DATA SHEET

NEC

GaAs INTEGRATED CIRCUIT

μPG2131T5D

L-BAND PA DRIVER AMPLIFIER

DESCRIPTION

The μPG2131T5D is GaAs MMIC for PA driver amplifier which were developed for dual band mobile phone and another L-band application. This device realizes high gain and high output power.

This device is housed in a 14-pin LGA (CSP Type) package. And this package is able to high-density surface mounting.

FEATURES

- Operation freqecncy : f_{opt1} = 893 to 960 MHz (0.8 GHz Band side)
  : f_{opt2} = 1 429 to 1 453 MHz (1.5 GHz Band side)
- Supply voltage : $V_{DD1, 3}$ = 2.7 to 2.9 V (2.8 V TYP.)
  : $V_{DD2, 4}$ = 3.2 to 4.23 V (3.5 V TYP.)
- Circuit current : I_{DD1} = 30 mA TYP. @ V_{DD1} = 2.8 V, V_{DD2} = 3.5 V, V_{AGC} = 2.5 V, P_{out} = +11 dBm, (0.8 GHz Band side)
  : I_{DD2} = 30 mA TYP. @ V_{DD3} = 2.8 V, V_{DD4} = 3.5 V, V_{AGC} = 2.5 V, P_{out} = +11 dBm, (1.5 GHz Band side)
- Output power : P_{out1} = +14 dBm TYP. @ V_{DD1} = 2.8 V, V_{DD2} = 3.5 V, V_{AGC} = 2.5 V (0.8 GHz Band side)
  : P_{out2} = −15 dBm MAX. @ V_{DD1} = 2.8 V, V_{DD2} = 3.5 V, V_{AGC} = 0.5 V (0.8 GHz Band side)
  : P_{out3} = +14 dBm TYP. @ V_{DD3} = 2.8 V, V_{DD4} = 3.5 V, V_{AGC} = 2.5 V (1.5 GHz Band side)
  : P_{out4} = −15 dBm MAX. @ V_{DD3} = 2.8 V, V_{DD4} = 3.5 V, V_{AGC} = 0.5 V (1.5 GHz Band side)
- Low distortion : P_{adj1} = −63 dBc TYP. @ V_{DD1} = 2.8 V, V_{DD2} = 3.5 V, V_{AGC} = 2.5 V, P_{out} = +11 dBm,
  f = 925 MHz, Δf = ±50 kHz, 21 kHz Bandwidth (0.8 GHz Band side)
  : P_{adj3} = −63 dBc TYP. @ V_{DD3} = 2.8 V, V_{DD4} = 3.5 V, V_{AGC} = 2.5 V, P_{out} = +11 dBm,
  f = 1 441 MHz, Δf = ±50 kHz, 21 kHz Bandwidth (1.5 GHz Band side)
- High-density surface mounting : 14-pin LGA (CSP Type) package (2.5 × 2.5 × 0.6 mm)

APPLICATION

- Digital cellular: PDC 0.8/1.5 GHz Dual Band etc.

★ ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPG2131T5D-E1	14-pin LGA (CSP Type)	G4B	• Embossed tape 8 mm wide • Pin 6, 7 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: μPG2131T5D

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

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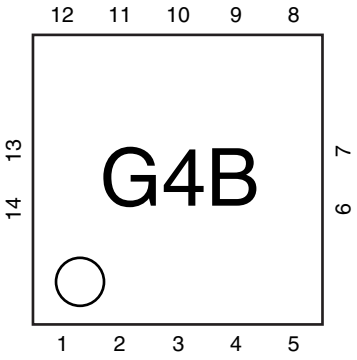
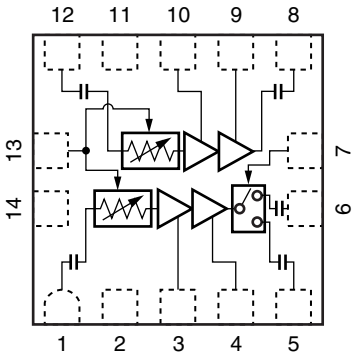
The mark ★ shows major revised points.

★ PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

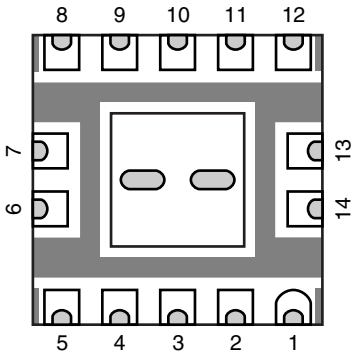
(Top View)



(Top View)



(Bottom View)



Pin No.	Pin Name
1	INPUT1 (0.8 GHz Band side)
2	GND
3	V_{DD1} (0.8 GHz Band side)
4	V_{DD2} (0.8 GHz Band side)
5	OUTPUT1 (0.8 GHz Band side)
6	OUTPUT2 (0.8 GHz Band side)
7	V_{SW} (0.8 GHz Band side)
8	OUTPUT3 (1.5 GHz Band side)
9	V_{DD4} (1.5 GHz Band side)
10	V_{DD3} (1.5 GHz Band side)
11	GND
12	INPUT2 (1.5 GHz Band side)
13	V_{AGC}
14	GND

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

Parameter	Symbol	Ratings	Unit
Supply Voltage 1, 2, 3, 4	$V_{DD1, 2, 3, 4}$	5.0	V
Gain Control Voltage	V_{AGC}	5.0	V
Switch Control Voltage	V_{SW}	5.0	V
Input Power 1 (1 pin)	P_{in1}	+10	dBm
Input Power 2 (12 pin)	P_{in2}	+10	dBm
Power Dissipation	P_D	140 Note	mW
Operating Ambient Temperature	T_A	−30 to +85	°C
Storage Temperature	T_{stg}	−40 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 1	f_{opt1}	893	–	960	MHz
Operating Frequency 2	f_{opt2}	1 429	–	1 453	MHz
Supply Voltage 1, 3	$V_{DD1, 3}$	2.7	2.8	2.9	V
Supply Voltage 2, 4	$V_{DD2, 4}$	3.2	3.5	4.23	V
Gain Control Voltage	V_{AGC}	0.5	–	2.5	V
Switch Control Voltage (High)	$V_{SW (High)}$	$V_{DD1,3}$–0.2	$V_{DD1, 3}$	$V_{DD1, 3}$	V
Switch Control Voltage (Low)	$V_{SW (Low)}$	0	0	0.2	V
Input Power 1 (1 pin)	P_{in1}	–10	–	0	dBm
Input Power 2 (12 pin)	P_{in2}	–10	–	0	dBm

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, $V_{DD1, 3}$ = 2.8 V, $V_{DD2, 4}$ = 3.5 V, π/4DQPSK modulated signal input, with external input and output matchig, unless otherwise specified)

0.8 GHz Band side

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Operating Frequency 1	f_{opt1}		893	–	960	MHz
Circuit Current 1	I_{DD1}	P_{out} = +11 dBm, V_{AGC} = 2.5 V	–	30	37	mA
Output Power 1	P_{out1}	P_{in} = –10 to 0 dBm, V_{AGC} = 2.5 V	+12	+14	–	dBm
Output Power 2	P_{out2}	P_{in} = –10 to 0 dBm, V_{AGC} = 0.5 V	–	–	–15	dBm
Adjacent Channel Power Leakage 1	P_{adj1}	P_{out} = +11 dBm, V_{AGC} = 2.5 V, P_{in} = –10 to 0 dBm, ⊿f = ±50 kHz, 21 kHz Bandwidth	–	–63	–58	dBc
Adjacent Channel Power Leakage 2	P_{adj2}	P_{out} = +11 dBm, V_{AGC} = 2.5 V, P_{in} = –10 to 0 dBm, ⊿f = ±100 kHz, 21 kHz Bandwidth	–	–72	–69	dBc
Noise Figure 1	NF_1	V_{AGC} = 2.5 V	–	6	–	dB

