

## Ceramic Disc DC Capacitors, Class 1, Class 2, Low Loss (0.2 %), 500 V<sub>DC</sub>, 1 kV<sub>DC</sub>, 2 kV<sub>DC</sub>, and 3 kV<sub>DC</sub>


**FEATURES**

- High reliability
- Low losses
- High capacitance in small size
- Kinked leads
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

**APPLICATIONS**

In electronic circuits where low losses and high capacitance per volume are essential, for example:

- SMPS
- HF ballast
- Snubber and high voltage circuits

| QUICK REFERENCE DATA       |        |      |      |      |      |      |      |
|----------------------------|--------|------|------|------|------|------|------|
| DESCRIPTION                | VALUE  |      |      |      |      |      |      |
| Ceramic Class              | 1      |      |      | 2    |      |      |      |
| Ceramic Dielectric         | S3N    |      |      | Y5R  |      |      |      |
| Voltage (V <sub>DC</sub> ) | 1000   | 2000 | 3000 | 500  | 1000 | 2000 | 3000 |
| Min. Capacitance (pF)      | 100    | 100  | 100  | 100  | 100  | 100  | 100  |
| Max. Capacitance (pF)      | 2200   | 4700 | 2700 | 2700 | 4700 | 4700 | 2700 |
| Mounting                   | Radial |      |      |      |      |      |      |

**MARKING**

Marking indicates capacitance value and tolerance in accordance with “EIA 198” and voltage marks.

**OPERATING TEMPERATURE RANGE**

-30 °C to +125 °C

**TEMPERATURE CHARACTERISTICS**

Class 1: S3N  
Class 2: Y5R

**SECTIONAL SPECIFICATION**

IEC 60384-9, EIA 198

**EXAMPLES OF MARKING CODE**

|  |  |
|--|--|
| Disc size (D <sub>max.</sub> ) ≤ 6.5 mm: | Disc size (D <sub>max.</sub> ) ≥ 7.5 mm: |
| RR = low loss with T.C. Y5R              | BC                                       |
| 101K                                     | RR                                       |
| 2 kV                                     | 102K                                     |
|  | 3 kV                                     |

**Note**

- Remark: no TC marking for S3N

**AGING**

Typical 0.5 % per time decade

**Note**

- The capacitors meet the essential requirements of “IEC 60384-9 and EIA 198”. Unless stated otherwise all electrical values apply at an ambient temperature of 25 °C ± 3 °C, at normal atmospheric conditions

**DESIGN**

The capacitors consist of a ceramic disc both sides of which are silver-plated. Connection leads are made of tinned copper having a diameter of 0.6 mm or 0.8 mm.

The capacitors are supplied with kinked leads and lead spacings of 5 mm or 7.5 mm and 10 mm. Encapsulation is made of epoxy-resin, flammable resistant in accordance with “UL 94 V-0”

**CAPACITANCE RANGE**

100 pF to 4700 pF

**RATED DC VOLTAGE**

500 V; 1 kV; 2 kV; 3 kV

**DIELECTRIC STRENGTH**

200 % of rated voltage

**INSULATION RESISTANCE AT 500 V<sub>DC</sub>**

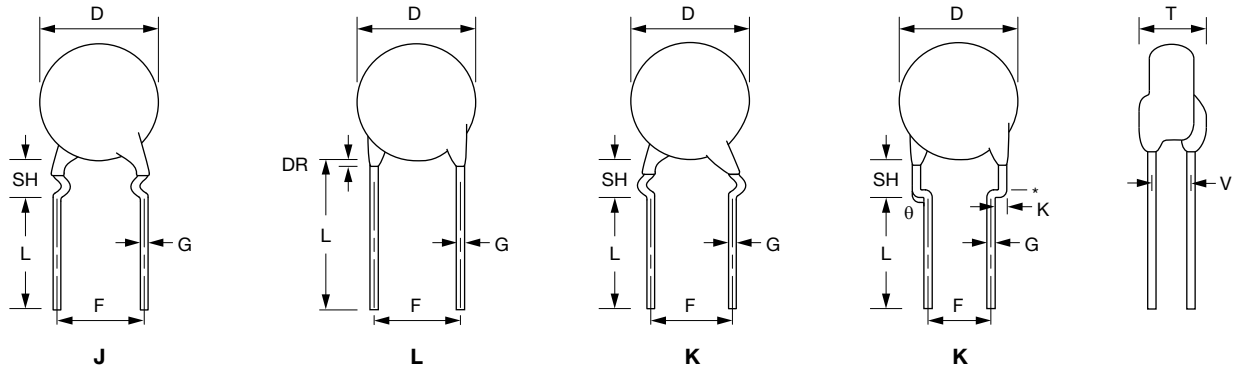
≥ 10 000 MΩ min.

