THERMAL MANAGEMENT PRODUCTS

APPLICATIONS

- Thermal conductive insulators for semiconductors
- Compression jointing materials for thermistors & temperature sensors
- Thermal conductive material for all types of heaters

FORMULATIONS / CONFIGURATIONS

A variety of specific compounds are available for a wide range of performance requirements in:

• Sheets • Rolls • Die-cuts • Sleeves • Gel • Extrusions • Moldings

CONVERSION TABLE

THERMAL CONDUCTIVITY	BTU-in/hrft²F	Cal/cm - sec - °C	Watt/m-k
BTU-in / hrft²F	1	3.4×10^{-4}	0.14
Cal / cm - see - °C	2.9×10^{3}	1	4.2×10^{2}
Watt / m-K	6.9	2.4×10^{-3}	1

WESLASTOMER SERIES #	TYPE	APPLICATION GUIDE	TYPICAL THERMAL CONDUCTIVITY Cal/cm - sec - °C	Watt/m-k
FILM - HA	Film	High heat conductivity with 0.05mm glass cloth reinforcement	3.4×10^{-3}	1.40
FILM - AN	Film	High heat conductivity mesh reinforced gap filler pad, 0.25mm thin, available in rolls	3.6×10^{-3}	1.50
FILM - GT	Film	Highest heat conductivity with 0.05mm glass cloth reinforcement	7.0×10^{-3}	2.90
FILM - FM	Film	General purpose extrusion with 0.05mm glass cloth reinforcement	2.2×10^{-3}	0.90
FILM - DO	Film	High heat conductivity	4.1×10^{-3}	1.70
FILM - UP	Film	Low hardness with high heat conductivity	2.6×10^{-3}	1.10
FILM - SS	Film	General Purpose for moldings and extrusions	2.9×10^{-3}	1.20
FILM - PI	Film	Very high heat conductivity	6.2×10^{-3}	2.60
FILM - HB	Film			1.6
FILM - MK	Film			1.3
FILM - IM	Film			2.5
FILM - ED	Film			2.0
FILM - WS	Film			1.5
FILM - WX	Film			1.5
FILM - WP	Film			1.2
CGF - LC		General purpose gap filler pad, UL 94 V-0/V-1 class	5.5×10^{-3}	2.30
CGF - CR		Electromagnetic wave absorption gap filler pad	2.9×10^{-3}	1.20
CGF - SC	Conformable	General purpose gap filler pad	3.6×10^{-3}	1.50
CGF - QX	Gap Filler	General purpose gap filler pad, UL94 V0-V1 Class	2.9×10^{-3}	1.20
CGF - MP		General purpose gap filler pad, UL94 V-0 class	6.8×10^{-3}	2.80
CGF - TS				.8
CGF - WL				1.2
CGF - WD				.76
CGF - WE				
UCGF - EX	Ultra	Low modulus gap filler material	3.4×10^{-3}	1.40
UCGF - BT	Conformable	Lowest modulus gap filler material	7.0×10^{-3}	2.90
UCGF - OP	Gap Filler			1
ECGF - ZA		High heat conductivity gap filler pad	14.4×10^{-3}	6.00
ECGF - ZB	Extreme	Very high heat conductivity gap filler pad	18.9×10^{-3}	7.90
ECGF - ZL	Conductivity	Highest performance heat conductivity gap filler pad	33.4×10^{-3}	14.00
ECGF - ZU	Gap Filler	New low thermal resistance gap filler pad	40.8×10^{-3}	17.00
ECGF - ZR				5
FORM - XT	Form in Place	High viscosity type silicone compound gap filler	3.6×10^{-3}	1.50
PUTTY - CE	Putty	High heat conductivity gap filler pad	14.4×10^{-3}	6.00
PUTTY - FZ	Putty	High performance heat conductivity gap filler pad	26.3×10^{-3}	11.00
PUTTY - RS	Putty	Highest thermal conductive putty type silicone sheet	40.8×10^{-3}	17.00
PUTTY - AL	Putty	Highest thermal conductive putty type silicone sheet with aluminum film	40.8×10^{-3}	17.00
NSIL - 2B	Non-Silicone	Highly conformable non-flammable non-silicone gap filler	3.6×10^{-3}	1.50

THERMAL MANAGEMENT: GAP FILLER

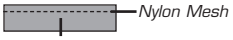
GAP FILLER PAD MATERIALS

- Supplied in a fully cured state which remain pliable
- Highly conformable: Excellent for filling air gaps and uneven surfaces
- High heat conducting gel materials
- Adheres to most all components of varying shapes and sizes -- including protrusions and recessed areas.
- Can be further enhanced for special handling and die-cutting requirements
- Available in four different construction options -- accommodates most every demanding application

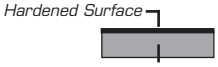
CONSTRUCTION

CGF, UCGF AND ECGF GAP FILLER

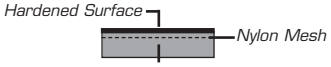
CGF WITH NYLON MESH (NM- DESIGNATION)



CGF, UCGF AND ECGF WITH HARDENED SURFACE (HS DESIGNATION)



CGF, UCGF AND ECGF WITH HARDENED SURFACE & NYLON MESH (NM-HS DESIGNATION)



NOTE: Even the most highly polished mating surfaces do not make reliable contact surfaces. Complete physical contact is necessary to minimize the resisitance to heat flow for the best thermally conductive path. All such surface voids, when properly filled with a conformable, thermally conductive CGF series gap filler pad, will in most cases exhibit the continuous charactersistics of a solid metal of the same dimensions.

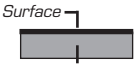
CFG = Conformable Gap Filler
ECGF = Extreme Conductivity Gap Filler

APPLICATIONS

CONSTRUCTION	CGF-LC	CGF-CR	CGF-SC	CGF-QX	CGF-MP	ECGF-ZA	ECGF-ZB	ECGF-ZL	ECGF-ZU
General Purpose Silcone Compound	CGF-LC UL94 V-0	CDG-CR UL94 V-0 (RFI sheilded version: 20dB sheilding effectiveness from 10MHz to 1GHz)	CGF-SC UL94 V-0	CGF-QX UL94 V-0	CGF-MP UL94 V-0	ECGF-ZA UL94 V-0	ECGF-ZB UL94 V-0	ECGF-ZL UL94 V-0	ECGF-ZU UL94 V-0
				Applications: • Between chassis wall and other surface • Between semi conductor and heat sink • Large area heat transfer to heat sink • Between CPU and heat sink					
Same general purpose silicone compound as above plus additional hardening of the top surface to facilitate handling and installation during complex assemblies.	CGF-LC-HS UL94 V-0	N'A UL94	CGF-SC-HS UL94 V-0	CGF-QX-HS UL94 V-0	CGF-MP-HS UL94 V-0	ECGF-ZA-HS UL94 V-0	ECGF-ZB-HS UL94 V-0	ECGF-ZL-HS UL94 V-0	ECGF-ZU-HS UL94 V-0
			Applications: • Same as above, except hardened top surface allows handling without distortion in cases where this feature is required.						
Same general purpose silicone compound as above plus mesh reinforcement stiffener to prevent stretching; i.e, elongation of die-cut holes.	CGF-LC-NM	N/A	CGF-SC-NM .5 to 2.5 UL94 V-1 / 3.0 to 5.0 UL94 V-0	CGF-QX-NM .5 to 2.5 UL94 V-1 / 3.0 to 5.0 UL94 V-0	CGF-MP-NM	N/A	N/A	N/A	N/A
					Applications: • Same CGF basic formula, plus specific construction for intricate die-cut shapes to prevent distorion of the die-cut shape during die-cutting and installation				
Same general purpose silicone compound as above plus additional hardening of the top surface to facilitate handling and installation during complex assemblies, and mesh reinforcement stiffener to prevent stretching; i.e., elongation of die-cut holes.	N/A	N/A	CGF-SC-HS-NM .5 to 2.5 UL94 V-1 / 3.0 to 5.0 UL94 V-0	CGF-QX-HS-NM .5 to 2.5 UL94 V-1 / 3.0 to 5.0 UL94 V-0	CGF-MP-HS-NM	N/A	N/A	N/A	N/A
					Applications: • Same CGF basic formula, plus specific construction with hardened top surface and mesh reinforcement for die-cutting and handling without distortion.				

CONFORMABLE GAP FILLER

CFG = Conformable Gap Filler

TEST PROPERTY	UNIT		WESLASTOMER CGF (CGF)	WESLASTOMER CGF WITH HS (CGF-HS)
Cross Section	Composition		 CGF Material	 Hardened Surface / CGF Material
Extractable Volatiles	Content % Cyclodimethyl Siloxane	WRS	D4~D10 <0.0010wt%	D4~D10 <0.0010wt%
Continuous Use	°C	WRS	-60 to +200	-60 to + 200
Flame Rating	UL-94V Standard	UL	UL94 V0-V1 (check product specification)	UL94 V0-V1 (check product specification)
Dimensions Available	Thickness (mm)	WRS	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$
	Width (mm)	WRS	200 standard, larger width by request	200 standard, larger width by request
	Length (mm)	WRS	300 standard, larger width by request	300 standard, larger width by request
Packaging	Standard	WRS	*Each Sheet is placed between top and bottom film liners for die cutting handling ease*	

