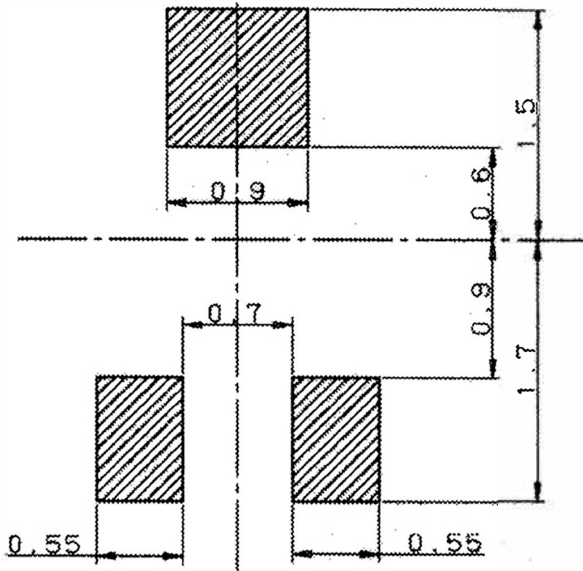
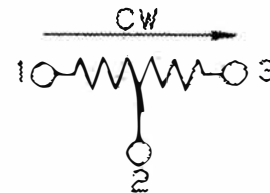


PATTERN (FOR REFLOW SOLDERING)  
(REFERENCE)



CIRCUIT DIAGRAM



UNLESS OTHERWISE TOLERANCE

LESS THAN 10	±0.3
ABOVE 10 TO 30	±0.5
ABOVE 30 TO 100	±1
ANGULAR DIMENSION	±5°

5			PROJ.ANGLE		UNIT	MM	FILE NAME	
4			DRAWN BY	CHECKED BY	APPROVED BY		ARTICLE NO.	
3			CHEN.				DESIGNED NO.	SCALE
2								
1								
NO.	DESCRIPTION	DATE	May 24th, 2012					

**FLYiNG**

**D2205**

DRAWING NO.	EDITION	SHEET
DN2012052401		/

3. Model : D2205

4. Appearance

- 4.1 Appearance: There shall be no remarkable damage in the visual inspection.
- 4.2 Dimension: Please see the drawing attached.

5. Test Conditions

In this specification standard temperature and atmospheric pressure are 20°C and 101.3 kPa {1013mbar} respectively. Unless otherwise specified, all tests shall be done in a 15 to 35°C at an atmospheric pressure of 86 to 106kPa {860 to 1060mbar} and a relative humidity 25 to 85%. In case there are any doubtful points in judgement or reproductivity is needed. They shall be in accordance with JIS C 0010 Referee Test Condition Symbol I Grade 2 (issued in 1985).

6. Rating

No.	Items	Testing Method and Condition	Specification	
6.1	Operating Temp. Range		-40~100°C	
6.2	Storage Temp. Range		Para.9.2 Cold Resistance (Storage) and para. 9.9 Resistance to Heat(Storage) shall be satisfied.	
6.3	Rated Power	Rated power shall be based on continuous full load between terminals 1 and 3 at ambient temperature of 70 °C. In case of ambient temperature 70 to 125 °C, The power level shall be derated in accordance with the diagram below. <u>Fig 1 Derating Curve of Rated Power</u>	Rated power shall comply with the table below.	
			Resistance Taper	Rated Power (W)
			B	0.1
		<p>The graph shows a derating curve where the power derating ratio is constant at 100% for ambient temperatures from -40°C to 70°C. Above 70°C, the ratio decreases linearly, reaching 0% at 100°C.</p>		
6.4	Rated Voltage	Rated voltage shall be continuous working voltage of DC or AC (r.m.s. value at power frequency) corresponding to the rated power, and be obtained from the following formula. When the obtained rated voltage exceeds the maximum working voltage of para. 6.5, the maximum working voltage shall be the rated voltage. $E = \sqrt{P \cdot R}$ E:Rated Voltage(V) P:Rated power(W) R:Nominal total resistance(Ω)	Rated voltage shall comply with the left.	
6.5	Max. Rated Voltage		AC 20 V, DC 20 V	

