GORE™ High Temperature Capacitors

200°C Film Capacitors for Oil & Gas Power Electronics

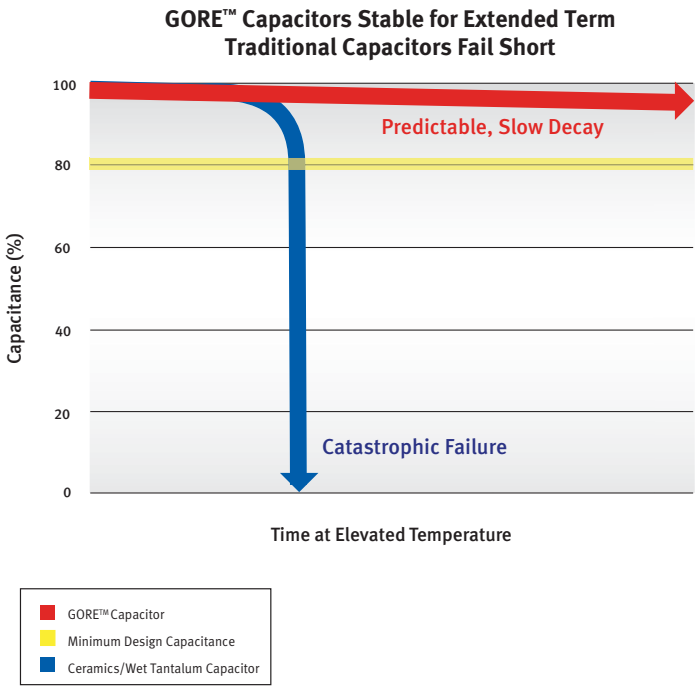
Increase tool reliability

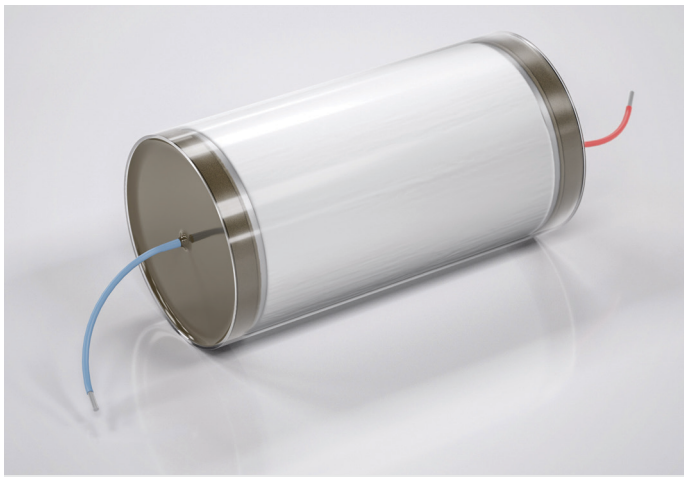
GORE™ High Temperature Capacitors reduce the risk of tool failure by delivering stable performance for an extended term in demanding downhole environments. Unlike traditional capacitors, Gore technology avoids sudden and complete failure for a more predictable mission completion.

With minimal de-rating, GORE™ Capacitors delivers higher voltage and capacitance at elevated temperature so that designs requiring large numbers of capacitors are no longer a burden—simplifying electronic system design, reducing failure points, and facilitating easier assembly.

Industry Challenge

Power electronics in downhole tools are subjected to some of the harshest operating conditions on the planet. Design teams have had to work around the challenges of legacy capacitor technologies: using multiple capacitors to meet power needs while overcoming de-rating, innovating specialty mounting techniques for shock & vibration, the use of dewar insulation systems, or even cooling systems to resist extreme temperatures. But despite the number of incremental improvements, the critical weakness is hidden in the failure mode of traditional capacitor choices. For when they fail, they fail short leading to risk of downhole tool failure.





Benefits of GORE™ Capacitors

- Increased tool reliability and reduced risk of unexpected failure
- Stable and predictable capacitance
- Withstand high temperatures and voltage spikes
- Withstand voltages up to 600 VDC and 200°C with minimal de-rating
- Withstand shock and vibration
- Reduce system design complexity and improve installation

GORE™ Capacitor Summary	
Capacitance Range	1–100 µF (single element design)
Temperature Rating	-55–200°C (-67 - 392°F)
Voltage Rating	600 VDC (with excursion to 750)
Typical ESR	20 –30 mΩ (50 µf @ 2 kHz)
Typical ESL	‹ 40 nH
Insulation Resistance Terminal-to-Terminal	› 100,000 MΩ x µF
Withstand Voltage Terminal-to-Case	1500 VDC
Environmental Compliance	RoHS

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Stable and Reliable Capacitance for Extended Term

