

**NPN SiGe RF POWER TRANSISTOR**

The THN5601B is a low cost, NPN medium power SiGe HBT(Hetero-Junction Bipolar Transistor) encapsulated in a plastic SOT-223 SMD package.

The THN5601B can be used as a driver device or an output device, depending on the specific application.

**FEATURES**

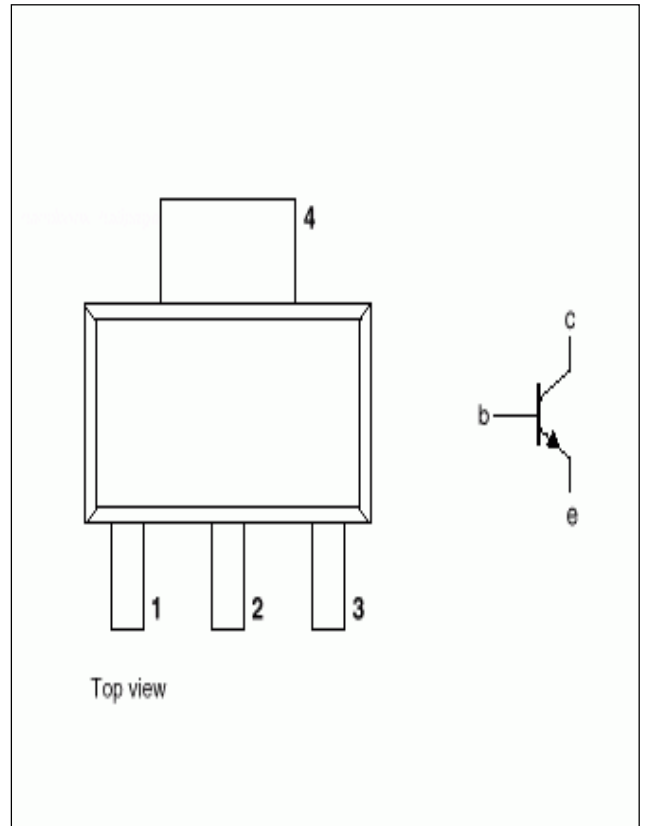
- o 4.8 Volt operation
- o P1dB 28 dBm @f=900MHz
- o Power gain 8.5 dB @f=900MHz

**APPLICATIONS**

- o Hand-held radio equipment in common emitter class-AB operation in 900 MHz communication band.

**MAXIMUM RATINGS**

SYMBOL	PARAMETER	CONDITION	VALUE	Unit
V <sub>CBO</sub>	Collector-Base Voltage	Open Emitter	20	V
V <sub>CEO</sub>	Collector-Emitter Voltage	Open Base	8	V
V <sub>EBO</sub>	Emitter-Base Voltage	Open Collector	3	V
I <sub>c</sub>	Collector Current (DC)		350	mA
P <sub>T</sub>	Total Power Dissipation	T <sub>s</sub> = 60 °C ; note 1	1	W
T <sub>STG</sub>	Storage Temperature		-65 ~ 150	°C
T <sub>J</sub>	Operating Junction Temperature		150	°C



**PIN CONFIGURATION**

PIN NO	SYMBOL	DESCRIPTION
1	E	emitter
2	B	base
3	E	emitter
4	C	collector

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITION	VALUE	Unit
Rth j-s	thermal resistance from junction to soldering point	PT=1W; Ts=60 °C;note1	55	K/W

\* Note 1. Ts is temperature at the soldering point of the collector pin.

 **QUICK REFERENCE DATA**

RF performance at  $T_s \leq 60 \text{ }^\circ\text{C}$  in common emitter test circuit (see Fig 8.)

