CEL

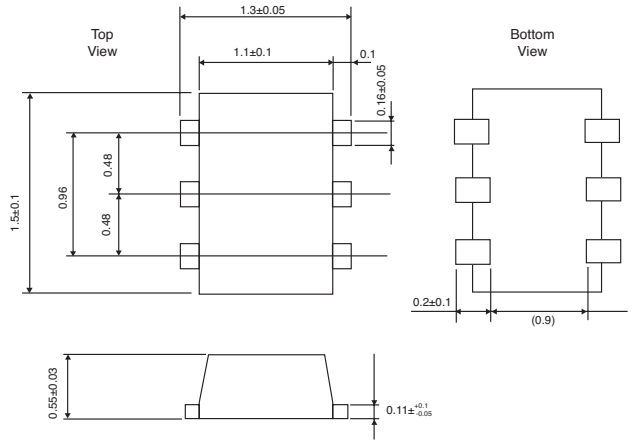
NEC's VARIABLE GAIN AMPLIFIER

UPC8204TK

FEATURES

- **OPERATING FREQUENCY:**
  f = 0.8 GHz to 2.5 GHz
- **MAXIMUM POWER GAIN:**
  G_{PMAX} = 14.5 dB TYP at f = 1.9 GHz
  G_{PMAX} = 14.0 dB TYP at f = 2.4 GHz
- **GAIN CONTROL RANGE:**
  GCR = 40 dB TYP at f = 1.9 GHz
  GCR = 40 dB TYP at f = 2.4 GHz
- **SUPPLY VOLTAGE:**
  V_{CC} = 2.7 to 3.3 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°C, V_{CC} = V_{OUT} = 3.0 V, Z_S = Z_L = 50Ω, 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
GCR	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	– –
RL_{IN}	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:
GCR = G_{PMAX} - G_{PMIN} (dB) Conditions G_{PMAX} at V_{AGC} = V_{CC}, G_{PMIN} at V_{AGC} = 0 V

ABSOLUTE MAXIMUM RATINGS[1] (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

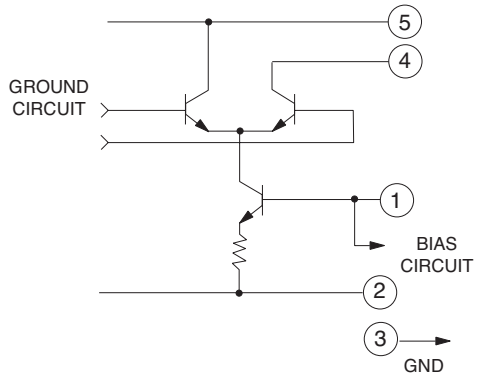
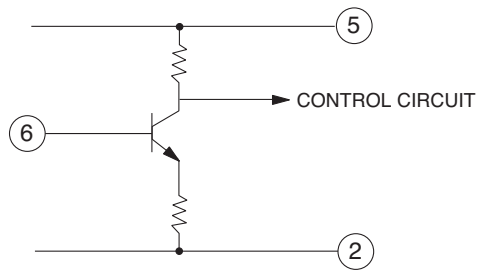
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{CC}	Supply Voltage	V	2.7	3.0	3.3
T_A	Operating Ambient Temperature	°C	-40	+25	+85
f_{in}	Operating Frequency Range	GHz	0.8	–	2.5
V_{AGC}	Gain Control Voltage	V	0	–	3.3

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)	GCR (dB)	NF (dB)	G_{PMAX} (dB)	GCR (dB)	NF (dB)	G_{PMAX} (dB)	GCR (dB)	NF (dB)	G_{PMAX}	GCR	NF
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

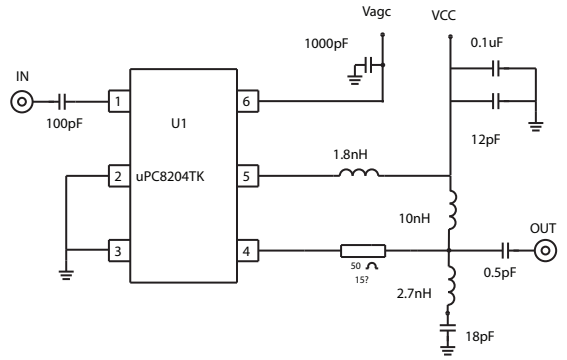
Note:
1. Typical performance. Please refer to Electrical Charateristics in detail.
( ): Reference

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.	

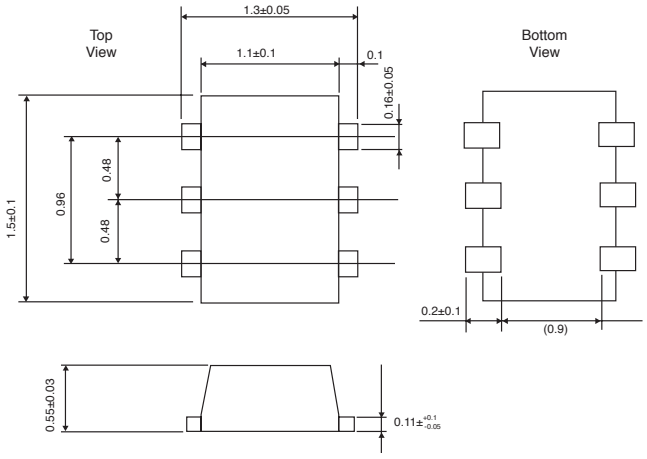
APPLICATION CIRCUIT

f = 2.4 GHz

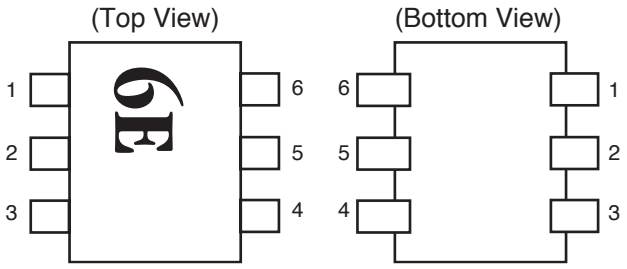


OUTLINE DIMENSIONS (Units in mm)

6-PIN LEAD-LESS MINIMOLD



PIN CONNECTIONS



PIN NO.	PIN NAME
1	INPUT
2	GND
3	GND
4	OUTPUT
5	V_{CC}
6	V_{AGC}

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).

California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.
4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • FAX (408) 988-0279 • **www.cel.com**

CEL California Eastern Laboratories

4590 Patrick Henry Drive
Santa Clara, CA 95054-1817
Telephone: (408) 919-2500
Facsimile: (408) 988-0279

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

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.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

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

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.