



PHOTOCOUPLER

PS8501,PS8501L1,PS8501L2,PS8501L3

HIGH SPEED ANALOG OUTPUT TYPE 8 mm CREEPAGE 8-PIN PHOTOCOUPLER

-NEPOC Series-

DESCRIPTION

The PS8501, PS8501L1, PS8501L2 and PS8501L3 are 8-pin high speed photocouplers containing a GaAlAs LED on input side and a PN photodiode and a high speed amplifier transistor on output side on one chip. The PS8501 is in a plastic DIP (Dual In-line Package) with 8 mm creepage distance product.

The PS8501L1 is lead bending type for long creepage distance.

The PS8501L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

The PS8501L3 is lead bending type (Gull-wing) for surface mounting.

FEATURES

- Long creepage distance (8 mm MIN.: PS8501L1, PS8501L2)
- High supply voltage (Vcc = 35 V MAX.)
- High speed response (tphL, tpLH = 0.8 μ s MAX.)
- High isolation voltage (BV = 5 000 Vr.m.s.)
- TTL, CMOS compatible with a resistor
- Ordering number of tape product: PS8501L2-E3: 1 000 pcs/reel

: PS8501L3-E3: 1 000 pcs/reel

- Pb-Free product
- Safety standards

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UL approved: No. E72422

CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
BSI approved: No. 8937, 8938

• SEMKO approved: No. 615433

NEMKO approved: No. P06207243

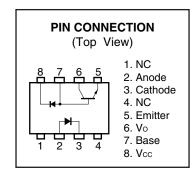
• DEMKO approved: No. 314091

• FIMKO approved: No. FI 22827

• DIN EN60747-5-2 (VDE0884 Part2) approved: No. 40019182 (Option)

APPLICATIONS

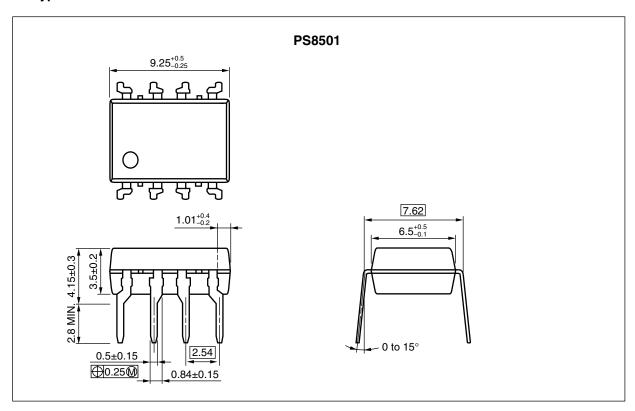
- · Interface for measurement or control equipment
- · Substitutions for relays and pulse transformers
- · Modem, communications device
- General purpose inverter



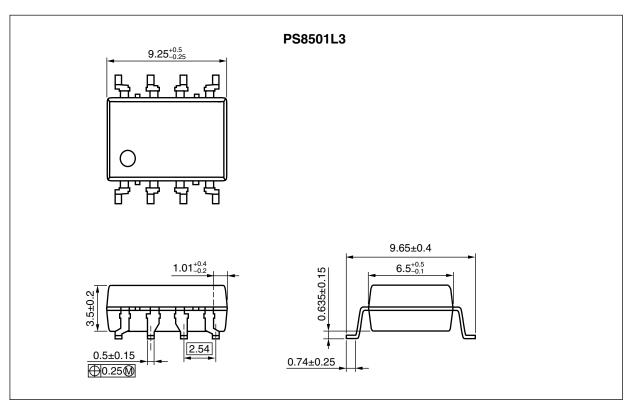
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<R> PACKAGE DIMENSIONS (UNIT: mm)

