Technical Data Sheet

3M™ Scotch-Weld™ One-Part Epoxy Adhesive
6105 Black

Product Description

3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6105 Black is a one-part epoxy exhibiting a very low temperature cure or fast high temperature cure with long room temperature pot life. It is designed to have a low dielectric constant and is toughened for impact performance.

Product Features

- One-part epoxy with long room temperature stability
- Low temperature (55°C) cure and fast, higher temperature cure options
- Good impact resistance
- Low dielectric constant (Dk)

Technical Information Note

The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Typical Uncured Physical Properties

Attribute Name	Test Method	Value
Density		1.08 g/mL
Color		Black
Components		1-Part
UV Tracer		No
Pot Life	ASTM D7867	3 weeks [1]
Halogens (Cl, Br)		Representative samples have been tested and meet the chlorine and bromine content requirements of IEC 61249-2-21 [2]

[1] Determined by meeting minimum application viscosity requirements of the adhesive over time @ 23°C

[2] Per IEC 61249-2-21

Temperature: 25 °C
Test Method: ASTM D7867

Attribute Name	Test Condition	Value
Viscosity - Cone and Plate	0.1 Hz	24 Pa·s [1]
Viscosity - Cone and Plate	1 Hz	24 Pa·s [1]
Viscosity - Cone and Plate	10 Hz	24 Pa·s [1]
Thixotropic Index	0.1 Hz / 1 Hz	1 [1]
Thixotropic Index	1 Hz / 10 Hz	1 [1]

[1] 40mm, 2.0°, 50um truncation cone and Peltier plate. 60s pre-shear at 100 Hz. 5 min flow ramp form 0.01 to 100 Hz @ 25°C

Typical Cure Profiles

Test Method: ASTM D4473

Attribute Name	Temperature	Value
Time to Double Complex Viscosity	65 °C	1 min [1]
Time to 1,000 Pa.s Complex Viscosity	65 °C	2.1 min [1]
Time to 0.1 MPa Storage Modulus	65 °C	2.4 min [1]
Time to 1 MPa Storage Modulus	65 °C	3 min [1]
Time to 80% Storage Modulus Max	65 °C	4.5 min [1]
Time to Double Complex Viscosity	55 °C	2.7 min [1]
Time to 1,000 Pa.s Complex Viscosity	55 °C	5 min [1]
Time to 0.1 MPa Storage Modulus	55 °C	5.7 min [1]
Time to 1 MPa Storage Modulus	55 °C	6.6 min [1]
Time to 80% Storage Modulus Max	55 °C	10 min [1]

[1] Parallel Plate Rheometer: Isothermal - 25mm parallel plate, 1 Hz

Substrate: Stainless Steel
Temperature: 65 °C
Test Condition: 23 °C
Test Method: ASTM D1002, ISO 4587

Attribute Name	Dwell Time	Value
Time to Handling Strength		10 min [1]
Time to Cure		10 min [2]
Overlap Shear Strength	10 min	21 MPa [3]
Overlap Shear Strength	20 min	23 MPa [3]
Overlap Shear Strength	60 min	24 MPa [4]

[1] 2mm thick substrate. Bond dimensions: 12.7 mm x 25.4 mm x 0.15 mm. Dwell time refers to time coupons are exposed to condition in oven. Time to consistent >50 psi (0.34 MPa) overlap shear strength. Tested 5±1 minutes out of oven.

[2] 2mm thick substrate. Bond dimensions: 12.7mm x 25.4mm x 0.15mm. Dwell time refers to time coupons are exposed to condition in oven. Time to 80% overlap shear full strength

[3] 2mm thick substrate. Bond dimensions: 12.7mm x 25.4mm x 0.15mm. Temperature refers to dwell time coupons are exposed to condition in oven. Coupons are tested 5±1 minutes after removing from oven. Pull rate 10 mm/min.

[4] 2mm thick substrate. Bond dimensions: 12.7mm x 25.4mm x 0.15mm. Temperature refers to dwell time coupons are exposed to condition in oven. Coupons are tested 24 hours after removing from oven. Pull rate 10 mm/min.

Substrate: Stainless Steel
Temperature: 55 °C
Test Condition: 23 °C
Test Method: ASTM D1002, ISO 4587

Attribute Name	Dwell Time	Value
Time to Handling Strength		10 min [1]
Time to Cure		20 min [2]
Overlap Shear Strength	10 min	18 MPa [3]
Overlap Shear Strength	20 min	22 MPa [3]
Overlap Shear Strength	40 min	23 MPa [3]
Overlap Shear Strength	60 min	23 MPa [4]

[1] 2mm thick substrate. Bond dimensions: 12.7 mm x 25.4 mm x 0.15 mm. Dwell time refers to time coupons are exposed to condition in oven. Time to consistent >50 psi (0.34 MPa) overlap shear strength. Tested 5±1 minutes out of oven.

[2] 2mm thick substrate. Bond dimensions: 12.7 mm x 25.4 mm x 0.15 mm. Dwell time refers to time coupons are exposed to condition in oven. Time to 80% overlap shear full strength

[3] 2mm thick substrate. Bond dimensions: 12.7 mm x 25.4 mm x 0.15 mm. Temperature refers to dwell time coupons are exposed to condition in oven. Coupons are tested 5±1 minutes after removing from oven. Pull rate 10 mm/min.

[4] 2mm thick substrate. Bond dimensions: 12.7 mm x 25.4 mm x 0.15 mm. Temperature refers to dwell time coupons are exposed to condition in oven. Coupons are tested 24 hours after removing from oven. Pull rate 10 mm/min.

