CEL

GaAs HJ-FET INTEGRATED CIRCUIT

μPG2253T6S

RF FRONT-END IC FOR Bluetooth™ CLASS 1

DESCRIPTION

The μPG2253T6S is a RF front-end integrated circuit for Bluetooth Class 1 and includes TX/Bypass switch and a power amplifier with low-pass filter. And this device has no RF matching parts.

This device realizes high efficiency and low harmonics by 3.0 V operation. This device is housed in a 16-pin plastic QFN (Quad Flat Non-leaded) (T6S) package. And this package is able to high-density surface mounting by small external parts.

FEATURES

- Operating frequency : f_{opt} = 2 400 to 2 500 MHz (2 450 MHz TYP.)
- Supply voltage : V_{DD}1, 2, 3 = 3.0 V TYP.
- Control voltage : V_{en} = 3.0 V TYP.
- Circuit current : I_{DD} = 95 mA TYP. @ P_{in} = 0 dBm
- Output power : P_{out} = 19 dBm TYP. @ P_{in} = 0 dBm
- High efficiency : PAE = 28% TYP. @ P_{in} = 0 dBm
- High-density surface mounting : 16-pin plastic QFN package (T6S) (3.0 × 3.0 × 0.75 mm)

APPLICATION

- Front-end IC for Bluetooth Class 1, ZigBee™ etc.

ORDERING INFORMATION

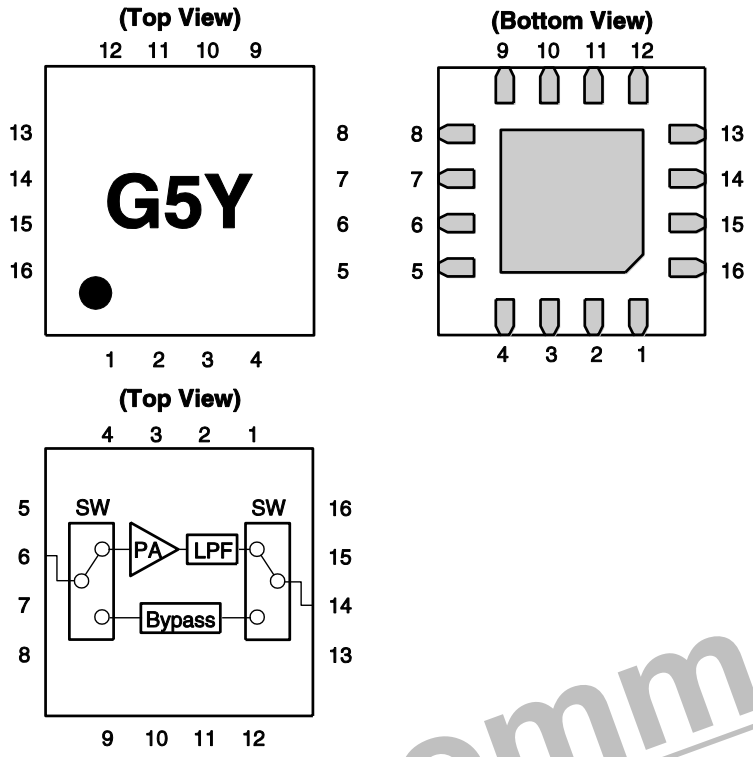
Part Number	Order Number	Package	Marking	Supplying Form
μPG2253T6S-E2	μPG2253T6S-E2-A	16-pin plastic QFN (T6S) (Pb-Free)	G5Y	• Embossed tape 8 mm wide • Pin 10, 11, 12 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPG2253T6S-A

Caution Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.

Document No. PG10761EJ01V0DS (1st edition)
Date Published April 2009 NS

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	GND
2	N.C.
3	V_{en}
4	N.C.
5	N.C.
6	RFin
7	N.C.
8	GND
9	$V_{D}1$
10	$V_{D}2$
11	$V_{D}3$ (1)
12	$V_{D}3$ (2)
13	GND
14	ANT
15	$V_{SW}1$
16	$V_{SW}2$

Remark Exposed pad : GND

TRUTH TABLE

$V_{SW}1$	$V_{SW}2$	Tx	Path
3.0 V	0 V	ON	OFF
0 V	3.0 V	OFF	ON

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD}1, 2, 3	5.0	V
Control Voltage	V_{en}	4.0	V
Switching Voltage	V_{SW}1, 2	5.0	V
Input Power	P_{in}	+5	dBm
Power Dissipation	P_D	400 Note	mW
Operating Ambient Temperature	T_A	–45 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.

