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# 2SC5140

Silicon NPN Epitaxial

# HITACHI

ADE-208-227A (Z)  
2nd. Edition  
Mar. 2001

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## Application

VHF / UHF wide band amplifier

## Features

- High gain bandwidth product  
 $f_T = 9 \text{ GHz typ}$
- High gain, low noise figure  
 $PG = 15 \text{ dB typ, NF} = 1.6 \text{ dB typ at } f = 900 \text{ MHz}$

## Outline

SMPAK



1. Emitter
2. Base
3. Collector

Note: Marking is "YH-".

Attention: This device is very sensitive to electro static discharge.

It is recommended to adopt appropriate cautions when handling this transistor.

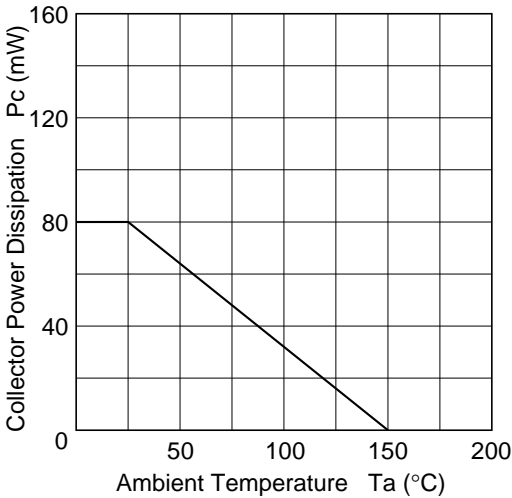
**Absolute Maximum Ratings** ( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Collector to base voltage	$V_{\text{CBO}}$	15	V
Collector to emitter voltage	$V_{\text{CEO}}$	9	V
Emitter to base voltage	$V_{\text{EBO}}$	1.5	V
Collector current	$I_{\text{C}}$	20	mA
Collector power dissipation	$P_{\text{C}}$	80	mW
Junction temperature	$T_{\text{j}}$	150	$^\circ\text{C}$
Storage temperature	$T_{\text{stg}}$	-55 to +150	$^\circ\text{C}$

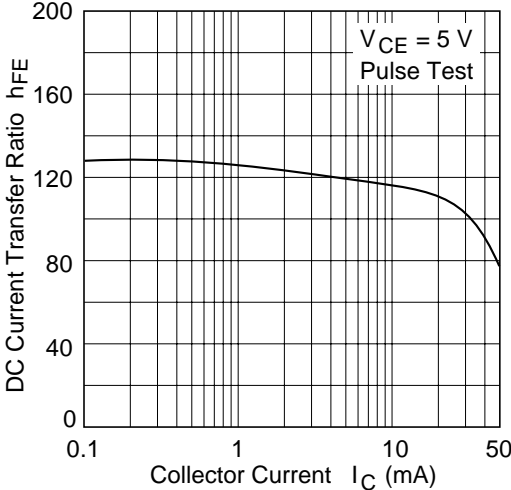
**Electrical Characteristics** ( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector cutoff current	$I_{\text{CBO}}$	—	—	10	$\mu\text{A}$	$V_{\text{CB}} = 15 \text{ V}, I_{\text{E}} = 0$
	$I_{\text{CEO}}$	—	—	1	mA	$V_{\text{CE}} = 9 \text{ V}, R_{\text{BE}} = \infty$
Emitter cutoff current	$I_{\text{EBO}}$	—	—	10	$\mu\text{A}$	$V_{\text{EB}} = 1.5 \text{ V}, I_{\text{C}} = 0$
DC current transfer ratio	$h_{\text{FE}}$	50	120	250		$V_{\text{CE}} = 5 \text{ V}, I_{\text{C}} = 10 \text{ mA}$
Collector output capacitance	$C_{\text{ob}}$	—	0.5	0.85	pF	$V_{\text{CB}} = 5 \text{ V}, I_{\text{E}} = 0,$ $f = 1 \text{ MHz}$
Gain bandwidth product	$f_{\text{T}}$	6	9	—	GHz	$V_{\text{CE}} = 5 \text{ V}, I_{\text{C}} = 10 \text{ mA}$
Power gain	PG	11	15	—	dB	$V_{\text{CE}} = 5 \text{ V}, I_{\text{C}} = 10 \text{ mA},$ $f = 900 \text{ MHz}$
Noise figure	NF	—	1.6	2.5	dB	$V_{\text{CE}} = 5 \text{ V}, I_{\text{C}} = 5 \text{ mA},$ $f = 900 \text{ MHz}$