**TOLERANCE ON CAPACITANCE**

± 10 %; ± 20 %

**DISSIPATION FACTOR**

0.2 % max.

**LEAD CONFIGURATION** (in millimeters)

**Notes**

- Lead-spacing 2.5 mm is available for L lead configuration only
- DR = 3.0 mm max., SH = 4.8 mm max.
- V: 1 kV = 1.2 mm ± 0.5 mm; 2 kV = 2.6 mm ± 0.8 mm; 3 kV = 3.5 mm ± 1.0 mm

**ORDERING CODES**

| <b>DIELECTRIC S3N (1000 V<sub>DC</sub> / 2000 V<sub>DC</sub>)</b> |                      |                       |                        |                      |                       |                        |
|---|----------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|
| CAP.<br>(pF)  | 1000 V <sub>DC</sub> |                       |                        | 2000 V <sub>DC</sub> |                       |                        |
|   | ORDERING CODE        | DIAMETER<br>(mm max.) | THICKNESS<br>(mm max.) | ORDERING CODE        | DIAMETER<br>(mm max.) | THICKNESS<br>(mm max.) |
| 100   | F101K25S3NN6###R     | 6.5                   | 4.0                    | F101K25S3NP6###R     | 6.5                   | 4.5                    |
| 120   | F121K25S3NN6###R     | 6.5                   | 4.0                    | F121K25S3NP6###R     | 6.5                   | 4.5                    |
| 150   | F151K25S3NN6###R     | 6.5                   | 4.0                    | F151K25S3NP6###R     | 6.5                   | 4.5                    |
| 180   | F181K25S3NN6###R     | 6.5                   | 4.0                    | F181K25S3NP6###R     | 6.5                   | 4.5                    |
| 220   | F221K25S3NN6###R     | 6.5                   | 4.0                    | F221K25S3NP6###R     | 6.5                   | 4.5                    |
| 270   | F271K25S3NN6###R     | 6.5                   | 4.0                    | F271K25S3NP6###R     | 6.5                   | 4.5                    |
| 330   | F331K25S3NN6###R     | 6.5                   | 4.0                    | F331K29S3NP6###R     | 7.5                   | 4.5                    |
| 390   | F391K25S3NN6###R     | 6.5                   | 4.0                    | F391K29S3NP6###R     | 7.5                   | 4.5                    |
| 470   | F471K25S3NN6###R     | 6.5                   | 4.0                    | F471K33S3NP6###R     | 8.5                   | 4.5                    |
| 560   | F561K29S3NN6###R     | 7.5                   | 4.0                    | F561K39S3NP6###R     | 10.0                  | 4.5                    |
| 680   | F681K29S3NN6###R     | 7.5                   | 4.0                    | F681K39S3NP6###R     | 10.0                  | 4.5                    |
| 820   | F821K33S3NN6###R     | 8.5                   | 4.0                    | F821K39S3NP6###R     | 10.0                  | 4.5                    |
| 1000  | F102K33S3NN6###R     | 8.5                   | 4.0                    | F102K43S3NP6###R     | 11.0                  | 4.5                    |
| 1200  | F122K39S3NN6###R     | 10.0                  | 4.0                    | F122K47S3NP63K7R     | 12.0                  | 4.5                    |
| 1500  | F152K39S3NN6###R     | 10.0                  | 4.0                    | F152K53S3NP63K7R     | 13.5                  | 4.5                    |
| 1800  | F182K43S3NN6###R     | 11.0                  | 4.0                    | F182K53S3NP63K7R     | 13.5                  | 4.5                    |
| 2200  | F222K47S3NN6###R     | 12.0                  | 4.0                    | F222K63S3NP63K7R     | 16.0                  | 4.5                    |
| 2700  | /                    | /                     | /                      | F272K63S3NP63K7R     | 16.0                  | 4.5                    |
| 3300  | /                    | /                     | /                      | F332K69S3NP63K7R     | 17.5                  | 4.5                    |
| 3900  | /                    | /                     | /                      | F392K75S3NP83K0R     | 19.0                  | 4.5                    |
| 4700  | /                    | /                     | /                      | F472K84S3NP83K0R     | 21.5                  | 4.5                    |

