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Spec No.	

REFERENCE

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光ファイバ受信器

Fiber-optic for digital audio interface

GP1FA313RZ0F 仕様書 Specification

シャープ株式会社

電子部品事業本部

オプトデバイス事業部

第3技術部

部長	副参事	主事	担当
小倉		水野	宗村

品名 光ファイバ受信器
 Product name: Fiber-optic for digital audio interface

形名
 Model No. : GP1FA313RZ0F

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(注意点) (Precautions)

①本製品は原則として下記の用途に使用する目的で製造された製品です。

This product is designed for use in the following application areas ;

- | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ・OA機器 OA equipment ・通信機器[端末] Telecommunication equipment (Terminal) ・工作機器 Tooling machines | <ul style="list-style-type: none"> ・AV機器 Audio Visual equipment ・電算機 Computers | <ul style="list-style-type: none"> ・家電製品 Home appliances ・計測機器 Measuring equipment ・遊技機 Amusement equipment 等 etc. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|

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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;

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ・運送機器(航空機、列車、自動車等)の制御と各種安全性にかかわるユニット
Transportation control and safety equipment (aircraft, train, automobile etc.) ・交通信号機 Traffic signals ・防災防犯装置 Rescue and security equipment | <ul style="list-style-type: none"> ・ガス漏れ検知遮断機 Gas leakage sensor breakers ・各種安全装置 Other safety equipment 等 etc. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|

③機能・精度等において極めて高い信頼性・安全性が必要とされる以下の用途にはご使用にならないで下さい。
 Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as;

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ・宇宙機器 Space equipment ・原子力制御機器 Nuclear power control equipment ・医療機器(人命に拘わるもの) Medical equipment 等 etc. | <ul style="list-style-type: none"> ・通信機器[幹線] Telecommunication equipment(for trunk lines) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|

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1. 適用範囲 Application

本仕様書は、デジタル・オーディオ・インターフェイス用光ファイバデータリンク受信ユニット GP1FA313RZ0F の外形及び特性について適用する。

This specification applied to the outline and characteristics of the fiber-optic receiver unit GP1FA313RZ0F for digital audio interface.

2. 外形 Outline

別図 CY12606i02 による。

Refer to the attached drawing No. CY12606i02.

3. 定格および特性 Ratings and characteristics

別紙による。

Refer to the attached sheet, Page 4 to 8.

4. 信頼性 Reliability

別紙による。

Refer to the attached sheet, Page 9.

5. 出荷検査 Outgoing inspection

別紙による。

Refer to the attached sheet, Page 10.

6. 補足事項 Supplements

6.1 包装仕様 Packing specification

別紙による。

Refer to the attached sheet, Page 13.

6.2 標準送信器はシャープ GP1FA313TZ0F または同等の性能を有するもの、および、標準光ファイバケーブルはシャープ GP1C331 (APF, 1m)、または、同等の性能を有するものを使用する。

To evaluate the characteristics, the Sharp GP1FA313TZ or its equivalent transmitter shall be used as the standard transmitter and the Sharp GP1C331 (APF, 1m) or its equivalent fiber optic cable shall be used as the standard fiber optic cable.

6.3 本製品は、耐電磁波/耐重荷電粒子線に対する設計はされていません。

This product is not designed against electromagnetic waves or heavily charged electric particles.

6.4 オゾン層破壊化学物質の有無

Ozone-damaging chemicals status.

①本製品には下記化学物質を含有していません。

②本製品には製造工程において下記化学物質を使用していません。

This product shall not contain the following materials. Also, the following materials shall not be used in the production process for this product.

規制対象物質: CFC_s・ハロン・四塩化炭素・1-1-1トリクロロエタン(メチルクロロホルム)

Materials for ODS: CFC_s, Halon, Carbon tetrachloride, 1,1,1-Trichloroethane (Methylchloroform)

6.5 製品質量: 3g(参考値)

Product mass: Approx. 3g

6.6 原産国: 日本

Country of origin : Japan

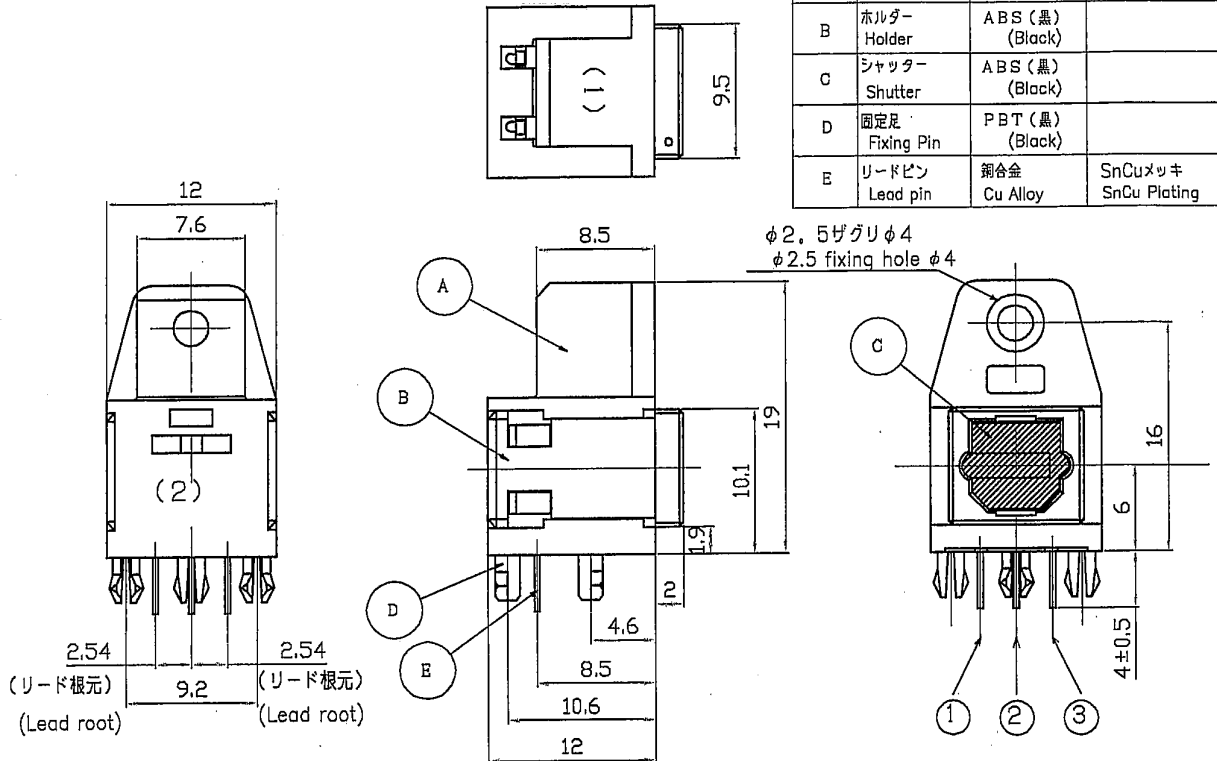
7. 使用上の注意事項 Notes

別紙による。

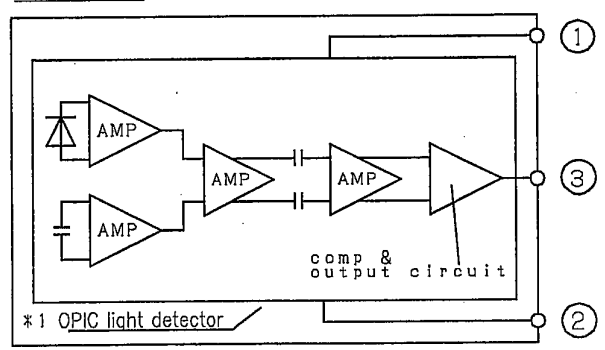
Refer to the attached sheet, Page 11,12.

SHARP

記号	名称	材質	仕上げ
Symbol	Description	Material	Finish
A	ホルダー Holder	PBT (黒) (Black)	
B	ホルダー Holder	ABS (黒) (Black)	
C	シャッター Shutter	ABS (黒) (Black)	
D	固定足 Fixing Pin	PBT (黒) (Black)	
E	リードピン Lead pin	銅合金 Cu Alloy	SnCuメッキ SnCu Plating



内部等価回路 Internal equivalent circuit



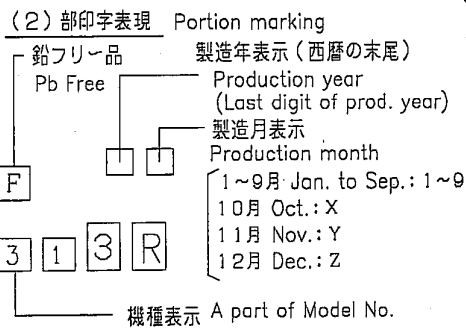
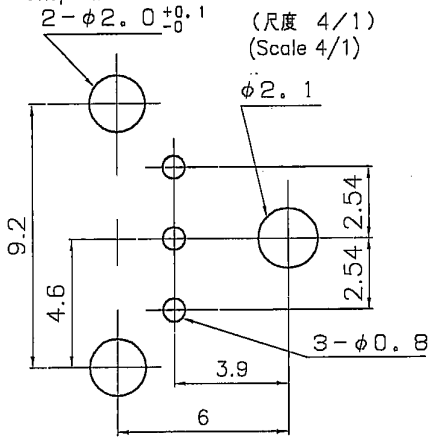
*1 OPIC受光素子はシャープの登録商標です。

OPIC is a registered trade mark of Sharp (Material: Silicon)

端子配置 Pin arrangement

- ① VCC
- ② GND
- ③ Vout

基板取り付け穴参考図 (はんだ面) 指示なき寸法公差±0.1
 Example of mounting drawing from solder side
 Unspecified tolerance ±0.1



- 基板への固定足形状が本受信器と異なる弊社製品がありますので、本受信器をご使用の際は、取付穴参考図を十分にご確認の上ご使用下さい。
 We have SHARP's products which the shape of fixing pin to PCB is different from this receiver. So, please understand that example of drawing for this receiver.
- 指示なき寸法公差は±0.3とする。
 Unspecified tolerance shall be ±0.3.
- (1) 部に SHARP の "S", (2) 部に機種名、データコードを表示する。
 (1) portion: "S" mark (2) portion: A part of Model No. and date code shall be indicated
- コネクタ挿入部は、EIAJ RC-5720B 角形コネクタに準ずる。
 The connector joint area complies with the square connector EIAJ RC-5720B.

