

Purpose

- Provide an introduction of chip attenuator

Objectives

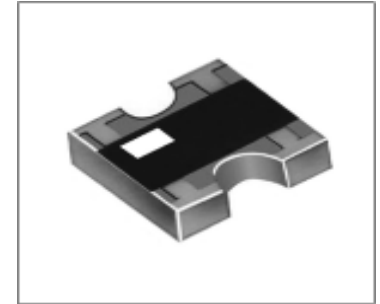
- The chip attenuator Introduction
- The theorem for fixed chip attenuator
- The application for chip attenuator
- How to order
- Product Lineup

Content

- 10 pages

Learning Time

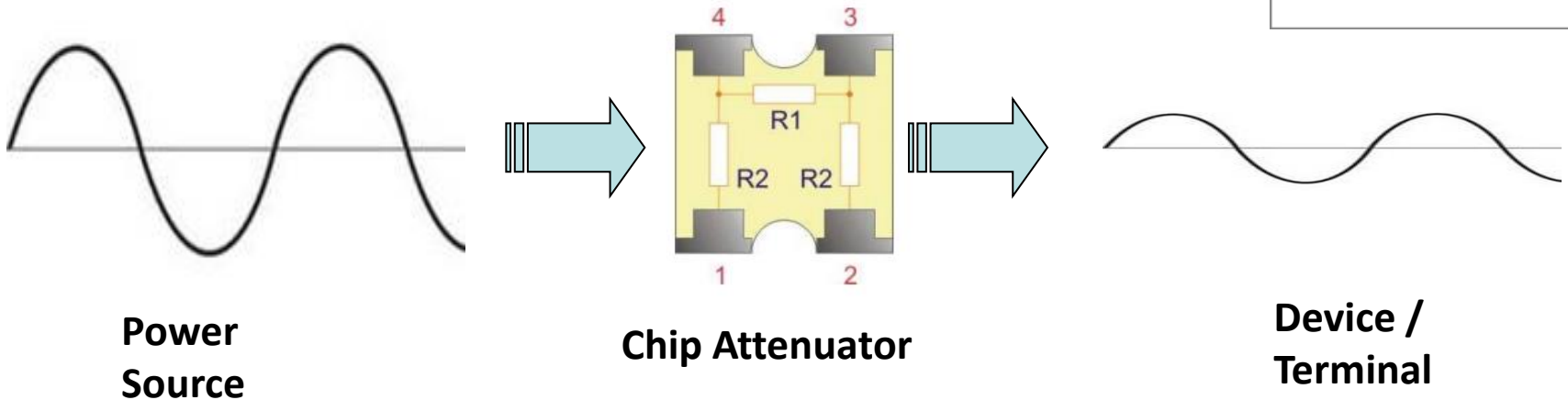
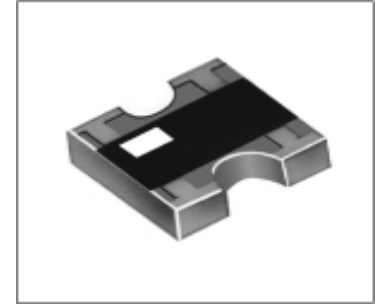
- 10 minutes



Welcome to the Walsin chip RF attenuator product training module. The following presentation will introduce the application and basic concept of chip RF attenuator and product lineup that Walsin provides to customer. We will also illustrate how to choose a suitable chip attenuator based on specification and our product lineup.

The Introduction of Chip Attenuator

Basic Function: Power wave will decay through attenuator



The Basic function of attenuator is to attenuate the power level of the pass-through signal. Normally, the insertion loss of communication component is required as lower as possible. However, the chip attenuator is acting as an opposite role. In order to achieve specific target, engineers has to use attenuator to lower the power to a specific level.

