

Applications

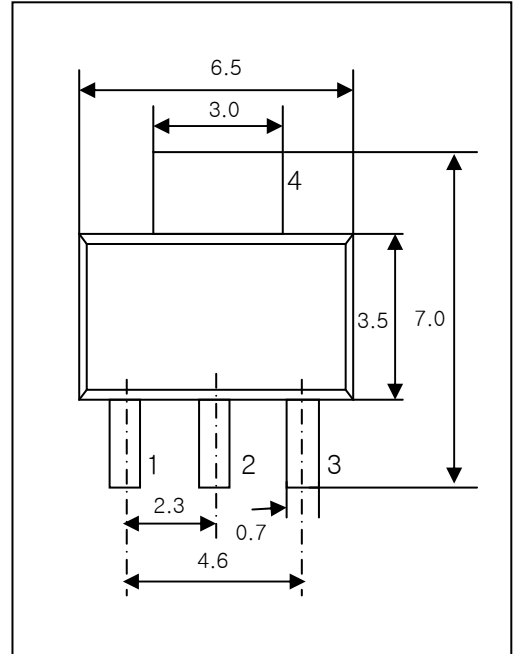
- o VHF and UHF band medium power amplifier

Features

- o 4.8 V operation
- o $P_{1dB} = 28$ dBm at $f = 900$ MHz
- o $G_p = 8.5$ dB at $f = 900$ MHz

SOT-223

Unit in mm



Pin Configuration

Pin No	Symbol	Description
1	E	Emitter
2	B	Base
3	E	Emitter
4	C	Collector

Absolute Maximum Ratings ($T_A = 25$ °C)

Symbol	Parameter	Ratings	Unit
V_{CBO}	Collector to Base Breakdown Voltage	20	V
V_{CEO}	Collector to Emitter Breakdown Voltage	8	V
V_{EBO}	Emitter to Base Breakdown Voltage	3	V
I_C	Collector Current	350	mA
P_{tot}	Total Power Dissipation	1	W
T_{stg}	Storage Temperature	-65 ~ 150	°C
T_j	Operating Junction Temperature	150	°C

THN5601B

Thermal Characteristics

Symbol	Parameter	Test Condition	Value	Unit
$R_{th\ j-s}$	Thermal resistance from junction to soldering point	$P_{tot} = 1W; T_s = 60\ ^\circ C; \text{note1}$	55	K/W

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

Quick Reference Data

RF performance at $T_s \leq 60\ ^\circ C$ in common emitter test circuit

Mode of Operation	f [MHz]	V_{CE} [V]	P_{OUT} [mW]	G_P [dB]	η_C [%]
CW, class-AB	900	4.8	600	≥ 7	≥ 60

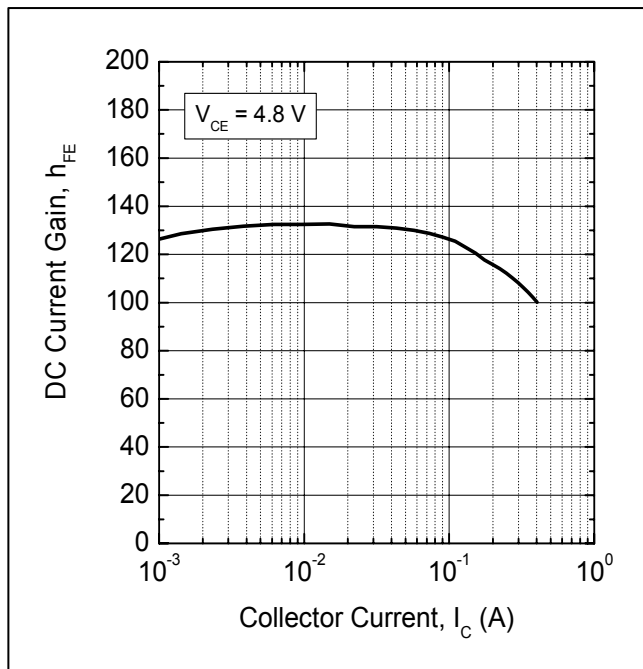
Electrical Characteristics ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Collector Cut-off Current	I_{CBO}	$V_{CB} = 19\text{ V}, I_E = 0\text{ mA}$			0.5	μA
	I_{CEO}	$V_{CE} = 8\text{ V}, I_B = 0\text{ mA}$			10	μA
Emitter Cut-off Current	I_{EBO}	$V_{EB} = 1.5\text{ V}, I_C = 0\text{ mA}$			1.0	μA
DC Current Gain	h_{FE}	$V_{CE} = 4.8\text{ V}, I_C = 60\text{ mA}$	60		300	
Gain Bandwidth Product	f_T	$V_{CE} = 4.8\text{ V}, I_C = 100\text{ mA}$				GHz
Insertion Power Gain	$ S_{21} ^2$	$V_{CE} = 4.8\text{ V}, I_C = 100\text{ mA}, f = 1\text{ GHz}$				dB
Maximun Available Gain	MAG	$V_{CE} = 4.8\text{ V}, I_C = 100\text{ mA}, f = 1\text{ GHz}$				dB
Reverse Transfer Capacitance	C_{re}	$V_{CB} = 4.8\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$			4.2	pF

