3M VHB™ Tapes

Technical Data **June, 2009**

Product Description:

3M™ VHB™ Tapes provide the convenience and simplicity of a tape fastener and are ideal for use in many interior and exterior bonding applications. In many situations, they can replace rivets, spot welds, liquid adhesives and other permanent fasteners.

These 3M™ VHB™ Tapes are made with acrylic foam which is viscoelastic in nature. This gives the foam energy absorbing and stress relaxing properties which provides these tapes with their unique characteristics. The acrylic chemistry provides outstanding durability performance.

These tapes utilize a variety of specific foam, adhesive, color and release liner types to provide each product/family with specific features. These features can include adhesion to specific or a broad range of materials, conformability, high tensile strength, high shear and peel adhesion, resistance to plasticizer migration, and UL746C recognition. All 3M™ VHB™ Tapes have excellent durability and excellent solvent and moisture resistance.

Note: All 3M™ VHB™ Tapes should be thoroughly evaluated by the user under actual use conditions with intended substrates to determine whether a specific tape is fit for a particular purpose and suitable for user's method of application, especially if expected use involves extreme environmental conditions or high dead load stress.

3M™ VHB™ Tape Products

Tape Number	Color	Thickness in. (mm)	Tape Number	Color	Thickness in. (mm)	Tape Number	Color	Thickness in. (mm)
4611	Dk Gray	0.045 (1.1)	4930 (F)	White	0.025 (0.64)	4955	White	0.080 (2.0)
4618	White	0.025 (0.64)	4932	White	0.025 (0.64)	4956 (F)	Gray	0.062 (1.55)
4622	White	0.045 (1.1)	4936 (F)	Gray	0.025 (0.64)	4957F	Gray	0.062 (1.55)
4624	White	0.062 (1.55)	4941 (F)	Gray	0.045 (1.1)	4959 (F)	White	0.120 (3.0)
4646	Dk Gray	0.025 (0.64)	4943F	Gray	0.045 (1.1)	4979F	Black	0.062 (1.55)
4655	Dk Gray	0.062 (1.55)	4945	White	0.045 (1.1)	4991	Gray	0.090 (2.3)
4905	Clear	0.020 (0.5)	4946	White	0.045 (1.1)	5915 (P)	Black	0.016 (0.4)
4910	Clear	0.040 (1.0)	4947F	Black	0.045 (1.1)	5925 (P)	Black	0.025 (0.64)
4919F	Black	0.025 (0.64)	4949	Black	0.045 (1.1)	5930 (P)	Black	0.032 (0.8)
4920	White	0.015 (0.4)	4950	White	0.045 (1.1)	5952 (P)	Black	0.045 (1.1)
4926	Gray	0.015 (0.4)	4951	White	0.045 (1.1)	5958FR	Black	0.040 (1.0)
4929	Black	0.025 (0.64)	4952	White	0.045 (1.1)	5962 (P)	Black	0.062 (1.55)

(F) or (P) after the product number designate that both a paper and film liner product version are available. [e.g. 4930 (paper liner) and 4930F (film liner), 5915 (film liner) and 5915P (paper liner). See page 3 for specific details.

3M™ VHB™ Tapes Adhesive Types:

Multi-Purpose Acrylic: This adhesive bonds to a wide range of materials including metals, glass, and high and medium surface energy plastics and paints. This unique adhesive also has the ability to resist migration of plasticizers in vinyl substrates.

Modified Acrylic: This adhesive bonds to medium low surface energy paints and plastics, including many powder coated paints in addition to the substrates listed with the multi-purpose acrylic adhesive (except plasticized vinyl).

General Purpose Acrylic: This adhesive bonds to most higher surface energy substrates including metal, glass and high surface energy plastics.

Low Temperature Appliable Acrylic: This adhesive can make bonds down to 32°F (0°C), compared to 50°F (10°C) for most acrylic adhesives. This adhesive system bonds to most high surface energy substrates including metal, glass and high surface energy plastics.

Low Surface Energy: This high performance synthetic adhesive bonds to many lower surface energy substrates, including many plastics and power coated paints, plus smooth general purpose substrates.

3M™ VHB™ Tapes Foam Types:

Conformable: This foam provides high strength with the capability of conforming to the irregularities of rigid substrates, even when there might be slight mismatch.

Very Conformable: This foam provides the highest level of conformability while maintaining high internal strength.

Firm: This foam provides the highest level of foam strength in the 3M™ VHB™ Tapes family.

Clear: Not technically a foam, this solid acrylic material provides excellent clarity.

3M™ VHB™ Tapes

3M™ VHB™ Tape Families:

4941 This family utilizes multi-purpose acrylic adhesive on both sides of conformable foam. The adhesive provides excellent adhesion to a broad range of high and medium surface energy substrates including metals, glass, and a wide variety of plastics, as well as plasticized vinyl. The conformable foam provides good contact, even with mismatched substrates. Available in gray and black.

5952 This family matches the modified acrylic adhesive on both sides of very conformable foam, providing adhesion to the broadest range of substrates, including most powder coated paints. Available in black.

4950 This family has general purpose adhesive on both sides of firm type foam. This family is typically used on metal, glass and high surface energy plastic substrates. Available in white and black.

4945 This family has multi-purpose adhesive on both sides of firm foam. Available in white.

4910 This family of clear tapes is excellent for applications where clear or colorless is desired. The general purpose adhesive on both sides is suitable for high surface energy substrates.