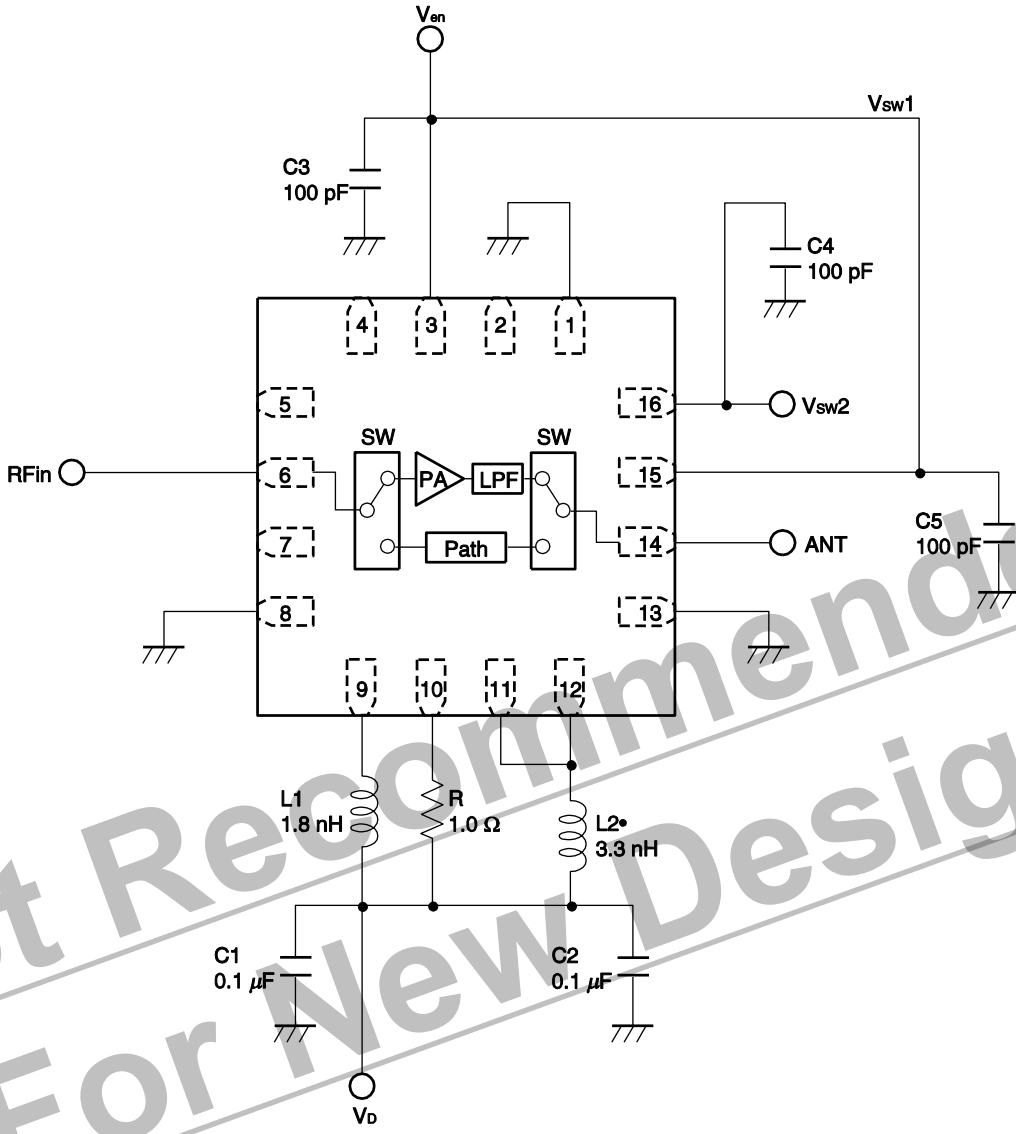
RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f_{opt}	2 400	2 450	2 500	MHz
Supply Voltage	V_{DD}1, 2, 3	2.7	3.0	3.6	V
Switch Control Voltage (H)	V_{SW}1, 2	1.8	3.0	3.6	V
Switch Control Voltage (L)	V_{SW}1, 2	–0.2	0.0	0.2	V
Control Voltage (H)	V_{en}	1.5	3.0	3.6	V
Control Voltage (L)	V_{en}	–	0	0.2	V

