SHARP

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CONPOUND SEMICONDUCTOR DIVISION

ELECTRONIC COMPONENTS GROUP

SHARP CORPORATION

# TECHNICAL LITERATURE

DEVICE TECHNICAL LITERATURE FOR

Photo Transistor

MODEL No.

## PT202MR0MP1

**** The technical literature is subject to be changed without notice ****

LED Business Project Team
Electronic Components Group
SHARP CORPORATION

PRODUCT NAME Photo Transistor

MODEL No. PT202MR0MP1

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(Precautions)

(1) This products is designed for use in the following application areas;

[ * OA equipment * Audio visual equipment * Home appliance
* Telecommunication equipment (Terminal) * Measuring equipment
* Tooling machines * Computers ]

If the use of the product in the above application areas is for equipment listed in paragraphs (2) or (3), please be sure to observe the precautions given in those respective paragraphs.

(2) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as ;

[ * Transportation control and safety equipment (aircraft, train, automobile etc.)
* Traffic signals * Gas leakage sensor breakers * Rescue and security equipment
* Other safety equipment ]

(3) Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;

[ * Space equipment * Telecommunication equipment (for trunk lines)
* Nuclear power control equipment * Medical equipment ]

(4) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.

3. Please contact and consult with a Sharp sales representative for any questions about this product.

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PT202MR0MP1 Technical Literature

1. Application

This Technical Literature applies to the outline and characteristics of silicon phototransistor Model No. PT202MR0MP1.

This model is designed for detector of LCD back-light power control.

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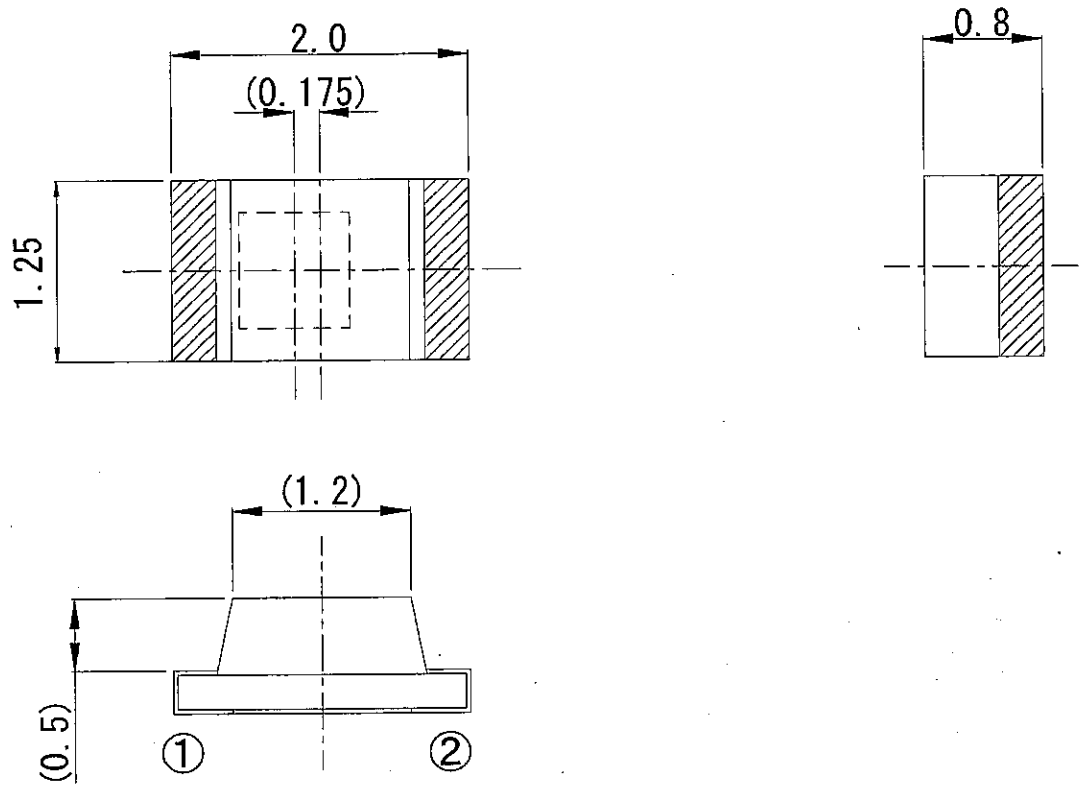
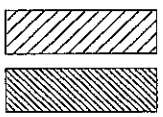
2. Outline dimensions and terminal connections