尺 度 SCALE	名 称 NAME	GP1FA313RZ0F	
2/1	外形図 Outline Dimensions		
単 位 UNIT	図 番 DRAWING No.	CY 1 2 6 0 6 i 0 2	
1 = 1/1 mm			

3. 定格および特性 Ratings and Characteristics

3.1 絶対最大定格 Absolute maximum ratings

項目 Parameter	記号 Symbol	定格値 Rating	単位 Unit	備考 Remark
電源電圧 Supply voltage	Vcc	-0.5 ~ 7.0	V	
動作温度 Operating temperature	Topr	-20 ~ 70	℃	
保存温度 Storage temperature	Tstg	-30 ~ 80	℃	
はんだ温度 Soldering temperature (※1)	Tsol	260	℃	5s/回を2回までとする。 5s/time up to 2 times
出力電流 Output current	IoH	2	mA	ソース電流 Source current
	IoL	10	mA	シンク電流 Sink current

(※1) はんだ付け領域個所は、リード端子根元から 1.6mm 以上離れた部分。
Solder at a position more than 1.6mm away from the base of the lead terminal.

3.2 推奨動作条件 Recommended operating conditions

項目 Parameter	記号 Symbol	MIN	TYP	MAX	単位 Unit	備考 Remark
動作電源電圧 Supply voltage	Vcc	2.7	3.0	3.6	V	
動作伝送速度 Operating transfer rate	T	0.1	—	15.5	Mb/s	注記(1)、(2) Notes (1), (2)
受信光電力 Receiver input optical power level	Pc	-24.0	—	-14.5	dBm	ピーク光出力値 Peak optical output

注記 Notes

- (1) 本動作伝送速度はNRZ信号、すなわち、duty50%の“0101...”連続信号を伝送する場合の規定です。
This operating transfer rate shall be a specification when NRZ, duty 50% of continuous “0101...” signal is transferred.
- (2) 0.1Mbps 以下の変調光(DC光、入力光無しを含む)を入力した場合、本受信器の出力はH/Lレベル定まりません。
The output(H/L Level) of GP1FA313RZ0F is not fixed constantly when it receives the modulated light(including DC light, no input light) less than 0.1Mb/s.

3.3 電氣的的光学的特性 Electro-optical characteristics

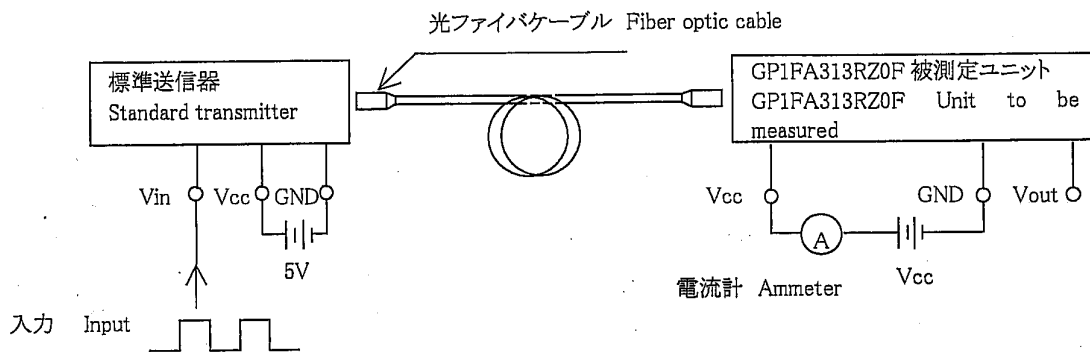
(Vcc=3.0V, Ta=25°C)

No.	項目 Parameter	記号 Symbol	測定条件 Conditions	最小 MIN.	標準 TYP.	最大 MAX.	単位 Unit	
1	ピーク感度波長 Peak sensivity wavelength	λp		—	700	—	nm	
2	消費電流 Supply current	Icc	測定方法 3.4.1 項参照 Measuring method Refer to 3.4.1	—	13	15	mA	
3	高レベル出力電圧 High level output voltage	VoH	測定方法 3.4.2 項参照 Measuring method Refer to 3.4.2	2.1	—	—	V	
4	低レベル出力電圧 Low level output voltage	VoL		—	—	0.5	V	
5	立ち上がり時間 Rise time	tr		—	15	—	ns	
6	立ち下がり時間 Fall time	tf		—	8	—	ns	
7	L→H遅延時間 L→H delay time	tpLH		—	—	180	ns	
8	H→L遅延時間 H→L delay time	tpHL		—	—	180	ns	
9	パルス幅ひずみ Pulse width distortion	Δtw		-20	—	20	ns	
10	ジッター Jitter	Δtj		測定方法 3.4.3 項参照, Pc=-14.5dBm Measuring method Refer to 3.4.3, Pc=-14.5dBm	—	1	20	ns
				測定方法 3.4.3 項参照, Pc=-24dBm Measuring method Refer to 3.4.3, Pc=-24dBm	—	—	20	ns

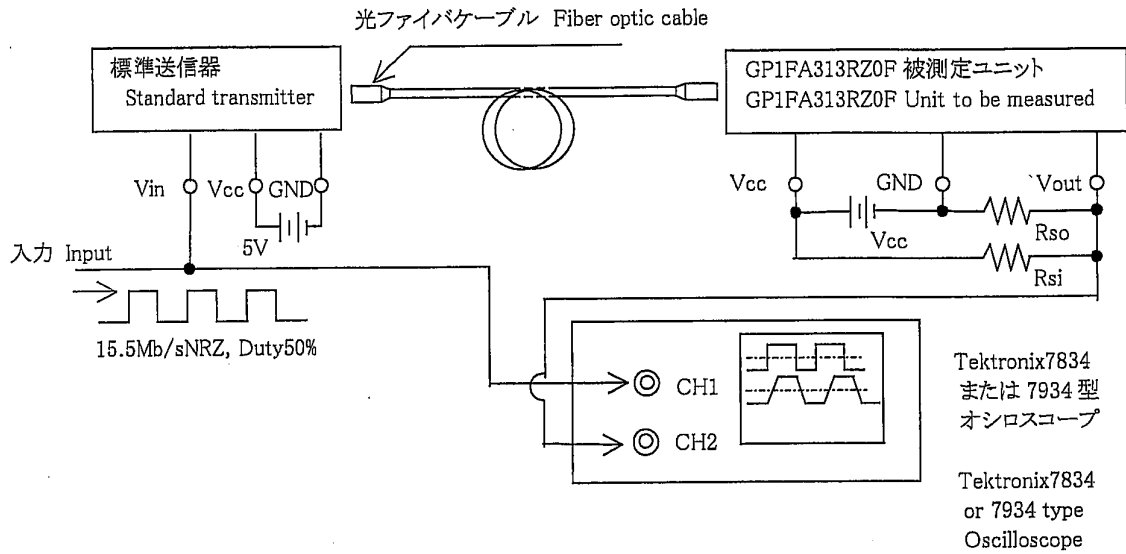
3.4 測定方法 Measuring method

3.4.1 消費電流 Supply current

入力条件 Input condition		測定方法 Measuring method
電源電圧 Supply Voltage	$V_{cc} = 3.0V$	電流計による。 (DC平均電流値) Measured on an ammeter (DC mean amperage)
ファイバ結合光出力 Optical fiber coupling light output	$P_c = -14.5 \text{ dBm}$	
標準送信器入力信号 Standard transmitter input signal	15.5Mb/s NRZ, Duty 50% または 7.75Mb/s バイフェーズ PRBS 信号 15.5Mb/s NRZ, Duty 50% or 7.75Mb/s biphasic mark PRBS signal	



3. 4. 2 出力電圧およびパルス応答測定方法 Output voltage and pulse response measuring method



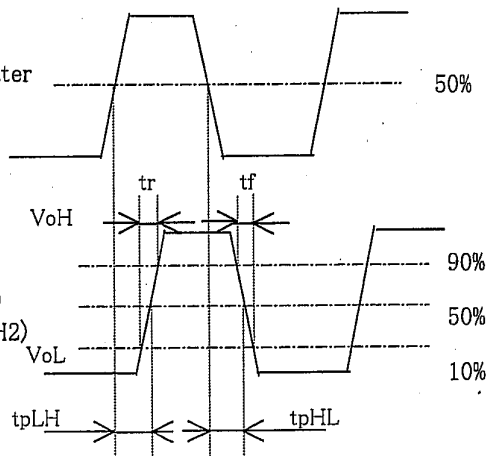
測定項目 Test item

No	測定項目 Test Item	記号 Symbol
1	L→Hパルス遅延時間 L→H pulse delay time	tpLH
2	H→Lパルス遅延時間 H→L pulse delay time	tpHL
3	立ち上がり時間 Rise time	tr
4	立ち下がり時間 Fall time	tf
5	パルス幅ひずみ Pulse width distortion $\Delta tw = tpHL - tpLH$	Δtw
6	高レベル出力電圧 High level output voltage	VoH
7	低レベル出力電圧 Low level output voltage	VoL

標準送信器
Standard Transmitter

入力信号(CH1)
Input signal(CH1)

