

### L-BAND VCO LOCAL BUFFER AMPLIFIER

#### DESCRIPTION

The  $\mu$ PG2304TK is GaAs HBT MMIC for VCO local buffer amplifier which were developed for mobile phone and another L-band application.

This device realizes excellent performance by using InGaP HBT. This device is housed in a 6-pin lead-less minimold package (1511). And this package is able to high-density surface mounting.

#### FEATURES

- Operation frequency :  $f_{opt1}$  = 679 to 768 MHz (720 MHz TYP.)  
:  $f_{opt2}$  = 1 270 to 1 371 MHz (1 320 MHz TYP.)
- Supply voltage :  $V_{CC}$  = 2.7 to 2.9 V (2.8 V TYP.)
- Low current consumption :  $I_{CC}$  = 3.5 mA TYP. @  $V_{CC}$  = 2.8 V
- Excellent isolation :  $ISL_1$  = 40 dB TYP. @  $f_{opt1}$  = 720 MHz,  $P_{in}$  = -4 dBm,  $V_{CC}$  = 2.8 V  
:  $ISL_2$  = 35 dB TYP. @  $f_{opt2}$  = 1 320 MHz,  $P_{in}$  = -4 dBm,  $V_{CC}$  = 2.8 V
- High-density surface mounting : 6-pin lead-less minimold package (1.5 × 1.1 × 0.55 mm)

#### APPLICATION

- VCO Buffer Amplifier etc.

#### ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
$\mu$ PG2304TK-E2	6-pin lead-less minimold (1511)	G3F	<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>

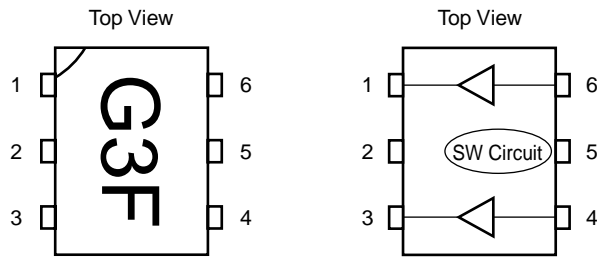
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PG2304TK

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

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.  
Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

**PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM**



Pin No.	Pin Name
1	OUTPUT2 (1.5 GHz) / V <sub>CC</sub>
2	GND
3	OUTPUT1 (800 MHz) / V <sub>CC</sub>
4	INPUT1 (800 MHz)
5	N.C.
6	INPUT2 (1.5 GHz) / V <sub>SW</sub>

**TRUTH TABLE**

	V <sub>SW</sub> = 0 V	V <sub>SW</sub> = 2.8 V
INPUT1 - OUTPUT1	High	Low
INPUT2 - OUTPUT2	Low	High

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>CC</sub>	4.0	V
Switch Voltage	V <sub>SW</sub>	4.0	V
Input Power	P <sub>in</sub>	+10	dBm
Power Dissipation	P <sub>D</sub>	125 <sup>Note</sup>	mW
Operating Ambient Temperature	T <sub>A</sub>	-30 to +85	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C
Circuit Current	I <sub>CC</sub>	15	mA
Control Current	I <sub>SW</sub>	0.3	mA

