

HIGH ISOLATION VOLTAGE, HIGH CTR
6-PIN PHOTOCOUPLER

—NEPOC™ Series—

DESCRIPTION

The PS2603, PS2604, PS2603L, PS2604L are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon darlington-connected phototransistor in a plastic DIP (Dual In-line Package).

The PS2603L, PS2604L are lead bending type (Gull-wing) for surface mount.

FEATURES

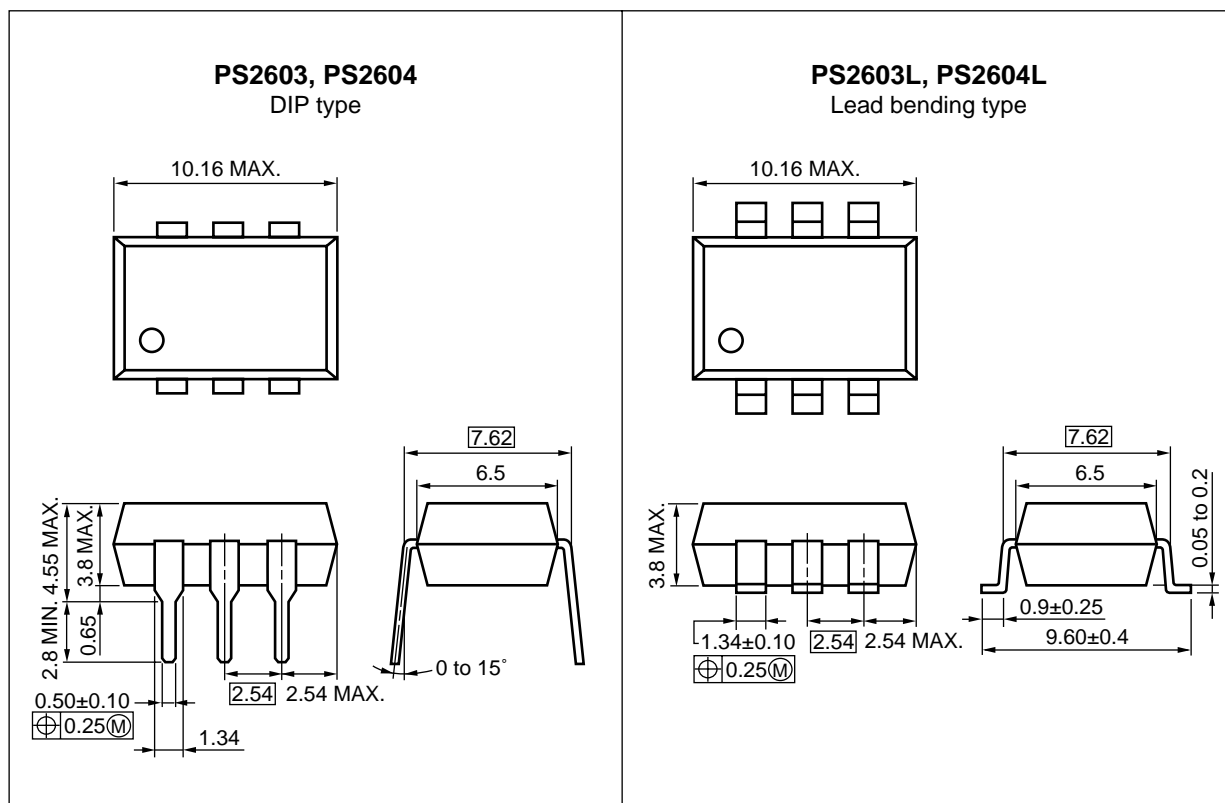
- High Isolation voltage ($BV = 5\,000\text{ V r.m.s.}$)
- High-speed switching ($t_r, t_f = 100\text{ }\mu\text{s TYP.}$)
- High current transfer ratio ($CTR = 2\,000\text{ \% TYP.}$)
- UL approved: File No. E72422 (S)
- Ordering number of taping product: PS2603L-E3, E4, PS2604L-E3, E4