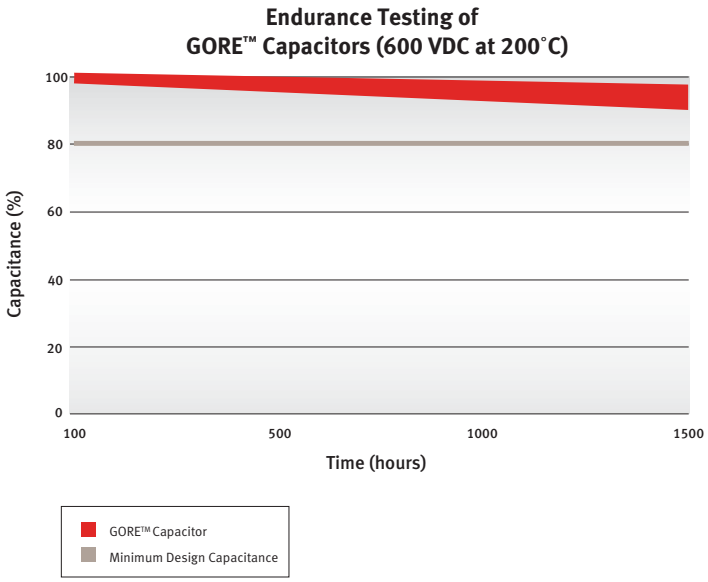
Traditional capacitors used in oil and gas downhole equipment do not typically survive in harsh well conditions for long periods. Ceramic capacitors become brittle in high temperatures over time that can lead to a short failure, particularly when exposed to shock and vibration. Other technologies, such as wet tantalum can fail short as a result of transient voltages. However, GORE™ Capacitors deliver stable and reliable capacitance over extended periods despite these challenging environments.

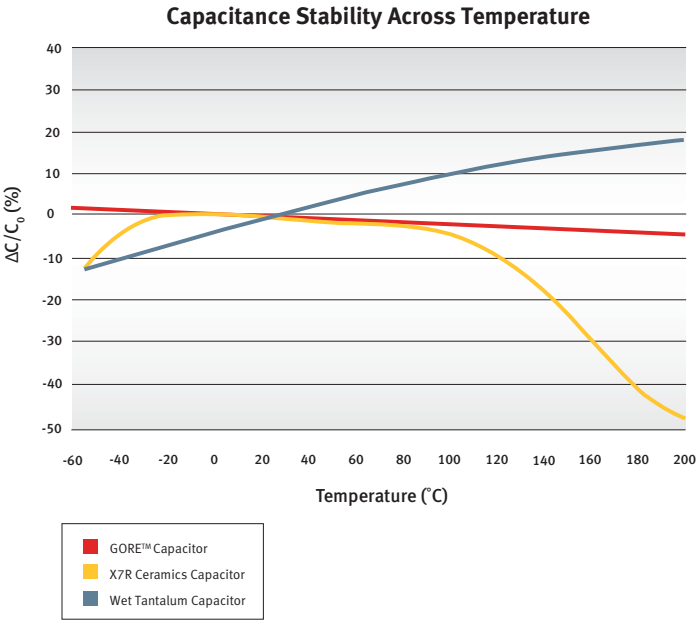
Endurance testing of 111 GORE™ Capacitors at the maximum operational ratings (200°C and 600 VDC) indicates 90% probability of capacitance performance.

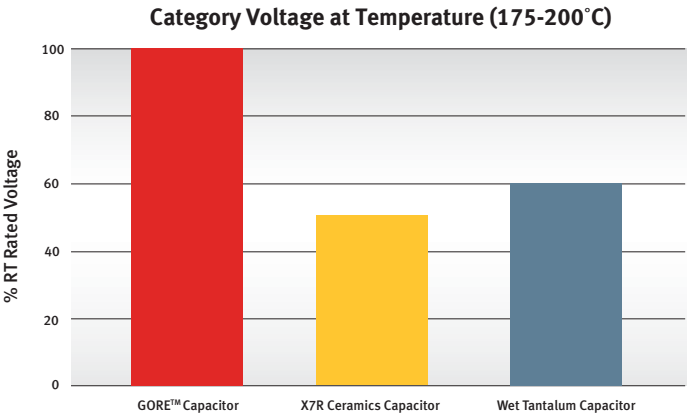
When considering an electronic system design that requires a minimum 80% starting capacitance to operate with stability, at least 95 percent of GORE™ Capacitors will pass at 1000 hours and at least 91 percent at 1500 hours (95% confidence levels). Note: For actual operating conditions below the maximum ratings, expectations of capacitor longevity can be substantially extended.

