Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1647
Flame-Retardant Modified Acrylic Adhesive on Polyimide Film

Description

T1647 Bus Bond® products use our proprietary flame-retardant, high temperature, modified acrylic adhesive, and polyimide film, creating a single or double sided laminated busbar insulation material. T1647 insulations are engineered for use in applications where temperature resistance and higher dielectric strength are required.

Features

- Service Temperature: 150 °C
- Dielectric: High stability PI films.
- Sheldahl® Brand modified acrylic adhesive makes T1647 ideal for use in laminated busbars in high temperature applications.
- High bond strength provides superior adhesion to copper, aluminium and other standard conductor materials.
- T1647 is RoHS compliant.
- Low variation in adhesive thickness (± 0.1 mil) simplifies production.
- Finished products can achieve a UL minimum continuous use temperature rating of 150°C.

Constructions

- Single and double sided
- Film thickness: 1, 3, and 5 mil (50, 75, and 125µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38, and 50 µm)
- Width: 12, 16, 24, and 48 inch (305, 407, 610 and 1220 mm)

Platen Press*

	SAE	Metric
Platen temperature	365 - 385°F	185 - 195°C
Pressure	300 - 400 PSI	2.0 - 2.7 MPa
Time (at temperature)	50 - 60 min	50 - 60 min
Cool under pressure	< 120°F	< 50°C

Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

*Oven-dry at 250-275°F (120-135°C) for >1 hour

T1647
Flame-Retardant Modified Acrylic Adhesive on Polyimide Film

Technical Properties

PROPERTY	UNITS	TYPICAL VALUE	TEST METHOD
Dimensional Stability	%	0.06	IPC-TM-650 2.2.4, A
Peel Strength	lb/in (N/mm)	9.0 (1.57) 12.0 (2.10) 12.0 (2.10) 12.0 (2.10)	IPC-TM-650 2.4.9 Method A Method B Method D Method F
Solder Float		Pass	IPC-TM-650 2.4.13, B
Service Temperature		Pass	IPC-TM-650 2.4.9 150 °C Heat Age Peels
Dielectric Constant (1KHz)		3.4(A)	ASTM-D-150-92
Dissipation Factor (1KHz)		0.002(A)	ASTM-D-150
Dielectric strength	V/mil (kV/mm)	5200 (205) (A)	ASTM-D-149
Volume Resistivity	ohm/cm	1.4×10^{17} (A)	ASTM-D-257
Surface Resistance	ohm/sq	1×10^{17} (A)	IPC-TM-650 2.5.17
Elongation	%	82 (A)	ASTM-D-882
Tensile Strength	lb/in^2 (MPa)	34,000 (234) (A)	ASTM-D-882
Moisture and Insulation Resistance	ohm	10^5	IPC-TM-650 2.6.3.2
Chemical Resistance	%	90	IPC-TM-650 2.3.2, A
Moisture Absorption, maximum	%	4.5	IPC-TM-650 2.6.2
(A)Based on film alone at 3 mil thickness.			

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, a Flex company, for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is 12 months from date of shipment when stored at 40-80°F (4-26°C) and below 70%RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1649
Flame Retardant Modified Acrylic Unsupported Bonding Adhesive

Description

T1649 Bus Bond® free film adhesive uses our proprietary flame retardant, RoHS compliant, high temperature, modified acrylic adhesive on a carrier with a release liner, creating an isolated adhesive suitable for use as bonding-layer. T1649 tapes are engineered for use in busbar applications where temperature resistance is key.

Features

- PBDE-Free formulation meets current ROHS regulations.
- High bond strength provides superior adhesion to copper, aluminium and most plated metals.
- Low variation in adhesive thickness.
- Our products are manufactured using quality systems that conform to ISO, QS, and TS quality standards.
- Dry to the touch for ease of handling.

Constructions

- Adhesive Thickness: 0.5 - 2mil (12.5 - 50µm)
- Width: Standard roll width is 24" (610mm)
  *Specialty thickness and widths available. Please contact your Sheldahl representative.

Platen Press*

	SAE	Metric
Platen temperature	365 - 385°F	185 - 195°C
Pressure	300 - 400 PSI	21 - 28 bar
Time (at temperature)	50 - 60 min	50 - 60 min
Cool under pressure	< 120°F	< 48°C

Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

*Oven-dry at 250-275°F (120-135°C) for >1 hour, prior to solder exposure.

T1649
Flame Retardant Modified Acrylic Unsupported Bonding Adhesive

Technical Properties

PROPERTY	UNITS	TYPICAL VALUE		TEST METHOD
Peel Strength	lb./in (N/mm)	Shiny Cu 11.0(1.90) 11.0 (1.90) 10.0 (1.75)	Treated Cu 12.0 (2.10) 12.0 (2.10) 12.0 (2.10)	IPC-TM-650 2.4.9 Method A Method B Method D
Solder Float		Pass		IPC-TM-650 2.4.13, B
Dielectric constant (1 MHz)		3.75		IPC-TM-650 2.5.5.3
Dissipation factor (1MHz)		0.03		IPC-TM-650 2.5.3
Dielectric strength	V/mil (kV/mm)	2000 (78)		ASTM-D-149
Volatile Content	%	1.0		IPC-TM-650 2.3.37
Volume Resistivity	ohm/cm	10^9		IPC-TM-650 2.5.17
Surface resistance	ohm/sq.	10^8		IPC-TM-650 2.5.17
Chemical Resistance	%	90		IPC-TM-650 2.3.2, A
Fungus Resistance		Non-nutrient		IPC-TM-650 2.6.1
Flow		2:1		IPC-TM-650 2.3.17.1
Moisture Absorption, maximum	%	4.5		IPC-TM-650 2.6.2.

