



Welcome to



- Quell's mission is to provide the best niche product, delivery, quality & service available in the EMI/ESD/TVS suppression market
- 12,000 sq. ft. facility in Albuquerque
- Quality Management System registered to:
 - ISO 9001:2015
 - AS9100D
 - Proudly made in the USA





History...



1994 – Founded Metatech Commercial Products Div - ABQ



1995 – Applied for EESeal® Patent



2003 – Quell Corporation spun-off from Metatech



2009 – AS9100 quality certification



2012 – Expansion into new 12,000 sq ft facility



2013 – Over 2,500,000 EESeals® sold



2014 – Manufacturers Representatives & Distributors



2015 – EESeal+, EESeal Inside the connector



2016 – Patent received for EESeal+®



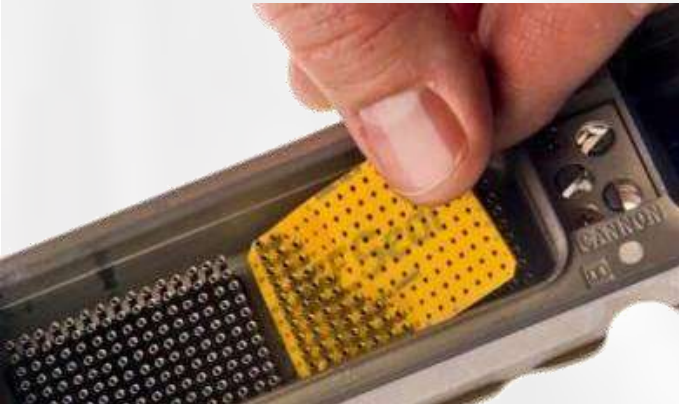
2019 – Acquired by HEICO Corporation



2021 – Over 2,500,000 EESeals® sold

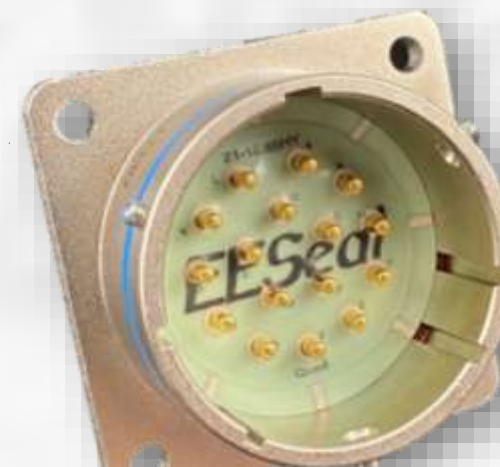


2022 – Updated Environmental Qualification for EESeal® & EESeal+®



EESeal® is a Silicone Rubber Packaging Technology.

- **EESeal's® unique elastomeric body & adaptive interconnect system* suspends, isolates & protects discrete electrical components**
 - Entire assembly can radically change shape and size in response to external forces
 - Individual components and interconnections move as body changes shape while maintaining electrical and mechanical integrity
 - Body acts as conformal coat & electrical isolation for suspended components
 - Natural compressive forces exploited to create re-usable electrical contacts that can withstand extreme abuse
 - Severe misalignments, vibration, wrong pin sizes...
 - Environmental seal created for the host location



* US Patents
5,686,697
9,478,887
9.692.188

- **EESeal inserts into any connector in seconds**

- No soldering
- No tools required
- **Multiple Uses**
 - EMI/RFI Filtering
 - Transient Protection
 - Add pull up resistors
 - Short pins, redistribute power
 - Add Grounding - Short coax shields

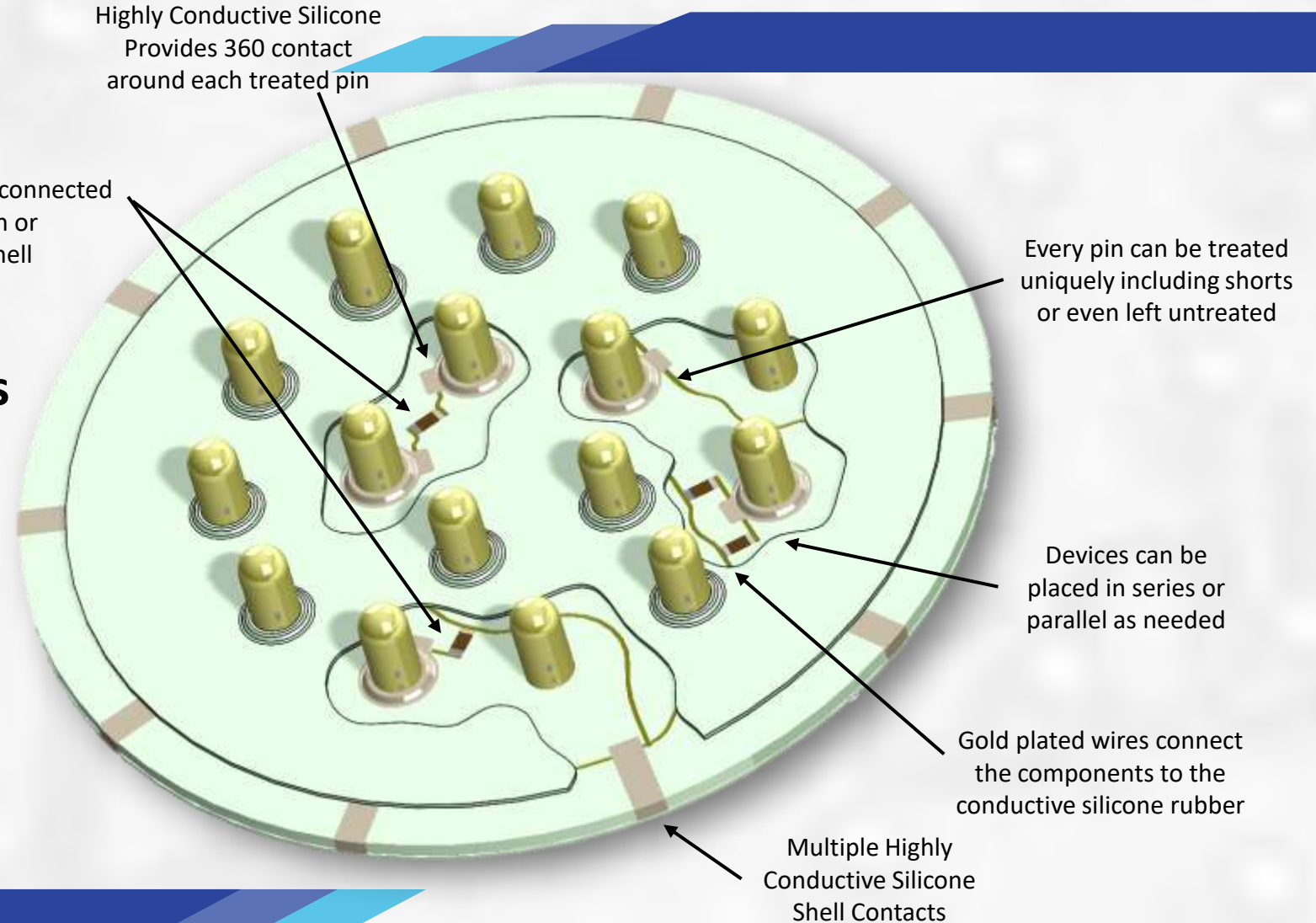




New & improved *EESeal*® Design...

