



NEC's POWER AMPLIFIER FOR BLUETOOTH™ CLASS 1

UPG2301TQ

FEATURES

- **OPERATION FREQUENCY**
 $f_{opt} = 2,400$ to $2,500$ MHz (2 450 MHz TYP.)
- **SUPPLY VOLTAGE**
 $V_{CC1,2} = V_{bias} = 2.7$ to 3.6 V (3.3 V TYP.)
- **CONTROL VOLTAGE**
 $V_{cont} = 0$ to 3.6 V (2.5 V TYP.)
 $V_{enable} = 0$ to 3.1 V (2.9 V TYP.)
- **CIRCUIT CURRENT**
 $I_{CC} = 120$ mA TYP.@ $V_{CC1,2} = V_{bias} = 3.3$ V, $V_{cont} = 2.5$ V,
 $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm
- **MAXIMUM POWER**
 $P_{out(MAX.)} = +23$ dBm TYP.@ $V_{CC1,2} = V_{bias} = 3.3$ V,
 $V_{cont} = 2.5$ V, $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm
- **GAIN CONTROL RANGE**
 $GCR = 23$ dB TYP.@ $V_{CC1,2} = V_{bias} = 3.3$ V,
 $V_{cont} = 0$ to 2.5 V, $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm
- **POWER GAIN**
 $G_P = 23$ dB TYP.(Reference value)
- **HIGH EFFICIENCY**
 $PAE = 50\%$ TYP.(Reference value)
- **SHUT DOWN FUNCTION**
- **HIGH-DENSITY SURFACE MOUNTING**
10 pin plastic TSON package ($2.4 \times 2.55 \times 0.6$ mm)

DESCRIPTION

NEC's μ PG2301TQ is a GaAs HBT MMIC for power amplifier for Bluetooth Class 1.

This device realizes high efficiency, high gain and high output power by using InGaP HBT. This device is housed in a low profile 10-pin plastic TSON package.

APPLICATION

- **POWER AMPLIFIER FOR BLUETOOTH CLASS 1**
- **WIRELESS LAN**

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $T_A = +25^\circ\text{C}$, $V_{CC1,2} = V_{bias} = 3.3$ V, $f = 2,450$ MHz, External input and output matching)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Circuit Current	I_{CC}	$V_{cont} = 2.5$ V, $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm	110	120	130	mA
Shut Down Current	$I_{shut\ down}$	$V_{cont} = 2.5$ V, $V_{enable} = 0$ V, $P_{in} = +4$ dBm	–	0.1	1.0	μA
Output Power 1	P_{out1}	$V_{cont} = 2.5$ V, $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm	+21	+23	+24.5	dBm
Output Power 2	P_{out2}	$V_{cont} = 0$ V, $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm	–	0	+1	dBm
Gain Control Range	GCR	$V_{cont} = 0$ to 2.5 V, $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm	20	23	–	dB

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $T_A = +25^\circ\text{C}$, $V_{CC1,2} = V_{bias} = 3.3$ V, $f = 2,450$ MHz, External input and output matching)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Efficiency	PAE	$V_{cont} = 2.5$ V, $V_{enable} = 2.9$ V, $P_{in} = +4$ dBm	–	50	–	%
Power Gain	G_P	$V_{cont} = 2.5$ V, $V_{enable} = 2.9$ V, $P_{in} = -5$ dBm	–	23	–	dB

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC1,2}$	5.0	V
	V_{bias}		
Control Voltage	V_{cont}	3.6	V
	V_{enable}		
Circuit Current	I_{cc}	400	mA
Control Current	I_{cont}	0.5	mA
	I_{enable}		
Power Dissipation	P_D	700 ^{Note}	mW
Operating Ambient Temperature	T_A	-40 to +85	°C
Storage Temperature	T_{stg}	-55 to +150	°C
Input Power	P_{in}	+10	dBm

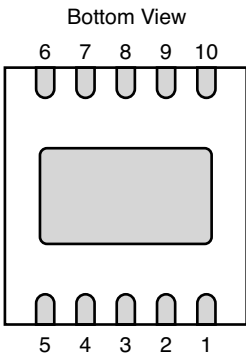
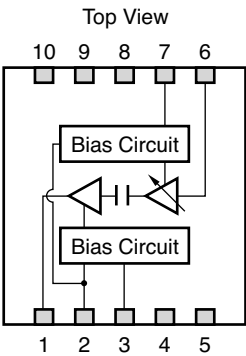
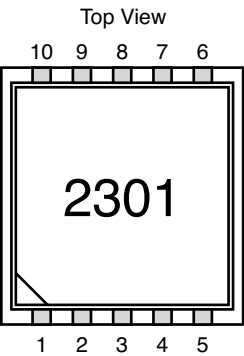
Note Mounted on double copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, $T_A = +85^{\circ}\text{C}$

