

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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MICROWAVE LOW NOISE AMPLIFIER  
NPN SILICON EPITAXIAL TRANSISTOR  
4 PINS MINI MOLD

DESCRIPTION

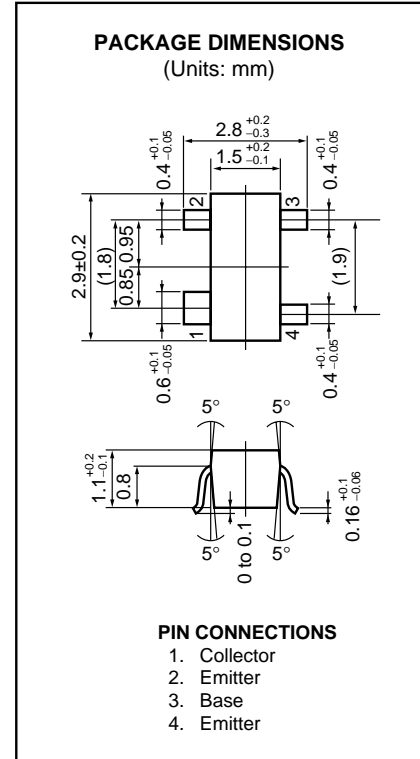
The 2SC4095 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. 2SC4095 features excellent power gain with very low-noise figures. 2SC4095 employs direct nitride passivated base surface process (DNP process) which is an NEC proprietary new fabrication technique which provides excellent noise figures at high current values. This allows excellent associated gain and very wide dynamic range.

FEATURES

- NF = 1.8 dB TYP. @ f = 2.0 GHz, V<sub>CE</sub> = 6 V, I<sub>c</sub> = 5 mA
- |S<sub>21e</sub>|<sup>2</sup> = 9.5 dB TYP. @ f = 2.0 GHz, V<sub>CE</sub> = 6 V, I<sub>c</sub> = 10 mA

ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)

Collector to Base Voltage	V <sub>CBO</sub>	20	V
Collector to Emitter Voltage	V <sub>CEO</sub>	10	V
Emitter to Base Voltage	V <sub>EBO</sub>	1.5	V
Collector Current	I <sub>c</sub>	35	mA
Total Power Dissipation	P <sub>T</sub>	200	mW
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C