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{DD}1, 2, 3 = 3.0 V, f = 2 400 to 2 500 MHz, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{DD}	P_{in} = 0 dBm, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	–	95	120	mA
SW Current	I_{SW}	RF off, V_{SW}1/V_{SW}2 = 3.0/0 V	–	10	40	μA
Shut Down Current	$I_{shut\ down}$	P_{in} = –30 dBm, V_{en} = 0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	–	4	15	μA
Output Power	P_{out}	P_{in} = 0 dBm, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	17.5	19	–	dBm
Power Efficiency	PAE	P_{in} = 0 dBm, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	–	28	–	%
Input Return Loss	RL_{in}	P_{in} = –30 dBm, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	–	–10	–	dB
Output Return Loss	RL_{out}	P_{in} = –30 dBm, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	–	–8	–	dB
2nd Harmonics	2f0	P_{in} = 0 dBm, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	–	–25	–	dBm
3rd Harmonics	3f0	P_{in} = 0 dBm, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0/0 V	–	–40	–	dBm
Insertion Loss	L_{ins}	P_{in} = –30 dBm, V_{en} = 0 V, V_{SW}1/V_{SW}2 = 0/3.0 V	–	1.5	2.0	dB

EVALUATION CIRCUIT

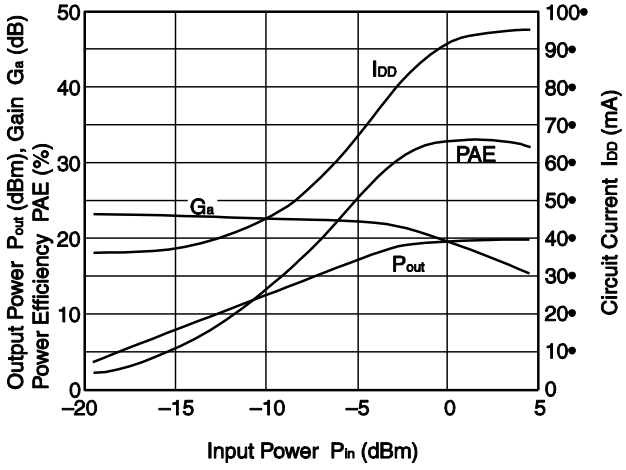


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

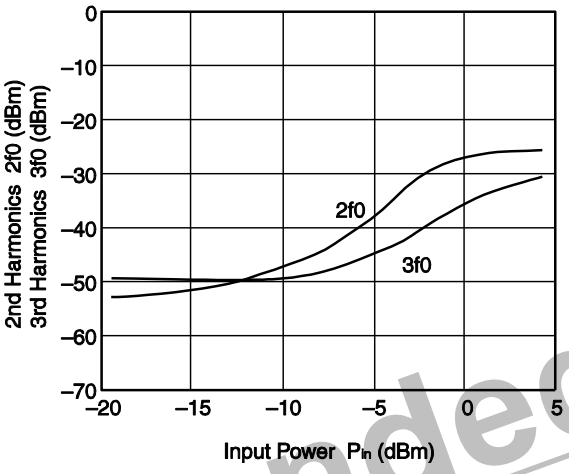
TYPICAL CHARACTERISTICS

(T_A = +25°C, V_{DD}1, 2, 3 = 3.0 V, V_{en} = 3.0 V, V_{SW}1/V_{SW} 2 = 3.0 V/0 V, f = 2.45 GHz, unless otherwise specified)

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



2ND HARMONICS, 3RD HARMONICS, vs. INPUT POWER

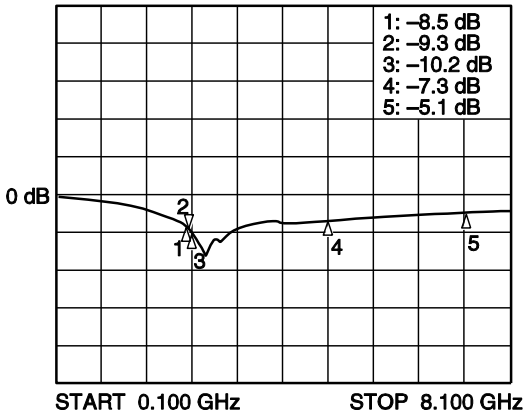


Remark The graphs indicate nominal characteristics.