CGF-LC	IDENTIFIER	TEST	50-LC	100-LC	150-LC	200-LC	250-LC	300-LC	(350-LC)	(400-LC)	(500-LC)	50-LC-HS	100-LC-HS	150-LC-HS	200-LC-HS	250-LC-HS	300-LC-HS	(350-LC)-HS	(400-LC)-HS	(500-LC)-HS
Thickness	mm	WRS	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$3.5^{\pm0.3}$	$4.0^{\pm0.4}$	$5.0^{\pm0.5}$	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$3.5^{\pm0.3}$	$4.0^{\pm0.4}$	$5.0^{\pm0.5}$
Thermal Resistance	°Cin2/W	FTM P-3020	.50	.83	1.19	1.40	1.80	2.10	2.38	2.58	3.20	.55	.92	1.30	1.59	2.07	2.17	2.40	2.59	3.31
Color	Visual	WRS	Gray									Gray								
Thermal Conductivity	watt/m-k	FTM P-1620	2.3									2.3								
Volume Resistivity	MΩ•m	ASTM D257	$1.0x10^5$									$1.0x10^5$								
Withstand Voltage	kV/mm•AC	ASTM D149	8									8								
Specific Gravity	gr/cm³	ASTM D792	2.5									2.5								
Hardness	Shore 00	ASTM D2240	49									49								
Elongation	%	ASTM D412	100									80								
Compression	kgf/in²@10%	WRS	8.7	11.6	7.4	5.0	4.2	3.8	3.7	3.8	3.7	13.5	13.4	10.8	7.9	6.5	6.2	6.1	5.5	4.8
	50% *sustain after 1 minute*		39.5	38.9	32.5	29.2	26.2	21.5	20.2	18.5	14.5	64.6	58.2	44.9	31.1	26.0	24.1	21.2	20.1	17.0

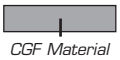
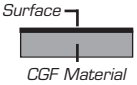
CGF-CR	IDENTIFIER	TEST	(100-CR)	(200-CR)	(300-CR)	
Thickness	mm	WRS	$1.0^{\pm0.2}$	$2.0^{\pm0.3}$	$3.0^{\pm0.3}$	
Thermal Resistance	°Cin2/W	FTM P-3020	1.24	2.06	3.27	
Color	Visual	WRS	Black			
Thermal Conductivity	watt/m-k	FTM P-1620	1.2			*Note:*
Volume Resistivity	MΩ•m	ASTM D257	$1.0x10^5$			*RFI shielded version*
Withstand Voltage	kV/mm•AC	ASTM D149	14			*20dB shielding*
Specific Gravity	gr/cm³	ASTM D792	2.8			*effectiveness*
Hardness	Shore 00	ASTM D2240	52			*10MHz to 1GHz*
Elongation	%	ASTM D412	150			
Compression	kgf/in²@10%	WRS	16.5	9.5	3.1	
	50% *sustain after 1 minute*		32.6	30.0	21.8	

Not Available At This Time

CGF-SC	IDENTIFIER	TEST	50-SC	100-SC	150-SC	200-SC	250-SC	300-SC	350-SC	400-SC	500-SC	50-SC-HS	100-SC-HS	150-SC-HS	200-SC-HS	250-SCh-HS	300-SC-HS	350-SCh-HS	400-SC-HS	500-SC-HS
Thickness	mm	WRS	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$3.5^{\pm0.3}$	$4.0^{\pm0.4}$	$5.0^{\pm0.5}$	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$3.5^{\pm0.3}$	$4.0^{\pm0.4}$	$5.0^{\pm0.5}$
Thermal Resistance	°Cin2/W	FTM P-3020	.57	1.02	1.45	1.71	2.11	2.34	2.59	2.79	3.30	.63	1.10	1.59	1.94	2.24	2.54	2.63	2.88	3.32
Color	Visual	WRS	Dark Gray									Dark Gray								
Thermal Conductivity	watt/m-k	FTM P-1620	1.5									1.5								
Volume Resistivity	MΩ•m	ASTM D257	$1.0x10^5$									$1.0x10^5$								
Withstand Voltage	kV/mm•AC	ASTM D149	14									13								
Specific Gravity	gr/cm³	ASTM D792	2.6									2.6								
Hardness	Shore 00	ASTM D2240	49									49								
Elongation	%	ASTM D412	100									80								
Compression	kgf/in²@10%	WRS	13.0	12.5	11.5	10.2	7.7	6.1	5.6	4.9	4.2	20.9	19.8	15.2	12.3	10.9	8.0	6.9	5.7	5.0
	50% *sustain after 1 minute*		40.2	39.2	33.1	30.9	27.2	24.7	23.5	20.3	15.8	106.9	91.6	59.8	33.4	28.1	25.2	24.7	23.1	20.1

CONFORMABLE GAP FILLER

CFG = Conformable Gap Filler

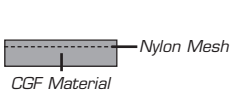
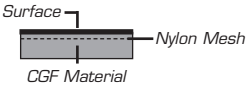
TEST PROPERTY	UNIT		WESLASTOMER CGF (CGF)	WESLASTOMER CGF WITH HS (CGF-HS)
Cross Section	Composition		 *CGF Material*	*Hardened Surface*  *CGF Material*
Extractable Volatiles	Content % Cyclodimethyl Siloxane	WRS	D4~D10 <0.0010wt%	D4~D10 <0.0010wt%
Continuous Use	°C	WRS	-60 to +200	-60 to + 200
Flame Retardance	UL-94V Standard	UL	UL94 V-0	UL94 V-0
Dimensions Available	Thickness (mm)	WRS	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$
	Width (mm)	WRS	200 standard, larger width by request	200 standard, larger width by request
	Length (mm)	WRS	300 standard, larger width by request	300 standard, larger width by request
Packaging	Standard	WRS	*Each Sheet is placed between top and bottom film liners for die cutting handling ease*	

CGF-QX	IDENTIFIER	TEST	50-QX	100-QX	150-QX	200-QX	250-QX	300-QX	(UL94 V-0)	50-QX-HS	100-QX-HS	150-QX-HS	200-QX-HS	250-QX-HS	300-QX-HS	(UL94 V-0)
Thickness	mm	WRS	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$		$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	
Thermal Resistance	°Cin2/W	FTM P-3020	.90	1.42	1.98	2.34	2.80	3.26		.90	1.52	2.12	2.45	2.87	3.26	
Color	Visual	WRS	Gray							Gray						
Thermal Conductivity	watt/m-k	FTM P-1620	1.20							1.20						
Volume Resistivity	MΩ•m	ASTM D257	$4.2x10^4$							$4.2x10^4$						
Withstand Voltage	kV/mm•AC	ASTM D149	16							17						
Specific Gravity	gr/cm³	ASTM D792	2.3							2.3						
Hardness	Shore 00	ASTM D2240	48							48						
Elongation	%	ASTM D412	250							200						
Compression	kgf/in²@10%	WRS	10.0	13.0	12.0	11.0	7.0	6.0		13.0	18.0	15.0	12.0	8.0	6.0	
	50% *sustain after 1 minute*		47.0	40.0	38.0	37.0	32.0	30.0		60.0	78.0	57.0	45.0	40.0	39.0	

CGF-MP	IDENTIFIER	TEST	50-MP	100-MP	150-MP	200-MP	250-MP	300-MP	50-MP-HS	100-MP-HS	150-MP-HS	200-MP-HS	250-MP-HS	300-MP-HS
Thickness	mm	WRS	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$
Thermal Resistance	°Cin2/W	FTM P-3020	.42	.76	1.00	1.20	1.42	1.68	.59	.93	1.17	1.41	1.76	1.88
Color	Visual	WRS	Gray						Gray					
Thermal Conductivity	watt/m-k	FTM P-1620	2.8						2.8					
Volume Resistivity	MΩ•m	ASTM D257	$2.5x10^4$						$2.4x10^4$					
Withstand Voltage	kV/mm•AC	ASTM D149	7						15					
Specific Gravity	gr/cm³	ASTM D792	2.7						2.7					
Hardness	Shore 00	ASTM D2240	53						53					
Elongation	%	ASTM D412	64						32					
Compression	kgf/in²@10%	WRS	12.0	11.0	9.0	6.0	6.0	5.0	18.0	16.0	13.0	9.0	8.0	7.0
	50% *sustain after 1 minute*		52.0	44.0	42.0	40.0	36.0	35.0	97.0	92.0	81.0	55.0	50.0	45.0

TECHNICAL INFORMATION

CONFORMABLE GAP FILLER WITH NYLON MESH

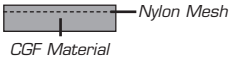
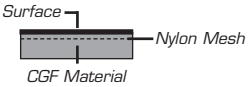
TEST PROPERTY	UNIT		WESLASTOMER CGF W/NM (CGF-NM)	WESLASTOMER CGF W/HS & NM (CGF-HS-NM)
Cross Section	Composition			
Extractable Volatiles	Content % Cyclodimethyl Siloxane	WRS	D4~D10 <0.0010wt%	D4~D10 <0.0010wt%
Continuous Use	°C	WRS	-60 to +200	-60 to + 200
Flame Rating	UL-94V Standard	UL	V0 - V1 (please check individual product specs)	V0 - V1 (please check individual product specs)
Dimensions Available	Thickness (mm)	WRS	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$	$0.5^{\pm0.1}$ $1.0^{\pm0.3}$ $1.5^{\pm0.3}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$
	Width (mm)	WRS	200 standard, larger width by request	200 standard, larger width by request
	Length (mm)	WRS	300 standard, larger width by request	300 standard, larger width by request
Packaging	Standard	WRS	*Each Sheet is placed between top and bottom film liners for die cutting handling ease*	

CGF-LC-NM	IDENTIFIER	TEST	50-LC	100-LC	
Thickness	mm	WRS	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	Not Avavailable At This Time
Thermal Resistance	°Cin2/W	FTM P-3020	.50	0.93	
Color	Visual	WRS	Gray	Gray	
Thermal Conductivity	watt/m-k	FTM P-1620	2.3	2.3	
Volume Resistivity	MΩ•m	ASTM D257	$1x10^6$	$1x10^6$	
Withstand Voltage	kV/mm•AC	ASTM D149	7	7	
Specific Gravity	gr/cm³	ASTM D792	2.5	2.5	
Hardness	Shore 00	ASTM D2240	49	49	
Elongation	%	ASTM D412	60	60	
Compression	kgf/in²@10%	WRS	11.0	15.0	
	50% *sustain after 1 minute*		85.0	69.0	

