PRELIMINARY DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC8204TK

VARIABLE GAIN AMPLIFIER FOR TRANSMITTER AGC

DESCRIPTION

The μPC8204TK is a silicon monolithic integrated circuit designed as variable gain amplifier. The package is 6-pin lead-less minimold suitable for surface mount.

This IC is manufactured using our 30 GHz f_{max} UHS0 (Ultra High Speed Process) silicon bipolar process.

This IC is as same circuit current as conventional μPC8119T and μPC8120T, but operates at higher frequency and wider gain control range.

FEATURES

- Gain control range : GCR = 40 dB TYP. @ f = 1.9 GHz
  : GCR = 40 dB TYP. @ f = 2.4 GHz
- Maximum power gain : G_{PMAX} = 14.5 dB TYP. @ f = 1.9 GHz
  : G_{PMAX} = 14.0 dB TYP. @ f = 2.4 GHz
- Operating frequency : f = 0.8 to 2.5 GHz
- Supply voltage : V_{CC} = 2.7 to 3.3 V
- High-density surface mounting : 6-pin lead-less minimold package

APPLICAION

- 0.8 to 2.5 GHz transmitter/receiver system (PHS, WLAN and so on)

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPC8204TK-E2	6-pin lead-less minimold (1511)	6E	• 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: μPC8204TK

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

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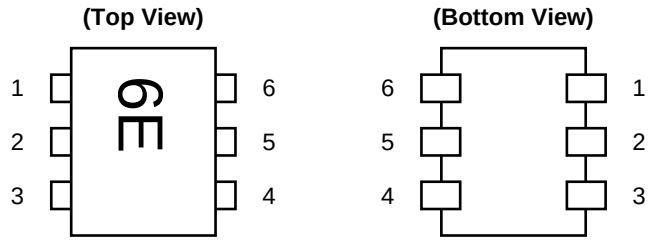
PIN CONNECTIONS



Pin No.	Pin Name
1	INPUT
2	GND
3	GND
4	OUTPUT
5	V_{CC}
6	V_{AGC}

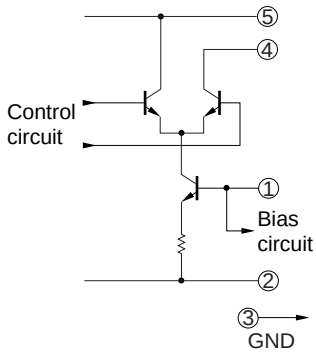
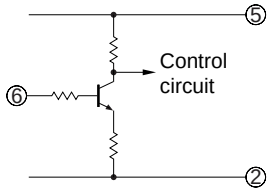
VARIABLE GAIN AMPLIFIER PRODUCT LINE-UP

Parameter / Part No.	I_{CC} (mA)	0.95 GHz output port matching frequency			1.44 GHz output port matching frequency			1.9 GHz output port matching frequency			2.4 GHz output port matching frequency		
		G_{PMAX} (dB)	GCR (dB)	NF (dB)	G_{PMAX} (dB)	GCR (dB)	NF (dB)	G_{PMAX} (dB)	GCR (dB)	NF (dB)	G_{PMAX} (dB)	GCR (dB)	NF (dB)
μPC8204TK	11.5	–	–	–	–	–	–	14.5	40	7.5	14.0	40	7.5
μPC8119T	11.0	12.5	50	8.5	13.0	45	7.5	(12.5)	(22)	(7.2)	–	–	–
μPC8120T	11.0	13.0	50	9.0	13.5	45	7.5	(13.0)	(22)	(7.3)	–	–	–

Remarks 1. Typical performance. Please refer to **ELECTRICAL CHARACTERISTICS** in detail. ( ): reference.

