

# DATA SHEET

# NEC

# GaAs INTEGRATED CIRCUIT $\mu$ PG2151TK

## L, S-BAND SPDT SWITCH

### DESCRIPTION

The  $\mu$ PG2151TK is a GaAs MMIC for L, S-band SPDT (Single Pole Double Throw) switch which was developed for mobile phone and another L, S-band application.

This device can operate 2 control switching by control voltage 1.8 to 5.3 V. This device can operate frequency from 0.5 to 3.0 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin lead-less minimold (1511) package. And this package is able to high-density surface mounting.

### FEATURES

- Switch control voltage :  $V_{\text{cont (H)}} = 1.8 \text{ to } 5.3 \text{ V (2.6 V TYP.)}$   
:  $V_{\text{cont (L)}} = -0.2 \text{ to } +0.2 \text{ V (0 V TYP.)}$
- Low insertion loss :  $L_{\text{INS1}} = 0.30 \text{ dB TYP. @ } f = 0.5 \text{ to } 1.0 \text{ GHz, } V_{\text{cont (H)}} = 2.6 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{INS2}} = 0.35 \text{ dB TYP. @ } f = 1.0 \text{ to } 2.0 \text{ GHz, } V_{\text{cont (H)}} = 2.6 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{INS3}} = 0.50 \text{ dB TYP. @ } f = 2.0 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 2.6 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$
- High isolation :  $ISL1 = 25 \text{ dB TYP. @ } f = 0.5 \text{ to } 1.0 \text{ GHz, } V_{\text{cont (H)}} = 2.6 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL2 = 18 \text{ dB TYP. @ } f = 1.0 \text{ to } 2.0 \text{ GHz, } V_{\text{cont (H)}} = 2.6 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL3 = 13 \text{ dB TYP. @ } f = 2.0 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 2.6 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$
- Handling power :  $P_{\text{in (0.1 dB)}} = +21.0 \text{ dBm TYP. @ } f = 2.0 \text{ GHz, } V_{\text{cont (H)}} = 2.6 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$
- High-density surface mounting : 6-pin lead-less minimold package (1.5 × 1.1 × 0.55 mm)

### APPLICATIONS

- L, S-band digital cellular or cordless telephone
- W-LAN, WLL and Bluetooth™ etc.

### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
$\mu$ PG2151TK-E2	$\mu$ PG2151TK-E2-A	6-pin lead-less minimold (1511) (Pb-Free) <sup>Note</sup>	G4N	<ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 1, 6 face the perforation side of the tape</li><li>• Qty 5 kpcs/reel</li></ul>

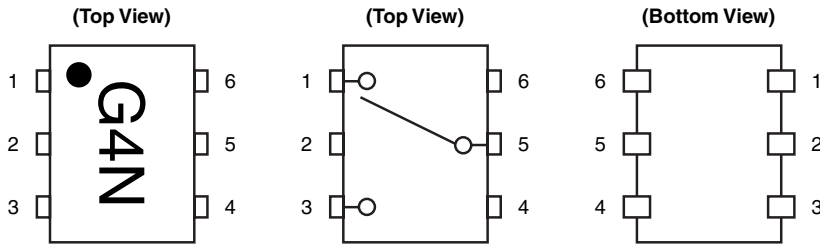
**Note** With regards to terminal solder (the solder contains lead) plated products (conventionally plated), contact your nearby sales office.

**Remark** To order evaluation samples, contact your nearby sales office.  
Part number for sample order:  $\mu$ PG2151TK

**Caution** Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

**PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM**



Pin No.	Pin Name
1	OUTPUT1
2	GND
3	OUTPUT2
4	V <sub>cont2</sub>
5	INPUT
6	V <sub>cont1</sub>

**TRUTH TABLE**

V <sub>cont1</sub>	V <sub>cont2</sub>	INPUT-OUTPUT1	INPUT-OUTPUT2
Low	High	OFF	ON
High	Low	ON	OFF

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V <sub>cont</sub>	+6.0 <sup>Note</sup>	V
Input Power	P <sub>in</sub>	+26	dBm
Operating Ambient Temperature	T <sub>A</sub>	-45 to +85	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

**Note** |V<sub>cont1</sub> - V<sub>cont2</sub>| ≤ 6.0 V

**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	V <sub>cont (H)</sub>	1.8	2.6	5.3	V
Switch Control Voltage (L)	V <sub>cont (L)</sub>	-0.2	0	+0.2	V