1.5 GHz Band side

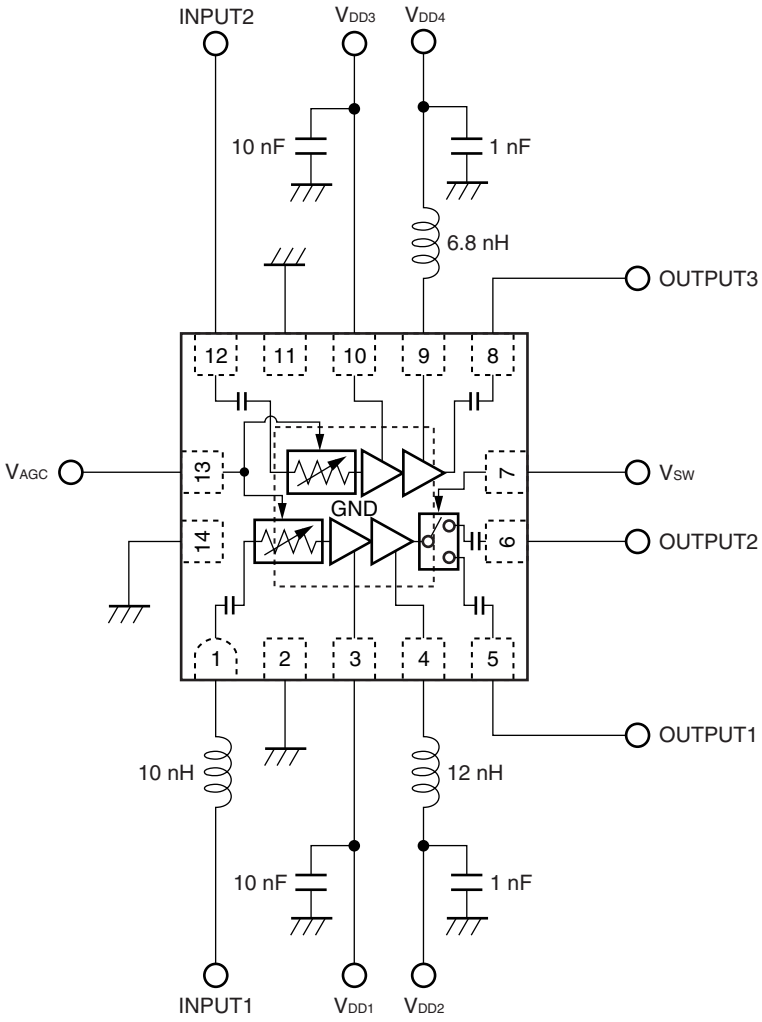
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Operating Frequency 2	f_{opt2}		1 429	–	1 453	MHz
Circuit Current 2	I_{DD2}	P_{out} = +11 dBm, V_{AGC} = 2.5 V	–	30	37	mA
Output Power 3	P_{out3}	P_{in} = –10 to 0 dBm, V_{AGC} = 2.5 V	+12	+14	–	dBm
Output Power 4	P_{out4}	P_{in} = –10 to 0 dBm, V_{AGC} = 0.5 V	–	–	–15	dBm
Adjacent Channel Power Leakage 3	P_{adj3}	P_{out} = +11 dBm, V_{AGC} = 2.5 V, P_{in} = –10 to 0 dBm, ⊿f = ±50 kHz, 21 kHz Bandwidth	–	–63	–58	dBc
Adjacent Channel Power Leakage 4	P_{adj4}	P_{out} = +11 dBm, V_{AGC} = 2.5 V, P_{in} = –10 to 0 dBm, ⊿f = ±100 kHz, 21 kHz Bandwidth	–	–72	–69	dBc
Noise Figure 2	NF_2	V_{AGC} = 2.5 V	–	6	–	dB

0.8 GHz/1.5 GHz Band side

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gain Control Current	I_{AGC}	$V_{DD1, 3}$ = 2.8/0 V, $V_{DD2, 4}$ = 3.5/0 V, V_{AGC} = 0.5/2.5 V	−100	–	300	μA
Switch Control Current	I_{SW}	V_{SW} = 2.8/0 V	−10	–	100	μA

