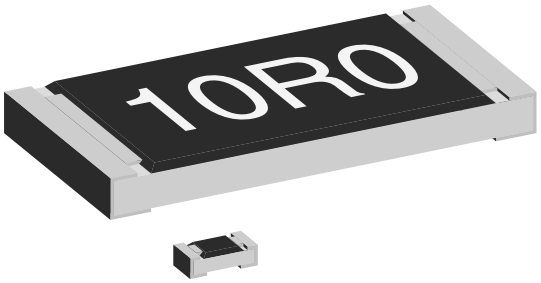
Lead (Pb)-free Thick Film, Rectangular Commodity Chip Resistors



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

HALOGEN FREE

STANDARD ELECTRICAL SPECIFICATIONS

TYPE	CASE SIZE IMPERIAL	CASE SIZE METRIC	POWER RATING P_{70} W	LIMITING ELEMENT VOLTAGE $U_{max.}$ AC_{RMS}/DC V	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	SERIES
CRCW01005...BC	01005	RR0402M	0.031	15	± 250	± 1	10.0 to 1M	E24; E96
						± 2, ± 5		E24
					-200 / +600	± 1	1.0 to 9.76	E24; E96
						± 2, ± 5	1.0 to 9.1	E24
			Zero-Ohm-Resistor: $R_{max.}$ = 50 mΩ, $I_{max.}$ = 0.5 A					
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	CRCW 01005...BC	CRCW 0201...BC	CRCW 0402...BC	CRCW 0603...BC	CRCW 0805...BC	CRCW 1206...BC	CRCW 1210...BC	CRCW 2010...BC	CRCW 2512...BC
Rated Dissipation P_{70} (1)	W	0.031	0.050	0.063	0.10	0.125	0.25	0.50	0.75	1.0
Limiting Element Voltage $U_{max.}$ AC_{RMS}/DC	V	15	30	50	75	150	200	200	400	500
Insulation Voltage U_{ins} (1 min)	V	30	50	75	100	200	300	300	300	300
Insulation Resistance	Ω	> 10^9								
Operating Temperature Range	°C	-55 to +125	-55 to +155							
Failure Rate	h^{-1}	0.3 x 10^{-9}								
Mass	mg	0.07	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

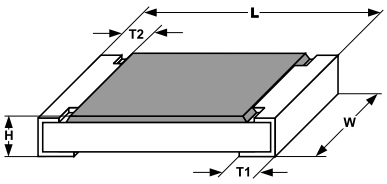
TYPE	RESISTANCE	TOLERANCE	TCR	PACKAGING	SPECIAL
CRCW0100 **CRCW0201** **CRCW0402** **CRCW0603** **CRCW0805** **CRCW1206** **CRCW1210** **CRCW2010** **CRCW2512**	**R** = decimal **K** = thousand **M** = million **0000** = jumper	**D** = ± 0.5 % **F** = ± 1.0 % **G** = ± 2.0 % **J** = ± 5.0 % **Z** = jumper	**K** = ± 100 ppm/K **N** = ± 200 ppm/K **R** = ± 250 ppm/K **X** = -200 ppm/K / +400 ppm/K **Y** = -200 ppm/K / +600 ppm/K **0** = jumper	**TA, TB,** **TC, TD,** **TE, TF,** **TH, TI,** **TL**	Up to 2 digits **BC** = commodity

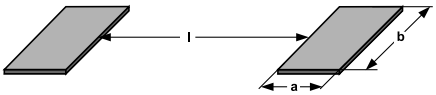
PRODUCT DESCRIPTION: CRCW0603-BC 100 562R 1 % RT6 e3

CRCW0603-BC	100	562R	1 %	RT6	e3
TYPE	TCR	RESISTANCE	TOLERANCE VALUE	PACKAGING	LEAD (Pb)-FREE
CRCW01005-BC **CRCW0201-BC** **CRCW0402-BC** **CRCW0603-BC** **CRCW0805-BC** **CRCW1206-BC** **CRCW1210-BC** **CRCW2010-BC** **CRCW2512-BC**	± **100** ppm/K ± **200** ppm/K ± **250** ppm/K -**200** ppm/K / +**400** ppm/K -**200** ppm/K / +**600** ppm/K	**10R** = 10 Ω **562R** = 562 Ω **10K** = 10.0 kΩ **1M** = 1 MΩ **0R0** = jumper	**± 0.5 %** **± 1 %** **± 2 %** **± 5 %**	**RT1, RT2,** **RT3, RT5,** **RT6, RT7,** **RF4, R02,** **R82**	**e3** = pure tin termination finish

