NEC

GaAs HBT INTEGRATED CIRCUIT

μPG2304TK

L-BAND VCO LOCAL BUFFER AMPLIFIER

DESCRIPTION

The μPG2304TK 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
μPG2304TK-E2	6-pin lead-less minimold (1511)	G3F	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 5 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPG2304TK

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

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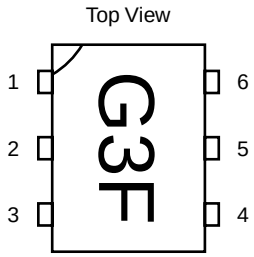
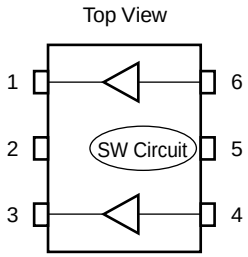
PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM





Pin No.	Pin Name
1	OUTPUT2 (1.5 GHz) / V_{CC}
2	GND
3	OUTPUT1 (800 MHz) / V_{CC}
4	INPUT1 (800 MHz)
5	N.C.
6	INPUT2 (1.5 GHz) / V_{SW}

TRUTH TABLE

	V_{SW} = 0 V	V_{SW} = 2.8 V
INPUT1 - OUTPUT1	High	Low
INPUT2 - OUTPUT2	Low	High

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{CC}	4.0	V
Switch Voltage	V_{SW}	4.0	V
Input Power	P_{in}	+10	dBm
Power Dissipation	P_D	125 Note	mW
Operating Ambient Temperature	T_A	–30 to +85	°C
Storage Temperature	T_{stg}	–65 to +150	°C
Circuit Current	I_{CC}	15	mA
Control Current	I_{SW}	0.3	mA

Note Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C

RECOMMENDED OPERATING RENGE (T_A = +25°C)

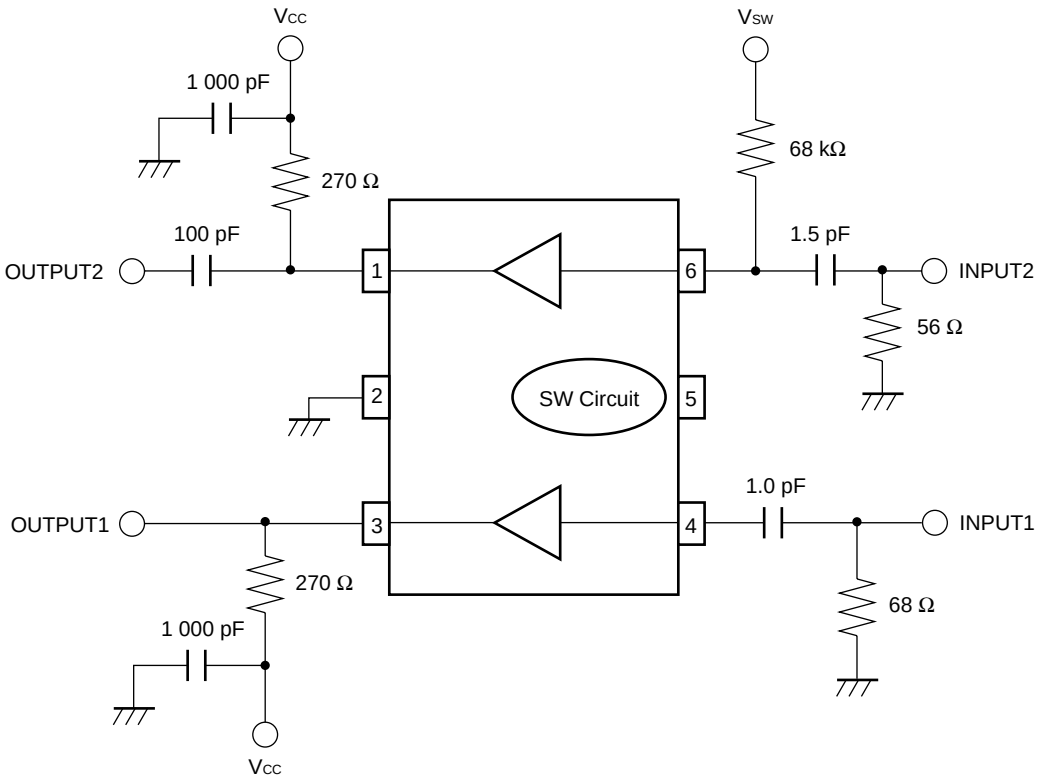
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency 1	f_{opt1}	679	720	768	MHz
Operating Frequency 2	f_{opt2}	1 270	1 320	1 371	MHz
Supply Voltage	V_{CC}	2.7	2.8	2.9	V
Switch Voltage 1	V_{SW1}	2.7	2.8	2.9	V
Switch Voltage 2	V_{SW2}	0	–	0.5	V

