Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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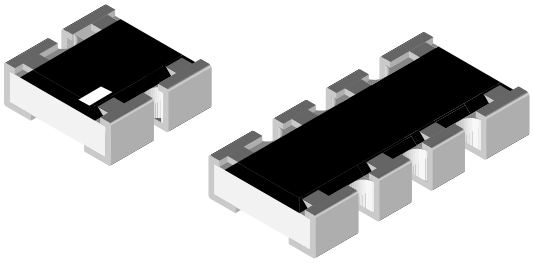
Thick Film Chip Resistor Array, Different Values



FEATURES

- Different values (CRAS0606 model) or two pairs of values (CRAS0612 / CRAE0612 model)
- Convex terminal array available with either scalloped corners (version E) or square corners (version S)
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT HALOGEN FREE

The thick film chip resistor arrays, different values series combine the reliability of thick film chip resistor products with the advantages of chip resistor arrays.

The small package enables the design of high density circuits with reduced assemblies' costs. Two different resistor values or two resistor pairs are available.

APPLICATIONS

- Voltage divider
- Feedback circuits
- DC/DC converters
- External circuits of operational amplifiers

TECHNICAL SPECIFICATIONS

DESCRIPTION	CRAS0606	CRAS0612, CRAE0612
EIA size	0606	0612
Metric size code	RR1616M	RR1632M
Configuration, isolated	2 x 0603	4 x 0603
Design: Different values (DF) Two pairs of values (TP)	DF	TP
Resistance range	10 Ω to 1 MΩ (2)	
Resistance tolerance	± 1 %; ± 5 %	
Temperature coefficient	± 100 ppm/K; ± 200 ppm/K	
Rated dissipation, P_{70} (1) Element Package	 0.063 W 0.125 W	 0.063 W 0.25 W
Operating voltage, $U_{max.}$ AC_{RMS}/DC	50 V	
Permissible film temperature, $\vartheta_{F\ max.}$ (1)	155 °C	
Operating temperature range	-55 °C to +155 °C	
Max. resistance change at P_{70} for resistance range, $\lvert\Delta R/R\rvert$ after: 1000 h 8000 h	 ≤ 1.0 % ≤ 2.0 %	
Permissible voltage against ambient (insulation): 1 min, U_{ins}	 100 V	

Notes

(1) Please refer to APPLICATION INFORMATION below.

(2) Resistance values to be selected from E24 + E96 (± 1 % tolerance) and E24 (± 5 % tolerance).

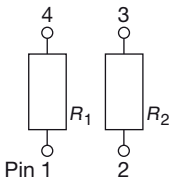
For technical questions, contact: thickfilmchip@vishay.com

APPLICATION INFORMATION

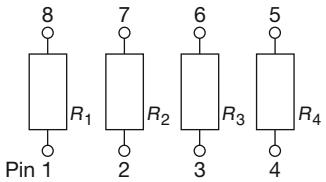
When the resistor dissipates power, a temperature rise above the ambient temperature occurs, dependent on the thermal resistance of the assembled resistor together with the printed circuit board. The rated dissipation applies only if the permitted film temperature is not exceeded.

These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

CIRCUITS



CRAS0606



CRAS0612, CRAE0612

Marking on CRAS0606: pin 1 is marked.

DESIGN		
	CRAS0606	**CRAS0612, CRAE0612**
TP		$R_1 = R_4 > R_2 = R_3$
DF	$R_1 > R_2$	

PART NUMBER AND PRODUCT DESCRIPTION

PART NUMBER: CRASA10K0F1K00TA

C	R	A	S	A	1	0	K	0	F	1	K	0	0	T	A		

TYPE	TERMINAL	SIZE	RESISTANCE (1)	ACCURACY GRADE (2)	RESISTANCE (1)	PACKAGING	SPECIAL
CRA	**S** = square corners **E** = scalloped corners	**N** = 0606 **A** = 0612	**R** = decimal **K** = thousand **M** = million	Tolerance and TCR **F** **J**	**R** = decimal **K** = thousand **M** = million	**TA** **TC**	Up to 2 digits

