



FILMS

Chang
Sung
Corporation **CSC**

Divisions in CSC

7 Divisions, 1 R&D Center

METAL POWDERS



- Cu & Cu-Alloys
- Ferrous Metals
- Tin, Ni, Al Alloys
- Ag, Ag Alloys
- Coated Powders

POWDER CORES



- MPP Cores
- High Flux Cores
- Sendust Cores
- Mega Flux Cores
- HS Cores

CONDUCTIVE PASTES



- Ag Pastes
- Ni Pastes
- Cu Pastes
- Ag/Cu Pastes

POWDER METALLURGY



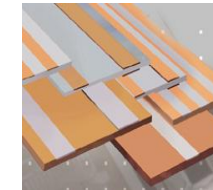
- Oil-Impregnated Bearings
- Balance Weights
- Counter Weights
- Heat Sinks

FILMS



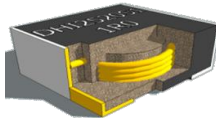
- EMI Absorbers
- Magnetic Shielding Materials
- Thermal Interface Materials
- Thermal Bonding Sheets

CLAD METALS



- Inlay Clads
- Overlay Clads
- Solder Clads
- Contact Bars

INDUCTORS



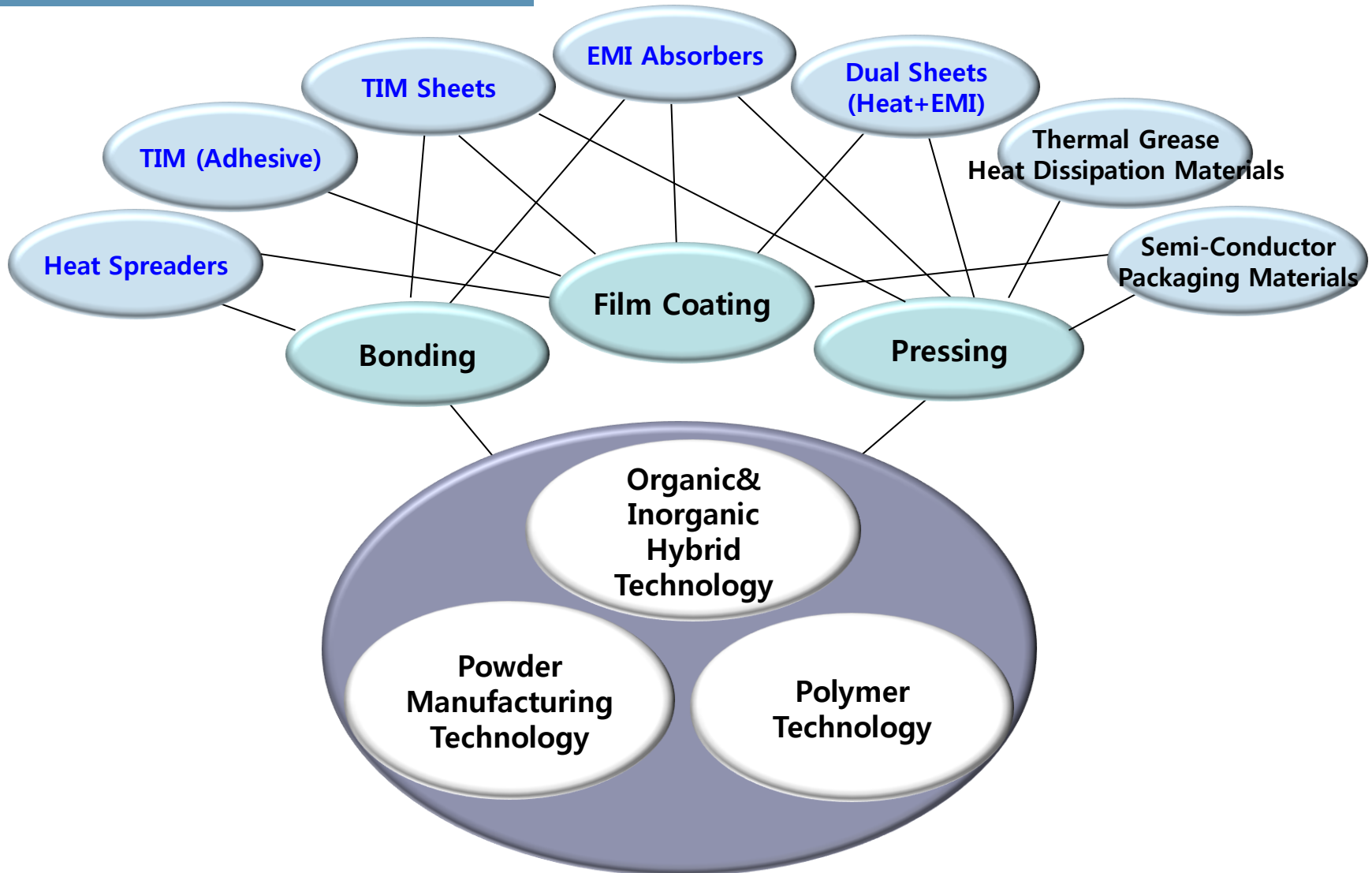
- Small SMD Power Inductors

R&D CENTER



- Soft Magnet Materials
- EMC Solutions
- Functional Fillers
- Magnetic Fillers
- Thick Film Materials
- Powder Metallurgy

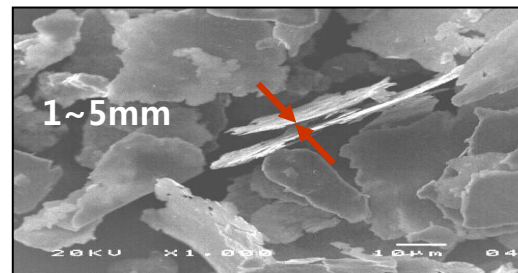
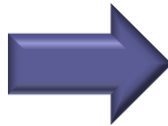
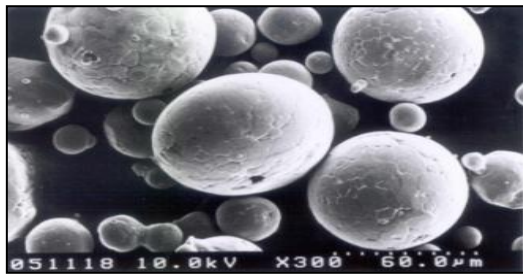
1-1. TECHNOLOGY



