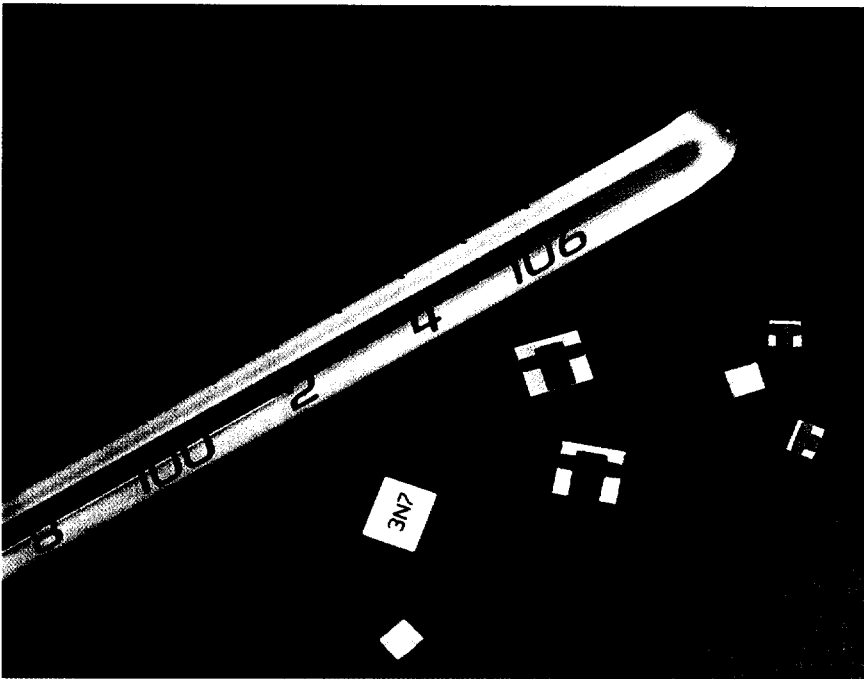


THERMOPAD® TEMPERATURE COMPENSATING ATTENUATORS



THERMOPAD TEMPERATURE COMPENSATING ATTENUATORS

The Thermopad is a patented (U.S. Patent # 5,332,981), absorptive microwave attenuator, which provides power dissipation that varies with temperature. The device can be used in any application that requires a known amount of attenuation change for a particular temperature shift. This is particularly useful for maintaining the output of gain stages, mixers, power dividers, and other signal processing components over temperature.

In applications from DC - 18 GHz, EMC's Thermopad is the ideal temperature compensation solution for cost, performance, and reliability. The Thermopad can replace closed loop temperature compensation circuits with a single chip device requiring no bias or control. It excels in multiple signal applications such as cellular telephone and PCN because of its low cost and because it produces no signal distortion. In high reliability, military, and spacecraft applications, the Thermopad reduces system complexity and cost while improving overall reliability. The Thermopad is available in a wide variety of package styles. All styles are available on tape and reel packaging.

The EMC Difference:

▶ The Thermopad is a totally passive temperature compensation element. This surface mountable attenuator requires no bias or control voltages and does not generate distortion. The Thermopad can be used in place of a standard chip attenuator to combine level setting or buffering and temperature compensation in one chip. This will reduce your component count, increase reliability, and save you money.

THERMOPAD® TEMPERATURE COMPENSATING ATTENUATORS

SPECIFICATIONS:

Frequency Range:	DC - 6 GHz, TVA Series DC - 18 GHz, MTVA Series
Attenuation Accuracy:	± 0.5 dB
TCA Tolerance:	± 0.001 dB/dB/°C
VSWR:	1.30 maximum at 1 GHz
Operating Temperature:	-55°C to +150°C
Substrate:	Alumina
Termination Material:	Thick film, nickel barrier with solder plated finish
Resistive Element:	Thick film

SELECTION GUIDE:

- Determine polarity and the amount of compensation required by your circuit.
- Refer to the "Thermopad Temperature Shift Cross Reference" chart on the next page to select the minimum room temperature attenuation and temperature coefficient of attenuation (TCA) which yields the required compensation. The available configurations are listed by type in the "Available Configuration of Thermopad" chart on the next page.
- Determine the part number as shown in the example on page 23.

