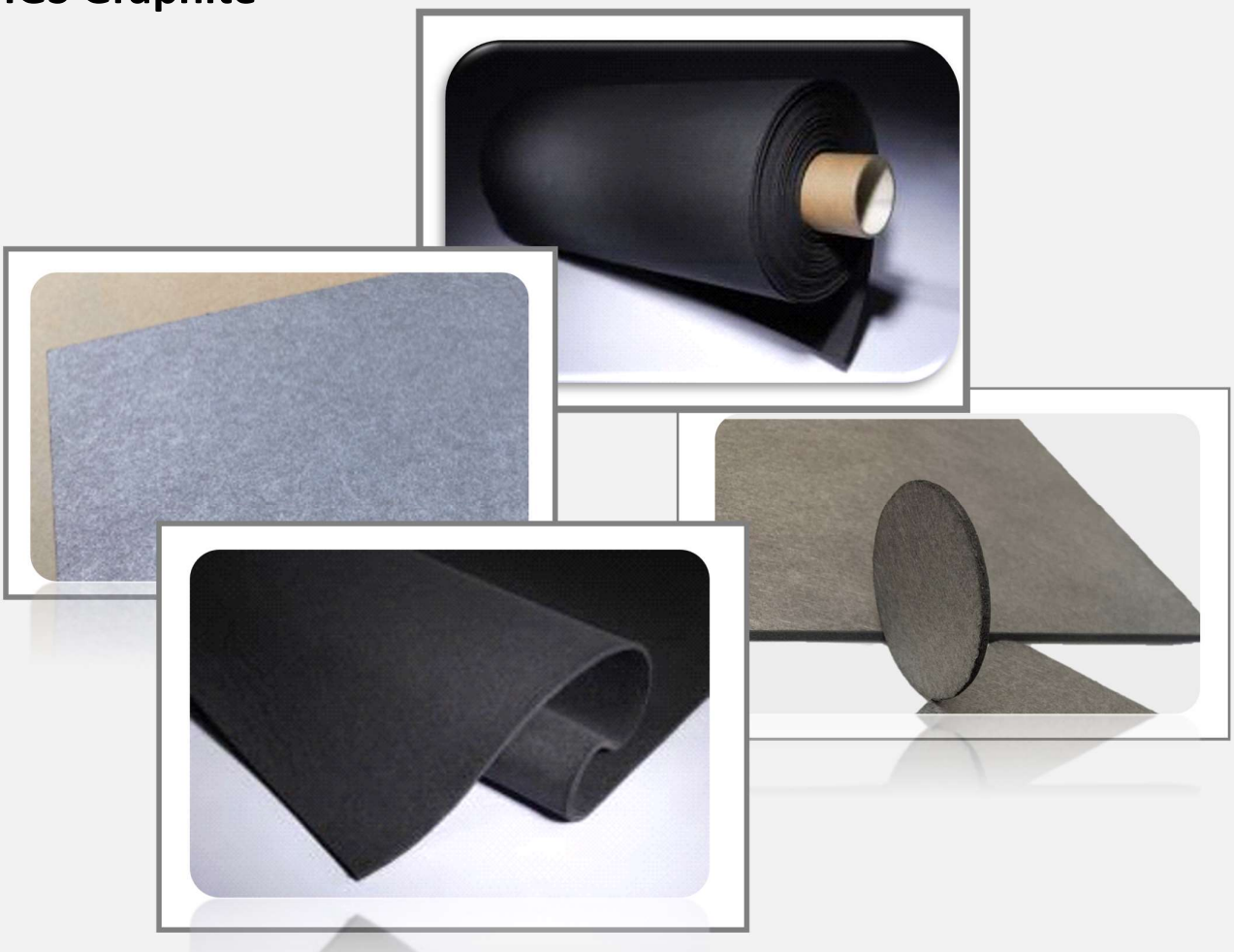
CeTech Co., Ltd.
Products Technology Data

CeTech Co, Ltd.

- Carbon Cloth
- Carbon Paper
- Carbon Plate
- Titanium Fiber Paper
- Nickel Fiber Paper
- Graphite Felt
- IGS Graphite



http://www.ce-tech.com.tw

CeTech Co, Ltd.