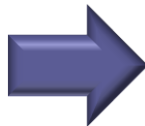
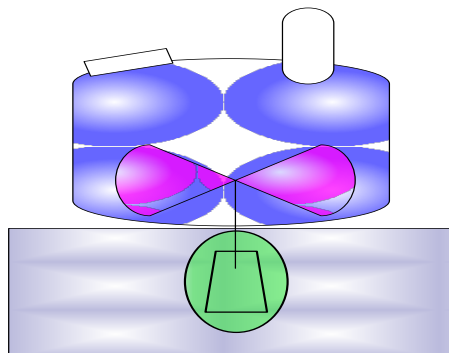
1-2. TECHNOLOGY

1) Power Manufacturing Technology

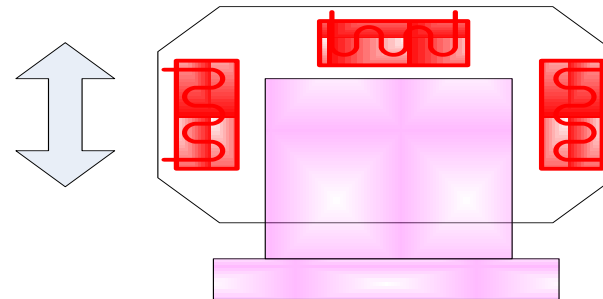
Micro Forging



Drying



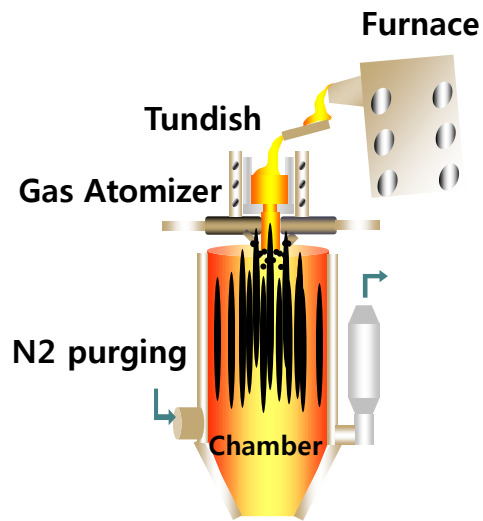
Heat Treatment



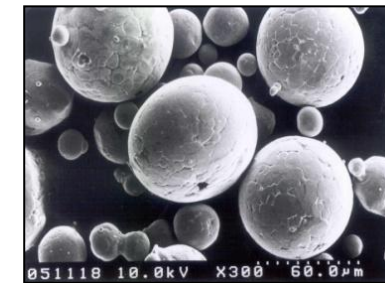
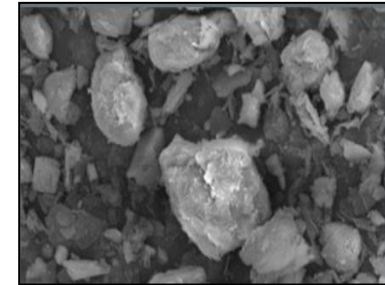
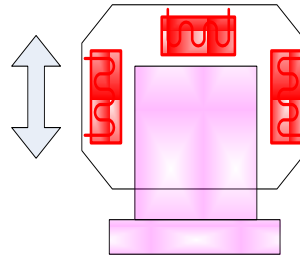
1-3. TECHNOLOGY

2) Complex Powder Manufacturing Technology

High Temperature Synthesis Methods (Metal/Ceramic)



Heat Treatment (Microstructure Control)

