

UHF POWER TRANSISTOR

DRF1401

NPN SiGe RF TRANSISTOR

The DRF1401 is a low cost, NPN medium power SiGe HBT(Hetero-Junction Bipolar Transistor) encapsulated in a plastic SOT-223 SMD package.

The DRF1401 can be used as a driver device or an output device, depending on the specific application.

FEATURES

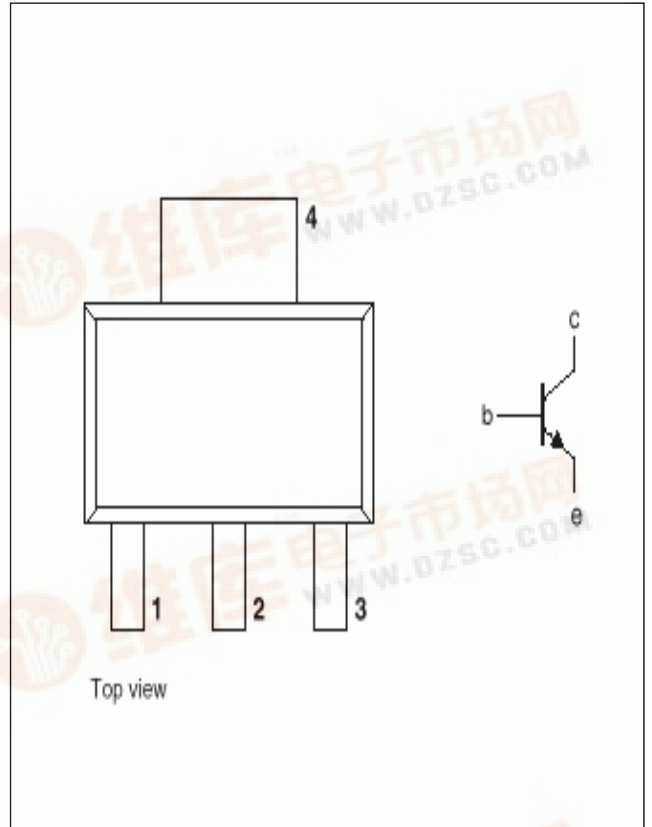
- o 4.8 Volt operation
- o P1dB 28 dBm @f=900MHz
- o Power gain 8.5 dB @f=900MHz

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 _{CBO}	Collector-Base Voltage	Open Emitter	20	V
V _{CEO}	Collector-Emitter Voltage	Open Base	8	V
V _{EB0}	Emitter-Base Voltage	Open Collector	4	V
I _c	Collector Current (DC)		350	mA
P _T	Total Power Dissipation	T _s = 60 ; note 1	1	W
T _{STG}	Storage Temperature		-65 ~ 150	
T _J	Operating Junction Temperature		150	



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 ;note1	55	K/W

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

QUICK REFERENCE DATA

RF performance at Ts ≤ 60 in common emitter test circuit (see Fig 8.)

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

DC CHARACTERISTICS

T_j=25 unless otherwise specified

SYMBOL	PARAMETER	CONDITION	MIN.	MAX.	UNIT
BV _{CBO}	collector-base breakdown voltage	open emitt	20		V
BV _{CEO}	collector-emitter breakdown voltage	open base	8		V
BV _{EBO}	emitter-base breakdown voltage	open collector	3		V
I _s	collector leakage current		0.1		mA
h _{FE}	DC current gain		60		
C _{CB}	collector capacitance			4.5	pF

