APPROVAL SHEET

WK12M / WK08M / WK06M

0/-20%, 0/-30%

Trimmable chip resistors

Size 1206, 0805, 0603,

Customer : _____

Approval No : _____

Issue Date : _____

Customer Approval :

FEATURE

1. Reduced size of final equipment
2. Lower assembly costs
3. Higher component and equipment reliability
4. Improved performance at high frequency
5. Low noise, when not trimmed
6. RoHS compliant and Lead free termination

APPLICATION

- Consumer electrical equipment
- Automotive application
- EDP, Computer application
- Telecom application

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 covered 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 Tin (lead free) alloy.

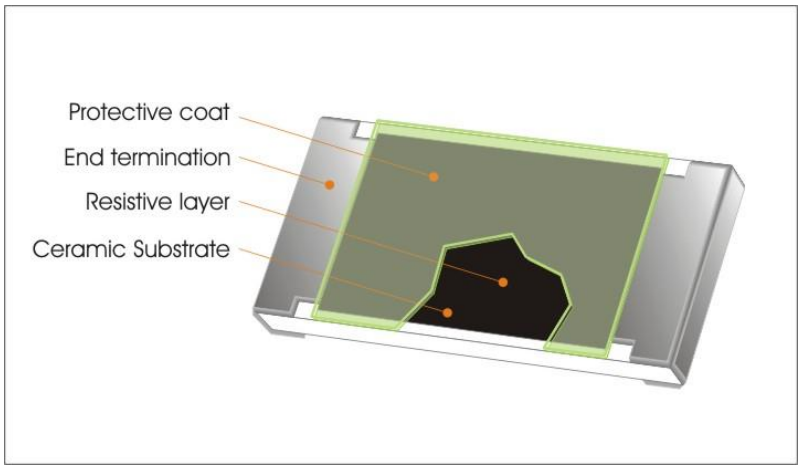


Fig 1. Construction of Trimmable Chip-R

QUICK REFERENCE DATA

Item	General Specification		
Series No.	WK12M	WK08M	WK06M
Size code	1206 (3216)	0805 (2012)	0603 (1608)
Resistance Range	1Ω ~ 4.7MΩ	1Ω ~ 4.7MΩ	10Ω ~ 4.7MΩ
Tolerance	0/-20% and 0/-30% (E24 series)		
TCR (ppm/°C) ≥10Ω <10Ω	 ≤ ± 200 ppm/°C -200~+500 ppm/°C	 ≤ ± 200 ppm/°C -200~+500 ppm/°C	 ≤ ± 200 ppm/°C
Max. dissipation at T_{amb}=70°C	1/8 W	1/10W	1/16W
Max. Operation Voltage (DC or RMS)	200V	150V	50V
Climatic category (IEC 60068)	55/125/56		

Note :

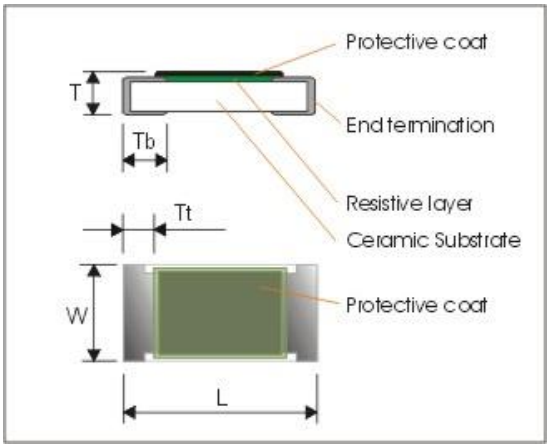
1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"

2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by

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

Dimensions

	WK12M
L	3.20 ± 0.15
W	1.60 ± 0.15
T	0.55 ± 0.10
Tb	1.30 ± 0.10
Tt	0.50 ± 0.25



	WK08M	WK06M
L	2.00 ± 0.10	1.60 ± 0.10
W	1.25 ± 0.10	0.80 ± 0.10
T	0.55 ± 0.10	0.45 ± 0.10
Tb	0.66 ± 0.10	0.30 ± 0.10
Tt	0.40 ± 0.20	0.30 ± 0.10