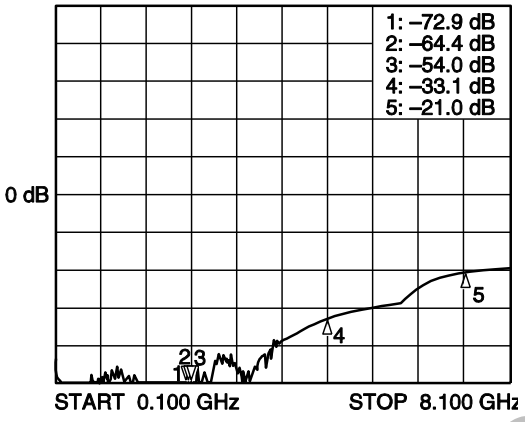
Tx mode S-PARAMETERS

Condition : T_A = +25°C, V_{DD}1, 2, 3 = 3.0 V, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 3.0 V/0 V, P_{in} = –30 dBm

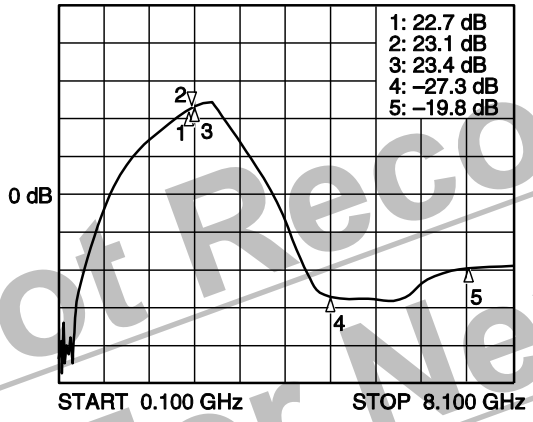
S_{11}-FREQUENCY



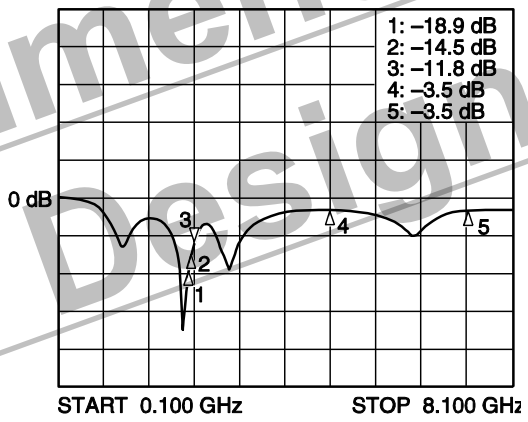
S_{12}-FREQUENCY



S_{21}-FREQUENCY



S_{22}-FREQUENCY



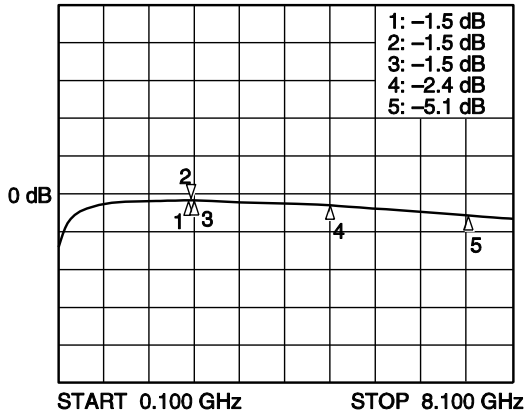
Remarks 1. The graphs indicate nominal characteristics.

