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APPROVAL APPLICATION

承　　認　　書

FOR HDK

VARIABLE RESISTOR

TYPE：VG067TL1 / VG067TH1

Pb(F)

力圖科技有限公司

台北市大同區承德路 3 段 163 號 2 樓

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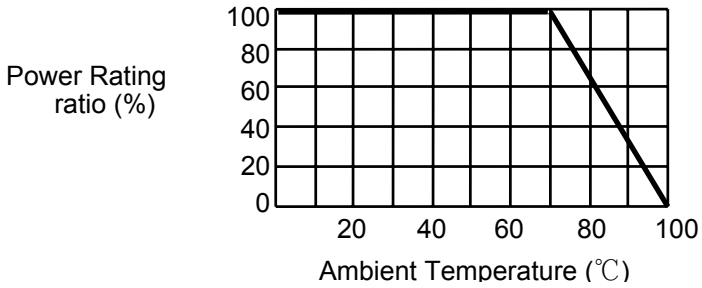
1. Scope

This specification applies to 6 mm type trimmer potentiometer with Metal - Glaze – Resistor , used in electronic equipment.

2. Construction (Dimensions and Materials) and Rating

2.1. Dimension	See attached Drawing.
2.2. Materiales	See attached Material List
2.3. Operating Temperature Range	-25 ℃～+100 ℃
2.4. Storage Temperature Range	-40 ℃～+100 ℃
2.5. Nominal Total Resistance Range	100 Ω ～ 1 MΩ (1・2・3・5 series , see attached Application List)
2.6. Total Resistance Tolerance	±25 %
2.7. Power Rating	0.3 W (～+70 ℃) Power rating vs. ambient temperature shall be denoted on the following chart.



2.8. Rated Voltage	Rated Voltage $E=\sqrt{P \cdot R}$ Where P : Power Rating (W) R : Nominal Total Resistance (Ω) When the rated voltage exceeds the maximum operating voltage, the maximum operating voltage shall be the rated voltage.
2.9. Maximum Operating Voltage	100 V

Nation of product CHINA

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REVISIONS REV:

TAIWAN HOKURIKU CO., LTD.	TITLE VARIABLE RESISTOR	HDK TYPE VG067OOOO Pb(F)	HDK. DWG. NO. C-1124	PAGE 1/7

3. Characteristics

Standard atmospheric conditions

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows :

Ambient temperature : 5 ℃ to 35 ℃
Relative humidity : 45 % to 85 %
Air pressure : 860 hPa to 1 060 hPa

If there is any doubt about the results, measurements shall be made within the following limits :

Ambient temperature : 20℃±2℃
Relative humidity : 60 % to 70 %
Air pressure : 860 hPa to 1 060 hPa

3.1. Mechanical characteristics

	Item	Conditions	Specifications
1	Total Mechanical Rotation		240°±10°
2	Rotational Torque		2.94 mN·m ～ 29.4 mN·m
3	End Stop Strength	The following torsion moment of 49 mN · m shall be applied to the spindle for 5 seconds in any direction.	Without distinct looseness or poor contact.
4	Terminal Strength	The following static load of 2.94 N shall be applied to the terminals for 10 seconds in any direction.	Without distinct looseness or poor contact.
5	Push - Pull Strength	The following static load of 6.86 N shall be applied to the knob for 10 seconds in axial direction.	Without distinct looseness or poor contact.
6	Wobble of Knob	Wobble at the top of the knob in radial direction.	Within 2 mm (p-p)
		Wobble at the top of knob in axial direction.	0.5 mm or less

3.2. Electrical characteristics

	Item	Conditions		Specifications
1	Resistance Law (Taper)	Output voltage ratio at the middle of total rotational angle.		40 %～60 % (Linear taper)
2	Ineffective Rotation	Ineffective rotation is the sum of all rotational distances in which resistance does not change and is calculated as a percentage of the total mechanical rotation.		10 % or less of total mechanical rotation, at each end.
3	Residual Resistance	The resistances at each end of the mechanical rotation between terminals 1 and 2, or 2 and 3 shall be measured.	Total nominal resistance 1 kΩ or less	10 Ω or less
			Total nominal resistance more than 1 kΩ but less than 100 kΩ	2 % or less of total nominal resistance.
			Total nominal resistance 100 kΩ and over	5 % or less of total nominal resistance.

