

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

DESCRIPTION

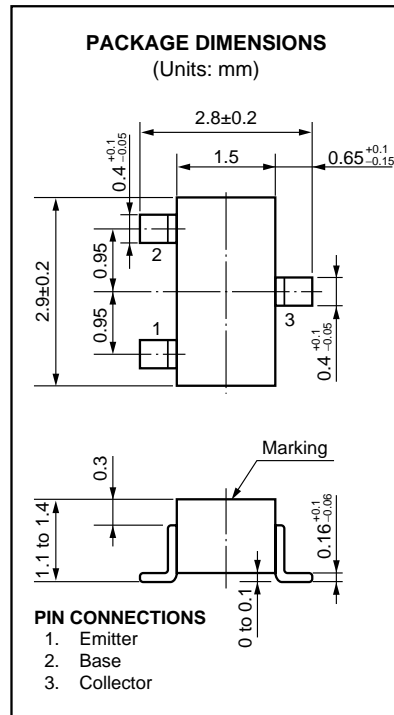
The 2SC3583 is an NPN epitaxial silicon transistor designed for use in low-noise and small signal amplifiers from VHF band to UHF band. Low-noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This is achieved by direct nitride passivated base surface process (DNP process) which is an NEC proprietary new fabrication technique.

FEATURES

- NF 1.2 dB TYP. @f = 1.0 GHz
- Ga 13 dB TYP. @f = 1.0 GHz

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

Collector to Base Voltage	V <sub>CB0</sub>	20	V
Collector to Emitter Voltage	V <sub>CE0</sub>	10	V
Emitter to Base Voltage	V <sub>EB0</sub>	1.5	V
Collector Current	I <sub>C</sub>	65	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>CB0</sub>			1.0	μA	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EB0</sub>			1.0	μA	V <sub>EB</sub> = 1 V, I <sub>E</sub> = 0
DC Current Gain	h <sub>FE</sub> *	50	100	250		V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA
Gain Bandwidth Product	f <sub>T</sub>		9		GHz	V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA
Feed-Back Capacitance	C <sub>re</sub> **		0.35	0.9	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>	11	13		dB	V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA, f = 1.0 GHz
Maximum Available Gain	MAG		15		dB	V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA, f = 1.0 GHz
Noise Figure	NF		1.2	2.5	dB	V <sub>CE</sub> = 8 V, I <sub>E</sub> = 7 mA, f = 1.0 GHz