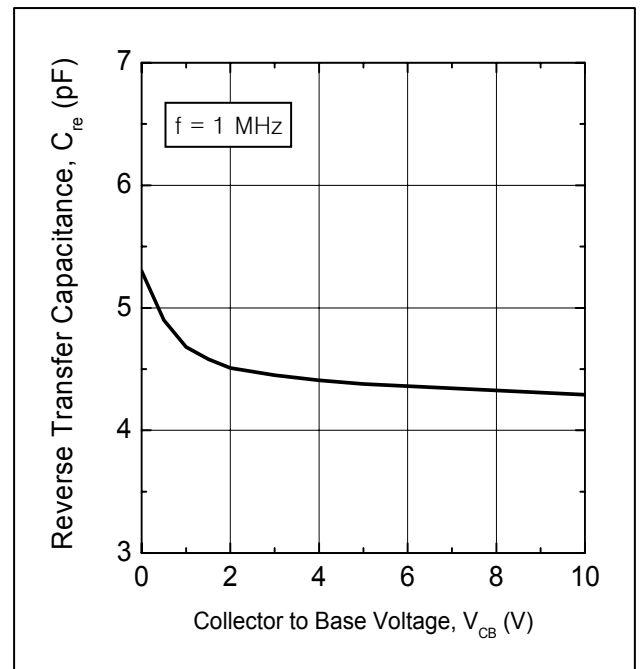
h_{FE} Classification

Marking	R1401	R1401'
h_{FE} Value	60 - 200	170 - 300

DC Current Gain
vs. Collector Current



Reverse Transfer Capacitance
vs. Collector to Base Voltage

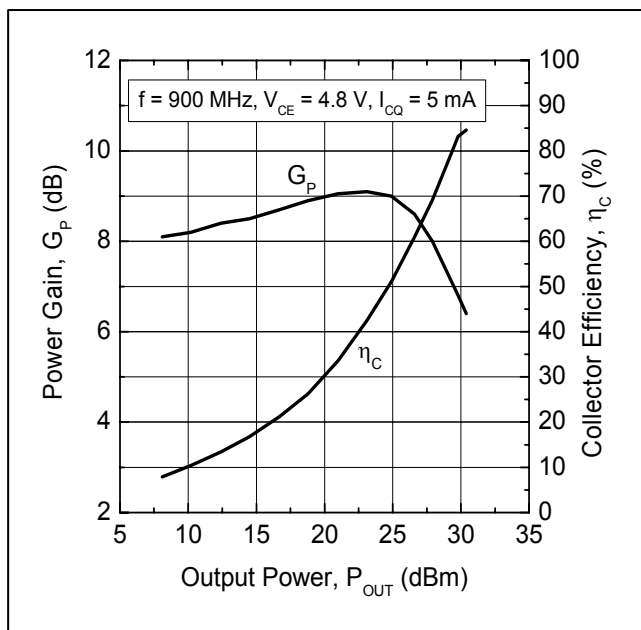


□ Application Information (I)

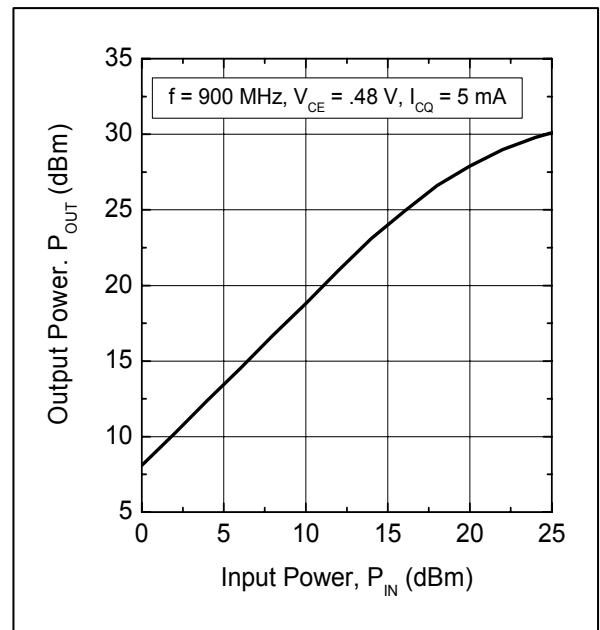
RF performance at $T_s \leq 60\text{ }^\circ\text{C}$ in common emitter test circuit

