



# 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  $\mu$ 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	$\mu\text{A}$
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 <sup>Note</sup>	mW
Operating Ambient Temperature	$T_A$	-40 to +85	°C
Storage Temperature	$T_{stg}$	-55 to +150	°C
Input Power	$P_{in}$	+10	dBm

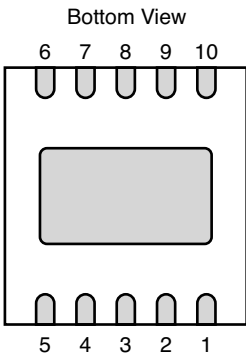
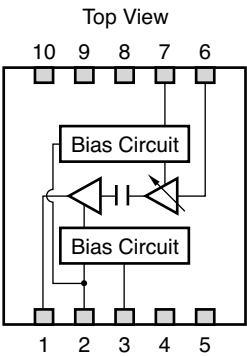
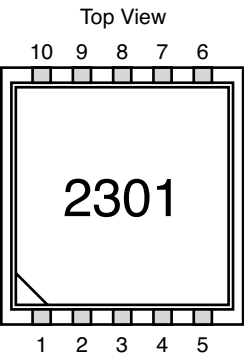
**Note** Mounted on double copper-clad 50 × 50 × 1.6 mm epoxy glass PWB,  $T_A = +85^{\circ}\text{C}$

RECOMMENDED OPERATING RANGE

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

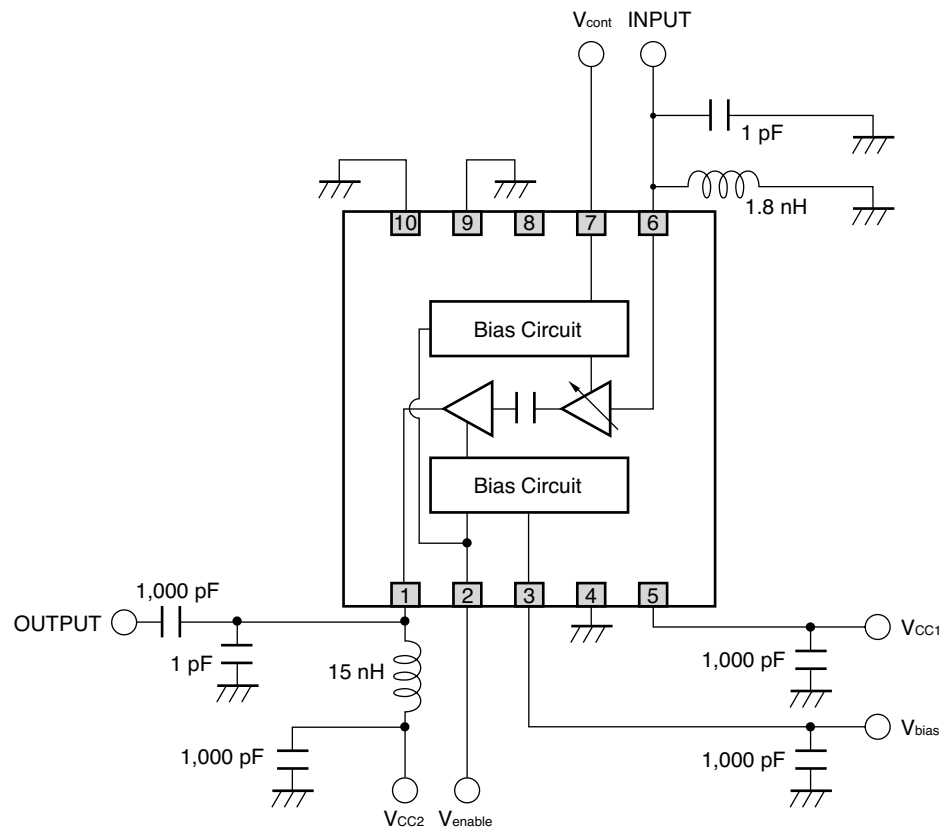
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Frequency	$f_{opt}$	2,400	2,450	2,500	MHz
Supply Voltage	$V_{CC1,2}$	2.7	3.3	3.6	V
	$V_{bias}$				
Control Voltage	$V_{cont}$	0	2.5	3.6	V
	$V_{enable}$	0	2.9	3.1	