**Notes**

- Lead diameter is 0.6 mm
- # 5<sup>th</sup> digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M
- # 13<sup>th</sup> digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14<sup>th</sup> digit is lead style code: L; J; K (J is valid for 500 V and 1 kV only)
- # 15<sup>th</sup> digit is lead spacing code: 5.0 mm = 5; 6.4 mm = 6; 7.5 mm = 7; 10.0 mm = 0



| DIELECTRIC S3N (3000 V <sub>DC</sub> ) |                  |                       |                        |
|--|------------------|-----------------------|------------------------|
| CAP.<br>(pF)                           | ORDERING CODE    | 3000 V <sub>DC</sub>  |                        |
|  |                  | DIAMETER<br>(mm max.) | THICKNESS<br>(mm max.) |
| 100                                    | F101K25S3NR6###R | 6.5                   | 5.5                    |
| 120                                    | F121K25S3NR6###R | 6.5                   | 5.5                    |
| 150                                    | F151K29S3NR6###R | 7.5                   | 5.5                    |
| 180                                    | F181K29S3NR6###R | 7.5                   | 5.5                    |
| 220                                    | F221K29S3NR6###R | 7.5                   | 5.5                    |
| 270                                    | F271K29S3NR6###R | 7.5                   | 5.5                    |
| 330                                    | F331K33S3NR6###R | 8.5                   | 5.5                    |
| 390                                    | F391K39S3NR6###R | 10.0                  | 5.5                    |
| 470                                    | F471K39S3NR6###R | 10.0                  | 5.5                    |
| 560                                    | F561K39S3NR6###R | 10.0                  | 5.5                    |
| 680                                    | F681K43S3NR6###R | 11.0                  | 5.5                    |
| 820                                    | F821K53S3NR6###R | 13.5                  | 5.5                    |
| 1000                                   | F102K53S3NR6###R | 13.5                  | 5.5                    |
| 1200                                   | F122K59S3NR6###R | 15.0                  | 5.5                    |
| 1500                                   | F152K63S3NR6###R | 16.0                  | 5.5                    |
| 1800                                   | F182K69S3NR6###R | 17.5                  | 5.5                    |
| 2200                                   | F222K75S3NR83K0R | 19.0                  | 5.5                    |
| 2700                                   | F272K75S3NR83K0R | 19.0                  | 5.5                    |

