MATERIAL DATA SHEET

Tough

Tough Resin for Rugged Prototyping

Tough Resin balances strength and compliance, making it the ideal choice for prototyping strong, functional parts and assemblies that will undergo brief periods of stress or strain.

Sturdy prototypes

Interference and press fits

Assemblies

FLTOTL05

formlabs

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Material Properties Data

	METRIC[1]		IMPERIAL[1]		METHOD
	Green2	Post-Cured[3]	Green2	Post-Cured[3]	
Mechanical Properties					
Ultimate Tensile Strength	34.7 MPa	55.7 MPa	5040 psi	8080 psi	ASTM D 638-14
Tensile Modulus	1.7 GPa	2.7 GPa	239 ksi	387 ksi	ASTM D 638-14
Elongation at Break	42 %	24 %	42 %	24 %	ASTM D 638-14
Flexural Strength at 5% Strain	20.8 MPa	60.6 MPa	3020 psi	8790 psi	ASTM D 790-15
Flexural Modulus	0.6 GPa	1.6 GPa	90.3 ksi	241 ksi	ASTM D 790-15
Notched IZOD	32.6 J/m	38 J/m	0.61 ft-lbf/in	0.71 ft-lbf/in	ASTM D256-10
Thermal Properties					
Heat Deflection Temp. @ 1.8 MPa	32.8 °C	45.9 °C	91.1 °F	114.6 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	40.4 °C	48.5 °C	104.7 °F	119.3 °F	ASTM D 648-16
Thermal Expansion (23 – 50 °C)	159.7 µm/m/°C	119.4 µm/m/°C	88.7 µin/in/°F	66.3 µin/in/°F	ASTM E 831-13

[1] Material properties can vary with part geometry, orientation, print settings, and temperature.

[2] Data was obtained from green parts, printed using Form 2, 100 µm, Tough settings, without additional treatments.

[3] Data was obtained from parts printed using print Form 2, 100 µm, Tough settings and post-cured with 2.5 mW/cm² of 405 nm LED light for 120 minutes at 60°C

Solvent Compatibility

Percent weight gain over 24 hours for a printed and post-cured 1 x 1 x 1 cm cube immersed in respective solvent:

Solvent	24 hr weight gain (%)	Solvent	24 hr weight gain (%)
Acetic Acid, 5 %	2.8	**Hydrogen Peroxide (3 %)**	2.1
Acetone	sample cracked	**Isooctane**	< 1
Isopropyl Alcohol	2.1	**Mineral Oil, light**	< 1
Bleach, ~5 % NaOCl	1.7	**Mineral Oil, heavy**	< 1
Butyl Acetate	1.6	**Salt Water (3.5 % NaCl)**	1.5
Diesel	< 1	**Sodium hydroxide** (0.025 %, pH = 10)	1.5
Diethyl glycol monomethyl ether	6.6	**Water**	1.6
Hydrolic Oil	< 1	**Xylene**	< 1
Skydrol 5	1.2	**Strong Acid (HCl Conc)**	distorted