Mode of Operation	f [MHz]	V <sub>CE</sub> [V]	P <sub>L</sub> [mW]	G <sub>P</sub> [dB]	$\eta_c$ [%]
CW, class-AB	900	4.8	600	$\geq 7$	$\geq 60$

□ DC CHARACTERISTICS

Tj=25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITION	MIN.	MAX.	UNIT
BV <sub>CBO</sub>	collector-base breakdown voltage	open emitter	20		V
BV <sub>CEO</sub>	collector-emitter breakdown voltage	open base	8		V
BV <sub>EBO</sub>	emitter-base breakdown voltage	open collector	3		V
I <sub>S</sub>	collector leakage current		0.1		mA
h <sub>FE</sub>	DC current gain		60		
C <sub>CB</sub>	collector capacitance			4.5	pF

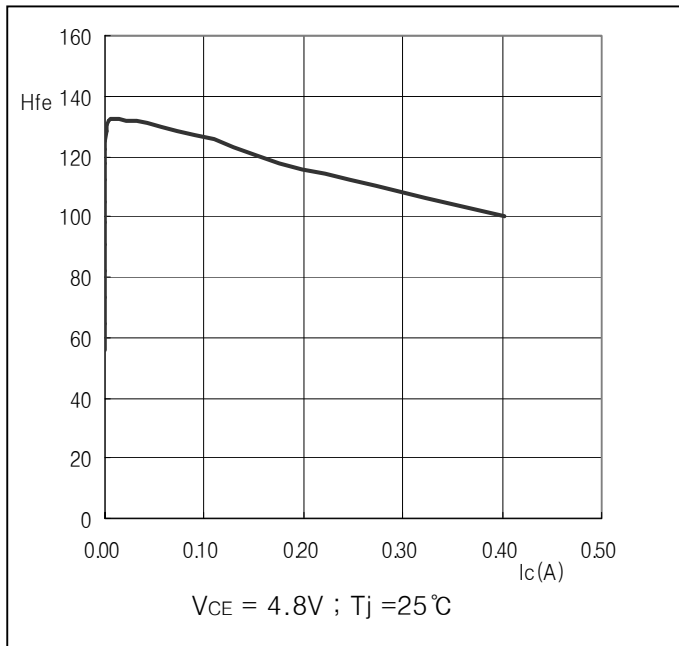


Fig 1. DC Current gain v.s Collector current

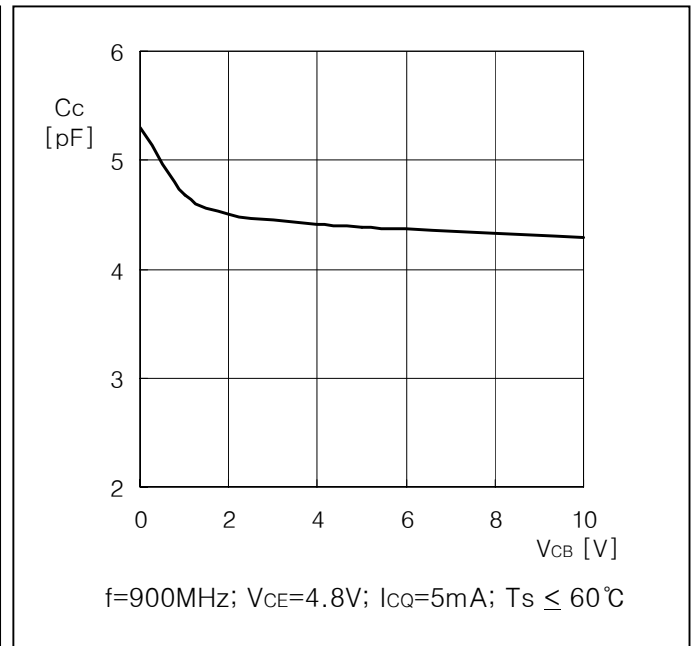


Fig 2. Collector-base capacitance v.s Collector-base voltage(DC)

□ APPLICATION INFORMATION (I)

RF performance at  $T_s \leq 60^\circ\text{C}$  in common emitter test circuit (see Fig 7)

Mode of Operation	f [MHz]	V <sub>CE</sub> [V]	P <sub>L</sub> [mW]	G <sub>P</sub> [dB]	$\eta_c$ [%]
CW, class-AB	900	4.8	600	$\geq 7$	70

