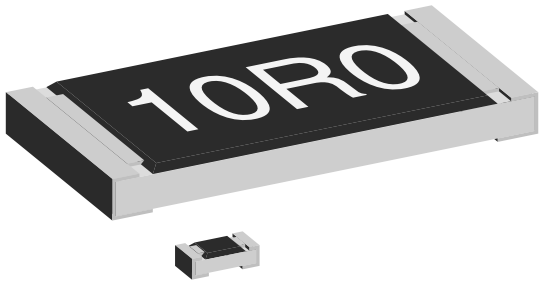
Automotive, Sulfur Resistant Lead (Pb)-Free Thick Film, Rectangular Chip Resistors



FEATURES

- Superior resistance against H_2S-atmosphere
- Stability $\Delta R/R$ = 1 % for 1000 h at 70 °C
- Metal glaze on high quality ceramic
- Pure tin solder contacts on Ni barrier layer, provides compatibility with lead (Pb)-free and lead containing soldering processes
- AEC-Q200 qualified, rev. C compliant
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

HALOGEN FREE

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	CASE SIZE INCH	CASE SIZE METRIC	POWER RATING $P_{70\,°C}$ W	LIMITING ELEMENT VOLTAGE MAX. V	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	SERIES
RCA0402	0402	RR1005	0.063	50	± 50	± 0.5, ± 1	100 to 1.0M	E24; E96
					± 100	± 0.5	10 to 1.0M	E24; E96
					± 100	± 1	10 to 10M	E24; E96
					± 200	± 1	1.0 to 9.76	E24; E96
					± 200	± 5	1.0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 1.5 A					
RCA0603	0603	RR1608	0.10	75	± 50	± 0.5, ± 1	100 to 10M	E24; E96
					± 100	± 0.5	10 to 10M	E24; E96
					± 100	± 1	1.0 to 10M	E24; E96
					± 200	± 5	1.0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 2.0 A					
RCA0805	0805	RR2012	0.125	150	± 50	± 0.5, ± 1	100 to 10M	E24; E96
					± 100	± 0.5	10 to 10M	E24; E96
					± 100	± 1	1.0 to 10M	E24; E96
					± 200	± 5	1.0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 2.5 A					
RCA1206	1206	RR3216	0.25	200	± 50	± 0.5, ± 1	100 to 10M	E24; E96
					± 100	± 0.5	10 to 10M	E24; E96
					± 100	± 1	1.0 to 10M	E24; E96
					± 200	± 5	1.0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 3.5 A					
RCA1210	1210	RR3225	0.5	200	± 50	± 0.5, ± 1	100 to 1.0M	E24; E96
					± 100	± 0.5	10 to 1.0M	E24; E96
					± 100	± 1	1.0 to 10M	E24; E96
					± 200	± 5	1.0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 5.0 A					
RCA1218	1218	RR3246	1.0	200	± 50	± 0.5, ± 1	100 to 2.2M	E24; E96
					± 100	± 0.5	100 to 2.2M	E24; E96
					± 100	± 1	1.0 to 2.2M	E24; E96
					± 200	± 5	1.0 to 2.2M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 7.0 A					
RCA2010	2010	RR5025	0.75	400	± 50	± 0.5, ± 1	100 to 10M	E24; E96
					± 100	± 0.5	10 to 10M	E24; E96
					± 100	± 1	1.0 to 10M	E24; E96
					± 200	± 5	1.0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 6.0 A					
RCA2512	2512	RR6332	1.0	500	± 50	± 0.5, ± 1	100 to 10M	E24; E96
					± 100	± 0.5	10 to 10M	E24; E96
					± 100	± 1	1.0 to 10M	E24; E96
					± 200	± 5	1.0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 7.0 A					

Notes

- 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 time.
- Marking: See document “Surface Mount Resistor Marking” (document number 20020).
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	RCA0402	RCA0603	RCA0805	RCA1206	RCA1210	RCA1218	RCA2010	RCA2512
Rated dissipation P_{70} (1)	W	0.063	0.10	0.125	0.25	0.5	1.0	0.75	1.0
Limiting element voltage $U_{max.}$ AC/DC	V	50	75	150	200	200	200	400	500
Insulation voltage $U_{ins.}$ (1 min)	V	> 75	> 100	> 200	> 300	> 300	> 300	> 300	> 300
Insulation resistance	Ω	$> 10^9$							
Category temperature range	°C	- 55 to + 155							
Failure rate	h^{-1}	$< 0.1 \times 10^{-9}$							
Mass	mg	0.65	2	5.5	10	16	29.5	25.5	40.5

Note

(1) The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 155 °C is not exceeded.

