ISSUED : January 16th. 2006. Version 7

FUJIPOLY®

SARCON®GR-b Series.

High Heat Conductive Flame Retardant High Performance Silicone Gap Filler Pad.

FUJIPOLY DATA SHEET NUMBER FPDS 99-23 / Version 7

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FUJIPOLY® DATA SHEET FPDS 99-23 (Version 7)

1] Product Name :

Sarcon® GR-b material (Gap Filler pads.)

2] Features. :

Sarcon® GR-b is a highly conformable, thermally conductive material in areas where space between surfaces is uneven and surface textures vary. Sarcon® GR-b material conforms to irregular surfaces and fills air gaps.

Applications include.

1) Between a chassis wall and other surface.
2) Between a "CPU" and heat sinks.
3) Between a semiconductors and heat sinks.
4) Areas where heat needs to be transferred to some type of heat spreader.

3] Variety of Sarcon® GR-b products.

Table - 1

Series	Construction	Application Guidelines
Sarcon® GR-b	Silicone compound	Between a chassis wall and other surface. Between CPU and heat sink. Between a semiconductor and heat sink.
Sarcon® GR-Hb	Silicone compound with hardened top surface	Same as above, except hardened top surface facilitates handling and installation during complex assemblies.
Sarcon® GR-Fb	Silicone compound with mesh embedded overall	Same as Sarcon GR-b, except nylon mesh reinforcement prevents stretching.
Sarcon® GR-HFb	Silicone compound with hardened top surface and mesh embedded overall	Same as Sarcon GR-b, except hardened top surface facilitates handling and installation during complex assemblies; nylon mesh reinforcement prevents stretching.

*Available in thicknesses for 0.50mm (0.020") to 3.00mm(0.118").
*Can be designed for custom applications.
*Flame retardant silicone polymer filled with an special organic substance.

4] Types and Configuration.

Table - 2

Series	Product Description	Width x Length	Thickness
Sarcon® GR-b	Sarcon® **50G-b** Sarcon® **100G-b** Sarcon® **150G-b** Sarcon® **200G-b** Sarcon® **250G-b** Sarcon® **300G-b**	Usable size 280mm x 180mm (11" x 7.1") Actual size 300mm x 200mm (11.8" x 7.8")	0.5mm ± 0.1mm 1.0mm ± 0.2mm 1.5mm ± 0.2mm 2.0mm ± 0.3mm 2.5mm ± 0.3mm 3.0mm ± 0.3mm
Sarcon® GR-Hb	Sarcon® **50G-Hb** Sarcon® **100G-Hb** Sarcon® **150G-Hb** Sarcon® **200G-Hb** Sarcon® **250G-Hb** Sarcon® **300G-Hb**	Usable size 280mm x 180mm (11" x 7.1") Actual size 300mm x 200mm (11.8" x 7.8")	0.5mm ± 0.1mm 1.0mm ± 0.2mm 1.5mm ± 0.2mm 2.0mm ± 0.3mm 2.5mm ± 0.3mm 3.0mm ± 0.3mm
Sarcon® GR-Fb	Sarcon® **50G-Fb** Sarcon® **100G-Fb**	Usable size 280mm x 180mm (11" x 7.1") Actual size 300mm x 200mm (11.8" x 7.8")	0.5mm ± 0.1mm 1.0mm ± 0.2mm
Sarcon® GR-HFb	Sarcon® **50G-HFb** Sarcon® **100G-HFb**	Usable size 280mm x 180mm (11" x 7.1") Actual size 300mm x 200mm (11.8" x 7.8")	0.5mm ± 0.1mm 1.0mm ± 0.2mm

Notice.

1) Standard Product Form.

Sarcon GR-b® series is placed between PET (polyester) Film and special polyethylene Film, Kisscut into the required shape.

5] Typical Properties.