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Storage and Shelf Life

Guaranteed shelf life and material warranty is 12 months from date of shipment when stored at 40-80°F (4-26°C) and below 70%RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1779
Low-Flow Flame Retardant Adhesive on Polyimide Film

Description

T1779 Bus Bond® insulations combine our proprietary low flow flame retardant adhesive with polyimide film and are designed for laminated busbar applications requiring a formable, higher temperature dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Features

- T1779 is RoHS compliant and registered UL 94 V-0 (E39696).
- Unique temperature resistant low flow adhesive makes T1779 ideal for uses in laminated busbars requiring more than one lamination process.
- High bond strength provides superior adhesion to copper, aluminium, and most plated metals.
- Low variation in adhesive thickness (± 0.1 mil).
- Reduced process time and wide lamination window cuts costs, prevents copper oxidation, and eliminates a major cause of dimensional change.
- Finished products can achieve a UL minimum continuous use temperature rating of 125°C.

Constructions

- Single and double-sided
- Film thickness: 1, 3, and 5 mil (50, 75, and 125µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38, and 50 µm)
- Width: 12, 16, 24 and 48 inches (305, 407, 610, and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	METRIC
Platen Temperature	275 – 320° F	135 – 160 °C
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Pressure	100 – 200 PSI	7 – 14 bar
Time (cool under pressure)	< 120°F	< 50°C
Pre-Bake (dependent on storage conditions and desired squeeze-out)	250°F for 1 hour, max	120°C for 1 hour, max

*Please note, appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

T1779
Low-Flow Flame Retardant Adhesive on Polyimide Film

Technical Data

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.40 TD +0.10	IPC-TM-650 2.2.4
Peel Strength	lb/in (N/mm)	8.0 (1.4)	IPC-TM-650 2.4.9
Melt Point Temperature	°F (°C)	220 (104)	Clarkston Bar
Adhesive Tack Temperature	°F (°C)	190 – 210 (88 – 99) (A)	Clarkston Bar
Flammability		Pass	UL 94 VTM-0 (C)
Dielectric Constant (1KHz)		3.4(B)	ASTM-D-150
Dissipation Factor (1KHz)		0.0036(B)	ASTM-D-150
Dielectric Strength	V/mil (kV/mm)	5200 (205)(B)	ASTM-D-149
Elongation	%	82 (B)	ASTM-D-882
Tensile Strength	lb/in² (MPa)	34,000 (234) (B)	ASTM-D-882
Volume Resistivity	ohm/cm	1.4×10^{17} (B)	ASTM-D-257
Surface Resistance	ohm/sq	1×10^{17} (B)	IPC-TM-650 2.5.17
Moisture Absorption, maximum	%	3.8 (B)	IPC-TM-650 2.6.2
Volatile Content	%	2	IPC-TM-650 2.3.37
(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.			
(B) Based on film alone at 3 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year (six months for double sided) from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1929
Low Flow Flame Retardant Adhesive on Polyester Film

Description

T1929 tapes are low flow self-extinguishing adhesive with PET film and are designed for dielectric applications such as flat cables, coverlays, and busbars. The material's superior dimensional stability, chemical resistance, dynamic flexibility, and high temperature tolerance provide end-users with solutions that are unattainable with other products.

Features

- T1929 is RoHS compliant and registered UL 94 VTM-0 (E39696).
- Unique temperature resistant low-flow adhesive makes T1929 ideal for use in laminated busbars requiring more than one lamination process.
- High bond strength provides superior adhesion to copper, aluminium, and standard conductor materials.
- Low variation in adhesive thickness (± 0.1 mil) simplifies production.
- Reduced process time and wide lamination window cuts costs, prevents copper oxidation, and eliminates a major cause of dimensional change.
- Finished products can achieve a UL minimum continuous use temperature rating of 105°C and above.

Constructions

- Film Thickness: 3,5,7.5, 10, and 14 mil (75, 125, 188, 250, and 350µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38 and 50 µm)
- Width: 12, 16, 24, and 48 inches (305, 407, 610, and 1220mm); 14mil film (23.5 and 47 inch)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen Temperature	275 - 320°F	135 - 160°C
Pressure	100 -200 PSI	7 - 14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cool under pressure	<120°F	<50°C

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

T1929
Low Flow Flame Retardant Adhesive on Polyester Film

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.6 TD -0.08	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	10.0 (1.75)	IPC-TM-650, 2.4.9
Melt Point Temperature	°F (°C)	220 (104)	Clarkson Bar
Adhesive Tack Temperature	°F (°C)	190 – 200 (88 – 93) (A)	Clarkston Bar
Flammability		PASS (B)	UL 94 VTM-0
Dielectric Constant (1MHz)		3.0 (C)	ASTM-D-150
Dissipation Factor (1MHz)		0.016(C)	ASTM-D-150
Dielectric Strength	V/mil (kV/mm)	5000 (200) (C)	ASTM-D-149
Elongation (MD)	%	180(C)	ASTM-D-882
Elongation (TD)	%	130(c)	ASTM-D-882
Tensile Strength	lb/in² (MPa)	29,000 (200) (C)	ASTM-D-882
Tensile Modulus	lb/in² (MPa)	350,000 (2400) (C)	ASTM-D-882
Initiation Tear Strength	gm/mil	800(C)	IPC-TM-650, 2.4.16 A
Volume Resistivity	ohm/cm	1.5×10^{17}(C)	ASTM-D-257
Surface Resistance	ohm/sq	1.0×10^{15} (C)	ASTM-D-257
Chemical Resistance	%	90 (D)	IPC-TM-650, 2.3.2
Fungus Resistance		Non-Nutrient	IPC-TM-660, 2.6.1
Moisture Absorption, maximum	%	0.5	IPC-TM-650, 2.6.2

(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.

(B) Based on standard constructions using flame retardant adhesives (UL file E39696).

