Issue No. :

Date of Issue :

Classification : ☐ New ☐ Changed

PRODUCT SPECIFICATION FOR APPROVAL

(REFERENCE)

Product Description : Chip Attenuator

Product Part Number : EXB24ABxxxxX

Country of Origin : JAPAN

Applications : Standard electronic equipment

*If you approve this specification, please fill in and sign the below and return 1 copy to us.

Approval No :

Approval Date :

Executed by :

(signature)

Title :

Dept. :

Device Solutions Business Division
Automotive & Industrial Systems Company
Panasonic Corporation

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Prepared by : Morita factory Engineering Department

Contact Person :

Signature

Name(Print)

Title :

Authorized by :

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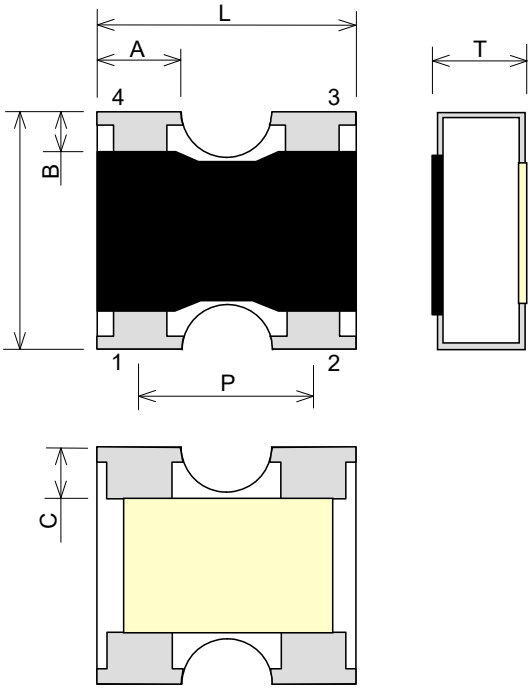
Name(Print)

Title : Manager of Engineering

Panasonic

1. Dimension



	L	W
Dimension (mm)	1.00 ± 0.10	1.00 ± 0.10

	T	A
Dimension (mm)	0.35 ± 0.10	0.40 ± 0.10

	B	C
Dimension (mm)	0.15 ± 0.10	0.30 ± 0.10

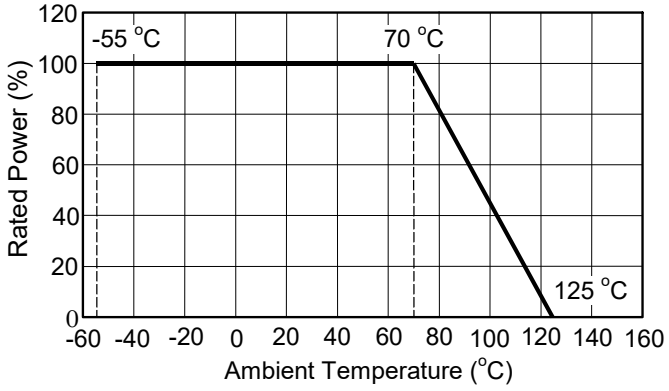
	P (typical value)
Dimension (mm)	0.65

2. General Specification

Attenuation value	0 dB, 1 dB, 2 dB, 3 dB, 6 dB, 10 dB
Attenuation value tolerance	0 dB, 1 dB, 2 dB, 3 dB: ± 0.8 dB 6 dB: ± 1.0 dB 10 dB: ± 2.0 dB
Rated power	0.04 W/package
Frequency range	DC to 2.5 GHz
VSWR	1.2 maximum (typical value) 1.5 maximum (0 dB, typical value)
Characteristic impedance	100 Ω / 200 Ω / 300 Ω
Working temperature range	-55 °C to 125 °C

* Custom attenuation values are available.

