CEL

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 × 2.55 × 0.6 mm)

DESCRIPTION

NEC's μPG2301TQ 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°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°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

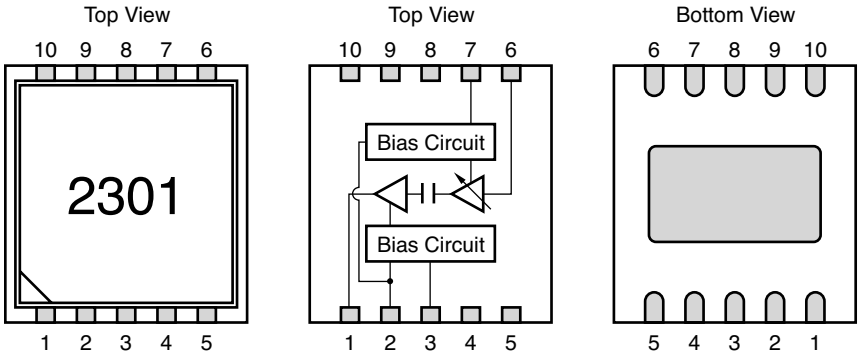
Note Mounted on double copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C

RECOMMENDED OPERATING RANGE

(T_A = +25°C)

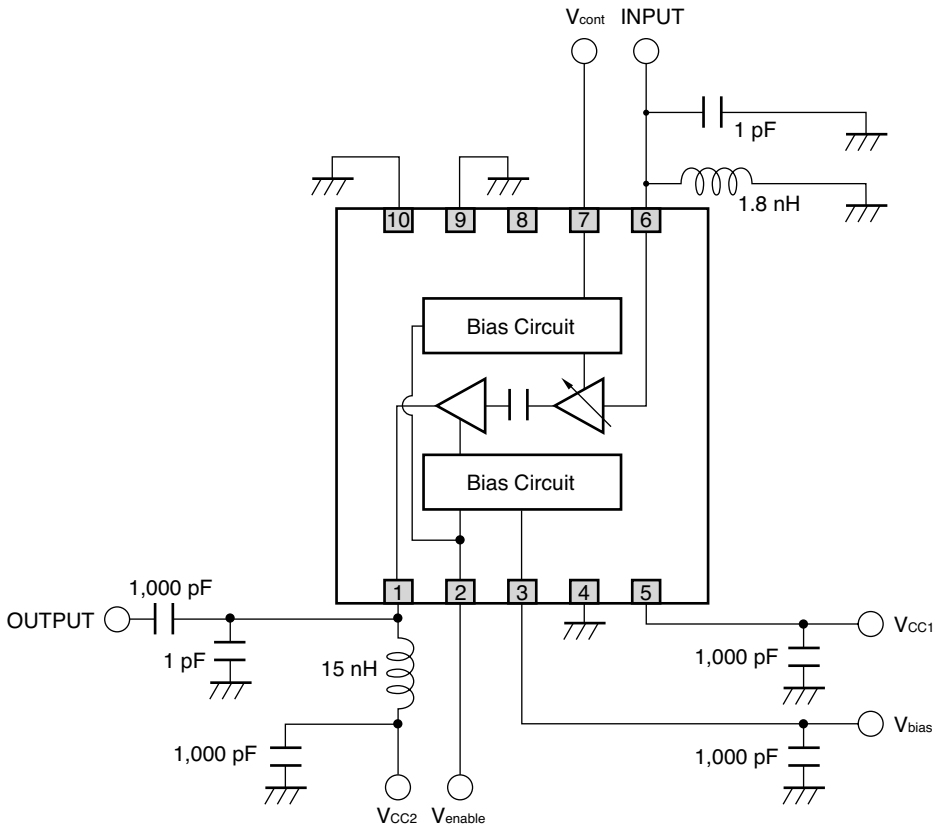
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Frequency	f_{opt}	2,400	2,450	2,500	MHz
Supply Voltage	$V_{CC1,2}$	2.7	3.3	3.6	V
	V_{bias}				
Control Voltage	V_{cont}	0	2.5	3.6	V
	V_{enable}	0	2.9	3.1	

