CEL

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC8232T5N

SiGe:C LOW NOISE AMPLIFIER FOR GPS

DESCRIPTION

The μPC8232T5N is a silicon germanium carbon (SiGe:C) monolithic integrated circuit designed as low noise amplifier for GPS. This device exhibits low noise figure and high power gain characteristics, so this IC can improve the sensitivity of GPS receiver. In addition, the μPC8232T5N which is included output matching circuit contributes to reduce external components and system size.

The package is a 6-pin plastic TSON (Thin Small Out-line Non-leaded) suitable for surface mount.

This IC is manufactured using our UHS4 (Ultra High Speed Process) SiGe:C bipolar process.

FEATURES

- Low noise : NF = 0.95 dB TYP. @ f_{in} = 1 575 MHz
- High gain : G_P = 17 dB TYP. @ f_{in} = 1 575 MHz
- Low current consumption : I_{CC} = 3.0 mA TYP. @ V_{CC} = 3.0 V
- Built-in power-saving function
- High-density surface mounting : 6-pin plastic TSON package (1.5 × 1.5 × 0.37 mm)
- Included output matching circuit
- Included very robust bandgap regulator (Small V_{CC} and T_A dependence)
- Included protection circuits for ESD

APPLICATION

- Low noise amplifier for GPS

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPC8232T5N-E2	μPC8232T5N-E2-A	6-pin plastic TSON (Pb-Free)	6L	• 8 mm wide embossed taping • Pin 1, 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: μPC8232T5N-A

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

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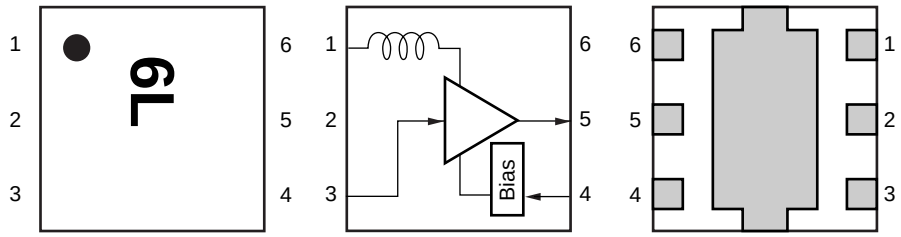
PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

(Top View) (Top View) (Bottom View)



Pin No.	Pin Name
1	V_{CC}
2	GND
3	INPUT
4	Power Save
5	OUTPUT
6	V_{CC}

Remark Exposed pad : GND

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C	4.0	V
Power-Saving Voltage	V_{PS}	T_A = +25°C	4.0	V
Total Power Dissipation	P_{tot}		150	mW
Operating Ambient Temperature	T_A		–40 to +85	°C
Storage Temperature	T_{stg}		–55 to +150	°C
Input Power	P_{in}		+10	dBm

RECOMMENDED OPERATING RANGE

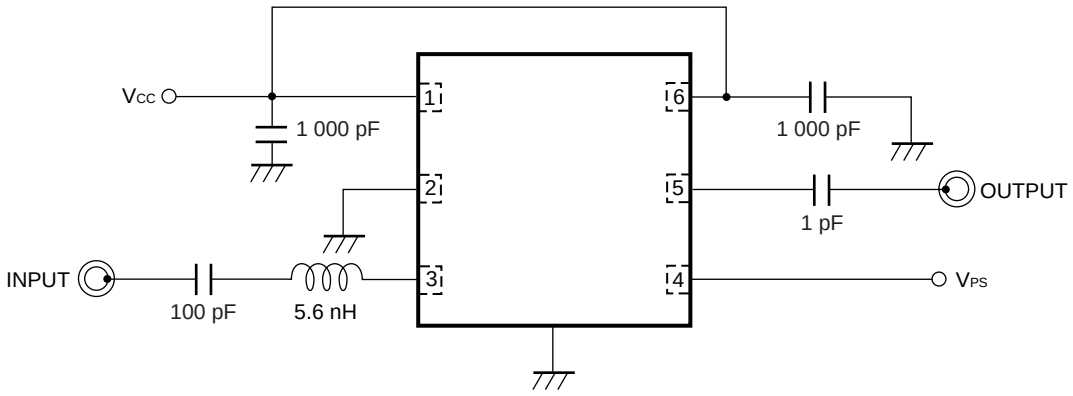
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	2.5	3.0	3.3	V
Operating Ambient Temperature	T_A	–40	+25	+85	°C
Power Save Turn-on Voltage	V_{PSon}	1.6	–	V_{CC}	V
Power Save Turn-off Voltage	V_{PSoff}	0	–	0.4	V