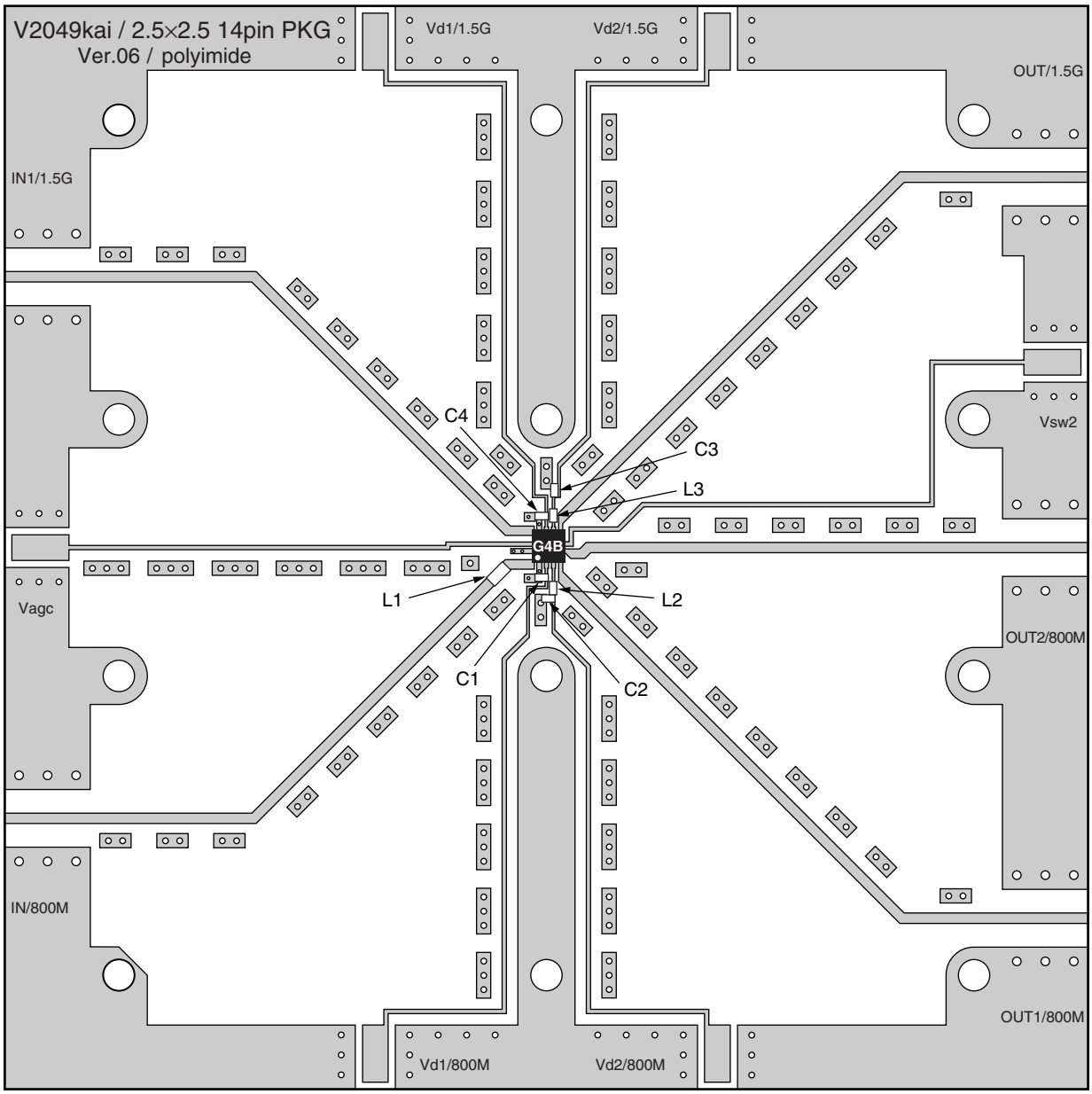
EVALUATION CIRCUIT

(f_{opt1} = 893 to 960 MHz, f_{opt2} = 1 429 to 1 453 MHz, $V_{DD1, 3}$ = 2.8 V, $V_{DD2, 4}$ = 3.5 V)



