ISSUED : January 31th. 2002. Version 2

FUJIPOLY®

SARCON®GR-m Series.

High Heat Conductive (6.0Watt/m-K) Silicone Gap Filler Pad.

FUJIPOLY DATA SHEET NUMBER FPDS 01-36 / Version 2

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FUJIPOLY® DATA SHEET FPDS 01-36 (Version 2)

1] Product Name :

Sarcon® GR-m

Sarcon® GR-Hm

2] Features. :

Sarcon® GR-m is a highly conformable,thermally conductive 6.0watt/m-k (No electricity conductive) in areas where space between surfaces are uneven and surface textures vary. Sarcon® GR-m 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-m products.

Table - 1

Series	Construction	Application Guidelines
Sarcon® GR-m	Silicone compound	Between a chassis wall and other surface. Between CPU and heat sink. Between a semiconductor and heat sink.
Sarcon® GR-Hm	Silicone compound with hardened top surface	Same as above, except hardened top surface facilitates handling and installation during complex assemblies.

*Available in thicknesses for 0.50mm to 3.00mm.
*Can be designed for custom applications. (Cuting. Punching)
*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-m	Sarcon® **50G-m**	Usable size 280mm x 180mm (11" x 7.1")	0.50mm ± 0.1mm
	Sarcon® **100G-m**		1.0mm ± 0.2mm
	Sarcon® **150G-m**		1.5mm ± 0.2mm
	Sarcon® **200G-m**	Actual size 300mm x 200mm (11.8" x 7.8")	2.0mm ± 0.3mm
	Sarcon® **250G-m**		2.5mm ± 0.3mm
	Sarcon® **300G-m**		3.0mm ± 0.3mm
Sarcon® GR-Hm	Sarcon® **50G-Hm**	Usable size 280mm x 180mm (11" x 7.1")	0.50mm ± 0.1mm
	Sarcon® **100G-Hm**		1.0mm ± 0.2mm
	Sarcon® **150G-Hm**		1.5mm ± 0.2mm
	Sarcon® **200G-Hm**	Actual size 300mm x 200mm (11.8" x 7.8")	2.0mm ± 0.3mm
	Sarcon® **250G-Hm**		2.5mm ± 0.3mm
	Sarcon® **300G-Hm**		3.0mm ± 0.3mm

Notice.

1) Standard Product Form.
Sarcon® GR-m series is placed between PET (polyester) Film and special polyethylene Film, Kiss cut into the required shape.

5] Typical Properties.

Table - 3

Property	Unit	GR-m	GR-Hm		Test Method (Based on)	Specimen
Color	—	Gray	Gray		Visual	—
Operating Temp. range	˚C	−60 ~ +200	−60 ~ +200		—	—
Specific Gravity	gr/cm^3	3.2	3.2		JIS-K-6220 ASTM D-792	—
Hardness	ASKER-C	26	26		SRIS0101	B
	Shore 00	52	52		ASTM D-2240	—
Tensile Strength	(MPa)	0.3	0.3		JIS-K-6251 (#2 Die) ASTM D-412	A
Elongation	%	80	80		JIS-K-6251 (#2 Die) ASTM D-412	A
Tear Resistance	(KN/m)	1.0	1.0		JIS-K-6252 (Angle) ASTM D-624	A
Volume Resistivity	(Mohms·m)	1.3 x 10^6	1.0 x 10^5		JIS-K-6249 ASTM D-257	C
Breakdown Voltage	(KV/mm)	18	19		JIS-K-6249 ASTM D-149	C
Withstand Voltage	(KV/mm)	13	13		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-m	GR-Hm
0.5mm	0.21	0.27
1.0mm	0.32	0.45
1.5mm	0.48	0.58
2.0mm	0.64	0.75
2.5mm	0.75	0.84
3.0mm	0.84	0.92

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

2) Thermal Conductivity.