3. Power Derating Curve



4. Explanation of Part Number

1	2	3	4	5	6	7	8	9	10	11	12
E	X	B	2	4	A	B	3	G	R	8	X
(1)							(2)	(3)	(4)		(5)

(1) Common code: 0404 size balanced O type chip attenuator

(2) Attenuation value

Code	0	1	2	3	6	A
Attenuation value (dB)	0	1	2	3	6	10

(3) Characteristic impedance

Code	C	E	G
Characteristic impedance (Ω)	100	200	300

Code	0
Attenuation value	0 dB *

* EXB24AB00R8X: 0dB ± 0.8dB (Characteristic impedance: 100 Ω / 200 Ω / 300 Ω)

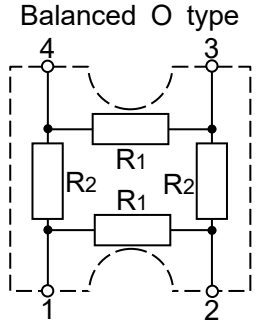
(4) Attenuation value tolerance

Code	R8	1R	2R
Attenuation value tolerance (dB)	± 0.8	± 1.0	± 2.0

(5) Packaging form

Code	X
Packaging form	Punched (paper) taping (2 mm pitch)

5. Schematic



Characteristic impedance / Attenuation	100 Ω		200 Ω		300 Ω	
	R1 (Ω)	R2 (Ω)	R1 (Ω)	R2 (Ω)	R1 (Ω)	R2 (Ω)
0 dB	0	open	0	open	0	open
1 dB	5.77	1.74k	11.5	3.48k	17.3	5.22k
2 dB	11.6	872	23.2	1.74k	34.8	2.62k
3 dB	17.6	585	35.2	1.17k	52.8	1.75k
6 dB	37.4	301	74.7	602	112	903
10 dB	71.2	192	142	385	213	577

6. Performance Specification

6-1. Standard environmental condition

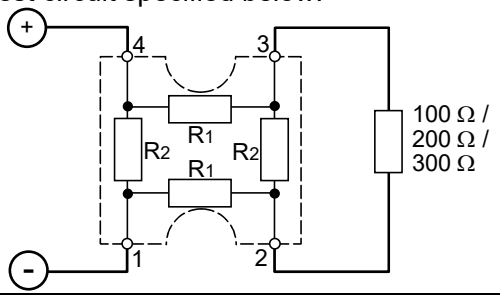
Unless otherwise specified, ambient atmosphere at performance tests and measuring shall meet the following conditions.

- Ambient temperature: 25 °C ± 2 °C
- Relative humidity: 45 % to 75 %
- Atmospheric pressure: 86 kPa to 106 kPa

6-2. Test condition

Unless otherwise specified, the board, the land pattern, the flux, the solder and the soldering method in performance tests shall be subjected to " 7. Precaution for mounting ".

6-3. Electrical performance

Characteristic	Specification	Test method
6-3-1 Characteristic impeadance	100 Ω / 200 Ω / 300 Ω	Characteristic impeadance shall be measured at the test circuit specified below. 
6-3-2 Attenuation value	Within the specified torelance of attenuation value	Measuring equipment: Network analyzer
6-3-3 VSWR	1.2 maximum (typical value) 1.5 maximum (0 dB, typical value)	Measuring equipment: Network analyzer
6-3-3 Insulation resistance	100 M Ω minimum	Insulation resistance shall be measured at DC 25V for 1 min. between the terminal and the protective coat.

