

High Voltage with Flexible Termination System (HV FT-CAP) X7R Dielectric, 500 – 3,000 VDC (Commercial Grade)



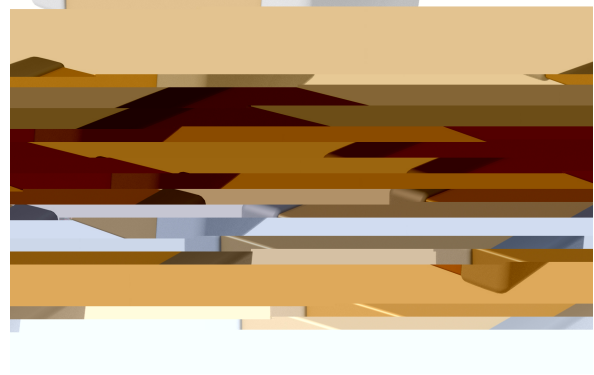
Overview

KEMET's High Voltage with Flexible Termination (HV FT-CAP) surface mount MLCCs in X7R dielectric address the primary failure mode of MLCCs— flex cracks, which are typically the result of excessive tensile and shear stresses produced during board flexure and thermal cycling. Featuring several of the highest CV (capacitance/voltage) values available in the industry, these devices utilize a pliable and conductive silver epoxy between the base metal and nickel barrier layers of the termination system. The addition of this epoxy layer inhibits the transfer of board stress to the rigid ceramic body, therefore mitigating flex cracks which can result in low IR or short circuit failures. Although flexible termination technology does not eliminate the potential for mechanical damage that may propagate during extreme environmental and handling conditions, it does provide superior flex performance over standard termination systems.

The HV FT-CAP offers low leakage current, exhibits low ESR at high frequencies and finds conventional use as snubbers or filters in applications such as switching power supplies and lighting ballasts. Their exceptional performance at high frequencies has made them a preferred choice of design engineers worldwide. In addition to their use in power supplies, these capacitors are widely used in industries related to automotive(hybrid), telecommunications, medical, military, aerospace, semiconductors and test/diagnostic equipment.

Combined with the stability of an X7R dielectric and designed to accommodate all capacitance requirements, these flex-robust devices are RoHS-compliant, offer up to 5 mm of flex-bend capability and exhibits a predictable change in capacitance with respect to time and voltage. Capacitance change with reference to ambient temperature is limited to $\pm 15\%$ from -55°C to $+125^{\circ}\text{C}$.

In addition to Commercial Grade, Automotive Grade devices are available which meet the demanding Automotive Electronics Council's AEC-Q200 qualification requirements.



Ordering Information

| C | 1210 | X | 154 | K | C | R | A | C | TU |
|---------|--|--------------------------|---|---|---|------------|----------------------|--|---|
| Ceramic | Case Size (L" x W") | Specification/ Series | Capacitance Code (pF) | Capacitance Tolerance | Rated Voltage (VDC) | Dielectric | Failure Rate/ Design | Termination Finish ¹ | Packaging/ Grade (C-Spec) |
| | 0603 0805 1206 1210 1808 1812 1825 2220 2225 | X = Flexible Termination | Two significant digits + number of zeros. | J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$ | C = 500 B = 630 D = 1,000 F = 1,500 G = 2,000 Z = 2,500 H = 3,000 | R = X7R | A = N/A | C = 100% Matte Sn L = SnPb (5% Pb minimum) | See "Packaging C-Spec Ordering Options Table" below |

¹ Additional termination finish options may be available. Contact KEMET for details.

Packaging C-Spec Ordering Options Table

| Packaging Type ₁ | Packaging/Grade Ordering Code (C-Spec) |
|-----------------------------|--|
| Bulk Bag/Unmarked | Not required (Blank) |
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Dimensions – Millimeters (Inches)



| EIA Size Code | Metric Size Code | L Length | W Width | T Thickness | B Bandwidth | S Separation Minimum | Mounting Technique |
|---------------|------------------|-------------------------------|-------------------------------|---------------------------|-------------------------------|----------------------|------------------------------|
| 0603 | 1608 | 1.60 (0.063) ±0.17 (0.007) | 0.80 (0.032) ±0.15 (0.006) | See Table 2 for Thickness | 0.45 (0.018) ±0.15 (0.006) | 0.58 (0.023) | Solder Wave or Solder Reflow |
| 0805 | 2012 | 2.00 (0.079) ±0.30 (0.012) | 1.25 (0.049) ±0.30 (0.012) | | 0.50 (0.02) ±0.25 (0.010) | 0.75 (0.030) | |
| 1206 | 3216 | 3.30 (0.130) ±0.40 (0.016) | 1.60 (0.063) ±0.35 (0.013) | | 0.60 (0.024) ±0.25 (0.010) | N/A | |
| 1210 | 3225 | 3.30 (0.130) ±0.40 (0.016) | 2.60 (0.102) ±0.30 (0.012) | | 0.60 (0.024) ±0.25 (0.010) | | |
| 1808 | 4520 | 4.70 (0.185) ±0.50 (0.020) | 2.00 (0.079) ±0.20 (0.008) | | 0.70 (0.028) ±0.35 (0.014) | | |
| 1812 | 4532 | 4.50 (0.178) ±0.40 (0.016) | 3.20 (0.126) ±0.30 (0.012) | | 0.70 (0.028) ±0.35 (0.014) | | |
| 1825 | 4564 | 4.60 (0.181) ±0.40 (0.016) | 6.40 (0.252) ±0.40 (0.016) | | 0.70 (0.028) ±0.35 (0.014) | | |
| 2220 | 5650 | 5.90 (0.232) ±0.75 (0.030) | 5.00 (0.197) ±0.40 (0.016) | | 0.70 (0.028) ±0.35 (0.014) | | |
| 2225 | 5664 | 5.90 (0.232) ±0.75 (0.030) | 6.40 (0.248) ±0.40 (0.016) | | 0.70 (0.028) ±0.35 (0.014) | | |