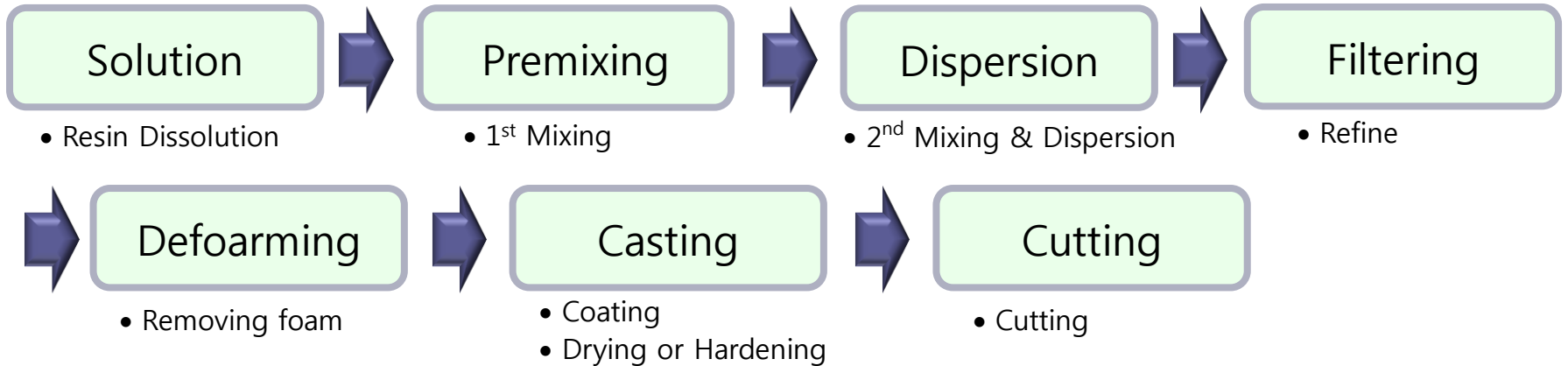


◆ Metal Powders

- Boron Nitride (BN)
- Complex Powders (BN+MgO)
- Magnetic Powders

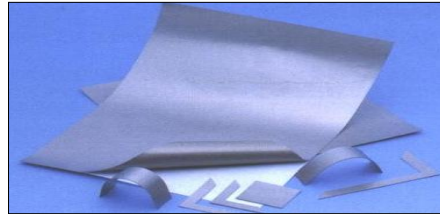
1-4. TECHNOLOGY

3) Filler Dispersion & Coating Technology



2. Products of Film Division

EMI Absorbers



EMI Absorber Sheets



EMI Absorber Films



Magnetic sheets for WPC/NFC

Thermal Interface Materials



TIM

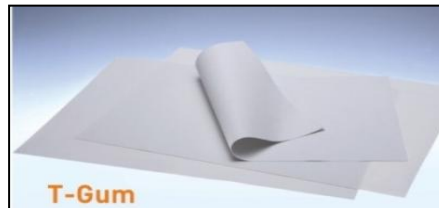


Dual sheets

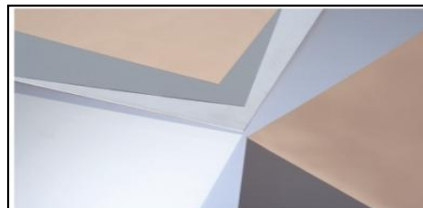


Heat Spreading Films

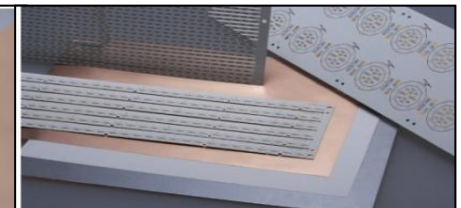
Functional Adhesives



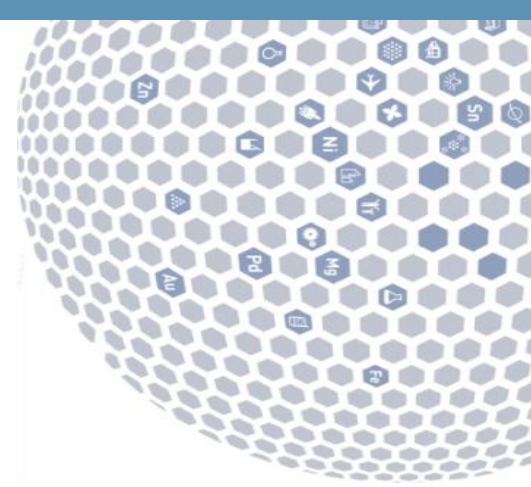
Preparation for MC PCB



Resin Coated Cu



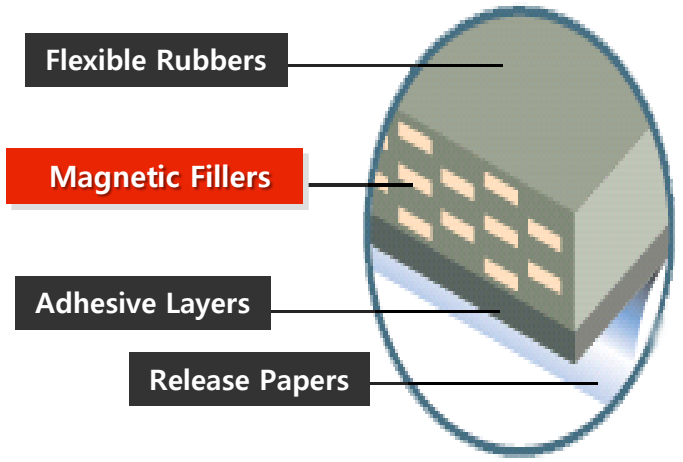
MCCL for Metal PCBs



EMI Absorbers

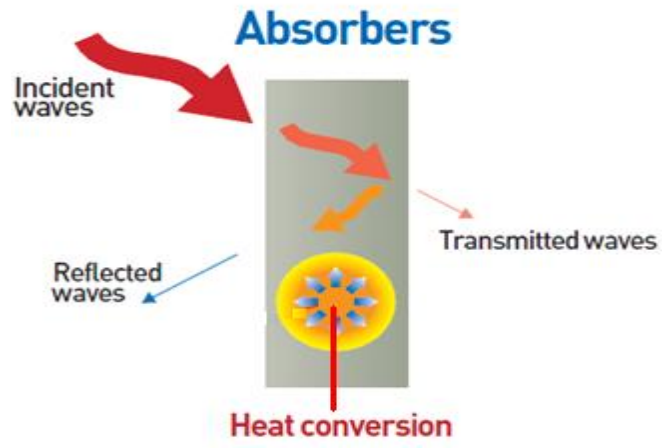
3-1. EMI Absorbers

EMI Absorber sheets absorb electromagnetic waves by changing them into heat with a magnetic domain.



