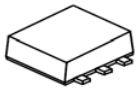
WIDE BAND LOW NOISE AMPLIFIER GaAs MMIC

■ GENERAL DESCRIPTION

The NJG1140KA1 is a wide band low noise amplifier GaAs MMIC designed for Set-top Boxes, TV tuners and DTV applications.

The NJG1140KA1 features broadband operation from 50MHz to 2150MHz, high linearity and high ESD tolerance. The NJG1140KA1 requires only four external components. The NJG1140KA1 is available in a small, lead-free, halogen-free, 1.6mm x 1.6mm x 0.55 mm, 6-pin FLP6-A1 package.

■ PACKAGE OUTLINE



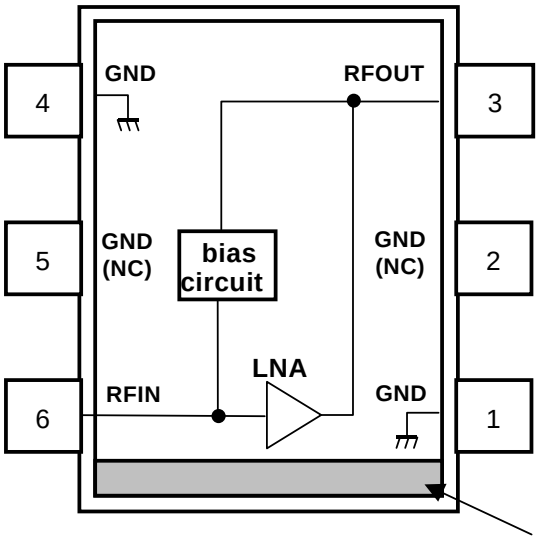
NJG1140KA1

■ FEATURES

● Wide operating frequency range	50MHz~2150MHz
● Operation voltage	3.3V typ. (+2.5V~+4.0V)
● Current consumption	10mA typ. @ V_{DD}=3.3V
● Gain	9.0dB typ. @ V_{DD}=3.3V
● High $P_{-1dB(IN)}$	+7.0dBm @ V_{DD}=3.3V
● High Input IP3	+9.0dBm @ V_{DD}=3.3V
● High ESD tolerance	On-chip ESD protection circuit
● External components count	4 pcs. (capacitors 3pcs, inductor 1pc)
● Small package	FLP6-A1 (package size: 1.6mm x 1.6mm x 0.55mm typ.)
● Lead -free and halogen-free	

■ PIN CONFIGURATION

(TOP VIEW)



Pin Connection

1. GND
2. GND(NC)
3. RFOUT
4. GND
5. GND(NC)
6. RFIN

NOTE: The information on this datasheet is subject to change without notice

■ ABSOLUTE MAXIMUM RATINGS

T_a=+25°C, Z_s=Z_l=50Ω

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
Supply voltage	V_{DD}		5.0	V
Input power	P_{IN}	V_{DD}=3.3V	+15	dBm
Power dissipation	P_D	4-layer FR4 PCB with through-hole (74.2mmx74.2mm), T_j=150°C	580	mW
Operating temperature	T_{opr}		-40~+85	°C
Storage temperature	T_{stg}		-55~+150	°C

■ ELECTRICAL CHARACTERISTICS (DC)

GENERAL CONDITIONS: V_{DD}=3.3V, T_a=+25°C, Z_s=Z_l=50Ω

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply voltage	V_{DD}		2.5	3.3	4.0	V
Supply current	I_{DD}		-	10	14	mA

■ ELECTRICAL CHARACTERISTICS (RF)

GENERAL CONDITIONS: V_{DD}=3.3V, f_{RF}=50~2150MHz, T_a=+25°C, Z_s=Z_l=50Ωwith application circuit

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating frequency	Freq		50	-	2150	MHz
Small signal gain	Gain	Exclude PCB and connector losses*1	7.0	9.0	12.0	dB
Noise figure	NF	Exclude PCB and connector losses*2	-	2.5	3.0	dB
Input power at 1dB gain compression point	$P_{-1dB(IN)}$		+2.0	+7.0	-	dBm
Input 3rd order intercept point	IIP3	f1=f_{RF}, f2=f_{RF}+100kHz, Pin=-20dBm	+5.0	+9.0	-	dBm
Isolation	ISO	S12	-	-16.0	-	dB
RF IN VSWR	VSWRi		-	1.5	3.3	
RF OUT VSWR	VSWRo		-	1.5	3.3	

