

PC410L0NIP0F Series

High Speed 10Mb/s, High CMR
Mini-flat Package *OPIC
Photocoupler



■ Description

PC410L0NIP0F Series contains a LED optically coupled to an OPIC chip.

It is packaged in a 5 pin mini-flat.

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

High speed response(TYP. 10 Mb/s) and CMR is MIN. 10 kV/μs.

■ Features

1. 5 pin Mini-flat package
2. Double transfer mold package
(Ideal for Flow Soldering)
3. High noise immunity due to high instantaneous common mode rejection voltage (CM_H : MIN.10 kV/μs, CM_L : MIN. -10 kV/μs)
4. High speed response
(t_{PHL} : TYP. 48 ns, t_{PLH} : TYP. 50 ns)
5. High isolation voltage between input and output
($V_{iso(rms)}$: 3.75 kV)
6. RoHS directive compliant

■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC410L**)
2. Approved by VDE, DIN EN60747-5-2^(*) (as an option), file No. 40009162 (as model No. **PC410L**)
3. Package resin : UL flammability grade (94V-0)

^(*)DIN EN60747-5-2 : successor standard of DIN VDE0884

■ Applications

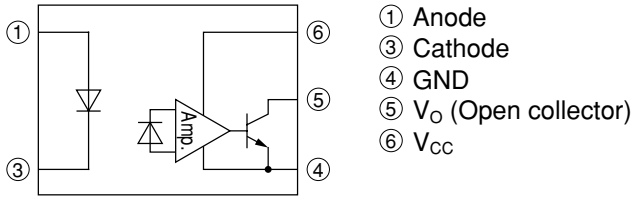
1. Programmable controllers
2. Inverter

* "OPIC"(Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and a signal-processing circuit integrated onto a single chip.

Notice The content of data sheet is subject to change without prior notice.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

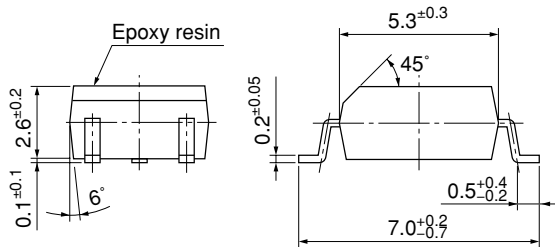
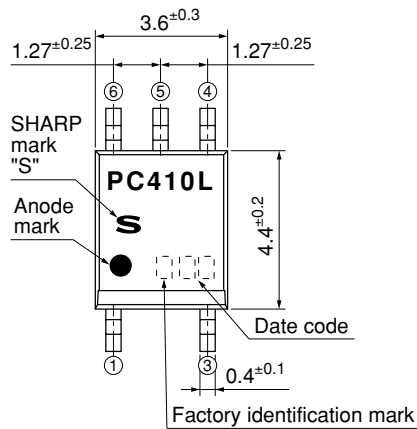
Internal Connection Diagram



Outline Dimensions

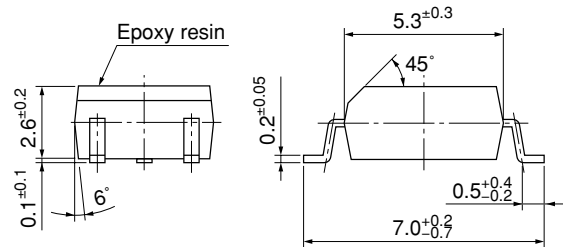
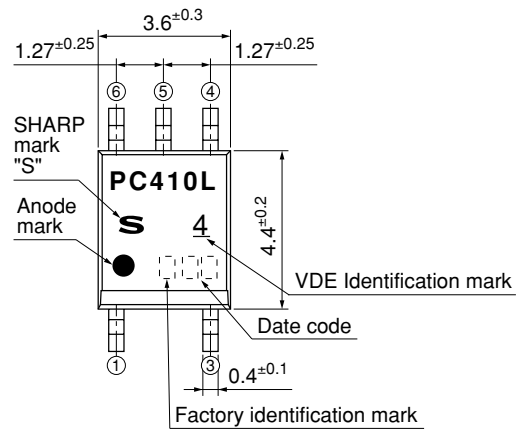
(Unit : mm)

1. Mini-flat Package [ex. PC410L0NIP0F]



Product mass : approx. 0.1g

2. Mini-flat Package (VDE option) [ex. PC410L0YIP0F]



Product mass : approx. 0.1g

Plating material : SnCu (Cu : TYP. 2%)

