

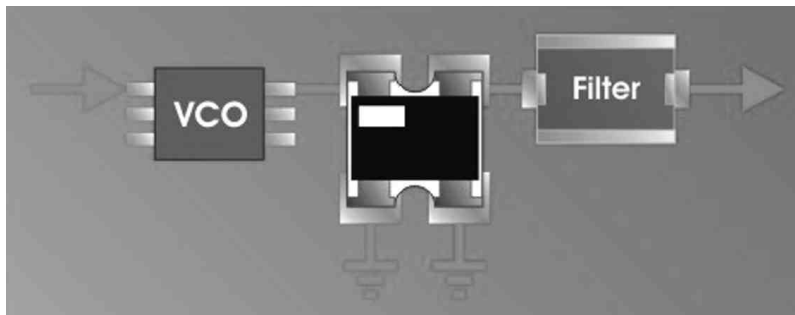
# Chip Resistors

## WA04P Chip Attenuator

### Typical Application of Chip Attenuator

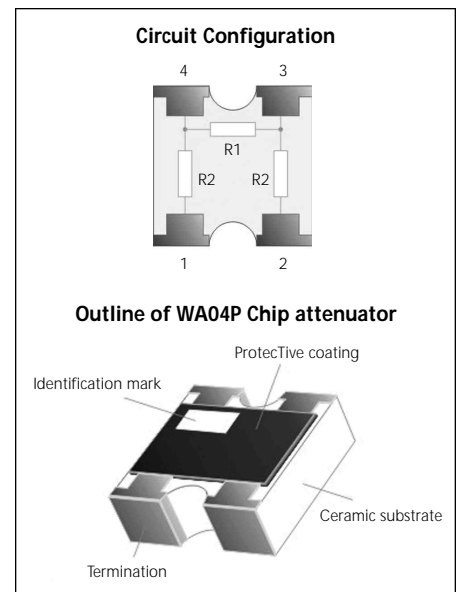
WA04	P	001	X	B	T	—
Size code	Type code	Attenuation code	Impedance	Tolerance	Packaging code	Termination code
WA04: 0402 per element	P: convex, type attenuator	001=1dB 002= 2dB 003= 3db 004= 4dB 005= 5dB 006=6dB 010= 10dB	X: 50	A: ±0.2dB B: ±0.3dB C: ±0.5dB D: ±1.0dB	T: 7" reel taped	_ = SnPb base ("_" means a blank) L= Sn base (lead free)

-Type Attenuator (-6dB, 50W) for VSWR improvement and output frequency level matching on VCO application.



### Quick Reference Data

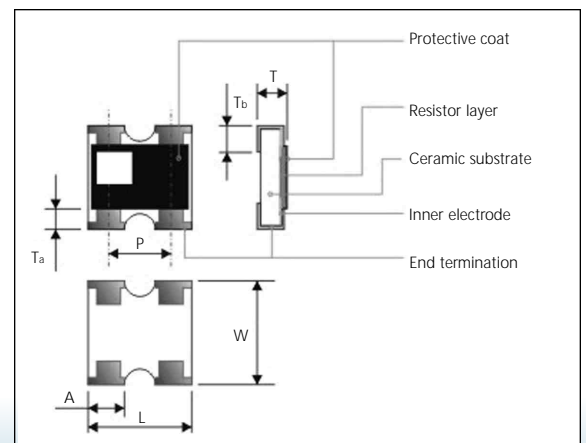
Item	General Specification
Series No.	WA04P
Size	0402x2 (1005x2)
Termination construction	Convex type
Attenuation Range	1dB, 2dB, 3dB, 4dB, 5dB, 6dB, 10dB
Attenuation Tolerance	
1dB ~ 5dB	±0.3dB
6dB ~ 10dB	±0.5dB
Characteristic impedance	50
Rated power at T <sub>amb</sub> =70°C	0.04 W / package
Limiting voltage (DC)	50V
Frequency range (DC)	Max. 2GHz
VSWR (Voltage Standing Wave Ratio)	Max. 1.3
Number of Resistors	3 resistors
Number of Terminals	4 terminals
Climatic category (IEC60068)	55/125/56



### Physical Dimensions

Unit: mm

	WA04P
L	1.00 ± 0.10
W	1.00 ± 0.10
T	0.35 ± 0.10
P	0.65 ± 0.10
A	0.34 ± 0.10
Ta	0.20 ± 0.15
Tb	0.25 ± 0.17



# Chip Resistors

## Test and Requirements

### For WR Series, WA Series, and WT Series

(Detail please refer to specific data sheet)