*1: Input and output PCB, connector losses: 0.016dB(at 50MHz), 0.254dB(at 2150MHz)
*2: Input PCB, connector losses: 0.008dB(at 50MHz), 0127dB(at 2150MHz)

■ TERMINAL INFORMATION

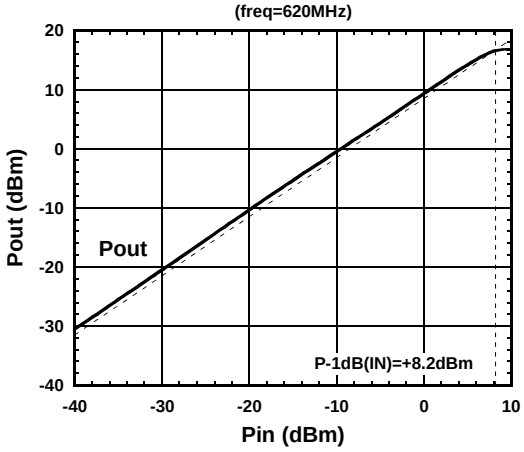
No.	SYMBOL	DESCRIPTION
1	GND	Ground terminal. Connect to the PCB ground plane.
2	NC (GND)	No connected terminal. This terminal is not connected with internal circuit. Connect to the PCB ground plane.
3	RFOUT	RF output terminal. Requires a DC blocking capacitor C2 and DC feed inductor L1.
4	GND	Ground terminal. Connect to the PCB ground plane.
5	NC (GND)	No connected terminal. This terminal is not connected with internal circuit. Connect to the PCB ground plane.
6	RFIN	RF input terminal. Requires a DC bloking capacitor C1.

Notes: Ground terminal (No.1 and 4) and NC terminal (No.2 and 5) should be connected with the PCB ground for good RF performance.

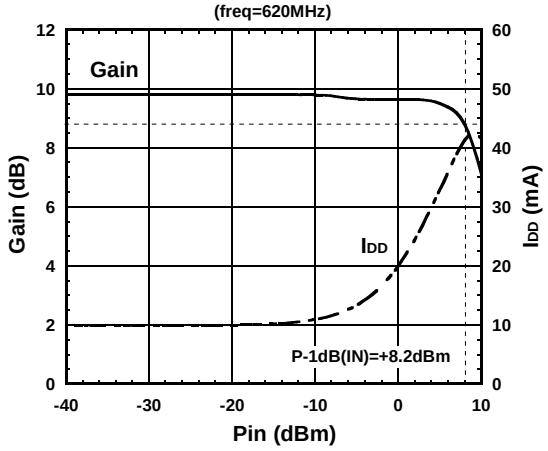
■ TYPICAL CHARACTERISTICS

GENERAL CONDITIONS : V_{DD}=3.3V, Ta=+25°C, Z_s=Z_l=50ohm

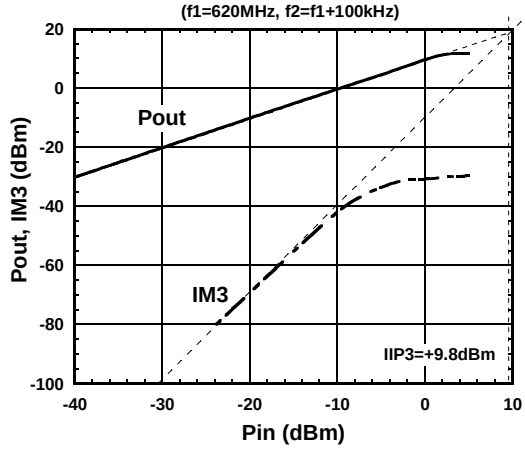
Pout vs. Pin
(freq=620MHz)



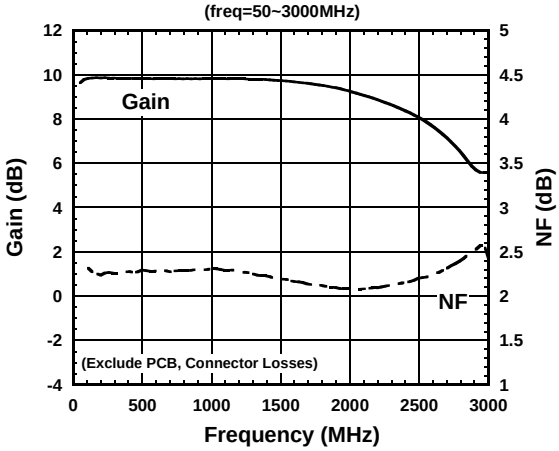
Gain, I_{DD} vs. Pin
(freq=620MHz)



