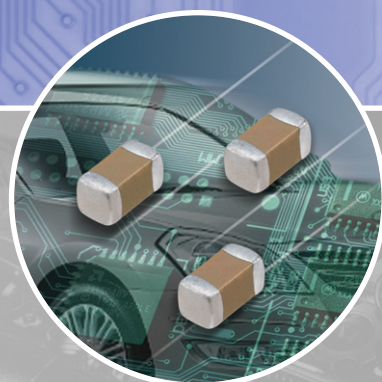




Premium Capacitors for Automotive Applications



**SAMSUNG
ELECTRO-MECHANICS**

SAMSUNG

★
Class I

| Symbol | EIA Code | Operation Temperature Range(°C) | Temperature Coefficient Range(ppm/°C) |
|--------|----------|---------------------------------|---------------------------------------|
| C | COG | -55 ~ +125 | 0 ±30 |

Class II

| Symbol | EIA Code | Operation Temperature Range(°C) | Capacitance Change (ΔC %) |
|--------|----------|---------------------------------|---------------------------|
| B | X7R | -55 ~ +125 | 0 ±15 |

★★
Capacitance Tolerance

| Code | Capacitance Tolerance | TC | Capacitance Step | Rated Capacitance |
|------|-----------------------|-----|------------------|-------------------|
| C | ± 0.25 pF | COG | Under 5 pF | E-12 series ★ |
| D | ± 0.5 pF | COG | 6.0 to 9.0 pF | E-12 series ★ |
| J | ± 5% | COG | Over 10 pF | E-12 series |
| K | ± 10% | X7R | Under 0.01 μF | E-3 series |
| | | | Over 0.01 μF | E-6 series |
| M | ± 20% | X7R | Under 0.01 μF | E-3 series |
| | | | Over 0.01 μF | E-6 series |

★E-24 series is also available

| Series | Capacitance Step | | | | | | | | | | | |
|--------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 1.0 | | | | 2.2 | | | | 4.7 | | | |
| E-3 | 1.0 | | | | 2.2 | | | | 4.7 | | | |
| E-6 | 1.0 | | 1.5 | | 2.2 | | 3.3 | | 4.7 | | 6.8 | |
| E-12 | 1.0 | 1.2 | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 3.9 | 4.7 | 5.6 | 6.8 | 8.2 |
| E-24 | 1.0 | 1.1 | 1.2 | 1.3 | 2.2 | 2.4 | 2.7 | 3.0 | 4.7 | 5.1 | 5.6 | 6.2 |
| | 1.5 | 1.6 | 1.8 | 2.0 | 3.3 | 3.6 | 3.9 | 4.3 | 6.8 | 7.5 | 8.2 | 9.1 |

★★★

| Size | Code | Thickness(mm) | Spec(mm) ★ |
|------------|------|---------------|------------|
| 0402(1005) | 5 | 0.50 | ±0.05 |
| 0603(1608) | 8 | 0.80 | ±0.10 |
| 0805(2012) | 6 | 0.60 | ±0.10 |
| | C | 0.85 | ±0.10 |
| | F | 1.25 | ±0.10 |
| 1206(3216) | C | 0.85 | ±0.15 |
| | P | 1.15 | ±0.10 |
| | H | 1.60 | ±0.20 |

★The tolerance will be changed by Customer' standards and our new products. (High Capacitance)
Please check with our sales representatives or product engineers before ordering.

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

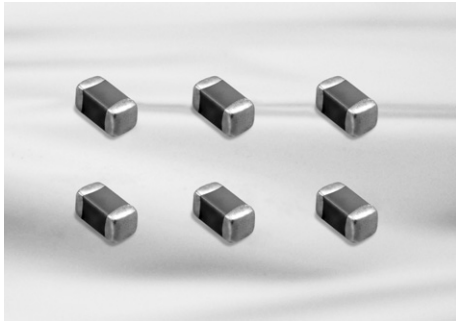
Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting



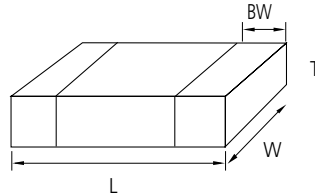
Feature

- Automotive products are manufactured in state of the art facilities recommended for registration to ISO/TS 16949:2002.
- Automotive products meet AEC-Q-200 requirements.
- Automotive products are RoHS compliant.
- Samsung terminations are suitable for all flow and reflow soldering systems. (10/21/31 size type only)
- Automotive products meet JEDEC-020-D requirements.
- COG dielectric components contain BME and copper terminations with a Ni/Sn plated overcoat.
- X7R dielectric components have BME and soft terminations with a Ni/Sn plated overcoat.

Application

- Automotive Electronic Equipment
(Powertrain, Safety, Body & Chassis, Convenience, Infotainment)

Structure and Dimensions



| Code | EIA Code | Dimension(mm) | | | |
|------|----------|---------------|-----------|-------------|--------------|
| | | L | W | T | BW |
| 05 | 0402 | 1.00±0.05 | 0.50±0.05 | 0.50(±0.05) | 0.25±0.10 |
| 10 | 0603 | 1.60±0.10 | 0.80±0.10 | 0.80(±0.10) | 0.3±0.2 |
| 21 | 0805 | 2.00±0.10 | 1.25±0.10 | 0.60(±0.10) | 0.5+0.2/-0.3 |
| | | | | 0.85(±0.10) | |
| | | | | 1.25(±0.10) | |
| 31 | 1206 | 3.20±0.20 | 1.60±0.20 | 0.85(±0.15) | 0.5±0.3 |
| | | | | 1.15(±0.10) | |
| | | | | 1.60(±0.20) | |

