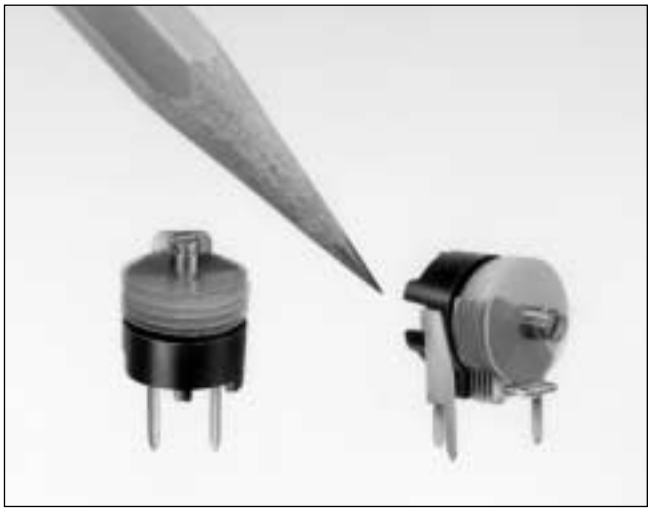
Sprague-Goodman

ENGINEERING BULLETIN
SG-402H.1
Supercedes SG-402G

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

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

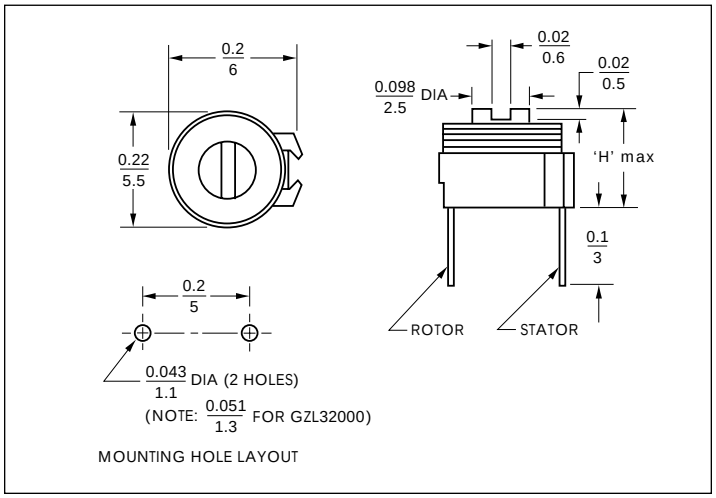
5mm TOP ADJUST

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 megohms min
Torque: 15 to 200 g-cm (0.21 to 3 oz-in)



All dimensions are in / mm.



Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm / °C)	Operating Temperature (°C)	'H' max in/mm	Color Code	Model Number
PTFE, High Temp	1.2	4.0	1500	0 ± 350	–40 to +125	0.20 / 5.0	Brown	GXL4R000
	1.8	10.0	1500	0 ± 300	–40 to +125	0.23 / 5.8	Black	GXL10000
	2.0	15.0	1500	0 ± 300	–40 to +125	0.24 / 6.0	White	GXL15000
	2.3	18.0	1500	0 ± 300	–40 to +125	0.24 / 6.0	Green	GXL18000
PI	1.2	5.0	150	0 ± 350	–40 to +85	0.20 / 5.0	Brown	GZL5R000
	1.4	10.0	150	0 ± 350	–40 to +85	0.20 / 5.0	Black	GZL10000
	2.0	15.0	150	0 ± 250	–40 to +85	0.23 / 5.8	White	GZL15000
	2.7	20.0	150	0 ± 250	–40 to +85	0.23 / 5.8	Green	GZL20000
	3.6	32.0	150	0 ± 250	–40 to +85	0.25 / 6.3	None	GZL32000

