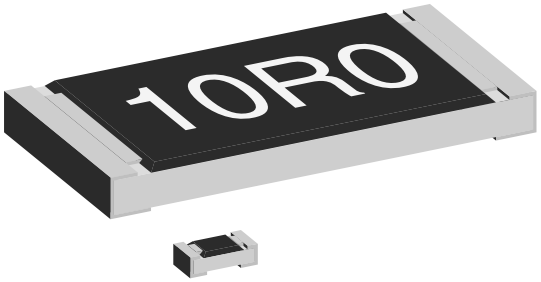
Lead (Pb)-free Thick Film, Rectangular Commodity Chip Resistors



FEATURES

- High volume product suitable for commercial applications
- Excellent stability ($\Delta R/R \leq 1$ % for 1000 h at 70 °C)
- Lead (Pb)-free solder contacts on Ni barrier layer
- Metal glaze on high quality ceramic
- Protective overglaze
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

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	E-SERIES
CRCW0201...BC	0201	RR 0603M	0.05	30	± 200	± 0.5	10R to 10M	E96
					- 200/+ 400		1R0 to 9R76	
					± 100	± 1	47R to 1M	E24; E96
					± 200		10R to 10M	
					- 200/+ 400		1R0 to 9R76	
					± 200	± 5	10R to 10M	E24
					- 200/+ 400		1R0 to 9R1	
			Zero-Ohm-Resistor: $R_{max.}$ = 50 mΩ, $I_{max.}$ at 70 °C = 1.0 A					
CRCW0402...BC	0402	RR 1005M	0.063	50	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 1.5 A					
CRCW0603...BC	0603	RR 1608M	0.10	75	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 2.0 A					
CRCW0805...BC	0805	RR 2012M	0.125	150	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 2.5 A					
CRCW1206...BC	1206	RR 3216M	0.25	200	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 3.5 A					
CRCW1210...BC	1210	RR 3225M	0.50	200	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 4.0 A					
CRCW2010...BC	2010	RR 5025M	0.75	400	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 5.0 A					
CRCW2512...BC	2512	RR 6332M	1.0	500	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 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 lifetime.
- Power rating depends on the maximum temperature at the solder point, the component placement density and the substrate material

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CRCW0201...BC	CRCW0402...BC	CRCW0603...BC	CRCW0805...BC	CRCW1206...BC	CRCW1210...BC	CRCW2010...BC	CRCW2512...BC
Rated Dissipation at 70 °C (1)	W	0.050	0.063	0.10	0.125	0.25	0.50	0.75	1.0
Limiting Element Voltage $U_{max.}$ AC/DC	V	30	50	75	150	200	200	400	500
Insulation Voltage U_{ins} (1 min)	V	50	75	100	200	300	300	300	300
Insulation Resistance	Ω	$> 10^9$							
Operating Temperature Range	°C	- 55 to + 155							
Failure Rate	°C	0.3×10^{-9}							
Weight/ 1000 Pieces	g	0.17	0.65	2	5.5	10	16	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: CRCW0603562RFKTCBC

C	R	C	W	0	6	0	3	5	6	2	R	F	K	T	C	B	C

MODEL	VALUE	TOLERANCE	TCR	PACKAGING	Special
CRCW0201 **CRCW0402** **CRCW0603** **CRCW0805** **CRCW1206** **CRCW1210** **CRCW2010** **CRCW2512**	**R** = Decimal **K** = Thousand **M** = Million **0000** = Jumper	**D** = ± 0.5 % **F** = ± 1.0 % **J** = ± 5.0 % **Z** = Jumper	**K** = ± 100 ppm/K **N** = ± 200 ppm/K **X** = - 200 ppm/K/ + 400 ppm/K **0** = Jumper	**TA, TB** **TC, TD** **TE, TF** **TH, TI**	Up to 2 digits **BC** = Commodity