No “brittle” spring metal contacts (e.g., BeCu)

- Designed to accommodate severe misalignment and mismatch
- Will not be over “sprung” by any overstress during installation or use



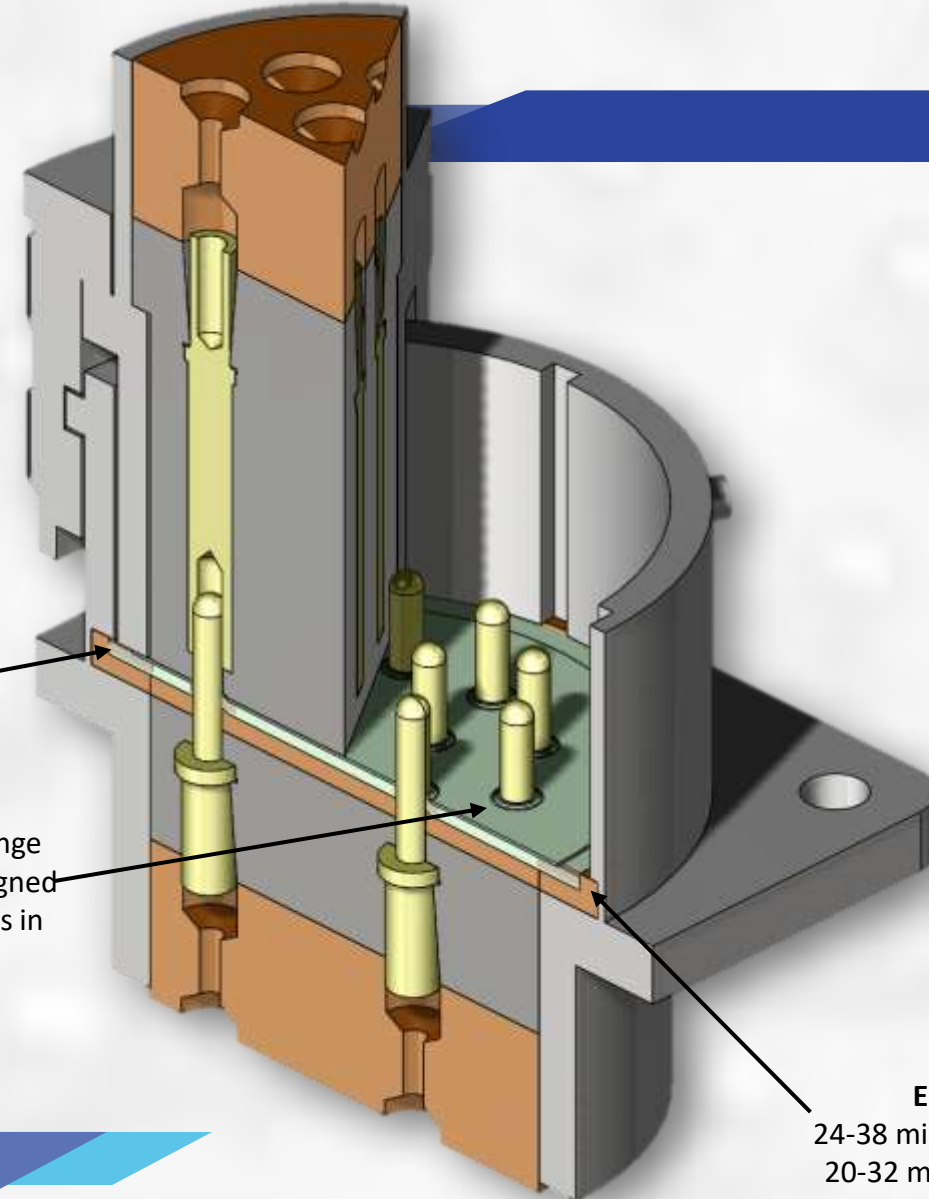


New & improved *EESeal*® Design...

EESeal® “At Home” at the Connector Interface

Multiple Highly
Conductive Silicone
Shell Contacts

Silicone rubber can change
shape to adjust to misaligned
pins and unique features in
your connector