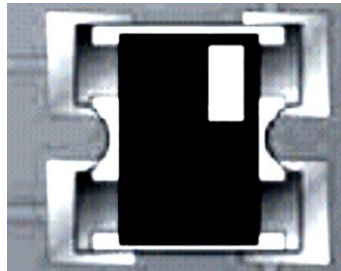
The Introduction of Chip Attenuator

Features

- π type attenuator circuit
- Compact chip size (1.0mm x 1.0mm)
- High Reliability Product Lines
- Frequency Range from DC to 3 GHz
- Attenuation Values from 0 to 20dB
- GSM/ 3G / 4G LTE applications



Wraparound



Item	General Specification
Series No.	WA04P
Size	0402×2 (1005×2)
Termination construction	Convex type
Attenuation Range	0dB, 0.5dB ~ 20dB
Attenuation Tolerance	
0dB	-
0.5 dB	□ ±0.1dB
1dB ~ 5dB	□ ±0.3dB
6dB ~ 10dB	□ ±0.4dB
11dB ~ 13dB	□ ±0.8dB
14dB	□ ±1.0dB
15 ~ 16dB	□ ±1.5dB
17 ~ 19dB	□ ±2.0dB
20dB	□ ±2.5dB
Characteristic impedance	50Ω
Rated power at Tamb=70°C	0.1 W / package
Limiting Voltage (DC)	50V
Frequency range (DC)	MAX. 3 GHz
VSWR (Voltage Standing Wave Ratio)	MAX. 1.2
Number of Resistors	3 resistors
Number of Terminals	4 terminals
Operation Temperature	-40 ~ +125°C

Walsin chip attenuator adopted Pi network design and the miniature design is suitable to be used in wireless communication products, such as Mobile phone, tablet, and laptops, with lower cost and high reliability.

WA04P series supports 0~ 20dB attenuation between DC to 3GHz. It may apply to high speed and frequency circuit. i.e. GSM 2G/3G/4G LTE.

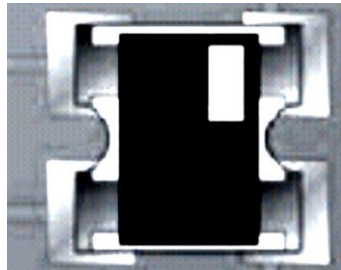
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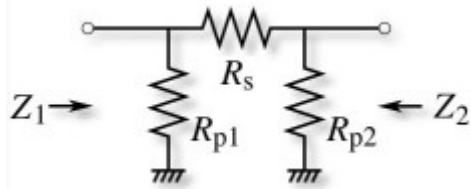
Wraparound



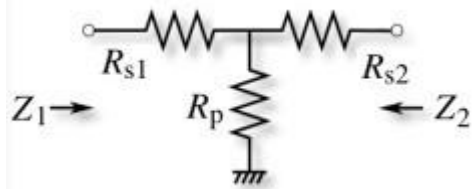
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With regards to the electrical specification selections, designer shall decide the required attenuation first. Besides, the VSWR, Characteristic impedance, Rated power, and Limited voltage are important parameters in your consideration. Generally, characteristic impedance is 50 ohm and VSWR is less than 2 in radio frequency applications.

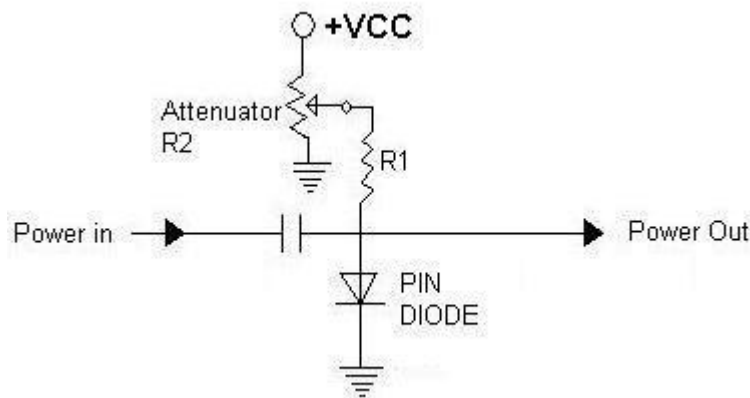
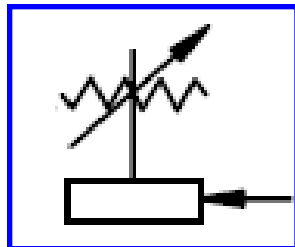
The Theorem of Fixed Chip Attenuator