Table - 5

	Unit	GR-m	GR-Hm
Thermal Conductivity	watt / m-k	6.0	6.0

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-m **Table - 6**

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	32	35	40	42	SRIS-0101	B
Tensile Strength	MPa	0.3	0.4	0.3	0.3	0.3	JIS-K-6251 (#2Die)	A
Elongation	%	80	50	40	30	20	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.3×10^6	9.2×10^4	8.7×10^4	5.4×10^5	1.1×10^5	JIS-K-6249	C
Breakdown Voltage	KV/mm	18	19	19	19	18	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

-2) **Test Condition** : 120˚C (250˚F) x 1,000hrs(42 days)

Sarcon® GR-m **Table - 7**

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	42	46	57	62	SRIS-0101	B
Tensile Strength	MPa	0.3	0.3	0.3	0.3	0.4	JIS-K-6251 (#2Die)	A
Elongation	%	80	40	40	35	25	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.3×10^6	8.0×10^3	9.5×10^3	1.3×10^4	2.1×10^4	JIS-K-6249	C
Breakdown Voltage	KV/mm	18	18	18	18	19	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

-3) **Test Condition** : 150˚C (300˚F) x 1,000hrs (42 days)

Sarcon® GR-m **Table - 8**

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	50	57	65	75	SRIS-0101	B
Tensile Strength	MPa	0.3	0.3	0.4	0.5	0.5	JIS-K-6251 (#2Die)	A
Elongation	%	80	40	30	15	5	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	1	2	2	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.3×10^6	1.5×10^5	5.1×10^5	4.9×10^5	5.8×10^5	JIS-K-6249	C
Breakdown Voltage	KV/mm	18	19	18	18	18	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

Remarks / Specimen A : 2.0mm Thickness.
Specimen B : 60.0mm Width x 120mm Length x 20.0mm Thickness. (GR-m for all products)
Specimen C : 120.0mm Width x 120mm Length x 1.0mm Thickness.

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

Sarcon® GR-Hm **Table - 9**

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	32	35	40	42	SRIS-0101	B
Tensile Strength	MPa	0.3	0.3	0.3	0.4	0.4	JIS-K-6251 (#2Die)	A
Elongation	%	80	50	40	35	30	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.0×10^5	9.8×10^4	1.0×10^5	1.3×10^5	4.9×10^4	JIS-K-6249	C
Breakdown Voltage	KV/mm	19	18	18	19	17	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

-2) Test Condition : 120˚C (250˚F) x 1,000hrs(42 days)

Sarcon® GR-Hm **Table - 10**

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	42	46	57	62	SRIS-0101	B
Tensile Strength	MPa	0.3	0.5	0.5	0.5	0.4	JIS-K-6251 (#2Die)	A
Elongation	%	80	30	25	15	10	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.0×10^5	6.9×10^3	1.3×10^4	1.8×10^4	2.8×10^4	JIS-K-6249	C
Breakdown Voltage	KV/mm	19	19	18	17	19	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

-3) Test Condition : 150˚C (300˚F) x 1,000hrs(42 days)

Sarcon® GR-Hm **Table - 11**

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	50	57	65	75	SRIS-0101	B
Tensile Strength	MPa	0.3	0.4	0.5	0.5	0.7	JIS-K-6251 (#2Die)	A
Elongation	%	80	25	20	10	5	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	2	2	2	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.0×10^5	2.2×10^5	2.0×10^5	1.9×10^5	5.8×10^5	JIS-K-6249	C
Breakdown Voltage	KV/mm	19	20	17	18	20	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

Remarks / Specimen A : 2.0mm Thickness.
Specimen B : 60.0mm Width x 120mm Length x 20.0mm Thickness. (GR-m for all products)
Specimen C : 120.0mm 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-m

Table - 12

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	27	27	28	30	SRIS-0101	B
Tensile Strength	MPa	0.3	0.2	0.3	0.2	0.2	JIS-K-6251 (#2Die)	A
Elongation	%	80	70	50	50	50	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.3×10^6	4.9×10^4	6.7×10^4	7.8×10^4	7.9×10^4	JIS-K-6249	C
Breakdown Voltage	KV/mm	18	18	18	17	19	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