EESeal®
24-38 mils before mate
20-32 mils after mate

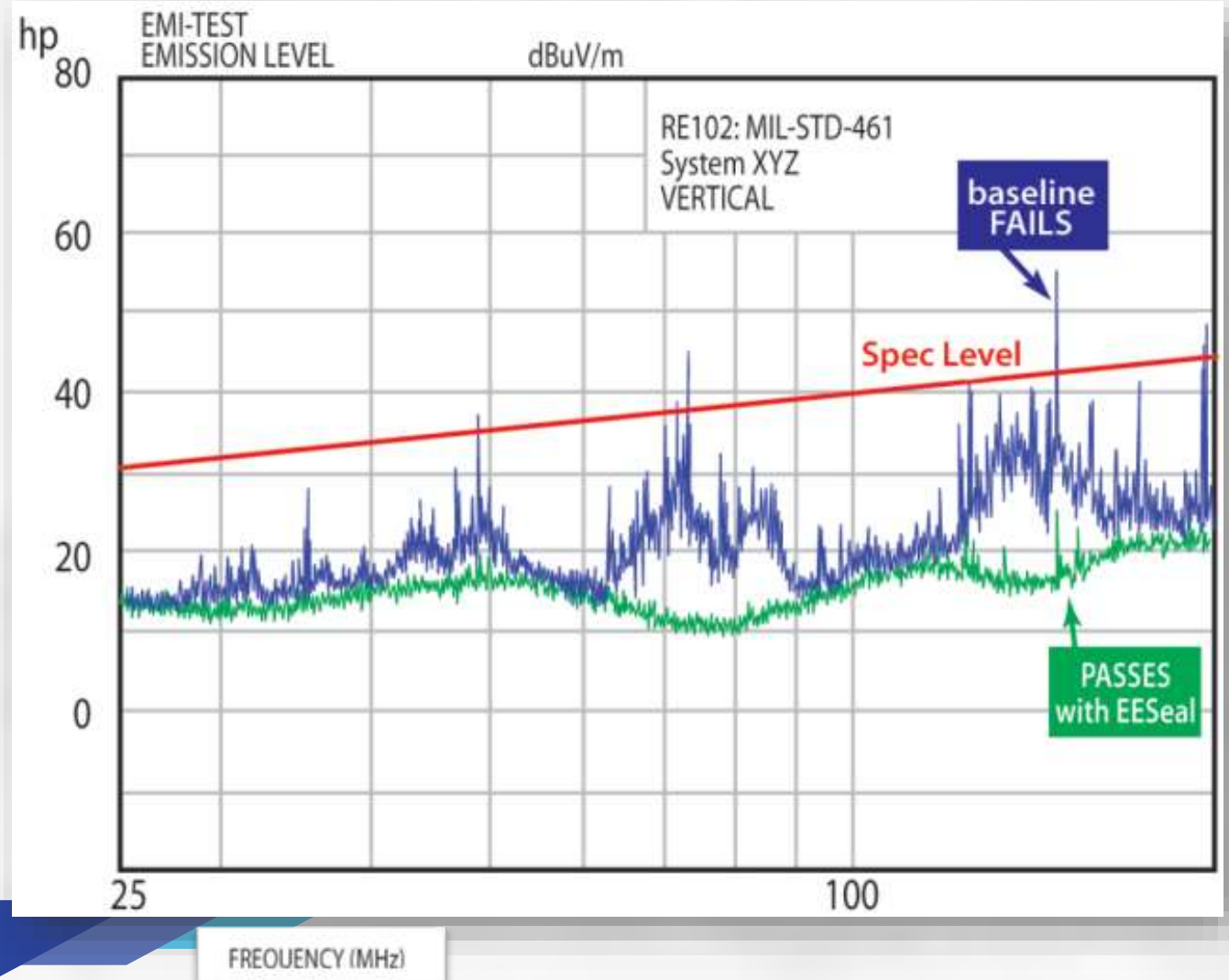


Typical *EESeal*® Construction



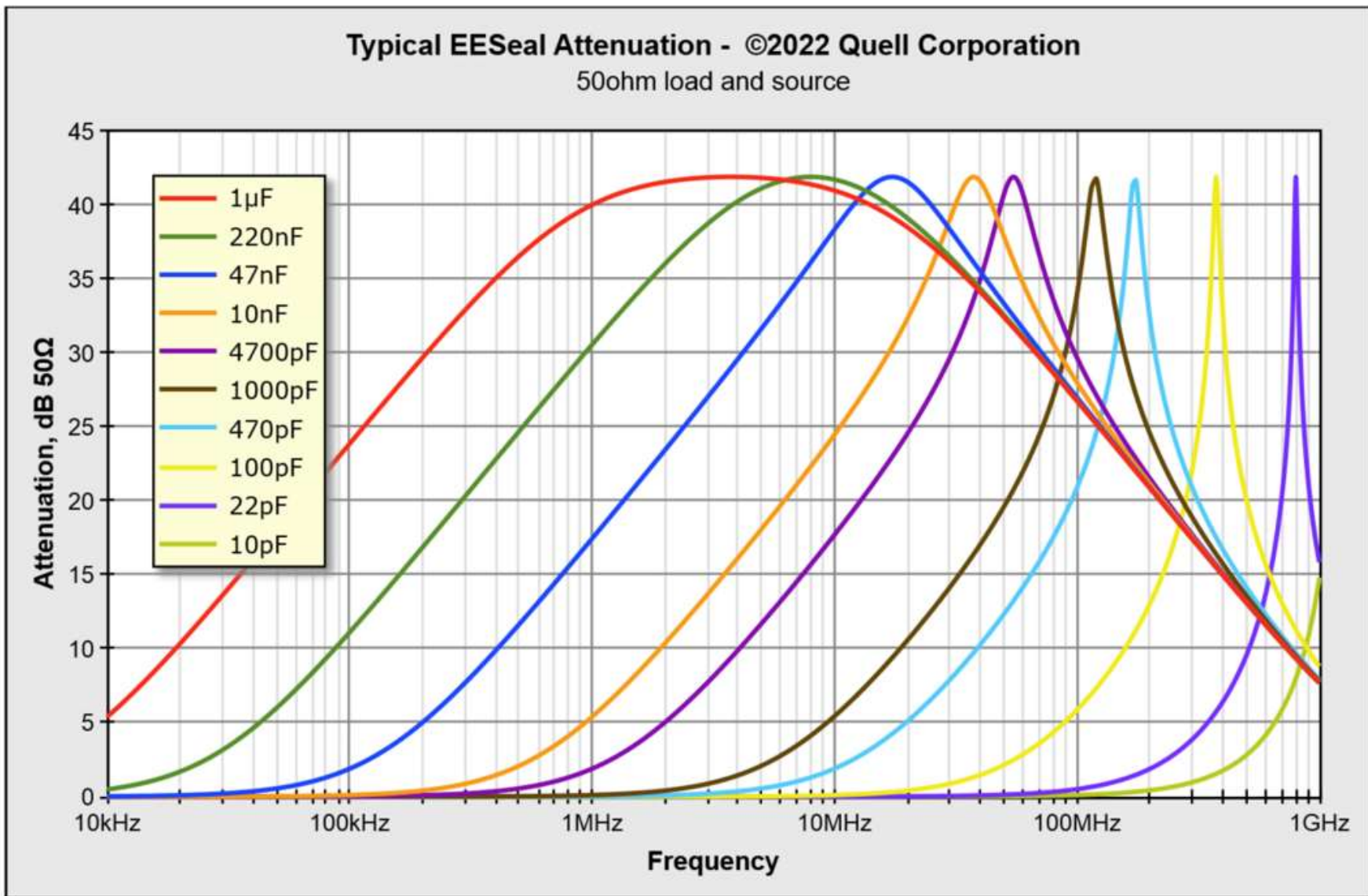
Pin	Signal	Voltage	Data Rate
A	PWR	40V	DC
B	PWR_RTN	0V	DC
C	MODE	5V	Static
D	GAIN	5V	Static
E	POL	5V	Static
F	USBP	5V	12MHz
G	USBN	5V	12MHz
H	CONTROL	5V	Static
J	CONTROL_RTN	5V	Static
K	LVL_MODE	5V	Static
L	LVL_MODE	5V	Static
M	SDVP	± 1V	12MHz
N	SDVN	± 1V	12MHz
P	232_RX	± 15V	1.5MHz
Q	232_TX	± 15V	1.5MHz
R	232_RTN	0V	DC
S	G_LOCK	5V	Static

- The EESeal “Quells” the frequencies needed to meet compliance.
- Fixes MIL-STD-461 Radiated Emissions Problems.