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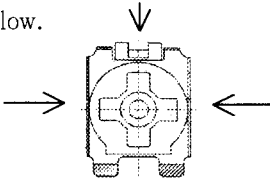
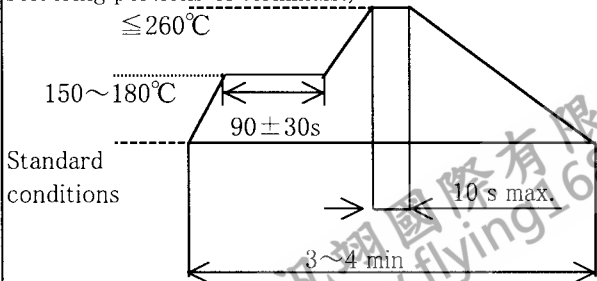
7. Electrical Performance

No.	Items	Testing Method and Condition	Specification						
7.1	Nominal Total Resistance		Nominal total resistance shall comply with the table 1.						
7.2	Total Resistance		Total resistance shall be within $\pm 30\%$ of the nominal total resistance.						
7.3	Resistance Taper		Taper B (Linear)						
7.4	Residual Resistance	<p>The wiper shall be placed at the each end of the effective rotational angle and then the resistance between terminal 1-2 and 2-3 shall be measured.</p> <table border="1"> <thead> <tr> <th>Nominal Total Resistance</th> <th>Residual Resistance</th> </tr> </thead> <tbody> <tr> <td><math>R &lt; 300 \Omega</math></td> <td>Less than <math>3 \Omega</math></td> </tr> <tr> <td><math>R \geq 300 \Omega</math></td> <td>Less than 1 % of the nominal total resistance</td> </tr> </tbody> </table>	Nominal Total Resistance	Residual Resistance	$R < 300 \Omega$	Less than $3 \Omega$	$R \geq 300 \Omega$	Less than 1 % of the nominal total resistance	Residual resistance shall comply with the table left.
Nominal Total Resistance	Residual Resistance								
$R < 300 \Omega$	Less than $3 \Omega$								
$R \geq 300 \Omega$	Less than 1 % of the nominal total resistance								
7.5	Concentration and Contact Resistance	<p>The wiper shall be placed at the point so that the resistance between terminal 1-2 is almost 1/2 of the total resistance.</p> <p>The concentration and contact resistance shall be calculated by the following formula.</p> $\frac{(R_{12}+R_{13})-R_{23}}{2 \times R_{23}} \times 100(\%)$ <p><math>R_{12}</math> : Resistance between terminals 1-2(<math>\Omega</math>)  <math>R_{23}</math> : Resistance between terminals 2-3(<math>\Omega</math>)  <math>R_{13}</math> : Resistance between terminals 1-3(<math>\Omega</math>)</p>	Within $\pm 5 \%$ .						
7.6	Rotational Noise	<p>The specimen shall be connected to the measuring circuit shown below. The operating knob shall be rotated through 10~90 % of the effective rotational angle at a rate of 6 cycles per minute (one cycle is one turn clockwise, then one turn counter clockwise.)</p> <p>Rotational noise : <math>\frac{EPN \times 100}{I \times RN} (\%)</math></p> <p>EPN : Maximum deviation limit on the oscilloscope (V)  I : Measuring current (A)  RN : Nominal total resistance of the specimen (<math>\Omega</math>)</p> <p>Input impedance of the oscilloscope must be more than 10 times as much as of the nominal total resistance of the specimen and measuring current must not exceed the rated current.</p>	Within $\pm 5 \%$ .						

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No.	Items	Testing Method and Condition	Specification								
7.7	Resistance Temperature Characteristic	<p>Total resistance after being exposed in a test chamber at a specified table below for 30 minutes shall be measured. Temperature at order 2 shall be considered as the reference temperature when calculating temperature coefficient.</p> <table border="1"> <thead> <tr> <th>Order</th> <th>Temperature °C</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40 ± 3</td> </tr> <tr> <td>2</td> <td>20 ± 3</td> </tr> <tr> <td>3</td> <td>100 ± 3</td> </tr> </tbody> </table> <p>Temperature coefficient (ppm/°C) = <math display="block">\frac{(R-R_0) \times 1000000}{R_0 \times (t-t_0)}</math></p> <p>Where  R : Total resistance at t (order 1 or 3) °C (Ω)  R<sub>0</sub> : Total resistance at t<sub>0</sub> (order 2) °C (Ω)  t : Temperature at t (order 1 or 3) °C  t<sub>0</sub> : Temperature at t<sub>0</sub> (order 2) °C</p>	Order	Temperature °C	1	-40 ± 3	2	20 ± 3	3	100 ± 3	Within ± 250 ppm/°C.
Order	Temperature °C										
1	-40 ± 3										
2	20 ± 3										
3	100 ± 3										

