

LOW NOISE AMPLIFIER GaAs MMIC

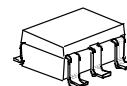
■GENERAL DESCRIPTION

NJG1102F1 is a Low Noise Amplifier GaAs MMIC designed for 800MHz band cellular phone handsets.

This amplifier provides low current consumption and low noise figure at low supply voltage of 2.5V, low noise of 1.5dB and low current consumption of 3mA at supply voltage of 2.7V.

NJG1102F1 includes internal self-bias circuit and input DC blocking capacitor with small package of MTP6-1.

■PACKAGE OUTLINE

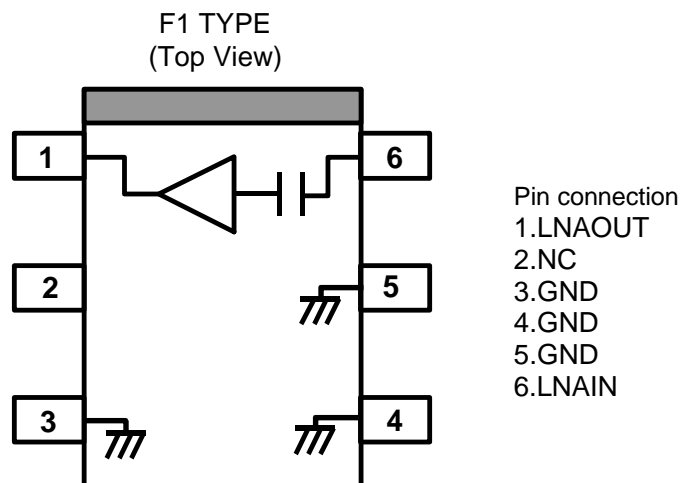


NJG1102F1

■FEATURES

- | | |
|--------------------------|--|
| ●Low voltage operation | +2.7V typ. |
| ●Low current consumption | 3mA typ. |
| ●High small signal gain | 17dB typ. @f=820MHz |
| ●Low noise figure | 1.4dB typ. @f=820MHz |
| ●High Input IP3 | -3dBm typ. @f=820.0+820.1MHz |
| ●High output IP3 | 14dBm typ. @f=820.0+820.1MHz |
| ●Package | MTP6-1 (Mount Size: 2.8 x 2.9 x 1.2mm) |

■PIN CONFIGURATION



Note: is package orientation mark.

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■ABSOLUTE MAXIMUM RATINGS

($T_a=25^{\circ}\text{C}$, $Z_s=Z_l=50\Omega$)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
Drain Voltage	V_{DD}		5.0	V
Input Power	P_{in}	$V_{DD}=2.7\text{V}$	+10	dBm
Power Dissipation	P_D		150	mW
Operating Temperature	T_{opr}		-40~+85	$^{\circ}\text{C}$
Storage Temperature	T_{stg}		-55~+125	$^{\circ}\text{C}$

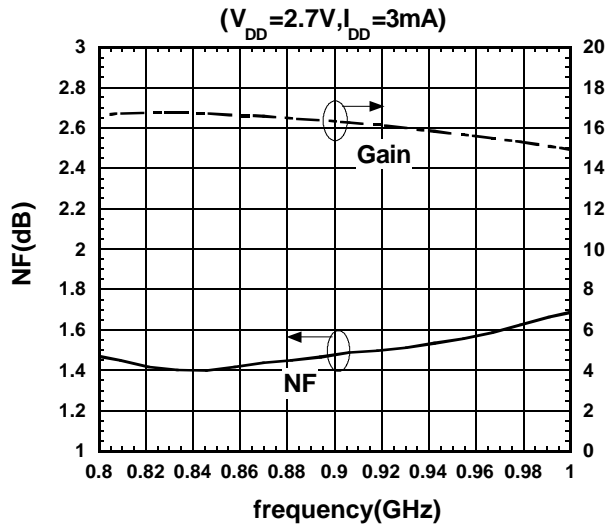
■ELECTRICAL CHARACTERISTICS

($V_{DD}=2.7\text{V}$, $f=820\text{MHz}$, $T_a=+25^{\circ}\text{C}$, $Z_s=Z_l=50\Omega$)

