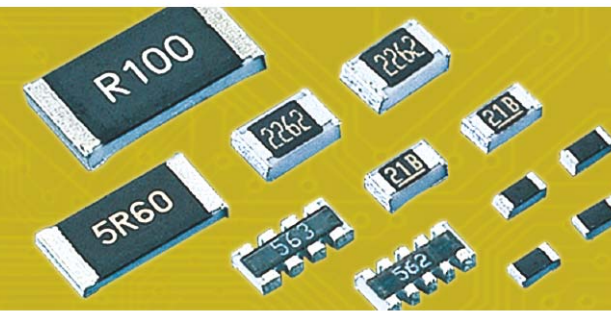
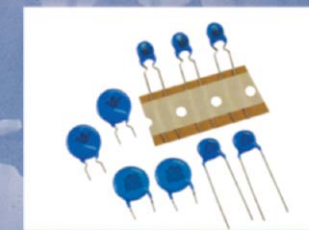
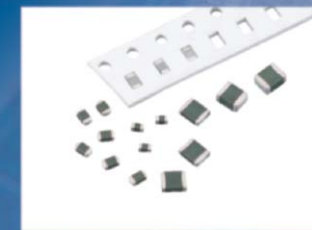




華新科技股份有限公司
Walsin Technology Corporation



Chip Resistors



2011

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*The specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

*This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

Chip Resistors

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HOW TO ORDER

WR	06	X	1000	F	T	L
Type code	Size code	Functional code	Resistance	Tolerance	Packaging code	Termination code
WR: General 1~10MR MR: Automotive SR: Anti-Sulfuration ZR: Non magnetic	25: 2512 (6432) 20: 2010 (5025) 18: 1218 (3248) 12: 1206 (3216) 10: 1210 (3225) 08: 0805 (2012) 06: 0603 (1608) 04: 0402 (1005) 02: 0201 (0603) 01: 0100 (0402)	X : 5%: 1ohm ~ 10Mohm 1%: 10ohm ~ 1Mohm W : 1%: <10ohm ; >1Mohm F : 1% for <10ohm ; >1Mohm (TC100ppm)	E24(J tol.) : 2 significant digits followed by No. of zeros and a blank e.g. : 3ohm=3R0_10ohm=100_220ohm=221_56Kohm=563_ (" " means blank) E24,E96(F tol.) : 3 significant digits followed by No. of zeros e.g.: 3ohm=3R0010ohm=10R0220ohm= 220056kohm = 5602	F : +/- 1% J : +/- 5% P : Jumper	P : 4" reel taping T : 7" reel taping A : 7" reel taping 15Kpcs Q : 10" reel taping G : 13" reel taping R : 0603 2mm pitch taping B : Bulk K : Bulkcase C : Bulk after measuring	L = Sn base (Lead free) R = Pb ≤ 100 ppm (total)
WW	25	M	R002	F	T	L
Type code	Size code	Functional code	Resistance	Tolerance	Packaging code	Termination code
WW: R< 1ohm MW: R< 1ohm Automotive SW: R< 1ohm Anti-sulfuration	25: 2512 (6432) 20: 2010 (5025) 18: 1218 (3248) 12: 1206 (3216) 10: 1210 (3225) 08: 0805 (2012) 06: 0603 (1608) 04: 0402 (1005)	X : Thick film low ohm W : Thick film low ohm low TCR Q : Metal low ohm M : Metal low ohm R : Metal low ohm high power N : Metal low ohm high power P : Thick film low TCR high Power 2512 = 2W 2010 = 1W 1210 = 0.5W 1206 = 0.5W C : Thick film Power low ohm up side down	"R" followed by 3 significant digits e.g. : 0.1ohm=R1000.033ohm=R0330.56ohm=R560	F : +/- 1% G : +/- 2% J : +/- 5%	P : 4" reel taping T : 7" reel taping Q : 10" reel taping G : 13" reel taping R : 0603 2mm pitch taping B : Bulk K : Bulkcase	L = Sn base (Lead free) G = Au base S = Ag base
WF	04	H	1001	B	T	L
Type code	Size code	Functional code	Resistance	Tolerance	Packaging code	Termination code
WF : Special function MF : Special function AUTO SF : Special function Anti-S WK: Special function made in KM	25: 2512 (6432) 20: 2010 (5025) 18: 1218 (3248) 12: 1206 (3216) 10: 1210 (3225) 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 : High power S : Surge T : Thin film, TCR50ppm U : Thin film, TCR25ppm Q : Thin film TC50, power R : Thin film TC25, power W : Thin film TC10 F : Thin film TC15 V : High voltage X : Special resistance Y : E24/E96 resistance with special termination (non SnPb or Sn base), ≥1%	E24(J tol.) : 2 significant digits followed by No. of zeros and a blank e.g. : 3ohm=3R0_10ohm=100_220ohm=221_56Kohm=563_ (" " means blank) E24,E96(F tol.) : 3 significant digits followed by No. of zeros e.g.: 3ohm=3R0010ohm=10R0220ohm= 220056kohm = 5602	A : ±0.05% B : +/- 0.1% C : +/- 0.25% D : +/- 0.5% F : +/- 1% G : +/- 2% J : +/- 5% K : +/- 10% L : +/- 15% M : +/- 20% P : Jumper X : 0/-30% Y : 0/-20% Z : 0/-10%	P : 4" reel taping T : 7" reel taping Q : 10" reel taping G : 13" reel taping R : 0603 2mm pitch taping B : Bulk K : Bulkcase	L = Sn base (Lead free) G = Au base S = Ag base
WA	04	Y	103_	J	T	L
Type code	Size code	Functional code	Resistance	Tolerance	Packaging code	Termination code
WA: Array MA: Array Automotive SA: Array Anti-sulfuration	06: 0603 (1608) 04: 0402 (1005) 02: 0201 (0603)	X : *4, convex Y : *2, convex W : *8, convex T : *4, concave U : *2, concave P : *3, convex (Attenuator)	E24(J tol.) : 2 significant digits followed by No. of zeros and a blank e.g. : 3ohm=3R0_10ohm=100_220ohm=221_56Kohm=563_ (" " means blank) E24,E96(F tol.) : 3 significant digits followed by No. of zeros	F : +/- 1% J : +/- 5% P : Jumper	T : 7" reel taping Q : 10" reel taping G : 13" reel taping B : Bulk K : Bulkcase	L = Sn base (Lead free)
WT	04	X	103_	J	T	L
Type code	Size code	Functional code	Resistance	Tolerance	Packaging code	Termination code
T: Network Resistors	04: total package size 1206 (3216)	X : *8, convex	E24(J tol.) : 2 significant digits followed by No. of zeros and a blank e.g. : 3ohm=3R0_10ohm=100_220ohm=221_56Kohm=563_ (" " means blank) E24,E96(F tol.) : 3 significant digits followed by No. of zeros	J : +/- 5%	T : 7" reel taping B : Bulk	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, Sn termination, 5000pcs taped in reel: WR08X4R3_JTL
3. 1218 standard packing q'ty is 3Kpcs in 10" reel and packing code is "T code"

Chip Resistors

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■ Chip Resistors Selection Guide

■ General Purpose Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WR25X	2512 (6432)	1W	±100 ±200	±1% ±5%	1 ~ 10MΩ
WR18X	1218 (3248)	1W	±100 ±200	±1% ±5%	
WR20X	2010 (5025)	1/2W	±100 ±200	±1% ±5%	
WR10X	1210 (3225)	1/3W	±100 ±200	±1% ±5%	
WR12X	1206 (3216)	1/4W	±100 ±200	±1% ±5%	
WR08X	0805 (2012)	1/8W	±100 ±200	±1% ±5%	
WR06X	0603 (1608)	1/10W	±100 ±200	±1% ±5%	
WR04X	0402 (1005)	1/16W	±100 ±200	±1% ±5%	
WR02X	0201 (0603)	1/20W	±200 ±200	±1% ±5%	
WR01X	0100 (0402)	1/32W	±200 ±200	±1% ±5%	
					4.7 ~ 1MΩ

Remark : 1. Detailed resistance v.s. TCR and ordering code please refer to specific specifications.

2. Jumper resistor is not designed for fusing applications, designers shall apply dedicate fusible resistors or standard fuse in application circuits.

■ Thick Film Low Ohm Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WW25X	2512 (6432)	1W	≤1500**	±1% ±5%	0.020Ω ~ 0.976Ω
WW18X	1218 (3248)	1W		±1% ±5%	0.015Ω ~ 0.976Ω
WW20X	2010 (5025)	1/2W		±1% ±5%	0.020Ω ~ 0.976Ω
WW10X	1210 (3225)	1/3W		±1% ±5%	0.015Ω ~ 0.976Ω
WW12X	1206 (3216)	1/4W	≤200	±1% ±5%	0.020Ω ~ 0.976Ω
WW08X	0805 (2012)	1/8W	≤1500**	±1% ±5%	0.020Ω ~ 0.976Ω
WW06X	0603 (1608)	1/10W	≤500**	±1% ±5%	0.100Ω ~ 0.976Ω
WW04X	0402 (1005)	1/16W	≤600**	±1% ±5%	0.100Ω ~ 0.976Ω

Remark : 1. "****" Detail resistance v.s. TCR please refer to detailed specification.

2. Resistance value will be changed by soldering condition and design of soldering pad, please design products in consideration of this change of resistance value.

■ Thick Film Power Low Ohm Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WW25P	2512 (6432)	2W	< 0.1Ω: 150ppm ≥ 0.1Ω: 100ppm	±1% ±5%	0.047Ω ~ 0.976Ω
WW20P	2010 (5025)	1W	< 0.1Ω: 150ppm ≥ 0.1Ω: 100ppm	±1% ±5%	0.047Ω ~ 0.976Ω
WW10P	1210 (3225)	1/2W	< 0.1Ω: 500ppm ≥ 0.1Ω: 200ppm	±1% ±5%	0.020Ω ~ 0.976Ω
WW12P	1206 (3216)	1/2W	< 0.1Ω: 200ppm ≥ 0.1Ω: 100ppm	±1% ±5%	0.047Ω ~ 0.976Ω
WW08P	0805 (2012)	1/3W	< 0.1Ω: 200ppm ≥ 0.1Ω: 150ppm	±1% ±5%	0.047Ω ~ 0.976Ω
WW06P	0603 (1608)	1/4W	< 0.1Ω: 250ppm ≥ 0.1Ω: 200ppm	±1% ±5%	0.047Ω ~ 0.976Ω
WW04P	0402 (1005)	1/8W	< 0.1Ω: 300ppm ≥ 0.1Ω: 200ppm	±1% ±5%	0.100Ω ~ 0.976Ω
WW08C	0805 (2012)	1/3W	< 0.03Ω: 0~+250ppm ≥ 0.03Ω: ±150ppm	±1% ±5%	0.020 ~ 0.050Ω
WW06C	0603 (1608)	1/4W	< 0.051Ω: 0~+250ppm ≥ 0.051Ω: ±150ppm	±1% ±5%	0.020 ~ 0.100Ω
WW04C	0402 (1005)	1/8W	< 0.051Ω: 0~+350ppm ≥ 0.051Ω: ±150ppm	±1% ±5%	0.025 ~ 0.100Ω

■ Metal Low Ohm Sensing Type Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WW25N	2512 (6432)	2W	±100	±1%, 5%	1 ~ 25mΩ*
WW25R		2W	±100	±1%, 5%	1, 2, 3, 4, 5, 6, 7mΩ
WW25M		1W	±100	±1%, 5%	1 ~ 50mΩ*
WW25Q		1W	±100	±1%, 5%	5, 6, 7, 10, 15mΩ
WW20N	2010 (5025)	1W	±75	±1%, 5%	5, 10, 15, 20mΩ
WW12N	1206 (3216)	1W	±70	±1%, 5%	5, 10, 15, 20, 25mΩ
WW12R		1W	±100	±1%, 5%	5, 6, 10, 15mΩ
WW12D		1W	±100	±1%, 5%	20, 25, 30, 40, 50mΩ
WW06R	0603 (1608)	1/3W	±100	±1%, 5%	5, 10mΩ

Remark: 1. Detailed resistance v.s TCR and ordering code please refer to specific specifications.