**Note** Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T<sub>A</sub> = +85°C

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

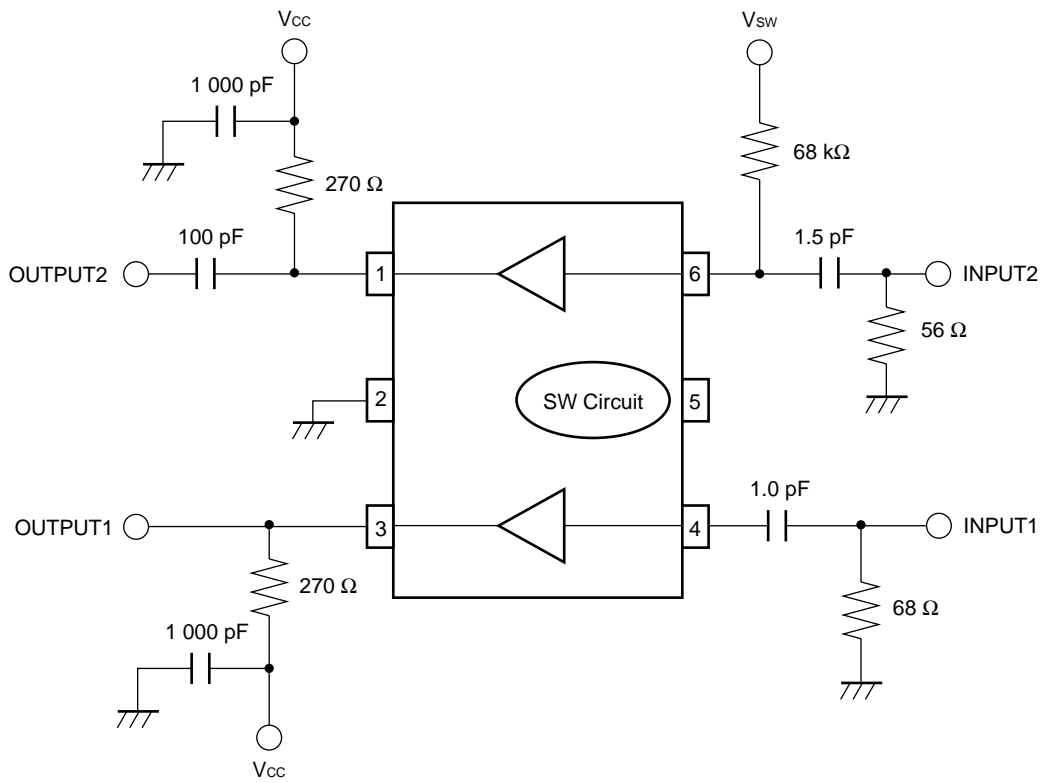
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency 1	f <sub>opt1</sub>	679	720	768	MHz
Operating Frequency 2	f <sub>opt2</sub>	1 270	1 320	1 371	MHz
Supply Voltage	V <sub>CC</sub>	2.7	2.8	2.9	V
Switch Voltage 1	V <sub>SW1</sub>	2.7	2.8	2.9	V
Switch Voltage 2	V <sub>SW2</sub>	0	-	0.5	V

**ELECTRICAL CHARACTERISTICS**

(T<sub>A</sub> = +25°C, V<sub>CC</sub> = 2.8 V, P<sub>in</sub> = -4 dBm, External input and output matching, unless otherwise specified)

