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Q. Ishikawa	Apr. 6, 1996	ELECTRONIC COMPONENTS GROUP SHARP CORPORATION	REPRESENTATIVE DIVISION
		SPECIFICATION	OPTO-ELECTRONIC DEVICES DIV.

DEVICE SPECIFICATION FOR

PHOTOINTERRUPTER

MODEL No.

GP1S93

(Specified for THOMSON)

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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
[o 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 safes representative for any questions about this product.

CUSTOMER'S APPROVAL

DATE

BY

DATE Apr. 6, 1996

PRESENTED BY K. Ebina

K. Ebina,
Chief Manager of
Opto-System Project Team
Opto-Electronic Devices Div.
ELECOM Group
SHARP CORPORATION

1. Application

This specification applies to the outline and characteristics of transmissive type photointerrupter; Model No. GP 1 S93.

2. Outline

Refer to the attached drawing No. CY755 1i02.

3. Ratings and characteristics

Refer to the attached sheet, Page 4 to 6.

4. Reliability

Refer to the attached sheet, Page 7.

5. Incoming inspection

Refer to the attached sheet, Page 8.

6. Supplements

6.1 parts

Refer to the attached sheet, Page 9.

6.2 Packing

Refer to the attached drawing No. SOE99 1548

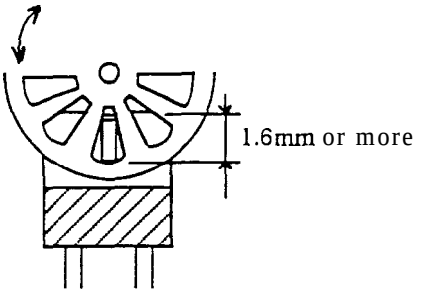
7. Notes

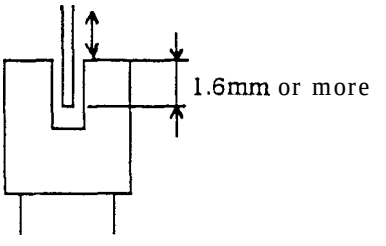
1) In circuit designing, make allowance for the degradation of the light emitting diode output that results from long continuous operation.
(MAX. : 50% degradation/5 years)

2) To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.

3) Opaque board shall be installed at place 1.6mm or more from the top of elements,

(E-pie)





4) To solder onto lead pins, solder at the position of 1 mm or more from the package's bottom at 260 'C for 5 s or less. Please don't bend lead pins from the root of package when soldering. And take please care not to let any external force exert on lead pins. Please don't do soldering with preheating, and please don't do soldering by reflow.

5) Cleaning shall carry out as the below items to avoid keeping solvent, solder and flux on the device.

(1) Solvent cleaning : Solvent temperature 45 ℃ or less
Immersion for 3 min or less

(2) Ultrasonic cleaning : Please don't carry out ultrasonic cleaning.

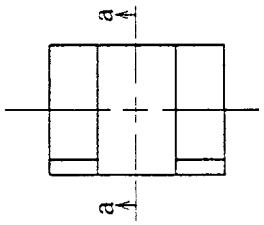
(3) The cleaning shall be carried out with solvent below.

Solvent : Ethyl alcohol, Methyl alcohol

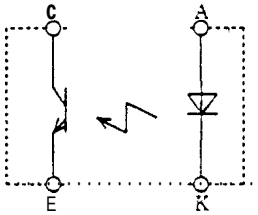
2. Outline Dimensions (Drawing No. CY7551i02)