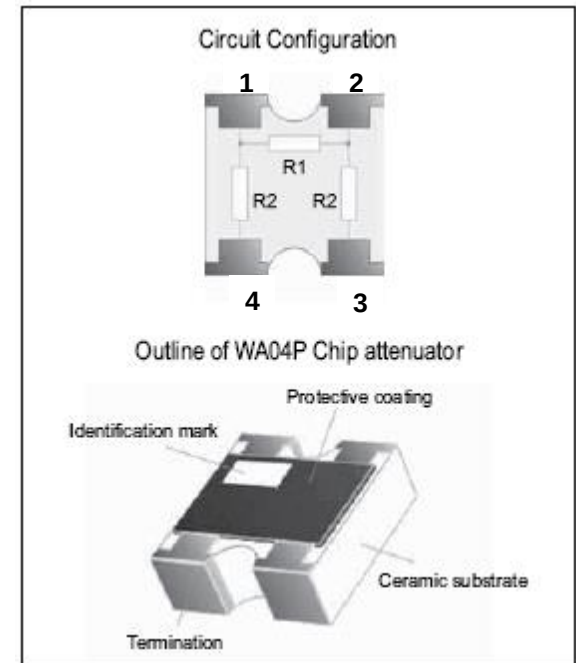
Fixed Pi-Schematic



Fixed T-Schematic



Variable Attenuator

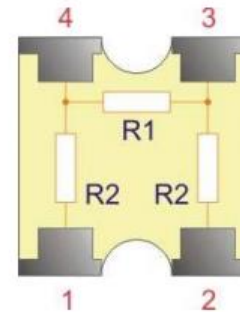


There are two types of attenuator in common: a. Variable attenuator, B. Fixed attenuator. Walsin uses Fixed type attenuator for the product design. Fixed attenuator is the most popular design structure, usually with pi network or T network circuit. Because of the symmetrical structure to the I/O port, pi network products will be more convenient for layout with better electrical specification.

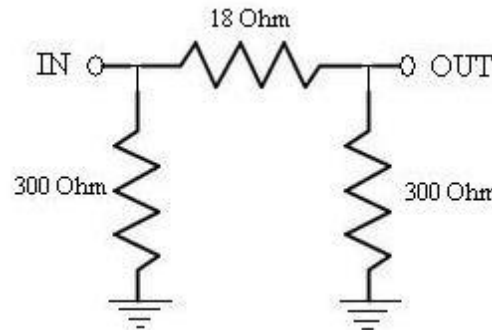
The Theorem of Fixed Chip Attenuator

Design Table

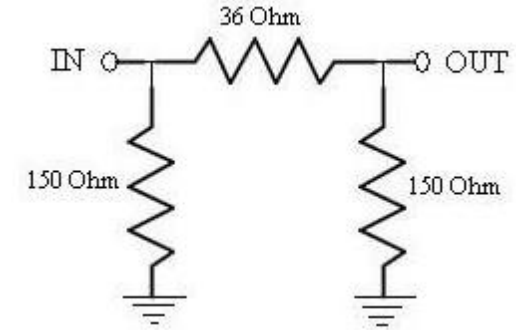
Allen(dB)	R1(Ω)	R2(Ω)
0.5	2.88	1737.66
1.00	5.77	869.55
1.50	8.68	580.50
2.00	11.61	436.21
2.50	14.59	349.83
3.00	17.61	292.40
3.50	20.70	251.52
4.00	23.85	220.97
4.50	27.08	197.32
5.00	30.40	178.49
5.50	33.82	163.17
6.00	37.35	150.48