Nation of product CHINA

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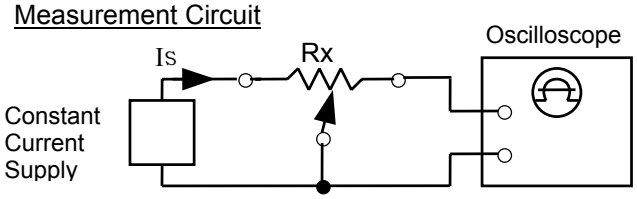
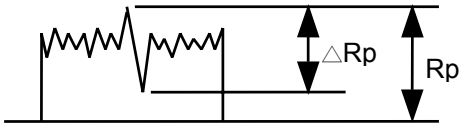
REVISIONS REV:

TAIWAN HOKURIKU CO., LTD.	TITLE: VARIABLE RESISTOR	HDK TYPE: VG067OOOO Pb(F)	HDK. DWG. NO.: C-1124	PAGE: 2/7

	Item	Conditions	Specifications
4	Rotational Noise	Rotational rate is about 6 min^{-1}. (A cycle of operation is defined as the travel of the moving contact from one end of the resistance element to the other and back.) <u>Measurement Circuit</u>  Is : Constant Current Rx : Sample For other procedures is refer to JIS C 5261, Test Method B. <u>Measurement data</u>  	Rp=4% or less of nominal total resistance. △ Rp=3% or less of nominal total resistance.
5	Contact Resistance	The moving contact shall be rotated to a point where the resistance between terminals 1 and 2 is half of the total resistance. Contact resistance shall be calculated by the following formula : $\frac{(R12+R23)-R13}{2\times R13} \times 100(\%)$ Where R12 : Resistance between terminals 1 and 2 R23 : Resistance between terminals 2 and 3 R13 : Resistance between terminals 1 and 3	4 % or less of nominal total resistance.
6	Temperature Coefficient (T. C. R.)	The trimmer potentiometer shall be maintained in a thermostatic chamber at a temperature, according to the table as shown below. Step / Temperature(℃) Initial / +25±2 1 / -25±3 2 / +25±2 3 / +100±3 The mesurement shall be made, after the thermostatic chamber achieved the mark temperature and maintained for 30 min ～ 45min.	Within ±250 ppm/ ℃

Nation of product CHINA

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REVISIONS REV:

TAIWAN HOKURIKU CO., LTD.	TITLE: VARIABLE RESISTOR	HDK TYPE: VG067OOOO Pb(F)	HDK. DWG. NO.: C-1124	PAGE: 3/7

3.3. Endurance characteristics

When the items in ☆mark, the moving contact shall be rotated to a point where the resistance between 1 and 2 is half of the total resistance.

	Item	Conditions	Specifications
1 ☆	Vibration	The entire frequency range, from 10 Hz to 55 Hz and return to 10 Hz, shall be transversed in 1 min. Amplitude (total excursion) : 1.5mm This motion shall be applied for a period of 2 h in each of 3 mutually perpendicular directions. (a total of 6 h)	Change in resistance between 1 and 2 is relative to the value before test . Within ±2 % Without an instant open during the test.
2 ☆	Resistance to Soldering Heat	Mounted on a 1.6 mm thick printed circuit board, the trimmer potentiometer is immersed in a pot of molten solder at 260℃± 5℃ for 10 s±1 s, or at 380℃± 10℃ for 3 s^{+1}_{0} s. Then the trimmer potensiometer shall be subjected to standard atmospheric conditions for 1 h ～ 2 h, after which measurements shall be made.	Change in total resistance is relative to the value before test. Within ±2 % Without deformation of knob or distinct looseness of terminals.
3	Solderability	The length 3mm of terminal end shall be immersed in the flux for 5 s to 10 s. After fluxing the terminal shall be immersed in a pot of molten solder at 245℃±3℃ for 3 s±0.5 s. Flux : Rosin ・・・・・Refer to JIS K 5902 Methanol ・・・ Refer to JIS K 1501 (The flux shall consist 25 % by weight of rosin.) Solder: Sn-3Ag-0.5Cu	A new uniform coating of solder shall cover a minimum of 95 % of the surface being immersed. However, except bare edge.
4 ☆	High Temperature Storage	The trimmer potentiometer shall be subjected in a thermostatic chamber at a temperature of 70℃±2℃ without electrical load for 1 000 h±12 h. Then the trimmer potentiometer shall be taken out from the chamber and maintained at standard atmospheric conditions for 1 h ～ 2 h, after which measurements shall be made.	Change in total resistance is relative to the value before test. Within ±5 %
5 ☆	Load Life	The trimmer potentiometer shall be subjected in a thermostatic chamber at a temperature of 70℃±2℃ with a DC rated voltage for 1.5 h between terminals 1 and 3 followed by a pause of 30 min for 1 000 h±12 h. Then the trimmer potentiometer shall be taken out from the chamber and maintained at standard atmospheric conditions for 1 h ～ 2 h without electrical load, after which measurements shall be made.	Change in total resistance is relative to the value before test. Within ±5 %

