

Data sheet

Part number : KUA0121C-TR



2011/65/EU, (EU)2015/863
10 Substances regulation compliant



Lead-free solder heat resistant product

Package	Surface mount type reflective sensor, IRED / Pd 2 in 1 package Outline dimension : 3.6 x 1.9 x 1.1mm (L x W x H)
Product features	<ul style="list-style-type: none"> • Higher temperature operating (corresponds to Automotive use) • MSL 2a • Visible radiation cut resin for lens • Lead-free soldering compatible • RoHS :2011/65/EU, (EU)2015/863 compliant

Recommended applications

Rotation detection of rotary switches for Automotive interior (audio, navigation system, HVAC, etc.), reflective sensor for object detection of general equipment (object detection, film detection, tape end detection, etc.).

KUA0121C-TR

Outline dimensions

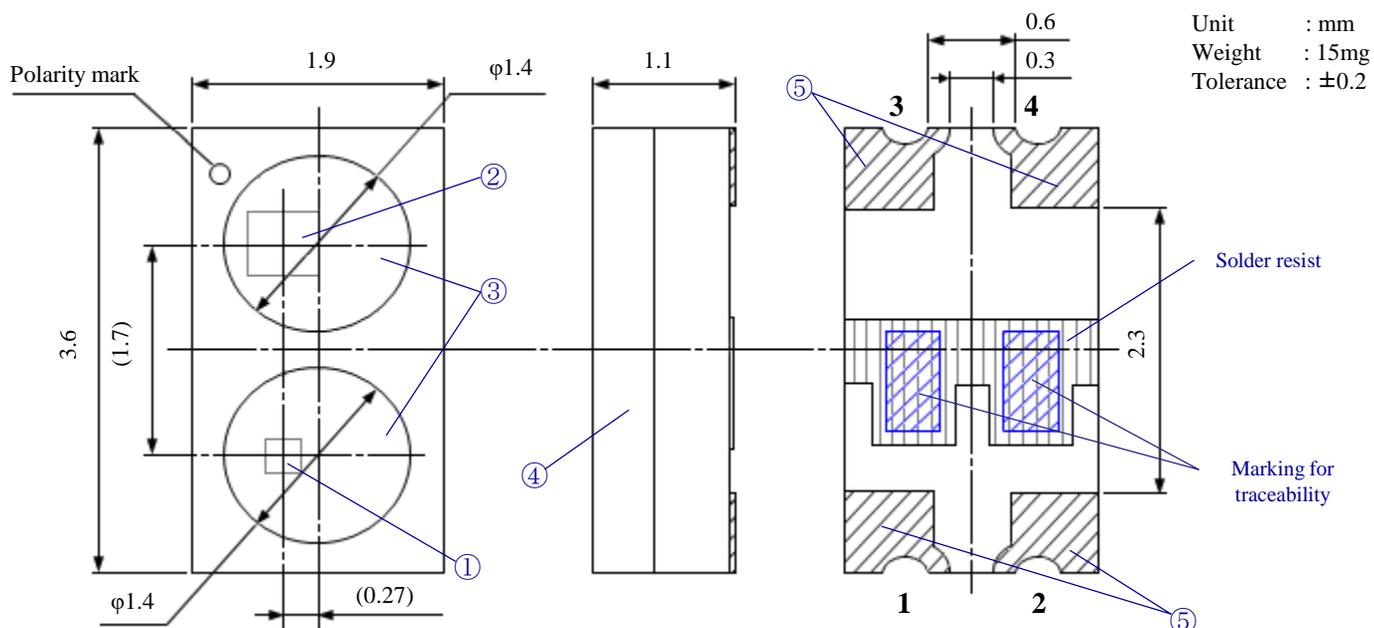
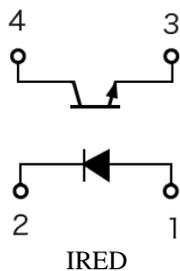


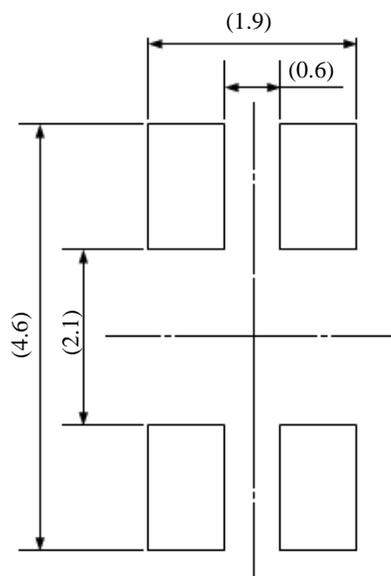
Photo transistor



- 1 : IRED Anode
- 2 : IRED Cathode
- 3 : Photo transistor Emitter
- 4 : Photo transistor Collector

NO.	PART NAME	MATERIAL	QTY.
①	IRE D die	GaAs	1
②	Photo transistor	Si	1
③	Mold resin	Epoxy resin	1
④	Substrate	Glass fabrics	1
⑤	Electrode	Au plating	4

Recommended pad



Unit : mm

Specifications

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【Absolute maximum ratings】

ITEM		SYMBOL	MAXIMUM RATING	UNIT	
Storage temperature		T_{stg}	-40 to +120	°C	
Operating temperature		T_{opr}	-40 to +100	°C	Notes3
IRED ($T_a=25^{\circ}C$)	Power dissipation	P_d	75	mW	
	Forward current	I_F	20	mA	
	Forward current derating	ΔI_F	1	mA/°C	Notes1
	Pulse forward current	I_{FRM}	300	mA	Notes2
	Pulse forward current derating	ΔI_{FRM}	18	mA/°C	Notes1
	Allowable reverse voltage	V_R	5	V	
Photo transistor ($T_a=25^{\circ}C$)	Collector loss	P_C	75	mW	
	Collector-Emitter voltage	V_{CEO}	20	V	
	Emitter-Collector voltage	V_{ECO}	5	V	
	Collector current	I_C	10	mA	

Notes1 I_F Derate linearly from " $T_a=85^{\circ}C$ "

Notes2 I_F Pulse width $\leq 0.1ms$, Duty $\leq 1/100$

Notes3 In case of using in the condition of $T_a=85^{\circ}C$ or more,
please take utmost care on the increase of dark current (I_{CEO}).

Specifications

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【 Electro-optical characteristics 】

(Ta=25°C)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input	Forward voltage	V_F	$I_F = 5\text{mA}$	0.9	1.1	1.5	V
	Reverse current	I_R	$V_R = 5\text{V}$	-	-	10	μA
	Peak wavelength	λ_P	$I_F = 20\text{mA}$	-	940	-	nm
Output	Dark current	I_{CEO}	$V_{CEO} = 10\text{V}$	-	-	0.1	μA
	Peak sensitivity wavelength	λ_P	-	-	880	-	nm
Coupling characteristics	Photo current	I_C	$V_{CE} = 5\text{V}$ $I_F = 5\text{mA}$ $d = 1\text{mm}$	184	300	520	μA
	Leak current	I_{LEAK}	$V_{CE} = 5\text{V}$ $I_F = 5\text{mA}$ No reflector	-	-	2	μA
	Rise time	t_r	$V_{CE} = 10\text{V}$ $R_L = 100\Omega$	-	10	-	μs
	Fall time	t_f	$I_F = 5\text{mA}$	-	10	-	μs