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

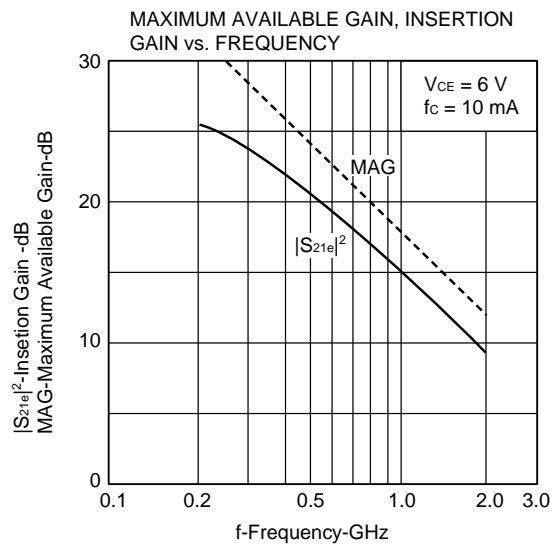
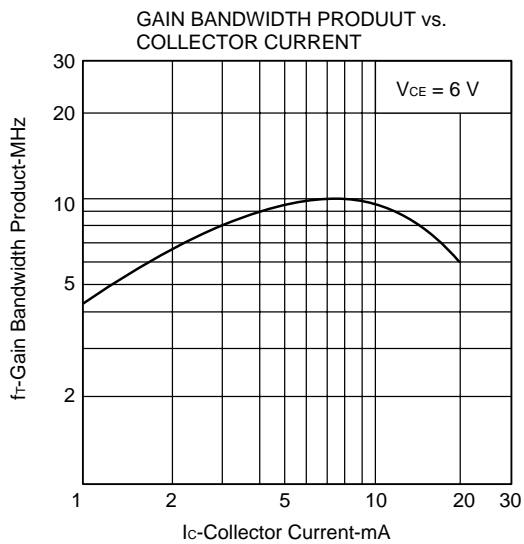
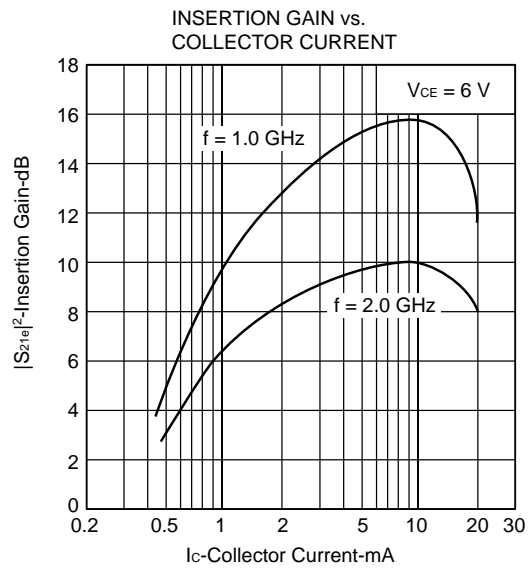
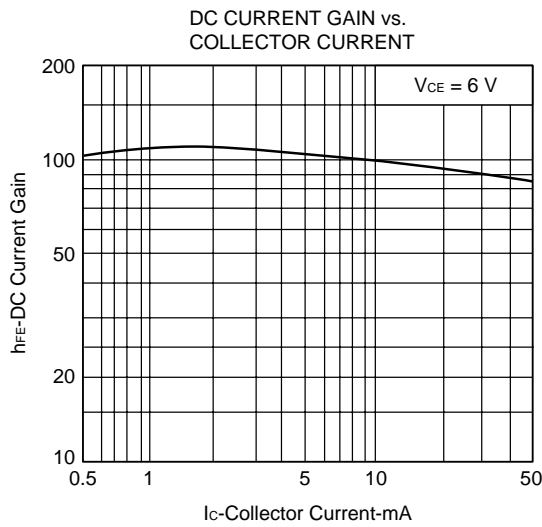
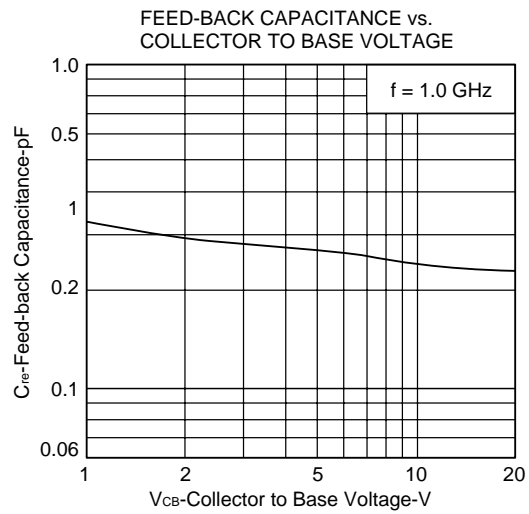
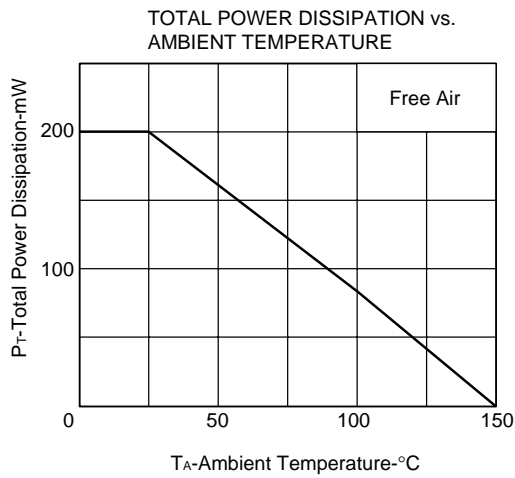
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I <sub>CBO</sub>			1.0	μA	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EBO</sub>			1.0	μA	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0
DC Current Gain	h <sub>FE</sub>	50	100	250		V <sub>CE</sub> = 6 V, I <sub>C</sub> = 10 mA
Gain Bandwidth Product	f <sub>T</sub>		10		GHz	V <sub>CE</sub> = 6 V, I <sub>C</sub> = 10 mA, f = 1.0 GHz
Feed-Back Capacitance	C <sub>re</sub>		0.25	0.8	pF	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1.0 MHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	7.5	9.5		dB	V <sub>CE</sub> = 6 V, I <sub>C</sub> = 10 mA, f = 2.0 GHz
Maximum Available Gain	MAG		12		dB	V <sub>CE</sub> = 6 V, I <sub>C</sub> = 10 mA, f = 2.0 GHz
Noise Figure	NF		1.8	3.0	dB	V <sub>CE</sub> = 6 V, I <sub>C</sub> = 5 mA, f = 2.0 GHz