Typical *EESeal*® Attenuation

Single Capacitor – Pin to Shell

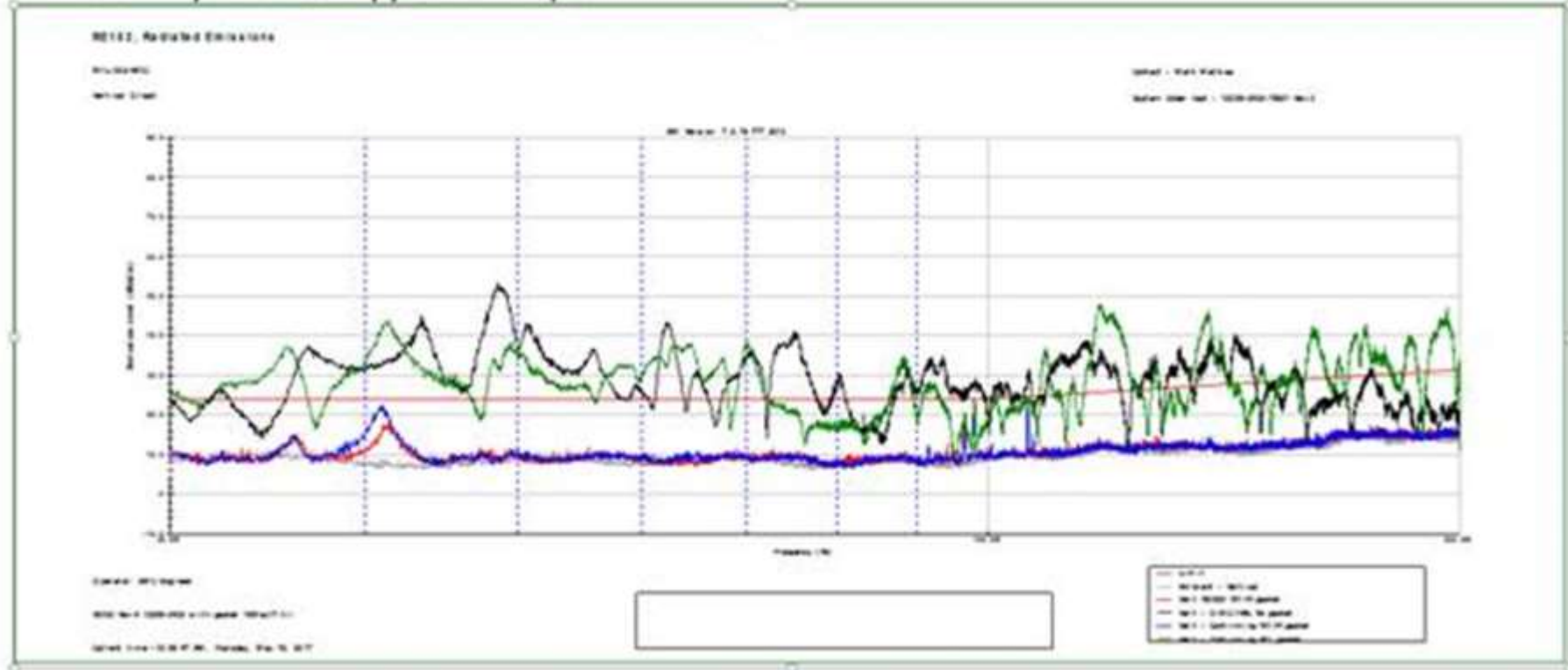


Many other cap values are available

Commercial grade, HiRel, Space, etc.

(ABC) Corporation – “WOW!!”

Vertical Only – Gasket approx. 5 amps.



Grey = ambient

Black = ORIGINAL no gasket

Red = RETEST with gasket

Green = Confirming NO gasket

Blue = Confirming with gasket

Typical *EESeal*® Construction

6 caps in Series-parallel network
of 470nF 300wvdc capacitors
(effectively 0.71uF) from
pins A, G to the
connector shell

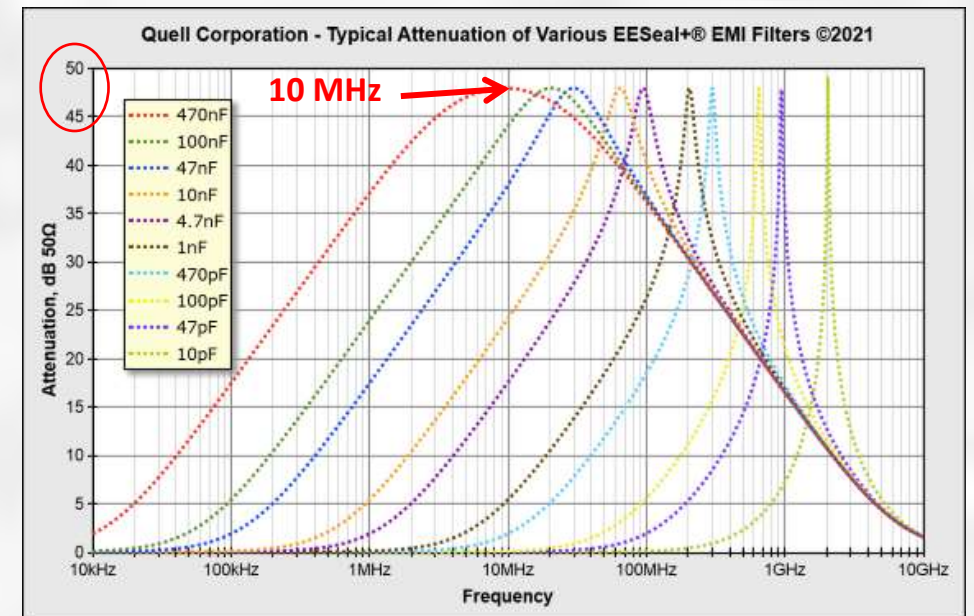


47nF 500wvdc
capacitor from
pins B, C, E, H to the
connector shell.
All other pins are not
treated.