2. Resistance value will be changed by soldering condition and design of soldering pad, please design products in consideration of this change.

■ Chip Resistors Array

Series	Size	Rated Power	TCR (ppm/°C)	Termination Type	Tolerance	Resistance
WA06X	1206 (0603x4)	1/10W	≤200	Convex	±1%, ±5%	10Ω ~ 1MΩ
WA06T	1206 (0603x4)	1/10W	≤200	Concave	±1%, ±5%	
WA06Y	0606 (0603x2)	1/10W	≤200	Convex	±1%, ±5%	
WA04X	0805 (0402x4)	1/16W	≤200	Convex	±1%, ±5%	
WA04Y	0404 (0402x2)	1/16W	≤300	Convex	±1%, ±5%	
WA04T	0805 (0402x4)	1/16W	≤300	Concave	±1%, ±5%	
WA04U	0404 (0402x2)	1/16W	≤300	Concave	±1%, ±5%	10Ω ~ 100KΩ
WA06W	1606 (0602x8)	1/16W	≤200	Convex	±1%, ±5%	

Remark: 1. Detailed resistance v.s TCR and ordering code please refer to specific specifications.

2. Resistance value will be changed by soldering condition and design of soldering pad, please design products in consideration of this change.

■ Chip Attenuator

Series	Size	Type	Termination	Tolerance	Attenuation	Impedance
WA04P	0404 (0402x2)	4P3R, Π type	Convex	±0.2dB ~ 1dB	1dB ~ 10dB	50Ω

■ Chip Resistor Network

Series	Size	Rated Power	TCR (ppm/°C)	Termination	Tolerance	Resistance
WT04X	1206 (10P8R)	1/16W	±200	Convex	±5%	10 ~ 100KΩ

■ High Power Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WF25P	2512 (6432)	2W	±100	±1%, ±5%	1 ~ 1MΩ
WF20P	2010 (5025)	1W	±100		
WF10P	1210 (3225)	1/2W	±100		
WF12P	1206 (3216)	1/2W	±100		
WF08P	0805 (2012)	1/4W	±100		
WF06P	0603 (1608)	1/8W	±100		
WF04P	0402 (1005)	1/10W	±100		

■ Automotive Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
MR12	1206 (3216)	1/4W	±200	±1%, ±5%	1 ~ 10MΩ
MR08	0805 (2012)	1/8W	±200		1 ~ 10MΩ
MR06	0603 (1608)	1/10W	±200		1 ~ 10MΩ
MR04	0402 (1005)	1/16W	±200		1 ~ 10MΩ

■ Anti-Sulfuration Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
SR12	1206 (3216)	1/4W	≤200	±1%, ±5%	1 ~ 10MΩ
SR08	0805 (2012)	1/8W	≤200		1 ~ 10MΩ
SR06	0603 (1608)	1/10W	≤200		1 ~ 10MΩ
SR04	0402 (1005)	1/16W	≤200		1 ~ 10MΩ

■ Surge Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WK25S	2512 (6432)	1W	≤200	±5%, ±10%	0.27 ~ 22MΩ
WK20S	2010 (5025)	3/4W	≤200		0.27 ~ 22MΩ
WK10S	1210 (3225)	1/2W	≤200		0.27 ~ 22MΩ
WK12S	1206 (3216)	1/4W	≤200		0.27 ~ 22MΩ
WK08S	0805 (2012)	1/8W	≤200		0.27 ~ 22MΩ

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■ High Voltage Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WK25V	2512 (6432)	1W	≤200	±1%, ±5%	47~ 51MΩ
WK20V	2010 (5025)	1/2W	≤200	±1%, ±5%	47~ 51MΩ
WK12V	1206 (3216)	1/4W	≤200	±1%, ±5%	47~ 51MΩ
WK08V	0805 (2012)	1/8W	≤200	±1%, ±5%	47~ 51MΩ
WK06V	0603 (1608)	1/10W	≤200	±1%, ±5%	47~ 10MΩ

■ Trimmable Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WK25M	2512 (6432)	1W	≤200	0/-20%, 0/-30%	1 ~ 4.7MΩ
WK20M	2010 (5025)	1/2W	≤200	0/-20%, 0/-30%	1 ~ 4.7MΩ
WK10M	1210 (3225)	1/4W	≤200	0/-20%, 0/-30%	1 ~ 4.7MΩ
WK12M	1206 (3216)	1/8W	≤200	0/-20%, 0/-30%	1 ~ 4.7MΩ
WK08M	0805 (2012)	1/10W	≤200	0/-20%, 0/-30%	1 ~ 4.7MΩ
WK06M	0603 (1608)	1/16W	≤100	0/-20%, 0/-30%	10~ 4.7MΩ

■ Total lead free Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WR12X_R	1206 (3216)	1/4W	≤200	±1%, ±5%	1~ 10MΩ
WR08X_R	0805 (2012)	1/8W	≤200	±1%, ±5%	1~ 10MΩ
WR06X_R	0603 (1608)	1/10W	≤200	±1%, ±5%	1~ 10MΩ
WR04X_R	0402 (1005)	1/16W	≤200	±1%, ±5%	1~ 10MΩ
WA04X_R	0402X4	1/16W	≤200	±1%, ±5%	10~ 1MΩ
WA04Y_R	0402X2	1/16W	≤200	±1%, ±5%	10~ 1MΩ

■ High Precision Chip-R

Series	Size	Rated Power	TCR (ppm/°C)	Tolerance	Resistance
WF12H	1206 (3216)	1/4W	≤100	±0.1%, ±0.5%	10~ 1MΩ
WF08H	0805 (2012)	1/8W	≤100	±0.1%, ±0.5%	10~ 1MΩ
WF06H	0603 (1608)	1/10W	≤100	±0.1%, ±0.5%	10~ 1MΩ
WF04H	0402 (1005)	1/16W	≤100	±0.1%, ±0.5%	10~ 1MΩ
WF12T	1206(3216)	1/8W	≤50	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF12Q	1206(3216)	1/4W	≤50	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF08T	0805(2012)	1/10W	≤50	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF08Q	0805(2012)	1/8W	≤50	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF06T	0603 (1608)	1/16W	≤50	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 330KΩ
WF06Q	0603 (1608)	1/10W	≤50	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 330KΩ
WF04T	0402 (1005)	1/16W	≤50	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 100KΩ
WF12U	1206(3216)	1/8W	≤25	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF12R	1206(3216)	1/4W	≤25	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF08U	0805 (2012)	1/10W	≤25	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF08R	0805 (2012)	1/8W	≤25	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 1MΩ
WF06U	0603 (1608)	1/16W	≤25	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 330KΩ
WF06R	0603 (1608)	1/10W	≤25	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 330KΩ
WF04U	0402 (1005)	1/16W	≤25	±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1.0%	10~ 100KΩ
WF12F	1206(3216)	1/8W	≤15	±0.05%, ±0.10%, ±0.25%	100~ 200KΩ
WF08F	0805(2012)	1/8W	≤15	±0.05%, ±0.10%, ±0.25%	100~ 200KΩ
WF06F	0603 (1608)	1/10W	≤15	±0.05%, ±0.10%, ±0.25%	100~ 100KΩ
WF04F	0402 (1005)	1/16W	≤15	±0.05%, ±0.10%, ±0.25%	100~ 20KΩ
WF12W	1206(3216)	1/8W	≤10	±0.05%, ±0.10%, ±0.25%	100~ 100KΩ
WF08W	0805(2012)	1/8W	≤10	±0.05%, ±0.10%, ±0.25%	100~ 100KΩ
WF06W	0603 (1608)	1/10W	≤10	±0.05%, ±0.10%, ±0.25%	100~ 50KΩ
WF04W	0402 (1005)	1/16W	≤10	±0.05%, ±0.10%, ±0.25%	100~ 10KΩ

General Purpose Chip Resistors (1Ω~10MΩ)

Feature

1. High reliability and stability
2. Reduced size of final equipment
3. Lower assembly costs
4. Higher component and equipment reliability
5. RoHS compliant and lead free products

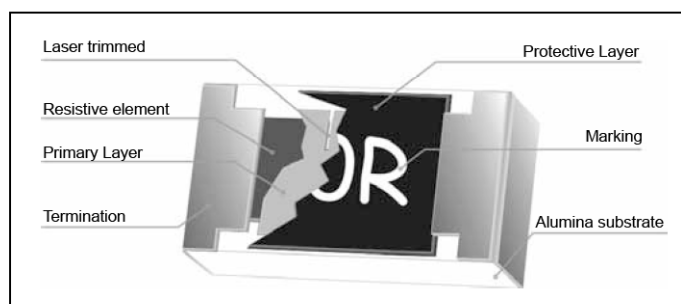
Description

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 Tin solder (Pb free) alloy.

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



Quick Reference Data

Series No.	WR25X	WR20X	WR18X	WR10X	WR12X	WR08X	WR06X	WR04X	WR02X	WR01X
Size Code	2512(6432)	2010(5025)	1218(3248)	1210(3225)	1206(3216)	0805(2012)	0603(1608)	0402(1005)	0201(0603)	0100(0402)
Resistance Range	±5% (E24): 1Ω~10MΩ; Jumper									
±1% Tolerance (E24+E96)	±1% (E24+E96): 1Ω~10MΩ									
TCR (ppm/°C)	$R > 1M\Omega$ ≤ ± 200 $1M\Omega \geq R \geq 10\Omega$ ≤ ± 100 $R \leq 10\Omega$ ≤ ± 200									
Max. dissipation @ T _{amb} =70°C	1.0 Watt	1/2 Watt	1.0 Watt	1/3 Watt	1/4 Watt	1/8 Watt	1/10 Watt	1/16 Watt	1/20 Watt	1/32 W
Max. Operation Voltage (DC or RMS)	250V	200V	200V	200V	200V	150V	50V	50V	25V	20V
Climatic category (IEC 60068)	55/155/56								55/125/56	55/125/56
Basic Specification	JIS C 5201-1 / IEC 60115-1									

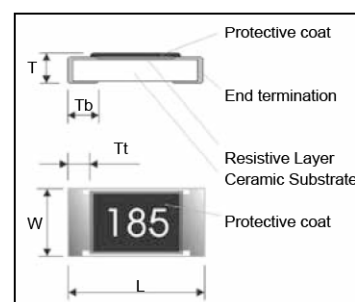
Note :

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
 $RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.
3. Detailed TCR please refer to specific specification.