ECONOMY 7mm TOP ADJUST

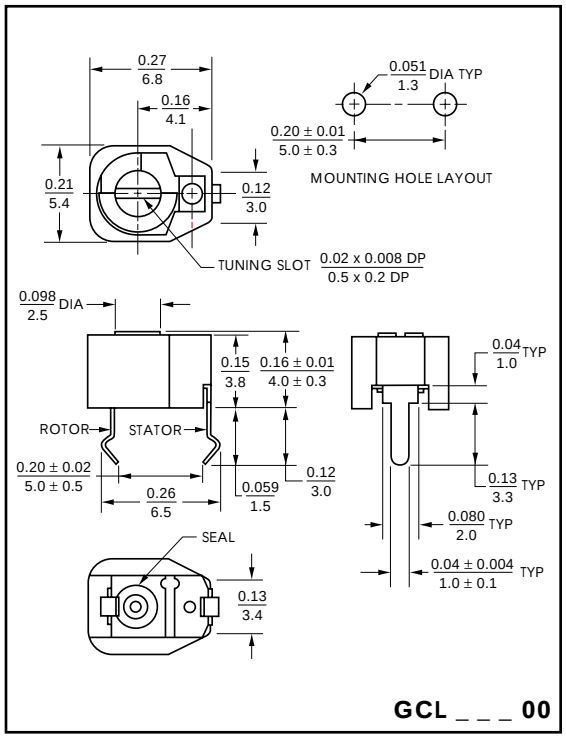
SPECIFICATIONS

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

FEATURES

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





Capacitance (pF) min	Capacitance (pF) max	TCC (ppm / °C)	Q min (1 MHz)	Color Code	Bulk Pack Model Number	Ammo Pack Model Number
0.7	10.0	350 ± 500	500	Brown	GCL10000	GCL10025
0.8	20.0	350 ± 500	500	Green	GCL20000	GCL20025
0.9	30.0	350 ± 500	500	Yellow	GCL30000	GCL30025
1.0	40.0	350 ± 500	500	Blue	GCL40000	GCL40025

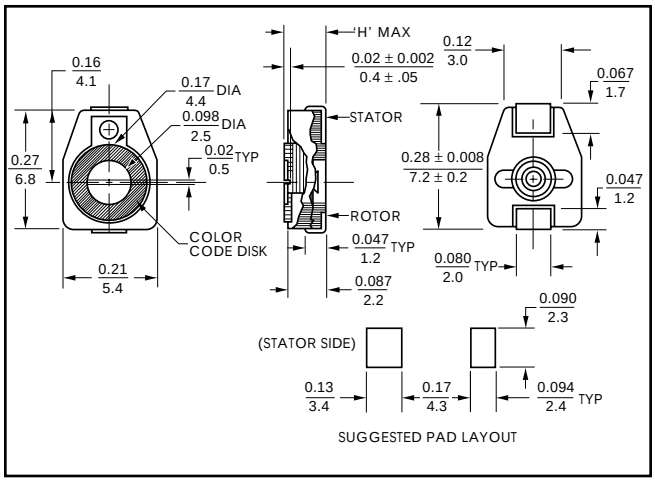
7 mm SURFACE MOUNT

FEATURES

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

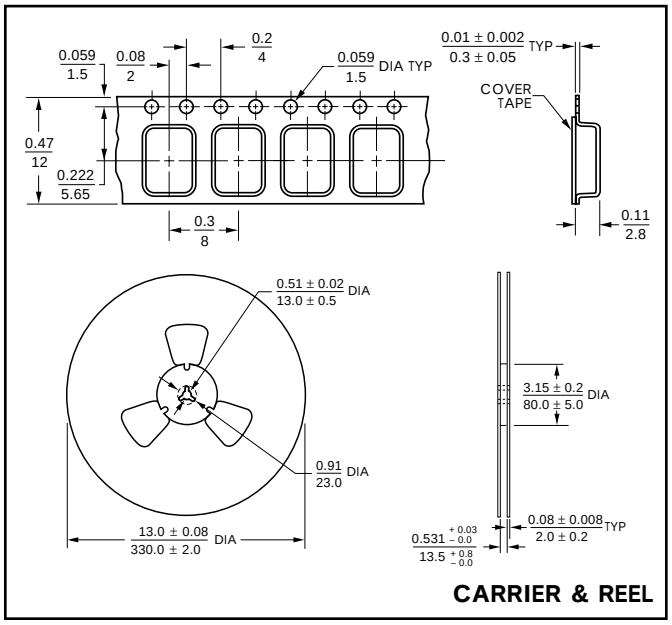


Capacitance (pF) min	Capacitance (pF) max	'H' max (in / mm)	Color Code	Model Number
0.5	4.5	0.087 / 2.2	Orange	GSX364
0.6	9.0	0.087 / 2.2	Black	GSX358
0.8	15.0	0.094 / 2.4	Blue	GSX365
1.0	20.0	0.100 / 2.6	Green	GSX366