MARKING

No marking for Trimmable Chip Resistor

TRIMMING INTRODUCTIONS

Typical value for a YAG-laser;

cutting speed	: 10-200 mm/sec,
laser power	: 1-6 Watt,
bite size	: 3~10μm (= speed / Q_rate , Bite Size is the distance each laser spot moving and influence the trimming accuracy)

maximum trimming length : 60% of resistive film width, minimum distance from end termination to trimming cut : 0.20mm, minimum distance between cuts (double-cut) : 0.5mm

Protection of the laser cut

by epoxy-fenol lacquers, epoxy resins or silicon alkyd-resins.

This is necessary for humidity test and stability under loaded.

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of 0/-20%, and 0/-30%. The values of the E24 series are in accordance with “IEC publication 60063”

Derating

The power that the resistor can dissipate depends on the operating temperature; see Fig.2

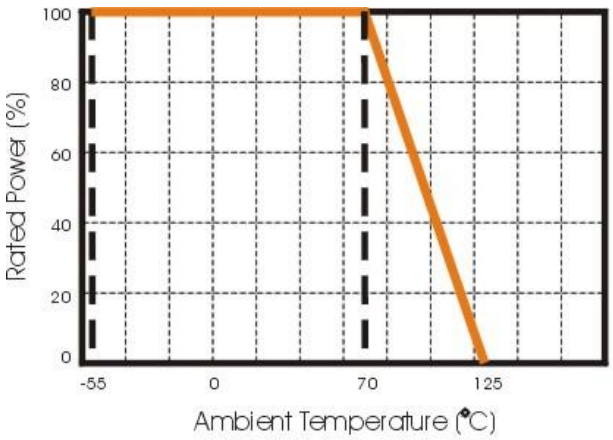


Figure 2 Maximum dissipation in percentage of rated power as a function of the ambient temperature

MOUNTING

Due to their rectangular shapes and small tolerances, Surface Mountable Resistors are suitable for handling by automatic placement systems.

Chip placement can be on ceramic substrates and printed-circuit boards (PCBs).

Electrical connection to the circuit is by individual soldering condition.

The end terminations guarantee a reliable contact.

SOLDERING CONDITION

The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260°C for 10 seconds. Therefore, it is possible to mount Surface Mount Resistors on one side of a PCB and other discrete components on the reverse (mixed PCBs).

Surface Mount Resistors are tested for solderability at 235°C during 2 seconds. The test condition for no leaching is 260°C for 30 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in Fig 3.

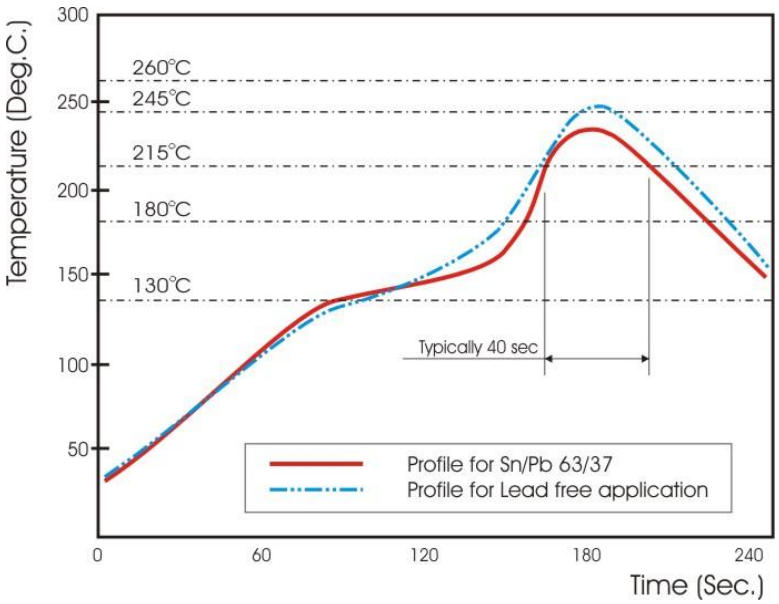


Fig 3. Infrared soldering profile for Chip Resistors

CATALOGUE NUMBERS

The resistors have a catalogue number starting with :

