PC357N Series

Mini-flat Package, General Purpose Photocoupler

■ Description

PC357N Series contains an IRED optically coupled to a phototransistor.

It is packaged in a 4-pin Mini-flat package.

Input-output isolation voltage(rms) is 3.75kV.

Collector-emitter voltage is 80V(*) and CTR is 50% to 600% at input current of 5mA.

■ Features

1. 4-pin Mini-flat package
2. Double transfer mold package (Ideal for Flow Soldering)
3. High collector-emitter voltage (V_{CEO} : 80V(*))
4. Current transfer ratio (CTR) : MIN. 50% at I_F=5mA, V_{CE}=5V
5. Several CTR ranks available
6. High isolation voltage between input and output ($V_{iso(rms)}$: 3.75kV)

(*) Up to Date code "P9" (September 2002) V_{CEO} : 35V. From the production Date code "J5" (May 1997) to "P9" (September 2002), however the products were screened by BV_{CEO}≥70V.

■ Agency approvals/Compliance

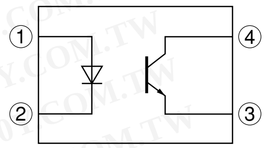
1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC357**)
2. Package resin : UL flammability grade (94V-0)

■ Applications

1. Hybrid substrates that require high density mounting
2. Programmable controllers

Sheet No.: D2-A00101EN
Date Sep. 30. 2003

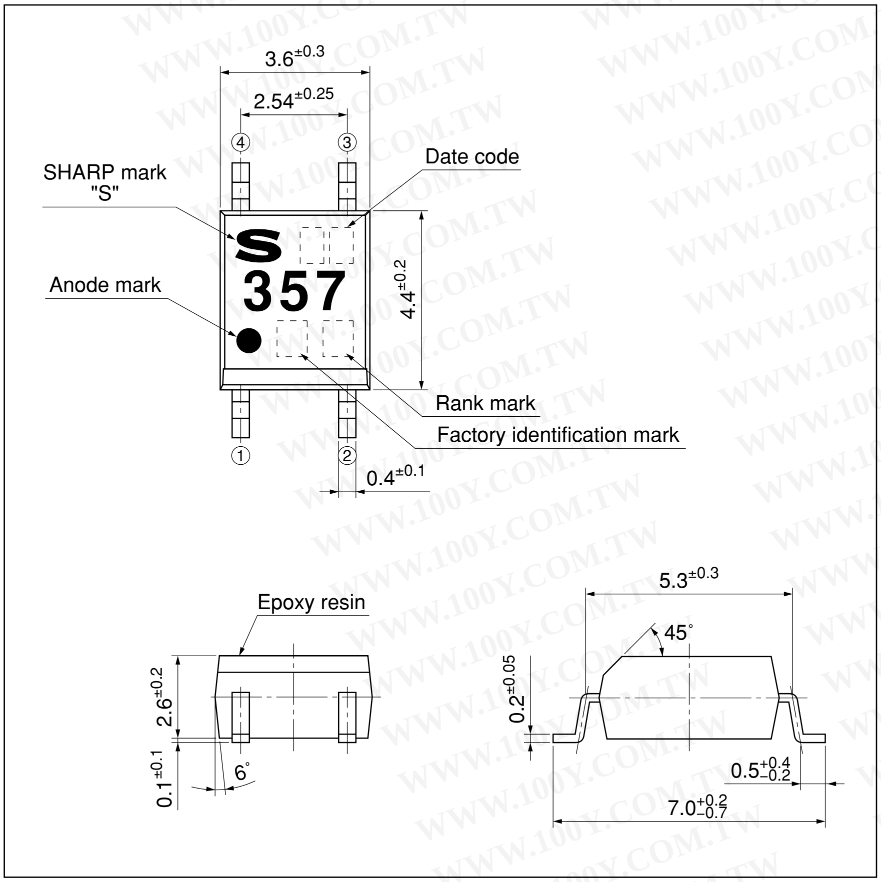
■ Internal Connection Diagram



① Anode
② Cathode
③ Emitter
④ Collector

■ Outline Dimensions

(Unit : mm)



Product mass : approx. 0.1g

Date code (2 digit)

