

# DATA SHEET

# NEC

## NPN SILICON RF TRANSISTOR **2SC4703**

### NPN EPITAXIAL SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW DISTORTION AMPLIFIER 3-PIN POWER MINIMOLD

#### DESCRIPTION

The 2SC4703 is designed for low distortion, low noise RF amplifier operating with low supply voltage ( $V_{CE} = 5\text{ V}$ ). This low distortion characteristic makes it suitable for CATV, tele-communication and other use. It employs surface mount type plastic package, power minimold (SOT-89).

#### FEATURES

- Low distortion, low voltage:  $IM_2 = 55\text{ dBc TYP.}$ ,  $IM_3 = 76\text{ dBc TYP.}$  @  $V_{CE} = 5\text{ V}$ ,  $I_C = 50\text{ mA}$ ,  $V_{in} = 105\text{ dB}\mu\text{V}/75\Omega$
- Large  $P_{tot}$  :  $P_{tot} = 1.8\text{ W}$  (Mounted on double-sided copper-clad  $16\text{ cm}^2 \times 0.7\text{ mm}$  (t) ceramic substrate)
- Small package : 3-pin power minimold package

#### ★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC4703	25 pcs (Non reel)	• 12 mm wide embossed taping
2SC4703-T1	1 kpcs/reel	• Collector face the perforation side of the tape

**Remark** To order evaluation samples, contact your nearby sales office.  
The unit sample quantity is 25 pcs.

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ )

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	25	V
Collector to Emitter Voltage	$V_{CEO}$	12	V
Emitter to Base Voltage	$V_{EBO}$	2.5	V
Collector Current	$I_C$	150	mA
Total Power Dissipation	$P_{tot}^{\text{Note}}$	1.8	W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
★ Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**Note** Mounted on double-sided copper-clad  $16\text{ cm}^2 \times 0.7\text{ mm}$  (t) ceramic substrate

**Caution** Observe precautions when handling because these devices are sensitive to electrostatic discharge.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.  
Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit	
DC Characteristics							
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 20 V, I <sub>E</sub> = 0 mA	–	–	1.5	μA	
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 2 V, I <sub>C</sub> = 0 mA	–	–	1.5	μA	
★ DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA	50	–	250	–	
RF Characteristics							
★ Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA	–	6.0	–	GHz	
Insertion Power Gain (1)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA, f = 1 GHz	6.5	8.3	–	dB	
Insertion Power Gain (2)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA, f = 1 GHz	–	8.5	–	dB	
Noise Figure	NF	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA, f = 1 GHz	–	2.3	3.5	dB	
Collector Capacitance	C <sub>ob</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	1.5	2.5	pF	
★ 2nd Order Intermodulation Distortion	IM <sub>2</sub>	I <sub>C</sub> = 50 mA, V <sub>O</sub> = 105 dBμV/75 Ω, f = 190 – 90 MHz	V <sub>CE</sub> = 5 V	–	55	–	dBc
			V <sub>CE</sub> = 10 V	–	63	–	
★ 3rd Order Intermodulation Distortion	IM <sub>3</sub>	I <sub>C</sub> = 50 mA, V <sub>O</sub> = 105 dBμV/75 Ω, f = 2 × 190 – 200 MHz	V <sub>CE</sub> = 5 V	–	76	–	dBc
			V <sub>CE</sub> = 10 V	–	81	–	

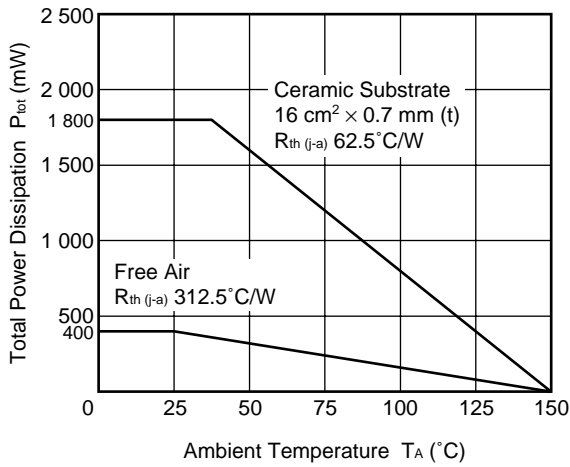
- Notes** 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%  
 2. Collector to base capacitance when the emitter grounded