(C) Based on Film alone at 5 mil thickness.

(D) Except chlorinated solvents and ketones.

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1939
Low Flow Flame Retardant Adhesive on Black PET Film

Description

T1939 Bus Bond® insulations combine our proprietary low flow flame retardant adhesive with black PET film and are designed for laminated busbar applications requiring a formable; all-purpose dielectric material for outer layers where the color black is desirable. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Construction

- Film Thickness: 2mil (50µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38, and 50µm)
- Width: 12, 16, 24, and 48 inches (305, 407, 610, and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	METRIC
Platen temperature	275 - 320°F	135 - 160°C
Pressure	100 - 200 PSI	7 -14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cooling under pressure	< 120°F	< 50°C

*Please note: appropriate values may depend on design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD – 2.0 TD – 2.0	IPC-TM-650 2.2.4
Peel Strength	lb/in (N/mm)	6.0 (1.0)	IPC-TM-650 2.4.9
Melt Point	°F (°C)	220 (104)	Clarkston Bar
Adhesive Tack Temperature	°F (°C)	190 – 200 (88 – 93) (A)	Clarkston Bar
Elongation at Break	%	MD – 165 (B) TD – 105	ASTM-D-882A
Tensile Strength	lb/in² (MPa)	22,000 (155) (B)	ASTM-D-882
Oxygen Index	% O_2	30	IPC –TM-650 2.3.8
(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.			
(B) Based on film alone at 2 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is six months from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1974
Flame Retardant Adhesive on White PET Film

Description

T1974 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with white PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Film Thickness:** 5 mil (125 µm)**additional thicknesses in development (7 mil - 175 µm)*
- **Adhesive Thickness:** 1.5 mil (38 µm)**additional thicknesses in development*
- **Width:** 12, 16, 24, and 48 inches, (305, 407, 610, and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120ºF	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.48 TD -0.33	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		VTM-1	UL 94(A)
Dielectric Strength	V/mil (kV/mm)	2700 (106)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	22,000(155)(B)	ASTM-D-882
Elongation (MD)	%	115(B)	ASTM-D-882
Elongation (TD)	%	90(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on White PET Film alone at 5 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1975
Flame Retardant Adhesive on PI Film

Description

T1975 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with polyimide film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Film Thickness:** 5 mil (125 µm)**additional thicknesses in development*
- **Adhesive Thickness:** 1.5 mil (38 µm)**additional thicknesses in development*
- **Width:** 12 and 24 (305 and 610 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120ºF	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.40% TD -0.33%	IPC-IM-650, Method 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		V-0	UL 94(A)
Dielectric Strength	V/mil (kV/mm)	5200 (205)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	34,000(234)(B)	ASTM-D-882
Elongation (MD)	%	82(B)	ASTM-D-882
Elongation (TD)	%	82(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified			
(B) Based on Polymide film alone at 3 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1976
Flame Retardant Adhesive on PEN Film

Description

T1976 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with PEN film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Film Thickness:** 5 mil (125 µm)**additional thicknesses in development*
- **Adhesive Thickness:** 1.5 mil (38 µm)**additional thicknesses in development*
- **Width:** 12, 16, 24, and 48 inches (305, 407, 610, and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120ºF	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.15% TD -0.08%	IPC-TM-650, Method 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		VTM-0	UL 94(A)
Tensile Strength (MD)	lb/in² (MPa)	34,000 (234)(B)	ASTM-D-882
Tensile Strength (TD)	lb/in² (MPa)	37,000(255)(B)	ASTM-D-882
Elongation (MD)	%	118(B)	ASTM-D-882
Elongation (TD)	%	115(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on PEN Film alone at 5 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1977
Flame Retardant Adhesive on Clear PET Film

Description

T1977 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with clear PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Film Thickness:** 5 mil (125 µm)**additional thicknesses in development (7.5 mil and 10 mil))*
- **Adhesive Thickness:** 1.5 mil (38 µm)**additional thicknesses in development*
- **Width:** 12, 16, 24, and 48 inches, (305, 407, 610, and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120ºF	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.6% TD -0.08%	IPC-IM-650, Method 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		HB	UL 94 (A)
Dielectric Strength	V/mil (kV/mm)	5000 (200)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	29,000(200)(B)	ASTM-D-882
Elongation (MD)	%	180(B)	ASTM-D-882
Elongation (TD)	%	130(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on PET Film alone at 5 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1978
Flame Retardant Adhesive on Clear PET Film (Double-Sided)

Description

T1978 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with clear PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Film Thickness:** 5 mil (125 µm)**additional thicknesses in development (7.5 mil and 10 mil))*
- **Adhesive Thickness:** 1.5 mil (38 µm)**additional thicknesses in development*
- **Width:** 12, 16, 24, and 48 inches, (305, 407, 610, and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120ºF	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.5% TD -0.3%	IPC-TM-650, Method 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		HB	UL 94(A)
Dielectric Strength	V/mil (kV/mm)	5000 (200)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	29,000(200)(B)	ASTM-D-882
Elongation (MD)	%	180(B)	ASTM-D-882
Elongation (TD)	%	130(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on PET Film alone at 5 mil thickness.			

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, a Flex Company, for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1979
Flame Retardant Adhesive on PEN Film (Double-Sided)

Description

T1979 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with PEN film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Film Thickness:** 5 mil (125 µm)**additional thicknesses in development*
- **Adhesive Thickness:** 1.5 mil (38 µm)**additional thicknesses in development*
- **Width:** 12 and 24 inches (305 and 610 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120ºF	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.15% TD -0.08%	IPC-TM-650, Method 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASDM-D-903
Flammability		VTM-0	UL 94(A)
Tensile Strength (MD)	lb/in² (MPa)	34,000 (234)(B)	ASTM-D-882
Tensile Strength (TD)	lb/in² (MPa)	37,000(255)(B)	ASTM-D-882
Elongation (MD)	%	118(B)	ASTM-D-882
Elongation (TD)	%	115(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on PET Film alone at 5 mil thickness.			