Automotive Capacitors Table (COG, X7R)

| TC | Size(mm) | Thickness (mm) | Vr | Capacitance (pF) | | | Capacitance (nF) | | | | | | |
|-----|------------|----------------------|-----|------------------|-----|-----|------------------|-----|-----|----|----|----|-----|
| | | | | 100 | 220 | 470 | 1 | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| COG | 0402(1005) | 0.50 | 50 | [Bar] | | | | | | | | | |
| | | | 100 | [Bar] | | | | | | | | | |
| | 0603(1608) | 0.80 | 50 | [Bar] | | | | | | | | | |
| | | | 100 | [Bar] | | | | | | | | | |
| | 0805(2012) | 0.60 0.85 1.25 | 50 | [Bar] | | | | | | | | | |
| | | | 100 | [Bar] | | | | | | | | | |

| TC | Size(mm) | Thickness (mm) | Vr | Capacitance (nF) | | | | | | Capacitance (μF) | | | | |
|------|------------|----------------|-----|------------------|-------|----|-----|-----|-----|------------------|-----|-----|----|--|
| | | | | 10 | 22 | 47 | 100 | 220 | 470 | 1 | 2.2 | 4.7 | 10 | |
| X7R | 0402(1005) | 0.50 | 10 | [Bar] | | | | | | | | | | |
| | | | 16 | [Bar] | | | | | | | | | | |
| | | | 25 | [Bar] | | | | | | | | | | |
| | | | 50 | [Bar] | | | | | | | | | | |
| | 0603(1608) | 0.80 | 10 | [Bar] | | | | | | | | | | |
| | | | 16 | [Bar] | | | | | | | | | | |
| | | | 25 | [Bar] | | | | | | | | | | |
| | | | 50 | [Bar] | | | | | | | | | | |
| | | | 100 | [Bar] | | | | | | | | | | |
| | 0805(2012) | 1.25 | 16 | 10 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | 0.60 | 25 | 10 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | 0.85 | 50 | 10 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | 0.60 | 100 | 10 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | 1206(3216) | 1.60 | 16 | 10 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| | | | | 16 | [Bar] | | | | | | | | | |
| 0.85 | | 25 | 10 | [Bar] | | | | | | | | | | |
| | | | 16 | [Bar] | | | | | | | | | | |
| | | | 16 | [Bar] | | | | | | | | | | |
| 0.85 | | 50 | 10 | [Bar] | | | | | | | | | | |
| | | | 16 | [Bar] | | | | | | | | | | |
| | | | 16 | [Bar] | | | | | | | | | | |

- Part Numbering System
- General Capacitors
- High Capacitance Capacitors
- Super Small Size Capacitors
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- Low ESL Capacitors
- Reliability Test Condition
- Premium Capacitors for Automotive Applications
- Packaging Specification
- Application Manual for Surface Mounting



Product Lineup (Automotive Capacitors_COG)

| | Part Number | Size L×W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|---------------|-------------|---------------------|-----------------------|---------------------|
| 1 | CL05C010CB51PN □ | 1.00×0.50 | 1.0pF | 50 | ±0.25pF | 0.55 |
| 2 | CL05C010CC51PN □ | | 1.0pF | 100 | ±0.25pF | 0.55 |
| 3 | CL05C1R5CB51PN □ | | 1.5pF | 50 | ±0.25pF | 0.55 |
| 4 | CL05C1R5CC51PN □ | | 1.5pF | 100 | ±0.25pF | 0.55 |
| 5 | CL05C2R2CB51PN □ | | 2.2pF | 50 | ±0.25pF | 0.55 |
| 6 | CL05C2R2CC51PN □ | | 2.2pF | 100 | ±0.25pF | 0.55 |
| 7 | CL05C3R3CB51PN □ | | 3.3pF | 50 | ±0.25pF | 0.55 |
| 8 | CL05C3R3CC51PN □ | | 3.3pF | 100 | ±0.25pF | 0.55 |
| 9 | CL05C4R7CB51PN □ | | 4.7pF | 50 | ±0.25pF | 0.55 |
| 10 | CL05C4R7CC51PN □ | | 4.7pF | 100 | ±0.25pF | 0.55 |
| 11 | CL05C6R8DB51PN □ | | 6.8pF | 50 | ±0.5pF | 0.55 |
| 12 | CL05C6R8DC51PN □ | | 6.8pF | 100 | ±0.5pF | 0.55 |
| 13 | CL05C100JB51PN □ | | 10pF | 50 | ±5% | 0.55 |
| 14 | CL05C100JC51PN □ | | 10pF | 100 | ±5% | 0.55 |
| 15 | CL05C120JB51PN □ | | 12pF | 50 | ±5% | 0.55 |
| 16 | CL05C120JC51PN □ | | 12pF | 100 | ±5% | 0.55 |
| 17 | CL05C150JB51PN □ | | 15pF | 50 | ±5% | 0.55 |
| 18 | CL05C150JC51PN □ | | 15pF | 100 | ±5% | 0.55 |
| 19 | CL05C180JB51PN □ | | 18pF | 50 | ±5% | 0.55 |
| 20 | CL05C180JC51PN □ | | 18pF | 100 | ±5% | 0.55 |
| 21 | CL05C220JB51PN □ | | 22pF | 50 | ±5% | 0.55 |
| 22 | CL05C220JC51PN □ | | 22pF | 100 | ±5% | 0.55 |
| 23 | CL05C270JB51PN □ | | 27pF | 50 | ±5% | 0.55 |
| 24 | CL05C270JC51PN □ | | 27pF | 100 | ±5% | 0.55 |
| 25 | CL05C330JB51PN □ | | 33pF | 50 | ±5% | 0.55 |
| 26 | CL05C330JC51PN □ | | 33pF | 100 | ±5% | 0.55 |
| 27 | CL05C390JB51PN □ | | 39pF | 50 | ±5% | 0.55 |
| 28 | CL05C390JC51PN □ | | 39pF | 100 | ±5% | 0.55 |
| 29 | CL05C470JB51PN □ | | 47pF | 50 | ±5% | 0.55 |
| 30 | CL05C470JC51PN □ | | 47pF | 100 | ±5% | 0.55 |
| 31 | CL05C560JB51PN □ | | 56pF | 50 | ±5% | 0.55 |
| 32 | CL05C560JC51PN □ | | 56pF | 100 | ±5% | 0.55 |
| 33 | CL05C680JB51PN □ | | 68pF | 50 | ±5% | 0.55 |
| 34 | CL05C680JC51PN □ | | 68pF | 100 | ±5% | 0.55 |
| 35 | CL05C820JB51PN □ | | 82pF | 50 | ±5% | 0.55 |
| 36 | CL05C820JC51PN □ | | 82pF | 100 | ±5% | 0.55 |
| 37 | CL05C101JB51PN □ | | 100pF | 50 | ±5% | 0.55 |
| 38 | CL05C101JC51PN □ | | 100pF | 100 | ±5% | 0.55 |
| 39 | CL05C121JB51PN □ | | 120pF | 50 | ±5% | 0.55 |
| 40 | CL05C151JB51PN □ | | 150pF | 50 | ±5% | 0.55 |
| 41 | CL05C221JB51PN □ | | 220pF | 50 | ±5% | 0.55 |
| 1 | CL10C010CB81PN □ | 1.60×0.80 | 1.0pF | 50 | ±0.25pF | 0.9 |
| 2 | CL10C010CC81PN □ | | 1.0pF | 100 | ±0.25pF | 0.9 |
| 3 | CL10C1R5CB81PN □ | | 1.5pF | 50 | ±0.25pF | 0.9 |
| 4 | CL10C1R5CC81PN □ | | 1.5pF | 100 | ±0.25pF | 0.9 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Product Lineup (Automotive Capacitors_COG)