Date code (2 digit)

Date code (2 digit)				Date code (2 digit)	
00	01	02	03	04	05
06	07	08	09	10	11
12	13	14	15	16	17
18	19	20	21	22	23
24	25	26	27	28	29
30	31	32	33	34	35
36	37	38	39	40	41
42	43	44	45	46	47
48	49	50	51	52	53
54	55	56	57	58	59
60	61	62	63	64	65
66	67	68	69	70	71
72	73	74	75	76	77
78	79	80	81	82	83
84	85	86	87	88	89
90	91	92	93	94	95
96	97	98	99	00	01

repeats in a 20 year cycle

Factory identification mark

Factory identification mark	Factory identification mark
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9



Rank mark

There is no rank mark indicator.

■ Absolute Maximum Ratings

Symbol	Parameter	Unit	Value
V _{DS}	Drain-Source Voltage (V _{GS} =0V, I _D =0A)	V	10
	Drain-Source Voltage (V _{GS} =0V, I _D =I _{DM})	V	10
	Drain-Source Voltage (V _{GS} =0V, I _D =I _{DM} , t _{transient} ≤ 100μs)	V	10
V _{GS}	Gate-Source Voltage	V	±10
	Gate-Source Voltage (Pulse)	V	±15
	Gate-Source Voltage (Pulse, t _{transient} ≤ 100μs)	V	±15
I _{DM}	Drain Current (Continuous, V _{GS} =0V, V _{DS} ≤ 10V)	A	1.0
	Drain Current (Pulse, V _{GS} =0V, V _{DS} ≤ 10V, t _{transient} ≤ 100μs)	A	1.5
I _{SM}	Drain Current (Short-Duration Pulse, V _{GS} =0V, V _{DS} ≤ 10V)	A	1.5
	Drain Current (Short-Duration Pulse, V _{GS} =0V, V _{DS} ≤ 10V, t _{transient} ≤ 100μs)	A	2.0
I _{RM}	Drain Current (Reverse, V _{GS} =0V, V _{DS} ≤ 10V)	A	0.5
	Drain Current (Reverse, V _{GS} =0V, V _{DS} ≤ 10V, t _{transient} ≤ 100μs)	A	0.5
I _{SMR}	Drain Current (Short-Duration Pulse, Reverse, V _{GS} =0V, V _{DS} ≤ 10V)	A	0.5
	Drain Current (Short-Duration Pulse, Reverse, V _{GS} =0V, V _{DS} ≤ 10V, t _{transient} ≤ 100μs)	A	0.5

■ Electro-optical Characteristics

Symbol	Parameter	Unit	Typical Value	Min. Value	Max. Value	Test Conditions
V _{th}	Threshold Voltage (V _{GS} =V _{DS})	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA
	Threshold Voltage (V _{GS} =V _{DS} , I _D =10mA)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA
	Threshold Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs
V _{GS(on)}	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA
	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs
	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V
	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V
V _{GS(off)}	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs
	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V
V _{GS(off)}	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V
	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V
V _{GS(off)}	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V
	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V
V _{GS(off)}	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V
	Gate-Source Voltage (V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V)	V	1.5	1.0	2.0	V _{GS} =V _{DS} , I _D =10mA, t _{transient} ≤ 100μs, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V, ΔV _{GS} ≤ 10V, ΔV _{DS} ≤ 10V