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{CC} = V_{PS} = 3.0 V, f_{in} = 1 575 MHz, unless otherwise specified)

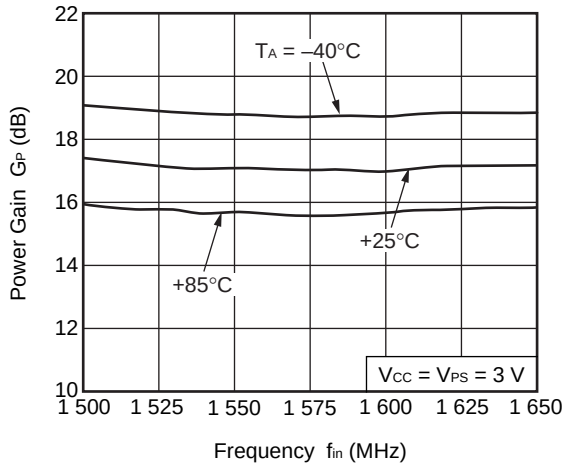
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No Signal (V_{PS} = 3.0 V)	2.3	3.0	4.1	mA
		At Power-Saving Mode (V_{PS} = 0 V)	–	–	1	μA
Power Gain	G_P	P_{in} = –35 dBm	15	17	19	dB
Noise Figure	NF		–	0.95	1.25	dB
Input 3rd Order Distortion Intercept Point	IIP_3	$f_{in}1$ = 1 574 MHz, $f_{in}2$ = 1 575 MHz	–	–8	–	dBm
Input Return Loss	RL_{in}		7	10	–	dB
Output Return Loss	RL_{out}		10	20	–	dB
Isolation	ISL		–	40	–	dB
Gain 1 dB Compression Input Power	$P_{in\ (1\ dB)}$		–	–21	–	dBm