4951 This family of tapes is based around the low temperature appliable acrylic adhesive system, utilized on both firm and conformable foam types. These products are suitable for high surface energy substrates. Available in white (firm foam) and gray (conformable foam).

4952 This family utilizes the low surface energy adhesive on a firm foam. Available in white.

4611 This family has a general purpose adhesive on both sides of firm foam. This family of tapes is typically used on metal substrates, and has the added feature of high temperature resistance, making it often suitable for bonding prior to high temperature paint processing. Available in dark gray.

4622 This family has general purpose adhesive on the face side (the side that typically would be bonded first) and multi-purpose adhesive on the liner side (the side exposed when the release liner is removed) of a conformable foam. Available in white.

3M™ VHB™ Tape Product Family Guide

Thickness inches (mm)	Family ▶	4941		5952	4950		4945	4910	4951		4952	4611	4622
	Color ▶	Gray	Black	Black	White	Black	White	Clear	White	Gray	White	Dk Gray	White
	Foam type ▶	Conform	Conform	Very Conf	Firm	Firm	Firm	n/a	Firm	Conform	Firm	Firm	Conform
	Adhesive ▶	Multi-Purpose		Modified	General Purpose		Multi-Purp	Gen-Purp	Low Temp Apply		LSE	Gen-Purp	Gen/Multi
0.015 / 0.016 (0.4)		4926		5915 5915P	4920								
0.020 (0.5)								4905					
0.025 (0.64)		4936 4936F	4919F	5925 5925P	4930 4930F	4929					4932	4646	4618
0.032 (0.8)				5930 5930P									
0.040 (1.0)				5958FR				4910					
0.045 (1.1)		4941 4941F	4947F	5952 5952P	4950	4949	4945 4946		4951	4943	4952	4611	4622
0.062 (1.55)		4956 4956F	4979F	5962 5962P						4957		4655	4624
0.080 (2.0)					4955								
0.090 (2.3)		4991											
0.120 (3.0)					4959 4959F								

NOTE: For easy product comparison, data in this product information page will be organized by product family.