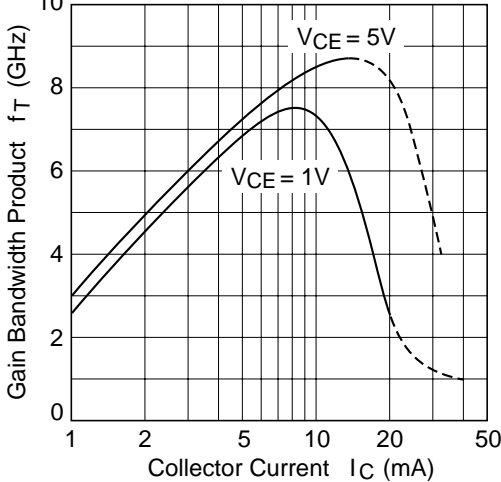
Maximum Collector Dissipation Curve



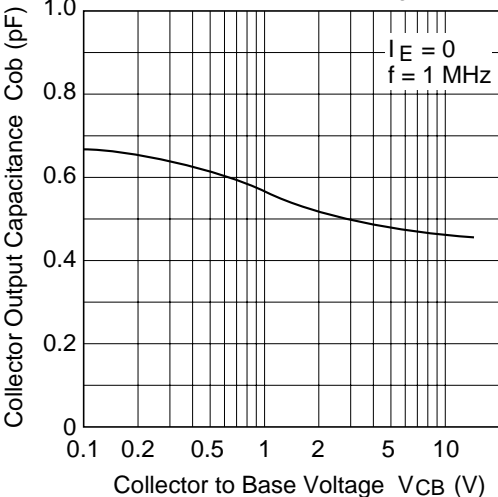
DC Current Transfer Ratio vs. Collector Current

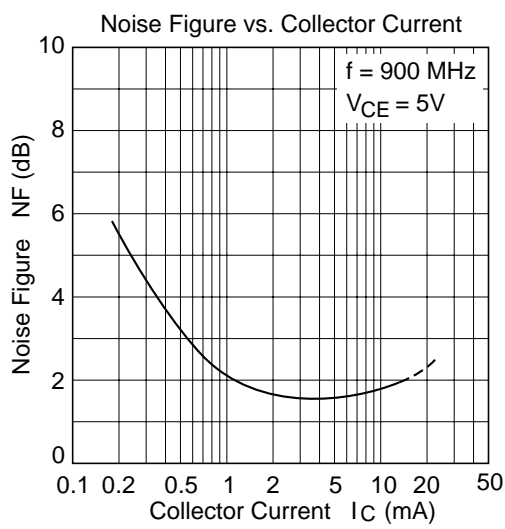
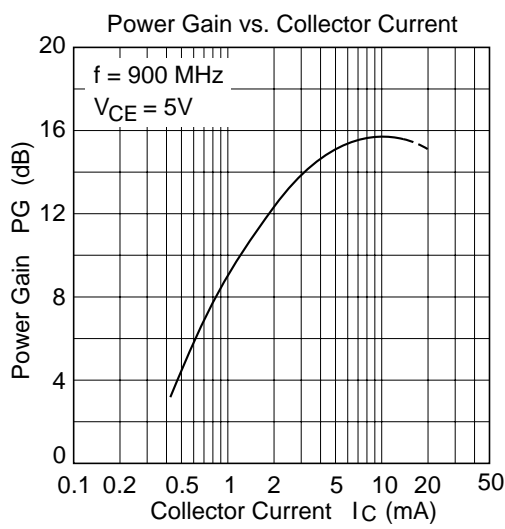