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



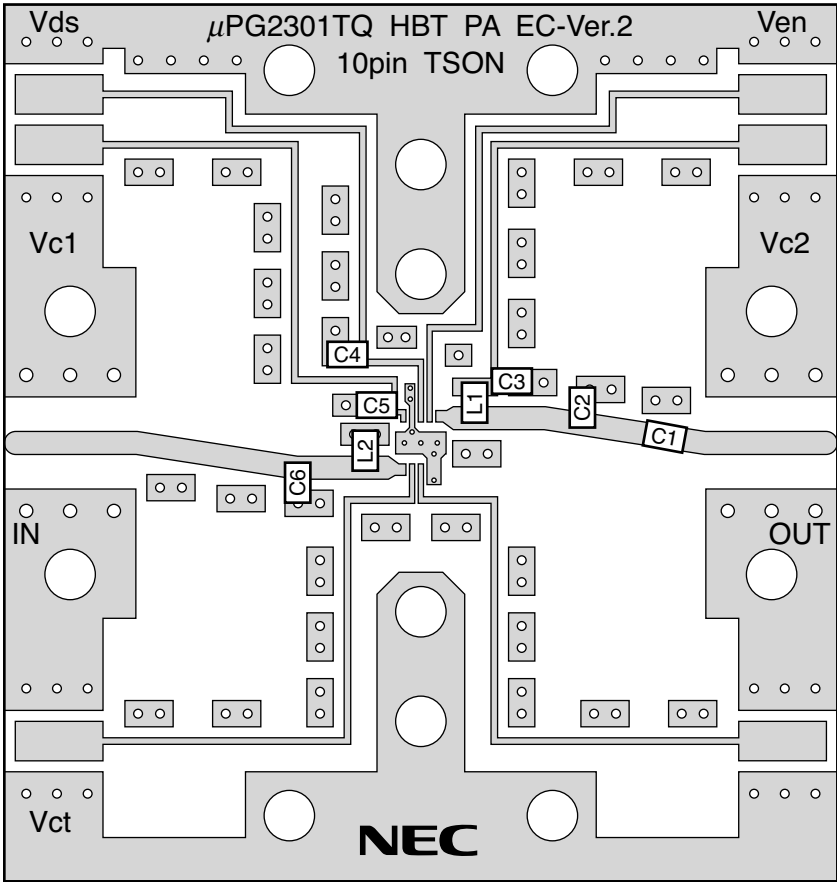
PIN NO.	PIN NAME
1	OUTPUT/ $V_{CC2}$
2	$V_{enable}$
3	$V_{bias}$
4	GND
5	$V_{CC1}$
6	INPUT
7	$V_{cont}$
8	N.C.
9	GND
10	GND