3M™ VHB™ Tapes

Typical Physical Properties

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

3M™ VHB™ Tapes Product Family	Number	Color	Thickness Inches	(mm)	Tolerance	Adhesive Adhesive Type	Foam Type	Density lb/ft³	(kg/m³)	Release Liner Thickness Type	Inches	(mm)	Color
4941	4919F	Black	0.025	(0.64)	± 15%	Multi-Purp	Conform	45	(720)	PE Film	0.005	(0.125)	Red (printed)
	4926	Gray	0.015	(0.4)	± 15%	Multi-Purp	Conform	45	(720)	DK Paper	0.003	(0.08)	White (printed)
	4936	Gray	0.025	(0.64)	± 15%	Multi-Purp	Conform	45	(720)	DK Paper	0.003	(0.08)	White (printed)
	4936F	Gray	0.025	(0.64)	± 15%	Multi-Purp	Conform	45	(720)	PE Film	0.005	(0.125)	Red (printed)
	4941	Gray	0.045	(1.1)	± 10%	Multi-Purp	Conform	45	(720)	DK Paper	0.003	(0.08)	White (printed)
	4941F	Gray	0.045	(1.1)	± 10%	Multi-Purp	Conform	45	(720)	PE Film	0.005	(0.125)	Red
	4947F	Black	0.045	(1.1)	± 10%	Multi-Purp	Conform	45	(720)	PE Film	0.005	(0.125)	Red (printed)
	4956	Gray	0.062	(1.55)	± 10%	Multi-Purp	Conform	45	(720)	DK Paper	0.003	(0.08)	White (printed)
	4956F	Gray	0.062	(1.55)	± 10%	Multi-Purp	Conform	45	(720)	PE Film	0.005	(0.125)	Red (printed)
	4979F	Black	0.062	(1.55)	± 10%	Multi-Purp	Conform	45	(720)	PE Film	0.005	(0.125)	Red (printed)
	4991	Gray	0.090	(2.3)	± 10%	Multi-Purp	Conform	45	(720)	PE Film	0.005	(0.125)	Red (printed)
5952	5915	Black	0.016	(0.4)	± 15%	Modified	Very Conf	43	(690)	PE Film	0.005	(0.125)	Red
	5915P	Black	0.016	(0.4)	± 15%	Modified	Very Conf	43	(690)	PCK Paper	0.004	(0.10)	White (printed)
	5925	Black	0.025	(0.64)	± 15%	Modified	Very Conf	37	(590)	PE Film	0.005	(0.125)	Red
	5925P	Black	0.025	(0.6)	± 15%	Modified	Very Conf	37	(590)	PCK Paper	0.004	(0.10)	White (printed)
	5930	Black	0.032	(0.8)	± 15%	Modified	Very Conf	37	(590)	PE Film	0.005	(0.125)	Red
	5930P	Black	0.032	(0.8)	± 15%	Modified	Very Conf	37	(590)	PCK Paper	0.004	(0.10)	White (printed)
	5952	Black	0.045	(1.1)	± 10%	Modified	Very Conf	37	(590)	PE Film	0.005	(0.125)	Red
	5952P	Black	0.045	(1.1)	± 10%	Modified	Very Conf	37	(590)	PCK Paper	0.004	(0.10)	White (printed)
	5958FR	Black	0.040	(1.0)	± 10%	Modified	Very Conf	50	(800)	PE Film	0.005	(0.125)	Red
	5962	Black	0.062	(1.55)	± 10%	Modified	Very Conf	37	(590)	PE Film	0.005	(0.125)	Red
	5962P	Black	0.062	(1.55)	± 10%	Modified	Very Conf	37	(590)	PCK Paper	0.004	(0.10)	White (printed)
4950	4920	White	0.015	(0.4)	± 15%	Gen Purp	Firm	50	(800)	DK Paper	0.003	(0.08)	White (printed)
	4929	Black	0.025	(0.64)	± 15%	Gen Purp	Firm	50	(800)	Polyester	0.002	(0.05)	Clear
	4930	White	0.025	(0.64)	± 15%	Gen Purp	Firm	50	(800)	DK Paper	0.003	(0.08)	White (printed)
	4930F	White	0.025	(0.64)	± 15%	Gen Purp	Firm	50	(800)	PE Film	0.005	(0.125)	Red
	4949	Black	0.045	(1.1)	± 10%	Gen Purp	Firm	50	(800)	Polyester	0.002	(0.05)	Clear
	4950	White	0.045	(1.1)	± 10%	Gen Purp	Firm	50	(800)	DK Paper	0.003	(0.08)	White (printed)
	4955	White	0.080	(2.0)	± 10%	Gen Purp	Firm	45	(720)	Polyester	0.002	(0.05)	Clear
	4959	White	0.120	(3.0)	± 10%	Gen Purp	Firm	45	(720)	Polyester	0.002	(0.05)	Clear
	4959F	White	0.120	(3.0)	± 10%	Gen Purp	Firm	45	(720)	PE Film	0.005	(0.125)	Red
4945	4945	White	0.045	(1.1)	± 10%	Multi-Purp	Firm	50	(800)	DK Paper	0.003	(0.08)	White (printed)
	4946	White	0.045	(1.1)	± 10%	Multi-Purp	Firm	50	(800)	PE Film	0.005	(0.125)	Clear
4910	4905	Clear	0.020	(0.5)	± 15%	Gen Purp	Solid	60	(960)	PE Film	0.005	(0.125)	Red (printed)
	4910	Clear	0.040	(1.0)	± 10%	Gen Purp	Solid	60	(960)	PE Film	0.005	(0.125)	Red (printed)
4951	4951	White	0.045	(1.1)	± 10%	Low Temp Appl	Firm	50	(800)	Polyester	0.002	(0.05)	Clear
	4943F	Gray	0.045	(1.1)	± 10%	Low Temp Appl	Conform	45	(720)	Polyester	0.002	(0.05)	Clear
	4957F	Gray	0.062	(1.55)	± 10%	Low Temp Appl	Conform	45	(720)	Polyester	0.002	(0.05)	Clear
4952	4932	White	0.025	(0.64)	± 15%	LSE	Firm	50	(800)	DK Paper	0.003	(0.08)	White (printed)
	4952	White	0.045	(1.1)	± 10%	LSE	Firm	50	(800)	DK Paper	0.003	(0.08)	White (printed)
4611	4611	Dk Gray	0.045	(1.1)	± 10%	Gen Purp	Firm	52	(840)	PE Film	0.005	(0.125)	Red
	4646	Dk Gray	0.025	(0.64)	± 15%	Gen Purp	Firm	52	(840)	PE Film	0.005	(0.125)	Red
	4655	Dk Gray	0.062	(1.55)	± 10%	Gen Purp	Firm	52	(840)	PE Film	0.005	(0.125)	Red
4622	4618	White	0.025	(0.64)	± 15%	Gen/Multi Purp	Conform	45	(720)	PE Film	0.004	(0.10)	Green
	4622	White	0.045	(1.1)	± 10%	Gen/Multi Purp	Conform	45	(720)	PE Film	0.004	(0.10)	Green
	4624	White	0.062	(1.55)	± 10%	Gen/Multi Purp	Conform	45	(720)	PE Film	0.004	(0.10)	Green

3M™ VHB™ Tapes

Typical Performance Characteristics

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

	3M™ VHB™ Tapes			Dynamic Adhesion Performance					
				90° Peel Adhesion		Normal Tensile		Dynamic Overlap Shear	
Family	Product Number	Color	Thickness Inches	lb/in	N/100 mm	lb/in²	kPa	lb/in²	kPa
4941	4919F	Black	0.025	17	(300)	90	(620)	80	(550)
	4926	Gray	0.015	12	(210)	95	(655)	90	(620)
	4936 (F)	Gray	0.025	17	(300)	90	(620)	80	(550)
	4941 (F)	Gray	0.045	20	(350)	85	(585)	70	(480)
	4947F	Black	0.045	20	(350)	85	(585)	70	(480)
	4956 (F)	Gray	0.062	20	(350)	80	(550)	70	(480)
	4979F	Black	0.062	20	(350)	80	(550)	70	(480)
	4991	Gray	0.090	20	(350)	70	(480)	65	(450)
5952	5915 (P)	Black	0.016	13	(230)	90	(620)	90	(620)
	5925 (P)	Black	0.025	17	(300)	90	(620)	90	(620)
	5930 (P)	Black	0.032	18	(315)	90	(620)	85	(585)
	5952 (P)	Black	0.045	20	(350)	90	(620)	80	(550)
	5958FR	Black	0.040	20	(350)	100	(690)	100	(690)
	5962 (P)	Black	0.062	20	(350)	90	(620)	80	(550)
4950	4920	White	0.015	15	(260)	160	(1100)	100	(690)
	4929	Black	0.025	20	(350)	160	(1100)	100	(690)
	4930 (F)	White	0.025	20	(350)	160	(1100)	100	(690)
	4949	Black	0.045	25	(440)	140	(970)	80	(550)
	4950	White	0.045	25	(440)	140	(970)	80	(550)
	4955	White	0.080	20	(350)	95	(655)	70	(480)
	4959 (F)	White	0.120	20	(350)	75	(520)	55	(380)
4945	4945	White	0.045	25	(440)	140	(970)	80	(550)
	4946	White	0.045	25	(440)	140	(970)	80	(550)
4910	4905	Clear	0.020	12	(210)	100	(690)	70	(480)
	4910	Clear	0.040	15	(260)	100	(690)	70	(480)
4951	4951	White	0.045	18	(315)	110	(760)	80	(550)
	4943F	Gray	0.045	20	(350)	85	(585)	70	(480)
	4957F	Gray	0.062	20	(350)	75	(515)	70	(480)
4952	4932	White	0.025	20	(350)	100	(690)	100	(690)
	4952	White	0.045	25	(440)	80	(550)	80	(550)
4611	4611	Dk Gray	0.045	18	(315)	90	(590)	65	(445)
	4646	Dk Gray	0.025	15	(250)	100	(690)	80	(550)
	4655	Dk Gray	0.062	18	(315)	80	(550)	60	(415)
4622	4618	White	0.025	17	(300)	85	(580)	80	(550)
	4622	White	0.045	20	(350)	70	(480)	65	(445)
	4624	White	0.062	20	(350)	55	(380)	60	(410)

