NEC

PHOTOCOUPLER
PS9851-1,-2

HIGH NOISE REDUCTION, 15 Mbps CMOS OUTPUT TYPE 8-PIN SSOP PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS9851-1, -2 are optically coupled isolators containing GaAlAs LED on the input side and a CMOS output IC on the output side.

They are high common mode transient immunity (CMR), high-speed CMOS output type photocouplers designed for high-speed logic interface circuits.

FEATURES

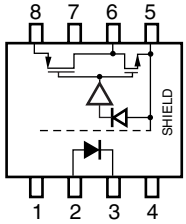
- High-speed response (15 Mbps)
- Operable at high temperature (–40 to +100°C)
- High common mode transient immunity (CM_H, CM_L = ±15 kV/μs TYP.)
- High isolation voltage (BV = 2 500 Vr.m.s.)
- Pulse width distortion ($|t_{PHL}-t_{PLH}|$ = 5 ns TYP.)
- Ordering number of tape product : PS9851-1-F3, F4: 1 500 pcs/reel
  : PS9851-2-F3, F4: 1 500 pcs/reel
- Safety standards
  - UL awaiting approved
  - DIN EN60747-5-2 (VDE0884 Part2) awaiting approved

APPLICATIONS

- FA Network
- Measurement equipment
- PDP

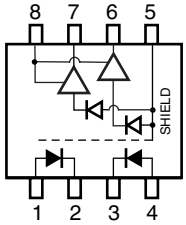
PIN CONNECTION
(Top View)

