NEC

PHOTOCOUPLER

PS2845-4A

WORLD'S SMALLEST CLASS, FOUR CHANNELS 12-PIN ULTRA SMALL SOP PHOTOCOUPLER –NEPOC Series–

DESCRIPTION

The PS2845-4A is optically coupled isolator containing GaAs light emitting diodes and NPN sillicon phototransistors.

This product includes four channels in a single package for high-density mounting applications.

The PS2845-4A is the world's smallest class of photocouplers and realize about 50% reduction in mounting area compared with the PS280x and PS281x Series.

FEATURES

- Ultra small and thin package (12-pin ultra small SOP, Pin pitch 0.8 mm, 4.4 (L) × 5.6 (W) × 2.5 (H))
- Common lead anode, cathode, collector common
- High current transfer ratio (CTR = 200% TYP. @ I_F = ±1mA)
- ★ • High isolation voltage (BV = 1 500 Vr.m.s.)
- Ordering number of tape product: PS2845-4A-F3, F4: 2 500 pcs/reel

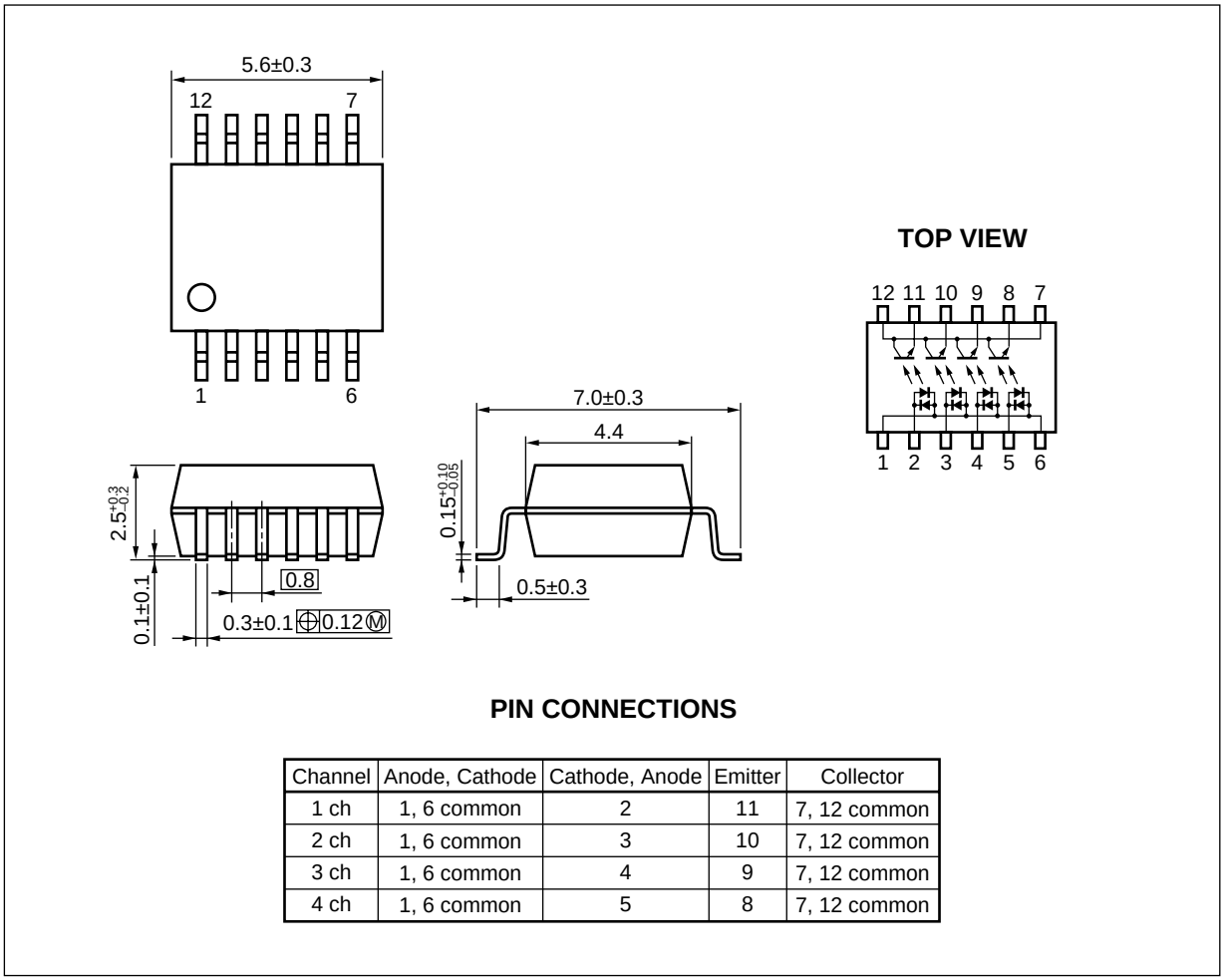
★ APPLICATIONS

- Programmable logic controllers (PLCs)
- Input and output for function automation
- Hybrid IC

Document No. PN10203EJ01V0DS (1st edition)
(Previous No. P15527EJ1V0DS00)
Date Published December 2002 CP(K)
Printed in Japan

The mark ★ shows major revised points.

