# T429 Series CWR29 Style MIL-PRF-55365/8

The Capacitance Company
KEMET
CHARGED.

## Overview

The KEMET T429 series is approved to MIL-PRF-55365/11 (CWR29), with Weibull failure rates of B level (0.1% failures per 1000 hours), C level (0.01% failures per 1000 hours), or D level (0.001% failures per 1000 hours). This CWR29 product is a precision-molded device, with compliant terminations and indelible laser marking. Tape and reeling per EIA 481-1 is standard.

## Benefits

- Established reliability options
- Taped and reeled per EIA 481-1
- Symmetrical, compliant terminations
- Laser-marked case
- 100% surge current test available on all case sizes
- Qualified to MIL-PRF-55365/11, Style CWR29
- Termination options B, C, H, K
- Weibull failure options B, C, and D
- Voltage rating of 4-50 VDC
- Operating temperature range of -55˚C to +125˚C

## Applications

Typical applications include decoupling and filtering in military and aerospace applications requiring CWR29 devices.


## Environmental Compliance

RoHS Compliant (6/6)* according to Directive 2002/95/EC

**When ordered with 100% Sn Solder*

## SPICE

For a detailed analysis of specific part numbers, please visit kemet.com for a free download of KEMET's SPICE software. The KEMET SPICE program is freeware intended to aid design engineers in analyzing the performance of these capacitors over frequency, temperature, ripple, and DC bias conditions.

## Ordering Information

| T | 429 | A | 225 | K | 004 | A | H | 4251 |
|---|---|---|---|---|---|---|---|---|
| Capacitor Class | Series | Case Size | Capacitance Code (pF) | Capacitance Tolerance | Voltage | Failure Rate/ Design | Lead Material | Surge |
| T = Tantalum | CWR 29 Established Reliability | A = 1005<br>B = 1505<br>C = 2005<br>D = 1510<br>E = 2010<br>F = 2214<br>G = 2711<br>H = 2915<br>X = 282 | First two digits represent significant figures. Third digit specifies number of zeros. | J = ±5%<br>K = ±10%<br>M = ±20% | 004 = 4V<br>006 = 6.3V<br>010 = 10V<br>015 = 15V<br>020 = 20V<br>025 = 25V<br>035 = 35V<br>050 = 50V | A = N/A<br>B = 0.1%/1000 hrs<br>C = .01%/1000 hrs<br>D=.001%/1000 hrs | C = Hot Solder Dipped<br>H = Standard Solder Coated (SnPb 5% Pb minimum)<br>B = Gold Plated<br>K = Solder Fused | 4250= 25ºC after Weibull<br>4251 = -55ºC and 85ºC after Weibull<br>4252 = -55ºC and 85ºC before Weibull |

## Performance Characteristics

| Item | Performance Characteristics |
|---|---|
| Operating Temperature | -55°C to 125°C |
| Rated Capacitance Range | 0.1µF - 330µF @ 120 Hz/25°C |
| Capacitance Tolerance | J Tolerance (5%), K Tolerance (10%), M Tolerance (20%) |
| Rated Voltage Range | 4V - 50V |
| DF(120Hz) | Refer to Part Number Electrical Specification Table |
| ESR (100kHz) | Refer to Part Number Electrical Specification Table |
| Leakage Current | ≤ 0.01CV (µA) at Rated Voltage after 5 minutes |

## Qualification

| Test | Condition | | Characteristics | | | |
|---|---|---|---|---|---|---|
| Endurance | 85°C @ Rated Voltage, 2000 Hrs.<br>125°C @ 2/3 Rated Voltage, 2000 Hrs. | | ΔC/C | Within ± 10% of initial value | | |
| | | | DF | Within initial limits | | |
| | | | DCL | Within 1.25 x initial limit | | |
| | | | ESR | Within initial limits | | |
| Storage Life | 125°C @ 0 Volts, 2000 Hrs. | | ΔC/C | Within ± 10% of initial value | | |
| | | | DF | Within initial limits | | |
| | | | DCL | Within 1.25 x initial limit | | |
| | | | ESR | Within initial limits | | |
| Thermal Shock | Mil-Std-202, Method 107, Condition B, mounted, -55C° to 125°C, 1000 cycles | | ΔC/C | Within ± 5% of initial value | | |
| | | | DF | Within initial limits | | |
| | | | DCL | Within 1.25 x initial limit | | |
| | | | ESR | Within initial limits | | |
| Temperature Stability | Extreme temperature exposure at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C. | | +25°C | -55°C | +85°C | +125°C |
| | | ΔC/C | IL* | ±10% | ±10% | ±20% |
| | | DF | IL | IL | 1.5 x IL | 1.5 x IL |
| | | DCL | IL | n/a | 10 x IL | 12 x IL |
| Surge Voltage | 25°C and 85° C, 1.32 x Rated Voltage 1000 cycles (125°C, 1.2 x Rated Voltage) | | ΔC/C | Within ± 5% of initial value | | |
| | | | DF | Within initial limits | | |
| | | | DCL | Within initial limits | | |
| | | | ESR | Within initial limits | | |
| Mechanical Shock/Vibration | Mil-Std-202, Meth. 213, Cond. I, 100G Peak<br>Mil-Std-202, Meth. 204, Cond. D, 10Hz to 2000Hz, 20G Peak | | ΔC/C | Within ±10 of initial value | | |
| | | | DF | Within initial limits | | |
| | | | DCL | Within initial limits | | |
| Additional qualification tests per MIL-PRF-55365/11 | | | | | | |

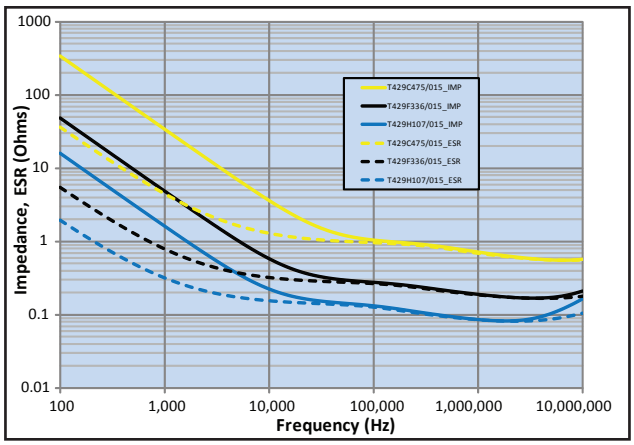
**IL = Initial Limit*

## Certification

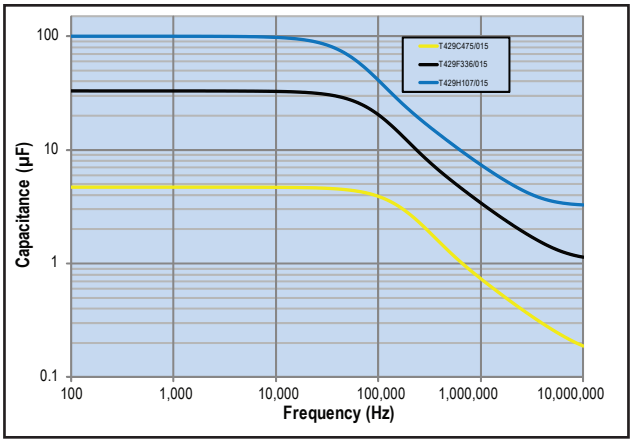
Mil-PRF-55365/11

## Electrical Characteristics

### ESR vs. Frequency

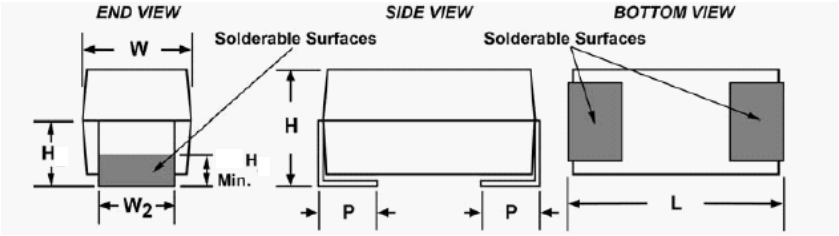



### Capacitance vs. Frequency




## Dimensions – Millimeters (Inches)

Metric will govern




| Case Size | | Component | | | |
|---|---|---|---|---|---|
| KEMET | L* +/- 0.38 (.015) | W* +/- 0.38 (.015) | H* +/- 0.38 (.015) | P +.025(.010), -0.13(.005) | $W_2$ |
| A | 2.54 (.100) | 1.27 (.050) | 1.27 (.050) | 0.76 (.030) | 1.27 +/- 0.13 (.050 +/- .005) |
| B | 3.81 (.150) | 1.27 (.050) | 1.27 (.050) | 0.76 (.030) | 1.27 +/- 0.13 (.050 +/- .005) |
| C | 5.08 (.200) | 1.27 (.050) | 1.27 (.050) | 0.76 (.030) | 1.27 +/- 0.13 (.050 +/- .005) |
| D | 3.81 (.150) | 2.54 (.100) | 1.27 (.050) | 0.76 (.030) | 2.41 +.13, -.25 (.095 +.005, -.010) |
| E | 5.08 (.200) | 2.54 (.100) | 1.27 (.050) | 0.76 (.030) | 2.41 +.13, -.25 (.095 +.005, -.010) |
| F | 5.59 (.220) | 3.43 (.135) | 1.78 (.070) | 0.76 (.030) | 3.30 +/- 0.13 (.130 +/- .005) |
| G | 6.73 (.265) | 2.79 (.110) | 2.79 (.110) | 1.27 (.050) | 2.67 +/- 0.13 (.105 +/- .005) |
| H | 7.24 (.285) | 3.81 (.150) | 2.79 (.110) | 1.27 (.050) | 3.68 +.013, -0.51 (.145 + .005, - .020) |
| X | 6.93 (.273) | 5.41 (.213) | 2.74 (.108) | 1.19 (.047) | 3.05 +/- 0.13 (.120 +/- .005) |

