

Product Data Sheet

General Information

PHOTOMER® 6008 is a proprietary, aliphatic urethane acrylate oligomer developed for energy curable systems. This high viscosity acrylate resin exhibits fast cure speed, low odour, low volatility and low skin irritancy. PHOTOMER® 6008 is an excellent film former and it contributes towards unique performance properties typical of urethane acrylates in UV/EB curable formulations.

Specification

Appearance	Visual	Clear viscous resin
Viscosity @ 60 °C	Brookfield, ISO 2555	12,000 - 20,000 mPa.s
Colour (Gardner)	ISO 4630	≤ 1
Isocyanate content (NCO)		≤ 0.1 %

Additional Data

Specific Gravity @ 25°C	1.200 g/cm ³
Weight/Gallon @ 25°C	9.0 lbs
Vapour Pressure @ 25°C	< 0.001 mmHg
Draize Value	Mild
H ₂ O Solubility at 25°C	Negligible

Application

PHOTOMER® 6008 is recommended for use in UV/EB curable electronic coatings including solder masks, plate resists, conformal coatings, component coatings and insulating varnishes. It is an excellent base resin for screen printing inks where it contributes to consistent application viscosity, better pattern resolution and uniform coating thickness during cure. PHOTOMER® 6008 forms tough, durable films with excellent high temperature stability, superior solvent resistance, high surface hardness and good flexibility when cured.

PHOTOMER® 6008 Homopolymer Studies

- 4,800 psi Tensile Strength
- 10% Elongation
- < 10% Shrinkage on Cure
- 0.18% Taber Abrasion Weight Loss

PHOTOMER® 6008 Electron Beam Studies

EB cured neat films (1 mil wet film thickness) of PHOTOMER® 6008 paralleled the results obtained during UV cure, that is tough, glossy, abrasion resistant and solvent resistant films were generated. It was observed that tensile strength and percent elongation increased with incremental dosages (3 passes @ 1 Mrad) compared to a single higher exposure level (1 pass @ 3 Mrad).

PHOTOMER® 6008**Film Studies**

	Aluminum	Tin-Steel	Copper
Scuff Resistance	Good	Good	Good
Gloss, 60°	90+	90+	90+
Adhesion (#600 Cellotape)	Good	Fair	Excellent
Pencil Hardness	6H	6H	6H
Chemical Resistance (MEK Double Rubs)	100+	100+	100+
Conical Mandrel	< 0.25"	< 0.25"	< 0.25"

Cure Conditions:

RDS Rod #3; 0.27 mils wet film thickness;
4.0% Omnirad® BDK; 100 ft/min;
one 300 watt/inch UV lamp

PHOTOMER® 6008 Chemical Resistance Study

UV cured coated copper panels were submerged for two minutes at 25°C in different solvents, air dried, then evaluated for blistering, delamination, swelling and color change. Following are the results:

• Isopropyl Alcohol	No effect
• 1,1,1-Trichloroethane	No effect
• Acetone	No effect
• 1.0N Sodium Hydroxide	No effect
• Methylene Chloride	Slight blistering with delamination
• Rosin Flux	No effect
• Organo Flux	No effect
• Methylene Ketone	No effect

Formulation Suggestions for PHOTOMER® 6008

The excellent high temperature stability, solvent resistance, flexibility, and toughness properties of PHOTOMER® 6008 underscore its utility in printed circuit applications.

When formulated into UV curable solder masks for rigid printed circuit boards, PHOTOMER® 6008 contributes to easy screenability, tight registration, reproducible fine line definition, and excellent delamination resistance during wave soldering.

Insulation resistance values averaged 4×10^9 ohms (0.025" spacing/96 hrs/35°C/90% RH) for the coated PCB with other performance properties such as thermal shock, flame retarding and moisture resistance being met or exceeded. Following are starting point formulations which can be further modified to meet the requirements of specific applications.