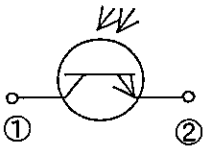



注記 (Note)

1．メッキ部　(Plated area)
　レジスト部　(Resist area)



2．端子接続　(Terminal Connection)
　①　：コレクタ (Collector)
　②　：エミッタ (Emitter)




3．指示無き寸法公差は、±0．1mm
　(Unspecified torerance to be ±0．1mm)

4．カッコ値は参考値。
　(Value inside the parenthesis is a reference value)

| Unit | Material | Finish | Drawing No. |
|---|---|---|---|
| mm | PWB: Glass-Epoxy<br>Resin: Epoxy | Au Plated | 51506003 |

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3. Ratings and characteristics

3-1. Absolute maximum ratings (Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Collector-emitter voltage | $V_{CEO}$ | 5 | V |
| Emitter-collector voltage | $V_{ECO}$ | 3.5 | V |
| Collector current | $I_C$ | 2 | mA |
| Collector power dissipation | $P_C$ | 5 | mW |
| Operating temperature | Topr | -30 ~ +85 | °C |
| Storage temperature | Tstg | -40 ~ +100 | °C |
| Soldering temperature *1 | Tsol | 260 | °C |

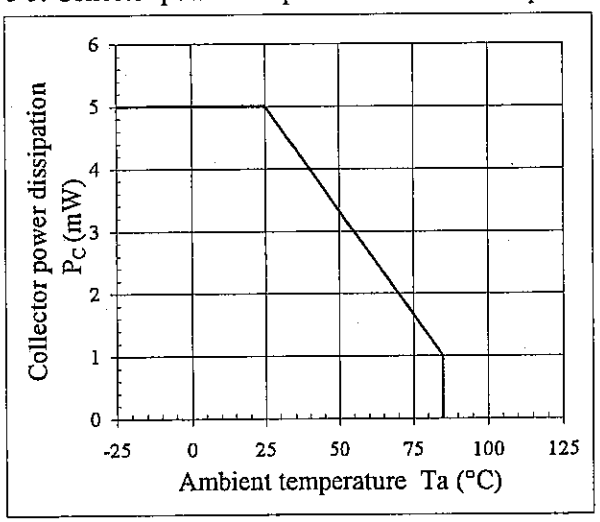
*1:Manual soldering : Max. 3 seconds ,reflow soldering : refer to the attached sheet Page 9/10

3-2. Electro-optical characteristics (Ta=25°C)

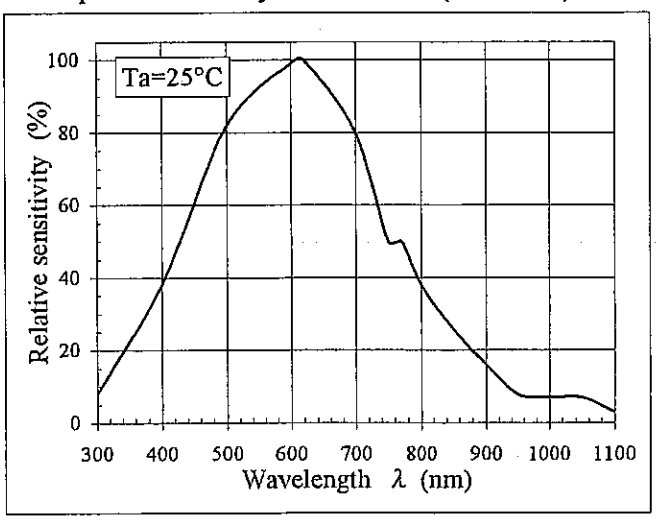
| Parameter | Symbol | Conditions *2 | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Collector current | $I_C$ | Ev=100lx,VCE=1.5V | See6-5. | 43 | See6-5. | μA |
| Dark current | $I_{CEO}$ | Ev=0,VCE=1.5V | - | - | 0.1 | μA |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | Ev=100lx,Ic=30μA | - | 0.1 | 0.4 | V |
| Peak sensitivity wavelength | λp | - | - | 620 | - | nm |
| Response time (Rise) | tr | VCE=1.5V,Ic=0.5mA, | - | 25 | - | μs |
| Response time (Fall) | tf | RL=1kΩ | - | 25 | - | μs |
| Angle of half intensity | $2\theta_{1/2}$ | - | - | 60 | - | ° |