### 8. Mechanical Performance

No.	Items	Testing Method and Condition	Specification
8.1	Total Rotational angle	Endless (effective rotational angle)	(260 ± 20°)
8.2	Rotational Torque	Rotational torque shall be measured according to JIS C 5261 (issued in 1987) para/6.2.	0.5 ~ 15 mN·m {5.1 ~ 153 gf·cm}
8.3	Resistance to Vibration	<p>The wiper shall be placed at the point so that the resistance between terminal 1-2 is almost 1/2 of the total resistance, and 2 hours of vibration specified below shall be applied in each of three mutually perpendicular directions for a total of 6 hours. (In accordance with JIS C 0040 issued in 1987)</p> <p>1 cycle : 10 Hz → 55 Hz → 10 Hz being swept linearly over 1 minute</p> <p>Amplitude : 1.5 mm sine wave</p>	Variation rate of total resistance shall be within ± 5 %.
8.4	Robustness of Electrode	<p>The specimen shall be soldered in a same manner as para. 8.5, and then the static load 5 N {510 gf} shall be applied to the side of resistance element as shown in figure below.</p> 	<p>There shall not be abnormality such as voids, breaks and cracks of soldering portions.</p> <p>Para. 7.4 Residual Resistance, para. 7.5 Concentration and Contact Resistance, para. 7.6 Rotational Noise and para. 8.2 Rotational Torque shall be satisfied.</p>
8.5	Resistance to Reflow Soldering Heat	<p>Resistance to reflow soldering heat shall be measured according to the figure next page. (Temperature shows the maximum value at the soldering portions of terminals.)</p> 	Variation rate of total resistance shall be within ± 2 %.

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No.	Items	Testing Method and Condition	Specification
8.6	Shock	The wiper shall be placed at the point so that the resistance between terminal 1-2 is almost 1/2 of the total resistance, and maximum acceleration 490 m/s {50 G}, half-sine pulse waveform with duration 11 ms shall be applied in each of 6 mutually perpendicular directions, 3 times for a total of 18, according to JIS C 5261 (issued in 1987) para, 6.7.	Variation rate of total resistance shall be within $\pm 3\%$ .

9. Environmental and Endurance Characteristics

No.	Items	Testing Method and Condition	Specification															
9.1	Resistance to Cold	The specimen shall be subjected in a test chamber at $-55 \pm 3^\circ\text{C}$ at no load for $48 \pm 4$ hours, and then left to the standard conditions for 1 to 2 hours.	Variation rate of total resistance shall be within $\pm 4\%$ .															
9.2	Resistance to Cold (Storage)	The specimens shall be packed in the minimum packing unit designated and subjected in a test chamber at $-5 \pm 3^\circ\text{C}$ for $72 \pm 2$ hours, and then left to the standard conditions for 1 to 2 hours.	Variation rate of total resistance shall be within $\pm 3\%$ . para. 7.6 Rotational noise, para. 8.2 Rotational Torque and para. 8.5. Resistance to Reflow Soldering Heat shall be satisfied.															
9.3	Temperature Cycle	The specimen shall be maintained at each temperature and duration specified in a table below for continuous 5 cycles, and then left to the standard conditions for 1 to 2 hours. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Order</th> <th>Temperature<math>^\circ\text{C}</math></th> <th>Time (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>-40 \pm 3</math></td> <td>30~35</td> </tr> <tr> <td>2</td> <td>Std. Condition</td> <td>10~15</td> </tr> <tr> <td>3</td> <td><math>100 \pm 2</math></td> <td>30~35</td> </tr> <tr> <td>4</td> <td>Std. Condition</td> <td>10~15</td> </tr> </tbody> </table>	Order	Temperature $^\circ\text{C}$	Time (minutes)	1	$-40 \pm 3$	30~35	2	Std. Condition	10~15	3	$100 \pm 2$	30~35	4	Std. Condition	10~15	Variation rate of total resistance shall be within $\pm 5\%$ .
Order	Temperature $^\circ\text{C}$	Time (minutes)																
1	$-40 \pm 3$	30~35																
2	Std. Condition	10~15																
3	$100 \pm 2$	30~35																
4	Std. Condition	10~15																
9.4	Resistance to Damp (Steady State)	The specimen shall be subjected in a test chamber at $40 \pm 2^\circ\text{C}$ , 90~95% RH at no load for $240 \pm 8$ hours, and then left to the standard conditions for 1 to 2 hours.	Variation rate of total resistance shall be within $\pm 5\%$ . Concentration and contact resistance shall be less than 7%.															
9.5	Endurance (Damp Resistant Loading)	The specimen shall be subjected in a test chamber at $40 \pm 2^\circ\text{C}$ , 90~95% RH with a rated DC voltage applied across terminals 1-3 for $1,000 \pm 12$ hours at a cycle consisting of an "ON" time 1.5 hours and an "OFF" time 0.5 hours, under the condition that the wiper shall be at the point so that the resistance between terminal 1-2 is almost 1/2 of the total resistance, and then left to the standard conditions for 1 to 2 hours.	Variation rate of total resistance shall be within $\pm 5\%$ . Concentration and contact resistance shall be less than 7%.															

