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# 2SC5139

Silicon NPN Epitaxial

# HITACHI

ADE-208-226A (Z)  
2nd. Edition  
Mar. 2001

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## Application

VHF / UHF wide band amplifier

## Features

- High gain bandwidth product  
 $f_T = 11 \text{ GHz typ}$
- High gain, low noise figure  
 $PG = 15 \text{ dB typ}$ ,  $NF = 1.1 \text{ dB typ}$  at  $f = 900 \text{ MHz}$

## Outline

SMPAK



1. Emitter
2. Base
3. Collector

Note: Marking is "YZ-".

Attention: This device is very sensitive to electro static discharge.  
It is recommended to adopt appropriate cautions when handling this transistor.

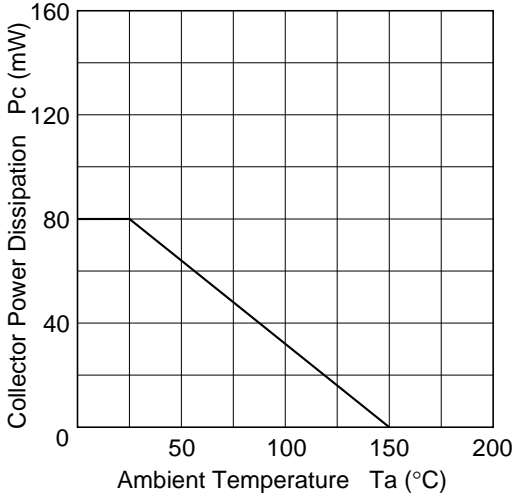
**Absolute Maximum Ratings** ( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Collector to base voltage	$V_{\text{CBO}}$	15	V
Collector to emitter voltage	$V_{\text{CEO}}$	8	V
Emitter to base voltage	$V_{\text{EBO}}$	1.5	V
Collector current	$I_{\text{C}}$	50	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	$^\circ\text{C}$

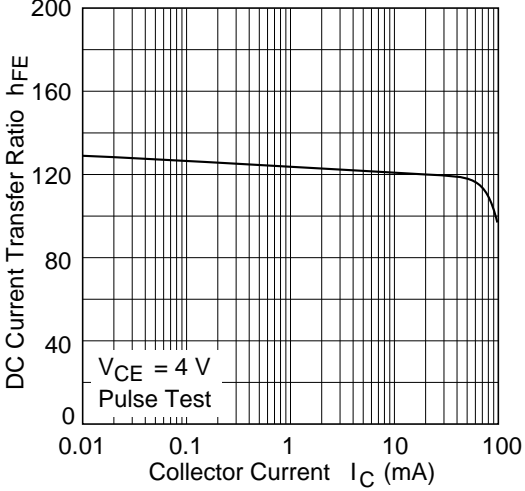
**Electrical Characteristics** ( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector to base breakdown voltage	$V_{(\text{BR})\text{CBO}}$	15	—	—	V	$I_{\text{C}} = 10\text{ }\mu\text{A}$ , $I_{\text{E}} = 0$
Collector cutoff current	$I_{\text{CBO}}$	—	—	1	$\mu\text{A}$	$V_{\text{CB}} = 12\text{ V}$ , $I_{\text{E}} = 0$
	$I_{\text{CEO}}$	—	—	1	mA	$V_{\text{CE}} = 8\text{ V}$ , $R_{\text{BE}} = \infty$
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		$V_{\text{CE}} = 4\text{ V}$ , $I_{\text{C}} = 20\text{ mA}$
Collector output capacitance	$C_{\text{ob}}$	—	0.65	1.15	pF	$V_{\text{CB}} = 5\text{ V}$ , $I_{\text{E}} = 0$ , $f = 1\text{ MHz}$
Gain bandwidth product	$f_{\text{T}}$	8	11	—	GHz	$V_{\text{CE}} = 4\text{ V}$ , $I_{\text{C}} = 20\text{ mA}$
Power gain	PG	11.5	15	—	dB	$V_{\text{CE}} = 4\text{ V}$ , $I_{\text{C}} = 20\text{ mA}$ , $f = 900\text{ MHz}$
Noise figure	NF	—	1.1	2.0	dB	$V_{\text{CE}} = 4\text{ V}$ , $I_{\text{C}} = 5\text{ mA}$ , $f = 900\text{ MHz}$