Fig. 1

Fig. 2

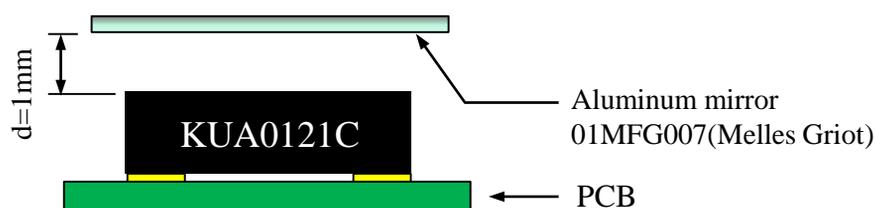


Fig.1 Photo current

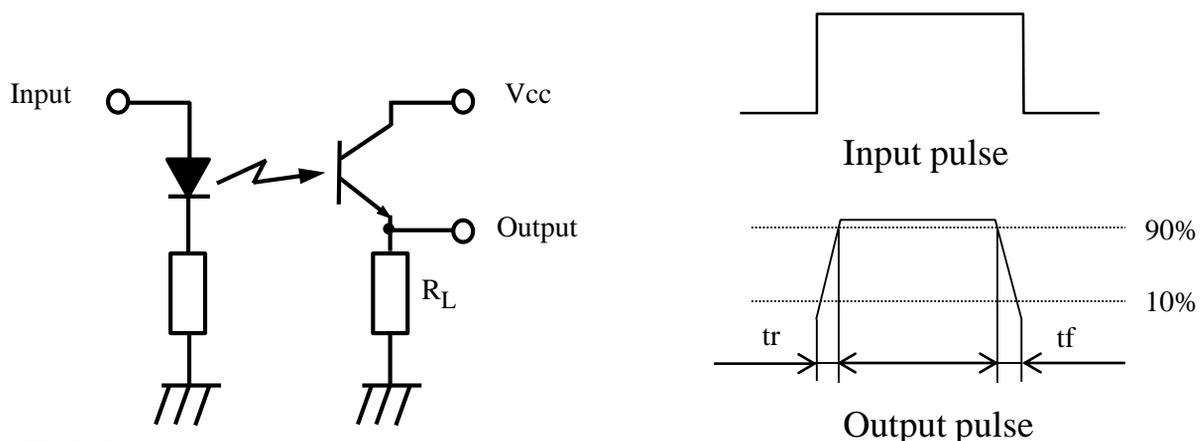


Fig.2 Response speed

Specifications

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【Sorting chart for photo current】

Photo current shall be sorted out into the following chart and each rank parts shall be packed separately when shipping.

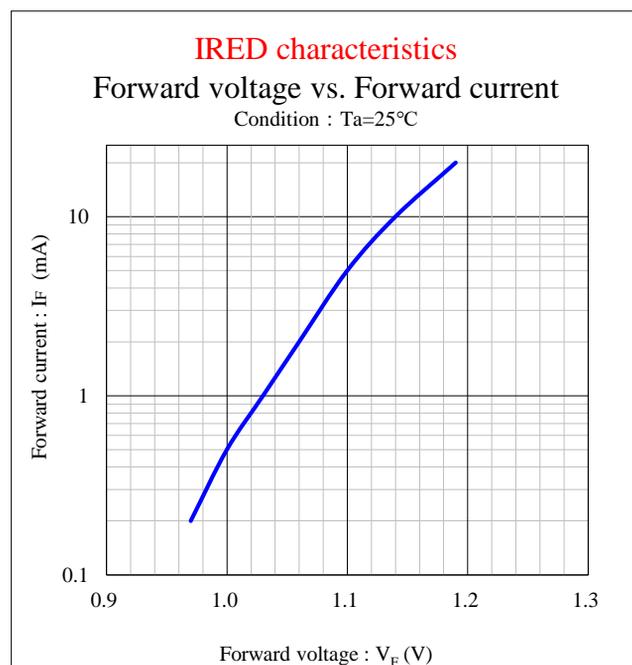
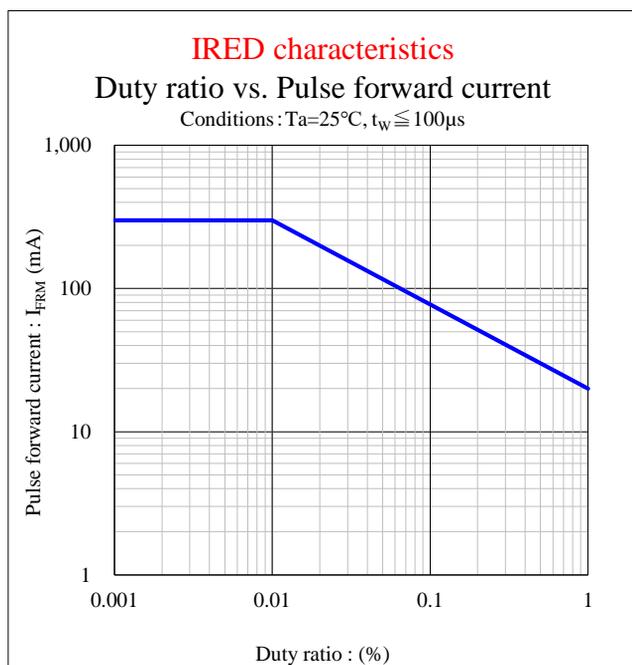
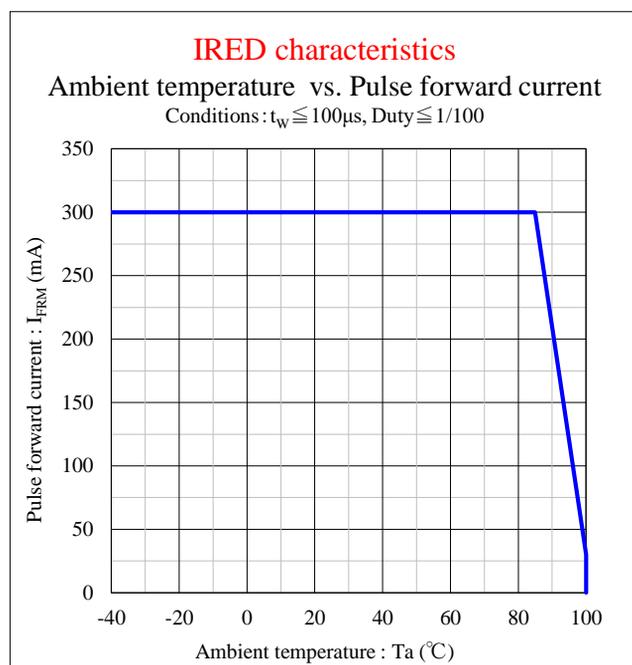
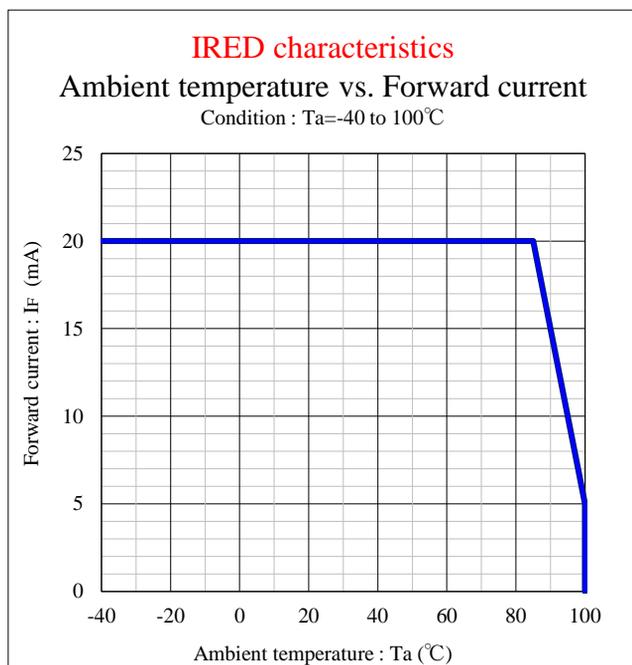
(Ta=25°C)

Rank	Photo current Ic (μA)		Conditions
	MIN.	MAX.	
B	184	260	V _{CE} = 5V I _F = 5mA d = 1mm
C	260	368	
D	368	520	