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, a Flex company, for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1981

Flame Retardant Adhesive on High - RTI White PET Film

Description

T1981 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with a high RTI rated white PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Standard construction:** Hi Temp White PET x Hi Temp adhesive (A719)
- **Film Thickness:** 2, 5, & 7 mil (50,125, & 175 µm)
- **Adhesive Thickness:** 1.5 mil (38 µm)
- **Width:** 24 and 48 inch, (610 and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120°F	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.
*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.5 TD -0.7	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	8.0 (1.4)	ASTM-D-903
Relative Thermal Index (RTI)	°C	130°C	UL
Flammability		V0	UL 94(A)
Dielectric Strength	V/mil (kV/mm)	2700 (106)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	MD 18,000 (124 MPa) TD 29,000 (200 MPa)	ASTM-D-882
Elongation (MD)	%	160(B)	ASTM-D-882
Elongation (TD)	%	90(B)	ASTM-D-882
(A) Based flammability testing of the tape construction on a 32 mil (0.8mm) Cu plate (5mil is UL-certified)			
(B) Based on White PET Film alone at 5 mil thickness.			

The information contained herein is based upon typical data of 5 mil constructions. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl materials for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl
A Flex Company

SHAPING WHAT'S NEXT™

BUS BOND®

Product Bulletin

T1982

Flame Retardant Adhesive on High - RTI White PET Film (Double Sided)

Description

T1982 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with a high RTI rated white PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- **Standard construction:** High Temp White PET x High Temp adhesive (A719)
- **Film Thickness:** 2, 5, & 7 mil (50, 125, & 175 µm)
- **Adhesive Thickness:** 1.5 mil (38 µm)
- **Width:** 24 and 48 inch, (610 and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120°F	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.48 TD -0.33	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Relative Thermal Index (RTI)	°C	130°C	UL
Flammability		V0	UL 94
Dielectric Strength	V/mil (kV/mm)	2700 (106)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	22,000 (155)(B)	ASTM-D-882
Elongation (MD)	%	115(B)	ASTM-D-882
Elongation (TD)	%	90(B)	ASTM-D-882
(A) Based on flammability testing of the tape construction on a 32 mil (0.8mm) Cu plate (5mil UL-certified)			
(B) Based on White PET Film alone at 5 mil thickness.			

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl materials for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C & ≤50% RH.

Sheldahl
A Flex Company

SHAPING WHAT'S NEXT™

BUS BOND®

Product Bulletin

T1986
Flame Retardant Adhesive on PI Film (Double-Sided)

Description

T1986 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with polyimide film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- Film Thickness: 5 mil (125 µm)**additional thicknesses in development*
- Adhesive Thickness: 1.5 mil (38 µm)**additional thicknesses in development*
- Width: 12 and 24 (305 and 610 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	338°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120°F	< 50°C

These conditions were used for all testing of A719 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD ± 2% TD ± 2%	IPC-TM-650, Method 2.2.4B
Peel Strength	lb/in (N/mm)	4.0 (0.7)	ASTM-D-903
Flammability		V-0	UL 94(A)
Dielectric Strength	V/mil (kV/mm)	5200 (205)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	34,000(234)(B)	ASTM-D-882
Elongation (MD)	%	82(B)	ASTM-D-882
Elongation (TD)	%	82(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on PI Film alone at 5 mil thickness.			

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, a Flex Company, for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1993
Flame Retardant Adhesive on White PET Film

Description

T1993 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with white PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance and high flow properties provides end-users with solutions that are unattainable with other products.

Constructions

- Film Thickness: 2, 5, and 7 mil (51, 127, and 178 µm)
- Adhesive Thickness: 0.8, 1, and 1.5 mil (20.2, 25.4, and 38 µm)
- Width: 12, 16, and 24 inches (305, 407, and 610 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	300°F	149°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120°F	< 50°C

These conditions were used for all testing of A741 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.48 TD -0.33	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		VTM-1	UL 94(A)
Dielectric Strength	V/mil (kV/mm)	2700 (106)(B)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	22,000(155)(B)	ASTM-D-882
Elongation (MD)	%	115(B)	ASTM-D-882
Elongation (TD)	%	90(B)	ASTM-D-882
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on White PET Film alone at 5 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1994
Flame Retardant Adhesive on Clear PET Film

Description

T1994 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with a heat-resistant, low oligomer PET and are designed for laminated busbar applications requiring a formable heat resistant material. The materials high temperature tolerance and high flow properties provides end-users with solutions that are unattainable with other products.

Constructions

- Film Thickness: 5 and 7 mil (127 and 178 µm)
- Adhesive Thickness: 0.8, 1, 1.5, and 2 mil (20.2, 25.4, and 38 µm)
- Width: 12, 16, and 24 inches (305, 407, and 610 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	300°F	149°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120°F	< 50°C

These conditions were used for all testing of A741 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD ±2 TD ±2	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		V-2	UL 94(A)
Tensile Strength	lb/in² (MPa)	39,000(270)(B)	ASTM-D-882
Elongation (MD)	%	120(B)	IPC 2.4.19
Elongation (TD)	%	120(B)	IPC 2.4.19
Thermal Shrinkage (MD)	%	2	IPC 2.2.4 A
Thermal Shrinkage (TD)	%	2	IPC 2.2.4 A
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on White PET Film alone at 5 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T1995
Flame Retardant Adhesive on Clear PET Film (Double-Sided)

Description

T1995 Bus Bond® RoHS compliant insulations combine our proprietary modified acrylic-flame retardant adhesive with a heat-resistant, low oligomer PET and are designed for laminated busbar applications requiring a formable heat resistant material. The materials high temperature tolerance and high flow properties provides end-users with solutions that are unattainable with other products.