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Carbon Cloth

Gas Diffusion Layer for Fuel Cells

Product Feature:

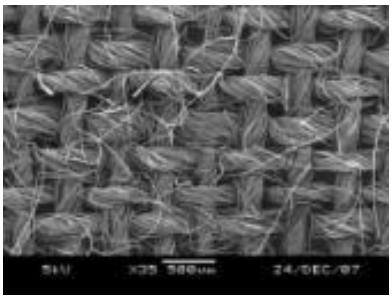
1. Offer many types of GDLs for different operating conditions
2. GDL can be customized for specific operating conditions

Products Technology Data

Properties	Unit	Carbon Cloth		
		W0S1001	W0S1011	W1S1011
SUBSTRATE (WITH OUT PTFE+MPL)		v	v	
MICROPOROUS LAYER (WITH PTFE+MPL)				v
Thickness (SM-114)	mm	0.3	0.36	0.41
Basic Weight (ASTM D-646)	g/m^2	110	130	200
Air Permeability (Gurley)	sec	<10	<10	<55
Through-Plane Resistance (ASTM C-611)	$m\Omega cm^2$	<5	<5	<13
Tensile Strength(MD) ASTM D-828	N/cm	8	10	10
Tensile Strength(XD) ASTM D-828	N/cm	4	5	5
Roll to Roll		v	v	v

* All data are the average values that do not represent specifications and tolerance.

Carbon Cloth SEM Images



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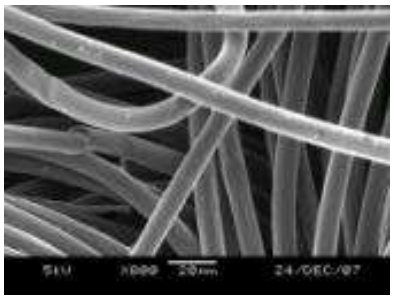

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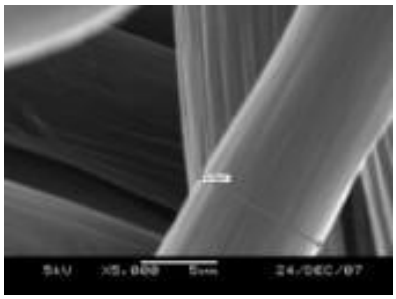
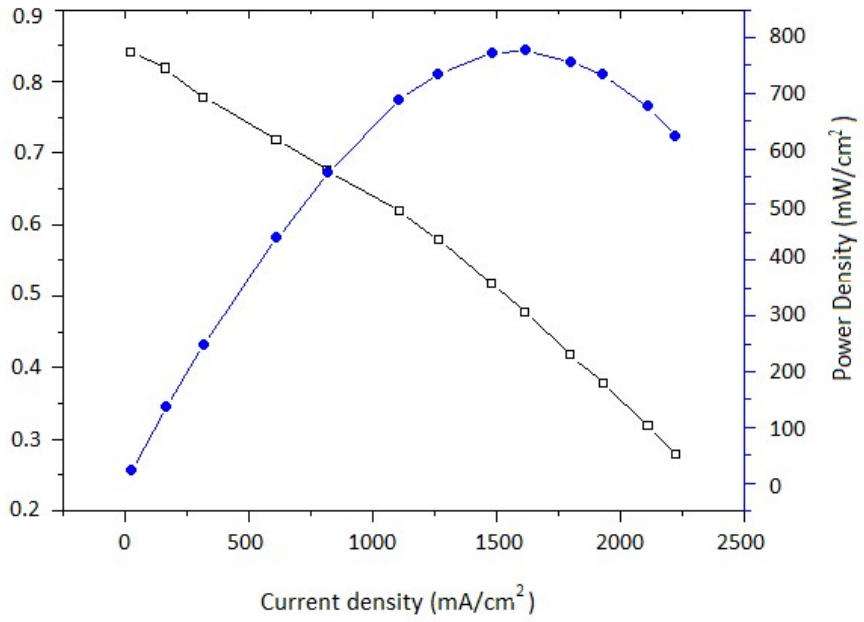


Magnification 5000 Times with Fiber Diameter

Carbon Cloth

Carbon Cloth W1S1011 Electrochemical Performance

Test Equipment FCED® PD50 / Asia Pacific Fuel Cell Technologies, Ltd.			
Reaction Area	25 cm^2	Fuel Supply Method	Constant Flow
Type of Anode Fuel	H_2	Type of Cathode Fuel	Air
Anode Gas Flow	1.5 slpm	Cathode Gas Flow	2.5 slpm
Anode Humidification Temperature	65℃	Cathode Humidification Temperature	65℃
Relative Humidity	0.9	Torque	25 kgf cm
Battery Temperature	60℃	Back Pressure	Non
Bipolar Plate	gate-type	Gasket(@50Kpa)	260 microns
CCM	Catalyst loading:An/Ca 0.1/0.3 mg/cm2 。		
GDL	W1S1011		



* All data are the average values that do not represent specifications and tolerance.

