CEL

GaAs INTEGRATED CIRCUIT

μPG2251T6M

+25 dBm MATCHED POWER AMPLIFIER FOR Bluetooth™ Class 1

DESCRIPTION

The μPG2251T6M is a fully matched, +25 dBm GaAs MMIC power amplifier for Bluetooth Class 1.

This device realizes high efficiency, high gain and high output power.

This device is housed in a 12-pin plastic TSQFN (Thin Small Quad Flat Non-leaded) (T6M) package, and is suitable for high-density surface mounting.

FEATURES

- Operating frequency : f_{opt} = 2 400 to 2 500 MHz (2 450 MHz TYP.)
- Supply voltage : V_{DD}1, 2, 3 = 2.5 to 3.5 V (3.0 V TYP.)
- Control voltage : V_{cont} = 1.5 to 2.1 V (1.8 V TYP.)
- Circuit current : I_{DD} = 230 mA TYP. @ V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 1.8 V, P_{out} = +25 dBm
- Output power : P_{out} = +25.0 dBm TYP. @ V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 1.8 V, P_{in} = –5 dBm
- Gain control range : GCR = 70 dB TYP. @ V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 0 to 1.8 V, P_{in} = –5 dBm
- High efficiency : PAE = 47% TYP. @ V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 1.8 V, P_{in} = –5 dBm
- High-density surface mounting : 12-pin plastic TSQFN (T6M) package (2.0 × 2.0 × 0.37 mm)

APPLICATIONS

- Power Amplifier for Bluetooth Class 1, ZigBee™ etc.

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2251T6M-E2	μPG2251T6M-E2-A	12-pin plastic TSQFN (T6M) (Pb-Free)	2251	• Embossed tape 8 mm wide • Pin 10, 11, 12 face the perforation side of the tape • Qty 3 kpcs/reel

Remark: To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPG2251T6M-A

Caution: Observe precautions when handling, because these devices are sensitive to electrostatic discharge.

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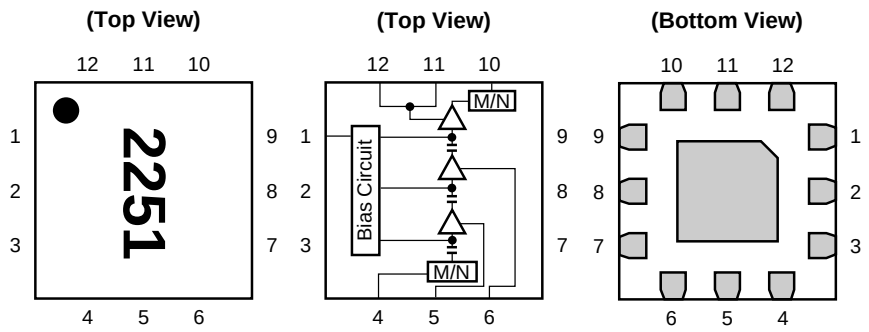
PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	V_{cont}
2	GND
3	GND
4	P_{in}
5	$V_{DD}1$
6	$V_{DD}2$
7	GND
8	GND
9	GND
10	P_{out}
11	$V_{DD}3$
12	$V_{DD}3$

Remark Exposed pad : GND

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Supply Voltage	$V_{DD}1, 2, 3$	6.0	V
Control Voltage	V_{cont}	3.0	V
Circuit Current	I_{DD}	300	mA
Control Current	I_{cont}	0.5	mA
Input Power	P_{in}	+10	dBm
Power Dissipation	P_D	600 Note	mW
Operating Ambient Temperature	T_A	−40 to +85	°C
Storage Temperature	T_{stg}	−55 to +150	°C