| DIELECTRIC Y5R (500 V <sub>DC</sub> / 1000 V <sub>DC</sub> ) |                     |                       |                        |                      |                       |                        |
|--|---------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|
| CAP.<br>(pF)   | 500 V <sub>DC</sub> |                       |                        | 1000 V <sub>DC</sub> |                       |                        |
|  | ORDERING CODE       | DIAMETER<br>(mm max.) | THICKNESS<br>(mm max.) | ORDERING CODE        | DIAMETER<br>(mm max.) | THICKNESS<br>(mm max.) |
| 100  | /                   | /                     | /                      | F101K25Y5RN6###R     | 6.5                   | 4.0                    |
| 120  | /                   | /                     | /                      | F121K25Y5RN6###R     | 6.5                   | 4.0                    |
| 150  | /                   | /                     | /                      | F151K25Y5RN6###R     | 6.5                   | 4.0                    |
| 180  | /                   | /                     | /                      | F181K25Y5RN6###R     | 6.5                   | 4.0                    |
| 220  | /                   | /                     | /                      | F221K25Y5RN6###R     | 6.5                   | 4.0                    |
| 270  | /                   | /                     | /                      | F271K29Y5RN6###R     | 7.5                   | 4.0                    |
| 330  | /                   | /                     | /                      | F331K29Y5RN6###R     | 7.5                   | 4.0                    |
| 390  | F391K25Y5RL6###R    | 6.5                   | 3.5                    | F391K29Y5RN6###R     | 7.5                   | 4.0                    |
| 470  | F471K25Y5RL6###R    | 6.5                   | 3.5                    | F471K29Y5RN6###R     | 7.5                   | 4.0                    |
| 560  | F561K25Y5RL6###R    | 6.5                   | 3.5                    | F561K33Y5RN6###R     | 8.5                   | 4.0                    |
| 680  | F681K25Y5RL6###R    | 6.5                   | 3.5                    | F681K33Y5RN6###R     | 8.5                   | 4.0                    |
| 820  | F821K29Y5RL6###R    | 7.5                   | 3.5                    | F821K39Y5RN6###R     | 10.0                  | 4.0                    |
| 1000   | F102K29Y5RL6###R    | 7.5                   | 3.5                    | F102K39Y5RN6###R     | 10.0                  | 4.0                    |
| 1200   | F122K33Y5RL6###R    | 8.5                   | 3.5                    | F122K43Y5RN6###R     | 11.0                  | 4.0                    |
| 1500   | F152K33Y5RL6###R    | 8.5                   | 3.5                    | F152K43Y5RN6###R     | 11.0                  | 4.0                    |
| 1800   | F182K39Y5RL6###R    | 10.0                  | 3.5                    | F182K47Y5RN6###R     | 12.0                  | 4.0                    |
| 2200   | F222K43Y5RL63J7R    | 11.0                  | 3.5                    | F222K53Y5RN6###R     | 13.5                  | 4.0                    |
| 2700   | F272K47Y5RL63J7R    | 12.0                  | 3.5                    | F272K53Y5RN6###R     | 13.5                  | 4.0                    |
| 3300   | /                   | /                     | /                      | F332K69Y5RN6###R     | 17.5                  | 4.0                    |
| 3900   | /                   | /                     | /                      | F392K69Y5RN83K0R     | 17.5                  | 4.0                    |
| 4700   | /                   | /                     | /                      | F472K75Y5RN83K0R     | 19.0                  | 4.0                    |

Notes

- Lead diameter is 0.6 mm
- # 5<sup>th</sup> digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M
- # 13<sup>th</sup> digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14<sup>th</sup> digit is lead style code: L; J; K (J is valid for 500 V and 1 kV only)
- # 15<sup>th</sup> digit is lead spacing code: 5.0 mm = 5; 6.4 mm = 6; 7.5 mm = 7; 10.0 mm = 0



