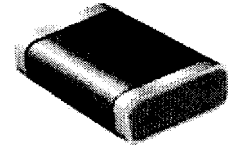


CAPACITORS



Ceramic Chip



TDK's new Sub-Miniature chip capacitor additions answer the electronics industry's need for higher density packaging. TDK's advanced technology allows for smaller size, highest capacitance, increased reliability, and automated assembly. Applications include computers and peripherals, telecommunications, measuring and medical equipment, and any application that requires miniaturization.

Electrical Specification

Capacitance Range

10pF to 10.0 μ F
 1V_{rms}, 1kHz 25 \pm 3%
 NPO 1,000pF and less: 1MHz

Working Voltage (DC WV)

6.3V, 10V, 16V, 25V, 50V

Capacitance Tolerance

.5pF, %, 0%
 0%, +80-20%

Dielectric Strength

250% DC WV

Operating Temperature Range

At the same condition as temperature characteristics

Insulation Resistance (DC WV) (I.R.)

Greater than 10G ohms or 500 ohms-F whichever is smaller
 16V, 10V, 6.3V: 10G ohms or 100 ohms-F whichever is smaller

Part Number Configuration

| CC | 0603 | H | NPO | 101 | J |
|----------------|-----------|---------|-----------------------------|------------------|-----------------------|
| (1) | (2) | (3) | (4) | (5) | (6) |
| Capacitor Type | Case Size | Voltage | Temperature Characteristics | Capacitance (pF) | Capacitance Tolerance |

(1) Capacitor Type

CC:

Chip Capacitor

| (3) Voltage | |
|--------------------|------|
| J: | 6.3V |
| A: | 10V |
| C: | 16V |
| E: | 25V |
| H: | 50V |

| (4) Temperature Characteristics | | |
|--|-------------------------|---|
| NPO: | Temp. Compensating Type | $0 \square 0 \text{ppm/}\square (-55 \square \text{ to } +125 \square)$ |
| X7R: | Stable Type | $\square 5\% (-55 \square \text{ to } +125 \square)$ |
| X5R: | Stable Type | $\square 5\% (-55 \square \text{ to } +85 \square)$ |
| Y5V: | General purpose | $+22-82\% (-30 \square \text{ to } +85 \square)$ |
| Z5U: | | $+22-56\% (+10 \square \text{ to } +85 \square)$ |

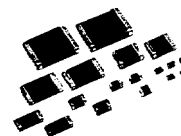
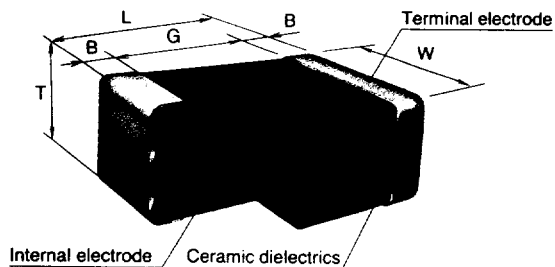
| (5) Capacitance (pF) | |
|-----------------------------|---------------------------|
| First two digits: | Significant figure |
| Last digit: | Number of zeros to follow |

| (6) Capacitance Tolerance | |
|----------------------------------|------------------------|
| D: | $\square .5 \text{pF}$ |
| J: | $\square \%$ |
| K: | $\square 0\%$ |
| M: | $\square 0\%$ |
| Z: | $+80-20\%$ |

