolerance only

Part Numbering

R 35 - 1209BB 50R00 F R 1 Q C

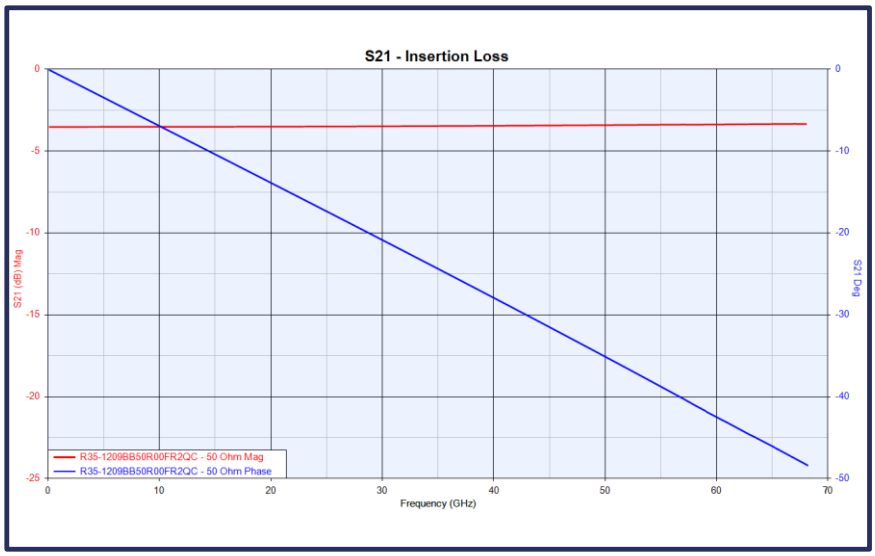
- **R** — Resistor
- **35** — Material: 35 = Alumina
- **1209BB** — Case Size (0.012" x .0.009")
- **50R00** — Resistance Value: 50Ω = 50R00
  Digits 1-4 are significant; Digit 5 is number of zeros to follow
- **F** — Tolerance: F = ±1%
- **R** — Metallization: **R** = For Soldering; **A** = For wirebonding
- **1** — Style: 1 or 2
  Both styles Flip Chip Configuration compatible
- **Q** — TCR: Q = ±150ppm/°C
- **C** — Power Handling: C = 50mW

Power Derating Curve

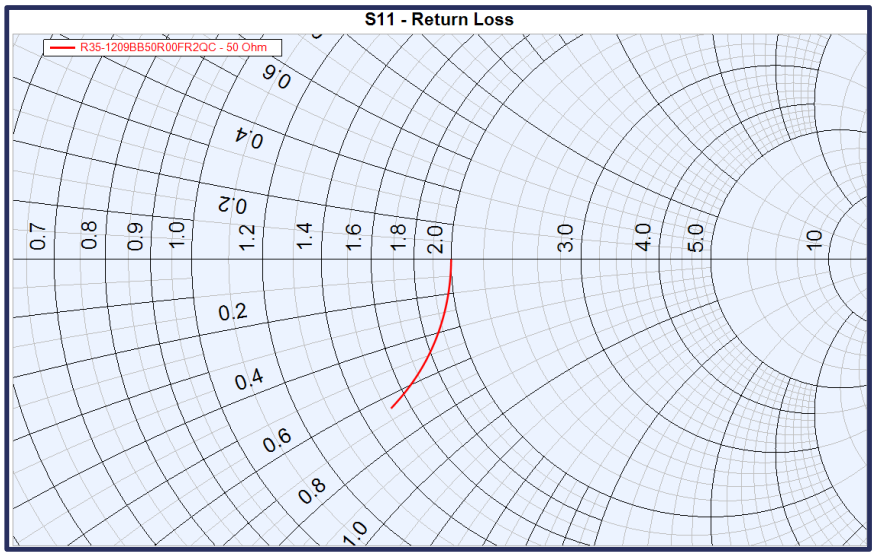


Performance Curves - Insertion and Return Loss Charts

12 x 09 50 Ω Insertion Loss



12 x 09 50 Ω Return Loss



Simulated Test Conditions / Pad Dimensions / Dielectric

Modelithics calculated data for 50 Ohm and 100 Ohm resistors from 0.1 to 67.0 GHz on 4 mil Rogers 4350B, Dielectric constant = 4.15. The pad dimensions used to develop the datasheet plots were: Length = 4.0 (0.102), Width = 10.0 (0.254), Gap = 5.0 (0.127). Units in mil (mm). Reference planes were at the pad edges.

Packaging

Parts are available in Waffle Packs. Contact PPI for additional packaging options.

High Frequency Resistors

R35-1209BB100R0Fx1QC

Product Features

Case Size	Std. Resistance
1209	100Ω

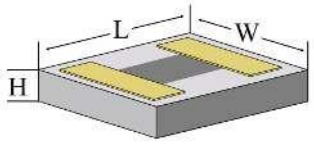
Mechanical Dimensions

L = 0.012" ± 0.001" (0.305mm ± 0.051mm)

W = 0.009" ± 0.001" (0.229mm ± 0.051mm)

H = 0.005" ± 0.001" (0.127mm ± 0.025mm)

Style: 1 Recessed Pad

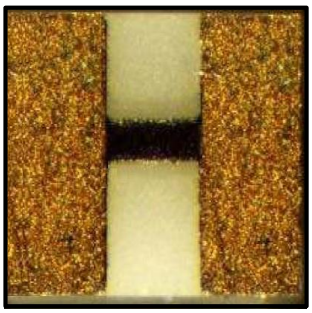


1% standard tolerance (other tolerances available)

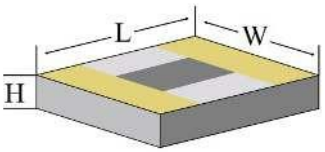
Specifications

Operating Frequency	DC to 67 GHz
Operating Temperature Range	-55°C to +150°C
Resistive Material	Tantalum Nitride (TaN)
Temperature Coefficient	±150 ppm/°C standard
Resistance Tolerance	±1% standard
Substrate	Alumina (Al_2O_3) other substrates available
Metallization	A = Tantalum/Palladium/Gold (TaN/Pd/Au) R = Titanium/Platinum/Gold (Ti/Pt/Au)
Power Derating *See Chart at Right*	Full power up to 70°C Derated linearly to zero power at 150°C

**All PPI Thin Film parts are Non-Magnetic*



Style: 2 Full Pad



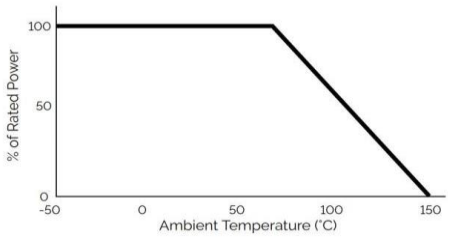
1% tolerance only

Part Numbering

R 35 - 1209BB 100R0 F R 1 Q C

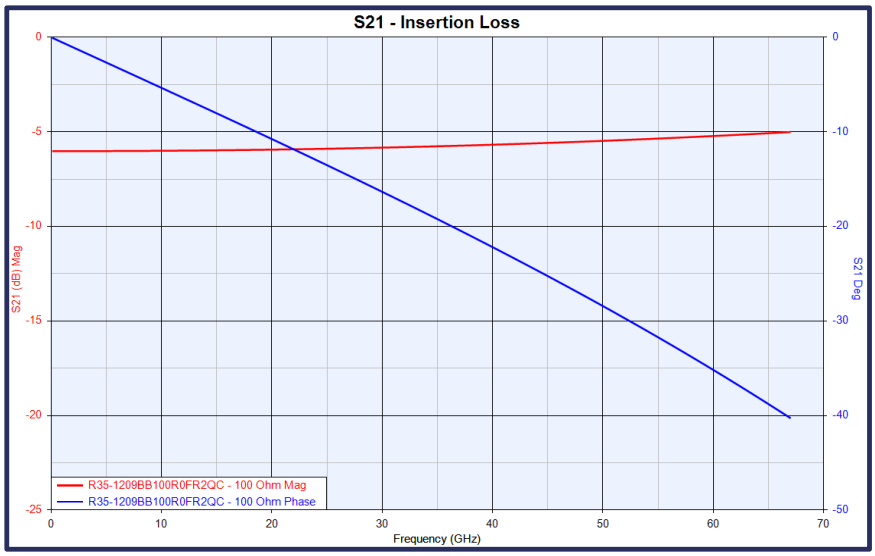
- **Resistor**
- **Material** 35 = Alumina
- **Case Size** (0.012" x .0.009")
- **Resistance Value** 100Ω = 100R0
  Digits 1-4 are significant; Digit 5 is number of zeros to follow
- **Tolerance** F = ±1%
- **Metallization** R = For Soldering; A = For wirebonding
- **Style** 1 or 2
  Both styles Flip Chip Configuration compatible
- **TCR** Q = ±150ppm/°C
- **Power Handling** C = 50mW