*2 Ee: Illuminance by CIE standard light source A (tungsten lamp)

3-3. Collector power dissipation vs. ambient temperature




3-3. Spectral sensitivity characteristics ( reference )



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4. Reliability

The reliability of products shall be satisfied with items listed below.

4-1. Test items and test conditions

Confidence level: 90%

| Test items | Test conditions | Samples (n) Defective (C) | LTPD (%) |
|---|---|---|---|
| temperature cycling | -40°C(30min) ~ +100°C(30min), 20times. | n=22, C=0 | 10 |
| High temp. and high humidity storage | Ta=+40°C, 90%RH, t=250h | n=22, C=0 | 10 |
| High temperature storage | Ta=+100°C, t=250h | n=22, C=0 | 10 |
| Low temperature storage | Ta=-40°C, t=250h | n=22, C=0 | 10 |
| Operating test | Ta=+25°C, Pc=5mW, t=250h | n=22, C=0 | 10 |
| Mechanical shock | 15km/s$^2$, 0.5ms,<br>3times / ±X,±Y,±Z direction | n=11, C=0 | 20 |
| Variable frequency vibration | 200m/s$^2$, 100~2 000~100Hz/sweep for 4min.<br>,4times/X,Y,Z direction | n=11, C=0 | 20 |
| Soldering heat | Refer to the attached sheet,<br>Page 9/10 2time | n=11, C=0 | 20 |

4-2. Failure judgement criteria *1

| Parameter | Symbol | Failure judgement criteria *2 |
|---|---|---|
| Collector current | $I_C$ | $I_C$ < L.S.L. × 0.8 or $I_C$ > U.S.L. × 1.2 |
| Dark current | $I_{CEO}$ | $I_{CEO}$ > U.S.L. × 2.0 |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $V_{CE(sat)}$ > U.S.L. × 1.2 |

*1: Measuring condition is in accordance with specification.

*2: U.S.L. is shown by Upper Specification Limit. L.S.L. is shown by Lower Specification Limit.

4-3. Solderbility test conditions and failure judgement criteria

| Test conditions | Failure judgement criteria | Samples (n) Defective (C) | LTPD (%) |
|---|---|---|---|
| Solder dip , 235±5℃/ 2±1s<br>(Solder paste : SnPb or Sn-3.0Ag-0.5Cu) | It must be covered with soldering paste more than 95 % of plated part of the electrode pin ,either side and bottom part by soldering position. | n=11, C=0 | 20 |

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5. Incoming inspection

5-1. Applied standard : ISO-2859-1

5-2. Inspection method

A single sampling plan, normal inspection level S-4

5-3. Description of inspection and criteria

| No. | Inspection items | Criteria | Defect | AQL |
| --- | --- | --- | --- | --- |
| 1 | Electro-optical characteristics | Not conforming to the specification ( $I_C$, $I_{CEO}$, $V_{CE(sat)}$ ) | Major defect | 0.1% |
| 2 | Taping | Product inserted in the reverse direction | | |
| 3 | Outline dimensions | Not conforming to the specification (Most external form dimension,Thickness) | Minor defect | 0.4% |
| 4 | Appearance | One that exerts the influence on the characteristic (Electrode crack,Resin flash,Resin crack,Dust and flaw) | | |