Nation of product CHINA

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REVISIONS REV:

TAIWAN HOKURIKU CO., LTD.	TITLE: VARIABLE RESISTOR	HDK TYPE: VG067○○○○ Pb(F)	HDK. DWG. NO.: C-1124	PAGE: 4/7

<table>
<tr><th></th><th>Item</th><th>Conditions</th><th>Specifications</th></tr>
<tr><td>6
☆</td><td>Temperature Cycle</td><td>The trimmer potentiometer shall be subjected in a thermostatic chamber at 5 successive change of temperature cycles, each as shown in table below.
Then the trimmer potentiometer shall be taken out from the chamber and maintained at standard atmospheric conditions for 1 h ～ 2 h, after which measurements shall be made.
<table><tr><th>Step</th><th>Temperature</th><th>Duration</th></tr><tr><td>1</td><td>－25 ℃±3 ℃</td><td>30 min</td></tr><tr><td>2</td><td>Standard atmospheric conditions</td><td>10 min to 15 min</td></tr><tr><td>3</td><td>100 ℃±2 ℃</td><td>30 min</td></tr><tr><td>4</td><td>Standard atmospheric conditions</td><td>10 min to 15 min</td></tr></table></td><td>Change in total resistance is relative to the value before test.
Within ±2 %
Without distinct looseness or poor contact.</td></tr>
<tr><td>7
☆</td><td>Humidity</td><td>The trimmer potentiometer shall be subjected in a thermostatic chamber at a temperature of 40℃±2℃ with relative humidity of 90% to 95% without electrical load for 1000 h±12 h.
Then the trimmer potentiometer shall be taken out from the chamber and its surface moisture shall be removed.
And then the trimmer potentiometer shall be maintained at standard atmospheric conditions for
1 h ～ 2 h, after which measurement shall be made.</td><td>Change in total resistance is relative to the value before test.
Within ±5 %</td></tr>
<tr><td>8
☆</td><td>Humidity Load Life</td><td>The trimmer potentiometer shall be subjected in a thermostatic chamber at a temperature of 40℃±2℃ and a relative humidity of 90 % to 95 % with a DC rated voltage for 1.5 hours between terminals 1 and 3 followed by a pause of 30 minutes for 1 000 h±12 h.
Then the trimmer potentiometer shall be taken out from the chamber and its surface moisture shall be removed.
And then the trimmer potentiometer shall be maintained at standard atmospheric conditions for 1 h ～ 2 h without electrical load, after wihch measurement shall be made.</td><td>Change in total resistance is relative to the value before test.
Within ±5 %</td></tr>
<tr><td>9</td><td>Rotational Life</td><td>The moving contact shall be rotated without electrical load for 50 cycles±2 cycles at a rate of 10 min^{-1}.
(A cycle of operation is defined as the travel of the moving contact from one end of the resistance element to the other and back through 90 % of the total mechanical rotation .)</td><td>Change in total resistance is relative to the value before test.
Within ±10 %</td></tr>
</table>

	Item	Conditions		Specifications
10 ☆	Resistance to Sulphurate Atmostphere	The trimmer potentiometer shall be subjected in a sulphurate atmospheric chamber at a sulphur concentration of 5 ppm±1 ppm (H_2S, 5 ppm±1 ppm) without electrical load for 500 h±12 h. Then the trimmer potentiometer shall be taken out of the chamber and maintained at standard atmospheric conditions for 1 h ～ 2 h, after which measurements shall be made.		
		Total Resistance	Change is relative to the value before test	Within ±10 %
		Residual Resistance	Nominal total resistance 1 kΩ or less	30 Ω or less
			Nominal total resistance more than 1 kΩ and less than 100 kΩ	1.5 % or less of nominal total resistance.
			Nominal total resistance 100 kΩ and over	6 % or less of nominal total resistance.
		Contact Resistance	Nominal total resistance 1 kΩ or less	12 % or less of nominal total resistance.
			Nominal total resistance more than 1 kΩ	8 % or less of nominal total resistance.

