FILMTRIM® PLASTIC DIELECTRIC CAPACITORS

TYPES
• Six Dielectrics:
  - High temperature PTFE
  - Standard PTFE
  - Polypropylene
  - Polyimide
  - Polycarbonate
  - Polyphenyl sulfide
• SMD and lead-through-hole mounting
• Top, bottom and side mount models
• Wide capacitance ranges
• Compact sizes
• Low cost for commercial/industrial applications
• Linear capacitance change vs. rotation

APPLICATIONS
• Mobile Radios
• Transmitters
• Pagers
• Instruments
• Electronic Games
• Wireless Security and Fire Alarms
• CATV

MODIFICATIONS AND VARIATIONS AVAILABLE
• Special capacitance ranges
• Special terminal sizes and shapes
• Extended adjust shafts
• High temperature versions for PTFE
• Silver and/or gold plating

Sprague-Goodman Electronics, Inc.
1700 SHAMES DRIVE, WESTBURY, NY 11590
TEL: 516-334-8700 • FAX: 516-334-8771
E-MAIL: info@spraguegoodman.com
5 mm TOP ADJUST

FEATURES
- High temperature PTFE or polyimide (PI) dielectrics
- Compact size
- Linear capacitance change vs. rotation

SPECIFICATIONS
Voltage Rating: 150 VDC
Dielectric Withstanding Voltage: 300 VDC
Contact Resistance: 0.010 Ohms max
Insulation Resistance: $10^4$ megarms min
Torque: 15 to 200 g-cm (0.21 to 3 oz-in)

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### FEATURES
- High temperature PTFE or polyimide (PI) dielectrics
- Compact size
- Linear capacitance change vs. rotation

### SPECIFICATIONS
- **Voltage Rating**: 150 VDC
- **Dielectric Withstanding Voltage**: 300 VDC
- **Contact Resistance**: 0.010 Ohms max
- **Insulation Resistance**: $10^4$ megarms min
- **Torque**: 15 to 200 g-cm (0.21 to 3 oz-in)

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### ECONOMY 7 mm TOP ADJUST

**SPECIFICATIONS**
- **Operating Temperature Range**: -25°C to +85°C
- **Dielectric**: Polyphenyl Sulfide
- **Voltage Rating**: 50 VDC
- **Dielectric Withstanding Voltage**: 100 VDC
- **Insulation Resistance**: 500 megarms min
- **Torque**: 20 - 200 g-cm (0.28 - 2.8 oz-in)

**FEATURES**
- Low setting drift
- High Q
- Low cost
- Compact size

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### FEATURES
- Low setting drift
- High Q
- Low cost
- Compact size

### SPECIFICATIONS
- **Operating Temperature Range**: -25°C to +85°C
- **Dielectric**: Polyphenyl Sulfide
- **Voltage Rating**: 50 VDC
- **Dielectric Withstanding Voltage**: 100 VDC
- **Insulation Resistance**: 500 megarms min
- **Torque**: 20 - 200 g-cm (0.28 - 2.8 oz-in)
7 mm SURFACE MOUNT

FEATURES
- Low setting drift
- High Q
- Low cost
- Linear Capacitance change vs. rotation
- Compact size

SPECIFICATIONS
- Q min (at 10 MHz): 1000
- Operating Temperature Range: -25°C to +85°C
- Dielectric: PTFE
- TCC: N100 ± 100 ppm/°C
- Voltage Rating: 100 VDC
- Dielectric Withstanding Voltage: 200 VDC
- Insulation Resistance: 10⁴ megohms min
- Torque: 20-300 g-cm (0.28 - 4.2 oz-in)

All dimensions are in / mm.
7 mm SURFACE MOUNT NONMAGNETIC

FEATURES
- Low setting drift
- High Q
- Low cost
- Linear Capacitance change vs. rotation
- Compact size