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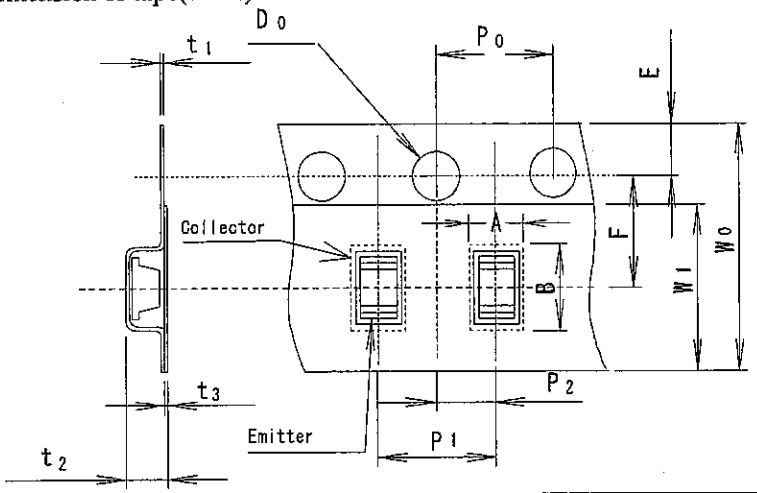
6.Supplement article

6-1. Taping

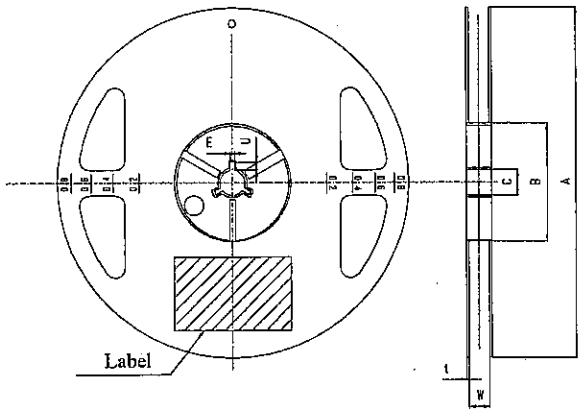
6-1-1.Shape and dimension of tape(TYP.)




| Parameter | | Symbol | Dimension [mm](TYP.) | Remarks |
|---|---|---|---|---|
| Concave square hole for part insertion | Vertical | A | 1.55 | Dimension excludes corner R at inside bottom |
| | Horizontal | B | 2.3 | |
| | Pitch | P 1 | 4.0 | |
| Round sprocket hole | Diameter | D 0 | 1.5 | |
| | Pitch | P 0 | 4.0 | Accumulated error ±0.5mm/10 pitch |
| | Position | E | 1.75 | Distance between tape edge and hole center |
| Center to center dimension | Vert.dire | P 2 | 2.0 | Center line of the concave square hole and round sprocket hole |
| | Hori.dire | F | 3.5 | |
| Cover tape | Width | W 1 | 5.5 | |
| Carrier tape | Thickness | t 3 | 0.1 | |
| | Width | W 0 | 8.0 | |
| Thickness | | t 1 | 0.2 | |
| Thickness of the entire unit | | t 2 | 1.2 | With cover tape and carrier tape combined |

※ Material : Carrier tape...PET, Cover tape...Polyester

6-1-2.Shape and dimension of reel(TYP.)




| Parameter | | | Symbol | Dimension [mm](TYP.) | Remarks |
|---|---|---|---|---|---|
| Frange | Diameter | | A | $\phi$178 | |
| | Thickness | | t | 1.5 | |
| | Inner space direction | | W | 10 | Dimension of shaft core |
| Hub | External diameter | | B | $\phi$60 | |
| | Spindle hole diameter | | C | $\phi$13 | |
| | Key slit | Width | E | 2.0 | |
| | | Depth | U | 4.5 | |
| Notation for part name etc. | | | Labeling on one side of flange.(part name,quantity,lot No.) | | |