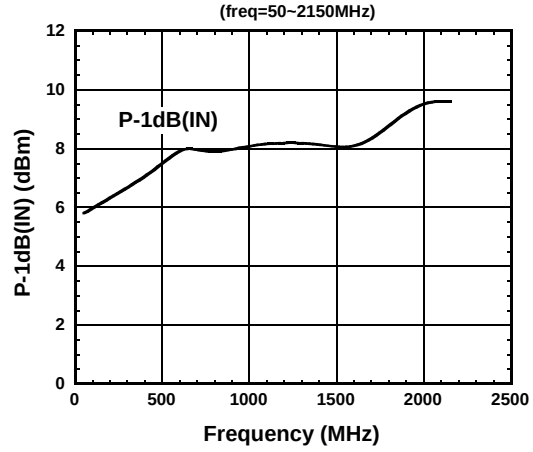
Pout, IM3 vs. Pin
(f1=620MHz, f2=f1+100kHz)



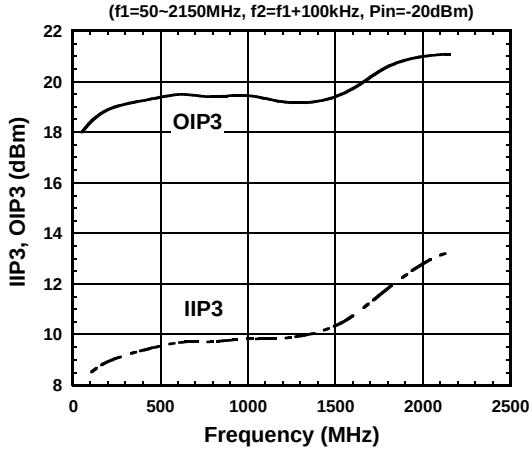
Gain, NF vs. Frequency
(freq=50~3000MHz)



P-1dB(IN) vs. Frequency
(freq=50~2150MHz)



IIP3, OIP3 vs. Frequency
(f1=50~2150MHz, f2=f1+100kHz, Pin=-20dBm)

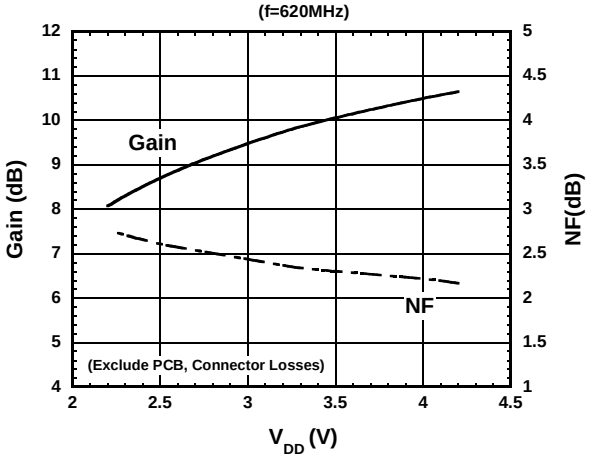


■ TYPICAL CHARACTERISTICS

GENERAL CONDITIONS : V_{DD}=3.3V, Ta=+25°C, Z_s=Z_l=50ohm

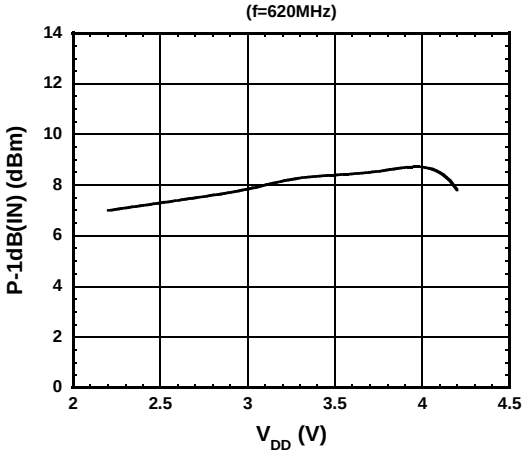
Gain, NF vs. V_{DD}

(f=620MHz)



