



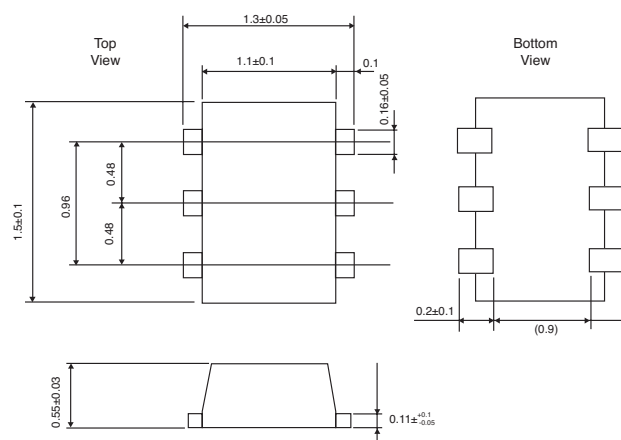
NEC's VARIABLE GAIN AMPLIFIER

UPC8204TK

FEATURES

- **OPERATING FREQUENCY:**
 $f = 0.8 \text{ GHz to } 2.5 \text{ GHz}$
- **MAXIMUM POWER GAIN:**
 $G_{\text{PMAX}} = 14.5 \text{ dB TYP at } f = 1.9 \text{ GHz}$
 $G_{\text{PMAX}} = 14.0 \text{ dB TYP at } f = 2.4 \text{ GHz}$
- **GAIN CONTROL RANGE:**
 $G_{\text{CR}} = 40 \text{ dB TYP at } f = 1.9 \text{ GHz}$
 $G_{\text{CR}} = 40 \text{ dB TYP at } f = 2.4 \text{ GHz}$
- **SUPPLY VOLTAGE:**
 $V_{\text{CC}} = 2.7 \text{ to } 3.3 \text{ V}$
- **HIGH DENSITY SURFACE MOUNTING:**
6-pin Lead-less minimold package

OUTLINE DIMENSIONS (Units in mm)



APPLICATION

- 0.8 GHz to 2.5 GHz transmitter/receiver systems
- PHS/PCS/Mobile Communication
- WLAN
- Cordless Phone
- Fixed Wireless Service

DESCRIPTION

NEC's UPC8204TK 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 NEC's 30 GHz f_{max} UHS0 (Ultra High Speed Process) silicon bipolar process.

This IC has the same circuit current as conventional UPC8119T and UPC8120T, but it operates at higher frequency and features a wider gain control range.

ELECTRICAL CHARACTERISTICS,

(Unless otherwise specified, $T_A = +25^\circ\text{C}$, $V_{\text{CC}} = V_{\text{OUT}} = 3.0 \text{ V}$, $Z_S = Z_L = 50\Omega$, External matched output port)

PART NUMBER PACKAGE OUTLINE			UPC8204TK TK			
SYMBOLS	PARAMETERS AND CONDITIONS		UNITS	MIN	TYP	MAX
I _{CC}	Circuit Current (no signal)		mA	8.5	11.5	15.0
G _{PMAX}	Maximum Power Gain,	f = 1.9 GHz, P _{IN} = -20 dBm f = 2.4 GHz, P _{IN} = -20 dBm	dB	11.5 11.0	14.5 14.0	17.5 17.0
G _{CR}	Gain Control Range (note 1)	f = 1.9 GHz, P _{IN} = -20 dBm f = 2.4 GHz, P _{IN} = -20 dBm	dB	35 35	40 40	— —
P _{o(1dB)}	1 dB Compression Output Power,	f = 1.9 GHz, G _{PMAX} f = 2.4 GHz, G _{PMAX}	dBm	+2.0 +2.0	+5.0 +5.0	— —
R _{LIN}	Input Return Loss,	f = 1.9 GHz, G _{PMAX} f = 2.4 GHz, G _{PMAX}	dB	8 9	11 13	— —
ISL	Isolation,	f = 1.9 GHz, G _{PMAX} f = 2.4 GHz, G _{PMAX}	dB	25 25	30 30	— —
NF	Noise Figure,	f = 1.9 GHz, G _{PMAX} f = 2.4 GHz, G _{PMAX}	dB	— —	7.5 7.5	10.0 10.0

Notes:

1. Gain control range GCR specification:

$G_{\text{CR}} = G_{\text{PMAX}} - G_{\text{PMIN}}$ (dB) Conditions G_{PMAX} at $V_{\text{AGC}} = V_{\text{CC}}$, G_{PMIN} at $V_{\text{AGC}} = 0 \text{ V}$

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CC}	Supply Voltage T _A = 25°C	V	3.6
I _{CC}	Total Circuit Current T _A = 25°C	mW	30
V _{AGC}	Gain Control Voltage T _A = 25°C	V	3.6
P _D	Power Dissipation T _A = 85°C (note)	mW	203
T _A	Operating Ambient Temperature	°C	-40 to +85
T _{STG}	Storage Temperature	°C	-55 to +150
P _{IN}	Input Power	dBm	+5

