

# UA2723

## Gain Block

## Data Sheet

## DS-2723-01

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**UA2723****Gain Block**

## 1. Product Description

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The UA2723 is a wideband LNA IC with an internal input/output matching and packaged in a 6-pin SOT363 plastic package.

## 2. Features

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- Single 3.3V power supply
- Internally matched to 50Ω
- Low noise figure: 1.9dB at 2.5GHz, 1.6dB at 0.4GHz.
- Very wide frequency over 0.05 to 4GHz
- Flat 20dB gain up to 2.2GHz
- Unconditionally stable
- P1dB over -1.5dBm at 2.5GHz

## 3. Typical Applications

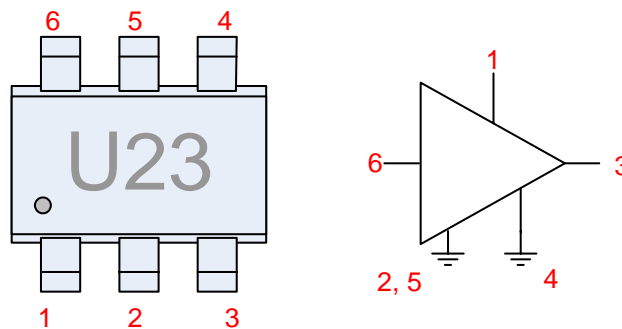
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- DBS
- LNB IF Amplifier
- DVB
- Cable
- ISM
- General Purpose

