

# Type SCR, Commutating Capacitors

## Type SCRN Film-Paper/Extended Foil Commutating Capacitor



Type SCRN capacitors are for SCR (silicon controlled rectifier) commutating applications that require high peak and rms current capability. These capacitors are ideal for other high frequency and pulsed applications. The SCRN is supplied in oval or rectangular metal cases with 1/4 x 20 threaded stud and insulated terminals to withstand high current and high peak voltages.

### Highlights

- Conforms to EIA RS401 for power semiconductor applications
- Non ferrous covers available for high frequency applications
- 40,000 hours life at full rated voltage and temperature
- High voltage, high current and high frequency
- Custom designs available

### Specifications

|  |   |
|--|---|
| Capacitance Range                            | 0.25 $\mu$ F to 50.0 $\mu$ F  |
| Capacitance Tolerance                        | $\pm$ 10%   |
| Rated Voltage                                | 200 Vpk to 2000 Vpk   |
| Operating Temperature Range                  | -40 °C to +80 °C  |
| Maximum rms Current                          | Case codes: A, B, C, D = 60 Irms max. E and F = 100 Irms max.         |
| Maximum rms Voltage                          | see application guide   |
| Test Voltage between Terminal @ 25°C         | DC voltage 2 x rated peak for 60 s                                    |
| Test Voltage between Terminals & Case @ 25°C | 2 x reference AC voltage +1000 Vac for 60 s                           |
| Life Test                                    | EIA RS401   |
| Life Expectancy                              | 40,000 h life at full rated voltage, current, case temperature and VA |
| Reliability                                  | Minimum of 95% survival   |
| Standards                                    | EIA RS401   |

### Regulatory Information

### Dimensions

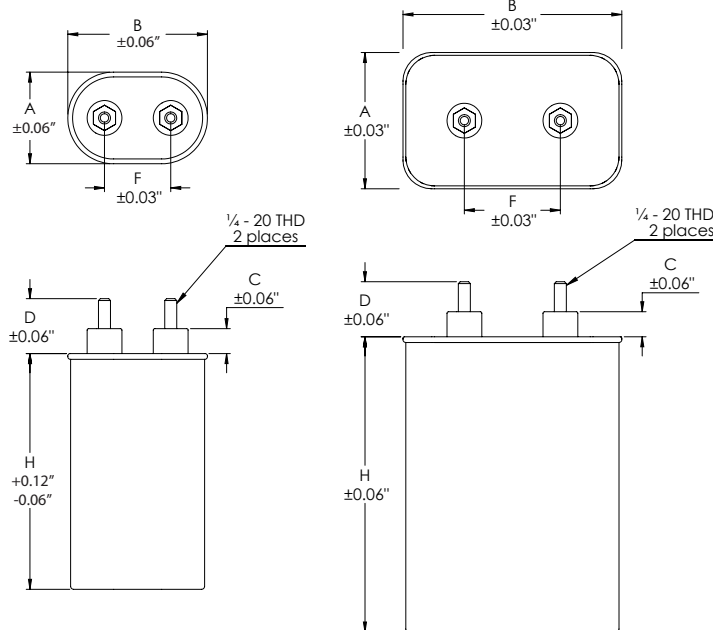


Figure 1

Figure 2

### Construction Details

|                   |  |
|-------------------|--|
| Case Material     | Tin Plated Steel or Aluminum                               |
| Encapsulation     | Biodegradable, Environmentally Compatible Fluid            |
| Terminal Material | Electro-tin plated copper stud and molded pillar insulator |

| Case Code | Dimensions Inches |      |      |      |      |           | Figure |
|-----------|-------------------|------|------|------|------|-----------|--------|
|           | A                 | B    | C    | D    | F    | H         |        |
| A         | 1.31              | 2.16 | 0.56 | 1.19 | 0.81 | see table | Fig. 1 |
| B         | 1.56              | 2.69 | 0.50 | 1.13 | 1.25 | see table | Fig. 1 |
| C         | 1.91              | 2.91 | 0.50 | 1.13 | 1.38 | see table | Fig. 1 |
| D         | 1.97              | 3.66 | 0.50 | 1.13 | 1.38 | see table | Fig. 1 |
| E         | 2.84              | 4.56 | 0.50 | 1.13 | 2.00 | see table | Fig. 2 |
| F         | 3.75              | 4.56 | 0.56 | 1.19 | 2.00 | see table | Fig. 2 |