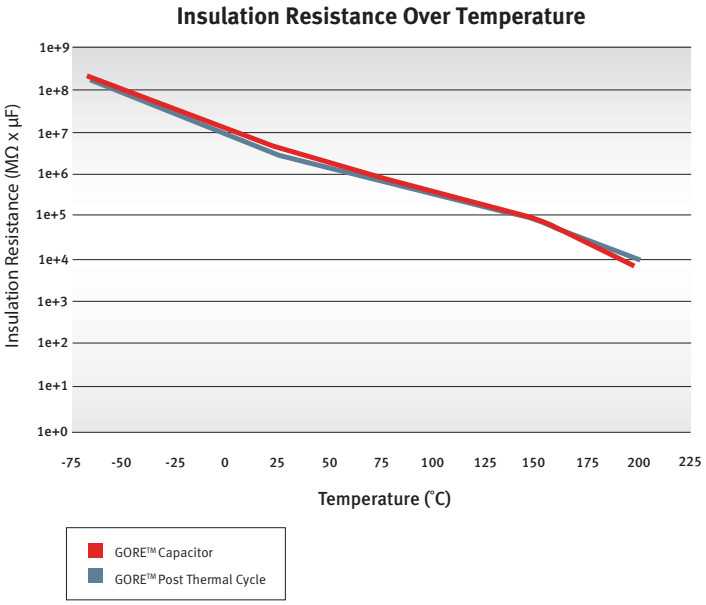
Simplified Design and Installation with Minimal De-rating

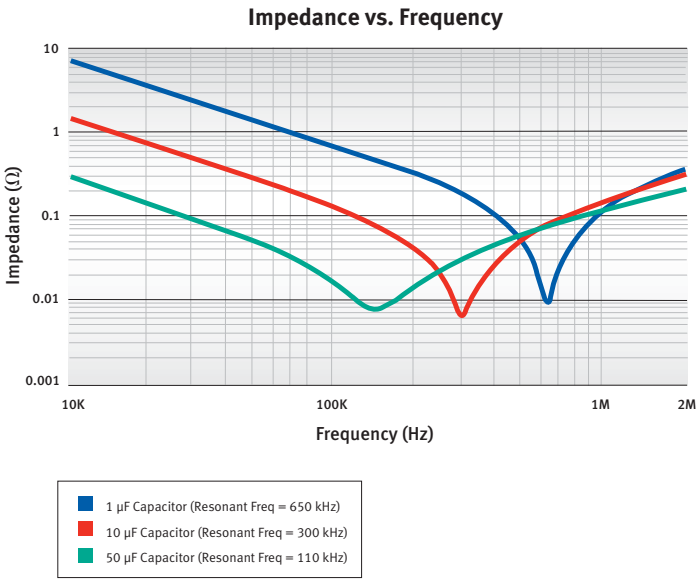
To meet the need for high capacitance/high voltage in high temperature conditions, traditional capacitors require substantial de-rating. Therefore, design engineers are often required to use large quantities of small capacitors resulting in a complex system design, a large number of potential failure points and increased installation costs. Alternatively, a single GORE™ Capacitor offers a large amount of stable capacitance with minimal de-rating under high temperature and voltage conditions.











Typical Equivalent Series Resistance (ESR)

Capacitor Size (µF)	Typical ESR @ 10 kHz (mΩ)
1	20 –50
10	15 –25
33	25 –35
50	20 –30

Capacitor dimensions shown next page.

Additional Qualification Testing for GORE™ Capacitors

Examination or Test	Specification or Examination/Test Conditions	Status
Insulation Resistance (DWV)	MIL-STD 202G Method 301 (1200 VDC)	Pass
Thermal Cycling	MIL-STD 883J, Modified Condition D (-55°C–200°C)	Pass
Mechanical Shock	MIL-STD 202G, Method 213, Test Condition I20–30	Pass
Vibration	MIL-STD 202G, Method 204D, Test Condition D (20 g Peak)	Pass
Lead Pull	MIL-STD 202G, Method 211A, Test Condition A (5 lbf)	Pass

Pass = No visual inspection or electrical failures (eg., capacitance and ESR) observed.

Additional test data available upon request.

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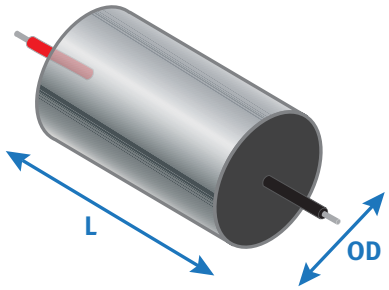
Example Dimensions

For rated use to 200°C / 600 VDC, the following table offers dimensional guidance on standard configurations of GORE™ Capacitors. Note: Custom configurations are possible, to include smaller sizes for lower power needs 300 VDC. Please contact Gore to discuss your specific application requirements.

Standard Sizes for GORE™ Capacitors

Capacitance (µF)	Outer Diameter (mm)	Overall Length (mm)
1	17	41
5	24	51
10	32	51
33	39	100
50	47	95
100	64	95



Other configurations are possible.

Contact Gore for more information

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