## 4. Pin Configuration

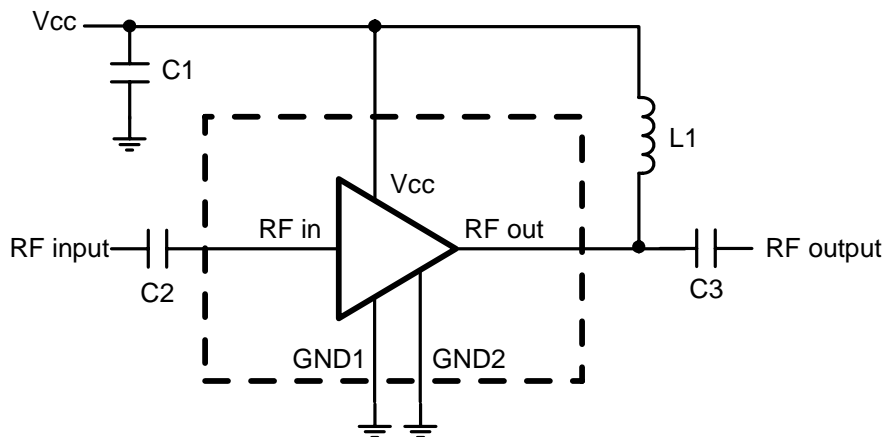
**Table 1. Pin Descriptions**

Pin #	Description
1	Vcc
2, 5	GND1
3	RF out
4	GND2
6	RF in



**Figure 1. Simplified Outline (SOT363) and Symbols**

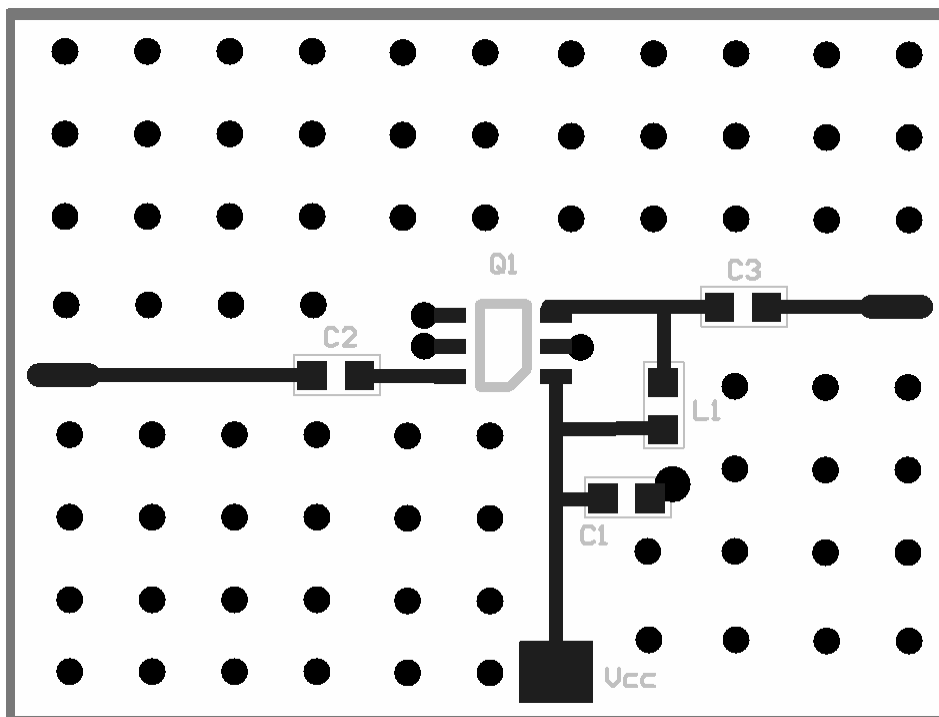
## 5. Application Circuit



**Figure 2. Operating Condition for the Application Circuit**

$C1=1\text{nF}$ ,  $C2=100\text{pF}$ ,  $C3=100\text{pF}$ . The nominal value of the RF choke,  $L1$  is  $33\text{nH}$ . Increasing the inductor value will shift the curve towards the lower frequency region. The operating frequency can be lowered to  $50\text{MHz}$  when  $L1$  is larger than  $220\text{nH}$ .

## 6. PCB Layout Design Guide



**Figure 3. GND via hole**

Notes:

1. Each ground pin must have individual via hole.