PS9851-1



1. NC
2. Anode
3. Cathode
4. NC
5. GND
6. V_O
7. NC
8. V_{DD}

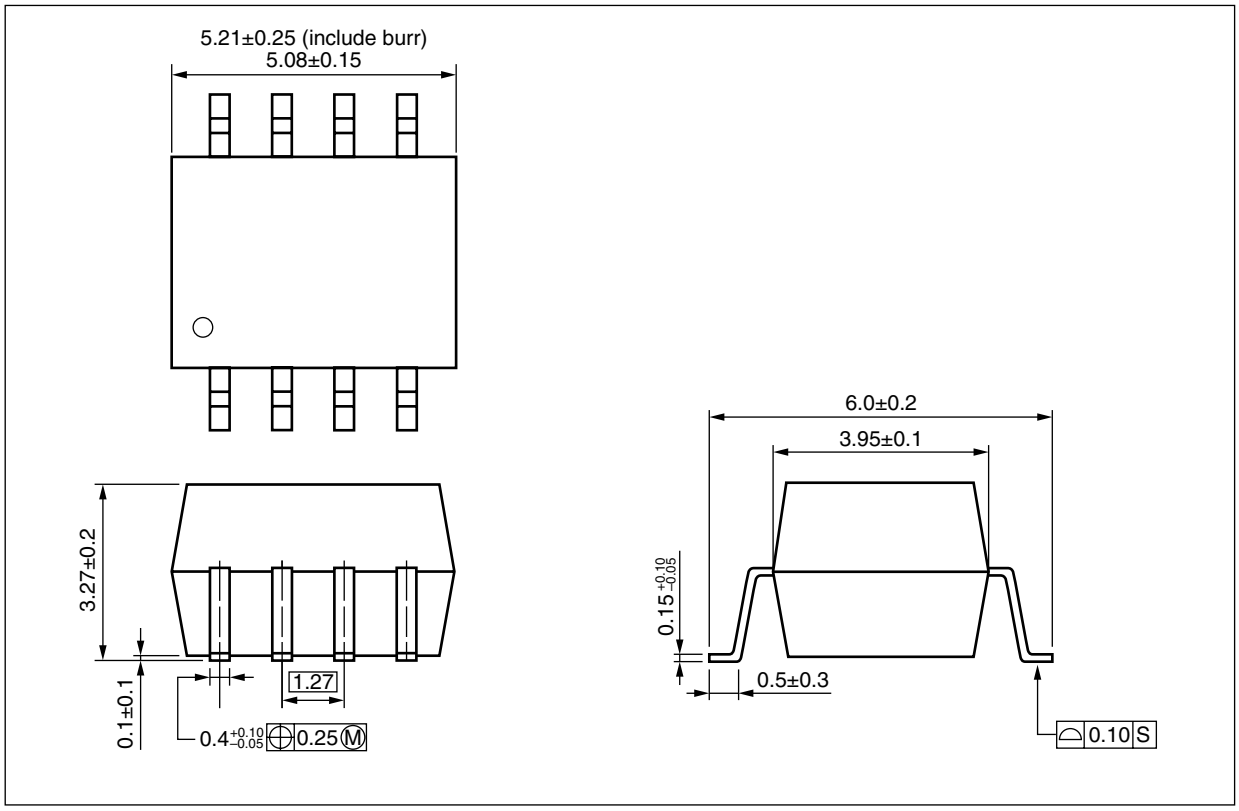
PS9851-2



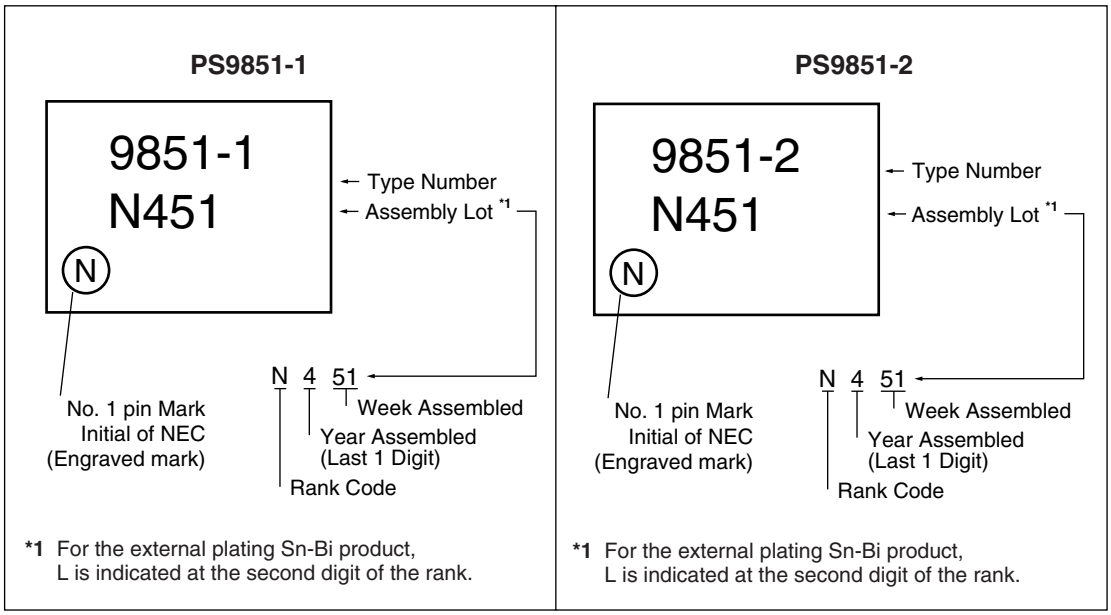
1. Anode1
2. Cathode1
3. Cathode2
4. Anode2
5. GND
6. V_O2
7. V_O1
8. V_{DD}

Document No. PN10493EJ01V0DS (1st edition)
Date Published May 2004 CP(K)
Printed in Japan

PACKAGE DIMENSIONS (UNIT: mm)



MARKING EXAMPLE



ORDERING INFORMATION

Part Number	Package	Packing Style	Safety Standards Approval	Solder plating specification	Application Part Number*1
PS9851-1	8-pin SSOP (SO-8)	20 pcs (Tape 20 pcs cut)	Standard products (UL awaiting approved)	Sn-Pb	PS9851-1
PS9851-1-F3		Embossed Tape 1 500 pcs/reel			
PS9851-1-F4					
PS9851-2		20 pcs (Tape 20 pcs cut)			PS9851-2
PS9851-2-F3		Embossed Tape 1 500 pcs/reel			
PS9851-2-F4					
PS9851-1-V		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) awaiting approved (Option)		PS9851-1
PS9851-1-V-F3		Embossed Tape 1 500 pcs/reel			
PS9851-1-V-F4					
PS9851-2-V		20 pcs (Tape 20 pcs cut)			PS9851-2
PS9851-2-V-F3		Embossed Tape 1 500 pcs/reel			
PS9851-2-V-F4					
PS9851-1-A		20 pcs (Tape 20 pcs cut)	Standard products (UL awaiting approved)	Sn-Bi	PS9851-1
PS9851-1-F3-A		Embossed Tape 1 500 pcs/reel			
PS9851-1-F4-A					
PS9851-2-A		20 pcs (Tape 20 pcs cut)			PS9851-2
PS9851-2-F3-A		Embossed Tape 1 500 pcs/reel			
PS9851-2-F4-A					
PS9851-1-V-A		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) awaiting approved (Option)		PS9851-1
PS9851-1-V-F3-A		Embossed Tape 1 500 pcs/reel			
PS9851-1-V-F4-A					
PS9851-2-V-A		20 pcs (Tape 20 pcs cut)			PS9851-2
PS9851-2-V-F3-A		Embossed Tape 1 500 pcs/reel			
PS9851-2-V-F4-A					

