To our customers,

Old Company Name in Catalogs and Other Documents

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

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

GaAs INTEGRATED CIRCUIT

μPG131GR

L-BAND SPDT SWITCH

DESCRIPTION

μPG131GR is an L-Band SPDT (Single Pole Double Throw) GaAs FET switch which was developed for digital cordless telephone application. The device can operate from 100 MHz to 2 GHz, having the low insertion loss. It housed in an 8 pin SOP that is easy to install and contributes to miniaturizing the system.

It can be used in wide-band switching applications.

FEATURES

- Maximum transmission power : 0.6 W (TYP.)
- Low insertion loss : 0.6 dB (TYP.)
- High switching speed : 10 ns
- Small package : 8 pins SOP

QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Control Voltage	V_{CONT}	−8 to +0.6	V
Input Power	P_{in}	31	dBm
Power Dissipation	P_{tot}	0.4	W
Operating Temperature	T_{opt}	−65 to +90	°C
Storage Temperature	T_{stg}	−65 to +150	°C

Note The IC must be handled with care to prevent static discharge because its circuit is composed of GaAs MES FET.

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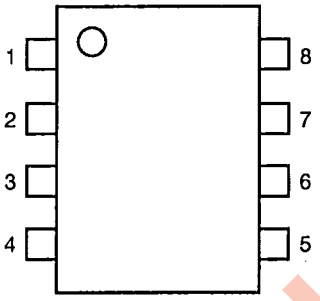
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Insertion Loss	L_{INS}	–	0.6	1.0	dB	f = 100 MHz to 2 GHz V_{CONT1} = 0 V V_{CONT2} = –4 V or V_{CONT1} = –4 V V_{CONT2} = 0 V
Isolation	ISL	20	23	–	dB	
Input Return Loss	RL_{in}	11	–	–	dB	
Output Return Loss	RL_{out}	11	–	–	dB	
Input Power at 1 dB Compression Point	P_{in}(1 dB)*1	28	30	–	dBm	
Switching Speed	t_{sw}	–	10	–	ns	
Control Current	I_{CONT}	–	–	50	μA	

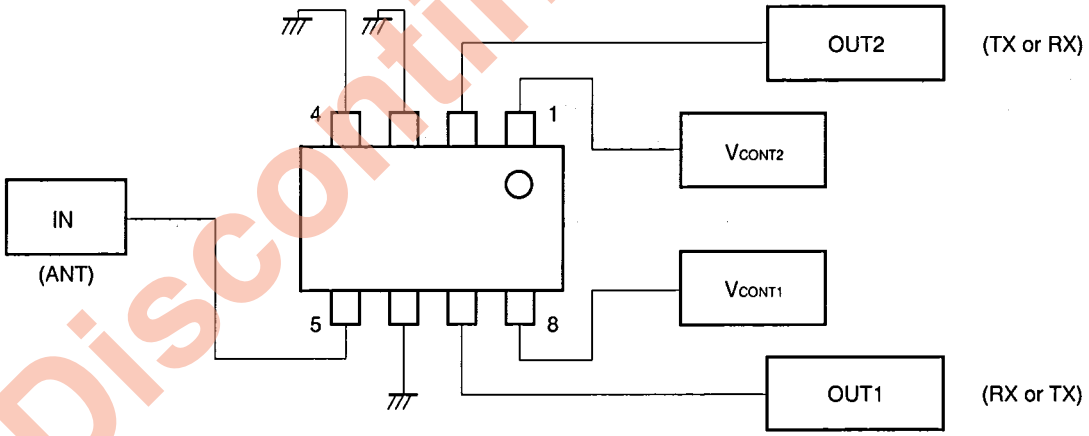
*1 Pin (1 dB) is measured the input power level when the insertion loss increase more 1 dB than that of linear range. All other characteristics are measured in linear range.

PIN CONNECTION DIAGRAM (Top View)



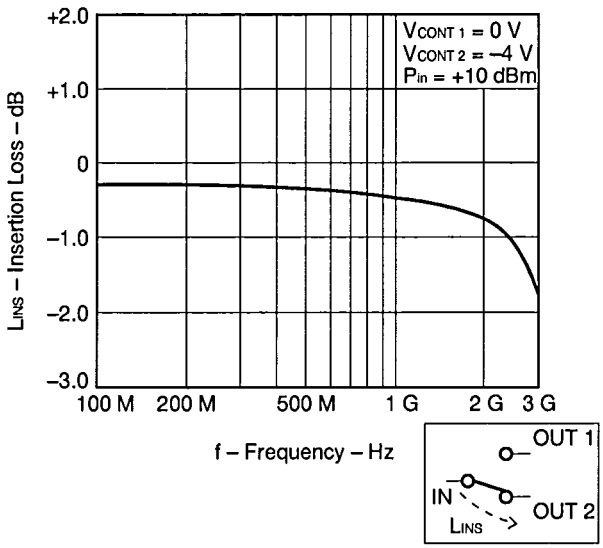
1. V_{CONT2}
2. OUT2
3. GND
4. GND
5. IN
6. GND
7. OUT1
8. V_{CONT1}