| | Part Number | Size L×W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|---------------|-------------|---------------------|-----------------------|---------------------|
| 5 | CL10C2R2CB81PN □ | 1.60×0.80 | 2.2pF | 50 | ±0.25pF | 0.9 |
| 6 | CL10C2R2CC81PN □ | | 2.2pF | 100 | ±0.25pF | 0.9 |
| 7 | CL10C3R3CB81PN □ | | 3.3pF | 50 | ±0.25pF | 0.9 |
| 8 | CL10C3R3CC81PN □ | | 3.3pF | 100 | ±0.25pF | 0.9 |
| 9 | CL10C4R7CB81PN □ | | 4.7pF | 50 | ±0.25pF | 0.9 |
| 10 | CL10C4R7CC81PN □ | | 4.7pF | 100 | ±0.25pF | 0.9 |
| 11 | CL10C6R8DB81PN □ | | 6.8pF | 50 | ±0.5pF | 0.9 |
| 12 | CL10C6R8DC81PN □ | | 6.8pF | 100 | ±0.5pF | 0.9 |
| 13 | CL10C100JB81PN □ | | 10pF | 50 | ±5% | 0.9 |
| 14 | CL10C100JC81PN □ | | 10pF | 100 | ±5% | 0.9 |
| 15 | CL10C120JB81PN □ | | 12pF | 50 | ±5% | 0.9 |
| 16 | CL10C120JC81PN □ | | 12pF | 100 | ±5% | 0.9 |
| 17 | CL10C150JB81PN □ | | 15pF | 50 | ±5% | 0.9 |
| 18 | CL10C150JC81PN □ | | 15pF | 100 | ±5% | 0.9 |
| 19 | CL10C180JB81PN □ | | 18pF | 50 | ±5% | 0.9 |
| 20 | CL10C180JC81PN □ | | 18pF | 100 | ±5% | 0.9 |
| 21 | CL10C220JB81PN □ | | 22pF | 50 | ±5% | 0.9 |
| 22 | CL10C220JC81PN □ | | 22pF | 100 | ±5% | 0.9 |
| 23 | CL10C270JB81PN □ | | 27pF | 50 | ±5% | 0.9 |
| 24 | CL10C270JC81PN □ | | 27pF | 100 | ±5% | 0.9 |
| 25 | CL10C330JB81PN □ | | 33pF | 50 | ±5% | 0.9 |
| 26 | CL10C330JC81PN □ | | 33pF | 100 | ±5% | 0.9 |
| 27 | CL10C390JB81PN □ | | 39pF | 50 | ±5% | 0.9 |
| 28 | CL10C390JC81PN □ | | 39pF | 100 | ±5% | 0.9 |
| 29 | CL10C470JB81PN □ | | 47pF | 50 | ±5% | 0.9 |
| 30 | CL10C470JC81PN □ | | 47pF | 100 | ±5% | 0.9 |
| 31 | CL10C560JB81PN □ | | 56pF | 50 | ±5% | 0.9 |
| 32 | CL10C560JC81PN □ | | 56pF | 100 | ±5% | 0.9 |
| 33 | CL10C680JB81PN □ | | 68pF | 50 | ±5% | 0.9 |
| 34 | CL10C680JC81PN □ | | 68pF | 100 | ±5% | 0.9 |
| 35 | CL10C820JB81PN □ | | 82pF | 50 | ±5% | 0.9 |
| 36 | CL10C820JC81PN □ | | 82pF | 100 | ±5% | 0.9 |
| 37 | CL10C101JB81PN □ | | 100pF | 50 | ±5% | 0.9 |
| 38 | CL10C101JC81PN □ | | 100pF | 100 | ±5% | 0.9 |
| 39 | CL10C121JB81PN □ | | 120pF | 50 | ±5% | 0.9 |
| 40 | CL10C151JB81PN □ | | 150pF | 50 | ±5% | 0.9 |
| 41 | CL10C221JB81PN □ | | 220pF | 50 | ±5% | 0.9 |
| 42 | CL10C271JB81PN □ | | 270pF | 50 | ±5% | 0.9 |
| 43 | CL10C331JB81PN □ | | 330pF | 50 | ±5% | 0.9 |
| 44 | CL10C391JB81PN □ | | 390pF | 50 | ±5% | 0.9 |
| 45 | CL10C471JB81PN □ | | 470pF | 50 | ±5% | 0.9 |
| 46 | CL10C561JB81PN □ | | 560pF | 50 | ±5% | 0.9 |
| 47 | CL10C681JB81PN □ | | 680pF | 50 | ±5% | 0.9 |
| 48 | CL10C821JB81PN □ | | 820pF | 50 | ±5% | 0.9 |
| 49 | CL10C102JB81PN □ | | 1nF | 50 | ±5% | 0.9 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

- Part Numbering System
- General Capacitors
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- Premium Capacitors for Automotive Applications
- Packaging Specification
- Application Manual for Surface Mounting



Product Lineup (Automotive Capacitors_COG)

