

CBR Series, C0G Dielectric, Ultra High Q, Low ESR, 6.3 – 500 VDC (RF & Microwave)

Overview

KEMET's CBR Series surface mount multilayer ceramic capacitors (MLCCs) in C0G dielectric feature a robust and exceptionally stable copper electrode dielectric system that offers excellent low loss performance (High Q). These devices provide extremely low ESR and high self-resonance characteristics, and are well-suited for resonant circuit applications or those where Q and stability of capacitance characteristics are required. CBR Series capacitors exhibit no change in capacitance with respect to time and voltage, and boast a negligible change in capacitance with reference to

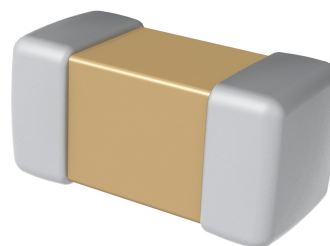
ambient temperature. Capacitance change is limited to ± 30 ppm/°C from -55°C to +125°C.

CBR Series devices are suitable for many circuit applications including RF power amplifiers, mixers, oscillators, low noise amplifiers, filter networks, antenna tuning, timing circuits, delay lines, and MRI imaging coils.



Benefits

- -55°C to +125°C operating temperature range
- Ultra high Q
- Base metal electrode (BME) dielectric system
- Pb-Free and RoHS Compliant
- 0201, 0402, 0603, and 0805 case sizes (inches)
- DC voltage ratings of 6.3 V, 10 V, 25 V, 50 V, 100 V, 250 V and 500 V
- Capacitance offerings ranging from 0.1 pF up to 100 pF
- Available capacitance tolerances of ± 0.05 pF, ± 0.1 pF, ± 0.25 pF, ± 0.5 pF, $\pm 1\%$, $\pm 2\%$, $\pm 5\%$, and $\pm 10\%$

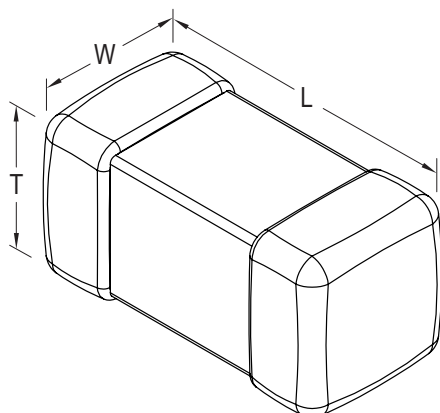


Ordering Information

CBR	02	C	330	F	9	G	A	C	
Series	Case Size (L"x W")	Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Dielectric	Termination Style	Termination Finish	Packaging/Grade (C-Spec) ¹
CBR	02 = 0201 04 = 0402 06 = 0603 08 = 0805	C = Standard	2 significant digits + number of zeros Use 9 for 1.0 – 9.9 pF Use 8 for 0.1 – .99 pF e.g., 2.2 pF = 229 e.g., 0.5 pF = 508	A = ± 0.05 pF B = ± 0.1 pF C = ± 0.25 pF D = ± 0.5 pF F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$	9 = 6.3 V 8 = 10 V 3 = 25 V 5 = 50 V 1 = 100 V A = 250 V C = 500 V	G = C0G	A = N/A	C = 100% Matte Sn	Blank = 7" Reel Unmarked

¹ When ordering CBR series devices, a "suffix" or "C-Spec" is not required to indicate a 7" reel packaging option. CBR devices are only available and shipped on 7" reels (paper tape). Bulk bag and cassette packaging options are not available. Please contact KEMET if you have a specific, non-standard packaging requirement.

Dimensions – Millimeters (Inches)



Case Size (in.)	Case Size (mm)	L Length	W Width	T Thickness	B Bandwidth	Mounting Technique
0201	0603	0.60 ± 0.03 (0.024 ± 0.001)	0.30 ± 0.03 (0.012 ± 0.001)	0.30 ± 0.03 (0.012 ± 0.001)	0.15 ± 0.05 (0.006 ± 0.002)	Solder Reflow Only
0402	1005	1.00 ± 0.05 (0.040 ± 0.002)	0.50 ± 0.05 (0.020 ± 0.002)	0.50 ± 0.05 (0.020 ± 0.002)	$0.25 + 0.05 / -0.10$ ($0.010 + 0.002 / -0.004$)	
0603	1608	1.60 ± 0.10 (0.063 ± 0.004)	0.80 ± 0.10 (0.031 ± 0.004)	0.80 ± 0.07 (0.031 ± 0.003)	0.40 ± 0.15 (0.016 ± 0.006)	Solder Wave or Solder Reflow
0805	2012	2.00 ± 0.20 (0.079 ± 0.008)	1.25 ± 0.20 (0.049 ± 0.008)	0.85 ± 0.10 (0.031 ± 0.004)	0.50 ± 0.20 (0.020 ± 0.008)	

Benefits

- No piezoelectric noise
- Low ESR
- High thermal stability
- No capacitance change with respect to applied rated DC voltage
- Negligible capacitance change with respect to temperature
- No capacitance decay with time
- Non-polar device, minimizing installation concerns
- 100% pure matte tin-plated termination finish allowing for excellent solderability

Applications

Typical applications include critical timing, tuning, bypass, coupling, feedback, filtering, impedance matching and DC blocking.

Field applications include wireless and cellular base stations, wireless LAN, subscriber-based wireless services, wireless broadcast equipment, satellite communications, RF power amplifier (PA) modules, filters, voltage-controlled oscillators (VCOs), PAs, matching networks, RF modules, and medical electronics.

Qualification

RF and microwave products are subject to internal qualification. Details regarding test methods and conditions are referenced in Table 4, Performance & Reliability.

Electrical Parameters/Characteristics

Item	Parameters/Characteristics
Operating Temperature Range	-55°C to +125°C
Capacitance Change with Reference to +25°C and 0 VDC Applied (TCC)	0 ±30 ppm/°C (0 ±60 ppm/°C for 0201 case size product ≥ 22 pF)
Aging Rate (Maximum % Capacitance Loss/Decade Hour)	0%
Dielectric Withstanding Voltage (DWV)	See Dielectric Withstanding Voltage Table (5 ±1 seconds and charge/discharge not exceeding 50 mA)
Quality Factor (Q)	≥1,000 for capacitance values ≥30 pF ≥400 +20C for capacitance values < 30 pF
Insulation Resistance (IR) Limit @ 25°C	10GΩ minimum (rated voltage applied for 120 ±5 seconds)

Capacitance and Quality Factor (Q) measured at 25°C and 30 – 70% relative humidity under the following conditions:

1 MHz ±100 kHz and 1.0 ±0.2 Vrms if capacitance ≤ 1,000 pF

1 kHz ±100 Hz and 1.0 ±0.2 Vrms if capacitance > 1,000 pF

Note: When measuring capacitance it is important to ensure the set voltage level is held constant. The HP4284 & Agilent E4980 have a feature known as Automatic Level Control (ALC). The ALC feature should be switched to "ON."