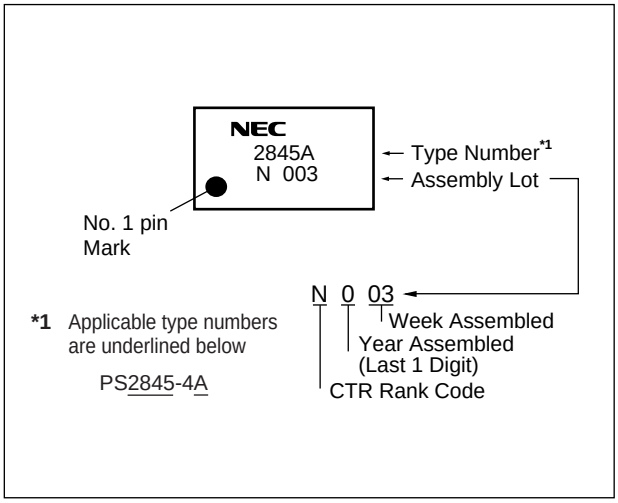
★ **PACKAGE DIMENSIONS (UNIT: mm)**



PIN CONNECTIONS

Channel	Anode, Cathode	Cathode, Anode	Emitter	Collector
1 ch	1, 6 common	2	11	7, 12 common
2 ch	1, 6 common	3	10	7, 12 common
3 ch	1, 6 common	4	9	7, 12 common
4 ch	1, 6 common	5	8	7, 12 common

MARKING EXAMPLE



★ ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number*1
PS2845-4A-F3	12-pin SSOP	Embossed Tape 2 500 pcs/reel	PS2845-4A
PS2845-4A-F4			

***1** For the application of the Safety Standard, following part number should be used.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified)

	Parameter		Symbol	Ratings	Unit
★	Diode	Forward Current (DC)	I_F	±20	mA/ch
★		Power Dissipation Derating	ΔP_D/°C	0.2	mW/°C
★		Power Dissipation	P_D	20	mW/ch
		Peak Forward Current*1	I_{FP}	±0.5	A
	Transistor	Collector to Emitter Voltage	V_{CEO}	70	V
		Emitter to Collector Voltage	V_{ECO}	5	V
		Collector Current	I_C	20	mA/ch
		Power Dissipation Derating	ΔP_C/°C	0.4	mW/°C
		Power Dissipation	P_C	40	mW/ch
★	Isolation Voltage*2		BV	1 500	Vr.m.s.
★	Operating Ambient Temperature		T_A	–40 to +100	°C
	Storage Temperature		T_{stg}	–55 to +125	°C