1st digit				2nd digit	
Year of production				Month of production	
A.D.	Mark	A.D	Mark	Month	Mark
1990	A	2002	P	January	1
1991	B	2003	R	February	2
1992	C	2004	S	March	3
1993	D	2005	T	April	4
1994	E	2006	U	May	5
1995	F	2007	V	June	6
1996	H	2008	W	July	7
1997	J	2009	X	August	8
1998	K	2010	A	September	9
1999	L	2011	B	October	O
2000	M	2012	C	November	N
2001	N	⋮	⋮	December	D

repeats in a 20 year cycle

Factory identification mark

Factory identification Mark	Country of origin
no mark	Japan
■	
◢	Indonesia
◸	Philippines
◥	China

* This factory marking is for identification purpose only.
Please contact the local SHARP sales representative to see the actual status of the production

Rank mark

Refer to the Model Line-up table

■ Absolute Maximum Ratings

(T_a=25˚C)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	*1 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	*4 80	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
Total power dissipation		P_{tot}	170	mW
Operating temperature		T_{opr}	−30 to +100	˚C
Storage temperature		T_{stg}	−40 to +125	˚C
*2 Isolation voltage		$V_{iso\ (rms)}$	3.75	kV
*3 Soldering temperature		T_{sol}	260	˚C

*1 Pulse width≤100µs, Duty ratio : 0.001
*2 40 to 60%RH, AC for 1 minute, f=60Hz
*3 For 10s
*4 Up to Date code "P9" (September 2002) V_{CEO}:35V.

■ Electro-optical Characteristics

(T_a=25˚C)

	Parameter		Symbol	Conditions	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	Collector 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	*5 80	−	−	V
	Emitter-collector breakdown voltage		BV_{ECO}	I_E=10µA, I_F=0	6	−	−	V
Transfer charac-teristics	Collector current		I_C	I_F=5mA, V_{CE}=5V	2.5	5	30	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}	1×10^{11}	−	Ω
	Floating capacitance		C_f	V=0, f=1MHz	−	0.6	1.0	pF
	Response time	Rise time	t_r	V_{CE}=2V, I_C=2mA, R_L=100Ω	−	4	18	µs
		Fall time	t_f		−	3	18	µs

*5 From the production Date code "J5" (May 1997) to "P9" (September 2002), however the products were screened by BV_{CEO}≥70V.

■ Model Line-up

Package	Taping 3 000pcs/reel	Taping 750pcs/reel	Rank mark	I_C [mA] (I_F=5mA, V_{CE}=5V, T_a=25˚C)
Model No.	**PC357N**	**PC357NT**	with or without	2.5 to 30.0
	PC357N1	**PC357N1T**	A	4.0 to 8.0
	PC357N2	**PC357N2T**	B	6.5 to 13.0
	PC357N3	**PC357N3T**	C	10.0 to 20.0
	PC357N4	**PC357N4T**	D	15.0 to 30.0
	PC357N5	**PC357N5T**	A or B	4.0 to 13.0
	PC357N6	**PC357N6T**	B or C	6.5 to 20.0
	PC357N7	**PC357N7T**	C or D	10.0 to 30.0
	PC357N8	**PC357N8T**	A, B or C	4.0 to 20.0
	PC357N9	**PC357N9T**	B, C or D	6.5 to 30.0
	PC357N0	**PC357N0T**	A, B, C or D	4.0 to 30.0

Please contact a local SHARP sales representative to inquire about production status and Lead-Free options.