Applications

Electromagnetic Waves



Absorber Sheet

- ▶ NS-S ▶ NS-K
- ▶ NS-B ▶ NS-L
- ▶ NS-H ▶ NS-HD

- Mobile phone
- Digital camera
- Camcorder
- Note Book PC
- LCD TV

Absorber Film

- ▶ NS-F
- ▶ NS-FK
- ▶ NS-FA

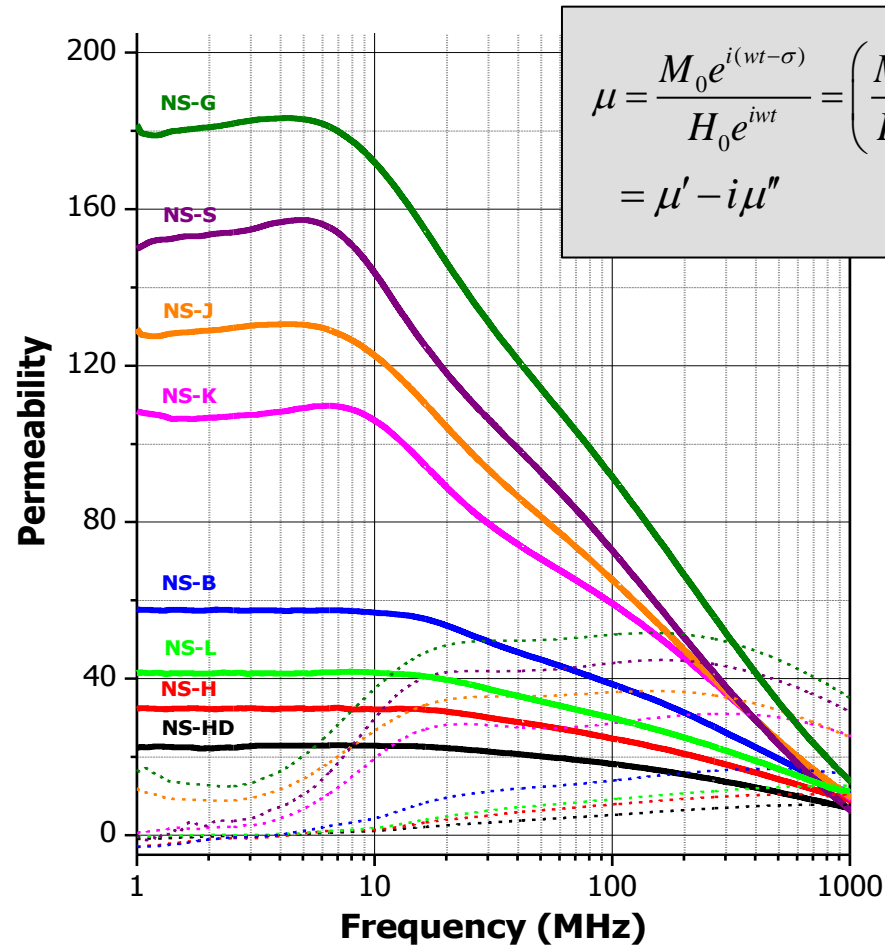
- High Frequency signal cable
- Flexible PCB
- Mobile / SMART Phone

WPC/NFC

- ▶ NS-RF50 / RF25

- RFID metal tag antenna for 13.56 MHz (Between antenna and metal)
- Wireless Charger

3-2. EMI Absorbers



$$\mu = \frac{M_0 e^{i(\omega t - \sigma)}}{H_0 e^{i\omega t}} = \left(\frac{M_0}{H_0} \right) e^{-i\sigma}$$

$$= \mu' - i\mu''$$

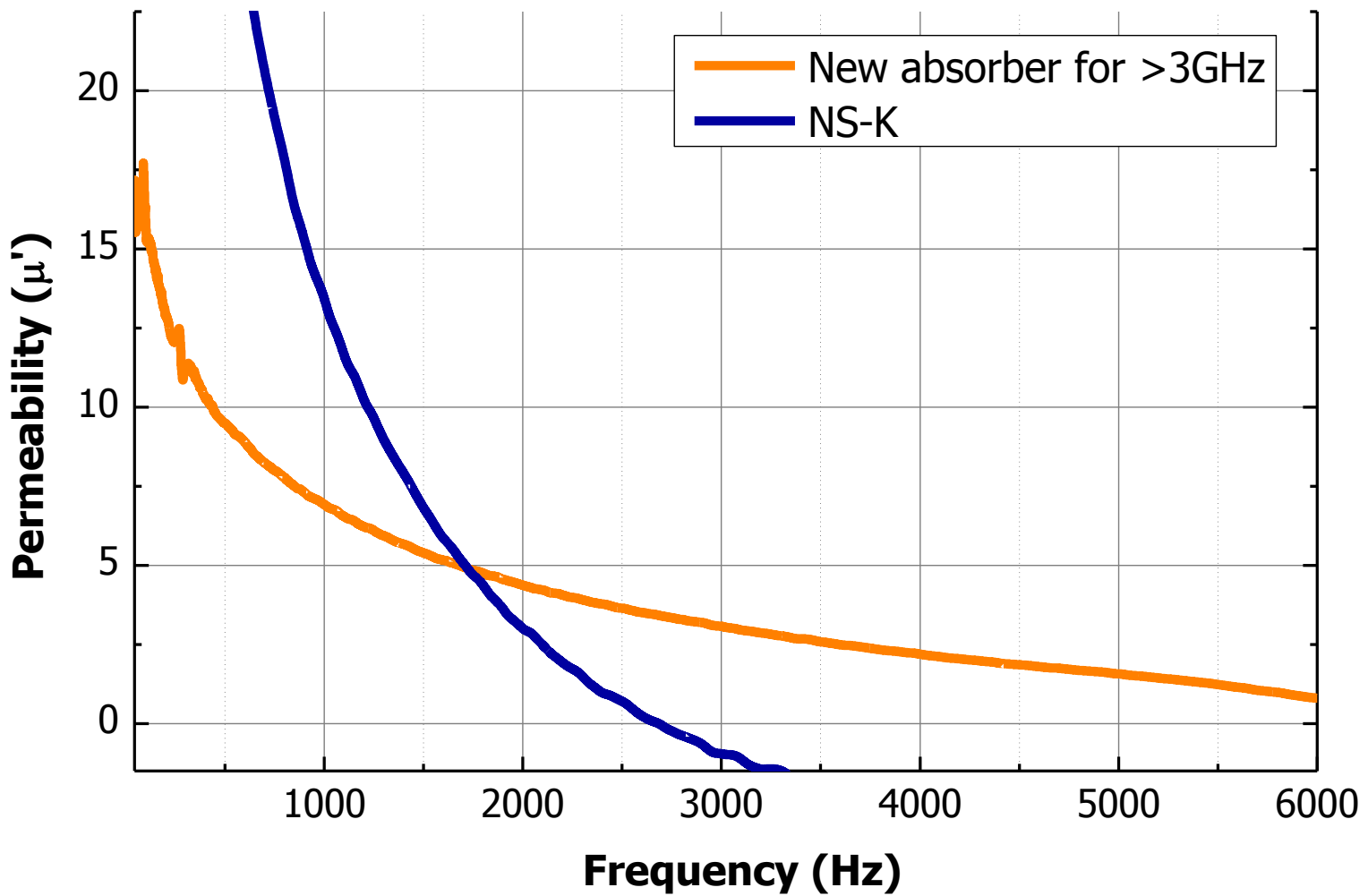
Performance $\propto \mu' \times d$

- μ' Magnetic Permeability
- d Thickness



Higher μ'
 → Thinner EMI Absorbers

3-3. EMI Absorbers Over 3GHz



3-4. EMI Absorber sheets

Type	NS - HD	NS - H	NS - L	NS - B	NS - K	NS - J	NS - S	NS - G
Permeability (at 3MHz)	25	30	45	70	100	130	150	180
Applicable Frequency	500MHz ~ 6GHz		300MHz ~ 6GHz	100MHz ~ 6GHz		100MHz ~ 6GHz		
Use Temp (°C)	-25 ~ +105							
Standard Thickness (mm)	0.05 ~ 0.1							
Standard Size	210mm x 297mm, roll type available							
Volume Resistivity (Ω • cm)	1 x 10 ⁸							
Remarks	High Freq. Halogen Free available.		←—————→				Low Freq.	