Dielectric Withstanding Voltage Table

Rated Voltage (VDC)	≤100 V	250 V	500 V
DWV	250%	200%	150%

Environmental Compliance

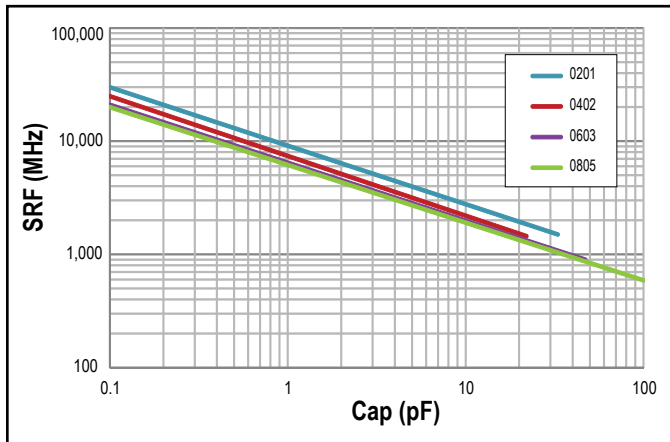
Pb-Free and RoHS Compliant.



RoHS Compliant

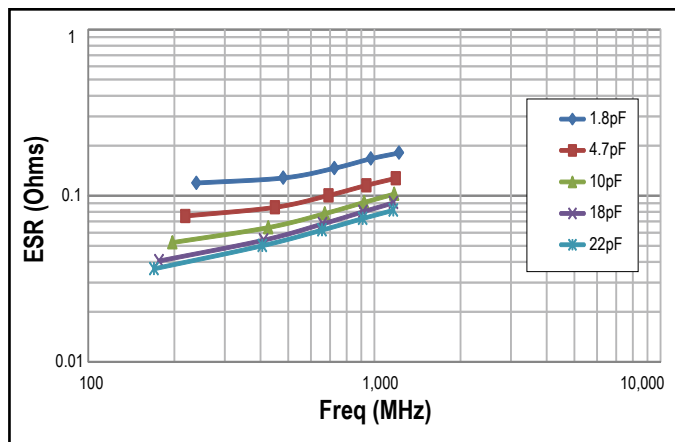
Electrical Characteristics

SRF (MHz) vs. Cap (pF)