Qualification/Certification

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

Environmental Compliance

Lead (Pb)-free, RoHS, and REACH compliant without exemptions (excluding SnPb termination finish option).

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) | ±15% |
| ¹ Aging Rate (Maximum % Capacitance Loss/Decade Hour) | 3.0% |
| ² Dielectric Withstanding Voltage (DWV) | 150% of rated voltage for voltage rating of < 1000V 120% of rated voltage for voltage rating of ≥ 1000V (5±1 seconds and charge/discharge not exceeding 50mA) |
| ³ Dissipation Factor (DF) Maximum Limit at 25°C | 2.5% |
| ⁴ Insulation Resistance (IR) Minimum Limit at 25°C | See Insulation Resistance Limit Table (500VDC applied for 120±5 seconds at 25°C) |

¹ Regarding Aging Rate: Capacitance measurements (including tolerance) are indexed to a referee time of 1,000 hours.

² DWV is the voltage a capacitor can withstand (survive) for a short period of time. It exceeds the nominal and continuous working voltage of the capacitor.

³ Capacitance and dissipation factor (DF) measured under the following conditions:

1kHz ± 50Hz and 1.0 ± 0.2 Vrms if capacitance ≤ 10µF

120Hz ± 10Hz and 0.5 ± 0.1 Vrms if capacitance > 10µF

⁴ To obtain IR limit, divide MΩ-µF value by the capacitance and compare to GΩ limit. Select the lower of the two limits.

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 | Dissipation Factor (%) | Capacitance Shift | Insulation Resistance |
| X7R | > 25 | All | 3.0 | ±20% | 10% of Initial Limit |
| | 16/25 | | 5.0 | | |
| | < 16 | | 7.5 | | |

Insulation Resistance Limit Table (X7R Dielectric)

| EIA Case Size | 1,000 Megohm Microfarads or 100 GΩ | 100 Megohm Microfarads or 10 GΩ |
|---------------|---------------------------------------|------------------------------------|
| 0603 | N/A | All |
| 0805 | < .0039 µF | ≥ .0039 µF |
| 1206 | < 0.012 µF | ≥ 0.012 µF |
| 1210 | < 0.033 µF | ≥ 0.033 µF |
| 1808 | < 0.018 µF | ≥ 0.018 µF |
| 1812 | < 0.027 µF | ≥ 0.027 µF |
| 1825 | < 0.120 µF | ≥ 0.120 µF |
| 2220 | < 0.150 µF | ≥ 0.150 µF |
| 2225 | < 0.180 µF | ≥ 0.180 µF |

Table 1B – Capacitance Range/Selection Waterfall (1825 – 2225 Case Sizes)

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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).