CGF-CR-NM	IDENTIFIER	TEST		
Thickness	mm	WRS	Not Avavailable At This Time	Not Avavailable At This Time
Thermal Resistance	°Cin2/W	FTM P-3020		
Color	Visual	WRS		
Thermal Conductivity	watt/m-k	FTM P-1620		
Volume Resistivity	MΩ•m	ASTM D257		
Withstand Voltage	kV/mm•AC	ASTM D149		
Specific Gravity	gr/cm³	ASTM D792		
Hardness	Shore 00	ASTM D2240		
Elongation	%	ASTM D412		
Compression	kgf/in²@10%	WRS		
	50% *sustain after 1 minute*			

CGF-SC-NM	IDENTIFIER	TEST	50-SC-NM	100-SC-NM	150-SC-NM	200-SC-NM	250-SC-NM	300-SC-NM	350-SC-NM	400-SC-NM	500-SC-NM	50-SC-HS-NM	100-SC-HS-NM	150-SC-HS-NM	200-SC-HS-NM	250-SC-HS-NM	300-SC-HS-NM	350-SC-HS-NM	400-SC-HS-NM	500-SC-HS-NM
Thickness	mm	WRS	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$3.5^{\pm0.3}$	$4.0^{\pm0.4}$	$5.0^{\pm0.5}$	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$3.5^{\pm0.3}$	$4.0^{\pm0.4}$	$5.0^{\pm0.5}$
Thermal Resistance	°Cin2/W	FTM P-3020	.60	1.04	1.57	1.85	2.27	2.57	2.63	2.90	3.33	.67	1.11	1.66	1.92	2.40	2.68	2.75	2.92	3.37
Color	Visual	WRS	Dark Gray									Dark Gray								
Thermal Conductivity	watt/m-k	FTM P-1620	1.5									1.5								
Volume Resistivity	MΩ•m	ASTM D257	$1.0x10^6$									$1.0x10^6$								
Withstand Voltage	kV/mm•AC	ASTM D149	9									8								
Specific Gravity	gr/cm³	ASTM D792	2.6									2.6								
Hardness	Shore 00	ASTM D2240	49									49								
Elongation	%	ASTM D412	60									60								
Compression	kgf/in²@10%	WRS	17.0	15.5	15.4	11.2	8.2	7.3	6.5	5.4	4.8	22.5	20.7	20.1	15.7	14.8	12.1	9.8	9.0	7.1
	50% *sustain after 1 minute*		96.4	71.6	49.9	31.2	25.8	20.0	18.9	18.2	17.9	119.8	102.9	78.2	50.8	41.7	38.9	32.2	32.1	25.2

CONFORMABLE GAP FILLER WITH NYLON MESH

TEST PROPERTY	UNIT		WESLASTOMER CGF W/NM (CGF-NM)	WESLASTOMER CGF W/HS & NM (CGF-HS-NM)
Cross Section	Composition			
Extractable Volatiles	Content % Cyclodimethyl Siloxane	WRS	D4~D10 <0.0010wt%	D4~D10 <0.0010wt%
Continuous Use	°C	WRS	-60 to +200	-60 to + 200
Flame Retardance	UL-94V Standard	UL	V0 - V1 (please check individual product specs)	V0 - V1 (please check individual product specs)
Dimensions Available	Thickness (mm)	WRS	0.5$^{\pm0.1}$ 1.0$^{\pm0.2}$ 1.5$^{\pm0.2}$ 2.0$^{\pm0.3}$ 2.5$^{\pm0.3}$ 3.0$^{\pm0.3}$ 3.5$^{\pm0.3}$ 4.0$^{\pm0.4}$ 5.0$^{\pm0.5}$	0.5$^{\pm0.1}$ 1.0$^{\pm0.3}$ 1.5$^{\pm0.3}$ 2.0$^{\pm0.3}$ 2.5$^{\pm0.3}$ 3.0$^{\pm0.3}$ 3.5$^{\pm0.3}$ 4.0$^{\pm0.4}$ 5.0$^{\pm0.5}$
	Width (mm)	WRS	200 standard, larger width by request	200 standard, larger width by request
	Length (mm)	WRS	300 standard, larger width by request	300 standard, larger width by request
Packaging	Standard	WRS	*Each Sheet is placed between top and bottom film liners for die cutting handling ease*	

CGF-QX-NM	IDENTIFIER	TEST	50-QX-NM	100-QX-NM	200-QX-NM	300-QX-NM	(UL94 V-1)	50-QX-HS-NM	100-QX-HS-NM	200-QX-HS-NM	300-QX-HS-NM	(UL94 V-1)
Thickness	mm	WRS	0.5$^{\pm0.1}$	1.0$^{\pm0.2}$	2.0$^{\pm0.3}$	3.0$^{\pm0.3}$		0.5$^{\pm0.1}$	1.0$^{\pm0.2}$	2.0$^{\pm0.3}$	3.0$^{\pm0.3}$	
Thermal Resistance	°Cin2/W	FTM P-3020	.90	1.52	2.45	3.36		1.00	1.63	2.55	3.47	
Color	Visual	WRS	Gray					Gray				
Thermal Conductivity	watt/m-k	FTM P-1620	1.20					1.20				
Volume Resistivity	MΩ•m	ASTM D257	3.9x10^{4}					4.2x10^{4}				
Withstand Voltage	kV/mm•AC	ASTM D149	–					–				
Specific Gravity	gr/cm^{3}	ASTM D792	2.3					2.3				
Hardness	Shore 00	ASTM D2240	48					48				
Elongation	%	ASTM D412	25					25				
Compression	kgf/in^{2}@10%	WRS	11.0	20.0	10.0	7.0		11.0	21.0	13.0	9.0	
	50% *sustain after 1 minute*		85.0	80.0	51.0	41.0		104.0	110.0	59.0	47.0	

CGF-MP-NM	IDENTIFIER	TEST	50-MP-NM	100-MP-NM	50-MP-HS-NM	100-MP-HS-NM
Thickness	mm	WRS	0.5$^{\pm0.1}$	1.0$^{\pm0.2}$	0.5$^{\pm0.1}$	1.0$^{\pm0.2}$
Thermal Resistance	°Cin2/W	FTM P-3020	.52	0.90	.67	1.02
Color	Visual	WRS	Gray	Gray	Gray	Gray
Thermal Conductivity	watt/m-k	FTM P-1620	2.8	2.8	2.8	2.8
Volume Resistivity	MΩ•m	ASTM D257	3.6x10^{4}	3.6x10^{4}	3.1x10^{4}	3.1x10^{4}
Withstand Voltage	kV/mm•AC	ASTM D149	8	8	10	10
Specific Gravity	gr/cm^{3}	ASTM D792	2.7	2.7	2.7	2.7
Hardness	Shore 00	ASTM D2240	53	53	53	53
Elongation	%	ASTM D412	40	40	30	30
Compression	kgf/in^{2}@10%	WRS	20.0	17.0	23.0	19.0
	50% *sustain after 1 minute*		115.0	104.0	127.0	110.0

CGF-TS: CONFORMABLE GAP FILLER / SOFT

- Soft, Highly conformable and low modulus
- Filled-silicone polymer on rubber coated fiberglass carrier
- Thermal conductivity: 0.8 W/m-k
- Conformable, low hardness
- Enhanced puncture, shear and tear resistance
- Electrically isolating
- Sheet form and die-cut parts available

APPLICATIONS

- For applications requiring minimum amount of pressure on components
- Telecommunications
- Computer and peripherals
- Power conversion
- Between heat-generating semiconductors
- Between magnetic components and a heat sink
- Where heat needs to be transferred to a frame, chassis or other heat spreader

TYPICAL PRODUCT PROPERTIES

CGF-TS	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
PROPERTY			
Color	Mauve/Pink	Mauve/Pink	Visual
Reinforcement Carrier	Coated Fiberglass	Coated Fiberglass	–
Thickness (inch)/(mm)	0.020 to 0.200	0.508 to 5.080	ASTM D374
Inherent Surface Tack (1 or 2 sided)	1	1	–
Density (g/cc)	1.6	1.6	ASTM D792
Heat Capacity (J/g-K)	1.0	1.0	ASTM E1269
Hardness Bulk Rubber (Shore 00) (1)	25	25	ASTM D2240
Young's Modulus (psi) / (kPa) (2)	40	275	ASTM D575
Continous Use Temp (°F) / (°C)	-76 to 392	-60 to 200	–
ELECTRICAL			
Dielectric Breakdown Voltage (Vac)	>6000	>6000	ASTM D149
Dielectric Constant (1000 Hz)	5.5	5.5	ASTM D150
Volume Resistivity (Ohm-meter)	10^{11}	10^{11}	ASTM D257
Flame Rating	V-0	V-0	UL94
THERMAL			
Thermal Conductivity (W/m-K)	0.8	0.8	ASTM D5470

NOTES: • Thirty second delay value Shore 00 hardness scale
• Young's Modulus, calculated using 0.01 in/min. step rate of strain with a sample size of 0.79 inch².