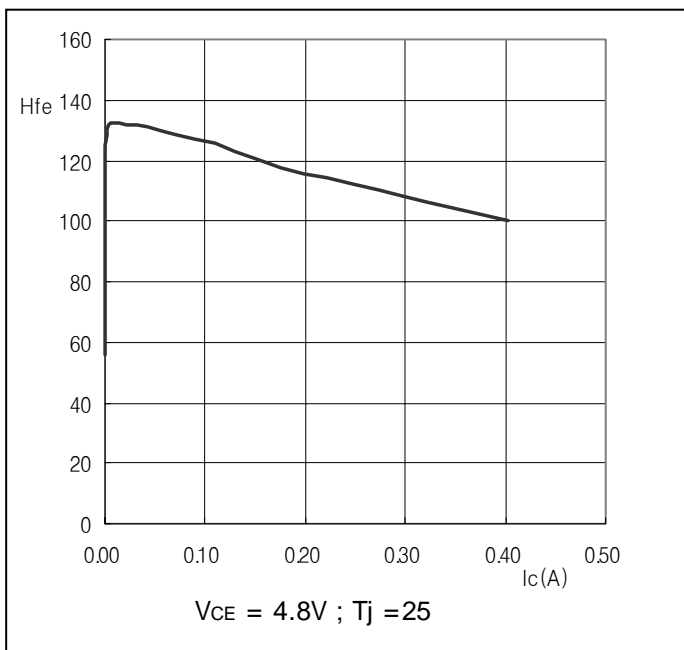


Fig 1. DC Current gain v.s Collector current

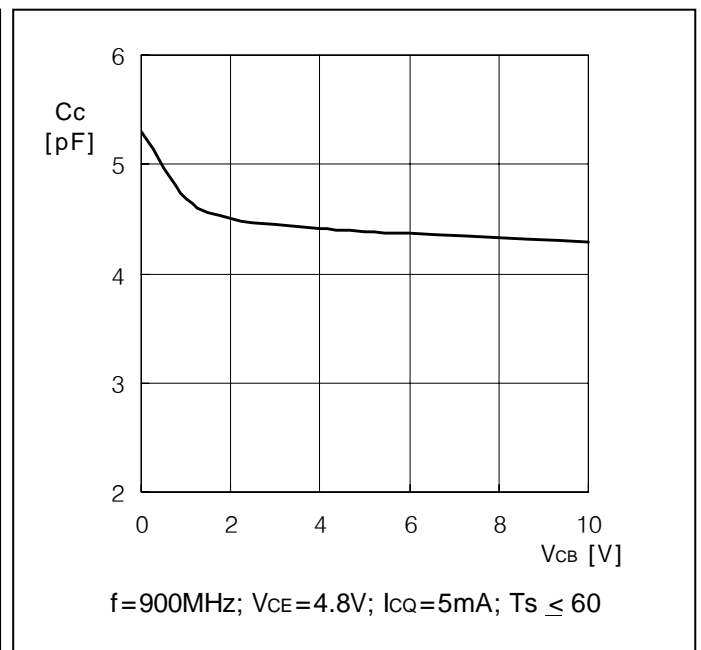


Fig 2. Collector-base capacitance v.s Collector-base voltage(DC)

APPLICATION INFORMATION (I)

RF performance at $T_s \leq 60$ in common emitter test circuit (see Fig 7)

Mode of Operation	f [MHz]	V _{CE} [V]	P _L [mW]	G _P [dB]	η_c [%]
CW, class-AB	900	4.8	600	7	70

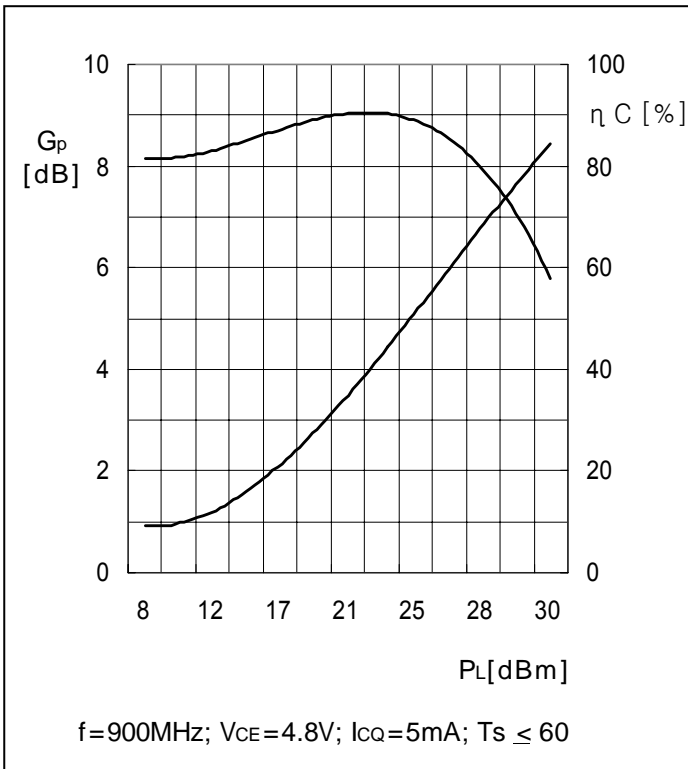


Fig 3. Power gain and collector efficiency v.s load power (typical value)

