

CHIP RESISTOR PART NUMBER CODES

Version 17 2002/7/24

WR	XX	X	XXXX	X	X	X
Type code	Size code	Functional code	Resistance	Tolerance	Packaging code	Termination code
R : Discrete 1~10MR	25 : 2512 (6432) 20 : 2010 (5025) 18 : 1218 (3248) 12 : 1206 (3216) 08 : 0805 (2012) 06 : 0603 (1608) 04 : 0402 (1005) 02 : 0201 (0603)	X : Normal F : Sputtering type W : 1% for <10ohm and >1Mohm	E24 : 2 significant digits followed by nr. Of zeros and a blank e.g. : 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank) E96 : 3 significant digits followed by nr. Of zeros	F : +/- 1% J : +/- 5% P : Jumper	T : 7" reel taping Q : 10" reel taping G : 13" reel taping B : Bulk K : Bulkcase	_ = SnPb base ("_" means a blank) L = Sn base (Lead free)

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

WF	XX	X	XXXX	X	X	X
Type code	Size code	Functional code	Resistance	Tolerance	Packaging code	Termination code
F : Special function	25 : 2512 (6432) 20 : 2010 (5025) 18 : 1218 (3248) 12 : 1206 (3216) 08 : 0805 (2012) 06 : 0603 (1608) 04 : 0402 (1005)	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%	E24 : 2 significant digits followed by nr. Of zeros and a blank e.g. : 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank) E96 : 3 significant digits followed by nr. Of zeros	B : +/- 0.1% C : +/- 0.25% D : +/- 0.5% F : +/- 1% G : +/- 2% J : +/- 5% K : +/- 20% M : 0-20% K : 0-30% P : Jumper	T : 7" reel taping Q : 10" reel taping G : 13" reel taping B : Bulk K : Bulkcase	_ = SnPb base ("_" means a blank) L = Sn base (Lead free) G = Au base K = Ni base S = Ag base

WA	XX	X	XXXX	X	X	X
Type code	Size code	Nr. of element, term. style	Resistance	Tolerance	Packaging code	Termination code
A : Isolated Resistors Array	06 : 0603 (1608) 04 : 0402 (1005)	X : *4, convex T : *4, concave Y : *2, convex W : *8, convex P : *3, convex (for Attenuator)	E24 : 2 significant digits followed by nr. Of zeros and a blank e.g. : 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank) E96 : 3 significant digits followed by nr. Of zeros	F : +/- 1% J : +/- 5% P : Jumper	T : 7" reel taping B : Bulk	_ = SnPb base ("_" means a blank) L = Sn base (Lead free)

WT	XX	X	XXXX	X	X	X
Type code	Size per element	Nr. of element, term. style	Resistance	Tolerance	Packaging code	Termination code
T : Bussed/Network Resistors	04 : total package size 1206 (3216)	X : *8, convex	E24 : 2 significant digits followed by nr. Of zeros and a blank e.g. : 3ohm=3R0_ 10ohm=100_ 220ohm=221_ 56Kohm=563_ ("_" means blank)	J : +/- 5%	T : 7" reel taping B : Bulk	_ = SnPb base ("_" means a blank) L = Sn base (Lead free)

Remark :

- Detail product part number, functional code, tolerance combination,..... please refer to specific data sheet.
- Example : ("_" means a 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_**
 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_**

GENERAL PURPOSE CHIP RESISTOR (1W~10MW)

FEATURE

1. High reliability and stability
2. Reduced size of final equipment
3. Lower assembly costs
4. Higher component and equipment reliability

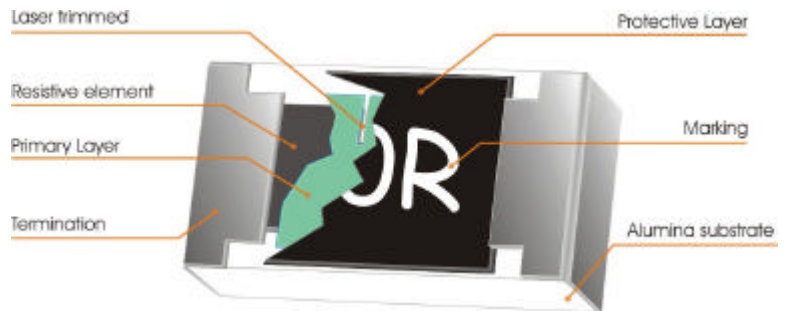
APPLICATION

1. Consumer electrical equipment, PDA, Digital Camcorder, ...
2. EDP, Computer application
3. Mobile phone, Telecom
4. Power supply, Battery charger, DC-DC power converter
5. Digital meter
6. Automotives

DESCRIPTION

The resistors are constructed in a high grade ceramic body (aluminum oxide). Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the substrate. The composition of the paste is adjusted to give the approximate resistance required and the value is trimmed to within tolerance by laser cutting of this resistive layer.