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{CC} = 2.8 V, P_{in} = –4 dBm, External input and output matching, unless otherwise specified)

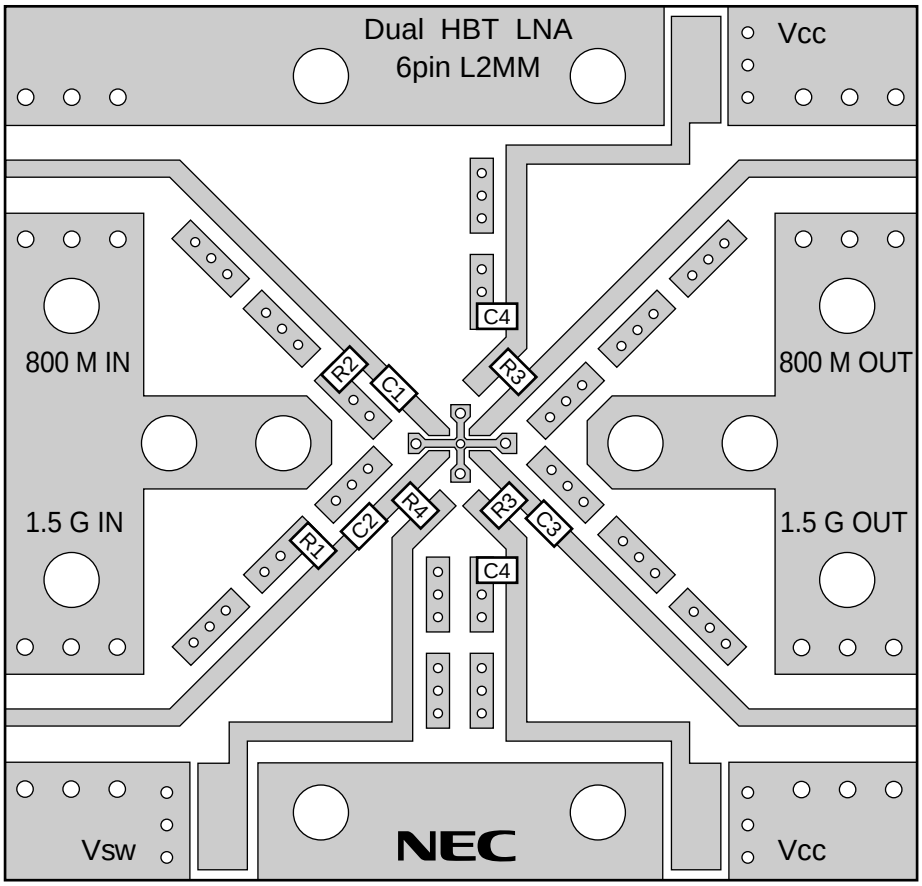
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current 1	I_{CC1}	V_{SW} = 0 V	–	3.5	4.0	mA
Circuit Current 2	I_{CC2}	V_{SW} = 2.8 V	–	3.5	4.0	mA
Power Gain 1	G_{P1}	V_{SW} = 0 V, f = 720 MHz	–2	0	+2	dB
Power Gain 2	G_{P2}	V_{SW} = 2.8 V, f = 1 320 MHz	–2	0	+2	dB
Input Return Loss 1	RL_{in1}	V_{SW} = 0 V, f = 720 MHz	–	10	–	dB
Input Return Loss 2	RL_{in2}	V_{SW} = 2.8 V, f = 1 320 MHz	–	10	–	dB
Output Return Loss 1	RL_{out1}	V_{SW} = 0 V, f = 720 MHz	–	5	–	dB
Output Return Loss 2	RL_{out2}	V_{SW} = 2.8 V, f = 1 320 MHz	–	5	–	dB
Isolation 1	ISL_1	V_{SW} = 0 V, f = 720 MHz	30	40	–	dB
Isolation 2	ISL_2	V_{SW} = 2.8 V, f = 1 320 MHz	30	35	–	dB
Noise Figure 1	NF_1	V_{SW} = 0 V, f = 720 MHz	–	8.5	9.5	dB
Noise Figure 2	NF_2	V_{SW} = 2.8 V, f = 1 320 MHz	–	7.0	8.0	dB