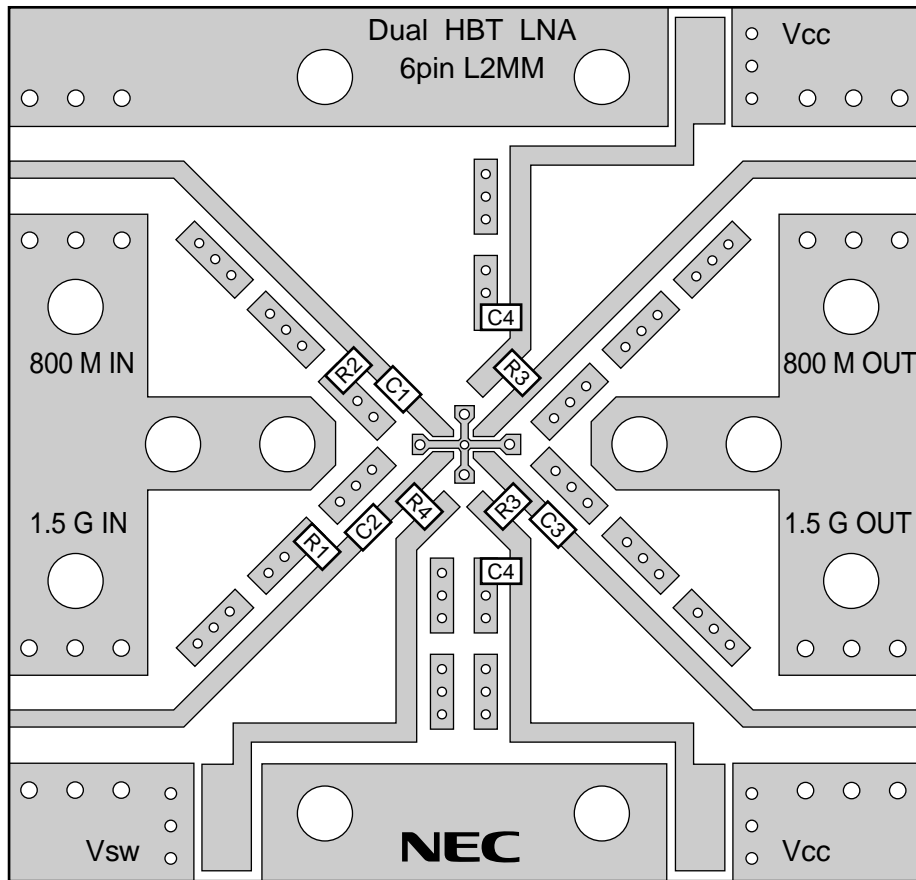
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current 1	I <sub>CC1</sub>	V <sub>SW</sub> = 0 V	-	3.5	4.0	mA
Circuit Current 2	I <sub>CC2</sub>	V <sub>SW</sub> = 2.8 V	-	3.5	4.0	mA
Power Gain 1	G <sub>P1</sub>	V <sub>SW</sub> = 0 V, f = 720 MHz	-2	0	+2	dB
Power Gain 2	G <sub>P2</sub>	V <sub>SW</sub> = 2.8 V, f = 1 320 MHz	-2	0	+2	dB
Input Return Loss 1	RL <sub>in1</sub>	V <sub>SW</sub> = 0 V, f = 720 MHz	-	10	-	dB
Input Return Loss 2	RL <sub>in2</sub>	V <sub>SW</sub> = 2.8 V, f = 1 320 MHz	-	10	-	dB
Output Return Loss 1	RL <sub>out1</sub>	V <sub>SW</sub> = 0 V, f = 720 MHz	-	5	-	dB
Output Return Loss 2	RL <sub>out2</sub>	V <sub>SW</sub> = 2.8 V, f = 1 320 MHz	-	5	-	dB
Isolation 1	ISL <sub>1</sub>	V <sub>SW</sub> = 0 V, f = 720 MHz	30	40	-	dB
Isolation 2	ISL <sub>2</sub>	V <sub>SW</sub> = 2.8 V, f = 1 320 MHz	30	35	-	dB
Noise Figure 1	NF <sub>1</sub>	V <sub>SW</sub> = 0 V, f = 720 MHz	-	8.5	9.5	dB
Noise Figure 2	NF <sub>2</sub>	V <sub>SW</sub> = 2.8 V, f = 1 320 MHz	-	7.0	8.0	dB

EVALUATION CIRCUIT ( $V_{CC} = 2.8 \text{ V}$ ,  $P_{in} = -4 \text{ dBm}$ )



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



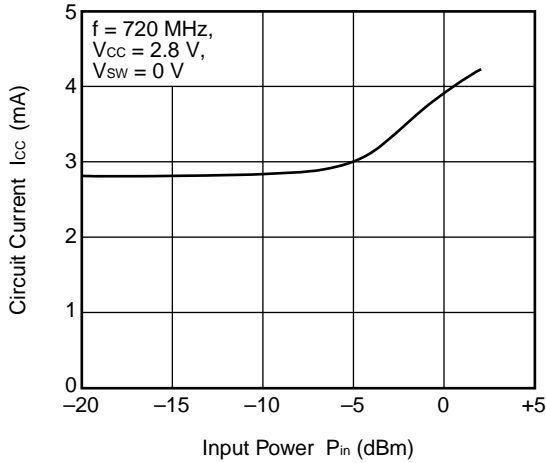
USING THE NEC EVALUATION BOARD

Symbol	Values	Part Number	Maker
R1	56 Ω	RR0816P-560-D	Susumu
R2	68 Ω	RR0816P-680-D	Susumu
R3	270 Ω	RR0816P-271-D	Susumu
R4	68 kΩ	RR0816P-683-D	Susumu
C1	1 pF	GRM39CH010C50PB	muRata
C2	1.5 pF	GRM39CH1R5C50PB	muRata
C3	100 pF	GRM39CH101J50PB	muRata
C4	1 000 pF	GRM39CH102J25PB	muRata