PACKAGING						
TYPE	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
CRCW01005…BC	TL = RT3	20 000	Paper tape acc. to IEC 60286-3, type 1a	8 mm	2 mm	180 mm / 7"
CRCW0201…BC	TD = RT7	10 000		8 mm	2 mm	180 mm / 7"
	TI = RT2	20 000				254 mm / 10"
	TE = RF4	50 000				330 mm / 13"
CRCW0402…BC	TD = RT7	10 000		8 mm	2 mm	180 mm / 7"
	TI = RT2	20 000				254 mm / 10"
	TE = RF4	50 000				330 mm / 13"
CRCW0603…BC	TA = RT1	5000		8 mm	4 mm	180 mm / 7"
	TB = RT5	10 000				254 mm / 10"
	TC = RT6	20 000				330 mm / 13"
CRCW0805…BC	TA = RT1	5000		8 mm	4 mm	180 mm / 7"
	TB = RT5	10 000				254 mm / 10"
	TC = RT6	20 000				330 mm / 13"
CRCW1206…BC	TA = RT1	5000		8 mm	4 mm	180 mm / 7"
	TB = RT5	10 000				254 mm / 10"
	TC = RT6	20 000				330 mm / 13"
CRCW1210…BC	TA = RT1	5000		8 mm	4 mm	180 mm / 7"
	TB = RT5	10 000				254 mm / 10"
	TC = RT6	20 000				330 mm / 13"
CRCW2010…BC	TF = R02	4000		12 mm	4 mm	180 mm / 7"
CRCW2512…BC	TH = R82	4000		12 mm	4 mm	180 mm / 7"

DIMENSIONS in millimeters





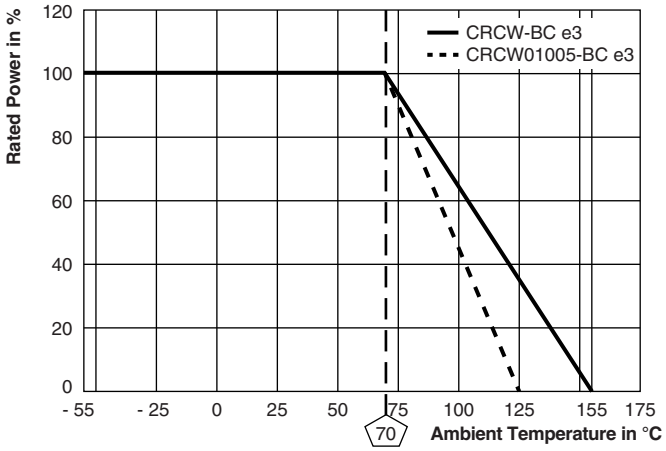
SIZE		DIMENSIONS					RECOMMENDED SOLDER PAD DIMENSIONS (1)					
							REFLOW SOLDERING			WAVE SOLDERING		
IMPERIAL	METRIC	L	W	H	T1	T2	a	b	l	a	b	l
01005	0402	0.4 ± 0.02	0.2 ± 0.02	0.13 ± 0.02	0.10 ± 0.03	0.10 ± 0.03	0.15	0.2	0.2	-	-	-
0201	0603	0.6 ± 0.05	0.3 ± 0.05	0.23 ± 0.05	0.15 ± 0.05	0.10 ± 0.05	0.3	0.43	0.2	-	-	-
0402	1005	1.0 ± 0.10	0.5 ± 0.05	0.30 ± 0.05	0.25 ± 0.10	0.2 ± 0.1	0.4	0.6	0.5	-	-	-
0603	1608	1.6 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	2.0 ± 0.10	1.25 ± 0.15	0.50 ± 0.10	0.35 ± 0.15	0.35 ± 0.2	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	3.05 ± 0.10	1.55 ± 0.10	0.50 $^{+0.10}_{-0.05}$	0.35 ± 0.15	0.45 ± 0.2	0.9	1.7	2.0	1.1	1.7	2.3
1210	3225	3.05 ± 0.10	2.5 ± 0.2	0.55 ± 0.10	0.50 ± 0.2	0.50 ± 0.2	0.9	2.5	2.0	1.1	2.5	2.2
2010	5025	5.0 ± 0.20	2.5 ± 0.20	0.55 ± 0.10	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	3.20 ± 0.20	0.55 ± 0.1	0.6 ± 0.2	0.6 ± 0.2	1.0	3.2	5.2	1.2	3.2	5.2

Notes

(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 board materials maybe required to maintain the reliability of the assembly. 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 01005, 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, dry heat	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)

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 for product types:	
			CRCW01005 e3	1 Ω to 1 MΩ
4.5	-	Resistance	-	± 1 %; ± 2 %; ± 5 %
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; duration according to style	± (2 % R + 0.1 Ω)
4.17.2	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; (235 ± 3) °C (2 ± 0.5) s	Good tinning (≥ 95 % covered) no visible damage
4.8.4.2	-	Temperature coefficient	(20/-55/20) °C and (20/125/20) °C	- 200 ppm/K/+600 ppm/K, ± 250 ppm/K
4.33	21 (Uu_1)	Substrate bending	Depth 3 mm; 1 time	No visible damage, no open circuit in bent position ± (1 % R + 0.05 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 for product types:	
			CRCW01005 e3	1 Ω to 1 MΩ
4.19	14 (Na)	Rapid change of temperature	15 min. at -55 °C; 15 min. at 125 °C; 300 cycles	± (2 % R + 0.1 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	± (5 % R + 0.1 Ω)
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 ± 5) °C; (10 ± 1) s	± (2 % R + 0.1 Ω)
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; (90 to 95) % RH; 1000 h	± (5 % R + 0.1 Ω)
4.25.3	-	Endurance at upper category temperature	125 °C, 1000 h	± (2 % R + 0.1 Ω)
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; (20 to 25) °C; (5 ± 0.5) min	No visible damage

APPLICABLE SPECIFICATIONS

- EN60115-1 Generic specification
- EN60115-8 Sectional specification
- EN140401-802 Detail specification
- IEC 60068-2-X Environmental test procedures
- IEC 60286-3 Packaging of SMD components