6-4. Environmental performance

Characteristic	Specification	Test method
6-4-1 Temperature cycling	0 dB, 1dB, 2 dB: ± 0.2 dB 3 dB, 6 dB: ± 0.3 dB 10 dB: ± 0.5 dB No evidence of mechanical damage.	Specimens shall be tested for 5 cycles continuously in accordance with the following duty cycle.
6-4-2 Load life in humidity	0 dB, 1dB, 2 dB: ± 0.2 dB 3 dB, 6 dB: ± 0.3 dB 10 dB: ± 0.5 dB No evidence of mechanical damage.	Specimens shall be operated at rated voltage for 1000 h +48 h / -0 h (1.5 h "ON" and 0.5 h "OFF"), with the test circuit in 6-3-1, In a humidity test chamber controlled at 60 °C ± 2 °C and 90 %RH to 95 %RH.
6-4-3 Load life	0 dB, 1dB, 2 dB: ± 0.2 dB 3 dB, 6 dB: ± 0.3 dB 10 dB: ± 0.5 dB No evidence of mechanical damage.	Specimens shall be operated at rated voltage for 1000 h +48 h / -0 h (1.5 h "ON" and 0.5 h "OFF"), with the test circuit in 6-3-1 in a test chamber controlled at 70 °C ± 2 °C.
6-4-4 Resistance to Soldering heat	0 dB, 1dB, 2 dB: ± 0.2 dB 3 dB, 6 dB: ± 0.3 dB 10 dB: ± 0.5 dB No evidence of mechanical damage.	Specimens shall be immersed in a solder bath at 260 °C ± 5 °C for 5 s ± 1 s after the pre-heat at 150 °C ± 5 °C for 1 min.
6-4-5 Resistance to solvent	No deterioration of protective coatings and terminals	Specimens shall be immersed in a bath of isopropyl alcohol completely for 5 min. with ultrasonic.

Step	Temperature (°C)	Time (min.)
1	-55 ± 2	30 ± 3
2	Room temperature	3 maximum.
3	+125 ± 2	30 ± 3
4	Room temperature	3 maximum.

* Attenuation value is measured in DC.

6-5. Mechanical performance

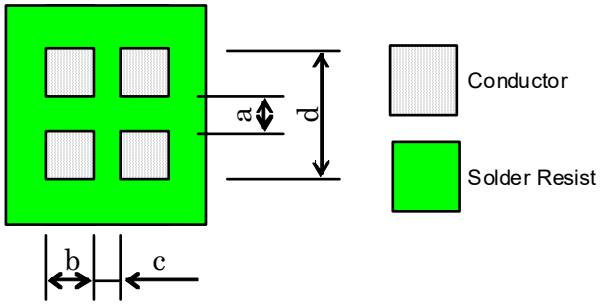
Characteristics	Specifications	Test methods
6-5-1 Vibration	0 dB, 1dB, 2 dB: ± 0.2 dB 3 dB, 6 dB: ± 0.3 dB 10 dB: ± 0.5 dB No evidence of mechanical damage.	Specimens shall be subjected to the vibration having the peak to peak amplitude of 1.6 mm in 3 directions perpendicular one another for 2 h each (6 h in total). The sweeping rato of the vibration frequency shall be so adjusted that the frequency increases from 10 Hz to 55 Hz, then returns to 10 Hz in approximately 1 min. And such vibration cycle shall be repeated.
6-5-2 Bending	0 dB, 1dB, 2 dB: ± 0.2 dB 3 dB, 6 dB: ± 0.3 dB 10 dB: ± 0.5 dB No evidence of mechanical damage.	Specimens shall be soldered to the test board. The the test boarbd shall be supported at two points 45 mm from its center with mounting surface, and the middle part of the test board shall be pressed by means of the pressing rod until the deflection becomes 1mm and then the pressure shall be maintained for 10 s. Test board: shall be glass-fabric based epoxy resin with 100 mm in length, 40 mm in width and 1.6 mm in thickness. Pressing rod: shall be a metal rod with 30 mm in thickness and 20 mm in width having a cylindrical end with radius R of 230 mm.
6-5-3 Terminal solderability	95% coverage minimum.	Rosin-based flux spread specimen's terminals shall be immersed in a solder bath at 230 °C ± 5 °C for 5 s ± 1 s.

* Attenuation value is measured in DC.

7. Precaution for Mounting

7-1. Recommendable land pattern

Recommendable land pattern is shown in the figure below.



	a	b
Dimension (mm)	0.5	0.35 to 0.4

	c	d
Dimension (mm)	0.3	1.4 to 1.5

7-2. Solder cream in reflow solderingpattern as printing mask pattern for solder cream.