***1** PW = 100 μs, Duty Cycle = 1%

***2** AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

	Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
	Diode	Forward Voltage	V_F	I_F = ±1 mA	0.9	1.1	1.2	V
★		Terminal Capacitance	C_t	V = 0 V, f = 1 MHz		30		pF
	Transistor	Collector to Emitter Current	I_{CEO}	I_F = 0 mA, V_{CE} = 70 V			100	nA
★	Coupled	Current Transfer Ratio (I_C/I_F)	CTR	I_F = ±1 mA, V_{CE} = 0.4 V	100	200	400	%
★		Optical Leakage Current[*1] (1 to 2-ch, 2 to 3-ch, 3 to 4-ch)	I_L	I_F = 5 mA, V_{CE} = 24 V			100	nA
		Collector Saturation Voltage	$V_{CE\ (sat)}$	I_F = ±1 mA, I_C = 0.2 mA		0.13	0.3	V
		Isolation Resistance	R_{I-O}	V_{I-O} = 1 kV_{DC}	10^{11}			Ω
		Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz		0.4		pF
		Turn-on Time[*2]	t_{on}	V_{CC} = 5 V, I_F = ±1 mA, R_L = 5 kΩ		20		μs
		Turn-off Time[*2]	t_{off}			110		

★ ***1** The optically induced leakage current is current which can be measured at transistor if LED = ”ON” and LED = ”OFF”.

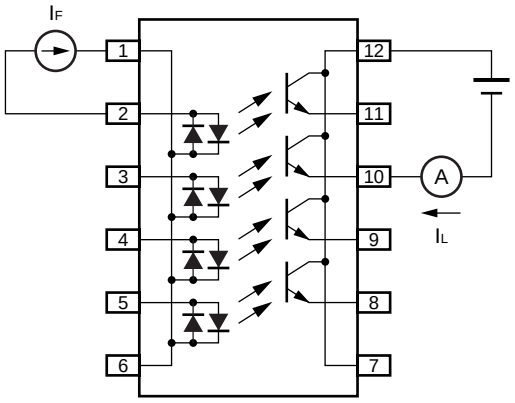
LED of channel 1 is switched to ”ON”.

At Tr-output of channel 2 a voltage is applied and one can measure a current between emitter and collector.

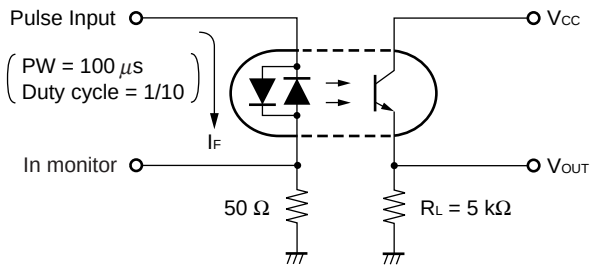
This is leakage current (at I_F = 5 mA, V_{CEO} = 24 V).