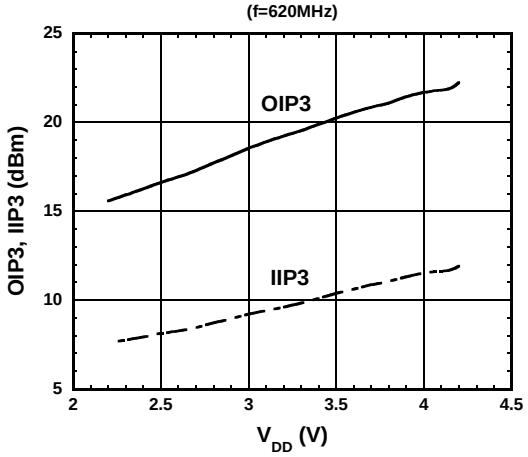
P-1dB(IN) vs. V_{DD}

(f=620MHz)



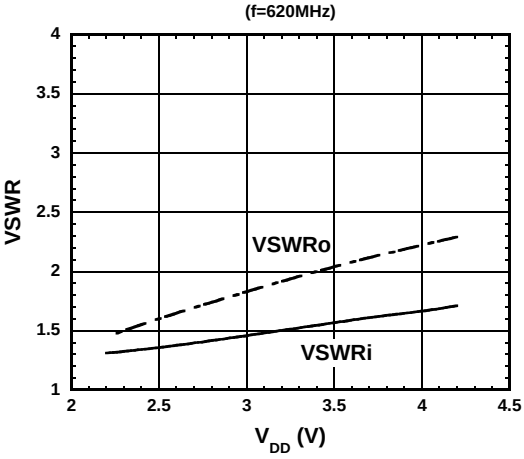
OIP3, IIP3 vs. V_{DD}

(f=620MHz)



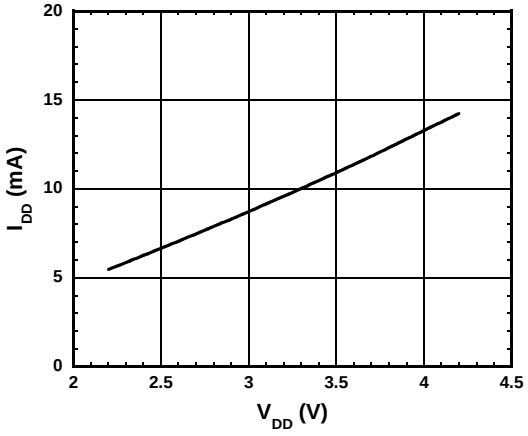
VSWR vs. V_{DD}

(f=620MHz)



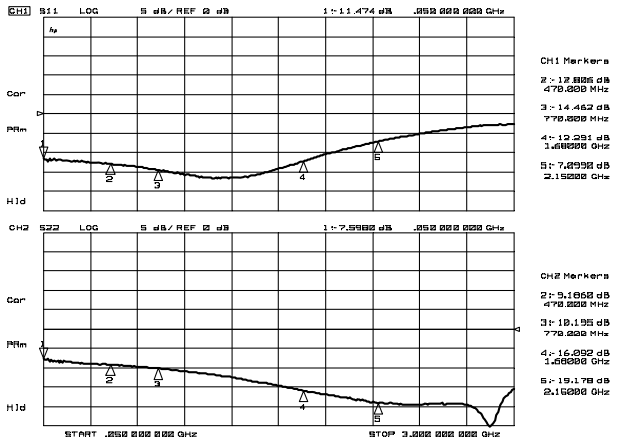
I_{DD} vs. V_{DD}

(RF OFF)