THERMOPAD POWER HANDLING CAPABILITY

Part Size	Average Power
TVA Negative Shifting Planar	2 watts
TVA Positive Shifting Planar	0.2 watts
MTVA Negative Shifting Series	0.2 watts
CTVA Negative Shifting Series	2 watts

USABLE FREQUENCY RANGE

TVA, W1, W3	DC – 6 GHz
MTVA, G	DC – 18 GHz
-0.003	
-0.004	
-0.005	
MTVA,	DC – 12.4 GHz
-0.006	
-0.007	
MTVAW3, WB1, W1	DC – 12.4 GHz

THERMOPAD® TEMPERATURE COMPENSATING ATTENUATORS

**THERMOPAD TEMPERATURE SHIFT CROSS REFERENCE CHART
(ATTENUATION SHIFT IN dB PER 10°C)**

TCA* dB/dB/°C	Attenuation at 25°C									
	1 dB	2 dB	3 dB	4 dB	5 dB	6 dB	7 dB	8 dB	9 dB	10 dB
-0.003	-0.03	-0.06	-0.09	-0.12	-0.15	-0.18	-0.21	-0.24	-	-0.30
-0.004	-0.04	-0.08	-0.12	-0.16	-0.20	-0.24	-0.28	-0.32	-	-0.40
-0.005	-0.05	-0.10	-0.15	-0.20	-0.25	-0.30	-0.30	-	-	-0.50
-0.006	-0.06	-0.12	-0.18	-0.24	-0.30	-0.36	-0.42	-	-	-
-0.007	-0.07	-0.14	-0.21	-0.28	-0.35	-0.42	-0.49	-0.56	-0.63	-0.70
-0.009	-0.09	-0.18	-0.27	-0.36	-	-0.54	-	-	-	-
+0.003	+0.03	-	+0.09	-	-	+0.18	-	-	-	-
+0.005	+0.05	-	+0.15	-	-	+0.30	-	-	-	-
+0.007	+0.07	+0.14	+0.21	-	-	+0.42	-	-	-	-

*TCA = Temperature Coefficient of Attenuation

AVAILABLE CONFIGURATION OF THERMOPAD

Temperature Coefficient Code	TCA* dB/dB/°C	Attenuation at 25°C									
		1 dB	2 dB	3 dB	4 dB	5 dB	6 dB	7 dB	8 dB	9 dB	10 dB
N03	-0.003	M,T	M,T	M,T	M,T	M,T	M,T	T	T	T	T
N04	-0.004	M	M	M,T	M,T	M,T	M,T	T	T	-	T
N05	-0.005	M,T	M,T	M,T	M,T	M,T	M,T	T	-	-	T
N06	-0.006	T	T	T	T	T	T	T	-	-	-
N07	-0.007	T	CT,M,T	CT,M,T	CT,M,T	M,T	M,T	T	T	T	T
N09	-0.009	T	CT,T	CT,T	T	-	M,T	-	-	-	-
P03	+0.003	T	-	T	-	-	T	-	-	-	-
P05	+0.005	T	-	T	-	-	T	-	-	-	-
P07	+0.007	T	T	T	-	-	T	-	-	-	-

The configurations most popular with designers are indicated in shaded area.

* TCA = Temperature Coefficient of Attenuation.

T = TVA series chips

M = MTVA series chips

CT = CTVA (75 OHM version of TVA)

► See drawings on pages 24 and 25.

ENGINEERING EVALUATION KIT



A NEW THERMOPAD® ENGINEERING EVALUATION KIT!

With all the values and configurations available, the possibilities are endless. We have selected several popular values and metallization schemes to demonstrate the amazing feats the Thermopad can perform for your amplifier design - and put them all in one place! The Thermopad Engineering Evaluation Kit (TVA-EE-Kit).

The kit includes samples of both planar chips and the popular "W3" (triple wrapped termination) chips in the following values:

3 pieces	TVA0100N09
3 pieces	TVA0300N07
3 pieces	TVA0300N07W3
3 pieces	TVA0600N07

The kit also includes our new Thermopad Selection Software Tool. Use it to select the Thermopad that enhances your amplifier's gain over temperature. The tool displays the resulting performance and allows you to select the Thermopad that will optimize temperature compensation and insertion loss. The Thermopad Selection Tool also tells you the actual Thermopad performance, which can be utilized for circuit simulation and optimization in other programs.