RECOMMENDED OPERATING RANGE

($T_A = +25^{\circ}\text{C}$)

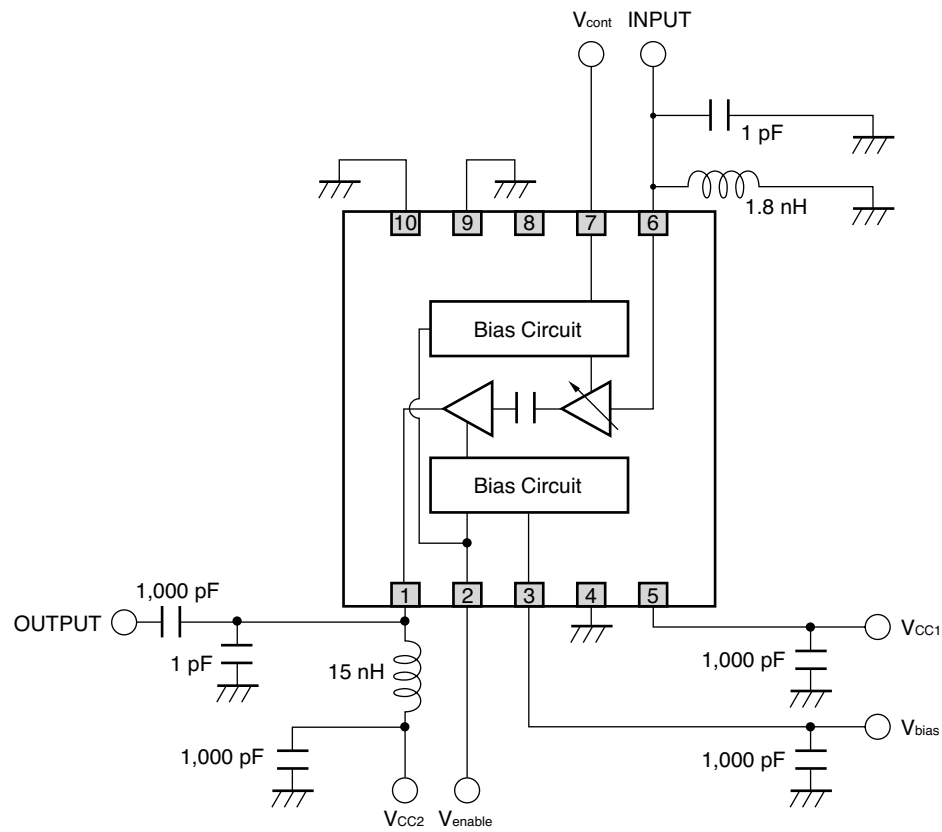
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Frequency	f_{opt}	2,400	2,450	2,500	MHz
Supply Voltage	$V_{CC1,2}$	2.7	3.3	3.6	V
	V_{bias}				
Control Voltage	V_{cont}	0	2.5	3.6	V
	V_{enable}	0	2.9	3.1	

