

Ceramic Disc Capacitors, Class 1, Class 2, Low Loss (0.2 %), 500 V_{DC}, 1 kV_{DC}, 2 kV_{DC}, and 3 kV_{DC}


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


**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 _{DC}) | 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 _{max.}) ≤ 6.5 mm: | Disc size (D _{max.}) ≥ 7.5 mm: |
| | BC |
| RR = low loss with T.C. Y5R | RR |
| 101K | 102K |
| 2 kV | 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_{DC}

≥ 10 000 MΩ min.

TOLERANCE ON CAPACITANCE

± 10 %; ± 20 %

DISSIPATION FACTOR

0.2 % max.



ORDERING CODES

| DIELECTRIC S3N (1000 V _{DC} / 2000 V _{DC}) | | | | | | |
|---|----------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|
| CAP. (pF) | 1000 V _{DC} | | | 2000 V _{DC} | | |
| | ORDERING CODE | DIAMETER (mm max.) | THICKNESS (mm max.) | ORDERING CODE | DIAMETER (mm max.) | THICKNESS (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 |

| DIELECTRIC S3N (3000 V _{DC}) | | | |
|--|----------------------|-----------------------|------------------------|
| CAP. (pF) | 3000 V _{DC} | | |
| | ORDERING CODE | DIAMETER (mm max.) | THICKNESS (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 |

Notes

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



| DIELECTRIC Y5R (500 V _{DC} / 1000 V _{DC}) | | | | | | |
|--|---------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|
| CAP. (pF) | 500 V _{DC} | | | 1000 V _{DC} | | |
| | ORDERING CODE | DIAMETER (mm max.) | THICKNESS (mm max.) | ORDERING CODE | DIAMETER (mm max.) | THICKNESS (mm max.) |
| 100 | F101K20Y5RL6###R | 5.0 | 3.5 | F101K25Y5RN6###R | 6.5 | 4.0 |
| 120 | F121K20Y5RL6###R | 5.0 | 3.5 | F121K25Y5RN6###R | 6.5 | 4.0 |
| 150 | F151K20Y5RL6###R | 5.0 | 3.5 | F151K25Y5RN6###R | 6.5 | 4.0 |
| 180 | F181K20Y5RL6###R | 5.0 | 3.5 | F181K25Y5RN6###R | 6.5 | 4.0 |
| 220 | F221K20Y5RL6###R | 5.0 | 3.5 | F221K25Y5RN6###R | 6.5 | 4.0 |
| 270 | F271K20Y5RL6###R | 5.0 | 3.5 | F271K29Y5RN6###R | 7.5 | 4.0 |
| 330 | F331K20Y5RL6###R | 5.0 | 3.5 | 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 |

| DIELECTRIC Y5R (2000 V _{DC} / 3000 V _{DC}) | | | | | | |
|---|----------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|
| CAP. (pF) | 2000 V _{DC} | | | 3000 V _{DC} | | |
| | ORDERING CODE | DIAMETER (mm max.) | THICKNESS (mm max.) | ORDERING CODE | DIAMETER (mm max.) | THICKNESS (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
- # 5th digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; J; K (J is valid for 1 kV only)
- # 15th 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 (mm) | VOLTAGE (V _{DC}) | SPQ | BOX DIMENSIONS L x W x H |
| Bulk (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 | ≤ 47 | ≤ 6.4 | < 500 | 2500 | 370 x 370 x 60 |
| | | | 500 ≤ WV ≤ 2000 | 2000 | |
| | | | 3000 | 1000 | |
| | ≥ 7.5 | all | 1000 | | |
| ≥ 53 | 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 $P_0 = 12.7$ | FEED-HOLE PITCH $P_0 = 15.0$ |
| D | Body diameter | 11.0 max. | 14.0 max. |
| d | Lead diameter | 0.6 ± 0.05 | 0.6 ± 0.05 |
| P ⁽¹⁾ | Pitch between capacitors | 12.7 ± 1.0 | 15.0 ± 1.0 |
| P_0 | Feed-hole pitch | 12.7 ± 0.3 | 15.0 ± 0.3 |
| ΔP | Plane deviation | 1.0 max. | 1.0 max. |
| P_1 ⁽²⁾ | Feed-hole center to lead center | 3.85 ± 0.7 | 3.75 ± 0.7 |
| P_2 ⁽²⁾ | Feed-hole center to component center | 6.35 ± 1.3 | 7.5 ± 1.5 |
| F | Lead spacing | $5.0 + 0.6/- 0.4$ | $7.5 + 0.6/- 0.4$ |
| Δh | Component alignment | 0 ± 1.0 | 0 ± 1.0 |
| W | Tape width | $18.0 + 1.0/- 0.5$ | $18.0 + 1.0/- 0.5$ |
| W_0 | Hold-down tape width | 5.0 min. | 5.0 min. |
| W_1 | Hole position | $9.0 + 0.75/- 0.5$ | $9.0 + 0.75/- 0.5$ |
| W_2 | Hold-down tape margin | 3.0 max. | 3.0 max. |
| H_0 | Height to seating plane | 16.0 ± 0.5 | 16.0 ± 0.5 |
| H_1 | 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_0 | Feed-hole diameter | 4.0 ± 0.2 | 4.0 ± 0.2 |
| t | Total tape thickness | 0.9 max. | 0.9 max. |
| t_1 | Maximum thickness of tape and wires | 1.5 max. | 1.5 max. |

Notes

 (1) Cumulative pitch error: $\pm \leq 1$ mm/20 pitches

(2) Obliquity maximum 3°

REEL AND TAPE DATA in millimeters


Reel with capacitors on tape



Ammpack with capacitors on tape

| DIMENSIONS OF AMMOPACK | | | |
|------------------------|-----------------------------|--------------------|------|
| PARAMETER | DISC SIZE ($D_{MAX.}$) | | 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 dissipation factor 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



Aging rate as a function of time



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