Fig.1 Forward Current vs. Ambient Temperature

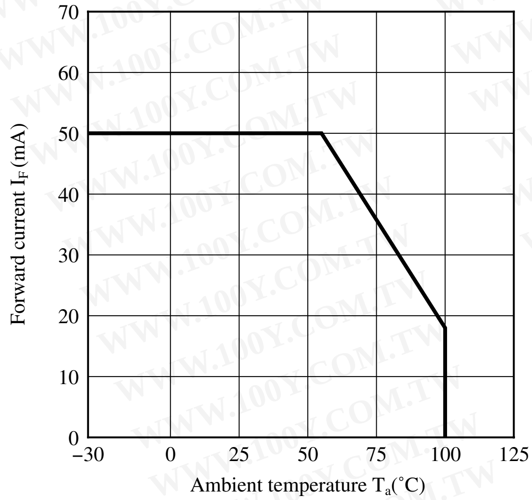


Fig.2 Diode Power Dissipation vs. Ambient Temperature

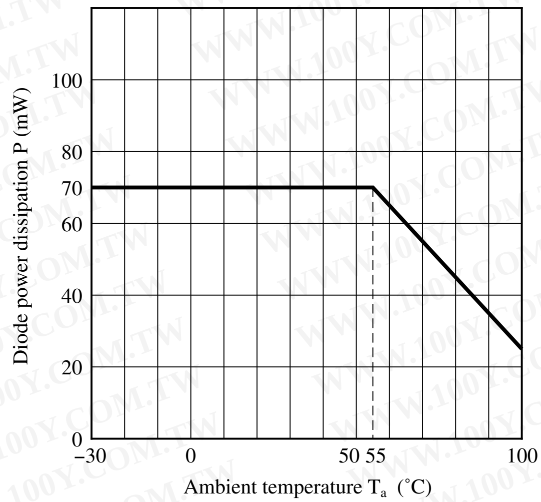


Fig.3 Collector Power Dissipation vs. Ambient Temperature

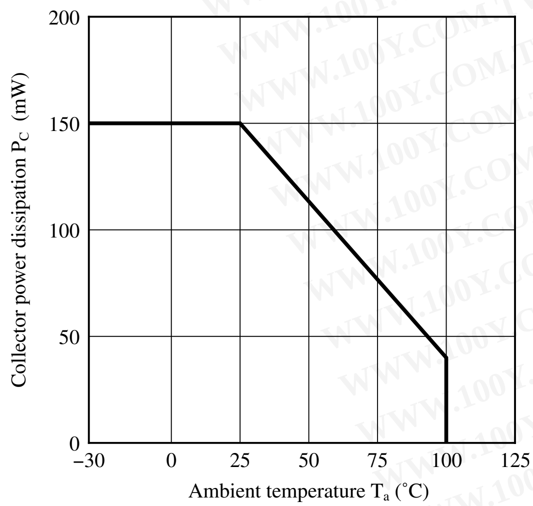


Fig.4 Total Power Dissipation vs. Ambient Temperature

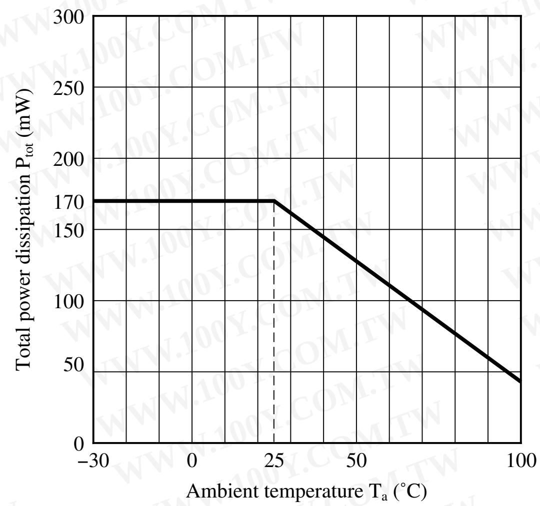


Fig.5 Peak Forward Current vs. Duty Ratio

