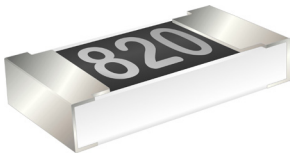
CR SERIES
GENERAL PURPOSE THICK FILM RESISTORS

VENKEL LTD.



FEATURES:

- TCR as low as ±100ppm
- Available Sizes 01005 to 2512
- Stable over temperature range
- Good power dissipation capabilities (Rated power is conservatively rated)
- 100% matte Tin over Nickel with wrap around termination for excellent solderability

RoHS Compliant | REACH Compliant | HF Halogen FREE | Conflict Minerals FREE 3TG

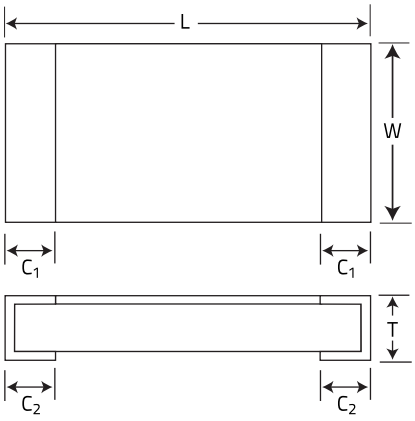
PART NUMBER STRUCTURE

CR	1206	-	8W	-	103	J	☐	T	☐
Series	**Size**		**Power Rating**		**Resistance**	**Tolerance**	**Terminaton**	**Packaging**	**Optional Reel Identifier**
	01005 0201 0402 0603 0805 1206 1210 2010 2512		32W = 0.031W 20W = 0.05W 16W = 0.063W 10W = 0.10W 8W = 0.125W 4W = 0.25W 2W = 0.50W 1W = 1W 2W =2W		3 DIGIT (J TOL.): 2R2=2.2Ω, 103=10KΩ 4 DIGIT (D & F TOL.): 10R2=10.2Ω, 1002=10KΩ Jumper: 3 zeros Note: 1% E24 values may be marked with a 3 digit code.	B = ± 0.1% D = ± 0.5% F = ± 1% J = ± 5% No tolerance specified for the zero ohm Leave blank for zero ohm value	Leave blank for standard termination. P = Palladium Silver Termination (PdAg)	T = Tape & Reel	Leave blank if standard Reel size. Add "-13" if 13" Reel is required

Example P/N: CR1206-8W-103JT

Standard temination finish is 100% matte Tin (Sn) over Nickel.

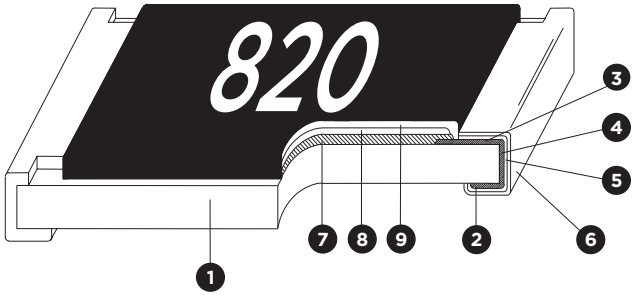
DIMENSIONS



Unit: inches (mm)

