

GaAs INTEGRATED CIRCUIT $\mu PG138GV$

L-BAND SPDT SWITCH

DESCRIPTION

The μ PG138GV is L-Band SPDT (Single Pole Double Throw) GaAs FET switch which was developed for digital mobile communication system.

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

FEATURES

• Maximum transmission power : +35 dBm min. (@ Vcont = -5 V/0 V: μ PG138GV)

+34 dBm typ. (@ Vcont = -3 V/0 V: μ PG138GV)

• Low insertion loss : 0.55 dB typ. (@ 1 GHz)

0.65 dB typ. (@ 2 GHz)

APPLICATION

• Digital Cellular: GSM, PDC, PCN etc.

• PHS Base Station, PCS etc.

ORDERING INFORMATION

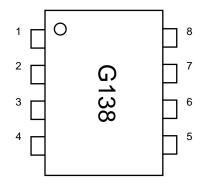
PART NUMBER	PACKAGE	PACKING FORM
μPG138GV-E1	8-pin plastic SSOP (175 mil)	Carrier tape width 12 mm Qty 2 kp/Reel.

ABSOLUTE MAXIMUM RATINGS (TA = 25 °C)

PARAMETERS	SYMBOL	RATINGS	UNIT
Control Voltage 1, 2	VCONT1, 2	-6.0 to +0.6	V
Input Power (Vcont = −5 V)	Pin	+36	dBm
Input Power (Vcont = -3 V)	Pin	+34	dBm
Total Power Dissipation	Ptot	0.7	W
Operating Temperature	Topt	-50 to +80	°C
Storage Temperature	T _{stg}	−65 to +150	°C



PIN CONNECTION DIAGRAM (Top View)



- 1. VCONT2 2. OUT2 3. GND 4. GND 5. IN
- 6. GND 7. OUT1
- 8. VCONT1

SPDT SWITCH IC SERIES PRODUCTS

PART NUMBER	PIN (1 dB) (dBm)	LINS (dB)	ISL (dB)	VCONT (V)	PACKAGE	APPLICATIONS
μPG130G	+34	0.5 @ 1 G	32 @ 1 G	-5/0		PDC, IS-54, PHS
μPG131G	+30	0.6 @ 2 G	23 @ 2 G	-4/0		PHS, DIVERSITY
μPG132G	+30	0.6 @ 2 G	22 @ 2 G	+3/0	8 pins SSOP	PHS, DIVERSITY
μPG133G	+25	0.6 @ 2 G	20 @ 2 G	-3/0	(175 mil)	DIVERSITY, VCO
μPG137GV	+34	0.55 @ 1 G	25 @ 2 G	+3/0		PDC, GSM, IS-136
μPG138GV	+34 +38	0.55 @ 1 G	30 @ 1 G	-3/0 -5/0		PDC, GSM, IS-136

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



[µPG138GV]

RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Control Voltage (ON)	VCONT	-0.2	0	+0.2	V
Control Voltage (OFF)	VCONT	-5.3	-3.0	-2.7	V
Input Power (Vcont = -5 V)	Pin			+35	dBm
Input Power (Vcont = −3 V)	Pin			+33	dBm

ELECTRICAL CHARACTERISTICS

(UNLESS OTHERWISE SPECIFIED TA = 25 °C, VCONT = -3 V/0 V, f = 100 MHz to 1 GHz)

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Insertion Loss 1	LINS1			0.55	0.75	dB
Insertion Loss 2	L _{INS2}	f = 2.0 GHz		0.65	0.90	dB
Insertion Loss 3	LINS3	f = 2.5 GHz		0.8 ^{Note 1}		dB
Isolation 1	I _{SL1}		25	30		dB
Isolation 2	I _{SL2}	f = 2.0 GHz	18	20		dB
Input Return Loss	RLin	f = 100 M to 2 GHz	11			dB
Output Return Loss	RLout		11			dB
Input Power at 1 dB	Pin (1 dB)	f = 500 M to 2 GHz	+32	+34		dBm
Compression Point	Note 2	f = 500 M to 2 GHz, VCONT = -5 V/0 V	+34	+38		dBm
Switching Speed	tsw			10		ns
Control Current	Ісонт	Vcont = -5 V/0 V			5	μΑ

Notes 1. Characteristic for reference at 2.0 to 2.5 GHz.

2. P_{in} (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.

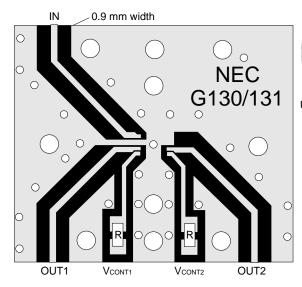
NOTE ON CORRECT USE

- 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 pattarn of substrate should be as shorter as possible to avoid parasitic parameters.



[μPG138GV]

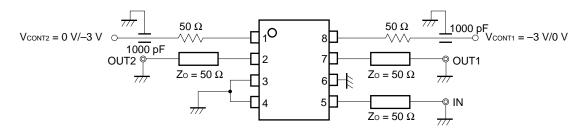
TEST BOARD



 $\begin{pmatrix} 0.4 \text{ mm} \\ \text{thickness} \\ \text{teflon glass} \end{pmatrix}$ $R = 50 \Omega$

Using the same board that of μ PG130/131G

TEST CIRCUIT





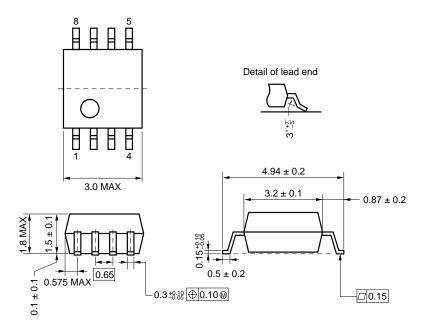
[μPG138GV]

TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE

		Vcont1			
		0 V	−3 V		
VCONT2	0 V	OUT1 OUT2	IN OUT1 OUT2		
	−3 V	OUT1	IN — 0 0UT1 0— OUT2		

PACKGE DIMENSIONS

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





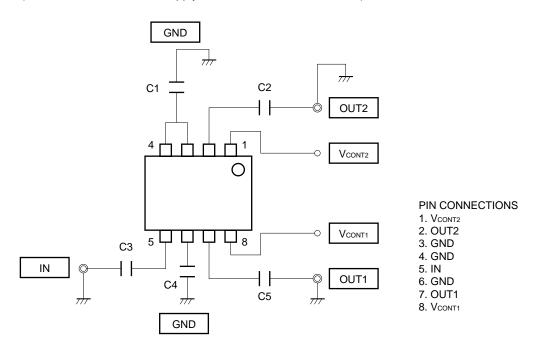
Floating the μ PG138GV

It is possible to use the μ PG138GV 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 μ PG138GV 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 $\mu PG138GV$ for wide band application.

(Floating the μ PG138GV with +3 V/0 V supply at 2 GHz-band, BW \leq 50 MHz)



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.

[μPG138GV]

Soldering process	Soldering conditions	Recommended condition symbol
Infrared ray reflow	Package peak temperature: 235 °C Hour: within 30 s. (more than 210 °C) Time: 3 times, Limited days: no. Note	IR35-00-3
VPS	Package peak temperature: 215 °C Hour: within 40 s. (more than 200 °C) Time: 3 times, Limited days: no. Note	VP15-00-3
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).

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 law concerned.

Keep the law concerned and so on, especially in case of removal.

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- 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.

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