Science. Applied to Life.™

3MThhermal Management Solutions

DARTON

Electronics Materials Solutions Division

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Heat Control ? Thermal Management !!



Ref. http://industrials-heater.com/



http://www.kuraray.co.jp/en/ir/analysis/share/genestar.html



3M[™] Thermal Management Materials



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Mercati di riferimento

Elettronica di potenza

LED Lighting















World of TIMs: Thermal Interface Material Options

Technology	Thermal Conductivity vs. Air*	Pro	Con
Adhesive	20-125X	Thin=Low Impedance High bond strength Good wetting	Messy Pot life of epoxy Need cure time and fixturing
Phase Change	20-125X	Good wet-out Less messy than grease Thin=Low Impedance	No adhesion Needs mechanical attach Need initial heat cycle
Tapes	20-40x	Good wet-out No mechanical fasteners Ease of use	Typically <10-15W applications
Pads	35-200X	Greater thicknesses Very soft/conformable Gap filling	Light adhesion Needs mechanical fastener Cost
Solder/Liquid Metal Phase Change Material	500-1000X	Thin thickness High conductivity Gap filling	Difficult to apply Low viscosity when melted CTE Cost

* Air Thermal Conductivity = 0.02 W/m-K

* Green denotes 3M Options



3M™ Thermal Management Materials

Thermally Conductive Interface Tapes

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* High bonding strength, thin (<0.2mm)

* Excellent conformability

Thermally Conductive Interface Pads



Next generation acrylic polymer thermal pads- No silicone oil bleed from acrylic Pad * High temp (RTI > 1000C), low odor

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Thermally Conductive Adhesives



* Thermal curing / Epoxy 2 part

* High Thermal K and Low cost

3M[™] Thermally Conductive Interface Tapes



Three Keys to Overall TIM Thermal Performance



3M™ Thermally Conductive Interface Tape

Thickness (mm)	Standard	High Adhesion Conformable	High Ahesion	No stretchable
0.05	9882			
0.10				
0.13	9885	8805	8708-013	
0.17				
0.20				8926-02
0.25	9890	8810	8708-025	8926-025
0.30				
0.40		8815		
0.50		8820	8708-050	8926-05





Relationship between Thickness and Wetting



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Performance Reliability Test





3M[™] Thermally Conductive Interface Pads

3M[™] Thermally Conductive Interface Pads

3M can service acrylic and silicone based solution together

- Wide product line up
- Excellent conformability, gap filling property provides excellent heat flow
- Excellent environmental durability

	Silicone Pad	Acrylic Pad
Softness / Conformability	Excellent	Good
Thermal conductivity	Up to 3.1	Up to 3.5
Dielectric strength	Good	Excellent
Heat Resistance	Excellent	Good
Flame Retardancy	Good	Good
Cost	High	Low
Key Advantage	High Temp. Reliability Softness	No Siloxane VOC & No Oil Breeding Low Price



3M™ Thermally Conductive Interface Pads



3M[™] Thermally Conductive Acrylic Interface Pads

	5570N	5571N	5571	5589H	5590H	5578H
Thermal Conductivity (W/m- k)	1.3	2	2	2	3	3.5
Hardness (Shore 00)	50	70	70	50	60	50
Standard Thickness (mm)	0.5/1.0/ 1.5/2.0	0.5	0.75/1.0/ 1.5/2.0	1.0/1.5	0.5/1.0/ 1.5	0.5/1.0
UL94 Flammability	V2	V2	VO	VO	VO	VO
Special characteristic	Good Recovery	Good Recovery	Good Recovery	Soft	High K Value	High K Value



3M[™] Thermally Conductive Silicone Interface Pads

	5514	5516	5591	5595
Base material	Silicone	Silicone	Silicone	Silicone
Standard Thickness (mm)	0.2 / 0.25	0.5 / 1.0 / 1.5 / 2.0	0.5 / 1.0 / 1.5 / 2.0	0.5 / 1.0 / 1.5 / 2.0
Thermal Conductivity (W/m-k)	1.6	3.1	1	1.6
Flammability	UL VO	UL VO	NA	UL 94 V0
Hardness (Shore 00)	55	50	15	50
High temp stability (°C)	130 °C	130 °C	130 °C	125 °C
Special characteristic	Roll available	Sheet only	Sheet only	Sheet only

* Shore A



3M[™] Thermal Management Materials EV & HEV Battery Applications

- In-vehicle battery charger and motor assembly
- Good thermal Conductivity
- Low VOC, No Oil Bleeding (Acrylic Pad)
- High Temperature resistance
- Flame resistance : UL 94 complied
- High dielectric strength
- Various Thickness
- Products : 5571, 5590H, 5589H, 5500H and etc.



Heat Sink Plate





3M[™] Thermally Conductive Adhesive

3M™ Thermally Conductive Epoxies





3M[™] EPX Applicator and Nozzle simultaneously and accurately mixes, meters, and applies adhesive with a squeeze of the trigger

This range of liquid adhesives has minimal odor and excellent structural strength adhesion. Dispensing is easy for high output, in-line automated manufacturing and manual application. Adhesive flows and fills micro-spaces on surfaces. Ultra-thin bond line helps achieve low thermal impedance.

3M[™] Thermally Conductive Epoxy TC-2707: 0.72 W/m-K : Aluminum Metal Filler 3M[™] Thermally Conductive Epoxy TC-2810: 1.0-1.4 W/m-K : BN Ceramic Filler

Note - Requires US size applicator *



3M[™] Thermally Conductive Epoxies

Product	TC-2707	TC-2810
Description	Two Part EG Epoxy	Two Part EG Epoxy
Filler	Aluminum Metal	BN Ceramic
Curative	Amine	Amine
Work Life	60 minutes	60 minutes
Shelf Life	12 months	12 months
Cure Schedule	23°C for 24 hrs 50°C for 270 min 70°C for 90 min 121°C for 10 min	23°C for 24 hrs 50°C for 270 min 70°C for 90 min 121°C for 10 min
Τ _g	23 - 60°C cure 100-121°C cure	23 - 60°C cure 100-121°C cure
CTE : below T _g	56 ppm/°C	62 ppm/°C
CTE : above T _g	132 ppm/°C	205 ppm/°C
T.C.	0.7 W/m-K	1.1 W/m-K



Thank you