SPECIFICATIONS
- Relative Permeability: 1.0025 max
- Q min (at 10 MHz): 1000
- Operating Temperature Range: -25°C to +85°C
- Dielectric: PTFE
- TCC: N100 ± 100 ppm/°C
- Voltage Rating: 100 VDC
- Dielectric Withstanding Voltage: 200 VDC
- Insulation Resistance: 10⁴ megarohms min
- Torque: 20-300 g-cm (0.28 - 4.2 oz-in)

<table>
<thead>
<tr>
<th>Capacitance (pF)</th>
<th>'H’ max (in/mm)</th>
<th>Color Code</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>min</td>
<td>max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>4.5</td>
<td>0.087 / 2.2</td>
<td>Orange</td>
</tr>
<tr>
<td>0.6</td>
<td>9.0</td>
<td>0.087 / 2.2</td>
<td>Black</td>
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<tr>
<td>0.8</td>
<td>15.0</td>
<td>0.094 / 2.4</td>
<td>Blue</td>
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<tr>
<td>1.0</td>
<td>20.0</td>
<td>0.100 / 2.6</td>
<td>Green</td>
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</table>

All dimensions are in /mm.

CARRIER & REEL
## FEATURES
- Compact size
- High temperature PTFE dielectric
- Linear capacitance change vs. rotation

## SPECIFICATIONS
- Voltage Rating: 300 VDC
- Dielectric Withstanding Voltage: 500 VDC
- Contact Resistance: 0.010 Ohms max
- Insulation Resistance: $10^4$ megohms min
- Torque: 15 to 245 g-cm (0.21 to 3.4 oz-in)

### TABLE

<table>
<thead>
<tr>
<th>Dielectric</th>
<th>Capacitance (pF)</th>
<th>Q min (1MHz)</th>
<th>TCC (ppm/°C)</th>
<th>Operating Temperature (°C)</th>
<th>Color Code</th>
<th>Top/Bottom Adjust 2 Lead Model Number</th>
<th>Top/Bottom Adjust 3 Lead Model Number</th>
<th>Side Adjust Model Number</th>
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<tbody>
<tr>
<td>PTFE, High</td>
<td>1.0 - 3.5</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>Orange</td>
<td>GXE3R511</td>
<td>GXE3R501</td>
<td>GQX3R501</td>
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<tr>
<td>High Temp</td>
<td>1.8 - 10.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>White</td>
<td>GXE10011</td>
<td>GXE10001</td>
<td>GQX10001</td>
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<tr>
<td>Temp</td>
<td>2.5 - 18.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>Red</td>
<td>GXE18011</td>
<td>GXE18001</td>
<td>GQX18001</td>
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### DIAGRAMS
- Side Adjust Layouts
- 3 Lead and 2 Lead Mounting Hole Layouts

All dimensions are in / mm.
8 mm TOP/BOTTOM & SIDE ADJUST

SPECIFICATIONS
Voltage Rating: 200 VDC (High temp PTFE), 100 VDC (all others)
Dielectric Withstanding Voltage:
300 VDC (High temp PTFE), 200 VDC (all others)
Contact Resistance: 0.010 Ohms max
Insulation Resistance: $10^4$ megohms min
Torque: 15 to 250 g-cm (0.21 to 3.5 oz-in)

FEATURES
• Choice of dielectrics: High Temp PTFE, Standard PTFE, Polypropylene, or Polycarbonate
• Linear capacitance change vs. rotation