Test	Procedure / Test Method	Requirement	
		Resistor	Jumper
DC resistance	<b>JIS C 5202 5.1 / IEC 60115-1 4.5</b> DC resistance values measured at the test voltages specified below : <10 @0.1V, <100 @0.3V, <1K @1.0V, <10K @3V, <100K @10V, <1M @25V, <10M @30V	Within the specified tolerance	< 50m
Temperature Coefficient of Resistance	<b>JIS C 5202 5.2 / IEC 60115-1 4.8.4.2</b> $\frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 \quad (\text{ppm}/^\circ\text{C})$ R1 : Resistance at reference temperature R2 : Resistance at test temperature t1 : room temperature; t2 : LCT or UCT	Within the specified TCR	N/a
Short Time Overload	<b>JIS C 5202 5.5 / IEC 60115-1 4.13</b> Permanent resistance change after a 5sec application of a voltage 2.5xU <sub>R</sub> or max. overload voltage, whichever is less.	R/R max ±(2%+0.10 )	< 50m
Resistance to Solder Heat	<b>JIS C 5202 6.4 / IEC 60115-1 4.18</b> Unmounted chip with a solder bath, 260°C±5°C, 10±1 sec	R/R max. ±(1%+0.05 )	< 50m
Solderability	<b>JIS C 5202 6.5 / IEC 60115-1 4.17</b> Termination SnPb base : Unmounted chips completely immersed for 2±0.5 sec. in a solder bath at 230±5°C Termination Sn base (lead free) : Unmounted chip completely immersed in a lead free solder bath, 245°C±5°C, 3±1 sec	95% coverage min., good tinning and no visible damage	
Leaching Test	<b>JIS C 5202 6.4 / IEC 60115-1 4.18</b> Unmounted chip with a solder bath, 260°C±5°C, 60±1 sec	Ditto	
Temperature Cycling	<b>JIS C 5202 7.4 / IEC 60115-1 4.19</b> 30min at LCT, 30min at UCT, 5 cycles	R/R max. ±(1%+0.05 )	< 50m
Damp heat (Humidity loaded in steady state)	<b>JIS C 5202 7.9</b> 1000+48/-0 hours@40±2°C, 90~95% RH; loaded with Pn or Vmax; 1.5 hours ON, 0.5 hours OFF	10 R<1M : R/R max. ±(3%+0.10 ) R<10 , R 1M : R/R max. ±(5%+0.10 )	< 50m
Load Life (Endurance)	<b>JIS C 5202 7.10 / IEC 60115-1 4.25.1</b> 1000+48/-0 hours@70±2°C; loaded with Pn or Vmax; 1.5 hours ON, 0.5 hours OFF	Ditto	Ditto
Bending	<b>JIS C 5202 6.1.4 / IEC 115-1 4.33</b> Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once or 10sec : >2mm for 2512 and 2010; >3mm for 1206, 0805, 0603, and 0402	No visual damaged, R/R max. ±(1%+0.05 )	< 50m

### For WWxxX Series

(Detail please refer to specific data sheet.)

Test	Procedure / Test Method	Requirement	
		Resistor	Jumper
Temperature Coefficient of Resistance	<b>JIS C 5202 5.2 / IEC 60115-1 4.8.4.2</b> $\frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 \quad (\text{ppm}/^\circ\text{C})$ R1 : Resistance at reference temperature R2 : Resistance at test temperature t1 : room temperature; t2 : LCT or UCT	Within the specified TCR	
Short Time Overload	<b>JIS C 5202 5.5 / IEC 60115-1 4.13</b> Permanent resistance change after a 5sec application of a voltage 2.5xU <sub>R</sub> or max. overload voltage, whichever is less.	R/R max. ±(2%+0.005 )	
Resistance to Solder Heat	<b>JIS C 5202 6.4 / IEC 60115-1 4.18</b> Unmounted chip with a solder bath, 260°C±5°C, 10±1 sec	R/R max. ±(1%+0.005 )	
Solderability	<b>JIS C 5202 6.5 / IEC 60115-1 4.17</b> Termination SnPb base : Unmounted chips completely immersed for 2±0.5 sec. in a solder bath at 230±5°C Termination Sn base (lead free) : Unmounted chip completely immersed in a lead free solder bath, 245°C±5°C, 3±1 sec	95% coverage min., good tinning and no visible damage	
Leaching Test	<b>JIS C 5202 6.4 / IEC 60115-1 4.18</b> Unmounted chip with a solder bath, 260°C±5°C, 60±1 sec	Ditto	
Temperature Cycling	<b>JIS C 5202 7.4 / IEC 60115-1 4.19</b> 30min at LCT, 30min at UCT, 5 cycles	R/R max. ±(1%+0.005 )	
Damp heat (Humidity loaded in steady state)	<b>JIS C 5202 7.9</b> 1000+48/-0 hours@40±2°C, 90~95% RH; loaded with Pn or Vmax; 1.5 hours ON, 0.5 hours OFF	R/R max. ±(3%+0.005 )	
Load Life (Endurance)	<b>JIS C 5202 7.10 / IEC 60115-1 4.25.1</b> 1000+48/-0 hours@70±2°C; loaded with Pn or Vmax; 1.5 hours ON, 0.5 hours OFF	Ditto	
Bending	<b>JIS C 5202 6.1.4 / IEC 115-1 4.33</b> Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once for 10sec : >2mm for 2512 and 2010; >3mm for 1206, 0805, 0603	No visual damaged, R/R max. ±(1%+0.005 )	