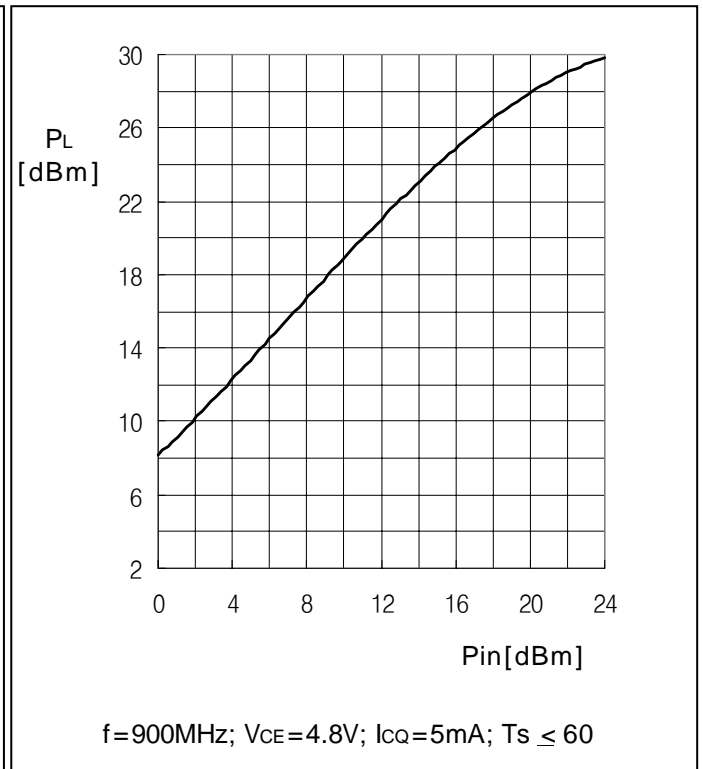


Fig 4. Load power v.s input power (typical value)

Typical Large Signal Impedance

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

Freq. [MHz]	source		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 $T_s \leq 60$ in common emitter configuration. ($I_{CQ} = 5\text{mA}$)

Mode of Operation	f [MHz]	V _{CE} [V]	P _L [mW]	G _p [dB]	c [%]
CW, class-AB	450	4.8	630	14	60

DRF1401 Input/Load Impedance as a frequency

Freq. [MHz]	Z _{in}		Z _L	
	r _{in}	x _{in}	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

Transistor Impedance

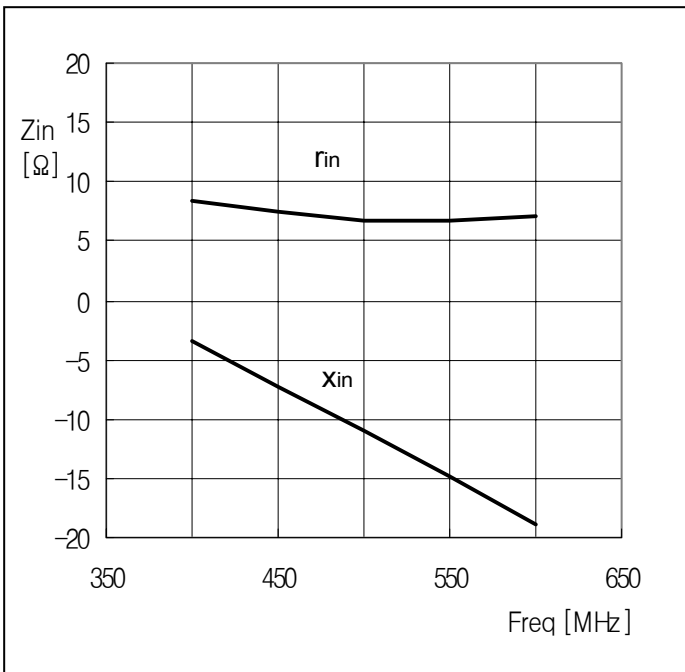
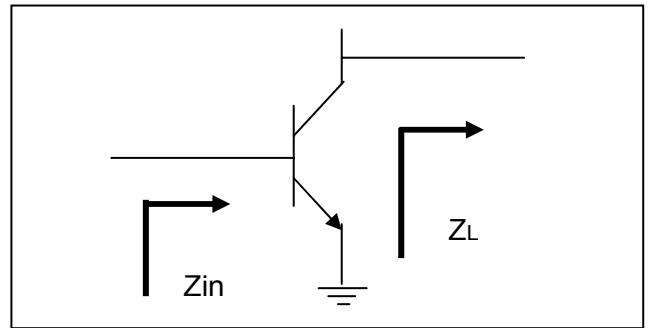


Fig 5. Input Impedance (series components) as a freq, typical values.