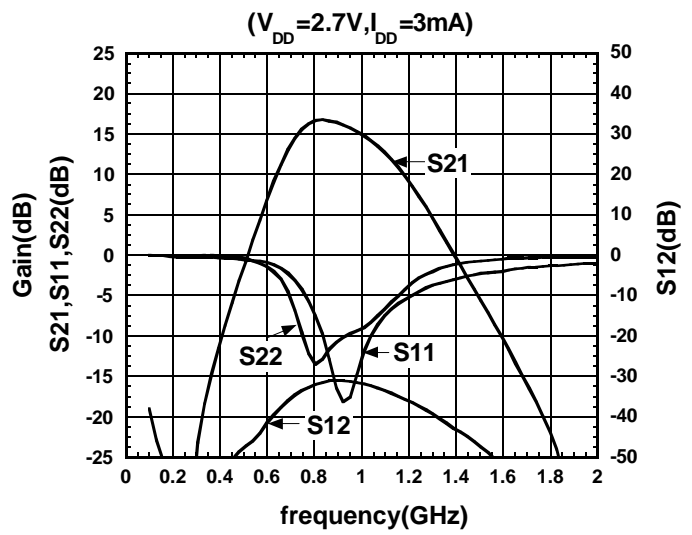
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency	freq		800	820	1000	MHz
Drain Voltage	V_{DD}		2.5	2.7	4.5	V
Operating Current	I_{DD}	RF OFF	-	3.0	4.0	mA
Small Signal Gain	Gain		15.0	17.0	19.0	dB
Gain Flatness	G_{flat}	$f_{RF}=810\sim 885\text{MHz}$	-	0.5	1.0	dB
Noise Figure	NF		-	1.4	1.6	dB
Pout at 1dB Gain Compression point	P_{-1dB}		-3.0	+1.0	-	dBm
Input 3rd Order Intercept Point	IIP3	$f=820.0\sim 820.1\text{MHz}$	-7.0	-3.0	-	dBm
RFIN Port VSWR	$VSWR_i$		-	2.0	3.0	
RFOUT Port VSWR	$VSWR_o$		-	2.0	3.0	