4. Marking

The following items shall be marked indelibly and legibly on the trimmer potentiometer.

4.1. Manufacturer's Name ・・・・・ HDK

4.2. Nominal Total Resistance

Express nominal total resistance using double figures. First number show significant figures and the other shows quantity of zero.

EX. 12 means 100 Ω
13 means 1 000 Ω (1 kΩ)
14 means 10 000 Ω (10 kΩ)
15 means 100 000 Ω (100 kΩ)

4.3. Date Code ・・・・・ Following EIAJ RC-1001

Nation of product CHINA

5. The others

5.1. Preset Position

The moving contact set half position of total rotation angle (50 %±15 % of total rotation angle) on delivery.

5.2. Application Notes

- Recommend speedy soldering (max.260 ℃)
- Be careful with flying flux in soldering.
- Handle the trimmer potentiometer with care.

5.3. Industrial Proprietorship

If the trouble on industrial proprietorship (related on delivered product's design and production) happens, we solves it on own responsibility.

5.4. Nation of product ・・・・・ CHINA

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REVISIONS REV:

TAIWAN HOKURIKU CO., LTD.	TITLE: VARIABLE RESISTOR	HDK TYPE: VG067OOOO Pb(F)	HDK. DWG. NO.: C-1124	PAGE: 7/7

MATERIAL LIST

HDK TYPE : **VG067TH Pb(F) series**
VG067TL Pb(F) series

MATERIAL LIST No. : **C-1024** REV. :

※ METAL MATERIALS AND OTHERES

No.	PART NAME	BASE MATERIAL		PLATING			
		GENERIC TYPE	TYPE NUMBER	UNDERCOAT		SURFACE COATING	
				TYPE OF COATING	THICKNESS	TYPE OF COATING	THICKNESS
1	SUBSTRATE	ALUMINA	——	——	——	——	——
2	RESISTANCE ELEMENT	METAL GRAZE	——	——	——	——	——
3	TERMINALS	STEEL	SPCC	NICKEL ELECTRO-PLATE	0.5 μm ～ 1 μm	Sn ELECTRO-PLATE	2 μm ～ 6 μm
4	TERMINAL CONNECTOR	SOLDER	Sn-3Ag-0.5Cu	——	——	——	——
5	MOVING CONTACT	NICKEL SILVER	NSR	——	——	——	——

※ PLASTIC MATERIALS

No.	PART NAME	GENERIC TYPE	MANUFACTURER	MANUFACTURER'S TYPE & TYPE NUMBER	U.L. FILE NUMBER	U.L. FLAM CLASS
1	KNOB	POLYAMIDE TYPE 6-NYLON (COLOR : BLUE)	MITSUBISHI ENGINEERING PLASTICS CO., LTD.	NOVAMID : ES 110C	E53664	94V-2
			TAKAYASU CO., LTD.	TANAGIN : TN - 300	E56345	94V-2
			TORAY CO.,LTD.	AMILAN : CM - 1017	E41797	94V-2

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APPLICATION LIST

NOMINAL RESISTANCE	TAPER	TOLERANCE	HDK TYPE NO.	PART NO.
100Ω	B	±25 %	VZ(G)067T B101	
200Ω	↓	↓	B201	
300Ω	↓	↓	B301	
500Ω	↓	↓	B501	
1 kΩ	↓	↓	B102	
2 kΩ	↓	↓	B202	
3 kΩ	↓	↓	B302	
5 kΩ	↓	↓	B502	
10kΩ	↓	↓	B103	
20kΩ	↓	↓	B203	
30kΩ	↓	↓	B303	
50kΩ	↓	↓	B503	
100kΩ	↓	↓	B104	
200kΩ	↓	↓	B204	
300kΩ	↓	↓	B304	
500kΩ	↓	↓	B504	
1 MΩ	↓	↓	B105	