2. No DC or signal line on the bottom of IC

## 7. Operating Condition

**Table 2. Absolute Maximum Ratings**

Symbol	Parameters	Conditions	Typ.	Max.	Unit
V <sub>cc</sub>	DC Supply Voltage	RF input AC coupled	-	4	V
I <sub>cc</sub>	Supply Current		-	30	mA
P <sub>tot</sub>	Total Power Dissipation	T <sub>a</sub> ≤ 90°C	-	120	mW
T <sub>st</sub>	Storage Temperature		-65	150	°C
T <sub>j</sub>	Operating Junction Temperature		-40	150	°C
P <sub>D</sub>	Maximum Drive Power		-	-5	dBm

**Table 3. Thermal Characteristics**

Symbol	Parameters	Conditions	Value	Unit
R <sub>th</sub>	Thermal Resistance from Junction to Solder Point	P <sub>tot</sub> =85mW; T <sub>a</sub> ≤ 90°C	300	K/W

## 8. Electrical Characteristics

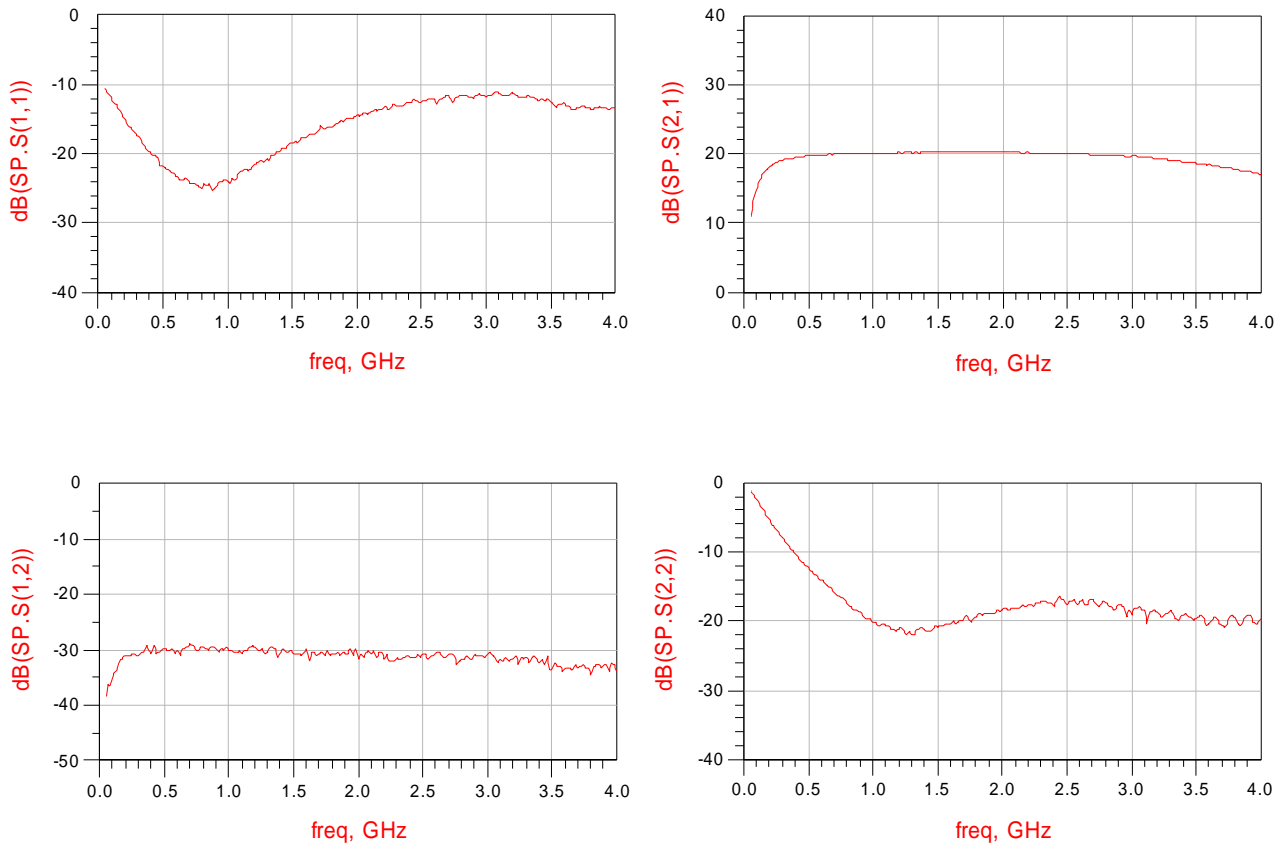
**Table 4. Electrical Characteristics with L1=33nH**