Notes Tolerance each rank: ±10%

Technical data

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Technical data

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IRED characteristics

Ambient temperature vs. Forward voltage

Condition : $I_F=0.5$ to 20mA

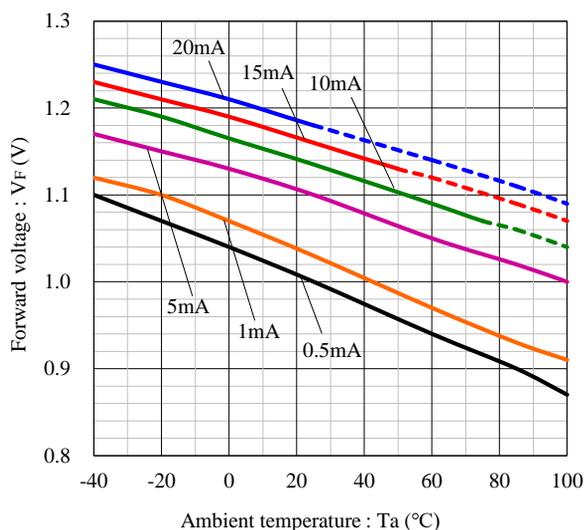


Photo transistor characteristics

Ambient temperature vs. Relative dark current

Condition : $V_{CE}=5\text{V}$

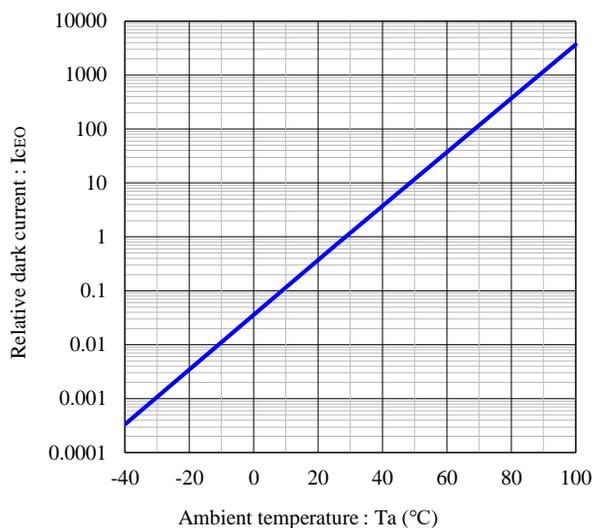
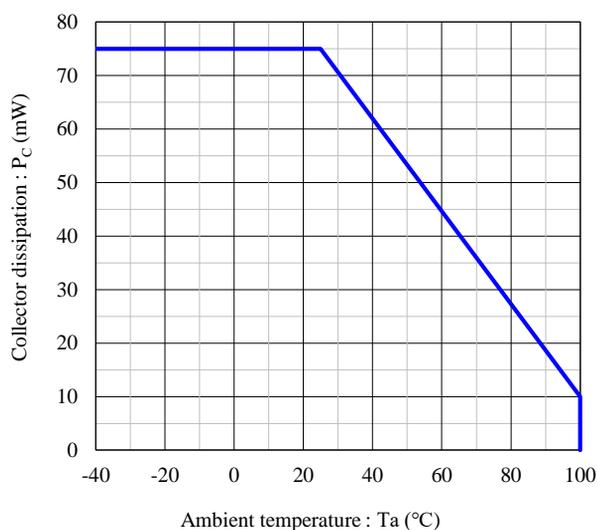


Photo transistor characteristics

Ambient temperature vs. Collector dissipation

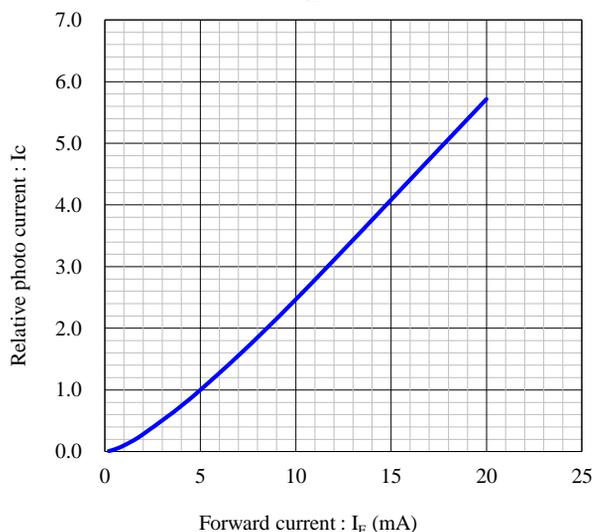
Condition : $T_a=-40$ to 100°C



Coupling characteristics

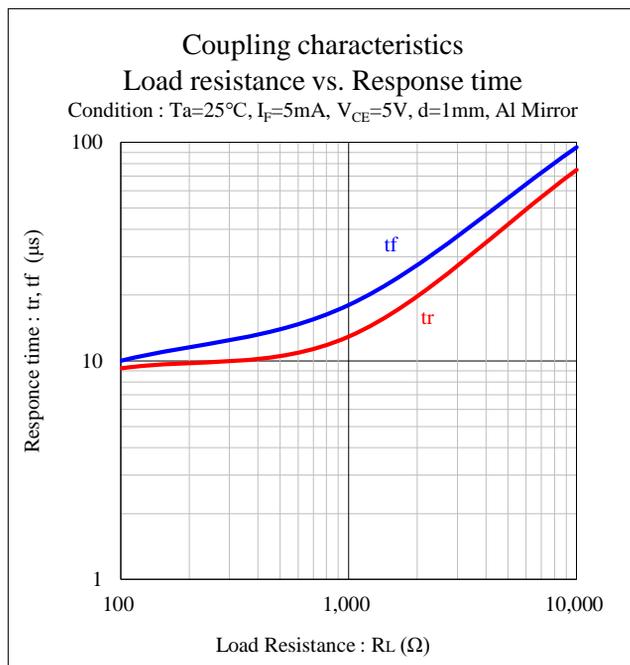
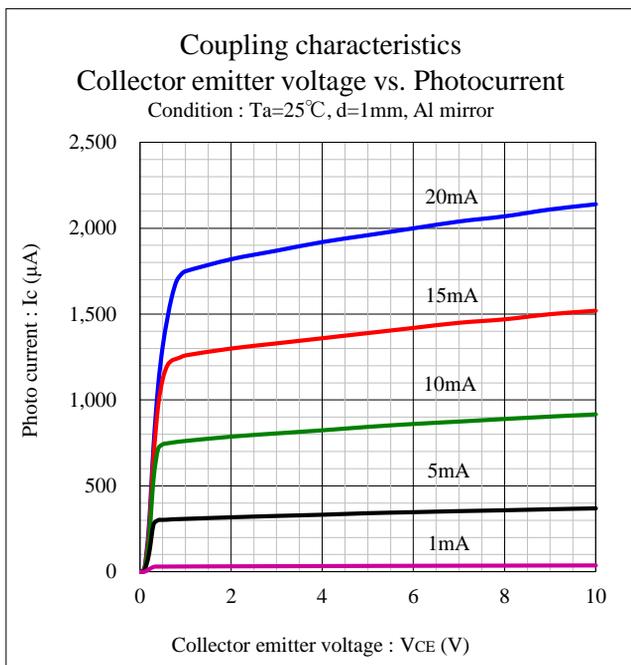
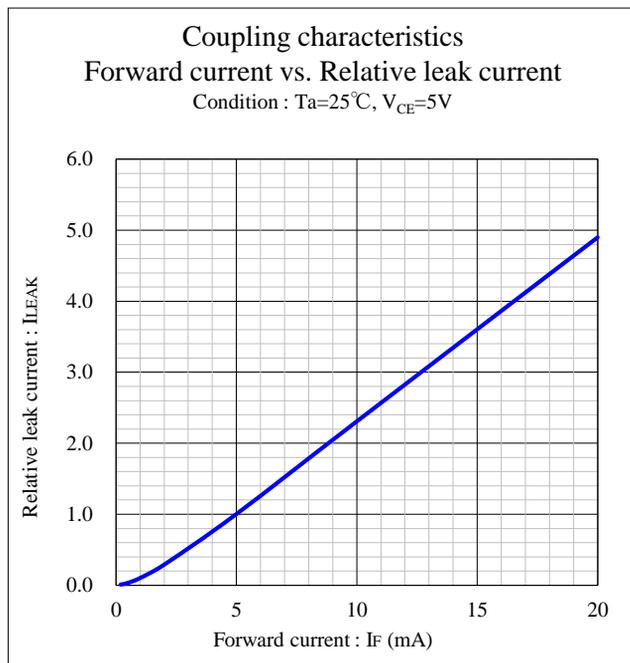
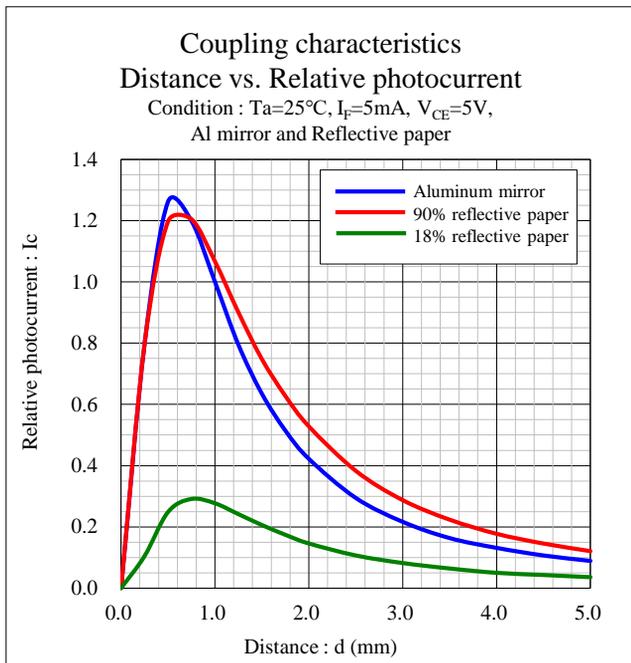
Forward current vs. Relative photocurrent

