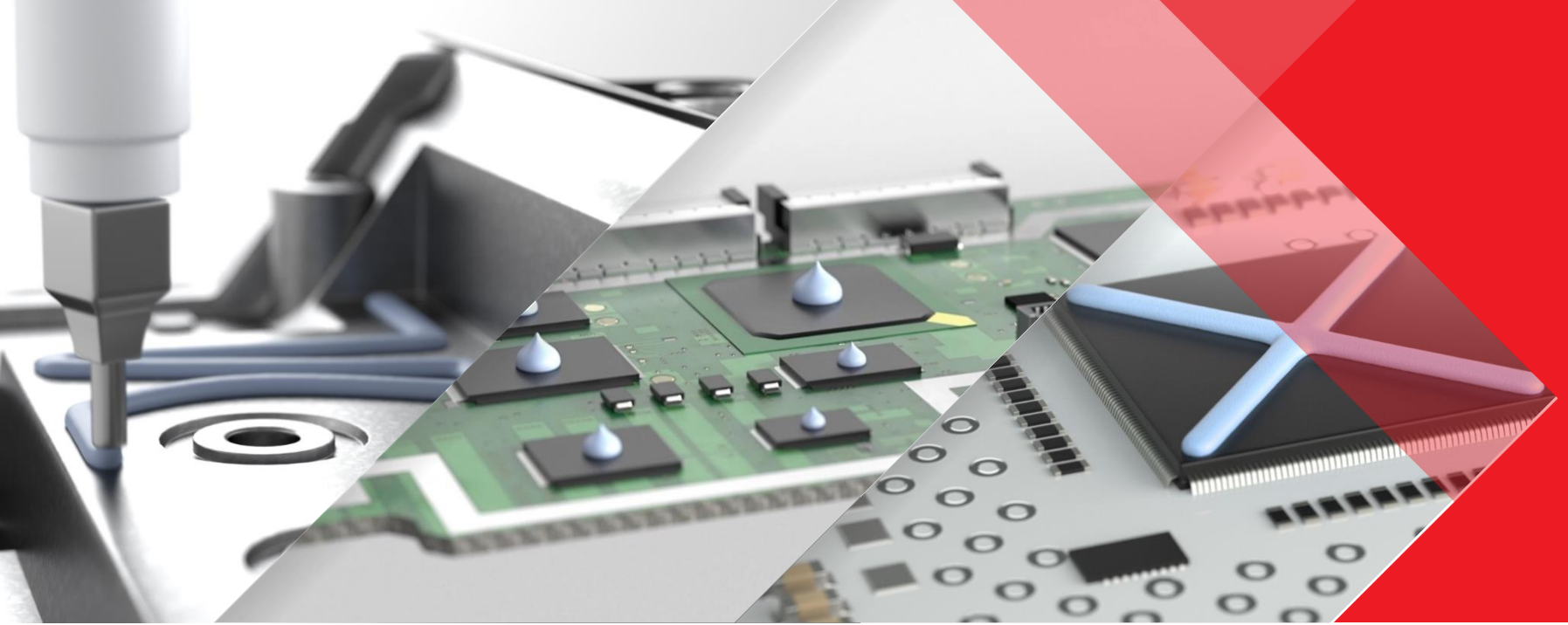


BERGQUIST GAP FILLER TGF 3000SF

AGENDA

01 Industry Challenge

02 Roadmap

03 Product Description

04 Markets

05 Regulatory

INDUSTRY CHALLENGES & SOLUTIONS

WHY WE DEVELOP THIS PRODUCT

- **BERGQUIST TGF 3000SF** is a 3.0 W/m-K, thermally conductive, silicone free, dielectric, liquid Gap Filling material
- Customers are demanding more silicone free TIM material esp. dealing in sensitive environments like semiconductor packaging equipment or bleeding which impact the surrounding components and applications.
- **BERGQUIST TGF 3000SF** is a 2 component Gap Filler that provides excellent thermal performance with a high dispense rate for easy, robust processing and silicone free so that it can be used in virtually any environment or application without fear of any silicone contamination.
- **BERGQUIST TGF 3000SF** provides the supreme electrical performance and reliability the industry has come to expect from the global leader in thermal gap filling solutions while making processing and automation easier than ever.