Scale: 5/1 unit: 1/1mm

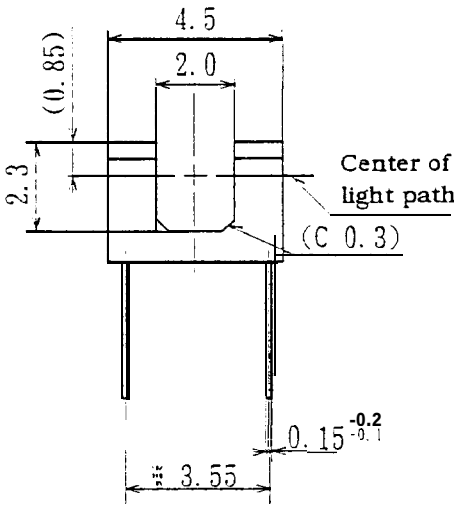
Top View



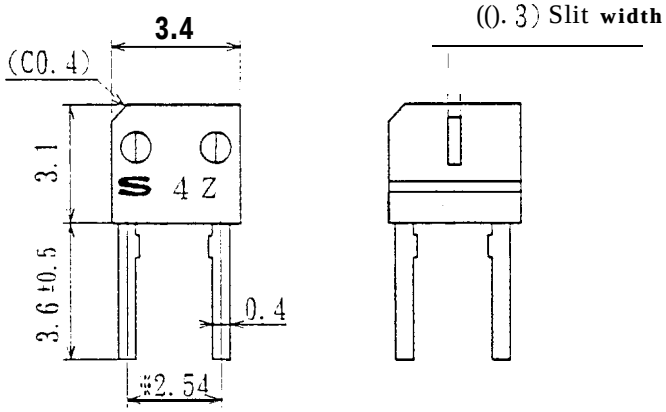
Circuit diagram : Top View

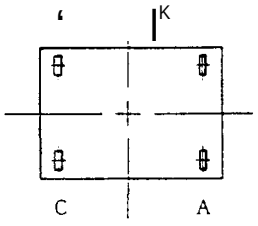


A: Anode
K: Cathode
C: Collector
E: Emitter



a–a section





1) Unspecified tolerance shall be ±0.2.

2) Dimensions in parenthesis are shown for reference.

3) The dimensions indicated by ※ refer to the those measured from the lead base.

4) The dimensions shown do not include those of burrs Burr's dimensions shall be 0.15 MAX..

5) The marking specifications are shown below,

S 4 Z Production month: 1 to 9 ; Jan. to Sep.
X: Oct., Y: Nov., Z: Dec.
Production year : Last digit of the year
Sharp mark

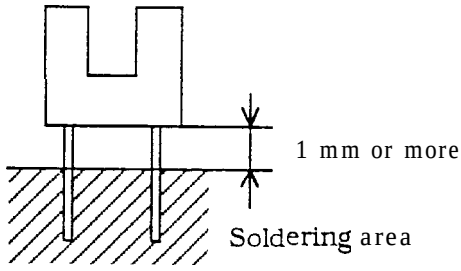
3. Ratings and characteristics

3.1 Absolute maximum ratings

Ta=25℃

Parameter		Symbol	Rating	unit
Input	Forward current	I_F	50	mA
	Reverse voltage	V_R	6	v
	Power dissipation	P	75	mW
output	CoHector-emitter voltage	v_{CEO}	35	v
	Emitter-collector voltage	v_{ECO}	6	V
	Collector current	Ic	20	mA
	Collector power dissipation	Pc	75	mW
Total power dissipation		Ptot	100	mW
Operating temperature		Topr	-25 to +85	℃
Storage temperature		Tstg	-40 to +100	℃
* Soldering temperature		Tsol	260	℃