Physical Dimensions

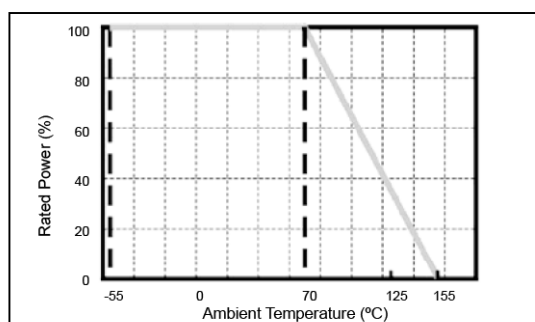
Unit: mm

Size	2512(6432)	2010(5025)	1218(3248)	1210(3225)	1206(3216)	0805(2012)	0603(1608)	0402(1005)	0201(0603)	0100(0402)
L	6.40 ± 0.20	5.00 ± 0.20	3.05 ± 0.15	3.10 ± 0.10	3.10 ± 0.10	2.00 ± 0.10	1.60 ± 0.10	1.00 ± 0.05	0.60 ± 0.03	0.40 ± 0.02
W	3.20 ± 0.20	2.50 ± 0.20	4.60 ± 0.20	2.60 ± 0.10	1.60 ± 0.10	1.25 ± 0.10	0.80 ± 0.10	0.50 ± 0.05	0.30 ± 0.03	0.20 ± 0.02
T	0.60 ± 0.10	0.55 ± 0.10	0.55 ± 0.10	0.55 ± 0.10	0.60 ± 0.15	0.50 ± 0.15	0.45 ± 0.15	0.35 ± 0.05	0.23 ± 0.03	0.13 ± 0.02
Tb	0.90 ± 0.25	0.60 ± 0.25	0.50 ± 0.25	0.50 ± 0.20	0.45 ± 0.20	0.40 ± 0.20	0.30 ± 0.15	0.25 ± 0.10	0.15 ± 0.05	0.10 ± 0.03
Tt	0.65 ± 0.25	0.65 ± 0.25	0.45 ± 0.25	0.50 ± 0.20	0.50 ± 0.20	0.40 ± 0.20	0.30 ± 0.10	0.20 ± 0.10	0.10 ± 0.05	0.08 ± 0.03

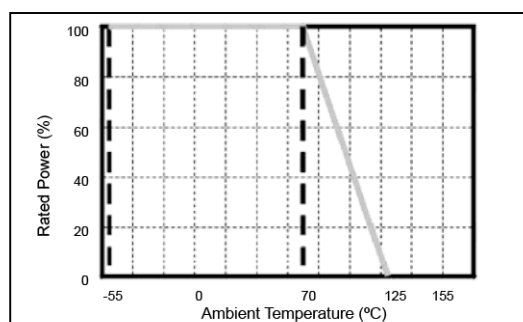


Power Deration Curve

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 (for 0201 type)

Chip Resistors

www.passivecomponent.com

Thick Film Low Ohm/Power Low Ohm Chip Resistors

Function For Low Ohm Chip Resistors

The low ohmic resistors are used to sense output current in power supply, automotive and engine control management system, and other power sensing application. As shows in figure below, the typical function of low ohmic (power) chip resistor is to be a current sensor (R_{sense}) to generate the sensing voltage (V_s) for the purpose of feedback control when output current (I_o) passed on it. The sensing voltage be treated as a signal to trigger the switches (CMOS) ON/OFF duration so that to monitor and/or adjust the output current from inductor.

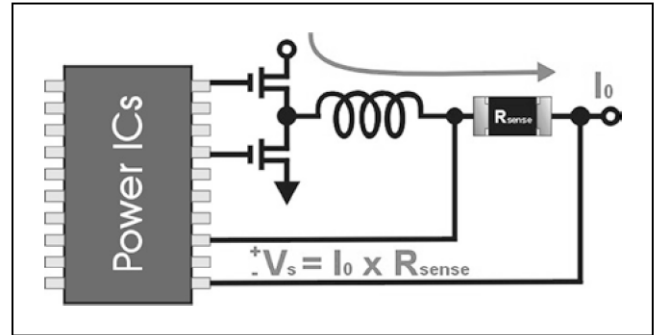
Simplify to say,

$$V_s = I_o \times R_{sense}$$

In general case, this feedback voltage is setting around 100mV for considering both on power saving and noise robustness. To sense a 5 ampere average output current, the R_{sense} resistance value therefore be required as $100\text{mV} / 5\text{A} = 20\text{m}\Omega$, the power dissipation will be :

$$P = I^2 \times R = 5\text{A}^2 \times 20\text{m}\Omega = 0.5\text{ Watt}$$

A low ohmic chip resistor with a power rating of 1.0 watt is recommended on this application in case the power safety margin is taken into account.



Quick Reference Data of Low Ohm Chip Resistor

Series No.	WW25X	WW20X	WW18X	WW10X	WW12X	WW08X	WW06X	WW04X
Size Code	2512 (6432)	2010 (5025)	1218(3248)	1210(3225)	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	±5%, ±1%							
Resistance Range	0.020Ω ~ 0.976Ω						0.100Ω ~ 0.976Ω	
TCR (ppm/°C)	Detailed TCR please refer to specific data sheets							
Max. dissipation @ T _{amb} =70°C	1 Watt	0.5 Watt	1 Watt	1/3 Watt	1/4 Watt	1/8 Watt	1/10 Watt	1/16 Watt
Max. Operation Voltage (DC or RMS)	250V	200V	200V	200V	200V	100V	50V	50V
Climatic category (IEC 60068)	55/155/56							55/125/56
Basic Specification	JIS C 5201-1 / 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. Power derating curve, and detail specification please refer to specific data sheets.
3. Resistance value will be changed by soldering condition and design of soldering pad, please design products in consideration of this change of resistance value.

Quick Reference Data of Power Low Ohm Chip Resistor

Item	General Specification					
Series No.	WW25P	WW20P	WW12P	WW08P	WW06P	WW04P
Size code	2512 (6432)	2010 (5025)	1206 (3216)	0805 (2012)	0603 (1608)	0402(1005)
Resistance Tolerance	$\pm 1\%$, $\pm 5\%$					
Resistance Range	0.047 Ω ~ 0.976 Ω					0.1 Ω ~0.976 Ω
TCR (ppm/ $^{\circ}\text{C}$) < 0.100 Ω	± 150 ppm/ $^{\circ}\text{C}$	± 150 ppm/ $^{\circ}\text{C}$	± 200 ppm/ $^{\circ}\text{C}$	± 200 ppm/ $^{\circ}\text{C}$	± 250 ppm/ $^{\circ}\text{C}$	-
≥ 0.100 Ω	± 100 ppm/ $^{\circ}\text{C}$	± 100 ppm/ $^{\circ}\text{C}$	± 100 ppm/ $^{\circ}\text{C}$	± 150 ppm/ $^{\circ}\text{C}$	± 200 ppm/ $^{\circ}\text{C}$	0~+300ppm/ $^{\circ}\text{C}$
Max. dissipation @ $T_{amb}=70^{\circ}\text{C}$	2W	1 W	1/2 W	1/3 W	1/4 W	1/8 W
Max. Operation Voltage (DC or RMS)	300V	200V	200V	150V	50V	50V
Climatic category (IEC 60068)	55/155/56					55/125/56

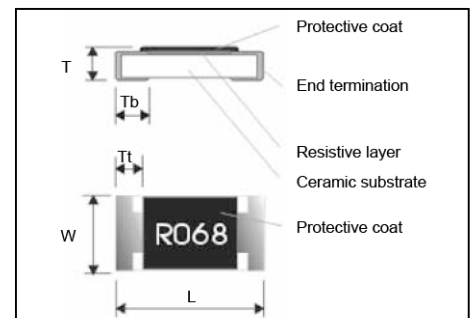
Note:

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 $\text{RCWV} = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.
3. 2W loading with total solder-pad and trace size of 300 mm²

Physical Dimensions

Unit: mm

Dimensions	WW25P	WW20P	WW12P	WW08P	WW06P	WW04P
L	6.30 $\pm$ 0.20	5.00 $\pm$ 0.20	3.10 $\pm$ 0.15	2.00 $\pm$ 0.15	1.60 $\pm$ 0.10	1.00 $\pm$ 0.05
W	3.10 $\pm$ 0.20	2.50 $\pm$ 0.20	1.60 $\pm$ 0.15	1.20 $\pm$ 0.15	0.80 $\pm$ 0.10	0.50 $\pm$ 0.05
T	0.60 $\pm$ 0.15	0.60 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.10	0.45 $\pm$ 0.10	0.35 $\pm$ 0.05
Tt	0.60 $\pm$ 0.25	0.60 $\pm$ 0.25	0.50 $\pm$ 0.25	0.40 $\pm$ 0.20	0.30 $\pm$ 0.20	0.20 $\pm$ 0.10
Tb	1.80 $\pm$ 0.25	0.60 $\pm$ 0.25	0.50 $\pm$ 0.25	0.40 $\pm$ 0.20	0.30 $\pm$ 0.20	0.25+0.05/-0.1



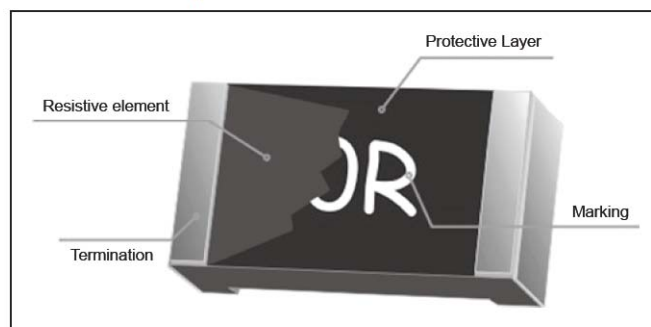
Chip Resistors

www.passivecomponent.com

■ Metal Low Ohm Sensing Chip Resistors (0.001Ω~0.050Ω)

■ Description

The resistors are constructed in a high grade low resistive metal body. The resistive layer is covered with a protective coat and printed a resistance marking code over it. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is lead free terminations.



■ Quick Reference Data

Item	General Specification				
Series No.	WW25R	WW25Q	WW12R	WW12D	WW06R
Size code	2512 (6432)		1206(3216)		0603 (1608)
Resistance Tolerance	±5% , ±1%				
Resistance Range	1, 2, 3, 4, 5, 6, 7mΩ	5, 6, 7, 10, 15mΩ	5, 6, 10, 15mΩ	20, 25, 30, 40, 50mΩ	5, 10mΩ
TCR (ppm/°C)	±100ppm		±100ppm		±100ppm
Max. dissipation @ T _{amb} =70°C	2 W	1 W	1 W	1 W	1/3 W
Max. Operation Current (DC or RMS)	44.7A		14A		8.1A
Climatic category (IEC 60068)	55/155/56				

Item	General Specification					
Series No.	WW25M	WW25N	WW20M	WW20N	WW12N	WW12M
Size code	2512 (6432)		2010 (5025)		1206 (3216)	
Resistance Tolerance	±5%, ±1%					
Resistance Range	1~10,12,15,20,25,30,40,50mΩ	1~10,12,15,20,25 mΩ	5,10,15,20mΩ		5,10,15,20,25mΩ	
TCR (ppm/°C)	1-4mΩ: 100ppm; > 4mΩ: ≤ 75 ppm/°C		≤ 75 ppm/°C		≤ 70 ppm/°C	
Max. dissipation @ T _{amb} =70°C	1 W	2 W	1/2 W	1 W	1 W	1/2 W
Max. Operation Voltage (DC or RMS)	250V		250V		200V	
Max. Overload Voltage (DC or RMS)	500V		500V		400V	
Climatic category (IEC 60068)	55/155/56					

Note :

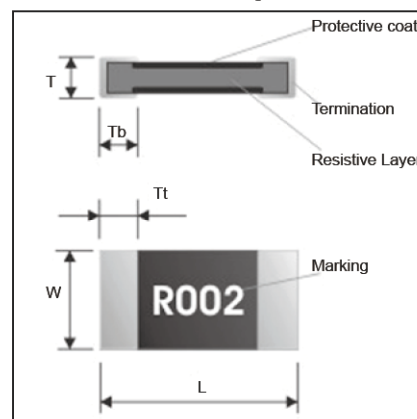
1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"
2. Power derating curve, and detail specification please refer to specific data sheets.
3. Resistance value will be changed by soldering condition and design of soldering pad, please design products in consideration of this change of resistance value.