***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	I_F	20	mA
	Reverse Voltage	V_R	5	V
Detector	Supply Voltage	V_{DD}	0 to 5.5	V
	Output Voltage	V_O	–0.5 to V_{DD}+0.5	V
	Output Current	I_O	2	mA
Isolation Voltage *1		BV	2 500	Vr.m.s.
Operating Ambient Temperature		T_A	–40 to +100	°C
Storage Temperature		T_{stg}	–55 to +125	°C

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

RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

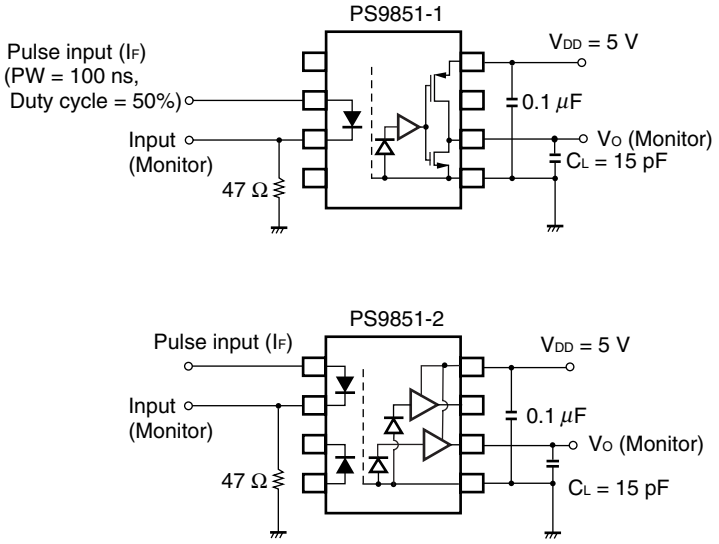
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Forward Current	I_F	10		16	mA
Supply Voltage	V_{DD}	4.5	5.0	5.5	V

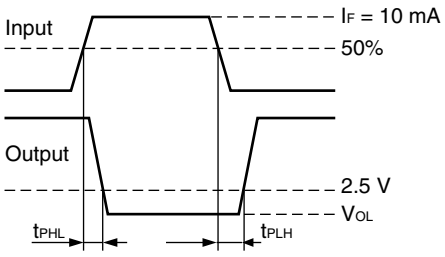
ELECTRICAL CHARACTERISTICS (T_A = –40 to +100°C, V_{DD} = 4.5 to 5.5 V, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP. *1	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 10 mA, T_A = 25°C		1.6	1.9	V
	Reverse Current	I_R	V_R = 3 V, T_A = 25°C			10	μA
	Terminal Capacitance	C_t	V = 0 V, f = 1 MHz, T_A = 25°C		30		pF
Detector	High Level Supply Current	I_{DDH}	I_F = 0 mA (1ch)		3	5	mA
	Low Level Supply Current	I_{DDL}	I_F = 10 mA (1ch)		3	5	
	High Level Output Voltage	V_{OH}	I_O = –20μA, I_F = 0 mA	4.0	5.0		V
	Low Level Output Voltage	V_{OL}	I_O = 20μA, I_F = 10 mA		0.01	0.1	
Coupled	Threshold Input Current	I_{FHL}	V_O < 1 V			6	mA
	Isolation Resistance	R_{I-O}	V_{I-O} = 1 kV_{DC}, RH = 40 to 60%, T_A = 25°C	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz, T_A = 25°C		0.9		pF
	Propagation Delay Time (H → L) *2	t_{PHL}	I_F = 10 mA, V_{DD} = 5 V, CL = 15 pF, CMOS Levels		35	60	ns
	Propagation Delay Time (L → H) *2	t_{PLH}			30	60	
	Pulse Width	PW		100			
	Pulse Width Distortion (PWD)	$\lvert t_{PHL}-t_{PLH} \rvert$			5	30	
	Propagation Delay Skew	t_{PSK}				40	
	Rise Time	t_r			3		
	Fall Time	t_f			3		
	Common Mode Transient Immunity at High Level Output *3	CM_H	V_{DD} = 5 V, I_F = 0 mA, V_{CM} = 1 kV, V_O > 4 V, T_A = 25°C	10	15		kV/μs
	Common Mode Transient Immunity at Low Level Output *3	CM_L	V_{DD} = 5 V, I_F = 10 mA, V_{CM} = 1 kV, V_O < 1 V, T_A = 25°C	10	15		

