NEC

GaAs INTEGRATED CIRCUIT

μPG133G

L-BAND SPDT SWITCH

DESCRIPTION

UPG133G is an L-Band SPDT (Single Pole Double Throw) GaAs FET switch which was developed for digital cellular or cordless telephone application.

The device can operate from 100 MHz to 2.5 GHz, having the low insertion loss.

It housed in an original 8 pin SSOP that is smaller than usual 8 pin SOP and easy to install and contributes to miniaturizing the system.

It can be used in wide-band switching applications.

FEATURES

- Maximum transmission power : 0.25 W (typ.)
- Low insertion loss : 0.6 dB (typ.) at f = 2 GHz
- High switching speed : 10 ns
- Small package : 8 pins SSOP

APPLICATION

- Digital cordless telephone : PHS, PCS, DECT etc.
- Digital hand-held cellular phone, WLAN

ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKING FORM
μPG133G-E1	8 pin plastic SSOP	Carrier tape width 12 mm. QTY 2kp/Reel.

For evaluation sample order, please contact your local NEC sales office.

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Control Voltage	V_{CONT}	–6 to +0.6	V
Input Power	P_{in}	25	dBm
Total Power Dissipation	P_{tot}	0.2	W
Operating Case Temperature	T_{opt}	–65 to +90	°C
Storage Temperature	T_{stg}	–65 to +150	°C

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

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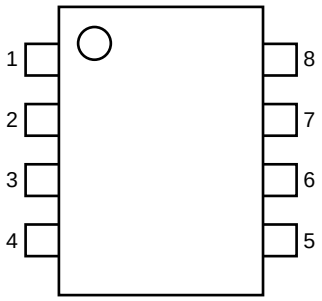
PIN CONNECTION DIAGRAM (Top View)



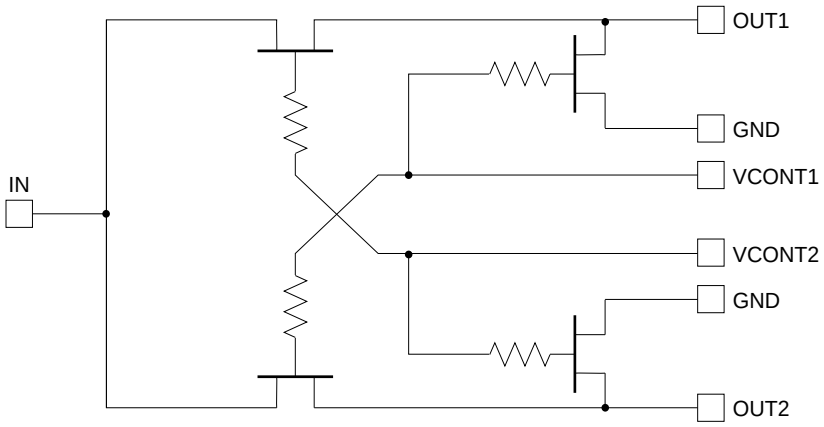
1. V_{CONT2}
2. OUT2
3. GND
4. GND
5. IN
6. GND
7. OUT1
8. V_{CONT1}

SPDT SWITCH IC SERIES PRODUCTS

PART NUMBER	Pin (1dB) (dBm)	LINS (dB)	ISL (dB)	VCONT (V)	PACKAGE	APPLICATIONS
μPG130GR	+34	0.5 @1G	32 @1G	–5/0	8 pin SOP (225 mil)	PDC, IS-136, PHS
μPG131GR	+30	0.6 @2G	23 @2G	–4/0		PHS, PCS, WLAN
μPG130G	+34	0.5 @1G	32 @1G	–5/0	8 pin SSOP (175 mil)	PDC, IS-136, PHS
μPG131G	+30	0.6 @2G	23 @2G	–4/0		PHS, PCS, WLAN
μPG132G	+30	0.6 @2G	22 @2G	+3/0		PHS, PCS, WLAN
μPG133G	+25	0.6 @2G	20 @2G	–3/0		DIVERSITY etc

Remark: As for detail information of series products, please refer to each data sheet.