V<sub>cc</sub>=3.3V; I<sub>cc</sub>=12mA; T<sub>a</sub>=25°C; unless otherwise specified.

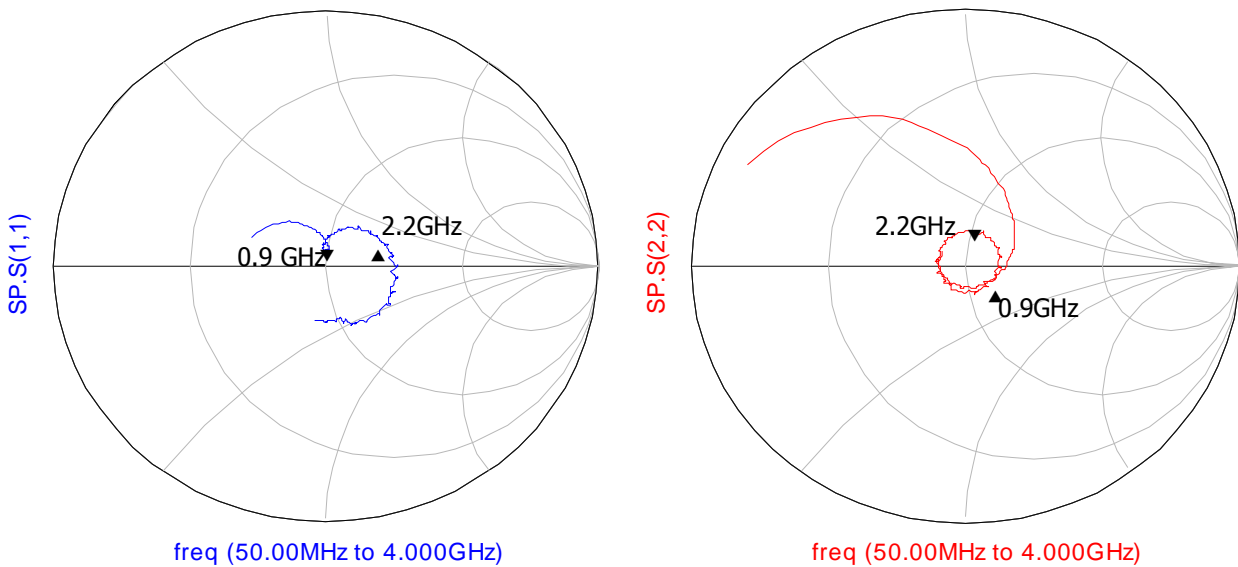
Symbol	Parameters	Conditions	Min.	Typ.	Max.	Unit
I <sub>cc</sub>	Supply Current		-	12	-	mA
S <sub>21</sub>   <sup>2</sup>	Insertion Power Gain	f=400MHz	-	19.5	-	dB
		f=0.9GHz	-	20	-	dB
		f=2.5GHz	-	20	-	dB
		f=3GHz	-	19.5	-	dB
		f=4GHz	-	17	-	dB
S <sub>11</sub>   <sup>2</sup>	Input Return Loss	f=0.4GHz	10	-	-	dB
		f=2.5GHz	10	-	-	dB
		f=4GHz	10	-	-	dB
S <sub>22</sub>   <sup>2</sup>	Output Return Loss	f=0.4GHz	10	-	-	dB
		f=2.5GHz	10	-	-	dB
		f=4GHz	10	-	-	dB
S <sub>12</sub>   <sup>2</sup>	Isolation	f=0.4GHz	-	31	-	dB
		f=2.5GHz	-	31.5	-	dB
		f=4GHz	-	34	-	dB
NF	Noise Figure	f=0.4GHz	-	1.6	-	dB
		f=2.5GHz	-	1.9	-	dB
		f=4GHz	-	2.6	-	dB
BW	Bandwidth	At  S <sub>21</sub>   <sup>2</sup> -3dB below flat gain at 1GHz	-	3.9	-	GHz
K	Stability Factor	f=0.9GHz	-	2	-	-
		f=2.5GHz	-	2	-	-
P <sub>L(sat)</sub>	Saturated Load Power	f=0.9GHz	-	5	-	dBm
		f=2.5GHz	-	4	-	dBm
P <sub>L,1dB</sub>	Output P <sub>1dB</sub>	At 1dB gain compression; f=0.9GHz	-	-1	-	dBm
		At 1dB gain compression; f=2.5GHz	-	-1.5	-	dBm



