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# NPN SILICON RF TRANSISTOR

## NE85639 / 2SC4093

JEITA  
Part No.

### NPN EPITAXIAL SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW-NOISE AMPLIFICATION 4-PIN MINIMOLD

#### DESCRIPTION

The NE85639 / 2SC4093 is a NPN silicon epitaxial transistor designed for low noise amplifier at VHF, UHF and CATV band.

It has large dynamic range and good current characteristics, and is contained in a 4-pin minimold package which enables high-isolation gain.

#### FEATURES

- Low Noise  
NF = 1.1 dB TYP. @  $V_{CE} = 10\text{ V}$ ,  $I_C = 7\text{ mA}$ ,  $f = 1\text{ GHz}$
- High Power gain  
 $|S_{21e}|^2 = 13\text{ dB TYP. @ } V_{CE} = 10\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $f = 1\text{ GHz}$
- Maximum available power gain: MAG = 14.2 dB TYP. @  $V_{CE} = 10\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $f = 1\text{ GHz}$
- 4-pin minimold Package

#### ★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
NE85639-A 2SC4093-A	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 3 (Base), Pin 4 (Emitter) face to perforation side of the tape
NE85639-T1-A 2SC4093-T1-A	3 kpcs/reel	

**Remark** To order evaluation samples, contact your nearby sales office.  
The unit sample quantity is 50 pcs.

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	20	V
Collector to Emitter Voltage	$V_{CEO}$	12	V
Emitter to Base Voltage	$V_{EBO}$	3.0	V
Collector Current	$I_C$	100	mA
Total Power Dissipation	$P_{tot}$ <sup>Note</sup>	200	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**Note** Free air

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

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**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> = 10 V, I <sub>E</sub> = 0 mA	–	–	1.0	μA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 mA	–	–	1.0	μA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA	50	120	250	–
RF Characteristics						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA	–	7.0	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA, f = 1.0 GHz	11	13	–	dB
Noise Figure	NF	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 7 mA, f = 1.0 GHz	–	1.1	2.0	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 mA, f = 1.0 MHz	–	0.6	0.95	pF

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

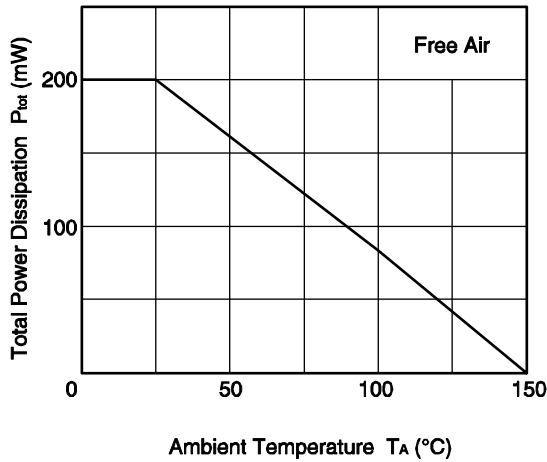
**h<sub>FE</sub> CLASSIFICATION**

Rank	R26/RBF <sup>Note</sup>	R27/RBG <sup>Note</sup>	R28/RBH <sup>Note</sup>
Marking	R26	R27	R28
Range	50 to 100	80 to 160	125 to 250

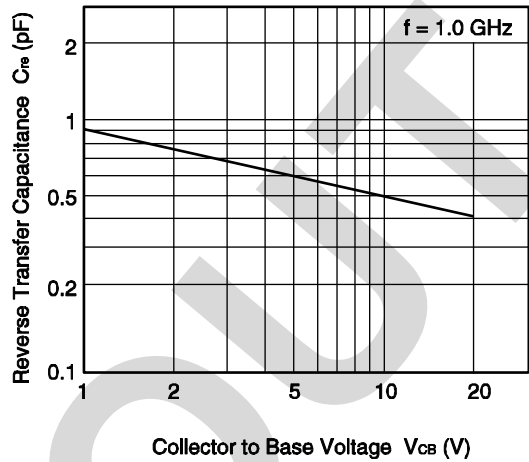
**Note** Old Specification / New Specification

TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)

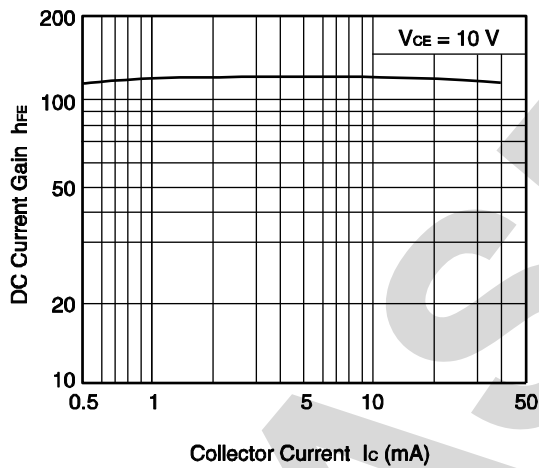
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