Measurement circuits for optical leakage current

E.g. : In the case of 1 to 2-ch

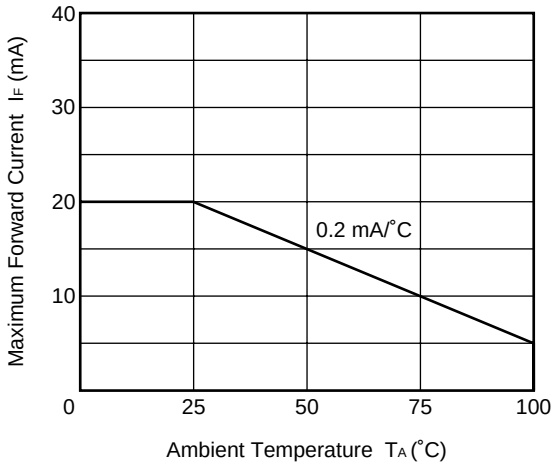


★ ***2** Test circuit for switching time

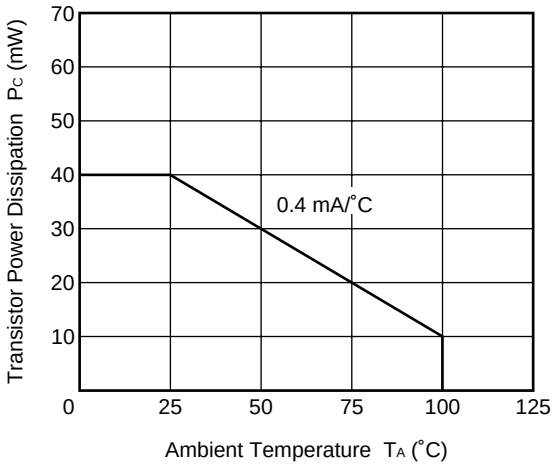


★ **TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)**

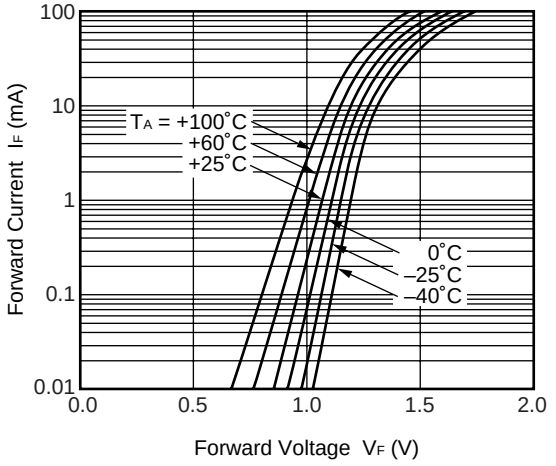
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



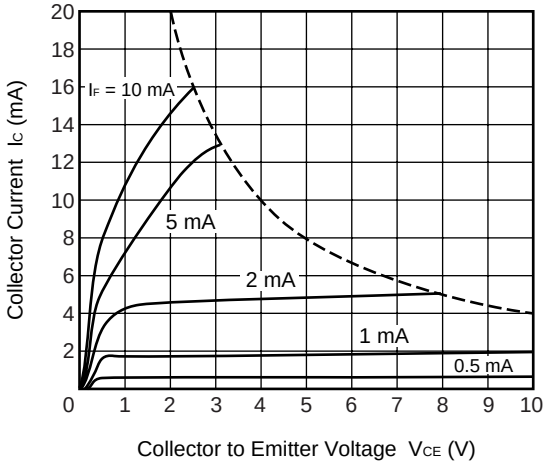
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



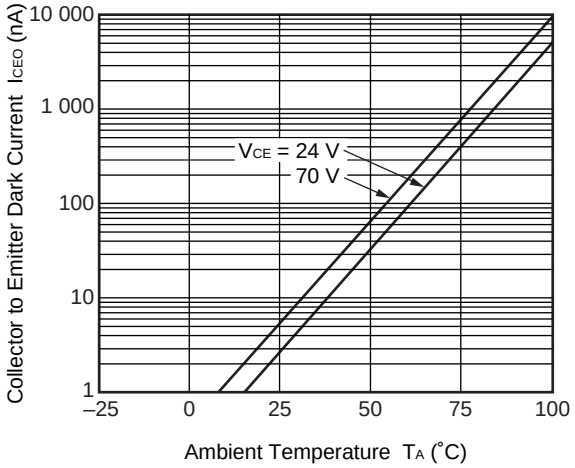
FORWARD CURRENT vs. FORWARD VOLTAGE



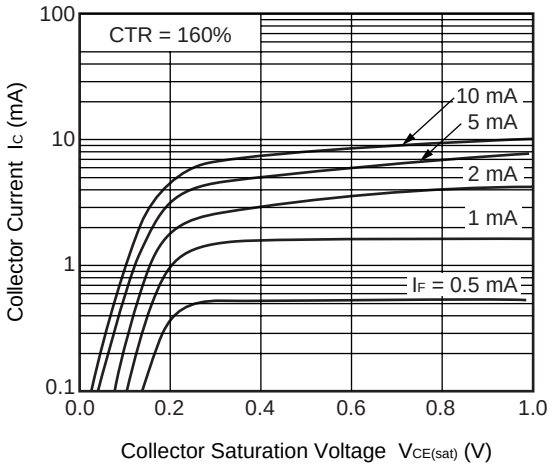
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