90° Peel Adhesion - Based on ASTM D3330 -To stainless steel, room temperature, jaw speed 12 in/min (305 mm/min). Average force to remove is measured. 72 hour dwell.

Normal Tensile (T-Block Tensile) - ASTM D-897 - To aluminum, room temperature, 1 in² (6.45 cm²), jaw speed 2 in/min (50 mm/min.) Peak force to separate is measured. 72 hour dwell.

Dynamic Overlap Shear - ASTM D-1002 - To stainless steel, room temperature, 1 in² (6.45 cm²), jaw speed 0.5 in/min (12.7 mm/min.) Peak force to separate is measured. 72 hour dwell.

3M™ VHB™ Tapes

Typical Performance Characteristics

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

	3M™ VHB™ Tapes			Static Shear					Temperature Tolerance			
				Weight (grams) that 1/2 square inch will hold 10,000 minutes (7 days)					Short Term (Minutes, Hours)		Long Term (Days, Weeks)	
Family	Product Number	Color	Thickness Inches	72°F (22°C)	150°F (66°C)	200°F (93°C)	250°F (121°C)	350°F (177°C)	°F	°C	°F	°C
4941	4919F	Black	0.025	1000	500	500			300	(149)	200	(93)
	4926	Gray	0.015	1000	500	500			300	(149)	200	(93)
	4936 (F)	Gray	0.025	1000	500	500			300	(149)	200	(93)
	4941 (F)	Gray	0.045	1000	500	500			300	(149)	200	(93)
	4947F	Black	0.045	1000	500	500			300	(149)	200	(93)
	4956 (F)	Gray	0.062	1000	500	500			300	(149)	200	(93)
	4979F	Black	0.062	1000	500	500			300	(149)	200	(93)
	4991	Gray	0.090	1000	500	500			250	(121)	200	(93)
5952	5915 (P)	Black	0.016	1000	500	500	250		300	(149)	250	(121)
	5925 (P)	Black	0.025	1000	500	500	250		300	(149)	250	(121)
	5930 (P)	Black	0.032	1000	500	500	250		300	(149)	250	(121)
	5952 (P)	Black	0.045	1000	500	500	250		300	(149)	250	(121)
	5958FR	Black	0.040	1000	350	250			300	(149)	200	(93)
	5962 (P)	Black	0.062	1000	500	500	250		300	(149)	250	(121)
4950	4920	White	0.015	1500	500	500			300	(149)	200	(93)
	4929	Black	0.025	1500	500	500			300	(149)	200	(93)
	4930 (F)	White	0.025	1500	500	500			300	(149)	200	(93)
	4949	Black	0.045	1500	500	500			300	(149)	200	(93)
	4950	White	0.045	1500	1000	500			300	(149)	200	(93)
	4955	White	0.080	1500	1000	750	750	750	400	(204)	300	(149)
	4959 (F)	White	0.120	1500	1000	750	750	750	400	(204)	300	(149)
4945	4945	White	0.045	1500	500	500			300	(149)	200	(93)
	4946	White	0.045	1500	500	500			300	(149)	200	(93)
4910	4905	Clear	0.020	1000	500	500			300	(149)	200	(93)
	4910	Clear	0.040	1000	500	500			300	(149)	200	(93)
4951	4951	White	0.045	1250	500	500			300	(149)	200	(93)
	4943F	Gray	0.045	1000	500	500			300	(149)	200	(93)
	4957F	Gray	0.062	1000	500	500			300	(149)	200	(93)
4952	4932	White	0.025	1500	500				200	(93)	160	(71)
	4952	White	0.045	1500	500				200	(93)	160	(71)
4611	4611	Dk Gray	0.045	1500	750	750	750	750	450	(232)	300	(149)
	4646	Dk Gray	0.025	1500	750	750	750	750	450	(232)	300	(149)
	4655	Dk Gray	0.062	1500	750	750	750	750	450	(232)	300	(149)
4622	4618	White	0.025	1000	250	250			250	(121)	200	(93)
	4622	White	0.045	1000	250	250			250	(121)	200	(93)
	4624	White	0.062	1000	250	250			250	(121)	200	(93)

Static Shear - ASTM D3654 - To stainless steel, tested at various temperatures and gram loadings. 0.5 in^2 (3.22 cm^2). Will hold listed weight for 10,000 minutes (approximately 7 days). Conversion: 1500 g/0.5 in^2 equals 6.6 lb/in^2; 500 g/0.5 in^2 = 2.2 lb/in^2.