Table - 3

Property	Unit	GR-b	GR-Hb	GR-Fb	GR-HFb	Test Method	Specimen
Color	—	Gray	Gray	Gray	Gray	Visual	—
Operating Temp. range	˚C	−60 ~ +200	−60 ~ +200	−60 ~ +200	−60 ~ +200	—	—
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220 ASTM D-792	—
Hardness	ASKER-C (Shore 00)	18 (49)	18 (49)	18 (49)	18 (49)	JIS-K-7312 ASTM D-2240	B (—)
Tensile Strength	(MPa)	0.1	0.1	0.6	0.7	JIS-K-6251 (#2) ASTM D-412	A
Elongation	%	100	80	60	60	JIS-K-6251 (#2) ASTM D-412	A
Tear Resistance	(KN/m)	1	1	2	2	JIS-K-6252 (Angle) ASTM D-624	A
Volume Resistivity	(Mohms·m)	1 x 10^6	1 x 10^6	1 x 10^6	1 x 10^6	JIS-K-6249 ASTM D-257	C
Breakdown Voltage	(KV/mm)	12	11	11	11	JIS-K-6249 ASTM D-149	C
Withstand Voltage	(KV/mm)	8	8	7	7	JIS-K-6249 ASTM D-149	C

Remarks / Specimen A : 2.0mm Thickness.
Specimen B : 60mm Width x 120mm Length x 20mm Thickness.
Specimen C : 120mm Width x 120mm Length x 1.0mm Thickness.

6] Thermal Properties.

1) Thermal Resistance.

(Unit :˚C·inch^2/ watt) **Table - 4**

Thickness	GR-b	GR-Hb	GR-Fb	GR-HFb
0.5mm	0.50	0.55	0.50	0.65
1.0mm	0.83	0.92	0.93	1.07
1.5mm	1.19	1.30		
2.0mm	1.40	1.59		
2.5mm	1.80	2.07		
3.0mm	2.10	2.17		

Test Method : Fujipoly test methed FTM P-3020 which gives ASTM D5470 eguivalent value.

2) Thermal Conductivity.

Table - 5

	Unit	GR-b	GR-Hb	GR-Fb	GR-HFb
Thermal Conductivity	watt / m-k	2.30	2.30	2.30	2.30

Test Method : Fujipoly test method FTM P-1620 (JIS R2618 / ASTM D2326 equivalent)

7] Heat Aging Test.

1) **Test Condition** : 70˚C (158˚F) x 1,000hrs (42 days)

Sarcon® GR-b

Table - 6

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(20)	(22)	(24)	JIS-K-7312	B
Tensile Strength	(MPa)	0.1	0.2	0.2	0.2	JIS-K-6251 (#2)	A
Elongation	%	100	90	80	70	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	3.9 x 10^6	2.9 x 10^6	1.2 x 10^6	1.0 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	12	13	13	14	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-Hb

Table - 7

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(20)	(22)	(24)	JIS-K-7312	B
Tensile Strength	(MPa)	0.3	0.4	0.4	0.4	JIS-K-6251 (#2)	A
Elongation	%	80	70	70	60	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	2.5 x 10^6	2.8 x 10^6	1.8 x 10^6	3.3 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	15	16	18	19	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-Fb

Table - 8

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(20)	(20)	(20)	JIS-K-7312	B
Tensile Strength	(MPa)	0.6	0.6	0.6	0.6	JIS-K-6251 (#2)	A
Elongation	%	60	60	50	50	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	2	2	2	2	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	1 x 10^6	1 x 10^6	1 x 10^6	1 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	11	11	12	14	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-HFb

Table - 9

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(20)	(20)	(20)	JIS-K-7312	B
Tensile Strength	(MPa)	0.7	0.7	0.7	0.7	JIS-K-6251 (#2)	A
Elongation	%	60	60	60	50	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	2	2	2	2	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	1 x 10^6	1 x 10^6	1 x 10^6	1 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	11	11	12	12	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Remarks / Specimen A : 2.0mT
Specimen B : 60mm Width x 120mm Length x 20mm Thickness. (GR-b for all products)
Specimen C : 120mm Width x 120mm Length x 1.0mm Thickness.