The resistive layer is covered with a protective coat. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a Lead-tin or Tin solder alloy.



QUICK REFERENCE DATA

Series No.	WR25X	WR20X	WR18X	WR12X	WR08X	WR06X	WR04X	WR02X	
Size code	2512 (6432)	2010 (5025)	1218 (3248)	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)	0201 (0603)	
Resistance Range	1Ω ~ 10MΩ, 0Ω			1Ω ~ 10MΩ, 0Ω			10Ω ~ 1MΩ, 0Ω		
±5% Tolerance (E24)	Ditto			10Ω ~ 1MΩ			10Ω ~ 1MΩ, 0Ω		
±1% Tolerance (E24+E96)	Ditto			10Ω ~ 1MΩ			10Ω ~ 1MΩ, 0Ω		
TCR (ppm/°C)									
>10Ω	≤± 200		≤± 100	≤± 200		≤± 300			
≤10Ω	≤± 300		≤± 200	-300~+500		-			
Max. dissipation @ T _{amb} =70°C (Watt)	1.0	1/2	1.0	1/4	1/8	1/10	1/16	1/20	
Max. Operation Voltage (DC or RMS)	250V	200V	200V	200V	150V	50V	50V	15V	
Climatic category (IEC 60068)	55/155/56							55/125/56	
Basic Specification	JIS C 5202 / IEC 60115-1								

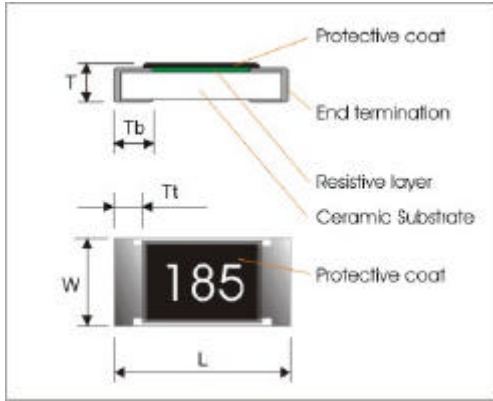
Note :

1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"
2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by

$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}} \text{ or Max. RCWV listed above, whichever is lower.}$$
3. Lead Free (Pb free) products are upon customer requested.
4. The resistance range 1~10Ω and 1M ~10MΩ with 1% tolerance please refer to WR12W / WR08W / WR06W / WR04W series specification.

GENERAL PURPOSE CHIP RESISTOR (1W~10MW)

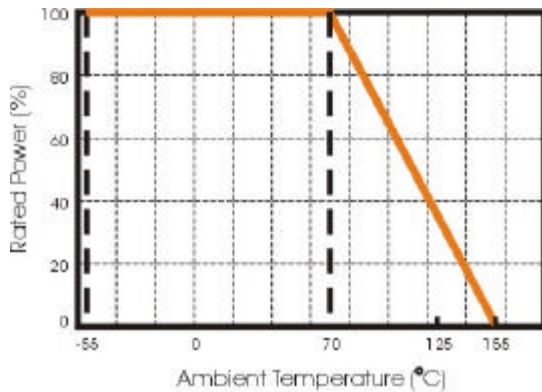
PHYSICAL DIMENSIONS (Unit : mm)