Power Derating Curve

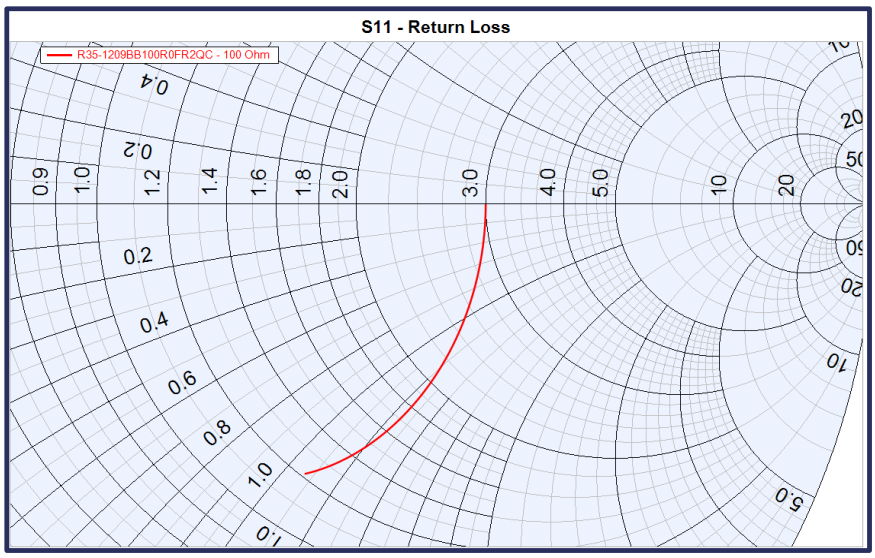


Performance Curves - Insertion and Return Loss Charts

12 x 09 100 Ω Insertion Loss



12 x 09 100 Ω Return Loss



Simulated Test Conditions / Pad Dimensions / Dielectric

Modelithics calculated data for 50 Ohm and 100 Ohm resistors from 0.1 to 67.0 GHz on 4 mil Rogers 4350B, Dielectric constant = 4.15. The pad dimensions used to develop the datasheet plots were: Length = 4.0 (0.102), Width = 10.0 (0.254), Gap = 5.0 (0.127). Units in mil (mm). Reference planes were at the pad edges.

Packaging

Parts are available in Waffle Packs. Contact PPI for additional packaging options.

High Frequency Resistors

R35-2010BB50R00Fx1QE

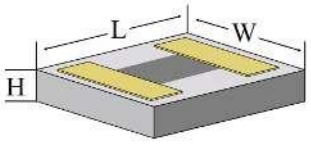
Product Features

Case Size	Std. Resistance
2010	50Ω

Mechanical Dimensions

L = 0.020" ± 0.002" (0.508mm ± 0.051mm)
W = 0.010" ± 0.001" (0.254mm ± 0.051mm)
H = 0.010" ± 0.001" (0.254mm ± 0.025mm)

Style: 1 Recessed Pad

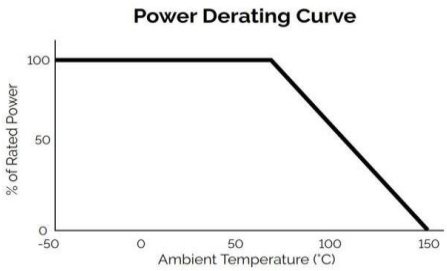


1% standard tolerance (other tolerances available)

Specifications

Operating Frequency	DC to 67 GHz
Operating Temperature Range	-55°C to +150°C
Resistive Material	Tantalum Nitride (TaN)
Temperature Coefficient	±150 ppm/°C standard
Resistance Tolerance	±1% standard
Substrate	Alumina (Al_2O_3) other substrates available
Metallization	A = Tantalum/Palladium/Gold (TaN/Pd/Au) R = Titanium/Platinum/Gold (Ti/Pt/Au)
Power Derating *See Chart at Right*	Full power up to 70°C Derated linearly to zero power at 150°C

**All PPI Thin Film parts are Non-Magnetic*



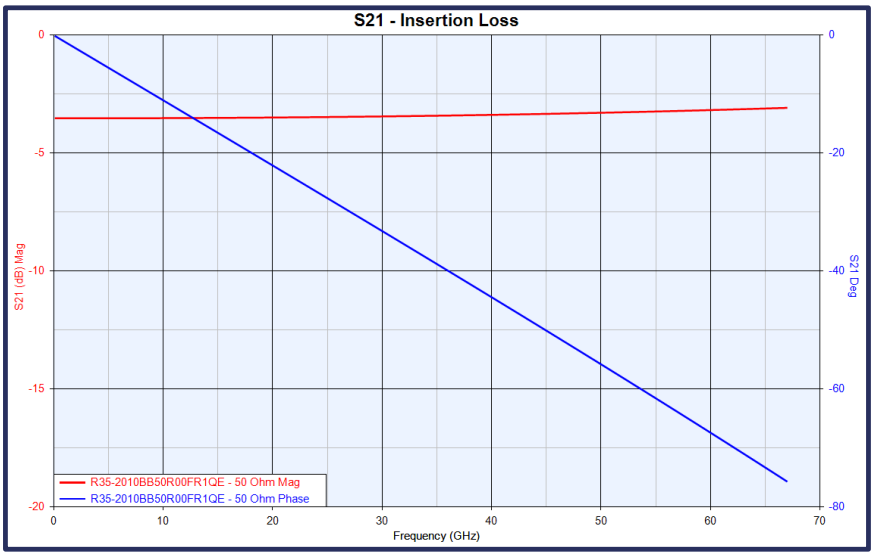
Part Numbering

R 35 - 2010BB 50R00 F R 1 Q E

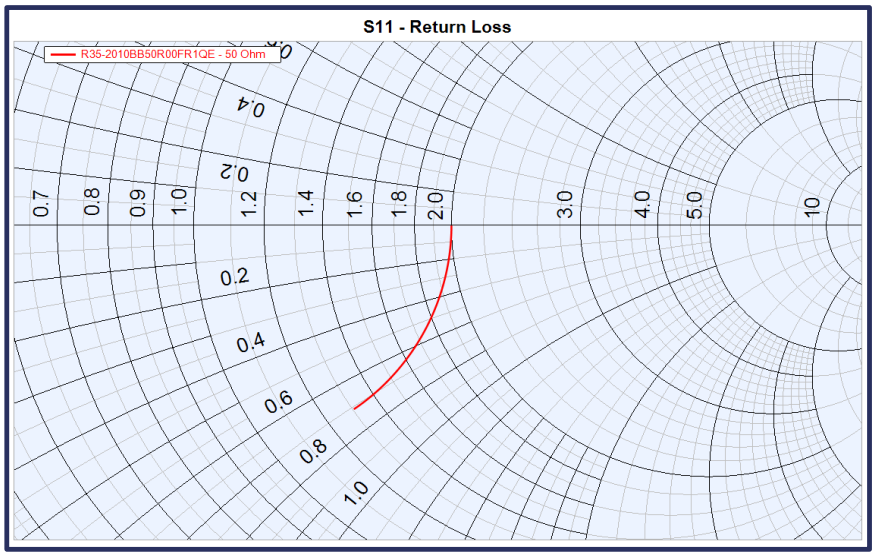
- **R** — Resistor
- **35** — Material: 35 = Alumina
- **2010BB** — Case Size (0.020" x 0.010")
- **50R00** — Resistance Value: 50Ω = 50R00
  Digits 1-4 are significant; Digit 5 is number of zeros to follow
- **F** — Tolerance: F = ±1%
- **R** — Metallization: **R** = For Soldering; **A** = For wirebonding
- **1** — Style: 1
  Best for wire bonding or surface mount applications Flip Chip Configuration compatible
- **Q** — TCR: Q = ±150ppm/°C
- **E** — Power Handling: E =100mW

Performance Curves - Insertion and Return Loss Charts

20 x 10 50 Ω Insertion Loss



20 x 10 50 Ω Return Loss



Simulated Test Conditions / Pad Dimensions / Dielectric

Modelithics calculated data for 50 Ohm and 100 Ohm resistors from 0.1 to 67.0 GHz on 4 mil Rogers 4350B, Dielectric constant = 4.15. The pad dimensions used to develop the datasheet plots were: Length = 4.0 (0.102), Width = 10.0 (0.254), Gap = 13.0 (0.330). Units in mil (mm). Reference planes were at the pad edges.