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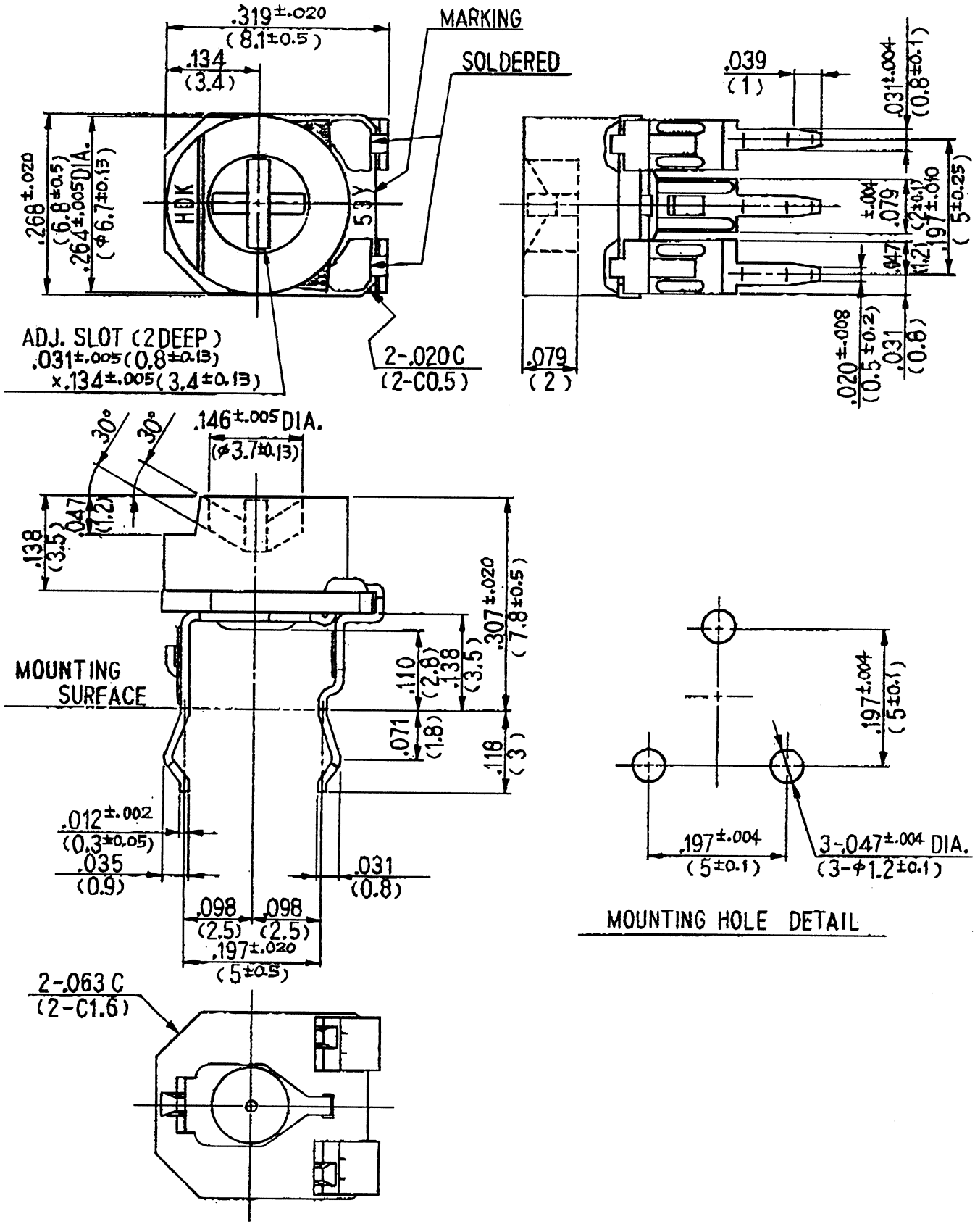
REVISIONS REV:

TAIWAN HOKURIKU CO., LTD.	TITLE: Variable Resistor	HDK TYPE: VZ(G)067T	HDK. DWG. NO.: C-1214	PAGE: 1/1



MOUNTING HOLE DETAIL

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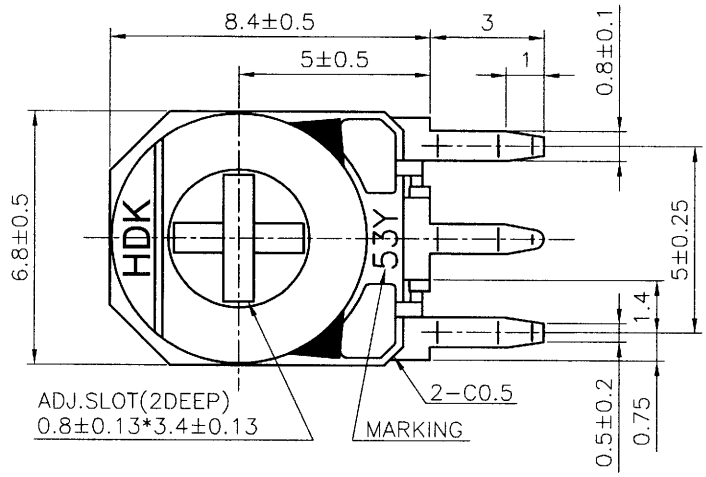
REVISIONS