EQUIVALENT CIRCUIT



RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Control Voltage (ON)	V_{CONT}	–0.2	0	+0.2	V
Control Voltage (OFF)	V_{CONT}	–5.0	–3.0	–2.7	V
Input Power Level	P_{in}		21	24	dBm

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Insertion Loss	L_{INS}		0.6	1.0	dB	
			0.8 Note1			f = 2.5 GHz
Isolation	ISL	20			dB	
			20 Note1			f = 2.5 GHz
Input Return Loss	RL_{in}	11	20		dB	f = 100 MHz to 2 GHz
Output Return Loss	RL_{out}	11	20		dB	V_{CONT1} = 0 V
Input Power at 1dB Compression Point	P_{in} (1dB) Note2	21	25		dBm	V_{CONT2} = –3 V or
Switching Speed	t_{sw}		10		ns	V_{CONT1} = –3 V
Control Current	I_{CONT}			50	μA	V_{CONT2} = 0 V

Notes 1: Characteristic for reference at 2.0 to 2.5 GHz

2: P_{in} (1dB) is measured the input power level when the insertion loss increase more 1dB than that of linear range.

All other characteristics are measured in linear range.

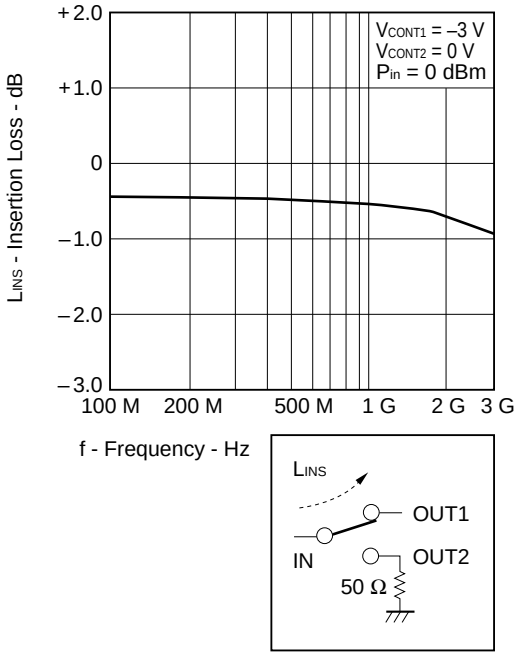
NOTE ON CORRECT USE

- Insertion loss and isolation of the IN-OUT2 is better than that of IN-OUT1, because No. 7 pin (OUT1) is placed to same side of No. 5 pin (IN).
- The distance between IC's GND pins and ground pattern of substrate should be as shorter as possible to avoid parasitic parameters.

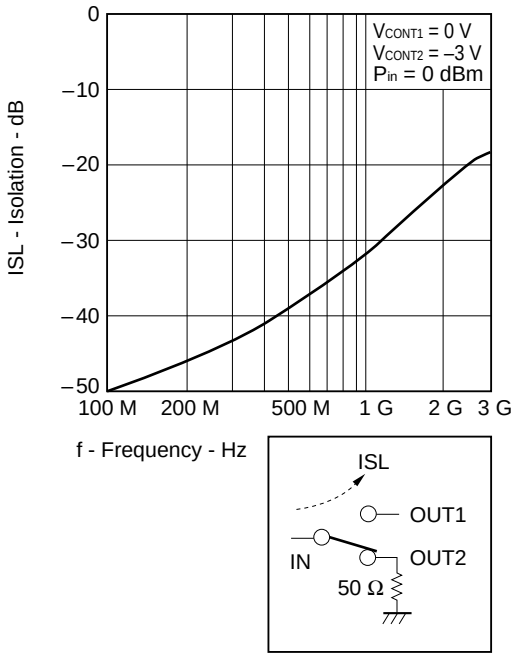
TYPICAL CHARACTERISTICS (T_A = 25 °C)

Note This data is including loss of the test fixture.