Short Term Temperature Tolerance - No change in room temperature dynamic shear properties following 4 hours conditioning at indicated temperature with 100 g/static load. (Represents minutes, hours in a process type temperature exposure).

Long Term Temperature Tolerance - Maximum temperature where tape supports at least 250 g load per 0.5 in^2 in static shear for 10,000 minutes. (Represents continuous exposure for days or weeks.

3M™ VHB™ Tapes

Available Sizes

Tape Thickness		Standard Length		Minimum Width		Maximum Width		Maximum Roll Length					
								Width 1/4"up to 3/8" (6.4mm up to 9.5mm)		Width >3/8" up to 1/2" (>9.5mm up to 12.7mm)		Width 1/2" and wider (12.7mm and wider)	
inches	(mm)	yards	(meters)	inches	(mm)	inches	(mm)	yards	(meters)	yards	(meters)	yards	(meters)
0.015/0.016	(0.4)	72	(65.8)	0.25	(6.4)	48*	(1220)	144	(131.6)	175	(160)	360	(330)
0.020	(0.5)	72	(65.8)	0.25	(6.4)	48*	(1220)	72	(65.8)	108	(98.8)	175	(160)
0.025	(0.64)	72	(65.8)	0.25	(6.4)	48	(1220)	72	(65.8)	108	(98.8)	175	(160)
0.032	(0.8)	72	(65.8)	0.25	(6.4)	48	(1220)	72	(65.8)	108	(98.8)	175	(160)
0.040	(1.0)	36	(32.9)	0.25	(6.4)	48	(1220)	72	(65.8)	108	(98.8)	144	(131.6)
0.045	(1.1)	36	(32.9)	0.25	(6.4)	48	(1220)	72	(65.8)	108	(98.8)	144	(131.6)
0.062	(1.55)	36	(32.9)	0.25	(6.4)	46	(1170)	72	(65.8)	72	(65.8)	108	(98.8)
0.080	(2.0)	36	(32.9)	0.25	(6.4)	46	(1170)	36	(32.9)	36	(32.9)	72	(65.8)
0.090	(2.3)	36	(32.9)	0.25	(6.4)	46	(1170)	36	(32.9)	36	(32.9)	72	(65.8)
0.120 (4959)	(3.0)	36	(32.9)	0.5	(12.7)	46	(1170)	N/A	N/A	N/A	N/A	36	(32.9)
0.120 (4959F)	(3.0)	36	(32.9)	0.25	(6.4)	46	(1170)	36	(32.9)	36	(32.9)	36	(32.9)

*****Exception – 5915 (P) max. width 46 inches (1170 mm); 5925 (P) max. width 47 inches (1195 mm).

Slitting Tolerance

Standard slitting tolerance ± 1/32 inch (± 0.031 inch, ± 0.8 mm).

Precision slitting with slitting tolerance of ± 1/64 inch (± 0.016 in., ± 0.44 mm) is available on select products with minimum order of full web increments.

Core Size

All products are available on a 3 inch ID Core (76.2 mm).

Converted Parts

In addition to standard and custom roll sizes available from 3M through the distribution network, 3M™ VHB™ Tapes are also available in limitless shapes and sizes through the 3M Converter network. For additional information, contact 3M Converter Markets at 1-800-223-7427 or on the web at www.3M.com/converter.

Shelf Life

All 3M™ VHB™ Tapes have a shelf life of 24 months from date of manufacture when stored at 40°F to 100°F (4°C to 38°C) and 0-95% relative humidity. The optimum storage conditions are 72°F (22°C) and 50% relative humidity.

Performance of tapes is not projected to change even after shelf life expires; however, 3M does suggest that 3M™ VHB™ Tapes are used prior to the shelf life date whenever possible.

The manufacturing date is available on all 3M™ VHB™ Tape cores as the lot number. The lot number, typically a 4 digit code, is a Julian date (Y D D D). The first digit refers to the year of manufacture, the last 3 digits refer to the days after January 1. Example: A lot number of 4266 would translate to a date of manufacture of Sept. 22 (266th day of year) in 2004. On most products this is found as the 4 digits after the “9” following the product number. For tapes printed continuously around the core (e.g. 3M™ VHB™ Tape 5952 family) the lot number typically will be the string of 4 digits preceding the product number.