WHERE THIS PRODUCT FITS INTO OUR CURRENT PORTFOLIO

GAP FILLER (2K)

Properties				
Material	**TGF 3500LVO**	**TGF 4500CVO**	**TGF 1100SF**	**TGF 3000SF**
Thermal Conductivity (W/m-K)	**3.5**	**4.5**	**1.1**	**3.0**
Capillary Viscosity (Pa-sec at 1500 sec^{-1})	**45**	**20**	**45**	**18**
Dielectric Strength (V/mil)	**275**	**250**	**400**	**250**
ASTM E595 – Total Mass Loss (TML) %	**0.06**	**0.10**	**0.73**	**1.01**
ASTM E595 – Collected Volatile Condensable Material (CVCM) %	**0.02**	**0.08**	**0.13**	**0.24**
Volatile Silicone Outgassing D4 to D10 (cyclic siloxanes) ppm	**40**	**300**	**Non-Detectable**	**Non-Detectable**
Maximum dispense rate with Scheugenpflug cartridge dispensing (cc/s)	**0.6**	**1.5**	**0.6**	**1.5**

GAP FILLER TGF 3000SF VALUE PROPOSITION

VALUE

- Reduced stress for applications
- No volatile silicones for sensitive applications (Silicone Free)
- High performance and efficient processability
- High Thermal Performance (3.0 W/m-K)
- Long Term Reliability: Minimal thermal changes at temperature up to 100° C
- Room temperature storage
- Available in cartridges and Pail kits

This product is additional to the existing Sil-Free Gap Filler portfolio and no cannibalization is expected

GAP FILLER TGF 3000SF PRODUCT DESCRIPTION
VALUE

- TGF3000SF is a 3.0 W/m-K, easily dispensable, Silicone Free Gap Filler

Property	TGP 3000SF	Units
Thermal Conductivity	3.0	W/m-K
Dielectric Strength	>10	kV/mm
Low Shear Viscosity	Part A - 500 Part B – 500	Pa-s (1 sec $^{-1}$)
Volume Resistivity	1x10^{8}	Ohm-m
Working Time	>12 @ 25^{o}C >6 @ 80^{o}C	hours
Cured Hardness	70	Shore OO

GAP FILLER TGF 3000SF PRODUCT DESCRIPTION

VALUE

- 2k Gap Filler for easy storage and handling
- Silicones Free chemistry for silicone sensitive applications
- High thermal conductivity and voltage breakdown customer expect from Henkel Gap Fillers
- Fast dispensing for easy automation and low-cost ownership
- Low strain on sensitive components and PCB’s in assembly
- Competitively and aggressively priced

VALUE PROPOSITION

SUMMARY

BERGQUIST GAP FILLER TGF 3000SF	
Challenge	**Solution**
Volatility	▪ Zero volatile silicones for sensitive applications ▪ Safe and effective for use with optical components, mechanical contacts and sensitive environments such as semiconductor or surface finish operations
Performance and processability	▪ High throughput – fast dispensing (pattern dependent) ▪ Optimized viscosity for high dispense rate ▪ Easy and robust mixing ratio (1:1)
Thermal control	▪ Thermal conductivity of 3.0 W/m-K ▪ Improved power output through high thermal conductivity and thorough wet out/gap filling
Long term reliability	▪ Safe for delicate devices with low assembly stress and low strain on PCBs and solder joints ▪ Minimal thermal changes at temperature up to 100° C ▪ Good wet out to various surfaces and topographies ▪ Stable heat path in thermal cycling conditions
Environmental sustainability	▪ Room temperature storage and shipping ▪ Provides benefits through logistics and operations chain
Total Cost of Ownership (TcO)	▪ Improved supply chain versatility, application adaptability, cost-effectiveness and performance as compared to thermal pads of similar thermal conductivity

Henkel

PRODUCT BRIEF DESCRIPTION

GAP FILLER TGF 3000SF – STORAGE

STORAGE (Cartridges)

- Check physically if any damage to the box upon receiving.
- Open Box with side up pointing to user.
- Remove Foam packing (if any) which are enclosed to protect the cartridges during shipping.
- Cartridges are sealed in an ESD bag to prevent moisture exposure
- Cartridges are shipped in “tip down” orientation
- Part A is white and Part B is blue in color.

PRODUCT BRIEF DESCRIPTION

GAP FILLER TGF 3000SF – PURGING

PURGING (Cartridges)	
▪ Remove Cartridge from box and remove ESD bag. Prior to any usage, remove the red cap. ▪ Check for any void – there should be no void in the cartridge.	
▪ Put the cartridge in a dispensing tool for purging. (manual dispenser shown) ▪ Purge if needed. ▪ The cartridge is ready for usage. ▪ If the cartridges are loaded unto an automatic dispenser, ensure purging prior to use.	 

PRODUCT BRIEF DESCRIPTION

GAP FILLER TGF 3000SF PRODUCT PROPERTIES

Typical Properties				
		Condition / Test Method	***Unit***	***Typical value***
PHYSICAL	**Shelf Life**		months	6
	Low Shear Viscosity (Part A)	1 / sec , DIN 53019	Pa-s	503
	Low Shear Viscosity (Part B)	1 / sec , DIN 53019	Pa-s	487
	High Shear Viscosity (Part A)	1500 / sec , DIN D50999	Pa-s	13
	High Shear Viscosity (Part B)	1500 / sec , ASTM D5099	Pa-s	22
	Density	ASTM D792	g/cc	3.0
	Heat Capacity	ASTM E2169	J/g-^{o}C	0.9
	Hardness (Post 7 days)	ASTM D2240	Shore OO	74
ELECTRICAL	**Dielectric Strength**	ASTM D149	kV/mm	10
	Dielectric Constant	ASTM D150 @ 1,000 Hz		9.0
	Volume Resistivity	ASTM D257	Ohm-m	10^{08}
THERMAL	**Thermal Conductivity**	ASTM D5470	W/m-K	3.0
CHEMICAL	**UL Flammability Rating (Preliminary)**	UL 94		V-0
	RoHS			Pass
	Halogens			Pass
	ASTM E595 NASA Outgassing			Exceed Standard Limits
	Siloxane Content (For Info Only)	GC-MS	ppm	N.D.

