

石碇福隆工業股份有限公司  
OCT 09 2005  
收文日

L	F		
15A	15	7	
20A	20	12	
25A	25	12	

台灣文華電子工業股份有限公司  
文管中心  
94.10.4  
發行

P.C.B. MOUNTING DETAIL

WASHER 2PCS t=0.4

2005.09.23		圖面重繪 何建志		RE160F-40E3-(L)A-24P			
No.	DATE	DESCRIPTION	PART No.	NAME			
TOL.UNLESS OTHERWISE STATED		DIMENSION	SCALE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING No.
less than	10	±0.3	2/1	張 94.9.23 月琴	王 94.9.23 復檢	吳 94.9.23 碧鋒	
above	10~30	±0.5					
above	30~100	±1.0					
above		±5'					

1. General

1-1 Scope

This specification applies to 16mm size low-profile rotary encoder (incremental type) for microscopic current circuits.Used in electronic equipment.

1-2 Standard atmospheric conditions

Unless otherwise specified. The standard range of atmospheric conditions for making measurements and tests is as follows;

Ambient temperature	:	15°C to 35°C
Relative humidity	:	25% to 85%
Air pressure	:	86kPa to 106kPa

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

Ambient temperature	:	20 ± 1°C
Relative humidity	:	63% to 67%
Air pressure	:	86kPa to 106kPa

1-3

Operating temperature range	:	-10°C to +70°C
-----------------------------	---	----------------

1-4

Storage temperature range	:	-40°C to +80°C
---------------------------	---	----------------

2. Construction

2-1 Dimensions

Refer to attached drawing.

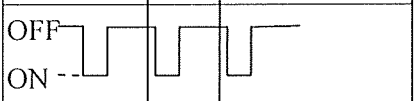
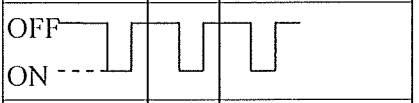
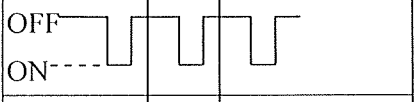
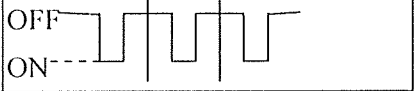
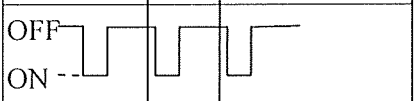
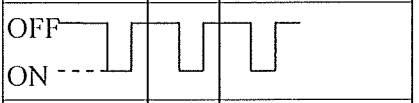
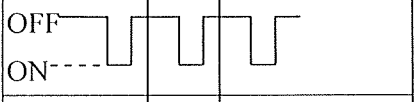
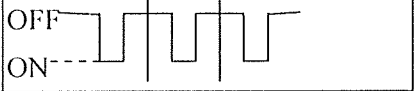
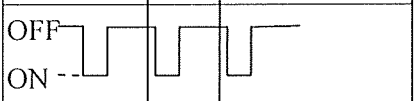
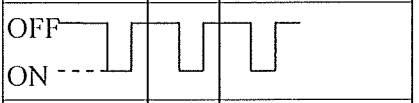
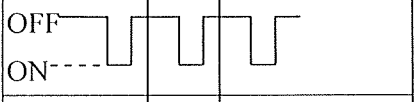
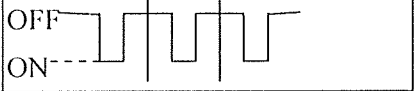
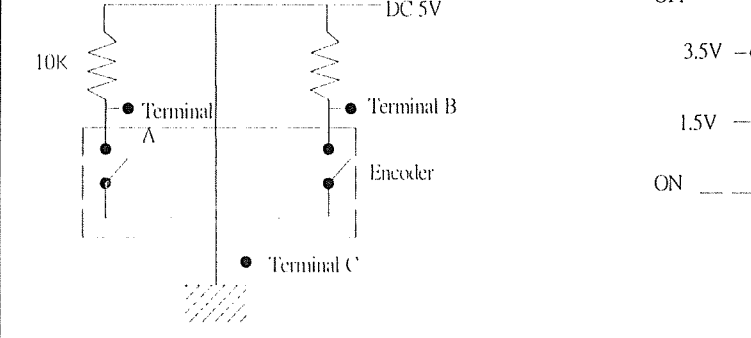
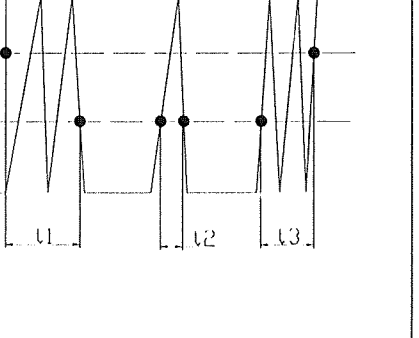
3. Rating