## Table 1 – Ratings & Part Number Reference

| Rated Voltage | Rated Cap | Case Code/ Case Size | KEMET Part Number | Mil-C-55365/4F Part Number | DC Leakage | DF | ESR | Moisture Sensitivity |
|---|---|---|---|---|---|---|---|---|
| 85°C | 120Hz | KEMET/EIA | (See below for part options) | (See below for part options) | µAmps +20°C | +20°C 120Hz | +20°C 100kHz | Temp≤260°C |
| VDC | µF | | | | max/5min | % Max | Ohms | J-STD-020D |
| 4 | 2.2 | A/1005 | T429A225(1)004(2)(3)(4) | CWR29C(3)225(1)(2)A(5) | 0.1 | 6.0 | 4.0 | 1.0 |
| 4 | 3.3 | A/1005 | T429A335(1)004(2)(3)(4) | CWR29C(3)335(1)(2)A(5) | 0.1 | 6.0 | 6.0 | 1.0 |
| 4 | 4.7 | A/1005 | T429A475(1)004(2)(3)(4) | CWR29C(3)475(1)(2)A(5) | 0.2 | 6.0 | 6.0 | 1.0 |
| 4 | 4.7 | B/1505 | T429B475(1)004(2)(3)(4) | CWR29C(3)475(1)(2)B(5) | 0.2 | 6.0 | 3.2 | 1.0 |
| 4 | 6.8 | A/1005 | T429A685(1)004(2)(3)(4) | CWR29C(3)685(1)(2)A(5) | 0.3 | 6.0 | 6.0 | 1.0 |
| 4 | 6.8 | C/2005 | T429C685(1)004(2)(3)(4) | CWR29C(3)685(1)(2)C(5) | 0.3 | 6.0 | 2.2 | 1.0 |
| 4 | 10 | B/1505 | T429B106(1)004(2)(3)(4) | CWR29C(3)106(1)(2)B(5) | 0.4 | 8.0 | 3.2 | 1.0 |
| 4 | 10 | D/1510 | T429D106(1)004(2)(3)(4) | CWR29C(3)106(1)(2)D(5) | 0.4 | 8.0 | 1.3 | 1.0 |
| 4 | 15 | B/1505 | T429B156(1)004(2)(3)(4) | CWR29C(3)156(1)(2)B(5) | 0.6 | 8.0 | 3.2 | 1.0 |
| 4 | 15 | E/2010 | T429E156(1)004(2)(3)(4) | CWR29C(3)156(1)(2)E(5) | 0.6 | 8.0 | 1.0 | 1.0 |
| 4 | 22 | B/1505 | T429B226(1)004(2)(3)(4) | CWR29C(3)226(1)(2)B(5) | 0.9 | 8.0 | 3.2 | 1.0 |
| 4 | 22 | D/1510 | T429D226(1)004(2)(3)(4) | CWR29C(3)226(1)(2)D(5) | 0.9 | 8.0 | 1.3 | 1.0 |
| 4 | 33 | D/1510 | T429D336(1)004(2)(3)(4) | CWR29C(3)336(1)(2)D(5) | 1.3 | 8.0 | 1.3 | 1.0 |
| 4 | 33 | E/2010 | T429E336(1)004(2)(3)(4) | CWR29C(3)336(1)(2)E(5) | 1.3 | 8.0 | 0.9 | 1.0 |
| 4 | 33 | F/2214 | T429F336(1)004(2)(3)(4) | CWR29C(3)336(1)(2)F(5) | 1.3 | 8.0 | 0.6 | 1.0 |
| 4 | 47 | E/2010 | T429E476(1)004(2)(3)(4) | CWR29C(3)476(1)(2)E(5) | 1.9 | 8.0 | 0.9 | 1.0 |
| 4 | 68 | E/2010 | T429E686(1)004(2)(3)(4) | CWR29C(3)686(1)(2)E(5) | 2.7 | 8.0 | 0.9 | 1.0 |
| 4 | 68 | G/2711 | T429G686(1)004(2)(3)(4) | CWR29C(3)686(1)(2)G(5) | 2.7 | 10.0 | 0.275 | 1.0 |
| 4 | 100 | F/2214 | T429F107(1)004(2)(3)(4) | CWR29C(3)107(1)(2)F(5) | 4.0 | 10.0 | 0.55 | 1.0 |
| 4 | 100 | H/2915 | T429H107(1)004(2)(3)(4) | CWR29C(3)107(1)(2)H(5) | 4.0 | 10.0 | 0.18 | 1.0 |
| 4 | 150 | G/2711 | T429G157(1)004(2)(3)(4) | CWR29C(3)157(1)(2)H(5) | 6.0 | 10.0 | 0.25 | 1.0 |
| 4 | 220 | H/2915 | T429H227(1)004(2)(3)(4) | CWR29C(3)227(1)(2)H(5) | 8.8 | 10.0 | 0.20 | 1.0 |
| 4 | 330 | H/2915 | T429H337(1)004(2)(3)(4) | CWR29C(3)337(1)(2)H(5) | 13.2 | 10.0 | 0.18 | 1.0 |
| 6.3 | 1.5 | A/1005 | T429A155(1)006(2)(3)(4) | CWR29D(3)155(1)(2)A(5) | 0.1 | 6.0 | 4.0 | 1.0 |
| 6.3 | 3.3 | A/1005 | T429A335(1)006(2)(3)(4) | CWR29D(3)335(1)(2)A(5) | 0.2 | 6.0 | 6.0 | 1.0 |
| 6.3 | 3.3 | B/1505 | T429B335(1)006(2)(3)(4) | CWR29D(3)335(1)(2)B(5) | 0.2 | 6.0 | 3.2 | 1.0 |
| 6.3 | 4.7 | A/1005 | T429A475(1)006(2)(3)(4) | CWR29D(3)475(1)(2)A(5) | 0.3 | 6.0 | 6.0 | 1.0 |
| 6.3 | 4.7 | C/2005 | T429C475(1)006(2)(3)(4) | CWR29D(3)475(1)(2)C(5) | 0.3 | 6.0 | 2.2 | 1.0 |
| 6.3 | 6.8 | B/1505 | T429B685(1)006(2)(3)(4) | CWR29D(3)685(1)(2)B(5) | 0.4 | 6.0 | 3.2 | 1.0 |
| 6.3 | 6.8 | D/1510 | T429D685(1)006(2)(3)(4) | CWR29D(3)685(1)(2)D(5) | 0.4 | 6.0 | 1.5 | 1.0 |
| 6.3 | 10 | B/1505 | T429B106(1)006(2)(3)(4) | CWR29D(3)106(1)(2)B(5) | 0.6 | 6.0 | 3.2 | 1.0 |
| 6.3 | 10 | E/2010 | T429E106(1)006(2)(3)(4) | CWR29D(3)106(1)(2)E(5) | 0.6 | 8.0 | 1.0 | 1.0 |
| 6.3 | 15 | B/1505 | T429B156(1)006(2)(3)(4) | CWR29D(3)156(1)(2)B(5) | 0.9 | 8.0 | 3.2 | 1.0 |
| 6.3 | 15 | D/1510 | T429D156(1)006(2)(3)(4) | CWR29D(3)156(1)(2)D(5) | 0.9 | 8.0 | 1.7 | 1.0 |
| 6.3 | 15 | E/2010 | T429E156(1)006(2)(3)(4) | CWR29D(3)156(1)(2)E(5) | 0.9 | 8.0 | 0.9 | 1.0 |
| 6.3 | 22 | D/1510 | T429D226(1)006(2)(3)(4) | CWR29D(3)226(1)(2)D(5) | 1.4 | 6.0 | 1.7 | 1.0 |
| 6.3 | 22 | E/2010 | T429E226(1)006(2)(3)(4) | CWR29D(3)226(1)(2)E(5) | 1.4 | 8.0 | 1.0 | 1.0 |
| 6.3 | 22 | F/2214 | T429F226(1)006(2)(3)(4) | CWR29D(3)226(1)(2)F(5) | 1.4 | 8.0 | 0.6 | 1.0 |
| 6.3 | 33 | E/2010 | T429E336(1)006(2)(3)(4) | CWR29D(3)336(1)(2)E(5) | 2.1 | 6.0 | 1.0 | 1.0 |
| 6.3 | 47 | F/2214 | T429F476(1)006(2)(3)(4) | CWR29D(3)476(1)(2)F(5) | 3.0 | 8.0 | 1.0 | 1.0 |
| 6.3 | 47 | G/2711 | T429G476(1)006(2)(3)(4) | CWR29D(3)476(1)(2)G(5) | 3.0 | 10.0 | 0.275 | 1.0 |
| 6.3 | 68 | F/2214 | T429F686(1)006(2)(3)(4) | CWR29D(3)686(1)(2)F(5) | 4.3 | 10.0 | 0.4 | 1.0 |
| 6.3 | 68 | G/2711 | T429G686(1)006(2)(3)(4) | CWR29D(3)686(1)(2)G(5) | 4.3 | 10.0 | 0.25 | 1.0 |
| 6.3 | 68 | H/2915 | T429H686(1)006(2)(3)(4) | CWR29D(3)686(1)(2)H(5) | 4.3 | 10.0 | 0.18 | 1.0 |
| 6.3 | 100 | G/2711 | T429G107(1)006(2)(3)(4) | CWR29D(3)107(1)(2)G(5) | 6.3 | 10.0 | 0.275 | 1.0 |
| 6.3 | 150 | G/2711 | T429G157(1)006(2)(3)(4) | CWR29D(3)157(1)(2)G(5) | 9.5 | 10.0 | 0.275 | 1.0 |