**Caution: ESD sensitive.**



**Figure 4. S-parameter ( $V_{cc}=3.3V$ ,  $I_{cc}=12mA$ ,  $P_{in}=-40dBm$ ,  $Z_0=50\Omega$ ) with  $L1=33nH$**

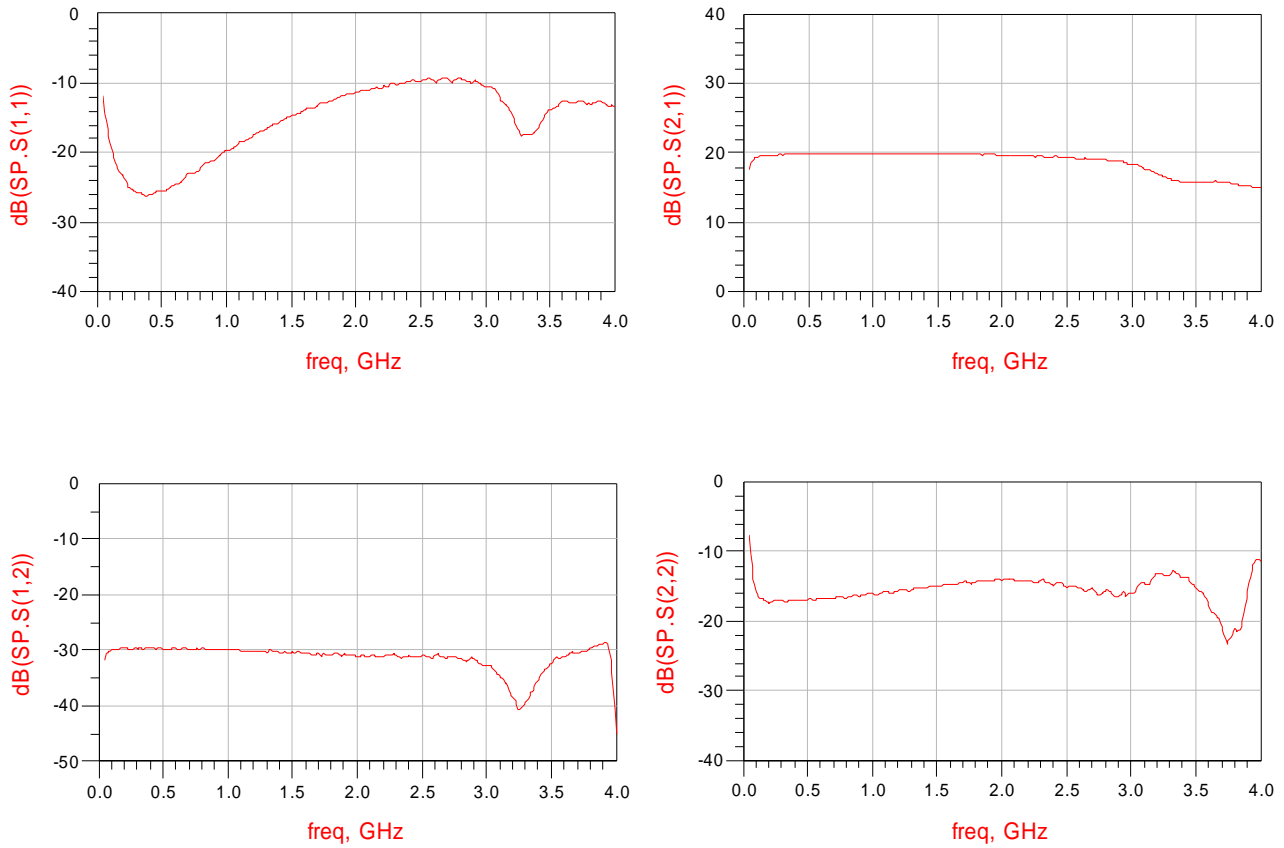


**Figure 5.  $S_{11}$  &  $S_{22}$  ( $V_{cc}=3.3V$ ,  $I_{cc}=12mA$ ,  $P_{in}=-40dBm$ ,  $Z_0=50\Omega$ ) with  $L1=33nH$**

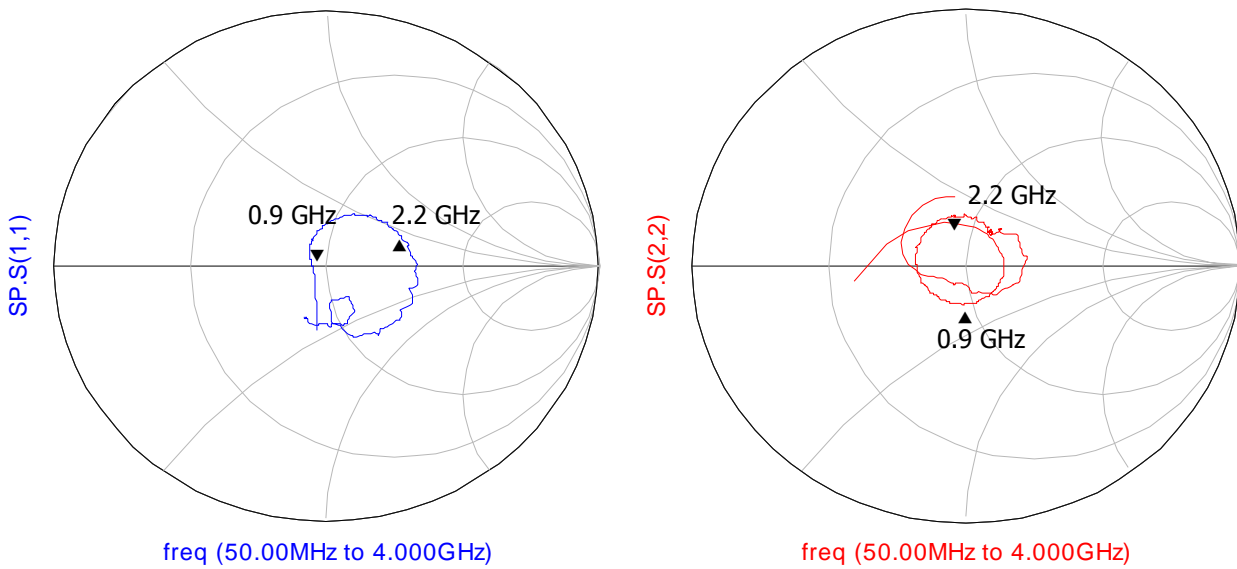
**Table 5. Electrical Characteristics with L1=120nH**

V<sub>cc</sub>=3.3V; I<sub>cc</sub>=12mA; T<sub>a</sub>=25°C; unless otherwise specified.