***1** Typical values at T_A = 25°C

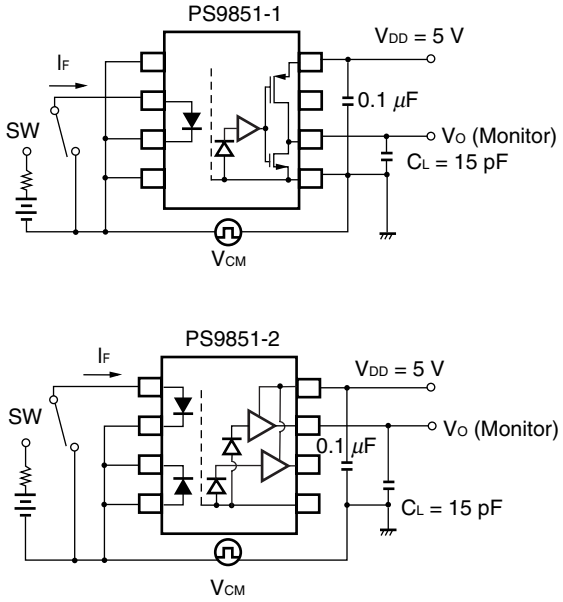
***2** Test circuit for propagation delay time

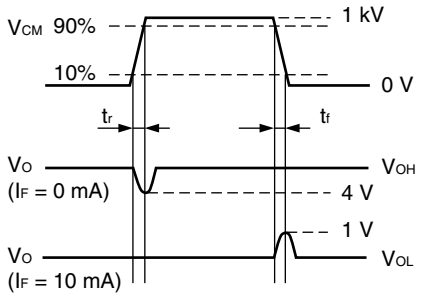




Remark C_L includes probe and stray wiring capacitance.

***3** Test circuit for common mode transient immunity





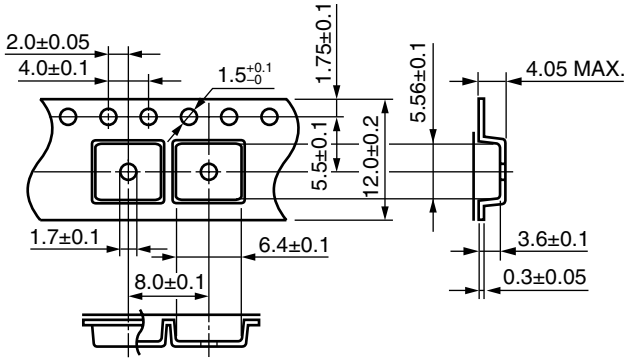
Remark C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

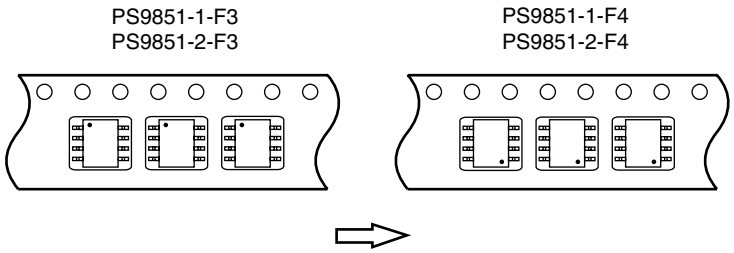
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between V_{DD} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Avoid storage at a high temperature and high humidity.