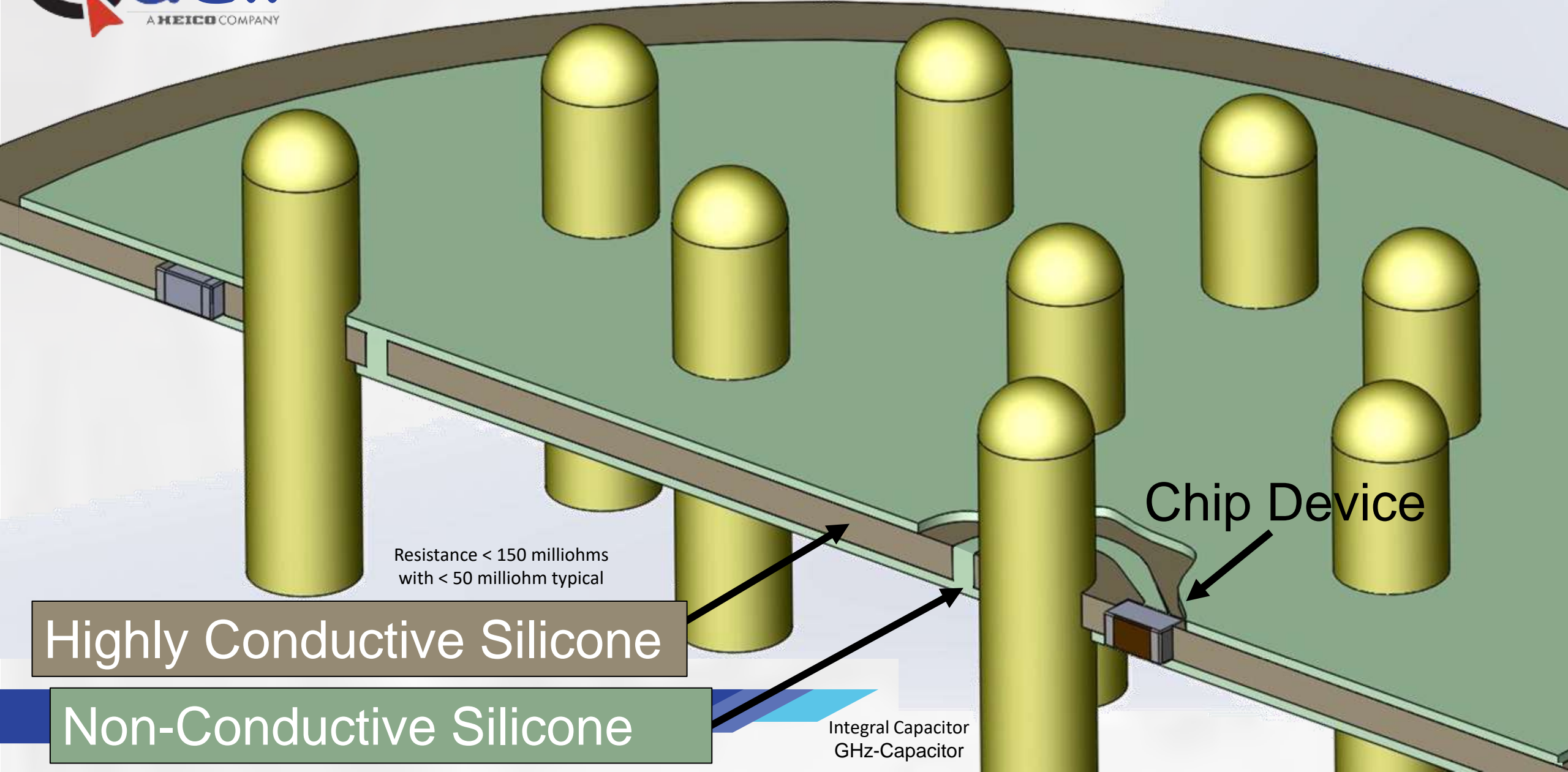
EESeal+® The Next Generation

- Conductive Silicone pin contacts and ground plane
 - Lowers contact resistance
 - Lowers Inductance
 - 45-50dB attenuation – Peak Frequency
 - Mitigation up to 20-40GHz
 - Nominal resistance < 150 milliohms with < 50 milliohm typical.

- Versions with...
 - Discrete Capacitors
 - Integral Capacitors
 - Discrete & Integral Capacitors



