

FUJIPOLY[®]

SARCON[®] GSR Series.

Highest Heat Conductivity Glass cloth reinforcement.

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FUJIPOLY DATA SHEET NUMBER FPDS 96-07 / Version 8

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FUJIPOLY[®] DATA SHEET FPDS 96-07 (Version 8)

1] Product Name :

1] -1) Sarcon[®] GSR (UL File Number E58126)

-2) Sarcon[®] GSR-AD (Silicone Pressure Sensitive Adhesive option)

2] Features for Sarcon[®] GSR / Sarcon[®] GSR-AD

1) High Heat Conductivity.

SARCON[®] GSR is Fujipoly's originally developed High Heat Conductive Silicone Rubber. Fine, high heat conductive ceramic particles are mixed with insulative silicone rubber to produce this excellent insulative, high heat conductive silicone material.

SARCON[®] GSR is a composite of Heat Conductive Silicone Rubber and Fiberglass. SARCON[®] GSR has excellent mechanical and physical characteristics.

2) Usable Over a Wide Temperature Range. (−60°C ~ 182°C / −76°F ~ +360°F)

Due to its superior resistance to heat and cold, SARCON[®] is ideal for use across a wide temperature range. Sarcon[®] maintains its outstanding electrical and electrical insulating properties which are characteristic of silicone. There is no significant variation in its physical properties.

SARCON[®] is distinguished by a wide range of other outstanding properties, such as excellent resistance to environmental conditions, arc, corona discharge, ozone and chemicals.

3) Simplified Processing and Reduced Operating Costs.

Unlike mica, SARCON[®] requires no grease. This significantly simplifies operation, and dispenses with the various costs required for applying the grease. Sarcon[®] is not messy, easy to apply and free from the problems of contamination due to grease application.

4) Cushion Effect.

Due to SARCON's elastic properties, it has an excellent cushion effect. Attached to devices like transistors. SARCON[®] provides superb protection against damage due to deformation as well as shock and vibration.

5) Complies with UL Standards. (UL 94. UL 746)

A. Complies with UL 746 (Electrical Insulant Standard) 150°C

B. Complies with UL 94 (Flame Retardancy Standard) V-0

6) Adhesive option.

Sarcon[®] GSR is available with a PSA (Pressure Sensitive Adhesive) mounting option. Temperature range performance is −46°C to +150°C. Simply remove the protective liner and press into position to attach.

3] Typical Product Properties of SARCON® GSR / SARCON® GSR-AD

Table - 1

| Item | Unit | SARCON 20GSR | SARCON 30GSR | SARCON 45GSR | SARCON 85GSR |
|-------------------------------|--------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Color | — | White | | | |
| Thickness | mm | 0.20 ±0.05 | 0.30 +0.10 / -0 | 0.45 ±0.05 | 0.85 ±0.05 |
| Hardness | ASTM D2240(A) | 85 | | | |
| Tensile Strength | KN/m | 14 | 15 | 18 | 15 |
| Elongation | % | 3 or less | | | |
| Volume Resistivity | MΩ·m | 1 x 10 ⁷ | 1 x 10 ⁷ | 1 x 10 ⁷ | 1 x 10 ⁷ |
| Breakdown Voltage | KV/AC | 6 | 10 | 15 | 20 |
| Withstand Voltage | KV/minute | 3 | 5 | 7 | 10 |
| Dielectric Constant | 50Hz | 2.6 | 3.0 | 3.2 | 3.7 |
| | 10 ³ Hz | 2.6 | 3.0 | 3.2 | 3.7 |
| | 10 ⁶ Hz | 2.6 | 3.0 | 3.2 | 3.7 |
| Dielectric Dissipation Factor | 50Hz | 0.0026 | 0.0021 | 0.0016 | 0.0013 |
| | 10 ³ Hz | 0.0007 | 0.0005 | 0.0001 | 0.0004 |
| | 10 ⁶ Hz | 0.0004 | 0.0003 | 0.0002 | 0.0009 |
| Thermal Impedance | FTM P-3010 | 0.30 °C·inch ² /watt | 0.34 °C·inch ² /watt | 0.39 °C·inch ² /watt | 0.51 °C·inch ² /watt |
| Thermal Impedance AD Type | FTM P-3010 | 0.64 °C·inch ² /watt | 0.66 °C·inch ² /watt | 0.71 °C·inch ² /watt | 0.83 °C·inch ² /watt |
| Flame Retardant | UL-94 | V-0 | V-0 | V-0 | V-0 |

Note.) 1. Test method is based on on JIS K-6249..