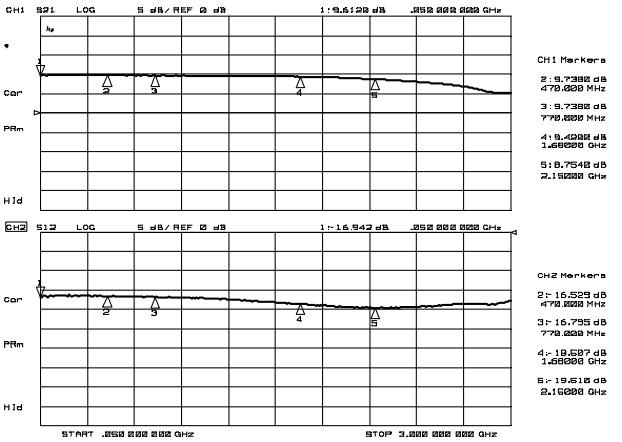


■ TYPICAL CHARACTERISTICS

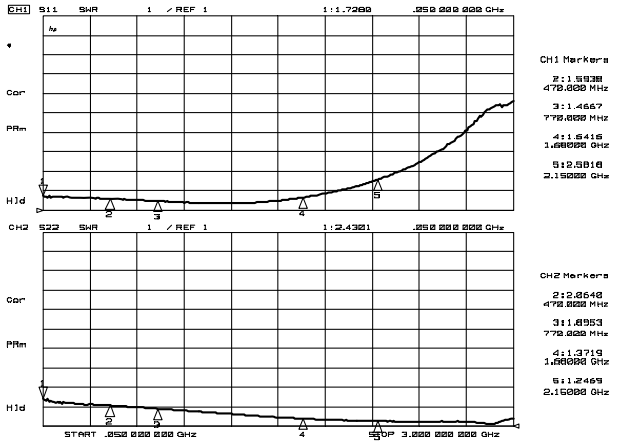
GENERAL CONDITIONS : V_{DD}=3.3V, Ta=+25°C, Z_s=Z_l=50ohm



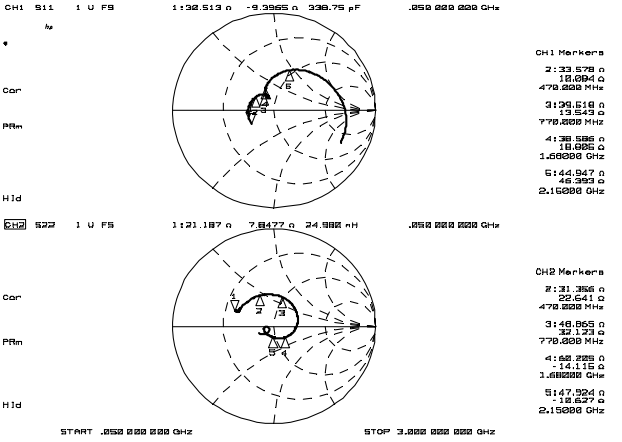
S11, S22



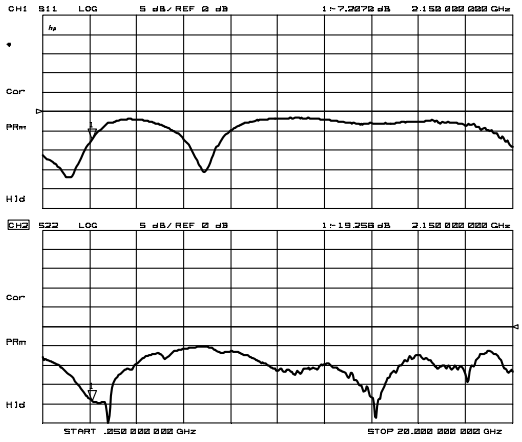
S21, S12



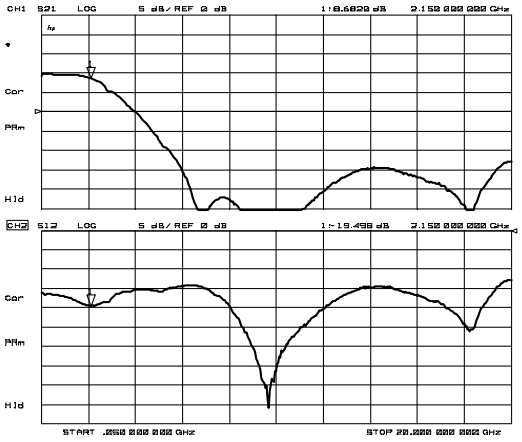
VSWR



Zin, Zout



S11, S22 (f=50MHz~20GHz)

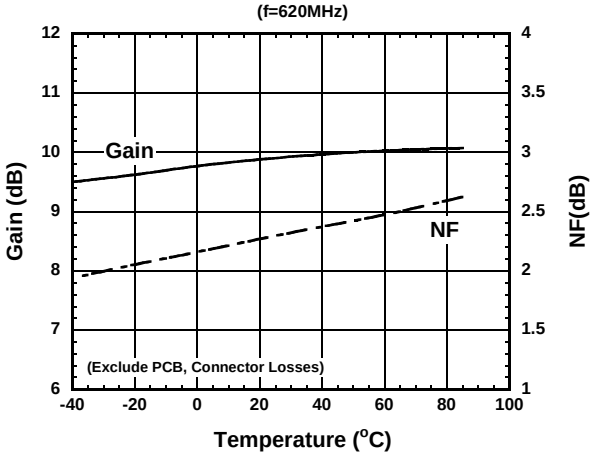


S21, S12 (f=50MHz~20GHz)

