

Capacitor Array, C0G Dielectric, 10VDC-200VDC (Commercial & Automotive Grade)

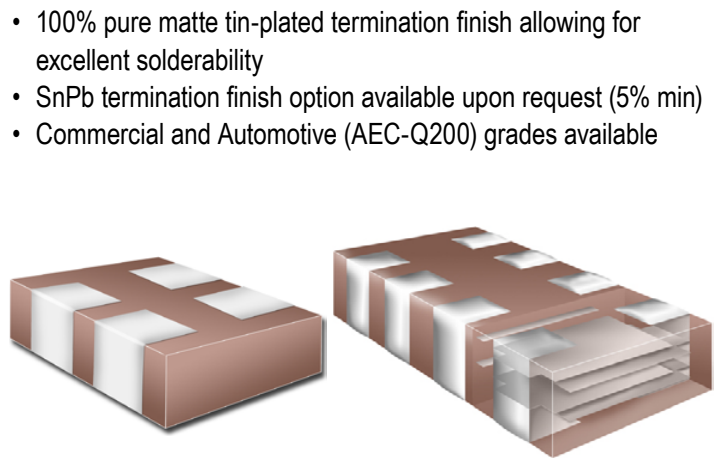
Overview

KEMET's Ceramic Chip Capacitor Array in C0G dielectric is an advanced passive technology where multiple capacitor elements are integrated into one common monolithic structure. Array technology promotes reduced placement costs and increased throughput. This is achieved by alternatively placing one device rather than two or four discrete devices. Use of capacitor arrays also saves board space which translates into increased board density and more functions per board. Arrays consume only a portion of the space required for standard chips resulting in savings in inventory and pick/place machine positions.

KEMET's C0G dielectric features a 125°C maximum operating temperature and is considered "stable." The Electronics Components, Assemblies & Materials Association (EIA) characterizes C0G dielectric as a Class I material. Components of this classification are temperature compensating and are suited for resonant circuit applications or those where Q and stability of capacitance characteristics are required. C0G exhibits no change in capacitance with respect to time and voltage and boasts a negligible change in capacitance with reference to ambient temperature. Capacitance change is limited to $\pm 30\text{ppm}/^\circ\text{C}$ from -55°C to $+125^\circ\text{C}$.

Benefits

- -55°C to $+125^\circ\text{C}$ operating temperature range
- Saves both circuit board and inventory space
- Reduces placement costs and increases throughput
- RoHS compliant
- EIA 0508 (2-element) and 0612 (4-element) case sizes
- DC voltage ratings of 10V, 16V, 25V, 50V, 100V and 200V
- Capacitance offerings ranging from 10pF to 2200pF
- Available capacitance tolerances of $\pm 5\%$, $\pm 10\%$ and $\pm 20\%$
- Non-polar device, minimizing installation concerns
- Flexible termination option is standard on 0508 case size arrays



Ordering Information

| CA | 06 | 4 | C | 104 | K | 4 | G | A | C | TU |
|---------------|----------------------------------|----------------------|--|------------------------------------|---|--|------------|----------------------|---------------------------------|---|
| Ceramic Array | Case Size (L" x W") ¹ | Number of Capacitors | Specification/ Series ² | Capacitance Code (pF) | Capacitance Tolerance | Voltage | Dielectric | Failure Rate/ Design | Termination Finish ³ | Packaging/Grade (C-Spec) ⁴ |
| | 05 = 0508 06 = 0612 | 2 = 2 4 = 4 | C = Standard X = Flexible Termination | 2 Sig. Digits + Number of Zeros | J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$ | 8 = 10V 4 = 16V 3 = 25V 5 = 50V 1 = 100V 2 = 200V | G = C0G | A = N/A | C = 100% Matte Sn | Blank = Bulk TU = 7" Reel Unmarked AUTO = Automotive Grade |

¹ All previous reference to metric case dimension "1632" has been replaced with an inch standard reference of "0612". Please reference all new designs using the "0612" nomenclature. "CA064" replaces "C1632" in the ordering code.

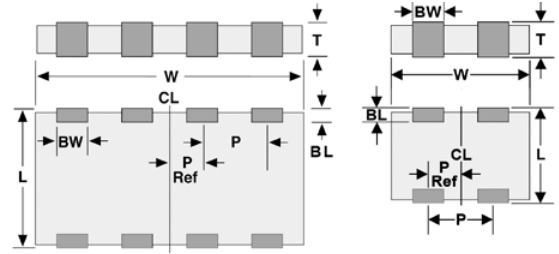
² 0508 case size is only available with the flexible termination option. "X" must be used in the 6th character position when ordering this case size. 0612 (1632) case size is not currently available with the flexible termination option. "C" must be used in the 6th character position when ordering this case size.

³ Additional termination finish options may be available. Contact KEMET for details.

⁴ Additional reeling or packaging options may be available. Contact KEMET for details.

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Dimensions – Millimeters (Inches)



| EIA Size Code | Metric Size Code | L Length | W Width | BW Bandwidth | BL Bandlength | T Thickness | P Pitch | P/2 Reference |
|---------------|------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-------------|------------------------------|
| 0508 | 1220 | 1.30 (.051) ± 0.15 (.006) | 2.10 (.083) ± 0.15 (.006) | 0.53 (.021) ± 0.08 (.003) | 0.30 (.012) ± 0.20 (.008) | See Table 2 for Thickness | 1.00 (.039) | 0.50 (.020) ± 0.10 (.004) |
| 0612 | 1632 | 1.60 (.063) ± 0.20 (.008) | 3.20 (.126) ± 0.20 (.008) | 0.40 (0.06) ± 0.20 (.008) | 0.30 (.012) ± 0.20 (.008) | | 0.80 (.031) | 0.40 (.031) ± 0.05 (.002) |

Applications

Typical applications include those that can benefit from board area savings, cost savings and overall volumetric reduction such as telecommunications, computers, handheld devices and automotive.