3-5. Roll type High Performance products



NS-KxxxTHF

NS-JxxxTHF

$\mu' = 100$

$\mu' = 130$

Thickness: 0.02, 0.03, 0.05mm

Width: 300mm

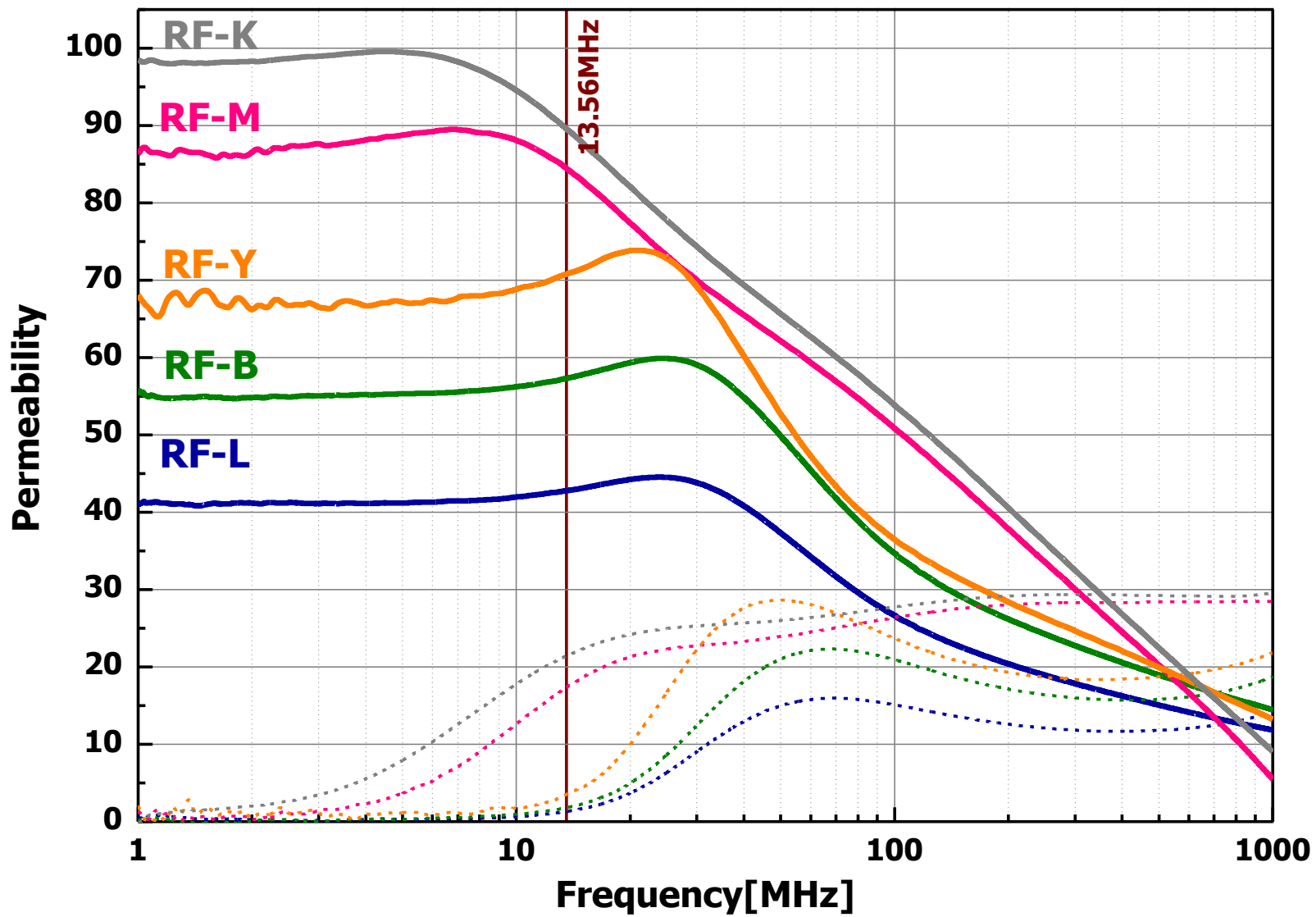
Length: up to 200m

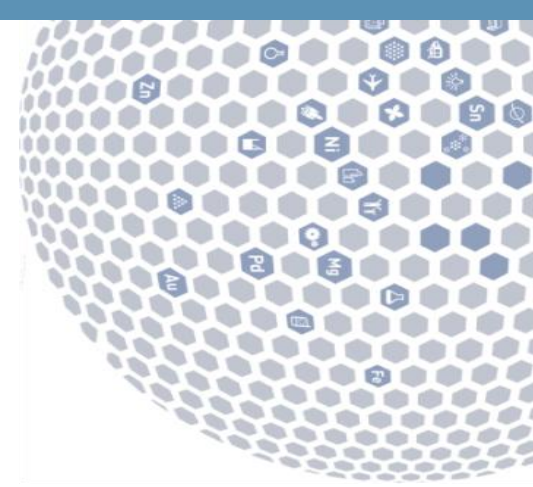
Minimum Thickness : 20 μ m

3-6. RF Induction Sheets

Grade	Permeability (@13.56MHz)		Thickness (mm)	Standard size (mm)	Applications	
	μ'	μ''			NFC	WPC
RF-K	100	17-25	0.15-1.0	210x297		◎
RF-M	85	15-20	0.15-1.0	210x297		◎
RF-Y	70	2.0-3.0	0.05-1.0	210x297	○	◎
RF-B	55	1.0-2.0	0.05-1.0	210x297	◎	○
RF-L	43	1.0-2.0	0.15-1.0	210x297	○	○