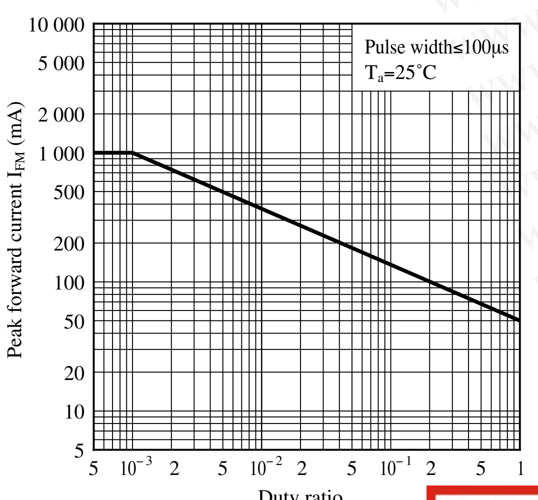


Fig.6 Forward Current vs. Forward Voltage

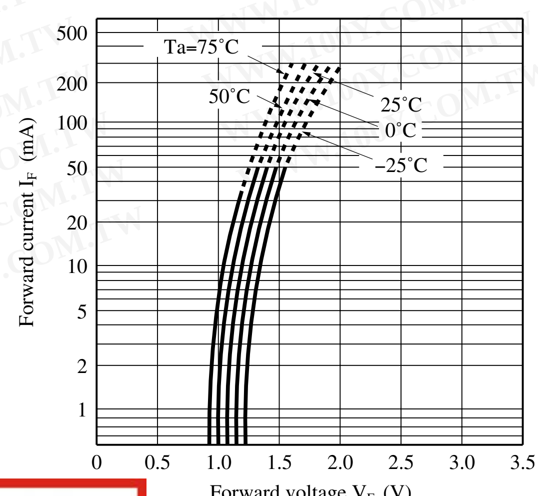


Fig.7 Current Transfer Ratio vs. Forward Current

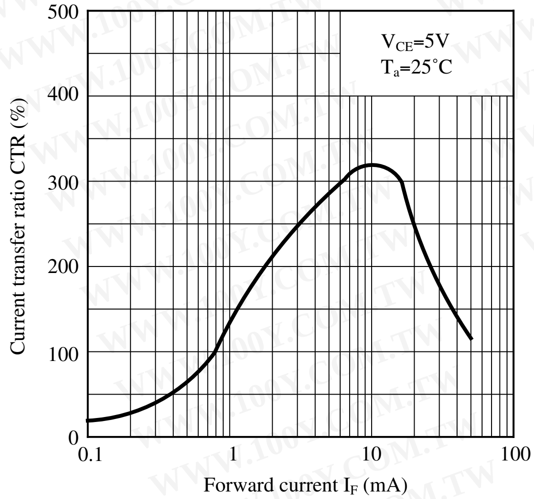


Fig.8 Collector Current vs. Collector-emitter Voltage

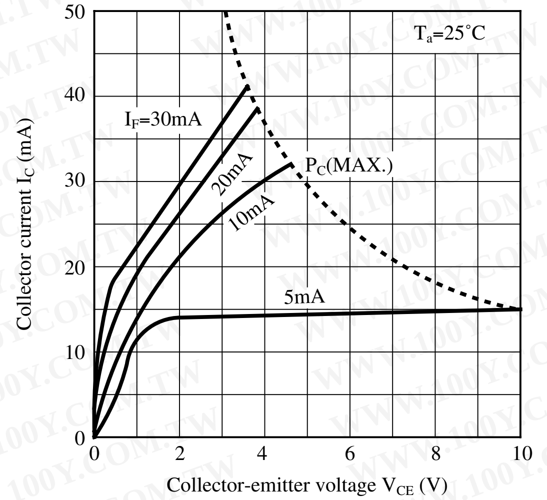


Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature

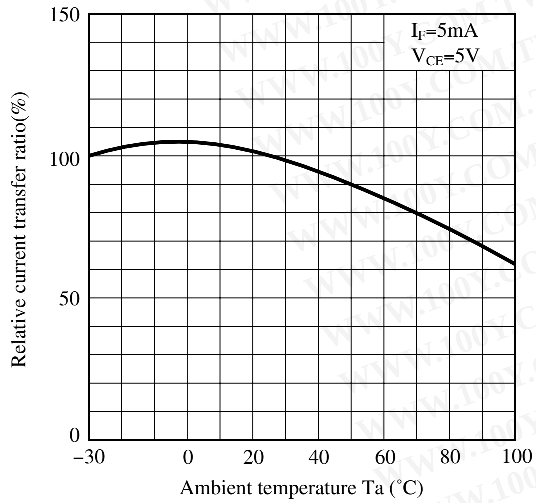


Fig.10 Collector - emitter Saturation Voltage vs. Ambient Temperature

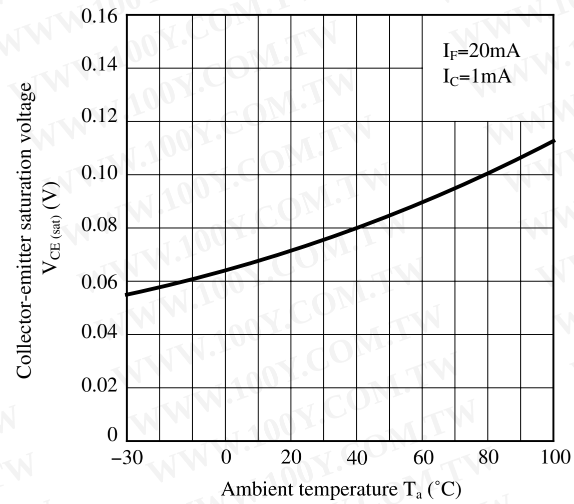


Fig.11 Collector Dark Current vs. Ambient Temperature

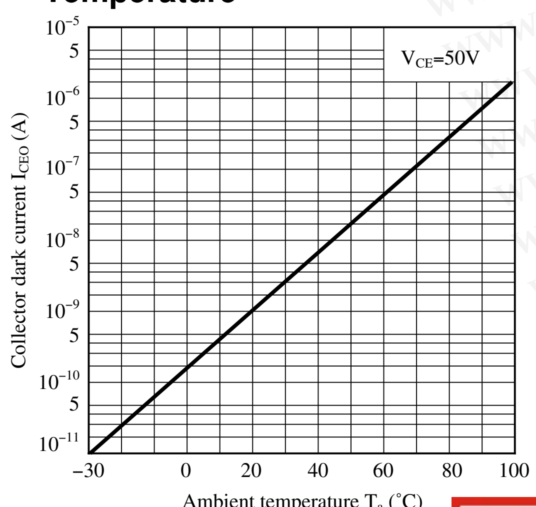


Fig.12 Response Time vs. Load Resistance

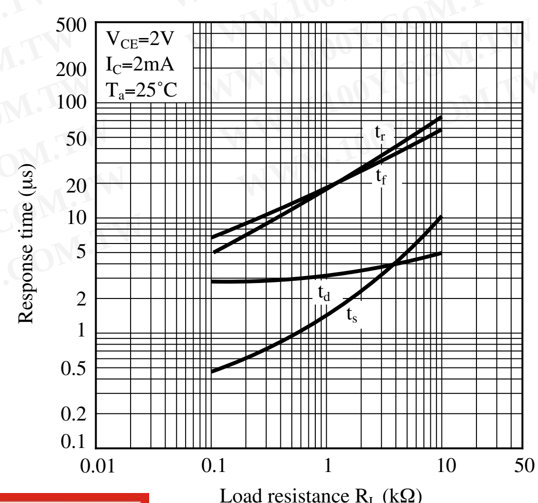
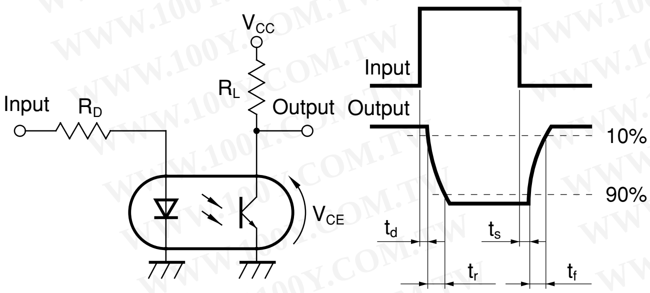
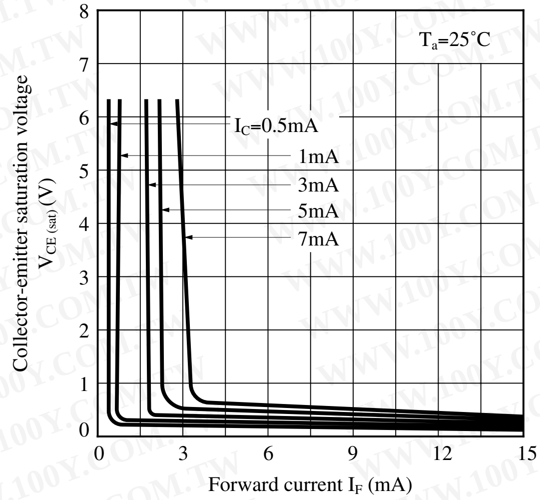