Conditions : $T_a=25^\circ\text{C}$, $V_{CE}=5\text{V}$, $d=1\text{mm}$, Al mirror



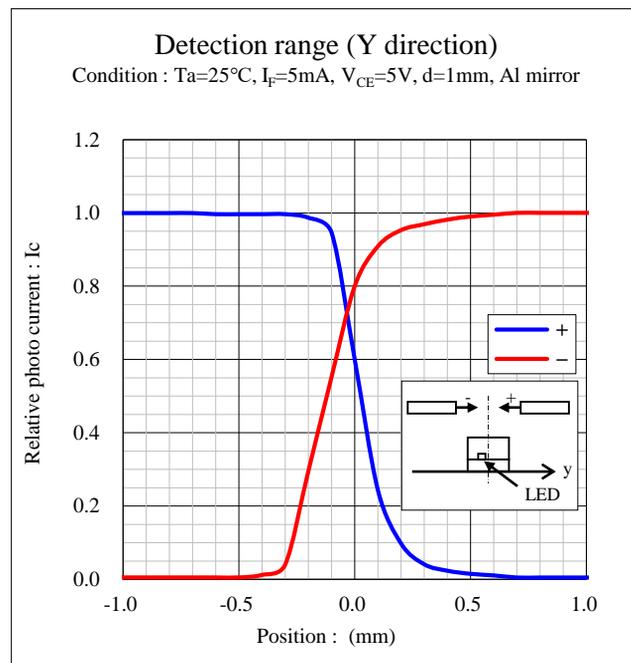
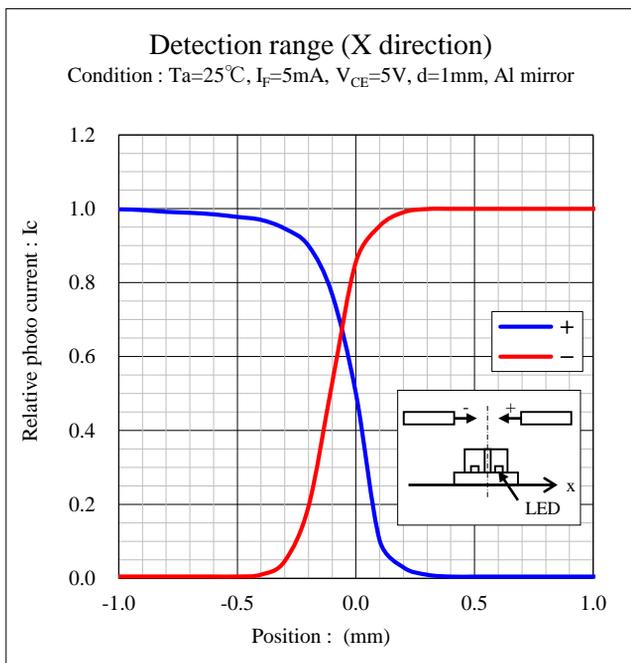
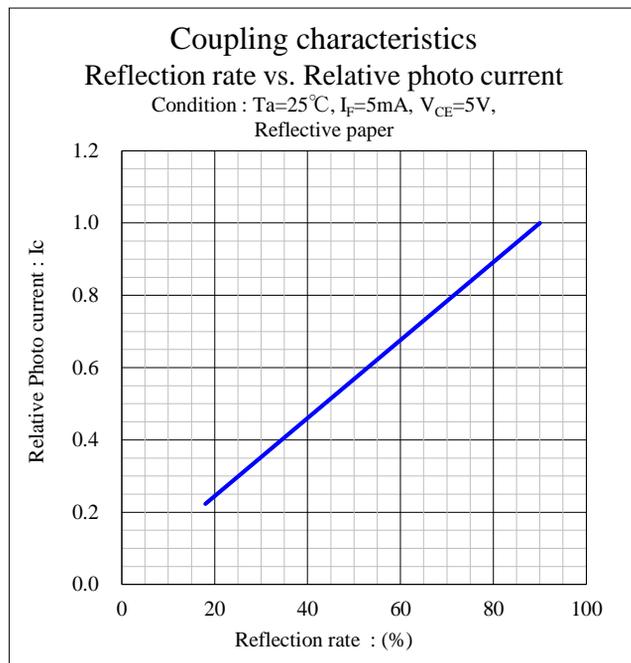
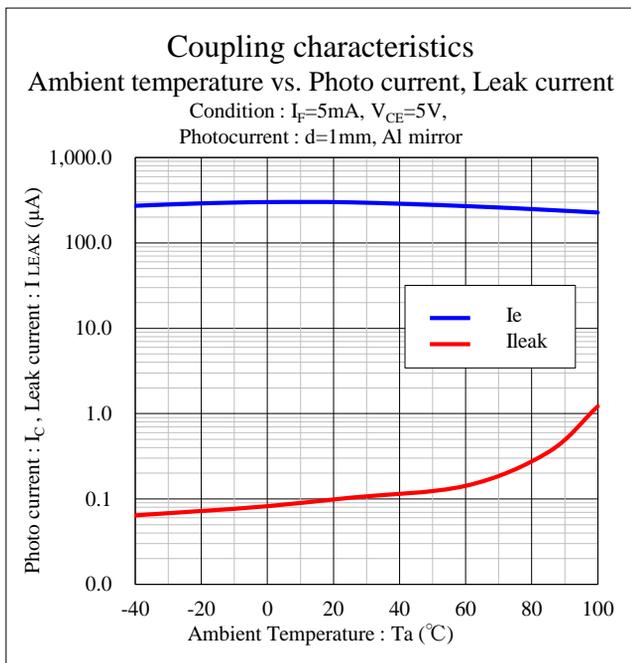
Technical data

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Technical data

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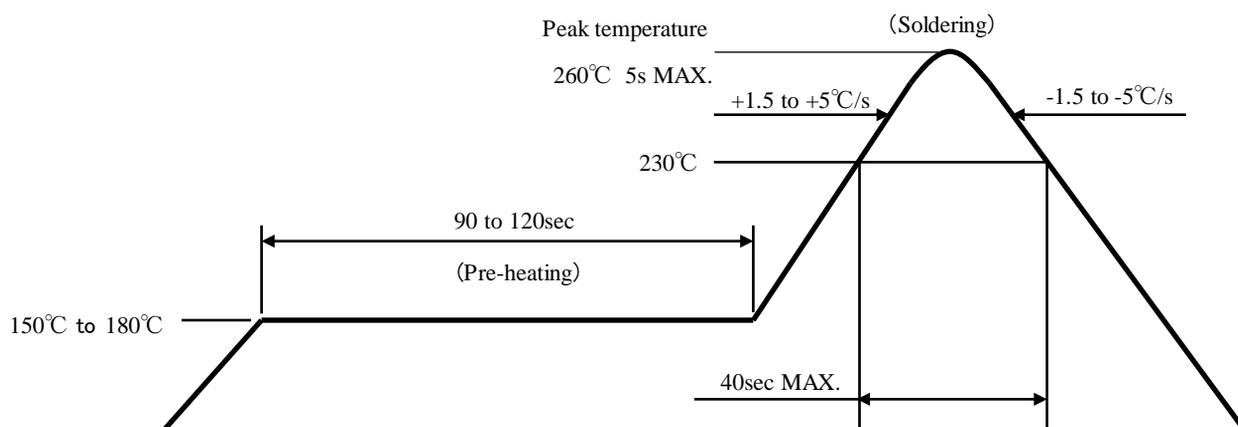
Soldering condition

【 Soldering precaution 】

(acc.to : EIAJ ED-4701/300)

- Heat stress during soldering will influence the reliability of sensor, however, that effect will vary on heating method.
Also, if more than one component needs to be mounted together, it is recommended to set the soldering pad temperature according to the component most vulnerable to heat.
(recommended Condition: Soldering Pad temp. > Package temp.)
- Sensor parts including the resin has not stabilized immediately after the soldering.
Any mechanical stress may cause damaged to the product. Please avoid these stresses, especially stacking of the boards, or any other storage method which may cause the boards to warp.
Also please avoid the boards from coming in contact, or sliding against hard materials.
- Recommended temperature profile for the Reflow soldering is listed as the temperature on the top surface.
This is due to the fact that temperature distribution varies on heating method, PCB material, other components in the and concentration of the parts mounted. Please do not repeat the heating process in reflow process more than twice.