EESeal+ Construction



Resistance < 150 milliohms
with < 50 milliohm typical

Highly Conductive Silicone

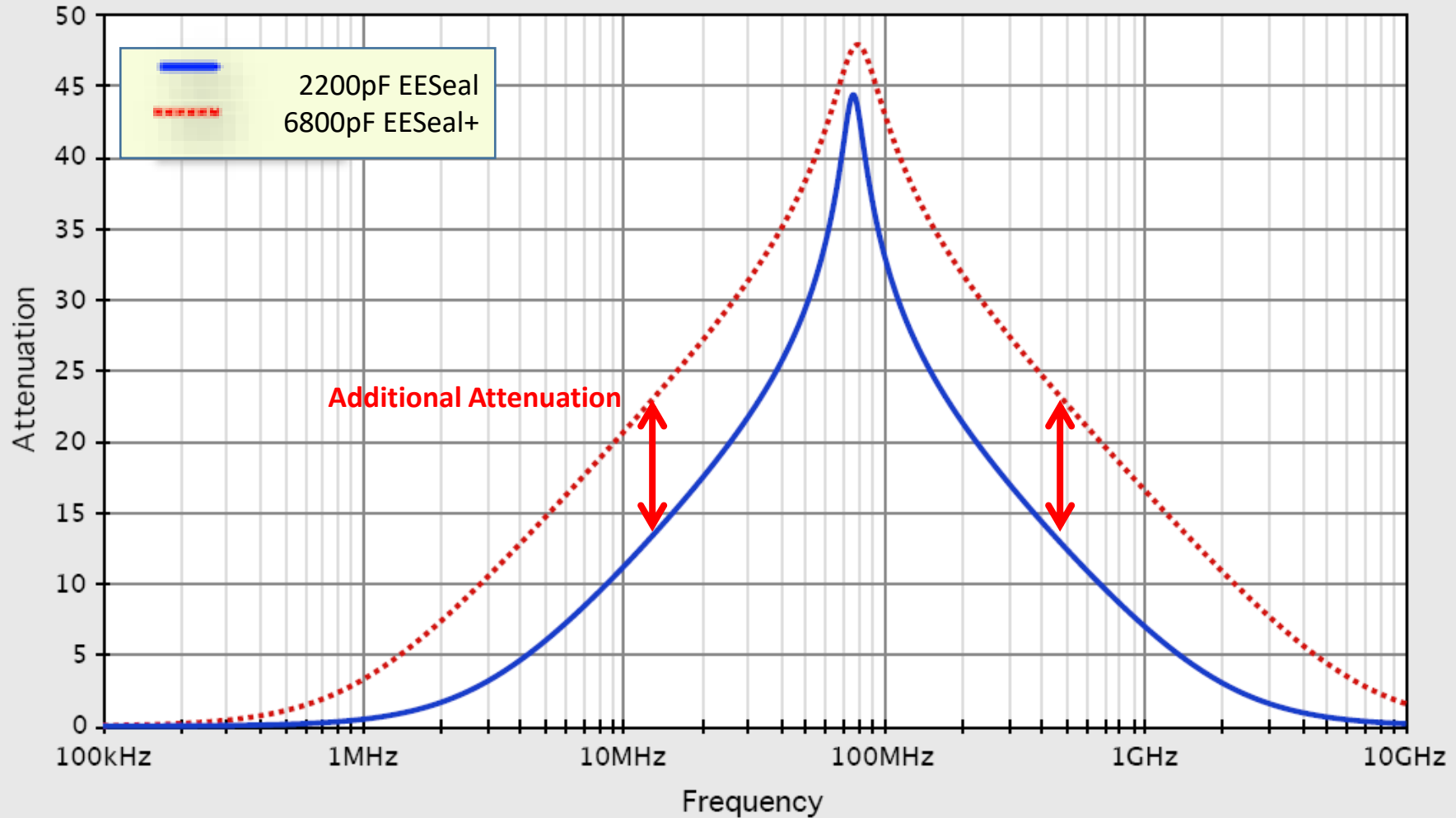
Non-Conductive Silicone

Chip Device

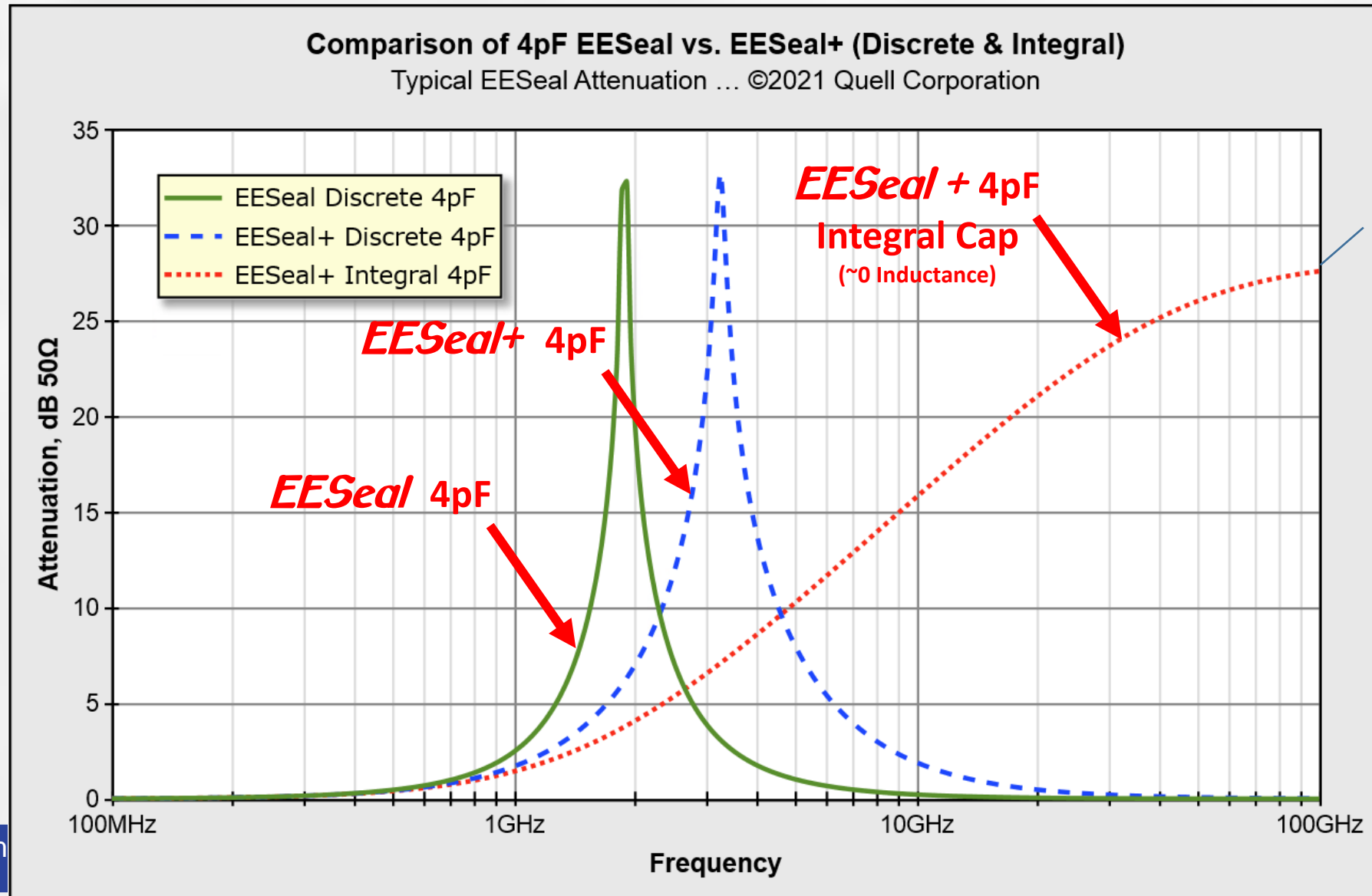
Integral Capacitor
GHz-Capacitor

EESeal[®] vs. EESeal +[®]

Typical EESeal[®] Attenuation – 50 ohm Load and Source
Quell Corporation – 2020 ©



EESeal[®] vs. EESeal +[®]



Curve flattens due to resistance of pin and shell contact



Environmental Capabilities...

EESeal® & EESeal+® Withstand **Extreme** Environmental Conditions

- Environmental and mechanical tests conducted by independent laboratories show that even severe environments do not affect the integrity of EESeal® FilterSeal EMI Filter Inserts or the host connectors*

- Shock
- Vibration
- Salt Spray
- Thermal Cycling
- Humidity Exposure
- Altitude Immersion
- Fluid Immersion
- Salt Fungus
- Outgassing
- Flammability

*Nearly every EESeal insert is custom designed for your specific application and connector. Whenever a particular environmental feature is critical to your application, we recommend that you test the specific EESeal and connector combination to verify its suitability for your use.

2022 Independent Testing Shows EESeals® are Unaffected by Extreme Mechanical & Environmental Conditions

EESeal® and EESeal+® are designed to withstand extremely harsh conditions. They meet or exceed the environmental requirements of most military and commercial connector specifications (e.g., D38999). These D38999 connectors showing that severe environments do not affect the integrity of EESeal® or the host connector. The testing below was completed for EESeal+® and Hybrid EESeals®. Full test reports are available upon request or can be downloaded from our website.

Test	Requirement	Notes/Exceptions
Temperature Cycling	EIA-364-32	-55°C to 125°C, 5 cycles
Altitude Immersion	EIA-364-03	Mated connectors immersed in salt solution, 30 min. @ 75,000 ft, then 30 min. @ ambient pressure, 3 cycles
Salt Spray - Dynamic test	EIA/ECA-364-26	95°F for 482hr with connectors mated followed by 48hr with connectors unmated
Altitude-Low Temperature Durability	EIA-364-105	-55°C, 100,000 ft
Vibration	MIL-DTL-38999M Paragraph 4.5.6 EIA-364-28	500 mate/demate cycles
Shock - Standard Shock	EIA-364-27	Sine: 254mm/sec from 10-50Hz, 1.5mm double amplitude from 60-140Hz, 60G from 140-2000Hz 4 hours/axis @ ambient temperature, 4 hours/axis @ -55°C, 4 hours/axis @ 125°C, total 3 axes Random: Test Condition V, 2.4Hz @ 0.1G2Hz to 100Hz @ 5G2Hz to 300Hz @ 5G2Hz to 2000Hz @ 0.1G2Hz, 8 hours in longitudinal direction, 8 hours in a perpendicular direction, ambient temperature ± 1 milliseconds
Humidity	EIA-364-31	Dynamic: 90-98% relative humidity, 25C to 85C, 10 cycles of 24hr each; 90-98% RH, -10C for 3hr during 5 of the first 9 cycles
Fluid Immersion Fungus	EIA-364-10	Fluids A-I, K with connectors mated:
Thermal Vacuum Outgassing	MIL-STD-810 Method 508.6	28 days
Flammability	ASTM-E-565-07 FAR 25.853	TML <1%; CVCM <0.1%; Post bake required, 24 hours @300F

Quell Corporation | A HEICO Company
5639 Jefferson NE Albuquerque, NM 87109 USA

EESeal® for Transient Protection

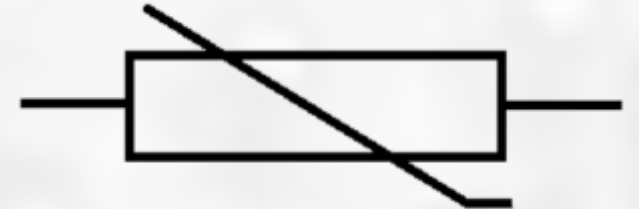
- TVS Diode Arrays

- ESD, IEC61000-4-2, $\pm 30\text{kV}$ contact, $\pm 30\text{kV}$ air
- EFT, IEC61000-4-4, 40A (5/50ns)
- Lightning, IEC61000-4-5, 8A ($t_P=8/20\mu\text{s}$, SPHV12-C)
- Low clamping voltage & Low leakage current