PART NUMBER AND PRODUCT DESCRIPTION

Part Number: RCA080510K0FKEA (2)

R	C	A	0	8	0	5	1	0	K	0	F	K	E	A

MODEL	VALUE	TOLERANCE	TCR	PACKAGING (3)
RCA0402 **RCA0603** **RCA0805** **RCA1206** **RCA1210** **RCA1218** **RCA2010** **RCA2512**	**R** = Decimal **K** = Thousand **M** = Million **0000** = 0 Ω Jumper	**D** = ± 0.5 % **F** = ± 1 % **J** = ± 5 % **Z** = Jumper	**H** = ± 50 ppm/K **K** = ± 100 ppm/K **N** = ± 200 ppm/K **S** = Jumper	**EA** **EB** **EC** **ED** **EE** **EF** **EG** **EH** **EK**

Product Description: RCA0805 10K 1 % 100 ET1 e3

RCA0805	10K	1 %	100	ET1	e3
MODEL	RESISTANCE VALUE	TOLERANCE	TCR	PACKAGING (3)	LEAD (Pb)-FREE
RCA0402 **RCA0603** **RCA0805** **RCA1206** **RCA1210** **RCA1218** **RCA2010** **RCA2512**	**10R** = 10 Ω **10K** = 10 kΩ **1M** = 1 MΩ **0R0** = Jumper	**± 0.5 %** **± 1 %** **± 5 %**	**± 50** ppm/K **± 100** ppm/K **± 200** ppm/K	**ET1, ET5** **ET6, ET7** **EF4, E02** **E67, E82** **ET9**	**e3** = Pure tin termination finish

Notes

(2) Preferred way for ordering products is by use of the PART NUMBER

(3) Please refer to table PACKAGING, see next page

PACKAGING

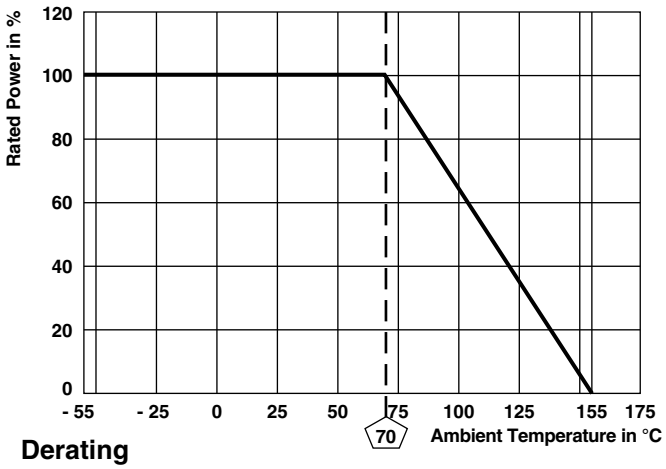
MODEL	REEL							
	TAPE WIDTH	DIAMETER	PITCH	PIECES/ REEL	PACKAGING CODE			
					PART NUMBER		PRODUCT DESC.	
					PAPER	BLISTER	PAPER	BLISTER
RCA0402	8 mm	180 mm/7"	2 mm	10 000	ED		ET7	
		285 mm/11.25"	2 mm	20 000	EC		ET6	
		330 mm/13"	2 mm	50 000	EE		EF4	
RCA0603	8 mm	180 mm/7"	4 mm	5000	EA		ET1	
		285 mm/11.25"	4 mm	10 000	EB		ET5	
		330 mm/13"	4 mm	20 000	EC		ET6	
RCA0805	8 mm	180 mm/7"	4 mm	5000	EA		ET1	
		285 mm/11.25"	4 mm	10 000	EB		ET5	
		330 mm/13"	4 mm	20 000	EC		ET6	
RCA1206	8 mm	180 mm/7"	4 mm	5000	EA		ET1	
		285 mm/11.25"	4 mm	10 000	EB		ET5	
		330 mm/13"	4 mm	20 000	EC		ET6	
RCA1210	8 mm	180 mm/7"	4 mm	5000	EA		ET1	
		285 mm/11.25"	4 mm	10 000	EB		ET5	
		330 mm/13"	4 mm	20 000	EC		ET6	
RCA1218	12 mm	180 mm/7"	4 mm	4000		EK		ET9
RCA2010	12 mm	180 mm/7"	4 mm	4000		EF		E02
RCA2512	12 mm	180 mm/7"	8 mm	2000		EG		E67
			4 mm	4000		EH		E82