Fig.13 Test Circuit for Response Time



Please refer to the conditions in Fig.12

Fig.14 Collector-emitter Saturation Voltage vs. Forward Current



Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

■ Design Considerations

● Design guide

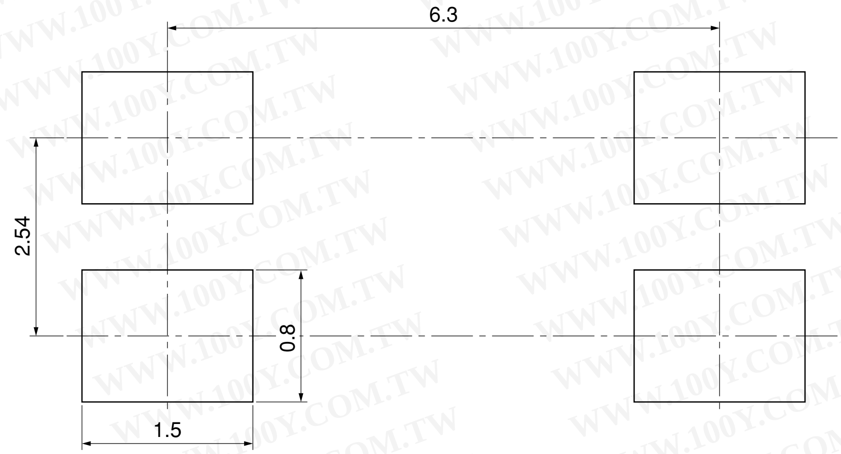
While operating at I_F<1.0mA, CTR variation may increase.
Please make design considering this fact.

This product is not designed against irradiation and incorporates non-coherent IRED.

● Degradation

In general, the emission of the IRED used in photocouplers will degrade over time.
In the case of long term operation, please take the general IRED degradation (50% degradation over 5years) into the design consideration.

● Recommended Foot Print (reference)



(Unit : mm)

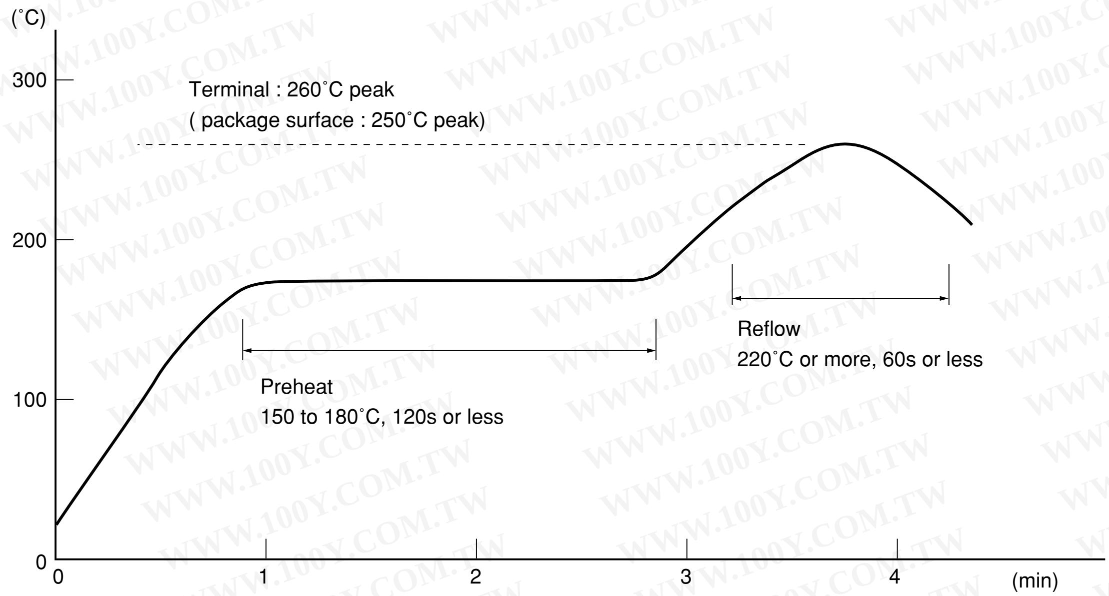
☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.

■ Manufacturing Guidelines

● Soldering Method

Reflow Soldering:

Reflow soldering should follow the temperature profile shown below.
Soldering should not exceed the curve of temperature profile and time.
Please don't solder more than twice.



Flow Soldering :

Due to SHARP's double transfer mold construction submersion in flow solder bath is allowed under the below listed guidelines.

Flow soldering should be completed below 260˚C and within 10s.
Preheating is within the bounds of 100 to 150˚C and 30 to 80s.
Please don't solder more than twice.

Hand soldering

Hand soldering should be completed within 3s when the point of solder iron is below 400˚C.
Please don't solder more than twice.

Other notices

Please test the soldering method in actual condition and make sure the soldering works fine, since the impact on the junction between the device and PCB varies depending on the tooling and soldering conditions.