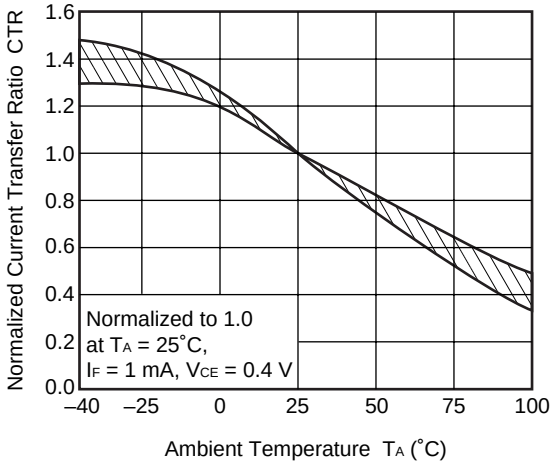
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



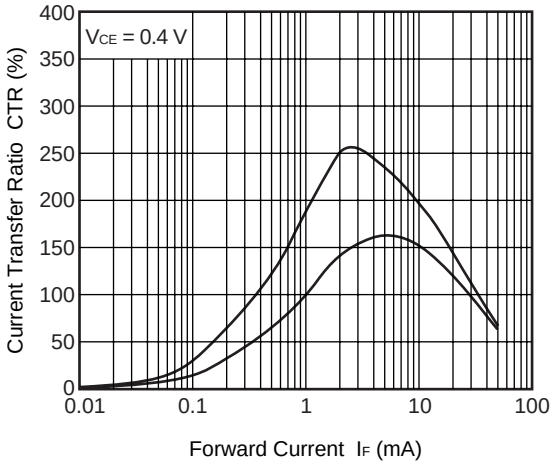
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



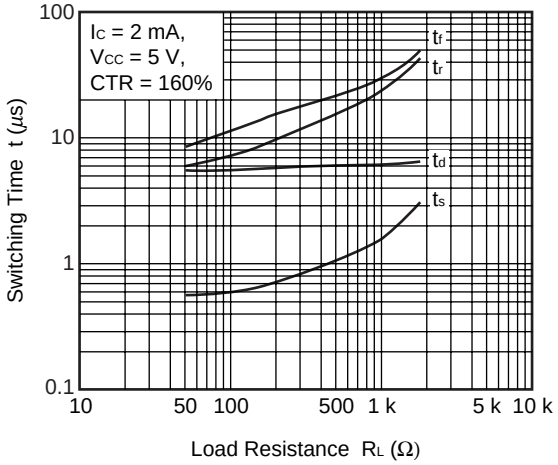
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



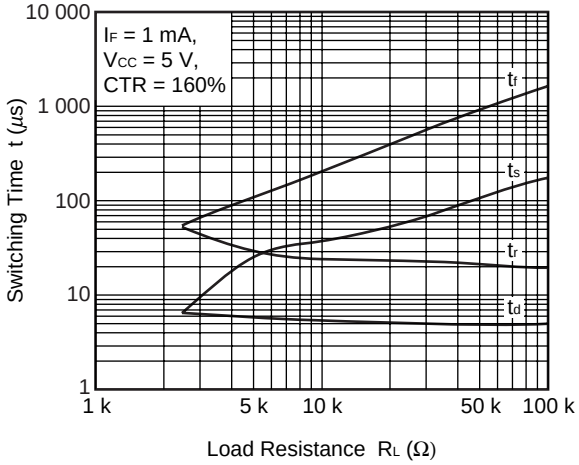
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