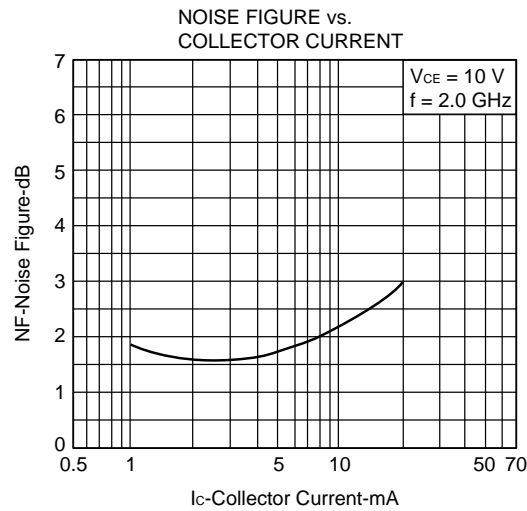
h<sub>FE</sub> Classification

Class	R46/RDF *	R47/RDG *	R48/RDH *
Marking	R46	R47	R48
h <sub>FE</sub>	50 to 100	80 to 160	125 to 250

\* Old Specification / New Specification

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





**S-PARAMETER**

$V_{CE} = 6.0\text{ V}$ ,  $I_c = 3.0\text{ mA}$ ,  $Z_o = 50\ \Omega$

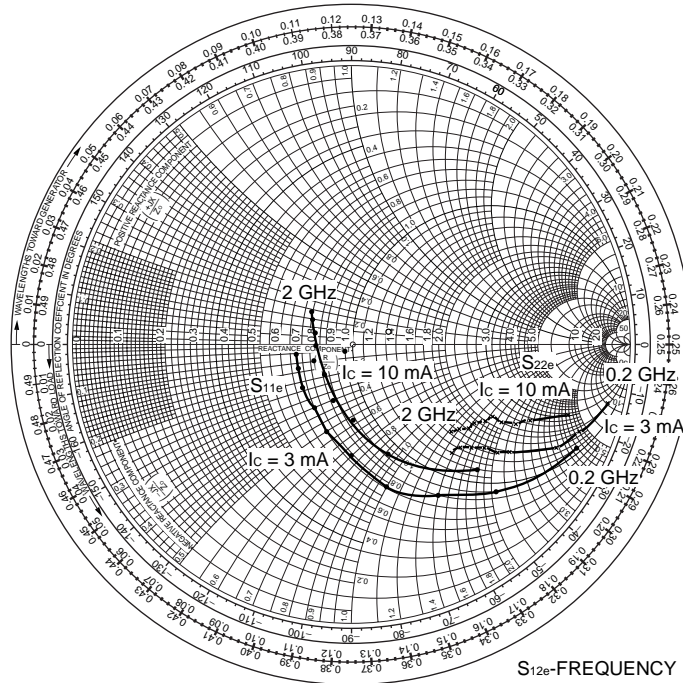
f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.870	-24.2	9.193	155.6	0.031	53.6	0.946	-12.8
400	0.747	-44.6	7.780	136.6	0.040	66.2	0.876	-20.7
600	0.628	-59.8	7.058	122.1	0.064	54.7	0.816	-26.4
800	0.516	-75.1	5.675	109.4	0.066	56.0	0.743	-30.9
1000	0.400	-87.7	5.180	99.6	0.090	49.4	0.689	-33.0
1200	0.327	-103.4	4.269	89.8	0.084	47.9	0.654	-35.7
1400	0.262	-118.7	3.950	81.7	0.106	48.5	0.604	-37.7
1600	0.231	-135.5	3.406	74.0	0.105	42.1	0.581	-41.5
1800	0.205	-155.3	3.290	66.4	0.126	46.4	0.548	-43.9
2000	0.196	-170.6	2.867	60.8	0.124	40.9	0.529	-47.1

$V_{CE} 6.0\text{ V}$ ,  $I_c = 10.0\text{ mA}$ ,  $Z_o = 50\ \Omega$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.671	-43.5	18.685	137.9	0.023	52.1	0.832	-19.0
400	0.458	-68.7	12.702	115.2	0.029	62.2	0.710	-23.9
600	0.319	-83.7	9.895	102.8	0.046	54.4	0.649	-26.0
800	.0239	-101.9	7.275	92.3	0.049	63.1	0.600	-27.5
1000	0.172	-119.3	6.261	85.1	0.067	58.6	0.578	-28.4
1200	0.149	-141.4	5.038	77.4	0.070	57.9	0.559	-30.3
1400	0.131	-163.0	4.597	71.0	0.088	56.1	0.527	-32.5
1600	0.132	179.6	3.927	64.8	0.094	54.0	0.514	-35.7
1800	0.150	160.0	3.743	58.8	0.113	55.3	0.494	-38.1
2000	0.163	150.1	3.233	54.5	0.115	50.0	0.478	-41.6