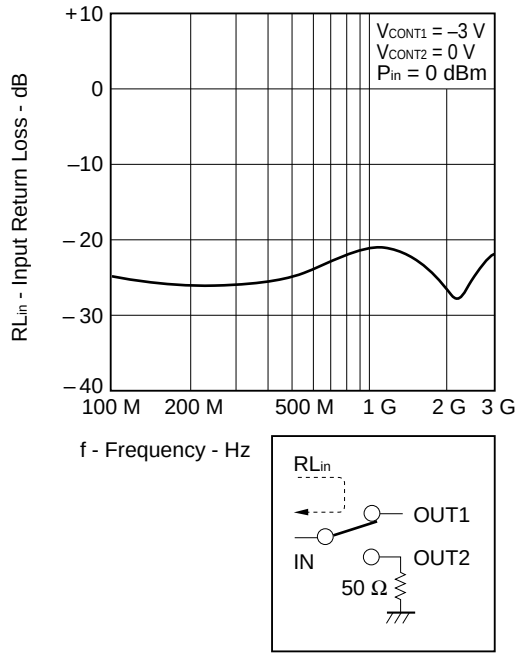
IN-OUT1 INSERTION LOSS vs. FREQUENCY



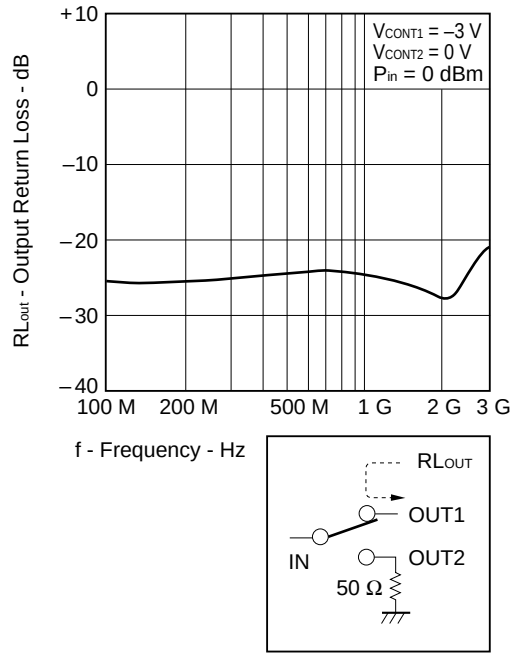
IN-OUT1 ISOLATION vs. FREQUENCY



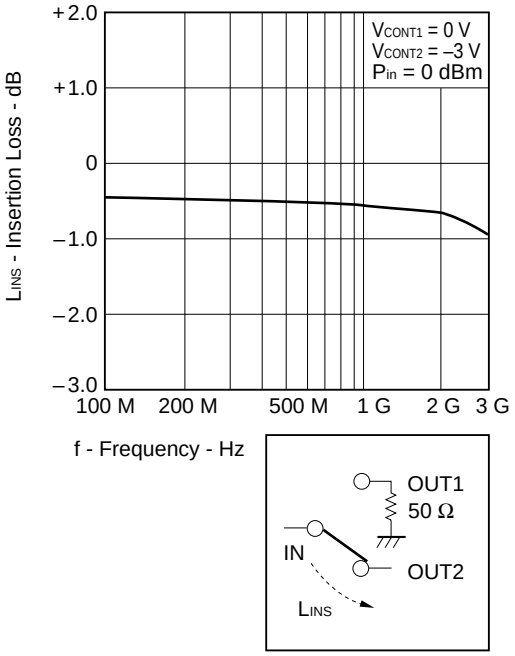
IN-OUT1 INPUT RETURN LOSS vs. FREQUENCY



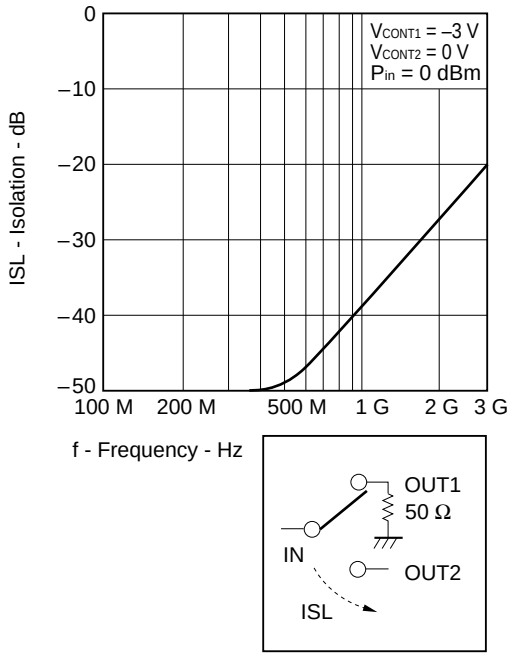
IN-OUT1 OUTPUT RETURN LOSS vs. FREQUENCY