Table 2A – Chip Thickness/Tape & Reel Packaging Quantities

| Thickness Code | Case Size ¹ | Thickness ± Range (mm) | Paper Quantity ¹ | | Plastic Quantity | |
|----------------|------------------------|------------------------|-----------------------------|----------|------------------|----------|
| | | | 7" Reel | 13" Reel | 7" Reel | 13" Reel |
| CG | 0603 | 0.80 ± 0.10 | 4,000 | 15,000 | 0 | 0 |
| DG | 0805 | 1.25 ± 0.15 | 0 | 0 | 2,500 | 10,000 |
| ES | 1206 | 1.00 ± 0.20 | 0 | 0 | 2,500 | 10,000 |
| EF | 1206 | 1.20 ± 0.15 | 0 | 0 | 2,500 | 10,000 |
| EU | 1206 | 1.60 ± 0.25 | 0 | 0 | 2,000 | 8,000 |
| EJ | 1206 | 1.70 ± 0.20 | 0 | 0 | 2,000 | 8,000 |
| FZ | 1210 | 1.25 ± 0.20 | 0 | 0 | 2,500 | 10,000 |
| FL | 1210 | 1.40 ± 0.15 | 0 | 0 | 2,000 | 8,000 |
| FU | 1210 | 1.55 ± 0.20 | 0 | 0 | 2,000 | 8,000 |
| FM | 1210 | 1.70 ± 0.20 | 0 | 0 | 2,000 | 8,000 |
| FK | 1210 | 2.10 ± 0.20 | 0 | 0 | 2,000 | 8,000 |
| FS | 1210 | 2.50 ± 0.30 | 0 | 0 | 1,000 | 4,000 |
| LE | 1808 | 1.00 ± 0.10 | 0 | 0 | 2,500 | 10,000 |
| LA | 1808 | 1.40 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| LB | 1808 | 1.60 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| LC | 1808 | 2.00 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| GB | 1812 | 1.00 ± 0.10 | 0 | 0 | 1,000 | 4,000 |
| GC | 1812 | 1.10 ± 0.10 | 0 | 0 | 1,000 | 4,000 |
| GE | 1812 | 1.30 ± 0.10 | 0 | 0 | 1,000 | 4,000 |
| GH | 1812 | 1.40 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| GF | 1812 | 1.50 ± 0.10 | 0 | 0 | 1,000 | 4,000 |
| GG | 1812 | 1.55 ± 0.10 | 0 | 0 | 1,000 | 4,000 |
| GK | 1812 | 1.60 ± 0.20 | 0 | 0 | 1,000 | 4,000 |
| GJ | 1812 | 1.70 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| GN | 1812 | 1.70 ± 0.20 | 0 | 0 | 1,000 | 4,000 |
| GL | 1812 | 1.90 ± 0.20 | 0 | 0 | 500 | 2,000 |
| GM | 1812 | 2.00 ± 0.20 | 0 | 0 | 500 | 2,000 |
| GS | 1812 | 2.10 ± 0.20 | 0 | 0 | 500 | 2,000 |
| GO | 1812 | 2.50 ± 0.20 | 0 | 0 | 500 | 2,000 |
| HE | 1825 | 1.40 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| HG | 1825 | 1.60 ± 0.20 | 0 | 0 | 1,000 | 4,000 |
| HJ | 1825 | 2.00 ± 0.20 | 0 | 0 | 500 | 2,000 |
| HK | 1825 | 2.50 ± 0.20 | 0 | 0 | 500 | 2,000 |
| JE | 2220 | 1.40 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| JK | 2220 | 1.60 ± 0.20 | 0 | 0 | 1,000 | 4,000 |
| JL | 2220 | 2.00 ± 0.20 | 0 | 0 | 500 | 2,000 |
| JN | 2220 | 2.50 ± 0.20 | 0 | 0 | 500 | 2,000 |
| KE | 2225 | 1.40 ± 0.15 | 0 | 0 | 1,000 | 4,000 |
| KF | 2225 | 1.60 ± 0.20 | 0 | 0 | 1,000 | 4,000 |
| KH | 2225 | 2.00 ± 0.20 | 0 | 0 | 500 | 2,000 |
| KJ | 2225 | 2.50 ± 0.20 | 0 | 0 | 500 | 2,000 |
| Thickness Code | Case Size ¹ | Thickness ± Range (mm) | 7" Reel | 13" Reel | 7" Reel | 13" Reel |
| | | | Paper Quantity ¹ | | Plastic Quantity | |

Package quantity based on finished chip thickness specifications.

¹ If ordering using the 2 mm Tape and Reel pitch option, the packaging quantity outlined in the table above will be doubled. This option is limited to EIA 0603 (1608 metric) case size devices. For more information regarding 2 mm pitch option see "Tape & Reel Packaging Information".

Table 2B – Bulk Packaging Quantities

| Packaging Type | | Loose Packaging | |
|------------------|-------------|--|---------|
| | | Bulk Bag (default) | |
| Packaging C-Spec | | N/A ² | |
| Case Size | | Packaging Quantities (pieces/unit packaging) | |
| EIA (in) | Metric (mm) | Minimum | Maximum |
| 0402 | 1005 | 1 | 50,000 |
| 0603 | 1608 | | |
| 0805 | 2012 | | |
| 1206 | 3216 | | |
| 1210 | 3225 | | |
| 1808 | 4520 | | 20,000 |
| 1812 | 4532 | | |
| 1825 | 4564 | | |
| 2220 | 5650 | | |
| 2225 | 5664 | | |

¹ 8LI 4EGOEKMRK ' 7TIG MW E XS HMKMX GSHI [LMGL MHIRXM¼IW XLI TEGOEKMRK MRGPYHIH MR XLI XL XLVSYKL RH GLEVEGXIV TSWMXMSRW SJ XLI SVHIVMRK GSHI 'SQQIVGMEP +VEHI TVSHYGX SVHIVIH [MXLSYX E TEGOEKMRK ' 7TIG [MPP HIJEYPX X FEK TEGOEKMRK STXMSR JSV %YXSQSMZI +VEHI TVSHYGXW

² % TEGOEKMRK ' 7TIG WII RSXI EFSZI MW RSX VIUVMVIH JSV &YPO &EK TEGOEKMRK XL XLVSYKL RH GLEVEGXIV TSWMXMSRW SJ XLI SVHIVMRK GSHI WLSYPH FI PIJX F WXRHEVH &YPO &EK TEGOEKMRK