Packaging

Parts are available in Waffle Packs. Contact PPI for additional packaging options.

High Frequency Resistors

R35-2010BB100R0Fx1QG

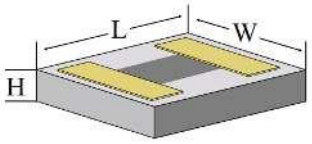
Product Features

Case Size	Std. Resistance
2010	100Ω

Mechanical Dimensions

L = 0.020" ± 0.002" (0.508mm ± 0.051mm)
W = 0.010" ± 0.001" (0.254mm ± 0.051mm)
H = 0.010" ± 0.001" (0.254mm ± 0.025mm)

Style: 1 Recessed Pad

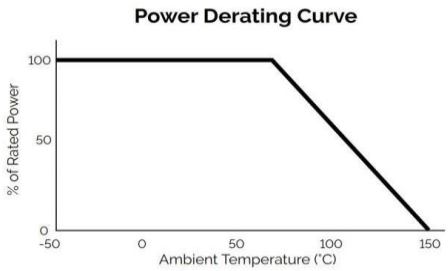


1% standard tolerance (other tolerances available)

Specifications

Operating Frequency	DC to 67 GHz
Operating Temperature Range	-55°C to +150°C
Resistive Material	Tantalum Nitride (TaN)
Temperature Coefficient	±150 ppm/°C standard
Resistance Tolerance	±1% standard
Substrate	Alumina (Al_2O_3) other substrates available
Metallization	A = Tantalum/Palladium/Gold (TaN/Pd/Au) R = Titanium/Platinum/Gold (Ti/Pt/Au)
Power Derating *See Chart at Right*	Full power up to 70°C Derated linearly to zero power at 150°C

**All PPI Thin Film parts are Non-Magnetic*



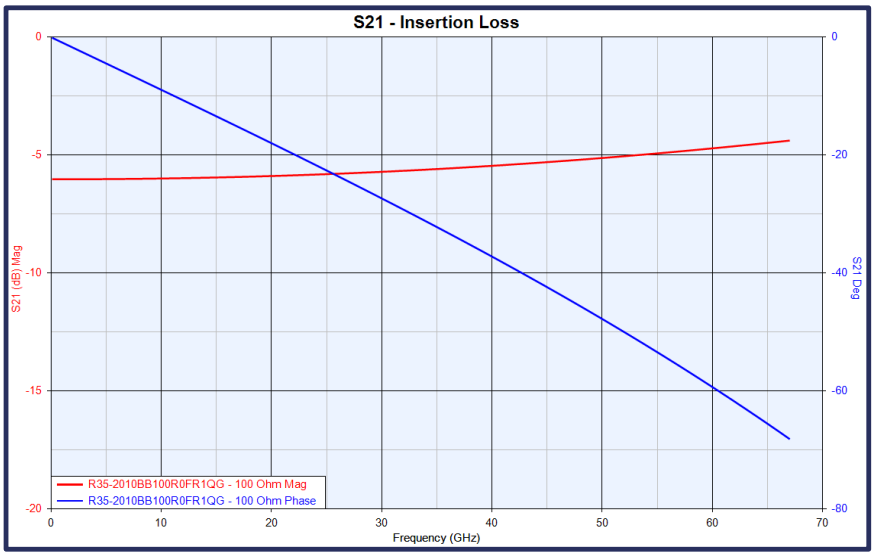
Part Numbering

R 35 - 2010BB 100R0 F R 1 Q G

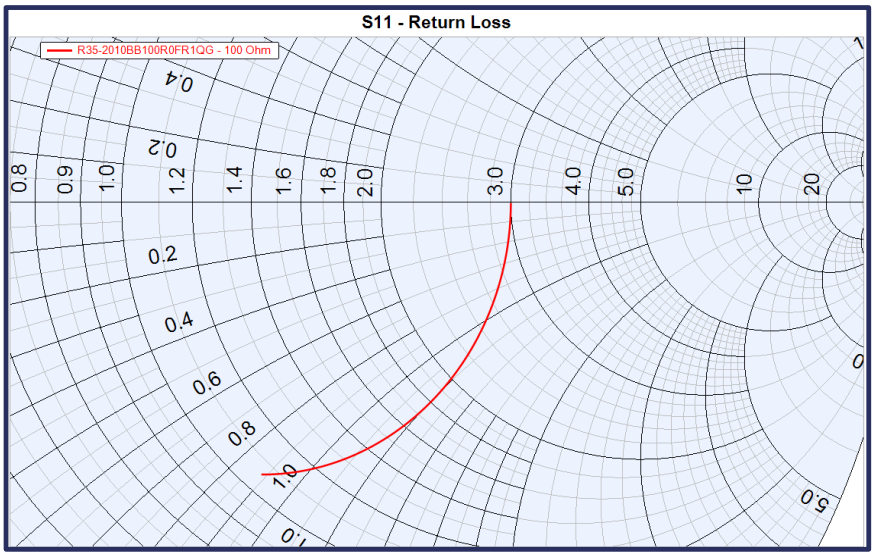
- **R** — Resistor
- **35** — Material: 35 = Alumina
- **2010BB** — Case Size (0.020" x 0.010")
- **100R0** — Resistance Value: 100Ω = 100R0
  Digits 1-4 are significant; Digit 5 is number of zeros to follow
- **F** — Tolerance: F = ±1%
- **R** — Metallization: **R** = For Soldering; **A** = For wirebonding
- **1** — Style: 1
  Best for wire bonding or surface mount applications Flip Chip Configuration compatible
- **Q** — TCR: Q = ±150ppm/°C
- **G** — Power Handling: G =250mW

Performance Curves - Insertion and Return Loss Charts

20 x 10 100 Ω Insertion Loss



20 x 10 100 Ω Return Loss



Simulated Test Conditions / Pad Dimensions / Dielectric

Modelithics calculated data for 50 Ohm and 100 Ohm resistors from 0.1 to 67.0 GHz on 4 mil Rogers 4350B, Dielectric constant = 4.15. The pad dimensions used to develop the datasheet plots were: Length = 4.0 (0.102), Width = 10.0 (0.254), Gap = 13.0 (0.330). Units in mil (mm). Reference planes were at the pad edges.

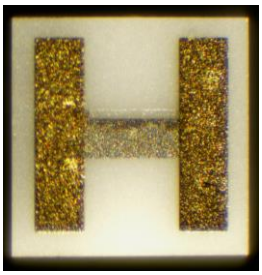
Packaging

Parts are available in Waffle Packs and Tape & Reel. Contact PPI for additional packaging options.

Thin Film Products

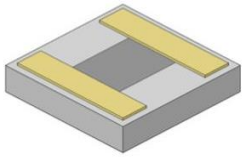
Microwave Chip Resistors – PM Series

Product Features



- Special microwave laser-trimming to ensure a tight tolerance at high frequencies
- Compatible with flip-chip configurations
- Operating frequencies up to 60 GHz; higher frequencies are available
- Can be used in Non-Magnetic Applications

Product Specifications



Resistance Range	2 Ω to 5kΩ		
Resistance Tolerance	±0.5% to ±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

Part Numbering

Example shown: Microwave 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, microwave trim, 100 mW max power handling.

P M T 1 35 – 20×20× 10 A 10000 J Q E W

RoHS

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Thickness
- Resistance Value *See Table*
- TCR *See Table*
- Packaging *W = Waffle Pack*
- Resistor Style *M = Microwave*
- Number of Resistors
- Length & Width (mils)
- Termination *See Table*
- Resistance Tolerance *See Table*
- Power Handling *See Table*

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

Packaging

Code	Style
W	Waffle Pack (Standard)

Contact PPI for additional packaging options.

