Chip Resistors

How to Order

WR	06	X	1000	F	T	L
Type code R : Discrete 1~10MR	**Size code** 25 : 2512 (6432) 20 : 2010 (5025) 18 : 1218 (3248) 12 : 1206 (3216) 10 : 1210 (3225) 06 : 0603 (1608) 08 : 0805 (2012) 04 : 0402 (1005) 02 : 0201 (0603)	**Functional code** X : Normal W : 1% for < 10ohm and >1Mohm	**Resistance** E24 : 2 significant digits followed by No. of zeros and a blank e.g. : 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank) E96 : 3 significant digits followed by No. of zeros	**Tolerance** F : +/- 1% J : +/- 5% P : Jumper	**Packaging code** T : 7" reel taping Q : 10" reel taping G : 13" reel taping R : 0603 2mm pitch taping B : Bulk K : Bulkcase	**Termination code** _ = SnPb base ("_" means blank) L = Sn base (Lead free) R = Pb ≤100 ppm (total)

WW	25	M	R002	F	T	L
Type code W : < 1ohm	**Size code** 25 : 2512 (6432) 20 : 2010 (5025) 18 : 1218 (3248) 12 : 1206 (3216) 10 : 1210 (3225) 08 : 0805 (2012) 06 : 0603 (1608) 04 : 0402 (1005)	**Functional code** X : Normal M : Sensing type L : Sensing type, wide termination W : Thick film low TCR type P : Power (2010 size=0.75 watt, 1206 size 0.5 watt, 0805 size 0.25 watt, 0603 size 0.125 watt)	**Resistance** "R" followed by 3 significant digits e.g.: 0.1ohm=R100 0.033ohm=R033 0.56ohm=R560	**Tolerance** F : +/- 1% G : +/- 2% J : +/- 5%	**Packaging code** T : 7" reel taping Q : 10" reel taping G : 13" reel taping B : Bulk K : BulkcaseK = Ni base	**Termination code** _ = SnPb base ("_" means blank) L = Sn base (Lead free) G = Au base S = Ag base

WF	04	H	1001	B	T	L
Type code F : Special function	**Size code** 25 : 2512 (6432) 20 : 2010 (5025) 18 : 1218 (3248) 12 : 1206 (3216) 10 : 1210 (3225) 08 : 0805 (2012) 06 : 0603 (1608) 04 : 0402 (1005)	**Functional code** G : High ohmic (>10Mohm) H : Thick film, Precision tolerance <1% K : Thick film, TCR50ppm M : Trimmable P : Power (> WR and WW series) S : Surge T : Thin film, TCR50ppm U : Thin film, TCR25ppm V : High voltage W : Filet less X : Special resistance Y : E24/E96 resistance with special termination (non SnPb or Sn base), ≥1%	**Resistance** E24 : 2 significant digits followed by No. of zeros and a blank e.g.: 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank) E96 : 3 significant digits followed by No. of zeros	**Tolerance** B : +/- 0.1% C : +/- 0.25% D : +/- 0.5% F : +/- 1% G : +/- 2% J : +/- 5% M : 0/- 20% K : 0/-30% P : Jumper	**Packaging code** T : 7" reel taping Q : 10" reel taping G : 13" reel taping B : Bulk K : BulkcaseK = Ni base	**Termination code** _ = SnPb base ("_" means blank) L = Sn base (Lead free) G = Au base S = Ag base

WA	04	Y	103_	J	T	L
Type code A : Isolated Resistor Array	**Size code** 06 : 0603 (1608) 04 : 0402 (1005)	**No. of element, term, style** X : *4, convex Y : *2, convex W : *8, convex T : *4, concave U : *2, concave P :*3, convex (Attenuator)	**Resistance** E24 : 2 significant digits followed by No. of zeros and a blank e.g.: 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank) E96 : 3 significant digits followed by No. of zeros	**Tolerance** F : +/- 1% J : +/- 5% P : Jumper	**Packaging code** T : 7" reel taping B : Bulk	**Termination code** _ = SnPb base ("_" means blank) L = Sn base (Lead free)