Fig.1 Test Circuit for Propagation Delay Time and Rise Time, Fall Time

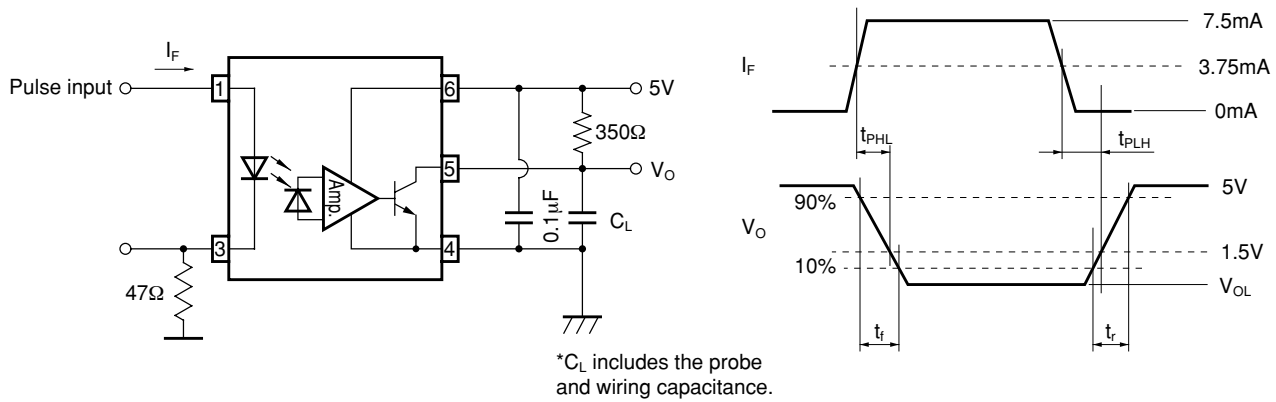


Fig.2 Test Circuit for Instantaneous Common Mode Rejection Voltage

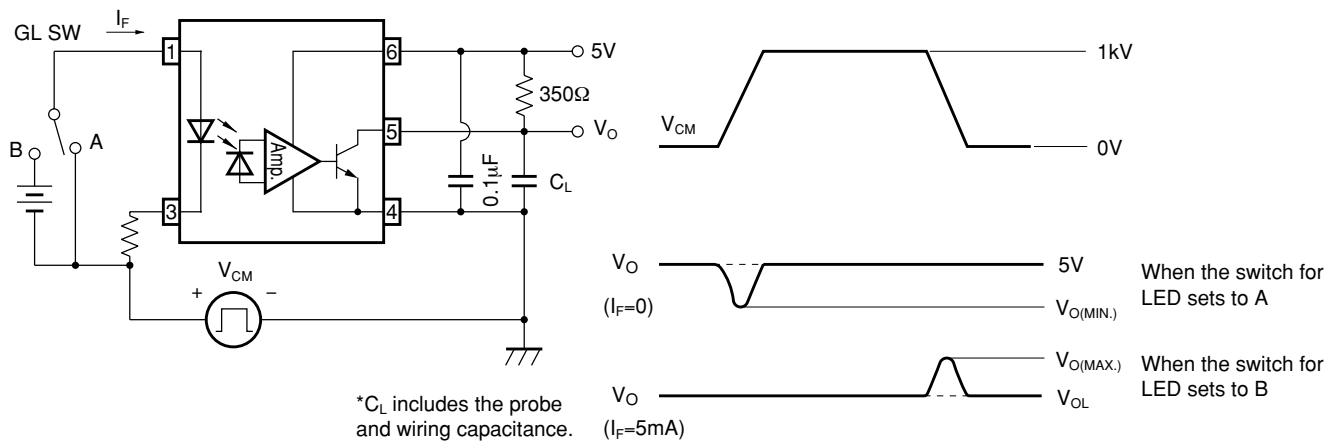


Fig.3 Forward Current vs. Ambient Temperature

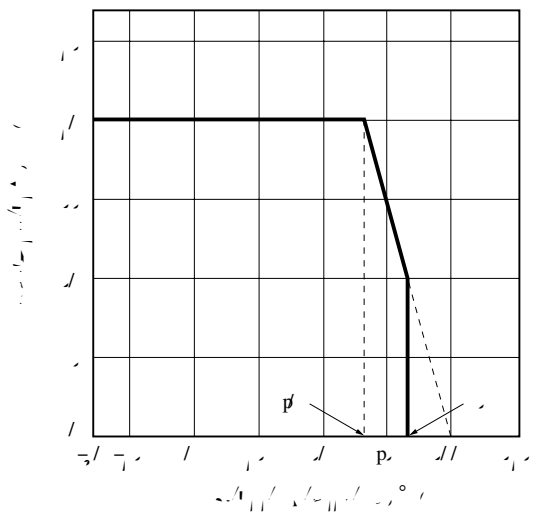


Fig.4 Collector Power Dissipation vs. Ambient Temperature

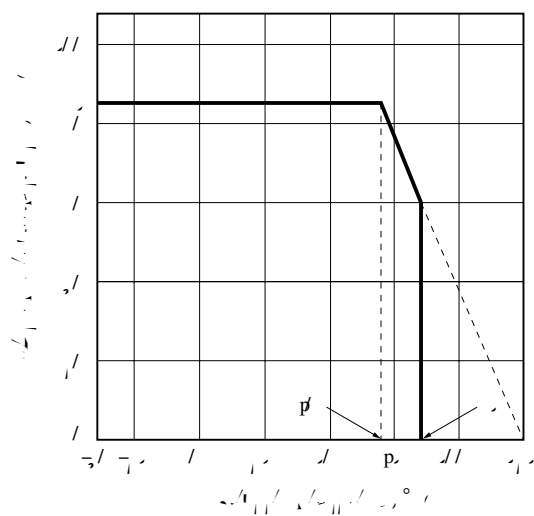