* Soldering time :5 s or less

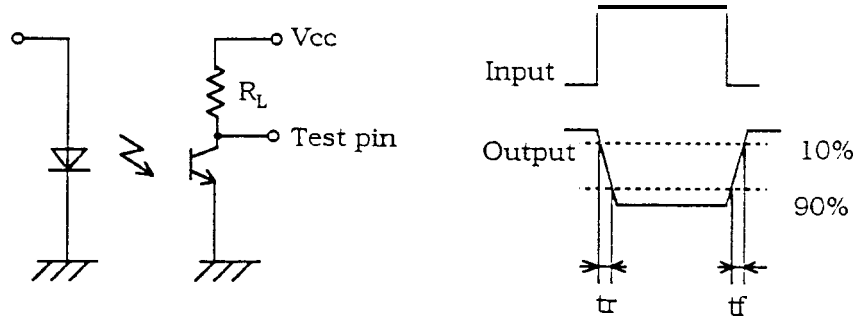


3.2 Electro-optical characteristics

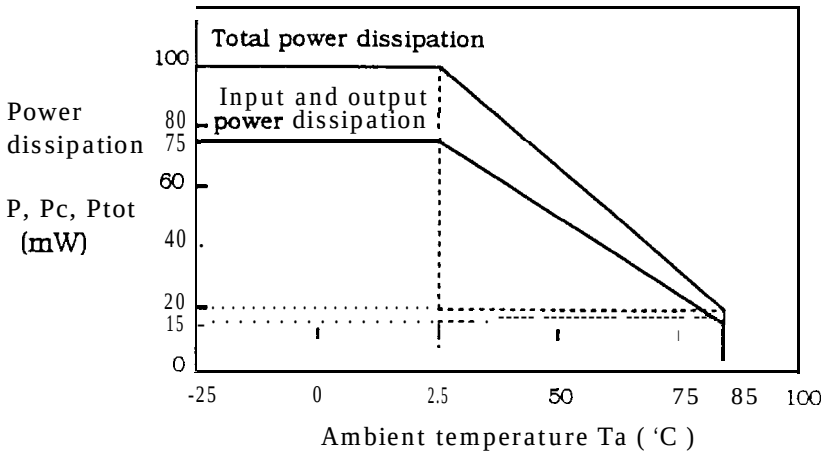
Ta=25°C

Parameter			Symbol	Conditions	MN.	TYP.	MAX.	unit
Input	Forward voltage		V_F	I_F=20mA		1.2	1.4	V
	Reverse current		I_R	V_R=3V			10	μA
output	Collector dark current		I_{CEO}	V_{CE}=20V			100	nA
Transfer characteristics	Collector current		Ic	V_{CE}=5V, I_F=5mA	100	-	400	μA
	Response time	(Rise)	tr	V_{CE}=5V, Ic= 100 μA R_L= 1000 Ω	-	50	150	μs
		(Fall]	tf			50	150	μs
	Collector-emitter saturation voltage		V_{CE}(sat)	I_F=10mA, Ic=40 μA	-	-	0.4	v

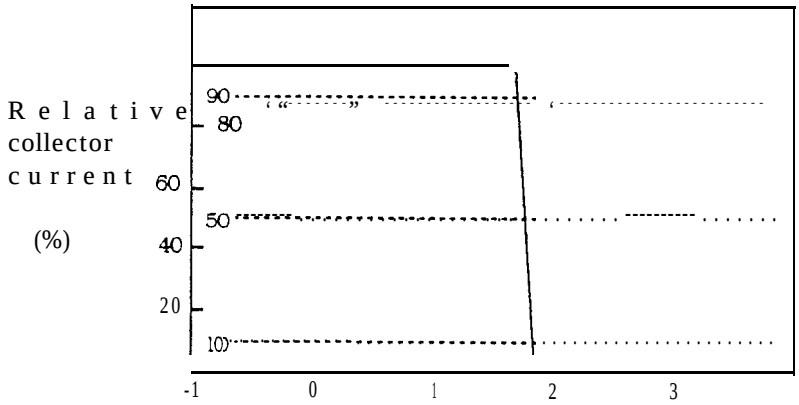
(Test circuit for response time)