2. To know the associated product, please refer to each latest data sheet.

PIN EXPLANATION

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (V) Note	Function and Applications	Internal Equivalent Circuit
1	INPUT	–	1.2	RF input pin. This pin should be coupled with capacitor (example 100 pF) for DC cut. Input return loss can be improved with external impedance matching circuit.	
2 3	GND	0	–	Ground pin. This pin should be connected to system ground with minimum inductance. Ground pa- ttern on the board should be formed as wide as possible. Ground pins must be connected together with wide ground pattern to decrease impedance difference.	
4	OUTPUT	Voltage as same as V_{CC} through external inductor	–	RF output pin. This pin is de-signed as open collector of high impedance. This pin must be externally equipped with matching circuits.	
5	V_{CC}	2.7 to 3.3	–	Supply voltage pin. This pin must be equipped with bypass capacitor (example 1 000 pF) to minimize its RF impedance.	———
6	V_{AGC}	0 to 3.3	–	Gain control pin.	

Note Pin voltage is measured at V_{CC} = 3.0 V

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C, Pin 4, 5	3.6	V
Total Circuit Current	I_{CC}	T_A = +25°C	30	mA
Gain Control Voltage	V_{AGC}	T_A = +25°C	3.6	V
Power Dissipation	P_D	T_A = +85°C **Note**	203	mW
Operating Ambient Temperature	T_A		–40 to +85	°C
Storage Temperature	T_{stg}		–55 to +150	°C
Input Power	P_{in}		+5	dBm

Note Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB

RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Supply Voltage	V_{CC}	2.7	3.0	3.3	V	Same voltage should be applied to pin 4 and pin 5.
Operating Ambient Temperature	T_A	–40	+25	+85	°C	
Operating Frequency Range	f_{in}	0.8	–	2.5	GHz	With external output-matching
Gain Control Voltage	V_{AGC}	0	–	3.3	V	

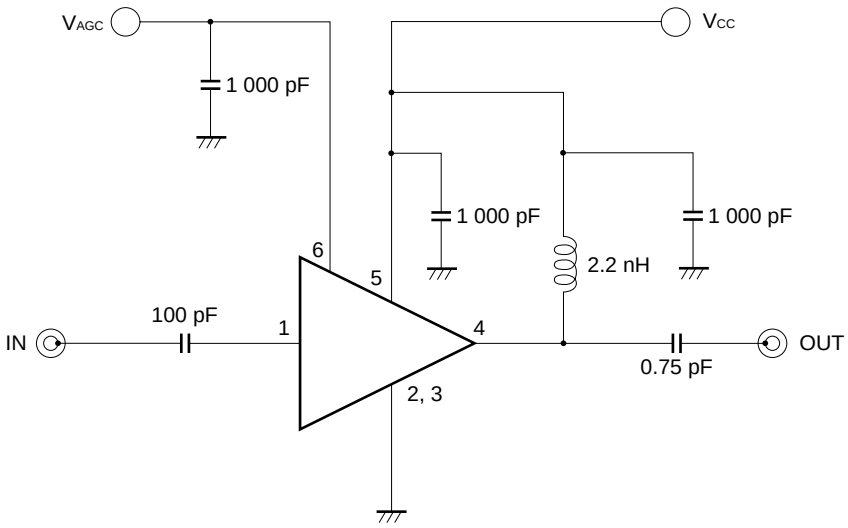
ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{CC} = V_{out} = 3.0 V, Z_S = Z_L = 50 Ω, external matched output port, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No signal	8.5	11.5	15.0	mA
Maximum Power Gain	G_{PMAX}	f = 1.9 GHz, P_{in} = –20 dBm	11.5	14.5	17.5	dB
		f = 2.4 GHz, P_{in} = –20 dBm	11.0	14.0	17.0	
Gain Control Range **Note**	GCR	f = 1.9 GHz, P_{in} = –20 dBm	35	40	–	dB
		f = 2.4 GHz, P_{in} = –20 dBm	35	40	–	
Gain 1 dB Compression Output Power	$P_{O(1\ dB)}$	f = 1.9 GHz, G_{PMAX}	+2.0	+5.0	–	dBm
		f = 2.4 GHz, G_{PMAX}	+2.0	+5.0	–	
Input Return Loss	RL_{in}	f = 1.9 GHz, G_{PMAX}	8	11	–	dB
		f = 2.4 GHz, G_{PMAX}	9	13	–	
Isolation	ISL	f = 1.9 GHz, G_{PMAX}	25	30	–	dB
		f = 2.4 GHz, G_{PMAX}	25	30	–	
Noise Figure	NF	f = 1.9 GHz, G_{PMAX}	–	7.5	10.0	dB
		f = 2.4 GHz, G_{PMAX}	–	7.5	10.0	