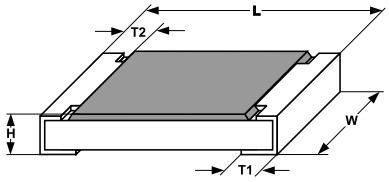
PRODUCT DESCRIPTION: CRCW0603-BC 100 562R 1 % RT6 e3

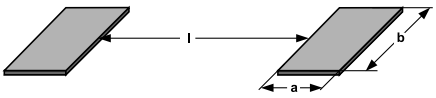
CRCW0603-BC	100	562R	1 %	RT6	e3
MODEL	TCR	RESISTANCE VALUE	TOLERANCE VALUE	PACKAGING	LEAD (Pb)-FREE
CRCW0201-BC **CRCW0402-BC** **CRCW0603-BC** **CRCW0805-BC** **CRCW1206-BC** **CRCW1210-BC** **CRCW2010-BC** **CRCW2512-BC**	± **100** ppm/K ± **200** ppm/K - **200** ppm/K/ + **400** ppm/K	**10R** = 10 Ω **562R** = 562 Ω **10K** = 10.0 kΩ **1M** = 1 MΩ **0R0** = Jumper	**± 0.5 %** **± 1 %** **± 5 %**	**RT1, RT2** **RT5, RT6** **RT7, RF4** **R02, R82**	**e3** = Pure tin termination finish

PACKAGING

MODEL	REEL								
	TAPE WIDTH	DIAMETER	PITCH	PIECES/ REEL	PACKAGING CODE			
					PART NUMBER		PRODUCT DESC.	
					PAPER	BLISTER	PAPER	BLISTER
CRCW0201…BC	8 mm	180 mm/7"	2 mm	10 000	TD	-	RT7	-
		254 mm/10"		20 000	TI	-	RT2	-
		330 mm/13"		50 000	TE	-	RF4	-
CRCW0402…BC	8 mm	180 mm/7"	2 mm	10 000	TD	-	RT7	-
		254 mm/10"		20 000	TI	-	RT2	-
		330 mm/13"		50 000	TE	-	RF4	-
CRCW0603…BC	8 mm	180 mm/7"	4 mm	5000	TA	-	RT1	-
		254 mm/10"		10 000	TB	-	RT5	-
		330 mm/13"		20 000	TC	-	RT6	-
CRCW0805…BC	8 mm	180 mm/7"	4 mm	5000	TA	-	RT1	-
		254 mm/10"		10 000	TB	-	RT5	-
		330 mm/13"		20 000	TC	-	RT6	-
CRCW1206…BC	8 mm	180 mm/7"	4 mm	5000	TA	-	RT1	-
		254 mm/10"		10 000	TB	-	RT5	-
		330 mm/13"		20 000	TC	-	RT6	-
CRCW1210…BC	8 mm	180 mm/7"	4 mm	5000	TA	-	RT1	-
		254 mm/10"		10 000	TB	-	RT5	-
		330 mm/13"		20 000	TC	-	RT6	-
CRCW2010…BC	12 mm	180 mm/7"	4 mm	4000	-	TF	-	R02
CRCW2512…BC	12 mm	180 mm/7"	4 mm	4000	-	TH	-	R82

DIMENSIONS in millimeters





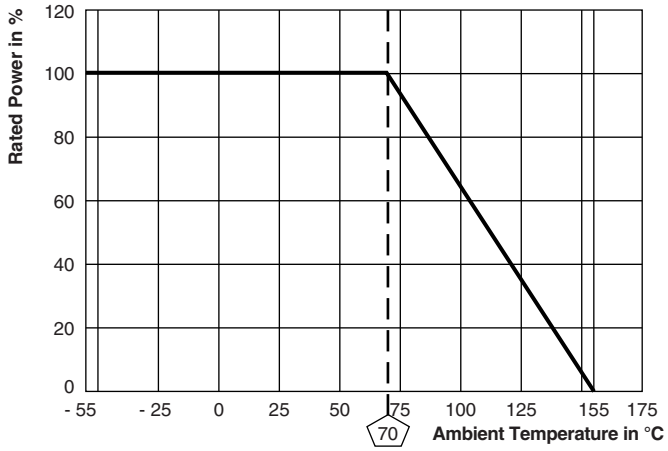
SIZE		DIMENSIONS					SOLDER PAD DIMENSIONS (1)					
							REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	W	H	T1	T2	a	b	l	a	b	l
0201	0603	0.6 ± 0.05	0.3 ± 0.05	0.23 ± 0.05	0.15 ± 0.05	0.2 $^{+0.05}_{-0.10}$	0.3	0.43	0.2	-	-	-
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1	0.4	0.6	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
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

