

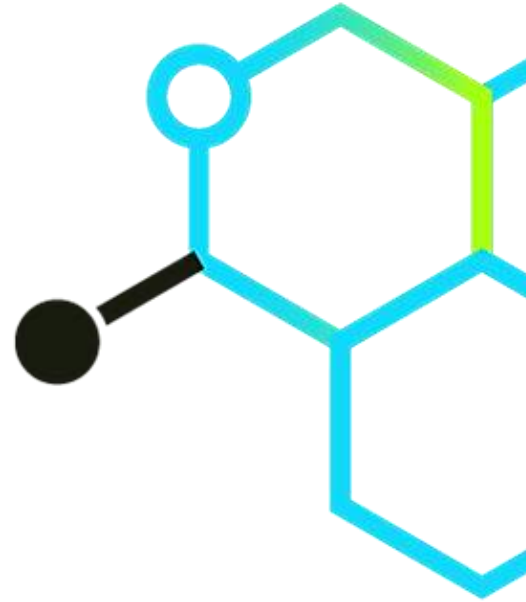
## Technical Datasheet

# FORMULA1B

Rigid Static Dissipative

Photopolymer Resin

Black



## Formula1B

Formula1B is a rigid, static-dissipative photopolymer resin. It uses a urethane methacrylate base that include a stable dispersion of discrete functionalized carbon nanotubes (D'Func) to yield consistent surface resistance and enhances key mechanical performance properties such as Tensile Strength, Flexural Strength, and Impact Resistance.



### Advantages

- Isotropic ESD performance:  $10^6 - 10^7 \Omega$
- Excellent surface finish & fine details
- Absence of carbon sloughing



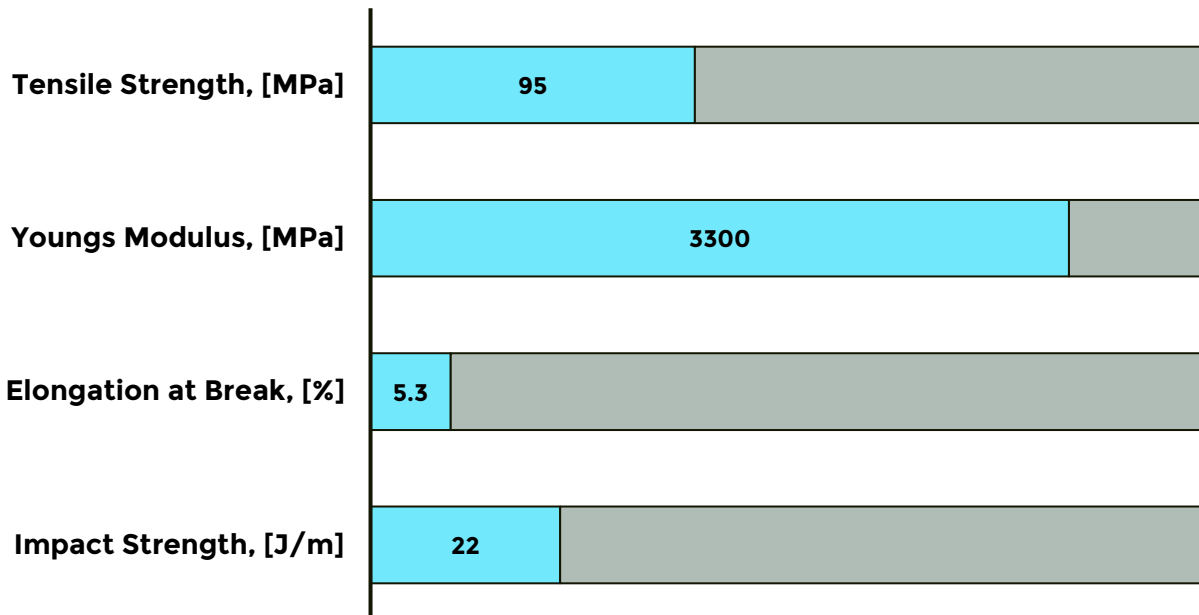
### Industries

- Electronic Manufacturing
- Semiconductor Manufacturing
- Automotive



### Applications

- Conformal coating masks
- Jigs & fixtures for electronic device manufacturing
- Electronic components carriers & housings



## PROPERTIES

The performance of the components is influenced by the hardware's processing parameters and post-cure protocols.

