



Waterproof Characteristics of 3M™ VHB™ Tape Pressure Sensitive Adhesives for Electronics Bonding Applications

Technical Bulletin

September 2018

Ingress Protection Background

The IP code, International Protection Marking, IEC standard 60529 classifies and rates the degree of protection provided against the intrusion of solid particles (such as dust) and liquids (water) by electrical enclosures. The rating is generically a 2-digit code, the first referring to solid particle protection and the second to liquid or water protection. Where there is no protection or where it isn't of interest, the digit is replaced with the letter X.

The electronics industry has used pressure sensitive adhesives (PSA) to seal their devices and certified them to particular ratings: IP68 is typical. This would refer to dust tight (6 rating for solid particle) and suitable for immersion up to 2 meters for 30 minutes (7 rating for liquid). It is important to note that this is a device level test or characterization and not something that can be tested on the PSA itself. A device manufacturer will test and rate their device, in addition to simulated devices being made to test the integrity of the PSA.

Recently, IPX8 has been designated by many manufacturers. There are a couple of concerns with this rating. The first is the same with other rating questions - this is a device level characteristic, not a tape characteristic. The second issue is that IPX8 is not specifically defined. The description for the 8 rating is *"suitable for continuous immersion in water under conditions which are specified by the manufacturer."* Typically, the device is immersed beyond 1 meter with specific depth and time duration specified by the manufacturer, albeit more stringent than the 7 rating.

Answering the question whether a PSA is capable of meeting IPX8 would require knowledge of how the device maker defines this. Any claims regarding meeting IPX8 will have to include a description of how IPX8 is defined (for example depth, duration, and geometry).

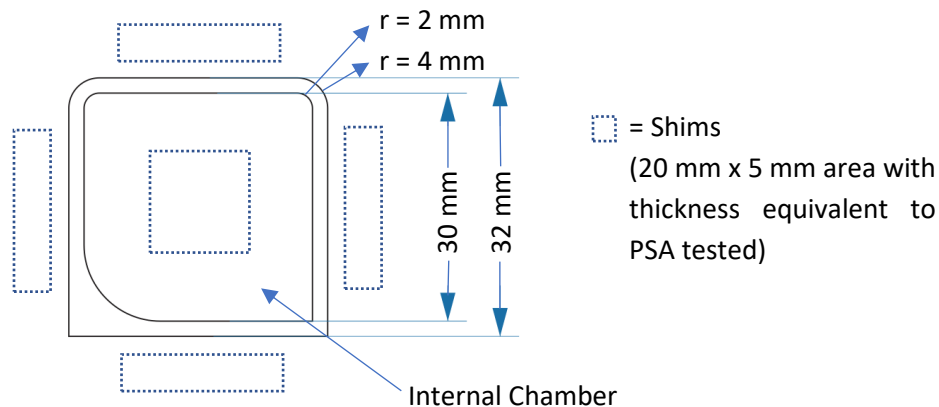
For this test development and characterization, IPX8 is considered equivalent to 14 psi (gauge) pressure (about 10 meters depth) for 30 minutes with a 1-millimeter line width of PSA. This testing was extended to 43 psi (about 30 meters depth) for samples that passed the 10 meter simulated depth.

Immersion	1	2	3	4	5
Simulated depth (chamber pressure)	3 m (4.3 psi)	10 m (14.2 psi)	30 m (42.7 psi)	10 m w/shims* (14.2 psi)	30 m w/shims* (42.7 psi)
Pressurized duration in min	30	30	30	30	30

*See page 2 for shim information

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Test Device and Procedure



Due to the viscoelastic nature of PSA's, the applied pressure across the edge of simulated devices would be decreased due to the compression of the PSA. To account for this, it is necessary that samples would need to pass the same pressures, with and without, shims (at the same thickness as the PSA used) to maintain and compress the bond line, respectively. The simulated devices will be considered as passing the test when no visible liquid has entered the internal chamber of the device.

Results

Simulated depth (chamber Pressure)		Pressurized duration in min	3M™ VHB™ Tape 86415	3M™ VHB™ Tape 5907	3M™ VHB™ Tape 5980
3 m	(4.3 psi)	30	Pass	Pass	Pass
10 m	(14.2 psi)	30	Pass	Pass	Pass
30 m	(42.7 psi)	30	Pass	Pass	Pass
10 m w/shims	(14.2 psi)	30	Pass	Pass	Pass
30 m w/shims	(42.7 psi)	30	Pass	Pass	Pass

Conclusions

The samples used were representatives of common 3M™ VHB™ Thin Foam Tapes for electronics applications: 3M™ VHB™ Tape 86415, 3M™ VHB™ Tape 5907, and 3M™ VHB™ Tape 5980. These have passed the testing described above. These results are not to be used as a certification of device waterproofness, only to show that if used properly, 3M™ VHB™ Tapes will provide a watertight seal.

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Technical Information

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