ROGERS CORPORATION

PORON® Polyurethanes

Elastomeric material Solutions
www.rogerscorp.com

PORON® CONDUXPLUS™

PORON® Condux Plus® Electrically Conductive Foam

The more compact the handheld device, the more complicated the design. With complicated designs come unexpected electrical grounding and shielding challenges that require immediate solutions. Rogers can help. PORON® Condux Plus® foam offers high, reliable electrical conductivity and excellent mechanical properties to act as a trusted grounding pad within mobile devices.

There are four critical properties where electrically conductive foams must excel in order to work properly.

1. High Conductivity

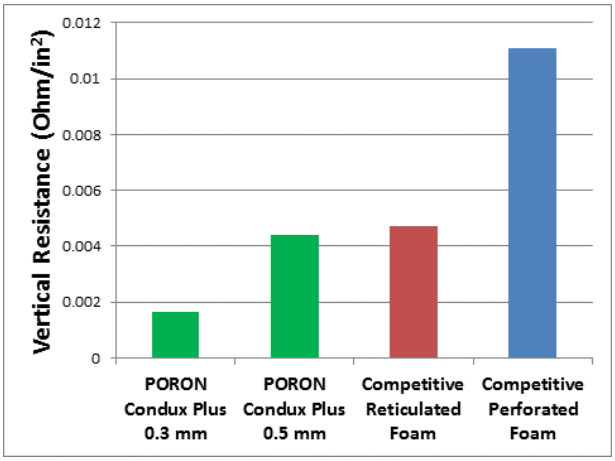
When conductive surfaces within a device have different electric potentials, an electromagnetic (EM) field can form. EM fields can interfere with other signals within a device, resulting in dropped calls.

The simplest solution to prevent interference is to connect those surfaces with a grounding pad that offers a highly conductive connection across a wide range of compression. In the conductivity graph to the right, Condux Plus materials demonstrate excellence, providing extremely low electrical resistance (low electrical resistance = high conductivity).

2. Consistent Connectivity

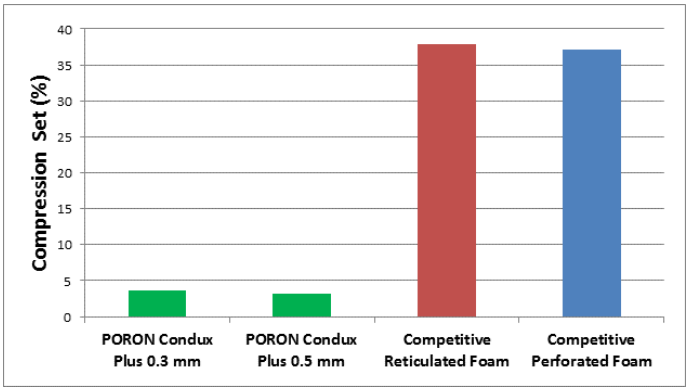
A grounding pad is of little value unless it consistently connects two electrically conductive surfaces over the life of the device. As you see in the graph to the right, Condux Plus materials retain their thickness over the long term, providing a consistent and reliable electrical connection where competitive materials fall short.

Conductivity (Vertical Resistance)



Note: *Reticulated Foam thickness is 0.49 mm, Perforated Foam thickness is 0.42 mm. The values above represent the vertical resistance of a 25.4mm x 25.4mm (1"x1")sample under 1 KgF.*

Compression Set



Note: *The above graph represents typical values, tested according to ASTM D 3574-95, Test D @ 70°FC (158°F).*

PORON® Condux Plus® Foam, Continued

3. Material Integrity

It is critical that grounding pad materials hold their shape and integrity throughout their useful life. If a foam fails during the first stage of processing, how well will it perform in the final product?

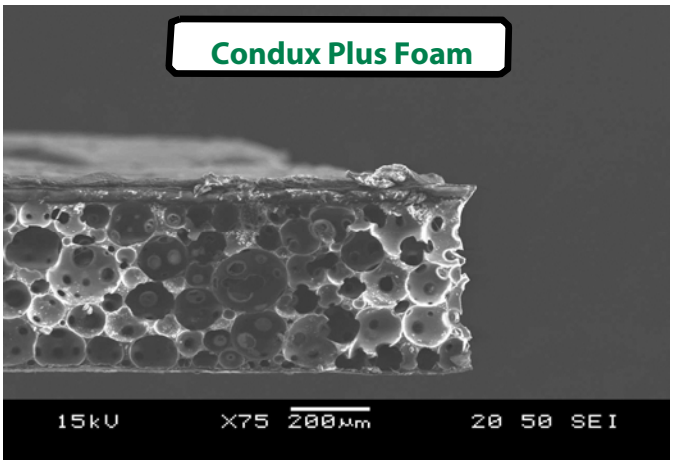
Consider the images on this page. After die cutting, Condux Plus material maintains a straight, cleanly die-cut edge. Compare this edge to competitive material pictured below. It is easy to recognize the collapsed, rough edges which denotes a deformation in processing that may lead to a degradation in performance within the completed device.