TYPICAL CHARACTERISTICS

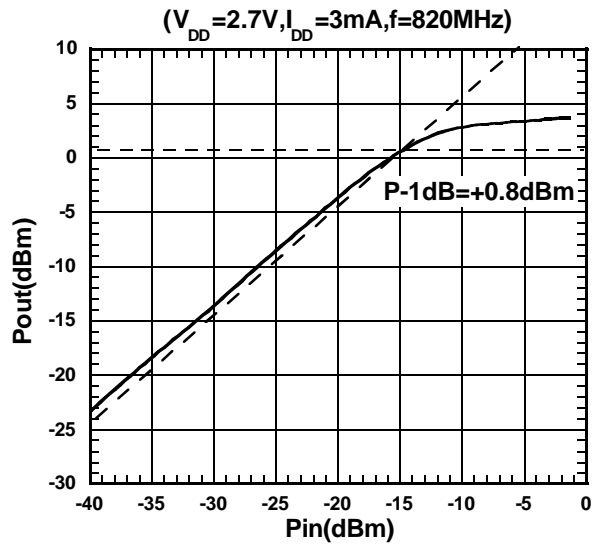
NF, Gain vs. frequency



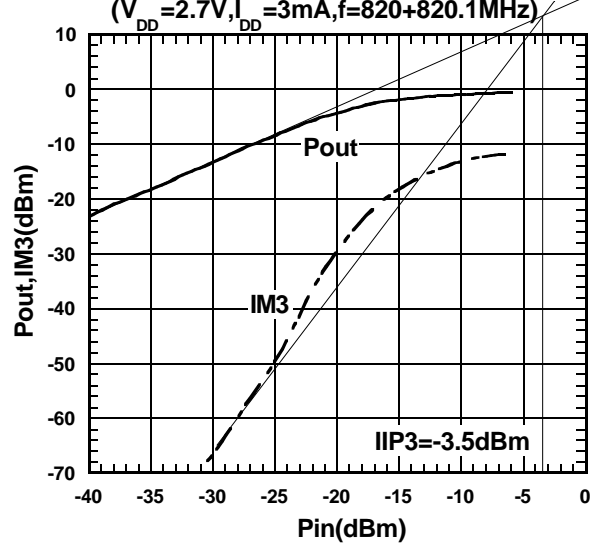
S21, S11, S22, S12 vs. frequency



Pin vs. Pout

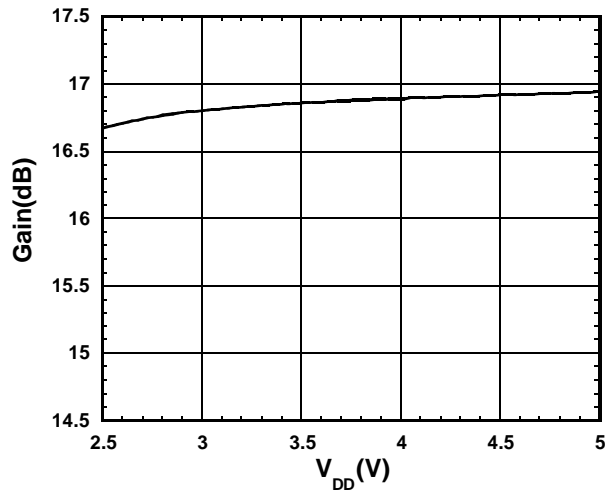


Pin vs. Pout, IM3



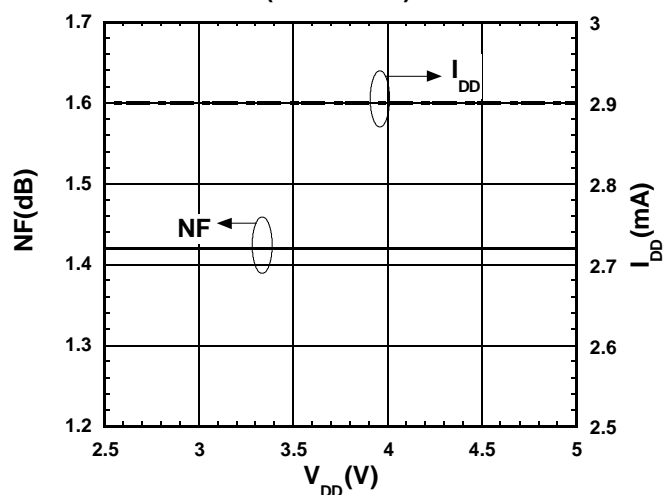
Gain vs. V_{DD}

($f=820MHz$)



NF, I_{DD} vs. V_{DD}

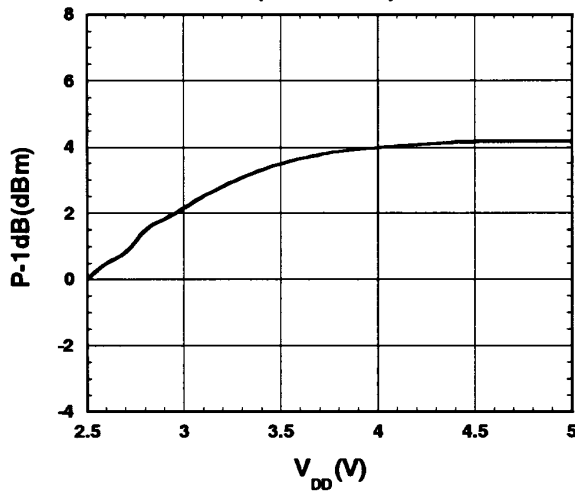
($f=820MHz$)



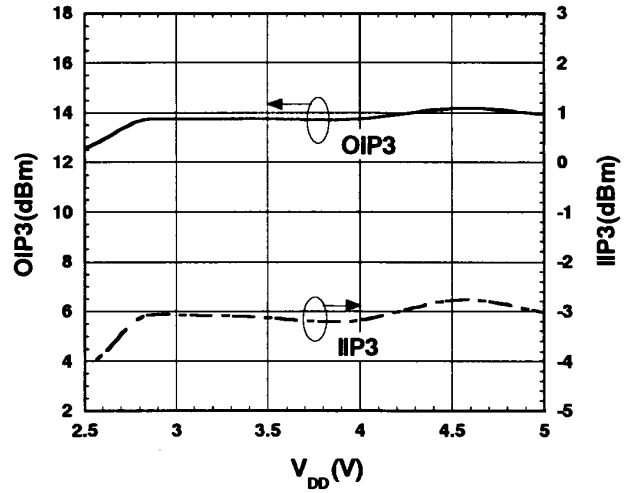
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TYPICAL CHARACTERISTICS