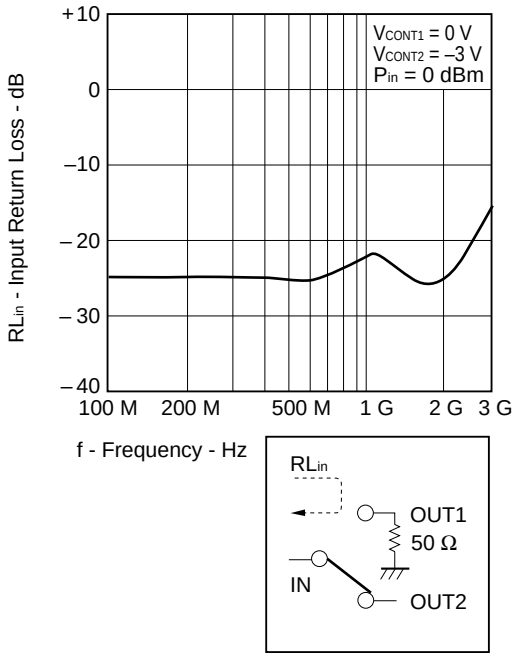
IN-OUT2 INSERTION LOSS vs. FREQUENCY



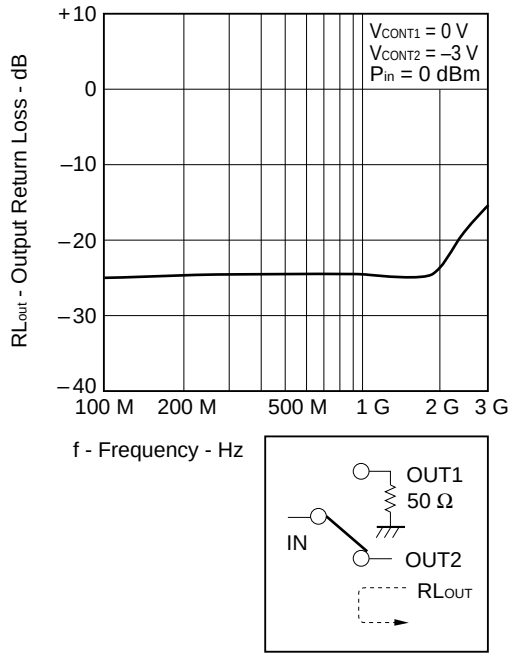
IN-OUT2 ISOLATION vs. FREQUENCY



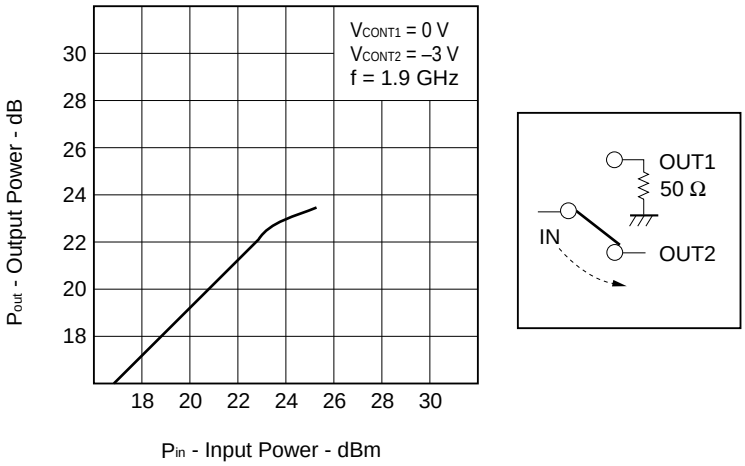
IN-OUT2 INPUT RETURN LOSS vs. FREQUENCY



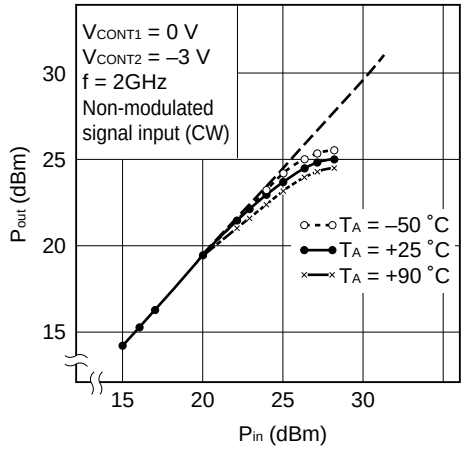
IN-OUT2 OUTPUT RETURN LOSS vs. FREQUENCY