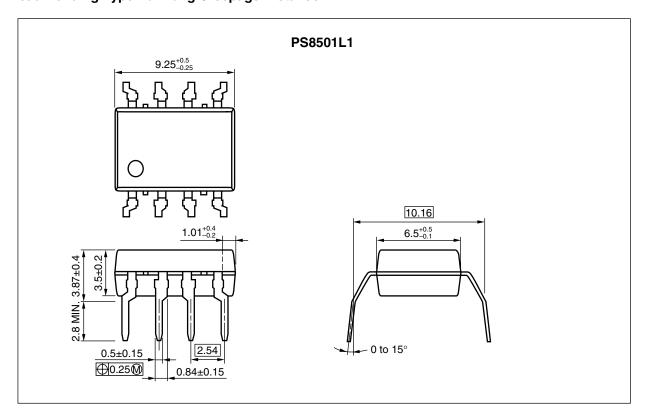
DIP Type



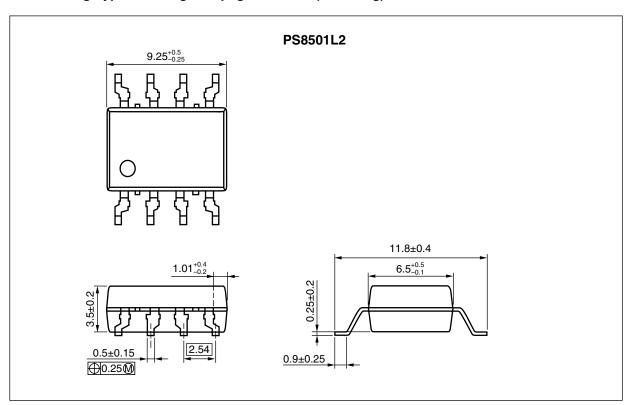
Lead Bending Type (Gull-wing) For Surface Mount



Lead Bending Type For Long Creepage Distance



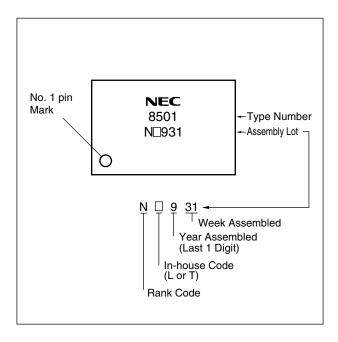
Lead Bending Type For Long Creepage Distance (Gull-wing) For Surface Mount



PHOTOCOUPLER CONSTRUCTION

Parameter	PS8501, PS8501L3	PS8501L1, PS8501L2
Air Distance (MIN.)	7 mm	8 mm
Outer Creepage Distance (MIN.)	7 mm	8 mm
Isolation Distance (MIN.)	0.4 mm	0.4 mm

<R> MARKING EXAMPLE



ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number* ¹	
PS8501	PS8501-AX	Pb-Free	Magazine case 50 pcs	Standard products	PS8501	
PS8501L1	PS8501L1-AX	(Ni/Pd/Au)		(UL, CSA, BSI,	PS8501L1	
PS8501L2	PS8501L2-AX			SEMKO, NEMKO,	PS8501L2	
PS8501L3	PS8501L3-AX			DEMKO, FIMKO	PS8501L3	
PS8501L2-E3	PS8501L2-E3-AX		Embossed Tape 1 000 pcs/reel	approved)	PS8501L2	
PS8501L3-E3	PS8501L3-E3-AX				PS8501L3	
PS8501-V	PS8501-V-AX		Magazine case 50 pcs	DIN EN60747-5-2	PS8501	
PS8501L1-V	PS8501L1-V-AX			(VDE0884 Part2)	PS8501L1	
PS8501L2-V	PS8501L2-V-AX			Approved (Option)	PS8501L2	
PS8501L3-V	PS8501L3-V-AX				PS8501L3	
PS8501L2-V-E3	PS8501L2-V-E3-AX		Embossed Tape 1 000 pcs/reel		PS8501L2	
PS8501L3-V-E3	PS8501L3-V-E3-AX				PS8501L3	

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

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

	Parameter	Symbol	Ratings	Unit
Diode	Forward Current 1	lF	25	mA
	Reverse Voltage	VR	5	V
Detector	Supply Voltage	Vcc	35	V
	Output Voltage	Vo	35	V
	Output Current	lo	8	mA
	Power Dissipation *2	Pc	100	mW
Isolation	Voltage ^{⁺3}	BV	5 000	Vr.m.s.
Operating Ambient Temperature		TA	−55 to +100	°C
Storage Temperature		T _{stg}	-55 to +125	°C

^{*1} Reduced to 0.33 mA/ $^{\circ}$ C at T_A = 70 $^{\circ}$ C or more.

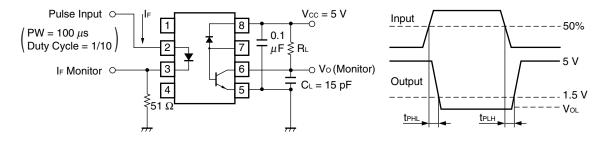
^{*2} Reduced to 2.0 mW/ $^{\circ}$ C at T_A = 75 $^{\circ}$ C or more.