TEST CIRCUIT

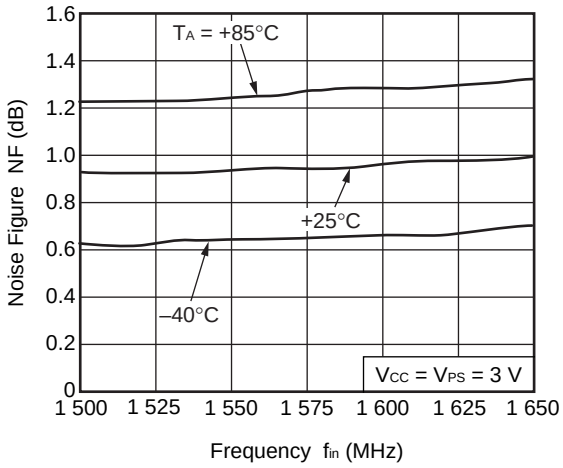


TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

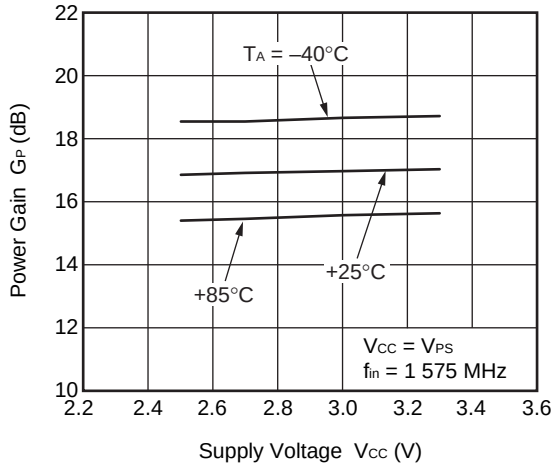
POWER GAIN vs. FREQUENCY



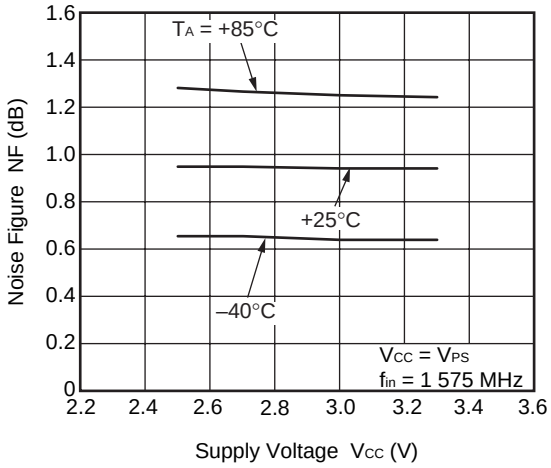
NOISE FIGURE vs. FREQUENCY



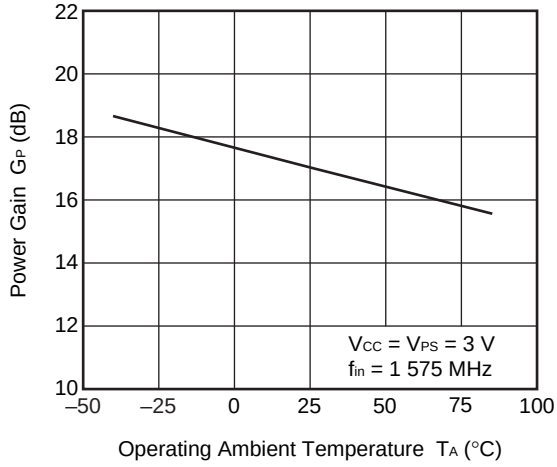
POWER GAIN vs. SUPPLY VOLTAGE



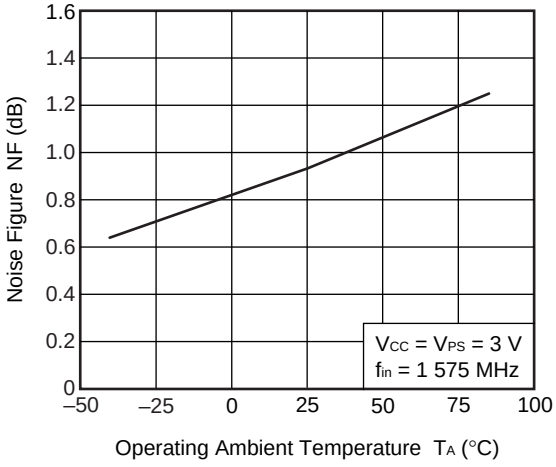
NOISE FIGURE vs. SUPPLY VOLTAGE