# 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

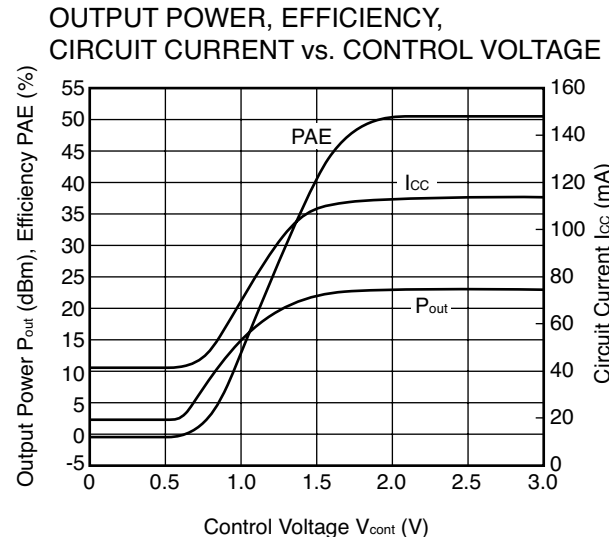


COMPONENT LIST

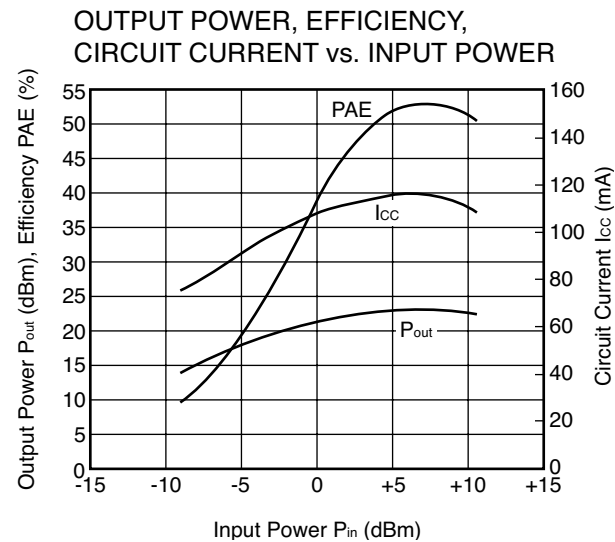
SYMBOL	RATING	PART NUMBER	MANUFACTURER
C1, C3, C4, C5	1,000 pF	GRM39CH102J50	muRata
C2, C6	1 pF	GRM39CH010C50	muRata
L1	15 nH	TFL0816-15N	Susumu
L2	1.8 nH	TFL0816-1N8	Susumu

## 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



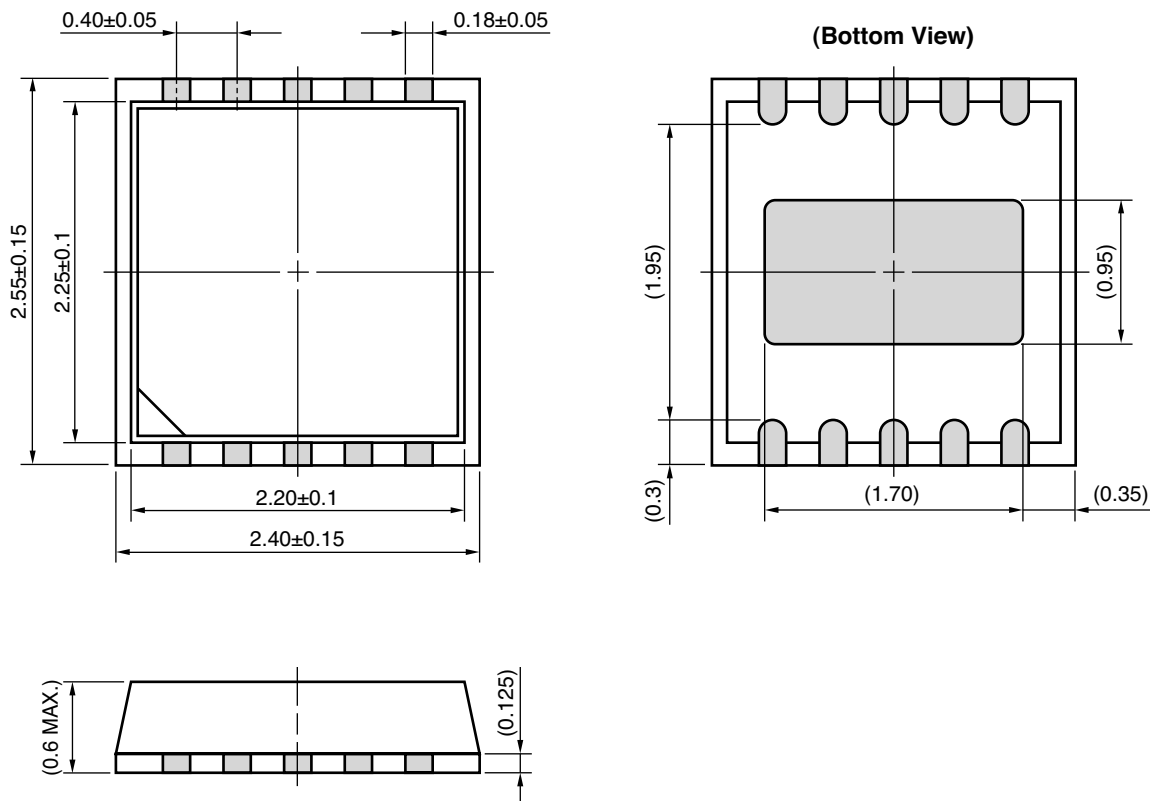
Condition :  $f = 2,450 \text{ MHz}$ ,  $V_{CC1} = V_{CC2} = V_{bias} = 3.3 \text{ V}$ ,  $V_{enable} = 2.9 \text{ V}$ ,  $V_{cont} = 2.5 \text{ V}$ , External input and output matching



**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	<ul style="list-style-type: none"> <li>Embossed tape 8 mm wide</li> <li>Pin 5, 6 face the perforation side of the tape</li> <li>Qty 3 kpcs/reel</li> </ul>

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

Part number for sample order: μPG2301TQ

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		-A Not Detected	-AZ (*)
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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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