^{*3} AC voltage for 1 minute at $T_A = 25^{\circ}C$, RH = 60% between input and output. Pins 1-4 shorted together, 5-8 shorted together.

ELECTRICAL CHARACTERISTICS (TA = 25°C)

	Parameter	Symbol	Conditions	MIN.	TYP. [™]	MAX.	Unit
Diode	Forward Voltage	VF	IF = 16 mA		1.7	2.2	V
	Reverse Current	lr	VR = 3 V			10	μA
	Forward Voltage Temperature Coefficent	⊿V F /⊿ TA	I _F = 16 mA		-2.1		mV/°C
	Terminal Capacitance	Ct	V = 0 V, f = 1 MHz		30		pF
Detector	High Level Output Current	Іон (1)	IF = 0 mA, Vcc = Vo = 5.5 V		3	500	nA
	High Level Output Current	Іон (2)	IF = 0 mA, Vcc = Vo = 35 V		1.7 -2.1 30 3 0.15 150 0.01 65	100	μΑ
	Low Level Output Voltage	Vol	IF = 16 mA, Vcc = 4.5 V, Io = 2.4 mA		0.15	0.4	V
	Low Level Supply Current	Iccl	IF = 16 mA, Vo = Open, Vcc = 35 V		150		μΑ
	High Level Supply Current	Іссн	IF = 0 mA, Vo = Open, Vcc = 35 V		0.01	1	μΑ
	DC Current Gain	hfe	Vo = 5 V, Io = 3 mA		65		
Coupled	Current Transfer Ratio	CTR	IF = 16 mA, Vcc = 4.5 V, Vo = 0.4 V	15	1.7 2 -2.1 30 3 5 0.15 150 0.01 65 15 10'' 0.7 0.22		%
	Isolation Resistance	Ri-o	V _{I-O} = 1 kV _{DC}	10 ¹¹			Ω
	Isolation Capacitance	Cı-o	V = 0 V, f = 1 MHz		0.7		pF
	Propagation Delay Time $(H \rightarrow L)^2$	t PHL	I _F = 16 mA, V _{CC} = 5 V, R _L = 1.9 k Ω		0.22	0.8	μs
	Propagation Delay Time (L → H) ²	tрын	IF = 16 mA, V_{CC} = 5 V, R_L = 1.9 $k\Omega$		0.35	0.8	μs

- *1 Typical values at T_A = 25°C
- *2 Test circuit for propagation delay time



Remark CL includes probe and stray wiring capacitance.

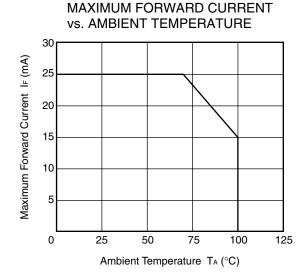
USAGE CAUTIONS

- 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 μ F is used between Vcc and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
- 3. Pins 1, 4 (which is an NC pin) can either be connected directly to the GND pin on the LED side or left open. Unconnected pins should not be used as a bypass for signals or for any other similar purpose because this may degrade the internal noise environment of the device.
 - *1 NC: Non-Connection (No Connection)
- 4. Avoid storage at a high temperature and high humidity.

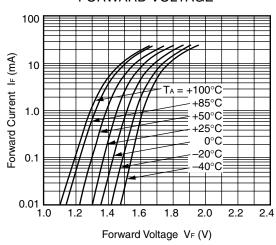
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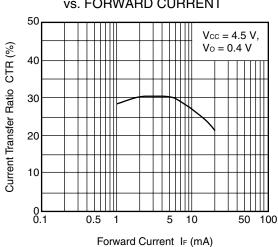
<R> TYPICAL CHARACTERISTICS (TA = 25°C, unless otherwise specified)



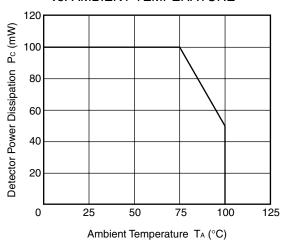
FORWARD CURRENT vs. FORWARD VOLTAGE



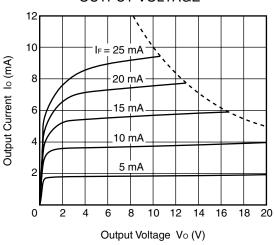
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