※ Material : Reel...Polystyrene

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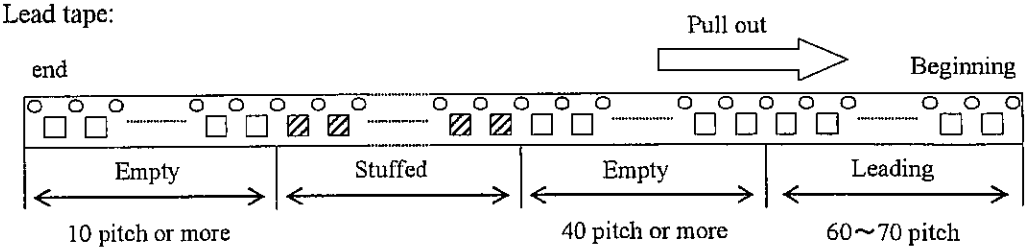
6-1-3.Taping specification

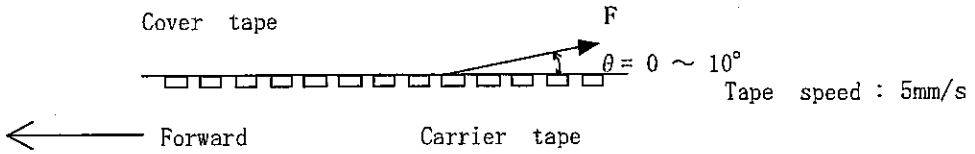
The specifications are in accodance with JIS C0806

(1) Lead tape:




(2) Empty and leading length : 400mm or more (100 pitch or more)

(3) Cover tape strength against peeling:F=0.1~0.8N( $\theta$ =10°or less)




(4) Tape strength against bending:

The radius of bending circle should be 30mm or more.

If it is less than 30mm, the cover may peel.

(5) Jointing of tape: There should not be joint of cover tape or carrier tape.

(6) Quantity per reel: Average 4,000pcs. per reel

(7)Packing mass: 100g(0ne packing/Reference)

(8)Product mass: 4mg(0ne product/Reference)

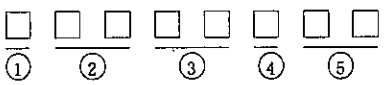
(9) Others: ① The lacking quantity of the products should be less than 0.1% of total product quantity.

② There should not be missing above continuous two products.

③ Products should be easily taken out.

6-2.Label

| | |
|---|---|
| SHARP CORPORATION | |
| PART No. PT202MR0MP1 | ← Model number |
| QUANTITY 4000 | ← Quantity of products |
| | ← EIAJ C-3 Bar code |
| | ← EIAJ C-3 Bar code |
| LOT No. KA01E01 RANK | ← Lot number * |
| <EIAJ C-3> MADE IN JAPAN | ← Production country (ex.) |




① Production plant code(to be indicated alphabetically)

② Production lot(single or double figures)

③ Year of production(the last two figures of the year)

④ Month of production

(to be indicated alphabetically with January corresponding to A)

⑤ Date of production(01～31)

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6-3.Collector current rank

(Unit : μA)

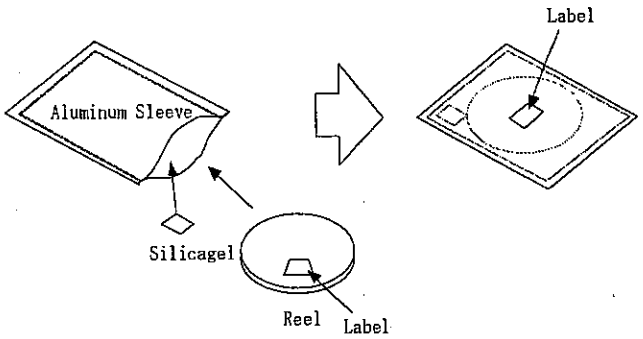
| Rank | MIN. | MAX. |
|---|---|---|
| A | 15 | 35 |
| B | 26 | 60 |
| C | 44 | 101 |

(mesurement accuracy : ±10%)

(Note) Also I Shall not ask the delivery ratio of each rank.

6-4.Dampproof package

In other to avoid the absorption of humidity in transport and storage, the device s are packed in aluminum sleeve.




6-4-1.Strage conditions

Temperature : 5~30℃ Humidity : less than 60%RH

6-4-2.Treatment after opening

(1) Please make a soldering within 2 days after opening.