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



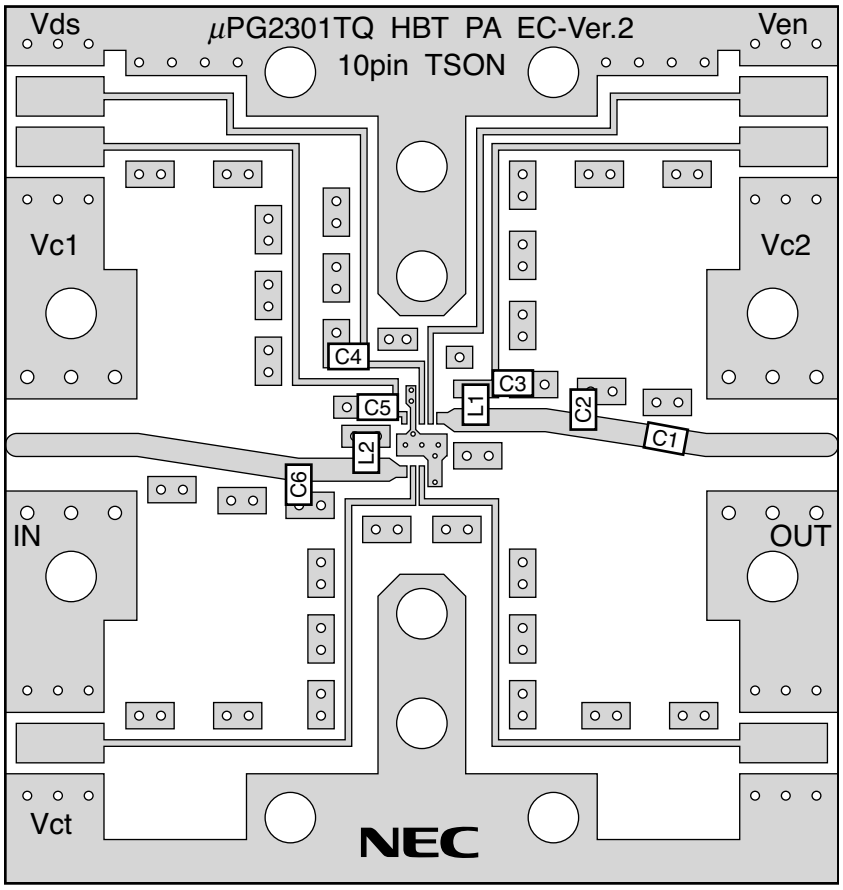
PIN NO.	PIN NAME
1	OUTPUT/ V_{CC2}
2	V_{enable}
3	V_{bias}
4	GND
5	V_{CC1}
6	INPUT
7	V_{cont}
8	N.C.
9	GND
10	GND