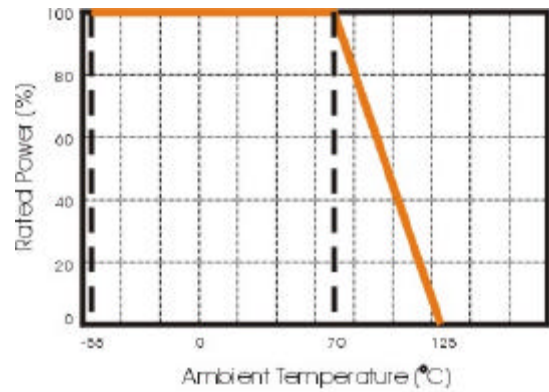
size	2512(6432)	2010(5025)	1218(3248)	1206(3216)
L	6.40±0.20	5.00±0.20	3.05±0.15	3.10 ± 0.10
W	3.20±0.20	2.50±0.20	4.60±0.20	1.60 ± 0.10
T	0.60±0.10	0.55±0.10	0.55±0.10	0.60 ± 0.15
Tb	0.90±0.25	0.60±0.25	0.45±0.25	0.45 ± 0.20
Tt	0.65±0.25	0.65±0.25	0.50±0.25	0.50 ± 0.20
size	0805(2012)	0603(1608)	0402(1005)	0201(0603)
L	2.00 ± 0.10	1.60 ± 0.10	1.00 ± 0.05	0.60 ± 0.03
W	1.25 ± 0.10	0.80 ± 0.10	0.50 ± 0.05	0.30 ± 0.03
T	0.50 ± 0.15	0.45 ± 0.15	0.35 ± 0.05	0.25 ± 0.05
Tb	0.40 ± 0.20	0.30 ± 0.20	0.25 ± 0.10	0.15 ± 0.05
Tt	0.40 ± 0.20	0.30 ± 0.10	0.20 ± 0.10	0.15 ± 0.05

POWER DERATING CURVE

For resistors operated in ambient temperature over 70°C, power rating should be derated in accordance with the following figures.



For Climatic category (IEC 60068) 55/155/56



For Climatic category (IEC 60068) 55/125/56

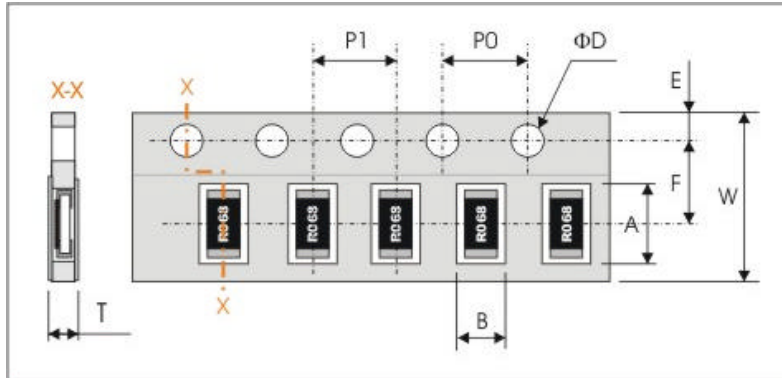
TESTS and REQUIREMENTS

For WR series, WA series, and WT series (Detail please refer to specific data sheet)

TEST	PROCEDURE / TEST METHOD	REQUIREMENT	
		Resistor	Jumper
DC resistance	JIS C 5202 5.1 / IEC 60115-1 4.5 DC resistance values measured at the test voltages specified below : <10Ω@0.1V, <100Ω@0.3V, <1KΩ@1.0V, <10KΩ@3V, <100KΩ@10V, <1MΩ@25V, <10MΩ@30V	Within the specified tolerance	< 50mΩ
Temperature Coefficient of Resistance	JIS C 5202 5.2 / IEC 60115-1 4.8.4.2 $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ R ₁ : Resistance at reference temperature R ₂ : Resistance at test temperature t ₁ : room temperature; t ₂ : LCT or UCT	Within the specified TCR	N/a
Short Time Overload	JIS C 5202 5.5 / IEC 60115-1 4.13 Permanent resistance change after a 5sec application of a voltage 2.5xU _R or max. overload voltage, whichever is less.	ΔR/R max. ±(2%+0.10Ω)	< 50mΩ
Resistance to Solder Heat	JIS C 5202 6.4 / IEC 60115-1 4.18 Unmounted chip with a solder bath, 260°C±5°C, 10±1 sec	ΔR/R max. ±(1%+0.05Ω)	< 50mΩ
Solderability	JIS C 5202 6.5 / IEC 60115-1 4.17 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	JIS C 5202 6.4 / IEC 60115-1 4.18 Unmounted chip with a solder bath, 260°C±5°C, 60±1 sec	Ditto	
Temperature Cycling	JIS C 5202 7.4 / IEC 60115-1 4.19 30min at LCT, 30min at UCT, 5 cycles	ΔR/R max. ±(1%+0.05Ω)	< 50mΩ
Damp heat (Humidity loaded in steady state)	JIS C 5202 7.9 1000+48/-0 hours@40±2°C, 90~95% RH; loaded with P _n or V _{max} ; 1.5 hours ON, 0.5 hours OFF	10Ω≤R<1MΩ : ΔR/R max. ±(3%+0.10Ω) R<10Ω, R≥1MΩ : ΔR/R max. ±(5%+0.10Ω)	< 50mΩ
Load Life (Endurance)	JIS C 5202 7.10 / IEC 60115-1 4.25.1 1000+48/-0 hours@70±2°C; loaded with P _n or V _{max} ; 1.5 hours ON, 0.5 hours OFF	Ditto	Ditto
Bending	JIS C 5202 6.1.4 / IEC 115-1 4.33 Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once for 10sec : >2mm for 2512 and 2010; >3mm for 1206, 0805, 0603, and 0402	No visual damaged, ΔR/R max. ±(1%+0.05Ω)	< 50mΩ