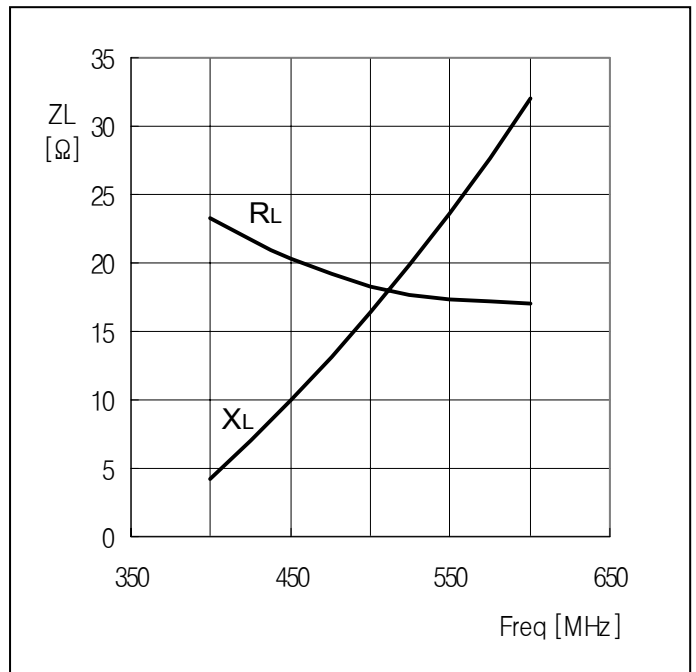


Fig 6. Load Impedance (series components) as a freq, typical values.

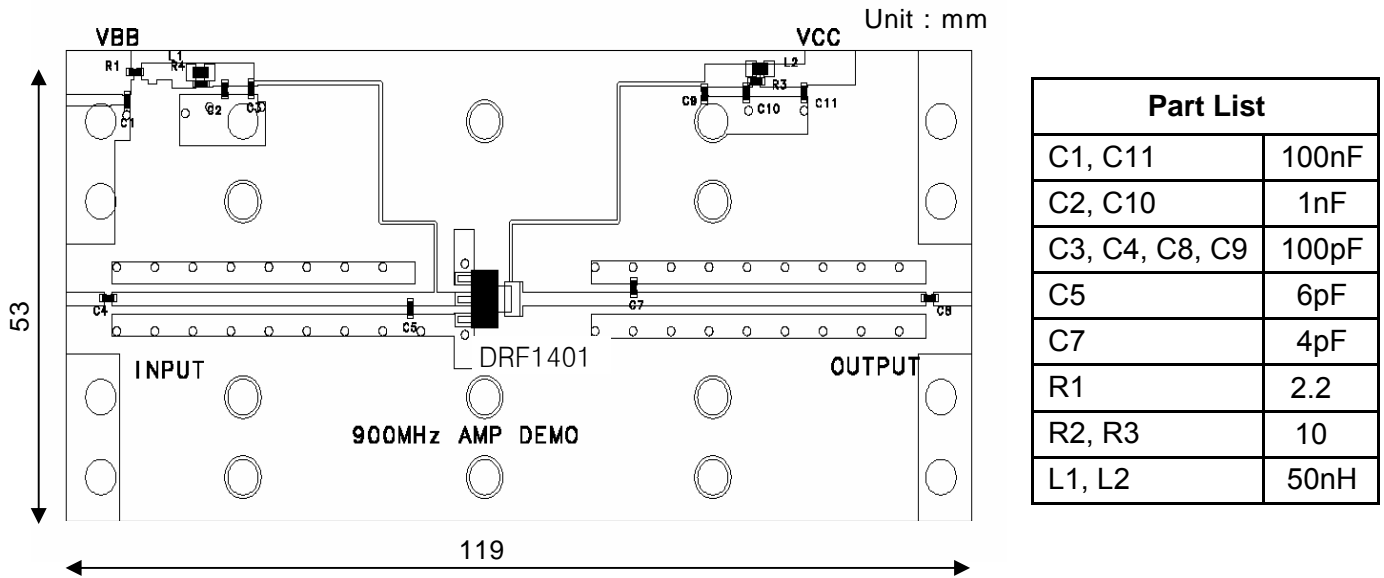


Fig 7. Test Circuit Board Layout @ f = 900MHz

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.