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



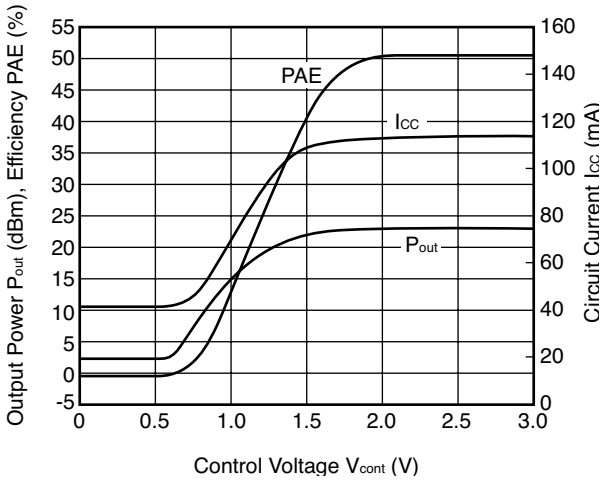
COMPONENT LIST

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 CHARACTERLISTICS

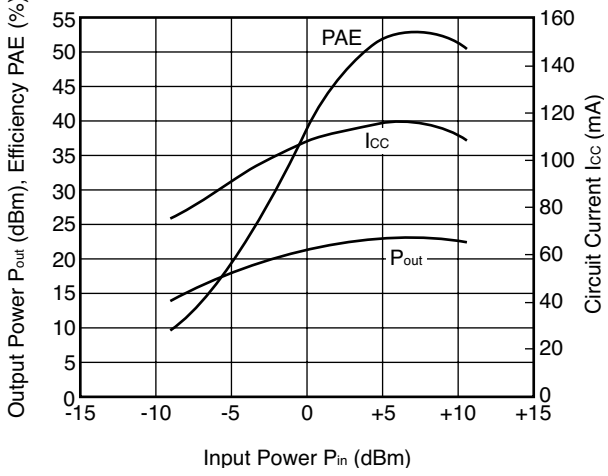
Condition : f = 2,450 MHz, $V_{CC1} = V_{CC2} = V_{bias}$ = 3.3 V, V_{enable} = 2.9 V, P_{in} = +4 dBm, External input and output matching

OUTPUT POWER, EFFICIENCY,
CIRCUIT CURRENT vs. CONTROL VOLTAGE



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

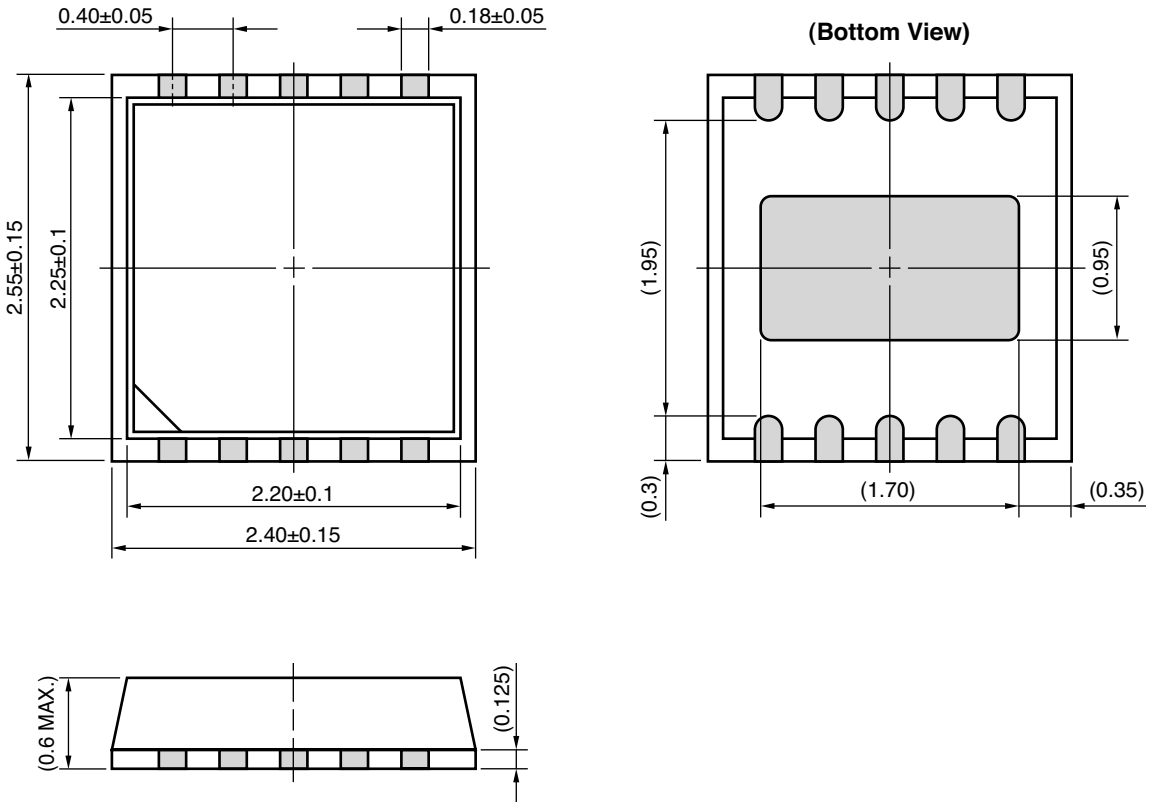
OUTPUT POWER, EFFICIENCY,
CIRCUIT CURRENT vs. INPUT POWER



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

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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.