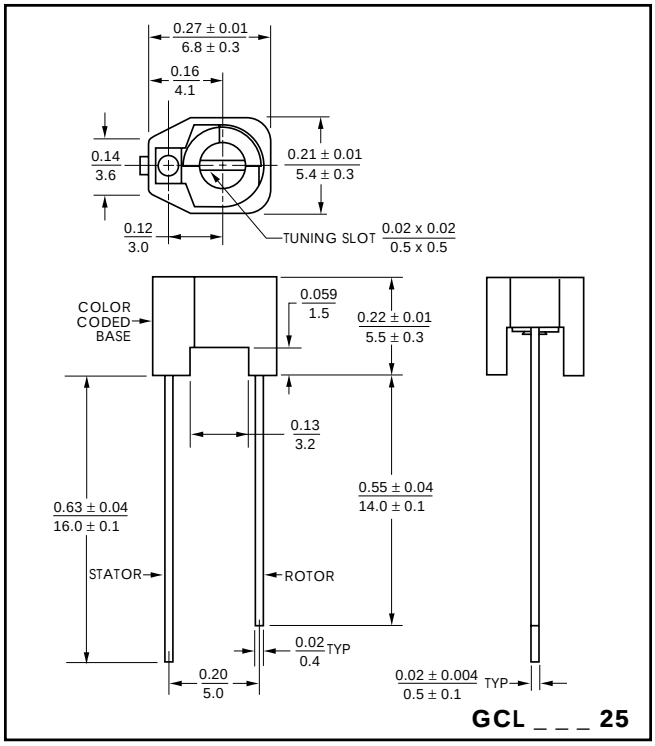


SPECIFICATIONS

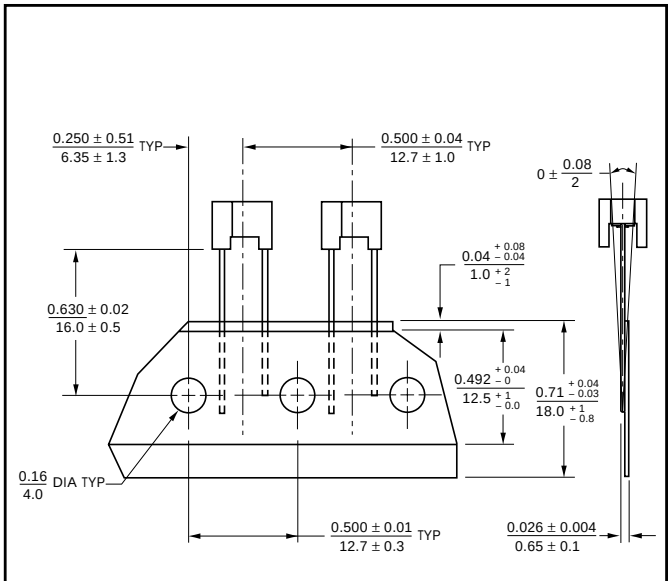
Q min (at 10 MHz): 1000
Operating Temperature Range: -25°C to +85°C
Dielectric: PTFE
TCC: N100 ± 100 ppm/°C
Voltage Rating: 100 VDC
Dielectric Withstanding Voltage: 200 VDC
Insulation Resistance: 10^4 megohms min
Torque: 20-300 g-cm (0.28 - 4.2 oz-in)



CARRIER & REEL



GCL _ _ _ 25



CARRIER

All dimensions are in / mm.

7 mm SURFACE MOUNT NONMAGNETIC

FEATURES

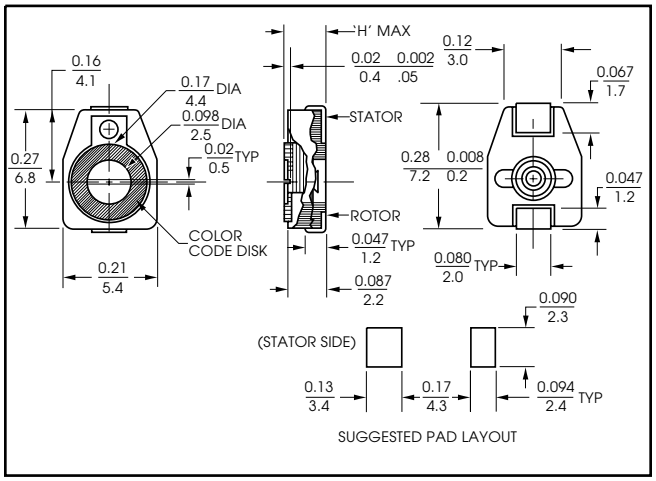
- Low setting drift
- High Q
- Low cost
- Linear Capacitance change vs. rotation
- Compact size