★ APPLICATIONS

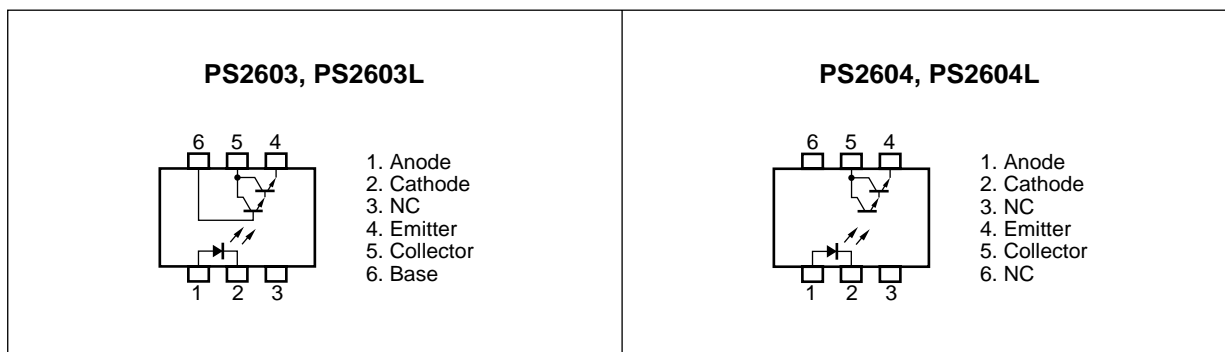
- Power supply
- Telephone
- AC/DC line interface
- Electric home appliances

The information in this document is subject to change without notice.

★ PACKAGE DIMENSIONS (in millimeters)



PIN CONNECTIONS (TOP VIEW)



ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current (DC)	I_F	80	mA
	Reverse Voltage	V_R	6.0	V
	Power Dissipation Derating	$\Delta P_D/^{\circ}\text{C}$	1.5	mW/ $^{\circ}\text{C}$
	Power Dissipation	P_D	150	mW
	Peak Forward Current ^{*1}	I_{FP}	1	A
Transistor	Collector to Emitter Voltage	V_{CEO}	40	V
	Emitter to Collector Voltage	V_{ECO}	6	V
	Collector Current	I_C	200	mA
	Power Dissipation Derating	$\Delta P_C/^{\circ}\text{C}$	2.0	mW/ $^{\circ}\text{C}$
	Power Dissipation	P_C	200	mW
Isolation Voltage ^{*2}		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T_A	-55 to +100	$^{\circ}\text{C}$
Storage Temperature		T_{stg}	-55 to +150	$^{\circ}\text{C}$

***1** PW = 100 μs , Duty Cycle = 1 %

***2** AC voltage for 1 minute at $T_A = 25\text{ }^{\circ}\text{C}$, RH = 60 % between input and output

ELECTRICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = 10\text{ mA}$		1.1	1.4	V
	Reverse Current	I_R	$V_R = 5\text{ V}$			5.0	μA
	Terminal Capacitance	C_t	$V = 0\text{ V}$, $f = 1.0\text{ MHz}$		30		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	$V_{CE} = 40\text{ V}$, $I_F = 0\text{ mA}$			400	nA
	DC Current Gain ^{*1}	h_{FE}	$I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$		180		
Coupled	Current Transfer Ratio (I_C/I_F) ^{*2}	CTR	$I_F = 1\text{ mA}$, $V_{CE} = 2\text{ V}$	200	2 000		%
	Collector Saturation Voltage	$V_{CE(sat)}$	$I_F = 1\text{ mA}$, $I_C = 2\text{ mA}$			1.0	V
	Isolation Resistance	R_{I-O}	$V_{I-O} = 1.0\text{ kV}_{DC}$	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	$V = 0\text{ V}$, $f = 1.0\text{ MHz}$		0.6		pF
	Rise Time ^{*3}	t_r	$V_{CC} = 5\text{ V}$, $I_C = 10\text{ mA}$, $R_L = 100\text{ }\Omega$		100		μs
	Fall Time ^{*3}	t_f			100		

*1 Second stage transistor (PS2603, PS2603L only)

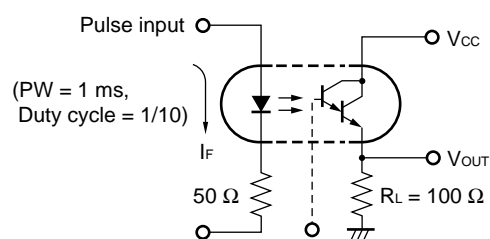
*2 CTR rank

K : 2 000 to (%)