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

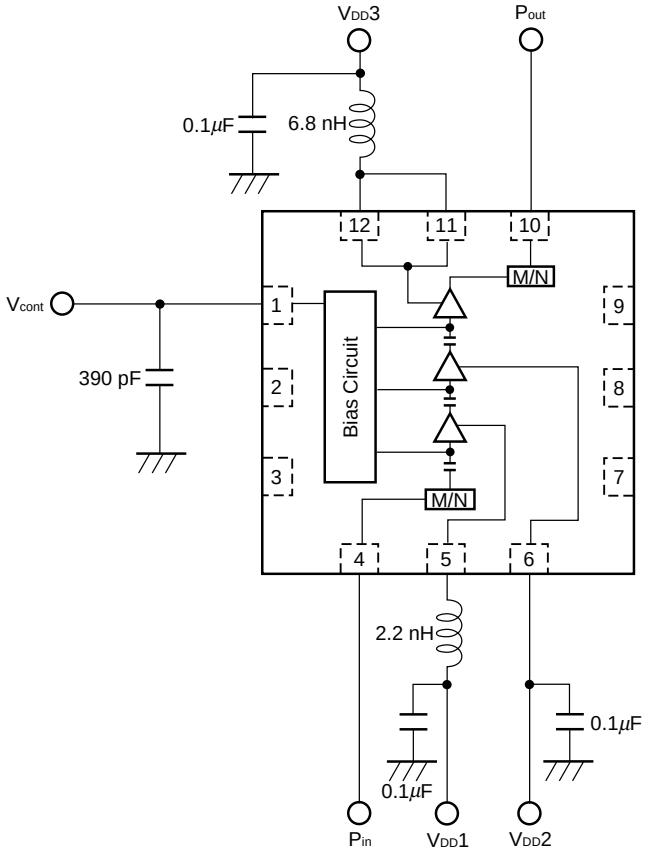
RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f_{opt}	2 400	2 450	2 500	MHz
Supply Voltage	$V_{DD}1, 2, 3$	2.5	3.0	3.5	V
Control Voltage	V_{cont}	1.5	1.8	2.1	V

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 1.8 V, f = 2.4 to 2.5 GHz, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{DD}	P_{in} = –5 dBm	–	230	265	mA
Output Power 1	$P_{out}1$	P_{in} = –5 dBm	+23	+25	–	dBm
Output Power 2	$P_{out}2$	V_{cont} = 0 V, P_{in} = –5 dBm	–	–45	–30	dBm
Gain Control Range	GCR	V_{cont} = 0 to 1.8 V, P_{in} = –5 dBm	–	70	–	dB
Efficiency	PAE	P_{in} = –5 dBm	–	47	–	%
2nd Harmonics	2f0	P_{in} = –5 dBm	–	–35	–	dBc
3rd Harmonics	3f0	P_{in} = –5 dBm	–	–30	–	dBc
Input Return Loss	RL_{in}	P_{in} = –30 dBm	–	–5	–	dB
Output Return Loss	RL_{out}	P_{in} = –30 dBm	–	–10	–	dB