Symbol	Parameters	Conditions	Min.	Typ.	Max.	Unit
I <sub>cc</sub>	Supply Current		-	12	-	mA
S <sub>21</sub>   <sup>2</sup>	Insertion Power Gain	f=100MHz	-	19.4	-	dB
		f=0.5GHz	-	19.7	-	dB
		f=0.9GHz	-	19.7	-	dB
		f=1.5GHz	-	19.7	-	dB
		f=2GHz	-	19.6	-	dB
S <sub>11</sub>   <sup>2</sup>	Input Return Loss	f=100MHz	10	-	-	dB
		f=0.9GHz	10	-	-	dB
		f=2GHz	10	-	-	dB
S <sub>22</sub>   <sup>2</sup>	Output Return Loss	f=100MHz	10	-	-	dB
		f=0.9GHz	10	-	-	dB
		f=2GHz	10	-	-	dB
S <sub>12</sub>   <sup>2</sup>	Isolation	f=100MHz	-	30	-	dB
		f=0.9GHz	-	30	-	dB
		f=2GHz	-	31	-	dB
NF	Noise Figure	f=100MHz	-	1.5	-	dB
		f=0.9GHz	-	1.6	-	dB
		f=2GHz	-	1.8	-	dB
BW	Bandwidth	at  S <sub>21</sub>   <sup>2</sup> -3dB below flat gain at 0.9GHz	-	3.2	-	GHz
K	Stability Factor	f=100MHz	-	2	-	-
		f=2GHz	-	1.8	-	-
P <sub>L(sat)</sub>	Saturated Load Power	f=100MHz	-	5	-	dBm
		f=2GHz	-	4	-	dBm
P <sub>L,1dB</sub>	Output P <sub>1dB</sub>	at 1dB gain compression; f=0.1GHz	-	-1	-	dBm
		at 1dB gain compression; f=2GHz	-	-1.5	-	dBm