PRODUCT DESCRIPTION: CRAS0612 10K 1% 1K0 RT1 e3

CRA	S	0612	10K	1 %	1K0	RT1	e3
TYPE	TERMINAL	SIZE	RESISTANCE R_1, R_4 (1)	ACCURACY GRADE (2)	RESISTANCE R_2, R_3 (1)	PACKAGING	LEAD (Pb)- FREE
CRA = thick film chip array	**S** = square corners **E** = scalloped corners	**0606** **0612**	**10R** = 10 Ω **10K** = 10 kΩ **1M** = 1 MΩ	Tolerance and TCR **1** % **5** %	**10R** = 10 Ω **10K** = 10 kΩ **1M** = 1MΩ	**RT1** **RT6**	**e3** = pure tin termination finish

Notes

(1) $R_1 = R_4 > R_2 = R_3$

(2) Please refer to the table TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

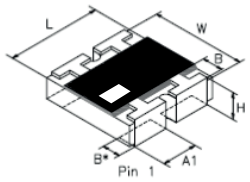
TYPE / SIZE	ACCURACY GRADE	TCR	TOLERANCE	RESISTANCE
CRAS0606 CRAS0612 CRAE0612	F	± 100 ppm/K	± 1 %	10 Ω to 1 MΩ
	J	± 200 ppm/K	± 5 %	10 Ω to 1 MΩ

PACKAGING

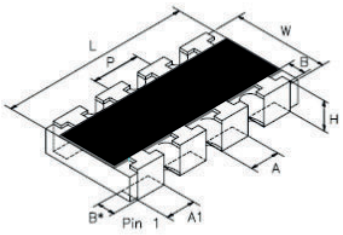
TYPE / SIZE	CODE	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	PACKAGING DIMENSIONS
CRAS0606 CRAS0612 CRAE0612	TA = RT1	5000	Paper tape acc. to IEC 60286-3, Type 1a	8 mm	4 mm	Ø 180 mm/7"
	TC = RT6	20 000				Ø 330 mm/13"

DIMENSIONS

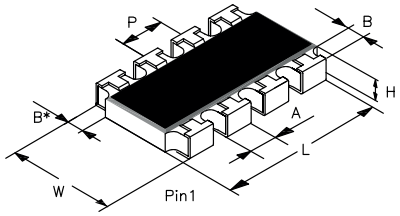
CRAS0606



CRAS0612

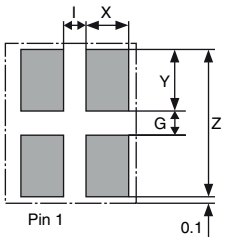


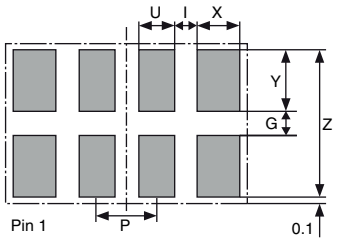
CRAE0612



TYPE	L (mm)	W (mm)	H (mm)	P (mm)	A1 (mm)	A (mm)	B (mm)	B* (mm)	MASS (mg)
CRAS0606	1.6 ± 0.15	1.5 ± 0.15	0.5 ± 0.1	-	0.61 ± 0.15	-	0.3 ± 0.15	0.3 ± 0.15	3.6
CRAS0612 CRAE0612	3.2 ± 0.15	1.5 ± 0.15	0.5 ± 0.1	0.8 ± 0.1	0.61 ± 0.15	0.38 ± 0.15	0.3 ± 0.15	0.3 ± 0.15	6.6

PATTERN STYLES FOR RESISTOR ARRAY





Dimensions in mm
limits for solder resist

TYPE	G (mm)	Y (mm)	X (mm)	U (mm)	Z (mm)	I (mm)	P (mm)
CRAS0606	0.8	1.15	0.64	-	3.1	0.36	-
CRAS0612 CRAE0612	0.8	1.15	0.64	0.5	3.1	0.36	0.8

DESCRIPTION

The production of the components is strictly controlled and follows an extensive set of instructions established for reproducibility. A cermet film layer and a glass-over are deposited on a high grade (Al_2O_3) ceramic substrate using a mask to separate the adjacent resistors and conditioned to achieve the desired temperature coefficient. Specially designed inner contacts are realized on both sides. A special laser is used to achieve the target value by smoothly fine trimming the resistive layer without damaging the ceramics. The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating.