POWER GAIN vs. OPERATING AMBIENT TEMPERATURE

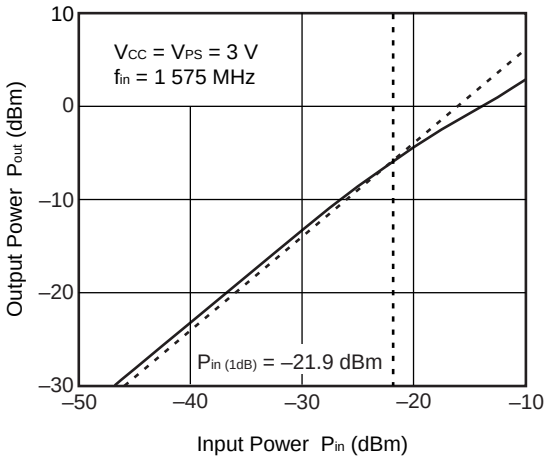


NOISE FIGURE vs. OPERATING AMBIENT TEMPERATURE

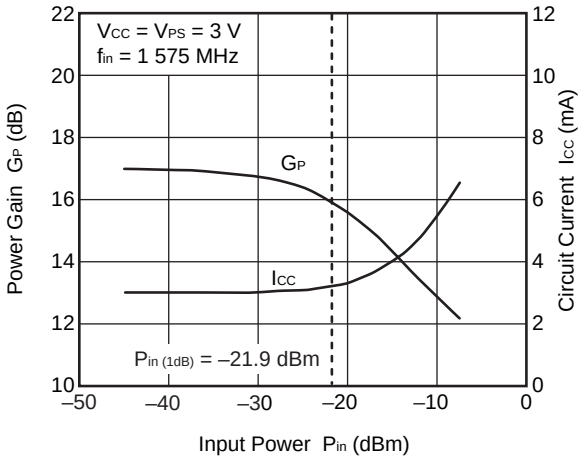


Remark The graphs indicate nominal characteristics.

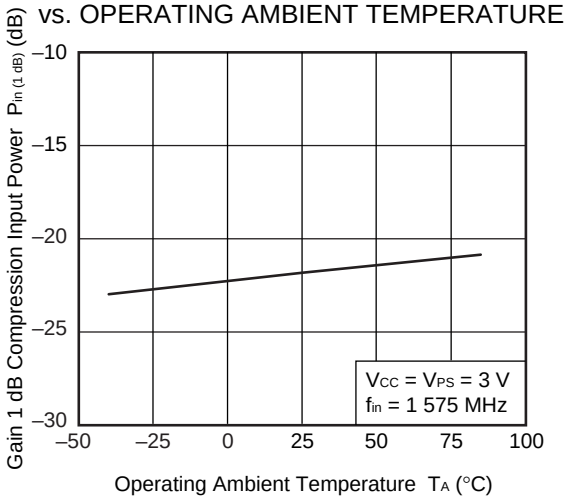
OUTPUT POWER vs. INPUT POWER



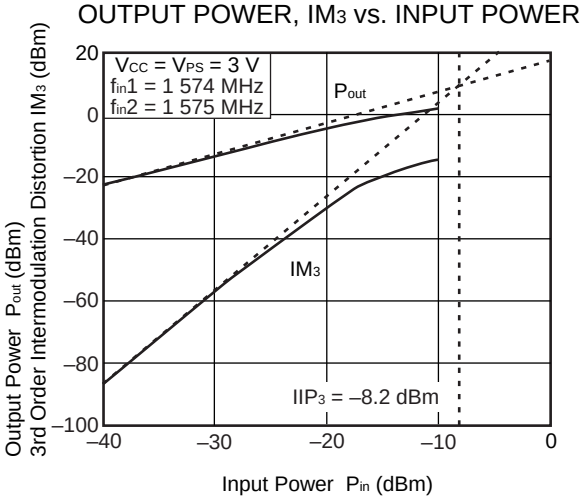
POWER GAIN, CIRCUIT CURRENT vs. INPUT POWER