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### Ratings

| Cap<br>( $\mu$ F)                          | Catalog<br>Part Number | Case<br>Code | H<br>(Inches) | Max VA<br>(65 °C) | Max<br>(Arms) | Cap<br>( $\mu$ F)                             | Catalog<br>Part Number | Case<br>Code | H<br>(Inches) | Max VA<br>(65 °C) | Max<br>(Arms) |
|--|------------------------|--------------|---------------|-------------------|---------------|---|------------------------|--------------|---------------|-------------------|---------------|
| <b>200 Vpk (Paper Dielectric)</b>          |                        |              |               |                   |               | <b>600 Vpk (Film Dielectric for Low-loss)</b> |                        |              |               |                   |               |
| 3  | SCRN201R-F             | A            | 2.13          | 400               | 60            | 1   | SCRN262R-F             | A            | 2.38          | 2200              | 60            |
| 5  | SCRN202R-F             | A            | 2.63          | 465               | 60            | 2   | SCRN263R-F             | A            | 2.38          | 2060              | 60            |
| 10   | SCRN203R-F             | A            | 3.88          | 625               | 60            | 3   | SCRN264R-F             | A            | 3.88          | 3190              | 60            |
| 15   | SCRN205R-F             | A            | 4.75          | 765               | 60            | 5   | SCRN265R-F             | A            | 4.25          | 4380              | 60            |
| 20   | SCRN206R-F             | B            | 4.25          | 875               | 60            | 10  | SCRN266R-F             | C            | 4.25          | 6060              | 60            |
| 30   | SCRN208R-F             | C            | 5.25          | 1200              | 60            | <b>1000 Vpk (Film and Paper Dielectric)</b>   |                        |              |               |                   |               |
| 40   | SCRN209R-F             | C            | 6.75          | 1500              | 60            | 1   | SCRN233R-F             | A            | 2.13          | 790               | 60            |
| 50   | SCRN210R-F             | D            | 5.75          | 1590              | 60            | 2   | SCRN234R-F             | A            | 3.13          | 1070              | 60            |
| <b>400 Vpk (Film and Paper Dielectric)</b> |                        |              |               |                   |               | 3   | SCRN235R-F             | A            | 3.88          | 1455              | 60            |
| 2  | SCRN211R-F             | A            | 2.63          | 790               | 60            | 5   | SCRN236R-F             | B            | 4.25          | 1785              | 60            |
| 3  | SCRN212R-F             | A            | 2.63          | 970               | 60            | 10  | SCRN237R-F             | C            | 5.75          | 2570              | 60            |
| 5  | SCRN213R-F             | A            | 3.88          | 1130              | 60            | 15  | SCRN238R-F             | D            | 5.75          | 3170              | 60            |
| 10   | SCRN214R-F             | B            | 4.75          | 1930              | 60            | 20  | SCRN239R-F             | E            | 5.13          | 5200              | 100           |
| 15   | SCRN215R-F             | C            | 4.75          | 2240              | 60            | <b>1500 Vpk (Film and Paper Dielectric)</b>   |                        |              |               |                   |               |
| 20   | SCRN216R-F             | C            | 6.25          | 2800              | 60            | .5  | SCRN240R-F             | A            | 2.13          | 990               | 60            |
| 30   | SCRN217R-F             | D            | 6.75          | 3720              | 60            | 1   | SCRN241R-F             | A            | 2.88          | 1240              | 60            |
| 40   | SCRN218R-F             | D            | 8.00          | 4330              | 60            | 2   | SCRN242R-F             | B            | 3.50          | 1890              | 60            |
| 50   | SCRN219R-F             | E            | 6.25          | 6050              | 100           | 3   | SCRN243R-F             | C            | 4.25          | 2550              | 60            |
| <b>600 Vpk (Film and Paper Dielectric)</b> |                        |              |               |                   |               | 5   | SCRN244R-F             | C            | 5.75          | 3250              | 60            |
| 2  | SCRN220R-F             | A            | 2.63          | 815               | 60            | 10  | SCRN245R-F             | E            | 5.13          | 6500              | 100           |
| 3  | SCRN221R-F             | A            | 3.13          | 1200              | 60            | <b>2000 Vpk (Film and Paper Dielectric)</b>   |                        |              |               |                   |               |
| 5  | SCRN222R-F             | A            | 4.25          | 1420              | 60            | .25   | SCRN246R-F             | A            | 2.13          | 990               | 60            |
| 10   | SCRN224R-F             | C            | 4.25          | 2040              | 60            | .33   | SCRN257R-F             | A            | 2.13          | 1000              | 60            |
| 15   | SCRN226R-F             | C            | 5.75          | 2800              | 60            | .5  | SCRN247R-F             | A            | 2.63          | 1180              | 60            |
| 20   | SCRN227R-F             | D            | 5.75          | 3260              | 60            | 1   | SCRN248R-F             | A            | 3.13          | 1300              | 60            |
| 25   | SCRN229R-F             | D            | 6.75          | 3720              | 60            | 2   | SCRN249R-F             | B            | 4.25          | 2230              | 60            |
| 30   | SCRN230R-F             | D            | 8.00          | 4330              | 60            | 3   | SCRN251R-F             | C            | 4.75          | 2800              | 60            |
| 40   | SCRN231R-F             | E            | 6.25          | 6060              | 100           | 5   | SCRN253R-F             | D            | 5.75          | 4020              | 60            |
| 50   | SCRN232R-F             | E            | 7.25          | 6850              | 100           | 10  | SCRN256R-F             | F            | 5.75          | 7600              | 100           |

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### Application Guide

#### How to Choose a Commutating Capacitor

1. From circuit analysis or measurement, determine application values for these six parameters:

- Nominal capacitance in  $\mu\text{F}$
- Current pulse width in  $\mu\text{s}$
- Current pulse period in  $\mu\text{s}$
- Maximum peak voltage
- Continuous AC voltage in  $V_{\text{rms}}$
- Maximum volt-amps (VA)

2. Choose a capacitor from the ratings table of the desired nominal capacitance with a peak voltage rating no less than your maximum peak voltage.