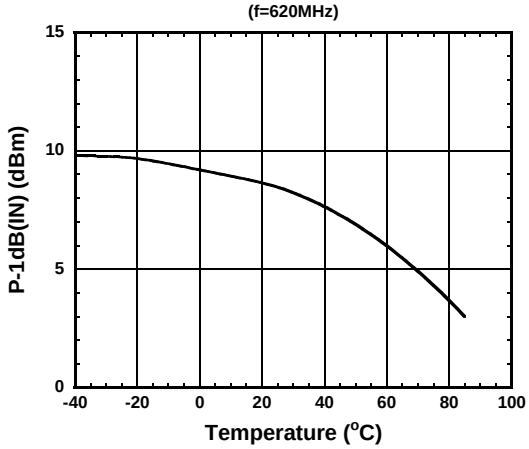
■ TYPICAL CHARACTERISTICS

GENERAL CONDITIONS : V_{DD}=3.3V, Z_s=Z_l=50ohm

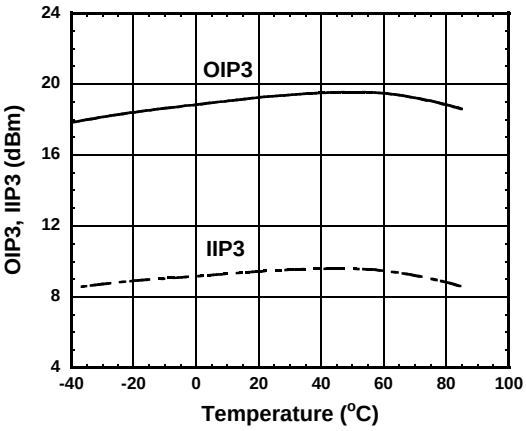
Gain, NF vs. Temperature
(f=620MHz)



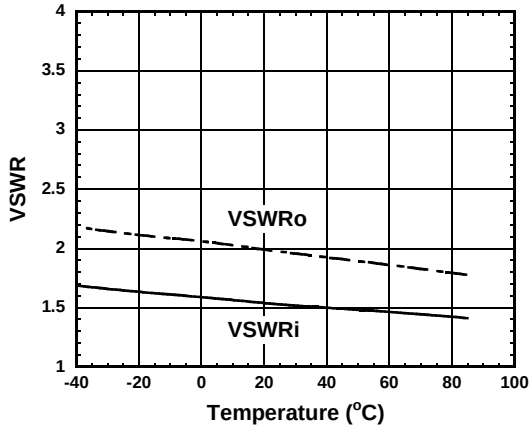
P-1dB(IN) vs. Temperature
(f=620MHz)



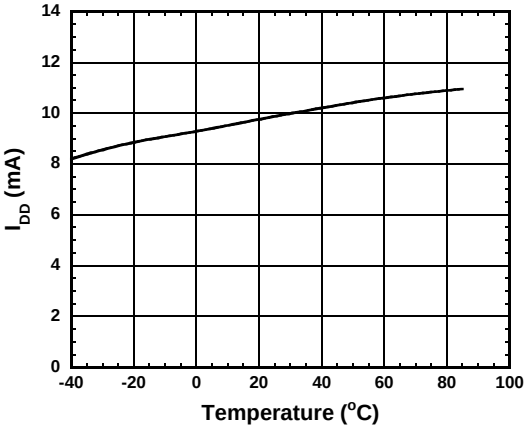
OIP3, IIP3 vs. Temperature
(f1=620MHz, f2=f1+100kHz, Pin=-20dBm)



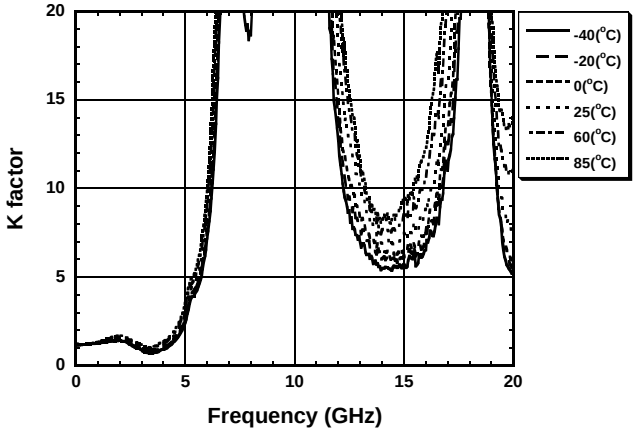
VSWR vs. Temperature
(f1=620MHz)