EVALUATION CIRCUIT (V_{CC} = 2.8 V, P_{in} = –4 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



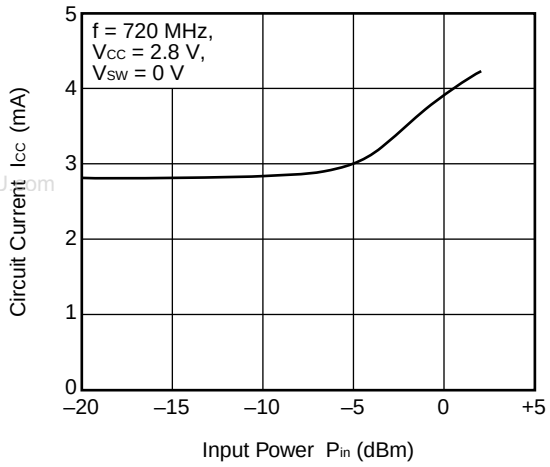
USING THE NEC EVALUATION BOARD

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

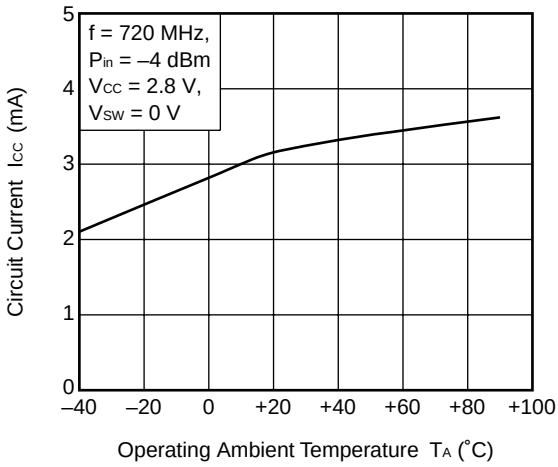
TYPICAL CHARACTERLISTICS (T_A = +25°C, unless otherwise specified)

INPUT1 - OUTPUT1

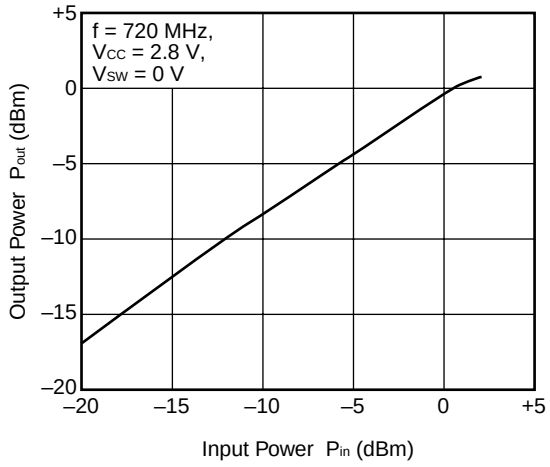
CIRCUIT CURRENT vs. INPUT POWER



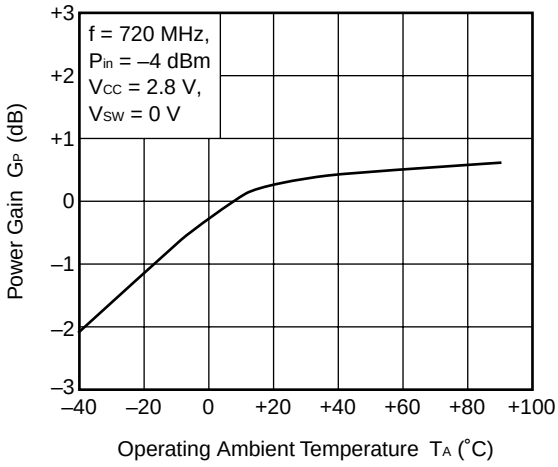
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



OUTPUT POWER vs. INPUT POWER



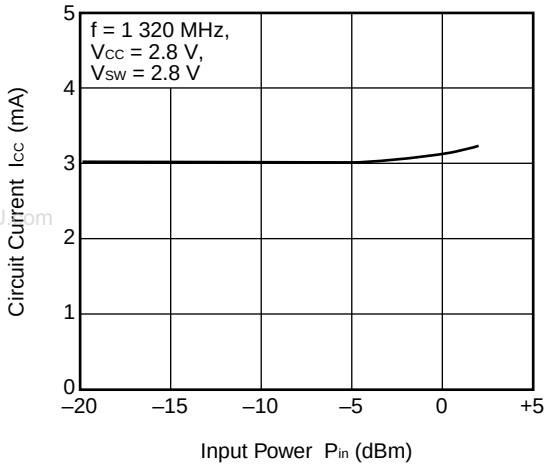
POWER GAIN vs. OPERATING AMBIENT TEMPERATURE