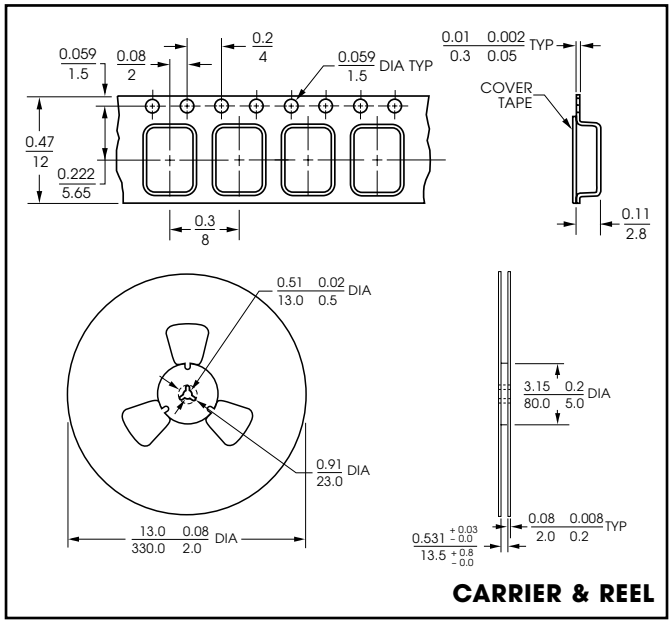
SPECIFICATIONS

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: 10^4 megohms min
Torque: 20-300 g-cm (0.28 - 4.2 oz-in)

Capacitance (pF) min	Capacitance (pF) max	`H' max (in/mm)	Color Code	Model Number
0.5	4.5	0.087 / 2.2	Orange	GSX364NM
0.6	9.0	0.087 / 2.2	Black	GSX358NM
0.8	15.0	0.094 / 2.4	Blue	GSX365NM
1.0	20.0	0.100 / 2.6	Green	GSX366NM



All dimensions are in / mm.



CARRIER & REEL

6 X 8 mm TOP / BOTTOM & SIDE ADJUST

FEATURES

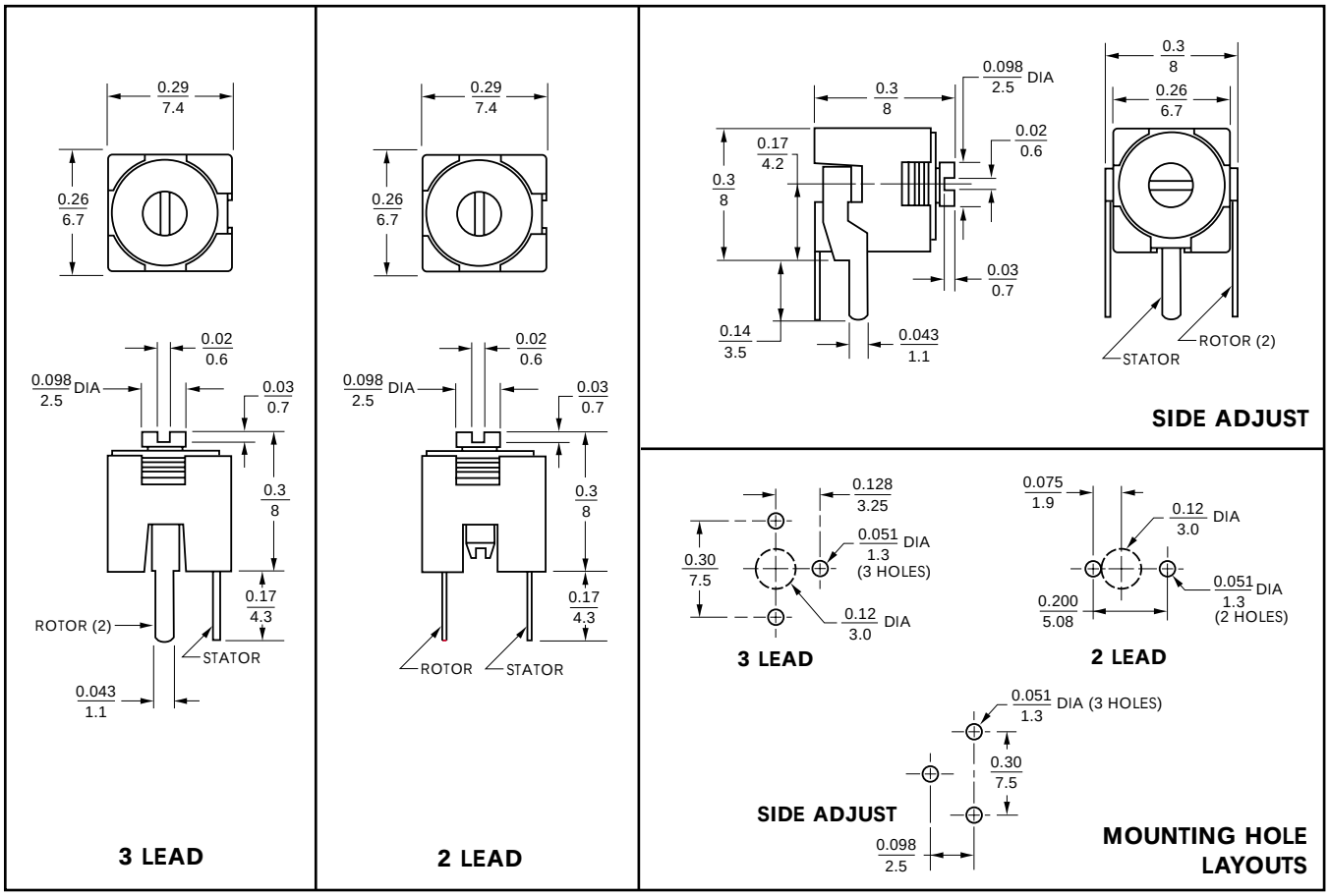
- Compact size
- High temperature PTFE dielectric
- Linear capacitance change vs. rotation