APPLICATION

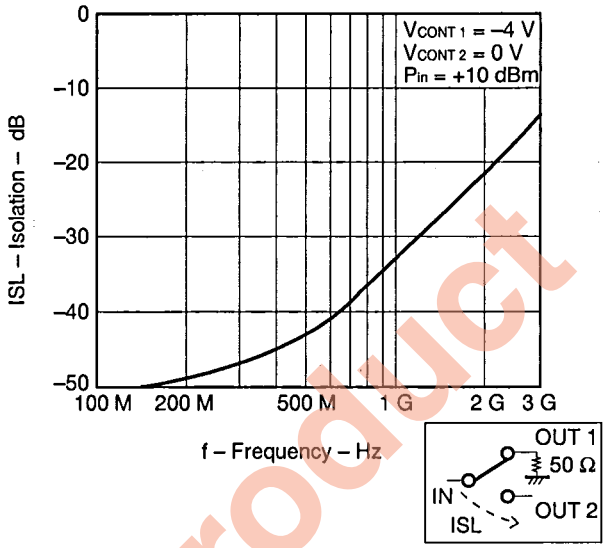


TYPICAL CHARACTERISTICS (T_A = 25 °C)

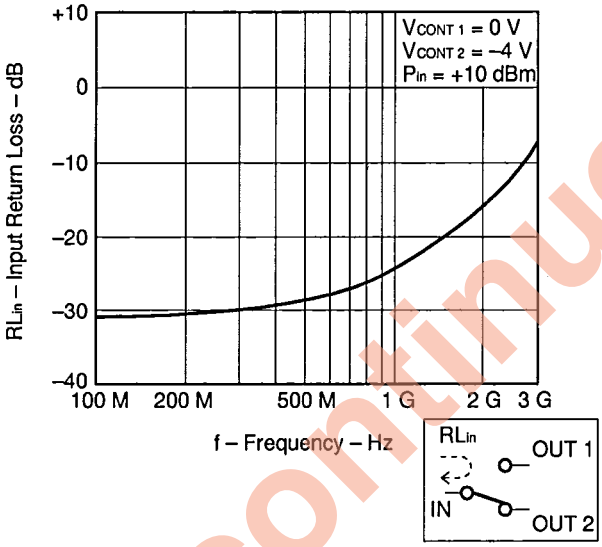
IN–OUT 2 INSERTION LOSS vs. FREQUENCY



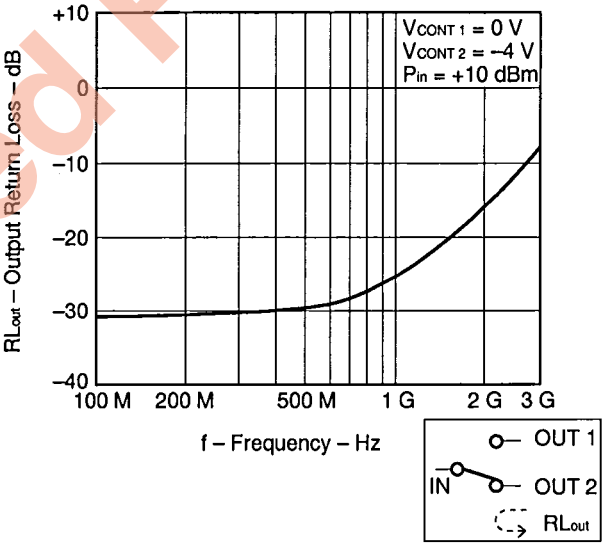
IN–OUT 2 ISOLATION vs. FREQUENCY



IN–OUT 2 INPUT RETURN LOSS vs. FREQUENCY

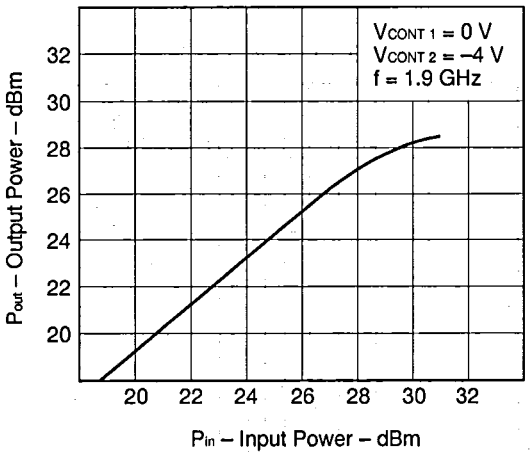


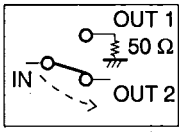
IN–OUT 2 OUTPUT RETURN LOSS vs. FREQUENCY