| T | 429 | A | 225 | K | 004 | A | H | 4251 |
|---|---|---|---|---|---|---|---|---|
| Capacitor Class | Series | Case Size | Capacitance Code (pF) | Capacitance Tolerance | Voltage | Failure Rate/ Design | Lead Material | Surge |
| T = Tantalum | CWR 29 Established Reliability | A = 1005<br>B = 1505<br>C = 2005<br>D = 1510<br>E = 2010<br>F = 2214<br>G = 2711<br>H = 2915<br>X = 282 | First two digits represent significant figures. Third digit specifies number of zeros. | J = ±5%<br>K = ±10%<br>M = ±20% | 004 = 4V<br>006 = 6.3V<br>010 = 10V<br>015 = 15V<br>020 = 20V<br>025 = 25V<br>035 = 35V<br>050 = 50V | A = N/A<br>B = 0.1%/1000 hrs<br>C = .01%/1000 hrs<br>D=.001%/1000 hrs | C = Hot Solder Dipped<br>H = Standard Solder Coated (SnPb 5% Pb minimum)<br>B = Gold Plated<br>K = Solder Fused | 4250= 25°C after Weibull<br>4251 = -55°C and 85°C after Weibull<br>4252 = -55°C and 85°C before Weibull |

*Other*
*When*
*When*
*Stand*
*Also*
*Highe* *arked with the higher voltage rating. Substitutions can include better than series.*



Roll Over for Order Info.

## Table 1 – Ratings & Part Number Reference con't

| Rated Voltage | Rated Cap | Case Code/ Case Size | KEMET Part Number | Mil-C-55365/4F Part Number | DC Leakage | DF | ESR | Moisture Sensitivity |
|---|---|---|---|---|---|---|---|---|
| 85°C | 120Hz | KEMET/EIA | (See below for part options) | (See below for part options) | µAmps +20°C | +20°C 120Hz | +20°C 100kHz | Temp≤260°C |
| VDC | µF | | | | max/5min | % Max | Ohms | J-STD-020D |
| 10 | 1 | A/1005 | T429A105(1)010(2)(3)(4) | CWR29F(3)105(1)(2)A(5) | 0.1 | 6.0 | 5.0 | 1.0 |
| 10 | 2.2 | A/1005 | T429A225(1)010(2)(3)(4) | CWR29F(3)225(1)(2)A(5) | 0.2 | 6.0 | 6.0 | 1.0 |
| 10 | 2.2 | B/1505 | T429B225(1)010(2)(3)(4) | CWR29F(3)225(1)(2)B(5) | 0.2 | 6.0 | 3.2 | 1.0 |
| 10 | 3.3 | A/1005 | T429A335(1)010(2)(3)(4) | CWR29F(3)335(1)(2)A(5) | 0.3 | 6.0 | 6.0 | 1.0 |
| 10 | 3.3 | C/2005 | T429C335(1)010(2)(3)(4) | CWR29F(3)335(1)(2)C(5) | 0.3 | 6.0 | 2.2 | 1.0 |
| 10 | 4.7 | B/1505 | T429B475(1)010(2)(3)(4) | CWR29F(3)475(1)(2)B(5) | 0.5 | 6.0 | 3.2 | 1.0 |
| 10 | 4.7 | C/2005 | T429C475(1)010(2)(3)(4) | CWR29F(3)475(1)(2)C(5) | 0.5 | 6.0 | 2.2 | 1.0 |
| 10 | 4.7 | D/1510 | T429D475(1)010(2)(3)(4) | CWR29F(3)475(1)(2)D(5) | 0.5 | 6.0 | 1.5 | 1.0 |
| 10 | 6.8 | B/1505 | T429B685(1)010(2)(3)(4) | CWR29F(3)685(1)(2)B(5) | 0.7 | 6.0 | 3.2 | 1.0 |
| 10 | 6.8 | C/2005 | T429C685(1)010(2)(3)(4) | CWR29F(3)685(1)(2)C(5) | 0.7 | 6.0 | 2.2 | 1.0 |
| 10 | 6.8 | D/1510 | T429D685(1)010(2)(3)(4) | CWR29F(3)685(1)(2)D(5) | 0.7 | 6.0 | 1.7 | 1.0 |
| 10 | 6.8 | E/2010 | T429E685(1)010(2)(3)(4) | CWR29F(3)685(1)(2)E(5) | 0.7 | 6.0 | 1.0 | 1.0 |
| 10 | 10 | B/1505 | T429B106(1)010(2)(3)(4) | CWR29F(3)106(1)(2)B(5) | 1.0 | 8.0 | 3.2 | 1.0 |
| 10 | 10 | C/2005 | T429C106(1)010(2)(3)(4) | CWR29F(3)106(1)(2)C(5) | 1.0 | 6.0 | 2.2 | 1.0 |
| 10 | 10 | D/1510 | T429D106(1)010(2)(3)(4) | CWR29F(3)106(1)(2)D(5) | 1.0 | 6.0 | 1.3 | 1.0 |
| 10 | 10 | E/2010 | T429E106(1)010(2)(3)(4) | CWR29F(3)106(1)(2)E(5) | 1.0 | 6.0 | 1.0 | 1.0 |
| 10 | 15 | D/1510 | T429D156(1)010(2)(3)(4) | CWR29F(3)156(1)(2)D(5) | 1.5 | 6.0 | 1.7 | 1.0 |
| 10 | 15 | E/2010 | T429E156(1)010(2)(3)(4) | CWR29F(3)156(1)(2)E(5) | 1.5 | 8.0 | 0.9 | 1.0 |
| 10 | 15 | F/2214 | T429F156(1)010(2)(3)(4) | CWR29F(3)156(1)(2)F(5) | 1.5 | 8.0 | 0.7 | 1.0 |
| 10 | 22 | E/2010 | T429E226(1)010(2)(3)(4) | CWR29F(3)226(1)(2)E(5) | 2.2 | 8.0 | 0.6 | 1.0 |
| 10 | 33 | F/2214 | T429F336(1)010(2)(3)(4) | CWR29F(3)336(1)(2)F(5) | 3.3 | 8.0 | 0.4 | 1.0 |
| 10 | 33 | G/2711 | T429G336(1)010(2)(3)(4) | CWR29F(3)336(1)(2)G(5) | 3.3 | 10.0 | 0.275 | 1.0 |
| 10 | 47 | F/2214 | T429F476(1)010(2)(3)(4) | CWR29F(3)476(1)(2)F(5) | 4.7 | 10.0 | 0.4 | 1.0 |
| 10 | 47 | G/2711 | T429G476(1)010(2)(3)(4) | CWR29F(3)476(1)(2)G(5) | 4.7 | 10.0 | 0.25 | 1.0 |
| 10 | 47 | H/2915 | T429H476(1)010(2)(3)(4) | CWR29F(3)476(1)(2)H(5) | 4.7 | 10.0 | 0.18 | 1.0 |
| 10 | 68 | G/2711 | T429G686(1)010(2)(3)(4) | CWR29F(3)686(1)(2)G(5) | 6.8 | 10.0 | 0.275 | 1.0 |
| 10 | 100 | G/2711 | T429G107(1)010(2)(3)(4) | CWR29F(3)107(1)(2)G(5) | 10.0 | 10.0 | 0.275 | 1.0 |
| 10 | 100 | H/2915 | T429H107(1)010(2)(3)(4) | CWR29F(3)107(1)(2)H(5) | 10.0 | 10.0 | 0.18 | 1.0 |
| 10 | 150 | H/2915 | T429H157(1)010(2)(3)(4) | CWR29F(3)157(1)(2)H(5) | 15.0 | 10.0 | 0.18 | 1.0 |
| 10 | 150 | X/2824 | T429X157(1)010(2)(3)(4) | CWR29F(3)157(1)(2)X(5) | 15.0 | 10.0 | 0.065 | 1.0 |
| 10 | 220 | H/2915 | T429H227(1)010(2)(3)(4) | CWR29F(3)227(1)(2)H(5) | 22.0 | 10.0 | 0.18 | 1.0 |
| 15 | 0.68 | A/1005 | T429A684(1)015(2)(3)(4) | CWR29H(3)684(1)(2)A(5) | 0.1 | 6.0 | 6.0 | 1.0 |
| 15 | 1 | A/1005 | T429A105(1)015(2)(3)(4) | CWR29H(3)105(1)(2)A(5) | 0.2 | 6.0 | 7.5 | 1.0 |
| 15 | 1.5 | A/1005 | T429A155(1)015(2)(3)(4) | CWR29H(3)155(1)(2)A(5) | 0.2 | 6.0 | 7.5 | 1.0 |
| 15 | 1.5 | B/1505 | T429B155(1)015(2)(3)(4) | CWR29H(3)155(1)(2)B(5) | 0.2 | 6.0 | 3.2 | 1.0 |
| 15 | 2.2 | A/1005 | T429A225(1)015(2)(3)(4) | CWR29H(3)225(1)(2)A(5) | 0.3 | 6.0 | 7.5 | 1.0 |
| 15 | 2.2 | C/2005 | T429C225(1)015(2)(3)(4) | CWR29H(3)225(1)(2)C(5) | 0.3 | 6.0 | 2.2 | 1.0 |
| 15 | 3.3 | B/1505 | T429B335(1)015(2)(3)(4) | CWR29H(3)335(1)(2)B(5) | 0.5 | 6.0 | 3.6 | 1.0 |
| 15 | 3.3 | D/1510 | T429D335(1)015(2)(3)(4) | CWR29H(3)335(1)(2)D(5) | 0.5 | 6.0 | 1.7 | 1.0 |
| 15 | 4.7 | B/1505 | T429B475(1)015(2)(3)(4) | CWR29H(3)475(1)(2)B(5) | 0.7 | 6.0 | 2.0 | 1.0 |
| 15 | 4.7 | C/2005 | T429C475(1)015(2)(3)(4) | CWR29H(3)475(1)(2)C(5) | 0.7 | 6.0 | 2.2 | 1.0 |
| 15 | 4.7 | D/1510 | T429D475(1)015(2)(3)(4) | CWR29H(3)475(1)(2)D(5) | 0.7 | 6.0 | 2.0 | 1.0 |
| 15 | 4.7 | E/2010 | T429E475(1)015(2)(3)(4) | CWR29H(3)475(1)(2)E(5) | 0.7 | 6.0 | 1.2 | 1.0 |
| 15 | 6.8 | D/1510 | T429D685(1)015(2)(3)(4) | CWR29H(3)685(1)(2)D(5) | 1.0 | 6.0 | 2.0 | 1.0 |
| 15 | 6.8 | E/2010 | T429E685(1)015(2)(3)(4) | CWR29H(3)685(1)(2)E(5) | 1.0 | 8.0 | 0.9 | 1.0 |
| 15 | 10 | D/1510 | T429D106(1)015(2)(3)(4) | CWR29H(3)106(1)(2)D(5) | 1.5 | 6.0 | 2.0 | 1.0 |
| 15 | 10 | E/2010 | T429E106(1)015(2)(3)(4) | CWR29H(3)106(1)(2)E(5) | 1.5 | 6.0 | 1.2 | 1.0 |

