

Customer: ALPS(CHINA) CO.,LTD.SHANGHAI

No. KK-2010-9648

Date: Jul. 13, 2010

Attention:

Your ref. No.:

Your Part No.: EC11G(FLY AUDIO)

SPECIFICATIONS

ALPS';

MODEL: EC11L1525G01

Spec. No.:

Sample No.: G 0 3 6 0 2 7 8 M

| |
|-----------------|
| RECEIPT STATUS |
| RECEIVED |
| By Date _____ |
| Signature _____ |
| Name _____ |
| Title _____ |



DSG'D *M. Chiba*

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Q1003#03A (EA)

S P E C I F I C A T I O N S

1. THIS SPECIFICATIONS APPLY TO EC11L1525G ROTARY ENCODERS.

2. CONTENTS OF THIS SPECIFICATIONS.

5LA211-LG2

5LA2114-L1

L-E1

LE2115L02G

4K-1

3. MARKING

- MARKING ON ALL UNITS
DATE CODE

• CAUTION

1. For the export of products which are controlled items subject to foreign and domestic export laws and regulations, you must obtain approval and/or follow the formalities of such laws and regulations.
2. Products must not be used for military and/or antisocial purposes such as terrorism, and shall not be supplied to any party intending to use the products for such purposes.
3. Unless provided otherwise, the products have been designed and manufactured for application to equipment and devices which are sold to end-users in the market, such as AV (audio visual) equipment, home electric equipment, office and commercial electronic equipment, information and communication equipment or amusement equipment. The products are not intended for use in, and must not be used for, any application of nuclear equipment, driving control equipment for aerospace or any other unauthorized use.
With the exception of the above mentioned banned applications, for applications involving high levels of safety and liability such as medical equipment, burglar alarm equipment, disaster prevention equipment and undersea equipment, please contact an Alps sales representative and/or evaluate the total system on the applicability. Also, implement a fail-safe design, protection circuit, redundant circuit, malfunction protection and/or fire protection into the complete system for safety and reliability of the total system.
4. Before using products which were not specifically designed for use in automotive applications, please contact an Alps sales representative.
5. The products shall be stored in the original packaging and kept at room temperature and humidity, out of direct sunlight, and away from any and all corrosive gas. The products shall be completely used as soon as possible, but no later than 6 months from the date of delivery.

Once product packaging is opened, the complete quantity of such products shall be promptly used.

| | | |
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| CLASS No. | TITLE 回転形エンコーダ 規格書 ROTATIONALENCODER SPECIFICATION | (SW01) |
|-----------|--|--------|

1. 一般事項 General

1-1 適用範囲 Scope

この仕様書は主として電子機器に用いる微小電流回路用11形薄形ロータリーエンコーダに適用する。
This specification applies to 11mm size low-profile rotary encoder (incremental type) for microscopic current circuits, used in electronic equipment.

1-2 標準状態 Standard atmospheric conditions

測定は特に指定のない限り、次の状態で行なう。

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

温度 Ambient temperature : 15°C to 35°C
 相対湿度 Relative humidity : 25% to 85%
 気圧 Air pressure : 86kPa to 106kPa

但し、疑義を生じた場合は、次の基準状態で行なう。

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

温度 Ambient temperature : 20 ± 1°C
 相対湿度 Relative humidity : 63% to 67%
 気圧 Air pressure : 86kPa to 106kPa

1-3 使用温度範囲

Operating temperature range : -40°C to +85°C

1-4 保存温度範囲

Storage temperature range : -40°C to +85°C

2. 構造 Construction

2-1 寸法 Dimensions

添付組立図による。
Refer to attached drawing.