2) **Test Condition** : 150˚C (302˚F) x 1,000hrs (42 days)

Sarcon® GR-b

Table - 10

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(20)	(22)	(24)	JIS-K-7312	B
Tensile Strength	(MPa)	0.1	0.2	0.2	0.2	JIS-K-6251 (#2)	A
Elongation	%	100	70	50	50	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	3.9 x 10^6	2.9 x 10^6	1.2 x 10^6	1.0 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	12	13	13	14	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-Hb

Table - 11

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(27)	(29)	(29)	JIS-K-7312	B
Tensile Strength	(MPa)	0.3	0.4	0.4	0.3	JIS-K-6251 (#2)	A
Elongation	%	80	50	50	50	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	2.5 x 10^6	2.7 x 10^6	2.0 x 10^6	2.2 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	15	19	21	22	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-Fb

Table - 12

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(24)	(26)	(27)	JIS-K-7312	B
Tensile Strength	(MPa)	0.6	0.6	0.7	0.7	JIS-K-6251 (#2)	A
Elongation	%	60	50	50	40	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	2	2	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	1 x 10^6	1 x 10^6	1 x 10^6	1 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	11	12	13	15	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-HFb

Table - 13

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(24)	(26)	(27)	JIS-K-7312	B
Tensile Strength	(MPa)	0.7	0.6	0.7	0.6	JIS-K-6251 (#2)	A
Elongation	%	60	50	50	40	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	2	2	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	1 x 10^6	1 x 10^6	1 x 10^6	1 x 10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	11	13	14	14	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Remarks / Specimen A : 2.0mT
Specimen B : 60mm Width x 120mm Length x 20mm Thickness. (GR-b for all products)
Specimen C : 120mm Width x 120mm Length x 1.0mm Thickness.

8] Humidity Test.

Test Condition : 60˚C (140˚F) x 1,000hrs(42 days) x 90%RH

Sarcon® GR-b

Table - 14

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(19)	(20)	(20)	JIS-K-7312	B
Tensile Strength	(MPa)	0.1	0.2	0.2	0.2	JIS-K-6251 (#2)	A
Elongation	%	100	90	80	80	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	3.9×10^6	0.8×10^6	0.7×10^6	0.2×10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	12	13	13	14	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-Hb

Table - 15

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(19)	(20)	(20)	JIS-K-7312	B
Tensile Strength	(MPa)	0.3	0.3	0.3	0.3	JIS-K-6251 (#2)	A
Elongation	%	80	70	70	70	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	2.5×10^6	0.9×10^6	0.5×10^6	0.1×10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	17	19	20	20	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-Fb

Table - 16

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(20)	(20)	(20)	JIS-K-7312	B
Tensile Strength	(MPa)	0.6	0.6	0.6	0.6	JIS-K-6251 (#2)	A
Elongation	%	60	55	55	50	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	2	2	2	2	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	1×10^6	1×10^6	1×10^6	1×10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	11	12	14	14	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Sarcon® GR-HFb

Table - 17

Property	Unit	Initial	100Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	gr/cm^3	2.5	2.5	2.5	2.5	JIS-K-6220	—
Hardness	ASKER-C	(18)	(20)	(20)	(20)	JIS-K-7312	B
Tensile Strength	(MPa)	0.7	0.7	0.7	0.7	JIS-K-6251 (#2)	A
Elongation	%	60	55	55	50	JIS-K-6251 (#2)	A
Tear Resistance	(KN/m)	2	2	2	2	JIS-K-6252 (Angle)	A
Volume Resistivity	(Mohms·m)	1×10^6	1×10^6	1×10^6	1×10^6	JIS-K-6249	C
Breakdown Voltage	(KV/mm)	11	12	14	14	JIS-K-6249	C
Thermal Conductivity	W/m·k	(2.3)	(2.3)	(2.3)	(2.3)	JIS-R-2618 equivalent	B

Remarks / Specimen A : 2.0mT
Specimen B : 60mm Width x 120mm Length x 20mm Thickness. (GR-b for all products)
Specimen C : 120mm Width x 120mm Length x 1.0mm Thickness.