| T | 429 | A | 225 | K | 004 | A | H | 4251 |
|---|---|---|---|---|---|---|---|---|
| Capacitor Class | Series | Case Size | Capacitance Code (pF) | Capacitance Tolerance | Voltage | Failure Rate/ Design | Lead Material | Surge |
| T = Tantalum | CWR 29 Established Reliability | A = 1005<br>B = 1505<br>C = 2005<br>D = 1510<br>E = 2010<br>F = 2214<br>G = 2711<br>H = 2915<br>X = 282 | First two digits represent significant figures. Third digit specifies number of zeros. | J = ±5%<br>K = ±10%<br>M = ±20% | 004 = 4V<br>006 = 6.3V<br>010 = 10V<br>015 = 15V<br>020 = 20V<br>025 = 25V<br>035 = 35V<br>050 = 50V | A = N/A<br>B = 0.1%/1000 hrs<br>C = .01%/1000 hrs<br>D=.001%/1000 hrs | C = Hot Solder Dipped<br>H = Standard Solder Coated (SnPb 5% Pb minimum)<br>B = Gold Plated<br>K = Solder Fused | 4250= 25°C after Weibull<br>4251 = -55°C and 85°C after Weibull<br>4252 = -55°C and 85°C before Weibull |



Roll Over for Order Info.

## Table 1 – Ratings & Part Number Reference con't

| Rated Voltage | Rated Cap | Case Code/ Case Size | KEMET Part Number | Mil-C-55365/4F Part Number | DC Leakage | DF | ESR | Moisture Sensitivity |
|---|---|---|---|---|---|---|---|---|
| 85°C | 120Hz | KEMET/EIA | (See below for part options) | (See below for part options) | µAmps +20°C | +20°C 120Hz | +20°C 100kHz | Temp≤260°C |
| VDC | µF | | | | max/5min | % Max | Ohms | J-STD-020D |
| 15 | 15 | F/2214 | T429F156(1)015(2)(3)(4) | CWR29H(3)156(1)(2)F(5) | 2.3 | 8.0 | 0.8 | 1.0 |
| 20 | 0.47 | A/1005 | T429A474(1)020(2)(3)(4) | CWR29J(3)474(1)(2)A(5) | 0.1 | 8.0 | 7.5 | 1.0 |
| 20 | 0.68 | A/1005 | T429A684(1)020(2)(3)(4) | CWR29J(3)684(1)(2)A(5) | 0.1 | 6.0 | 7.5 | 1.0 |
| 20 | 0.68 | B/1505 | T429B684(1)020(2)(3)(4) | CWR29J(3)684(1)(2)B(5) | 0.1 | 6.0 | 5.6 | 1.0 |
| 20 | 1 | A/1005 | T429A105(1)020(2)(3)(4) | CWR29J(3)105(1)(2)A(5) | 0.2 | 6.0 | 7.5 | 1.0 |
| 20 | 1 | B/1505 | T429B105(1)020(2)(3)(4) | CWR29J(3)105(1)(2)B(5) | 0.2 | 6.0 | 4.8 | 1.0 |
| 20 | 1.5 | B/1505 | T429B155(1)020(2)(3)(4) | CWR29J(3)155(1)(2)B(5) | 0.3 | 6.0 | 3.6 | 1.0 |
| 20 | 1.5 | C/2005 | T429C155(1)020(2)(3)(4) | CWR29J(3)155(1)(2)C(5) | 0.3 | 6.0 | 2.4 | 1.0 |
| 20 | 2.2 | B/1505 | T429B225(1)020(2)(3)(4) | CWR29J(3)225(1)(2)B(5) | 0.4 | 6.0 | 3.6 | 1.0 |
| 20 | 2.2 | D/1510 | T429D225(1)020(2)(3)(4) | CWR29J(3)225(1)(2)D(5) | 0.4 | 6.0 | 1.7 | 1.0 |
| 20 | 3.3 | D/1510 | T429D335(1)020(2)(3)(4) | CWR29J(3)335(1)(2)D(5) | 0.7 | 6.0 | 2.0 | 1.0 |
| 20 | 3.3 | E/2010 | T429E335(1)020(2)(3)(4) | CWR29J(3)335(1)(2)E(5) | 0.7 | 6.0 | 1.2 | 1.0 |
| 20 | 4.7 | E/2010 | T429E475(1)020(2)(3)(4) | CWR29J(3)475(1)(2)E(5) | 0.9 | 6.0 | 1.7 | 1.0 |
| 20 | 6.8 | E/2010 | T429E685(1)020(2)(3)(4) | CWR29J(3)685(1)(2)E(5) | 1.4 | 6.0 | 1.5 | 1.0 |
| 20 | 6.8 | F/2214 | T429F685(1)020(2)(3)(4) | CWR29J(3)685(1)(2)F(5) | 1.4 | 6.0 | 0.7 | 1.0 |
| 20 | 10 | E/2010 | T429E106(1)020(2)(3)(4) | CWR29J(3)106(1)(2)E(5) | 2.0 | 6.0 | 1.5 | 1.0 |
| 20 | 10 | F/2214 | T429F106(1)020(2)(3)(4) | CWR29J(3)106(1)(2)F(5) | 2.0 | 6.0 | 0.8 | 1.0 |
| 20 | 15 | F/2214 | T429F156(1)020(2)(3)(4) | CWR29J(3)156(1)(2)F(5) | 3.0 | 6.0 | 0.8 | 1.0 |
| 20 | 15 | G/2711 | T429G156(1)020(2)(3)(4) | CWR29J(3)156(1)(2)G(5) | 3.0 | 6.0 | 0.275 | 1.0 |
| 20 | 22 | G/2711 | T429G226(1)020(2)(3)(4) | CWR29J(3)226(1)(2)G(5) | 4.4 | 6.0 | 0.625 | 1.0 |
| 20 | 22 | H/2915 | T429H226(1)020(2)(3)(4) | CWR29J(3)226(1)(2)H(5) | 4.4 | 6.0 | 0.18 | 1.0 |
| 20 | 33 | H/2915 | T429H336(1)020(2)(3)(4) | CWR29J(3)336(1)(2)H(5) | 6.6 | 8.0 | 0.18 | 1.0 |
| 20 | 47 | H/2915 | T429H476(1)020(2)(3)(4) | CWR29J(3)476(1)(2)H(5) | 9.4 | 8.0 | 0.18 | 1.0 |
| 20 | 47 | X/2824 | T429X476(1)020(2)(3)(4) | CWR29J(3)476(1)(2)X(5) | 9.4 | 8.0 | 0.11 | 1.0 |
| 25 | 0.33 | A/1005 | T429A334(1)025(2)(3)(4) | CWR29K(3)334(1)(2)A(5) | 0.1 | 6.0 | 7.5 | 1.0 |
| 25 | 0.47 | A/1005 | T429A474(1)025(2)(3)(4) | CWR29K(3)474(1)(2)A(5) | 0.1 | 6.0 | 7.5 | 1.0 |
| 25 | 0.68 | B/1505 | T429B684(1)025(2)(3)(4) | CWR29K(3)684(1)(2)B(5) | 0.2 | 6.0 | 4.0 | 1.0 |
| 25 | 1 | B/1505 | T429B105(1)025(2)(3)(4) | CWR29K(3)105(1)(2)B(5) | 0.3 | 6.0 | 4.0 | 1.0 |
| 25 | 1 | C/2005 | T429C105(1)025(2)(3)(4) | CWR29K(3)105(1)(2)C(5) | 0.3 | 6.0 | 2.6 | 1.0 |
| 25 | 1.5 | D/1510 | T429D155(1)025(2)(3)(4) | CWR29K(3)155(1)(2)D(5) | 0.4 | 6.0 | 1.7 | 1.0 |
| 25 | 2.2 | D/1510 | T429D225(1)025(2)(3)(4) | CWR29K(3)225(1)(2)D(5) | 0.6 | 6.0 | 2.0 | 1.0 |
| 25 | 2.2 | E/2010 | T429E225(1)025(2)(3)(4) | CWR29K(3)225(1)(2)E(5) | 0.6 | 6.0 | 1.0 | 1.0 |
| 25 | 3.3 | E/2010 | T429E335(1)025(2)(3)(4) | CWR29K(3)335(1)(2)E(5) | 0.8 | 6.0 | 1.2 | 1.0 |
| 25 | 4.7 | F/2214 | T429F475(1)025(2)(3)(4) | CWR29K(3)475(1)(2)F(5) | 1.2 | 6.0 | 0.7 | 1.0 |
| 25 | 6.8 | F/2214 | T429F685(1)025(2)(3)(4) | CWR29K(3)685(1)(2)F(5) | 1.7 | 6.0 | 0.8 | 1.0 |
| 25 | 6.8 | G/2711 | T429G685(1)025(2)(3)(4) | CWR29K(3)685(1)(2)G(5) | 1.7 | 6.0 | 0.3 | 1.0 |
| 25 | 10 | G/2711 | T429G106(1)025(2)(3)(4) | CWR29K(3)106(1)(2)G(5) | 2.5 | 6.0 | 0.35 | 1.0 |
| 25 | 15 | G/2711 | T429G156(1)025(2)(3)(4) | CWR29K(3)156(1)(2)G(5) | 3.8 | 6.0 | 0.35 | 1.0 |
| 25 | 15 | H/2915 | T429H156(1)025(2)(3)(4) | CWR29K(3)156(1)(2)H(5) | 3.8 | 6.0 | 0.2 | 1.0 |
| 25 | 22 | G/2711 | T429G226(1)025(2)(3)(4) | CWR29K(3)226(1)(2)G(5) | 5.5 | 6.0 | 0.35 | 1.0 |
| 25 | 22 | H/2915 | T429H226(1)025(2)(3)(4) | CWR29K(3)226(1)(2)H(5) | 5.5 | 6.0 | 0.18 | 1.0 |
| 25 | 22 | X/2824 | T429X226(1)025(2)(3)(4) | CWR29K(3)226(1)(2)X(5) | 5.5 | 6.0 | 0.16 | 1.0 |
| 25 | 33 | H/2915 | T429H336(1)025(2)(3)(4) | CWR29K(3)336(1)(2)H(5) | 8.3 | 8.0 | 0.18 | 1.0 |
| 25 | 33 | X/2824 | T429X336(1)025(2)(3)(4) | CWR29K(3)336(1)(2)X(5) | 8.3 | 8.0 | 0.13 | 1.0 |
| 35 | 0.22 | A/1005 | T429A224(1)035(2)(3)(4) | CWR29M(3)224(1)(2)A(5) | 0.1 | 6.0 | 12.0 | 1.0 |