**h<sub>FE</sub> CLASSIFICATION**

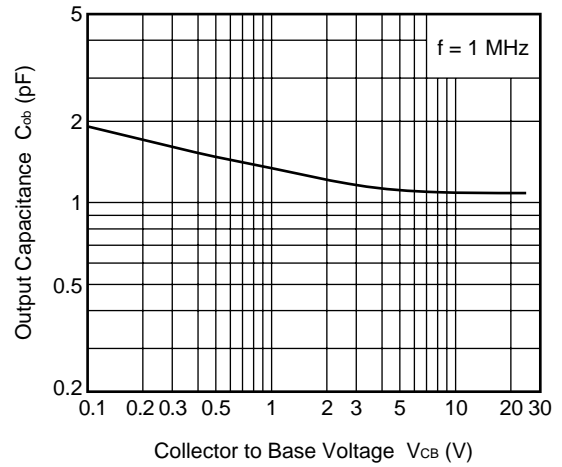
Rank	SH	SF	SE
Marking	SH	SF	SE
h <sub>FE</sub> Value	50 to 100	80 to 160	125 to 250

★ TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)

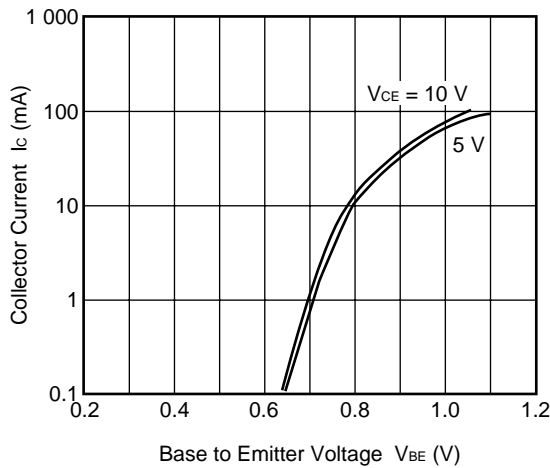
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



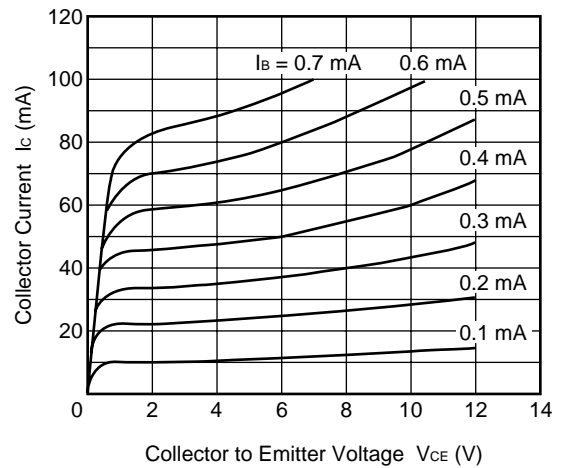
OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



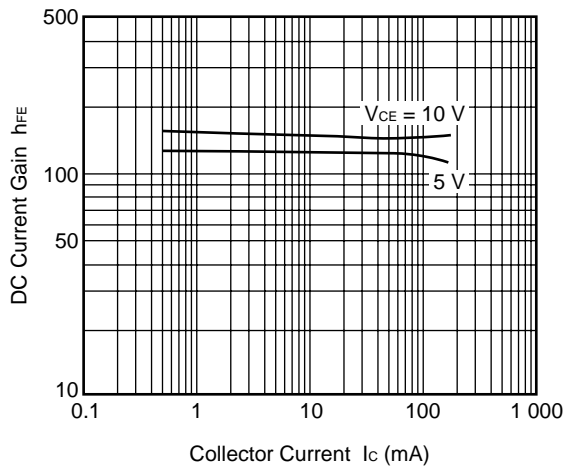
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



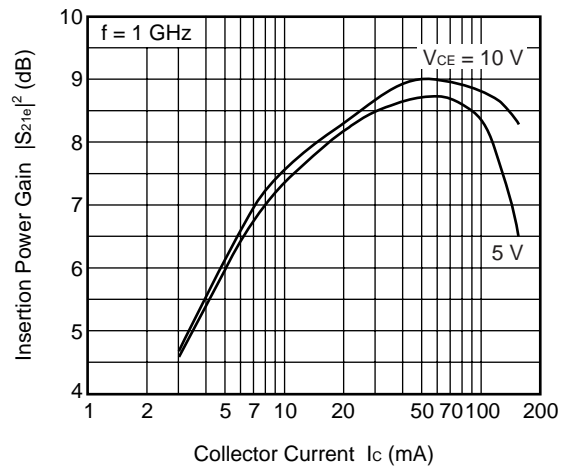
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