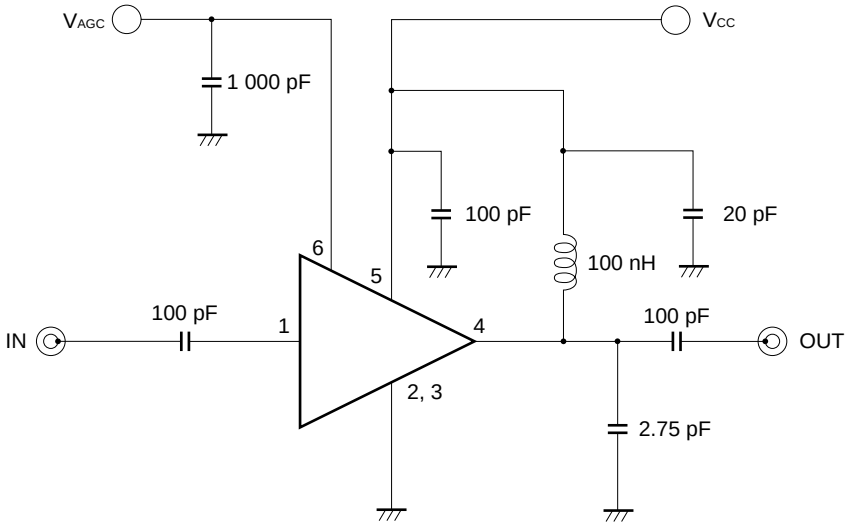
Note Gain control range GCR specification : GCR = G_{PMAX} – G_{PMIN} (dB)
Conditions G_{PMAX}@V_{AGC} = V_{CC}, G_{PMIN}@V_{AGC} = 0 V

TEST CIRCUITS

<1> f = 1.9 GHz

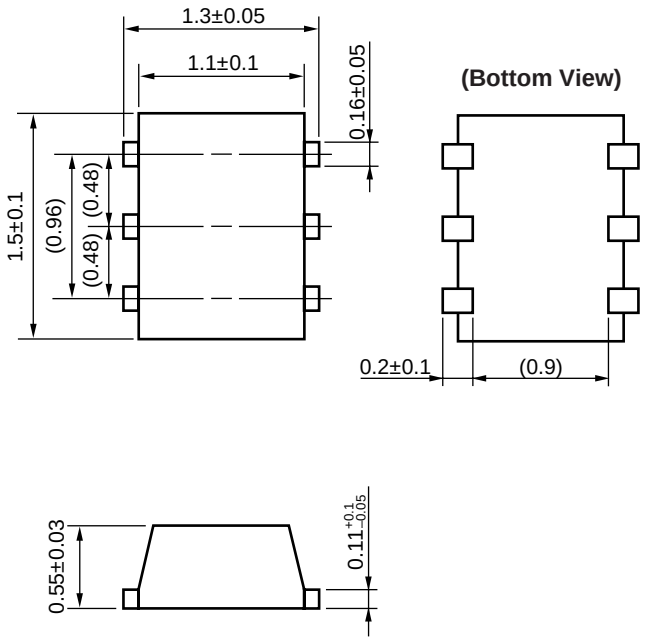


<2> f = 2.4 GHz



PACKAGE DIMENSIONS

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



Remark ( ): reference

NOTES ON CORRECT USE

(1) Observe precautions for handling because of electro-static sensitive devices.

(2) Form a ground pattern as wide as possible to minimize ground impedance (to prevent undesired oscillation). All the ground pins must be connected together with wide ground pattern to decrease impedance difference.

(3) The bypass capacitor should be attached to the V_{CC} pin.

(4) Impedance matching circuit must be each externally attached to input and output ports.

(5) The DC capacitor must be attached to input pin.

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	IR260
	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	
VPS	Peak temperature (package surface temperature)	: 215°C or below	VP215
	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	
Wave Soldering	Peak temperature (molten solder temperature)	: 260°C or below	WS260
	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	
Partial Heating	Peak temperature (pin temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

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

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