In addition, this invaluable tool provides the user with application notes, recommended circuit board layouts, and mechanical drawings.

The TVA-EE-Kit is available from stock at your local distributor. Call for yours today!

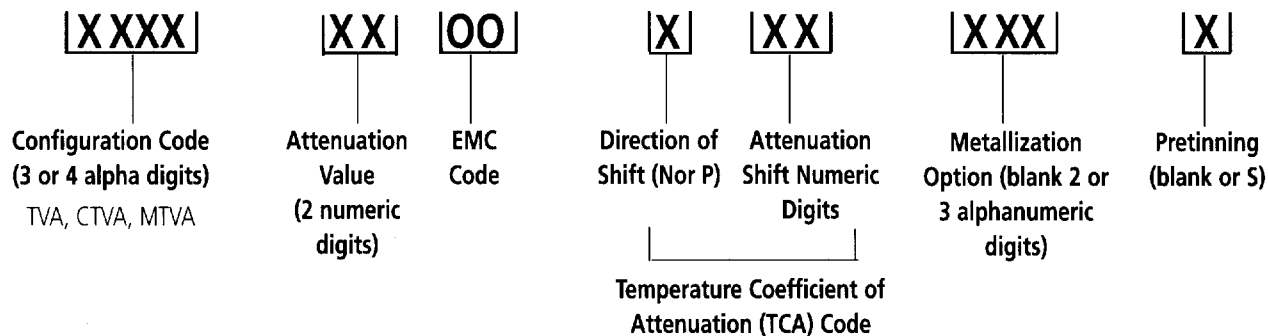


THERMOPAD® TEMPERATURE COMPENSATING ATTENUATORS

ORDERING INFORMATION

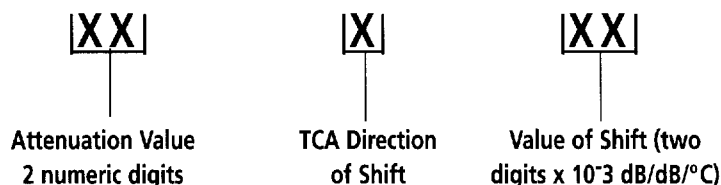
METALLIZATION OPTIONS

- **Planar (no code)** Planar device for flip chip mounting offers the best RF performance and lowest cost.
- **Triple Wrap (W3)** Metallization wraps around input, output, and ground terminals. Permits inspectable solder fillets when flip chip mounting. See Application Note 006 on page 92.
- **Single Wrap (W1)** Metallization wraps around ground terminal only. Full backside metallization.
- **Pretinned (S)** Pretinning (with Sn 62) improves solderability (available on all of the above options).
- **Single Wrap (WB1) (MTVA series only)** Metallization wraps around ground terminal only. Full backside metallization. Input and output terminals have gold metallization for wire bonding.
- **Gold (G) (MTVA series only)** Planar device with gold metallization. Typically used for wire bonding.

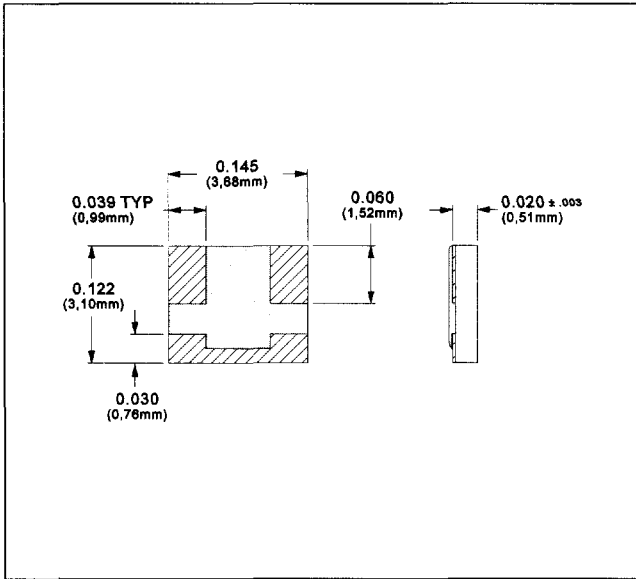


Example: P/N TVA0300N07W3S is TVA configuration code, 3 dB nominal value at +25 °C, negative shifting thermopad with TCA of 0.007dB/dB/°C, triple wrap with pretinning.

