

1 GENERAL

1-1 Scope: This specification applies to 12mm size low-profile rotary encoder (incremental type) for microscopic current circuits used in electronic equipment.

1-2 Standard Atmospheric Conditions: unless other specified, the standard range of atmospheric conditions for making measurements and tests are follows:

Ambient Temperature: +15 to +35C.

Relative Humidity: 25% to 85%.

Air Pressure: 86kPa to 106kPa.

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

Ambient Temperature: +19 to +21C.

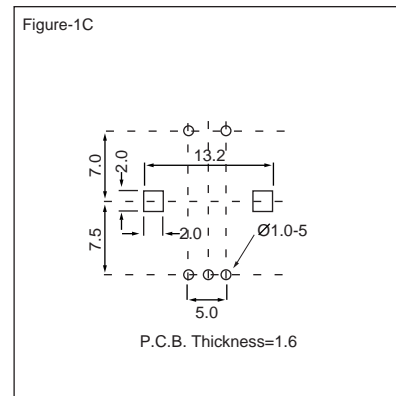
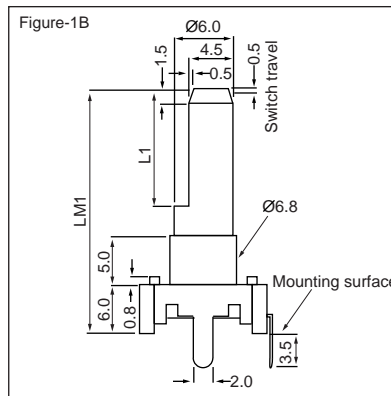
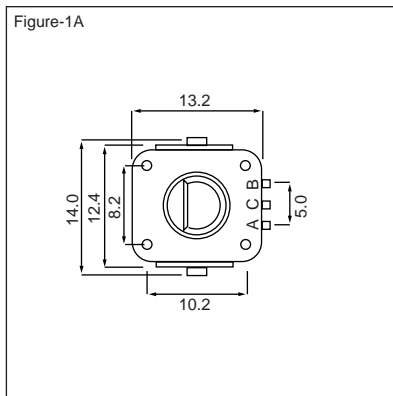
Relative Humidity: 63% to 67%.

Air Pressure: 86kPa to 106kPa.

1-3 Operating Temperature: -10 to +70C.

1-4 Storage Temperature: -40 to +85C.

2 DIMENSIONS (mm)



3 RATING: 5V/10mA DC (1mA min.)

Each Lead: 0.5mA (resistive load; 5mA max. 0.5mA min.)

Common Lead: 1mA (resistive load; 10mA max. 0.5mA min.)

4 ELECTRICAL CHARACTERISTICS

4-1 Output Signal Format

*The broken lines show the detent positions of with-detent type.

Direction	Terminal	Signal
Clockwise	A & C	
	B & C	
Counter Clockwise	A & C	
	B & C	

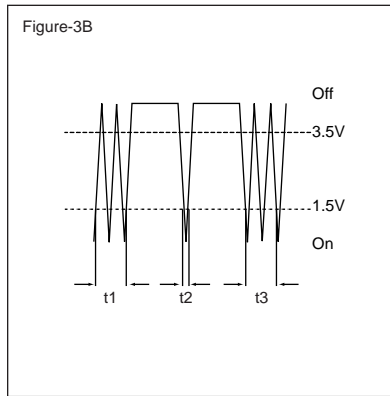
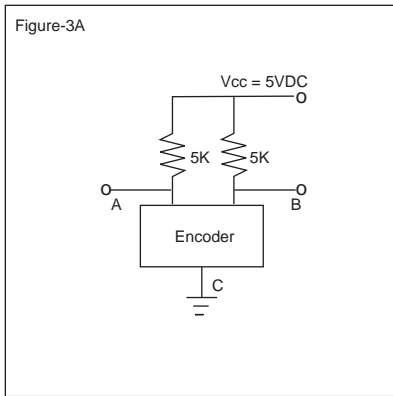
Figure-2

4-2 Resolution: 24 pul./rev. for each phase.

4-3 Switching Characteristics: Measurements shall be made under the conditions as follows.

(1) **Shaft Rotational Speed:** 360 deg./sec.

(2) **Test Circuit.**



"On" area: the area which the voltage is 1.5V or less.

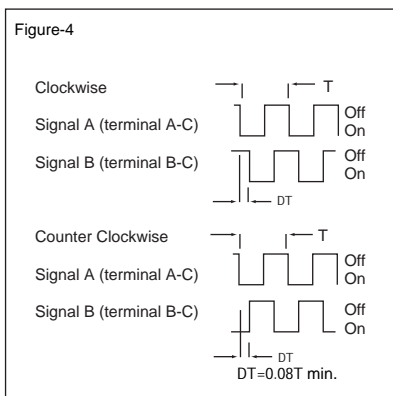
"Off" area: the area which the voltage is 3.5V or more.

4-3-1 Chattering: $t_1, t_3 < \text{or} = 3\text{ms}$ (specified by the signal's passage time from 3.5V to 1.5V or from 1.5V to 3.5V of each switching position (off to on or on to off).