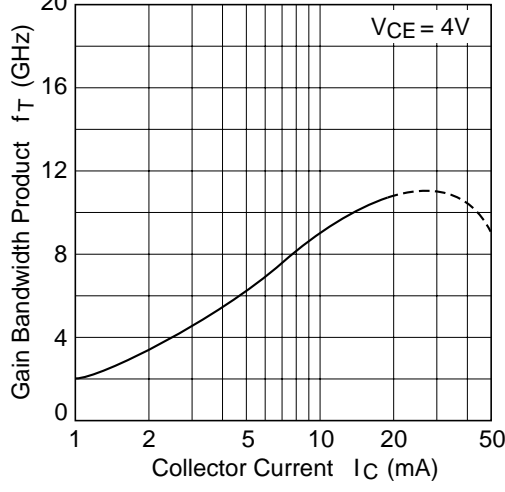
Maximum Collector Dissipation Curve



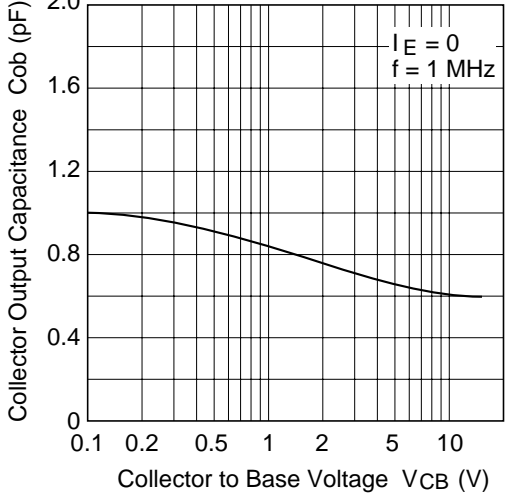
DC Current Transfer Ratio vs. Collector Current

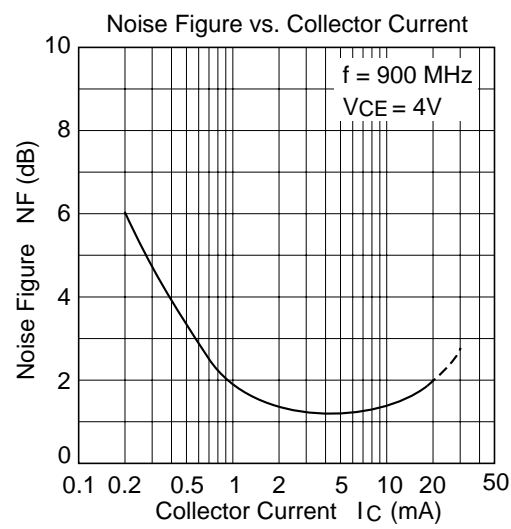
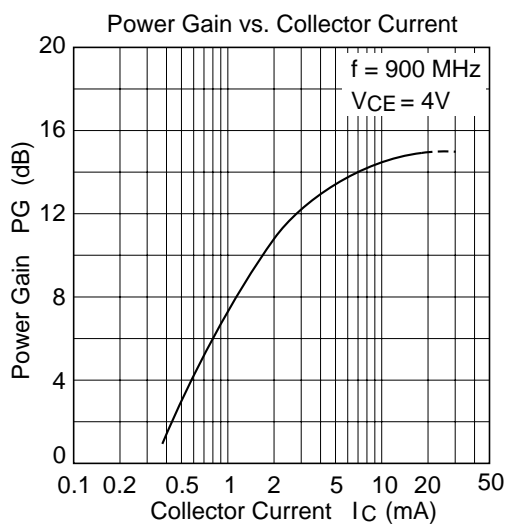