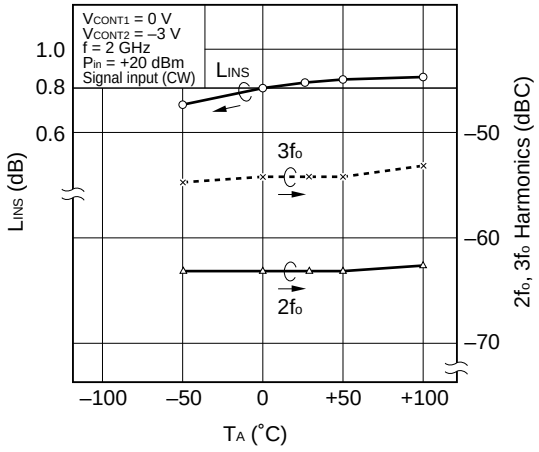
IN-OUT2 P_{in} vs. P_{out}



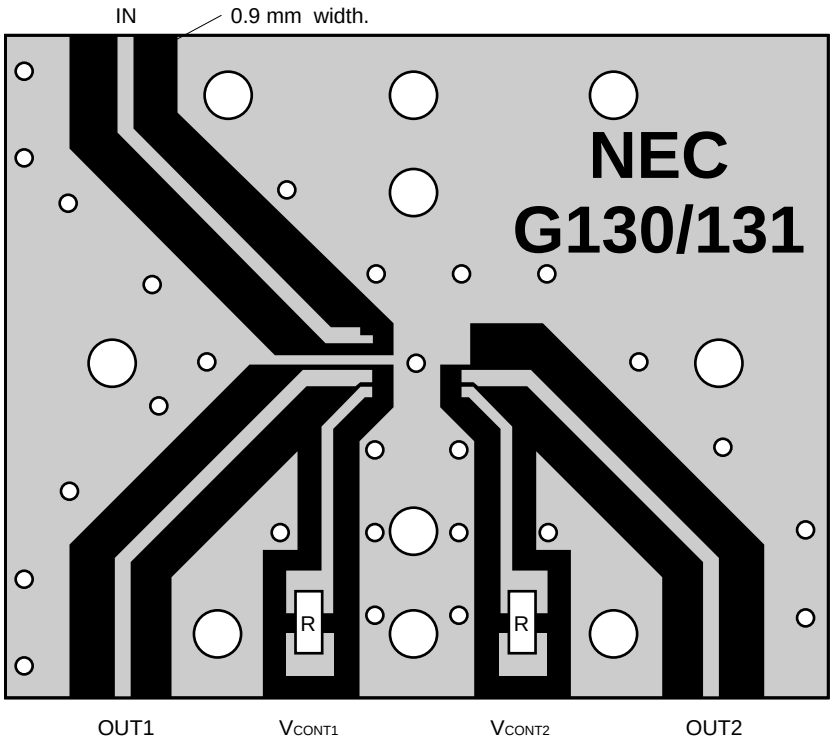
INPUT POWER vs. OUTPUT POWER



INSERTION LOSS, $2f_o$, $3f_o$ vs. AMBIENT TEMPERATURE



TEST BOARD

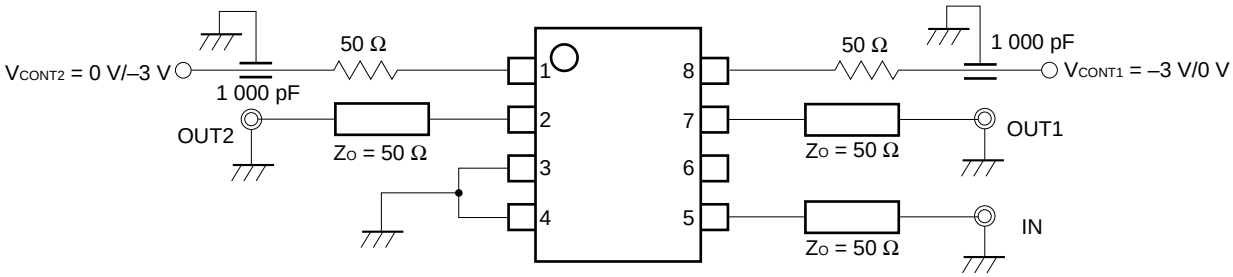


[0.4 mm thickness
teflon glass]

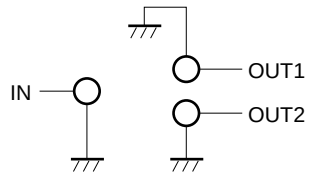
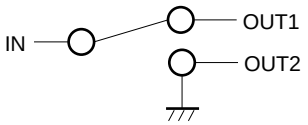
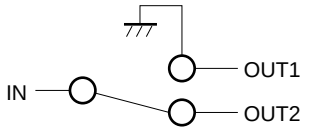
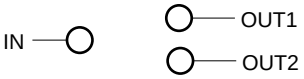
R = 50 Ω