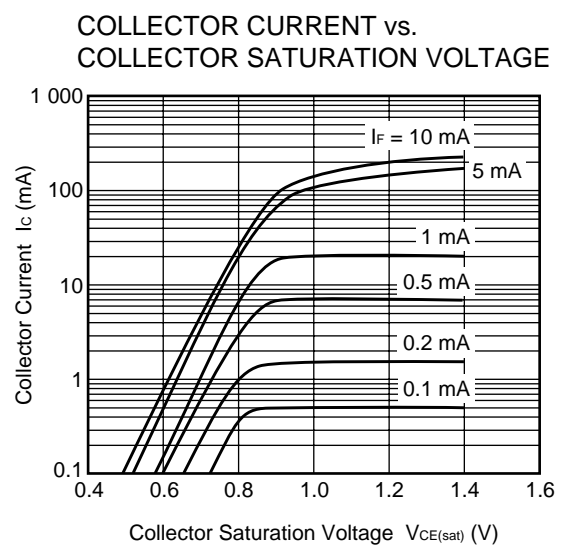
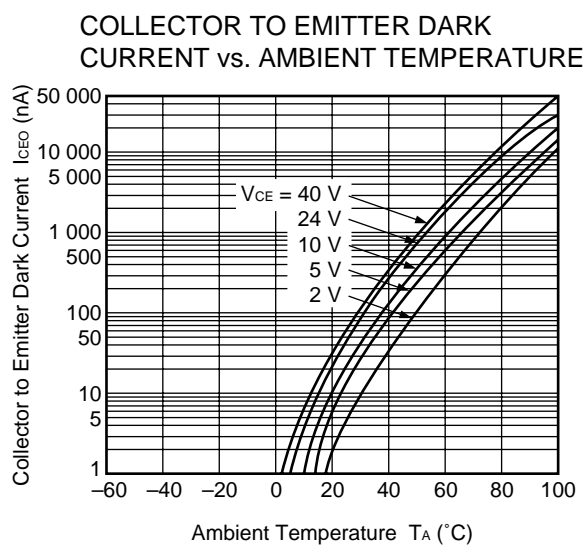
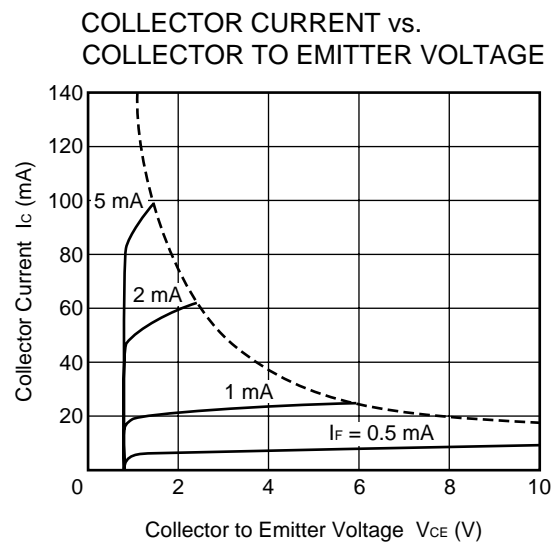
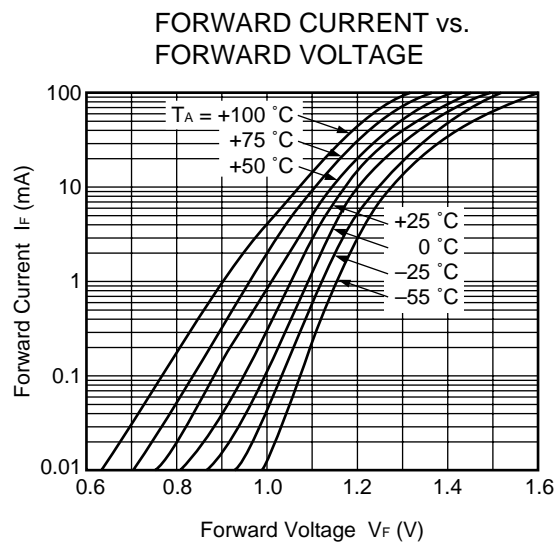
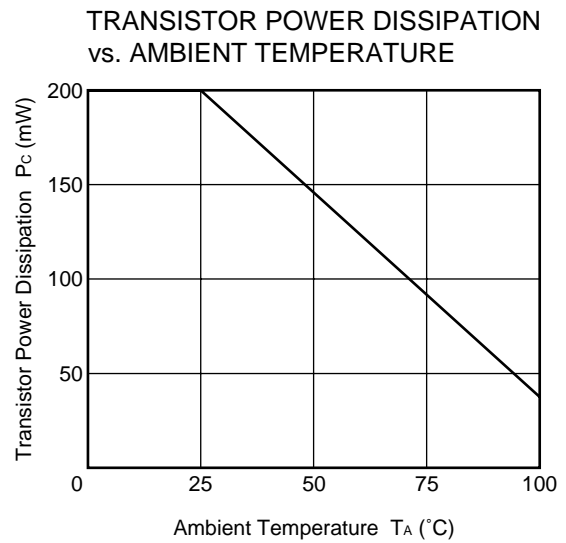
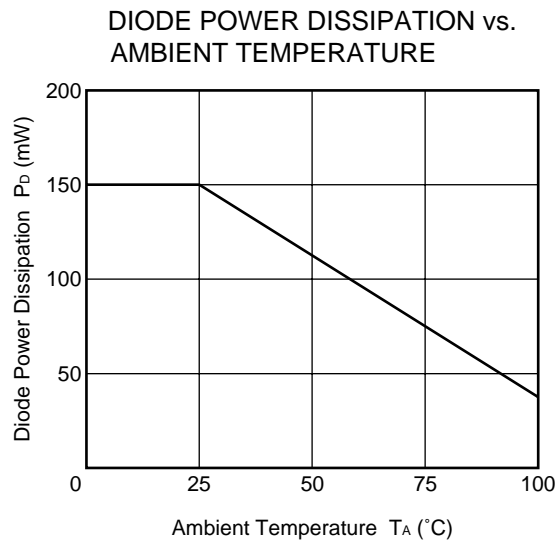
L : 700 to 3 400 (%)