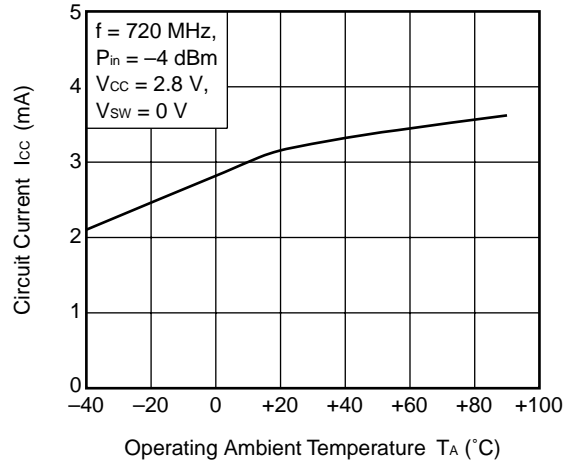
TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, unless otherwise specified)

INPUT1 - OUTPUT1

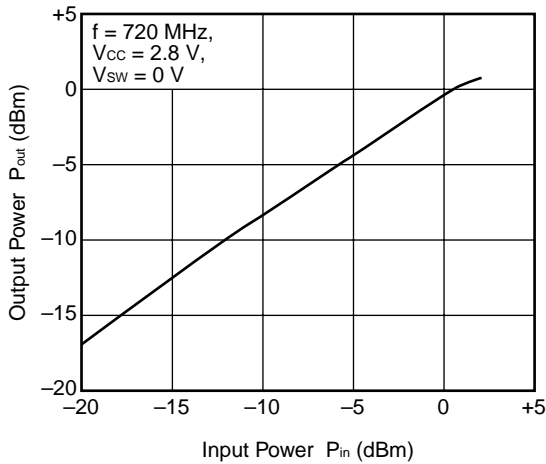
CIRCUIT CURRENT vs. INPUT POWER



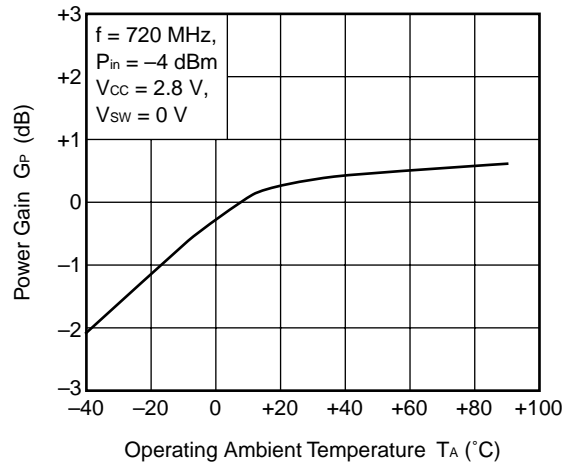
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



OUTPUT POWER vs. INPUT POWER



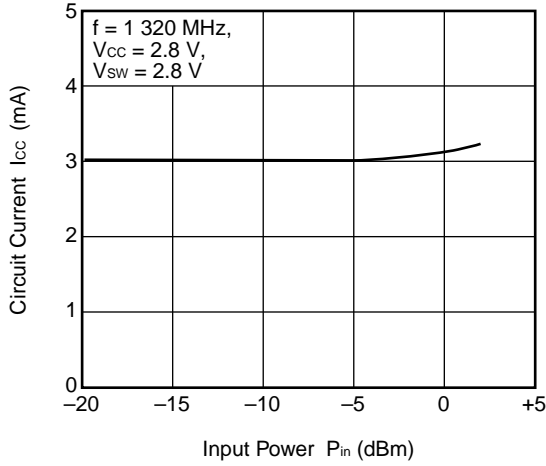
POWER GAIN vs. OPERATING AMBIENT TEMPERATURE



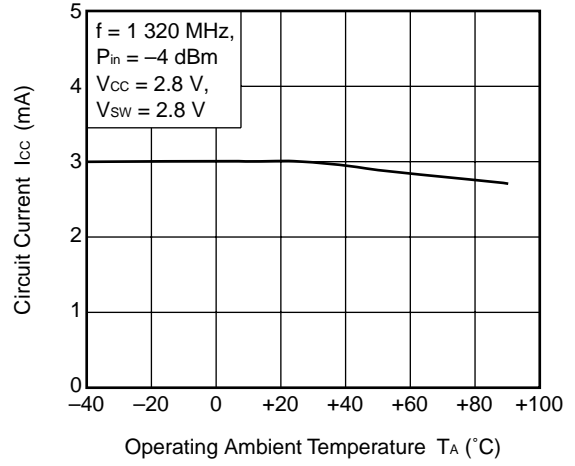
**Remark** The graphs indicate nominal characteristics.