■ Physical Dimensions:

WW25M(0.002Ω~0.025Ω), WW25N(0.003Ω~0.025Ω)

Unit: mm

Symbol	2512	2010	1206
L	6.40 ± 0.20	5.00 ± 0.20	3.10 ± 0.20
W	3.20 ± 0.20	2.50 ± 0.20	1.60 ± 0.20
T	0.60 ± 0.15	0.60 ± 0.15	0.60 ± 0.25
Tt	0.65 ± 0.25	0.65 ± 0.25	0.60 ± 0.20
Tb	0.65 ± 0.25	0.65 ± 0.25	0.60 ± 0.20

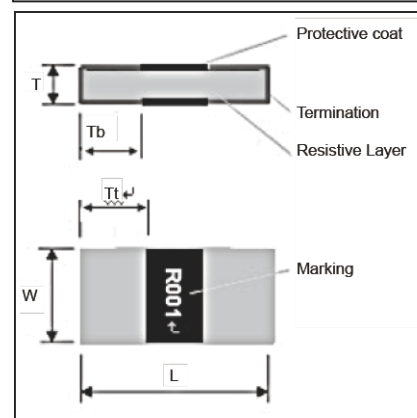


■ Physical Dimensions:

WW25M(0.001Ω), WW25N(0.001Ω~0.002Ω)

Unit: mm

Symbol	Dimensions
L	6.40 ± 0.20
W	3.20 ± 0.20
T	0.60 ± 0.10
Tt	1.60 ± 0.25
Tb	1.60 ± 0.25



WW25Q, WW25R, WW12R, WW12D, WW06R

Note : 1. The detailed dimensions please refer to data sheet per type!

Chip Resistors

www.passivecomponent.com

■ Chip Resistors Array : Convex Termination

■ Feature

1. High reliability and stability
2. Reduced size of final equipment
3. Lower assembly cost and higher surface mounted efficiency
4. Higher component and equipment reliability

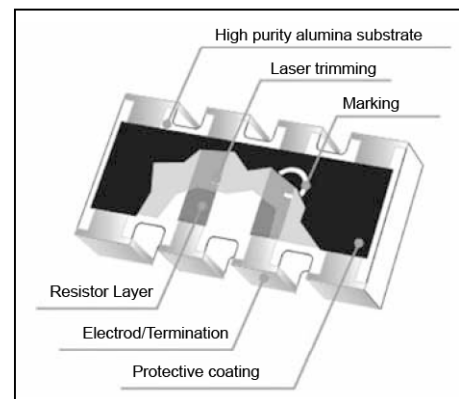
■ Application

1. Consumer electrical equipment, PDA, Digital Camcorder, ...
2. EDP, Computer application
3. Mobile phone, Telecom
4. DIMM

■ Description and Physical Dimensions

The resistors array is 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.

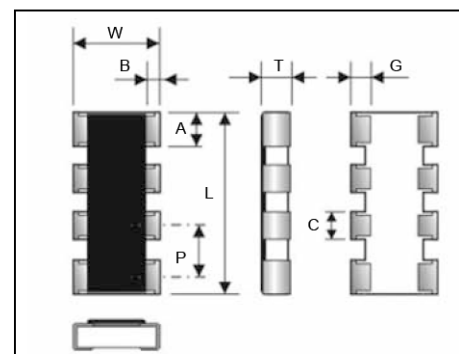
The resistive layer is covered with a protective coat. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is Tin solder alloy. Marking code description is depended on component size and tolerance. Following figure shown the construction of a Chip-R array.



■ Physical Dimensions

Unit: mm

Type	WA06X	WA04X	WA06Y	WA04Y
L	3.20 ± 0.10	2.00 ± 0.10	1.60 ± 0.10	1.00 ± 0.10
W	1.60 ± 0.10	1.00 ± 0.10	1.50 ± 0.10	1.00 ± 0.10
T	0.50 ± 0.10	0.45 ± 0.10	0.50 ± 0.10	0.35 ± 0.10
P	0.80 ± 0.10	0.50 ± 0.05	1.00 ± 0.10	0.65 ± 0.10
A	0.60 ± 0.10	0.4 ± 0.10	0.60 ± 0.10	0.34 ± 0.10
B	0.30 ± 0.10	0.20 ± 0.10	0.30 ± 0.15	0.20 ± 0.15
C	0.40 ± 0.10	0.30 ± 0.05	-	-
G	0.30 ± 0.20	0.25 ± 0.10	0.30 ± 0.15	0.25 ± 0.17



■ Quick Reference Data

Series No.	WA06X	WA04X	WA06Y	WA04Y
Size	0603x4 (1608x4)	0402x4 (1005x4)	0603x2 (1608x2)	0402x2 (1005x2)
Termination construction	8p4R, Convex	8p4R, Convex	4p2R, Convex	4p2R, Convex
Resistance Tolerance	±5%, ±1% (E24 series)			
Resistance Range	10Ω ~ 1MΩ (E24 series), Jumper (0Ω)			
TCR (ppm/°C)	≤ ± 200 ppm/°C	≤ ± 200 ppm/°C	≤ ± 200 ppm/°C	≤ ± 300 ppm/°C
Max. dissipation @ Tamb=70°C	1/10 Watt	1/16 Watt	1/10 Watt	1/16 Watt
Max. Operation Voltage (DC or RMS)	50V	50V	50V	25V
Max. Overload Voltage (DC or RMS)	100V	100V	100V	50V
Climatic category (IEC 60068)	55/155/56			55/125/56
Basic Specification	JIS C 5201-1 / IEC 60115-1			
Circuit Mode: R1=R2(=R3=R4)				

Note :

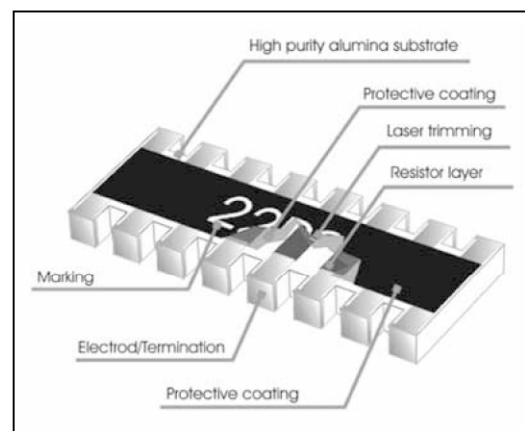
1. Power derating curve, and detail specification please refer to specific data sheets.

■ WA06W Chip Resistors Array 16P8R

■ Description

The resistors array is 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 Tin (Pb free) solder alloy.



■ Quick Reference Data

Item	General Specification	
Series No.	WA06W	WA06W_N
Size	1606 (0602x8)	1606 (0602x8)
Termination construction	Convex type	1606 (0602x8)
Resistance Tolerance	±5% (E24 series)	±5% (E24 series)
Resistance Range	10Ω ~ 100KΩ, Jumper (0Ω)	10Ω~100KΩ, Jumper (0Ω)
TCR (ppm/°C)	≤ ± 200 ppm/°C	± 200 ppm/°C
Max. dissipation @ T _{amb} =70°C	1/16 W	1/16 W
Max. Operation Voltage (DC or RMS)	50V	50V
Max. Overload Voltage (DC or RMS)	100V	100V
Climatic category (IEC 60068)	55/125/56	55/125/56
Circuit Mode		

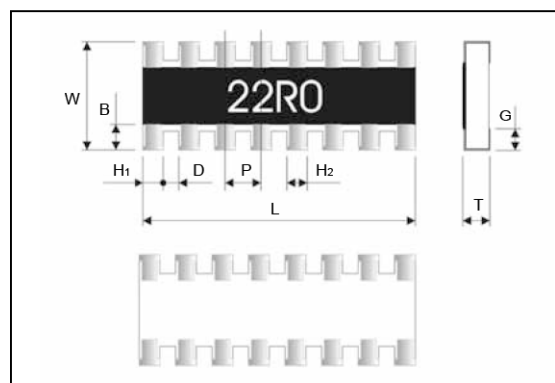
Note :

1. Power derating curve, and detail specification please refer to specific data sheets.

■ Physical Dimensions

Unit: mm

Dimension	WA06W	WA06W_N
L	4.00 ± 0.20	3.80 ± 0.10
W	1.60 ± 0.15	1.60 ± 0.10
T	0.45 ± 0.10	0.45 ± 0.10
B	0.30 ± 0.20	0.30 ± 0.10
G	0.30 ± 0.20	0.30 ± 0.10
D	0.20 ± 0.10	0.20 ± 0.10
P	0.50 ± 0.20	0.50 ± 0.10
H1	0.40 ± 0.20	0.30 ± 0.10
H2	0.30 ± 0.10	0.30 ± 0.10



Chip Resistors

www.passivecomponent.com

■ Chip Resistors Array : Concave Termination

■ Feature

1. High reliability and stability
2. Reduced size of final equipment
3. Lower assembly costs and higher surface mounted efficiency
4. Higher component and equipment reliability
5. Strong body and terminations
6. Excellence performance in surface mounting assembly.

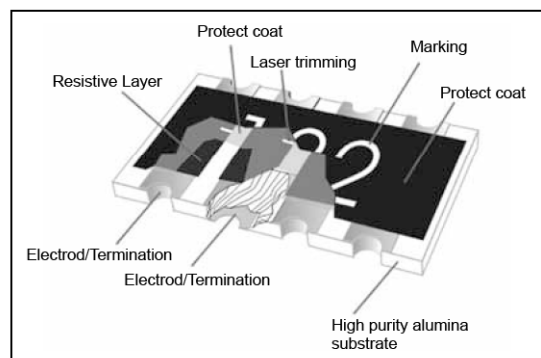
■ Description and Physical Dimensions

The resistors array is 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 Tin solder alloy. Marking code description is depended on component size and tolerance. Following figure shown the construction of a Chip-R array.

■ Application

1. Consumer electrical equipment, PDA, Digital Camcorder, ...
2. EDP, Computer application
3. Mobile phone, Telecom
4. DIMM



■ Quick Reference Data

Item	General Specification		
Series No.	WA06T	WA04T	WA04U
Size	0603x4 (1608x4)	0402x4 (1005x4)	0402x2 (1005x2)
Termination construction	Concave type		
Resistance Tolerance	±5% , ±1% (E24 series)		
Resistance Range	10Ω ~ 1MΩ, Jumper (0Ω)		
TCR (ppm/°C)	≤ ± 200 ppm/°C	≤ ± 300 ppm/°C	± 300 ppm/°C
Max. dissipation @ T _{amb} =70°C	1/10 W	1/16 W	1/16 W
Max. Operation Voltage (DC or RMS)	50V	25V	25V
Max. Overload Voltage	100V	50V	50V
Climatic category (IEC 60068)	55/125/56	55/125/56	55/125/56
Circuit Mode	 R1=R2=R3=R4		 R1=R2
	L	3.20 + 0.20/-0.10 mm	2.00 ± 0.10mm
	W	1.60 + 0.20/-0.10 mm	1.00 ± 0.10mm
	T	0.60 ± 0.20 mm	0.40 ± 0.10 mm
	P	0.80 ± 0.10 mm	0.50 ± 0.05mm
	A	0.60 ± 0.15 mm	0.35 ± 0.05 mm
	B	0.35 ± 0.15 mm	0.20 ± 0.15 mm
	C	0.50 ± 0.15mm	0.25 ± 0.05 mm
	G	0.50 ± 0.15 mm	0.25 ± 0.15mm

Note :

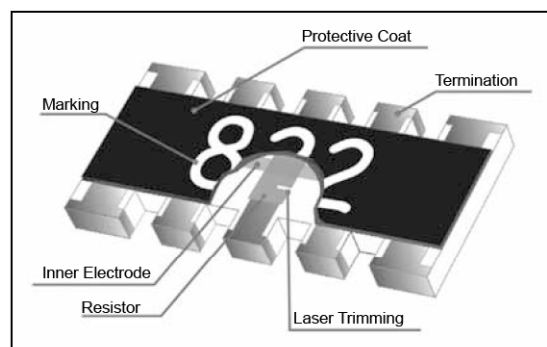
1. Power derating curve and detail specification please refer to specific data sheets.
2. Max. Operation Voltage : So called RCWW (Rated Continuous Working Voltage) is determined by $RCWW = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWW listed above, whichever is lower.