Mode of Operation	f [MHz]	V_{CE} [V]	P_{OUT} [mW]	G_P [dB]	η_C [%]
CW, class-AB	900	4.8	600	≥ 7	≥ 60

Power Gain and Collector Efficiency vs. Output Power



Output Power vs. Input Power



Typical Large Signal Impedance

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

Freq. [MHz]	Γ source		Γ load	
	Mag	Ang	Mag	Ang
800	0.615	-162.5	0.460	161.4
820	0.631	-164	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

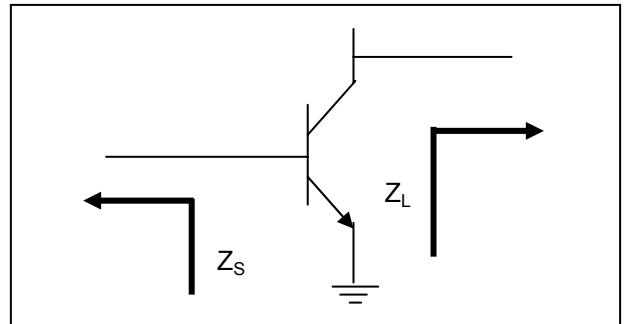
□ Application Information (II)

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

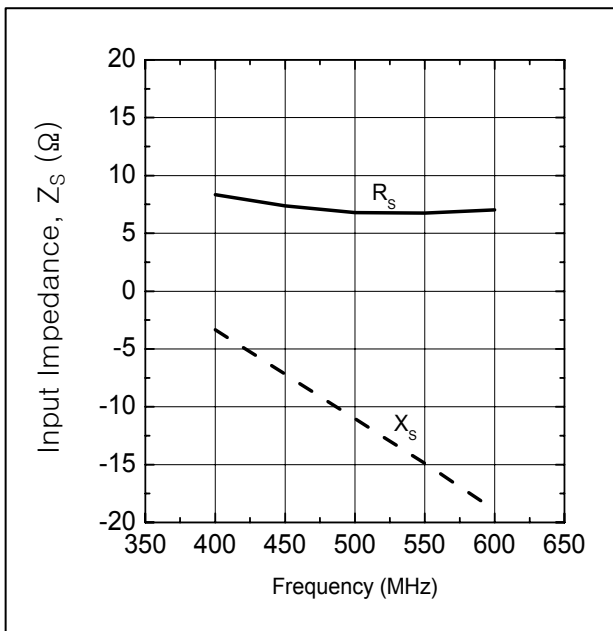
Mode of Operation	f [MHz]	V_{CE} [V]	P_L [mW]	G_P [dB]	η_C [%]
CW, class-AB	450	4.8	630	≥ 14	≥ 60

Optimum Input/Load Impedance as a frequency

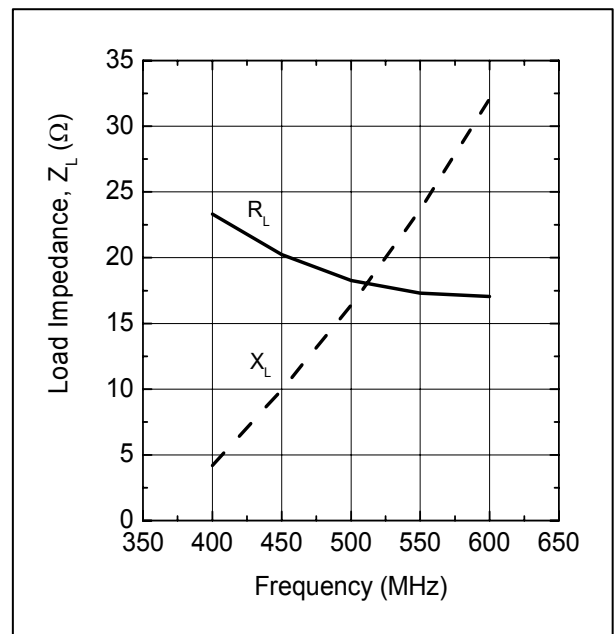
Freq. [MHz]	Z_S		Z_L	
	R_S	X_S	R_L	X_L
400	8.35	-3.34	23.32	4.19
450	7.38	-7.19	20.24	9.95
500	6.80	-11.03	18.27	16.37
550	6.74	-14.89	17.30	23.65
600	7.03	-18.92	17.05	32.08