WT	04	X	103_	J	T	L
Type code T : Bussed/Network Resistors	**Size per elements** 04: total package size 1206 (3216)	**No. of element, term, style** X : *8, convex	**Resistance** E24 : 2 significant digits followed by No. of zeros e.g.: 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank)	**Tolerance** J : +/- 5%	**Packaging code** T : 7" reel taping B : Bulk	**Termination code** _ = SnPb base ("_" means blank) L = Sn base (Lead free)

Remark: 1. Detail product part number, functional code, tolerance combination,...please refer to specific data sheet.
2. Example: ("_" means blank)
Chip-R 0805 size, 4.3ohm, 5% Normal type, SnPb termination, 5000pcs taped in reel: WR08X4R3_JT_
Chip-R 0805 size, 4.3ohm, 5% Normal type, Sn Lead free termination, 5000pcs taped in reel: WR08X4R3_JTL
Chip-R 0603 size, 100ohm, 5% Normal type, SnPb termination, 5000pcs taped in reel: WR06X101_JT_
Chip-R 0603 size, 100ohm, 1% Normal type, Sn termination, 5000pcs taped in reel: WR06X1000FTL
Low ohmic Chip-R 2512 size, 0.1ohm, 1% Normal type, SnPb termination, 4000pcs taped in reel: WW25XR100FT_
Low ohmic Chip-R 2512 size, 0.1ohm, 1% Normal type, Sn Lead free termination, 4000pcs taped in reel: WW25XR100FTL
Chip-R array 0603x4, 10Kohm, 5% convex with SnPb termination, 5000pcs taped in reel: WA06X103_JT_
Chip-R 0402 size, 220ohm, Normal type, Gold termination, 5% 10,000pcs taped in reel: WF04Y221_JTG
Chip-R 0603 size, 0ohm, Normal type, SnPb termination, 5000pcs taped in reel: WR06X000_PT_

Chip Resistors

Special Chip Resistors

Feature

1. Provided gold terminations (WFxxD series) provide special application for hybrid board gluing & can replace Pd/Ag terminations
2. Provided ultra high ohmic resistance (WFxxG series) upto 30Mohm for special application
3. Provided trimmable resistors (WFxxM series) for customer special tolerance requirement.
4. Provided precision tolerance (WFxxH) to ±0.1% and TCR down to 50ppm/°C(WF12K) for voltage sensing application.
5. High reliability and stability
6. Reduced size of final equipment
7. Lower assembly costs
8. Higher component and equipment reliability.
9. Special resistance, tolerance are available upon customer's request.

WFxxY Series of Gold Terminations

Feature

1. High reliability and stability
2. Gold terminations provide special application for hybrid board gluing & can replace Pd/Ag terminations
3. Miniature size 0603(1608) and 0402(1005)

Application

1. Automotive application
2. Consumer electrical equipment
3. EDP, Computer application
4. Telecom application

Quick Reference Data

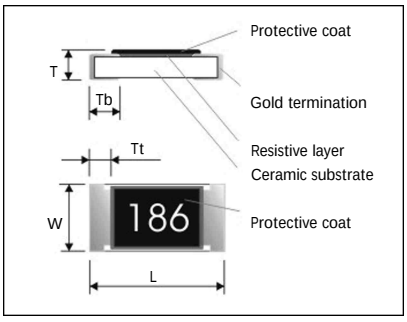
Series No.	WF06YxxxxxxG	WF04YxxxxxxG
Size code	0603 (1608)	0402 (1005)
Resistance Tolerance	±1% (E96 series), ±5% (E24 series)	
Resistance Range	1Ω ~ 10MΩ (±5% tolerance), 10Ω ~ 1MΩ (±1% tolerance)	
TCR (ppm/°C) ≥10Ω ±5% Tolerance ≥10Ω ±1% Tolerance <10Ω	 ≤ ± 200 ppm/°C ≤ ± 100 ppm/°C -300~+500 ppm/°C	 ≤ ± 200 ppm/°C ≤ ± 200 ppm/°C 300ppm/°C ~ +500 ppm/°C
Max. dissipation at T_{amb}=70°C	1/10 Watt	1/16 Watt
Max. Operation Voltage (DC or RMS)	50V	50V
Climatic category (IEC 60068)	55/125/56	
Basic Specification	JIS C 5202 / IEC 60115-1	

(Detail specification please refer to specific data sheets)