The result of the determined production is verified by an extensive testing procedure and optical inspection performed on 100 % of the individual chip resistors. Only accepted products are laid directly into the paper tape in accordance with **IEC 60286-3, Type 1a** [(1)].

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapor phase as shown in **IEC 61760-1**. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The suitability of conformal coatings potting compounds and their processes, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system.

The resistors are RoHS-compliant, the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. Solderability is specified for 2 years after production or requalification. The permitted storage time is 20 years. The immunity of the plating against tin whisker growth has been proven under extensive testing.

MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein [(2)]
- The Global Automotive Declarable Substance List (GADSL) [(3)]
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) [(4)] for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see www.vishay.com/how/leadfree.

Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at www.vishay.com/doc?49037.

APPROVALS

The resistors are qualified according to AEC-Q200.

Where applicable, the resistors are tested in accordance with **EN 140401-802** which refers to **EN 60115-1**, **EN 60115-8** and the variety of environmental test procedures of the **IEC 60068** [(1)] series.

RELATED PRODUCTS

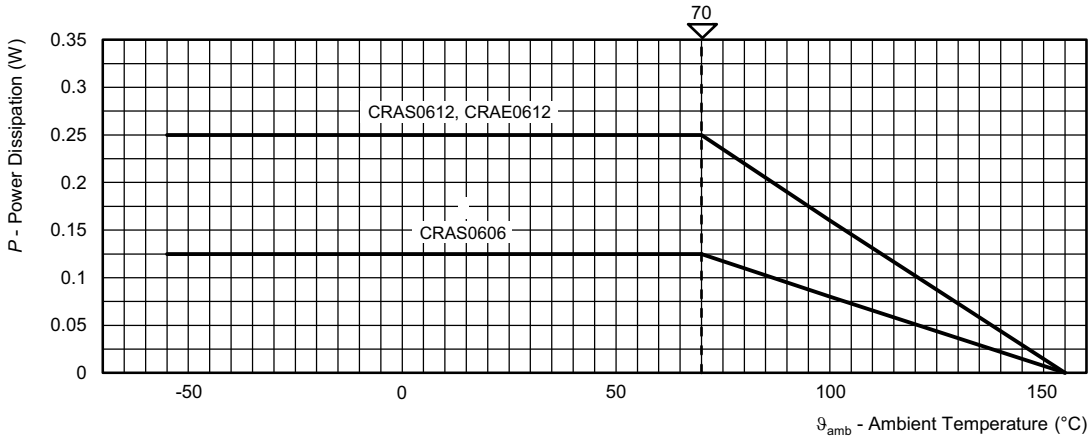
For the thick film chip array with equal resistance values, please refer to CRA06E, CRA06S, Thick Film Chip Resistor Array datasheet (www.vishay.com/doc?31002).

Notes

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents.
(2) The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at http://std.iec.ch/iec62474.
(3) The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at www.gadsl.org.
(4) The SVHC list is maintained by the European Chemical Agency (ECHA) and available at http://echa.europa.eu/candidate-list-table.

FUNCTIONAL PERFORMANCE

Derating



TESTS AND REQUIREMENTS

All executed tests are carried out in accordance with the following specifications:

EN 60115-1, generic specification

EN 60115-8 (successor of EN 140400), sectional specification

EN 140401-802, detail specification

IEC 60068-2-xx, test methods

The parameters stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-802. The table presents only the most important tests, for the full test schedule refer to the documents listed above. However, some additional tests and a number of improvements against those minimum requirements have been included.

The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5201-1.