| | Part Number | Size L×W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|---------------|-------------|---------------------|-----------------------|---------------------|
| 1 | CL21C100JB61PN □ | 2.00×1.25 | 10pF | 50 | ±5% | 0.7 |
| 2 | CL21C100JC61PN □ | | 10pF | 100 | ±5% | 0.7 |
| 3 | CL21C120JB61PN □ | | 12pF | 50 | ±5% | 0.7 |
| 4 | CL21C120JC61PN □ | | 12pF | 100 | ±5% | 0.7 |
| 5 | CL21C150JB61PN □ | | 15pF | 50 | ±5% | 0.7 |
| 6 | CL21C150JC61PN □ | | 15pF | 100 | ±5% | 0.7 |
| 7 | CL21C180JB61PN □ | | 18pF | 50 | ±5% | 0.7 |
| 8 | CL21C180JC61PN □ | | 18pF | 100 | ±5% | 0.7 |
| 9 | CL21C220JB61PN □ | | 22pF | 50 | ±5% | 0.7 |
| 10 | CL21C220JC61PN □ | | 22pF | 100 | ±5% | 0.7 |
| 11 | CL21C270JC61PN □ | | 27pF | 100 | ±5% | 0.7 |
| 12 | CL21C330JB61PN □ | | 33pF | 50 | ±5% | 0.7 |
| 13 | CL21C330JC61PN □ | | 33pF | 100 | ±5% | 0.7 |
| 14 | CL21C390JB61PN □ | | 39pF | 50 | ±5% | 0.7 |
| 15 | CL21C390JC61PN □ | | 39pF | 100 | ±5% | 0.7 |
| 16 | CL21C470JB61PN □ | | 47pF | 50 | ±5% | 0.7 |
| 17 | CL21C470JC61PN □ | | 47pF | 100 | ±5% | 0.7 |
| 18 | CL21C560JB61PN □ | | 56pF | 50 | ±5% | 0.7 |
| 19 | CL21C560JC61PN □ | | 56pF | 100 | ±5% | 0.7 |
| 20 | CL21C680JB61PN □ | | 68pF | 50 | ±5% | 0.7 |
| 21 | CL21C680JC61PN □ | | 68pF | 100 | ±5% | 0.7 |
| 22 | CL21C820JB61PN □ | | 82pF | 50 | ±5% | 0.7 |
| 23 | CL21C820JC61PN □ | | 82pF | 100 | ±5% | 0.7 |
| 24 | CL21C101JB61PN □ | | 100pF | 50 | ±5% | 0.7 |
| 25 | CL21C101JC61PN □ | | 100pF | 100 | ±5% | 0.7 |
| 26 | CL21C121JB61PN □ | | 120pF | 50 | ±5% | 0.7 |
| 27 | CL21C121JC61PN □ | | 120pF | 100 | ±5% | 0.7 |
| 28 | CL21C151JB61PN □ | | 150pF | 50 | ±5% | 0.7 |
| 29 | CL21C151JC61PN □ | | 150pF | 100 | ±5% | 0.7 |
| 30 | CL21C221JB61PN □ | | 220pF | 50 | ±5% | 0.7 |
| 31 | CL21C221JC61PN □ | | 220pF | 100 | ±5% | 0.7 |
| 32 | CL21C271JB61PN □ | | 270pF | 50 | ±5% | 0.7 |
| 33 | CL21C271JC61PN □ | | 270pF | 100 | ±5% | 0.7 |
| 34 | CL21C331JB61PN □ | | 330pF | 50 | ±5% | 0.7 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Product Lineup (Automotive Capacitors_COG)

| | Part Number | Size L×W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|---------------|-------------|---------------------|-----------------------|---------------------|
| 35 | CL21C331JC61PN □ | 2.00×1.25 | 330pF | 100 | ±5% | 0.7 |
| 36 | CL21C471JBC1PN □ | | 470pF | 50 | ±5% | 0.95 |
| 37 | CL21C471JCC1PN □ | | 470pF | 100 | ±5% | 0.95 |
| 38 | CL21C561JBC1PN □ | | 560pF | 50 | ±5% | 0.95 |
| 39 | CL21C561JCC1PN □ | | 560pF | 100 | ±5% | 0.95 |
| 40 | CL21C681JBC1PN □ | | 680pF | 50 | ±5% | 0.95 |
| 41 | CL21C681JCC1PN □ | | 680pF | 100 | ±5% | 0.95 |
| 42 | CL21C821JBC1PN □ | | 820pF | 50 | ±5% | 0.95 |
| 43 | CL21C821JCC1PN □ | | 820pF | 100 | ±5% | 0.95 |
| 44 | CL21C102JBC1PN □ | | 1nF | 50 | ±5% | 0.95 |
| 45 | CL21C102JCC1PN □ | | 1nF | 100 | ±5% | 0.95 |
| 46 | CL21C102JCF1PN □ | | 1nF | 100 | ±5% | 1.35 |
| 47 | CL21C122JBC1PN □ | | 1.2nF | 50 | ±5% | 0.95 |
| 48 | CL21C152JBC1PN □ | | 1.5nF | 50 | ±5% | 0.95 |
| 49 | CL21C182JBC1PN □ | | 1.8nF | 50 | ±5% | 0.95 |
| 50 | CL21C222JBC1PN □ | | 2.2nF | 50 | ±5% | 0.95 |
| 51 | CL21C272JBC1PN □ | | 2.7nF | 50 | ±5% | 0.95 |
| 52 | CL21C332JBC1PN □ | | 3.3nF | 50 | ±5% | 0.95 |
| 53 | CL21C392JBC1PN □ | | 3.9nF | 50 | ±5% | 0.95 |
| 54 | CL21C472JBC1PN □ | | 4.7nF | 50 | ±5% | 0.95 |
| 55 | CL21C562JBC1PN □ | | 5.6nF | 50 | ±5% | 0.95 |
| 56 | CL21C102JBF1PN □ | | 1nF | 50 | ±5% | 1.35 |
| 57 | CL21C122JBF1PN □ | | 1.2nF | 50 | ±5% | 1.35 |
| 58 | CL21C152JBF1PN □ | | 1.5nF | 50 | ±5% | 1.35 |
| 59 | CL21C182JBF1PN □ | | 1.8nF | 50 | ±5% | 1.35 |
| 60 | CL21C222JBF1PN □ | | 2.2nF | 50 | ±5% | 1.35 |
| 61 | CL21C272JBF1PN □ | | 2.7nF | 50 | ±5% | 1.35 |
| 62 | CL21C332JBF1PN □ | | 3.3nF | 50 | ±5% | 1.35 |
| 63 | CL21C392JBF1PN □ | | 3.9nF | 50 | ±5% | 1.35 |
| 64 | CL21C472JBF1PN □ | | 4.7nF | 50 | ±5% | 1.35 |
| 65 | CL21C562JBF1PN □ | | 5.6nF | 50 | ±5% | 1.35 |
| 66 | CL21C682JBF1PN □ | | 6.8nF | 50 | ±5% | 1.35 |
| 67 | CL21C822JBF1PN □ | 8.2nF | 50 | ±5% | 1.35 | |
| 68 | CL21C103JBF1PN □ | 10nF | 50 | ±5% | 1.35 | |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

- Part Numbering System
- General Capacitors
- High Capacitance Capacitors
- Super Small Size Capacitors
- Medium-High Voltage Capacitors
- Array Type Capacitors
- Low ESL Capacitors
- Reliability Test Condition
- Premium Capacitors for Automotive Applications
- Packaging Specification
- Application Manual for Surface Mounting

