### C0G/NP0 (F) Ultra Stable High Temperature (up to 160°C)

- **Operating temperature range:** -55°C to 160°C
- **Temperature coefficient:** 0 ±30 ppm/°C
- **Dissipation factor:** 0.1% max @ 25°C
- **Insulation resistance:**
  - @25°C: ≥1000Ω or >1000μF whichever is less
  - @125°C: >10μΩ or >1000μF whichever is less
- **Dielectric withstanding voltage:**
  - ≤200V: 250% or 500V whichever is greater
  - 201-500V: 150% or 500V whichever is greater
  - >500V: 120% or 750V whichever is greater
- **Ageing rate:** 0% per decade
- **Test parameters:**
  - 1KHz, 1.0 ±0.2 VRMS, 25°C
  - 1MHz for Capacitance ≤100pF

### C0G/NP0 (M) Ultra Stable Non Magnetic

- **Operating temperature range:** -55°C to 125°C
- **Temperature coefficient:** 0 ±30 ppm/°C
- **Dissipation factor:** 0.1% max @ 25°C
- **Insulation resistance:**
  - @125°C: >1000W or >10000W whichever is less
  - >10W or >1000W whichever is less
- **Dielectric withstanding voltage:**
  - ≤200V: 250% or 500V whichever is greater
  - 201-500V: 150% or 500V whichever is greater
  - >500V: 120% or 750V whichever is greater
- **Ageing rate:** 0% per decade
- **Test parameters:**
  - 1KHz, 1.0 ±0.2 VRMS, 25°C
  - 1MHz for Capacitance ≤100pF

### C0G/NP0 (D) Ultra Stable High Temperature (up to 200°C)

- **Operating temperature range:** -55°C to 200°C
- **Temperature coefficient:** 0 ±30 ppm/°C
- **Dissipation factor:** 0.1% Max.
- **Insulation resistance:**
  - @25°C: >1000Ω or >1000μF whichever is less
  - @125°C: >1μΩ or >10μF whichever is less
- **Dielectric withstanding voltage:**
  - ≤200V: 250% or 500V whichever is greater
  - 201-500V: 150% or 500V whichever is greater
  - >500V: 120% or 750V whichever is greater
- **Ageing rate:** 0% per decade
- **Test parameters:**
  - 1KHz, 1.0 ±0.2 VRMS, 25°C
  - 1MHz for Capacitance ≤100pF

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**Dielectric Characteristics**

**R3L (K) Ultra Stable**
- Operating temperature range: -55°C to 125°C
- Temperature coefficient: -2200 ±500 ppm/°C
- Dissipation factor: 0.1% max @ 25°C
- Insulation resistance @25°C: >10000Ω or >100000Ω whichever is less
- Temperature coefficient: -2200 ±500 ppm/°C
- Dielectric withstand voltage: 250% or 500V whichever is greater
- Ageing rate: 0% per decade
- Test parameters: 1KHz, 1.0 ±0.2 VRMS, 25°C

**R2D (R) Pulse Energy**
- Operating temperature range: -55°C to 200°C
- Temperature coefficient: -2200 ±500 ppm/°C
- Dissipation factor: 0.1% max @ 25°C
- Insulation resistance @25°C: >100GΩ or >1000GΩ whichever is less
- Temperature coefficient: -2200 ±500 ppm/°C
- Dielectric withstand voltage: 120%
- Ageing rate: 0% per decade
- Test parameters: 1KHz, 1.0 ±0.2 VRMS, 25°C

**Y5V (Y) General Purpose**
- Operating temperature range: -30°C to 85°C
- Temperature coefficient: +22% -56% AC Max.
- Dissipation factor: >25V rating: 5.0% max
- Insulation resistance @25%: >10GΩ or >100GΩ whichever is less
- Temperature coefficient: +22% -56% AC Max.
- Dielectric withstand voltage: 250% or 500V whichever is greater
- Ageing rate: 4.0% per decade
- Test parameters: 1KHz, 1.0 ±0.2 VRMS, 25°C

**Z5U (Z) General Purpose**
- Operating temperature range: +10°C to 85°C
- Temperature coefficient: +22% -56% AC Max.
- Dissipation factor: 4.0% max @ 25°C
- Insulation resistance @25%: >10GΩ or >100GΩ whichever is less
- Temperature coefficient: +22% -56% AC Max.
- Dielectric withstand voltage: 250% or 500V whichever is greater
- Ageing rate: 4.0% per decade
- Test parameters: 1KHz, 0.5 ±0.2 VRMS, 25°C
**X7R (B) Stable and RoHS 2013 (RB) type**

- **Operating temperature range:** -55°C to 125°C
- **Temperature coefficient:** ±15% ΔC Max.
- **Dissipation factor**
  - >25V rating: 2.5% max
  - ≤25V rating: 3.5% max
- **Insulation resistance:**
  - @25°C: >1000Ω or >1000μF whichever is less
  - @125°C: >100Ω or >10μF whichever is less
- **Dielectric withstanding voltage**
  - ≤200V: 250%
  - 201-500V: 150% or 500V whichever is greater
  - >500V: 120% or 750V whichever is greater
- **Ageing rate:** <2.0% per decade
- **Test parameters:** 1KHz, 1.0 ±0.2 VRMS, 25°C