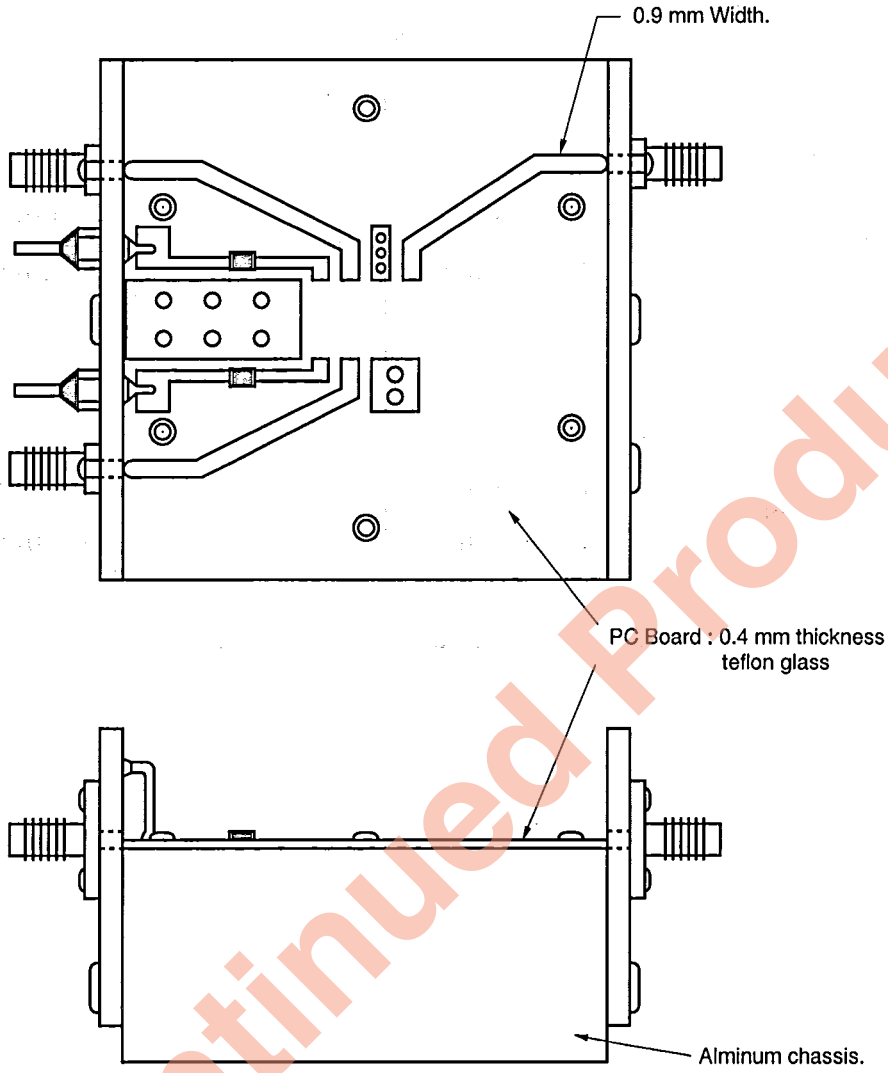
Note This data is including loss of the test fixture.