3. 定格 Rating

3-1 定格容量 Rating : D.C. 5V 10mA (1mA MIN)

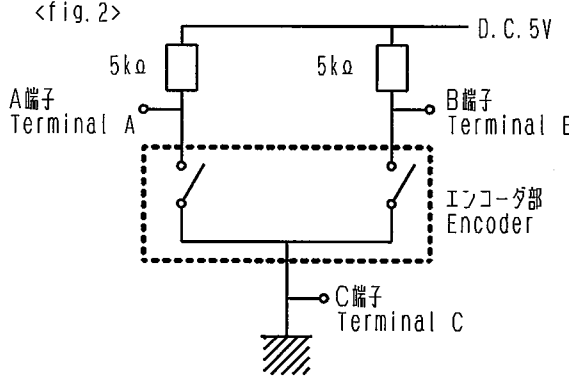
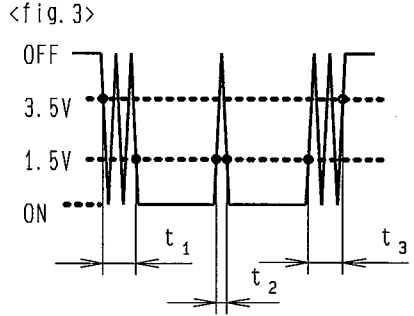
4. 電気的性能 Electrical characteristics

| 項目 Item | 条件 Conditions | 規格 Specifications | |
|----------------------------------|-------------------------------------|------------------------------|--------------------------|
| 4-1 出力信号 Output signal format | <Fig 1> | | |
| | 軸回転方向 Shaft rotational direction | 信号 Signal | |
| | 時計方向 C.W. | A(A-C端子間) A(Terminal A-C) | 出力波形 Output OFF ON |
| | | B(B-C端子間) B(Terminal B-C) | OFF ON |
| | 反時計方向 C.C.W. | A(A-C端子間) A(Terminal A-C) | OFF ON |
| | | B(B-C端子間) B(Terminal B-C) | OFF ON |

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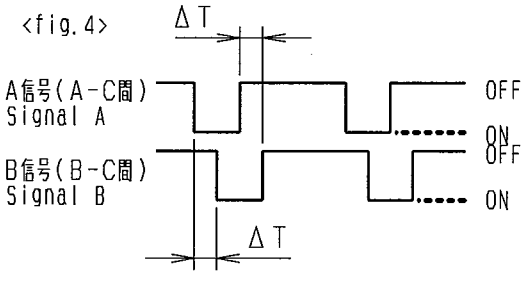
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|---------|----------|----------|--------------------------------|------|------------|------------|------------|------------------|
| APPD. | CHKD. | DSGD. | TITLE | | | | | |
| M-ENG2 | M-ENG2 | M-ENG2 | 回転形エンコーダ ROTATIONAL ENCODER | | | | | |
| Y. KATO | T. OUCHI | M. CHIBA | DOCUMENT NO. | | | | | |
| SYMB | DATE | APPD | CHKD | DSGD | 2010-07-13 | 2010-07-13 | 2010-07-13 | 5LA211-LG2 (1/4) |

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| CLASS NO. | TITLE 回転形エンコーダ 規格書 ROTATIONALENCODER SPECIFICATION | (SW01) |
|-----------|--|--------|

| 項目 Item | 条件 Conditions | 規格 Specifications |
|---|---|---|
| 4-2 分解能 Resolution | 1回転にて出力されるパルス数 Number of pulses in 360° rotation. | 各相15パルス/360° 15 pulses/360° for each phase (2クリック 1パルス) (2click 1pulse) |
| 4-3 スイッチング特性 Switching characteristics | <p>下記測定回路<fig. 2>を用い、回転軸を$360^{\circ} \cdot s^{-1}$の速さで回転し測定する。 Measurement shall be made under the condition as follows.</p> <p>1) Shaft rotational speed : $360^{\circ} \cdot s^{-1}$ 2) Test circuit : <fig. 2></p> <p><fig. 2></p>  <p><fig. 3></p>  <p>(注記) コードOFF状態 : 出力電圧が3.5V以上の状態を言う。 コードON状態 : 出力電圧が1.5V以下の状態を言う。 (note) Code-OFF area : The area which the voltage is 3.5V or more. code-ON area : The area which the voltage is 1.5V or less.</p> | |
| 1) チャタリング Chattering | コードのOFF→ON及びON→OFFの際の、出力1.5V~3.5Vの通過時間にて規定する。 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). | $t_1, t_3 \leq 3ms$ |
| 2) 摺動ノイズ (バウンス) Sliding noise (Bounce) | コードONの部分の1.5V以上の電圧変動時間とし、チャタリング t_1, t_3 両者との間に1ms以上の1.5V以下のON部分を有するものとする。また、摺動ノイズ間に1.5V以下の範囲が1msある場合は、別の摺動ノイズと判断する。 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 1 linked bounce. | $t_2 \leq 2ms$ |
| 3) 摺動ノイズ Sliding noise | コードOFFの部分の電圧変動 The voltage change in code-OFF area. | 3.5V以上 3.5V MIN |