INPUT2 - OUTPUT2

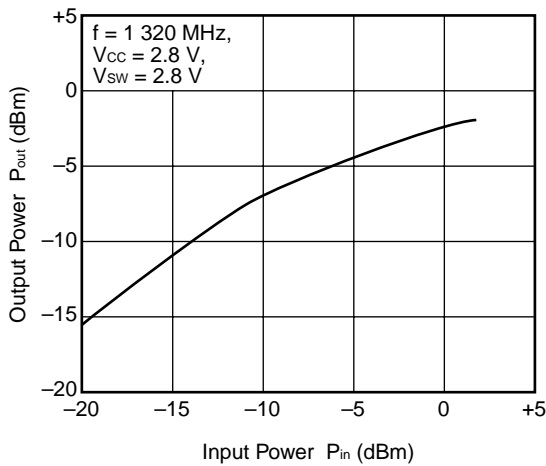
CIRCUIT CURRENT vs. INPUT POWER



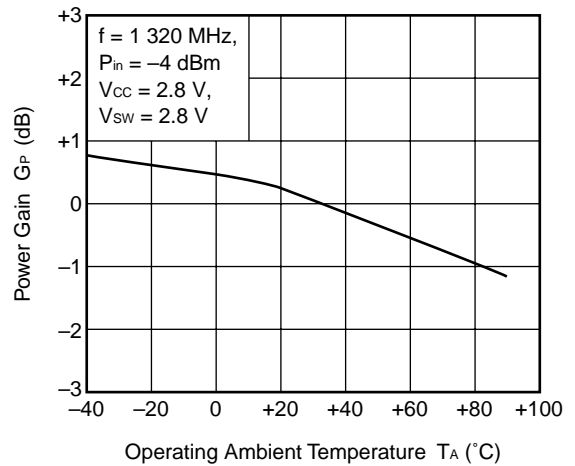
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



OUTPUT POWER vs. INPUT POWER



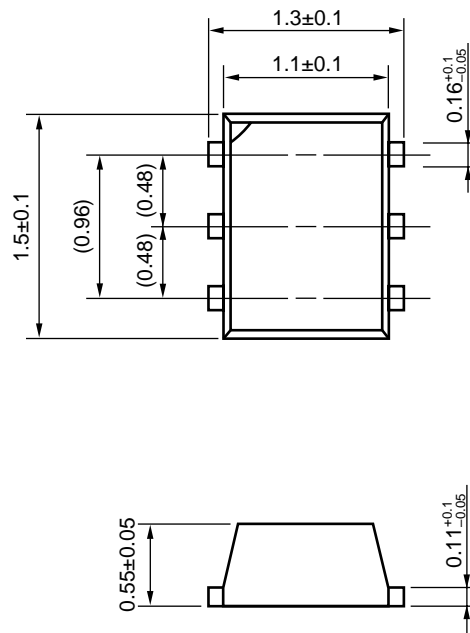
POWER GAIN vs. OPERATING AMBIENT TEMPERATURE



**Remark** The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

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



Remark ( ) : Reference value

**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	IR260
VPS	Peak temperature (package surface temperature) : 215°C or below Time at temperature of 200°C or higher : 25 to 40 seconds Preheating time at 120 to 150°C : 30 to 60 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	VP215
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	WS260
Partial Heating	Peak temperature (pin 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	HS350

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

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M8E 00.4-0110

**SAFETY INFORMATION ON THIS PRODUCT**

<p><b>Caution</b></p>	<p>GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> <li>• Do not destroy or burn the product.</li> <li>• Do not cut or cleave off any part of the product.</li> <li>• Do not crush or chemically dissolve the product.</li> <li>• Do not put the product in the mouth.</li> </ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
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► **Business issue**

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► **Technical issue**

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