\* Pulse Measurement PW ≤ 350 μs, Duty Cycle ≤ 2 %

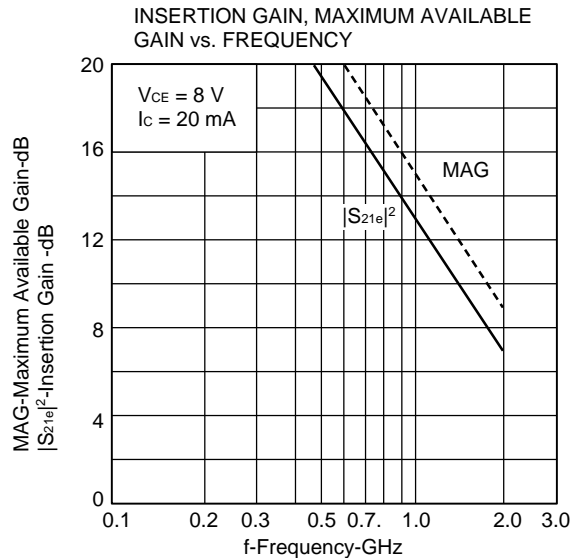
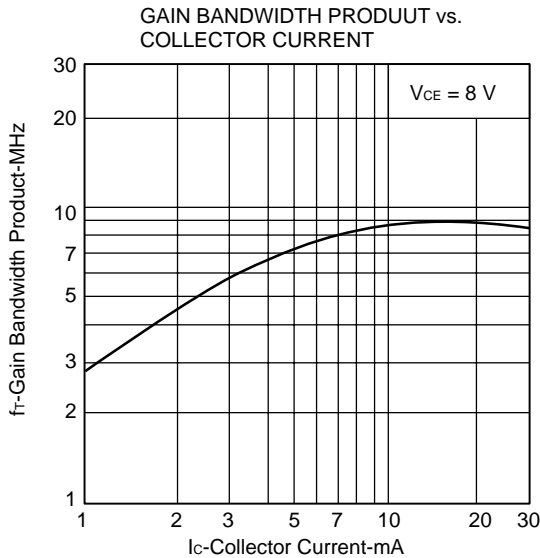
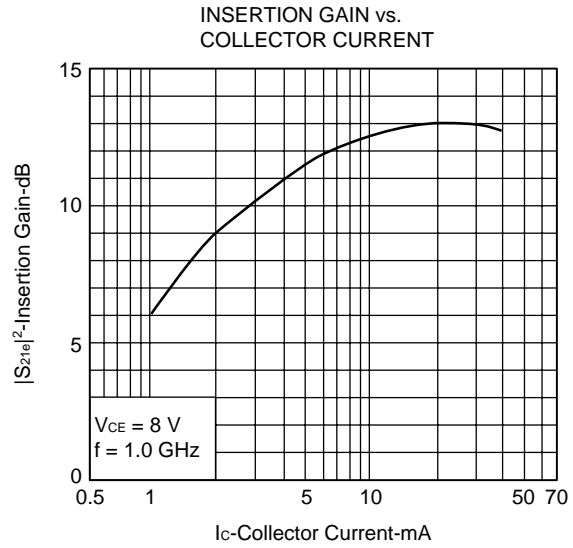
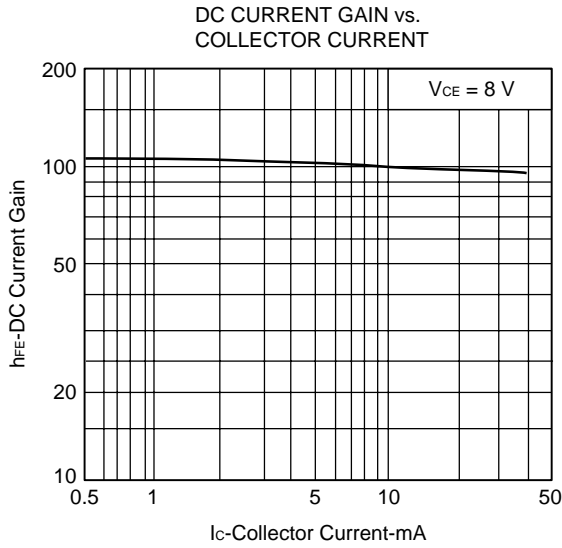
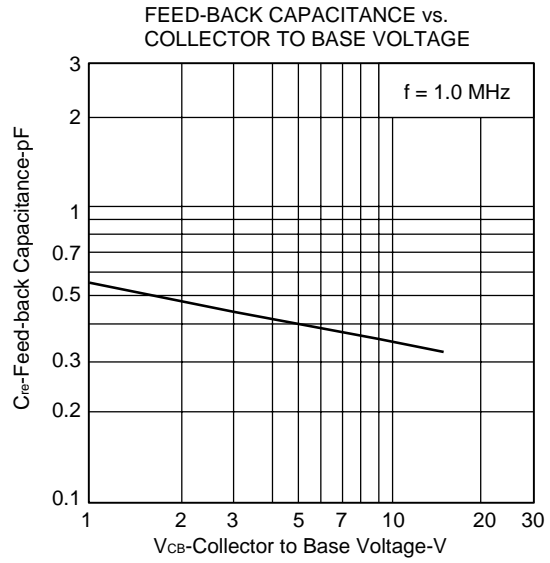
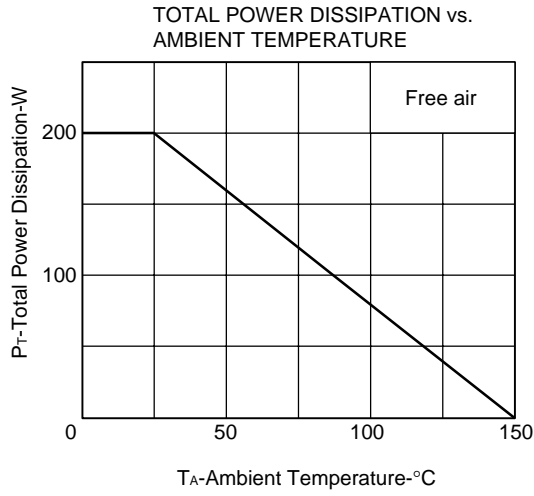
\*\* The emitter terminal and the case shall be connected to the ground terminal of the three-terminal capacitance bridge.