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

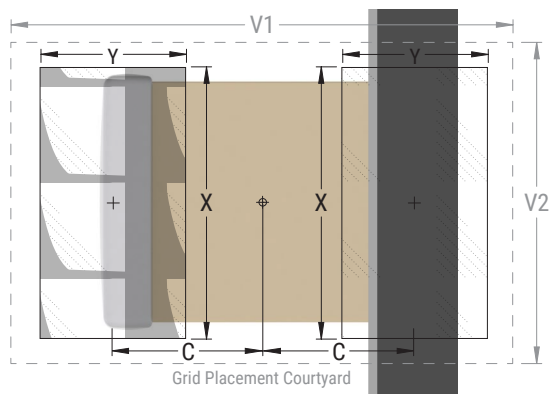
| EIA Size Code | Metric Size Code | Density Level A: Maximum (Most) Land Protrusion (mm) | | | | | Density Level B: Median (Nominal) Land Protrusion (mm) | | | | | Density Level C: Minimum (Least) Land Protrusion (mm) | | | | |
|---------------|------------------|--|------|------|------|------|--|------|------|------|------|---|------|------|------|------|
| | | C | Y | X | V1 | V2 | C | Y | X | V1 | V2 | C | Y | X | V1 | V2 |
| 0603 | 1608 | 0.85 | 1.25 | 1.10 | 4.00 | 2.10 | 0.75 | 1.05 | 1.00 | 3.10 | 1.50 | 0.65 | 0.85 | 0.90 | 2.40 | 1.20 |
| 0805 | 2012 | 0.99 | 1.44 | 1.66 | 4.47 | 2.71 | 0.89 | 1.24 | 1.56 | 3.57 | 2.11 | 0.79 | 1.04 | 1.46 | 2.42 | 1.81 |
| 1206 | 3216 | 1.59 | 1.62 | 2.06 | 5.85 | 3.06 | 1.49 | 1.42 | 1.96 | 4.95 | 2.46 | 1.39 | 1.22 | 1.86 | 4.25 | 2.16 |
| 1210 | 3225 | 1.59 | 1.62 | 3.01 | 5.90 | 4.01 | 1.49 | 1.42 | 2.91 | 4.95 | 3.41 | 1.39 | 1.22 | 2.81 | 4.25 | 3.11 |
| 1808 | 4520 | 2.30 | 1.75 | 2.30 | 7.40 | 3.30 | 2.20 | 1.55 | 2.20 | 6.50 | 2.70 | 2.10 | 1.35 | 2.10 | 5.80 | 2.40 |
| 1812 | 4532 | 2.10 | 1.80 | 3.60 | 7.00 | 4.60 | 2.00 | 1.60 | 3.50 | 6.10 | 4.00 | 1.90 | 1.40 | 3.40 | 5.40 | 3.70 |
| 1825 | 4564 | 2.15 | 1.80 | 6.90 | 7.10 | 7.90 | 2.05 | 1.60 | 6.80 | 6.20 | 7.30 | 1.95 | 1.40 | 6.70 | 5.50 | 7.00 |
| 2220 | 5650 | 2.85 | 2.10 | 5.50 | 8.80 | 6.50 | 2.75 | 1.90 | 5.40 | 7.90 | 5.90 | 2.65 | 1.70 | 5.30 | 7.20 | 5.60 |
| 2225 | 5664 | 2.85 | 2.10 | 6.90 | 8.80 | 7.90 | 2.75 | 1.90 | 6.80 | 7.90 | 7.30 | 2.65 | 1.70 | 6.70 | 7.20 | 7.00 |

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 EIA 0603, 0805 and 1206 case sizes.

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

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 1210 case size.



Soldering Process

Recommended Soldering Technique:

- Solder wave or solder reflow for EIA case sizes 0603, 0805 and 1206
- All other EIA case sizes are limited to solder reflow only

Recommended Reflow Soldering Profile:

KEMET's families of surface mount multilayer ceramic capacitors (SMD MLCCs) are compatible with wave (single or dual), convection, IR or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J-STD-020 standard for moisture sensitivity testing. These devices can safely withstand a maximum of three reflow passes at these conditions.

| Profile Feature | Termination Finish | |
|---|--------------------|--------------------|
| | SnPb | 100% Matte Sn |
| Preheat/Soak | | |
| Temperature Minimum (T_{Smin}) | 100°C | 150°C |
| Temperature Maximum (T_{Smax}) | 150°C | 200°C |
| Time (t_s) from T_{Smin} to T_{Smax} | 60 – 120 seconds | 60 – 120 seconds |
| Ramp-Up Rate (T_L to T_p) | 3°C/second maximum | 3°C/second maximum |
| Liquidous Temperature (T_L) | 183°C | 217°C |
| Time Above Liquidous (t_L) | 60 – 150 seconds | 60 – 150 seconds |
| Peak Temperature (T_p) | 235°C | 260°C |
| Time Within 5°C of Maximum Peak Temperature (t_p) | 20 seconds maximum | 30 seconds maximum |
| Ramp-Down Rate (T_p to T_L) | 6°C/second maximum | 6°C/second maximum |
| Time 25°C to Peak Temperature | 6 minutes maximum | 8 minutes maximum |

Note 1: All temperatures refer to the center of the package, measured on the capacitor body surface that is facing up during assembly reflow.