WT04X Chip Resistors Network 10P8R

Description

The resistors array is 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 Tin solder (Pb free) alloy.



Quick Reference Data

Item	General Specification
Series No.	WT04X
Size	0402x8 (1005x8)
Termination construction	Convex type
Resistance Tolerance	±5% (E24 series)
Resistance Range	10Ω ~ 100KΩ
TCR (ppm/°C)	≤ ± 200 ppm/°C
Max. dissipation @ T _{amb} =70°C	1/16 Watt
Max. Operation Voltage (DC or RMS)	25V
Max. Overload Voltage	50V
Climatic category (IEC 60068)	55/155/56
Basic Specification	JIS C 5201-1/IEC 60115-1
Circuit Mode Resistor elements on pin1~pin4, pin6~pin9; R1=R2=R3=R4=R6=R7=R8=R9 pin5 and pin10 common (Grounded).	

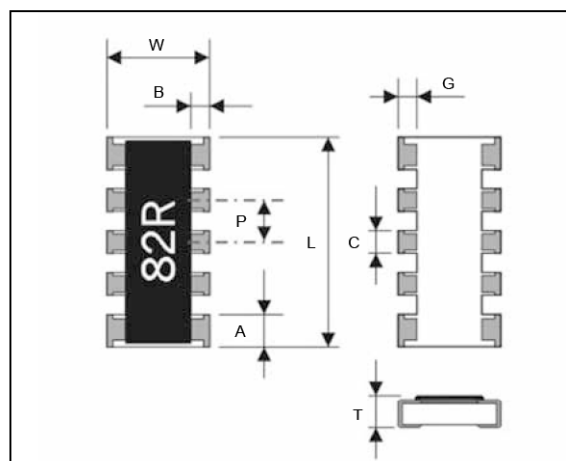
Note :

1. Power derating curve, and detail specification please refer to specific data sheets.
2. Lead Free (Pb free) products are available upon customer's request.

Physical Dimensions

Unit: mm

	WT04X
L	3.30 ± 0.20
W	1.60 ± 0.15
T	0.55 ± 0.10
P	0.64 ± 0.05
A	0.50 ± 0.05
B	0.40 ± 0.15
C	0.40 ± 0.15
G	0.40 ± 0.15



Chip Resistors

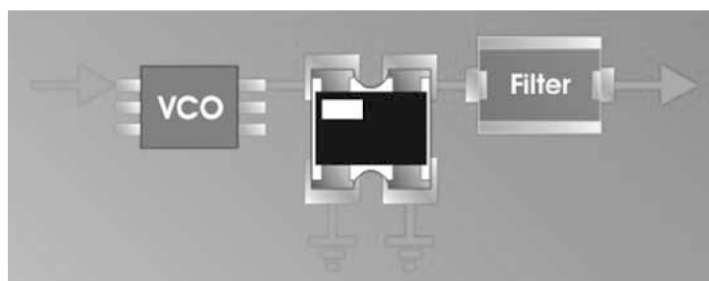
www.passivecomponent.com

WA04P Chip Attenuator

Typical Application of Chip Attenuator

WA04	P	001	X	B	T	L
Size code WA04: 0402 per element	Type code P: convex, π type attenuator	Attenuation Range 001 = 1dB 002 = 2dB 003 = 3dB 004 = 4dB 005 = 5dB 006 = 6dB 007 = 7dB 008 = 8dB 009 = 9dB 010 = 10dB	Characteristic Impedance X: 50 Ω	Attenuation Tolerance A: ± 0.2 dB B: ± 0.3 dB C: ± 0.5 dB D: ± 1.0 dB	Termination T=7" reel taped	Packaging L= Sn base (lead free)

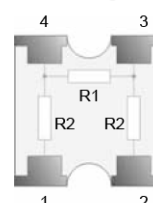
π -Type Attenuator (-6dB, 50W) for VSWR improvement and output frequency level matching on VCO application.



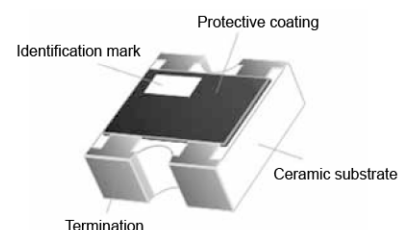
Quick Reference Data

Item	General Specification
Series No.	WA04P
Size	0402 $\times$ 2 (1005 $\times$ 2)
Termination construction	Convex type
Attenuation Range	1dB, 2dB, 3dB, 4dB, 5dB, 6dB, 7dB, 8dB, 9dB, 10dB
Attenuation Tolerance	
1dB ~ 5dB	± 0.3 dB
6dB ~ 10dB	± 0.5 dB
Characteristic impedance	50 Ω
Rated power at T _{amb} =70°C	0.04W / package
Limiting voltage (DC)	50V
Frequency range (DC)	MAX. 2.2 GHz
VSWR (Voltage Standing Wave Ratio)	Max. 1.3
Number of Resistors	3 resistors
Number of Terminals	4 terminals
Climatic category (IEC 60068)	55/125/56

Circuit Configuration



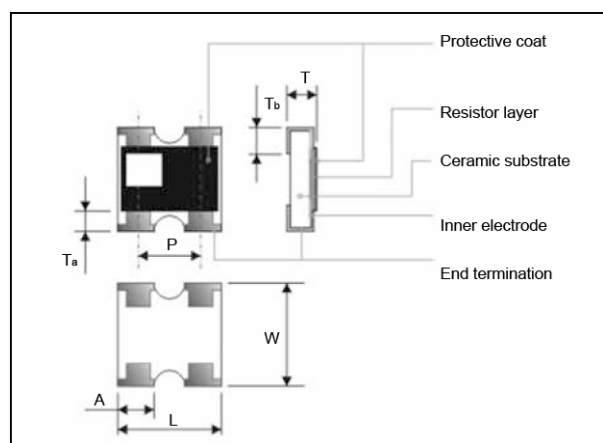
Outline of WA04P Chip attenuator



Physical Dimensions

Unit: mm

	WA04P
L	1.00 $\pm$ 0.10
W	1.00 $\pm$ 0.10
T	0.35 $\pm$ 0.10
P	0.65 $\pm$ 0.10
A	0.33 $\pm$ 0.10
Ta	0.15 $\pm$ 0.10
Tb	0.25 $\pm$ 0.10



■ Special Application Chip Resistors

■ Feature

1. Provided Automotive & Anti-sulfuration resistors (MR/SR series) for Auto & Anti-sulfuration application.
2. Provided Total Lead Free resistors (WR_R series) to fulfill RoHS environmental regulation.
3. Provided trimmable resistors (WKxxM series) for customer special tolerance requirement.
4. Provided high precision tolerance (WFxxH/ WFxxT/WFxxU/WFxxW) down to $\pm 0.05\%$ and TCR down to 10ppm/°C 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.

■ MR/SR Series of Automotive & Anti-Sulfuration Chip Resistor

■ Feature

1. High reliability and stability $\pm 1\%$
2. Sulfuration resistant
3. Automotive grade AEC Q-200 compliant
4. 100% CCD inspection
5. RoHS compliant and lead free

■ Application

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

■ Quick Reference Data

Series No.	MR12X	MR08X	MR06X	MR04X
Size code	1206(3126)	0805(2012)	0603(1608)	0402(1005)
Resistance Range	1Ω~10MΩ ($\pm 1\%$, $\pm 5\%$), Jumper			
TCR (ppm/°C)	± 200 ppm*			
Max. dissipation @ $T_{amb}=70^{\circ}\text{C}$	1/4 W	1/8 W	1/10 W	1/16 W
Max. Operation Voltage (DC or RMS)	200V	150V	75V	50V
Climatic category (IEC 60068)	55/155/56			

Series No.	SR12X	SR08X	SR06X	SR04X
Size code	1206(3126)	0805(2012)	0603(1608)	0402(1005)
Resistance Range	1Ω~10MΩ ($\pm 1\%$, $\pm 5\%$), Jumper			
TCR (ppm/°C)	± 200 ppm*			
Max. dissipation @ $T_{amb}=70^{\circ}\text{C}$	1/4 W	1/8 W	1/10 W	1/16 W
Max. Operation Voltage (DC or RMS)	200V	150V	75V	50V
Climatic category (IEC 60068)	55/155/56			

Remark: *Detail specification please refer to specific data sheets!

* MR series can withstand H_2S 3ppm x 1000 hrs

* SR series can withstand H_2S 1000ppm x 720 hrs

■ WR_R Series of Total Lead Free Chip Resistors

■ Feature

1. High reliability and stability
2. Reduced size of final equipment
3. Low assembly costs
4. Higher component and equipment reliability
5. RoHS compliant and total lead free

■ Quick Reference Data

Series No.	WR12_R	WR08_R	WR06_R	WR04_R
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Range	1Ω -10MΩ ($\pm 1\%$, $\pm 5\%$), Jumper			
TCR (ppm/°C)	$\leq \pm 200$ ppm*			
Max. dissipation @ $T_{amb}=70^{\circ}\text{C}$	1/4 W	1/8 W	1/10 W	1/16 W
Max. Operation Voltage (DC or RMS)	200V	150V	50V	50
Climatic category (IEC 60068)	55/155/56			

Remark: *Detail specification please refer to specific data sheets!

■ Part No. Definition

1 st code	2 nd code	3 rd ~ 4 th code	5 th code	6 th ~ 9 th code	10 th code	11 th code	12 th code
□	□	□□	□	□□□□	□	□	R
WTC	Type code	Size code	Functional code	Marking code (Resistance)	Tolerance code	Packaging code	Termination code
Example W	R	04	X	1000	F	T	R

Chip Resistors

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■ WKxxM 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 end 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 covered with a transparent protective coating. Finally the two external end terminations are added. For case of soldering the outer of these end terminations is Tin solder (Pb free) alloy.