| | | | | | | | | | |
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| | | | | | ALPS ELECTRIC CO., LTD. | | | | |
| | | | | | APPD. M-ENG2 | CHKD. M-ENG2 | DSGD. M-ENG2 | TITLE 回転形エンコーダ ROTATIONALENCODER | |
| | | | | | Y. KATO | T. OUCHI | M. CHIBA | DOCUMENT NO. | |
| SYMB | DATE | APPD | CHKD | DSGD | 2010-07-13 | 2010-07-13 | 2010-07-13 | 5LA211-LG2 (2/4) | |

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| CLASS NO. | TITLE 回転形エンコーダ 規格書 ROTATIONALENCODER SPECIFICATION | (SW01) |
|-----------|--|--------|

| 項目 Item | 条件 Conditions | 規格 Specifications |
|-----------------------------------|--|---|
| 4-4 位相差 Phase-difference | <p>360°・s⁻¹の定速にて操作軸を回転する。 Measurement shall be made under the condition which the shaft is rotated in 360°・s⁻¹ (constant speed).</p> <p><fig. 4></p>  <p>注意事項：摺動接点ですので手動操作時の出力波形はご使用されるツマミ径、軸の回転速度によって変化致します。回路設計時は実装にて確認願います。 Note: Above specification (4-4) is changeable when operate by manual. Please check performance using actual circuit and knob.</p> | <p><fig. 4>において ΔT≥6ms ln<fig. 4></p> |
| 4-5 絶縁抵抗 Insulation resistance | <p>端子-軸受間にD. C. 250V印加する。 Measurement shall be made under the condition which a voltage of 250V D.C. is applied between individual terminals and bushing.</p> | <p>端子-軸受間にて100MΩ以上 Between individual terminals and bushing: 100MΩ MIN.</p> |
| 4-6 耐電圧 Dielectric strength | <p>端子-軸受間にA. C. 300V1分間又は、A. C. 360V2秒間印加する。 (リーク電流1mA) A voltage of 300V A.C. shall be applied for 1min or a voltage of 360V A.C. shall be applied for 2s between individual terminals and bushing. (Leak current: 1mA)</p> | <p>損傷・アーク・絶縁破壊がないこと。 Without damage to parts, arcing or breakdown.</p> |

5. 機械的性能 Mechanical characteristics

| 項目 Item | 条件 Conditions | 規格 Specifications |
|---|--|--|
| 5-1 全回転角度 Total rotational angle | | <p>360° (エンドレス) 360° (Endless)</p> |
| 5-2 クリックトルク Detent torque | | <p>10±7mN・m</p> |
| 5-3 クリック点数及び位置 Number and position of detents. | | <p>30点クリック 30 detents (ステップ角度 12°±3°) (Step angle: 12°±3°)</p> |
| 5-4 端子強度 Terminal strength | <p>端子先端の任意の方向に5Nの力を1分間加える。 A static load of 5N be applied to the tip of terminals for 1min in any direction.</p> | <p>端子の破損、著しい力ゝがないこと。 但し、端子の曲がりは可とする。 Without damage or excessive looseness of terminals. Terminal bend is permitted.</p> |

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| APPD. M-ENG2 | CHKD. M-ENG2 | DSGD. M-ENG2 | TITLE 回転形エンコーダ ROTATIONALENCODER |
| Y. KATO | T. OUCHI | M. CHIBA | DOCUMENT NO. |
| SYMB | DATE | APPD | CHKD |
| | 2010-07-13 | | 2010-07-13 |
| | | | 2010-07-13 |
| | | | 5LA211-LG2 (3/4) |