SIZE	L	W	T	C1	C2
01005	0.016 ± 0.0008 (0.4 ± 0.02)	0.008 ± 0.0008 (0.2 ± 0.02)	0.005 ± 0.0008 (0.13 ± 0.02)	0.003 ± 0.001 (0.08 ± 0.03)	0.003 ± 0.001 (0.08 ± 0.03)
0201	0.024 ± 0.002 (0.6 ± 0.05)	0.012 ± 0.001 (0.3 ± 0.02)	0.010 ± 0.002 (0.25 ± 0.05)	0.020 ± 0.008 (0.50 ± 0.20)	0.006 ± 0.002 (0.15 ± 0.05)
0402	0.040 ± 0.002 (1.0 ± 0.05)	0.020 ± 0.002 (0.5 ± 0.05)	0.014 ± 0.002 (0.35 ± .05)	0.008 ± 0.004 (0.2 ± 0.1)	0.008 ± 0.004 (0.2 ± 0.1)
0603	0.063 ± 0.004 (1.6 ± 0.1)	0.031 ± 0.004 (0.8 ± 0.1)	0.018 ± 0.004 (0.45 ± 0.1)	0.012 ± 0.006 (0.30 ± 0.15)	0.012 ± 0.006 (0.30 ± 0.15)
0805	0.079 ± 0.006 (2.0 ± 0.15)	0.050 ± 0.006 (1.25 ± 0.15)	0.018 ± 0.006 (0.45 ± 0.15)	0.014 ± 0.006 (0.35 ± 0.15)	0.014 ± 0.006 (0.35 ± 0.15)
1206	0.126 ± 0.006 (3.2 ± 0.15)	0.063 ± 0.006 (1.6 ± 0.15)	0.022 ± 0.006 (0.56 ± 0.15)	0.020 ± 0.008 (0.50 ± 0.20)	0.020 ± 0.008 (0.50 ± 0.20)
1210	0.126 ± 0.006 (3.2 ± 0.15)	0.098 ± 0.006 (2.50 ± 0.15)	0.022 ± 0.006 (0.56 ± 0.15)	0.020 ± 0.008 (0.50 ± 0.20)	0.020 ± 0.008 (0.50 ± 0.20)
2010	0.197 ± 0.006 (5.0 ± 0.15)	0.098 ± 0.006 (2.50 ± 0.15)	0.022 ± 0.006 (0.56 ± 0.15)	0.026 ± 0.008 (0.65 ± 0.25)	0.024 ± 0.008 (0.60 ± 0.20)
2512 (1W)	0.248 ± 0.006 (6.3 ± 0.15)	0.126 ± 0.006 (3.2 ± 0.15)	0.022 ± 0.006 (0.56 ± 0.15)	0.026 ± 0.008 (0.65 ± 0.25)	0.024 ± 0.008 (0.60 ± 0.20)
2512 (2W)	0.248 ± 0.006 (6.3 ± 0.15)	0.126 ± 0.006 (3.2 ± 0.15)	0.024 ± 0.008 (0.60 ± 0.20)	0.024 ± 0.008 (0.60 ± 0.20)	0.020 ± 0.008 (0.50 ± 0.20)

STRUCTURE



1	Alumina Substrate	6	Solder Plating (Sn)
2	Bottomside Electrode	7	Resistive Element
3	Topside Electrode	8	Resistive Element Overcoat
4	Edge Electrode	9	Primary Overcoat
5	Barrier Layer (Ni)		