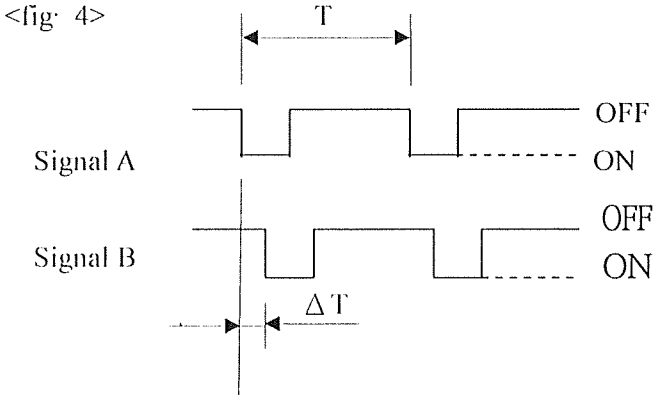
3-1 Rated voltage	:	D. C. 5V
-------------------	---	----------

3-2 Maximum operating current (resistive load)

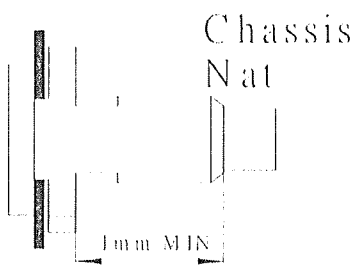
Each lead	:	0.5mA
Common lead	:	1mA

4. Electrical characteristics

	Item	Conditions	Specifications													
4-1	Output signal format	<p>Conditions</p> <p>&lt;Fig 1&gt;</p> <table border="1" data-bbox="360 562 1110 999"> <thead> <tr> <th data-bbox="360 562 719 607">Shaft rotational direction</th> <th data-bbox="719 562 1110 607">Signal</th> <th data-bbox="1110 562 1527 607">Output</th> </tr> </thead> <tbody> <tr> <td data-bbox="360 607 719 707" rowspan="2">C. W.</td> <td data-bbox="719 607 1110 707">A(Terminal A-C)</td> <td data-bbox="1110 607 1527 707">  </td> </tr> <tr> <td data-bbox="719 707 1110 808">B(Terminal B-C)</td> <td data-bbox="1110 707 1527 808">  </td> </tr> <tr> <td data-bbox="360 808 719 909" rowspan="2">C. C. W.</td> <td data-bbox="719 808 1110 909">A(Terminal A-C)</td> <td data-bbox="1110 808 1527 909">  </td> </tr> <tr> <td data-bbox="719 909 1110 999">B(Terminal B-C)</td> <td data-bbox="1110 909 1527 999">  </td> </tr> </tbody> </table>	Shaft rotational direction	Signal	Output	C. W.	A(Terminal A-C)		B(Terminal B-C)		C. C. W.	A(Terminal A-C)		B(Terminal B-C)		<p>2 Phase-different signals (Signal A signal B)</p> <p>Details shown in &lt;fig 1&gt;.(The broken line shows detent position)</p>
Shaft rotational direction	Signal	Output														
C. W.	A(Terminal A-C)															
	B(Terminal B-C)															
C. C. W.	A(Terminal A-C)															
	B(Terminal B-C)															
4-2	Resolution	Number of pulses in 360° rotation	24 pulses/360 for each phase													
4-3	Switching Characteristics	<p>Measurement shall be made under the condition as follows.</p> <p>1)Shaft rotational speed : <math>360^{\circ} \cdot S^{-1}</math></p> <p>2)Test circuit : &lt;fig.2&gt;</p> <p>&lt;fig .2&gt;</p>  <p>&lt;fig.3&gt;</p>  <p>(note)Code-ON area : The area which the voltage is 1.5V or less-</p> <p>code-OFF area :The area which the voltage is 3.5V or more-</p>														
1)	Chattering	Specified by the signal's passage time from 3.5V to 1.5V or from 1.5V to 3.5V of each switching position (code OFF+ON or ON+OFF)	$t1, t3 \leq 3ms$													