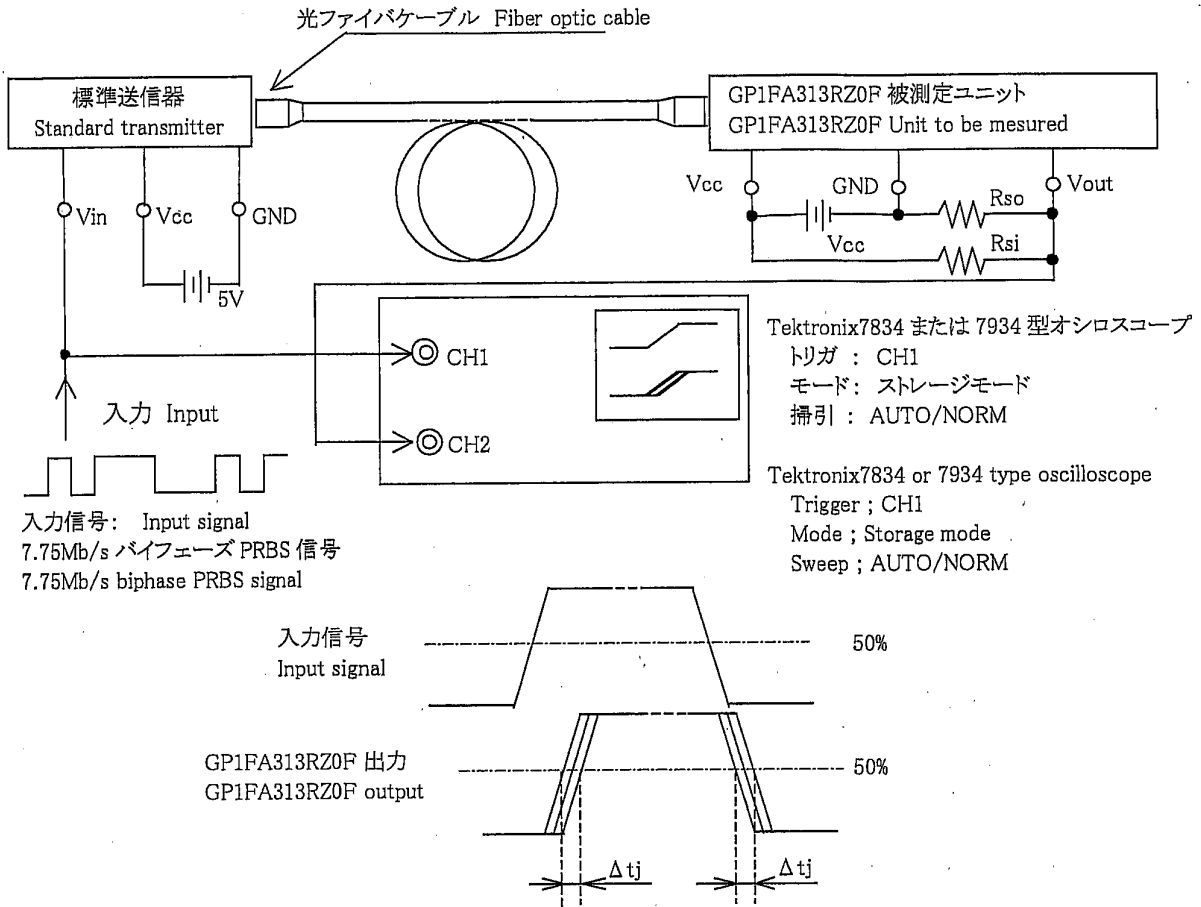
GP1FA313RZ0F
出力信号(CH2)
Output signal(CH2)



注記 Notes

- Vcc = 3.0 V (動作状態)
Vcc = 3.0V (State of operating)
- ファイバ結合光出力を-14.5dBm および-24.0dBm に設定し計測する。
The fiber coupling light output set at -14.5dBm or -24.0dBm.
- オシロスコープ用プローブは 1M Ω 以上、10pF 以下のプローブを使用すること。
The probe for the oscilloscope must be more than 1M Ω and less than 10pF.
- Rsi, Rso: 標準負荷抵抗 (Rsi: 3.3k Ω , Rso: 2.2k Ω)
Rsi, Rso: Standard load resistor (Rsi: 3.3k Ω , Rso: 2.2k Ω)
- 0.1Mbps 以下の変調光 (DC 光、入力光無しを含む) を入力した場合、本ユニットの出力は、H/L レベル定まりません。
The output (H/L level) of GP1FA313RZ0F are not fixed constantly when it receives the modulating light (including DC light, no input light) less than 0.1Mb/s.

3.4.3 ジッター測定方法 Measuring method of pulse response and Jitter



測定項目 Test item

No.	測定項目 Test item	記号 Symbol	測定条件 Measuring Condition
1	ジッター Jitter	Δt_j	トリガーを入力信号の立ち上がりに設定し、出力立ち上がりのジッターを測定する。 Set the trigger on the rise of input signal to measure the jitter of the rise of output.
2	ジッター Jitter	Δt_j	トリガーを入力信号の立ち下がりに設定し、出力立ち下がりのジッターを測定する。 Set the trigger on the fall of input signal to measure the jitter of the fall of output.

注記 Notes

- (1) ファイバ結合光出力を、-14.5dBm 及び -24.0dBm に設定し計測する。
The fiber coupling light output set at -14.5dBm or -24.0dBm.
- (2) Rsi / Rso: 標準負荷抵抗 (Rsi: 3.3k Ω , Rso: 2.2k Ω)
Rsi, Rso: Standard load resistor (Rsi: 3.3k Ω , Rso: 2.2k Ω)
- (3) オシロスコープはストレージモードに設定し、書き込み時間は 3s とする。
ただし、輝度を上げすぎ波形にじみを生じさせないこと。
Set the oscilloscope to the storage mode and write time to 3 seconds. Do not allow the brightness to be increased too much. The waveform would be distorted.
- (4) Vcc = 3.0 V (動作状態)
Vcc= 3.0V (State of operating)
- (5) オシロスコープ用プローブは 1M Ω 以上、10pF 以下のプローブを使用すること。
The probe for the oscilloscope must be more than 1M Ω and less than 10pF.

3.5 機械的特性 Mechanical characteristics

項目 Parameter	記号 Symbol	最小 MIN.	標準 TYP.	最大 MAX.	単位 Unit	条件 Condition
結合力、離脱力 Insertion force, withdrawal force	—	6	—	40	N	GP1C331 使用時の初期値 Initial value when GP1C331 is used

4. 信頼性 Reliability

製品の信頼性については、下記内容を満足するものとする。
The reliability of products shall satisfy items listed below.

信頼水準 Confidence level :90%
LTPD :10 or 20

No.	試験項目 Test Items	試験条件 Test Conditions	故障判定条件 Failure Judgment Criteria	供試数 (n) Samples(n)
				故障数 (C) Defective(C)
1	高温高湿保存 High temp. and high humidity storage	Ta = 40°C、90%RH、500h	3. 3項 No.2~10 に示す各特性値の故障判定基準を下記に示す。	n = 22, C = 0
2	高温保存 High temp. storage	Ta = 80°C、500h		n = 22, C = 0
3	低温保存 Low temp. storage	Ta = -30°C、500h	Failure judgment criteria of each characteristics given in 3.3 No. 2 to 10 must be the following range.	n = 22, C = 0
4	温度サイクル Temperature cycling	Ta = -30°C(30min)~+80°C(30min) 20 サイクル 20 cycles test		n = 22, C = 0
5	高温動作寿命 High temp operation life	Ta = 60°C、Vcc = 3V 通電、500h applying	No. 2 ~ 8, 10 U×1.2 以上 L×0.8 以下	n = 22, C = 0
6	はんだ耐熱性 Soldering heat	Tsol = 260°C、5 s/2 回 times		n = 11, C = 0
7	端子引っ張り Terminal strength(Tension)	荷重 5N、30 s/各端子 Weight each terminal	No. 9 U×1.2 以上 L×1.2 以下	n = 11, C = 0
8	端子折り曲げ Terminal strength (Bending)	荷重 2.5N、0° → 90° → 0° Weight 折り曲げ2回 2 times/each terminal		n = 11, C = 0
9	衝撃 Shock	加速度 1000m/s ² 、パルス幅 6ms Acceleration Pulse width X, Y, Z 各 3 回 X, Y, Z/3 times each	U: 規格上限値 Upper specification limit L: 規格下限値 Lower specification limit	n = 11, C = 0
10	振動 Vibration	周波数範囲 10~55 Hz/掃引 1min Frequency range Hz/sweep 全振幅 1.5mm、X,Y,Z 方向 各 2h Overall amplitude: 1.5mm, X, Y, Z/2h each		n = 11, C = 0
11	繰り返し動作 Repeated operation	500 回 times (光ファイバケーブル GP1C331 を使用する) (fiber optic cable GP1C331 used)	結合力 ≥40N Coupling force 4N ≥ 離脱力 Withdrawal force 40N ≤ 離脱力 Withdrawal force	n = 11, C = 0

4.1 測定条件 Measuring conditions

上記 1~6 項については試験後、常温常湿中に 2h 放置後、特性を測定する。
In the test 1 to 6 above, to measure the characteristics, leave 2h at normal temperature and humidity after being tested.

5. 出荷検査 Outgoing inspection

5.1 検査ロット Inspection lot
 納入ロット毎に検査するものとする。

Inspection shall be carried out per each delivery lot.

5.2 検査項目 Inspection method

抜き取り方法は、ISO2859ナミ水準検査-II、1回抜き取り方式を採用する。

A single sampling plan, normal inspection level II based on ISO2859 shall be adopted.

項目 Parameter	検査内容 Inspection items	AQL(%)
重欠点 Major defect	1 3. 3項 No.2~10 での電氣的・光学的特性を満足すること。 Satisfies electro-optical characteristics in parameter 3.3 (No2 to 10).	0.4
	2 リード端子の断線、ケース端子の破損、及び PWB 挿入に支障となる異物の付着がないこと。 It should have no disconnection of lead terminal and case terminal. It should have no dust and solder that would hinder PCB insertion.	
	3 コネクタ嵌合部に光ファイバーケーブル挿入時、支障となる異物の付着がないこと。 Free from foreign matter on the jack junction portion that would hinder plug insertion.	
軽欠点 Minor defect	1 ケース及びリード端子の変形(2項の外形寸法を満足すること。) Deformation of case and lead terminal (Satisfying outline dimensions of parameter 2)	1.5
	2 刻印 (2項の刻印の判読が可能で所定の位置に行われていること。) Stamp (It should be possible to read stamp of parameter 2. Stamp should be indicated at fixed position.)	