Note

(1) The rated dissipation applies only if the permitted film temperature is not exceeded. Furthermore, a high level of ambient temperature or of power dissipation may raise the temperature of the solder joint, hence special solder alloys or boardmaterials maybe required to maintain the reliability of the assembly. Specified power rating above 125 °C requires dedicated heat-sink pads, which depend on boardmaterials. The given solder pad dimensions reflect the considerations for board design and assembly as outlined e.g. in standards IEC 61188-5-x, or in publication IPC-7351. They do not guarantee any supposed thermal properties, particularly as these are also strongly influenced by many other parameters. Still the given solder pad dimensions will be found adequate for most general applications.

(2) No marking for 0201 and 0402 sizes.

DERATING



TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE		REQUIREMENTS PERMISSIBLE CHANGE (ΔR)		
					STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER	SIZE 0201
			Stability for product types:				
				CRCW....BC e3	1 Ω to 10 MΩ	1 Ω to 10 MΩ	1 Ω to 10 MΩ
4.5	-	Resistance	-		± 1 %	± 5 %	± 0.5 %, ± 1 %, ± 5 %
4.8.4.2	-	Temperature coefficient	(20/- 55/20) °C and (20/125/20) °C		± 100 ppm/K, ± 200 ppm/K	± 200 ppm/K	± 100 ppm/K, ± 200 ppm/K, - 200 ppm/K/ + 400 ppm/K
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; duration: Acc. to the style		± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)	± (1 % R + 0.05 Ω)
4.17.5	58 (Td)	Solderability	Pre-aging 4 h at 155 °C, dryheat	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		
4.18.2	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)	± (1 % R + 0.05 Ω)
4.19	14 (Na)	Rapid change of temperature	30 min. at - 55 °C; 30 min. at 125 °C; 5 cycles		± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
			1000 cycles		± (1 % R + 0.05 Ω)	± (1 % R + 0.05 Ω)	± (1 % R + 0.05 Ω)
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH		± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)	± (2 % R + 0.1 Ω)

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)		
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER	SIZE 0201
			Stability for product types:			
			CRCW....BC e3	1 Ω to 10 MΩ	1 Ω to 10 MΩ	1 Ω to 10 MΩ
4.23	-	Climatic sequence:	-			
4.23.2	2 (Ba)	Dry heat	125 °C; 16 h			
4.23.3	30 (Db)	Damp heat, cyclic	55 °C; ≥ 90 % RH; 24 h; 1 cycle			
4.23.4	1 (Aa)	Cold	- 55 °C; 2 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)	± (2 % R + 0.1 Ω)
4.23.5	13 (M)	Low air pressure	1 kPa; (25 ± 10) °C; 1 h			
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; ≥ 90 % RH; 24 h; 5 cycles			
4.23.7	-	DC load	$U = \sqrt{P_{70} \times R} \leq U_{max.}$			
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)	± (2 % R + 0.1 Ω)	± (2 % R + 0.1 Ω)
			70 °C; 8000 h	± (2 % R + 0.1 Ω)	± (4 % R + 0.1 Ω)	± (4 % R + 0.1 Ω)
4.25.3	-	Endurance at 125 °C	125 °C, 1000 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)	± (2 % R + 0.1 Ω)

APPLICABLE SPECIFICATIONS

- EN60115-1Generic specification
- EN140400Sectional specification
- EN140401-802Detail specification
- IEC 60068-2-XVariety of environmental test procedures
- IEC 60286-3Packaging of SMD components