| DIELECTRIC Y5R (2000 V <sub>DC</sub> / 3000 V <sub>DC</sub> ) |                      |                       |                        |                      |                       |                        |
|---|----------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|
| CAP.<br>(pF)  | 2000 V <sub>DC</sub> |                       |                        | 3000 V <sub>DC</sub> |                       |                        |
|   | ORDERING CODE        | DIAMETER<br>(mm max.) | THICKNESS<br>(mm max.) | ORDERING CODE        | DIAMETER<br>(mm max.) | THICKNESS<br>(mm max.) |
| 100   | F101K25Y5RP6###R     | 6.5                   | 5.0                    | F101K33Y5RR6###R     | 8.5                   | 5.5                    |
| 120   | F121K25Y5RP6###R     | 6.5                   | 5.0                    | F121K33Y5RR6###R     | 8.5                   | 5.5                    |
| 150   | F151K25Y5RP6###R     | 6.5                   | 5.0                    | F151K33Y5RR6###R     | 8.5                   | 5.5                    |
| 180   | F181K29Y5RP6###R     | 7.5                   | 5.0                    | F181K33Y5RR6###R     | 8.5                   | 5.5                    |
| 220   | F221K29Y5RP6###R     | 7.5                   | 5.0                    | F221K33Y5RR6###R     | 8.5                   | 5.5                    |
| 270   | F271K29Y5RP6###R     | 7.5                   | 5.0                    | F271K33Y5RR6###R     | 8.5                   | 5.5                    |
| 330   | F331K29Y5RP6###R     | 7.5                   | 5.0                    | F331K33Y5RR6###R     | 8.5                   | 5.5                    |
| 390   | F391K33Y5RP6###R     | 8.5                   | 5.0                    | F391K39Y5RR6###R     | 10.0                  | 5.5                    |
| 470   | F471K33Y5RP6###R     | 8.5                   | 5.0                    | F471K39Y5RR6###R     | 10.0                  | 5.5                    |
| 560   | F561K39Y5RP6###R     | 10.0                  | 5.0                    | F561K43Y5RR6###R     | 11.0                  | 5.5                    |
| 680   | F681K39Y5RP6###R     | 10.0                  | 5.0                    | F681K43Y5RR6###R     | 11.0                  | 5.5                    |
| 820   | F821K43Y5RP6###R     | 11.0                  | 5.0                    | F821K53Y5RR6###R     | 13.5                  | 5.5                    |
| 1000  | F102K43Y5RP6###R     | 11.0                  | 5.0                    | F102K53Y5RR6###R     | 13.5                  | 5.5                    |
| 1200  | F122K47Y5RP6###R     | 12.0                  | 5.0                    | F122K59Y5RR6###R     | 15.0                  | 5.5                    |
| 1500  | F152K53Y5RP6###R     | 13.5                  | 5.0                    | F152K59Y5RR6###R     | 15.0                  | 5.5                    |
| 1800  | F182K59Y5RP6###R     | 15.0                  | 5.0                    | F182K75Y5RR6###R     | 19.0                  | 5.5                    |
| 2200  | F222K69Y5RP83K0R     | 17.5                  | 5.0                    | F222K75Y5RR83K0R     | 19.0                  | 5.5                    |
| 2700  | F272K75Y5RP83K0R     | 19.0                  | 5.0                    | F272K84Y5RR83K0R     | 21.0                  | 5.5                    |
| 3300  | F332K75Y5RP83K0R     | 19.0                  | 5.0                    | /                    | /                     | /                      |
| 3900  | F392K75Y5RP83K0R     | 19.0                  | 5.0                    | /                    | /                     | /                      |
| 4700  | F472K96Y5RP83K0R     | 24.5                  | 5.0                    | /                    | /                     | /                      |

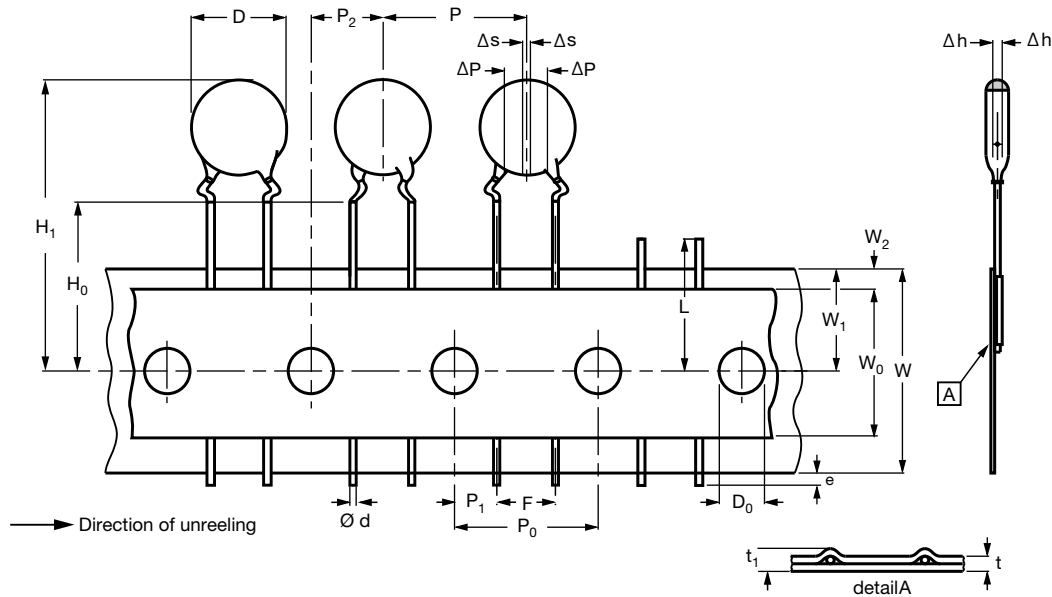
**Notes**

- Lead diameter is 0.6 mm
- # 5<sup>th</sup> digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M
- # 13<sup>th</sup> digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14<sup>th</sup> digit is lead style code: L; J; K (J is valid for 500 V and 1 kV only)
- # 15<sup>th</sup> digit is lead spacing code: 5.0 mm = 5; 6.4 mm = 6; 7.5 mm = 7; 10.0 mm = 0