7. 注意事項 Notes

- (1) 電源ラインの安定化 Steadiness of power supply line
 バイパスコンデンサ(0.1 μ F)を GP1FA313RZ0F ユニットリード端子より 7mm 以内の位置に接続して下さい。
 また近くに 4.7 μ F のコンデンサを電源ラインに接続して下さい。
 Connect a by-pass capacitor (0.1 μ F) of one piece per one element close to the GP1FA313RZ0F within 7mm of the unit lead terminal. (And connect a 4.7 μ F capacitor of one piece per one element across the power supply line.)

- (2) はんだ付け条件 Soldering condition
 はんだ付け温度 260°C以下、5s 以内の条件で 2 回以内に収めて下さい。手はんだをされる場合は使用されるはんだごてで実装上問題ないことをご確認の上、端子にストレスを与えないようにはんだづけを行ってください。
 (はんだ付け箇所は、リード端子根元から 1.6mm 以上離れた部分とする。
 No more than two times of less than 5 seconds each at soldering temperatures not exceeding 260°C. Check your soldering condition damaged device and do not getting stress in the lead terminal in case of using soldering rod.
 (Solder at a position more than 1.6mm away from the base of the lead terminal.)

- (3) コネクタ嵌合部へのゴミ、ホコリ等の侵入について About getting dirt and dust in the connector coupling portion.
 コネクタ嵌合部にゴミ、ホコリ等が侵入した場合、ブロアー等を使用してゴミ、ホコリを取り除いて下さい。また、コネクタ嵌合部に硬い棒状の物を挿入しないで下さい。内部デバイスが傷つき特性が劣化する場合があります。
 Dirt and dust in the connector coupling portion, if any, must be blown off by a blower .
 Do not insert any rigid rod-like object into the connector junction.
 The device inside might get damaged resulting deteriorated characteristics.

- (4) 洗浄について Cleaning
 洗浄を実施する場合は、浸漬を伴う洗浄は行わないで下さい。コネクタ嵌合部に溶剤が入り込み特性が劣化する場合があります。なお、やむを得ずフラックスを除去する場合、ハケ洗浄等により下記に示す溶剤のみ使用しフラックス除去を実施して下さい。
 溶剤: イソプロピルアルコール、メチルアルコール
 Do not immerse when cleaning. The solvent would get into the jack junction portion resulting deteriorated characteristics. Should it be necessary to remove the flux, use one of the following solvents only to be applied with a brush.
 Solvent: isopropyl alcohol, Methyl alcohol

- (5) 組み立て工程における接地 Ground during assembling
 IC の静電破壊を避けるため組み立て工程における人体、はんだごての接地を行ってください。また、組み立て工程前は出来る限り端子に触れないで下さい。
 The human body and the soldering rod must be grounded against the static breakdown of the IC during assembling. Avoid as much as possible touching the IC terminals before assembling.

- (6) 製品の固定 Assembly of the device
 本受信器は必ずネジ止めにて固定して下さい。ネジ止め実施されない場合、コネクタ脱着時に内部デバイス、および、リード部にストレスが加わり特性が劣化する場合があります。ネジ締め付けには、M3.0 タッピングネジを使用し、締め付け強度は 0.25~0.4N・m で締め付けて下さい。ただし、ネジ締め付けを行う際、事前に取り付け物との取り付け強度を確認の上実施して下さい。また、ドライバー等でネジ締め付ける際、ドライバー等で押す力が強すぎると、ホルダーおよび内部デバイスに無理なストレスが加わり性能を損なう場合があります。作業上注意下さい。
 (参考:ドライバー等で押す力が 39N 以下であれば問題ありません。)
 When assembling the device, please fix it with M3.0 screw. In case that this device is not fixed fully, there is the possibility that characteristics deteriorates by stress to be given to internal device and lead wire portion when connector detaching.
 The tightening torque of M3.0 screw for fixing this device shall be 0.25 to 0.40N・m.
 However, in case of fixing with screw, please confirm the limit of fixing strength to the fixed object before fixing actually. In case of fixing the device with screw by screwdriver etc., if excessive force by screwdriver etc. is applied to the holder or internal devices, the performance might fall down. Please be careful at work.
 (ref: the force applied by driver etc. shall be 39N or less for safety.)

- (7) 入力信号 Input signal
 本受信器への入力信号は、EIAJ 規格 CP-1201 に準拠したものとして下さい。EIAJ 規格 CP-1201 に準拠していない信号では、正常に動作しない場合があります。
 This receiver is designed intentionally based upon the signal transmission which is defined by the digital audio interface standard ; CP1201. When signal out of EIAJ standard CP-1201 is inputted to this receiver, there are cases that this receiver can not receive normally signal to transmitting unit.

(8) 基板への固定足形状 Fixing pin

基板への固定足形状が本受信器と異なる弊社製品がありますので本受信器をご使用の際には、取り付け穴参考図を十分にご確認の上ご使用下さい。

We have SHARP's products which the shape of fixing pin to PCB is different from this receiver. So please understand that example of mounting drawing for this receiver.

(9) コネクタ嵌合部の変形について Deformation of connector coupling portion

本受信器のコネクタ嵌合部に、コネクタ嵌合部が変形するような無理な力を加えないで下さい。シャッター一部が正常に開閉しなくなる恐れがあります。

Please take care for force provided to connector coupling portion of this receiver, such as deformation of connector coupling portion. Because there are cases that shutter window can't open and shut in normally.

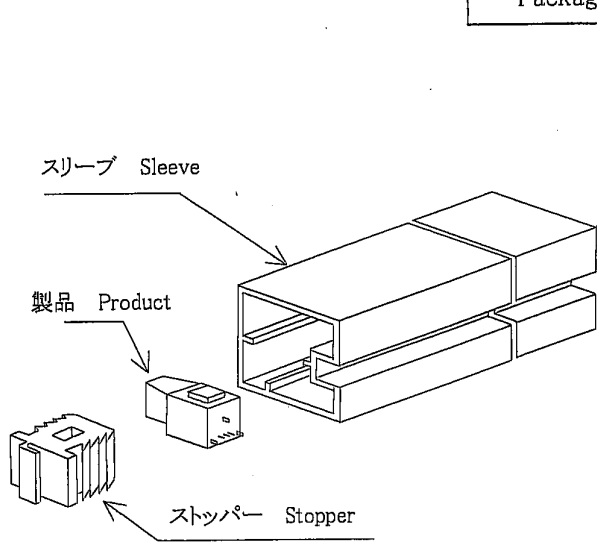
(10) コネクタ嵌合部へのフラックス浸入について About getting the solvent into connector coupling portion

本受信器のコネクタ嵌合部に、フラックスを浸入させないで下さい。特性の劣化やシャッターが正常に開閉しなくなる恐れがあります。

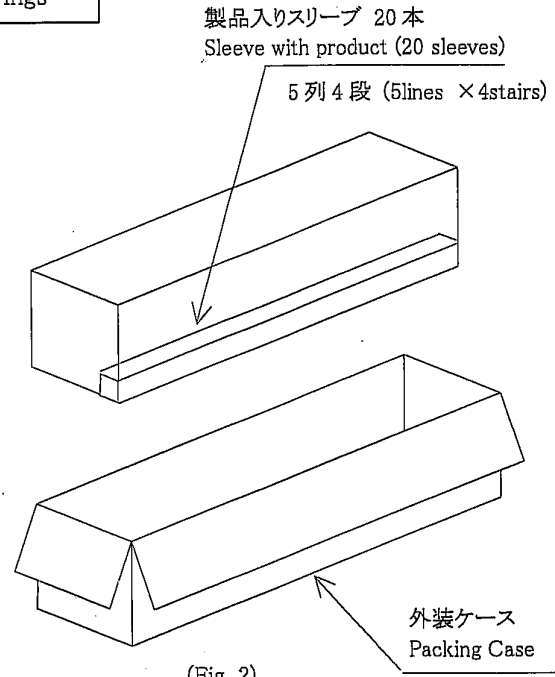
Please do not get the solvent into connector coupling portion of this receiver. Because there are cases that the characteristics deteriorated and the shutter window can't open and shut in normally.

6.1 梱包仕様 Packing specification

包装図
Package drawings



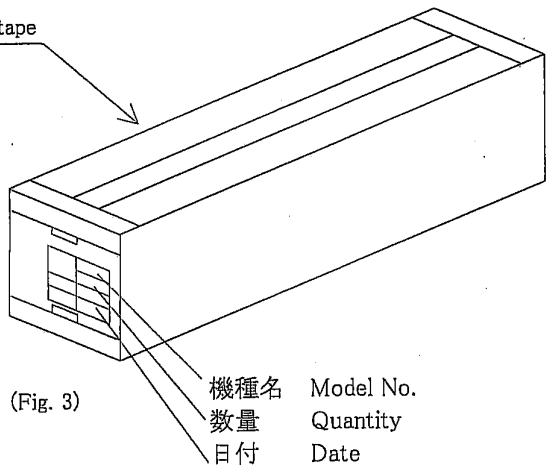
(Fig. 1)



(Fig. 2)

部材 Parts name	材質 Material
スリーブ Sleeve	ハイインパクトスチロール HIPS with preventing static electricity
ストッパー Stopper	SBR45 Styrene butadiene rubber 45
外装ケース Packing case	ダンボール Corrugated cardboard

クラフトテープ Kraft tape



(Fig. 3)

包装方法 Packaging method

- (1) 製品 50 個 (GP1FA313RZ0F: 50 個) をスリーブに収納し両端をストッパーでとめる。(Fig. 1)
Products of appointed quantity shall be packaged in a sleeve and both of sleeve edge shall be fixed by stopper.
(GP1FA313RZ0F: 50 pcs.)
- (2) 上記 (1) のもの 20 組を外装ケースに収納する。(Fig. 2)
20 sleeves shall be packaged in a packing case.
- (3) 外装ケースをクラフトテープで封じ機種名、数量、検査日付を記入する。(Fig. 3)
(1 包装あたり GP1FA313RZ0F: 1000 個入り)
Fix the packing case by kraft tape, and fill in the blanks of Model No., Quantity and Inspection date.
(Quantity per a packing case : 1000pcs.)