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



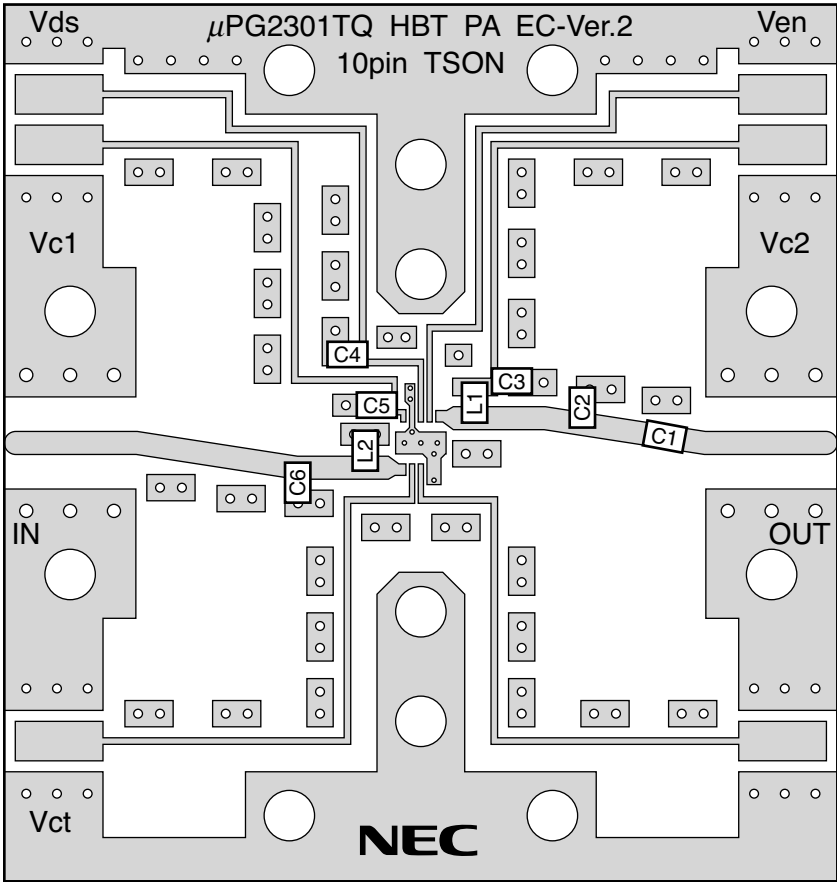
PIN NO.	PIN NAME
1	OUTPUT/ V_{CC2}
2	V_{enable}
3	V_{bias}
4	GND
5	V_{CC1}
6	INPUT
7	V_{cont}
8	N.C.
9	GND
10	GND

ELEVALUATION CIRCUIT ($V_{CC1,2} = V_{bias} = 3.3\text{ V}$, $f = 2,450\text{ MHz}$)



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

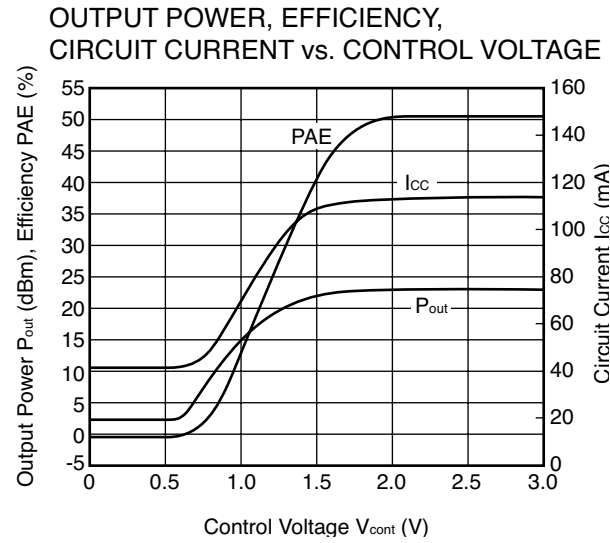


COMPONENT LIST

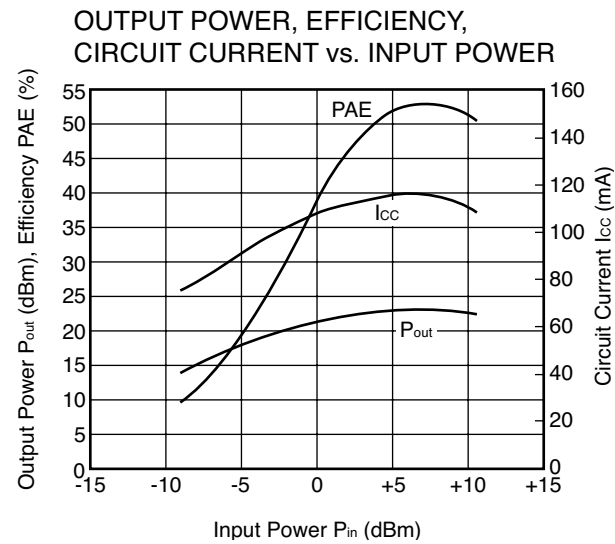
SYMBOL	RATING	PART NUMBER	MANUFACTURER
C1, C3, C4, C5	1,000 pF	GRM39CH102J50	muRata
C2, C6	1 pF	GRM39CH010C50	muRata
L1	15 nH	TFL0816-15N	Susumu
L2	1.8 nH	TFL0816-1N8	Susumu