ELECTRICAL SPECIFICATIONS & RANGE

	SIZE	01005	0201	0402		0603		0805	
	Power Rating at 70°C (W)	0.03W (1/32W)	0.05W (1/20W)	0.063W (1/16W)	0.10W (1/10W)	0.063W (1/16W)	0.10W (1/10W)	0.10W (1/10W)	0.125W (1/8W)
	Max. Working Voltage	√—PR or 15V whichever is less	√—PR or 25V whichever is less	√—PR or 50V whichever is less		√—PR or 75V whichever is less		√—PR or 150V whichever is less	
	*Max. Overload Voltage	30V	50V	100V		150V		300V	
	Operating Temp. Range	-55°C to +125°C	-55°C to +125°C	-55°C to +155°C		-55°C to +155°C		-55°C to +155°C	
Zero Ohm (Jumper)	Current Rating	0.5A	0.5A	1A		1A		2A	
Zero Ohm (Jumper)	Resistance	50 mΩ (max)	50 mΩ (max)	50 mΩ (max)		50 mΩ (max)		50 mΩ (max)	
Tolerance	TCR	Resistance Range	Resistance Range	Resistance Range		Resistance Range		Resistance Range	
±0.1% (B)	±100ppm	-	-	-	-	10Ω - 1MΩ		10Ω - 1MΩ	
±0.5% (D)	±100ppm	-	-	10Ω - 1MΩ	-	10Ω - 1MΩ		10Ω - 1MΩ	
	±200ppm	-	-	1.02MΩ - 10MΩ	-	1.02MΩ - 10MΩ		1.02MΩ - 10MΩ	
±1% (F)	±100ppm	-	-	10Ω - 10MΩ	10Ω - 1MΩ	10Ω - 10MΩ		10Ω - 10MΩ	
	±200ppm	-	10Ω - 10MΩ	1Ω - 9.76Ω; 10.2MΩ - 20MΩ	1Ω - 9.76Ω; 1.02MΩ - 10MΩ	1Ω - 9.76Ω; 10.2MΩ - 21.5MΩ		1Ω - 9.76Ω; 10.2MΩ - 21.5MΩ	
	±250ppm	100Ω - 1MΩ	-	-	-	-		-	
	±300ppm	10Ω - 99Ω	-	-	-	-		-	
±5% (J)	±100ppm	-	-	-	-	-		-	
	±200ppm	-	1Ω - 10MΩ	1Ω - 10MΩ	1Ω - 10MΩ	1Ω - 10MΩ		1Ω - 10MΩ	
	±250ppm	100Ω - 1MΩ	-	-	-	-		-	
	±300ppm	10Ω - 99Ω	-	-	-	-		-	
	±350ppm	-	-	-	-	10MΩ - 22MΩ		10MΩ - 22MΩ	

	SIZE	1206		1210		2010		2512	
	Power Rating at 70°C (W)	0.125W (1/8W)	0.25W (1/4W)	0.25W (1/4W)	0.50W (1/2W)	0.50W (1/2W)	1.0W	1.0W	2.0W
	Max. Working Voltage	√—PR or 200V whichever is less		√—PR or 200V whichever is less		√—PR or 200V whichever is less		√—PR or 200V whichever is less	
	*Max. Overload Voltage	400V		400V		400V		500V	
	Operating Temp. Range	-55°C to +155°C		-55°C to +155°C		-55°C to +155°C		-55°C to +155°C	
Zero Ohm (Jumper)	Current Rating	2A		2.5A		3.5A		4A	
Zero Ohm (Jumper)	Resistance	50 mΩ (max)		50 mΩ (max)		50 mΩ (max)		50 mΩ (max)	
Tolerance	TCR	Resistance Range		Resistance Range		Resistance Range		Resistance Range	
±0.1% (B)	±100ppm	10Ω - 1MΩ		10Ω - 1MΩ		10Ω - 1MΩ		10Ω - 1MΩ	
±0.5% (D)	±100ppm	10Ω - 1MΩ		-		-		-	
	±200ppm	1.02MΩ - 10MΩ		-		-		-	
±1% (F)	±100ppm	10Ω - 10MΩ		10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ
	±200ppm	1Ω - 9.76Ω; 10.2MΩ - 21.5MΩ		1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω
	±250ppm	-		-		-		-	
	±300ppm	-		20.5MΩ - 21.5MΩ	-	20.5MΩ - 21.5MΩ	-	-	
±5% (J)	±100ppm	-		10Ω - 1MΩ		10Ω - 1MΩ		10Ω - 1MΩ	
	±200ppm	1Ω - 10MΩ		1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω 1.1MΩ - 20MΩ	1Ω - 9.76Ω
	±250ppm	-		-		-		-	
	±300ppm	-		20.5MΩ - 21.5MΩ	-	20.5MΩ - 21.5MΩ	-	-	
	±350ppm	10MΩ - 22MΩ		-		-		-	