Input Impedance vs. Frequency

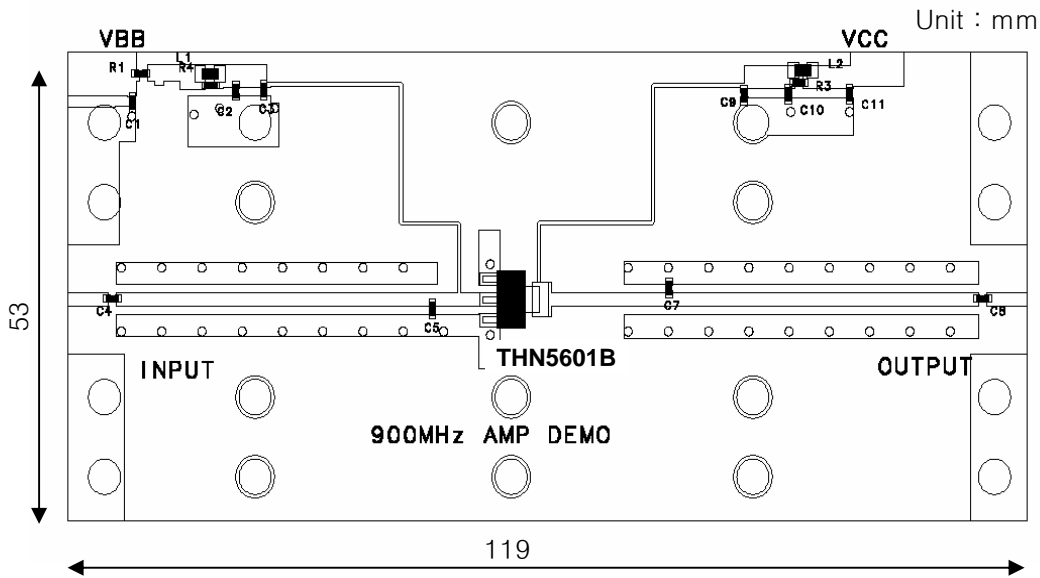


Load Impedance vs. Frequency



THN5601B

□ Evaluation Board for 900 MHz Application

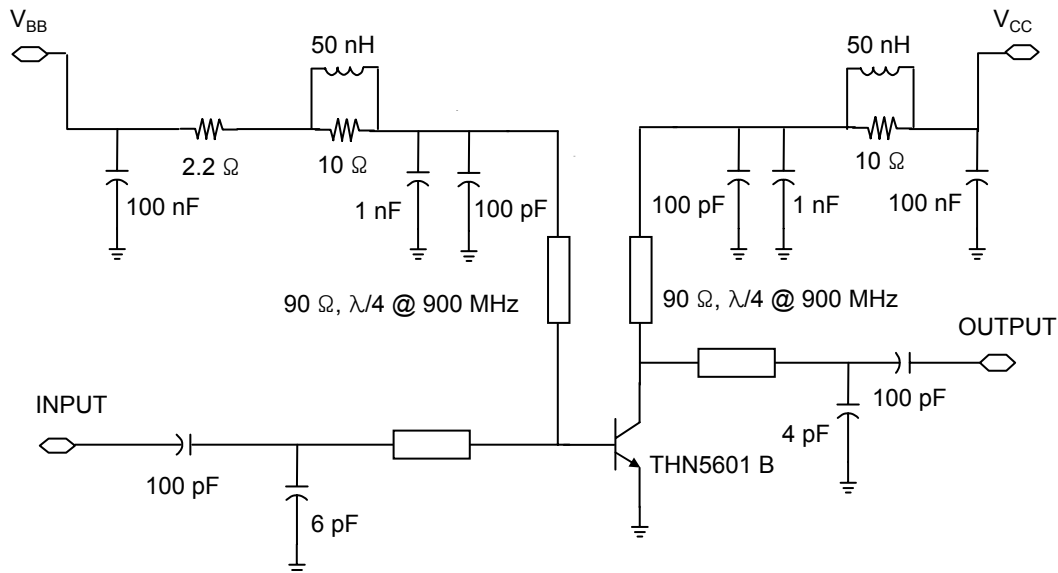


Part List	
C1, C11	100nF
C2, C10	1nF
C3, C4, C8, C9	100pF
C5	6pF
C7	4pF
R1	2.2Ω
R2, R3	10Ω
L1, L2	50nH

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

Test condition : CW test, $V_{CC} = 4.8$ V, $I_{CQ} = 5$ mA, frequency = 900 MHz.

□ Test Circuit Schematic Diagram



THN5601B

□ Package Dimensions