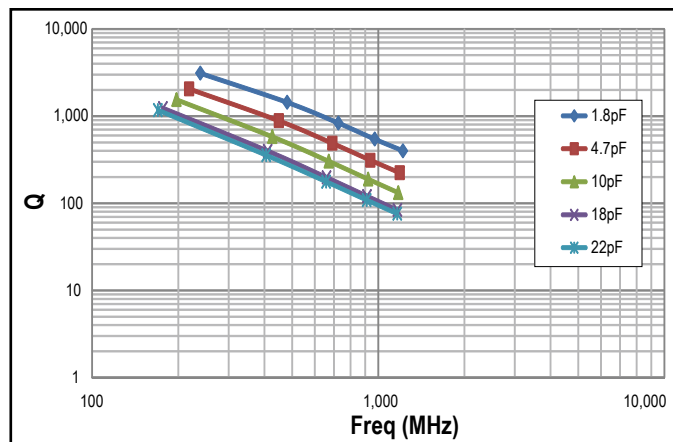


Electrical Characteristics cont'd

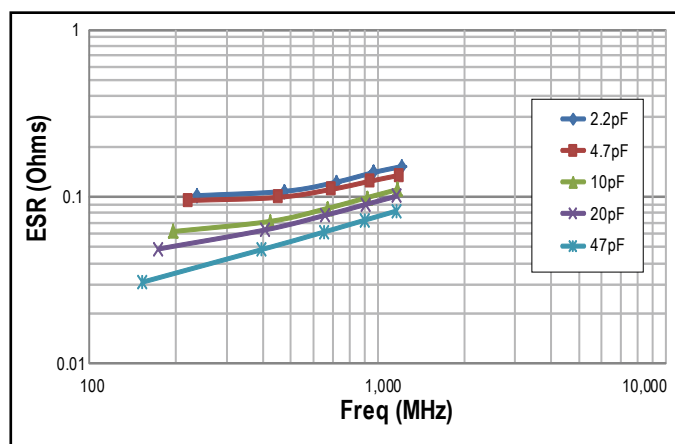
ESR vs. Frequency 0402



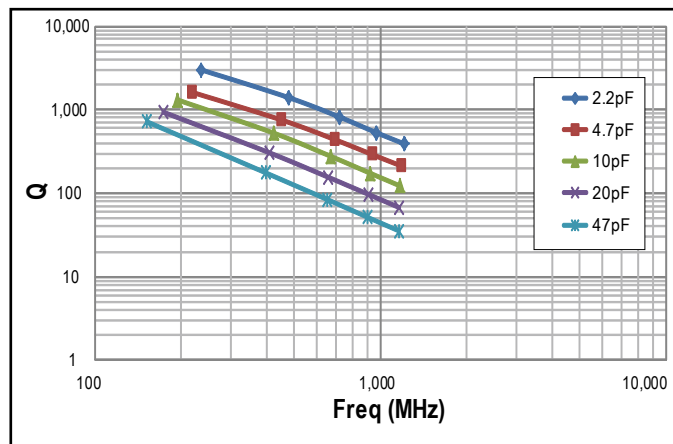
Q vs. Frequency 0402



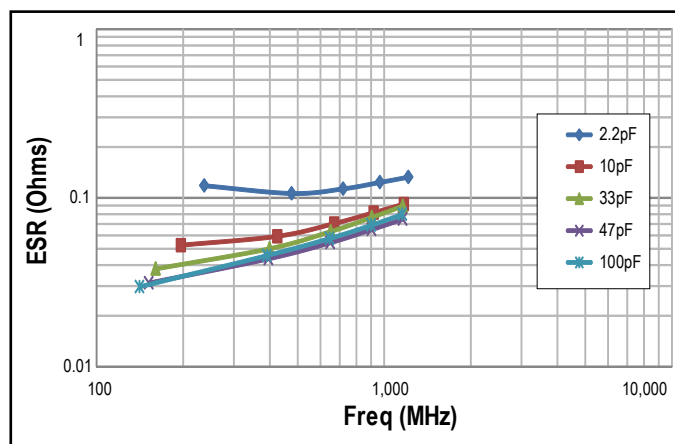
ESR vs. Frequency 0603



Q vs. Frequency 0603



ESR vs. Frequency 0805



Q vs. Frequency 0805

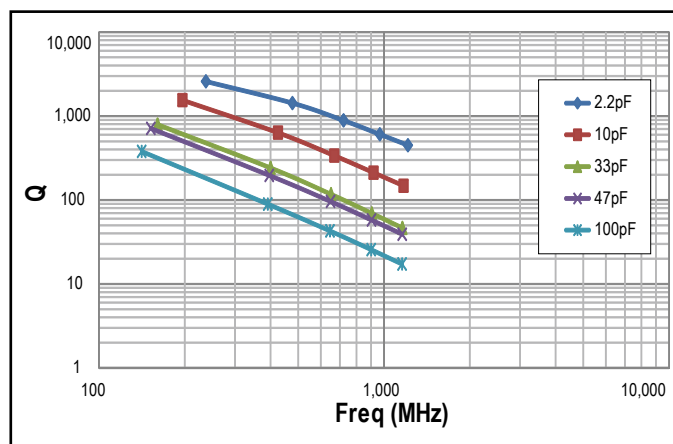


Table 1 – CBR Series, Capacitance Range Waterfall

Case Size – Inches (mm)		0201 (0603)				0402 (1005)			0603 (1608)			0805 (2012)			
Length	mm (Inches)	0.60 ± 0.03 (0.024 ± 0.001)				1.00 ± 0.05 (0.040 ± 0.002)			1.60 ± 0.10 (0.063 ± 0.004)			2.00 ± 0.20 (0.079 ± 0.008)			
Width	mm (Inches)	0.30 ± 0.03 (0.012 ± 0.001)				0.50 ± 0.05 (0.020 ± 0.002)			0.80 ± 0.10 (0.031 ± 0.004)			1.25 ± 0.20 (0.049 ± 0.008)			
Thickness	mm (Inches)	0.30 ± 0.03 (0.012 ± 0.001)				0.50 ± 0.05 (0.020 ± 0.002)			0.80 ± 0.07 (0.031 ± 0.003)			0.85 ± 0.10 (0.031 ± 0.004)			
Bandwidth	mm (Inches)	0.15 ± 0.05 (0.006 ± 0.002)				0.25 ± 0.05 / -0.10 (0.010 ± 0.002 / -0.004)			0.40 ± 0.15 (0.016 ± 0.006)			0.50 ± 0.20 (0.020 ± 0.008)			
Rated Voltage (VDC)		6.3	10	25	50	25	50	100	50	100	250	50	100	250	500
Voltage Code		9	8	3	5	3	5	1	5	1	A	5	1	A	C
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)													
0.1 pF	A = ±0.05 pF B = ±0.1 pF	108*	108*	108*	108*	108	108	108*							
0.2 pF		208	208	208	208	208	208	208							
0.3 pF		308	308	308	308	308	308	308	308	308	308	308	308	308	308
0.4 pF		408	408	408	408	408	408	408	408	408	408	408	408	408	408
0.5 pF		508	508	508	508	508	508	508	508	508	508	508	508	508	508
0.6 pF		608	608	608	608	608	608	608	608	608	608	608	608	608	608
0.7 pF		708	708	708	708	708	708	708	708	708	708	708	708	708	708
0.8 pF		808	808	808	808	808	808	808	808	808	808	808	808	808	808
0.9 pF		908	908	908	908	908	908	908	908	908	908	908	908	908	908
1.0 pF		109	109	109	109	109	109	109	109	109	109	109	109	109	109
1.1 pF	119	119	119	119	119	119	119	119	119	119	119	119	119	119	
1.2 pF	129	129	129	129	129	129	129	129	129	129	129	129	129	129	
1.3 pF	139	139	139	139	139	139	139	139	139	139	139	139	139	139	
1.4 pF	149	149	149	149	149	149	149	149	149	149	149	149	149	149	
1.5 pF	159	159	159	159	159	159	159	159	159	159	159	159	159	159	
1.6 pF	169	169	169	169	169	169	169	169	169	169	169	169	169	169	
1.7 pF	179	179	179	179	179	179	179	179	179	179	179	179	179	179	
1.8 pF	189	189	189	189	189	189	189	189	189	189	189	189	189	189	
1.9 pF	199	199	199	199	199	199	199	199	199	199	199	199	199	199	
2.0 pF	209	209	209	209	209	209	209	209	209	209	209	209	209	209	
2.1 pF	219	219	219	219	219	219	219	219	219	219	219	219	219	219	
2.2 pF	229	229	229	229	229	229	229	229	229	229	229	229	229	229	
2.3 pF	239	239	239	239	239	239	239	239	239	239	239	239	239	239	
2.4 pF	249	249	249	249	249	249	249	249	249	249	249	249	249	249	
2.5 pF	259	259	259	259	259	259	259	259	259	259	259	259	259	259	
2.6 pF	269	269	269	269	269	269	269	269	269	269	269	269	269	269	
2.7 pF	279	279	279	279	279	279	279	279	279	279	279	279	279	279	
2.8 pF	289	289	289	289	289	289	289	289	289	289	289	289	289	289	
2.9 pF	299	299	299	299	299	299	299	299	299	299	299	299	299	299	
3.0 pF	309	309	309	309	309	309	309	309	309	309	309	309	309	309	
3.1 pF	319	319	319	319	319	319	319	319	319	319	319	319	319	319	
3.2 pF	329	329	329	329	329	329	329	329	329	329	329	329	329	329	
3.3 pF	339	339	339	339	339	339	339	339	339	339	339	339	339	339	
3.4 pF	349	349	349	349	349	349	349	349	349	349	349	349	349	349	
3.5 pF	359	359	359	359	359	359	359	359	359	359	359	359	359	359	
3.6 pF	369	369	369	369	369	369	369	369	369	369	369	369	369	369	
3.7 pF	379	379	379	379	379	379	379	379	379	379	379	379	379	379	
3.8 pF	389	389	389	389	389	389	389	389	389	389	389	389	389	389	
3.9 pF	399	399	399	399	399	399	399	399	399	399	399	399	399	399	
4.0 pF	409	409	409	409	409	409	409	409	409	409	409	409	409	409	
4.1 pF	419	419	419	419	419	419	419	419	419	419	419	419	419	419	
4.2 pF	429	429	429	429	429	429	429	429	429	429	429	429	429	429	
4.3 pF	439	439	439	439	439	439	439	439	439	439	439	439	439	439	
4.4 pF	449	449	449	449	449	449	449	449	449	449	449	449	449	449	
4.5 pF	459	459	459	459	459	459	459	459	459	459	459	459	459	459	
4.6 pF	469	469	469	469	469	469	469	469	469	469	469	469	469	469	
4.7 pF	479	479	479	479	479	479	479	479	479	479	479	479	479	479	
4.8 pF	489	489	489	489	489	489	489	489	489	489	489	489	489	489	
4.9 pF	499	499	499	499	499	499	499	499	499	499	499	499	499	499	
Rated Voltage (VDC)		6.3	10	25	50	25	50	100	50	100	250	50	100	250	500
Voltage Code		9	8	3	5	3	5	1	5	1	A	5	1	A	C

* Available only in "B" (±0.1pF) capacitance tolerance.