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**



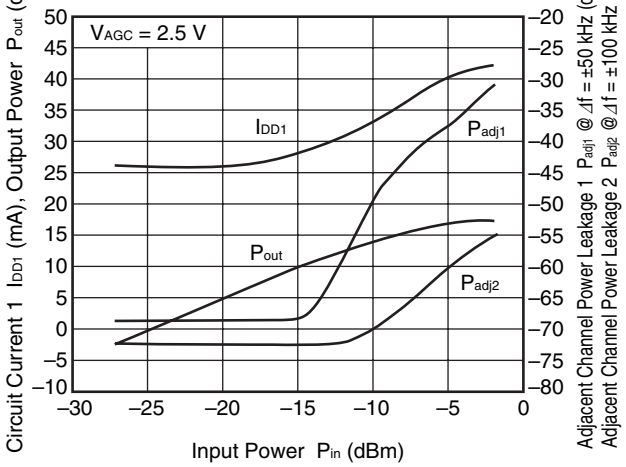
USING THE NEC EVALUATION BOARD

Symbol	Values
L1	10 nH
L2	12 nH
L3	6.8 nH
C1, C4	10 nF
C2, C3	1 nF

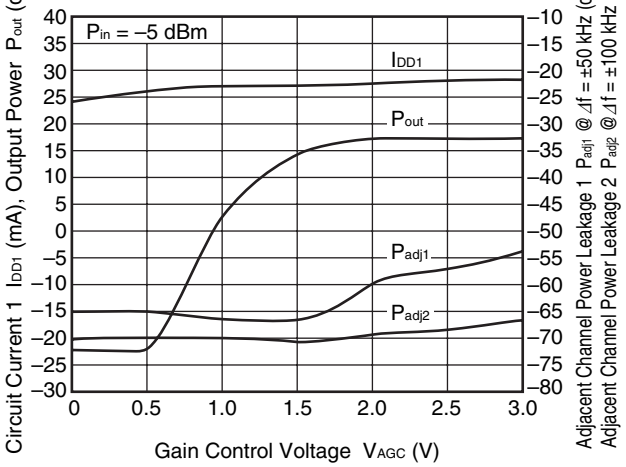
TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