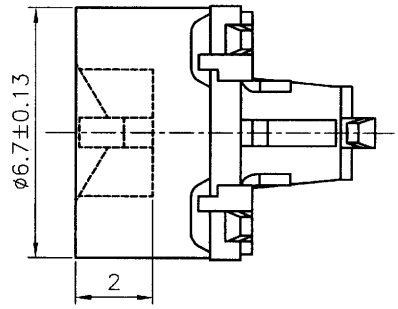
DRAWN	CHECKED	APPROVALS	UNIT	SCALE	TITLE	HDK TYPE
K. Hirake Apr. 4 '03 DATE	H. Terasoki Apr. 4 '03 DATE		INCH (mm)	5/1	VARIABLE RESISTOR	V_G^Z 067 TL1

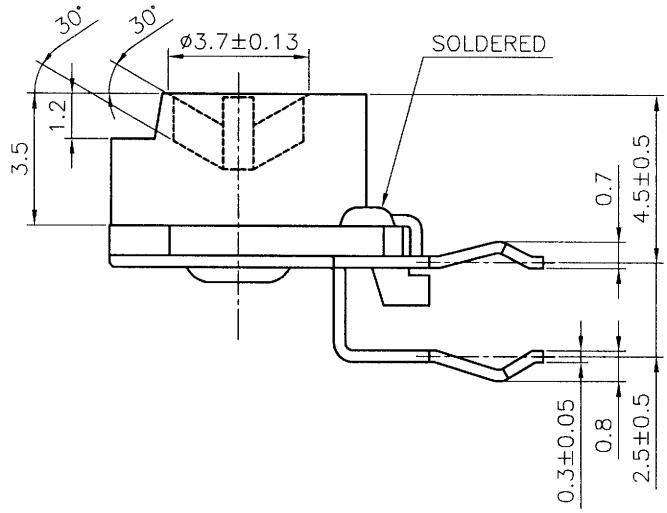
TOLERANCES UNLESS OTHERWISE SPECIFIED ±.012 (0.3)

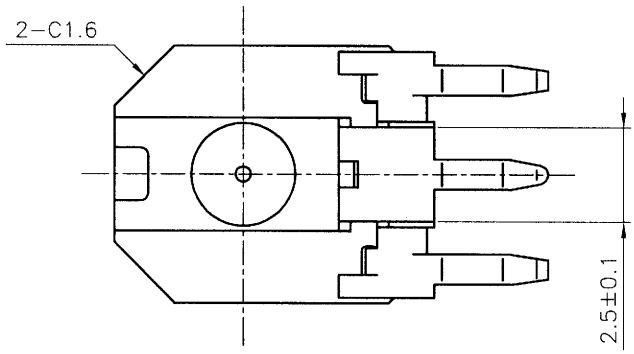
TAIWAN HOKURIKU CO., LTD.

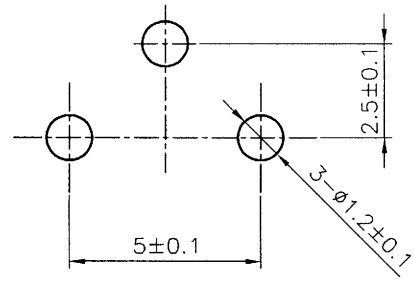
HDK. DWG. NO. F-220,076T











MOUNTING HOLE DETAIL

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REVISIONS

DRAWN	CHECKED	APPROVALS	SCALE	TITLE	HDK TYPE	ISSUE
Jenny Chua	H. Hiroki	Y. Tarasaka	5/1	VARIABLE RESISTOR	VZ(G)067TH1	

TOLERANCES UNLESS OTHERWISE SPECIFIED	UNIT		HDK. DWG. NO.
± 0.3	mm	TAIWAN HOKURIKU CO.,LTD.	C-1703