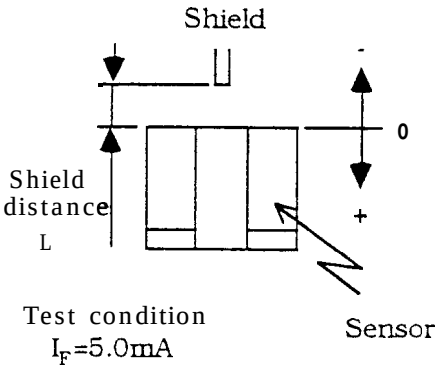


Power dissipation vs. ambient temperature



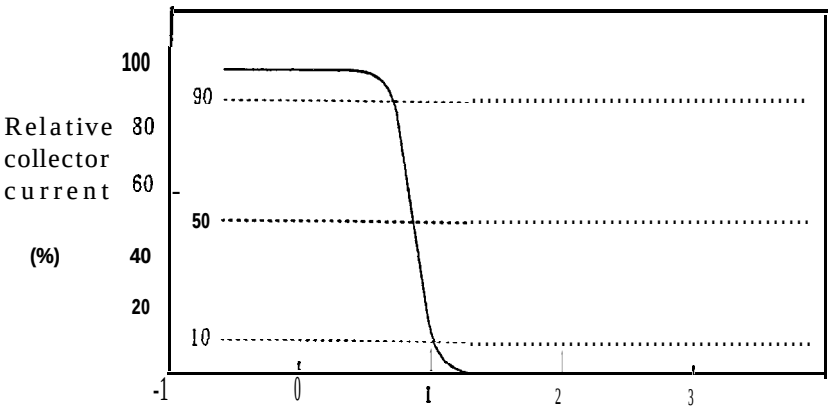
Relative collector current vs, shield distance 1 (Reference value)

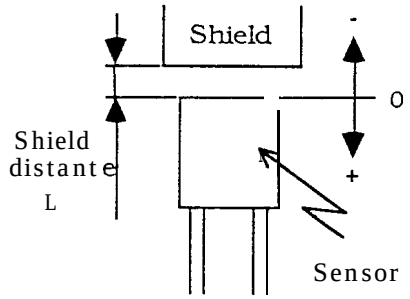




Test condition
I_F=5.0mA
V_{CE}=5V
Ta=25℃

Relative collector current vs. shield distance 2 (Reference value)





Test condition
I_F=5.0mA
V_{CE}=5V
Ta=25℃

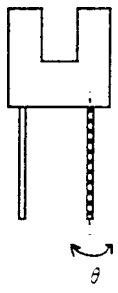
4. Reliability

The reliability of products shall be satisfied with items listed below. Confidence level :907.
LTPD : 10%/20%

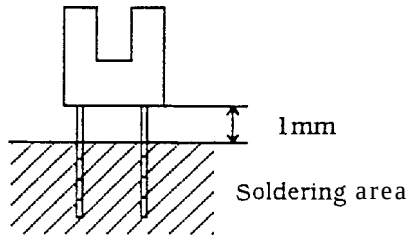
Test Items	Test Conditions	Failure Judgement Criteria	Samples (n) / Defective (c)
Temperature cycling	1 cycle -40 'C to +100℃ (30min) (30min) 20 cycles test	$I_R \geqq U \times 2$ $I_{CEO} \geqq U \times 2$ $V_F \geqq U \times 1.2$ $Ic \leqq L \times 0.8$ U: Upper specification limit L: Lower specification limit	n=22, c=O
humidity storage	+60℃, 90%RH, 500h		n=22, c=0
High temp. storage	+100℃, 500h		n=22, c=O
Low temp. storage	-40℃, 500h		n=22, c=O
Operation life	I_F=20mA, Ta=25°C, 500h		n=22, c=0
Mechanical shock	15000m/s², 0.5ms 3 times/ ±X, ±Y, ±Z direction		n=11, c=0
Variable frequency vibration	100 to 2000 to 100Hz/20min 2h/X, Y, Z direction 100m/s²		n=11, c=0
Terminal strength (Tension)	Weight: 3N 30s / each terminal		n=11, c=0
Terminal strength (Bending)	Weight: 1N 0″ →90° →0° 2 times bending		n=11, c=0
Soldering heat	260℃, 5s Immerse up to 1 mm from the bottom face of package.		n=11, c=0
Solderability	230 'C, 5s Prior disposition: Dip rogin flux. Then immerse up to 1 mm from the bottom face of package.	Judgement only appearance Solder shall adhere at less than 95% area of less than of dipped portion	n=11, c=O

For details, conforms to JIS C 7021,

* Terminal bending direction is shown below.



• Soldering area is shown below.



5. Incoming inspection

5.1 Inspection items

(1) Electrical characteristics

V_F, I_R, BV_{ECO}, BV_{CEO}, Ic, I_{CEO} $V_{CE(sat)}$

(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	Characteristics defect Unreadable marking	0.4
Minor defect	Appearance defect except the above mentioned.	1.0

* Crack . . . Visible crack shall be defect.