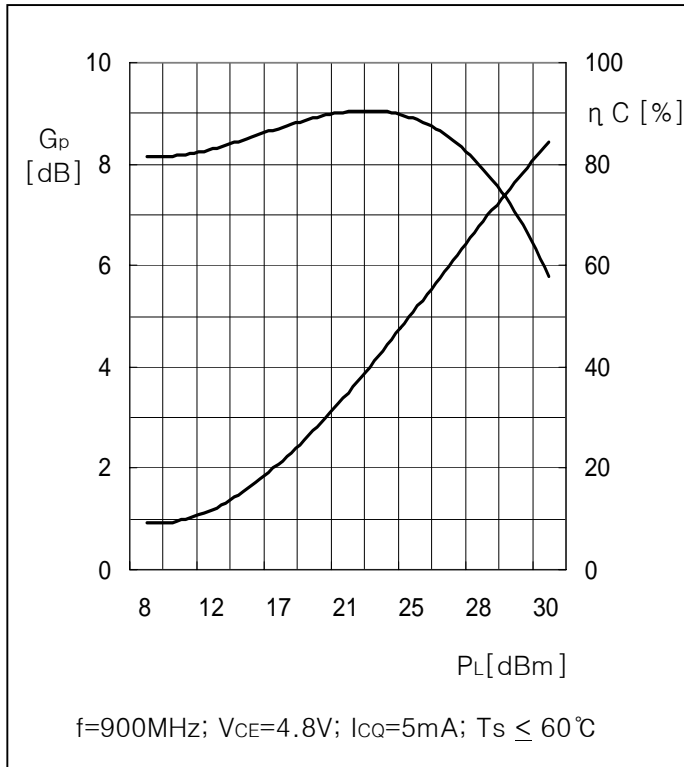


Fig 3. Power gain and collector efficiency v.s load power (typical value)

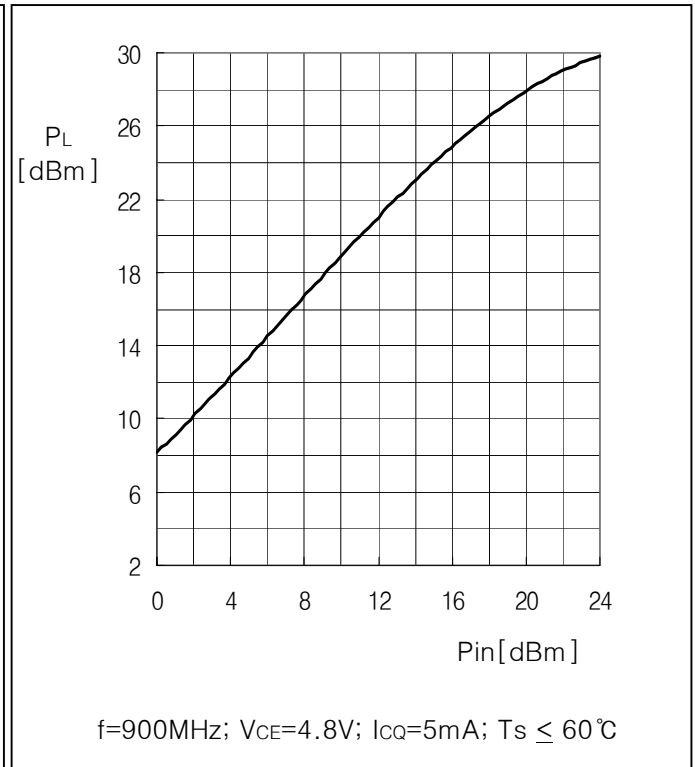


Fig 4. Load power v.s input power (typical value)

● Typical Large Signal Impedance

$V_{CE} = 4.8\text{V}$ ,  $I_{CQ} = 5\text{mA}$ ,  $P_{out} = 28\text{dBm}$

Freq. [MHz]	$\Gamma$ source		$\Gamma$ load	
	Mag	Ang	Mag	Ang
800	0.615	-162.5	0.460	161.4
820	0.631	-164.0	0.478	159.6
840	0.65	-165.9	0.494	158.0
860	0.666	-167.6	0.509	156.2
880	0.682	-169.5	0.524	154.0
900	0.698	-171.2	0.538	151.9
920	0.711	-172.7	0.550	150.0
940	0.724	-174.5	0.563	147.3
960	0.735	-175.9	0.578	145.0
980	0.746	-177.6	0.593	142.8
1000	0.760	-179.3	0.600	140.3

□ APPLICATION INFORMATION (II)

RF performance at  $T_s \leq 60\text{ }^\circ\text{C}$  in common emitter configuration. ( $I_{CQ} = 5\text{mA}$ )