Table 1 – CBR Series, Capacitance Range Waterfall cont'd

Case Size – Inches (mm)		0201 (0603)				0402 (1005)			0603 (1608)			0805 (2012)			
Length	mm (Inches)	0.60 ± 0.03 (0.024 ± 0.001)				1.00 ± 0.05 (0.040 ± 0.002)			1.60 ± 0.10 (0.063 ± 0.004)			2.00 ± 0.20 (0.079 ± 0.008)			
Width	mm (Inches)	0.30 ± 0.03 (0.012 ± 0.001)				0.50 ± 0.05 (0.020 ± 0.002)			0.80 ± 0.10 (0.031 ± 0.004)			1.25 ± 0.20 (0.049 ± 0.008)			
Thickness	mm (Inches)	0.30 ± 0.03 (0.012 ± 0.001)				0.50 ± 0.05 (0.020 ± 0.002)			0.80 ± 0.07 (0.031 ± 0.003)			0.85 ± 0.10 (0.031 ± 0.004)			
Bandwidth	mm (Inches)	0.15 ± 0.05 (0.006 ± 0.002)				0.25 ± 0.05 / -0.10 (0.010 + 0.002 / -0.004)			0.40 ± 0.15 (0.016 ± 0.006)			0.50 ± 0.20 (0.020 ± 0.008)			
Rated Voltage (VDC)		6.3	10	25	50	25	50	100	50	100	250	50	100	250	500
Voltage Code		9	8	3	5	3	5	1	5	1	A	5	1	A	C
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)													
5.0 pF	A = ±0.05 pF B = ±0.1 pF C = ±0.25 pF	509	509	509	509	509	509	509	509	509	509	509	509	509	509
5.1 pF	B = ±0.1 pF C = ±0.25 pF D = ±0.5 pF	519	519	519	519	519	519	519	519	519	519	519	519	519	519
5.2 pF		529	529	529	529	529	529	529	529	529	529	529	529	529	529
5.3 pF		539	539	539	539	539	539	539	539	539	539	539	539	539	539
5.4 pF		549	549	549	549	549	549	549	549	549	549	549	549	549	549
5.5 pF		559	559	559	559	559	559	559	559	559	559	559	559	559	559
5.6 pF		569	569	569	569	569	569	569	569	569	569	569	569	569	569
5.7 pF		579	579	579	579	579	579	579	579	579	579	579	579	579	579
5.8 pF		589	589	589	589	589	589	589	589	589	589	589	589	589	589
5.9 pF		599	599	599	599	599	599	599	599	599	599	599	599	599	599
6.0 pF		609	609	609	609	609	609	609	609	609	609	609	609	609	609
6.1 pF		619	619	619	619	619	619	619	619	619	619	619	619	619	619
6.2 pF		629	629	629	629	629	629	629	629	629	629	629	629	629	629
6.3 pF		639	639	639	639	639	639	639	639	639	639	639	639	639	639
6.4 pF		649	649	649	649	649	649	649	649	649	649	649	649	649	649
6.5 pF		659	659	659	659	659	659	659	659	659	659	659	659	659	659
6.6 pF		669	669	669	669	669	669	669	669	669	669	669	669	669	669
6.7 pF		679	679	679	679	679	679	679	679	679	679	679	679	679	679
6.8 pF		689	689	689	689	689	689	689	689	689	689	689	689	689	689
6.9 pF		699	699	699	699	699	699	699	699	699	699	699	699	699	699
7.0 pF		709	709	709	709	709	709	709	709	709	709	709	709	709	709
7.1 pF		719	719	719	719	719	719	719	719	719	719	719	719	719	719
7.2 pF		729	729	729	729	729	729	729	729	729	729	729	729	729	729
7.3 pF		739	739	739	739	739	739	739	739	739	739	739	739	739	739
7.4 pF		749	749	749	749	749	749	749	749	749	749	749	749	749	749
7.5 pF		759	759	759	759	759	759	759	759	759	759	759	759	759	759
7.6 pF	769	769	769	769	769	769	769	769	769	769	769	769	769	769	
7.7 pF	779	779	779	779	779	779	779	779	779	779	779	779	779	779	
7.8 pF	789	789	789	789	789	789	789	789	789	789	789	789	789	789	
7.9 pF	799	799	799	799	799	799	799	799	799	799	799	799	799	799	
8.0 pF	809	809	809	809	809	809	809	809	809	809	809	809	809	809	
8.1 pF	819	819	819	819	819	819	819	819	819	819	819	819	819	819	
8.2 pF	829	829	829	829	829	829	829	829	829	829	829	829	829	829	
8.3 pF	839	839	839	839	839	839	839	839	839	839	839	839	839	839	
8.4 pF	849	849	849	849	849	849	849	849	849	849	849	849	849	849	
8.5 pF	859	859	859	859	859	859	859	859	859	859	859	859	859	859	
8.6 pF	869	869	869	869	869	869	869	869	869	869	869	869	869	869	
8.7 pF	879	879	879	879	879	879	879	879	879	879	879	879	879	879	
8.8 pF	889	889	889	889	889	889	889	889	889	889	889	889	889	889	
8.9 pF	899	899	899	899	899	899	899	899	899	899	899	899	899	899	
9.0 pF	909	909	909	909	909	909	909	909	909	909	909	909	909	909	
9.1 pF	919	919	919	919	919	919	919	919	919	919	919	919	919	919	
9.2 pF	929	929	929	929	929	929	929	929	929	929	929	929	929	929	
9.3 pF	939	939	939	939	939	939	939	939	939	939	939	939	939	939	
9.4 pF	949	949	949	949	949	949	949	949	949	949	949	949	949	949	
9.5 pF	959	959	959	959	959	959	959	959	959	959	959	959	959	959	
Rated Voltage (VDC)		6.3	10	25	50	25	50	100	50	100	250	50	100	250	500
Voltage Code		9	8	3	5	3	5	1	5	1	A	5	1	A	C