| PACKAGING                       |           |                    |                               |                |                             |
|---------------------------------|-----------|--------------------|-------------------------------|----------------|-----------------------------|
| PACKAGING TYPE                  | SIZE CODE | LEAD SPACE<br>(mm) | VOLTAGE<br>(V <sub>DC</sub> ) | SPQ            | BOX DIMENSIONS<br>L x W x H |
| Bulk<br>(long lead L ≥ 25.4 mm) | 20 to 25  | All                | All                           | 1000           | 245 x 120 x 65              |
|                                 | 29 to 39  |                    |                               | 1000           |                             |
|                                 | 43 to 47  |                    |                               | 1000           |                             |
|                                 | 53 to 75  |                    |                               | 500            |                             |
|                                 | 84 to 96  |                    |                               | 250            |                             |
| Tape and reel                   | ≤ 43      | ≤ 6.4              | < 500                         | 2500           | 370 x 370 x 60              |
|                                 |           |                    | 500 ≤ WV ≤ 2000               | 2000           |                             |
|                                 |           |                    | 3000                          | 1000           |                             |
|                                 | ≥ 7.5     | All                | 1000                          |                |                             |
| ≥ 47                            | All       | All                | 1000                          |                |                             |
| Ammopack                        | ≤ 47      | ≤ 6.4              | < 500                         | 2000           | 335 x 240 x 50              |
|                                 |           |                    | 500 ≤ WV < 2000               | 2000           | 335 x 290 x 50              |
|                                 |           |                    | 2000 and 3000                 | 1500           | 360 x 330 x 55              |
|                                 | ≥ 7.5     | All                | 1500                          | 360 x 330 x 55 |                             |
| ≥ 53                            | All       | All                | 1500                          | 335 x 290 x 50 |                             |

**Note**

- The capacitors are supplied in bulk packaging (cardboard boxes), in tape on reel, or in ammpack

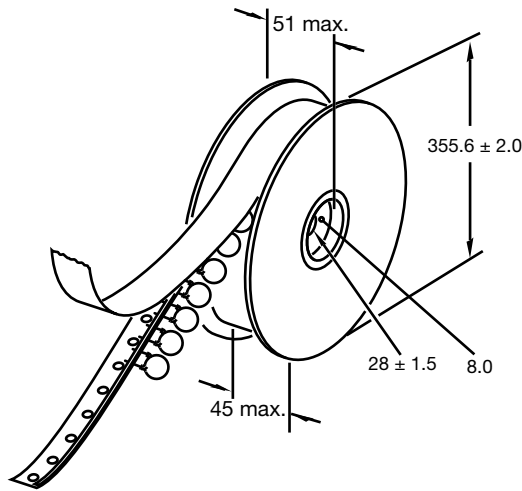


Kinked capacitors on tape, lead spacing 5.0 mm (0.2) or 7.5 mm (0.3)