■ Physical Dimensions

Unit: mm

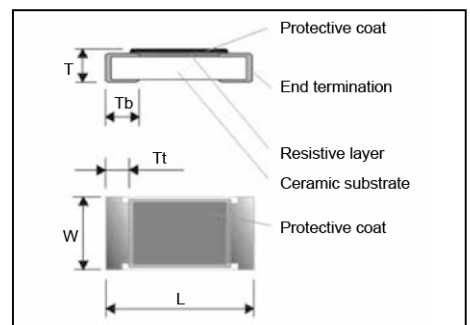
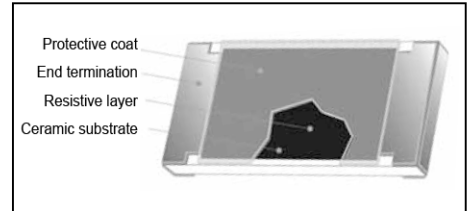
Dimension	WK25M	WK20M	WK10M	WK12M	WK08M	WK06M
L	6.30±0.15	5.00±0.15	3.10±0.15	3.10±0.15	2.00±0.10	1.60±0.10
W	3.20±0.15	2.50±0.15	2.50±0.15	1.60±0.15	1.25±0.10	0.80±0.15/-0.10
T	0.55±0.15	0.55±0.15	0.55±0.15	0.55±0.10	0.55±0.10	0.45±0.10
Tb	0.60±0.20	0.60±0.20	0.50±0.25	0.50±0.25	0.40±0.20	0.30±0.10
Tt	0.60±0.20	0.60±0.20	0.50±0.25	0.50±0.25	0.40±0.20	0.30±0.10

■ Quick Reference Data

Series No.	WK25M	WK20M	WK10M	WK12M	WK08M	WK06M
Size code	2512(6332)	2010(5025)	1210(3225)	1206(3216)	0805(2012)	0603(1608)
Resistance Tolerance	0/-20%(Y) and 0/-30%(X) E24 series					
Resistance Range	1Ω ~ 4.7MΩ					10Ω ~ 4.7MΩ
TCR (ppm/°C)	10Ω ~ 4.7MΩ: ±200 ppm/°C 1Ω ~ 9.1Ω: -200 ~ +500 ppm/°C					±200 ppm/°C
Max. dissipation @ Tamb=70°C	1 W	1/2 W	1/4 W	1/8 W	1/10 W	1/16 W
Max. Operation Voltage (DC or RMS)	200V	200V	200V	200V	150V	50V
Climatic category (IEC 60068)	55/125/56					
Basic Specification	JIS C 5201-1 / IEC 60115-1					

■ Application

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



■ Trimming Conditions

Please refer to specific data sheet.

■ WKxxV Series of High Voltage Chip Resistors

■ Feature

1. Special material and design for high working voltage required
2. Compatible with flow and reflow soldering.
3. Suitable for lead free soldering.

■ Quick Reference Data

Series No.	WK25V	WK20V	WK12V	WK08V	WK06V
Size code	2512 (6432)	2010 (5025)	1206 (3216)	0805 (2012)	0603 (1608)
Resistance Tolerance	±5%, ±1%				
Resistance Range	47 ~ 51MΩ				47 ~ 10MΩ
TCR (ppm/°C)	±200ppm * details refer to data sheet				
Max. dissipation @ Tamb=70°C	1W	1/2W	1/4W	1/8W	1/10W
Max. Operation Voltage (DC or RMS)	800V	500V	500V	400V	200V
Climatic category (IEC 60068)	55/125/56				

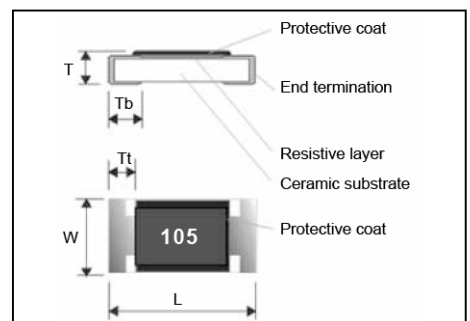
Note:

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 $RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.

■ Physical Dimensions

Unit: mm

Symbol	WK25V	WK20V	WK12V	WK08V	WK06V
L	6.30±0.15	5.00±0.15	3.10±0.15	2.00±0.10	1.60±0.10
W	3.20±0.15	2.50±0.15	1.60±0.15	1.25±0.10	0.80±0.15/-0.10
T	0.55±0.15	0.55±0.15	0.55±0.10	0.55±0.10	0.45±0.10
Tt	0.60±0.20	0.60±0.20	0.50±0.25	0.40±0.20	0.30±0.10
Tb	0.60±0.20	0.60±0.20	0.50±0.25	0.40±0.20	0.30±0.10



WFxxP Series of High Power Chip Resistors

Feature

1. High power rating and compact size
2. High reliability and stability
3. Reduced size of final equipment
4. Lead free product is upon customer requested.

Quick Reference Data

Series No.	WF25P	WF20P	WF10P	WF12P	WF08P	WF06P	WF04P
Size code	2512(6432)	2010(5025)	1210(3225)	1206(3216)	0805(2012)	0603 (1608)	0402(1005)
Resistance Tolerance	±1% , ±5%						
Resistance Range	0Ω, 1Ω ~ 1MΩ						
TCR (ppm/°C)	± 100 ppm/°C						
Max. dissipation @ T _{amb} =70°C	2W	1W	1/2W	1/2W	1/4W	1/8W	1/10W
Max. Operation Voltage (DC or RMS)	300V	200V	200V	200V	150V	50V	50V
Climatic category (IEC 60068)	55/155/56						

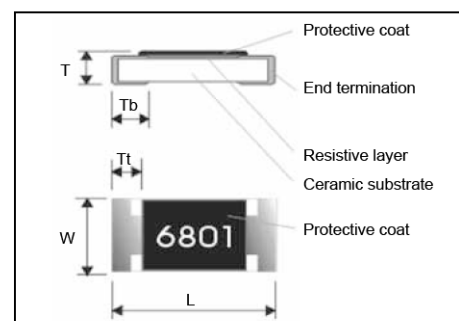
Note:

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 $RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.
3. 2W loading with total solder-pad and trace size of 300 mm²
4. 0Ω maximum resistance R_{max} < 15mΩ and rated current < 4Amp

Physical Dimensions

Unit: mm

Symbol	WF25P	WF20P	WF10P	WF12P	WF08P	WF06P	WF04P
L	6.30±0.20	5.00±0.20	3.10±0.10	3.10±0.15	2.00±0.15	1.60±0.10	1.00±0.05
W	3.10±0.20	2.50±0.20	2.60±0.10	1.60±0.15	1.20±0.15	0.80±0.10	0.50±0.05
T	0.60±0.15	0.60±0.10	0.55±0.10	0.55±0.10	0.50±0.10	0.45±0.10	0.35±0.05
Tt	0.60±0.25	0.60±0.25	0.50±0.20	0.50±0.25	0.40±0.20	0.30±0.20	0.25±0.10
Tb	1.80±0.25	0.60±0.25	0.50±0.20	0.50±0.25	0.40±0.20	0.30±0.20	0.25±0.10



WKxxS Series of Surge Chip Resistors

Feature

1. Power rating and compact size
2. High reliability and stability
3. Reduced size of final equipment
4. Surge protection

Quick Reference Data

Item	General Specification				
Series No.	WK25S	WK20S	WK10S	WK12S	WK08S
Size code	2512(6432)	2010(5025)	1210(3225)	1206(3216)	0805(2012)
Resistance Tolerance	±5%, ±10%, ±20%, (E24)				
Resistance Range	0.27Ω ~ 22MΩ				
TCR (ppm/°C)	± 200 ppm/°C				
Max. dissipation @ T _{amb} =70°C	1 W	3/4W	1/2W	1/4W	1/8W
Max. Operation Voltage (DC or RMS)	200V				150V
Climatic category (IEC 60068)	55/155/56				

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 $RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$ or Max. RCWV listed above, whichever is lower.

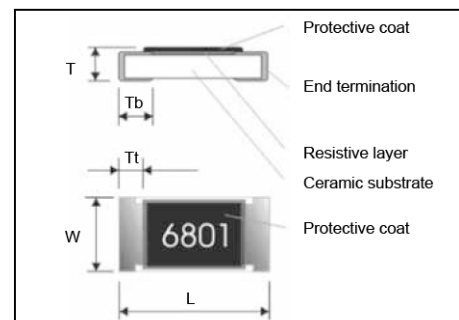
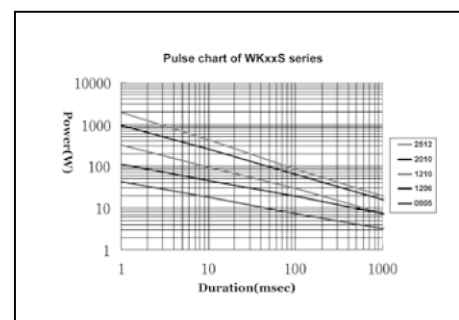
Physical Dimensions

Unit: mm

Symbol	WK25S	WK20S	WK10S	WK12S	WK08S
L	6.30±0.15	5.00±0.15	3.20±0.15	3.20±0.15	2.00±0.10
W	3.20±0.15	2.50±0.15	2.50±0.15	1.60±0.15	1.25±0.10
T	0.55±0.15	0.55±0.15	0.55±0.15	0.55±0.10	0.55±0.10
Tt	0.30±0.15	0.30±0.15	0.30±0.20	0.30±0.20	0.30±0.20
Tb	0.60±0.20	0.60±0.20	0.50±0.25	0.50±0.25	0.40±0.20

Application

1. Power supply
2. Measurement instrument
3. Automotive industry
4. Medical or Military equipment



Chip Resistors

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High Precision Chip Resistors

Narrow Tolerance Thick Film TC100 WFxxH Series

Quick Reference Data

Series No.	WF12H	WF08H	WF06H	WF04H
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	$\pm 0.5\%$, $\pm 0.1\%$			
Resistance Range	10 Ω ~ 1M Ω (E96+E24 series)			
TCR (ppm/ $^{\circ}$ C) 10M Ω ≤R≤1M Ω	± 100 ppm/ $^{\circ}$ C			
Max. dissipation @ T _{amb} =70 $^{\circ}$ C	1/4 W	1/8 W	1/10 W	1/16 W
Max. Operation Voltage (DC or RMS)	200V	100V	50V	50V
Climatic category (IEC 60068)	55/155/56			
Basic Specification	JIS C 5201-1 / IEC 60115-1			

(Detail specification please refer to specific data sheets)

Narrow Tolerance Thin Film TC50 WFxxT/ WFxxQ Series

Quick Reference Data

Series No.	WF12T	WF12Q	WF08T	WF08Q	WF06T	WF06Q	WF04T
Size	1206 (3216)	1206 (3216)	0805 (2012)	0805 (2012)	0603 (1608)	0603 (1608)	0402 (1005)
Resistance Tolerance	$\pm 1\%$, $\pm 0.5\%$, $\pm 0.1\%$						
Resistance Range	10 ~ 1M Ω	10 ~ 1M Ω	10 ~ 1M Ω	10 ~ 1M Ω	10 ~ 330K Ω	10 ~ 330K Ω	10 ~ 100K Ω
TCR (ppm/ $^{\circ}$ C)	± 50 ppm/ $^{\circ}$ C						
Max. dissipation @ T _{amb} =70 $^{\circ}$ C	1/8W	1/4W	1/10W	1/8W	1/16W	1/10W	1/16W
Max. Operation Voltage (DC or RMS)	200V	200V	100V	150V	50V	75V	25V
Climatic category (IEC 60068)	55/125/56						
Basic Specification	JIS C 5201-1 / IEC 60115-1						

(Detail specification please refer to specific data sheets)