2. Breakdown Voltage : AC 60Hz

Withstand Voltage : AC 60Hz

3. Thermal Impedance : Fujipoly Test Method FTM P-3010 which gives ASTM D5470 Equivalent value.

4. Flame Retardant : UL-94

5. Tensile Strength / Elongation : Test methods according to ASTM D1458 (JIS C 2367),
double silicone rubber / Glass clothtest method.

4] Heat Aging Test

Test Condition : 150°C (300°F) x 1000hrs (42days)

SARCON® 20GSR

Table - 2

| Properties | Unit | Before test | After 100hrs | After 500hrs | After 1,000hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 90 | 90 | 90 | 88 |
| Tensile Strength (ASTM D1458) | KN/m | 14 | 16 | 14 | 6 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ·m | 2.9 x 10 ⁷ | 7.5 x 10 ⁸ | 8.4 x 10 ⁸ | 2.6 x 10 ⁷ |
| Breakdown Voltage | KV/AC | 6 | 6 | 6 | 6 |
| Dielectric Constant | 50Hz | 2.00 | 1.89 | 1.84 | 1.92 |
| | 10 ³ Hz | 2.00 | 1.89 | 1.84 | 1.92 |
| | 10 ⁶ Hz | 2.01 | 1.90 | 1.85 | 1.93 |
| Dielectric Dissipation Factor | 50Hz | 0.0023 | 0.0009 | 0.0004 | 0.0015 |
| | 10 ³ Hz | 0.0010 | 0.0003 | 0.0001 | 0.0005 |
| | 10 ⁶ Hz | 0.0014 | 0.0007 | 0.0004 | 0.0006 |

SARCON® 30GSR

Table - 3

| Properties | Unit | Before test | After 100hrs | After 500hrs | After 1,000hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 90 | 90 | 91 | 90 |
| Tensile Strength (ASTM D1458) | KN/m | 15 | 15 | 14 | 7 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ·m | 2.5 x 10 ⁷ | 2.2 x 10 ⁸ | 3.3 x 10 ⁸ | 1.1 x 10 ⁸ |
| Breakdown Voltage | KV/AC | 10 | 14 | 14 | 14 |
| Dielectric Constant | 50Hz | 3.03 | 2.97 | 2.91 | 2.91 |
| | 10 ³ Hz | 3.02 | 2.97 | 2.91 | 2.91 |
| | 10 ⁶ Hz | 3.04 | 2.99 | 2.93 | 2.93 |
| Dielectric Dissipation Factor | 50Hz | 0.0024 | 0.0009 | 0.0007 | 0.0011 |
| | 10 ³ Hz | 0.0010 | 0.0003 | 0.0001 | 0.0005 |
| | 10 ⁶ Hz | 0.0009 | 0.0007 | 0.0007 | 0.0005 |

SARCON® 45GSR

Table - 4

| Properties | Unit | Before test | After 100hrs | After 500hrs | After 1,000hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 90 | 90 | 92 | 90 |
| Tensile Strength (ASTM D1458) | KN/m | 18 | 14 | 16 | 14 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ·m | 3.3 x 10 ⁷ | 2.3 x 10 ⁸ | 3.9 x 10 ⁸ | 1.5 x 10 ⁷ |
| Breakdown Voltage | KV/AC | 15 | 18 | 16 | 17 |
| Dielectric Constant | 50Hz | 3.20 | 3.13 | 3.09 | 3.09 |
| | 10 ³ Hz | 3.19 | 3.13 | 3.09 | 3.09 |
| | 10 ⁶ Hz | 3.20 | 3.15 | 3.11 | 3.11 |
| Dielectric Dissipation Factor | 50Hz | 0.0028 | 0.0007 | 0.0005 | 0.0011 |
| | 10 ³ Hz | 0.0009 | 0.0002 | 0.0000 | 0.0003 |
| | 10 ⁶ Hz | 0.0006 | 0.0001 | 0.001104 | 0.0002 |

SARCON® 85GSR

Table - 5

| Properties | Unit | Before test | After 100hrs | After 500hrs | After 1,000hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 88 | 89 | 92 | 90 |
| Tensile Strength (ASTM D1458) | KN/m | 15 | 18 | 18 | 17 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ·m | 2.1 x 10 ⁷ | 3.5 x 10 ⁸ | 2.3 x 10 ⁸ | 1.2 x 10 ⁸ |
| Breakdown Voltage | KV/AC | 20 | 21 | 20 | 22 |
| Dielectric Constant | 50Hz | 3.71 | 3.63 | 3.59 | 3.63 |
| | 10 ³ Hz | 3.71 | 3.63 | 3.60 | 3.63 |
| | 10 ⁶ Hz | 3.72 | 3.66 | 3.62 | 3.65 |
| Dielectric Dissipation Factor | 50Hz | 0.0019 | 0.0001 | 0.0006 | 0.0007 |
| | 10 ³ Hz | 0.0004 | 0.0005 | 0.0006 | 0.0001 |
| | 10 ⁶ Hz | 0.0001 | 0.0004 | 0.0005 | 0.0004 |

5] Humidity Test.