	Item	Conditions	Specifications
2)	Sliding noise (Bounce)	Specified by the time of voltage change exceed 1.5V in code-ON area. When the bounce has code-ON time less than 1ms between chatterings ( $t_1$ or $t_3$ ). The voltage change shall be regarded, as a part of chattering. When the code-ON time between 2 bounces is less than 1ms. They are regarded as linked bounce.	$t_2 \leq 2\text{ms}$
3)	Sliding noise	The voltage change in code-OFF area	3.5V MIN
4-4	Phase-difference	Measurement shall be made under the condition which the shaft is rotated in constant speed.  <fig. 4> 	$\Delta T = 0.15 \pm 0.1T$ In <fia.4>
4-5	Dielectric strength	A voltage of 50V A.C. shall be applied for 1min between individual terminals and bushing	Without arcing or breakdown
4-6	Insulation Resistance	Measurement shall be made under the condition which a voltage of 50V D.C is applied between individual terminals and bushing	Between individual terminals and bushing, 10MΩ MIN.

## 5. Mechanical characteristics

	Item	Conditions	Specifications
5-1	Total rotational angle		360° (Endless)
5-2	Rotation torque		50~200gf-cm( Applied for with detent type )
5-3	Number and position of deten		24 detents ( Step angle $15^{\circ}\pm 3^{\circ}$ , Applied for with detent type )
5-4	Push-pull Strength of shaft	Push and pull static load of 80N shall be applied to the shaft In the axial direction for 10S. (After installing)	Without damage to. Or Excessive play in shaft No excessive.abnormality In rotational feline.And electrical Characteristics Shall be satisfied
5-5	Terminal strength	A static load of 3N shall be applied to the tip of terminals for 10S in any direction	Without excessive play Play in terminals or poor contact.
5-6	Shaft wobble	A momentary load of 50mN·m shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft.	0.7xL/30mmp-p MAX (1:shaft length)
5-7	Shaft play in axial Direction	Push and pull static load of 5N shall be applied to the shaft in the axial directions	0.4mmp-p MAX
5-8	Side thrust strength of shaft	A load of 30N shall be applied at the point 5mm from the tip Of the shaft in a direction perpendicular to the axis of shaft	Without excessive' play or bending in shaft. No mechanical abnormality.
5-9	Bushing nut tightening strength	Tighten the nut according to <fig.5>   <fig.5>	Tightening torque to be no greater than 1N.m.
5-10	Resistance to soldering heat	Specified by the clause 7 Soldering conditions	Electrical Characteristics shall Be satisfied . No mechanical Abnormality such as a excessive play.

6. Endurance characteristics			
	Item	Conditions	Specifications
6-1	Rotational life	The shaft of encoder shall be rotated to 50,000 cycles at a speed of 500 cycles per hour without electrical load. After which measurements shall be made. However an interim measurement shall be made immediately after 5,000 cycles .(1 cycle : rotate 360° c.c.w and rotate 360° cw).	Chattering $t_u, t_s \leq 5mS$ Bounce $t_2 \leq 3mS$ Except above items. Specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.
6-2	Damp heat	The encoder shall be stored at a temperature of $40 \pm 2^\circ C$ with relative humidity of 90% to 95% for $240 \pm 10H$ in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. after which measurements shall be made.	Specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.
6-3	Dry heat	The encoder shall be stored at a temperature of $80 \pm 3^\circ C$ for $240 \pm 10H$ in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. after which measurements shall be made.	Specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.
6-4	Cold	The encoder shall be stored at a temperature of $-40 \pm 3^\circ C$ for $240 \pm 10H$ in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5H. after which measurements shall be made.	Specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.
6-5	Free falling	The encoder shall be fallen freely at any posture from 60cm height to the concrete floor covered with vinyl-tile. After which measurement shall be made.	No excessive Deformation or damage.(Except the deformation of terminals .) And specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.
6-6	Vibration	The following vibration shall be applied to the encoder. After which measurement shall be made ; The entire frequency range, from 10Hz to 55Hz and return to 10Hz.shall be transversed in 1 min. Amplitude(total excursion):1.5mm This motion shall be applied for a period of 2H in each of 3 mutually perpendicular axes (A total of 6H ).	Specifications in clause 4.1~4.6 and 5.1~5.3 shall be satisfied.