Qualification/Certification

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

Automotive grade products meet or exceed the requirements outlined by the Automotive Electronics Council. Details regarding test methods and conditions are referenced in document AEC-Q200, Stress Test Qualification for Passive Components. For additional information regarding the Automotive Electronics Council and AEC-Q200, please visit their website @www.aecouncil.com.

Environmental Compliance

RoHS compliant.

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) | ±30PPM/°C |
| Aging Rate (Max % Cap Loss/Decade Hour) | 0% |
| Dielectric Withstanding Voltage | 250% of rated voltage (5 ± 1 seconds and charge/discharge not exceeding 50mA) |
| Dissipation Factor (DF) Maximum Limit @ 25°C | 0.1% |
| Insulation Resistance (IR) Limit @ 25°C | 1000 megohm microfarads or 100GΩ (Rated voltage applied for 120 ± 5 secs @ 25°C) |

To obtain IR limit, divide $M\Omega\text{-}\mu F$ value by the capacitance and compare to $G\Omega$ limit. Select the lower of the two limits.

Capacitance and Dissipation Factor (DF) measured under the following conditions:

1MHz ± 100kHz and 1.0Vrms ± 0.2V if capacitance ≤ 1000pF

1kHz ± 50Hz and 1.0Vrms ± 0.2V if capacitance > 1000pF

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".

Post Environmental Limits

| High Temperature Life, Biased Humidity, Moisture Resistance | | | | | |
|---|------------------|-------------------|--------|-------------------|----------------------|
| Dielectric | Rated DC Voltage | Capacitance Value | DF (%) | Cap Shift | IR |
| COG | All | All | 0.5 | 0.3% or ± 0.25 pF | 10% of Initial Limit |

Table 1 – (0508 - 0612 Case Sizes)

| Cap | Cap Code | Series | | | CA052 (0508 Case Size) | | | | | CA064 (0612 Case Size) | | | | | |
|----------|----------|---------------|---|---|---|----|----|----|-----|------------------------|----|----|----|-----|-----|
| | | Voltage Code | | | 8 | 4 | 3 | 5 | 1 | 8 | 4 | 3 | 5 | 1 | 2 |
| | | Voltage DC | | | 10 | 16 | 25 | 50 | 100 | 10 | 16 | 25 | 50 | 100 | 200 |
| | | Cap Tolerance | | | Product Availability and Chip Thickness Codes - See Table 2 for Chip Thickness Dimensions | | | | | | | | | | |
| 10 pF | 100 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 12 pF | 120 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 15 pF | 150 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 18 pF | 180 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 22 pF | 220 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 27 pF | 270 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 33 pF | 330 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 39 pF | 390 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 47 pF | 470 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 56 pF | 560 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 68 pF | 680 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 82 pF | 820 | J | K | M | | | | | | MA | MA | MA | MA | MA | MA |
| 100 pF | 101 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 120 pF | 121 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 150 pF | 151 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 180 pF | 181 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 220 pF | 221 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 270 pF | 271 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 330 pF | 331 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 390 pF | 391 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 470 pF | 471 | J | K | M | PA | PA | PA | PA | PA | MA | MA | MA | MA | MA | MA |
| 560 pF | 561 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 680 pF | 681 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 820 pF | 821 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 1,000 pF | 102 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 1,100 pF | 112 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 1,200 pF | 122 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 1,300 pF | 132 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 1,500 pF | 152 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 1,600 pF | 162 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 1,800 pF | 182 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 2,000 pF | 202 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| 2,200 pF | 222 | J | K | M | PA | PA | PA | PA | PA | | | | | | |
| Cap | Cap Code | Voltage DC | | | 10 | 16 | 25 | 50 | 100 | 10 | 16 | 25 | 50 | 100 | 200 |
| | | Voltage Code | | | 8 | 4 | 3 | 5 | 1 | 8 | 4 | 3 | 5 | 1 | 2 |
| | | Series | | | CA052 (0508 Case Size) | | | | | CA064 (0612 Case Size) | | | | | |

KEMET reserves the right to substitute product with an improved temperature characteristic, tighter capacitance tolerance and/or higher voltage capability within the same form factor (configuration and dimensions).

These products are protected under US Patents 7,172,985 & 7,670,981, other patents pending, and any foreign counterparts.

Table 2 – Chip Thickness / Packaging Quantities

| Thickness Code | Chip Size | Thickness ± Range (mm) | Qty per Reel 7" Plastic | Qty per Reel 13" Plastic | Qty per Reel 7" Paper | Qty per Reel 13" Paper | Qty per Bulk Cassette |
|----------------|-----------|------------------------|-------------------------|--------------------------|-----------------------|------------------------|-----------------------|
| PA | 0508 | 0.80 ± 0.10 | 4000 | 10000 | N/A | N/A | N/A |
| MA | 0612 | 0.80 ± 0.10 | 4000 | 10000 | N/A | N/A | N/A |

Soldering Process

Recommended Soldering Technique:

- Solder reflow only

Recommended Soldering Profile:

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

Table 3 – Chip Capacitor Array Land Pattern Design Recommendations per IPC-7351

| EIA SIZE CODE | METRIC SIZE CODE | Density Level A: Maximum (Most) Land Protrusion (mm) | | | | | | Density Level B: Median (Nominal) Land Protrusion (mm) | | | | | | Density Level C: Minimum (Least) Land Protrusion (mm) | | | | | |
|---------------|------------------|--|------|------|------|------|------|--|------|------|------|------|------|---|------|------|------|------|------|
| | | C | Y | X | P | V1 | V2 | C | Y | X | P | V1 | V2 | C | Y | X | P | V1 | V2 |
| 0508/CA052 | 1220 | 1.60 | 1.00 | 0.55 | 1.00 | 3.50 | 3.30 | 1.50 | 0.90 | 0.50 | 1.00 | 2.90 | 2.80 | 1.40 | 0.75 | 0.45 | 1.00 | 2.40 | 2.50 |
| 0612/CA064 | 1632 | 1.80 | 1.10 | 0.50 | 0.80 | 3.90 | 4.40 | 1.80 | 0.95 | 0.50 | 0.80 | 3.30 | 3.90 | 1.70 | 0.85 | 0.40 | 0.80 | 2.80 | 3.60 |

Density Level A: For low-density Product applications. Provides a wider process window for reflow solder processes. soldering processes for array type capacitors.

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).

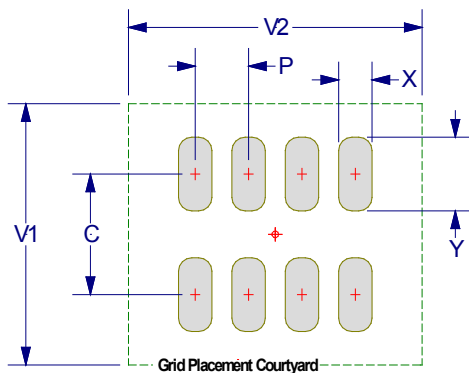


Table 4 – Performance & Reliability: Test Methods and Conditions

| Stress | Reference | Test or Inspection Method |
|------------------------|------------------------------------|--|
| Terminal Strength | JIS-C-6429 | Appendix 1, Note: Force of 1.8kg for 60 seconds. |
| Board Flex | JIS-C-6429 | Appendix 2, Note: 2mm (min) for all except 3mm for COG. |
| Solderability | J-STD-002 | Magnification 50X. Conditions: |
| | | a) Method B, 4 hrs @ 155°C, dry heat @ 235°C |
| | | b) Method B @ 215°C category 3 |
| | | c) Method D, category 3 @ 260°C |
| Temperature Cycling | JESD22 Method JA-104 | 1000 Cycles (-55°C to +125°C), Measurement at 24 hrs. +/- 2 hrs after test conclusion. |
| Biased Humidity | MIL-STD-202 Method 103 | Load Humidity: 1000 hours 85°C/85%RH and Rated Voltage. Add 100K ohm resistor. Measurement at 24 hrs. +/- 2 hrs after test conclusion. |
| | | Low Volt Humidity: 1000 hours 85°C/85%RH and 1.5V. Add 100K ohm resistor. Measurement at 24 hrs. +/- 2 hrs after test conclusion. |
| Moisture Resistance | MIL-STD-202 Method 106 | t = 24 hours/cycle. Steps 7a & 7b not required. Unpowered. Measurement at 24 hrs. +/- 2 hrs after test conclusion. |
| Thermal Shock | MIL-STD-202 Method 107 | -55°C/+125°C. Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time-15 minutes. Air-Air. |
| High Temperature Life | MIL-STD-202 Method 108/ EIA-198 | 1000 hours at 125°C (85°C for X5R, Z5U and Y5V) with 2X rated voltage applied. |
| Storage Life | MIL-STD-202 Method 108 | 150°C, 0VDC, for 1000 Hours. |
| Mechanical Shock | MIL-STD-202 Method 213 | Figure 1 of Method 213, Condition F. |
| Resistance to Solvents | MIL-STD-202 Method 215 | Add aqueous wash chemical - OKEM Clean or equivalent. |

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 degrees C, and maximum storage humidity not exceed 70% relative humidity. In addition, 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.

Tape & Reel Packaging Information

KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8mm, 12mm and 16mm tape on 7" and 13" reels in accordance with EIA standard 481. This packaging system is compatible with all tape fed automatic pick and place systems. See Table 2 for details on reeling quantities for commercial chips.