CONFORMABLE GAP FILLER

CGF-WE	IDENTIFIER	TEST	50-WE	100-WE	150-WE	200-WE	250-WE	300-WE	400-WE	500-WE	640-WE
Thickness	mm	WRS	0.5	1	1.5	2	2.5	3	4	5	6.4
Sheet Size	mm	WRS	304mm x 406mm								
Thermal Resistance	°Cin2/W	FTM P-3020	0.35								
Color	Visual	WRS	Violet								
Thermal Conductivity	watt/m-k	FTM P-1620	2.5								
Volume Resistivity	ohm.cm	ASTM D257	8×10^{13}								
Breakdown Voltage	kV•AC	ASTM D149	>6000								
Specific Gravity	gr/cm^3	ASTM D792	2.98								
Hardness	Shore 00	ASTM D2240	40								

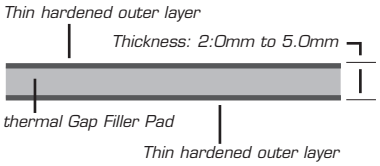
CGF-WD	IDENTIFIER	TEST	50-WE	100-WE	150-WE	200-WE	250-WE	300-WE	400-WE	500-WE	640-WE
Thickness	mm	WRS	0.5	1	1.5	2	2.5	3	4	5	6.4
Sheet Size	mm	WRS	304mm x 406mm								
Thermal Resistance	°Cin2/W	FTM P-3020	0.76								
Color	Visual	WRS	White								
Thermal Conductivity	watt/m-k	FTM P-1620	0.67								
Volume Resistivity	ohm.cm	ASTM D257	8×10^{13}								
Breakdown Voltage	kV•AC	ASTM D149	>4000								
Specific Gravity	gr/cm^3	ASTM D792	1.8								
Hardness	Shore 00	ASTM D2240	40								

CGF-WL	IDENTIFIER	TEST	50-WE	100-WE	150-WE	200-WE	250-WE	300-WE	400-WE	500-WE	640-WE
Thickness	mm	WRS	0.5	1	1.5	2	2.5	3	4	5	6.4
Sheet Size	mm	WRS	200mm x 400mm								
Thermal Resistance	°Cin2/W	FTM P-3020	0.78								
Color	Visual	WRS	Grey								
Thermal Conductivity	watt/m-k	FTM P-1620	1.2								
Volume Resistivity	ohm.cm	ASTM D257	8×10^{15}								
Breakdown Voltage	kV•AC	ASTM D149	>6000								
Specific Gravity	gr/cm^3	ASTM D792	1.8								
Hardness	Shore 00	ASTM D2240	15-40								

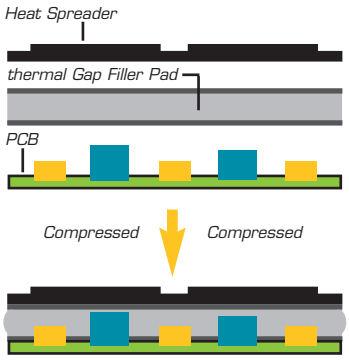
UCGF-EX AND UCGF-BT ULTRA CONFORMABLE GAP FILLER

- Absolute lowest modulus with high adhesion
- Easily fills air gaps and uneven surfaces
- Lower thermal resistance with complete surface contact
- Low molecular silicone content
- Ideal for applications requiring low compression force
- Available in sheets

CONSTRUCTION



APPLICATION GUIDE



APPLICATIONS

- Semiconductors to heat sink
- Chassis walls to other surfaces
- Components to heat spreader
- CD-ROM, DVD-ROM cooling

TYPICAL PRODUCT PROPERTIES

NOTE: Maximum compression is 50%

TEST PROPERTY	UNIT	MEASURE UCGF-EX		MEASURE UCGF-BT		METHOD
Thickness	mm	2.5	5.0	2.5	5.0	–
Thermal Conductivity	watt/m-k	1.4		2.9*		ASTM D5470 *ASTM D2326
Thermal Resistance	°Cin²/W	1.72	2.33	1.43	1.95	ASTM D5470
Flame Rating	UL94	V-1		V-1		UL94
Operating Temperature	°C	-60 to +200		-60 to +200		WRS
Color	Visual	Gray		Dark Gray		–
Tensile Strength	MPa	0.1		0.1		ASTM D412
Breakdown Voltage	kV/mn	14		10		ASTM D149
Compression (area = 25mm x 25mm)	kgf/in² 10%	6.1	2.2	2.0		WRS
	50% sustain	18.2	9.1	20		WRS

UCGF = Ultra Conformable Gap Filler

UCGF-OP: ULTRA CONFORMABLE GAP FILLER / VERY SOFT

- Thermal conductivity: 1.0 W/m-K
- Highly conformable, low hardness
- "Gel-like" modulus
- Excellent low-stress vibration dampening and shock absorbing characteristics
- Electrically isolating material (isolation between heat sinks & high voltage, bare- leaded devices)
- Designed for low-stress applications
- Puncture, shear and tear resistant

APPLICATIONS

- For applications requiring minimum amount of pressure on components
- Telecommunications
- Computer and peripherals
- Power conversion
- Between heat-generating semiconductors
- Between magnetic components and a heat sink
- Where heat needs to be transferred to a frame, chassis or other heat spreader

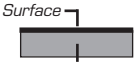
TYPICAL PRODUCT PROPERTIES

UCGF-OP	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
PROPERTY			
Color	Mauve/Pink	Mauve/Pink	Visual
Reinforcement Carrier	Coated Fiberglass	Coated Fiberglass	–
Thickness (inch)/(mm)	0.020 to 0.250	0.508 to 6.350	ASTM D374
Inherent Surface Tack (1 or 2 sided)	1	1	–
Density (g/cc)	1.6	1.6	ASTM D792
Heat Capacity (J/g-K)	1.0	1.0	ASTM E1269
Hardness Bulk Rubber (Shore 00) (1)	5	5	ASTM D2240
Young's Modulus (psi) / (kPa) (2)	8	8	ASTM D575
Continous Use Temp (°F) / (°C)	-76 to 392	-60 to 200	–
ELECTRICAL			
Dielectric Breakdown Voltage (Vac)	>6000	>6000	ASTM D149
Dielectric Constant (1000 Hz)	5.5	5.5	ASTM D150
Volume Resistivity (Ohm-meter)	10^{11}	10^{11}	ASTM D257
Flame Rating	V-0	V-0	UL94
THERMAL			
Thermal Conductivity (W/m-K)	1.0	1.0	ASTM D5470

NOTES: • Thirty second delay value Shore 00 hardness scale
• Young's Modulus, calculated using 0.01 in/min. step rate of strain with a sample size of 0.79 inch².

EXTREME CONDUCTIVITY GAP FILLER

ECFG = Extreme Conductivity Gap Filler

TEST PROPERTY	UNIT		WESLASTOMER ECGF (ECGF)	WESLASTOMER ECGF WITH HS (ECGF-HS)
Cross Section	Composition		 *ECGF Material*	*Hardened Surface*  *ECGF Material*
Extractable Volatiles	Content % Cyclodimethyl Siloxane	WRS	D4~D10 <0.0010wt%	D4~D10 <0.0010wt%
Continuous Use	°C	WRS	-60 to +200	-60 to + 200
Flame Rating	UL-94V Standard	UL	V0 - V1 (please check individual product specs)	V0 - V1 (please check individual product specs)
Dimensions Available	Thickness (mm)	WRS	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$
	Width (mm)	WRS	200 standard, larger width by request	200 standard, larger width by request
	Length (mm)	WRS	300 standard, larger width by request	300 standard, larger width by request
Packaging	Standard	WRS	*Each Sheet is placed between top and bottom film liners for die cutting handling ease*	

ECGF-ZA	IDENTIFIER	TEST	50-ZA	100-ZA	150-ZA	200-ZA	250-ZA	300-ZA	50-ZA-HS	100-ZA-HS	150-ZA-HS	200-ZA-HS	250-ZA-HS	300-ZA-HS
Thickness	mm	WRS	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$2.5^{\pm0.3}$	$3.0^{\pm0.3}$
Thermal Resistance	°Cin2/W	FTM P-3020	0.21	0.32	0.48	0.64	0.75	0.84	0.27	0.45	0.58	0.75	0.84	0.92
Color	Visual	WRS	Dark Reddish Gray						Dark Reddish Gray					
Thermal Conductivity	watt/m-k	FTM P-1620	6.0						6.0					
Volume Resistivity	MΩ•m	ASTM D257	$1.3x10^{6}$						$1.0x10^{5}$					
Withstand Voltage	kV/mm•AC	ASTM D149	13						13					
Specific Gravity	gr/cm³	ASTM D792	3.2						3.2					
Hardness	Shore 00	ASTM D2240	52						52					
Elongation	%	ASTM D412	80						80					
Compression	kgf/in²@10%	WRS	8.5	10.7	8.4	8.1	7.0	5.7	13.9	15.6	14.6	9.6	9.5	8.3
	50% *sustain after 1 minute*		53.7	50.6	46.5	39.5	38.5	30.2	76.6	74.8	68.8	54.2	50.3	42.5

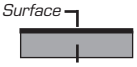
ECGF-ZB	IDENTIFIER	TEST	100-ZB	150-ZB	200-ZB	50-ZB-HS	100-ZB-HS	150-ZB-HS	200-ZB-HS
Thickness	mm	WRS	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$
Thermal Resistance	°Cin2/W	FTM P-3020	0.28	0.40	0.48	0.19	0.37	0.48	0.57
Color	Visual	WRS	Gray			Gray			
Thermal Conductivity	watt/m-k	FTM P-1620	7.9			7.9			
Volume Resistivity	MΩ•m	ASTM D257	$5.2x10^{3}$			$6.8x10^{3}$			
Withstand Voltage	kV/mm•AC	ASTM D149	11			11			
Specific Gravity	gr/cm³	ASTM D792	3.2			3.2			
Hardness	Shore 00	ASTM D2240	64			64			
Elongation	%	ASTM D412	25			40			
Compression	kgf/in²@10%	WRS	16.7	17.2	11.0	15.5	19.0	14.8	12.8
	50% *sustain after 1 minute*		76.7	70.2	70.7	79.3	87.3	83.5	81.2

ECGF-ZL	IDENTIFIER	TEST	100-ZL	150-ZL	200-ZL	30-ZL-HS*	50-ZL-HS	100-ZL-HS	150-ZL-HS	200-ZL-HS
Thickness	mm	WRS	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$	$0.3^{\pm0.1}$	$0.5^{\pm0.1}$	$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$
Thermal Resistance	°Cin2/W	ASTM-D5470	0.17	0.21	0.29	0.09	0.14	0.20	0.25	0.34
Color	Visual	WRS	Gray			Gray				
Thermal Conductivity	watt/m-k	ASTM-D5470	14.0			14.0				
Volume Resistivity	MΩ•m	ASTM D257	$7.4x10^{3}$			$7.4x10^{3}$				
Withstand Voltage	kV/mm•AC	ASTM D149	11			11				
Specific Gravity	gr/cm³	ASTM D792	3.2			3.2				
Hardness	Shore 00	ASTM D2240	64			64				
Elongation	%	ASTM D412	40			40				
Compression	kgf/in²@10%	WRS	10.5	12.5	13.5	4.6	12.6	10.5	12.6	13.2
	50% *sustain after 1 minute*		79.4	78.3	72.8	60.3	89.4	82.1	79.2	75.6