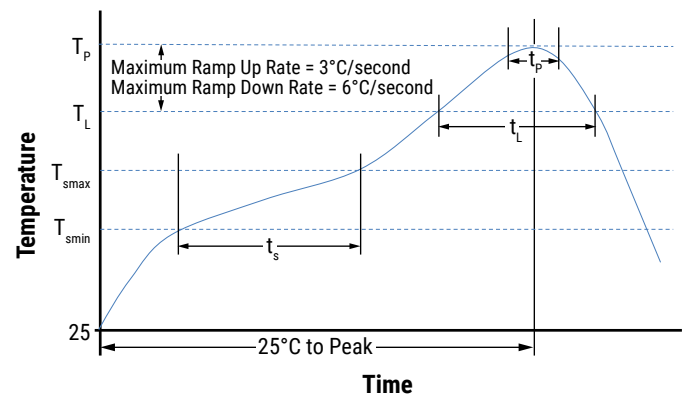
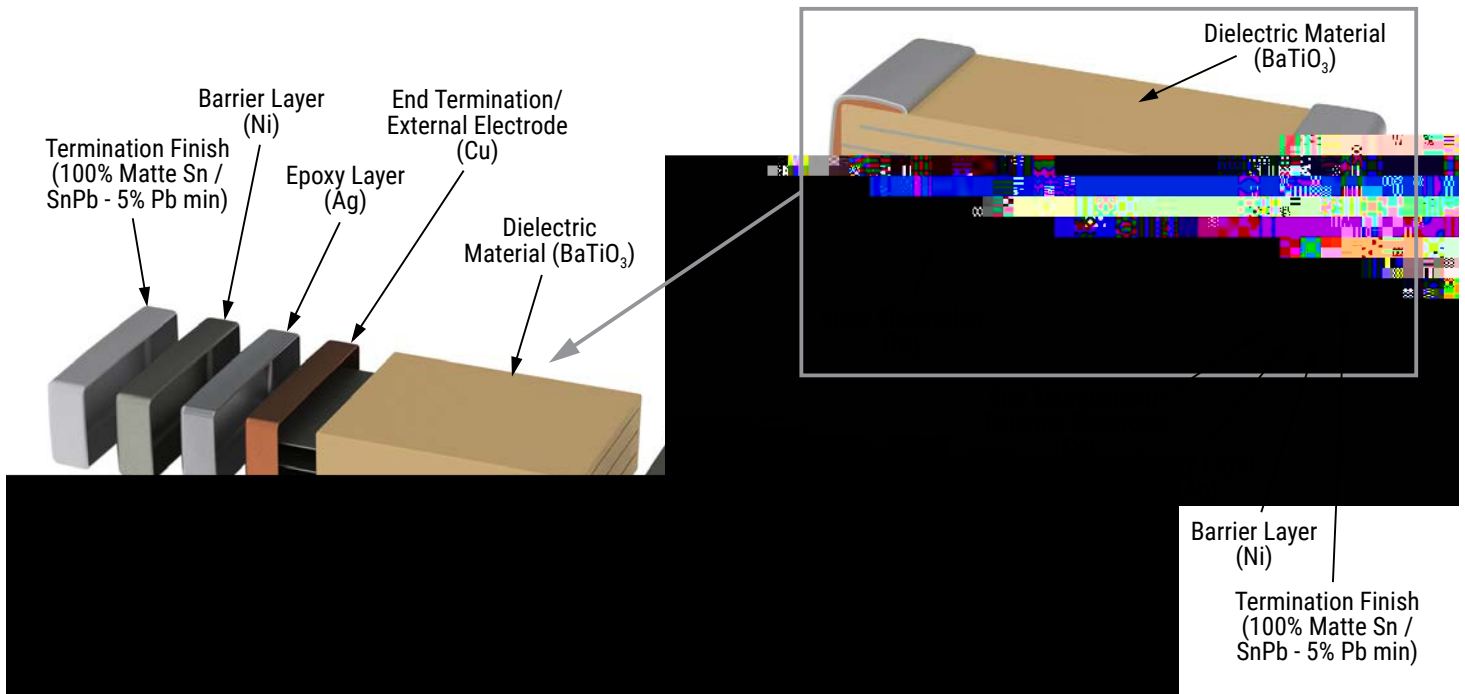