Narrow Tolerance Thick Film TC25 WFxxU/ WFxxR Series

Quick Reference Data

Series No.	WF12U	WF12R	WF08U	WF08R	WF06U	WF06R	WF04U
Size code	1206 (3216)	1206 (3216)	0805 (2012)	0805 (2012)	0603 (1608)	0603 (1608)	0402 (1005)
Resistance Tolerance	$\pm 0.5\%$, $\pm 0.1\%$, $\pm 0.05\%$						
Resistance Range	10 ~ 1M Ω	10 ~ 1M Ω	10 ~ 1M Ω	10 ~ 1M Ω	10 ~ 330K Ω	10 ~ 330K Ω	10 ~ 100K Ω
TCR (ppm/ $^{\circ}$ C)	± 25 ppm/ $^{\circ}$ C						
Max. dissipation @ T _{amb} =70 $^{\circ}$ C	1/8W	1/4W	1/10W	1/8W	1/16W	1/10W	1/16W
Max. Operation Voltage (DC or RMS)	200V	200V	100V	150V	50V	75V	25V
Climatic category (IEC 60068)	55/125/56						
Basic Specification	JIS C 5201-1 / IEC 60115-1						

(Detail specification please refer to specific data sheets)

Narrow Tolerance Thin Film TC15 WFxxF Series

Series No.	WF12F*	WF08F	WF06F	WF04F*
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	$\pm 0.5\%$, $\pm 0.1\%$, $\pm 0.05\%$			
Resistance Range	100 ~ 200K Ω	100 ~ 200K Ω	100 ~ 100K Ω	100 ~ 20K Ω
TCR (ppm/ $^{\circ}$ C)	± 15 ppm			
Max. dissipation @ T _{amb} =70 $^{\circ}$ C	1/8W	1/8W	1/10W	1/16W
Max. Operation Voltage (DC or RMS)	150V	100V	50V	25V
Climatic category (IEC 60068)	55/125/56			
Basic Specification	JIS C 5201-1 / IEC 60115-1			

(Detail specification please refer to specific data sheets)

* Sample is available upon request

Narrow Tolerance Thin Film TC10 WFxxW Series

Series No.	WF12W*	WF08W	WF06W	WF04W*
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	$\pm 0.5\%$, $\pm 0.1\%$, $\pm 0.05\%$			
Resistance Range	100 ~ 100K Ω	100 ~ 100K Ω	100 ~ 50K Ω	100 ~ 10K Ω
TCR (ppm/ $^{\circ}$ C)	$\leq \pm 10$ ppm/ $^{\circ}$ C			
Max. dissipation @ T _{amb} =70 $^{\circ}$ C	1/8W	1/8W	1/10W	1/16W
Max. Operation Voltage (DC or RMS)	150V	100V	50V	25V
Climatic category (IEC 60068)	55/125/56			
Basic Specification	JIS C 5201-1 / IEC 60115-1			

(Detail specification please refer to specific data sheets)

* Sample is available upon request

Test and Requirements

For WR Series

Test	Procedure / Test Method	Requirements	
		Resistor	0Ω
Electrical Characteristics JISC5201-1: 1998 Clause 4.8	- DC resistance values measurement - Temperature Coefficient of Resistance (T.C.R) Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ $t_1 : 20^\circ\text{C} \pm 5^\circ\text{C} - 1^\circ\text{C}$ $R_1 : \text{Resistance at reference temperature (20}^\circ\text{C} \pm 5^\circ\text{C} - 1^\circ\text{C)}$ $R_2 : \text{Resistance at test temperature (-55}^\circ\text{C or +155}^\circ\text{C)}$	Within the specified tolerance Refer to "QUICK REFERENCE DATA"	< 50m Ω
Resistance to soldering heat (R.S.H) JISC5201-1:1998 Clause 4.18	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C±5°C	±5%: ΔR/Rmax. (1%+0.05Ω) ±1%: ΔR/Rmax. (0.5%+0.05Ω) no visible damage	< 50m Ω
Solderability JISC5201-1: 1998 Clause 4.17	Un-mounted chips completely immersed for 2±0.5 second in a SAC solder bath at 235°C±5°C	95% coverage min., good tinning and no visible damage	
Temperature cycling JISC5201-1: 1998 Clause 4.19	30 minutes at -55°C±3°C, 2~3 minutes at 20°C+5°C-1°C, 30 minutes at +155°C±3°C, 2~3 minutes at 20°C+5°C-1°C, total 5 continuous cycles	±5%: ΔR/Rmax. (1%+0.05Ω) ±1%: ΔR/Rmax. (0.5%+0.05Ω) no visible damage	< 50m Ω
High Temperature Exposure MIL-STD-202 method 108	1000+48/-0 hours; without load in a temperature chamber controlled 155±3°C	±5%: ΔR/Rmax. (2%+0.1Ω) ±1%: ΔR/Rmax. (1%+0.1Ω) no visible damage"	< 50m Ω
Bending strength JISC5201-1: 1998 Clause 4.33	Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 3mm for 10sec, 5mm for WR04	±5%: ΔR/Rmax. (1%+0.05Ω) ±1%: ΔR/Rmax. (1%+0.05Ω) no visible damage	< 50m Ω
Adhesion JISC5201-1: 19 Clause 4.32	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations	
Short Time Overload (STOL) JISC5201-1: 1998 Clause 4.13	2.5 times RCWV or max. overload voltage, for 5seconds	±5%: ΔR/Rmax. (2%+0.1Ω) ±1%: ΔR/Rmax. (1%+0.1Ω) no visible damage	< 50m Ω
Load life in Humidity JISC5201-1: 1998 Clause 4.24	1000 +48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller at 40°C±2°C and 90~95% relative humidity, 1.5hours on and 0.5 hours off	±5%: ΔR/Rmax. (2%+0.1Ω) ±1%: ΔR/Rmax. (1%+0.1Ω) no visible damage	< 50m Ω
Load life (endurance) JISC5201-1: 1998 Clause 4.25	1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 70±2°C, 1.5 hours on and 0.5 hours off	±5%: ΔR/Rmax. (2%+0.1Ω) ±1%: ΔR/Rmax. (1%+0.1Ω) no visible damage	< 50m Ω
Insulation Resistance JISC5201-1: 1998 Clause 4.6	Apply the maximum overload voltage (DC) for 1minute	R≥10GΩ	
Dielectric Withstand Voltage JISC5201-1: 1998 Clause 4.7	Apply the maximum overload voltage (AC) for 1 minute	No breakdown or flashover	

Chip Resistors

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■ For WW Series

Test	Procedure / Test Method	Requirements
		Resistor
Electrical Characteristics JISC5201-1: 1998 Clause 4.8	- DC resistance values measurement - Temperature Coefficient of Resistance (T.C.R) Natural resistance change per change in degree centigrade. $R2-R1/R1(T2-T1) \times 10^6$ (ppm/°C) T1:20°C+5°C-1°C R1:Resistance at reference temperature (20°C+5°C/-1°C) R2:Resistance at test temperature (-55°C or +155°C)	Within the specified tolerance Refer to "QUICK REFERENCE DATA"
Resistance to soldering heat(R.S.H) JISC5201-1:1998 Clause 4.18	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C±5°C	ΔR/R max. ±(1%+0.005Ω) no visible damage
Solderability JISC5201-1:1998 Clause 4.17	Un-mounted chips completely immersed for 2±0.5 second in a SAC solder bath at 235°C±5°C	95% coverage min., good tinning and no visible damage
Temperature cycling JISC5201-1:1998 Clause 4.19	30minutes at -55°C±3°C, 2~3minutes at 20°C+5°C-1°C,30minutes at +155°C±3°C,2~3minutes at 20°C+5°C-1°C,total 5continuous cycles	ΔR/R max. ±(1%+0.005Ω) no visible damage
High Temperature Exposure MIL-STD-202 Method 108	1000+48/-0 hours; without load in a temperature chamber controlled 155°C±3°C	ΔR/R max. ±(3%+0.005Ω) no visible damage
Bending strength JISC5201-1:1998 Clause 4.33	Resistors mounted on a 90mm glass epoxy resin PCB(FR-4), bending once 3mm for 10sec, 5mm for WR04	ΔR/R max. ±(1%+0.005Ω) no visible damage
Adhesion JISC5201-1:1998 Clause 4.32	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations
Short Time Overload (STOL) JISC5201-1:1998 Clause 4.13	2.5 times RCWV or max. overload voltage, for 5seconds	ΔR/R max. ±(2%+0.005Ω) no visible damage
Load life in Humidity JISC5201-1:1998 Clause 4.24	1000+48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller 40°C±2°Cat and 90~95% relative humidity, 1.5 hours on and 0.5 hours off	ΔR/R max. ±(3%+0.005Ω) no visible damage
Load life (endurance) JISC5201-1:1998 Clause 4.25	1000+48/-0 hours, loaded with RCWV or Vmax in chamber controller 70°C±2°C 1.5 hours on and 0.5 hours off	ΔR/R max. ±(3%+0.005Ω) no visible damage
Insulation Resistance JISC5201-1:1998 Clause 4.6	Apply the maximum overload voltage (DC) for 1minute	R≥10GΩ
Dielectric Withstand Voltage JISC5201-1:1998 Clause 4.7	Apply the maximum overload voltage (AC) for 1minute	No breakdown or flashover

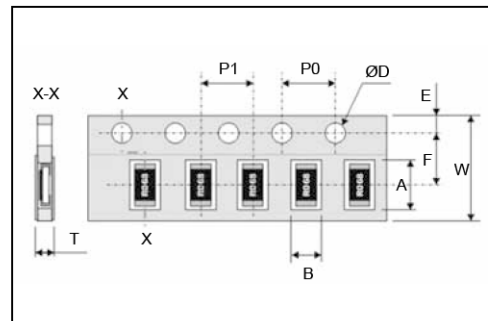
Packing on Tape and Reel

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, WA04T, WA04U, 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			
WR02X	8.00 ± 0.20	3.50 ± 0.05			

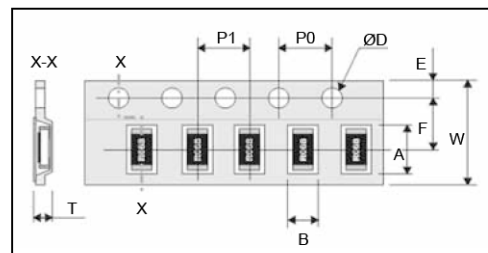
Component Size / Series	A	B	P1	T
1206 (3216), WA06X, WA06T	3.60 ± 0.20	2.00 ± 0.20	4.00 ± 0.10	Max. 1.0
0805 (2012)	2.40 ± 0.20	1.65 ± 0.20		0.65 ± 0.05
0603 (1608)	1.90 ± 0.20	1.10 ± 0.20		0.40 ± 0.05
0402 (1005)	1.20 ± 0.10	0.70 ± 0.10	2.00 ± 0.10	Max. 0.6
WA04X, WA04T	2.20 ± 0.20	1.20 ± 0.20	2.00 ± 0.05	0.45 ± 0.05
WA04Y, WA04P, WA04U	1.15 ± 0.10	1.15 ± 0.10	2.00 ± 0.05	0.85 ± 0.05
WT04X	3.45 ± 0.2/-0	1.85 ± 0.2/-0	4.00 ± 0.10	0.65 ± 0.05
WA06W	4.20 ± 0.2/-0	1.80 ± 0.2/-0	4.00 ± 0.10	0.45 ± 0.05
WR02X	0.67 ± 0.05	0.37 ± 0.05	2.00 ± 0.05	