**ELECTRICAL CHARACTERISTICS**(TA = +25°C, V<sub>cont</sub> (H) = 2.6 V, V<sub>cont</sub> (L) = 0 V, DC cut capacitors = 56 pF, unless otherwise specified)

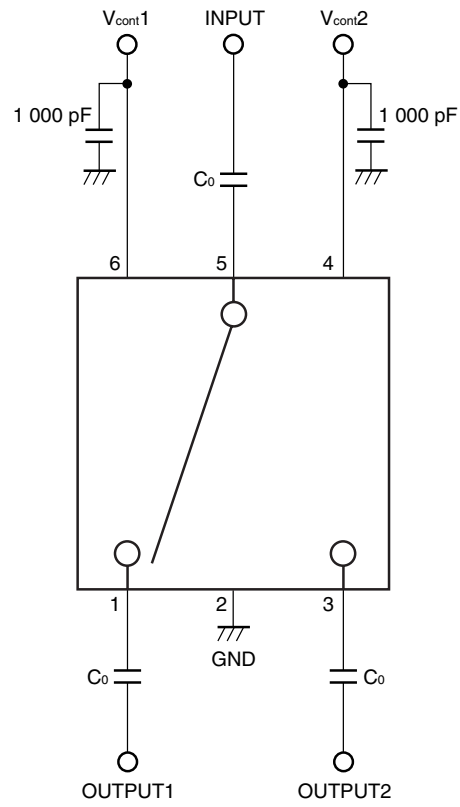
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	L <sub>INS1</sub>	f = 0.5 to 1.0 GHz	–	0.30	0.42	dB
Insertion Loss 2	L <sub>INS2</sub>	f = 1.0 to 2.0 GHz	–	0.35	0.47	
Insertion Loss 3	L <sub>INS3</sub>	f = 2.0 to 3.0 GHz	–	0.50	0.65	
Isolation 1	ISL1	f = 0.5 to 1.0 GHz	22	25	–	dB
Isolation 2	ISL2	f = 1.0 to 2.0 GHz	15	18	–	
Isolation 3	ISL3	f = 2.0 to 3.0 GHz	10	13	–	
Input Return Loss	RL <sub>in</sub>	f = 0.5 to 3.0 GHz	–	20	–	dB
Output Return Loss	RL <sub>out</sub>	f = 0.5 to 3.0 GHz	–	20	–	dB
0.1 dB Loss Compression Input Power <sup>Note</sup>	P <sub>in (0.1 dB)</sub>	f = 2.0 GHz	+18.0	+21.0	–	dBm
Switch Control Current	I <sub>cont</sub>		–	0.2	20	$\mu$ A
Switch Control Speed	t <sub>sw</sub>	50% CTL to 90/10% RF	–	1.0	–	$\mu$ s

**Note** P<sub>in (0.1 dB)</sub> is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

**Caution** This device is used it is necessary to use DC cut capacitors.

The value of DC cut capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system. The range of recommended DC cut capacitor value is less than 100 pF.