Gain Bandwidth Product vs. Collector Current

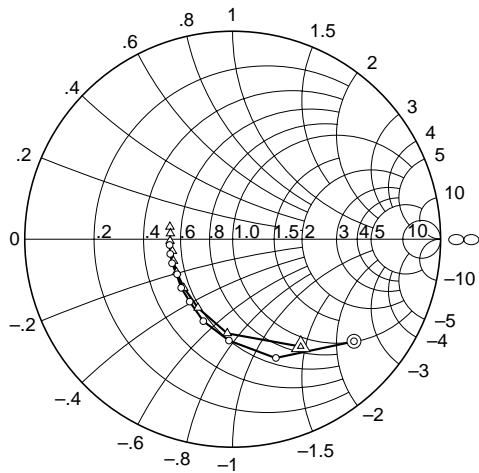


Collector Output Capacitance vs. Collector to Base Voltage



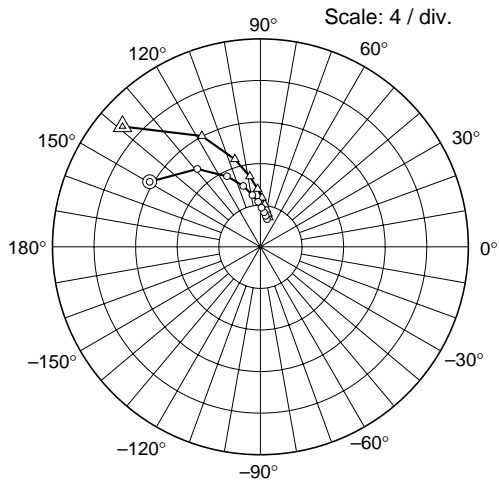


S11 Parameter vs. Frequency



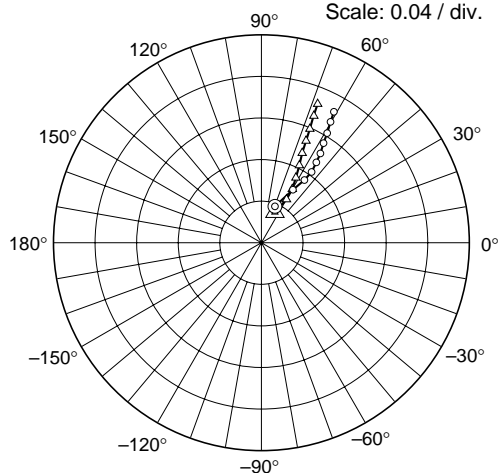
Condition:  $V_{CE} = 5 \text{ V}$ ,  $Z_o = 50 \Omega$   
200 to 2000 MHz (200 MHz step)  
○ (  $I_C = 5 \text{ mA}$  )  
△ (  $I_C = 10 \text{ mA}$  )

S21 Parameter vs. Frequency



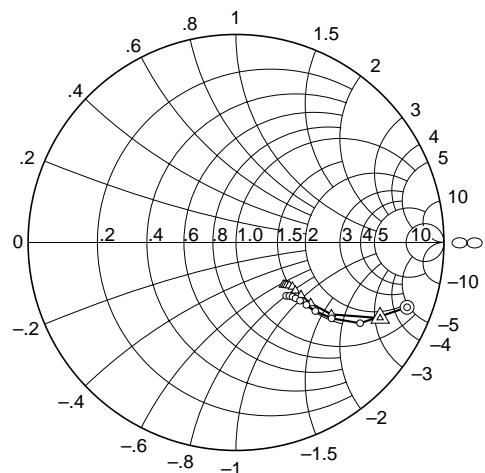
Scale: 4 / div.  
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200 to 2000 MHz (200 MHz step)  
○ (  $I_C = 5 \text{ mA}$  )  
△ (  $I_C = 10 \text{ mA}$  )

S12 Parameter vs. Frequency



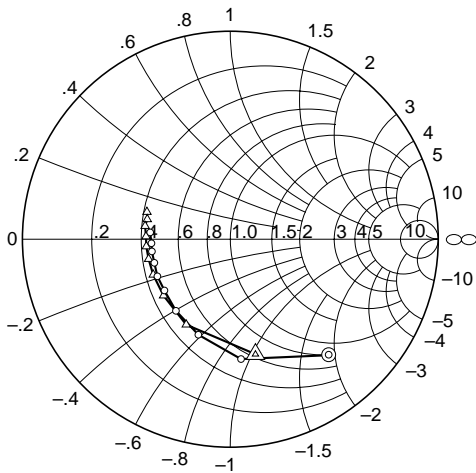
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200 to 2000 MHz (200 MHz step)  
○ (  $I_C = 5 \text{ mA}$  )  
△ (  $I_C = 10 \text{ mA}$  )