I_{DD} vs. Temperature
(RF OFF)

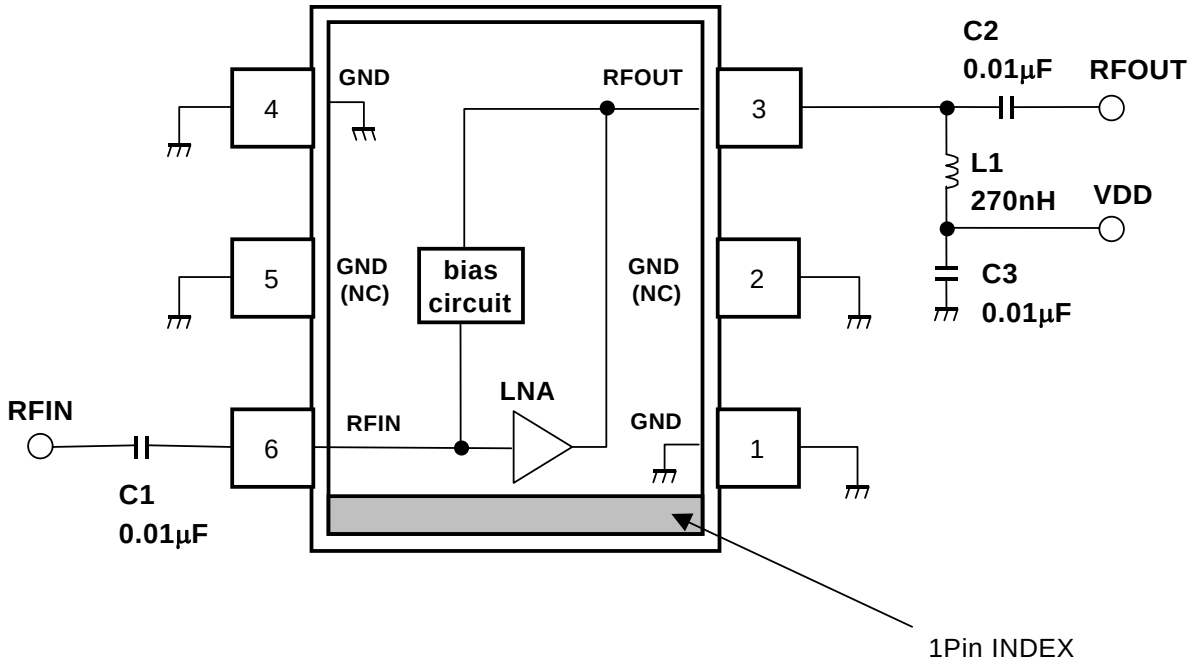


K factor vs. Temperature
(f=50MHz~20GHz)



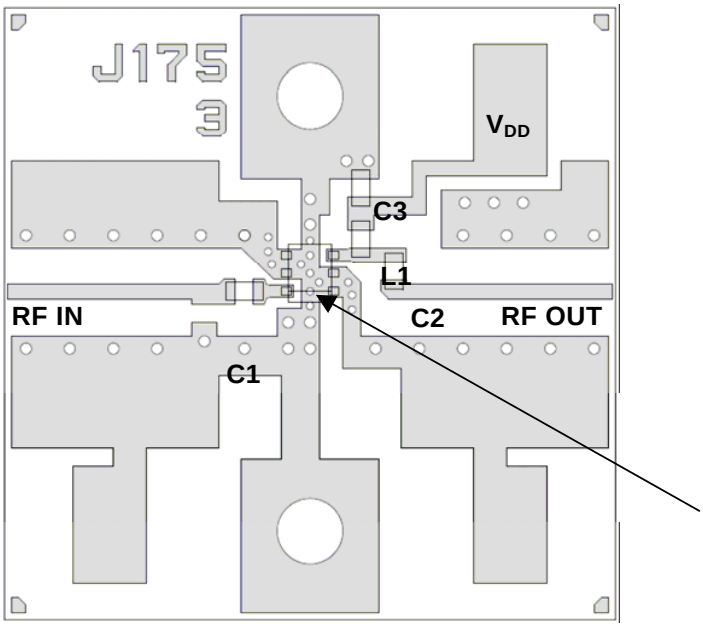
■ APPLICATION CIRCUIT

(Top View)