Table 4 – Performance & Reliability: Test Methods and Conditions

| Stress | Reference | Test or Inspection Method |
|---------------------|------------------------|---|
| Terminal Strength | JIS-C-6429 | Appendix 1, Note: Force of 1.8 kg for 60 seconds. |
| Board Flex | JIS-C-6429 | Appendix 2, Note: Standard termination system – 2.0 mm (minimum) for all except 3 mm for COG. Flexible termination system – 3.0 mm (minimum). |
| Solderability | J-STD-002 | Magnification 50 X. Conditions: |
| | | a) Method B, 4 hours at 155°C, dry heat at 235°C |
| | | b) Method B at 215°C category 3 |
| | | c) Method D, category 3 at 260°C |
| Temperature Cycling | JESD22 Method JA-104 | 1,000 cycles (-55°C to +125°C). Measurement at 24 hours +/-4 hours after test conclusion. |
| Biased Humidity | MIL-STD-202 Method 103 | Load Humidity: 1,000 hours 85°C/85% RH and 200 VDC maximum. Add 100 K ohm resistor. Measurement at 24 hours +/-4 hours after test conclusion. |
| | | Low Volt Humidity: 1,000 hours 85°C/85% RH and 1.5 V. Add 100 K ohm resistor. Measurement at 24 hours +/-4 hours after test conclusion. |
| Moisture Resistance | MIL-STD-202 Method 106 | t = 24 hours/cycle. Steps 7a and 7b not required. Measurement at 24 hours +/-4 hours after test conclusion. |
| Thermal Shock | MIL-STD-202 Method 107 | -55°C/+125°C. Note: N u125 |
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Construction



Capacitor Marking (Optional):

These surface mount multilayer ceramic capacitors are normally supplied unmarked. If required, they can be marked as an extra cost option. Marking is available on most KEMET devices but must be requested using the correct ordering code identifier(s). If this option is requested, two sides of the ceramic body will be laser marked with a "K" to identify KEMET, followed by two characters (per EIA-198 - see table below) to identify the capacitance value. EIA 0603 case size devices are limited to the "K" character only.

Laser marking option is not available on:

- COG, ultra stable X8R and Y5V dielectric devices.
- EIA 0402 case size devices.
- EIA 0603 case size devices with flexible termination option.
- KPS commercial and automotive grade stacked devices.
- X7R dielectric products in capacitance values outlined below.

Marking appears in legible contrast. Illustrated below is an example of an MLCC with laser marking of "KA8", which designates a KEMET device with rated capacitance of 100 μ F. Orientation of marking is vendor optional.



| EIA Case Size | Metric Size Code | Capacitance |
|---------------|------------------|----------------------|
| 0603 | 1608 | ≤ 170 pF |
| 0805 | 2012 | ≤ 150 pF |
| 1206 | 3216 | ≤ 910 pF |
| 1210 | 3225 | $\leq 2,000$ pF |
| 1808 | 4520 | $\leq 3,900$ pF |
| 1812 | 4532 | $\leq 6,700$ pF |
| 1825 | 4564 | ≤ 0.018 μ F |
| 2220 | 5650 | ≤ 0.027 μ F |
| 2225 | 5664 | ≤ 0.033 μ F |

Capacitor Marking (Optional) cont'd



Tape & Reel Packaging Information

KEMET offers multilayer ceramic chip capacitors packaged in 8, 12 and 16 mm 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.