Ceramic Capacitors

MULTILAYER CERAMIC CHIP CAPACITORS

C TYPE [16,25, 50Vdc], CLASS I AND CLASS II



| Type | EIA style | Dimensions (mm) [inches] | | | | |
|-------|-----------|----------------------------|-----------------------------|------------------------------|----------------|---------------|
| | | L | W | T | B min. | G min. |
| C1005 | CC0402 | 1 ± 0.05 [.039 ± .002] | 0.5 ± 0.05 [.020 ± .002] | 0.55 max. [.022] | 0.15 [.006] | 0.3 [.012] |
| C1608 | CC0603 | 1.6 ± 0.1 [.063 ± .004] | 0.8 ± 0.1 [.031 ± .004] | 0.9 max. [.035] | 0.2 [.008] | 0.3 [.012] |
| C2012 | CC0805 | 2 ± 0.2 [.079 ± .008] | 1.25 ± 0.2 [.049 ± .008] | 0.6 ± 0.15 [.024 ± .006] | 0.2 [.008] | 0.5 [.020] |
| | | | | 0.85 ± 0.15 [.033 ± .006] | | |
| C3216 | CC1216 | 3.2 ± 0.2 [.126 ± .008] | 1.6 ± 0.2 [.063 ± .008] | 1.25 ± 0.2 [.049 ± .008] | 0.2 [.008] | 1 [.039] |
| | | | | 0.6 ± 0.15 [.024 ± .006] | | |
| | | | | 0.85 ± 0.15 [.033 ± .006] | | |
| | | | | 1.1 ± 0.2 [.043 ± .008] | | |
| C3225 | CC1210 | 3.2 ± 0.4 [.126 ± .016] | 2.5 ± 0.3 [.098 ± .016] | 1.3 ± 0.2 [.051 ± .008] | 0.3 [.012] | 1 [.039] |
| | | | | 0.85 ± 0.15 [.033 ± .006] | | |
| C4532 | CC1812 | 4.5 ± 0.5 [.177 ± .020] | 3.2 ± 0.4 [.126 ± .016] | 1.1 ± 0.2 [.043 ± .008] | 0.4 [.016] | 2 [.079] |
| | | | | 0.85 ± 0.15 [.033 ± .006] | | |
| C5650 | CC2220 | 5.6 ± 0.5 [.220 ± .020] | 5 ± 0.5 [.197 ± .020] | 1.1 ± 0.2 [.043 ± .008] | 0.4 [.016] | 2 [.079] |
| | | | | 0.85 ± 0.15 [.033 ± .006] | | |

CAPACITANCE TEMPERATURE CHARACTERISTICS Class I

| Temperature coefficient symbol | Temperature coefficient (ppm/°C) | Temperature range (°C) [°F] |
|--------------------------------|----------------------------------|------------------------------|
| COG | 0 ± 30 | -55 to +125 [-67 to +125] |
| CH | 0 ± 60 | -25 to +85 [-13 to +185] |
| PH | -150 ± 60 | -25 to +85 [-13 to +185] |
| RH | -220 ± 60 | -25 to +85 [-13 to +185] |
| SH | -330 ± 60 | -25 to +85 [-13 to +185] |
| TH | -470 ± 60 | -25 to +85 [-13 to +185] |
| UJ | -750 ± 120 | -25 to +85 [-13 to +185] |
| SL | +350 to -1000 | 20 to 85 [68 to 185] |

Class II

| Temperature characteristics | Capacitance change (%) | Temperature range (°C) [°F] |
|-----------------------------|------------------------|------------------------------|
| X8R | ± 15 | -55 to +150 [-67 to +302] |
| X7R | ± 15 | -55 to +125 [-67 to +257] |
| X7S | ± 22 | -55 to +125 [-67 to +257] |
| Z5U | +22 -56 | 10 to 85 [50 to 185] |
| Y5V | +22 -82 | -30 to +85 [-22 to +185] |

CAPACITANCE AND TOLERANCE

| Capacitance tolerance | Capacitance 0.5 to 10 pF | Step value for capacitance of over 10pF [× 10 ⁿ] |
|-------------------------------------|------------------------------|---|
| C (±0.25pF), D (±0.5pF), F (±1.0pF) | 0.5 1 1.5 2 3 4 5 6 7 8 9 10 | |
| Z (+80, -20%) | | 1 1.5 2.2 3.3 4.7 6.8 |
| M (±20%) | | 1 1.5 2.2 3.3 4.7 6.8 |
| K (±10%) | | 1 1.2 1.5 1.8 2.2 2.7 3.3 3.9 4.7 5.6 6.8 8.2 |
| J (±5%) | | 1 1.1 1.2 1.3 1.5 1.6 1.8 2 2.2 2.4 2.7 3 3.3 3.6 3.9 4.3 4.7 5.1 5.6 6.2 6.8 7.5 8.2 9.1 |

* Step value × 10ⁿ = capacitance value by pF unit. See the tables for the service range of actual rated capacitance (P. 3 - 2).