Additional Typical Performance Characteristics

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

Outgassing:

3M™ VHB™ Tapes	% TML	%VCM	%WVR
4930	0.77	0.01	0.21
4932	2.41	0.66	0.23
4945	1.24	0.01	0.19

TML - Total Mass Loss

VCM - Volatile Condensible Materials

WVR - Water Vapor Regained

NASA Reference Publication, "Outgassing Data for Selecting Spacecraft Materials", (11/18/2004) Available online at http://outgassing.nasa.gov

Dielectric Constant
(ASTM D150)

3M™ VHB™ Tapes	Dielectric Constant	Dissipation Factor
4941 at 1 kHz	2.29	0.0245
at 1 MHz	1.99	0.0374
5952 at 1 kHz	2.14	0.0065
at 1 MHz	1.95	0.0506
4950 at 1 kHz	2.28	0.0227
at 1 MHz	1.99	0.0370
4910 at 1 kHz	3.21	0.0214
at 1 MHz	2.68	0.0595
4611 at 1 kHz	2.80	0.0130
at 1 MHz	2.43	0.0564

Resistivity
(ASTM D257)

3M™ VHB™ Tapes	Volume Resistivity (in ohm-cm)	Surface Resistance (in ohms/square)
4941	2.1×10^{14}	2.7×10^{14}
5952	2.5×10^{14}	$>10^{16}$
4950	1.5×10^{15}	$>10^{16}$
4920	1.7×10^{15}	$>10^{16}$
4910	3.1×10^{15}	$>10^{16}$
4611	1.4×10^{15}	$>10^{16}$

Typical 3M™ VHB™ Tape Properties for Modeling

Thermal Coefficient of Expansion
1×10^{-4} in/in/°F
1.8×10^{-4} mm/mm/°C

Shear Modulus (@25°C, 1 Hz)
4950 Family: 6×10^{5} Pa
4941 Family: 3×10^{5} Pa

(Shear Modulus is both temperature and frequency dependent).

Youngs Modulus: For VHB tapes the Youngs Modulus will be about 3 times the Shear Modulus.

Poisson's Ratio
0.49

Burn Characteristics 3M™ VHB™ Tape 5958FR

Meets FAR 25.853 (a) 12 second vertical burn, Appendix F, Part I (a)(ii).

Meets NBS Smoking Density (ASTM F814/E662).

Meets Toxicity (Draeger Tube ABD0031, AITM 3.0005)

Dielectric Breakdown Strength
(ASTM D149)

3M™ VHB™ Tapes	(in volts/mil)
4941	360
4926	330
5952	455
5925	520
4950	460
4920	640
4910	630
4611	330

Thermal Conductivity - K-value

3M™ VHB™ Tapes	BTU in/ hr ft² °F	(w/mK)
4941	0.53	(0.08)
5952	0.37	(0.05)
4950/4945	0.63	(0.09)
4910	1.09	(0.16)
4611	0.77	(0.11)

$$R\text{-Value} = \frac{\text{thickness}}{\text{K-value}}$$

(When units of K-value are BTU-in/hr ft² °F and thickness is given in inches.)

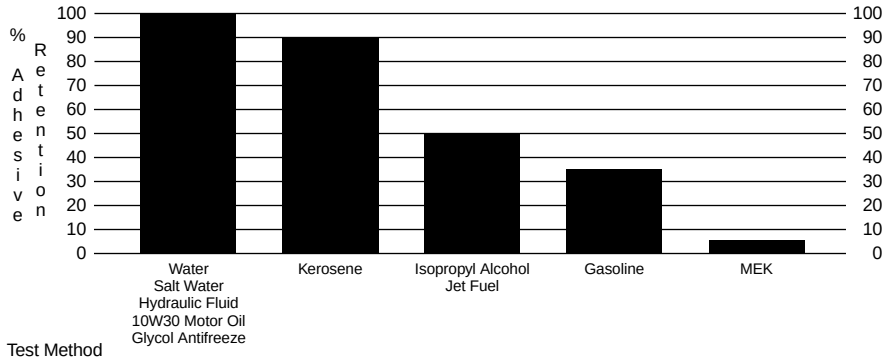
3M™ VHB™ Tapes
UL746C Listings - File MH 17478

Category QOQW2 Component - Polymeric Adhesive Systems, Electrical Equipment

3M™ VHB™ Tapes/ Product Families	Substrates	Temperature Rating Minimum	Maximum
4919F, 4926, 4936, 4936F, 4941, 4941F, 4947F, 4956, 4956F, 4979F	Ceramic	-35°C	110°C
	Aluminum, Galvanized steel, stainless steel, enameled steel, nickel coated ABS, glass (with or without silane coating) PVC, glass/epoxy, PBT, polycarbonate, acrylic/polyurethane paint, polyester paint	-35°C	90°C
	ABS	-35°C	75°C
4920, 4930, 4950	Aluminum, galvanized steel, enameled steel, stainless steel, ceramic, glass/epoxy	-35°C	110°C
	PBT, Acrylic	-35°C	90°C
	ABS, Polycarbonate, Rigid PVC	-35°C	75°C
4945, 4946	Phenolic, aluminum, galvanized steel, alkyd enamel	-35°C	110°C
	ABS, polycarbonate, polyimide, stainless steel, acrylic/polyurethane paint, polyester paint	-35°C	90°C
	unplasticized PVC	-35°C	75°C
5915, 5915P, 5925, 5925P, 5930, 5930P, 5952, 5952P 5962, 5962P	Polycarbonate, Primer 94 coated polycarbonate, aluminum, acrylic/ polyurethane paint, galvanized steel, steel, polyester paint, epoxy/polyester paint, epoxy paint, glass (with or without silane coating), stainless steel, enameled steel, glass epoxy, polybutylene terephthalate, Nylon®, Noryl® (PPE) polyphenenlene ether	-35°C	90°C
	Rigid PVC, ABS	-35°C	75°C
5915, 5925, 5930, 5952	Acrylic	-35°C	90°C
5962	Acrylic	-35°C	80°C
5952	Cellulose Acetate Butyrate	-35°C	90°C
4991	Polycarbonate, aluminum, acrylic/ polyurethane paint, polyester paint	-35°C	90°C
4611, 4646, 4655	Stainless steel, aluminum, galvanized steel, glass, glass/epoxy, phenolic	-35°C	110°C
	Nylon, polycarbonate	-35°C	90°C
	ABS, rigid PVC	-35°C	75°C
4905, 4910	Polycarbonate, aluminum, acrylic/polyurethane paint	-35°C	90°C

A current list can be found at www.ul.com (select certifications, search file MH17478)

Solvent and Fuel Resistance



Test Method
- Tape between stainless steel and aluminum foil.
- 72 hours dwell at room temperature.
- Solvent immersion for 72 hours.
- Test within 45 minutes after removing from solvent.
- 90° peel angle.
- 12 in./min. rate of peel.
- Peel adhesion compared to control.