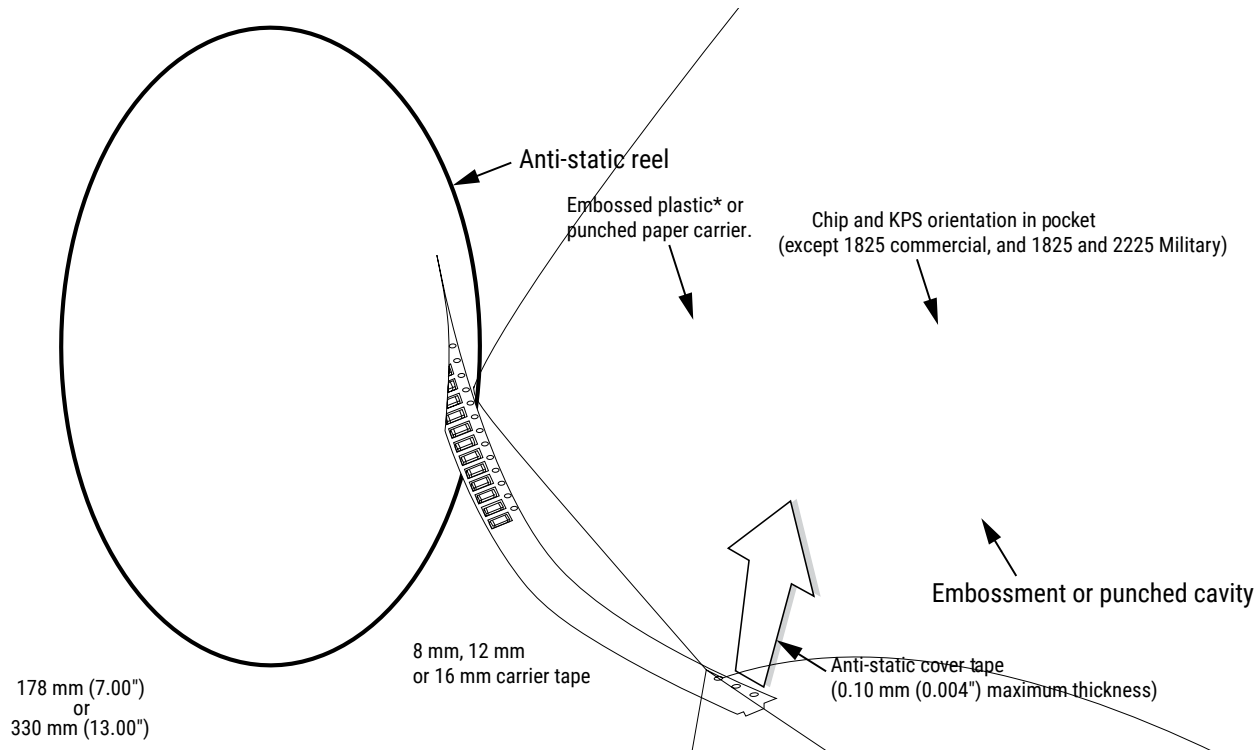


Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

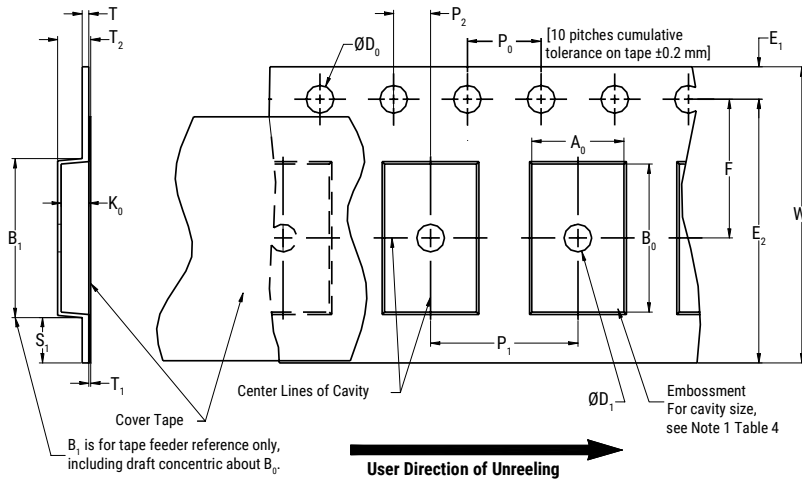


Table 6 – Embossed (Plastic) Carrier Tape Dimensions

Metric will govern

| Constant Dimensions – Millimeters (Inches) | | | | | | | | | |
|--|---|-------------------------|------------------------------------|-----------------------------------|-----------------------------------|-----------------------|-------------------------|--------------|------------------|
| Tape Size | D_0 | D_1 Minimum Note 1 | E_1 | P_0 | P_2 | R Reference Note 2 | S_1 Minimum Note 3 | T Maximum | T_1 Maximum |
| 8 mm | $1.5 + 0.10 / - 0.0$ (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 (0.9.8-1.06) | | | |
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Figure 2 – Punched (Paper) Carrier Tape Dimensions