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| CLASS No. | TITLE 回転形エンコーダ 規格書 ROTATIONAL ENCODER SPECIFICATION | (SW01) |
|-----------|---|--------|

| 項目 Item | 条件 Conditions | 規格 Specifications |
|---|--|--|
| 5-4 軸の押し引き強度 Push-pull strength of shaft | 軸の押し及び引張り方向に100Nの力を10秒間加える。 (セット実装状態) Push and pull static load of 100N shall be applied to the shaft in the axial direction for 10s. (After installing) | 軸の破損、著しいガタのないこと。 感触に異常がないこと。 Without damage or excessive play in shaft. No excessive abnormality in rotational feeling. |
| 5-5 軸ガタ Shaft wobble | 軸先端から2mmの位置に1Nの力を加える。 Force of 1N to be applied at the point 2mm from the tip of the shaft. | 0.1 mmp-p 以下 less |
| 5-6 軸のスラスト方向ガタ Shaft play in axial direction | | 0.4 mm 以下 less. |
| 5-7 軸の回転方向ガタ Rotation play at the click position | 角度板にて測定する。 Measure with jig for rotational angle. | 3° 以内 3° MAX. |
| 5-8 取付け上の注意 Notice for mounting | 右図の様にスイッチ本体を押えてご使用下さい。セット側でスイッチ本体の引き及び回転方向の「カイト」が無い場合は、はんだ付けだけの固定となり、はんだ付け信頼性及びスイッチ本体強度が不安定となる可能性があります。 Hold the bushing use front panel or light pipe. Because this switch not has thread. If don't hold the bushing, the switch maybe become intermittent rough mounting after soldering by knob stopper face. | |

6. 耐久性能 Endurance characteristics.

| 項目 Item | 条件 Conditions | 規格 Specifications |
|---------------------------------|---|---|
| 6-1 しゅう動寿命性能 Rotational life | 無負荷で軸を毎時500サイクルの速さで、15,000サイクル断続動作を行う。 但し、試験途中5,000で中間測定を行う。(1サイクルは、360° 1往復) The shaft of encoder shall be rotated to 15,000 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° CCW rotate 360° CW) | クリックトルクは 初期規格値に対し ^{+10%} _{-30%} その他、初期規格を満足すること。 Detent torque: Relative to the previously specified value. ^{+10%} _{-30%} Except above items, specifications in clause 4.1~4.6 and 5.1, 5.3 shall be satisfied. |

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| | | | | | ALPS ELECTRIC CO., LTD. | | | |
| | | | | | APPD. M-ENG2 | CHKD. M-ENG2 | DSGD. M-ENG2 | TITLE 回転形エンコーダ ROTATIONAL ENCODER |
| | | | | | Y. KATO | T. OUCHI | M. CHIBA | DOCUMENT NO. |
| SYMB | DATE | APPD | CHKD | DSGD | 2010-07-13 | 2010-07-13 | 2010-07-13 | 5LA211-LG2 (4/4) |

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|-----------|---|--------|
| CLASS No. | TITLE プッシュモーメンタリスイッチ規格書 PUSH MOMENTARY SWITCH SPECIFICATION | (SW02) |
|-----------|---|--------|

1. 定格容量 (抵抗負荷)
Switch rating (Resistor load) D.C. 5V 0.1A (MIN 500μA)

2. 電気的性能 Electrical characteristics

| 項目 Item | 条件 Conditions | 規格 Specifications |
|-----------------------------------|--|---|
| 2-1 接触抵抗 Contact resistance | D. C. 5V1mA電圧降下法にて測定する。 Measured by the 1mA 5V D.C. voltage drop method. | 100mΩ MAX. |
| 2-2 チャタリング Chattering | 1サイクル (OFF-ON-OFF) 1秒で動作させる。 Switch is operated at the rate of 1 cycle 1s. The 1 cycle shall be OFF-ON-OFF. | 10ms以下 Less than 10ms |
| 2-3 絶縁抵抗 Insulation resistance | 端子-軸受間にD. C. 250V印加する。 Measurement shall be made under the condition which a voltage of 250V D.C. is applied between individual terminals and bushing. | 端子-軸受間に100MΩ以上 Between individual terminals and bushing: 100MΩ MIN. |
| 2-4 耐電圧 Dielectric strength | 端子-軸受間にA. C. 300V1分間又は、A. C. 360V2秒間印加する。 (リーク電流1mA) A voltage of 300V A.C. shall be applied for 1min or a voltage of 360V A.C. shall be applied for 2s between individual terminals and bushing. (Leak current:1mA) | 損傷・アーク・絶縁破壊がないこと。 Without damage to parts, arcing or breakdown. |

注記:
Note: 軸・スイッチ端子間は絶縁されております。
Shaft is insulated from switch terminal.