正規包装状態での質量: 5.4 kg (参考値)
Formal packaged mass: Approximately 5.4kg

SHARP



OPTO-ELECTRONIC DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR
PHOTOCOUPLER
MODEL No. PC123

Business dealing name

	PC123PJ0000F		PC123PYJ000F
	PC123P1J000F		PC123PY1J00F
	PC123P2J000F		PC123PY2J00F
	PC123P5J000F		PC123PY5J00F
	PC123PSJ000F		PC123PY8J00F

Specified for _____

Enclosed please find copies of the Specifications which consists of 14 pages including cover.
After confirmation of the contents, please be sure to send back copies of the Specifications
with approving signature on each.

CUSTOMER'S APPROVAL

PRESENTED

DATE

DATE

BY

BY *Y. Yashiro*

for H. Imanaka,
Department General Manager of
Engineering Dept.,II
Opto-Electronic Devices Div.
ELECOM Group
SHARP CORPORATION

REFERENCE

Product name : PHOTOCOUPLER

Model No. : PC123

Business dealing name

PC123PJ0000F	PC123PYJ000F
PC123PIJ000F	PC123PY1J00F
PC123PJ000F	PC123PY2J00F
PC123PJ000F	PC123PY5J00F
PC123PSJ000F	PC123PY8J00F

1. These specification sheets include materials protected under copyright of Sharp Corporation ("Sharp"). Please do not reproduce or cause anyone to reproduce them without Sharp's consent.
2. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets, as well as the precautions mentioned below. Sharp assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets, and the precautions mentioned below.

(Precautions)

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

· OA equipment	· Audio visual equipment	· Home appliances
· 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.)	· Rescue and security equipment	
· Traffic signals	· Gas leakage sensor breakers	· Other safety equipment etc.
- (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)	· Medical equipment etc.
· Nuclear power control 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.

1. Application

This specification applies to the outline and characteristics of photocoupler Model No. PC123 (Lead-Free Type).

- 2. Outline Refer to the attached sheet, page 3.
- 3. Ratings and characteristics Refer to the attached sheet, page 4, 5.
- 4. Reliability Refer to the attached sheet, page 6.
- 5. Outgoing inspection Refer to the attached sheet, page 7.
- 6. Supplement

6.1 Isolation voltage shall be measured in the following method.

- (1) Short between anode and cathode on the primary side and between collector and emitter on the secondary side.
 - (2) The dielectric withstanding tester with zero-cross circuit shall be used.
 - (3) The wave form of applied voltage shall be a sine wave.
- (It is recommended that the isolation voltage be measured in insulation oil.)

6.2 Package specifications Refer to the attached sheet, page 8, 9.

6.3 Collector current (Ic) Delivery rank table

("O" mark indicates business dealing name of ordered product)

Rank at delivery	Business dealing name	Rank at delivery	* Business dealing name	Rank mark	Ic (mA)
	PC123PJ000F		PC123PYJ000F	with or without	2.5 to 20.0
	PC123P1J000F		PC123PY1J00F	A	2.5 to 7.5
	PC123P2J000F		PC123PY2J00F	B	5.0 to 12.5
	PC123P5J000F		PC123PY5J00F	No mark	10.0 to 20.0
	PC123PSJ000F		PC123PY8J00F	S	5.0 to 10.0

Test conditions
I _F =5mA
V _{CE} =5V
T _a =25°C

* Applied to products as option (Attachment-2-1 to 2-3)

6.4 This Model is approved by UL.

Approved Model No. : PC123
UL file No. : E64380

6.5 This Model is approved by CSA.

Approved Model No. : PC123
CSA file No. : CA95323

CSA approved mark " " shall be indicated on minimum unit package.

6.6 This product is approved by BSI. (BS EN60065, BS EN60950)

Approved Model No. : PC123
Certificate No. : 7087/7409

6.7 This product is approved by SEMKO, DEMKO NEMKO and FIMKO.

6.8 This product is not designed against irradiation.

This product is assembled with electrical input and output.
This product incorporates non-coherent light emitting diode.

6.9 ODS materials

This product shall not contain the following materials.
Also, the following materials shall not be used in the production process for this product.
Materials for ODS : CFCS, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methyl chloroform)

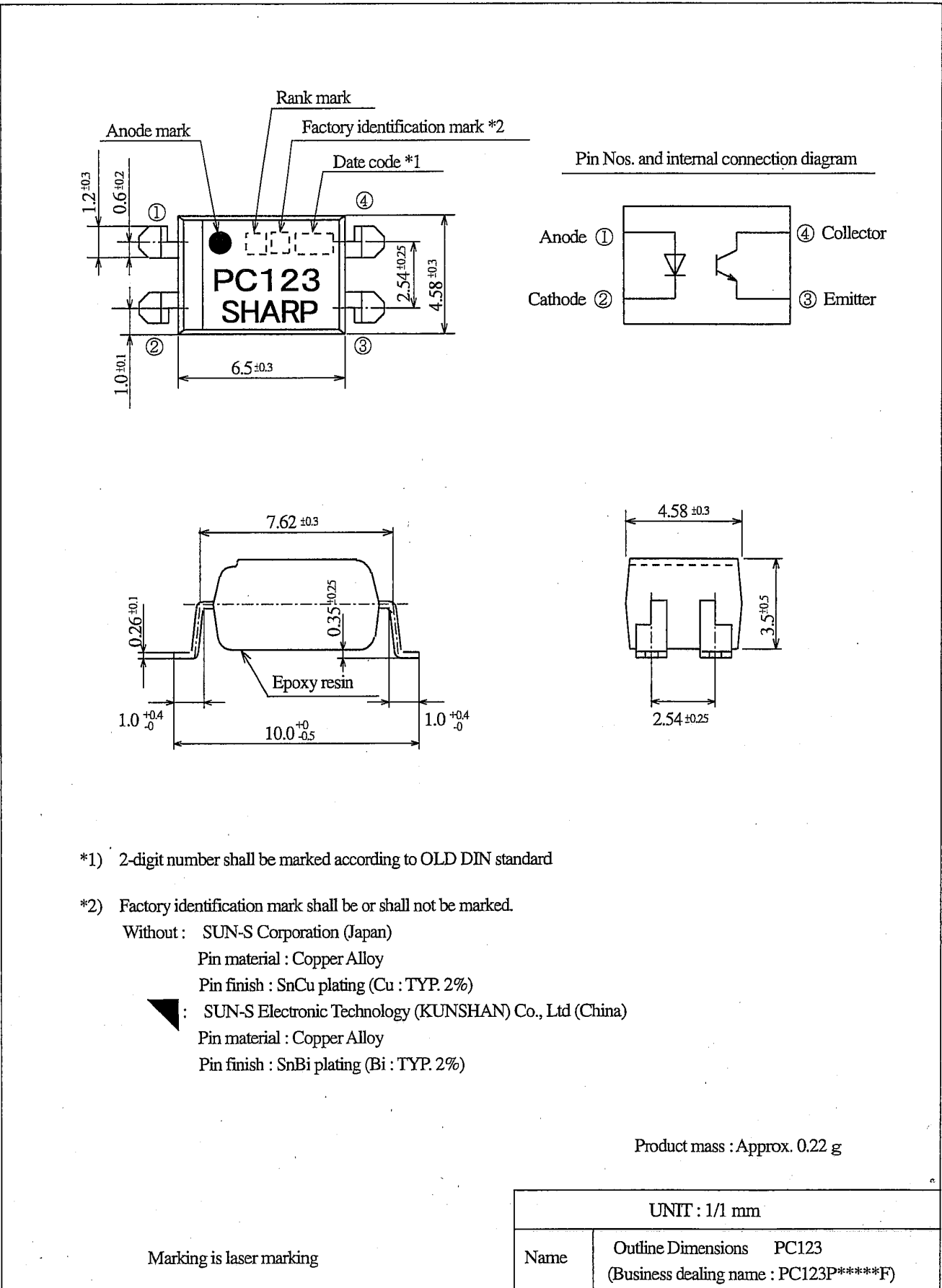
6.10 Brominated flame retardants

Specific brominated flame retardants such as the PBBOS and PBBS are not used in this device at all.

7. Notes

Precautions for photocouplers : Attachment-1

2. Outline



*1) 2-digit number shall be marked according to OLD DIN standard

*2) Factory identification mark shall be or shall not be marked.

Without : SUN-S Corporation (Japan)

Pin material : Copper Alloy

Pin finish : SnCu plating (Cu : TYP. 2%)



SUN-S Electronic Technology (KUNSHAN) Co., Ltd (China)

Pin material : Copper Alloy

Pin finish : SnBi plating (Bi : TYP. 2%)

Product mass : Approx. 0.22 g

Marking is laser marking

UNIT : 1/1 mm	
Name	Outline Dimensions PC123 (Business dealing name : PC123P****F)

3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=25°C

Parameter		Symbol	Rating	Unit
Input	*1 Forward current	I_F	50	mA
	*2 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	*1 Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	70	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_c	50	mA
	*1 Collector power dissipation	P_c	150	mW
*1 Total power dissipation	P_{tot}	200	mW	
*3 Isolation voltage	$V_{iso(ms)}$	5	kV	
Operating temperature	T_{opr}	-30 to +100	°C	
Storage temperature	T_{sig}	-55 to +125	°C	
*4 Soldering temperature	T_{sol}	270	°C	

3.1 Electro-optical characteristics

Ta=25°C

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V_F	$I_F=20mA$	-	1.2	1.4	V
	Reverse current	I_R	$V_R=4V$	-	-	10	μA
	Terminal capacitance	C_t	$V=0, f=1kHz$	-	30	250	pF
Output	Dark current	I_{CEO}	$V_{CE}=50V, I_F=0$	-	-	100	nA
	Collector-emitter breakdown voltage	BV_{CEO}	$I_c=0.1mA, I_F=0$	70	-	-	V
	emitter-Collector breakdown voltage	BV_{ECO}	$I_c=10 \mu A, I_F=0$	6	-	-	V
Transfer characteristics	Collector current	I_c	$I_F=5mA, V_{CE}=5V$	2.5	-	20	mA
	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_F=20mA, I_c=1mA$	-	0.1	0.2	V
	Isolation resistance	R_{ISO}	DC500V 40 to 60%RH	5×10^{10}	10^{11}	-	Ω
	Floating capacitance	C_f	$V=0, f=1MHz$	-	0.6	1.0	pF
	Cut-off frequency	f_c	$V_{CE}=5V, I_c=2mA, R_L=100 \Omega, -3dB$	-	80	-	kHz
	Rise time	t_r	$V_{CE}=2V, I_c=2mA$	-	4	18	μs
	Fall time	t_f	$R_L=100 \Omega$	-	3	18	μs

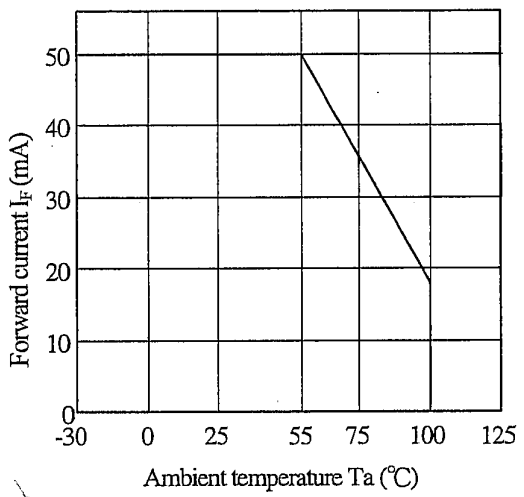
*1 The derating factors of absolute maximum ratings due to ambient temperature are shown in Fig. 1 to 4.