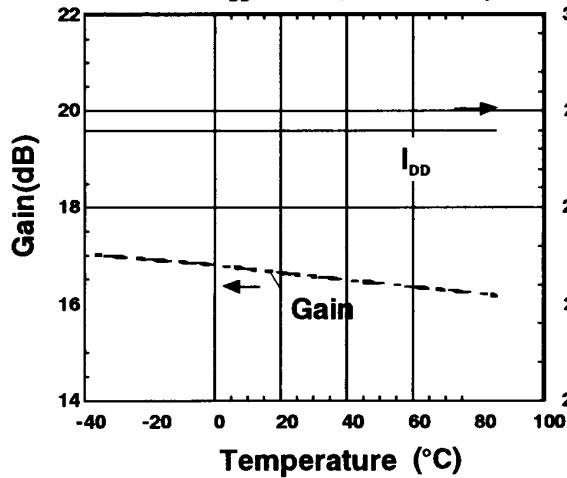
P-1dB vs. V_{DD}
(f=820MHz)



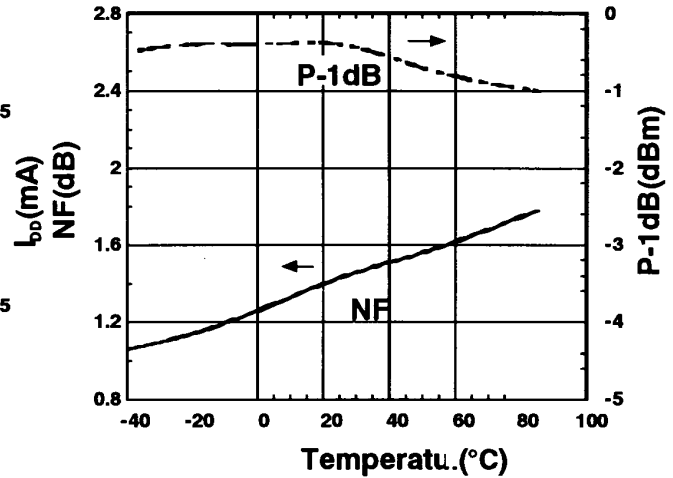
OIP3, IIP3 vs. V_{DD}
(f=820.0+820.1MHz, Pin=-30dBm)



Gain, I_{DD} vs. Temperature
($V_{DD}=2.7V, f=820MHz$)

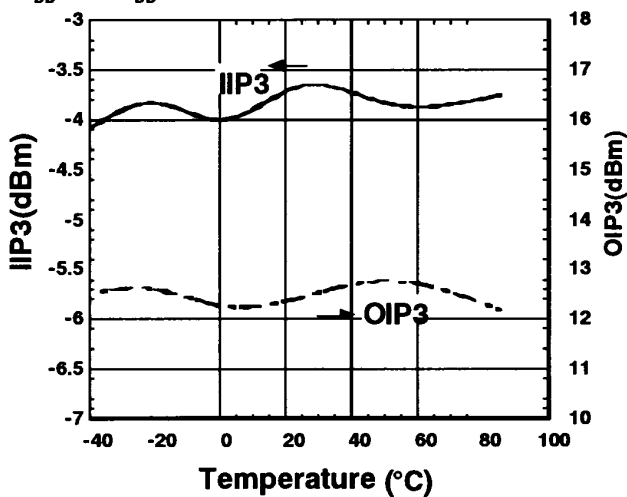


NF, P-1dB vs. Temperature
($V_{DD}=2.7V, f=820MHz$)



IIP3, OIP3 vs. Temperature

($V_{DD}=2.7V, I_{DD}=3.0mA, f=820.0+820.1MHz, Pin=-30dBm$)



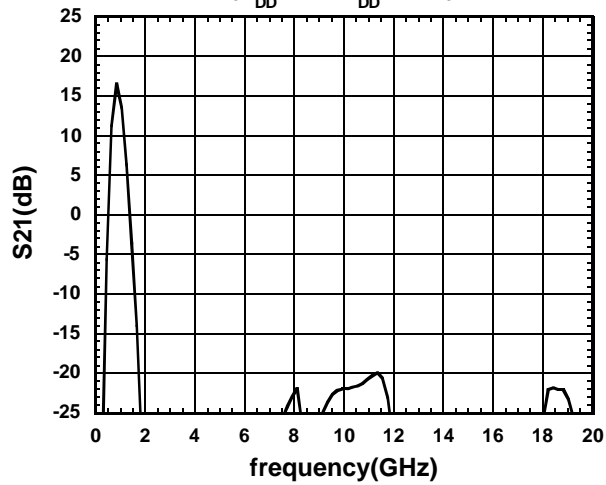
$$OIP3 = \frac{3 \times P_{out} - IM3}{2}$$