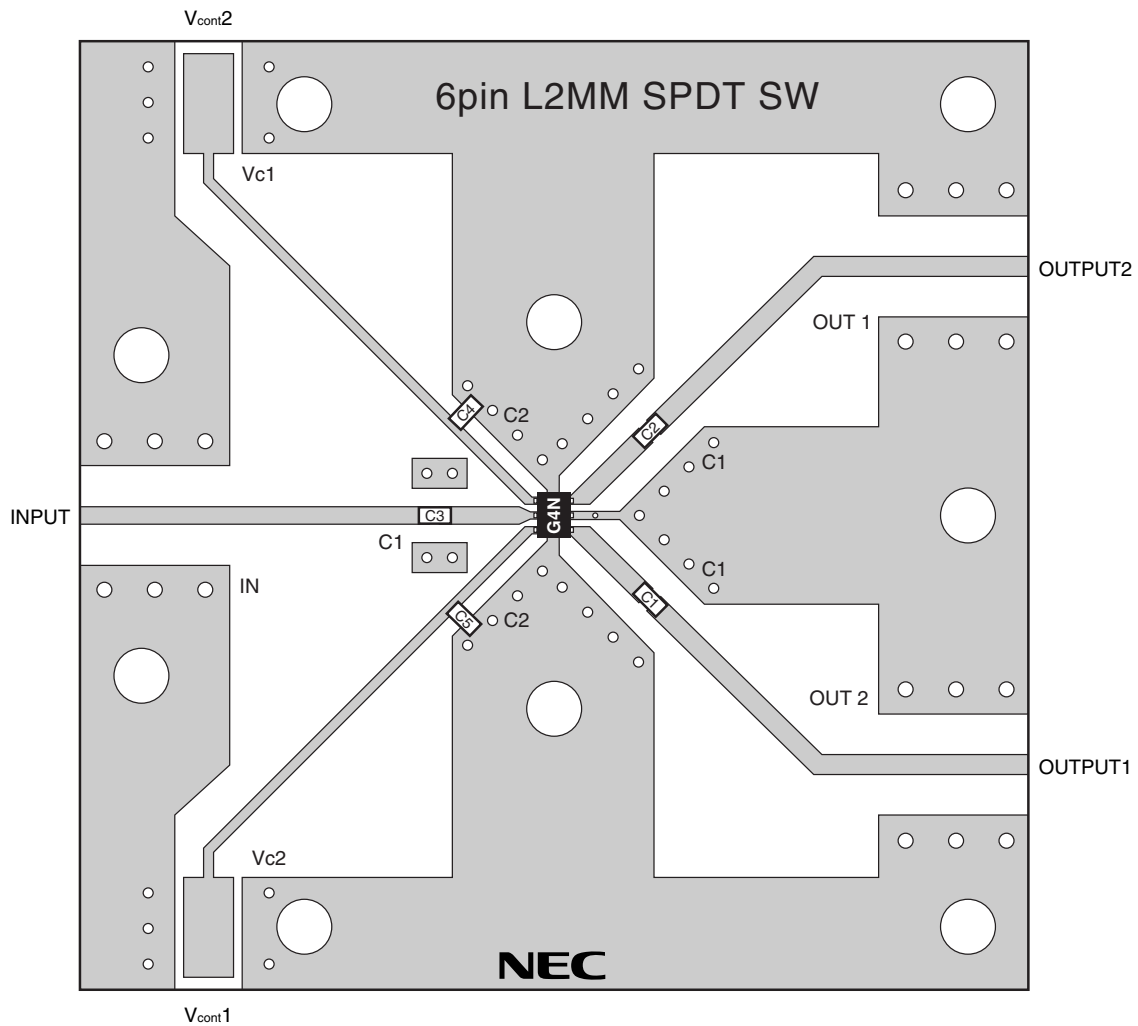
EVALUATION CIRCUIT



**Remark** C<sub>0</sub> : 56 pF

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

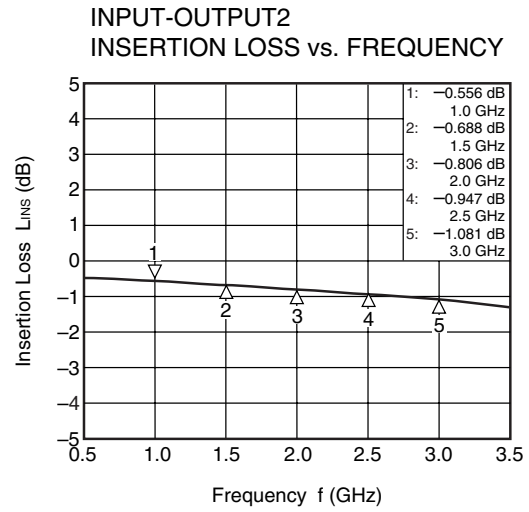
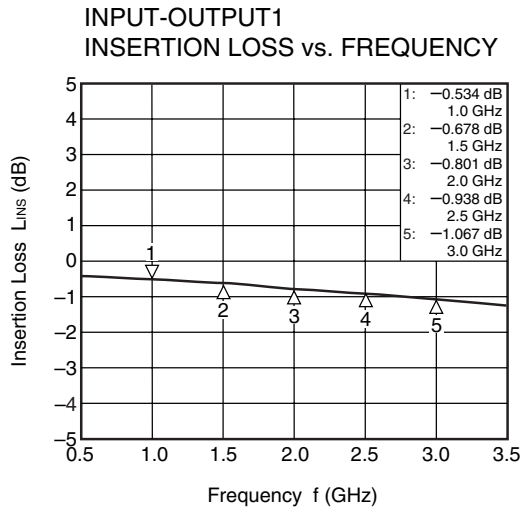
ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