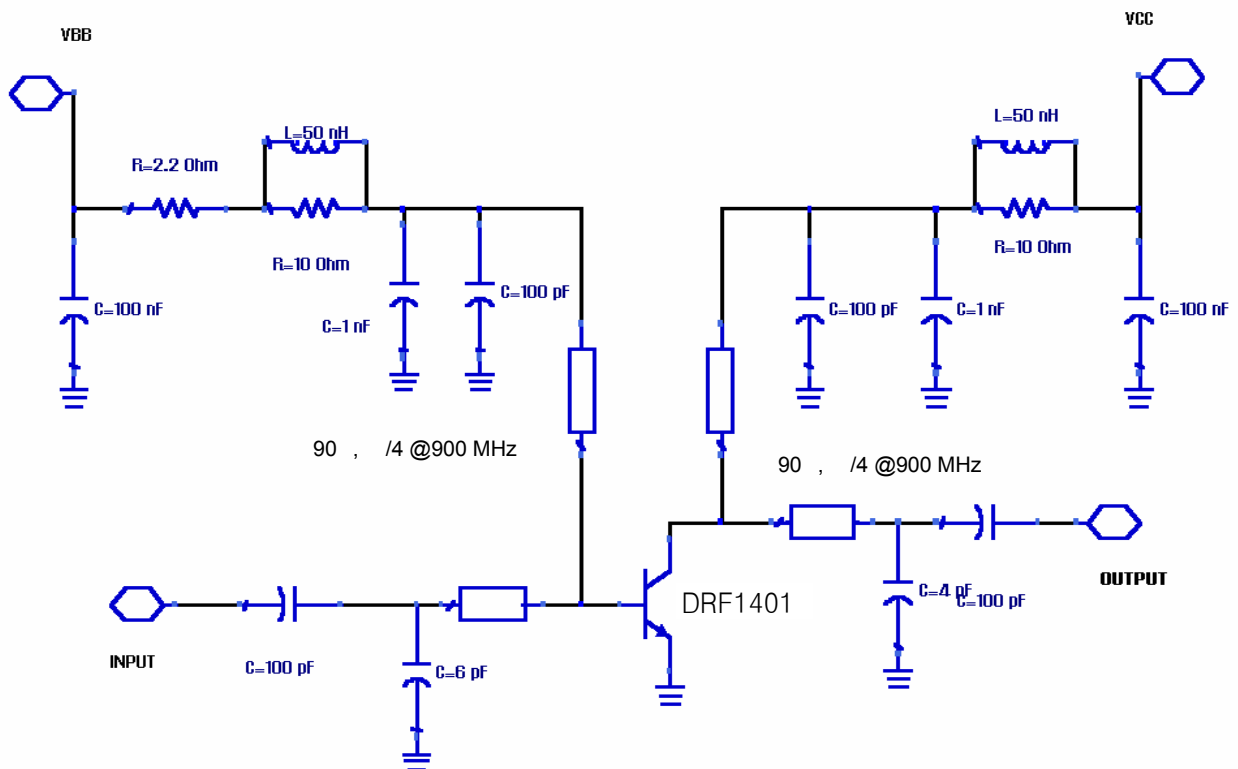
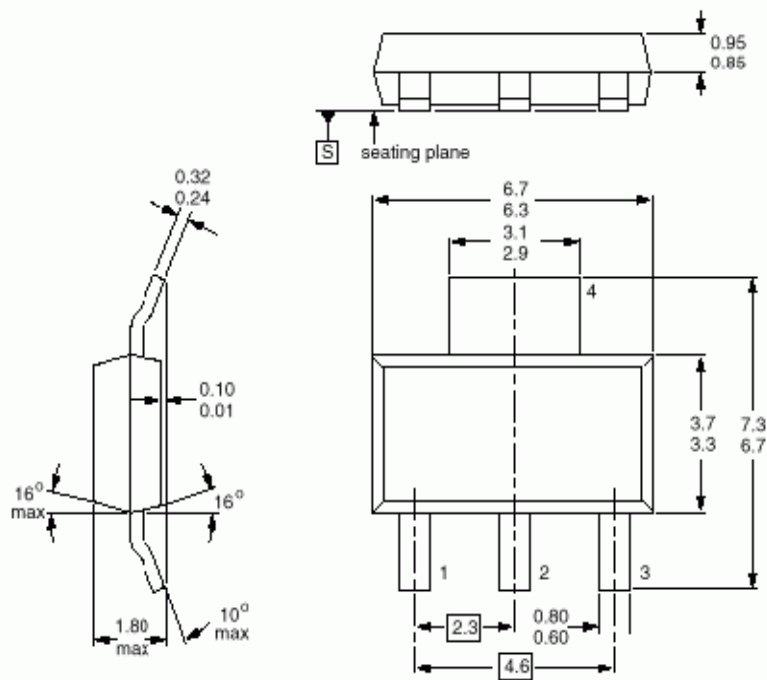


Fig 8. Test Circuit Schematic Diagram @f = 900MHz

PACKAGE DIMENSION



Dimensions in mm.

Fig 9. SOT-223 Package dimension