3. 機械的性能 Mechanical characteristics

| 項目 Item | 条件 Conditions | 規格 Specifications |
|---------------------------------------|------------------|---|
| 3-1 スイッチ回路・接点数 Contact arrangement | | 単極単投 (Push on) S. P. S. T. (Push on) |
| 3-2 スイッチ移動量 Switching stroke | | 1.5±0.5mm |
| 3-3 スイッチ作動力 Switch operation force | | 4±2N |

4. 耐久性能 Endurance characteristics.

| 項目 Item | 条件 Conditions | 規格 Specifications |
|------------------------------|--|--|
| 4-1 動作寿命特性 Operating life | 無負荷にて軸を毎時500回の速さで20,000回断続動作を行う。 但し、試験途中5,000で中間測定を行う。 The shaft of switch shall be 20,000 times at a speed of 500times per hour without electrical load, after which measurements shall be made. However, an interim measurement shall be made immediately after 5,000 times. | 接触抵抗: 200mΩ以下 その他、初期規格を満足すること。 Switch contact resistance: 200mΩ MAX. Except above items, specifications in clause 2.2~4. and 3.1~3 shall be satisfied. |

5. その他 Note

5-1 軸にツマミを取り付け、センターから10mmの位置で押しした時にひっかかり感が無いこと。
No sticky feel shall be observed when the knob on the shaft is pushed at 10mm off the center.

6. 注意事項 Note

6-1 プッシュスイッチ付きのエンコーダは、軸が押されたままの状態では梱包や保管をされず、スイッチ部に支障をきたす恐れがありますのでご配慮下さい。
Encoder equipped with a push-on switches are packaged or stored with their shafts being pushed-in, the switch part may be out of order and pay attention when you package or store them.

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| | | | | | ALPS ELECTRIC CO., LTD. | | | |
| | | | | | APPD. | CHKD. | DSGD. | TITLE |
| | | | | | M-ENG2 | M-ENG2 | M-ENG2 | プッシュモーメンタリスイッチ PUSH MOMENTARY SWITCH |
| | | | | | Y. KATO | Y. SHIMIZU | M. CHIBA | DOCUMENT NO. |
| | | | | | 2010/06/16 | 2010/06/16 | 2010/06/16 | 5LA2114-L1 (1/1) |
| SYMB | DATE | APPD | CHKD | DSGD | | | | |


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| CLASS No. | TITLE |
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1. はんだ耐熱 Resistance to soldering heat

下記の「はんだ付け条件」にて絶縁体の変形、破損のないこと、感触に異常のないこと。
 At the specified by the soldering conditions below.
 There shall be no deformation or cracks, in molded part.
 No excessive abnormality in rotational feeling.

はんだ付け条件 Soldering conditions

手はんだの場合 Manual soldering

 温度350°C以下、時間3秒以内
 Bit temperature of soldering iron : 350°C or less.
 Application time of soldering iron : within 3s.

ディップはんだの場合 Dip soldering

使用基板 : t1.6両面銅張積層板
 Printed wiring board: Both-sided copper clad laminate board with thickness of 1.6mm.

フラックス : 比重0.82以上のフラックスを用い発泡式フラクサーにて発泡面高さは、基板厚の3分の2。
 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 2/3 of its thickness.



プリヒート : 基板表面温度100°C以下、時間2分以内
 Preheating:

- Surface temperature of board: 100°C or less.
- Preheating time: within 2 min.

はんだ : 温度260±5°C、時間5±1秒
 Soldering:

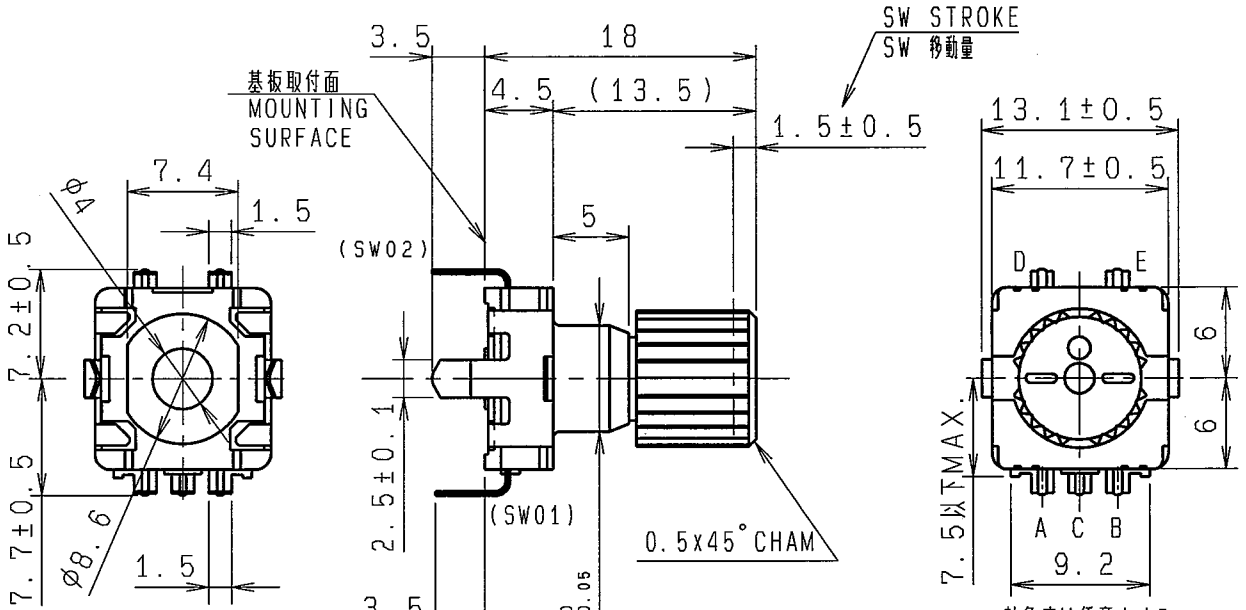
- Solder temperature: 260±5°C.
- Immersion time: within 5±1s.

以上の工程を1回または2回通過する。
 Apply the above soldering process for 1 or 2 times.

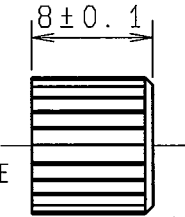
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| | | | | |  ALPS ELECTRIC CO., LTD. | | | |
| | | | | | APPD. 1-設2 | CHKD. 1-設2 | DSGD. 1-設2 | TITLE |
| | | | | | K. KAWASAKI | S. MIZOBUCHI | H. MIURA | DOCUMENT NO. |
|  2 | 2004-02-23 | S. M. | H. H. | H. I. | 1997/06/12 | 1997/06/12 | 1997/06/11 | L-E1 (1/1) |
| SYMB | DATE | APPD | CHKD | DSGD | | | | |

注記 軸受材質：亜鉛タ^クイキャスト
 軸材質：アルミニウム, ABS
 NOTES BUSHING MATERIAL: ZINC ALLOY DIE CASTING
 SHAFT MATERIAL: ALUMINUM, ABS

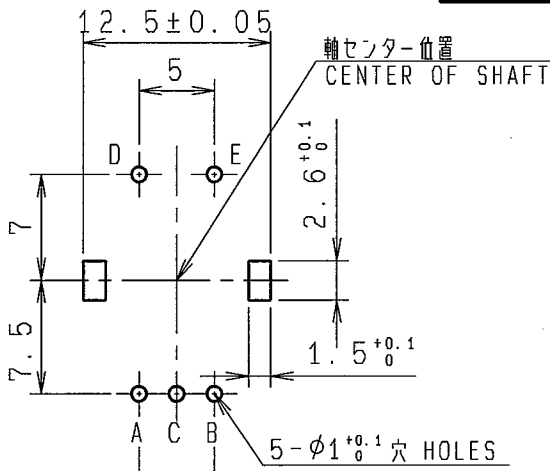
(SW01) ENCODER
 (SW02) PUSH SW



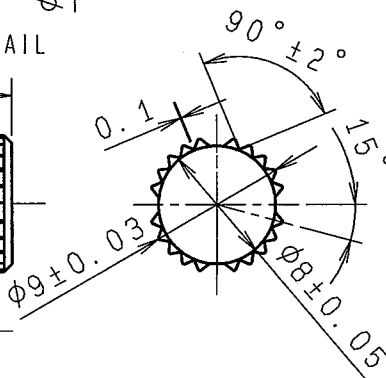
軸部詳細図
 SHAFT DETAIL



取付穴寸法図 許容差±0.1
 (部品挿入側)
 P.W.B. MOUNTING DETAIL
 TOLERANCE±0.1
 VIEWED FROM MOUNTING SIDE