Using the same board that of μPG130/131G

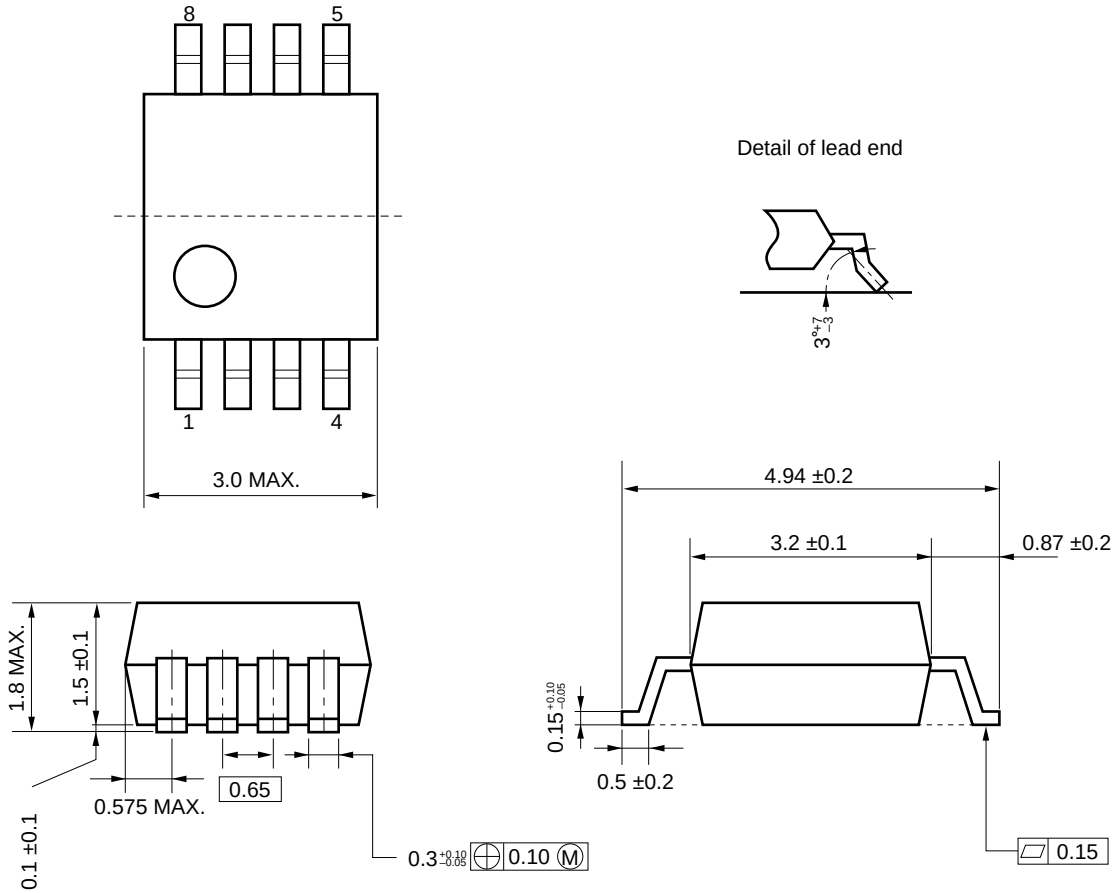
TEST CIRCUIT



μPG133G TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE

V_{CONT2} \ V_{CONT1}	0 V	–3 V
0 V		
–3 V		

8-PIN PLASTIC SHRINK SOP (175 mil) (Unit mm)



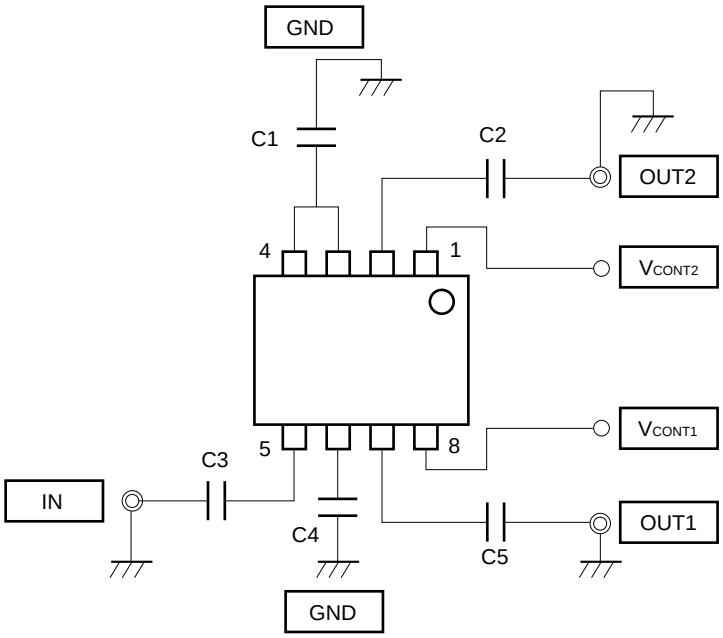
Floating the μPG133G

It is possible to use the μPG133G with only a single +3 V supply by employing a technique known as “floating”. When the IC is floated using a +3 V supply, the voltage levels used to control the switch are elevated above ground by +3 V.

When the μPG133G is floated it is necessary to use DC blocking (C2, C3, C5) and grounding (C1, C4) capacitors. This enables the IC to isolated so that +3 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 accommodate the frequency of operation.

It is not recommended to float the μPG133G for wide band application.

(Floating the μPG133G with +3 V/0 V supply at 2 GHz-band, BW ≤ 50 MHz)



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

C1, C4 = 10 pF below : Grounding capacitor
C2, C3, C5 = 100 pF : DC blocking capacitor

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.

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered in the following recommended conditions. Other soldering methods and conditions than the recommended conditions are to be consulted with our sales representatives.

[μPG133G]

Soldering process	Soldering conditions	Recommended condition symbol
Infrared ray reflow	Package peak temperature: 230 ˚C Hour: within 30 s. (more than 210 ˚C) Time: 2 time, Limited days: no.**Note**	IR30-00-2
VPS	Package peak temperature: 215 ˚C Hour: within 40 s. (more than 200 ˚C), Time: 2 time, Limited days: no.**Note**	VP15-00-2
Wave Soldering	Soldering tub temperature: less than 260 ˚C, Hour: within 10 s. Time: 1 time, Limited days: no.**Note**	WS60-00-1
Pin part heating	Pin area temperature: less than 300 ˚C, Hour: within 10 s. Limited days: no.**Note**	

Note It is storage days after opening a dry pack, the storage conditions are 25 ˚C, less than 65 %, RH.

Caution The combined use of soldering method is to be avoided (However, except the pin area heating method).

[MEMO]

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.

M4 94.11