

smt



The more things change, the more AMODEL® stays the same.

AMODEL PPA outperforms alternative resins for meeting today's
and tomorrow's challenges in SMT applications.

Solvay
Advanced Polymers





Today's manufacturers of SMT components need polymers
that can deliver improved temperature performance, ease of processing,
dimensional stability, strength and chemical resistance—

hello AMODEL

AMODEL resin outpaces alternative resins

Our broad product platform lets you select the grade that can optimize each of your application criteria, including performance, processing and price. Plus with AMODEL resin, you can be ready to meet emerging processing challenges using grades specifically designed to work in lead-free soldering operations.

Overall, AMODEL resin can offer a superior combination of higher HDT, lower moisture absorption, higher stiffness and lower thermal expansion than competitive materials including HTN, PA-4,6, PCT, PPS and SPS. Plus, AMODEL resin can offer good molding productivity by allowing faster cycle times than many other resins.

A flat-out winner for today's hottest applications

In SMT, flatness is extremely important to ensure good solder joint formation and reliability on the finished board. This requires the use of polymers that can withstand temperatures up to 250°C without warping, changing dimensions or blistering. Figures 1 and 5 show the superior heat deflection temperature (HDT) of AMODEL resin, illustrating how it can withstand reflow soldering without warping.



After a one-minute dip in solder at lead-free temperatures (260°C), glass-filled PCT warps and blisters — while AMODEL PPA stays the same.

Figures 2 and 6 demonstrate the tendency for AMODEL resin to remain dimensionally stable over a wide temperature range. This can contribute to long-life reliability in connector applications by maintaining strong pin retention. And Figures 3 and 7 show that the minimal moisture absorption of AMODEL resin* does not lead to blistering when exposed to typical reflow soldering temperatures. What's more, with AMODEL resin, moisture does not degrade the performance of the polyphthalamide polymer. So for automotive applications, you won't lose important strength and elongation properties after thermal cycling as you may with materials such as PCT.

**As with many engineering polymers, AMODEL resin performs best when adequately dried immediately prior to molding.*



Lead-free concerns heat up

Although the amount of lead in solder accounts for less than 1% of the lead used in the world, there are concerns about the potential for lead to leach into ground water from electronics devices discarded into landfills. This has instigated discussions and legislation around the world aimed at eliminating the use of lead in the solder process.

Unlike most electronics solutions today, lead-free solder alternatives are far from plug-and-play. One key difference is the higher melting point of the most viable lead-free solder alternatives. As a result, higher SMT reflow temperatures will likely be required. This means the polymers you select for SMT components may need to withstand temperatures up to 270°C.

Non-Flame Retardant Grades

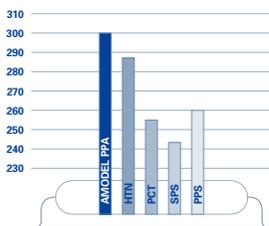


FIGURE 1: HDT @ 1.8 MPa (°C)

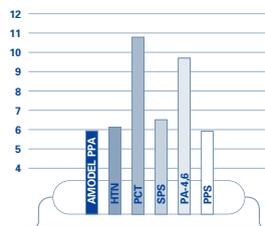


FIGURE 2: CTE, Transverse Direction, 0-100°C (10⁻⁵ m/m°C)

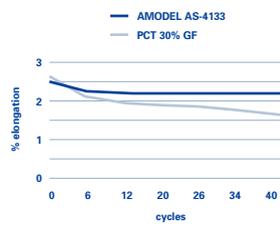


FIGURE 3: Effect of Humidity on Elongation (-40 - 155°C / 95%RH)

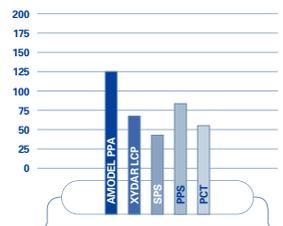


FIGURE 4: Weld-Line Strength

As Figures 1 and 5 reveal, AMODEL PPA has an HDT of 300°C—295°C for flame retardant grades—outperforming other competitively priced SMT-capable polymers. This makes AMODEL resin a cost-effective solution that can help you avoid retooling costs as you implement lead-free soldering operations which comply with emerging regulations.

Ease of processing allows complex designs

Part geometries for both electronics and automotive applications continue to evolve toward thinner walls and finer connector pitches. The electronics area, however, has experienced greater competitive pressure to miniaturize, leading to an increased use of LCPs. For these applications, XYDAR® LCP features excellent flow properties and warp-resistance, so it can be injection molded into complex thin-wall components. Plus for lead-free soldering applications, we offer special grades that are thermally stable to 300°C.

For many electronics components, as well as for most automotive components, AMODEL resin offers good processability at a significantly lower price point. Flow characteristics for AMODEL resin are comparable to PPS without the associated flash concerns, and superior to PCT.