Applications

1. PEMFC / PAFC / DMFC fuel cell gas diffusion layer
2. Electrode for hydrogen generator/water electrolysis machine

Carbon Paper

Gas Diffusion Layer & Electrode for Fuel Cells

Product Feature:

1. Offer many types of GDLs for different operation conditions
2. GDL can be customized for specific operating conditions

Carbon Paper without MPL + PTFE Technology Data

Properties	Unit	Carbon Paper without MPL + PTFE			
		GDS180S	GDS210	GDS250	GDS310S
Thickness (SM-114)	mm	0.18	0.21	0.25	0.31
Basic Weight (ASTM D-646)	g/m^2	50	50	65	80
Air Permeability (Gurley)	sec	<10	<10	<10	<10
Through-Plane Resistance (ASTM C-611)	$m\Omega cm^2$	<7	<6	<6	<5
Tensile Strength(MD) ASTM D-828	N/cm	25	24	24	20
Tensile Strength(XD) ASTM D-828	N/cm	18	20	22	10
Porosity (Mercury Intrusion Porosimeters)	%	77		77	77
Custom 10WT% PTFE (Optional)		v	v	v	v
Roll to Roll		-	v	v	v

* All data are the average values that do not represent specifications and tolerance.

Carbon Paper

Gas Diffusion Layer & Electrode for Fuel Cells

Carbon Paper with MPL + PTFE Technology Data

Properties	Unit	Carbon Paper (with MPL + PTFE)			
		GDL210S	GDL240	GDL280	GDL340
Thickness (SM-114)	mm	0.21	0.24	0.28	0.34
Basic Weight (ASTM D-646)	g/m^2	85	90	100	125
Air Permeability (Gurley)	sec	<225	<85	<200	<200
Through-Plane Resistance (ASTM C-611)	$m\Omega cm^2$	<15	<15	<10	<10
Tensile Strength (MD) ASTM D-828	N/cm	35	30	37	45
Tensile Strength (XD) ASTM D-828	N/cm	17	18	33	36
Voltage Loss (@500mA/cm2 & 20N/cm2)	Mv	-	-	-	-
Roll to Roll			v	v	v

* All data are the average values that do not represent specifications and tolerance.

Carbon Paper

Gas Diffusion Layer & Electrode for Fuel Cells

Carbon Paper with High Heat Treatment

Properties	Unit	without MPL + PTFE		with MPL + PTFE	
		GDS090S	GDS180SHT	GDL120S	GDL210SHT
Thickness (SM-114)	mm	0.09	0.18	0.12	0.21
Basic Weight (ASTM D-646)	g/m^2	55	50	80	85
Air Permeability (Gurley)	sec	<50	<10	<100	<225
Through-Plane Resistance[1]	$m\Omega cm^2$	<6	<5	<15	<10
Tensile Strength (MD) ASTM D-828	N/cm	15	25	20	35
Tensile Strength (XD) ASTM D-828	N/cm	10	10	15	17
Voltage Loss (@500mA/cm2 & 20N/cm2)	Mv	<7	-	<10	-
Porosity (Mercury Intrusion Porosimeters)	%	68	77	-	-

[1] Through-Plane Resistance (mΩcm2) Four Point measurement, copper plate contact under 200psi, testing area 19.6cm2