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

Thin Film Products

Microwave Chip Resistors – PM Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

Code	D	F	G	H	J	K	L	M
Tolerance	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Terminations

Code	Top Side Metallization	Top Side Attachement Options	Bottom Side Metallization	Bottom Side Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
R	Flip Chip (Ti/Pt/Au)	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Temperature Coefficient of Resistance

Code	TCC	Material: Tantallum Nitride (TaN)	Material: NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	Yes	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Power Handling Codes

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

Thin Film Products

Microwave Chip Resistors – PM Series

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		Quartz (20)		High Power Resistor				
										Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	150K	10 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	200K	20 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	250K	20 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	500K	20 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	750K	50 mW	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	1M	50 mW	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	1.5M	50 mW	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2M	50 mW	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	3M	50 mW	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	5M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	3M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	6M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	7M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	15M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	20M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	25M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	30M	125 mW	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	35M	125 mW	2	1000	2.8 W	10.0 W	15.0 W

Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.

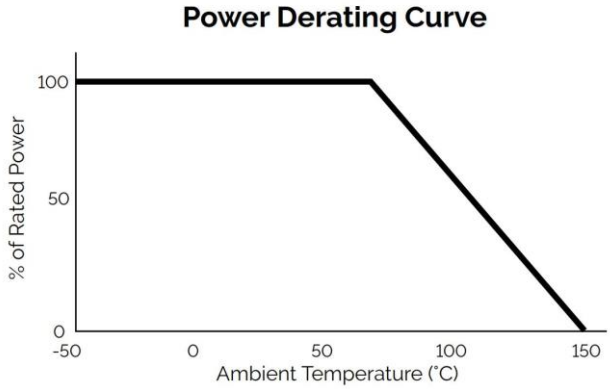
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Microwave Chip Resistors – PM Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 60 GHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

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

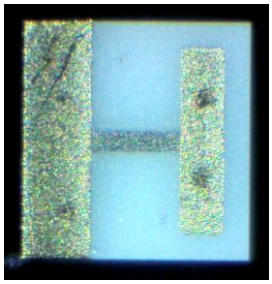
Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Thin Film Products

Microwave Edge Wrapped Chip Resistors

Product Features

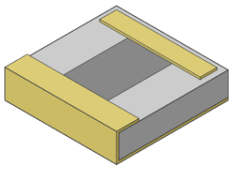


- Edge Wrap similar in construction to our standard surface mount wrap resistors, with half wrap and full wrap styles available.
- The addition of a microwave design allows for operation at frequencies up to 60 GHz.
- Can be used in Non-Magnetic Applications

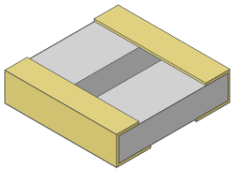
Product Specifications

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

Half Wrap



Full Wrap



Part Numbering

Example shown below: Microwave Resistor, TaN resistive element, AlN substrate, case size 0.040" × 0.020" × 0.010", dual edge wrap, resistance 200 Ω ± 2%, 150 ppm TCR, 1.0 W max power handling.

P M T 1 28 – 40×20× 10 N 200R0 G Q K W

RoHS

P = Passive Plus	Resistive Material *See Table*	Substrate *See Table*	Thickness	Resistance Value *See Table*	TCR *See Table*	Packaging *W = Waffle Pack*			
Resistor Style *M = Microwave*	Number of Resistors	Length & Width (mils)	Termination *See Table*	Resistance Tolerance *See Table*	Power Handling *See Table*				

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

Packaging

Code	Style
W	Waffle Pack (Standard)

Contact PPI for additional packaging options.

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

Thin Film Products

Microwave Edge Wrapped Chip Resistors

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285

Resistance Tolerance Codes

Code	D	F	G	H	J	K	L	M
Tolerance	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	Yes	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Terminations

Code	Metallization	Description	Attachement Options
H	Ta/Pd/Au	1 Side Wrap	Wirebond, Non-Cond. Epoxy
M	TiW/Ni/Au	1 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
S	TiW/Ni/Au - Solder Dipped	1 Side Wrap	Sn Solder Ball
J	Ta/Pd/Au	2 Side Wrap	Wirebond, Non-Cond. Epoxy
N	TiW/Ni/Au	2 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
T	TiW/Ni/Au - Solder Dipped	2 Side Wrap	Sn Solder Ball

Power Handling Codes

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

Thin Film Products

Microwave Edge Wrapped Chip Resistors

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		High Power Resistor				
								Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	2	1000	2.8 W	10.0 W	15.0 W

Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.

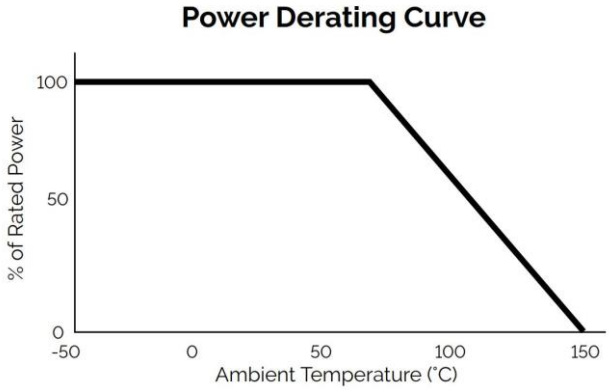
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Microwave Edge Wrapped Chip Resistors

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 60 GHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

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

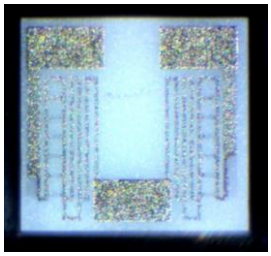
Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Thin Film Products

Dual Chip Resistors – PD Series

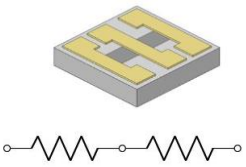
Product Features



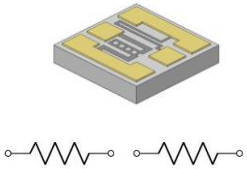
- Two resistors on a single chip area.
- Available styles are common or isolated node.
- The nature of this design lends itself to tightly matched TCR and electrical tolerance, with resistance ratios within 0.01% possible (value dependent).
- Can be used in Non-Magnetic Applications

Product Specifications

Resistance Range	2Ω - 1MΩ per resistor (Silicon or Quartz) 2Ω - 160kΩ per resistor (Al_2O_3, BeO, or AlN)
Resistance Tolerance	±0.01% to ±20% value dependent
Standard Size	30 mil x 30 mil x 10 mil 0.03” x 0.03” x 0.01”



Common Node Configuration



Isolated Node Configuration

Part Numbering

P D T – 35 – 30×30 – 10000–20000 – A J Q K

- P = Passive Plus
- Resistive Material *See Table*
- Length & Width (mils)
- Termination *See Table*
- TCR *See Table*
- Resistor Style *See Table*
- Substrate *See Table*
- Resistance for First & Second Resistors
- Resistance Tolerance *See Table*
- Resistance Ratio

Resistor Style

Code	Style
D	Common Node
I	Isolated Node

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

Thin Film Products

Dual Chip Resistors – PD Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285
22	Silicon (Si) (with 12kÅ SiO_2)	0.005" - 0.010"	Chemical Polish	N/A (SiO_2 K=1.38)	2.49 - 4.44 (25°C to < 1000°C)	149 (SiO_2 1.38)
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

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

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
R	Flip Chip (Ti/Pt/Au)	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	Yes	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Resistance Ratio Codes

Code	Tolerance to Other Resistors	Code	Tolerance to Other Resistors
G	±0.01%	**M**	±0.50%
H	±0.05%	**N**	±1.00%
J	±0.10%	**R**	No Ratio
K	±0.25%		

Power Handling Range by Material

Case Size mils (inches)	Alumina (35)	Silicon (22)	AlN (28)	BeO (25)	Quartz (20)
30 x 30 (0.030 x 0.030)	125 mW	125 mW	500 mW	1.0 W	25 mW

Thin Film Products

Dual Chip Resistors – PD Series

Packaging

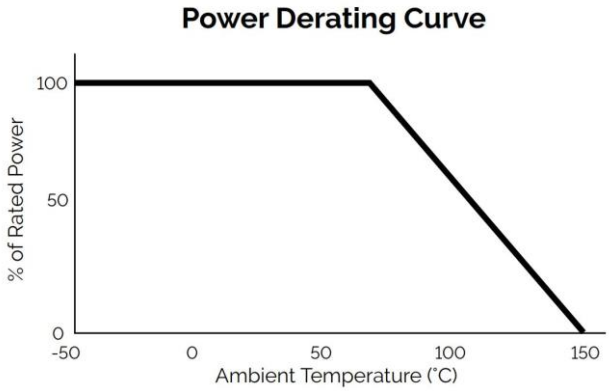
Code	Style
W	Waffle Pack (Standard)

Contact PPI for additional packaging options.