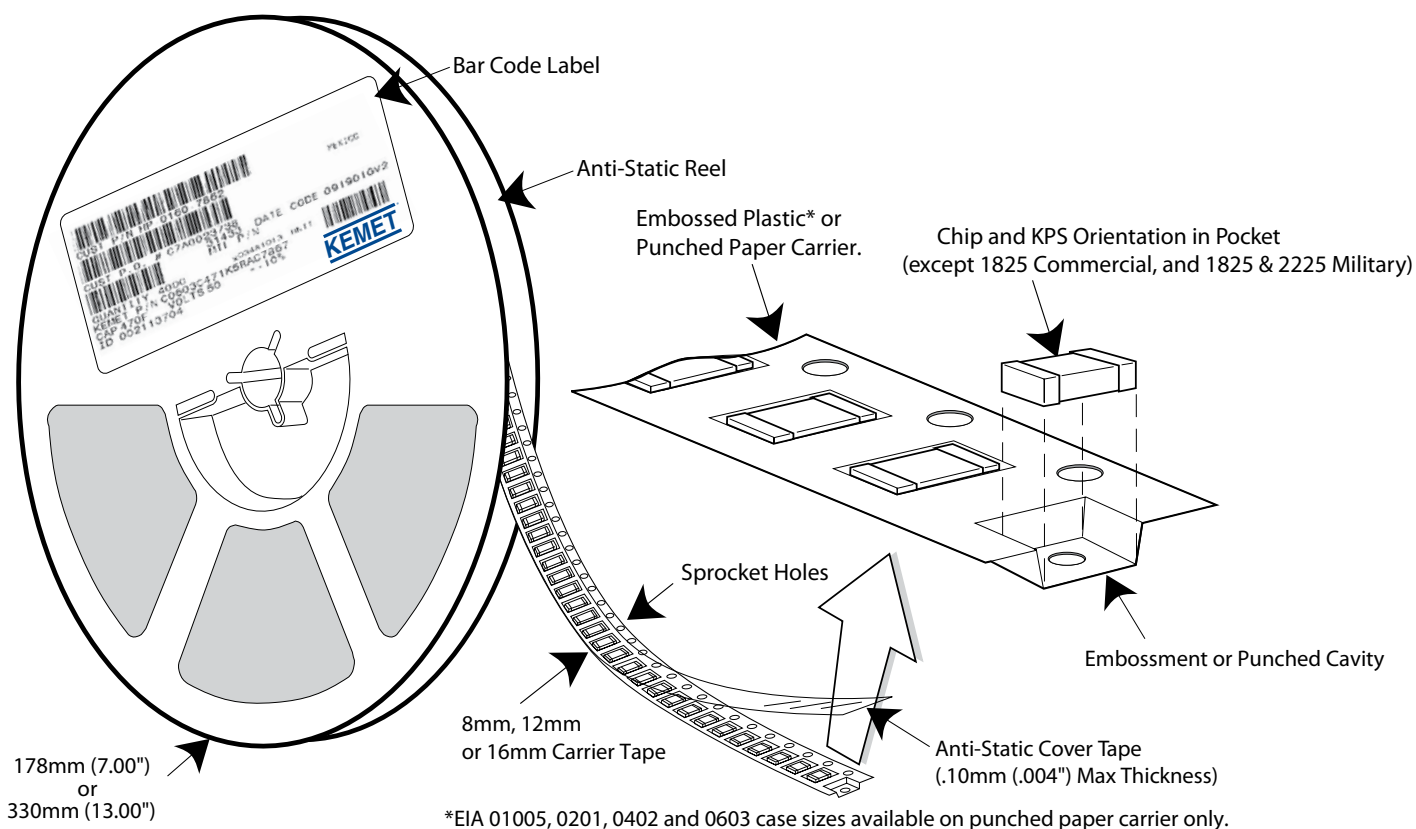


Table 5 – Carrier Tape Configuration (mm)

| EIA Case Size | Tape size (W)* | Pitch (P ₁)* |
|-------------------|----------------|--------------------------|
| 01005 - 0402 | 8 | 2 |
| 0603 - 1210 | 8 | 4 |
| 1805 - 1808 | 12 | 4 |
| ≥ 1812 | 12 | 8 |
| KPS 1210 | 12 | 8 |
| KPS 1812 & 2220 | 16 | 12 |
| Array 0508 & 0612 | 8 | 4 |

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

*Refer to Table 6 for tolerance specifications.

Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

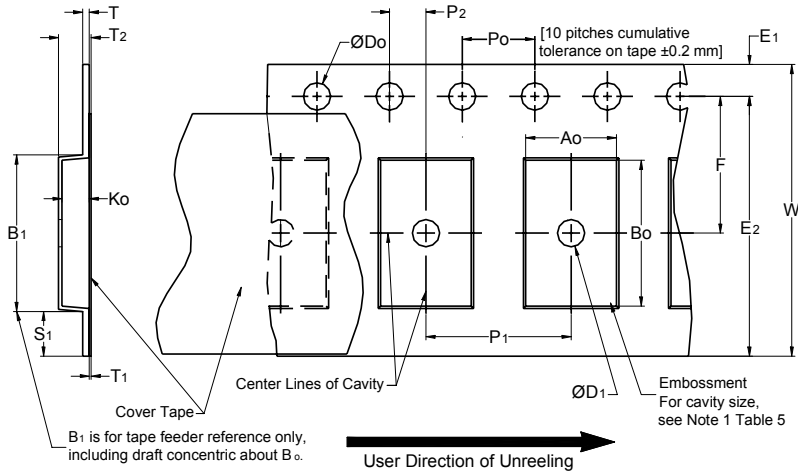


Table 6 – Embossed (Plastic) Carrier Tape Dimensions

Metric will govern

| Constant Dimensions — Millimeters (Inches) | | | | | | | | | |
|--|---|----------------------|--|---|---|------------------|----------------------|--------------------|------------------|
| Tape Size | D_0 | D_1 Min. Note 1 | E_1 | P_0 | P_2 | R Ref. Note 2 | S_1 Min. Note 3 | T Max. | T_1 Max. |
| 8mm | $1.5 +0.10/-0.0$ ($0.059 +0.004/-0.0$) | 1.0 (0.039) | 1.75 ± 0.10 (0.069 ± 0.004) | 4.0 ± 0.10 (0.157 ± 0.004) | 2.0 ± 0.05 (0.079 ± 0.002) | 25.0 (0.984) | 0.600 (0.024) | 0.600 (0.024) | 0.100 (0.004) |
| 12mm | | 1.5 (0.059) | | | | 30 (1.181) | | | |
| 16mm | | | | | | | | | |
| Variable Dimensions — Millimeters (Inches) | | | | | | | | | |
| Tape Size | Pitch | B_1 Max. Note 4 | E_2 Min. | F | P_1 | T_2 Max | W Max | A_0, B_0 & K_0 | |
| 8mm | Single (4mm) | 4.35 (0.171) | 6.25 (0.246) | 3.5 ± 0.05 (0.138 ± 0.002) | 4.0 ± 0.10 (0.157 ± 0.004) | 2.5 (0.098) | 8.3 (0.327) | Note 5 | |
| 12mm | Single (4mm) & Double (8mm) | 8.2 (0.323) | 10.25 (0.404) | 5.5 ± 0.05 (0.217 ± 0.002) | 8.0 ± 0.10 (0.315 ± 0.004) | 4.6 (0.181) | 12.3 (0.484) | | |
| 16mm | Triple (12mm) | 12.1 (0.476) | 14.25 (0.561) | 5.5 ± 0.05 (0.217 ± 0.002) | 8.0 ± 0.10 (0.315 ± 0.004) | 4.6 (0.181) | 16.3 (0.642) | | |