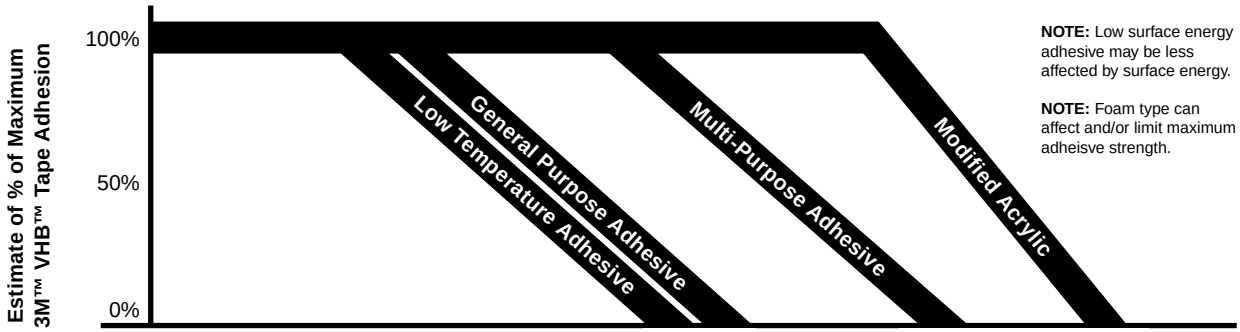
Note: Continuous submersion in chemical solutions is not recommended. The above information is presented to show that occasional chemical contact should not be detrimental to tape performance in most applications in ordinary use.

Design and Tape Selection Considerations

► **Choose the right tape for the substrate:** Adhesives must flow onto the substrate surfaces in order to achieve intimate contact area and allow the molecular force of attraction to develop. The degree of flow of the adhesive on the substrate is largely determined by the surface energy of the substrate.

This illustration demonstrates the effect of surface energy on adhesive interfacial contact. High surface energy materials draw the adhesive closer for high bond strength.

Relationship of Adhesion and Surface Energy for 3M™ VHB™ Tape Adhesive Families



HIGH		MEDIUM		LOW
400-1100	42-50	38-39	36-37	18-33
Aluminum	Kapton®	ABS	PVA	EVA
Stainless Steel	Phenolic	Polycarbonate (Lexan®)	Polystyrene	Polyethylene
Copper	Nylon	PVC	Acetal	Polypropylene
Zinc	Alkyd Enamel	Noryl®	Kynar® Paint	Tedlar®
Tin	Polyester	Acrylic	Powder Paint	Silicone
Lead	Epoxy Paint	Polane® Paint		Teflon®
Anodized Aluminum	Polyurethane	Powder Paint		
Glass				

NOTES: There are a wide variety of formulations, surfaces finishes and surface treatments available on substrate materials which can affect adhesion. This chart is intended to provide only a rough estimate of the adhesion levels which can be expected on some common materials relative to a reference surface such as aluminum.
Light surface abrasion will significantly increase adhesion levels on many materials, except when using tapes 4952/4932.

► **Use the right tape thickness:** The necessary thickness of tape depends on the rigidity of substrates and their flatness irregularity. While the 3M™ VHB™ Tapes will conform to a certain amount of irregularity, they will not flow to fill gaps between the materials. For bonding rigid materials with normal flatness, consider use of tapes with thickness of 45 mils (1.1 mm) or greater. As the substrate flexibility increases thinner tapes can be considered.

► **Use the right amount of tape:** Because 3M™ VHB™ Tapes are viscoelastic by nature their strength and stiffness is a function of the rate at which they are stressed. They behave stronger with relatively faster rate of stress load (dynamic stresses) and will tend to show creep behavior with stress load acting over a long period of time (static stresses). As a general rule, for **static loads,** approximately four square inches of tape should be used for each pound of weight to be supported in order to prevent excessive creep. For **dynamic loads,** the dynamic performance characteristics provided on page 4 should be useful, factoring in the appropriate safety factors.

► **Allow for thermal expansion/contraction:** 3M™ VHB™ Tapes can perform well in applications where two bonded surfaces may expand and contract differentially. Assuming good adhesion to the substrates, the tapes can typically tolerate differential movement in the shear plane up to 3 times their thickness.

► **Bond Flexibility:** While an advantage for many applications where allowing differential movement is a benefit, the tape bonds are typically more flexible than alternate bonding methods. Suitable design modifications or periodic use of rigid fasteners or adhesives may be needed if additional stiffness is required.

► **Severe Cold Temperature:** Applications which require performance at severe cold temperatures must be thoroughly evaluated by the user if the intended use will subject the tape product to high impact stresses. A technical bulletin "3M™ VHB™ Tape Cold Temperature Performance" is available for additional information. (70-0707-3991-0)

Application Techniques

► **Clean:** Most substrates are best prepared by cleaning with a 50:50 mixture of isopropyl alcohol (IPA*) and water prior to applying 3M™ VHB™ Tapes.