UV Curable Solder Masks

	A	B	C
PHOTOMER® 6008	40.0	50.0	50.0
PHOTOMER® 4028	18.0	8.0	14.0
PHOTOMER® 4072	-	10.0	10.0
PHOTOMER® 4061	-	16.0	16.0
PHOTOMER® 4171	-	6.0	-
PHOTOMER® 4006	4.0	-	-
HEMA (Hydroxyethyl methacrylate)	28.0	-	-
PT3MP (Pentaerythritol tetra-3-mercaptopropionatel)	5.0	5.0	5.0
Omnirad® BDK	5.0	5.0	5.0

Properties

Formulation Viscosity @ 25°C, cps	5,900	26,750	23,750
Scuff Resistance	Good	Good	Good
Pencil Hardness	6H	6H	6H
Cross-Hatch Adhesion (#600 Cellotape):			
a) Organo Flux-Mild			
Initial	100%	100%	100%
Final	100%	100%	95%
b) Rosin Flux-Strong			
Initial	100%	100%	100%
Final	25%	90%	50%

Hydrolytic Stability:

Class	Temperature	UV Lamp			
1	35 ± 1°C	96 Hrs	OK	OK	OK
2	85 ± 2°C	168 Hrs	Slight Delamination	OK	OK
3	100 ± 2°C	168 Hrs	Cracking	Slight Delamination	OK

Flux Resistance - 2 minutes @ 25°C:

Organo Flux 3355-11 (London Chemical Co.)	No effect	No effect	No effect
Rosin Flux 77-33TA (London Chemical Co.)	No effect	No effect	No effect

Chemical Resistance - 2 minutes @ 25°C:

Isopropanol	No effect	No effect	No effect
1,1,1-Trichloroethane	No effect	No effect	No effect

Cure Conditions: RDS Rod #3; 0.27 mils wet film thickness; two passes under one 300 watt/inch bulb; 30 ft/min line speed.

Formulated UV/EB curable products containing PHOTOMER® 6008 may be applied by lithographic and direct roll methods in addition to screen printing presses. Coatings based on this high viscosity urethane acrylate oligomer provide high gloss, high build and protection to printed surfaces.

These attributes are particularly important in overprint coatings (varnishes) for paper/paperboard, plastics, metals and wood.

The following coating formulations are illustrative of the wide variety of substrates to which this versatile oligomer can be effectively utilized:

Wood Formulation	A
PHOTOMER® 3016	32.0
PHOTOMER® 6008	10.0
PHOTOMER® 4061	38.0
PHOTOMER® 4072	3.0
PHOTOMER® 4094	10.0
Omnirad® BDK	4.0
Omnirad® BP	2.0
PHOTOMER® 4967	1.0

Properties

Viscosity (25° C), cps	1300
Cure Speed, ft/min	100
Scuff Resistance	Good
Gloss, 60°	85+
Pencil Hardness	6H
Cross-Hatch Adhesion (#600 Cellotape)	100%
Solvent Resistance (MEK Double Rubs)	100+
Weatherability (200 hours in QUV Tester)	Pale Yellow
Abrasion Resistance (Taber - CS17 wheel, 500g load, 500 cycles)	0.004 gram loss

Copper Magnet Wire

	A	B
PHOTOMER® 6008	50.0	72.0
PHOTOMER® 4028	8.0	-
PHOTOMER® 4072	10.0	-
PHOTOMER® 4061	16.0	16.0
PHOTOMER® 4171	6.0	-
Omnirad® BDK	5.0	-
Omnirad® 73	-	7.0
PHOTOMER® 4967	2.0	2.0
Omnirad® BP	3.0	3.0

Properties

Viscosity (25° C), cps	2300	3500
90° Crease	Good	Good
180° Crease	Good	Good
Snap Test - Adhesion	Good^	Good^
% Elongation	12/12*	15/14*
Tensile Strength, psi	2392/107*	2016/108*

Cure Conditions: 30 gauge copper wire substrate; 4.5 mils film thickness; 700+ ft/min line speed; one 300 watt/inch UV lamp