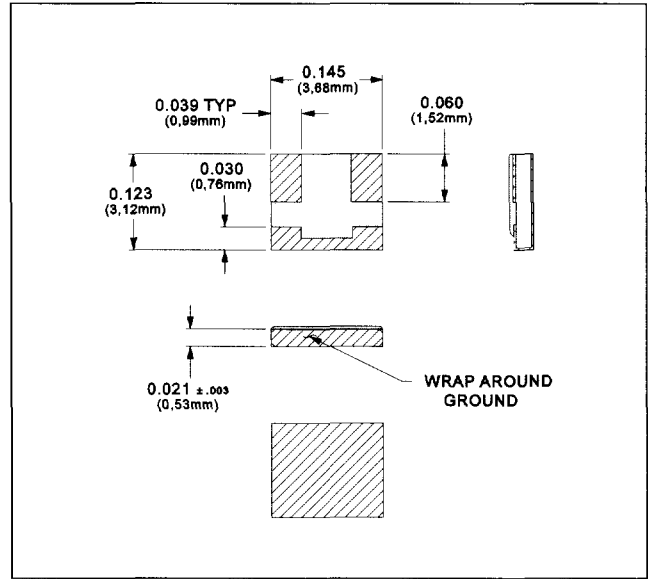
Thermopads are marked with attenuation value and temperature coefficient of attenuation code as follows:



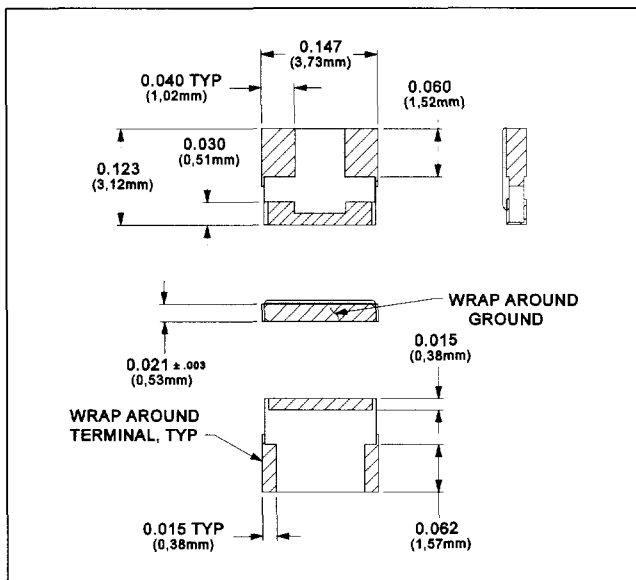
THERMOPAD® TEMPERATURE COMPENSATING ATTENUATORS