4. Effective Shielding

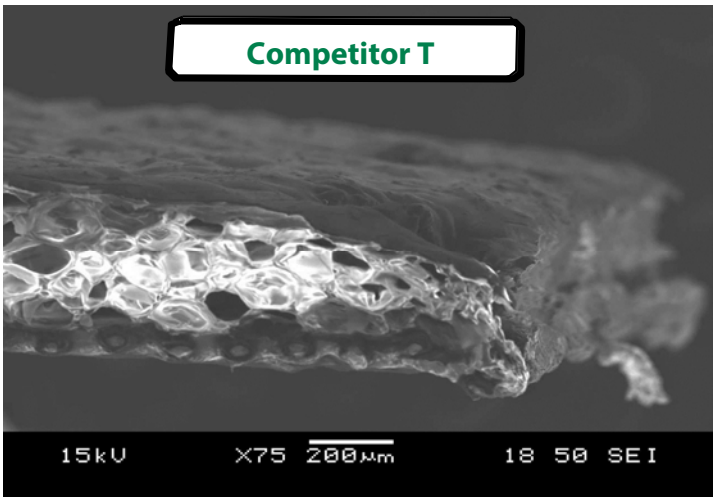
Condux Plus materials have been shown to shield electrical devices from a wide range of EM frequencies. From 300 MHz to 10 GHz, Condux Plus foams provide a shielding effectiveness of 50 dB, thereby reducing the power of external EM fields by greater than 99%.

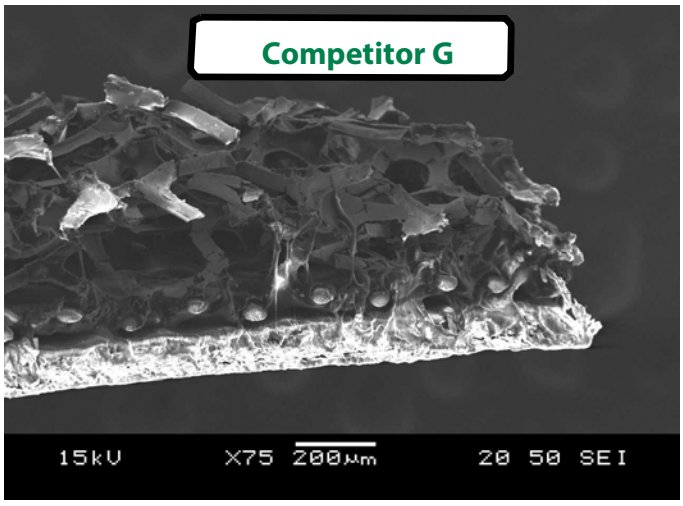
For reliable grounding and shielding, Condux Plus electrically conductive foam is the best solution for high quality mobile devices.

No Deformation During Processing



Notice the integrity of the die cut edge of Condux Plus foam above. Compare that to the collapsed, crushed edges of die-cut competitive foams below.





PORON® Condux Plus® Foam, Continued

PROPERTY	TEST METHOD	VALUE	
Typical Physical Properties			
Thickness*, mm (inches)		0.33 (0.013)	0.53 (0.021)
Tolerance, %		± 20%	± 15%
Standard Color (surface / foam)		Metallic / Black	
Compression Force Deflection, Typical Values, kPa (psi)	.51 cm/min (0.2" / min) Strain Rate Force Measured @ 25% Deflection	14 (2)	21 (3)
Compression Set, Maximum Value, %	Max Value, ASTM D 3574-95 Test D @ 70°C (158°F)	10	
Compression Set	Typical Value, ASTM D 3574-95 Test D @ 70°C (158°F)	4	3
Vertical Contact Resistance, Ω	Max based on modified MIL-G-83528	0.03	
	Typical based on modified MIL-G-83528	0.001	0.003
Volume Resistivity, Ω•cm	Max based on modified MIL-G-83528	19.6	12.1
	Typical based on modified MIL-G-83528	2.94	1.3
Foam Side Surface Resistivity, Ω/sq	Max based on modified MIL-G-83528	0.2	
	Typical based on modified MIL-G-83528	0.1	0.12
Adhesive Side Surface Resistivity, Ω/sq	Max based on modified MIL-G-83528	0.3	
	Typical based on modified MIL-G-83528	0.12	0.12
Shielding Effectiveness, Minimum, dB	IEEE-299: Tested from 300 MHz to 10GHz	60	65
	IEEE-299: Tested from 10 GHz-15 GHz	-	50
	IEEE-299: Tested from 15 GHz-20 GHz	-	48
Shielding Effectiveness, Average, dB	IEEE-299: Tested from 300 MHz to 1GHz	65	70
	IEEE-299: Tested from 1 GHz to 10 GHz	60	65
	IEEE-299: Tested from 10 GHz-15 GHz	-	55
	IEEE-299: Tested from 15 GHz-20 GHz	-	50
Adhesive Strength, g/in	ASTM D3330 & ASTMD100	5.78 +/- 1.01	
Thermal Conductivity, W/mk	ASTM C518	0.06 - 0.08	

PROPERTY	TEST METHOD	VALUE
Temperature Resistance		
Recommended Constant Use (max) °C (°F)	SAE J-2236	90° (194°)
Recommended Intermittent Use (max) °C (°F)		121° (250°)
Embrittlement °C (°F)	ASTM D 746-98	-18° (0°)
Cold Flex	MIL-P-12420D 1991 @ -40°C (-40°F)	-
PSA °C (°F)	Manufacturer Supplied	-40° to 120° (-40° to 248°)

PORON Condux Plus foam is provided on a PET liner which is typically removed by the end user and is not included as part of the total thickness.