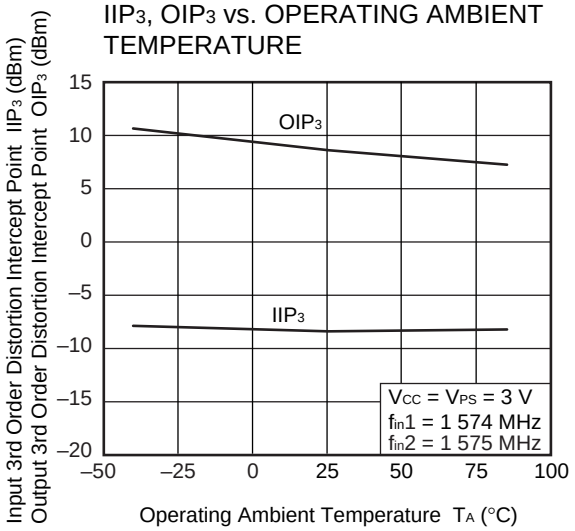
GAIN 1 dB COMPRESSION INPUT POWER vs. OPERATING AMBIENT TEMPERATURE



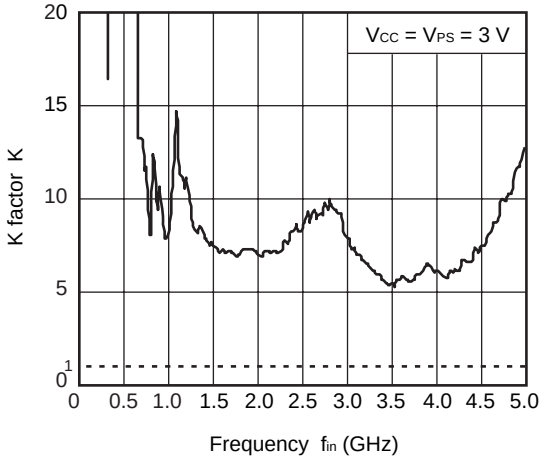
OUTPUT POWER, IM3 vs. INPUT POWER



IIP3, OIP3 vs. OPERATING AMBIENT TEMPERATURE

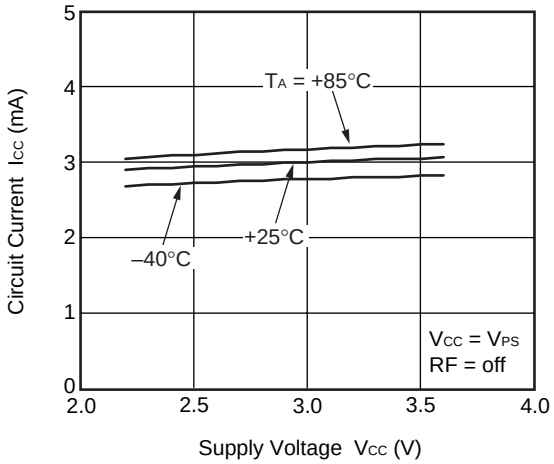


K FACTOR vs. FREQUENCY

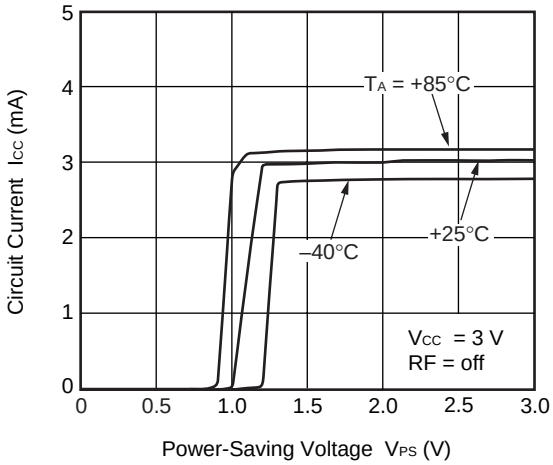


Remark The graphs indicate nominal characteristics.

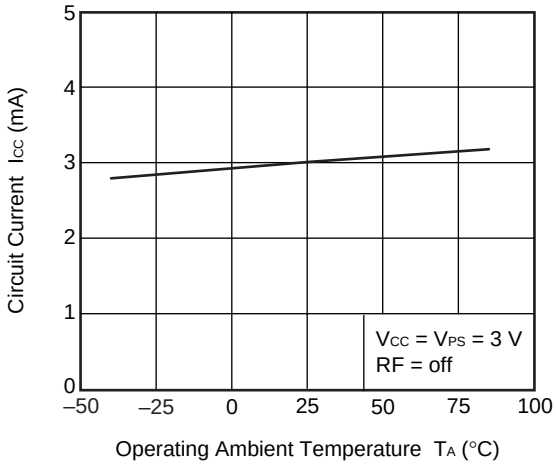
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



CIRCUIT CURRENT vs. POWER-SAVING VOLTAGE



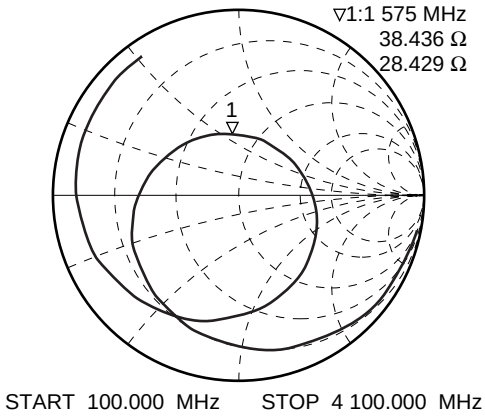
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



