



NPN SIGE RF ANALOG INTEGRATED CIRCUIT $\mu PA901TU$

NPN SiGe RF IC IN A 8-PIN LEAD-LESS MINIMOLD

DESCRIPTION

The μ PA901TU is a silicon germanium HBT IC designed for the power amplifier of 5.8 GHz cordless phone and other 5.8 GHz applications. This IC consists of two stage amplifiers and has excellent performance, high efficiency, high gain, low power consumption.

The device is packaged in surface mount 8-pin lead-less minimold plastic package.

The device is fabricated with our SiGe HBT process UHS2-HV technology.

FEATURES

- Output Power : Pout = 19 dBm @ Pin = -3 dBm, VCE = 3.6 V, f = 5.8 GHz
- Low Power : Ic = 90 mA @ P_{in} = -3 dBm, VcE = 3.6 V, f = 5.8 GHz
- Single Power Supply Operation : VCE = 3.6 V
- Built-in bias circuit
- 8-pin lead-less minimold (2.0 × 2.2 × 0.5 mm)

APPLICATIONS

- 5.8 GHz cordless phone
- 5.8 GHz band DSRC (Dedicated Short Range Communication) system
- 5.8 GHz video transmitter

ORDERING INFORMATION

Part Number	Order Number	Quantity	Package	Marking	Supplying Form
μΡΑ901TU	μΡΑ901TU-A	50 pcs (Non reel)	8-pin lead-less	A901	• 8 mm wide embossed taping
μPA901TU-T3	μΡΑ901TU-T3-A	5 kpcs/reel	minimold (Pb-Free)		• Pin 1, Pin 8 face the perforation side of the tape

Remark To order evaluation samples, contact your nearby sales office. The unit sample quantity is 50 pcs.

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

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PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS ($T_A = +25^{\circ}C$)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	Vсво	15	V
Collector to Emitter Voltage	Vceo	4.5	V
Emitter to Base Voltage	Vebo	2	V
Collector Current of Q1	Ic1	75	mA
Collector Current of Q2	Ic2	250	mA
Bias Current	Ibias	25	mA
Total Power Dissipation	Ptot Note	410	mW
Junction Temperature	Tj	150	°C
Storage Temperature	Tstg	-65 to +150	°C
Operating Ambient Temperature	TA	-40 to +85	°C

Note Mounted on $20 \times 20 \times 0.8$ mm (t) glass epoxy PCB (FR-4)

THERMAL RESISTANCE (TA = +25°C)

Parameter	Symbol	Test Conditions	Ratings	Unit
Channel to Ambient Resistance	$R_{th \ (j-a1)}{}^{\text{Note}}$		150	°C/W
	Rth (j-a2)	Free Air	TBD	°C/W

Note Mounted on $20 \times 20 \times 0.8$ mm (t) glass epoxy PCB (FR-4)

RECOMMENDED OPERATING RANGE (All Parameter)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Collector to Emitter Voltage	Vce	-	3.6	4.5	V
Total Current	Itotal	-	90	300	mA
Input Power	Pin	-	-3	+5	dBm

ELECTRICAL CHARACTERISTICS (T_A = +25°C) -DC CHARACTERISTICS-

(1) Q1

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	Ісво	$V_{CB} = 5 V$, $I_E = 0 mA$	-	-	60	nA
Emitter Cut-off Current	Іево	V _{EB} = 1 V, Ic = 0 mA	١	١	120	nA
DC Current Gain		Vce = 3 V, Ic = 6 mA	80	120	160	-
Current Ratio (Ic (set) 1/IBIAS)	CR1	V_{CE} = 3.6 V, V_{BE} = V_{BIAS} = 0.865 V	2	4.5	9	_

(2) Q2

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	Ісво	$V_{CB} = 5 V$, $I_E = 0 mA$	-	-	200	nA
Emitter Cut-off Current	Іево	V _{EB} = 1 V, Ic = 0 mA	-	-	400	nA
DC Current Gain	hfe Note	Vce = 3 V, Ic = 20 mA	80	120	160	_
Current Ratio (Ic (set) 2/IBIAS)	CR2	Vce = 3.6 V, Vbe = Vbias = 0.865 V	8	10	13	-

(3) Bias Circuit

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Bias Circuit Current	BIAS	VBIAS = 0.865 V	-	4	-	mA