(1) Refer to the recommendable land

(2) Print solder cream in a thickness of prevention from no solder and solder bridge happens (Reference : 150 μm to 200 μm)

7-3. Flux and solder in flow soldering

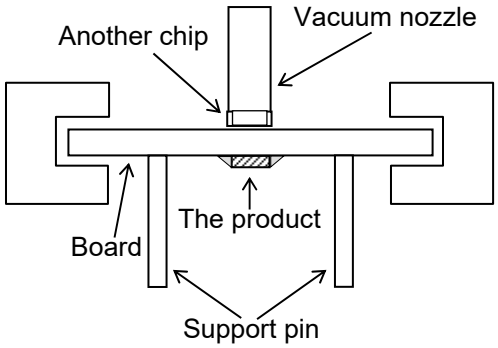
Use a rosin-based flux. Do not use high-activity fluxes (the chlorine content is 0.2 weight percent or more).

7-4. Precaution for handling of substrate

Do not bend the board after soldering the product extremely.

[examples]

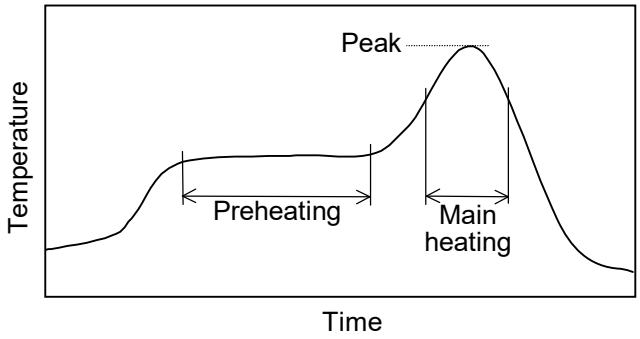
- Mounting place should be as far as possible from the position which is close to the break line of the board or the line of large holes of board.
- When mounting other components, do not bend the board extremely. If necessary, use back-up pin (support pin) to prevent from bending extremely.
- Do not break the board by hand. We recommend to use the machine or the jig to break it.



7-5. Precaution for soldering

Note that the product will be easily damaged by rapid heating, rapid cooling and local heating. Allow enough preheating so that the difference of soldering temperature and temperature of surface of the part is 100 °C or less. This temperature difference shall be kept in rapid cooling by immersion into solvent.

7-6. Recommendable reflow soldering



<Eutectic solder> (Sn/Pb system et al.)

	Condition	Time
Preheating	140°C to 160°C	60s to 120s
Main heating	200°C min.	30s to 40s
Peak	235°C ± 5°C	10s max.

<Lead-free solder> (Sn/Ag/Cu system et al.)

	Condition	Time
Preheating	150°C to 180°C	60s to 120s
Main heating	230°C min.	30s to 40s
Peak	260°C max.	10s max.

∗ Please measure temperature of terminals and study solderability every type of boards, before actual use.

∗ Please inquire of us when you use the different conditions.

∗ Reflow soldering shall be within two times.

7-7. Caution of flow soldering

We can not recommend the flow soldering to the product, because we are afraid that solder bridge happens owing to narrow 0.65mm pitch of it's terminals.

7-8. Soldering gun procedure

Note the follows in case of using soldering gun for replacement.

(1) The tip temperature should be less than 350 °C for the period within 3 s by using soldering gun.

(2) The soldering gun tip should not touch the product directly.

7-9. Soldering volume

Note that excess of soldering volume will easily give crack to the body of the product.

7-10. Recommendable cleaning method

Solvents		isopropyl alcohol
Cleaning method	Dipping	40 °C maximum, 5 min. maximum
	Ultrasonic	1 min. maximum (power: 20 W/L maximum, frequency: 10 kHz to 100 kHz)

Residual flux after board washing may cause solder migration. Carefully check the status of board washing.

Study type and amount of flux to be used when no washing is made. Study type of water-soluble flux and cleaning agent and drying condition when water washing is made. Confirm they will not cause any trouble.

8. Notice for Use

⚠ Notice for use

(1) This specification shows the quality and performance of the product in a unit component. Before adoption, be sure to evaluate and verify the product mounted on your circuit board.