(2) In case the devices are not used for a long time after opening ,the storage in dry box is recommendable. Or it is better to repack the devices with a desiccative by the sealer and put them in the some storage conditions as 6-4-1. Then they should be used within 2 weeks.

(3) Please make a soldering after a follewing baking treatment if unused term should be over the conditions of (2)

*Recommendable conditions:

Temprature:60℃,Time:90~100 hours (in taping)

6-5. Environment

6-5-1. Ozonosphere destructive chemicals.

(1) The device doesn't contain following substance.

(2) The device doesn't have a production line whose process requires following substance.
Restricted part: CFCs,halones,$CCl_4$,Trichloroethane(Methychloroform)

6-5-2. Bromic non-burning materials

The device doesn't contain bromic non-burning materials(PBBOs,PBBs)

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7. Precautions for use

7-1. Precautions matters for designing circuit

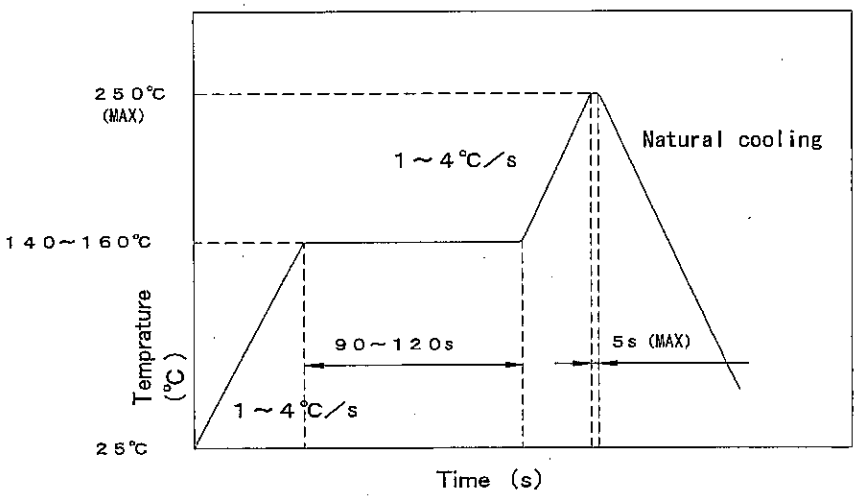
This product is not designed as electromagnetic and ionized-particle radiation resistant.

7-2. Soldering

(1) It is not recommended to exceed the soldering temperature and time shown below. Caused by substrate bend or the other mechanical stress during reflow soldering may happen gold wire disconnection etc. Therefore please check and study your solder reflow machine's best condition.

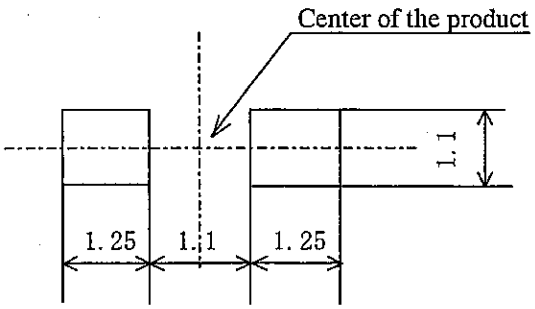
(2) In case of 2 times reflow process,2nd reflow process should be done within 8 hours after 1st reflow process.

(3) Reflow soldering temperature profile




(4) Recommendable Metal Mask pattern for screen print

Recommend 0.2mm to 0.3mm thickness metal mask for screen print. Caused by solder reflow condition, solder paste, substrate and the other material etc, may change solderbility. Please check and study actual solderbility before usage.




Recommended soldar pattern (Unit:mm)

7-3. Cleaning method

(1) Ultrasonic cleaning

The affect on the device from ultrasonic bath, ultrasonic output, duration, board size and device mounting method. Test the cleaning method under actual conditions and check for abnormalities before actual use.

(2) Solvents

Use only the following types of solvent.

water, methyl alcohol, ethyl alcohol, isopropyl alcohol

Recommend conditions: R.T. 40kHz, 30W/l , 3 to 5 minutes