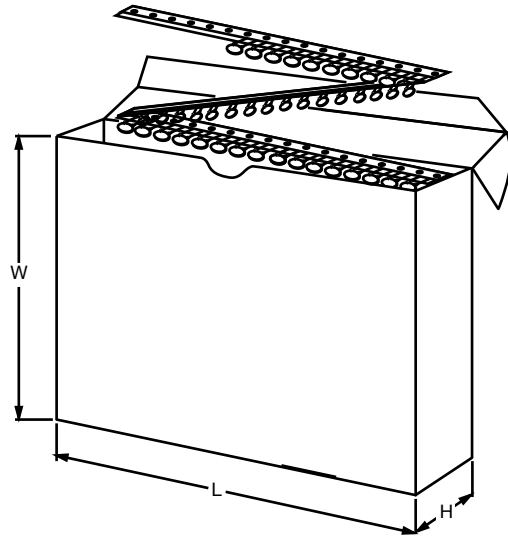
| DIMENSIONS OF TAPE            |                                      |                                 |                                 |
|-------------------------------|--------------------------------------|---------------------------------|---------------------------------|
| SYMBOL                        | PARAMETER                            | DIMENSIONS (mm)                 |                                 |
|                               |                                      | FEED-HOLE PITCH<br>$P_0 = 12.7$ | FEED-HOLE PITCH<br>$P_0 = 15.0$ |
| D                             | Body diameter                        | 11.0 max.                       | 14.0 max.                       |
| d                             | Lead diameter                        | $0.6 \pm 0.05$                  | $0.6 \pm 0.05$                  |
| P <sup>(1)</sup>              | Pitch between capacitors             | $12.7 \pm 1.0$                  | $15.0 \pm 1.0$                  |
| P <sub>0</sub>                | Feed-hole pitch                      | $12.7 \pm 0.3$                  | $15.0 \pm 0.3$                  |
| ΔP                            | Plane deviation                      | 1.0 max.                        | 1.0 max.                        |
| P <sub>1</sub> <sup>(2)</sup> | Feed-hole center to lead center      | $3.85 \pm 0.7$                  | $3.75 \pm 0.7$                  |
| P <sub>2</sub> <sup>(2)</sup> | Feed-hole center to component center | $6.35 \pm 1.3$                  | $7.5 \pm 1.5$                   |
| F                             | Lead spacing                         | $5.0 + 0.6/- 0.4$               | $7.5 + 0.6/- 0.4$               |
| Δh                            | Component alignment                  | $0 \pm 1.0$                     | $0 \pm 1.0$                     |
| W                             | Tape width                           | $18.0 + 1.0/- 0.5$              | $18.0 + 1.0/- 0.5$              |
| W <sub>0</sub>                | Hold-down tape width                 | 5.0 min.                        | 5.0 min.                        |
| W <sub>1</sub>                | Hole position                        | $9.0 + 0.75/- 0.5$              | $9.0 + 0.75/- 0.5$              |
| W <sub>2</sub>                | Hold-down tape margin                | 3.0 max.                        | 3.0 max.                        |
| H <sub>0</sub>                | Height to seating plane              | $16.0 \pm 0.5$                  | $16.0 \pm 0.5$                  |
| H <sub>1</sub>                | Maximum component height             | 32.0                            | 40.0                            |
| e                             | Lead end protrusion                  | 1.0 max.                        | 1.0 max.                        |
| L                             | Maximum length of snapped lead       | 11.0                            | 11.0                            |
| D <sub>0</sub>                | Feed-hole diameter                   | $4.0 \pm 0.2$                   | $4.0 \pm 0.2$                   |
| t                             | Total tape thickness                 | 0.9 max.                        | 0.9 max.                        |
| t <sub>1</sub>                | Maximum thickness of tape and wires  | 1.5 max.                        | 1.5 max.                        |

**Notes**

- (1) Cumulative pitch error:  $\pm 1$  mm/20 pitches  
 (2) Obliquity maximum 3°