Mode of Operation	f [MHz]	V <sub>CE</sub> [V]	P <sub>L</sub> [mW]	G <sub>P</sub> [dB]	$\eta_c$ [%]
CW, class-AB	450	4.8	630	$\geq 14$	$\geq 60$

DRF1401 Input/Load Impedance as a frequency

Transistor Impedance

Freq. [MHz]	Z <sub>in</sub>		Z <sub>L</sub>	
	r <sub>in</sub>	x <sub>in</sub>	R <sub>L</sub>	Z <sub>L</sub>
400	8.35	-3.34	23.32	4.19
450	7.38	-7.19	20.24	9.95
500	6.80	-11.03	18.27	16.37
550	6.74	-14.89	17.30	23.65
600	7.03	-18.92	17.05	32.08

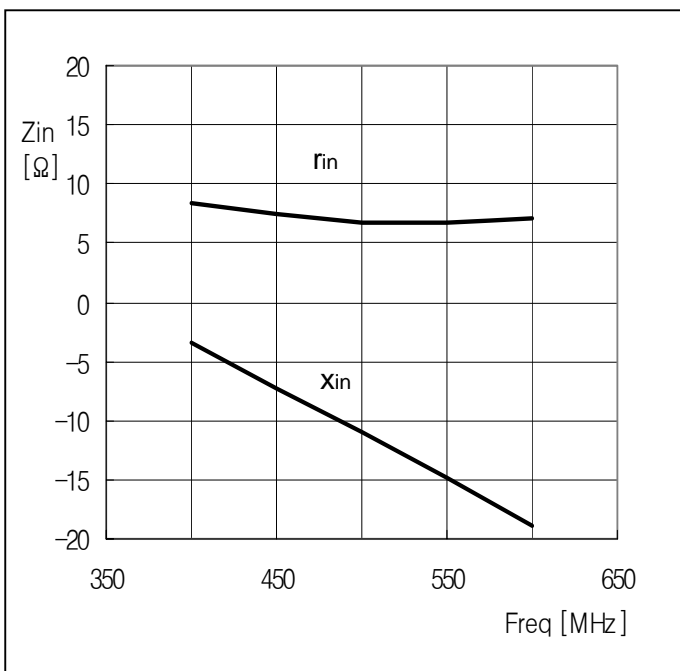
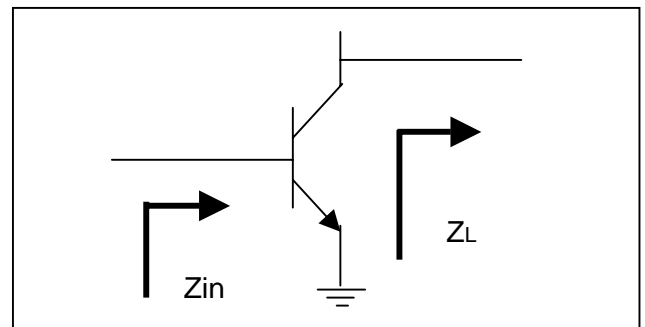


Fig 5. Input Impedance (series components) as a freq, typical values.

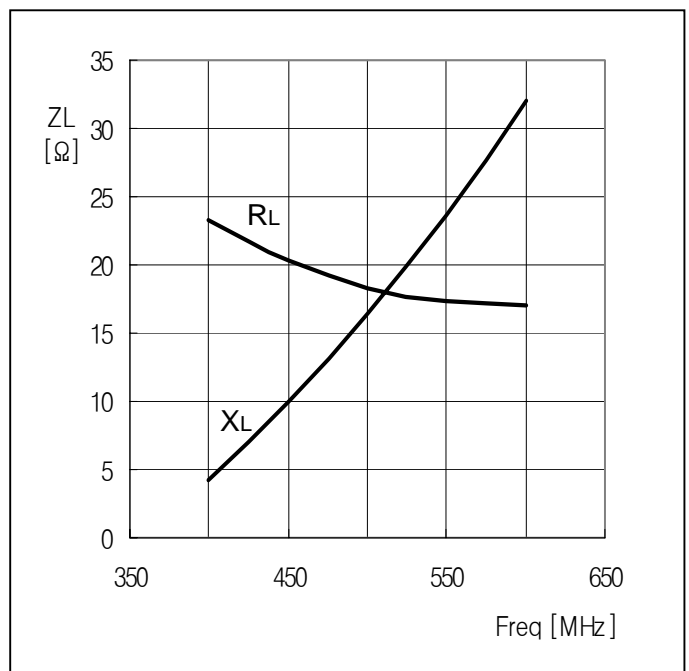


Fig 6. Load Impedance (series components) as a freq, typical values.