【Recommended reflow soldering condition】



Notes1 Temperature profile set to device top resin surface temperature, which is the maximum ratings for soldering.
Lowering the heating temperature and decreasing heating time than the values shown is very effective in achieving higher

Notes2 The reflow soldering process shall be 2 times Max. if 2nd process would be performed, interval between 1st and 2nd process shall be as short as possible to prevent absorption of moisture to resin of this device.
The temperature of this device after 1st soldering shall be room temperature condition before 2nd.

Soldering condition

- 4 If soldering manually, Stanley recommends using a soldering iron equipped with temperature control. During the actual soldering process, make sure that the soldering iron never touches the device itself, and avoid the device's electrode temperature reaching above the temperature of the solder pad. All repairs must be performed only once in the same place, and please avoid reusing components.
- 5 During the soldering process with a soldering iron, if the iron, tip has been cleaned, please make sure that the soldering iron reaches the appropriate temperature before resuming the solder process. Also, please avoid applying any types of pressure to the soldered components while the solder is cooling and hardening, as it may influence solder performance and solder quality.

【Recommended manual soldering condition】

Temperature of iron tip	350°C MAX.
Soldering duration, time	3sec.Max., 1 time

- 6 When using adhesive material for tentative fixatives, thermosetting resin or Ultraviolet radiation(UV) setting resin with heat shall be recommended.《The curing condition, Temperature:150°C Max./Time:120sec.Max.》
- 7 When cleaning, isopropyl alcohol shall be recommended. Some chemicals, including Freon substitute detergent could corrode or affect the optical characteristics of the lens or the casing surface. Please review the reference chart below for cleaning. Cleaning with ultrasonic shall not be recommended.

Cleaning agents	Recommended / Not recommended
Isopropyl alcohol	✓Recommended
Ethyl alcohol	✓Recommended
Pure water	✓Recommended
Trichloroethylene	x Not recommended
Chloroethene	x Not recommended
Acetone	x Not recommended
Thinner	x Not recommended

- 8 This products should not be recommended flow soldering (dip soldering).

Handling precaution

1. The products are designed to achieve the highest performance reliability, however they can be influenced by usage conditions.
2. Absolute Maximum Ratings are set to prevent sensor products from breaking due to extreme stress (temperature, current, voltage, etc.).
Usage conditions must not exceed the ratings for moment , not do reach one item of absolute maximum ratings
3. To achieve the highest performance reliability, it is necessary to take into account, factors such as forward voltage adjusted to the usage temperature condition, derating of the power consumption, and other variable factors.
4. If there are objects except detecting object in the sensing range, photo current shall have changes. So when laid on the product in a narrow place or space, please have your confirmation referring to "Sensing range characteristics".
5. If plural products are arranged in the neighborhood, photo current shall have changes under the influence of
So when arranged in the neighborhood, please don't have any interference referring to "Product interval
6. If the reflectivity of detecting object are changed, photo current shall have changes. When detecting object is decided, please refer to "Reflectivity of detecting object charactoristics". And if there are reflector on background of the detecting object, it makes low to the utmost reflectivity of reflector on background.
7. Please insert Straight Protective Resistors into the circuit in order to stabilize LED operation and to prevent the device from overheating.
8. If LED's forward current are changed, leak current shall have changes. When you decide on LED's forward please have your attention referring to "LED's forward current- leak current charactoristics".
9. Dirt stuck on the mold resin surface affects the photo current.
Please avoid to stick foreign material because molding resin in the products has adhesiveness.
And keep lens out of touch. Don't apply pressue of lens. Sensor might not be operated, if lens has been touched.
10. Dew or Freezing cause output fall of sensor,improper operation, deterioration of insulation, Please have your so as not to dew or freeze.
11. It is generally said that the near infrared rays used this product is harmless to human body.However, to look straight near infrared rays are not always safty, please have your attention.
12. The products are designed to perform without failure in the recommended usage conditions. However, please take necessary precautions to prevent fire, injury, and other damages from these unexpected failures.
13. The products are manufactured to be used for ordinary electronic equipment. Please contact our sales staff in advance exceptional quality and reliability are required, when the failure or malfunction of the products might directly jeopardize health.
(such as for airplanes, aerospace, transport equipments, medical applications, nuclear reactor control systems and so on.)
14. The formal specification sheets should be exchanged and signed by both parties.

Handling precaution

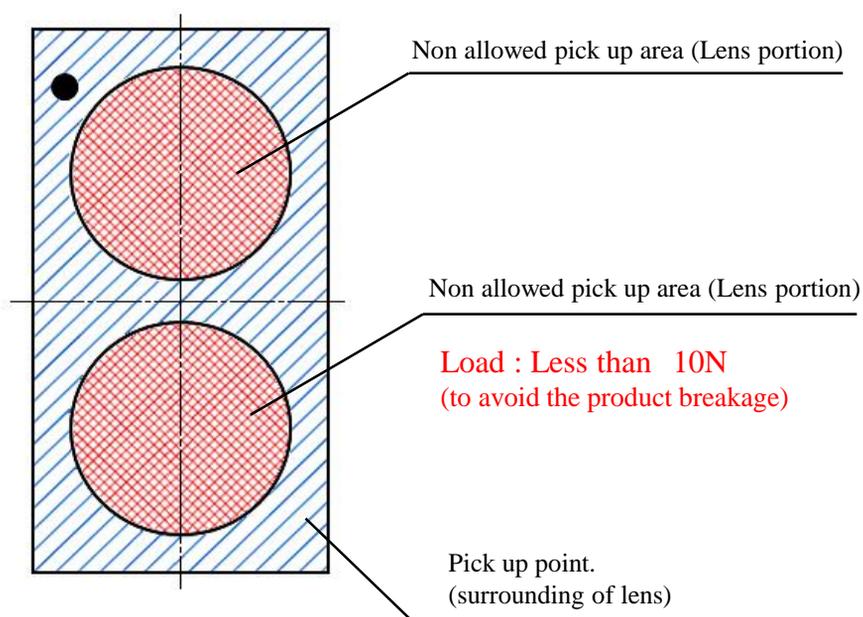
【 Handling precautions for product mounting 】

<Recommended condition>

- 1 Pick up point : The surrounding of LED ( area) (Shown below)

Pick up should only be limited to the surrounding of lens.

(If the nozzle makes contact with the lens, the products might be damaged.)



Please adjust the load, the pick up point, the nozzle diameter and etc. before mounting because the over load can cause the breakage of the surrounding of lens.

Packaging specifications

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This products are baked (moisture removal) before packaging, and are shipped in moisture-proof packaging (as shown below) to minimize moisture absorption during transportation.

However, in regards to storing the products, the use of dry-box under the following conditions is recommended. Moisture-proof bag as the packaging is made of anti-static material but packaging box is not.

【Recommended storage condition / Products warranty period】

Temperature	+5 to 30°C
Humidity	Under 70%

In the case of the package unopened , **6 months under 【 Recommended storage condition 】**.

Please avoid rapid transition from low temp. condition to high temp. condition and storage in corroding and dusty environment.

【Time elapsed after package opening】

The package should not be opened until immediately prior to its use, and please keep the time frame between package opening and soldering which is **【maximum 672h.】** If the device needs to be soldered twice, both soldering must be completed within 672h.

If any components should remain after their use, please seal the package and store them under the conditions Described in the **【 Recommended storage condition 】**.

The product must be required to perform baking process (moisture removal) for **at least 24h and not exceed for 72h , at 60+/-5 °C** if following conditions apply.

1. In the case of color of indicators (those are in the package of desiccant) change or lose its blue color.
2. In the case of time is passed for 672h after the package is opened once.