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**X7R (C) Stable Non Magnetic**

- **Operating temperature range:** -55°C to 125°C
- **Temperature coefficient:** ±15% ΔC Max.
- **Dissipation factor**
  - >25V rating: 2.5% max
  - ≤25V rating: 3.5% max
- **Insulation resistance:**
  - @25°C: >1000Ω or >1000μF whichever is less
  - @125°C: >100Ω or >10μF whichever is less
- **Dielectric withstanding voltage**
  - ≤200V: 250%
  - 201-500V: 150% or 500V whichever is greater
  - >500V: 120% or 750V whichever is greater
- **Ageing rate:** <2.0% per decade
- **Test parameters:** 1KHz, 1.0 ±0.2 VRMS, 25°C

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**BX (X) Stable**

- **Operating temperature range:** -55°C to 125°C
- **Temperature coefficient:** ±15% ΔC Max.
- **Temp-voltage coefficient:** +15% -25% ΔC Max.
- **Dissipation factor**
  - >25V rating: 2.5% max
  - ≤25V rating: 3.5% max
- **Insulation resistance:**
  - @25°C: >1000Ω or >1000μF whichever is less
  - @125°C: >100Ω or >10μF whichever is less
- **Dielectric withstanding voltage**
  - ≤200V: 250%
  - 201-500V: 150% or 500V whichever is greater
  - >500V: 120% or 750V whichever is greater
- **Ageing rate:** <2.0% per decade
- **Test parameters:** 1KHz, 1.0 ±0.2 VRMS, 25°C

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**X8R (S) Stable**

- **Operating temperature range:** -55°C to 150°C
- **Temp. coefficient ≤150°C:** ±15% ΔC Max.
- **Dissipation factor**
  - >25V rating: 2.5% max
  - ≤25V rating: 3.5% max
- **Insulation resistance:**
  - @25°C: >1000Ω or >1000μF whichever is less
  - @150°C: >100Ω or >10μF whichever is less
- **Dielectric withstanding voltage**
  - ≤200V: 250%
  - 201-500V: 150% or 500V whichever is greater
  - >500V: 120% or 750V whichever is greater
- **Ageing rate:** <2.0% per decade
- **Test parameters:** 1KHz, 1.0 ±0.2 VRMS, 25°C
### Class II (G) Stable High Temperature (up to 160°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>-55°C to 160°C</td>
</tr>
<tr>
<td>Temperature coefficient up to 160°C</td>
<td>+15 -40% ΔC Max.</td>
</tr>
<tr>
<td>Dissipation factor @ 25°C</td>
<td>2.5% Max.</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>@25°C: &gt;100GΩ or &gt;1000MΩ whichever is less&lt;br&gt;@160°C: &gt;1GΩ or &gt;10GΩ whichever is less</td>
</tr>
<tr>
<td>Dielectric withstanding voltage</td>
<td>&lt;200V: 250%&lt;br&gt;20-500V: 150% or 500V whichever is greater&lt;br&gt;500V: 120% or 750V whichever is greater</td>
</tr>
<tr>
<td>Ageing rate</td>
<td>&lt; 2.0% per decade</td>
</tr>
<tr>
<td>Test parameters</td>
<td>1KHz, 1.0 ±0.2 VRMS, 25°C</td>
</tr>
</tbody>
</table>

### Class II (E) Stable High Temperature (up to 200°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>-55°C to 200°C</td>
</tr>
<tr>
<td>Temperature coefficient up to 200°C</td>
<td>+15 -65% ΔC Max.</td>
</tr>
<tr>
<td>Dissipation factor @ 25°C</td>
<td>2.5% Max.</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>@25°C: &gt;100GΩ or &gt;1000MΩ whichever is less&lt;br&gt;@200°C: &gt;1GΩ or &gt;10GΩ whichever is less</td>
</tr>
<tr>
<td>Dielectric withstanding voltage</td>
<td>&lt;200V: 250%&lt;br&gt;20-500V: 150% or 500V whichever is greater&lt;br&gt;500V: 120% or 750V whichever is greater</td>
</tr>
<tr>
<td>Ageing rate</td>
<td>&lt; 2.0% per decade</td>
</tr>
<tr>
<td>Test parameters</td>
<td>1KHz, 1.0 ±0.2 VRMS, 25°C</td>
</tr>
</tbody>
</table>

### X5R (W) Stable

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>-55°C to 85°C</td>
</tr>
<tr>
<td>Temperature coefficient up to 200°C</td>
<td>±15% ΔC Max.</td>
</tr>
<tr>
<td>Dissipation factor @ 25°C</td>
<td>5% Max.</td>
</tr>
<tr>
<td>Insulation resistance @25°C</td>
<td>&gt;10GΩ or &gt;500GΩ whichever is less</td>
</tr>
<tr>
<td>Dielectric withstanding voltage</td>
<td>250%</td>
</tr>
<tr>
<td>Ageing rate</td>
<td>&lt; 5.0% per decade</td>
</tr>
<tr>
<td>Test parameters: Except 22µF, 47µF &amp; 100µF</td>
<td>1KHz, 1.0 ±0.2 VRMS, 25°C&lt;br&gt;120KHz, 0.5 ±0.1 VRMS, 25°C</td>
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</tbody>
</table>