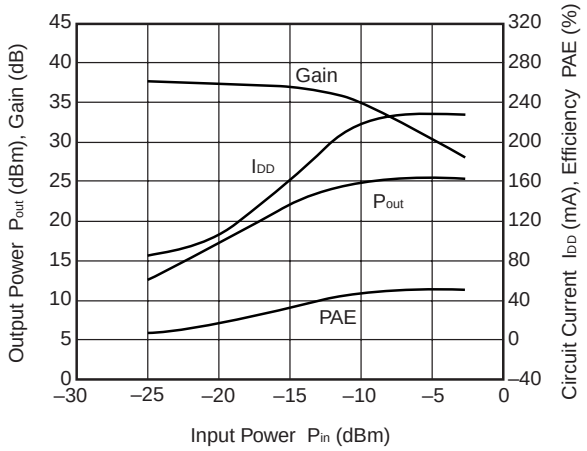
EVALUATION CIRCUIT



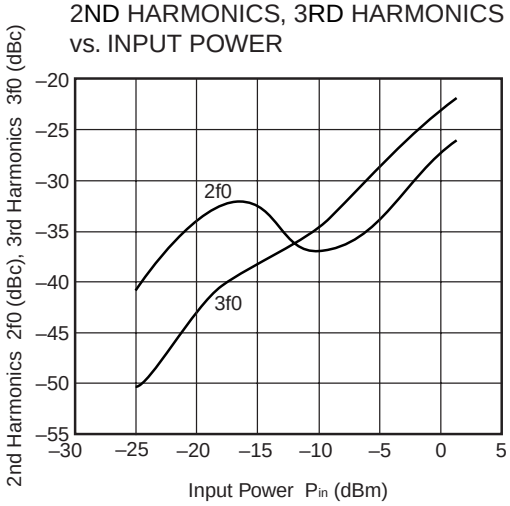
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

TYPICAL CHARACTERISTICS (T_A = +25°C, V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 1.8 V, f = 2.45 GHz, unless otherwise specified)

OUTPUT POWER, GAIN, CIRCUIT CURRENT, PAE vs. INPUT POWER



2ND HARMONICS, 3RD HARMONICS vs. INPUT POWER

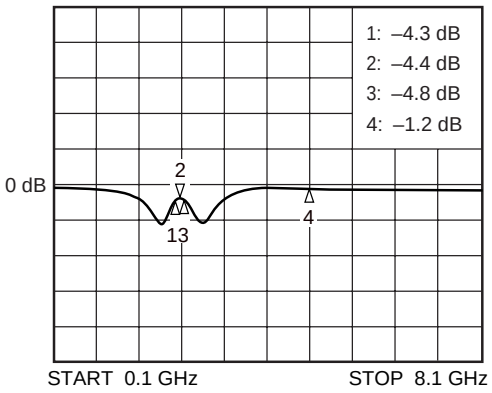


Remark The graphs indicate nominal characteristics.

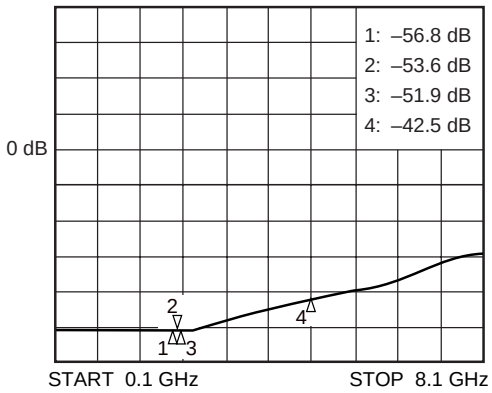
S-PARAMETERS

Condition : T_A = +25°C, V_{DD}1, 2, 3 =3.0 V, V_{cont} = 1.8 V, P_{in} = –30 dBm