Carbon Paper

Gas Diffusion Layer & Electrode for Fuel Cells

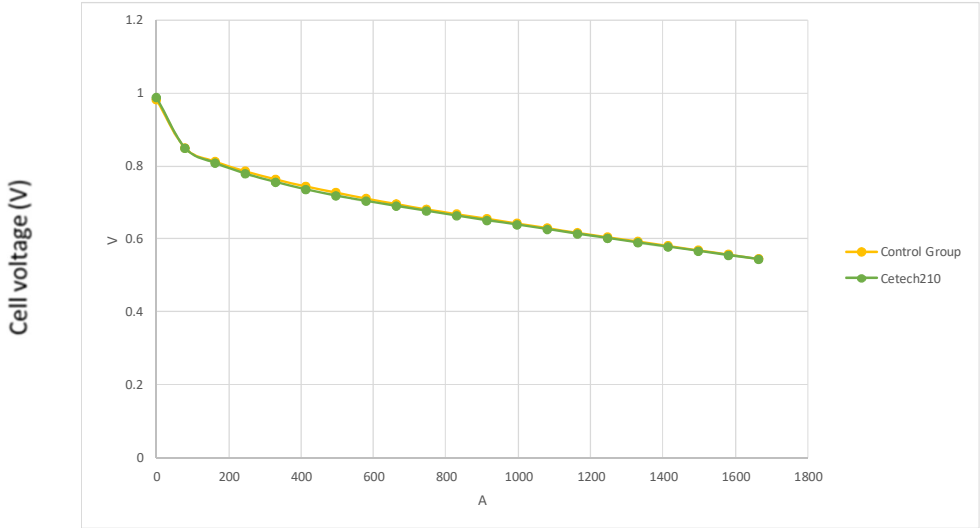
Selections of GDL's in PEMFC/DMFC

Product	Stationary	Light Vehicle	High Humidity	Low Humidity
GDL280	v		v	
GDL340				v

Carbon Paper Electrochemical Performance

GDL210SHT

Reaction Area	300 c ㎡	Fuel Supply Method	Constant Flow
Type of Anode Fuel	H_2	Type of Cathode Fuel	Air
Relative Humidity	1	Back Pressure	Non
Battery Temperature	60℃	---	
GDL	GDL210SHT，Control Group		



Current density (Ma/cm2)

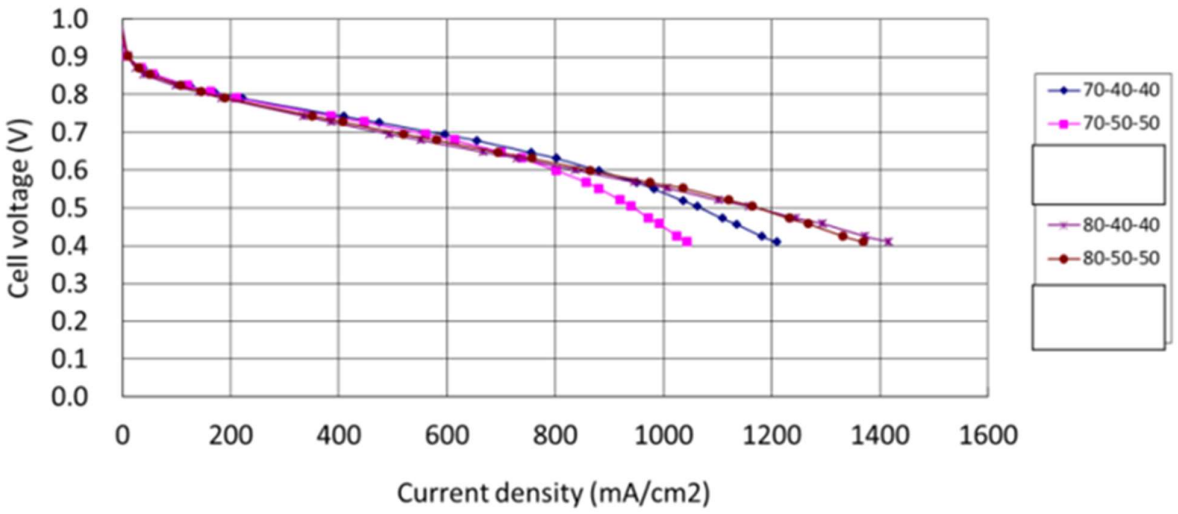
* All data are the average values that do not represent specifications and tolerance.

Carbon Paper

Gas Diffusion Layer & Electrode for Fuel Cells

Polarization Curves of MEA at Various Test Conditions: GDL120

GDL	GDL120	
Cell Temp (℃)	Anode	Cathode
70	H2, 1.2 stoic, dew point 40℃, ambient pressure	air, 2.4 stoic, dew point 40℃, ambient pressure
70	H2, 1.2 stoic, dew point 50℃, ambient pressure	air, 2.4 stoic, dew point 50℃, ambient pressure
80	H2, 1.2 stoic, dew point 40℃, ambient pressure	air, 2.4 stoic, dew point 40℃, ambient pressure
80	H2, 1.2 stoic, dew point 50℃, ambient pressure	air, 2.4 stoic, dew point 50℃, ambient pressure