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)



Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm / °C)	Operating Temperature (°C)	Color Code	Top/Bottom Adjust 3 Lead Model Number	Top/Bottom Adjust 2 Lead Model Number	Side Adjust Model Number
PTFE,	1.0	3.5	1500	0 ± 350	–40 to +125	Orange	GXE3R511	GXE3R501	GXQ3R501
High	1.8	10.0	1500	0 ± 350	–40 to +125	White	GXE10011	GXE10001	GXQ10001
Temp	2.5	18.0	1500	0 ± 350	–40 to +125	Red	GXE18011	GXE18001	GXQ18001



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)

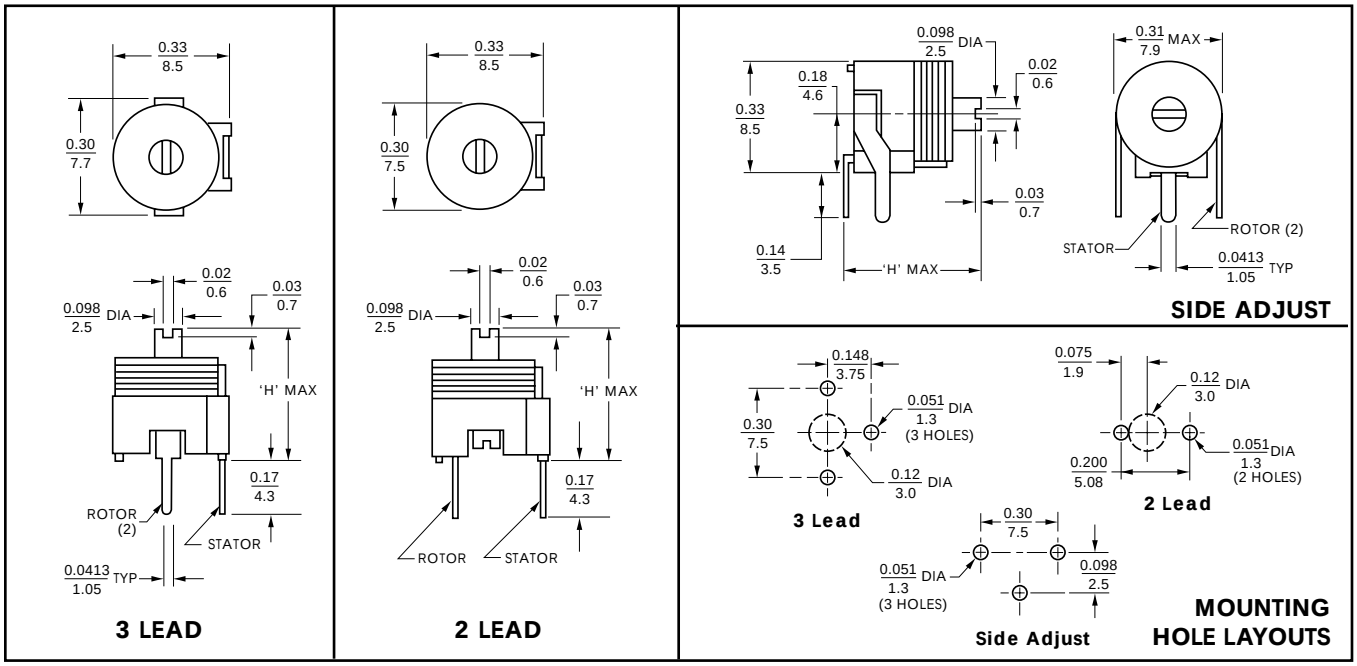
FEATURES

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



Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	'H' max in/mm	Color Code	Top/Bottom Adjust 3 Lead Model Number	Top/Bottom Adjust 2 Lead Model Number	Side Adjust Model Number
PTFE*, High Temp	1.5	5.0	1500	0 ± 250	–40 to +125	.402/10.2	Clear	GXE5R000	GXE5R002	GXR5R000
	1.8	9.0	1500	0 ± 250	–40 to +125	.402/10.2	Yellow	GXE9R000	GXE9R002	GXR9R000
	2.6	18.0	1500	0 ± 250	–40 to +125	.402/10.2	Green	GXE18000	GXE18002	GXR18000
	3.5	27.0	1500	0 ± 250	–40 to +125	.402/10.2	Red	GXE27000	GXE27002	GXR27000
	4.5	36.0	1500	0 ± 250	–40 to +125	.449/11.4	Violet	GXE36000	GXE36002	GXR36000
	5.0	45.0	1500	0 ± 250	–40 to +125	.449/11.4	Orange	GXE45000	GXE45002	GXR45000
