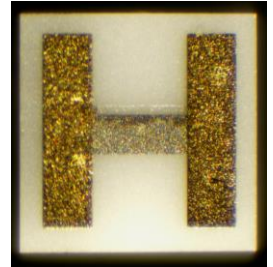


# Microwave Chip Resistors – PM Series

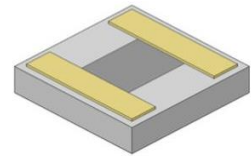
## Product Features

- 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



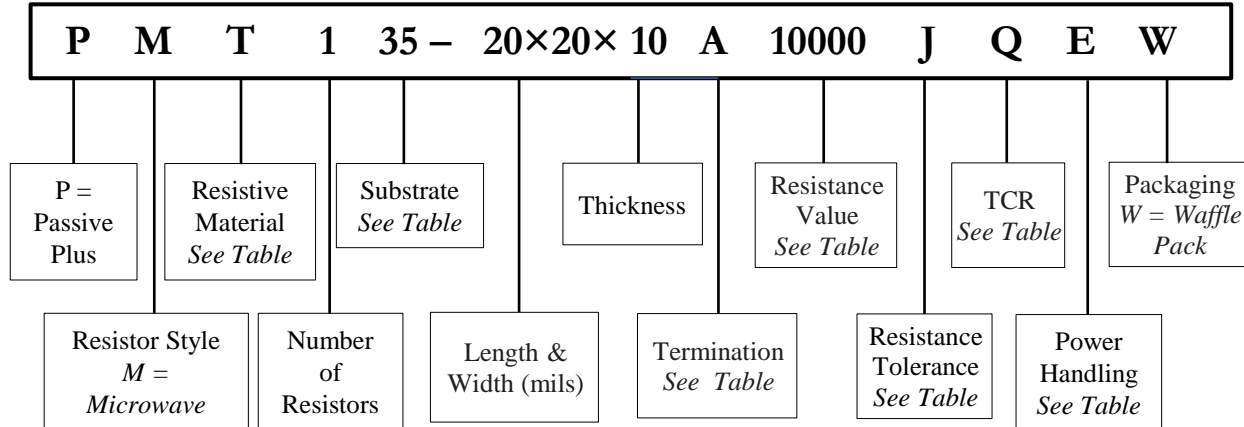
## Product Specifications

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.



## Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	Tantalum Nitride (TaN)	Self Passivating Ta <sub>2</sub> O <sub>5</sub>	5 to 270	From ±0.01%	From ±0.01%
N	NiChrome (NiCr)	SiO <sub>2</sub>	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.



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## Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10 <sup>6</sup> /°C)	Thermal Conductivity (W/m*K)
35	Alumina (Al <sub>2</sub> O <sub>3</sub> )	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		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

## 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		



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# 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				
	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Resistance Range		Power Handling		
mils (inches)										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	15.0 W
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.



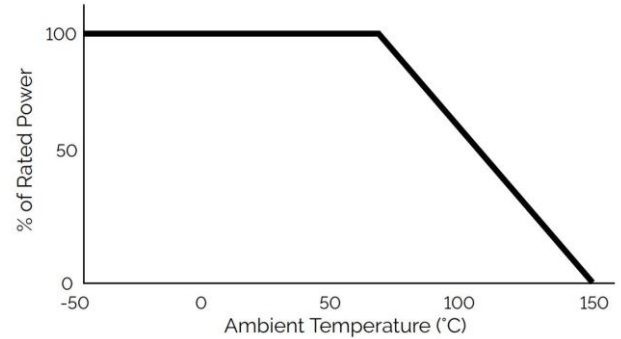
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# Microwave Chip Resistors – PM Series

## 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

Power Derating Curve



## 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.