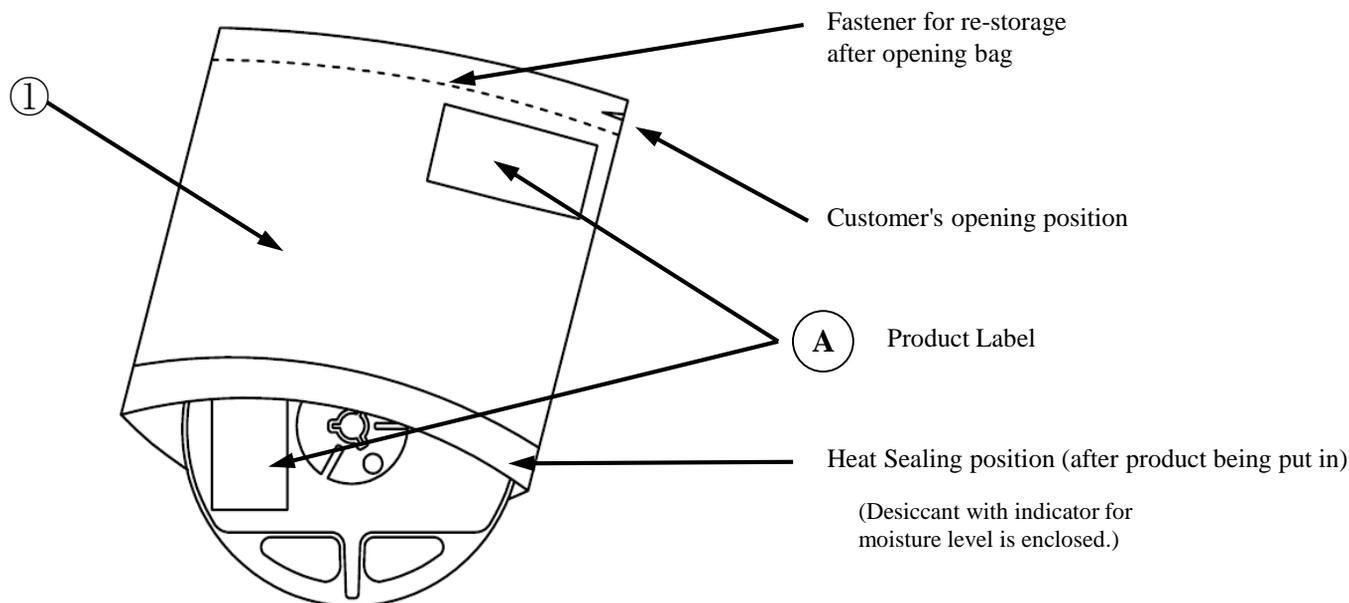
Please backing process must be performed after putting out from package.

Baking may be performed in the tape-reel form, however if it is performed with the reel stacked over one another, it may case deformation of the reels and taping materials, which may cause problems during production. Please make sure that the product has cooled to normal temperature after performing the baking process. Provided that, baking process shall be 2 times MAX.

Packaging specifications

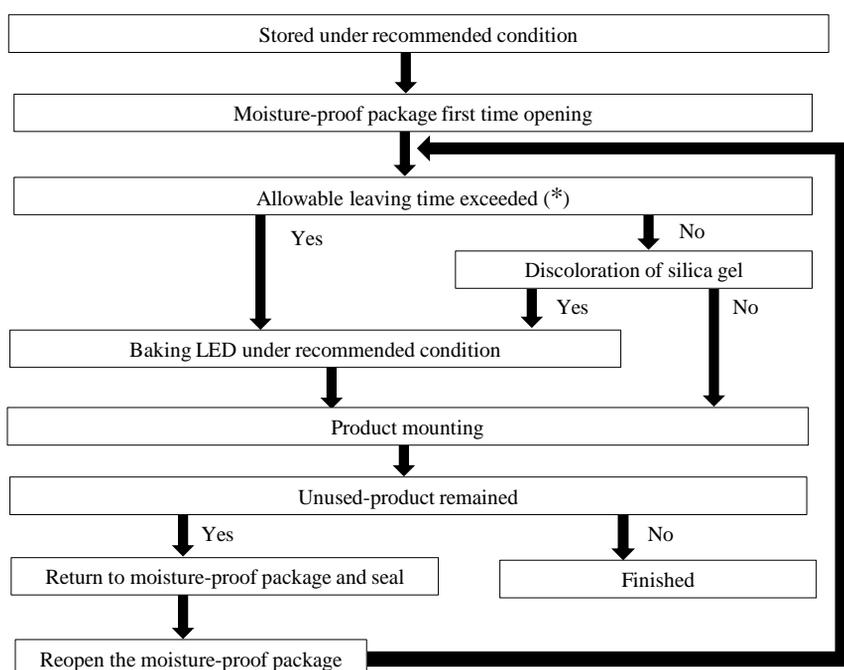
KUA0121C-TR

【Moisture-proof Packaging Specification】



NO.	PART NAME	MATELRIAL	REMARKS
①	Moisture-proof bag with Aluminum layer	PET+Al+PE	with ESD protection

【Flow chart-package opening to mounting】



Allowable leaving time means the maximum allowable leaving time after opening package, which depends on each LED type. The allowable leaving time should be calculated from the first opening of package to the time when soldering process is finished. When judging if the allowable leaving time has exceeded or not, please subtract the soldering time. The allowable leaving time after reopening should be calculated from the first opening of package, or from the time when baking process is finished.

Packaging specifications

KUA0121C-TR

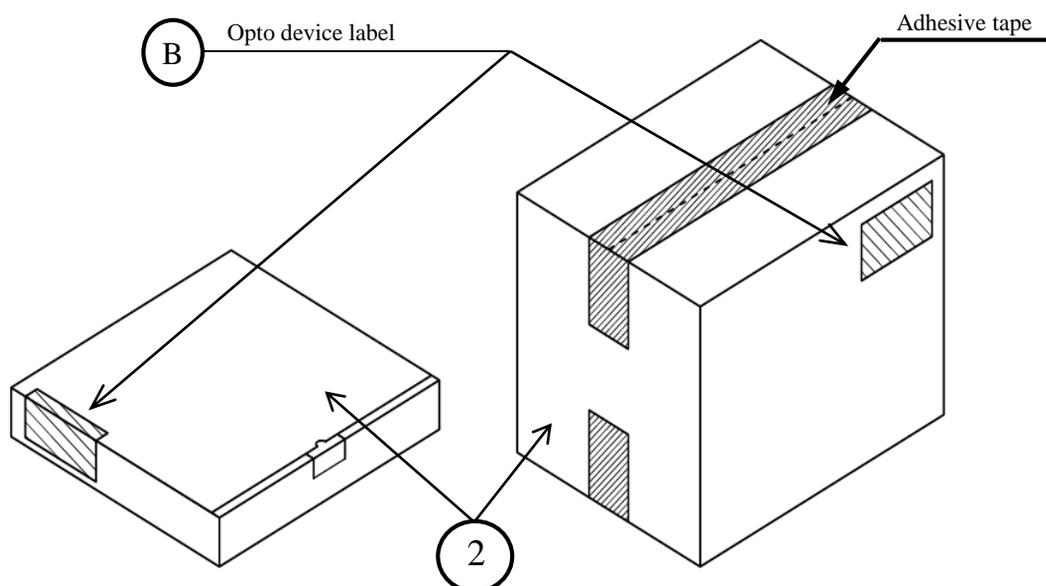
【Packing Box】

(RoHS / ELV Compliant)

Box type	Outline dimension L × W × H (mm)	Capacity of the box
Type A	280 × 265 × 45 (mm)	2 reels
Type B	310 × 235 × 265 (mm)	10 reels
Type C	440 × 310 × 265 (mm)	20 reels
Type D	305 × 270 × 65 (mm)	2 reels
Type E	370 × 280 × 270 (mm)	20 reels
Type F	530 × 380 × 270 (mm)	40 reels

The above measures are all the reference values.

The box is selected out of the above table by shipping quantity.

Type A

Material / Box : Cardboard C5BF

Type B, C

Material / Box : Cardboard K5AF , Partition : Cardboard K5BF

Type D

Material / Box : Cardboard C5WF

Type E, F

Material / Box : Cardboard BC-KA 125/3CA125/KA125

NO.	Part name	Material	Remarks
②	Packing box	Corrugated cardboard	without ESD protection

Packaging specifications

KUA0121C-TR

【Label specification】

(acc.to JIS-X0503(Code-39))

A Product label

STANLEY -STANLEY ELECTRIC CO.,LTD.-

A

B

(C)

D PCS

E

Lot No. F

G

- A. Parts number
- B. Bar-code for parts number
- C. Parts code (In-house identification code for each parts number)
- D. Packed parts quantity
- E. Bar-code for packed parts quantity
- F. Lot number & rank
(refer to Lot number notational system for details)
- G. Bar-code for lot number & rank

B Opto device label

STANLEY OPTO DEVICES

A 御中

B D

(C)

Q'TY E PCS G

C/NO F

H

STANLEY ELECTRIC CO.,LTD.