Ceramic Capacitors

CAPACITANCE RANGE

Class I

25Vdc

| Part No. | Capacitance (pF) |
|---------------------|------------------|
| C1005C0G1E□□□□*1□*2 | 0.5 to 120 |
| C1005CH1E□□□□□ | 0.5 to 120 |
| C1005SL1E□□□□□ | 0.5 to 330 |

*1. Capacitance code *2. Capacitance tolerance code

50Vdc

| Part No. | Capacitance (pF) |
|---------------------|---------------------|
| C1608C0G1H□□□□*1□*2 | 0.5 to 330 |
| C1608PH1H□□□□□ | 0.5 to 180 |
| C1608RH1H□□□□□ | 0.5 to 220 |
| C1608SH1H□□□□□ | 0.5 to 270 |
| C1608TH1H□□□□□ | 0.5 to 330 |
| C1608UJ1H□□□□□ | 0.5 to 470 |
| C1608SL1H□□□□□ | 0.5 to 1000 |
| C2012C0G1H□□□□□ | 0.5 to 1100 |
| C2012PH1H□□□□□ | 0.5 to 820 |
| C2012RH1H□□□□□ | 0.5 to 1000 |
| C2012SH1H□□□□□ | 0.5 to 1000 |
| C2012TH1H□□□□□ | 0.5 to 1000 |
| C2012UJ1H□□□□□ | 0.5 to 1300 |
| C2012SL1H□□□□□ | 0.5 to 2700 |
| C3216C0G1H□□□□□ | 0.5 to 2200 |
| C3216PH1H□□□□□ | 0.5 to 1500 |
| C3216RH1H□□□□□ | 0.5 to 2200 |
| C3216SH1H□□□□□ | 0.5 to 2700 |
| C3216TH1H□□□□□ | 0.5 to 2700 |
| C3216UJ1H□□□□□ | 0.5 to 3300 |
| C3216SL1H□□□□□ | 0.5 to 6800 |
| C3225C0G1H□□□□□ | 2400 to 3900 |
| C3225SL1H□□□□□ | 7500 to 12000 |
| C4532C0G1H□□□□□ | 4300 to 8200 |
| C4532SL1H□□□□□ | 13000 to 30000 |
| C5650C0G1H□□□□□ | 9100 to 15000 |
| C5650SL1H□□□□□ | 33000, 36000, 39000 |

*1. Capacitance code *2. Capacitance tolerance code

Class II

16Vdc

| Part No. | Capacitance (pF) |
|---------------------|-------------------|
| C1005X7R1C□□□□*1□*2 | 5600 to 10000 |
| C1005Y5V1C□□□□□ | 22000, 33000 |
| C1608X7R1C□□□□□ | 12000 to 47000 |
| C1608X7S1C□□□□□ | 22000 to 82000 |
| C1608Y5V1C□□□□□ | 47000 to 330000 |
| C2012X7R1C□□□□□ | 27000 to 220000 |
| C2012X7S1C□□□□□ | 27000 to 390000 |
| C2012Y5V1C□□□□□ | 100000 to 2200000 |
| C3216X7R1C□□□□□ | 68000 to 680000 |
| C3216X7S1C□□□□□ | 68000 to 1000000 |
| C3216Y5V1C□□□□□ | 220000 to 4700000 |