Mechanical Properties	Green	Post-Cured	Units	Method
Ultimate Tensile Strength	70-80	80-95	MPa	ASTM D 638-14
Tensile Modulus	2600-2700	3200-3300	MPa	ASTM D 638-14
Elongation at Break	3.2-5.5	3.3-5.3	%	ASTM D 638-14
Flexural Strength	85-110	80-115	MPa	ASTM D 790-15
Flexural Modulus	2200-2600	2800-3400	MPa	ASTM D 790-15
Flexural Strain at Break	5.8-9.2	3.8-4.6	%	ASTM D 790-15
IZOD Impact Strength (Notched)	15-24	17-22	J/m	ASTM D 256-10
Hardness Shore "D"	80-86	86-88		ASTM D 2240
Electrical Properties				
Surface Resistance	$10^7$	$10^6-10^7$	$\Omega$	ANSI ESD S11.11
Volume Resistivity	$10^6-10^7$	$10^7$	$\Omega \times \text{cm}$	ASTM D257
Liquid Properties				
Viscosity (25°C) <sup>1</sup>	1200-1300		cps	ASTM D7867
Density	1.1 - 1.2		$\text{g/cm}^3$	ASTM D1475

### Notes

<sup>1</sup>The resin is shear-thinning. The data reported at shear rate 10, [1/s] @25°C

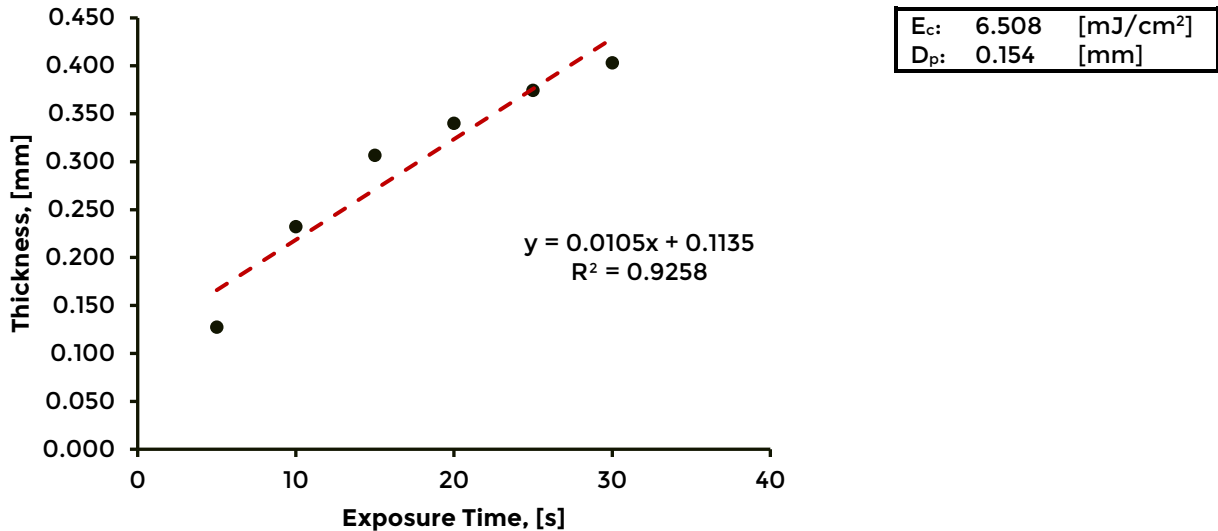


## WORKFLOW

To achieve the properties specified in the TDS, validated workflows must be complied with. The following is an example of the verified workflow steps.

## WORKING CURVE

The working curve was collected using 3.0 mW/cm<sup>2</sup> light source (405 nm) at room temperature.



## MACHINE SETTINGS

Formula1B is designed to fabricate parts on desktop and industrial DLP machines.

Recommended Build Parameters		Example Build Parameters (5 mW/cm <sup>2</sup> at 405 nm, 22°C):	
Temperature, [°C]	20 - 22	Layer Height, [µm]	100
Wavelength, [nm]	385, 405	Base Layer Exposure, [s]	7 - 25
Irradiance, [mW/cm <sup>2</sup> ]	3 - 10	Model Layer Exposure, [s]	5 - 15

## VERIFIED HARDWARE

OEM	System(s)	Status
3D Systems	Figure 4	Qualified
Asiga	All models	Qualified
B9 Creations	Core 550	Qualified
BMF	25 µm & 10 µm	Qualified
Elegoo	Mars	Qualified
Nexa3D	XiP	Qualified
Stratasys	Origin One	Qualified
MiiCraft	Alpha, Prime 4K, Profession	Qualified
Phrozen	Sonic Mighty 8K	Qualified



## POST-PROCESSING

Formula1B requires post-processing to achieve specified performance. Prior to post-curing, support structures should be removed from the fabricated component, and the part should be washed. It is recommended to use compressed air to remove residual solvent from features such as holes, pockets, slots, etc. between cleaning steps and prior to post-curing.

Step	Agent	Method	Duration	Intervals
Cleaning 1	Glycol-Ether based cleaner	Agitated Bath	2 - 5 min	1 to 2
Cleaning 2*	IPA	Agitated Bath	2 - 3 min	1 to 2
Dry**	n/a	Compressed air	60 s	1 or 2
Wait before post-cure	n/a	Ambient	60 min	1

### Notes

<sup>1</sup>Dry before intervals

<sup>2</sup>Dark space is recommended for storage

## POST-CURE

Formula1B requires post-curing to achieve specified properties. The following protocol and post-curing equipment has been qualified to date. Other post-curing protocols will be added later.

Curing Unit	Energy Source	Wavelength	Cure Time/side	Cure Temperature
Nexa3D XiP Cure	UV LED	405 nm	10 min	ambient
Photocentric Cure L2	UV LED	405 nm	15 min	60°C

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