Note Pulse measurement: PW \leq 350 μ s, Duty Cycle \leq 2%

IBIAS, IC (set) 1, IC (set) 2 MEASUREMENT CIRCUIT



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

ELECTRICAL CHARACTERISTICS (T_A = +25°C) -RF CHARACTERISTICS-

(1) Q1

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Power Gain (Q1)	S _{21e} ²	V_{CE} = 3.6 V, Ic = 12 mA, f = 5.8 GHz	8.5	10.0	11.5	dB
Maximum Available Power Gain (Q1)	MAG1	$V_{CE} = 3.6 \text{ V}, \text{ Ic} = 12 \text{ mA}, \text{ f} = 5.8 \text{ GHz}$	13.5	15.0	-	dB
Output Power (Q1)	Pout1	$V_{CE} = 3.6 \text{ V}, \text{ Ic } (set) = 12 \text{ mA},$ f = 5.8 GHz, Pin = -3 dBm	10.2	11.2	-	dBm
Collector Current (Q1)	lcc1	$V_{CE} = 3.6 \text{ V}, \text{ Ic }_{(set)} = 12 \text{ mA},$ f = 5.8 GHz, $P_{in} = -3 \text{ dBm}$	-	20	-	mA

(2) Q2

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Power Gain (Q2)	S _{21e} ²	V_{CE} = 3.6 V, Ic = 40 mA, f = 5.8 GHz	2	3.5	5	dB
Maximum Available Power Gain (Q2)	MAG2	V_{CE} = 3.6 V, Ic = 40 mA, f = 5.8 GHz	8.5	10.0	10.5	dB
Output Power (Q2)	Pout2	Vce = 3.6 V, Ic (set) = 40 mA, f = 5.8 GHz, Pin = 11 dBm	17.5	19.0	-	dBm
Collector Current (Q2)	lcc2	$V_{CE} = 3.6 \text{ V}, \text{ Ic }_{(set)} = 40 \text{ mA},$ f = 5.8 GHz, $P_{in} = 11 \text{ dBm}$	-	70	-	mA

(3) Q1 + Q2, 2 stage Amplifiers

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Power	Pout	$\label{eq:Vce} \begin{array}{l} V_{CE} = 3.6 \ V, \ R_{BIAS} = 680 \ \Omega, \\ f = 5.8 \ GHz, \ P_{in} = -3 \ dBm \end{array} \qquad \mbox{Note}$	17.5	19.0	-	mA
Total Current	Itotal		-	90	-	mA

Note by MEASUREMENT CIRCUIT 1

MEASUREMENT CIRCUIT 1



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ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

Remarks

- 1. Substrate : 20 × 20 × 0.8 (t) mm FR-4 (4 Layer, each thickness 0.2 mm), copper thickness 18 µm, gold flash plating
- 2. Back side : GND pattern
- 3. o: Through hole

USING THE NEC EVALUATION BOARD

Symbol	Values	Symbol	Values
R1	680 Ω	C2	0.5 pF
R2	10 Ω	C3	0.5 pF
R3	10 Ω	C4	1.0 pF
R4	10 Ω	C5	0.75 pF
R5	10 Ω	C6	1.0 pF
L1	100 nH	C7	1.0 pF
L2	5.6 nH	C8	1.0 pF
L3	5.6 nH	C9	1.0 pF
L4	12 nH	C10	10 nF
C1	0.75 pF	C11	10 nF

TYPICAL CHARACTERISTICS

(TA = +25°C , VCE = 3.6 V, RBIAS = 680 Ω , f = 5.8 GHz, unless otherwise specified)



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

8-PIN LEAD-LESS MINIMOLD (UNIT: mm)





Remark (): Reference value

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▶ For further information, please contact

NEC Compound Semiconductor Devices, Ltd. http://www.ncsd.necel.com/ E-mail: salesinfo@ml.ncsd.necel.com (sales and general) techinfo@ml.ncsd.necel.com (technical) Sales Division TEL: +81-44-435-1588 FAX: +81-44-435-1579

NEC Compound Semiconductor Devices Hong Kong Limited

E-mail: ncsd-hk@elhk.nec.com.hk (sales, technical and general)

 Hong Kong Head Office
 TEL: +852-3107-7303
 FAX: +852-3107-7309

 Taipei Branch Office
 TEL: +886-2-8712-0478
 FAX: +852-3107-7309

 Korea Branch Office
 TEL: +822-2-558-2120
 FAX: +86-2-2545-3859

 Korea Branch Office
 TEL: +82-2-558-2120
 FAX: +82-2-558-5209

NEC Electronics (Europe) GmbH http://www.ee.nec.de/ TEL: +49-211-6503-0 FAX: +49-211-6503-1327

California Eastern Laboratories, Inc. http://www.cel.com/ TEL: +1-408-988-3500 FAX: +1-408-988-0279