**(30-ZL max. W & L = 50mm)*

EXTREME CONDUCTIVITY GAP FILLER

ECFG = Extreme Conductivity Gap Filler

TEST PROPERTY	UNIT		WESLASTOMER ECGF (ECGF)	WESLASTOMER ECGF WITH HS (ECGF-HS)
Cross Section	Composition		 *ECGF Material*	*Hardened Surface*  *ECGF Material*
Extractable Volatiles	Content % Cyclodimethyl Siloxane	WRS	D4~D10 <0.0010wt%	D4~D10 <0.0010wt%
Continuous Use	°C	WRS	-60 to +200	-60 to + 200
Flame Rating	UL-94V Standard	UL	V0 - V1 (please check individual product specs)	V0 - V1 (please check individual product specs)
Dimensions Available	Thickness (mm)	WRS	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$	$0.5^{\pm0.1}$ $1.0^{\pm0.2}$ $1.5^{\pm0.2}$ $2.0^{\pm0.3}$ $2.5^{\pm0.3}$ $3.0^{\pm0.3}$ $3.5^{\pm0.3}$ $4.0^{\pm0.4}$ $5.0^{\pm0.5}$
	Width (mm)	WRS	200 standard, larger width by request	200 standard, larger width by request
	Length (mm)	WRS	300 standard, larger width by request	300 standard, larger width by request
Packaging	Standard	WRS	*Each Sheet is placed between top and bottom film liners for die cutting handling ease*	

ECGF-ZU	IDENTIFIER	TEST	30-ZU*	50-ZU	*(30-ZL max. W & L = 50mm)	100-ZU-HS	150-ZU-HS	200-ZU-HS
Thickness	mm	WRS	$0.3^{\pm0.1}$	$0.5^{\pm0.2}$		$1.0^{\pm0.2}$	$1.5^{\pm0.2}$	$2.0^{\pm0.3}$
Thermal Resistance	°Cin2/W	ASTM-D5470	0.07	0.10		0.14	0.19	0.24
Color	Visual	WRS	Gray			Gray		
Thermal Conductivity	watt/m-k	ASTM-D5470	17.0			17.0		
Volume Resistivity	MΩ•m	ASTM D257	$1x10^5$			$1x10^5$		
Withstand Voltage	kV/mm•AC	ASTM D149	15			15		
Specific Gravity	gr/cm^3	ASTM D792	3.2			3.2		
Hardness	Shore 00	ASTM D2240	80			80		
Elongation	%	ASTM D412	35			35		
Compression	kgf/in^2@10%	WRS	4.0	4.0		10.0	18.0	16.0
	50% *sustain after 1 minute*		63.0	90.0		66.0	55.0	44.0

ECGF-ZR: EXTREME CONDUCTIVITY GAP FILLER PLUS SOFT

- High thermal conductivity: 5 W/m-k
- Highly Conformable
- Natural inherent tack reduces interfacial thermal resistance
- Conforms to demanding contours and maintains structural integrity to fragile component leads
- Very low compression force at high compression rate
- Fiberglass reinforced for puncture, shear and tear resistance
- Excellent thermal performance at low pressures

AVAILABLE IN MANY CONFIGURATIONS

- Die-cut parts in any shape or size, seperated or in sheet form
- Standard material thickness of .020, .040, .060, .080, .10 and .125 mil
- Custom thicknesses available upon request

APPLICATIONS

- CD-ROM and DVD-ROM
- Voltage Regulator Modules (VRMs) and POLs
- Thermally-enhanced BGAs
- Memory packages and modules
- PC Board to chassis
- ASICs and DSPs

TYPICAL PRODUCT PROPERTIES

ECGF-ZR	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
PROPERTY			
Color	Light Green	Light Green	Visual
Reinforcement Carrier	Fiberglass	Fiberglass	–
Thickness (inch)/(mm)	0.02 to 0.125	0.508 to 3.175	ASTM D374
Inherent Surface Tack (1 or 2 sided)	2	2	–
Density (g/cc)	3.6	3.6	ASTM D792
Heat Capacity (J/g-K)	1.0	1.0	ASTM C351
Hardness Bulk Rubber (Shore 00) (1)	35	35	ASTM D2240
Young's Modulus (psi) / (kPa) (2)	17.5	121	ASTM D575
Continous Use Temp (°F) / (°C)	-76 to 392	-60 to 200	–
ELECTRICAL			
Dielectric Breakdown Voltage (Vac)	>5000	>5000	ASTM D149
Dielectric Constant (1000 Hz)	7.5	7.5	ASTM D150
Volume Resistivity (Ohm-meter)	10^9	10^9	ASTM D257
Flame Rating	V-0	V-0	UL94
THERMAL			
Thermal Conductivity (W/m-K)	5.0	5.0	ASTM D5470

THERMAL PERFORMANCE vs. PRESSURE					
Pressure (psi)	**10**	**25**	**50**	**100**	**200**
TO-220 Thermal Performance (°C/W) (20mil)	1.18	1.10	0.99	0.84	0.72
Thermal Impedance (°C-in²/W) (3)	0.21	0.18	0.15	0.14	0.12
TO-220 Thermal Performance (°C/W) (40mil)	1.54	1.34	1.15	1.00	0.90
Thermal Impedance (°C-in²/W) (3)	.30	.28	.25	.22	.13

NOTES: • One second delay value Shore 00 hardness scale
• Young's Modulus, calculated using 0.01 in/min. step rate of strain with a sample size of 0.79 inch².
• The ASTM D5470 test fixture was used. The recorded value includes interfacial thermal resistance. These values are provided for referance only. Actual application performace is directly related to the surface roughness, flatness and pressure applied.

NSIL-2B NON SILICONE GAP FILLER

- Silicone free
- Lower thermal resistance
- UL 94V-0
- Very thin 0.5mm thickness
- Available in sheets for scoring or die cutting

APPLICATIONS

- Between chassis wall and heat sink
- Between CPU and heat sink
- Between semiconductor and heat sink
- Component to heat spreader

TYPICAL PRODUCT PROPERTIES

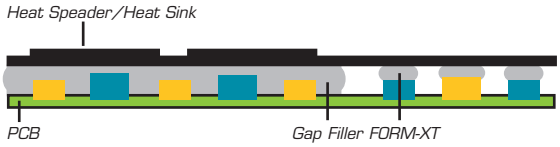
TEST PROPERTY	UNIT	MEASURE	METHOD	SPECIMEN*
Thermal Conductivity	watt/m-k	1.5	ASTM D2326	–
Thermal Resistance				
0.50mm thickness	°Cin²/W	0.72	ASTM D5470	–
1.0mm thickness	°Cin²/W	1.06	ASTM D5470	–
1.50mm thickness	°Cin²/W	1.44	ASTM D5470	–
2.00mm thickness	°Cin²/W	1.83	ASTM D5470	–
Flame Rating	UL94	V-0	UL94	–
Operating Temperature	°C	-40° to + 105°	WRS	–
Color	–	Gray	Visual	–
Specific Gravity	g/cm³	2.1	ASTM D792	A
Hardness	Asker–C (Shore–00)	27 (53)	ASTM D2240	B
Tensile Strength	Mpa	0.2	ASTM D412	A
Elongation	%	150	ASTM D412	A
Tear Resistance	KN/m	1.5	ASTM D624	A
Volume Resistivity	MΩ-m	2.0 x 10³	ASTM D257	C
Breakdown Voltage	kV/mm	11	ASTM D149	C

*Specimen A = 2.0mm thickness
*Specimen B = 2.0mm width x 60mm length x 10mm thickness
*Specimen C = 120mm width x 120mm length x 1.0mm thickness

FORM-XT: FORM IN PLACE GAP FILLER

- Fill large gaps while providing superior thermal transfer
- Conformable with very low compression forces
- Excellent vibration absorption capabilities
- Maintains all initial properties across a wide temperature range
- Used to "Form-In-Place" and remain form stable
- Adheres to most surfaces, shapes and sizes of components
- Requires no heat curing
- Will not cause corrosion on any metal surface
- Provides handling properties that are superior to thermal grease & potting materials

CONSTRUCTION



APPLICATIONS

- Thermal transfer from heat-generating device to heat spreader or heat sink

TYPICAL PRODUCT PROPERTIES

PROPERTY	UNIT	FORM-XT	METHOD
Specific Gravity	–	2.8	ASTM D792
Viscosity	Pa-s	2,000	WRS
Flow Rate	cc/min	8	WRS
Thermal Conductivity	W/mK	1.5	WRS
Volume Resistivity	MΩ-m	1.0 x 10^6	ASTM D257
Breakdown Voltage	kV/mm	10	ASTM D149
Withstand Voltage	kV/mm	8	–
Flame Rating	UL94	V-0 equivalent	Thickness: 0.5 - 3.0mm
TGA weight Loss	wt%	0.10	After + 150°C 24hrs aging
Operating Temp. Range	°C	-40 to + 150	—
Thermal Resistance	°Cin^2/W	0.6 at 1.0mm gap	ASTM D5470
Compression Load/Modulus	Kgf	Peak 2.0 (4.5psi) Sustain 0.1 (0.2psi)	WRS

RELIABILITY

Thermal resistance under heat, cold, humid and thermal shock conditions

CONDITIONS	GAPS	INITIIAL	100hrs	250hrs	500hrs	1,000hrs
+150 °C Aging	1.0mm	0.6	0.6	0.6	0.6	0.6
	2.0mm	1.1	1.1	1.2	1.2	1.2
	3.0mm	1.6	1.9	1.9	1.9	1.9
-40 °C Aging	1.0mm	0.6	0.6	0.6	0.6	0.6
	2.0mm	1.1	1.1	1.1	1.1	1.1
	3.0mm	1.6	1.6	1.6	1.6	1.6
+60°C 95% RH Aging	1.0mm	0.6	0.6	0.6	0.6	0.6
	2.0mm	1.1	1.1	1.2	1.2	1.2
	3.0mm	1.6	1.9	1.9	1.9	1.9
-40 °C to +125°C Heat Shock	1.0mm	0.6	0.6	0.6	0.6	0.6
	2.0mm	1.1	1.2	1.3	1.3	1.3
	3.0mm	1.6	2.0	2.0	2.0	2.0