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

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

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

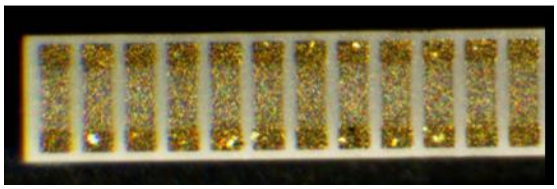
Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Thin Film Products

Standard Resistor Array – PS, PB, PI Series

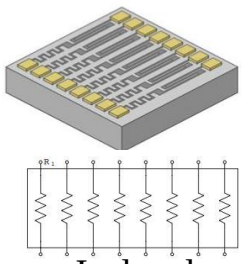
Product Features



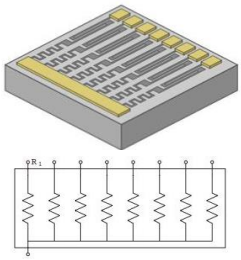
- Configured in 3 to 12 resistor combinations with all resistors at the same value and tolerance.
- Custom arrays can be designed to engineer's specifications.
- Can be used in Non-Magnetic Applications

Product Specifications

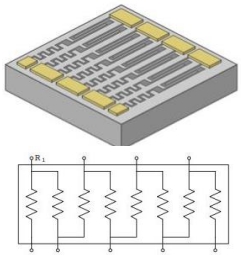
Resistance Range	5Ω to 100 kΩ per resistor (Alumina) 5Ω to 1 MΩ per resistor (Silicon)
Resistive Material	Tantalum Nitride
Ratio Tolerance	To 0.01% value dependent



Isolated



Common



Series

Part Numbering

P I T 12 35 – 130×60× 10 A 200R0 G Q C W

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Thickness
- Resistance Value
- TCR *See Table*
- Packaging *See Table*
- Resistor Style *See Table*
- Number of Resistors
- Length & Width
- Termination *See Table*
- Resistance Tolerance *See Table*
- Power Handling *See Table*

Resistor Style

Code	Style
I	Isolated Array
B	Common-Bus Array
S	Series Array

Resistive Material

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%

Thin Film Products

Standard Resistor Array – PS, PB, PI Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

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

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd / Au	Wirebond, Non-Cond. Epoxy	–	–
D	Pd / Au	Wirebond, Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach, Solder
K	Pd/ Au	Wirebond, Non-Cond. Epoxy	Au Sputtered	Solder

Temperature Coefficient of Resistance

Code	TC	Material
Q*	±150 ppm/°C	Tantalum Nitride (TaN)
V	±100 ppm/°C	

Power Handling

Resistors	3	4	5	6	7	8	9	10	11	12
Length (mils)	40 (0.04")	50 (0.05")	60 (0.06")	70 (0.07")	80 (0.08")	90 (0.09")	100 (0.10")	110 (0.11")	120 (0.12")	130 (0.13")
Width	60 mils (0.06") standard									
Thickness	10 mils (0.01") standard									
Power	50 mW/ Resistor standard									

Power Handling

Code	Rating
C	**50mW**

Packaging

Code	Style
W	Waffle Pack (Standard)

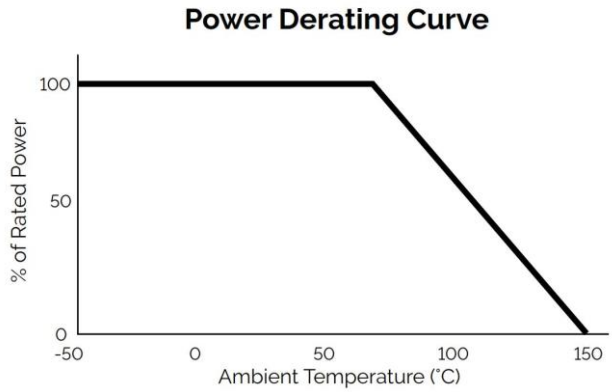
Contact PPI for additional packaging options.

Thin Film Products

Standard Resistor Array – PS, PB, PI Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

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

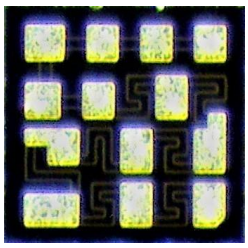
Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Thin Film Products

Network Resistor Array – PN Series

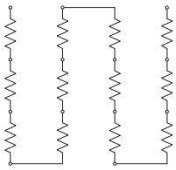
Product Features



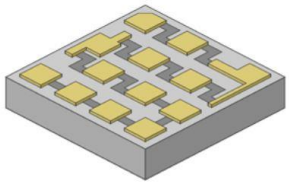
- Multiple resistances in a single, space saving chip.
- Single chip geometry offers excellent TCR tracking and resistance ratio tracking.
- PPI offers chips with 12 or 20 resistive elements as standard.
- Other configurations are available upon request.
- Can be used in Non-Magnetic Applications

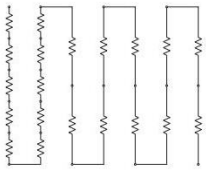
Product Specifications

Resistive Material	Tantalum Nitride
Ratio Tolerance	To 0.01% value dependent



12 Resistor Configuration





20 Resistor Configuration

Part Numbering

P N T 20 35 – 38 × 38 × 10 A 200R0 J Q C W

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Resistor Style *See Table*
- Number of Resistors *12 or 20*
- Length & Width
- Thickness
- Termination *See Table*
- Resistance Value
- Resistance Tolerance *See Table*
- TCR *See Table*
- Power Handling *See Table*
- Packaging *See Table*

Resistor Style

Code	Style
N	Network Array

Resistive Material

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%

Thin Film Products

Network Resistor Array – PN Series

Resistance Range

Code	Size	Substrate Metallization	Resistance Range	Resistance Distribution
12	30x30 (0.030"x0.030")	Silicon	80Ω to 240kΩ	R_1 to R_7 = R_t/8 R_8 to R_{12} = R_t/40
		Alumina	80Ω to 50kΩ	
20	38x38 (0.038"x0.038")	Silicon	550Ω to 500kΩ	R_1 to R_{10} = R_t/110 R_{11} to R_{20} = R_t/11
		Alumina	550Ω to 50kΩ	

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
22	Silicon (Si) (with 12kÅ SiO_2)	0.005" - 0.010"	Chemical Polish	N/A (SiO_2 K=1.38)	2.49 - 4.44 (25°C to < 1000°C)	149 (SiO_2 1.38)

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd / Au	Wirebond, Non-Cond. Epoxy	–	–
D	Pd / Au	Wirebond, Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach, Solder
K	Pd/ Au	Wirebond, Non-Cond. Epoxy	Au Sputtered	Solder

Resistance Tolerance Codes

Code	J	K	M
Tolerance	± 5%	± 10%	± 20%

Temperature Coefficient of Resistance

Code	TC	Material
Q*	±150 ppm/°C	Tantalum Nitride (TaN)
V	±100 ppm/°C	

**Standard*

Power Handling

Code	Rating
C	50mW

Packaging

Code	Style
W	Waffle Pack (Standard)

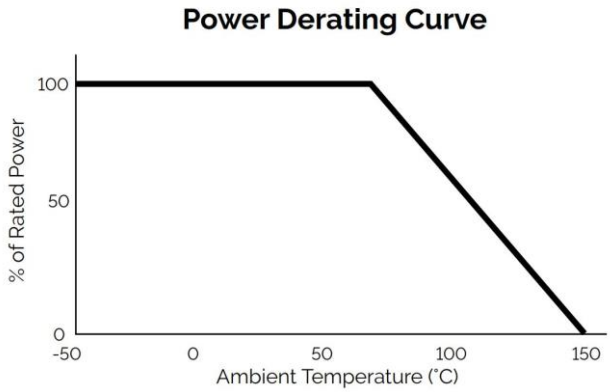
Contact PPI for additional packaging options.

