

# PREMIER™ PEI-140

HIGH TEMPERATURE CONDUCTIVE PLASTIC FOR  
EMI SHIELDING



## Customer Value Proposition:

PEI-140 can provide up to a 65% cost reduction by eliminating secondary operations such as assembly, machining, painting/plating and the logistics that accompany these processes.

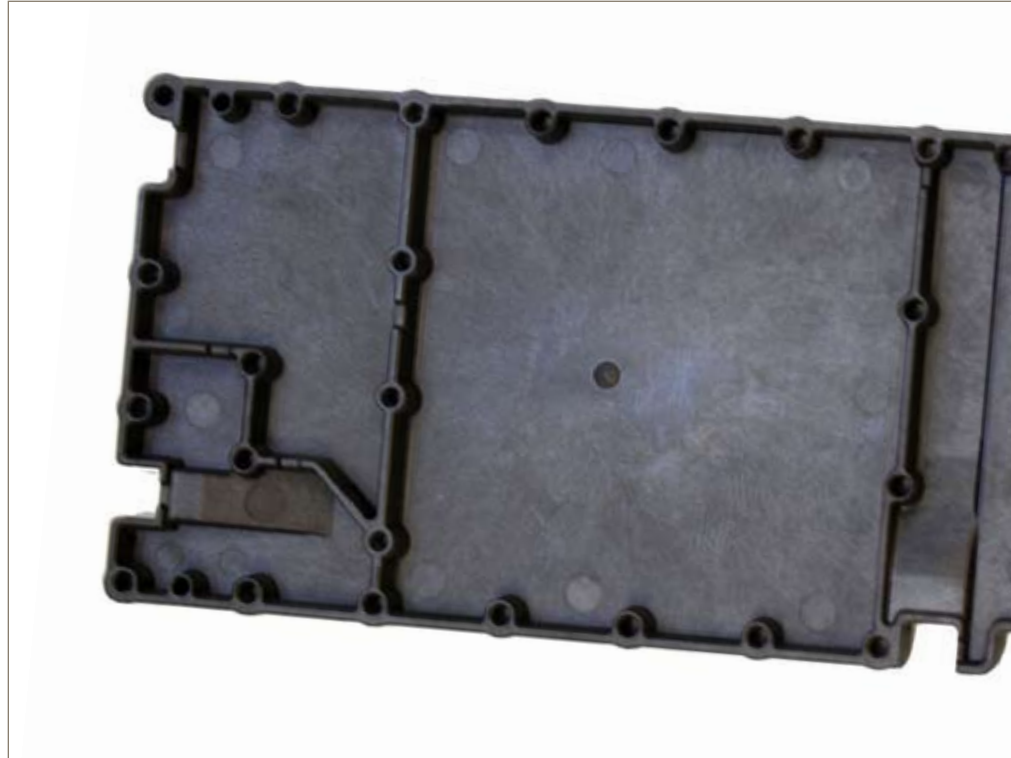
The shielding effectiveness, high temperature performance, low smoke generation, chemical resistance and UL 94V-0 flammability rating combined with a weight savings of 50 - 75%, make using PEI-140 for aerospace applications economically viable. PEI-140 specific gravity is 40% less than aluminum and 80% less than steel. PEI-140 offers an opportunity to reduce the weight of airborne electronic housings by up to 75%. PEI-140 housings will not only cost less themselves, but also improve aircraft operating cost through weight reduction.

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## Product Features:

- High performance shielding up to 85 dB
- Stable electrical and shielding properties for applications requiring continuous use of 170°C
- Short term capability (HDTUL) of 180°C
- Lightweight (Density=1.61 g/cc)
- High strength
- Tensile strength: 15,000 psi
- Flexural Strength: 20,000 psi
- Flammability rating: UL 94 V-0
- Avionic Smoke Density Compliance: MAX 110 Ds; < 200 Ds required to pass
- Low system costs
- Precision tolerance (0.001)
- Single source supply chain
- Elimination of secondary operations
- Recyclable
- RoHS & WEEE compliant
- Globally available as pellets or parts