Fig.5 Forward Current vs. Forward Voltage

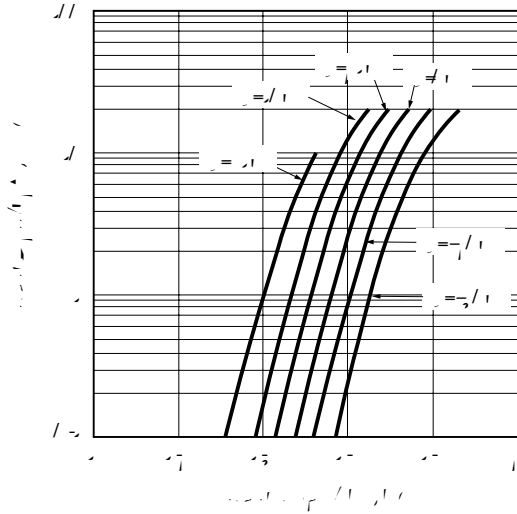


Fig.6 High Level Output Current vs. Ambient Temperature

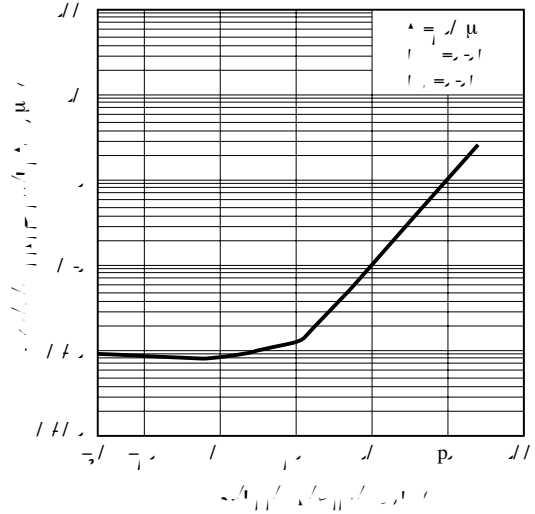


Fig.7 Low Level Output Voltage vs. Ambient Temperature

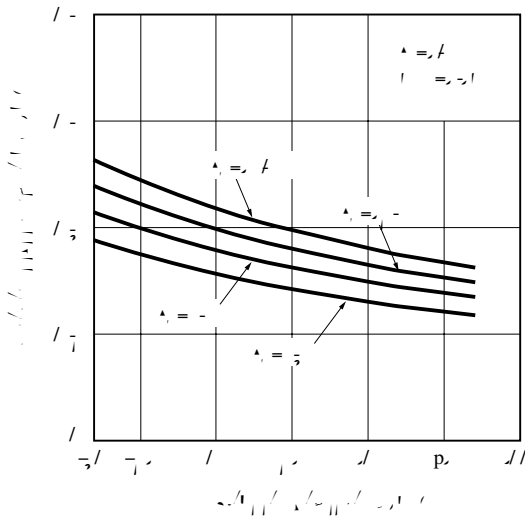


Fig.8 Output Voltage vs. Forward Current

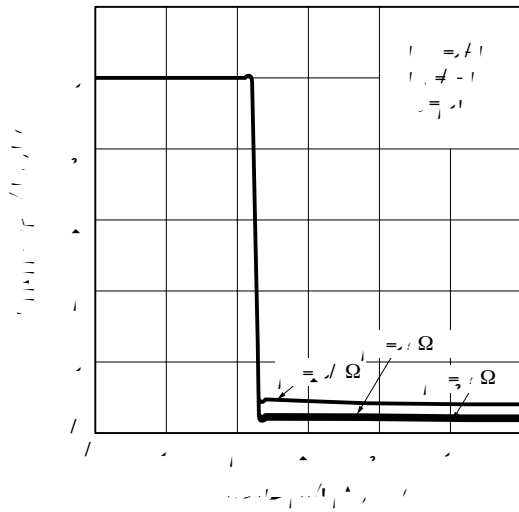


Fig.9 Input Threshold Current vs. Ambient Temperature

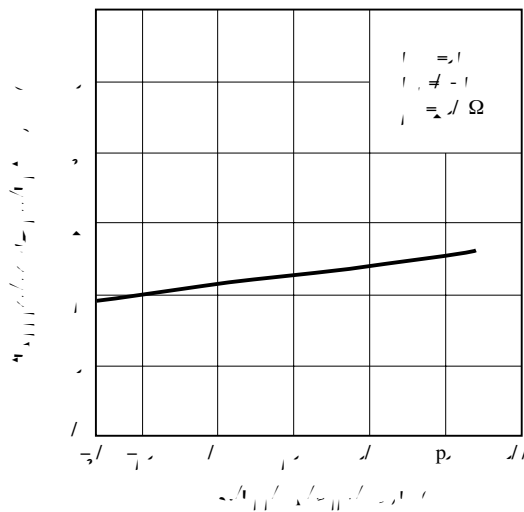