Constructions

- Film Thickness: 5 and 7 mil (127 and 178 µm)
- Adhesive Thickness: 0.8, 1, 1.5, and 2 mil (20.2, 25.4, and 38 µm)
- Width: 12, 16, and 24 inches (305, 407, and 610 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	300°F	149°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cooling under pressure	< 120°F	< 50°C

These conditions were used for all testing of A741 coated films, based on our experience with acrylic systems. Ranges may be developed in the future. However, we always encourage our customers to perform their own tests with their unique construction, materials, and equipment.

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD ±2 TD ±2	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	ASTM-D-903
Flammability		V-2	UL 94(A)
Tensile Strength	lb/in² (MPa)	39,000(270)(B)	ASTM-D-882
Elongation (MD)	%	120(B)	IPC 2.4.19
Elongation (TD)	%	120(B)	IPC 2.4.19
Thermal Shrinkage (MD)	%	2	IPC 2.2.4 A
Thermal Shrinkage (TD)	%	2	IPC 2.2.4 A
(A) Based on typical flammability testing of the tape construction performed at Sheldahl, not UL-certified.			
(B) Based on White PET Film alone at 5 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T4317
Low Flow Flame Retardant Adhesive on Nomex® Type 410 Film

Description

T4317 Bus Bond® insulations combine our proprietary low flow flame retardant adhesive with NOMEX® Type 410 film and are designed for laminated busbar applications requiring a tough, abrasion and heat resistant dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Features

- RoHS compliant.
- Abrasion resistant.
- Available with both single- and double-sided adhesive coating.
- Unique temperature resistant low-flow adhesive makes T4317 ideal for use in laminated busbars requiring more than one lamination process.
- High bond strength provides superior adhesion to copper, aluminium and most plated metals.
- Low variation in adhesive thickness (± 0.1mil).
- Reduced process time and wide lamination window cuts costs, prevents copper oxidation, and eliminates a major cause of dimensional change.
- Finished products may achieve a UL minimum continuous use temperature rating of 125°C

Constructions

- Single and double sided
- Film Thickness: 2, 5, and 10 mil (50, 125, and 250 µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38, and 50 µm)
- Width: contact factory for widths available

Processing Recommendations

Platen Press*

	SAE	Metric
Platen Temperature	275 - 320°F	135 - 160°C
Pressure	100 -200 PSI	7 - 14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cool under pressure	< 120°F	< 50°C

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

T4317

Low-Flow Flame Retardant Adhesive on Nomex® Type 410 Film

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	0 + .50	IPC-TM-650 2.2.4
Peel Strength	lb/in (N/mm)	4.0 (0.70)	IPC-TM-650 2.4.9
Adhesive Tack Temperature	°F (°C)	150 – 250 (57 – 121) (A)	Clarkston Bar
Dielectric Constant (60 Hz)		2.4(B)	ASTM D-150
Dissipation Factor (60 Hz)		0.006(B)	ASTM D-150
Dielectric Strength	V/mil (kV/mm)	680 (2.70) (B)	ASTM-D-149
Tensile Strength	N/cm	MD - 137(B) TD - 66(B)	ASTM-D-828
Initiation Tear Strength	N	33(B)	IPC-TM-650 2.4.16 Method A
Elongation (MD)	%	15(B)	ASTM-D-882
Elongation (TD)	%	12(B)	ASTM-D-882
Chemical Resistance	%	70(C0	IPC-TM-650 2.3.2
Volatile Content	%	1.5	IPC-TM-650 2.3.37
(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.			
(B) Based on Film alone at 5 mil thickness.			
(C) Except chlorinated solvents and ketones.			

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, a Flex company, for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is six months from date of shipment when stored at ≤20°C and ≤50%RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T4318
Low Flow Flame Retardant Adhesive on Nomex® Type 410 Film (Double-Sided)

Description

T4318 Bus Bond® insulations combine our proprietary low flow flame retardant adhesive with NOMEX® Type 410 film and are designed for laminated busbar applications requiring a tough, abrasion and heat resistant dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Features

- RoHS compliant.
- Abrasion resistant.
- Unique temperature resistant low-flow adhesive makes T4318 ideal for use in laminated busbars requiring more than one lamination process.
- High bond strength provides superior adhesion to copper, aluminium and most plated metals.
- Low variation in adhesive thickness (± 0.1mil).
- Reduced process time and wide lamination window cuts costs, prevents copper oxidation, and eliminates a major cause of dimensional change.
- Finished products may achieve a UL minimum continuous use temperature rating of 125°C.

Constructions

- **Double Sided**
- **Film Thickness:** 2, 5, and 10 mil (50, 125, and 250 µm)
- **Adhesive Thickness:** 1, 1.5, and 2 mil (25, 38, and 50 µm)
- **Width:** contact factory for widths available

Processing Recommendations

Platen Press*

	SAE	Metric
Platen Temperature	275 - 320°F	135 - 160°C
Pressure	100 -200 PSI	7 - 14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cool under pressure	< 120°F	< 50°C

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

T4318
Low-Flow Flame Retardant Adhesive on Nomex® Type 410 Film (Double-Sided)

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	0 + .50	IPC-TM-650 2.2.4
Peel Strength	lb/in (N/mm)	4.0 (0.70)	IPC-TM-650 2.4.9
Adhesive Tack Temperature	°F (°C)	150 – 250 (57 – 121) (A)	Clarkston Bar
Dielectric Constant (60 Hz)		2.4(B)	ASTM D-150
Dissipation Factor (60 Hz)		0.006(B)	ASTM D-150
Dielectric Strength	V/mil (kV/mm)	680 (2.70) (B)	ASTM-D-149
Tensile Strength	N/cm	MD - 137(B) TD - 66(B)	ASTM-D-828
Initiation Tear Strength	N	33(B)	IPC-TM-650 2.4.16 Method A
Elongation (MD)	%	15(B)	ASTM-D-882
Elongation (TD)	%	12(B)	ASTM-D-882
Chemical Resistance	%	70(C0	IPC-TM-650 2.3.2
Volatile Content	%	1.5	IPC-TM-650 2.3.37
(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.			
(B) Based on Film alone at 5 mil thickness.			
(C) Except chlorinated solvents and ketones.			