(2) Use fail-safe design and ensure safety by carrying out the following items in cases where it is forecast that the failure of the product gives serious damage to something important like human life, for instant in traffic transportation equipment (trains, cars, traffic signal equipment, etc.), medical equipment, aerospace equipment, electric heating appliances, combustion and gas equipment, rotating equipment, disaster and crime preventive equipment.

*Ensure safety as the system by setting protective circuits and protective equipment.

*Ensure safety as the system by setting such redundant circuits as do not cause danger by a single failure.

(3) The product is designed to use in general standard applications of general electric equipment (AV products, household electric appliances, office equipment, information and communication equipment, etc.); hence, it do not take the use under the following special environments into consideration.

Accordingly, the use in the following special environments, and such environmental conditions may affect the performance of the product; prior to use, verify the performance, reliability, etc. thoroughly.

1) Use in liquids such as water, oil, chemical, and organic solvent.

2) Where the product is close to a heating component, or where an inflammable such as a polyvinyl chloride wire is arranged close to the product.

3) Where the product is sealed or coated with resin, etc.

4) Where water or a water-soluble detergent is used in cleaning free soldering (Pay particular attention to soluble flux.)

5) Use in such a place where the product is wetted due to dew condensation.

6) Use in places full of corrosive gases such as sea breeze, Cl_2, H_2S, NH_3, SO_2, and NO_X.

7) Use under direct sunlight, in outdoor or in dusty atmospheres.

8) Use in environment with large static electricity or strong electromagnetic waves.

(4) In case that there are any doubt about safety problems, please inform us immediately and be sure to evaluate and verify the product mounted on your circuit board.

9. Storage Method

If the product is stored in the following environments and conditions, the performance and solderability may be badly affected, avoid the storage in the following environments.

1) Storage in places full of corrosive gases such as sea breeze, Cl_2, H_2S, NH_3, SO_2, and NO_X.
2) Storage in places exposed to direct sunlight.
3) Storage in places outside the temperature range of 5 °C to 35 °C and humidity range of 45 %RH to 85 %RH.
4) Storage over a year after our delivery (This item also applies to the case where the storage method specified in item 1) to 3) has been followed.).

10. Laws and Regulations

(1) This product has not been manufactured with any ozone-depleting chemical controlled under the Montreal Protocol.
(2) This product complies with the RoHS Directive (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (DIRECTIVE 2011/65/EU)).
(3) All materials used in this part are registered material under the Law Concerning the Examination and Regulation of Manufacturs, etc. of Chemical substances.
(4) If you need the notice by letter of “A preliminary judgement on the Laws of Japan foreign exchange and Foreign Trade control”, be sure to let us know.

11. Production Place

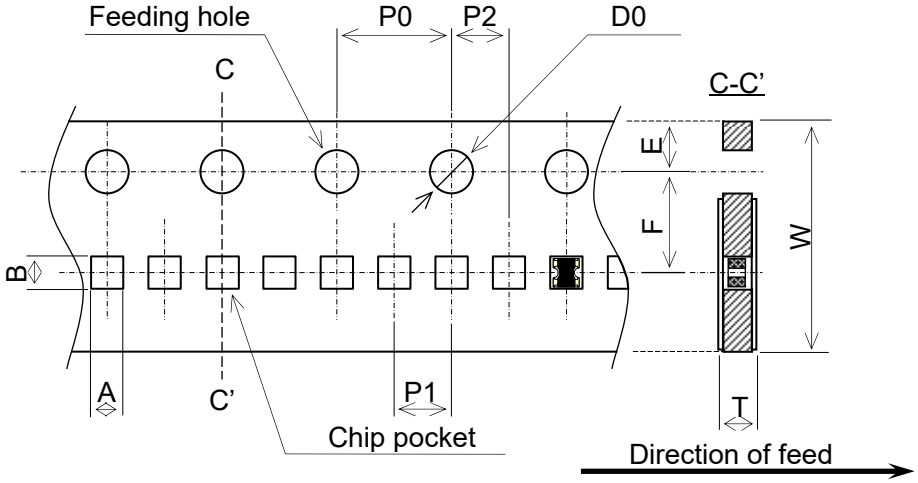
Production Country : Japan
Production Plant : Device Solutions Business Division, Panasonic Corporation

12. Taping Package and Label Marking

12-1. Packaging method

Products shall be heat-sealed in the chip pocket, spacing pitch 2 mm, of paper carrier tape with cover tape, and the carrier tape shall be reeled to the reel.