**Figure 6. S-parameter ( $V_{cc}=3.3V$ ,  $I_{cc}=12mA$ ,  $P_{in}=-40dBm$ ,  $Z_0=50\Omega$ ) with  $L1=120nH$**

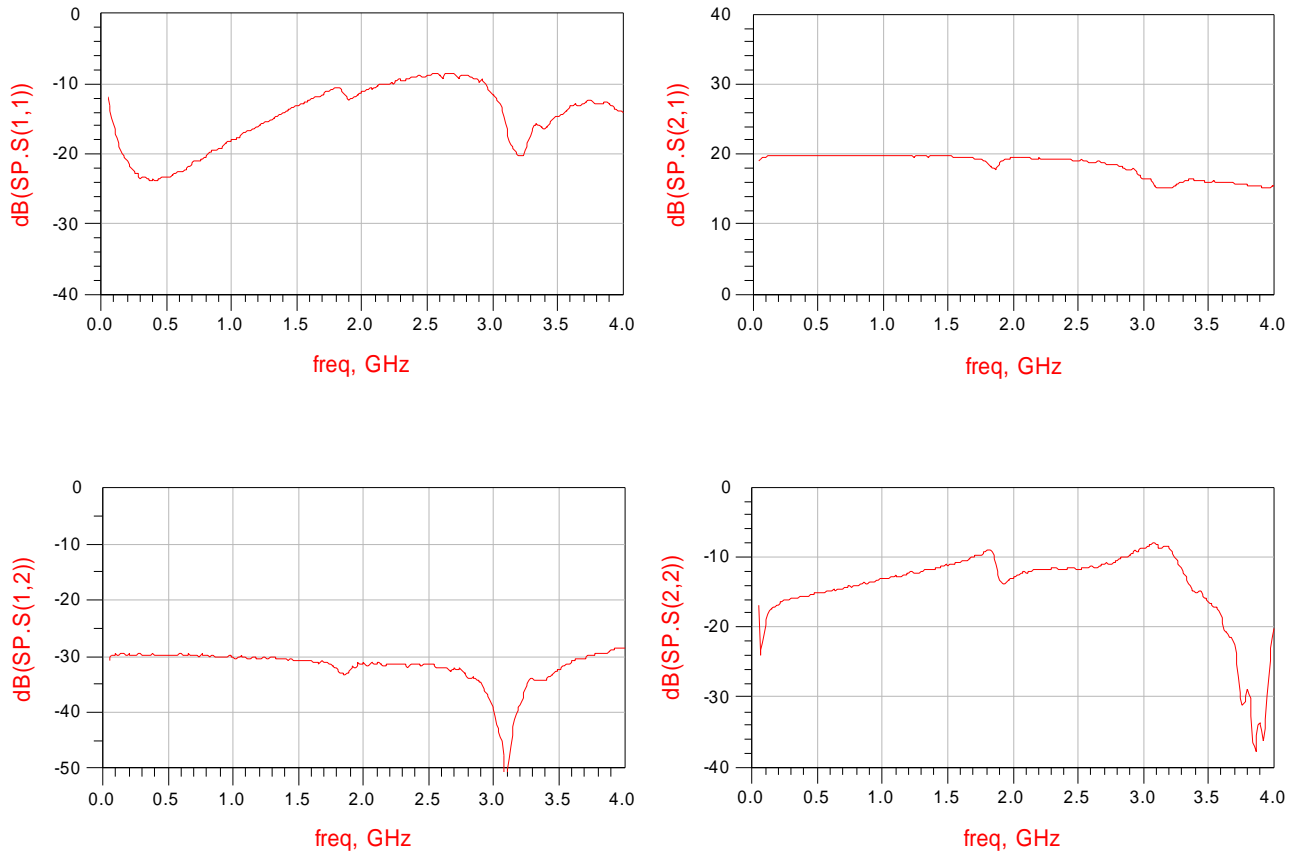


**Figure 7.  $S_{11}$  &  $S_{22}$  ( $V_{cc}=3.3V$ ,  $I_{cc}=12mA$ ,  $P_{in}=-40dBm$ ,  $Z_0=50\Omega$ ) with  $L1=120nH$**

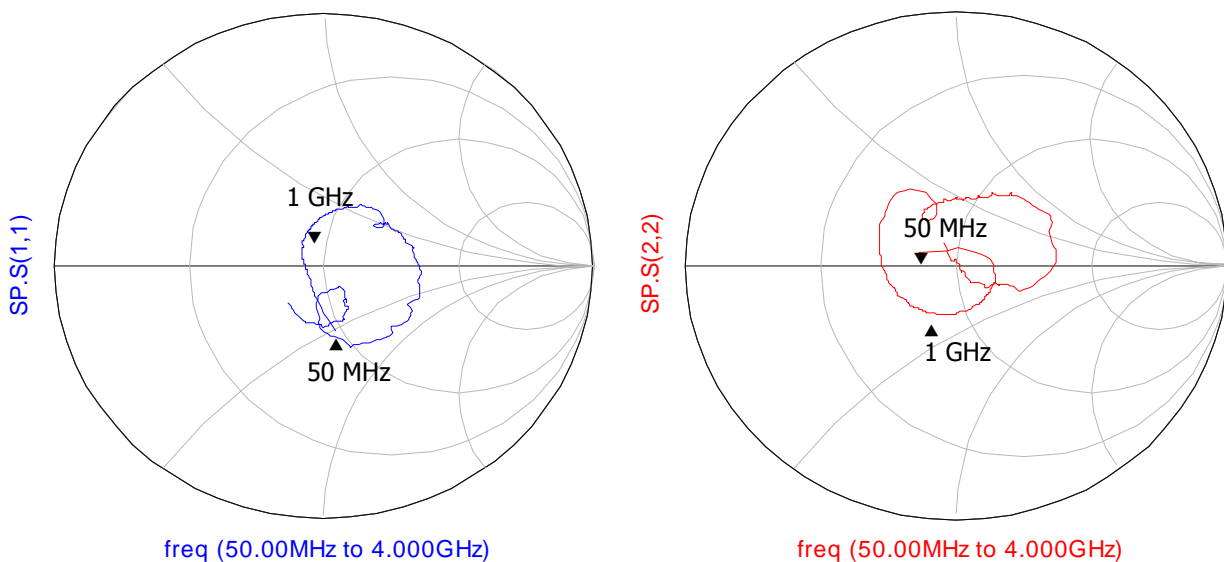
**Table 6. Electrical Characteristics with L1=220nH**

Vcc=3.3V; Icc=12mA; T<sub>a</sub>=25°C; unless otherwise specified.

Symbol	Parameters	Conditions	Min.	Typ.	Max.	Unit
I <sub>cc</sub>	Supply Current		-	12	-	mA
S <sub>21</sub>   <sup>2</sup>	Insertion Power Gain	f=50MHz	-	19	-	dB
		f=100MHz	-	19.5	-	dB
		f=0.4GHz	-	19.7	-	dB
		f=0.9GHz	-	19.7	-	dB
		f=1.5GHz	-	19.7	-	dB
S <sub>11</sub>   <sup>2</sup>	Input Return Loss	f=50MHz	10	-	-	dB
		f=0.4GHz	10	-	-	dB
		f=1.5GHz	10	-	-	dB
S <sub>22</sub>   <sup>2</sup>	Output Return Loss	f=50MHz	10	-	-	dB
		f=0.4GHz	10	-	-	dB
		f=1.5GHz	10	-	-	dB
S <sub>12</sub>   <sup>2</sup>	Isolation	f=50MHz	-	31	-	dB
		f=0.4GHz	-	30	-	dB
		f=1.5GHz	-	31	-	dB
NF	Noise Figure	f=50MHz	-	1.5	-	dB
		f=0.4GHz	-	1.6	-	dB
		f=1.5GHz	-	1.7	-	dB
BW	Bandwidth	at  S <sub>21</sub>   <sup>2</sup> -3dB below flat gain at 0.5GHz	-	2.5	-	GHz
K	Stability Factor	f=50MHz	-	2	-	-
		f=0.9GHz	-	1.9	-	-
P <sub>L(sat)</sub>	Saturated Load Power	f=50MHz	-	5	-	dBm
		f=0.9GHz	-	4	-	dBm
P <sub>L,1dB</sub>	Output P <sub>1dB</sub>	at 1dB gain compression; f=50GHz	-	-0.5	-	dBm
		at 1dB gain compression; f=0.9GHz	-	-1	-	dBm