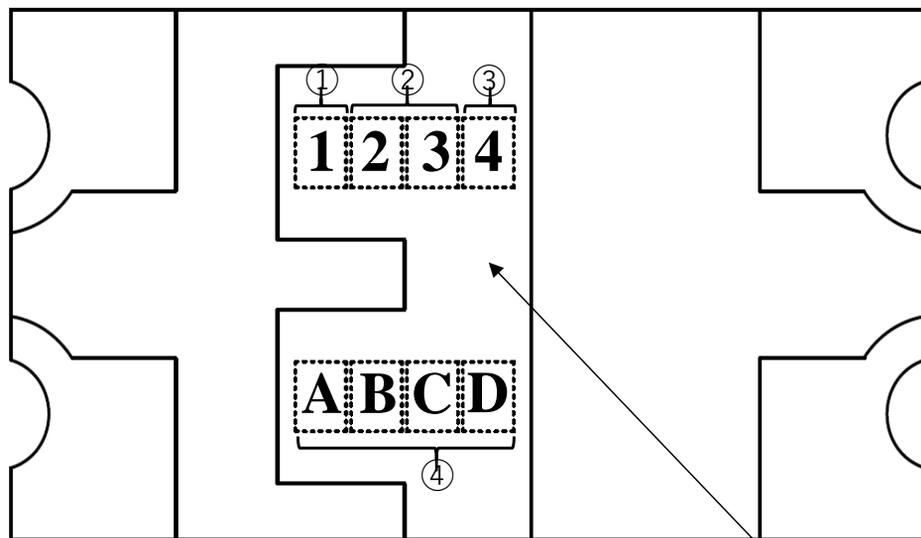
- A. Customer name
- B. Parts type
- C. Parts code
- D. Parts number
- E. Packed parts quantity
- F. Carton number
- G. Shipping date
- H. Bar-code for In-house identification number

<Remarks> Bar-code font : acc.to Code-39(JIS-X0503)

Notational system of printing for traceability

KUA0121C-TR

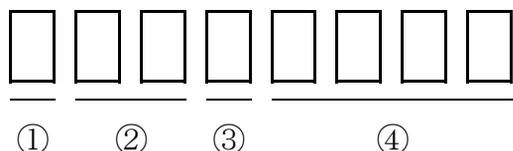
<Printing position>



Back view

Solder Resist

<Printing method>



【Character size】
 Height 0.25mm
 Width 0.20mm
 Pitch 0.22mm

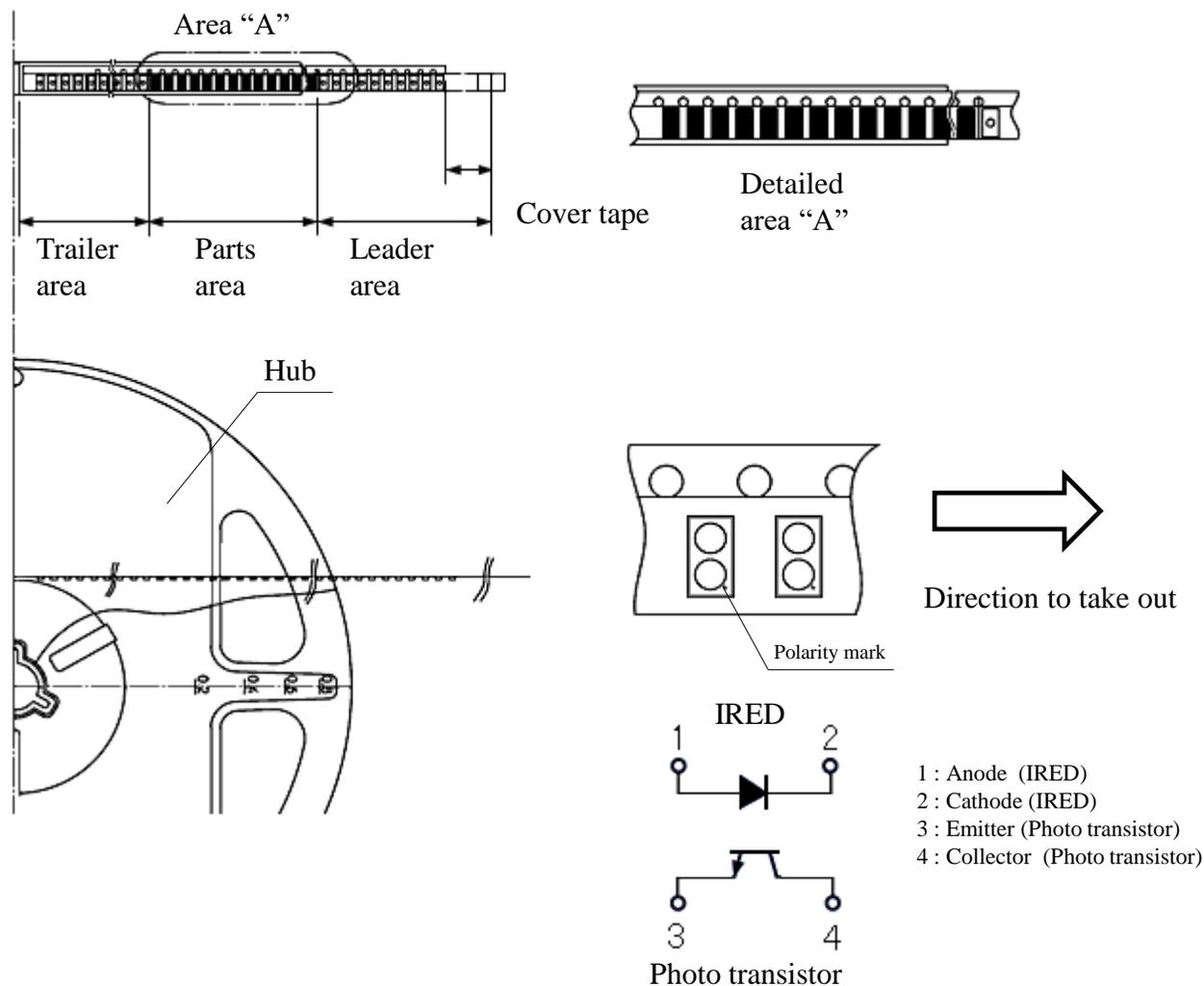
- ① - 1 digit : Production year (Last 1 digit of production year)
- ② - 2 digits : Production month and date
- ③ - 1 digit : Line / Lot. Number
- ④ - 4 digits : Serial number

Taping and reel specifications

KUA0121C-TR

(acc.to JIS-C0806-3)

【Appearance】



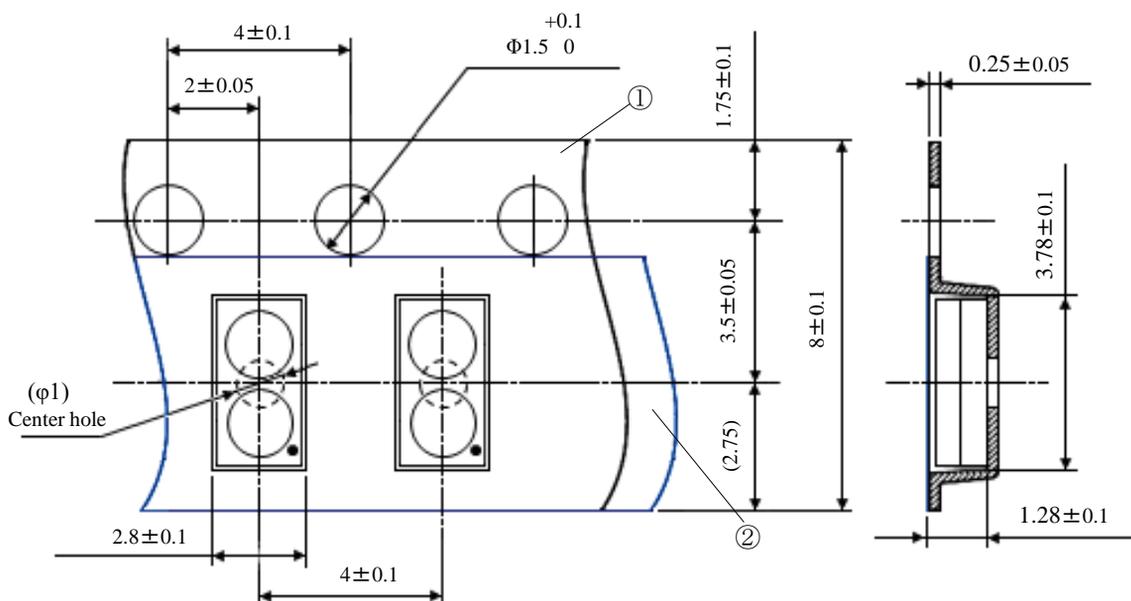
ITEMS		SPECIFICATION	REMARKS
Leader area	Cover-tape	Cover-tape shall be longer than 320mm without carrier-tape	The end of cover-tape shall be held with adhesive tape.
	Carrier-tape	Empty pocket shall be more than 25 pieces.(100mm)	Taping & reel orientation is ; please refer to the above figure.
Trailer area		Empty pocket shall be more than 40 pieces.(160mm)	The end of taping shall be inserted into a slit of the hub.