Test Condition : 60°C (140°F) x 500hrs (20days) x 95%RH

SARCON® 20GSR

Table - 6

| Properties | Unit | Before test | After 250hrs | After 500hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 90 | 86 | 85 |
| Tensile Strength (ASTM D1458) | KN/m | 14 | 12 | 16 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ.m | 2.9 x 10 ⁷ | 4.7 x 10 ⁸ | 8.4 x 10 ⁸ |
| Breakdown Voltage | KV/AC | 6 | 6 | 5 |
| Dielectric Constant | 50Hz | 2.00 | 1.93 | 2.09 |
| | 10 ³ Hz | 2.00 | 1.89 | 1.84 |
| | 10 ⁶ Hz | 2.01 | 1.90 | 1.85 |
| Dielectric Dissipation Factor | 50Hz | 0.0023 | 0.0030 | 0.0004 |
| | 10 ³ Hz | 0.0010 | 0.0011 | 0.0001 |
| | 10 ⁶ Hz | 0.0014 | 0.0011 | 0.0004 |

SARCON® 30GSR

Table - 7

| Properties | Unit | Before test | After 250hrs | After 500hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 90 | 88 | 85 |
| Tensile Strength (ASTM D1458) | KN/m | 15 | 18 | 16 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ.m | 2.5 x 10 ⁷ | 6.5 x 10 ⁶ | 8.4 x 10 ⁷ |
| Breakdown Voltage | KV/AC | 10 | 11 | 7 |
| Dielectric Constant | 50Hz | 3.03 | 3.02 | 3.02 |
| | 10 ³ Hz | 3.02 | 3.01 | 3.00 |
| | 10 ⁶ Hz | 3.04 | 3.02 | 3.00 |
| Dielectric Dissipation Factor | 50Hz | 0.0024 | 0.0052 | 0.0062 |
| | 10 ³ Hz | 0.0010 | 0.0015 | 0.0025 |
| | 10 ⁶ Hz | 0.0009 | 0.0009 | 0.0014 |

SARCON® 45GSR

Table - 8

| Properties | Unit | Before test | After 250hrs | After 500hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 90 | 90 | 91 |
| Tensile Strength (ASTM D1458) | KN/m | 18 | 18 | 18 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ.m | 3.3 x 10 ⁷ | 9.1 x 10 ⁶ | 0.9 x 10 ⁷ |
| Breakdown Voltage | KV/AC | 15 | 17 | 18 |
| Dielectric Constant | 50Hz | 3.20 | 3.21 | 3.15 |
| | 10 ³ Hz | 3.19 | 3.19 | 3.13 |
| | 10 ⁶ Hz | 3.20 | 3.19 | 3.12 |
| Dielectric Dissipation Factor | 50Hz | 0.0028 | 0.0052 | 0.0059 |
| | 10 ³ Hz | 0.0009 | 0.0018 | 0.0024 |
| | 10 ⁶ Hz | 0.0006 | 0.0009 | 0.0011 |

SARCON® 85GSR**Table - 9**

| Properties | Unit | Before test | After 250hrs | After 500hrs |
|-------------------------------|--------------------|-----------------------|-----------------------|-----------------------|
| Hardness | ASTM D2240(A) | 88 | 87 | 89 |
| Tensile Strength (ASTM D1458) | KN/m | 15 | 18 | 17 |
| Elongation (ASTM D1458) | % | 3 or less | 3 or less | 3 or less |
| Volume Resistivity | MΩ·m | 2.1 x 10 ⁷ | 9.2 x 10 ⁶ | 3.6 x 10 ⁶ |
| Breakdown Voltage | KV/AC | 20 | 22 | 20 |
| Dielectric Constant | 50Hz | 3.71 | 3.72 | 3.68 |
| | 10 ³ Hz | 3.71 | 3.70 | 3.66 |
| | 10 ⁶ Hz | 3.72 | 3.71 | 3.66 |
| Dielectric Dissipation Factor | 50Hz | 0.0019 | 0.0042 | 0.0047 |
| | 10 ³ Hz | 0.0004 | 0.0013 | 0.0018 |
| | 10 ⁶ Hz | 0.0001 | 0.0004 | 0.0007 |

6] Clamping Torque VS Thermal Impedance (°C/W).