7. Soldering conditions

7-1 Manual soldering

Bit temperature of soldering iron :350°C or less.

Application time of soldering iron : within 3s.

Dip soldering

Printed wiring board: Single-sided copper clad laminate board with thickness of 1.6mm.

Flux:

·Specific gravity :0.82 or more.

·Flux shall be applied to the board using a bubble foaming type fluxer.

·The board shall be soaked in the flux bubble only to the middle of its thickness.

·Flux shall not come into contact with the component side surface.

Preheating:

·Surface temperature of board : 100°C or less.

·Preheating time : within 2 min.

Soldering:

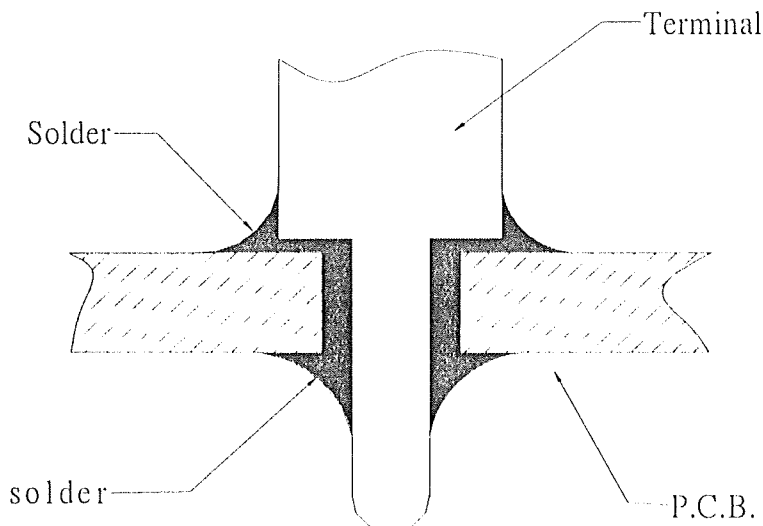
·Soldering: To be performed in 10 seconds within 260°C±5°C .

Manual soldering condition: to be performed in 3 seconds within350±5°C

Apply the above soldering process for 1 or 2 times.

8. Note for soldering method.

Please avoid soldering on upper surface (the component side surface) of the PC board as shown below.



**Common Specification of Variable Resistor (RoHS)**  
**VR 共通規格書(RoHS compliant version)**

**1 Soldering conditions**

無鉛錫條件

Soldering shall be certified with following condition.

作錫處理時，請確保在下列工作條件。

**1-1 Substrate to be soldered: Copper clad laminated phenol board of 1.6mm thickness.**

使用基板：t 1.6 mm 銅箔積層板。

**1-2 Solder Flux: Flux of 0.82 specific weight in bubbling type solder flux coating apparatus shall be used and bubbling surface height shall be defined substantially as half thickness of substrate. Flux shall not flow up on the substrate surface.**

助錫劑：使用發泡式比重 0.82 以上的錫劑，發泡面高大致在基板厚度一半的位置，而助錫劑不可流入基板表面上。

**1-3 Preheating: Surface temperature of the substrate shall be settled within 100°C in two minutes.**

預熱：基板表面溫度 100°C 以下，2 分鐘以內。

**1-4 Soldering: To be performed in 10 seconds within 260°C. (Belongs to terminal the surface)**

錫：260°C 以下，10 秒以內。(屬於端子面)

(This item of soldering tin temperature condition ill uses in wave ridge soldering tin work equipment or reflow soldering tin work equipment)

(本項焊錫溫度條件不適用於波峰焊錫作業設備或回流焊錫作業設備)

**1-5 Manual soldering condition : to be performed in 3 seconds within 350±5°C**

手錫：350±5°C，3 秒以內。

Please process the above procedure no more than 2 times.

以上工程 1 回或 2 回通過即可。

Above for the common soldering tin work condition, the use high temperature soldering tin work equipment invites other to propose the demand.

以上為一般焊錫作業條件，使用高溫焊錫作業設備請另外提出需求。