Gain Bandwidth Product vs. Collector Current

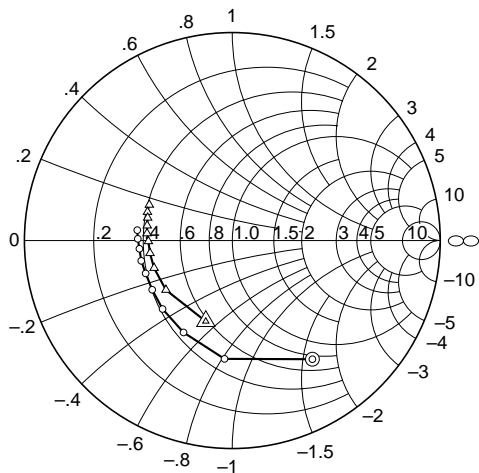


Collector Output Capacitance vs. Collector to Base Voltage





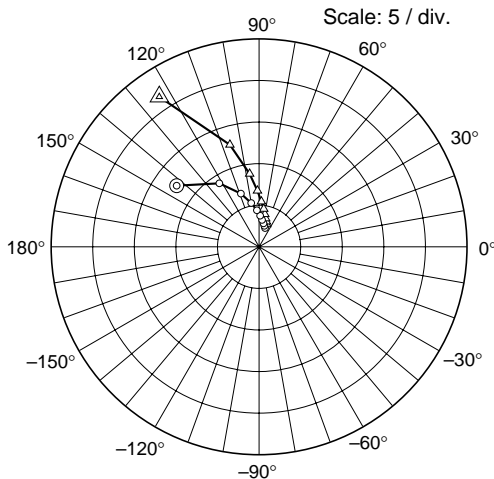
S11 Parameter vs. Frequency



Condition:  $V_{CE} = 4 \text{ V}$ ,  $Z_o = 50 \Omega$   
200 to 2000 MHz (200 MHz step)

○ — ○ ( $I_C = 5 \text{ mA}$ )  
△ — △ ( $I_C = 20 \text{ mA}$ )

S21 Parameter vs. Frequency

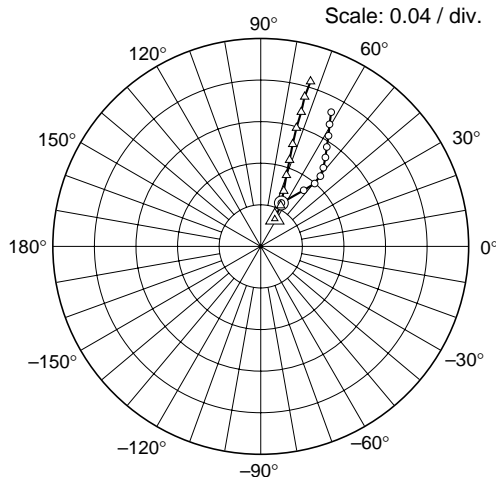


Scale: 5 / div.

Condition:  $V_{CE} = 4 \text{ V}$ ,  $Z_o = 50 \Omega$   
200 to 2000 MHz (200 MHz step)

○ — ○ ( $I_C = 5 \text{ mA}$ )  
△ — △ ( $I_C = 20 \text{ mA}$ )

S12 Parameter vs. Frequency

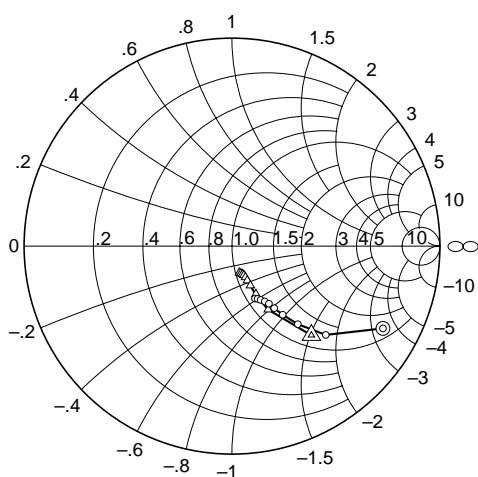


Scale: 0.04 / div.