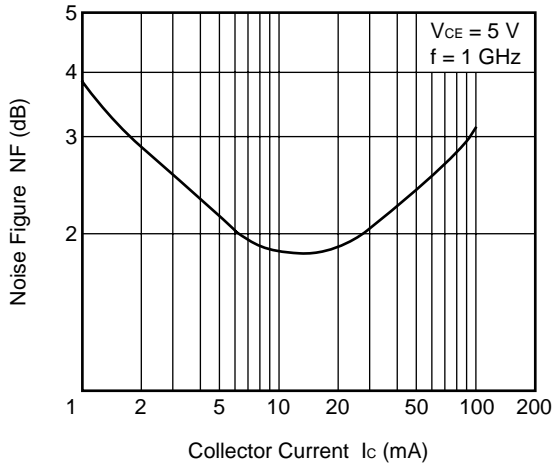
DC CURRENT GAIN vs. COLLECTOR CURRENT



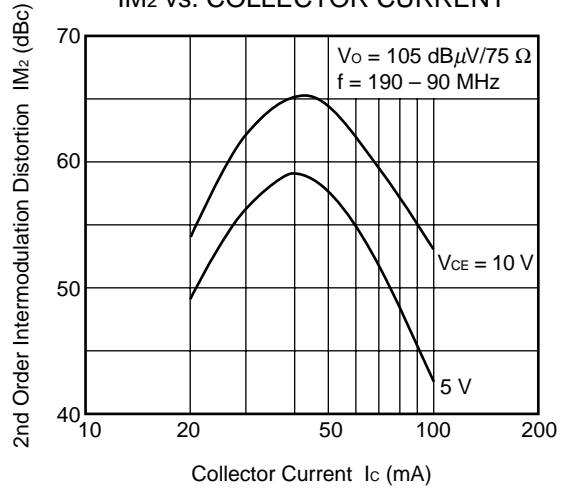
INSERTION POWER GAIN vs. COLLECTOR CURRENT



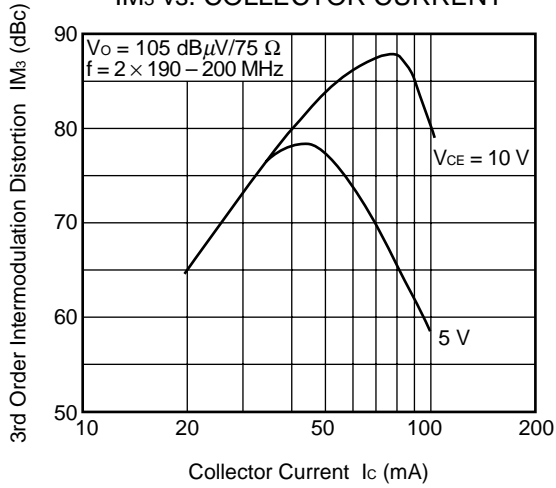
NOISE FIGURE vs. COLLECTOR CURRENT



IM<sub>2</sub> vs. COLLECTOR CURRENT



IM<sub>3</sub> vs. COLLECTOR CURRENT



**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS**

S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices Web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

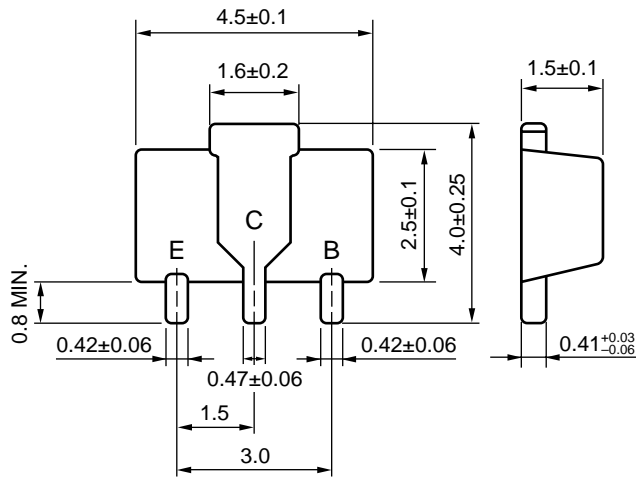
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL <http://www.csd-nec.com/>

★ PACKAGE DIMENSIONS

3-PIN POWER MINIMOLD (UNIT: mm)



**PIN CONNECTIONS**

- E : Emitter
- C : Collector (Fin)
- B : Base

(IEC : SOT-89)

- **The information in this document is current as of May, 2003. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
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