S22 Parameter vs. Frequency



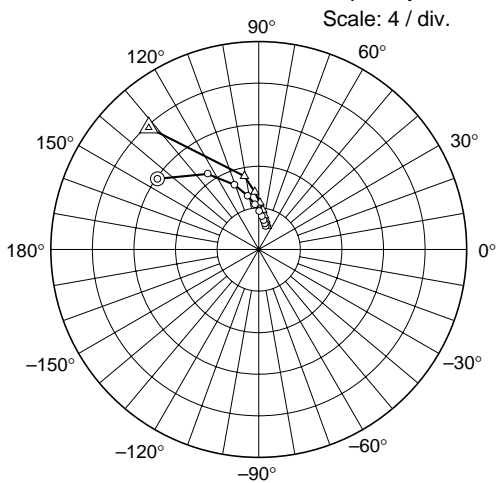
Condition:  $V_{CE} = 5 \text{ V}$ ,  $Z_o = 50 \Omega$   
200 to 2000 MHz (200 MHz step)  
○ (  $I_C = 5 \text{ mA}$  )  
△ (  $I_C = 10 \text{ mA}$  )

S11 Parameter vs. Frequency



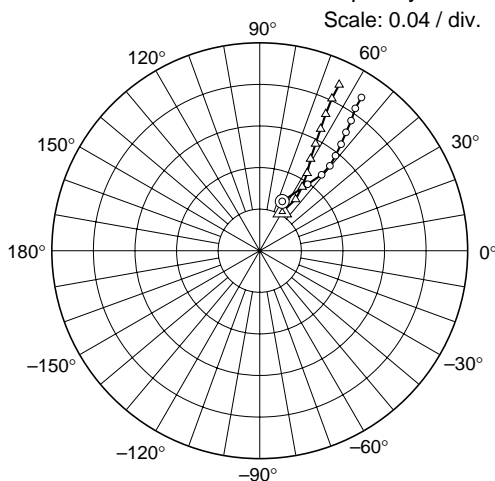
Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — ○ ( $I_C = 5\text{ mA}$ )  
△ — △ ( $I_C = 10\text{ mA}$ )

S21 Parameter vs. Frequency



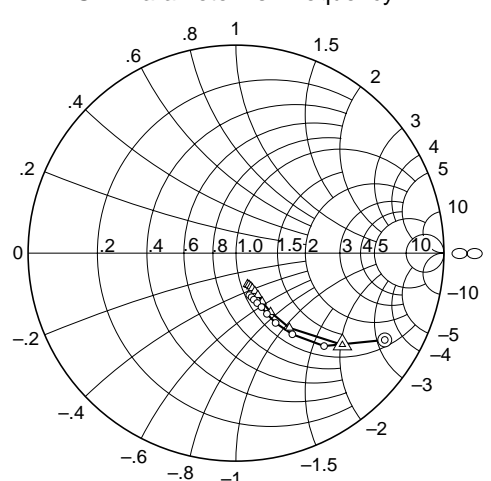
Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — ○ ( $I_C = 5\text{ mA}$ )  
△ — △ ( $I_C = 10\text{ mA}$ )

S12 Parameter vs. Frequency



Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — ○ ( $I_C = 5\text{ mA}$ )  
△ — △ ( $I_C = 10\text{ mA}$ )

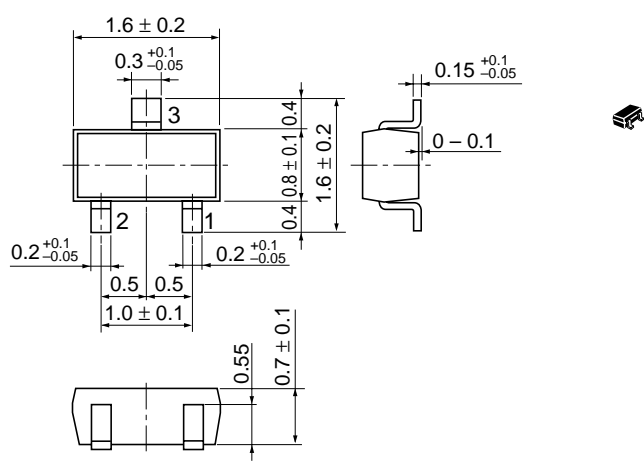
S22 Parameter vs. Frequency



Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — ○ ( $I_C = 5\text{ mA}$ )  
△ — △ ( $I_C = 10\text{ mA}$ )

Package Dimensions

As of January, 2001  
Unit: mm



Hitachi Code	SMPAK
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.003 g

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