- The embossment hole location shall be measured from the sprocket hole controlling the location of the embossment. Dimensions of embossment location and hole location shall be applied independent of each other.
- The tape with or without components shall pass around R without damage (see Figure 5).
- If $S_1 < 1.0$ mm, there may not be enough area for cover tape to be properly applied (see EIA Document 481 paragraph 4.3 (b)).
- B_1 dimension is a reference dimension for tape feeder clearance only.
- The cavity defined by A_0 , B_0 and K_0 shall surround the component with sufficient clearance that:
 - the component does not protrude above the top surface of the carrier tape.
 - the component can be removed from the cavity in a vertical direction without mechanical restriction, after the top cover tape has been removed.
 - rotation of the component is limited to 20° maximum for 8 and 12mm tapes and 10° maximum for 16mm tapes (see Figure 3).
 - lateral movement of the component is restricted to 0.5 mm maximum for 8mm and 12mm wide tape and to 1.0mm maximum for 16mm tape (see Figure 4).
 - for KPS Series product A_0 and B_0 are measured on a plane 0.3mm above the bottom of the pocket.
 - see Addendum in EIA Document 481 for standards relating to more precise taping requirements.

Figure 2 – Punched (Paper) Carrier Tape Dimensions

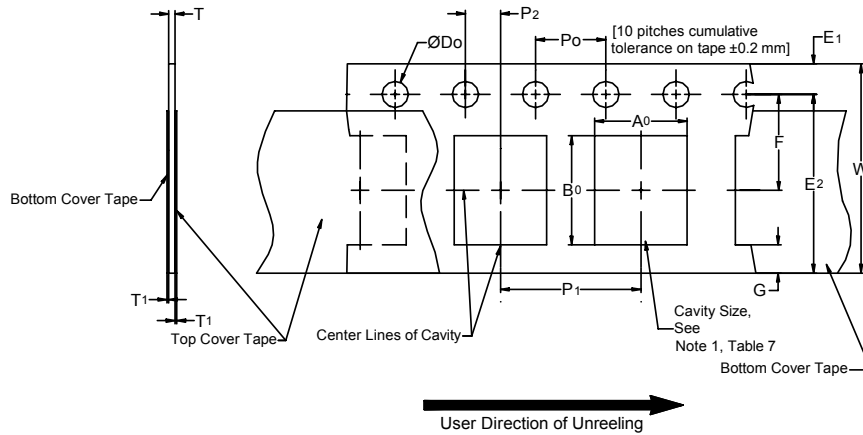


Table 7 – Punched (Paper) Carrier Tape Dimensions

Metric will govern

| Constant Dimensions — Millimeters (Inches) | | | | | | | |
|--|---|-----------------------------------|-----------------------------------|-----------------------------------|---------------------|----------------|---------------|
| Tape Size | D_0 | E_1 | P_0 | P_2 | T_1 Max | G Min | R Ref. Note 2 |
| 8mm | $1.5 +0.10-0.0$ (0.059 +0.004, -0.0) | 1.75 ± 0.10 (0.069 ±0.004) | 4.0 ± 0.10 (0.157 ±0.004) | 2.0 ± 0.05 (0.079 ±0.002) | 0.10 (.004) Max. | 0.75 (.030) | 25 (.984) |
| Variable Dimensions — Millimeters (Inches) | | | | | | | |
| Tape Size | Pitch | E_2 Min | F | P_1 | T Max | W Max | $A_0 B_0$ |
| 8mm | Half (2mm) | 6.25 (0.246) | 3.5 ± 0.05 (0.138 ± 0.002) | 2.0 ± 0.05 (0.079 ± 0.002) | 1.1 (0.098) | 8.3 (0.327) | Note 5 |
| 8mm | Single (4mm) | | | 4.0 ± 0.10 (0.157 ± 0.004) | | | |

- The cavity defined by A_0 , B_0 and T shall surround the component with sufficient clearance that:
 - the component does not protrude beyond either surface of the carrier tape.
 - the component can be removed from the cavity in a vertical direction without mechanical restriction, after the top cover tape has been removed.
 - lateral movement of the component is restricted to 0.5 mm maximum (see Figure 4).
 - see Addendum in EIA Document 481 for standards relating to more precise taping requirements.
- The tape with or without components shall pass around R without damage (see Figure 5).

Packaging Information Performance Notes

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

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

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.