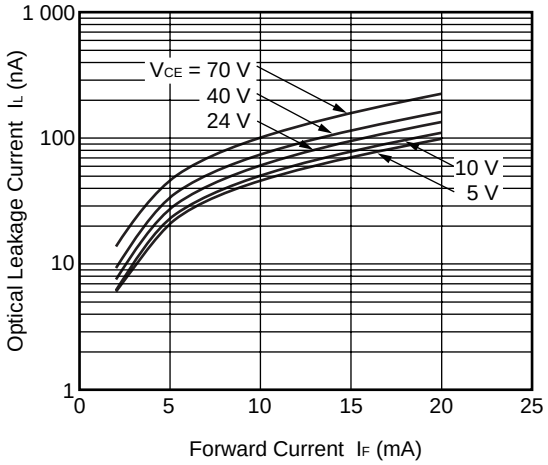
SWITCHING TIME vs. LOAD RESISTANCE



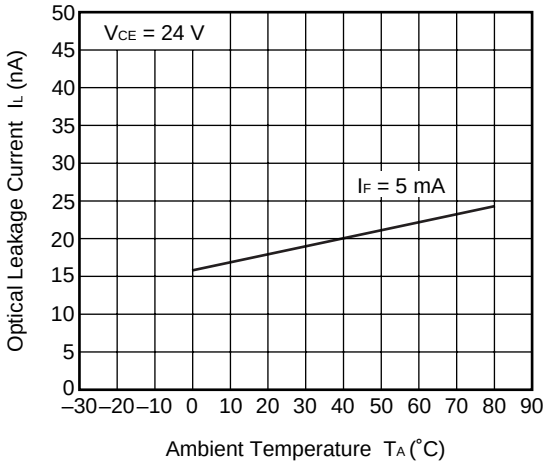
SWITCHING TIME vs. LOAD RESISTANCE



OPTICAL LEAKAGE CURRENT vs. FORWARD CURRENT



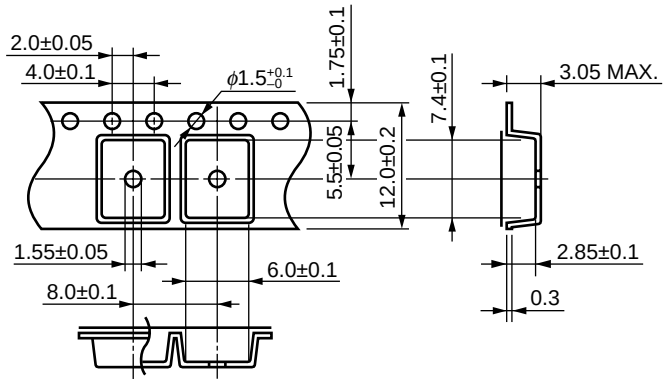
OPTICAL LEAKAGE CURRENT vs. AMBIENT TEMPERATURE



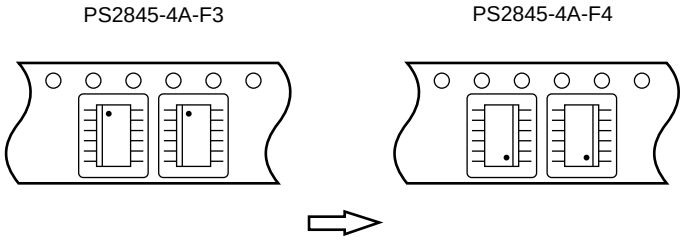
Remark The graphs indicate nominal characteristics.

★ **TAPING SPECIFICATIONS (UNIT: mm)**

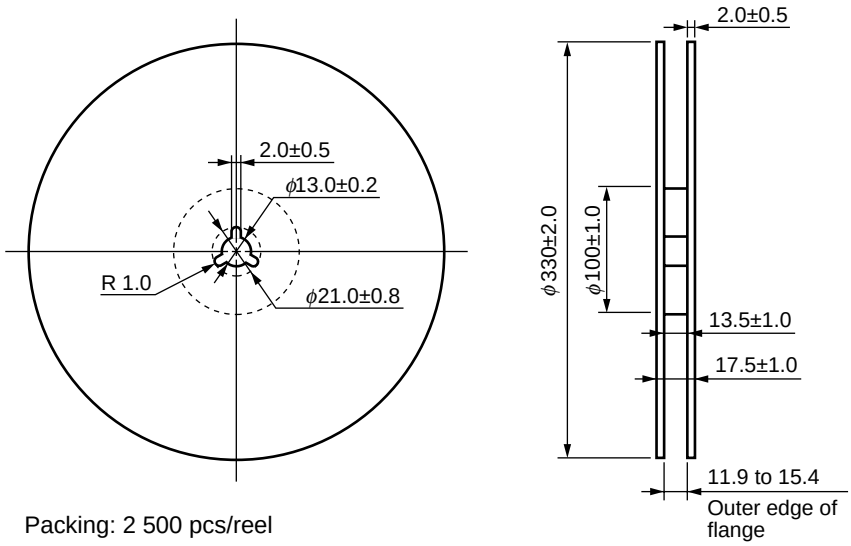
Outline and Dimensions (Tape)