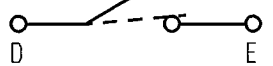


基板板厚 t=1.6mm
 P.C.B. THICKNESS t=1.6mm



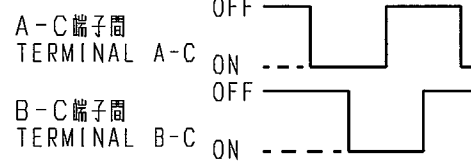
軸角度は任意とする。
 SHAFT ANGLE IS
 OPTIONAL.

(SW02)回路図
 SWITCH CIRCUIT
 DIAGRAM

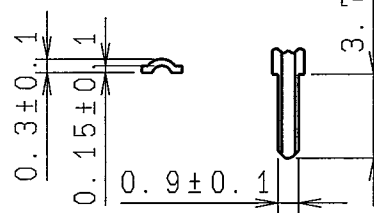


(SW01)出力信号
 ENCODER OUTPUT SIGNAL

時計方向回転
 CW ROTATION



基板挿入部端子形状詳細(3:1)
 TERMINAL DETAIL



| | |
|--|------|
| 指定なき部分の許容差 TOLERANCES UNLESS OTHERWISE SPEC | |
| $L \leq 10$ | ±0.3 |
| $10 < L < 100$ | ±0.5 |
| $100 \leq L$ | ±0.8 |
| 角度 ANGULAR DIMENSION | ±5° |

| | | | | | |
|--------------------------------|------------|----------------------|--------------|--|--|
| | | | | 15P/30C | |
| PART NO. | NAME | MATERIAL NAME / CODE | FINISH | | |
| ALPS ELECTRIC CO., LTD. | | | | | |
| DSGD. | M. CHIBA | 2010-07-13 | SCALE 2:1 | NO. | |
| CHKD. | Y. SHIMIZU | 2010-07-13 | | TITLE 11形1軸 PUSH ON SW付エンコーダ ^ク 組立図 | |
| APPD. | Y. KATO | 2010-07-13 | UNIT mm | DOCUMENT NO. LE2115L02G | |
| SYMB | DATE | APPD | CHKD | DSGD | |

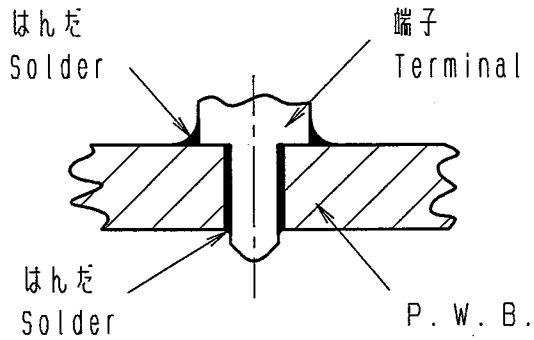


CLASS No. _____

TITLE _____

<はんだ付け時の注意事項>
Caution for soldering

図のようにP.W.Bの上面にはんだ付けをする配線はお避け下さい。
Please avoid soldering on upper surface of P.W.B. as shown



⚠ 基板に挿入される金属足ははんだ付けしてご使用願います。
Solder all metal inserted fixing including terminals & metal lugs into a substrate.

| | | | | | | | | |
|------|----------|------|------|------|-------------------------------------|---------------|---------------|--------------|
| | | | | | ALPS ALPS ELECTRIC CO., LTD. | | | |
| | | | | | APPD. DSG1 | CHKD. DSG1 | DSGD. DSG1 | TITLE _____ |
| | | | | | Y. YOSHIOKA | Y. SATO | Y. OYA | DOCUMENT NO. |
| | | | | | 1996/01/11 | 1996/01/11 | 1996/01/11 | 4K-1 (1/1) |
| ⚠ | 09-01-27 | Y. K | Y. K | H. M | | | | |
| SYMB | DATE | APPD | CHKD | DSGD | | | | |