DIMENSIONS in millimeters

SIZE		DIMENSIONS					SOLDER PAD DIMENSIONS					
							REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	W	H	T1	T2	a	b	l	a	b	l
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1	0.4	0.6	0.5			
0603	1608	$1.55^{+0.10}_{-0.05}$	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	$2.0^{+0.20}_{-0.10}$	1.25 ± 0.15	0.45 ± 0.05	$0.3^{+0.20}_{-0.10}$	0.3 ± 0.2	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	$3.2^{+0.10}_{-0.20}$	1.6 ± 0.15	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2	0.9	1.7	2.0	1.1	1.7	2.3
1210	3225	3.2 ± 0.2	2.5 ± 0.2	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2	0.9	2.5	2.0	1.1	2.5	2.2
1218	3246	$3.2^{+0.10}_{-0.20}$	4.6 ± 0.15	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2	1.05	4.9	1.9	1.25	4.8	1.9
2010	5025	5.0 ± 0.15	2.5 ± 0.15	0.6 ± 0.1	0.6 ± 0.2	0.6 ± 0.2	1.0	2.5	3.9	1.2	2.5	3.9
2512	6332	6.3 ± 0.2	3.15 ± 0.15	0.6 ± 0.1	0.6 ± 0.2	0.6 ± 0.2	1.0	3.2	5.2	1.2	3.2	5.2

FUNCTIONAL PERFORMANCE

PERFORMANCE IN SULFUR-CONTAINING AMBIANCE		
TEST NAME	**HUMID SULFUR VAPOR TEST**	**HUMID SULFUR VAPOR TEST (Accelerated)**
Reference specification	ASTM B809-95	ASTM B809-95 accelerated conditions
Test conditions (temperature, humidity)	60 °C ± 2 °C 85 % ± 4 % RH	90 °C ± 2 °C 74 % ± 7 % RH
Aggressive agent	Sulfur (saturated vapor)	Sulfur (saturated vapor)
Failure criteria in VI under magnification	No silver sulfide growth at the interface between termination and protective overcoat. No signs of mechanical damage.	No silver sulfide growth at the interface between termination and protective overcoat. No signs of mechanical damage.
Failure criteria in electrical test	≤ (± 1 % R + 0.05 Ω)	≤ (± 1 % R + 0.05 Ω)
Time before failure	8000 h	1000 h



TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				SIZE 0402	SIZE 0603 TO 2512
				STABILITY CLASS 2 OR BETTER	
			Stability for product types:		
			RCA e3	1 Ω to 10 MΩ	
4.5	-	Resistance	-	0.5 %, ± 1 %, ± 5 %	
4.8.4.2	-	Temperature coefficient	(20/- 55/20) °C and (20/125/20) °C	± 50 ppm/K, ± 100 ppm/K, ± 200 ppm/K	
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{max.}$; duration: According to style	± (0.25 % R + 0.05 Ω)	
4.19	14 (Na)	Rapid change of temperature	30 min. at - 55 °C; 30 min. at 125 °C 5 cycles 1000 cycles	± (0.25 % R + 0.05 Ω) ± (1 % R + 0.05 Ω)	
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	± (1 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 ± 5) °C (10 ± 1) s	± (0.25 % R + 0.05 Ω)	
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; (93 ± 3) % RH; 56 days	± (1 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
4.25.3	-	Endurance at upper category temperature	155 °C, 1000 h	± (0.5 % R + 0.05 Ω)	

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

- EN 60115-1, generic specification
- EN 140400, sectional specification
- EN 140401-802, detail specification
- AEC-Q200, automotive specification
- IEC 60068-2, environmental test procedures
- ASTM B 809-95, standard test method for porosity in metallic coatings by humid sulfur.

Packaging of components is done in paper or blister tapes according to IEC 60286-3.

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