● Cleaning instructions

Solvent cleaning:

Solvent temperature should be 45˚C or below Immersion time should be 3minutes or less

Ultrasonic cleaning:

The impact on the device varies depending on the size of the cleaning bath, ultrasonic output, cleaning time, size of PCB and mounting method of the device.

Therefore, please make sure the device withstands the ultrasonic cleaning in actual conditions in advance of mass production.

Recommended solvent materials:

Ethyl alcohol, Methyl alcohol and Isopropyl alcohol

In case the other type of solvent materials are intended to be used, please make sure they work fine in actual using conditions since some materials may erode the packaging resin.

● Presence of ODC

This product shall not contain the following materials.

And they are not used in the production process for this device.

Regulation substances : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

Specific brominated flame retardants such as the PBBOs and PBBs are not used in this product at all.

■ Package specification

● Tape and Reel package

1. 3 000pcs/reel

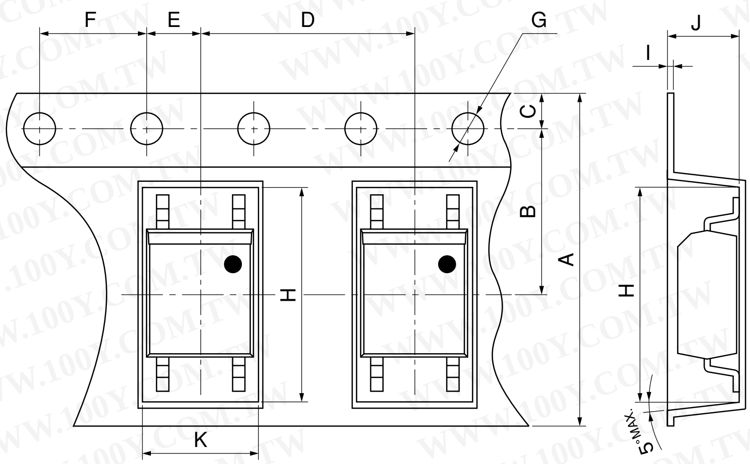
Package materials

Carrier tape : A-PET (with anti-static material)

Cover tape : PET (three layer system)

Reel : PS

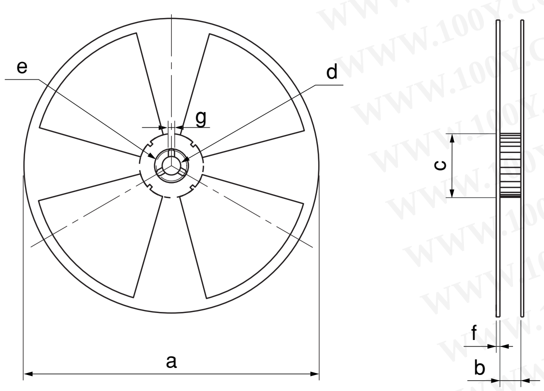
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

A	B	C	D	E	F	G
$12.0^{\pm 0.3}$	$5.5^{\pm 0.1}$	$1.75^{\pm 0.1}$	$8.0^{\pm 0.1}$	$2.0^{\pm 0.1}$	$4.0^{\pm 0.1}$	$\phi 1.5^{+0.1}_{-0}$
H	I	J	K			
$7.4^{\pm 0.1}$	$0.3^{\pm 0.05}$	$3.1^{\pm 0.1}$	$4.0^{\pm 0.1}$			

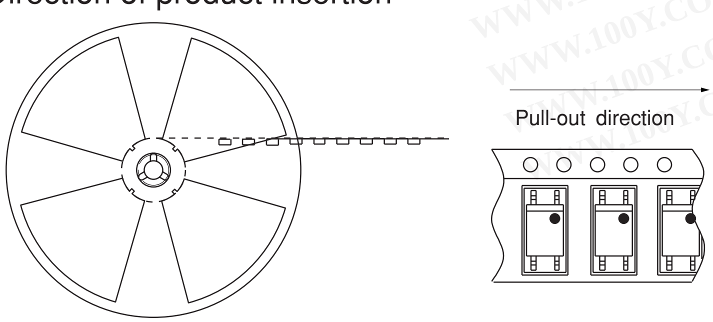
Reel structure and Dimensions



Dimensions List (Unit : mm)

a	b	c	d
370	$13.5^{\pm 1.5}$	$80^{\pm 1.0}$	$13^{\pm 0.5}$
e	f	g	
$21^{\pm 1.0}$	$2.0^{\pm 0.5}$	$2.0^{\pm 0.5}$	