Unit of Thermal Resistance: °Cin^2/W based on ASSTM D5470 Test Method
Contace Surface: 3.14cm^2 (0.49in^2)
Filled FORM-XT material's weight: 1.0mm - 09.g; 2.0mm - 1.8g; 3.0mm - 2.6g

Viscosity under heat, cold humid and thermal shock conditions

CONDITIONS	UNIT	INITIAL	1,000hrs
+150 °C Aging	Pa•s*	2,000	3,100
-40 °C Aging		2,000	2,000
+60°C 95% RH Aging		2,000	2,000
-40 °C to +125°C Heat Shock		2,000	2,200

**Accurate Rotary Viscometer (RV1)*

THIN FILM PRODUCTS AVAILABLE IN ROLLS & SHEETS

- Available in rolls or single sheets
- Can be die cut or trimmed to any proprietary shape
- 6 thicknesses options

SHEETS: AVAILABLE DIMENSIONS (mm)

MATERIAL	THICKNESS	WIDTH	LENGTH
FILM-SS	N/A	N/A	N/A
FILM-DO	N/A	N/A	N/A
FILM-FM	N/A	N/A	N/A
FILM-HA	N/A	N/A	N/A
FILM-GT	0.20, 0.30, 0.45, 0.85	300.0	300.0
FILM-PI	N/A	N/A	N/A
FILM-UP	N/A	N/A	N/A
FILM-FM (w/adhesive)	N/A	N/A	N/A
FILM-HA (w/adhesive)	N/A	N/A	N/A
FILM-GT (w/adhesive)	0.20, 0.30, 0.45, 0.85	300.0	300.0
NSIL-2B	0.50, 1.00, 1.50, 2.00	100.0	150.0

ROLLS: AVAILABLE DIMENSIONS (mm)

MATERIAL	THICKNESS	WIDTH	LENGTH
FILM-SS	0.30, 0.45, 0.85	36.0, 48.0, 85.0, 150.0	100 meters for all thicknesses up to 0.30
FILM-DO	0.30, 0.45, 0.85	36.0, 48.0, 85.0	
FILM-FM	0.15, 0.20, 0.30	10.0min. - 475.0max	
FILM-HA	0.15, 0.20, 0.30	10.0min. - 475.0max	
FILM-GT	N/A	N/A	
FILM-PI	0.30, 0.45, 0.85	36.0, 48.0, 85.0, 150.0	50.0 meters for thicknesses over 0.30
FILM-UP	0.30, 0.45, 0.85	36.0, 48.0, 85.0, 150.0	
FILM-FM (w/adhesive)	0.15, 0.20, 0.30	10.0min. - 450.0max	
FILM-HA (w/adhesive)	0.15, 0.20, 0.30	10.0min. - 450.0max	
FILM-GT (w/adhesive)	N/A	N/A	

TECHNICAL INFORMATION

TYPICAL MATERIAL PROPERTIES

TEST PROPERTIES		FILM-SS			FILM-DO			FILM-PI			FILM-UP		
Physical Properties	Color	Greenish Gray			Brown			Gray			Black		
	Hardness (ASTM D22, type A)	75			85			79			55		
	Tensile Strength (MPa)	5.4			4.9			2.5			2.3		
	Elongation (%)	100			60			110			250		
	Tear Strength (KN/m) (Angle Non-slit)	9			7			8			13		
Heat Aging (Aging test by heating in air, to 200° C)	Change in Hardness (Point)	3 days	10 days	20 days	3 days	10 days	20 days	3 days	10 days	20 days	3 days	10 days	20 days
		±0	±5	±9	+1	+1	+3	+8	+11	+15	±0	+1	+5
	Change in Tensile Strength (%)	±0	±0	±6	-12	-12	-12	+19	+42	+62	±0	+14	+24
	Change in Elongation (%)	-16	-26	-34	-18	-24	-35	-46	-49	-49	-7	-15	-27
Electrical Properties	Volume Resistivity (MΩ-m)	1.0×10^7			1.0×10^7			1.0×10^7			1.0×10^7		
	Dielectric Breakdown Strength (kV/mm)	20			19			17			22		
	Dielectric Contstant	50Hz	10^3Hz	10^6Hz	50Hz	10^3Hz	10^6Hz	50Hz	10^3Hz	10^6Hz	50Hz	10^3Hz	10^6Hz
		4.9	4.9	4.9	5.7	5.4	4.9	5.34	5.32	5.33	4.67	4.61	4.62
	Dielectric Dissipation Factor	0.002	0.001	0.002	0.004	0.002	0.002	0.0026	0.0014	0.0010	0.0031	0.0015	0.0008
Thermal Properties	Thermal Dissipation Factor (W/m-K)	1.2			1.7			2.6			1.1		
	Flame Rating (UL94)	V-0			V-0			V-0			V-0		

TYPICAL PRODUCT PROPERTIES

PROPERTIES	UNIT	FILM-SS			FILM-DO			FILM-PI			FILM-UP		
		30S	45S	85S	30D	45D	85D	30P	45P	85P	30U	45U	85U
Color	Visual	Greenish Gray			Brown			Gray			Black		
Thickness	mm	$0.30^{+0.1}/_{-0}$	$0.45^{\pm0.05}$	$0.85^{\pm0.05}$	$0.30^{+0.1}/_{-0}$	$0.45^{\pm0.05}$	$0.85^{\pm0.05}$	$0.30^{+0.1}/_{-0}$	$0.45^{\pm0.05}$	$0.85^{\pm0.05}$	$0.30^{+0.1}/_{-0}$	$0.45^{\pm0.05}$	$0.85^{\pm0.05}$
Material	Binder	Silicone			Silicone			Silicone			Silicone		
	Filler	Alumina			Alumina+ALN			Alumina			Alumina		
	Reinforcement	N/A			N/A			N/A			N/A		
Thermal Resistance	°Cin²/W	0.62	0.73	1.35	0.42	0.52	0.76	0.26	0.35	0.56	0.57	0.77	1.25
Thermal Resistance w/PSA	°Cin²/W	N/A			N/A			N/A			N/A		
Specific Gravity	g/cm³	2.29			2.44			2.57			2.20		
Hardness (ASTM D2240)	type A	75			85			79			55		
Tensile Strength	kN/m	1.7	2.3	4.3	1.7	2.3	4.2	0.9	1.2	2.2	0.8	1.0	2.0
Elongation	%	100			60			110			250		
Tear Strength	Kn	0.3	0.4	0.8	0.2	0.3	0.6	0.3	0.4	0.7	0.5	0.6	1.1
Volume Resistivity	MΩ-m	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^7$	$1x10^6$	$1x10^6$	$1x10^6$
Withstand Voltage	kV/minute	7	8	10	6	7	10	6	8	11	7	8	11
Dielectric Constant	1KHz	4.4	4.5	4.9	4.9	4.5	5.7	4.3	4.6	5.3	4.1	4.2	4.9
Maximum Use Temperature	°C	-60°C to + 180°C			-60°C to + 180°C			-60°C to + 180°C			-60°C to + 180°C		
Adhesive Coating	-	N/A			N/A			N/A			N/A		

PROPERTIES	UNIT	FILM-FM			FILM-HA			FILM-GT			
		15FM	20FM	30FM	15GHA	20HA	30HA	20GT	30GT	45GT	85GT
Color	Visual	Greenish Gray			Brown			White			
Thickness	mm	$0.15^{+0.02}/_{-0.04}$	$0.20^{+0.02}/_{-0.04}$	$0.30^{+0.10}/_{-0}$	$0.15^{+0.02}/_{-0.04}$	$0.20^{+0.02}/_{-0.04}$	$0.30^{+0.10}/_{-0}$	$0.20_{\pm0.05}$	$0.30^{+0.1}/_{-0}$	$0.45_{\pm0.05}$	$0.85_{\pm0.05}$
Material	Binder	Silicone			Silicone			Silicone			
	Filler	Alumina			Alumina+ALN			Baron Nitride			
	Reinforcement	Fiberglass			Fiberglass			Fiberglass			
Thermal Resistance	°Cin²/W	0.51	0.56	0.66	0.55	0.57	0.61	0.30	0.34	0.39	0.51
Thermal Resistance w/PSA	°Cin²/W	0.78	0.83	0.93	0.63	0.66	0.72	0.64	0.66	0.71	0.83
Specific Gravity	g/cm³	2.18			2.36			1.69			
Hardness (ASTM D2240)	type A	87	87	92	92	92	95	90	90	90	88
Tensile Strength	kN/m	11			8			14	15	18	15
Elongation	%	2 or less			2 or less			3 or less			
Volume Resistivity	MΩ-m	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$	$1.0x10^7$
Withstand Voltage	kV/minute	4	6	7	2	4	8	3	5	7	10
Dielectric Constant	1KHz	2.5	3.2	3.5	3.0	3.3	3.9	2.6	3.0	3.2	3.7
Maximum Use Temperature	°C	-60°C to + 180°C			-60°C to + 180°C			-60°C to + 180°C			
Adhesive Coating	-	Available			Available			Available			

TYPICAL PRODUCT PROPERTIES

FILM-WS	IDENTIFIER	TEST	30-WS	40-WS	50-WS	81-WS
Thickness	mm	WRS	0.3	0.4	0.5	0.81
Sheet Size	mm	WRS	304mm x 406mm			
Thermal Resistance	°Cin2/W	FTM P-3020	0.36			
Color	Visual	WRS	Grey			
Thermal Conductivity	watt/m-k	FTM P-1620	1.5			
Volume Resistivity	ohm.cm	ASTM D257	8×10^{15}			
Breakdown Voltage	kV•AC	ASTM D149	>4000			
Specific Gravity	gr/cm^3	ASTM D792	2			
Hardness	Shore 00	ASTM D2240	60			