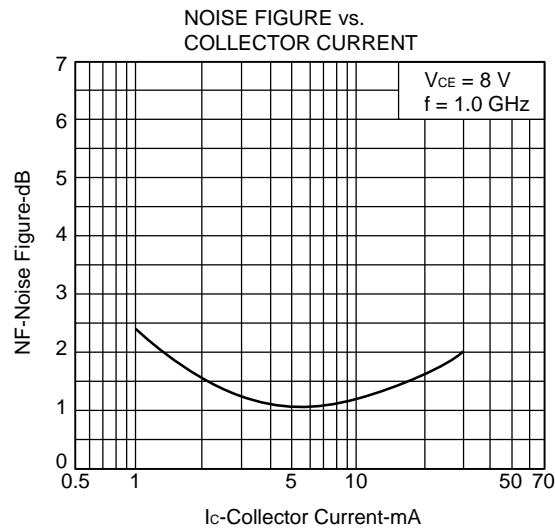
h<sub>FE</sub> Classification

Class	R33/Q *	R34/R *	R35/S *
Marking	R33	R34	R35
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**

$V_{CE} = 8.0\text{ V}$ ,  $I_c = 5.0\text{ mA}$ ,  $Z_o = 50\ \Omega$

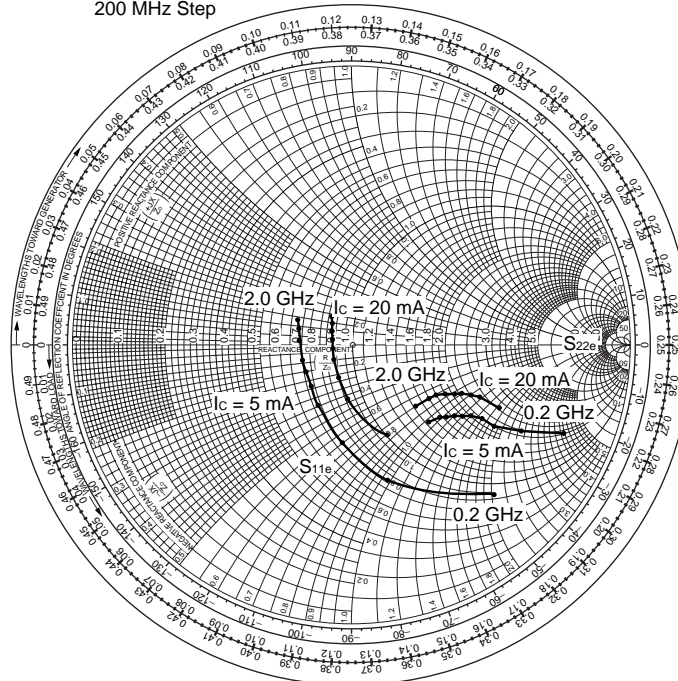
f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.728	-45.3	12.107	138.7	0.036	66.2	0.825	-21.6
400	0.490	-74.5	8.097	114.2	0.065	61.6	0.675	-26.6
600	0.343	-93.2	6.260	102.3	0.079	61.6	0.582	-29.0
800	0.253	-110.1	4.623	90.1	0.090	61.2	0.529	-28.6
1000	0.202	-131.1	4.004	83.6	0.101	61.3	0.500	-30.1
1200	0.176	-148.9	3.250	75.8	0.125	60.8	0.470	-31.4
1400	0.176	-162.8	3.021	69.4	0.144	60.0	0.448	-33.4
1600	0.179	173.9	2.575	63.4	0.160	59.8	0.427	-34.8
1800	0.186	163.3	2.520	58.9	0.188	59.1	0.406	-37.5
2000	0.211	151.1	2.183	53.4	0.202	58.9	0.386	-44.5