*2 Pulse width $\leq 100 \mu s$, Duty ratio : 0.001 (Refer to Fig. 5)

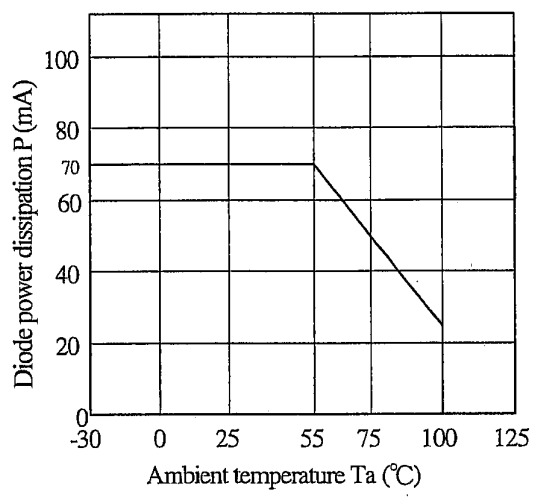
*3 AC for 1 min, 40 to 60%RH

*4 For 10 s

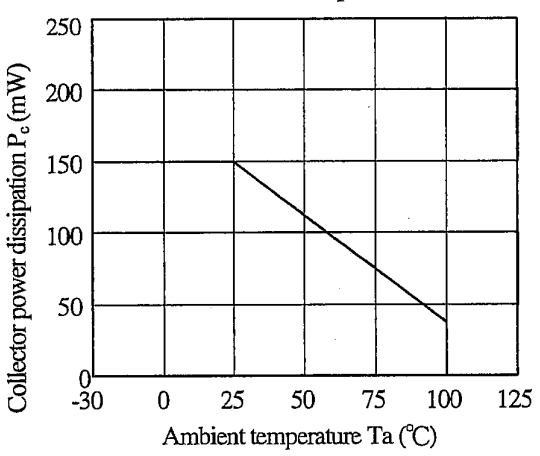
(fig.1) Forward current vs. ambient temperature



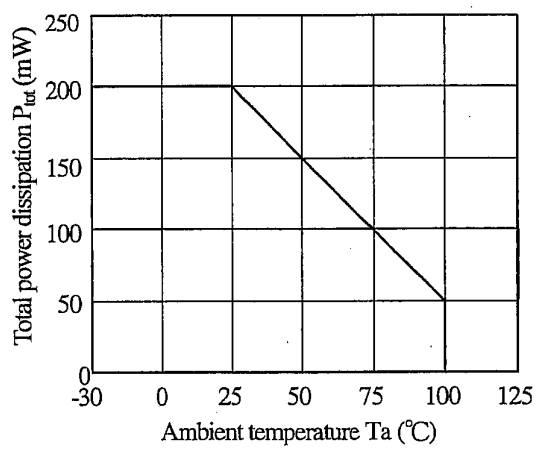
(fig.2) Diode power dissipation vs. ambient temperature



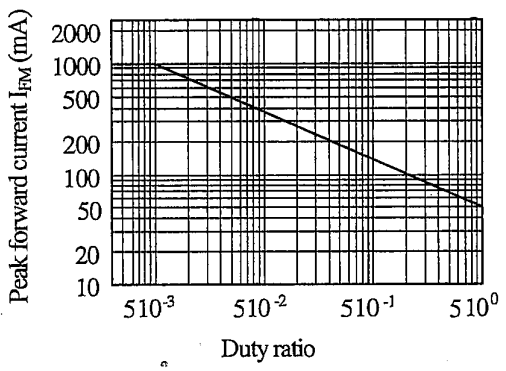
(fig.3) Collector power dissipation vs. ambient temperature



(fig.4) Total power dissipation vs. ambient temperature



(fig.5) Forward current vs. ambient temperature



Pulse width ≤ 100 μs
Ta = 25°C

REFERENCE

4. Reliability

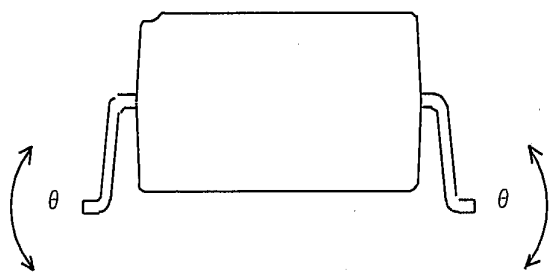
The reliability of products shall satisfy items listed below.

Confidence level : 90%

LTPD : 10 or 20

Test Items	Condition *1	Failure Judgment Criteria	Samples (n) Defective (C)
Solder ability *2	245±3°C, 5s	-	n=11, C=0
Soldering heat	(Flow soldering) 270°C, 10 s	$V_F > U \times 1.2$ $I_R > U \times 2$ $I_{CBO} > U \times 2$ $I_C < L \times 0.7$ $V_{CE(sat)} > U \times 1.2$ U: Upper specification limit L: Lower specification limit	n=11, C=0
	(Soldering by hand) 400°C, 3 s		n=11, C=0
Terminal strength (Tension)	Weight: 5N 5 s/each terminal		n=11, C=0
Terminal strength (Bending) *3	Weight: 2.5N 2 times/each terminal		n=11, C=0
Mechanical shock	15km/s ² , 0.5ms 3 times/±X, ±Y, ±Z direction		n=11, C=0
Variable frequency vibration	100 to 2000 to 100Hz/4 min 200m/s ² 4 times/X, Y, Z direction		n=11, C=0
Temperature cycling	1 cycle -55 °C to +125 °C (30 min) (30 min) 20 cycles test		n=22, C=0
High temp. and high Humidity storage	+85°C, 85%RH, 1000h		n=22, C=0
High temp. storage	+125 °C, 1000h		n=22, C=0
Low temp. storage	-55 °C, 1000h		n=22, C=0
Operation life	I _F =50mA, P _{tot} =200mW T _a =25 °C, 1000h	n=22, C=0	

- *1 Test method, conforms to EIAJ ED 4701.
- *2 Solder shall adhere at the area of 95% or more of immersed portion of lead, and pin hole or other holes shall not be concentrated on one portion.
- *3 Terminal bending direction is shown below.



REFERENCE

ED 04 P 19 PCI 25P****F
September 15, 2004

5. Outgoing inspection

5.1 Inspection items

(1) Electrical characteristics

$V_F, I_R, I_{CEO}, V_{CE(sat)}, I_C, R_{ISO}, V_{iso}$

(2) Appearance

5.2 Sampling method and Inspection level

A single sampling plan, normal inspection level II based on ISO 2859 is applied.

The AQL according to the inspection items are shown below.

Defect	Inspection item	AQL (%)
Major defect	Electrical characteristics Unreadable marking	0.065
Minor defect	Appearance defect except the above mentioned.	0.25

6.2 Package specifications

6.2.1 Taping conditions

- (1) Tape structure and Dimensions (Refer to the attached sheet, Page 8)
The carrier tape has the heat pressed structure of PS material carries tape and three layers cover tape (PET material base).
- (2) Reel structure and Dimensions (Refer to the attached sheet, Page 9)
The taping reel shall be of plastic (PS material) with its dimensions as shown in the attached drawing.
- (3) Direction of product insertion (Refer to the attached sheet, Page 9)
Product direction in carrier tape shall direct to the anode mark at the hole side on the tape.
- (4) Joint of tape
The cover tape and carrier tape in one reel shall be joint less.
- (5) To repair taped failure devices
To repair taped failure devices cutting a bottom of carrier tape with a cutter, and after replacing to good devices, the cut portion shall be sealed with adhesive tape.

6.2.2 Adhesiveness of cover tape

The exfoliation force between carrier tape and cover tape shall be 0.2N to 0.7N for the angle 160° to 180° .

6.2.3 Rolling method and quantity

Wind the tape back on the reel so that the cover tape will be outside the tape.
Attach more than 20cm of blank tape to the trailer and the leader of the tape and fix the both ends with adhesive tape.
One reel shall contain 2000pcs.

6.2.4 Outer packing appearance (Refer to attached sheet, Page 9)

6.2.5 Marking

The outer packaging case shall be marked with following information.