Storage Information: Condux Plus materials have a shelf life of 12 months from the date of manufacture when stored at room temperature. Storage in the original packaging located in a dry cool environment is recommended.

Notes:

- Typical values are a representation of an average value.
- All unit conversions are approximate.
- Additional technical information is available.

PORON® Condux Plus® Foam, Continued

Grounding

Figures 1 and 2 to the right depict the change in pushback force and resistivity of Condux Plus materials across a range of compression levels. These graphs clearly show that Condux Plus foams maintain high conductivity (low resistance) in a variety of compression states, from extremely low to extremely high.

Shielding

Condux Plus materials have been tested under two different, well-accepted test methods for electronic shielding:

1. Figure 3 in the bottom right-hand side of the page illustrates the shielding performance of Condux Plus 0.3 mm and 0.5 mm material ranging from 300 MHz to 10 GHz according to a modified version of ASTM-D-4935.
2. Table 1 below summarizes both the minimum and best attenuation (shielding) performance for each Condux Plus material ranging from 300 MHz to 10 GHz according to IEEE-299 (300 MHz-20 GHz for 0.5mm).

Condux Plus Thickness	Minimum Attenuation (dB)	Best Case Attenuation (dB)
0.3mm	51 @ 10 GHz	69 @ 300 MHz
0.5mm	48 @ 18 GHz	72 @ 300 MHz

Table 1: Summary of Condux Plus 0.3 & 0.5 Shielding Effectiveness

For additional information on PORON Condux Plus Materials, please contact solutions@rogerscorp.com or your Rogers Sales Engineer.

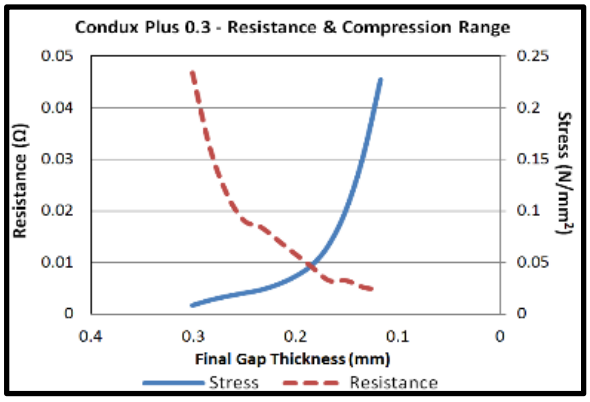


Figure 1: Condux Plus 0.3 mm Resistance & Compression

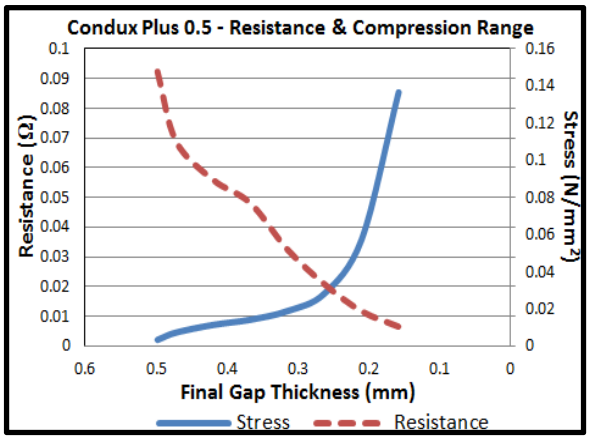


Figure 2: Condux Plus 0.5 mm Resistance & Compression

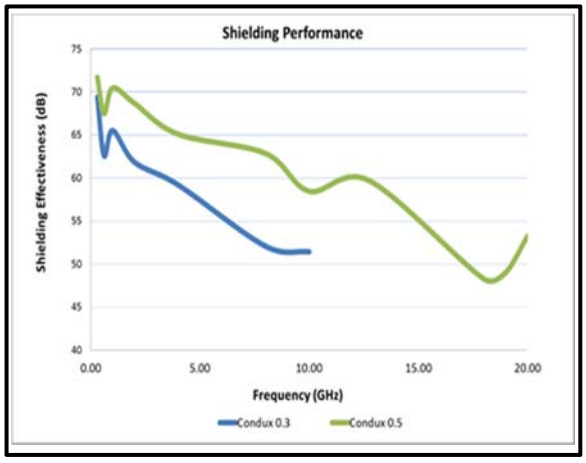


Figure 3: Condux Plus 0.3 mm & 0.5 mm Shielding Effectiveness Graph