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

Figure 3 – Maximum Component Rotation

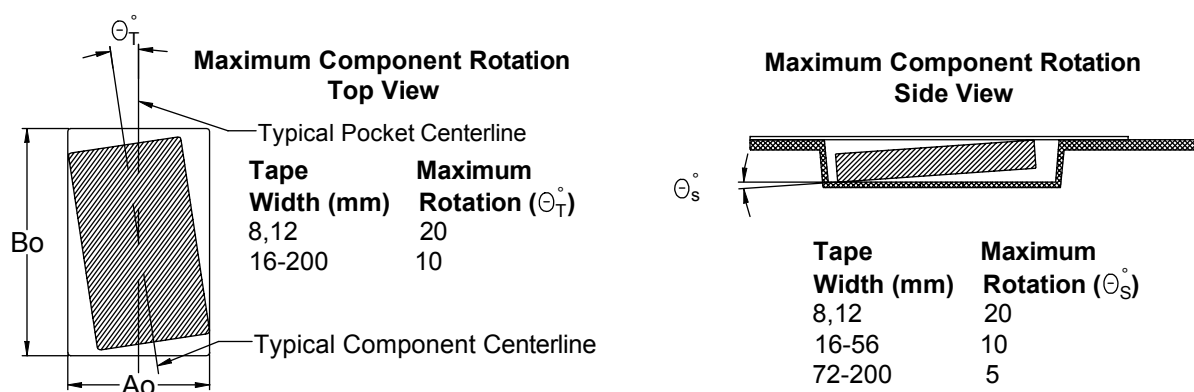


Figure 4 – Maximum Lateral Movement

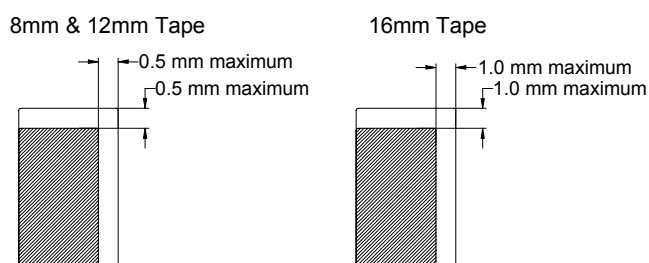


Figure 5 – Bending Radius

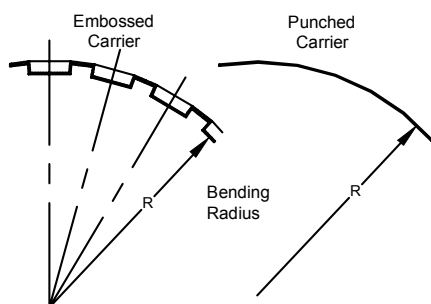
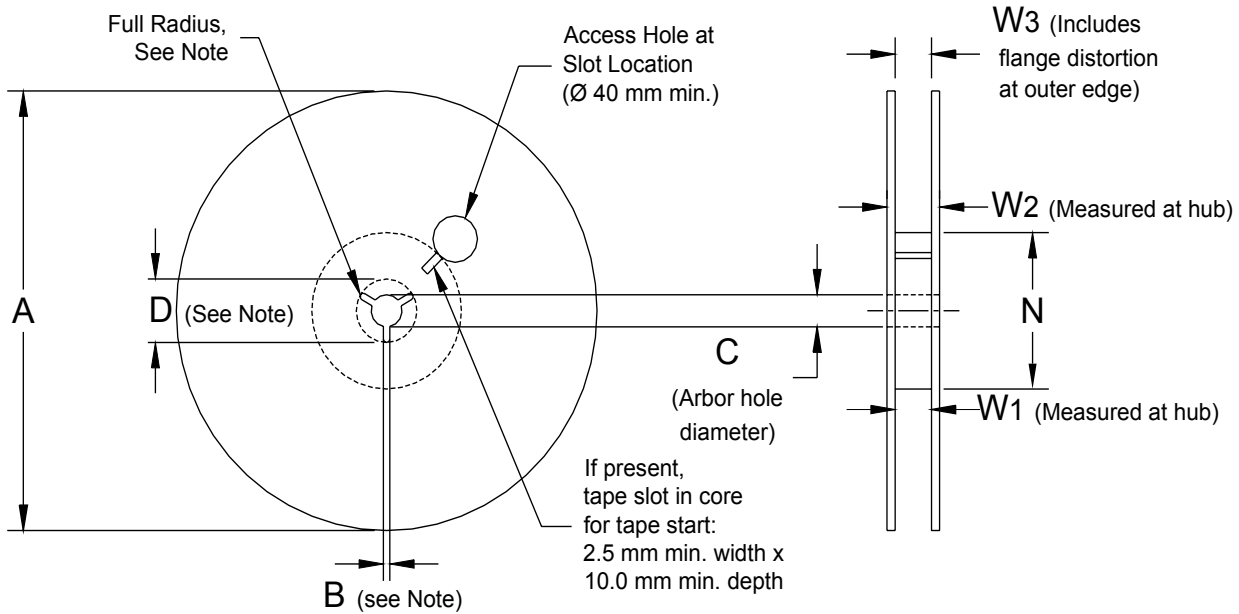


Figure 6 – Reel Dimensions



Note: Drive spokes optional; if used, dimensions B and D shall apply.

Table 8 – Reel Dimensions

Metric will govern

| Constant Dimensions — Millimeters (Inches) | | | | |
|--|--------------------------------|---------------------------------------|--|---|
| Tape Size | A | B Min | C | D Min |
| 8mm | 178 ± 0.20 (7.008 ± 0.008) | 1.5 (0.059) | 13.0 +0.5/-0.2 (0.521 +0.02/-0.008) | 20.2 (0.795) |
| 12mm | or | | | |
| 16mm | 330 ± 0.20 (13.000 ± 0.008) | | | |
| Variable Dimensions — Millimeters (Inches) | | | | |
| Tape Size | N Min | W ₁ | W ₂ Max | W ₃ |
| 8mm | 50 (1.969) | 8.4 +1.5/-0.0 (0.331 +0.059/-0.0) | 14.4 (0.567) | Shall accommodate tape width without interference |
| 12mm | | 12.4 +2.0/-0.0 (0.488 +0.078/-0.0) | 18.4 (0.724) | |
| 16mm | | 16.4 +2.0/-0.0 (0.646 +0.078/-0.0) | 22.4 (0.882) | |