- * Model No.
- * Number of pieces delivered
- * Production date

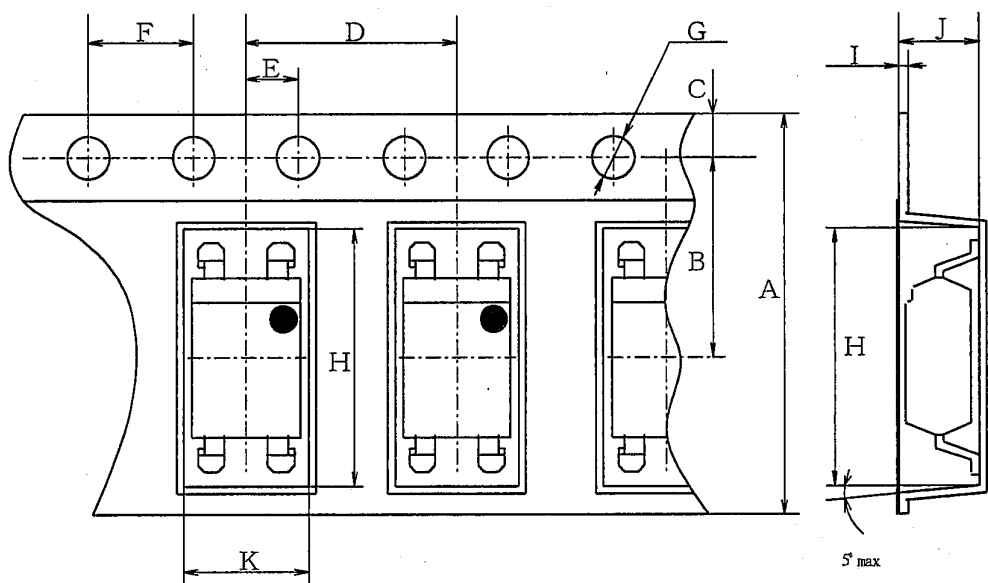
6.2.6 Storage condition

Taped products shall be stored at the temperature 5 to 30°C and the humidity lower than 70%RH.

6.2.7 Safety protection during shipping

There shall be no deformation of component or degradation of electrical characteristics due to shipping.

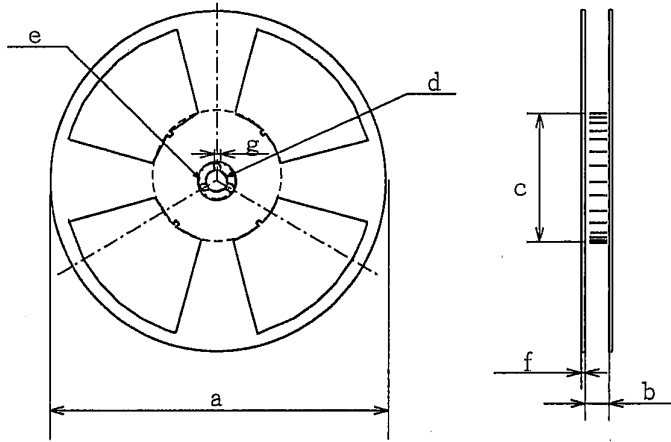
Carrier tape structure and Dimensions



Dimensions list (Unit : mm)

A	B	C	D	E	F	G	H	I	J	K
16.0±0.3	7.5±0.1	1.75±0.1	8.0±0.1	2.0±0.1	4.0±0.1	φ 1.5 ^{+0.1} ₋₀	10.4±0.1	0.4±0.05	4.2±0.1	5.1±0.1

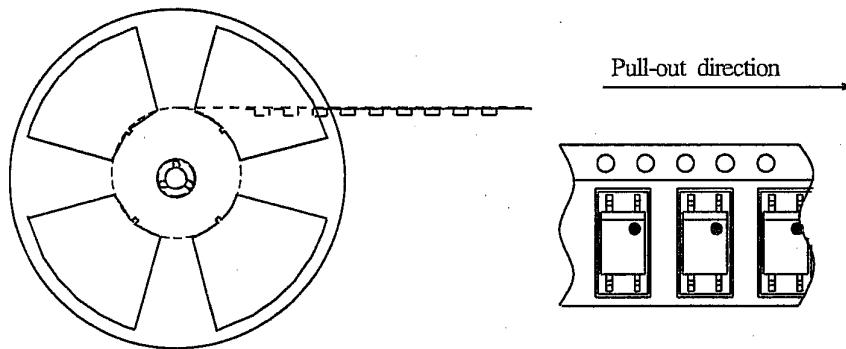
Reel structure and Dimensions



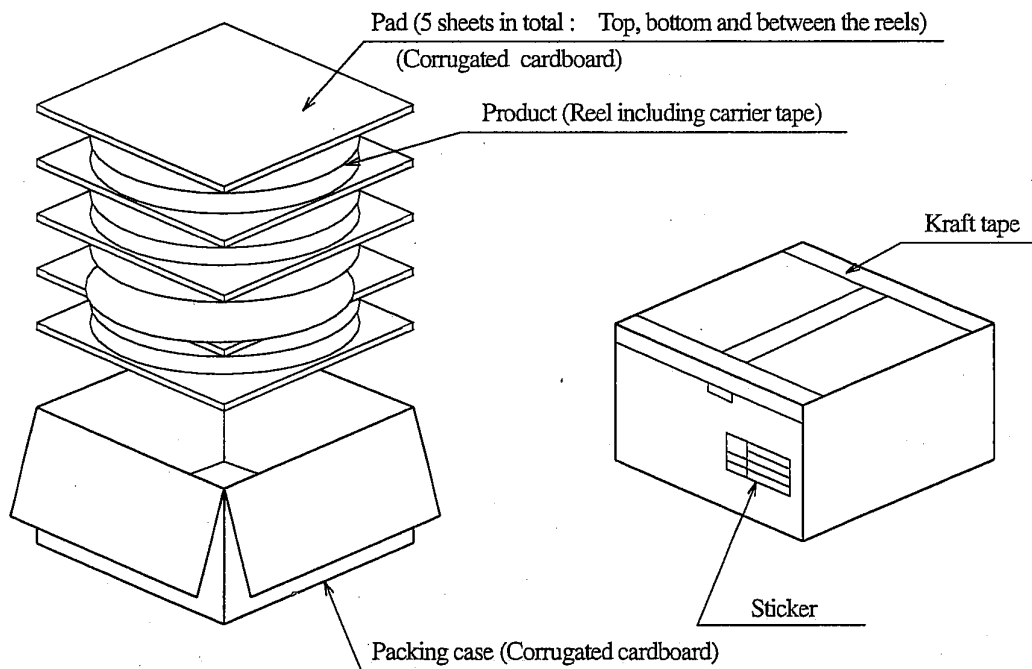
Dimensions list (Unit : mm)

a	b	c	d
330	17.5±1.5	100±1.0	13±0.5
e	f	g	
23±1.0	2.0±0.5	2.0±0.5	

Direction of product insertion



Outer packing appearance



Regular packing mass : Approx. 4.1kg

Precautions for Photocouplers

1 For cleaning

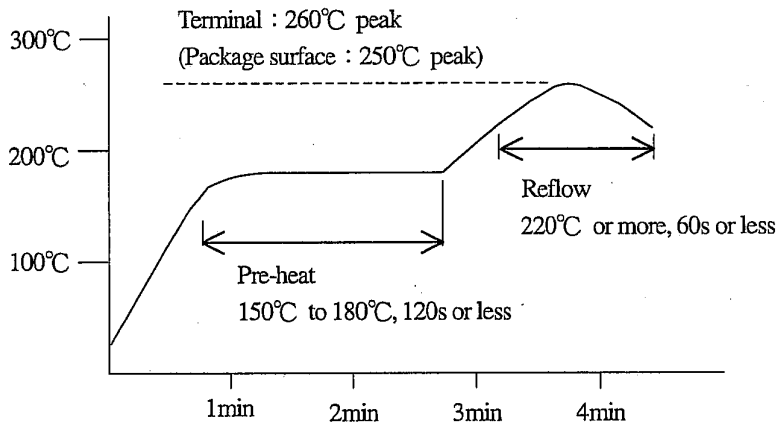
- (1) Solvent cleaning : Solvent temperature 45°C or less
 Immersion for 3 min or less
- (2) Ultrasonic cleaning : The effect to device by ultrasonic cleaning differs by cleaning bath size, ultrasonic power output, cleaning time, PCB size or device mounting condition etc. Please test it in actual using condition and confirm that doesn't occur any defect before starting the ultrasonic cleaning.
- (3) Applicable solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol
 When the other solvent is used, there are cases that the packaging resin is eroded.
 Please use the other solvent after thorough confirmation is performed in actual using condition.

2. For circuit design

- (1) The LED used in the Photocoupler generally decreases the light emission power by operation.
 In case of long operation time, please design the circuit in consideration of the degradation of the light emission power of the LED.(50%/5years)
- (2) There are cases that the deviation of the CTR and the degradation of the relative light emission power of the LED increase when the setting value of I_F is less than 1.0mA. Please design the circuit in consideration of this point.

3. Precautions for Soldering

- (1) In the case of flow soldering (Whole dipping is possible.)
 It is recommended that flow solder be at 270°C or less and within 10 s (Pre-heating : 100 to 150°C, 30 to 80s).
 (2 times or less)
- (2) If solder reflow :
 It is recommended to be done at the temperature and the time within the temperature profile as shown in the figure below. (2 times or less)



- (3) In the case of hand soldering
 What is done on the following condition is recommended. (2 times or less)
 Soldering iron temperature : 400°C or less
 Time : 3s or less
- (4) Depending on equipment and soldering conditions (temperature, Using solder etc.),
 the effect to junction between PCB and lead pins of photocoupler is different.
 Please confirm that there is no problem on the actual use conditions in advance.

1. This specification shall be applied to photocoupler, Model No. PC123 as an option.
2. Applicable Models (Business dealing name)
PC123PYJ000F, PC123PY1J00F, PC123PY2J00F, PC123PY5J00F, PC123PY8J00F
3. The relevant models are the models Approved by VDE according to DIN EN 60747-5-2.
Up to date code "RD" (December 2003), the relevant models are approved by VDE according to DIN VDE 0884/08.87.

Approved Model No. : PC123

VDE approved No. : 40008087 (According to the specification DIN EN 60747-5-2)

- Operating isolation voltage U_{IORM} : 890V (Peak)
- Transient voltage : 9000V (Peak)
- Pollution : 2
- Clearances distance (Between input and output) : 6.4 mm (MIN.)
- Creepage distance (Between input and output) : 6.4 mm (MIN.)
- Isolation thickness between input and output : 0.4mm (MIN.)
- Tracking-proof : CTI 175
- Safety limit values
 Current (Isi) : 200mA (Diode side)
 Power (Psi) : 300mW (Phototransistor side)
 Temperature (Tsi) : 150°C

In order to keep safety electric isolation of photocoupler, please set the protective circuit to keep within safety limit values when the actual application equipment troubled.