3-7. RF Induction Sheets



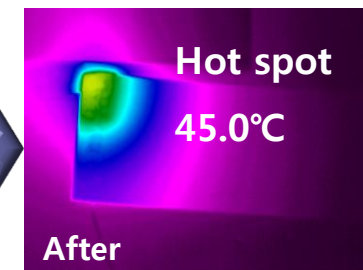
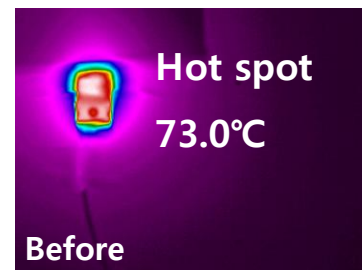
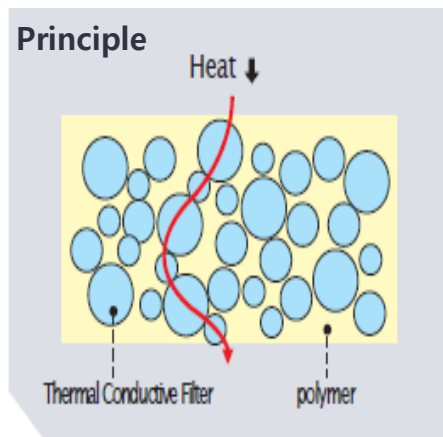


Thermal Interface Materials

4-1. Thermal Interface Materials

TIM Sheets are manufactured with high thermal conductive functional fillers (dispersed evenly in high temperature heat resisting resin).

They are widely used in electronic products and to solve a variety of heat related problems in the electric industry.