M : 200 to 1 000 (%)

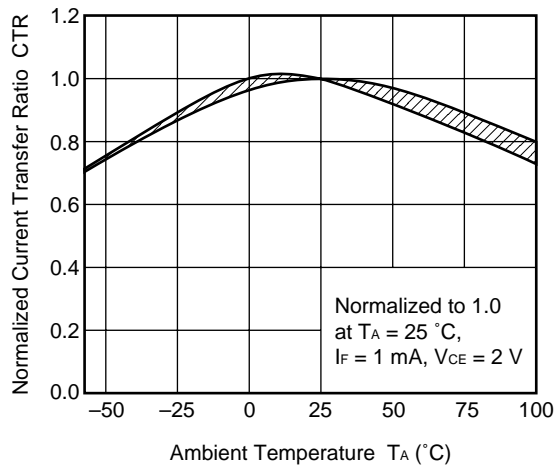
*3 Test circuit for switching time



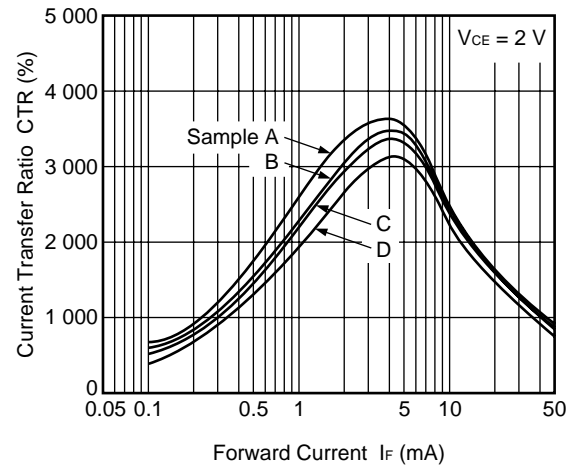
★ TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)



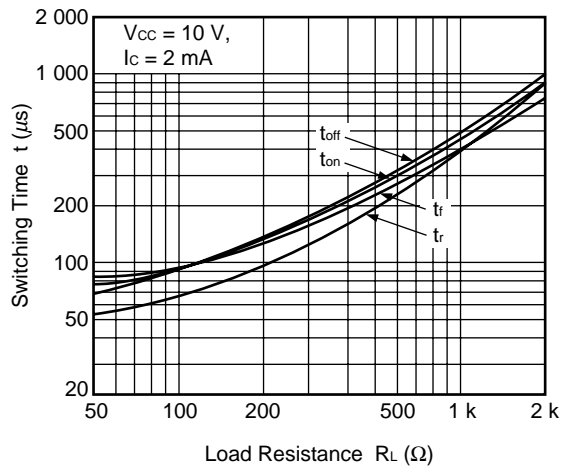
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



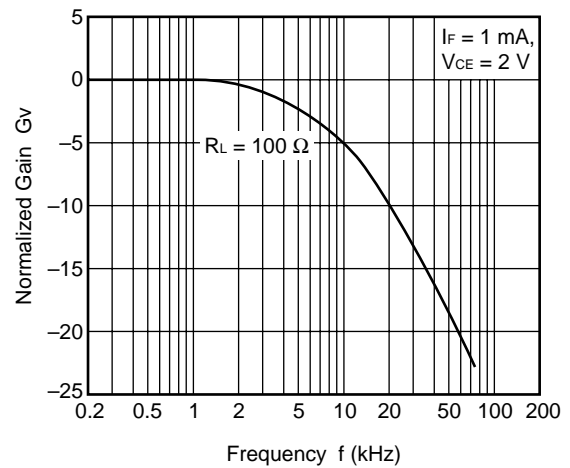
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