| T | 429 | A | 225 | K | 004 | A | H | 4251 |
|---|---|---|---|---|---|---|---|---|
| Capacitor Class | Series | Case Size | Capacitance Code (pF) | Capacitance Tolerance | Voltage | Failure Rate/ Design | Lead Material | Surge |
| T = Tantalum | CWR 29 Established Reliability | A = 1005<br>B = 1505<br>C = 2005<br>D = 1510<br>E = 2010<br>F = 2214<br>G = 2711<br>H = 2915<br>X = 282 | First two digits represent significant figures. Third digit specifies number of zeros. | J = ±5%<br>K = ±10%<br>M = ±20% | 004 = 4V<br>006 = 6.3V<br>010 = 10V<br>015 = 15V<br>020 = 20V<br>025 = 25V<br>035 = 35V<br>050 = 50V | A = N/A<br>B = 0.1%/1000 hrs<br>C = .01%/1000 hrs<br>D=.001%/1000 hrs | C = Hot Solder Dipped<br>H = Standard Solder Coated (SnPb 5% Pb minimum)<br>B = Gold Plated<br>K = Solder Fused | 4250= 25°C after Weibull<br>4251 = -55°C and 85°C after Weibull<br>4252 = -55°C and 85°C before Weibull |

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*with the higher voltage rating. Substitutions can include better than series.*



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## Table 1 – Ratings & Part Number Reference con't

| Rated Voltage | Rated Cap | Case Code/ Case Size | KEMET Part Number | Mil-C-55365/4F Part Number | DC Leakage | DF | ESR | Moisture Sensitivity |
|---|---|---|---|---|---|---|---|---|
| 85°C | 120Hz | KEMET/EIA | (See below for part options) | (See below for part options) | µAmps +20°C | +20°C 120Hz | +20°C 100kHz | Temp≤260°C |
| VDC | µF | | | | max/5min | % Max | Ohms | J-STD-020D |
| 35 | 0.68 | C/2005 | T429C684(1)035(2)(3)(4) | CWR29M(3)684(1)(2)C(5) | 0.2 | 6.0 | 4.0 | 1.0 |
| 35 | 1 | D/1510 | T429D105(1)035(2)(3)(4) | CWR29M(3)105(1)(2)D(5) | 0.4 | 6.0 | 2.2 | 1.0 |
| 35 | 1.5 | E/2010 | T429E155(1)035(2)(3)(4) | CWR29M(3)155(1)(2)E(5) | 0.5 | 6.0 | 1.3 | 1.0 |
| 35 | 3.3 | F/2214 | T429F335(1)035(2)(3)(4) | CWR29M(3)335(1)(2)F(5) | 1.2 | 6.0 | 0.7 | 1.0 |
| 35 | 4.7 | G/2711 | T429G475(1)035(2)(3)(4) | CWR29M(3)475(1)(2)G(5) | 1.6 | 6.0 | 0.375 | 1.0 |
| 35 | 6.8 | F/2214 | T429F685(1)035(2)(3)(4) | CWR29M(3)685(1)(2)F(5) | 2.4 | 6.0 | 0.375 | 1.0 |
| 35 | 6.8 | H/2915 | T429H685(1)035(2)(3)(4) | CWR29M(3)685(1)(2)H(5) | 2.4 | 6.0 | 0.5 | 1.0 |
| 35 | 10 | H/2915 | T429H106(1)035(2)(3)(4) | CWR29M(3)106(1)(2)H(5) | 3.5 | 8.0 | 0.5 | 1.0 |
| 35 | 15 | X/2824 | T429X156(1)035(2)(3)(4) | CWR29M(3)156(1)(2)X(5) | 5.3 | 6.0 | 0.19 | 1.0 |
| 50 | 0.1 | A/1005 | T429A104(1)050(2)(3)(4) | CWR29N(3)104(1)(2)A(5) | 0.1 | 6.0 | 12.0 | 1.0 |
| 50 | 0.15 | A/1005 | T429A154(1)050(2)(3)(4) | CWR29N(3)154(1)(2)A(5) | 0.1 | 6.0 | 12.0 | 1.0 |
| 50 | 0.22 | B/1505 | T429B224(1)050(2)(3)(4) | CWR29N(3)224(1)(2)B(5) | 0.1 | 6.0 | 6.8 | 1.0 |
| 50 | 0.33 | B/1505 | T429B334(1)050(2)(3)(4) | CWR29N(3)334(1)(2)B(5) | 0.2 | 6.0 | 4.8 | 1.0 |
| 50 | 0.47 | C/2005 | T429C474(1)050(2)(3)(4) | CWR29N(3)474(1)(2)C(5) | 0.2 | 6.0 | 3.2 | 1.0 |
| 50 | 0.68 | D/1510 | T429D684(1)050(2)(3)(4) | CWR29N(3)684(1)(2)D(5) | 0.3 | 6.0 | 2.3 | 1.0 |
| 50 | 1 | E/2010 | T429E105(1)050(2)(3)(4) | CWR29N(3)105(1)(2)E(5) | 0.5 | 6.0 | 1.7 | 1.0 |
| 50 | 1.5 | F/2214 | T429F155(1)050(2)(3)(4) | CWR29N(3)155(1)(2)F(5) | 0.8 | 6.0 | 1.1 | 1.0 |
| 50 | 2.2 | F/2214 | T429F225(1)050(2)(3)(4) | CWR29N(3)225(1)(2)F(5) | 1.1 | 6.0 | 0.7 | 1.0 |
| 50 | 3.3 | G/2711 | T429G335(1)050(2)(3)(4) | CWR29N(3)335(1)(2)G(5) | 1.7 | 6.0 | 0.5 | 1.0 |
| 50 | 4.7 | H/2915 | T429H475(1)050(2)(3)(4) | CWR29N(3)475(1)(2)H(5) | 2.4 | 6.0 | 0.5 | 1.0 |
| VDC | µF | KEMET/EIA | (See below for part options) | (See below for part options) | max/5min | % Max | Ohms | J-STD-020D |
| 85°C | 120Hz | | | | µAmps +20°C | +20°C 120Hz | +20°C 100kHz | Temp≤260°C |
| Rated Voltage | Rated Cap | Case Code/ Case Size | KEMET Part Number | Mil-C-55365/4F Part Number | DC Leakage | DF | ESR | Moisture Sensitivity |