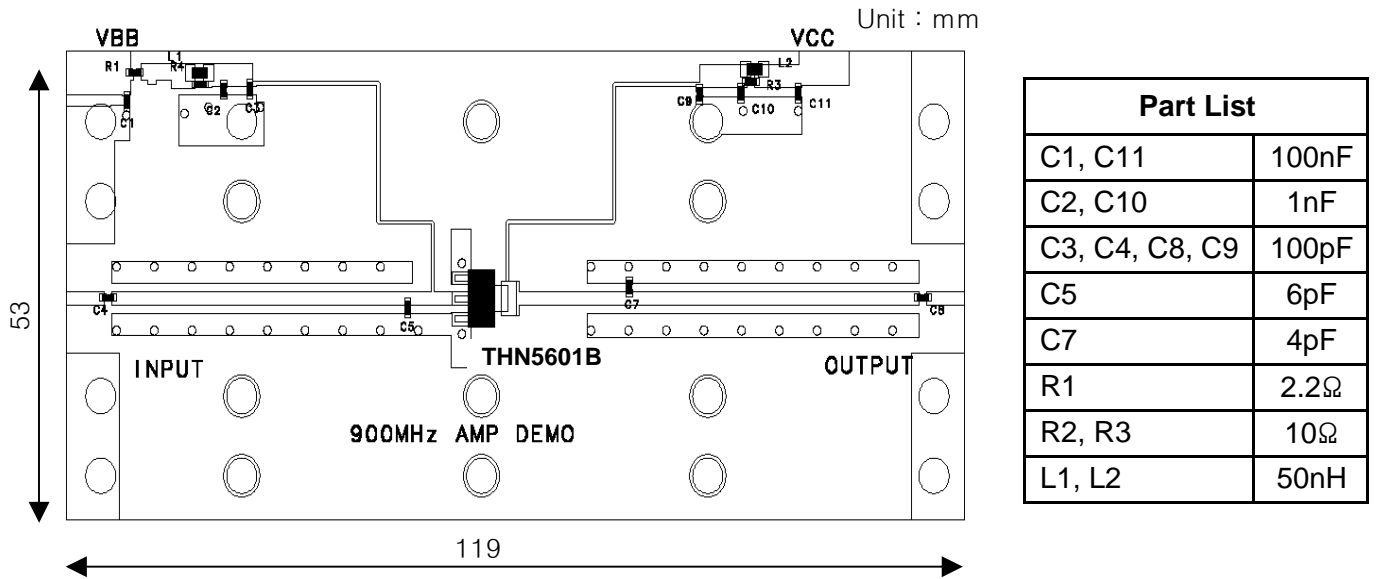


Fig 7. Test Circuit Board Layout @ f = 900MHz

Test board : FR4 glass epoxy board, dielectric constant = 4.5, thickness = 0.8 mm

Test condition : CW test, Vcc = 4.8 V, Icq = 5 mA, frequency = 900 MHz.