Product Lineup (Automotive Capacitors_X7R)

| | Part Number | Size L×W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|---------------|-------------|---------------------|-----------------------|---------------------|
| 1 | CL05B223KB54PN □ | 1.00×0.50 | 22nF | 50 | ±10% | 0.55 |
| 2 | CL05B104KO54PN □ | | 100nF | 16 | ±10% | 0.55 |
| 1 | CL10B221KC85PN □ | 1.60×0.80 | 220pF | 100 | ±10% | 0.90 |
| 2 | CL10B471KC85PN □ | | 470pF | 100 | ±10% | 0.90 |
| 3 | CL10B102KB85PN □ | | 1.0nF | 50 | ±10% | 0.90 |
| 4 | CL10B102KC85PN □ | | 1.0nF | 100 | ±10% | 0.90 |
| 5 | CL10B222KB85PN □ | | 2.2nF | 50 | ±10% | 0.90 |
| 6 | CL10B222KC85PN □ | | 2.2nF | 100 | ±10% | 0.90 |
| 7 | CL10B472KB85PN □ | | 4.7nF | 50 | ±10% | 0.90 |
| 8 | CL10B472KC85PN □ | | 4.7nF | 100 | ±10% | 0.90 |
| 9 | CL10B103KA85PN □ | | 10nF | 25 | ±10% | 0.90 |
| 10 | CL10B103KB85PN □ | | 10nF | 50 | ±10% | 0.90 |
| 11 | CL10B103KC85PN □ | | 10nF | 100 | ±10% | 0.90 |
| 12 | CL10B153KA85PN □ | | 15nF | 25 | ±10% | 0.90 |
| 13 | CL10B153KB85PN □ | | 15nF | 50 | ±10% | 0.90 |
| 14 | CL10B223KA85PN □ | | 22nF | 25 | ±10% | 0.90 |
| 15 | CL10B223KB85PN □ | | 22nF | 50 | ±10% | 0.90 |
| 16 | CL10B333KA85PN □ | | 33nF | 25 | ±10% | 0.90 |
| 17 | CL10B333KB85PN □ | | 33nF | 50 | ±10% | 0.90 |
| 18 | CL10B473KO85PN □ | | 47nF | 16 | ±10% | 0.90 |
| 19 | CL10B473KA85PN □ | | 47nF | 25 | ±10% | 0.90 |
| 20 | CL10B473KB85PN □ | | 47nF | 50 | ±10% | 0.90 |
| 21 | CL10B683KO85PN □ | | 68nF | 16 | ±10% | 0.90 |
| 22 | CL10B683KA85PN □ | | 68nF | 25 | ±10% | 0.90 |
| 23 | CL10B683KB85PN □ | | 68nF | 50 | ±10% | 0.90 |
| 24 | CL10B104KO85PN □ | | 100nF | 16 | ±10% | 0.90 |
| 25 | CL10B104KA85PN □ | | 100nF | 25 | ±10% | 0.90 |
| 26 | CL10B104KB85PN □ | | 100nF | 50 | ±10% | 0.90 |
| 27 | CL10B154KO84PN □ | | 150nF | 16 | ±10% | 0.90 |
| 28 | CL10B154KA84PN □ | | 150nF | 25 | ±10% | 0.90 |
| 29 | CL10B224KO84PN □ | | 220nF | 16 | ±10% | 0.90 |
| 30 | CL10B224KA84PN □ | | 220nF | 25 | ±10% | 0.90 |
| 31 | CL10B334KO84PN □ | | 330nF | 16 | ±10% | 0.90 |
| 32 | CL10B334KA84PN □ | | 330nF | 25 | ±10% | 0.90 |
| 33 | CL10B474KO84PN □ | | 470nF | 16 | ±10% | 0.90 |
| 34 | CL10B474KA84PN □ | | 470nF | 25 | ±10% | 0.90 |
| 35 | CL10B105KO84PN □ | | 1μF | 16 | ±10% | 0.90 |
| 1 | CL21B102KB65PN □ | 2.00×1.25 | 1.0nF | 50 | ±10% | 0.70 |
| 2 | CL21B102KC65PN □ | | 1.0nF | 100 | ±10% | 0.70 |
| 3 | CL21B222KB65PN □ | | 2.2nF | 50 | ±10% | 0.70 |
| 4 | CL21B222KC65PN □ | | 2.2nF | 100 | ±10% | 0.70 |
| 5 | CL21B472KB65PN □ | | 4.7nF | 50 | ±10% | 0.70 |
| 6 | CL21B472KC65PN □ | | 4.7nF | 100 | ±10% | 0.70 |
| 7 | CL21B103KB65PN □ | | 10nF | 50 | ±10% | 0.70 |
| 8 | CL21B103KC65PN □ | | 10nF | 100 | ±10% | 0.70 |
| 9 | CL21B153KB65PN □ | | 15nF | 50 | ±10% | 0.70 |
| 10 | CL21B153KC65PN □ | | 15nF | 100 | ±10% | 0.70 |
| 11 | CL21B223KB65PN □ | | 22nF | 50 | ±10% | 0.70 |
| 12 | CL21B223KC65PN □ | | 22nF | 100 | ±10% | 0.70 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Product Lineup (Automotive Capacitors_X7R)