$$IIP3 = OIP3 - Gain \quad @P_{in} = -30dBm$$

■ TYPICAL CHARACTERISTICS

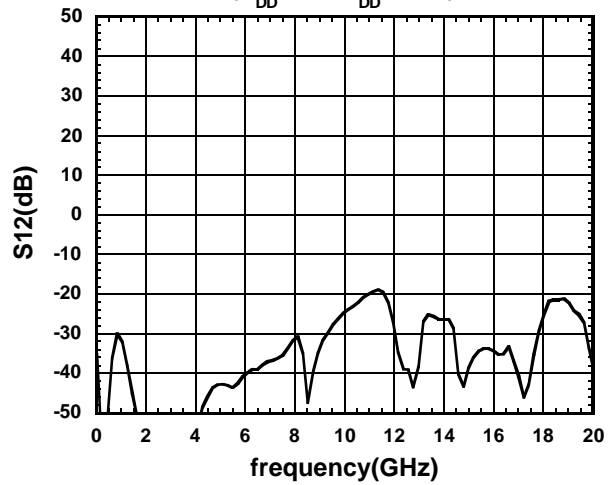
S21 vs. frequency (~20GHz)

($V_{DD}=2.7V, I_{DD}=3mA$)



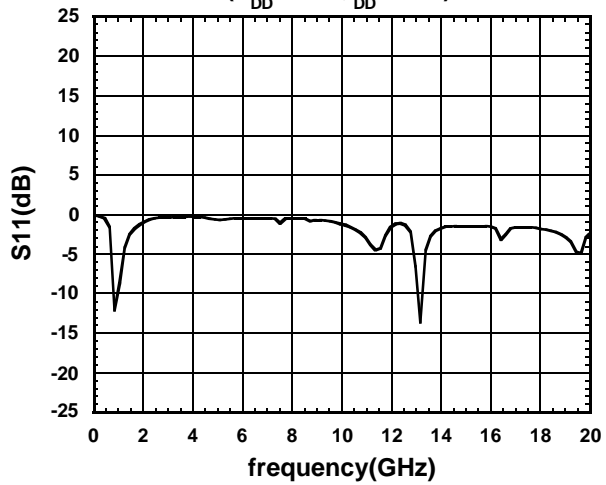
S12 vs. frequency (~20GHz)

($V_{DD}=2.7V, I_{DD}=3mA$)



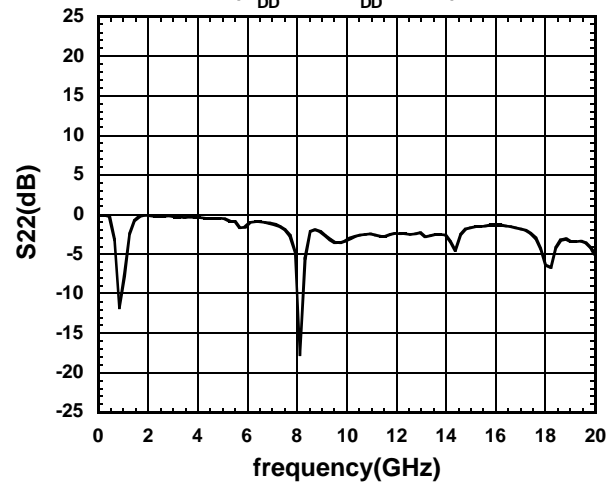
S11 vs. frequency (~20GHz)

($V_{DD}=2.7V, I_{DD}=3mA$)



S22 vs. frequency (~20GHz)

($V_{DD}=2.7V, I_{DD}=3mA$)



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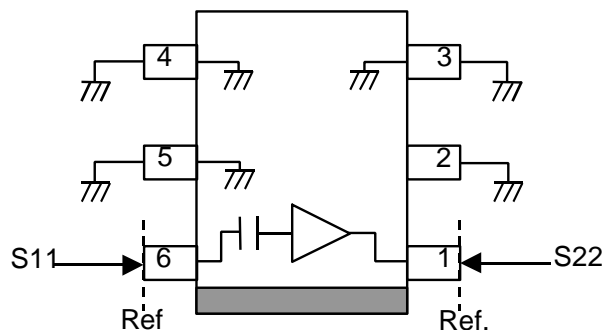
■ TYPICAL CHARACTERISTICS