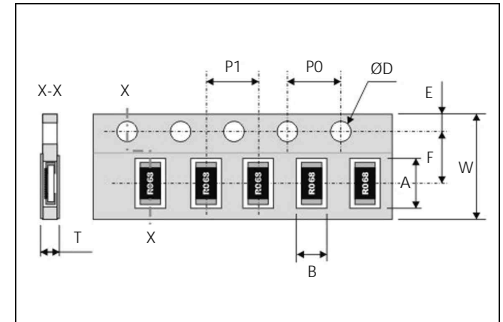
# Chip Resistors

## Packing on Tape and Reel

### Paper Tape Specifications for WR, WF, WW Series and WA, WT Series

Unit: mm

Component Size / Series	W	F	E	P0	ØD
1206, 0805, 0603, 0402, WA06X, WA06T, WA04X, WA04Y, WA04P, WT04X	8.00±0.30	3.50±0.20	1.75±0.10	4.00±0.10	Ø1.50 <sup>+0.1</sup> <sub>-0.0</sub>
WA06W	12.0±0.10	5.50±0.05			
WR02W	8.00±0.20	3.50±0.05			

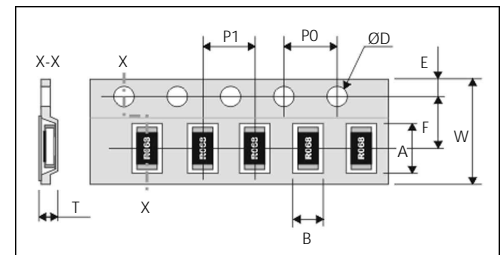


Component Size / Series	A	B	P1	T
1206 (3216), WA06X, WA06T	3.60±0.20	2.00±0.20	4.00±0.10	Max. 1.0
0805 (2012)	2.40±0.20	1.65±0.20		
0603 (1608)	1.90±0.20	1.10±0.20		
0402 (1005)	1.20±0.10	0.70±0.10	2.00±0.10	0.40±0.05
WA04X	2.20±0.20	1.20±0.20	2.00±0.05	Max. 0.6
WA04Y, WA04P	1.15±0.10	1.15±0.10	2.00±0.05	0.45±0.05
WT04X	3.45+0.20/-0	1.85+0.20/-0	4.00±0.10	0.85±0.05
WA06W	1.80+0.2/-0	4.20+0.2/-0	4.00±0.10	0.65±0.05
WR02X	0.70±0.05	0.40±0.05	2.00±0.05	0.30±0.05

### Plastic Tape Specifications for WR, WF, WW Series of Chip-R

Unit: mm

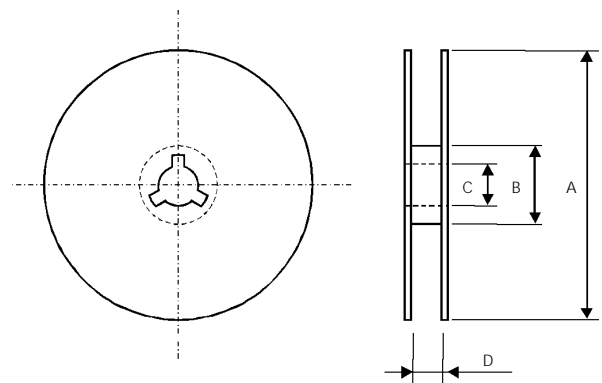
Component Size	2512 (6432)	2010 (5025)	1218 (3248)
A	6.90±0.20	5.50±0.20	3.55±0.30
B	3.60±0.20	2.80±0.20	4.90±0.20
W	12.00±0.30		
F	5.50±0.1		
E	1.75±0.10		
P1	4.00±0.10		
P0	4.00±0.10		
ØD	Ø1.50 <sup>+0.1</sup> <sub>-0.0</sub>		
T	Max. 1.2		



### Reel Dimensions

Unit: mm

Reel / Tape	A	B	C	D
7" reel for 8mm tape	Ø178.0±2.0	Ø60.0±1.0	13.0±0.2	9.0 ± 0.50
7" reel for 12mm tape				12.4 ± 1.00
10" reel for 8mm tape	Ø254.0±2.0	Ø100.0±1.0	13.0±0.2	9.0 ± 0.50
10" reel for 12mm tape				14.0 ± 0.20
13" reel for 8mm tape	Ø330.0±2.0	Ø100.0±1.0	13.0±0.2	9.0 ± 0.50