TAPING SPECIFICATIONS (UNIT: mm)

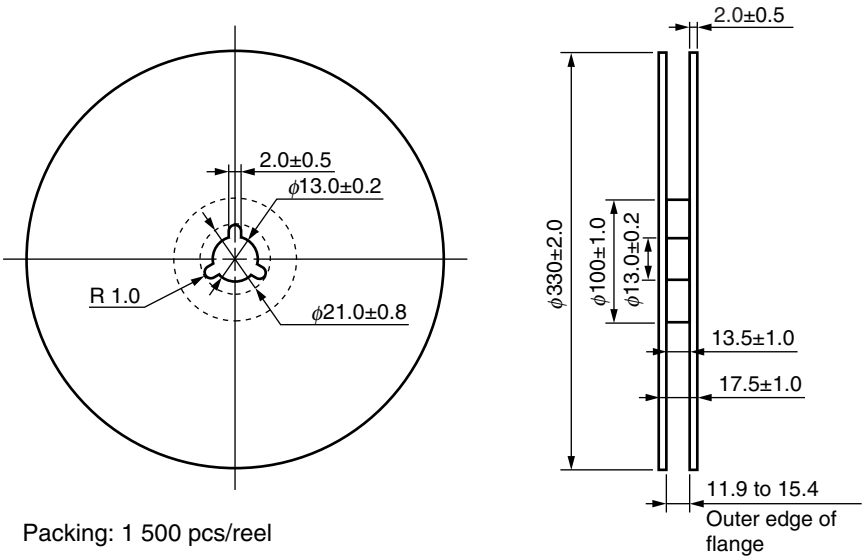
Outline and Dimensions (Tape)



Taping Direction



Outline and Dimensions (Reel)



Packing: 1 500 pcs/reel

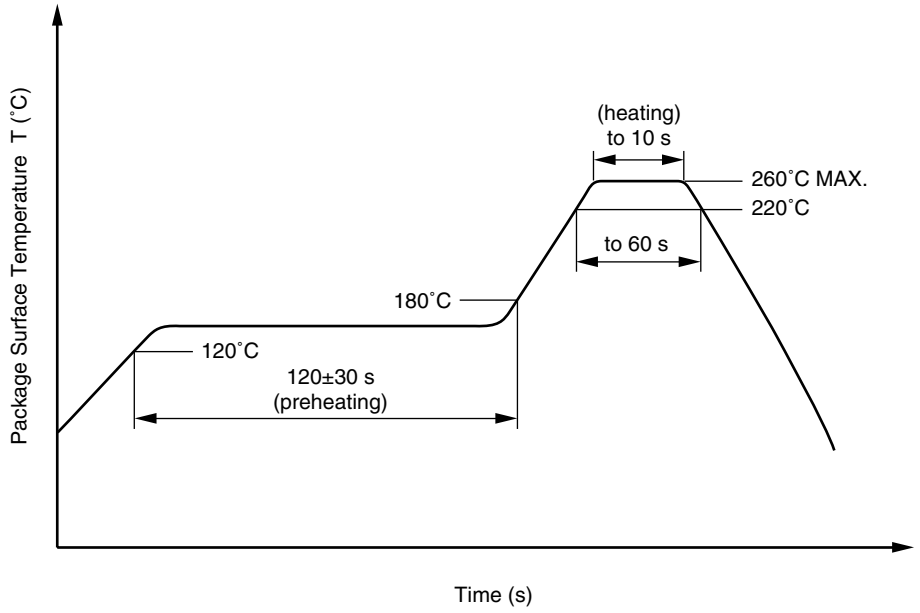
NOTES ON HANDLING

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 collector-emitters at startup, the output side may enter the on state, even if the voltage is within the absolute maximum ratings.

- **The information in this document is current as of May, 2004. 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

Caution GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.

▶**For further information, please contact**

NEC Compound Semiconductor Devices, Ltd. **http://www.ncsd.necel.com/**
E-mail: salesinfo@ml.ncsd.necel.com (sales and general)
techinfo@ml.ncsd.necel.com (technical)
5th Sales Group, Sales Division TEL: +81-44-435-1588 FAX: +81-44-435-1579

NEC Compound Semiconductor Devices Hong Kong Limited
E-mail: ncsd-hk@elhk.nec.com.hk (sales, technical and general)
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: +82-2-558-2120 FAX: +82-2-558-5209

NEC Electronics (Europe) GmbH **http://www.ee.nec.de/**
TEL: +49-211-6503-0 FAX: +49-211-6503-1327

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

0401