4-3-2 Sliding Noise (bounce): $t_2 < \text{or} = 2\text{ms}$ (specified by the time of voltage change exceed 1.5V in on area. When the bounce has 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 on time, between 2 bounces is less than 1ms, they are regarded as 1 linked bounce.

4-3-3 Sliding Noise: 3.5V min. (the voltage change is in "off" area).

4-4 Phase-Difference: $DT = 0.08T$ min. (measurement shall be made under the condition which the shaft is rotated in 360 deg./sec.)



*Note: above specification(4-4) is changeable, when operated by manual please check performance using actual circuit and knob.

4-5 Insulation Resistance: 100 megaohms min. between individual terminals and bracket (measurement shall be made under the condition which a voltage of 50VDC 1mA is applied between individual terminals and bracket.)

4-6 Dielectric Strength: a voltage of 50VAC shall be applied for 1 minute (leak current = 1mA) without damage to parts arcing or breakdown.

5 MECHANICAL CHARACTERISTICS

5-1 Total Rotational Angle: 360 degrees.

5-2 Detent Torque: 3~20mN.m.

5-3 Number And Position Of Detents: 24 detents in 15 degrees step angle.

5-4 Terminal Strength: without damages or excessive looseness of terminals (a static load of 3N should be applied to the tip of terminals for 10 seconds in any direction.)

5-5 Push-Pull Strength Of Shaft: without damage or excessive play in shaft and no excessive abnormality in rotational feeling and electrical characteristics shall be satisfied (push and static load of 80N shall be applied to the shaft in the axial direction for 10 seconds, after soldering of the PC board.)

6 Rotational Life: the shaft of encoder shall be rotated to 30,000 cycles at a speed of 600~1,000 cycles per hour without electrical load.

7 SOLDERING

7-1 Manual Soldering:

Bit Temperature Of Soldering Iron: 300C or less.

Application Time Of Soldering Iron: within 3s.

7-2 Dip Soldering:

Single-sided copper clad laminated 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 fluxes.

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

Flux shall not come into the component side surface.

Preheating:

Surface Temperature Of Board: 100C or less.

Preheating Time: within 1 minute.

Soldering Temperature: 255~265C.

Immersion Time: within 3 minutes.

Conduct the above soldering process for 1 or 2 times.

8 NOTE FOR SOLDERING METHOD

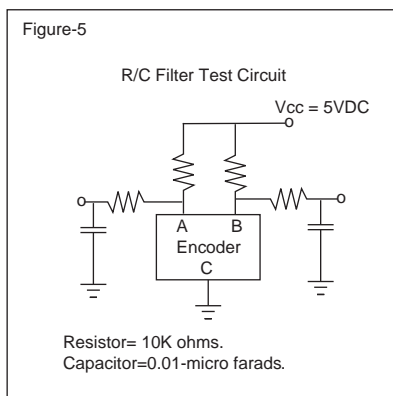
Avoid soldering on upper surface (the component side surface) of the PC board. Avoid cleaning of PC board because the flux used during the dip soldering process may enter the encoder and cause poor contact.

9 PRECAUTIONS IN USE

9-2 Care should be taken with operational speed, sampling time, and masking time etc., at design of the pulse count process.

9-3 Detent position will always be aligned with "A"-Off phase with this part. Therefore make the "A" phase the reference at the software design stage.

9-4 Using the RC filter circuit as below is recommended at design of the pulse count process.



9-5 Care must be taken not to expose this product to water or moisture to prevent possible problem in pulse output wave form.

9-6 Consideration to provide protective guard for knob is highly recommended to avoid side pressure to the shaft.

9-7 Pay attention to impact force. Excessive impact force may decrease the performance of this product.

10 MATERIALS

Shaft: PC(94V-0).

Base: PBT(94V-0).

Bouncing Tips: JIS-H-3130 C 7701R.

Pulsated Piece: phosphor bronze.

Bushing: tinplate plated bright-tin.

Terminal: phosphor bronze plated silver.

Push Plate: POM.

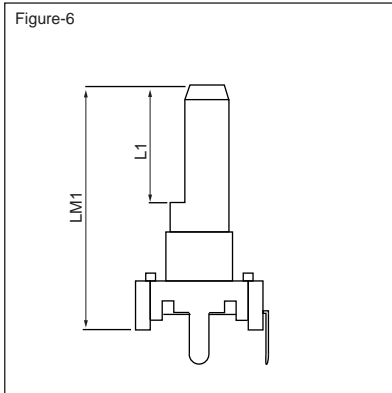
Contact: phosphor bronze.

Switch Base: POM.

Switch Terminal: phosphor bronze plated silver.

11 ORDERING INFORMATION

Figure-6



Part Number	LM1	L1
RE12CT-V24A	17.5	5.0
RE12CT-V24B	20.5	7.0
RE12CT-V24C	22.5	7.0
RE12CT-V24D	25.0	12.0

Packaging: 1000 encoders per box.

Lead Time: 3 to 4 weeks.