TYPICAL CHARACTERISTICS

Condition : $f = 2,450 \text{ MHz}$, $V_{CC1} = V_{CC2} = V_{bias} = 3.3 \text{ V}$, $V_{enable} = 2.9 \text{ V}$, $P_{in} = +4 \text{ dBm}$, External input and output matching



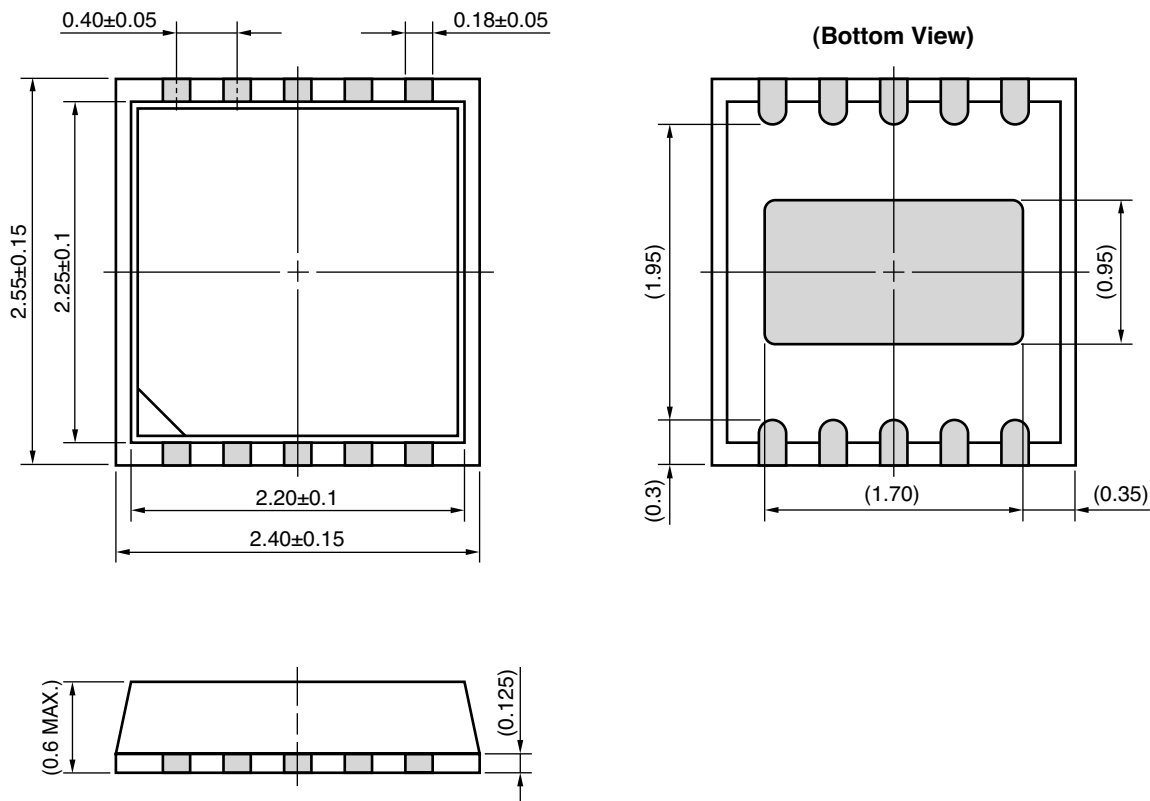
Condition : $f = 2,450 \text{ MHz}$, $V_{CC1} = V_{CC2} = V_{bias} = 3.3 \text{ V}$, $V_{enable} = 2.9 \text{ V}$, $V_{cont} = 2.5 \text{ V}$, External input and output matching



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

10-PIN PLASTIC TSON (UNIT: mm)



Note () : Reference value

ORDERING INFORMATION

PART NUMBER	PACKAGE	MARKING	SUPPLYING FORM
μPG2301TQ-E1-A	10-pin plastic TSON	2301	- Embossed tape 8 mm wide - Pin 5, 6 face the perforation side of the tape - Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.

Part number for sample order: μPG2301TQ

Life Support Applications

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02/04/2004

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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	
		-A	-AZ
Lead (Pb)	< 1000 PPM	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	

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