*1. Capacitance code *2. Capacitance tolerance code

25Vdc

| Part No. | Capacitance (pF) |
|---------------------|------------------|
| C1005X7R1E□□□□*1□*2 | 220 to 4700 |
| C1005Y5V1E□□□□□ | 1000 to 15000 |
| C1608X7R1E□□□□□ | 8200 to 15000 |
| C1608Y5V1E□□□□□ | 47000, 100000 |
| C2012X7R1E□□□□□ | 12000 to 100000 |
| C2012Z5U1E□□□□□ | 4700 to 390000 |
| C2012Y5V1E□□□□□ | 22000 to 470000 |
| C3216X7R1E□□□□□ | 12000 to 330000 |
| C3216Z5U1E□□□□□ | 10000 to 220000 |
| C3216Y5V1E□□□□□ | 47000 to 680000 |

*1. Capacitance code *2. Capacitance tolerance code

50Vdc

| Part No. | Capacitance (pF) |
|---------------------|------------------|
| C1608X7R1H□□□□*1□*2 | 220 to 15000 |
| C1608Y5V1H□□□□□ | 1000 to 33000 |
| C2012X8R1H□□□□□ | 1000 to 56000 |
| C2012X7R1H□□□□□ | 470 to 100000 |
| C2012Z5U1H□□□□□ | 4700 to 68000 |
| C2012Y5V1H□□□□□ | 4700 to 100000 |
| C3216X8R1H□□□□□ | 1000 to 150000 |
| C3216X7R1H□□□□□ | 470 to 150000 |
| C3216Z5U1H□□□□□ | 10000 to 150000 |
| C3216Y5V1H□□□□□ | 4700 to 220000 |
| C3225X7R1H□□□□□ | 180000, 220000 |
| C3225Z5U1H□□□□□ | 220000, 330000 |
| C3225Y5V1H□□□□□ | 330000, 470000 |
| C4532X7R1H□□□□□ | 270000 to 390000 |
| C4532Y5V1H□□□□□ | 1000000 |
| C5650X7R1H□□□□□ | 47000 to 680000 |
| C5650Y5V1H□□□□□ | 1500000 |

*1. Capacitance code *2. Capacitance tolerance code

Ceramic Capacitors

C TYPE [BASEMETAL ELECTRODE, 16, 25, 50Vdc], CLASS II

CAPACITANCE RANGE

16 Vdc

| Part No. | Capacitance (pF) |
|---------------------|-------------------|
| C1608Y5V1C□□□□*1□*2 | 47000 to 150000 |
| C2012Y5V1C□□□□□ | 100000 to 1000000 |
| C3216Y5V1C□□□□□ | 220000 to 2200000 |

*1. Capacitance code *2. Capacitance tolerance code

50Vdc

| Part No. | Capacitance (pF) |
|---------------------|------------------|
| C1608Y5V1H□□□□*1□*2 | 1000 to 22000 |
| C2012Y5V1H□□□□□ | 4700 to 47000 |
| C3216Y5V1H□□□□□ | 4700 to 150000 |

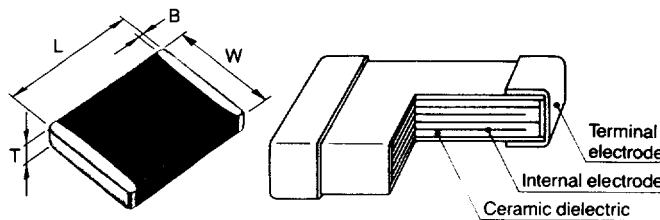
*1. Capacitance code *2. Capacitance tolerance code

| Part No. | Capacitance (pF) |
|---------------------|------------------|
| C1608Y5V1E□□□□*1□*2 | 1000 to 33000 |
| C2012Y5V1E□□□□□ | 22000 to 100000 |
| C3216Y5V1E□□□□□ | 22000 to 220000 |