<table>
<thead>
<tr>
<th>Dielectric</th>
<th>Capacitance (pF) min</th>
<th>Capacitance (pF) max</th>
<th>Q min (1MHz)</th>
<th>Operating Temperature (°C)</th>
<th>'H' max</th>
<th>Color Code</th>
<th>Top/Bottom Adjust 3 Lead Model Number</th>
<th>Top/Bottom Adjust 3 Lead Model Number</th>
<th>Side Adjust Model Number</th>
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</thead>
<tbody>
<tr>
<td>PTFE High Temp</td>
<td>1.5 5.0</td>
<td>1500</td>
<td>0 ± 250</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Clear</td>
<td>GXE50000</td>
<td>GXE5002</td>
<td>GXR50000</td>
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<tr>
<td>PTFE</td>
<td>1.8 9.0</td>
<td>1500</td>
<td>0 ± 250</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Yellow</td>
<td>GXE90000</td>
<td>GXE9002</td>
<td>GXR90000</td>
</tr>
<tr>
<td>PTFE High Temp</td>
<td>2.6 18.0</td>
<td>1500</td>
<td>0 ± 250</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Green</td>
<td>GXE18000</td>
<td>GXE18002</td>
<td>GXR18000</td>
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<tr>
<td>PTFE</td>
<td>3.6 27.0</td>
<td>1500</td>
<td>0 ± 250</td>
<td>-40 to +125</td>
<td>449/14.14</td>
<td>Violet</td>
<td>GXE27000</td>
<td>GXE27002</td>
<td>GXR27000</td>
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<tr>
<td>PTFE High Temp</td>
<td>4.5 36.0</td>
<td>1500</td>
<td>0 ± 250</td>
<td>-40 to +125</td>
<td>449/14.14</td>
<td>Orange</td>
<td>GXE36000</td>
<td>GXE36002</td>
<td>GXR36000</td>
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<tr>
<td>PTFE</td>
<td>5.0 45.0</td>
<td>1500</td>
<td>0 ± 250</td>
<td>-40 to +125</td>
<td>449/14.14</td>
<td>Orange</td>
<td>GXE45000</td>
<td>GXE45002</td>
<td>GXR45000</td>
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<tr>
<td>PP</td>
<td>2.0 9.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Yellow</td>
<td>GYA90000</td>
<td>GYA9002</td>
<td>GYB90000</td>
</tr>
<tr>
<td>PP</td>
<td>2.0 10.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Red</td>
<td>GYA10000</td>
<td>GYA1002</td>
<td>GYB10000</td>
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<tr>
<td>PP</td>
<td>2.0 15.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Blue</td>
<td>GYA15000</td>
<td>GYA1502</td>
<td>GYB15000</td>
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<tr>
<td>PP</td>
<td>2.2 20.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Green</td>
<td>GYA20000</td>
<td>GYA2002</td>
<td>GYB20000</td>
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<tr>
<td>PP</td>
<td>2.3 22.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Red</td>
<td>GYA22000</td>
<td>GYA2202</td>
<td>GYB22000</td>
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<tr>
<td>PP</td>
<td>3.0 30.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Blue</td>
<td>GYA30000</td>
<td>GYA3002</td>
<td>GYB30000</td>
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<tr>
<td>PP</td>
<td>4.0 40.0</td>
<td>1500</td>
<td>0 ± 350</td>
<td>-40 to +125</td>
<td>402/10.2</td>
<td>Violet</td>
<td>GYA40000</td>
<td>GYA4002</td>
<td>GYB40000</td>
</tr>
<tr>
<td>PC</td>
<td>2.5 30.0</td>
<td>200</td>
<td>100 ± 300</td>
<td>-40 to +85</td>
<td>402/10.2</td>
<td>Red</td>
<td>GZA30000</td>
<td>GZA3002</td>
<td>GZB30000</td>
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<tr>
<td>PC</td>
<td>4.0 40.0</td>
<td>200</td>
<td>100 ± 300</td>
<td>-40 to +85</td>
<td>402/10.2</td>
<td>Violet</td>
<td>GZA40000</td>
<td>GZA4002</td>
<td>GZB40000</td>
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</tbody>
</table>

*Gold plated metal parts are standard on GXE and GXR models shown above.