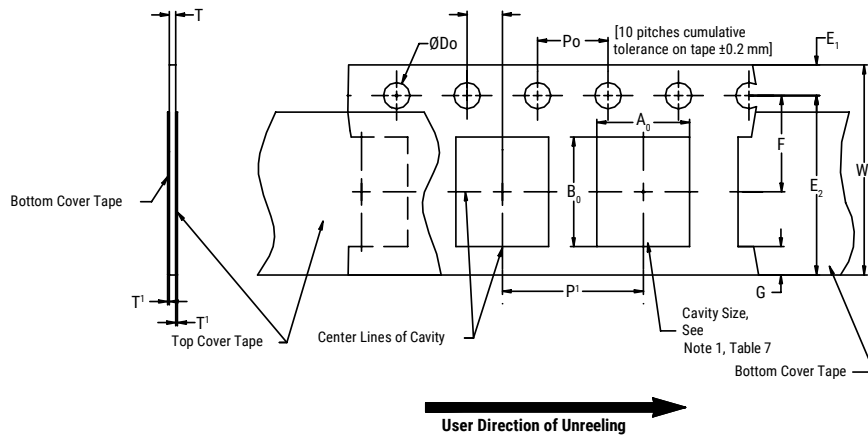


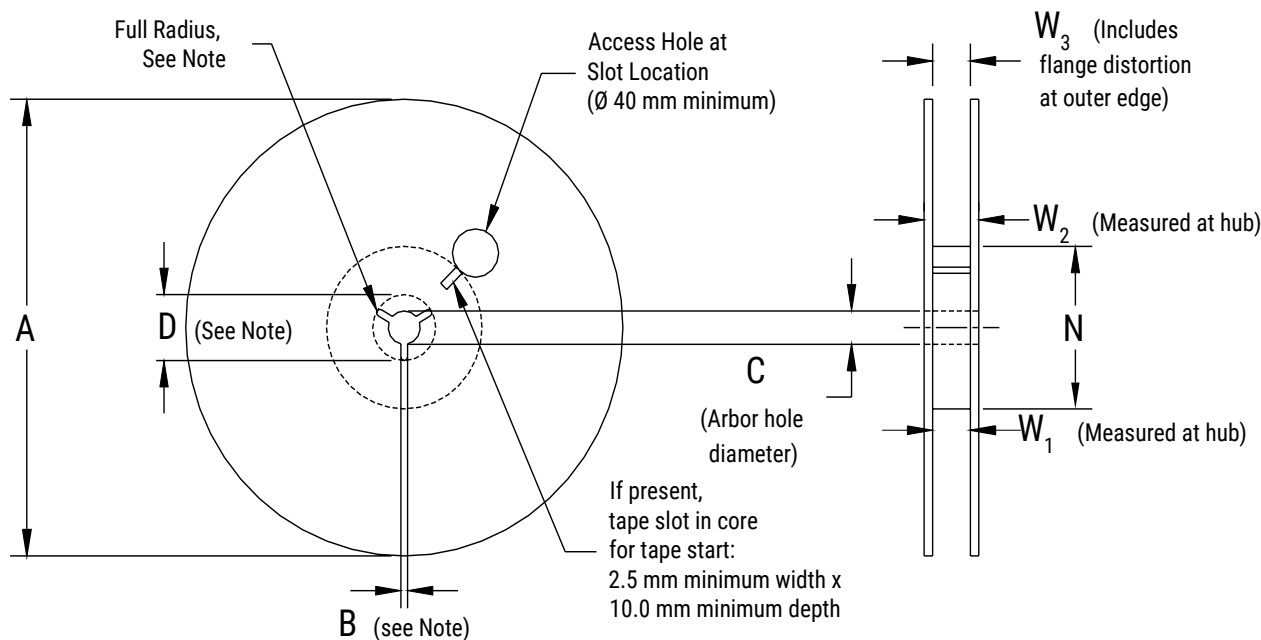
Table 7 – Punched (Paper) Carrier Tape Dimensions

Metric will govern

| Constant Dimensions – Millimeters (Inches) | | | | | | | |
|--|---------------------------------------|------------------------------|-----------------------------|-----------------------------|----------------------------|-----------------|--------------------|
| Tape Size | D_0 | E_1 | P_0 | P_2 | T_1 Maximum | G Minimum | R Reference Note 2 |
| 8 mm | 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 (0.004) maximum | 0.75 (0.030) | 25 (0.984) |
| Variable Dimensions – Millimeters (Inches) | | | | | | | |
| Tape Size | Pitch | E2 Minimum | F | P_1 | T Maximum | W Maximum | $A_0 B_0$ |
| 8 mm | Half (2 mm) | 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 1 |
| 8 mm | Single (4 mm) | | | 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.
 - rotation of the component is limited to 20° maximum (see Figure 3.)
 - lateral movement of the component is restricted to 0.5 mm maximum (see Figure 4.)
 - see addendum in EIA Standard 481 for standards relating to more precise taping requirements.
- The tape with or without components shall pass around R without damage (see Figure 6.)

Figure 6 – Reel Dimensions



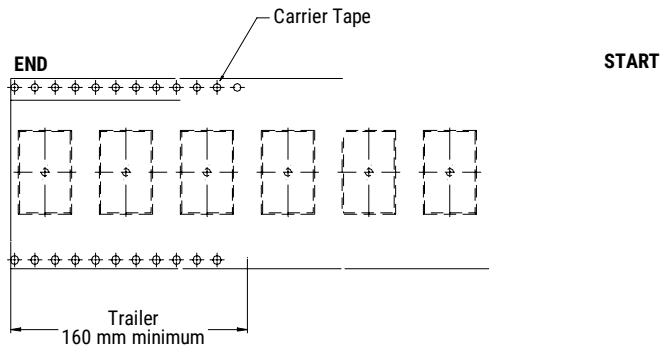
Note: Drive spokes optional; if used, dimensions B and D shall apply.

Table 8 – Reel Dimensions

Metric will govern

| Constant Dimensions – Millimeters (Inches) | | | | |
|--|---|---------------------------------------|--|---|
| Tape Size | A | B Minimum | C | D Minimum |
| 8 mm | 178 ±0.20 (7.008 ±0.008) or 330 ±0.20 (13.000 ±0.008) | 1.5 (0.059) | 13.0 +0.5/-0.2 (0.521 +0.02/-0.008) | 20.2 (0.795) |
| 12 mm | | | | |
| 16 mm | | | | |
| Variable Dimensions – Millimeters (Inches) | | | | |
| Tape Size | N Minimum | W ₁ | W ₂ Maximum | W ₃ |
| 8 mm | 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 |
| 12 mm | | 12.4 +2.0/-0.0 (0.488 +0.078/-0.0) | 18.4 (0.724) | |
| 16 mm | | 16.4 +2.0/-0.0 (0.646 +0.078/-0.0) | 22.4 (0.882) | |

Figure 7 – Tape Leader & Trailer Dimensions



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