*1. Capacitance code *2. Capacitance tolerance code

CATALOG NO. BBE-008, EVE-001, EVE-005

HC TYPE [LARGECAPACITANCE, 16, 25,50, 75Vdc], CLASS II HIGH DIELECTRIC CONSTANT



Dimensions in mm [inches]

| Type | L ± 1.5 [.059] | W ± 0.8 [.031] | T max. | B ± 0.5 [.020] |
|--------|----------------|----------------|----------|----------------|
| HC8050 | 8 [.315] | 5 [.197] | 6 [.236] | 1.5 [.059] |
| HC1063 | 10 [.394] | 6.3 [.248] | 6 [.236] | 1.5 [.059] |
| HC1280 | 12.5 [.492] | 8 [.315] | 6 [.236] | 1.5 [.059] |
| HC1612 | 16 [.630] | 12.5 [.492] | 6 [.236] | 1.5 [.059] |

CAPACITANCE RANGE (Operating temperature range: - 25 to +85°C [-13 to +185°F])

16Vdc

| Part No. | Capacitance (pF) |
|-----------------|------------------|
| HC8050Y5T1C685M | 6800000 [6.8μF] |
| HC1063Y5T1C106M | 10000000 [10μF] |
| HC1280Y5T1C156M | 15000000 [15μF] |
| HC1280Y5T1C226M | 22000000 [22μF] |
| HC1612Y5T1C336M | 33000000 [33μF] |
| HC1612Y5T1C476M | 47000000 [47μF] |

25Vdc

| Part No. | Capacitance (pF) |
|-----------------|------------------|
| HC8050Y5T1E335M | 3300000 [3.3μF] |
| HC1063Y5T1E475M | 4700000 [4.7μF] |
| HC1063Y5T1E685M | 6800000 [6.8μF] |
| HC1280Y5T1E106M | 10000000 [10μF] |
| HC1612Y5T1E156M | 15000000 [15μF] |
| HC1612Y5T1E226M | 22000000 [22μF] |

50Vdcc

| Part No. | Capacitance (pF) |
|-----------------|------------------|
| HC8050Y5T1H335M | 3300000 [3.3μF] |
| HC1063Y5T1H475M | 4700000 [4.7μF] |
| HC1280Y5T1H685M | 6800000 [6.8μF] |
| HC1280Y5T1H106M | 10000000 [10μF] |
| HC1612Y5T1H156M | 15000000 [15μF] |
| HC1612Y5T1H226M | 22000000 [22μF] |

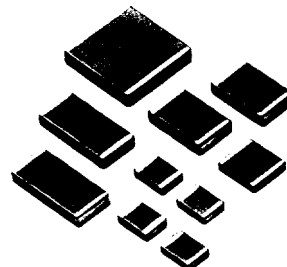
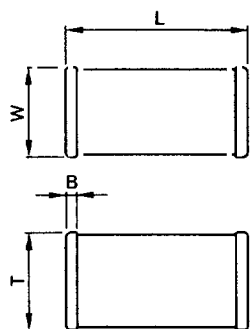
75Vdc

| Part No. | Capacitance (pF) |
|-----------------|------------------|
| HC8050Y5T1N155M | 1500000 [1.5μF] |
| HC1063Y5T1N255M | 2200000 [2.2μF] |
| HC1280Y5T1N335M | 3300000 [3.3μF] |
| HC1280Y5T1N475M | 4700000 [4.7μF] |
| HC1280Y5T1N685M | 6800000 [6.8μF] |
| HC1612Y5T1N106M | 10000000 [10μF] |

CATALOG NO. BBE-009, EVE-001, EVE-005

Ceramic Capacitors

C TYPE [HIGH VOLTAGE] CLASS I [3kVdc] AND CLASS II [500Vdc,1k, 2kVdc]