All dimensions are in /mm.
FILMTRIM® PLASTIC DIELECTRIC CAPACITORS

SG-402H

10 mm TOP / BOTTOM & SIDE ADJUST

SPECIFICATIONS
Voltage Rating: 200 VDC (High temp PTFE), 100 VDC (all others)
Dielectric Withstanding Voltage: 300 VDC (High temp PTFE), 200 VDC (all others)
Contact Resistance: 0.010 Ohms max
Insulation Resistance: 10^4 megohms min
Torque: 15 to 360 g-cm (0.2 to 5 oz-in)

FEATURES
• Choice of dielectrics: High Temp PTFE, Standard PTFE, Polypropylene (PP), or Polycarbonate (PC)
• Linear capacitance change vs. rotation
• Wide capacitance ranges

Dielectric | Capacitance (pF) | Q min (1MHz) | TCC (ppm°C) | Operating Temperature (°C) | ‘H’ max in/mm | Color Code | Top/Bottom Model No. | Top/Bottom Model No. | Top/Bottom Model No. | Top/Bottom Model No. | Side Model No.
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
PTFE, High Temp | 2.5 | 15.0 | 1500 | 0 ± 250 | -40 to +125 | 0.402/10.2 | Red | GXF15000 | GXF15003 | GXF15004 | GXT15000
| 3.0 | 25.0 | 1500 | 0 ± 250 | -40 to +125 | 0.402/10.2 | Clear | GXF25000 | GXF25003 | GXF25004 | GXT25000
| 4.0 | 40.0 | 1500 | 0 ± 250 | -40 to +125 | 0.402/10.2 | Yellow | GXF40000 | GXF40003 | GXF40004 | GXT40000
| 5.5 | 60.0 | 1500 | 0 ± 250 | -40 to +125 | 0.449/11.4 | Blue | GXF60000 | GXF60003 | GXF60004 | GXT60000
| 6.0 | 75.0 | 1500 | 0 ± 250 | -40 to +125 | 0.449/11.4 | Violet | GXF75000 | GXF75003 | GXF75004 | GXT75000
| 6.5 | 90.0 | 1500 | 0 ± 250 | -40 to +125 | 0.488/12.4 | Orange | GXF90000 | GXF90003 | GXF90004 | GXT90000

PTFE | 2.0 | 13.0 | 1500 | 0 ± 400 | -40 to +85 | 0.402/10.2 | Blue | GX13000 | GX13003 | GX13004 | GXT13000
| 3.0 | 26.0 | 1500 | 0 ± 400 | -40 to +85 | 0.402/10.2 | Green | GX26000 | GX26003 | GX26004 | GXT26000
| 3.5 | 40.0 | 1500 | 0 ± 400 | -40 to +85 | 0.449/11.4 | Clear | GX38000 | GX38003 | GX38004 | GXT38000
| 4.0 | 65.0 | 1500 | 0 ± 400 | -40 to +85 | 0.449/11.4 | Yellow | GX60000 | GX60003 | GX60004 | GXT60000
| 5.0 | 90.0 | 1500 | 0 ± 400 | -40 to +85 | 0.488/12.4 | Orange | GX75000 | GX75003 | GX75004 | GXT75000
| 7.0 | 120.0 | 1500 | 0 ± 400 | -40 to +85 | 0.488/12.4 | Green | GX15000 | GX15003 | GX15004 | N/A

PP | 2.0 | 15.0 | 1000 | 0 ± 400 | -40 to +70 | 0.402/10.2 | Blue | GYC15000 | GYC15003 | GYC15004 | GYD15000
| 3.0 | 20.0 | 1000 | 0 ± 400 | -40 to +70 | 0.402/10.2 | Green | GYC20000 | GYC20003 | GYC20004 | GYD20000
| 3.5 | 40.0 | 1000 | 0 ± 400 | -40 to +70 | 0.402/10.2 | Clear | GYC38000 | GYC38003 | GYC38004 | GYD38000
| 4.5 | 65.0 | 1000 | 0 ± 400 | -40 to +70 | 0.402/10.2 | Yellow | GYC65000 | GYC65003 | GYC65004 | GYD65000

PC | 8.0 | 80.0 | 200 | 0 ± 200 | -40 to +85 | 0.402/10.2 | Red | GZC80000 | GZC80003 | GZC80004 | GZD80000
| 9.0 | 100.0 | 200 | 0 ± 200 | -40 to +85 | 0.402/10.2 | Clear | GZC10000 | GZC10003 | GZC10004 | GZD10000
| 9.0 | 120.0 | 200 | 0 ± 200 | -40 to +85 | 0.449/11.4 | Orange | GZC12000 | GZC12003 | GZC12004 | GZD12000
| 10.0 | 150.0 | 200 | 0 ± 200 | -40 to +85 | 0.472/12.0 | Orange | GZC15100 | GZC15103 | GZC15104 | GZD15100
| 12.0 | 180.0 | 200 | 0 ± 200 | -40 to +85 | 0.472/12.0 | Orange | GZC18100 | GZC18103 | GZC18104 | GZD18100

*Gold plated metal parts are standard on GXF and GXT models shown above.