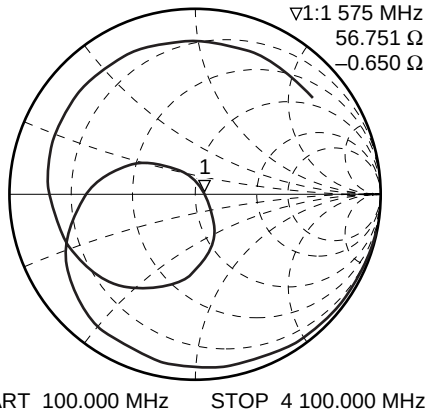
Remark The graphs indicate nominal characteristics.

S-PARAMETERS (T_A = +25°C, V_{CC} = V_{PS} = 3.0 V, monitored at connector on board)

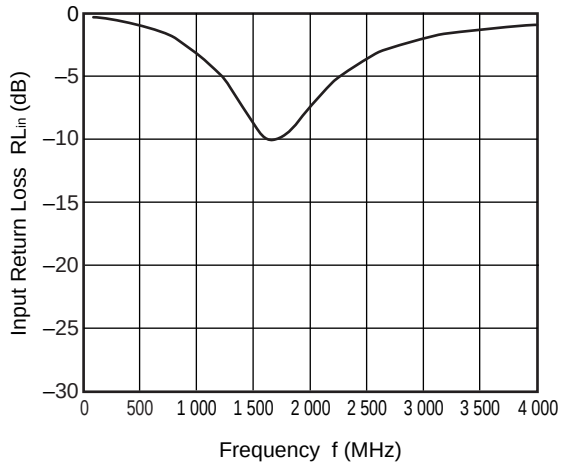
S_{11}–FREQUENCY



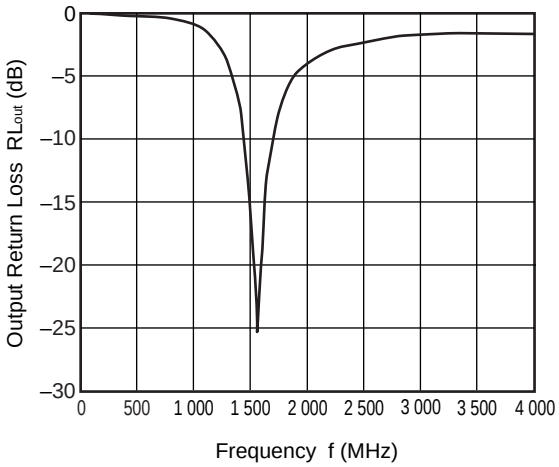
S_{22}–FREQUENCY



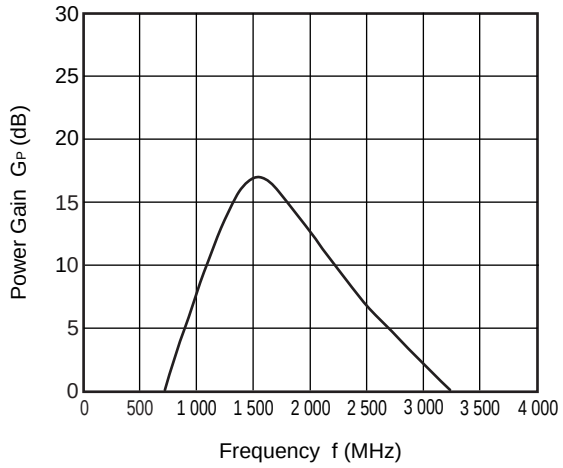
INPUT RETURN LOSS vs. FREQUENCY



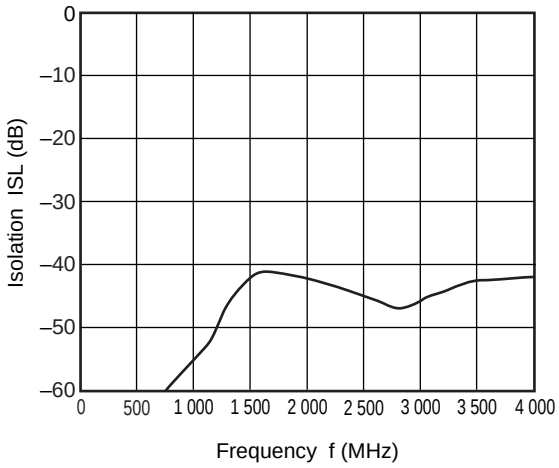
OUTPUT RETURN LOSS vs. FREQUENCY



POWER GAIN vs. FREQUENCY



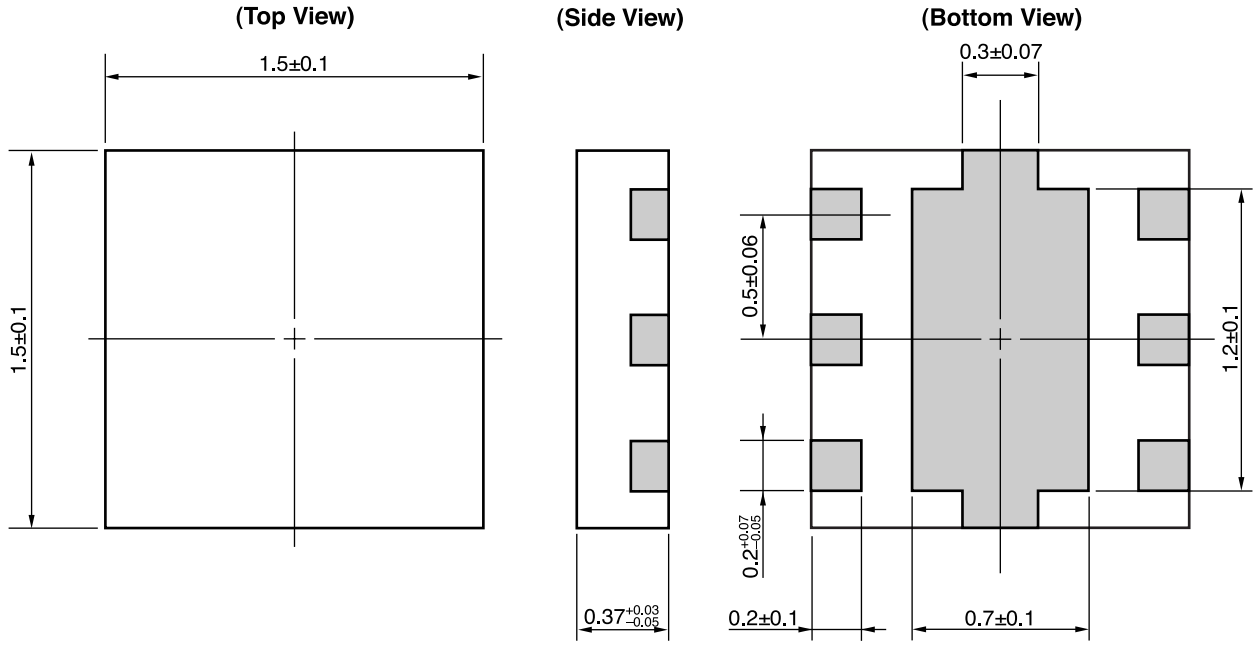
ISOLATION vs. FREQUENCY



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)



NOTES ON CORRECT USE

(1) Observe precautions for handling because of electro-static sensitive devices.

(2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation). All the ground terminals must be connected together with wide ground pattern to decrease impedance difference.

(3) The bypass capacitor should be attached to V_{CC} line.

(4) Do not supply DC voltage to INPUT pin.

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
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 (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).

- **The information in this document is current as of July, 2007. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
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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.

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