Thin Film Products

Network Resistor Array – PN Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

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

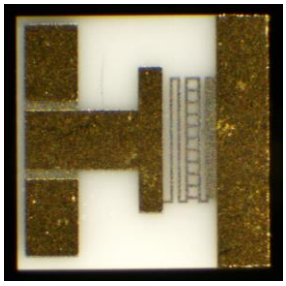
Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

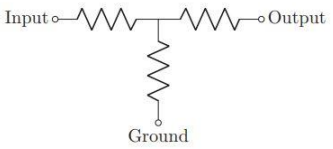
Thin Film Products

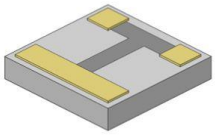
Attenuators – PAT Series

Product Features

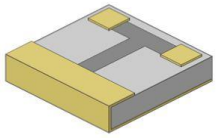


- Reduces amplitude or power of a signal by a known value. This is achieved with very little distortion of the signal, maintaining accuracy up to 40 GHz.
- Attenuators are available with or without center Taps
- Single wraps of the ground pad to a full gold backside available
- Additional Attenuator configurations, including balanced attenuators, are available as custom parts
- Can be used in Non-Magnetic Applications

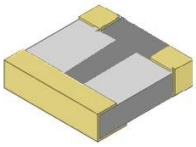




Attenuator Top Contact



Attenuator, Single Pad Wrap



Attenuator, 3-Sided Wrap

Part Numbering

P A T S 35 – 50×50× 10 A 3R00 F Q G W

P = Passive Plus	Attenuator	Resistive Metallization *See Table*	Attenuator Type *See Table*	Material *See Table*	Length & Width	Thickness	Bond Pad Metallization *See Table*	Attenuation (dB)	Attenuation Tolerance *See Table*	TCR *See Table*	Power Handling *See Table*	Packaging *See Table*

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%

Attenuator Type

Code	Description
S	T-Pattern

Thin Film Products

Attenuators – PAT Series

Materials

(LxWxT) Dimensions (mils)	Power (W)			Value	
	Al_2O_3	AlN	BeO	Min	Max
CODE	35	28	25		
50x50x10	250mW	1W	2W	0.5dB	24.5dB
80x60x15	250mW	1W	2W	0.5dB	24.5dB
150x120x25	2W	8W	16W	0.5dB	24.5dB

Bond Pad Metallizations

Code	Metallization	Description	Attachement Options
A	Pd/Au	Top Only	Wirebond, Non-Cond. Epoxy
M	TiW/Ni/Au	Single Wrap, Full GRD Place	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
R	Pd/Au	Flip Chip	Wirebond, Non-Cond. Epoxy
X	TiW/Ni/Au	3-Sided Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder

Attenuation Tolerance

Code	Tolerance
F	±0.1dB (-0.5 to -6.0dB)
G	±0.2dB (-6.5 to -24.5dB)

Temperature Coefficient

Code	TC
Q*	±150 ppm/°C
V	±100 ppm/°C

Power Handling

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

Power Ratings assume proper heat sinking is used.

Packaging

Code	Style
W	Waffle Pack (Standard)

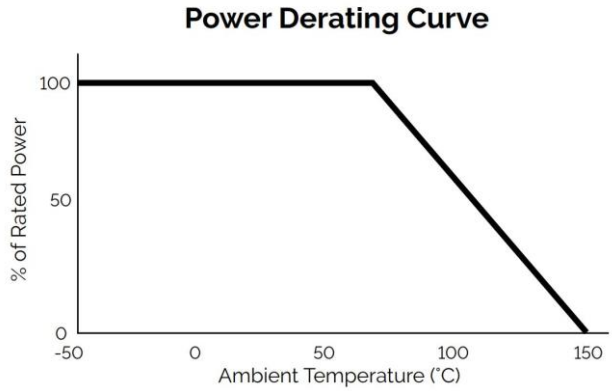
Contact PPI for additional packaging options.

Thin Film Products

Attenuators – PAT Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 40 GHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

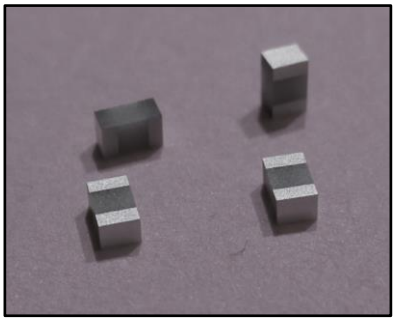
Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal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

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Thin Film Products

Thermal Conductors – PTC Series



λ Product Features

With the increase in heat dissipation from microelectronics devices and the reduction in overall form factors, thermal management becomes a more and more important element of electronic product design.

PPI's Thermal conductors are a passive heat exchanger that transfers the heat generated by an electronic device to a thermal ground plane or any specific thermal point where it gets dissipated away from the device.

Our thermal conductors are available in a variety of sizes including standard EIA case sizes and are constructed using Aluminum Nitride (AlN) or Beryllium Oxide (BeO).

λ Product Features

- High Thermal Conductivity
- Low Thermal Resistance
- Low Capacitance
- One piece construction
- RoHS Compliant
- EIA case sizes
- More efficient thermal management

λ Applications

- GaN Power Amplifiers
- High RF Power Amplifiers
- Filters
- Synthesizers
- Switch Mode Power Supplies
- Pin & Laser Diodes

λ Functional Applications

- Between active device & adjacent ground planes
- Specific contact pad to case
- Contact pad to contact pad
- Direct component contact to via pad or trace
- Edges fully metalized

λ Part Numbering

Example shown below: Thermal Conductor, AlN, 1005, thickness (40 mils), Platinum/Gold (Pt/Au), Waffle Pack

P	TC0	28	100×50×40	N	W
P = Passive Plus	Thermal Conductor	Material *See Table*	Length, Width & Thickness *See Parts Characterization Table*	Metallization *See Table*	Packaging *See Table*

RoHS

Thin Film Products

Thermal Conductors – PTC Series

λ Parts Characterizations

Case Size	Length (L) mils / (mm)	Width (W) mils / (mm)	Thickness (T) mils / (mm)	Terminal (t) mils / (mm)	Thermal Resistance (°C/W)		Thermal Conductivity (mW/°C)	
					AlN	BeO	AlN	BeO
0302	30 ± 2 (.762 ± .051)	20 ± 2 (.508 ± .051)	20 (.508)	10 (0.25)	19	12	53	81
0402	40 ± 2 (1.016 ± .051)	20 ± 2 (.508 ± .051)	20 (.508)	10 (0.25)	25	16	40	61
0505	50 ± 2 (1.270 ± .051)	50 ± 2 (1.270 ± .051)	25 (.635)	15 (0.38)	10	7	100	153
0603	60 ± 2 (1.524 ± .051)	30 ± 2 (.762 ± .051)	25 (.635)	15 (0.38)	20	13	50	76
0805	80 ± 2 (2.032 ± .051)	50 ± 2 (1.27 ± .051)	40 (1.016)	20 (0.51)	10	7	100	153
1005	100 ± 2 (2.540 ± .051)	50 ± 2 (1.27 ± .051)	40 (1.016)	20 (0.51)	13	8	77	122
1020	100 ± 2 (2.540 ± .051)	200 ± 2 (5.080 ± .051)	40 (1.016)	20 (0.51)	3	2	320	508
1111	110 ± 2 (2.794 ± .051)	110 ± 2 (2.794 ± .051)	40 (1.016)	20 (0.51)	7	4	153	240
2010	200 ± 10 (5.080 ± .254)	100 ± 10 (2.540 ± .254)	60 (1.524)	30 (0.77)	10	6	100	159
2525	250 ± 10 (6.350 ± .254)	250 ± 10 (6.350 ± .254)	60 (1.524)	40 (1.02)	4	3	240	380
3725	370 ± 10 (9.398 ± .254)	250 ± 10 (6.350 ± .254)	60 (1.524)	50 (1.27)	6	4	160	254
3737	370 ± 10 (9.398 ± .254)	370 ± 10 (9.398 ± .254)	60 (1.524)	50 (1.27)	4	3	240	380

λ Materials

	AlN	BeO
CODE	**28**	**25**

λ Metallizations

Code	Metallization	Attachement Options
N*	Platinum/Gold (Pt/Au)	Solder Only
X	Platinum/Silver (Pt/Ag)	Solder Only

**Recommended*

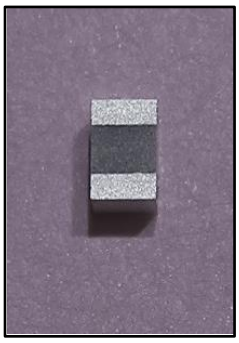
λ Packaging

Code	Style
W	Waffle Pack (Standard)

Contact PPI for additional packaging options.