Condition:  $V_{CE} = 4 \text{ V}$ ,  $Z_o = 50 \Omega$   
200 to 2000 MHz (200 MHz step)

○ — ○ ( $I_C = 5 \text{ mA}$ )  
△ — △ ( $I_C = 20 \text{ mA}$ )

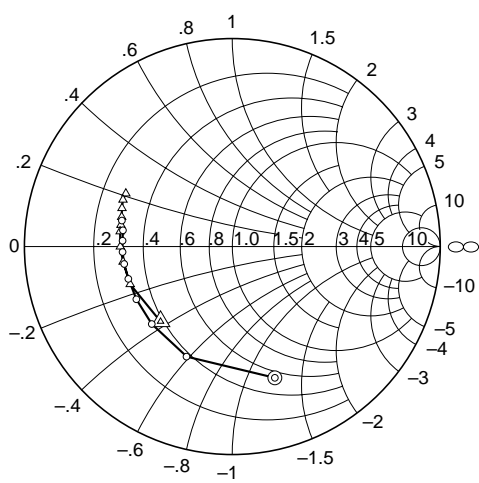
S22 Parameter vs. Frequency



Condition:  $V_{CE} = 4 \text{ V}$ ,  $Z_o = 50 \Omega$   
200 to 2000 MHz (200 MHz step)

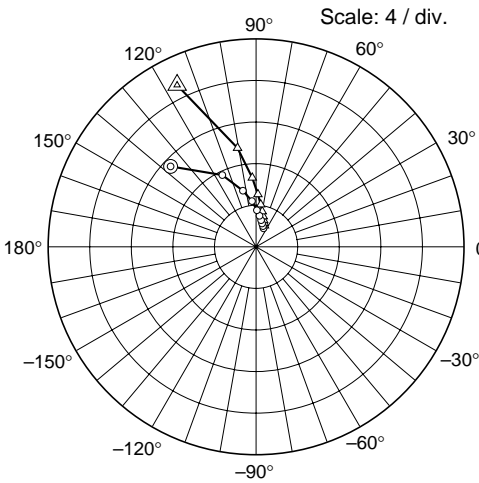
○ — ○ ( $I_C = 5 \text{ mA}$ )  
△ — △ ( $I_C = 20 \text{ mA}$ )

S11 Parameter vs. Frequency



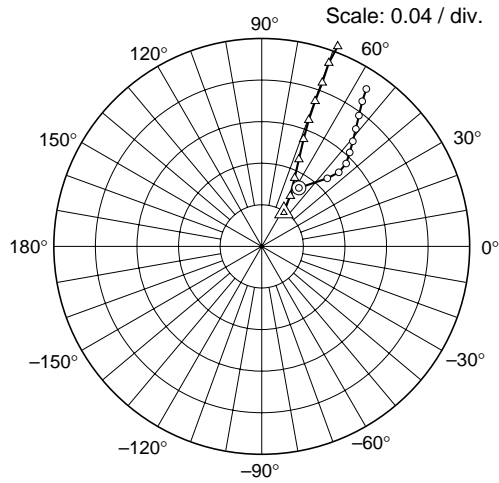
Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — (I<sub>C</sub> = 5 mA)  
△ — (I<sub>C</sub> = 20 mA)