IN–OUT 2 P_{in} vs. P_{out}

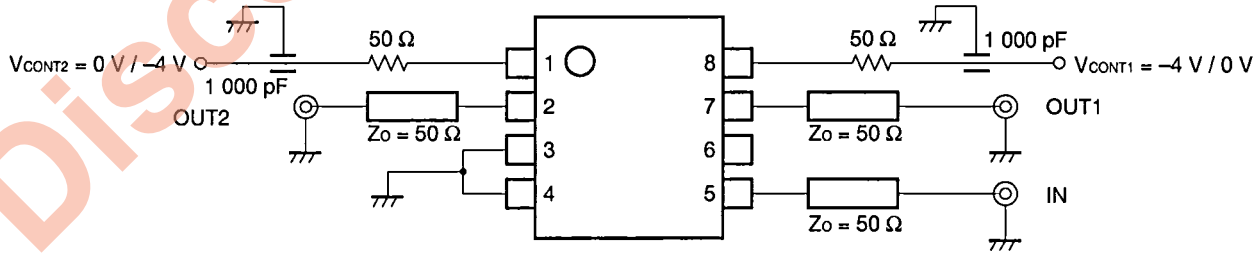




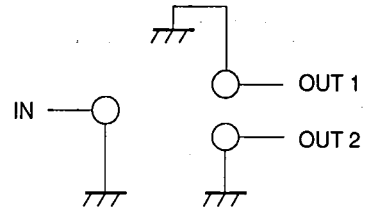
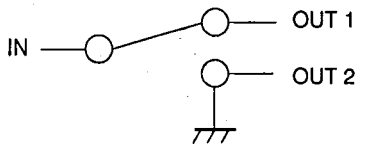
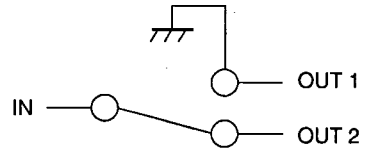
TEST JIG DRAWING



TEST CIRCUIT



μPG131GR TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE

V_{CONT2} \ V_{CONT1}	0 V	−4 V
0 V		
−4 V		

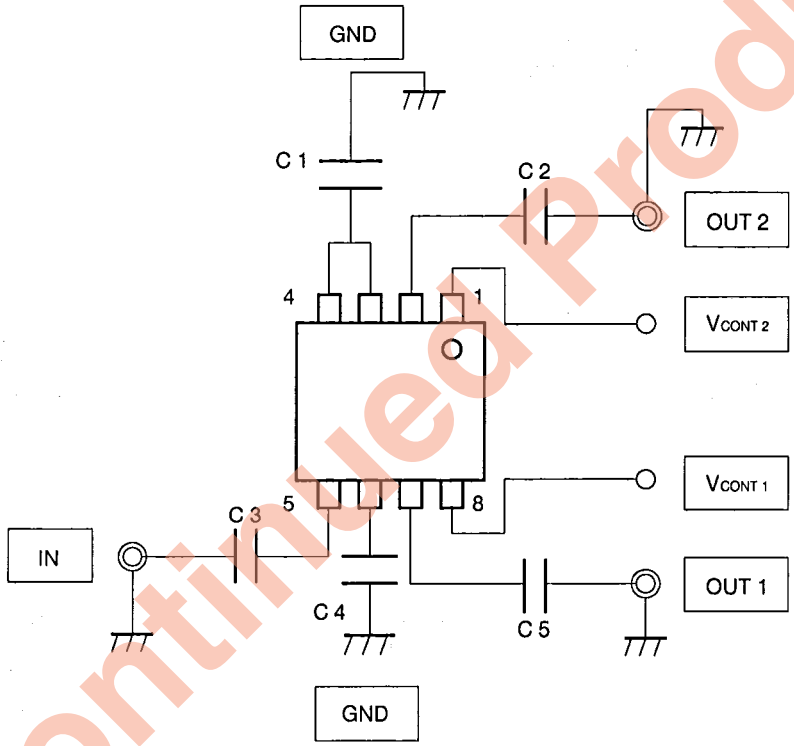
Floating the μPG131GR

It is possible to used the μPG131GR with only a single +4 V supply by employing a technique known as "floating". When the IC is floated using a +4 V supply, the voltage levels used to control the switch are elevated above ground by +4 V.

When the μPG131GR is floated it is necessary to use DC blocking (C2, C3, C5) and grounding (C1, C4) capacitors. This enables the IC to be isolated so that +4 V can be applied to RF line. The value for DC blocking capacitors should be chosen to accommodate the frequency of operation. Grounding capacitors are required to float the IC above ground. The value for grounding capacitor should be chosen to accomodate the frequency of operation.

It is not recommended to float the μPG131GR above 1 GHz operation. The performance of the isolation goes bad by affection of grounding capacitors.