Physical Dimensions

Unit: mm

	WF06Y	WF04Y
L	1.60 ± 0.10	1.00 ± 0.05
W	0.80 ± 0.10	0.50 ± 0.05
T	0.45 ± 0.15	0.35 ± 0.05
Tb	0.30 ± 0.20	0.25 ± 0.10
Tt	0.30 ± 0.10	0.20 ± 0.10



WFxxG Series of High Ohmic Chip Resistors

Quick Reference Data

Series No.	WF12G	WF08G	WF06G	WF04G
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Range and tolerance ±5% tolerance	10MΩ < R ≤ 30MΩ (E24 series)			
TCR (ppm/°C)	≤ ± 300 ppm/°C			
Max. dissipation at T_{amb}=70°C	1/4 Watt	1/8 Watt	1/10 Watt	1/16 Watt
Max. Operation Voltage (DC or RMS)	200V	150V	50V	50V
Climatic category (IEC 60068)	55/125/56			
Basic Specification	JIS C 5202 / IEC 60115-1			

(Detail specification please refer to specific data sheets)

Feature

1. High precision, reliability and stability
2. Miniature size to 0603(1608)
3. Small and stable TCR

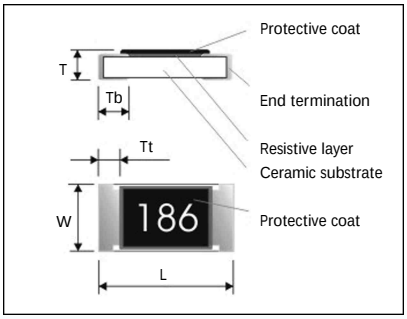
Application

1. Power supply
2. Digital meter
3. Measuring instruments
4. EDP, Computer application

Physical Dimensions

Unit: mm

	WF12G	WF08G	WF06G	WF04G
L	3.10 ± 0.10	2.00 ± 0.10	1.60 ± 0.10	1.00 ± 0.05
W	1.60 ± 0.10	1.25 ± 0.10	0.80 ± 0.10	0.50 ± 0.05
Tt	0.50 ± 0.20	0.40 ± 0.20	0.30 ± 0.10	0.20 ± 0.10
Tb	0.45 ± 0.20	0.40 ± 0.20	0.30 ± 0.20	0.25 ± 0.10
T	0.65 ± 0.15	0.50 ± 0.15	0.45 ± 0.15	0.35 ± 0.05



Chip Resistors

WFxxM Series of Trimmable Chip Resistors

Feature

1. High precision, reliability and stability
2. Miniature size to 0603(1608)

Description

The resistors are constructed on a high-grade ceramic body (aluminum oxide). Internal metal electrodes are added at each and connected by a resistive paste, which is applied to the substrate. The composition of the paste is adjusted to give the approximate resistance required.
The resistive layer is converted with a transparent protective coating. Finally the two external end terminations are added. For case of soldering the outer of theses end terminations is a lead-tin alloy.

Physical Dimensions

Unit: mm

	WF20M	WF12M	WF08M	WF06M
L	5.00 ± 0.20	3.10 ± 0.10	2.00 ± 0.10	1.60 ± 0.10
W	2.50 ± 0.20	1.60 ± 0.10	1.25 ± 0.10	0.80 ± 0.10
T	0.55 ± 0.15	0.60 ± 0.15	0.50 ± 0.15	0.45 ± 0.15
Tb	0.65 ± 0.25	0.45 ± 0.20	0.40 ± 0.20	0.30 ± 0.20
Tt	0.60 ± 0.25	0.50 ± 0.20	0.40 ± 0.20	0.30 ± 0.10

Quick Reference Data

Series No.	WF20M	WF12M	WF08M	WF06M
Size code	2010 (5025)	1206 (3216)	0805 (2012)	0603 (1608)
Resistance Tolerance	0/-20% and 0/-30% (E24 series)			
Resistance Range	1Ω ~ 10MΩ			
TCR (ppm/°C)	≥10Ω ≤ ± 200 ppm/°C <10Ω -300~+500 ppm/°C			
Max. dissipation at T_{amb}=70°C	1/2Watt	1/4 Watt	1/8Watt	1/10Watt
Max. Operation Voltage (DC or RMS)	200V	200V	100V	50V
Climatic category (IEC 60068)	55/125/56			
Basic Specification	JIS C 5202 / IEC 60115-1			