| | Part Number | Size L×W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) | |
|----|------------------|---------------|-------------|---------------------|-----------------------|---------------------|------|
| 13 | CL21B333KBC5PN □ | 2.00×1.25 | 33nF | 50 | ±10% | 0.95 | |
| 14 | CL21B333KCC5PN □ | | 33nF | 100 | ±10% | 0.95 | |
| 15 | CL21B473KAC5PN □ | | 47nF | 25 | ±10% | 0.95 | |
| 16 | CL21B473KBC5PN □ | | 47nF | 50 | ±10% | 0.95 | |
| 17 | CL21B473KCC5PN □ | | 47nF | 100 | ±10% | 0.95 | |
| 18 | CL21B683KAC5PN □ | | 68nF | 25 | ±10% | 0.95 | |
| 19 | CL21B683KBC5PN □ | | 68nF | 50 | ±10% | 0.95 | |
| 20 | CL21B683KCC5PN □ | | 68nF | 100 | ±10% | 0.95 | |
| 21 | CL21B104KOC5PN □ | | 100nF | 16 | ±10% | 0.95 | |
| 22 | CL21B104KAC5PN □ | | 100nF | 25 | ±10% | 0.95 | |
| 23 | CL21B104KBC5PN □ | | 100nF | 50 | ±10% | 0.95 | |
| 24 | CL21B104KBF5PN □ | | 100nF | 50 | ±10% | 1.35 | |
| 25 | CL21B104KCC5PN □ | | 100nF | 100 | ±10% | 0.95 | |
| 26 | CL21B104KCF5PN □ | | 100nF | 100 | ±10% | 1.35 | |
| 27 | CL21B154KOF4PN □ | | 150nF | 16 | ±10% | 1.35 | |
| 28 | CL21B154KAF4PN □ | | 150nF | 25 | ±10% | 1.35 | |
| 29 | CL21B154KBF4PN □ | | 150nF | 50 | ±10% | 1.35 | |
| 30 | CL21B224KOF4PN □ | | 220nF | 16 | ±10% | 1.35 | |
| 31 | CL21B224KAF4PN □ | | 220nF | 25 | ±10% | 1.35 | |
| 32 | CL21B224KBF4PN □ | | 220nF | 50 | ±10% | 1.35 | |
| 33 | CL21B334KOF4PN □ | | 330nF | 16 | ±10% | 1.35 | |
| 34 | CL21B334KAF4PN □ | | 330nF | 25 | ±10% | 1.35 | |
| 35 | CL21B334KBF4PN □ | | 330nF | 50 | ±10% | 1.35 | |
| 36 | CL21B474KOF4PN □ | | 470nF | 16 | ±10% | 1.35 | |
| 37 | CL21B474KAF4PN □ | | 470nF | 25 | ±10% | 1.35 | |
| 38 | CL21B474KBF4PN □ | | 470nF | 50 | ±10% | 1.35 | |
| 39 | CL21B684KOF4PN □ | | 680nF | 16 | ±10% | 1.35 | |
| 40 | CL21B684KAF4PN □ | | 680nF | 25 | ±10% | 1.35 | |
| 41 | CL21B105KOF4PN □ | | 1μF | 16 | ±10% | 1.35 | |
| 42 | CL21B105KAF4PN □ | | 1μF | 25 | ±10% | 1.35 | |
| 43 | CL21B225KOF4PN □ | | 2.2μF | 16 | ±10% | 1.35 | |
| 1 | CL31B104KBC5PN □ | | 3.20×1.60 | 100nF | 50 | ±10% | 1.00 |
| 2 | CL31B154KBP5PN □ | | | 150nF | 50 | ±10% | 1.25 |
| 3 | CL31B224KAC5PN □ | | | 220nF | 25 | ±10% | 1.00 |
| 4 | CL31B224KBP5PN □ | | | 220nF | 50 | ±10% | 1.25 |
| 5 | CL31B334KAC5PN □ | | | 330nF | 25 | ±10% | 1.00 |
| 6 | CL31B334KBH5PN □ | | | 330nF | 50 | ±10% | 1.80 |
| 7 | CL31B474KAC5PN □ | | | 470nF | 25 | ±10% | 1.00 |
| 8 | CL31B474KBH5PN □ | | | 470nF | 50 | ±10% | 1.80 |
| 9 | CL31B684KAP5PN □ | | | 680nF | 25 | ±10% | 1.25 |
| 10 | CL31B684KBH5PN □ | | | 680nF | 50 | ±10% | 1.80 |
| 11 | CL31B105KOP5PN □ | | | 1μF | 16 | ±10% | 1.25 |
| 12 | CL31B105KAP5PN □ | | | 1μF | 25 | ±10% | 1.25 |
| 13 | CL31B105KBH5PN □ | 1μF | | 50 | ±10% | 1.80 | |
| 14 | CL31B155KOH4PN □ | 1.5μF | | 16 | ±10% | 1.80 | |
| 15 | CL31B155KAH4PN □ | 1.5μF | | 25 | ±10% | 1.80 | |
| 16 | CL31B155KBH4PN □ | 1.5μF | | 50 | ±10% | 1.80 | |
| 17 | CL31B225KOH4PN □ | 2.2μF | | 16 | ±10% | 1.80 | |
| 18 | CL31B225KAH4PN □ | 2.2μF | | 25 | ±10% | 1.80 | |
| 19 | CL31B225KBH4PN □ | 2.2μF | | 50 | ±10% | 1.80 | |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting



Reliability Test Condition (Automotive Capacitors)

| No | Item | Performance | Test Condition | |
|----|-------------------------------------|--|---------------------------------|--|
| 1 | Pre-and Post-Stress Electrical Test | - | | |
| 2 | High Temperature Exposure | Appearance | No abnormal exterior appearance | |
| | | Capacitance Change | CLASS I | Within $\pm 2.5\%$ or $0.25\mu\text{F}$, (Whichever is larger) |
| | | | CLASS II | Within $\pm 10\%$ |
| | | Q | CLASS I | Capacitance $\geq 30\mu\text{F}$: $Q \geq 1,000$ $< 30\mu\text{F}$: $Q \geq 400 + 20 \times C$ (C : Capacitance) |
| | | Tan δ | CLASS II | Rated Voltage $\geq 25\text{V}$: 0.03 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max |
| IR | | More than $10,000 \text{M}\Omega$ or $500 \text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) | | |
| 3 | Temperature Cycling | Appearance | No abnormal exterior appearance | |
| | | Capacitance Change | CLASS I | Within $\pm 2.5\%$ or $0.25\mu\text{F}$, (Whichever is larger) |
| | | | CLASS II | Within $\pm 10\%$ |
| | | Q | CLASS I | Capacitance $\geq 30\mu\text{F}$: $Q \geq 1,000$ $< 30\mu\text{F}$: $Q \geq 400 + 20 \times C$ (C : Capacitance) |
| | | Tan δ | CLASS II | Rated Voltage $\geq 25\text{V}$: 0.03 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max |
| IR | | More than $10,000 \text{M}\Omega$ or $500 \text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) | | |
| 4 | Destructive Physical Analysis | No defects or abnormalities | Per EIA 469 | |
| 5 | Moisture Resistance | Appearance | No abnormal exterior appearance | |
| | | Capacitance Change | CLASS I | Within $\pm 2.5\%$ or $0.25\mu\text{F}$, (Whichever is larger) |
| | | | CLASS II | Within $\pm 12.5\%$ |
| | | Q | CLASS I | Capacitance $\geq 30\mu\text{F}$: $Q \geq 350$ $10 \leq \text{Capacitance} < 30\mu\text{F}$: $Q \geq 275 + (5/2) \times C$ Capacitance $< 10\mu\text{F}$: $Q \geq 200 + 10 \times C$ (C : Capacitance) |
| | | Tan δ | CLASS II | Rated Voltage $\geq 25\text{V}$: 0.03 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max |
| IR | | More than $10,000 \text{M}\Omega$ or $500 \text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) | | |

1000Cycles
Measurement at 24 ± 2 hrs after test conclusion

| Step | Temperature(°C) | Time(min.) |
|------|------------------------------|------------|
| 1 | Min. operating Temp. ± 2 | 15 ± 3 |
| 2 | 25 ± 2 | 1 |
| 3 | Max. operating Temp. ± 2 | 15 ± 3 |
| 4 | 25 ± 2 | 1 |