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is six months from date of shipment when stored at ≤20°C and ≤50%RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T4350
Low Flow Flame Retardant Unsupported Adhesive Free Film

Description

T4350 is our proprietary low-flow ROHS compliant self-extinguishing adhesive on a carrier with a release liner, creating an isolated adhesive suitable for use as a bonding layer. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Features

- Low flow, flame-retardant, ROHS compliant adhesive.
- Adhesive thickness: 1, 1.5, and 2 mil (25, 38, and 50 micron)
- Low variation in adhesive thickness (± 0.1 mil).
- T4350 is thermally activated and allows for efficient processing with no drying time.
- Free films are manufactured using quality systems that conform to ISO, QS, and TS quality standards.
- High bond strength provides superior adhesion to copper, aluminum and most plated materials.
- Dry to the touch for ease of handling.

Processing Recommendations

Platen Press*

	SAE	Metric
Platen Temperature	275 - 320°F	135 - 160°C
Pressure	100 - 200 PSI	7 - 14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cool under pressure	< 120°F	< 50°C

*Please note, appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

T4350
Low Flow Flame Retardant Unsupported Adhesive Free Film

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Peel Strength	lb/in (N/mm)	8.0 (1.4)	IPC-TM-650, 2.4.9 B
Melt Point	°F (°C)	215 (102)	Clarkston Bar
Flow		1.5:1	IPC-TM-650, 2.3.17.1
Adhesive thickness	%	±10	In process basis weight
Chemical Resistance	%	90	IPC-TM-650, 2.3.2, A
Fungus Resistance		Non-nutrient	IPC-TM-650, 2.6.1
Volatile Content	%	1.5	IPC-TM-650, 2.3.37

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, a Flex company, for each individual application.

Storage

Guaranteed shelf life and material warranty is six months from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T9004
Low Flow Flame Retardant Adhesive on Polyester Film (Double-Sided)

Description

T9004 Bus Bond® insulations combine our proprietary low flow, flame retardant adhesive with PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The material's high temperature tolerance provides end users with solutions that are unattainable with other products.

Features

- T9004 is RoHS compliant and registered UL 94 VTM-0 (E39696).
- Unique temperature resistant low-flow adhesive coated on both sides of stabilized PET film make T9004 ideal for use as internal layers in laminated busbars requiring more than one lamination process.
- High bond strength provides superior adhesion to copper, aluminium and other standard conductor materials.
- Low variation in adhesive thickness (± 0.1 mil) simplifies production.
- Reduced process time and wide lamination window cuts costs, prevents copper oxidation, and eliminates a major cause of dimensional change.
- Finished products can achieve a UL minimum continuous use temperature rating of 105°C and above.

Constructions

- Film Thickness: 3, 5, 7.5, 10 and 14 mil, (75, 125, 188, 250, and 350 µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38, and 50 µm)
- Width: 12, 16, 24, and 48 inches (305, 407, 610, and 1220 mm); 14 mil film (23.5 and 47 inch)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	275 - 320°F	135 - 160°C
Pressure	100 - 200 PSI	7 - 14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cool under pressure	<120°F	<50°C

*Please note, appropriate values may depend on the design and stack up of the laminated busbar as well as fabricating equipment.

T9004
Low Flow Flame Retardant Adhesive on Polyester Film (Double-Sided)

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.5 TD -0.3	IPC-IM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	10.0 (1.75)	IPC-IM-650, 2.4.9
Melt Point Temperature	°F (°C	220 (104)	Clarkson Bar
Adhesive Tack Temperature	°F (°C)	190 – 210 (88 – 99) (A)	Clarkston Bar
Flammability		PASS (B)	UL 94VTM-0
Dielectric Constant (1 MHz)		3.0(C)	IPC-IM-650, 2.5.5.3
Dissipation Factor (1 MHz)		0.016(C)	IPC-IM-650, 2.5.5.3
Dielectric Strength	V/mil (kV/mm)	5000 (200) (C)	ASTM-D-149
Elongation (MD)	%	180(C)	ASTM-D-882
Elongation (TD)	%	130(C)	ASTM-D-882
Tensile Strength	lb/in² (MPa)	29,000 (200) (C)	ASTM-D-882
Tensile Modulus	lb/in² (MPa)	350,000 (2400) (C)	ASTM-D-882
Initiation Tear Strength	gm/mil	800(C)	IPC-IM-650 24.16 A
Volume Resistivity	ohm/cm	$1x10^{17}$(C)	IPC-IM-650, 2.5.17
Surface Resistance	ohm/sq.	$1x10^{15}$(C)	IPC-IM-650, 2.5.17
Chemical Resistance	%	90(D)	IPC-IM-650, 2.3.2
Fungus Resistance		Non-Nutrient	IPC-IM-660, 2.6.1
Moisture Absorption, maximum	%	0.4	IPC-IM-650, 2.6.2

(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.
(B) Based on standard constructions using flame retardant adhesives (UL file E39696).
(C) Based on Film alone at 5 mil thickness.
(D) Except chlorinated solvents and ketones.