Thin Film Products

Thermal Conductors – PTC Series



λ General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Insulation Resistance	10^{12} Ω min at 25°C

λ Testing

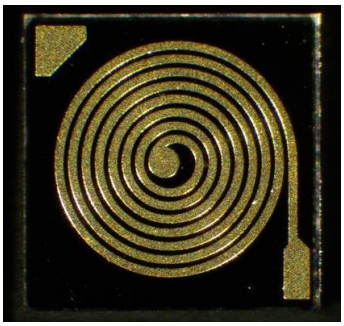
Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal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

Thin Film Products

Spiral Inductors

PPI Spiral Inductors consist of a thin film gold spiral patterned on a substrate for use in a wide variety of uses, including storing electrical energy in the form of magnetic energy, 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, backside metallization is also available. A second corner pad is provided for easy wire-bonding from the center pad for edge-contact mounting.



50x50 Spiral Inductor

Product Features

- Low Capacitance
- Less Resistive & Capacitive losses
- RoHS Compliant

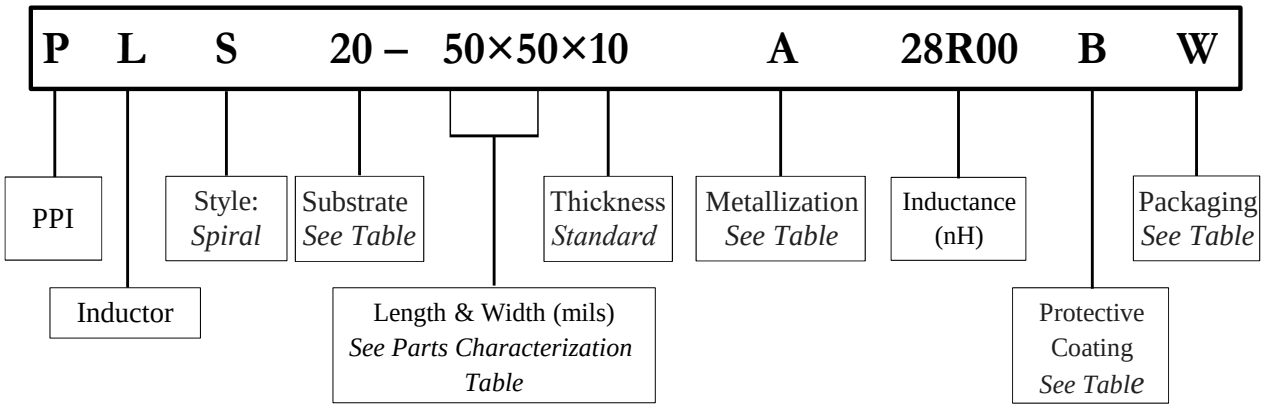
Applications

- Microwave Circuit Resonant elements
- Electrical Power & Electronic Devices

Functional Applications

- Choking, Blocking, Attenuating, or filtering/smoothing high frequency noise
- Storing & transferring energy in power converters
- Creates tuned oscillators or LC "tank" circuits
- Impedance matching

Part Numbering



Other inductance values, DC resistance values, substrates, geometries, metallizations, and custom inductors are available.

Substrate Materials

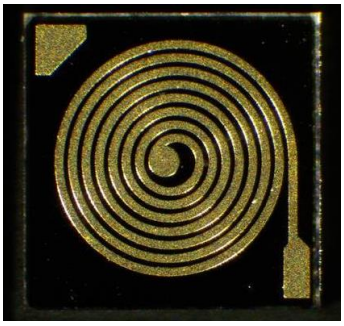
Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Thin Film Products

Spiral Inductors

Parts Characterizations

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



50x50 Spiral Inductor

Metallizations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Other metallizations available. Please contact PPI.

Inductance Codes

Inductance (nH)
Digits 1-4 are significant figures
The "R" is used as a decimal point.
e.g. 28R0 = 28nH, 1R50 = 1.5nH

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.

Protective Coating

Code	Polymide Coating
B	Without Coating
P	With Polymide Coating

Packaging

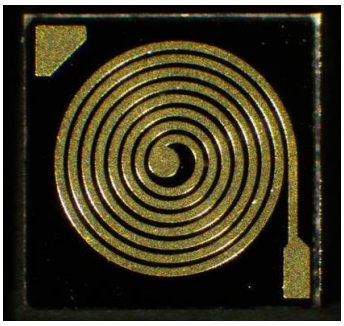
Code	Style
W	Waffle Pack (Standard)

Contact PPI for additional packaging options.

Thin Film Products

Spiral Inductors

General Properties

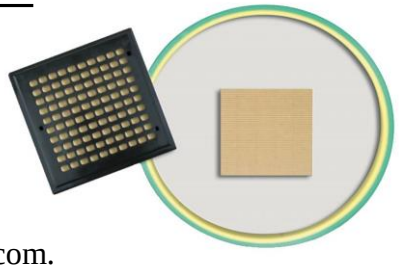


50x50 Spiral Inductor

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Insulation Resistance	$10^{12}\Omega$ · min at 25°C

Testing

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
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



Performance Specifications

Additional sizes and custom inductors available. Please contact sales@passiveplus.com.

Thin Film Products

Custom Design

Our advanced manufacturing methods ensure sheet uniformity, metallization adhesion, and thickness control allowing PPI to meet or exceed custom requirements from simple patterned submounts to highly complex boards that include: Transmission Lines Combiners & Splitters, Interposers, Inductors, Filters, Direct Patterns, and Integrated tight tolerance resistors.

- Full In-House Design Capabilities
- Low NRE
- 100% Visual and DC Electrical Inspection
- Element Evaluation & Test Capabilities per MIL-PRF-55342 and MIL-STD-883

Design Characteristics

Resistance Tolerance	±0.01% to ±20%
Resistance Ratio	0.01% available
TCR Tracking	±2 ppm/°C
Termination Material	Gold (Standard)
Wafer: Size **Thickness Tolerances**	Up to 4 in x 4 in As low as ±.5 mils for height matching applications
Line Width Definition (Resistor)	0.1 mils
Line Width Definition (Conductor)	0.2 mils
Metals Available	Gold, Nickel, NiChrome, Palladium, Platinum, Tantalum, Tantalum Nitride, Titanium, Titanium Tungsten (TiW), Silver
Specialty Materials	Metallization available on 1 - 6 sides Through-holes (vias), edge wraps, and custom laser cutouts
Patterning Processes	Full Photolithography capabilities and Lift-off patterning available
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
RF & DC Sputtering	Supporting Au, Pt, Ag, Ni, Pd, Ta, TiW, Ti, Tan, NiCr, and SiO_2. Custom plating stacks available
Repackaging	Tape and Reel, waffle pack, gel pak, and film frame
Other Capabilities	Gold filled Vias, Gold Bumping

Thin Film Products

Custom Design

Resistive Material Characteristics

Code	Resistive Material	Sheet Resistivity	Passivation	Standard TCR	Optional TCR
T	Tantalum Nitride	5 Ω/sq - 300 Ω/sq	Ta_2O_5 (self-Passivating)	± 150 ppm/°C	± 50 ppm/°C
N	NiChrome	5 Ω/sq - 250 Ω/sq	SiO_2	± 25 ppm/°C	± 5 ppm/°C