All dimensions are in / mm.
11 X 13 mm TOP / BOTTOM ADJUST

FEATURES
- Housing protected
- High capacitance range
- Linear capacitance change vs. rotation

SPECIFICATIONS
Voltage Rating: 100 VDC
Dielectric Withstanding Voltage: 200 VDC
Contact Resistance: 0.010 Ohms max
Insulation Resistance: $10^4$ megohms min
Torque: 20 to 360 g-cm (0.28 to 5 oz-in)

<table>
<thead>
<tr>
<th>Dielectric</th>
<th>Capacitance (pF)</th>
<th>Q min</th>
<th>TCC (ppm/°C)</th>
<th>Operating Temperature (°C)</th>
<th>Color Code</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>15.0 to 30.0</td>
<td>200</td>
<td>0 ± 400</td>
<td>-40 to +85</td>
<td>Orange - 1dot</td>
<td>GZC23112</td>
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<tr>
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<td>30.0 to 43.0</td>
<td>150</td>
<td>0 ± 350</td>
<td>-40 to +85</td>
<td>Orange - 2dot</td>
<td>GZC43112</td>
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16 mm TOP / SIDE ADJUST

FEATURES
- Highest capacitance range
- Linear capacitance change vs. rotation

SPECIFICATIONS
Voltage Rating: 150 VDC
Dielectric Withstanding Voltage: 300 VDC
Contact Resistance: 0.010 Ohms max
Insulation Resistance: $10^4$ megohms min
Torque: 20 to 360 g-cm (0.28 to 5 oz-in)

<table>
<thead>
<tr>
<th>Dielectric</th>
<th>Capacitance (pF)</th>
<th>Q min</th>
<th>TCC (ppm/°C)</th>
<th>Operating Temperature (°C)</th>
<th>Color Code</th>
<th>Top Adjust Model Number</th>
<th>Side Adjust Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>9.0 to 18.0</td>
<td>200</td>
<td>0 ± 300</td>
<td>-40 to +85</td>
<td>Orange</td>
<td>GZN20100</td>
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<tr>
<td></td>
<td>18.0 to 30.0</td>
<td>200</td>
<td>0 ± 300</td>
<td>-40 to +85</td>
<td>Clear</td>
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<td>PI</td>
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All dimensions are in / mm.
PART NUMBERING SYSTEM