(Floating the μPG131GR with +4 V/0 V supply at 1 GHz)



C1, C4 = 1 000 pF : Grounding capacitor
C2, C3, C5 = 100 pF: DC blocking capacitor

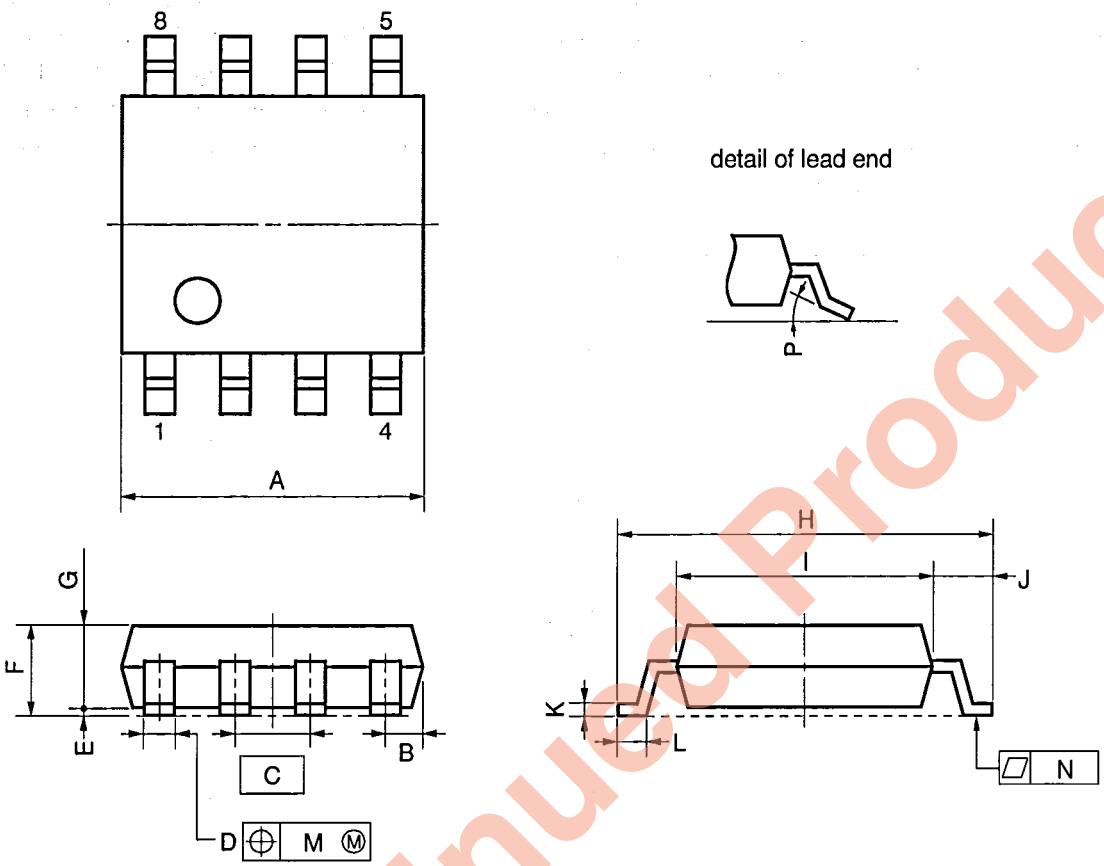
PIN CONNECTIONS

1. V_{CONT2}
2. OUT2
3. GND
4. GND
5. IN
6. GND
7. OUT1
8. V_{CONT1}

Note The distance between grounding capacitor and IC's GND pins, grounding capacitor and ground of the substrate should be as shorter as possible to avoid the parasitic parameters. IC's GND pin, No. 3, No. 4 and No. 6 are connected inside of the IC.

PACKAGE DIMENSIONS

8 PIN PLASTIC SOP (225 mil)



NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	5.37 MAX.	0.212 MAX.
B	0.78 MAX.	0.031 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
E	0.1±0.1	0.004±0.004
F	1.8 MAX.	0.071 MAX.
G	1.49	0.059
H	6.5±0.3	0.256±0.012
I	4.4	0.173
J	1.1	0.043
K	$0.15^{+0.10}_{-0.05}$	$0.006^{+0.004}_{-0.002}$
L	0.6±0.2	$0.024^{+0.008}_{-0.009}$
M	0.12	0.005
N	0.10	0.004
P	$3°^{+7°}_{-3°}$	$3°^{+7°}_{-3°}$

S8GM-50-225B-4

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI-1207).

μPG131GR

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature: 230 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 1, Exposure limit*: None	IR30-00-2
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 1, Exposure limit*: None	VP15-00-2
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below, Number of flow process: 1, Exposure limit*: None	WS60-00-1
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 10 seconds or below, Exposure limit*: None	

* Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Note Do not apply more than a single process at once, except for "Partial heating method".

Caution

The Great Care must be taken in dealing with the devices in this guide.
The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the Japanese law concerned.
Keep the law concerned and so on, especially in case of removal.

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