The graph shows a temperature and humidity cycle over 24 hours. The y-axis represents temperature in degrees Celsius (0 to 80) and the x-axis represents time in hours (0 to 24). The cycle consists of four 6-hour segments. Each segment starts with a 2-hour ramp up from 25°C to 65°C, followed by a 4-hour dwell at 65°C with 90-100% RH. The temperature then ramps down to 25°C over the next 2 hours. The cycle repeats three times, with the final dwell at 80-100% RH.

| No | Item | Performance | Test Condition | |
|----|---------------------------------|--|---------------------------------|--|
| 6 | Biased Humidity | Appearance | No abnormal exterior appearance | |
| | | Capacitance Change | CLASS I | Within $\pm 2.5\%$ or $0.25\mu\text{F}$, (Whichever is larger) |
| | | | CLASS II | Within $\pm 12.5\%$ |
| | | Q | CLASS I | Capacitance $\geq 30\mu\text{F}$: $Q \geq 200$ $< 30\mu\text{F}$: $Q \geq 100 + (10/3) \times C$ (C : Capacitance) |
| | | Tan δ | CLASS II | Rated Voltage $\geq 25\text{V}$: 0.035 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max |
| IR | | More than $500\mu\Omega$ or $25\mu\Omega \times \mu\text{F}$ (Whichever is Smaller) | | |
| 7 | High Temperature Operating Life | Appearance | No abnormal exterior appearance | |
| | | Capacitance Change | CLASS I | Within $\pm 3.0\%$ or $0.3\mu\text{F}$, (Whichever is larger) |
| | | | CLASS II | Within $\pm 12.5\%$ |
| | | Q | CLASS I | Capacitance $\geq 30\mu\text{F}$: $Q \geq 350$ $\geq 10\mu\text{F}$: $Q \geq 275 + (5/2) \times C$ $< 10\mu\text{F}$: $Q \geq 200 + 10 \times C$ (C : Capacitance) |
| | | Tan δ | CLASS II | Rated Voltage $\geq 25\text{V}$: 0.035 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max |
| IR | | More than $1,000\mu\Omega$ or $50\mu\Omega \times \mu\text{F}$ (Whichever is smaller) | | |
| 8 | External Visual | No abnormal exterior appearance | Microscope (x10) | |
| 9 | Physical Dimensions | Within the specified dimensions | Using the calipers | |
| 10 | Mechanical Shock | Appearance | No abnormal exterior appearance | |
| | | Capacitance Change | CLASS I | Within $\pm 2.5\%$ or $0.25\mu\text{F}$, (Whichever is larger) |
| | | | CLASS II | Within $\pm 10\%$ |
| | | Q | CLASS I | Capacitance $\geq 30\mu\text{F}$: $Q \geq 1,000$ $< 30\mu\text{F}$: $Q \geq 400 + 20 \times C$ (C : Capacitance) |
| | | Tan δ | CLASS II | Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05 max |
| IR | | More than $10,000\mu\Omega$ or $500\mu\Omega \times \mu\text{F}$ (Whichever is smaller) | | |

| Peakvalue | Duration | Wave |
|-----------|----------|-----------|
| 1,500G | 0.5ms | Half sine |

- Part Numbering System
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- Low ESL Capacitors
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- Premium Capacitors for Automotive Applications
- Packaging Specification
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| No | Item | Performance | Test Condition | |
|----|--------------------|---|--|--|
| 11 | Appearance | No abnormal exterior appearance | 5g's for 20min., 12cycles each of 3 orientations, Use 8" x5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000 Hz. | |
| | Capacitance Change | CLASS I | | Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger) |
| | | CLASS II | | Within $\pm 10\%$ |
| | Q | CLASS I | | Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance) |
| | Tan δ | CLASS II | | Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max |
| IR | | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) | | |
| 12 | Appearance | No abnormal exterior appearance | Solder pot : $260 \pm 5^\circ\text{C}$, $10 \pm 1\text{sec}$. | |
| | Capacitance Change | CLASS I | | Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger) |
| | | CLASS II | | Within $\pm 10\%$ |
| | Q | CLASS I | | Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance) |
| | Tan δ | CLASS II | | Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max |
| IR | | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) | | |
| 13 | Appearance | No abnormal exterior appearance | -55 $^\circ\text{C}$ /+125 $^\circ\text{C}$ Note: Number of cycles required - 300, Maximum transfer time-20 sec, Dwell time-15min. Air-Air | |
| | Capacitance Change | CLASS I | | Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger) |
| | | CLASS II | | Within $\pm 10\%$ |
| | Q | CLASS I | | Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance) |
| | Tan δ | CLASS II | | Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max |
| IR | | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) | | |
| 14 | Appearance | No abnormal exterior appearance | AEC-Q200-002 | |
| | Capacitance Change | CLASS I | | Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger) |
| | | CLASS II | | Within $\pm 10\%$ |
| | Q | CLASS I | | Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance) |
| | Tan δ | CLASS II | | Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max |
| IR | | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) | | |