- Indication of VDE approval "  " is printed on minimum unit package.

4. Outline Refer to the attachment-2-2.

5. Isolation specification according to EN 60747-5-2

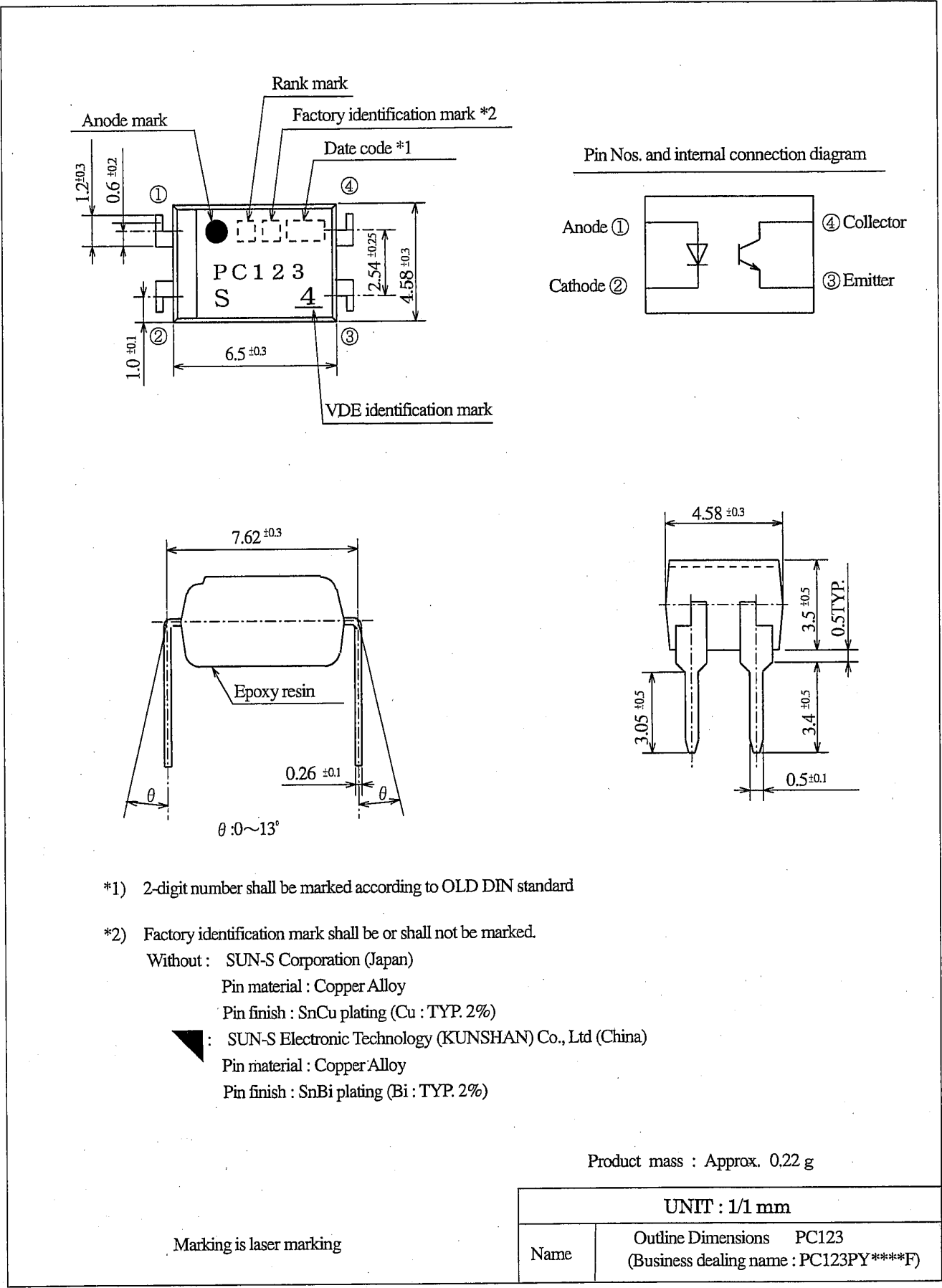
Parameter	Symbol	Condition	Rating	Unit	Remark
Class of environmental test	-	-	55/100/21	-	
Pollution	-	-	2	-	
Maximum operating isolation voltage	U_{IORM} (PEAK)	-	890	V	Refer to the Diagram 1,2 (Attachement-2-4)
Partial discharge test voltage (Between input and output)					
Diagram 1	U_{pr}	$t_p=10s, q_c<5pC$	1340	V	
Diagram 2	(PEAK)	$t_p=1s, q_c<5pC$	1670	V	
Maximum over-voltage	U_{IOTM} (PEAK)	$t_{NI}=60s$	9000	V	
Safety maximum ratings					Refer to the Diagram 6,7 (Attachement-2-4)
1) Case temperature	Tsi	$I_F=0, P_C=0$	150	°C	
2) Input current	Isi	$P_C=0$	200	mA	
3) Electric power (Output or Total power dissipation)	Psi	-	300	mW	
Isolation resistance (Test voltage between input and output ; DC500V)	R_{ISO}	$T_a=T_{si}$	MIN.10 ⁹	Ω	
		$T_a=T_{opr}(MAX.)$	MIN.10 ¹¹		
		$T_a=25°C$	MIN.10 ¹²		

6. Precautions in performing isolation test

6.1 Partial discharge test methods shall be the ones according to the specifications of EN 60747-5-2

6.2 Please don't carry out isolation test (V_{iso}) over U_{IOTM} . This product deteriorates isolation characteristics by partial discharge due to applying high voltage (ex. $U_{INITIAL}$). And there is possibility that this product occurs partial discharge in operating isolation voltage (U_{IORM}).

4. Outline



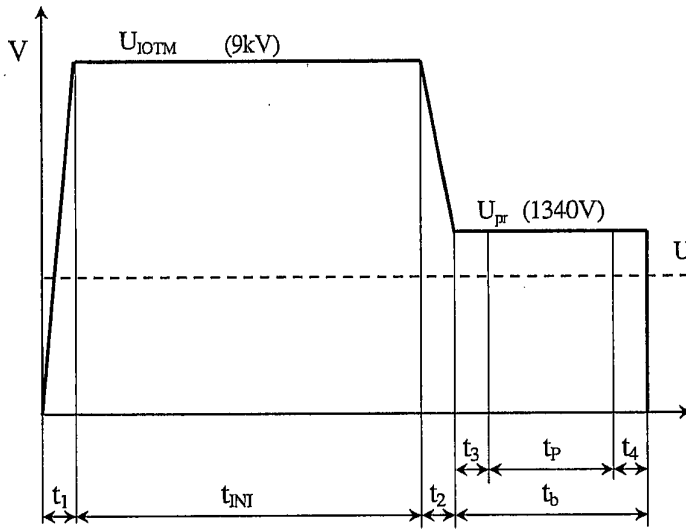
- *1) 2-digit number shall be marked according to OLD DIN standard
- *2) Factory identification mark shall be or shall not be marked.
 - Without : SUN-S Corporation (Japan)
 - Pin material : Copper Alloy
 - Pin finish : SnCu plating (Cu : TYP. 2%)
 - ▲ : SUN-S Electronic Technology (KUNSHAN) Co., Ltd (China)
 - Pin material : Copper Alloy
 - Pin finish : SnBi plating (Bi : TYP. 2%)

Product mass : Approx. 0.22 g

Marking is laser marking

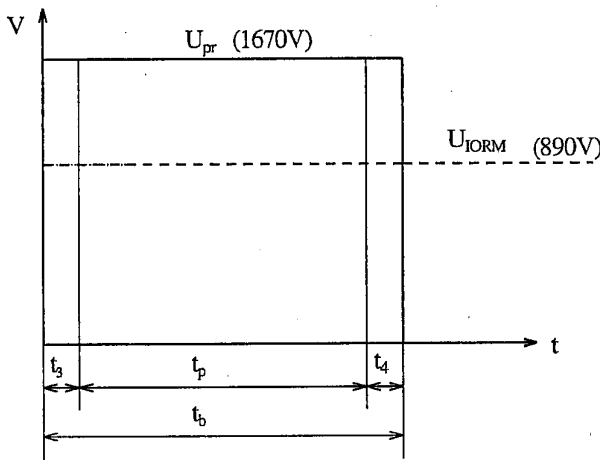
UNIT : 1/1 mm	
Name	Outline Dimensions PC123 (Business dealing name : PC123PY****F)

Method of Diagram 1: Breakdown test (Apply to tape test and sampling test)



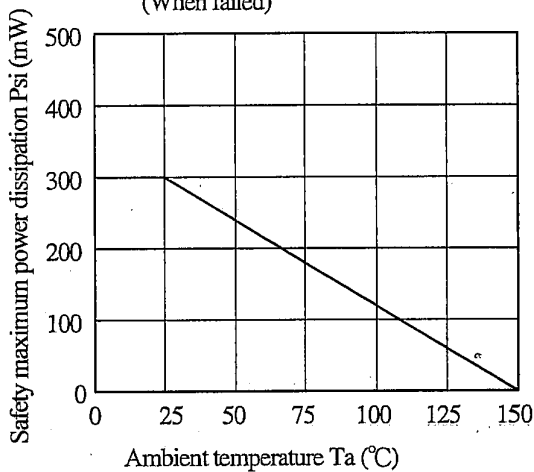
- $t_1, t_2 = 1 \text{ to } 10 \text{ s}$
- $t_3, t_4 = 1 \text{ s}$
- t_p (Partial discharge measuring time) = 10 s
- $t_b = 12 \text{ s}$
- $t_{NI} = 60 \text{ s}$

Method of Diagram 2: Non breakdown test (Apply to all device test)



- $t_3, t_4 = 0.1 \text{ s}$
- t_p (Partial discharge measuring time) = 1 s
- $t_b = 1.2 \text{ s}$

(Fig.6) Safety maximum power dissipation vs. ambient temperature (When failed)



(Fig. 7) Safety maximum forward current vs. ambient temperature (When failed)