The information contained herein is based upon typical data. Sheldahl makes no warranty expressed or implied as to its accuracy and assumes no liability arising out of its use by others. The user should determine suitability of Sheldahl® materials, a Flex company, for each individual application.

Storage and Shelf Life

Guaranteed shelf life and material warranty is six months from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T9029
Low-Flow Flame Retardant Adhesive on PEN Film

Description

T9029 Bus Bond® insulations combine our proprietary low flow flame retardant adhesive with PEN film and are designed for laminated busbar requiring a formable, higher temperature, hydrolysis resistant dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Features

- T9029 is RoHS compliant and registered UL 94 VTM-0 (E39696).
- Unique temperature resistant low flow adhesive makes T9029 ideal for use in laminated busbars requiring more than one lamination process.
- High bond strength provides superior adhesion to copper, aluminium, and standard conductor materials.
- Low variation in adhesive thickness (± 0.1 mil) simplifies production.
- Reduced production time and wide lamination window cuts costs, prevents copper oxidation, and eliminates a major cause of dimensional change.
- Finished products can achieve a UL minimum continuous use temperature rating of 125°C.
- T9029, made with a biaxially oriented polyethylene naphthalate (PEN) film is a high temperature, low moisture absorption insulation solution.

Constructions

- Film Thickness: 2 and 5 mil (50 and 125 µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38, and 50 µm)
- Width: 5 mil: 12, 18, 36, and 37.5 inch (305, 457, 915, and 953 mm); 2 mil: 12 and 24 inches (305 and 610mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Temperature	275 - 300°F	135 - 160°C
Pressure	100 - 200 PSI	7 - 14 bar
Time (cool under pressure)	10 min to 120°F	10 min to 50°C

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

T9029
Low-Flow Flame Retardant Adhesive on PEN Film

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD - .15 TD - .08	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	10.0 (1.75)	IPC-TM-650, 2.4.9
Melt Point Temperature	°F (°C)	220 (104)	Clarkson Bar
Adhesive Tack Temperature	°F (°C)	190 – 200 (88 – 93) (A)	Clarkston Bar
Flammability		Pass (B)	UL 94 VTM-0
Dielectric Constant		2.9(C)	JIS C-2318 (60Hz @ 25°C)
Dissipation Factor		4.6 (C)	JIS C-2318 (60Hz @ 25°C)
Elongation at Break MD	%	118(C)	JIS C-2318
Elongation at Break TD	%	115(C)	JIS C-2318
Tensile Strength MD	lb/in² (MPa)	34,000 (234) (C)	JIS C-2318
Tensile Strength TD	lb/in² (MPa)	37,000 (255) (C)	JIS C-2318
Tear Propagation	lbs (kg)	2.0 (0.91) (C)	JIS-P8116
Volume Resistivity	ohm/cm	1.5 x 10^{18} (C)	JIS C-2318 (@ 25°C)
Chemical Resistance	%	90(D)	IPC-TM-650, 2.3.2
Moisture Absorption, maximum	%	0.5	IPC-TM-650, 2.6.2
(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.			
(B) Based on standard constructions using flame retardant adhesives, consult factory for data on specific constructions, or UL File E39696.			
(C) Based on Film alone at 5 mil thickness.			
(D) Except chlorinated solvents and ketones.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
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BUS BOND®

Product Bulletin

T9041
Low-Flow Flame Retardant Adhesive on White PET Film

Description

T9041 Bus Bond® insulations combine our proprietary low flow flame retardant adhesive with white PET film and are designed for laminated busbar applications requiring a formable, all-purpose dielectric material. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products.

Constructions

- Film Thickness: 3, 5, and 7 mil (75, 125, and 175 µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38, and 50 µm)
- Width: 12, 16, 24, and 48 inches (305, 407, 610, and 1220 mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen temperature	275-300°F	135-150°C
Pressure	100-200 PSI	7-14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cooling under pressure	< 120°F	< 50°C

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD -0.48% TD -0.33%	IPC-IM-650, Method 2.2.4B
Peel Strength	lb/in (N/mm)	5.0 (0.9)	IPC-IM-650, Method 2.4.9
Melt Point Temperature	°F (°C)	220 (104)	Clarkson Bar
Adhesive Tack Temperature	°F (°C)	190–210 (88-99)(A)	Clarkston Bar
Flammability		PASS (B)	UL 94 VTM-0
Dielectric Strength	V/mil (kV/mm)	2700 (106)(C)	ASTM-D-149
Tensile Strength	lb/in² (MPa)	22,000(155)(C)	ASTM-D-882
Elongation (MD)	%	115(C)	ASTM-D-882
Elongation (TD)	%	90(C)	ASTM-D-882
(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.			
(B) Based on standard constructions using flame retardant adhesives (UL file E39696)			
(c) Based on Film alone at 5 mil thickness.			

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Storage and Shelf Life

Guaranteed shelf life and material warranty is one year from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
A Flex Company

BUS BOND®

Product Bulletin

T9068
Low-Flow Flame Retardant Adhesive on PEN Film (Double- Sided)

Description

T9068 Bus Bond® insulations combine our proprietary low flow flame retardant adhesive with PEN film and are designed for laminated busbar applications requiring a formable, higher temperature, hydrolysis resistant dielectric material. The material's high temperature tolerance provides end-users with solutions that are unattainable with other products.

Features

- T9068 is RoHS compliant and registered UL 94 VTM-0 (E39696).
- Unique temperature resistant low-flow adhesive coated on both sides of PEN film make T9068 ideal for use as internal layers in laminated busbars requiring more than one lamination process.
- High bond strength provides superior adhesion to copper, aluminium and other standard conductor materials.
- Low variation in adhesive thickness (± 0.1 mil) simplifies production.
- Reduced process time and wide lamination window cuts costs, prevents copper oxidation, and eliminates a major cause of dimensional change.
- Finished products can achieve a UL minimum continuous use temperature rating of 125°C.
- T9068, made with a biaxially oriented polyethylene naphthalate (PEN) film, is a high temperature, low moisture absorption insulation solution.