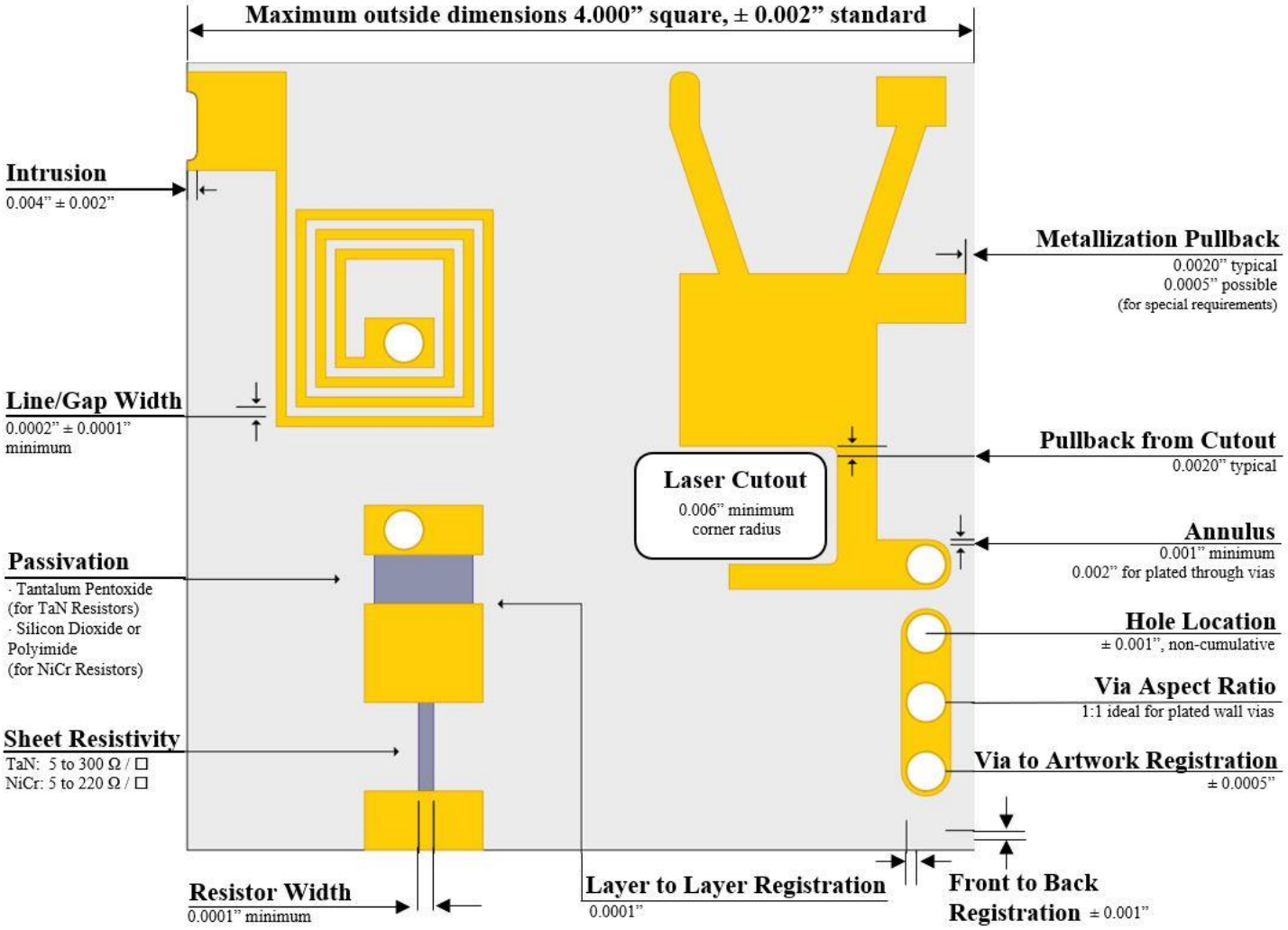
Standard Substrate Characteristics

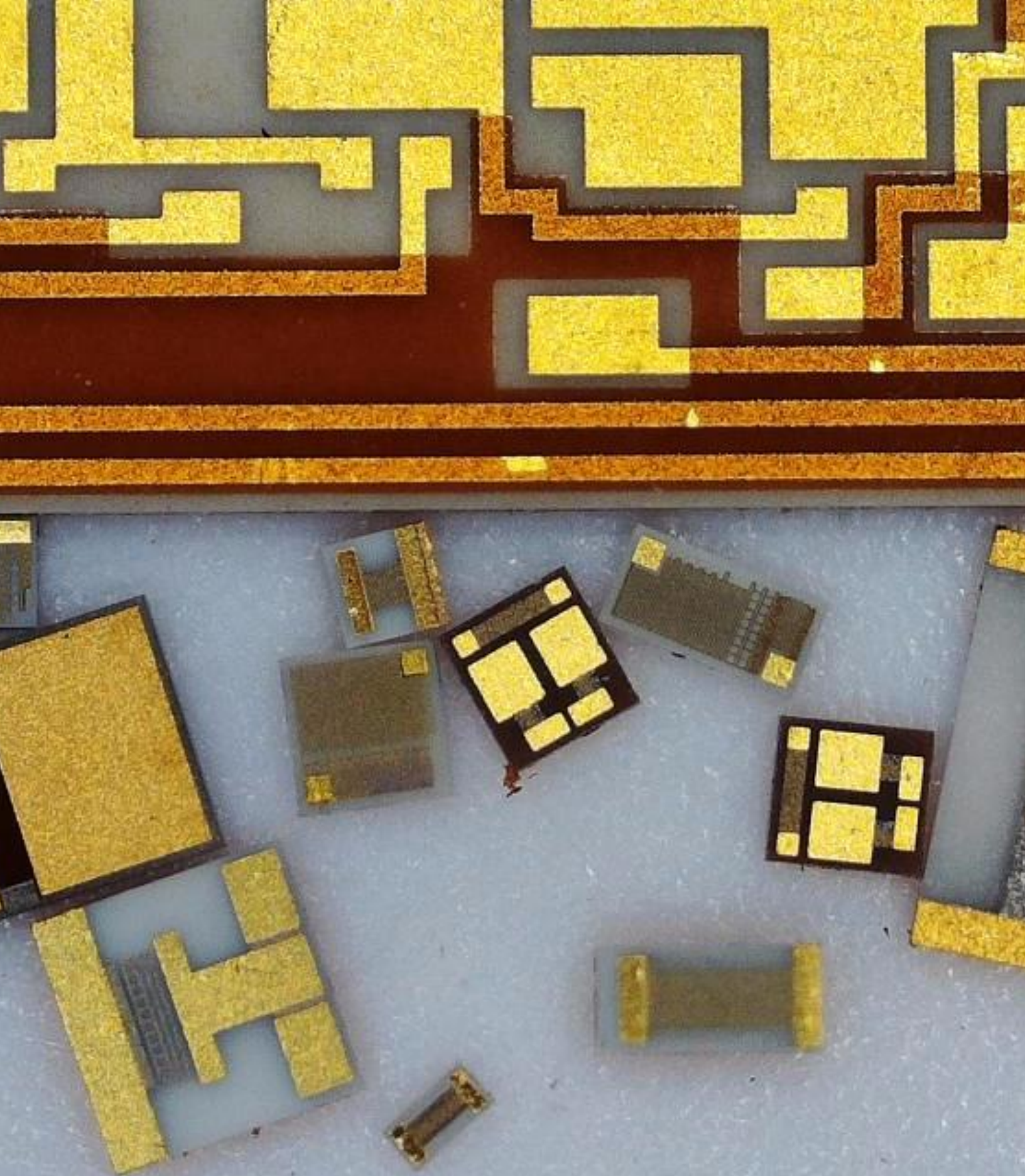
Code	Substrate Material	Available Thickness (standard)	Dielectric Constant (@ 1 MHz)	Thermal Conductivity ($W \times m^{-1} \times K^{-1}$)
35	Alumina (Al_2O_3)	0.005 in - 0.025 in	9.8	26.9
28	Aluminum Nitride (AlN)	0.005 in - 0.025 in	8.7	170
25	Beryllium Oxide (BeO)	0.005 in - 0.025 in	6.6	285
22	Silicon	0.005 in - .010 in	N/A (SiO_2 K = 3.8)	149 (SiO_2 1.38)
20	Quartz	0.005 in - .010 in	3.8	1.38

Testing

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
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

Custom Design





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