USING THE NEC EVALUATION BOARD

Symbol	Values
C1, C2, C3	56 pF
C4, C5	1 000 pF

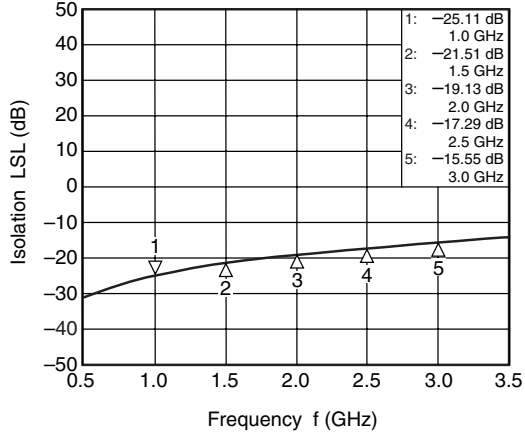
**TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, V<sub>cont</sub> (H) = 2.6 V, V<sub>cont</sub> (L) = 0 V, DC cut capacitors = 56 pF, using test fixture, unless otherwise specified)**



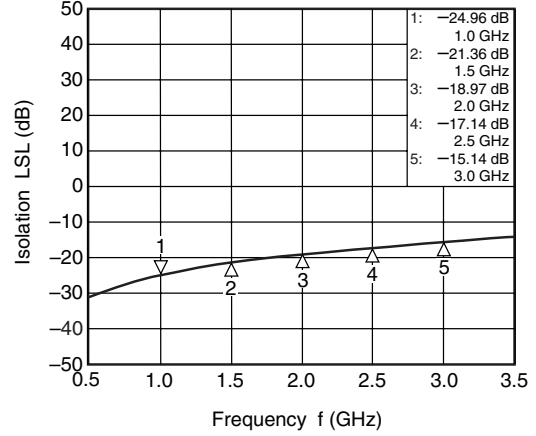
**Remark** The graphs indicate nominal characteristics.

**Caution** These characteristics values include the losses of NEC evaluation board.

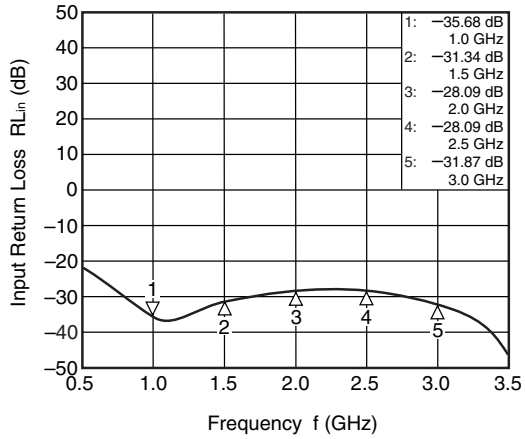
INPUT-OUTPUT1  
ISORATION vs. FREQUENCY



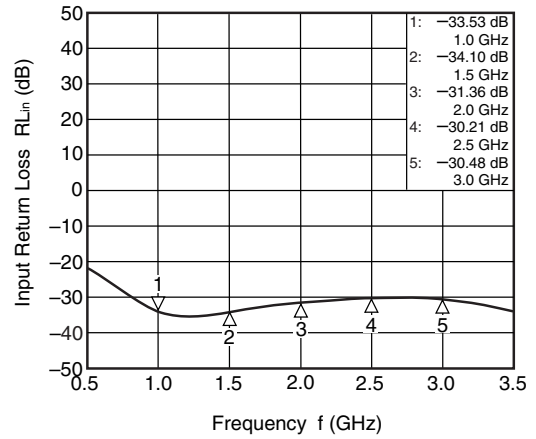
INPUT-OUTPUT2  
ISORATION vs. FREQUENCY



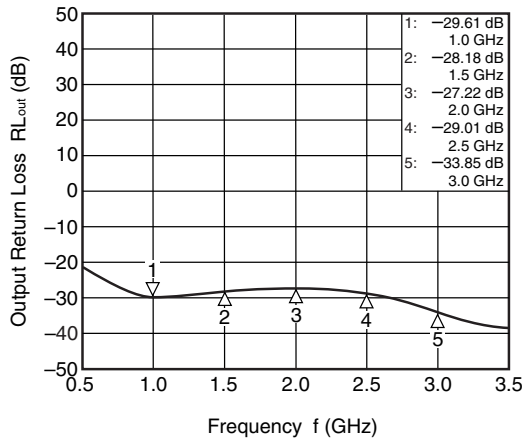
INPUT-OUTPUT1  
INPUT RETURN LOSS vs. FREQUENCY