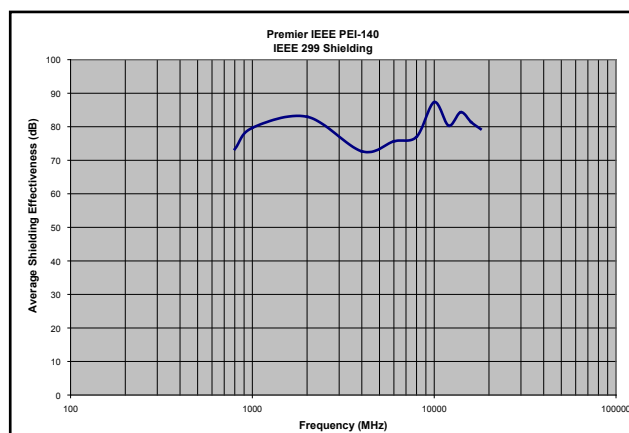
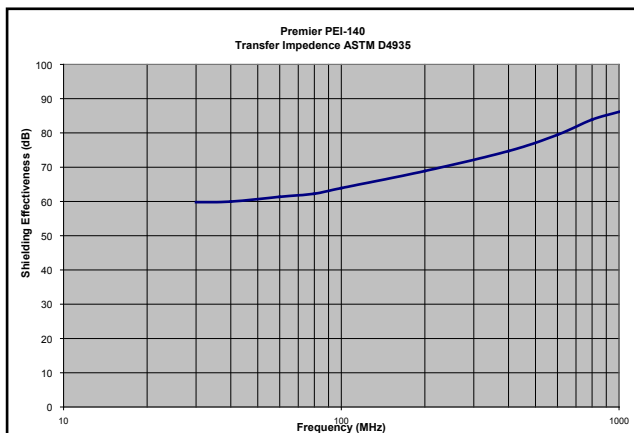
# PREMIER PEI-140 Properties

Table 1 - Typical PEI-140 Properties

	Value	Test Method	Nominal Value (English)	Unit	Nominal Value (SI)	Unit
Shielding Effectiveness	Average from 800 to 18,000 MHz - Thickness 0.07 in (1.8 mm)	IEEE 299	80	dB	80	dB
	Average from 30 to 1000 MHz - Thickness 0.07 in (1.8 mm)	ASTM D4935	72	dB	72	dB
Physical	Specific Gravity	ASTM D792	1.61	--	1.61	--
	Mold Shrinkage 0.125 in (3.2 mm)	ASTM D995	0.0035	in/in	0.35	%
Mechanical	Tensile Modulus	ASTM D638	2.1 x 10 <sup>6</sup>	psi	15.8	GPa
	Tensile Strength @ Break	ASTM D638	15,000	psi	103	MPa
	Tensile Elongation @ Break	ASTM D638	4.3	%	4.3	%
	Flexural Modulus	ASTM D790	1.1 x 10 <sup>6</sup>	psi	8.2	GPa
	Flexural Strength	ASTM D790	20,000	psi	138	MPa
Impact	Izod - Unnotched 73° F (23° C)	ASTM D256	4	ft-lb/in	210	J/m
	Izod - Notched 73° F (23° C)	ASTM D256	1.1	ft-lb/in	60	J/m
	Charpy Impact Notched 73° F (23° C)	ASTM D6110-05a	0.84	ft-lb/in	45	J/m
Thermal	HDTUL @ 264 psi (1.82 MPa)	ASTM D648	363	F°	184	C°
	Thermal Conductivity	ASTM D5470	0.71	W/mk	0.71	W/mk
Electrical	Surface Resistance	MIL-DTL-83528C	450	mOhm/sq	0.45	Ohm/sq
	Through Resistance	PRE-012	380	mOhm	0.38	Ohm
Flammability	UL 94 V-0 UL Flammability Rating	UL 94 V-0	0.07	in	1.8	mm
	Smoke Density 3.0 mm @ 4 minutes	BSS 7238/7239	MAX 110	Ds	MAX 110	Ds
	Limited Oxygen Index	ASTM D2863	41	%	41	%

## ORDERING INFORMATION

Part Number	Specify Quantity Upon Order
CP-PEI-140	55lb box or 1100lb gaylord
CK-PEI-140	25kg box or 500kg gaylord



# PREMIER™ PEI-140

## Product Features:

PREMIER™ PEI-140 is a custom blend of polyetherimide plus engineered filler for stable electrical, mechanical and physical performance at high continuous temperature exposures. It is filled with the production proven PREMIER proprietary filler system that is formulated for consistent shielding over a wide range of frequencies. Two elements of this technology make it unique in the marketplace: filler morphology and our proprietary dispersion agent.

## Filler Morphology

A proprietary combination of fibers and powders provides unique EMI absorptive properties of nickel-plated carbon fiber, the conductivity of stainless steel, and the visual improvement of plated powder. The increase in EMI shielding performance is far beyond values expected from surface conductivity and EMI reflection alone.

## Dispersion Technology

The fiber is treated with a unique agent. Upon molding, the agent provides complete fiber dispersion delivering the only commercially available homogeneous fully entangled fiber matrix within a molded part.



Fig 1 - Polymer burn-off of a PREMIER molded part reveals homogeneous fiber dispersion that is key to performance.

## Technology Comparison

PREMIER is a more cost effective EMI shielding solution compared to conductive paint or plating. Costs are competitive and there is no long supply chain with associated transportation costs and secondary process yield losses. WIP is reduced. PREMIER requires fewer layers of tooling, process approval, design constraints and packaging requirements. PREMIER frees the design engineer from the manufacturing constraints of metal fabrication or die-casting by allowing the use of thermoplastic injection molding without the need for secondary operations. Housings are lighter, thinner and less costly.

