

**SANYO**

**2SA1778**

## VHF Converter, Local Oscillator Applications

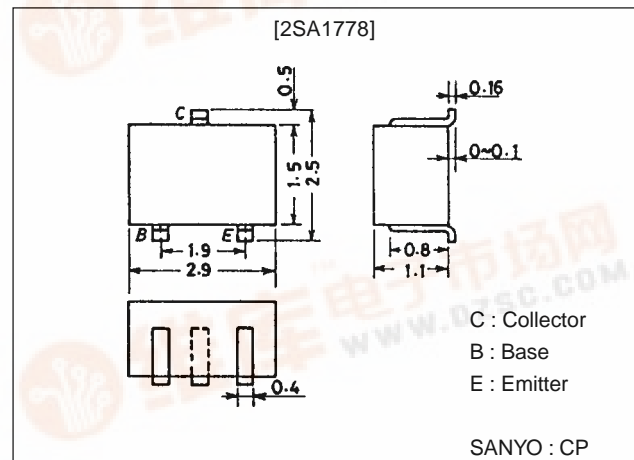
### Features

- High power gain (PG=13dB typ ; f=0.4GHz).
- High cutoff frequency ( $f_T=1.2\text{GHz}$  typ).
- Low  $C_{ob}$  ( $C_{ob}=1.0\text{pF}$  typ).
- Complementary pair with the 2SC4269.

### Package Dimensions

unit:mm

2018A



### Specifications

#### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CBO}$		-15	V
Collector-to-Emitter Voltage	$V_{CEO}$		-15	V
Emitter-to-Base Voltage	$V_{EBO}$		-3	V
Collector Current	$I_C$		-50	mA
Collector Dissipation	$P_C$		250	mW
Junction Temperature	$T_j$		150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

#### Electrical Characteristics at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB}=-15\text{V}, I_E=0$			-0.1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=-2\text{V}, I_C=0$			-0.1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE}=-10\text{V}, I_C=-5\text{mA}$	40*		200*	
Gain-Bandwidth Product	$f_T$	$V_{CE}=-10\text{V}, I_C=-5\text{mA}$	0.6	1.2		GHz
Output Capacitance	$C_{ob}$	$V_{CB}=-10\text{V}, f=1\text{MHz}$		1.0	1.5	pF
Reverse Transfer Capacitance	$C_{re}$	$V_{CB}=-10\text{V}, f=1\text{MHz}$		0.75		pF
Power Gain	PG	$V_{CE}=-10\text{V}, I_C=-5\text{mA}, f=0.4\text{GHz}$		13		dB
Noise Figure	NF	$V_{CE}=-10\text{V}, I_C=-3\text{mA}, f=0.4\text{GHz}$		2.5		dB

\* : The 2SA1778 is classified by 5mA  $h_{FE}$  as follows :

40	2	80	60	3	120	100	4	200
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Note : Marking : HS