Sarcon® GR-Hm

Table - 13

Property	Unit	Initial	100Hrs	250Hrs	500Hrs	1,000Hrs	Test Method	Specimen
Specific Gravity	—	3.2	3.2	3.2	3.2	3.2	JIS-K-6220	—
Hardness	ASKER-C	26	27	27	28	30	SRIS-0101	B
Tensile Strength	MPa	0.3	0.3	0.3	0.3	0.3	JIS-K-6251 (#2Die)	A
Elongation	%	80	50	40	40	40	JIS-K-6251 (#2Die)	A
Tear Resistance	KN/m	1	1	1	1	1	JIS-K-6252 (Angle)	A
Volume Resistivity	Mohms·m	1.0×10^5	3.8×10^4	7.8×10^4	9.4×10^4	9.2×10^4	JIS-K-6249	C
Breakdown Voltage	KV/mm	19	17	18	19	18	JIS-K-6249	C
Thermal Conductivity	W/m·k	6.0	6.0	6.0	6.0	6.0	JIS-R-2618 equivalent	C

Remarks / Specimen A : 2.0mm Thickness.
Specimen B : 60.0mm Width x 120mm Length x 20.0mm Thickness. (GR-m for all products)
Specimen C : 120.0mm Width x 120mm Length x 1.0mm Thickness.

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

Sarcon® GR-m

(Unit : Kgf/inch^2) **Table - 14**

Compression rate	50G-m	100G-m	150G-m	200G-m	250G-m	300G-m
10%	8.5	10.7	8.4	8.1	7.0	5.7
20%	28.4	22.5	21.9	34.3	18.2	16.0
30%	45.7	42.4	49.3	42.2	32.0	29.6
40%	65.3	64.0	62.6	54.8	48.3	41.2
50%	90.5	87.3	84.1	76.8	70.8	62.0
Sustain 50% *1	(53.7)	(50.6)	(46.5)	(39.5)	(36.5)	(30.2)

Sarcon® GR-Hm

(Unit : Kgf/inch^2) **Table - 15**

Compression rate	50G-Hm	100G-Hm	150G-Hm	200G-Hm	250G-Hm	300G-Hm
10%	13.9	15.6	14.6	9.3	9.5	8.3
20%	38.4	36.4	31.9	38.5	40.2	36.9
30%	59.2	56.1	53.7	49.8	49.5	45.7
40%	80.8	81.5	79.3	68.4	67.5	60.8
50%	104.3	103.2	97.3	85.4	81.5	79.5
Sustain 50% *1	(76.6)	(74.8)	(68.8)	(54.2)	(50.3)	(42.5)

Test Method : Fujipoly Test Method
Compression Velocity : 5.0mm / minute with 200Kgf load Cell
Compression Area : 6.25cm^2 (25mm x 25mm)
***1** Sustain 50% at One (1) minute after

10] Extractable Volatiles.

Table - 16

D n	**Sarcon® GR-m**
Total D_{20} or less	0.0031wt %

Test Method (**13]**) : Gas Chromatographic Analysis.

11] Flame Retardancy.