PACKAGING ON TAPE AND REEL

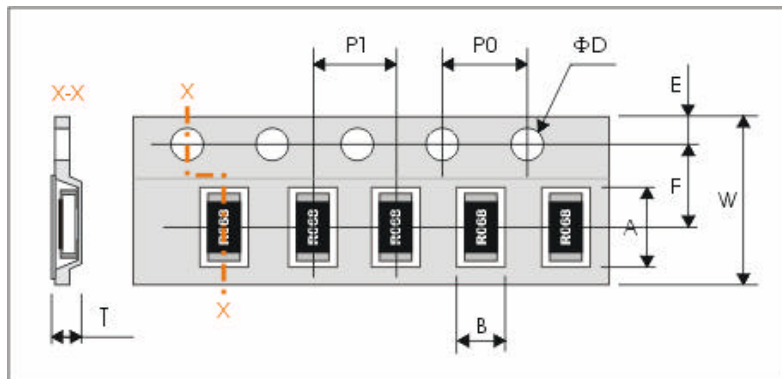
Paper Tape specifications for WR, WF, WW series and WA, WT series (unit :mm)



Component Size / Series	W	F	E	P0	ΦD
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	Φ1.50 ^{+0.1} _{-0.0}
WA06W	12.0±0.10	5.50±0.05			
WR02X	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		0.65±0.05
0603 (1608)	1.90±0.20	1.10±0.20		0.40±0.05
0402 (1005)	1.20±0.10	0.70±0.10	2.00±0.10	0.45±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

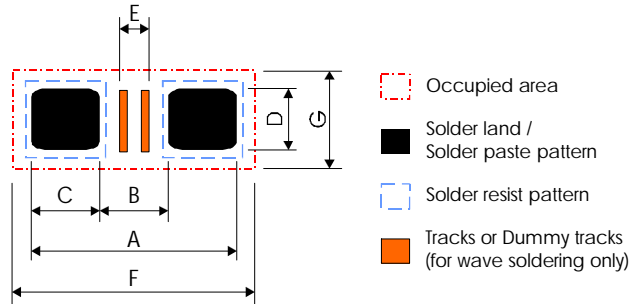
Plastic Tape specifications for WR, WF, WW series of Chip-R (unit :mm)



Component Size	A	B	W	F	E	P1	P0	ΦD	T
2512 (6432)	6.90±0.20	3.60±0.20	12.00±0.30	5.50±0.1	1.75±0.10	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max. 1.2
1218 (3248)	3.55±0.30	4.90±0.20							
2010 (5025)	5.50±0.20	2.80±0.20							

FOOTPRINT DESIGN

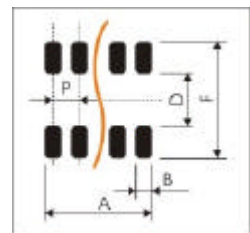
WRxx series, WFxx series, WWxx series footprints :



SIZE	REFLOW SOLDERING (unit : mm)							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 (unit : mm)							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
W ₁	0.35 ± 0.05
W ₂	0.50 ± 0.05
H ₂	0.80 ± 0.10
P ₁	0.70 ± 0.05
P ₂	0.65 ± 0.05
A	3.20 ± 0.10
F	2.80 +0.40/-0.20