| No | Item | Performance | Test Condition | | | | | | | | | | | | | | | | | | |
|---|--|---|---|---|-------------|-----------------|-----------|---------|----------|-------------|-----------|--------------------------|-------------|---------------|----------|---------|-------------|--------------------------|---------|--------------|---------------|
| 15 | Solderability | 95% of the terminations is to be soldered evenly and continuously | a) Preheat at 155 °C for 4 hours, Immerse in solder for 5s at 235 ± 5 °C b) Steam aging for 8 hours, Immerse in solder for 5s at 235 ± 5 °C c) Steam aging for 8 hours, Immerse in solder for 120s at 260 ± 5 °C solder : a solution ethanol and rosin | | | | | | | | | | | | | | | | | | |
| 16 | Electrical Characterization | Capacitance | Within specified tolerance | | | | | | | | | | | | | | | | | | |
| | | Q | CLASS I Capacitance ≥ 30pF : Q ≥ 1,000 < 30pF : Q ≥ 400 + 20 × C (C : Capacitance) | | | | | | | | | | | | | | | | | | |
| | | Tanδ | CLASS II Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max | | | | | | | | | | | | | | | | | | |
| | | IR@25 °C | CLASS I | More than 100,000 MΩ or 1,000 MΩ × μF (Whichever is smaller) | | | | | | | | | | | | | | | | | |
| | | | CLASS II | More than 10,000 MΩ or 500 MΩ × μF (Whichever is smaller) | | | | | | | | | | | | | | | | | |
| | | IR@125 °C | CLASS I | More than 10,000 MΩ or 100 MΩ × μF (Whichever is smaller) | | | | | | | | | | | | | | | | | |
| CLASS II | More than 1,000 MΩ or 10 MΩ × μF (Whichever is smaller) | | | | | | | | | | | | | | | | | | | | |
| Dielectric Strength | No dielectric breakdown or mechanical breakdown | | | | | | | | | | | | | | | | | | | | |
| The Capacitance /D.F. should be measured at 25 °C, | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Class</th> <th>Capacitance</th> <th>Frequency</th> <th>Vrms</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Class I</td> <td>1000pF ↓</td> <td>1 kHz ± 10%</td> <td>0.5~5Vrms</td> </tr> <tr> <td>1000pF ↑</td> <td>1 kHz ± 10%</td> <td>1.0 ± 0.2Vrms</td> </tr> <tr> <td rowspan="2">Class II</td> <td>10 μF ↓</td> <td>1 kHz ± 10%</td> <td>1.0 ± 0.2Vrms</td> </tr> <tr> <td>10 μF ↑</td> <td>120 Hz ± 20%</td> <td>0.5 ± 0.1Vrms</td> </tr> </tbody> </table> | | | | Class | Capacitance | Frequency | Vrms | Class I | 1000pF ↓ | 1 kHz ± 10% | 0.5~5Vrms | 1000pF ↑ | 1 kHz ± 10% | 1.0 ± 0.2Vrms | Class II | 10 μF ↓ | 1 kHz ± 10% | 1.0 ± 0.2Vrms | 10 μF ↑ | 120 Hz ± 20% | 0.5 ± 0.1Vrms |
| Class | Capacitance | Frequency | Vrms | | | | | | | | | | | | | | | | | | |
| Class I | 1000pF ↓ | 1 kHz ± 10% | 0.5~5Vrms | | | | | | | | | | | | | | | | | | |
| | 1000pF ↑ | 1 kHz ± 10% | 1.0 ± 0.2Vrms | | | | | | | | | | | | | | | | | | |
| Class II | 10 μF ↓ | 1 kHz ± 10% | 1.0 ± 0.2Vrms | | | | | | | | | | | | | | | | | | |
| | 10 μF ↑ | 120 Hz ± 20% | 0.5 ± 0.1Vrms | | | | | | | | | | | | | | | | | | |
| I.R. should be measured with a DC voltage not exceeding Rated Voltage @25 °C, @125 °C for 60~120 sec. | | | | | | | | | | | | | | | | | | | | | |
| Dielectric Strength : 250% of the rated voltage for 1~5 seconds The charge/discharge current is less than 50mA. | | | | | | | | | | | | | | | | | | | | | |
| 17 | Board Flex | Appearance | No abnormal exterior appearance | | | | | | | | | | | | | | | | | | |
| | | Capacitance Change | CLASS I Within ± 5.0% or 0.5pF, (Whichever is larger) | | | | | | | | | | | | | | | | | | |
| | | | CLASS II Within ± 10% | | | | | | | | | | | | | | | | | | |
| Bending to the limit for 5 seconds Limit : Class I - 3mm Class II - 2mm | | | | | | | | | | | | | | | | | | | | | |
| 18 | Terminal Strength(SMD) | Appearance | No abnormal exterior appearance | | | | | | | | | | | | | | | | | | |
| | | Capacitance Change | CLASS I Within ± 2.5% or 0.25pF, (Whichever is larger) | | | | | | | | | | | | | | | | | | |
| | | | CLASS II Within ± 10% | | | | | | | | | | | | | | | | | | |
| 18N, for 60 ± 1 sec. * 0603(1608) -10N, 0402(1005) -2N | | | | | | | | | | | | | | | | | | | | | |
| 19 | Beam Load | Destruction value should be exceed Chip Length ≤ 2.5mm a) Chip Thickness > 0.5mm : 20N b) Chip Thickness ≤ 0.5mm : 8N Chip Length ≥ 3.2mm a) Chip Thickness ≥ 1.25mm : 54.5N b) Chip Thickness < 1.25mm : 15N | Beam speed Chip Length ≤ 2.5mm, 0.5 ± 0.05 mm/sec Chip Length ≥ 3.2mm, 2.5 ± 0.25 mm/sec | | | | | | | | | | | | | | | | | | |
| 20 | Capacitance Temperature Characteristics | Capacitance Change | CLASS I 0 ± 30 ppm/°C | | | | | | | | | | | | | | | | | | |
| | | | CLASS II Within ± 15% | | | | | | | | | | | | | | | | | | |
| | | Temperature Coefficient | CLASS I 0 ± 30 ppm/°C | | | | | | | | | | | | | | | | | | |
| | | Capacitance Drift | CLASS I Within ± 0.2% or 0.05pF, (Whichever is larger) | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> <th>Time(min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25 ± 2</td> <td>1</td> </tr> <tr> <td>2</td> <td>Min. Operating Temp. ± 2</td> <td>15 ± 3</td> </tr> <tr> <td>3</td> <td>25 ± 2</td> <td>1</td> </tr> <tr> <td>4</td> <td>Max. Operating Temp. ± 2</td> <td>15 ± 3</td> </tr> <tr> <td>5</td> <td>25 ± 2</td> <td>1</td> </tr> </tbody> </table> | | | Step | Temperature(°C) | Time(min) | 1 | 25 ± 2 | 1 | 2 | Min. Operating Temp. ± 2 | 15 ± 3 | 3 | 25 ± 2 | 1 | 4 | Max. Operating Temp. ± 2 | 15 ± 3 | 5 | 25 ± 2 |
| Step | Temperature(°C) | Time(min) | | | | | | | | | | | | | | | | | | | |
| 1 | 25 ± 2 | 1 | | | | | | | | | | | | | | | | | | | |
| 2 | Min. Operating Temp. ± 2 | 15 ± 3 | | | | | | | | | | | | | | | | | | | |
| 3 | 25 ± 2 | 1 | | | | | | | | | | | | | | | | | | | |
| 4 | Max. Operating Temp. ± 2 | 15 ± 3 | | | | | | | | | | | | | | | | | | | |
| 5 | 25 ± 2 | 1 | | | | | | | | | | | | | | | | | | | |

* If you want more detailed information, Please Visit Samsung Electro-mechanics website(www.semclcr.com)

- Part Numbering System
- General Capacitors
- High Capacitance Capacitors
- Super Small Size Capacitors
- Medium-High Voltage Capacitors
- Array Type Capacitors
- Low ESL Capacitors
- Reliability Test Condition
- Premium Capacitors for Automotive Applications
- Packaging Specification
- Application Manual for Surface Mounting