PTFE	1.6	5.0	1500	0 ± 350	–40 to +85	.402/10.2	Clear	GXA5R000	GXA5R002	GXB5R000
	2.0	9.0	1500	0 ± 350	–40 to +85	.402/10.2	Yellow	GXA9R000	GXA9R002	GXB9R000
	2.0	18.0	1500	0 ± 300	–40 to +85	.402/10.2	Green	GXA18000	GXA18002	GXB18000
	3.9	27.0	1500	0 ± 300	–40 to +85	.402/10.2	Red	GXA27000	GXA27002	GXB27000
	4.5	36.0	1500	0 ± 300	–40 to +85	.449/11.4	Violet	GXA36000	GXA36002	GXB36000
	5.0	45.0	1500	0 ± 300	–40 to +85	.449/11.4	Orange	GXA45000	GXA45002	GXB45000
PP	1.6	5.0	1000	0 ± 300	–40 to +70	.402/10.2	Clear	GYA5R000	GYA5R002	GYB5R000
	2.0	10.0	1000	0 ± 300	–40 to +70	.402/10.2	Yellow	GYA10000	GYA10002	GYB10000
	2.0	15.0	1000	0 ± 400	–40 to +70	.402/10.2	Blue	GYA15000	GYA15002	GYB15000
	2.2	22.0	1000	0 ± 400	–40 to +70	.402/10.2	Green	GYA22000	GYA22002	GYB22000
	2.3	27.0	1000	0 ± 350	–40 to +70	.402/10.2	Red	GYA27000	GYA27002	GYB27000
	3.0	36.0	1000	0 ± 300	–40 to +70	.402/10.2	Violet	GYA36000	GYA36002	N/A
PC	2.5	30.0	200	100 ± 300	–40 to +85	.402/10.2	Red	GZA30000	GZA30002	GZB30000
	4.0	40.0	200	100 ± 300	–40 to +85	.402/10.2	Violet	GZA40000	GZA40002	GZB40000

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



All dimensions are in / mm.

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)

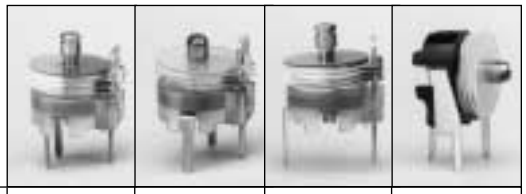
Contact Resistance: 0.010 Ohms max

Insulation Resistance: 10^4 megohms min

Torque: 15 to 360 g-cm (0.2 to 5 oz-in)

