PRELIMINARY DATA SHEET

NEC

GaAs INTEGRATED CIRCUIT

μPG2121TB

L-BAND UP/DOWN CONVERTER

DESCRIPTION

The μPG2121TB is L-band up-converter or down-converter IC (LO Buff. Amp. + Passive Mixer). The device can convert the RF frequency to IF frequency and operate low current. It housed in an original 6-pin super minimold package that is smaller than usual 6-pin minimold easy to install and contributes to miniaturizing the system.

FEATURES

- +2.8 V single voltage
- Low distortion (IIP_3 = +23 dBm TYP.)
- Low current operation (I_{DD} = 3.5 mA TYP.)
- LO buffer amplifier and passive mixer on a single chip
- 6-pin super minimold package (Size: 2.0 × 1.25 × 0.9 mm)

APPLICATION

- L-band digital cellular etc.

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPG2121TB-E3	6-pin super minimold	G2E	Embossed tape 8 mm wide. Pin 1 face the tape perforation side. Qty 3kpcs / reel.

Remark To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: μPG2121TB)

Caution The IC must be handled with care to prevent static discharge because its circuit composed of GaAS HJ-FET.

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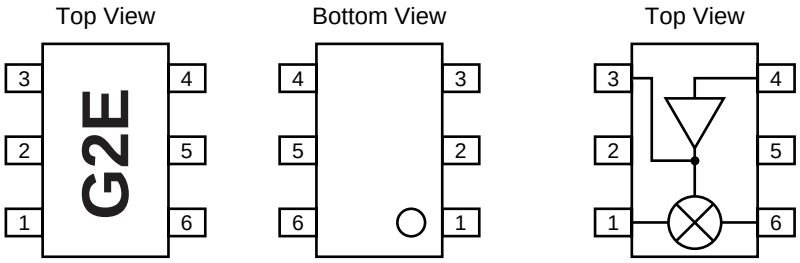
PIN CONNECTIONS

Pin No.	Connection	Pin No.	Connection
1	RF or IF	4	LO IN
2	GND	5	GND
3	V_{DD}	6	IF or RF



ABSOLUTE MAXIMUM RATINGS (T_A = +25 °C)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD}	6.0	V
LO Input Power	P_{LO}	+10	dBm
RF Input Power	P_{RF}	+10	dBm
Total Power Dissipation	P_{tot}	140[Note]	mW
Operating Ambient Temperature	T_A	−30 to +90	°C
Storage Temperature	T_{stg}	−35 to +150	°C

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

ELECTRICAL CHARACTERISTICS (T_A = +25 °C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{DD}	+2.7	+2.8	+3.0	V
RF Frequency	f_{RF}	810	–	960	MHz
IF Frequency	f_{IF}	50	–	400	MHz
LO Input Power	P_{LO}	–10	–5	0	dBm

ELECTRICAL CHARACTERISTICS

(T_A = +25 °C, V_{DD} = 2.8 V, f_{RF1} = 850 MHz, f_{RF2} = 850.1 MHz, P_{RF1} = P_{RF2} = –3 dBm, f_{LO} = 940 MHz, P_{LO} = –5 dBm, f_{IF} = 90 MHz, f_{IM3} = 90.1 MHz)

Parameter	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Total Current	I_{DD}		–	3.5	4.5	mA
Conversion Loss	L_C		–	–6.0	–7.5	dB
3rd Order Distortion Input Intercept Point[Note]	IIP_3		+18	+23	–	dBm
3rd Order Intermoduration Distortion	IM_3		–	–52	–42	dBc
Local Leackage	L_{LO}		–	–13	–11	dBm

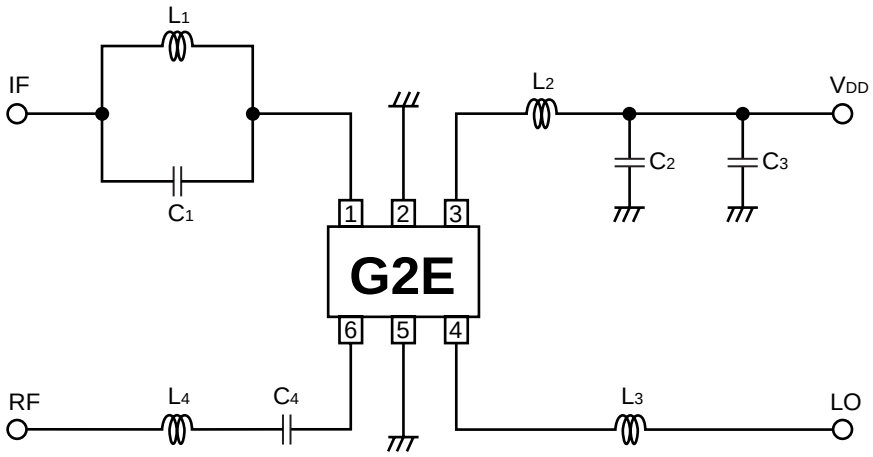
Note IIP_3 is determined by comparing two method; theoretical calculation and cross point of IM_3 curve.