Table 1 – CBR Series, Capacitance Range Waterfall cont'd

Case Size – Inches (mm)		0201 (0603)				0402 (1005)			0603 (1608)			0805 (2012)				
Length	mm (Inches)	0.60 ± 0.03 (0.024 ± 0.001)				1.00 ± 0.05 (0.040 ± 0.002)			1.60 ± 0.10 (0.063 ± 0.004)			2.00 ± 0.20 (0.079 ± 0.008)				
Width	mm (Inches)	0.30 ± 0.03 (0.012 ± 0.001)				0.50 ± 0.05 (0.020 ± 0.002)			0.80 ± 0.10 (0.031 ± 0.004)			1.25 ± 0.20 (0.049 ± 0.008)				
Thickness	mm (Inches)	0.30 ± 0.03 (0.012 ± 0.001)				0.50 ± 0.05 (0.020 ± 0.002)			0.80 ± 0.07 (0.031 ± 0.003)			0.85 ± 0.10 (0.031 ± 0.004)				
Bandwidth	mm (Inches)	0.15 ± 0.05 (0.006 ± 0.002)				0.25 ± 0.05 / -0.10 (0.010 + 0.002 / -0.004)			0.40 ± 0.15 (0.016 ± 0.006)			0.50 ± 0.20 (0.020 ± 0.008)				
Rated Voltage (VDC)		6.3	10	25	50	25	50	100	50	100	250	50	100	250	500	
Voltage Code		9	8	3	5	3	5	1	5	1	A	5	1	A	C	
Capacitance	Capacitance Tolerance	Capacitance Code (Available Capacitance)														
9.6 pF	B = ±0.1 pF C = ±0.25 pF D = ±0.5 pF	969	969	969	969	969	969	969	969	969	969	969	969	969	969	
9.7 pF		979	979	979	979	979	979	979	979	979	979	979	979	979	979	
9.8 pF		989	989	989	989	989	989	989	989	989	989	989	989	989	989	
9.9 pF		999	999	999	999	999	999	999	999	999	999	999	999	999	999	
10 pF	F = ±1% G = ±2% J = ±5%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
11 pF		110	110	110	110	110	110	110	110	110	110	110	110	110	110	
12 pF		120	120	120	120	120	120	120	120	120	120	120	120	120	120	
13 pF		130	130	130	130	130	130	130	130	130	130	130	130	130	130	
15 pF		150	150	150	150	150	150	150	150	150	150	150	150	150	150	
16 pF		160	160	160	160	160	160	160	160	160	160	160	160	160	160	
18 pF		180	180	180	180	180	180	180	180	180	180	180	180	180	180	
20 pF		200	200	200	200	200	200	200	200	200	200	200	200	200	200	
22 pF		220	220	220		220	220	220	220	220	220	220	220	220	220	
24 pF		240	240	240		240	240	240	240	240	240	240	240	240	240	
27 pF		270	270	270		270	270	270	270	270	270	270	270	270	270	
30 pF		300	300	300		300	300	300	300	300	300	300	300	300	300	
33 pF		330	330	330		330	330	330	330	330	330	330	330	330	330	
36 pF						360	360	360	360	360	360	360	360	360	360	
39 pF						390	390	390	390	390	390	390	390	390	390	
43 pF						430	430	430	430	430	430	430	430	430	430	
47 pF						470	470	470	470	470	470	470	470	470	470	
51 pF						510	510	510				510	510	510	510	
56 pF						560	560	560				560	560	560	560	
62 pF						620						620	620	620	620	
68 pF						680						680	680	680	680	
75 pF						750						750	750	750		
82 pF						820						820	820	820		
91 pF						910						910	910	910		
100 pF						101						101	101	101		
Rated Voltage (VDC)		6.3	10	25	50	25	50	100	50	100	250	50	100	250	500	
Voltage Code		9	8	3	5	3	5	1	5	1	A	5	1	A	C	

Table 2 – Chip Thickness/Reeling Quantities

Chip Size Inches (mm)	Chip Thickness (mm)	Reel Quantity	
		7" Paper	13" Paper
0201 (0603)	0.30 ±0.03	15,000	Contact KEMET for availability.
0402 (1005)	0.50 ±0.05	10,000	
0603 (1608)	0.80 ±0.07	4,000	
0805 (2012)	0.85 ±0.10	4,000	

Table 3 – Chip Capacitor Land Pattern Design Recommendations per IPC–7351 (mm)

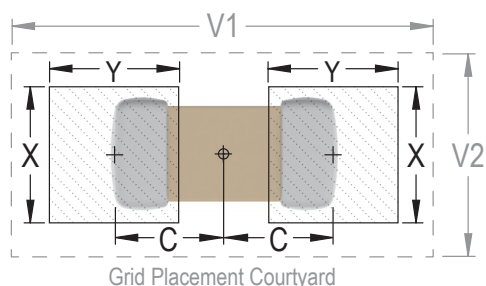
Case Size (Inches)	Case Size (mm)	Density Level A: Maximum (Most) Land Protrusion					Density Level B: Median (Nominal) Land Protrusion					Density Level C: Minimum (Least) Land Protrusion				
		C	Y	X	V1	V2	C	Y	X	V1	V2	C	Y	X	V1	V2
0201	0603	0.38	0.56	0.52	1.80	1.00	0.33	0.46	0.42	1.50	0.80	0.28	0.36	0.32	1.20	0.60
0402	1005	0.50	0.72	0.72	2.20	1.20	0.45	0.62	0.62	1.90	1.00	0.40	0.52	0.52	1.60	0.80
0603	1608	0.90	1.15	1.10	4.00	2.10	0.80	0.95	1.00	3.10	1.50	0.60	0.75	0.90	2.40	1.20
0805	2012	1.00	1.35	1.55	4.40	2.60	0.90	1.15	1.45	3.50	2.00	0.75	0.95	1.35	2.80	1.70

Density Level A: For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes. KEMET only recommends wave soldering of 0603(1608) and 0805 (2012) case sizes.

Density Level B: For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.

Density Level C: For high component density product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC Standard 7351 (IPC–7351).

Image below based on Density Level B for an EIA 1608 case size.