| T | 429 | A | 225 | K | 004 | A | H | 4251 |
|---|---|---|---|---|---|---|---|---|
| Capacitor Class | Series | Case Size | Capacitance Code (pF) | Capacitance Tolerance | Voltage | Failure Rate/ Design | Lead Material | Surge |
| T = Tantalum | CWR 29 Established Reliability | A = 1005<br>B = 1505<br>C = 2005<br>D = 1510<br>E = 2010<br>F = 2214<br>G = 2711<br>H = 2915<br>X = 282 | First two digits represent significant figures. Third digit specifies number of zeros. | J = ±5%<br>K = ±10%<br>M = ±20% | 004 = 4V<br>006 = 6.3V<br>010 = 10V<br>015 = 15V<br>020 = 20V<br>025 = 25V<br>035 = 35V<br>050 = 50V | A = N/A<br>B = 0.1%/1000 hrs<br>C = .01%/1000 hrs<br>D=.001%/1000 hrs | C = Hot Solder Dipped<br>H = Standard Solder Coated (SnPb 5% Pb minimum)<br>B = Gold Plated<br>K = Solder Fused | 4250= 25°C after Weibull<br>4251 = -55°C and 85°C after Weibull<br>4252 = -55°C and 85°C before Weibull |

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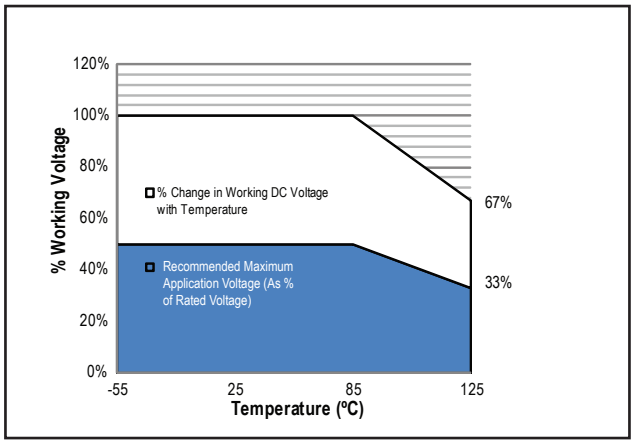
Roll Over for Order Info.

## Recommended Voltage Derating Guidelines




## Ripple Current/Ripple Voltage

| Case Code | | Maximum Power Dissipation (Pmax) mWatts @ 25°C w/+20°C Rise |
|---|---|---|
| KEMET | EIA | |
| A | 1005 | 50 |
| B | 1505 | 70 |
| C | 2005 | 75 |
| D | 1510 | 80 |
| E | 2010 | 90 |
| F | 2214 | 100 |
| G | 2711 | 125 |
| H | 2915 | 150 |

| Temperature Compenstion Multipliers for Maximum Power Dissipation | | |
|---|---|---|
| ≤25°C | 85°C | 125°C |
| 1.00 | 0.90 | 0.40 |

*T= Environmental Temperature*

Using the P max of the device, the maximum allowable rms ripple current or voltage may be determined.

$I(max) = \sqrt{P\ max/R}$
$E(max) = \sqrt{P\ max * R}$

*I = rms ripple current (amperes)*
*E = rms ripple voltage (volts)*
*Pmax = maximum power dissipation(watts)*
*R = ESR at specified frequency (ohms)*

## Reverse Voltage

Solid tantalum capacitors are polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe plus in some cases a beveled edge. A small degree of transient reverse voltage is permissible for short periods per the table. The capacitors should not be operated continuously in reverse mode, even within these limits.

| Temperature | Permissible Transient Reverse Voltage |
|---|---|
| 25° C | 15% of Rated Voltage |
| 85° C | 5% of Rated Voltage |
| 125° C | 1% of Rated Voltage |

## Table 2 – Land Dimensions/Courtyard

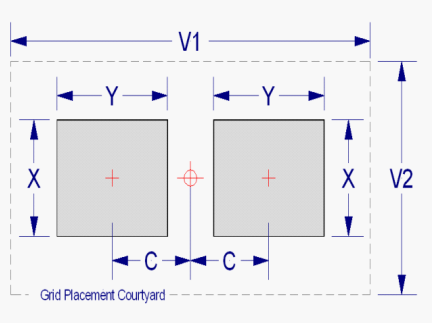
| KEMET | Metric Size Code | Density Level A: Maximum (Most) Land Protrusion (mm) | | | | | Density Level B: Median (Nominal) Land Protrusion (mm) | | | | | Density Level C: Minimum (Least) Land Protrusion (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Case | EIA | X | Y | C | V1 | V2 | X | Y | C | V1 | V2 | X | Y | C | V1 | V2 |
| A[1] | 1005 | 1.45 | 2.15 | 1.20 | 5.60 | 2.70 | 1.35 | 1.85 | 1.05 | 4.50 | 2.20 | 1.25 | 1.55 | 0.90 | 3.60 | 1.90 |
| B | 1505 | 1.45 | 2.30 | 1.75 | 6.80 | 2.70 | 1.35 | 1.90 | 1.65 | 5.70 | 2.20 | 1.25 | 1.55 | 1.55 | 4.90 | 1.92 |
| C | 2005 | 1.45 | 2.30 | 2.40 | 8.10 | 2.70 | 1.35 | 1.90 | 2.30 | 7.00 | 2.20 | 1.25 | 1.55 | 2.15 | 6.10 | 1.90 |
| D | 1510 | 2.60 | 2.30 | 1.75 | 6.80 | 4.00 | 2.45 | 1.90 | 1.65 | 5.70 | 3.50 | 2.35 | 1.55 | 1.55 | 4.90 | 3.20 |
| E | 2010 | 2.60 | 2.30 | 2.40 | 8.10 | 4.00 | 2.45 | 1.90 | 2.30 | 7.00 | 3.50 | 2.35 | 1.55 | 2.15 | 6.10 | 3.20 |
| F | 2214 | 3.50 | 2.30 | 2.65 | 8.60 | 4.90 | 3.35 | 1.90 | 2.55 | 7.50 | 4.40 | 3.25 | 1.55 | 2.45 | 6.70 | 4.10 |
| G | 2711 | 2.85 | 2.80 | 2.95 | 9.70 | 4.20 | 2.75 | 2.40 | 2.85 | 8.60 | 3.70 | 2.65 | 2.05 | 2.75 | 7.80 | 3.40 |
| H | 2915 | 3.85 | 2.80 | 3.20 | 10.20 | 5.20 | 3.75 | 2.40 | 3.10 | 9.10 | 4.70 | 3.65 | 2.05 | 3.00 | 8.30 | 4.40 |
| X | 2824 | 3.25 | 2.75 | 3.10 | 10.00 | 6.80 | 3.10 | 2.35 | 3.00 | 8.90 | 6.30 | 3.00 | 1.95 | 2.90 | 8.00 | 6.00 |

***Density Level A:*** *For low-density Product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes.*

***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 desity 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).*

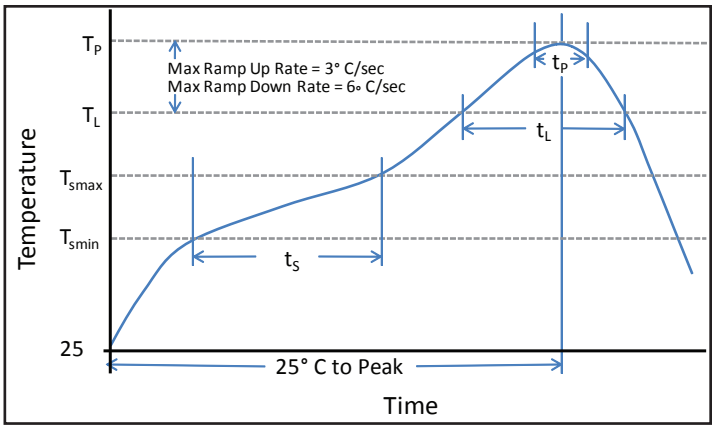
[1] *Land pattern geometry is too small for silkscreen outline.*



## Soldering Process

KEMET's families of surface mount tantalum capacitors 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-020D standard for moisture sensitivity testing. The devices can safely withstand a maximum of three reflow passes at these conditions.

Note that although the X/7343-43 case size can withstand wave soldering, the tall profile (4.3mm maximum) dictates care in wave process development.