Taping and reel specifications

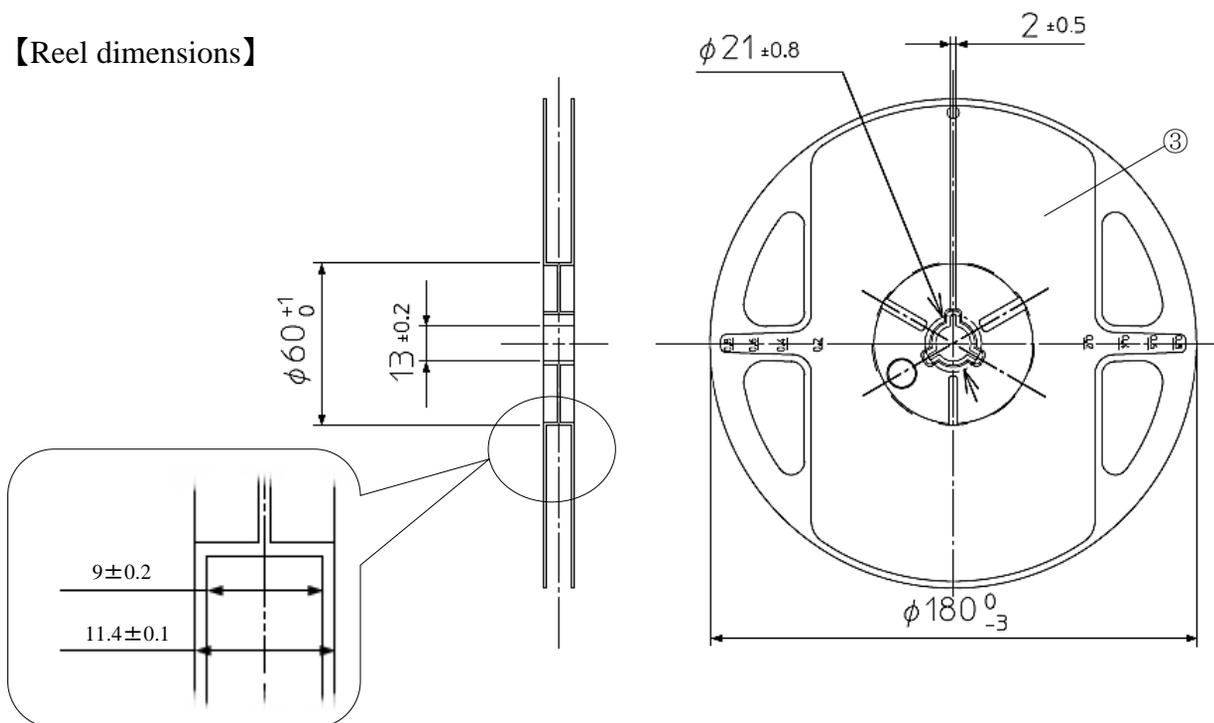
KUA0121C-TR

【Taping dimensions】

(acc.to JIS-C0806-03)



【Reel dimensions】



NO.	PART NAME	REMARKS
①	Carrier-tape	without ESD protection
②	Cover-tape	with ESD protection
③	Carrier-reel	without ESD protection

Taping and reel specifications

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(acc.to JIS-C0806-03)

【 Qty. per reel 】

2,500 pcs. / reel

Note Minimum Qty. per reel might be 500 parts when getting less than 2,500 parts.

In such case, parts of 100-unit-qty. shall be packed in a reel and the qty. shall be identified on the label.

【 Mechanical strength 】

Cover-tape adhesive strength shall be 0.1 to 1.0N (an angle between carrier-tape and cover-tape shall be 170 deg.)

Both tapes shall be so sealed that the contained parts will not come out from the tape when it is bent at a radius of 15mm.

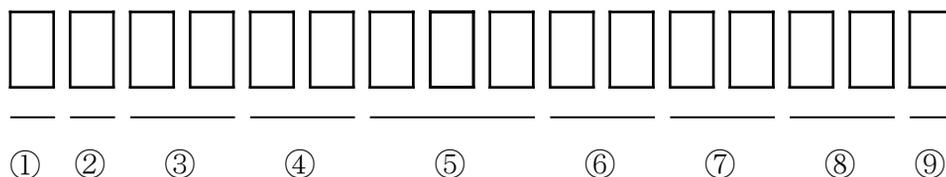
【 Others 】

Reversed-orientation, up-side down placing, side placing and out of spec. parts mix shall not be held.

Max qty. of empty pocket per reel shall be defined as follows.

Qty./Reel	Max. qty. of empty pocket	Remarks
500	1	-
1,000	1	-
1,500	1	-
2,000	2	No continuance
2,500	2	No continuance

Lot number notational system



① - 1digit : Production location (Mark identify alphabet)

② - 1digit : Production year (Last digit of production year 2025→5, 2026→6, 2027→7, 2028→8,···)

③ - 2digits : Production month (Jan. to Sep. ,should be 01,02,03,·····)

④ - 2digits : Production date

⑤ - 3digits : Serial number

⑥ - 2digits : Tape and reel following number

⑦ - 2digits : Photo current rank,

(If intensity rank is 1 digit, "-" shall be dashed on the place for the second digit.

If there is no identified intensity rank, "- -" is used to indicate.)

⑧ - 2digits : Not in use

(Indicated "- -" .)

⑨ - 1digit : Option rank (Stanley normally print "-" to indicate)

Correspondence to RoHS / ELV instruction

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This product is in compliance with RoHS / ELV.

Prohibition substance and its criteria value of RoHS / ELV are as follows.

- RoHS instruction ... Refer to following 1 to 10.
- ELV instruction ... Refer to following 1 to 4.

2011/65/EU, (EU)2015/863

No.	Substance group name	Maximum permissible concentration value
1	Lead and its compounds	1,000ppm (0.1%)
2	Cadmium and its compounds	100ppm (0.01%)
3	Mercury and its compounds	1,000ppm (0.1%)
4	Hexavalent chromium compounds	1,000ppm (0.1%)
5	PBB : Polybrominated Biphenyls	1,000ppm (0.1%)
6	PBDE : Polybrominated Biphenyl Ethers	1,000ppm (0.1%)
7	DEHP : Bis (2-ethylhexyl) phthalate	1,000ppm (0.1%)
8	BBP : Butyl benzyl phthalate	1,000ppm (0.1%)
9	DBP : Dibutyl phthalate	1,000ppm (0.1%)
10	DIBP : Diisobutyl phthalate	1,000ppm (0.1%)

Reliability testing result

KUA0121C-TR

1. Reliability testing result

Test item	Standard	Test condition	Duration	Failure
Room temperature operating life	EIAJ ED-4701 /100(101)	Ta=25°C, I _F =5mA, Photo transistor V _{CE} =5V, Reflector d=1mm	1,000h	0 / 25
High temperature operating life	EIAJ ED-4701 /100(101)	Ta=100°C, I _F =5mA, Photo transistor V _{CE} =5V, Reflector d=1mm	1,000h	0 / 25
Low temperature operating life	EIAJ ED-4701 /100(101)	Ta=-40°C, I _F =5mA, Photo transistor V _{CE} =5V, Reflector d=1mm	1,000h	0 / 25
Wet high temperature operating life	EIAJ ED-4701 /100(102)	Ta=85°C, RH=85%, I _F =5mA, Photo transistor V _{CE} =5V, Reflector d=1mm	1,000h	0 / 25
Thermal shock	EIAJ ED-4701 /100(105)	Ta=-40°C to 120°C (each 15min)	1,000 cycles	0 / 25
Resistance to reflow soldering	EIAJ ED-4701 /300(301)	Moisture soak : 60°C 60% 121H Preheating : 150 to 180°C 120sec MAX. Soldering : 260°C Peak	2 times	0 / 25

2. Failure criteria

Item	Symbol	Condition	Failure criteria
Forward voltage	V _F	I _F =5mA	Testing MAX. value \geq Initial value \times 1.2
Reverse current	I _R	V _R =5V	Testing MAX. value \geq Standard MAX. value \times 2.5
Photo current	I _C	I _F =5mA, V _{CE} =5V, d=1mm	Testing MAX. value \geq Initial value \times 1.3 Testing MIN. value \leq Initial value \times 0.7
Leak current	I _{LEAK}	I _F =5mA, V _{CE} =5V, No reflector	Testing MAX. value \geq Standard MAX. value \times 1.2

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