Exceptions to the general procedure that may require additional surface preparation include:

- **Heavy Oils:** A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
- **Abrasion:** Abrading a surface, followed by cleaning with IPA/water, can remove heavy dirt or oxidation and can increase surface area to improve adhesion.
- **Adhesion Promoters:** Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
- **Porous surfaces:** Most porous and fibered materials such as wood, particleboard, concrete, etc. need to be sealed to provide a unified surface.
- **Unique Materials:** Special surface preparation may be needed for glass and glass-like materials, copper and copper containing metals, and plastics or rubber that contain components that migrate (e.g. plasticizers).

Refer to 3M Technical Bulletin "Surface Preparation for 3M™ VHB™ Tape Applications" for additional details and suggestions. (70-0704-8701-5)

***Note:** These cleaner solutions contain greater than 250 g/l of volatile organic compounds (VOC). Please consult your local Air Quality Regulations to be sure the cleaner is compliant. When using solvents, be sure to follow the manufacturer's precautions and directions for use when handling such materials.

► **Pressure:** Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. Typically, good surface contact can be attained by applying enough pressure to insure that the tape experiences approximately 15 psi (100 kPa) pressure. Either roller or platen pressure can be used. Note that rigid surfaces may require 2 or 3 times that much pressure to make the tape experience 15 psi.

► **Temperature:** Ideal application temperature range is 70°F to 100°F (21°C to 38°C). Pressure sensitive adhesives use viscous flow to achieve substrate contact area. Minimum suggested application temperatures:

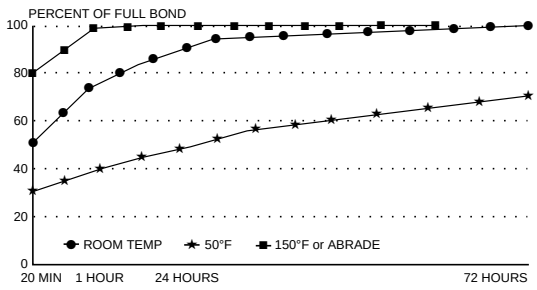
- 50°F (10°C): 3M™ VHB™ Tapes 4950, 5952, 4910, 4952, 4611, 4622 families.
- 60°F (15°C): 3M™ VHB™ Tapes 4941, 4945 families.
- 32°F (0°C): 3M™ VHB™ Tape 4951 families.

Note: Initial tape application to surfaces at temperatures below these suggested minimums is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is generally satisfactory.

To obtain good performance with all 3M™ VHB™ Tapes, it is important to ensure that the surfaces are dry and free of condensed moisture.

► **Time:** After application, the bond strength will increase as the adhesive flows onto the surface. At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. This flow is faster at higher temperatures and slower at lower temperatures. Ultimate bond strength can be achieved more quickly (and in some cases bond strength can be increased) by exposure of the bond to elevated temperatures (e.g. 150°F [66°C] for 1 hour). This can provide better adhesive wetout onto the substrates. Abrasion of the surfaces or the use of primers/ adhesion promoters can also have the effect of increasing bond strength and achieving ultimate bond strength more quickly.

Bond Typical Build vs. Time



Special Cases:

Rough Surfaces with 3M™ VHB™ Tapes 4932/4952 – 3M™ VHB™ Tapes 4932/4952 were designed to adhere to many low surface energy substrates. Rough surfaces created by light abrasion or textured molds are typically detrimental to bond strength with this tape family.

Plasticized Vinyl – Plasticizers compounded in soft vinyl can migrate into adhesives and significantly change their performance characteristics. 3M™ VHB™ Tapes 4941 and 4945 families have very good plasticizer resistance and adhesion to many vinyl formulations. Because of the wide variation in vinyl formulations, however, evaluation by the user must be conducted with the specific vinyl used to ensure that performance will be satisfactory over time. Problems related to plasticizer migration can often be predicted by accelerated aging of assembled parts at 150°F (66°C) for one week).

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

Limited Warranty

3M warrants for 24 months from the date of manufacture that 3M™ VHB™ Tape will be free of defects in material and manufacture. 3M MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. This limited warranty does not cover damage resulting from the use or inability to use 3M™ VHB™ Tape due to misuse, workmanship in application, or application or storage not in accordance with 3M recommended procedures. AN APPLICATION WARRANTY EXPRESSLY APPROVED AND ISSUED BY 3M IS AN EXCEPTION. THE CUSTOMER MUST APPLY FOR A SPECIFIC APPLICATION WARRANTY AND MEET ALL WARRANTY AND PROCESS REQUIREMENTS TO OBTAIN AN APPLICATION WARRANTY. CONTACT 3M FOR MORE INFORMATION ON APPLICATION WARRANTY TERMS AND CONDITIONS.

Limitation of Remedies and Liability

If the 3M™ VHB™ Tape is proved to be defective within the warranty period stated above. THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M™ VHB™ TAPE. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including negligence, warranty, or strict liability.

ISO 9001:2000

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2000 standards.

3M

Industrial Adhesives and Tapes Division

3M Center, Building 225-3S-06
St. Paul, MN 55144-1000
800-362-3550 • 877-369-2923 (Fax)
www.3M.com/vhb

Recycled Paper
40% pre-consumer
10% post-consumer