S21 Parameter vs. Frequency



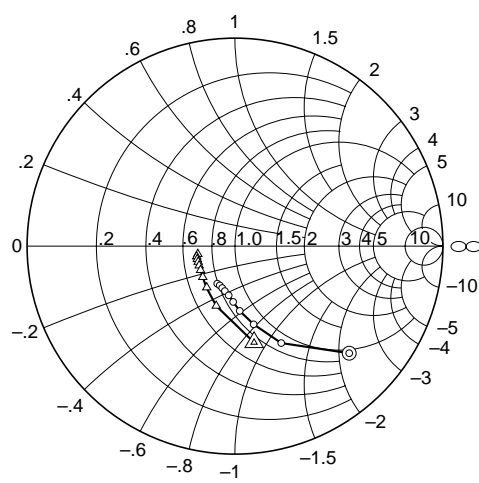
Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — (I<sub>C</sub> = 5 mA)  
△ — (I<sub>C</sub> = 20 mA)

S12 Parameter vs. Frequency



Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — (I<sub>C</sub> = 5 mA)  
△ — (I<sub>C</sub> = 20 mA)

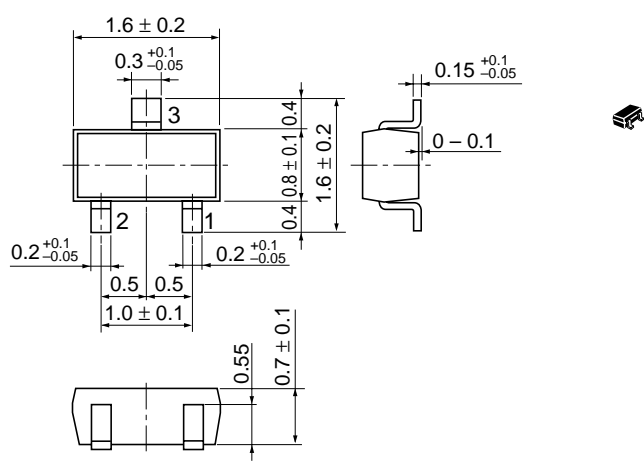
S22 Parameter vs. Frequency



Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
200 to 2000 MHz (200 MHz step)  
○ — (I<sub>C</sub> = 5 mA)  
△ — (I<sub>C</sub> = 20 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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# HITACHI

**Hitachi, Ltd.**

Semiconductor & Integrated Circuits.  
 Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
 Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL	NorthAmerica	: <a href="http://semiconductor.hitachi.com/">http://semiconductor.hitachi.com/</a>
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**For further information write to:**

Hitachi Semiconductor  
 (America) Inc.  
 179 East Tasman Drive,  
 San Jose, CA 95134  
 Tel: <1> (408) 433-1990  
 Fax: <1> (408) 433-0223

Hitachi Europe GmbH  
 Electronic Components Group  
 Dornacher Straße 3  
 D-85622 Feldkirchen, Munich  
 Germany  
 Tel: <49> (89) 9 9180-0  
 Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.  
 Electronic Components Group.  
 Whitebrook Park  
 Lower Cookham Road  
 Maidenhead  
 Berkshire SL6 8YA, United Kingdom  
 Tel: <44> (1628) 585000  
 Fax: <44> (1628) 585160

Hitachi Asia Ltd.  
 Hitachi Tower  
 16 Collyer Quay #20-00,  
 Singapore 049318  
 Tel: <65>-538-6533/538-8577  
 Fax: <65>-538-6933/538-3877  
 URL: <http://www.hitachi.com.sg>

Hitachi Asia Ltd.  
 (Taipei Branch Office)  
 4/F, No. 167, Tun Hwa North Road,  
 Hung-Kuo Building,  
 Taipei (105), Taiwan  
 Tel: <886>-(2)-2718-3666  
 Fax: <886>-(2)-2718-8180  
 Telex: 23222 HAS-TP  
 URL: <http://www.hitachi.com.tw>

Hitachi Asia (Hong Kong) Ltd.  
 Group III (Electronic Components)  
 7/F., North Tower,  
 World Finance Centre,  
 Harbour City, Canton Road  
 Tsim Sha Tsui, Kowloon,  
 Hong Kong  
 Tel: <852>-(2)-735-9218  
 Fax: <852>-(2)-730-0281  
 URL: <http://www.hitachi.com.hk>

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