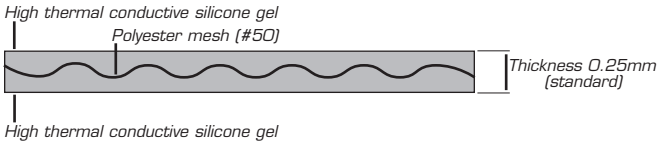
FILM-WX	IDENTIFIER	TEST	30-WS	40-WS	50-WS	81-WS
Thickness	mm	WRS	0.3	0.4	0.5	0.81
Sheet Size	mm	WRS	304mm x 406mm			
Thermal Resistance	°Cin2/W	FTM P-3020	0.31			
Color	Visual	WRS	Grey			
Thermal Conductivity	watt/m-k	FTM P-1620	1.5			
Volume Resistivity	ohm.cm	ASTM D257	8×10^{15}			
Breakdown Voltage	kV•AC	ASTM D149	>4000			
Specific Gravity	gr/cm^3	ASTM D792	2			
Hardness	Shore 00	ASTM D2240	60			

FILM-WP	IDENTIFIER	TEST	30-WS	40-WS	50-WS	81-WS
Thickness	mm	WRS	0.23	0.4	0.5	0.81
Sheet Size	mm	WRS	300mm x 50mm			
Thermal Resistance	°Cin2/W	FTM P-3020	0.75			
Color	Visual	WRS	Grey			
Thermal Conductivity	watt/m-k	FTM P-1620	1.2			
Volume Resistivity	ohm.cm	ASTM D257	8×10^{13}			
Breakdown Voltage	kV•AC	ASTM D149	>6000			
Specific Gravity	gr/cm^3	ASTM D792	1.8			
Hardness	Shore 00	ASTM D2240	70			

FILM-AN

- Highly conformable
- Very soft, low stress component
- Naturally tacky, no adhesive required (ease of assmebly)
- Thin, low thermal resistance
- Polyester reinforcement = tight tolerances more easily maintained
- Excellent between varing surface textures
- Suitable for high or low volume applications
- Sheets, Die-cuts and rolls available

CONSTRUCTION



APPLICATIONS

- Semiconductors to heat sink
- Chassis walls to other surfaces
- Component to heat spreader
- CD-Rom, DVD-Rom cooling

TYPICAL PROPERTIES FILM-AN

PROPERTIES		TEST METHOD	UNIT	MEASURE			
Thermal Properties	Thermal Conductivity	FTM P-1620	watt/m-k	1.5 (ASTM-D2326 equivalent)			
	Thermal Resistance	FTM P-3020	°Cin²/W	0.39 (ASTM D5470 equivalent)			
	Operating Temperature	WRS	°C	-40° to +150°			
Electrical Properties	Volume Resistivity	ASTM D257	MΩ-m	2.9×10^5			
	Breakdown Voltage	ASTM D149	kV	5			
	Withstand Voltage	ASTM D149	kV/minute	3			
Physical Properties	Color	WRS	Visual	Dark Gray			
	Thickness	WRS	mm	0.25			
	Sheet Sizes	WRS	mm	200mm wide x 300mm length			
	Roll Sizes	WRS	mm	100mm, 200mm, 400mm wide x 10m length			
	Hardness	ASTM D2240	Shore 00	49			
	Tensile Strength	ASTM D412	MPa	11			
	Elongation	ASTM D412	%	15			
	Tear Strength	ASTM D624	kN/m	21 (angle, not slit)			
	Specific Gravity	ASTM D792	g/cm³	2.6			
	Extractable Volatiles	WRS	wt %	0.0091 (D4 ~ D20) Siloxane			
	Flammability	UL94		VTM-0			
	Compression	WRS	kgf/in²	5.5 @ 10%, 17.4 @ 20%, 33.6 @ 30%, 51.0 @ 40%, 69.5 @ 50%			
				Initial	**100hrs**	**500hrs**	**1000hrs**
Heat Aging +70°C (1000 hrs)	Specific Gravity	ASTM D792	g/cm³	2.45	2.49	2.51	2.51
	Tensile Strength	ASTM D412	MPa	11	7	7	6
	Elongation	ASTM D412	%	15	15	15	15
	Tear Strength	ASTM D624	kN/m	20	14	11	11
	Volume Resistivity	ASTM D257	MΩ-m	2.9×10^5	7.8×10^5	1.5×10^6	7.8×10^5
	Thermal Conductivity	FTM P-1620	watt/m-k	1.5	1.5	1.5	1.5
+150°C (1000 hrs)	Specific Gravity	ASTM D792	g/cm³	2.45	2.52	2.54	2.56
	Tensile Strength	ASTM D412	MPa	11	6	5	5
	Elongation	ASTM D412	%	15	15	15	15
	Tear Strength	ASTM D624	kN/m	20	14	11	11
	Volume Resistivity	ASTM D257	MΩ-m	2.9×10^5	7.8×10^5	7.8×10^5	1.6×10^6
	Thermal Conductivity	FTM P-1620	watt/m-k	1.5	1.5	1.5	1.5
Humidity Test +60°C (1000 hrs x 90% R.H.)	Specific Gravity	ASTM D792	g/cm³	2.45	2.47	2.50	2.52
	Tensile Strength	ASTM D412	MPa	11	7	7	7
	Elongation	ASTM D412	%	15	15	15	15
	Tear Strength	ASTM D624	kN/m	20	14	14	14
	Volume Resistivity	ASTM D257	MΩ-m	2.9×10^5	1.6×10^5	3.9×10^5	1.5×10^6
	Thermal Conductivity	FTM P-1620	watt/m-k	1.5	1.5	1.5	1.5

FILM-ED: GLASS-REINFORCED GREASE REPLACEMENT

- Thermal impedance: 0.35 °C-in²/W (@50psi)
- Eliminates processing contraints typically associated with grease
- Conforms to surface textures
- Between surfaces: air-free interface between heat-generating components and heat sinks
- Fiberglass reinforcement: endures processing stresses w/o losing physical integrity
- Fiberglass reinforcement: easy handling during application
- May be installed prior to soldering and cleaning without worry
- Available in sheet, die-cut parts and roll
- Available with or without pressure sensitive adhesive

APPLICATIONS

- Between a transistor and heat sink
- Between 2 large surfaces: i.e. L-bracket and chassis of assembly
- Between heat sink and chassis
- Under electrically isolated power modulus
- Under devices such as resistors, transformers and solid state relays

TYPICAL PRODUCT PROPERTIES

UCGF-OP	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
PROPERTY			
Color	Black	Black	Visual
Reinforcement Carrier	Fiberglass	Fiberglass	–
Thickness (inch)/(mm)	0.005	0.127	ASTM D374
Hardness (Shore A)	86	86	ASTM D2240
Continuous Use Temp (°F) / (°C)	-76 to 356	-60 to 180	–
ELECTRICAL			
Dielectric Breakdown Voltage (Vac)	Non-Insulating	Non-Insulating	ASTM D149
Dielectric Constant (1000 Hz)	NA	NA	ASTM D150
Volume Resistivity (Ohm-meter)	10^2	10^2	ASTM D257
Flame Rating	V-0	V-0	UL94
THERMAL			
Thermal Conductivity (W/m-K)	2.0	2.0	ASTM D5470

THERMAL PERFORMANCE vs PRESSURE Pressure (psi)	10	25	50	100	200
TO-220 Thermal Performance (°C/W)	2.26	1.99	1.76	1.53	1.30
Thermal Impedance (°C-in²/W) (1)	0.65	0.48	0.35	0.24	0.16

NOTES: • The ASTM D5470 test fixture was used. The recorded value includes interfacial thermal resistance. These values are provided from referance only. Actual application performance is directly related to the surface roughness, flatness and pressure applied.

FILM-IM: FOIL FORMAT GREASE REPLACEMENT / MAX HEAT

- Thermal impedance: 0.22 °C-in²/W (@50psi)
- Maximum heat transfer
- Aluminum foil coated both sides
- Designed to replace thermal grease
- Eliminates dust collection
- May be used prior to soldering and cleaning without worry
- Available in sheet, die-cut parts and roll
- Available with or without pressure sensitive adhesive

APPLICATIONS

- Designed for maximum heat trasfer applications where electrical isolation is NOT required
- Between a transistor and heat sink
- Between 2 large surfaces: i.e. L-bracket and chassis of assembly
- Between heat sink and chassis
- Under electrically isolated power modulus
- Under devices such as resistors, transformers and solid state relays

TYPICAL PRODUCT PROPERTIES

FILM-IM	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
PROPERTY			
Color	Black	Black	Visual
Reinforcement Carrier	Aluminum	Aluminum	–
Thickness (inch)/(mm)	0.006	0.152	ASTM D374
Hardness (Shore A)	93	93	ASTM D2240
Continuous Use Temp (°F) / (°C)	-76 to 356	-60 to 180	–
ELECTRICAL			
Dielectric Breakdown Voltage (Vac)	Non-Insulating	Non-Insulating	ASTM D149
Dielectric Constant (1000 Hz)	NA	NA	ASTM D150
Volume Resistivity (Ohm-meter)	10^2	10^2	ASTM D257
Flame Rating	V-0	V-0	UL94
THERMAL			
Thermal Conductivity (W/m-K)	2.5	2.5	ASTM D5470

THERMAL PERFORMANCE vs PRESSURE Pressure (psi)	10	25	50	100	200
TO-220 Thermal Performance (°C/W)	2.44	1.73	1.23	1.05	0.92
Thermal Impedance (°C-in²/W) (1)	0.52	0.30	0.22	0.15	0.12

NOTES: • The ASTM D5470 test fixture was used. The recorded value includes interfacial thermal resistance. These values are provided from referance only. Actual application performance is directly related to the surface roughness, flatness and pressure applied.