■ Applications

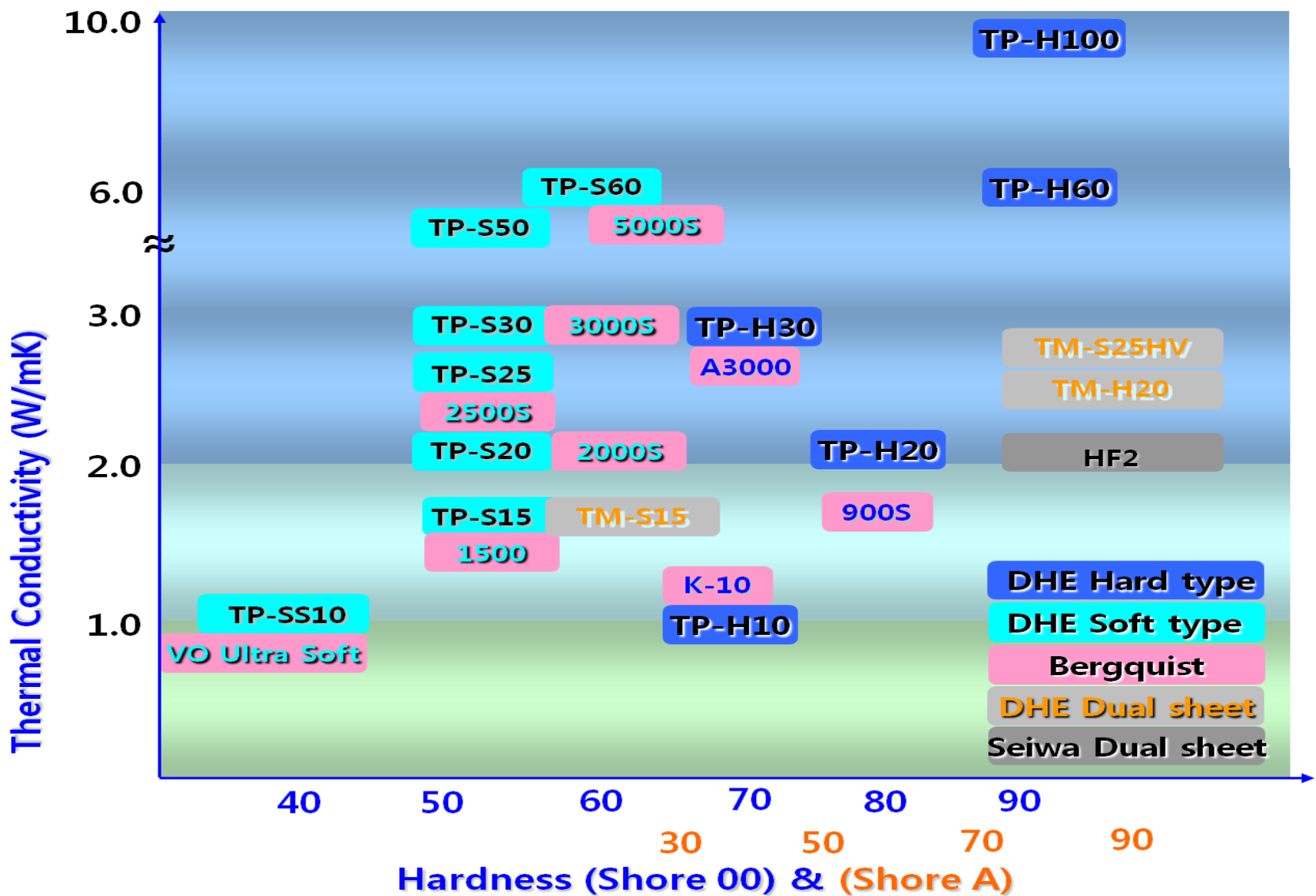


- Computers
- Mobile Phones
- Displays , LCDs, LEDs





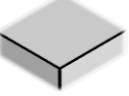


- Electronic Home Appliances
- Communication Devices
- Automobiles





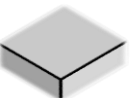
4-2. Thermal Interface Materials








4-3. Soft Types

	Standard Size (mm x mm)	Thickness (mm)	Hardness (Asker C/Shore 00)	Thermal Conductivity (W/mK)	Tensile Strength (MPa)	Breakdown Voltage (kV)	Volume Resistivity (Ω -cm)	Flame Rating (UL94)
TP-S10	 210 x 297 or 300 x 300	0.2 ~ 5.0	25 / 55	1.0	> 0.2	> 5	> 10^{13}	V-0
TP-S15	 210 x 297 or 300 x 300	0.2 ~ 5.0	25 / 55	1.5	> 0.2	> 5	> 10^{13}	V-0
TP-S20	 210 x 297 or 300 x 300	0.2 ~ 5.0	25 / 55	2.0	> 0.2	> 5	> 10^{13}	V-0
TP-S25	 210 x 297 or 300 x 300	0.3 ~ 5.0	25 / 55	2.5	> 0.2	> 5	> 10^{13}	V-0
TP-S30	 210 x 297 or 300 x 300	0.3 ~ 5.0	25 / 55	3.0	> 0.2	> 5	> 10^{13}	V-0

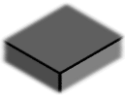

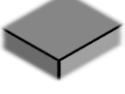

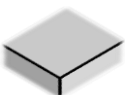
4-4. Super Soft Types

	Standard Size (mm x mm)	Thickness (mm)	Hardness (Asker C/Shore 00)	Thermal Conductivity (W/mK)	Tensile Strength (MPa)	Breakdown Voltage (kV)	Volume Resistivity (Ω -cm)	Flame Rating (UL94)
TP-SS10	 210 x 297 or 300 x 300	0.2 ~ 5.0	15 / 30	1.0	> 0.1	> 5	> 10^{13}	V-0
TP-SS15	 210 x 297 or 300 x 300	0.2 ~ 5.0	15 / 30	1.5	> 0.1	> 5	> 10^{13}	V-0
TP-SS20	 210 x 297 or 300 x 300	0.2 ~ 5.0	15 / 30	2.0	> 0.1	> 5	> 10^{13}	V-0
TP-SS25	 210 x 297 or 300 x 300	0.3 ~ 5.0	15 / 30	2.5	> 0.1	> 5	> 10^{13}	V-0
TP-SS30	 210 x 297 or 300 x 300	0.3 ~ 5.0	15 / 30	3.0	> 0.1	> 5	> 10^{13}	V-0




4-5. Hard Types

	Standard Size (mm x mm)	Thickness (mm)	Hardness (Shore A)	Thermal Conductivity (W/mK)	Tensile Strength (MPa)	Breakdown Voltage (kV)	Volume Resistivity (Ω -cm)	Flame Rating (UL94)
TP-H10	 210 x 297 or 300 x 300	0.2 ~ 3.0	40	1.0	> 1.0	> 5	> 10^{13}	V-0
TP-H15	 210 x 297 or 300 x 300	0.2 ~ 3.0	50	1.5	> 2.0	> 5	> 10^{13}	V-0
TP-H20	 210 x 297 or 300 x 300	0.2 ~ 3.0	55	2.0	> 1.5	> 5	> 10^{13}	V-0
TP-H25	 210 x 297 or 300 x 300	0.2 ~ 3.0	55	2.5	> 1.0	> 5	> 10^{13}	V-0
TP-H30	 210 x 297 or 300 x 300	0.2 ~ 3.0	40	3.0	> 0.5	> 5	> 10^{13}	V-0


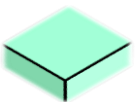

4-6. Reinforced Types

	Standard Size (mm x mm)	Thickness (mm)	Hardness (Asker C)	Thermal Conductivity (W/mK)	Tensile Strength (MPa)	Breakdown Voltage (kV)	Volume Resistivity (Ω -cm)	Flame Rating (UL94)
TP-HG10 	210 x 297 or 300 x 300	0.3 ~ 3.0	85	1.0	> 10	> 5	> 10^{13}	V-0
TP-HG15 								
TP-SG20 	210 x 297 or 300 x 300	0.3 ~ 3.0	60	2.0	> 4.0	> 5	> 10^{13}	V-0
TP-SG25 								
TP-SG30 	210 x 297 or 300 x 300	0.3 ~ 3.0	65	3.0	> 4.0	> 5	> 10^{13}	V-0



4-7. Dual Types

	Standard Size (mm x mm)	Thickness (mm)	Hardness	Thermal Conductivity (W/mK)	Tensile Strength (MPa)	Breakdown Voltage (kV)	Volume Resistivity (Ω -cm)	Flame Rating (UL94)
TM-H20	 210 x 297 or 300 x 300	0.2 ~ 1.0	90 (Shore A)	2.0	> 0.2	> 0.25	> 10^9	V-0
TM-S15	 210 x 297 or 300 x 300	0.5 ~ 3.0	25 (Asker C)	1.5	> 0.2	> 0.25	> 10^{10}	V-0
TM-S25HV	 210 x 297 or 300 x 300	0.5 ~ 3.0	25 (Asker C)	2.5	> 0.2	> 3.0	> 10^{12}	V-0

4-8. High Conductive Types

	Standard Size (mm x mm)	Thickness (mm)	Hardness	Thermal Conductivity (W/mK)	Tensile Strength (MPa)	Breakdown Voltage (kV)	Volume Resistivity (Ω -cm)	Flame Rating (UL94)
TP-H60	210 x 297 or 300 x 300	0.1 ~ 0.3	90 (Shore A)	6.0	> 2.0	> 5	> 10^{13}	-
 (Urethane)								
TP-S50	210 x 297 or 300 x 300	1.0 ~ 3.0	35 (Asker C)	5.0	> 0.2	> 5	> 10^{13}	V-0
 (Silicone)								
TP-S60	210 x 297 or 300 x 300	1.0 ~ 3.0	35 (Asker C)	6.0	> 0.2	> 5	> 10^{13}	V-0
 (Silicone)								

4-9. Molding Compound Types

	A/B Mixing Ratio (wt%)	Viscosity (cp)	Density (g/cm ³)	Hardness (Asker C)	Thermal Conductivity (W/mK)	Breakdown Voltage (kV)	Volume Resistivity (Ω·cm)	Flame Rating (UL94)	Cure Condition (°C/min)
1W/mK Type	100 : 100	9,000	1.68	50	1.0	> 5	> 10 ¹³	V-0	120 / 30
 (2-Component)									
2W/mK Type	100 : 100	2,6000	2.65	50	2.0	> 5	> 10 ¹³	V-0	120 / 30
 (2-Component)									

4-10. Thermal Adhesive Tapes

4) Thermal Adhesive Tapes

T-Gums (P Series) are insulating adhesive materials for MCCL, and are used in applications that require high heat dissipating characteristics such as LED lights.