Table - 10

| Clamping Torque | | 3kg-cm | 5kg-cm | 7kg-cm |
|-----------------|----------------|--------|--------|--------|
| Product Name | Thickness (mm) | | | |
| 20GSR | 0.20 | 0.31 | 0.30 | 0.30 |
| 30GSR | 0.35 | 0.37 | 0.34 | 0.33 |
| 45GSR | 0.45 | 0.40 | 0.39 | 0.37 |
| 85GSR | 0.85 | 0.52 | 0.51 | 0.50 |

Note.) Test method : Fujipoly test method FTM P-3010 which gives ASTM D5470 Equivalent gives.

7] Chemical Resistance. (Chemical Name : HCFC AK-225 (Substitutive Freon9))

Table - 11

| Product Name | Insulative Resistivity (MΩ·m) | | Breakdown Voltage (KV) | | Thermal Impedance (°C/W) | |
|--------------|-------------------------------|-------------------|------------------------|-------------|--------------------------|-------------|
| | before soak | after 24hrs | before soak | after 24hrs | before soak | after 24hrs |
| 20GSR | 2.9×10^7 | 3.9×10^7 | 6 | 5 | 0.30 | 0.28 |
| 30GSR | 2.5×10^7 | 1.8×10^7 | 10 | 9 | 0.34 | 0.32 |
| 45GSR | 3.3×10^7 | 5.6×10^7 | 15 | 13 | 0.39 | 0.38 |
| 85GSR | 2.1×10^7 | 1.1×10^7 | 20 | 19 | 0.51 | 0.54 |

8] Standard Products.

20GSR 300 x 300

30GSR 300 x 300

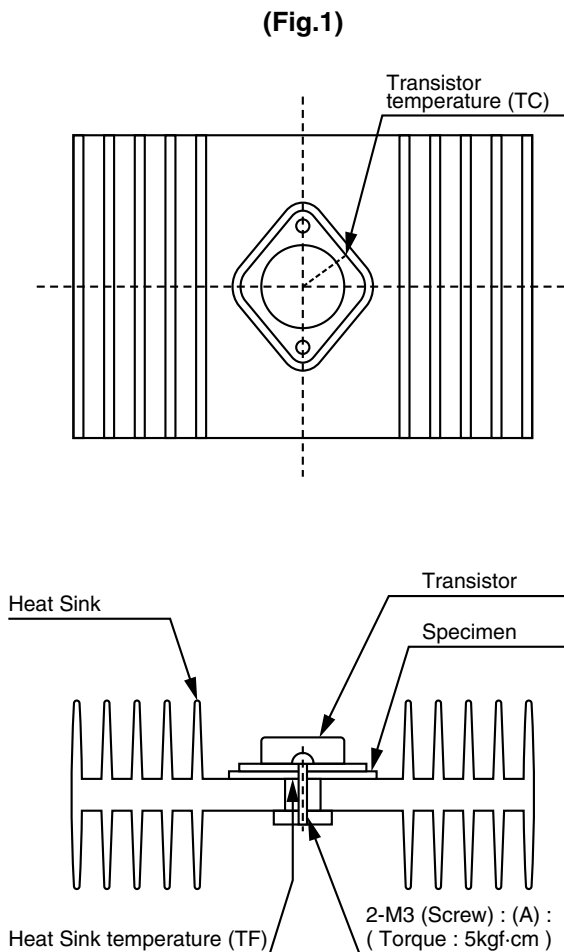
45GSR 300 x 300

85GSR 300 x 300

9] Test Method for Thermal Resistance (Impedance) .

Test method : Fujipoly test method FTM P-3010 which gives ASTM D5470 equivalent value.

- 1) Punched-out specimen in TO-3 package is located between a transistor and heat sink (Fig.1). and secured with screws the position (A), using a screwdriver.
- 2) DC 10V, 2A (20W) current is applied to the transistor.
- 3) After three minutes, the thermal resistance is calculated based on the following formula (B).



Test Apparatus

Transistor : 2SC2245

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

Heat Sensor : 2SC1-OHK300 x 532W x J002Y
(manufactured by Chino Co., Ltd)

Condition : 25°C 60%RH

Formula for Thermal Impedance calculation.

$$(B) : R_t = (T_c - T_f) / P_C$$

R_t : Thermal resistance (°C·inch² / W)

T_c : Transistor temperature °C

T_f : Heat sink temperature °C

P_C : Power applied to transistor

10] Other Technical Information and Design Guide.

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

: January 16th 2006 version 8
: September 1st 2005 version 7
: February 14th 2003 version 6
: January 31th 2002 version 5
: October 31th 1999 version 4
: June 1st 1999 version 3
version 2

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