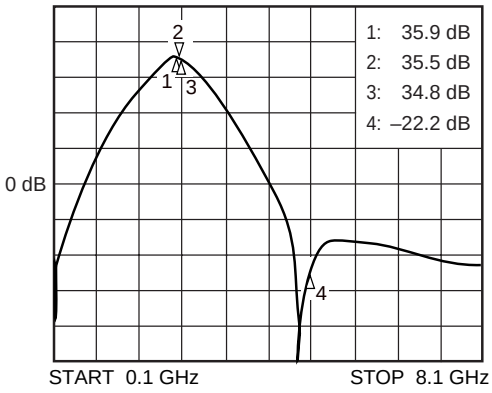
S_{11}-FREQUENCY



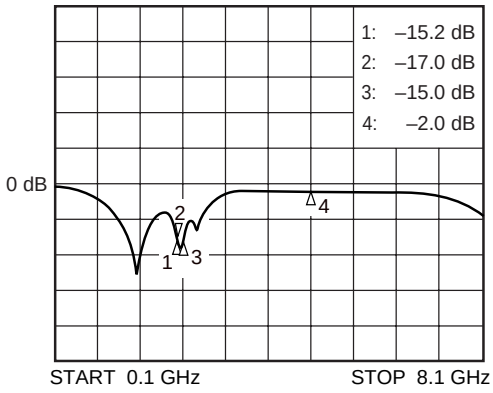
S_{12}-FREQUENCY



S_{21}-FREQUENCY



S_{22}-FREQUENCY



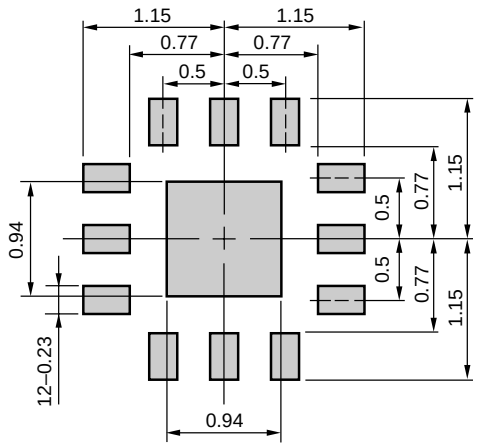
Remarks 1. The graphs indicate nominal characteristics.

2. Maker 1 : 2.4 GHz, 2 : 2.45 GHz, 3 : 2.5 GHz, 4 : 4.9 GHz

MOUNTING PAD LAYOUT DIMENSIONS

12-PIN PLASTIC TSQFN (T6M) (UNIT: mm)

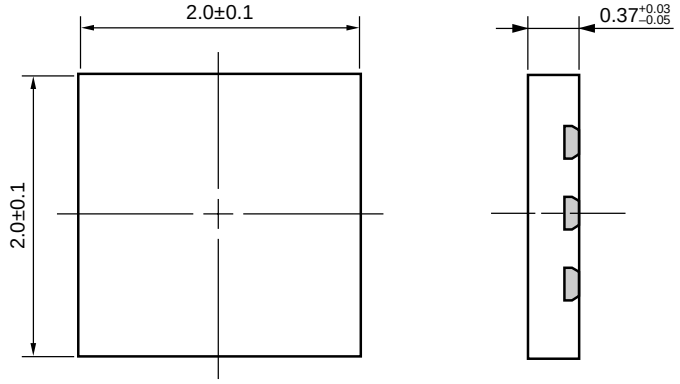
MOUNTING PAD



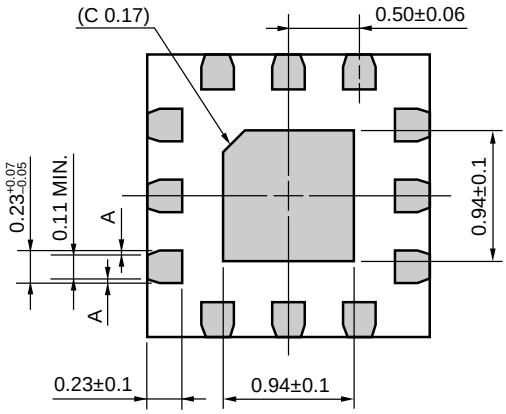
Remark The mounting pad layout in this document is for reference only.
When designing PCB, please consider workability of mounting, solder joint reliability, prevention of solder bridge and so on, in order to optimize the design.

PACKAGE DIMENSIONS

12-PIN PLASTIC TSQFN (T6M) (UNIT: mm)



(Bottom View)



Remark A > 0

( ): Reference value

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature)	: 260°C or below	IR260
	Time at peak temperature	: 10 seconds or less	
	Time at temperature of 220°C or higher	: 60 seconds or less	
	Preheating time at 120 to 180°C	: 120±30 seconds	
	Maximum number of reflow processes	: 3 times	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	
Partial Heating	Peak temperature (terminal temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

Caution Do not use different soldering methods together (except for partial heating).

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M8E0904E

Caution GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.

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