WK12	M	472_	X	T	L
Size code WK12 : 1206 WK08 : 0805 WK06 : 0603	**Type code** M : Trimmable	**Resistance code** E24 : 2 significant digits followed by no. of zeros and a blank 4.7Ω =4R7_ 10Ω =100_ 220Ω =221_ ("_" means a blank)	**Tolerance** X : 0/-30% Y : 0/-20%	**Packaging code** T : 7" Reeled taping B : Bulk	**Termination code** L = Sn base (lead free)

1. Reeled tape packaging : WK12M / WK08M / WK06M - 8mm width paper taping 5000pcs per reel.
   Bulk packaging : WK12M / WK08M / WK06M - 5000pcs per poly bag

TEST AND REQUIREMENTS (JIS C 5201-1 : 1998)

No.	Test items	Condition of test (JIS C 5201–1)	Performance requirements
1	Visual examination	Sub–clause 4.4.1 Checked by visual examination.	As in 4.4.1
2	Dimension Resistance	Sub–clause 4.4.2 Sub–clause 4.5	As specified in Table–3 of this specification. As in 4.5.2 The resistance value shall correspond with the rated resistance taking into account the specified tolerance.
3	Voltage proof	Sub–clause 4.7 Method: 4.6.1.4(See Figure–5) Test voltage: Alternating voltage with a peak value of 1.42 times the insulation voltage. Duration: 60 s ± 5 s Insulation resistance Test voltage: Insulation voltage Duration: 1 min.	No breakdown or flash over R ≥ 1 GΩ
4	Solderability	Sub–clause 4.17 Without ageing Flux: The resistors shall be immersed in a non–activated soldering flux for 2s. Bath temperature: 235 °C ± 5 °C Immersion time: 2 s ± 0.5 s	As in 4.17.4.5 The terminations shall be covered with a smooth and bright solder coating.
5	Mounting Overload (in the mounted state)	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3 Sub–clause 4.13 The applied voltage shall be 2.5 times the rated voltage or twice the limiting element voltage, whichever is the less severe. Duration: 2 s Visual examination Resistance	 No visible damage ΔR ≤ ± (1%+0.05Ω)

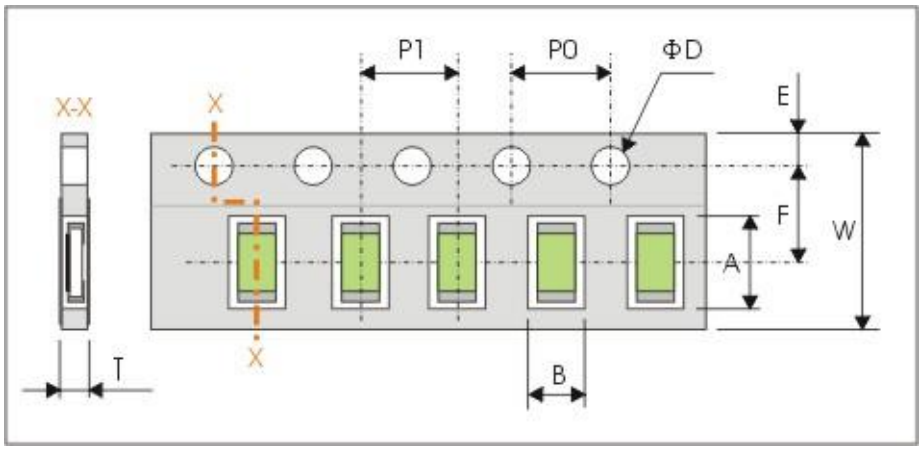
No	Test items	Condition of test (JIS C 5201–1)	Performance requirements
6	Mounting Bound strength of the end face plating Final measurements	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–4 Sub–clause 4.33 Bent value: 3 mm Resistance Sub–clause 4.33.6 Visual examination	 ΔR ≤ ± (1%+0.05Ω) No visible damage
7	Resistance to soldering heat	Sub–clause 4.18 Solder temperature: 260 °C ± 5 °C Immersion time: 10 s ± 0.5 s Visual examination	 As in 4.18.3.4 No sign of damage such as cracks. ΔR ≤ ± (1%+0.05Ω)
8	Mounting Adhesion Rapid change temperature	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3 Sub–clause 4.32 Force: 5 N Duration: 10 s ± 1 s Visual examination Sub–clause 4.19 Lower category temperature: –55 °C Upper category temperature: +125 °C Duration of exposure at each temperature: 30 min. Number of cycles: 5 cycles. Visual examination Resistance	 No visible damage No visible damage ΔR ≤ ±(1%+0.05Ω)