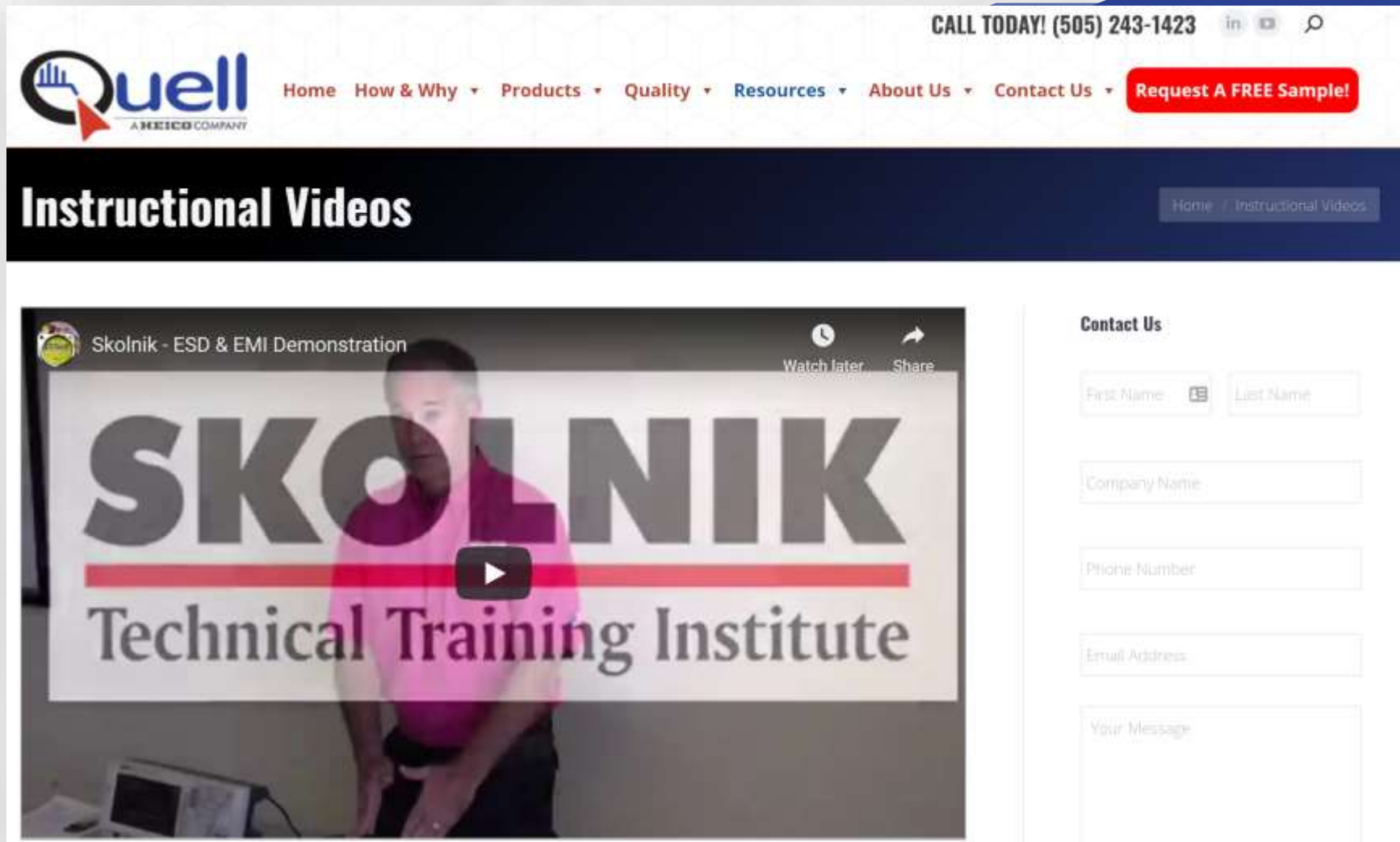
- Varistors

- Multilayer ceramic construction technology
- -55°C to $+125^{\circ}\text{C}$ operating temp. range
- Operating voltage range $V_M(\text{DC}) = 5.5\text{V}$ to 120V
- ESD rated to IEC61000-4-2, Level 4: Air Discharge 15KV and Contact Discharge 8KV
- RoHS compliant



- Others??

- We can incorporate virtually any 0402 or 0603 SMD

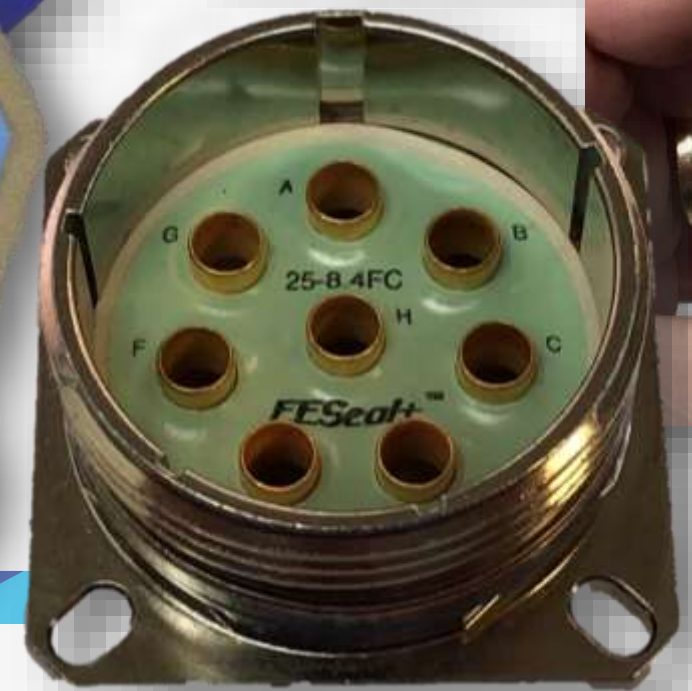


The screenshot shows the Quell website's 'Instructional Videos' page. At the top, there is a navigation bar with the Quell logo, a 'CALL TODAY! (505) 243-1423' button, and social media icons. Below the navigation bar, there are menu items: Home, How & Why, Products, Quality, Resources, About Us, and Contact Us. A prominent red button says 'Request A FREE Sample!'. The main heading is 'Instructional Videos'. A video player is embedded, showing a man in a pink shirt standing in front of a sign that reads 'SKOLNIK Technical Training Institute'. The video title is 'Skolnik - ESD & EMI Demonstration'. To the right of the video player is a 'Contact Us' form with fields for First Name, Last Name, Company Name, Phone Number, Email Address, and a text area for 'Your Message'.

- Designed for ESD protection
- Highly Resistive Material
 - 10^7 to 10^{10} ohms
- Initial Applications
 - Space
 - Navy
- Video Tutorial & Demo
 - <https://www.youtube.com/watch?v=HIFs3EfWILo>
 - <https://www.youtube.com/watch?v=nWpKXyVI6HE>

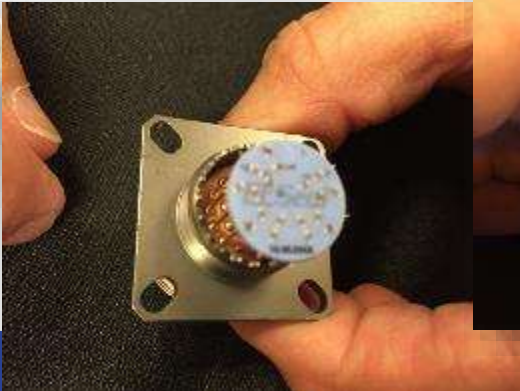


EESeal Gaskets Grounding



EESeals® Inside...