Fig.10 Propagation Delay time vs. Forward Current

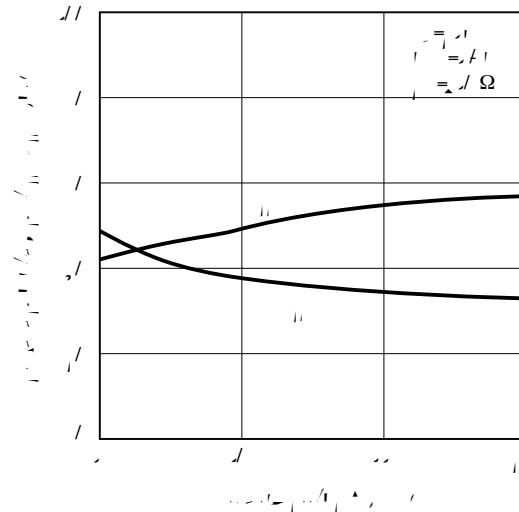
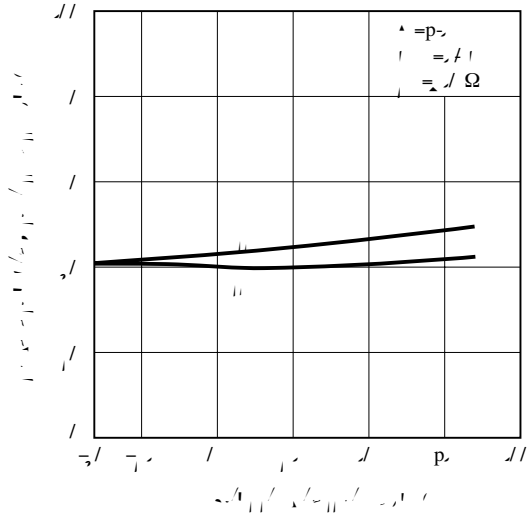


Fig.11 Propagation Delay Time vs. Ambient Temperature



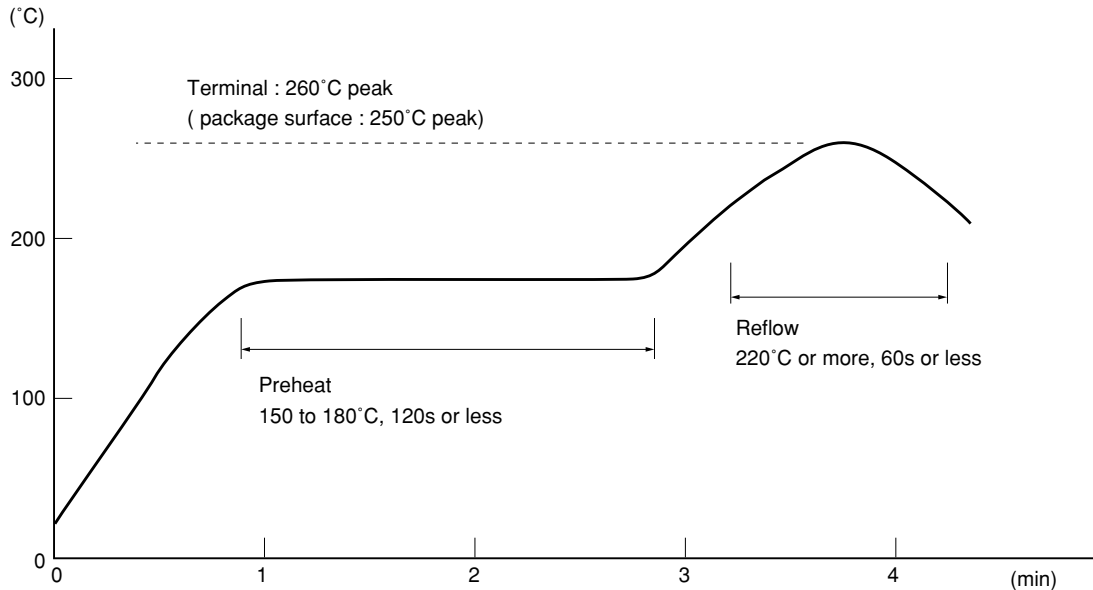
Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

■ 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 3 minutes 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 product.