Henkel

PRODUCT BRIEF DESCRIPTION

GAP FILLER TGF 3000SF PRODUCT PROPERTIES

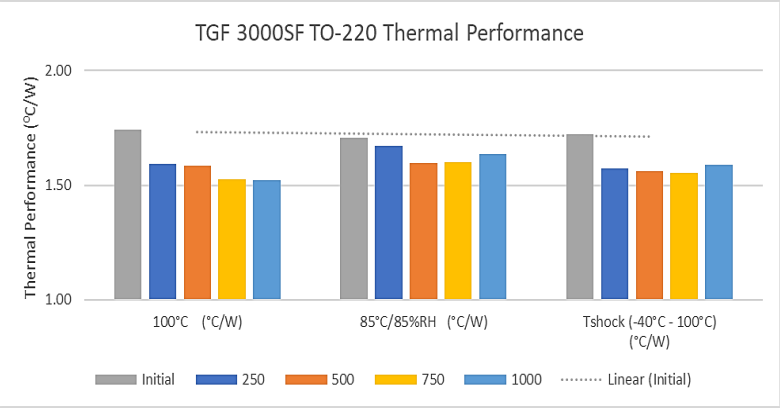
Typical Properties				
		Condition / Test Method	***Unit***	***Typical value***
CHEMICAL	**Working Time (1)**	Parallel Plate Rheometer – 2nd derivate peak		
	25 C		Hours	>12
	80 C		Hours	>6
	Cure Time (1)	Parallel Plate Rheometer – time to 90% cure (1st derivate)		
	25 C		Hours	>48
	80 C		Hours	>3

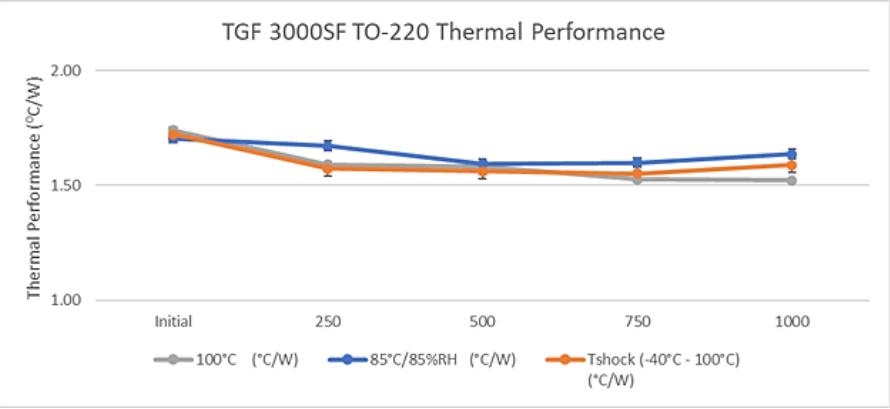
Notes: (1) Parallel Plate rheometer. Please note that the curing time will be longer pending on the application.

PRODUCT BRIEF DESCRIPTION

GAP FILLER TGF 3000SF PRODUCT RELIABILITY

- Reliability Testing Results
  - Below shows 100 ^{0}C, 85RH/85 ^{0}C and -40 to 100 ^{0}C
  - No significant changes over the 1000-hour period.





PRODUCT BRIEF DESCRIPTION

GAP FILLER TGF 3000SF DISPENSING DOTS TRIAL

- Dot Size Target = 2.07 g @ Top/Bottom of the cartridge
- One run was done at each section of the cartridge - 25 dots per array. Target @ 0.69 ml with 0.2 ml/s
- 10 Random dots were picked to measure the weight after allowing to room temperature cure for at least 72 hours.
- No differences were seen from top and bottom of the cartridge.
- No stringing were seen.

TARGET MARKETS

Power & Industrial Automation

- Power Inverter
- Surface Mount Power Switching
- EV Charger

Automotive

- Audio amplification
- Infotainment Systems
- Power Conversion

Electronics

- Memory
- SOC
- High thermals ICs dissipation required

REGULATORY
GAP FILLER TGF 3000SF

- Compliant to UL (94V-0), Halogen, RoHS
  - Check respective internal and UL websites for documents details

PRODUCT INFORMATION

BERGQUIST GAP FILLER TGF 3000SF

IMPORTANT LINKS
Product web page
Sell sheet
TDS
SDS search

THANK YOU