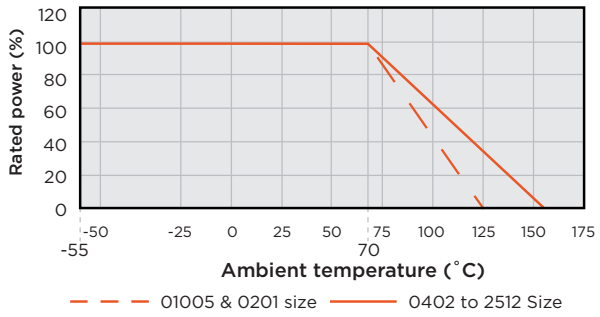
* Note: Max OverLoad Voltage = $2.5*(P*R)^{1/2}$ or Max. overload voltage listed above, whichever is lower.

MARKING CODE



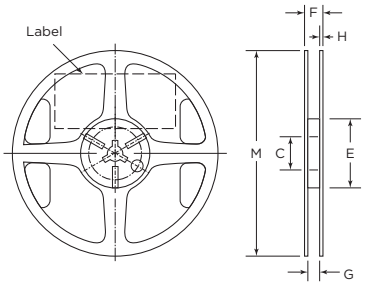
- 1% E-24 values for 0603 size and larger are typically marked with the standard 3 digit marking code.
- 1% E-96 values for 0805 size and larger may or may not be marked with the standard 4 digit marking code.
- 5% E-24 values for 0603 size and larger, will be marked with standard 3 digit marking code.
- 0603 -1% E-96 values will be marked with a standard 3 digit alpha numeric code (Please see page 5 for alpha numeric codes).
- 01005, 0201 and 0402 cannot be marked.
- 5% E-24 values for 1210~2512, may be marked with 4 digit marking code.
- E-192 values will not typically be marked.

DERATING CURVE



TAPE & REEL SPECIFICATIONS

REEL

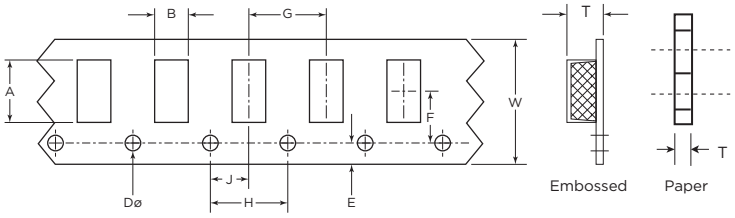


Unit: mm (inch)

C	E	F	G	H	M
13.0 ± 0.2 (0.51 ± 0.008)	60.0 ± 1.0 (2.36 ± 0.03)	11.4 ± 1.0 (0.45 ± 0.04)	9.0 ± .3 (0.35 ± 0.012)	1.5 ± .3 (0.06 ± 0.012)	180 ± 2.0 (7.09 ± 0.08)

Minimum of 30 empty pockets at the beginning of reel, 65 minimum empty pockets at the end.

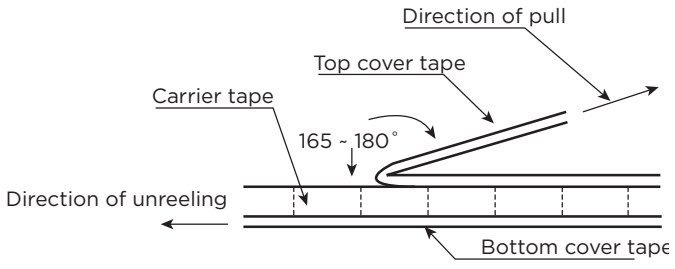
TAPE



All dimensions in mm.