Direction of product insertion



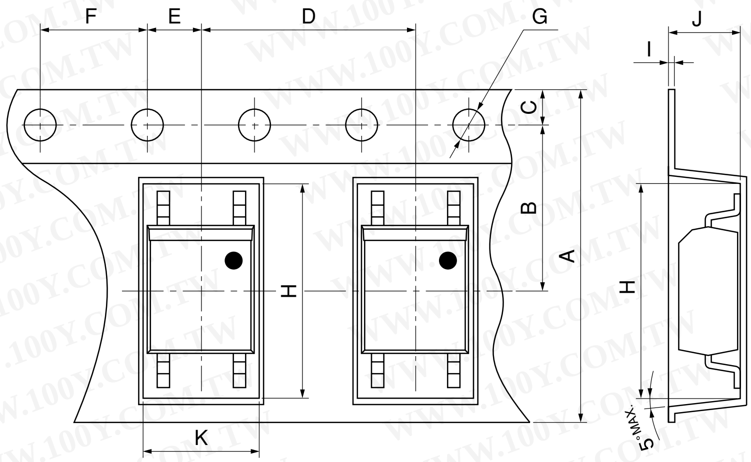
[Packing : 3 000pcs/reel]

2. 750pcs/reel

Package materials

Carrier tape : A-PET (with anti-static material)
Cover tape : PET (three layer system)
Reel : PS

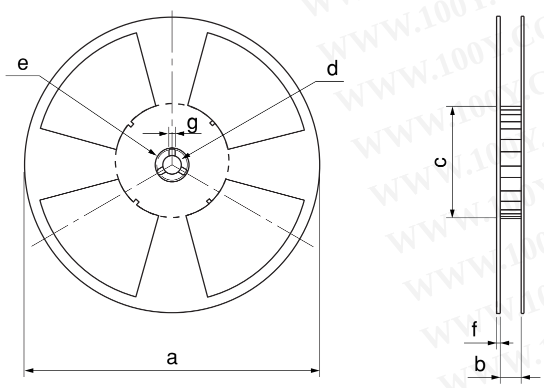
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

A	B	C	D	E	F	G
$12.0^{\pm 0.3}$	$5.5^{\pm 0.1}$	$1.75^{\pm 0.1}$	$8.0^{\pm 0.1}$	$2.0^{\pm 0.1}$	$4.0^{\pm 0.1}$	$\phi 1.5^{+0.1}_{-0}$
H	I	J	K			
$7.4^{\pm 0.1}$	$0.3^{\pm 0.05}$	$3.1^{\pm 0.1}$	$4.0^{\pm 0.1}$			

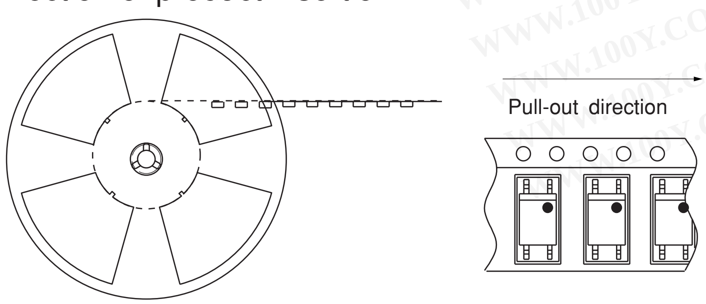
Reel structure and Dimensions



Dimensions List (Unit : mm)

a	b	c	d
180	$13.5^{\pm 1.5}$	$80^{\pm 1.0}$	$13^{\pm 0.5}$
e	f	g	
$21^{\pm 1.0}$	$2.0^{\pm 0.5}$	$2.0^{\pm 0.5}$	

Direction of product insertion



[Packing : 750pcs/reel]

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(i) The devices in this publication are designed for use in general electronic equipment designs such as:

--- Personal computers
--- Office automation equipment
--- Telecommunication equipment [terminal]
--- Test and measurement equipment
--- Industrial control
--- Audio visual equipment
--- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:

--- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:

--- Space applications
--- Telecommunication equipment [trunk lines]
--- Nuclear power control equipment
--- Medical and other life support equipment (e.g., scuba).

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