Constructions

- Film Thickness: 2 and 5 mil (50 and 125µm)
- Adhesive Thickness: 1, 1.5, and 2 mil (25, 38 and 50µm)
- Width: 5 Mil: 12, 18, 36, and 37.5 inch (305, 457, 915, and 953 mm); 2 Mil: 12 and 24 inches (305 and 610mm)

Processing Recommendations

Platen Press*

	SAE	Metric
Platen Temperature	275 - 320°F	135 - 160°C
Pressure	100 -200 PSI	7 - 14 bar
Time at Temperature	15 to 45 minutes	15 to 45 minutes
Cool under pressure	< 120°F	< 50°C

*Please note: appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

T9068
Low-Flow Flame Retardant Adhesive on PEN Film (Double-Sided)

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Dimensional Stability	%	MD - .15 TD - .08	IPC-TM-650, 2.2.4B
Peel Strength	lb/in (N/mm)	10.0 (1.75)	IPC-TM-650, 2.4.9
Melt Point Temperature	°F (°C)	220 (104)	Clarkson Bar
Adhesive Tack Temperature	°F (°C)	190 – 200 (88 – 93) (A)	Clarkston Bar
Flammability		Pass (B)	UL 94 VTM-0
Dielectric Constant		2.9(C)	JIS C-2318 (60Hz @ 25°C)
Dissipation Factor		4.6 (C)	JIS C-2318 (60Hz @ 25°C)
Elongation at Break MD	%	118(C)	JIS C-2318
Elongation at Break TD	%	115(C)	JIS C-2318
Tensile Strength MD	lb/in² (MPa)	34,000 (234) (C)	JIS C-2318
Tensile Strength TD	lb/in² (MPa)	37,000 (255) (C)	JIS C-2318
Tear Propagation	lbs (kg)	2.0 (0.91) (C)	JIS-P8116
Volume Resistivity	ohm/cm	1 x 10^{18} (C)	JIS C-2318 (@ 25°C)
Chemical Resistance	%	90(D)	IPC-TM-650, 2.3.2
Moisture Absorption, maximum	%	0.5	IPC-TM-650, 2.6.2

(A) Tack temperature is when the adhesive starts sticking (tacks) to the Clarkson Bar but does not transfer the adhesive on the bar.
(B) Based on standard constructions using flame retardant adhesives, consult factory for data on specific constructions, or UL File E39696.
(C) Based on Film alone at 5 mil thickness.
(D) Except chlorinated solvents and ketones.

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Storage and Shelf Life

Guaranteed shelf life and material warranty is six months from date of shipment when stored at ≤20°C and ≤50% RH.

Sheldahl®
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BUS BOND®

Product Bulletin

T9072
Flame Retardant Unsupported Adhesive Free Film

Description

T9072 is our proprietary modified acrylic-flame retardant, ROHS compliant self-extinguishing adhesive on a carrier with a release liner, creating an isolated adhesive suitable for use as a bonding layer. The materials high temperature tolerance provides end-users with solutions that are unattainable with other products

Features

- Flame-retardant, ROHS compliant adhesive.
- Adhesive thickness: 1.5 mil (38µm)**additional thicknesses in development*
- Free films are manufactured using quality systems that conform to ISO, QS, and TS quality standards.
- High bond strength provides superior adhesion to copper, aluminum and most plated materials.
- Dry to the touch for ease of handling.

Processing Recommendations

Platen Press*

	SAE	Metric
Platen Temperature	388°F	170°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cool under pressure	< 120°F	< 50°C

*Please note, appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Peel Strength	lb/in (N/mm)	5.0 (0.9)(A)	ASTM-D-903
Adhesive thickness	%	±10	In process basis weight
(A) When bonded to 5 mil PET film and 1.0 oz cu per recommended process parameters.			

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Storage

Guaranteed shelf life and material warranty is 12 months from date of shipment when stored at ≤20°C and ≤50% RH

Sheldahl®
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BUS BOND®

Product Bulletin

T9098
Flame Retardant Unsupported Adhesive Free Film

Description

T9098 is our proprietary modified acrylic-flame retardant, ROHS compliant self-extinguishing adhesive on a carrier with a release liner, creating an isolated adhesive suitable for use as a bonding layer. The materials high flow provides end-users with solutions that are unattainable with other products.

Features

- Flame-retardant, ROHS compliant adhesive.
- Adhesive thickness: 0.8, 1.0, 1.5 mil, and 2.0 mil (20.3, 25.4, 38, and 50.8µm)
- Free films are manufactured using quality systems that conform to ISO, QS, and TS quality standards.
- High bond strength provides superior adhesion to copper, aluminum and most plated materials.
- Dry to the touch for ease of handling.
- High Flow enables a superior bond to rough surfaces.

Processing Recommendations

Platen Press*

	SAE	Metric
Platen Temperature	300°F	149°C
Pressure	218 PSI	15 bar
Time at Temperature	30 minutes	30 minutes
Cool under pressure	< 120°F	< 50°C

*Please note, appropriate values may depend on the design and stack up of the laminated busbar as well as the fabricating equipment.

Technical Properties

PROPERTY	UNITS	TYPICAL DATA	TEST METHOD
Peel Strength	lb/in (N/mm)	5.0 (0.9)(A)	ASTM-D-903
Adhesive thickness	%	±10	In process basis weight

(A) When bonded to 5 mil PET film and 1.0 oz cu per recommended process parameters.

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Storage

Guaranteed shelf life and material warranty is 12 months from date of shipment when stored at ≤20°C and ≤50% RH