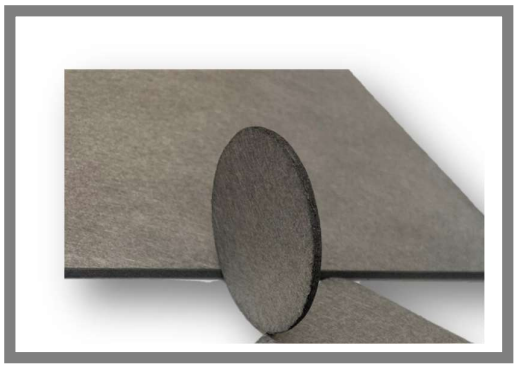
* All data are the average values that do not represent specifications and

- CCM lot: 0000619070
- GDL PN: GD120
- LN: 200121
- an/ca = H2, 1.2 stoic / air, 2.4 stoic
- GDL Compression: 16.7%

Carbon Plate

Product Feature:

1. Excellent Chemical Stability
2. Good for Electrolyzers
3. Available for custom the carbon plate's sheet size & thickness



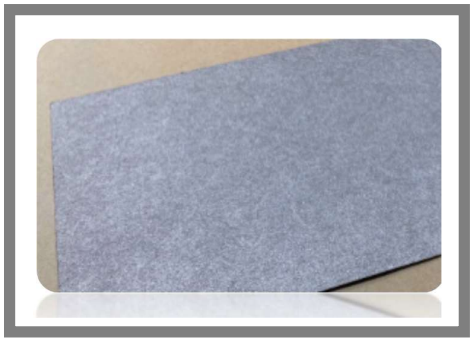
Carbon Plate Technology Date

Properties	Unit	Carbon Plate without MPL + PTFE		
		GPP140	GPP035	GPP043
Thickness ASTM D645 @50kpa	mm	1.4	0.35	0.43
Basic Weight (ASTM D-646)	g/m^2	N/A	200	240
Density	g/m^3	N/A	0.49	0.56
Voltage Loss (@500mA/cm^2 & 20N/cm^2)	m V	<9	<9	<9
Through-Plane Resistance *[12]	$m\Omega cm^2$	<15	<9	<9
Size (Sheet Only) Ruler	mm	400*400	400*400	400*400

* All data are the average values that do not represent specifications and tolerance.

[2] Through-Plane Resistance (mΩcm2) Four Point measurement, copper plate contact under 200psi, testing area 19.6cm2

Titanium Fiber Paper



Product Features:

1. Low resistance
2. Incompressible
3. Hydrogen generator applicable

Titanium Fiber PaperTechnology Data

Properties	Unit	TiP025L	TiP040L	TiP060L	TiP080L
Thickness	mm	0.25	0.40	0.60	0.80
Porosity	%	45% ~ 60%	45%~ 60%	45% ~ 60%	45% ~ 60%

* All data are the average values that do not represent specifications and tolerance.

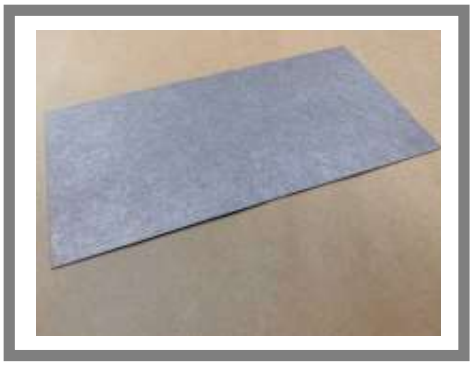
Properties	Unit	TiP025H	TiP040H	TiP060H	TiP080H
Thickness	mm	0.25	0.40	0.60	0.80
Porosity	%	60% ~75 %	60% ~75 %	60% ~75 %	60% ~75 %

* All data are the average values that do not represent specifications and tolerance.

Specifications of Titanium Fiber Paper:

1. **High Porosity: 60%-75%**
   A. Thickness: 0.25/ 0.40/ 0.60/ 0.80 mm
   B. Dimensions: 20x20 cm
2. **Low Porosity: 45%-60%**
   A. Thickness: 0.25/ 0.40/ 0.60/ 0.80 mm
   B. Dimensions: 20x20 cm

Nickel Fiber Paper



Product Features:

1. Excellent Chemical Stability
2. High surface area
3. Improve electrochemical reactions

Nickel Fiber Paper Technology Data

Properties	Unit	NiP040	NiP060
Thickness	mm	0.40	0.60
Porosity	%	65%-85%	65%-85%

* All data are the average values that do not represent specifications and tolerance.