## Competitive Advantage

**Cost Reduction** - Up to 65% in total cost of ownership by *eliminating secondary operations such as:*

- Machining for tolerance control; PEI-140 can maintain flatness within 0.003" (0.076mm)
- Tapping for screws; PEI-140 uses thread forming screws or heat-staked inserts
- Plating or painting
- Multiple tools and fixtures; No need for machining jigs, painting/plating fixtures or assembly stations

**Weight reduction** - 50 to 75% compared to current metal-based solutions due to the significantly lower density than metals

**Exceptional shielding** - up to 85dB without a gasket in high performance thermoplastic

**High Temperature Performance** - (340°F/170°C)

**Smoke Density** - Meets strict Avionics guidelines for optical smoke density tests at MAX 110 Ds, requirement to pass is 200 D's or less

## Environmentally Friendly

At end of life PREMIER can be recycled using regrind procedures to comply with ever growing disposal concerns. Testing shows no ill effect on shielding up to 15% re-grind processed using standard industry practices. PREMIER complies with RoHS, WEEE, EPA, EU, and TCO specifications for ecological compatibility containing no halogenated compounds.



## Injection Molding

Tooling is similar to 20% glass filled PEI thermoplastic. A hot material distribution system designed for filled PEI can be used to eliminate in-process scrap. Otherwise standard tool practices should be used. Pre-existing tooling designed for filled PEI can be used to manufacture parts in PREMIER and Chomerics can provide EMI testing of molded parts for evaluation. Chomerics has complete EMI testing facilities for both near field and far field testing per MIL-STD or FCC protocol. Generally, 2 mm thick walls are desired. However, localized areas of 1.5 mm thickness can be molded successfully. As with any design, material flow within the tool must be evaluated to ensure fill. Chomerics is ready and willing to assist in tool design using mold flow analysis. Chomerics can upon request design and manufacture the tool for you or work closely with current sources to supply the tool.

# Processing Information

## Description

A patented pelletizing process is used by Chomerics to make PREMIER pellets. These pellets standardize material handling during molding. No blending is required at the press. PREMIER injection molding integration onto any production floor is painless and seamless

PREMIER provides the only commercially available thermoplastic system with a homogenous dispersion of the fiber throughout the molded part, regardless of part geometry. This is the result of combining pelletizing with Chomerics unique proprietary fiber dispersion technology.

Unlike other filled materials, PREMIER's dispersion agent ensures the formation of a homogeneous fully entangled fiber matrix within the part avoiding resin rich or poor areas plus positive fiber retention within the part. Conductivity and shielding are consistent throughout the part, giving high part yields.

## Application Guidelines

Table 2 should be used as a guideline for processing and drying. There are several principles used to achieve a quality part.

1. Higher back pressure is suggested to promote homogeneous fiber distribution, consistent shot size, and improved surface appearance.
2. Screw speed should be adjusted so that the screw is rotating during

Table 2 - Processing Parameters

Drying Temperature	°F (°C)	300 to 325 (150 to 160)
Drying Time, Typical	hours	5 to 7
Drying Time, Maximum	hours	24
Suggested Maximum Moisture	%	0.02
Rear Temperature	°F (°C)	680 to 720 (360 to 385)
Middle Temperature	°F (°C)	690 to 730 (365 to 390)
Front Temperature	°F (°C)	700 to 740 (370 to 395)
Nozzle Temperature	°F (°C)	700 to 740 (370 to 395)
Processing (Melt) Temperature	°F (°C)	700 to 740 (370 to 395)
Mold Temperature	°F (°C)	190 to 240 (90 to 115)
Back Pressure	Psi (bar)	75 to 125 (5 to 8)
Screw Speed	inch/minute (cm/minute)	300 to 400 (760 to 1000) 95 to 130 rpm for a 1.0 inch (25.4 mm) screw
Clamp Pressure	tons/in <sup>2</sup> (MPa/cm <sup>2</sup> )	4 to 6 (55 to 80)
Cushion	inch (mm)	0.4 to 0.5 (10 to 13)

3. PREMIER materials are thermally conductive as well as electrically conductive. A small diameter nylon type nozzle tip will help eliminate tip freeze-off.
4. Residence time in the barrel should be kept as short as possible. Although not mandatory, hot runner systems with gate valves can be used for cost control through process scrap reduction and elimination of secondary de-gating.
5. Short fill times are recommended. Fast fill speeds will provide longer flow, fill thinner wall sections, give better knit line strength, and improve surface appearance.

6. For molding PEI-140, Chomerics recommends using only high temperature equipment capable of filling a glass filled Ultem part with a minimum wall thickness of 2 mm. Localized areas of 1.5 mm thickness can be molded successfully, depending on part geometry.

## Processing Benefits

- Hybrid-filler pellet system
- No dry blending
  - No weighing
  - High machine up time
- Processing similar to non-conductive systems
- Environmentally friendly and recyclable
- Global supply
- Revolutionary dispersion technology
- High EMI shielding at a lowcost
- Consistent high part yield