| Type | EIA style | Dimensions (mm) [inches] | | | |
|-------|-----------|--------------------------|--------------------------|--------------------------|-----------------------|
| | | L | W | T max. | B min. |
| C3216 | CC1206 | 3.2 ± 0.2 [.126 ± .008] | 1.6 ± 0.15 [.063 ± .006] | 1.75 [.069] | 0.2 [.008] |
| C3225 | CC1210 | 3.2 ± 0.3 [.126 ± .012] | 2.5 ± 0.2 [.098 ± .008] | 2 [.079] | 0.3 [.012] |
| C4532 | CC1812 | 4.5 ± 0.3 [.177 ± .012] | 3.2 ± 0.3* [.126 ± .012] | 2.5 [.098] 3 [.118] | 0.4 [.016] |
| C5650 | CC2220 | 5.6 ± 0.5 [.220 ± .020] | 5 ± 0.5 [.197 ± .020] | 2.5 [.098] 3.2 [.126] | 0.4 [.016] |
| C8050 | | 8 ± 0.5 [.315 ± .020] | 5 ± 0.5 [.197 ± .020] | 2.5 [.098] | 1 ± 0.5 [.039 ± .020] |
| C1050 | | 10.6 ± 0.5 [.417 ± .020] | 5 ± 0.5 [.197 ± .020] | 3.4 [.134] | 0.2 [.008] |
| C1010 | | 10.6 ± 0.5 [.417 ± .020] | 10 ± 0.5 [.394 ± .020] | 3.4 [.134] | 0.2 [.008] |

* 3kV products: 3.2 ± 0.4 [.126 ± .016]

CAPACITANCE TEMPERATURE CHARACTERISTICS Class I

| Temperature coefficient symbol | Temperature coefficient (ppm/°C) | Temperature range (°C) |
|--------------------------------|----------------------------------|------------------------|
| SL | + 350 to - 1000 | 25 to 85 |

Class II

| Temperature characteristics | Capacitance change (%) | Temperature range (°C) |
|-----------------------------|------------------------|------------------------|
| X7R | ± 15 | - 55 to + 125 |

CAPACITANCE RANGE Class I 3kVdc

| Part No. | Capacitance (pF) |
|-----------------|------------------|
| C4532SL○○○*1□*2 | 10 to 100 |

Class II 500Vdc

| Part No. | Capacitance (pF) |
|--------------|------------------|
| C3216X7R○○○□ | 100 to 2200 |
| C3225X7R○○○□ | 330 to 6800 |
| C4532X7R○○○□ | 1200 to 33000 |
| C5650X7R○○○□ | 39000 to 82000 |
| C8050X7R○○○□ | 100000, 120000 |

1kVdc

| Part No. | Capacitance (pF) |
|--------------|------------------|
| C4532X7R○○○□ | 820 to 10000 |
| C5650X7R○○○□ | 12000 to 33000 |

2kVdc

| Part No. | Capacitance (pF) |
|--------------|------------------|
| C1050X7R○○○□ | 470 to 15000 |
| C1010X7R○○○□ | 18000 to 33000 |

*1. Capacitance code

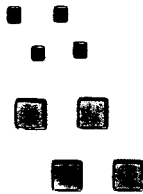
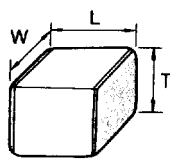
*2. Capacitance tolerance code

Ceramic Capacitors

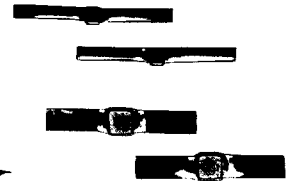
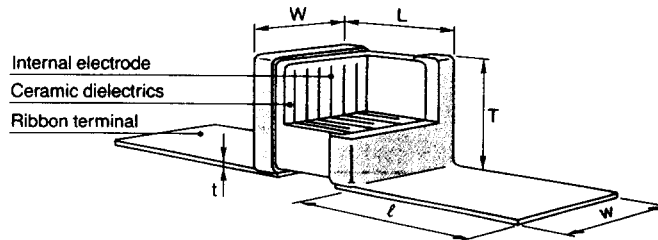
FC AND FR TYPE [LOWLOSS FOR VHF/UHF] CLASS I [50,100, 200,300, 500Vdc] AND CLASS II [50Vdc]

Multilayer Ceramic Capacitors for high frequency and low loss are designed for 100 to 1000MHz power circuit applications.