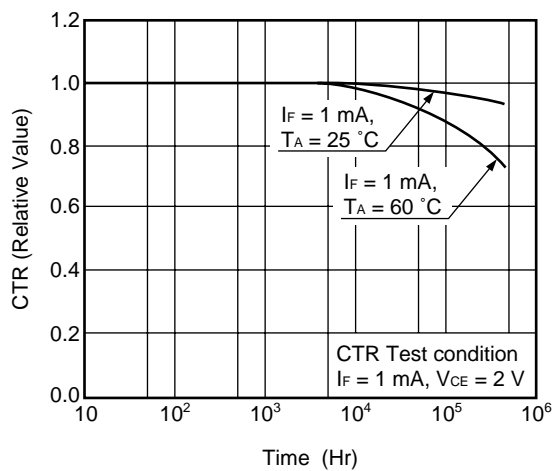
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE



LONG TERM CTR DEGRADATION



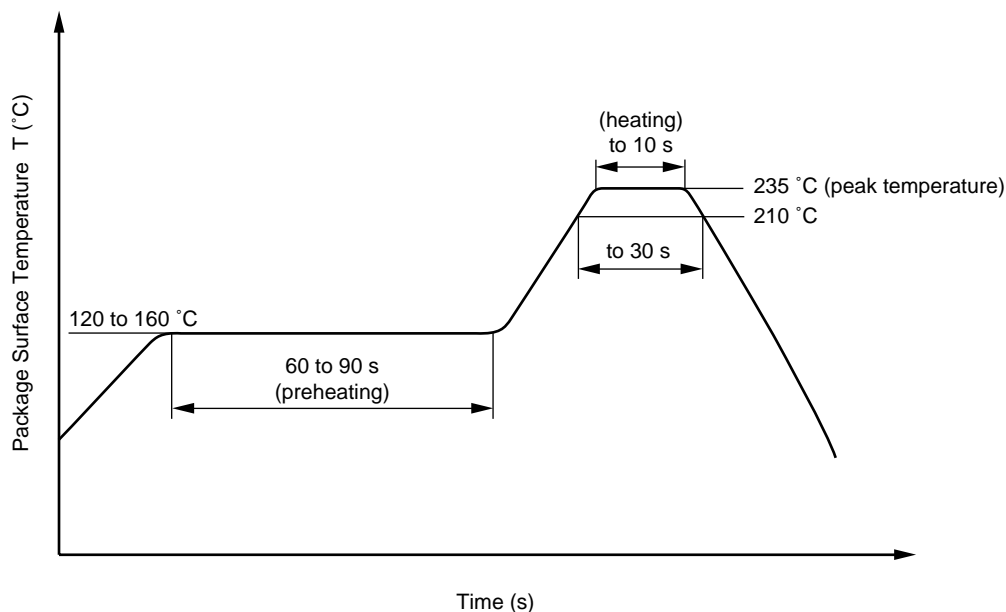
Remark The graphs indicate nominal characteristics.

RECOMMENDED SOLDERING CONDITIONS

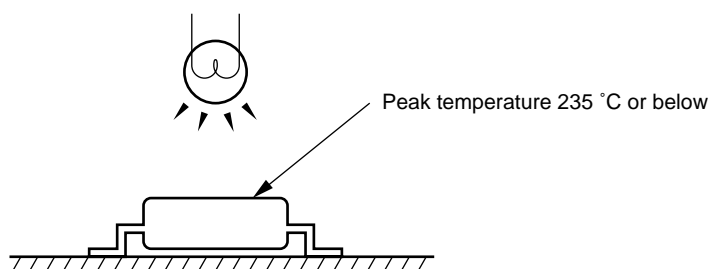
(1) Infrared reflow soldering

- Peak reflow temperature 235 °C (package surface temperature)
- Time of temperature higher than 210 °C 30 seconds or less
- 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



Caution Please avoid removing the residual flux by water after the first reflow process.



(2) Dip soldering

- Temperature 260 °C or below (molten solder temperature)
- Time 10 seconds or less
- Number of times One
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)

CAUTION

Within this device there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstances break the hermetic seal.

NEPOC is a trademark of NEC Corporation.

No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.

NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.

While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.

NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device 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: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.