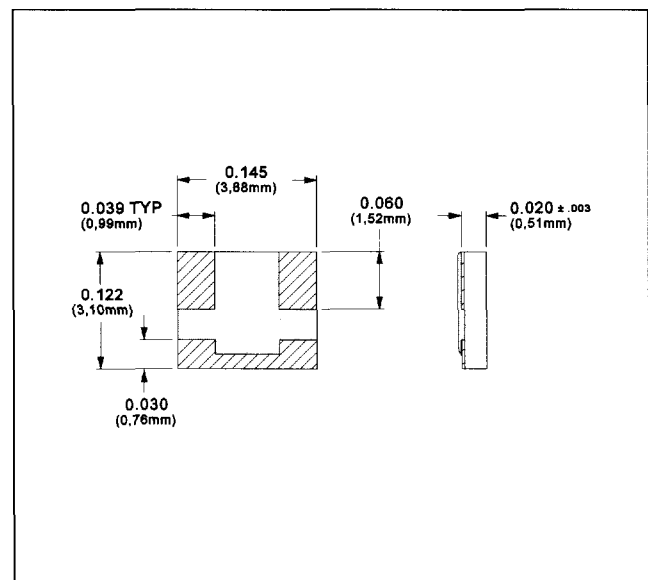
TVA Planar Configuration



TVA W1 Configuration



TVA W3 Configuration

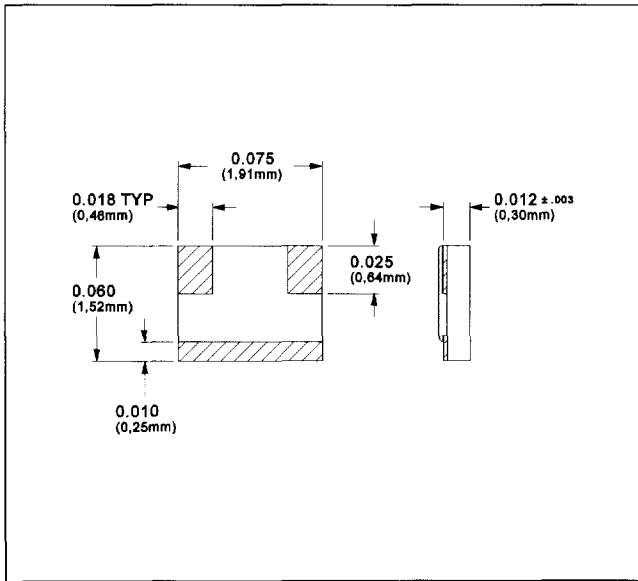


CTVA Planar Configuration

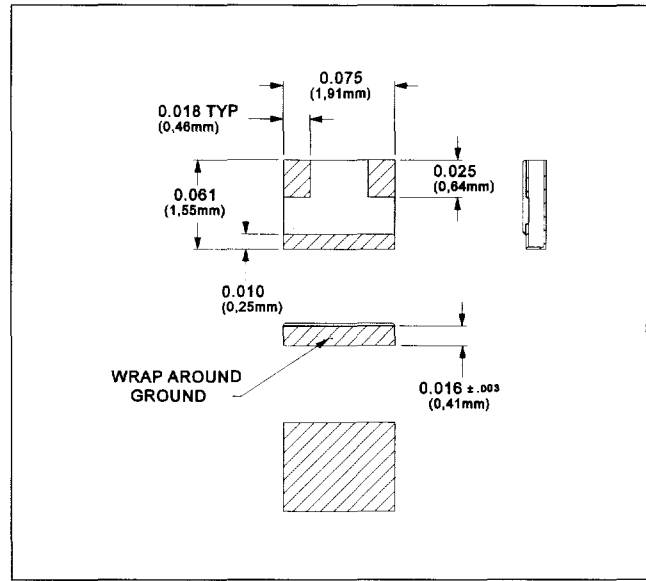


► See Application Note 003 on page 85.