$$IIP_3 = \frac{\Delta IM_3 \times P_{RF} + CG - P_{IM3}}{\Delta IM_3 - 1} \text{ [dBm]}$$ ΔIM_3: P_{IM3} gradient

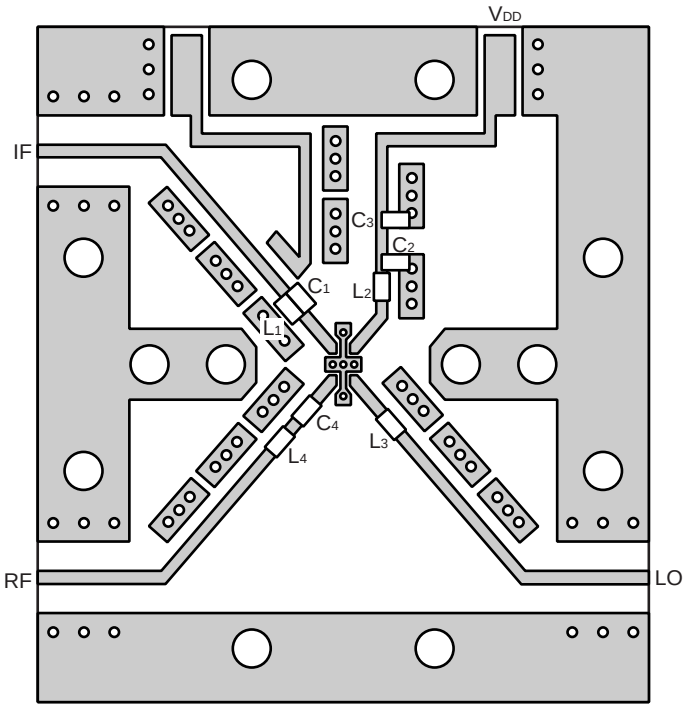
Calculated as $\Delta IM_3 = 3$

EVALUATION CIRCUIT

T_A = +25 °C, V_{DD} = +2.8 V, f = 850 MHz



EVALUATION BOARD

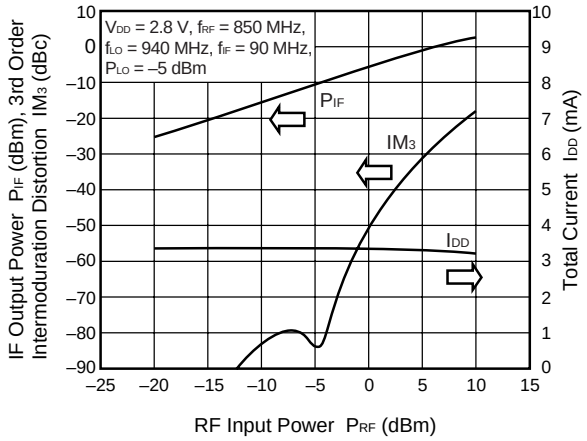


USING THE NEC EVALUATION BOARD

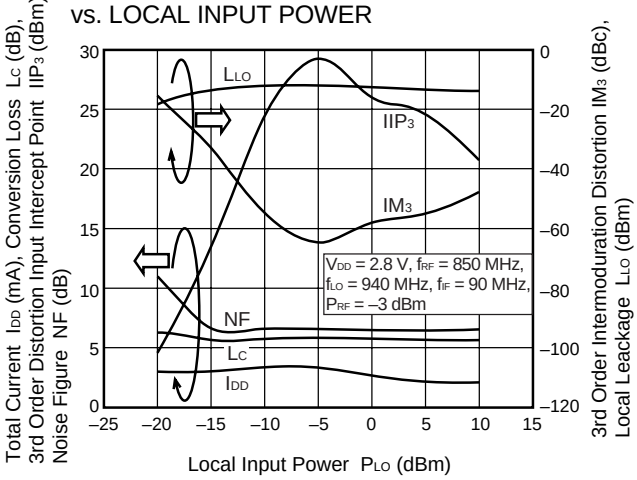
	Values	Part Number	Maker
C_1	5 pF	GRM39CH 050 C50	muRata
C_2	33 pF	GRM36CH 330 J50	muRata
C_3	1 000 pF	GRM39B 102 K50	muRata
C_4	5 pF	GRM39CH 050 C50	muRata
L_1	6.8 nH	TFL0510 6N8	susumu
L_2	15 nH	TFL0816 15N	susumu
L_3	27 nH	TFL0816 27N	susumu
L_4	6.8 nH	TFL0816 6N8	susumu