2. Marker1 : 2.40 GHz
Marker2 : 2.45 GHz
Marker3 : 2.50 GHz
Marker4 : 4.90 GHz
Marker5 : 7.35 GHz

Path mode S-PARAMETER

Condition : T_A = +25°C, V_{DD}1, 2, 3 = 3.0 V, V_{en} = 3.0 V, V_{SW}1/V_{SW}2 = 0 V/3.0 V, P_{in} = –30 dBm

S_{21}-FREQUENCY

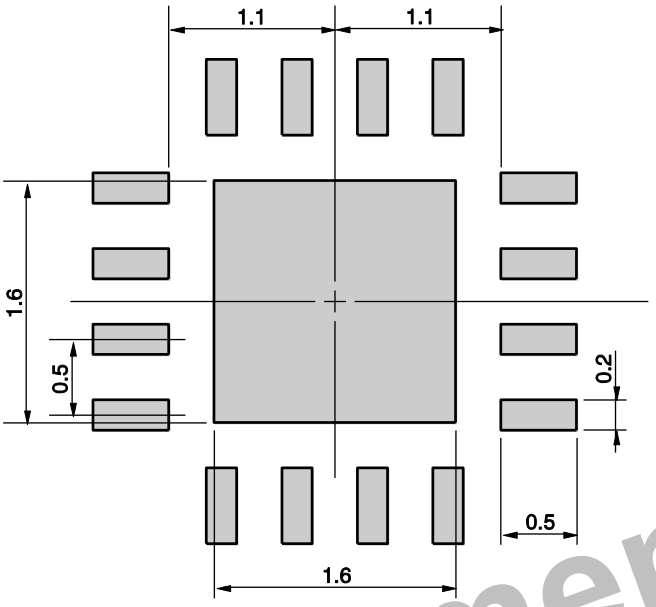


Remarks 1. The graph indicates nominal characteristics.

2. Marker1 : 2.40 GHz
Marker2 : 2.45 GHz
Marker3 : 2.50 GHz
Marker4 : 4.90 GHz
Marker5 : 7.35 GHz

MOUNTING PAD LAYOUT DIMENSIONS

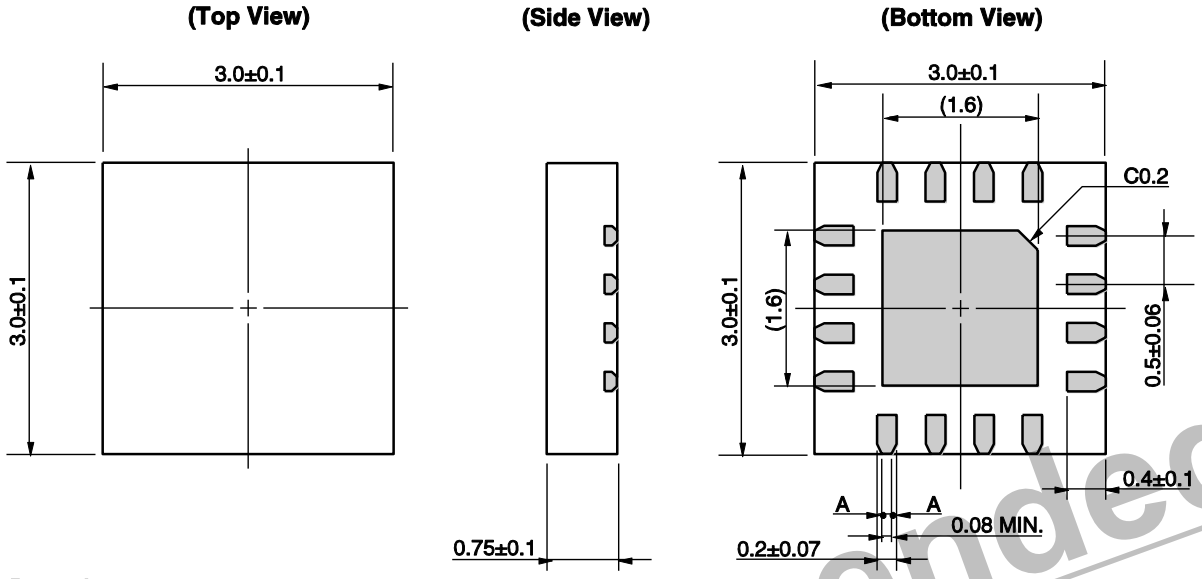
16-PIN PLASTIC QFN (UNIT: mm)



Remark The mounting pad layouts in this document are 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

16-PIN PLASTIC QFN (T6S) (UNIT: mm)



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

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

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.