Soldering Process

Recommended Soldering Technique:

- Solder wave or solder reflow for 0603 and 0805 case sizes
- 0201 and 0402 case sizes are limited to solder reflow only

Recommended Soldering Profile:

- KEMET recommends following the guidelines outlined in IPC/JEDEC J–STD–020

Recommended Solder Alloys:

Alloy	Composition	Solidus	Liquidous
In50	50 In, 50 Pb	180°C	209°C
In52	52 In, 48 Sn	118°C	118°C
Sn62	62.5 Sn, 36.1 Pb, 1.4 Ag	179°C	179°C
Sn63	63 Sn, 37 Pb	183°C	183°C
Pb-Free	95.5 Sn, 3.8 Ag, 0.7 Cu	217°C	217°C
Hi-Temp	5 Sn, 93.5 Pb, 1.5 Ag	296°C	301°C
Sn5	5 Sn, 95 Pb	308°C	312°C

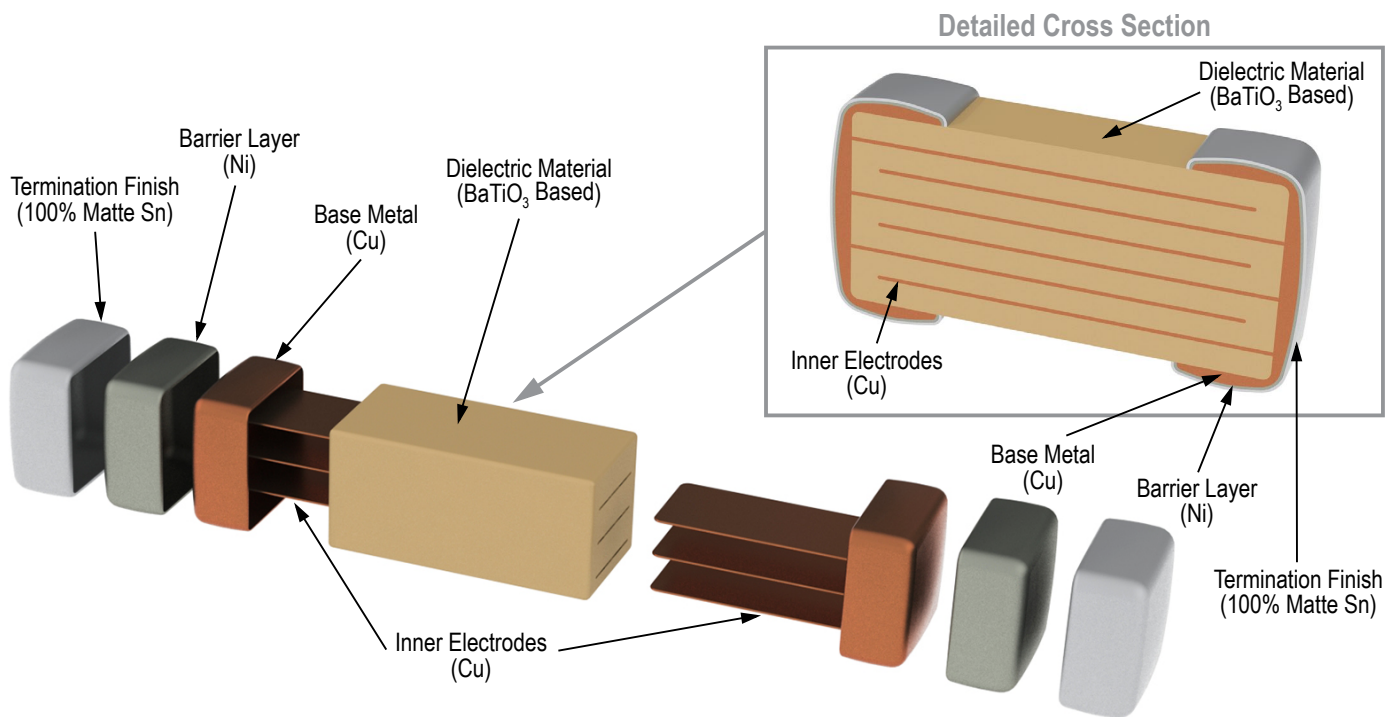
Table 4 – Performance & Reliability: Test Methods & Conditions

Stress	Test or Inspection Method	Requirements															
Terminal Strength	Pressurizing force: 0201 case size: 2N 0402 & 0603 case sizes: 5N 0805 case size: 10N Test time: 10 ±1 second	No visible damage or separation of termination system.															
Vibration Resistance	Vibration frequency: 10 ~ 55 Hz/minimum Total amplitude: 1.5 mm Test time: 6 hours (Two hours each in three mutually perpendicular directions.)	No visible damage. Cap change and Q/DF: To meet initial specification															
Solderability	Solder temperature: 235 ± 5°C Dipping time: 2 ±0.5 seconds	95% minimum coverage of termination finish.															
Board Flex	Capacitor is mounted to a substrate which is flexed by means of ram at a rate of 1 mm per second until the deflection becomes 1 mm. (Deflection is maintained for 5 ±1 second) Store at room temperature for 24 ±2 hours before measuring electrical properties.	No visible damage. Capacitance change: within ±5.0% or ±0.5 pF, whichever is larger. (Capacitance change is monitored during flexure.)															
Resistance to Soldering Heat	Solder temperature: 260 ±5°C Dipping time: 10 ±1 second Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. Store at room temperature for 24 ±2 hours before measuring electrical properties.	No visible damage. Capacitance change: within ±2.5% or ±0.25 pF, whichever is larger. Q/DF, IR and dielectric strength: To meet initial requirements. 25% maximum leaching on each edge.															
Temperature Cycling	5 cycles of steps 1 - 4: <table border="1"> <thead> <tr> <th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr> </thead> <tbody> <tr> <td>1</td><td>Minimum operating temp. +0/-3</td><td>30 ±3</td></tr> <tr> <td>2</td><td>Room temp</td><td>2 ~ 3</td></tr> <tr> <td>3</td><td>Maximum operating temp. +3/-0</td><td>30 ±3</td></tr> <tr> <td>4</td><td>Room temp (25°C)</td><td>2 ~ 3</td></tr> </tbody> </table> Store at room temperature for 24 ± 2 hours before measuring electrical properties.	Step	Temp. (°C)	Time (min.)	1	Minimum operating temp. +0/-3	30 ±3	2	Room temp	2 ~ 3	3	Maximum operating temp. +3/-0	30 ±3	4	Room temp (25°C)	2 ~ 3	No visible damage. Capacitance change: within ±2.5% or ±0.25 pF, whichever is larger. Q/DF, IR and dielectric strength: To meet initial requirements.
Step	Temp. (°C)	Time (min.)															
1	Minimum operating temp. +0/-3	30 ±3															
2	Room temp	2 ~ 3															
3	Maximum operating temp. +3/-0	30 ±3															
4	Room temp (25°C)	2 ~ 3															
Humidity (Damp Heat) Steady State	Test temperature: 40 ±2°C Humidity: 90 ~ 95% RH Test time: 500 +24/-0 hours Store at room temperature for 24 ±2 hours before measuring electrical properties.	No visible damage. Capacitance change: within ±5.0% or ±0.5 pF, whichever is larger. Q/DF value: Capacitance ≥ 30 pF, Q ≥ 350, 10 pF ≤ Capacitance < 30 pF, Q ≥ 275 +2.5°C Capacitance < 10 pF; Q ≥ 200 +10°C IR: ≥ 1GΩ															
Humidity (Damp Heat) Load	Test temperature: 40 ±2°C Humidity: 90 ~ 95% RH Test time: 500 +24/-0 hours Applied voltage: rated voltage Store at room temperature for 24 ±2 hours before measuring electrical properties.	No visible damage. Capacitance change: within ±7.5% or ±0.75 pF, whichever is larger. Q/DF value: Capacitance ≥ 30 pF, Q ≥ 200, Capacitance < 30 pF, Q ≥ 100+10/3°C IR: ≥ 500MΩ															
High Temperature Life	Test temperature: 125 ±3°C Applied voltage: 200% of rated voltage (6.3 VDC - 250 VDC) 150% of rated voltage (500 VDC) Test time: 1,000 +24/-0 hours Store at room temperature for 24 ±2 hours before measuring electrical properties.	No visible damage. Capacitance change: within ±3.0% or ±0.3 pF, whichever is larger. Q/DF value: Capacitance ≥ 30 pF, Q ≥ 350, 10 pF ≤ Capacitance < 30 pF, Q ≥ 275 +2.5°C Capacitance < 10 pF, Q ≥ 200 +10°C IR: ≥ 1 GΩ															