**GX**  
Dielectric Form Factor Cap Code (Top Adjust Models)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Industry Standard, i.e.</th>
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<tbody>
<tr>
<td>GC</td>
<td>PPS (Polyphenyl Sulfide)</td>
<td>A</td>
<td>8 mm Top/Bottom Adjust</td>
<td>1R6 = 1.6 pF, 400 = 40.0 pF, 301 = 300.0 pF</td>
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<tr>
<td>GSX**</td>
<td>PTFE (Polytetrafluoroethylene)</td>
<td>B</td>
<td>8 mm Side Adjust</td>
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<tr>
<td>GX</td>
<td>PTFE (Polytetrafluoroethylene)</td>
<td>C</td>
<td>10 mm Top/Bottom Adjust, 11x13 mm Top/Bottom Adjust</td>
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<tr>
<td>GY</td>
<td>PP (Polypropylene)</td>
<td>D</td>
<td>10 mm Side Adjust</td>
<td></td>
</tr>
<tr>
<td>GZ</td>
<td>PC or PI (Polycarbonate or Polyimide)</td>
<td>E</td>
<td>6x8 mm Top/Bottom Adjust, 8 mm Top/Bottom Adjust</td>
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<td>10 mm Top/Bottom Adjust</td>
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<td>P</td>
<td>16 mm Side Adjust</td>
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<td>6x8 mm Side Adjust</td>
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<td>R*</td>
<td>8 mm Side Adjust</td>
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<tr>
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<td>T*</td>
<td>10 mm Side Adjust</td>
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**A**  
Form Factor Cap Code (Top Adjust Models)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Modifications (Top Adjust Models)</th>
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<tbody>
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<td>01</td>
<td>6x8 mm, 2 leads,</td>
<td>01</td>
<td>6x8 mm, 2 leads,</td>
<td>GXE and GXQ series only</td>
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<td>02</td>
<td>8 mm, 2 leads</td>
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<td>only</td>
<td>03</td>
<td>10 mm, 3 lead, special</td>
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<td>04</td>
<td>10 mm, 2 leads</td>
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<td>6x8 mm, 3 leads</td>
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<td></td>
<td>12</td>
<td>11x13 mm, housing protected</td>
<td>(available on all 10 mm top and bottom adjust units)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>Ammo pack version for GCL only</td>
<td></td>
</tr>
</tbody>
</table>

**900**  
Cap Code (Top Adjust Models)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>01</td>
<td>6x8 mm, 2 leads,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>GXE and GXQ series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>02</td>
<td>8 mm, 2 leads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03</td>
<td>10 mm, 3 lead, special</td>
</tr>
<tr>
<td></td>
<td></td>
<td>04</td>
<td>10 mm, 2 leads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>6x8 mm, 3 leads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>11x13 mm, housing protected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>Ammo pack version for GCL only</td>
</tr>
</tbody>
</table>

* Extended temperature range: -40°C to +125°C
** GSX parts do not conform to part numbering system above.

For other modifications such as high temperature base material or special lead plating, contact factory.

**SPECIFICATION NOTES**

1. Parts are 100% tested for capacitance range and dielectric withstanding voltage.
2. Capacitance range specified is that which is guaranteed, and is measured at 1 MHz at room temperature.
3. Q factor is measured at maximum rated capacitance and at room temperature.
4. Dielectric strength is measured at maximum rated capacitance and room temperature, with test voltage (as listed for each model) applied for 60 seconds.
5. Insulation resistance is measured at maximum rated capacitance and room temperature and at rated voltage, unless otherwise specified.
6. Temperature coefficient of capacitance (TCC) is measured at 1 MHz over the operating temperature range, with capacitor set at maximum rated capacitance.
7. Axial load during tuning should not exceed 200 grams force. At maximum axial load, capacitance change is no more than 15%.
8. Capacitors should not be operated outside of rated capacitance range and working voltage.

**Soldering and Cleaning of FILMTRIM® Trimmer Capacitors**

**Soldering Methods**

1. Reflow soldering for GSX series
   - Pre-heat: 140°C ±10°C for 2 to 3 minutes.
   - Soldering: 200 to 250°C within 25 seconds.
   (Peak soldering temperature: 250°C maximum).
2. Dip soldering (does not apply to GSX models)
   - 260°C ±10°C for 7 seconds maximum.
3. Hand soldering (for lead-through-hole models)
   - Soldering: Tip temperature 350°C ±10°C for 3 to 4 seconds
4. Hand soldering (GSX models)
   - Preheating: Fully preheat on a hot plate with a surface temperature of 100 to 150°C
   - Soldering: 260°C ±10°C for 5 seconds maximum.

**Cleaning**

1. Water soluble fluxes and detergents with a water flush after soldering of the boards can be used for GX, GY and GZ models.
2. Do not immerse FILMTRIM models in chlorinated or fluorinated hydrocarbon solvents as this would adversely affect the plastic dielectrics and base materials. Some customers have successfully used GX models in scrubbers or sprayers where only the bottom of the printed circuit boards is exposed to solvents. If the process requires immersion in solvents for cleaning boards, the FILMTRIM capacitors should be hand soldered to board after the boards have been cleaned.