- Allows for both sockets and pins
- Multiple EESeals
 - More capacitance
 - Higher voltage
 - Wider frequency capabilities
 - Invisible

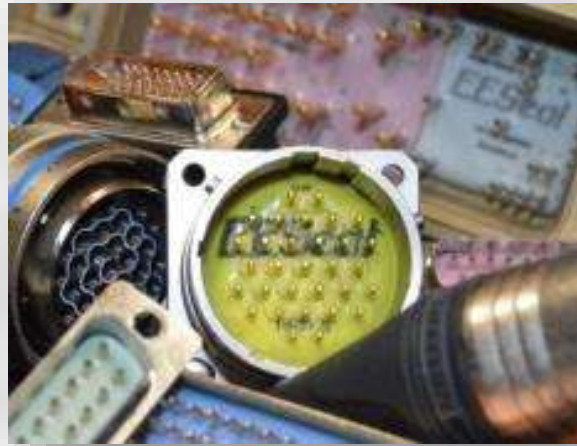




Where to use an *EESeal*®?

At ANY connector Interface.

- ANY style connector
 - MIL-Circular
 - MIL-C-38999, MIL-C-26482, MIL-C-5015, Mighty Mouse, & many others....
 - D-Subminiature
 - MDM/Micro D
 - ARINC
 - Plastic
 - Non-conductive connectors and more
- Any Manufacturer - Molex, Deutsch, Souriau, Amp, etc.



Circular Connectors

- MIL-C-38999 s1 plug
- MIL-C-38999 s1 receptacle
- MIL-C-38999 s2 plug
- MIL-C-38999 s2 receptacle
- MIL-C-38999 s3 plug
- MIL-C-38999 s3 receptacle
- MIL-C-38999 s4 plug
- MIL-C-38999 s4 receptacle
- MIL-C-26482 s1&2 plug
- MIL-C-26482 s1&2 receptacle
- MIL-C-5015 plug
- MIL-C-5015 receptacle
- MIL-C-83723 s3 plug
- MIL-C-83723 s3 receptacle
- MIL-C-81511 s2 receptacle
- MIL-C-81511 s3 receptacle
- MIL-C-26500 receptacle
- MIL-C-55181 plug
- JN1003 Eurofighter receptacle
- JN1003 Eurofighter plug
- MIL-C-28840 receptacle

DSub Connectors

- DSubminiature 9, 15, 25, 37, 50, combos
- Micro-DSub (MDM) 9, 15, 21, 25, 31, 37, 51, 69, 100, combos
- Double & High Density DSub 15, 19, 26, 31, 44, 52, 62, 78, 104 combos
- Combo DSub

Headers

- Centronix
- Header

DIN

- circular DIN
- miniDIN
- rectangular DIN

ARINC & Rack

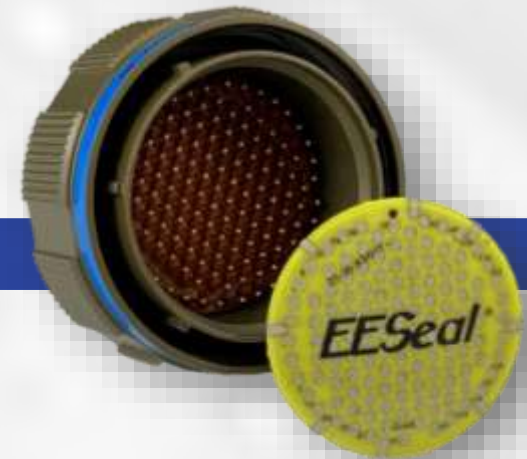
- ARINC404
- ARINC600
- ITT Cannon DPDMA Insert

LEMO

- LEMO various connectors

Custom Connectors and More

EESeal® Benefits...



- Custom!
 - Matches your exact application
 - Application dependent - Every pin exactly the way you need it...
 - Pin to Pin, pin to shell, Capacitors, Resistors, ESD - MOV/diodes, shorts, opens, etc....
 - No tooling
 - Light weight & No Additional Space Needed
 - < 1 gram
 - Field Installable/Replaceable (Retrofit)
 - Custom labeling, colors, etc.





EESeal® Benefits...

- Fast!
 - FREE Samples in 24-48 hours.
 - Production orders in 6-8 weeks...
...or better if needed...
- Cost!
 - Competitively priced as a long-term, permanent solution vs. Filtered Connectors.
 - No redesign or schedule delays
 - Ease of assembly



- A Few Quell Customers...

Raytheon



BOEING



Panasonic



L3HARRIS™

**CURTISS -
WRIGHT**

**GENERAL
DYNAMICS**

MOOG

NORTHROP GRUMMAN

Honeywell

EATON

Powering Business Worldwide

BAE SYSTEMS



Collins Aerospace



EMBRAER



THALES



AIRBUS

LOCKHEED MARTIN



GENERAL ATOMICS



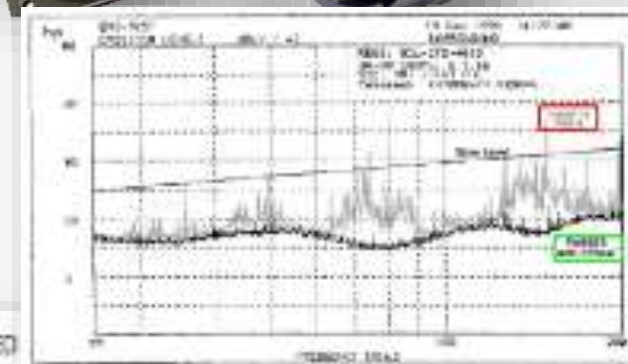
EESeals[®] on the Ground, in the Air and in Space...



LMCO "Black" Satellite, F-35 Lightning, B1 Lancer, A10 Thunderbolt, A400M, F-18 Growler, C5 Galaxy, Boeing 787, Eclipse 500, Embraer 160/170, Cessna Citation X, AH-64 Apache, UH-60 Seahawk, V-22 Osprey, OH-58 Kiowa, CH-47 Chinook, HH-65 Eurocopter, Humvee 1, MRAP, M1128 Mobile Gun System, M1A Abrams, M109 Paladin Howitzer, Boeing GBU-39 (SDB), TIM-162 Sea Sparrow, RQ-1/MQ-1, Predator, JDAM, NGC X-47B, RQ-4/MQ-4 Global Hawk, MQ-8 Fire Scout, SpaceX Dragon

What we need...

1. What is the connector p/n?
2. What are the frequency issues, scans and/or Capacitor values you would like?
3. What are the voltages on each of your pins?
4. What is the data rates on each pin? (RS422, ethernet, video, etc.)
5. Any transient or lightning specifications?
6. What is the best shipping address for your FREE EESeal samples?





Quell Key Contacts...

Title	Name	Office Phone	E-Mail	Mobile Phone
Inside Sales	Carleigh Baughman	(505) 243-1423	EESeal@quell.us	(303)-718-6001
Office/Sales Support	Amber Blanco	(505) 243-1423	Office@quell.us	
Engineering Technician	David Moya	(505) 243-1423	david@quell.us	
Chief Engineer	Ken Godana	(505) 243-1423	Ken@quell.us	
Director of Operations	Jack Morrison	(505) 243-1423	Jack@quell.us	(505) 450-1432
President	Scott Lindberg	(505) 243-1423	scott@quell.us EESeal@quell.us	(720) 394-3308

Thank you



Quell