$V_{CE} = 8.0\text{ V}$ ,  $I_c = 20\text{ mA}$ ,  $Z_o = 50\ \Omega$

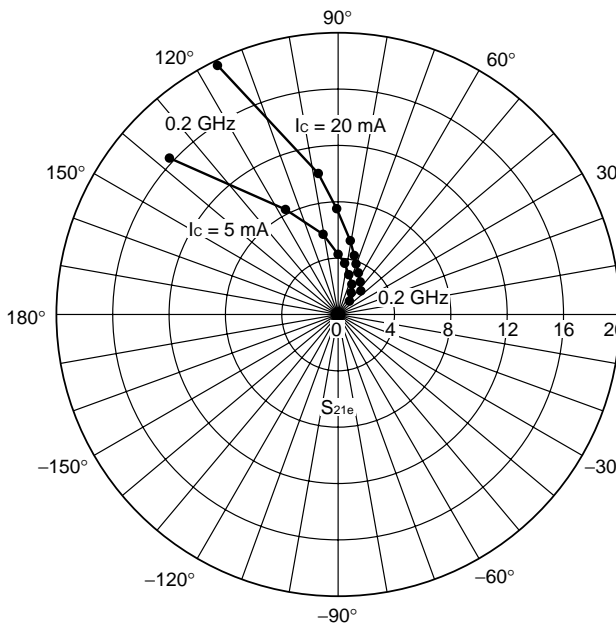
f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.366	-66.8	19.757	116.9	0.033	62.6	0.587	-22.5
400	0.194	-88.9	10.502	98.8	0.055	70.6	0.485	-23.8
600	0.124	-104.3	7.591	91.1	0.072	74.6	0.453	-24.3
800	0.077	-132.0	5.446	82.0	0.095	73.2	0.419	-23.2
1000	0.063	-156.4	4.653	77.6	0.107	72.1	0.413	-24.2
1200	0.065	179.5	3.754	71.6	0.135	72.1	0.392	-26.4
1400	0.074	168.0	3.460	66.5	0.164	70.1	0.369	-29.9
1600	0.108	147.0	2.934	61.9	0.178	69.6	0.347	-32.2
1800	0.116	137.6	2.870	58.2	0.205	66.3	0.333	-34.3
2000	0.134	131.2	2.479	53.4	0.221	64.0	0.312	-42.1

S-PARAMETER

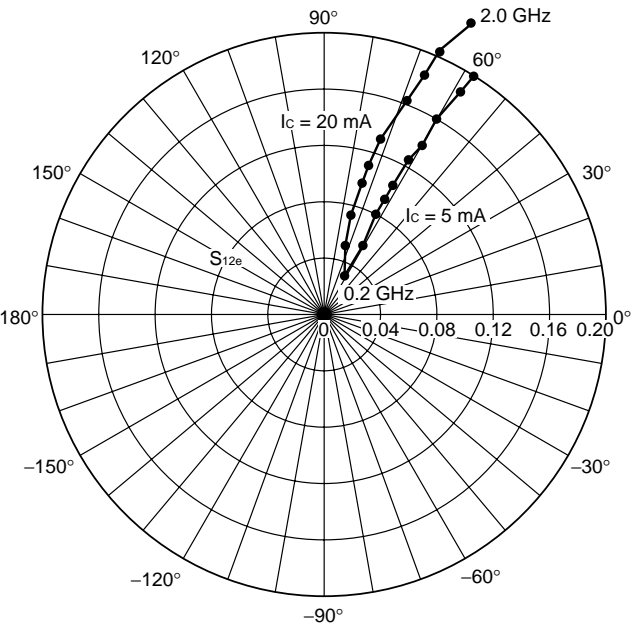
S<sub>11e</sub>, S<sub>22e</sub>-FREQUENCY CONDITION V<sub>CE</sub> = 8 V  
200 MHz Step



S<sub>21e</sub>-FREQUENCY CONDITION V<sub>CE</sub> = 8 V



S<sub>12e</sub>-FREQUENCY CONDITION V<sub>CE</sub> = 8 V



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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.

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Anti-radioactive design is not implemented in this product.