Specifications of Nickel Fiber Paper:

1. Porosity: 65%-85%
2. Dimensions: 20x20 cm
3. Hi-tech product with metals characteristics, electric and heat conductivity, high strength, corrosion, and high-temperature resistance

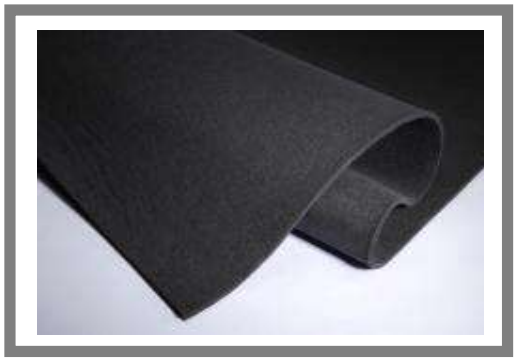
Applications: As a Gas Diffusion Layer (GDL)

1. Proton Exchange Membrane Fuel Cells (PEMFC)
2. Solid Oxide Fuel Cells (SOFCs)
3. Redox Flow Batteries
4. Electrolyzers
5. Water Treatment System

Graphite Felt

Product Feature:

1. Excellent Chemical Stability
2. Good Electrical Conductivity
3. Long Life Cycle



Graphite Felt Technology Data

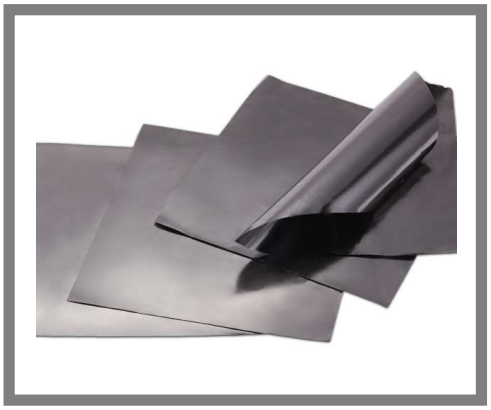
Properties	Unit	Graphite Felt			
		GF100	GF065	GF020	GF030
Thickness	mm	10	6.0 ~ 8.0	1.5~3.5	2.0~4.0
Basic Weight	g/m^2	500~800	590	---	---
Carbon Content	%	98	98	98	98
Ash Content	%	<0.2	<0.09	---	---
Thermal Conductivity @1500°C	W/mK	0.1	0.1	---	---
Tensile Strength	MPa	0.2	0.12	---	---
Voltage Loss (@500mA/cm2 & 20N/cm2)	---	---	---	35	35

* All data are the average values that do not represent specifications and tolerance.

Applications

1. Electrode for Vanadium Redox Flow Batteries (VRBs)
2. Thermal insulation materials for vacuum burn-out furnace, powder metallurgy equipment, or heat treatment furnaces above 2000 degrees
3. Electrode materials for water purification equipment

iGS Graphite



Application:

1. Smart Phone
2. Tablet PC
3. Ultra book
4. Digital Camera; Camcorder

IGS GraphiteTechnology Data

Properties	Unit	iGS Graphite Sheet	
		iGS025	iGS040
Thickness Micrometer	mm	0.025	0.04
Thermal Conductivity (x, y) Angstrom Method	W/mk	1500	1250
Thermal Conductivity (z) Laser Flash	W/mk	10	10
Thermal Diffusivity Angstrom Method	cm^2/s	7.5	7.5
Density Archimedes Law	g/cm^3	2.1	1.8
Specific Heat DSC	J/g K	0.94	0.94
Extensional Strength (x, y) ASTM D882	Mpa	30	15
Bending Test MIT(R5/180°)	Frequency	>10000	>10000
Electric Conductivity JIS K7194	S/cm	>13000	>13000
Temperature Condition Thermometer	^oC	-40 ~ 400	-40 ~ 400
Size (Sheet type only) Ruer	mm	220X220 220X260	220X260

* All data are the average values that do not represent specifications and tolerance.

Product Feature

1. Excellent thermal conductivity enables higher heat flow and higher computing speed
2. Light weighted: Only 1/4 of copper and 1/2 of aluminum
3. Flexible as paper and can be bent in three-dimensional design
4. With low thermal conductivity in the z-direction, iGS can keep hot spots on one side and maintain its x-y-direction conductivity at the same time
5. Can survive in extreme environment

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