No	Test items	Condition of test (JIS C 5201–1)	Performance requirements
9			
10	Mounting Endurance at 70 °C	Sub–clause 4.31 Substrate material: Epoxide woven glass (FCR1may use Alumina substrate.) Test substrate: Figure–3 Sub–clause 4.25.1 Ambient temperature: 70 °C ± 2 °C Duration: 1000 h The voltage shall be applied in cycles of 1.5 h on and 0.5 h. The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller. Examination at 48 h , 500 h and 1000 h: Visual examination Resistance	 No visible damage $\Delta R \leq \pm (5\%+0.1\Omega)$

No	Test items	Condition of test (JIS C 5201–1)	Performance requirements
11	Mounting Variation of resistance with temperature	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3 Sub–clause 4.8 – 55 °C / + 20 °C + 20 °C / + 125°C	As in Table–1
12	Mounting Damp heat, steady state	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3 Sub–clause 4.24 Ambient temperature: 40 °C ± 2 °C Relative humidity : 93^{+2}_{-3} % a) 1st group: without voltage applied. b) 2nd group: The d. c. voltage shall be applied continuously. The voltage shall be accordance with Sub–clause 4.24.2.1 b). without polarizing voltage [4.24.2.1, c)] Visual examination Resistance	No visible damage $\Delta R \leq \pm (5\%+0.1\Omega)$
13	Dimensions (detail)	Sub–clause 4.4.3	As in Table–3

PACKAGING

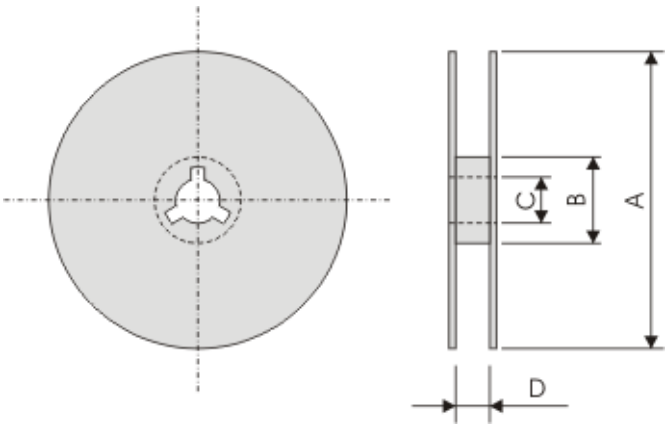
Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WK12M	3.60±0.20	2.00±0.15	8.00±0.20	3.50±0.05	1.75±0.10
WK08M	2.50±0.20	1.65±0.15			
WK06M	1.90±0.20	1.15±0.15			

Series No.	P1	P0	ΦD	T
WK12M / WK08M	4.0±0.10	4.0±0.10	1.50+0.10	Max. 1.0
WK06M				Max. 0.8

Reel dimensions



Symbol (unit : mm)	A	B	C	D
WK12M / WK08M / WK06M	Φ180-1.5	Φ60.0+1.0	13.0±0.2	9.0+1.0