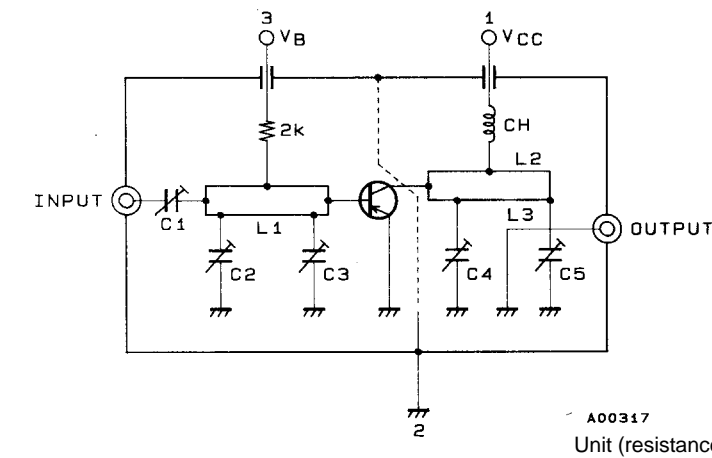
$h_{FE}$  rank : 2, 3, 4

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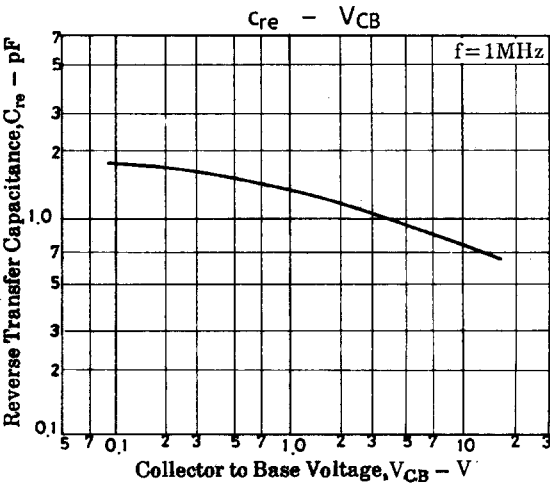
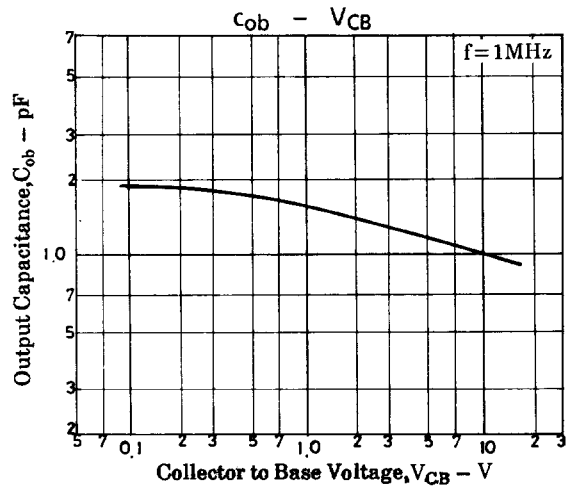
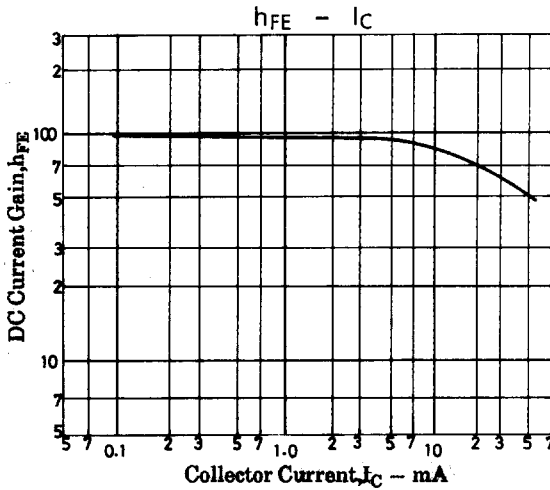
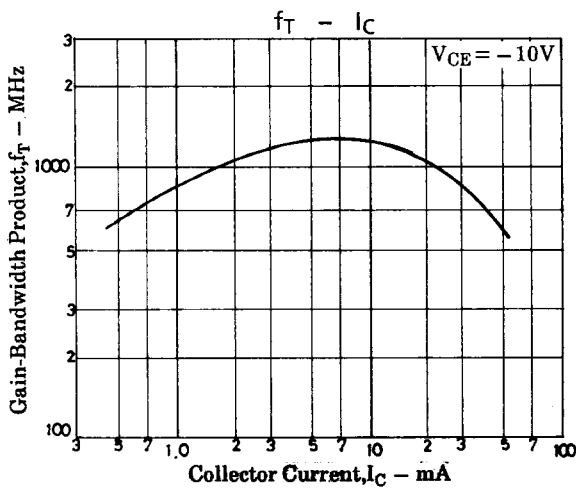
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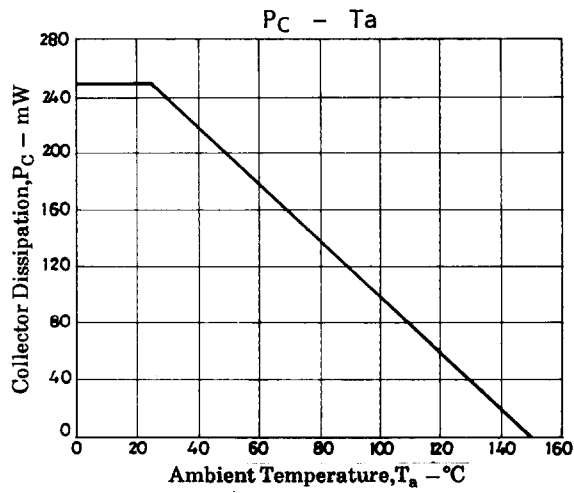
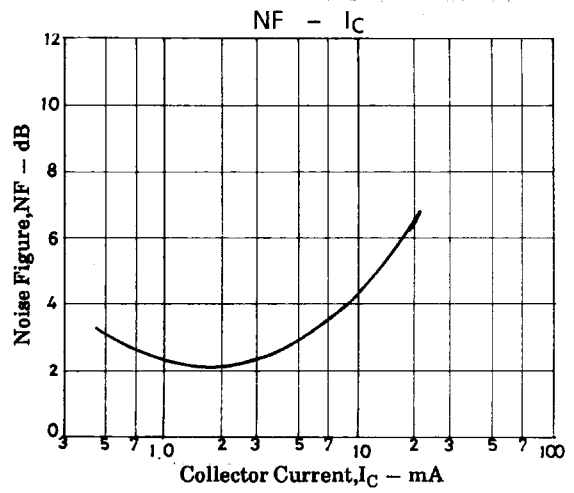
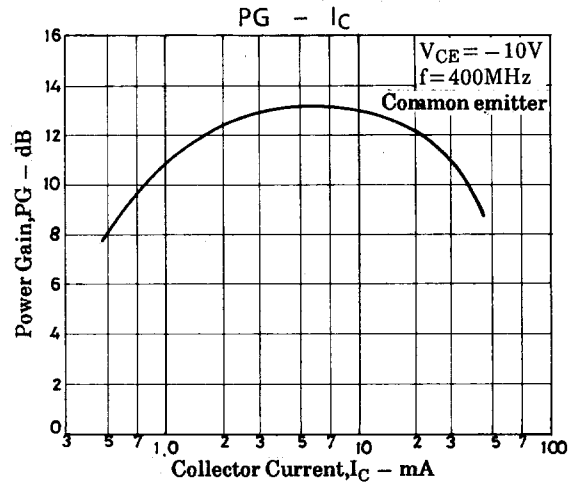
PG, NF Test Circuit