FILM-HB: HIGH PERFORMACE INSULATOR / LOW-PRESSURE

- Thermal impedance: 0.61 °C-in²/W (@50psi)
- Electrically isolating and high thermal performance
- Low mounting pressure
- Smooth and highly compliant surface
  (minimizes interfacial thermal resistance / maximizes thermal performance)
- General purpose thermal interface material solution
- Available in sheet, die-cut parts and roll
- Available with or without pressure sensitive adhesive

APPLICATIONS

- Designed for applications requiring low clamping forces
  (discrete semiconductors: TO-220, TO-247 and TO-218)
- Power supplies
- Automobile electronics
- Motor controls
- Power semiconductors

TYPICAL PRODUCT PROPERTIES

FILM-HB	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
PROPERTY			
Color	Pink	Pink	Visual
Reinforcement Carrier	Fiberglass	Fiberglass	–
Thickness (inch)/(mm)	0.009	0.229	ASTM D374
Hardness (Shore A)	92	92	ASTM D2240
Elongation (%45° to Warp and Fill)	20	20	ASTM D412
Tensile Strength (psi) / (MPa)	1300	9	ASTM D412
Continuous Use Temp (°F) / (°C)	-76 to 356	-60 to 180	–
ELECTRICAL			
Dielectric Breakdown Voltage (Vac)	5500	5500	ASTM D149
Type 3 Electrodes	8300	8300	ASTM D149
Dielectric Constant (1000 Hz)	6.0	6.0	ASTM D150
Volume Resistivity (Ohm-meter)	10^{10}	10^{10}	ASTM D257
Flame Rating	V-0	V-0	UL94
THERMAL			
Thermal Conductivity (W/m-K)	1.6	1.6	ASTM D5470

THERMAL PERFORMANCE vs PRESSURE					
Pressure (psi)	**10**	**25**	**50**	**100**	**200**
TO-220 Thermal Performance (°C/W)	3.96	3.41	2.90	2.53	2.32
Thermal Impedance (°C-in²/W) (1)	0.95	0.75	0.61	0.47	0.41

NOTES: • The ASTM D5470 test fixture was used. The recorded value includes interfacial thermal resistance. These values are provided for referance only. Actual application performance is directly related to the surface roughness, flatness and pressure applied.

FILM-MK: HIGH PERFORMACE INSULATOR

- Thermal impedance: 0.41 °C-in²/W (@50psi)
- Tough dielectric barrier against cut-through
- High performance film with filled silicone rubber
- Excellent thermal performance
- Designed to replace ceramic insulators i.e. Beryllium Oxide, Boron Nitride and Alumina
- Available in sheet, die-cut parts and roll
- Available with or without pressure sensitive adhesive

APPLICATIONS

- Power supplies
- Motor controls
- Power semiconductors

TYPICAL PRODUCT PROPERTIES

FILM-MK	IMPERIAL VALUE	METRIC VALUE	TEST METHOD
PROPERTY			
Color	Beige	Beige	Visual
Reinforcement Carrier	Kapton	Kapton	–
Thickness (inch)/(mm)	0.006	0.152	ASTM D374
Hardness (Shore A)	90	90	ASTM D2240
Breaking Stregth (lbs/inch) / (kN/m)	30	5	ASTM D1458
Elongation (%45° to Warp and Fill)	40	40	ASTM D412
Tensile Strength (psi) / (MPa)	5000	34	ASTM D412
Continuous Use Temp (°F) / (°C)	-76 to 356	-60 to 180	–
ELECTRICAL			
Dielectric Breakdown Voltage (Vac)	6000	6000	ASTM D149
Dielectric Constant (1000 Hz)	3.7	3.7	ASTM D150
Volume Resistivity (Ohm-meter)	10^{12}	10^{12}	ASTM D257
Flame Rating	VTM-0	VTM-0	UL94
THERMAL			
Thermal Conductivity (W/m-K)	1.3	1.3	ASTM D5470

THERMAL PERFORMANCE vs PRESSURE Pressure (psi)	10	25	50	100	200
TO-220 Thermal Performance (°C/W)	2.35	2.19	2.01	1.87	1.76
Thermal Impedance (°C-in²/W) (1)	0.86	0.56	0.41	0.29	0.24

NOTES: • The ASTM D5470 test fixture was used. The recorded value includes interfacial thermal resistance. These values are provided for referance only. Actual application performance is directly related to the surface roughness, flatness and pressure applied.

PUTTY-RS AND PUTTY-AL SILICONE SHEET

- Highest thermal conductive putty type silicone sheet
- Putty nature enables low contact thermal resistance
- PUTTY-AL has one surface with aluminum film:
  enables users to remove carrier film after installation (before operation) with NO-PULL-OUT effect.
- Low Molecular Siloxane content is very low
- UL94-V0 Flame Rating

APPLICATIONS

- Thermal transfer from CPU and other heat generating devices to heat sink

TYPICAL PRODUCT PROPERTIES

TEST PROPERTY	UNIT	PUTTY-RS	PUTTY-AL	METHOD
Thermal Conductivity	W/m-k	17	17	ASTM D5470
Thermal Resistance				
0.2mm thickness	°Cin²/W	0.03	0.06	ASTM D5470
0.3mm thickness	°Cin²/W	0.04	0.07	ASTM D5470
0.4mm thickness	°Cin²/W	0.05	0.08	ASTM D5470
0.5mm thickness	°Cin²/W	0.06	0.10	ASTM D5470
Flame Rating	UL94	V-0	V-0 equivalent	UL94

DURABILITY

TEST CONDITIONS	PUTTY-RS	PUTTY-AL
+120°C Aging	Thermal Resistance (°Cin²/W)	
Initial	0.031	0.045
250hrs	0.026	0.046
500hrs	0.029	0.047
1,000hrs	0.032	0.047
+150°C Aging		
Initial	0.031	0.045
250hrs	0.040	0.048
500hrs	0.040	0.054
1,000hrs	0.040	0.057
+85°C 85%RH Aging		
Initial	0.031	0.045
250hrs	0.031	0.043
500hrs	0.034	0.044
1,000hrs	0.034	0.046
-40°C - +125°C Heat Stock		
Initial	0.031	0.045
250hrs	0.028	0.045
500hrs	0.029	0.044
1,000hrs	0.030	0.048

EXTRACTABLE VOLATILE

LOW MOLECULAR SILOXANE CONTENT DN	PUTTY-RS	TEST METHOD
Total less D^{20}	Less than 0.0010 wt%	Gas Chromatographic Analysis by Abstracting Acetone

PUTTY-RS

ITEM	SIZE		TOLERANCE
Width (mm)	10.0 - 50.0		±1.0
Length (mm)	10.0 - 50.0		±1.0
Thickness (mm)	20X-RS	0.22	±0.04
	30X-RS	0.30	±0.06
	40X-RS	0.40	±0.08
	50X-RS	0.50	±0.10

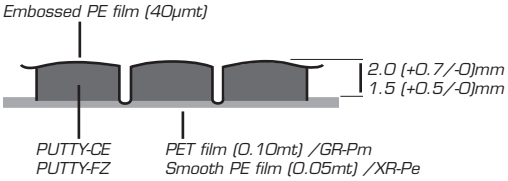
PUTTY-AL

ITEM	SIZE		TOLERANCE
Width (mm)	10.0 - 50.0		±1.0
Length (mm)	10.0 - 50.0		±1.0
Thickness (mm)	20X-AL	0.22	±0.04
	30X-AL	0.30	±0.06
	40X-AL	0.40	±0.08
	50X-AL	0.50	±0.10

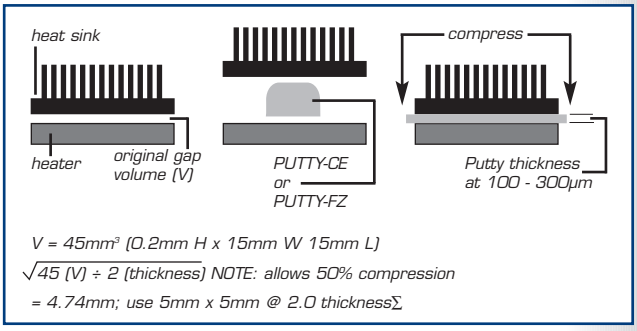
PUTTY-CE AND PUTTY-FZ SILICONE

- Highly conformable
- Non flamable interface materials
- Thermal performace equal to highly rated silicone gap filler pads
- Excellent for filling small air gaps (0.3mm or less) and uneven mating surfaces
- Very low compression force at high compression rate
- UL94-V0 Rated
- Sheets and Die cuts available in three formulations

CONSTRUCTION



APPLICATION GUIDE



$V = 45mm^3$ (0.2mm H x 15mm W 15mm L)

$\sqrt{45\ (V) \div 2\ (thickness)}$ NOTE: allows 50% compression

$= 4.74mm$; use 5mm x 5mm @ 2.0 thicknessΣ

APPLICATIONS

- Between Chasis wall and heat sink
- Between CPU and heat sink
- Between Semiconductor and heat sink
- Component to heat spreader

TYPICAL PRODUCT PROPERTIES

TEST PROPERTY	UNIT	PUTTY-CE	PUTTY-FZ	METHOD
Thermal Conductivity	watt/m-k	6	11	ASTM D5470
Thermal Resistance				
Compression 30%	°Cin²/W	0.32	0.22	ASTM D5470
50%	°Cin²/W	0.25	0.18	ASTM D5470
70%	°Cin²/W	0.18	0.12	ASTM D5470
90% (original thickness 2.0mm)	°Cin²/W	0.08	0.06	ASTM D5470
Flame Rating	UL94	V-0	V-0	UL94
Operating Temperature	°C	-60 to +200	-60 to +200	WRS
Color	Visual	Dark Reddish Gray	Gray	–
Plasticity	mm	0.23	0.25	ASTM D962
Specific Gravity	g/cm³	3.1	3.3	ASTM D792
Volume Resistivity	MΩ-m	1.3 x 10^6	7.0 x 10^3	ASTM D257
Dielectric Strength: 50Hz	kV/mm	6.4	NA	AST D149
1KHz	kV/mm	6.4	7.5	
1MHz	kV/mm	6.4	7.5	
Dissipation Factor: 50Hz	kV/mm	0.035	NA	ASTM D149
1KHz	KV/mm	0.005	0.018	
1MHz	kV/mm	0.001	0.008	
Compression: 10%	Kgf	0.4	0.8	WRS
Sustain after 1minute 50%	Kgf	1.4	2.0	