* split chip
Scratch
The others
··· One which affects the electrical characteristics shall be defect.

6. Supplements

6.1 Parts

This product uses the below parts.

6.1.1 Light detector (Q'ty : 1)

Type	Material	Maximum sensitivity (nm)	Sensitivity (rim)	Response time (μs)
Phototran-sister	Silicon (Si)	930	700 to 1200	20

6.1.2 Light emitter (Q'ty : 1)

Type	Material	Maximum light emitting wavelength (rim)	I/O Frequency (MHZ)
Infrared light emitting diode (non-coherent)	GaAs	950	0.3

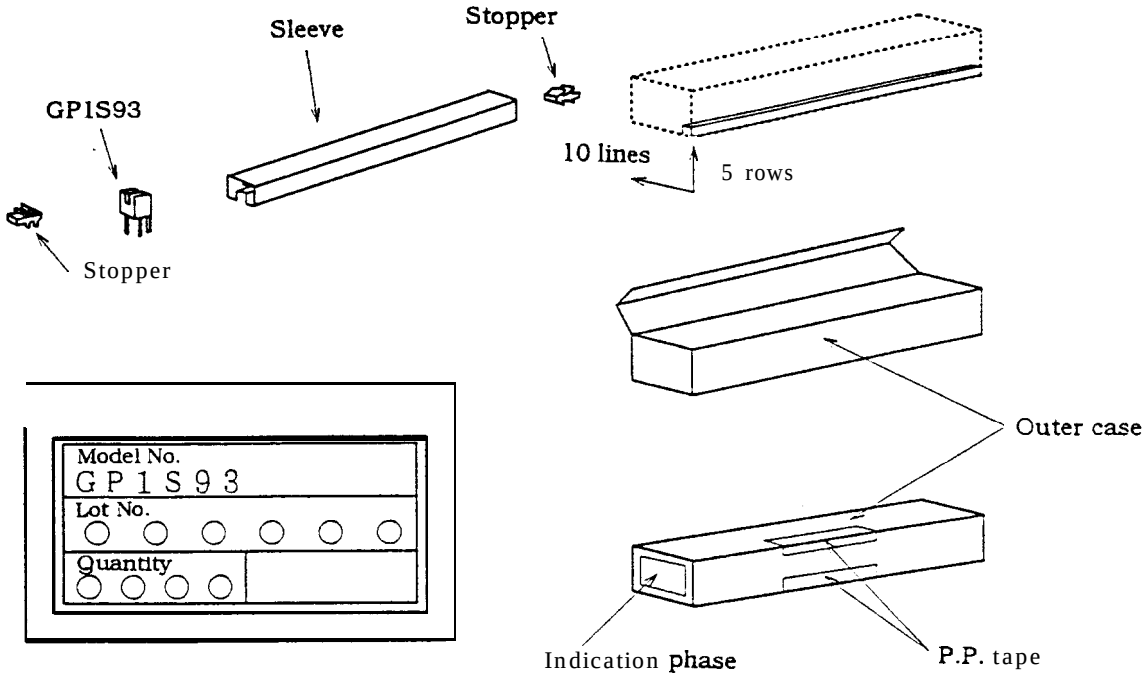
6.1.3 Material

Case	Lead frame	Lead frame plating
Black PPS resin (UL 94V-0)	42 Alloy	Solder plating

6.1.4 Others

This product shall not be proof against radiation flux.

6.2 Package (Drawing No. : SOE991548)



(Indication phase diagram)

1) Package materials

Outer package : Outer case
Inner package : Sleeve, Stopper

2) Packaging numbers

MAX. 50 pieces per sleeve
MAX. 2,500 pieces per case

3) Package specifications

Arranges in 5 rows in 10 lines of sleeves containing GP 1S93 into the outer case.
Closes the lid of outer case and seals with P.P. tapes.

4) Indication items

Indicates on the outer case “Model No.”, “Lot No.”, “Quantity” and “Inspection date”.