FC type



FR type



| Dimensions in mm [inches] | | | | | | |
|---------------------------|--|--|------------|----------|-------------------------|---|
| Type | L | W | T max. | ℓ min. | w | t |
| FC1414 | 1.4 ± 0.4 [.055 ± .016] | 1.4 ± 0.3 [.055 ± .012] | 1.6 [.063] | — | — | — |
| FC2828 | 2.8 ^{+0.5} _{-0.3} [.110 ^{+0.020} _{-.012}] | 2.8 ± 0.4 [.110 ± .016] | 3 [.118] | — | — | — |
| FR1414 | 1.4 ± 0.4 [.055 ± .016] | 1.4 ± 0.3 [.055 ± .012] | 1.6 [.063] | 2 [.079] | 1.3 ± 0.3 [.051 ± .012] | 0.1 ^{+0.3} _{-0.01} [.004 ^{+0.12} ₋₀] |
| FR2828 | 2.8 ^{+0.5} _{-0.3} [.110 ^{+0.020} _{-.016}] | 2.8 ^{+0.5} _{-0.7} [.110 ^{+0.020} _{-.028}] | 3 [.118] | 2 [.079] | 2.2 ± 0.3 [.087 ± .012] | 0.1 ^{+0.3} _{-0.01} [.004 ^{+0.12} ₋₀] |

CAPACITANCE AND TOLERANCE

| Capacitance tolerance | Capacitance 0.5 to 10 pF | Step value for capacitance of over 10pF [× 10 ⁿ] |
|-------------------------------------|--|--|
| C (±0.25pF), D (±0.5pF), F (±1.0pF) | 0.5 1.5 2 2.5 3 3.5 4 4.5 5 6 7 8 9 10 | |
| J (±5%), K (±10%) | | 1 1.1 1.2 1.3 1.5 1.6 1.8 2 2.2 2.4 2.7 3 3.3 3.6 3.9 4.3 4.7 5.1 5.6 6.2 6.8 7.5 8.2 9.1 |
| Class II K (±10%), M (±20%) | | 1 1.2 1.5 1.8 2.2 2.7 3.3 3.9 4.7 5.6 6.8 8.2 |

* Step value × 10ⁿ = capacitance value by pF unit. See the below tables for the service range of actual rated capacitance.

CAPACITANCE RANGE (Operating temperature range: -55 to +125°C [-67 to +257°F])

Class I 50,100, 200, 300, 500Vdc

| Part No. | Rated voltage (V) | Capacitance (pF) |
|---------------------|-------------------|------------------|
| FC1414C0G1H○○○*1□*2 | 50 | 0.5 to 100 |
| FC2828C0G1H○○○□ | 50 | 620 to 1000 |
| FR1414C0G1H○○○□ | 50 | 0.5 to 100 |
| FR2828C0G1H○○○□ | 50 | 620 to 1000 |
| FC2828C0G2A○○○□ | 100 | 510 to 560 |
| FR2828C0G2A○○○□ | 100 | 510 to 560 |
| FC2828C0G2D○○○□ | 200 | 200 to 470 |
| FR2828C0G2D○○○□ | 200 | 200 to 470 |
| FC2828C0G2F○○○□ | 300 | 110 to 180 |
| FR2828C0G2F○○○□ | 300 | 110 to 180 |
| FC2828C0G2H○○○□ | 500 | 0.5 to 100 |
| FR2828C0G2H○○○□ | 500 | 0.5 to 100 |

*1. Capacitance code *2. Capacitance tolerance code

Class II 50Vdc

| Part No. | Capacitance (pF) |
|---------------------|------------------|
| FC1414X7R1H○○○*1□*2 | 150 to 3300 |
| FC2828X7R1H○○○□ | 470 to 22000 |
| FR1414X7R1H○○○□ | 150 to 3300 |
| FR2828X7R1H○○○□ | 470 to 22000 |

*1. Capacitance code *2. Capacitance tolerance code