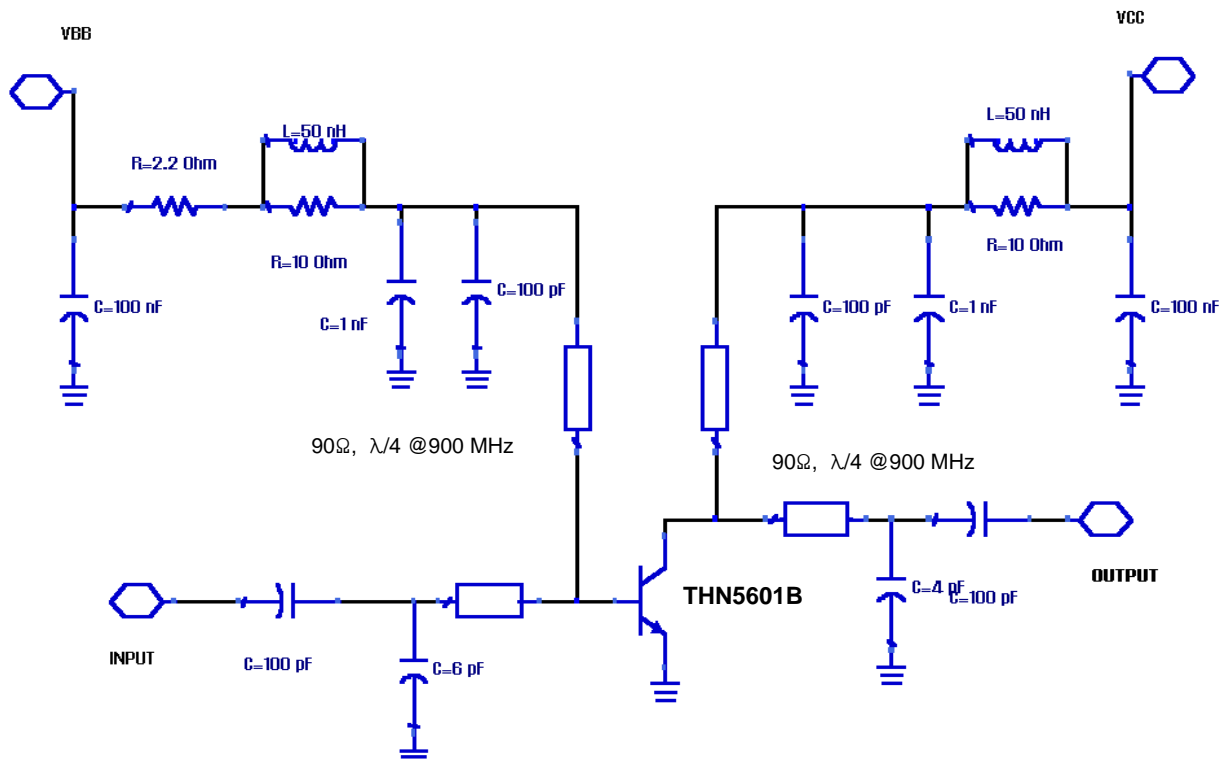
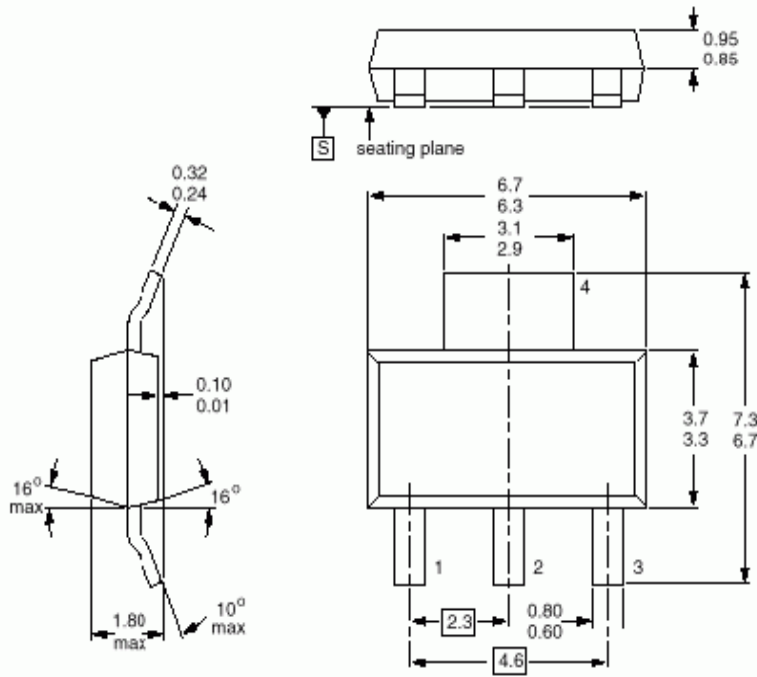


Fig 8. Test Circuit Schematic Diagram @f = 900MHz

□ PACKAGE DIMENSION



Dimensions in mm.

Fig 9. SOT-223 Package dimension