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

Unit: mm

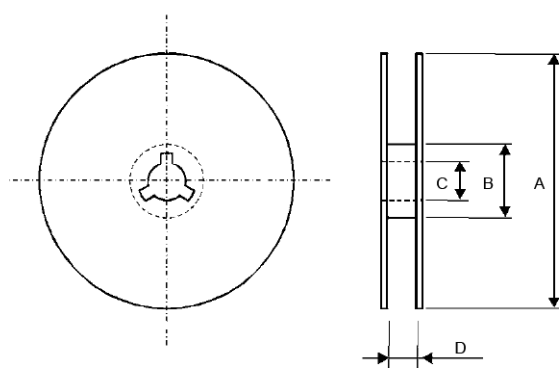
Component Size	2512 (6432)	2010 (5025)	1218 (3248)
A	6.90 ± 0.20	5.50 ± 0.20	3.55 ± 0.30
B	3.60 ± 0.20	2.80 ± 0.20	4.90 ± 0.20
W	12.00 ± 0.30		
F	5.50 ± 0.1		
E	1.75 ± 0.10		
P1	4.00 ± 0.10		
P0	4.00 ± 0.10		
ØD	Ø1.50 $^{+0.1}_{-0.0}$		
T	Max. 1.2		



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

Unit: mm

Reel / Tape	A	B	C	D
7" reel for 8mm tape	Ø178.0 ± 0.2	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 ± 0.2
13" reel for 8mm tape	Ø330.0 ± 2.0	Ø100.0 ± 1.0	13.0 ± 0.2	9.0 ± 0.50



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

Unit: mm

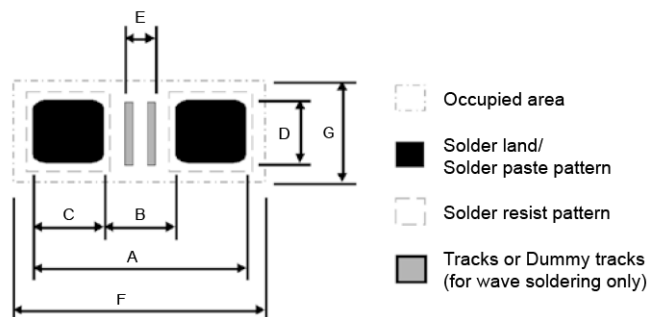
Component Size / Series	Q'ty per reel	Reel diameter
0603, 0805, 1206	1,000 pcs	4" reel
1210, 1206, 0805, 0603, WA06X, WA06T, WT04X	5,000 pcs	7" reel
0402, WA04X, WA04Y, WA04P, WA04T, WA04U	10,000 pcs	7" reel
0201, 0402	15,000 pcs	7" reel
WA06X, WA06Y	5,000 pcs	7" reel
2512, 2010	4,000 pcs	7" reel
1218	3,000 pcs	10" reel
1206, 0805, 0603, WA06X, WA06T	10,000 pcs	10" reel
0402, WA04X, WA04Y	20,000 pcs	10" reel
2010, 2512	8,000 pcs	10" reel
0402	70,000 pcs	13" reel
WA04X, WA04Y	40,000 pcs	13" reel
1206, 0805, 0603, WA06X	20,000 pcs	13" reel
2010, 2512	16,000 pcs	13" reel

Chip Resistors

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Footprint Design

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



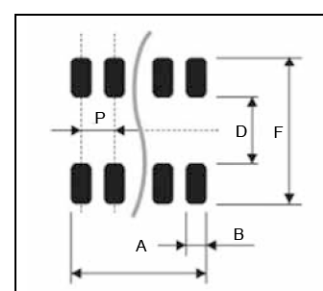
Unit: mm

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							Processing 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	1 x (0.15 x 0.80)	± 0.25
0805	3.40	1.30	1.05	1.30	0.20	4.30	2.70	1 x (0.20 x 1.30)	± 0.25
1206	4.80	2.30	1.25	1.70	1.25	5.90	3.20	3 x (0.25 x 1.70)	± 0.25
1218	4.80	2.30	1.25	4.80	1.30	5.90	5.60	3 x (0.25 x 4.80)	± 0.25
2010	6.30	3.50	1.40	2.50	3.00	7.00	3.60	3 x (0.75 x 2.50)	± 0.25
2512	8.50	4.50	2.00	3.20	3.00	9.00	4.30	3 x (1.00 x 3.20)	± 0.25

Footprint Design for Array Resistor/Attenuator :

Unit: mm

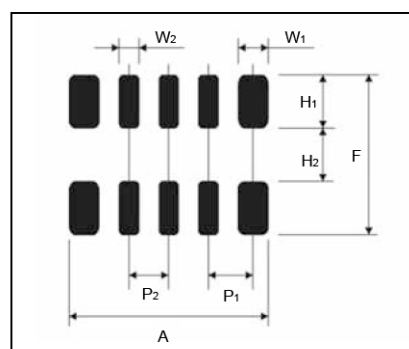
Symbol	0603*4 array	0402*4 array	WA04Y, WA04P	WA06W
A	2.85+0.10/-0.05	1.80+0.15/-0.05	1.20 ± 0.05	3.85+0.20/-0.05
B	0.45 ± 0.05	0.30 ± 0.05	0.40 +0/-0.05	0.28 +0/-0.05
D	0.80 ± 0.10	0.50 ± 0.1	0.50 ± 0.05	1.00 +0.10/-0.20
P	0.80	0.50	0.65	0.50
F	3.10 ± 0.30	2.00 +0.40/-0.20	1.50 +0.20/-0.10	3.20 ± 0.40



Footprint Design for 10P8R Network Resistor :

Unit: mm

Symbol	WT04X
W1	0.50 ± 0.05
W2	0.35 ± 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



Storage and Handling Conditions:

1. Products are recommended to be used up within one year. Check solderability in case shelf life extension is needed.
2. To store products with following condition:
Temperature : 5 to 40°C
Humidity : 20 to 70% relative humidity
3. Caution:
 - a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
 - b. To store products on the shelf and avoid exposure to moisture.
 - c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

Precaution of Soldering

1. It is recommended to use a mildly activated rosin flux (less than 0.1% wt chlorine)
2. Excessive flux must be avoided
3. When water-soluble flux is used, enough washing is necessary
4. Two times limitations for reflow soldering is highly recommended
5. Solder repair by soldering iron
 - a. max. 350°C for below 3 seconds is highly recommended
 - b. Do not directly contact termination to avoid thermal shock
6. Prevent any external force on the products until solder is cooled

Mounting

1. Imperfect adjustment of mounting machine may cause the cracks, the chipping and the alignment error.
Check and inspect the mounting machine in advance.
2. Set the backup pins in proper layout otherwise the components mounted on the backside of the board are damaged. Do not set these pins at the position of the nozzle.
3. Adjust the bottom dead point of dispenser away from the board when you apply adhesive.
4. Confirm that the products are corresponding to flow soldering when you perform it.
5. Pay attention to the amount of solder because improper amount of solder place large stress on the products and cause cracks or malfunctions.

Recommendation of Soldering Profile:

In general application, the lead free (Pb-free) termination CRs are used and may be mounted on PCB by IR reflow or wave soldering process with lead-free solder material. The recommended soldering profiles are shown as Fig.1 & 2.

The lead-free termination CRs are also suitable on SMT process against lead-containing solder paste. But the soldering temperature should be higher than the melting point of solder paste 30°C at least.

If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N₂ within oven are recommended. Advised IR reflow soldering profile is shown as Fig.3.

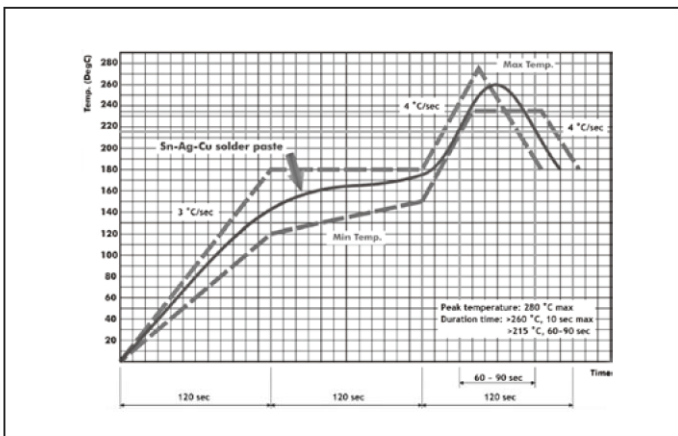


Fig. 1 Recommended IR reflow soldering profile for SMT process with SnAgCu series solder paste.

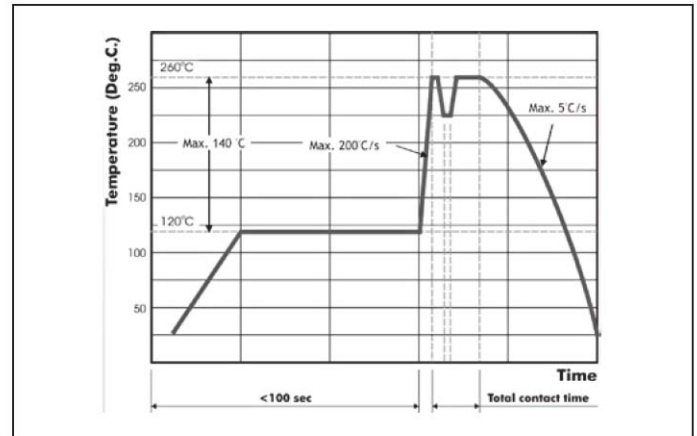


Fig. 2 Recommended wave soldering profile for SMT process with SnAgCu series solder.

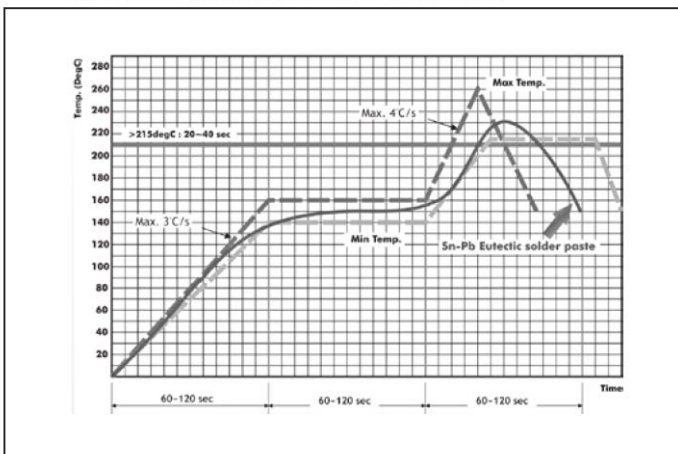


Fig. 3 Recommended reflow soldering profile for SMT process with eutectic SnPb solder paste.

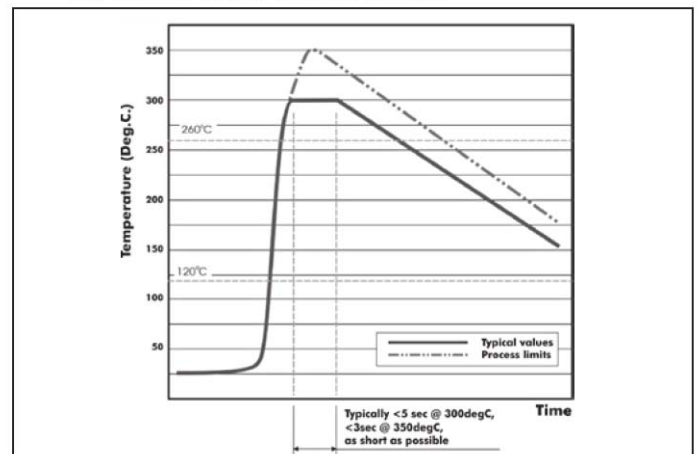


Fig. 5 Recommended soldering profile by manual with SnAgCu series solder material.

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