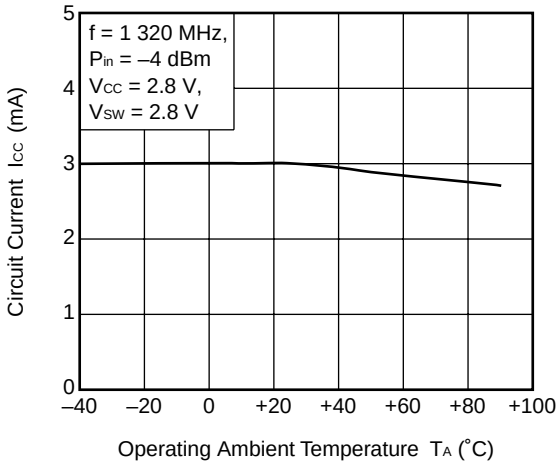
Remark The graphs indicate nominal characteristics.

INPUT2 - OUTPUT2

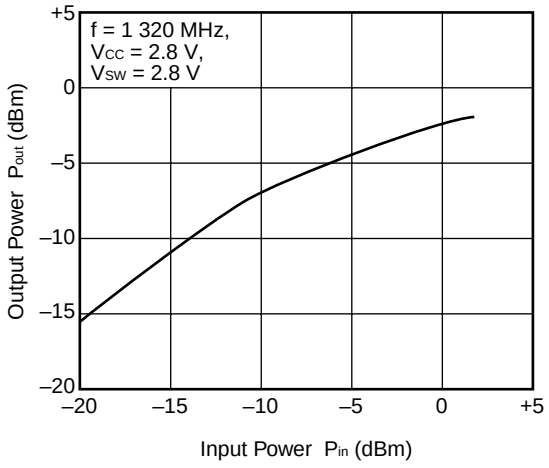
CIRCUIT CURRENT vs. INPUT POWER



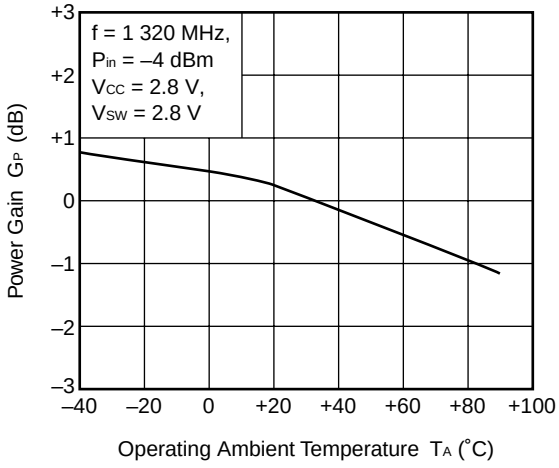
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



OUTPUT POWER vs. INPUT POWER



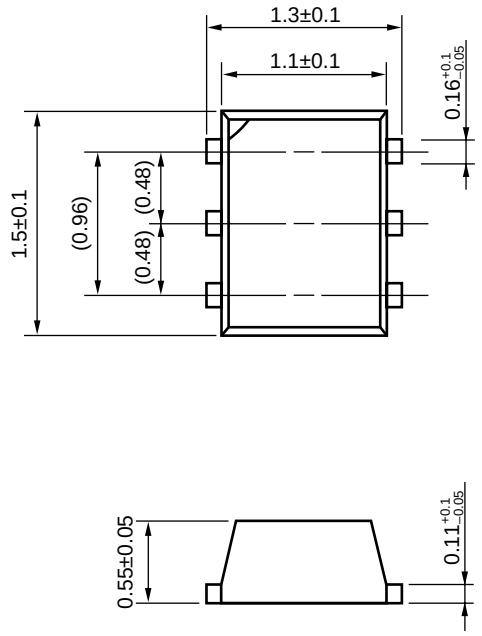
POWER GAIN vs. OPERATING AMBIENT TEMPERATURE



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) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
VPS	Peak temperature (package surface temperature) Time at temperature of 200°C or higher Preheating time at 120 to 150°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 215°C or below : 25 to 40 seconds : 30 to 60 seconds : 3 times : 0.2%(Wt.) or below	VP215
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

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

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