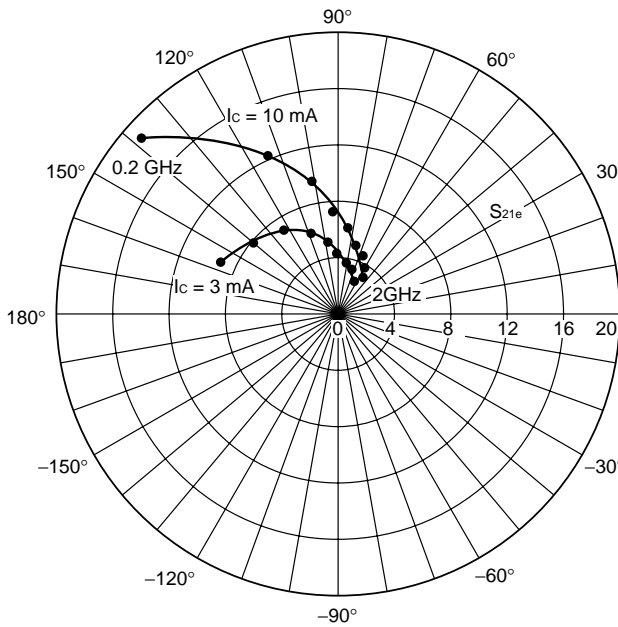
S-PARAMETER

S<sub>11e</sub>, S<sub>22e</sub>-FREQUENCY CONDITION V<sub>CE</sub> = 6 V, I<sub>c</sub> = 10/3 mA, freq. = 0.2 to 2 GHz (Step 200 MHz)



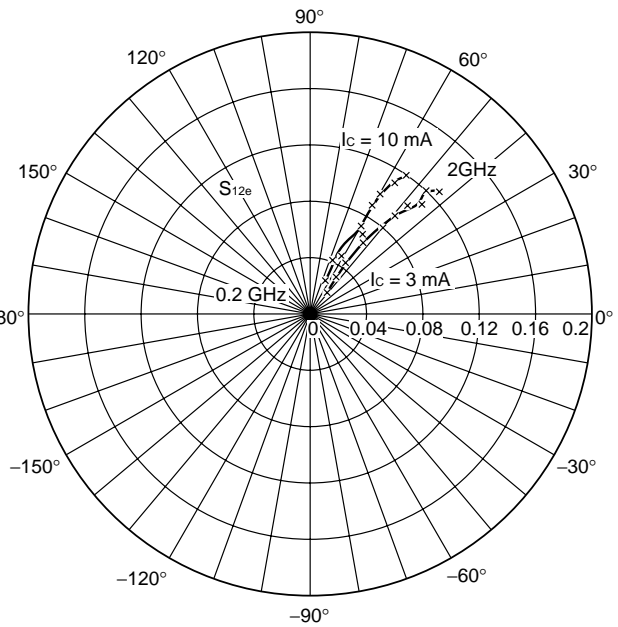
S<sub>21e</sub>-FREQUENCY

CONDITION V<sub>CE</sub> = 6 V  
I<sub>c</sub> = 10/3 mA  
freq. = 0.2 to 2 GHz (Step 200 MHz)



S<sub>12e</sub>-FREQUENCY

CONDITION V<sub>CE</sub> = 6 V  
I<sub>c</sub> = 10/3 mA  
freq. = 0.2 to 2 GHz (Step 200 MHz)



**RECOMMENDED SOLDERING CONDITIONS**

The following conditions (see table below) must be met then soldering this product. Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different contions.

**TYPES OF SURFACE MOUNT DEVICE**

For more details, refer to our document "SMT MANUAL" (IEI-1207).

2SC4095

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature: 230 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 1, Exposure limit*: None	IR30-00-1
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 1, Exposure limit*: None	VP15-00-1
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below, Number of reflow process: 1, Exposure limit*: None	WS60-00-1
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 3 seconds or below, Exposure limit*: None	○

\*: Exposure limit before soldering after dry-pack package is opened.

Storage conditions: 25 °C and relative humidity at 65 % or less.

**Note:** Do not apply more than a single process at once, except for "Partial heating method".

[MEMO]



[MEMO]

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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.