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.

This product shall not contain the following materials banned in the RoHS Directive (2002/95/EC).

- Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE).

■ **Package specification**

● **Tape and Reel package**

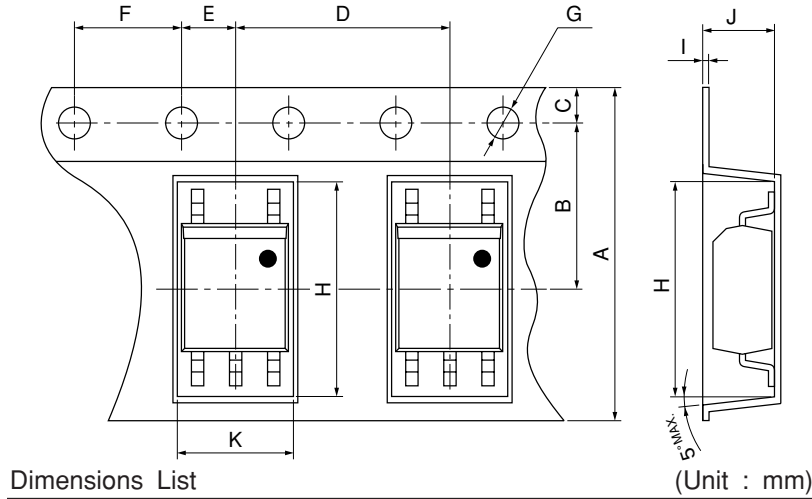
Package materials

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

Cover tape : PET (three layer system)

Reel : PS

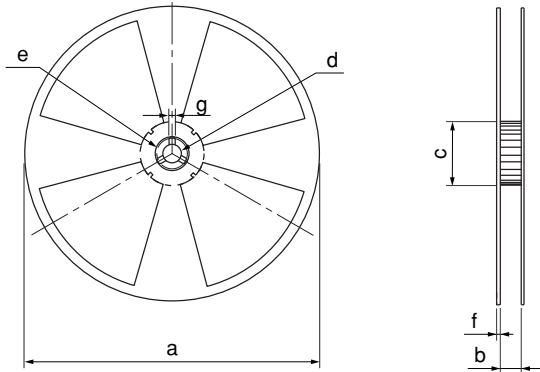
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

$t \pm 0.2$	$r \pm 0.2$	$p_2 \pm 0.2$	$t \pm 0.2$	$t \pm 0.2$	$t \pm 0.2$	$\phi \pm 0.2$
$p_2 \pm 0.2$	$l \pm 0.2$	$a \pm 0.2$	$t \pm 0.2$			

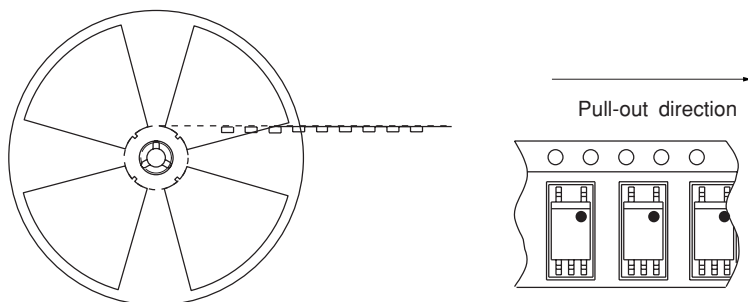
Reel structure and Dimensions



Dimensions List (Unit : mm)

p	$r \pm 0.2$	$l \pm 0.2$	$r \pm 0.2$
$t \pm 0.2$	$t \pm 0.2$	$t \pm 0.2$	

Direction of product insertion



[Packing : 3 000pcs/reel]

■ Important Notices

· The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.

· Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.

· Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:

(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).

· If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Law of Japan, it is necessary to obtain approval to export such SHARP devices.

· This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.

· Contact and consult with a SHARP representative if there are any questions about the contents of this publication.