The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1, 4.3, whereupon the following values are applied:

Temperature: 15 °C to 35 °C

Relative humidity: 25 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

A climatic category LCT / UCT / 56 is applied, defined by the lower category temperature (LCT), the upper category temperature (UCT), and the duration of exposure in the damp heat, steady state test (56 days).

The components are mounted for testing on boards in accordance with EN 60115-8, 2.4.2 unless otherwise specified.

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 (1) TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
			Stability for product types:	**STABILITY CLASS 1 OR BETTER**	**STABILITY CLASS 2 OR BETTER**
			CRAS0606, CRAS0612, CRAE0612	10 Ω to 1 MΩ	
4.5	-	Resistance	-	± 1 %	± 5 %
4.8	-	Temperature coefficient	(20 / -55 / 20) °C and (20 / 155 / 20) °C	± 100 ppm/K	± 200 ppm/K
4.25.1	-	Endurance at 70 °C	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1.5 h on; 0.5 h off; 70 °C; 1000 h 70 °C; 8000 h	± (1 % R + 0.05 Ω) ± (2 % R + 0.1 Ω)	± (2 % R + 0.1 Ω) ± (4 % R + 0.1 Ω)
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; (93 ± 3) % RH; 56 days	± (1 % R + 0.05 Ω)	

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 [1] TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
			Stability for product types:	**STABILITY CLASS 1 OR BETTER**	**STABILITY CLASS 2 OR BETTER**
			CRAS0606, CRAS0612, CRAE0612	10 Ω to 1 MΩ	
4.23	-	Climatic sequence:	-	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
4.23.2	2 (Bb)	Dry heat	125 °C; 16 h		
4.23.3	30 (Db)	Damp heat, cyclic	55 °C; 24 h; ≥ 90 % RH; 1 cycle		
4.23.4	1 (Ab)	Cold	-55 °C; 2 h		
4.23.5	13 (M)	Low air pressure	8.5 kPa; 2 h; (25 ± 10) °C		
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; 24 h; ≥ 90 % RH; 5 cycles		
4.23.7	-	DC load	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1 min		
-	1 (Aa)	Cold	-55 °C; 2 h	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
4.19	14 (Na)	Rapid change of temperature	30 min. at -55 °C; 30 min. at 125°C 1000 cycles	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
4.13	-	Short time overload [2]	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; whichever is less severe; 5 s	± (2 % R + 0.05 Ω)	
4.40	-	Electrostatic discharge (Human body model) [2]	IEC 61340-3-1 3 pos. + 3 neg. discharges; 500 V	± (1 % R + 0.05 Ω)	
4.22	6 (Fc)	Vibration, endurance by sweeping	f = 10 Hz to 2000 Hz; x, y, z ≤ 1.5 mm; A ≤ 200 m/s^2; 10 sweeps per axis	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
4.17	58 (Td)	Solderability	Solder bath method; Sn60Pb40; non-activated flux; (235 ± 5) °C (2 ± 0.2) s	Good tinning (≥ 95 % covered); no visible damage	
			Solder bath method; Sn96.5Ag3Cu0.5 non-activated flux; (245 ± 5) °C (3 ± 0.3) s	Good tinning (≥ 95 % covered); no visible damage	
4.18	58 (Td)	Resistance to soldering heat	Solder bath method (260 ± 5) °C; (10 ± 1) s	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; 50 °C; method 2	No visible damage	
4.30	45 (XA)	Solvent resistance of marking	Isopropyl alcohol; 50 °C; method 1, toothbrush	Marking legible, no visible damage	
4.32	21 (Uu_3)	Shear (adhesion)	17.7 N	No visible damage	
4.33	21 (Uu_1)	Substrate bending	Depth 2 mm; 3 times	No visible damage, no open circuit in bent position ± (0.25 % R + 0.05 Ω)	
4.7	-	Voltage proof	$U = 1.4 \times U_{ins}$; 60 s	No flashover or breakdown	
4.35	-	Flammability, needle flame test	IEC 60695-11-5 [1]; 10 s	No burning after 30 s	

Notes

[1] The quoted IEC standards are also released as EN standards with the same number and identical contents

[2] For a single element

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