#### Using Volt-Ampere Ratings

The capacitor's maximum VA rating is the maximum product of the sine wave voltage and current that may be applied at 65 °C without overheating the capacitor and reducing its expected life. For other temperatures and pulsed current, use the multipliers of Figures 2 and 3 to derate the Max VA rating.

The Max Amps RMS rating is set by the capability of the capacitor terminals. Exceeding this limit can damage the terminals and cause capacitor failure.

Calculate the capacitor's actual VA load as the product of the rms voltage across the capacitor and the rms current through the capacitor. To calculate rms current for an applied sine wave or squarewave voltage, use these equations.

For a sinewave voltage the current is:

$$I_{\text{rms}} = 2\pi f C V_{\text{rms}} \times 10^{-6}$$

and for a squarewave the current is:

$$I_{\text{rms}} = C \Delta V / [0.64(tT)^{0.5}] = I_{\text{peak}}(t/T)^{0.5}$$

where (f) is repetition frequency in Hz, C is nominal capacitance in  $\mu\text{F}$ ,  $\Delta V$  the peak-to-peak squarewave amplitude in volts, (t) is the pulse width in  $\mu\text{s}$  and T is the pulse period in  $\mu\text{s}$ .

The peak current for the square wave voltage is:

$$I_{\text{peak}} = C \Delta V / 0.64t$$

3. Check that your application's rms current is no more than the capacitor's Max. Amps RMS. You can calculate the current from your  $V_{\text{rms}}$  using the equations in the following section.

4. Check that your application's volt-amperes is not more than the capacitor's VA capability. The VA capability is the max VA rating times the Volt-Ampere multiplier from Figure 2 (Current Pulse Width) and that times the Volt-Ampere Multiplier from Figure 3 (Ambient Temperature). See the following section for more on using volt-ampere multipliers.

If you need a greater VA capability, repeat these steps for a higher peak voltage capacitor or consider connecting units in parallel to divide the VA required. For up to peak voltage of 600 V, you may also consider polypropylene film dielectric units, Catalog Numbers SCR262R through SCR266R, with higher VA capability.

Pulse Wave Applications

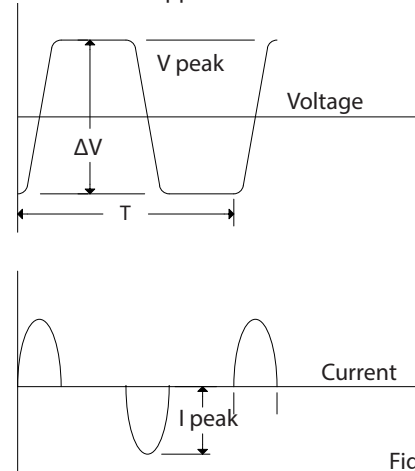


Figure 1

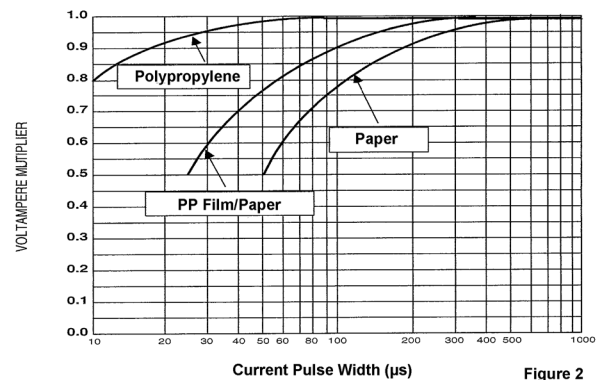


Figure 2

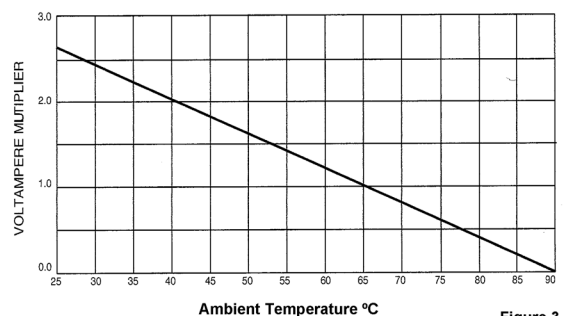


Figure 3

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