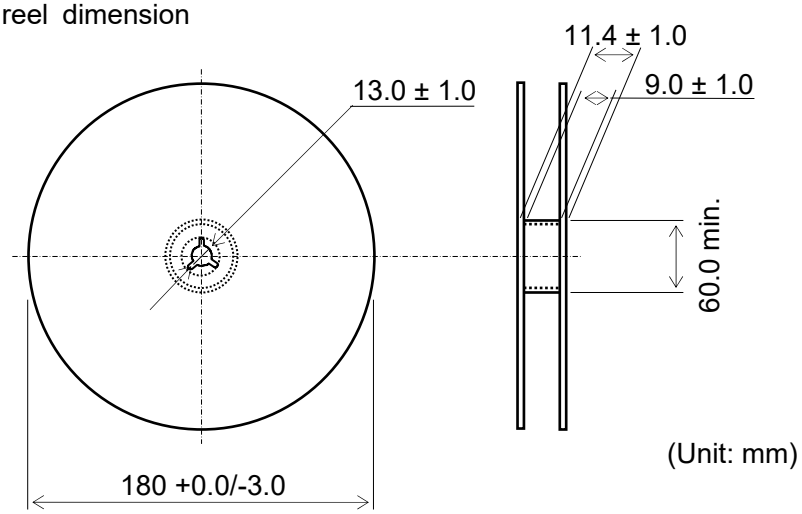
12-2. Carrier tape dimension



	A	B	W	F	E
Dimension (mm)	1.20 ± 0.10	1.20 ± 0.10	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10

	P0	P1	P2	D0	T
Dimension (mm)	4.00 ± 0.10	2.00 ± 0.10	2.00 ± 0.05	1.50 +0.1/-0	0.45 ± 0.10

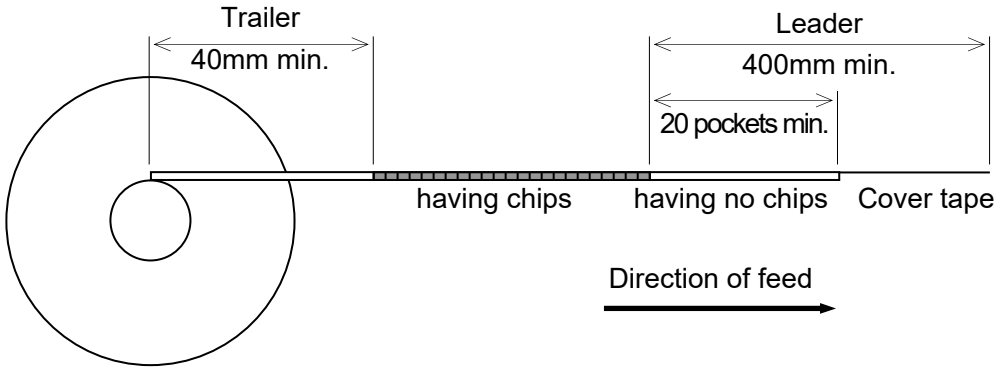
12-3. Taping reel dimension



(Unit: mm)

12-4. Taping specification

There shall be portions having no product in both the trailer and the leader of taping, and there shall be portion having only cover tape in the leader of taping as shown below.



12-5. Label Marking

Items listed below shall be displayed.

- Side of reel (Marking shall be on one side.)

  (1)Part name (2)Part number (3)Quantity (4)Lot number (5)Maker name

  (6)Production country

- Packaging box

  (1)Customer name (2)Part name (3)Part number (4)Customer part number
  (5)Quantity (6)Maker name (7) Production country

12-6. Quantity of products in the taping package

(1) Standard quantity: 10000 pcs./reel
(2) Shipping quantity: multiple of standard quantity

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