	400MHz
C1	~20pF
C2	~10pF
C3	~10pF
C4	~20pF
C5	~30pF
L1	2φ, 1 ≐ 40mm 2/3t
L2	2φ, 1 ≐ 40mm 2/3t
L3	1φ, 1 ≐ 40mm 1/2t
CH	3t+ Bead core

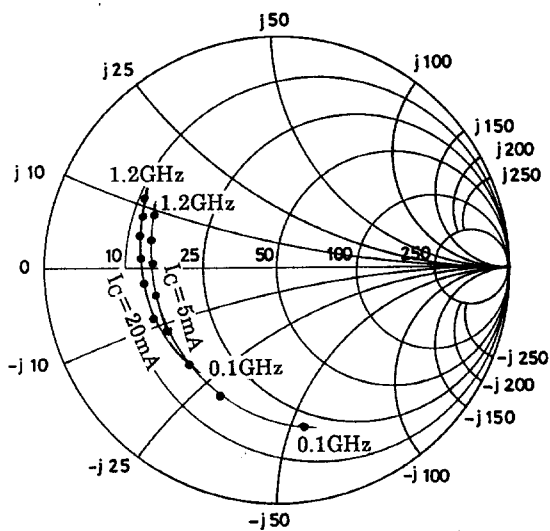


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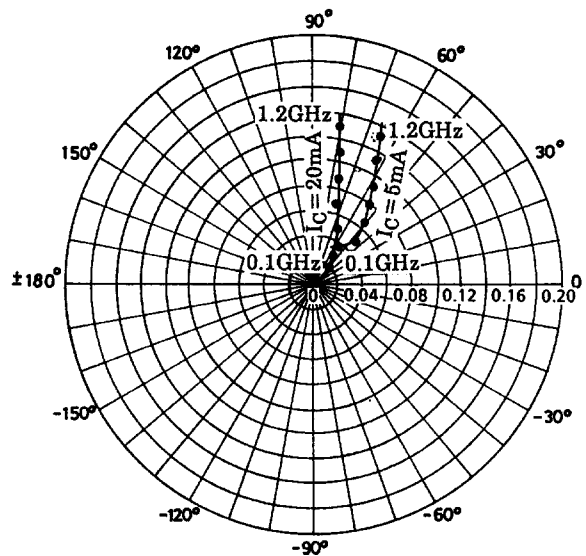