Precision Chip Resistors

Narrow Tolerance WFxxH Series

Quick Reference Data

Series No.	WF12H	WF08H	WF06H	WF04H
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	±0.5%, ±0.1%			
Resistance Range	10Ω ~ 1MΩ (E96+E24 series)			
TCR (ppm/°C) 10Ω≤ R ≤ 1MΩ	≤ ± 100 ppm/°C			≤ ± 200 ppm/°C
Max. dissipation at T_{amb}=70°C	1/4 Watt	1/8 Watt	1/10 Watt	1/16Watt
Max. Operation Voltage (DC or RMS)	200V	100V	50V	50V
Climatic category (IEC 60068)	55/155/56			
Basic Specification	JIS C 5202 / IEC 60115-1			

(Detail specification please refer to specific data sheets)

Narrow Tolerance WFxxT Series

Quick Reference Data

Series No.	WF12T	WF08T	WF06T	WF04T
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	± 0.5%, ± 0.1%			
TCR (ppm/°C)	≤ 50 ppm/°C			
Max. dissipation at T_{amb}=70°C	1/8 Watt	1/10 Watt	1/16 Watt	1/20 Watt
Max. Operation Voltage (DC or RMS)	200V	100V	50V	50V
Climatic category (IEC 60068)	55/155/56			
Basic Specification	JIS C 5202 / IEC 60115-1			

(Detail specification please refer to specific data sheets)

Narrow Tolerance WFxxU Series

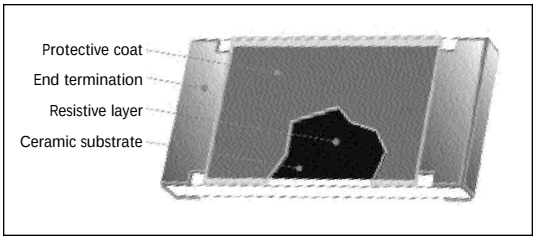
Quick Reference Data

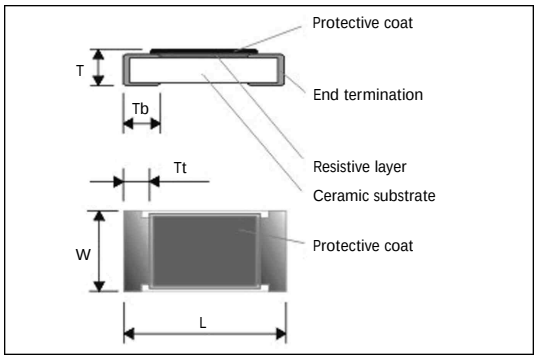
Series No.	WF12U	WF08U	WF06U	WF04U
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	± 0.5%, ± 0.1%			
TCR (ppm/°C)	≤ 25 ppm/°C			
Max. dissipation at T_{amb}=70°C	1/8 Watt	1/10 Watt	1/16 Watt	1/20 Watt
Max. Operation Voltage (DC or RMS)	200V	100V	50V	50V
Climatic category (IEC 60068)	55/155/56			
Basic Specification	JIS C 5202 / IEC 60115-1			

(Detail specification please refer to specific data sheets)

Application

1. Digital meter
2. LED display module
3. Measuring instruments
4. Automotive





Trimming Conditions

Please refer to specific data sheet.

Typical Resistance Change

The resistors can meet the specification in long time stability test for 1000 hours , no load at 125ºC