Time/Temperature Soldering Profile

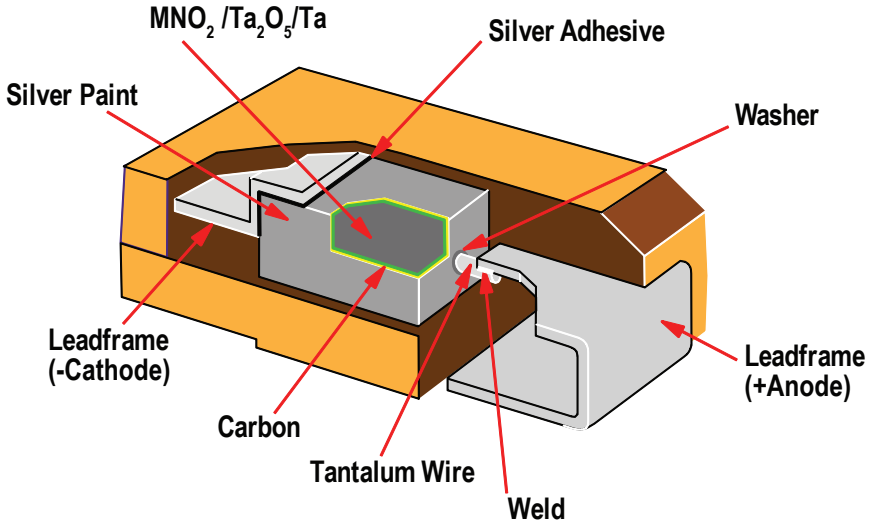
| Profile Feature | Sn-Pb Assembly | Pb-Free Assembly |
|---|---|---|
| Preheat/Soak | | |
| Temperature Min ($T_{Smin}$) | 100°C | 150°C |
| Temperature Max ($T_{Smax}$) | 150°C | 200°C |
| Time ($t_s$) from $T_{smin}$ to $T_{smax}$) | 60-120 sec | 60-120 sec |
| Ramp-up rate ($T_L$ to $T_P$) | 3°C/sec max | 3°C/sec max |
| Liquidous temperature ($T_L$) | 183°C | 217°C |
| Time above liquidous ($t_L$) | 60-150 sec | 60-150 sec |
| Peak Temperature ($T_P$) | 220°C*<br>235°C** | 250°C*<br>260°C** |
| Time within 5°C of max peak temperature ($t_P$) | 20 sec max | 30 sec max |
| Ramp-down rate ($T_P$ to $T_L$) | 6°C/sec max | 6°C/sec max |
| Time 25°C to peak temperature | 6 minutes max | 8 minutes max |

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

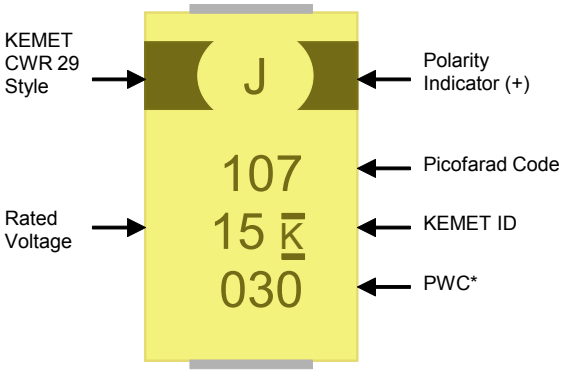
** Case Size D, E, P, Y and X*

***Case Size A, B, C, H, I, K, M, R, S, T, U, V, W and Z*

## Construction



## Capacitor Marking



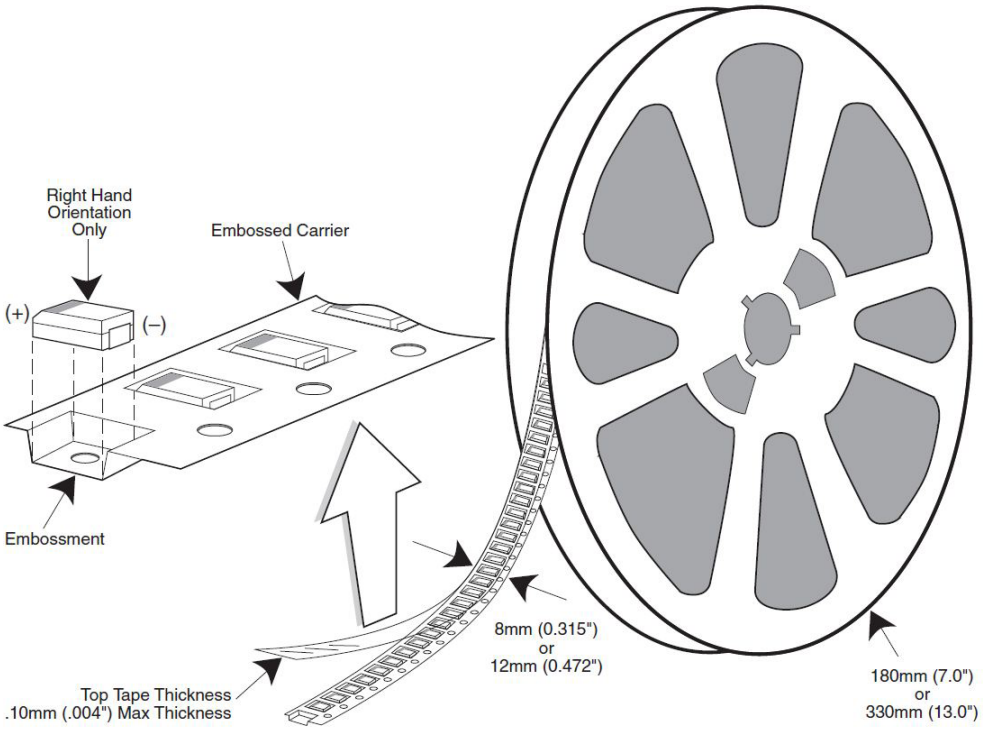

* 030 = 30th week of 2010

## Storage

Tantalum 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 60% relative humidity. In addition, temperature fluctuations should be minimized to avoid condensation on the parts, and atmospheres should be free of chlorine and sulphur bearing compounds. For optimized solderability, chip stock should be used promptly, preferably within three years of receipt.

## Tape & Reel Packaging Information

KEMET's Molded Tantalum and Aluminum Chip Capacitor families are packaged in 8 mm and 12 mm plastic tape on 7" and 13" reels, in accordance with EIA Standard 481-1: Taping of Surface Mount Components for Automatic Handling. This packaging system is compatible with all tape fed automatic pick and place systems.

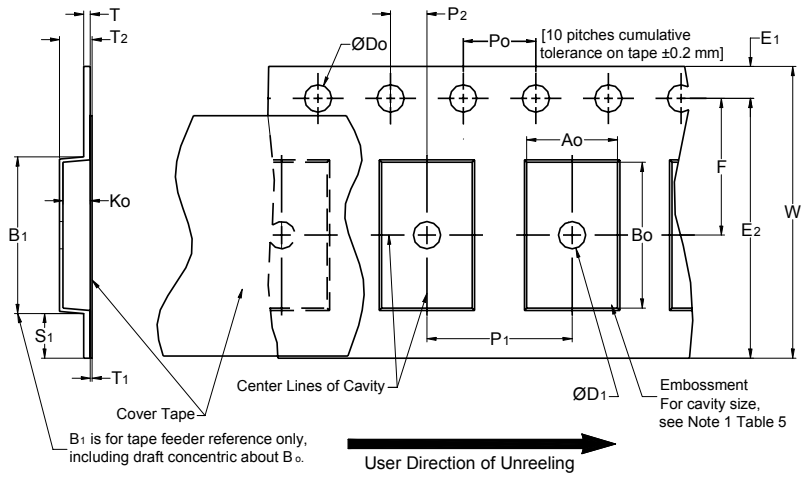



## Table 4 – Packaging Quantity

| Case Code | | Tape Width-mm | 7" Reel* | 13" Reel* |
|---|---|---|---|---|
| KEMET | EIA | | | |
| R | 2012-12 | 8 | 2,500 | 10,000 |
| I | 3216-10 | 8 | 3,000 | 12,000 |
| S | 3216-12 | 8 | 2,500 | 10,000 |
| T | 3528-12 | 8 | 2,500 | 10,000 |
| M | 3528-15 | 8 | 2,000 | 8,000 |
| U | 6032-15 | 12 | 1,000 | 5,000 |
| L | 6032-19 | 12 | 1,000 | 5,000 |
| W | 7343-15 | 12 | 1,000 | 3,000 |
| Z | 7343-17 | 12 | 1,000 | 3,000 |
| V | 7343-20 | 12 | 1,000 | 3,000 |
| A | 3216-18 | 8 | 2,000 | 9,000 |
| B | 3528-21 | 8 | 2,000 | 8,000 |
| C | 6032-28 | 12 | 500 | 3,000 |
| D | 7343-31 | 12 | 500 | 2,500 |
| Y | 7343-40 | 12 | 500 | 2,000 |
| X | 7343-43 | 12 | 500 | 2,000 |
| E | 7260-38 | 12 | 500 | 2,000 |

** No c-spec required for 7" reel packaging. C-7280 required for 13" reel packaging.*

## Figure 1 – Embossed (Plastic) Carrier Tape Dimensions




## Table 5 – 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) | |

*1. 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.*

*2. The tape with or without components shall pass around R without damage (see Figure 5).*