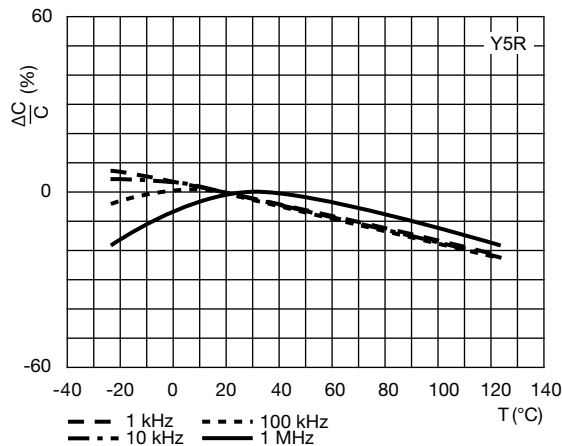
**REEL AND TAPE DATA** in millimeters


Reel with capacitors on tape

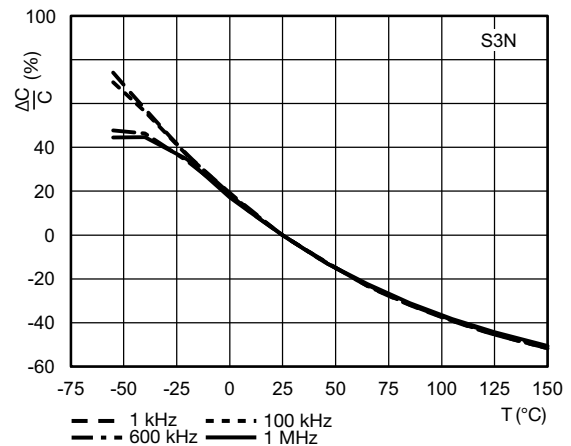


Ammpack with capacitors on tape

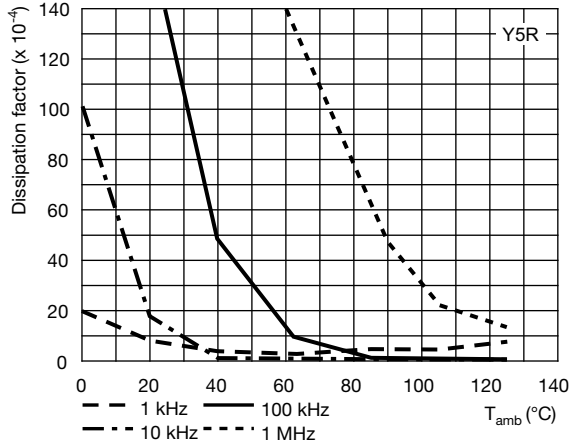
| <b>DIMENSIONS OF AMMPACK</b> |                                |                    |      |
|------------------------------|--------------------------------|--------------------|------|
| PARAMETER                    | DISC SIZE (D <sub>MAX.</sub> ) |                    | UNIT |
|                              | 6.5 mm to 11.0 mm              | 12.0 mm to 13.5 mm |      |
| Taping pitch                 | 12.7                           | 15.0               | mm   |
| L                            | 335                            | 360                | mm   |
| W                            | 290                            | 330                | mm   |
| H                            | 50                             | 55                 | mm   |



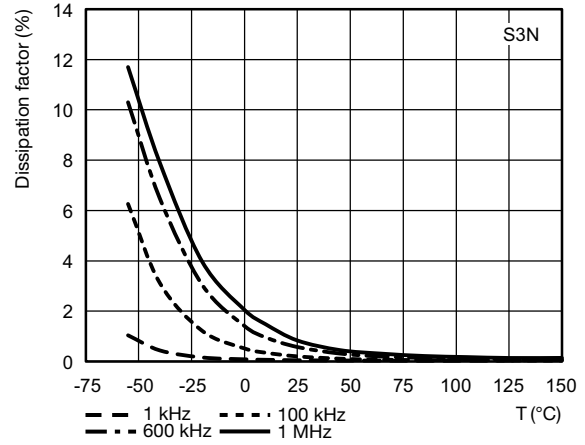
Typical capacitance change as a function of temperature and frequency



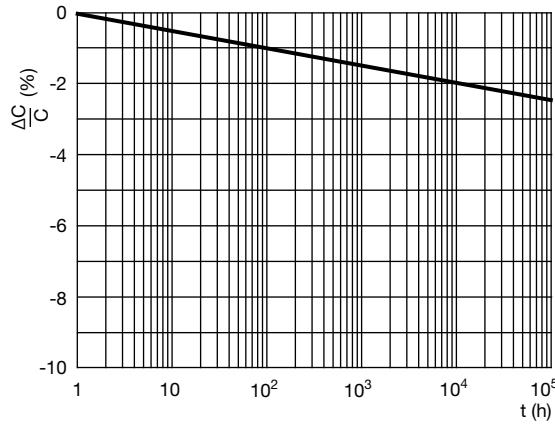
Typical capacitance change as a function of temperature and frequency



Typical dissipation factor as a function of temperature and frequency



Typical dissipation factor as a function of temperature and frequency



Aging rate as a function of time



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