Tape Direction

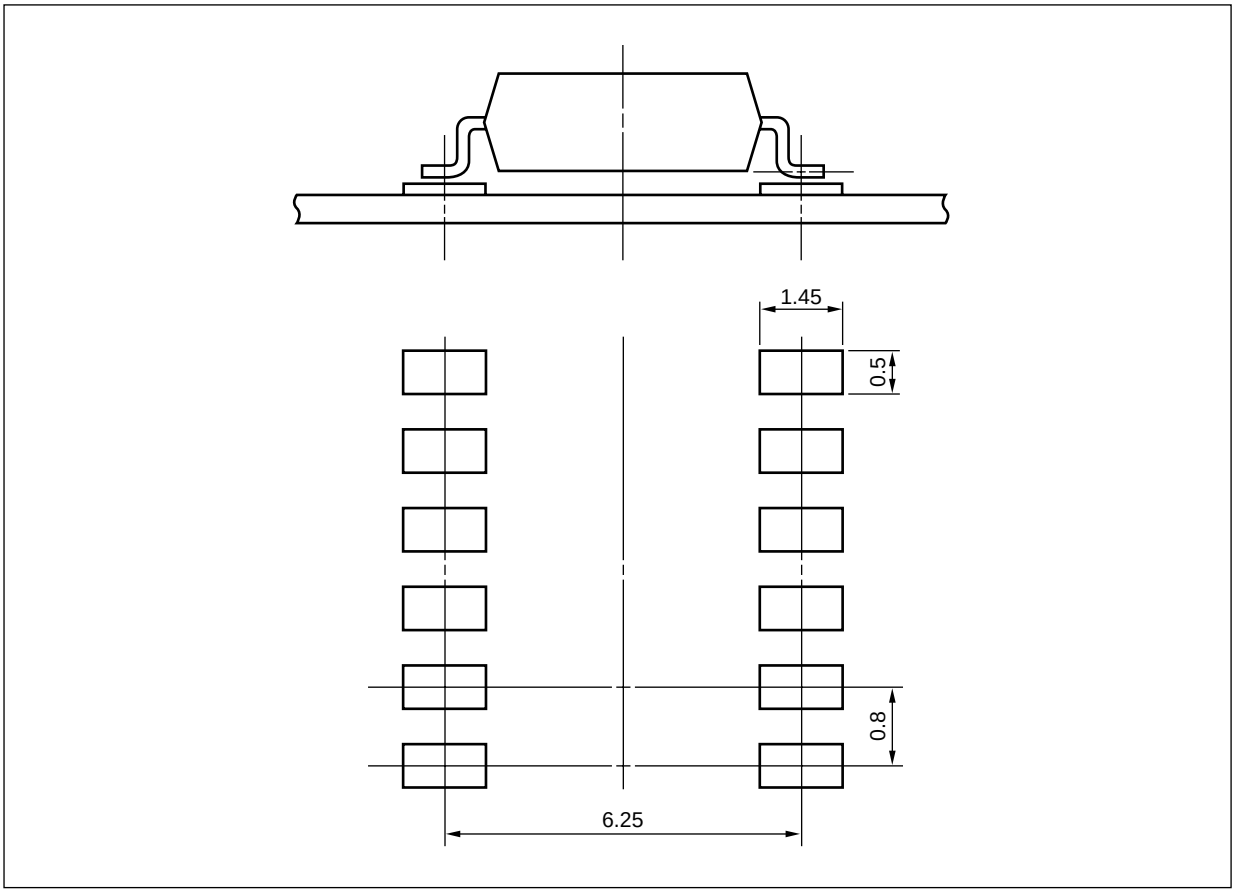


Outline and Dimensions (Reel)