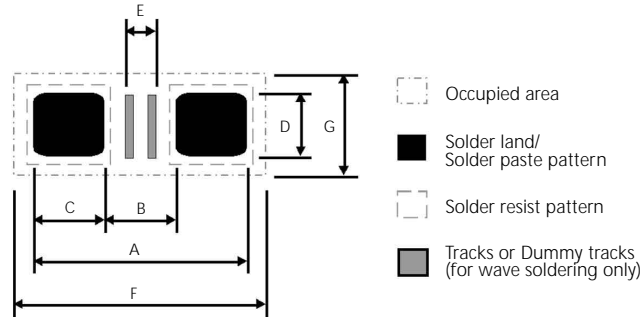
### Typical Taping Quantity

Component Size / Series	Q'ty per reel	Reel diameter
1210, 1206, 0805, 0603, WA06X, WA06T, WT04X	5,000 pcs	7" reel
0201, 0402, WA04X, WA04Y, WA04P	10,000 pcs	7" reel
WA06W	5,000 pcs	7" reel
2512, 2010	4,000 pcs	7" reel
1218	3,000 pcs	10" reel
1206, 0805, 0603	10,000 pcs	10" reel
0402, WA04X, WA04Y	20,000 pcs	10" reel
0402	70,000 pcs	13" reel
WA04X, WA04Y	40,000 pcs	13" reel
1206, 0805, 0603	20,000 pcs	13" reel

# Chip Resistors

## Footprint Design

### Footprint Design for WRxx Series, WFxx Series, WWxx Series :



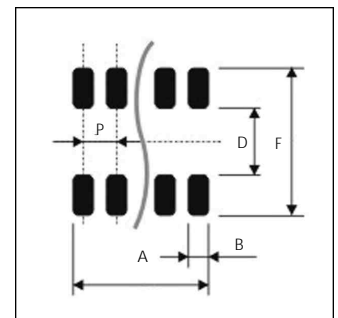
Unit: mm

Size	Reflow Soldering							Processing remarks	Placement Accuracy
	A	B	C	D	E	F	G		
0201	0.75	0.30	0.30	0.30	0.20	1.10	0.50	IR or hot plate soldering	± 0.05
0402	1.50	0.50	0.50	0.60	0.10	1.90	1.00		± 0.15
0603	2.10	0.90	0.60	0.90	0.50	2.35	1.45		± 0.25
0805	2.60	1.20	0.70	1.30	0.75	2.85	1.90		± 0.25
1206	3.80	2.00	0.90	1.60	1.60	4.05	2.25		± 0.25
1218	3.80	2.00	0.90	4.80	1.40	4.20	5.50		± 0.25
2010	5.60	3.80	0.90	2.80	3.40	5.85	3.15		± 0.25
2512	7.00	3.80	1.60	3.50	3.40	7.25	3.85		± 0.25
Size	Wave Soldering							Proposed number & Dimensions of dummy tracks	Placement Accuracy
A	B	C	D	E	F	G			
0603	2.70	0.90	0.90	0.80	0.15	3.40	1.90	1x (0.15x0.80)	± 0.25
0805	3.40	1.30	1.05	1.30	0.20	4.30	2.70	1x (0.20x1.30)	± 0.25
1206	4.80	2.30	1.25	1.70	1.25	5.90	3.20	3x (0.25x1.70)	± 0.25
1218	4.80	2.30	1.25	4.80	1.30	5.90	5.60	3x (0.25x4.80)	± 0.25
2010	6.30	3.50	1.40	2.50	3.00	7.00	3.60	3x (0.75x2.50)	± 0.25
2512	8.50	4.50	2.00	3.20	3.00	9.00	4.30	3x (1.00x3.20)	± 0.25

### Footprint Design for Array Resistor/Attenuator :

Unit: mm

Symbol	0603*4 array	0402*4 array	WA04Y, WA04P	WA06W
A	2.85 +0.10/-0.05	1.80 +0.15/-0.05	1.20 ± 0.05	3.85 +0.20/-0.05
B	0.45 ± 0.05	0.30 ± 0.05	0.40 +0/-0.05	0.28 +0/-0.05
D	0.80 ± 0.10	0.50 ± 0.1	0.50 ± 0.05	1.00 +0.10/-0.20
P	0.80	0.50	0.65	0.50
F	3.10 ± 0.30	2.00 +0.40/-0.20	1.50 +0.20/-0.10	3.20 ± 0.40



### Footprint Design for 10P8R Network Resistor :

Unit: mm

Symbol	WT04X
W1	0.35 ± 0.05
W2	0.50 ± 0.05
H2	0.80 ± 0.10
P1	0.70 ± 0.05
P2	0.65 ± 0.05
A	3.20 ± 0.10
F	2.80 +0.40/-0.20