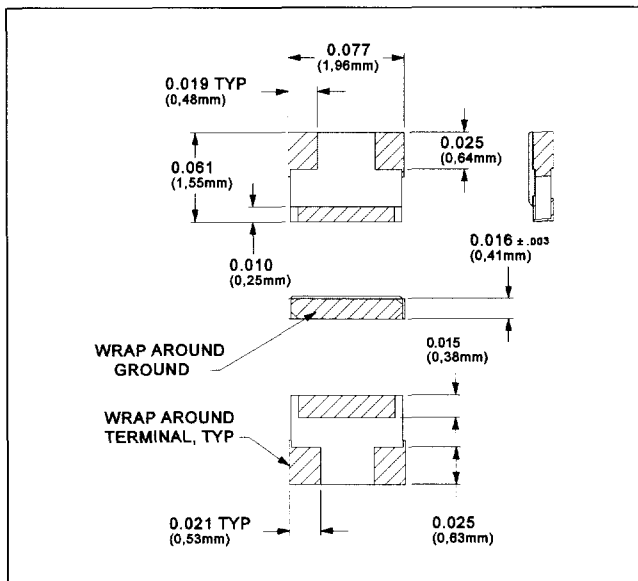
THERMOPAD® TEMPERATURE COMPENSATING ATTENUATORS



MTVA Planar Configuration



MTVA W1/WB1 Configuration

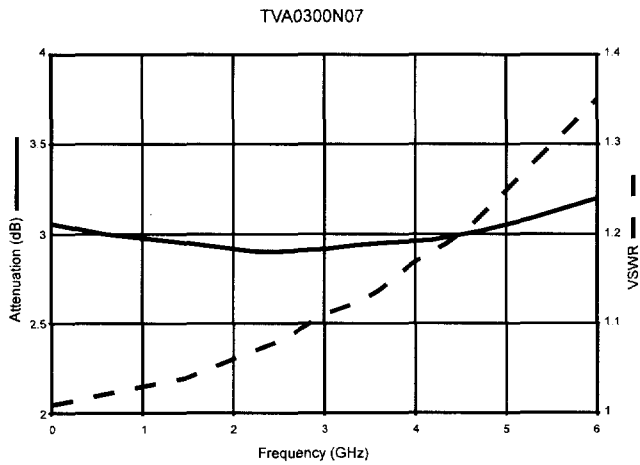


MTVA W3 Configuration

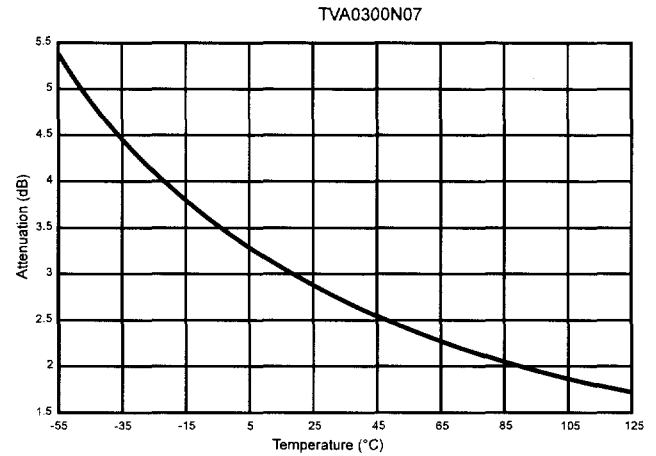


► See Application Note 003 on page 85.

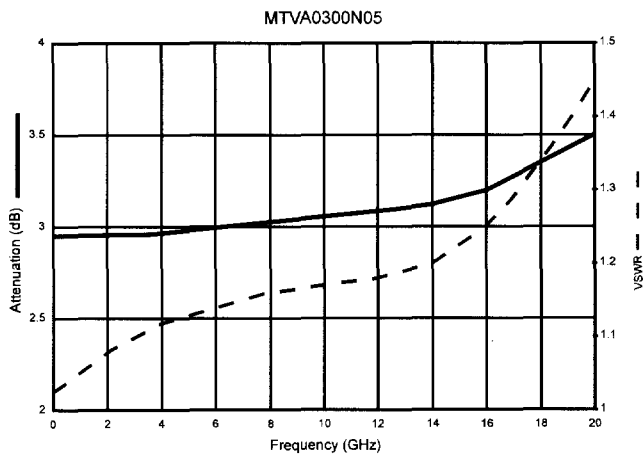
THERMOPAD® TEMPERATURE COMPENSATING ATTENUATORS



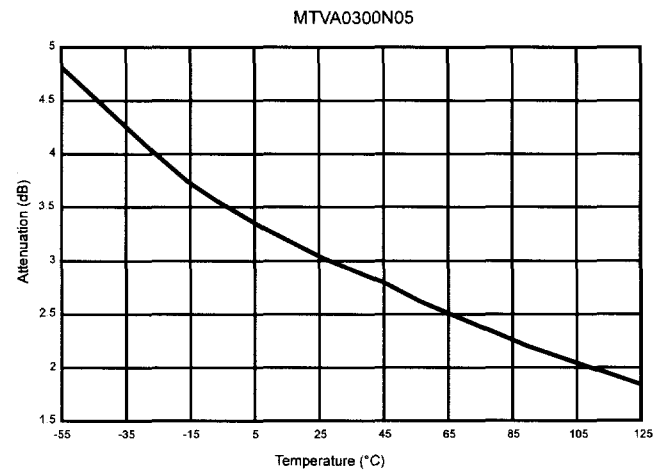
Typical Thermopad® RF Performance
TVA0300N07



Thermopad® Attenuation vs. Temperature for
TVA0300N07



Typical Thermopad® RF Performance
MTVA0300N05



Thermopad® Attenuation vs. Temperature for
MTVA0300N05