Figure 7 – Tape Leader & Trailer Dimensions

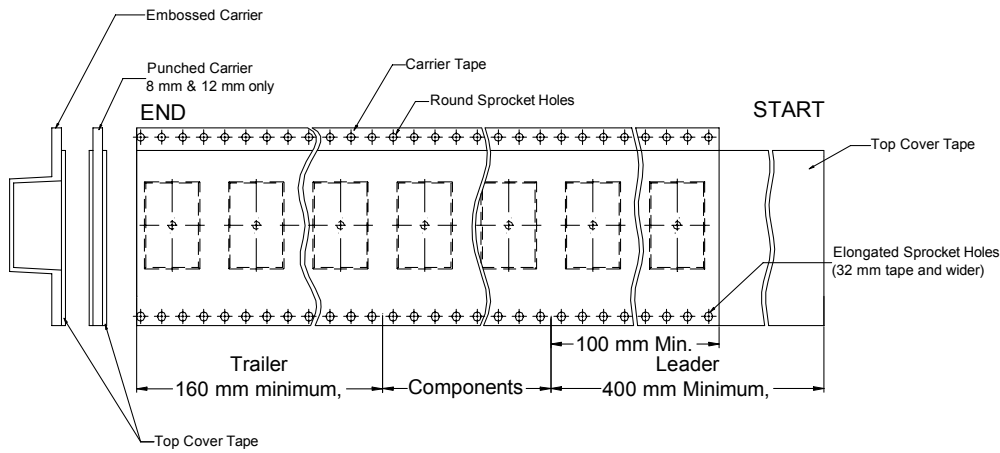


Figure 8 – Maximum Camber

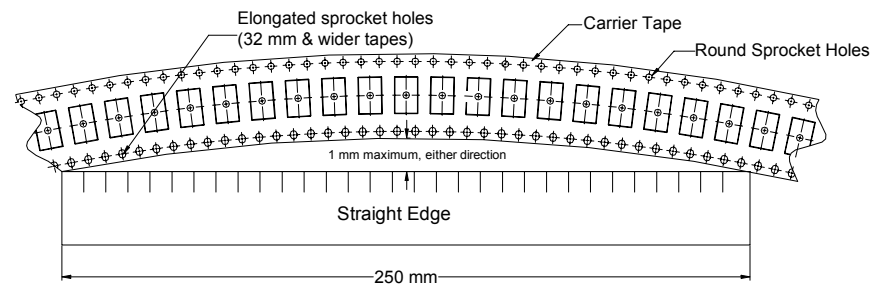


Figure 9 – Bulk Cassette Packaging (Ceramic Chips Only)

Meets Dimensional Requirements IEC-286 and EIAJ 7201

Unit mm *Reference

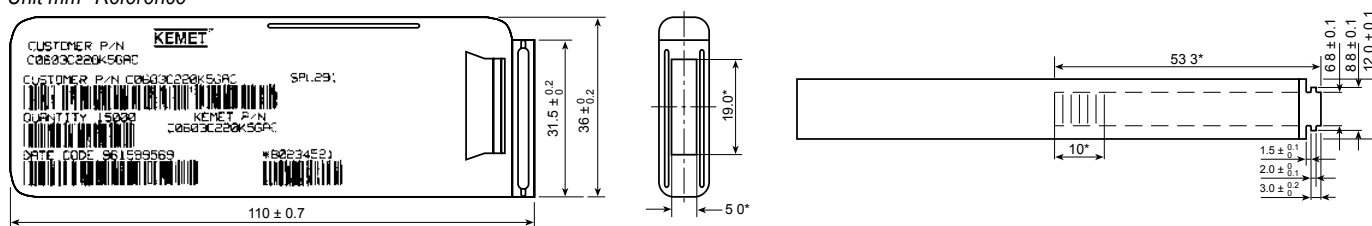


Table 9 – Capacitor Dimensions for Bulk Cassette

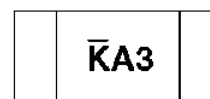
Cassette Packaging – Millimeters

| EIA Size Code | Metric Size Code | L Length | W Width | B Bandwidth | S Separation minimum | T Thickness | Number of Pcs/Cassette |
|---------------|------------------|------------|------------|-------------|----------------------|-------------|------------------------|
| 0402 | 1005 | 1.0 ± 0.05 | 0.5 ± 0.05 | 0.2 to 0.4 | 0.3 | 0.5 ± .05 | 50,000 |
| 0603 | 1608 | 1.6 ± 0.07 | 0.8 ± 0.07 | 0.2 to 0.5 | 0.7 | 0.8 ± .07 | 15,000 |

Table 10 – Capacitor Marking

Laser marking is available as an extra-cost option for most KEMET ceramic chips. Such marking is two sided, and includes a K to identify KEMET, followed by two characters (per EIA-198) to identify the capacitance value. Note that marking is not available for any Y5V chip. In addition, the 0603 marking option is limited to the K only. (Marking Optional – Not Available for 0402 Size)