Packing: 2 500 pcs/reel

★ **RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)**



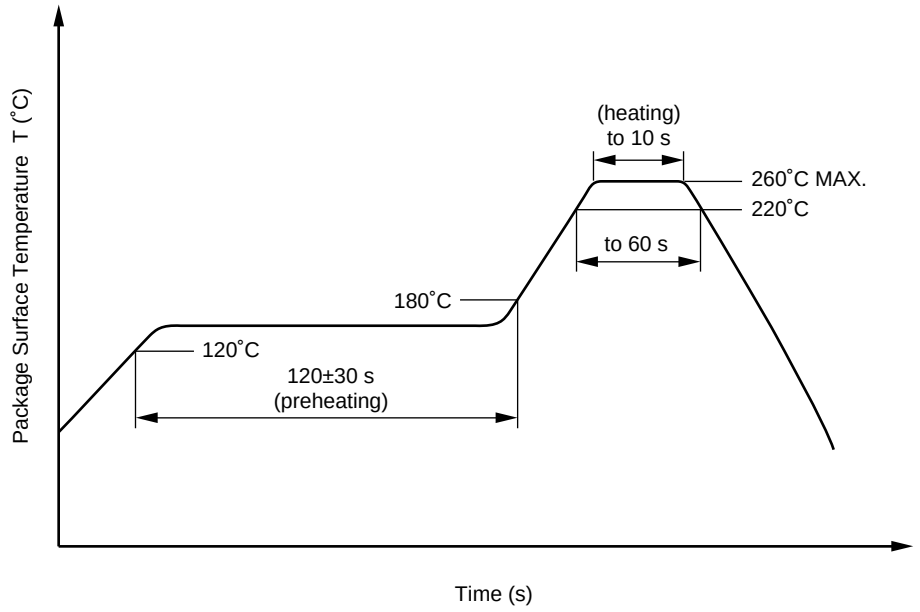
★ NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

• Peak reflow temperature	260°C or below (package surface temperature)
• Time of peak reflow temperature	10 seconds or less
• Time of temperature higher than 220°C	60 seconds or less
• Time to preheat temperature from 120 to 180°C	120±30 s
• Number of reflows	Three
• Flux	Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow



(2) Wave soldering

• Temperature	260°C or below (molten solder temperature)
• Time	10 seconds or less
• Preheating conditions	120°C or below (package surface temperature)
• Number of times	One (Allowed to be dipped in solder including plastic mold portion.)
• Flux	Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(3) Cautions

• Fluxes

Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

2. Cautions regarding noise

Be aware that when voltage is applied suddenly between the photocoupler's input and output or between corrector-emitters at startup, the output side may enter the on state, even if the voltage is within the absolute maximum ratings.

★ USAGE CAUTIONS

1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.

- **The information in this document is current as of December, 2002. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.

  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

  The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

  (Note)

  (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.

  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

SAFETY INFORMATION ON THIS PRODUCT

Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

▶Business issue

NEC Compound Semiconductor Devices, Ltd.
5th Sales Group, Sales Division TEL: +81-3-3798-6372 FAX: +81-3-3798-6783 E-mail: salesinfo@csd-nec.com

NEC Compound Semiconductor Devices Hong Kong Limited
Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309
Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859
Korea Branch Office TEL: +82-2-528-0301 FAX: +82-2-528-0302

NEC Electronics (Europe) GmbH http://www.ee.nec.de/
TEL: +49-211-6503-01 FAX: +49-211-6503-487

California Eastern Laboratories, Inc. http://www.cel.com/
TEL: +1-408-988-3500 FAX: +1-408-988-0279

▶Technical issue

NEC Compound Semiconductor Devices, Ltd. http://www.csd-nec.com/
Sales Engineering Group, Sales Division
E-mail: techinfo@csd-nec.com FAX: +81-44-435-1918