9] **Mechanical Property** / Compression VS Compression Load

Sarcon® GR-b

(Unit : Kgf / inch^2) **Table - 18**

	50G-b	100G-b	150G-b	200G-b	250G-b	300G-b
10%	8.7	11.6	7.4	5.0	4.2	3.8
20%	25.8	23.7	15.6	11.7	8.9	8.1
30%	49.0	39.8	28.3	22.6	18.0	17.5
40%	66.3	53.5	46.2	38.4	31.1	29.3
50%	84.8	76.0	64.2	60.1	55.2	43.8
sustain 50%	39.5	38.9	32.5	29.2	26.2	21.5

Sarcon® GR-Hb

(Unit : Kgf / inch^2) **Table - 19**

	50G-Hb	100G-Hb	150G-Hb	200G-Hb	250G-Hb	300G-Hb
10%	13.5	13.4	10.8	7.9	6.5	6.2
20%	36.4	35.3	22.6	17.6	14.5	9.5
30%	59.7	53.4	38.1	31.3	26.3	17.6
40%	81.3	74.9	61.7	50.2	44.3	30.6
50%	103.6	97.2	89.6	75.2	67.8	52.4
sustain 50%	64.6	58.2	44.9	31.1	26.0	24.1

Sarcon® GR-Fb

(Unit : Kgf / inch^2) **Table - 20**

	50G-Fb	100G-Fb
10%	11	15
20%	37	28
30%	65	42
40%	95	61
50%	108	100
sustain 50%	85	69

Sarcon® GR-HFb

(Unit : Kgf / inch^2) **Table - 21**

	50G-HFb	100G-HFb
10%	16	16
20%	46	47
30%	79	72
40%	111	100
50%	135	122
sustain 50%	116	94

Remarks / Test Method : Fujipoly Test Method
Compression Velocity 5.0mm / minute with 200Kgf load
Compression Area 6.25cm^2 (25mm x 25mm)
Sustain 50% at One minute after

10] Extractable Volatiles.

Table - 22

D_n	**Sarcon® GR-b**
total D_{20} or less	0.0093wt %
Test Method : Gas Chromatographic Analysis	
Bellcore Test	Passed Bellcore Specification TR-NWT000930

11] Flame Retardancy.

Table - 23

Series	Product Description	UL94	Series	Product Description	UL94
Sarcon® GR-b	Sarcon **50G-b**	94V – 0	**Sarcon® GR-Hb**	Sarcon **50G-Hb**	94V – 0
	Sarcon **100G-b**	94V – 0		Sarcon **100G-Hb**	94V – 0
	Sarcon **150G-b**	94V – 0		Sarcon **150G-Hb**	94V – 0
	Sarcon **200G-b**	94V – 0		Sarcon **200G-Hb**	94V – 0
	Sarcon **250G-b**	94V – 0		Sarcon **250G-Hb**	94V – 0
	Sarcon **300G-b**	94V – 0		Sarcon **300G-Hb**	94V – 0
Sarcon® GR-Fb	Sarcon **50G-Fb**	94V – 1	**Sarcon® GR-HFb**	Sarcon **50G-HFb**	94V – 1
	Sarcon **100G-Fb**	94V – 1		Sarcon **100G-HFb**	94V – 1

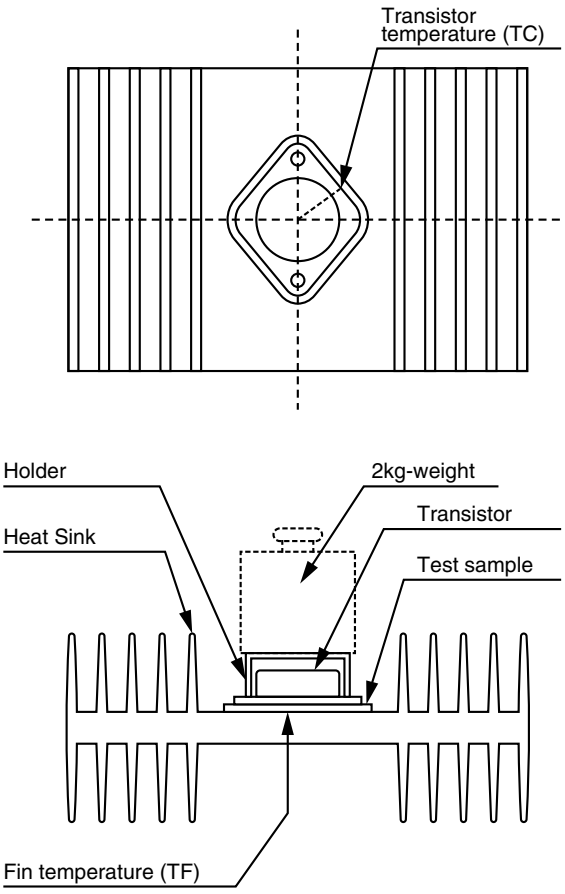
12] Test Method for Sarcon® GR-b products.