0.8 GHz Band side (INPUT1–OUTPUT1, f = 960 MHz, V_{DD1} = 2.8 V, V_{DD2} = 3.5 V, V_{SW} = 0 V)

CIRCUIT CURRENT 1, OUTPUT POWER, ADJACENT CHANNEL POWER LEAKAGE 1, 2 vs. INPUT POWER

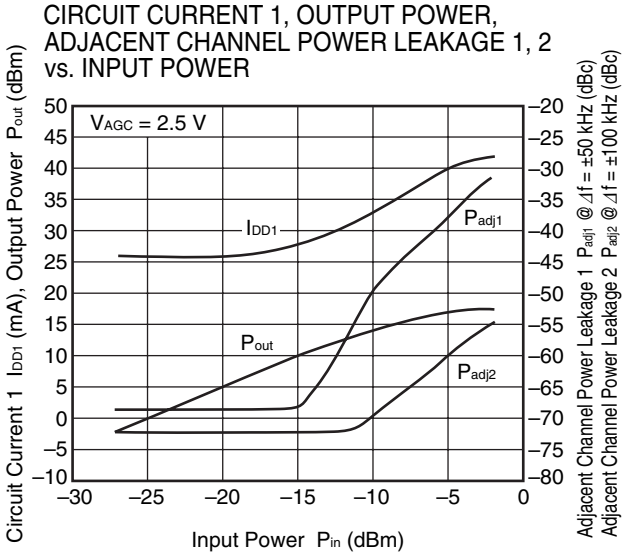


CIRCUIT CURRENT 1, OUTPUT POWER, ADJACENT CHANNEL POWER LEAKAGE 1, 2 vs. GAIN CONTROL VOLTAGE

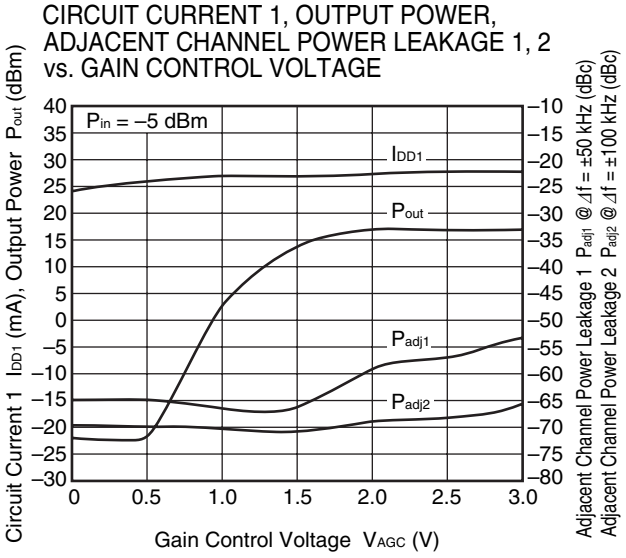


0.8 GHz Band side (INPUT1–OUTPUT2, f = 960 MHz, V_{DD1} = 2.8 V, V_{DD2} = 3.5 V, V_{SW} = 2.8 V)

CIRCUIT CURRENT 1, OUTPUT POWER, ADJACENT CHANNEL POWER LEAKAGE 1, 2 vs. INPUT POWER



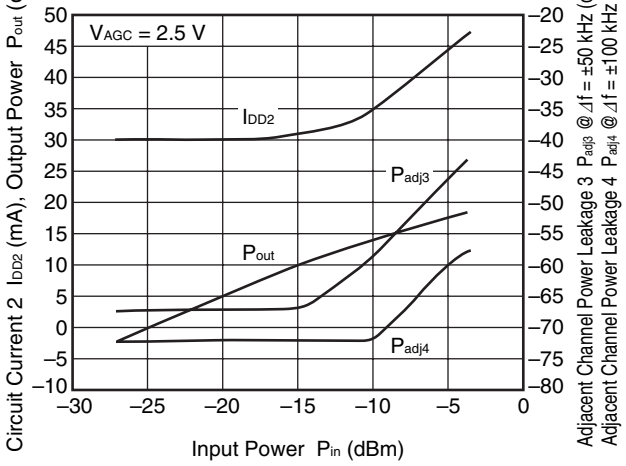
CIRCUIT CURRENT 1, OUTPUT POWER, ADJACENT CHANNEL POWER LEAKAGE 1, 2 vs. GAIN CONTROL VOLTAGE



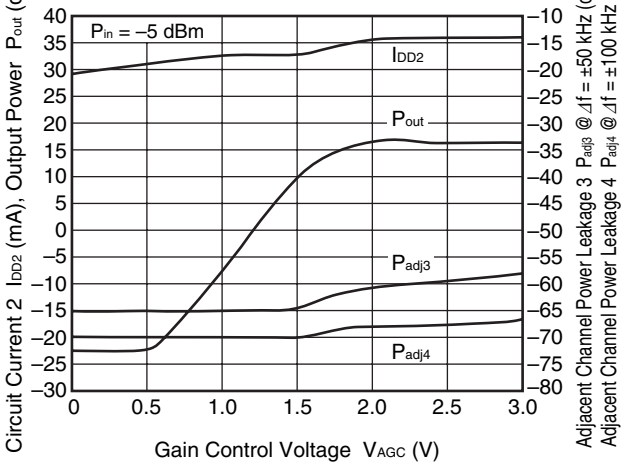
Remark The graphs indicate nominal characteristics.