Typical Cured Characteristics

Temperature: 23 °C (73 °F)

Attribute Name	Test Method	Dwell Time	Value
Density - Cured Solid	ASTM B962		1.1 g/mL
Volume Shrinkage	ASTM B962 and ASTM D1875		1.6 % [1]
Peak Stress	ASTM D638, ISO 527		26 MPa [2]
Young's Modulus	ASTM D638, ISO 527		1,450 MPa [2]
Poisson's Ratio	ASTM D638, ISO 527		0.34 [2]
Toughness	ASTM D638, ISO 527		1.1 J/m³ [2]
Elongation at Break	ASTM D638, ISO 527		5 % [2]
Notched Izod Impact	ASTM D256-10		42 J/m [3]
Shore D Hardness	ASTM D2240	7 d	67

[1] Solid and liquid densities were measured with different methods for this material.

[2] 0.5mm film cured at 65°C for 1 hour. Conditioned for >5 days in 23°C/50%RH. Die cut type IV dog bone. 100mm/min pull rate. Digital Image Correlation (DIC) used for strain measurements.

[3] 3 mm thick sample

Attribute Name	Test Method	Temperature	Test Condition	Value
Tg: DMA Temp Ramp	ASTM D7028		1 Hz	63 °C [1]
Storage Modulus: DMA Temp Ramp	ASTM D7028	-20 °C (-4 °F)	1 Hz	1,600 MPa [1]
Storage Modulus: DMA Temp Ramp	ASTM D7028	0 °C	1 Hz	1,500 MPa [1]
Storage Modulus: DMA Temp Ramp	ASTM D7028	25 °C	1 Hz	1,400 MPa [1]
Storage Modulus: DMA Temp Ramp	ASTM D7028	45 °C	1 Hz	1,200 MPa [1]
Storage Modulus: DMA Temp Ramp	ASTM D7028	65 °C	1 Hz	42 MPa [1]
Storage Modulus: DMA Temp Ramp	ASTM D7028	85 °C	1 Hz	15 MPa [1]
Storage Modulus: DMA Master Curve	ASTM D4065	25 °C	0.1 Hz	1,400 MPa [2]
Storage Modulus: DMA Master Curve	ASTM D4065	25 °C	1 Hz	1,400 MPa [2]
Storage Modulus: DMA Master Curve	ASTM D4065	25 °C	10 KHz	1,500 MPa [2]

[1] 0.5mm film cured at 65°C for 1 hour. Conditioned for >5 days in 23°C/50%RH (CTH). 1Hz film tension DMA Heat from -20°C to 100°C at 3°C/min. Tg reported as peak of Tan Delta.

[2] 0.5mm film conditioned for >5 days in 23°C/50%RH (CTH). Multi-frequency incremental temperature sweep film tension DMA Heat from -20°C to 100°C.

Typical Performance Characteristics

Overlap Shear Strength

Temperature: 23 °C
Test Condition: 1 hr at 65 °C + 24 hr at 23 °C
Test Method: ASTM D1002, ISO 4587

Substrate	Value
Etched Aluminum	27 MPa (Mixed Mode Failure) [1]
Stainless Steel	24 MPa (Mixed Mode Failure) [2]
FR-4	26 MPa (Mixed Mode Failure) [2]
PC/ABS	>5 MPa (Substrate Failure) [2]
PC	5 MPa (Adhesive Failure) [2]
PBT	5 MPa (Adhesive Failure) [2]

[1] Bond dimensions: 12.7mm x 25.4mm x 0.15mm. Pull rate: 10 mm/min.

[2] Bond dimensions: 12.7 mm x 25.4 mm x 0.15 mm. Pull rate: 10 mm/min.

Electrical and Thermal Properties

Attribute Name	Test Method	Temperature	Test Condition	Value
Thermal Conductivity				0.183 W/m·K
Coefficient of Thermal Expansion (CTE), Alpha 1	ASTM E831	25 °C		100 µm/m/°C [1]
Coefficient of Thermal Expansion (CTE), Alpha 2	ASTM E831	25 °C		193 µm/m/°C [1]
Dielectric Strength	ASTM D149	23 °C (73 °F)		38.6 kV/mm [2]
Dielectric Constant (Dk)	ASTM D150	23 °C (73 °F)	100 KHz	3.3
Dielectric Constant (Dk)	ASTM D2520	23 °C (73 °F)	1.1 GHz	3.0
Dielectric Constant (Dk)	ASTM D2520	23 °C (73 °F)	2.5 GHz	2.9
Dissipation Factor (Df)	ASTM D150	23 °C (73 °F)	100 KHz	0.022
Dissipation Factor (Df)	ASTM D2520	23 °C (73 °F)	1.1 GHz	0.026
Dissipation Factor (Df)	ASTM D2520	23 °C (73 °F)	2.5 GHz	0.026

[1] 0.5mm film cured at 65°C for 1 hour. Conditioned for >5 days in 23°C/50%RH. TA Instruments Q400 TMA. Temperature Range: -40°C to 90°C 2°C/min. 2 heats. Data reported from second heat.

[2] Measured at 0.5 mm

Handling/Application Information

Directions for Use

For a 30 mL cartridge, thaw for a minimum of one hour at room temperature before using. For a 55 mL cartridge, thaw for a minimum of two hours at room temperature before using. Verify thawing times for your speciifc conditions. Do not heat syringe above 27°C when warming.

Application Techniques

- Dispensing
- Molding

Application Examples

- Mobile device bonding
- Wearable electronic device bonding
- Electronic Assembly
- Encapsulation

Storage and Shelf Life

Store product at -20°C (-4°F) in the original, unopened packaging. For best performance, use this product within 12 months from date of manufacture.

Available Sizes

Attribute Name	Value
Packaging	30 mL syringe, 55 mL cartridge

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