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No.	Items	Testing Method and Condition	Specification
9.6	Endurance (Rated Load)	The specimen shall be subjected in a test chamber at $70 \pm 3^{\circ}\text{C}$ , with a rated DC voltage applied across terminals 1-3 for $1,000 \pm 12$ hours at a cycle consisting of an "ON" time 1.5 hours and an "OFF" time 0.5 hours under the condition that the wiper shall be at the point so that the resistance between terminal 1-2 is almost 1/2 of the total resistance, and then left to the standard conditions for 1 to 2 hours.	Variation rate of total resistance shall be within $\pm 5\%$ . Concentration and contact resistance shall be less than 7%.
9.7	Endurance (Sliding)	The wiper shall be rotated for 10 cycles (one cycle is one turn clockwise, then one turn counter clockwise), at a rate of 10~17 cycles per minute, according to JIS C5261 (issued in 1987) para. 7.8. In case nominal total resistance is less than $200\ \Omega$ , the operating life is 10 cycles.	Variation rate of total resistance shall be within $\pm 10\%$ .
9.8	Resistance to Heat	The specimen shall be subjected in a test chamber at $100 \pm 3^{\circ}\text{C}$ at no load for $240 \pm 2$ hours. Under the condition that the wiper shall be at the point so that the resistance between terminal 1-2 is almost 1/2 of the total resistance, and then left to the standard conditions for 1 to 2 hours.	Variation rate of total resistance shall be within $\pm 5\%$ . Concentration and contact resistance shall be less than 7%.
9.9	Resistance to Heat (Storage)	The specimens shall be packed in the minimum packing unit designated and subjected in a test chamber at $40 \pm 2^{\circ}\text{C}$ for $72 \pm 2$ hours, and then left to the standard conditions for 1 to 2 hours.	Variation rate of total resistance shall be within $\pm 3\%$ . para. 7.6 Rotational noise para. 8.2 Rotational Torque and para 8.4. Resistance to Reflow Soldering Heat shall be satisfied.

10. Notice

10.1 Storage under being packed

- After being received the products packed shall be stored under 85% max. RH at 5 to  $35^{\circ}\text{C}$  but not in the place where dew and/or harmful gas are apt to occur.
- Please use the products within 3 months after the receipt.

10.2 Operating temperature range

At a range of  $-40$  to  $100^{\circ}\text{C}$ , the product shall be able to be operated electrically and mechanically.

10.3 In case of soldering by a solder iron, it shall be finished within 3 seconds and the temperature of the tip of the soldering iron shall be  $350^{\circ}\text{C}$  max.

10.4 Flux Rinsing

After reflow-soldering operation, part may be used without rinsing, if flux is well controled. In case flux rinsing is done, flux shall be removed sufficiently.

10.5 In case of adjustment of unit by driver, the push static force shall be less than 5 N {510 gf}

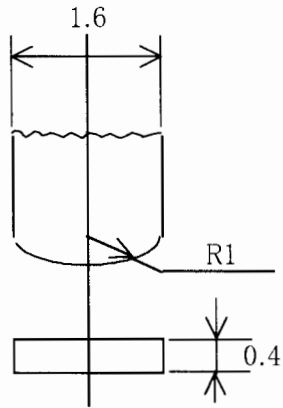
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11. Others

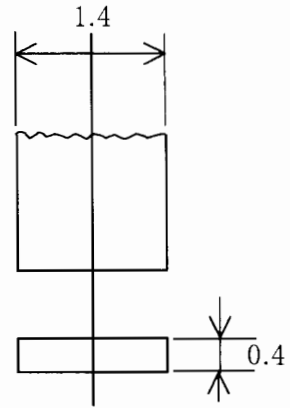
11.1 Recommendable shape of the driver tip shall be shown as figure below (Please use as hard material as possible.)

Recommendable shape (unit : mm)

For automatic adjustment



For hand-operated adjustment  
(Width is the same to the figure left.)



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