*3. 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)).*

*4. B1 dimension is a reference dimension for tape feeder clearance only.*

*5. The cavity defined by $A_0$, $B_0$ and $K_0$ shall surround the component with sufficient clearance that:*

*(a) the component does not protrude above the top surface of the carrier tape.*

*(b) the component can be removed from the cavity in a vertical direction without mechanical restriction, after the top cover tape has been removed.*

*(c) rotation of the component is limited to 20° maximum for 8 and 12mm tapes and 10° maximum for 16mm tapes (see Figure 3).*

*(d) 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).*

*(e) for KPS Series product $A_0$ and $B_0$ are measured on a plane 0.3mm above the bottom of the pocket.*

*(f) see Addendum in EIA Document 481 for standards relating to more precise taping requirements.*

## Packaging Information Performance Notes

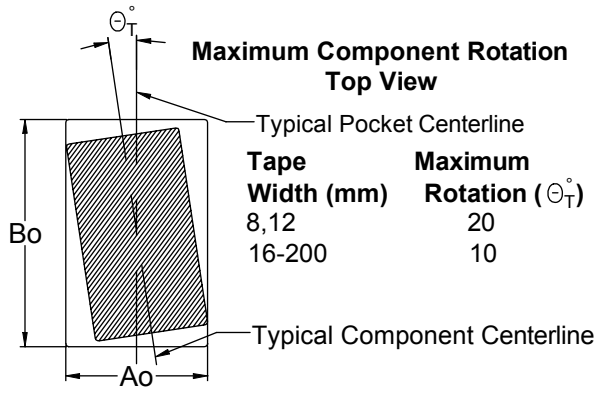
1. **Cover Tape Break Force:** *1.0 Kg Minimum.*
2. **Cover Tape Peel Strength:** *The total peel strength of the cover tape from the carrier tape shall be:*

| 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) |

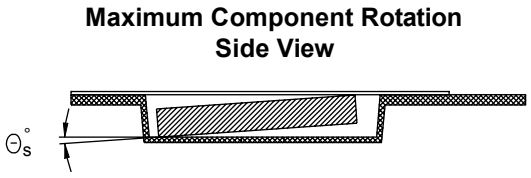
*The direction of the pull shall be opposite the direction of the carrier tape travel. The pull angle of the carrier tape shall be 165° to 180° from the plane of the carrier tape. During peeling, the carrier and/or cover tape shall be pulled at a velocity of 300±10 mm/minute.*

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

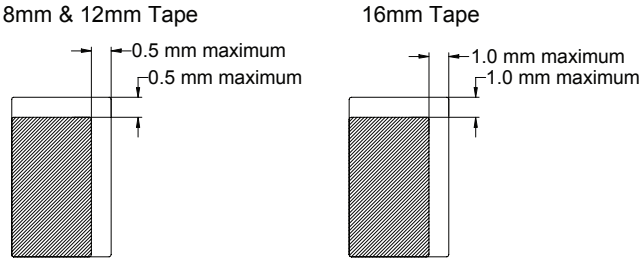



| Tape Width (mm) | Maximum Rotation ($\Theta^{\circ}_{T}$) |
|---|---|
| 8,12 | 20 |
| 16-200 | 10 |

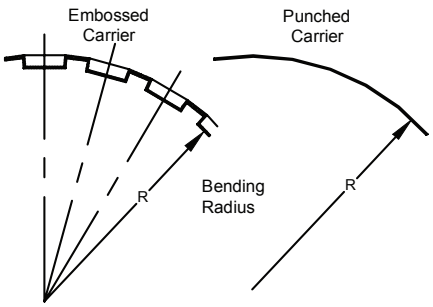



| Tape Width (mm) | Maximum Rotation ($\Theta^{\circ}_{S}$) |
|---|---|
| 8,12 | 20 |
| 16-56 | 10 |
| 72-200 | 5 |

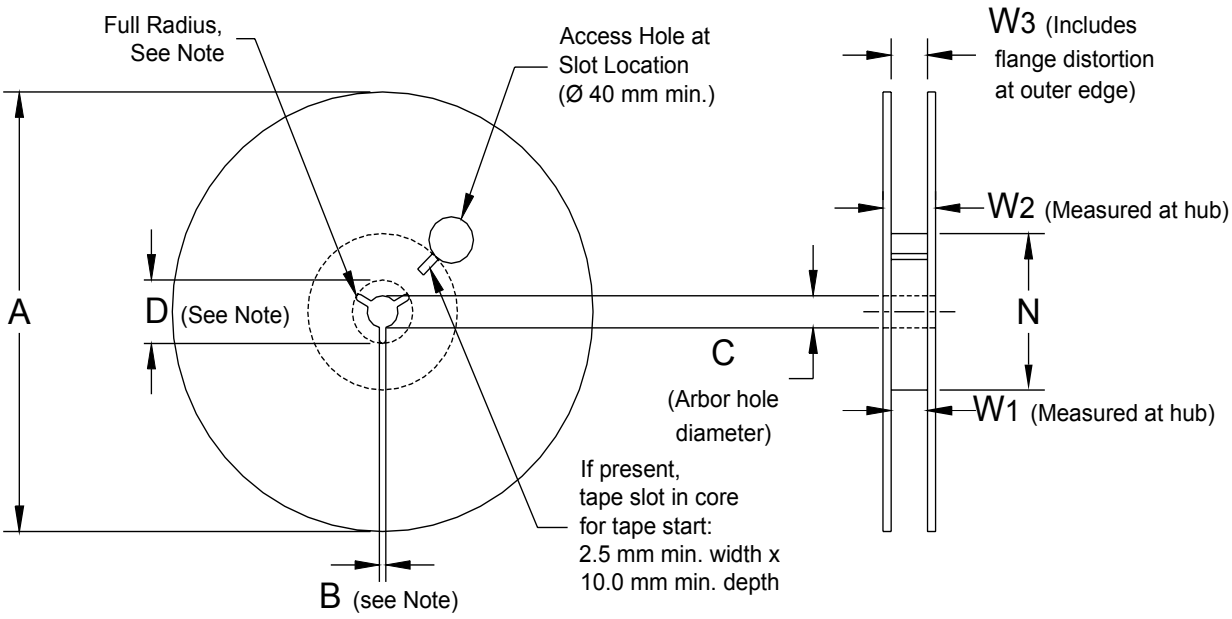
## Figure 4 – Maximum Lateral Movement




## Figure 5 – Bending Radius



## Figure 6 – Reel Dimensions




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

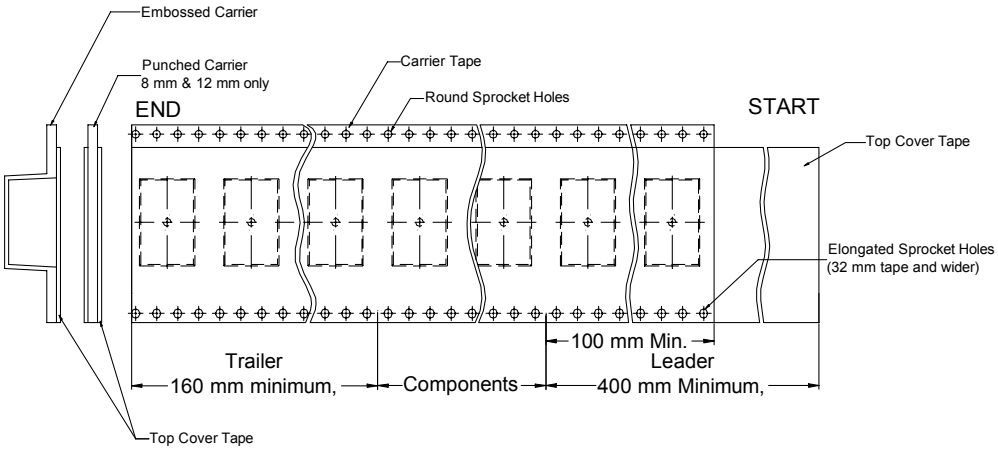
## Table 7 – Reel Dimensions

Metric will govern

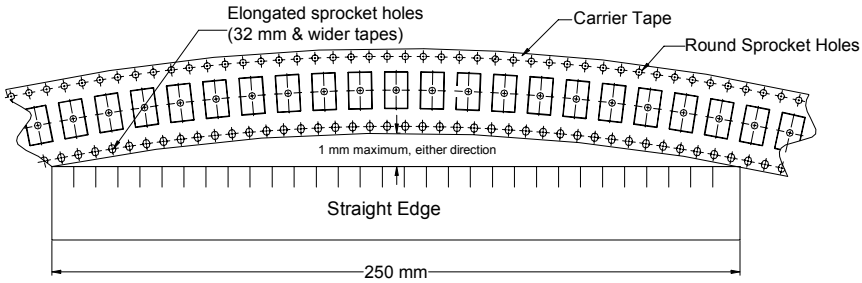
| Constant Dimensions — Millimeters (Inches) | | | | |
|---|---|---|---|---|
| Tape Size | A | B Min | C | D Min |
| 8mm | 178 ± 0.20 (7.008 ± 0.008) or 330 ± 0.20 (13.000 ± 0.008) | 1.5 (0.059) | 13.0 +0.5/-0.2 (0.521 +0.02/-0.008) | 20.2 (0.795) |
| 12mm | | | | |
| 16mm | | | | |

| 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



## 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 | |
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| Resource | Location |
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