1.5 GHz Band side (INPUT2–OUTPUT3, f = 1 453 MHz, V_{DD3} = 2.8 V, V_{DD4} = 3.5 V)

CIRCUIT CURRENT 2, OUTPUT POWER, ADJACENT CHANNEL POWER LEAKAGE 3, 4 vs. INPUT POWER



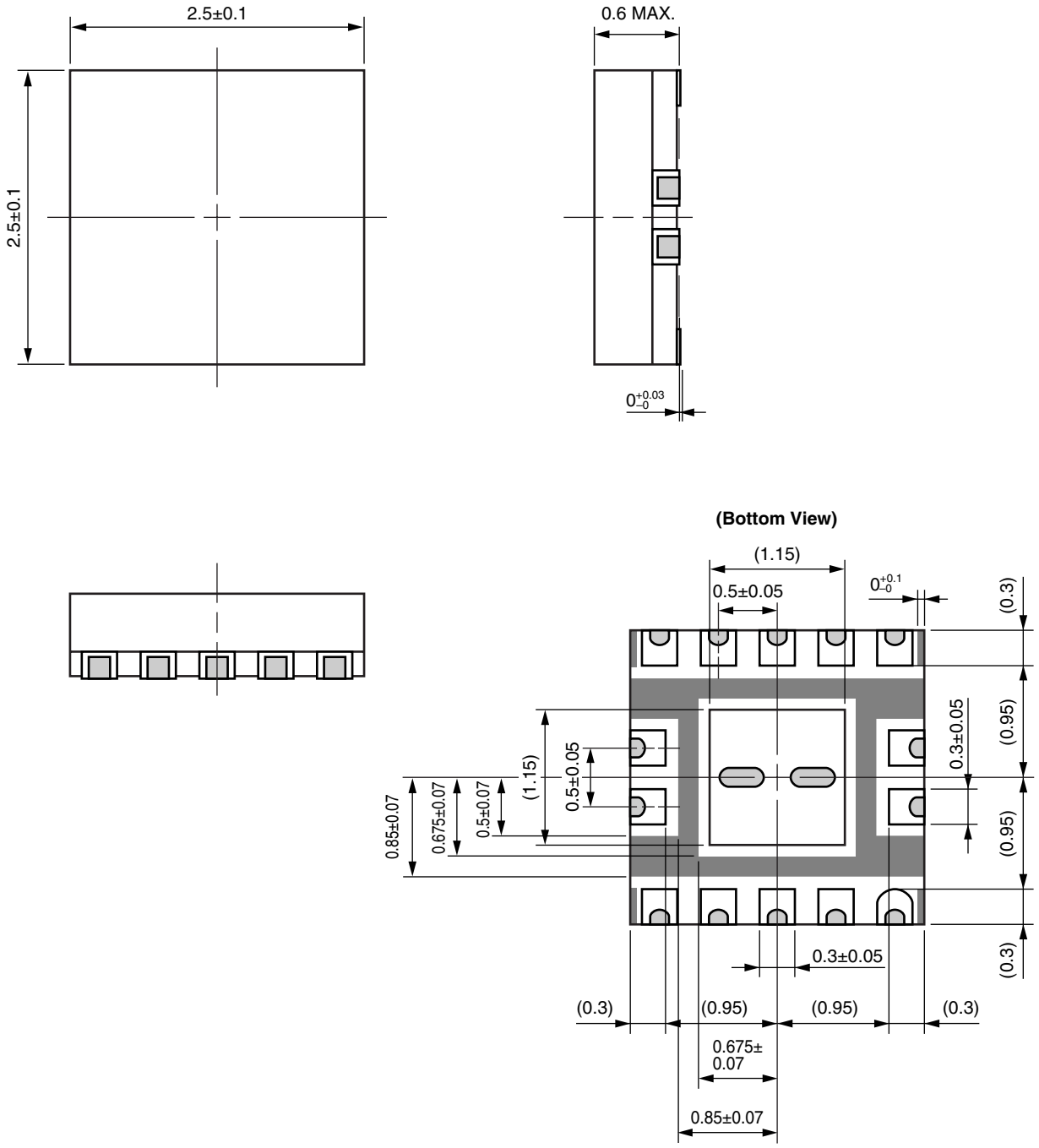
CIRCUIT CURRENT 2, OUTPUT POWER, ADJACENT CHANNEL POWER LEAKAGE 3, 4 vs. GAIN CONTROL VOLTAGE



Remark The graphs indicate nominal characteristics.

★ **PACKAGE DIMENSIONS**

14-PIN LGA (CSP TYPE) (UNIT: mm)



Remark ( ) : Reference value

: Through hole

: Solder resist

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
VPS	Peak temperature (package surface temperature) Time at temperature of 200°C or higher Preheating time at 120 to 150°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 215°C or below : 25 to 40 seconds : 30 to 60 seconds : 3 times : 0.2%(Wt.) or below	VP215
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin 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).

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M8E 00.4-0110

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▶**For further information, please contact**

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