**Figure 8. S-parameter ( $V_{cc}=3.3V$ ,  $I_{cc}=12mA$ ,  $P_{in}=-40dBm$ ,  $Z_0=50\Omega$ ) with  $L1=220nH$**



**Figure 9.  $S_{11}$  &  $S_{22}$  ( $V_{cc}=3.3V$ ,  $I_{cc}=12mA$ ,  $P_{in}=-40dBm$ ,  $Z_0=50\Omega$ ) with  $L1=220nH$**

## 9. Package Drawing

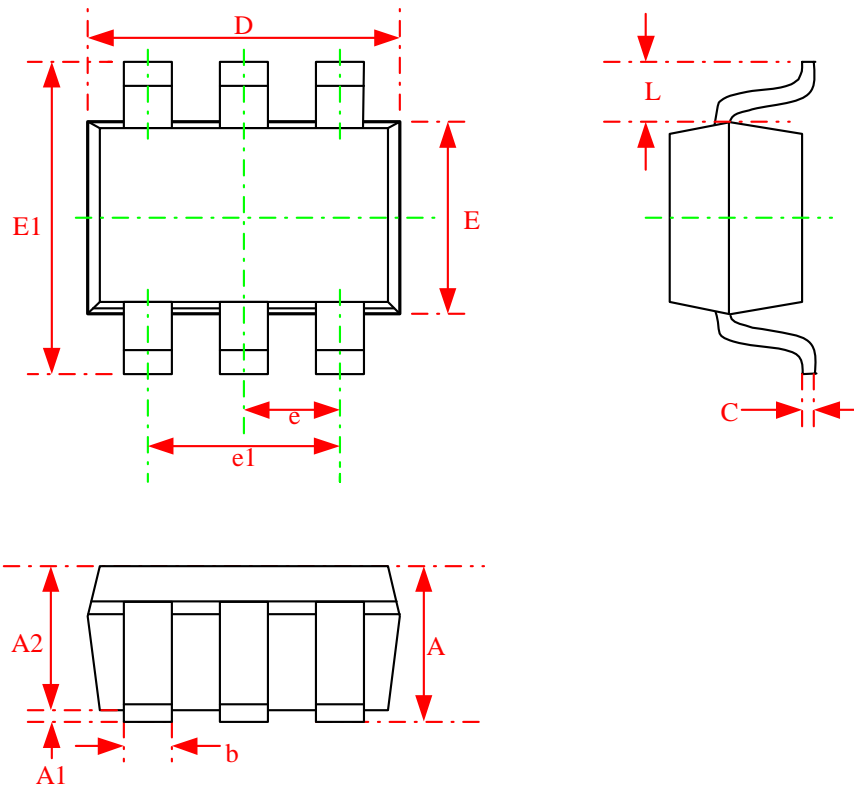


Figure 10. Package Outline

Table 7. Dimension Description

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.10	.038	.044
A1	0.025	0.10	.001	.004
A2	0.875	1.00	.035	.040
b	0.20	0.40	.008	.016
C	0.10	0.15	.004	.006
D	1.90	2.10	.076	.084
E	1.15	1.35	.046	.054
E1	2.00	2.20	.080	.088
e	0.65 BSC.		.026 BSC.	
e1	1.30 BSC.		.052 BSC.	
L	0.425 REF.		.017 BSC.	

## Revision History

Revision	Date	Description of Change
0.0	2005/8/2	Original.
0.1	2005/10/26	Modified electrical characteristics with measurement data.
0.2	2005/12/26	Updated measurement data of the new version
0.3	2006/2/22	Added S-parameter and Smith Chart Figures.
1.0	2008/1/17	Update test condition and add PCB layout design guide.

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