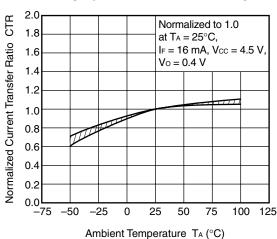
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



OUTPUT CURRENT vs. OUTPUT VOLTAGE

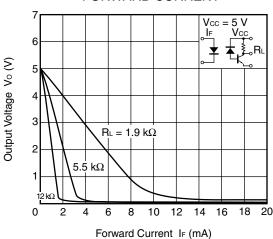


NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE

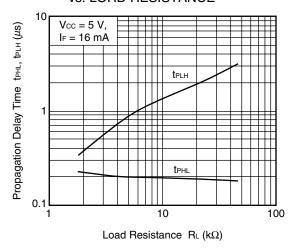


Remark The graphs indicate nominal characteristics.

OUTPUT VOLTAGE vs. FORWARD CURRENT

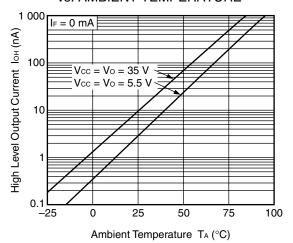


PROPAGATION DELAY TIME, vs. LORD RESISTANCE

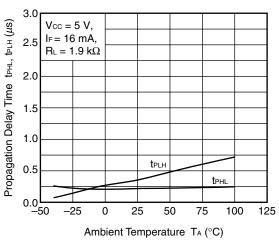


Remark The graphs indicate nominal characteristics.

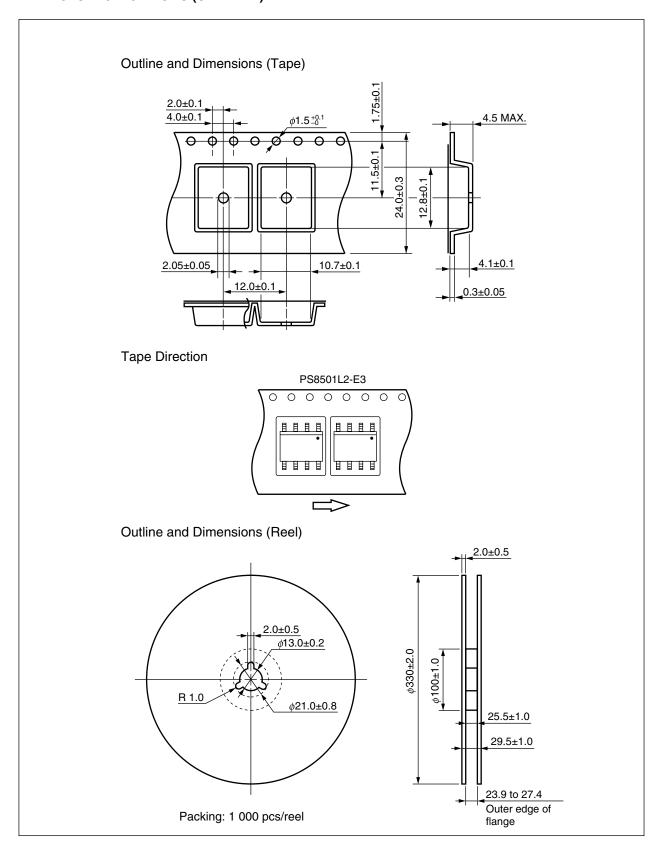
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE

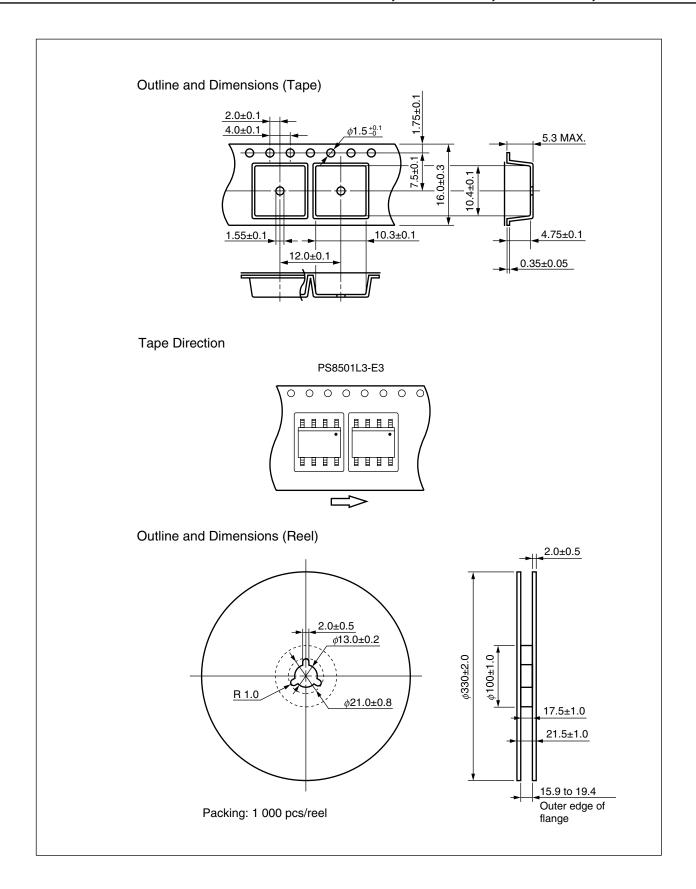


PROPAGATION DELAY TIME, vs. AMBIENT TEMPERATURE

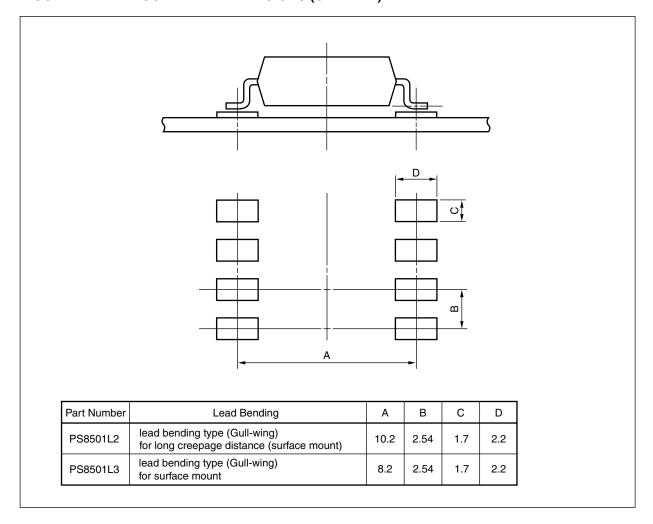


TAPING SPECIFICATIONS (UNIT: mm)





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)

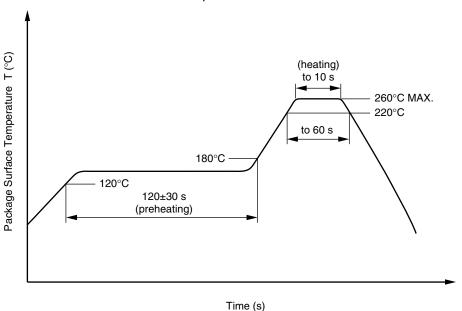
Time of peak reflow temperature
 Time of temperature higher than 220°C
 60 seconds or less

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) Soldering by soldering iron

Peak temperature (lead part temperature)
 Time (each pins)
 350°C or below
 3 seconds or less

Flux
 Rosin flux containing small amount of chlorine (The flux with a

maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead.

(b) Please be sure that the temperature of the package would not be heated over 100°C.

(4) 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 Vccemitters at startup, the output side may enter the on state, even if the voltage is within the absolute maximum ratings.

<R> SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Speck	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}, P_d < 5 pC$	Uюям Upr	1 130 1 695	V _{peak} V _{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr}=1.875\times U_{IORM},\ P_d<5\ pC$	Upr	2 119	V_{peak}
Highest permissible overvoltage	Utr	8 000	V _{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11))	СТІ	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)		III a	
Storage temperature range	T _{stg}	-55 to +125	°C
Operating temperature range	TA	-55 to +100	°C
Isolation resistance, minimum value VIO = 500 V dc at TA = 25°C VIO = 500 V dc at TA MAX. at least 100°C	Ris MIN. Ris MIN.	10 ¹² 10 ¹¹	Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current I _F , Psi = 0) Power (output or total power dissipation) Isolation resistance	Tsi Isi Psi	175 400 700	°C mA mW
V _{IO} = 500 V dc at T _A = Tsi	Ris MIN.	10°	Ω

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M8E0904E

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.
 - 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.

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On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010 Renesas Electronics Corporation

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Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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