Storage and Handling

Ceramic chip capacitors should be stored in normal working environments. While the chips themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature— reels may soften or warp and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 70% relative humidity. Temperature fluctuations should be minimized to avoid condensation on the parts and atmospheres should be free of chlorine and sulfur bearing compounds. For optimized solderability chip stock should be used promptly, preferably within 1.5 years of receipt.

Construction



Marking

CBR series devices are supplied unmarked.
If you require marked product, please contact KEMET for availability of a laser-marked option.

Tape & Reel Packaging Information

KEMET offers RF and Microwave Multilayer Ceramic Chip Capacitors packaged in 8 mm tape on 7" reels. This packaging system is compatible with all tape-fed automatic pick and place systems.

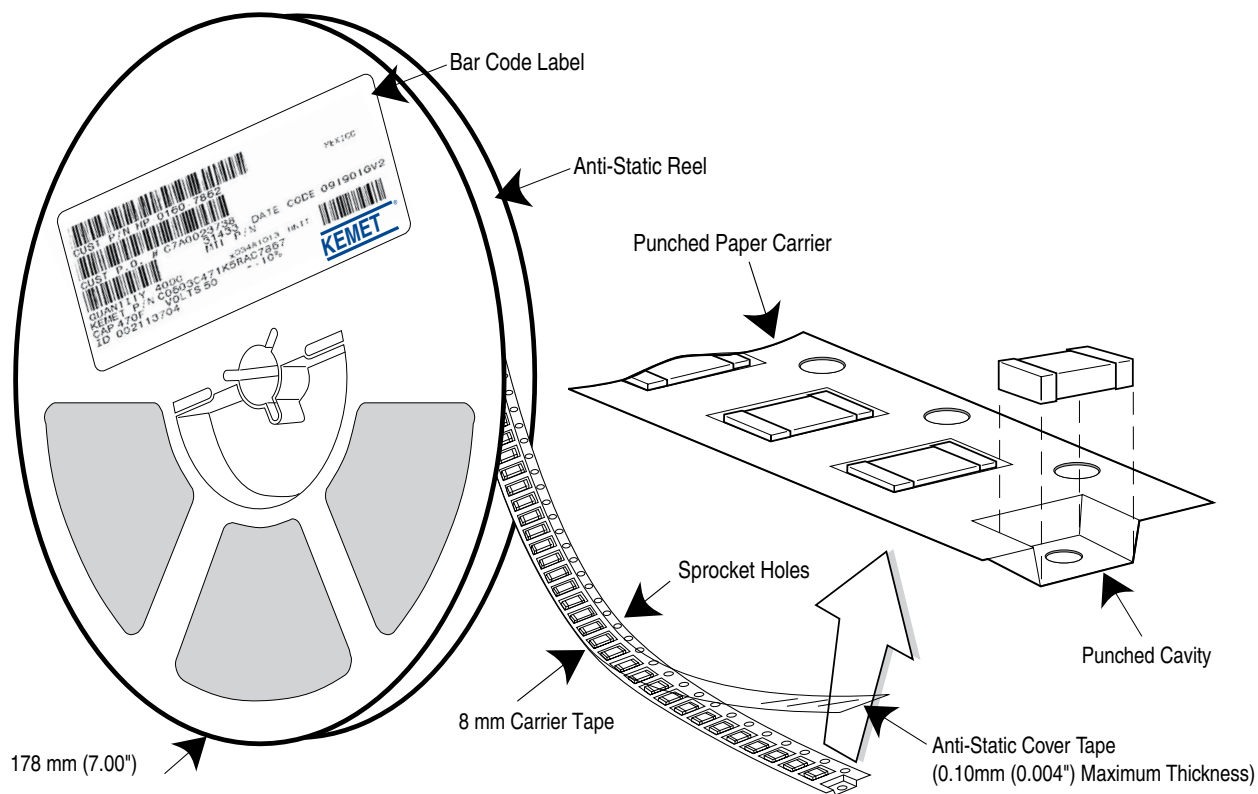


Table 5 – Carrier Tape Configuration (mm)

EIA Case Size	Tape Size (W)*	Lead Space (P ₁)*
0201 – 0402	8	2
0603 – 1210	8	4

*Refer to Figure 1 for W and P₁ carrier tape reference locations.

*Refer to Table 6 for tolerance specifications.