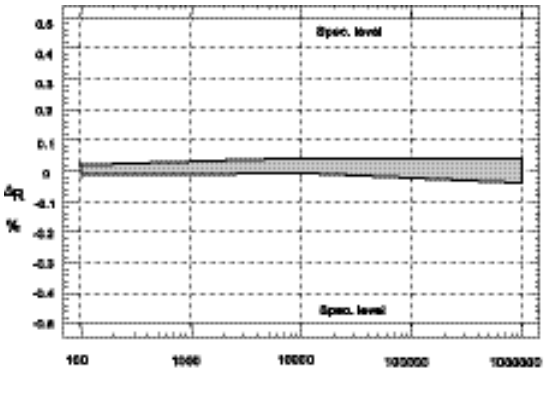


Figure. WFxxK series Resistance changed after 1000hrs, no load@125°C

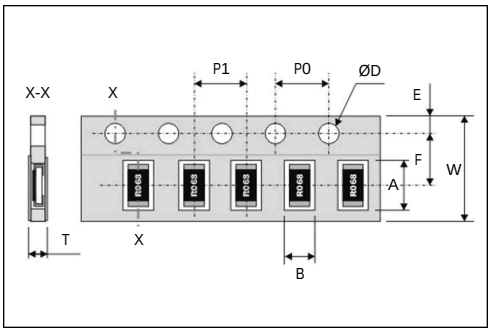
Chip Resistors

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 $^{+0.1}_{-0.0}$
WA06W	12.0±0.10	5.50±0.05			
WR02W	8.00±0.20	3.50±0.05			

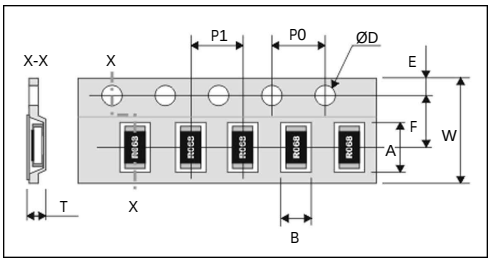


Component Size / Series	A	B	P1	T
1206 (3216), WA06X, WA06T	3.60±0.20	2.00±0.20	4.00±0.10	Max. 1.0
0805 (2012)	2.40±0.20	1.65±0.20		
0603 (1608)	1.90±0.20	1.10±0.20		0.65±0.05
0402 (1005)	1.20±0.10	0.70±0.10	2.00±0.10	0.40±0.05
WA04X	2.20±0.20	1.20±0.20	2.00±0.05	Max. 0.6
WA04Y, WA04P	1.15±0.10	1.15±0.10	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

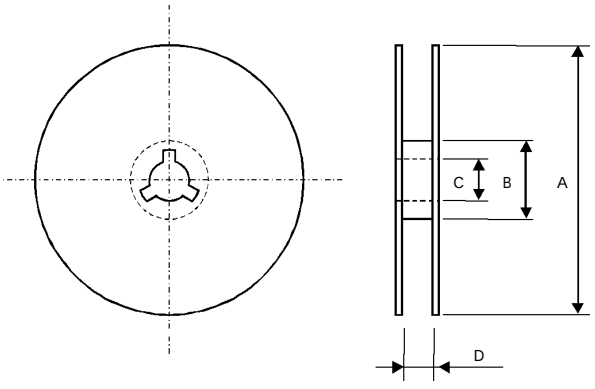
Component Size	2512 (6432)	2010 (5025)	1218 (3248)
A	6.90±0.20	5.50±0.20	3.55±0.30
B	3.60±0.20	2.80±0.20	4.90±0.20
W	12.00±0.30		
F	5.50±0.1		
E	1.75±0.10		
P1	4.00±0.10		
P0	4.00±0.10		
ØD	Ø1.50 $^{+0.1}_{-0.0}$		
T	Max. 1.2		



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	Ø254.0±2.0	Ø100.0±1.0	13.0±0.2	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



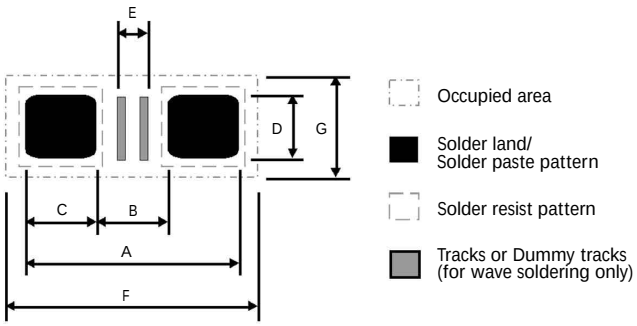
Typical Taping Quantity

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 :



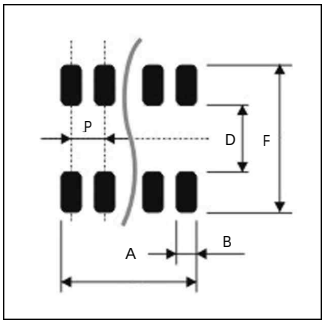
Unit: mm

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