Mechanical and electrical properties deliver powerful advantages

As pin and circuit densities continue to increase, you need to work with polymers that can withstand high pin insertion forces without breaking. Glass-reinforced AMODEL PPA exhibits higher tensile and flexural properties than most alternative materials. This translates to outstanding weld-line strength, which Figure 4 exemplifies. Plus AMODEL resin delivers extremely high stiffness which contributes to excellent impact strength and blister resistance. These remarkable mechanical properties allow AMODEL resin to withstand most shocks and vibrations experienced in automotive applications.

Further, today’s tightening geometries call for enhanced electrical properties. AMODEL resin offers superior performance in the areas of arc resistance and UL Comparative Tracking Index (CTI), helping to eliminate crosstalk. Silver migration may also be reduced using AMODEL PPA.

Chemical resistance surpasses that of less hardy polymers

Crystalline polymers typically offer superior chemical resistance—AMODEL PPA is no exception. This hardy polymer shows excellent resistance to many of the cleaning chemicals typically used in the electronics industry. Plus AMODEL PPA can easily withstand exposure to most fuels and other automotive fluids for exceptional long-life performance under-the-hood. In addition, XYDAR liquid crystal polymer offers incredible chemical resistance beyond that of most other polymers.

Flame Retardant Grades

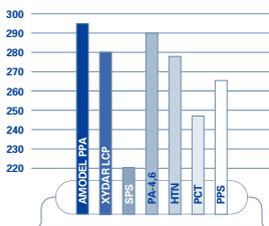


FIGURE 5: HDT @ 1.8 MPa (°C)

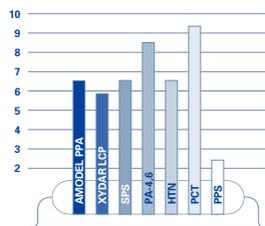


FIGURE 6: CTE, Transverse Direction, 0-100°C (10⁻⁵ m/m°C)

	250°C	260°C	270°C	280°C
AMODEL PPA	OK	OK	OK	OK
XYDAR LCP	OK	OK	OK	OK
SPS	OK	OK	B	B
PA-4,6	OK	B	B	B
HTN	OK	OK	B	B
PCT	OK	B	B	B
PPS	OK	OK	OK	OK

cycles

B = Blister

FIGURE 7: Solder Dip Results (23°C / 50%RH / 48 hrs)

Solvay Advanced Polymers

Performance chart

Relative performance for engineering polymers used in electronics and automotive electronics applications.

	AMODEL PPA	HTN	PCT	PPS	SPS	XYDAR LCP
Heat deflection temperature (HDT)	○	◐	●	◐	●	○
Lead-free reflow solderable	○	●	●	○	●	○
Reflow solderable	○	◐	◐	●	◐	○
Impact strength	○	○	◐	◐	◐	○
Tensile strength	○	○	◐	◐	◐	◐
Flexural modulus	○	○	⊘*	○	◐	○
Weld-line strength	○	○	◐	◐	◐	◐
Moisture absorption	◐	◐	○	○	○	○
Hydrolytic stability	○	○	◐	○	◐	○
Coefficient of thermal expansion (CTE)	○	○	●	●	◐	○
Processing—cycle time	○	○	◐	◐	◐	○
Processing—flow	◐	◐	●	○	○	○
Tendency to flash	○	○	○	●	○	○
Relative \$ for FR grades for electronics	\$\$\$	\$\$\$	\$\$	\$\$\$	\$\$\$	\$\$\$\$
Relative \$ for non-FR grades for automotive electronics	\$\$	\$\$	\$\$	\$\$\$	\$	\$\$\$\$

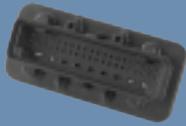
* ○ for non-FR grades / ● for FR grades; all values are for glass-reinforced materials, except for LCP.

- KEY**
- expected to perform well or meet the needs of most applications
 - ◐ adequate for many application requirements but may show some limitations
 - limited or poor performance expected

AMODEL PPA can provide the most cost-effective solution for delivering across-the-board performance in automotive and electronics applications.



Automotive



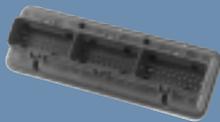
Specific grades of AMODEL resin can be compatible with molded-in-place (MIP) gaskets.



Toughened grades of AMODEL resin can provide enhanced elongation for terminal locking and snap-fit features.

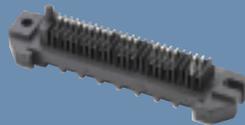


The enhanced processing of AMODEL resins can deliver fast cycle times for good connector productivity which can reduce processing costs.



The addition of mineral reinforcement to specific AMODEL grades can provide superior flatness for high pin-count connectors with challenging geometries.

Electronics



The high flow and thermal stability of XYDAR LCP can allow you to design parts with tighter tolerances and thinner walls.



White AMODEL resin offers superior opacity and reflectivity for insert molding in LED applications.



The low moisture absorption of AMODEL resin allows high-density connectors to be molded in geographic regions with extremely high humidity.



AMODEL resins can be ultrasonically welded as well as laser marked for producing two-part dip switches.

To learn more about our products and services, please visit our website at www.solvayadvancedpolymers.com.

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Engineering polymers for high-performance applications are developed at our Alpharetta, Georgia facility.



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