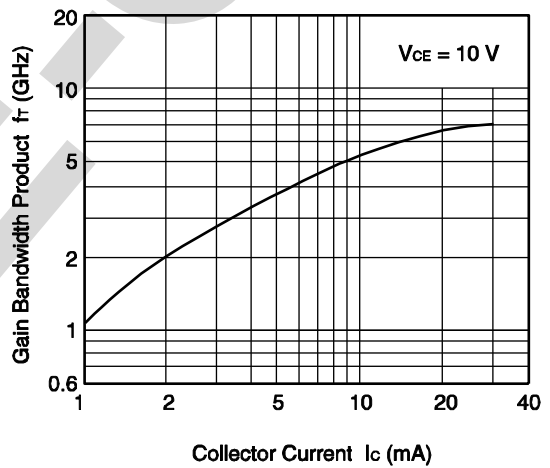
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



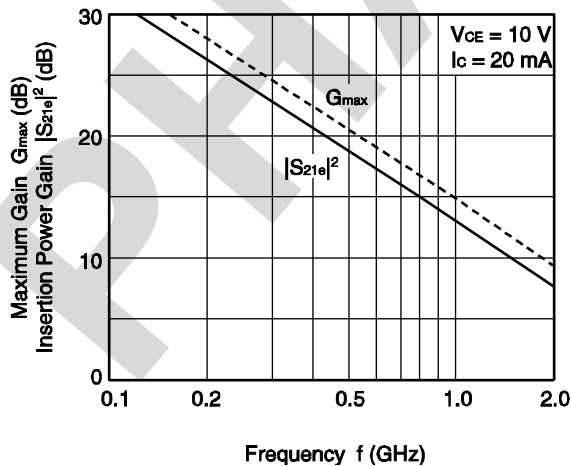
DC CURRENT GAIN vs. COLLECTOR CURRENT



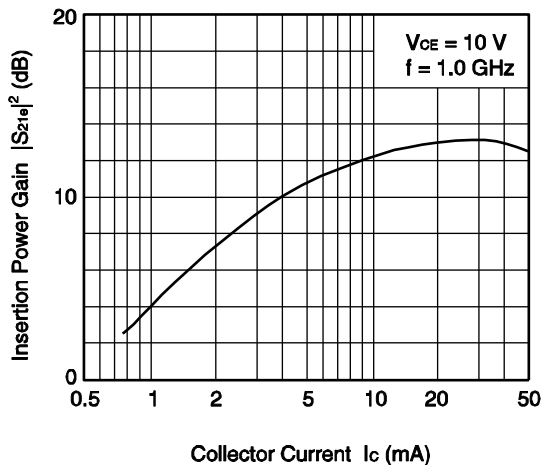
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



MAXIMUM GAIN/INSERTION POWER GAIN vs. FREQUENCY

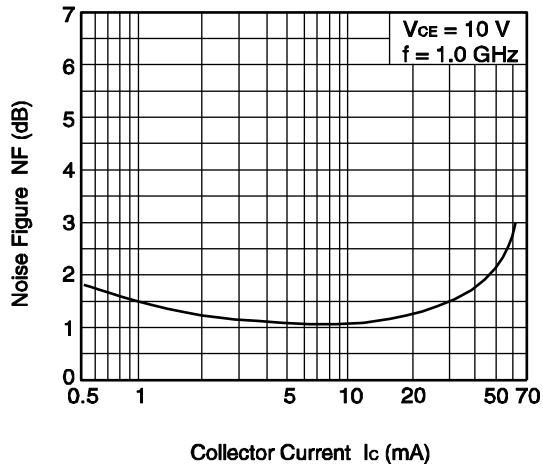


INSERTION POWER GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

**NOISE FIGURE vs.  
COLLECTOR CURRENT**



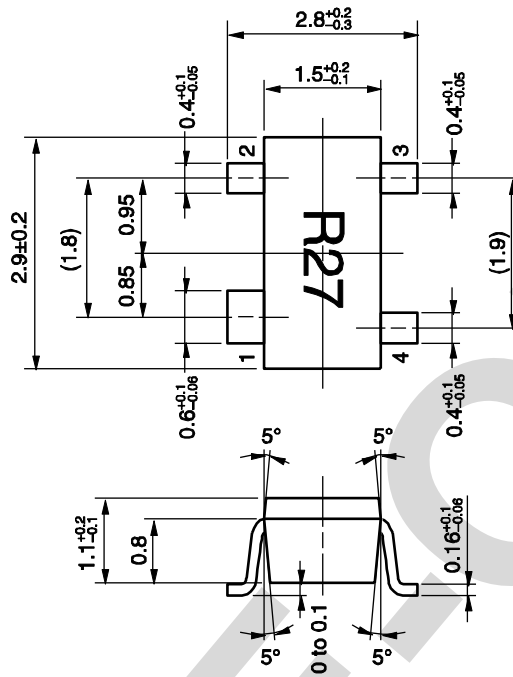
**Remark** The graph indicates nominal characteristics.

★ **S-PARAMETERS**

- S-parameters and noise parameters are provided on our Web site in a format (S2P) that enables the direct import of the parameters to microwave circuit simulators without the need for keyboard inputs.
- Click here to download S-parameters.
- [RF and Microwave] ® [Device Parameters]
- URL <http://www.necel.com/microwave/en/>

★ PACKAGE DIMENSIONS

4-PIN MINIMOLD PACKAGE (UNIT: mm)



**PIN CONNECTIONS**

- 1. Collector
- 2. Emitter
- 3. Base
- 4. Emitter



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