Figure 1 – Punched (Paper) Carrier Tape Dimensions

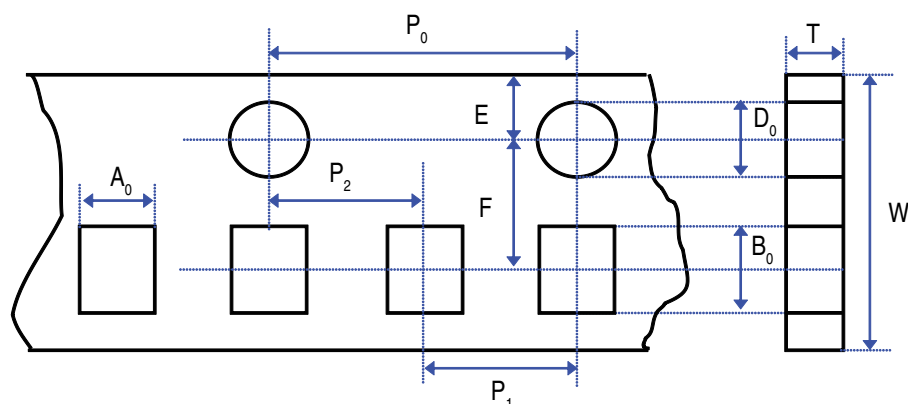


Table 6 – Punched (Paper) Carrier Tape Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)					
Tape Size	D ₀	E ₁	P ₀	P ₂	R Reference Note 2
8 mm	1.55 +0.05 (0.061 +0.002)	1.55 ±0.05 (0.061 ±0.002)	4.0 ±0.10 (0.157 ±0.004)	2.0 ±0.05 (0.079 ±0.002)	25.0 (0.984)
Variable Dimensions — Millimeters (Inches)					
Tape Size	Pitch	F	P ₁	T	W
8 mm	Half (2 mm)	3.5 ±0.05 (0.138 ±0.002)	2.0 ±0.05 (0.079 ±0.002)	0.42 ±0.05 (0.017 ±0.002)	8.0 ±0.10 (0.315 ±0.004)
				0.60 ±0.05 (0.024 ±0.002)	
8 mm	Single (4 mm)		4.0 ±0.10 (0.157 ±0.004)	0.95 ±0.05 (0.037 ±0.002)	
				0.97 ±0.05 (0.038 ±0.002)	
				0.75 ±0.05 (0.030 ±0.002)	

2. The tape with or without components shall pass around R without damage (see Figure 3).

Packaging Information Performance Notes

- Cover Tape Break Force:** 1.0 Kg minimum.
- Cover Tape Peel Strength:** The total peel strength of the cover tape from the carrier tape shall be:

Tape Width	Peel Strength
8 mm	0.1 to 1.0 Newton (10 to 100 gf)
12 and 16 mm	0.1 to 1.3 Newton (10 to 130 gf)

The direction of the pull shall be opposite the direction of the carrier tape travel. The pull angle of the carrier tape shall be 165° to 180° from the plane of the carrier tape. During peeling, the carrier and/or cover tape shall be pulled at a velocity of 300 ±10 mm/minute.

- Labeling:** Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. Refer to EIA Standards 556 and 624.

Figure 2 – Bending Radius

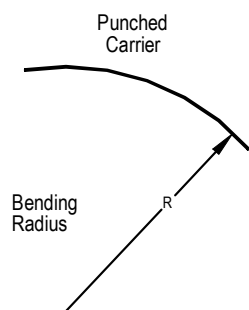


Figure 3 – Tape Leader & Trailer Dimensions

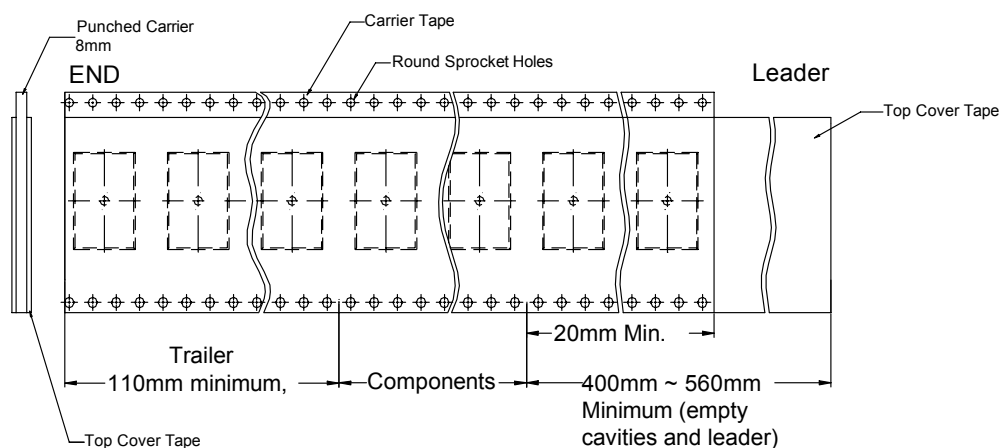


Figure 4 – Maximum Camber

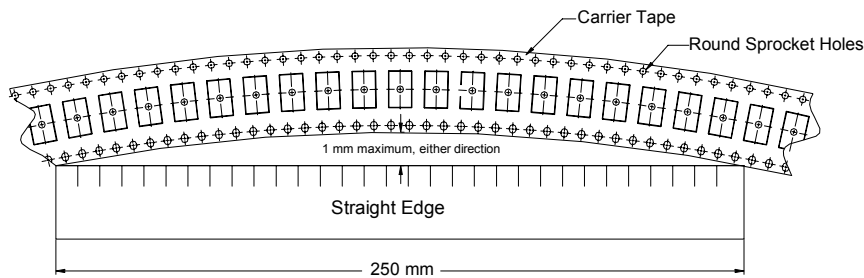


Figure 5 – Reel Dimensions

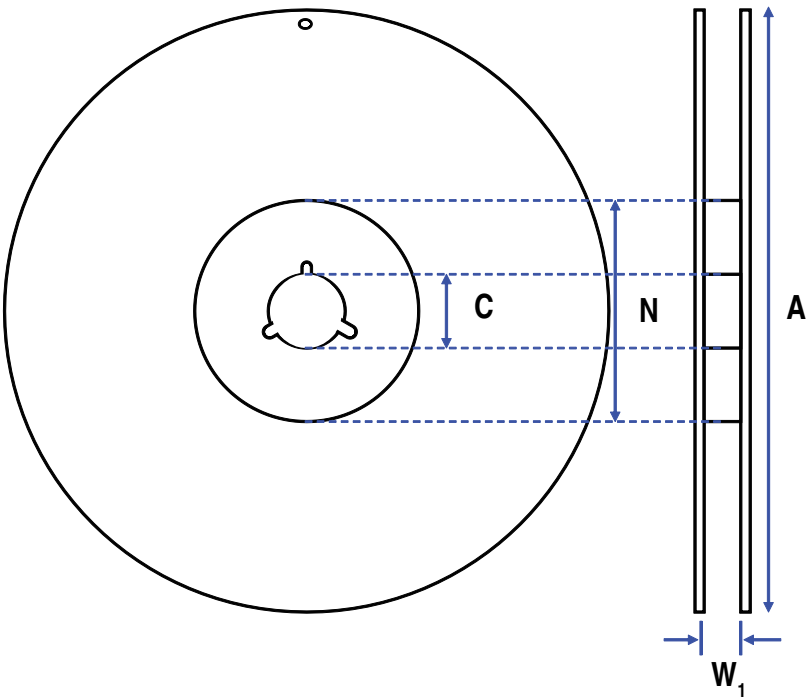


Table 7 – Reel Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)			
Tape Size	Reel Size	A	C
8 mm	7	178 ±0.10 (7.008 ±0.004)	13.0 ±0.20 (0.512 ±0.008)
Variable Dimensions — Millimeters (Inches)			
Tape Size	N Minimum See Note 2, Table 6	W_1	
8 mm	50 (1.969)	8.4 +1.5/-0.0 (0.331 +0.059/-0.0)	

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