Table - 17

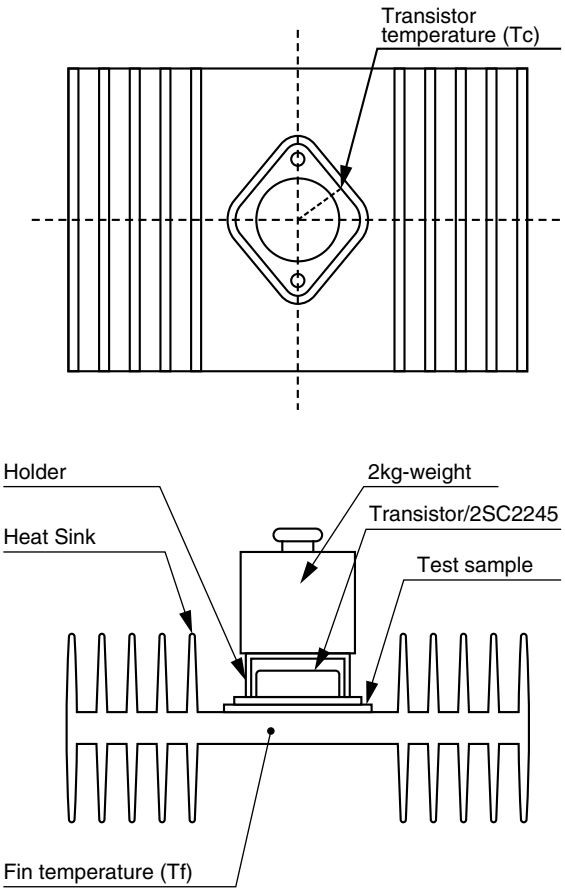
Series	Product Description		Series	Product Description	
Sarcon® GR-m	Sarcon® **50G-m**	94V – 0	**Sarcon® GR-Hm**	Sarcon® **50G-Hm**	94V – 0
	Sarcon® **100G-m**	94V – 0		Sarcon® **100G-Hm**	94V – 0
	Sarcon® **150G-m**	94V – 0		Sarcon® **150G-Hm**	94V – 0
	Sarcon® **200G-m**	94V – 0		Sarcon® **200G-Hm**	94V – 0
	Sarcon® **250G-m**	94V – 0		Sarcon® **250G-Hm**	94V – 0
	Sarcon® **300G-m**	94V – 0		Sarcon® **300G-Hm**	94V – 0

12] Test Method for 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 (To-3 package)

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.

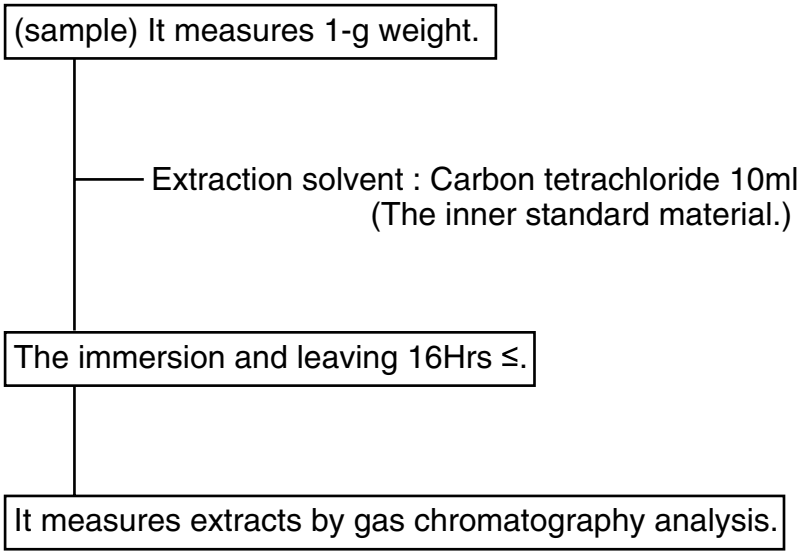
$$Rt = \frac{(Tc - Tf)}{Pc}$$

Rt : Thermal resistance (˚C·inch^2 / watt)
Tc : Transistor temperature ˚C
Tf : Heat sink temperature ˚C
PC : Power applied to transistor
(DC10V x 2A)

13] Test Method for the Low Molecular Siloxane content.

[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-programed 16˚C / min→maintenance 300˚C
ventage temperature: 280˚C
carrier gas flow rate: 40ml / min
inculcating quantity: 2μl

14] Other Technical Information and Design Guide.

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

ISSUED : January.31th 2002 version 2
ISSUED : April.25th 2001 version 1

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