1) Thermal Resistance.

Test method : Fujipoly test method FTM P-3020 which gives ASTM D5470 equivalent value.

1) Punched-out specimen in TO-3 package is located between a transistor and heat sink. (Fig.1)
2) The transistor is covered with resin holder and added 2kg -weight as a load.
3) DC 10V, 2A (20W) current is applied to the transistor.
4) After three minutes, the thermal resistance is calculated based on the following formula.

(Fig.1)



Test Apparatus

Transistor : 2SC2245

Heat Sink : 40CH104L-90-K
(manufactured by Ryosan Co., Ltd)

Heat Sensor : 2SC1-OHK300 x 532W x JOO2Y
(manufactured by Chino Co., Ltd)

Condition : 25˚C 60%RH

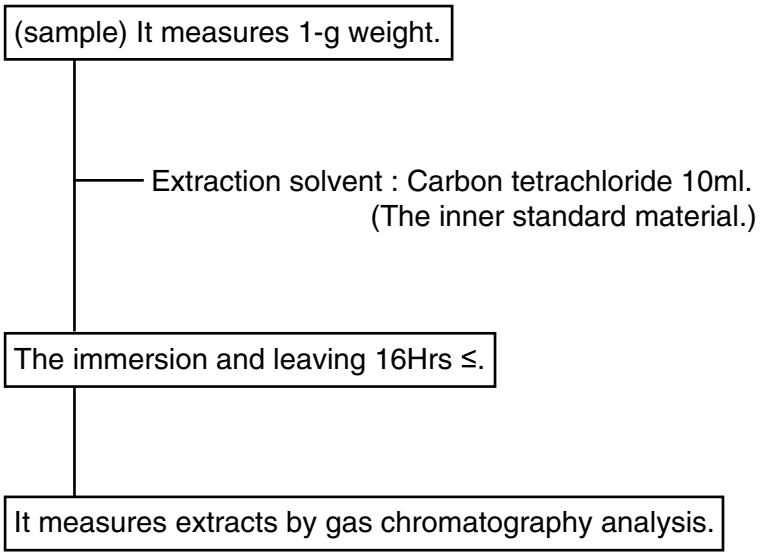
Formula for Thermal resistance calculation.
Rt= (Tc-Tf) / PC

Rt : Thermal resistance (˚C·inch^2 / watt)
Tc : Transistor temperature ˚C
Tf : Heat sink temperature ˚C
PC : Power applied to transistor

2) Gas Chromatography Analysis.

[Test method]

[The preprocessing]



[The measurement condition]

model : SHIMAZU SEISAKUSHO Co,. Ltd. GC-12A
detector : FID (The hydrogen flame ionization detector.)
column : OV-17 (3m)
column temperature : 60˚C · 2min temperature-programmed 16˚C / min maintenance 300˚C
ventage temperature : 280˚C
carrier gas flow rate : 40ml / min
inculcating quantity : 2μl

13] Other Technical Information and Design Guide.

Fuji Poly website http://www.fujipoly.com

: January.16th 2006 version 7
: September.1st 2005 version 6
: February.14th 2003 version 5
: January.31th 2002 version 4
: September 15th. 1999 version 3
: July 9th. 1999 version 2
ISSUED : March 28th. 1999 version 1

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