| Numeral Alpha Character | Capacitance (pF) For Various Numeral Identifiers | | | | | | | | | |
|-------------------------|--|-----|----|-----|------|-------|--------|---------|----------|--|
| | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| A | 0.1 | 1 | 10 | 100 | 1000 | 10000 | 100000 | 1000000 | 10000000 | |
| B | 0.11 | 1.1 | 11 | 110 | 1100 | 11000 | 110000 | 1100000 | 11000000 | |
| C | 0.12 | 1.2 | 12 | 120 | 1200 | 12000 | 120000 | 1200000 | 12000000 | |
| D | 0.13 | 1.3 | 13 | 130 | 1300 | 13000 | 130000 | 1300000 | 13000000 | |
| E | 0.15 | 1.5 | 15 | 150 | 1500 | 15000 | 150000 | 1500000 | 15000000 | |
| F | 0.16 | 1.6 | 16 | 160 | 1600 | 16000 | 160000 | 1600000 | 16000000 | |
| G | 0.18 | 1.8 | 18 | 180 | 1800 | 18000 | 180000 | 1800000 | 18000000 | |
| H | 0.2 | 2 | 20 | 200 | 2000 | 20000 | 200000 | 2000000 | 20000000 | |
| J | 0.22 | 2.2 | 22 | 220 | 2200 | 22000 | 220000 | 2200000 | 22000000 | |
| K | 0.24 | 2.4 | 24 | 240 | 2400 | 24000 | 240000 | 2400000 | 24000000 | |
| L | 0.27 | 2.7 | 27 | 270 | 2700 | 27000 | 270000 | 2700000 | 27000000 | |
| M | 0.3 | 3 | 30 | 300 | 3000 | 30000 | 300000 | 3000000 | 30000000 | |
| N | 0.33 | 3.3 | 33 | 330 | 3300 | 33000 | 330000 | 3300000 | 33000000 | |
| P | 0.36 | 3.6 | 36 | 360 | 3600 | 36000 | 360000 | 3600000 | 36000000 | |
| Q | 0.39 | 3.9 | 39 | 390 | 3900 | 39000 | 390000 | 3900000 | 39000000 | |
| R | 0.43 | 4.3 | 43 | 430 | 4300 | 43000 | 430000 | 4300000 | 43000000 | |
| S | 0.47 | 4.7 | 47 | 470 | 4700 | 47000 | 470000 | 4700000 | 47000000 | |
| T | 0.51 | 5.1 | 51 | 510 | 5100 | 51000 | 510000 | 5100000 | 51000000 | |
| U | 0.56 | 5.6 | 56 | 560 | 5600 | 56000 | 560000 | 5600000 | 56000000 | |
| V | 0.62 | 6.2 | 62 | 620 | 6200 | 62000 | 620000 | 6200000 | 62000000 | |
| W | 0.68 | 6.8 | 68 | 680 | 6800 | 68000 | 680000 | 6800000 | 68000000 | |
| X | 0.75 | 7.5 | 75 | 750 | 7500 | 75000 | 750000 | 7500000 | 75000000 | |
| Y | 0.82 | 8.2 | 82 | 820 | 8200 | 82000 | 820000 | 8200000 | 82000000 | |
| Z | 0.91 | 9.1 | 91 | 910 | 9100 | 91000 | 910000 | 9100000 | 91000000 | |
| a | 0.25 | 2.5 | 25 | 250 | 2500 | 25000 | 250000 | 2500000 | 25000000 | |
| b | 0.35 | 3.5 | 35 | 350 | 3500 | 35000 | 350000 | 3500000 | 35000000 | |
| d | 0.4 | 4 | 40 | 400 | 4000 | 40000 | 400000 | 4000000 | 40000000 | |
| e | 0.45 | 4.5 | 45 | 450 | 4500 | 45000 | 450000 | 4500000 | 45000000 | |
| f | 0.5 | 5 | 50 | 500 | 5000 | 50000 | 500000 | 5000000 | 50000000 | |
| m | 0.6 | 6 | 60 | 600 | 6000 | 60000 | 600000 | 6000000 | 60000000 | |
| n | 0.7 | 7 | 70 | 700 | 7000 | 70000 | 700000 | 7000000 | 70000000 | |
| t | 0.8 | 8 | 80 | 800 | 8000 | 80000 | 800000 | 8000000 | 80000000 | |
| y | 0.9 | 9 | 90 | 900 | 9000 | 90000 | 900000 | 9000000 | 90000000 | |



Example shown is 1,000 pF capacitor

Other KEMET Resources

| Tools | |
|--------------------------------|---|
| Resource | Location |
| Configure A Part: CapEdge | http://capacitoredge.kemet.com |
| SPICE & FIT Software | http://www.kemet.com/spice |
| Search Our FAQs: KnowledgeEdge | http://www.kemet.com/keask |

| Product Information | |
|--|---|
| Resource | Location |
| Products | http://www.kemet.com/products |
| Technical Resources (Including Soldering Techniques) | http://www.kemet.com/technicalpapers |
| RoHS Statement | http://www.kemet.com/rohs |
| Quality Documents | http://www.kemet.com/qualitydocuments |

| Product Request | |
|-------------------------|---|
| Resource | Location |
| Sample Request | http://www.kemet.com/sample |
| Engineering Kit Request | http://www.kemet.com/kits |

| Contact | |
|--------------------|---|
| Resource | Location |
| Website | www.kemet.com |
| Contact Us | http://www.kemet.com/contact |
| Investor Relations | http://www.kemet.com/ir |
| Call Us | 1-877-MyKEMET |
| Twitter | http://twitter.com/kemetcapacitors |

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Tel: 44-1305-830747

Coatbridge, Scotland
Tel: 44-1236-434455

Färjestaden, Sweden
Tel: 46-485-563934

Espoo, Finland
Tel: 358-9-5406-5000

Asia

Northeast Asia

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Shenzhen, China
Tel: 86-755-2518-1306

Beijing, China
Tel: 86-10-5829-1711

Shanghai, China
Tel: 86-21-6447-0707

Taipei, Taiwan
Tel: 886-2-27528585

Southeast Asia

Singapore
Tel: 65-6586-1900

Penang, Malaysia
Tel: 60-4-6430200

Bangalore, India
Tel: 91-806-53-76817

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