3dB Attenuator



6dB Attenuator

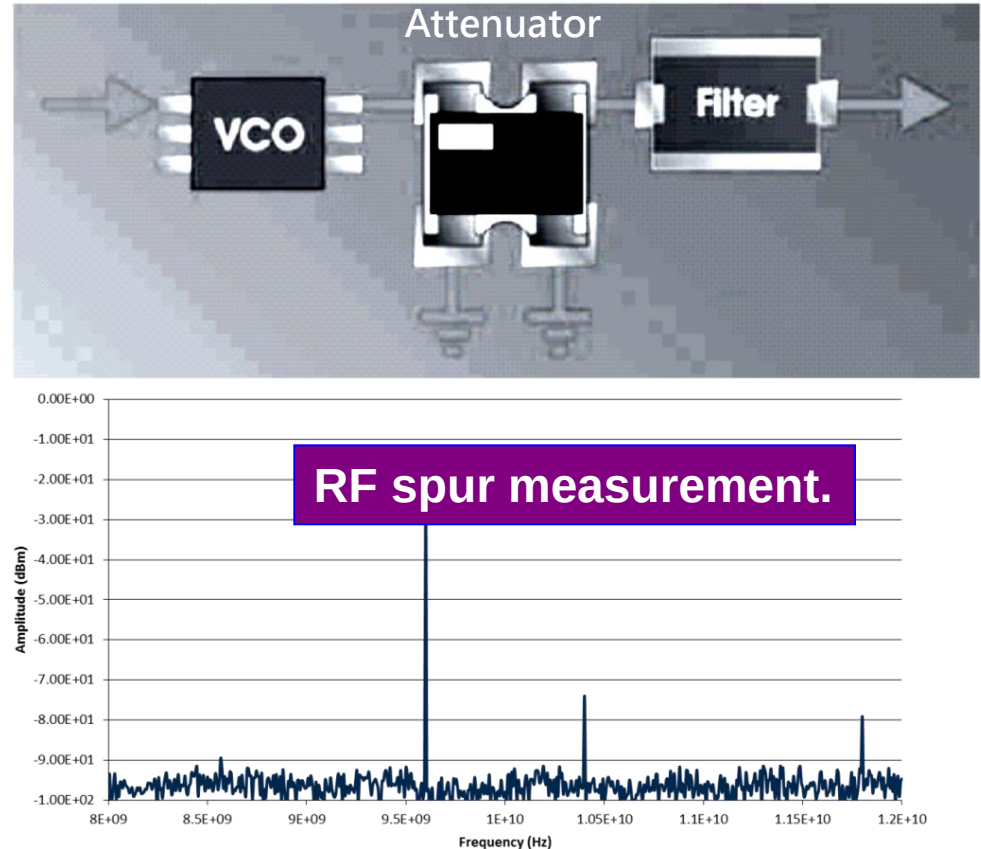


Once the structure of chip attenuator has been determined, usually pi network, the designer will be able to check design table for the attenuation as shown above. All kinds of design table resources are available on the internet or related books. Walsin chip attenuators were designed from 0dB~ 20dB of attenuation which satisfied the most of radio frequency applications.

The Application for Chip Attenuator

Attenuator Functions:

- Inter-stage impedance matching
- RF spur measurement.
- Dynamic range extension
- Power monitoring

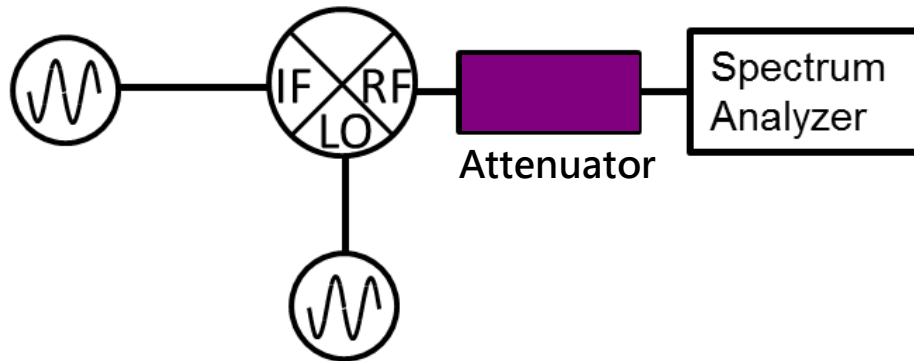


Four major applications for chip attenuators:

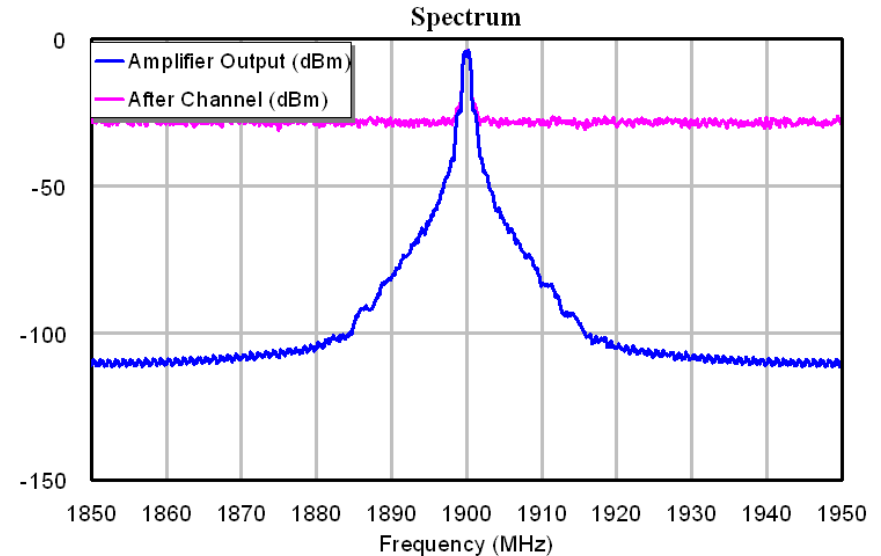
1. inter-stage impedance matching. It helps to enhance the stability of system.
i.e. VCO active components.
2. RF abnormal spur signal measurements

The Application for Chip Attenuator

Dynamic Range Extension



Power Monitoring



3. Improving system dynamic range extension to have more precise measurement result.
4. It can be used on power Monitoring.

How to order

The attenuators have a catalogue number starting with .

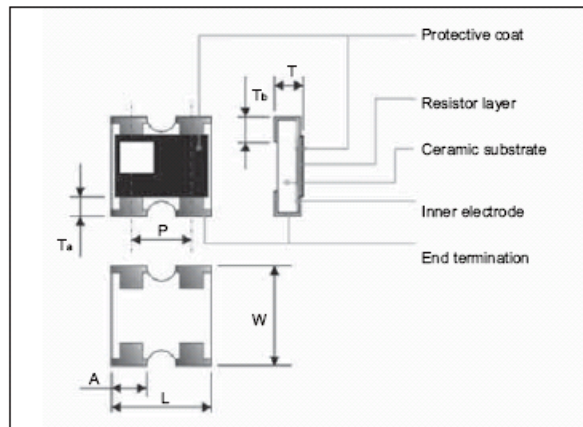
WA04	P	001	X	B	T	L
Size code WA04 : 0402 per element	Type code P : convex, π type attenuator	Attenuation code 000 = 0dB 001 = 1dB 005 = 5dB 010 = 10dB 020 = 20dB R05 = 0.5dB R15 = 1.5dB	Impedance X : 50 Ω	Tolerance A : ± 0.1 dB B : ± 0.3 dB C : ± 0.4 dB D : ± 0.8 dB E : ± 1.0 dB F : ± 1.5 dB G : ± 2.0 dB H : ± 2.5 dB P : -	Packaging code T : 7" reel taped	Termination code L = Sn base (lead free)

Packaging : 8mm width paper taping 10,000pcs per reel.

You may find above part number definition for your selections, or contact us for more details.

Product Lineup WA04P

Physical Dimensions:	
	WA04P
L	1.00±0.10
W	1.00+0.10/-0
T	0.35±0.10
P	0.65±0.20
A	0.33±0.10
Ta	0.15±0.10
Tb	0.25±0.10



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WA04P provides 1.0mm x 1.0mm size, with attenuation value 0dB, 0.5dB ~ 20dB. Characteristic impedance 50ohm! Max. working frequency up to 3GHz !