Scattering Parameter Table

$V_{DD}=2.7V$, $I_{DD}=3mA$, $Z_0=50\Omega$

Freq (GHz)	S11		S21		S12		S22	
	mag (units)	ang (deg)	mag (units)	ang (deg)	mag (units)	ang (deg)	mag (units)	ang (deg)
0.1	1.000	-4.866	1.342	-159.147	0.006	14.420	0.945	-3.745
0.2	1.000	-10.234	1.524	-179.085	0.006	22.117	0.935	-5.657
0.3	1.000	-14.972	1.557	169.103	0.006	29.722	0.927	-7.752
0.4	0.994	-20.871	1.572	158.960	0.007	31.125	0.926	-9.779
0.5	0.976	-24.915	1.564	150.714	0.007	35.066	0.920	-11.953
0.6	0.965	-30.526	1.548	142.447	0.007	41.693	0.915	-14.091
0.7	0.925	-35.290	1.504	134.839	0.007	44.722	0.912	-16.312
0.8	0.912	-40.103	1.499	127.579	0.008	48.888	0.905	-18.499
0.9	0.868	-45.428	1.467	120.278	0.008	53.252	0.906	-20.641
1.0	0.849	-49.349	1.443	113.971	0.008	58.494	0.898	-22.933
1.1	0.813	-54.587	1.408	107.103	0.009	65.663	0.902	-25.089
1.2	0.790	-58.371	1.379	101.107	0.009	71.121	0.896	-27.460
1.3	0.761	-63.046	1.337	95.249	0.010	79.229	0.897	-29.474
1.4	0.739	-66.963	1.322	89.341	0.011	84.816	0.898	-31.516
1.5	0.713	-71.006	1.308	83.704	0.013	90.070	0.895	-33.708
1.6	0.697	-75.141	1.258	78.278	0.015	93.627	0.894	-35.562
1.7	0.669	-78.451	1.233	72.642	0.017	96.762	0.895	-37.942
1.8	0.647	-82.248	1.198	67.296	0.019	98.510	0.889	-39.726
1.9	0.616	-84.912	1.163	61.655	0.022	99.423	0.890	-42.289
2.0	0.592	-87.965	1.132	56.671	0.024	99.437	0.885	-44.339
2.1	0.567	-90.200	1.099	51.306	0.027	99.393	0.883	-46.238
2.2	0.542	-92.166	1.068	46.616	0.030	98.567	0.889	-48.338
2.3	0.523	-93.962	1.041	41.818	0.033	97.417	0.886	-50.652
2.4	0.498	-95.631	1.011	37.218	0.036	96.016	0.889	-52.442
2.5	0.486	-96.784	0.981	32.941	0.040	94.289	0.892	-54.490
2.6	0.466	-97.556	0.958	28.504	0.043	92.819	0.890	-55.710
2.7	0.455	-97.902	0.931	24.687	0.046	90.816	0.892	-57.821
2.8	0.441	-98.495	0.901	20.371	0.050	89.017	0.895	-59.505
2.9	0.429	-98.609	0.877	16.741	0.053	86.927	0.894	-60.952
3.0	0.420	-98.095	0.849	12.899	0.057	84.724	0.899	-62.567

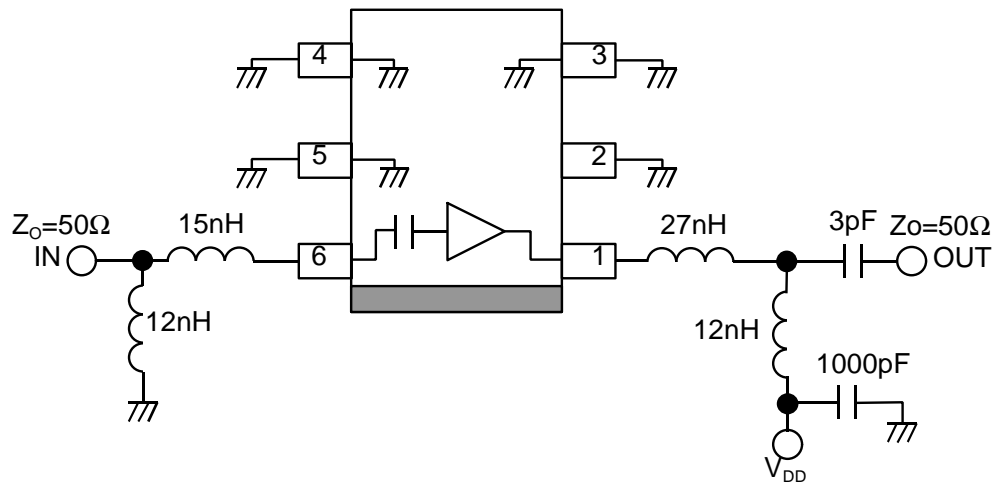
Note: $V_{DD}(=2.7V)$ is supplied through "BIAS CONNECT(PORT2)" of Network Analyzer.