Notes:

1. Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB (T_A = +85°C).**RECOMMENDED
OPERATING CONDITIONS**

SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{CC}	Supply Voltage	V	2.7	3.0	3.3
T _A	Operating Ambient Temperature	°C	-40	+25	+85
f _{in}	Operating Frequency Range	GHz	0.8	—	2.5
V _{AGC}	Gain Control Voltage	V	0	—	3.3

SERIES PRODUCTS

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)	G _{CR} (dB)	N _F (dB)	G _{PMAX} (dB)	G _{CR} (dB)	N _F (dB)	G _{PMAX} (dB)	G _{CR} (dB)	N _F (dB)	G _{PMAX} (dB)	G _{CR} (dB)	N _F (dB)
UPC8119T	11.0	12.5	50	8.5	13.0	45	7.5	(12.5)	(22)	(7.2)	—	—	—
UPC8120T	11.0	13.0	50	9.0	13.5	45	7.5	(13.0)	(22)	(7.3)	—	—	—
UPC8204TK	11.5	—	—	—	—	—	—	14.0	40	7.5	14.0	35	7.5

Note:

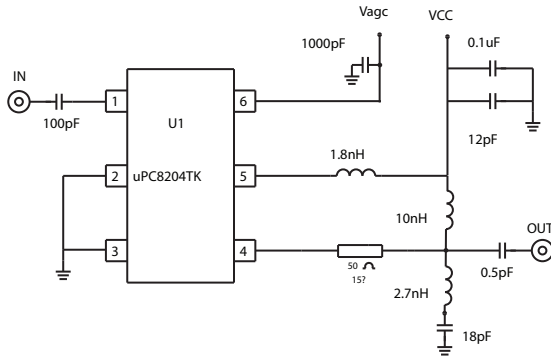
1. Typical performance. Please refer to Electrical Characteristics in detail.

(): Reference

PIN FUNCTIONS

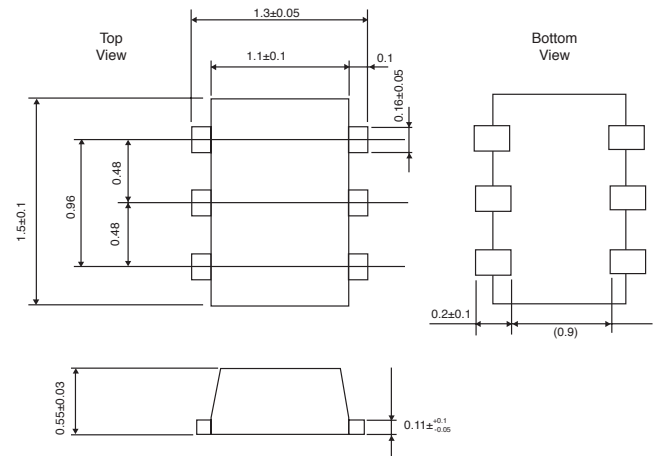
Pin No.	Symbol	Applied Voltage	Pin Voltage	Description	Equivalent Circuit
1	INPUT	—	1.2	RF input pin This pin should be coupled with capacitor (eg 1000 pF) for DC cut. Input return loss can be improved with external impedance matching circuit.	
2 3	GND	0	—	Ground pin. This pin should be connected to system ground with minimum inductance. Ground pattern 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 designed as open collector of high impedance. This pin must be externally equipped with matching circuits.	
5	V _{CC}	2.7~3.3	—	Supply voltage pin. this pin must be equipped with bypass capacitor (eg 1000 pF) to minimize its RF impedance.	
6	V _{AGC}	0~3.3	—	Gain control pin.	

APPLICATION CIRCUIT

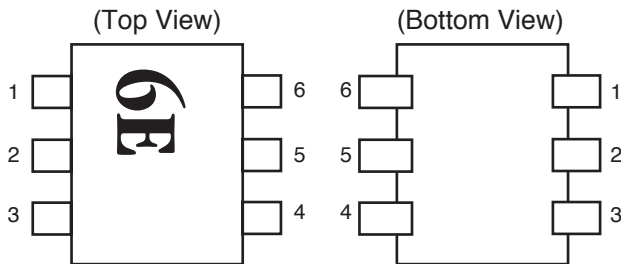
 $f = 2.4 \text{ GHz}$ 

OUTLINE DIMENSIONS (Units in mm)

6-PIN LEAD-LESS MINIMOLD



PIN CONNECTIONS



PIN NO.	PIN NAME
1	INPUT
2	GND
3	GND
4	OUTPUT
5	VCC
6	VAGC

ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKING INFORMATION
UPC8204TK-E2-A	TK	6-pin lead-less minimold

Note:

To order evaluation samples, contact sales office (p/n: UPC8204TK).

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

CEL California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.

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NEC

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

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Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A Not Detected	-AZ (*)
Lead (Pb)	< 1000 PPM		
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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