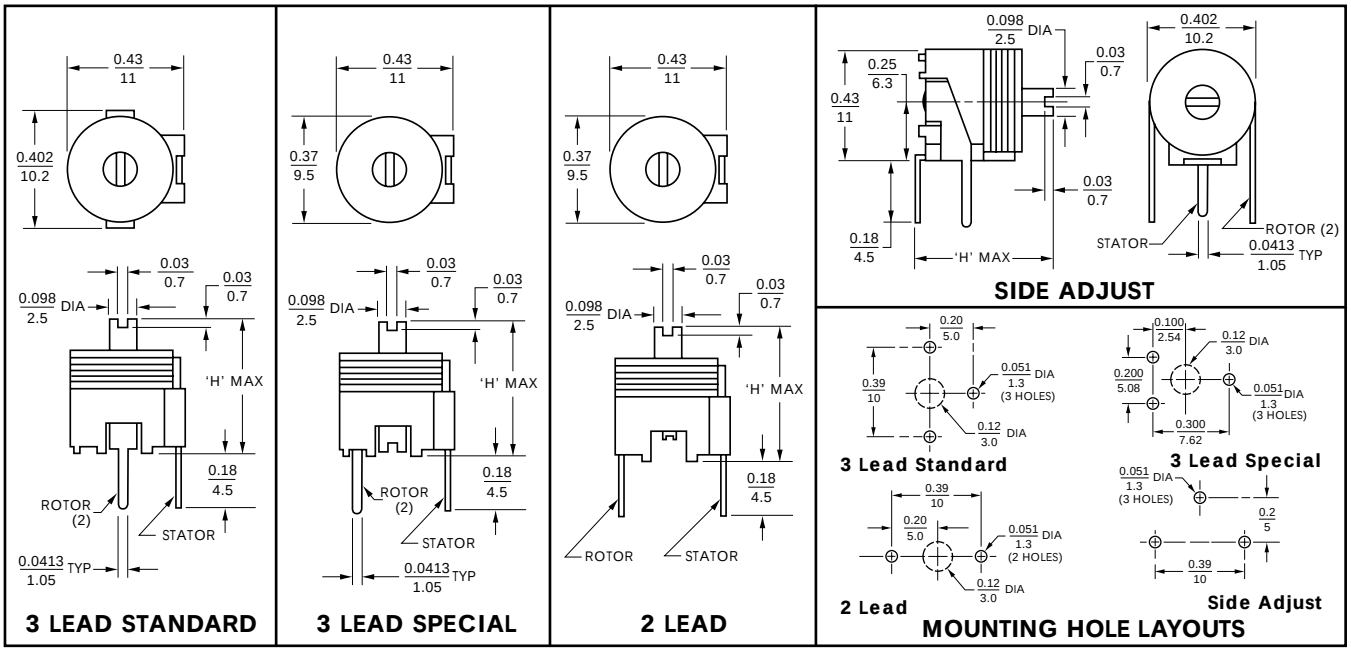
FEATURES

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



Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	'H' max in/mm	Color Code	Top/Bottom 3 Lead-Std. Model No.	Top/Bottom 3 Lead-Spec. Model No.	Top/Bottom 2 Leads 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
	8.0	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	GXC13000	GXC13003	GXC13004	GXD13000
	3.0	26.0	1500	0 ± 350	–40 to +85	0.402/10.2	Green	GXC26000	GXC26003	GXC26004	GXD26000
	3.5	38.0	1500	0 ± 300	–40 to +85	0.402/10.2	Clear	GXC38000	GXC38003	GXC38004	GXD38000
	6.0	60.0	1500	0 ± 300	–40 to +85	0.449/11.4	Yellow	GXC60000	GXC60003	GXC60004	GXD60000
	7.0	75.0	1500	0 ± 300	–40 to +85	0.449/11.4	Red	GXC75000	GXC75003	GXC75004	GXD75000
	8.0	90.0	1500	0 ± 300	–40 to +85	0.488/12.4	Violet	GXC90000	GXC90003	GXC90004	GXD90000
	10.0	150.0	1500	0 ± 300	–40 to +85	0.488/12.4	Orange	GXC15100	GXC15103	GXC15104	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 ± 350	–40 to +70	0.402/10.2	Clear	GYC40000	GYC40003	GYC40004	GYD40000
	4.5	65.0	1000	0 ± 350	–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 ± 400	–40 to +85	0.449/11.4	Violet	GZC10100	GZC10103	GZC10104	GZD10100
	9.0	120.0	200	0 ± 350	–40 to +85	0.449/11.4	Orange	GZC12100	GZC12103	GZC12104	GZD12100
	10.0	150.0	200	0 ± 350	–40 to +85	0.472/12.0	Orange	GZC15100	GZC15103	GZC15104	GZD15100
	12.0	180.0	200	0 ± 350	–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.

SPRAGUE-GOODMAN ELECTRONICS, INC., 1700 SHAMES DRIVE, WESTBURY, NY 11590 • TEL: 516-334-8700 • FAX: 516-334-8771 • E-MAIL: info@spraguegoodman.com

11 X 13 mm TOP / BOTTOM ADJUST

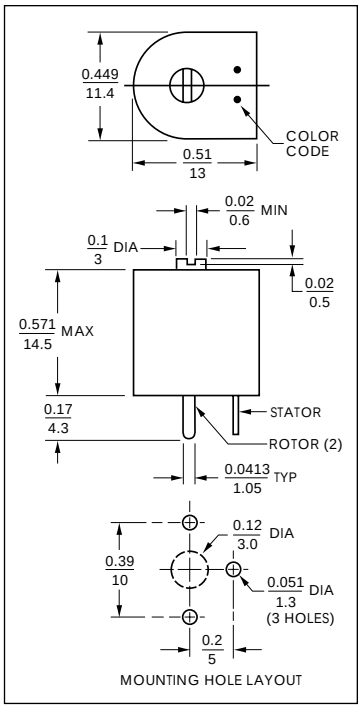
FEATURES

- 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)





Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	Color Code	Model Number
PC	15.0	230.0	200	0 ± 400	–40 to +85	Orange - 1 dot	GZC23112
	30.0	430.0	150	0 ± 350	–40 to +85	Orange - 2 dot	GZC43112

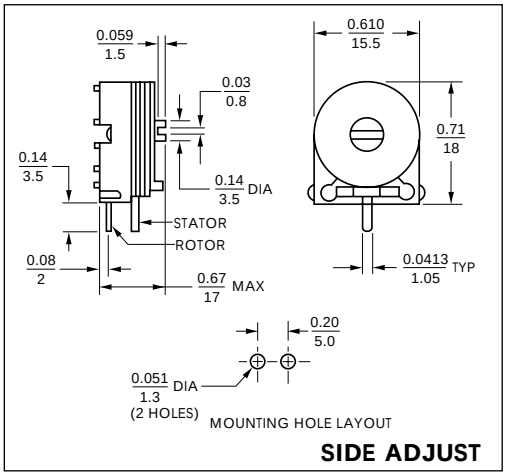
16 mm TOP / SIDE ADJUST

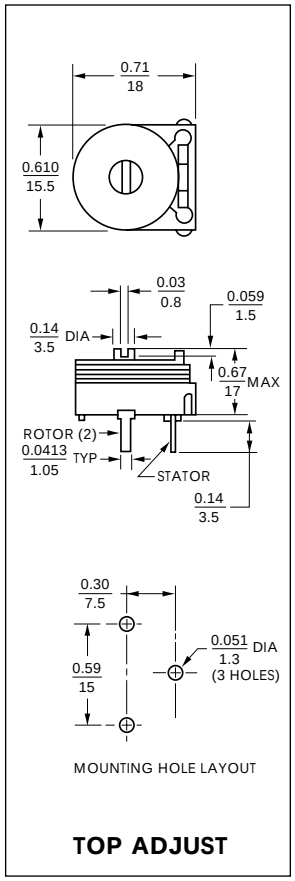
FEATURES

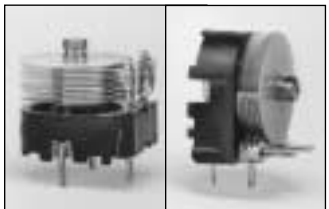
- Highest capacitance range
- Linear capacitance cange vs. rotation

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)







Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	Color Code	Top Adjust Model Number	Side Adjust Model Number
PC	9.0	200.0	200	0 ± 300	–40 to +85	Orange	GZN20100	GZP20100
	18.0	300.0	200	0 ± 300	–40 to +85	Clear	GZN30100	GZP30100
PI	25.0	600.0	150	0 ± 350	–40 to +85	None	GZN60100	GZP60100

All dimensions are in / mm.

PART NUMBERING SYSTEM

GX Dielectric	A Form Factor	9R0 Cap Code	00 Modifications (Top Adjust Models)
Symbol **Description** GC PPS (Polyphenyl Sulfide) GSX** PTFE (Polytetrafluoroethylene) GX PTFE (Polytetrafluoroethylene) GY PP (Polypropylene) GZ PC or PI (Polycarbonate or Polyimide)	**Symbol** **Description** A 8 mm Top/Bottom Adjust B 8 mm Side Adjust C 10 mm Top/Bottom Adjust, 11 x 13 mm Top/Bottom Adjust D 10 mm Side Adjust E* 6 x 8 mm Top/Bottom Adjust, 8 mm Top/Bottom Adjust F* 10 mm Top/Bottom Adjust L 5 mm Top Adjust, 7 mm Economy N 16 mm Top Adjust P 16 mm Side Adjust Q* 6 x 8 mm Side Adjust R* 8 mm Side Adjust T* 10 mm Side Adjust	**Industry Standard, i.e.** 1R6 = 1.6 pF, 400 = 40.0 pF, 301 = 300.0 pF	**Symbol** **Description** 01 6 x 8 mm, 2 leads, GXE and GXQ series only 02 8 mm, 2 leads 03 10 mm, 3 lead, special 04 10 mm, 2 leads 11 6 x 8 mm, 3 leads 12 11 x 13 mm, housing protected (available on all 10 mm top and bottom adjust units) 25 Ammo pack version for GCL only

* 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.

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