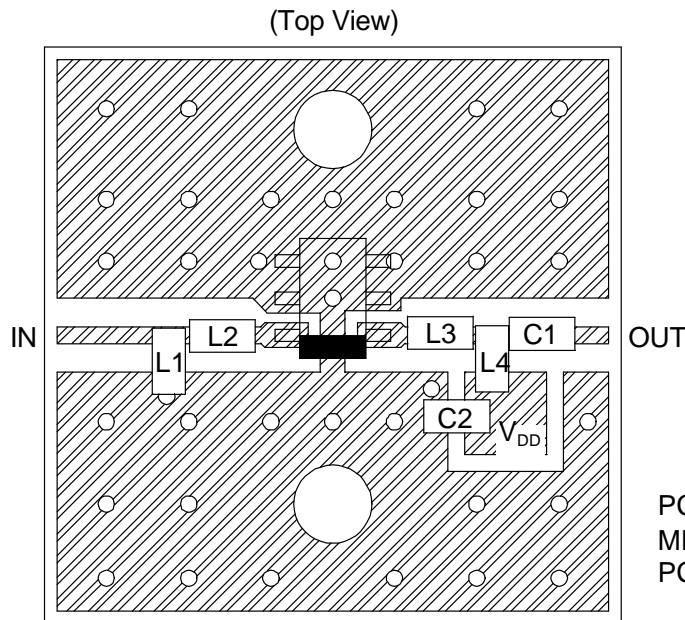
Scattering Parameter Measurement Configuration

New Japan Radio Co., Ltd.

RECOMMEND CIRCUIT (f=810~885MHz)



RECOMMENDED PCB DESIGN



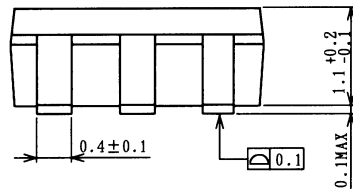
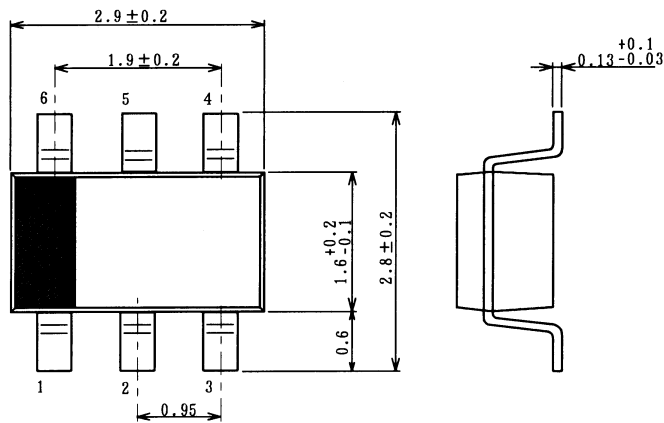
PCB : FR4, t=0.2mm
 MICROSTRIP LINE WIDTH=0.4mm($Z_0=50\Omega$)
 PCB SIZE : 14.0x14.0mm

PARTS LIST (f=810~885MHz)

PART ID	PARAMETER	COMMENT
L1	12nH	TAIYO-YUDEN HK1608 Series
L2	15nH	TAIYO-YUDEN HK1608 Series
L3	27nH	TAIYO-YUDEN HK1608 Series
L4	12nH	TAIYO-YUDEN HK1608 Series
C1	3pF	MURATA GRM39 Series
C2	1000pF	MURATA GRM39 Series

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PACKAGE OUTLINE (MTP6-1)



Lead material : Copper
Lead surface finish : Solder plating
Molding material : Epoxy resin
UNIT : mm
Weight : 15mg

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.

[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

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