Metal-PCB



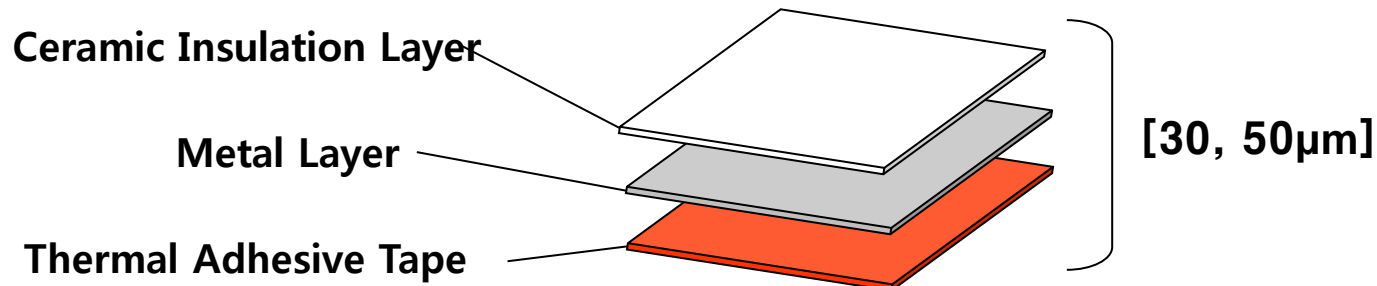
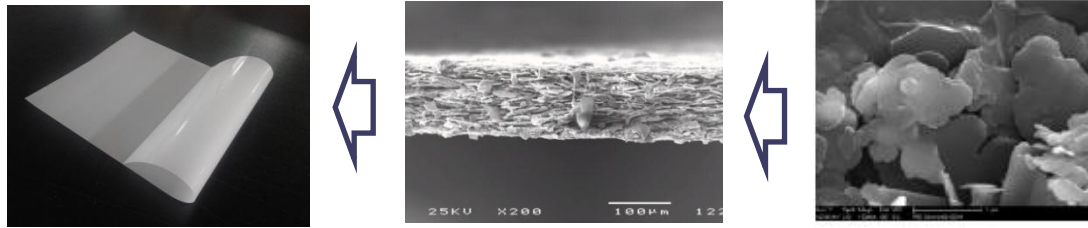
LED Lights



LED Bar


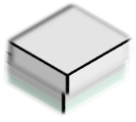
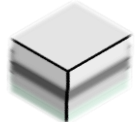
Item	TA-2510
Thermal Conductivity (W/mK)	2.5
Thickness (μm)	85 \pm 5

4-11. Heat Spreading Sheets



- Horizontally Heat Spread = Ceramic Insulation layer + Metal Layer + Thermal Adhesive Tape
- EMI Shielding = Metal Layer + Thermal Adhesive Tape

4-12. Heat Spreading Sheets

	Standard Size (mm x mm)	Thickness (mm)	Adhesion Strength (gf/inch)	Vertical Resistivity (Ω)	Thermal Conductivity (W/mK)		Flame Rating (UL94)
					In-plane	Through-plane	
TS-C030A	 200 x 600	0.03	> 1,000	> 10^9	200	2.0	V-0
TS-C050A	 200 x 600	0.05	> 1,000	> 10^9	250	2.3	V-0
TS-G050A	 200 x 600	0.05	> 1,000	> 10^9	700	2.5	V-0

5. R & D CENTER

• Established	October 31, 2008
• Personnel	25 (2 Ph.Ds, 15 Master's)
• Patents	Registered : 6 patents are on process, 5 domestic patents, 2 overseas patents

R&D Field	Applications
• Magnetic Fillers	• Fillers for EMI Absorbers • Multi Functional Fillers
• EMI Absorbers	• Electronic Noise Absorbers • Magnetic Shielding Sheets • Absorbers for RFID
• TIM	• Thermal Conductive Sheets • Thermal Adhesives • Adhesive Insulating Films for PCB for LED
• Dual Sheets	• EMI Absorbers + Thermal Conductive Sheets • Multi Layer Heat Spreaders
• EMI Shielding Materials	• Shielding Gaskets • Shielding Fibers and Papers • Shielding Tapes

R & D Equipment

Metal Powders



- Laser Particle Size Analyzer
- FSSS
- Tap Denser
- Flow Meter
- Furnace
- Pearl Mills
- Attrition Mills
- Micro Sieve
- Vacuum Oven
- Polishing & Mounting Machine

EMC Solutions



- B-H Analyzer
- VSM
- AC Loop Tracer
- Flux meter
- Gauss meter
- Impedance Analyzer
- Network Analyzer
- Electronic Load
- DC Bias Tester
- Core Loss Tester
- LCR Meter
- Contact Resistance Tester
- Tubular Mixer
- Press
- Spectrum Analyzer

TIM



- Thermal Conductivity Analyzer
- Constant Temp. Chamber
- Data Logger
- Withstand Voltage Tester
- Viscometer
- Rubber Hardness Tester
- Probe Tack Tester
- Ball Tack Tester
- Hot Press
- Tape Coater

Fundamentals



- SEM
- Optical Microscope
- Universal Testing Machine(UTM)
- Atomic Absorption Spectrophotometer
- Video Microscope IT System
- Kneader
- Constant Humid. & Temp. Chamber
- Thermal Shock Tester
- HAST Chamber
- Flame Retardant Tester



Thank You