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

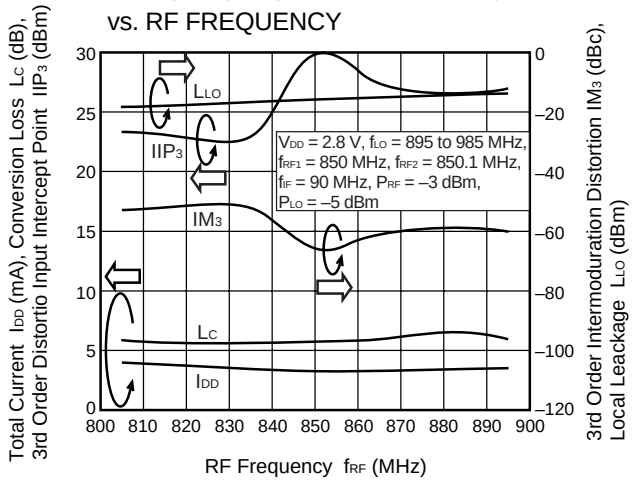
IF OUTPUT POWER, IM3,
TOTAL CURRENT vs. RF INPUT POWER



TOTAL CURRENT, CONVERSION LOSS,
IIP3, NOISE FIGURE, IM3, LOCAL LEAKAGE
vs. LOCAL INPUT POWER



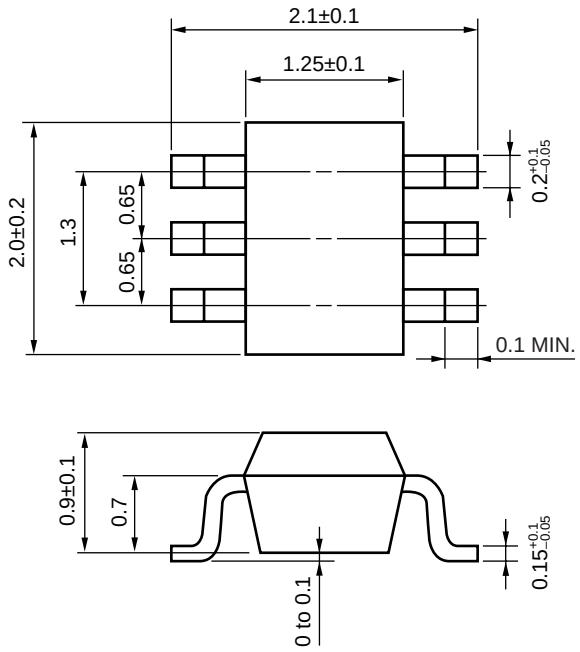
TOTAL CURRENT, CONVERSION
LOSS, IIP3, IM3, LOCAL LEAKAGE,
vs. RF FREQUENCY



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

6-PIN SUPER MINIMOLD (UNIT: mm)



RECOMMENDED SOLDERING CONDITIONS

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

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235 °C or below Time: 30 seconds or less (at 210 °C) Count: 3, Exposure limit: None[Note]	IR35-00-3
VPS	Package peak temperature: 215 °C or below Time: 40 seconds or less (at 200 °C) Count: 3, Exposure limit: None[Note]	VP15-00-3
Wave Soldering	Soldering bath temperature: 260 °C or below Time: 10 seconds or less Count: 1, Exposure limit: None[Note]	WS60-00-1
Partial Heating	Pin temperature: 300 °C Time: 3 seconds or less (per side of device) Exposure limit: None[Note]	–

Note After opening the dry pack, keep it in a place below 25 °C and 65 % RH for the allowable storage period.

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

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).

CAUTION

The great care must be taken in dealing with the devices in this guide.
The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned.
Keep the law concerned and so on, especially in case of removal.