### S Parameter

S11e:  $V_{CE} = -10V$   
 $f = 100MHz, 200$  to  $1200MHz$  (200MHz step)

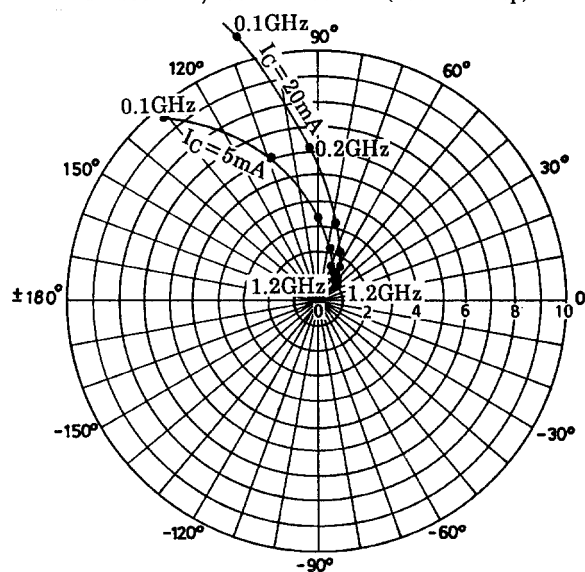


S12e:  $V_{CE} = -10V$   
 $f = 100MHz, 200$  to  $1200MHz$  (200MHz step)

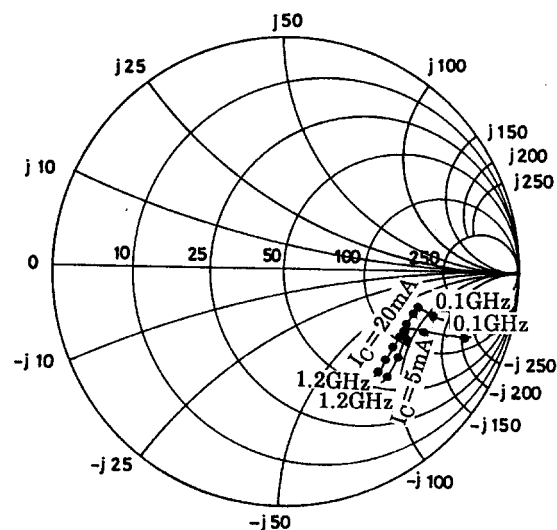


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S21e:  $V_{CE} = -10V$   
 $f = 100MHz, 200$  **to**  $1200MHz$  (200MHz step)



S22e:  $V_{CE} = -10V$   
 $f = 100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$



### S Parameter (Common emitter)

 $V_{CE} = -10V, I_C = -5mA, Z_o = 50\Omega$ 

Freq. (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.685	-79.5	9.506	130.8	0.039	55.5	0.770	-19.6
200	0.594	-117.7	6.031	108.6	0.052	45.9	0.670	-21.2
400	0.554	-154.4	3.349	89.0	0.065	48.3	0.599	-22.8
600	0.551	-170.6	2.331	76.1	0.079	53.9	0.579	-26.4
800	0.555	179.4	1.823	65.9	0.095	58.8	0.575	-31.4
1000	0.568	169.6	1.496	57.0	0.112	62.5	0.576	-37.3
1200	0.581	162.5	1.292	48.9	0.132	65.8	0.579	-43.6

$$V_{CE} = -10V, I_C = -20mA, Z_o = 50\Omega$$

Freq (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.566	-134.4	11.446	110.0	0.022	51.6	0.660	-16.2
200	0.579	-159.2	6.160	92.9	0.030	56.4	0.600	-14.3
400	0.599	-175.8	3.152	77.2	0.047	66.3	0.586	-16.4
600	0.613	174.8	2.128	65.9	0.066	71.2	0.591	-21.4
800	0.632	167.3	1.618	56.4	0.084	75.3	0.601	-27.8
1000	0.645	160.0	1.305	47.6	0.106	77.8	0.610	-34.7
1200	0.663	153.9	1.097	40.4	0.130	79.9	0.620	-42.0

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