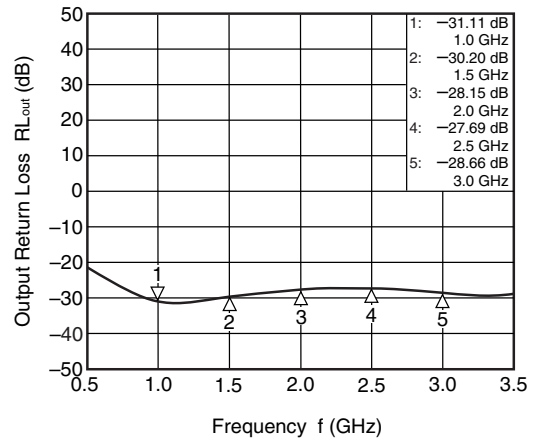
INPUT-OUTPUT2  
INPUT RETURN LOSS vs. FREQUENCY



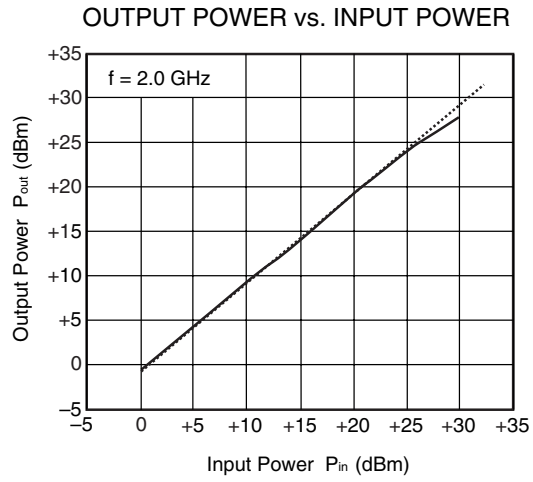
INPUT-OUTPUT1  
OUTPUT RETURN LOSS vs. FREQUENCY



INPUT-OUTPUT2  
OUTPUT RETURN LOSS vs. FREQUENCY



**Remark** The graphs indicate nominal characteristics.

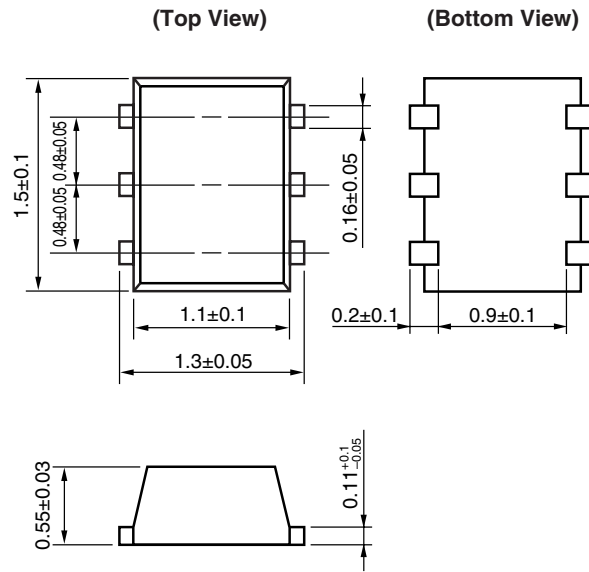


**Remark** The graph indicates nominal characteristics.



PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (1511) (UNIT: mm)



**RECOMMENDED SOLDERING CONDITIONS**

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions	Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature)	: 260°C or below
	Time at peak temperature	: 10 seconds or less
	Time at temperature of 220°C or higher	: 60 seconds or less
	Preheating time at 120 to 180°C	: 120±30 seconds
	Maximum number of reflow processes	: 3 times
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below
Wave Soldering	Peak temperature (molten solder temperature)	: 260°C or below
	Time at peak temperature	: 10 seconds or less
	Preheating temperature (package surface temperature)	: 120°C or below
	Maximum number of flow processes	: 1 time
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below
Partial Heating	Peak temperature (terminal temperature)	: 350°C or below
	Soldering time (per side of device)	: 3 seconds or less
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below

**Caution Do not use different soldering methods together (except for partial heating).**

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M8E 02.11-1

<b>Caution</b>	GaAs Products	<p>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.</p> <ul style="list-style-type: none"> <li>• 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.               <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol> </li> <li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li> <li>• Do not lick the product or in any way allow it to enter the mouth.</li> </ul>
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► For further information, please contact

**NEC Compound Semiconductor Devices Hong Kong Limited**

E-mail: [contact@ncsd-hk.necel.com](mailto:contact@ncsd-hk.necel.com)

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.eu.necel.com/>**

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

**Compound Semiconductor Devices Division**

**NEC Electronics Corporation**

URL: <http://www.ncsd.necel.com/>