TAPE	SIZE	A	B	W	E	F	T	G	H	J	DØ
Paper	01005	0.45 ± 0.05	0.25 ± 0.05	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.40 ± 0.10	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0201	0.7 ± 0.08	0.4 ± 0.08	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.42 ± 0.20	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0402	1.15 ± 0.1	0.65 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.45 ± 0.10	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0603	1.9 ± 0.1	1.1 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.70 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0805	2.4 ± 0.1	1.65 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.85 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	1206	3.5 ± 0.2	1.9 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.85 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	1210	3.5 ± 0.1	2.8 ± 0.2	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.85 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
Embossed	2010	5.4 ± 0.2	2.9 ± 0.2	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.5	1.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	2512	6.8 ± 0.2	3.6 ± 0.2	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.5	1.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0

PEEL BACK FORCE & DIRECTION DIAGRAM



Peel back force and direction of peel back angle should follow EIA481-1-A. Peel back force should be between 0.1N – 1.3N and peel back angle of 165° – 180°.

MARKING CODES FOR 0603, 1% RESISTORS

As the chart shows, a Two-Digit Number Code is assigned to each standard Resistance Value per E96 guidelines (Decade value listings). This is followed by an Alpha Code System which is a multiplier for the value table. Each letter, from "A" — "Z", represents a specific multiplier.

STANDARD RESISTANCE VALUES FOR THE 10 TO 100 DECADE

(also usable in decade multiples or sub-multiples)

MARKING CODES FOR RESISTANCE VALUES

E96		E96		E96		E96		E96		E96	
DECADE	CODE	DECADE	CODE	DECADE	CODE	DECADE	CODE	DECADE	CODE	DECADE	CODE
100	01	147	17	215	33	316	49	464	65	681	81
102	02	150	18	221	34	324	50	475	66	698	82
105	03	154	19	226	35	332	51	487	67	715	83
107	04	158	20	232	36	340	52	499	68	732	84
110	05	162	21	237	37	348	53	511	69	750	85
113	06	165	22	243	38	357	54	523	70	768	86
115	07	169	23	249	39	365	55	536	71	787	87
118	08	174	24	255	40	374	56	549	72	806	88
121	09	178	25	261	41	383	57	562	73	825	89
124	10	182	26	267	42	392	58	576	74	845	90
127	11	187	27	274	43	402	59	590	75	866	91
130	12	191	28	280	44	412	60	604	76	887	92
133	13	196	29	287	45	422	61	619	77	909	93
137	14	200	30	294	46	432	62	634	78	931	94
140	15	205	31	301	47	442	63	649	79	953	95
143	16	210	32	309	48	453	64	665	80	976	96

LETTER MULTIPLIER CROSS REFERENCE

A – 10^0
B – 10^1
C – 10^2
D – 10^3
E – 10^4
F – 10^5
G – 10^6
H – 10^7
X – 10^{-1}
Y – 10^{-2}
Z – 10^{-3}

(Letter multipliers may also come in lower case.)

By combining a specific two-digit code and a letter multiplier, you have a series of Numeric/Alpha digits that give you the complete E96 Resistance Value Codes for parts marking.

0603, ±1%	**EXAMPLE:**	
Chip Marking	**Explanation**	**Value:**
01A	01 means 100 and A = 1	100 x 1.0 = 100 Ohm
25C	25 means 178 and C = 100	178 x 100 = 17.8K Ohm
93D	93 means 909 and D = 1000	909 x 1000 = 909K Ohm

ENVIRONMENTAL CHARACTERISTICS

ITEM	REQUIREMENT			TEST METHOD
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55˚C~+12˚C, 25˚C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70±2˚C, RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”
Damp Heat with Load	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	JIS-C-5201-1 4.24 IEC-60115-1 4.24 40±2˚C, 90-95% R.H., RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +125/+155˚C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5˚C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5˚C for 10 seconds
Voltage Proof	No breakdown or flashover			JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%			JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5˚C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55˚C to +125/+155˚C, 5 cycles

RCWV (Rated Continuous Working Voltage)=√(P*R) or or Max. Operating Voltage whichever is lower.
Storage Temperature: 15-28°C; Humidity: < 80%RH°C