■ TEST PCB LAYOUT

(Top View)



Parts list

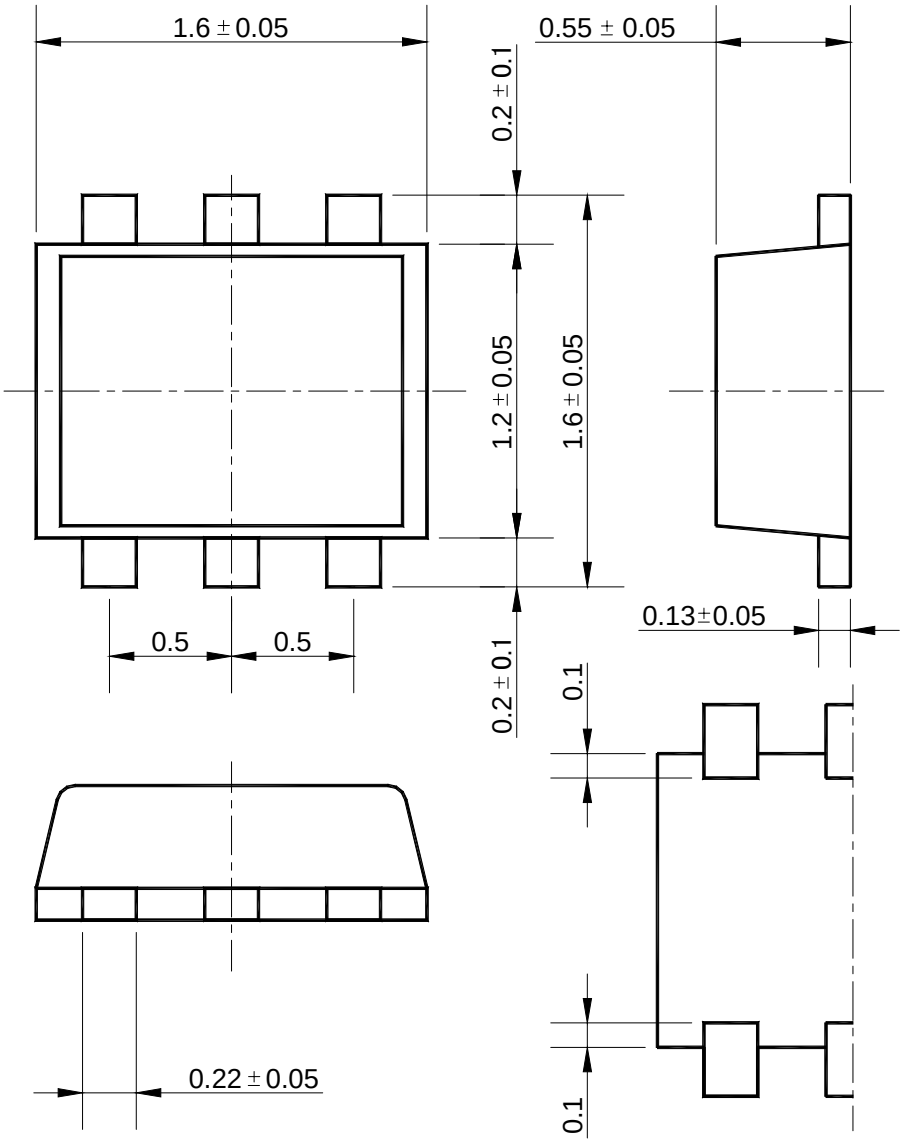
Parts ID	Comments
L1	TAIYO YUDEN HK1005 Series
C1~C3	MURATA MFG GRM15 Series

PCB (FR-4):
t=0.2mm
MICROSTRIP LINE WIDTH
=0.40mm (Z_0=50Ω)
PCB SIZE=16.8mm x 16.8mm

CAUTION

In order not to couple with terminal RFIN and RFOUT, please layout ground pattern under the IC.

■ PACKAGE OUTLINE (FLP6-A1)



Unit: mm

Cautions on using this product

This product contains Gallium-Arsenide (GaAs) which is a harmful material.

- Do NOT eat or put into mouth.
- Do NOT dispose in fire or break up this product.
- Do NOT chemically make gas or powder with this product.
- To waste this product, please obey the relating law of your country.

This product may be damaged with electric static discharge (ESD) or spike voltage. Please handle with care to avoid these damages.