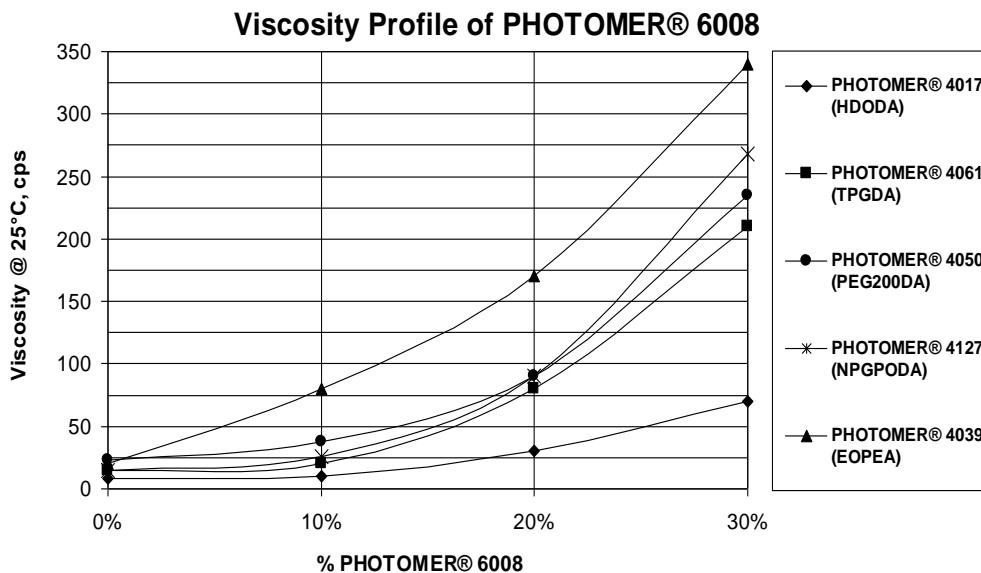
^Films broke evenly and straight with no rough edges. The coating did not shatter, but adhered to the wire.
*Two values are given, X/Y: X = Results for neat film and Y = Results for the coating on the copper wire.

Thermal Stability

PHOTOMER® 6008 exhibited outstanding high temperature stability characteristics during thermal bake loss studies. Aluminum panels were coated, UV cured, then subjected to 260°C (500°F) for 5 minutes in a hot air oven. There were no coating losses observed due to volatilization or degradation.

Viscosity Reduction Profile

The following graph demonstrates the relative ease in diluting PHOTOMER® 6008 oligomer. Oligomer concentrations up to 30% can be incorporated to yield workable solution viscosities that can serve as starting points from which modifications may be made to meet various end-use applications. The actual reactive diluents used in the formulation will affect the properties of the cured coating such as flexibility and hardness.



Regulatory Status

TSCA (USA), NDSL (Canada), AICS (Australia), ECL (Korea), ENCS/MITI (Japan), ECS (China), EU (Europe)

Miscellaneous

PACKAGING, STORAGE AND HANDLING

PHOTOMER® 6008 is available in 55 gallon (200 liter) lined openhead steel drums. PHOTOMER® 6008 may solidify and crystallize if subjected to cold or freezing conditions. Allow to warm to 50°C until a uniform product is obtained, mix on a drum roller if necessary.

Storage must be in a cool, shaded, well ventilated and dry area away from sources of direct heat and sunlight. Additional handling information is contained within the material safety data sheet which is available upon request.

FREIGHT CLASSIFICATION

PHOTOMER® 6008 is classified as: Synthetic Resins NOIBN (Resin or Resin Compounds).

Subject to appropriate storage under the usual storage and temperature conditions, our products are durable for at least 12 months.

Suggestions of processing and using our products are given with best knowledge and information but without obligation. IGM Resins, B.V. does not accept any guarantee to the suitability of a product for the user's specific purpose. Further on the user himself assumes a liability to follow all legal regulations by using our products. The user can only pass on our sample to third parties with previous assent of IGM Resins, B.V.